TWILIGHT SENTINEL

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DESCRIPTION AND OPERATION

SYSTEM DESCRIPTION

The twilight sentinel will provide light sensitive automatic on-off control of lights during vehicle operation. Also, for night visibility when leaving the vehicle, it will keep the lights turned on for a preselected period of time after the ignition is turned off.

Lights will automatically turn off after the preselected time elapses. The system is available as a dealer-installed option on all Buicks.

The system consists of a light sensitive photocell assembly, which includes a variable time delay control and on-off switch and a transistorized amplifier.

The photocell assembly is mounted on the left windshield post so that the photocell light sensing surface is exposed to direct skylight through the windshield. Light strikes the cell through an opening near the top of the assembly. Sensitivity can be adjusted by rotating the "early-late" disk to control amount of light striking the cell. The "off-max. delay" control knob adjusts time delay for keeping lights on after ignition is turned off and also operates the on-off switch (manual-automatic). The amplifier unit is mounted behind the instrument panel on the left side with a serial number label attached on one end for field identification.

CIRCUIT DESCRIPTION

The photocell acts as the light sensor by varying its internal resistance according to the amount of light applied. It is connected between battery voltage and ground through resistor R1 and potentiometer P1 to form a circuit for controlling the base of transistor Q1. In darkness the photocell internal resistance is very high (megohm range), and it will have no significant effect on base voltage of Q1. As light is applied, the internal resistance lowers and current begins to flow, causing Q1 base voltage to rise. Potentiometer P1 is adjusted to control sensitivity output of photocell.

The ground circuit is supplied through the on-off switch in the time delay control. If the control knob is rotated to "Off" position, the switch is open and system cannot operate. Vehicle lights must then be operated by means of the regular light switch.

The power relay contacts in the amplifier are connected in parallel with regular light switch contacts. For this reason, the regular light switch must be turned off to permit the unit to control the lights. Battery voltage for the power relay coil, headlamps, and the photocell is supplied through the circuit breaker in the amplifier.

The system is energized when the ignition is turned on which applies battery voltage from the ignition line through the turn signal flasher feed line (pink). In "Off" position the ignition circuit is essentially grounded through the vehicle car wiring (indicator lights, accessories, etc.). This provides a discharge path for the time delay circuit (after ignition off).

Transistor Q1 does the actual switching of the sensitive and power relays to control the on-off operation of vehicle lights. It is biased through resistors R3, R4, and potentiometer P1 so that with no light strik-

ing the photocell (or photocell disconnected or cell opening closed), it will conduct to "pull on" the sensitive and power relays to turn lights on. Light striking the photocell causes its internal resistance to drop, increasing Q1 base voltage which tends to turn off Q1 and shut lights off.

Capacitor C1 is connected between base and collector to provide a delaying action to prevent undue cycling of Q1 when vehicle is passing under trees, viaducts, bright light, etc.

Transistor Q2 is connected across Q1 and is in the time delay circuit (after ignition off). When the ignition is on, Q2 is biased to turn off through diode D2, resistors R3, R4, R7, R8, and time delay capacitor C2. When ignition is turned off, capacitor C2 starts discharging through Q2, R7, R8, and time delay control back to the ignition line which is now at ground potential. During discharge of C2, voltage at base of Q2 is gradually lowered until Q2 turns on, which effectively shorts out or turns off transistor Q1. When the ignition is turned off (with vehicle lights on), operating voltage is applied from the power relay tail lamp contact through resistor R2 to Q1 and Q2. Resistor R2 will reduce voltage applied to approximately one-half of the battery voltage. When the time delay has elapsed and Q2 turns on, which turns off Q1, the power relay contacts open and remove operating voltage and de-energizes the circuit until the ignition is turned on again.

Diode D2 provides a low resistance path for charging capacitor C2 and turning off Q1 immediately when ignition is turned on to prevent delay in turning on vehicle lights at night. Diodes D1 and D2 also block feedback when ignition is turned off.

AUTOMATIC OPERATION

With time delay control knob rotated anywhere counterclockwise of "Off" position, "early-late" disk set so skylight may strike photocell, and light switch off, turn ignition on. Battery voltage is applied through the ignition line to immediately charge time delay capacitor C2, turn off Q2 and, if the photocell is exposed to bright light, Q1 will also be turned off, which will keep the vehicle lights off. As daylight reduces to the point where lights are needed, the photocell resistance will have increased to permit Q1 to turn on, which turns on the vehicle lights. A time delay capacitor (C1) prevents undue cycling when passing under trees, viaducts, bright light, etc. The desirable time at which lights turn on may be selected by rotating the "early-late" disk on the photocell assembly. Rotating clockwise reduces the amount of light striking the sensitive surface through the opening and turns lights on earlier. Adjust disk in small steps to avoid overcorrecting.

This is necessary due to system being designed with a time delay to ignore rapid changes in light level. This prevents lights turning on or off immediately if vehicle passes under trees, shadows, overpass, bright lights, etc. The time delay period normally ranges between 10 and 30 seconds. However, in some units, the time delay could range as high as 60 seconds.

When the ignition is turned off with lights on, capacitor C2 starts discharging through the time delay control and gradually reduces voltage at base of Q2. Discharge time may be controlled by rotating the "off- max. delay" control knob to obtain from a few seconds to a maximum of 1.5 to 4.5 minutes.

Additional lighting during this time may be obtained by turning on a cornering light (if equipped). When base voltage reaches a certain level, Q2 turns on and turns off Q1 which turns off lights and removes operating voltage.

MANUAL OPERATION

If the driver desires to turn lights on for identification in such conditions as fog, rain, or when driving in a funeral or through a tunnel, he may do so by either rotating "early-late" disk to extreme clockwise position to block light exposure or operate the regular light switch. If he blocks light to the photocell, the lights will turn off automatically after the ignition is turned off. Operating the light switch parallels the twilight sentinel, and the switch must be turned off for the unit to regain control. Failure to turn light switch off will result in a run-down battery.

Strictly manual operation of lights can be obtained by rotating the "off-max. delay" control knob to "Off" position. This disables the twilight sentinel by disconnecting ground circuit. Lights will operate only by use of the regular light switch. This is useful, particularly in areas of low light level (tunnels, etc.) when the law requires the lights to be turned off.

DIAGNOSIS

ELECTRICAL DIAGNOSIS GUIDE

LIGHTS TURN ON TOO EARLY OR TOO LATE - SEE SENSITIVITY ADJUSTMENT

Check time delay control for possible rotation to "Off".

Make sure photocell opening is not closed.

Time delay (10 to 60 seconds) must elapse before amplifier can switch when photocell is suddenly exposed to bright light and darkness.

Regular light switch must be turned "Off".

Check fuses (tail, instrument, park and signal, cornering and front marker lamps).

IF ABOVE STEPS ISOLATE PROBLEM

Proper operation should be explained to owner.

IF PRECEDING STEPS DO NOT ISOLATE PROBLEM

Rotate "early-late" disk and "off-max. delay" knob to extreme clockwise position; turn light switch off and ignition on.

LIGHTS DO NOT TURN ON WITHIN 10 SECONDS

Turn light switch on. If lights fail to turn on, check for defective car wiring or connections between amplifier and light switch. Turn light switch off.

Check for loose ground wire connection (from photocell assembly).

Connect jumper wire between body ground and purple wire in amplifier 10-way connector.

If lights turn on, check ground path through on-off switch in photocell assembly. If switch is defective, replace photocell assembly.

Disconnect black wire from amplifier 10-way connector. If lights turn on, replace defective photocell assembly.

If lights still do not turn on, replace defective amplifier.

LIGHTS TURN ON WITHIN 10 SECONDS

Rotate "early-late" disk to extreme counterclockwise position (late). Shine light from flashlight through windshield onto photocell.

Lights Do Not Turn Off Within 10 to 60 Seconds

Connect jumper between black and gray wires in amplifier 10-way connector.

If lights do not turn off within 10 to 60 seconds, replace defective amplifier.

If lights turn off within 10 to 60 seconds, check continuity from amplifier to photocell. Connect ohmmeter between black and gray wire in amplifier 10- way connector. Shine bright light on photocell.

Reading of 10 K Ohms or Less Indicates Photocell Is Exposed to Light and Connections Good

Replace amplifier.

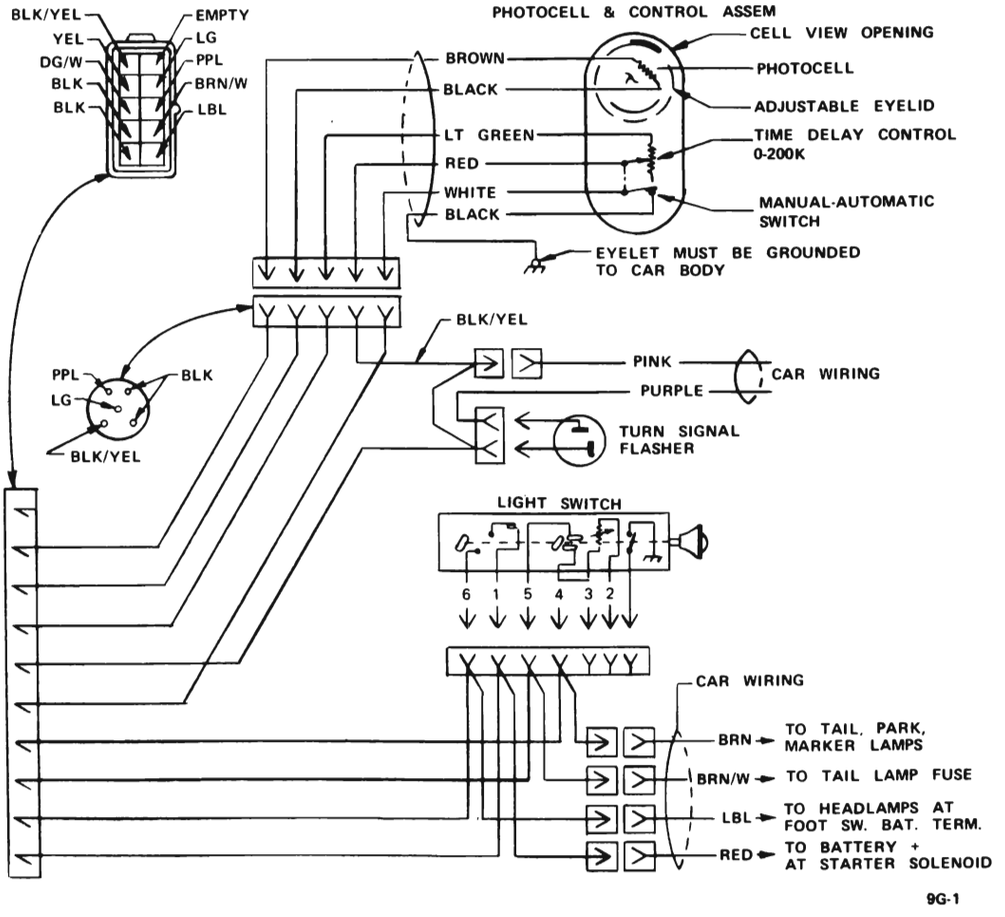

Figure 9G-1 Twilight Sentinel Wiring Diagram - Typical

Reading of More Than 200 K Ohms Indicates Photo-cell Is Not Exposed to Light or Wiring Circuit Could Be Defective Or Poor Connection In the 5-Way Connector

Replace defective photocell assembly.

LIGHTS TURN OFF WITHIN 10 TO 60 SECONDS

Rotate "early-late" disk and "off-max. delay" knob to extreme clockwise position. With ignition on, lights should turn on within 10 to 60 seconds.

Turn ignition off and lights should remain on for one and a half to four and a half minutes.

Lights Remain on Specified Time and Then Turn Off

Twilight sentinel is functioning normally. Possibly an explanation to owner regarding sensitivity adjustment or operation of light switch and "off-max. delay" control may help him.

Lights Do Not Remain on Specified Time

Check taillight fuse (taillights must be on during time delay).

Turn ignition off and check continuity through time delay control. Rotating "off-max. delay" knob should vary resistance between 500 ohms and 200 K ohms.

If not, check wiring. If wiring is okay, replace photocell assembly.

If resistance varies, as specified, replace amplifier.

LIGHTS DO NOT TURN OFF

Turn ignition off and check continuity through time delay control. Rotating "off-max. delay" knob should vary resistance between 500 ohms and 200 K ohms.

If not, check for open wiring or open time delay control. If control is defective, replace photocell assembly.

If control resistance varies between 500 ohms and 200 K ohms, check ignition line to be sure it is at ground potential when ignition is turned off.

If okay, replace defective amplifier.

HEADLIGHTS TURN ON BUT TAILLIGHTS DO NOT

Check taillight fuse or connections at light switch or amplifier.

If tail lamp bulbs and connections are okay, replace amplifier.

MAINTENANCE AND ADJUSTMENTS

SENSITIVITY ADJUSTMENT

All sensitivity adjustments are made by rotating the "early-late" disk on the photocell assembly to change the dimension of the opening over the photocell, as explained under "Automatic Operation". For this reason, no sensitivity adjustment equipment is required.

Due to high light levels during daylight hours, the sensitivity should be adjusted at the time lights are desired to turn on. *Adjustment must be in small steps to allow time delay to elapse and avoid overcorrecting.*

If a photocell or amplifier is defective, replace only the defective item. The "early-late" disk provides sufficient adjustment to permit interchange of units.

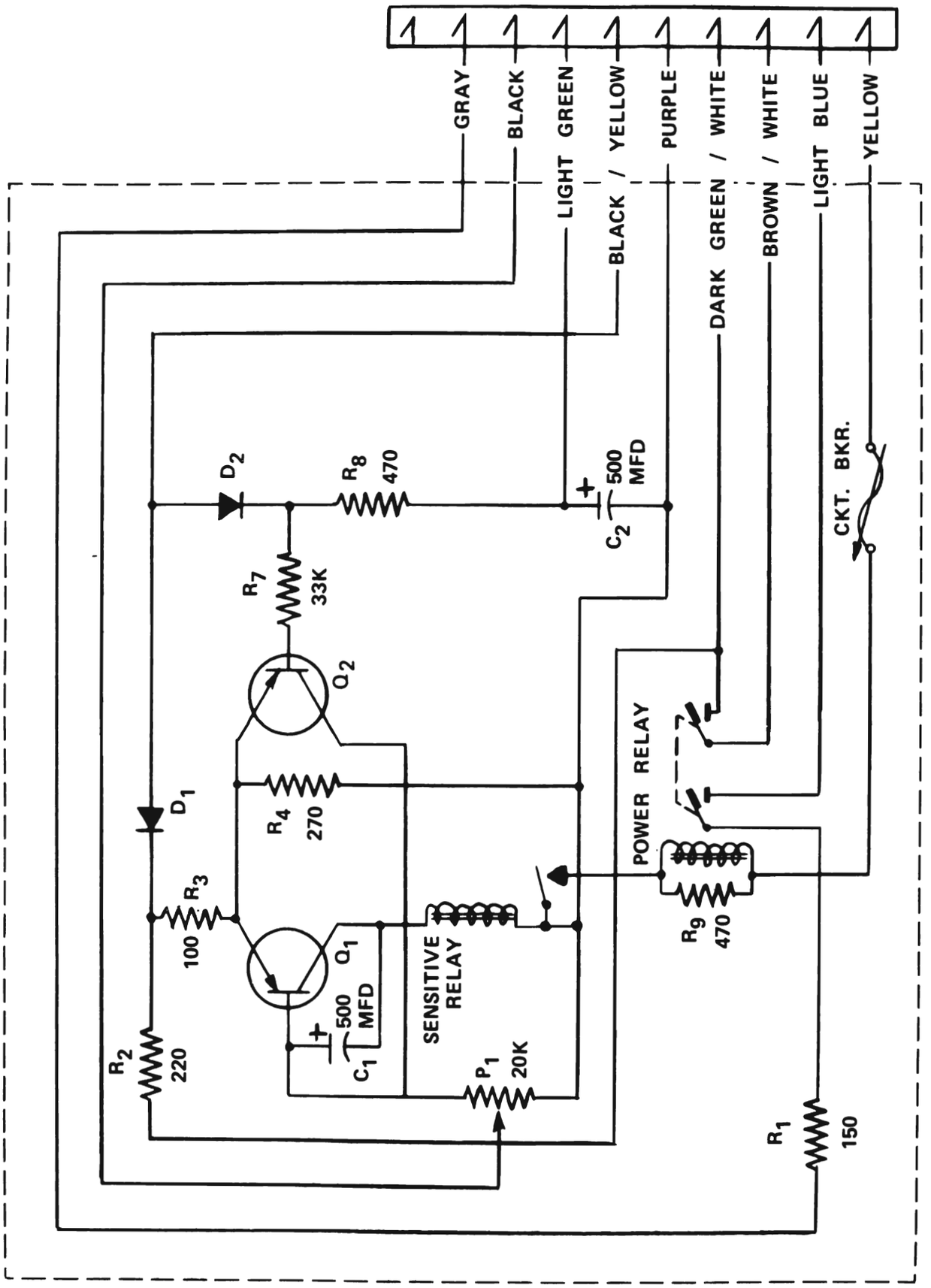

Figure 9G-2 Twilight Sentinel Schematic