TRANE®

Installation
Owner
Diagnostics

Tracer® ZN524 for water-source heat pumps

Order No: CNT-SVX11A-EN Date: August 2003

CNT-SVX11A-EN

Notice

Notice

Warnings and Cautions appear at appropriate sections throughout this manual. Read these carefully.

⚠ WARNING - Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury

⚠ CAUTION - Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It may also be used to alert against unsafe practices.

CAUTION - Indicates a situation that may result in equipment or property damage only accidents.

Contents

Start-up Procedures

Installation of New Units

⚠ WARNING
Hazardous Voltage!
Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

1. Follow all instruction for installation of the water-source heat pump as detailed in the unit's installation guide. (Installation Operation Diagnostics manual).

2. Disconnect power or disable the circuit breaker to unit.

3. Run communication link wire when required. (See wiring diagram in the unit).

4. Install zone sensor when required. (See wiring diagram in the unit and zone sensor submittals).

5. Reapply power.

6. Check for GREEN Status LED operation to ensure power has been made to the Tracer™ ZN524 unit controller.

7. Check for YELLOW Comm LED operation to help ensure communication has been made to the Tracer ZN524 unit controller when applicable.

8. Write the Unit Identification number, using the IDENTIFICATION TAG on the unit, in the Appendix of this document, or on building plans for future location use.

Power Up Sequence

Manual output test can be initiated at any time in the power up sequence or during normal operation.

When 24 VAC power is initially applied to the controller, the following sequence occurs:

1. Green Status LED turns on.

2. All outputs are controlled Off.

3. The controller reads input values to determine initial values.

4. Stand-alone control is assumed unless occupancy data is communicated.

5. Random start timer expires (5 to 30 seconds, random).

6. Power-up control Wait feature is applied. When power up control Wait is enabled, the controller waits 2-minutes to allow ample time for communicated control data to arrive. If, after 2-minutes, the controller does not receive a communicated occupancy request, the unit assumes standalone operation.

7. All valves and damper calibrate closed.

8. Normal operation begins after 290 (potentially) seconds have passed.

Note: Manual output test can be initiated at any time.

General Information

Tracer® ZN524 Overview

The Trane Tracer® ZN524 controller is a factory-installed and commissioned, direct-digital controller (DDC) offering for single or dual compressor water-source heat pump systems. (See Figure 1: "Tracer ZN524 Control Board")

Trane offers a complete solution to space comfort control with the flexibility of Integrated Comfort System (ICS) and stand-alone control packages. The ICS control package combines HVAC equipment and building management into one environmental comfort system.

Integrating the Tracer ZN524 on water-source heat pumps and tying them to a Tracer Summit® system will provide a complete building management system. The stand-alone control package offers the features and functionality of the direct digital control without a front-end building automation system, while providing future considerations for ICS.

Equipment problems can often be diagnosed on each unit without having to access the unit componets. These diagnostics can be received remotely via a modem with a Tracer Summit building automation system, thus reducing the number of actual on-site service calls; through the Rover® service tool connected to a communication jack located inside the Trace zone sensor; or connected to the unit.

The Tracer ZN524 is factory-mounted, tested, wired, configured and commissioned for the selected application.

The Tracer ZN524 configuration has flexible point and product configurations. For example, with point configuration, a specific binary point can be configured to accept input from either a time clock or some type of generic device.

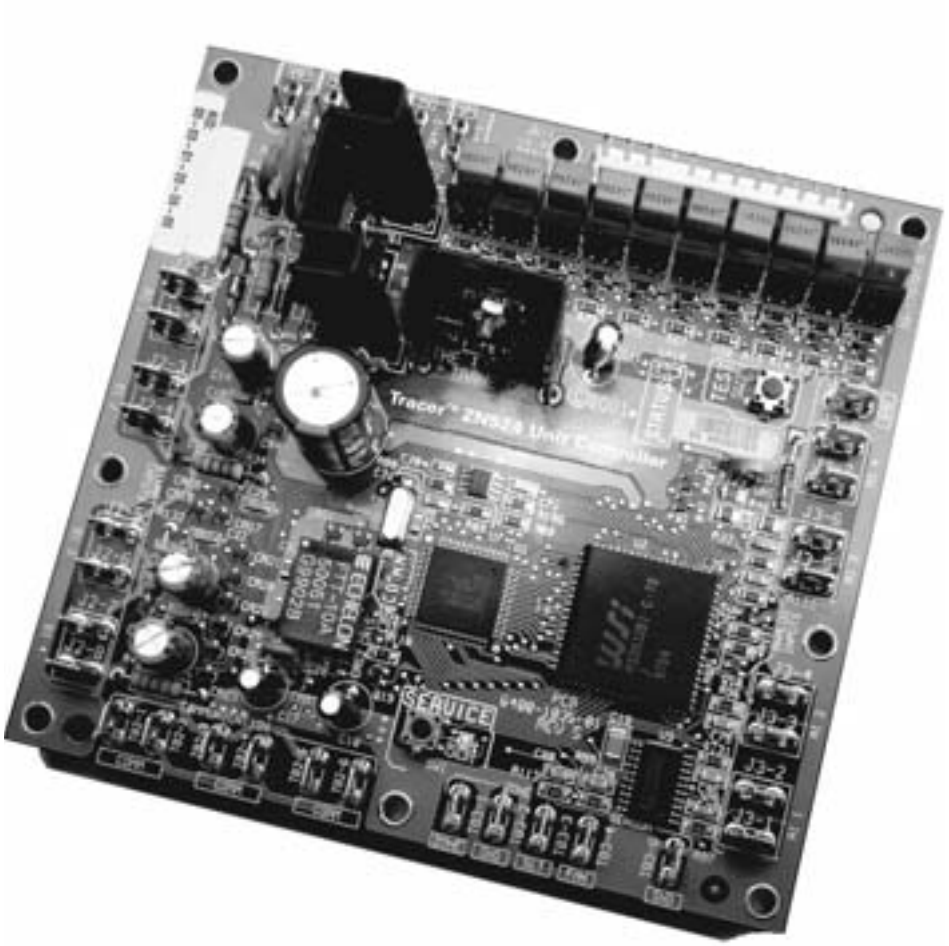
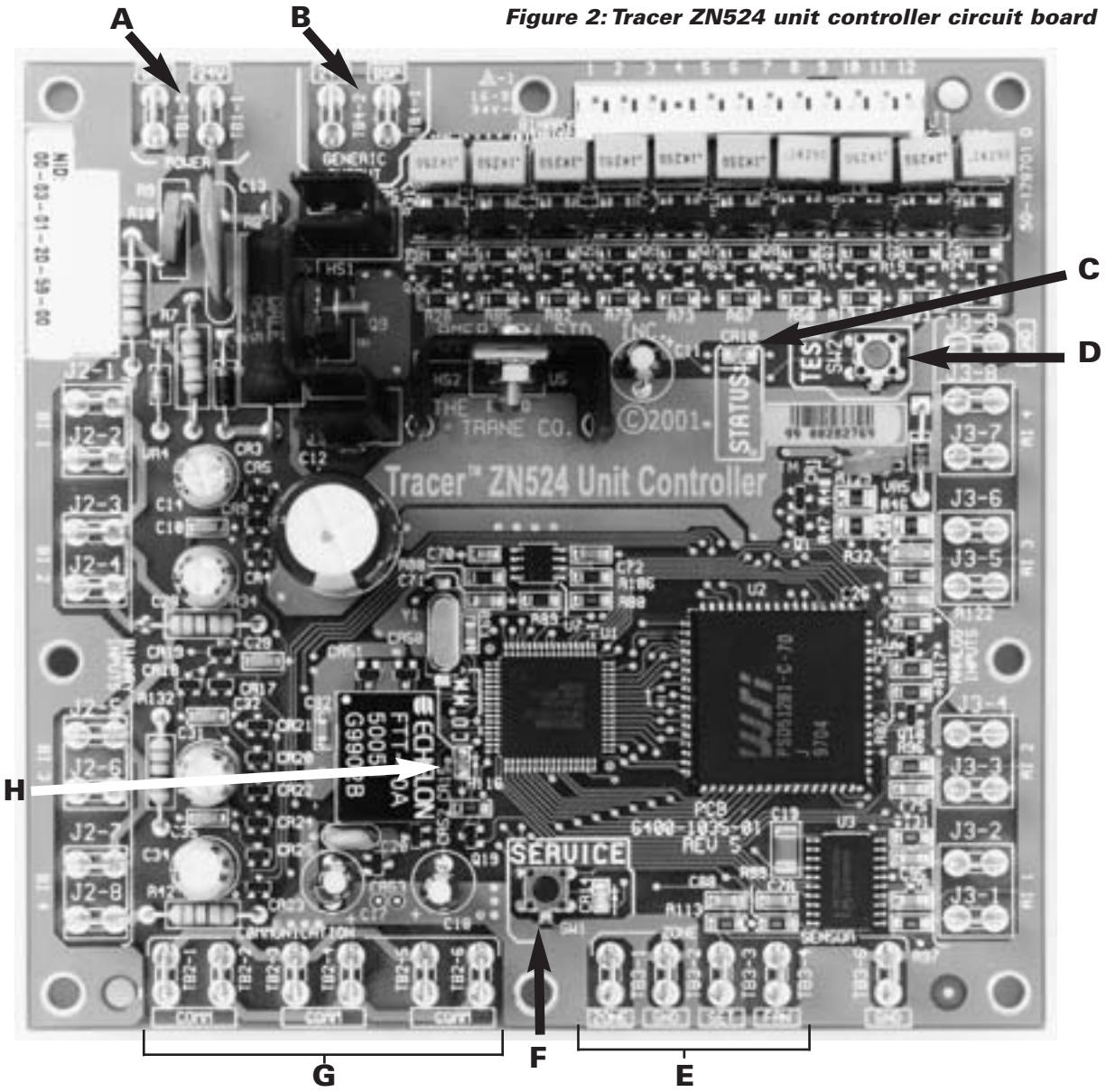


Figure 1: Tracer ZN524 control board

Controller Circuit Board and Features

Figure 2: Tracer ZN524 unit controller circuit board



Controller features:

A. Power Connections
B. Generic Connections (BOP)
C. Status LED
D. Auto Test Button
E. Zone Sensor Connections
F. Service Button/LED
G. Communications Connections
H. Communications LED

Controller Features

Each Tracer ZN524 unit controller circuit board is equipped with enhancements to help facilitate service, testing, and diagnosis.
Each board has:
- Manual test button,
- Status LED,
- Communication status LED,
- Service button,
- Quick terminal connectors, and
- Easy to read screen printing. (See Figure 2: Page 6).

Service

The Trane Tracer ZN524 unit controller is serviced using Rover®, the software service tool. Rover is designed to support the Tracer ZN524 unit controller on a single or dual compressor water-source heat pump.

For "remote" access to the communicating units, the zone sensors offered with the Tracer ZN524 have a telephone style (RJ-11) connector allowing field connection between Rover and the zone sensor; however, the RJ-11 connector must be connected to the communications terminals on the Tracer ZN524 unit controller.(See Figure 3: "Rover service tool connected to the RJ-11 communication jack in a zone sensor")

The zone sensor may also be used when trying to locate a unit. By pressing the on button on the zone sensor for 5 seconds or using the "wink" command in Rover, the circuit board receives the signal causing the status LED to "wink." Winking allows visual identifier on the board for service technicians.

The Tracer ZN524 also includes features such as a test output to manually test all of the end devices. (See "Manual Output Test" on page 32, for more information.)

Figure 3: *Rover service tool connected to the RJ-11 communication jack in a zone sensor*

Typical Components

A typical water-source heat pump system with a DDC package consists of the following physical components, in addition to the mechanical equipment:

- Tracer ZN524—contains the sensor input circuits, service adjustments, microprocessor control electronics, and communications hardware. Power is supplied by a separately mounted 24 VAC transformer.

- Sensor Modules—a variety of analog sensors that provide temperature and optional humidity sensing and CO2 sensor; and an operator interface to the Tracer ZN524 for operating modes, status, and temperature set points.

- Standard End Devices—a variety of devices that help to gather information and control capacity are used by the Tracer ZN524 in its control algorithm to condition the space to the desired temperature and relative humidity level.

Note: The Tracer ZN524 is a configured controller. It will not operate without a valid downloaded configuration file.

The Tracer ZN524 controller supports ICS and peer-to-peer communications as well as stand-alone operation. A number of control features may be configured at the factory or by using the Rover service tool.
(See "Configuration" on page 20, for more information.)

Communication Configurations

Integrated Comfort System

Note: The Tracer ZN524 controller may only be used with Tracer Summit version 11.0 or greater with a Comm5 communications card.

Water-source heat pumps can operate as part of a large building automation system controlled by Tracer Summit. The Tracer ZN524 is linked directly to the Tracer Summit via a twisted pair communication wire. Each Tracer Summit building automation system can connect to a maximum of 120 Tracer ZN524 controllers.

Communications link wire

The ICS system allows for complete communication with the water-source heat pumps via Tracer ZN524 unit controller. All points connected to the Tracer ZN524 may be observed from the Tracer Summit front-end controller. The Tracer Summit can also initiate an alarm on a loss of performance or equipment malfunctions.

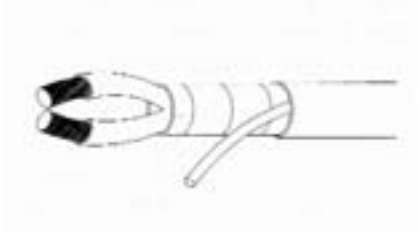


Figure 4: *Communications link wire*

The ICS system also allows all of the water-source heat pumps to share information without the presence of hard-wired sensors at each unit. Some typical shared points include outside air temperature, entering water temperature, and occupancy schedules.

Peer-to-Peer Communications

On a peer-to-peer communication system, multiple Tracer ZN524 controllers may share data, via a twisted pair communication wire, without the need for a Tracer Summit system. (See Figure 5: "Peer-to-peer communication connections")

Peer-to-peer communications allows features such as master/slave operation, in which multiple units operate off of a single zone sensor. This is typically seen in large spaces requiring multiple units.

The Rover service tool is required to set up peer-to-peer communications.

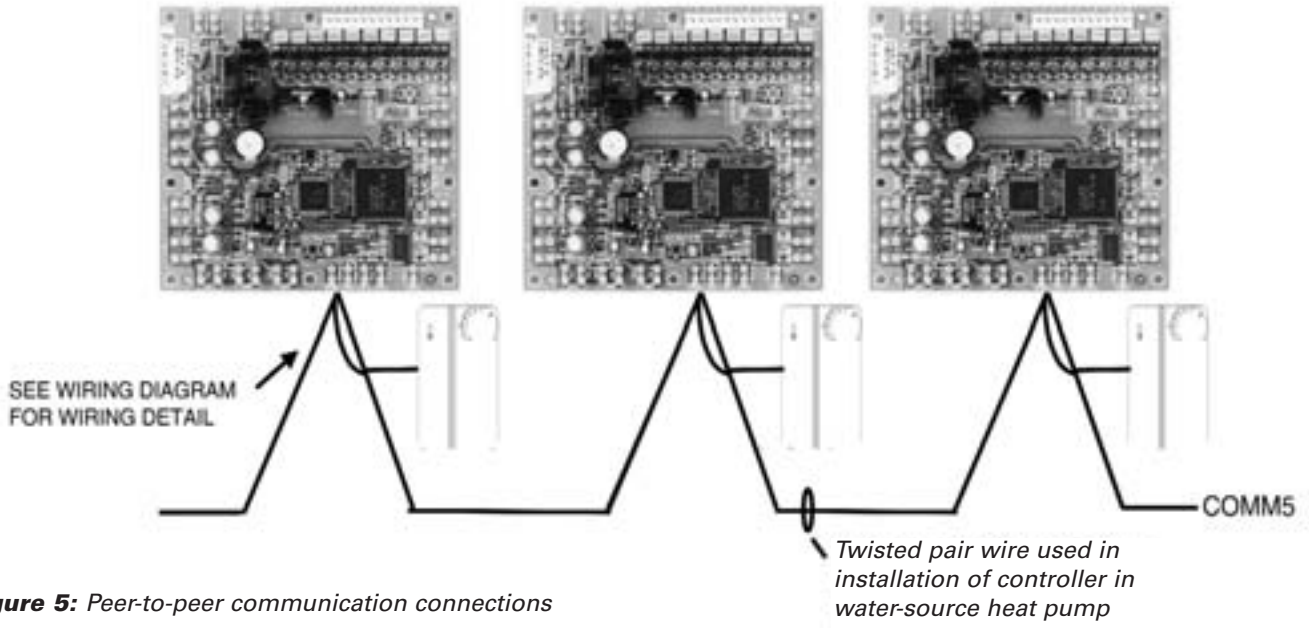


Figure 5: *Peer-to-peer communication connections*

Communication Configurations

Communication Interface

Important! To help ensure optimal performance of the Rover service tool, please use the latest version. To obtain the latest version contact your local Trane sales representative or service technician.

Note: Refer to the Tracer system manuals for more information on communications.

The Tracer ZN524 communicates via Comm5 (LonTalk) to a building management system, the Rover service tool, and other unit controllers on the communications link. Each Tracer ZN524 requires a unique address for the system to operate properly. Every Tracer ZN524 has this address (Neuron ID) embedded in the microprocessor, which eliminates the need for field-addressing of the units. Each unit also ships from the factory with a unit identification tag. (See "Location Identifier" on page 23, for more information.)

Figure 6: *Standard GEH (horizontal water-source heat pump) with single control*

Building automation system

Trane offers a state-of the art front-end building automation system designed to coordinate and monitor Trane equipment and controllers: Tracer Summit. The Tracer Summit system allows the user to monitor and/or change Tracer ZN524:

- status, parameters, sensor data, diagnostics, and internal variables; and
- setpoints, operating modes, and out puts.

Service tool

Trane also offers a service tool to work in conjunction with the Tracer Summit system or with peer-to-peer and stand-alone systems: the Rover service tool.

Communication to the Tracer ZN524, or multiple controllers, can also be accomplished by using the ICS software service tool.

A personal computer running Rover may be directly connected to a stand-alone Tracer ZN524; connected to the communications jack in the Trane zone sensor; or connected to a communicating unit's Tracer ZN524 unit controller, to access all of the units on a communicating link.

Rover allows the user to interface with the Tracer ZN524, but will not allow any advanced control (e.g. equipment scheduling or trending). To purchase a copy of the ICS software service tool, contact the BAS department at your local Trane dealer.

Stand-Alone

In a stand-alone configuration, commands for operation are determined based on input from the zone sensor, humidity sensor, and field-mounted timeclock (See Figure 6).

- Timeclock can be wired to the Tracer ZN524 to index the unit between occupied and unoccupied modes.

- A unit-mounted, analog, leaving water temperature sensor is used to initiate the boilerless control or the optional waterside economizer routines.

These sensors are required for proper system operation and are provided as standard on stand-alone units.
Typical water-source heat pump installation

Interoperability

Trane has lead the industry with BACnet interoperability and Trane is now expanding the realm of interoperable solutions by offering LonMark certified unit controllers. The Tracer ZN524 controller conforms to the LonMark Space Comfort Controller profile. (See "Appendix—Data Lists" on page 47, for more information.) This allows the ZN524 to be used as a unit controller on other control systems that support LonTalk and the SCC profile. Now building owners have more choices and design engineers have more flexibility to meet the challenges of building automation.

Installation & Wiring

Specifications

Dimensions
Tracer ZN524 board and mounting hardware:
- Height: 5.25 inches (133 mm.)
- Width: 5.50 inches (140 mm)
- Depth: 2.25 inches (57 mm)

Power Requirements
- 18 to 32 VAC (24 VAC nominal)
- 50 or 60 Hz
- 570 mA AC

Operating Environment
- 32° to 140°F (0× to 60°C)
- 5% to 95% relative humidity, non-condensing

Storage Environment
- -40° to 185°F (-40° to 85°C)
- 5% to 95% relative humidity, non-condensing

Agency Listings
- UL and CUL 916 Energy Management System
- Agency Compliance IEC 1000-4-2 (ESD), IEC 1000-4-4(EFT), IEC 1000-4-5 (Surge)

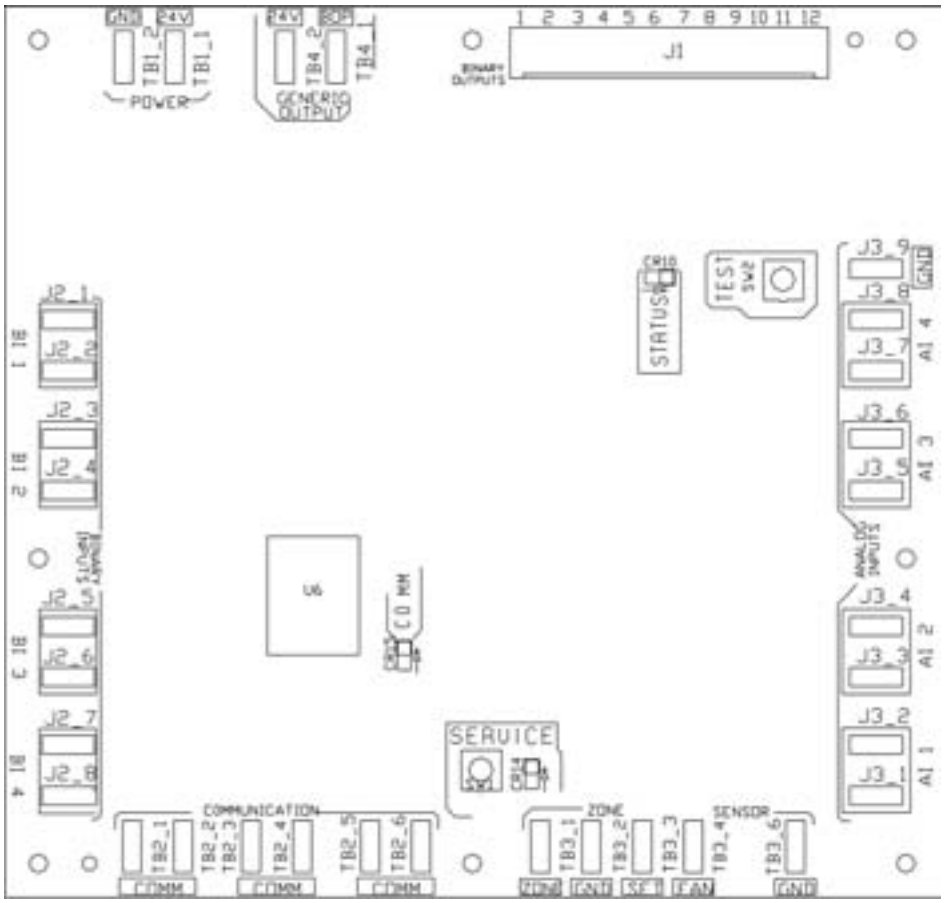


Figure 7: *Tracer ZN524 circuit board schematic*

Installation & Wiring

Binary Inputs

Each binary input associates an input signal of 0 VAC with open contact and 24 VAC with closed contacts.

Binary Outputs

Outputs are load side switching triacs. The triac acts as a switch, either making or breaking the circuit between the load (valve, damper, contactor, relay) and ground.

Table 1: *Binary input summary for the J2 terminal board connections*[1]

Binary input	Pin Location	Function	Configuration	Valid range
BI 1	J2 - 1 J2 - 2	24 VAC Input	Low evaporation temperature	Normally open Normally closed
BI 2	J2 - 3 J2 - 4	24 VAC Input	Condensate overflow	Normally open Normally closed
BI 3	J2 - 5 J2 - 6	24 VAC Input	Occupancy/Generic	Normally open Normally closed
BI 4	J2 - 7 J2 - 8	24 VAC Input	Fan status or not used	Normally open Normally closed

1. Trane Rover service tool uses the unit type to help determine and download the proper default binary input configuration.

Table 2: *Binary output summary*[1]

Binary Output	Pin Location	Function	Valid range	Output Rating	Load Energized	Load De-Energized
BOP-1	J1-1	Fan	NA	12VA	1 VAC RMS	24 VAC RMS
BOP-2	J1-2	Reversing valve	NA	12VA	1 VAC RMS	24 VAC RMS
BOP-3	J1-3	Electric heat or reheat	NA	12VA	1 VAC RMS	24 VAC RMS
	J1-4	(Key)	NA	12VA	1 VAC RMS	24 VAC RMS
BOP-4	J1-5	Compressor 1	Normally open or normally closed[2]	12VA	1 VAC RMS	24 VAC RMS
BOP-5	J1-6	Compressor 2	NA	12VA	1 VAC RMS	24 VAC RMS
BOP-6	J1-9	Isolation valve 1	Normally open or normally closed[2]	12VA	1 VAC RMS	24 VAC RMS
BOP-7	J1-10	Isolation valve 2[4]	NA	12VA	1 VAC RMS	24 VAC RMS
BOP-8	J1-11	Economizer valve	NA	12VA	1 VAC RMS	24 VAC RMS
BOP-9	J1-12	Outdoor air damper	NA	12VA	1 VAC RMS	24 VAC RMS
BOP-10[3]	TB4-1/ TB4-2	Generic output	NA	12VA	1 VAC RMS	24 VAC RMS

1. Trane Rover service tool uses the unit type to help determine and download the proper default binary output configuration.
2. The normally open/closed configuration item refers to the inactive state of the controller output.
3. BOP-10 is a generic output but requires a 24 VAC source for usage.
4. Typical factory installation has only one (1) ISO valve.

Installation & Wiring

Analog Inputs

Table 3: *Analog Inputs (Zone Sensor)*

Description	Terminals	Function	Range
Zone	TB3-1	Space temperature input	5× to 122×F (-15× to 50×C)
Ground	TB3-2	Analog ground	NA
Set	TB3-3	Local setpoint input	40× to 115×F (4.4× to 46.1×C)
Fan	TB3-4	Fan switch input	4821 to 4919 Ω (Off) 2297 to 2342 Ω (Auto) 15137 to 16463 Ω (High)
Ground	TB3-6	Analog ground	NA

Table 4: *Analog Inputs with terminal connections[1,2]*

Analog input	*Terminal*	*Function*	*Range*
AI 1	J3 - 1 J3 - 2	Entering water temperature or outside air temperature	-40 to 212°F (-40° to 100°C) -40 to 212°F (-40° to 100°C)
AI 2	J3 - 3 J3 - 4	Discharge air temperature	-40 to 212°F (-40° to 100°C)
AI 3	J3 - 5 J3 - 6	Leaving water temperature	-40 to 212°F (-40° to 100°C)
AI 4	J3 - 7 J3 - 8 J3 - 9	Universal 4-20mA input Humidity CO^2	4-20ma 0-100% 0 - 2000 ppm

1. Trane Rover service tool uses the unit type to help determine and download the proper default analog input configuration.
2. Analog input 3 (AI 3) configured as generic temperature input does not affect unit operation. When configured, the Tracer™ ZN524 unit controller communicates the generic temperature value to Rover or Tracer Summit and displays it as generic temperature.

Installation & Wiring

Mounting

The Tracer ZN524 circuit board is located in the control box, which is mounted behind the front panel of the water-source heat pump (See **Figures 9** and **10** for more information). The sheet metal mounting plate has raised embosses to accept the mounting feet on the circuit board. (See **Figure 8**: For close-up of horseshoe embosses and circuit board mounting feet.) This design allows the Tracer ZN524 controller to be secured with a minimal number of sheet metal screws.

The mounting position on the vertical water-source heat pump allows complete access to the Tracer ZN524 by removing the front panel - six screws total. (See **Figure 9**) Removing the screws and panel allows access to the components of the control board.

The mounting plate on both the horizontal and vertical water-source heat pumps allow complete access to the Tracer ZN524 by removing the front panel - also six screws total. (See Figure 10) Removing the screws and panel allows access to the components of the control board.

For additional convenience, quick connects and modular wire harnesses are used on the control board and mounting plate. These quick connects help facilitate ease of wiring devices (e.g., zone sensor) to the control board, and helps add accessibility to major components.

⚠ WARNING
Hazardous Voltage!
Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

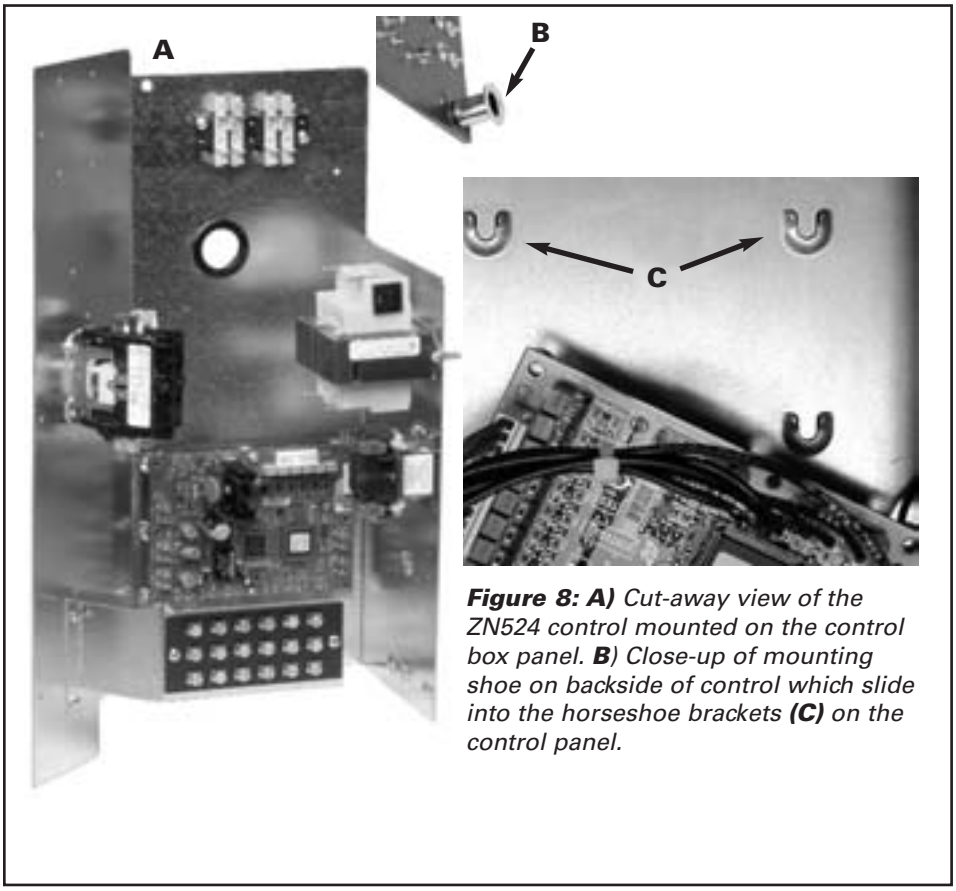


Figure 8: A) *Cut-away view of the ZN524 control mounted on the control box panel.* ***B****) Close-up of mounting shoe on backside of control which slide into the horseshoe brackets* ***(C)*** *on the control panel.*

Figure 9: *Removing front panel of vertical unit to access control panel.*

Figure 10: *Removing front panel of horizontal unit to access control panel.*

Installation & Wiring

Wiring

⚠ WARNING

Live Electrical Components!
During installation, testing, servicing, and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

CAUTION

Use Copper Conductors Only!
Unit terminals are not designed to accept other types of conductors. Failure to use copper conductors may result in equipment damage.

Important! All wiring must comply with state, local, and federal guidelines. Contact the appropriate local agency for further information.

Important! Wires for temperature sensors, communication lines, 24 VAC, and contact closure sensing inputs should not be bundled with or run near high voltage wiring.

- To prevent damage to the unit, refer to the diagram provided on the unit's inside access panel for specific wiring information. Most control components are factory-wired. Zone sensors and communication wiring is to be installed by the contractor.
- Power wiring must be separated from the Tracer ZN524 and all low voltage wires. External input wires should be run in separate conduits from high voltage wires.
- Wires connected to pin headers should be formed and routed so as to cause minimum strain on the Tracer ZN524 connector.
- A minimum of 1.5" clearance (from the pin centerline) for wires up to 16 AWG is recommended for bending and forming wires.
- All sensor and input circuits are at or near ground potential. Do not connect any sensor or input circuit to an external ground connection.
- A close-coupled ground connection is required for the Tracer ZN524.
- Table 5: Tracer ZN524 Wiring Requirements, shows Tracer ZN524 wire types and lengths.

Power

The Tracer ZN524 controller is powered by 24 VAC. (See Table 5: "Tracer ZN524 wiring requirements")A total of two 1/4-inch quick-connect terminals are provided for 24 VAC connection to the board.

Application	Wire Type	Length
Contact Closure	18 AWG	Up to 1000 ft.
24 VAC	16-22 AWG	Up to 1000 ft.
Zone Sensor	16-22 AWG	Up to 200 ft.
Communications	Belden 8760 or equivalent	Up to 5000 ft.

Table 5: *Tracer ZN524 wiring requirements*

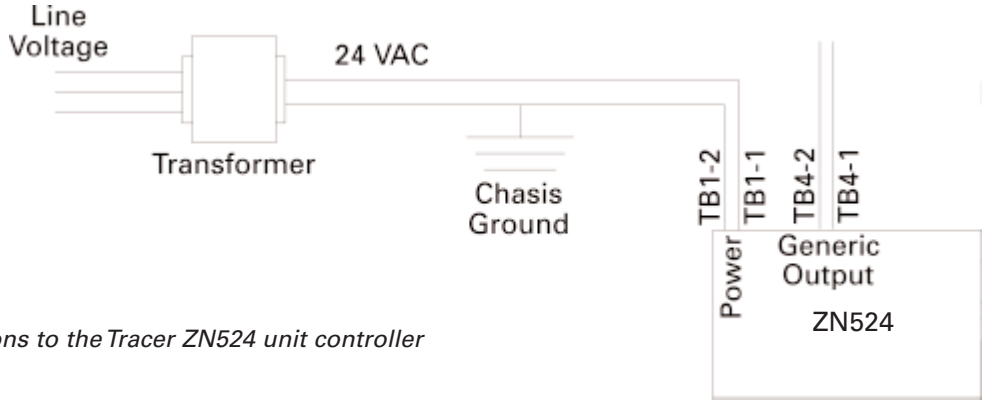


Figure 10: *Power connections to the Tracer ZN524 unit controller*

Installation & Wiring

Installing the Wall-Mounted Zone Sensor (Optional)

Zone sensor location is an important element of effective room control and comfort.

The best sensor location is typically on a wall, remote from the HVAC unit. Readings at this location assure that the desired setpoint is achieved across the space, not just near the unit itself.

Note: It may be necessary to subdivide the zone with multiple units to ensure adequate control and comfort throughout the space.

The following are typical areas where the zone sensor should not be mounted:

- Near drafts or "dead spots" (e.g., behind doors or corners);
- Near hot or cold air ducts;
- Near radiant heat (e.g., heat emitted from appliances or the sun);
- Near concealed pipes or chimneys;
- On outside walls or other non-conditioned surfaces; or
- In air flows from adjacent zones or other units.

The communications link is not connected in the factory. Communications could be wired to the wall-mounted sensor if desired.

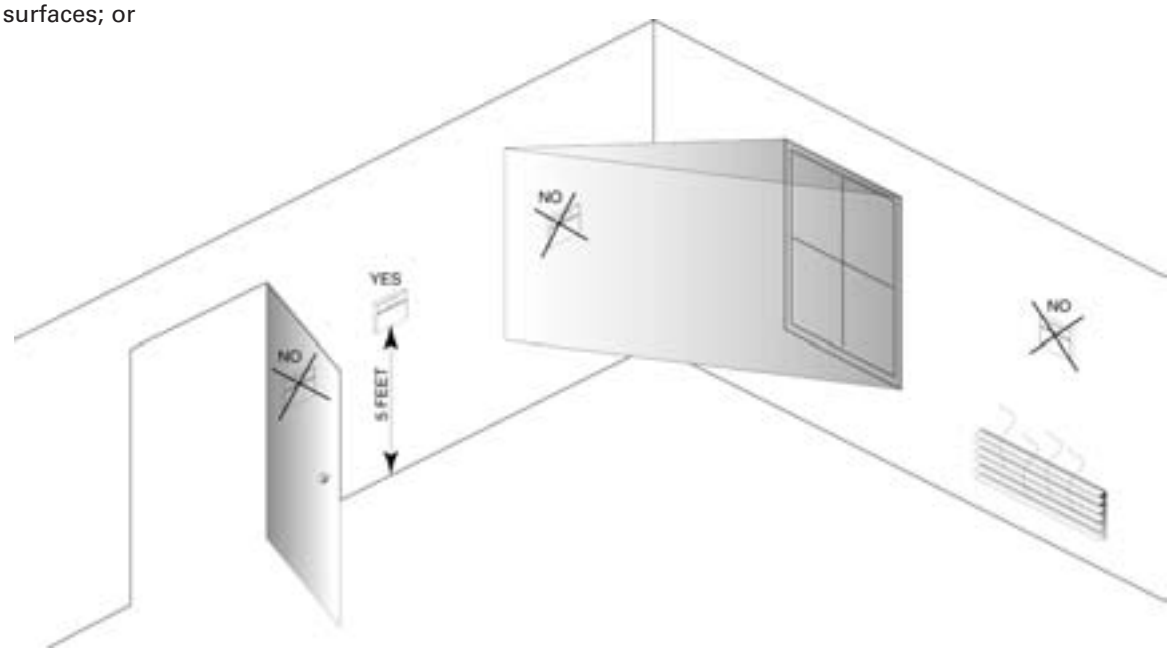


Figure 11: *Proper zone sensor placement*

Installation & Wiring

Zone Sensor Features Fan Switch (Optional)

The zone sensor fan switch provides the controller with an occupied (and occupied standby) fan request signal of off or auto. If the fan control request is communicated to the controller, the controller ignores the hardwired fan switch input and uses the communicated value. The zone sensor fan switch signal can be enabled or disabled through configuration in the ZN524 controller.

ON or CANCEL Buttons

Momentarily pressing the on button during unoccupied mode places the controller in occupied bypass mode for 120 minutes. You can adjust the number of minutes in the unit controller configuration using Trane's service tool, Rover. The controller remains in occupied standby mode until the override timer expires or until the cancel button is pressed.

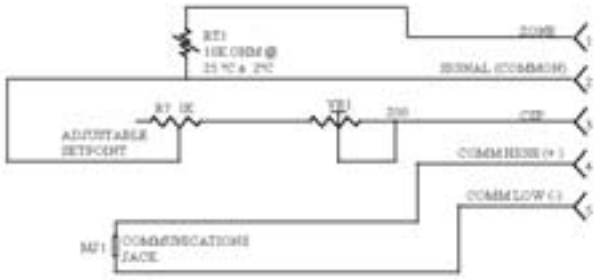
Communication Jack

Use the RJ-11 communication jack as the connection point from Rover to the communication link (when the communication jack is wired to the communication link at the controller). By accessing the communication jack via Rover, entrance to all controllers on the link may be gained.

Table 6: *Zone Sensor Options*

Part number:
X13510628010

Description:
- Space temperature (0.2 C resolution)
- Internal setpoint
- Communication jack
- Vertical case with Trane logo



Part number:
X13510606010

Description:
- Space temperature (0.2 C resolution)
- External setpoint
- Communication jack
- Vertical case with Trane logo

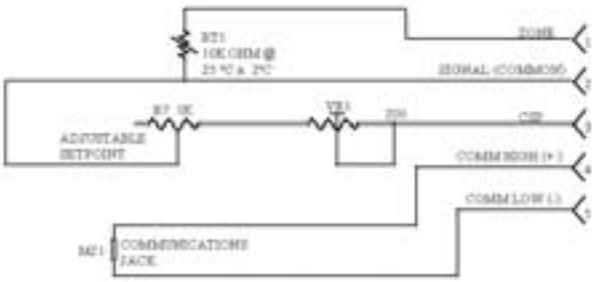
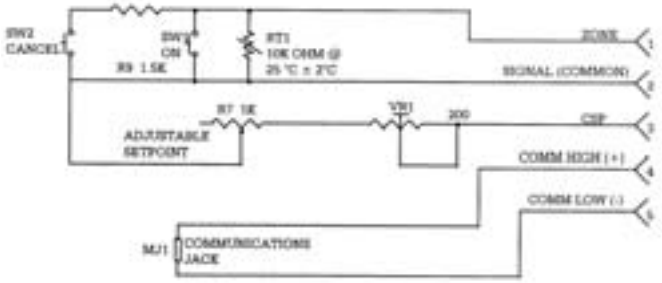


Table 6: *Zone Sensor Options - continued*

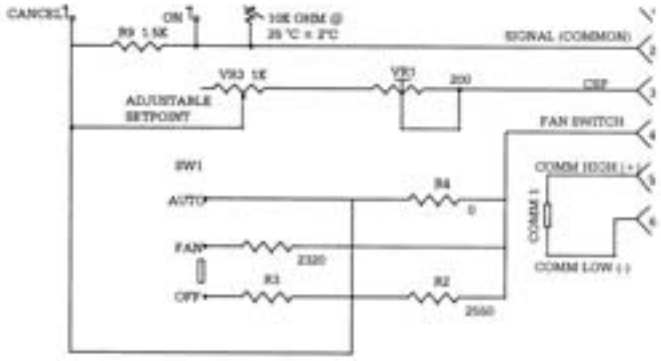
Part number:
X13510606020

Description:
- Space temperature (0.2 C resolution)
- ON and CANCEL buttons
- External setpoint
- Communication jack
- Vertical case with Trane logo



Part number:
X13510635010

Description:
- Space temperature (0.2 C resolution)
- ON and CANCEL buttons
- Fan switch (OFF and AUTO)
- External setpoint
- Communication jack
- Vertical case with Trane logo



Typical wiring diagram

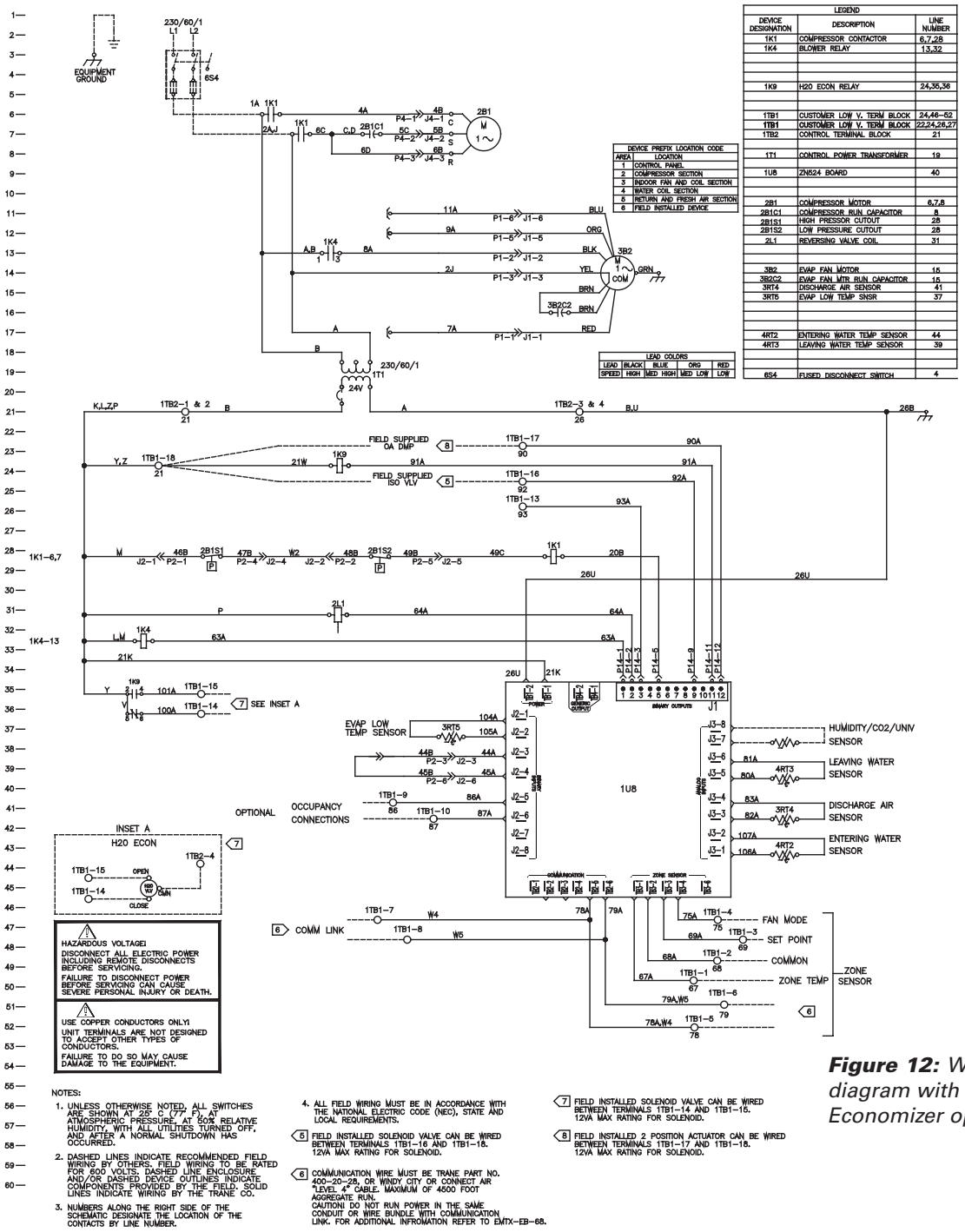


Figure 12: *Wiring diagram with Waterside Economizer option*

Typical wiring diagram

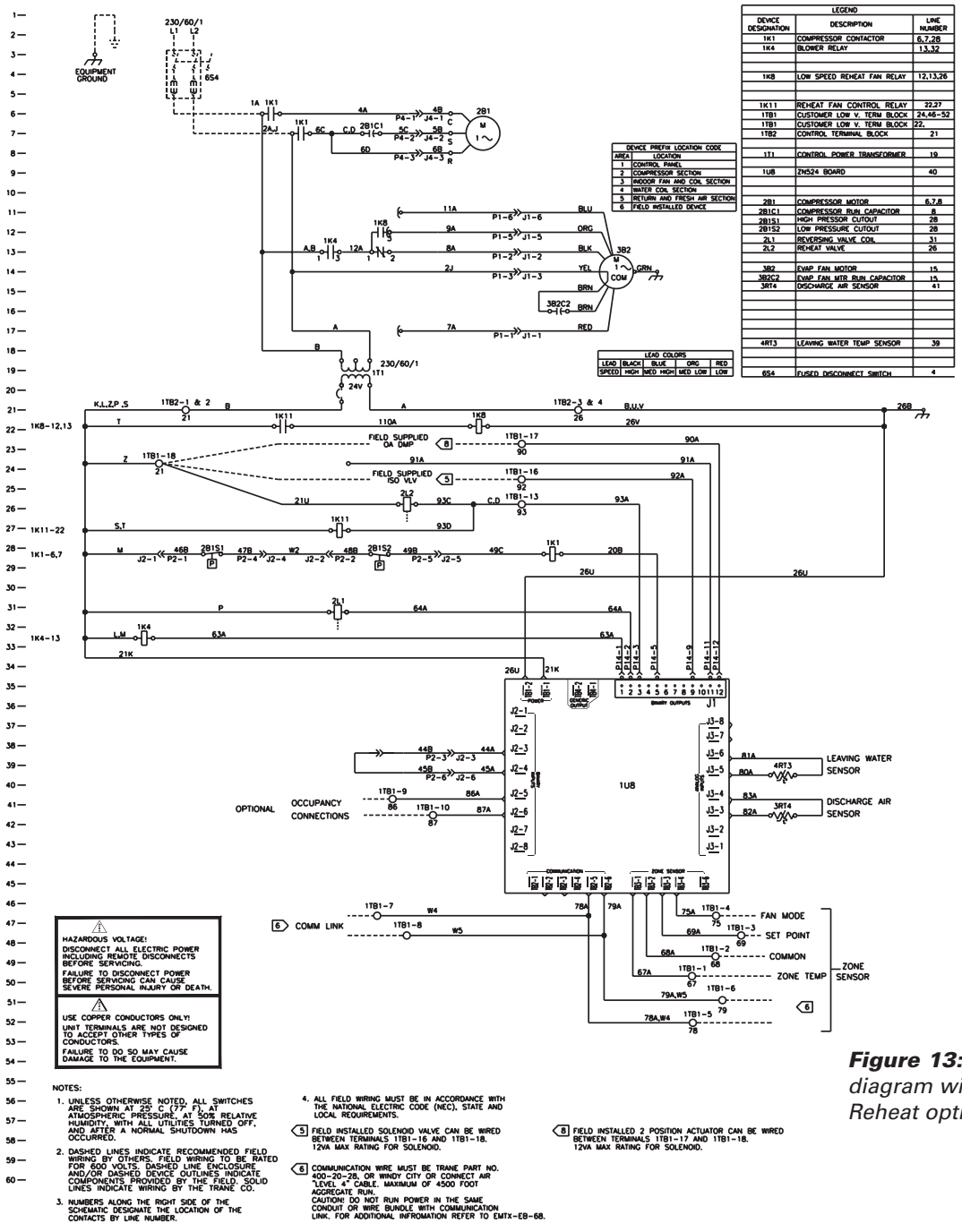


Figure 13: *Wiring diagram with Hot Gas Reheat option*

Configuration

Trane configures the Tracer® ZN524 Unit Controller at the factory per the selected unit configuration. The controller is applied to water-source heat pumps designed for cooling only or standard heat pump usage, in both single or dual-compressor design. The controller also supports the useage of water-side economizer, hot gas reheat, electric heat or boilerless units. **Table 7** defines the configuration options supported by the ZN524 controls.

Table 7: *Typical Applications Supported*[1]

Unit	Water-side Economizer	Hot Gas Reheat	Electric Heat	Boilerless
Cooling Only	X			
		X		
			X	
	X		X	
	X	X		
Heat Pump	X			
		X		
			X	
				X
	X	X		
	X		X	
	X			X

1. Information applies to both single or dual compressor design

Configurable parameters

Rover service tool uses the unit type to determine and download many other aspects of the unit configuration, such as the default analog input configuration, the default binary input configuration, and the default binary output configuration.

Cooling source
- DX Cooling
- Waterside economizer

Heating source
- None
- Electric heat
- DX Heating

Configuration

Table 8: *Fan configuration ranges*

Fan configuration	Default	Valid range
Fan operation in heating	Continuous	Continuous[1] Cycling with capacity
Fan operation in cooling	Continuous	Continuous (during occupied) Cycling with capacity (unoccupied)
Number of fan speeds	One	1
Configurable fan speed heating	High	Off, high, auto
Configurable fan speed cooling	High	Off, high, auto
Zone sensor fan switch	Enable	Disable or enable

1. Fan will cycle when unoccupied

Table 9: *Setpoint defaults*

Setpoint	Default	Valid range
Occupied heating setpoint	71°F	40 to 115°F
Occupied cooling setpoint	74°F	40 to 115°F
Occupied standby heating setpoint	67°F	40 to 115°F
Occupied standby cooling setpoint	78°F	40 to 115°F
Unoccupied heating setpoint	60°F	40 to 115°F
Unoccupied cooling setpoint	85°F	40 to 115°F
Heating setpoint low limit[1]	40°F	40 to 115°F
Cooling setpoint low limit[1]	40°F	40 to 115°F
Heating setpoint high limit[1]	105°F	40 to 115°F
Cooling setpoint high limit [1]	110°F	40 to 115°F
Thumbwheel setpoint	Enable	Disable or enable
Economizer setpoint	50°F	40 to 100°F
Humidity setpoint	60%	0 to 100%

1. The heating and cooling setpoint high and low limits only apply to the occupied and occupied standby setpoints and are not applied to the unoccupied setpoints.

Table 10: *Discharge air limit ranges*

	Default	Valid Range
Low Limit[1]	45°F	30 to 50°F

1. The low limit is the temperature at which the controller shuts down the unit to prevent the coil from frosting.

Configuration

Occupied Bypass Timer

Table 11: *Bypass timer range*

	Default	Valid Range
Occupancy bypass timer[1]	120 minutes	30 to 240 minutes (1-minute resolution)

1. The occupied bypass timer is used for timed override applications.

Power-up Control Wait

Table 12: *Control wait timer*

	Default	Valid Range
Power up control wait (2 minutes)	120 seconds	Disable or enable

Maintenance Timers

Table 13: *Maintenance timer range*[1]

	Default	Valid Range
Maintenance timer	0	0 to 10,000 hours

1. Based on fan run hours.

Location Identifier

Unit Identification Tag

The unit identification tag is factory mounted and provided for easy identification of an installed unit. It contains model number, tagging, and location information.

The unit identification tag remains permanently affixed to the unit for identification purposes. The bottom portion of the tag provides pertinent information that can be written to in building plans or in the ***"Appendix—Location Identifier" on page 48.*** This provides identification history about the unit's location for quick reference.

These tags provide information about:

• unit serial number **(A)**

• NID (neuron identification number)—The NID is similar to the serial number of the unit but is specific to the identification of the Tracer ZN524 unit controller circuit board **(B)**

• unit location—The location identification is a customer defined, clear English description, of the unit's physical location. This is a 27 character description, including spaces, of the location. For example, if the location identification for a unit is "Conference Room 101", the ZN524, Rover (the Trane Loop Controller service tool), and Tracer Summit, will recognize this clear English description. **(C)**

If location identification is not defined, it will default to the unit serial number. This unit identification tag provides some information so the user has multiple references to the unit. The blank location is provided for field modification in case the unit is moved from the initial location.

Figure 14: *Water-source heat pump unit identification tag.*

Winking

Winking a device causes the green status LED on the device selected to blink at a rate of twice per second for approximately 10 seconds. This feature is useful when a discrepancy in device location exists. As part of the troubleshooting process, one person can wink the device while another can observe the blinking and verify the device's physical location.

Important! If the status LED on the ZN524 does not blink, the device may not be communicating or it may not be the device you selected according to the stored address. A Tracer ZN524 unit controller may be set to wink by pressing zone sensor On button for 5 seconds and using Rover, Trane's communication service tool or the Tracer Loop Controller.

Unit Operation

Power-Up

When 24 VAC is initially applied to the controller, the following sequence of events occurs:

- Green status LED turns on.
- All outputs are controlled OFF.
- The controller reads input values to determine initial values.
- Random-start timer expires (5 to 30 seconds).
- When **POWER-UP CONTROL WAIT** is enabled, the controller waits 0-120 seconds (depending on configuration) to allow ample time for communicated control data to input. If the controller does not receive communi-cated information, stand alone control is assumed.
- All valves and dampers are closed.
- **NORMAL** operation begins.

Occupancy

The valid occupancy modes for the Tracer ZN524 controller are:

- **OCCUPIED** - Normal operating mode for occupied spaces or daytime operation.
- **UNOCCUPIED** - Normal operating mode for unoccupied spaces or nighttime operation.
- **OCCUPIED STANDBY** - Mode used to reduce the heating and cooling demands during the occupied hours when the space is vacant or is unoccupied.
- **OCCUPIED BYPASS** -Used to temporarily transition the unit from unoccupied to occupied operation.

The occupancy mode can be hardwired to the controller via the occupancy binary input or communicated to the controller.

OCCUPIED mode

When the controller is in the **OCCUPIED** mode, the unit attempts to maintain the space temperature at the active occupied heating or cooling setpoint. **OCCUPIED** mode is the default mode of the Tracer ZN524 controller.

UNOCCUPIED mode

When the controller is in the **UNOCCUPIED** mode, the unit attempts to maintain space temperature at the stored unoccupied heating or cooling setpoint (i.e., configurable through Tracer Summit or the Rover service tool) regardless of the presence of a hardwired or communicated setpoint. When the space temperature exceeds the stored unoccupied setpoint, the controller brings on 100% of the primary heating or cooling capacity.

The **UNOCCUPIED** mode can be initiated through a hardwired signal to the occupancy binary input or by a communicated request.

OCCUPIED STANDBY mode

The **OCCUPIED STANDBY** mode allows the unit to operate at a heating or cooling setpoint between the occupied and unoccupied setpoints to help maintain the environment while decreasing energy consumption.

This mode can decrease the energy consumption for heating or cooling during brief periods of vacancy in the space. Unit operation in this mode is similar to the occupied mode except for the different heating and cooling setpoints.

The **OCCUPIED STANDBY** mode is initiated only when occupancy is communicated to the Tracer ZN524 controller and the hardwired signal to the occupancy input is calling for unoccupied operation.

OCCUPIED BYPASS mode

The **OCCUPIED BYPASS** mode is used to transition the unit from the **UNOCCUPIED** mode to the occupied mode for a period of time from 0 to 4 hours (configurable through Rover. Default=**2 HRS**).

The controller can be placed in **OCCUPIED BYPASS** mode by either communicating an occupancy request of bypass or by using the **TIMED OVERRIDE** (i.e., **ON**) button on the Trane zone sensor.

ON and CANCEL Buttons

Some Trane zone sensors have **ON** and **CANCEL** buttons for timed override operation. Pressing the On button on the zone sensor when the unit is in the **UNOCCUPIED** mode initiates the **OCCUPIED BYPASS** mode and initializes the bypass timer. The cancel button is used to send the unit back into **UNOCCUPIED** mode before the bypass timer has expired.

The On button may also be used for the unit identification or the **"WINK"** feature. When the Tracer ZN524 controller is connected to a Tracer Summit system, Loop Controller, or the Rover service tool, the On button may be used in place of the service pin for easy unit identification.

Heating And Cooling Changeover Logic

The Tracer™ ZN524 Unit Controller can receive communicated requests for heating or cooling operation. The communicated variable nviApplicMode is used to communicate the requests for the controller's operating mode based on the following values:
0 = Auto (mode determined by controller)
1 = Heat (uses heating setpoints)
2 = Morning Warm-up
3 = Cool (uses cooling setpoints)
5 = Pre-cool (morning cool down)
6 = Off (no unit operation allowed)
7 = Test (special test mode)
9 = Fan Only (no heating or cooling)

Unit Operation

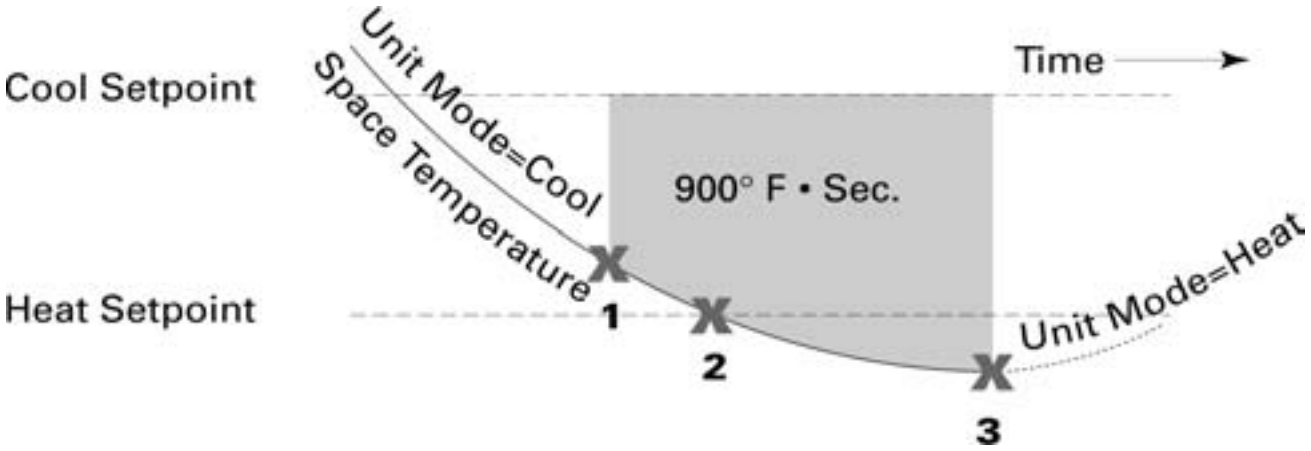


Figure 15: *Heat/Cool Changeover logic*

All other numers will be interpreted as Auto.

As the controller automatically determines its heating or cooling mode, it changes from cool to heat or from heat to cool, while the error (integrated over time between the active setpoint and the space temperature) is (900°F • Sec).

Integration only begins once the heating and cooling capacity is equal to 0% (See Figure 15).

Heat/Cool Changeover Logic

If the measured space temperature is 69°F and the active cooling setpoint is 72°F, the error between the space temperature and the setpoint is three degrees. If the same error exists for one minute (60 seconds), the integration term is (3°F • 60 Sec) or (180°F • Sec).

The Tracer™ ZN524 Unit Controller changes from heating to cooling and cooling to heating when the integration term exceeds (900°F • Sec). Along with satisfying the integration for heating and cooling changeover, the measured space temperature must fall outside the setpoint range. This means the space temperature must be greater than the active cooling setpoint or lower than the active heating setpoint.

Example: If the cooling setpoint is 75°F and the heating setpoint 70°F, any space temperature greater than 75°F or less than 70°F is outside the setpoint range.

Once the integration term is satisfied and the space temperature is outside the setpoint range, the controller changes modes. However, before the unit's heating or cooling capacity ramps up, the controller checks to make sure it is capable of heating or cooling.

In instances where waterside economizers or boilerless controls are in use, it is necessary to verify the water temperature before unit operation is allowed.

Unit Operation

Cooling Operation

During the **COOLING** mode, the Tracer ZN524 controller attempts to maintain the space temperature at the active cooling setpoint, which is one of the following:
- Occupied cooling
- Occupied standby cooling
- Unoccupied cooling

The controller uses the measured space temperature, the active cooling setpoint along with the control algorithm to determine the requested cooling capacity of the unit (0-100%). The outputs are controlled based on the unit configuration and the requested cooling capacity.

Heating Operation

During the heating mode, the Tracer ZN524 controller attempts to maintain the space temperature at the active heating setpoint, which is one of the following:
- Occupied heating
- Occupied standby heating
- Unoccupied heating

The controller uses the measured space temperature, the active heating setpoint along with the control algorithm to determine the requested heating capacity of the unit (0-100%). The outputs are controlled based on the unit configuration and the requested heating capacity.

Fan Operation

The Tracer ZN524 controller also allows the fan speed to be configured as auto. When the fan speed switch is in the auto position and the default fan speed is configured as auto, the unit may change between cycling and continuous, depending on how the default fan speeds are configured for heating and cooling modes.

The fan mode request can be either hardwired or communicated to the Tracer ZN524 controller. When both are present, the communicated request has priority over the hardwired input.

During o**CCUPIED, OCCUPIED STANDBY,** and **OCCUPIED BYPASS** modes, the fan will operate as configured (cycling or continuous). The fan may be controlled off in these mode when the **MANUAL OUTPUT TEST** has been initiated, a latching diagnostic is present, or the communicated or hardwired fan speed is off.

During the **UNOCCUPIED** mode, the unit fan is controlled off. When capacity is required to maintain the **UNOCCUPIED** heating or cooling setpoint, the unit fan is controlled on until the **UNOCCUPIED** setpoint is satisfied.

Fan Off Delay

If the fan is configured for cycling and the heating output is controlled off, the Tracer ZN524 Unit Controller automatically holds the fan on for an additional 30 seconds. This 30-second delay gives the fan time to blow off any residual heat from the heating source.

Entering Water Temperature Sampling Function

The Tracer ZN524 controller will sample the Entering Water Temperature (EWT) to determine proper control action for units equipped with boilerless electric heat or Waterside Economizer (WSE). Each unit is treated as having isolation valves - whether present or not. If the EWT is communicated to the controller via a BAS system, then no sampling will be required.

If the EWT is present as a hardwired input and communicated from a BAS, the communicated value will be used. When the EWT sample is used, the isolation valve on circuit 1 will be driven open for 3 minutes and the EWT reading will be taken at that time.

To avoid sampling each time a new cooling/heating request is initiated, the last EWT value recorded is used for the next (1)hour. During boilerless control heating, if setpoint has not been met following the hour, a new EWT reading is made and the appropriate control action is taken.

During WSE and DX operation, the EWT is refreshed as often as the analog imput is polled. NOTE: If the WSE is disable due to enable setpoint AND DX cooling is in operation, DX cooling will not be disabled until the load is met. This will occur even if the EWT has lowered to the point the WSE can be used. Refer to the WSE documentation for further details.

Sampling for Waterside Economizer Units

EWT is used to determine if WSE operation is feasible. If the EWT meets the configured Enable setpoint, WSE operation is possible.

Unit Operation

EWT sampling will be invoked when the following conditions have been met:

- EWT is not communicated via a BAS and:
- Unit is equipped with a WSE

The the following must occur:

- There is a new control request for cooling and isolation valve 1 is not open and more than 1-hour has elapsed since the last EWT sample

When these conditions are met, circuit 1 isolation valve is opened for 3-minutes and the EWT reading is taken and WSE operation feasability is determined. The isolation valve will remain open regardless.

Sampling for Electric Heat Units

For units equipped with electric Heat and configured for boilerless control, EWT is used to determine whether DX heating should be disabled and electric heat enabled. EWT sampling is invoked when the folowing conditions are met:

- EWT is not communication via a BAS and:
- Unit is equipped with electric heat configured for boilerless control and is not a cooling only unit

Then the following must occur:

- There is a new control request for heating and isolation valve 1 is not open and more than 1-hour has elapsed since the last EWT sample or:
- Boilerless electric heat is running and more than 1-hour has elapsed since the last EWT sample

When these conditions are met, circuit 1 isolation valve is opened for 3-minutes, the EWT reading is taken and electric heat operation feasability is determined. If boilerless electric heat is enabled, the isolation valve will be closed, halting water flow to the unit.

The following chart provides a quick reference to unit configurations in which EWT is enabled:

EWT Sampling Enabled	Unit Build Configuration
No	Heat pump (HP)
Yes	HP with WSE
Yes	HP + electric heat (boilerless)
Yes	HP + electric heat + WSE
No	HP + electric heat (concurrent)
Yes	HP + electric heat (concurrent) + WSE
No	Cooling only
Yes	Cool only with WSE
No	Cool + electric heat (boilerless)
Yes	Cool + electric heat (boilerless) + WSE

Water-side Economizer Operation

The ZN524 supports the use of a 2-position Water Side Economizer (WSE). The WSE is only active in cooling mode and the EWT setpoint has been met. If the zone requires cooling and the WSE is enabled, the WSE valve will open and begin controlling the zone. If the WSE capacity can not cool the zone, then 1-stage of compressor cooling will be allowed to operate with the WSE. The second stage of compressor cooling will not be allowed to run, under any circumstances, when the WSE is in operation. Note: If the zone temperature continues to rise, the WSE enable setpoint may need to be redueced in order to increase unit capacity.

When the WSE and the compressor are running simultaneously, coil frosting may occur. The ZN524 controls two devices to prevent this from occuring.

Coil Icing Protection

A fixed temperature device is mounted to the evaporator coil and wired to a binary input on the ZN524 controller. When the binary input on the ZN524 trips (in alarm situations) the following actions will occur:

Cooling Mode	Control Action
Economizer	None
Economizer & 1-stage DX	Disable 1st Stage DX
1st and 2nd stage DX	Disable DX stages 1 and 2

Note: The fan will remain on during this operation

This low-level diagnostic will automatically rest when the binary input changes to the normal state. The compressor minimum on and off times (3 minutes) will be enforced during this mode.

Low Leaving Air Protection

This mode is activated during WSE operation and controlled by the discharge air sensor. If the discharge air temperature drops below 45 F for 1-minute while the unit is economizing, the following actions will occur:

Cooling Mode	Control Action
Economizer	None
Economizer & 1-stage DX	Disable 1st Stage DX
1st and 2nd stage DX	None

Note: The fan will remain on during this operation

This low-level diagnostic will reset when the discharge air temperature has risen above 50 F. The compressor minimum on and off times (3 minutes) will be enforced during this mode.

Unit Operation

Electric Heat Operation

The Tracer ZN524 supports 1-stage electric heat in one of three ways: Supplemental, Boilerless and Main heat.

Supplemental

When applied, the electric heat is cycled on as the last stage of heating. Compressor 1 and 2 (where applicable) will be energized and the electric heat will operate concurrently with the compressors as needed to maintain space temperature.

Boilerless

When applied, the electric heat will be enabled based on EWT. The compressor(s) and electric heat is not allowed to operate at the same time. Boilerless electric heat is controlled by the EWT and compressor heat disable setpoint. If the unit is in the heating mode and the EWT falls below the compressor heat disable setpoint, then the compressor will be disabled for heating and the electric heat will be cycled to maintain temperature.

Boilerless control will be disabled if the EWT rises 5 F above the compressor heat disable setpoint. The EWT value can be either local or communicated. In applications where the local water sensor is used, the unit may utilize the Entering Water Temperature Sampling function to verify water temperature.

Main Heat

The electric heat will be utilized as the only form of heat for the unit. The compressor and electric heat will not operate at the same time. When in the heating mode the electric heat cycle to maintain space temperature.

Compressor (DX) Cooling

The ZN524 controller supports two stages of DX cooling. The control is proportional and based on an error rate of 3 F for single compressor operation and 5 F for 2-compressor units. Zone temperature is compared against active setpoints for compressor operation: **Off, pulse width modulation** or **On.** ***Note: When the control is in the dehumidification mode only Off and On are valid compressor states.***

At start-up or during mode transition, if both compressors are requested to run, compressor 1 will be energized first. Compressor 2 waits until the next control cycle (10 seconds) to energize.

Water Isolation Valves

The ZN524 supports the operation of water isolation valves for varialble speed pumping systems. Up to 2 isolation valves are supported, one for each compressor circuit. The valves are spring return and normally closed. The ZN524 operates as if isolation vlalves are present. The presence or absence of isolation valves is not a configuration factor.

Under normal operation, the ZN524 opens the isolation valve(s) under the following conditions:

- DX Heating request
- DX Cooling or WSE request
- When control is in DX heat or cool mode AND is controlling with pulse width modulation, the valves will remain open during the pulse width modulation cycle.
- Dehumidification request
- EWT sampling request. Valves will remain open for 3 minutes.
- Manual testing
- During DX operation. The valves will open for 20 seconds to ensure adequate water flow before energizing the compressor outputs.
- Upon opening, the valves remain open for a 10 minute minimum to reduce excessive valve cycling.

Note: If only a single isolation valve is used on a two-circuit heat unit, it must be wired to the isolation valve 1 output.
Isolation valve 1 must remain open as long as the control is in an active cooling, heating, or dehumidification. If circuit/compressor 1 is taken off-line, isolation valve 1 will remain open to allow operation of circuit 2.

Under normal operation, isolation valves will be closed under the following conditions:

- Compressor and WSE are controlled **Off** and the 10-minute minimum on has expired. Note: If the WSE is disabled due to economizer enable paramenter or through BAS system and cooling demand is still present, the isolation valve will remain open for compressor operation.
- Isolation valve 2 will close if compressor 2 is taken off-line due to a diagnostic or no capacity call and the 10-minute minimum on has expired
- Power is lost, valves de-energize to the closed position
- Manual test off

There is no time delay when an isolation valve is to be closed. The ouptut will be de-energized and the valve will spring return closed.

Unit Operation

Other Modes

Dehumidification

The ZN524 controller controls the zone to the active cooling setpoint using proportional control. The ZN524 also controls one stage of DX cooling in conjunction with one stage of reheat. The only supported dehumidification type during this period is hot gas reheat.

The factory-supplied ZN524 supports one binary output for the control of a two-position hot gas reheat solenoid valve. This valve is normally closed and will open when energized providing the flow of hot refrigerant gas through the reheat coil. The reheat coil is sized to provide neutral air at 75 F loop condition with 75 F dry bulb return air at 75% relative humidity. When in the dehumidification mode, only the first stage DX cooling will be allowed to run on two stage units.

Active dehumidification can only occur when the controller is in the cooling mode. Active dehumidification is not allowed in heating mode. Dehumidification can be active during all time of day schedules.

A humidity transmitter is used to measure the zone relative humidity and is compared against the relative humidity enable/disable setpoints. Relative humidity level can be communicated to the ZN524 from a Tracer Summit system. The default values for dehumidification enable is 60% relative humidity. Disable point is 52% relative humidity. These values are configurable.

To avoid subcooling the space if the reheat is not sized properly or during certain system conditions, a low limit temp is established to exit dehumidification mode. The low limit is the active cooling setpoint in the Occupied and Unoccupied standby modes.

In the Unoccupied mode, the default Occupied cooling setpoint is used as the low limit. This enables extended dehumidification during unoccupied modes which allows sub-cooling the space to the default Occupied setpoint. If the zone temperature reaches the low limit the DX cooling and reheat will be turned off. The zone temperature must then rise 0.75 F above the low limit before the DX cooling and reheat are allowed to operate again.

Note: While in the dehumidification mode, if there is a call for capacity by the unit, the zone temperature setpoint will take priority over the relative humidity setpoints.

Dehumidification will occur during the following:

- Unit mode = cooling
- Relative humidity > Enable setpoint

Reheat in the dehumidification mode is utilized under the following conditions:

- Zone temp is above the active cooling setpoint
- Zone temp error < 1.5 F above the active cooling setpoint

The compressor will be energized 100% of the time during dehumidification mode. No pulse width modulation is used during dehumidification.

Dehumidification will occur during the following:

- Unit mode = cooling
- Relative humidity > Enable setpoint

Reheat in the dehumidification mode is utilized under the following conditions:

- Zone temp is above the active cooling setpoint
- Zone temp error < 1.5 F above the active cooling setpoint

Compressor 2 will not be on at the same time as the reheat solenoid. No pulse width modulation is used during dehumidification.

For both **single and two-stage** cooling, the following conditions will cause the ZN524 to transition out of dehumidification mode:

- Relative humidity ≤ disable setpoint
- Zone temp ≥ 1.5 F
- Unit mode = heating

Note: For both single and two-stage cooling, the occupied cooling and occupied heating setpoints can be the same, which may create some risk of switching over to heating mode unless the transition.

Defrost

For defrost operation, a sensor is wired to BIP 1. When a defrost condition is detected, the compressor(s) are disabled, and the unit is placed in the **DEFROST** mode.

During **DEFROST** the compressor(s) are off, and the fan will continue to operate as continuous. The unit will remain in the **DEFROST** mode until the sensor resets. The unit will return to **NORMAL** operation after the mode is discontinued.

Pre-Heat

The Tracer ZN524 controller keeps the 2-position outdoor air damper closed anytime during the **OCCUPIED** mode when the space temperature is 3°F or more below the heating setpoint.

The damper remains closed indefinitely during morning pre-heat until the space temperature is within 2°F of the effective heating setpoint. The unit runs at full capacity until setpoint is met.

Unit Operation

PRE-COOL
The Tracer ZN524 controller keeps the 2-position outdoor air damper closed for up to one hour at every transition from unoccupied to occupied mode when the space temperature is 3°F or more above the cooling setpoint.

The damper remains closed during pre-cool until the space temperature is within 2°F of the effective cooling setpoint. The unit runs at full capacity until setpoint is met.

Output Overrides

Manual Output Test
Manual output test allows the binary outputs to be energized in a predefined sequence. (For more information see, Manual Output Test, on pages 32-33 for more information.)

Fan Status
There are two ways to do fan status monitoring:

1. The status of the fan is reported based on the state of the binary out put(s) dedicated to fan control. The fan status is reported as **ON** whenever the corresponding binary output is directed on. The fan status is reported as off when the fan output is directed **ON**.

2. The Tracer ZN524 controller has a binary input available for a fan status device (current sensing relay) which can provide feedback of fan operation. If the device does not indicate fan operation after 1 minute as commanded **ON**, a unit shut down is initiated, and the unit is latched **OFF**.

Filter Status/Maintenance Timer

The unit filter status\maintenance timer is based on the cumulative run hours of the unit fan. The controller compares the fan run time against an adjustable fan run hour limit and recommends unit maintenance as required.

The Rover service tool is used to edit the maintenance required setpoint time. Once the setpoint limit is exceeded, the controller generates a maintenance required informational diagnostic. When the MAINTENANCE REQUIRED setpoint time is set to zero, the controller disables this feature.

The Tracer Summit, Tracker or the Rover service tool are required to clear the MAINTENANCE REQUIRED informational diagnostic. Once the diagnostic is cleared, the controller resets the fan run time to zero and begins accumulating fan run hours again.

Note: If at any time the unit loses power, the timer is reset to zero.

Unit Operation

Data Sharing—LonWorks

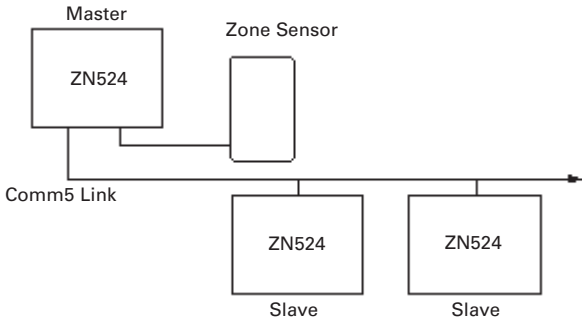
Tracer ZN524 allows peer-to-peer data communication through the use of LonWork's technology. Data such as space temperature setpoint, occupancy, etc. can be shared from a master controller to a peer controller over a twisted pair of communication wire with or without the presence of a front end building management system. (See Figure 16: "Simple data sharing application") This ability allows units to operate with the same data to prevent conflicting control.

Data sharing is established through the use of "bindings". Bindings are set up through the Rover service tool.

The Tracer ZN524 controller includes a network variable for master/slave operation. This variable includes all of the information required for the slave units to operate with master controller. (See Figure 17: "More complex data sharing application")

For more information on establishing bindings, see the Rover service tool manual. For a complete listing on shared points see *"Appendix—Data Lists" on page 47.*

Figure 16: *Simple data sharing application*



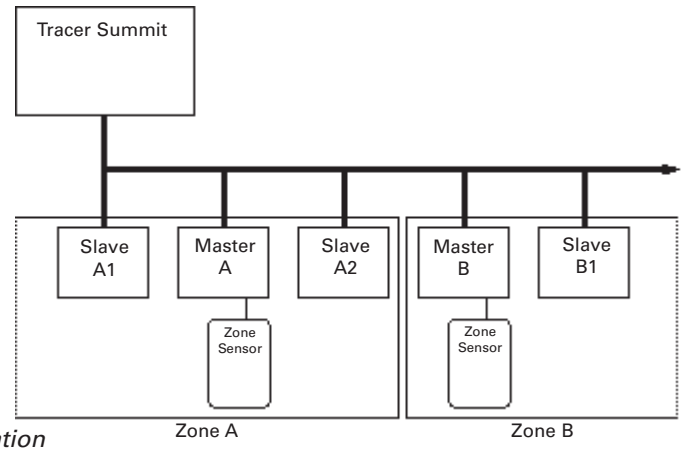


Figure 17: *More complex data sharing application*

Troubleshooting

Important! When viewing the Tracer ZN524 through the Rover service tool, it is important that the version be up-to-date. To help ensure that your version is the most recent, contact you local Trane sales representative or service center.

⚠ WARNING
Live Electrical Components
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

Led Operation

Table 15: *Red Service LED*

Red LED activity	Description
LED is off continuously after power is applied to the controller.	Normal operation.
LED is on continuously, even when power is first applied to the controller.	Someone is pressing the Service push button or the controller has failed.
LED flashes about once every second.	Un-install (normal controller mode). Use Rover service tool to restore the unit to normal operation. Refer to the Rover product literature for more information.

Black Service Push Button

Note: If the Service push button is held down for more than 15 seconds, the Tracer ZN524 Unit Controller will uninstall itself from the ICS communication network and shut down all unit operation. This mode is indicated by the red Service LED flashing once every second. See the Red Service LED section. Use Rover service tool to restore the unit to normal operation.

The Service push button, located at the bottom center of the controller, can be used to install the Tracer ZN524 Unit Controller in a communication network. Refer to the Rover and Tracer Summit product literature for more information.

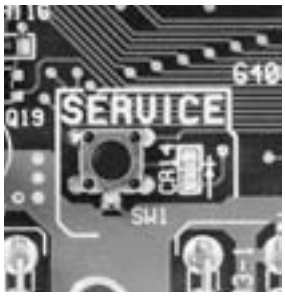


Figure 18: *Black service button*

Green Status LED

The green LED normally indicates whether or not the controller is powered on (24 VAC).

Table 16: *Green status LED activity*

Green LED activity	Description
LED is on continuously.	Power on (normal operation).
LED blinks (1 blink per second)	The controller is in manual output test mode. No diagnostics present.
LED blinks (2 blinks per second).	The controller is in manual output test mode. One or more diagnostics are present.
LED blinks 1/4 second on, 1/4 second off for 10 seconds	Wink mode
LED off	Power is off. Controller failure. Test button is pressed.

Yellow Comm LED

The yellow Comm LED blinks at the rate the controller receives communication. The yellow LED does not blink when the controller is transmitting communication data.

Table 17: *Yellow comm LED activity*

Yellow LED activity	Description
LED off continuously.	Controller is not detecting any communication. (Normal for standalone applications.)
LED blinks or . flickers	The controller detects communication. (Normal for communicating applications, including data sharing.)
LED on continuously.	Abnormal condition or extremely high traffic on the link.

Manual Output Test

The test sequence verifies output and end device operation. The manual output test can be conducted to verify output wiring and actuator operation, without using the Rover service tool, by pressing the test button.

Many service calls are initiated due to unit diagnostics, so the test sequence attempts to clear unit diagnostics and restore normal unit operation prior to testing the outputs. If the diagnostics remain after an attempt to clear diagnostics, the status LED lights in a two-blink pattern, indicating the diagnostic condition is still present. *See Table 18, Page 33 for more details.*

Figure 19: *Blue test button*

Troubleshooting

If a two-blink pattern remains after an attempt to clear diagnostics, the diagnostic condition is still present and may affect the manual output test. The diagnostic must then be cleared using another method. (See "**Resetting Diagnostics**" on page 35 for more information.)

Test Procedure

The procedure for testing is:

1. Press and hold the Test button for at least two seconds, then release the button to start the test mode.
2. When manual output test mode begins, the controller turns off all out puts and calibrates end devices closed.
3. Press the Test button once to advance through each step of the test sequence.

Note: To help ensure accurate testing do not press the test button more than once per second.

Alternatively, the manual output test can be controlled over the communications network by using Rover. When conducting the manual output test via communications network, the sequence must start with Step 1 (OFF), as shown in **Table 18.**

Table 18: *Test sequence*

Step	Fan	Reversing Valve	Elec. Heat/ Reheat	Compressor 1	Compressor 2	Isolation Valve 1	Isolation Valve 2	Water-side Economizer	Outside Air Damper	Generic
	BO1	BO2	BO3	BO4	BO5	BO6	BO7	BO8	BO9	BO10
1. Off[1]	Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
2. Fan[2]	On									
3. Isolation Valve 1	On					On				
4. Waterside Economizer	On					On		On		
5. Isolation Valve 1 & 2	On					On	On			
6. Reversing Valve	On	On				On	On			
7. 1st Stage Cool	On	On		On		On	On			
8. 1st & 2nd Stage Cool	On	On		On	On	On	On			
9. Heat Mode: ***See Table Below***										
10. Compressor[3]	On					On	On			
11. 1st Stage Heat	On			On		On	On			
12. 2nd Stage Heat	On			On	On	On	On			
13. Outside[4] Air Damp.	On								On	
14. Generic[5] Output	On									On
Heat Type										
9. Hot Gas	On	On	On	On		On	On			
9. No Heat/ Boilerless	On		On			On	On			
9. Concurrent	On		On	On	On	On	On			

1. Upon entering manual output test mode, the controller turns off all fan outputs and drives all dampers and valves closed (if required).
2. At the beginning of Step 2, the controller attempts to clear all diagnostics.
3. This stage helps avoid an abrupt transition from cooling to heating by turning off the compressors prior to changing the reversing valve state.
4. Binary output 9 (BOP9) will be controlled during this step regardless of its configuration.
5. After the generic output setup, the test sequence performs the exit step. This initiates a reset and attempts to return the controller to normal operation.

Troubleshooting

Diagnostics

Fan Failure
A "Low Air Flow—Fan Failure" diagnostic is generated when a fan status device is present and fails to close after 1 minute of unit start-up or when it opens for more than 1 minute during normal unit operation.

Space Temperature Failure
If the Tracer ZN524 has validated a space temperature input and then the input becomes invalid, a space temperature failure diagnostic occurs.

Entering Water Temperature Failure
If the Tracer ZN524 has validated an entering water temperature input and then the input becomes invalid, an entering water temperature failure diagnostic occurs.

Discharge Air Temperature Limit
When the discharge air exceeds the low limit setpoint and the unit can not correct it by altering capacity, a "Discharge Air Temp Limit" diagnostic is generated.

Outdoor Air Temperature Failure
If the Tracer ZN524 has validated an outdoor air temperature input and then the input becomes invalid, an outdoor air temperature failure diagnostic occurs.

Humidity Input Failure
If the Tracer ZN524 has validated a relative humidity input and then the input becomes invalid, a humidity input failure diagnostic occurs.

CO^2 Sensor Failure
If the Tracer ZN524 has validated a CO^2 input and then the input becomes invalid, a CO^2 input failure diagnostic occurs.

Generic AIP Failure
If the Tracer ZN524 has validated a generic analog input and then the input becomes invalid, a generic analog input failure diagnostic occurs.

Defrosting-Compressor Lockout
The defrost stat used with Tracer ZN524 on DX units is wired in series with the condensing unit. When it opens to indicate a frost condition, the Tracer ZN524 senses the open circuit and de-energizes the compressor output. A defrosting diagnostic is generated at this point.

Maintenance Required
Note: If power to the unit is cycled or discontinued for any reason, all maintenance timers are automatically reset.
The "Maintenance Required" diagnostic is generated when the fan run-time exceeds the configurable limit. This diagnostic is useful for filter change notification.

Local Fan Mode Failure
If the hardwired fan mode input to the Tracer ZN524 controller is present and then becomes invalid, a local fan mode failure diagnostic is generated.

Local Setpoint Failure
If the hardwired setpoint input to the Tracer ZN524 controller is present and then becomes invalid, a local setpoint failure diagnostic is generated.

Generic Temperature Failure
If the Tracer ZN524 has validated a generic temperature input and then the input becomes invalid, a generic temperature input failure diagnostic occurs.

Invalid Unit Configuration
If the Tracer ZN524 has been configured improperly or loses its configuration, an invalid unit configuration diagnostic is generated. The unit must be re-configured with a valid configuration to correct this problem.

Troubleshooting

Table 19: *Tracer ZN524 Unit Controller diagnostics*

Diagnostic	Unit Response	Latching/ non-latching	Reset
High/Low Pressure Cutout[2]	Fan—off Valves—closed Compressor - off	Latching	Auto reset once within 24 hrs. If safety generates a diagnostic more than once a communicated or manual reset will be necessary
Low Air Flow/ Fan Failure[2]	Fan—off Valves—closed Compressors—off	Latching	Communicated or manual reset
Space Temperature Failure[2,3]	Fan—off Valves—closed Compressors—off	Non-latching	Communicated or manual reset
Entering Water Temperature Failure[2,3]	Fan—enabled Boilerless control—disabled Waterside Economizer—enabled	Non-latching	Communicated or manual reset
Discharge Air Temperature Limit	Fan—on Compressor—disable Waterside Economizer—enabled	Non-Latching	Auto reset once within 24hrs. If safety generates a diagnostic more than once a communicated or manual reset will be necessary.
Discharge Air Temperature Failure[2,3]	Fan—enable Compressors—enabled	Non-latching	Communicated or manual reset
Outdoor Air Temperature Failure[2,3]	Fan—enable Compressor—enable	Non-latching	Communicated or manual reset

1: The generic binary output (TB4-1, TB4-2) state is unaffected by all unit diagnostics.
2: During manual output test, these diagnostics make the green status LED flash in a two-blink pattern. For more information see, Manual Output Test, on page 32.
3: These diagnostics are non-latching and automatically reset when the input is present and valid.

Troubleshooting

Table 19: *Tracer ZN524 Unit Controller diagnostics - continued*

Diagnostic	Unit Response	Latching/ non-latching	Reset
Humidity Input Failure[3]	Fan—enabled Valves—enabled Compressor—enabled Reheat—disabled	Non-latching	Communicated or manual reset
CO2 Sensor Failure[3]	Fan—enabled Valves—enabled Compressor—enabled	Non-latching	Communicated or manual reset
Generic AIP Failure[3]	No Unit Reaction	Non-latching	Communicated or manual reset
Maintenance Required	Fan—enabled Valves—enabled Compressor—enabled	Non-latching	Communicated or manual reset
Local Fan Mode Failure[3]	Fan—enabled Valves—enabled Compressor—enabled	Non-latching	Communicated or manual reset
Local Setpoint Failure[3]	Fan—enabled Valves—enabled Outdoor air damper—enabled	Non-latching	Communicated or manual reset
Invalid Unit Configuration[2]	Fan—disabled Valves—disabled Compressor—disabled	Latching	Communicated or manual reset
Normal	Fans—enabled Valves—enabled Compressor—enabled	Non-latching	N/A

1: The generic binary output (TB4-1, TB4-2) state is unaffected by all unit diagnostics.
2: During manual output test, these diagnostics make the green status LED flash in a two-blink pattern. For more information see, Manual Output Test, on page 32.
3: These diagnostics are non-latching and automatically reset when the input is present and valid.

Troubleshooting

Translating Multiple Diagnostics

The controller senses and records each diagnostic independently of other diagnostics. It is possible to have multiple diagnostics present simultaneously. The diagnostics are reported in the order they occur.

Resetting Diagnostics
There are many ways to reset unit diagnostics:

- Automatically by the controller
- By initiating a manual output test at the controller
- By cycling power to the controller
- By using a building automation system
- By using the Rover service tool
- By cycling the fan switch from off to **ON** or **AUTO**

High/Low Pressure Cutout
The Tracer™ ZN524 Unit Controller includes an automatic diagnostic reset function. This function attempts to automatically recover a unit when the High/Low Pressure Cutout diagnostic occurs. When this diagnostic occurs, the controller responds as defined in Table 19: Tracer™ ZN524 Unit Controller diagnostics.

After the controller detects the High/Low Pressure Cutout diagnostic, the unit waits 30 minutes before invoking the automatic diagnostic reset function. The automatic diagnostic reset function clears the High/Low Pressure Cutout diagnostic and attempts to restore the controller to normal operation. The controller resumes normal operation until another diagnostic occurs.

If a High/Low Pressure Cutout diagnostic reoccurs within 24 hours after an automatic diagnostic reset, you must manually reset the diagnostic. See other possible methods for resetting diagnostics in this section.

Manual output test
The test button on the controller may be used either during installation to verify proper end device operation or during troubleshooting.

When the Test button is pressed, the controller exercises all outputs in a predefined sequence. The first and last steps of the sequence reset the controller diagnostics. (See "Manual Output Test" on page 32 for more information.)

Cycling power
When turned-off, the controller's 24 VAC power, and power is reapplied, the unit cycles through a power-up sequence and clears all timers.
By default, the controller attempts to reset all diagnostics at power-up.

Diagnostics present at power-up and those that occur after power-up are handled according to the defined unit diagnostics sequences (For more information see, Table 19).

Building automation system
Some building automation systems (i.e., Tracer Summit, Tracker or Tracer Loop Controller building automation system) can reset diagnostics in the Tracer ZN524 unit controller. For more complete information, refer to the product literature for the building automation system.

Rover service tool
Rover service tool can reset diagnostics in the Tracer ZN524 unit controller. For more complete information, refer to the Rover Installation, Operation, and Programming manual.

Diagnostic reset
Any device that can communicate the network variable nviRequest (enumeration "clear_alarm") can reset diagnostics in the Tracer ZN524 unit controller. The controller also attempts to reset diagnostics whenever power is cycled.

Cycling the fan switch
If the user cycles the fan speed switch from off to **ON** or **AUTO**, the controller resets all diagnostics. Diagnostics may recur immediately if the problem still exists.

Troubleshooting

Fans

Table 19: *Fan Outputs do not energize*

Probable cause	Possible Explanation
Unit wiring	The wiring between the controller outputs and the fan contactor must be present and correct for normal fan operation
No power to the controller	If the controller does not have power, the unit fan does not operate. For the Tracer ZN524 Unit Controller to operate normally, it must have an input voltage of 24 VAC. When the green LED is off continuously, the controller does not have sufficient power or has failed.
Unit configuration	The controller must be properly configured based on the actual installed end devices and application. When the unit configuration does not match the actual end devices, the fans may not work correctly.
Random-start observed	After power-up, the controller always observes a random-start from 5 to 30 seconds. The controller remains off until the random-start time expires.
Power-up control wait	When power-up control wait is enabled (non-zero time), the controller remains off until one of two conditions occurs: 1. The controller exits power-up control wait once it receives communicated information. 2. The controller exits power-up control wait once the power-up control wait time expires.
Diagnostic present	A specific list of diagnostics affects fan operation. For more information see, Table 19: Tracer ZN524 Unit Controller diagnostics, page 33.
Manual output test	The controller includes a manual output test sequence you can use to verify output operation and associated output wiring. However, based on the current step in the test sequence, the unit fan may not be on. For more information see, Manual Output Test, on page 32 for more information.)
Fan mode off	When a local fan mode switch (provided on the Trane zone sensor) determines the fan operation, the off position controls the unit off.
Requested mode off	You can communicate a desired operating mode (such as off, heat, and cool) to the controller. When off is communicated to the controller, the unit controls the fan off. There is no heating or cooling.
Unoccupied operation	When the controller is in the unoccupied mode, the fan is cycled.
Cycling fan operation/continuous	The controller can cycle fan with unit capacity. If no capacity is present, the fan will be de-energized

Troubleshooting

Valves

Table 20: *Isolation valves stay closed*

Probable cause	Possible Explanation
Unit wiring	The wiring between the controller outputs and the valve(s) must be present and correct for normal valve operation.
Random-start observed	After power-up, the controller always observes a random-start from 5 to 30 seconds. The controller remains off until the random-start time expires.
Power-up control wait	When power-up control wait is enabled (non-zero time), the controller remains off until one of two conditions occurs: 1. The controller exits power-up control wait once it receives communicated information. 2. The controller exits power-up control wait once the power-up control wait time expires.
Diagnostic present	A specific list of diagnostic affects valve operation. For more information see, Table 19 for more information
Manual output test	The controller includes a manual output test sequence you can use to verify output operation and associated output wiring. However, based on the current step in the test sequence, the valve(s) may not be open. For more information see, Manual Output Test, on page 32 for more information.)
Fan mode off	When a local fan mode switch (provided on the Trane zone sensor) determines the fan operation, the off position controls the unit off and valves to close.
Requested mode off	You can communicate a desired operating mode (such as off, heat, and cool) to the controller. When off is communicated to the controller, the unit controls the fan off. There is no heating or cooling (valves are closed).
Sampling logic	The controller includes entering water temperature sampling logic which is automatically invoked when a waterside economizer or boilerless control is present. For more information see, Entering Water Temperature Sampling, on Sampling logic page 26 for more information.)

Table 21: *Isolation valves stay open*

Probable cause	Possible Explanation
Unit wiring	The wiring between the controller outputs and the valve(s) must be present and correct for normal valve operation.
Manual output test	The controller includes a manual output test sequence you can use to verify output operation and associated output wiring. However, based on the current step in the test sequence, the valve(s) may be open. For more information see, Manual Output Test, on page 32 for more information.)
Sampling logic	The controller includes entering water temperature sampling logic which automatically invoked during when waterside economizer or boilerless control is present. For more information see, Entering Water Temperature Sampling, on page 26 for more information.)
Normal operation	The controller opens and closes the valves to meet the unit capacity requirements.

Troubleshooting

DX/Electric Heat

Table 22: *Compressor or electric heat output(s) do not energize*

Probable cause	Possible Explanation
Unit wiring	The wiring between the controller outputs and the end devices must be present and correct for normal operation.
Unit configuration	The controller must be properly configured based on the actual installed end devices and application. When the unit configuration does not match the actual end devices, the unit may not work correctly.
Diagnostic present	A specific list of diagnostics affect compressor and electric heat operation. For more information see, Table 19, page 35 for more information.
Manual output test	The controller includes a manual output test sequence you can use to verify output operation and associated output wiring. However, based on the current step in the test sequence, the DX or electric outputs may be off. For more information see, Manual Output Test, on page 32 for more information.)
Normal operation	The controller energizes the outputs only as needed to meet the unit capacity requirements.

Outside Air Damper

Table 23: *Outside air damper stays closed*

Probable cause	Possible Explanation
Unit wiring	The wiring between the controller outputs and the outdoor air damper must be present and correct for normal damper operation.
Unit configuration	The controller must be properly configured based on the actual installed end devices and application. When the unit configuration does not match the actual end devices, the damper may not work correctly.
Random-start observed	After power-up, the controller always observes a random-start from 5 to 30 seconds. The controller remains off until the random-start time expires.
Power-up control wait	When power-up control wait is enabled (non-zero time), the controller remains off until one of two conditions occurs: 1. The controller exits power-up control wait once it receives communicated information. 2. The controller exits power-up control wait once the power-up control wait time expires.
Diagnostic present	A specific list of diagnostics affects outdoor air operation. For more information see, Table 19 on page 35 for more information.)
Manual output test	The controller includes a manual output test sequence you can use to verify output operation and associated output wiring. However, based on the current step in the test sequence, the unit damper may not be open. For more information see, Manual Output Test, on page 32 for more information.)
Fan mode off	When a local fan mode switch (provided on the Trane zone sensor) determines the fan operation, the off position controls the unit off and damper to close.

Troubleshooting

Table 23: *Outdoor air damper stays closed - continued*

Probable cause	Possible Explanation
Requested mode off	You can communicate a desired operating mode (such as off, heat, and cool) to the controller. When off is communicated to the controller, the unit controls the fan off. There is no heating or cooling (valves are closed).
Unoccupied mode	When the controller is in the unoccupied mode, the outdoor air damper remains closed.
Warm up and cool-down	The controller includes both a morning warm up and cool-down sequence to keep the outdoor air damper closed during the transition from unoccupied to occupied. This is an attempt to bring the space under control as quickly as possible.
Normal operation	The controller opens and closes the outdoor air damper based on the controller's occupancy mode and fan operation. Normally, the outdoor air damper is open during occupied, occupied standby, and occupied bypass mode when the fan is running and closed during unoccupied mode.

Table 24: *Outdoor air damper stays open*

Probable cause	Possible Explanation
Unit wiring	The wiring between the controller outputs and the outdoor air damper must be present and correct for normal damper operation.
Unit configuration	The controller must be properly configured based on the actual installed end devices and application. When the unit configuration does not match the actual end devices, the damper may not work correctly.
Manual output test	The controller includes a manual output test sequence you can use to verify output operation and associated output wiring. However, based on the current step in the test sequence, the unit damper may be open. For more information see, Manual Output Test, on page 32 for more information.)
Normal operation	The controller opens and closes the outdoor air damper based on the controller's occupancy mode and fan operation. Normally, the outdoor air damper is open during occupied, occupied standby, and occupied bypass mode when the fan is running and closed during unoccupied mode unless the controller is economizing.

Table 25: *Entering Water Temperature sensor read-out error*

Probable cause	Possible Explanation
Sensor reading too low	Unit economizing without much cooling capacity or unit stops DX heating early and switches to boiler-less electric heat.
Sensor reading too high	Unit not utilizing economizer capacity when possible or DX heating stays on longer than possible for boilerless electric heat unit.
Reading out of range	Boilerless electric heat or waterside economizer disabled.

Replacing Circuit Boards

Tracer ZN524 Unit Controller Replacement

⚠ WARNING
Hazardous Voltage!
Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

1. Disconnect power or disable the circuit breaker to unit.
2. Remove bad or questionable Tracer ZN524 controller circuit board.
3. Install controller in the unit with the heat-sink placement at the top of the control box.
4. Connect the power to the circuit board ONLY.
5. Connect Rover and properly configure the controller, unless a previously configured board is purchased.
6. Power down.
7. Connect the remaining input and output wiring to the controller and comm wire.
8. Reapply power.
9. Complete sequence 7 and 8 above in the installation section of this manual.
10. Record NID numbers and unit location
11. Refer to BAS manual for instructions on how to configure the new ZN524 into BAS system.

Appendix

Hardwired Setpoint Adjustment

Table 26: *Hardwired setpoint adjustment*

Resistance (Ω)	Setpoint (°F)
889.4	50
733.6	58
577.9	66
500	70
422.1	74
344.2	78
266.4	82
188.5	86
110.6	90

Fan Switch Resistance Values

Table 27: *Resistance Values*

Resistance (Ω)	Switch Position
16,300	High
10,700	Low
2,320	Auto
4,870	Off

Hardwired Thermistor Values

Table 28: *Hardwired 10kΩ thermistor values*

Resistance (Ω)	Temperature
87.5kΩ	0°F
74.6kΩ	5°F
63.8kΩ	10°F
54.6kΩ	15°F
46.9kΩ	20°F
40.4kΩ	25°F
34.8kΩ	30°F
30.2kΩ	35°F
26.2kΩ	40°F
22.8kΩ	45°F
20.0kΩ	50°F
17.5kΩ	55°F
15.3kΩ	60°F
13.5kΩ	65°F
11.9kΩ	70°F
10.5kΩ	75°F

Resistance (Ω)	Temperature
10.0kΩ	77°F
9.3kΩ	80°F
8.2kΩ	85°F
7.3kΩ	90°F
6.5kΩ	95°F
5.8kΩ	100°F
5.2kΩ	105°F
4.7kΩ	110°F
4.2kΩ	115°F
3.8kΩ	120°F
3.4kΩ	125°F
3.1kΩ	130°F
2.8kΩ	135°F
2.5kΩ	140°F
2.3kΩ	145°F
2.1kΩ	150°F

Appendix - Binary Configuration

Binary Configuration

Table 29: *Binary configuration details*

Binary input or output	Function	Configuration	Description
BI 1	Low temp detection	Normally closed	Closed: BIP 1 is Normal (no diagnostic) Open: BIP 1 is Active (diagnostic)
BI 2	Condensate overflow	Normally closed	Closed: BIP 2 is Normal (no diagnostic) Open: BIP 2 is Active (diagnostic)
BI 3	Occupancy/Generic	Normally closed Normally open	Closed: BIP 3 is Normal (Occupied) Open: BIP 3 is Active (Unoccupied)[1] Open: BIP 3 is Normal (Occupied) Closed: BIP 3 is Active (Unoccupied)[1]
BI 4	Fan status[2]	Normally open	When the controller commands the fan on and the binary input remains open for one minute, BIP is normal (diagnostic). When the controller commands the fan on and the binary input closes, BIP is active (no diagnostic).
J1-1	Fan	Normally open	De-energized: Fan off Energized: Fan on
J1-2	RV	Normally open	De-energized: Heat Energized: Cool
J1-3	Electric Heat/ Reheat	Normally open	De-energized: Off Energized: Electric Heat/Reheat active
TB4-1 and TB4-2	Generic binary output	Normally open	De-energized: Output off (de-energized) Energized: Output on (energized)

1. The occupancy input applications vary for standalone and communicated instances. For more information, see Occupancy arbitration tables in the Appendix.
2. The fan status device is normally closed during normal fan operation. When the fan is off either from a fan failure or the controller commanding the fan off, the binary input device opens.

Appendix - Unit Operation

Unit Operation Based On The Effective HEAT/COOL Output

Table 30: *Unit operation based on HEAT/COOL ouput*

Application mode input (nviApplicMode)	Heat/cool mode input (nviHeatCool)	Effective heat/ cool mode output (nvoHeatCool)	Unit Operation
Auto	Auto	Determined by controller	Fan—Enabled Heating—Enabled Cooling—Enabled Damper—Enabled
	Heat	Heating	Fan—Enabled Heating—Enabled Cooling—Disabled Damper—Enabled
	Morning warm up	Pre-heat	Fan—Enabled Heating—Enabled Cooling—Disabled Damper—Disabled
	Cooling	Cooling	Fan—Enabled Heating—Disabled[1] Cooling—Enabled Damper—Enabled
	Pre-cool	Pre-cool	Fan—Enabled Heating—Disabled[1] Cooling—Enabled Damper—Disabled
	Off	Off	Fan—Disabled Heating—Disabled Cooling—Disabled Damper—Disabled
	Test	Test	Fan—Enabled Heating—Enabled Cooling—Enabled Damper—Enabled
	Fan only	Fan only	Fan—Enabled Heating—Disabled Cooling—Disabled Damper—Enabled
	Not present	Determined by controller	Fan—Enabled Heating—Enabled Cooling—Enabled Damper—Enabled
Heat	Any state	Heating	Fan—Enabled Heating—Enabled Cooling—Disabled Damper—Enabled
Morning warm up	Any state	Pre-heat	Fan—Enabled Heating—Enabled Cooling—Disabled Damper—Disabled

Appendix - Unit Operation

Table 30: *Unit operation based on HEAT/COOL ouput - continued*

Application mode input (nviApplicMode)	Heat/cool mode input (nviHeatCool)	Effective heat/ cool mode output (nvoHeatCool)	Unit Operation
Cool	Any state	Cool	Fan—Enabled Heating—Disabled Cooling—Enabled Damper—Enabled
Pre-cool	Any state	Pre-cool	Fan—Enabled Heating—Disabled Cooling—Enabled Damper—Disabled
Off	Any state	Off	Fan—Disabled Heating—Disabled Cooling—Disabled Damper—Disabled
Test	Any state	Determined by controller	Fan—Enabled Heating—Enabled Cooling—Enabled Damper—Enabled
Fan only	Any state	Fan only	Fan—Enabled Heating—Disabled Cooling—Disabled Damper—Enabled

Note: Night purge, Emergency heat, and Nul modes are not supported by the Tracer ZN524 Unit Controller. If one of these modes is received by the controller, it is interpreted as Auto.

Appendix - Data Lists

Data Lists

Table 31 provides an input/output listing for the Tracer ZN524 unit controller. The content of the lists conforms to both the LonMark Space Comfort Controller Functional Profile and the LonMark node object

Table 31: *Input/Output listing*

Input	SNVT type	Output	SNVT type
nviRequest	SNVT_obj_request	nvoStatus	SNVT_obj_status
nviSpaceTemp[1]	SNVT_temp_p	nvoFileDirectory	SNVT_address
nviSetpoint	SNVT_temp_p	nvoSpaceTemp[1]	SNVT_temp_p
nviSetptOffset	SNVT_temp_p	nvoUnitStatus[1]	SNVT_hvac_status
nviOccSchedule	SNVT_tod_event	nvoEffectSetpt	SNVT_temp_p
nviOccManCmd	SNVT_occupancy	nvoEffectOccup	SNVT_occupancy
nviOccSensor	SNVT_occupancy	nvoHeatCool	SNVT_hvac_mode
nviApplicMode	SNVT_hvac_mode	nvoSetpoint	SNVT_temp_p
nviHeatCool	SNVT_hvac_mode	nvoDischAirTemp	SNVT_temp_p
nviFanSpeedCmd	SNVT_switch	nvoLoadAbsK	SNVT_power_kilo
nviComprEnable	SNVT_switch	nvoTerminalLoad	SNVT_lev_percent
nviAuxHeatEnable	SNVT_switch	nvoSpaceRH	SNVT_lev_percent
nviEconEnable	SVNT_switch	nvoOutdoorTemp	SNVT_temp_p
nviEmergOverride	SNVT_hvac_emerg	nvoSpaceCO2	SNVT_ppm
nviSourceTemp	SNVT_temp_p	nvoEnterWaterTemp	SNVT_temp_p
nviSpaceRH	SNVT_lev_percent	nvoLeaveWaterTemp	SNVT_temp_p
nviOutdoorTemp	SNVT_temp_p		

Table 32: *Configuration properties*

Configuration property	SNVT type	SCPT reference	Description
nciSndHrtBt[1]	SNVT_time_sec	SCPTmaxSendTime (49)	Send heartbeat
nciSetpoints[1]	SNVT_temp_setpt	SCPTsetPnts (60)	Occupancy temperature set points
nciUnitType[1]	SNVT_hvac_type	SCPThvacUnitType (169)	Unit type
nciMinOutTm	SNVT_time_sec	SCPTminSendTime (52)	Minimum send time
nciRcvHrtBt	SNVT_time_sec	SCPTmaxRcvTime (48)	Receive heartbeat
nciLocation	SNVT_str_asc	SCPTlocation (17)	Location label
nciBypassTime	SNVT_time_min	SCPTbypassTime (34)	Local bypass time
nciSpaceRHSetpt	SNVT_lev_percent	SCPThumSetPT(36)	Space RH Setpoint

1. Required points under Space Comfort Controller profile. All other points are optional.

Location Identifier

Location Identifier

Location Identifier

Location Identifier

Trane
A business of American Standard Companies
www.trane.com

For more information, contact
your local district office or
e-mail us at comfort@trane.com

Literature Order Number	CNT-SVX11A-EN
Date	August 2003
Supercedes	New
Stocking Location	Inland