Note: We also have Operating Instruction Manual

DENCOR

PRELIMINARY SPECIFICATIONS
March 15, 1985

DENCOR MODEL 809

The new Dencor Model 809 Energy Management System is a programmable computer based device with a locked, non-battery, back-up memory for efficient and reliable control of electrical demand. Savings of up to 50% or more may be realized on Electric Utility charges.

The 809 controller can be configured to control from 5 to 17 load circuits, with 9 modes of load sequencing schedules ranging from straight priority control to total rotation. Any priority level may be programmed for both minimum shed and minimum restore times for protection of compressor-type loads.

Versatility is the keyword for the Model 809. Simple touches of four pushbuttons on the Digital Display Station (DDS) can give all the following features:

* Automatic setpoint selection with selectable comfort range;
* Manual setpoint control with increase or decrease prompts;
* Single, dual, or triple demand setpoint control levels;
* Instantaneous demand display;
* Average and MAX average demand usage displays;
* Display of two remote temperature readings (optional);
* Circuit override control;
* 15, 30, 60 minute demand intervals;
* Display of present cost of energy usage;
* Shed sequence display lights;
* Visual overlimit alarm indicators;
* Audio overlimit alarm with volume control and selectable time delay;
* 9 modes of load sequencing control;
* Selectable on/off delay timers up to 60 minutes;
* Display of 25 hour average demand load factor;
* Selectable maximum and minimum demand setpoint limits;
* Selectable deadband control gap;
* Selectable automatic setpoint control parameter to match the control to your usage pattern and climate;
* Automatic ramping of setpoint after power outages or utility control intervals to prevent electrical "payback";
* Selectable for use with current transformer or pulse meter installations;
* Demand scale increments from .5 to 10KW for control ranges from 32.5 to 850KW (or 8500KW);
* Special codes to prevent tampering are available;
* Time of Day control with 8 daily time settings and a 7 day clock;
* Error Displays;
* And more with custom orders for your application.

Along with the programmable features are many special hardware features. The Model 809 has many housing configurations with sizes to fit your needs. All versions include a Class II SPDT pilot relay to control an air conditioner or heat pump compressor, timed load, or temperature setback.

Other hardware features include:

* 5 analog inputs;
* 2 special outputs;
* 2 setpoint select inputs;
* 1 pulse meter input;
* 2 programable jumpers;
* Compatible with the premium DDS or low cost SC800 set stations, or can be used without a set station;
* Only 4-wire cable required for DDS set station or 5 for the SC800;
* 8 relay driver outputs;
* Plug in and snap on/off circuit cards for easy maintenance.

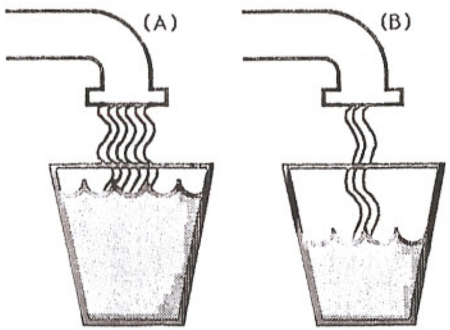
Besides all of the above, the Model 809 Controller with DDS set station is eligible for available energy tax credits.

Special applications control may include remote reading of demand or other data from central stations.

What is "demand"?

In the electrical world, *demand* is the average *rate* of energy consumption over a given period of time (15 minutes to an hour). It's measured in kilowatts (kW).

The other form of measuring electricity is called energy usage, or kilowatt-hours (kWh). Kilowatt-hours is the *total* amount of energy used over a given period of time. To illustrate the difference, consider water flowing into a bucket at different rates.



In example (A), the water pressure is turned on high, filling the bucket in one minute. By turning the pressure down, as in example (B), it takes twice as long to fill the bucket.

Now to describe these examples in "electrical" terms: Example (A) has a *high* demand, while (B) has a *low* demand. Water flow is similar to the flow of electricity into your home. By turning on every switch or electrical appliance in your home at one time, you are "demanding" a lot of energy quickly.

The total amount of water in either bucket, however, is similar to the amount of energy used, or kilowatt-hours. If you are willing to take a little longer, you can fill bucket (B) to the same level as bucket (A) — at a lower "demand."

Most utilities charge customers only for the total amount of energy used, the kilowatt-hours, during a billing period. However, other utilities seriously consider the effect of demand on their system and want their customers to "level" demand — making it possible for the power company to serve more people with the same generating capacity. To further illustrate demand, let's look at another example.

Suppose the Taylor family arrives home after a vacation. Probably only a few electrical appliances such as the refrigerator, hot water heater, clocks, and minimal baseboard heat or air conditioning were operating during their absence. The home may be either hot or cold. Let's see what can occur in the next hour.

1. The lights are turned on and the electric heat or air-conditioning is turned to 70 degrees.
2. Mrs. Taylor puts dinner in the oven and washes and dries a load of laundry.
3. Dad turns on the TV while the kids line up to take hot showers.

Looking at demand, this is what the utility could record for the Taylor home:

	kW before Returning	**kW after Returning**
Heating or A/C	5.0	12.0
Hot water	(wasn't heating)	4.5
Range	(not on)	3.5
Dryer	(not on)	4.5
Misc. (lights,etc.)	.5	3.5
Total (kW)	5.5	28.0

To satisfy the Taylor family, the utility is obligated to provide all the power necessary — now flowing into this home at a rapid rate.

Suppose that 5,000 homeowners did the same thing at the same time. Imagine what would happen at the utility generating station. It could easily exceed its capacity to deliver electricity. Fortunately, such cases of peaking occurring at one time are rare, but it sometimes gets close . . . in very hot weather, for example, when everyone has their air conditioning on, or in very cold weather when electric heating is high.

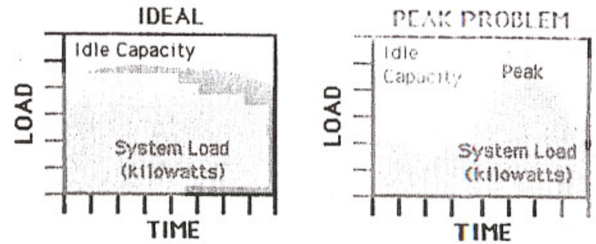
To satisfy customers under *all* conditions, the generating utility has to plan for and build sufficient generating capacity to handle demand even under emergency conditions. It is very expensive to build plants — about $1,000 to $1,500 per kilowatt of generation. A typical 500 megawatt plant (500,000 kW) would cost between 500 and 750 million dollars.

The utility which buys energy for its customers, shares this capacity cost by being charged for energy used in addition to a "demand" charge. These charges are, in turn, passed on to its customers — directly or indirectly.

The utility also measures its "efficiency" in delivering energy by what is called a "Load Factor".

To explain: Suppose you bought a $10,000 car and only drove it a few miles per year. Like an expensive utility generator infrequently used, your car would be a poor investment...it would have a low "load factor".

The ideal load factor situation for power generating facilities, illustrated below, is to maintain a steady flow of energy 24 hours a day, 365 days a year. On the other hand, often they can't avoid situations as in the other example: high fluctuations in power usage which cause "peaks".



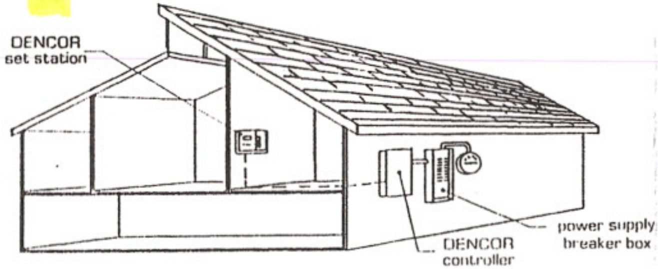
Utilities are concerned about peaks, unusually high demand periods which typically occur during extreme weather conditions. To avoid brown-outs or extra operating costs, they must have available sufficient generating capacity and/or stand-by emergency generating equipment, or be forced to buy emergency energy from another utility at a premium price.

Consequently, many utilities are willing to reward customers who can assist them in leveling out system peaks. One of the more effective methods of leveling demand is to promote the use of demand controllers for their customers with all-electric homes.

What is a demand controller?

A demand controller is a sophisticated piece of electrical equipment which monitors and controls power consumption — leveling out peak electrical consumption.

The controller is mounted next to your power supply breaker box. Sensors monitor the demand level of the home and turn off certain loads during high demand periods, restoring them at the end of that period — all on a priority basis. What you need least is turned off first, and what you need most is turned off last. It's all done automatically and all controlled circuits are turned on again when the peak load goes down. The homeowner selects the controlled level of demand — by a set station.



If you own an all-electric home, and your utility offers an incentive rate to control demand, the most sensible solution is to install a Dencor energy management system — essentially an "electric money saver".

With this system, only a few major, non-critical loads are controlled — electric heating, air conditioning, water heater, and clothes dryer heating element. You don't need to control more than these to keep your demand down.

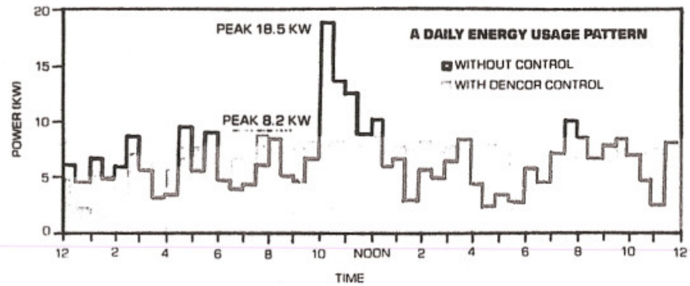
You manage everything else — TV, range, oven, lights, washing machine, etc. These are *not* controlled which allows you to maintain a normal lifestyle.

There are various models of Dencor demand controllers, but whichever is in place, they all function alike — keeping firm control so your kilowatt peaks do not exceed a reasonable demand set point.

The following illustration shows the power usage of two homes: One has a Dencor energy management system, the other does not. Although the total amount of energy used (kWh) is the same in both homes, the utility bill for the uncontrolled home will be higher because of its higher peak demand.

On a demand rate where the total energy consumption (kWh) is the same, the utility bill for the uncontrolled example is much higher because of the higher peak demand.

NOTE: The utility charges the homeowner at the highest demand peak reached in the billing month. This peak may occur in any 15, 30 or 60 minute period during that month.



Three ways a demand controller may be used:

1. Utilities who want to measure and bill a homeowner's demand will install a demand/energy meter. The difference between this meter and a common kilowatt-hour meter is a needle or register that records the highest demand reached in that home during the billing period. In many utilities, the meter measures demand in 15 minute segments, so it can only take you one 15 minute period in any billing month to reach your highest demand. The meter is reset monthly after being read by the meter reader.

2. Customers on time-of-day demand rates, have a more sophisticated meter. It records demand only during certain hours of the day and/or seasons, and the controller is activated during these selected periods by a programmed time clock.

3. Lastly, some utilities use a demand controller to control only when they see their system demand approaching a "red condition" peaking level. They then send out a signal, either a radio signal, or via a powerline. The controller is then activated to begin controlling until a subsequent signal to de-activate is sent once the emergency has passed.

So you see, Dencor demand controllers may be used by utility companies in different ways to solve their specific load management requirements. But for you, it should be a pleasant experience to own a Dencor controller — it lowers your utility bill!

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