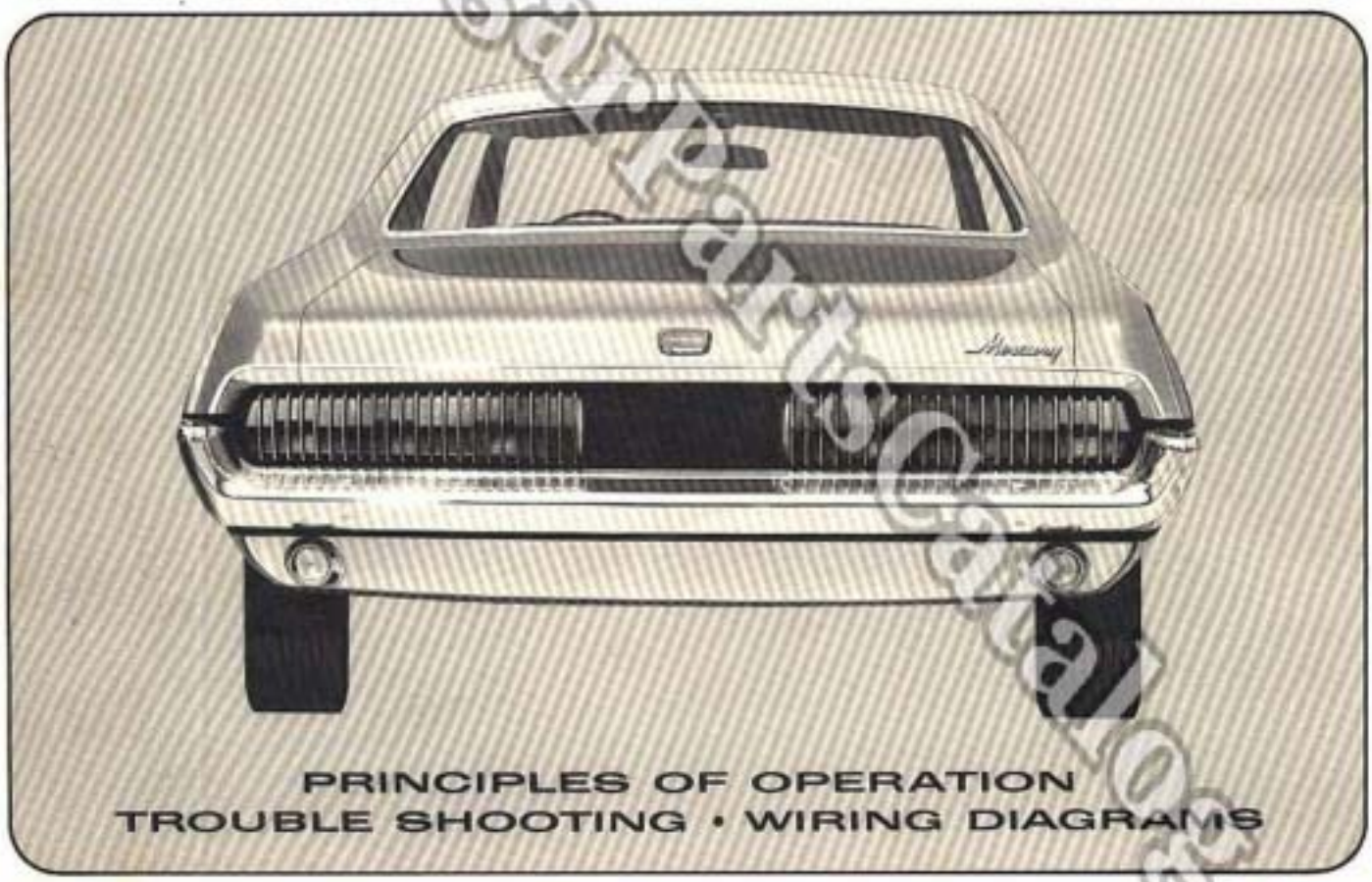
1967

*Mercury Cougar*

# SEQUENTIAL TURN SIGNAL AND EMERGENCY FLASHER SYSTEMS



PRINCIPLES OF OPERATION
TROUBLE SHOOTING • WIRING DIAGRAMS

## SERVICE DEPARTMENT

LINCOLN-MERCURY DIVISION

Ford

# TABLE OF CONTENTS



# FOREWORD

In order to diagnose accurately problems that may develop in the Mercury Cougar sequential turn signal system, it is necessary to understand each of its electrical circuits and the function of each component that makes up the system.

This manual illustrates each circuit schematically that is activated during each cycle of an indicated turn. In addition to turn signal operation, the circuits involved in the emergency flasher system are also described schematically. The stop lamp circuit as it is interrelated to turn signal operation is likewise described.

Following a study of all the circuits in schematic form, a complete wiring diagram is presented as an aid in locating logical test locations for trouble shooting purposes.

Next a pictorial view of the car is shown to help in the actual location of each of the components and connectors involved.

The final section of this manual presents a road map type procedure for trouble shooting specific sequential turn signal, emergency flasher, and stop lamp problems.

# 1967 COUGAR SEQUENTIAL TURN SIGNAL SYSTEM SCHEMATIC WIRING DIAGRAMS

The schematic wiring diagram on the facing page illustrates the basic circuits involved in the 1968 Cougar sequential turn signal system. The components of the system are so arranged in this illustration that the circuits involved can be more easily understood. Connectors and harnesses are omitted for added simplification.

The sequential turn signal wiring system can be subdivided into five sub-circuits as follows:

1. The Sequential Main Turn Signal Relay Circuit

   This portion of the circuit provides for the operation of the right or the left turn signals depending on the position of the turn signal lever. This system does not provide current to the lamp filiaments. It is a switching system only.

2. The Sequential Motor and Lighting Circuit

   This portion of the circuit provides current to operate the motor which controls the sequential lighting of the rear signal lamps. In addition to the motor system, this subcircuit,also provides the current that lights the appropriate signal lamps.

3. The Instrument Panel Indicator Lamp Circuit

   This portion of the circuit provides for the operation of the instrument panel indicator lamps.

4. The Emergency Flasher Circuit

   This system makes use of the three subcircuits described above in addition to its operating switch, emergency warning relay, and emergency relay "A".

5. The Stop Lamp Circuit

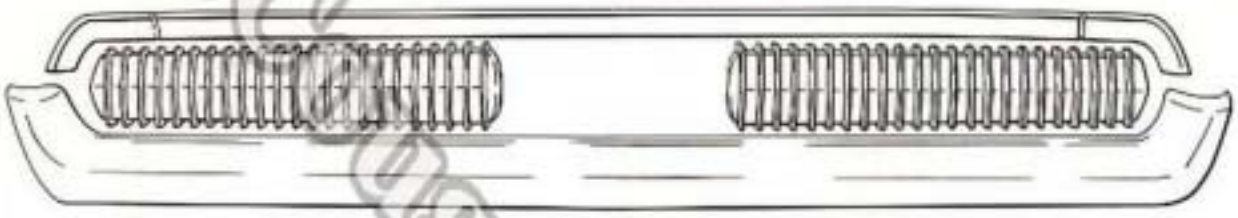
   This circuit bypasses the turn signal system to illuminate all rear lamps when the stop lamp switch is activated.

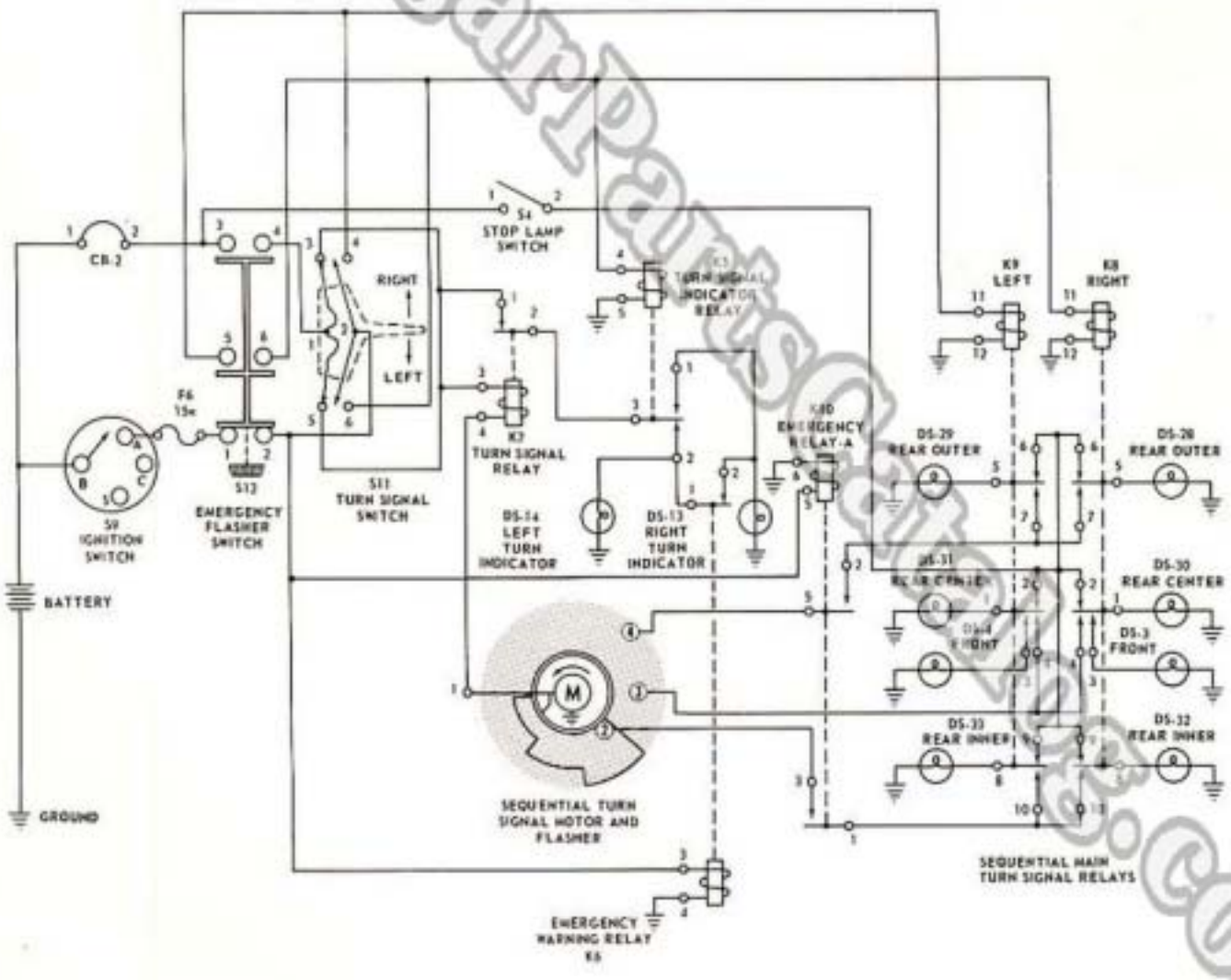
For general diagnosis, it must be determined which subcircuit is malfunctioning. Except for a burned out fuse or a defective circuit breaker, it is unlikely that all components of the total sequential system will fail at a given time.

It should be noted in the accompanying illustration the position of all the relay contacts when the system is not in operation, that is, the ignition switch, the stop lamp switch, and the emergency flasher switch all in their "off" positions.

The schematic wiring diagrams that follow illustrate the operation of all the subcircuits that are necessary for each mode of operation. The operation of the turn signal switch, emergency flasher switch and all relays are also described in detail at the appropriate time.

# 1967 COUGAR SEQUENTIAL TURN SIGNAL SYSTEM SCHEMATIC WIRING DIAGRAMS

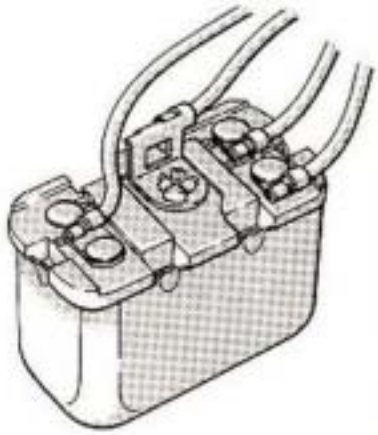




# RELAYS AND THEIR FUNCTIONS

## TURN SIGNAL INDICATOR RELAY, K5

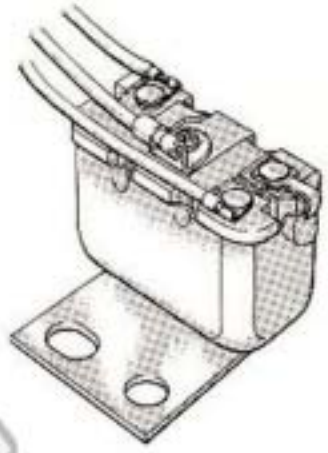
The turn signal indicator relay switches the indicator light circuit so that left indicator lamp on the instrument panel flashes for left turns and the right lamp flashes for right turns.



## EMERGENCY WARNING RELAY, K6

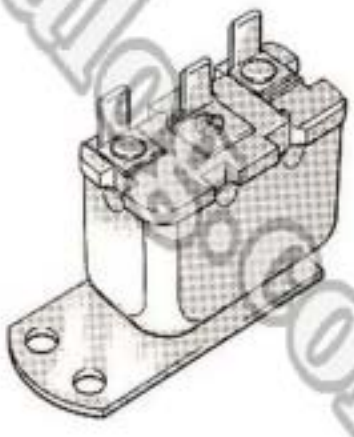
It is the function of this relay to open the circuit between the two instrument panel turn indicator lamps during normal turn signal operation.

During emergency flasher operation, the relay points are closed (normal position) and the two instrument panel indicator lamps flash at the same time.



## TURN SIGNAL RELAY, K7

This relay causes the flashing action of the instrument panel indicator lights.

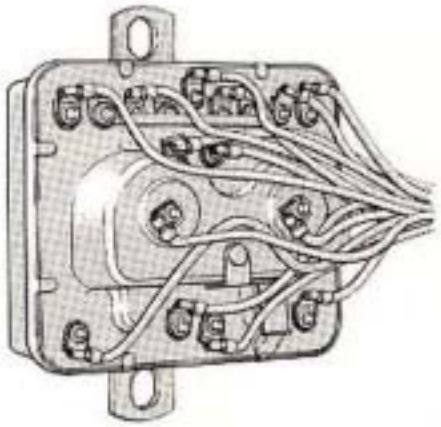


# RELAYS AND THEIR FUNCTIONS

## SEQUENTIAL MAIN TURN SIGNAL RELAYS, K8 - K9

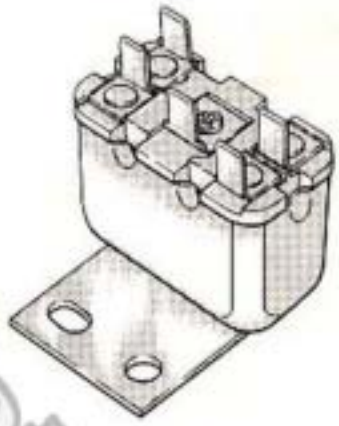
This relay assembly is made up of two separate relays, K8 which is energized for signaling right turns and K9, which is energized for signaling left turns.

When these relays are not energized, their contacts are positioned for stop lamp operation.



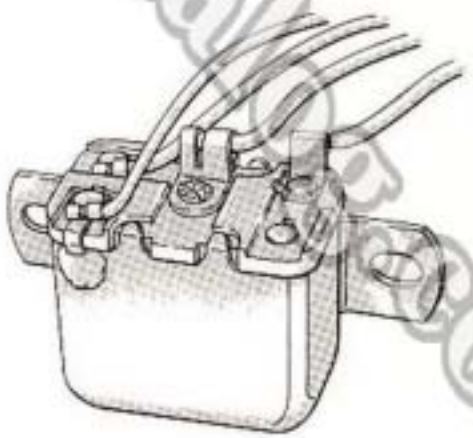
## EMERGENCY RELAY "A", K10

The emergency relay "A", when it is energized, maintains through circuits from the motor and cam assembly to the rear lamps. During emergency flasher operation, this relay opens the circuits (normal position) to the inner and outer rear signal lamps. Thus, only the center rear lamps operate when the emergency flasher system is functioning.



## STOP LAMP RELAY - K11

This relay, used in production prior to 1-3-67, provides a low current circuit through the relay solenoid and the stop lamp switch, and a separate circuit through the relay points to handle the higher current load of the stop lamps.



# RIGHT TURN

## INNER REAR LAMP "ON"

This diagram illustrates the lighting of the inner rear lamp on the right side to start the sequential lighting the rear lamps. The ignition switch is "on" thus providing current to the turn signal switch. By subdividing the sequential system into the subcircuits described below, the complete operation can more easily be understood.

A. Operation of Main Turn Signal Relay - Right Side

1. Current flows from the battery through contacts (1) and (2) of the EMERGENCY FLASHER SWITCH to terminal 2 of the TURN SIGNAL SWITCH.
2. In the right turn position, the path of the current is through contact 6 of TURN SIGNAL SWITCH to the K8 RELAY.
3. The K8 RELAY when so activated forces its three moveable contacts against the fixed contacts 7, 3, 4, and 10 respectively.
4. Activating the circuit to the K8 RELAY also energizes the K5 TURN SIGNAL INDICATOR RELAY, pulling the K8 moveable contact 3 against its fixed contact 1. This provides a through circuit to the instrument panel right side indicator lamp; however, this circuit does not cause the indicator to light.

B. Operation of the Sequential Motor and Lighting Circuit

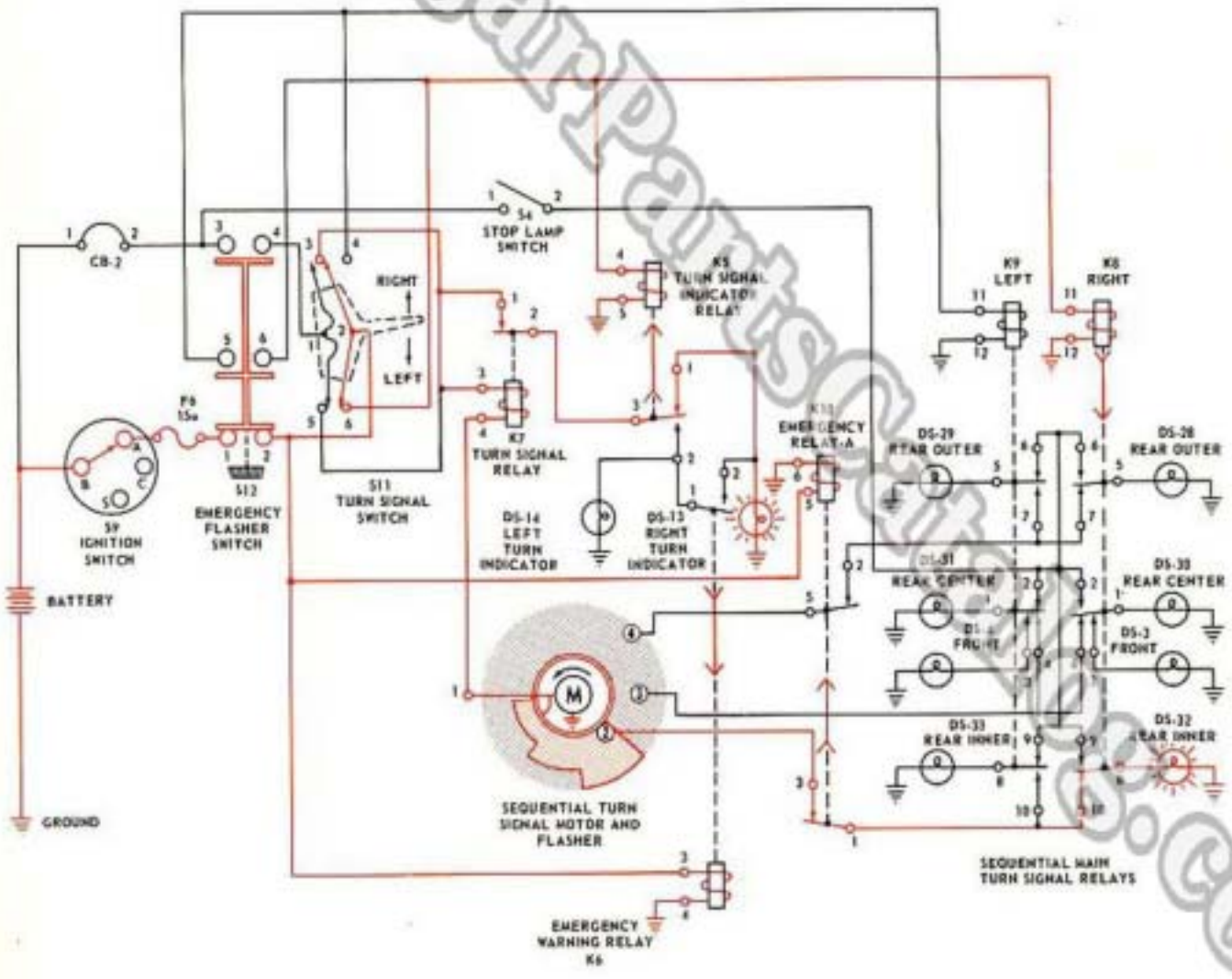
1. Current from terminal 3 of the TURN SIGNAL SWITCH is directed to the TURN SIGNAL RELAY K7, terminal 3, through its relay coil to the SEQUENTIAL TURN SIGNAL MOTOR AND FLASHER.
2. In all operations of the sequential turn signal system, the relays K6 and K10 are energized from terminal 2 of the emergency flasher switch. These relays are always energized whenever the ignition key is "on" and the emergency flasher is in the "off" position. K10 RELAY when energized closes its contact 3 and 1 and 5 and 2 which provide through circuits from terminal 2, and 4 of the sequential motor cam to contacts 10, and 7 respectively of the sequential main relay. The circuit from cam contact 3 to terminal 4 of the sequential relay is always complete. EMERGENCY WARNING RELAY, K6, when energized pulls its contacts 1 and 2 apart thus maintaining an open circuit between the RIGHT and LEFT turn signal indicator lamps.
3. The motor, when energized, rotates three cams. In the schematic drawing, one cam is contacting terminal 2 of the cam assembly. This completes an electrical circuit through to contacts 3 and 1 of K10 RELAY, through contacts 10 and 6 of the K8 RELAY to the rear turn signal inner lamp, DS-32.

C. Operation of the Right Indicator Lamp

1. Current from terminal 2 of the TURN SIGNAL SWITCH flows through contact 3 of the switch to contact 1 of TURN SIGNAL RELAY, K7, through moveable contact 2 of this relay, through contacts 3 and 1 of the K5 RELAY to the RIGHT indicator lamp. The right indicator lamp is thus illuminated and remains "on" (no flashing action at this time).

# RIGHT TURN

## INNER REAR LAMP "ON"



# RIGHT TURN

## INNER REAR TURN SIGNAL "ON"
## CENTER REAR TURN SIGNAL "ON"
## RIGHT FRONT TURN SIGNAL "ON"

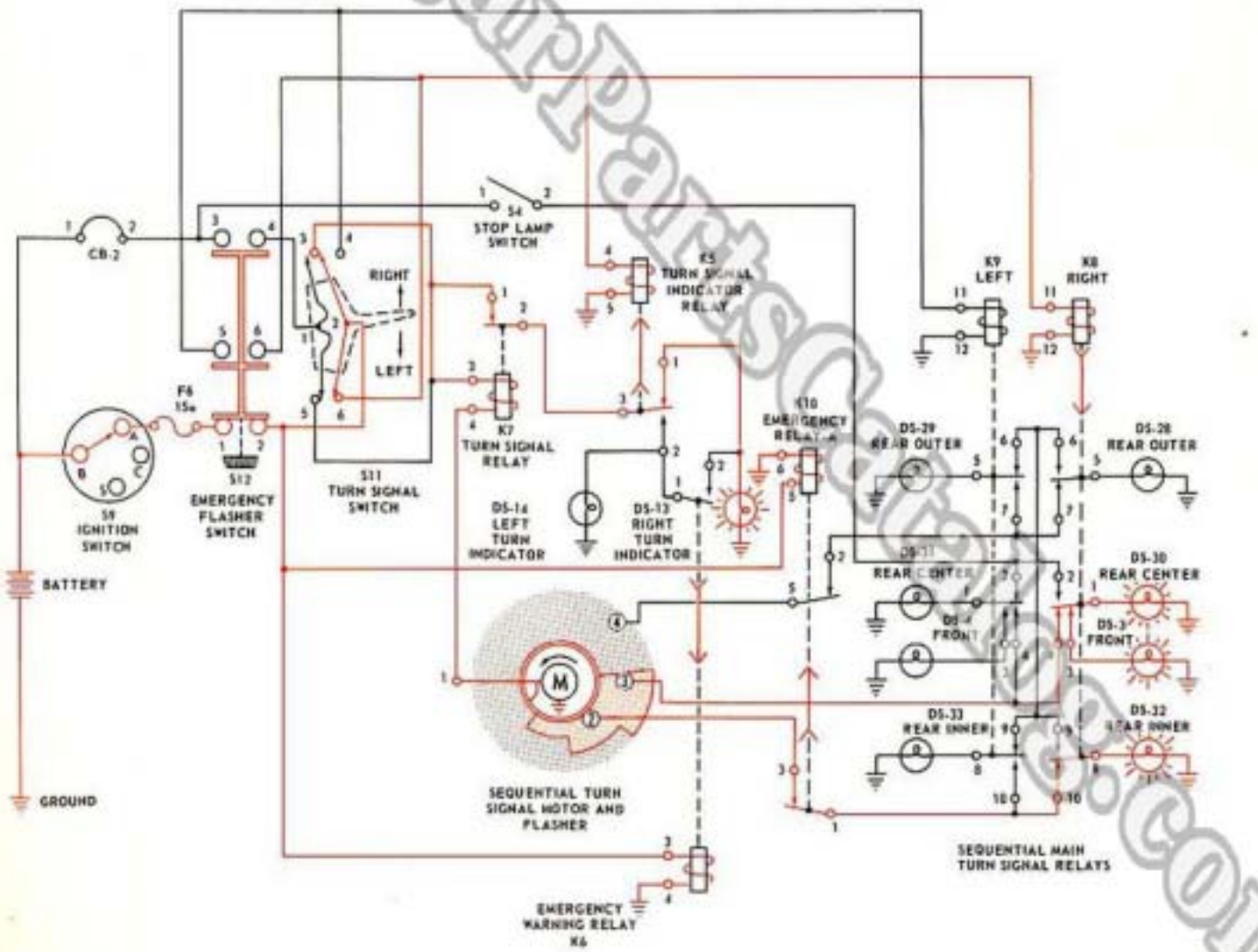
The action in this schematic diagram is identical to that on page 7 except that the SEQUENTIAL TURN SIGNAL MOTOR has rotated its cam so that a circuit is completed from cam terminal 3 to lamp DS-30 as well as from cam terminal 2 to lamp DS-32. Thus, two circuits are completed to the right rear turn signal lamps.

Note, also, that when cam terminal 3 of the motor is activated, current is also directed to the right front signal lamp DS-3, through contact point 3 of the SEQUENTIAL MAIN RELAY, K8.

The right turn indicator lamp on the instrument panel remains illuminated.

# RIGHT TURN

## INNER REAR TURN SIGNAL "ON"
## CENTER REAR TURN SIGNAL "ON"
## RIGHT FRONT TURN SIGNAL "ON"



# RIGHT TURN

## INNER REAR TURN SIGNAL "ON"
## CENTER REAR TURN SIGNAL "ON"
## OUTER REAR TURN SIGNAL "ON"
## RIGHT FRONT TURN SIGNAL "ON"

This schematic diagram illustrates the SEQUENTIAL MOTOR CAM rotated to contact cam terminal 4. This provides current through contacts 5 and 2 of EMERGENCY RELAY, K10, through contacts 7 and 5 of SEQUENTIAL MAIN TURN SIGNAL RELAY, K8, to illuminate the outer rear signal lamp DS-28.

When the outer signal lamp lights up, there are a total of 4 signal lamps illuminated (3 rear and one front) to indicate a right turn.

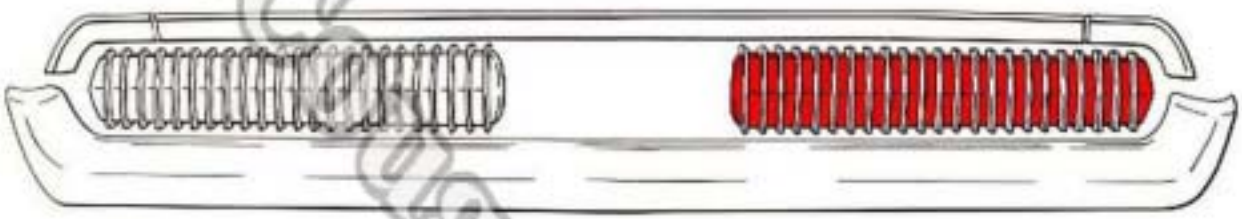
The current flow increase through the solenoid coil of K7 relay due to the added electrical load of the 4th lamp causes an increase in its magnetic pull. This opens the contacts 1 and 2 of K7 RELAY breaking the circuit to the right indicator lamp.

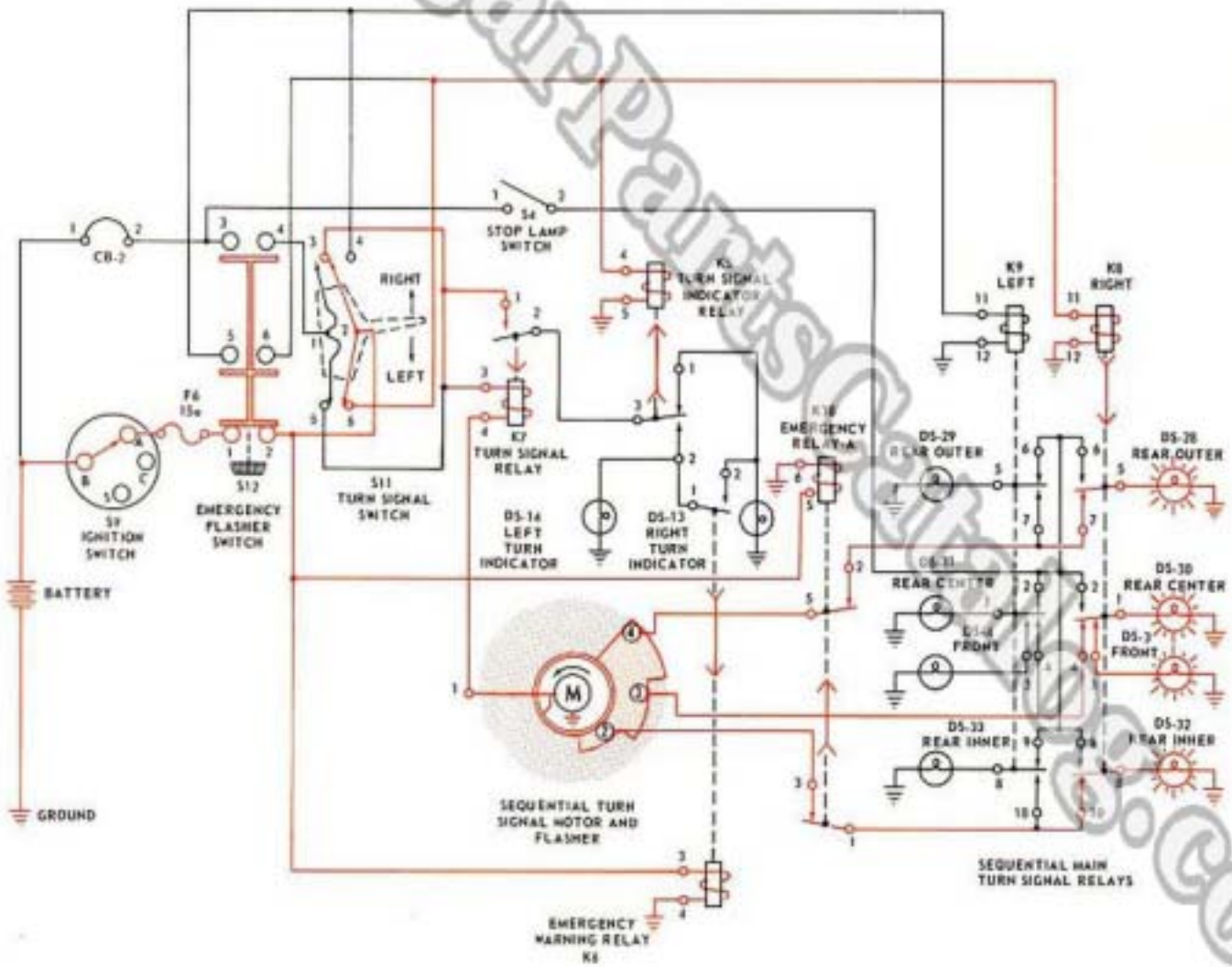
As the motor continues to rotate, the cams will break their contact with terminals 2, 3, and 4 at the same instant. All signal lamps will then go out. The magnetic strength of the K7 TURN SIGNAL RELAY coil is thus weakened because of the reduced current flow and will release contact 2 and thus again complete the circuit to the instrument panel right indicator lamp. It is the making and breaking of the TURN SIGNAL RELAY K7 contacts that cause the flashing action of the turn signal indicator lamps.

The Schematics on pages 7, 9, and 11 illustrate one complete cycle of a right turn signal operation. The cycle will be repeated until the turn signal switch is cancelled.

# RIGHT TURN

## INNER REAR TURN SIGNAL "ON"
## CENTER REAR TURN SIGNAL "ON"
## OUTER REAR TURN SIGNAL "ON"
## RIGHT FRONT TURN SIGNAL "ON"





# LEFT TURN

## INNER REAR LAMP "ON"

The turn signal lever has been moved to the left turn position. This provides for current to flow from the TURN SIGNAL SWITCH terminal 2 to the switch contacts 4 and 5.

The principle of operation is similiar to that of a right turn previously described except the left side, K9, portion of the MAIN TURN SIGNAL RELAY, is activated, This forces its moveable contacts against the contacts 7, 3, 4, and 10.

In the left turn position of the turn signal switch, current is cut off from the TURN SIGNAL INDICATOR RELAY, K5. This causes the moveable contact of the RELAY to remain in its normal closed position, providing an electrical circuit to the LEFT TURN INDICATOR LAMP.

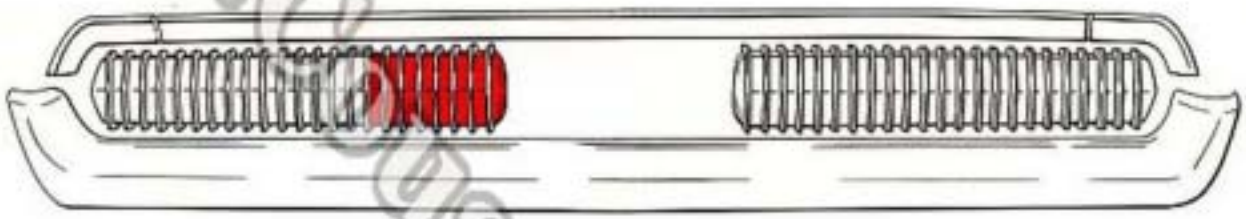
The circuit to the SEQUENTIAL MOTOR and CAM is identical to that of a right turn, however, the left turn signal lamps operate because of the action of the K9 RELAY portion of the SEQUENTIAL MAIN RELAY.

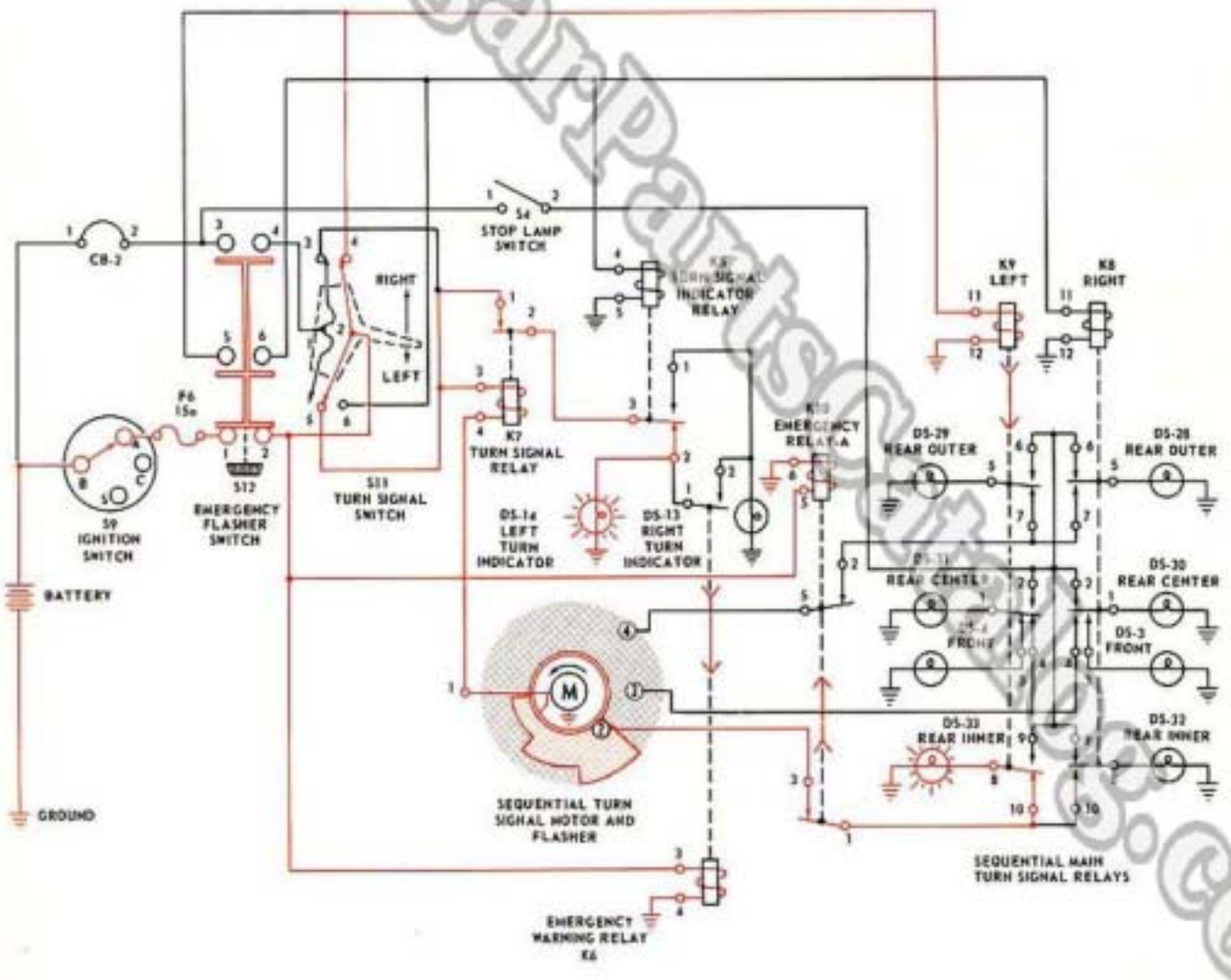
The action of the EMERGENCY WARNING RELAY, K6, and EMERGENCY RELAY, K10 is identical to that of the right turn operation.

The sequence of operation of the left rear signal lamps as the cam is rotated, the lighting of the front left signal lamp and the flashing action of the left indicator lamp are identical to that described for the right turn cycle.

# LEFT TURN

## INNER REAR LAMP "ON"





# EMERGENCY FLASHER SYSTEM

## (INDICATOR LAMPS "OFF")

The depressing of the EMERGENCY FLASHER SWITCH opens the circuit at its contacts 1 and 2, and completes a circuit to terminals 4, 5, and 6 from circuit breaker CB-2. The plunger portion of the switch, as shown schematically, conducts the current from contact 3 to contacts 4, 5, and 6.

Because a flashing action is required from both front signal lamps and from the right and left rear center signal lamps, it is necessary to energize both SEQUENTIAL MAIN RELAYS, K8 and K9. This forces the moveable contacts of K8 and K9 against the 3 and 4 contacts on both the right and left sides. Contacts 3 and 5 of the TURN SIGNAL SWITCH are both conducting current through the coil of the TURN SIGNAL RELAY, K7, to the SEQUENTIAL MOTOR.

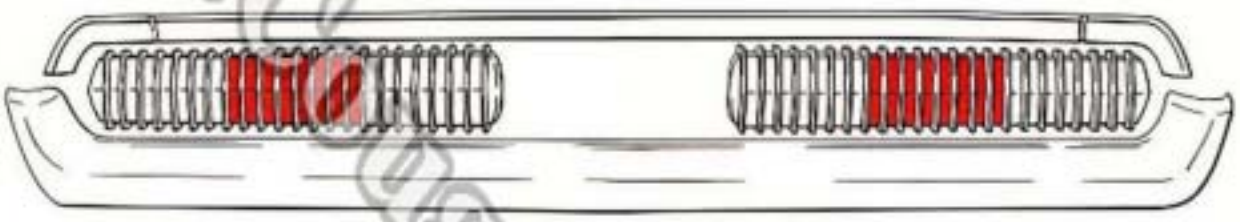
Because contact 2 of the EMERGENCY FLASHER SWITCH is open due to the position of its switch, current is cut off from both the K6 and K10 relays. The K6 relay contacts are now closed, thus connecting the indicator lights together.

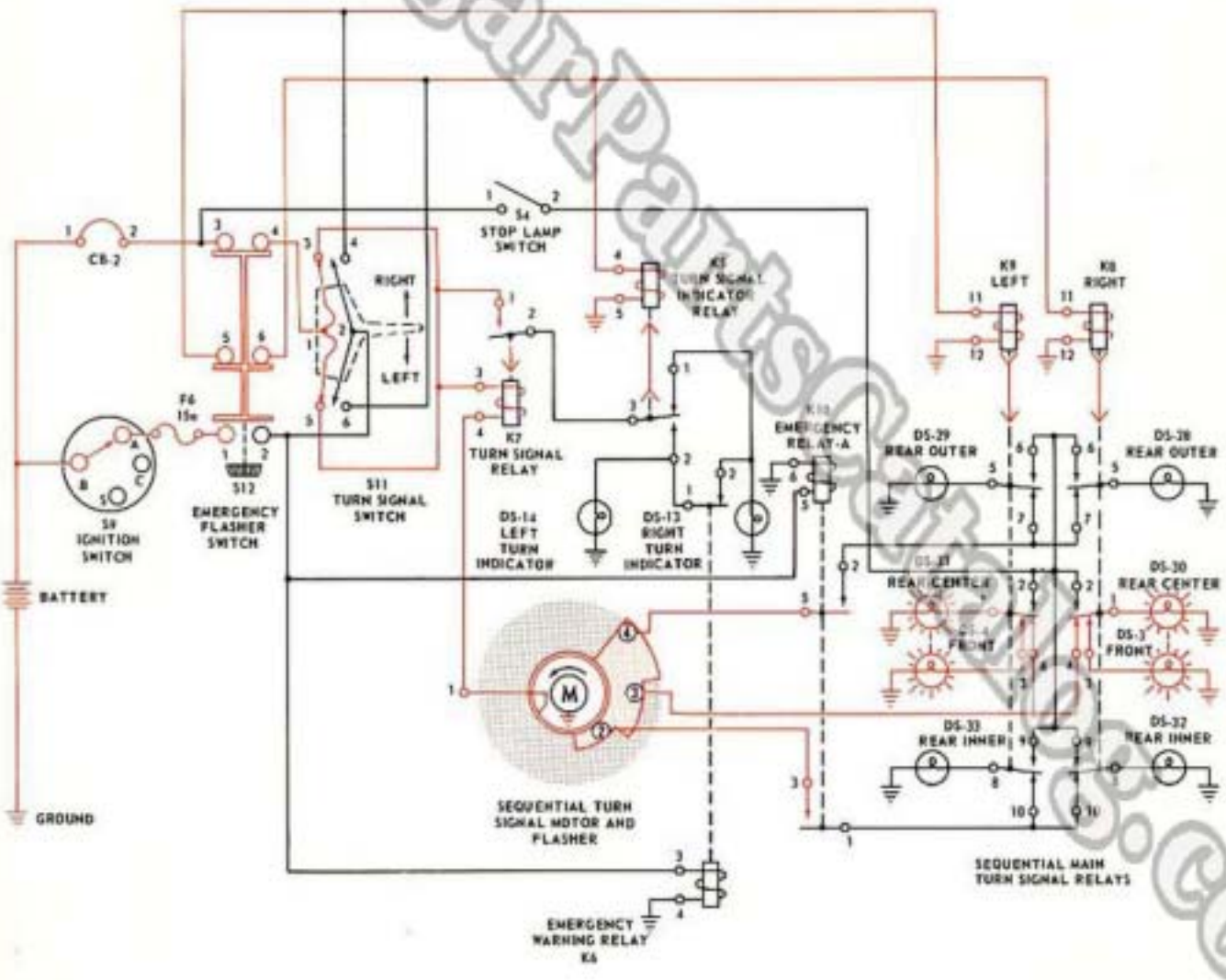
The contact points of the EMERGENCY RELAY, K10, are open, thus breaking the circuits from cam terminal 2 to the REAR INNER LAMPS and from cam terminal 4 to the REAR OUTER LAMPS. Only the CENTER REAR LAMPS flash during EMERGENCY FLASHER OPERATION.

The facing illustration shows four signal lamps illuminated, two front and two rear. As stated previously, this sets up a current flow through the coil of the TURN SIGNAL RELAY, K7, that creates sufficient magnetic strength to pull its contacts apart. Therefore, in EMERGENCY FLASHER OPERATION when the exterior signal lamps are "ON" the instrument panel indicator lamps are "off".

# EMERGENCY FLASHER SYSTEM

## (INDICATOR LAMPS "OFF")





# EMERGENCY FLASHER SYSTEM

## (INDICATOR LAMPS "ON")

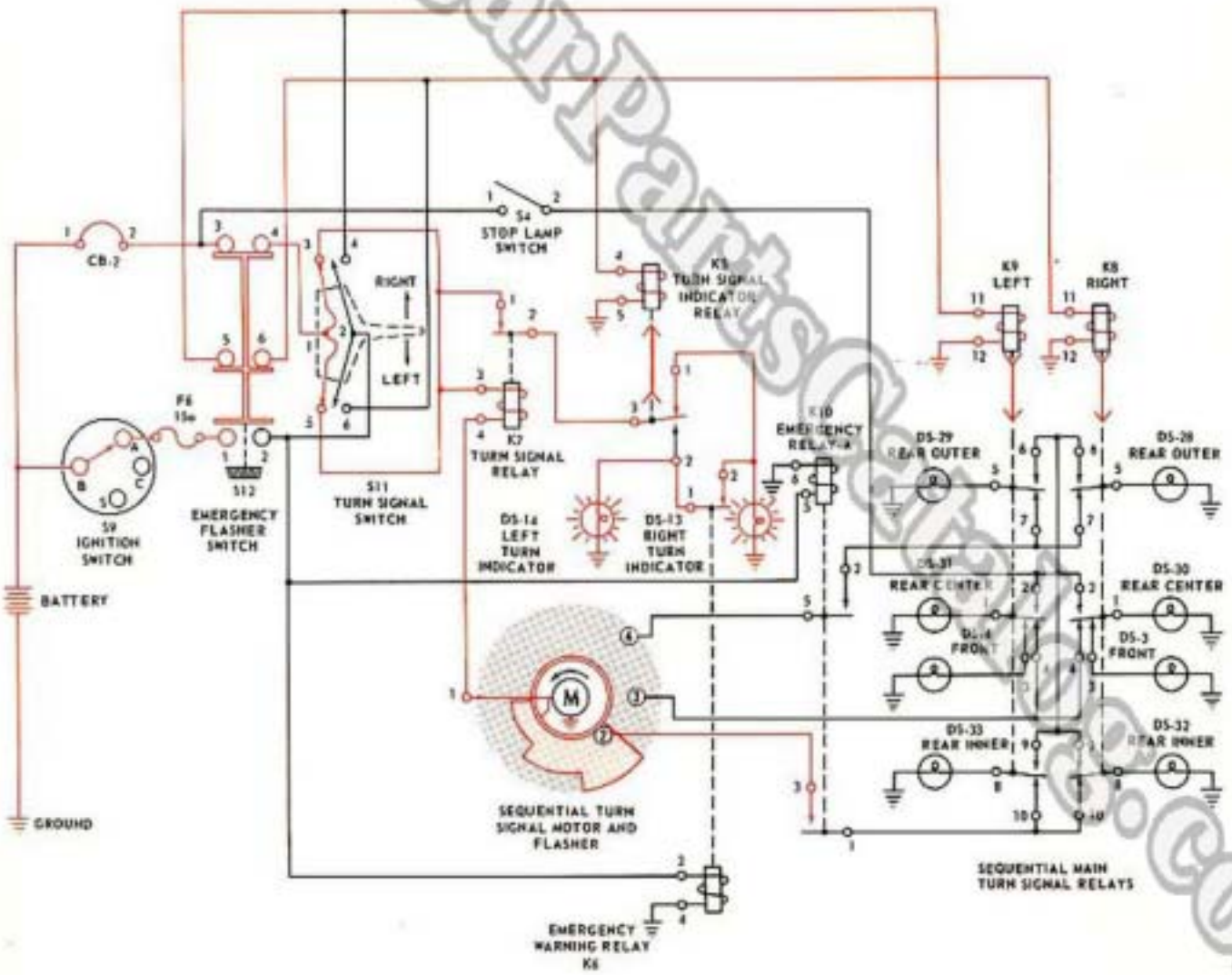
This illustration is a continuation of the EMERGENCY FLASHER CYCLE started in the previous schematic diagram. The CAM of the SEQUENTIAL MOTOR has rotated to a position wherein the circuits to the center rear signal lamps are open.

The reduced current flow through the coil of the TURN SIGNAL RELAY, K7, has weakened the magnetic strength of its coil and thus the K7 contacts move to their normally closed position. This action provides current to illuminate both indicator lamps.

From the above description, it can be seen that there is an alternating flashing action between the indicator lamps and the exterior signal lamps.

# EMERGENCY FLASHER SYSTEM

## (INDICATOR LAMPS "ON")



# STOP LAMP OPERATION

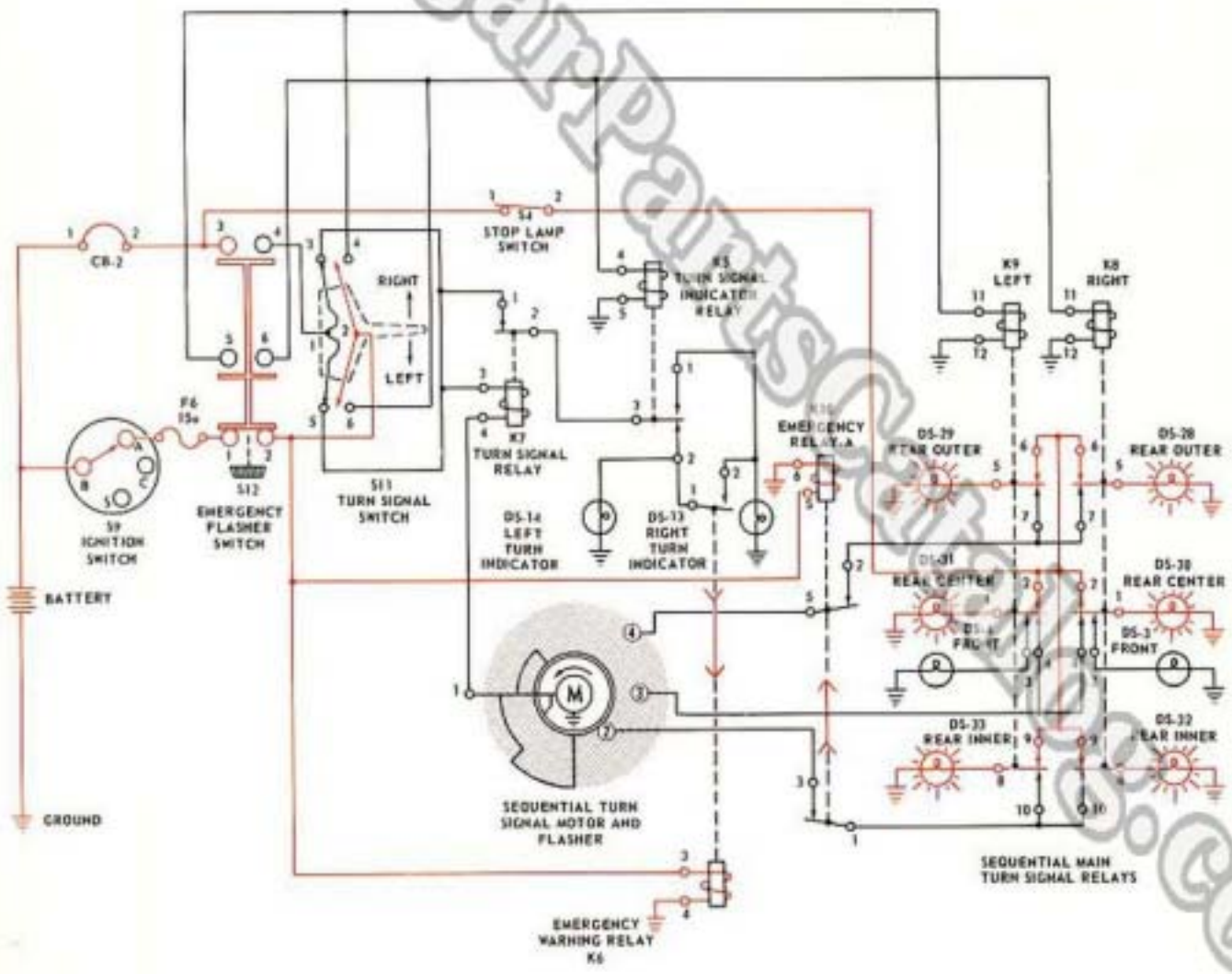
## (WITHOUT STOP LAMP RELAY)

The stop lamp current originates from the circuit breaker CB-2 (units built after January 2, 1967). When the brakes are applied closing the stop lamp switch, current flows to contacts 6, 2, and 9 the main buss bar of the SEQUENTIAL MAIN TURN SIGNAL RELAYS, K8 and K9 through their contacts to the SIX rear stop and turn signal lamps.

Relays K6 and K10 are energized, however, both are unimportant during stop lamp operation.

# STOP LAMP OPERATION

## (WITHOUT STOP LAMP RELAY)



# STOP LAMP OPERATION

## (WITH STOP LAMP RELAY)

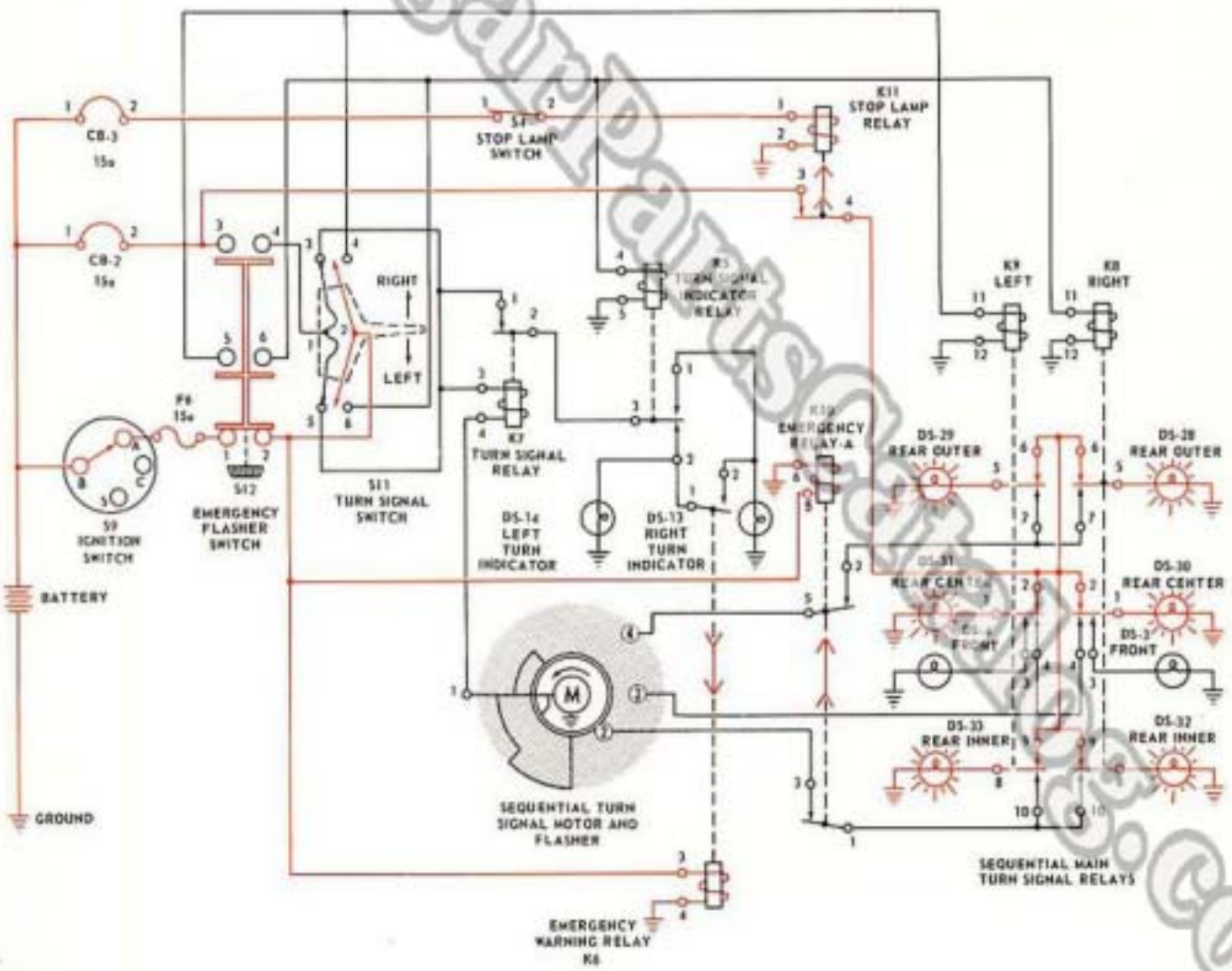
The operation of the stop lamp system in the facing illustration differs from the previous diagram in that a STOP LAMP RELAY, K11, is used in the STOP LAMP CIRCUIT. The coil of the relay has its current source from the CIRCUIT BREAKER in the head lamp switch, CB-3. The current source for the STOP LAMPS is from a 15 ampere circuit breaker, CB-2.

When the stop lamp switch is activated, the stop lamp relay coil is energized and will force relay contacts 3 and 4 together.

The closing of these contacts results in an identical electrical operation to that of the non-stop lamp relay system when the brake pedal operates the stop lamp switch directly. Without this relay, a heavier duty stop lamp switch must be used. The stop lamp relay was used in vehicles built prior to January 3, 1967.

# STOP LAMP OPERATION

## (WITH STOP LAMP RELAY)

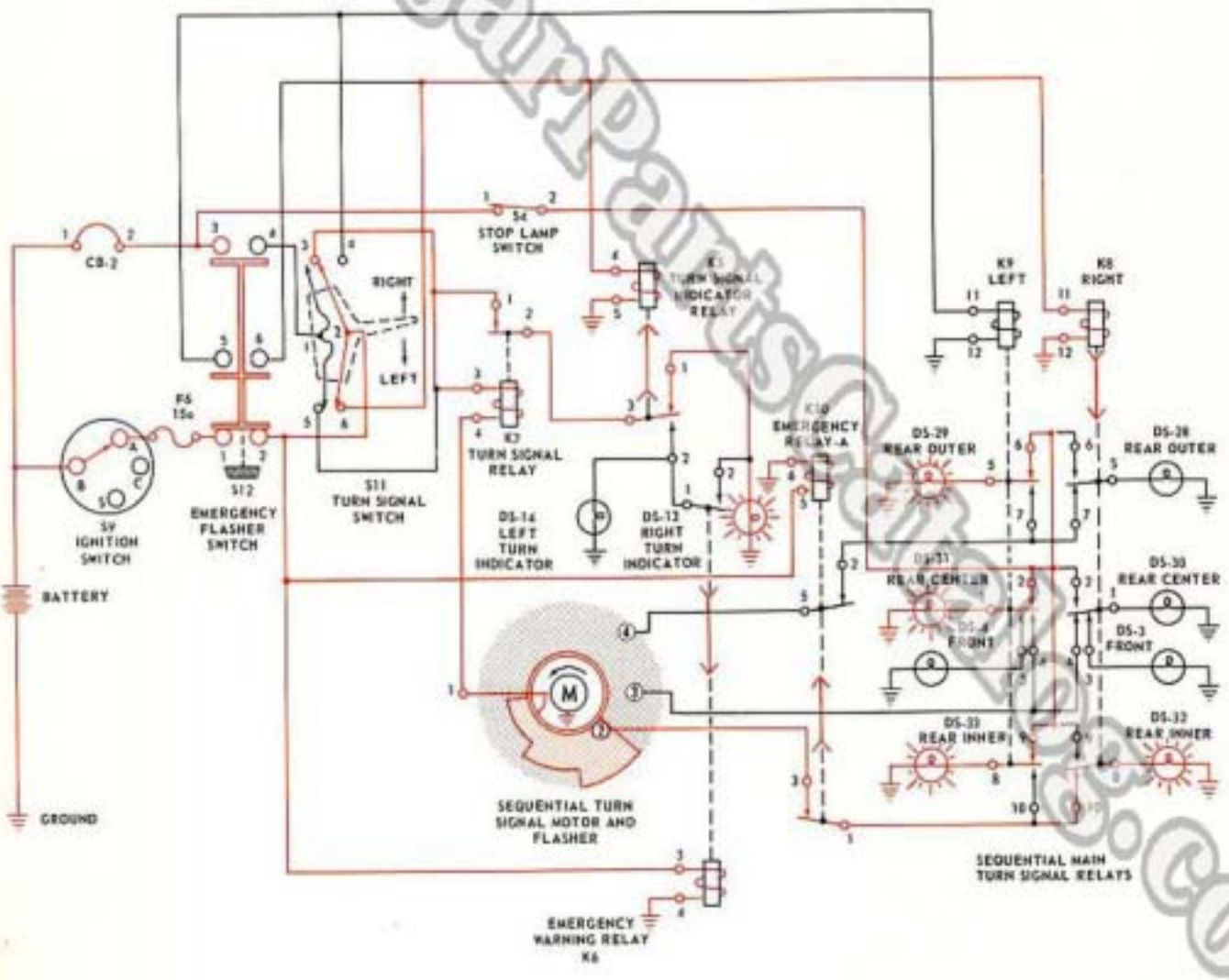


# STOP LAMP CIRCUIT DURING TURN SIGNAL OPERATION

This schematic diagram illustrates a combination of two unrelated operations. The TURN SIGNAL SWITCH, S-11, has been moved to indicate a right turn and the brake pedal has been applied. Thus K8 of the SEQUENTIAL MAIN RELAY is activated to position its contacts for the sequential action of the rear signal lamps. Here the INNER LAMP is shown in operation and the right indicator lamp is illuminated. As the motor and cam rotate, a sequential action will follow. The stop lamp switch bypasses the turn signal switch and, because the contacts of K9 are closed (normal position) the three left stop and signal lamps are "on".

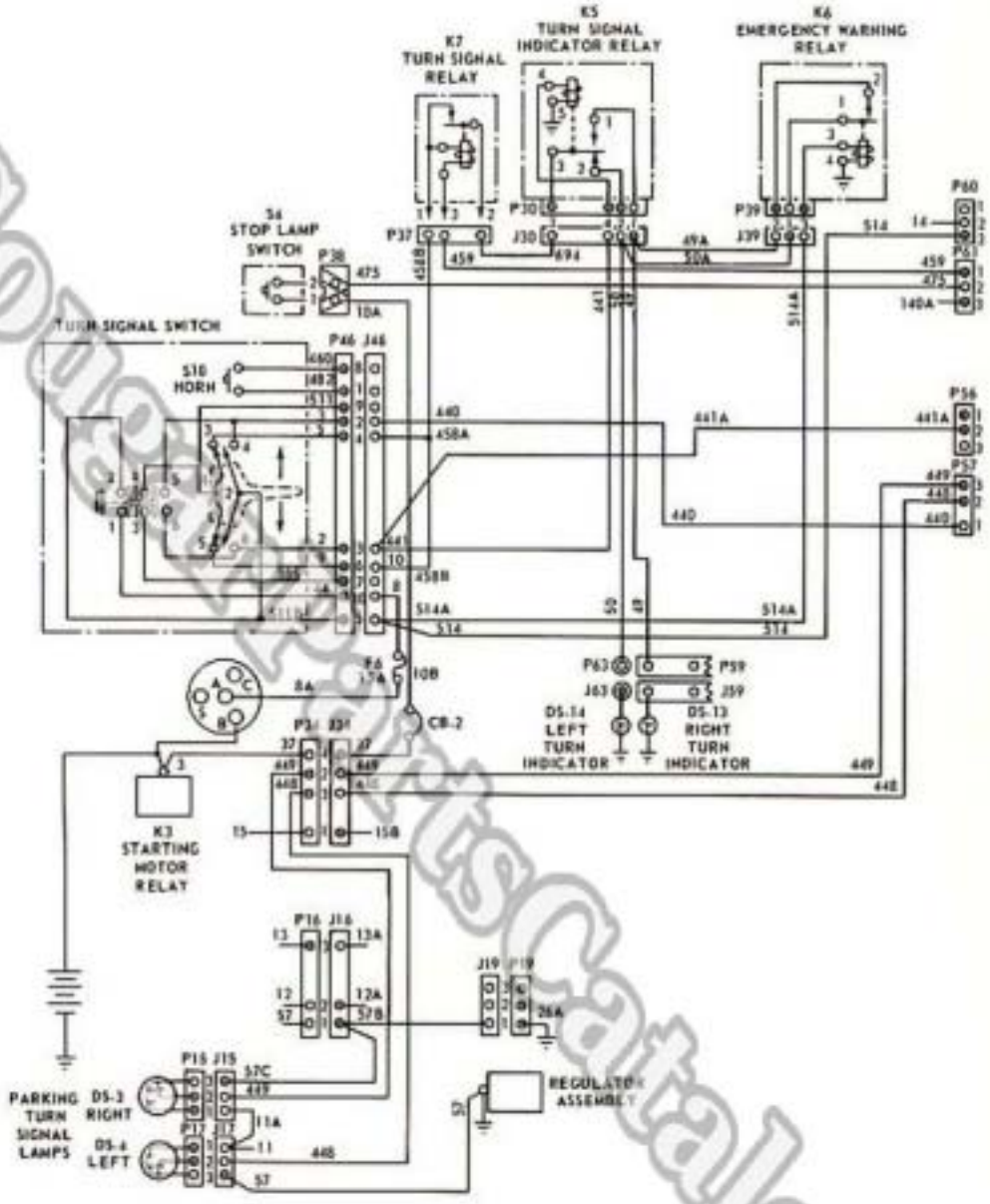
Note that the indicator lamp on the side of the sequential action is not affected by the added current load of the three stop lamps. Only current flow through the TURN SIGNAL RELAY, K7 can cause the indicator lamp to flash.

# STOP LAMP CIRCUIT DURING TURN SIGNAL OPERATION



# 1967 COUGAR SEQUENTIAL TURN

## WITHOUT STOP




Here is a complete wiring diagram of the 1967 Cougar Sequential Turn Signal System. All the plugs and jacks (the two parts of a connector) are shown. The wire numbers, their color codes, and numbered position in a connector are also given.

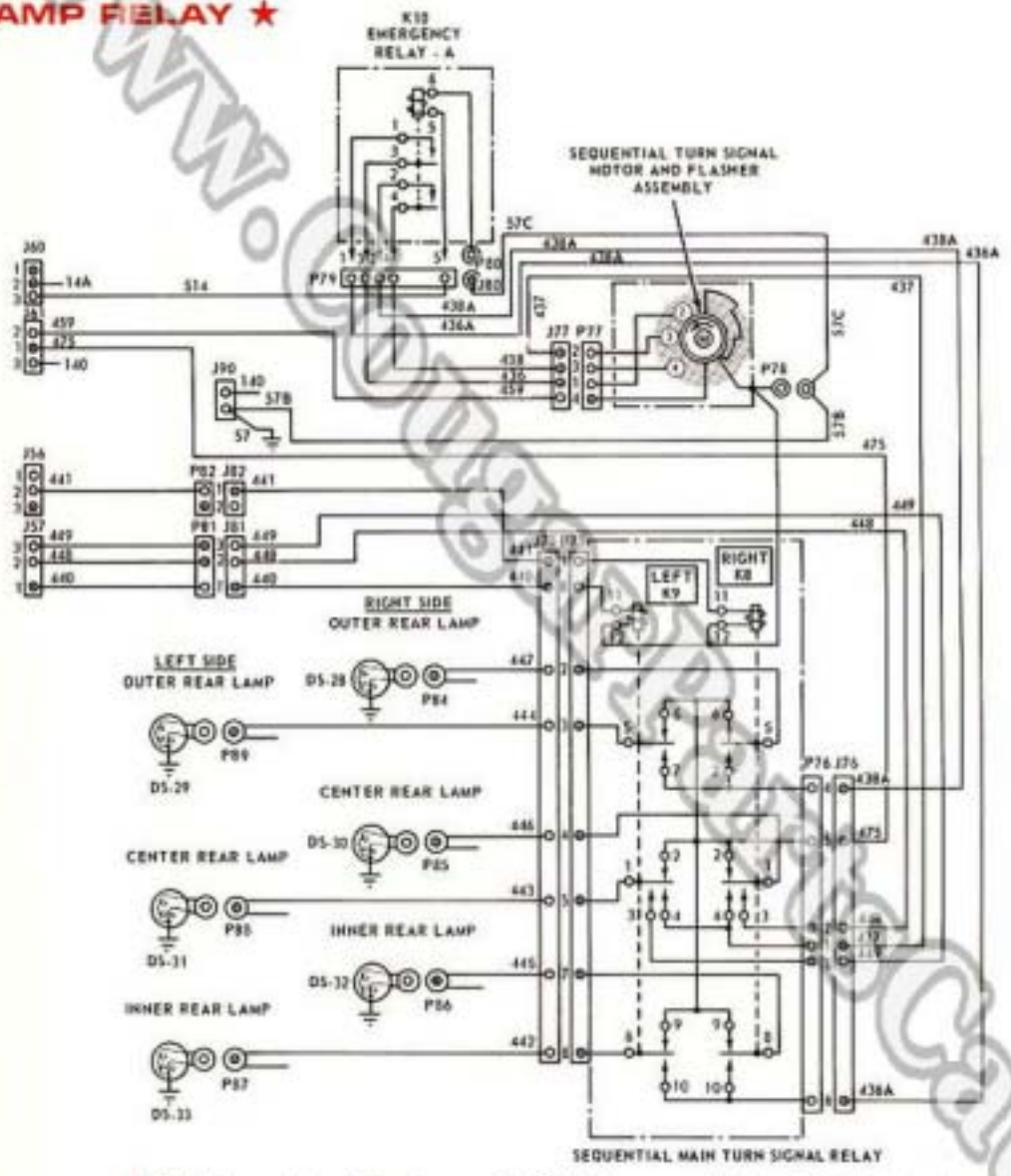
With an understanding of the schematic drawings and this wiring diagram, any circuit can be traced from component to component through all the connectors and wiring harness involved.

By using the schematic diagrams and the actual wiring diagram, many problems can be correctly diagnosed prior to the use of a volt meter or test light.

One deficiency of the wiring diagram is that the actual locations of the various connectors, relays and other components of the system are not shown. The illustrations on pages 28 to 34 cover not only the location of all the parts of the system, but also illustrate all the connectors and the sequence in which their wires are installed.

# SIGNAL SYSTEM WIRING DIAGRAM

## LAMP RELAY ★



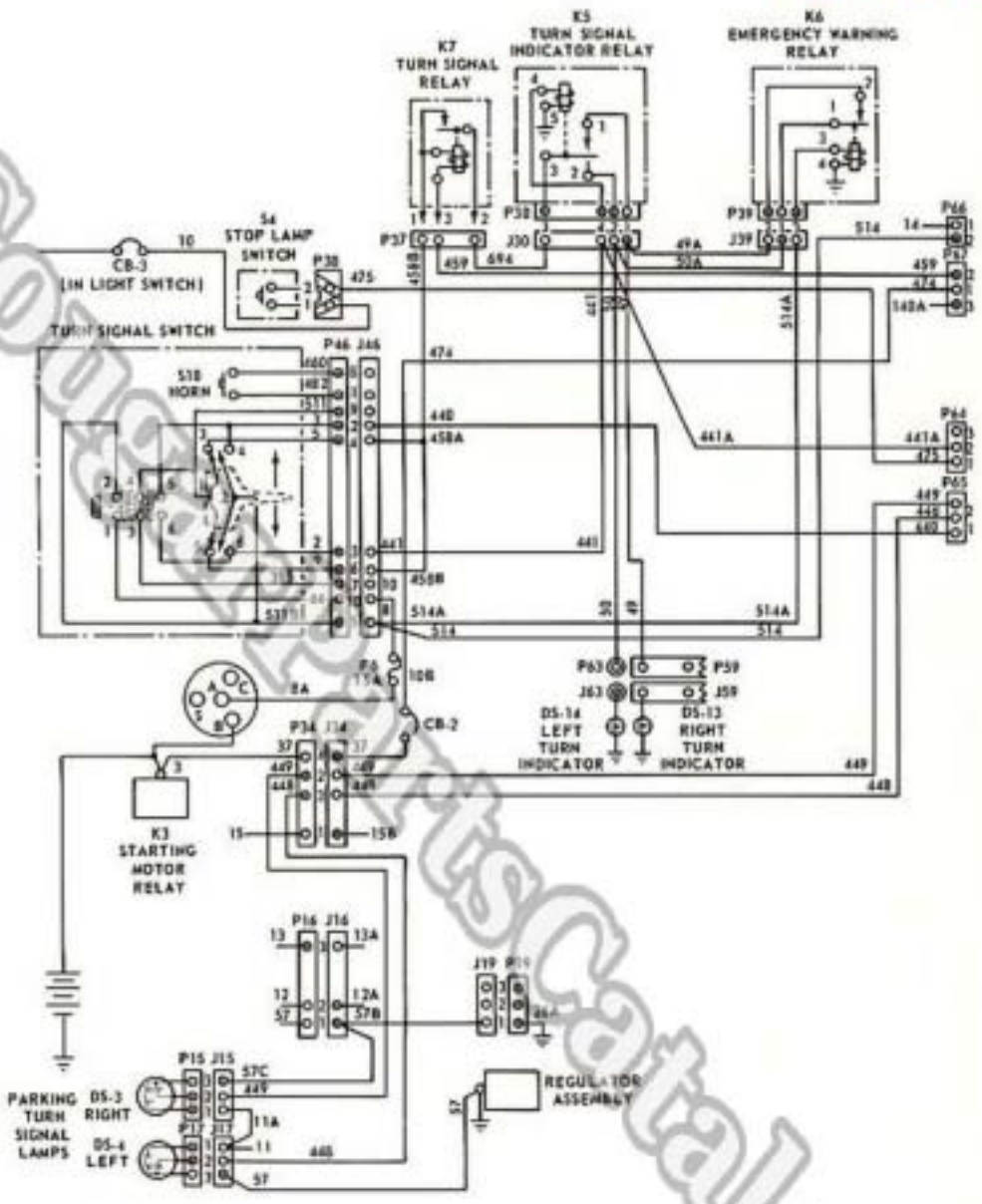

★ Vehicles produced after January 2, 1967. However vehicles built prior to January 3, 1967 may have been modified in service so that this relay is removed from the circuit.

## WIRING COLOR CODE

| | | | |
|---|---|---|---|
| 449 | 49 | 45 | 2 WHITE-BLUE STRIPE |
| | 3 | 50 | 50A GREEN-WHITE STRIPE |
| | | | 8 ORANGE-YELLOW STRIPE |
| | | | 10 GREEN-RED STRIPE |
| | | 11 | 11A BLACK-YELLOW STRIPE |
| | | 12 | 12A GREEN-BLACK STRIPE |
| | | | 13 RED-BLACK STRIPE |
| | 14 | 14A thru | 14K BLACK |
| | 15 | 15A | 15B RED-YELLOW STRIPE |
| | | | 25 BLACK-ORANGE STRIPE |
| | | | 29 YELLOW-WHITE STRIPE |
| | | | 32 RED-BLUE STRIPE |
| | | | 34 GREEN-BLACK STRIPE |
| | | | 37 BLACK-YELLOW STRIPE |
| | | | 44 BLUE |
| | | 476 | 511 GREEN |
| 57 | 57A | 57B | 57C BLACK |
| | | 140 | 140A BLACK-RED STRIPE |
| | | | 297 BLACK-GREEN STRIPE |
| | | 436 | 436A YELLOW |
| | | | 437 YELLOW-RED STRIPE |
| | | 438 | 438A YELLOW-BLACK STRIPE |
| | | | 440 WHITE |
| | | | 441 VIOLET |
| 9 | | | 442 GREEN-ORANGE STRIPE |
| | | | 443 GREEN-RED STRIPE |
| | | | 444 GREEN-BLACK STRIPE |
| 5 | | | 445 ORANGE-BLUE STRIPE |
| | | | 446 ORANGE-WHITE STRIPE |
| | | | 447 ORANGE-RED STRIPE |
| | | | 448 GREEN-WHITE STRIPE |
| | | | 474 RED |
| | | | 458 ORANGE-BLACK STRIPE |
| | | | 459 ORANGE-GREEN STRIPE |
| | | | 460 YELLOW |
| | | | 475 GREEN-WHITE STRIPE |
| | | | 514 BLUE |
| | | | 694 BROWN |
| | | | ● SPLICE |
| | | | GROUND |
| | | | 385 WHITE-RED STRIPE (OR VIOLET) |
| 511B | | | 296 RED |
| | | | 482 BLUE-YELLOW STRIPE |

# 1967 COUGAR SEQUENTIAL

## WITH STOP

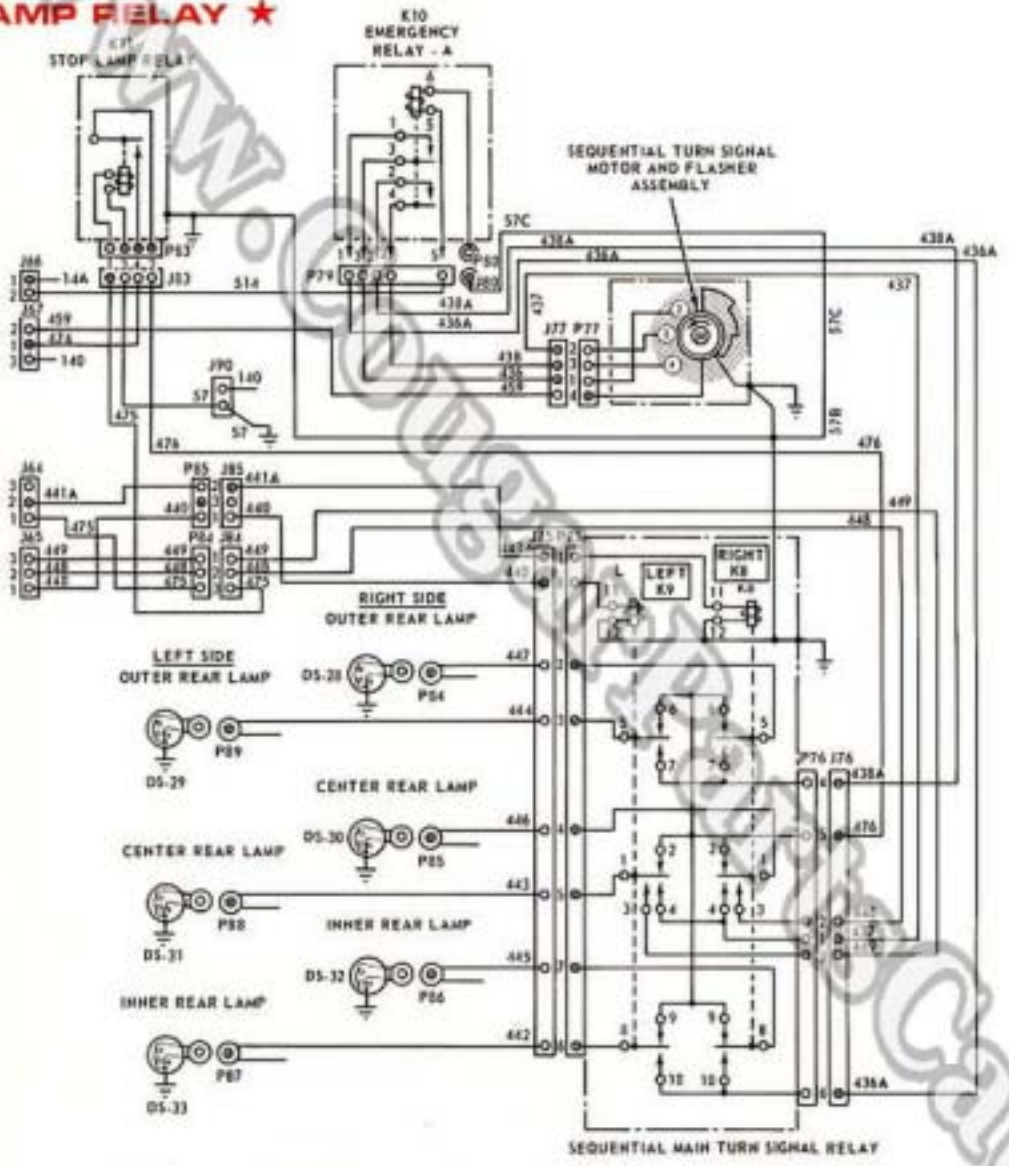



This wiring diagram illustrates the sequential turn signal circuit used in vehicles built prior to January 3, 1967. In this design, the stop lamp switch energized the stop lamp relay. This relay handled the heavier current draw of the stop lamps. After January 2, 1967, a heavy duty stop lamp switch replaced the original light duty switch. This heavy duty switch is designed to handle the stop lamp current draw and thus eliminate a need for the relay.

The sequential turn signal and emergency flasher circuits are the same whether or not a stop lamp relay is used. Thus, trouble shooting procedures for sequential turn signal system problems are not affected by this circuit modification. There are, however, changes in wire location and color codes in a few of the connectors. Pages 28 to 34 illustrate the various connectors and the sequence in which their wires are installed.

# TURN SIGNAL SYSTEM

## LAMP RELAY ★

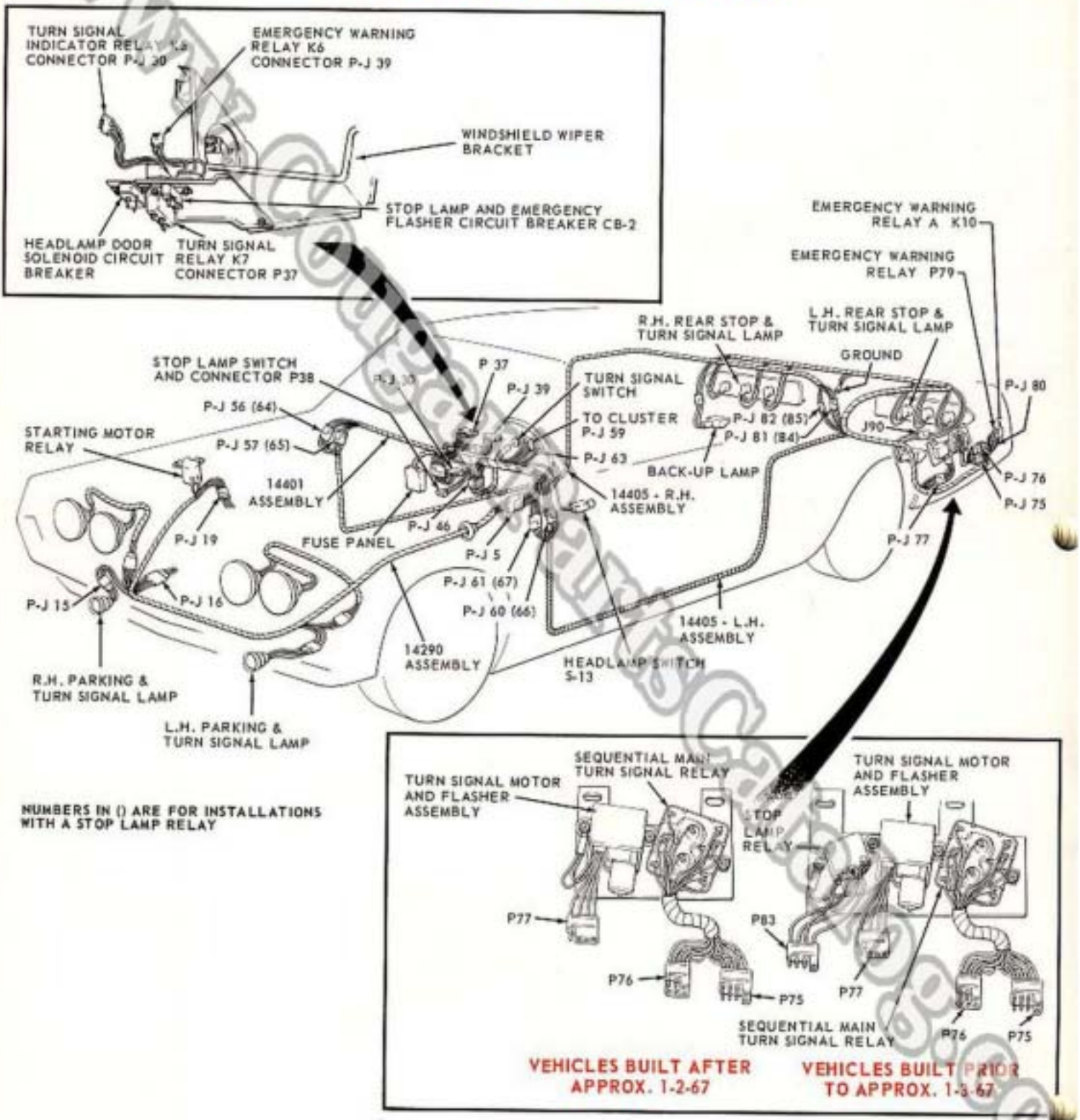



★ The stop lamp relay was used in production up to January 3, 1967. It is possible that some of these vehicles may have been modified so that this relay is no longer required.

## WIRING COLOR CODE

| | | | |
|---|---|---|---|
| 449 | 49 | 45 | 2 WHITE-BLUE STRIPE |
| | 3 | 50 | 50A GREEN-WHITE STRIPE |
| | | | 8 ORANGE-YELLOW STRIPE |
| | | | 10 GREEN-RED STRIPE |
| | | 11 | 11A BLACK-YELLOW STRIPE |
| | | 12 | 12A GREEN-BLACK STRIPE |
| | | | 13 RED-BLACK STRIPE |
| | 14 | 14A thru | 14K BLACK |
| | 15 | 15A | 15B RED-YELLOW STRIPE |
| | | | 25 BLACK-ORANGE STRIPE |
| | | | 29 YELLOW-WHITE STRIPE |
| | | | 32 RED-BLUE STRIPE |
| | | | 34 GREEN-BLACK STRIPE |
| | | | 37 BLACK-YELLOW STRIPE |
| | | | 46 BLUE |
| | | 476 | 511 GREEN |
| 57 | 57A | 57B | 57C BLACK |
| | | 140 | 140A BLACK-RED STRIPE |
| | | | 297 BLACK-GREEN STRIPE |
| | | 436 | 436A YELLOW |
| | | | 437 YELLOW-RED STRIPE |
| | | 438 | 438A YELLOW-BLACK STRIPE |
| | | | 440 WHITE |
| | | | 441 VIOLET |
| 9 | | | 442 GREEN-ORANGE STRIPE |
| | | | 443 GREEN-RED STRIPE |
| | | | 444 GREEN-BLACK STRIPE |
| 5 | | | 445 ORANGE-BLUE STRIPE |
| | | | 446 ORANGE-WHITE STRIPE |
| | | | 447 ORANGE-RED STRIPE |
| | | | 448 GREEN-WHITE STRIPE |
| | | | 474 RED |
| | | | 458 ORANGE-BLACK STRIPE |
| | | | 459 ORANGE-GREEN STRIPE |
| | | | 460 YELLOW |
| | | | 475 GREEN-WHITE STRIPE |
| | | | 514 BLUE |
| | | | 694 BROWN |
| | | | • SPLICE |
| | | | GROUND |
| | | | 385 WHITE-RED STRIPE (OR VIOLET) |
| 511B | | | 296 RED |
| | | | 482 BLUE-YELLOW STRIPE |

# PICTORIAL DIAGRAM OF SEQUENTIAL TURN SIGNAL SYSTEM




NUMBERS IN () ARE FOR INSTALLATIONS WITH A STOP LAMP RELAY

# WIRING HARNESS CONNECTORS

The connectors required to complete the Sequential Turn Signal and Emergency Flasher Circuit are illustrated on the following pages.

Each connector has been assigned arbitrary identification numbers that are the same as shown on the wiring diagrams and pictorial views. Each pin and socket of a connector have likewise been assigned numbers. This simplifies the location of a check point when trouble shooting a circuit problem. For example, if the diagnosis of a problem suggested checking for voltage in the 440 (white) wire at connector P-J75, it can be seen in the wiring diagram that the location of pin number 8 is required. The drawing of connector P-J 75 shows the location of the pin and socket. The pictorial view aids in finding the exact location of the connectors and other components in the vehicle.

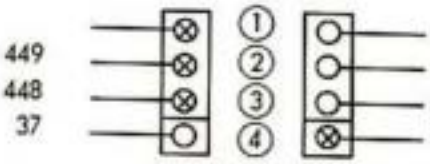
NOTE:

- Circled numbers are pin and socket location numbers of a connector. The uncircled numbers are for wire color code identification. Except for Emergency Relay "A" and the Sequential Main Turn Signal Relay, the numbers do not exist on the connectors or other components. The numbers on the actual Sequential Main Turn Signal Relay should be disregarded as they do not correspond to numbers used in the wiring diagrams.

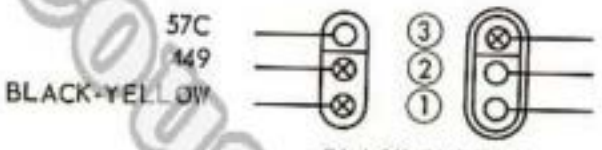
- The pin and socket numbers apply to the exposed end or ends of a connector when it is pulled apart.

- When two wire colors are given, the first number is the principal wire color, the second color is the color of the wire stripe.

## WIRING HARNESS CONNECTORS (CONT.)

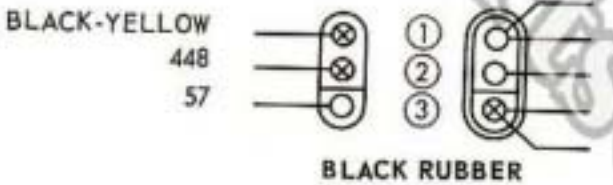



BLACK RUBBER
P5 J5

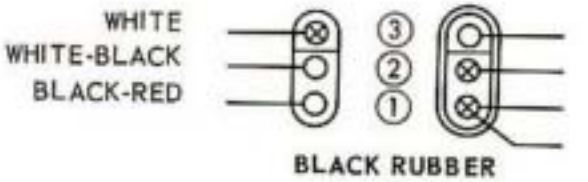



BLACK RUBBER
P15 J15

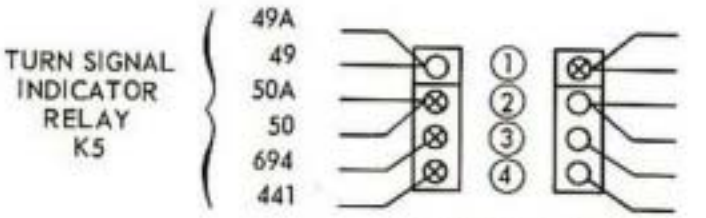

BROWN RUBBER
P16 J16




BLACK RUBBER
P17 J17

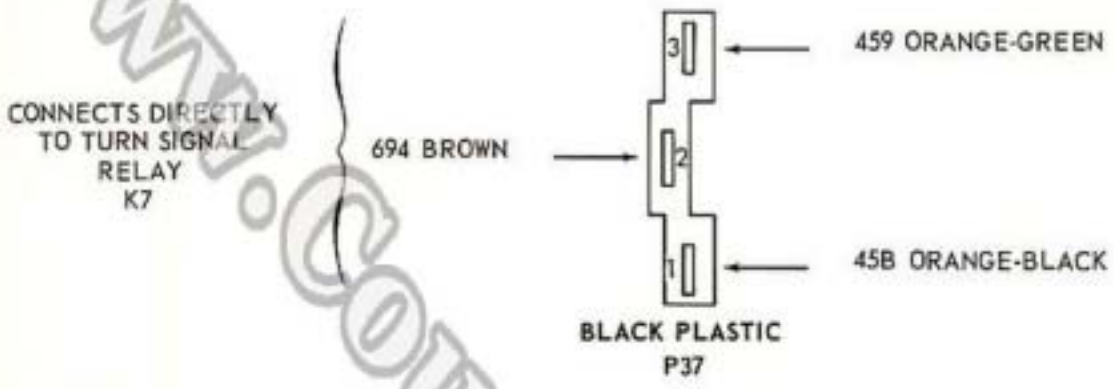



BLACK RUBBER
J19

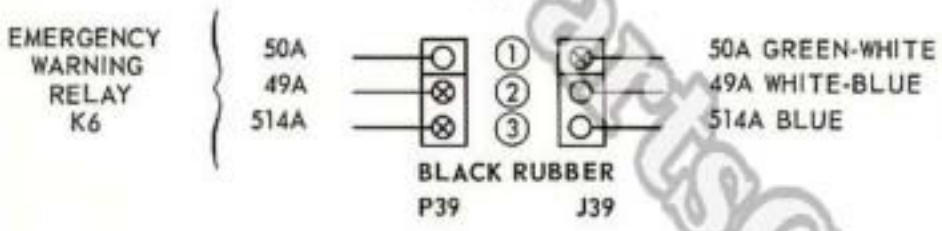


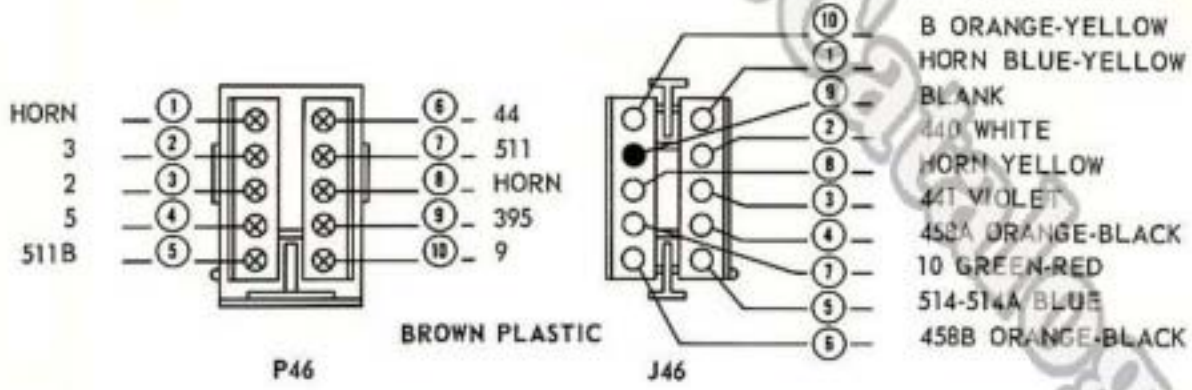

BLACK RUBBER
P30 J30

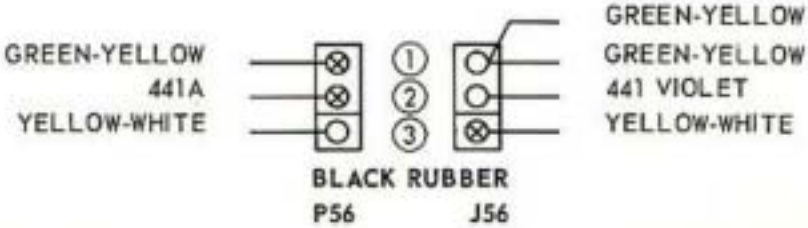
# WIRING HARNESS CONNECTORS (CONT.)



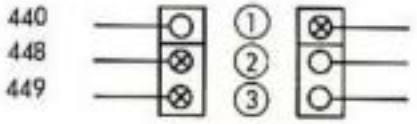




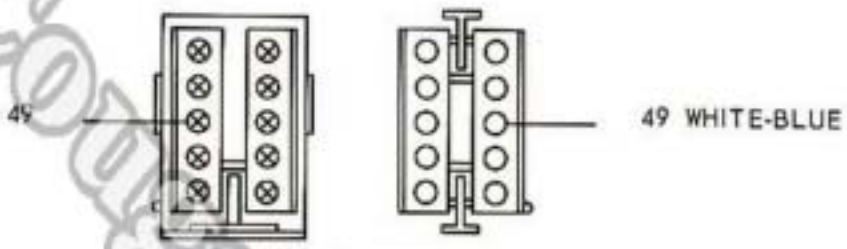



## WIRING HARNESS CONNECTORS (CONT.)

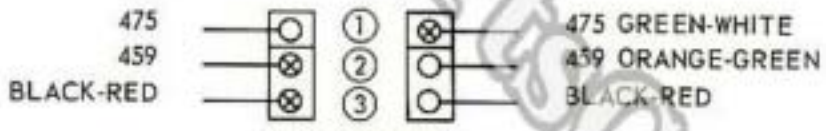



RED RUBBER
P57 J57



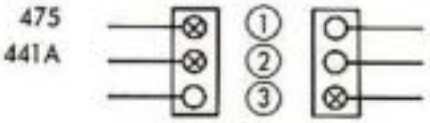

WHITE PLASTIC
J59 P59


BLUE RUBBER
P60 J60

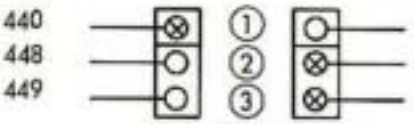



BLACK RUBBER
P61 J61


BLACK RUBBER
P63 J63

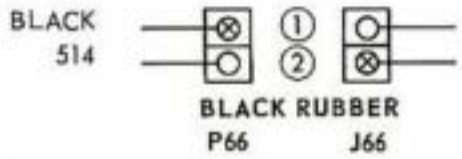


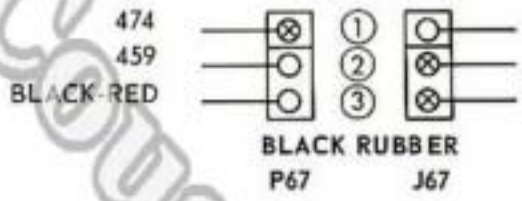

BLACK RUBBER
P64 J64

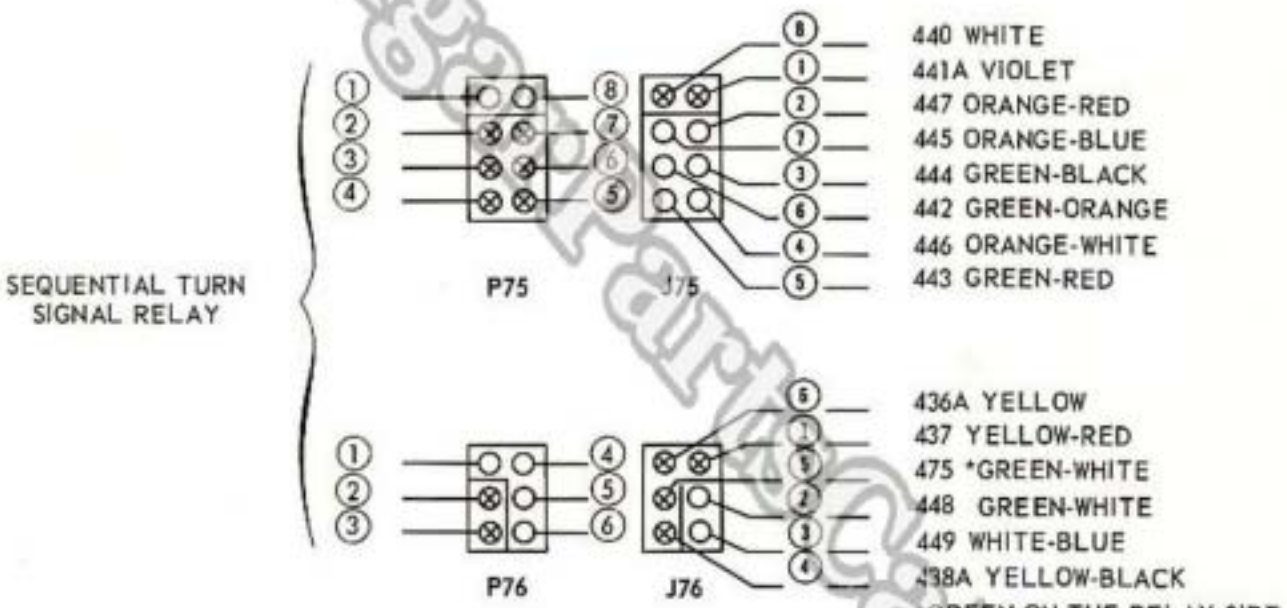


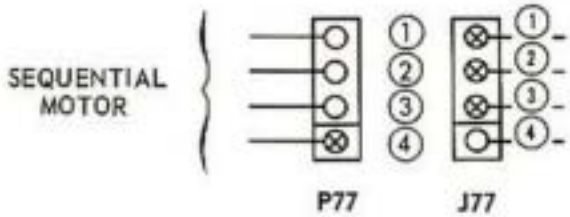

BLACK RUBBER
P65 J65

# WIRING HARNESS CONNECTORS (CONT.)



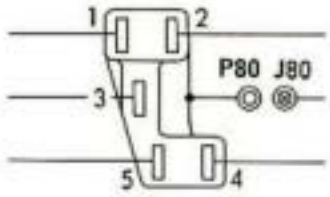




## WIRING HARNESS CONNECTORS (CONT.)

CONNECTS DIRECTLY TO EMERGENCY RELAY "A"

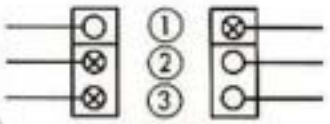
YELLOW 436A
YELLOW 436
BLUE 514




438A YELLOW-BLACK
BLACK
438 YELLOW-BLACK

P79
BLACK PLASTIC

WHITE 440
GREEN-WHITE 448
WHITE-BLUE 449




440 WHITE
448 GREEN-WHITE
449 WHITE-BLUE

BLACK RUBBER
J81 P81

441
BLACK-BLUE


441 VIOLET
BLACK-BLUE

BLACK RUBBER
P82 J82

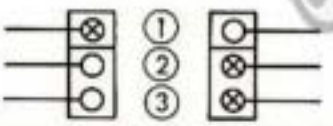
STOP LAMP RELAY K11

BLACK 57B
GREEN 476
GREEN-WHITE 475
RED 474


57B BLACK
476 GREEN
475 GREEN-WHITE
474 RED

J83 P83

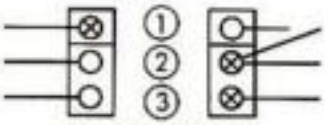
449
448
475




449 WHITE-BLUE
448 GREEN-WHITE
475 GREEN-WHITE

BLACK RUBBER YELLOW RUBBER
P84 J84

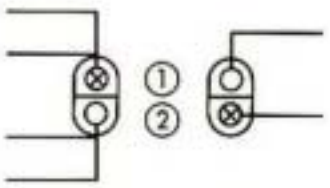
441A
440




441A VIOLET
441 VIOLET
440 WHITE

BLACK RUBBER
P85 J85

BLACK 57
BLACK 57B
BLACK-RED
BLACK-RED




BLACK RUBBER
J90 P90

# TROUBLE SHOOTING PROCEDURES

## CONTENTS



1. Except for Emergency Flasher operation, the ignition switch must be in the "accessory" or "on" position when making voltage tests within the Sequential Turn Signal System.
2. When checking for voltage at a molded rubber multiple connector, part the two halves of the connector only enough to permit contacting its pins with a test prod. To check for voltage at the pins of the hard plastic, locking type connectors it is necessary to insert a thin test prod down into the connector beside the wire being tested.
3. A twelve volt test light or a voltmeter are recommended when checking circuit continuity.
4. A self-powered test light can be used to check for electrical continuity through relays and segments of a wiring harness.
5. When trouble shooting a sequential turn signal or emergency flasher system problem which indicates that the turn signal and emergency flasher switches are at fault, substitute a new turn signal switch at the external multiple connector before condeming the original switch assembly.
6. If test points recommended in a trouble shooting road map procedure are at locations that are difficult to reach, it is suggested that the step be omitted unless later tests indicate that the omitted test be made.
7. The wiring diagrams for the system with a Stop Lamp Relay and the later production system that does not employ a Stop Lamp Relay are somewhat different. Therefore, it must be determined before using the trouble shooting road maps and wiring diagrams which system is installed in the car in question.

   An easy method of determining which system is in the car is to examine the two connectors near the deck lid left hinge for wire colors and note whether they are P-J 81 and 82 of the Non-Stop Lamp Relay System or P-J 84 and 85 of the Stop Lamp Relay System.

# PROBLEM

## ALL TURN SIGNALS INOPERATIVE

*Actuate emergency warning flasher switch, if lamps operate, remove the protective fuse for the turn signal system (located in the fuse panel) and check for burned out fuse. (If emergency warning lights do not operate, see emergency warning system diagnosis).

**FUSE OK.**

**DEFECTIVE FUSE.**

*Replace the 15 amp fuse.

*Check for voltage through the steering column switch system with a 12 volt tester as follows: Place ignition in "ACC" position and with connector P-J 46 connected, test for voltage in circuit #511B (Red Wire) in the P46 connector. If no voltage exists, separate the P-J 46 connector and check for voltage from the fuse panel through circuit #8 (Orange-yellow stripe wire) in the J46 connector.

**VOLTAGE AVAILABLE.**

**OPEN CIRCUIT BETWEEN FUSE PANEL AND TURN SIGNAL SWITCH.**

(A) If both checks indicate no voltage in either circuit, follow circuit #8 back to the fuse panel and isolate the open circuit and perform necessary repairs.

(B) If only circuit #511B checks no voltage, open circuit is in wiring in steering column, or in the emergency flasher switch in the switch system. (See Note 1.) Determine the location of open circuit and perform the necessary repairs or replace the turn signal & emergency flasher switch assembly if the system operated with the new switch installed.

CONTINUED

## ALL TURN SIGNALS INOPERATIVE (Cont.)

*Operate turn signal switch in both directions and listen for solenoid click in the main sequential turn signal relay. If no solenoid click is evident, make a visual check for a proper external ground connection from the sequential relay & turn signal motor and flasher assembly through circuit #57 and #57B.

GROUND OK.

INADEQUATE GROUND FOR MAIN SEQUENTIAL TURN SIGNAL RELAY AND TURN SIGNAL MOTOR AND FLASHER ASSEMBLY.

*Make proper connections or repair or replace wires or connectors.

*Operate turn signal switch and check for voltage in circuit #458 (Orange-black stripe) at the P37 connector to the turn signal relay K7.

CIRCUIT OK.

OPEN CIRCUIT BETWEEN TURN SIGNAL RELAY K7 AND TURN SIGNAL SWITCH.

*Isolate open circuit back to turn signal switch and make necessary repairs or replacement.

*Remove P37 connector from turn signal relay K7. Continuity should exist between the center spade terminal and each of the other two terminals on the relay.

RELAY OK.

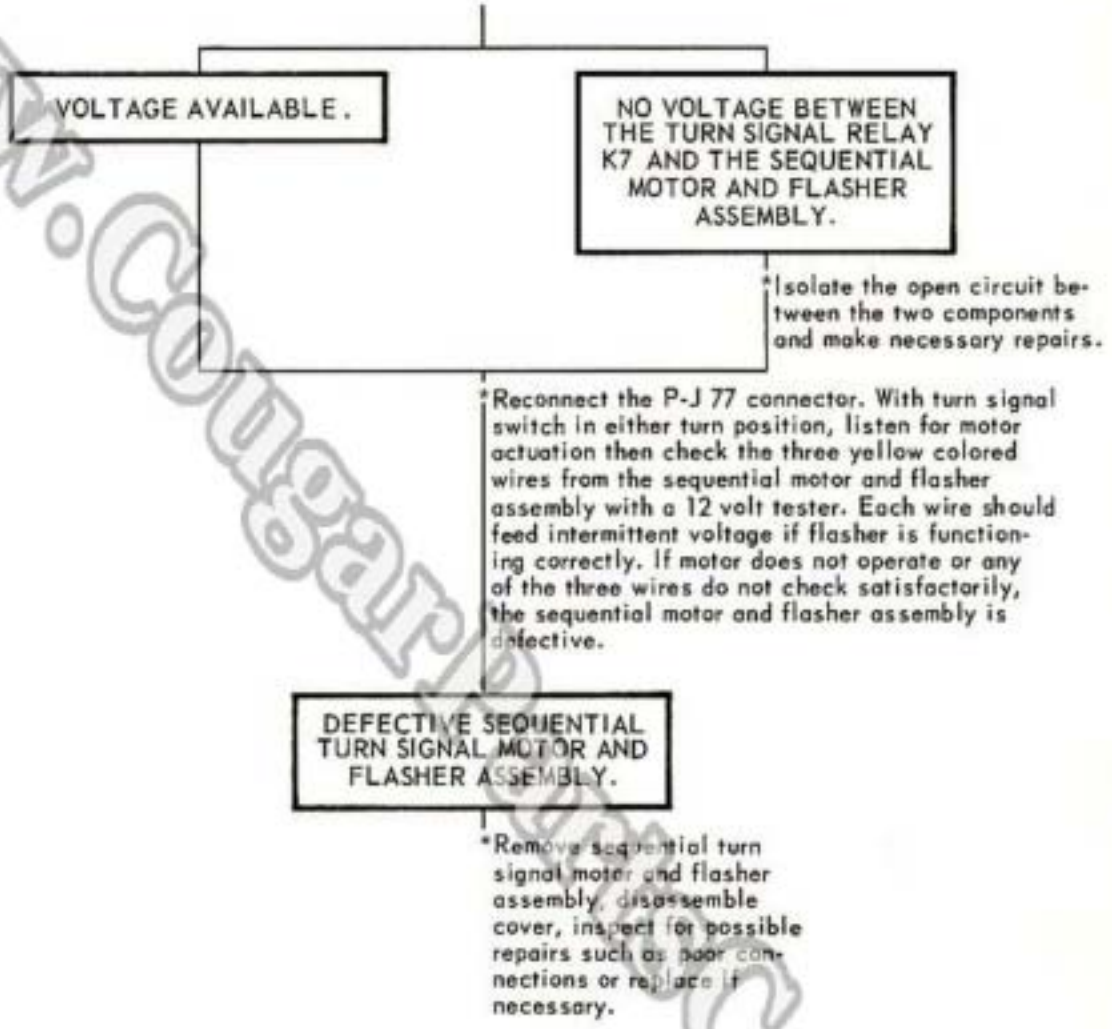
OPEN CIRCUIT IN TURN SIGNAL RELAY K7.

*Replace relay assembly.

*Place ignition switch to "ACC" position. Operate turn signal switch, separate the P-J 77 connector at the turn signal motor and flasher assembly. Check for voltage at circuit #459 (Orange-green stripe) at the J77 side of the connector.

CONTINUED

## ALL TURN SIGNALS INOPERATIVE (Cont.)

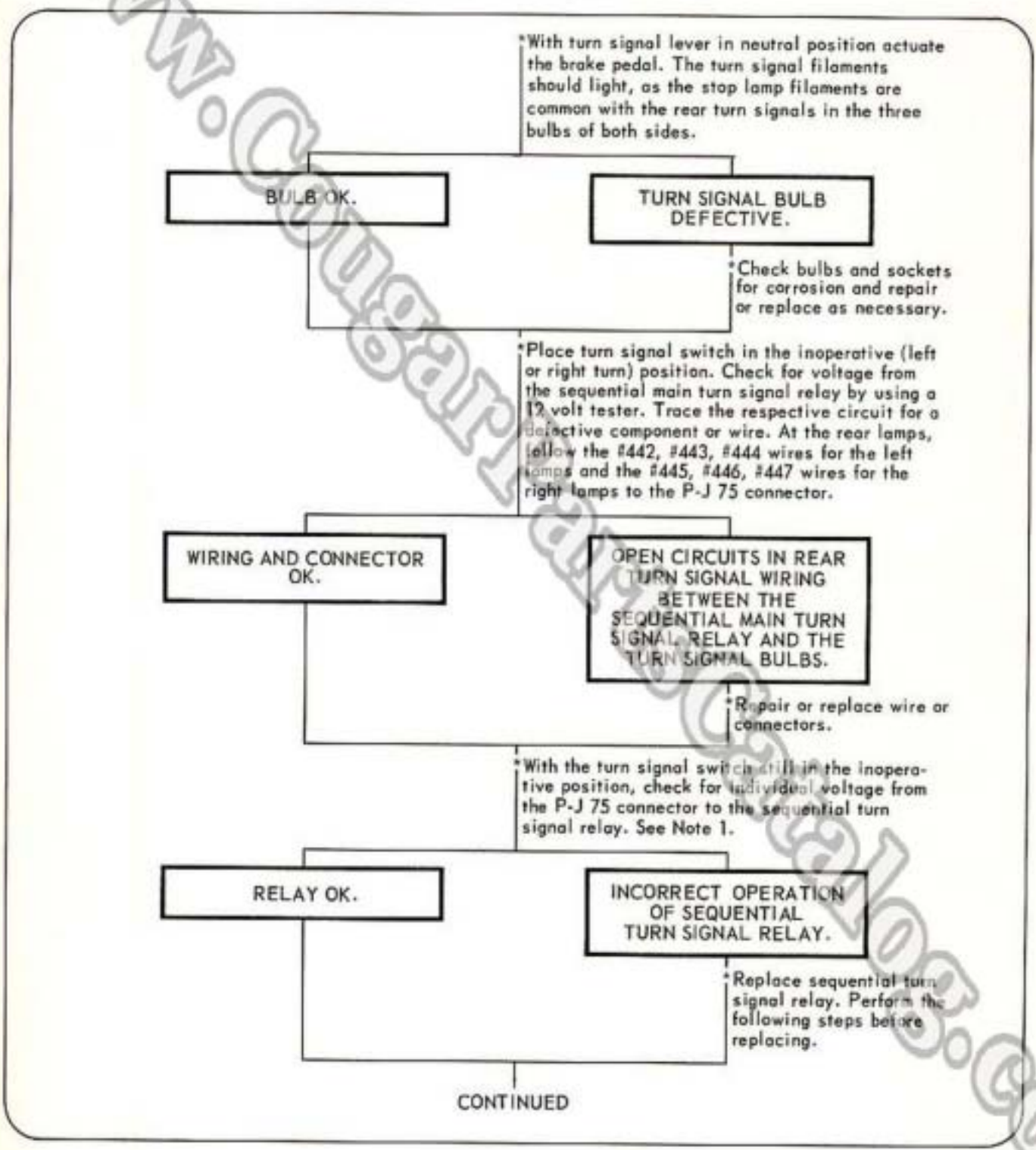



**NOTE 1.** To prevent unnecessary replacement of the turn signal and/or emergency flasher switch, the following diagnostic procedure should be followed:

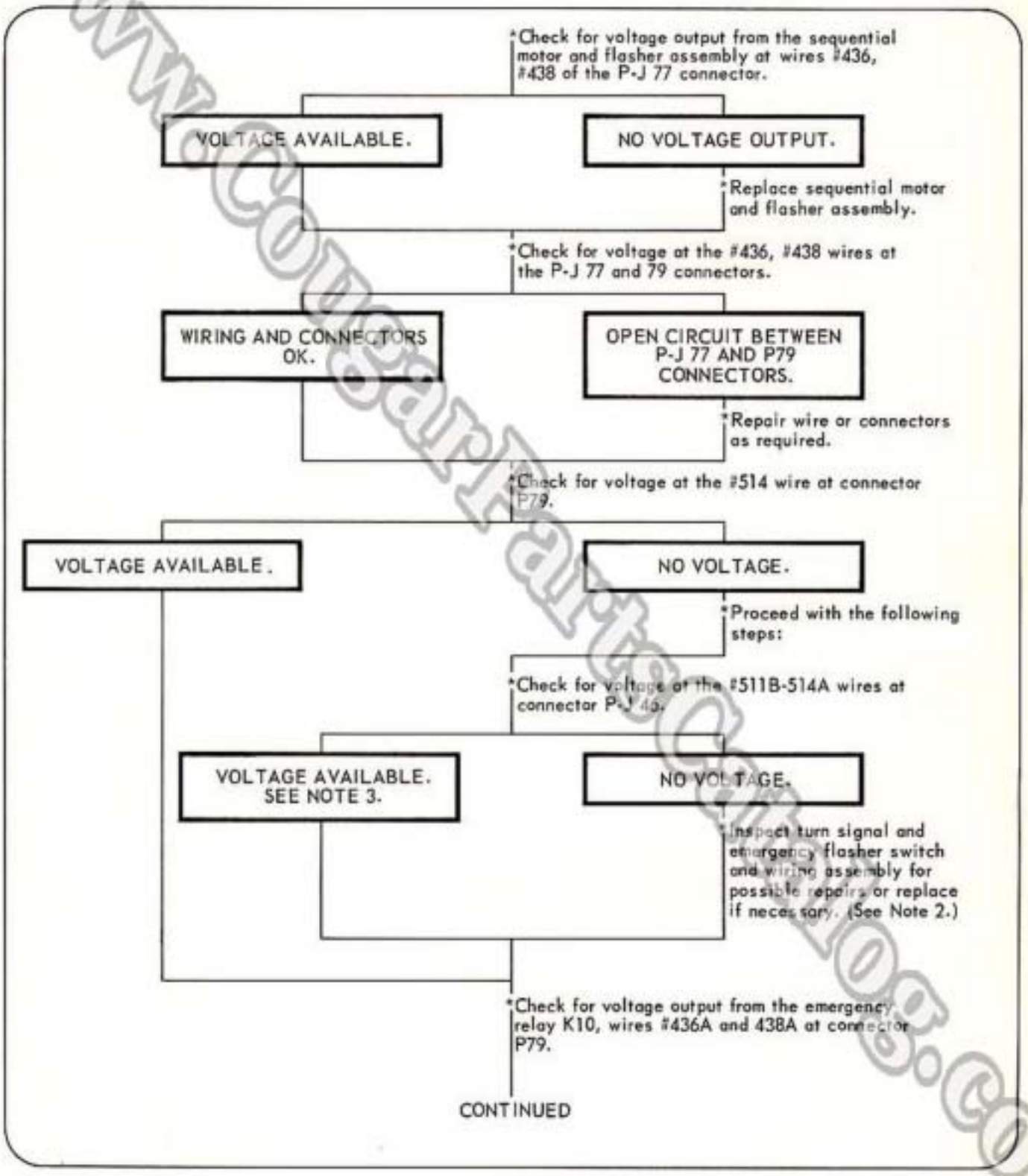
1. Disconnect the turn-signal emergency flasher switch wires from the connector at the base of the column.
2. Attach a new switch to the main wiring harness connector and test the turn signal system by actuating the new switch.
3. If the system responds normally, the new switch may be installed.

# PROBLEM

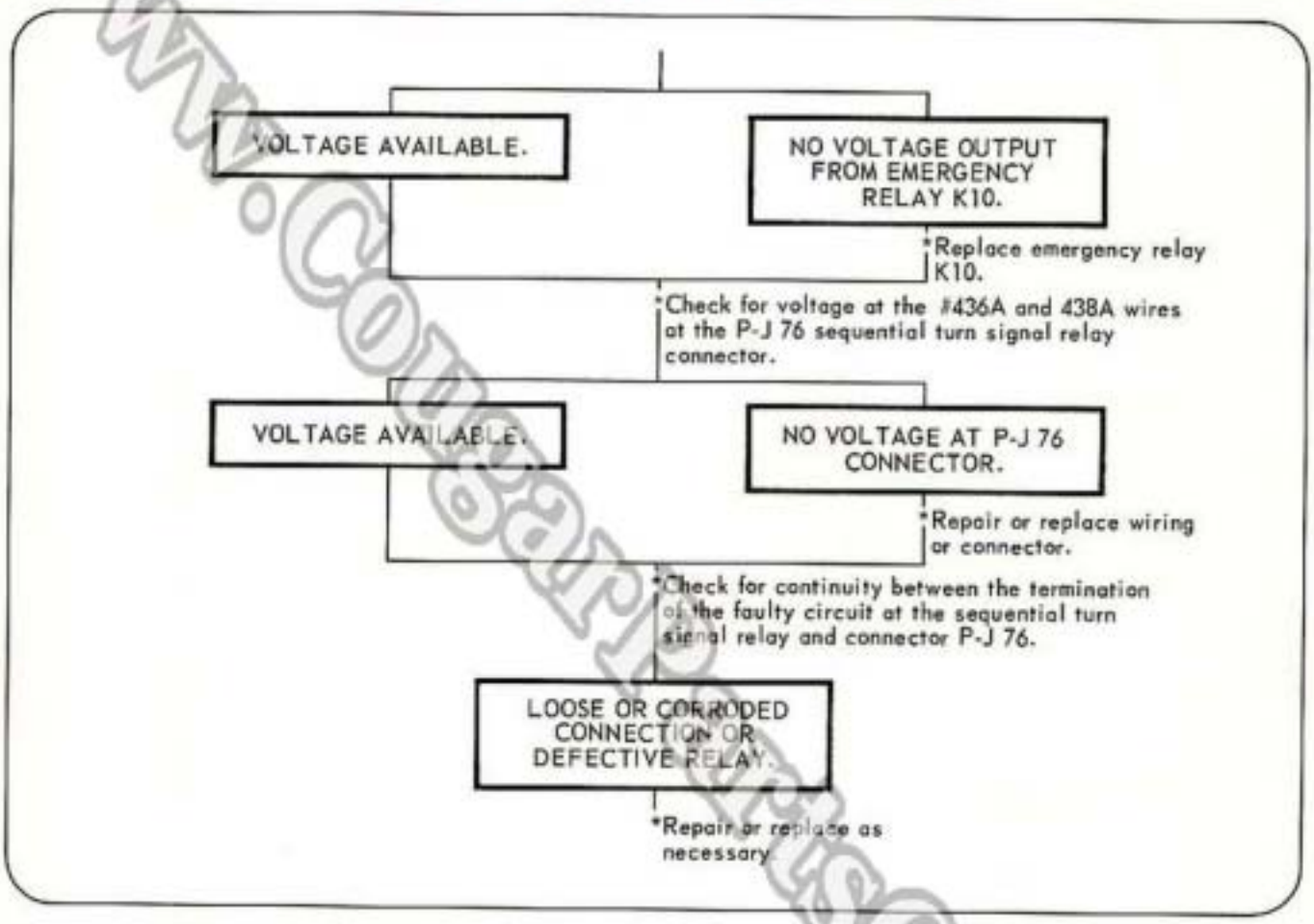
ONLY THE CENTER LAMP OF THE THREE REAR LAMPS FLASH FOR THE TURN SIGNAL SWITCH DIRECTION SELECTED. (TURN INDICATOR LAMP GLOWS STEADY AND FRONT TURN SIGNAL BULBS FLASH).



## ONLY THE CENTER LAMP OF THE THREE REAR LAMPS FLASH FOR THE TURN SIGNAL SWITCH DIRECTION SELECTED. (TURN INDICATOR LAMP GLOWS STEADY AND FRONT TURN SIGNAL BULBS FLASH). (Cont.)



## ONLY THE CENTER LAMP OF THE THREE REAR LAMPS FLASH FOR THE TURN SIGNAL SWITCH DIRECTION SELECTED. (TURN INDICATOR LAMP GLOWS STEADY AND FRONT TURN SIGNAL BULBS FLASH). (Cont.)




**NOTE 1.** If electrical feed exists only at the following circuits #443 Green-red stripe (L.H. center turn signal) or #446 Orange-white stripe (R.H. center turn signal), these circuits are connected to the front turn signal lamp circuits which are flashing in this example.

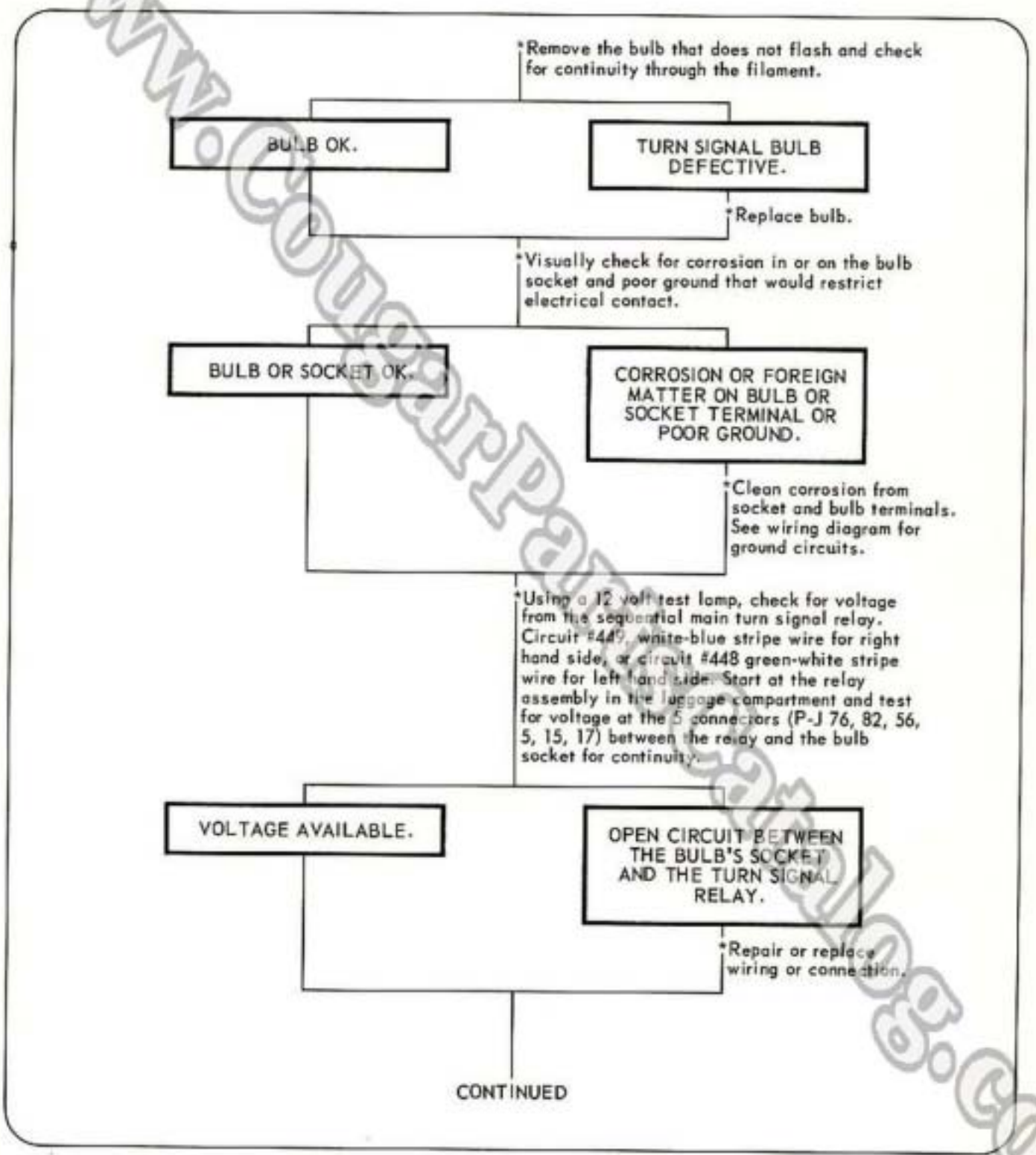
**NOTE 2.** To prevent unnecessary replacement of the turn signal and/or emergency flasher switch, the following diagnostic procedure should be followed:

1. Disconnect the turn-signal emergency flasher switch wires from the connector at the base of the column.
2. Attach a new switch to the main wiring harness connector and test the turn signal system by actuating the new switch.
3. If the system responds normally, the new switch may be installed.

**NOTE 3.** If voltage is available at the #511B-514A wires at connector P-J 46, the #514 wire should be checked for continuity between connectors P-J 46 and P79 - through connector P-J 60.

# PROBLEM

**ONE OR BOTH FRONT TURN SIGNALS DO NOT OPERATE**
**(TURN INDICATOR LIGHT REMAINS ON. REAR TAIL LAMPS OPERATE.)**



## ONE OR BOTH FRONT TURN SIGNALS DO NOT OPERATE (TURN INDICATOR LIGHT REMAINS ON. REAR TAIL LAMPS OPERATE.) (Cont.)

*If in the above check the relay clicks and operates the rear turn signal lamps, but voltage does not exist at the sequential main turn signal relay for front lamps, open the insulated package (if so equipped) assembly and inspect for improper connection at the turn signal relay. Check for continuity between the termination of the faulty circuit at the relay and at connector P-J 76.

**DEFECTIVE TURN SIGNAL RELAY OR WIRES LOCATED IN THE LUGGAGE COMPARTMENT.**

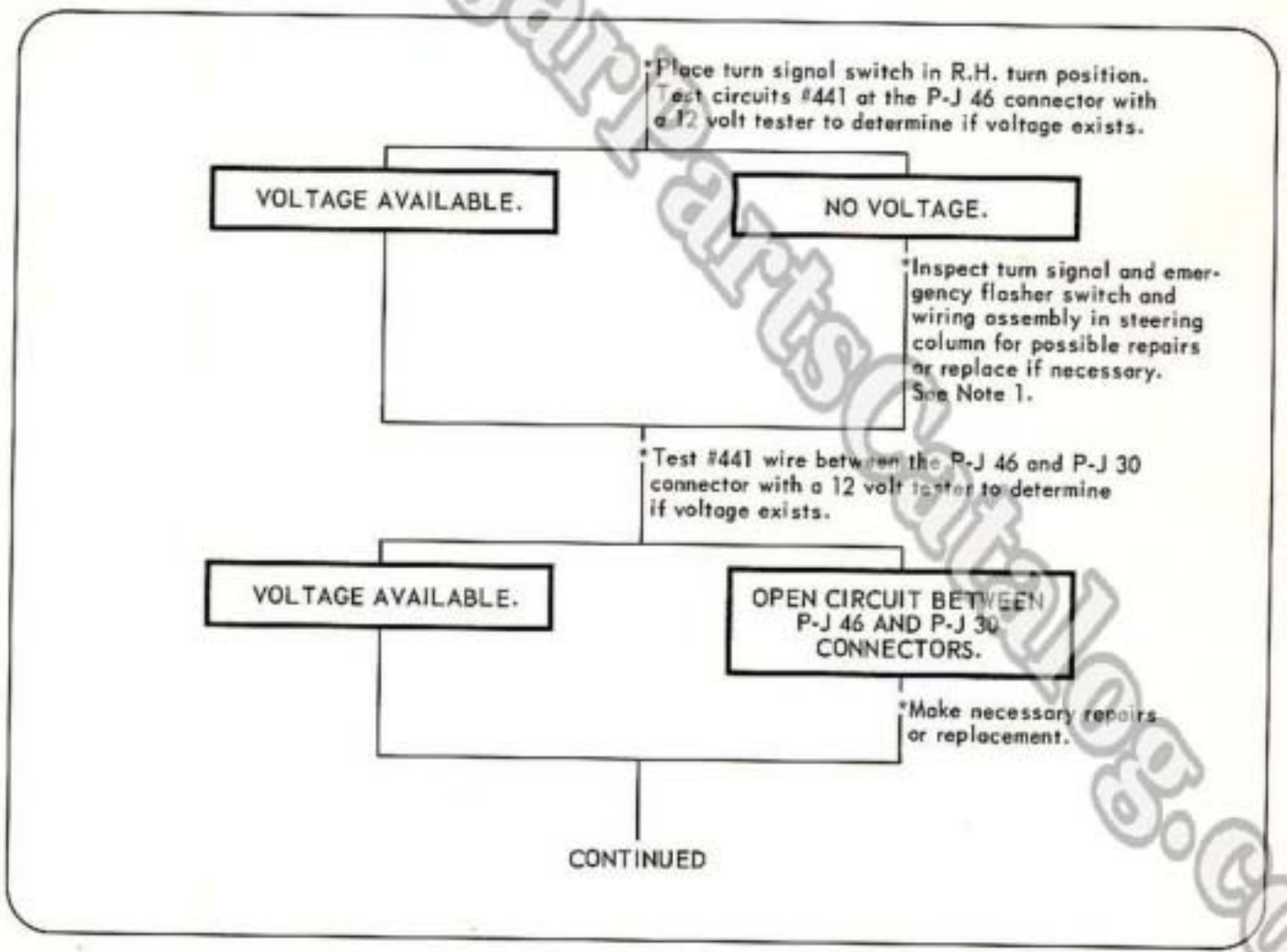
*Repair wiring or replace relay as necessary.

# PROBLEM

MALFUNCTION OF TURN INDICATOR LAMPS (BULBS IN INSTRUMENT PANEL)
ALL OTHER SYSTEMS WORK.

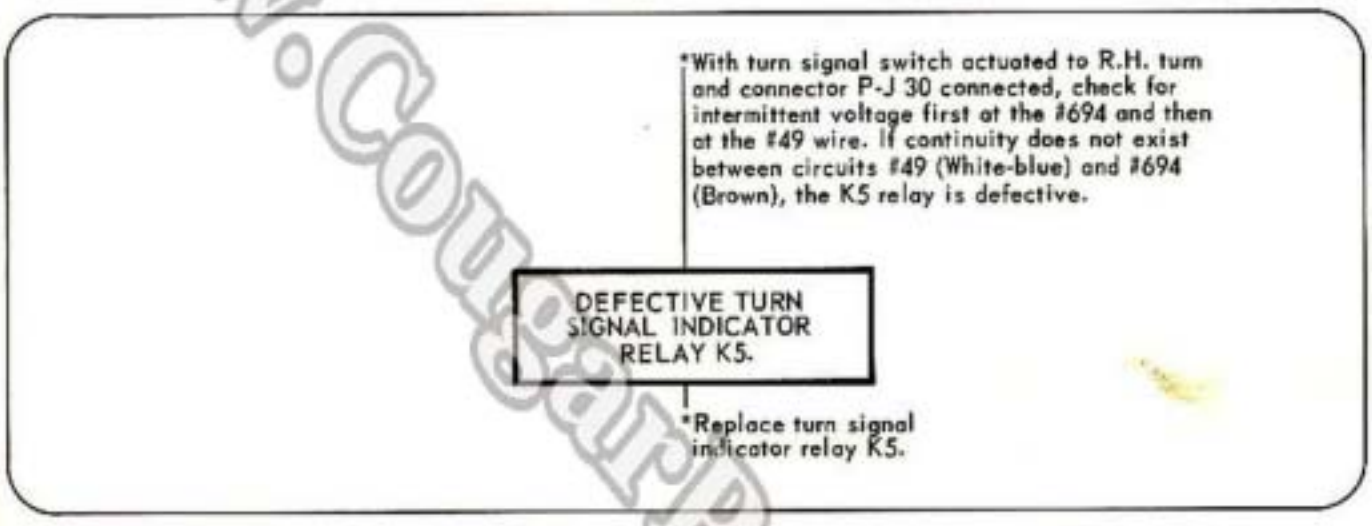
(A) L.H. LAMP FLASHES IN EITHER DIRECTION SELECTED.
(B) BOTH LAMPS FLASH IN EITHER POSITION OF THE TURN SIGNAL.
(C) L.H. LAMP INOPERATIVE.
(D) R.H. LAMP INOPERATIVE.
(E) BOTH LAMPS WILL NOT LIGHT.
(F) INDICATOR LAMPS LIGHT BUT DO NOT FLASH.

(A) L.H. INDICATOR LAMP FLASHES IN EITHER DIRECTION SELECTED



## MALFUNCTION OF TURN INDICATOR LAMPS (BULBS IN INSTRUMENT PANEL) ALL OTHER SYSTEMS WORK. (Cont.)

### (A) L.H. INDICATOR LAMP FLASHES IN EITHER DIRECTION SELECTED (Cont.)




**NOTE 1.** To prevent unnecessary replacement of the turn signal and/or emergency flasher switch, the following diagnostic procedure should be followed.

1. Disconnect the turn-signal emergency flasher switch wires from the connector at the base of the column.
2. Attach a new switch to the main wiring harness connector and test the turn signal system by actuating the new switch.
3. If the system responds normally, the new switch may be installed.

## MALFUNCTION OF TURN INDICATOR LAMPS (BULBS IN INSTRUMENT PANEL) ALL OTHER SYSTEMS WORK. (Cont.)

### (B) BOTH INDICATOR LAMPS FLASH IN EITHER TURN DIRECTION SELECTED

*Place turn signal switch in either turn position. Check for voltage at the #511B, #514A wire at the P-J 46 turn signal switch connector.

- VOLTAGE AVAILABLE.
- NO VOLTAGE.

*Inspect turn signal and emergency flasher switch and wiring assembly in steering column for possible repairs or replace if necessary. See Note 1.

*Check circuit #514A (Blue) at the P-J 49 connector at the emergency warning relay K6 with a 12 volt tester. Voltage should exist whenever ignition is "ON" and emergency flasher not actuated.

- VOLTAGE AVAILABLE.
- OPEN CIRCUIT BETWEEN P-J 49 AND P-J 46 CONNECTORS.

*Make necessary repairs.

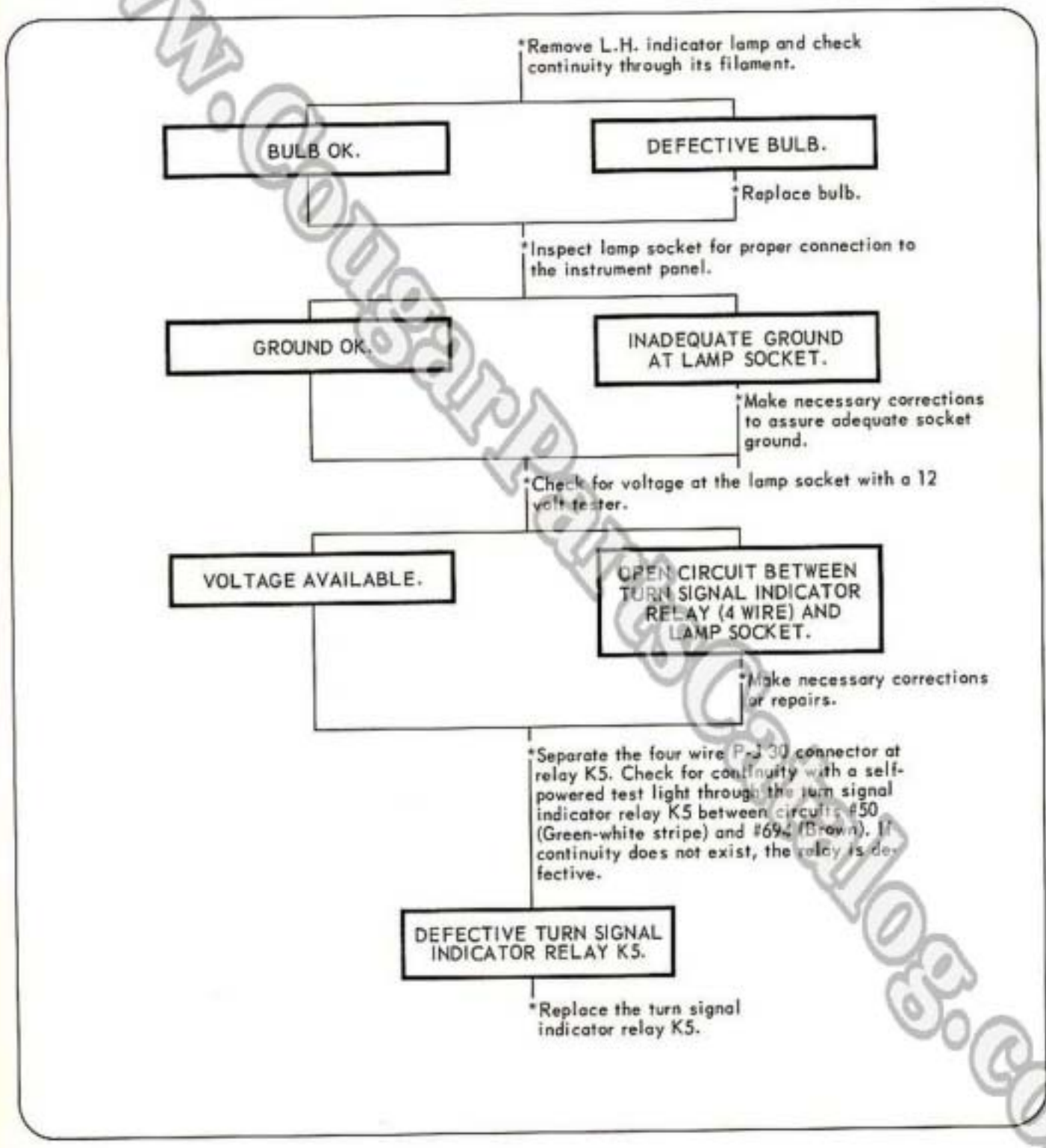
*Check both the #50A and #49A wires at the P-J 39 connector for intermittent voltage. The #50A wire should have voltage in a left turn position only. The #49A wire should have voltage in a right turn position only.

- DEFECTIVE EMERGENCY WARNING RELAY K6.

*Replace the emergency warning relay K6.

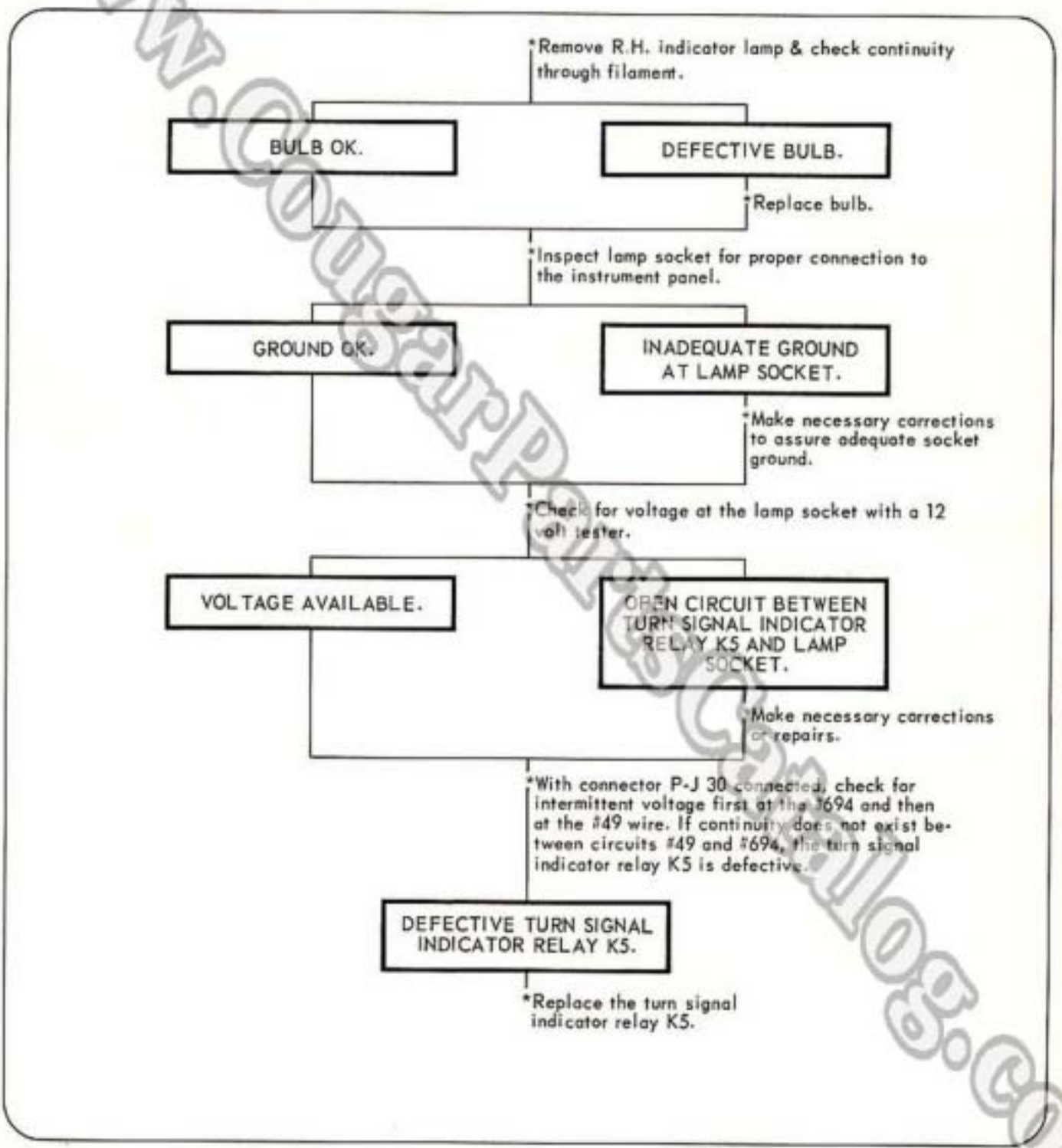
## MALFUNCTION OF TURN INDICATOR LAMPS (BULBS IN INSTRUMENT PANEL) ALL OTHER SYSTEMS WORK. (Cont.)

### (C) L.H. INDICATOR LAMP INOPERATIVE
(turn signal in left hand direction)



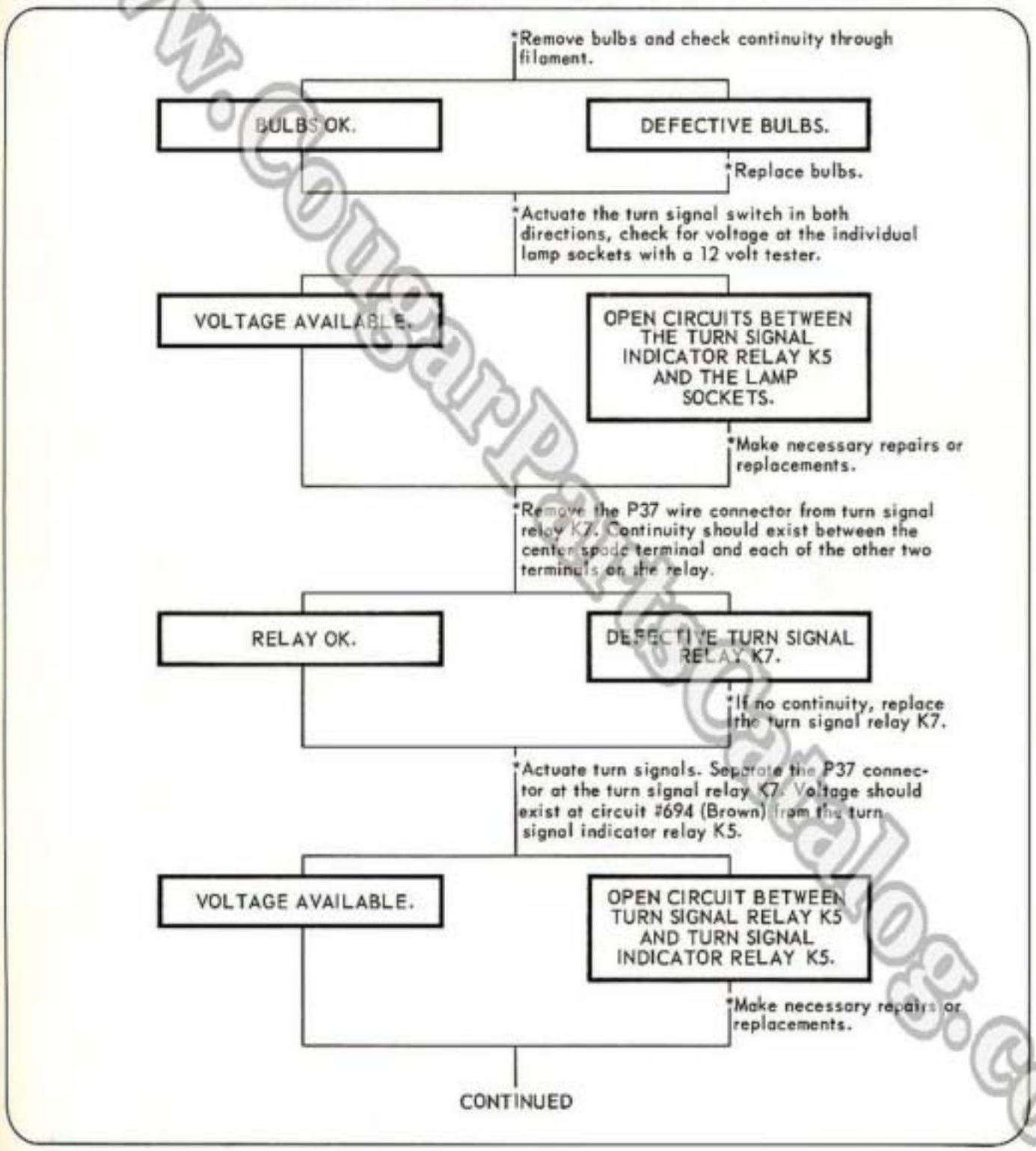
## MALFUNCTION OF TURN INDICATOR LAMPS (BULBS IN INSTRUMENT PANEL) ALL OTHER SYSTEMS WORK. (Cont.)

### (D) R.H. INDICATOR LAMP INOPERATIVE
(turn signal in R.H. direction)



## MALFUNCTION OF TURN INDICATOR LAMPS (BULBS IN INSTRUMENT PANEL) ALL OTHER SYSTEMS WORK. (Cont.)

### (E) BOTH INDICATOR LAMPS WILL NOT LIGHT



## MALFUNCTION OF TURN INDICATOR LAMPS (BULBS IN INSTRUMENT PANEL) ALL OTHER SYSTEMS WORK. (Cont.)

### (E) BOTH INDICATOR LAMPS WILL NOT LIGHT (Cont.)

*With connector P-J 30 connected, check for intermittent voltage first at the #49 wire in a right turn position and then at the #50 wire in a left turn position. If continuity does not exist at wires #49 and #50, the turn signal indicator relay K5 is defective.

DEFECTIVE TURN SIGNAL INDICATOR RELAY K5.

*Replace turn signal indicator relay K5.

### (F) BOTH INDICATOR LAMPS LIGHT BUT DO NOT FLASH

*Check all turn signal bulbs for proper operation (See Note 2).

BULBS OK.

DEFECTIVE OUTSIDE TURN SIGNAL BULB(S) IN SYSTEMS.

*Replace bulb(s) in system as required.

*Operate turn signal switch. Listen for indicator click in both positions. If there are no clicks, check for voltage from the turn signal relay K7 by prodding with a 12 volt tester at the #694 (Brown wire) at relay connector P37. If the voltage is constant when the turn signal switch is in either position, the relay assembly is at fault.

DEFECTIVE TURN SIGNAL RELAY K7.

*Replace the turn signal relay K7.

**NOTE 2.** The turn signal relay in the instrument panel "reads" the number of lights that are operating in either the R.H. or L.H. side of turn signal operation. A solenoid in this relay will not open unless all four lights in the particular system are operating.

The following problems with the emergency warning system assumes that the exterior lamp & turn signal systems are operating correctly. If, for example, only one side of the lamps operate in the turn signal system the same can usually be expected in the emergency warning system. Therefore, refer to other system diagnosis procedures to correct similar problems occurring in the other systems.

# PROBLEM

## EMERGENCY FLASHER SYSTEM INOPERATIVE (ASSUME CURRENT TO CIRCUIT BREAKER)

*Pull emergency flasher switch out to "OFF" position and operate the brake. If the stop lights do not operate also, circuit breaker CB-2 probably is at fault. Check circuit breaker CB-2 under instrument panel to determine if continuity exists between the two terminal studs. If continuity does not exist, circuit breaker CB-2 is defective.

CIRCUIT BREAKER OK.

DEFECTIVE 15 AMP. CIRCUIT BREAKER CB-2.

*Replace circuit breaker CB-2.

*Determine if voltage exists at the main harness multiple connector at the base of the steering column in circuit #10 (Green-red stripe wire).

VOLTAGE AVAILABLE.

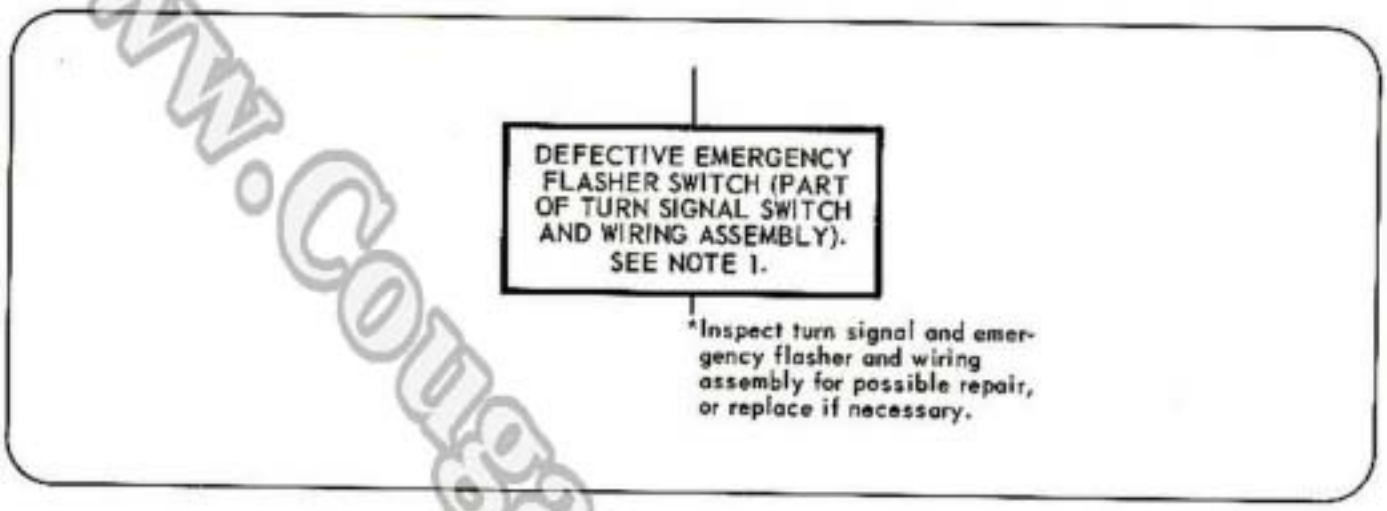
OPEN CIRCUIT BETWEEN CIRCUIT BREAKER AND TURN SIGNAL AND EMERGENCY FLASHER SWITCH AND WIRING ASSEMBLY IN STEERING COLUMN.

*Make necessary repairs or replacement.

*Place emergency flasher switch in "ON" position (push in). If switch is operating correctly, voltage should exist through the following circuits at the J46 connector.
#440 - white wire
#441 - violet wire
#458A - orange-black stripe wire
#458B - orange-black stripe wire

CONTINUED

## EMERGENCY FLASHER SYSTEM INOPERATIVE (ASSUME CURRENT TO CIRCUIT BREAKER) (Cont.)




**NOTE 1.** To prevent unnecessary replacement of the turn signal and/or emergency flasher switch, the following diagnostic procedure should be followed.

1. Disconnect the turn-signal emergency flasher switch wires from the connector at the base of the column.
2. Attach a new switch to the main wiring harness connector and test the turn signal system by actuating the new switch.
3. If the system responds normally, the new switch may be installed.

# PROBLEM

**EMERGENCY FLASHER SYSTEM OPERATES BUT ALL SIX REAR LAMPS FLASH SEQUENTIALLY ON BOTH SIDES OF THE VEHICLE AT THE SAME TIME, OR TWO LAMPS (4 IN ALL) FLASH SEQUENTIAL ON EACH SIDE.**

*Put turn signal switch in neutral position.

SEE NOTE 1.

THE EMERGENCY WARNING SYSTEM IS ACTIVATED AND THE TURN SIGNAL LEVER IS IN EITHER TURN DIRECTION POSITION.

*Parts are not defective if problem exists as stated in this step of diagnosis. See Note 1.

*With the emergency flasher switch in "OFF" position, disconnect the P79 connector at the K10 emergency warning relay "A". There should be no continuity between the #436 and #436A spades of the K10 relay. Likewise there should be no continuity between the #438 and #438A spades of the K10 relay.

RELAY OK.

DEFECTIVE K10 EMERGENCY WARNING RELAY "A".

*Replace the K10 emergency warning relay "A".

*Place emergency flasher switch in "ON" position. Test circuit #514 (Blue wire) at the P-J46 connector with a 12 volt tester. If voltage exists, the emergency flasher switch portion of the turn signal and emergency flasher switch assembly is defective.

DEFECTIVE EMERGENCY FLASHER SWITCH IN THE TURN SIGNAL SWITCH AND WIRING ASSEMBLY. SEE NOTE 2.

*Inspect the turn signal and emergency flasher switch and wiring assembly for possible repair or replace if necessary.

CONTINUED

## EMERGENCY FLASHER SYSTEM OPERATES BUT ALL SIX REAR LAMPS FLASH SEQUENTIALLY ON BOTH SIDES OF THE VEHICLE AT THE SAME TIME, OR TWO LAMPS (4 IN ALL) FLASH SEQUENTIAL ON EACH SIDE. (Cont.)

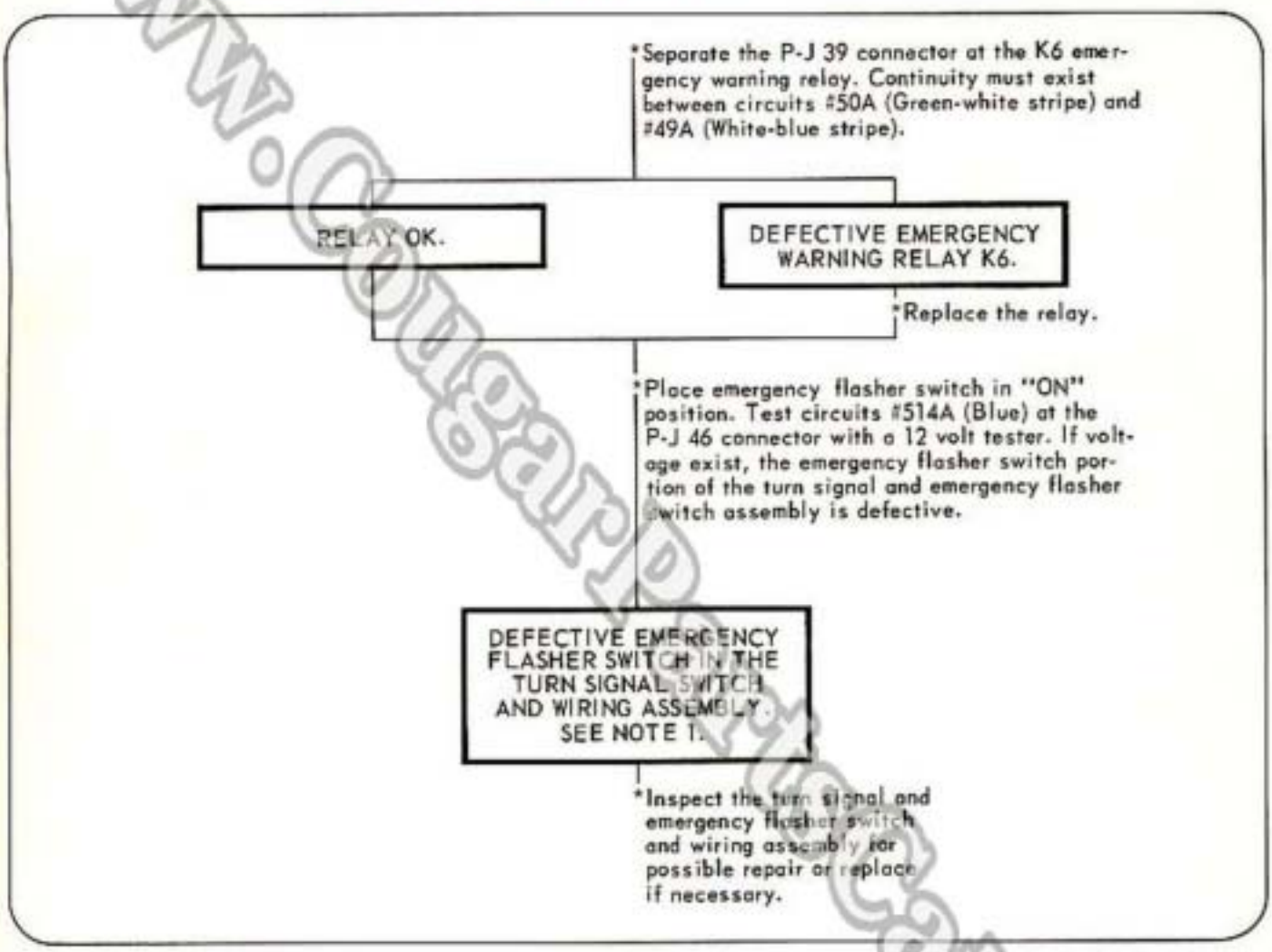
**NOTE 1.** This is a normal response with the emergency warning system because the turn signal electrical system will override the emergency warning relays. The indicator lamp for the direction in which the turn signal lever is in will not flash also in this condition.

**NOTE 2.** To prevent unnecessary replacement of the turn signal and/or emergency flasher switch, the following diagnostic procedure should be followed.

1. Disconnect the turn-signal emergency flasher switch wires from the connector at the base of the column.
2. Attach a new switch to the main wiring harness connector and test the turn signal system by actuating the new switch.
3. If the system responds normally, the new switch may be installed.

# PROBLEM

**EMERGENCY FLASHER SYSTEM OPERATES BUT L.H. TURN INDICATOR BULB DOES NOT FLASH. (IT DOES FLASH DURING L.H. TURN SIGNAL OPERATION.)**




**NOTE 1.** To prevent unnecessary replacement of the turn signal and/or emergency flasher switch, the following diagnostic procedure should be followed.

1. Disconnect the turn-signal emergency flasher switch wires from the connector at the base of the column.
2. Attach a new switch to the main wiring harness connector and test the turn signal system by actuating the new switch.
3. If the system responds normally, the new switch may be installed.

LINCOLN-MERCURY DIVISION

Ford

LM - 7848 MKTG. OFC. JUNE, 1967