tekmar® - Wiring Brochure

Power Manager 346

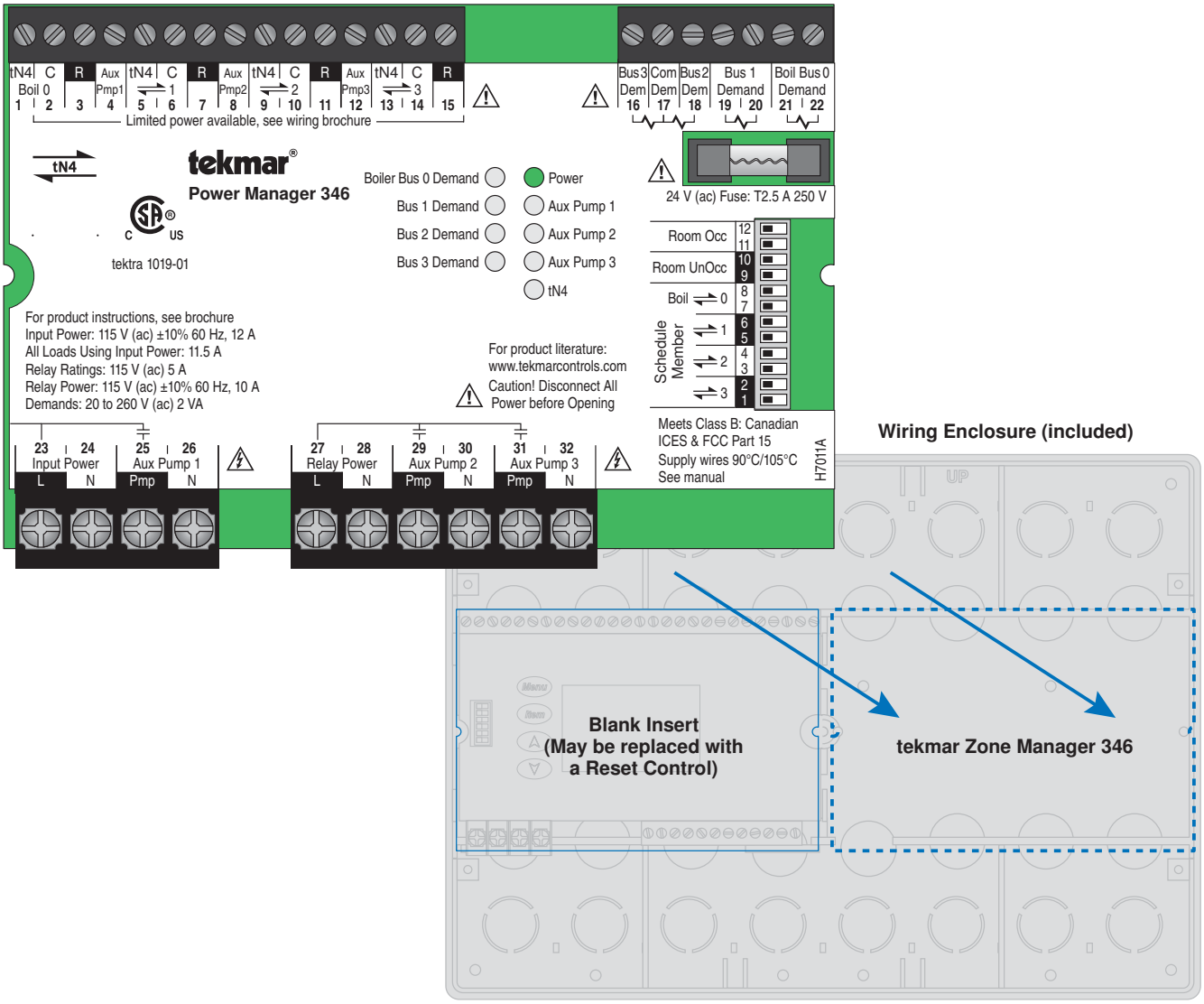
tN4

W346
12/08

1 Information Brochure	2 Application Brochure	3 Rough-in Wiring	4 Wiring Brochure	5 Data Brochure	6 Job Record
Choose controls to match application	Design your mechanical applications	Rough-in wiring instructions	Wiring and installation of specific control	Control settings and sequence of operation	Record settings & wiring details for future reference

Introduction

The Power Manager 346 is factory installed on the right side of an enclosure with blank plastic insert on the left. The blank insert is to be replaced with a Reset Module.



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Wiring Symbols

L or R	Powered switch. 24-115 V (ac) power, switched output to valve, pump, etc.	Pump	Black reverse lettering denotes an internally powered output.
tN4	tekmarNet®4		Earth ground.
	Fuse, field replaceable.		

Definitions

The following defined terms and symbols are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important information concerning the life of the product.

– Caution: Refer to accompanying documents

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INSTALLATION CATEGORY II – Local level appliances

⚠ 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 uses 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. Apart from any field replaceable fuse(s) 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.

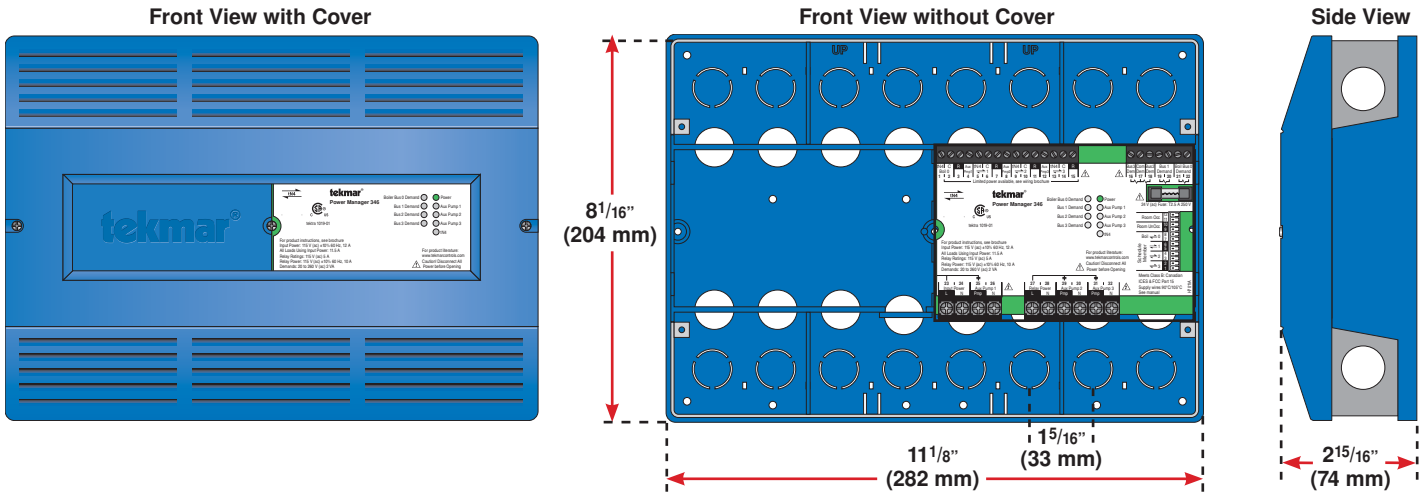
Control and Enclosure Location

Placement of the controls is important. To enable proper wiring during rough in, select an appropriate location for the controls early in the construction process. Consider the following:

- Keep dry. Avoid potential leakage onto the control. RH ≤ 80% to 88°F (31°C), down to 50% from 104 to 117°F (40 to 47°C). Non-condensing environment.
- Do not expose to temperatures beyond 32-117°F (0-47°C).
- Provide adequate ventilation.
- Keep away from equipment, appliances or other sources of electrical interference.
- Provide easy access for wiring, viewing, and adjusting the display screen.
- Mount approximately 5 ft. (1.5 m) off the finished floor.
- Mount close to the zones and any equipment being controlled.
- Mount the enclosure to a solid backing.

The wiring enclosure allows for easy wiring of devices as the upper and lower chambers provide ample room for wiring.

- Use the conduit knockouts provided on the upper, lower, back and sides of the enclosure.
- Thermostat wiring enters through the upper half of the enclosure.
- Power and auxiliary pump wiring enters through the lower half of the enclosure.



Mounting the Enclosure

To mount the wiring enclosure:

Remove the front cover of the enclosure by removing the two screws in the cover.

- Place the enclosure in the location decided upon during the rough-in wiring stage. Wiring will enter through either the top and bottom knockouts or through the back upper and lower knockouts. See figures 1 and 2.
- There are twelve holes in the back of the enclosure that allow for mounting.
- Using screws, ensure that the enclosure is securely fastened in place.

Note: The nonmetallic conduit entries in the back of the enclosure do not provide grounding between conduit connections. Use bonding bushings and jumpers to provide a continuous path to ground.

Figure 1

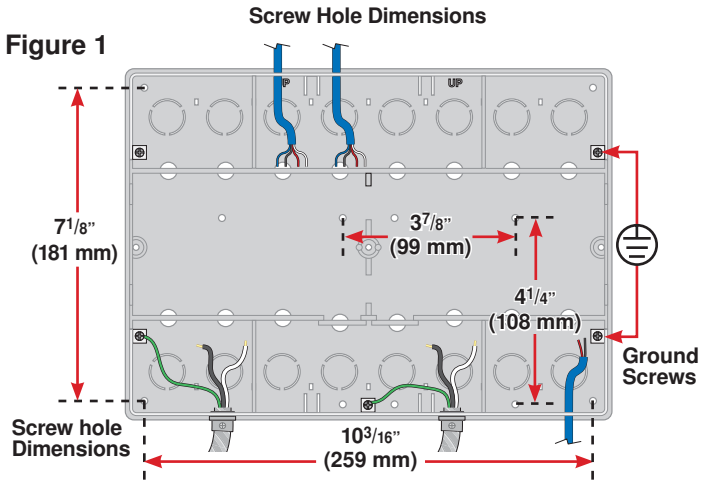
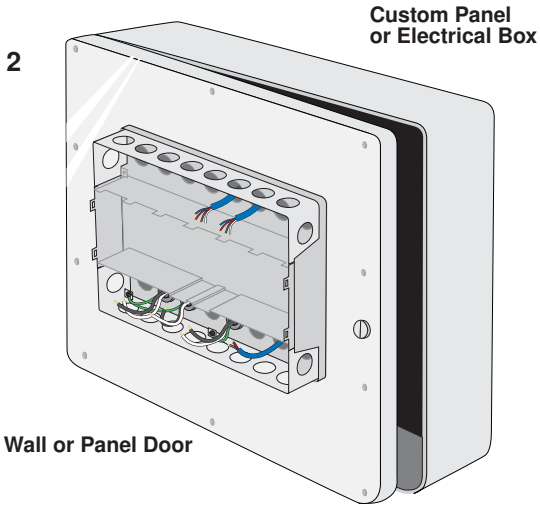


Figure 2



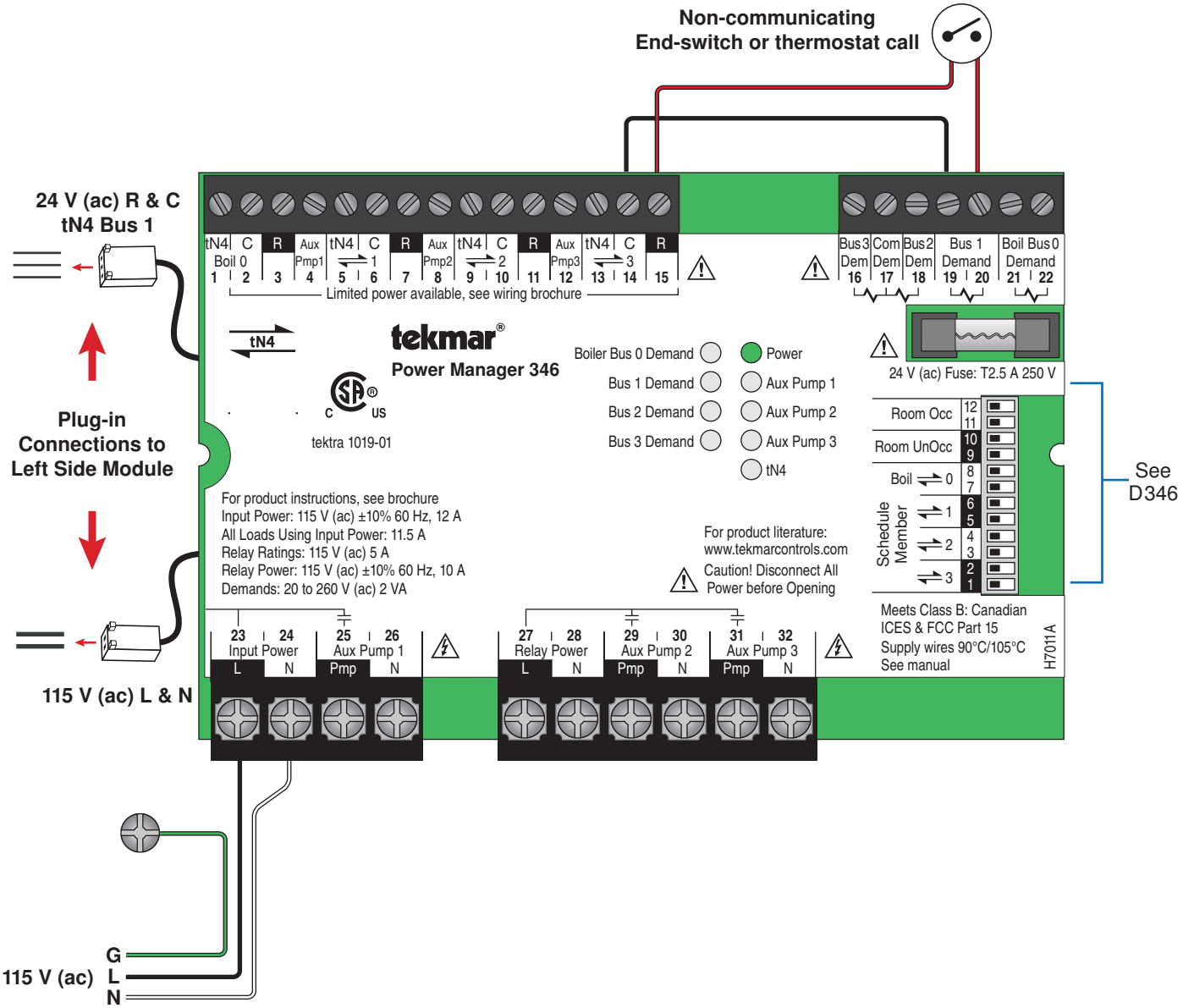
Electrical Drawings

⚠ The electrical drawing examples on the following pages show the 346 in common applications. These drawings have a brief explanation of what is being operated in each system. Choose the components in your system and use the drawings as a guide to aid in wiring your system.

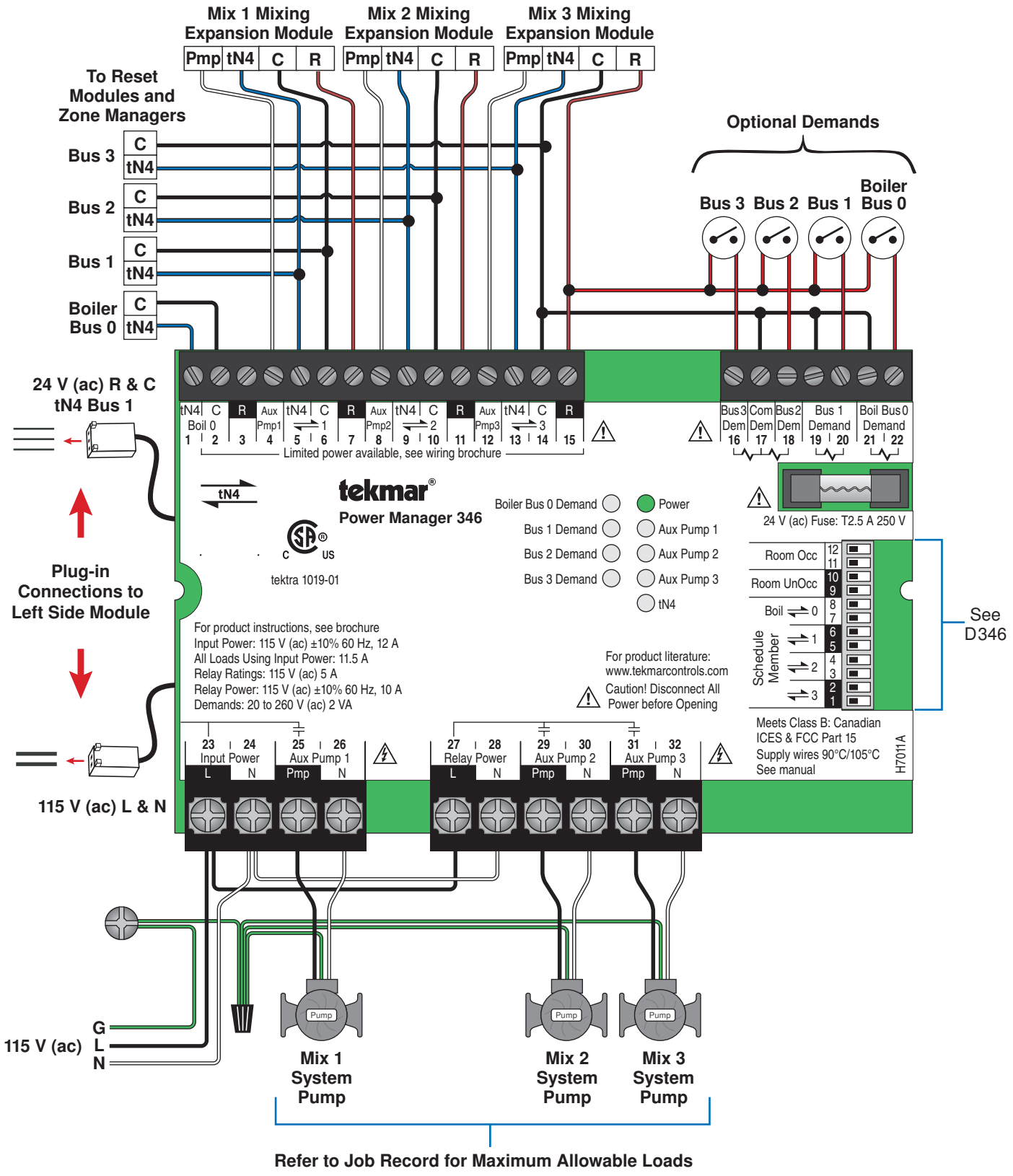
These are only concept drawings, not engineered drawings. They are not intended to describe a complete system nor any particular system. It is up to the system designer to determine the necessary components for and configuration of the particular system being designed including additional equipment isolation relays (for loads greater than the controls specified output ratings) and any safety devices which in the judgement of the designer are appropriate in order to properly size, configure and design that system and to ensure compliance with building and safety code requirements.

Electrical Application 346 E1

Description: The Power Manager 346 provides power to a reset module. An on-off Bus 1 Demand signal is provided by non-communicating equipment. The 346 receives a Bus 1 Demand and sends a tN4 message on the tN4 Bus 1 to activate the heating equipment.



Description: The Power Manager 346 provides power to a reset module and up to three mixing expansion modules. The 346 allows zone managers to be connected to each tN4 bus. As an option, Bus Demands can be used to call for heat on a tN4 Bus. This allows a mixture of tN4 communicating and non-communicating devices to call for heat.



Wiring the Control — Terminals 1 - 33

⚠ This section explains how to wire individual devices to the Power Manager 346. For step by step wiring refer to the terminal number on the right of the page.

- Before wiring ensure all power is turned off and take all necessary precautions.
- Install the supplied wiring compartment barriers by sliding them into the grooves provided to isolate the low and high voltage wiring.
- Strip all wiring to a length of 3/8 in. or 10 mm for all terminals.
- A circuit breaker or power disconnect that provides power to the control should be located nearby and clearly labeled as the power disconnect for the 346.
- Refer to the current and voltage ratings at the back of this brochure before connecting devices to this control.
- Only qualified personnel should install or service the control.

Wiring tekmarNet®4 (tN4) Buses — Terminals 1 - 15

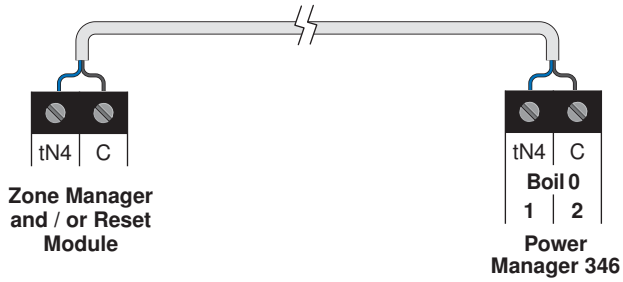
Each tN4 bus on the reset module must connect to the Power Manager 346. Bus 1 plugs into the reset module and does not require any external wiring.

The Boiler Bus 0, as well as Bus 2 and Bus 3 must be externally wired to a reset module if those buses are being used.

Buses 1, 2 ,and 3 can potentially be connected to Mixing Expansion Modules.

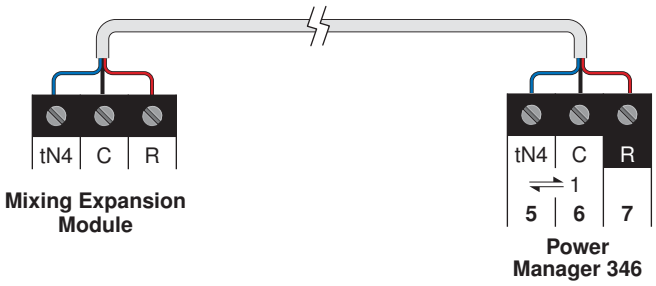
⚠ tN4 Boiler Bus 0 — Terminals 1, 2

- Connect the Boiler Bus tN4 (terminal 1) to the Boiler Bus tN4 on the Reset Module (if applicable).
- Connect the Boiler Bus C (terminal 2) to the Boiler Bus C on the Reset Module (if applicable).



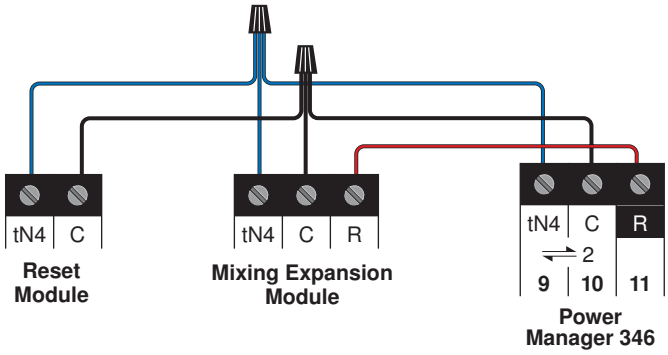
⚠ tN4 Bus 1 Connection to Mixing Expansion Module — Terminals 5, 6, 7

- Connect Bus 1 tN4 (terminal 5) to the tN4 terminal on the Mixing Expansion Module.
- Connect Bus 1 C (terminal 6) to the C terminal on the Mixing Expansion Module (if applicable).
- Connect R (terminal 7) to the R terminal on the Mixing Expansion Module.



⚠ tN4 Bus 2 — Terminals 9, 10, 11

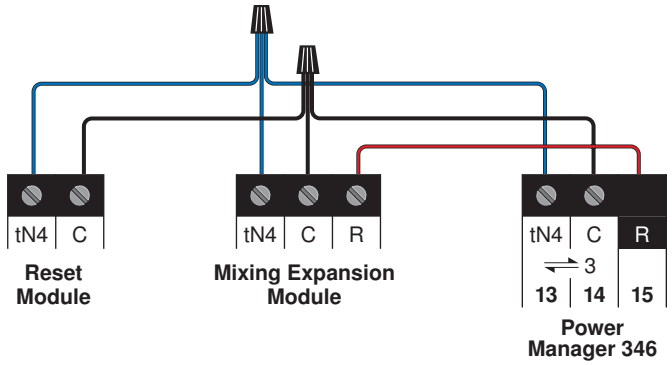
- Connect Bus 2 tN4 (terminal 9) to Bus 2 tN4 on the Reset Module.
- Connect Bus 2 C (terminal 10) to Bus 2 C on the Reset Module.
- Connect Bus 2 tN4 (terminal 9) to the tN4 terminal on the Mixing Expansion Module.
- Connect Bus 2 C (terminal 10) to the C terminal on the Mixing Expansion Module.
- Connect R (terminal 11) to the R terminal on the Mixing Expansion Module.



⚠ tN4 Bus 3

Terminals 13, 14, 15

- Connect Bus 3 tN4 terminal (13) to Bus 3 tN4 on the Reset Module.
- Connect Bus 3 C terminal (14) to Bus 3 C on the Reset Module.
- Connect Bus 3 tN4 (terminal 13) to the tN4 terminal on the Mixing Expansion Module.
- Connect Bus 3 C (terminal 14) to the C terminal on the Mixing Expansion Module.
- Connect R (terminal 15) to the R terminal on the Mixing Expansion Module.



Wiring the Bus Demands

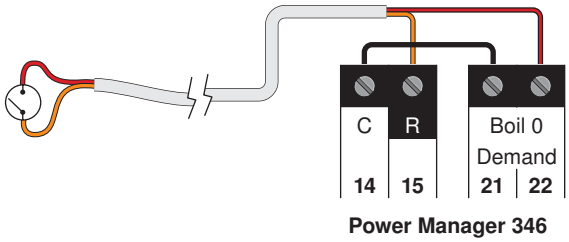
Terminals 16 - 22

Each tN4 Bus has a corresponding Bus Demand input. When a Bus Demand is powered, the Power Manager sends a message on the corresponding tN4 bus to activate the Reset Module. This allows non-communicating thermostats to be able to call for heat on a tN4 bus.

⚠ Boiler Bus 0 Demand

Terminals 21, 22

- To create a demand on the boiler bus, a voltage between 24 V (ac) and 230 V (ac) must be applied across the Boil Bus 0 Demand terminals (21 and 22).



⚠ Bus 1 Demand

Terminals 19, 20

- To create a demand on bus 1, a voltage between 24 V (ac) and 230 V (ac) must be applied across the Bus 1 Demand terminals (19 and 20).

⚠ Bus 2 Demand

Terminals 17, 18

- To create a demand on bus 2, a voltage between 24 V (ac) and 230 V (ac) must be applied across the Bus 2 Dem and Com Dem terminals (18 and 17).

⚠ Bus 3 Demand

Terminals 16, 17

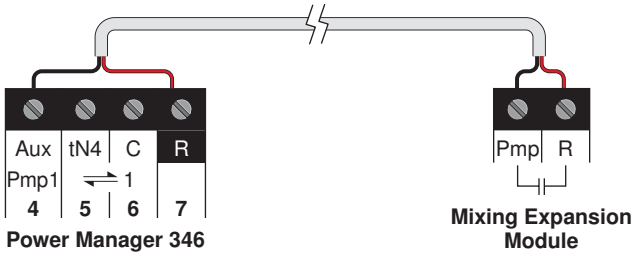
- To create a demand on bus 3, a voltage between 24 V (ac) and 230 V (ac) must be applied across the Dem 3 and Com Dem terminals (16 and 17).

Wiring the Auxiliary Pump Inputs — *Terminals 4 - 15*

The 346 has three Auxiliary Pump outputs that are activated once 24 V (ac) is applied to the Auxiliary Pump input from any one of the R terminals. Either Mixing Expansion Modules, tN4 Thermostats, or tN4 Setpoint Controls can activate the Auxiliary Pump inputs.

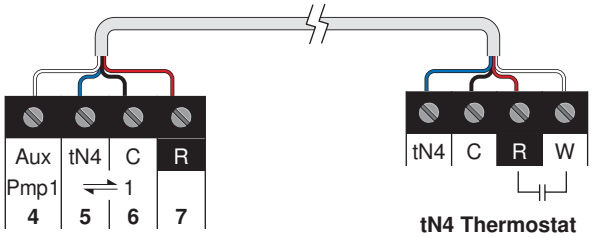
⚠ Auxiliary Pump 1 to Mixing Expansion Modules — *Terminals 4, 6, 7*

- Connect the Aux Pmp1 terminal 4 to the Mixing Expansion Module System Pump terminal.
- Connect the R terminal 7 to the Mixing Expansion Module R terminal.



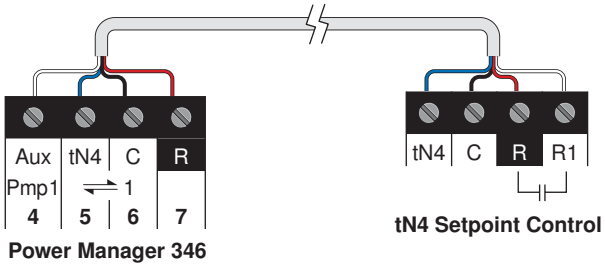
⚠ Auxiliary Pump 1 to tN4 Thermostats — *Terminals 4, 6, 7*

- Connect the Aux Pmp1 terminal 4 to the tN4 Thermostat W terminal.
- Connect the C terminal 6 to the tN4 Thermostat C terminal.
- Connect the R terminal 7 to the tN4 Thermostat R terminal.
- Connect the tN4 terminal 5 to the tN4 Thermostat tN4 terminal.



⚠ Auxiliary Pump 1 to tN4 Setpoint Controls — *Terminals 4, 6, 7*

- Connect the Aux Pmp 1 terminal 4 to the tN4 Setpoint Control R1 terminal.
- Connect the C terminal 6 to the tN4 Setpoint Control C terminal.
- Connect the R terminal 7 to the tN4 Setpoint Control R terminal.
- Connect the tN4 terminal 5 to the tN4 Setpoint Control tN4 terminal.



⚠ Auxiliary Pump 2 to Mixing Expansion Modules — *Terminals 8, 10, 11*

- Connect the Aux Pmp 2 terminal 8 to the Mixing Expansion Module System Pump terminal.
- Connect the C terminal 10 to the Mixing Expansion Module C terminal.
- Connect the R terminal 11 to the Mixing Expansion Module R terminal.

⚠ Auxiliary Pump 2 to tN4 Thermostats — *Terminals 8, 10, 11*

- Connect the Aux Pmp 2 terminal 8 to the tN4 Thermostat W terminal.
- Connect the C terminal 10 to the tN4 Thermostat C terminal.
- Connect the R terminal 11 to the tN4 Thermostat R terminal.

⚠ Auxiliary Pump 2 to tN4 Setpoint Controls — *Terminals 8, 10, 11*

- Connect the Aux Pmp 2 terminal 8 to the tN4 Setpoint Control R1 terminal.
- Connect the C terminal 10 to the tN4 Setpoint Control C terminal.
- Connect the R terminal 11 to the tN4 Setpoint Control R terminal.

⚠ Auxiliary Pump 3 to Mixing Expansion Modules

Terminals 12, 14, 15

- Connect the Aux Pmp 3 terminal 12 to the Mixing Expansion Module System Pump terminal.
- Connect the C terminal 14 to the Mixing Expansion Module C terminal.
- Connect the R terminal 15 to the Mixing Expansion Module R terminal.

⚠ Auxiliary Pump 3 to tN4 Thermostats

Terminals 12, 14, 15

- Connect the Aux Pmp 3 terminal 12 to the tN4 Thermostat W terminal.
- Connect the C terminal 14 to the tN4 Thermostat C terminal.
- Connect the R terminal 15 to the tN4 Thermostat R terminal.

⚠ Auxiliary Pump 3 to tN4 Setpoint Controls

Terminals 12, 14, 15

- Connect the Aux Pmp 3 terminal 12 to the tN4 Setpoint Control R1 terminal.
- Connect the C terminal 14 to the tN4 Setpoint Control C terminal.
- Connect the R terminal 15 to the tN4 Setpoint Control R terminal.

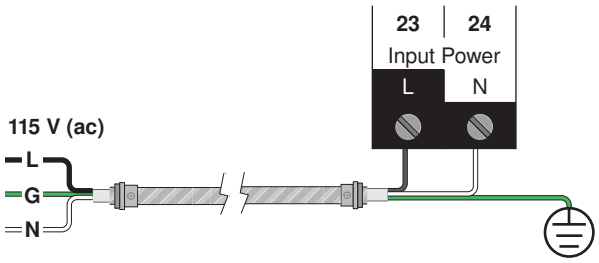
Wiring the Input Power

Terminals 23, 24, 27, 28

Provide a 15 Amp circuit for the input power.

- Connect the 115 V (ac) line wire (L) to terminal 23.
- Connect the neutral wire (N) to terminal 24.
- Connect the ground wire (G) to one of the ground screws provided in the wiring chamber.

Note: Installations up to 104°F (40°C) only require 90°C supply wiring, whereas environments of 105 to 117°F (41 to 47°C) require 105°C rated wiring.



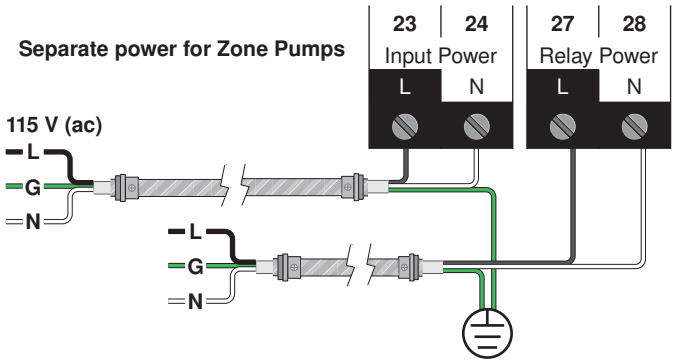
Wiring the Relay Power

Terminals 27, 28

If using Auxiliary Pump Outputs 2 and 3, either provide a 15 Amp circuit for the relay power, or share the same circuit as the input.

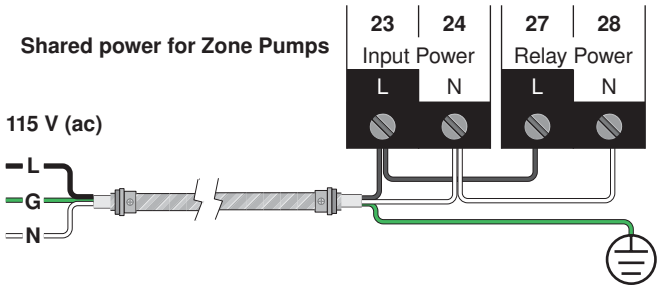
If separate power is used for the Relay Power:

- Connect 115 V line in (L) to the Relay Power L terminal 27.
- Connect a neutral to the Relay Power N terminal 28.
- Connect the ground wire to one of the grounding screws provided in the wiring chamber.



If shared power is used for the Relay Power:

- Connect 115 V line in (L) to terminal 27 using a jumper wire from terminal 23.
- Connect a neutral (N) to terminal 28 using a jumper wire from terminal 24.



Wiring the Auxiliary Pump Outputs — *Terminals 25 - 32*

The 346 has three Auxiliary Pump outputs that are activated once 24 V (ac) is applied to the Auxiliary Pump input from any one of the R terminals.

Note: For pumps larger than the control's rated capacity, an external isolation relay must be used.

⚠ Auxiliary Pump 1 — *Terminals 25, 26*

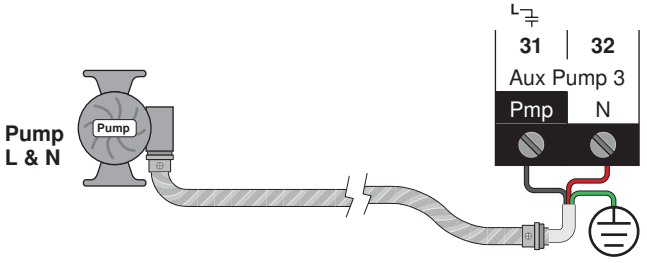
- Connect the pump's line in (L) to the Pmp terminal 25.
- Connect the pump's neutral (N) to the N terminal 26.
- Connect the pump ground wire to one of the ground screws provided in the wiring chamber.

⚠ Auxiliary Pump 2 — *Terminals 29, 30*

- Connect the pump's line in (L) to the Pmp terminal 29.
- Connect the pump's neutral (N) to the N terminal 30.
- Connect the pump ground wire to one of the ground screws provided in the wiring chamber.

⚠ Auxiliary Pump 3 — *Terminals 31, 32*

- Connect the pump's line in (L) to the Pmp terminal 31.
- Connect the pump's neutral (N) to the N terminal 32.
- Connect the pump ground wire to one of the ground screws provided in the wiring chamber.

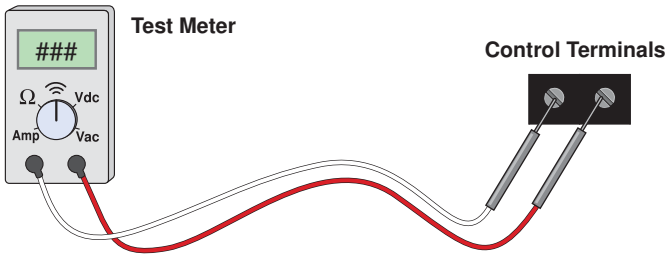


Troubleshooting the Control

⚠ General

The following tests are to be performed using standard testing practices and procedures and should only be carried out by properly trained and experienced persons.

A good quality electrical test meter, capable of reading from at least 0 - 300 V (ac), 0 - 30 V (dc), 0 - 2,000,000 Ohms, and testing for continuity is essential to properly test the wiring and sensors.



For an explanation on the use of the Test Button, the 'Test' sequence or any error messages, refer to the Data Brochure.

⚠ Testing the Input Power — *Terminals 23, 24*

1. Remove the front cover from the control.
2. Use an electrical test meter to measure (ac) voltage between the Input Power L and N terminals (23 and 24). The reading should be 115 V (ac) + / – 10% and the "Power" LED should be lit green.
3. If power is not present and the light is off:

- Check the circuit that supplies power to the Power Manager.

4. If power is present but the 'Power' LED is lit amber:

- Check the field replaceable transformer fuse on the Power Manager.
- If the fuse is blown, determine the cause of the failure before replacing the fuse.

⚠ Testing the Relay Power — *Terminal 27, 28*

1. Remove the front cover from the control.
2. Use an electrical test meter to measure (ac) voltage between the Relay Power L and N terminals (27 and 28). The reading should be 115 V (ac) + / – 10%.
3. If power is not present, check the circuits that supply power to the Relay Power terminals.

⚠ Testing the Auxiliary Pump Inputs

Terminals 4 - 14

1. Remove the front cover from the control.
2. Use an electrical test meter to measure the (ac) voltage between the Aux Pmp1 and the C terminals (4 and 6).

- When the Aux Pump 1 LED is off, the reading should be 0 V (ac) and the pump should be off.
- When the Aux Pump 1 LED is on, the reading should be 24 V (ac) + / – 10% and the pump should be running.

3. Repeat the process for Auxiliary Pump 2 (terminals 8 and 10), and Auxiliary Pump 3 (terminals 12 and 14).

Note: If the pump does not operate properly, refer to any troubleshooting information supplied by the pump manufacturer.

⚠ Testing the Auxiliary Pump Outputs

Terminals 25 - 32

1. Remove the front cover from the control.
2. Use an electrical test meter to measure the (ac) voltage between the Aux Pump 1 terminals (25 and 26).

- When the Aux Pump LED is off, the reading should be 0 V (ac) and the pump should be off.
- When the Aux Pump LED is on, the reading should be 115 V (ac) + / – 10% and the pump should be running.

3. Repeat the process for Auxiliary Pump 2 (terminals 29 and 30), and Auxiliary Pump 3 (terminals 31 and 32).

Note: If the pump does not operate properly, refer to any troubleshooting information supplied by the pump manufacturer.

⚠ Testing the tN4 Buses

Terminals 5 - 14

The tN4 communication symbol is shown on the display of thermostats, setpoint controls and reset modules when communication is present. If the thermostat is connected in a network and the communication is missing, there may be an open or short circuit on the tN4 and C bus wires.

1. Remove the front cover from the thermostat.
2. To test for short circuits:

- Disconnect the tN4 bus wires on one end.
- Install wire nuts on each wire to ensure the wire ends are not touching.
- Disconnect the tN4 bus wires on the other end.
- Measure for continuity using an electrical meter.
- If continuity is present, there is a short circuit fault along the wires. It is recommended to replace the tN4 bus wires.

3. To test for open circuits:

- Disconnect the tN4 bus wires on one end and connect them together.
- Disconnect the tN4 bus wires on the other end.
- Use an electrical meter to measure for continuity.
- If there is no continuity, there is an open circuit fault along the wires. It is recommended to replace the tN4 bus wires.

⚠ Testing the Bus Demand Inputs

Terminals 16 - 22

To test a Bus Demand input, use an electrical meter to measure the voltage on the Boiler Bus 0 Demand (terminals 21 and 22), Bus 1 Demand (terminals 19 and 20), Bus 2 Demand (terminals 17 and 18), and Bus 3 Demand (terminals 16 and 17). When the demand device calls for heat, the electrical meter should measure between 20 and 260 V (ac) at the terminals and the appropriate bus demand LED is on. When the demand device is off, the electrical meter should read less than 5 V (ac) and the appropriate bus demand LED is off.

If a bus demand is applied and the reset control does not acknowledge the call for heat on the tN4 bus, then the tN4 LED and the respective bus demand LED will begin flashing together. This indicates a problem with the wiring of the respective tN4 Bus. See “Testing the tN4 Bus” section for troubleshooting.

Technical Data

Power Manager 346; *Three Auxiliary Pumps, Four Demands*	
Control	Microprocessor PID control; This is **not a safety (limit) control**
Packaged weight	3.5 lb. (1610 g)
Enclosure	Blue PC+ABS plastic with metal top and bottom conduit connection walls
Dimensions	8-1/16” H x 11-1/8” W x 2-15/16” D (204 x 282 x 74 mm)
Approvals	CSA C US, CSA/UL 61010-1, meets Class B: ICES and FCC Part 15
Ambient conditions	Indoor use only, 36 to 117°F (2 to 47°C)
	RH ≤ 80% to 88°F (31°C) down to 50% above 104°F (40°C)
	Altitude <6560 feet (2000 m), Installation Category II, Pollution Degree 2
Power Supply	115 V (ac) ± 10% 60 Hz 12 A
Relay Power	115 V (ac) ± 10% 60 Hz 10 A
Wire Rating	Installations up to 104°F (40°C) only require 90°C supply wiring, whereas environments of 105 to 117°F (41 to 47°C) require 105°C rated wiring.
Max Low Voltage Load	24 V (ac) 2.1 A 50 VA, Fuse: T2.5 A 250 V
Auxiliary Pump Inputs	24 V (ac), < 0.1 VA
Auxiliary Pump Relays	115 V (ac) 5 A
Bus Demands	20 to 260 V (ac) 2 VA

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.

tekmar® Control Systems

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