SYSTEM 2100

Load Management System

Owner's Manual

Table of Contents

Revision 1.1

Owner's Manual

ORIGINAL PURCHASER

Name:_____
Address:_____
City:_____ State: _____ Zip:_____

SALES, INSTALLATION, AND EQUIPMENT

Sold By: _____ Organization: _____
Phone#: _____

Installed By:_____ Organization:_____
Phone#: _____

Date Installed:_____ Serial Number: _____
Model Number: _____

INSTALLATION NOTES

MANUFACTURER

ElectroSem, LLC
2600 South Hardy Drive
Tempe, AZ 85282-1916
Telephone: 602-955-6566

INTRODUCTION

Congratulations on your purchase of a Pensar energy management system. The name Pensar represents quality and superior technical achievements. Please take the time to carefully read this manual before attempting to make any changes in operation. Keep it handy for future reference.

The SYSTEM 2100 is an advanced microcomputer load control system that can help substantially save on your utility bills. It does so by monitoring your total electric consumption and controlling high energy usage appliances in order to limit your "peak demand".

DEMAND is the amount of power needed to operate all the appliances you have on at one time. PEAK DEMAND is the highest demand for electricity, averaged over a given period of time (15, 30 or 60 minutes), that you require during a billing month. Your SYSTEM 2100 has been programmed by your installer to coincide with the averaging period used by your utility.

When the SYSTEM 2100 senses that your kilowatt demand limit may be exceeded, it automatically "sheds" (turns off) selected electrical devices, one at a time, in an order (priority) that you have selected. As the demand lessens, each device is restored at the earliest possible moment, usually within six to ten minutes.

High peak demand is a concern to utilities because they must always have enough energy available to service all of their customers at any given time. The higher the total peak demand, the more costly it is to the utility, and ultimately to you the consumer. In order to encourage customers to lower their peak demand, many utilities have created demand rates which reward you with lower energy bills.

With the help of a Pensar energy management system, thousands of utility customers have been able to reduce their peak demand and take full advantage of the savings potential of these demand rates. Your wise investment in a SYSTEM 2100 makes it possible for you to enjoy these savings, starting today and for many years to come.

COMPONENTS

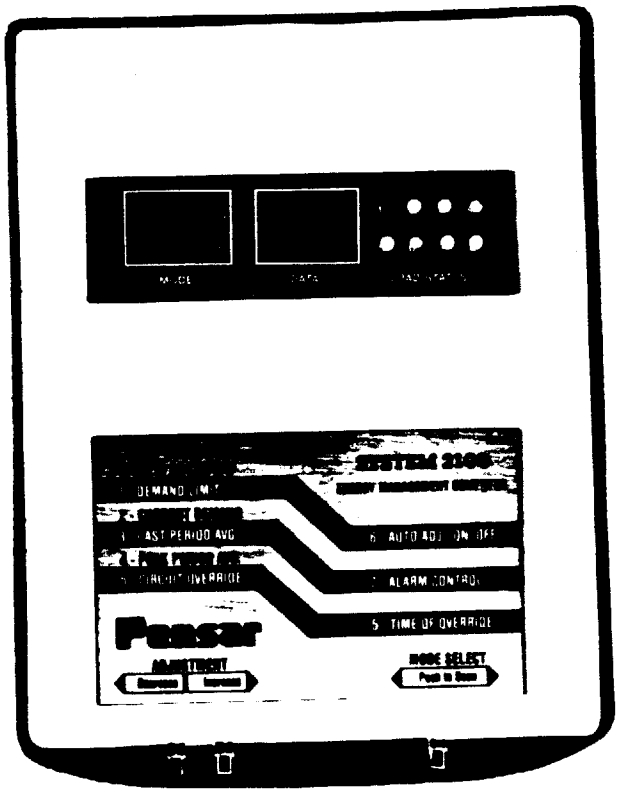
Relay Enclosure

The relay enclosure contains the switching devices used to control the loads (circuits and appliances). It is usually located next to the circuit breaker panel.

To Turn Off the SYSTEM 2100 simply turn off the circuit breaker labeled "Load Controller" located inside the breaker panel.

Indoor Display

An attractive display panel houses the microcomputer and places all the controls and information you need to operate your SYSTEM 2100 at your fingertips. References made below to the display windows or switches are in *italic*.



The *Mode* display indicates which data is currently in the *Data* display area. The definition of each mode is given on the Information label. The switch labeled *Mode Select* is used to scan through the display modes. *Increase Adjustment* and *Decrease Adjustment* switches are used to change the displayed data.

The *Load Status* lights indicate at a glance which electrical devices have been shed. When a light is on, that circuit has been turned off. If a light is not illuminated, that circuit has power available. However, it may not be operating due to its own controls.

USER MODES

These modes are provided to allow access to all controls necessary to effectively operate your SYSTEM 2100.

As a measure to prevent unauthorized or inadvertent change of control data, data can be locked or unlocked. To unlock (allowing change of data), simultaneously press *Increase Adjustment* and *Decrease Adjustment* switches until a beep is sounded. Data is automatically locked if no switches are pressed for more than two minutes.

MODE 1 Demand Limit:

This mode displays the highest point the SYSTEM 2100 will allow your demand to rise in kilowatts. You may adjust this limit or set the computer to adjust automatically. See Mode 6.

The demand limit is adjustable in tenths of kilowatt hours when set under ten kilowatts and in increments of a half kilowatt when over ten. If the limit is ten or more and the decimal point is lit, add a half kilowatt to the displayed value.

It may take some trail and error to determine the setting that best suits your needs, and maximizes your savings. There are several variables affecting your choice of demand limit, such as location, climate, home size and life style. We recommend consulting your local dealer or installer for advice on adjusting your peak limit.

IMPORTANT NOTE: The demand limit displayed in mode 1 may be manually or automatically adjusted below the maximum setting made in mode 6, but **can not** exceed this limit.

How To Change Demand Limit Setting:

1. If not already in mode 1, press *Mode Select* until "1" is displayed in the *Mode* window.

2. If data is locked, unlock data by pressing both *Increase Adjustment* and *Decrease Adjustment* switches until a beep is sounded.

3. Raise or lower kilowatt setting in the *Data* window using either *Increase Adjustment* or *Decrease Adjustment.* If data does not change see important note above.

4. Your displayed selection is valid. You may press *Mode Select* to change display mode as desired.

Mode 2 Current Demand:

The rate at which you are currently using power is displayed. When loads are turned on and off, the display will change within 15 seconds to show the change in your rate of power consumption.

NOTE: Because the SYSTEM 2100 is an averaging controller, you will, at times, see the current demand go above the demand limit. However, the average value displayed in this mode, over the entire averaging period, will be less than or equal to the demand limit.

Mode 3 Last Period Average:

The power consumption of the past averaging period is displayed. Knowing how much energy was used during the last period can be valuable in determining if there is enough energy available to run additional appliances.

Mode 4 Peak Period Average:

The highest period demand is retained in memory for your convenience. The amount shown will approximate the kilowatt demand that you'll be billed by the power company. To keep this reading current, erase once a month just after your meter has been read.

How To Erase Peak Period Average:

1. If not already in mode 4, press *Mode Select* until "4" is displayed in the *Mode window.*

2. Press both the *Increase Adjustment* and *Decrease Adjustment* switches until the *Data* display is zeroed.

Mode 5 Circuit Override:

This mode allows you to temporarily change the priority of one or more loads for a period of up to 99 hours. This will prove quite helpful if you need to use an appliance (such as an air conditioner) which is currently being shed, or if you desire to disable a circuit which may use power you desire for other circuits. For instance, you may wish to disable a water heater before a warm wash cycle to reserve energy for your cloths dryer.

When a load is selected for override "E", it is given the highest priority. When a load is selected for override "d", power to the circuit will be disabled. After the selected period of time, the load will automatically revert back to its original priority (unless you remain in mode 5 or 5 dot).

How To Override The Normal Operation Of A Circuit:

1. If not already in mode 5, press *Mode Select* until "5" is displayed in the *Mode* window.

2. If locked, unlock data by pressing both *Increase Adjustment* and *Decrease Adjustment* until a beep is sounded.

3. Select the circuit you wish to override by pressing *Increase Adjustment* until its number appears in the *Data* window.

4. Select "E" for Enable, "d" for disable, or "_" for Normal operation by pressing *Decrease Adjustment* until your selection appears in the *Data* window.

5. To override more than one circuit simply repeat steps 3 and 4.

6. Your displayed selections are valid. If you desire to set a time limit for the override, press *Mode Select* to display mode 5 dot. Otherwise, your selections remain valid until a mode other than 5 or 5 dot is selected.

NOTE: The circuit override WILL NOT allow a load to operate when the last period average exceeds the demand limit. If this should occur, the load in override will be the first allowed to operate once the average is again below the demand limit.

Mode 5. (5 dot) Time Of Override:

If a load is currently in override this mode will reflect how much time remains, otherwise this mode will be skipped. However, any override selections made remain valid until this mode is exited regardless of the timer.

How To Set Override Time:

1. If locked, unlock data by pressing both *Increase Adjustment* and *Decrease Adjustment* until a beep is sounded.

2. Raise or lower setting in the *Data* window using either *Increase Adjustment* or *Decrease Adjustment*. Time is represented in hours and tenths of hours. "4.5" means four and one-half hours and "0.1" means one tenth of an hour or six minutes.

3. Your displayed selection is valid. You may press *Mode Select* to change display mode as desired.

Mode 6 Auto Adjust On/Off and Maximum Limit:

Auto Adjust is designed to provide maximum savings with minimum attention. However, some people may realize more savings in manual. To select manual control, simply set the maximum to "0.0". Otherwise, the computer will automatically adjust your demand limit (see mode 1), but will never exceed the maximum you selected in this mode. If a maximum limit is set (selection other than "0.0"), attempts to manually exceed it using mode 1 will fail.

How To Change Auto Adjust Maximum Limit:

1. If not already in mode 6, press *Mode Select* until "6" is displayed in the *Mode* window.

2. If locked, unlock data by pressing both *Increase Adjustment* and *Decrease Adjustment* until a beep is sounded.

3. Raise or lower setting in *Data* window using either *Increase Adjustment* or *Decrease Adjustment*.

4. Your displayed selection is valid. You may press *Mode Select* to change display mode as desired.

Mode 7 Alarm Control:

When the SYSTEM 2100 has shed all loads, and the last period average is rising above the demand limit, an alarm will be sounded. Mode 7 has nine settings ranging from 0 through 8. Selecting "0" will disable the alarm. 1-8 represent different alarm sound levels and tones, 1 being the highest and 8 the lowest pitch. The alarm will only be activated by an uncontrolled load such as an oven or range. To prevent the demand limit from being exceeded you should turn the uncontrolled load off for a few minutes. If the alarm condition occurs frequently, your demand limit is probably too low.

How To Change Alarm Sound Or Turn Off:

1. If not already in mode 7, press *Mode Select* until "7" is displayed in the *Mode* window.

2. If locked, unlock data by pressing both *Increase Adjustment* and *Decrease Adjustment* until a beep is sounded.

3. Raise or lower setting in *Data* window using either *Increase Adjustment* or *Decrease Adjustment*. The alarm is sounded for up to 15 seconds.

4. Your displayed selection is valid. You may press *Mode Select* to change display mode as desired.

SERVICE QUESTIONS

What if my display has an error message?

The SYSTEM 2100 has several self check features. If your display should read "Err#", record the number and report it to your service organization. The demand limit and installation setup may have been altered by the failure.

How do I turn off my System 2100?

You may turn off the SYSTEM 2100 at the circuit breaker panel. One of the breakers should be labeled for the load controller. All circuits connected should be restored to normal operation.

What if an appliance does not work?

If one of the appliances controlled by the SYSTEM 2100 is not functioning properly first check to see that the Load Status lights indicate a restored status (light off).

If the load light is lit:

1) Insure your demand limit (see mode 1) is not set too low to allow the appliance to run See mode 2 and mode 3).

2) Insure the override selections (mode 5) do not include the disable of the involved load.

3) Insure proper setup (you will probably need to call your installer for help).

If the load light is dark:

You may locate the source of a problem by turning off the SYSTEM 2100 at the circuit breaker panel. One of the breakers should be labeled for the load controller. All circuits connected will be restored to normal operation. **Watch your demand.**

If the Problem Persists: The appliance involved might be malfunctioning and the appropriate serviceman should be notified. Insure the serviceman knows a load controller is connected.

If the Problem Ends: The SYSTEM 2100 might be malfunctioning and your installer should be notified.

Installation Settings & Controls

CAUTION: Use of the installation setup and test modes by an unqualified person could cause damage or improper operation of both controlled equipment and the SYSTEM 2100. The setup modes are not intended for user modification. All the information and control necessary to operate the SYSTEM 2100 has been provided in the user modes. Unauthorized use is at the users own risk. **ElectroSem, LLC accepts no liability for damages that may occur due to improper setup or use.**

The setup mode is entered by simultaneously pressing the *Increase Adjustment*, *Decrease Adjustment*, and *Mode Select* switches for several seconds (until an alarm sounds). Once the mode is increased past the last mode, user mode "1" is selected. Simultaneously pressing all three switches will, at any point in the programming procedure, restart the set-up mode. Pressing *Mode Select* and *Increase Adjustment* displays the next setup group. Pressing *Mode Select* and *Decrease Adjustment* scrolls back one display mode.

1) If you are familiar with the setup control parameters, fill out the installation worksheet. Otherwise, the section following the installation worksheet contains definitions. Appendix B contains a listing of all setup modes in the order they are entered. Appendix C contains example setups.

2) Enter the setup mode by simultaneously pressing *Increase Adjustment, Decrease Adjustment*, and *Mode Select* switches for several seconds (until an alarm sounds).

3) The worksheet may now be used as a guide for setup. Use the *Increase Adjustment* and *Decrease Adjustment* switches to enter the desired data. Once the data is entered, use the *Mode Select* to display the next setup mode.

NOTE: It is good practice to re-enter the setup mode and review each setup.

SYSTEM 2100 INSTALLATION WORKSHEET

Prior to actual setup, the following worksheet should be filled out. This will provide a permanent record for future reference. Indicate the setup by placing a number, or "E" for enabled, or "_" for normal in each column.

Full Scale Demand Kilowatts F1 ___
Demand Period Length (15, 30, OR 60) PL ___
Limit Multiplier (0.0 TO 9.9) dA ___
Utility Peak Control Flag: C1 ___

RESTORATION DELAY					
DISABLE TIME (MINIMUM OFF MINUTES)					
ENABLE TIME (MINIMUM ON MINUTES)					
LOAD KILOWATT HOUR DRAW					
PRIORITY					
# LOAD NAME AND LOCATION					
1)					
2)					
3)					
4)					
5)					
6)					
7)					
8)					

SETUP MODE DEFINITIONS

Definition of Mode P1 through P8

PRIORITY is used to specify which loads to shed or restore first or which loads to time share with equal priority (rotate). In addition to the normal function of priority, loads may have operation tied to another load (special priority) or to specify loads which are not connected.

NORMAL PRIORITY is selected by settings of 1 through 8. Priority 1 allows the greatest amount of operation time. Priority 8 allows the least operation time. As the priority number increases, more headroom (greater difference between the current average and the demand limit) is allocated. This allows optimizing of reserve energy for more important loads. For example, a water heater may be assigned priority 8 even though only 4 loads are controlled, insuring more energy "headroom" for other loads.

SPECIAL PRIORITY is selected with settings of 9 through 11. These selections tie operation to the next lowest numbered load (or relay) of normal priority. The effective priority number for a load with special priority is one half more than the load to which it is tied. Special priority loads will not be restored unless the load to which they are tied is restored. Special priority loads may not be directly overridden but override of the normal priority load to which it is tied effectively overrides all special priority loads tied to it.

PRIORITY 9 (for equipment such as pool sweeps) insures 5 minutes expire after restoration of the normal priority load before the special priority load may be restored.

PRIORITY 10 (for a second stage of a thermostat or heat strips without 90 second time delays) insures the normal priority load is restored first.

PRIORITY 11 is designed for heat strips with 90 second delay from call to shed to actual shed, is similar to priority 10 but has additional headroom (energy reserve) to accommodate the delay to actual shed. Restoration delay (see mode r.1) may also be required for control of heat strips with delays to activation.

PRIORITY 12 through 14 should be reserved for future expansion but currently select no connection.

PRIORITY 15 is used to select no connection. These loads are always restored saving power & response time.

Definition of Mode L1 through L8

LOAD KILOWATT DRAW is the kilowatt hours which would be used if the load operated for an hour without interruption (see user mode 2). Set the draw to the next highest whole kilowatt. The load draw in conjunction with the minimum enable time determines if it is possible to restore the load without exceeding the limit.

Definition of Mode E1 through E8

ENABLE TIME is the minimum minutes the load is desired to operate if restored. The enable time should seldom exceed 6 except for loads with low kilowatt demand. Very short times for resistive loads smooth control but may cause excessive relay wear. Set time to balance load efficiency, relay life, & smoothness of control.

Definition of Mode d1 through d8

DISABLE TIME is the minimum minutes the load is desired to remain shed. CAUTION: Disable time is critical to bleed pressure from H.V.A.C. compressor systems before motor start. Most manufacturers recommend 6 minutes. Some H.V.A.C. units have internal time delays for this purpose. Consult equipment specifications to insure proper settings.

Definition of Mode F1

FULL SCALE READING for current transformer analog input is provided to scale the input to the current transformer, terminating resistance and line voltage parameters. See the section on current transformers and terminating resistance.

Definition of Mode PL

PERIOD LENGTH is provided to select the demand period length used by the utility for billing. Capacity charge is based on the maximum demand in the period during the billing month. Selections are 15, 30, and 60 minutes.

Definition of Mode dA

LIMIT MULTIPLIER is used to modify the demand limit set in user mode 1. The limit multiplier is controlled by an external contact. See following section.

Definition of Mode C1

UTILITY PEAK CONTROL FLAG defines the contact arrangement across analog input #1 and analog ground (pins J1.12 and J1.16). See section in Hardware Installation Manual on Connection of Optional Controls.
CAUTION: If not using the Utility on / off peak, C1 must be set to "O" and analog input #1 left open.

Set C1 to "C" when contacts are closed during the on peak period. Opening the contracts when set on "C" will result in the limit multiplier (mode dA) modifying the demand limit (Mode 1).

Set C1 to "O" when contacts are open during the on peak period. Closing the contracts when set on "O" will result in the limit multiplier (mode dA) modifying the demand limit (Mode 1).

Definition of Mode r.1 through r.8

RESTORATION DELAY permits any load, when restored, to cause a 5 minute delay before restoration of any other load. This is provided for equipment such as H.V.A.C. with internal time delays from call to actual activation.

TEST MODE DEFINITION

The test mode allows the installer to test each individual load. The test mode is entered from the setup mode by pressing the *Increase Adjustment* and *Decrease Adjustment* switches for several seconds (until alarm sounds). The mode in the test mode is changed by *Increase Adjustment* and *Decrease Adjustment* switches. Pressing *Mode Select* will select the user mode "1". **CAUTION:** When in test mode "0_" the program is executed several times faster than normal and may therefore cause short cycle times for equipment under control. Deactivate all loads which may be damaged by rapid cycling prior to entry into this test mode.

TEST MODE	DATA	COMMENTS
_0	Current demand	See **CAUTION** above
_1	Current demand	All shed but load #1
_2	Current demand	All shed but load #2
_3	Current demand	All shed but load #3
_4	Current demand	All shed but load #4
_5	Current demand	All shed but load #5
_6	Current demand	All shed but load #6
_7	Current demand	All shed but load #7
_8	Current demand	All shed but load #8
_0.	Scaled a/d ch 0	Undefined
_1.	Scaled a/d ch 1	Undefined
_2.	Scaled a/d ch 2	Undefined
_3.	Scaled a/d ch 3	Undefined
_4.	Scaled a/d ch 4	Undefined
_5.	Scaled a/d ch 5	Undefined
_6.	Scaled a/d ch 6	Undefined
_7.	Scaled a/d ch 7	Undefined
_8.	Scaled a/d ch 8	Undefined
_9.	Scaled a/d ch 9	Undefined
_P.	Scaled a/d ch 10	Undefined
_L.	Scaled a/d ch 11	Undefined

Hardware Installation Manual

PREFACE

Please read all instructions carefully and completely before attempting installation. Certain instructions will be followed by a **WARNING** or a **CAUTION** note. **Failure to heed these notes may result in equipment failure or damage and exclusion of claims under the terms and conditions of the warranty.**

These instructions are intended only as GENERAL GUIDELINES to be used in conjunction with local and national electrical and building codes. This unit should be installed and serviced by qualified persons only.

A significant amount of time, money, and frustration may be saved by performing the following steps.

1) Check all equipment and be sure that it works before installing the load controller.

2) If you do not know the control capabilities of the SYSTEM 2100 read through the System 2100 Settings and Controls before going to the job site. Further, if this is your first installation you may need to study the entire manual and attend the installation class.

3) Determine location and method of control for each load to be connected.

4) Inspect optional areas for mounting current transformers, relay enclosure, and any additional fixtures. Plan wire and conduit runs for each possibility.

5) Consult with the customer. Insure he is aware of his options and your professional recommendations. This discussion should include control strategies, control settings, and location of equipment.

MOUNTING RELAY ENCLOSURE & CONDUIT

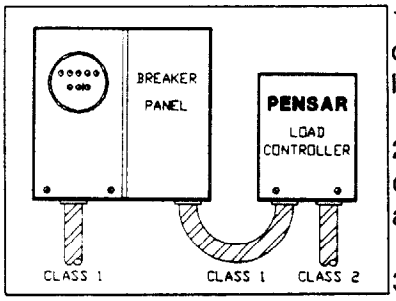


Figure 1 Mounting Enclosure

1) Locate a suitable position adjacent to the main breaker enclosure. Plan conduit runs with regard to segregation of class 1 and class 2 circuits. Insure the lead length of the current transformers is sufficient.

2) Remove cover of the enclosure. Next remove chassis from the enclosure and carefully set it aside. **CAUTION:** Physical shock may damage the electronics and relays.

3) Remove required knockouts. Cut any holes required for entry into the side of the class 1 compartment. All entry holes should be cut below chassis level.

CAUTION: Remove all metal particles.

CAUTION: Fittings for entry above the level of connection must be water tight and must allow insertion of the chassis.

4) Using available mounting holes, securely mount the enclosure with suitable hardware. These holes should be weatherproofed in some way (e.g. a bead of silicone sealant).

5) Install weatherproof conduit between the bottom of the relay enclosure and circuit breaker panel. The size of the conduit required is based on the number and gage of wiring. The following table assumes four 18 AWG for current transformers, two 14 AWG for supply and one 10 AWG for the ground conductor. Each CLASS 1 load requires two copper conductors of either 10 or 12 AWG.

CONDUIT	NUMBER OF LOADS	
Trade Size	**12 AWG**	**10 AWG**
0.75 Inch	5 Loads	3 Loads
1.00 Inch	8 + Loads	6 Loads
1.25 Inch	8 + Loads	8 + Loads

NOTE: Table assumes THNN wire insulation.

6) Next cut control wiring to lengths needed and feed it through the conduit along with the current transformer leads. Use a color code or mark the wires for identification. **CAUTION:** Connectors are approved for copper conductors only.

7) Re-install chassis.

CONNECTION OF CURRENT TRANSFORMERS & RESISTORS

WARNING: RISK OF INJURY. Current transformers should never be installed over energized conductors. If the meter must be pulled to remove power, insure the procedure is approved by the utility.

WARNING: RISK OF ELECTRIC SHOCK. Energized current transformers produce high voltages when not properly terminated. Exercise caution when handling unterminated current transformer leads. For temporary termination connect the two current transformer leads together.

The current transformers supplied are toroid type for use of services of 400 amperes or less. The length of the 18 AWG leads is either 4 or 6 feet. Wires carrying the current to be measured are passed through the hole in the center of the transformer. The ratio of the current passing through the center of the transformer and that induced to the leads is 200:1.

The current transformers MUST be placed to measure total current. Optimal placement is in the circuit breaker panel just after the main breaker(s). Installing current transformers outside the circuit breaker panel must be made in an acceptable enclosure. If there is any doubt concerning proper installation of the current transformers consult your local electrical inspector.

Several illustrations of how to position current transformers are provided. See Appendix D. **CAUTION:** If the transformers are not phased properly there will be an error in current measurement.

WARNING: RISK OF ELECTRIC SHOCK. Do not overload the current transformer terminating resistor. Failure of the resistor may cause high voltages and damage to the equipment.

All relay enclosures come from the factory with a terminating resistor installed on the factory wiring side of the terminals which accept the current transformer connections. Five watts is sufficient to handle full scale readings for resistance greater than 0.75 ohms. Use 10 watts for resistances less than 0.75 ohms. If increased resolution is desired, the resistance may be varied and the full scale setup modified. The full scale kilowatt setup "F1" may be calculated using the equation in the following table when using 200:1 current transformers. "V" is voltage and "R" is the terminating resistance.

Kilowatts = V / R * 0.4	**SYSTEM**
48 = 120 / 1 * 0.4	1 phase nominal line voltage
46 = 115 / 1 * 0.4	1 phase low line voltage
50 = 125 / 1 * 0.4	1 phase high line voltage
24 = 120 / 2 * 0.4	1 phase modified scale using 2 ohms
96 = 120 / 0.5 * 0.4	1 phase nominal line voltage 400 ampere

1) First connect the current transformer to the proper terminating resistor.

2) Next place the conductors to be measured through the hole in the current transformers. Insure the current transformers are protected from sharp protrusions and the insulation is not deformed when connections are tightened. **CAUTION:** High voltage on the current transformer inputs will cause permanent damage to the SYSTEM 2100 which may not be covered in the product warranty.

CONNECTION OF HIGH VOLTAGE (CLASS 1) CIRCUITS

WARNING: RISK OF ELECTRIC SHOCK. Disconnect power to all circuits which are being serviced.

CAUTION: Insure the rating of the circuit under control does not exceed the rating of the control relay (30 amperes x 240 V.A.C. = 7.2 Kilowatts). In this instance use the control relay to drive a slave relay of proper rating.

For information on relay expansion cards, see Appendix E.

1) First make supply connections including the bonding ground conductor. It is recommended that a separate circuit breaker be installed in the main circuit breaker panel to supply power to the load controller. The circuit breaker must be rated not larger than 20 amperes.

2) Next make the load control connections at the individual circuit breakers and apply appropriate control labels. A selection of either normally-closed or normally-open contacts are available. The normally-open contracts are intended for control of pilot relays. Class 389 relays are wired at the factory for normally-closed operation. This can be changed by moving the quick disconnects from normally-closed relay contacts (1 & 3) to normally-open contracts (4 & 6). See figure 2.

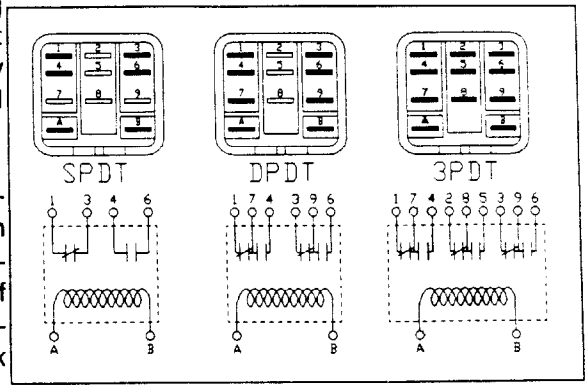


Figure 2 Class 389 Relay Contact Options

Water Heater Connection

Water heaters are generally the lowest priority items for control so make connections to the highest numbered control relays available. For each water heater, disconnect one leg from the circuit breaker and reconnect it through a normally-closed contact. Use two of the 12 to 10 AWG copper conductors previously pulled through the conduit.

CAUTION: Insure Solar System freeze protection is not affected by control of any loads. The solar pump must be supplied from a separate circuit breaker other than the water heater breaker.

Clothes Dryer Connection

Clothes dryers are generally the highest priority item under control so make connections to relay K1. Disconnect the leg of the supply which allows the motor to run and breaks the heating element and reconnect it through a normally-closed contact. **CAUTION:** Shedding the motor side causes service calls. The only sure way to determine proper connection is by trial and error. Disconnect one leg from the circuit breaker which supplies the heating element and NOT the motor and reconnect it through a normally-closed contact. Use two of the 12 to 10 AWG copper conductors previously run through the conduit. IF THE DRYER IS NOT PRESENT, DO NOT CONNECT PLUG.

In most all in one units, it is not possible to break just the heating element. One leg of the supply is the dryer motor. The other leg of the supply is the washer motor. In this case, the element must be controlled inside the dryer.

Resistive Heating Connections

This section concerns direct control of the heating elements; not class 2 control through the thermostat circuits. Insure the ampere rating of the power relays is observed (30 amperes x 240 V.A.C. = 7.2 Kilowatts). Some electric heating circuits have timing devices for either delayed activation or deactivation. When timing devices are present insure proper setup. See definition of mode P1 to P8 (priority 11) and of mode r.1 to r.8.

Baseboard or radiant heaters can usually be controlled at the breaker panel. Disconnect one leg from the circuit breaker and reconnect it through a normally-closed contact. Use lower numbered relays for the higher priority heaters (e.g. dining area, family room, kitchen and baths). Use higher numbered relays for the lower priority heaters (e.g. basement, garage, utility room).

It is recommended that large kilowatt loads (greater than 8-10 kilowatts) be split into several smaller loads. If this is not possible, insure the minimum on time for the load is as short as possible (see definition of mode E1 to E8).

Many heat pump systems use auxiliary strip heaters. Where only one or two strips are used (4-8 kilowatts), control can often be handled with the compressor through thermostat circuits. When systems use more than two heat strip circuits, the use of remotely located power relays may be required to separately control the strips in addition to thermostat control of the compressor circuit.

Spa Heater Connection

Attempt to connect only the heating coil on the spa and allow pumps to run uninterrupted. Some spas may have an accessible thermostat which can be controlled. Others may require a contactor to meet power requirements. Usually a contactor with a 120 or 240 V.A.C. coil is selected from a local electrical supply house. The coil of a contactor with a normally-closed contact is connected through the normally-open contact of one of the control relays. The coil of a normally-open contactor is connected through the normally-closed contact of the control relay.

Pool Equipment

Pool circuits usually include timers to set the time of operation and sometimes to provide delays for pool sweep pump priming. Insure timers operate properly in the shed mode. This may entail rewiring the timer to operate on 120 V.A.C. The SYSTEM 2100 provides some control for operation duration (see definition of setup modes E1 to E8) and delay to activation (see definition of setup modes r.1 to r.8). Setup the pool equipment to operate during times of lowest demand.

CONNECTION OF LOW VOLTAGE (CLASS 2) CIRCUITS

Low Voltage wiring is to enter through the bottom right knockout of the relay enclosure. All wiring should be 18 AWG or larger and have proper type of insulation for the application. Thermostat wire is usually suitable. If wiring is exposed to sunlight it should be placed in conduit or have a ultraviolet resistant jacket. A suitable type of strain relief or conduit fitting should be used.

Two relays are mounted on the circuit board in the interface module for low voltage control circuits. Normally-open and normally-closed contacts for each relay, and 12 V.D.C. supply connections are provided to facilitate both direct and slave control.

If power relays are also needed for class 2 control, insure the insulation of any wires run meet requirements for class 1. On the other hand, more class 1 circuits may be constructed using the on board relays to drive slave relays. If the 12 V.D.C. power supply is to drive 12 V.D.C. slave coils, insure transient suppression is provided (see figure 3).

CAUTION: Failure to provide transient protection will result in erratic controller operation. Your local Pensar dealer supplies pilot relays incorporating the required transient suppression diodes.

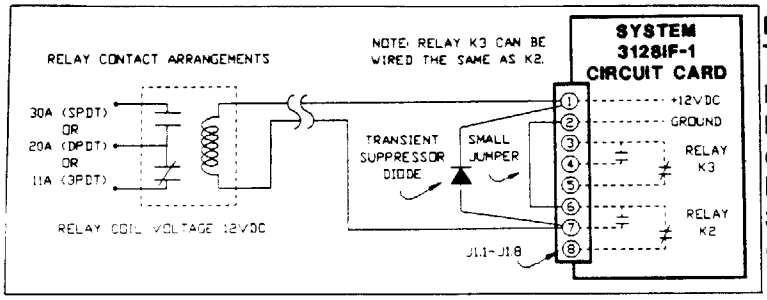


Figure 3 Transient Suppression

Heating Ventilating and Air Conditioning Systems

Heating Ventilating and Air Conditioning systems can be controlled by interrupting certain thermostat circuits. **CAUTION:** It is recommended that slave relays be used when H.V.A.C. systems are located more than 35 feet from the controller or when more than one circuit must be interrupted. Refer to the examples provided in figures 6, 7, and 9. Your local Pensar dealer supplies these 24 V.A.C. and 12 V.D.C. pilot relays.

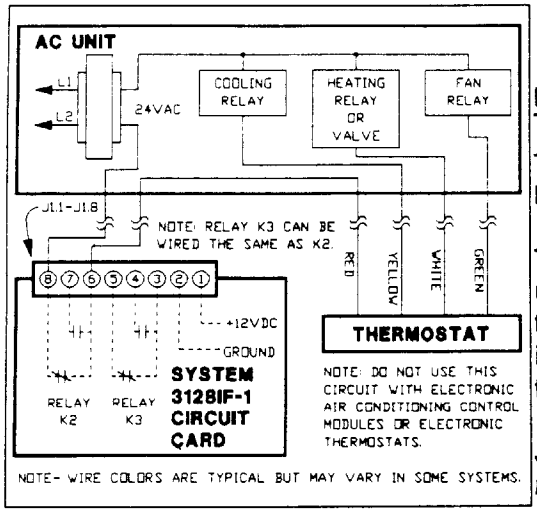


Figure 4
Interrupting 24 V.A.C. to Shed H.V.A.C.

Interrupting 24 V.A.C. to Shed Entire H.V.A.C.

This circuit provides a simple yet effective method of controlling both the heating and cooling functions without additional components.

This circuit should be used with non-electronic thermostats only. Breaking 24 V.A.C. works best for most systems.

See Harvest Aire section for fan control.

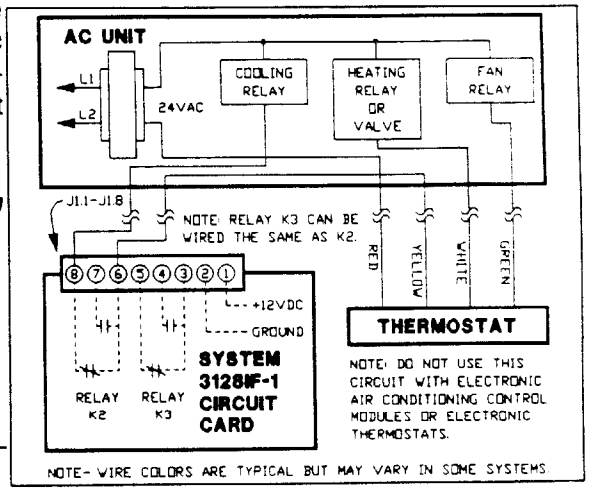


Figure 5
Interrupting Compressor to Shed H.V.A.C.

Interrupting Only the Compressor to Shed H.V.A.C.

This method can be used for dual energy or heat pump systems. Some heat pump systems work best if just the compressor relay is interrupted due to operation of their reversing valves. If the system has auxiliary heat strips they must be separately controlled.

See Connection of Class 1 - Resistive Heating Connections. Note: The fan will operate continuously when cooling is called and if heating is called in heat pump systems. See use of 3PDT pilot on H.V.A.C.

Interrupting 24 V.A.C. to Shed H.V.A.C. With Pilot Relay

This figure illustrates the use of a remote relay for air conditioning systems located more then 35 feet from the load controller.

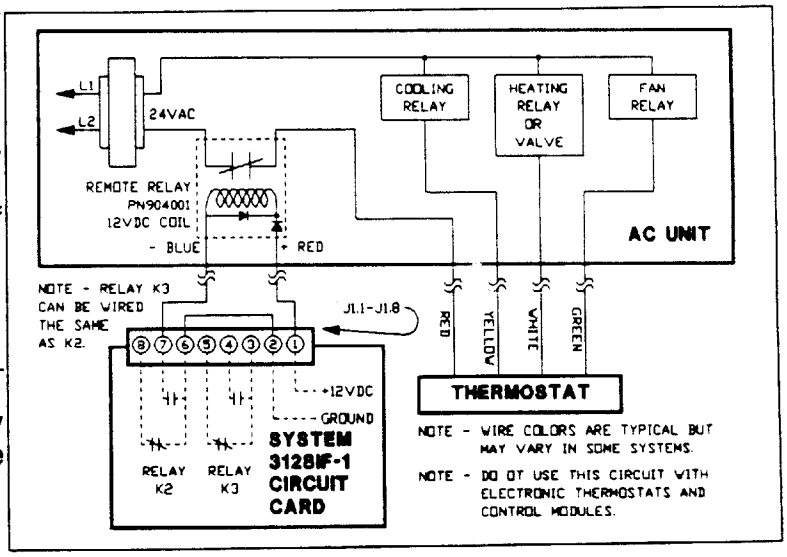


Figure 6
Interrupting 24 V.A.C. with Pilot

Interrupting Fan, Heat, & Cool to Shed H.V.A.C. With 3PDT

This method is used on H.V.A.C. systems that make a loud noise when the load controller "sheds" them. This circuit eliminates control of the reversing valve, thereby eliminating the problem. The 3PDT 24 V.A.C. or 12 V.D.C. relay is used to control the fan, heating, and cooling contractors.

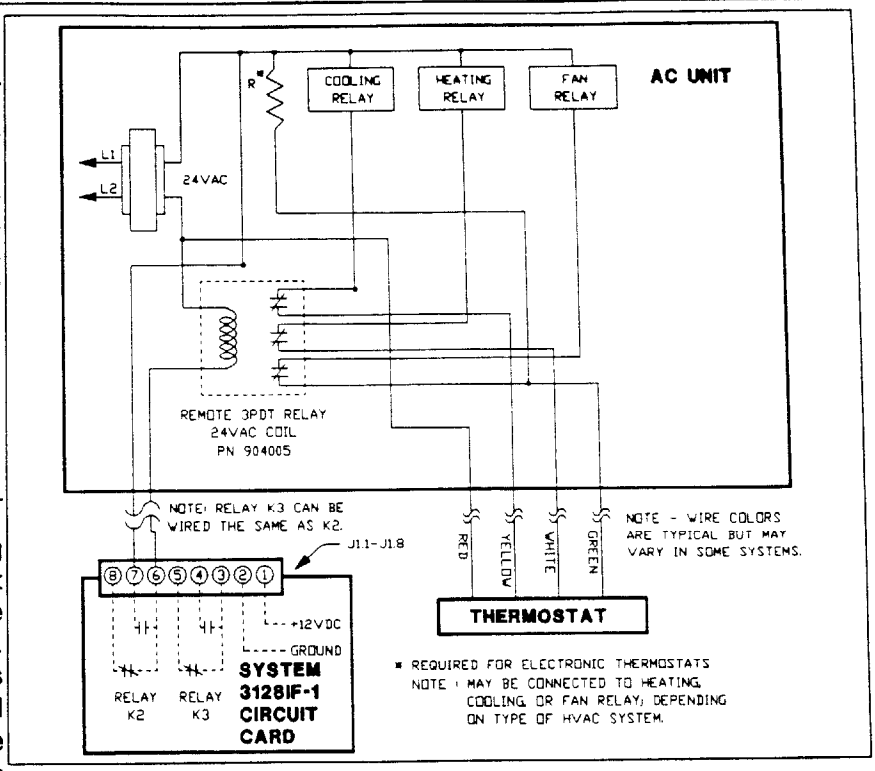


Figure 7
Using 3PDT Pilot to Shed H.V.A.C.

Harvest Aire Thermostat Optimizer

Improving the heating and cooling system operation on systems without a time-delay fan is possible with the HARVEST AIRE thermostat optimizer. Each time the H.V.A.C. system is cycled off by either thermostat or load management control, the fan will be run to harvest the warm or cool air in the duct work or coils.

Part Number	Harvest Aire Description	Enclosure
3142A	1.5 minutes fan off delay	wall mount
3142A-1	1.5 minutes fan off delay	encapsulated
3142	3.0 minutes fan off delay	wall mount
3142-1	3.0 minutes fan off delay	encapsulated

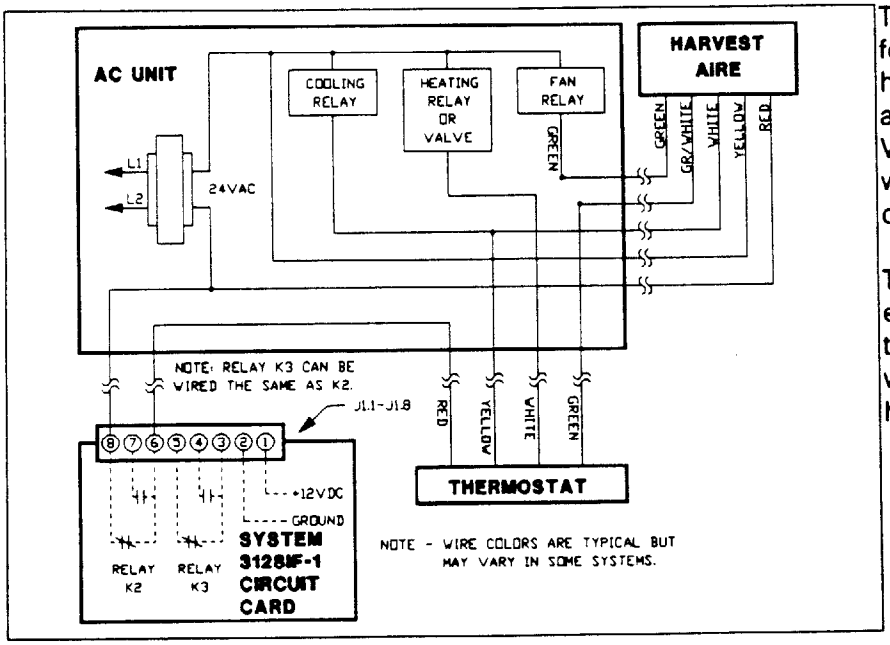


Figure 8
Control H.V.A.C. with Harvest Aire

This circuit provides a simple yet effective method of controlling both heating and cooling functions without additional components. The HARVEST AIRE fan optimizer is shown wired for high impedance operation on the cooling and heating cycles.

This circuit should be used with non-electronic thermostats only. Breaking the 24 V.A.C. works best for systems with electric heat strips and with most heat pumps.

This circuit provides independent control of the heat, cool and fan relays. The HARVEST AIRE is connected to operate in cooling and heating modes.

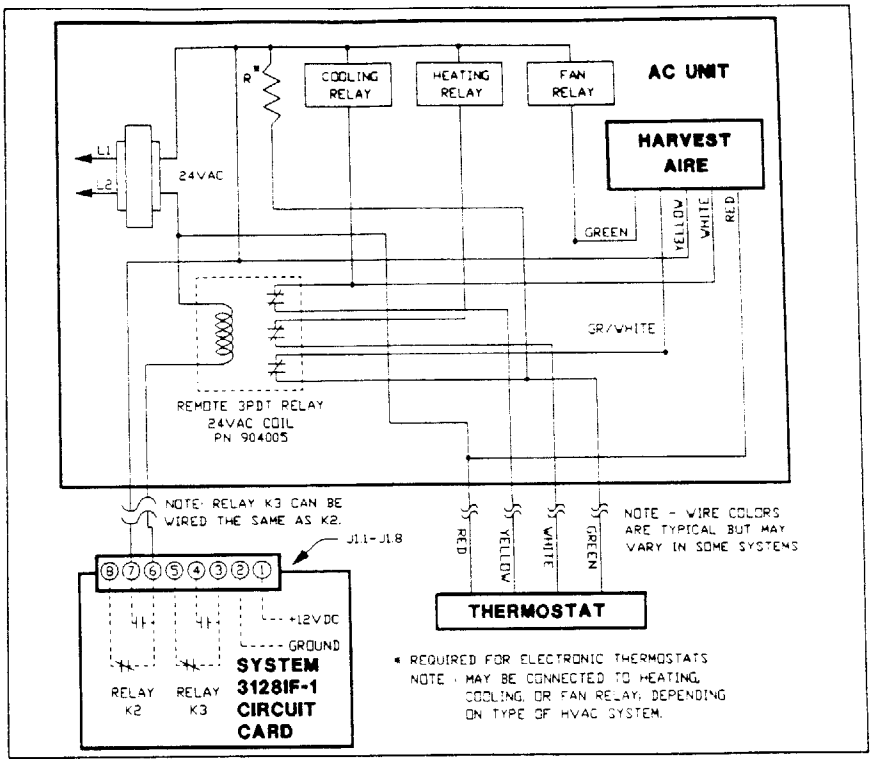
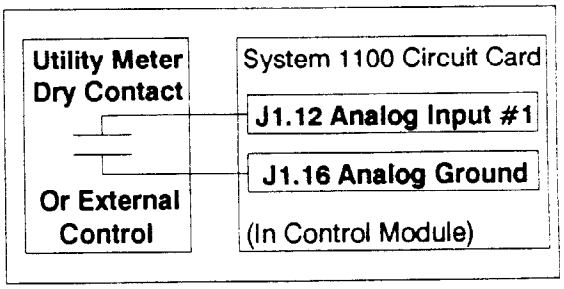


Figure 9
Control H.V.A.C. with Harvest Aire

CONNECTION OF OPTIONAL CONTROLS

Control of periods when demand limiting is not required may be provided through the use of demand limit multiplier (see mode dA) and of utility peak control flag (see mode C1).



CONNECTIONS FOR INDOOR DISPLAY

CAUTION: Static electricity can cause immediate failure or reduce the life expectancy of solid state components. Always ground yourself to the metal chassis (and earth ground if available) before handling electronic equipment.

CAUTION: Insure the maximum wiring distance for connection of the display unit to the interface is observed.

Maximum Distance From Display To Interface

NUMBER POWER RELAYS	3128IF	3128IF-1
2 Power Relays	65 Feet	200 Feet
2 Power Relays	65 Feet	200 Feet
4 Power Relays	65 Feet	200 Feet
6 Power Relays	50 Feet	200 Feet
8 Power Relays	35 Feet	200 Feet

Connections between the SYSTEM 2100 indoor display unit and the relay enclosure are made through the MODEL 3128IF or 3128IF-1 interface module. All wiring should be 18 AWG or larger and have proper type of insulation for the application. Thermostat wire is usually suitable. If wiring is exposed to sunlight it should be placed

in conduit or have a ultraviolet resistant jacket. Terminal assignments for the interface are clearly labeled on the equipment. Identify the appropriate terminal for connection to the display.

Display units may directly control a 12 VDC relay coil without connection through the relay enclosure. This is accomplished using the common 12 VDC connection and the selected relay drive. Insure the location of the relay is accessible and properly documented.

1) Remove the plastic case from the SYSTEM 2100 controller. The case is secured to the base with four #4 screws. Select a location on the wall at the location agreed upon with the customer. Hold the unit against the wall to mark the mounting holes and location of the hole for the wire run to the interface before drilling.

2) Run the wires for connection of the display to the interface module. Use terminal assignments to determine the number of conductors required for the run to the interface. Required wires are marked with an "*". Each load controlled will add one wire. Additional channels may be required for current transformer installation (see section on current transformers). It is highly recommended that spare wires for future addition of features are run.

SYSTEM 2100 TERMINALS

Terminal	Description
J1.1 *	12 V.A.C. source
J1.2 *	12 V.A.C. source
J1.3	future expansion for serial input / output
J1.4 *	+12 VDC output common to all relays
J1.5	digital ground
J1.6	load #8
J1.7	load #7
J1.8	load #6
J1.9	load #5
J1.10	load #4
J1.11	load #3
J1.12	load #2
J1.13	load #1
J1.14	analog input #1 (utility on/off peak)
J1.15	future expansion
J1.16	future expansion
J1.17 *	C.T. input #1 (phase 1)
J1.18	future expansion
J1.19	future expansion
J1.20 *	analog ground

3) Connect the wires to the terminal strip and mount the 3128-20 to the wall with appropriate mounting hardware.

4) Reinstall the plastic display case.

5) Next make connections to corresponding terminals (by function not number) on the interface card. The terminals are clearly marked on the equipment. If the ravages of time wear them away refer to appendix A.

6) There are no corresponding terminals on the interface card for the utility interface to J1.14. These connections may be wire nutted in the low voltage section.

7) There are no corresponding terminals on the interface card to J1.18 and J1.19 (current transformer inputs for phases 2 and 3). If these inputs are required, wire nut the proper terminating resistance (see section on current transformers) to the conductors and place them in the low voltage section of the relay enclosure.

8) Double check your connections prior to energizing the equipment. Energize the equipment. Proceed to the setup procedure for the SYSTEM 2100 in the settings and controls section.

FINAL INSPECTION AND DOCUMENTATION

1) Insure the unit sheds and restores all loads. The H.V.A.C. unit must be tested for proper operation & control in both heat and cool modes.

2) Insure user mode 2 displays the correct kilowatt draw.

3) Set the demand limit (mode 1).

4) Erase highest registered peak demand (mode 4).

5) Insure all overrides are clear (mode 5).

6) Set the automatic adjustment maximum (mode 6) to "0.0" for manual or to a reasonable maximum seasonal adjustment point.

7) Set the automatic adjustment minimum (mode 6 dot) to "0.0" for manual or to a reasonable minimum seasonal adjustment point.

8) Set the alarm (mode 7) to "4" or "5" or as the customer desires.

9) After the system is fully operational, replace and secure the front cover. Insure the area is clean of installation debris.

10) Fill in the necessary information as indicated on the various labels. Use a permanent type ink. Supplementary labels are proved for controlled devices. Place these in a conspicuous locations in the circuit breaker panel and on the controlled devices.

11) Place the required label with the installing company's name and telephone is number on the outside of the box.

12) Last but most important, educate the customer on control strategies and operation of their new unit. Leave the customer with this manual and a goal to save.

SERVICE

The first step in any trouble-shooting procedure is to clearly define the problem including the possibility of operator error or misconception. This is usually done over the phone. Have the user indicate the data of each of the modes and insure no override is in effect. Analysis of this data usually leads directly to the problem. Directed override may also prove beneficial to problem solving.

Check power supplies and fuses. The SYSTEM 2100 module is protected with a 2.5 ampere fast-blow fuse type AGC or equivalent. The intention of the fuse is to protect the card and transformer but not necessarily external devices connected to it.

Insure the relays are in operational order. De-energize the controller and insure all equipment is operational through the normally closed contacts. Energize the controller and set the demand limit to 0.1. Insure all loads are disabled. Insure the proper connection of the coil and contacts.

Keep connections tight. It is good practice to insure all terminal and wire nut connections are secure.

To isolate equipment, when override is not possible, de-energize load controller (turn off all the other controlled equipment). This will allow the device to work continuously.

If the chassis must be removed for service, properly terminate all wires. **WARNING:** Short current transformer wires together to prevent high voltages. Remove the bottom mounting screw and loosen the keyed screws. To have the chassis serviced, contact your local PENSAR dealer. If there is not a dealer in your area contact ElectroSem, LLC at 602-955-6566.

Appendix A Connector Terminal Assignments

3128IF-1 TERMINALS

TERMINAL	DESCRIPTION
J-1,1	+12 V.D.C. Supply
J-1,2	Ground
J-1,3	Relay K3, Common Contact
J-1,4	Relay K3, Normally Open Contact
J-1,5	Relay K3, Normally Closed Contact
J-1,6	Relay K2, Common Contact
J-1,7	Relay K2, Normally Open Contact
J-1,8	Relay K2, Normally Closed Contact
J-2,1	12 V.A.C. Source (1)
J-2,2	12 V.A.C. Source (2)
J-2,3	+12 VDC (4)
J-2,4	Digital Ground (chassis Ground) (5)
J-2,5	Current Transformer Ground (20)
J-2,6	Current Transformer Signal (17)
J-2,7	Relay K8 Control (6)
J-2,8	Relay K7 Control (7)
J-2,9	Relay K6 Control (8)
J-2,10	Relay K5 Control (9)
J-2,11	Relay K4 Control (10)
J-2,12	Relay K3 Control (11)
J-2,13	Relay K2 Control (12)
J-2,14	Relay K1 Control (13)

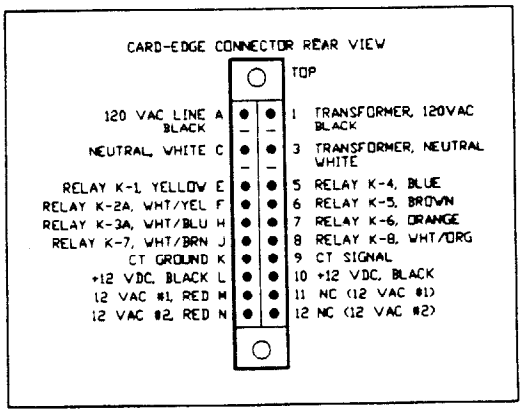
J-1 is located at the bottom of the module (bottom edge of the card).
J-2 is the connector located behind the on board relays.
Numbers in parentheses indicate System 2100 display terminal connections.

3128IF TERMINALS

TERMINAL	DESCRIPTION
J-1,1	+12 V.D.C. Supply
J-1,2	Ground
J-1,3	Relay K3, Common Contact
J-1,4	Relay K3, Normally Open Contact
J-1,5	Relay K3, Normally Closed Contact
J-1,6	Relay K2, Common Contact
J-1,7	Relay K2, Normally Open Contact
J-1,8	Relay K2, Normally Closed Contact
J-2,1	12 V.A.C. Source (1)
J-2,2	12 V.A.C. Source (2)
J-2,3	+12 V.D.C. (4)
J-2,4	Current Transformer Ground (20)
J-2,5	Current Transformer Signal (17)
J-2,6	Relay K6 Control (8)
J-2,7	Relay K5 Control (9)
J-2,8	Relay K4 Control (10)
J-2,9	Relay K3 Control (11)
J-2,10	Relay K2 Control (12)
J-2,11	Relay K1 Control (13)

J-1 is located at the bottom of the module (bottom edge of the card).
J-2 is the connector located behind the on board relays.
Numbers in parentheses indicate System 2100 display terminal connections.

CARD-EDGE CONNECTOR TERMINALS



Appendix B Setup Parameters In Step-by-step Order

Remember to change modes, press *Mode Select.* To change data, use *Increase Adjustment* or *Decrease Adjustment.*

P1 Enter the Priority for load #1 (1-7).
L1 Enter the Kilowatt draw of the Load #1 (round up to nearest kilowatt).
E1 Enter the Enabled time of load #1 (minimum on time in minutes).
d1 Enter the disable time of load #1 (minimum off time in minutes).
P2 Enter the Priority for load #2 (1-11). For no connection set priority 15.
L2 Enter the Kilowatt draw of the Load #2 (round up to nearest kilowatt).
E2 Enter the Enabled time of load #2 (minimum on time in minutes).
d2 Enter the disable time of load #2 (minimum off time in minutes).
P3 Enter the Priority for load #3 (1-11). For no connection set priority 15.
L3 Enter the Kilowatt draw of the Load #3 (round up to nearest kilowatt).
E3 Enter the Enabled time of load #3 (minimum on time in minutes).
d3 Enter the disable time of load #3 (minimum off time in minutes).
P4 Enter the Priority for load #4 (1-11). For no connection set priority 15.
L4 Enter the Kilowatt draw of the Load #4 (round up to nearest kilowatt).
E4 Enter the Enabled time of load #4 (minimum on time in minutes).
d4 Enter the disable time of load #4 (minimum off time in minutes).
P5 Enter the Priority for load #5 (1-11). For no connection set priority 15.
L5 Enter the Kilowatt draw of the Load #5 (round up to nearest kilowatt).
E5 Enter the Enabled time of load #5 (minimum on time in minutes).
d5 Enter the disable time of load #5 (minimum off time in minutes).
P6 Enter the Priority for load #6 (1-11). For no connection set priority 15.
L6 Enter the Kilowatt draw of the Load #6 (round up to nearest kilowatt).
E6 Enter the Enabled time of load #6 (minimum on time in minutes).
d6 Enter the disable time of load #6 (minimum off time in minutes).
P7 Enter the Priority for load #7 (1-11). For no connection set priority 15.
L7 Enter the Kilowatt draw of the Load #7 (round up to nearest kilowatt).
E7 Enter the Enabled time of load #7 (minimum on time in minutes).
d7 Enter the disable time of load #7 (minimum off time in minutes).
P8 Enter the Priority for load #8 (1-11) For no connection set priority 15.
L8 Enter the Kilowatt draw of the Load #8 (round up to nearest kilowatt).
E8 Enter the Enabled time of load #8 (minimum on time in minutes).
d8 Enter the disable time of load #8 (minimum off time in minutes).

F1 Full scale demand for current transformer input

PL Demand period selection (15 minute, 30 minute, and 60 minute).
dA Limit multiplier, Multiplies the demand limit by this number when off peak is set. To inhibit select 1.0.

C1 Control Flag Set to "C" for peak (no multiplier) when input at gnd.
Set to "O" for peak (no multiplier) when input open

r.1 Load 1 restoration delay. Select with "E" to cause 5 minutes delay
r.2 Load 2 restoration delay. before any load may be restored after
r.3 Load 3 restoration delay. selected load is restored.
r.4 Load 4 restoration delay.
r.5 Load 5 restoration delay.
r.6 Load 6 restoration delay.
r.7 Load 7 restoration delay.
r.8 Load 8 restoration delay.

Appendix C Setup Examples

Setup Mode	Example 1 Set / Comment	Example 2 Set / Comment	Example 3 Set / Comment	Example 4 Set / Comment
P1 L1 E1 d1	1 5 Load #1 3 (dryer) 1	1 5 Load #1 3 (dryer) 1	2 5 Load #1 3 (dryer) 1	1 5 Load #1 3 (dryer) 1
P2 L2 E2 d2	2 6 Load #2 6 (HVAC) 6	2 6 Load #2 6 (HVAC) 7	3 6 Load #2 6 (HVAC) 6	2 6 Load #2 6 (ac #1 6
P3 L3 E3 d3	15 X Load #3 X (no Load) X	2 7 Load #3 6 (HVAC) 7	3 7 Load #3 6 (HVAC) 8	3 6 Load #3 6 (ac #2) 8
P4 L4 E4 d4	8 5 Load #4 3 (w/h) 1	7 5 Load #4 3 (w/h) 1	8 5 Load #4 2 (w/h #1) 2	5 6 Load #4 2 (heat #1) 2
P5 L5 E5 d5	15 X Load #5 X (no Load) X	8 12 Load #5 1 Spa 3 Heater	8 5 Load #5 2 (w/h #2) 2	6 5 Load #5 2 (heat #2) 2
P6 L6 E6 d6	15 X Load #6 X (no Load) X	15 X Load #6 X (no Load) X	1 2 Load #6 15 (pool Pump) 5	6 5 Load #6 2 (heat #3) 3
P7 L7 E7 d7	15 X Load #7 X (no Load) X	15 X Load #7 X (no Load) X	9 2 Load #7 10 (sweep) 5	6 5 Load #7 2 (heat #4) 3
P8 L8 E8 d8	15 X Load #8 X (no Load) X	15 X Load #8 X (no Load) X	15 X Load #8 X (no Load) X	8 5 Load #8 2 (w/h #1) 2
F1 PL dA C1	24 Full Scale 60 Period Len 1.0 Multiply O always peak	48 Full Scale 60 Period Len 1.0 Multiply O always peak	48 Full Scale 60 Period Len 1.0 Multiply O always peak	48 Full Scale 15 Period Len 1.0 Multiply O always peak
r.1 r.2 r.3 r.4 r.5 r.6 r.7 r.8	_ no r delay _ no r delay _ no r delay _ no r delay _ no r delay _ no r delay _ no r delay _ no r delay	_ no r delay _ no r delay E delay on r _ no r delay _ no r delay _ no r delay _ no r delay _ no r delay	_ no r delay _ no r delay _ no r delay _ no r delay _ no r delay _ no r delay _ no r delay _ no r delay	_ no r delay _ no r delay _ no r delay _ no r delay _ no r delay _ no r delay _ no r delay _ no r delay

See SETUP MODE DEFINITIONS for detailed information.

Example 1: Illustrates connection of a clothes dryer, HVAC, and water heater. Full scale is set at 24 KW (2 ohm terminator). The demand period is one hour. Demand is always limited.

Example 2: Illustrates connection of a clothes dryer, 2 HVAC, a spa, and a water heater. Full scale is at 48 kilowatts. The demand period is one hour. The unit is set to always limit demand.

Example 3: Illustrates connection of a clothes dryer, 2 HVAC, and 2 water heaters, a pool pump & sweep. Full scale of 48 kilowatts. The demand period is one hour. The unit is set to always limit demand. Notice the use of priority 9 on the pool sweep.

Example 4: Illustrates connection of a clothes dryer, 2 Air Conditioners, 4 heat strips, and a water heater. Full scale at 48. The demand period is 15 minutes. The unit is set to always limit demand.

Appendix D Typical Current Transformer Installations

Single Phase 200 Ampere

This is the most commonly used C.T. hook-up.

NOTE: C.T. are inverted (reversed).

MODE DATA
F1 48

NOTE: C.T. are inverted on each set of lines.

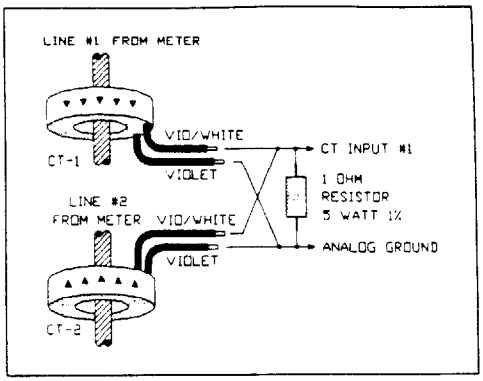


Figure 10 Single Phase 200 Ampere C.T. Placement

Single Phase 400 Ampere - 2 CT's

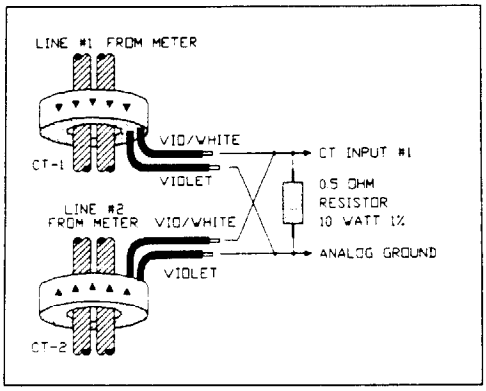


Figure 11 Single Phase 400 Ampere C.T. Placement (2 C.T.s)

If the house has a 400 ampere service (four hot lines) and the lines can be fit two to a C.T. use this configuration.

MODE DATA
F1 96

NOTE: C.T. are inverted on each set of lines.

Single Phase 400 Ampere - 4CT's

If the house has a 400 ampere service (four hot lines) and the lines can not be fit two to a C.T. use this configuration.

NOTE: match the phase going through C.T.

MODE DATA
F1 96

NOTE: C.T. are inverted on each set of lines.

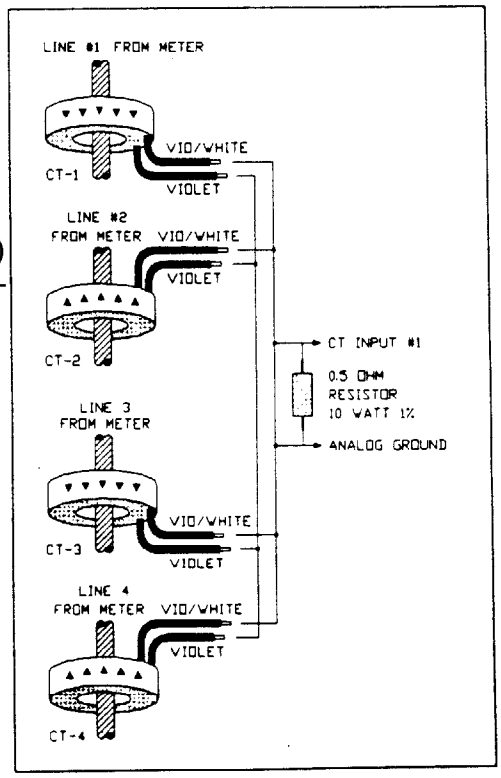


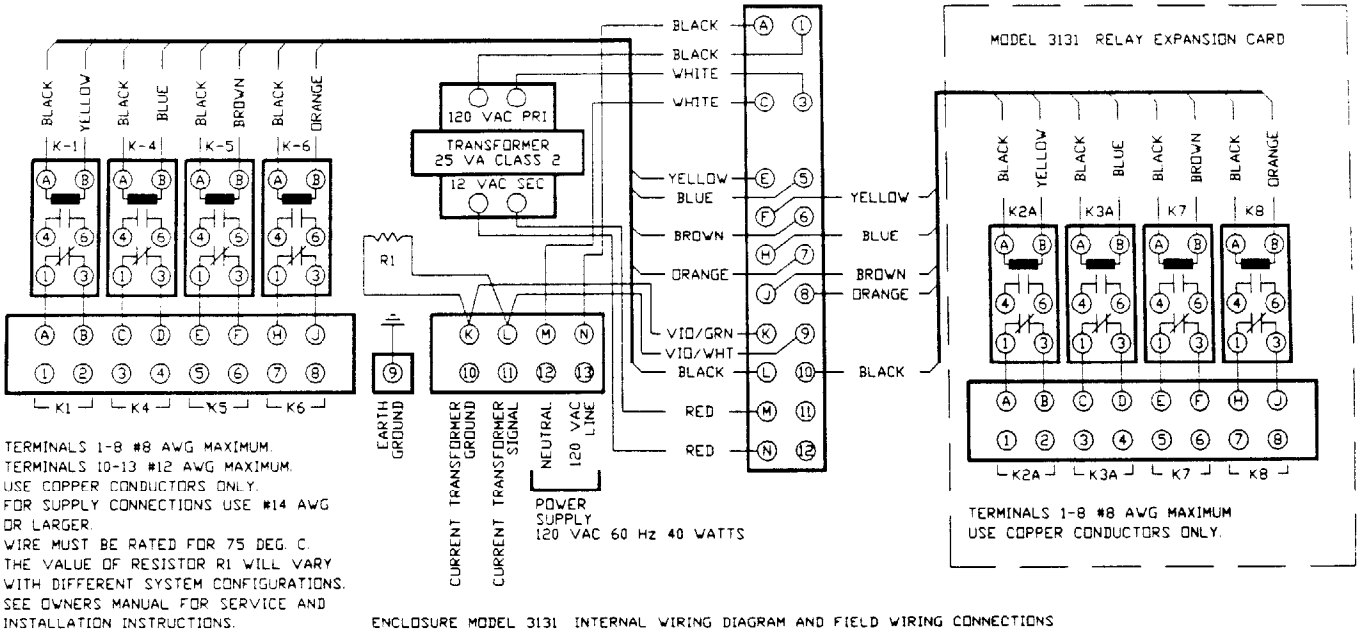
Figure 12 Single Phase 400 Ampere C.T. Placement (4 C.T.s)

Appendix E Relay Expansion Cards

CAUTION: MORE THAN ONE DISCONNECT MAY BE REQUIRED TO DE-ENERGIZE THIS EQUIPMENT BEFORE SERVICING. Relays come from factory wired in normally-closed configuration. To change to normally-open, disconnect wires connected to contacts 1 and 3 (marked on relay) and reconnect to contacts 4 and 6.

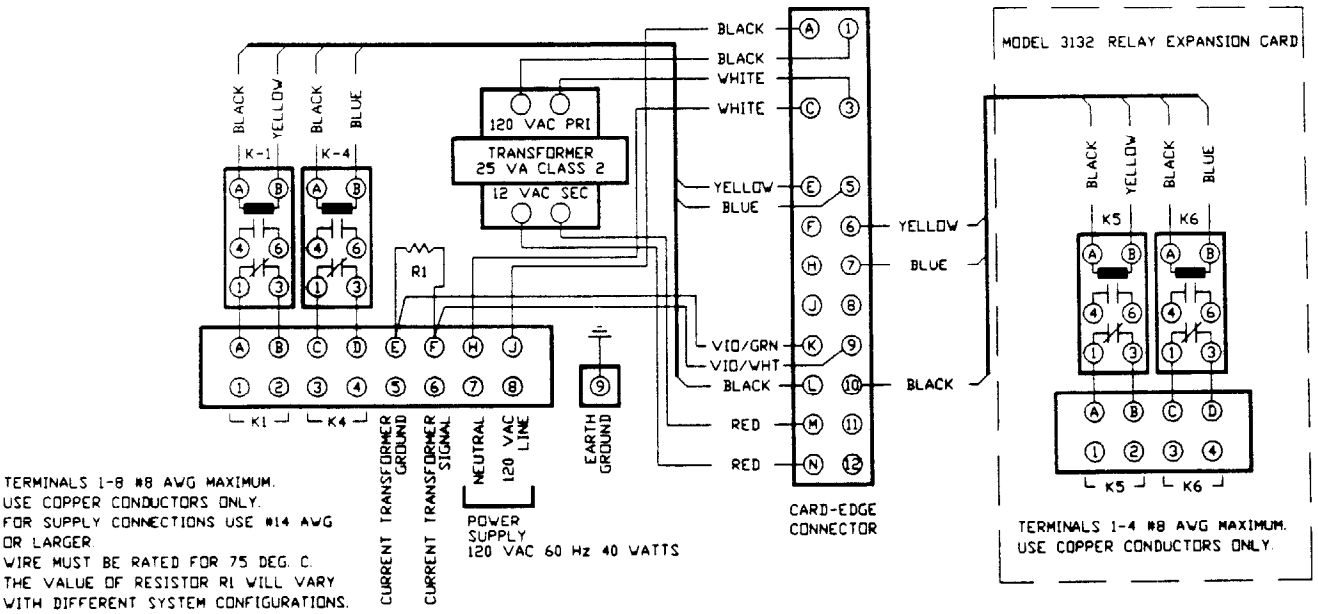
RELAY CONTACT SPECIFICATIONS:DPST-DB (standard.); SPST-DM (optional)
30 AMPERE RESISTIVE 120/240 V.A.C. 3/4 HP 120 V.A.C., 1-1/2 HP 240 V.A.C.

FOUR CIRCUIT EXPANSION CARD PN-800025: The relay expansion card provides four additional circuits for control. The new circuits are designated K2A, K3A, K7, and K8. Circuits K7 and K8 are controlled independent of all other circuits. Circuits K2A and K3A are switched at the same time as the standard pilot relays K2 and K3.



ENCLOSURE MODEL 3131 INTERNAL WIRING DIAGRAM AND FIELD WIRING CONNECTIONS

TWO CIRCUIT EXPANSION CARD PN-800026: The relay expansion card provides two additional circuits for control. The new circuits are designated K5 and K6. Circuits K5 and K6 are controlled independent of all other circuits.



ENCLOSURE MODEL 3132 INTERNAL WIRING DIAGRAM AND FIELD WIRING CONNECTIONS

Technical Specifications

DISPLAY PANEL

Dimensions:	4.75"w x 6"h x 1.3"d.
Mounting:	Surface (vertical)
Color and Material:	Ivory or gray molded plastic
Power Requirements:	Class 2, 12 V.A.C., 4 watts, 60 Hz.

TYPICAL RELAY ENCLOSURES

Model 3131

Dimensions:	10"w x 12"h x 4.0"d. (Optional sizes available)
Enclosure type:	NEMA 3R Rain tight, screw cover
Operating Temperature:	-40F to +170F.
Power Requirements:	120 V.A.C., 60 Hz.
	40 watts maximum
	4 watts standby
Relays:	Electromechanical type.
	Two 3 ampere pilot-duty SPDT.
	Up to eight 30 ampere 1 1/2 HP SPDT (DPDT optional)

Model 3132

Dimensions:	8"w x 10"h x 4.0"d.
Enclosure type:	NEMA 3R Rain tight, screw cover
Operating Temperature:	-40F to +170F.
Power Requirements:	117 V.A.C., 60 Hz.
	40 watts maximum 4 watts standby
Relays:	Electromechanical type.
	Two 3 ampere pilot-duty SPDT.
	Up to four 30 ampere 1 1/2 HP SPDT (DPDT optional)

CURRENT TRANSFORMERS

Two ring type with 48" 600 volt leads
Standard type: 200 : 1 ampere Class 2
Dimensions: 2.4" O.D. x 1.1" I.D. x 0.8" width
400 and 600 ampere ratings also available

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.