

# STEFFES

## Heating Systems

# Power Line Carrier (PLC) Transceiver

"Manufactured in North America"



5-Pole Transceiver



2-Pole Transceiver



3-Phase Transceiver

### Configurations Available:

*2-pole Indoor*  
*2-pole 3-phase Outdoor*  
*2-pole with Umbilical Cord Outdoor*  
*2-pole Outdoor*  
*2-pole with Time Clock Indoor*

*3-phase Outdoor*  
*5-pole Indoor*  
*5-pole with CT Indoor*  
*5-pole Outdoor*



## WARNING

**HAZARDOUS VOLTAGE:** Risk of electric shock. Can cause injury or death. System may be connected to more than one branch circuit. Disconnect power to all circuits before servicing. Equipment must be installed and serviced by a qualified technician.

### FOR CUSTOMER USE

Please record the serial number of the transceiver below. This information is located inside the transceiver enclosure. Retain this information for future reference.

Serial Number: \_\_\_\_\_

Date Installed: \_\_\_\_\_



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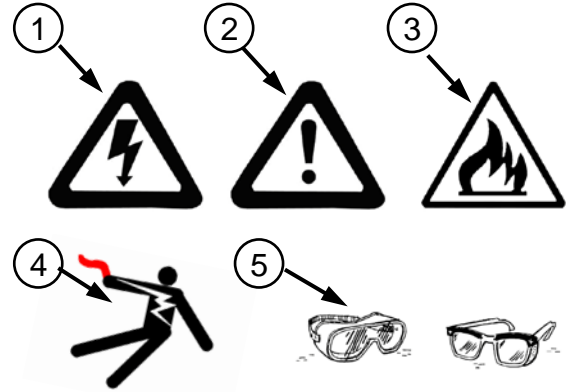
# PERSONAL SAFETY INSTRUCTIONS

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## Safety Alert Symbols

Three safety alert symbols may be used to alert you to personal safety instructions. They are:

- **Electrical (1 & 4)**
- **Mechanical (2)**
- **Fire (3)**
- **Personal Protective Equipment (PPE) (5)**



These safety alert symbols are used to alert you to hazards. Obey all safety messages that follow these symbols to avoid possible injury or death.

## Signal Words

Signal words that may appear next to the safety alert symbol are:

- **DANGER**
- **WARNING**
- **CAUTION**
- **IMPORTANT**
- **NOTE**

Carefully read and understand the instructions before you continue.

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

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

**CAUTION**, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

**IMPORTANT** indicates a special instruction or procedure which, if not followed, may cause damage to the equipment.

**NOTE** indicates additional information about a subject or procedure for a more efficient or convenient installation.

## IMPORTANT

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- ♦ The equipment described herein is intended for installation by a qualified technician in accordance with applicable local, state, and national codes and requirements.
- ♦ This manual should be retained by the owner upon completion of the installation and made available to service personnel as required.
- ♦ **Disclaimer:**
  - In compiling this manual, Steffes Corporation has used its best judgment based upon information available, but disclaims any responsibility or liability for any errors or miscalculations contained herein, or any revisions hereof, or which result, in whole or in part, from the use of this manual or any revisions hereof.
  - Conditions may occur which cause the power line carrier transceiver to have difficulties communicating; therefore, not operating properly. In no event shall Steffes Corporation be liable for any indirect, special, or consequential damages or lost profits.

# GENERAL OPERATION

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## General Information

This Steffes Power Line Carrier (PLC) Transceiver is to be installed in your customer's home or business to provide communication to and control of Steffes heating systems and/or other devices. The PLC Transceiver is used for communicating information through the local electric circuits and must be wired into the line voltage power serving the installation.



The transceiver can be installed as a transmitter OR a receiver.

In **transmit mode**, it receives a signal from an external control device such as a power company's meter or radio receiver, a time clock, or other control device. The transmitter interprets the signal and sends the signal to any Steffes receivers installed on the same distribution transformer. The transmitter also collects and transmits outdoor temperature data. Steffes heating systems have a built-in receiver. There are also relays in the transceiver which can be used to control other loads.

In **receive mode**, the transceiver reads and translates the signal from the transmitter. It uses the information received to control other electric load devices by turning power off and on to the device with its relays. Other controlled-load devices might be an electric water heater, electric baseboard heater, electric clothes dryer, etc.

**NOTE:** *PLC Communication is very reliable in most applications but can be affected and hindered by connection method used, electrical layout of the application, operation of other equipment in the same electric system, dirty power, etc. Steffes Corporation does not guarantee effective communication of the PLC system in all applications and is not responsible for communication issues.*

## SPECIFICATIONS

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### Electrical

#### Control Circuit:

Line Power (single-phase).....	120 or 240/208 VAC
Current .....	0.2 amps
Communication Channels .....	15
Transmitter Frequency .....	13.3 – 15.2 kHz
Low Voltage Input Switch Loading from R terminal to all other low voltage terminals .....	1-2 mA

#### Load-Control Relays:

Line Power (single-phase).....	120 or 240/208 VAC
Maximum Load per Relay.....	24 amps
Maximum Controlled Motor Load @ 120VAC.....	1 HP
Maximum Controlled Motor Load @ 208 or 240 VAC .....	1.5 HP

**NOTE:** *In single-phase applications, the most effective circuit board operation voltage is 240/208 VAC.*

# SPECIFICATIONS

## Mechanical

### Enclosures Available:

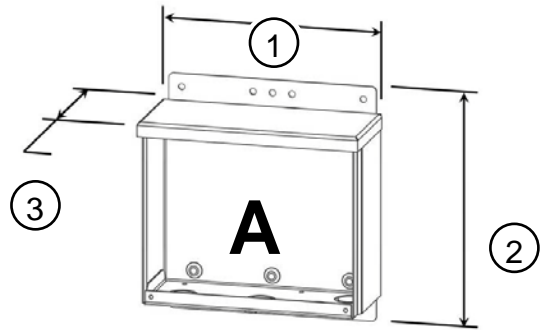
- Outdoor, (A) ..... Surface Mount
- Indoor Only, (B) ..... Flush or Surface Mount

### Features:

- Knockout Size ..... 1/2 & 3/4" (12.7 & 19 mm)
- Number of Knockouts:
  - Outdoor ..... 4
  - Indoor ..... 8
- Ground Bond Point ..... SecureGround™ Screw
- Security ..... Power Company Seal/Lockout

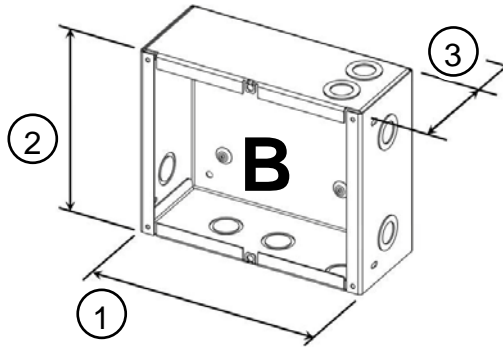
### 2-pole Outdoor Size:

- Width, (1) ..... 8.50" (215.9 mm)
- Height, (2) ..... 9.00" (228.6 mm)
- Depth, (3) ..... 3.68" (93.5 mm)



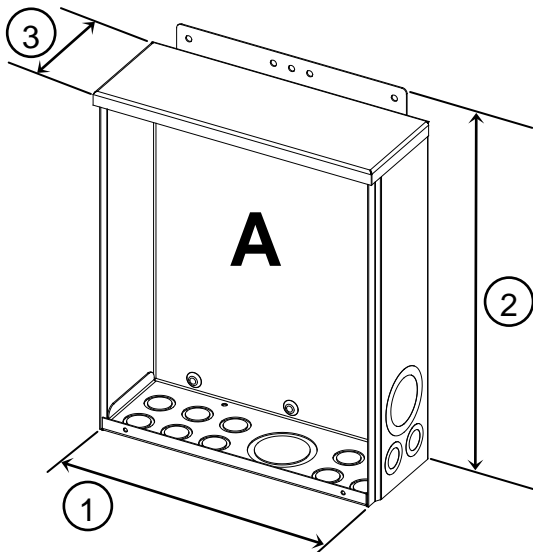
### 2-pole Indoor Size:

- Width, (1) ..... 8.50" (215.9 mm)
- Height, (2) ..... 7.00" (177.8 mm)
- Depth, (3) ..... 3.50" (88.9 mm)
- \*Available with Optional Time Clock



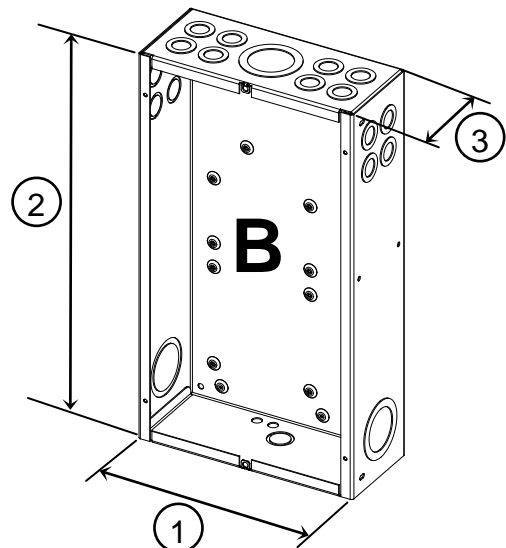
### 5-pole Outdoor Size:

- Width, (1) ..... 11.50" (292.1 mm)
- Height, (2) ..... 16.00" (406.4 mm)
- Depth, (3) ..... 4.25" (108 mm)



### 5-pole Indoor Size:

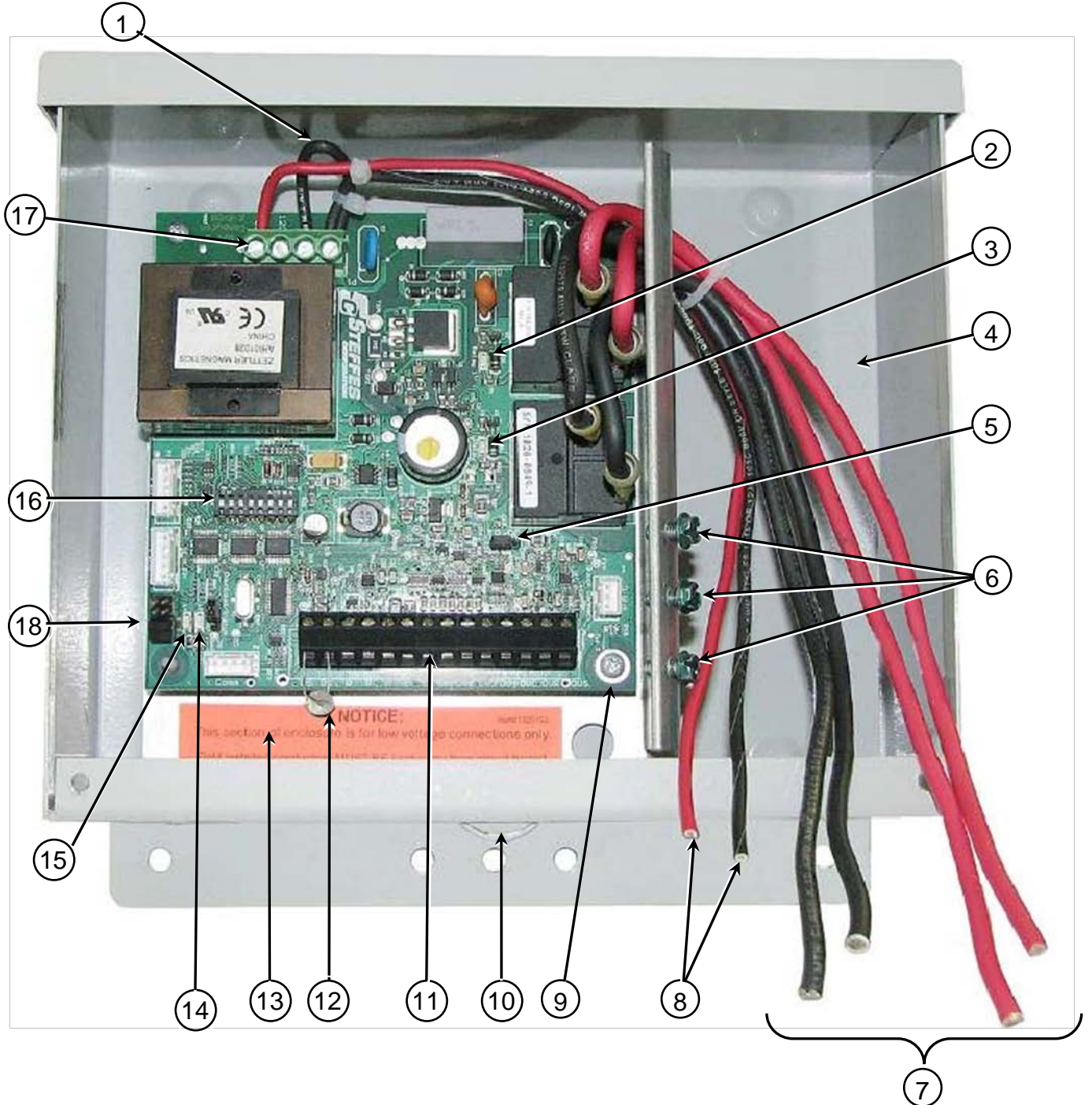
- Width, (1) ..... 10.00" (254 mm)
- Height, (2) ..... 18.00" (457.2 mm)
- Depth, (3) ..... 4.25" (108 mm)
- \*Available with Optional CT





# COMPONENT LOCATION 2-POLE INDOOR/OUTDOOR

Use this illustration to familiarize yourself with the location of parts you will use as the transceiver is installed, set up, and its operation checked. The 2-pole transceiver shown is an outdoor enclosure; however, all components are located in relatively the same locations in the indoor enclosure.

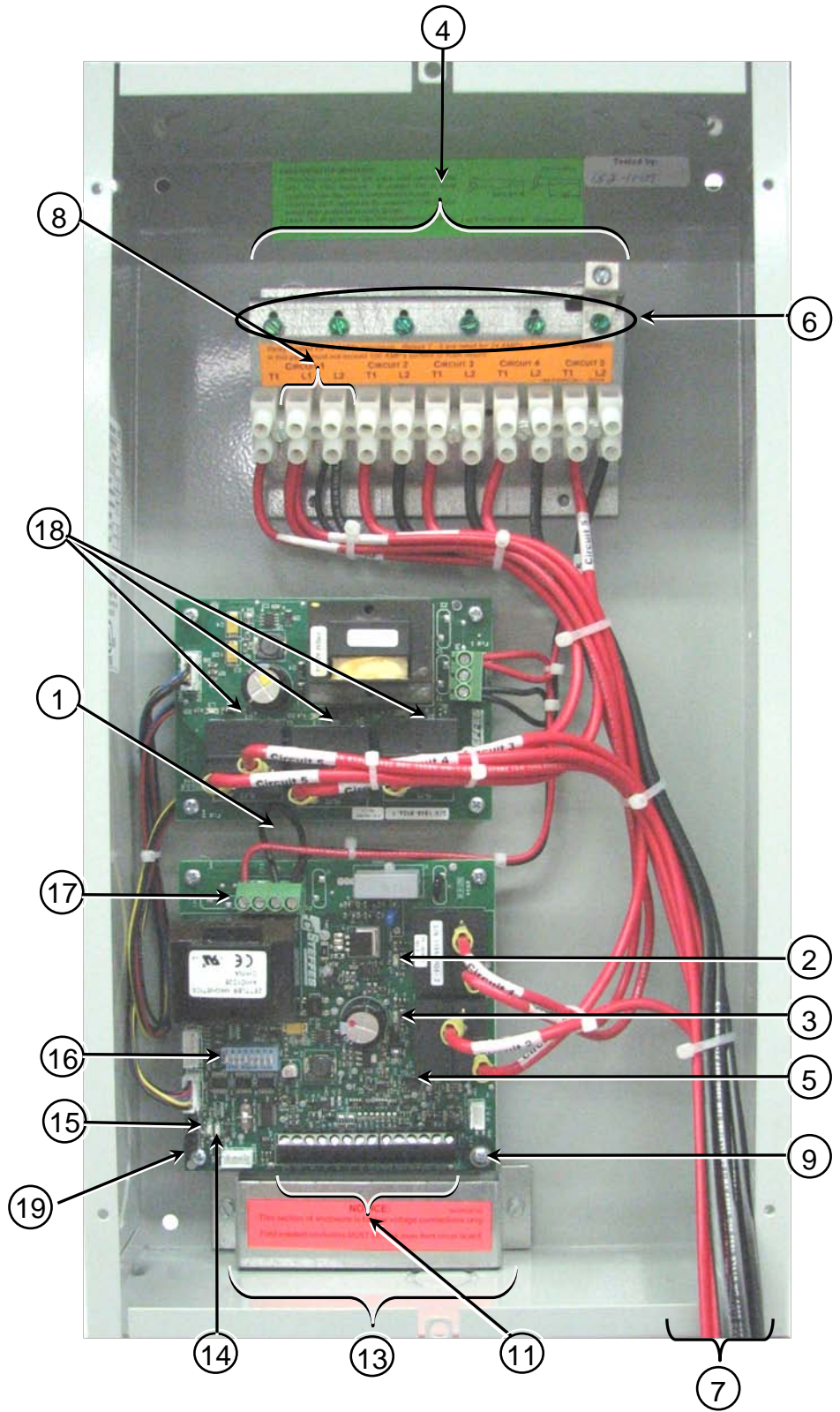


- |   |   |
|---|---|
| 1 - Line Voltage Tapping [Page 10]                          | 10 - Security Lockout/Seal Loop                         |
| 2 - Relay #1 LED (marked "Relay 1") [Page 17]               | 11 - Low Voltage Terminal Block [Page 13]               |
| 3 - Relay #2 LED (marked "Relay 2") [Page 17]               | 12 - Temperature Sensing Thermistor [Page 13]           |
| 4 - Line Voltage Connection Area [Page 24]                  | 13 - Low Voltage Connection Area [Page 13]              |
| 5 - Transmit/Receive Jumper ("TR/RC") [Page 13]             | 14 - Outside Temperature Indicator LED ("L3") [Page 17] |
| 6 - SecureGround™ Ground Bond Screw [Page 10]               | 15 - PLC Signal Indicator LED ("L4") [Page 17]          |
| 7 - Supply Conductors (from circuit breaker panel) [Page 9] | 16 - DIP Switches [Page 14-15]                          |
| 8 - PCB Line Voltage Conductor "Control Circuit" [Page 9]   | 17 - Line Voltage Terminal Block [Page 9]               |
| 9 - Low Voltage Ground Screw                                | 18 - THER Jumpers – Must be ON for all Transceivers     |

# COMPONENT LOCATION 5-POLE INDOOR

Use this illustration to familiarize yourself with the location of parts you will use as the transceiver is installed, set up, and its operation checked.

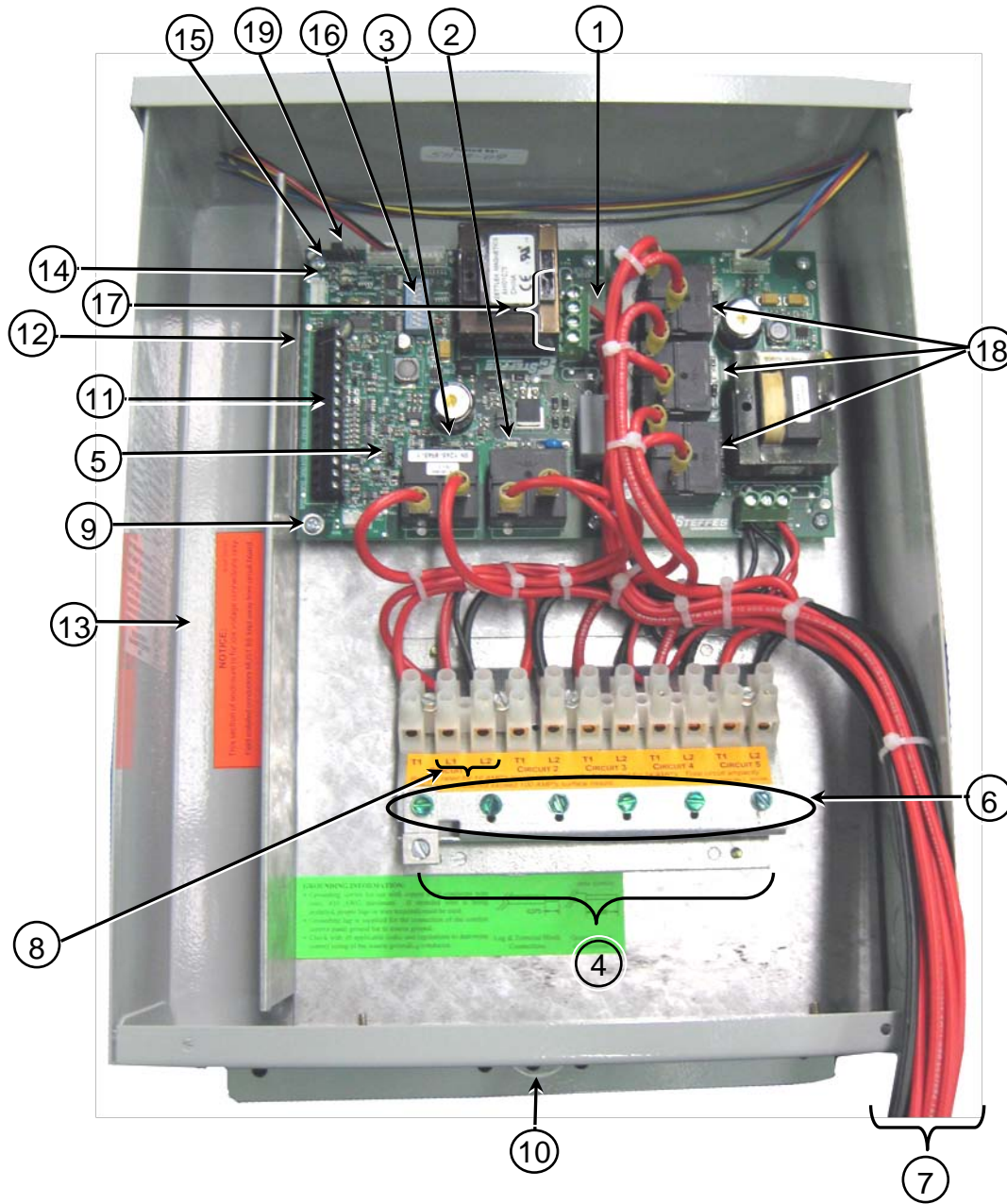
- 1 Line Voltage Select Jumper [Page 11]
- 2 Relay #1 LED (marked "Relay 1") [Page 17]
- 3 Relay #2 LED (marked "Relay 2") [Page 17]
- 4 Load Connection Area [Page 11]
- 5 Transmit/Receive Jumper ("TR/RC") [Page 13]
- 6 SecureGround™ Ground Bond Screw [Page 11]
- 7 Controlled Load Line Voltage Conductors [Page 12]
- 8 PCB Line Voltage Conductor "Control Circuit" [Page 11]
- 9 Low Voltage Ground Screw
- 10 Security Lockout/Seal Loop (N/A on Indoor Enclosure)
- 11 Low Voltage Terminal Block [Page 13]
- 12 Temperature Sensing Thermistor (N/A on Indoor Enclosure. Install outdoor sensor if desired.) [Page 13]
- 13 Low Voltage Connection Area [Page 13]
- 14 Outside Temperature Indicator LED ("L3") [Page 17]
- 15 PLC Signal Indicator LED ("L4") [Page 17]
- 16 DIP Switches [Page 14-15]
- 17 Line Voltage Terminal Block [Page 11]
- 18 Relay LED's for expansion board relays [Page 17]
- 19 THER Jumpers – Must be ON for all Transceivers





# COMPONENT LOCATION 5-POLE OUTDOOR

Use this illustration to familiarize yourself with the location of parts you will use as the transceiver is installed, set up, and its operation checked.

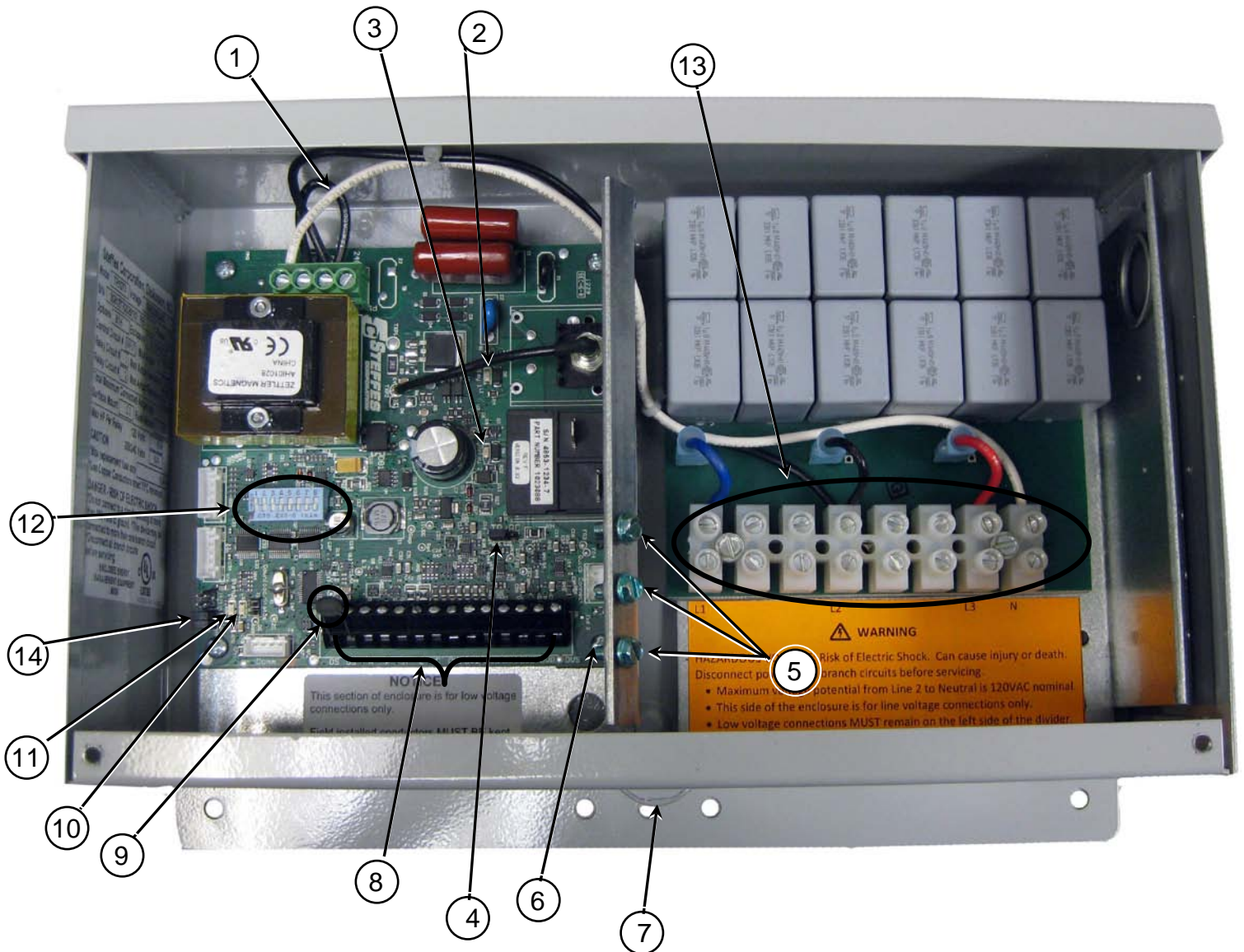


- |  |   |
|--|---|
| 1 - Line Voltage Select Jumper [Page 11]                   | 10 - Security Lockout/Seal Loop                         |
| 2 - Relay #1 LED (marked "Relay 1") [Page 17]              | 11 - Low Voltage Terminal Block [Page 13]               |
| 3 - Relay #2 LED (marked "Relay 2") [Page 17]              | 12 - Temperature Sensing Thermistor [Page 13]           |
| 4 - Load Connection Area [Page 11]                         | 13 - Low Voltage Connection Area [Page 13]              |
| 5 - Transmit/Receive Jumper ("TR/RC") [Page 13]            | 14 - Outside Temperature Indicator LED ("L3") [Page 17] |
| 6 - SecureGround™ Ground Bond Screw [Page 11]              | 15 - PLC Signal Indicator LED ("L4") [Page 17]          |
| 7 - Controlled Load Line Voltage Conductors [Page 12]      | 16 - DIP Switches [Page 14-15]                          |
| 8 - PCB Line Voltage Conductor "Control Circuit" [Page 11] | 17 - Line Voltage Terminal Block [Page 11]              |
| 9 - Low Voltage Ground Screw                               | 18 - Relay LED's for expansion board relays [Page 17]   |
|  | 19 - THER Jumpers – Must be ON for all Transceivers     |



# COMPONENT LOCATION 3-PHASE OUTDOOR

Use this illustration to familiarize yourself with the location of parts you will use as the transceiver is installed, set up, and its operation checked.



- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>1 - Line Voltage Select Jumper [See Note]</li> <li>2 - Relay #1 LED (marked "Relay 1") [Page 17]</li> <li>3 - Relay #2 LED (marked "Relay 2") [Page 17]</li> <li>4 - Transmit/Receive Jumper ("TR/RC") [Page 13]</li> <li>5 - SecureGround™ Ground Bond Screw [Page 10]</li> <li>6 - Low Voltage Ground Screw</li> <li>7 - Security Lockout/Seal Loop</li> </ul> | <ul style="list-style-type: none"> <li>8 - Low Voltage Terminal Block [Page 13]</li> <li>9 - Temperature Sensing Thermistor [Page 13]</li> <li>10 - Outside Temperature Indicator LED ("L3") [Page 17]</li> <li>11 - PLC Signal Indicator LED ("L4") [Page 17]</li> <li>12 - DIP Switches [Page 14-15]</li> <li>13 - Line Voltage Terminal Block [Page 10]</li> <li>14 - THER Jumpers – Must be ON for all Transceivers</li> </ul> |
|---|--|

**NOTE: The 3-phase transceiver circuit board must be tapped for 120 VAC.**

# UNIT IDENTIFICATION LABEL

The unit identification label shown is a sample. The actual unit identification label is located inside the transceiver and contains the following information:



Model	<input type="text" value="1"/>	Voltage	<input type="text" value="2"/>
S/N	<input type="text" value="3"/>	Phase	<input type="text" value="4"/>
Options	<input type="text" value="5"/>	Enclosure	<input type="text" value="6"/>
Crcr #	<input type="text" value="7"/>	Max Amps	<input type="text" value="8"/>
Crcr #	<input type="text" value="9"/>	Max Amps Resistance	<input type="text" value="10"/>
Crcr #	<input type="text" value="9"/>	Max Amps Resistance	<input type="text" value="10"/>
Total Maximum Connected Amperage:			
Surface Mount	<input type="text" value="11"/>	Flush Mount	<input type="text" value="12"/>
Max HP 120Volt	<input type="text" value="13"/>	208/240V	<input type="text" value="14"/>

Unit Identification Label



### CAUTION

\*Use Copper Conductors rated at a min. of 75°C

ENCLOSED  
ENERGY MANAGEMENT  
EQUIPMENT  
80GM



- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>1 Model Number</li> <li>2 Operation Voltage(s)             <ul style="list-style-type: none"> <li>• "208/240"</li> <li>• "120"</li> </ul> </li> <li>3 Serial Number</li> <li>4 Electrical Phase             <ul style="list-style-type: none"> <li>• 1</li> <li>• 3</li> </ul> </li> <li>5 Options (Includes Software Version)             <ul style="list-style-type: none"> <li>• T = Time Clock</li> <li>• C = Current Transformer</li> <li>• W = Pre-Wired</li> </ul> </li> <li>6 Enclosure Type             <ul style="list-style-type: none"> <li>• I = Indoor</li> <li>• R = Rainproof</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>7 Circuit # for Circuit Board</li> <li>8 Maximum Amperage for Circuit Board:             <ul style="list-style-type: none"> <li>• Power Input = 0.2</li> <li>• Time Clock = N/A</li> </ul> </li> <li>9 Relay Circuit Number</li> <li>10 Maximum Amperage Load for Relay</li> <li>11 Maximum Connected Amperage for Surface Mount Installation</li> <li>12 Maximum Connected Amperage for Flush Mount Installation (Indoor Enclosure Only)</li> <li>13 Maximum Controlled Electric Motor Load when powered with 120 VAC</li> <li>14 Maximum Controlled Electric Motor Load when powered with 208/240 VAC</li> </ul> |
|---|---|

# TRANSCEIVER INSTALLATION



**CAUTION:** Risk of eye injury due to flying debris. Wear eye protection at all times during this installation.

**IMPORTANT:** Maximum Transceivers per Utility or Distribution Transformer – The transceiver can be installed as a transmitter OR a receiver. Install no more than four transmitters on one distribution transformer. There is no limit to the number of receivers in a system.

## Remove Enclosure Cover

### Rainproof Enclosure

1. Remove two screws, (1).
2. Move bottom of cover down 1/2" (12 mm) and toward you, (2), to remove cover.



### Indoor Enclosure

1. Remove four screws, (1).

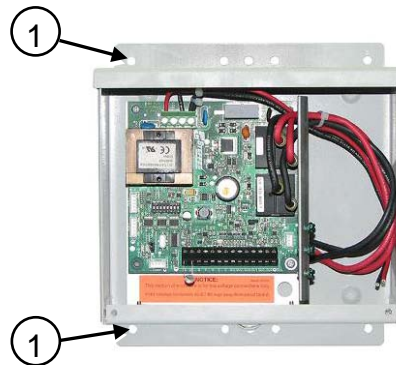


## Mount Transceiver

### Rainproof Enclosure

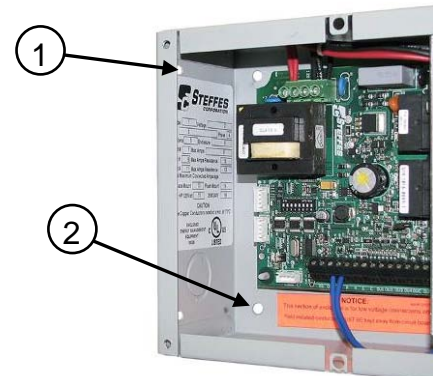
Securely mount the transceiver for your application.

**NOTE:** 10 – 1/4" (6.5 mm) holes, (1), are provided to attach the rainproof enclosure to the mounting surface.



### Indoor Enclosure

**NOTE:** 4 – 3/16 x 3/8" (4.8 x 9.5 mm) slots, (1), are provided to install indoor enclosure flush mounted.  
4 – 1/4" (6.5 mm) holes, (2), are provided to install indoor enclosure surface mounted.





# Line Voltage Connections



## WARNING:

Hazardous Voltage. Can cause injury or death.

- Route line-voltage conductors (circuit board power and controlled-load circuits) and make line-voltage connections only in the line-voltage connection area, (1).
- Use only copper conductors that are rated for 75° C minimum.
- Route low-voltage conductors (remote outdoor sensor, power company signal/control switch, override switch, etc.) only into the low-voltage connection area, (2).
- Install in accordance with applicable local, state, and national codes and regulations.

## 2-Pole

1. The transceiver can be powered with 120 VAC or 208/240 VAC. Before connecting power to the transceiver, the circuit board MUST be tapped for the appropriate input voltage as shown.

**NOTE: 208VAC/240VAC is factory default.**

2. Route line voltage wiring to the transceiver and connect to the two 16 AWG wires coming from the circuit board.



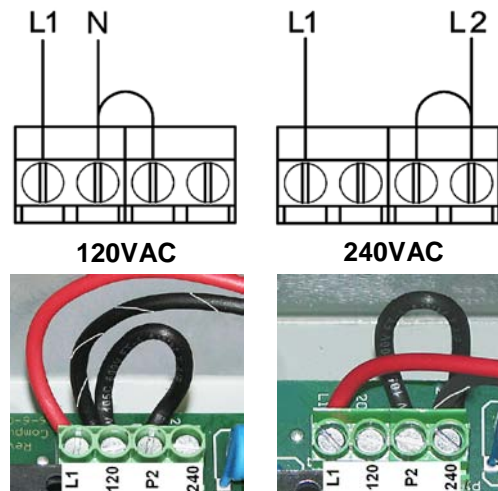
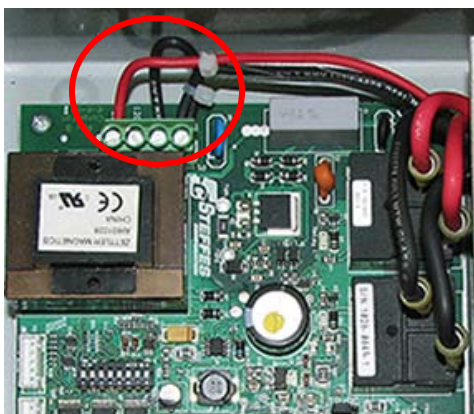
## 5-Pole

1. The transceiver can be powered with 120 VAC or 208/240 VAC. Before connecting power to the transceiver, the circuit board MUST be tapped for the appropriate input voltage as shown.

**NOTE: 208VAC/240VAC is factory default.**

2. Power to the circuit board is fed through Circuit 1. Connect the two wires labeled "Circuit 1" to a breaker in the breaker panel to power the 5-pole transceiver.

**NOTE: Any load connected to L1 and L2 on Circuit 1 of the terminal block will remain uncontrolled.**

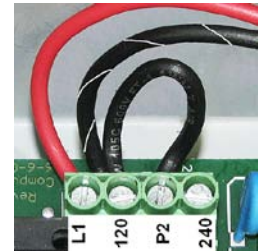
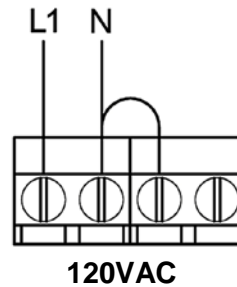




## 3-Phase

1. The 3-phase transceiver circuit board is powered from Line 2 and Neutral. Line 2 **can not** exceed 120VAC to ground.
2. Power the transceiver as shown in the wiring diagram on page 24.

**NOTE:** *The 3-phase transceiver can be used in non 3-phase commercial applications. In these applications, Line 3 is not used.*



**NOTE:** *The 3-phase transceiver circuit board must be tapped for 120 VAC.*

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## SecureGround™ Ground Bond

**NOTE:** *This transceiver has SecureGround™ ground wire bond points. Use this procedure to connect line-voltage ground wires to the enclosure throughout this installation instruction.*

1. If used, connect ground wire to SecureGround™ screw by removing  $1\pm 1/8"$  (25.4 $\pm$ 3 mm) insulation from ground wire.

**NOTE:** *Anchor hole accepts 14 to 10 AWG solid conductor.*

2. Insert end of wire into SecureGround™ anchor hole. Hold wire firmly and bend it clockwise, 350° around screw shank.

**IMPORTANT:** *Make sure no insulation is between wire and screw head.*

3. Tighten screw securely.



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## Transceiver Relay Connections



**CAUTION:** Risk of fire. Can cause personal injury or death. Use only copper conductors that are rated at 75° C. minimum.

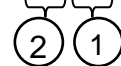
### 2-Pole (Optional)

1. If any transceiver relay(s) are NOT being used to control other loads, insulate the ends of the unused wires.
2. If the transceiver relay(s) are being used to control other loads, one leg of the circuit going to the controlled load will be broken through the relay.
3. To use controlled-load Relay #1, use the red relay wires, (1). To use controlled-load Relay #2, use the black relay wires, (2).

**NOTE:** *Refer to the Relay Operation section of the manual for more information.*

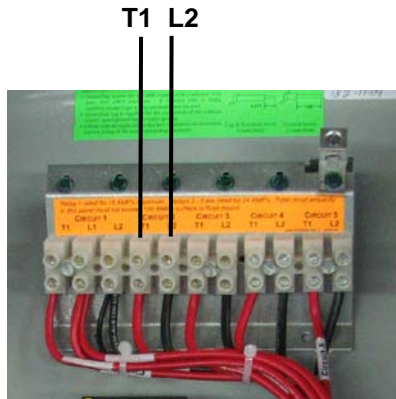


Transceivers with time clocks installed are not allowed to have external loads connected to the relays. Doing so is a violation of the Transceiver's UL Listing.



## 5-Pole

1. Controlled loads will be connected to the T1 and L2 terminals for the desired Circuit # as shown below.
2. Locate the red and black wires at the bottom of the transceiver, (1), for that Circuit # and route them to the service entrance panel. Connect these wires to an appropriate circuit breaker in the panel.



**NOTE:** Refer to the Relay Operation section of the manual for more information.

## 3-Phase

The relays on the 3-phase transceiver are unused. Do not connect loads to these relays.

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## Transmit/Receive Select Jumper

1. The transceiver can be used as a transmitter OR a receiver, dependent upon how the TR/RC jumper is positioned.
2. To use as a transmitter, place the select jumper is on the "TR" position as shown (jumper covers the left and center pins).
3. To use as a receiver, place the select jumper to the "RC" position (jumper covers the center and right pins).

**NOTE:** The 3-phase transceiver can only be used as a transmitting device.



# TRANSMIT MODE LOW VOLTAGE CONNECTIONS

## Low Voltage Terminal Strip

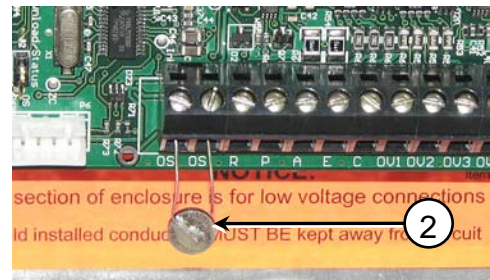
OS	Outdoor Sensor
OS	Outdoor Sensor
R	Low Voltage Hot
P	Peak Control
A	Anticipated Peak Control
E	Room Temperature Setback
C	Common
OV1	Override 1
OV2	Override 2
OV3	Override 4
OVC	Override Common
OVR	Override Hot
OVS	Override Switch



**NOTE:** Each terminal accepts 22-16 AWG wire.

1. Remove applicable knockout(s), (1), from bottom of enclosure in low-voltage connection area.
2. Connect the peak control wires to R and P.

**NOTE:** Outdoor transceivers have a factory-installed outdoor temperature sensor (thermistor), (2). If the transmitter is being installed in an area where an accurate outdoor temperature is not available, the thermistor should be removed and an outdoor temperature sensor (Order Item #1302044) should be installed.



3. If installing an outdoor temperature sensor, connect the outdoor temperature sensor to the two OS terminals. The outdoor sensor must be placed in a location where it can accurately sense outdoor temperature and is not affected by direct sunlight or other abnormal temperature conditions.

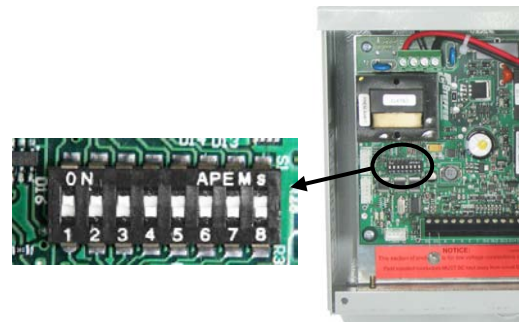
**NOTE:** If necessary, the outdoor sensor can be extended to a total of 250 ft. No other loads can be controlled or supplied through this cable. It is for connection of the outdoor sensor ONLY.



## DIP SWITCH SETTINGS

### Factory Defaults

DIP Switch #	Setting
1	ON
2	ON
3	ON
4	OFF
5	OFF
6	OFF
7	OFF
8	OFF



# TRANSMIT MODE DIP SWITCH SETTINGS

## DIP Switch #1 – Invert Peak

The transceiver receives a signal, (i.e. switch closure), related to on-peak or off-peak from the power company or other signaling device. The signal may be a switch “open-to-charge” or “close-to-charge” signal. The transceiver must be set to match the signaling device. If unsure whether or not the signaling device opens or closes for charging, contact the power company.

**ON = Close to Charge (Off-peak), Open for Control (Peak)**

**OFF = Open for Charge (Off-peak), Close for Control (Peak)**

## DIP Switches #2, 3, 4, 5 – Channel Selection

DIP switches 2, 3, 4, and 5 are used to select the channel on which the transceiver will transmit (send signal). There are 15 channels available. Only one transceiver is required per distribution transformer. If multiple transceivers in the transmit mode are installed on a single distribution transformer, they must be set to different channels. Select a channel and set DIP switches 2-5 according to the chart below:

Channel	DIP Switch 2	DIP Switch 3	DIP Switch 4	DIP Switch 5	Channel Speed*	Transmit Option**
1	On	Off	Off	Off	Slow	Constant
2	Off	On	Off	Off	Slow	Intermittent
3	<b>On</b>	<b>On</b>	<b>Off</b>	<b>Off</b>	<b>Fast</b>	<b>Constant</b>
4	Off	Off	On	Off	Fast	Constant
5	On	Off	On	Off	Fast	Constant
6	Off	On	On	Off	Fast	Intermittent
7	On	On	On	Off	Fast	Constant
8	Off	Off	Off	On	Fast	Intermittent
9	On	Off	Off	On	Fast	Constant
10	Off	On	Off	On	Fast	Constant
11	On	On	Off	On	Fast	Constant
12	Off	Off	On	On	Slow	Constant
13	On	Off	On	On	Slow	Constant
14	Off	On	On	On	Slow	Constant
15	On	On	On	On	Slow	Constant

\* Steffes 1000 and 2000 Series room heating units receive only on “slow” speed channels (Channels 1 or 2 as set from the factory or on channels 12/13 or 14/15 with a software upgrade). Slow channels transmit a signal every 3-4 minutes, so can take up to 7-10 minutes for a receiver to receive. Fast channels transmit every minute, so it generally only takes 2-3 minutes to receive.

\*\* The Steffes transceiver transmits a signal over the power lines constantly unless set to one of the intermittent transmit channels shown above. If the power company’s control device is power line carrier (PLC) such as those manufactured by Cooper Power System/Cannon Technologies, the transceiver must transmit intermittently to allow the power company’s control device to operate properly. When set to transmit intermittently, the Steffes Heating systems will display a lower-than-normal percentage of good packets received.

## DIP Switch #6 – Service Override & Automatic Shoulder Charge

DIP switch #6 has two functions. The first function is to provide a short term peak override for checkout and service of the system. If the transceiver is powered up and DIP switch #6 is moved from the “off” position to the “on” position and back to “off” again, a 3 hour override will be enabled. This short term override is to be used when installing or servicing the system.

The second function of DIP switch #6 is to allow for an automatic shoulder charge period for devices controlled by the relays on the transceiver. When in the “on” position, the transceiver has a built in timer that starts timing when it receives a peak signal from the power company’s control device. It times for 5 hours and then allows a shoulder charge period (anticipated peak) for 4 hours. After four hours of shoulder charge, the peak period is resumed until a charge signal is received from the control device. More information regarding this feature is available in the Relay Operation section of this manual.



## **DIP Switch #7 – Negative Outdoor Temperature Calibration**

DIP switch #7 is used to adjust the outdoor temperature reading being transmitted to the Steffes receivers by 5° F (2.78° C) lower than the actual outdoor temperature. This DIP switch is only used if the heating system is reading an outdoor temperature higher than the actual outdoor temperature.

## **DIP Switch #8 – Positive Outdoor Temperature Calibration**

DIP switch #8 is used to adjust the outdoor temperature reading being transmitted to the Steffes receivers by 5° F (2.78° C) higher than the actual outdoor temperature. This DIP switch is only used if the heating system is reading an outdoor temperature lower than the actual outdoor temperature.

## **RECEIVE MODE DIP SWITCH SETTINGS**

### **DIP Switch #1 – Anticipated Peak (Pre-Peak) Operation Mode**

This DIP switch determines how an anticipated peak (pre-peak) signal will affect the relays. For power companies desiring to control loads separately using separate signals, this DIP switch can be used to do peak control of devices on a separate rate strategy. Generally, anticipated-peak signals are not used and this DIP switch should be placed in the "OFF" position.

**ON = Relays will be activated by an anticipated peak (pre-peak) signal.**

**OFF = Relays will NOT respond to an anticipated peak (pre-peak) signal.**

### **DIP Switches #2, 3, 4, 5 – Channel Selection**

DIP switches 2, 3, 4, and 5 are used to select the channel on which the receiver will receive. The receiver and the transmitting device **MUST** be set to the same channel for proper communication to occur. To select the desired channel, use the chart on page 14 and set DIP switches 2, 3, 4, and 5 accordingly.

### **DIP Switch #6 – Automatic Shoulder Charge (Specialty Applications Only)**

DIP switch #6 is to allow for an automatic shoulder charge period for devices controlled by the relays on the transceiver. When in the "on" position, the transceiver has a built in timer that starts timing when it receives a peak signal from the power company's control device. It times for 5 hours and then allows a shoulder charge period (anticipated peak) for 4 hours. After four hours of shoulder charge, the peak period is resumed until an off-peak or anticipated peak signal is received from the control device.

To enable the shoulder charge timers, turn DIP switch #6 to the ON position.

**ON = Shoulder Charge Enabled**

**OFF = Shoulder Charge Disabled**

### **DIP Switch #7 – Default Relay Status**

DIP switch #7 determines how the relays will respond when the power line carrier control system is first energized or if the receiver loses signal from the transmitting device.

**ON = The relays will close until a signal is received from the transmitting device.**

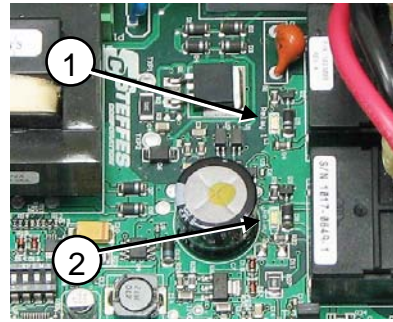
**OFF = The relays will open until a signal is received from the transmitting device.**

### **DIP Switch #8 – Currently Not Utilized**

# LED FUNCTIONS

## LED 1 and 2

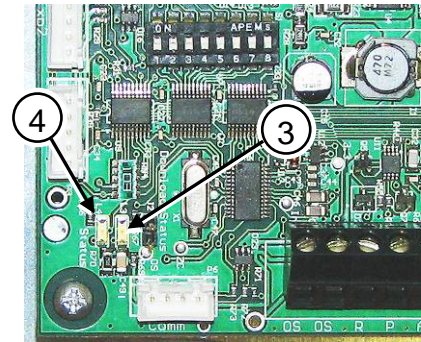
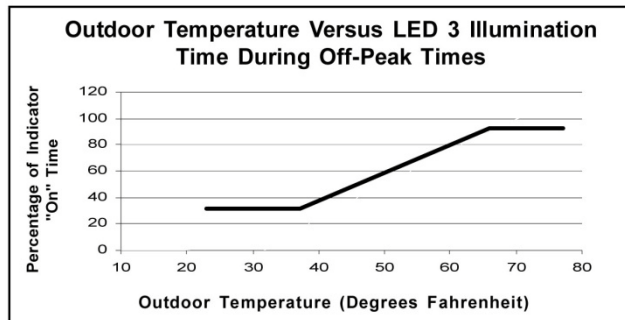
The relays on the transceiver have LED's. On the 2-pole transceiver, these are marked Relay 1, (1), and Relay 2, (2). When the corresponding LED is on, the relay is energized and should be closed. When the corresponding LED is off, the relay is not energized and should be open.



## LED 3

When set up as a **transmitter**, LED 3, (3), blinks OFF and ON in 4 second intervals with a percentage of ON time as based on the outdoor temperature. The graph below illustrates the percent of time the LED is ON at various temperatures.

The warmer the outside temperature, the longer the LED stays ON. At 65° F or warmer, the LED is ON solid.



When the operation mode is **receiver**, LED 3 indicates when the PLC signal reception is established from the transmitting device. It blinks OFF-and-ON slowly then increasingly faster until it is ON solid. ON solid indicates that PLC reception is "locked in".

**NOTE: It can take 2-3 minutes for PLC signal reception when using a "fast" channel and 7-10 minutes when using a "slow" channel.**

## LED 4

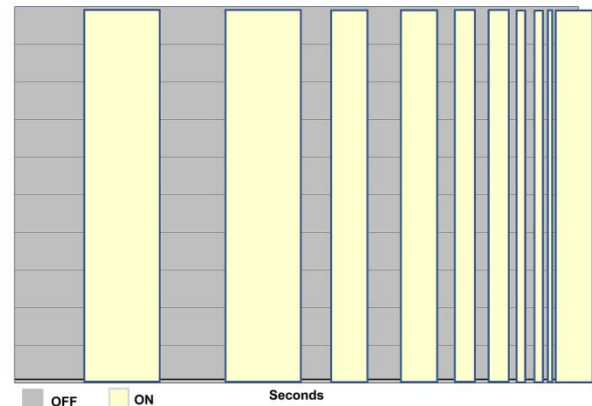
LED 4, (4), responds to the power company's control signal.

- OFF when receiving an off-peak signal
- ON solid if an override switch is enabled
- blinking OFF and ON according to the type of signal being received from the control device.

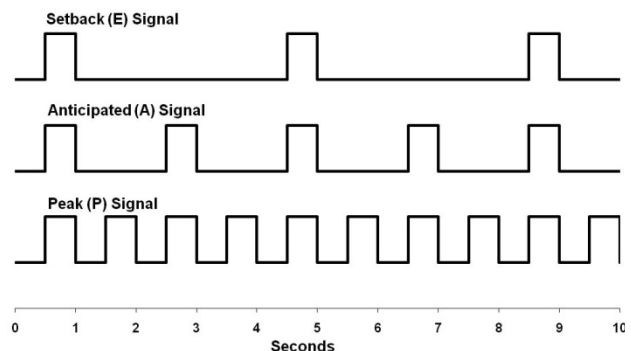
This graph illustrates the time, in seconds, the LED is OFF-and-ON during various types of signal periods.

**NOTE: Power company peak signal overrides anticipated-peak and/or setback signals.**

Receiver LED-L3 Operation



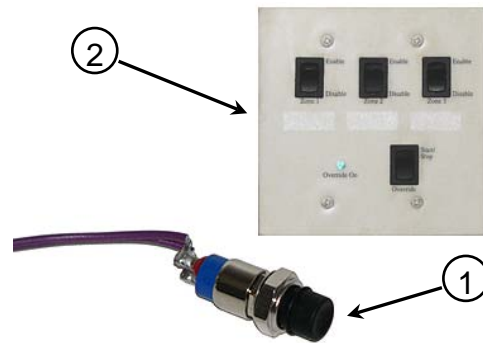
Transmitter & Receiver LED-L4 Blink Rate



# ELECTRONIC OVERRIDE MODULES (OPTIONAL)

The Steffes Override Modules are optional devices that allow the use of a normally controlled device, such as a water heater, during a peak control time (power company permitting). Either override timer will allow for an override of the relays. The override duration is 90 minutes (1.5 hours). It can be cancelled anytime during the cycle.

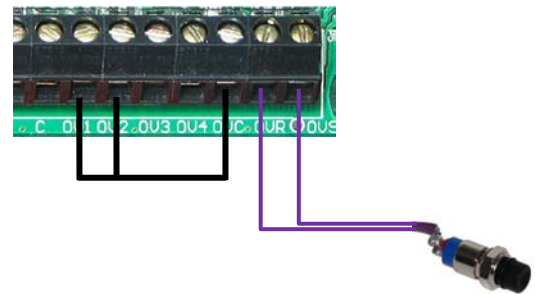
There are two electronic override controls available to use with the transceiver. The push-button override switch, (1), and the three zone override module, (2).



## PUSH-BUTTON OVERRIDE SWITCH

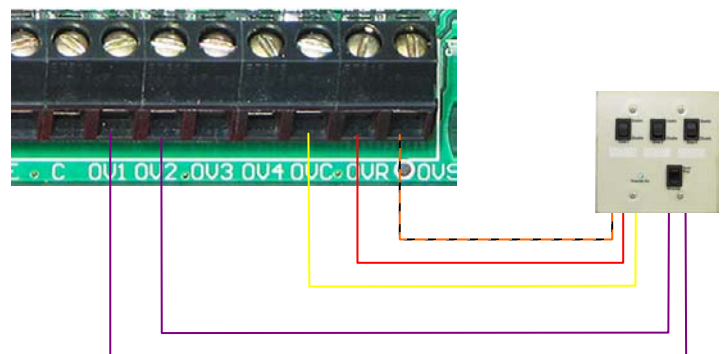
1. When using the push-button override switch, connect the two purple override wires to the OVR and OVS terminals on the transceiver board's low voltage terminal block.
2. Connect a jumper wire from OVC to OV1 to override relay #1 and/or from OVC to OV2 to override relay #2.

**NOTE:** Refer to the Relay Operation section for more information on which relays will utilize the various override inputs.



## 3-ZONE OVERRIDE MODULE

1. Mount the module into a 2-gang box anywhere in the structure where it will be convenient for the user to access.
2. If using the 3-zone override module, remove applicable transceiver knockout(s) from the bottom of the enclosure below the low-voltage connection area.
3. Connect wires to low-voltage terminal circuit connection points to match circuit leads marked on override module circuit board (OVS to OVS, OVR to OVR, etc.). Tighten terminal screws securely.
4. The module contains five (5) low voltage wires: 3 purple, 1 yellow, 1 red, and 1 orange/black. Splice 18/6 low voltage wire to these wires and route them through the low voltage raceway compartment in the transceiver.
5. Using only line voltage rated wire inside the transceiver, connect the override to the low voltage terminal strip in the transceiver as follows:
  - ♦ Purple wires connect to OV1, OV2, OV3, or OV4 terminals
  - ♦ Red wire connects to OVR terminal
  - ♦ Orange/black wire connects to OVS terminal
  - ♦ Yellow wire connects to OVC terminal



**NOTE:** The OV1 terminal will control relays 1 and 5; OV2 controls relay 2; OV3 controls relay 3; and OV4 controls relay 4. Therefore, if wanting to override the loads connected to relays 1, 3, and 5 with one of the 3 buttons, connect the purple wire for that button from the override switch to OV1 on the transceiver board and jumper from OV1 to OV3.

6. Label each override zone on the module and in the relay panel (inside, on the front cover label).
7. Install the front cover on the transceiver and energize the system.

## Operating the 3-Zone Override Module

1. The module is marked with three separate zones: Zone 1, Zone 2 and Zone 3. These zones correspond to the relays in the transceiver. To enable the override module, press the Override Start/Stop rocker switch once. The green indicator “Override On” light will illuminate.
2. To activate the override of a zone, press the zone(s) rocker switch(es) to the “Enable” position.

**NOTE: Zone 1, 2 or all three can be enabled at the same time in any sequence. The light on the 3-Zone Override Module corresponds to LED4 in the Transceiver.**

3. To deactivate the override of a zone, press the zone(s) rocker switch(es) to the “Disable” position. The override period can be cancelled by pressing the Override Start/Stop rocker switch again.

## Testing the 3-Zone Override Module

1. Initiate a peak mode. Check voltage between T1 and L2 positions of the main wiring terminal block on those circuits connected to the override. There should be no voltage present on any of the circuits.
2. Activate the override by pressing the Start/Stop rocker switch once. Press the rocker switch for Zone 1 to the “Enable” position.
3. Test voltage between T1 and L2 positions of the main wiring terminal block on those circuits connected to Zone 1 Override. There should be a voltage reading. Press Zone 1 rocker switch to the “Disable” position.
4. Follow steps 1-3 to test voltages of those circuits connected to Zone 2 and Zone 3 of the override as well.

# RELAY OPERATION

**Transceiver Relay Operation**  
(Applicable to Controls with Factory Default Settings)

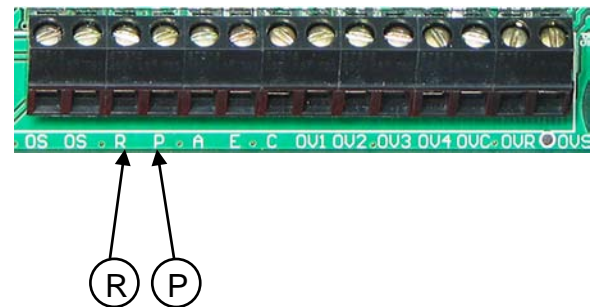
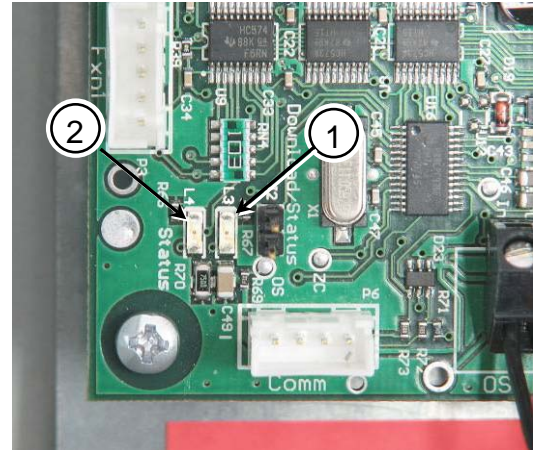
Circuit Board	Relay	Response to Input Signal								
		Low Voltage Inputs				DIP Switch #6 Input (ON position)	Override Module Inputs			
		P	A	C	E	Shoulder Charge	OV1	OV2	OV3	OV4
Main Board	Relay 1	Open	Closed	Closed	Closed	Closed	Closed	Open	Open	Open
	Relay 2	Open	Closed	Closed	Closed	Open	Open	Closed	Open	Open
Expansion Board #1	Relay 3	Open	Closed	Closed	Closed	Closed	Open	Open	Closed	Open
	Relay 4	Open	Closed	Closed	Closed	Open	Open	Open	Open	Closed
	Relay 5	Open	Closed	Closed	Closed	Closed	Closed	Open	Open	Open



# CHECK OUT PROCEDURES

## CHECK OUT PROCEDURE FOR TRANSMIT MODE

1. Turn power on to the transceiver.
2. Look at LED-L3, (1). It should blink OFF-and-ON at a rate based on the outdoor temperature.
3. Look at LED-L4, (2). It may be:
  - OFF when receiving an off-peak signal
  - ON solid if an override switch is enabled
  - blinking OFF and ON according to the type of signal being received from the control device.
4. Simulate an off-peak period.
  - If DIP switch #1 is in the ON position, this can be done by placing a jumper wire across the R and P terminals.
  - If DIP switch #1 is in the OFF position, an open across R and P will simulate the off-peak period.
5. LED-L4 should be OFF and the relay LED's should all be ON.
6. Make sure PLC signal is received by each controlled device: transceiver receiver, Steffes Heating Systems Electric Thermal Storage (ETS) heater, receivers, and all other controlled loads.
7. Simulate a peak period.
  - If DIP switch #1 is in the OFF position, this can be done by placing a jumper wire across the R and P terminals.
  - If DIP switch #1 is in the ON position, an open across R and P will simulate the peak period.
  - Look at the relay LED's. They should all be OFF.
8. Look at LED-L4. It should be blinking at the peak rate as shown for Peak (P) Signal.
9. Make sure PLC signal is received by each controlled device: transceiver receiver, Steffes Heating Systems Electric Thermal Storage (ETS) heater, receivers, and all other controlled loads to ensure that these loads turn off.



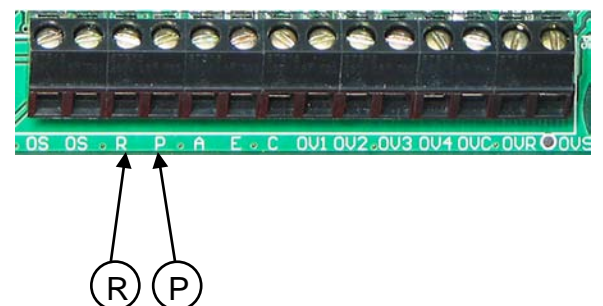
### When checkout is complete, make sure:

- DIP switches are all set to the proper position
- jumper wire has been removed
- low voltage connections have been reconnected
- all wiring connections are tight

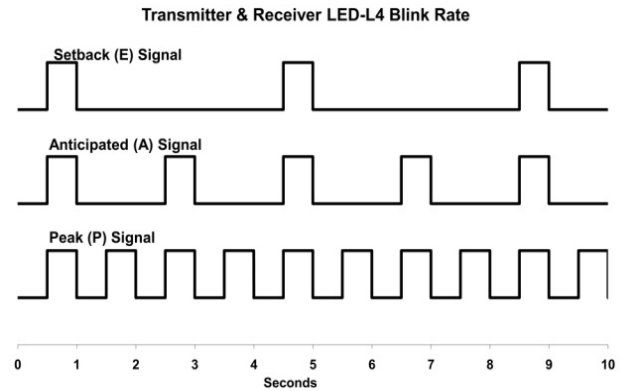
## CHECK OUT PROCEDURE FOR RECEIVE MODE

1. Turn power on to the transceiver.
2. Look at LED-L3. It should blink OFF-and-ON slowly then increasingly faster until it locks ON indicating it has received PLC signal from the transmitter.

**NOTE:** *It can take 2-3 minutes for PLC signal reception when using a "fast" channel and 7-10 minutes when using a "slow" channel.*



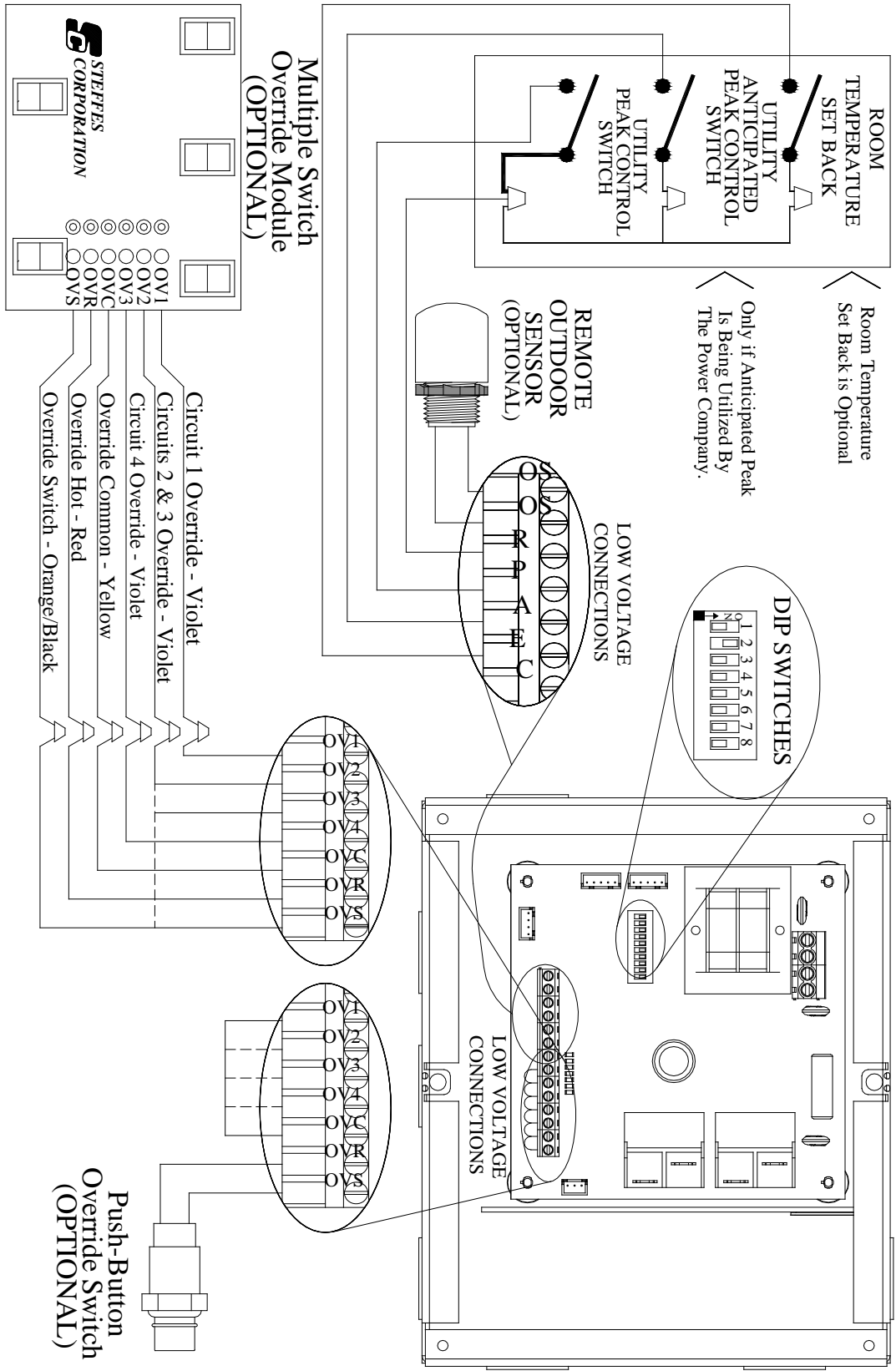
3. Look at LED-L4, (2). It may be:
  - OFF when receiving an off-peak signal
  - ON solid if an override switch is enabled
  - blinking OFF and ON according to the type of signal being received from the control device.
4. Simulate an off-peak period at the transmitting device.
  - If DIP switch #1 is in the ON position at the transmitting device, this can be done by placing a jumper wire across the R and P terminals.
  - If DIP switch #1 is in the OFF position at the transmitting device, an open across R and P will simulate the off-peak period.
5. LED 4 should be OFF.
6. The relay LED's should all be ON.
7. Go to each controlled load (appliance) and make sure it is operating.
8. Simulate a peak period at the transmitting device.
  - If DIP switch #1 is in the OFF position at the transmitting device, this can be done by placing a jumper wire across the R and P terminals.
  - If DIP switch #1 is in the ON position at the transmitting device, an open across R and P will simulate the peak period.
9. Look at the relay LED's. They should all be off.
10. Look at LED-L4. It should be blinking at the peak rate as shown.
11. If one of the optional overrides has been installed, verify proper operation of the override device.



**When checkout is complete, make sure:**

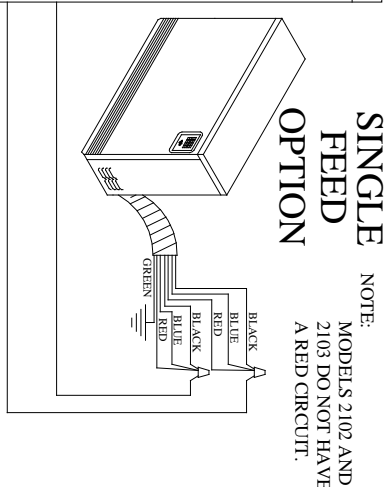
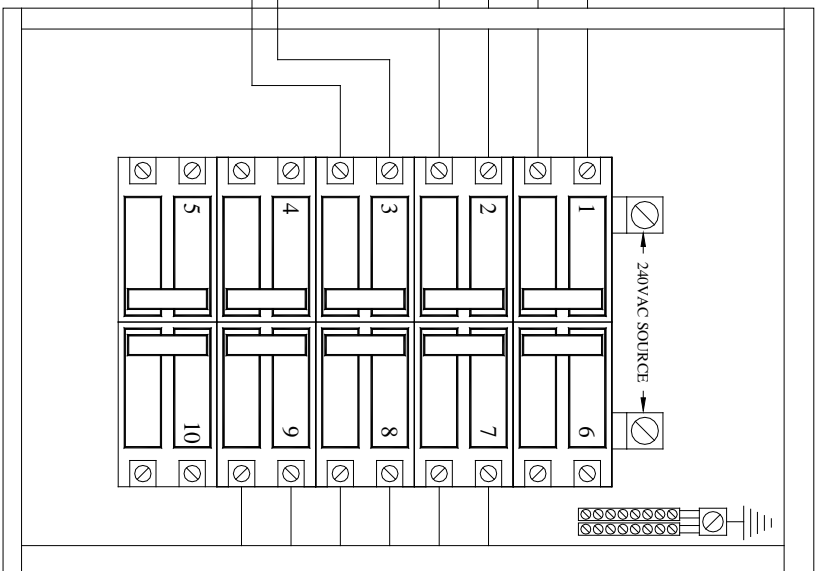
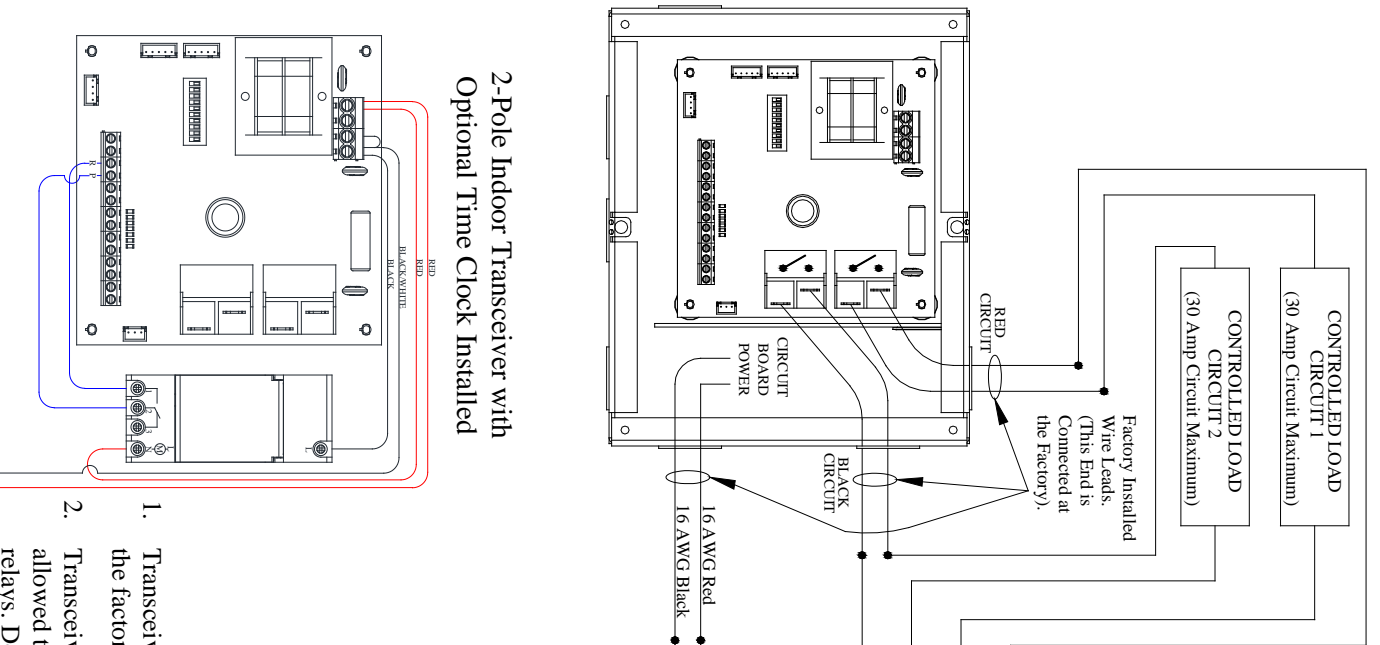
- **DIP switches are all set to the proper position**
- **jumper wire has been removed from the transmitting device**
- **all wiring connections are tight**

# LOW VOLTAGE WIRING DIAGRAM

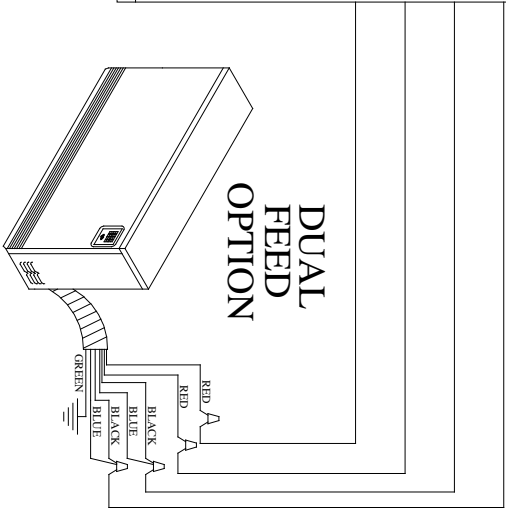


# LINE VOLTAGE WIRING DIAGRAM – 2 POLE

## GROUNDING AND BONDING NOT SHOWN



NOTE:  
 MODELS 2102 AND 2103 DO NOT HAVE A RED CIRCUIT.

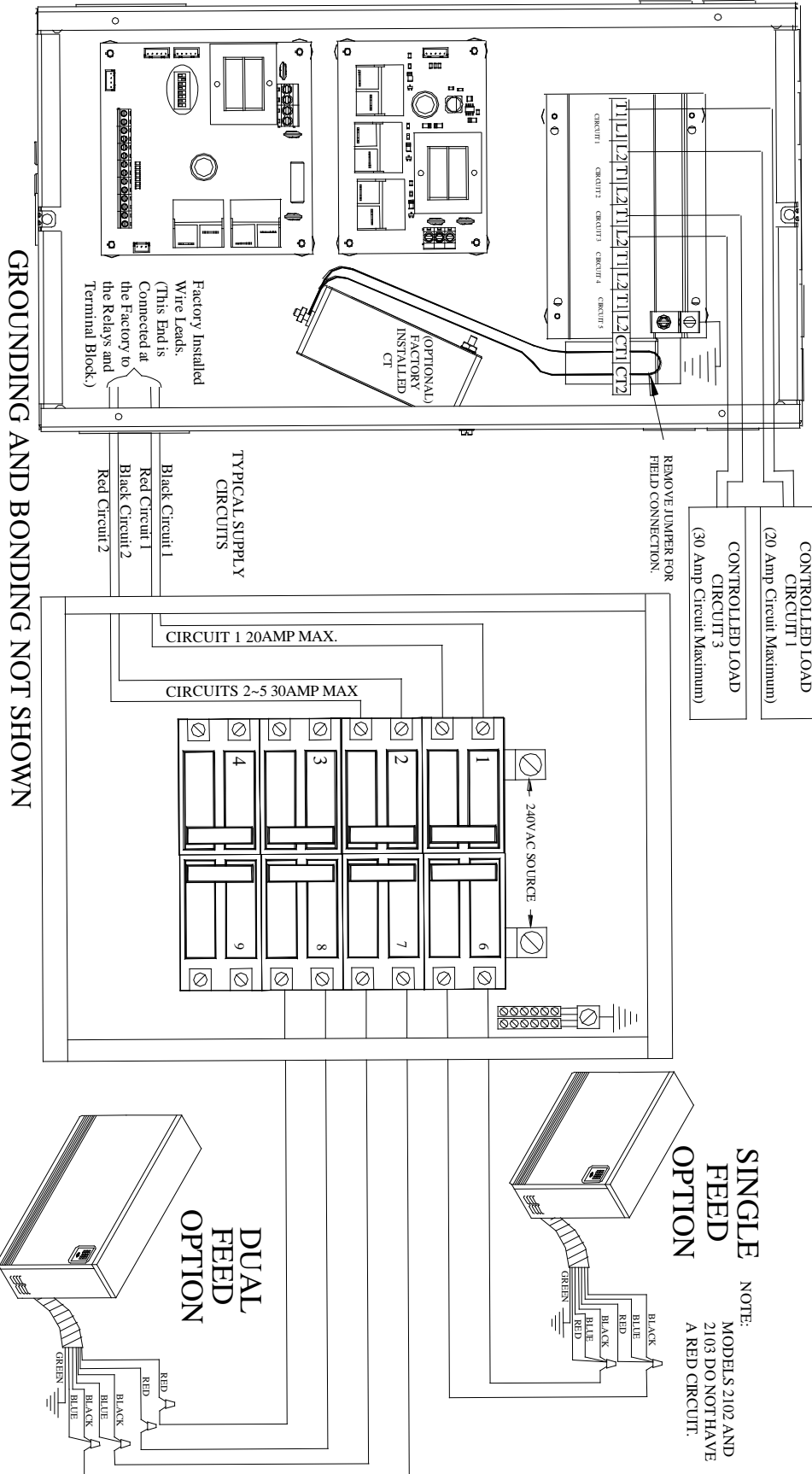


### 2-Pole Indoor Transceiver with Optional Time Clock Installed

1. Transceiver with time clock must be ordered from the factory. Time clock cannot be field installed.
2. Transceivers with time clocks installed are not allowed to have external loads connected to the relays. Doing so is a violation of the Transceiver's UL Listing.



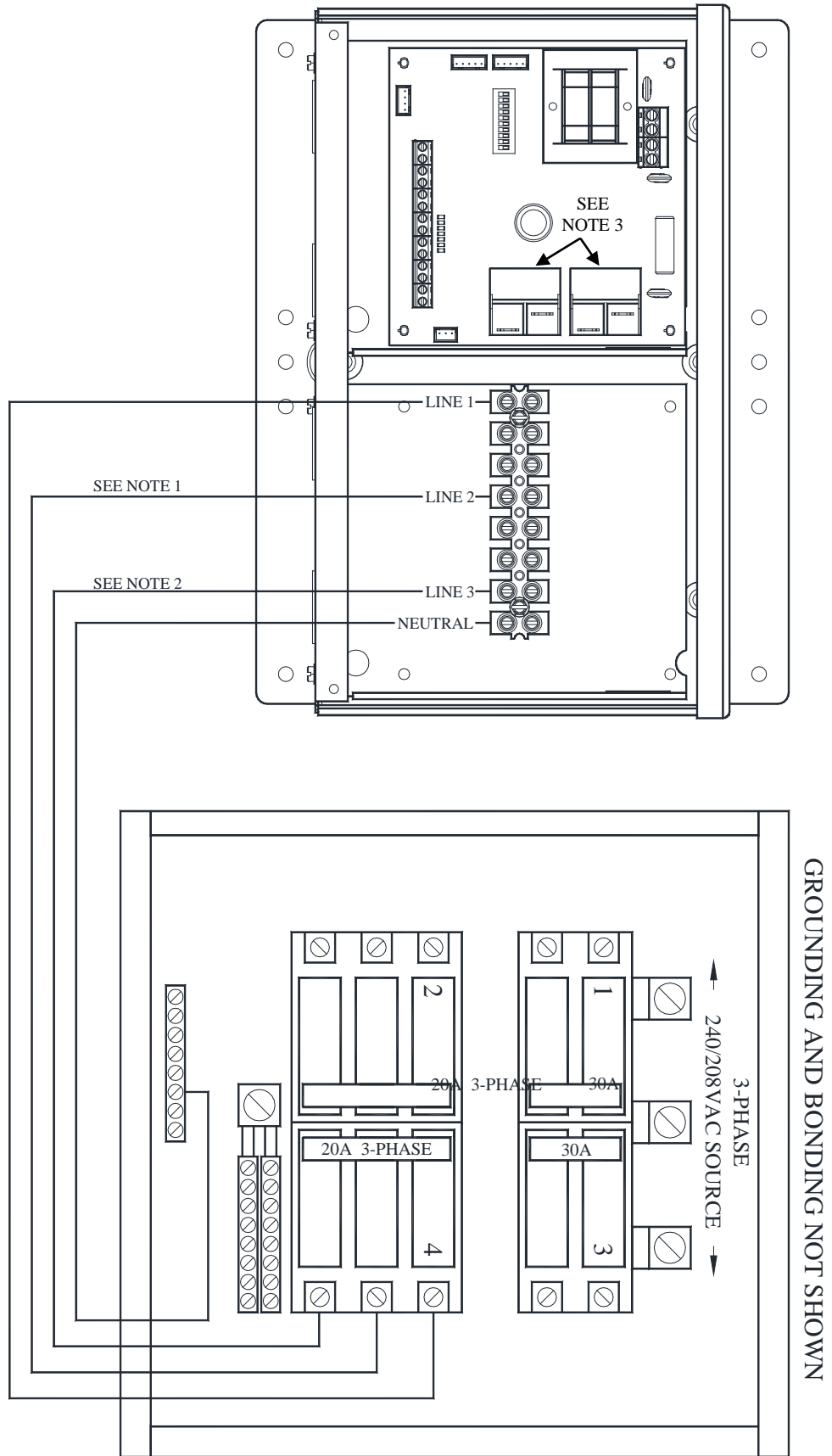
# LINE VOLTAGE WIRING DIAGRAM – 5 POLE



GROUNDING AND BONDING NOT SHOWN

# LINE VOLTAGE WIRING DIAGRAM – 3 PHASE

- NOTES:**
1. Not to Exceed 120 Volts to Ground
  2. Not Used in Single Phase High Power Installation
  3. Not Used





# WARRANTY

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Steffes Corporation (“Steffes”) warrants that the Steffes Control is free from defects in materials and workmanship under normal use and service. Steffes’ obligation under this Warranty is limited to the repair or replacement of the appliance or parts only which prove to be defective under normal use within **three (3) years** of the date of purchase, limited to **five (5) years** from the date of manufacture, and which Steffes’ examination of the returned device or part(s) shall verify to Steffes’ satisfaction that it is defective. The user shall be responsible for any labor costs associated with the repair or replacement of the device or part(s) including the cost of returning the defective appliance or part(s) to Steffes Corporation.

This Warranty is void if the device is moved from the premises in which it was originally installed. This Warranty shall not apply to a device or part which has been altered in any respect, or improperly installed, serviced or used, or has been subject to accident, negligence, abuse or misuse.

**THE ABOVE WARRANTY BY STEFFES IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN OR ORAL, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE.**

The user assumes all risk and liability whatsoever resulting from the use of this device. In no event shall Steffes be liable for any indirect, special or consequential damages or lost profits.

This Limited Warranty contains the complete and exclusive statement of Steffes’ obligations with respect to this device and any parts thereof. The provisions hereof may not be modified in any respect except in writing signed by a duly authorized officer of Steffes.



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