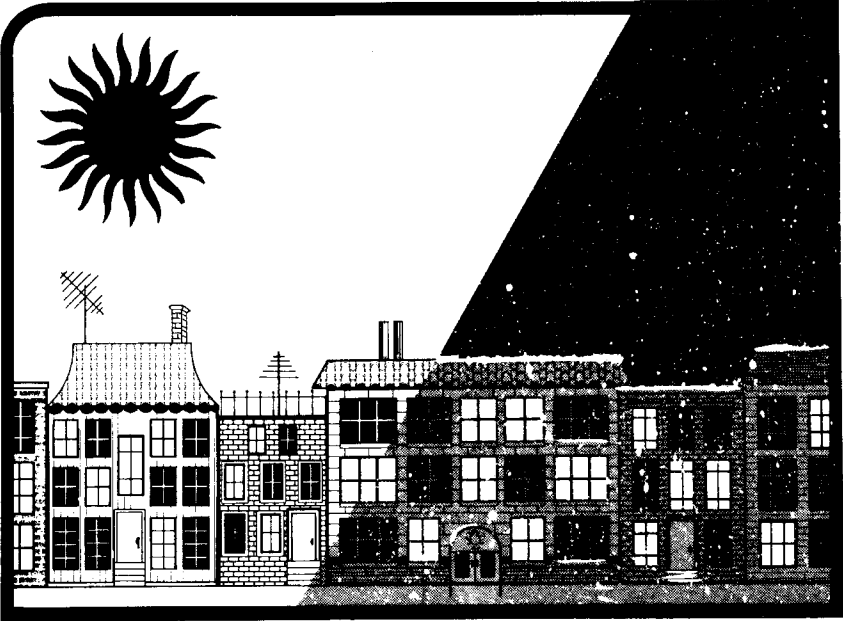


# OWNERS MANUAL



# ENERGY SENTRY<sup>®</sup>

## DEMAND CONTROLLER

Thank you for buying the Energy Sentry® Demand Controller. You will find it to be an effective tool in automatically controlling your electrical demand. How much you save on your electric bill each month will depend upon the power company's rate and the proper use of the Energy Sentry.

MAXIMUM SAVINGS will occur by keeping your controller's demand setting as low as possible.

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## **How Your Home Consumes Electricity**

At any one time, your home is using a certain amount of electricity. This usage is called your energy demand. A 100 w light bulb "demands" 100 watts of electricity when you turn it on. Your toaster may demand 1200 watts, or 1.2 kilowatts (1000 watts = 1 kilowatt). Your lights, refrigerator, water heater, household heat and any other appliances you use add up to your home's energy demand level.

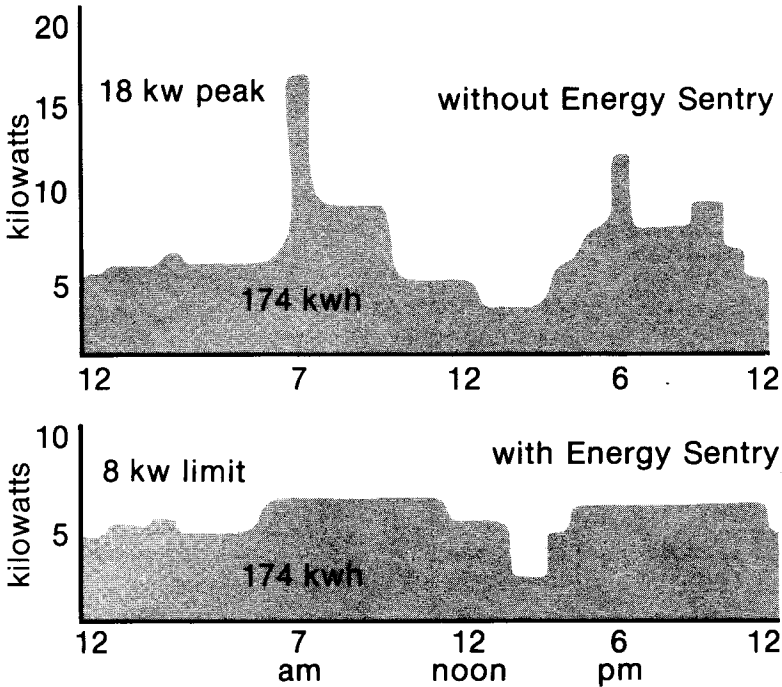
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## **Why Do Demand/Energy Rates Save You Money?**

Your power company is required to furnish enough electricity to satisfy the demand of the area it serves. If an area's demand increases beyond the power company's capacity to generate electricity, the power company must either buy power from some other company, or build new generating stations to supply more power of its own.

Both of these options cost money — money which is reflected in the rates you pay for electricity.

Most households have their maximum electricity use during 4 to 8 p.m. This high residential demand, multiplied by all the houses in the area, is what puts the squeeze on the power company's generators. If the power company can encourage enough people to cut back on their maximum demand it can limit the amount it must spend to meet an area's power requirements. The savings then can be passed on to consumers who are helping by reducing the maximum rate at which they use electricity.



The graphs above show identical power consumption over a one day period. The top graph shows a daily peak of 18 kw uncontrolled demand. The bottom graph is controlled to an 8 kw demand.

The Energy Sentry® Demand Controller automatically limits the peak electric power usage in your home. This is called demand limiting or load leveling. The Energy Sentry control system measures the total power being consumed and controls the demand (kw) to the limit you have set by temporarily switching loads off and on. The demand limit is adjusted to suit the seasonal needs for comfort and economy.

The system is comprised of the following:

**Control Unit**

consists of logic unit and power switching relays. The controller is mounted next to the main circuit breaker panel.

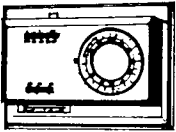

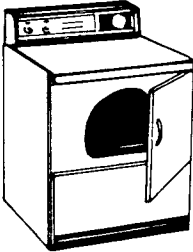
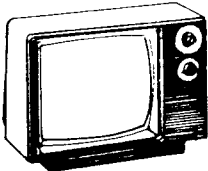
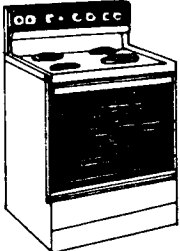
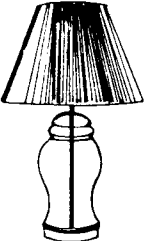
**Control Panel**

for setting the limit and to display the shedding status of loads. (The ESC Model does not have a remote control panel.)

**Current Transformers**

for measuring the total power being consumed. They are

mounted on the incoming power lines inside the breaker panel.

ENERGY SENTRY Manages	YOU Manage
 <p data-bbox="370 240 472 331">Heat Furnace A/C</p> <p data-bbox="217 558 352 584">Hot Water</p>   <p data-bbox="380 899 451 925">Dryer</p>	 <p data-bbox="703 396 894 422">TV/Appliances</p>  <p data-bbox="780 558 855 584">Stove</p> <p data-bbox="621 889 727 915">Lighting</p> 
<p data-bbox="263 1019 397 1068"><b>Controlled Loads</b></p>	<p data-bbox="663 1019 834 1068"><b>Uncontrolled Loads</b></p>

Your Energy Sentry is controlling approximately 70% of the electrical loads in your home. Except for the stove the uncontrolled loads are relatively small and do not create much of a demand.

If your demand limit is set below 6 kw, the total of your **uncontrolled** loads may exceed the limit setting. When this happens, the Energy Sentry will give an audible and/or visual alarm to warn you that the limit has been exceeded by the **uncontrolled** loads. This means you have a minute or two to cut off something to keep the meter from registering a higher kw than the control setting.

**Important:** Only your **uncontrolled** loads can initiate the over-limit alarm.

## Load Shedding Sequence

When your total power consumption starts to exceed the demand setting the controller sheds the first load. If necessary, additional loads will be shed to keep the average demand below the demand setting. Loads are shed in a fixed sequence. The first load shed is the last to be restored. Conversely, the last shed is the first to be restored.

The load shedding priority is based on the type of heating and cooling equipment and the design of your house. If desired, the priorities can be easily changed by your electrician. The following are typical priorities for a house with baseboard heating and one with a heat pump:

### Baseboard Heated Home

Shed Sequence	Load	Wattage
First	Basement	4000
	Entry	3000
Second	Bedrooms	3500
	Living Room	2000
Third	Water Heater	4200
	Dining Room	1000
Fourth	Dryer	5500
	Family Room	2000

**Note:** The Heat Balancer control mode rotates the first and second loads every three minutes when the first load is the only load shed.

### Heat Pump Home

Shed Sequence	Load	Wattage
First	Furnace	5,000 - 20,000
Second	Water Heater	4,500
Third	Compressor	5,000
Fourth	Dryer	5,500

**Note:** (1) Compressor is not shed when outside temperature is below 30° F (when outside thermostat is installed).

(2) Compressor cannot be restarted for at least five minutes after it is shed. This delay feature is for compressor protection.

# Alpha & ES Control Panels

## Common Features

### Power Available

When the yellow numbers are ON, there is power available to the loads connected to Energy Sentry. Each number represents a relay which controls one or more assigned loads. When the number is OFF, the load is shed.

The circuit assignment numbers should be recorded on the inside of the control panel door at the time of installation.

For the Alpha 8 and ES 8, the numbers will be 1 through 4. Each number represents a relay that can switch one to two load circuits at a time.

The Alpha 16 and ES 16 will have numbers 1 through 8; each light represents a relay that can switch one or two load circuits at a time.

### Test

Pressing the Test Button will make the High Demand Alarm light and buzzer turn on. This confirms that the alarm system is working and that there is power to the Energy Sentry.

### Tone Control

This three position alarm switch gives you a choice of Loud-Soft-Off. When it is in the OFF position, you will not be warned of exceeding the demand limit unless you notice the blinking red light.

## Additional Features for Alpha

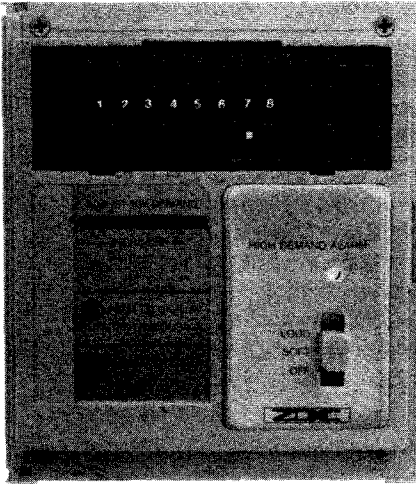
### Bar Graph Display

The Alpha control panel provides continuous display of Demand Limit and the Average Demand. This makes it possible for you to get a better understanding of your load activity and make intelligent judgments on how to manage your electric power.

### Instantaneous kw

By pushing the instantaneous button, the measured instantaneous kilowatts will be displayed instead of the average kw. This measurement is helpful in determining the kw of each appliance as soon as it is turned on.

**Note:** If all lights are off for several minutes and there is no over limit alarm, the controller may be without power. Check by turning the kw limit up. If the lights do not turn on within 5 minutes, check the 15 amp circuit breaker in the main distribution panel. If this does not restore the status lights, return the setting to its original position, and call your electrician.



Alpha Control Panel  
(door open)



ES Control Panel  
(door open)

## ESC Controller

The ESC model does not have a control panel. The demand limit setting is integral with the controller unit. To set the demand limit (if applicable), raise the cover and set the knob to the desired set point.

Some installations, such as rentals, may wish to turn off the over limit alarm. If this is desired, the switch is on the lower right side of the logic card.

To verify that the controller is operative, observe the small blinking green light above the kw scale. If the green LED is not blinking, check the appropriate 15 amp breaker in the main breaker panel to see if it is on. If the power is ON to the controller and the controller still does not function correctly, call your electrician for service.

**Note:** Some installations have their demand limit set by outdoor temperature or utility control and the demand limit cannot be changed by the occupant.

## Setting The Demand Limit

There are no fixed demand settings that will be suitable for everyone. The level of energy (demand) that is required to satisfy comfort, economy and convenience will vary widely with the uniqueness of each house and its occupants.

In arriving at the best demand setting for you, we recommend that you start with the lowest kw that you think you will need during the present billing period. If you need more energy to maintain comfort, just increase the kw by one. If this is not enough, increase it by one again until you are comfortable.

It is important to remember that once the meter increases, it will not come down until it is reset to zero each month by the meter reader. So it will not benefit you to lower your demand below what is already registered on the meter.

The following kw values are given to assist you in setting your demand limit:

- 3 - 4 kw Small condos and apts during non heating & cooling seasons
- 5 - 6 kw Suitable for cooking, washing, lighting, and light heating or cooling
- 7 - 8 kw Increased kw for greater heating or cooling
- 9 - 10 kw More extreme temperatures
- 11 - 16 kw Larger homes during peak heating or cooling periods.

At a comfortable inside temperature the kw demand level will be directly proportional to the heat loss or gain of your home. Homes that have high power consumption (kwh) will generally require higher demand settings than those homes with low power consumption.

## Control Of Clothes Dryer

The clothes dryer is usually one of the last circuits the Energy Sentry sheds. When the dryer is shed, the dryer motor continues to tumble the clothes. Only the heating element is cut off during this brief period. This means that when you are at 5 kw or 6 kw and cooking a large meal, the dryer will be shed when the oven element (4.5 kw) is on. When the oven element is off, the dryer element is restored. This may result in your clothes being slightly damp at the end of the drying period and may require longer drying times.

**NOTE:** If the dryer cannot be restarted each time it is shed, it is not properly wired to the controller. Have your electrician change it. It will only take a few minutes at the breaker panel.

## **Stove Test (Systems Test)**

To verify that your demand control system is measuring the demand and shedding loads, make the following test:

- a. Set demand limit to 4 kw or lower.
- b. Turn on oven and all top elements of your stove.  
(The Alpha will show the measured average and/or instantaneous kw of the stove.)
- c. Each status light will turn off until all lights are off and the over-limit alarm beeps.
- d. Turn OFF all stove elements and oven.
- e. Beeper will stop and all status lights will turn on sequentially (providing no other large loads are on).

### **System is OK**

Reset demand to desired limit.

## **Service Of Heating/Air Conditioning, Water Heater And Clothes Dryer**

When service technicians service any electrical equipment that is controlled by the Energy Sentry, they should be advised that you have a demand controller. They should also be warned not to disconnect Energy Sentry wiring or leave its power supply off. Otherwise they may unknowingly disable Energy Sentry which could result in a very high electric bill.

The Energy Sentry simply acts as another switch on the water heater, dryer or heating/cooling equipment. It cannot cause damage or premature failure of the equipment it is connected to when it is installed correctly.

When the status lights on the control panel are ON, there is power available to the loads and the Energy Sentry. When power to the energy Sentry is turned OFF at the breaker panel, the lights will be OFF and power will be available to the loads as long as the power to the controller is OFF (contacts close when power is OFF). Without power the Energy Sentry cannot control your demand. This is why the power must be restored to the Energy Sentry after a service call.

## **Demand Metering**

To benefit from your Energy Sentry Demand Control your home must have a demand measuring electric meter. Obtain a free booklet from your power company that describes your electric rate and how to read your electric meter. We recommend that you read the metered demand on the day prior to when the meter is read by the power company.

## Questions And Answers

- Q. What happens to the controller when the power to the house is off? Do I have to do anything to keep the demand from going up?
- A. The Energy Sentry has a "hard limit", meaning that it stays where it is regardless of how long the power is off. When the power is restored, the controller will allow all your loads to come on for a few minutes. Then it will start shedding to keep the demand within the limit setting.
- 

- Q. Sometimes my meter shows exactly the same as the limit setting, but on some months it is as much as 1 kw higher or lower. Is the meter wrong, or is it the Energy Sentry?

- A. The Energy Sentry is the most advanced optimizing demand control available today. The circuit incorporates error integration and load forecasting with memory. It makes it possible for you to use as much power as possible and still stay within your limit. Occasionally when large loads are turned on at the end of a metering period, the controller may not be able to shed the load fast enough to prevent the meter from sensing it. As an example: on some occasions if a dryer (5.5 kw) is turned on when the meter is 80% into its period, the controller will shed the dryer, but the meter may increase  $\frac{1}{2}$ kw above the limit setting.

Another source of random differences between the utility meter and the Energy Sentry is that the utility meter is a direct power measuring and integrating device. The Energy Sentry measures current and computes the power based on an assumed 240 Volt supply.

Another possibility is meter error and meter reading error. This can happen, but it seldom does.

Accidental or unauthorized changing the limit setting is also a source of difference between the meter and the controller. To avoid misunderstandings we strongly advise that you make a practice of reading the demand on your meter shortly before the power company reads the meter and records it.

Q. My neighbor has an Energy Sentry and they are operating at a 6 kw in January while we have to keep ours at 10 kw. Is something wrong with our controller?

A. There is nothing wrong with the controller. There are many reasons why some people can operate at a lower demand.

The following are just a few reasons for low demands:

Lower heat losses, lower infiltration

Lower inside temperature during winter

Higher inside temperature with air conditioning

Supplemental heating with wood, kerosene or solar

Away from home during coldest or hottest days of a month

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Q. Does the Energy Sentry reduce the kilowatt-hours we use each month?

A. If there is any kwh reduction due to the Energy Sentry, it will be small. Experience has shown that people with good load control often use more power. They adjust their thermostats to be more comfortable because the cost of electricity is more affordable.

---

Q. Is there any periodic maintenance or adjustments necessary for proper care of the Energy Sentry?

A. No.

## LIMITED WARRANTY

The **SII Demand Controller Warranty** extends to the end user of this product for a period of three years from the date of initial installation.

**This controller** is warranted against defective materials and workmanship.

Any implied warranties arising out of the sale, including but not limited to the implied warranties of merchantability and fitness for a particular purpose, are limited in duration to the above three years. SII shall not be liable for loss of use of the controller or other incidental or consequential costs, expenses or damages incurred by the user or any other purchaser.

This warranty is void for any claim of damage or defect due to improper installation or use, improper voltage or frequency, lightning or water.

**Warranty Service:** During the above three year period, any part of your SII controller will either be repaired or replaced with a reconditioned comparable unit at SII's option, when the product is returned prepaid to the address below. If examination proves the part to be covered by the above warranty, it will be repaired or replaced at no charge and returned prepaid. If it does not meet the above warranty conditions, you will be advised of the cost for repair and replacement.

**FOR SERVICE OR REPAIR  
CALL INSTALLING DEALER:**

**BRAYDEN AUTOMATION CORPORATION  
P.O. BOX 8730  
FORT COLLINS, CO 80524**

# **INSTALLATION INSTRUCTIONS**



2450 Central Avenue  
Boulder, CO 80301  
303/449-9949



## DESCRIPTION

The Energy Sentry measures the total power consumption in a dwelling and automatically controls the metered demand by temporarily switching sheddable loads off and on. The demand set point can be conveniently adjusted to suit the seasonal need for economy and comfort.

The Energy Sentry is designed for use with all types of electric heating and cooling equipment. The system is comprised of a control panel, logic/relay unit and a pair of current transformers.

## LOAD CONTROL SEQUENCE

The Energy Sentry sheds the least critical load first when it senses that the average total power consumption is about to exceed the demand set point. As necessary, additional

loads are sequentially shed to prevent the metered demand from exceeding the set point. The last load to be shed will be restored first, whereas the first load to be shed will be restored last.

By continuously averaging the total power consumption over the metering period the controller sheds loads only when the average demand reaches the set point. This makes it possible to operate loads that are greater than the demand setting during a portion of the metering period.

When operating in the Heat Balancer mode, the controller rotates the first two relays shed every three minutes to avoid prolonged shed periods of loads of the "first off" relay. This feature is for baseboard heating. It can be selected by jumper option on the logic card.

**NOTE:** Model ESB Controller does not have a control panel or a cable

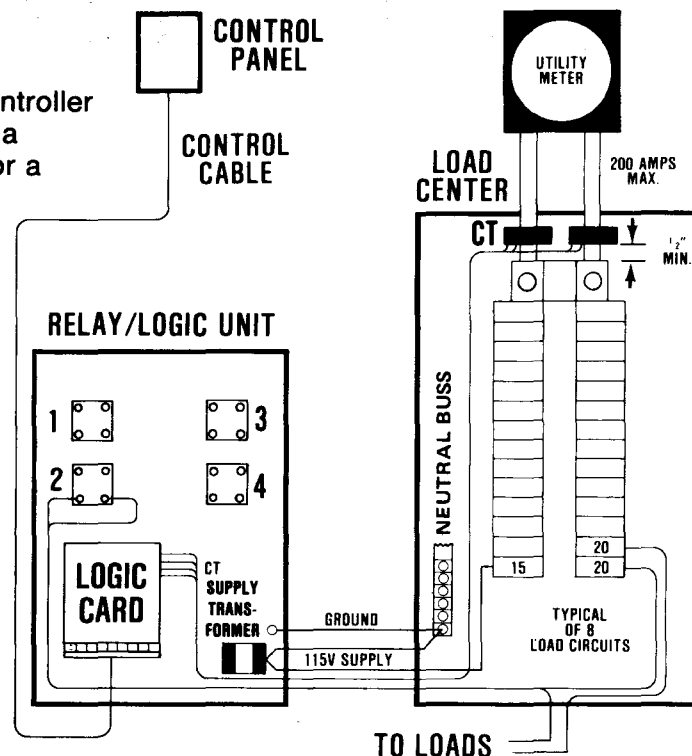


FIG. 1

**NOTE:** The installer is responsible for furnishing all interconnecting wiring and fittings. A U.L. listed two-gang J-box for mounting the control panel is required for ES models.

## SUGGESTED MATERIAL LIST

Thermostat Cable, #18 AWG, 6 conductor  
#10, #12, #14 Solid cu. wire. 600V U.L. Listed  
15 ampere circuit breaker  
1"-2" Off-set nipple with bushings and locknuts  
Additional material as required by job

## NOTE

The Energy Sentry is UL Listed and designed for installation in accordance with the NEC. Improper installation may result in voiding the warranty.

## INSTALLATION PROCEDURE

1. Spot locations for the control panel (if red), relay/logic unit, current transformers and control cable(s). Make certain that there is ample space for proper installation.
2. Remove relay/logic base plate from the enclosure.
3. Make holes in the enclosure for wiring relays to the load center and for the control cable as shown in Figure 1.
4. Mount the enclosure on the wall adjacent to the load center using the offset nipple to join the two boxes together.
5. Remove all metal filings from the enclosure.
6. Replace the relay/logic plate in the enclosure carefully.
7. Install a current transformer on each phase of the supply cable between the electric meter and the main breaker as shown in Figure 1.

**WARNING: DISCONNECT THE MAIN POWER AT THE METER — DO NOT ATTEMPT TO INSTALL CURRENT TRANSFORMERS OVER HOT LINES.**

8. If main power is distributed to more than one load center from the meter housing use additional current transformers. It is absolutely essential that the total power be measured in order for the system to operate properly. Connect leads from the transformers in parallel so that phase A of branch I is additive to the current of phase A in branch II. To be parallel, the CT's must be installed on the same phase, in the same direction and match the color of the leads from each transformer. Mismatched phases will result in an error in controlling the demand to the desired set point.

9. With main power OFF connect one leg of each controlled load in series to the relay contact as shown in Figures 1 through 5.

For ESB model, skip to #13.

10. Locate the control panel in the kitchen, hallway, entry or any other place agreeable to the owner. Mount it approximately 60 inches above the floor.
11. Run cable(s) from the relay/logic unit to the control panel.
12. Connect the cable as shown in Figure 6.
13. Connect 115V AC power to R/L unit supply transformer using a separate 15 ampere breaker in the load center. See Fig. 1.
14. Switch main power ON. With all relays normally closed the status lights on the control panel will be ON.

## SYSTEM TEST

Perform a "Stove Test" to verify that the loads are shedding and restoring in proper sequence and that the alarm signals when the demand exceeds the set point.

1. Set demand as low as possible: 3-4 Kw.
2. Turn all burners and oven ON (make sure oven is empty)
3. Light 1 Turns off in approximately 45 sec.-5 min.  
Light 2 Turns off in approximately 15 sec. later  
Light 3 Turns off in approximately 2 min. later  
Light 4 Turns off in approximately 15 sec. later  
Alarm turns ON in approximately 1 sec.
4. Turn stove OFF — alarm stops.
5. Status lights will turn on in the reverse sequence as load is reduced below set point. This may take as long as 5-10 min.
6. Return demand setpoint to appropriate setting.

**NOTE:** Only the uncontrolled loads such as the stove can cause the alarm to sound.

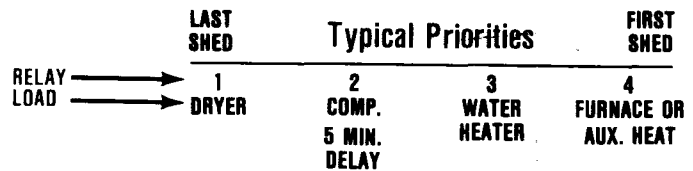
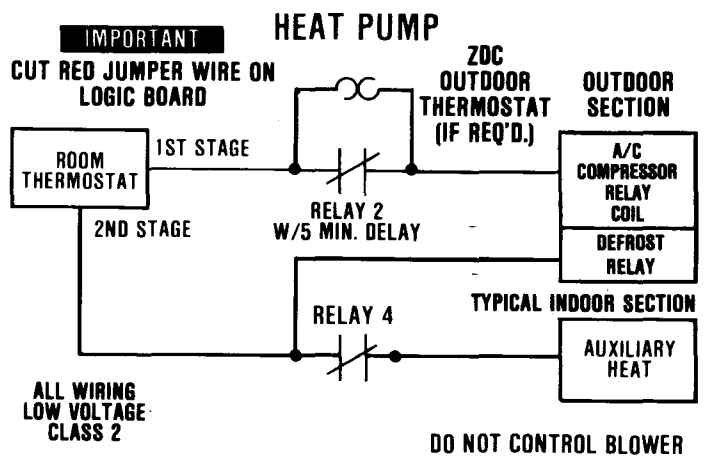


FIG. 2



## BASEBOARD HEATING

**IMPORTANT**

**CUT YELLOW JUMPER WIRE ON LOGIC BOARD**

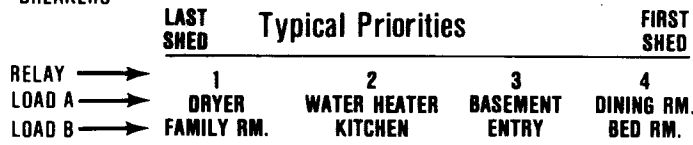
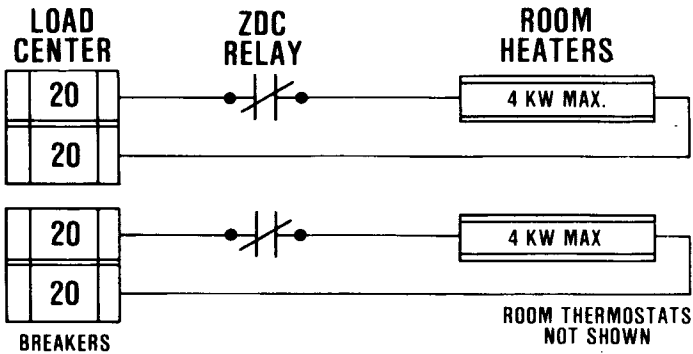


FIG. 3

## WATER HEATER

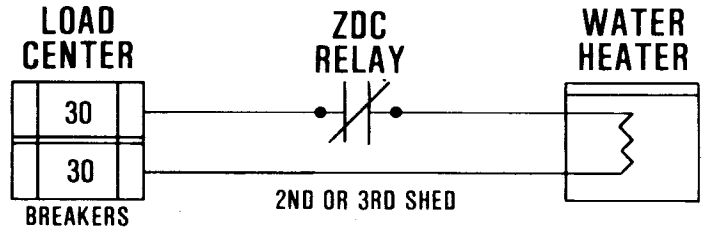


FIG. 4

## AIR CONDITIONER

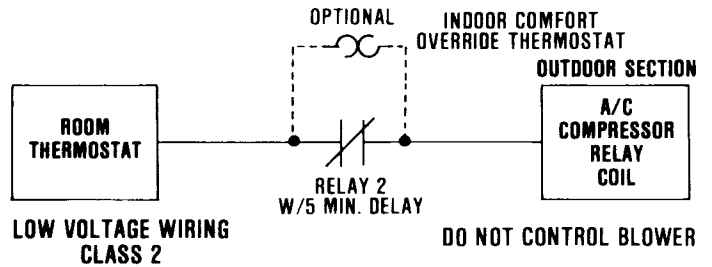
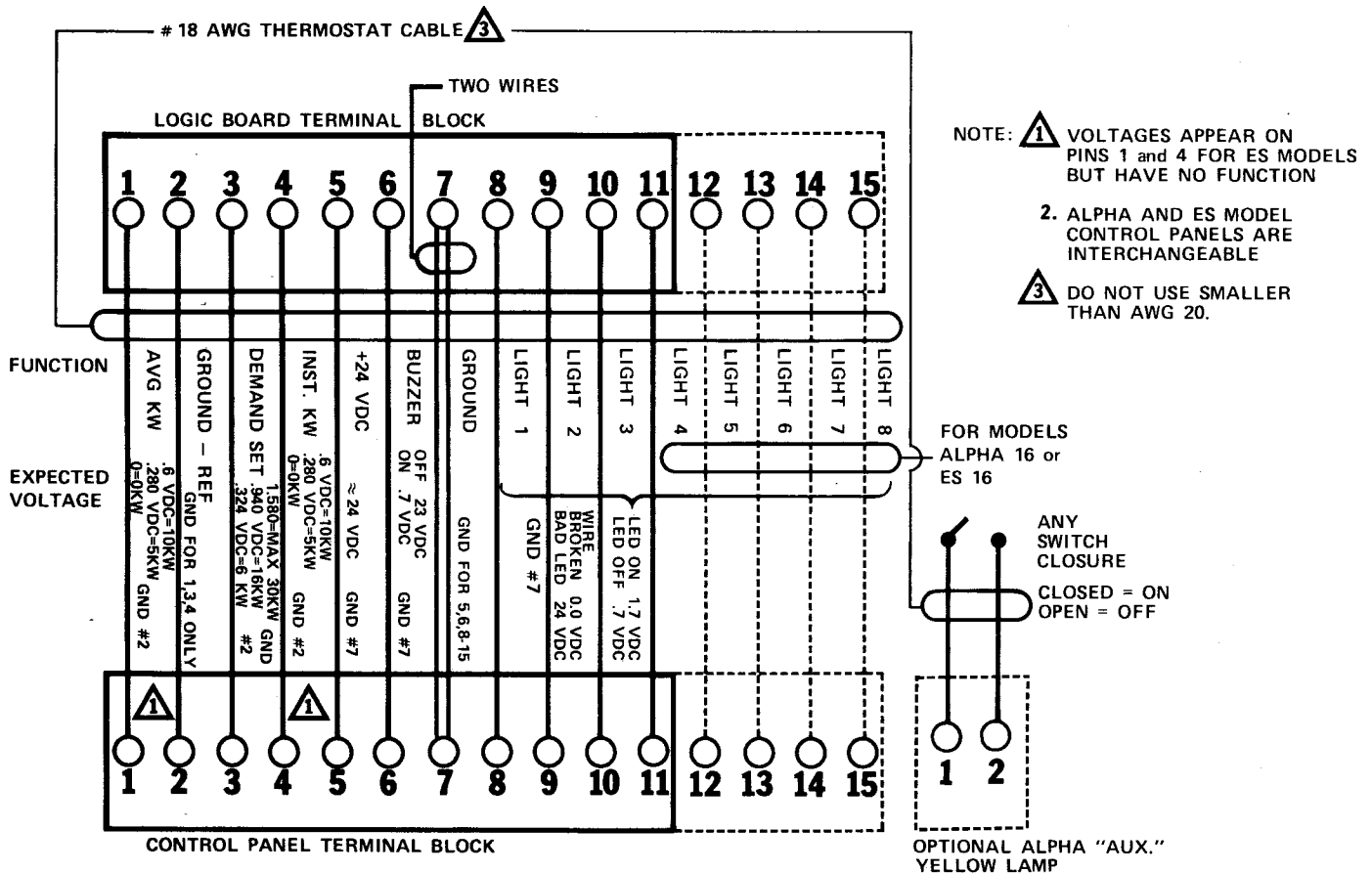


FIG. 5

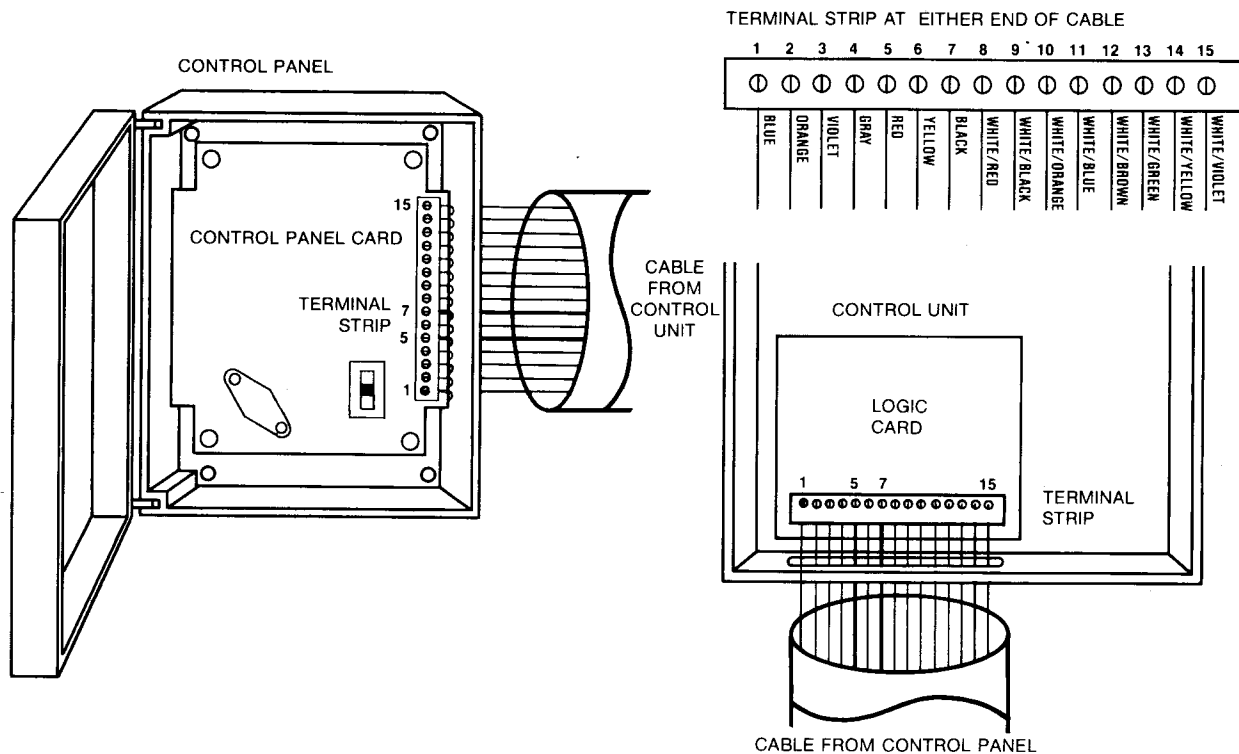
ALL VOLTAGES AND WIRING NEC CLASS 2



CONTROL PANEL WIRING FOR ES AND ALPHA MODELS

FIG. 6

# Control Panel



### Hook-up

1. Use template to locate mounting and cable hole, and feed cable through wall. (See back of this sheet.)
2. Remove door of control panel by holding open at 90° to case and gently snap to left with finger at top and bottom of door, being careful not to break off ears. (See above.)
3. Mount base to wall using anchors provided.
4. Attach wires at control panel terminal strip and gently fold wiring under card..
5. Fasten intermediate cover with Phillips screws provided.
6. Write connected loads on label inside door.
7. Reinstall door.
8. Attach wires of other end of cable to controller logic card.

### Caution

Wiring from control panel to control unit logic card is point to point: 1 to 1, 2 to 2, 3 to 3, etc. Up to 11 or 15 connections depending on model. Mis-wiring can cause serious damage to either, or both, the control unit logic card and control panel card, and will void the warranty.

Always have cable exit at bottom of control unit enclosure so intermingling with power wiring is avoided. Use cable clamp at entry of box, but do not overtighten.

Run cable as far from power wiring as practical.

### Specifying Control Panel to Controller Cable

Cable	Cable Length
P/N 4220	Bulk Cable on 250' spool
P/N 4235	Precut 35'
P/N 4260	Precut 60'
P/N 4299	Precut 100'

# Template for Control Panel

Mount in a location where overlimit alarm can be heard in the kitchen area.

