

TS200 Series Sensor

SUPERSEDES: October 25, 2011

EFFECTIVE: February 26, 2015

Plant ID: 001-3965

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TS200 SERIES SENSORS

iWorx® TS200 Series Sensors are a family of wall-mounted thermostats for use only with iWorx® BZU3 Zoning Controllers. These sensors feature a pulse communication protocol which provides an interface for exchange of sensor and control information. Control information includes temperature setpoints, manual and timed temperature override selection, system mode, and fan mode.

Overview

The iWorx® TS200 Series Sensors are available in three models.

Table 1: Product Information Table

Thermostat Model	Description	Keypad	Sensors
TS202-1	Room Air Sensor with setpoint adjustment and override. Heat only.	Six Button Keypad with On/Off control.	Air Temp Only.
TS203-1	Room Air Sensor with optional TRP floor temp sensor, setpoint adjustment, and override. Heat only.	Six Button Keypad with On/Off control.	Air and Floor Temp Sensors.
TS204-1	Room Air Sensor with optional TRP floor temp sensor, setpoint adjustment, override, and fan mode control. Heat and cool. BZU3 must be associated to a DXU-series controller for cooling.	Seven Button Keypad with Mode and Fan control.	Air and Floor Temp Sensors.

Features

- Contemporary, low-profile packaging.
- Blue backlit LCD display; displays setpoints or current temperatures.
- Digital zone temperature indication.
- Dual temperature (air and floor) capabilities (TS203 and TS204 models)
- Pushbutton override capabilities allow occupants to override the system schedule and switch to local operation.
- Timed overrides can be selected for 1-4 hours.
- Manual overrides to change temperature setpoint permanently.
- Displays selected system values such as space temperature, setpoints, system operating mode, and fan mode.
- Separate wiring subbase and electronics.

REPRESENTATIONS AND WARRANTIES

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iWorx® products shall only be used for the applications identified in the product specifications and for no other purposes. For example, iWorx® products are not intended for use to support fire suppression systems, life support systems, critical care applications, commercial aviation, nuclear facilities or any other applications where product failure could lead to injury to person, loss of life, or catastrophic property damage and should not be used for such purposes.

Taco Electronic Solutions, Inc. will not be responsible for any product or part not installed or operated in conformity with the Document and instructions or which has been subject to accident, disaster, neglect, misuse, misapplication, inadequate operating environment, repair, attempted repair, modification or alteration, or other abuse. For further information, please refer to the last page of this Document for the company's Limited Warranty Statement, which is also issued with the product or available at www.taco-hvac.com.

INSTALLATION INSTRUCTIONS

PRECAUTIONS

General



This symbol is intended to alert the user to the presence of important installation and maintenance (servicing) instructions in the literature accompanying the equipment.



WARNING: Electrical shock hazard. Disconnect **ALL** power sources when installing or servicing this equipment to prevent electrical shock or equipment damage. Do not allow live wires to touch the circuit board.



FOLLOW THESE PROVIDED INSTRUCTIONS TO PROPERLY INSTALL AND CONFIGURE THE THERMOSTAT.

THE THERMOSTAT IS A PRECISION INSTRUMENT; PLEASE HANDLE IT WITH CARE!

DO NOT RUN THE THERMOSTAT WIRING IN ANY CONDUIT WITH MAINS POWER SYSTEM WIRING.

USE A SEPARATE UL-LISTED CLASS 2 TRANSFORMER WHEN POWERING THE THERMOSTAT WITH 24VAC.

FAILURE TO WIRE DEVICES WITH THE CORRECT POLARITY WHEN USING A SHARED TRANSFORMER MAY RESULT IN DAMAGE TO ANY DEVICE POWERED BY THE SHARED TRANSFORMER.

Make all wiring connections in accordance with these instructions and in accordance with pertinent national and local electrical codes.

Static Electricity

Static charges produce voltages that can damage this equipment. Follow these static electricity precautions when handling this equipment.

- Work in a static free area.
- Touch a known, securely grounded object to discharge any charge you may have accumulated.

Location

Avoid locations where corrosive fumes, excessive moisture, vibration or explosive vapors are present.

Avoid electrical noise interference. Do not install near large contactors, electrical machinery, or welding equipment.

This equipment is suitable for indoor use only. Operate where ambient temperatures do not exceed 122 °F (50 °C) or fall below 32 °F (0 °C) and relative humidity does not fall below 5% or exceed 95%, non-condensing.

Locate the sensor on an inside wall where the sensor is exposed to at least 30 feet (9 meters) per minute of unrestricted air circulation. The location should represent the average temperature in the room or space. Make certain sensor is located out of direct sunlight, away from sources of heat or cold, and away from concealed ducts or pipes.

FCC Compliance

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference. This equipment can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment to a power source different from that to which the receiver is connected.
- Consult the equipment supplier or an experienced radio/TV technician for help.

You are cautioned that any changes or modifications to this equipment not expressly approved in these instructions could void your authority to operate this equipment in the United States.

Canadian Department of Communications

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

INSTALLATION



Warning: Electrical shock hazard. To prevent electrical shock or equipment damage, disconnect **ALL** power sources to controllers and loads before installing or servicing this equipment or modifying any wiring.

Mounting the Device

1. Loosen the hex screws at the bottom of the base and carefully separate the cover from the base by pulling apart towards the lower part of the unit.
2. Attach the base directly to drywall, or to a standard 2" x 4" junction box using the mounting hardware provided.
3. Route the wires through the access hole in the center of the base and screw them into the terminal blocks. Refer to the *Wiring Information* section to make the necessary connections.
4. After wiring, attach the cover to the base and tighten the hex-screw at the bottom of the base until the cover cannot be removed.

WIRING INFORMATION

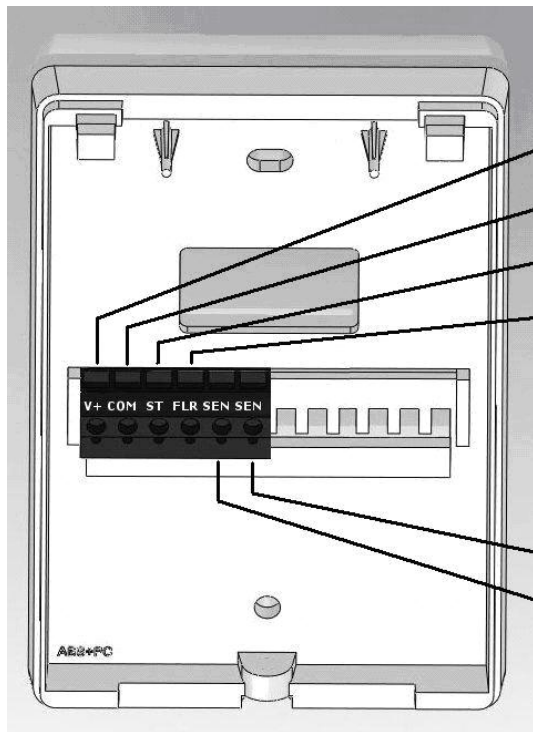
The number of wires needed to connect the Thermostat to an iWorx® BZUR controller depends on the application. All signals are common ground referenced.

TACO recommends 16-22 AWG twisted pair wires or shielded cable for all sensor installations. Be sure to connect the cable shield to the ground at the controller ONLY.

Table 2: Required Wiring

Thermostat Type	Space Temp Only	Floor + Space Temp	Floor + Space Temp w/Fan
TS202-1	3	N/A	NA
TS203-1	3	4	N/A
TS204-1	3	4	4

Figure 1: Thermostat Connections



V+: +15 to +32VDC, or 24VAC(+)

COM: Ground or signal common, 24VAC(-)

ST: Space temperature signal to controller

FLR: Floor temperature signal to controller

SEN: External floor sensor input, terminal 1

SEN: External floor sensor input, terminal 2

Figure 2: Application Wiring Example 1

Four Zone - Space Heating Only with BZU3 and TS202 Thermostats

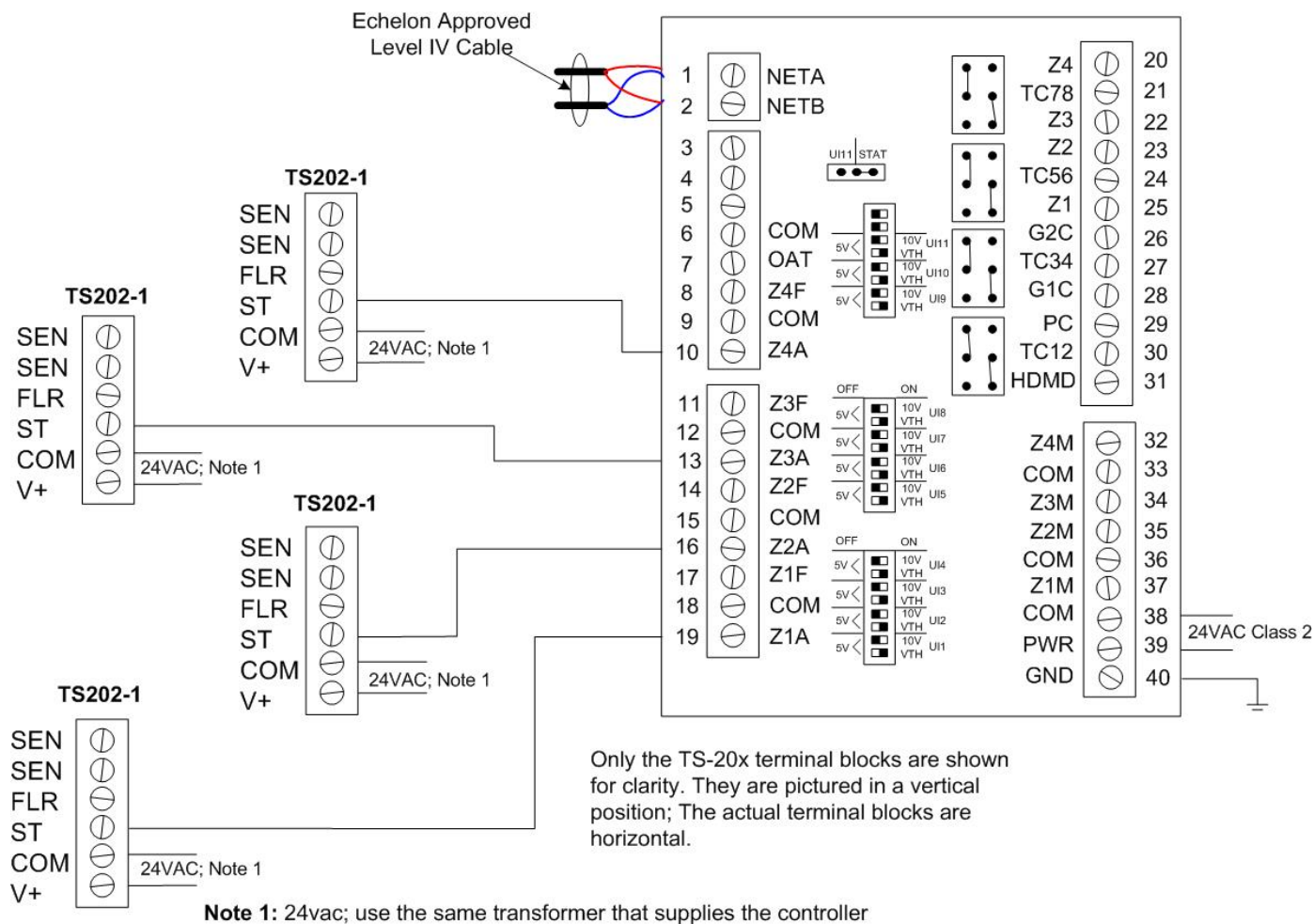


Figure 3: Application Wiring Example 2

Four Zone - Space Heating with BZU3 and TS203 Thermostats

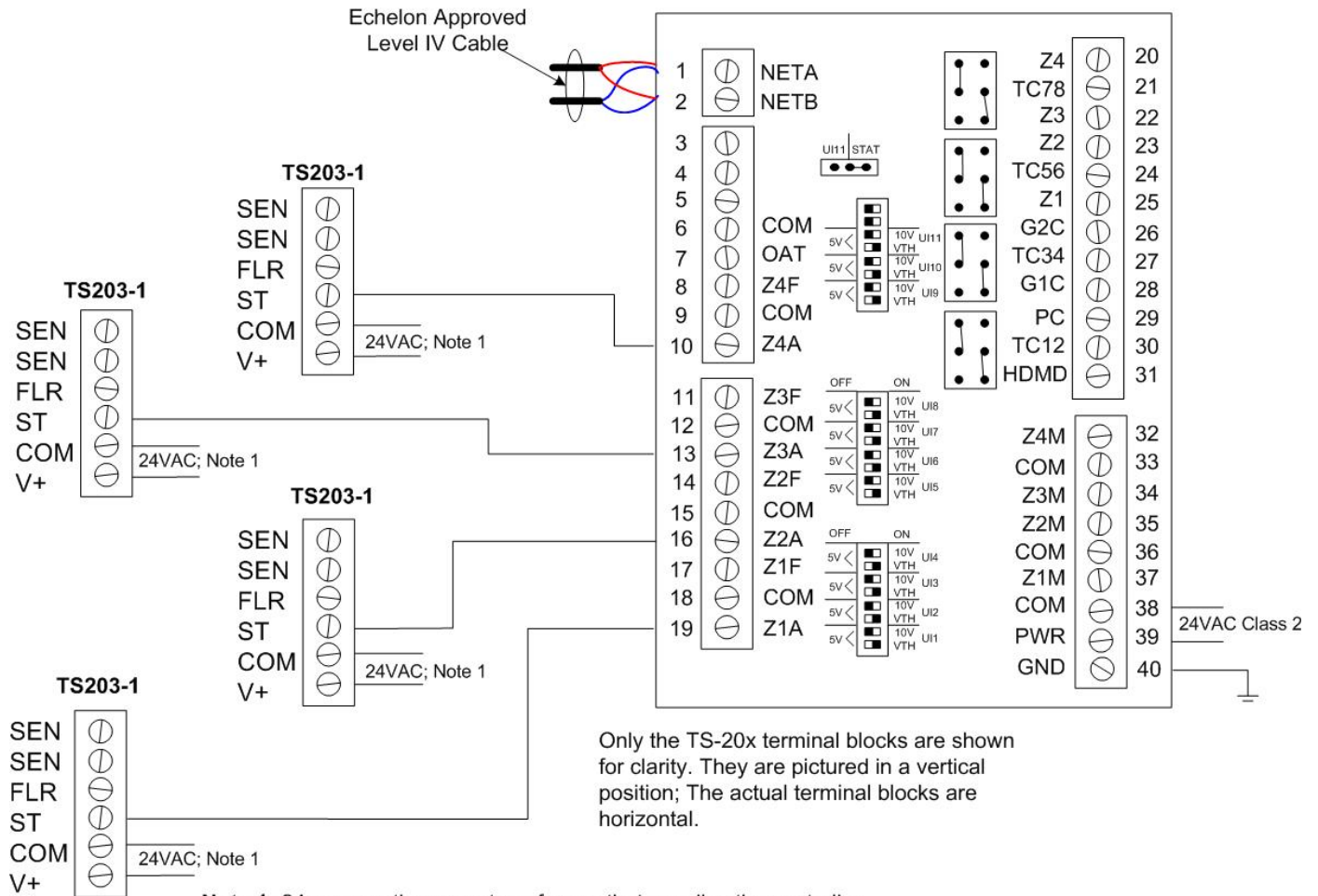


Figure 4: Application Wiring Example 3

Four Zone - Space and Floor Heating with BZU3 and TS203 Thermostats

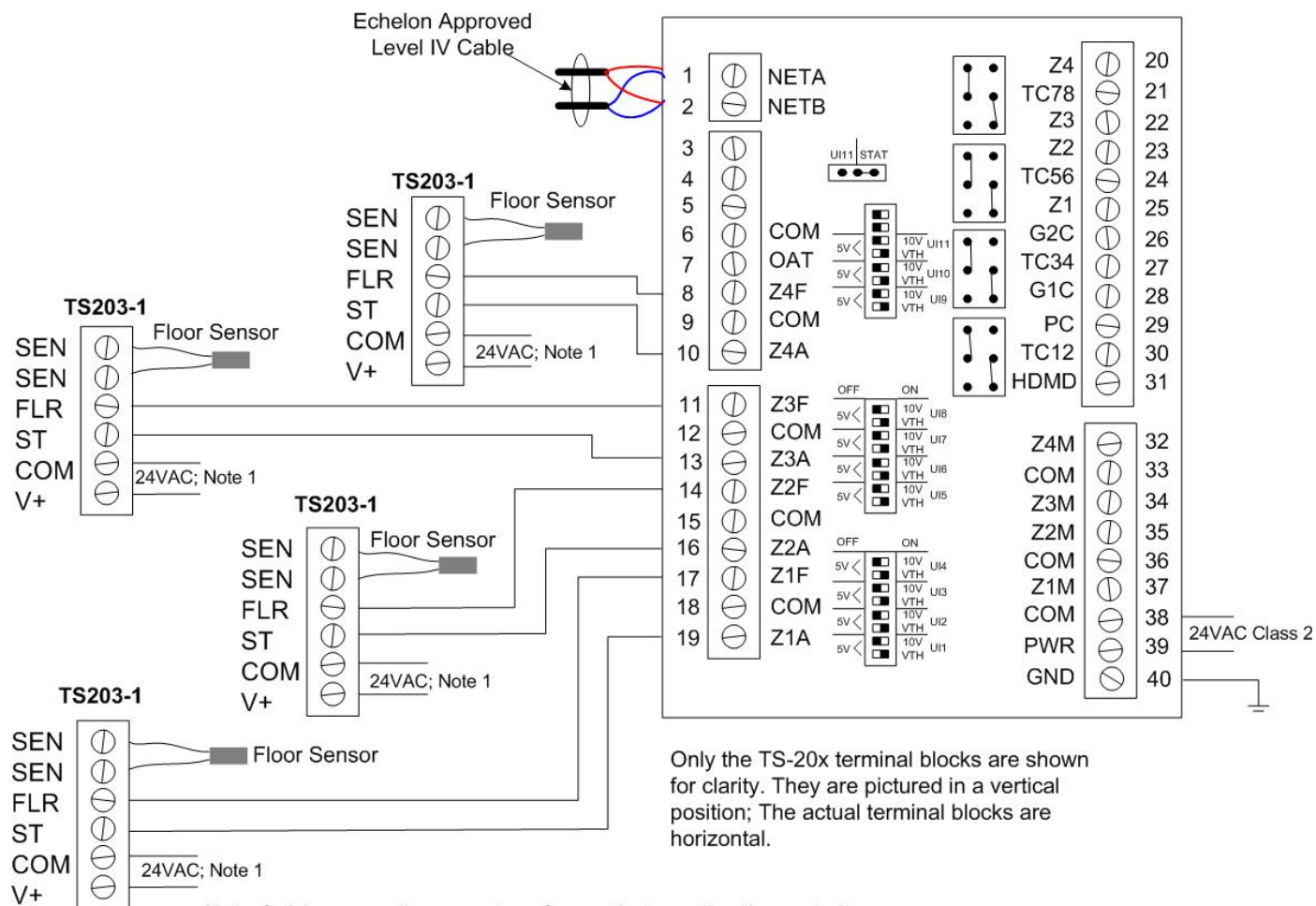


Figure 5: Application Wiring Example 4

Four Zone - Floor Heating with BZU3 and TS203 Thermostats

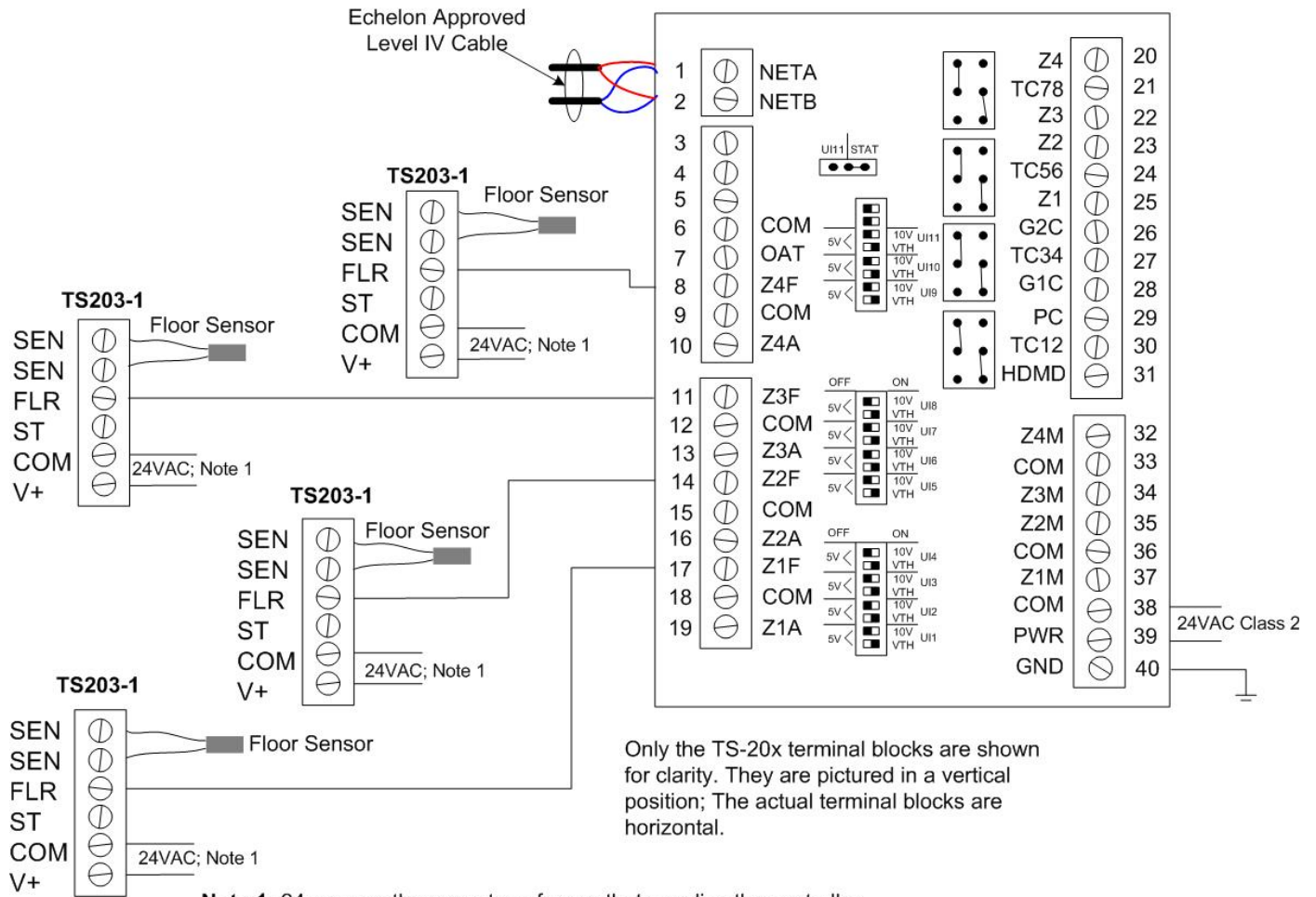


Figure 6: Application Wiring Example 5

Four Zone - Floor Heating with BZU3 and TS204 Thermostats

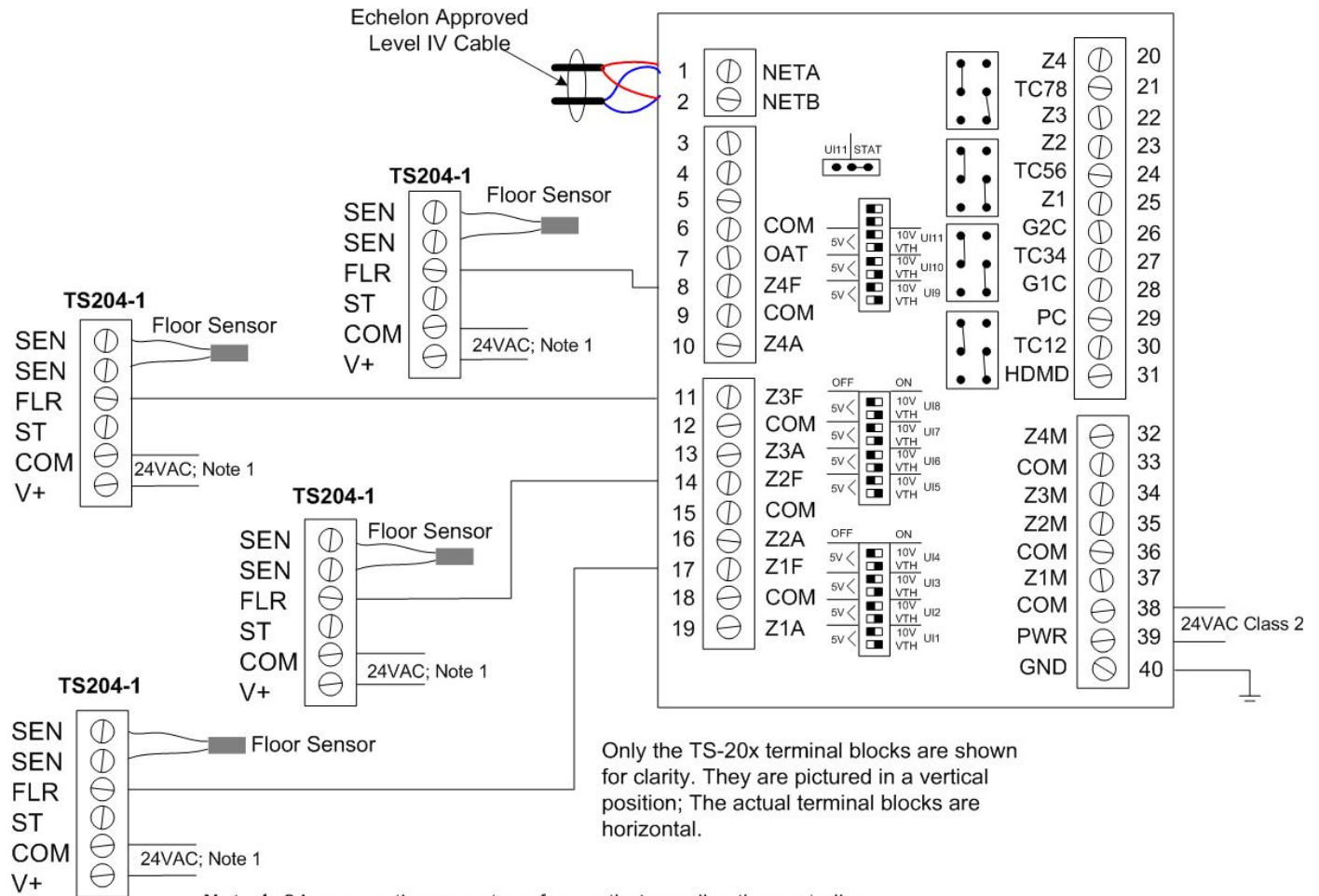


Figure 7: Application Wiring Example 6

Four Zone - Space and Floor Heating with BZU3 and TS204 Thermostats

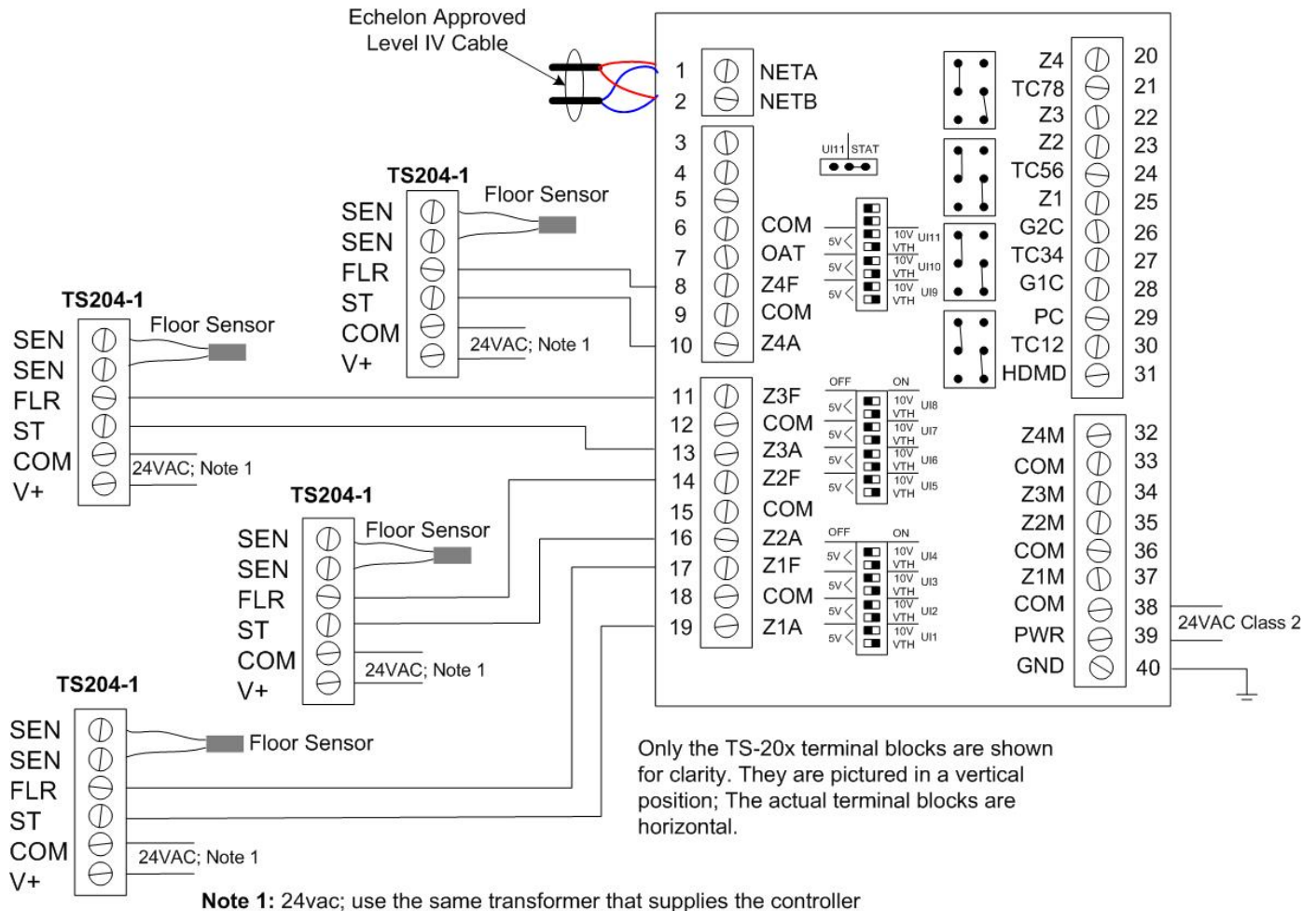
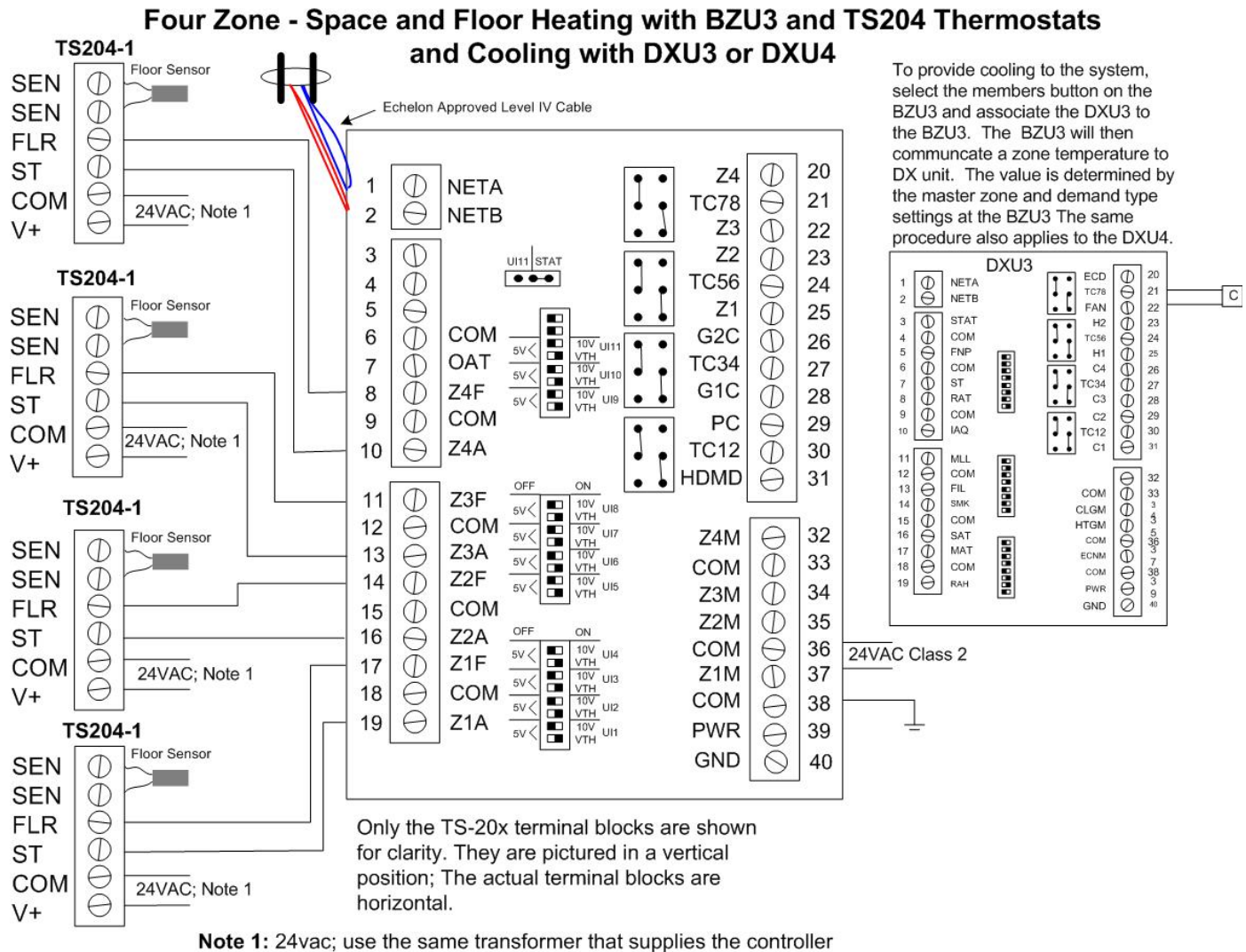


Figure 8: Application Wiring Example 7



To provide cooling to the system, select the members button on the BZU3 and associate the DXU3 to the BZU3. The BZU3 will then communicate a zone temperature to DX unit. The value is determined by the master zone and demand type settings at the BZU3. The same procedure also applies to the DXU4.

Figure 9: Application Wiring Example 8

Four Zone - Space Heating with BZU3 and TS204 Thermostats

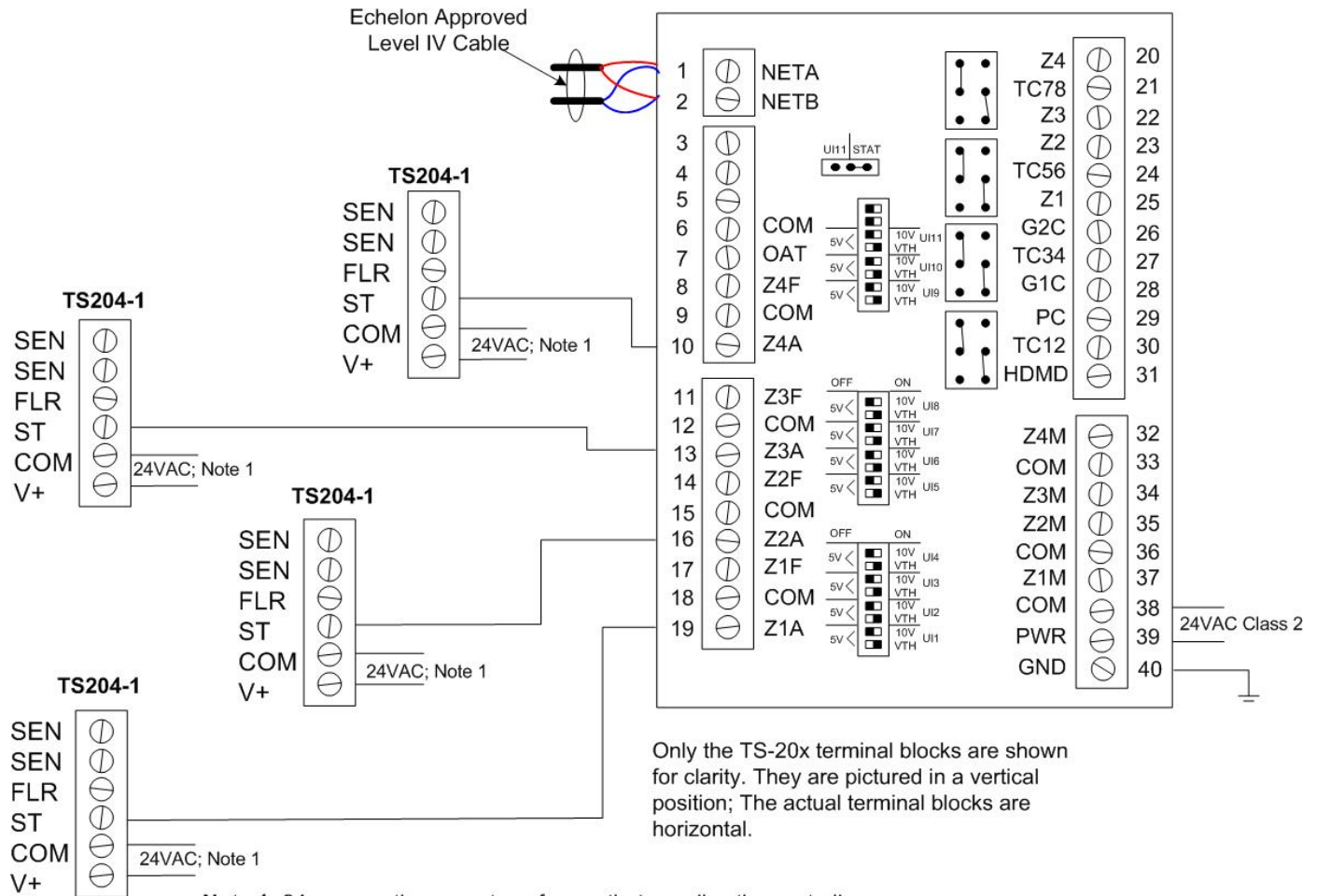
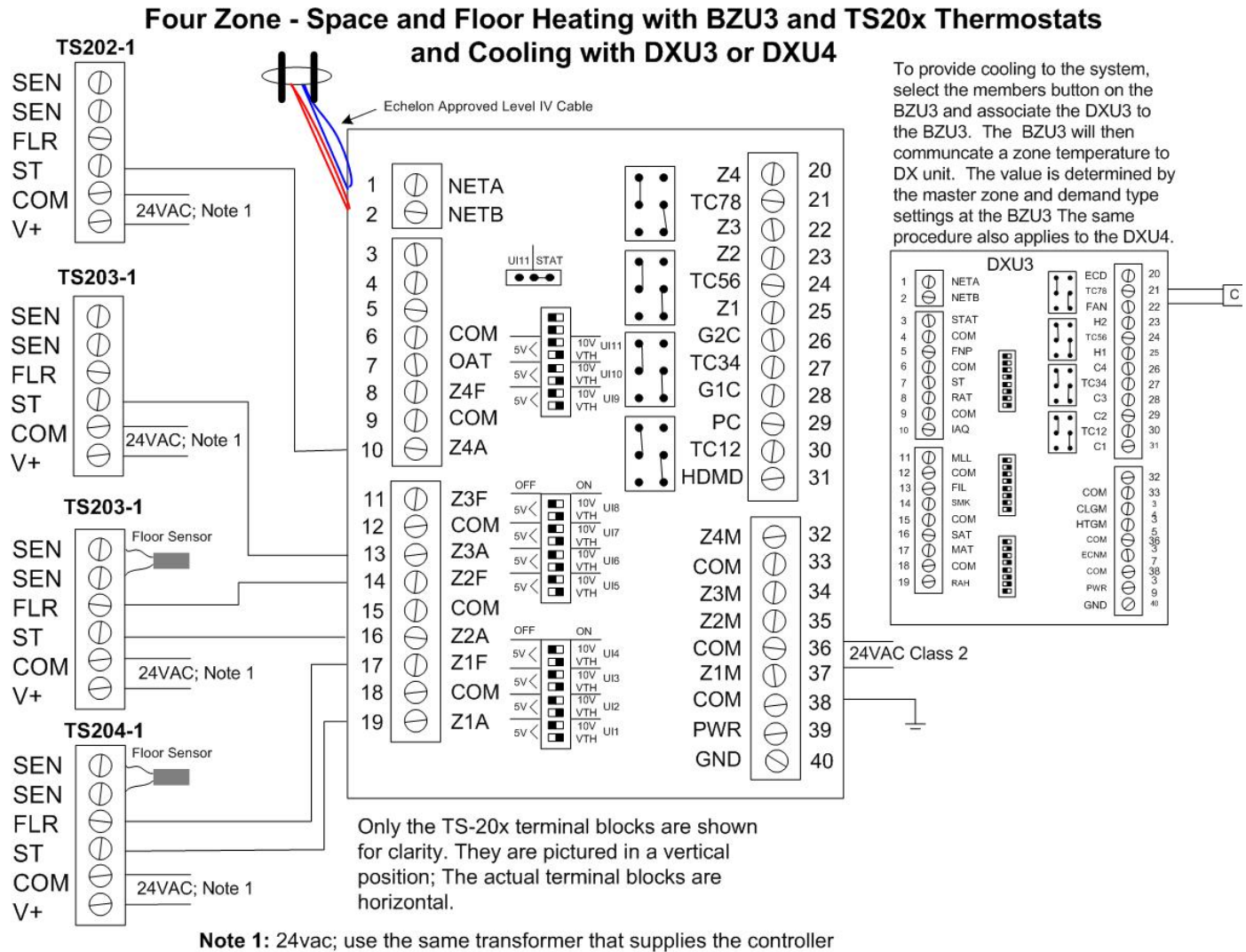


Figure 10: Application Wiring Example 9

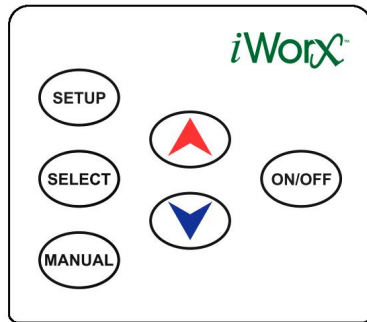


USAGE INSTRUCTIONS

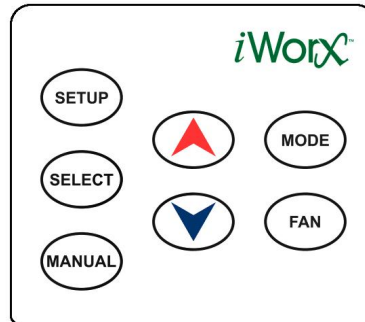
Control Panel (User Interface)

The TS200 Series user interface is shown below. The Mode and Fan switches are only available on the TS204-1. The user can modify settings and temperature setpoints using the keypad buttons and interacting with the unit's display.

Figure 11: Thermostat Keypads



TS202-1 / TS203-1 Keypad



TS204-1 Keypad

Temperature Display Mode

The TS200 Series default mode of operation is to display the space and floor temperatures along with additional system information. The sensor type, denoted by the words AIR and FLOOR, are illuminated next to the corresponding display digits for that particular sensor. The temperature display mode also provides the user with information regarding the current FAN and SYSTEM settings. The thermostat also displays the override information next to each sensor.

Setup

The setup mode allows the user to change various display settings and configuration limits and defaults. Follow the steps below to change any of the configuration settings.

1. Press **SETUP** to enter the setup mode.
2. Keep pressing **SETUP** until the desired configuration setting is illuminated. The selections cycle as follows: SENSOR --> TEMP SCALE --> SETPT RANGE (Setpoint Range) --> BACKLIGHT.
3. Press **UP** or **DOWN** to change the options associated with the selected configuration item.
4. Press **SELECT** to save the new option.
5. Press **SETUP** again to select additional configuration settings. After a short period, the thermostat returns to the temperature display mode. Configuration settings are saved if there is a power failure or if the thermostat is disconnected.

Setup Options

SENSOR: (AIR / FLR) - Select AIR or FLR to make it the primary sensor. The primary sensor will be shown in the upper portions of the display. The SELECT button can also be used to toggle the sensor while in temperature display mode.

TEMP SCALE: (°F / °C) - Selecting °F or °C will make temperature readings displayed in that particular temperature scale. By default, the unit is set to display temperatures in degrees F.

SETPT RANGE: (±2.5°C, ±4.0°C, ±6.0°C) / (±5°F, ±7°F, ±10°F) - The setpoint range limits how far a setpoint can be changed from the factory defaults of 69°F or 20.5°C. This limits the setpoint for both the manual and timed overrides. By default, the unit is set to ±5°F.

BACKLIGHT: (OFF, ON, PAD) - The backlight settings change the backlight's mode of operation. By default, the unit is configured for PAD mode, which will make the backlight turn on in response to a button press. Selecting OFF or ON will turn the backlight off or on indefinitely.



CAUTION SETTING THE BACKLIGHT TO ALWAYS ON CAN SIGNIFICANTLY REDUCE THE LIFE EXPECTANCY OF THE BACKLIGHT.

System Modes

The system must be set to any of the ON modes (HEAT, AUTO, COOL) in order for the user to have control over the local space or floor temperature settings. If the system is OFF, the user will not be able to set an override. Press **MODE** (ON/OFF if applicable) to toggle through the system modes. Selecting OFF will cancel any overrides in progress, and allow the iWorx® system to function according to the temperature schedule stored in the associated BZU.

Fan Modes (TS204-1 only)

Press **FAN** to toggle through the fan modes (AUTO/ON). If the fan mode is set to AUTO the fan is controlled by the system controller and only runs when necessary. Set the fan to ON to continuously run the fan.

Untimed Override

Setting an override allows the user to change the space and floor temperature setpoint for an unlimited duration.



CAUTION THE USER MUST MANUALLY CANCEL THE UNTIMED OVERRIDE TO RETURN THE SYSTEM TO ITS PREVIOUSLY PROGRAMMED SCHEDULE.

The space and floor temperatures can be overridden independently. The TS202-1 configuration is a single sensor unit and does not support a floor sensor or floor setpoints.

Set an untimed override by performing the following steps:

1. The system must be set to any active operation mode. Press **MODE** (ON/OFF if applicable) until any mode but OFF is displayed.
2. The sensor you wish to override must be in the upper portion of the display. Press **SELECT** to toggle between the sensors.
3. Press **UP** or **DOWN** to access the setpoint modify mode. If an override is already in progress, the current setpoint will be displayed. Otherwise, dashes will appear in the "Set Temperature" box.
4. Using the "Up" and "Down" arrow keys, select the desired temperature. The adjustment range is limited by the Setpoint Range configuration setting.
5. Once the desired temperature is selected, press **MANUAL**. The override begins immediately. The thermostat returns to the temperature display mode and displays the override information next to the sensor.
6. If **MANUAL** was not pressed in time, the thermostat goes to timer modify mode. A manual override can be set by pressing the UP arrows until the display reads "HLD". In this case, after a short period, the override will be enabled and the thermostat will return to the temperature display mode. The new override information will be displayed next to the sensor.

Timed Override

Setting a timed override allows the user to change the space or floor temperature for 1, 2, 3, or 4 hours. After the selected time has elapsed, the system will return to its previously stored schedule in the associated BZU. The space and floor temperatures can be overridden independently. The TS202-1 configuration is a single sensor unit and does not support a floor sensor or floor setpoints.

Set a timed override by performing the following steps:

1. The system must be set to any active operation mode. Press **MODE** (ON/OFF if applicable) until any mode but OFF is displayed.
2. The sensor you wish to override must be in the upper portion of the display. Press the SELECT button to toggle between the sensors.
3. Press **UP** or **DOWN** to access the setpoint modify mode. If an override is already in progress, the current setpoint will be displayed. Otherwise, there will be dashes in the "Set Temperature" box.
4. Using the "Up" and "Down" arrow keys, select the desired temperature. After a short period, the thermostat will enter the timer modify mode.
5. Using the "Up" and "Down" arrow keys, select the desired timed override duration. The override can be set to 1, 2, 3 or 4 hours. Selecting "HLD" specifies untimed override (see the *Untimed Override* section for details).
6. After a short period, the timed override will be enabled and the thermostat returns to the temperature display mode. The new timed override information will be visible on the display next to the sensor.

Cancel Override

In order to return to the programmed schedule, any active override must be cancelled. Cancel an override by performing the following steps:

1. While in the temperature display mode, press **SELECT** to toggle the sensors. The sensor override you wish to cancel must be in the upper portion of the display.
2. Press **MANUAL**. The system will immediately return to the previously stored schedule in the associated BZU, and the override information for the selected sensor will disappear.

The alternative way to cancel an override is change the system to the OFF state by pressing **MODE** (ON/OFF if applicable). Overrides for both the space and floor sensor (if applicable) will be cancelled immediately when the system is turned off.

Calibration Offset

The calibration mode allows the user to apply an offset to the temperature display and the temperature information relayed back to the iWorx® controller. This calibration is required to keep the temperature displayed by the LCI consistent with the temperature displayed on the thermostat.

The space and floor temperatures can be offset independently. The TS202-1 configuration is a single sensor unit and only supports calibration of the space sensor. To set an offset, perform the following steps:

1. The sensor you wish to override must be in the upper portion of the display. Press the SELECT button to toggle between the sensors.
2. Press **UP** and **DOWN** simultaneously to access calibration mode. The current calibration offset will be shown in the upper display. The word CAL will be shown in the lower display.
3. Using the "Up" and "Down" arrow keys, select the desired temperature offset. A range of $\pm 10^{\circ}$ F or $\pm 5^{\circ}$ C is available depending on selected mode.
4. After a short period, the thermostat will return to temperature display mode and the calibration offset will be applied to all future readings.

Restore Factory Defaults

The user can restore the factory defaults, which includes configuration settings and calibration offsets by simultaneously pressing and holding both **SETUP** and **SELECT** for 6 seconds. The unit will perform the restoration and blink the entire display for 3 seconds to indicate the defaults were restored successfully. The thermostat will then return to temperature display mode once the restore is complete. Restoring factory defaults will cancel any overrides in progress and set both the Fan and System modes to AUTO.

Power Loss

If at any time a power loss or brown-out condition causes the unit to reset, the last configured settings and calibrations will be restored. Any overrides that were in progress will be lost.

Error Codes

The TS203-1 and TS204-1 thermostats may display an error message if there is a problem with the floor sensor.

E30: Shorted floor sensor - Check sensor wiring for broken jacket or shorted connections. Replace sensor if wiring is good.

E20: Open floor sensor - Check sensor wiring for separated connections. Make sure that the sensor wiring is securely fastened to the thermostat terminals. Replace sensor if wiring is good.

SPECIFICATIONS

Sensors

Temperature Sensor

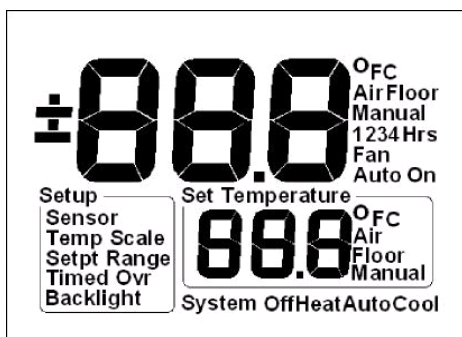
- Type: Precision thermistor
- Accuracy: ± 1 °F (0.6 °C)
- Range: 40 to 122°F (4.5 to 50 °C)

General

Enclosure

- Dimensions: 4-1/2 H x 3 W x 1-1/2 D in (114 x 76 x 38 mm)
- Hinged keypad cover
- White ABS/PC Plastic

Display



- Not all display segments used by all TS200 series models.

Weight

- Thermostast Weight: 0.2 pounds (0.09 kilograms)
- Shipping Weight: 0.35 pounds (0.16 kilograms)

Wiring Terminals

- Six (6) screw terminals. AWG #18 to #22 (0.823 mm² maximum) wire

Wire Length

- 100 feet max. (30 meters) between thermostat and BZU3 or floor sensor

Electrical Rating

- 24 VAC, Class 2

Setpoint Range

- Selectable:
 - a. 69°F +/- 5°F (20.5°C +/- 5°F)
 - b. 69°F +/- 7°F (20.5°C +/- 7°F)
 - c. 69°F +/- 10°F (20.5°C +/- 11°F)

Units

- °F or °C

System Mode

- TS202, TS203 - On/Off
- TS204 - Heat/Cool/Auto/Off

Fan Mode

- On/Auto (TS204 only)

Override

- Up to 4 hour timed override or continuous manual override

Ambient Limits

- Operating temperature: 40 to 122 °F (4.5 to 50 °C).
- Shipping and storage temperature: -4 to 131 °F (-20 to 55 °C).
- Humidity: 0 to 95% RH, non-condensing

Agency Listings

- UL-916 (Category PAZX)
- UL Listed to Canadian Safety Standards (CAN/CSA C22.2)

Agency Compliances

- "FCC Part 15 Subpart J, Class B

LIMITED WARRANTY STATEMENT

Taco Electronic Solutions, Inc. (TES) will repair or replace without charge (at the company's option) any product or part which is proven defective under normal use within one (1) year from the date of start-up or one (1) year and six (6) months from date of shipment (whichever occurs first).

In order to obtain service under this warranty, it is the responsibility of the purchaser to promptly notify the local TES stocking distributor or TES in writing and promptly deliver the subject product or part, delivery prepaid, to the stocking distributor. For assistance on warranty returns, the purchaser may either contact the local TES stocking distributor or TES. If the subject product or part contains no defect as covered in this warranty, the purchaser will be billed for parts and labor charges in effect at time of factory examination and repair.

Any TES product or part not installed or operated in conformity with TES instructions or which has been subject to accident, disaster, neglect, misuse, misapplication, inadequate operating environment, repair, attempted repair, modification or alteration, or other abuse, will not be covered by this warranty.

TES products are not intended for use to support fire suppression systems, life support systems, critical care applications, commercial aviation, nuclear facilities or any other applications where product failure could lead to injury to person, loss of life, or catastrophic property damage and should not be sold for such purposes.

If in doubt as to whether a particular product is suitable for use with a TES product or part, or for any application restrictions, consult the applicable TES instruction sheets or in the U.S. contact TES at 401-942-8000 and in Canada contact Taco (Canada) Limited at 905-564-9422.

TES reserves the right to provide replacement products and parts which are substantially similar in design and functionally equivalent to the defective product or part. TES reserves the right to make changes in details of design, construction, or arrangement of materials of its products without notification.

TES OFFERS THIS WARRANTY IN LIEU OF ALL OTHER EXPRESS WARRANTIES. ANY WARRANTY IMPLIED BY LAW INCLUDING

WARRANTIES OF MERCHANTABILITY OR FITNESS IS IN EFFECT ONLY FOR THE DURATION OF THE EXPRESS WARRANTY SET FORTH IN THE FIRST PARAGRAPH ABOVE.

THE ABOVE WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR STATUTORY, OR ANY OTHER WARRANTY OBLIGATION ON THE PART OF TES.

TES WILL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL, INDIRECT OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF ITS PRODUCTS OR ANY INCIDENTAL COSTS OF REMOVING OR REPLACING DEFECTIVE PRODUCTS.

This warranty gives the purchaser specific rights, and the purchaser may have other rights which vary from state to state. Some states do not allow limitations on how long an implied warranty lasts or on the exclusion of incidental or consequential damages, so these limitations or exclusions may not apply to you.

CONTROLS MADE EASY®

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