



Zoning

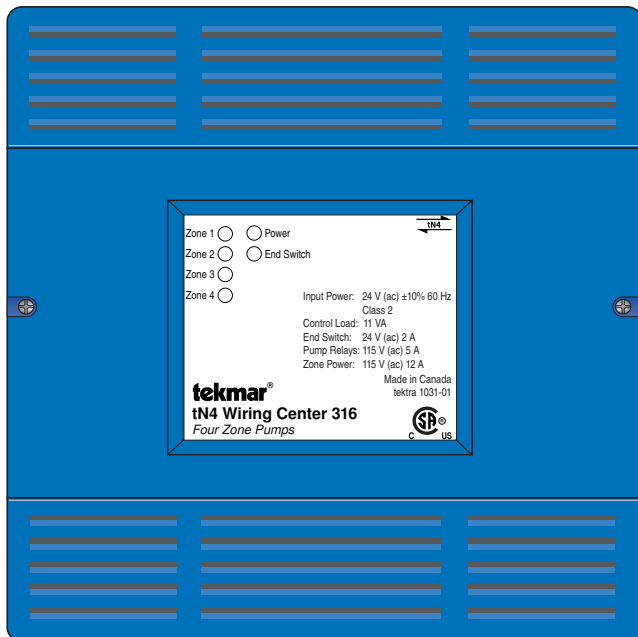
D 316

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Replaces: 04/09

Introduction

The tekmarNet®4 Wiring Center 316 is designed to operate up to four zone pumps in a hydronic heating system. It provides a convenient location to wire both thermostats and zone pumps while only requiring two wires to integrate with the rest of the mechanical equipment. The 316 is optimized for use with tekmarNet®4 Thermostats. These thermostats communicate with the tN4 Wiring Center to provide a synchronized end switch that reduces cycling of equipment.



Features

- Four 115 V (ac) powered zone outputs
- For use with tekmarNet®4 Thermostats
- tN4 expansion terminals
- Isolated end switch
- External diagnostic LEDs
- CSA C US Certified for use in USA and Canada

Benefits

- Simple, convenient wiring location
- Compact enclosure for flexible installation
- Reduce equipment cycling when combined with tekmarNet®4 Thermostats

Notes

- Not for use with tekmarNet®2 Thermostats

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Getting Started

Congratulations on the purchase of your new tekmarNet® Wiring Center!

This manual covers the complete installation, programming and sequence of operation for this control. You will also find instruction on testing, commissioning, and troubleshooting the control and system that it operates.

Installation

Caution

Improper installation and operation of this control could result in damage to the equipment and possibly even personal injury or death. It is your responsibility to ensure that this control is safely installed according to all applicable codes and standards. This electronic control is not intended for use as a primary limit control. Other controls that are intended and certified as safety limits must be placed into

the control circuit. Do not attempt to service the control. Refer to qualified personnel for servicing. There are no user serviceable parts. Attempting to do so voids warranty and could result in damage to the equipment and possibly even personal injury or death.

Radio Frequency Interference

The installer must ensure that this control and its wiring are isolated and/or shielded from strong sources of electromagnetic noise. Conversely, this Class B digital apparatus complies with Part 15 of the FCC Rules and meets all requirements of the Canadian Interference-Causing Equipment Regulations. However, if this control does cause harmful interference to radio or television reception, which is determined by turning the control off and on, the user is encouraged to try

to correct the interference by re-orientating or relocating the receiving antenna, relocating the receiver with respect to this control, and/or connecting the control to a different circuit from that to which the receiver is connected.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Preparation

Tools Required

- tekmar or jeweller screwdriver
- Phillips head screwdriver
- Needle-nose pliers
- Wire stripper

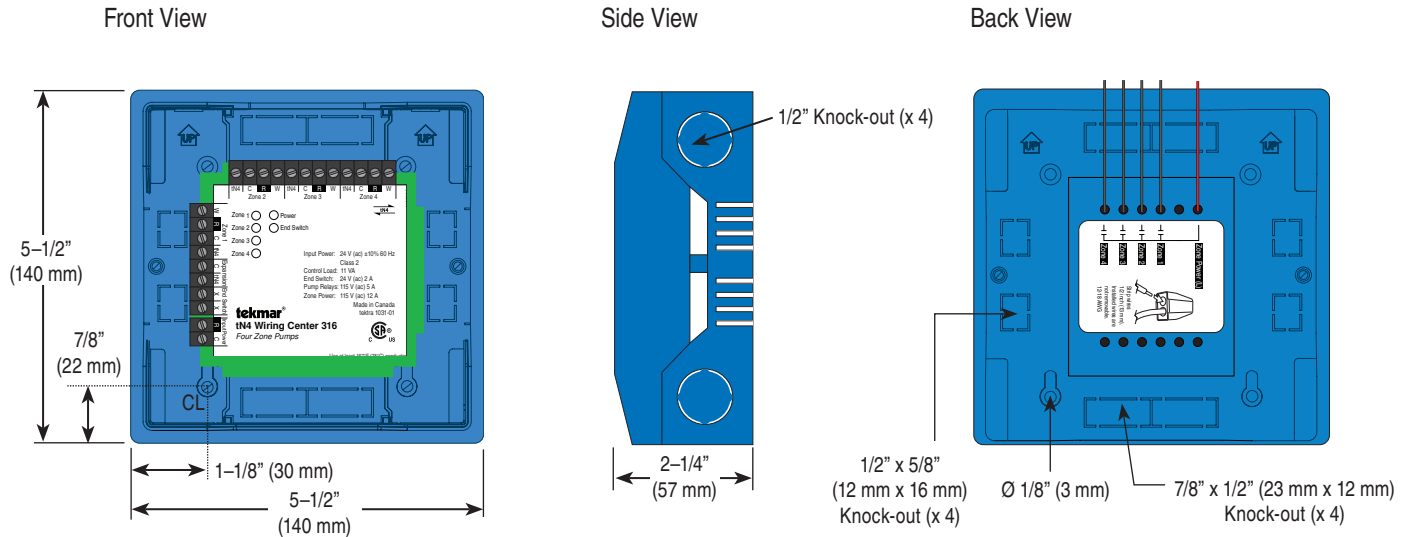
Materials Required

- (2) #10 x 1" wood screws
- (2) Wire nuts
- 18 AWG LVT solid wire (low voltage connections)
- 14 AWG solid wire (line voltage connections)
- tekmar 009K (24 V (ac) transformer with 4" x 4" junction box)
- Cable or conduit connectors

Power Required

- 120 V (ac), 1-phase, 15 A service from circuit breaker panel
- Power disconnect (optional)

Physical Dimensions



Installation Location

- When choosing the location for the control, consider the following:
- Keep dry. Avoid potential leakage onto the control.
RH ≤ 90% to 122°F (50°C).
Non-condensing environment.
- Do not expose to operating temperatures beyond 32-122°F (0-50°C).
- Provide adequate ventilation.
- Keep away from equipment, appliances or other sources of electrical interference.
- Locate the control near pumps if possible.
- Provide easy access for wiring and viewing the control.
- Mount approximately 5 ft. (1.5 m) off the finished floor.
- Install the electrical junction box to a wall using #10 x 1" wood screws. Wall anchors are recommended when mounting to sheet rock, wallboard or masonry.

Rough-In Wiring

Line Voltage Wiring

The control may be mounted to a 4" x 4" electrical junction box so that the high voltage electrical connections for the transformer are safely contained.

For ease of service, the circuit breaker or power disconnect should be located in reasonably close proximity to the equipment.

All line voltage wire connections are recommended to be pulled inside a flexible or solid conduit. Always follow proper wiring practices, building and electrical codes for your jurisdiction.

Each cable must be pulled to the electrical junction box. It is recommended to label each cable for easy identification. All line voltage wires should be stripped to a length of 1/2" (13 mm).

Pull a three conductor 14 AWG cable for the following equipment:

- Circuit Breaker or Power Disconnect (if applicable)
- Zone Pumps

Low Voltage Wiring

Each cable must be pulled from the equipment to the control's plastic enclosure. All low voltage wiring connections enter the enclosure through conduit knockouts on the sides, or through the square knockouts on the rear. It is recommended to label each cable for easy identification. All low voltage wires are to be stripped to a length of 3/8" (9 mm) to ensure proper connection to the control.

Pull two conductor 18 AWG LVT cable, up to 500 feet (150 m) for the following equipment:

- tekmarNet®4 Expansion (if applicable)
- 24 V (ac) Power
- Boiler T-T (If using End Switch)

Pull three conductor 18 AWG LVT cable, up to 500 feet (150 m) for the following equipment:

tekmarNet®4 Accessories (User Switch, Timer)

Pull four conductor 18 AWG LVT cable, up to 500 feet (150 m) for the following equipment:

tekmarNet®4 thermostats

Sizing the Transformer

The control requires an external transformer with 20 VA capacity or greater. A tekmar Transformer 009 (or 009K which includes a 4" x 4" electrical box) can supply up to 40

VA, and includes an in-line fuse to protect the transformer and control.

Control Wiring

Line Voltage Wiring

CAUTION: TURN ALL POWER OFF BEFORE PERFORMING ANY WIRING.

Wire the Pump Grounds

- Connect the pump grounds to the power supply ground as shown in Figure 1. The ground wire must also be grounded to the electrical box.

Wire the Pump Neutrals (N)

- Connect the Neutral (N) wires from each pump and wire to the 115 V (ac) Neutral (N) wire. If the transformer has been mounted to this electrical box, connect its neutral wire with this group. This is shown in Figure 2.

Figure 1 - Connect Ground Wires

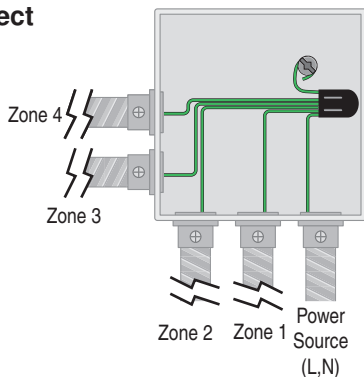
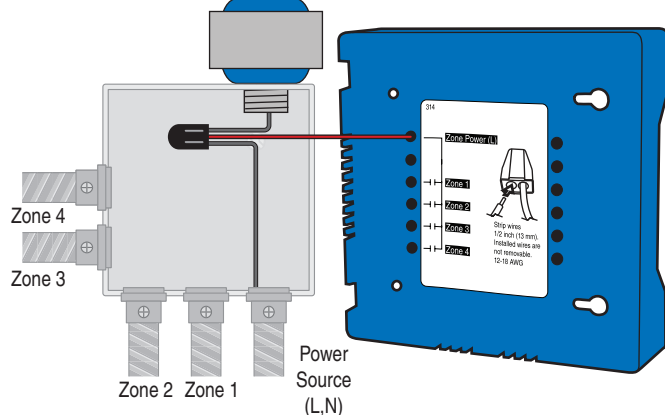


Figure 3 - Connect Line Voltage (Hot)



Wire the Pump Power (L)

- Connect the 115 V (ac) line voltage (L) wire to the red Pump Power (L) wire on the back of the Wiring Center and to the 115 V (ac) side of the transformer. Use a wire nut or approved connector. See Figure 3.

Wire the Pumps

- Wire each remaining line voltage pump wire into the push-in wire connector of the corresponding pump lead on the back of the Wiring Center. This is shown in Figure 4.

Figure 2 - Connect Neutral Wires

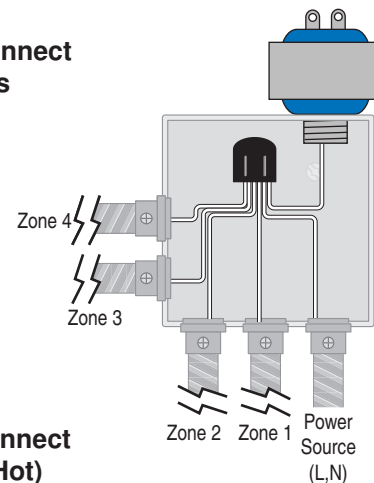
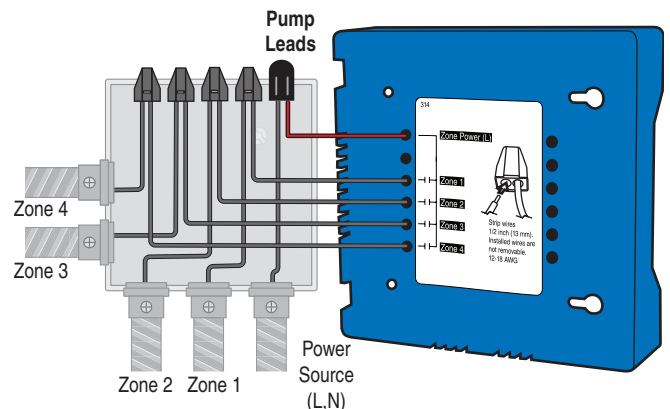
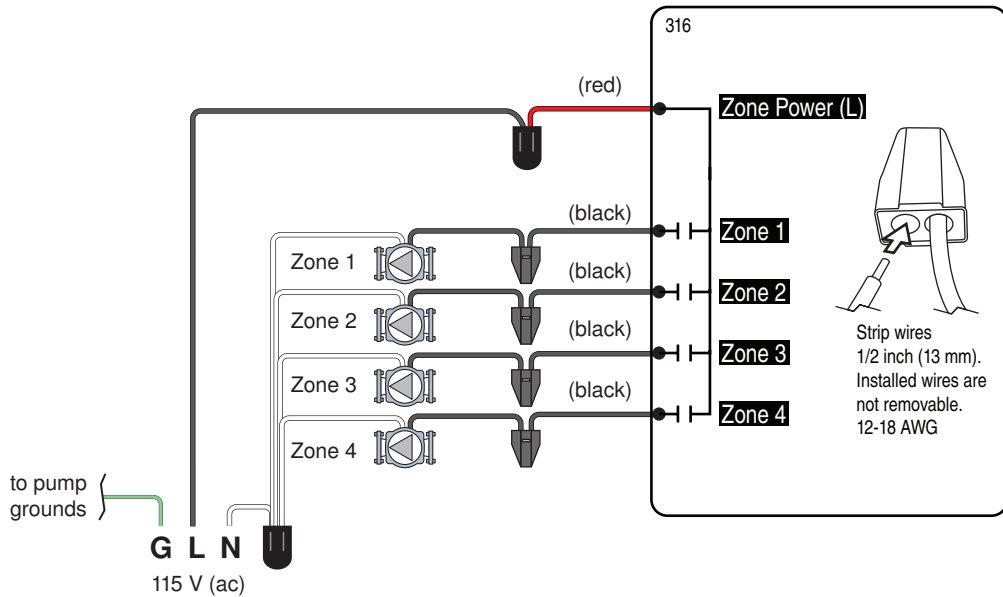


Figure 4 - Connect Pump Line (Hot)

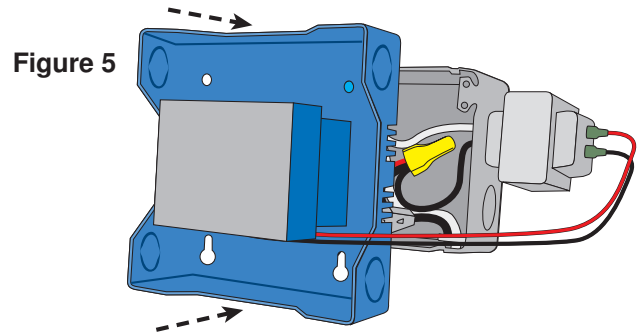


Rear Line Voltage Wiring Diagram



Install The Enclosure

- Ensure that the high voltage wires are neatly tucked inside the electrical box.
- Using 2 of the 4 holes in the back of the enclosure, securely fasten it to the electrical junction box with 2 #10 screws as shown in Figure 5.



Low Voltage Wiring

External Power Supply

It is strongly recommended that a transformer with an in-line fuse be used in order to protect the transformer from high currents. The tekmar Transformer 009 includes a fuse.

- Connect the 24 V (ac) leads from the transformer to the C and R terminals marked “Input Power” on the 316.

tekmarNet®4 Thermostats

The tN4 Wiring Center 316 is designed to operate with tekmarNet®4 Thermostats. They provide a synchronized end switch on the Wiring Center and communicate with any other tN4 device on the system.

- Connect the tN4, C, R and W terminals from each thermostat to the corresponding terminals for each zone on the Wiring Center.
- Ensure the tN4 and C wires are not reversed.

Conventional Thermostats

The tN4 Wiring Center 316 may be used with conventional and ‘power stealing’ type thermostats. However, the end switch synchronization feature will not be available.

- Install the thermostat to the appropriate R and W terminals on the 316.

tN4 Expansion Terminals

The 316 uses the Expansion tN4 and C terminals to communicate with additional Wiring Centers, House Controls, and other tekmarNet® devices.

- Connect the tN4 and C Expansion terminals on the 316 to the corresponding tN4 and C Expansion terminals of the additional external device.

Wiring the End Switch

The 316 can operate a single on-off boiler or provide a demand to a tekmar control.

- Connect the X X End Switch terminals on the 316 to the T-T (or R-W) terminals on the boiler.
- If required, use the X X End Switch terminals to switch 24 V (ac) to power a demand on a tekmar outdoor reset control.

Testing the Control Wiring

Testing the Power

If the control Power light does not turn on, check the Input Power wiring terminals using an electrical multimeter. The voltage should measure between 21.6 to 26.4 V (ac). If the voltage is below this range, measure the line voltage side of the transformer. The voltage should measure between 103.5 to 126.5 V (ac).

Testing tekmarNet®4 Thermostats

1. To test the tN4 Network, check the tN4 and C wires for continuity.
 - Disconnect the tN4 and C wires from the tekmarNet®4 Wiring Center and twist them together.
 - Go to the thermostat and disconnect the tN4 and C wires.
 - Using an electrical test meter, check for continuity. If continuity exists, then proceed to next step, if not, verify that correct wires are in place prior to continuing to next step
 - Reconnect the wires to the proper terminals.
2. To test the call for Heat (W), a continuity test is used between terminals R and W.
 - Disconnect the wire from terminal W on the 316.
 - When the thermostat calls for heat, the resistance between R and the disconnected W wire should be 0 ohms or tone indicating continuity.
 - When there is no call for heat the resistance between R and W should be infinite, O.L. or no tone should be heard.

Testing Conventional Thermostats

To test the call for Heat (W), a continuity test is used between terminals R and W.

1. Disconnect the wire from terminal W.
2. When the thermostat calls for heat, the resistance between R and the disconnected W wire should be less than 7 ohms or tone indicating continuity.
3. When there is no call for heat the resistance between R and the disconnected W wire should be infinite, O.L., or no tone should be heard.

Testing Power-Stealing Thermostats

The tN4 Wiring Center 316 can also accept 'power-stealing' type thermostats. They must output less than 5 V (ac) when not calling for heat, or the 316 may detect a false heat call and open the corresponding zone valve.

1. Connect the R & W wires from the thermostat to the desired zone R and W terminals on the 316.
2. When the thermostat is not calling for heat, the corresponding zone LED should not be lit.
 - If the zone LED is lit, then a resistor may have to be added to reduce the trickle voltage through the thermostat. See the thermostat installation manual for details.

Testing the Zone Output

1. Using an electrical meter, test the voltage across the pump terminals on the zone pump:
 - When the zone LED is off, the reading should be 0 V (ac) and the pump should be off.
 - When the zone LED is on, the reading should be 115 V (ac) + / - 10% and the pump should be running.
 - If no voltage is present at the pump when the Zone LED is on:
2. Complete a continuity check to test the zone pump relay. If the control passes the continuity test, this indicates either a fault with the pump, or a fault with the wiring between the control and the pump.
 - Replace damaged or shorted wires, test, and reconnect them to their proper terminals.
 - If wires are okay, refer to troubleshooting information supplied by the pump manufacturer.

Testing tekmarNet®4 Expansion

To test the tN4 Network, check the wires for continuity and shorts.

1. Disconnect the two tN4 expansion wires (tN4 and C) at one end and twist them together.
2. Go to the other end of the wires and disconnect them.
3. Using an electrical test meter, check for continuity. Resistance should read 0 ohms, or continuity should produce a tone. If not, this indicates that there are damaged wires connecting the tN4 control to the 316. Repair or replace the wires as necessary.
4. Go back to the original end of the wires and, using a wire nut, cap each expansion wire individually so that these ends cannot touch another conductor.
5. Go to the other end of the wires and again, test for shorts. Resistance should be infinite, or O.L. and there should be no tone. If tone exists or less than 50 000 ohms is found, then the wires are not insulated from one another. This is generating a short on the wires connecting the tN4 control to the tN4 Wiring Center.
6. Replace the damaged wires, test, and reconnect them to their proper terminals.

Testing The End Switch

If the tN4 expansion terminals are not used to connect the tN4 Wiring Center to the system, the end switch may be used.

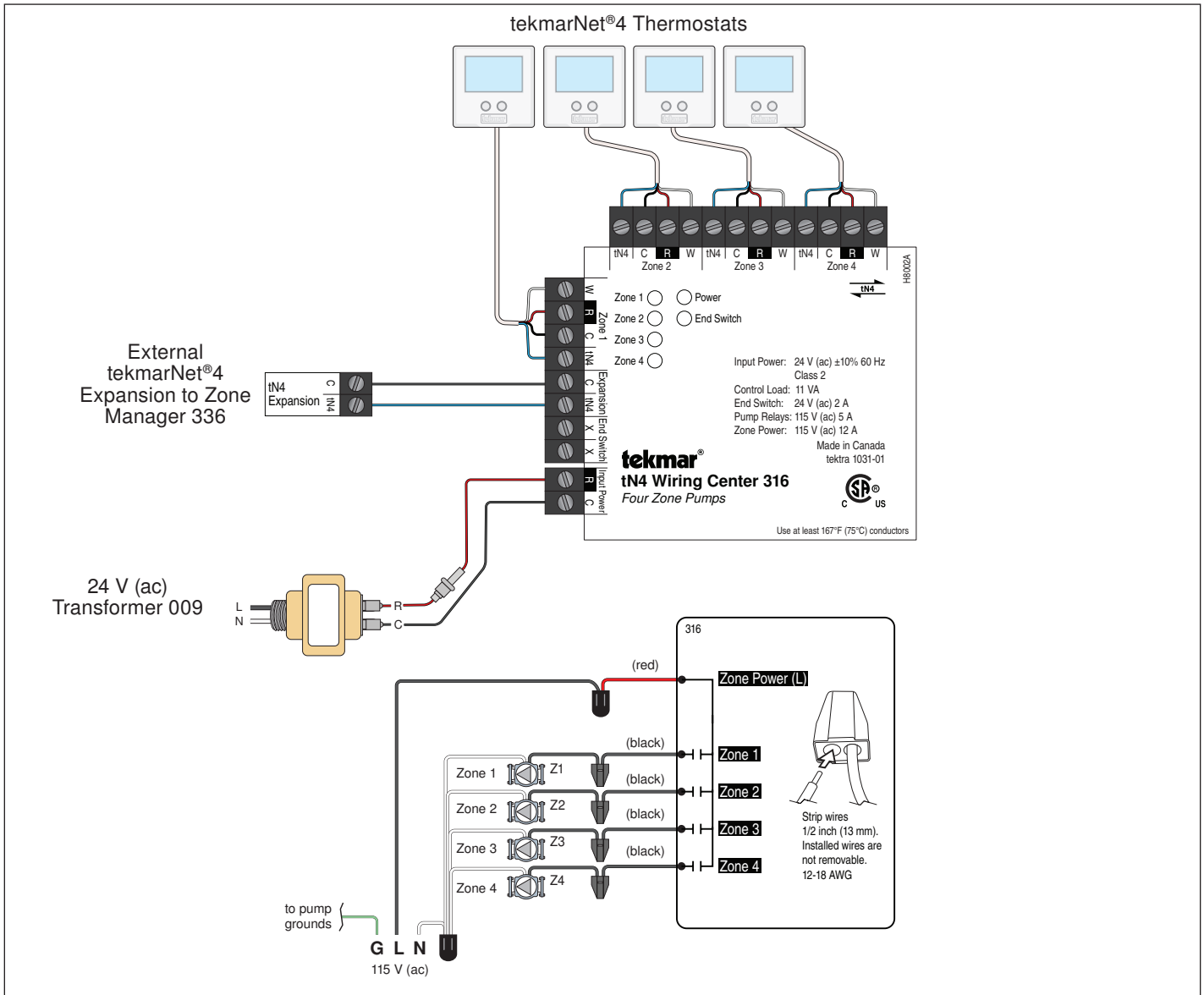
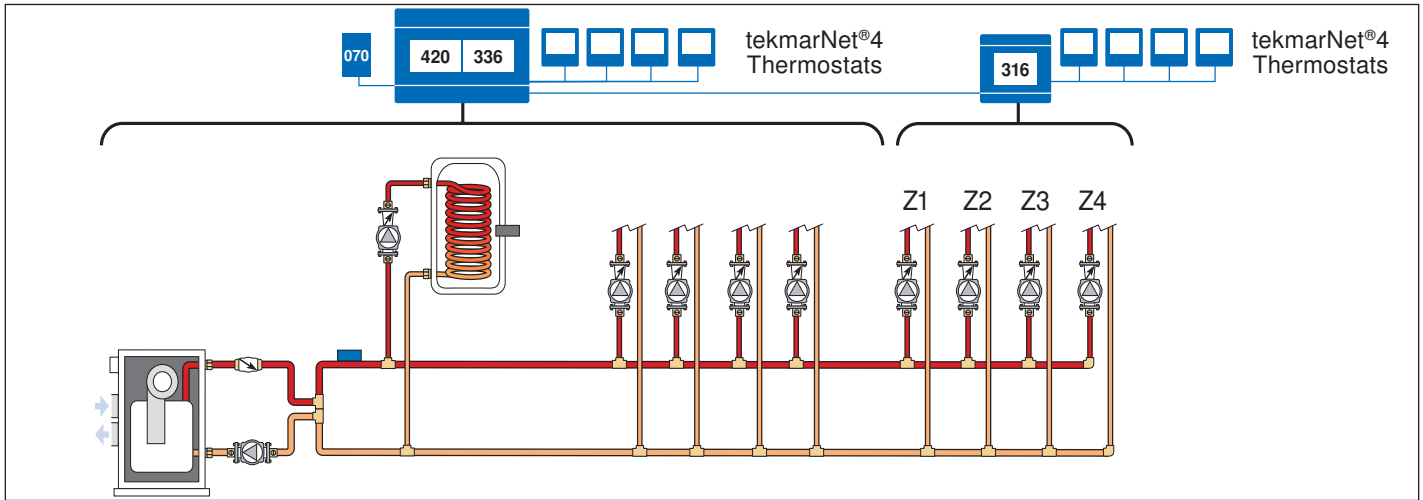
1. Remove the wires from the end switch terminals.
2. Use an electrical test meter to measure continuity across the XX end switch terminals on the 316.
 - When the end switch LED is off, no continuity should be present (no tone).
 - When the end switch LED is on, continuity should be present (tone).

Applications

tekmarNet®4 Expansion to Boiler Reset Module

A316-1

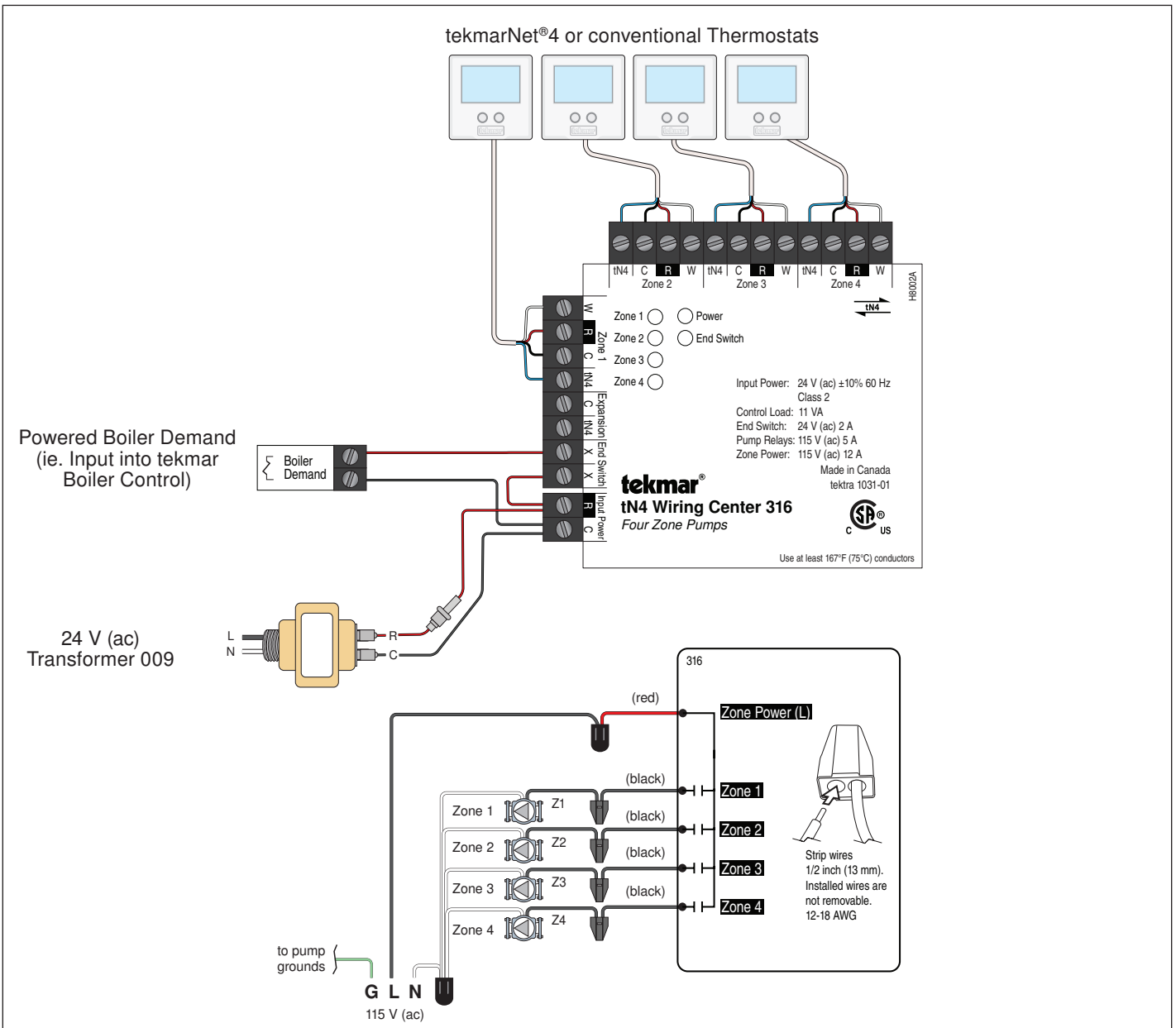
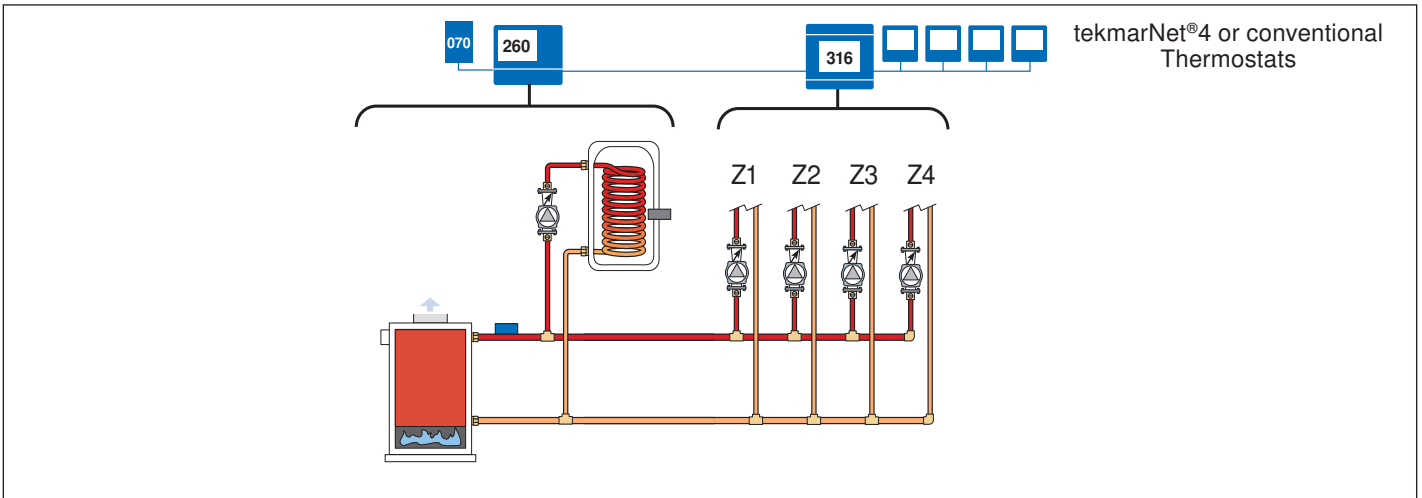
Description: tN4 Wiring Center 316, four tekmarNet®4 Thermostats, and four zone pumps wired into a tekmar Boiler Reset Module 420 and Zone Manager 336 which controls the boiler and DHW pump.



End Switch (X-X) To Powered Boiler Demand

A316-2

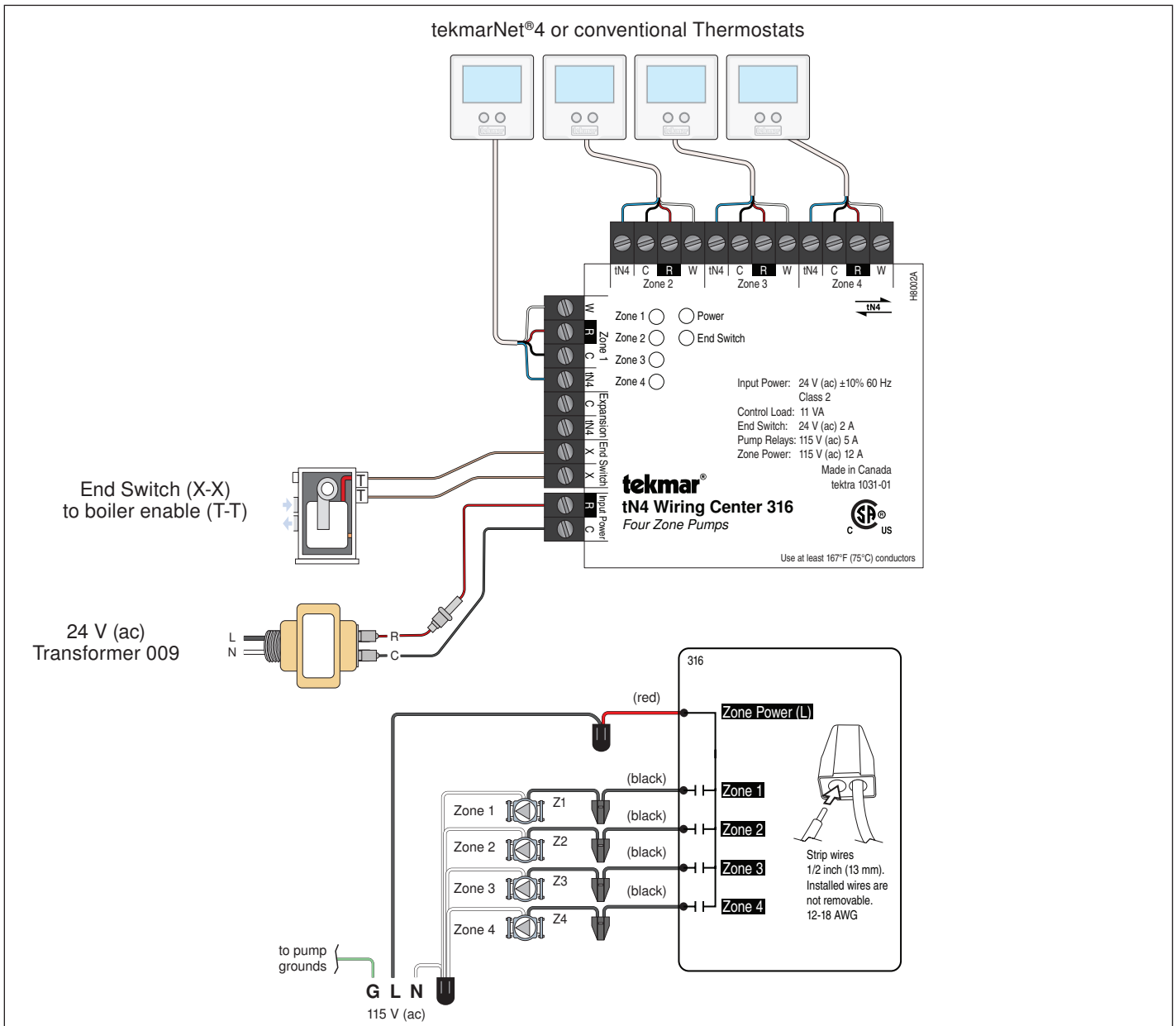
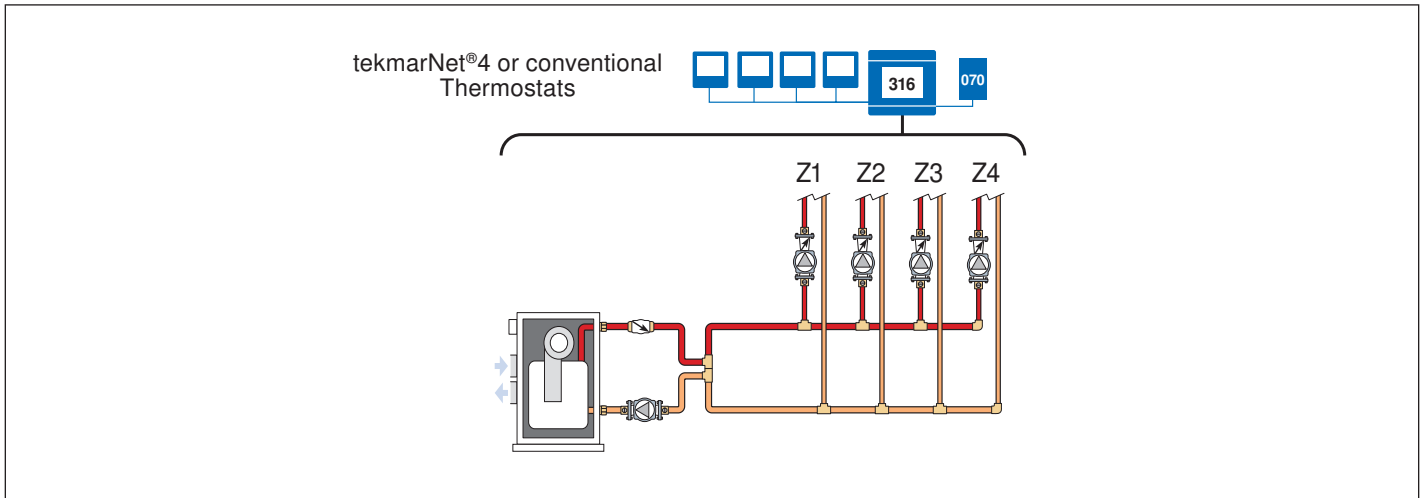
Description: tN4 Wiring Center 316, four tekmarNet®4 Thermostats, and four zone pumps wired into a powered boiler demand input on a device such as a tekmar Boiler Control 260 which controls the boiler and DHW pump.



End Switch (X-X) To Boiler Enable (T-T)







A316-3

Description: tN4 Wiring Center 316, four tekmarNet®4 Thermostats, and four zone pumps wired into the T-T terminals on the boiler to provide a boiler enable.

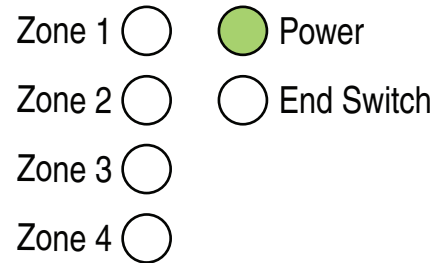


User Interface

LEDs

	ZONE 1 The zone 1 thermostat is calling for heat and the 115 V (ac) output is energized.
	ZONE 2 The zone 2 thermostat is calling for heat and the 115 V (ac) output is energized.
	ZONE 3 The zone 3 thermostat is calling for heat and the 115 V (ac) output is energized.
	ZONE 4 The zone 4 thermostat is calling for heat and the 115 V (ac) output is energized.
	POWER 24 V (ac) is being applied to the Wiring Center to provide it with power.
	END SWITCH At least one of the zone thermostats are calling for heat and the end switch relay output is closed.

Wiring Center 316



Sequence of Operation

tekmarNet® System

Section A

tekmarNet® is a family of products that use communication to operate the HVAC system in a comfortable and efficient manner. The Wiring Center is a central component in a tekmarNet® system and requires tekmarNet®4 (tN4) Thermostats to be directly connected to it.

The tekmarNet®4 (tN4) Expansion terminals can link the Wiring Center with other tekmarNet® components:

- House Controls 400, 401, 402, 403 - Provides boiler and DHW control

- Wiring Centers 313, 314, 315, 316 - Add additional zones
- tN4 Thermostats - Add thermostats
- tN4 Timer 033 - Adds 4 programmable schedules
- tN4 User Switch 479 - Provides a system override for vacations and holidays
- tN4 Setpoint Control 161, 162 - Control hot tubs, pools and more.

Relay Outputs

Section B

End Switch Operation

The End Switch relay ('XX') closes and the end switch LED turns on. The switch remains closed as long as any zone is calling for heat. This can provide a boiler demand to a tekmar reset control, or provide a boiler enable to a boiler's TT terminals.

If the Wiring Center is connected to a tekmarNet® system, all communication messages will pass through the 316's tN4 expansion connection. A tN4 message is required in order to create a boiler demand on a device such as a tekmar House Control 400.

115 V (ac) Zone Relay Operation

When a thermostat calls for heat, it connects 'W' to 'R' and the corresponding zone LED turns on. Power is then supplied to the appropriate zone pump output on the back of the control as indicated by the LED.

Network Schedules

Adding a schedule to a tekmarNet® system is both easy and valuable. A Timer 033 provides scheduling with up to 4 events per day for every tekmarNet® Thermostat. Turning down the room temperatures when they are unoccupied reduces boiler on-time and energy consumption which helps save money and the environment.

One-Touch Economy

A User Switch 479 allows for one-touch overrides of the system. For example, if leaving the building for vacation, simply press the “Away” button and all the thermostats will immediately operate at a lower temperature, instead of having to walk around the building lowering the heating temperature setting and raising the cooling temperature setting on each thermostat.

Zone Synchronization

The Wiring Center includes an energy saving feature called Zone Synchronization. In typical zoned systems, the thermostats operate on a stand-alone basis. This means that a zone turns on and off as required without any regard for other zones. The net effect is random operation of the zones causing short cycling of the heat source. tekmarNet® thermostats communicate to ensure that their cycles are synchronized. Energy is saved by ensuring zones requiring heat operate on the same cycle, therefore reducing short cycling of the boiler.

Troubleshooting

Frequently Asked Questions

Symptom	Look For...	Corrective Action
Power LED is off	Power to control	Use electrical meter to measure 24 V (ac) voltage on input power R and C terminals.
No central heating	Zone LEDs	If there are no green Zone LEDs, there are no thermostats calling for heat.
	System in AWAY	During AWAY, the thermostats operate at a lower temperature. Locate a ‘User Switch’ and set to Normal to resume heating.
Single zone over heating	LED shows zone on	Thermostats have a differential of +/- 1.5° F (0.8°C) of the temperature setting. Due to the display rounding numbers up, heating can appear on when the temperature is 2° F (1°C) above the setting. This is normal operation.
	LED shows zone off	Ensure zone pump terminals measure 0 V (ac). Measuring 0 V (ac) indicates the control relay is functioning correctly and the problem may be related to the mechanical piping. Measuring 115 V (ac) indicates control relay may have failed.
Single zone under heating	LED shows zone on	Ensure zone pump terminals measure 115 V (ac). Measuring 115 V (ac) indicates the control relay is functioning correctly and the problem may be related to the mechanical piping. Measuring 0 V (ac) indicates control relay may have failed.
	LED shows zone off	Check the thermostat to see if it is calling for heat (H1 displayed on the screen).

Technical Data

tN4 Wiring Center 316 Four Zone Pumps	
Literature	D316, Q316, C316
Control	Microprocessor control. This is not a safety (limit) control.
Packaged weight	1.4 lbs (630 g)
Dimensions	5.5" H x 5.5" W x 2.25" D (140 x 140 x 57 mm)
Enclosure	Blue PC+ABS plastic, NEME type 1
Approvals	CSA C US, meets class B: ICES & FCC Part 15
Ambient conditions	Indoor use only, 32 to 122°F (0 to 50°C), RH ≤ 90% Non-condensing
Power supply	24 V (ac) ±10% 60 Hz, 3 VA min, 11 VA max, Class 2
Zone pump relays	115 V (ac) 5 A
End switch relay	24 V (ac) 2 A
Zone power input	115 V (ac) 12 A max
Warranty	Limited 3 Year

Limited Warranty and Product Return Procedure

Limited Warranty *The liability of tekmar under this warranty is limited. The Purchaser, by taking receipt of any tekmar product ("Product"), acknowledges the terms of the Limited Warranty in effect at the time of such Product sale and acknowledges that it has read and understands same.*

The tekmar Limited Warranty to the Purchaser on the Products sold hereunder is a manufacturer's pass-through warranty which the Purchaser is authorized to pass through to its customers. Under the Limited Warranty, each tekmar Product is warranted against defects in workmanship and materials if the Product is installed and used in compliance with tekmar's instructions, ordinary wear and tear excepted. The pass-through warranty period is for a period of twenty-four (24) months from the production date if the Product is not installed during that period, or twelve (12) months from the documented date of installation if installed within twenty-four (24) months from the production date.

The liability of tekmar under the Limited Warranty shall be limited to, at tekmar's sole discretion: the cost of parts and labor provided by tekmar to repair defects in materials and/or workmanship of the defective product; or to the exchange of the defective product for a warranty replacement product; or to the granting of credit limited to the original cost of the defective product, and such repair, exchange or credit shall be the sole remedy available from tekmar, and, without limiting the foregoing in any way, tekmar is not responsible, in contract, tort or strict product liability, for any other losses, costs, expenses, inconveniences, or damages, whether direct, indirect, special, secondary, incidental or consequential, arising from ownership or use of the product, or from defects in workmanship or materials, including any liability for fundamental breach of contract.

The pass-through Limited Warranty applies only to those defective Products returned to tekmar during the warranty period. This Limited Warranty does not cover the cost of the parts or labor to remove or transport the defective Product, or to reinstall the repaired or replacement Product, all such costs and expenses being subject to Purchaser's agreement and warranty with its customers.

Any representations or warranties about the Products made by Purchaser to its customers which are different from or in excess of the tekmar Limited Warranty are the Purchaser's sole responsibility and obligation. Purchaser shall indemnify and hold tekmar harmless from and against any and all claims, liabilities and damages of any kind or nature which arise out of or are related to any such representations or warranties by Purchaser to its customers.

The pass-through Limited Warranty does not apply if the returned Product has been damaged by negligence by persons other than tekmar, accident, fire, Act of God, abuse or misuse; or has been damaged by modifications, alterations or attachments made subsequent to purchase which have not been authorized by tekmar; or if the Product was not installed in compliance with tekmar's instructions and/or the local codes and ordinances; or if due to defective installation of the Product; or if the Product was not used in compliance with tekmar's instructions.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, WHICH THE GOVERNING LAW ALLOWS PARTIES TO CONTRACTUALLY EXCLUDE, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, DURABILITY OR DESCRIPTION OF THE PRODUCT, ITS NON-INFRINGEMENT OF ANY RELEVANT PATENTS OR TRADEMARKS, AND ITS COMPLIANCE WITH OR NON-VIOLATION OF ANY APPLICABLE ENVIRONMENTAL, HEALTH OR SAFETY LEGISLATION; THE TERM OF ANY OTHER WARRANTY NOT HEREBY CONTRACTUALLY EXCLUDED IS LIMITED SUCH THAT IT SHALL NOT EXTEND BEYOND TWENTY-FOUR (24) MONTHS FROM THE PRODUCTION DATE, TO THE EXTENT THAT SUCH LIMITATION IS ALLOWED BY THE GOVERNING LAW.

Product Warranty Return Procedure All Products that are believed to have defects in workmanship or materials must be returned, together with a written description of the defect, to the tekmar Representative assigned to the territory in which such Product is located. If tekmar receives an inquiry from someone other than a tekmar Representative, including an inquiry from Purchaser (if not a tekmar Representative) or Purchaser's customers, regarding a potential warranty claim, tekmar's sole obligation shall be to provide the address and other contact information regarding the appropriate Representative.



tekmar Control Systems Ltd., Canada, tekmar Control Systems, Inc., U.S.A. **Head Office: 5100 Silver Star Road, Vernon, B.C. Canada V1B 3K4, 250-545-7749, Fax. 250-545-0650 Web Site: www.tekmarcontrols.com**

