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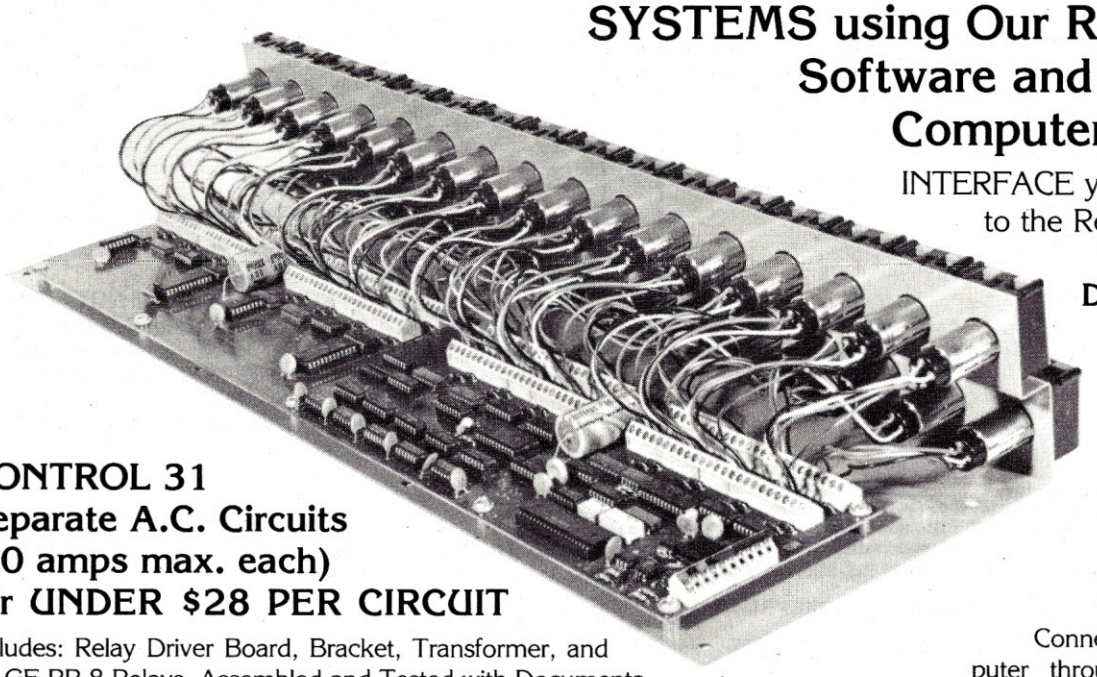

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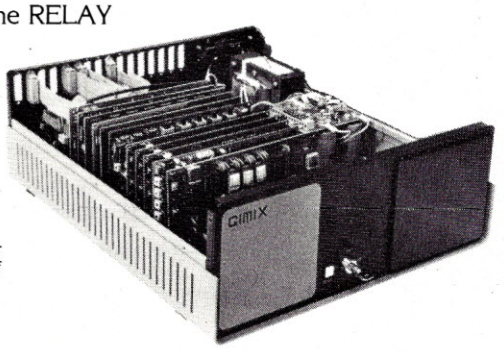

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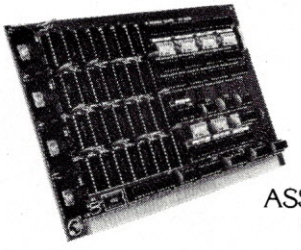

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We would like to call your attention to the **June 1979** issue of **Interface Age Magazine.** It will contain an article about **GIMIX** and go into more detail about our **GHOST Power Control System** than we can in this ad.

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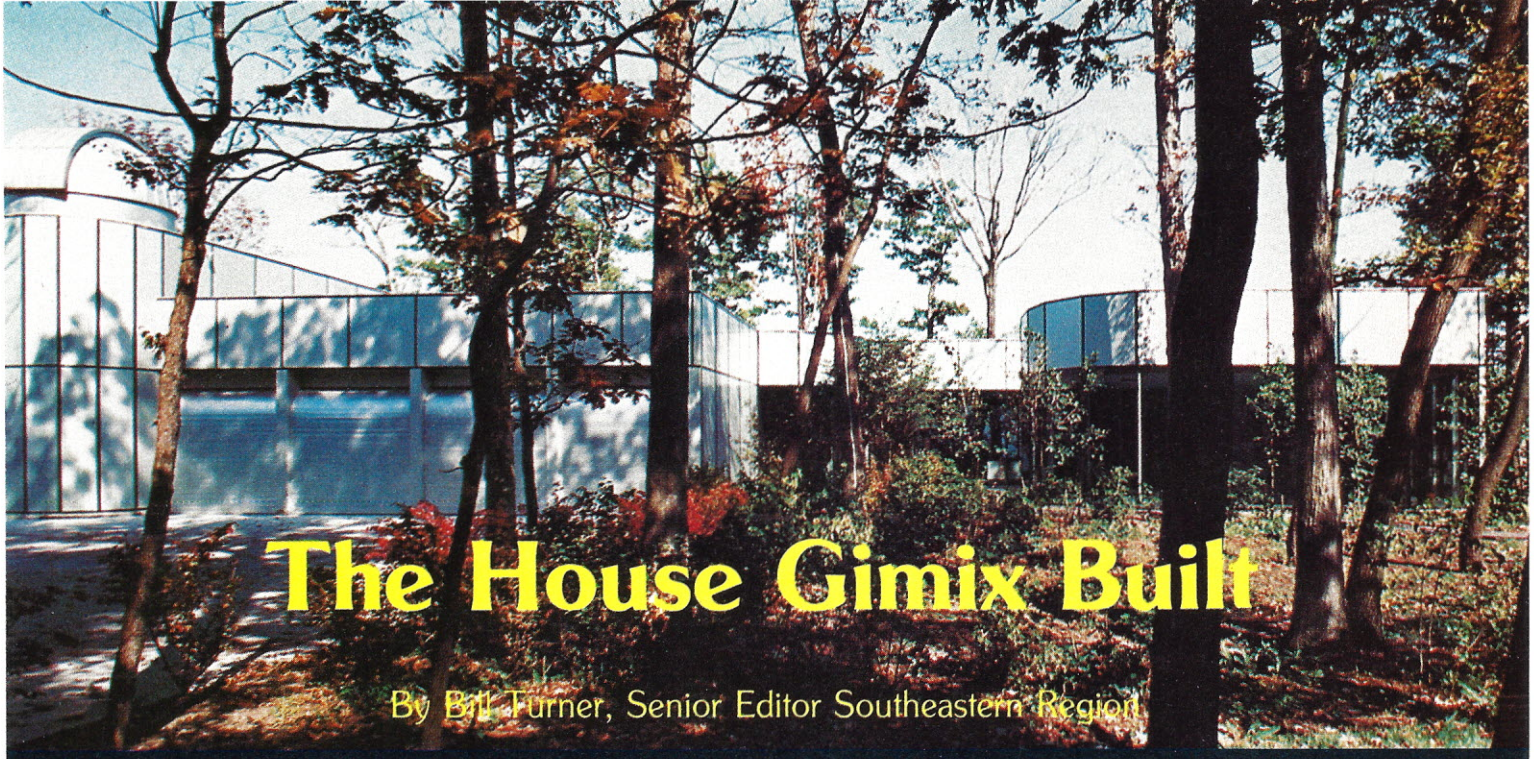


The House Gimix Built

By Bill Turner, Senior Editor Southeastern Region

From what was intended to be an elaborate garage door opening device, a Chicago resident has ended up with a house that can be run almost entirely by computers from anywhere in the world.

This surprising combination of the garage door opener, a computer and a telephone paging system came about in part through the work of employees of Gimix, Inc., a company that specializes in manufacturing telephone devices and microprocessing equipment that is based on the Motorola 6800 and the SS-50 bus. The product is called the "house control system."

The house control system is actually the commercial adaptation of a computerized control system that has been controlling several Chicago area homes for several years.

Architect Stanley Tigerman was selected to design the house, which was to be "different." Just how different was a source of concern for the owner's wife. He wanted a futuristic MACHINE IN THE GARDEN.

She was more interested in a "white brick country villa," and was less than enthralled with the glass and stainless steel cladding that was proposed.

Eventually, though, everybody agreed to the duller pewter-like finish of aluminum in place of stainless steel. The glass and aluminum structure nestled beneath the snow covered trees at the end of a long curved driveway is truly impressive. The only regret of the owners is that perhaps less glass and slightly lower ceilings might have been better.

The house sits atop a 1.5 acre cliff overlooking Lake Michigan. The floor plan derives its unusual configuration from the decision to have rooms overlooking the lake, and the desire to provide space and privacy for each of the five family members. There are several unique features, such as the two walkways that run the full length of the house along the windows on the east and west walls. This eliminates the necessity for other house members to interrupt guests while "passing through." The house also has a radiant-heated indoor pool and an observatory where the owner can enjoy one of his many hobbies — star gazing.

The owner, who prefers anonymity, took a much larger interest in the planning and construction aspects than normally occurs. In fact, he acted as the general contractor for the prefab custom house and included extra features such as installing guidance cables in the floor for a computerized serving cart. Much to my disappointment, and also to several recent visitors from Japan, the cart has not yet been assembled.

The house was built using techniques very similar to those used in constructing a warehouse. The roof is supported entirely by joists that are themselves supported by columns built into the outside walls. To use the more technically correct architectural terms, the house is described as ". . .being designed using a structural mullion system of lally columns on 5 foot centers, which carry 35 foot long open web steel joists. The interior space is a structurally uninterrupted space approximately 35 feet wide and 100 feet long. . .".

This, for "non-architects," simply means that none of the interior walls hold up the roof, and the 35 by 100 foot interior space can be redesigned without tearing down the outer walls or the roof.

One of the many features of the house is its four-car garage with separate roll-up garage doors. And for a house overlooking Lake Michigan, that can be handy in mid-January. Apparently, the owner seems to like warmth, so he tried to order a radio controlled garage door opener.

No problem, as long as you don't want a radio controlled garage door opener that will control each door separately and independently from the others.

One suggestion was to use four separate systems. The "engineer" who suggested this overlooked the problem of having the correct transmitter in the right car. When asked how to solve this problem, the "instant" solution was to buy a separate transmitter for each car.

But with four cars and four different systems. . .that makes 16 transmitters. Besides requiring a very large glove compartment, eventually someone would end up with two or more transmitters for the same door. Where would the correct one be? Clearly, this was not a very acceptable solution.

The pertinacious owner was not about to give in. Armed with the knowledge that model airplanes could be controlled by a four-channel radio control system, he went looking for someone who could build a garage door opener. Eventually he was introduced to a young electronic wizard, Robert Phillips. Bobby was subsequently hired to design, build, and install a four-channel radio controlled garage door opener for the house.

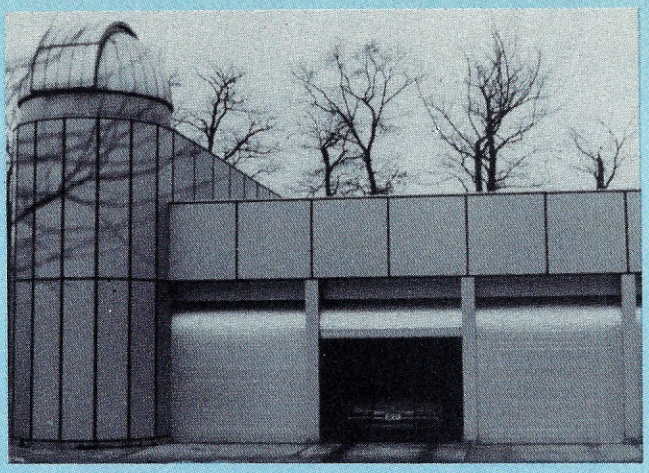
The owner may have ordered a garage door opener, but what he received was a system capable (when expanded) of controlling the entire house.

As a result, the small hand-held radio transmitters with their telephone-styled pushbuttons can actually be used to control anything that is connected to the house control sys-

tem. All of the house's normal "environmental control" systems are connected to the computer system that Bobby designed and installed. These functions include the house heating systems, the air conditioning system, and lighting systems. In addition, the stereo, TV, some kitchen equipment, the security systems, etc. are also connected to the house control system.

According to Bobby, most control systems place very expensive receivers inside the equipment to be controlled, and make the transmitters extremely simple. Bobby feels that the transmitters should contain more logic, so that the receiver in each device can be the simpler (and less costly) device. This would allow a single transmitter to control many different devices, rather than having to have a special transmitter and receiver pair for each device.

The 21 telephones throughout the house are also multi-function devices. Each has a four-digit readout device that



Micros Join in the Conservation Battle

By Terry Costlow, Assistant Editor

While energy prices and technological advances race each other into the 1980s, a Southern California businessman is using one to defeat the other. Bill Mandl, president of Hometech Computers, has created an interactive computerized control unit to keep the cost of powering the home to a minimum.

In addition to managing the power consumption, the prototype home in the hills near Los Angeles features a security system, timing controls for a variety of equipment and priority scheduling of some other appliances. The system is designed for installation in any home costing $100,000 or more.

Mandl put his $7,000 computer system into the $350,000 three-bedroom home last December as construction was finishing and has since been testing the operation of his Intel 8085-based machine. By publication time, it is hoped that the test system will be removed and the company's new production-line model will be installed. That vital step comes when the house is sold.

An important detail for the prospective homeowner is the energy savings of up to 50% which the computerized system offers. The timing control unit manages a sunshade closing system by sensing the amount of light coming through the many picture windows. The heavy shades will be opened or closed, depending on whether the heating or cooling mode is operational.

"With the sunshade controller, we meet the standards for the state energy conservation tax rebate. That allows the buyer to get back up to $3,000 against the price of our unit. That's nearly half the cost of the computer. And with the energy savings on top of that, it's saving you money from the beginning," the electrical engineer says.

Water is conserved via sensors in the lawn which tell the computers to turn on the sprinklers only when necessary. A zone temperature system keeps heating and cooling costs at a minimum by circulating air when possible.

The computer also has a security system that turns on the lights, sounds a horn and, with an optional dialer, calls the police or a neighbor. When someone attempts to break in and all those systems go into action, the description of the area where the door or window is being opened is displayed on the CRT screen, allowing anyone at home to avoid the thief or go to the scene of the problem.

The security also hooks into smoke detectors for fire protection. As with the alarm system, it will tell the user the area of the alert. In addition, the zone temperature control is commanded to turn off all the fans and close the vents to slow the circulation of smoke throughout the house.

As with most power control systems, there is a priority shutdown for all appliances when the emergency reaches a hazardous point.

To facilitate operations throughout the house, there are RS232 ports in most rooms. The owner can plug in a terminal and monitor any room, change any of the timers or reprogram parts of the control package.

But to make the system easy to run, Mandl has made most of the controls self-supporting. The home can operate without manual adjustments most of the time. And when changes are desired, menus and complete programming instructions are printed on the terminal screen.

Because there is little need for reprogramming, there is only 1K of RAM or memory. The system uses 8K of ROM now, but there is room for up to 15K. The additional ROM will probably be used when food processing is expanded from timed coffee making and other simple chores now being done in the kitchen.

Hardware alterations and software filtering allow the computer to distinguish quick noises and power surges such as those that occur when a doorbell rings from legitimate commands. Each section of the control unit has specific safeguards so it is not affected by extraneous information. To keep on track, the system also goes through a self-recovering recycle every 24 hours. To avoid potential tampering, the computer lines are run independently from the electric lines.

While controlling the temperature, turning on the lights when the home is being burglarized and starting a cup of coffee when the alarm clock goes off aren't dramatic innovations by themselves, Mandl feels his computerized system will soon become standard in new houses because the functions work together.

"If you have other things like timers running different things, they still won't be interactive like this computer. By the time you get all the separate controllers and the priority shutoff and the phone dialer and the closing air vents and the rest, if you pile all that stuff on your house it would cost you more than our interactive unit," Mandl explains.□

continuously displays the time. Since all phones in the house are also used as computer input devices, the entire house can be controlled from any pushbutton phone, either in the house, or for that matter, in the world. (To control the house from outside the house, two things must be known — the telephone number and the security number used to access the computer.) The inside telephones are also part of a phone-to-phone intercom or a housewide paging system.

Even the radiant heating system in the indoor pool area can be remotely controlled. The owner emphasized very strongly, however, that no machinery that could be considered dangerous can be turned on from anywhere other than the immediate area of that device.

Any of the 200 ceiling lights (there are no floor or table lamps) can be turned on or off, in any combination and with a choice of brightness levels.

This allows a house occupant to "pre-program" any mood desired, and to cause the room to assume that "mood" with a single command. Any number of "moods" can be stored in the system and retrieved on command. Even after a "preset" mood has been commanded, individual lamps may be independently controlled to further adjust the mood.

A snow-melting system installed under the driveway is also controlled by the computer. The outdoor sprinkler solenoid control valve is also connected to the computer. This allows the owner to turn on the sprinkler system from inside the car as he leaves for work each morning. Any of a number of devices could be used to turn off the water, including the simple method of noting what time the water was turned on, and turning it off a half-hour later.

The house control system also makes it easier to conserve energy and yet not hamper or restrict the homeowner's lifestyle. The GIMIX house has two completely separate heating systems — a radiant heat system in the floor and a forced air heating system that blows warm air in from ceiling diffusers.

The radiant heat system has enough capacity to raise the house temperature 50-60 degrees above the outside temperature. In the fall and spring the boiler water temperature is set to 120°. During the winter the water temperature is set to 140° to provide extra system capacity. The burner is a modulating gas valve, which provides only enough heat to maintain the water in the boiler at a constant temperature. The garage and utility area are on a separate radiant heat system, which is currently set to maintain the normal temperature in those areas at 40 to 50 degrees.

The forced air heating system is currently broken up into five separate zones, each controlled by its own thermostat. The thermostats are connected as part of the computer OUTPUT devices.

The owner emphasizes safety, and he feels that to tamper with any part of the furnace control system is courting disaster. As a result, the computer merely controls the power to the thermostat, never the output. This way if the computer system should fail, the worst thing that could happen is either the thermostat controls the heat in the normal way or that the heating system is totally shut down.

The safest method for temperature control is also the most economical. To have several preset temperatures, the owner selects one or several thermostats, Again, the "fail safe" feature is that should several be selected at the same time, the room temperature would not rise above the setting of the highest thermostat.

When the house is unoccupied, the forced air system is totally shut down, leaving only the radiant heat system active. This allows the house temperature to fall to approximately 60°, conserving heating costs. The computer can be commanded remotely through the use of a standard pushbutton phone, making it possible to switch the forced air system on just before leaving work. This provides the best of two worlds, energy conservation and a nice, warm house to come home to.

Several security devices are also implemented; fire and burglar alarms, electric eyes in the driveway and entrance walkway. The house also has a closed circuit TV that shows approaching visitors. As the power to the closed circuit system is also controlled by the computer, it is automatically turned on whenever someone enters the premises. All of the security systems devices are direction sensitive — they are triggered by approaching vehicles or people, but not by anyone leaving the premises.

In the GIMIX house, a car coming up the driveway will signal the house, and if it is dark out, the driveway lights will go on automatically. This is also true of the garage lights — at night they are turned on when the garage door is opened.

Inside, lights and other equipment can also be controlled by the computer. The house really controls the wall outlets that various equipment is plugged into, rather than to modify the equipment for remote control operation. This proved to be the undoing of a very clever idea for controlling the owner's sons' stereo equipment.

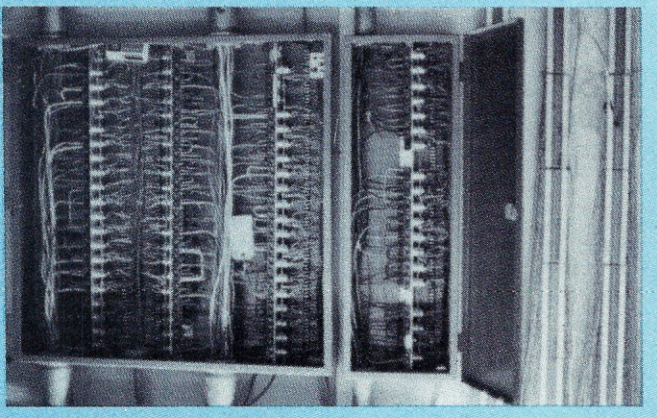
The three teenage boys each had their own stereo. Old "dad" figured that when the sound got too loud, he could key in the "off" command for the wall outlet that the offending unit was plugged into. This worked for about a week. One son started playing the stereo loud, then Number 2 joined in, and finally all three boys were playing the stereos full bore. Dad punched the off button for the wall outlet — nothing happened. He turned off another wall outlet — still nothing. He commanded the computer to shut off the power to the room — still nothing happened.

He figured that he had a computer failure, and started for the boys' rooms. As he approached, he noticed a long extension cord coming. . . They knew that he would try to shut the power off. So they got power from the kitchen via a long extension cord.

CONTROLLING THE UNIT

The computer receives its commands in a number of ways: by pressing small switches throughout the house or by dialing a code using one of the telephones, or even by using one of the garage door remote control transmitters.

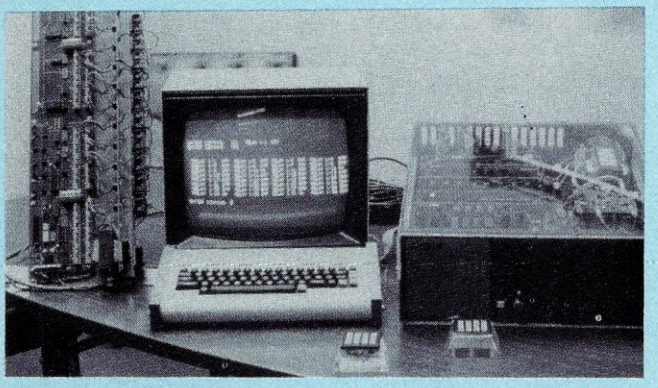
Each room can also be controlled manually through the use of small pushbuttons located on the doorjam of each room. These buttons control the remote control relays directly, and do not require computer assistance. This is done for safety, in case the computer should ever fail.



Pushbuttons on any of the house's 21 "control panels" or on the portable transmitters direct the computer by means of a three-digit code. As currently programmed in the prototype system, the computer can understand up to 999 different commands. The system is set up so that the first button in each series of three specifies a different section of the house. The second digit asks for a general function, such as turning on all the lights. The third has a more specific function. For instance "123" could mean turn on the third ("3") light ("2") from the window in the living room ("1"). "423"

could mean the same thing, but in the family room ("4").

If a command starts with a star ("*"), it identifies not a command for a specific device, but instead it identifies a string of commands for the computer to follow. "*10" could mean turn on all the living room lights according to the pre-programmed sequence "121,122,123".



The owner of the house said there were some unexpected savings that he attributed to the computer. Because room light controls are readily at hand for any room, the lights are seldom left burning when not in use. Lighting levels themselves are no higher than needed. When the computer controlled lighting is first switched on, it is turned on at a low-brightness level; for more light you must press the button again. The end result is that bulbs last longer, and less power is consumed.

Several other techniques were used to conserve power. In the laundry room, for example, the wall outlet for the iron is on the same circuit as the ceiling lamp — no light, no iron. Apparently his wife seldom leaves the room lights on, but will forget and leave the iron on.

The dressing area in the master bedroom is lit by fluorescent lights. The owner had four tube strips installed, but had two tubes in each fixture wired to one circuit, and the remaining two wired to a separate circuit. This way when a tube burns out, all he has to do is switch the lighting control to the other circuit. Now he can change the burned out tube when he has time.□

Controlling the GIMIX Home

Most homes are wired by running 110 volts from the light being switched to a wall switch and then to the circuit breaker or fuse panel.

However, if you want two switches to control the same light or wall outlet then you must run an extra 110 volt wire in conduit from each switch. In addition you must use a special wall switch.

If you want to control the same circuit from more than two places, the cost becomes prohibitive. In addition, very few electricians know right off the top of their heads how to wire a circuit requiring control from more than two points. (Figure 1)

Relay control becomes desirable at the two switch control level, and they become necessary when you want control from more than two places.

A relay can be controlled from any number of switches. Wire the light to the relay and the relay to the panel using 110 volt wire, in conduit as necessary. The control wiring to activate the relay is 24 volts, and uses ordinary bell wire. Low voltage wiring is not required to be in conduit. Therefore, the cost of installing a single circuit can actually be less using the relay, when the cost of conduit and labor are also considered. (Figure 2)

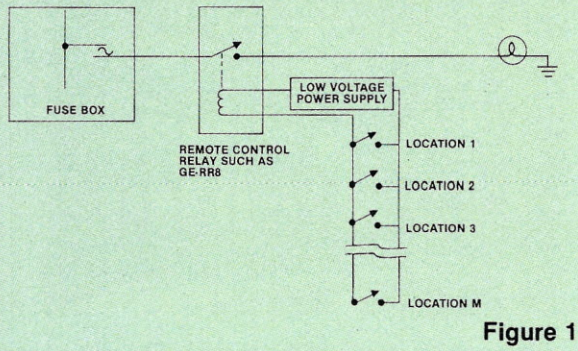


Figure 1.

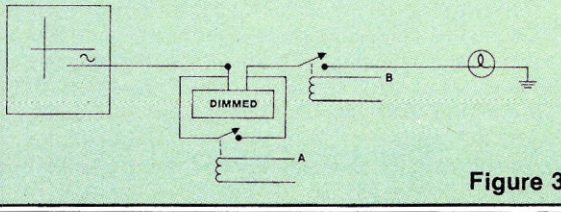


Figure 3.

The G.E. RR8 relay draws power only at the time of switching to either an "on" or an "off" state. It then stays mechanically latched at the ON or OFF position, until it is positively commanded to go to the other state. If the relay is on it will stay on until it receives an off signal, and any further ON signals will not cause anything to happen. Each relay can control up to 20 amps and up to 277 volts. The G.E. RR8 relay is U.L. approved and they have been in use for over 20 years. They are available through electrical supply houses and cost around $12 each.

Since all power for lights and other electrical items must be connected back to the breaker panel, the most convenient location for the relays is next to the breaker panel. Since the relays have four screw based terminals — two on the line side (breaker panel) and two on the load side (light or wall outlet), they are convenient for terminating several lights to each breaker. Only one wire is needed from the breaker to one of the relays on that breaker. The power can be run in a daisy chain fashion from relay to relay to feed the power from the breaker. (Figure 3)

To dim the lights we suggest using an extra relay in series with the light's relay. Place a diode, or a rotary

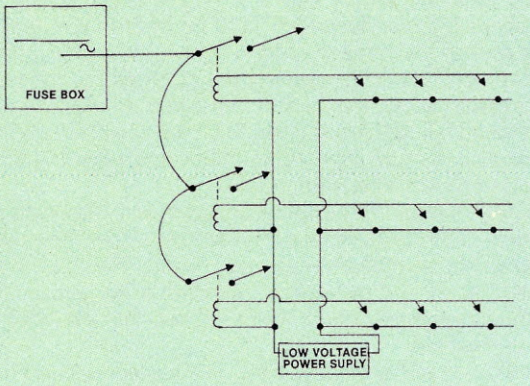


Figure 2.

RELAYS BA ON — FULL
RELAY B ON ONLY — DIMMED
B ACTS AS ON/OFF SWITCH

Figure 4.

dimmer if preferred, across the line and the load side. When the relay is off, current flows through the diode creating a dim condition. When the relay is on, the diode or dimmer is shunted, and the current path is unimpeded. (Figure 4)

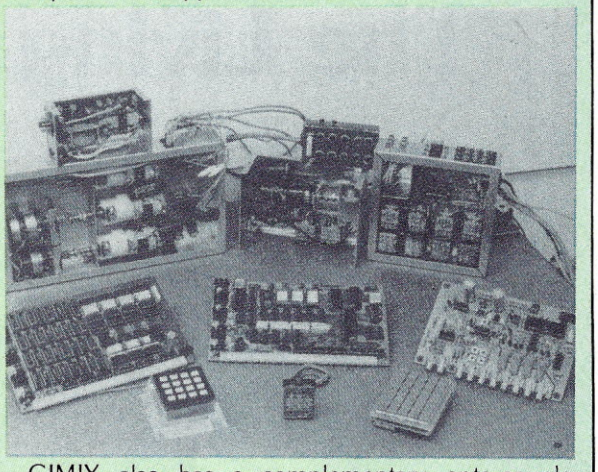
The low voltage side of the G.E. relay has four wires: the blue is the common, and the red wire is used to switch the relay on, while the black wire is used to switch the relay off. The fourth wire, yellow, is used for a pilot light to indicate remotely the status of the relay.

The GIMIX relay driver board terminal strip has connections for all four leads, plus it provides terminal tie points for wiring ON and OFF switches to each relay as desired. When switches are wired directly to the board, you then have a normal low voltage switching system, providing a "fail safe" method of controlling your lights, even when the computer is down or powered off.

There is no limit to the number of switches that can be directly wired to each relay, as all manually controlled switches are wired in parallel with each other. Normally open, push to close, pushbutton switches must be used as the manually operated remote control switches.

The GIMIX relay control board has several unique features, one of which is that it only requires two pairs of wires to communicate with the computer. One pair is used for communication from the computer to the relay driver board, which is generally located near the circuit breaker panel. The second pair of wires is for communications from the relay driver board back to the computer. These messages can either be relay status messages (relay 1 on, relay 2 on, relay 3 off, etc.) or error messages (last command had a parity error, relay won't respond, wrong board or relay responding, etc.). The relay driver board is an intelligent device and can be commanded to constantly scan all attached relays (it does this by interrogating the blue wire to the G.E. RR8 relay).

Each relay driver board can control 31 20-amp circuits. Each computer port can control four relay driver boards, for a total of 124 controllable circuits per port. Obviously the only limit is the speed of the computer and the number of serial current loop I/O ports the computer will support.



GIMIX also has a complementary opto-coupler board, which will accept 34 ON/OFF input circuits. In addition the corporation also markets a touch-tone receiver circuit, used to convert touch-tone signals into 8-bit ASCII characters for processing by any CPU. Both the opto-coupler board and the 2-wire tone receiver circuit interface to the CPU through an 8-bit parallel input port.

Application notes and examples of home automation are available from GIMIX Inc., 1337 W. 37th Place, Chicago, IL 60609, (312) 927-5510.□