



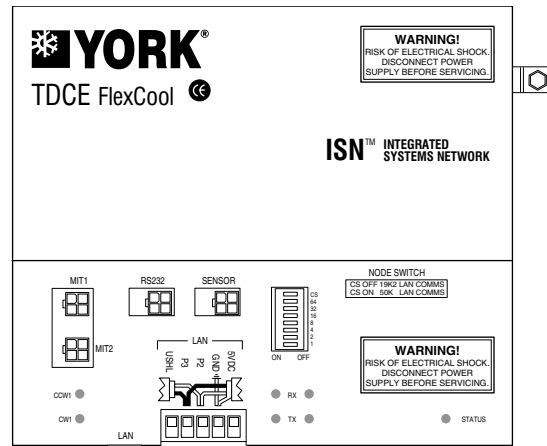
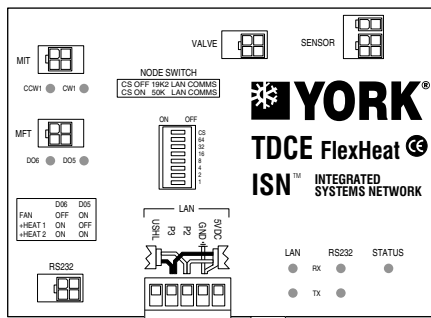
FlexHeat and FlexCool Controllers FlexSys Underfloor System

USER GUIDE

Supersedes 450.20-NOM2 (703)

Form 450.20-NOM2 (1103)

FlexHeat FlexCool



IMPORTANT!

READ BEFORE PROCEEDING!

GENERAL SAFETY GUIDELINES

During installation, operation, maintenance or service, individuals may be exposed to certain components or conditions including, but not limited to, refrigerants, oils, materials under pressure, rotating components, and both high and low voltage. Each of these items has the potential, if misused or handled improperly, to cause bodily injury or death. It is the obligation and responsibility of operating/service personnel to identify and recognize these inherent hazards, protect themselves, and proceed safely in completing their tasks. Failure to comply with any of these requirements could result in serious damage to the equipment and the property in which it is situated, as well as severe personal injury or death to themselves and people at the site.

This document is intended for use by owner-authorized operating/service personnel. It is expected that this individual possesses independent training that will enable them to perform their assigned tasks properly and safely. It is essential that, prior to performing any task on this equipment, this individual shall have read and understood this document and any referenced materials. This individual shall also be familiar with and comply with all applicable governmental standards and regulations pertaining to the task in question.

SAFETY SYMBOLS

The following symbols are used in this document to alert the reader to areas of potential hazard:



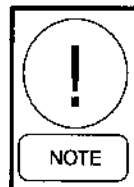
DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



CAUTION identifies a hazard which could lead to damage to the machine, damage to other equipment and/or environmental pollution. Usually an instruction will be given, together with a brief explanation.



WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



NOTE is used to highlight additional information which may be helpful to you.

CHANGEABILITY OF THIS DOCUMENT

In complying with YORK's policy for continuous product improvement, the information contained in this document is subject to change without notice. While YORK makes no commitment to update or provide current information automatically to the manual owner, that information, if applicable, can be obtained by contacting the nearest YORK Sales, Service and Authorized Distributor offices.

It is the responsibility of operating/service personnel as to the applicability of these documents. If there is any question in the mind of operating/service personnel as to the applicability of these documents, then, prior to working on the equipment, they should verify with the owner whether the equipment has been modified and if current documentation is available.

SUMMARY OF CHANGES

- 902 Original Release
- 703 Added requirement for common ground/earth between MFT and FlexHeat (page 21)
Corrected part numbers (Appendix).
- 1103 Added PAP-F (page 8, 17) and Conduit Box information (page 18, 19).
Changed Fig 4 to reflect socket labels as viewed from connection joint instead of wire end.
Added associated part numbers (Appendix).

REFERENCE INSTRUCTIONS

DESCRIPTION	FORM NO.
FlexCool Controller Specifications	450.20-S31
FlexHeat Controller Specifications	450.20-S28
Schematics for FlexHeat/FlexCool Controllers and MIT Underfloor Air Applications	450.20-AD11
FlexFloor Specifications	450.20-S36
FlexFloor Users Guide	450.20-NOM3
Conduit Installation	450.20-N30

TABLE OF CONTENTS

- GENERAL SAFETY GUIDELINES 2
- SAFETY SYMBOLS 2
- SUMMARY OF CHANGES 3
- REFERENCE INSTRUCTIONS 3
- SECTION 1 – GENERAL INFORMATION 7
 - Overview..... 7
 - Integrated System Network 7
 - Setup 7
 - Components 8
 - Zone Sensor 9
 - Communications 10
- SECTION 2 – NETWORK TOPOLOGY 11
 - General..... 11
 - Communication Method..... 11
 - Background vs. Foreground Communications 13
 - Speed of Communications 13
 - Summary of ISN Network Restrictions 13
- SECTION 3 – INSTALLATION 15
 - Installation Guidelines 15
 - Environment..... 15
 - Electrical 15
 - Electrical Noise 15
 - Ground/Earth 15
 - Cable Specifications 16
 - Power Cables 16
 - FlexSys Modular Cables..... 16
 - FlexCool Controller 18
 - Line Voltage Power Supply 18
 - MIT Box Connection 20
 - Additional FlexCool Connections..... 20
 - FlexHeat Controller 21
 - MFT Box Connection 22
 - Hot Water Valve 22
 - Additional Sensor..... 22
 - Zone Sensor 24
 - Zone Sensor Connection 24
 - RS232 Port 24
 - RS232 Connection to the Zone Sensor 24
 - LAN Communications 25
 - Network Communications..... 26

TABLE OF CONTENTS (CONTINUED)

SECTION 4 – OPERATION.....	27
Introduction.....	27
Tools	27
RS232 Device and Software.....	27
Connection.....	28
Setting the Node Switch for Network Use	28
Network Transfer Rate	29
ISN PalmPort Interface	29
Starting the Application.....	30
Menu Screen	30
Network.....	30
Logon.....	31
Keypad Screen	31
Auto Update.....	32
Using the Software	32
Menu Field Example	33
Value Field Example	33
Password Field Example	33
Application Notes.....	34
Summary Report.....	34
Local Setup Report.....	35
Calibration Reports	36
Network Command Report.....	38
Transfer Out Report	39
Reset Report.....	40
Calculation Theory.....	41
MIT Damper Actuation.....	41
Stages of Heat	41
MFT Heater Actuation	42
SECTION 5 – MAINTENANCE	43
LEDs.....	43
STATUS LED	43
Communication LEDs.....	43
Output LEDs	43
APPENDIX	45
FlexCool Specifications	45
FlexHeat Specifications	46

LIST OF FIGURES

Figure 1. FlexCool Controller8

Figure 2. FlexHeat Controller9

Figure 3. Typical Network Configurations12

Figure 4. Modular PAP Cables17

Figure 5. DIN Rail Clip Attachment18

Figure 6. Power Supply Connector.....19

Figure 7. FlexCool Controller Connections19

Figure 8. Typical FlexCool Configuration.....20

Figure 9. FlexHeat Controller Connections21

Figure 10. Typical FlexHeat Network.....23

Figure 11. FlexHeat Network Cables and Connectors24

Figure 12. Zone Sensor.....25

Figure 13. Zone Sensor Connections.....25

Figure 14. LAN Port Wiring Details26

Figure 15. PDA Connection.....27

Figure 16. Node Switch Usage.....29

Figure 17. Menu Screen.....30

Figure 18. Network Screen.....30

Figure 19. Logon Screen.....31

Figure 20. Keypad Screen.....31

Figure 21. Modular Valve Change Points41

Figure 22. Stage Heat Change Points.....41

LIST OF TABLES

Table 1 – Passwords.....31

Table 2 – Button Functions32

Table 3 – Summary Report (Section 01)34

Table 4 – Local Setup Report (Section 02).....35

Table 5 – Calibration Report (Section 03).....36

Table 6 – Network Command Report (Section 04)38

Table 7 – Transfer Out Report (Section 05)39

Table 8 – Reset Report (Section 06)40

Table 9 – STATUS LED Codes43

Table 10 – Heating Stage LEDs44

SECTION 1

GENERAL INFORMATION

Overview

The FlexCool and FlexHeat controllers work in conjunction with the Modular Integrated Terminals (MIT) and Modular Fan Terminals (MFT) used in the FlexSys underfloor air system. The FlexCool controller operates with the MIT boxes, modulating the damper in response to the cooling demands of the zone. The FlexHeat controller operates through the MFT boxes for perimeter zones. The FlexHeat controller sequences the fan and heat functions in the MFT boxes and provides signals for control of the corresponding MIT boxes.

A remote zone sensor measures the temperature and returns the signal to the controller.

The FlexCool controller uses 115/230 VAC transformer and can operate up to 14 MIT boxes. The FlexHeat controller draws 24 VAC from the MFT box. Outputs to the box control the heat (water or 2-stage electric) and power the fan. While not powered directly from the controller, the FlexHeat controller provides a signal to the MFT which sends power to the MIT boxes for damper actuation.

The FlexCool and FlexHeat controllers can be placed at any location under the floor (in the cool air plenum) and cables routed to the various boxes and remote sensor.

Integrated System Network

The FlexCool and FlexHeat controllers expand on the capabilities of the FlexSys underfloor system by adding ISN network capabilities. The ISN network allows YORK products to communicate with one another. As a peer-to-peer network, each controller can be accessed from a single point on the network, allowing adjustments for many zones to be made from a single point.

The ISN network can be expanded as additional controllers are added for additional devices. A total of 92 subnetworks can be combined into a single network. Each subnetwork has a maximum of 91 controllers.

The full range of ISN control products (UDC, TDCE, FDC, etc.) is able to reside on a common network structure with full peer-to-peer communications. The network architecture supports a potential of 8372 con-

trollers, each one able to communicate to any number of other controllers on the common network and outside of the network system via a modem to remote facilities. This gives the potential for a high volume of “traffic” trying to access the network at any one time.

The network is “contention” based, which means information can only be transferred if the network is free of traffic. Each controller has the ability to access the network directly. If access to the network is denied, the controller immediately starts running an algorithm that controls the amount of time before attempting to re-send the message. In this way no message is ever lost due to the network being busy, although message delivery may be slowed.

The network architecture is designed to allow “fragmenting” of the overall structure into common groupings or subnetworks. Local messages remain contained within the subnetwork. Full network communications is then limited to only the data relevant to the other subnetworks, greatly reducing the network traffic.

The devices on an ISN network communicate using the RS485 protocol at either 19.2 or 50 kbaud.

Setup

To simplify the setup of the FlexCool and FlexHeat controllers, default setpoints and deadbands have been programmed into the software. If desired, these default values can be changed or simply viewed using a Personal Digital Assistant (PDA) such as a PalmPilot® operating a VT100 terminal emulation program. The YORK Controls Group has made available a version of this software specifically for interfacing with ISN equipment called ISN PalmPort. This gives full access to the ISN Feature-Section-Page software architecture.

To simplify the FlexCool and FlexHeat controllers further, reports have been preconfigured to allow access to monitor the system setpoints or change the setpoints, network transfers, etc. The PalmPort software provides a simple universal interface for fine tuning a application, even for those not well versed in the ISN programming commands.

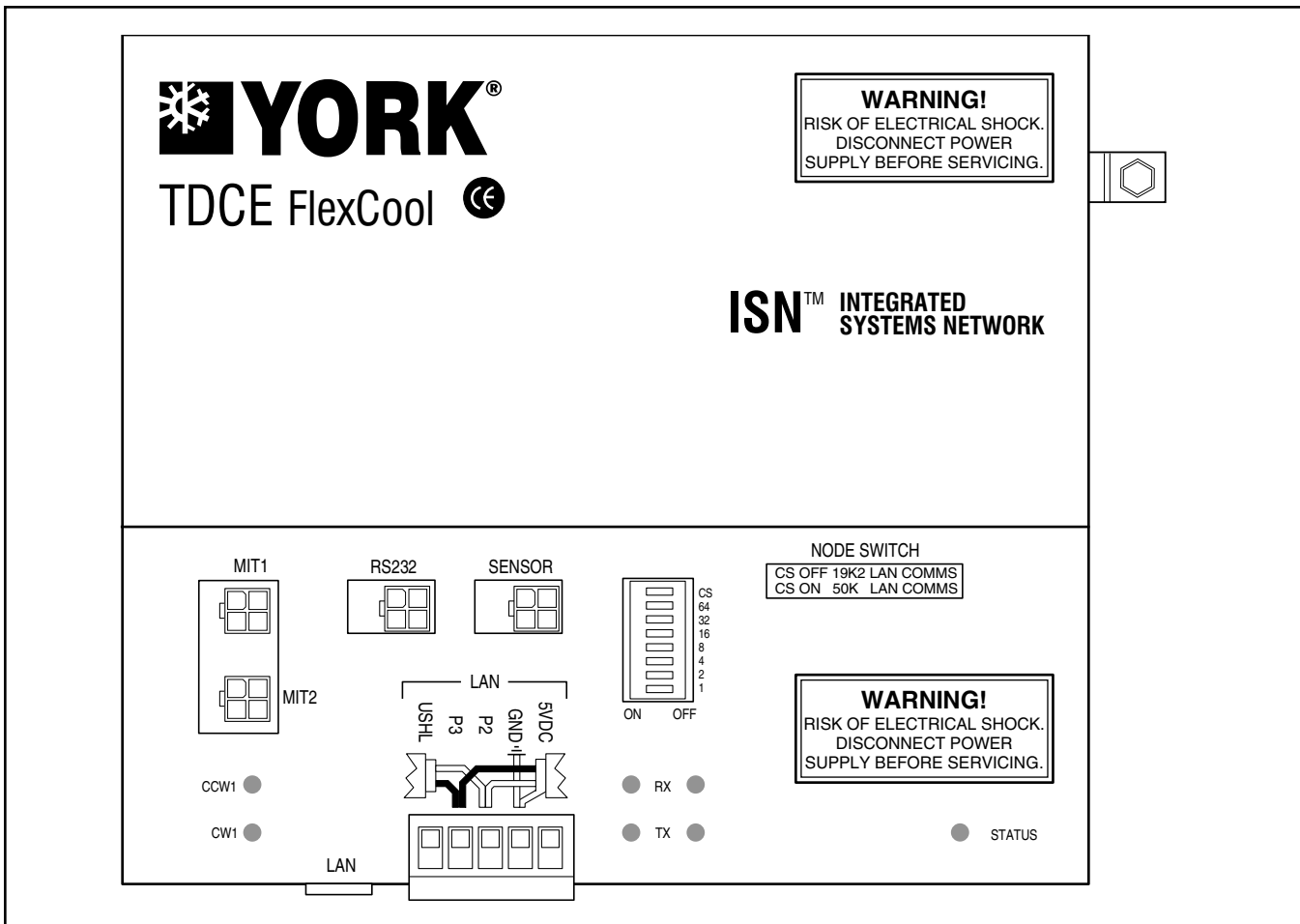


Figure 1. FlexCool Controller

Components

The FlexCool controller is a small footprint controller that operates from a 115/230 VAC line voltage power supply. The transformer converts power to 24 VAC for operation of the circuit board and MIT boxes.

Based on the TDCE controller, the input and output points are specifically adapted for use with the FlexSys system and the modular cabling used by previous versions of FlexSys controllers. This allows the same cables to be used. The cables consist of

PAP-A – 25 ft. (7.5 m) 4-conductor cable with a Molex plug at each end. This is used between the controller, MIT, and MFT boxes.

PAP-B – 50 ft. (15 m) 4-conductor cable with a Molex plug at one end. The other end has the individual conductors available for connection to screw terminals. This connects to the zone sensor for temperature input to the controller or data transfer through the RS232 port on the sensor. The Molex plug end attaches to the controller.

PAP-C – 50 ft. (15 m) 4-conductor cable with a Molex socket on one end and a Molex plug on the other end. This is used for extending the length between devices.

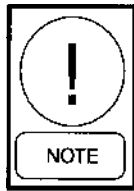
PAP-D – 25 ft. (7.5 m) 2-conductor cable with a Molex plug on one end for connection to the auxiliary sensor input on the FlexHeat. The other end has individual conductors available for connection to screw terminals.

PAP-E – 5 ft. (1.5 m) 4-conductor cable with a Molex plug at each end. This is used between the controller and an MFT box (shorter version of PAP-A).

PAP-F – 10 ft. (3 m) 4-conductor cable with a Molex plug at one end. The other end has the individual conductors available for connection to screw terminals (short version of PAP-B).

A node switch allows the controller software address and transfer speed to be configured. The switch is an 8-way DIP switch. The CS rocker specifies either 19.2 or 50 kbaud transfer rates on the ISN network.

The remainder of the rocker switches allow the user to specify the network address of the controller. The network address must be between 1 and 98.



NOTE: If not connected to a network, the node switch rockers may be ignored. For new installations, the recommended network transfer speed is 50 kbaud.

There are several LEDs to indicate the condition of the communications and operating status.

STATUS LED – The red LED indicates the current operating condition of the unit.

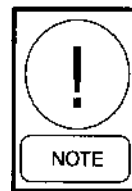
MIT LEDs – Two LEDs per MIT connector indicate the direction of rotation of the MIT box actuator. CCW1 indicates the damper is driving open (more cooling), CW1 indicates the damper is driving closed (less cooling).

MFT LEDs (FlexHeat only) – Two LEDs indicate the status of the outputs. This is an indication of the current heating stage.

Communication LEDs – Two LEDs for the LAN and two for the RS232 port indicate when data is transmitted (red) or received (green).

Zone Sensor

Input to the FlexCool and FlexHeat controllers is via a YORK zone sensor. The zone sensor includes a Type III thermistor (10 kOhm at 77° F), a 20 kOhm setpoint adjust, and an override button (Normally Open in parallel with the zone sensor) programmed to extend occupied hours if scheduling is used.



NOTE: Occupied and unoccupied states are only applicable if networked to a controller which uses a clock for time management. The FlexCool and FlexHeat do not contain a real time clock.

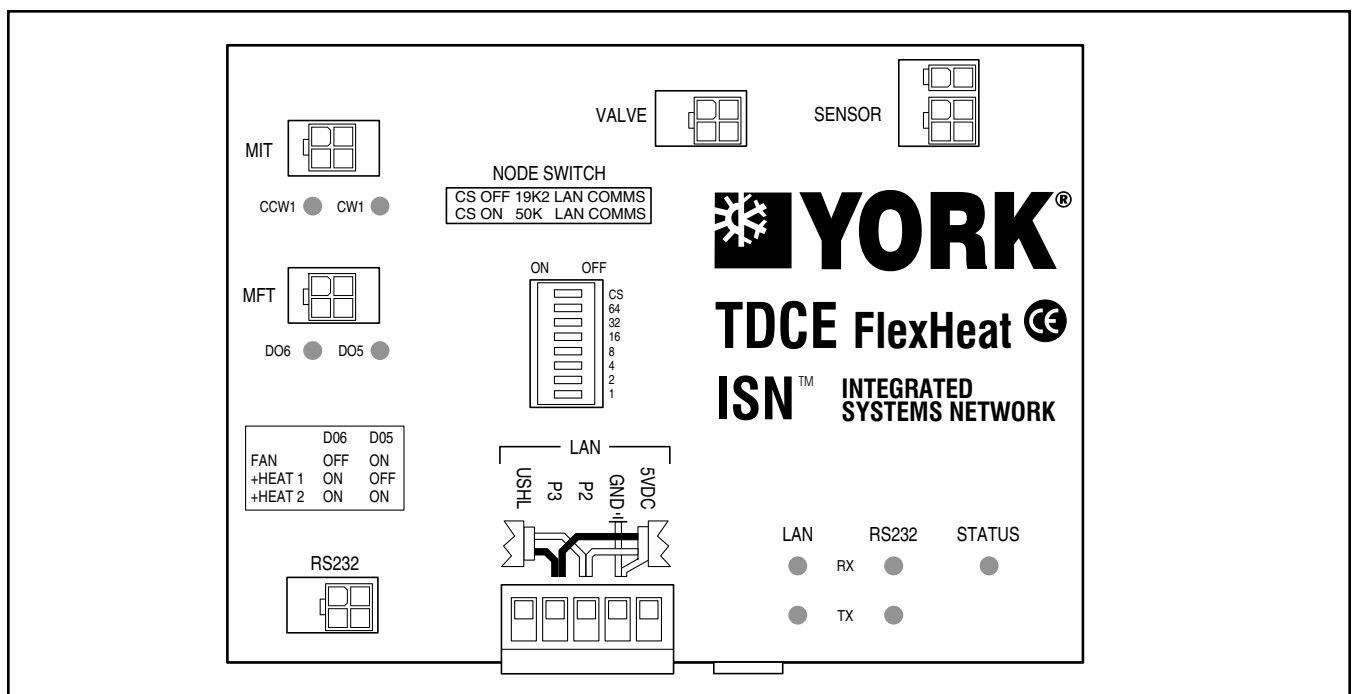


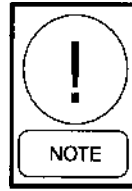
Figure 2. FlexHeat Controller

Communications

To aid the technician in setup, an RS232 port is included on the zone sensor. By connecting an RS232 device, such as a laptop computer or Portable Digital Assistant (PDA) to the RS232 port, access to the controller software can be obtained without having to remove any floor panels. If networked, multiple controllers can be configured or monitored from a single point.

Logging on via the user's password provides convenient access to data such as temperature, setpoints, occupied status, and damper position. A complete

start-up can be accomplished from this level, including sensor calibration, setpoint adjustment, damper synchronization, and tuning.



NOTE: Although any device with RS232 capabilities may be used to communicate with the controller, an interface has been created to interface with the Palm OS. YORK recommends using this interface, which can be obtained from the YORK Controls Group website.

SECTION 2

NETWORK TOPOLOGY

General

The FlexCool and FlexHeat controllers may be operated as single, stand-alone units controlling the MIT and MFT boxes. However, the controllers can be connected to other devices to form a Local Area Network (LAN). The LAN allows the transfer of data between controllers and other network devices. The entire building or complex may then be linked together to form a Building Automation System (BAS) or Building Management System (BMS).

The LAN may consist of a single, stand-alone network or have many subnetworks with additional devices.

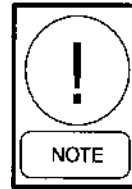
YORK's proprietary network protocol is the Integrated System Network (ISN). The ISN network is RS485, utilizing Ethernet principles and background and foreground communication levels.

All ISN controllers have the ability to communicate directly to all other ISN controllers or devices on a network or any subnetwork – this is known as “peer to peer” communications.

A variety of devices may be attached to the ISN network to enhance usability and functionality. Some of these devices are:

- Any type of ISN controller, such as UDC, IDC, TDCE, EDC, LDC, FDC, etc. The only stipulation is they must be operating at the same transfer rate (19.2 or 50 kbaud).
- The Universal LINC485 configured as a repeater amplifies the network signal to extend the physical length of a network or subnetwork cable. They also extend the number of ISN controllers by segmenting the network.
- The Universal LINC485 configured as a router separates subnetworks from the main network.
- The LINC Fiber Optics interfaces the ISN network with fibre optic cable.
- The LINC Guardian manages the remote transmission of multiple alarms from the ISN network.

- The Universal LINC232 allows communication to RS232 devices such as modems, serial printers, terminals or PC's.



NOTE: *The PC must be running a VT100 emulation program, YORK Icon Engineering Software (IcE) or YORK Facility Manager for Windows™ software.*

Physically, a twisted-pair (2-core) shielded cable is daisy-chained between the network devices.

Communication Method

The ISN network communicates on a “contention” basis. Every ISN controller on the network can transmit a message but only the designated receiving controller(s) act on the message. Each receiving controller sends a receipt back to the sending controller as acknowledgment of the transmission. A calculated checksum is used to verify the integrity of each message.

If no acknowledgment is received, the message is automatically retransmitted up to 3 times. After 3 attempts to communicate, the sending controller starts to increase the amount of time between transmissions. The time increases in intervals of 10 seconds, 15 seconds, 30 seconds, 1 minute, 15 minutes, 30 minutes and then 1 hour if unsuccessful. Retransmission of the message then occurs automatically every hour until receipt is acknowledged.

If an external device is connected to Port 2 (RS232), such as a modem through the Universal LINC232, the retransmission interval between failed communications changes from 1 minute to 15 minutes to 30 minutes to 1 hour, 2 hours, 4 hours and then 6 hours. Retransmission of the message then automatically occurs every 6 hours until receipt is acknowledged.

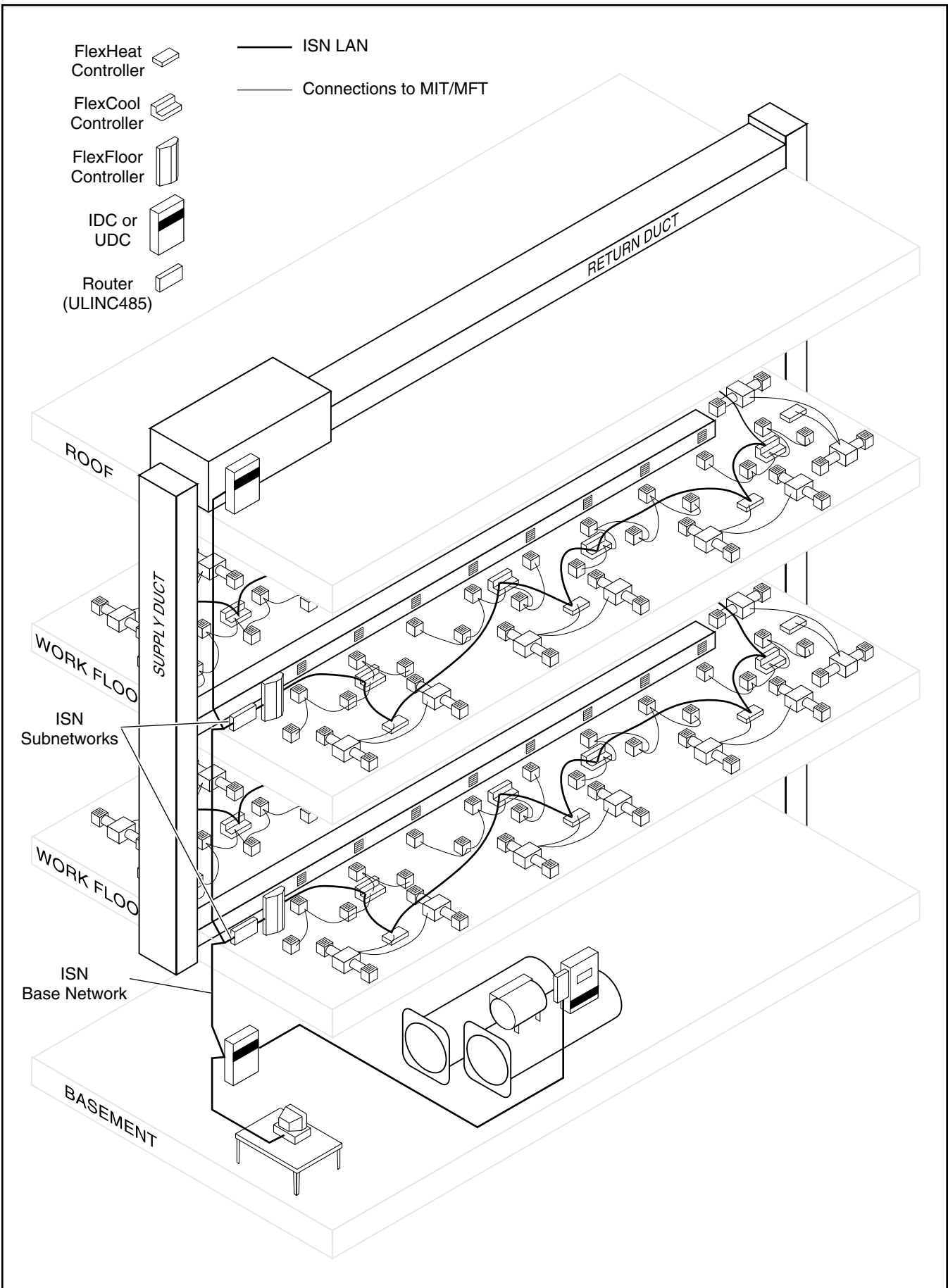


Figure 3. Typical Network Configurations

Background vs. Foreground Communications

The ISN network uses both “background” and “foreground” communication to ensure essential data is transmitted without delay.

Background communication supports multiple source messages at the same time, although the speed of communications may be affected if large quantities of data are being transmitted around the network.

Examples of background communication are:

Automatic transfer of digital states and analog values to other ISN controllers.

Analog and digital alarms to a Universal LINC232 connected to a PC running the YORK Facility Manager for Windows™ software.

Using a PC running the YORK Facility Manager for Windows™ software to read and write data to and from an ISN controller via a Universal LINC232.

Analog and Digital alarms to a LINC Guardian.

Only one foreground communication to a specific ISN controller can occur at any one time. A “busy” message is displayed if the ISN controller is already communicating with another device using this method. Background communication can occur simultaneously with foreground communication.

Examples of foreground communications are:

Manual communication between ISN controllers using the optional Keypad and Display Module or Windows™ HyperTerminal software running on a PC connected to the RS232 port of an ISN controller.

Using a PC running the York Facility Manager for Windows™ software to write data into an ISN controller via a Universal LINC232.

Printing of analog and digital alarms to a Universal LINC232 connected to an serial printer.

Using a PC running the York Ice to Save or Load an ISN controller configuration via a Universal LINC232.

Using a PC running the York Facility Manager for Windows™ to Save or Load an ISN controller Configuration via a Universal LINC232.

Speed of Communications

The ISN network communicates at either a 19.2 or 50 kbaud rate. The Universal LINC232 is switch selected to communicate at 1200, 2400, 4800 or 9600 baud rates through the serial RS232 port.

The typical response time between ISN controllers for automatic transfer of data or alarms is 100 milliseconds.

Each Universal LINC485 repeater and router increases the typical response time by 100 milliseconds.

Summary of ISN Network Restrictions

- The maximum single length of a network or subnetwork is 4000 ft. (1200 m). This can be extended to 12,000 ft. (3600 m) using two Universal LINC485 units configured as repeaters. This provides a maximum combined network end-to-end length of 36,000 ft. (10,800 m).
- A Universal LINC485 configured as a repeater is required every 4000 ft. (1200 m) or 32 nodes. A node is any device which uses an RS485 driver, such as an ISN controller, Universal LINC485 or Universal LINC232.
- The maximum number of nodes on a main network is 92 plus two Universal LINC485 units configured as repeaters. A maximum of 91 plus two Universal LINC485 units are allowed on a subnetwork.
- When the main network or subnetworks are extended between different buildings, the ground/earth voltage of the buildings must be at the same potential. If this cannot be guaranteed, the network connection between building(s) should be a fiber optic cable with LINC Fiber Optics fitted in each building to interface onto the ISN network.
- The LINC Guardian should be used where it is expected multiple alarms will be transmitted via a modem to a remote Facility Manager for Windows™. It acknowledges receipt of any alarm to a transmitting ISN controller and can store up to 20 alarms in each of the 8 standard ISN Alarm Classes.
- All node numbers connected to the LAN Port 1 of a Universal LINC485 configured as a repeater must be lower than the node address of the repeater. All node numbers connected to the LAN

Port 2 of a Universal LINC485 configured as a repeater must be higher than the node address of the repeater.

- Each ISN controller must have the node switch set to a unique address number between 1 and 98 per subnetwork. The node switches are used for filtering messages at a Universal LINC485 configured as a repeater which also must have a unique node number. The node switches on a Universal LINC485 configured as a router set the subnetwork address and must be between

1 and 98, with the main network automatically being network address 99. Communications between ISN devices on the same network or subnetwork(s) should use network 0 (zero) as the network address.

SECTION 3

INSTALLATION

Installation Guidelines

This manual assumes the installer is competent in environments with moving machinery, and is able to recognize and protect against any inherent hazards, such as, but not limited to, refrigerants, oil, corrosive chemicals or gases, materials under pressure, rotating parts, and both high and low voltages. Each of these items has the potential, if misused or handled improperly, to cause bodily injury or death.

It is the obligation and responsibility of the operating/service personnel to identify and recognize inherent hazards, protect themselves, and proceed safely in completing their tasks. Failure to comply with any of these requirements could result in serious damage to the equipment, as well as severe personal injury or death. In addition to following standard local, state and country codes and procedures, it is recommended that a lockout procedure be used to prevent inadvertent start up of equipment during installation and maintenance procedures.

All wiring should be carried out in a safe and neat manner and should always comply in all respects to the latest edition of any local, state or country codes that may be applicable. The wiring should be installed in a manner that does not cause a hazard and is protected against electrical and mechanical damage.

Care should also be taken when mounting the enclosure so access to other equipment within the vicinity is not restricted.

Environment

The FlexCool and FlexHeat controllers are designed to operate in the underfloor air plenum of a FlexSys system. They are intended to be placed on the floor of the air plenum within reasonable proximity to the zone sensor and FlexSys terminal boxes being controlled.

The air plenum space must be within the following:

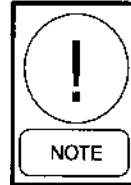
Temperature: 32 to 122° F (0 to 50° C).

Humidity: 10% to 95% non-condensing.

The controllers should never be mounted outside the confines of a building.

Electrical

Use a suitably sized wire (refer to the table titled “Recommended Cable Specifications”) to connect the line voltage feed to the FlexCool controller. The line voltage power source should be “clean” and separately fused for either 115 or 230 VAC.



NOTE: *The FlexHeat controller connects to the MFT box and draws 24 VAC. Use the PAP-A or PAP-E cable for connection.*

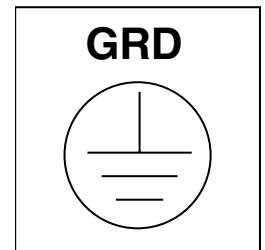
Electrical Noise

As with all electrical equipment, an ISN controller may be affected by external electrical noise. This noise may take the form of Radio Frequency Interference (RFI) or Electro-Magnetic Interference (EMI). To minimize the affects of electrical noise, choose a mounting location where the controller is removed from all possible RFI and EMI sources. These include high voltage cables, high voltage transformers, breakers, and high frequency drives.

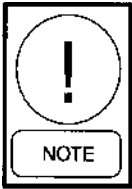
All high voltage wiring (>75 volts) must be run in conduit and kept separate from low voltage communication wiring. This will greatly reduce network communication problems.

Ground/Earth

All ISN controllers are designed to use the building ground (earth) as a reference point. This electrical orientation helps maintain all electronic components communicating to the controller within their specified voltage limits.



CAUTION: *The controller must connect to a true building ground. Failure to do so may cause equipment damage and will void all warranty claims.*



NOTE: *The FlexHeat controller is grounded through the MFT box. Hence, the MFT box must be properly grounded.*

Electrical grounding also protects the controller from the effects of lightning strikes. When lightning strikes near an ISN installation, it alters the potential of the building's ground. If the ISN controller is properly grounded, it responds to this change much faster than if the ground connection is inadequate. Controllers that are poorly grounded provide a lower resistance path through their signal or power connections than the actual ground of the building. Under these circumstances large surge currents may flow through the controller and result in component failure.

An example of a poor ground would be a galvanized steel cold water pipe. As the pipe corrodes it no longer acts as a true ground. The corrosion acts as an insulator, raising the potential of the pipe with respect to earth ground.

YORK strongly recommends that the building's ground be checked prior to the start of the installation. The power distribution panel should be checked to ensure that it is not connected to a corroded or galvanized pipe. As a minimum, it must be connected with 14 AWG wire.

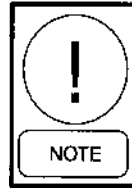
Cable Specifications

The cables (other than the LAN cable) used with the FlexSys components are modular cables with Molex® connectors. These pre-assembled cables provide communication and power to various devices connected to a controller. Additional cables required are the line voltage power cable for the FlexCool controller, any ISN network cables, and the connection cable to the RS232 device (PDA or laptop computer).

Power Cables



CAUTION: *Aluminum wire is absolutely not acceptable.*

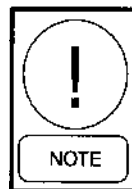


NOTE: *The MFT box should follow the same guidelines as outlined in the following section.*

The FlexCool controller requires a 3-conductor cable for the line voltage power supply. This power cable should be at least a 16 AWG copper wire rated for 10 amps per core at 250 volt AC. The ground conductor must be, as a minimum, the same size with the same current carrying capacity as the live and neutral conductors.

The controller (or MFT box) should be wired to a non-switched, fused spur to prevent the power from being turned off accidentally. The supply spur should be protected with either a suitable fuse or an approved circuit breaker.

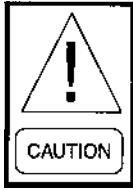
FlexSys Modular Cables



NOTE: *Be sure cables are securely attached without tensile load.*

FlexSys system uses modular cables that are plug and play (PAP). These cables provide connection between the FlexCool or FlexHeat controllers, the MIT and MFT boxes, and the zone sensor. An extender cable allows greater distances between the components when needed.

Each cable, excluding the PAP-D, has four conductors. The function of the individual conductors varies depending on the use of the cable.



CAUTION: All ports accept the same connector. Be sure the cable is connected properly at both ends to prevent supplying power to unintended locations.

PAP-A – 25 ft. (7.5 m) 4-conductor cable with a Molex plug at each end. This connects a controller to the MFT or MIT boxes. It also is used to daisy-chain the MFT or MIT boxes together.

PAP-B – 50 ft. (15 m) 4-conductor cable with a Molex plug at one end. The other end has the individual conductors available for connection to screw terminals. Two PAP-B cables connect between the controller and the zone sensor. One cable provides the temperature to the controller (port labelled SENSOR) and the other cable

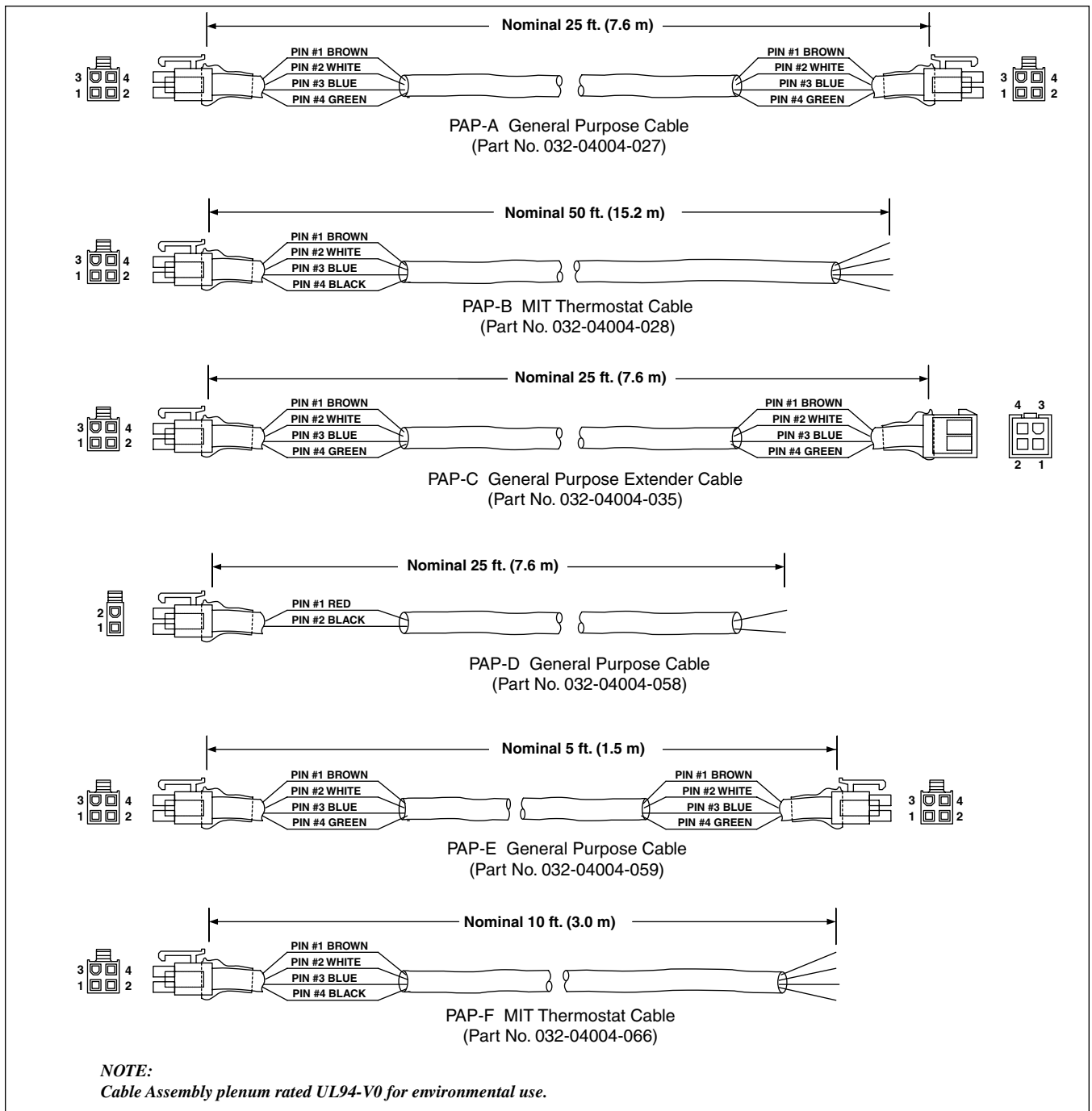
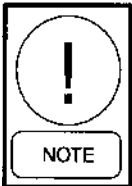


Figure 4. Modular PAP Cables

transfers data through the RS232 port on the zone sensor (port labelled RS232 on the controller).

PAP-C – 50 ft. (15 m) 4-conductor cable with a Molex socket on one end and a Molex plug on the other end. PAP-C, when connected to either PAP-A or PAP-B, extends the distance between the controller and/or MIT and MFT boxes.



NOTE: *The theory behind a temperature zone ensures that devices are not typically located at great distances. Therefore, use of the PAP-C cable is limited.*

PAP-D – 25 ft., (7.5 M) 2-conductor cable with a Molex plug at one end. The other end has the individual conductors available for connection to screw terminals. This is for connecting from the FlexHeat controller to an additional sensor.

PAP-E – 5 ft. (1.5 m) 4-conductor cable with a Molex plug at each end. This connects an Flex-Heat controller to the MFT box when the PAP-A cable is too long (shorter version of PAP-A).

PAP-F – 10 ft. (3 m) 4-conductor cable with a Molex plug at one end. The other end has the individual conductors available for connection to screw terminals (short version of PAP-B).

FlexCool Controller

The FlexCool controller resides in the plenum under the raised floor. Included with each controller are DIN rail clips to be attached to the back of the controller. Ensure that cabling includes sufficient slack to allow positioning of the controller and MIT boxes.

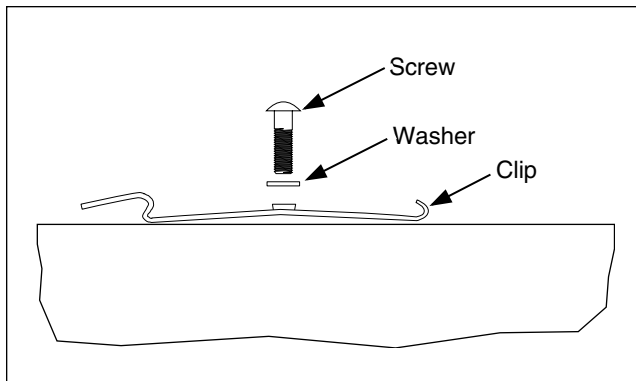
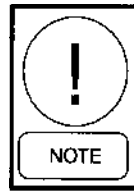


Figure 5. DIN Rail Clip Attachment



NOTE: *Take care not to restrict access to other equipment in the installation area.*

Line Voltage Power Supply



CAUTION: *Do not apply power to the FlexCool controller until all components have been installed and commissioning checks completed.*



DANGER: *Disconnect any line voltage power supply at the source before attaching wiring to prevent possible electrocution.*

The FlexCool controller requires a line voltage power supply of either 115 or 230 VAC. A switch selects the correct input voltage level. The unit is shipped with the switch in the 115 volt position. If a 230 volt line voltage is to be connected to the FlexCool controller, remove the cover and change the switch position. The switch is located near the line voltage input connector.

The line voltage power supply should be wired to a non-switched fused spur to prevent the power from being turned OFF accidentally. Ensure that all wiring meets local, state and country codes, as well as follows NEC recommendations.

The FlexCool controller includes a removable power supply connector with individual screw terminals. This style connector allows the technician to obtain cabling which meets the requirements for the proper color codes. This must be acquired locally. The cable should be a 3-conductor cable with conductors from 12 to 16 gauge.

A conduit box is available for the FlexCool controller to aid in attachment of 1/2 in. conduit which is often required by building specifications or local codes. The two-piece conduit box allows use of the standard, removable power supply connector.

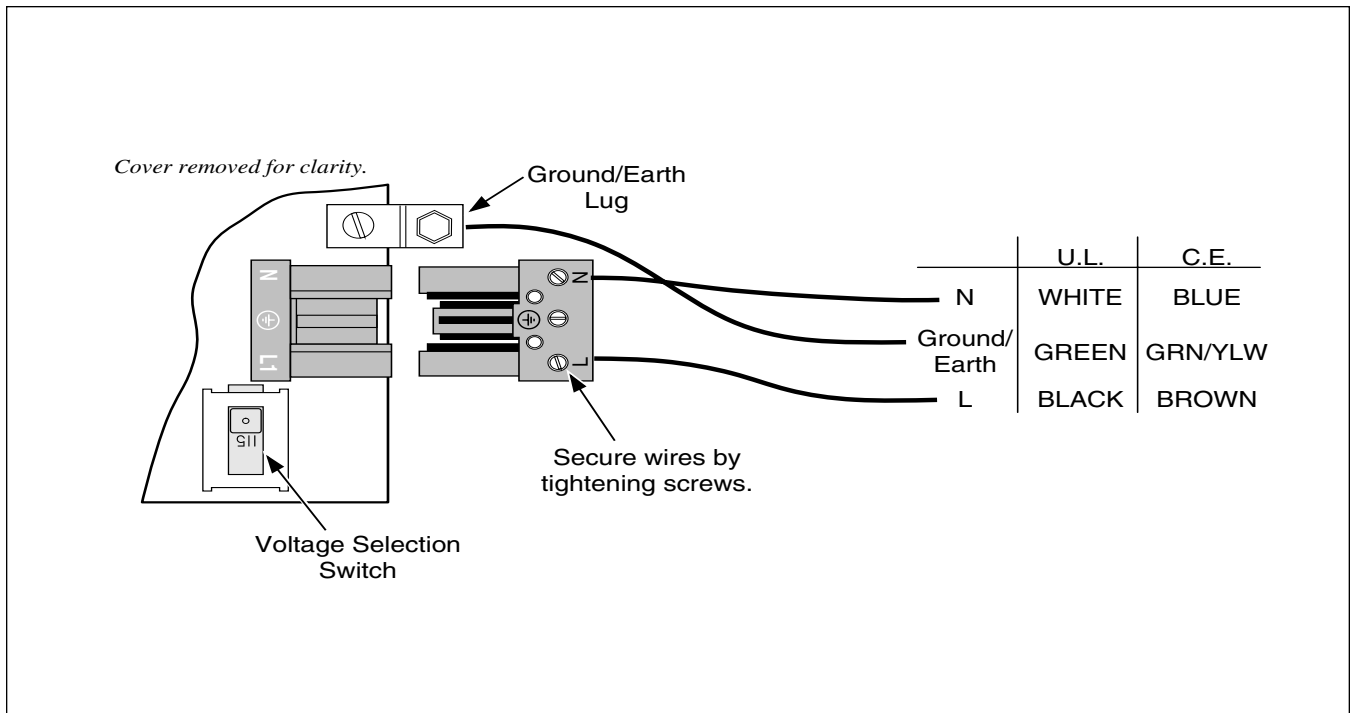


Figure 6. Power Supply Connector

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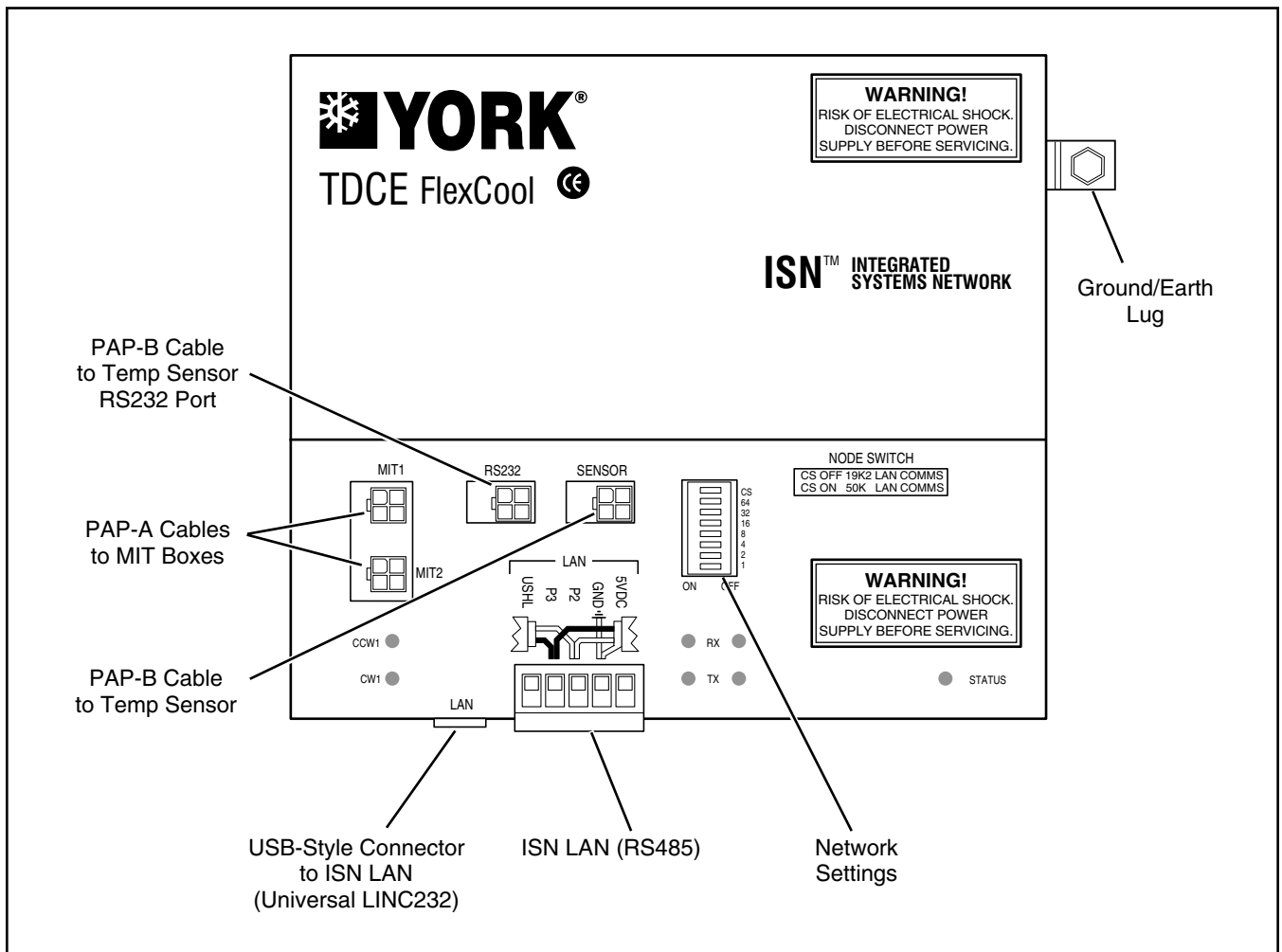


Figure 7. FlexCool Controller Connections



DANGER: Always disconnect the power before working inside or around an electrical enclosure.

The power supply connector has three terminals. A ground lug is located next to the connector. The ground lug is connected to the board, providing a ground for the device even when the power connector is removed for service.

Connect the appropriate color-coded conductor to the connector as shown in the figure titled "Power Supply Connector." Connect the Line and Neutral conductors to the connector. Connect the ground conductor to the ground lug.

To connect power to the FlexCool controller, push the connector into the socket until the latch closes. To remove the connector, use a small screwdriver to raise the latch before pulling the connector from the socket.

MIT Box Connection

The outputs from the FlexCool controller to the MIT boxes are through two, 4-pin connectors labeled MIT. Each connector has two digital outputs. The outputs power the actuator in either a clockwise or counter-clockwise direction, closing or opening the damper.

There are two connectors but a single set of outputs sized to handle up to 14 damper motors (3.2 amps @24 volts). The FlexCool controller can be placed anywhere within the daisy-chain of 14 MIT boxes, i.e., at either end or any point in the middle. The box is placed based on zone layout and convenience.



CAUTION: The use of more than 14 MIT boxes will draw more current than the output circuit can handle, resulting in damage to the controller.

A modular cable (PAP-A or PAP-C) connects the controller to an MIT box. The MIT boxes are daisy-chained from one to another using the same modular cables. The two connectors allow for one or two "chains" for flexible cable routing.

Additional FlexCool Connections

The FlexCool controller has two additional Molex connectors. The connector labelled SENSOR connects to the zone sensor through a PAP-B cable. The cable is wired to the Type 3 thermistor and the 20 kOhm temperature setpoint adjust potentiometer.

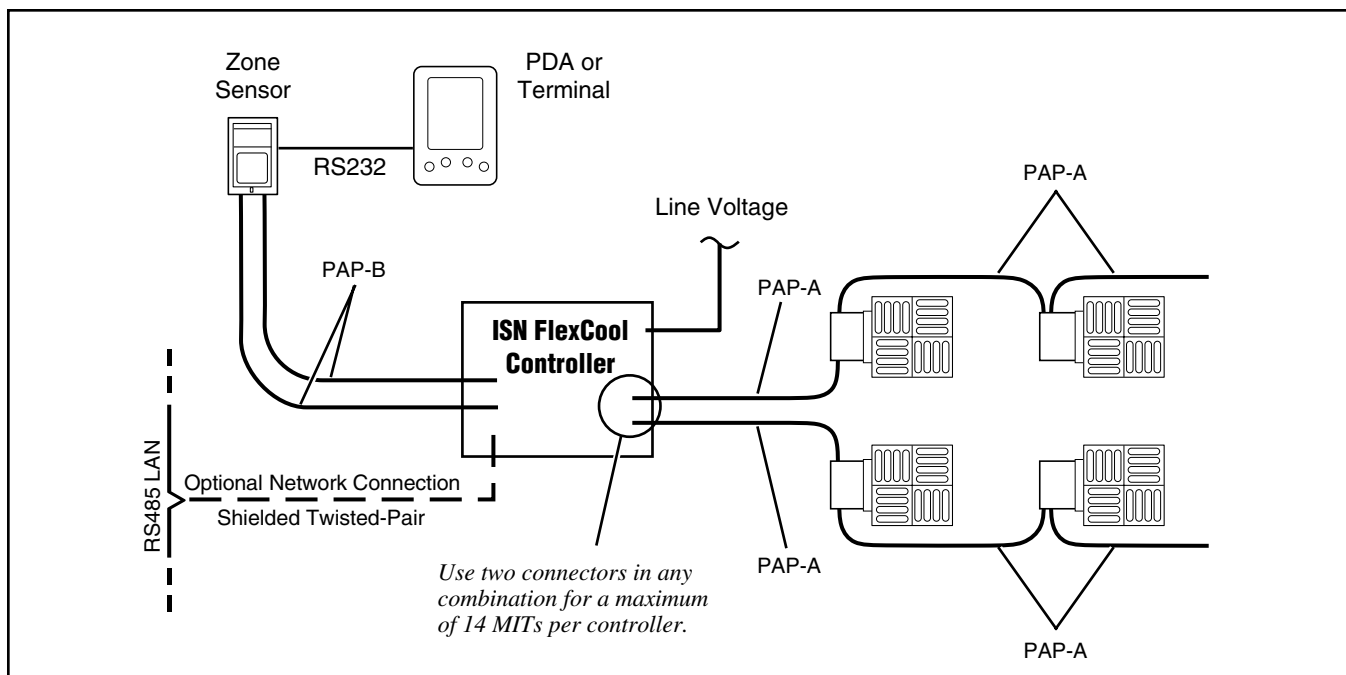
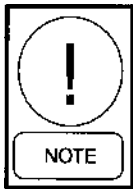


Figure 8. Typical FlexCool Configuration

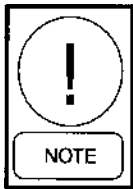


NOTE: Do not cut the PAP-B cable. Allow any excess wire to remain in the plenum to allow for future movement of the zone sensor and/or controller.



CAUTION: Do not use PAP cables for network wiring. LAN cable must be shielded.

The second connector is labelled RS232 and, using a PAP-B cable, it also connects to the zone sensor. This allows an RS232 device to be connected to the controller without the need to locate and remove the proper access panel from the floor.

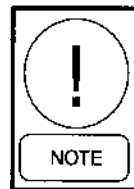


NOTE: Details concerning each of the above connections are described in the respective section.

FlexHeat Controller

The FlexHeat controller resides in the plenum under the raised floor. Included with each controller are DIN rail clips for attaching the controller to the MFT box or a floor support.

Ensure that cabling includes sufficient slack to allow positioning of the controller and MIT or MFT boxes.



NOTE: Take care not to restrict access to other equipment in the installation area.

To connect a network to the FlexCool controller, a 5-pin connector is provided to attach the ISN network.

3

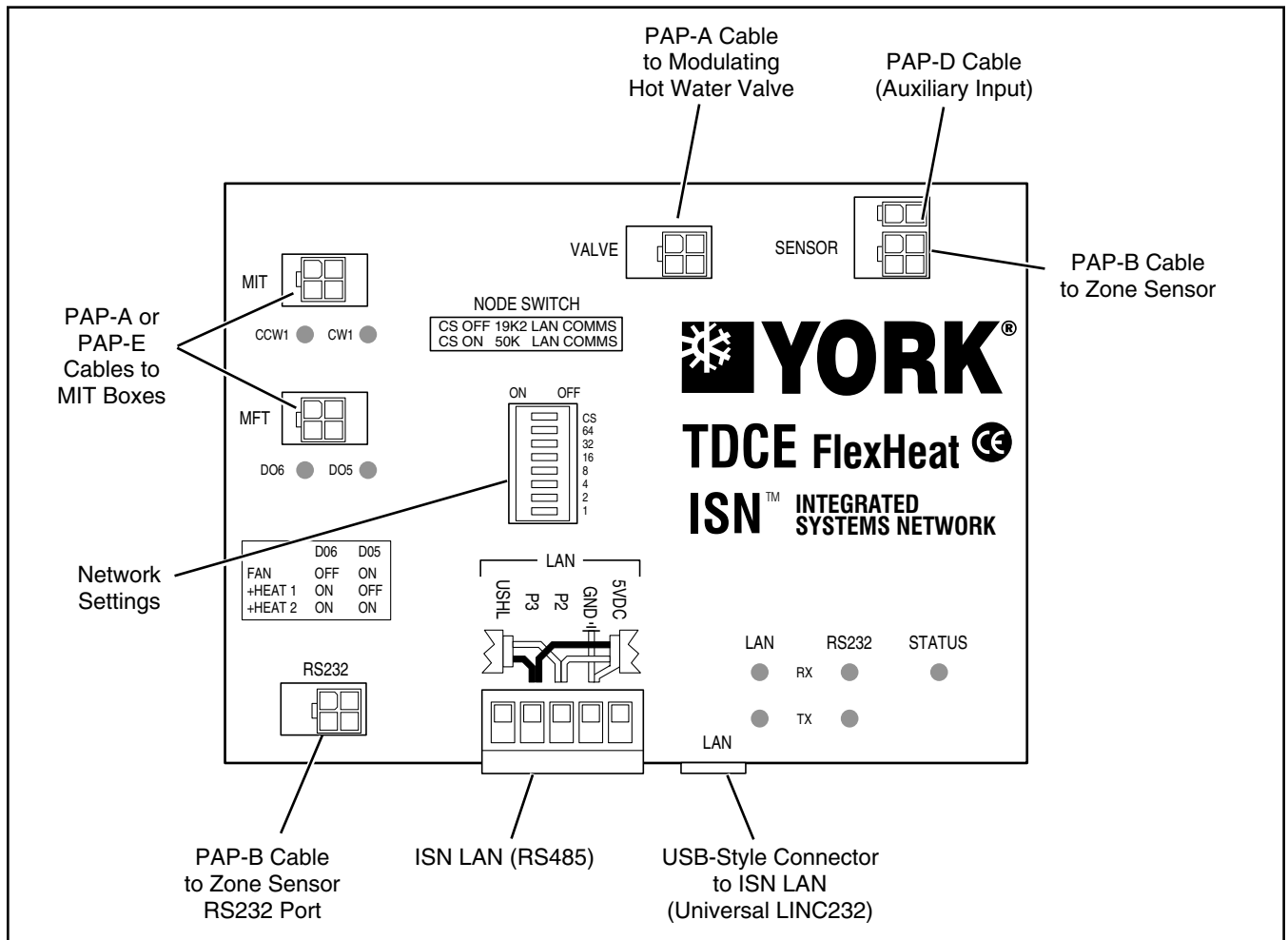


Figure 9. FlexHeat Controller Connections

The FlexHeat controller requires 24 VAC power to operate. The 24 VAC is obtained through the PAP-A or PAP-E communication cable(s) from the MFT box. Mounting the FlexHeat directly on the MFT box ensures a common ground/earth. If the controller is not mounted directly to the MFT box, a ground/earth wire (minimum of 18 AWG) must be installed between the two devices.



CAUTION: When attaching DIN rail to the MFT box, avoid areas where contact with electrical wiring or heater coils may occur.

The line voltage is supplied directly to each MFT box for operation of the heater, fan and subsequent MIT boxes. The FlexHeat controller provides digital signals to relays located on the MFT box. The power to drive the MIT dampers is obtained from the MFT box.

MFT Box Connection

The two connections on the FlexHeat controller are labelled MIT and MFT. Both connectors utilize PAP-A or PAP-E cables to interface with the relay panel on the MFT box. (Refer to Figure 10 for cable routing.) The relay panel, in turn, controls up to 14 MIT boxes and up to 3 stages of heat (fan, first stage, second stage). The relay panel can also daisy-chain to an additional MFT box through two additional PAP-A cables. In this way a series of MFT cables can be daisy-chained together, all controlled by a single FlexHeat controller with a single zone sensor.

The outputs from the connector labelled MIT operate in the same manner as the FlexCool controller outputs but do not power the MIT dampers directly.

A digital signal from the FlexHeat controller closes the appropriate relay in the MFT, completing the control circuit which turns the MIT actuator in either a clockwise or counterclockwise direction. Each MFT box is capable of powering a maximum of 14 MIT boxes due to the limitations of the MFT transformer.



CAUTION: The use of more than 14 MIT boxes will draw more current than the MFT relay circuits can handle, resulting in damage to the MFT box.

Two PAP-A or PAP-E cables are required to connect the controller to the MFT box. The cables are the same but connect to different ports on the MFT box. The connectors are labelled according to their function.

Each MFT has its own line voltage power source. This allows multiple MFT boxes to be daisy-chained together without the limitation of controller power output. However, the number of MFTs per zone (or sensor) is limited by the suitability of one zone sensor to measure a specific area. If a large daisy-chain is used, the chain can be broken and an additional sensor/controller added to begin a new chain and zone.

Hot Water Valve

There are two options for hydronic heat:

Two-position hot water valve – This is wired into a terminal strip within the relay panel and takes the place of the electric heat in the control sequence.

Modulating hot water valve – This is wired into the FlexHeat via a PAP-B cable. The signal is 0-10 VDC. 24 VAC is also supplied to power the device.

Additional Sensor

A connection point for an additional sensor is provided on the FlexHeat controller. This additional input requires custom programming. The additional input is not included in the standard FlexHeat software sequences.

Use a PAP-D cable to connect to this additional 2-pin input.

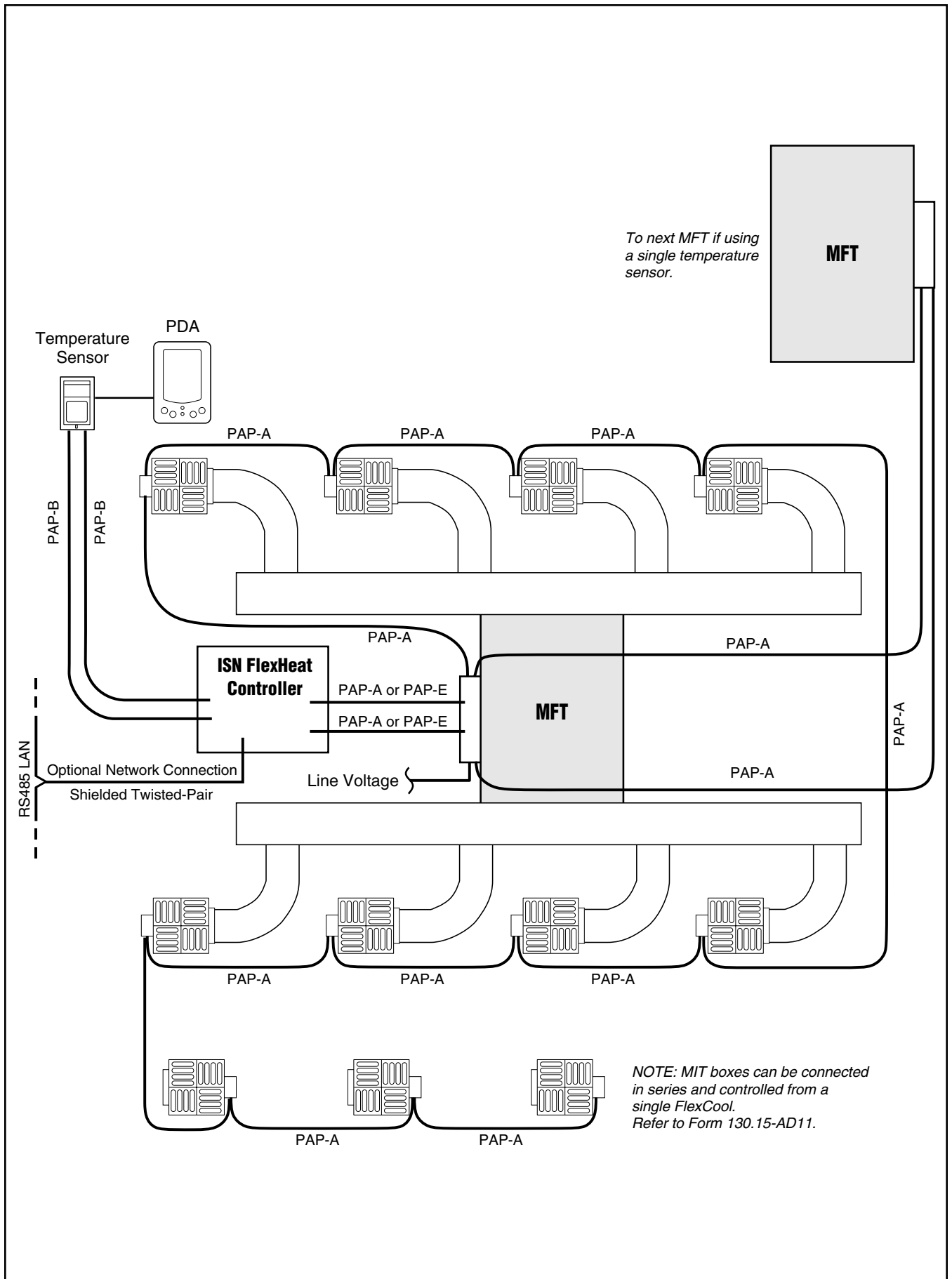
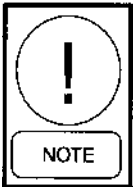


Figure 10. Typical FlexHeat Network

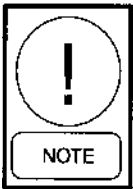
Zone Sensor

The temperature of the zone is measured by a wall-mounted zone sensor. The recommended sensor is equipped with a sliding potentiometer and an override switch. The potentiometer allows variation of the setpoint by users and the override switch can be used to change the status of the room from unoccupied to occupied.



NOTE: *Occupied and unoccupied states are only applicable if networked to a controller which uses a clock for time management.*

The sliding potentiometer is a 20 kOhm resistor. The variance from the setpoint is determined by the software in the controller. This can be changed based on the software configuration.



NOTE: *Other sensors are available. Part No. 031-02432-000 has been chosen to work with the FlexCool and FlexHeat controllers because of its communication and adjustment capabilities.*

Zone Sensor Connection

The zone sensor connects to the controller using a pre-manufactured cable (PAP-B). Individual screw terminals secure the cable to the zone sensor and a Molex connector plugs into the port labelled SENSOR on the controller.

The individual conductors attach to the screw terminals as shown in the figure titled “Zone Sensor Connections.”

RS232 Port

To communicate with the controller, an RS232 port is provided. However, the location of the controller under the floor is often difficult to locate. To simplify access to the RS232 port of the controller, the zone sensor provides a port for connecting an RS232 device.

RS232 Connection to the Zone Sensor

The RS232 port available at the zone sensor connects to the controller using a pre-manufactured cable (PAP-B). Individual screw terminals secure the cable to the zone sensor and a Molex connector plugs into the port labelled RS232 on the controller.

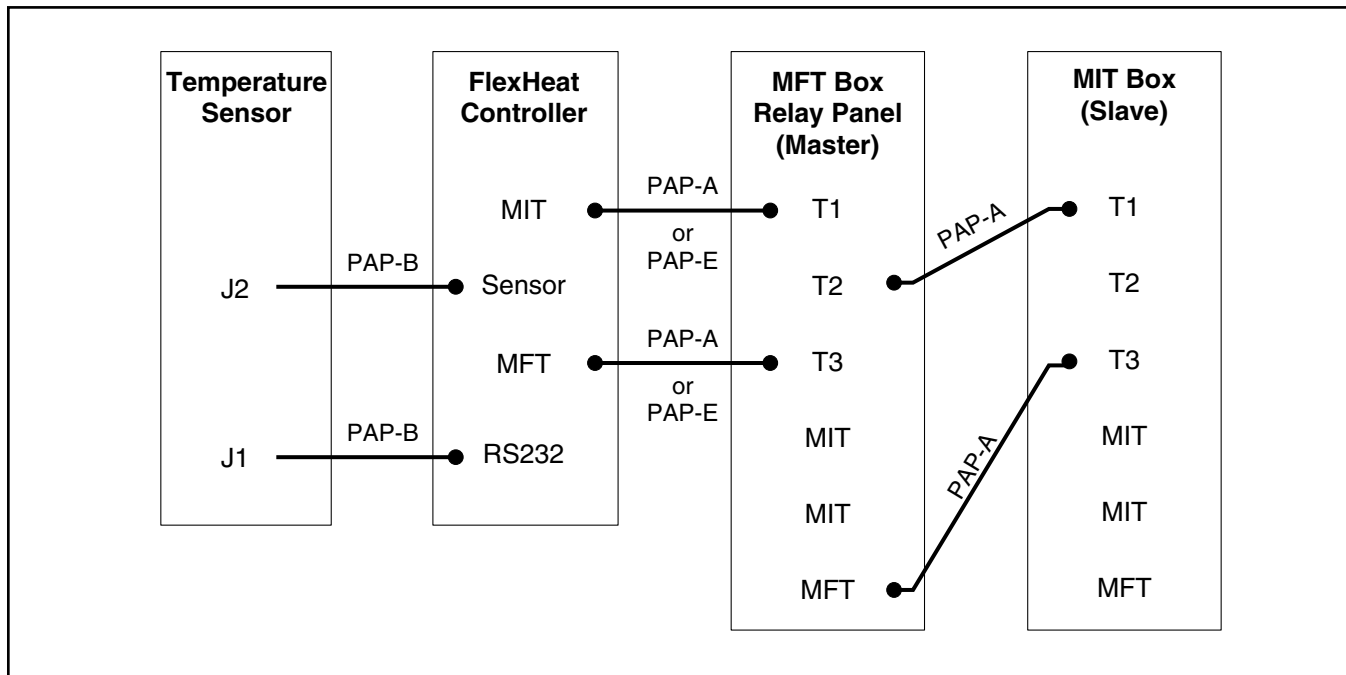


Figure 11. FlexHeat Network Cables and Connectors

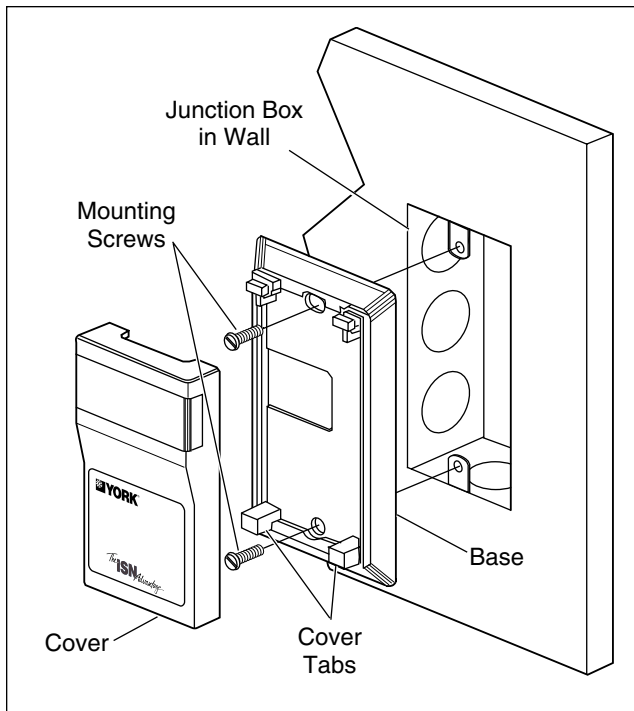
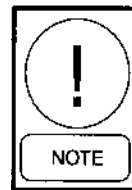


Figure 12. Zone Sensor

The individual conductors attach to the screw terminals as shown in the figure titled “Zone Sensor Connections.”

LAN Communications

The LAN port has two types of connectors. One uses individual screw terminals for each core connection. The second connector is a USB-style connector (although it does not use USB protocols) for connecting to a Universal LINC485 or Universal LINC232. The two connectors may be used simultaneously. Two LEDs are used to indicate the transmitting and receiving of information on the RS485 port.



NOTE: For information on LED codes, connecting to a terminal and troubleshooting, refer to Section 5.

3

The incoming and outgoing LAN wiring must both be connected to this single connector to ensure the continuity of the network is not broken if the connector is removed from the controller.

To attach the controller to the LAN connect the wiring as shown in the figure titled “LAN Port Wiring Details.”

If a device is located at the end of a network line or “leg,” a Termination Module (PN 031-01488-000) must be installed. The Termination Module is an as-

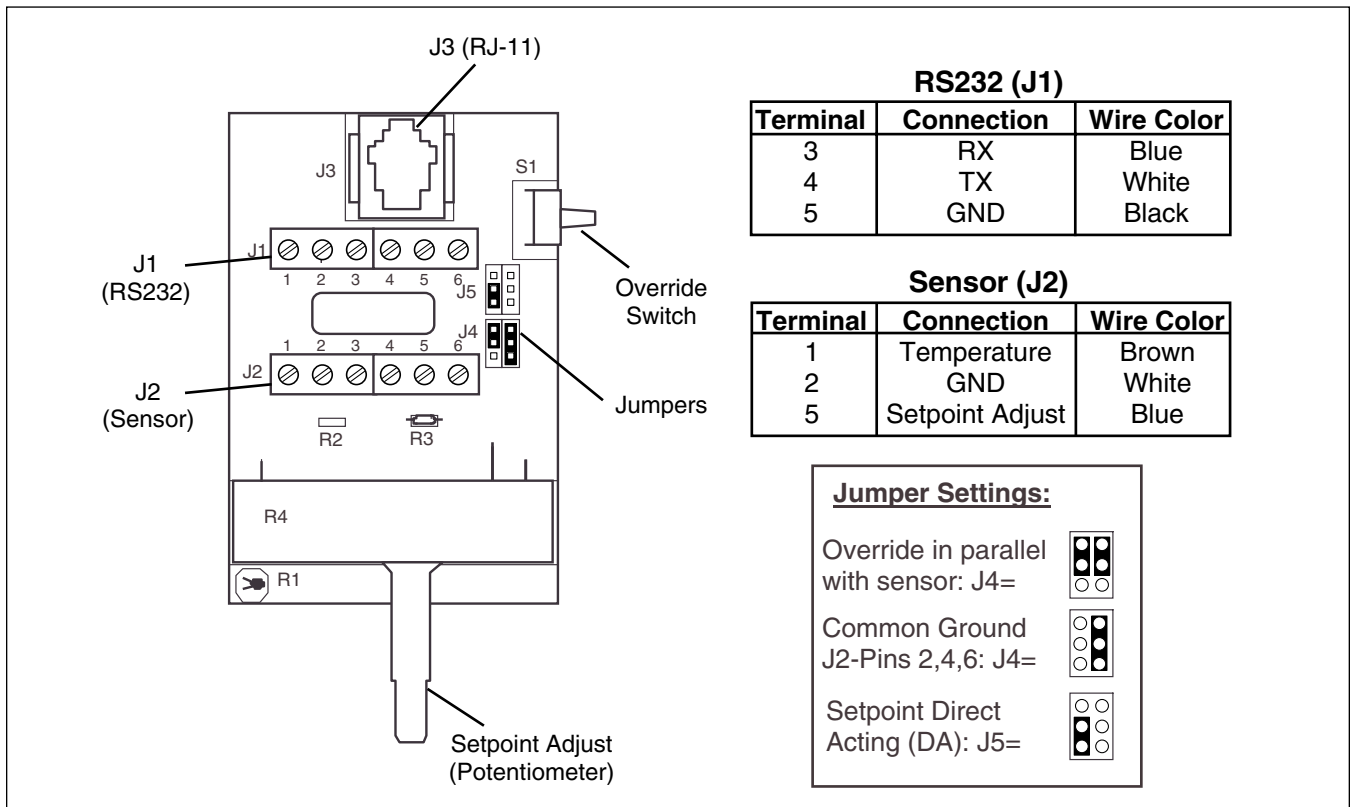


Figure 13. Zone Sensor Connections

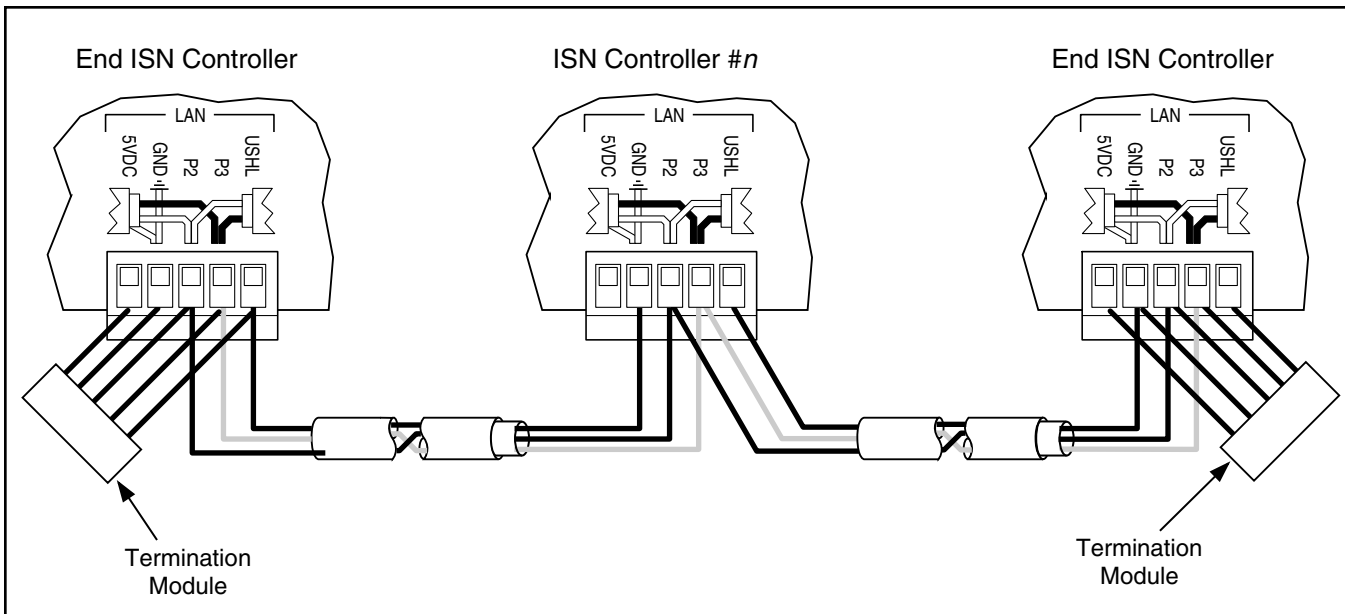
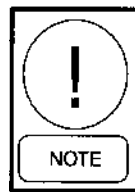


Figure 14. LAN Port Wiring Details

and impedance matching to improve the integrity of network communications.

Network Communications

Located on the controller is an 8-way DIP switch for setting the communications rate and ISN network address. The rocker labeled CS is used to select the communication rate for the ISN network. If set to ON, LAN communication operates at 50 kbaud. If set to OPEN, LAN communication operates at 19.2 kbaud.



NOTE: *If connecting to an existing network using Rev 76 software or earlier, LAN transfer rates are limited to 19.2 kbaud. For Rev 77 and above, the transfer rate is switch selectable as either 19.2 or 50 kbaud.*

The network address for the ISN LAN is set using the remaining rockers on the DIP switch. The network address must be between 1 and 98.

SECTION 4

OPERATION

Introduction

The FlexCool and FlexHeat controllers are plug-and-play devices and, as such, will begin to operate as soon as power is applied. The default parameters have been chosen to work in most buildings. In this case, no configuration adjustments are required and the controller and FlexSys system should run for many years.

However, in some cases, fine tuning may be required to allow for the specifics of a particular installation. Provisions for fine tuning are part of the product and are simple to do.

Tools

To accomplish the configuration an interface with the controller must be established. The zone sensor includes an RS232 port (RJ-11 connector) for this purpose. It allows the connection of a device using VT100 terminal emulation software.

RS232 Device and Software

The RS232 device can be a laptop computer or PDA, such as a PalmPilot®. The YORK Controls Group has available the ISN PalmPort software to assist the user with interfacing with ISN products. Operating on PDAs using PalmOS® v3.5 or later operating systems,

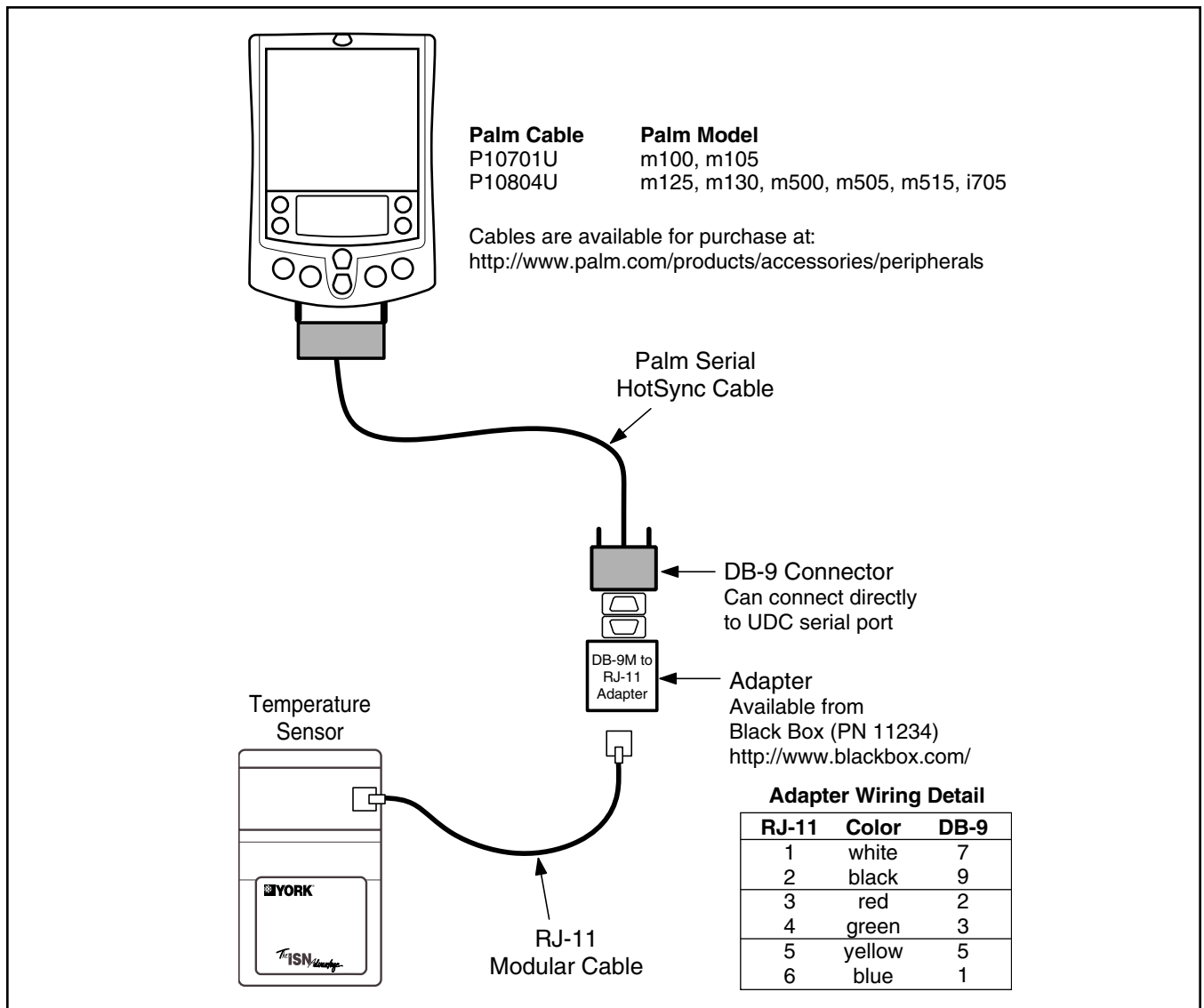
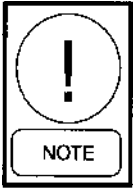


Figure 15. PDA Connection

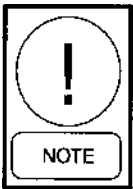
PalmPort is a VT100 terminal emulation application specifically designed for interfacing with ISN controllers. It may be downloaded by authorized technicians from the YORK Controls Group website at

<http://intranet.york.com/web0147/>



NOTE: *Other PDAs and laptop computers capable of RS232 communication through a VT100 terminal emulation may be used. However, at the time of printing YORK is supporting the ISN PalmPort application for the Palm OS only.*

Connection



NOTE: *This manual assumes the use of a Palm PDA and ISN PalmPort software interface. Although references to other devices may be made, examples and instructions relate specifically to the Palm PDA operating YORK's ISN PalmPort VT100 terminal emulation program.*

The FlexCool and FlexHeat controllers each have an RS232 port. Although the PDA can be connected here, the physical location of the controller under the floor is often difficult to locate and access. The FlexCool and FlexHeat controllers are designed to connect to the zone sensor located on the wall. This connection method provides simple, instant access to the controller, eliminating the need to remove floor panels and physically locate the device.



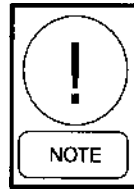
NOTE: *The RS232 cable connection between the controller and zone sensor is optional. If communication does not readily occur, verify proper installation of the PAP-B cable.*

The recommended zone sensor incorporates an RJ-11 connector which is wired to the RS232 connector on the controller through a PAP-B cable. This allows the PDA to be connected to the sensor and communicate with the controller very quickly and simply.

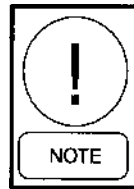
A serial port cable is available for Palm Pilot PDAs called a Serial HotSync cable that is normally used to interface with a desktop computer. Connected at

one end to the PDA, the other end connects to a DB-9 port.

A DB-9 to RJ-11 adapter and RJ-11 modular telephone cable can be obtained locally to complete the connection cable from the PDA to the zone sensor RS232 port.



NOTE: *A variety of HotSync cables are available from Palm, some of which use USB technology. Also various adapter may be available from other sources. Refer to the figure titled "Terminal Cables" for the proper recommended components.*



NOTE: *Assembling the PDA to sensor cable in this manner allows greater flexibility for connecting to other YORK controllers. The cable can be separated between components to allow PDA connection to UDC and IDC controllers. The FlexCool and FlexHeat controllers do not utilize a DB-9 connector.*

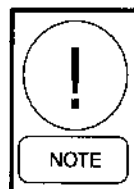
Setting the Node Switch for Network Use

The FlexCool and FlexHeat controllers control air flow to the respective zones as standalone devices. A FlexFloor controller controls the air flow into the underfloor plenum in much the same way. To operate these devices more efficiently, they can be linked together into a network to share data.

This network is an ISN network. As an ISN network, the following set of rules apply:

Observe the RS485 standard, i.e., maximum of 32 nodes, 4000 ft. (1220 m) per segment, etc.

More than 32 nodes and greater distances may be accommodated through the use of repeaters and routers (Universal LINC485). Up to three segments can be combined into a subnetwork.

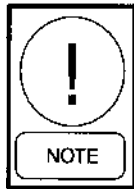


NOTE: *Refer to documentation relating to the Universal LINC485 for additional network architecture information, such as node sequences and LAN IN vs LAN OUT orientation.*

Each device on a subnetwork must have a unique number (node address). This is set using the DIP switch on the network device.

The base network is always named network 99. If the LAN is divided into subnetworks, each subnetwork must have a unique network number from 1 to 98. Up to 92 subnetworks can be attached to the base network.

If multiple plenums are used, such as in a multi-floor building, then each plenum requires a FlexFloor and at least one router (Universal LINC485). The subnetwork number is established by the address on the Universal LINC485. Each device within the subnetwork also has a node address. The subnetwork number and node address combine to make a unique identifier for each device.



NOTE: The software in each FlexCool and FlexHeat controller is configured to communicate to a FlexFloor controller with a node address of 64. It is assumed the network architecture has only one FlexFloor per subnetwork.

The FlexCool and FlexHeat controllers use a node switch consisting of eight individual DIP switches that are binary-weighted. Adding together the value of each of these switches in the ON position forms the decimal value of the node switch. To determine

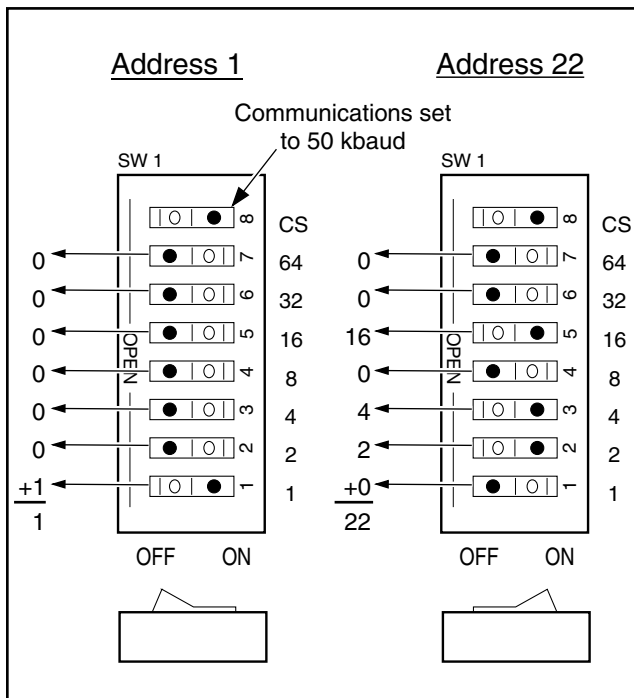


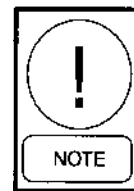
Figure 16. Node Switch Usage

the numeric value assigned to the switch, add the numbers above the corresponding DIP switches which are in the ON position. The resulting sum is the number (address) selected.

Network Transfer Rate

The ISN network allows selection of the network transfer speed to accommodate adding on to older legacy systems.

The CS rocker sets the communications rate to either 19.2 kbaud or 50 kbaud. When installing a new ISN network always select the 50 kbaud position. When attaching to systems using Rev 76 or older software, the 19.2 kbaud position must be selected.



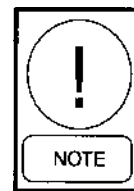
NOTE: The software checks the position of the CS rocker at power up only. Any change in position will not take effect until a power up sequence is completed.

4

ISN PalmPort Interface

The ISN PalmPort software is a VT100 terminal interface program. This software allows configuration of the application program within the FlexCool or FlexHeat controllers through an RS232 connection. ISN PalmPort operates on any PDA using PalmOS 3.5 or higher operating system.

The ISN PalmPort software emulates the appearance of a keypad. The buttons are labeled for use with all ISN products using the Feature-Section-Page terminology. However, to simplify setup of the FlexCool and FlexHeat controllers using a PDA, six reports have been created to guide the technician in configuration, if custom configuration is necessary.



NOTE: For advanced users, all Feature-Section-Page commands are operable and the application program can be modified as necessary. However, this is not recommended.

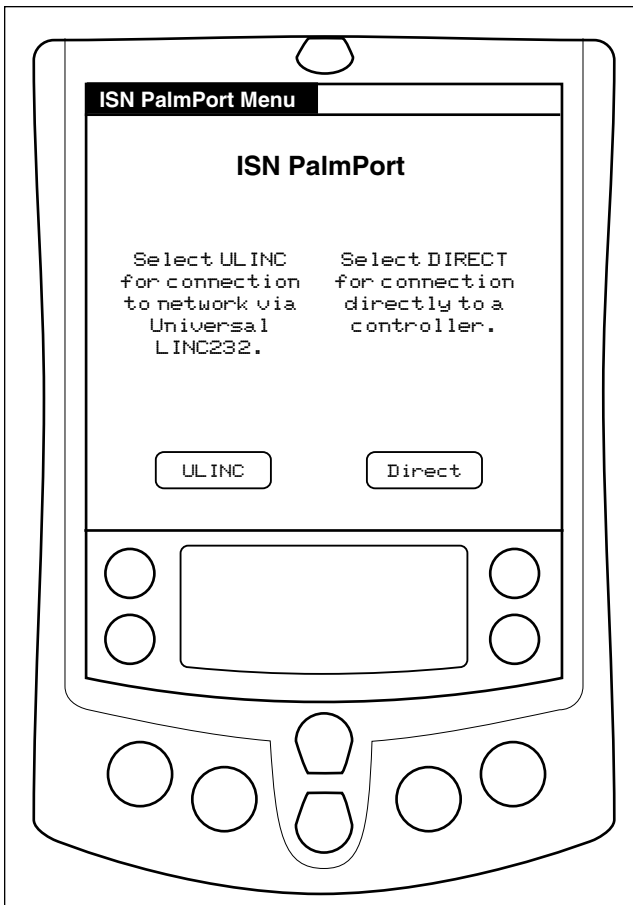


Figure 17. Menu Screen

The six reports are categorized according to function:

- Summary
- Local Setup
- Calibration
- Network Commands
- Transfer Out
- Reset

The ISN PalmPort software can be used for interfacing with products other than FlexCool and FlexHeat controllers. Hence, the buttons are labelled using standard ISN terminology. Table 1 defines the functions of each button when used with the FlexCool or FlexHeat controllers.

Starting the Application

When ISN PalmPort is loaded to the PDA, a category is created called York Software. An ISN PalmPort application icon is placed in this category. To start the software, tap the PalmPort icon.

Menu Screen

The first screen (Figure 18) prompts for the type of connection desired. Two types of connection method are available:

Direct – For communicating directly to the Flex-Cool or FlexHeat controller via the RS232 port on the zone sensor.

ULINC – For communicating over the network through a Universal LINC232.

This manual assumes the PAP-B cable is connected to the RS232 port on the controller and the zone sensor's RJ-11 connector. With this cable installed, **Direct** is the correct choice.

Network

The Network screen (Figure 19) allows selection of the transfer speed of the network as either **19.2** or **50** kbaud rate. For direct connection always select **50** kbaud. The **19.2** kbaud option is to be used when connecting to an older system (Rev. 76 and older) through via a Universal LINC232.

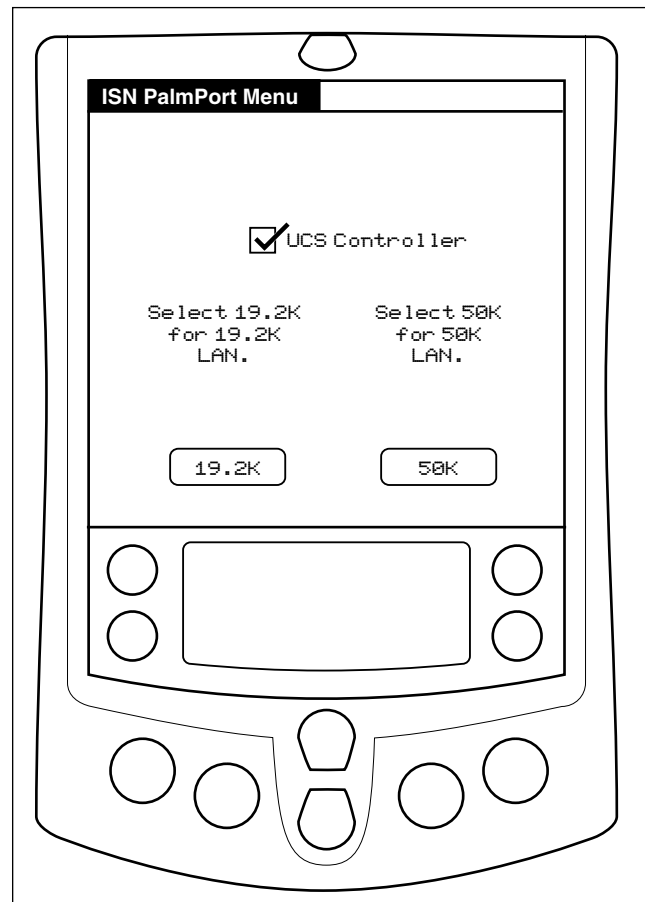


Figure 18. Network Screen

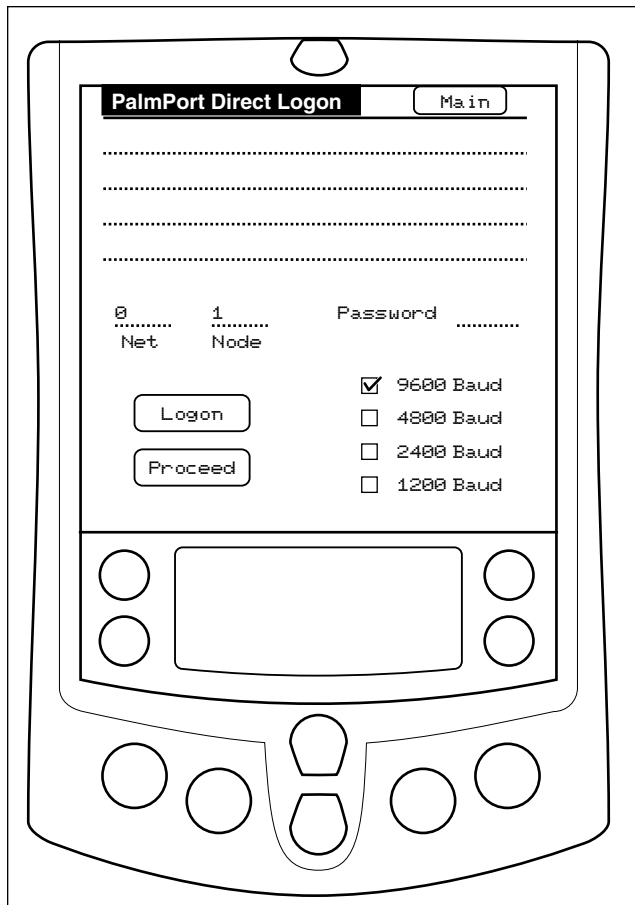


Figure 19. Logon Screen

An option to select a UCS Controller should be checked when communicating with a FlexCool or FlexHeat controller. This allows the password to be entered properly on the next screen.

Logon

The Logon screen prompts for the Net and Node addresses.

Although defaults appear, these items are only necessary if connecting in the **ULINC** mode. When connecting to a controller in the **Direct** mode, these items are irrelevant.

Transfer rates from **1200** to **9600** baud can be selected. For the FlexCool and FlexHeat controllers, and most other devices, select **9600** baud.

As with all ISN controllers, the application is protected by a password. There are two preconfigured password levels. Level **1** provides access to read the Summary Report. Level **2** provides access to read data in all six reports and change the operating parameters where applicable.

Table 1 – Passwords

	Password	Access	Rights
Level 1	1	Summary	Read Only
Level 2	2	All Reports	Read/Write

To move to the next screen, tap **Logon**, then **Proceed**.

Keypad Screen

The Keypad screen is the main interface screen to the controller. The upper portion is a display of responses from the controller. The lower portion is for data entry. The buttons are similar in function to a standard ISN keypad. See Table 1 for a description of each button. Data can be entered through the standard PalmOS methods, i.e., Graffiti® or keyboard screen.

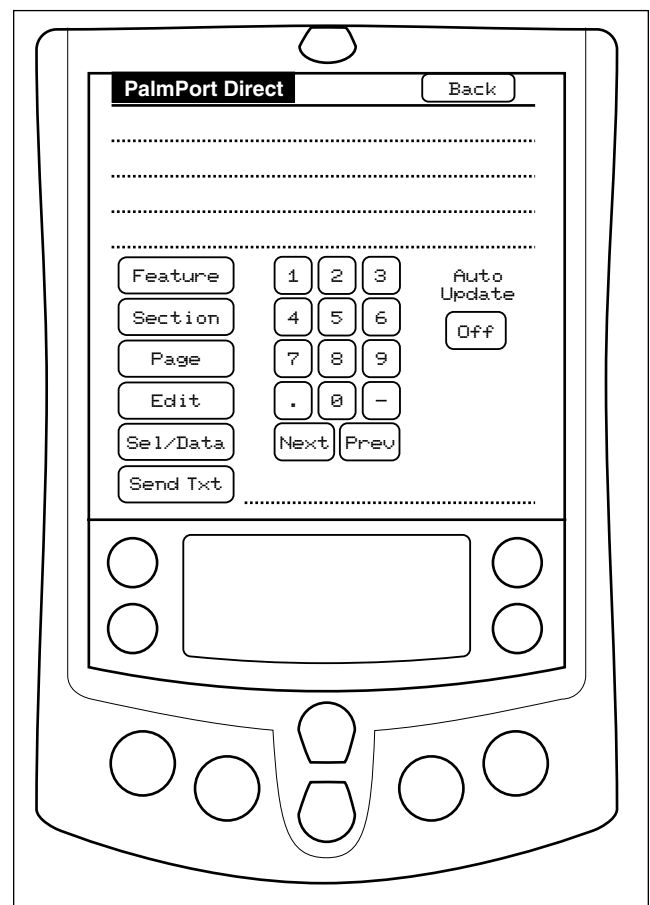


Figure 20. Keypad Screen

Table 2 – Button Functions

Button	Function
Feature	Not used.
Section	Selects the specific report.
Page	Selects the line of the report.
Edit	Enter button. "Opens" and "closes" the field for data entry.
Sel/Data	When an editable field is open, this cycles through the menu choices if it is a menu driven field. Updates controller data when not in Auto Update mode.
Command Line	Text entry location. Use numeric keys or standard Palm text entry methods to enter data on the Command Line.
Send Txt	Sends the Command Line data to the controller.
0-9, .	Enters character shown on data entry line.
–	Decrements backward to the previous Page if no other entry. Enters negative value in editable fields.
Next	Increments forward to the next Section.
Prev	Decrements backward to the previous Section.
Auto Update	Default is OFF. Select ON to automatically refresh data.

Auto Update

Normally, the Auto Update button is set to Off when the ISN PalmPort is first activated. To update the data, the Sel/Data button can be tapped or the Auto Update button tapped and turned On. Auto Update updates the data approximately every second so data can be observed in “real time.”

Using the Software

Once the password is entered, data can be reviewed by accessing the desired report. The six reports are:

- Summary (Section 01)
- Local Setup (Section 02)
- Calibration (Section 03)
- Network Command (Section 04)
- Transfer Out (Section 05)
- Reset (Section 06)

To access a report, tap:

Section then Send Txt

Each successive tap of the Section and Edit buttons accesses the next report. An alternative method is to enter the appropriate Section number on the Command Line before tapping **Send Txt**.

Each report displays one Page of data at a time. The number of Pages in each report varies but is always 10 or less. To cycle through the pages, tap:

Page then Send Txt

If desired, a specific Page may be accessed directly by entering the Page number on the Command Line before tapping **Send Txt**.

The Pages either display data from the controller or allow data, such as a setpoint, to be entered into a field. To open a field, tap:

Edit

The cursor is visible in the Command line at the bottom of the screen. Data can be typed for entry into the field. When finished, tap:

Send Txt

to close the field and send the data to the controller.

There are three types of field which allow data entry:

Menu Fields

Value Fields

Password Fields

Menu Field Example

To manually force the damper open. Tap:

Section, 0, 3, Page, 0, 6, Send Txt

to view the page. The screen displays

DMPR.FORCE OPEN OPEN POS 23.2

To “open” the editable field, tap:

Edit

The screen displays

DMPR.FORCE OPEN mmmm POS 23.2

where mmmm indicates an editable menu field. To cycle through the available menu choices, tap:

Sel/Data

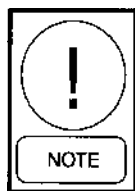
The next menu choice appears and displays as

DMPR.FORCE OPEN MADE POS 23.2

Each successive tap displays the next menu choice. In this case, there are two choices: MADE and OPEN. When MADE is displayed tap:

Edit

to send the command to the controller. The controller immediately starts to open the damper, indicated by the CCW1 LED illuminating. The POS field will still indicate the initial value, in this case 23.2. To see the value, tap the Auto Update button to display **ON**.



NOTE: It is not recommended that the Auto Update button remain ON. When not reviewing live data, turn the Auto Update feature to OFF.

Value Field Example

To calibrate the zone sensor, tap:

Section, 0, 2, Page, 0, 1, Send Txt

to view the page. The screen displays

ZONE TEMP 70.0 CALIBR 0.0

To “open” the editable field, tap:

Edit

The screen displays

ZONE TEMP 70.0 CALIBR vvvvv

where vvvvv indicates an editable value field. To enter a calibration value of 1.5, tap:

1, ., 5, Edit

The new calibration value appears

ZONE TEMP 70.0 CALIBR 1.5

To update the temperature reading to reflect the new calibration value, tap the Auto Update button to display **ON**. The following display appears:

ZONE TEMP 71.5 CALIBR 1.5

Password Field Example

To store the calibration settings in Flash memory, tap:

Section, 0, 2, Page, 0, 8, Send Txt

to view the page. The screen displays

STORE CONFIGURATION?

To “open” the editable field, tap:

Edit

The screen displays

STORE CONFIGURATION? tttt

where tttt indicates an editable text field. To enter text, tap:

5, 5, 5, 5, Edit

The current application parameters are loaded to Flash memory and the display again shows

STORE CONFIGURATION?

Application Notes

The application software loaded into the FlexCool and FlexHeat controllers is the same. The reports and screens for the FlexCool controller show items applicable only to the FlexHeat controller and vice versa.

Network parameters are visible as part of the application but are not editable from the FlexHeat and FlexCool controllers. These items are editable only from a remote controller, such as the FlexFloor controller. If not connected to a network, these parameters have no effect.

The FlexCool and FlexFloor controllers do not contain a Real Time Clock (RTC) and cannot, on their own, change status from occupied to unoccupied. Typically, the FlexFloor or Air Handling Unit controller contain the RTC. Scheduling can be made from this single location and distributed through the network to each FlexCool and FlexHeat controller. As standalone controllers, the default is occupied and will not change unless overridden by a network command.

Summary Report

Table 3 – Summary Report (Section 01)

Page	Description
1	ZONE TEMP VVV.V
2	OCCUPIED MMM (YES) TIMER VVV.V (60.0)
3	OCC. CLG.SP VVV.V (75.0) HTG.SP VVV.V (73.0)
4	UNOCC. CLG.SP VVV.V (85.0) HTG.SP VVV.V (65.0)
5	DAMPER POSITION VVV.V
6	HEATING PERCENT VVV.V

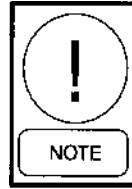
Factory default shown in parenthesis

The Summary Report shows the current setpoints and parameter settings for the attached controller. The items shown in the Summary Report cannot be edited from this report. Where applicable, data shown in the Summary Report can be edited in the Local Setup Report.

The Summary Report data is as follows:

ZONE TEMP – This is the temperature (°F) as measured by the zone sensor and adjusted by the calibration value.

OCCUPIED – When connected to a network controller equipped with a clock function, the status of the zone can be changed from occupied to unoccupied with different setpoints to reduce energy usage.



NOTE: *The FlexCool and FlexHeat controllers do not include a clock function and are not capable of changing occupational status.*

If not connected to a clock-equipped controller, the occupational status is always “occupied.”

TIMER – The zone sensor includes a push-button switch to override the unoccupied state. Pressing the switch changes zone from unoccupied to an occupied status for a predetermined time period (default 60 minutes). This field displays the time remaining in the override condition.

Press the switch a second time to extend the override condition an additional time period. To return to the unoccupied state, press and hold the switch 5 seconds.

OCC CLGSP (Occupied Cooling Setpoint) – In occupied periods, the MIT damper opens when the zone temperature is above this setpoint. The default occupied cooling setpoint is 75° F.

OCC HTG.SP (Occupied Heating Setpoint) – In occupied periods the heating sequence begins when the zone temperature is below this setpoint. The default occupied heating setpoint is 73° F.

UNOCC CLG.SP (Unoccupied Cooling Setpoint) – This is the cooling setpoint when the occupational status is “unoccupied.” The default unoccupied cooling setpoint is 85° F (29° C).

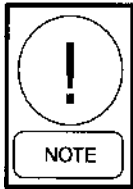
If not networked to a clock-equipped controller, this setpoint has no effect on the controller.

UNOCC HTG.SP (Unoccupied Heating Setpoint) – This is the heating setpoint when the occupational status is “unoccupied.” The default unoccupied heating setpoint is 65° F.

If not networked to a clock-equipped controller, this setpoint has no effect on the controller.

DAMPER POSITION – This indicates the position of the damper as a percentage of its full travel. It is a calculation based on the sum of the open and close pulses.

HEATING PERCENT – Indicates the heating demand on the FlexHeat controller. The heating requirement is based on a calculation. This calculation generates a commands which cause either the MFT box to operate or, if in Perimeter Heat mode, an analog valve to open. If using a modulating valve, the heating percent is an indication of how open the valve is. If using an MFT with stages of heat, the percentage corresponds to a heat stage.



NOTE: *Additional information on the heating percentage calculation can be found under Calculation Theory.*

Local Setup Report

Table 4 – Local Setup Report (Section 02)

Page	Description
1	ZONE TEMP vvv.v CALIBR vvv.v (0.0)
2	SP ADJ RANGE vvv.v (5.0) ACTUAL vvv.v
3	OCC. CLG.SP vvv.v (75.0)
4	CLG-HTG DEADBAND vvv.v (2.0)
5	UNOCC. OFFSET vvv.v (10.0)
6	FAN ON IN DEADBAND? MMMM mmmm (OPEN)
7	PERIMETER HEAT? MMMM mmmm (OPEN)
8	STORE CONFIGURATION? tttt

Factory default shown in parenthesis

The Local Setup Report allows the user to set the parameters required for the FlexCool or FlexHeat controller to operate as a standalone system. Most of the items reported in the Summary Report can be edited here.

ZONE TEMP – This is the temperature (°F) as measured by the zone sensor and adjusted according to the calibration of sensor.

CALIBR – This field is used to calibrate the temperature. To enter a calibration value, use an accurate thermometer to measure actual room temperature. Compare the measured temperature with the temperature shown in the ZONE TEMP field. Enter the difference in the CALIB field. Negative numbers are acceptable.

SP ADJ RANGE (Setpoint Adjustment Range) – This field sets the range of adjustment available from the slider on the zone sensor. The slider allows an equal amount of adjustment up and down. The default is ±5.

Since the heating setpoint is based on a deadband (difference from the cooling setpoint) the heating setpoint is also adjusted by the position of the slider. The unoccupied setpoint does not take into account the slider position.

The slider is based on a resistor which may or may not be exact in both directions. To overcome this, push the slider fully one direction, observe the value and repeat in the other direction. Edit the range field until the actual values are within an acceptable level.

ACTUAL – This field indicates the position, in degrees, of the slide potentiometer. Move the slider fully in either direction to display the Setpoint Adjustment Range.

OCC. CLG SETPT (Occupied Cooling Setpoint) – This field sets the occupied cooling setpoint. This is the setpoint when the slider is centered and the controller is in an occupied state. The default occupied cooling setpoint is 75° F.

CLG-HTG DEADBAND (Cooling-Heating Deadband) – This field sets the difference between the cooling setpoint and the heating setpoint. The number must be a positive number greater than 1. This deadband, subtracted from the Occupied Cooling Setpoint, sets the Occupied Heating Setpoint. The default is 2.

UNOCC. OFFSET (Unoccupied Offset) – This field sets the difference between the Occupied Cooling Setpoint and the unoccupied temperature. The number is added to the Occupied Cooling Setpoint (without slider adjustment correction) to establish the Unoccupied Cooling Setpoint. Similarly, the number is subtracted from the Occupied Cooling Setpoint to establish the Unoccupied Heating Setpoint.

The default Occupied Cooling Setpoint is 75° F and the default Unoccupied Offset is 10. This establishes an Unoccupied Cooling Setpoint of 85° F and an Unoccupied Heating Setpoint of 65° F.

FAN ON IN DEADBAND? – This field activates an option to operate the fan in an MFT box when in the Heating Deadband, the temperature range between the cooling and heating setpoints when approached from a lower temperature. If

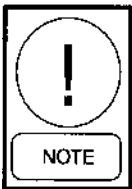
approached from a higher temperature, it is considered Cooling Deadband and the fan does not operate. The default is NO (OPEN). To change to YES, select the MADE menu option.

To change the operation mode, tap **Edit** and **Sel/Data**. **Sel/Data** toggles between MADE and OPEN. When the desired choice is visible in the field, tap **Edit**.

PERIMETER HEAT? – This field sets the controller to operate with a perimeter heat method other than an MFT box. It uses a Power Control Module (PCM) to provide power to the FlexHeat which typically employs an analog valve. This analog valve is connected to the VALVE port of the FlexHeat controller and opens on a one-to-one ratio according to the heating percent rather than the “staged” effects of the MFT box. The default status is NO (OPEN). To change to ON, select the MADE menu option.

To change the operation mode, tap **Edit** and **Sel/Data**. **Sel/Data** toggles between MADE and OPEN. When the desired choice is visible in the field, tap **Edit**.

STORE CONFIGURATION? – This field sends the current configuration to be stored in the FLASH memory. Normally, changes made during a terminal session are stored in BRAM. This is volatile memory and, if power is lost, any changes are lost. By activating this Page, changes are immediately stored in FLASH.



NOTE: BRAM memory is automatically backed up to FLASH memory once every 24 hours by the firmware. If STORE CONFIGURATION is not activated immediately and a power loss occurs before the automatic save is completed, information will be lost.

This Store Configuration function should be the last item completed when changing operating parameters on the FlexCool and FlexHeat controllers.

To invoke the Store Configuration process, tap **Edit**. Enter **5555** and tap **Edit** to complete the process.

Calibration Reports

Table 5 – Calibration Report (Section 03)

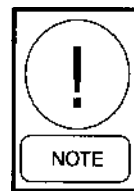
Page	Description
1	ACTUATOR TRAVEL vv SEC (420)
2	ACTUATOR SCALE FACTOR vv (30)
3	ACTUATOR CALC. INTERVAL vv (30.0) SEC
4	HTG PI CALC. INTERVAL vv (120) SEC
5	HTG PI CALC. CONSTANT vv (25) SEC
6	DAMPER FORCE OPEN mmmm POS vv.v
7	DAMPER FORCE CLSE mmmm POS vv.v
8	HEATER CONTROL vvv% mmmm (AUTOMATIC)
9	POWERUP CALIBRATION TIMER vvv (550)
10	STORE CONFIGURATION? tttt (5555)

Factory default shown in parenthesis

The Calibration Reports provide access to items and constants used in calculations within the controller. By modifying these items, the tuning loops can be fine tuned for specific applications. The factory defaults typically provide adequate control.



CAUTION: Only experienced technicians should modify these items. Changing constants to unreasonable values can make the system inoperable.



NOTE: Additional information can be found in the Calculation Theory section of this manual.

ACTUATOR TRAVEL – This field sets the amount of time (time constant) required to fully open or close an MIT damper. Based on a travel distance of 10 inches, the input electrical frequency determines the time. Assuming an input frequency of 60 Hz, the travel time is 420 seconds, which is the default value. If using a 50 Hz electrical

supply, the time required to travel the full 10 inches is lengthened to 504 seconds. This must be manually edited on this page.

ACTUATOR SCALE FACTOR – This field sets a constant used in determining the length of the pulse. It has been set based on past experience. Increasing the value decreases the length of the pulse.

ACTUATOR CALC. INTERVAL – This field sets how often the temperature of the zone is analyzed and the position of the damper adjusted.

HTG PI CALC. INTERVAL – This field sets the amount of time before recalculating the heating percent. This determines the stage of heat or position of the analog valve (if Perimeter Heat is invoked).

HTG PI CALC. CONSTANT – This field sets a constant for calculating the heating percent. The default has been chosen based on past experience. Increasing the value increases the length of the pulse.

DAMPER FORCE OPEN – This invokes a command which operates all dampers to fully open. Normally, this is indicated as OPEN and the POS (position) is indicated as a percentage.

To invoke this function, tap **Edit** and **Sel/Data**. **Sel/Data** toggles between MADE and OPEN. When MADE is visible in the field, tap **Edit**. The controller will immediately begin to drive the damper open. This will continue until the DAMPER FORCE OPEN field is changed to OPEN.

To view the changing damper position as a percentage, tap the **Auto Update** button to ON.

To stop the controller from driving the damper open, tap **Edit** and **Sel/Data** until OPEN appears in the field. Tap **Edit** to close the field and turn off the function.



CAUTION: The DAMPER FORCE OPEN and DAMPER FORCE CLOSE commands override any calculations or automatic operation. They must be turned off before normal operation can resume.

DAMPER FORCE CLSE – This actuates a command which operates all actuators to close the damper. Normally, this is indicated as OPEN and the POS (position) is indicated as a percentage.

To invoke this function, tap **Edit** and **Sel/Data**. **Sel/Data** toggles between MADE and OPEN. When MADE is visible in the field, tap **Edit**. The controller will immediately begin to drive the damper closed. This will continue until the DAMPER FORCE CLOSED field is changed to OPEN.

To view the changing damper position as a percentage, tap the **Auto Update** button to ON.

To stop the controller from driving the damper closed, tap **Edit** and **Sel/Data** until OPEN appears in the field. Tap **Edit** to close the field and turn off the function.

HEATER CONTROL – This allows the technician to verify heater operation. Normally, this is an Automatic mode, with heater operation controlled by the FlexHeat controller.

To invoke this function, tap **Edit** and **Sel/Data** to toggle between AUTOMATIC and MANUAL. Tap **Edit** when MANUAL appears. The percentage of heat value will not change.

To change the percentage of heat value, tap **Edit** and enter the value desired on the Command Line. Tap **Send Txt** and the controller will immediately demand that percentage of heat. This percentage of heat corresponds to a heat stage or valve position, creating heat in the zone.

To change the controller back to an AUTOMATIC mode of heat demand, tap **Edit** twice and then **Sel/Data** until AUTOMATIC appears in the field. Tap **Edit** to close the field and turn off the function.



CAUTION: When the Heater Control is in MANUAL mode it will always create the manually entered amount of heat. It must be reset back to AUTOMATIC before normal operation can resume.

POWERUP CALIBRATION TIMER – This indicates the amount of time remaining for the damper (actuator) to be forced closed at pow-

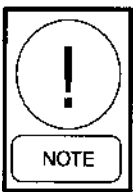
erup. To calibrate the damper position, the controller forces the dampers closed for 550 seconds to establish position.

STORE CONFIGURATION? – This field sends the current configuration to be stored in the FLASH memory. Normally, changes made during a terminal session are stored in BRAM. This is volatile memory and, if power is lost, any changes are lost. By activating this Page, changes are immediately stored in FLASH.

This Store Configuration function should be the last item completed when changing operating parameters on the FlexCool and FlexHeat controllers.

To invoke the Store Configuration process, tap **Edit**. Enter **5555** and tap **Edit** to complete the process.

Network Command Report



NOTE: *These items cannot be modified at this level and should be ignored if not connected to a network.*

Table 6 – Network Command Report (Section 04)

Page	Description
1	DEVICE NODE NUMBER VV
2	OCC. CLG.SP VVV.V
3	SP ADJ RANGE VVV.V ACTUAL VVV.V
4	OVERRIDE MINUTES VVV.V
5	UNOCC. OFFSET VVV.V
6	OCCUPIED MMMM TIMER VVV.V
7	DMPR.FORCE OPEN MMMM POS VVV.V
8	DMPR.FORCE CLSE MMMM POS VVV.V
9	FAN ON IN DEADBAND MMMM X-FER MMMM
10	PERIMETER HEAT MMMM X-FER MMMM

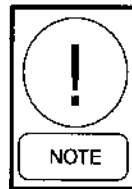
Factory default shown in parenthesis

The Network Command Report shows the parameters received from another networked controller, such as the FlexFloor controller. These values override the local values in the FlexCool or FlexHeat controller. The default values are set outside the normal range causing the controller to ignore them when not

networked. When a network controller is connected and acceptable values are received by the FlexCool or FlexHeat controller, the local values are overridden by the network values.

The values are typically the same as shown on the Summary Report but the setup values and constants are received from the network controller and not editable from the local controller. Using a FlexFloor controller allows the values to be entered once at a single location without the need to set parameters at each FlexCool and FlexHeat controller.

DEVICE NODE NUMBER – This is the node number of the FlexCool or FlexHeat controller. It is set using the node switch on the controller and must be a unique number on the network.



NOTE: *It is recommended that node 64 be reserved for the FlexFloor controller. FlexCool and FlexFloor controllers are preconfigured to transfer to address 64 and the FlexFloor is preconfigured to use this node address.*

OCC. CLG SETPT (Occupied Cooling Setpoint) – This is the network setpoint received from the network controller. The default is -40. Anything greater than 0 causes the network setpoint to override the local setpoint.

SP ADJ RANGE (Setpoint Adjustment Range) – This is the range of adjustment available to the user when the slide potentiometer on the zone sensor is moved. It overrides the local Setpoint Adjustment Range.

ACTUAL – This is the setpoint of the local zone sensor with the effect of the sliding potentiometer taken into account.

OVERRIDE MINUTES – This field indicates the time remaining in the override state when the override button on the zone sensor is activated. Refer to the section regarding **TIMER** on the Summary Report.

UNOCC. OFFSET (Unoccupied Offset) – This field shows the difference between the Occupied Cooling Setpoint and the unoccupied temperature.

OCCUPIED – This indicates the current status of occupancy. It is received from the network controller and is usually based on time setting.

DMPR. FORCE OPEN – This indicates the status of the damper actuation. If MADE, it indicates that the network controller has actuated a command which is forcing all dampers open.

POS – This indicates the current position, as a percentage, of the dampers attached to the local controller.

DMPR. FORCE CLSE – This indicates the status of the damper actuation. If MADE, it indicates that the network controller has actuated a command which is forcing all dampers closed.

POS – This indicates the current position, as a percentage, of the dampers attached to the local controller.

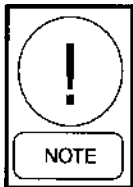
FAN ON IN DEADBAND – This indicates that the MFT fan operates in the deadband between the Cooling Setpoint and the Heating Setpoint. The status is indicated as NO (default) or YES.

PERIMETER HEAT – This indicates the type of perimeter heat selected. If NO, perimeter heat is generated using the MFT box. If YES, perimeter heat is generated using a modulating analog valve.

Transfer Out Report



CAUTION: Only experienced technicians should modify these items. Changing constants to unreasonable values can make the system inoperable.



NOTE: The Transfer Out Report is only relative when connected to a network.

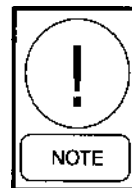
Table 7 – Transfer Out Report (Section 05)

Page	Description
1	F27S01 CH: m ND: vv (64) ZONE TEMP VVV.V
2	F27S02 CH: m ND: vv (64) HT-DB-CL VVV.V
3	F27S03 CH: m ND: vv (64) DMPR. POS VVV.V
4	F27S04 CH: m ND: vv (64) HTG % VVV.V
5	F27S05 CH: m ND: vv (64) OCCUPIED VVV.V
6	STORE CONFIGURATION? tttt (5555)

Factory default shown in parenthesis

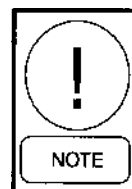
The Transfer Out Report configures the FlexCool or FlexHeat controller to supply information to an outside controller such as the FlexFloor controller. This data is used by the AHU controller to adjust the temperature of the air in the underfloor space according to the needs in the interior zone.

The first five pages indicate information that can be transferred, if desired. To transfer a specific page of data, change the Channel No. to 1.



NOTE: Available channel numbers are blank, 1, and 2. These correspond to a port. Channel number 1 is the LAN port, Channel number 2 is the RS232 port.

The data can be transferred to any node on the sub-network. The default node for transfer is 64, which is the default node address of the FlexFloor controller. This can be changed, if desired.



NOTE: F27S01 through F27S05 is the final programming block destination of the data. For example: all zone temperature can be transferred to net=0, node=64, Feature 27, Section 01 where the highest and lowest value is selected.

This report is not used if a network is not connected to the controller. If the controller is connected and information is required by another controller(s), the

channel must be turned “on”, indicated by a 1, and the receiving node selected.

The information normally required by the FlexFloor for effective AHU management, loaded as factory defaults, is:

ZONE TEMP (S01) – This is the temperature of the zone.

HT-DB-CL (S02) – This is the operational mode of the controller. If heating, 1 is indicated. If cooling, -1 is indicated. If within the deadband, 0 is indicated. The AHU controller can count the number of zones in cooling versus heating and make the appropriate adjustments to the output of the AHU.

DMPR. POS (S03) – The Damper Position is an indication of underfloor air temperature requirement. If most of the dampers are open fully, the underfloor temperature may be lowered. If most of the dampers are closed, the underfloor temperature may be raised.

HTG. % (S04) – The Heating Percentage changes the underfloor air temperature based on the amount of heat required in a similar manner as the Damper Position.

OCCUPIED (S05) – The Occupied status changes the underfloor pressure based on the need for air flow. In an unoccupied state, air pressure can be reduced.

STORE CONFIGURATION? – This field sends the current configuration to be stored in the FLASH memory. Normally, changes made during a terminal session are stored in BRAM. This is volatile memory and, if power is lost, any changes are lost. By activating this Page, changes are immediately stored in FLASH.

This Store Configuration function should be the last item completed when changing operating parameters on the FlexCool and FlexHeat controllers.

To invoke the Store Configuration process, tap **Edit**. Enter **5555** and tap **Edit** to complete the process.

Reset Report

Table 8 – Reset Report (Section 06)

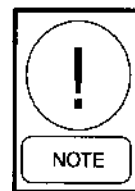
Page	Description
1	RESET SYSTEM? tttt (5555)

The Reset Report allows the user to return to local control after a network controller has been connected.

The FlexCool and FlexHeat application software gives priority to the network controller, if a network controller is connected. To do this, the default network values are unrealistic when shipped from the factory so the controller ignores them. This allows the local parameters to have priority.

When a network controller is connected, it changes these unrealistic network values to real values. The controller then uses these new network values instead of the local parameters. The realistic network values are then held in BRAM memory.

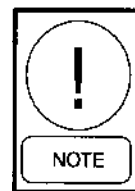
Since the original, unrealistic values still remain in Flash memory, they may be “reinstated” by invoking Page 1 or the Reset Report.



NOTE: Network transfers must be stopped before invoking the reset or network parameters will be re-installed upon power up. This can be accomplished by either disconnecting the LAN cable or stopping transfers from the sending controller.

To invoke the command tap:

Edit, 5, 5, 5, 5, Edit.



NOTE: Invoking this command will cause the controller to drive the dampers closed for 550 seconds. This process cannot be stopped.

Calculation Theory

MIT Damper Actuation

The MIT dampers open and close to allow cool air to flow from the underfloor space to the occupied zone. As the zone sensor determines the need, an actuator in each box moves the dampers.

To prevent over-reaction of the dampers, the controller operates for a given amount of time (ACTUATOR CALC. INTERVAL) before calculating the length of time to open (or close) the damper. This time is known as a pulse.

The formula for calculating a pulse is based on the overall travel length and the temperature difference between the setpoint and actual temperature. A constant (ACTUATOR SCALE FACTOR) is also used.

$$\text{Length of Pulse} = \frac{(T-SP)}{SF} (\text{ACT. TRAVEL})$$

If SP-T is negative the actuator is driven the opposite direction.

Example:

Zone Temp (T) = 76
Setpoint (SP) = 75

$$\begin{aligned} \text{Length of Pulse} &= \frac{(76-75)}{30} (420) \\ &= 14 \text{ seconds} \end{aligned}$$

To obtain the correct amount of air flow and temperature adjustment speed, these factors can be modified. To slow the rate of temperature change, the scale factor (SF) can be increased to decrease the length of the pulse or the Actuator Calc. Interval can be increased to change how often the calculation is performed.

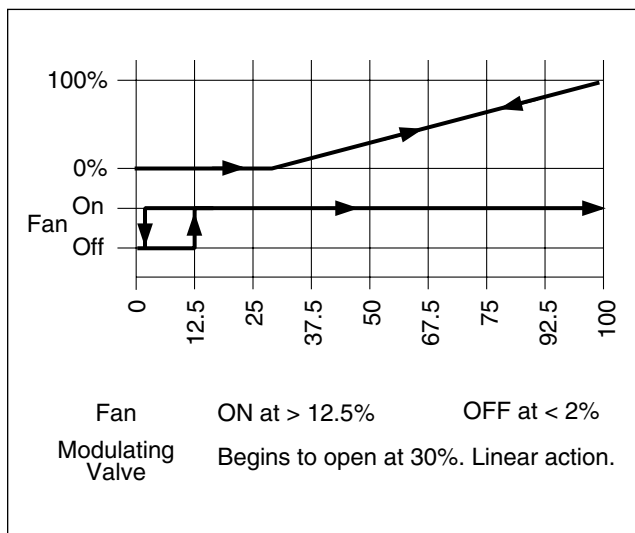


Figure 21. Modular Valve Change Points

Using the default values, the length of a pulse is 14 seconds or approximately 3% of total travel. The calculation is performed every 30 seconds until the temperature difference is 0.

Stages of Heat

The MFT box has three methods of providing heat to the zone. These are referred to as stages as each one becomes increasingly aggressive. The first stage uses the fan in the MFT to draw air from the warmer, interior zone and supply it to the cooler perimeter. Since the temperature is significantly warmer than the 63° F typically in the underfloor zone, this begins to heat the room.

In the second stage, a heater coil in the MFT box is activated, adding additional heat to the air blowing through the fan.

The third stage adds a second heater coil to increase the heat flowing through the MFT box.

Since the % Heat is an analog value, operational ranges have been assigned to each of the stages. The actuation of each stage differs depending upon the percent heat required.

Two methods of controlling hydronic heat are available. One method uses the MFT box with a binary valve incorporated to open and close flow to a heat exchanger in the MFT box. The valve is connected to and controlled by the logic in the MFT box.

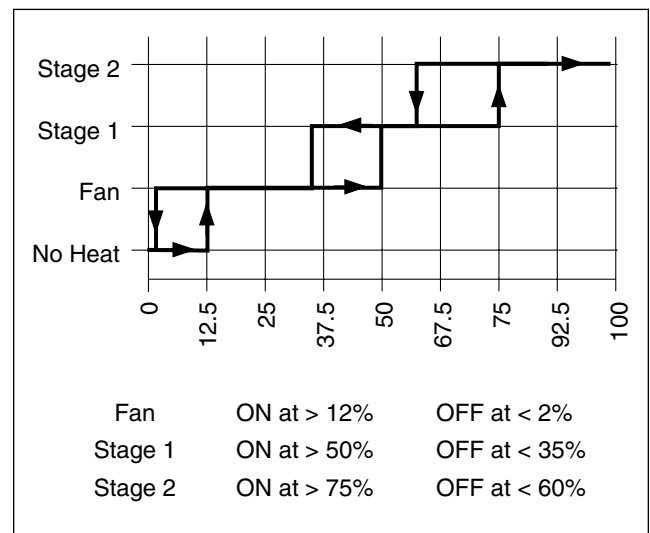


Figure 22. Stage Heat Change Points

Using this method changes the number of stages to two, with the fan being the first stage and operating at the same on/off points. The second stage opens the valve fully and uses the same on/off points as the First Stage with electric heat.

A second method of hydronic heat is to use an analog valve. This connects directly to the FlexHeat controller. The electric heat stages are then disabled using the PERIMETER HEAT? function. Turning this ON changes the heat method to a 0-10 VDC analog signal for operating an analog valve. The % Heat required is then equal to the percentage of flow allowed by the valve.

MFT Heater Actuation

In much the same way as the MIT dampers must be modulated, so, too, must the heater function. To do this, the FlexHeat controller takes advantage of a PI loop to adjust the amount of heat required. A PI loop is a formula which takes into account the history of the function. Two constants are chosen, a multiplier (or gain) and a time interval to allow changes to take effect.

The formula takes into account the previous heat percentage.

$$\% \text{ Heat} = K(SP - T) + \text{Last } \% \text{ Heat}$$

If $SP - T$ is negative the heat requirement is reduced.

Example:

$$\text{Zone Temp (T)} = 72$$

$$\text{Setpoint (SP)} = 73$$

$$K = 25$$

$$\% \text{ Heat} = 25(73 - 72) + \text{Last } \% \text{ Heat}$$

The percentage of heat can be modified by changing one of two variables.

1. If the constant K (HTG PI CALC. CONSTANT) is increased, the percent of heat required is increased.
2. If the HTG PI CALC. INTERVAL is reduced, the calculation is performed more often.

The default values have been chosen for efficiency and from previous experience. Using the default values and assuming a $1/2^\circ$ difference, the maximum time for the fan to engage is 2 minutes. For the first stage of heat to engage is 8 minutes.

SECTION 5

MAINTENANCE

LEDs

The FlexHeat and FlexCool controllers are equipped with LEDs to aid in troubleshooting operation and communications.

STATUS LED

The FlexCool and FlexHeat controllers each utilize a STATUS LED. This LED indicates a processor fault or the software status.

The following table indicates the codes used by the STATUS LED.

Communication LEDs

LAN LEDs

The LAN port has two LEDs; the TX LED indicates the controller is transmitting and the RX LED indicates the controller is receiving data across the ISN LAN. Data transmission can be due to a request by another controller or, if properly configured, due to the application within the controller.

ISN software requires an acknowledgement any-time communications are sent. Due to this required response, a TX flash will be followed by an RX flash,

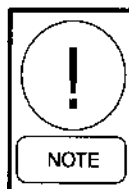
The RX flash signifies the receipt of the acknowledgement.

RS232 LEDs

The RS232 port also has a TX and RX LED. By observing the LEDs a technician can determine that the controller is receiving or transmitting data. Although a limited amount of information can be ascertained, it is helpful in eliminating possible causes of communication failure.

Output LEDs

The output channels on the FlexCool and FlexHeat controllers incorporate LEDs to signify status. The connectors to the MIT boxes signify rotation in either a clockwise (CW) or counterclockwise (CCW) direction.



NOTE: *The clockwise LED indicates the damper is opening. Counterclockwise indicates the damper is closing.*

Table 9 – STATUS LED Codes

LED	Code	Action
OFF	System is OFF or has failed (crashed).	Reboot system. If failure repeats, contact York Service.
ON	System is operating correctly.	
Quick Flash	(1.6 sec on, 0.2 sec off) System is resetting.	Normal. If continues for more than 1 minute, contact York Service.
2 flashes	System is in the UNCONFIGURED mode.	Software is not loaded. Contact York Service.
3 flashes	System is in the HALT mode.	Contact York Service.
4 flashes	System is in the MONITOR mode.	Contact York Service.
5 flashes	System has UNACKNOWLEDGED alarms.	This may indicate unconnected sensors. If unit does not function properly, contact York Service. Otherwise, alarms may be ignored
10 flashes	System is in the RTOS mode (application is not loaded).	Software is not loaded. Contact York Service.

For the FlexCool controller, a pair of LEDs indicate rotation for both the MIT1 and MIT2 connectors. The output through both these connectors is always the same.

For the FlexHeat controller the MIT cable connects to the MFT box initially but the LED indicates the signal to the MFT box which controls the MIT actuator.

The FlexHeat controller has two additional LEDs to indicate heat output. These outputs provide a signal to the MFT box relay card. By using an ON-OFF logic table, the two outputs can provide three stages of con-

trol. The following table indicates the heating stage for the output logic as indicated by the LEDs labeled DO5 and DO6.

Table 10 – Heating Stage LEDs

Heat Stage	D06	D05
No heat	OFF	OFF
Fan only	OFF	ON
Heat Stage 1	ON	OFF
Heat Stage 2	ON	ON

FlexCool Specifications

General		
Primary Power Source		115/230 VAC, ($\pm 10\%$) Switch selectable
Frequency		45-65 Hz
Protection		Internal Thermal Reset on Transformer
Power Consumption		Nominally 75 VA (1.5 VA plus connected load)
Storage Temperature		-40 to 160° F (-40 to 70° C)
Operating Environment		32 to 120° F (0 to 50° C)
		10 to 95% RH non-Condensing
Size (H x W x D)		6.0 x 6.5 x 2.25 in. (145 X 165 X 66 mm)
Weight		5 lb. (2.2 kg)
Processor		
Type		NEC V25 Operating at 8 MHz
Memory PROM		128 kbytes of CMOS EPROM
Memory RAM		128 kbytes of CMOS RAM
Memory Backup		512 kbytes Flash Memory
Connections		
MIT 1 and MIT 2		2 Connectors provide access to a single set of triac outputs. Each output is 24 VAC and 3.2 amps. Connects up to 14 MITs via PAP-A cable.
Sensor		2 Analog Inputs from thermostat. Connects to temperature input and setpoint adjuster via a PAP-B cable.
RS232		RS232 communication link to zone sensor via PAP-B cable.
LAN		RS485. Switch-selectable 19.2 or 50 kbaud.
LAN Cable		5-pin screw terminals or USB-style connector to Universal LINC Screened Twisted-Pair (Belden 9272 or Equivalent)
Interface		
LEDs		FlexCool Controller Status; LAN Communication; RS232 Communication; MIT Actuator Rotation Direction
Switch Selections		Node Address (1-92); LAN Transfer Rate (19.2 or 50 kbaud)
Configuration		PalmPilot® Emulation Software; Other ISN devices
Approvals		
		UL 916
		UL 94-5VB Plenum Flammability Rating
		FCC Part 15 Class A
		LVD Standard EN61010: 2001
		CE Directive EN61000: 2001
Ordering Information		
TDCE FlexCool (115 VAC)		371-03772-001
TDCE FlexCool (230 VAC)		371-03772-002
Zone Sensor		031-02432-000
PAP-A Cable		32-04004-027
PAP-B Cable		32-04004-028
PAP-C Cable (Extender)		32-04004-035
PAP-D Cable		32-04004-058
PAP-E Cable		32-04004-059
PAP-F Cable		32-04004-066
Conduit Box		371-04184-000

FlexHeat Specifications

General		
Primary Power Source		24 VAC \pm 15% (from MFT box via PAP-A cable)
Frequency		45 to 65 Hz
Protection		At MFT box
Max. Power		18 VA
Storage Temperature		-40 to 160° F (-40 to 70° C)
Operating Environment		32 to 120° F (0 to 50° C)
		10 to 95% RH non-Condensing
Size (H x W x D)		3.9 x 5.5 x 1.6 in. (100 X 140 X 40 mm)
Weight		1 lb. (0.45 kg)
Processor		
Type		NEC V25 Operating at 8 MHz
Memory PROM		128 kbytes of CMOS EPROM
Memory RAM		128 kbytes of CMOS RAM
Memory Backup		512 kbytes Flash Memory
Connections		
MIT		2 Digital Triac Outputs. Each output is 24 VAC and 0.5 amps per channel. Connects to MFT via PAP-A or PAP-E cable for control of up to 14 MITs.
MFT		2 Digital Triac Outputs to control MFT via PAP-A or PAP-E cable. 24 VAC 0.5 amps per channel.
Sensor		2 Analog Inputs from thermostat. Connects to temperature input and setpoint adjuster via a PAP-B cable. Additional analog input for customization
Valve		Analog Output 0.15 mA @ 0-10 VDC, 3 VA max. and 24 VAC @ 3VA. Connects via PAP-A cable.
RS232		RS232 communication link to zone sensor via PAP-B cable.
LAN		RS485. Switch-selectable 19.2 or 50 kbaud.
LAN Cable		5-pin screw terminals or USB-style connector to Universal LINC. Screened Twisted-Pair (Belden 9272 or Equivalent)
Interface		
LEDs		FlexHeat Controller Status; LAN Communication; RS232 Communication; MIT Actuator Rotation Direction; MFT Heat Stage
Switch Selections		Node Address (1-92); LAN Transfer Rate (19.2 or 50 kbaud)
Programming		PalmPilot® Emulation Software; Other ISN devices
Approvals		
		UL 916
		UL 94-5VB Plenum Flammability Rating
		FCC Part 15 Class A
		CE Directive 61010: 2001
Ordering Information		
TDCE FlexHeat		371-03773-001
Zone Sensor		031-02432-000
PAP-A Cable		32-04004-027
PAP-B Cable		32-04004-028
PAP-C Cable (Extender)		32-04004-035
PAP-D Cable		32-04004-058
PAP-E Cable		32-04004-059
PAP-F Cable		32-04004-066

NOTES



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