

# ***STEFFES***

## **Heating Systems**

# ***MASTER PLC CONTROL MODULE INSTALLATION INSTRUCTIONS***

**For Heater Software Version 2.08 or greater**



***For Use in 2100 Series  
Room Heating Systems***

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***THIS PROCEDURE MUST BE PERFORMED BY A QUALIFIED TECHNICIAN***

## THEORY OF OPERATION

The Master PLC Control Module (*Item # 1301018*) provides whole house control through power line carrier (PLC) transmission. The time clock module built into the Master PLC Control Module provides time of use signals to the PLC transmitting device on the module.

The Master PLC Control Module (referred to as “module”) is installed in the “master” heater and sends peak status and outdoor temperature information to the other “slave” heaters and/or Steffes receivers in the application, provided they are on the same power company distribution transformer as the module.

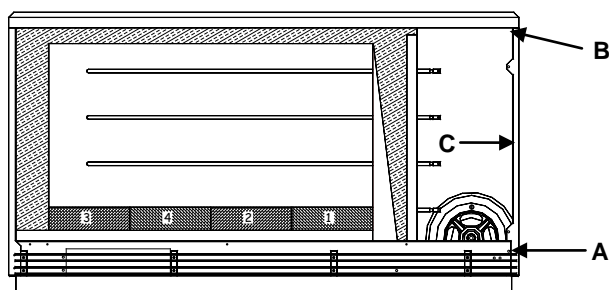
### NOTES:

1. **The 2100 Series heater in which the module is being installed MUST have software version 208 or later. To verify the software version, press and release the M button until the heater displays “HELP”. Then press the up arrow one time to find the software version (i.e. F208).**
2. **The 2100 Series heater in which the module is being installed MUST have Rev H or higher processor control board. To verify the board revision, look at the revision label on the back of the processor control board.**
3. **Programming of the Steffes heating systems (master and slave) is vital to operation.**
4. **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.**

## MASTER PLC CONTROL MODULE INSTALLATION

1. Disconnect power to all branch circuits of the master heater and remove the painted front panel.
2. Hinge the right side panel open by a) removing the screw located above the grill slats on the lower right side of the heater; b) loosening the screw located at the top right corner of the electrical compartment; and c) pushing out on the right side panel. Refer to Figures 1 and 2.
3. Unhinge the processor control board mounting bracket (with the board still attached) and set aside. Do not disconnect any wires.
4. Mount the module to the right side panel using the existing right side panel screw as shown in Figure 3.

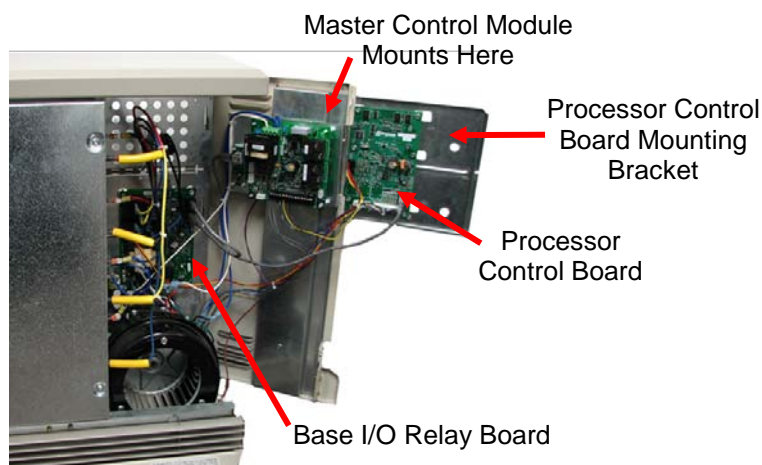
FIGURE 1



### WARNING

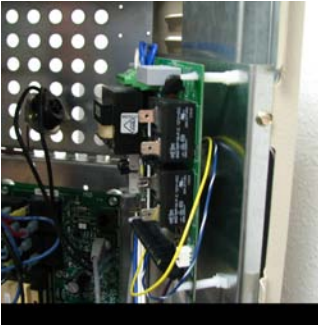
**HAZARDOUS VOLTAGE: Risk of electric shock. Can cause injury or death. System may be connected to more than one branch circuit. Disconnect power to all circuits before servicing. Equipment must be installed and serviced by a qualified technician.**

FIGURE 2

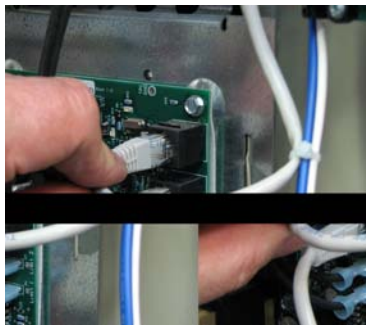


5. Connect the RJ45 interface cable from the module to the “Expansion” port on the base I/O relay board at the back of the heater as shown in Figure 4.

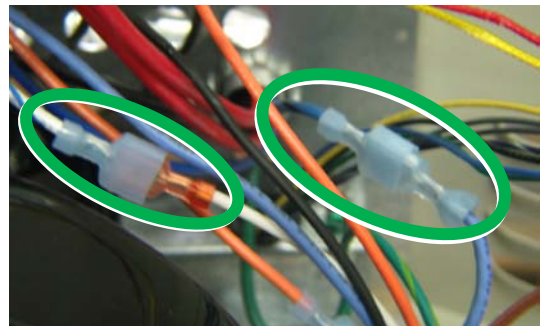
**FIGURE 3**



**FIGURE 4**



**FIGURE 5**



6. Locate the connection points of the white/blue to white wire and the blue/black to blue wires as shown in Figure 5. Disconnect both of these connections.

- Connect the white wires from the module to the white/blue wire and the white wire. (See Figure 6.)
- Connect the blue wires from the module to the blue/black wire and the blue wire. (See Figure 6.)

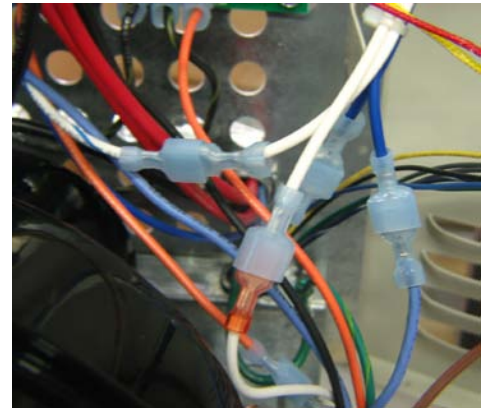
7. Attach the 9-position harness from the module to the processor control board as shown in Figure 7.

8. Locate the two gray wires from the 15-pin wiring harness attached to the processor control board.

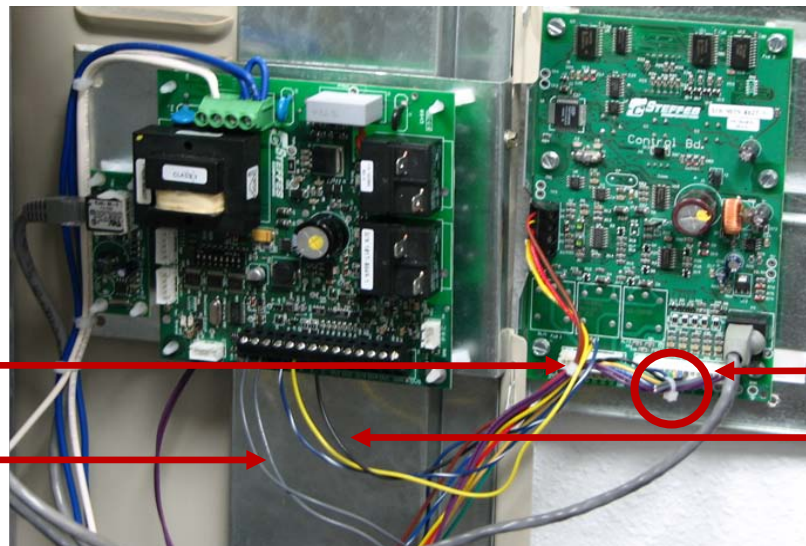
- a. Cut and insulate the gray wires approximately 1-1.5 inches from where they connect to the processor control board. (See Figure 7.)
- b. Connect the gray wires (coming from the low voltage raceway) to the two “OS” terminals on the low voltage terminal strip of the module as shown in Figure 7.
- c. The other end of these wires (taped off in the low voltage raceway) will be connected to the outdoor sensor later.

9. Locate the black wire from the 15-pin wiring harness attached to the processor control board. Connect the black wire to the “C” terminal on the low voltage terminal strip of the module as shown in Figure 7. The black wire now routes from “C” on the module to the 15-pin harness on the processor control board.

**FIGURE 6**



**FIGURE 7**



Route the 9-pin harness from the module to the processor control board.

Route the two gray wires from the low voltage raceway at the back of the heater to the “OS” terminals on the module board.

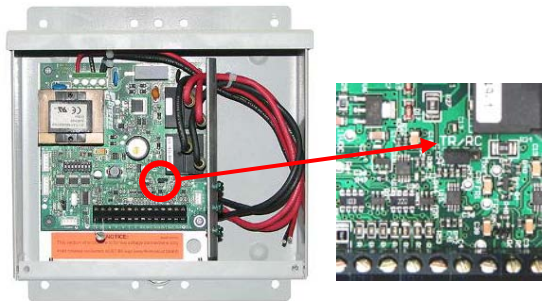
Cut and insulate the two gray wires.

Cut black wire and connect to the “C” terminal.

# MASTER PLC CONTROL MODULE SETUP

1. The module must be set up to transmit information. Make sure the select jumper is on the "TR" position as shown in Figure 8 (jumper covers the left and center pins).
2. Set the DIP switches (Figure 9) for the installation:

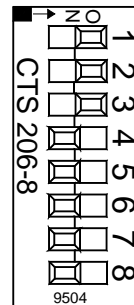
**FIGURE 8**



**FIGURE 9**

## Dip Switches

Note Direction of Dip Switch for "ON" Position versus "OFF" Position. DIP Switches 1, 2, and 3 are "ON" in this Diagram.



## DIP Switch #1 – Invert Peak

DIP Switch #1 **MUST** be in the ON position when utilizing the module.

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

DIP switches 2, 3, 4, and 5 are used to select the channel on which the module will transmit. There are 15 channels available. Only one module is required per distribution transformer. If multiple modules are installed on a single distribution transformer, they must be set to different channels. Select a channel by using DIP switches 2-5 as shown 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 module 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

DIP switch #6 can be used to provide a short term peak override for checkout and service of the system. If the module 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 and only occurs one time.

## 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.

# LED OPERATION

## LED 1 and 2

Not utilized in the module as the relays are not used. These LED's will illuminate during the "C" (charge) and "A" (anticipated peak) times.

## LED 3

LED 3, (3), blinks OFF and ON in 4 second intervals with a percentage of ON time as based on the outdoor temperature. The Figure 11 illustrates the percent of time the LED is ON at various temperatures.

The warmer the outside temperature, the longer the LED stays ON.



***It can take 1-2 minutes for PLC signal reception when using a "fast" channel and 7-10 minutes when using a "slow" channel.***

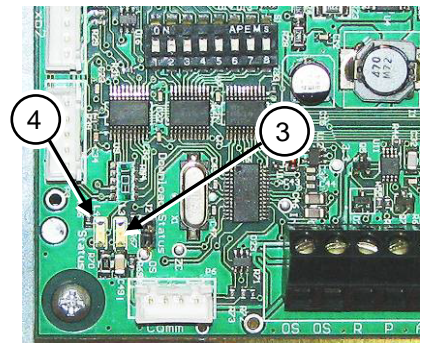


FIGURE 10

## LED 4

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

- OFF when receiving an off-peak signal (charge)
- Blinking OFF and ON according to the type of signal being received from the control device

Figure 12 illustrates the time, in seconds, the LED is OFF-and-ON during various types of signal periods.

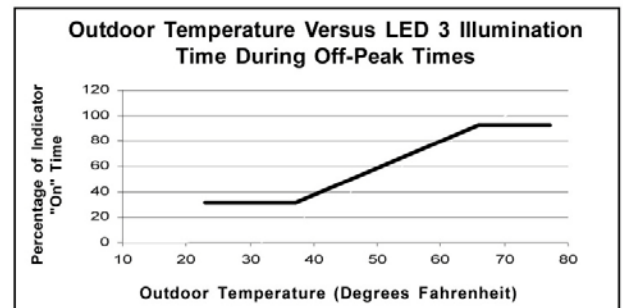
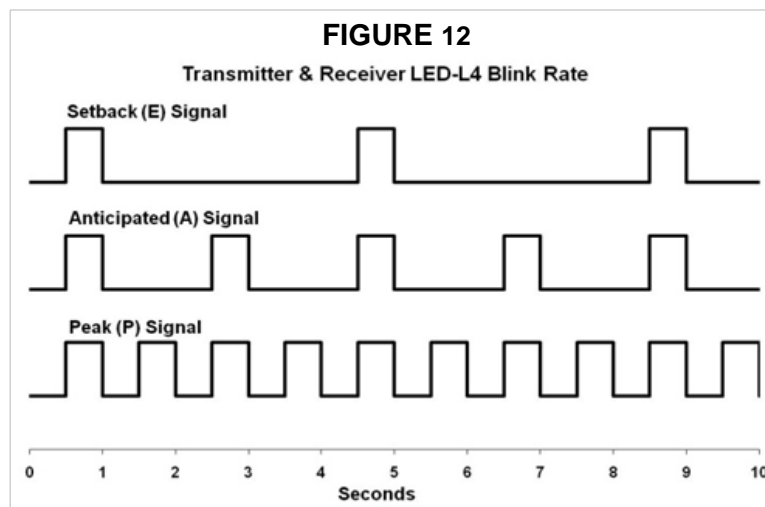


FIGURE 11



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



# OUTDOOR SENSOR INSTALLATION

## PLACEMENT & MOUNTING

The outdoor temperature sensor must be placed in a location where it can accurately sense the outdoor temperature and will not be affected by direct sunlight or other sources of heat or cold. Mount the sensor using the enclosed bracket or by screwing it into an enclosure with a 1/2" threaded knockout, making sure the sensor is located outside the enclosure.

## LOW VOLTAGE WIRING



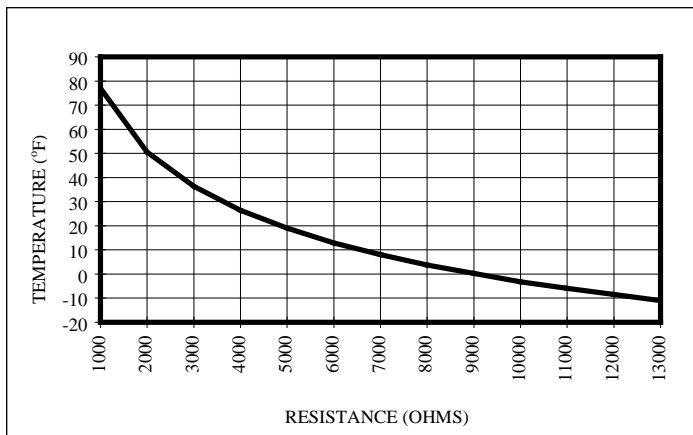
**NEVER install wiring in the line voltage electrical compartment unless it is rated for line voltage.**

1. Route the low voltage wire from the outdoor sensor to the low voltage raceway of the heater. If needed, Class II (thermostat) wire can be used as extension wire provided it does not enter the line voltage electrical compartment.
  - The opening in the structure through which the wire is routed **MUST** be sealed. Failure to do so may affect the accuracy of the sensor.
  - Always segregate low voltage wiring from line voltage wiring.
  - Ground the shield in the low voltage wire.
2. With an ohm meter, check resistance across the outdoor sensor wires. Use the Temperature Sensor Resistance Graph (Figure 13) to verify that the ohm value of the sensor is appropriate for the current outdoor temperature. Check to ensure that each wire is open to ground as well.
3. Locate the two gray wires in the low voltage raceway at the back of the heater. Connect the outdoor sensor wires to these two gray wires (See Figure 14). Ensure the remaining wires are secured and the ends are insulated so they cannot short to ground or to each other.

**FIGURE 13**

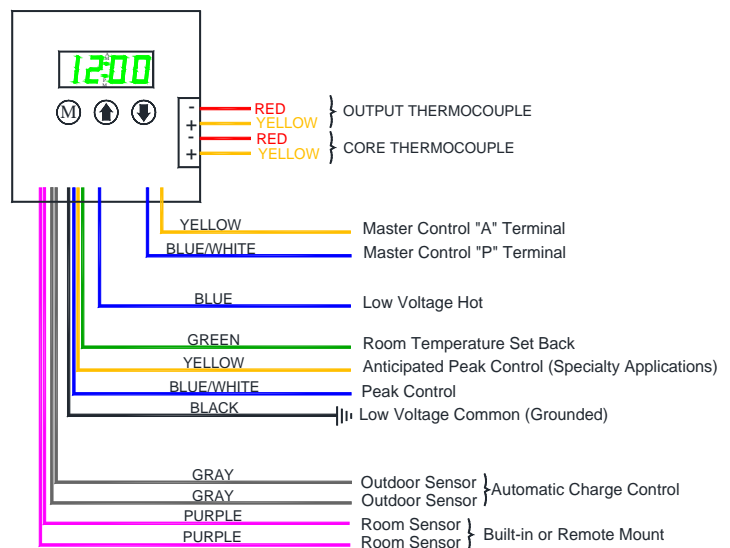
### Temperature Sensor Resistance Graph For Outdoor and Room Temperature Sensors

The ohm value must be within  $\pm 10\%$  at the respective temperature in the graph.



**FIGURE 14**

### 2100 Series Low Voltage Wiring Diagram



## HEATER SETUP

1. Energize the system.



***To complete the system set up, location 98 (L098) value in the system MUST be changed as follows. During the first few minutes of operation you may edit L001 through L099. If access to these locations is lost, you MUST power the system off and back on.***

2. Press and hold the **M** button. The faceplate should display "EdIt".
3. While holding the **M** button and with "EdIt" displayed on the faceplate, press and hold the up arrow button. Continue to hold both buttons simultaneously until "L000" is displayed.



***If the M button is released before "L000" is displayed, start over from Step 1.***

4. Release the buttons. The faceplate will flash between "L000" and the value in this location. The "L" indicates location and the last three numbers indicate the specific location number. (For example: Location 91 reads "L091".) Press the up arrow until L098 is reached.
5. After reaching L098, press and hold the **M** button. Use the up or down arrow buttons to change the value in the location as follows:

**Master System: L098 value = 23**

**Slave System: L098 value = 24**

6. Go to L029 and set accordingly:

2102	2103	2104	2105	2106
20	65	110	155	200

7. Release the **M** button. Press the down arrow button until "L000" is displayed. Then, press the down arrow button one more time. The normal display mode will be shown and changes made will be saved.

## SETTING THE CLOCK ON THE MASTER HEATER



***This menu can only be accessed within the first two (2) minutes of operation. After this time, entry into the Clock Menu is denied, unless the heater is powered off and back on again.***

1. Energize the heater or power the heater off and back on.
2. Press and release the "**M**" button until the faceplate displays "YeAr". Use the up and/or down arrows to set the year.
3. Press and release the "**M**" button until the faceplate displays "dAtE". Use the up and/or down arrows to set the month and day. Month is first and then the day.
4. Press and release the "**M**" button until the faceplate displays "CLOC". Use the up and/or down arrows to set the time of day. Time is displayed on a 12-hour clock with a flashing light to indicate a.m. or p.m. hours.



***The Master PLC Control module DOES NOT recognize daylight savings time.***

5. Press and release the "**M**" button until the faceplate displays "dAY". Use the up and/or down arrow to move to the correct day of the week.
6. Press and release the "**M**" button to return to normal operation.



***The clock's built-in power back-up is approximately 3 days; thus, it is not recommended to turn off the main power supply (breaker) feeding the heater. Doing so may cause the heater to lose its time and day settings. Refer to your Owner's Manual for directions to alternative methods in turning the heater off.***

## SYSTEM CHECKOUT

To make sure the heater is working properly, it is important to change the time to various times of day and make sure the heater responds accordingly. This should be done in addition to the normal checkout outlined in the Owners/Installers manual supplied with each 2100. The chart below indicates the times of day and how the heater should respond during each time interval.

	Winter*	Summer**	Duration
10pm to 7am	C	C	9 hrs
7-11am	P	A	4 hrs
11am-5pm	A	P	6 hrs
5pm-10pm	P	A	5 hrs

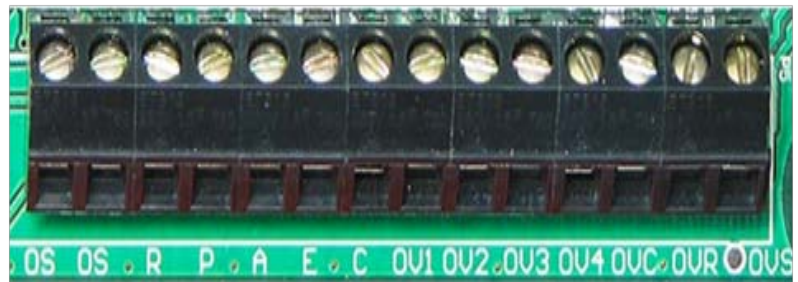
- ◆ Heater display shows C, P or A to the left of the room temperature
- ◆ \*Winter schedule is Nov 1 to April 30
- ◆ \*\*Summer schedule is May 1 to October 31
- ◆ On Weekends, the heater(s) should show "C"

1. Energize the heater.
2. Press and release the "M" button until the faceplate displays "CLOC". Use the up and/or down arrows to set the time of day. Time is displayed on a 12-hour clock with a flashing light to indicate a.m. or p.m. hours.
3. Set the time to a charge period such as 6:55 am. The display should show C and there should now be 10.5VDC from the "C" terminal to the P terminal (Figure 15). The P terminal is energized for Charge time because DIP switch #1 is ON.

**FIGURE 15**



***The clock menu "CLOC" can only be accessed within the first two (2) minutes of operation. After this time, entry into the Clock Menu is denied, unless the heater is powered off and back on again.***



4. The system should be set up to run on a fast PLC channel (3-11), so all other heaters in the application should switch to C in 1-2 minutes.
5. Set the time to 7:05 AM. This will tell the system to put the heaters in a P time. There should be 0 VDC from the "C" terminal to the P terminal (Figure 15). Within 1-2 minutes all of the other heaters should change to P and charging should stop.
6. Set the time to 11:05 AM, so the system will be in an A time. Check for 10.5VDC from the "C" terminal to P (Figure 15) and from the "C" terminal to A. Within 1-2 minutes, all of the other heaters should show A.
7. Set the CLOC to the proper time and make sure the heaters switch to the proper C, A, or P mode according to the current time of day.
8. Take the time needed to instruct the owner on how to operate the heater. Many service calls with new ETS systems are a result of owner confusion on equipment operation. The time spent in training greatly reduces the chance of a call back.

## Non-Ontario Province Installations

### HEATER SETUP

1. Energize the system.



***To complete the system set up, location values must be changed as per the table below. During the first few minutes of operation you may edit L001 through L099. If access to these locations is lost, you MUST power the system off and back on.***

2. Press and hold the **M** button. The faceplate should display “EdIt”.
3. While holding the **M** button and with “EdIt” displayed on the faceplate, press and hold the up arrow button. Continue to hold both buttons simultaneously until “L000” is displayed.



***If the M button is released before “L000” is displayed, start over from Step 1.***

4. Release the buttons. The faceplate will flash between “L000” and the value in this location. The “L” indicates location and the last three numbers indicate the specific location number. (For example: Location 91 reads “L091”.) Press the up arrow until the desired location is reached.
5. After reaching the desired location, press and hold the **M** button. Use the up or down arrow buttons to change the value as indicated.
6. Release the **M** button. Press the down arrow button until “L000” is displayed. Then, press the down arrow button one more time. The normal display mode will be shown and changes made will be saved.

#### Master Heater:

LOCATION #	
L020	<b>Set to channel selected on Master PLC Control Module</b>
L035	<b>Set to a value of 158</b>
L052	<b>Set to a value of 66</b>
L060	<b>Set to a value of 1</b>
L062	<b>Weekday Peak Time #1</b> – Specifies the time at which the <b>first</b> peak period is to begin during weekdays (Monday - Friday.) Value is set in military time.
L063	<b>Weekday Peak Time #1 Duration</b> – Sets the number of hours of the first weekday peak period set in configuration C014. (Value is specified in 15-minute intervals.)
L064	<b>Weekday Peak Time #2</b> – Specifies the time (military) at which the <b>second</b> peak period is to begin each weekday (Monday – Friday).
L065	<b>Weekday Peak Time #2 Duration</b> – Sets the number of hours of the second weekday peak period set in configuration C016. (Value is specified in 15-minute intervals.)
L068	<b>Weekend Peak Time #1</b> – Specifies the time at which the first peak period is to begin each weekend day (Saturday and Sunday). Value is set in military time.
L069	<b>Weekend Peak Time #1 Duration</b> – Sets the number of hours of the first weekend peak period set in configuration C018. (Value is specified in 15-minute intervals.)
L070	<b>Weekend Peak Time #2</b> – Specifies the time (military) at which the second peak period is to begin each weekend day (Saturday and Sunday).
L071	<b>Weekend Peak Time #2 Duration</b> – Sets the number of hours of the second weekend peak period set in configuration C020. (Value is specified in 15-minute intervals.)

**Slave Heater:** In order for the slave heaters to receive a signal from the master heater, L020 must be set to the same channel as the master heater.

## Non-Ontario Province Installations

### SETTING THE CLOCK ON THE MASTER HEATER



**This menu can only be accessed within the first two (2) minutes of operation. After this time, entry into the Configuration Menu is denied, unless the heater is powered off and back on again.**

1. Energize the heater or power the heater back off and back on.
2. Press and release the "M" button until the faceplate displays "CLOC". Use the up and/or down arrows to set the time of day. Time is displayed on a 12-hour clock with a flashing light to indicate a.m. or p.m. hours.



**The Master PLC Control module DOES NOT recognize daylight savings time.**

3. Press and release the "M" button until the faceplate displays "dAY". Use the up and/or down arrow to move to the correct day of the week.
4. Press and release the "M" button to return to normal operation.



**The clock's built-in power back-up is approximately 3 days; thus, it is not recommended to turn off the main power supply (breaker) feeding the heater. Doing so may cause the heater to lose its time and day settings. Refer to your Owner's Manual for directions to alternative methods in turning the heater off.**

### SYSTEM CHECK OUT

- \_\_\_\_ 1. Make sure the dip switch settings on the module are in the correct positions for the application. Remember, the desired PLC channel MUST be selected for communication to occur.
- \_\_\_\_ 2. Energize the heater. Verify that LED 4 corresponds with the utility peak signal of the current time.
- \_\_\_\_ 3. To verify that the module will switch peak times, change the current time to a peak control time. The master heater should indicate a "P" on the display and within 7 minutes the rest of the heaters in the application should show a "P" as well.
- \_\_\_\_ 4. Once confirmed, change the current time on the master heater to an off-peak time and verify that the display changes to a "C". Within 7 minutes the rest of the heaters in the application should show a "C" as well.
- \_\_\_\_ 5. Use the guidelines which follow to verify the module is communicating with all receivers in the application.



**Communication between the module and receiver occurs on a continuous basis. Upon energizing a system, there will be some delay in a receiver's response to the signal. It can take up to seven (7) minutes to establish initial communication when using a "SLOW" channel. Subsequent communication will occur more rapidly.**

### INTERFACING THE MODULE WITH THE STEFFES 2100 SERIES:



**The "Help Menu" on the heater is accessed through the faceplate on the front of the heater. Refer to the Owner's and Installer's Manual for operating instructions.**

Using the "Help Menu" on the heater's control panel:

- \_\_\_\_ 1. Compare the outdoor temperature information from the "Help Menu" to current outdoor temperature. If the temperature information in the help menu is substantially higher or lower than actual outdoor temperature, refer to DIP Switch Settings 7 and 8.
- \_\_\_\_ 2. Verify that the heater is operating on the same channel as the module. The 2100 Series heater is factory preset to operate on channel 3.
- \_\_\_\_ 3. Verify that power line carrier communication is occurring.