BUILD AND INSTALL THE PROCAR ONE INTELLIGENT AUTO ANTI-THEFT SYSTEM

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We live in uncertain and dangerous times. With vehicle theft in the millions of cars per year, and now carjacking situations on the TV news almost every night, it seemed to this author that there was something wrong with the currently availiable auto alarms. All you ever hear about auto alarms is that they drive everyone crazy with their chirps and arcade-like sirens every time they false, yet auto theft and carjackings are on the rise. It seemed that no one was going to come out with a decent product, and with the knowledge that this author's limited edition SVO Mustang was increasing in value and too old for theft insurance, a lot of thought went into the features and quality required of the "ultimate" anti-theft system. After designing and adding improvements over a three year period, the ProCar One vehicle anti-theft system is ready to be shared with my fellow Electronics Now readers.

What makes ProCar different is that it uses intelligence and facts about the vehicle's owner that enable ProCar to recognize the difference between the normal driver and an intruder. The owner only needs to drive the car normally, and ProCar will automatically arm and disarm itself, even automatically locking the doors if the owner forgets! But if a stranger tries to steal the car, even if a carjacker tries to take over, ProCar will recognize an intruder by his actions, warn them that the vehicle will be disabled, and after a limited time, shut down the engine SAFELY and drive the intruder out of the vehicle with an internal 110 db siren. The owner can come back to the abandoned vehicle afterwoods, and after ProCar recognizes the owner, will allow the vehicle to be driven away.

ProCar has several other features; the owner can tell ProCar to expect a stranger to park the vehicle, similar to the "valet" button on other systems, except that ProCar will still protect the car after the valet driver parks it. In fact, the valet driver will be protected from carjackers as he drives your car back to you! You can inform ProCar that the car will be serviced, and ProCar will allow anyone to drive or service the vehicle, and will warn the driver that it is disarmed each time the car is started. A "High Security" feature tells ProCar that only one person is allowed to drive the vehicle, verses the default "standard security" mode which will allow family members or friends to drive the vehicle. Even with all of these features, there are no hidden switches anywhere in the car for a bad guy to find!

Yes, there is also a remote for those who must have this feature, with the usual arm, disarm and panic modes, plus a feature that I call "Insta-Stop", which will tell ProCar that you are outside, and the person driving your car away is BAD. ProCar will warn the unauthorized driver that his actions are not acceptable, and if the driver ignores ProCar, after a few seconds the engine quits and the internal siren sounds.

ProCar also has the usual features such as an outside siren, lights flasher and starter kill. The system was designed to be installed easily into any 12VDC vehicle, and there so many ways to interface the system with any car that you may customize the system to the driver's wishes. ProCar will even adapt to a vehicle that already has keyless entry, thus adding the additional features of anti-carjacking, protected valet, and high-security options.

CIRCUIT DESCRIPTION

Although the circuitry to do all of this seems as if a microprocessor is mandatory, the original concept was only the anti-carjacking feature which only required a simple circuit. Each time the system was improved or a feature was added, another

chip was required. Eventually, ProCar grew to three boards in two cases requiring 14 chips, but happily all of the chips are simple cmos and all cost only pennies each, except for the voice chip.

To make installation easier, ProCar uses two modules; the Logic Module (LM) mounts inside the car under the dash, and provides wires for sensor and option selections, with only one three-conductor harness that goes through the firewall to the engine compartment. In the engine compartment mounts the Power Module (PM) which powers the siren, lights flasher and engine-kill circuits. If the remote feature is wanted, the FCC accepted receiver module is availiable as
a completed module.

LOGIC MODULE

The LM contains two pc boards: the Input board (IM) and the Voice/Options board (VO). Both boards are double-sided because of the large number of parts that must be stuffed into the two compact four inch by three inch boards. The IM board schematic, shown in figure 1, will be discussed first.

Since ProCar is designed to automatically arm itself, a latching/timing circuit is used using IC1, a 4011 quad nand gate. When leaving the vehicle, closing the driver's door sends a pulse to ground through D2 and filter/pulse shaper R4 and C3 to pin 13 of IC1. This latches the nand gates on pins 8 to 13 so that pins 10 and 12 go low (to illuminate the green portion of the LED indicator), and pins 9 and 11 go high to start charging C4 through R7. This allows a 15 second period that allows the driver to re-enter the vehicle to load or unload packages through another door or trunk. The 15 second period is reset to zero through Q2 and Q3 as long as any door remains open, or motion is picked up by the motion sensor. After the driver is done and ProCar senses no furthur actions, the 15 second timer is restarted from zero and completes its cycle. The voltage across C4 becomes high enough to cause the nand gate on pins 4 through 6 to change state from high to low. The low is pulsed via D7, C7 and R16 to pin 13 of IC2, an identical circuit to IC1. The additional 15 second timer is required to flash the red portion of the LED and trigger the voice module which will warn anyone listening that the system will be active in ten seconds. Since the red and green LEDs are both active, the indicator turns yellow.

After the second latch/timer circuit runs its course, the active low output, pin 4 of IC2, pulses through D16, C10 and R25 to turn off the green LED, so now the indicator is red. Also, pin 4 drives the ARM line high through Q6. This line tells the PM to cut off the engine and tells the door lock circuit to lock all of the doors. The ARM line also activates IC3 and IC5, the alarm latch timers that monitor all entry points and motion sensor.

IC3 is the main alarm latch. This 555 timer is triggered via buffer IC4 by any passenger door, trunk, hood or motion sensor, and is set by C22 and R46 for one minute. IC3 will activate the internal siren via Q8 and Q9, as well as telling the PM through one of the wires in the three-wire harness through the firewall, to activate the outside siren and the lights flasher for one minute. Note that if the driver's door is entered, both IC3 and IC5 are triggered. IC5 is another timer, set for 15 seconds, to allow the voice module to warn the driver that the sirens and lights will be activated unless proper action is taken. IC5 also inhibits Q9 from activating the sirens and lights via D27.

If ProCar is set for the default Standard Security mode, anyone with the ignition key can reset ProCar as long as the ignition key is activated within the 15 second time slot provided by IC5. Ignition power, actually accessory power derived from the power wire to the car stereo, is applied to the A input through timer R1, C1. This timer's function, set for ten seconds, will become apparent when the anti-carjacking circuitry is explained later. Also, a high pulse into the Disarm input can be derived from the automobile's existing keyless entry to disarm ProCar. This high is converted

to a low pulse by the nand gate pins 1 through 3 of IC1 and circuit D5, C6, R15 and D6, to reset the latch pins 8 through 13 of IC2. As voltage is removed from C13, it is inverted by IC2 to bring the ARM line to ground via Q7 and R36. As the red LED goes dark, the change is signalled to the VO board to tell ProCar to announce that the system is reset.

IC4 is the filter and level shifter for all trigger inputs. Since ProCar must not false like other systems, quite a lot of attention has been addressed to this circuit. Water in a hood or door switch, flakes of rust, even a passing police car radio transmitter will set off most other systems. The filters using C16, C17, R38 and R41 filter all noise, while the inverters of IC4 allow only true ground or positive signals to trigger the system. Also, the use of inverters allow the installer to select either positive or grounded dome light switching activation using header pin jumpers.

Since ProCar must know the difference between the driver and the passenger doors, the circuit using diodes D25 and D26 are used so that any door will illuminate the dome lamps, but only the DRIVER's door will trigger IC1, giving ProCar the information it needs if and when a carjacking takes place.

Finally, since no hidden switches are to be installed in the vehicle, a means of communicating with ProCar must be used. The input labeled S (for Secret switch) is a multi-level communications port that the driver can send information through to allow ProCar to recognize different situations. Any momentary switch inside the vehicle may be used, as long as it switches positive +12 volts. For example, a power window UP button, or a horn honk, or a power seat adjust, or a windshield washer button, or high beams flash lever, and so on. In this manner, the driver can send signals to ProCar while driving, using buttons already familiar to the touch.

In the case where ProCar is unsure at the identity of the driver, or if the High Security mode is active and the driver attempts to start the car, ProCar will warn the driver that the system is activated, and will wait for the correct response. The only person who will know the proper response is the vehicle owner, who now must, for example, flash their high beam lever for three seconds. The delay circuit R19 and C8 require the switch to be held for three seconds, so that the random pushing of buttons by a stranger will be ignored. The nand gate at pins 1, 2 and 3 of IC2 invert the signal to the low level required by the latching circuit of pins 8 to 13.

VOICE/OPTIONS BOARD

See figure 2 for the schematic of the VO board. The VO board takes cues from the IM board to know what ProCar will say (there are five different messages) and whatever options the driver wants ProCar to perform. The options are selected using the Secret switch by the number of times that the driver taps the switch. Also, special anti-carjacking circuits are on the VO board.

IC2, a 4049 hex inverter, is used to create a positive pulse for every time the red "system armed" LED changes status. The circuit from C2 through the two inverters to pin 4 creates a positive pulse at D11 when the LED turns on, while C3 through an inverter to pin 15 creates a positive pulse at D10 when the LED turns off. The pulses are joined by D10 and D11 to C4 and R15, where another inverter supplies +5V to the PD pin 24 of the voice chip IC1. This powers up the chip from its sleep state for 10 seconds. Similiar circuitry from D12 and D9 power another inverter via R16 and C5 to provide a negative pulse to the CE pin 23 of IC1 to start the speech chip talking. Another inverter powers Q2 and Q3 to activate the speaker relay, which switches the car's left front stereo speaker to ProCar for 10 seconds. With this unique idea, even Twisted Sister at full volume won't be a match for ProCar's voice module. Q3 also supplies power to the amplifier chips IC4 and IC5. Because power is removed from the audio chips when the voice chip is in the sleep mode, standby power is very low.

The voice chip is coupled to IC4 and IC5, both the popular LM386-1 amplifier chips run in an out-of-phase bridge circuit that provides about two watts maximum at four ohms. If this is too loud for you, reduce R17 and R18 to 470 ohms.

If you intend to install ProCar into a show vehicle that you enter in soundoffs, you might want to use the external horn speaker instead of the internal car speaker, for a most dramatic effect. This way, the horn speaker will do double duty as both ProCar's voice and the outside siren. Don't try this at home, or your neighbors will get even!

IC7, a cmos decimal counter/driver, is used to decode the number of pulses from the Secret switch to put ProCar into its various optional modes. The output for 1, 2 or 3 pulses are routed through D17, D18 and D21 to a 2.5 second timer circuit C15 and R32, to automatically reset IC7 through D24. This is provided so that normal use of the Secret switch is possible, or a child playing with the switch will be ignored.

ProCar will only acknowledge 4, 5, 6 or 7 pulses. Four pulses, a request for HIGH security, activates Q7; Five pulses, a request for ProCar to allow a VALET driver to park the car, activates Q8; Six pulses tell ProCar to DISARM itself temporarily; Seven or more pulses activate Q4 to put ProCar into the Panic mode by activating the outside siren and the lights flasher (but not the inside siren). Because the panic output will inhibit the ENable pin 13 of IC7, anything more than 7 pulses is ignored. Also, the other four options drive timer circuit R22 and C11 through isolation diodes so that a selection must be made within three seconds, after which all other selections are locked out. This lockout timer also creates a voice chip start pulse by supplying a high to pin 2 of IC6. When this AND gate receives a high on pins 1 and 2, a high will pulse through C12, R23 and D7 to the inverter circuit IC2 as described earlier.

If you are a regular reader of Electronics Now, you may recall an article in the March, 1992 issue of Radio Electronics that describes a circuit that you can build to program the ISD1016 voice chip. Although the voice chip included in the kit is already programmed using a professional announcer, some readers may want their own voice, or a different wording. For those readers, figure 3 has the programming, timing and wording of the author's chip.

To reset any mode to the default Standard security mode, holding the Secret switch on for three seconds will reset IC7 via the R25 and C13 timer via pins 4, 5 and 6 of IC6, a quad 2-input AND gate.

How ProCar's special features work will be described feature by feature.

HIGH SECURITY:

While driving, if the driver feels uncomfortable with the surroundings, he or she can tap the secret button FOUR times for H I G H security. Pin 10 of IC7 decimal counter goes high, and this signal passes through D1 and D3 to program the voice chip IC1 so that A5 and A6 are high. The voice chip has been programmed to say "High Security Enabled" at this address. The high from pin 10 of IC7 also saturates Q7, which brings its collector to ground through wire "B" to the IM board. Because the node at the junction of C6, D5 and R15 is brought to ground, attempting to disarm ProCar by turning the ignition on will be ignored, as the pulse through D5 will be non-existant. When the car owner enters the vehicle, he must turn on the ignition and hold the secret switch for three seconds; this will disarm ProCar as described in the operation of the IM board, and will simultaneously reset the options selector IC7 to standard security. Therefore, the driver must select High Security each time before he leaves the vehicle if he wants the added protection.

Some readers have requested that ProCar always default to the HIGH security mode. Keep in mind that you will loose the VALET feature if you do this; however, if you

are always the only driver, this might be a good idea. Simply solder a bridge between the collector and emitter of Q7. Remember that the voice chip will not be updated, and ProCar will not say "High Security Enabled".

VALET DRIVER MODE:

When ProCar receives the FIVE pulses for V A L E T driver, pin 1 of IC7 goes high. Similiar to the other options, the proper address A4, A5 and A6 for the voice chip goes high, and the voice chip says "Valet Parking Enabled". Q8 pulls wire "K" low to the IM board to C4. Because C4 will never charge, the first 15 second timer (green LED) will not complete. The driver leaves the car with the engine running, and when the door is closed the green LED will be activated, but ProCar will not auto-arm. After the valet driver parks, turns off the ignition and leaves the car, the timer consisting of R2 and C1 at the Accessory input of the IM board runs out after 10 seconds. The gate output at pin 3 of IC1 then goes high to wire "L". At the VO board, the high at "L" is compared with the high at pin 1 of IC7 (the VALET output) and the resultant high on pin 11 of IC6 resets IC7 through D15. Therefore, ProCar will automatically default to the Standard security mode, and the valet driver will be allowed to enter and disarm ProCar using only the ignition key.

DISARM for service MODE:

SIX pulses for D I S A R M will make IC7 put pin 5 high to program IC2 to say "ProCar Fully Disarmed". Q6 is saturated and brings wire "J" to ground, which keeps C13 on the IM board from charging. Similiar to the HIGH security function that inhibits the first 15 second timer, the DISARM feature inhibits the second 15 second timer from working. Therefore, both the red and green LEDs will be on, thus the orange color will remind anyone that ProCar is temporarily disarmed. When the car is entered, turning the ignition key on will reset the latches in both IC1 and IC2 on the IM board, and as the red LED turns off, this will cause a low on wire "C" to the VO board, and the voice chip will again remind the driver that ProCar is disarmed.

PANIC MODE:

Seven pulses make pin 6 of decoder IC7 go high. The voice chip has not been programmed to say anything, but Q4 will be biased to turn on MOSFET Q5 and will activate the outside siren and lights flasher by the TRIGGER wire to the PM. The panic mode will continue with no time limit until the Secret switch signal is received.

ANTI-CARJACK MODE:

While the ignition key is on, opening and closing the DRIVER's door will, as usual, start the first 15 second timer and light the green LED. This gives the carjacker time to get safely away from the owner. If the carjacker reopens the door in order to inhibit the timer (as in the package loading timer reset feature described earlier), his efforts will be in vain because pin 3 of IC1 (on the IM board) is low, causing Q2 to have no function. The first timer will time out at 15 seconds, and when the second latch becomes active, the voice module will be triggered by the activation of the red LED. With the voice chip address A5 high, the recording is three beeps, then the carjacker is warned that ProCar has been activated and that the vehicle will be disabled in ten seconds. If the carjacker tries to turn the ignition key off and on to try to disarm ProCar, the timer consisting of R2 and C1 keeps the system armed because the key would have to be off for ten seconds to reset this timer.

Once the second 15 second timer has timed out, the ARMED line to the Power Module goes high and the engine is stopped. Because the motion sensor will pick up any movement from the carjacker, the TRIGGER line also goes high and the sirens and lights flasher become activated.

Turn your attention to IC8 on the VO board. Pins 8 and 9 will be high only when the alarm was triggered (pin 8) when the ignition was on (pin 9). Therefore, pin 10 will go low and the latch on pins 1 through 6 will cause pin 4 to go high. This simulates the HIGH security feature by turning on the HIGH security transistor Q7. This will protect the vehicle in case the carjacker comes back after the sirens stop, and tries to re-start the car. Because ProCar automatically activated HIGH security when the carjacking occured, only the vehicle owner will be able to start the vehicle by giving the secret signal. When the owner gives the secret signal, the latch in IC will be reset to standard security because pin 1 is joined via wire "U" to the reset section of latch IC2 on the IM board.

THE POWER MODULE

Figure 4 shows the PM schematic. This uses a single-sided printed circuit board and has the siren/amplifier circuit, the engine stop circuits and the lights flash circuit.

SIREN CIRCUIT

IC1 and IC2 are 555 astable oscillators that closely simulate a police siren, although in areas that this type of siren is prohibited, simply omitting smoothing capacitor C3 will change the sound to the European "hi-lo" sound. After cleaning up the square waves with filter R8 through C7, amplifier chips IC3 and IC4 supply up to 16 watts in the classic bridged amplifier design.

LIGHTS FLASH CIRCUIT

IC1 runs at about 1 hertz, and besides being used in the siren circuit, also activates Q1 and "P" channel mosfet Q2 to provide up to 18 amps of 12 volt power to flash the parking lamps. Thus, the lights will flash in time to the siren. Note that Q1 also activates Q3, which is part of the engine stop circuitry. As the lights and siren flash, the engine will start to stall, then restart, until the driver brings the vehicle to a complete stop. This action only occurs when the Armed line is high, as in an attempted carjacking. If the Armed line is low, the engine is not affected.

ENGINE KILL CIRCUITS

Actually, there are two completely unrelated engine circuits, depending on whether the driver wants a simple starter interrupt, or the engine pulse circuit described in the last paragraph, or an outright engine stop circuit with both fuel and ignition removed. On standard transmission autos, the engine stop circuit is recommended, since the engine will still turn as long as the car is coasting, thereby still providing steering and braking power. On automatic transmissioned autos, total engine shutdown may cause problems in steering and braking in large cars, and the engine pulse circuit should be used, along with the starter interrupt circuit.

The circuit consisting of "N" channel mosfet Q4 is designed to bring line "P" or line "E" low in rythym to the siren and lights flasher. On older cars with carbureters and a single ignition coil, the "P" line would be connected to the points or coil negative, and will cause the engine to pulse and jerk only while the siren and lights are activated. The coil will not be damaged because MOSFET Q4 has a high resistance, which is furthur increased by diode D1, so that the voltage drop across the coil is only 7 volts and not the full 12 volts.

On newer autos with engine computers, fuel injection, or multiple coil systems, the "E" output, called the Engine Sensor Defeat (ESD) line, is used. The ESD line is brought to ground through protection resistor R26. This can go to the throttle position sensor or mass air sensor to give the computer fits. No damage will occur because of R26, and in fact the engine will not stall, but because of the incorrect signals, the engine computer will cause the engine to hiccup and act erratic, and

some fault codes will be stored in the computer's memory. On most cars, this will cause the "CHECK ENGINE" light to come on also.

The other engine circuit is the exact opposite of the Q4 circuit. Where Q4 brings the "P" and "E" lines to ground, the Q7 and Q8 circuit interrupt power between the "I" and "C" lines. This can be used to cut power to the fuel injectors, or can be wired as a simple starter interrupt. When ProCar is activated, the Armed line is high, which saturates Q5. With Q6 inactive, the Q7/Q8 pair will not conduct. The reason for using two mosfets is to provide a backup or failsafe, so that the driver will never be stranded. Also, since the mosfets can handle 18 amps each, there will be plenty of capacity built in for powering hungry circuits such as fuel injectors or fuel pumps. D3 is used to protect the mosfets from inductive spikes from the starter relay, and D4 is used to protect the mosfets in case the installer confused the input and output wires.

An additional thought was, what if the car thief cut the wire harness between the LM module and the PM module? The Armed line needs to be high to cut out the engine, and D2 will gladly provide the missing voltage and keep the engine cut out. During normal operation, the Armed line is brought down to ground by Q7 in the IM board.

CONSTRUCTION

BUILDING THE LOGIC MODULE

The IM and VO boards are both mounted in a popular LMB #402 cabinet, called the Logic Module (LM). This cabinet is formed of two interlocking covers, with the IM board mounted in one cover and the VO board mounted in the other. With the cabinet screwed together and screwholes facing up, drill two holes in the top thin side of the cabinet for the wire harnesses. The left hole should be 3/8 inch, and the right hole should be 3/16 inch. Also, mill or melt down the six square supports in each cover (not the four pc board mounts) to allow room for the components at the edges of the boards.

The top and bottom full size pc board layouts of the IM board are shown in figure 5, and the layouts of the VO board are shown in figure 6. If you decide to make the boards yourself, remember that you will have to solder both sides of the boards. Alternatively, the boards provided in the kit will have drilled, screened and through-plated holes.

The parts layout for the component side of the IM board is shown in figure 7. Mount everything on the component side, except for C2 and C11 and all of the electrolytic capacitors except for C27, which mounts normally. C2 and C11 are small 0.1 uF monolithic caps that solder in between IC1 and IC2 in the strips under the chips. Because of their size, the electrolytics must also solder underneath the board. Use the layout shown in figure 8, keeping the caps parallel and as close as possible to the board.

All of the parts of the VO board mount normally on the component side of the board, as shown in figure 9. The capacitors must be mounted parallel to the board, and all components must be mounted close to the board. Because this board is mounted with the components facing towards the outside of the cabinet, they must fit in the area defined by the pc board standoffs.

After both boards are stuffed, they must be wired together. First, mount the IM board in the plain cover with the component side up, with the IC1 end of the board facing the holes for the wire harnesses. Then mount the VO board in the cover with the screwholes, with the component side facing down and the solder side showing. Sit the IM side to the left and the VO side to the right, touching each other. You will know that the boards are oriented properly if all of the lettered wire locations are right-side up.

For the 13 jumper wires labeled A,B,C,E,F,GN,J,K,L,M,S,U and +, solder wires from the SMALL marked holes in the IM board to the solder areas marked on the VO board. These jumpers will have to be thin (24 gauge) so that they can be folded as the shells are closed. The Gn or ground wire should be larger (18 gauge). Do not solder anything to the LARGE holes in the IM board, they are for the harness wires to be installed next.

There are three harnesses: the main wiring harness, the small harness for the LED, and the harness to the optional remote receiver (if used). The small harness is a three-conductor cable with a two-color LED soldered to one end. Solder the red, green and black wires of the small harness to the red, green and common negative of the LED. At the other end, solder the black and green wires to the small holes in the top right corner of the IM board marked "-" and "G". The red wire solders slightly lower in the small "R" hole.

The main harness is 14 heavy (18 gauge) wires crimped at one end in an AMP A1462 15 pin male connector using A1440 pins. The other ends solder in the LARGE holes marked in the IM board and the solder pads marked on the VO board, as shown in the chart in figure 10. If you will be using the remote, the remote receiver requires an additional four wires soldered to the IM board. The grey wire of this pre-made harness mounts in the "PA" hole and the brown wire mounts in the "RD" hole. The yellow and green wires are not used from the remote receiver's connector. Solder the black wire to the heavy perimeter ground foil underneath the board, and the red wire to the heavy perimeter +12 power bus foil on the top of the board.

The mating end of the 15 pin harness uses an AMP A1463 15 pin female connector using A1441 socket pins. Use heavy 18 gauge wire for power pins 1 and 2, and 20 gauge thinner wire for the rest. The wires should be long enough to wire into the vehicle's radio, driver's door and fuse box, about six feet or so. Pins 13 through 15 wire to a 10 foot long 3 conductor harness that will run through the firewall to the Power Module in the engine compartment. Figure 11 contains a chart with the functions and colors of the main wire harness of the IM module.

Note that the speaker switching relay is not inside the IM module cabinet, but wires instead to the vehicle side of the main harness. Wires from pins 7, 8 and 9 only need to be a foot or so, just long enough to wire to the relay. Additionally, join a thin black wire to the thick black ground wire from pin 2 for ground. The chart in figure 11 shows the wiring and colors of this circuit.

AUTOMATIC LOCK and UNLOCK CIRCUITS

If you want ProCar to automatically lock the doors after you leave the vehicle, or if you are using the remote and would like ProCar to unlock the driver's door as you disarm the system, build the circuit shown in figure 12. Because of the simplicity of this circuit, the components can simply be soldered directly to the relay terminals. The lock and unlock circuits are shown individually, as some readers will only want the unlock feature. The circuits are designed to work with any vehicle, whether a positive switching, ground switching, or 5-wire Ford switching scheme is used. More detailed instructions are provided in the installation portion of this article.

BUILDING THE POWER MODULE

The Power Module is a simple single-sided pc board that mounts in a popular aluminum LMB 875 cabinet. The metal cabinet is required as the siren amplifiers and engine cutout MOSFETs must be heatsinked. Figure 13 shows the actual size pc board. Use the parts layout in figure 14, and mount all of the components on the top layer of the pc board. Don't forget the two jumpers! The amplifier chips IC3, IC4, and MOSFETS Q2, Q4, Q7 and Q8 mount vertically, with their flat metal heatsinks even to the edge of the PC board, to be mounted to the cabinet sides. Drill 1/8 inch holes for mounting

these devices, and be sure to use mica insulators and insulated washers to mount the MOSFETs. The amplifier chips are grounded and do not have to be insulated.

Use an AMP A1463 female connector with female A1441 pin sockets for the PM end of the wire harness. Figure 15 shows each function and color of the harness. You must use heavy 16 gauge wires for all connections except for a thin 20 gauge brown wire for pin 2. Keep these wires short, just long enough to extend the connector about six inches from the cabinet. The mating connector is an AMP A1462 plug with A1440 pins and 8 foot lengths of wire. Punch a 3/4 inch hole in one side of the cabinet and install a large HG-11 grommet to protect the wires, and solder the wires to the pc board as shown in figure 16. The long wires to the vehicle end of the AMP connector will connect to various places in the engine compartment.

This concludes the construction phase. Next, we will do the installation and final testing of the ProCar system.

INSTALLATION INSTRUCTIONS for the PROCAR 1 AUTOMOBILE SECURITY SYSTEM

GENERAL INFORMATION

The basic ProCar 1 automobile security system consists of the Logic Module (LM) and the Power Module (PM). An external and internal siren, a motion sensor, a remote control, and door locking/unlocking module may also be included. (The kit version does not include the siren, horn speaker or motion sensor). The under-dash LM module contains the system control, input sensors and voice chip, while the engine compartment PM module contains the fully electronic (MOSFET) lights flasher, engine cutout circuitry, and high-power siren amplifier. The siren amplifier can power up to four horn speakers.

The basic system is expandable so that any factory installed features such as keyless entry, or accessories from any other manufacturers such as special sensors or sirens may be integrated to customize the system.

The ProCar 1 system features true carjacker identification, and removes both fuel and ignition (or simple starter kill if desired) from the engine. ProCar 1 also features standard and high security modes, driver recognition, passive arming and disarming with auto-wait for package loading. The optional four-function remote adds remote panic, arm, disarm, and engine insta-stop functions. Also optional are door lock relays that allow ProCar 1 to lock and unlock the doors as it automatically arms and disarms.

Additional features of this system are two selectable security levels, protected valet, panic, and service/disarm functions that are selected with only one switch that already exists in the car. ProCar 1 uses a voice chip to confirm selections, and will also warn a carjacker that the engine will shut down in ten seconds. A three color LED mounts anywhere on the dashboard to indicate Armed, Disarmed, Monitoring, Anti-carjacking activated, vehicle entered while armed, or Disarmed for service mode.

The use of two modules makes wiring and installation easier, as only one three conductor cable joins the modules across the firewall.

The LM module mounts under the dash and has inputs for battery + and ground, accessory power, (keyless entry) disarm, customer ID (secret) switch, doors and motion sensor, and car stereo audio output. The outputs consist of stereo left front speaker, internal siren, armed/engine kill (and auto door lock/unlock) line, and external siren power.

The PM module has inputs for battery + and ground, engine power, and the wire from the IM module. The outputs consist of lights flash, ignition coil to ground kill, engine sensor defeat (ESD), external siren speaker(s), and power interrupt (to fuel injectors or fuel pump or starter).

LM MODULE DETAILS

The LM has a 15 pin plug with numbers stamped on the wire side of the plug. Mount the module under the dash behind the center console. The remote receiver must be mounted high so that the antenna wire is close to the windshield. If you wire the LM harness with the LM module connected, be sure that all wires are connected first except the RED battery power wire, which must be the last wire connected because ProCar 1 will auto-arm as soon as the RED wire becomes positive. If the optional remote receiver is installed, it should be plugged into the flat plug from the LM module. When power is applied after the system is wired, ProCar will start to arm. In the off chance that the remote receiver enters the panic mode immediately, the lights and sirens will activate immediately as power is applied. If this happens, reset the remote by pushing the left remote button ONCE to exit the panic mode, and push and hold the right button to reset the ProCar LM. The three color LED is mounted into any flat surface of the dash that is less than 3/16 inch thick. Start by drilling a 3/16 inch hole, then reaming it out carefully for a tight fit.

ProCar 1 LM MODULE WIRING DIAGRAM; Also see the diagram in figure 11.

Pin 1: RED: Positive to the battery (constant power). Be sure that the supply can handle at least
10 amps. (connect up LAST!)

Pin 2: BLK: Negative ground.

Pin 3: ORN: Accessory power. Tie into the radio accessory power "ignition on" wire.

Pin 4: no connection

Pin 5: YEL: Positive input disarm from factory installed keyless entry.

Pin 6: BLUE: Secret switch. Requires + to identify car owner, or to select features such as HIGH
security, VALET, DISARM/service, or PANIC. Use momentary voltage from door LOCK switch, or window UP switch, or windshield WASHer lever, or bright lights FLASH, etc.

Pins 7,8,9: Red (relay +), Green and Black (ProCar voice output).

This harness wires to a relay with four wires, used to switch the left front speaker
from the stereo system to ProCar's voice module. SPEAKER WIRES MUST BE FLOATING!

Relay wiring:

From car stereo:

YEL: Speaker + output

BLUE: Speaker - output

To left front speaker:

WHT: to Speaker +

GRN: to Speaker -

If you do not want to use the stereo's speaker system, you may use a single dedicated
speaker wired to the WHT and GRN wires.

Pin 10: WHT: POSITIVE to internal piezo siren. Ground the siren's negative lead.

Pin 11: BRN: Driver's door. The LM must be opened and + or - door switching must be selected
with pin headers. See specific directions.

Pin 12: GRY: Passenger doors. This wire is availiable at the DRIVER's door. See specific
directions. Also must select + or - door switching same as the driver's door.

Pins 13 to 15: This wire harness is run through the firewall to the PM. The individual wires are:

Red: + output to PM to power external siren. This wire may be used for powering
other sirens or relays as long as the current draw is less than 1 amp.

Grn: becomes + when system is armed to cut out engine. This line is also used to
signal the optional automatic door locking and unlocking relays.

Blk: hood switch and motion sensor from PM. Any special sensors, such as
microwave field sensors, should be connected to this black wire. (standard
grounded switching.) You may join as many pin switches as you want.

PM MODULE WIRING DIAGRAM; See figure 15.

The PM has a 15 pin jack with numbers stamped on the wire side of the jack.

Pin 1: RED: Battery positive for lights flasher power. Must be able to supply up to 15 amps.

Pin 2: Brn: ESD or Engine Sensor Defeat. Intermittently brings sensor output from
throttle position sensor or mass air sensor to ground through protection
resistor. Simulates engine problems to carjacker. NOTE: IF THIS WIRE IS
USED, DO NOT WIRE PIN 9 GREEN WIRE.

Pins 3,4,5: Harness from LM. Also, connect the thin black wire from pin 5 to the motion
sensor, and to the HOOD pin switch. Any number or type of motion sensors or
pin switches may be connected to the thin black wire.

Pin 6: WHT: Positive output to parking lamps. Maximum load 15 amps, protected by a 10
amp auto-reset circuit breaker.

Pin 7 and 8: To horn speakers from siren module. Wires are floating.
SILVER, GOLD: Up to four horn speakers may be powered, 4 ohm load MINIMUM. See diagram.

Pin 9: GRN: Ignition killer. Will intermittently short points coil negative to ground when
siren is activated. See instructions and diagram. NOTE: IF THIS WIRE IS
USED, DO NOT WIRE PIN 2 BROWN WIRE.

Pins 10 and 11: Engine power INPUT. Positive power wire that powers the fuel injectors, or the
ORN: main relay that is controlled by the computer. This wire is cut and the end with
POSITIVE power joins to both ORANGE wires. Both ORANGE wires are
connected together, as one is a backup.

Pins 12 and 14: Engine power OUTPUT. This powers the fuel injectors, or engine relay. Joins to the cut wire that
YEL: normally powers the injectors or relay. Will supply up to 20 amps. Again, both wires are used, as one is
a backup.

***NOTE: The connection between ORANGE and YELLOW wires is broken as soon as ProCar is armed, unlike the Ignition Kill GREEN wire or ESD engine sensor defeat BROWN wire, which only pulse in conjunction with the siren.

Pins 13 and 14: Black wires are grounded to the closest good ground.
BLACK:

SPECIFIC INSTRUCTIONS FOR WIRING THE DOOR MONITORING CIRCUITS

The door switches in any car can either switch POSITIVE to the dome lamps, or with positive already to one side of the lamps, switch NEGATIVE (ground) to the other side of the lamps. Typically, General Motors uses the negative switching method while Ford uses positive.

Although ProCar 1 needs to monitor the doors individually, the system has been designed so that the installer needs only to get to the wiring of the switch in the driver's door. ProCar 1 has circuitry internally that will fool the car's electrical system into lighting the dome lights when any door is opened, yet will discriminate between the different doors.

POSITIVE SWITCHERS

First you must identify the door light switching wire. Make sure all of the passenger doors, hatch or trunk are closed. Open the driver's door, and remove the door switch. On Ford, and other POSITIVE switchers, there will be three wires. One wire will be battery +, one wire will usually be key-in-ignition buzzer, and one will be for the lights. Measuring each wire with a test light, keep the door switch pushed in, and turn on and off the dome light switch on the dash, watching to see which wire is flashing with the switch. After identifying the door wire, turn off the dome light switch on the dash and release the door switch so the light stays on. Cut the wire about two inches from the switch; the dome light should go out. The short wire from

the switch connects to the BROWN Driver's door wire from pin 11of the LM. The remaining end connects to the GREY Passenger's door wire from pin 12 of the LM.

The LM module must be programmed to the car. Remove the four screws from the LM to expose the printed circuit boards. There are header pins on the IM board for the drivers and passenger doors for + and - switching. Be sure to program both doors for + switching.

NEGATIVE SWITCHERS

First you must identify the door light switching wire. Make sure all of the passenger doors, hatch or trunk are closed. Open the driver's door, and remove the door switch. On GM, and other NEGATIVE switchers, there will be two wires. One wire will be for key-in-ignition buzzer, and the other will be for the dome lights. With the switch removed, the dome light will be out. Touch one wire, then the other, to ground. The wire that turns the light on is the one you will cut about two inches from the switch. The short wire from the switch connects to the BROWN Driver's door wire from pin 11 of the LM. The remaining end connects to the GREY Passenger's door wire from pin 12 of the LM.

The LM module must be programmed to the car. Remove the four screws from the LM to expose the printed circuit boards. There are header pins on the IM board for the drivers and passenger doors for + and - switching. Be sure to program both doors for - switching.

SPECIFIC DIRECTIONS FOR INSTALLING THE PM MODULE

The PM contains circuitry for flashing the lights, powering the external siren speakers, supplying power for the fuel system, ignition killer and ESD circuits. The module must be mounted in a DRY area that has some air flow. Mount away from exhaust manifold. If the module is mounted first, be sure that the RED battery POSITIVE wire is the last wire to be hooked up. The module should be completely sealed with silicone rubber before mounting to make the unit as water-tight as possible. If you have not bench-checked the system first, it would be a good idea to do this before sealing the module.

Although most of the wiring is self-explainatory, there are special instructions for hooking up the ignition killer, ESD circuit, fuel system power, and lights flasher circuits. Follow them EXACTLY.

LIGHTS FLASHER

After mounting the PM, locate the auto's parking lights wire on the same side of the auto as the module. Identify the power wire to the lights by turning on the parking lights and finding the hot wire. DO NOT USE THE HEADLIGHTS WIRES! Join this wire to the WHITE wire from pin 6 of the PM. If ProCar only lights the driver's side lamps when activated, use heavy-duty diodes to isolate the two circuits. See diagram in figure 15.

IGNITION KILLER

The GREEN wire from pin 9 of the PM is designed to intermittently short the negative of the ignition coil to ground through an internal ballast only when the siren is activated, to simulate an intermittent engine problem. It is designed for typical single-coil ignition systems, but can be wired to only one coil of a multi-coil system if desired.

***NOTE: If the GREEN ignition kill wire is used, DO NOT wire the ESD kill BROWN wire.

On conventional vehicles with one coil and a distributor, locate the coil. There will be two or more small wires to the coil. Do not concern yourself with the high voltage distributor wire. Start the car and measure the voltage at the small wires. One wire will be +12 volts power, the other wire(s) are switching to the ignition amplifier module (or points on older cars) and should measure a lower voltage that varies with engine RPM. If you are using a scope, there will be a square wave on this wire as the coil fires. This is the correct wire to join to the GREEN wire on pin 9 of the PM.

On more recent engine systems, the engine electronics may seem very complicated and confusing, and the ignition coil system may not be used. The BROWN ESD kill wire from the PM can be wired to many sensors on a fuel-injected engine that will cause the engine to sputter and stall without damage, for example, the airflow sensor, or the throttle position sensor.

On these cars, a voltage is varied as the engine is revved. A sensor has two or three wires; one or two wires will always be the same voltage, but one wire will vary voltage as the engine is revved. It is this wire with the changing voltage that you can tie into the BROWN wire to the PM. The installer can use his imagination and is encouraged to experiment with different cars. No engine electronics damage will occur, as long as ONLY THE WIRE WITH THE CHANGING VOLTAGE IS WIRED to the BROWN wire.

***NOTE: If the BROWN ESD kill wire is used, DO NOT wire the Ignition Kill GREEN wire.

POWER CUTOFF CIRCUIT

On cars with automatic transmissions, to totally shut off the engine will cause the steering and brakes to become heavy. On these cars, you may not want to hook up the ORANGE and YELLOW power cutoff wires to kill the fuel system if liability is a concern for you. The GREEN or BROWN wires will pulsate to ground, which will make the car jerk and slow down, and will generally be undrivable without attracting attention, but will not cause the driver to loose control. On cars with standard transmissions, the direct link between engine and transmission will allow the engine to turn as the car coasts down, and the brakes and steering will be unaffected. You might want to use the power cutoff circuit to disable the starter instead. This is described later as a third choice.

POWER CUTOFF to FUEL SYSTEM

Fuel-injected cars have an electric fuel pump, fuel injectors, and a fuel control relay. The dual ORANGE and YELLOW wires from the PM act as a switch, normally conducting to run the engine, or opening the connection when told to shut down the engine by the LM. ProCar 1 uses two identical switchers, wired in parallel for failsafe operation. Always use BOTH orange and BOTH yellow wires. Together, they will switch up to 20 amperes.

First choice is wiring to the fuel relay, as this is usually in the engine compartment, and requires the least amount of current. With someone turning the ignition key on and off, listen in the engine compartment for a clicking relay. Find the wire that actuates the relay coil and cut it. Try to start the car, it should not start. Wire the ORANGE wire from the PM to the voltage source, and the YELLOW wire to the relay coil. It is MOST IMPORTANT that the ORANGE wire get the voltage and the YELLOW wire deliver the power to the load. The MOSFETS used are directional and if the wires are reversed, the PM may be damaged!

Second choice is to cut power to the fuel injectors. The injectors appear to be wired together, with the wire bundle terminating at a multi-pin connector. Measure the voltage at each wire as the engine is running. Only one wire will be constant 12 volts, the others measuring slightly lower with small negative pulses as the injectors fire. It helps to rev the engine for a better reading, as the injector

wires measure LOWER as the engine is revved HIGHER. If you are using a scope, the injector wires have a very narrow negative pulse riding on the 12 volts. You will wire into the CONSTANT POWER WIRE that supplies ALL of the injectors.

Cut the constant 12 volt wire to all injectors and connect the 12 volt side (supply) to the dual ORANGE wire of the PM, and the other (to injectors) side to the dual YELLOW wire of the PM. Remember that if these wires are reversed, the PM may be damaged!

The third choice of using the fuel power cutoff circuit is to use the circuit as a starter interrupter. Some customers may feel uncomfortable about having the engine cut completely off upon an attempted carjacking, especially if the vehicle uses an automatic transmission. Simply cut the small START wire from the ignition key to the starter solenoid and wire the power source to the ORANGE wire, and the solenoid wire to the YELLOW wire.

CARS WITH MECHANICAL FUEL SYSTEMS

On these cars, you may use the power cutoff circuit to cut off power to the ignition coil. Recall the wiring of the Ignition Kill circuit listed above. The coil has 12 volt ignition input, and points or ignition module output. You have already wired the Ignition Kill GREEN wire to the ignition module (coil negative) wire; simply cut the 12 volt ignition power to the coil positive, wire the dual ORANGE wire to the power source, and the dual YELLOW wire to the coil power input.

Remember that you can use the power cutoff circuit to disable the starter in these cars instead of removing ignition power.

Alternatively, you may use an electric fuel cutoff solenoid, availiable at any auto parts store.

***REMEMBER THAT USING THE POWER CUTOFF CIRCUIT TO CUT POWER TO THE FUEL OR IGNITION SYSTEM WILL CAUSE THE ENGINE TO SHUT DOWN COMPLETELY TEN SECONDS AFTER THE VOICE WARNING!

MOTION SENSOR and PIN SWITCH DETAILS

The motion sensor should be mounted to a vertical METAL wall on the driver's side inside the engine compartment as close to the firewall as possible. DO NOT MOUNT TO ANY SOFT PLASTIC SURFACES, as they will not conduct sound properly to the shock sensor. The trigger wire is connected to the thin BLACK wire from pin 5 of the PM, the power and ground wires are tapped into the heavy RED and BLACK wires of the PM (pins 1 and 13). When adjusting the motion sensor, remember to temporarily disconnect the pin switches. The motion sensor should be adjusted so that a fist needs to be pounded hard from one foot away on front and rear bumpers.

Any number of grounded pin switches may be connected to the thin black wire (pin 5 of the PM). ProCar 1 has been calibrated so that a pin switch can be saturated with water or corrosion without affecting the system in most cases. A pin switch should be zero ohms when actuated and infinite when open. ProCar considers anything less than 400 ohms as "zero" and anything more as "infinite". If you measure the voltage at this point, it should measure 11 volts when all entry points are closed (ProCar does not have to be armed to measure). If the reading is lower than 10 volts, suspect a defective pin switch or motion sensor. If the sirens are being activated right after the system arms itself, the only cause will be a leaky pin switch or other sensor that is intermittent. Any "stuck" sensor that pulls the voltage to zero will keep the system from arming itself and the status indicator will remain green at all times. Use a polycarbonate or stainless steel pin switch instead of a steel switch to eliminate falsing due to moisture or corrosion.

WIRING PROCAR INTO A VEHICLE'S EXISTING KEYLESS ENTRY SYSTEM

The LM module has the ability to be wired into a vehicle's existing keyless entry system using a positive pulse from the door lock solenoid. Pin 5 (YELLOW) will disarm ProCar immediately with a + pulse. To integrate the system into an already existing vehicle remote, or keyless entry system, simply tap into the lock motor wire that becomes + when OPENED.

If the HIGH security level is selected, the keyless entry will only unlock the doors; ProCar will let the driver in, but the system will sound if ProCar does not receive the secret signal within 15 seconds.

WIRING THE FOUR-FUNCTION REMOTE

The receiver is plugged into the flat plug as described on page 1. Let the antenna wire hang clear from other wires or metal surfaces. The range is dependent on the height of the receiver, so mount it as high in the dash as possible.

NOTE: When the system is powered up, ProCar will auto-arm, and the remote receiver MAY enter the panic mode immediately. If the sirens and lights flasher start immediately after power-up, push the left PANIC button on the remote once, then disarm the system by holding the right RESET button for three seconds.

INSTALLING OPTIONAL AUTOMATIC DOOR LOCKING AND UNLOCKING CIRCUIT

This feature will allow the factory power door locks to syncronize with ProCar 1. The lock/unlock relay circuit ties into the thin GREEN wire (Armed line, pin 14 of the LM). The circuit will lock ALL door locks as ProCar 1 arms, and the unlocking relay will unlock the driver's door ONLY when ProCar 1 disarms. Because the locking feature will lock the keys inside the car if someone leaves the keys in the ignition and closes all of the car doors, ProCar gives plenty of time and verbal warnings before it arms and locks. Of course, if the driver keeps the remote in his pocket, he can unlock the driver's door as he disarms ProCar 1.

The diagrams in figure 17 show typical Ford 5-wire, GM positive switching, and foreign negative switching.

After you have installed the ProCar system in the vehicle, every circuit will be tested in the next section.

TESTING PROCEEDURE FOR THE PROCAR ONE SYSTEM

The following 29 tests will check every circuit of the system. If any test fails, check that circuit for proper components, polarities and solder connections. WARNING: HEARING PROTECTION SHOULD BE WORN DURING ALL TESTS!

1: Be sure that the LM module door polarity headers are set for the proper polarity of the automobile.

2: After powering up the system for the first time, hold your "secret switch" for three seconds to clear the system.
Remember that the ignition must be on if your secret switch is active only when the ignition key is on.

3: With all doors, hood and trunk closed, open, then close the DRIVER door. Check that the green LED lights for 15
seconds, then the LED should turn orange and ProCar should announce that the system has been activated. After
another 15 seconds, the LED should turn red, and all door locks should lock (if the locking relays are installed).

4: Check the shock sensor by pounding the bumper. The internal and external sirens should sound and the lights should flash. Reset by holding the right remote button down for three seconds. The DRIVER door lock should unlock only (if the locking relay option is installed) and ProCar should announce System Reset.

5: Open, then close the DRIVER door to start the arming process again, but reopen any door within ten seconds. The system should not arm, and the green LED should remain lit. This checks the arm delay circuit for package loading. After 30 seconds, close the door and the system should arm fully within 30 seconds.

6: Start a 60 sec timer, open, then close the PASSENGER door. The sirens and lights should be activated, then reset within 60 seconds.

7: Open the DRIVER door and get inside, then close door. The sirens and lights should NOT activate, and ProCar should warn that the system is active. After 10 seconds, the external siren and internal siren should activate; try to start the engine. The car should not start.

8: With the ignition key still on, hold your secret switch in for three seconds. ProCar should reset.

9: Get out of the vehicle and close the door to allow the system to rearm.

10: After the system is fully armed, open the DRIVER door, get in and close the door. Within ten seconds, turn the ignition key on and start the car. ProCar should announce System Reset and the car should start.

11: Turn off the engine, leave the car and close the door. Before ProCar rearms, push and hold the right remote button for three seconds, and the green LED should turn off. Push the left remote button once for PANIC/FORCED REARM, then push the left button again. With the first push, the outside siren and lights should activate, the red LED should light, and ProCar should announce that the system is activated; with the second push, the sirens and lights should turn off, but ProCar should be armed within 15 seconds.

12: If your car has a factory installed keyless entry, check it now to make sure ProCar disarms when you unlock the DRIVER door; otherwise, reset ProCar by the ignition key or the remote.

13: Enter the car, close the door and start the engine. While the engine is running, open the PASSENGER door and close it; the LED should remain off.

14: Open and close the DRIVER door to simulate a carjacking. The LED should turn green for 15 seconds, then the warning should be heard when the LED turns orange.

15: Turn the ignition key off and on several times to simulate a carjacker trying to disarm the system; ProCar should ignore this and the engine should become inoperative within 10 seconds. The motion sensor should pick up the moving actions of the vehicle and activate the sirens and lights.

16: Turn the ignition off and leave the car. Within 15 seconds, ProCar should sound all alarms again for 45 seconds.

17: After ProCar resets the sirens and lights, enter the vehicle and try to start it normally; the car should not start. ProCar should have set itself for HIGH security (owner identification required).

18: Identify yourself using your secret switch, and ProCar should reset and allow the engine to be started.

19: With the ignition on, tap your secret switch 3 times; there should be no response except for the normal function of the switch.

20: With the ignition on, QUICKLY tap your secret switch FOUR times for HIGH SECURITY test. ProCar should announce High Security within four seconds.

21: Turn the ignition off and leave the car. Allow the system to arm.

22: Enter the car and attempt to start the engine. ProCar should announce that the system is active and the engine should not start. Reset using your secret switch.

23: With the ignition on, tap your secret switch FIVE times for VALET, open, then close drivers door to simulate a chance of drivers. Wait 45 seconds; the green LED should light but the anti-carjack circuit should not be activated.

24: Turn the ignition off and leave the auto. ProCar should start to automatically rearm itself within 25 seconds.

25: After ProCar is fully armed, enter and start the vehicle; the system should allow normal operation.

26: With the ignition on, tap FIVE times for DISARM, and check that ProCar announces that the system is Disarmed for Service. Turn off the ignition and leave the vehicle.

27: The system should start to arm, up to the orange LED, but no announcements should be heard and the LED should remain orange indefinately.

28: Open the DRIVER door, turn the ignition on, and ProCar should again announce that it is fully disarmed.

29: Reset using your secret switch, and with the ignition still on, QUICKLY tap 7 or more times to check the PANIC mode, then reset the system.

If ProCar passes all of these tests, then all circuits are operating normally. The Operations manual should be copied and kept in the automobile's owner's manual.

---------- OPERATION OF THE PROCAR 1 SYSTEM ----------

SECRET IDENTIFICATION SIGNAL

Your installer, ProCar 1, and yourself are the only ones who know what your secret signal is to identify yourself to ProCar 1. The device selected is also your communications port to ProCar 1 in order to select any of ProCar 1's special features. At any time that ProCar 1 is requesting identification verification from you, give the secret signal using this device, or by using the RIGHT button on the remote control.

HOW PROCAR ARMS ITSELF AUTOMATICALLY

After parking and turning off your engine, you may stay in your car for as long as you desire. When you leave, ProCar 1 uses the driver's door CLOSING as a signal to start arming, and will signal this by lighting the indicator GREEN. However, if you need to load or unload packages from the trunk or any door, simply by opening any door or trunk, the arming is temporarily halted. The indicator will remain green while ProCar 1 waits for you to finish. After all of the doors, hood and trunk are closed for at least 15 seconds, and ProCar senses that all motion has stopped from the motion sensor, the indicator will flash ORANGE and ProCar 1 will warn that it is arming. After 15 seconds of flashing orange, the indicator will flash RED and the system will be fully armed, the engine will be cut off, and the doors will lock (if the optional auto-locking/unlocking module is installed).

If the vehicle is assaulted, or if any passenger door, hood or trunk is opened, the internal and external sirens and the lights flasher will run for one minute and reset. If any entry point is left open, the one minute timer is bypassed and the sirens and lights will operate continously.

HOW TO DISARM PROCAR IN THE STANDARD SECURITY MODE

ProCar 1 normally defaults to the STANDARD SECURITY mode, which will allow the driver to simply disarm the system with the ignition key.

After unlocking and opening the door, ProCar will warn you that it is active and flash the indicator ORANGE. Simply close the door and turn the ignition key on, then start the car as usual. The ignition must be turned on within 15 seconds. ProCar will announce that it is reset and you may drive away at your convienience. However, if you must load or unload packages, flick the ignition key on and off briefly to disarm ProCar, then load up. You may take as long as you want, as long as any door or the trunk is open, or the motion sensor picks up any motion. After you are done, simply enter the car, close the door, turn the ignition on, start up and drive off.

*NOTE: If ProCar 1 is not disarmed within 15 seconds using the ignition key, ProCar will lock out the key disarm feature and you will have to identify yourself using your secret signal in order to disarm the system.

DISARMING PROCAR IN THE HIGH SECURITY MODE

This locks out the ignition key disarm feature, so that you must identify yourself each time to ProCar 1 before you can start the vehicle. To set ProCar 1 for HIGH SECURITY mode, at any time while you are driving, QUICKLY tap your secret button four times: H-I-G-H. This must be done within three seconds.

ProCar 1 will announce that you have selected HIGH SECURITY. If you wish to clear your selection, HOLD your secret button on for three seconds.

When entering your car, ProCar will remind you that the system is active. Close the door, turn the ignition key on, and give your secret signal. ProCar will announce SYSTEM RESET and turn off the indicator. You may then start the engine. The system will default to standard security after system reset, so you must select HIGH SECURITY each time you feel that you need it.

KEYLESS ENTRY / EXTERNAL DISARM OPTION

If you have a factory installed keyless entry feature on your car, you may have chosen the EXTERNAL DISARM option with your ProCar 1 system. This feature allows you to disarm ProCar 1 from outside the vehicle using your factory-installed method of keyless entry. ProCar 1 will integrate perfectly with your factory installed keyless entry, while adding the valuable PROTECTED VALET, ANTI-CARJACK, and PANIC features for your convienience and protection.

If you set ProCar to the HIGH SECURITY mode, anyone who attempts to use your keyless entry will, as usual, unlock the doors, but will not be able to disarm ProCar 1 or start the engine. ProCar 1 will allow them to enter, but will sound all sirens and lights if it does not receive your secret signal within 15 seconds.

If you use the HIGH SECURITY mode, when you return to your car and use your keyless entry to enter the vehicle, turn on the ignition switch; the multi-color indicator will remain green to remind you to give your secret signal before starting the car. The indicator will turn off, showing that ProCar recognizes you.

*NOTE: You will reset ProCar to STANDARD SECURITY when you give your secret signal to identify yourself. You must select HIGH SECURITY each time before you leave your car if you want this feature. Normally, you would only use this feature if you were driving in a
bad area, or if you do not want anyone with access to your keys to be able to use your car. If you want the HIGH security feature PERMANENTLY enabled, see your
ProCar installer.

ENTRY WARNING INDICATOR

If someone had entered your vehicle through the driver's door while ProCar is armed, the indicator will be flashing ORANGE instead of RED when you return to your car.

MALFUNCTION INDICATOR

If the indicator remains GREEN at all times and will not arm, this is an indication that ProCar has picked up an input sensor problem such as a mis-adjusted pin switch or motion sensor problem.

ANTI-CARJACK FEATURE

While driving, ProCar 1 monitors all doors. Any passenger may enter or exit, or anyone may open the trunk or hood while the driver sits in the auto with the engine running, and ProCar will ignore this. However, opening the DRIVER's door while the engine is running will signal ProCar to start watching for an unauthorized driver. ProCar will not indicate this in any way and for any length of time as long as the door remains open.

If you are ever carjacked, do not resist! Get out of the car as quickly as you can, run away and let the carjacker take the vehicle. ProCar 1 will do the rest!

When the carjacker closes the door and takes off, ProCar will light the indicator green for 15 seconds, but will not take any other action, in order to allow the carjacker to get away to a safe distance. When the driver has not been recognized by ProCar 1 within 15 seconds, ProCar 1 will lock out the ignition disarm capability, flash the indicator ORANGE and announce that the vehicle will be disabled in ten seconds. If the driver still has not been recognized by ProCar, the engine will shut down (or loose power and run erratically, depending on the installation) after ten seconds, the external and internal sirens will activate, and the outside lights will flash. The siren and lights will continue until the carjacker leaves, then will

reset. If the carjacker leaves the door open, the sirens and lights will continue to be activated to draw as much attention as possible.

When the anti-carjacking circuit activates, ProCar locks out the ignition key reset feature, even if you had ProCar set for STANDARD SECURITY. If you wish, you may walk back to your abandoned vehicle, enter and let ProCar know that you are back by turning on the ignition key and giving your secret signal, then start the engine and drive away. If you feel uncomfortable with this, find a telephone and report the car's last direction of travel to the police. Your car will be found within one quarter of a mile.

PROTECTED VALET PARKING FEATURE

Unlike other systems that require you to completely disarm your alarm for valet parking, ProCar will protect your car even when you give the keys to the valet driver. You continue to keep your remote control.

Since a valet driver will enter your car with the engine running, ProCar will pick this up as an attempted carjacking, unless you let ProCar know ahead of time. As you drive up to the restaurant, TAP your secret button five times:
V-A-L-E-T. Remember to do this within a three second time span.

ProCar 1 will announce your selection. You may leave your car, and ProCar 1 will allow the valet driver to park the car. THE IGNITION MUST BE ON TO SELECT THIS FUNCTION.

Twenty seconds after the car is parked, ProCar 1 will automatically reset for the STANDARD SECURITY mode and protect your car. When the valet driver returns with the keys, he may enter and start the car, and ProCar 1 will allow him to drive the car to you. You should warn the valet driver that ProCar will talk to him and not to worry. When you enter your car, remember to let ProCar 1 know that you are back by giving your secret signal.

SYSTEM DISARM (FOR SERVICE) MODE

If you will be bringing your car to a service station for repairs, be sure to disarm ProCar 1, so that the system will not shut down the engine when it senses strangers. With the ignition on, TAP your secret button six times: D-I-S-A-R-M. This must be done within a three second window. If you select the wrong function, HOLD the button for three seconds to clear, then try again.

ProCar 1 will announce that it is fully disarmed. Fifteen seconds after exiting the vehicle, the indicator will flash orange, and remain flashing orange at all times. Each time the ignition is turned on, ProCar 1 will remind the driver that it is disarmed. As usual, you may reset the system by turning on the ignition and giving your secret signal.

PANIC MODE

The outside siren and lights flasher can be operated without activating the inside siren, and without killing the engine. With the ignition key ON, TAP your secret button seven or more times within a three second time period. ProCar 1 will remain in the PANIC mode, ignition on or off, with no time limit. The panic mode can only be disabled with the ignition on, and by giving your secret signal.

STOPPING FOR GASOLINE

Turn off the engine, take the keys and close the door. ProCar will start to arm, but if you have the remote, hold the right button until the green light is off. You may then proceed to fill your tank. If you are in a bad area, remember to use the HIGH

security feature. This way, if someone gets your keys and tries to steal the car, ProCar will re-arm and automatically go into the anti-carjack mode.

If you are not using the remote, you may keep the dome light on by keeping the door open slightly, or if this is too dangerous, turn on the dome light switch. This will keep ProCar 1 in the suspended mode while you pump gas. (Remember to turn off the dome light switch when you re-enter your car!)

If you normally leave your engine running, leave the driver's door open so that ProCar does not enter the anti-carjack mode right away. (You cannot use the domelight switch method described above, because ProCar enters a different program while the engine is running and will immediately enter the anti-carjack mode when the driver's door is opened and closed.)

ProCar will wait while the door remains open, but will monitor the situation. When you re-enter the vehicle, ProCar will enter the anti-carjack mode, but you can reset the system with your secret signal.

Alternatively, if you have the remote, you may close the door with the engine running, then immediately reset ProCar with the right button. If a thief enters the vehicle, ProCar will re-arm automatically, then enter the anti-carjack mode immediately.

USING THE FOUR-FUNCTION REMOTE

With the remote, you can activate system reset, system rearm, panic, and INSTA-STOP functions from outside your car.

*NOTE: It is very important to realize that you must not attach the remote to your keychain, so
that a carjacker cannot disarm ProCar using the remote. Instead, keep the remote unconnected, in a front pocket or another safe place. This is ESPECIALLY IMPORTANT if you have the automatic door locking feature, in case you accidently leave your keys in the ignition!

To DISARM ProCar, within 25 feet of your car, press and hold the right button for three seconds. ProCar will announce SYSTEM RESET, and you simply enter, close the door, start up and drive off. If you have the auto-unlock feature, ProCar 1 will unlock the driver's side door as it resets.

If you have ProCar set for HIGH SECURITY, disarming the system with the remote will cause ProCar to remind you that it is set for HIGH SECURITY. After entering, remember to give your secret signal to allow ProCar to recognize you.

If you disarmed ProCar to get something from the trunk, after closing the trunk you may rearm the system using the remote without having to open and close the drivers door. Touch the left button, wait one second, and touch it again. The lights will flash and the siren will sound to verify, and if the automatic door lock option is installed, all doors will automatically lock within 15 seconds.

The PANIC and INSTA-STOP functions are activated together with the left button.

If the car is already parked with ProCar armed, pushing the left button ONCE will activate the PANIC function, flashing lights and siren, and pushing this button once more will turn off the PANIC mode.

If someone who knows your secret signal is driving away with your car, you can still stop them with your remote by activating the PANIC/INSTA-STOP function. You must keep your remote separate from the car's keys to use this feature.

To activate the PANIC and INSTA-STOP functions, push the left button ONCE only. ProCar will lock out any attempt to disarm it, even the secret signal inside the car will be locked out! When this button is pushed, Procar will immediately flash the indicator RED and warn the driver that the engine will stop in ten seconds and activate the OUTSIDE siren and lights immediately. If the driver ignores the warning, after ten seconds ProCar will then activate the INSIDE siren and shut down the engine. You may reset the PANIC and INSTA-STOP functions by pushing the left button once again. You must then allow ProCar to recognize you by the usual three second push of the right button.

IN CASE OF TROUBLE

In the rare case that after the system arms itself, the sirens and lights are activated immediately, this indicates that a perimeter or motion sensor is intermittent. If the system never arms and the indicator remains green, this indicates that a switch or motion sensor is shorted.