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PREFACE

This Service Manual will introduce you to a new concept of personal transportation, with a new technology and the need for some special training. We sincerely hope you will have the opportunity to come to Sebring to learn the necessary techniques for repairing and servicing the CitiCar.

You will find most of your problems will be caused by the driver of the CitiCar being unfamiliar with the proper driving methods. The CitiCar is a free-wheeling vehicle and when not driven as such undue use of the brakes will show up in early wear.

We will take you through the workings of the CitiCar before getting down to specifics.

HOW THE CITICAR WORKS

The CitiCar is powered by 8 six-volt batteries wired in parallel and in series. The batteries are divided into two packs of four, providing 24 volts from each pack. We use 24 volts from each pack in parallel for the first two speeds and 48 volts in series for the top speed. The speeds are changed by changing the voltage through use of an accelerator switch that works three micro switches off a cam.

The micro switches of the accelerator operate the contactor units located behind the right seat, enclosed in a plastic box. You will note a distinct click when you turn the ignition key. That is one of the contactor units snapping into position to drive the CitiCar. This clicking is evident as you change from one speed to the other and is no cause for alarm.

As you depress the accelerator, current will flow from the 2 packs of batteries in parallel or 24V. In the first speed the current goes through a nichrome ribbon resistor. This cuts the amperage load and permits a fairly smooth take off. The first position has a top speed of about 11 MPH. Depressing the accelerator further will activate a solenoid in the contactor box. This will bypass the resistor and increase your speed to about 23 MPH. You are still in parallel using 24V off each pack of batteries.

In the third speed, the current will change from 24V in parallel to 48V in series. To drive the CitiCar in reverse, a toggle switch on the dash is used to change the current flow to the opposite direction.

The accessories use a 12V circuit and the voltmeter and wiper run off 18V.

The CitiCar has hydraulic brakes; drum brakes are on the rear and disc brakes are on the front, before Car No. 2211 After Car No. 2211 drum

brakes are on all four wheels.

The motor is a traction motor. It will drive the CitiCar through a differential to a speed of 38 to 40 MPH.

A 48V charger is built into the CitiCar with an outlet box on the fender for customer convenience. It has a built-in interlock that cuts the current to the rest of the vehicle when the cord is plugged in, preventing driving away with the cord still attached. A micro switch interlock is attached to the hand brake to prevent you from driving with the brake partially on. There is also a micro switch on the foot brake in cars after No. 2842.

We have made every effort to construct the CitiCar as a long-lasting people-mover, from the all-aircraft aluminum frame to the ABS Cycolac plastic body. We have designed it with you, the serviceman, in mind.

***SPECIFICATIONS ***

LENGTH:	95"
WIDTH:	55"
WHEELBASE:	63"
HEIGHT:	58"
FRONT TRACK:	43"
REAR TRACK:	44"
CLEARANCE:	4½"
WEIGHT:	1300 pounds.
REAR STORAGE:	12 Cu. Ft.
TIRES:	4.80 x 12, 4 ply rated
SPEED:	38 mph cruising.
RANGE:	Up to 50 miles
ACCELERATION:	0 to 25 -- 6.2 secs. 0 to 35 -- 19 secs.
TURNING CIRCLE:	22 ft.
CONTROLLER:	Vanguard Multivoltage speed control.
MOTOR:	Series wound DC 6 HP
DIFFERENTIAL	Direct pinion drive.
SUSPENSION:	Leaf springs, front & rear. 4 wheel shock absorbers.
BODY:	Impact resistant Cycolac® (ABS) rust & corrosion proof.
FRAME:	Rectangular aluminum chassis, tubular aluminum body support.
BRAKES:	Four wheel hydraulic brakes, parking brake.
POWER SOURCE:	Eight 6 volt batteries (HD)

SERVICE PROCEDURES

VEHICLE DOES NOT MOVE

This section will give the technician a quick run down as to what to look for if the vehicle does not operate. Most of the areas to check in this section will be explained in full detail in other sections of the Manual.

Note: When making any check of the running gear, the rear wheels must be off the ground.

Note: In this section of the Manual, we will assume the vehicle already has a fully charged battery pack and also that the battery charger is not connected to a 110-volt source.

1. POWER LAMP

Power Lamp Off with Ignition Key On

If click is heard when ignition is turned on but power light does not light, make sure shift lever is not in neutral, emergency brake is off and charging cord is not plugged in. Then check bulb.

If brake lamp is on with park brake off, micro switch must be adjusted so as to operate properly (see section on Parking Brake Switch).

Check other lamps on dash to see if any lamps operate. Also, did controller "click" when turning on ignition switch?

If no other lamps operate and controller did not "click" (click noise when turning on ignition switch is the series/parallel contactor switching from 48 volt series charge cycle to parallel for running), check ground fuse in controller. If ground fuse is intact, check fuses under dash.

There are only four other causes of no power at the ignition switch

a. Bad charger interlock relay
b. Wire off interlock
c. Wire off ignition switch
d. Defective ignition switch

IGNITION SWITCH ON WITH POWER LAMP ON

Vehicle Does Not Move

Is shift switch in forward or reverse? When the shift switch is not engaged in either the forward or reverse position, the controller will make noise but the vehicle will not move.

Does the controller operate properly? Depress accelerator pedal to see if all the parts of the controller work. There should be three distinct clicks, the F&R contactor, the second speed solenoid and the SP contactor.

If all three clicks are heard, check the high power electric for cause and cure (next section).

If only two clicks are heard, check orange and/or green wire on the F&R contactor and/or the shift switch.

2. HIGH POWER ELECTRICAL

Vehicle Will Not Move

Check main fuse or circuit breaker, depending on whether vehicle is 36 or 48 volt.

Main fuse O.K.?

Check F&R contactor for burned points.

Points O.K.?

Check for burned high power cable and a blown 30 or 40 amp ground fuse.

Check to see if the motor studs on the motor have been cut off. If the armature studs on the aluminum end plate have not been cut off even with the hold down nut, the far rear stud could come in contact with the right rear shock and blow the fuse.

The upper armature bolt in some cases interferes with the movement of the main power cable to the motor and this could cause the insulation to be worn away and could burn the cable in half. (Terrell axle only).

The 40 amp fuse could also blow due to a loose connection in the fuse block itself. The wires and connections at the fuse block should be tightened periodically to assure a tight fit.

If 40 amp fuse blows more than a few times, the diode above the fuse block should be checked.

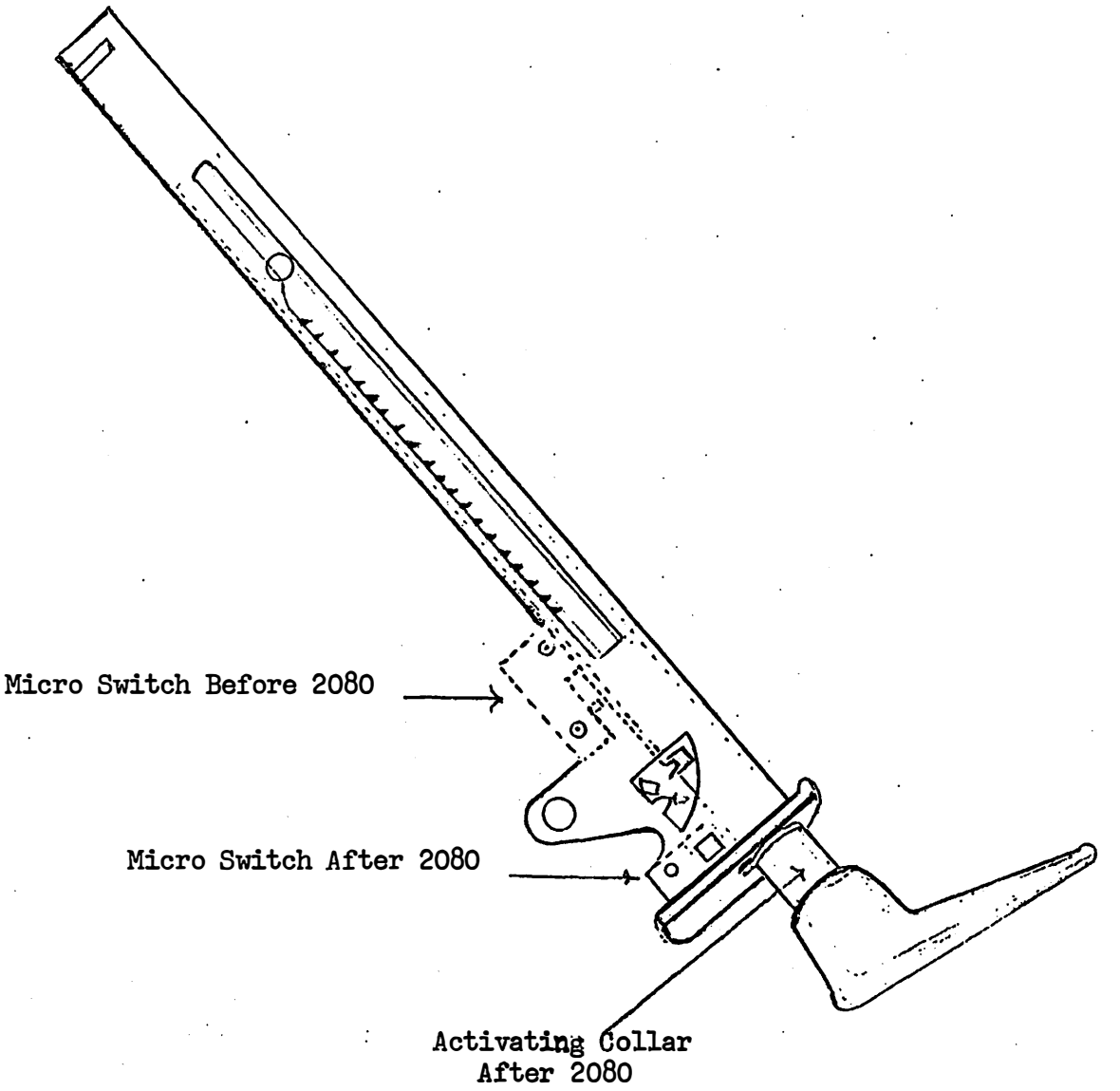
NOTE On vehicles with Lester or Gould chargers, it is advisable to remove the diode assembly completely and eliminate the ground fuse block by butt splicing the ground wires together.

3. PARK BRAKE SWITCH

The park brake switch is used to disable the vehicle when parked with the brake on.

The micro switch is activated by pulling the park brake handle up. (See diagram).

Hand Brake


Micro Switch Before 2080
Micro Switch After 2080
Activating Collar
After 2080

The micro switch activating arm rests in a notch cut into the park brake ratchet arm when the park brake is off, up to CitiCar No. 2080. After Car No. 2080, the switch is relocated and works off a collar on the hand brake.

It is possible for the switch to come out of adjustment from normal use.

If the vehicle does not move when the brake is off, the switch on the park brake could be at fault.

The switch can be adjusted by bending the activating arm with a small screw driver when the brake is off (before Car No. 2080). If this fails to work, then the switch should be removed from the mounting bracket and the mounting holes for the switch enlarged so that the switch can be moved for a better adjustment.

4. 12 VOLT LOW POWER ELECTRICAL FOR CONTROLLER

The controller is operated by the 12 volt electrical power system. This is controlled by the forward/reverse shift switch and the accelerator cam switches. The cam switches at the accelerator activate the three speeds of the controller.

If any part of the controller fails to operate, first check the low power electrical to see if cause is here. If upon raising the rear wheels and checking the workings of the controller and all parts operate, then check the high power.

Low Power Electrical Problems

Many problems may be traced to one cause, A BAD GROUND. Always inspect the ground connections when working on any vehicle. This could save a service call.

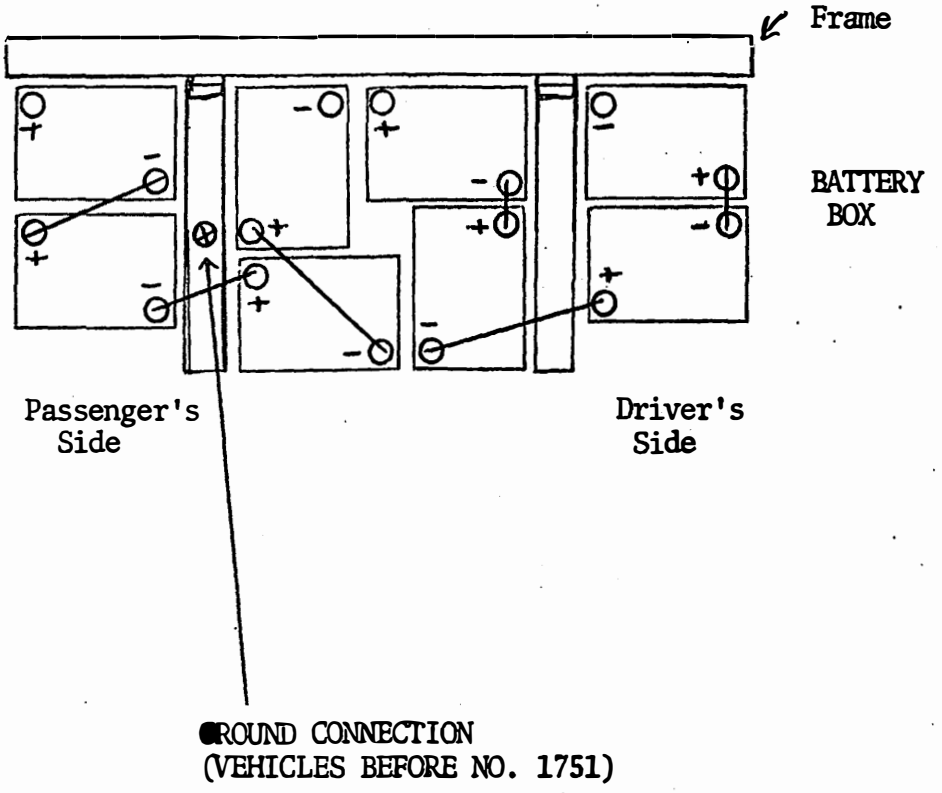
It has been found that ground wire problems are more pronounced on vehicles below #1751. These vehicles have a ground connection in the battery compartment on the chassis rail. Battery acid can corrode this connection and cause a NO ground situation. This connection should be checked whenever the vehicle is in for service and cleaned as necessary.

Vehicle does not move but clicking is heard in control box. Check F/R shift switch to make sure it is in forward or reverse.

Check to see if wire is off of cam switch. This would most likely be the red wire or the red wire with a black stripe.

Check the F&R contactor to make sure the orange wire is connected to the contactor magnetic coil (green wire if vehicle will not go into reverse).

Check shift switch for loose wire.



On some early production vehicles, the ground wire was of 16 gauge wire. This wire could melt during the charge cycle and cause the controller harness to short.

The complete low power controller harness would have to be remade.

5. TEST CHECKS FOR LOW POWER TO CONTROLLER

Is there power to the controller? SV-48 controllers are mounted directly to the plastic floor pan of the vehicle, therefore, they must be externally grounded to the chassis. Some vehicles before Car No. 1751 were equipped with a 16-gauge ground wire that was attached to the forward controller plate mounting bolt and ran through the wiring harness to the battery box where it was attached to the chassis. In some cases a circuit overload during charging could overheat the ground wire and melt the harness wiring to the controller together causing the controller to malfunction. If this happens, the controller harness must be replaced. It is advisable to run the ground wire (using a larger gauge wire) from the forward mounting bolt to the frame. This will eliminate any further harness problems.

On Cars No. 1751 and above, the controller was grounded by mounting the ground fuse block wires directly to the chassis at the rear body panel support frame behind the right rear wheel well.

Once the controller has a proper ground, then the following test checks should be made to find if 12-volt power is going to the controller:

a. Raise rear of vehicle.

b. Turn on ignition key.

c. Using a suitable test lamp, check the purple wires at the accelerator cam switches for juice.

d. Always check the power flow at the park brake switch first because the juice comes from the ignition switch through the fuse box to the park brake switch, then to the cam switch, on to the F&R dash switch and the controller. If the park brake switch is out of adjustment, broken, or wired incorrectly, the controller will not operate. If the switch does not show visual damage and seems to be operating properly, connect the green and the purple wires together. If this enables the vehicle to operate, the park brake switch must be replaced.

e. With the accelerator depressed, check the first and second speed switches for power leaving the switch (brown and red wires).

f. With the accelerator in the off position, check the third speed switch for power. The (3) third speed switch is a normally closed switch (meaning power flows through it when it is in the off position).

g. If there is power through the switches, then proceed to the controller low power wiring.

h. To check the F&R contactor wiring, the F&R dash switch must be in either forward to power the forward coil or vice versa for reverse. The first speed cam switch sends juice to the F&R dash switch which controls the F&R contactor coils.

i. If there is power at the cam but no power at the controller, check the wire harness carefully for broken wires.

On some SV-48 vehicles and all 36-volt vehicles, the F&R contactor operates forward low speed when the points move to the top position. Reverse is achieved when the points contact in the lower position. All other SV-48 vehicles activate in the reverse order. Sebring-Vanguard suggests that vehicles be modified to the latter operating condition for most reliability.

To find out which way the F&R operates, first remove the controller box cover and look to see where the cables attach to the F&R contactor on the side facing the 1/4 panel. If the cables are on the top of the contactor, forward activates at the top; cables at the bottom - forward at the bottom.

Usually the points that burn out are the forward ones and replacing all the contactor points may not be necessary. Some points may not be burned out but may be lightly pitted and may only need to be cleaned or filed lightly to be serviceable.

In some cases a large carbon burn deposit may form on a point or points causing a bad connection and no power will flow through the connection. By cleaning or filing the carbon deposit, the point or points are again serviceable.

Loose connections at the contactor cable connections can cause contactor and/or cable burnout. Always keep all connections tight. A loose or bad connection can cause a no-power flow condition which would result in a burned contactor point and vehicle malfunction.

Always look into the contactor arm point area to make sure that the points are actually making contact. They must make a good contact with each other to let the power flow to the motor.

When replacing points, make sure the movable bridge points are not bent as this will cause a bad contact and early failure of the repaired unit. A bent movable bridge can be straightened with a pair of pliers. If the points are not making a good contact, and the points do not look bent, the cause may be an overheated bridge spring in which case the spring must be replaced or the contactor points will definitely burn out.

6. HIGH POWER AND LOW POWER ELECTRICAL PROBLEMS

Vehicle starts out in second speed.

Check the resistor coil under the chassis to make sure that the coil and/or the cables are burned off. Also, if the car starts out in second speed after the coil has just been replaced, then the cables were reinstalled improperly.

If everything looks O.K. under the chassis, check the F&R contactor to see if one of the points is burned off.

If the vehicle starts off in second speed by the F&R contactor and the solenoid engaging at the same time, check the accelerator switch for loose connection. If the wire from the first speed micro switch comes in contact with the second speed switch, both speeds will work at the same time.

7. VEHICLE HAS NO HIGH SPEED

Check the accelerator pedal assembly for proper throw. Does the vehicle go into high speed before the pedal reaches the floor? If not, pull the accelerator rod off of the pedal arm and activate the cam switch. If the vehicle goes into high speed, then the rod adjustment must be corrected or the pedal may have to be bent.

If this is not the case, check for a burned set of points on the SP contactor.

8. CONTACTOR REPAIRS

Repairs are very simple if you keep in mind that you are only replacing parts. There is no real adjustment that can be made. The adjustments are made at the factory and should not need to be changed.

It is recommended that the contactor be repaired and not replaced if only the points are burned out. If the points and the coils are burned out at the same time, the complete assembly should be replaced.

When any repairs are attempted in the controller, the batteries should be disconnected to prevent any electrical short.

Both the F&R and the SP contactors are taken apart in the same manner.

NOTE The contactor repair kits contain parts for both the F&R and SP contactor. The main difference is in the insulators for the center of the movable bridge. The F&R center insulators are SMALLER than the ones for the SP. Be careful NOT to install the SP insulators in the F&R . There will not be enough clearance for the points to keep separated in the neutral position.

a. Disconnect the batteries.

b. Remove the controller box cover.

c. Remove the cable connections and the buss jumpers from the top insulator plate.

d. Remove the 4 small nuts and washers from the insulator plate. This will enable you to remove it.

e. If the bottom point set is burned, the center movable bridge must be removed. This is done by removing the nuts on the top of the movable bridge towers and removing the parts. It is best to lay the parts out in the position that they were removed so they can be reinstalled in the same manner. Remember: When making any repairs to the contactors where disassembly is necessary, the springs under the movable bridge assembly MUST be replaced. This is a common cause of contactor failure.

f. Reassemble in reverse order.

9. OTHER CONTROLLER PROBLEMS

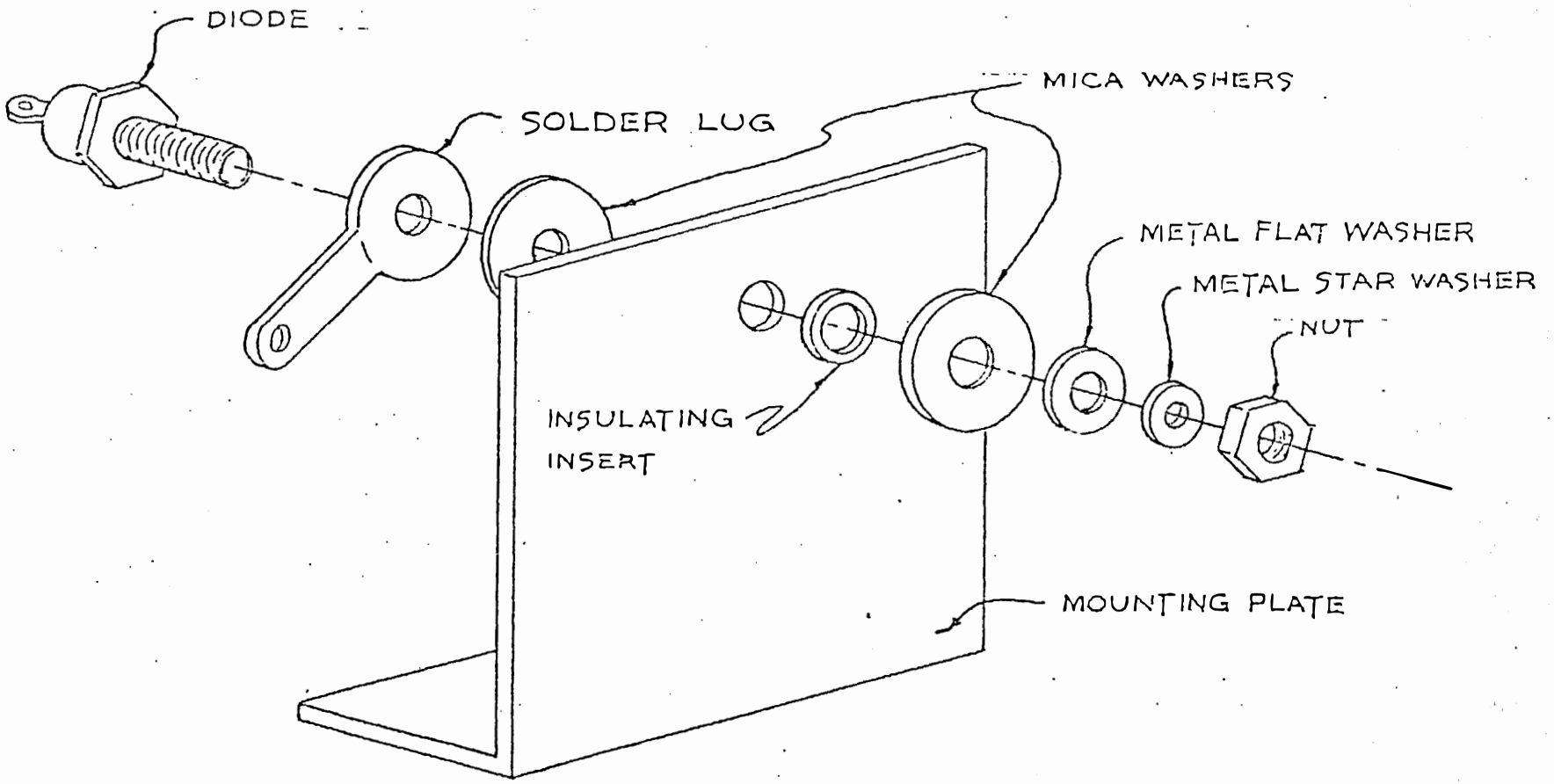
If high speed contactor fluctuates or vibrates when engaged, the CitiCar may have a very low battery charge.

Check for bad battery and/or loose connection on a battery.

When making any repairs to the F&R contactor, check the diode assembly (mounted on the solenoid mounting plate) to make sure it is functioning properly. If voltage passes only one way through the assembly, it is good. If voltage passes both ways, the unit must be replaced.* Use a battery powered continuity tester or voltmeter. The diode is used to prevent an amp throwback on the contactor from the motor when changing speeds.

There are no repairs to be made on the second speed solenoid. If found defective, it must be replaced.

*NOTE: When replacing the diode, always replace the mounting kit (consisting of the mica washers and the insulating insert). Be very careful to install all the parts per the illustration. If the mica washer gets cracked or broken, of if the plastic insert is left out, the diode will ground itself and be useless.



DIODE MOUNTING ASS'Y (KIT)

10. VEHICLE SPEED

There are many factors in maintaining the vehicle speed.

Does the owner drive with his or her foot on the brake? This will not only keep the vehicle speed down, but will cause early failure of other parts of the vehicle.

Riding the brake will wear out the brake pads prematurely and will also overheat the batteries, controller and motor which will severely reduce the vehicle range.

Inherent brake drag will also reduce the vehicle speed.

Constantly running vehicle with poorly charged batteries will keep speed down.

A motor that consistently draws too many amps will make the vehicle run slow, will heat up and result in a loss of range as well as speed.

These problems and cures will be covered in other sections of this Manual.

Outside temperature, road grade and wind speed also contribute to vehicle speed being slow.

Low tire pressure reduces speed.

ACCELERATOR

The accelerator is a cam which activates 3 micro switches in succession to supply the motor with 3 different voltages.

The first position transmits 24V through a resistor suspended above the right rear spring. The resistor burns off 6V and allows 18V to go to the motor for starting. In this speed the CitiCar will go about 11 MPH.

In the second position the resistor is bypassed and 24V will go to the motor and drive the CitiCar 23 MPH.

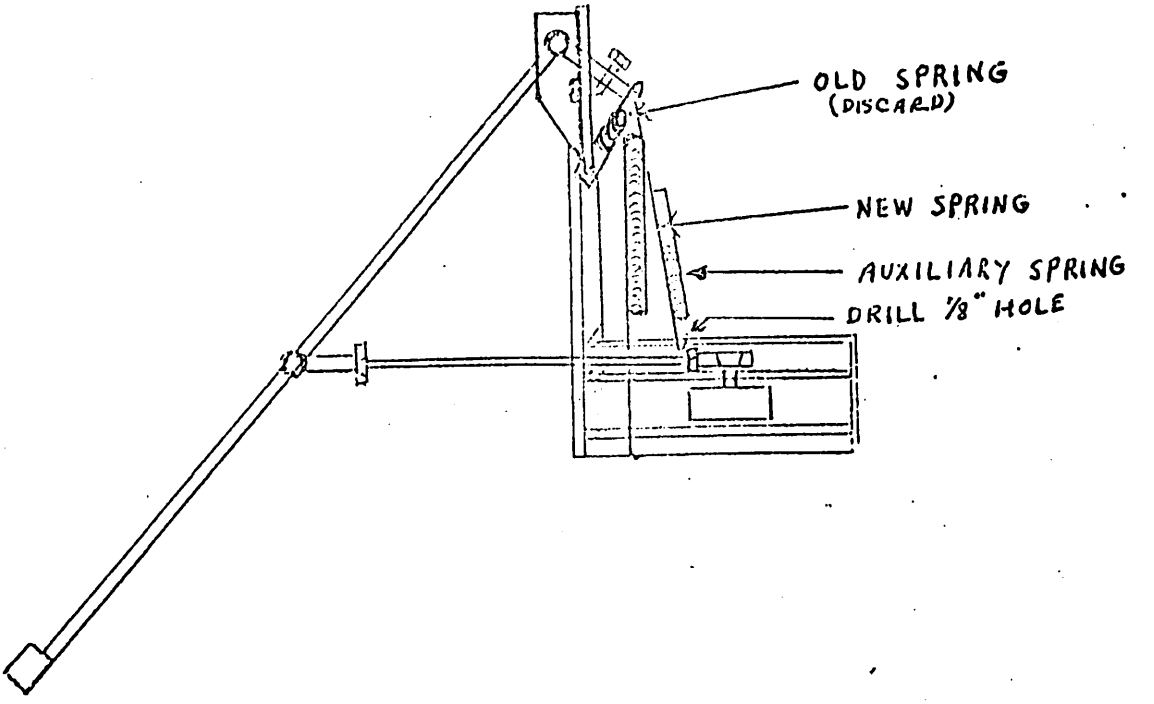
In the third position the SP contactor changes the current from parallel to series and provides 48V.

The first 2 micro switches allow current to flow. The third works opposite. It cuts current flow to the SP and allows the spring loading to return the SP to its normal position which puts the current in series. The SP is in this position during the charging period.

ACCELERATOR SPRING MODIFICATION

Below is a diagram showing the installation of the new spring along with the auxiliary spring. The new spring is attached to the same hole at the top of the accelerator pedal and extends to the bottom of the bracket which holds the cam. The auxiliary is attached to the same hole at the top of the pedal but requires a 1/8" hole be drilled in the cam bracket.

This section applies to cars before serial numbers ending with #2426.



DISC BRAKES
(UP TO CAR NO. 2011)

1. SYMPTOMS

a. Hard Pedal

b. Loss of Pedal

c. Pulls to right or left

a. HARD PEDAL

Most likely due to unequal pressure between front and rear system.

Check vehicle to see if self-adjusting system on rear brakes has been reset in the following manner.

Raise vehicle. Remove rear wheels and brake drums. Loosen self-adjusting rod locking bolt and nut until it can be rotated freely by the fingers. Retighten bolt until friction just overcomes pull of spring mounted between shoes. Reinstall the drums and wheels. Adjust the brake system by pushing brake pedal hard three times, then take up on the park brake adjuster until the rear wheels cannot be turned. Loosen the adjuster until the wheels move freely. Lock the park brake adjuster cable with its lock nut. Handle should pull up no more than 2" in normal use.

Pump the brake pedal a few times to even the fluid pressure in the system. This should make the pedal softer and improve the functioning of the complete system.

b. LOSS OF PEDAL

(1) This can be caused by either air in the system, by a defective part in the master cylinder, or a loose connection in the system.

First, check the complete system for fluid leaks and tighten any connections that are leaking.

(2) If no leaks are found, it is advisable to bleed the complete system to remove any possible air that may be trapped in it.

Always start with the right rear wheel, then the left rear, the right front and, lastly, the left front. Always bleed each wheel cylinder until the fluid is the same color as the new fluid that is being installed in the master cylinder. This assures that new fluid is passed completely through the

system and should indicate that all the air is bled out of the system.

(3) If after trying (1) and (2) and loss of pedal still occurs, check the master cylinder for defective parts.

Most likely, the check valve will be at fault, but check all the parts for possible defects. Look for torn seals or dirt in the fluid. Overhaul the complete master cylinder if necessary. Bleed complete system.

Teflon tape should be on all joints where dissimilar metals are joined in the brake line system. If it is not, you should install it.

c. VEHICLE PULLS TO RIGHT OR LEFT DURING STOPS

This is usually caused by the front disc calipers sticking due to dirt or corrosion building up.

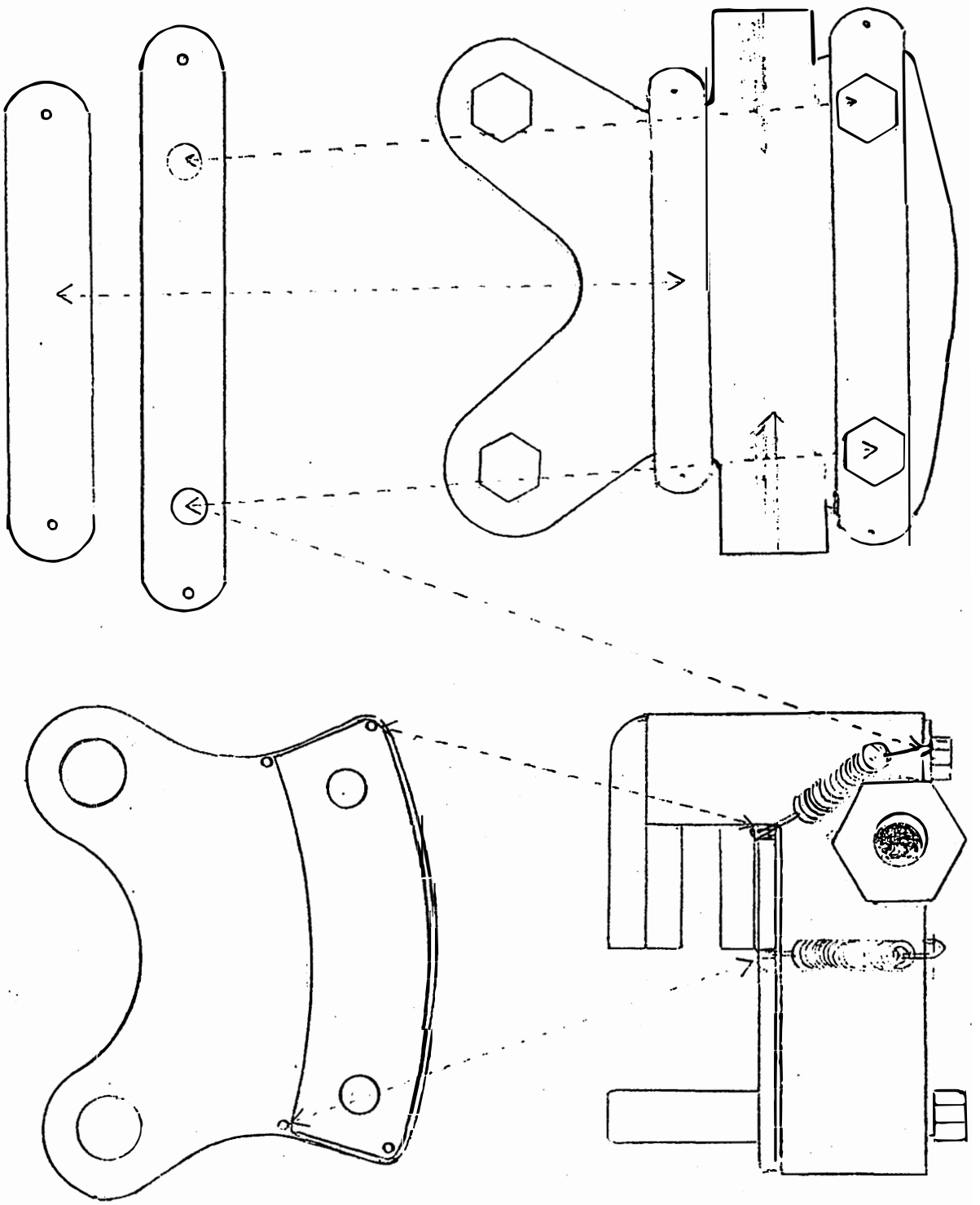
Remove outer disc pad and remove caliper from spindle; clean caliper pin bushings and check to see if the bushings are seated against the spindle plate. Check the end play of the caliper and make sure the caliper pins and bushings don't bind. Clean any debris or dirt out from behind the inner disc pad. Check the caliper piston movement to make sure the return springs on the disc pad are pulling the piston back against the caliper. If not, then the caliper should be disassembled, cleaned of any foreign particles, and a new "O" ring installed.

It has been found that some of the caliper sticking problems are attributed to the return springs. When the pads are about 50% worn, the caliper piston has a tendency to cock in the cylinder.

By installing two additional springs and a new plate on the top of the caliper to attach under the outer pad attachment bolts (also drill two more holds in the pad), this can be eliminated.

The additional springs will allow the piston to be returned to its travel stop and allow the rear brakes to come in before the front. This will also give a significant increase in pad life. (See drawing on next page).

When reassembling the parts, use some anti-sieze compound on the parts. Coat the face of the caliper piston groove; also, the guide pins and bushings. The anti-sieze compound is better than regular chassis lube, due to the fact that it wouldn't wash out as easily as chassis grease.



CALIPER 4-SPRING RETURN SYSTEM FOR FRONT DISC BRAKES

2. PROBLEMS IN THE BRAKE SYSTEM CAN BE THE REASON FOR OTHER MALFUNCTIONS

A vehicle that will not attain at least 35 MPH may have improperly adjusted brakes or front calipers that are bound up in the guide pin bushings, or caliper pistons that do not return properly.

All of the above lead to severe brake drag and not only can cause a slow vehicle, but also will reduce its full range and premature battery aging.

One of the best checks for brake drag is to have the vehicle on a flat, level surface. Then, with the park brake off, push the vehicle with one hand. If it rolls easily, it could be safe to say that there is very little or no brake drag.

A vehicle that has brake drag which is left uncorrected for a long period of time will most likely have battery trouble because the vehicle will work harder to overcome the drag problem and heat up the batteries, not only causing short range but needlessly shortening the batteries' life.

The front disc pads and rear shoes should be periodically checked for wear and must be replaced before the attaching rivets come in contact with the rotors or drums.

When the disc rotors and/or rear drums get scarred or gouged by the metal-to-metal contact of the rivets or the backing plates, it is recommended that the rotor and/or drums be replaced.

DRUM BRAKES (AFTER CAR NO. 2011)

The symptoms remain the same as with the disc brake installation and remedies are similar down to Paragraph C, "Vehicle Pulls to Right or Left During Stops". Disregard this section and proceed as follows:

1. Remove wheel and drum.
2. Inspect lining for grease or other foreign matter.
3. If any foreign matter is found, remove with Brake Kleen. This product is available at all auto stores.
4. Inspect cylinder for leakage. If none, inspect grease seal and replace if evidence of leakage.
5. Reassemble.
6. Drive vehicle at top speed down road with light foot pressure on brake pedal for about 100 yards. Release for 1/4 mile and repeat. This should remove glaze from brake shoes and insure even stop.
7. It has been found that the drum brakes may generate some pulsation when stopping. A small amount is normal due to the size of the vehicle, but it may be advisable to remove the drums and have them resurfaced in a brake lathe to get a smooth stopping surface.

NOTE: There is a dual master cylinder employed in the drum brake installation.

REAR BRAKES (VEHICLES #2781 & ABOVE)

With the installation of the Dana axle, all vehicles from #2781 have 7" drum brakes on the rear.

These units are exactly the same as the 7" units on the front with the exception of the backing plate (plastic) and the brake drum.

When installing new shows or a complete cluster, it must be remembered that the shoe with orange paint goes to the front.

CHARGER

NORMAL OPERATION - ONBOARD LESTER CHARGER

The state of discharge of the batteries will be slightly different every time they are put on charge, but the charger varies automatically the initial charge rates, and taper off of charge rates over the charge period. Thus, the initial charge rate will drop quickly to a lower value, then taper gradually over the charge period to a finish rate of 1-4 amps for the last 1-3 hours.

When batteries are slightly discharged, the ammeter needle will be in the 1-4 amps area for 7-8 hours, but the specific gravity will not rise to full charge until the cells have been equalized. The normal charging with the ammeter needle in the 1-4 amps area is important to achieve equalization of all battery cells every time the batteries are charged. Since the taper of the charging rate (in amps, as indicated by the ammeter needle) is controlled by the rising voltage of the batteries being charged, proper performance of the charger and resulting good battery life is dependent upon the following factors:

1. An adequate AC line to handle the power required. An electrician or the power company should survey any questionable installation.

2. All cells of the batteries must be good, raising to approximately 2.5 DC volts per cell while still on charge or near the end of a 12-hour charging period. When in doubt, check each cell with a single cell voltmeter while still on charge. If a low reading is obtained, check the low cells with a temperature corrected hydrometer.

   NOTE: Hydrometer float must be thoroughly clean to obtain accurate specific gravity readings.

3. Battery and controller connections of the vehicle must be clean and tight.

4. The timer knob is set to "ON" (12 hours) as long as ammeter needle tapers down into green area toward the end of the 12 hour period.

TROUBLE SIGNS

The necessity of adding water more frequently than two or three weeks, and/or hot battery cases at the end of the charging cycle, indicates the finish rate is too high, due to one or both of the following:

1. One or more bad cells in the batteries.

2. Batteries are starting to age. In this case, batteries should be charged at a lower rate. A good way to do this is to charge the batteries in two stages of 6 hours each with a rest period of at least 2 hours. This gives batteries a chance to cool and will result in a better charge.

CAUTION:

Due to the electrical characteristics of this charger, it is possible to improperly hook up the batteries and not blow the fuses when charging. When installing batteries, be sure polarity is correct. With a DC voltmeter, check terminal voltage and polarity at the vehicle wiring terminals. When working near capacitor terminals, be sure charger is turned off. With charger "on", transformer capacitor terminals provide a very high voltage. Care is to be shown.

Ammeter Does Not Register and No Transformer Hum

In the event no hum is detected from the transformer, check the circuit from AC plug to transformer primary with a suitable continuity tester. This would include AC cord, timer and connections.

Transformer Hums But No Ammeter Indication

Remove the DC fuse on the front of the charger and check for continuity. Replace any blown fuses. Also, check the ground fuse circuit in the control box. Check to see if the positive charger lead is connected to the 48 volt positive battery terminal.

1. Remove positive charger lead from battery, using a low voltage continuity tester. Connect clip lead (-) to chassis and test probe (+) to charger wire. Circuit should be complete. If not complete, it can be assumed an "opening" in the complete DC circuit exists; check fuses, fuse holder connections, DC cord and diode connections.

2. If circuit is complete, then reverse test light leads. Circuit should not be complete. If circuit is complete, then probably one or both diodes in the charger have shorted.

3. If 1 and 2 check O.K., check for shorted capacitor. Remove one wire from a capacitor terminal and place test clip from lamp on terminal. Probe to other terminal. If circuit is complete, capacitor is shorted and must be replaced.

Charger Fuse, One or All, Blow as Soon as Charger is Fully Installed Into Vehicle

This condition may be caused by:

1. Reverse polarity between charger and batteries, such as incorrect installation of batteries or positive charger lead.

2. A short circuit failure of one or both diodes. First, disconnect one diode. With a low voltage continuity tester, current should pass in one direction only through the diodes. Connect one lead of the tester to the diode mounting plate. Connect the other lead to diode lead. Then reverse test leads. If diodes allow current to flow in both directions, replace entire heat sink assembly.

Charger Fuse Blows During Charge

This may be caused by a loose fuse. Charger fuses should be screwed in at maximum hand tightness. A weak fuse or poor fusehold or connection can also cause this condition. Always check the ground fuse holder and connections in controller box and battery compartment for looseness.

AC Line Circuit Breaker Opens or Fuse Blows

If this happens when charger is turned on, disconnect positive charger lead from batteries. If this still happens, the diodes, timer motor coil, or transformer may be shorted. To check timer motor coil, disconnect one primary wire leading to timer and connect test lamp to coil terminals. If lamp glows, coil is shorted. To check transformer, disconnect transformer secondary leads #1 and #4. If the AC fuse still blows or breaker still opens after such disconnection, the transformer is shorted and must be replaced.

Charger Does Not Turn Off And/Or Timer Knob Does Not Move

Replace timer.

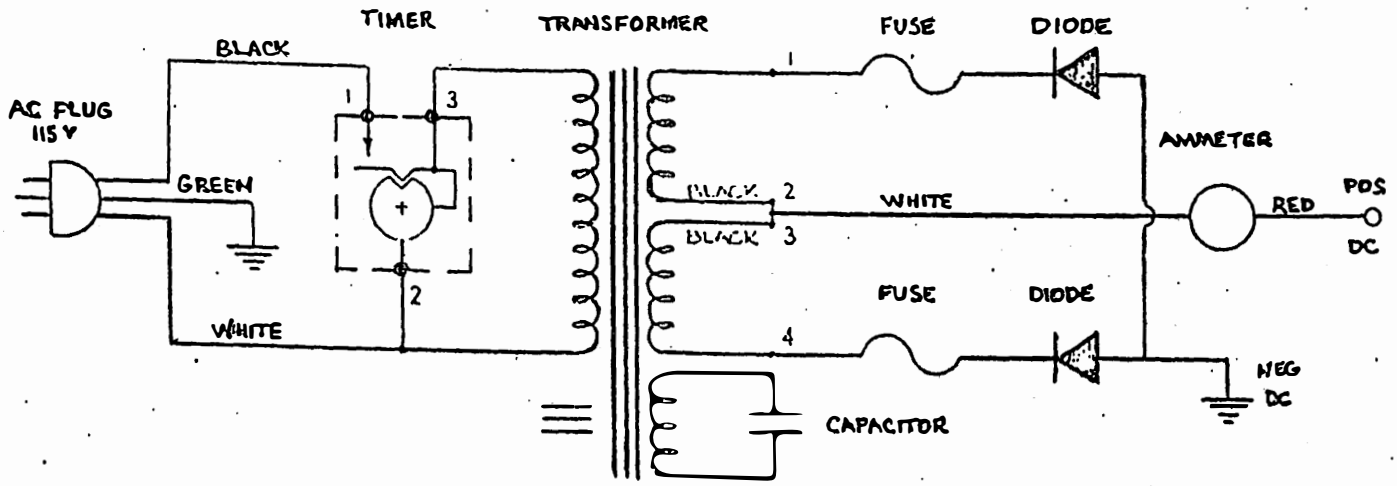
Charger Output Is Low

Probable cause is one diode failing (shorted), blowing one fuse. Replace fuse. If fuse continues to blow, check for diode failure.

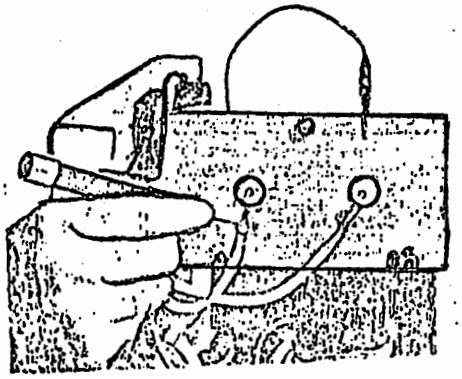
Transformer Shorts or Burns Out

Failure of transformer may be caused by natural aging or premature shorting of adjacent coil turns. Symptom is low or complete lack of output and can be observed on ammeter. However, charger may still hum when timer is "ON". Replace transformer or complete charger.

CHARGER CIRCUIT WIRING
(LESTER)



DIODE CIRCUIT CHECK



OPERATIONAL PROCEDURES FOR VANGUARD AUTOMATIC CHARGER

Upon plugging charger into 110VAC 20 amp or better service, the internal interlock will cut in and charging will automatically begin.

A rate in excess of 30 amps is not uncommon for the first few minutes of operation into heavily discharged batteries.

The charge rate will average approximately 20 amps for the majority of the charge cycle and the amperage will gradually taper as the batteries approach full charge, but the voltage will increase.

When the majority of the cells have reached their full charge as determined by the total voltage of the battery, the charger will automatically shut down and the panel "ready" light will come on.

At this point the charger will begin pulsing the battery as required to maintain it in a full state of charge. As cell equalization improves during this time, the pulse rate will change with the "off" periods (light "on") increasing in relation to the "on" periods.

ONCE THE LIGHT STARTS TO FLASH, THE BATTERIES CAN BE CONSIDERED FULLY CHARGED FOR ALL PRACTICAL PURPOSES.

The charger can be left plugged in for long periods of time without heating the batteries, boiling off the electrolyte, or harming the batteries. It will automatically maintain the batteries in peak condition.

Economy and good judgment suggest that the charger should be unplugged when it is known that the vehicle is to remain idle for extended periods. Prior to placing the vehicle back in service, a short charge duration should again signal with the "ready" light that the batteries are in peak condition.

SPECIFICATIONS - VANGUARD AUTOMATIC CHARGER

The automatic charger has been developed specifically for Vanguard electric vehicles. It is of solid state design and is cut off controlled by the cell voltage of the batteries, as opposed to the timed charger.

Characteristically, a lead acid storage battery cell will exhibit a voltage rise from the 2.2 volts during charge, to over 2.4 volts as it reaches full charge. It is this voltage rise which controls the Vanguard charger, turning it completely off and lighting a "ready light" on the front panel. Once this point is reached, the charger will continue to monitor the battery and send short timed pulses to the battery as required to keep it is full charge without destructive heating. The charger may be left on indefinitely without harming the battery. Electrolyte boil off is minimized, and cell equalization is excellent.

SPECIFICATIONS:

Input: 110VAC 60 CPS 15 Amps 20 Amp service required.

Output: 25-28 amp charge rate (start) into 24 cell battery system

Customer Controls: None

Charge Lamp and Ready Lamp: On Dash

Interlock: Provided internal to charger

Circuit Protection: External

Size: 12" wide 6.5" deep 6" high overall

Weight: 22 pounds (pending)

TESTING - VANGUARD AUTOMATIC CHARGER

The automatic charger is pre-set at the factory for 57-1/2 volts with a device that simulates a completely charged set of batteries. It is possible that on a fully discharged set of batteries, the voltage reading may only be 50 volts.

1. To test the charger, it must be connected to a set of batteries in order to the automatic circuit to operate properly.

2. The ready lamp MUST be plugged in the circuit or a 12 volt bulb tapped in the line when testing because the lamp is part of the automatic circuit.

   IF THE READY LAMP IS BURNED OUT, THE CHARGER WILL NOT OPERATE. VOLTAGE CAN BE FOUND AT THE TRANSFORMER SIDE OF THE SCR DIODE BUT NO VOLTAGE WILL PASS THE DIODE.

3. If the ready lamp is good and the charger still fails to operate, jumper the SCR diode. Run a jumper wire from the small lug on the face of the diode (the white wire is soldered there) to the side terminal of the diode.

The charger should put out 20 amps. If the charger operates when the diode is jumped, the printed circuit is defective and must be replaced.

If the charger does not work, the SCR diode is bad and must be replaced. (See Note 2).

Before making any checks on a charger that does not work, check the ready lamp to make sure the bulb is not burned out.

To check the charger cut off operation, charge the batteries to achieve a balance (about 10 hours). If the ready lamp comes on within 8 to 10 hours, check the voltage output, and check the specific gravity. If the specific gravity is between 1275 and 1300 and the light is coming on at 56 to 58 volts, it is operating properly.

If the gravity is low all across the battery pack, the lamp may light early and the volt pot may have to be adjusted up (see Note 3).

NOTE 1: The voltage can be adjusted by inserting a small screw driver in the hole at the left side of the charger.

If the gravity is high (between 1275 & 1300) and the lamp does not come on, the volt pot should be adjusted counterclockwise until the lamp comes on (See Note 3).

NOTE 2: When replacing the SCR diode, make sure the solder connections are good, but DO NOT overheat the diode with the soldering iron or put too much stress on the terminal. When mounting the diode to the charger, use some silicone diode mounting compound between the diode base and the charger case.

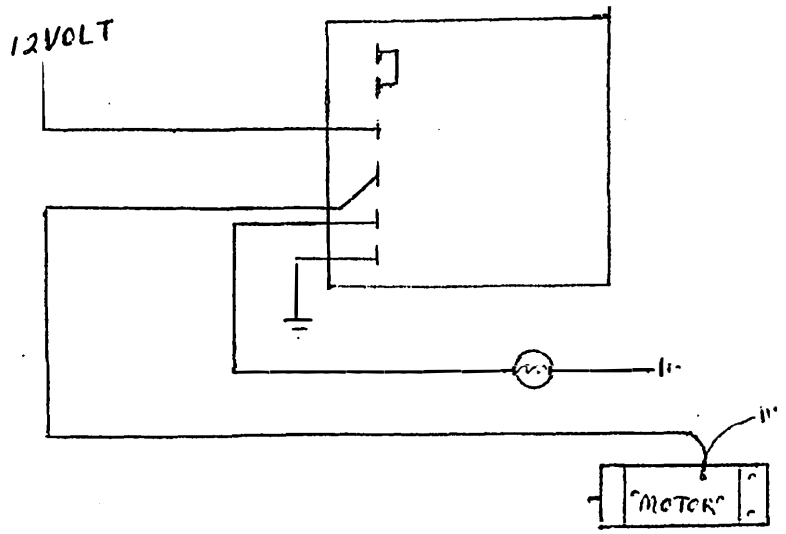
NOTE 3: Pot Adjustment: Turning the pot clockwise will increase the voltage; counterclockwise decreases the voltage.

NOTE 4: If the charge is low and the charger seems to operate properly, check the circuit breaker, after the system gets warm, to see if the breaker has not overheated and is cutting in and out.

TROUBLE SHOOTING GUIDE

SYMPTOM	POSSIBLE CAUSE
No output on ammeter, charge light ON.	1. Defective CR-3 2. Shorted CR-4 3. Open "ready" lamp 4. Shorted CR-5 Removing CR-4 or CR-5 from the circuit will permit full charging if they are at fault.
No output ammeter. Charge light OFF.	1. Open 120 VAC house fuse or breaker 2. Bad extension cord 3. Open connection on transformer primary side
Ammeter shows charging. Charge light OFF.	1. Defective interlock relay or charge lamp
Low charge rate.	1. High impedance cells in batteries 2. Low AC power line voltage 3. Light duty extension cord 4. Poor connection from charger to battery
Charge tapers but will not shut off.	1. Improper setting of pot R-5--set for 58 V output 2. Cell imbalance--check with hydrometer 3. Open CR-4--check by rotating pot R-5 counterclockwise. If charging shuts off, CR-4 is good. Repeat 1 & 2 above.
Charger shuts off prior to charging batteries fully.	1. Improper setting of R-5. Increase setting (clockwise).

HOT LAMP CIRCUIT



The hot warning lamp is used to indicate an overheating condition in the motor. The motor is designed to operate between 185° and 195°*. The hot light comes on at 225°*.

Connected to the motor field windings by the use of fiberglass tape, one will find the thermal switch sensor; this is used to measure the motor heat. The sensor is connected through the wiring harness to the printed regulator circuit board, mounted on the back of the speedometer head. When the motor gets hot, the thermal switch opens and the regulator board turns on the lamp indicating a hot condition at the motor.

TROUBLE SHOOTING

If it is thought that the hot lamp is not operating properly, the following checks should be made.

1. Hot Lamp Stays On After Key Is Turned On

   a. Check for loose connections in the circuit. If the circuit is not complete, the register board will not operate and the lamp will not go out.

      Check all the connections on the circuit board to make sure they are tight.

* Degrees measured externally.

b. Connect a jumper between the thermal switch lead connector and the harness connection and a suitable ground. This should be done where the motor leads connect via butt connectors to the harness. If the lamp goes out, the switch (inside the motor) is not working and it should be replaced.

2. Lamp Lights After Driving the Vehicle a Short Distance

a. First, ground the system as in Part 1b. If the lamp goes out, the thermal switch may be working properly.

b. Tape a metal meat thermometer, or any thermometer that will register to 250°, to the motor and run the vehicle until the lamp comes on. Check the thermometer. If it reads a temperature less than 225°, the circuit board is not operating properly and should be replaced.

c. If the lamp comes on at 225° or over, then the motor is hot and it may need to be replaced.

HOT LAMP CIRCUIT NOTES

In vehicles with serial numbers below 1751, the thermal switch was connected to a light green wire that ran to the PC board. The other switch wire was either connected to the motor field bolt, the end plate bolt or direct to the chassis frame rail.

The color code for the wiring did not always match what was on the circuit print.

In vehicles 1751 and above, the switch lead to the PC board is yellow and the other lead is connected to the chassis ground wire at the harness.

Also, the top two leads on the PC board which are wired on the late production vehicles (after 1750) are used for the brake warning lamp circuit to be used when the vehicle has the dual master cylinder installed.

DASHBOARD ELECTRICAL

Upon checking any switch or lamp on the dash, check to see if the switch or lamp is getting power to it. (A test lamp should be used for this). In most cases, a problem can be traced to the fuse box, either a blown fuse or a loose connection at the fuse box.

In the case of a bad lamp, it must be noted that in vehicles before serial number 1751 the bulb can be replaced by pulling the socket out from behind the dash and replacing the bulb. In vehicles 1751 and above, a burned out bulb also means either replacing the bulb socket or the switch that the bulb is in.

If the ground wiring at the dash panel has come loose or has fallen off, the dash lamps will intermittently flash on and off and the turn signal actuation will cause all the lamps in the vehicle to flash.

Head Lamps, Tail Lamps and Marker Lamps

If the bulb is not burned out, it is then usually the power connection or the ground connection to that lamp that has come loose.

On earlier model vehicles (up to car 1750) with floor mounted high beam switch, check the connection at the switch. If the head lamps do not work, also check to see if the switch works.

WIPER MOTOR

There are two types of wiper motors used. Some vehicles have the Delco Remey and others have American Bosch.

The type can be distinguished by the wiper arm. The Bosch unit has the wiper arm fixed to the motor shaft by the use of a large crown nut. The Delco arm is pushed on.

If the wiper does not work, check for blown fuse. Then check for power to the switch. Check for power away from the switch. If there is power to the motor but it still does not work, check the motor transmission and wiper arm to see if something is holding it from working. If not, replace the motor.

WIPER MOTOR WORKS BUT DOES NOT PARK WHEN TURNED OFF

Some Delco motors had a transistor canceling device mounted on the wiper motor chassis mount. If the motor does not cancel, replace this device. If the motor still does not cancel, then replace the motor after checking all the connections.

Other Delco equipped vehicles had a self-canceling dash switch. Check the switch first to see if the brass cross bar (on the back of the switch) is intact. If so, check all wiring connections. If they are O.K., then the motor is bad.

On the Bosch motors, first check wiring at the wiper switch, then check the diode plugged into the switch. If they are intact, then the motor is probably the cause of the malfunction.

WIPER MOTOR NOTES

It should be noted that all Delco wiper motors were connected on the 18 volt circuit serving the voltmeter, horn and wiper and the voltage was stepped down to 12 volts by a resistor that was mounted on one of the anchor bolts of the motor. This should always be checked when trouble shooting motor problems and replaced if it is not sending a full twelve (12) volts to the motor. If the resistor is sending more than 13.8 volts, it should also be replaced as more voltage than 13.8 will damage the motor.

DASH DIMMER

The dimmer receives its power from the head lamp switch.

If the dash lamps will not dim, the resistor pot in the switch may be bad. The complete dimmer switch should be replaced.

On vehicles after serial number 1751 (and until further notice), the dash lamps will not dim to the point where they go completely out. This is due to the use of the same dimmer as in early production vehicles and also the usage of less lamps, so there is not enough resistance created to completely turn them out.

DEFROSTER SWITCH

The defroster switch is not connected. Because of Federal regulations, it must be installed in every vehicle built, even though not connected.

Owners of earlier vehicles may now purchase the new optional defroster and have it installed.

Note 1: In some early production vehicles with factory-installed heaters, the electric start heater switch may have been connected to the defroster switch. If this is the case, you may reconnect the heater to the red and black wires that are located under the dash above the charger. This was only done on some vehicles below serial number 1751.

DEFROSTER SWITCH (CONTINUED)

Note 2: On vehicles with the auxiliary defroster strip affixed to the windshield, the defroster switch is used to operate the relay that turns on the defroster.

Note 3: On vehicles with the Dana axle and the factory installed heater/defroster, the defroster switch has been moved to the heater control panel and the old switch mounted on the dash is for use as an accessory switch.

F&R DASH CONTROL SWITCH

Because of its neutral interlock, the F&R dash control switch must be replaced with an exact item.

If for some reason the internal workings of the switch become jammed, do NOT attempt to repair the switch. (The internal parts are spring loaded). The complete switch must be replaced.

HORN

VEHICLES BEFORE SERIAL NUMBER 1751

In vehicles before serial number 1751, the horn was on the 18-volt circuit and is mounted on the front chassis cross member. The horn mounting bracket is insulated from the vehicle chassis by nylon washers. This is because the horn has power to it at all times. The horn button grounds the circuit thereby blowing the horn.

If the horn does not work, check it by grounding the horn to the chassis. If it works, then check all the connections. Make sure that where the power wire bolts to the horn that all the paint is cleaned off the connection. Check the plug-in connection for the horn button wire and clean it. Check the horn button plate and clean it. Check the horn button in the steering column to make sure that it makes contact with the horn button plate.

The horn also has an adjustment screw which can be turned if the horn will not work after all the other parts have been checked.

If the horn still does not work, replace it.

VEHICLES AFTER SERIAL NUMBER 1751

The horn is activated by pushing in the turn signal lever. These vehicles operate at 18 volts (after Serial No. 2854)

The power for the horn goes first to the horn button and the horn itself completes the ground.

If the horn fails to operate, first check the fuse. Then check the horn with a jumper wire connected to 18 volts*; if the horn works, the horn button at the turn signal may be at fault. However, the circuit should be checked for continuity before replacing the signal assembly. Also check the horn button connection in the signal assembly for dirt or corrosion which also keep the horn from working.

* After Serial No. 2854

TURN SIGNALS

VEHICLES BEFORE SERIAL NUMBER 1751

Signal Stat Model 900 is not self-canceling.

Most problems with this turn signal system can be traced down to a bad fuse, blown bulb, a bad connection at the lamp, or a bad flasher.

If the complete system is out, check the fuse.

In some vehicles, there is a fuse in the circuit line between the fuse box and the flasher.

If one side or the other is out, check to see if the complete side is out. If not, it may be a bad bulb or loose connection.

Most times the rear lamps go out due to the connection coming loose.

If the complete side system is out, it most likely is the flasher.

If the indicator lamp is out: first check the bulb by removing the housing cover at the signal indicator. If the lamp is not bad, the flasher is most likely out.

Before the flasher is replaced, check the connection on the blue wire for continuity and check the flasher housing for proper ground.

NOTE: On some early production SV-48 vehicles, the rear turn signals were reversed because of the wiring harness being relocated to the right side of the chassis. The wiring harness connection plug under the dash has been changed to correct this situation. On these vehicles the yellow and green wires are inter-connected at the connector block.

VEHICLES AFTER SERIAL NUMBER 1751

Self-canceling type.

These units are English Lucas units and incorporate not only the turn signals but also the high beam, high beam flashing device and horn.

They work basically the same as the earlier type, but use two (2) relays mounted on a plate behind the dash just above the steering column.

The relays are spring loaded to hold them in the off position until the relay coil is activated for each side.

If malfunction occurs, always check for a burned out light bulb. If the dash indicator lamp fails to operate, it is most likely the relay spring tension for that side.

Check the fuse and if fuse is intact, check relays. If relays operate properly, replace flasher.

Remove the relay board from the dash and engage the turn signal lever for the side not working.

Depress the relay for that side with a finger. If the lamps operate, then bend the spring mount slightly so that the relay activates.

Turn the signal to the off position to make sure the signal relay shuts off. If it does not, then the spring mount has too little tension and must be rebent.

NOTE: If a complaint should arise about the signals not always canceling, check the canceling pin in the steering wheel to make sure it is properly seated into the canceling locater slot. It may be necessary to install a small piece of rubber hose (1/2" to 5/8" long) over the pin to take up some of the slack in the slot in the plastic sleeve to make the canceling locater cancel the turn signal.

BRAKE WARNING LAMP

On all vehicles before serial number 2211, the brake lamp on the dash is used only to indicate that the park brake is engaged; also to indicate that the vehicle will not move until the park brake is released.

The lamp would also indicate that the switch needs adjustment if the park brake is off and the lamp is on.

On vehicles after serial number 2211, the lamp will also indicate that there may be a problem with the brake system. The light is designed to go on if pressure drops in the system.

If, after working on the brake system (such as bleeding the system), the lamp stays on, then it will be necessary to remove the switch from the regulator block (located on the left front side of the chassis) and re-install it (the switch) in the block to reset the system.

BATTERIES

The batteries used to power the vehicle are electric vehicle type, 106 minute, 6-volt batteries and only exact replacements should be used.

Batteries should be kept charged. A battery left in a discharged state will go bad in a very short period of time. Keep all terminal connections clean and tight.

Keep all batteries not only clean but also dry. When moisture builds up on batteries, it can draw the charge out of them.

Only add distilled water and only add that water at the end of the charge cycle. This way, the electrolite will have expanded to its fullest extent and there will be no chance of the electrolite spilling over the battery top during charging.

Adding water before the charge will only lead to spilling over of electrolite and this will kill the battery.

Remember, only add water up to the filler ring in the battery top and never allow the water level to drop below the plates.

BATTERY CHECKS

Inspect the battery visually for case condition (corrosion, cracks) and water level.

If the case is cracked, replace the battery. DO NOT attempt to repair the case.

Remove any corrosion from battery terminals and hold-down plates with a solution of baking soda and water.

CAUTION: Do not get any of the solution into the battery.

State of Charge Test

Always test the state of charge with a temperature corrected hydrometer.

Specific Gravity Reading	Charged Condition
1.260 - 1.280	Fully Charged
1.230 - 1.250	3/4 Charged
1.200 - 1.220	1/2 Charged
1.170 - 1.190	1/4 Charged
1.140 - 1.160	Just about flat
1.110 - 1.130	All the way down

The hydrometer will only give the specific gravity in relation to the state of charge. Even though the specific gravity may read 1.280, the hydrometer will not tell how long that charge will hold up.

The most effective way to test the condition of the charge is to use a battery load tester or test the vehicle under a load.

The load test method will show just how long the battery or batteries will last.

By using a voltmeter on each battery, or a bank of voltmeters on all the batteries, the voltage drop can be recorded to find out what battery, if any, might be causing trouble in the system.

Connect the voltmeter or meters to the battery pack so that the voltage of each battery can be recorded. Drive the vehicle and record the voltage drop.

If, before moving the vehicle, any battery shows less than six volts, that battery should be charged so that the complete pack will be the same. When making this test, all the batteries should have about the same voltage drop. This indicates a good pack of batteries. Any battery that drops back more than 3 volts over the rest of the pack, (if all but one of the batteries dropped back to 5 volts from 6 volts, and one battery dropped to 2 volts) that battery, or batteries, should be considered bad and should be replaced.

If a defective battery is left too long without being replaced, it will pull down other batteries, and they may have to be replaced also.

Batteries are the life of any electric vehicle and should be properly maintained at all times.

When checking the battery pack, always check the battery cables and cable connections. Look for cracked or broken insulation, broken or loose clamps, or any corrosion that may be building up under the cable insulation.

Corrosion that builds up under cable insulation will show up usually near the terminal end as a slight bulge under the insulation.

Any cable problems can make even a good battery inefficient and also can affect the type of charge that the battery receives.

HEATER/DEFROSTER

The heater models used on the Dana and Terrell axle CitiCars work on the same principal. They blow air through the motor via a fan to extract the heat generated by the motor's normal operation. The air is heated as it passes through the motor to a manifold where it is either shunted to the outside or forced into the vehicle through hoses.

On vehicles with the Dana axle, air pick-up scoops have been installed in each 1/4 panel to channel cool air to the motor. In cold weather these scoops can be closed off by the controls behind the driver's seat. This will recirculate the warm air from inside the vehicle back through the heater system.

When operating the defroster control, the heater control must also be pulled out.

In some areas the auxiliary defroster may have to be installed to give enough heat to properly warm the glass.

NOTE: The heater will not give instant heat. The heat will build up as the motor gets warm.

HEATER SERVICING

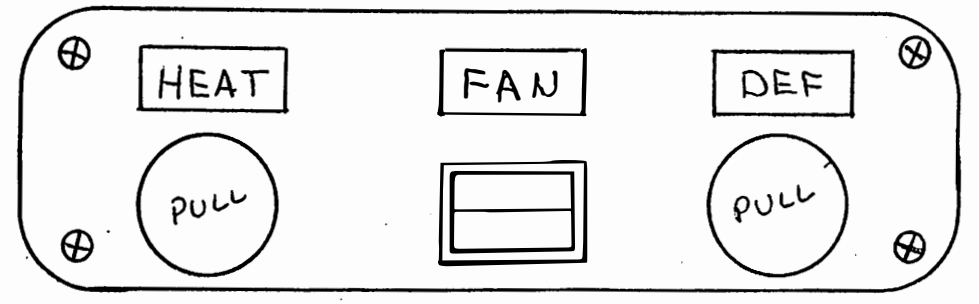
Most of the heater parts should not give trouble. If any of the control cables become hard to move, a small amount of oil on the cable should free them.

If the rear compartment control is hard to operate, some oil in the slots below the knobs will loosen them.

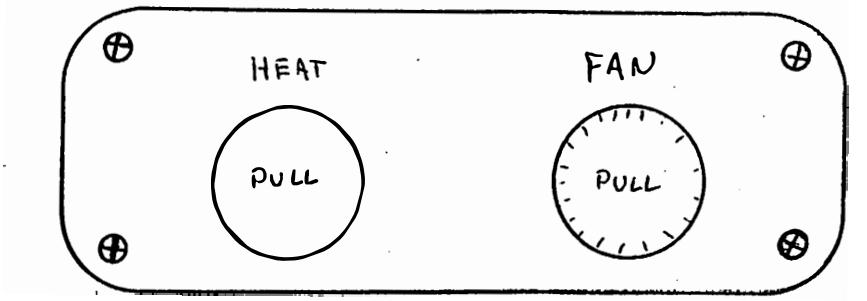
Periodically remove the hose from the rear of the manifold and check for foreign material that might keep the manifold doors from operating properly.

If the fan fails to operate:

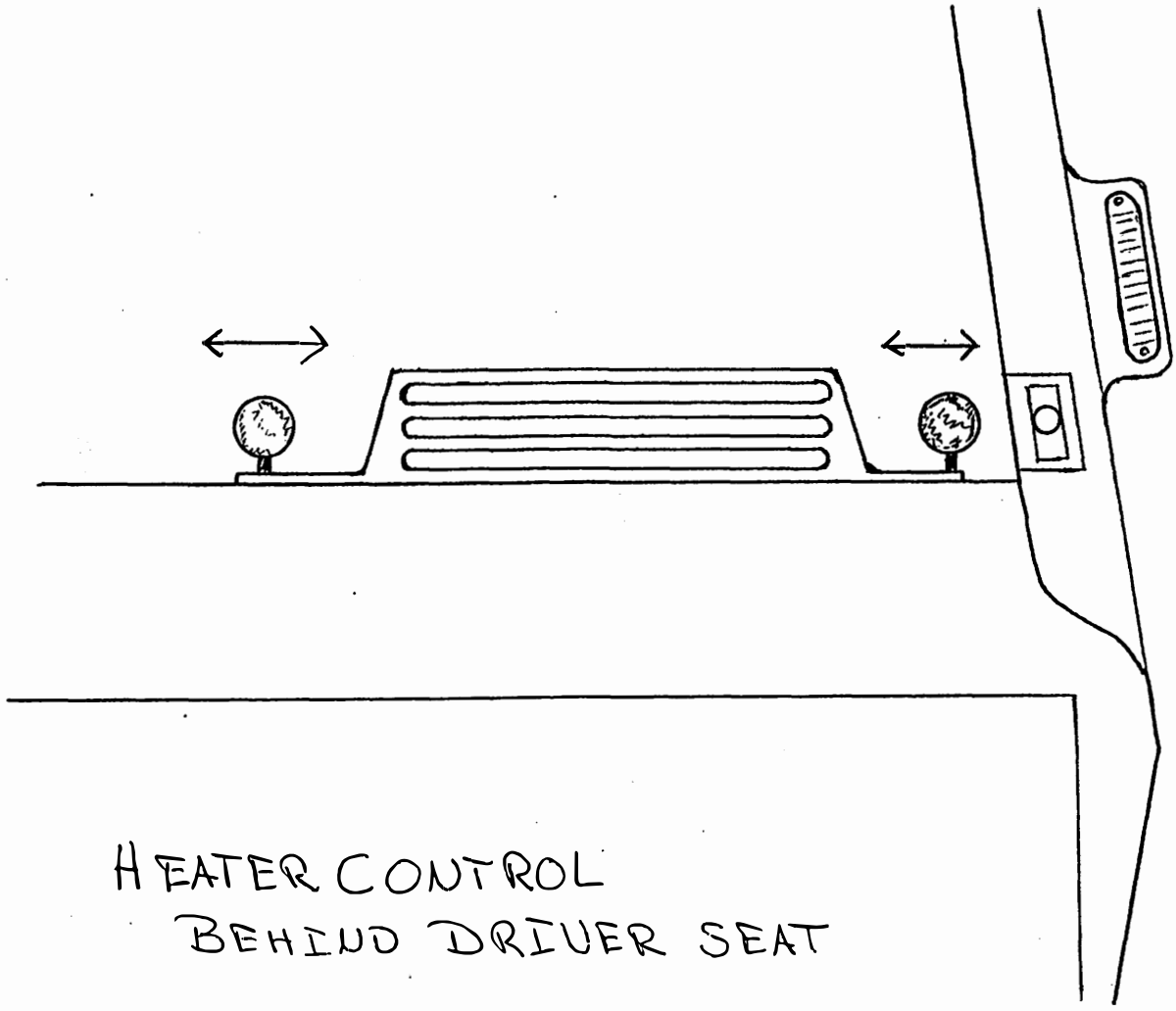
- check fuse
- remove hose from fan housing and check to see if fan blade will turn free
- check for loose or broken wire in circuit.



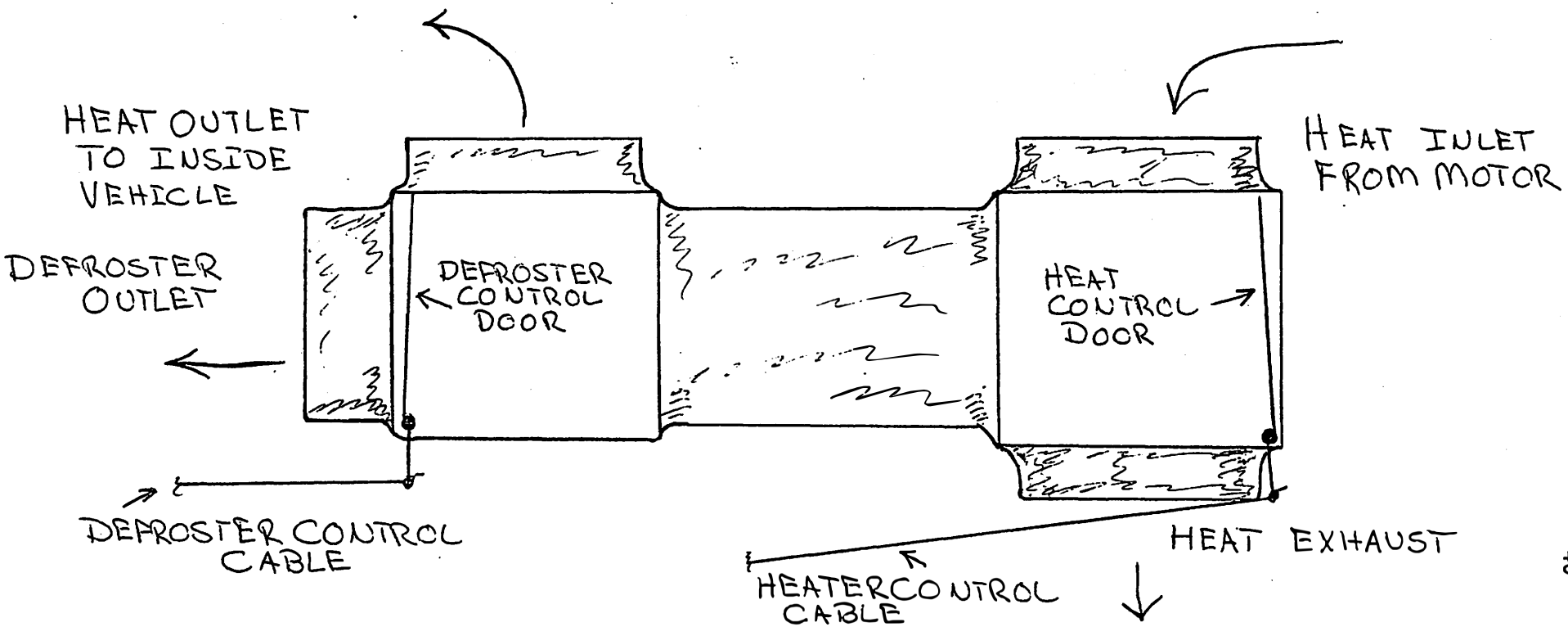
HEATER CONTROL - VEHICLE 2781 AND ABOVE - FACTORY INSTALLED ONLY



HEATER CONTROL - DEALER INSTALLED - TERRELL AXLE ONLY



Note: In the "Winter" position the motor is not forced air cooled unless blower switch is "On". Use the "Summer" positions whenever possible.



HEATER/DEFROSTER CONTROL MANIFOLD

INSTRUCTIONS FOR DEALER INSTALLED DEFROSTER KIT

1. Mount defroster on windshield with epoxy glue 2" above bottom of windshield and 4" toward center from left edge with wire lead toward left.
2. Open door and drill 5/16" hole in left side of dash.
3. Insert wire lead from defroster until attached grommet is seated.
4. Drill two 9/64" holes in bottom of dash to the left of the fuse block. Use templet on diagram just below relay.
5. Cut one lead wire from defroster and attach to lower lug on relay.
6. Other end of cut should be attached to center lug on relay then fastened to fuse holder at right end of fuse block.
7. Balance of wire should follow wiring harness under the floor to the battery box.
8. Hook 2 wires up according to diagram.
9. Install relay under dash.
10. Run jumper wire from ignition switch to defroster switch.
11. Then from defroster switch to base of relay.
12. Ground other lug on relay switch.

SEBRING VANGUARD, INC

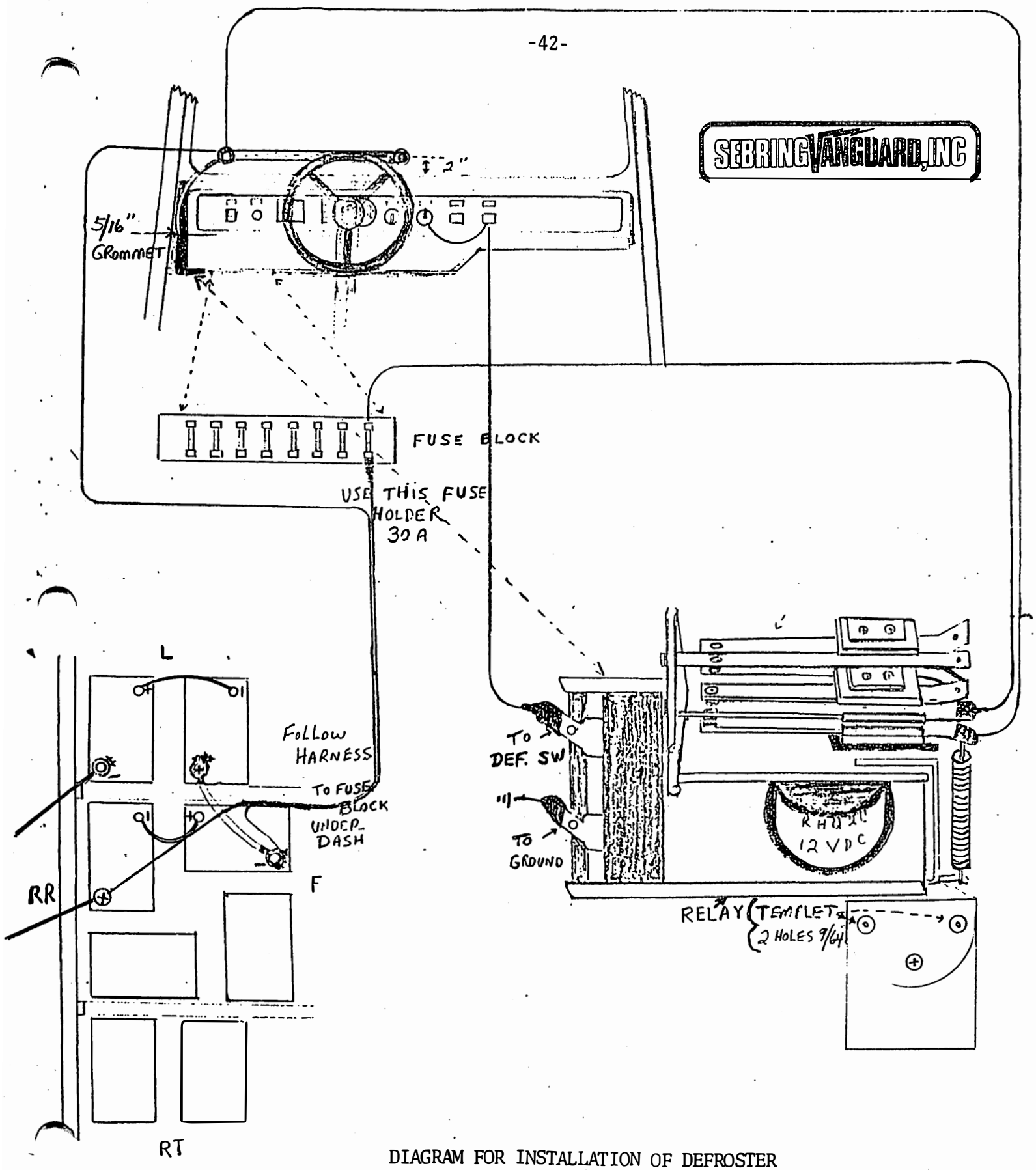


DIAGRAM FOR INSTALLATION OF DEFROSTER

GENERAL MAINTENANCE INSTRUCTIONS - TRANSAXLE

CAUTION: Replacement axles are shipped to the dealer without lubricant. Follow lubrication instructions below before operating.

Numbers is parenthesis ( ) refer to parts shown on Parts List.
Numbers in brackets [ ] refer to tools in Tool Kit.

1. Tighten ten bolts securing housing (1) and (3), and three bolts securing motor to housing (3), after first two weeks of operation. Check periodically thereafter.

2. Maintain lubricant level in housing as prescribed in lubrication instructions below.

3. When servicing axle, use care not to score, mar, or deface surfaces which come in contact with seals or bearings.

4. Prevent dirt, dust, or any foreign matter from getting into the axle housing when the motor, filler, check or drain plugs have been removed.

5. When working on internal parts of axle, prevent damage to bearings by pressing against the inner race only to remove or install. ("Press" indicates the use of an arbor press, or similar device to force an interference fit). Bearings must be properly aligned to press straight. Use clean tools with clean hands to keep bearings clean. Replace damaged bearings to insure trouble-free operation.

6. It has been noticed that some transaxles have a tendency to leak from the top. This is because of the vent hole in the filler plug. (This type plug is removed with 1/2" wrench). This leakage can be stopped by removing the filler plug and replacing it with a pipe plug with no vent hole. This leak is actually caused by the transaxle angle, the intermediate gear throws the axle oil at the vent hole making it spill out.

LUBRICATION INSTRUCTIONS

1. Remove filler plug (2) from gear box. Through filler plug hole, add lubricant: SAE 90-EP (approximately 11 oz.) Replace filler plug and tighten.

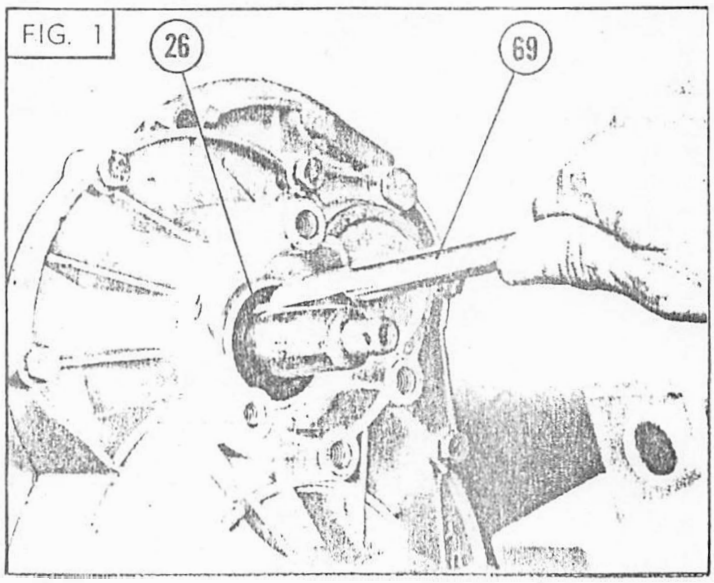
2. Drain original lubricant from axle after 1,000 miles use and refill as in paragraph 1. (Note - two drain plugs (43) and (44) are located at the bottom of the axle housing. Remove plug located at the very bottom and filler plug (2) to drain lubricant. Drain and refill after each 12 months' operation thereafter. Be sure the drain plug is reinstalled.

SERVICE INSTRUCTIONS

1. TO REMOVE SEAL ON SPEEDOMETER SHAFT

   a. Remove speedometer adaptor and plate.
   b. Clean dirt from around seal (26). Insert tip of seal puller [69] undr seal lip, twist out by bearing shank of tool against casting, push down on handle as shown. (Fig. 1).

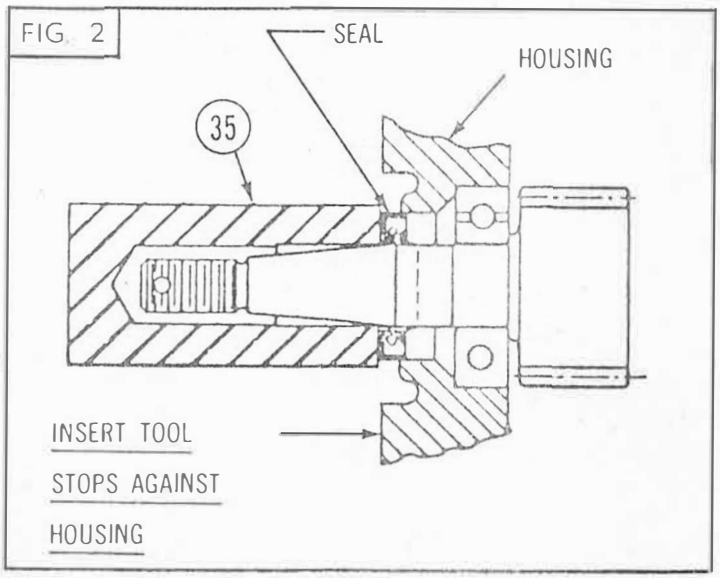
FIG. 1



2. TO REPLACE SEAL

   a. Lubricate the rubber seal lips. Carefully push new seal insert tool [35] with the seal lip turned as shown (Fig. 2).

FIG. 2



b. Clean and deburr edge of housing bore. (Break sharp edge).

c. Place insert tool [35] over shaft and push insert into housing until tool touches housing.

d. Remove insert [35] with a twisting motion.

3. TO REMOVE AXLE SHAFT (13) and (16) OR AXLE SHAFT BEARING (12) - FOR SHAFTS HAVING INTEGRAL WHEEL PLATES.

a. Remove retainer ring (19) using pliers [37].

b. Remove axle (13) and (16) with bearing (12) by pulling from axle tube.

c. Use bearing plate [79] inserted between bearing and wheel flange plate and press bearing and bearing safety ring from shaft.

CAUTION: Do not reuse old bearing after removing - replaced with a new bearing.

4. TO REPLACE AXLE SHAFT 913) and (16) OR AXLE SHAFT BEARING (12) - FOR SHAFTS HAVING INTEGRAL WHEEL MOUNTING PLATES.

a. Clean bearing seat of axle to be installed.

b. Using suitable pipe against bearing inner race, press new bearing (12) on to shaft (13) or (16) until bearing seats firmly against shoulder. Use arbor press, if available.

c. Again using pipe, force bearing safety ring firmly against bearing inner race.

d. Insert shaft (splined end first) into housing (1) or (3) and gently rotate shaft to align shaft splines with splined bore of differential side gear and push shaft into position until bearing (12) seats against shoulder in axle tube.

e. Replace retainer ring (19) in axle tube with pliers [37].

CAUTION: Be sure retainer ring is seated properly in groove.

5. TO DISASSEMBLE AXLE UNIT

a. Drain lubricant from gear box per Paragraph 2, Lubrication Instructions.

b. Remove 6 hex head screws (5) and 4 hex screws (7) securing housings.

c. Separate housings by pulling apart in a straight line.

NOTE: Dowel pins (1) located top and bottom of housing (3) resist separation unless pulled in straight line. Use care in prying housing apart so that gasket is not damaged or the mating housing surfaces defaced.

d. With the housings apart gently remove motor pinion and bearings (29) (47) (48) and intermediate shaft assembly (27) (28) (46).

NOTE: The following work can best be done with the entire assembly placed on a bench or table edge and sitting on motor with axle tube vertical.

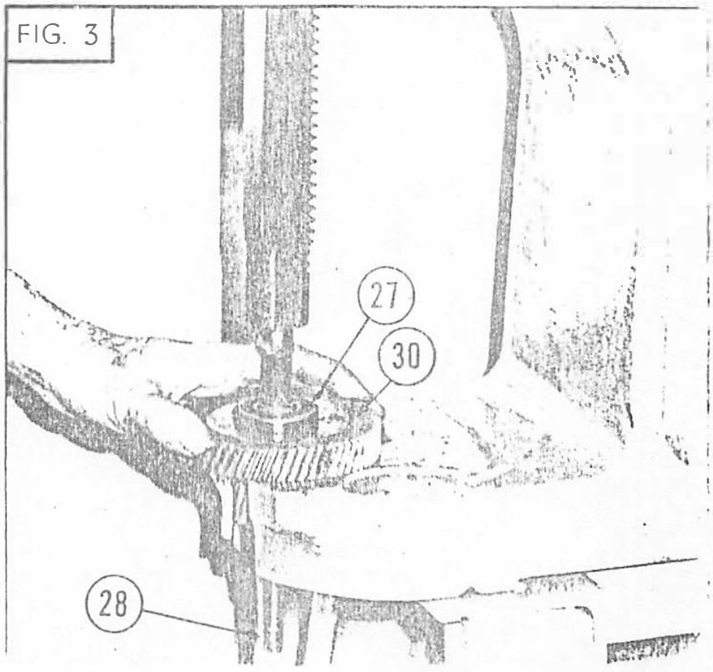
e. To remove bearing from motor pinion (29) insert bearing plate [79] between gear teeth and bearing (48). Using push rod [78] press bearing from pinion.

CAUTION: Do not reuse old bearing after removing - replace with new bearing.

f. Press bearing (47) from pinion in like manner.

g. To remove intermediate gear (30) and bearing (27) from pinion shaft (28), press pinion (28) from gear (30). (See Fig. 3).

FIG. 3

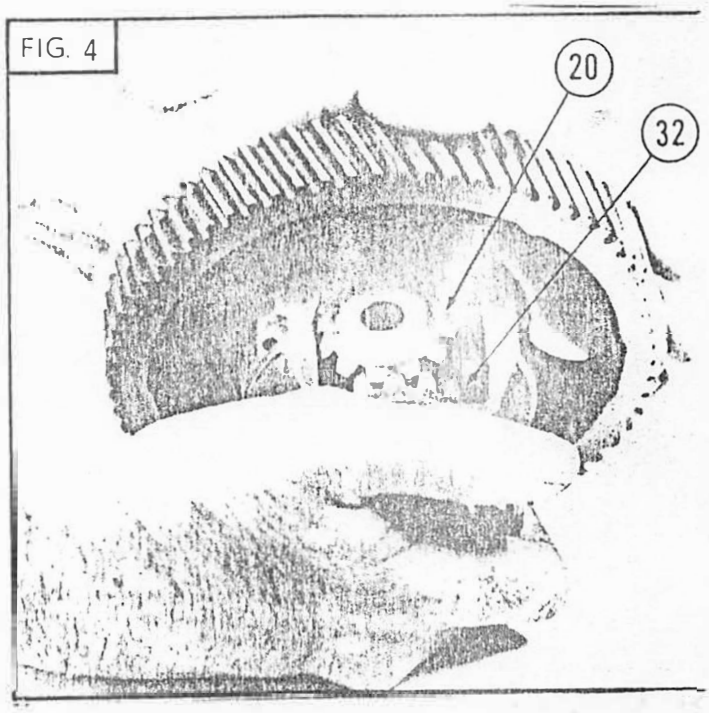


h. To remove remaining bearing (27) from pinion (28), insert bearing plate [75] between gear and bearing, and press bearing off. Use correct push cap [65] or [66].

i. To remove differential unit from housing, grasp unit and pull straight out.

j. To disassemble differential gear assembly from the cage, push out roll pin (21) and differential pin (31). Rotate differential idlers (2) from cage and lift idlers free through cage opening. (See Fig. 4).

FIG. 4



k. Differential side gears (32) and thrust washers (41) may then be removed through the cage opening.

l. To remove bearings from cage gear, use plug [33] and puller [36].

NOTE: To pull bearing adjacent to gear, locate notches on puller legs under bearing.

6. TO ASSEMBLE AXLE UNIT

Before reassembly of the axle, all parts should be inspected for wear or other damage. Worn or damaged parts should be replaced to avoid possible early failure in service.

Differential thrust washers and spherical washers (if used) should, particularly, be inspected visually for wear, scoring or slight cracks and should be replaced as indicated by this inspection.

Reasonable care should be used to keep dirt, trash and foreign matter out of the assembly as repair and assembly work is done. Bearings should be visually inspected and roll tested for rough spots before being reused. Rough bearings should always be replaced.

CAUTION: Housings should be carefully washed with varsol, wiped clean and dry before starting assembly.

a. Press bearings on cage gear (15) using sleeve [77].

b. Replace differential side gears, thrust washers, idler gears, spherical washers, pin and roll pin per Paragraphs 5 j. and k. in reverse.

c. Press intermediate gear (30) on pinion (28) using pinion end of sleeve tool [34]. Be sure key (40) is in place.

d. Press bearings (27) in place on pinion using pinion end of sleeve tool [34].

e. Insert seal protector [35] through seal in housing from outside. Push pinion assembly into housing until bearing is inserted into housing bore 1/4 inch. Differential gear must go under intermediate gear (30).

f. Push differential unit into housing (1). Push pinion assembly and differential gear alternately to seat in housing.

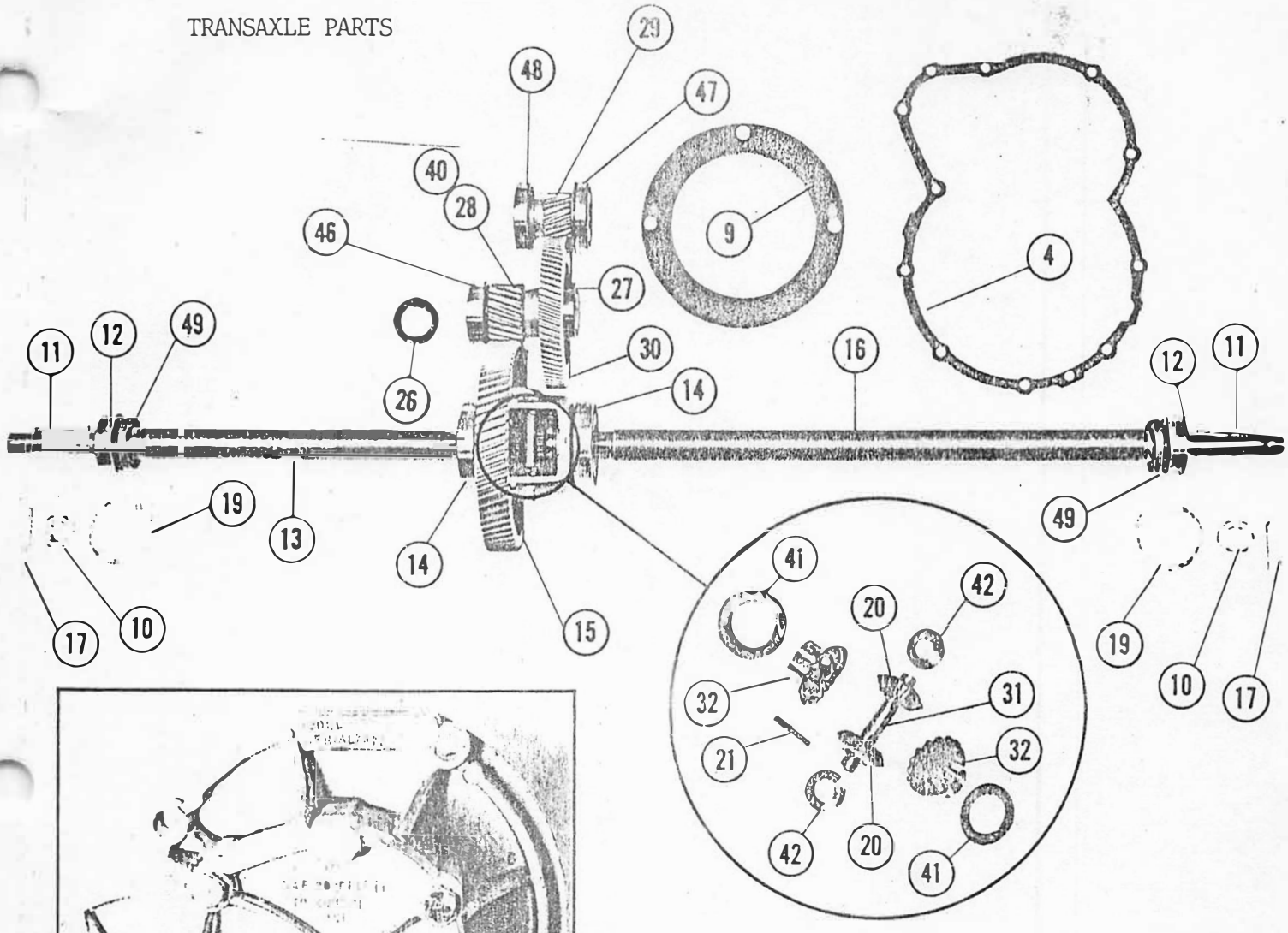
g. Put gasket (4) in place. Gasket must be clean, free of tears and lay flat against gasket faces of housing.

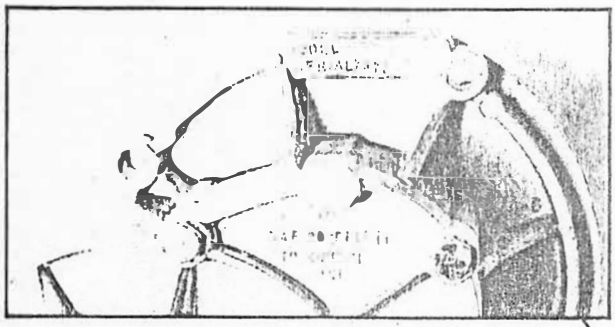
h. Push housings together aligning dowel pin (8). Push in straight line.

i. Replace 6 hex head screws (5) and 4 hex head screws (7) torque to 8-10 foot pounds.

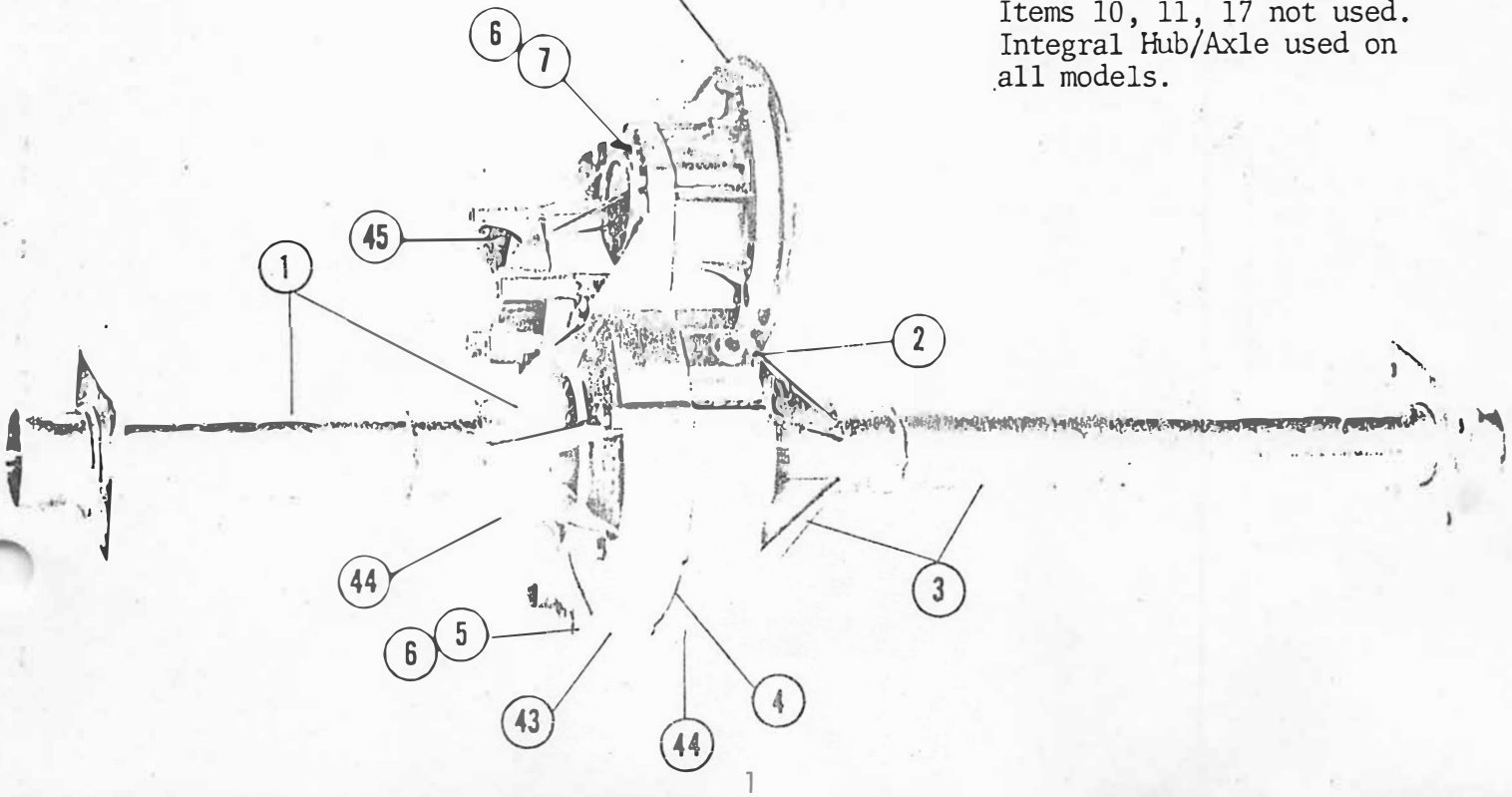
j. Add lubricant per Paragraph 1, Lubrication Instructions.

TRANSAXLE PARTS





NOTE:
Items 10, 11, 17 not used.
Integral Hub/Axle used on all models.



TRANSAXLE PARTS LIST

ITEM NO.	DESCRIPTION	NUMBER REQUIRED	PART NUMBER
1	Housing Assembly, L.H. - includes Tubes	1	10201
2	Fill Plug	1	10202
3	Housing Assembly, R.H. - includes Tubes	1	10203
4	Housing Gasket	1	925
5	Hex Hd. Cap Screw	6	10204
6	Lockwasher	10	10205
7	Hex Hd. Cap Screw	4	10206
8	Dowel Pin	2	10207
9	Motor Gasket	1	5743
12	Bearing - Axle Shaft	2	10208
13	Axle, L.H.	1	5700
14	Bearing - Differential Carrier	2	10209
15	Output Gear & Cage	1	10210
16	Axle, R.H.	1	5699
19	Retaining Ring	2	10211
20	Differential Idler Gear	2	Part of 10212
21	Roll Pin	1	Part of 10212
26	Seal	1	10213
27	Bearing - Intermediate Shaft	1	10214
28	Intermediate Pinion	1	10215
29	Motor Pinion	1	10216
30	Intermediate Gear	1	10217
31	Differential Pin	1	Part of 10212
32	Differential Side Gear	2	Part of 10212

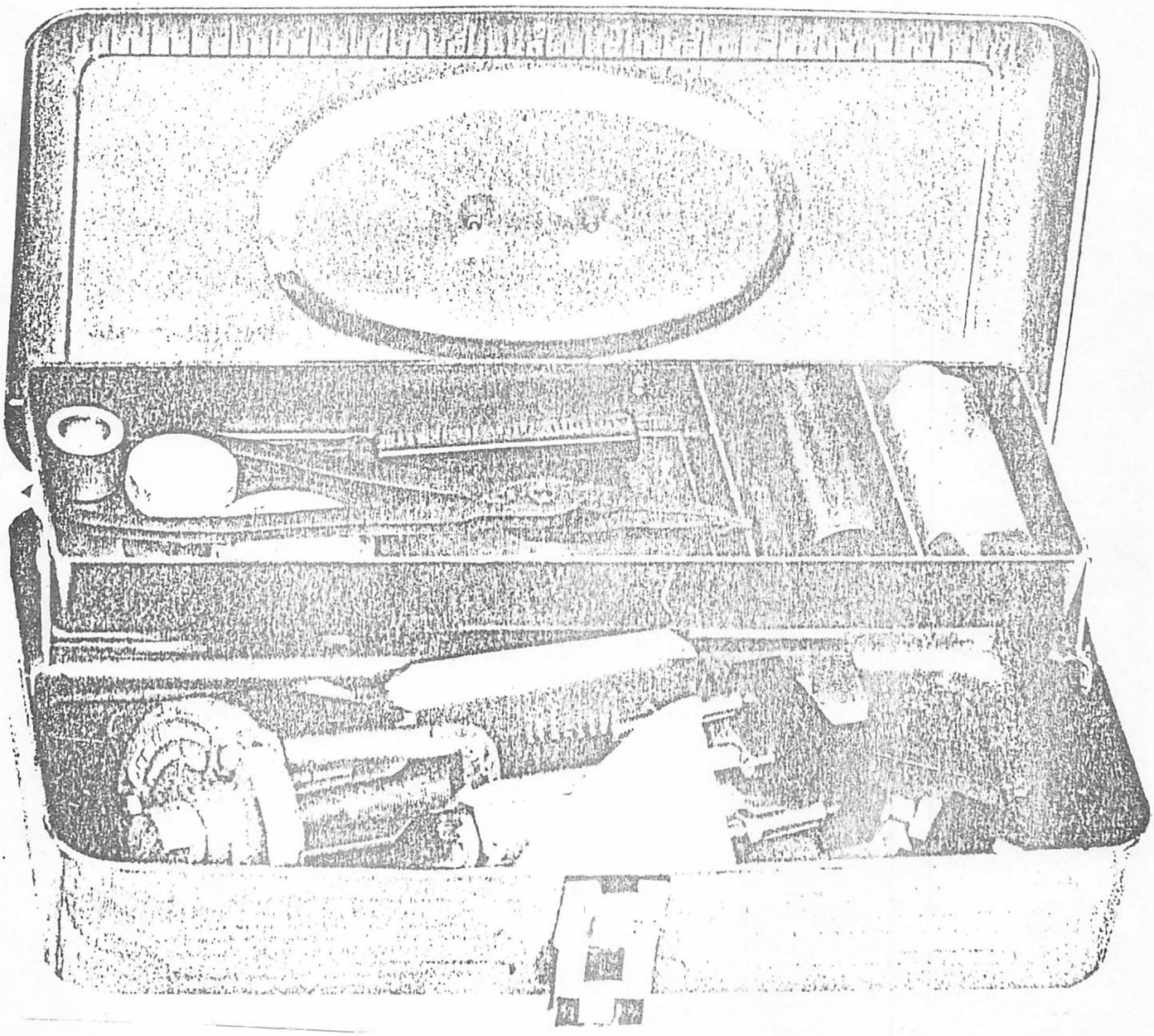
Continued

TRANSAXLE PARTS LIST (CONTINUED)

ITEM NO.	DESCRIPTION	NUMBER REQUIRED	PART NUMBER
40	Key (Not Shown, use Hardened Alloy Steel only)	1	10218
41	Thrust Washer	2	Part of 10212
42	Spherical Washer	2	Part of 10212
43	Drain Plug, Magnetic (Not Shown)	1	10219
44	Plug - Check or Drain	2	10220
46	Bearing - Intermediate Shaft	1	10221
47	Bearing - Pinion	1	10222
48	Bearing - Pinion	1	10223
49	Seal - Axle Shaft	2	5698

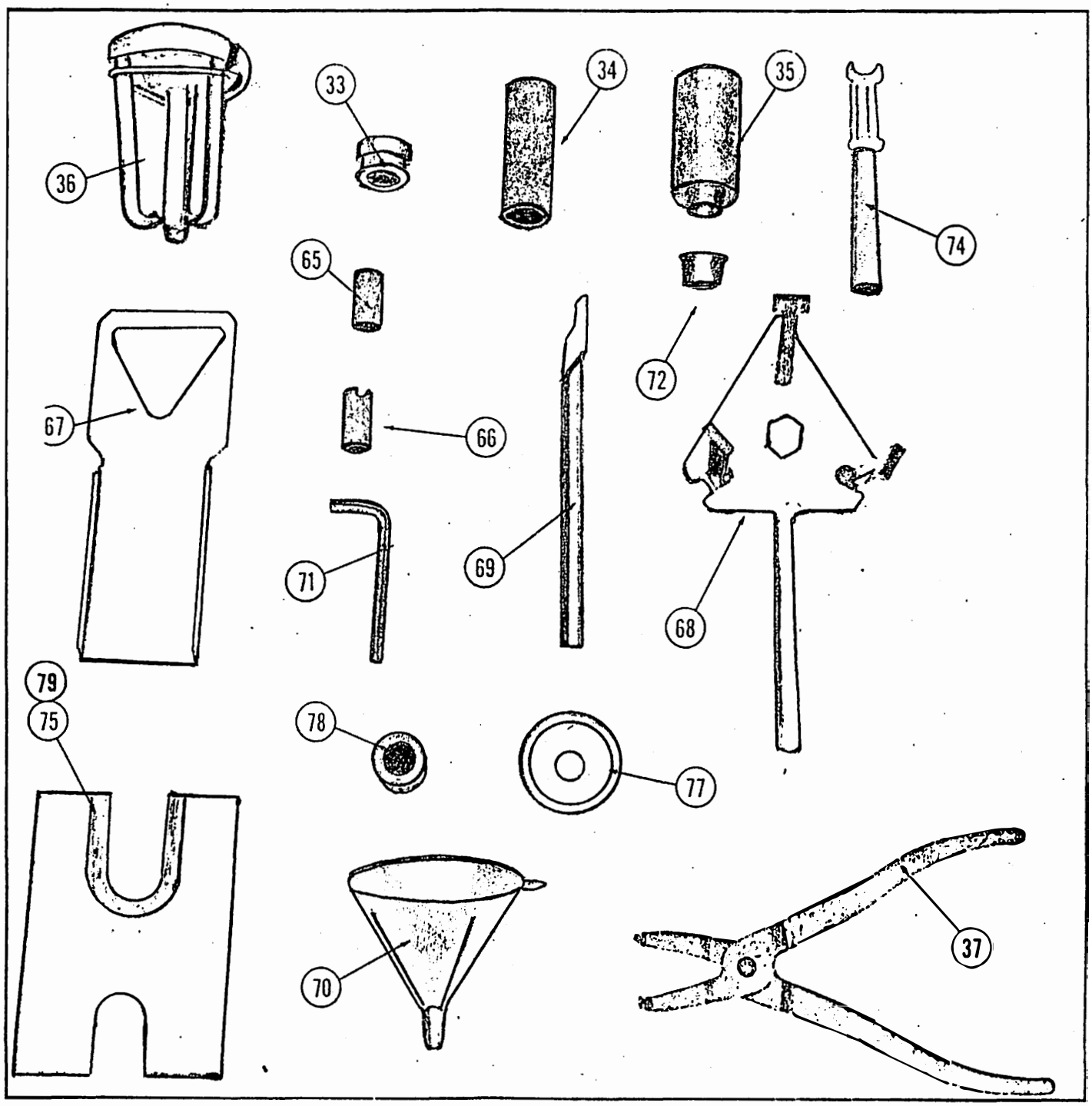
TOOL KIT

To assist Sebring-Vanguard dealers in easy maintenance, the axle manufacturer has developed a Service Tool Kit. This Kit is available on special order through the Sebring-Vanguard Parts Department.



MODEL 25 TRANSAXLE TOOL KIT

Part No.	Name	Part No.	Name	Part No.	Name
33	Plug	66	Push Cap	72	Cap
34	Sleeve Tool	67	Puller Wrench	74	Insert Tool
35	Insert Tool	68	Puller	75	Bearing Plate
36	Puller Wrench	69	Seal Puller	77	Sleeve
37	Pliers	70	Funnel	78	Push Cap
65	Push Cap	71	Allen Wrench	79	Bearing Plate



GENERAL ELECTRIC MOTOR

As of March 1, 1976, all G.E. motor repairs will be handled through the Authorized G.E. Repair Station in your local area.

You will be supplied with a listing of all G.E. Repair Stations. Take or send the motor to the nearest one to your location.

Sebring-Vanguard will pay to remove and replace the motor. G.E. will take care of the warranty.

You as a dealer must supply the G.E. Repair Station with the information on the vehicle to obtain warranty service.

You must supply:

- Vehicle serial number
- Mileage of vehicle
- Delivery date of vehicle

If you don't know the delivery date, and the customer cannot supply the date, call the Service Department and we can supply the delivery date.

If the vehicle is out of warranty, the G.E. Repair Station will be glad to quote a price on the repair for the customer.

It would be advisable to stock a motor for substitution in the customer's vehicle to get it on the road as soon as possible. When you receive the repaired motor back, put it in stock. A motor repaired by G.E. will be considered a new motor.

MOTOR REMOVAL - DANA AXLE ONLY

1. It would be easier to remove the motor from under the vehicle, but remember, it weighs 65 pounds. Raise the vehicle and support on suitable stands.
2. Disconnect the heater pipes from the manifold.
3. Disconnect cables and mark for later installation. Disconnect heat lamp wires, remove fan motor thermal switch from outside motor case, if equipped.
4. Remove the rear heater manifold casting from motor.
5. Remove the front 4 end plate bolts and retain.
6. Slide motor back and lower out of vehicle.
7. Remove front end plate from rear axle housing and install on motor.
8. Remove front heater manifold casting and retain.
9. Reinstall in reverse order.

GENERAL ELECTRIC MOTOR

ROUTINE EXAMINATION AND BRUSH REPLACEMENT

1. At 3,000 miles or six months, remove the covers over the brush access openings and examine the interior.

   a. Make sure the brush shunts are positioned so they can move freely down the brush holder slot as the brush wears, and remove any obstruction which may have occurred since the last inspection which might cause the brush to bind in its holder.

   b. Check each brush for free movement in its holder and examine it for wear and general condition. If a brush is broken, cracked, severely chipped, or worn to a length of less than 5/8 inch measured on the short side of the brush, replace it. Whenever any brushes are replaced, it is good practice to replace all of them. Keep extra brushes on hand. It is recommended that only brushes obtained from General Electric Company be used.

   c. Examine the condition of the brush springs. Make sure the spring coils are uniform and the springs do not appear discolored which could indicate heating that has caused loss of spring quality. If these or other signs of spring damage are evident, replace the spring or use a small spring scale to see if the spring requires one pound or more force to lift it at the point of contact with the worn brush.

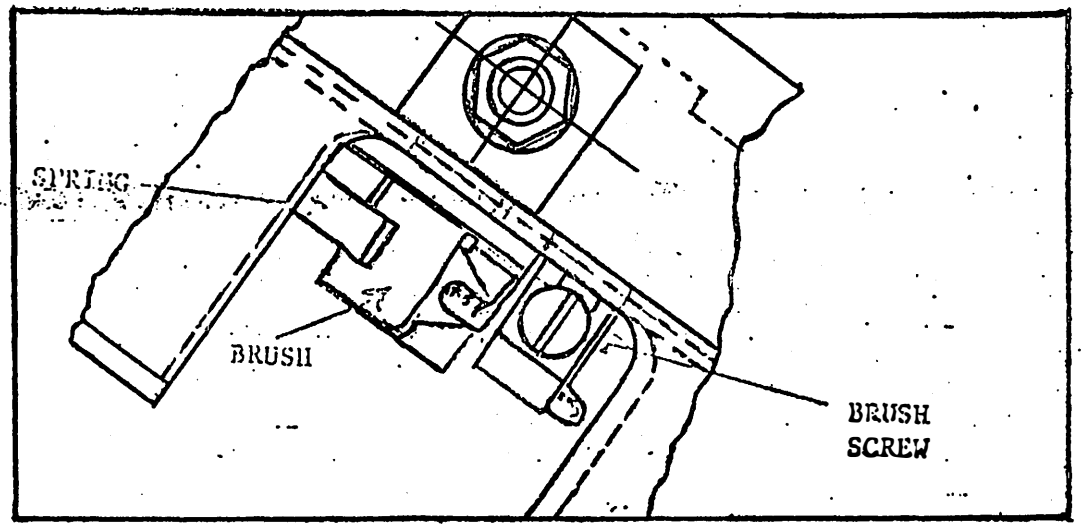
   d. Observe the condition of the commutator and the armature coils which may be visible. Refer to section entitled, "Inspection of Armature" for details to look for during this inspection.

2. Brush Replacement

   a. With fingers or a suitable hook, lift the brush spring end up so the brush may slide up out of its holder, loosen the brush screw to remove the brush shunt terminal and remove the brush.

   b. Again, lift the end of the brush spring and place the new brush in the holder in the same relative position as the old brush removed. Place end of spring in position on top of brush. Connect the brush shunt terminal to its proper crossover with the brush screw. Note that the position of the brush shunt is important when installing brushes. Assure positioning to permit the brush shunt to travel down the brush holder slot as the brush wears. If it hangs up, commutator damage and motor failure will result. Install the brush like the sketch below and observe if the shunt

will follow down the slot with wear. Make minor adjustments to make sure the path of movement will be free before final tightening of the brush screw to make a firm, secure connection. Also make sure that only the insulated portion of the shunt touches the motor endshield or is touched by the brush cover when it is reinstalled.



c. Replace the covers over the brush access openings.

3. Cleaning

At regular maintenance periods for the vehicle, remove the cover over the brush access openings and remove all foreign material, such as dirt and carbon dust, from the motor interior with dry, compressed air of moderate pressure. Clean by suction, if possible, to avoid blowing dirt, carbon dust, or metal particles into the bearings and insulation.

4. When parts have worn considerably, the motor interior is very dirty, or other indications suggest a higher echelon of maintenance, the motor must be disassembled.

DISASSEMBLY (AFTER ANY ATTACHMENTS HAVE BEEN REMOVED FROM THE MOTOR)

1. Smooth away any signs of roughness or burrs from the shaft.

2. Remove brush access covers.

3. With fingers, or suitable hook, lift the end of the brush spring and lift the brush by its shunt so that the spring can be released against the side of the brush to hold it free from the commutator.

4. With light chisel mark spanning the joint between the endshield and stator identify exact relationship of these parts for later reassembly reference.

5. Remove the two clamp screws at each end of the motor which hold the close fit rabbeted endshields to the stator.

6. Provide some suitable covering on the shaft to protect the shaft seal lip and coat it and the seal lip with bearing grease. Carefully remove the pulley endshield. Note exactly the arrangement and location of spring and spacer washers for reassembly use later.

7. Remove the stator assembly, being careful to thread the thermostat leads free from the endshield in the process. When necessary to change field coils, the old ones can be removed by removing the terminal nuts and pole piece screws from the stator. Note that the old or new thermostat must be glass-cloth taped and cemented with LEEBOND #12-78 epoxy adhesive (Leepoxy Plastics, Inc., Ft. Wayne, Indiana) or equivalent, to the new coil in the same location as on the original before reassembly into the stator.

8. Remove the armature.

9. When necessary, the commutator endshield may be further disassembled to change brushes, brush rigging, and cross-over leads by removing the appropriate and obvious screws. This should be done if the brush holders or insulation plate appear burned, warped or have loosened rivets.

INSPECTION OF ARMATURE

1. If deep burned sections are evident on the commutator bars, this is a symptom of an open circuit in the armature winding. If such evidence is noted, measure the armature resistance by selecting at random any two bars of the commutator with a bar span of 1-10.

NOTE: This condition could be caused by an undetected fault of manufacture appearing early in normal field service conditions, or it could be caused by overloading of the motor causing high temperature failure of connections. The resulting high resistance in a joint could cause this symptom appearance. Evidence of general overheating accompanying flat spots would tend to indicate overworking of the motor.

2. If one or more armature conductors are abnormally black or appear burned compared with the other armature conductors, this is an indication of shorted armature winding. If such evidence is detected, a dirty armature should first be blown off to clean it and then checked with a growler. If the short circuit is not confirmed by this indication, check resistance and apply a high potential test not exceeding 600 volts AC for 1 minute, If the armature does not pass these tests, it should not be used.

   NOTE: Short circuited coils can be caused by many things, as well as an undetected manufacturing fault which most likely would show up early in normal service.

3. If a generally heat discolored appearance uniformly over the commutator or windings is observed, it is usually a sign of overloading of the vehicle or motor. This should be corrected or the symptoms will be repetitive and motors will be burned out frequently. While an armature of this appearance might pass checks for resistance, shorts, and high potential, it has lost some survival ability and will not have a normal service life.

4. Bubbled insulation and individual brush burn marks on the commutator is rather a classic example of a motor armature which has been loaded up to stall with power applied. It promptly overheated and its elements boiled to quick failure. Other comments are similar to 3 above.

   In general, armatures with other than normal service wear are not recommended to be repaired and reused although some re-soldering of commutators in the field has been successfully done. Replacement is suggested as the best means for maintaining the integrity of these heavy duty motors which sometimes run at high speed under light load conditions.

5. Commutator Inspection and Care

   a. Inspect the commutator during each brush inspection.

   b. Commutator bars should not be pitted, burned or grooved in the brush track. If found in this condition, the surface should be

refinished in a lathe, limiting the depth of cut to .005 inch or less on a side and repeat until smooth.

Before a final cut, the mica insulation between commutator bars should be undercut .032 inch and no mica slivers should be left along the side of the bars above the undercut.

Next, dynamic balance the armature to within .0015 inch amplitude at 3000 RPM. After this, the final finish cut should be made with a diamond tool to obtain a surface finish of 8 to 16 micro inch. The armature should not be put back in service with a diameter of less than 2.625 inches.

c. After refinishing a commutator, check it for eccentricity. It should not exceed .001 inch total indicator reading for the entire diameter and with a .0002 inch maximum bar-to-bar difference.

INSPECTION OF FIELD WINDINGS

If, upon inspection, the insulation on the field coils appears blackened or charred, the serviceability of the coils is questionable. Burned or scorched coil insulation is a symptom of coil overheating due to overloads, grounded, or short circuited winding.

To check the windings electrically for grounds or open circuits, a continuity tester, ground tester, and ohm meter are required.

To check for a grounded field connect the tester between terminal studs S1 to ground and S2 to ground.

To check for an open or shorted winding: Connect the ohm meter between S2 and S1. The resistance should read .0138 plus or minus .0014 ohm.

BEARING INSPECTION AND CARE

1. The bearings are prelubricated with Chevron SRI-2 high temperature grease, or equivalent (do not use silicone grease in a DC motor), sufficient for the life of the bearings.

2. Check bearings by turning them with your fingers. Feel for binding or gritty effects and for excessive looseness or wobble. If any defect is apparent or if there is any doubt at all as to serviceability of the bearings, replace them with new ones.

3. Pull the old bearings by means of a suitable bearing puller. Press new bearings into place by means of an arbor that exerts pressure on the inner ring. Do not use a hammer for bearing replacement. It will damage the bearing.

REASSEMBLY

1. Set commutator endshield in place on bench with brush rigging facing upward.

   Push each brush back up into brush holder until its end would permit commutator to pass under without hitting. Adjust end of spring so that it is against side of brush and holds brush in "cocked" position.

2. Set armature, with the ball bearings already assembled, into place in the endshield.

3. Push on end of each brush to release onto the commutator. Observe that brushes seat on commutator properly and that end of springs ride on brush tops in line with brush holder grooves. Make sure that the brush shunt will travel down the holder slot as the brush wears.

4. Mount the stator over the armature and position it exactly with chisel mark on endshield. Thread thermostat leads through the proper hole in the commutator endshield. Gently seat on rabbet.

5. a. The pulley endshield contains a seal whose inside lip rides on a highly finished surface of the shaft. If the shaft surface is still polished and undamaged but the seal requires replacement then:

      (1) Drive the seal from the pulley endshield with a suitable punch and hammer.

      (2) Apply "Hanna Oil Sealer" to the mating surface before placement of the oil seal (Use #709957 Oil Seal Compound - Hanna Paint Company, Columbus, Ohio, or equivalent). Do not allow to dry before assembly.

      (3) Press seal into position with a suitable press so that its outside diameter is flush with the face of the endshield surface recess (see motor outline). Locate seal into the pulley endshield with the seal lip spring facing away from the bearing.

b. Position spring, spacer, and shim washers into the pulley endshield using enough Chevron SRI-2 grease in the cavity to hold these parts in place. After suitably covering the spline of the armature shaft to prevent damage to the seal lip (also use bearing grease to coat seal lip and shaft cover surface), gently fit the endshield assembly over the shaft and pulley end bearing. Line up chisel marks and seat the endshield into the stator rabbet.

6. Be sure endshields are snugly fit in stator rabbets, then replace clamp screws on both ends. Check to determine that armature is free to turn. If it will not turn, the parts have been assembled to cause binding.

7. Replace brush access covers.

8. Make a high potential test (up to maximum of 600 volts AC for 1 minute) to assure motor has been properly reassembled.

9. If a running performance test is to be made before reinstalling motor in vehicle, observe caution that this series motor will overspeed if voltage is applied under no load or inadequate load conditions. Do not apply voltage to the motor unless a torque load equivalent to 3-1/2 HP at 3200 RPM is first connected to the shaft, and use only direct current battery power.

BODY REFINISHING

It is up to you, the repairman, whether it is easier to repair or replace a damaged panel.

Many times the repair of a large crack takes more labor time than the replacement part costs.

Most scratches, nicks, dents or gouges can be filled with a lacquer-based spot putty or glazing compound and painted over with no problems.

Most cracks can be filled by using a mixture of Cycolac chips and a chemical, Metholene Chloride. The chips can be obtained from Sebring-Vanguard and the chemical from a supply house.

Mix the chemical and the chips together and let the chemical melt the chips to make a solution of either paste or medium-to-thin glue to seal the crack. Always take a razor knife and "V" cut the crack so that the mixture of glue will melt both sides of the crack together. Let the glue dry at least 24 hours so that it will dry all the way through. Sand the finish and repaint.

Never use plastic body filler putty or Bondo as it is sometimes called, because it will not adhere to the Cycolac well and will soon fall off.

When repainting with Korad, you should first use some lacquer paint that comes close to matching the finish of the vehicle, then spray the Korad over the top. This will take less time and give better coverage. The Korad should be thinned to about 7 parts lacquer thinner to 1 part Korad to get a good shine on the finish. A good grade of thinner is required.

The painted vehicles are acrylic enamel for the outside color and flat black lacquer on the inside, all available from Sebring-Vanguard.

Normal painting procedures prevail on all painted vehicles.

When installing new body parts, always use the body sealing tape between the two Cycolac parts and between the Cycolac and aluminum frame. This helps prevent stress cracks later.

When replacing parts, use only the recommended rivets for the job. The wrong rivet will compress the plastic to the point of stress and it will crack.

Ditzler Automotive Finishes
PPG INDUSTRIES

INFO BULLETIN
for DITZLER® Jobbers

DITZLER AUTOMOTIVE FINISHES, PPG INDUSTRIES, INC./DETROIT, MICHIGAN 48235

Index No. 1

February, 1976

CITICAR COLORS

Sebring Vanguard-Sebring Florida

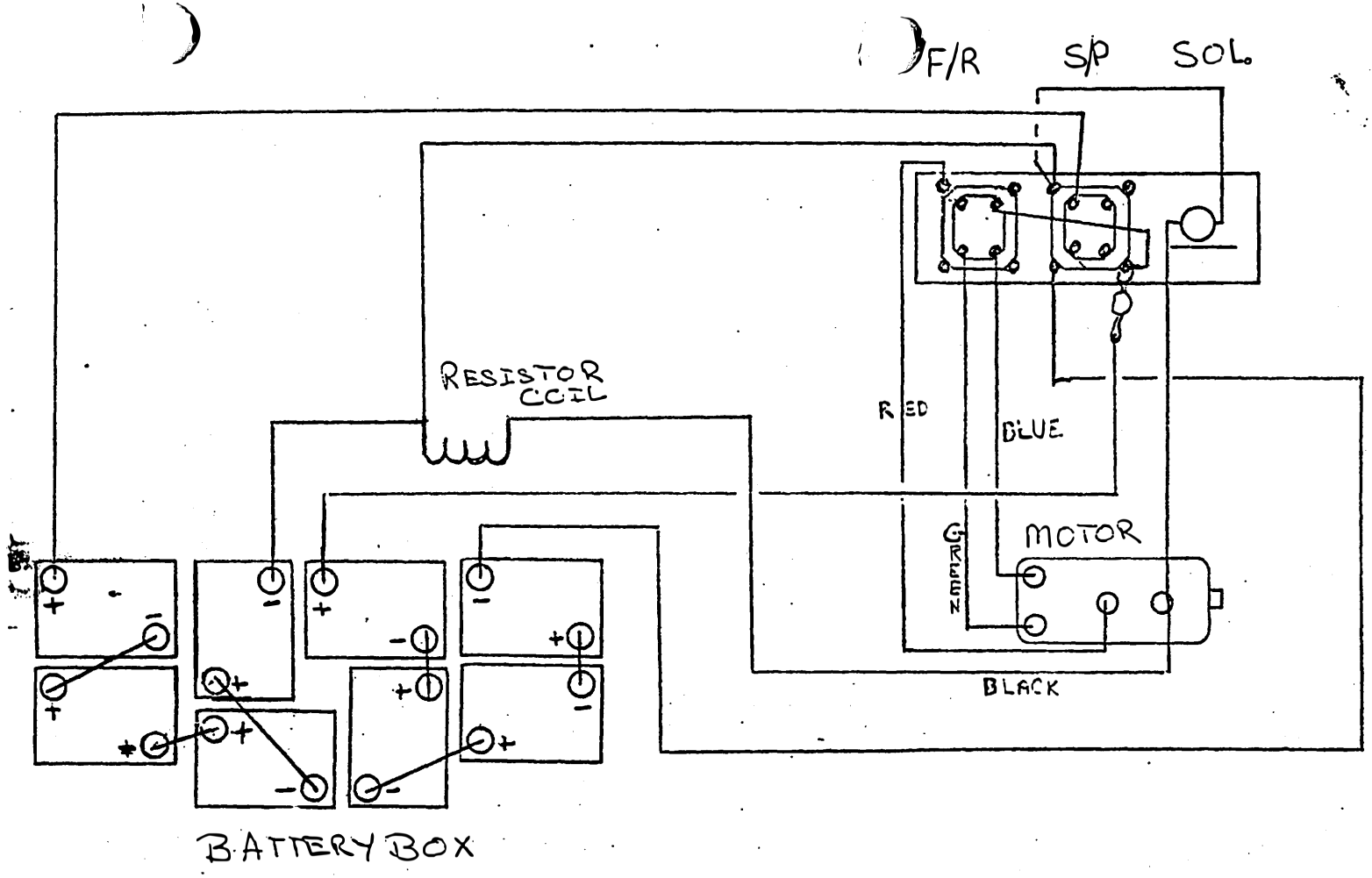
COLOR	DITZLER CODE (DAR)
White	90036
Blue	14953
Green	44187
Orange	60836
Red	72196
Yellow	82275

LIGHT BULB CHART

Headlamps	6012
Parking Lamps - First Design	1895
Parking Lamps - Second Design	1156
Turn Signal Front - First Design	1895
Turn Signal Front - Second Design	1156
Turn Signal Upper Rear, If Equipped	1895
Turn Signal Lower Rear	1157
Stop & Tail Lamp	1157
Back-Up Lamp	1156
License Plate Lamp	67
Instrument Cluster - First Design	53
Instrument Cluster - Second Design - Must replace complete Switch or complete Indicator	
Radio Dial	1893
Courtesy Lamp	1003
Speedometer Lamp	53

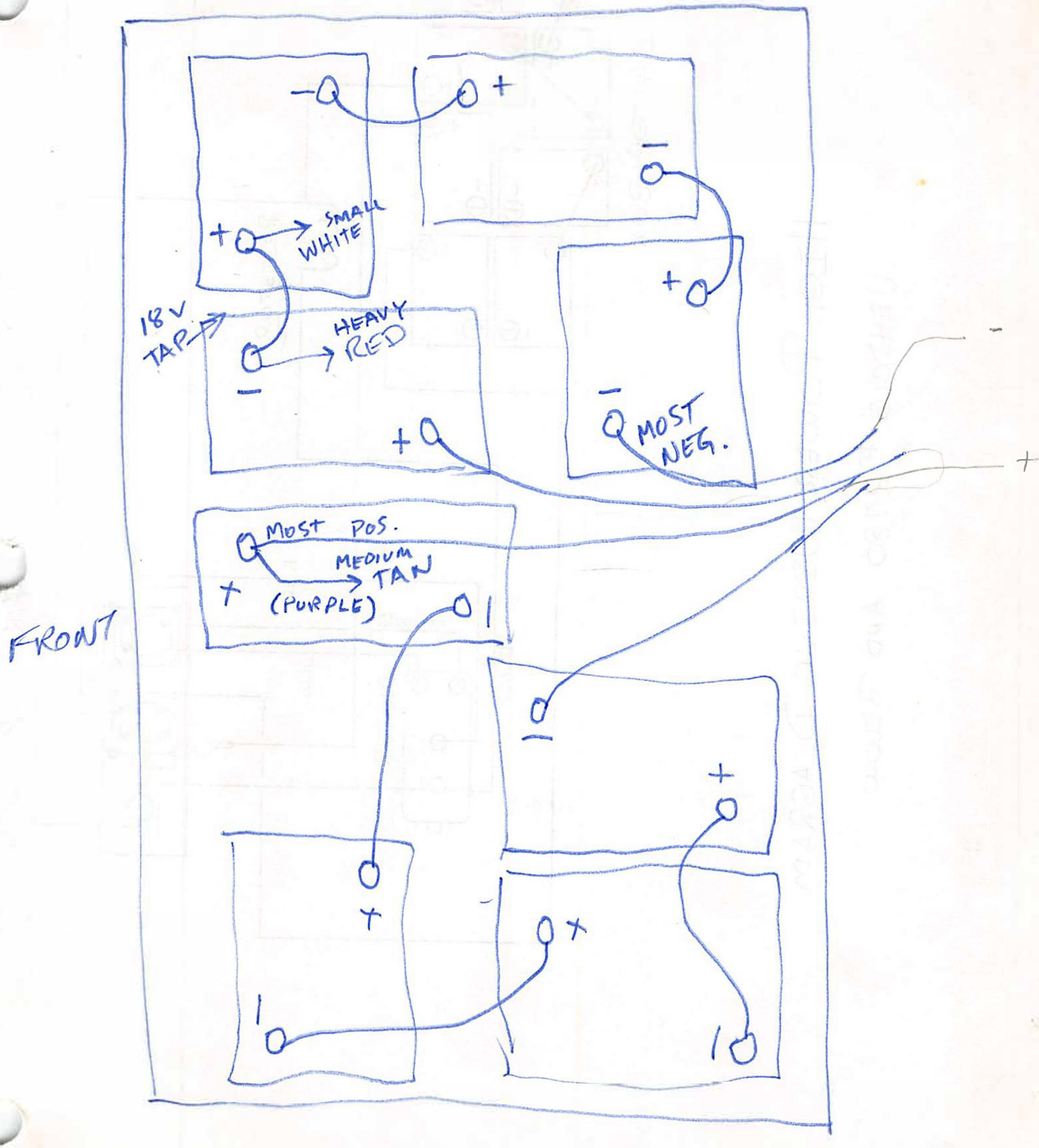
FUSE CHART

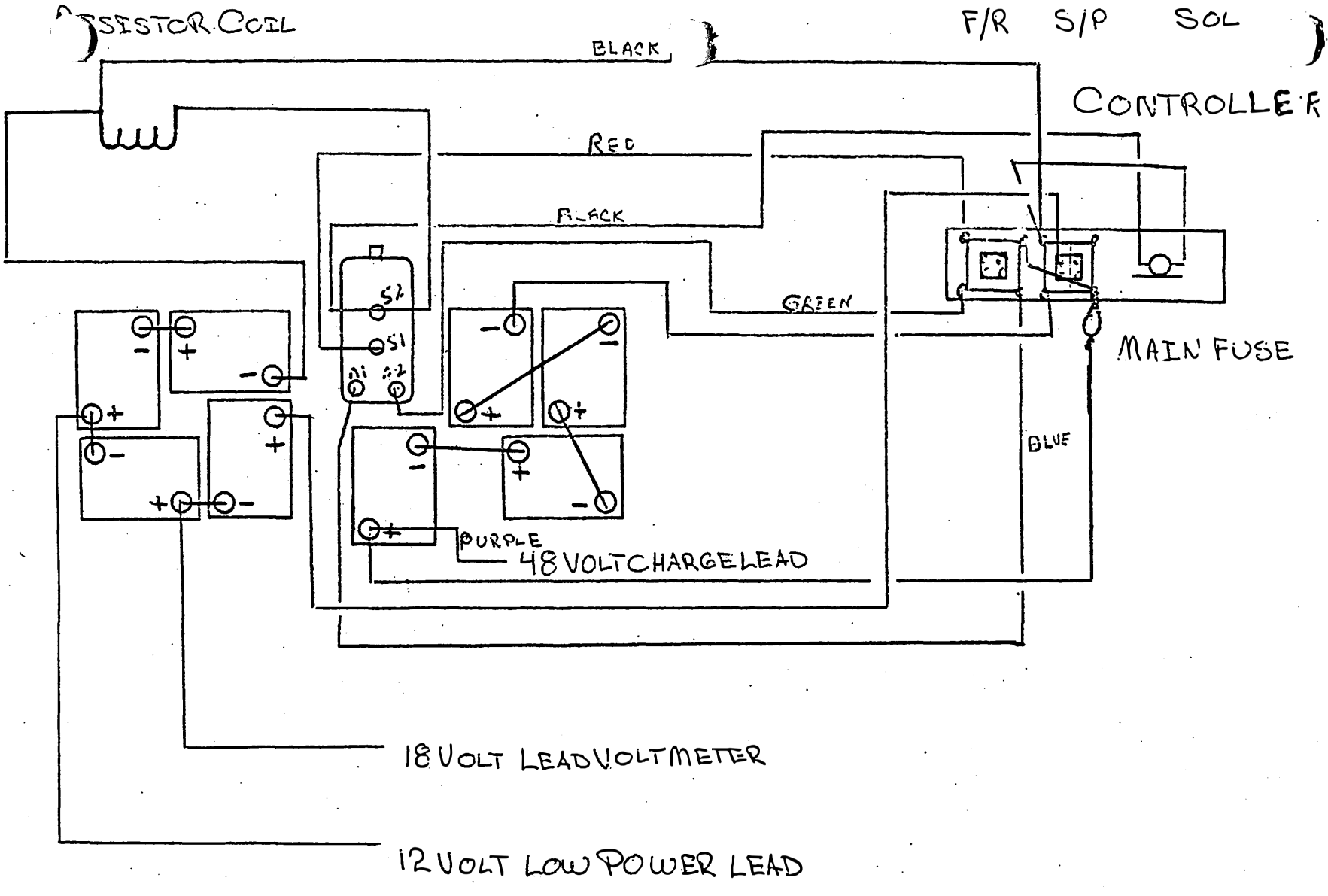
Location		
1	Voltmeter - Second Design Dash	10 Amp
2	Accessory	10 Amp
3	Light	20 Amp
4	Turn & Brake	15 Amp
5	Controller	15 Amp
6	Radio & Defroster	10 Amp
7	Empty	
8	First Design - Dash - Voltmeter - Horn - Wiper	20 Amp
8	Second Design - Horn - Wiper - Dash	20 Amp



HIGH POWER WIRING DIAGRAM

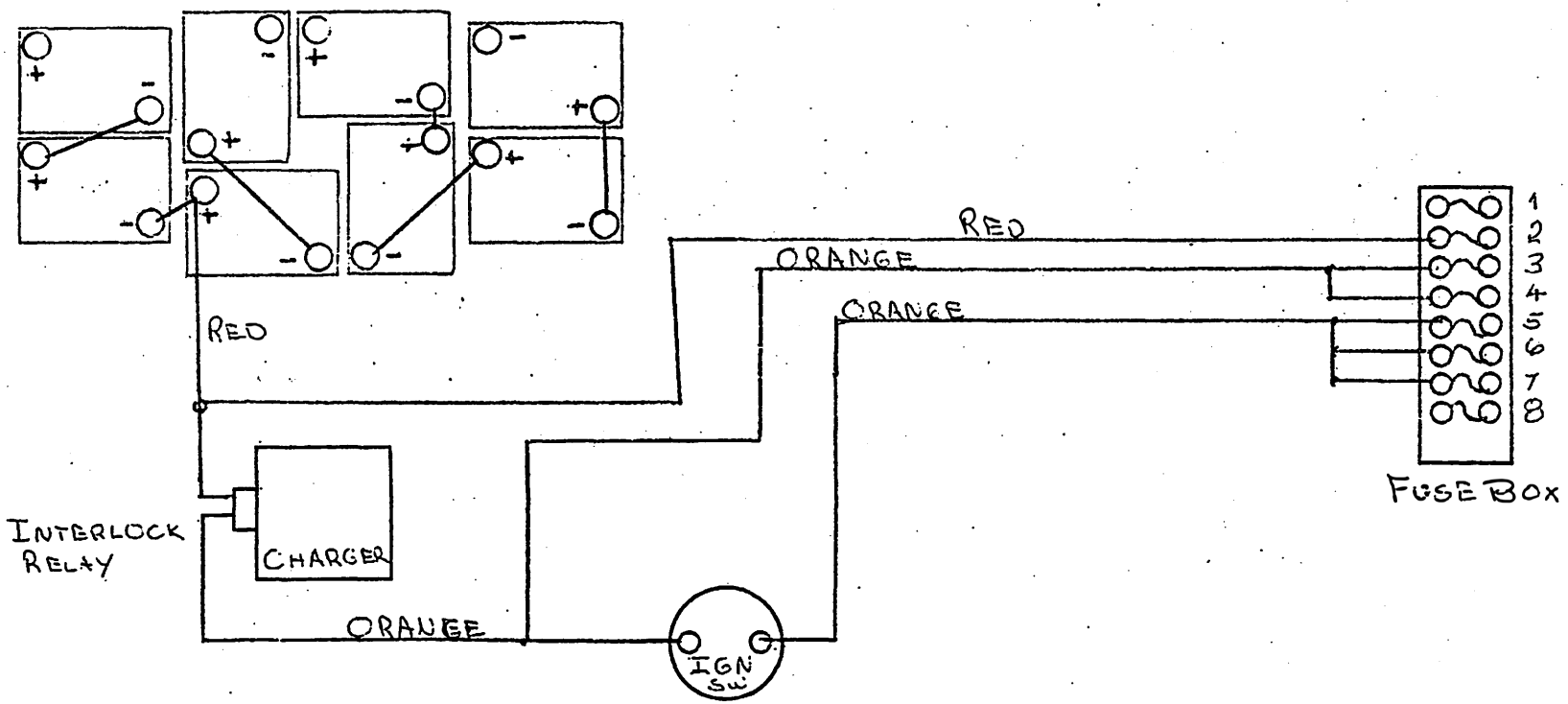
VEHICLE # 2780 AND BELOW


SMALL WHITE
18 V TAP
HEAVY RED
MOST NEG.
MOST POS.
MEDIUM TAN
(PURPLE)
FRONT

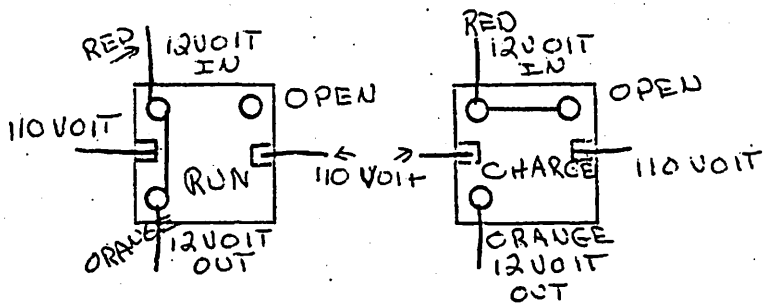


HIGH POWER WIRING DIAGRAM
DANA AXLE VEHICES

3176



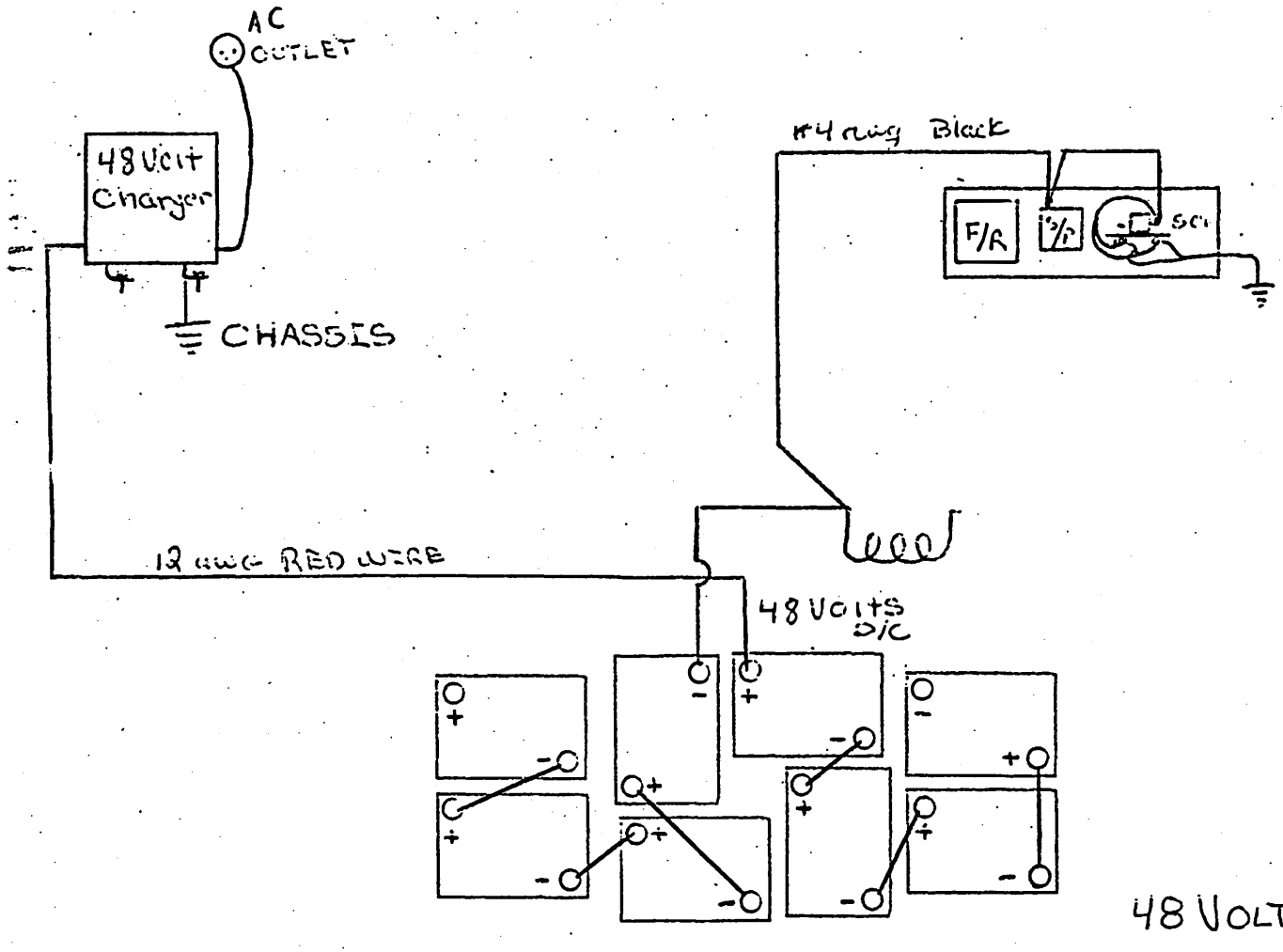
INTERLOCK RELAY CIRCUIT



12 VOLT CIRCUIT FROM BATTERY BOX TO FUSE BOX

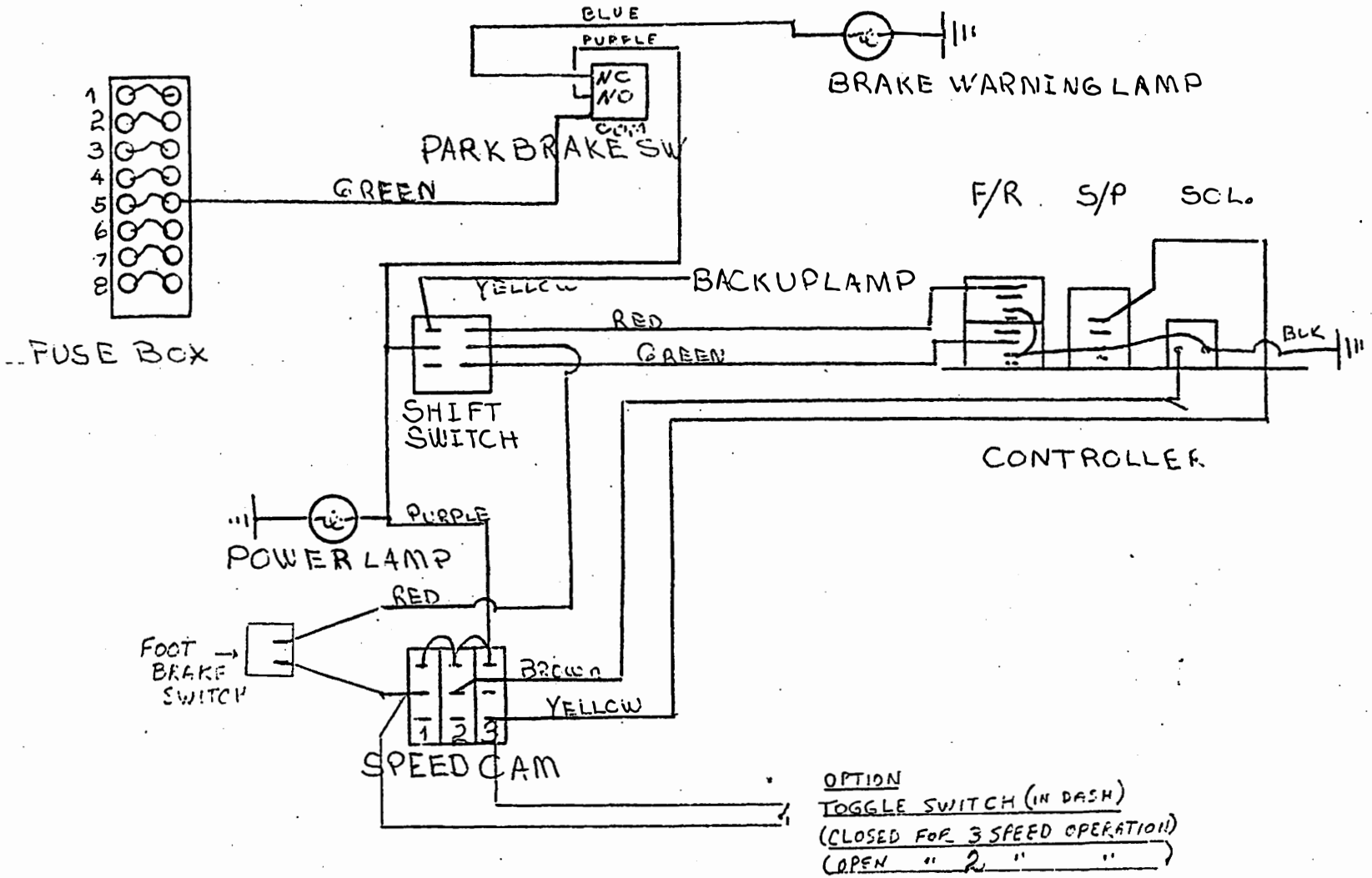
WITHOUT ACC. BATTERY

2/2176
G. DELANEY



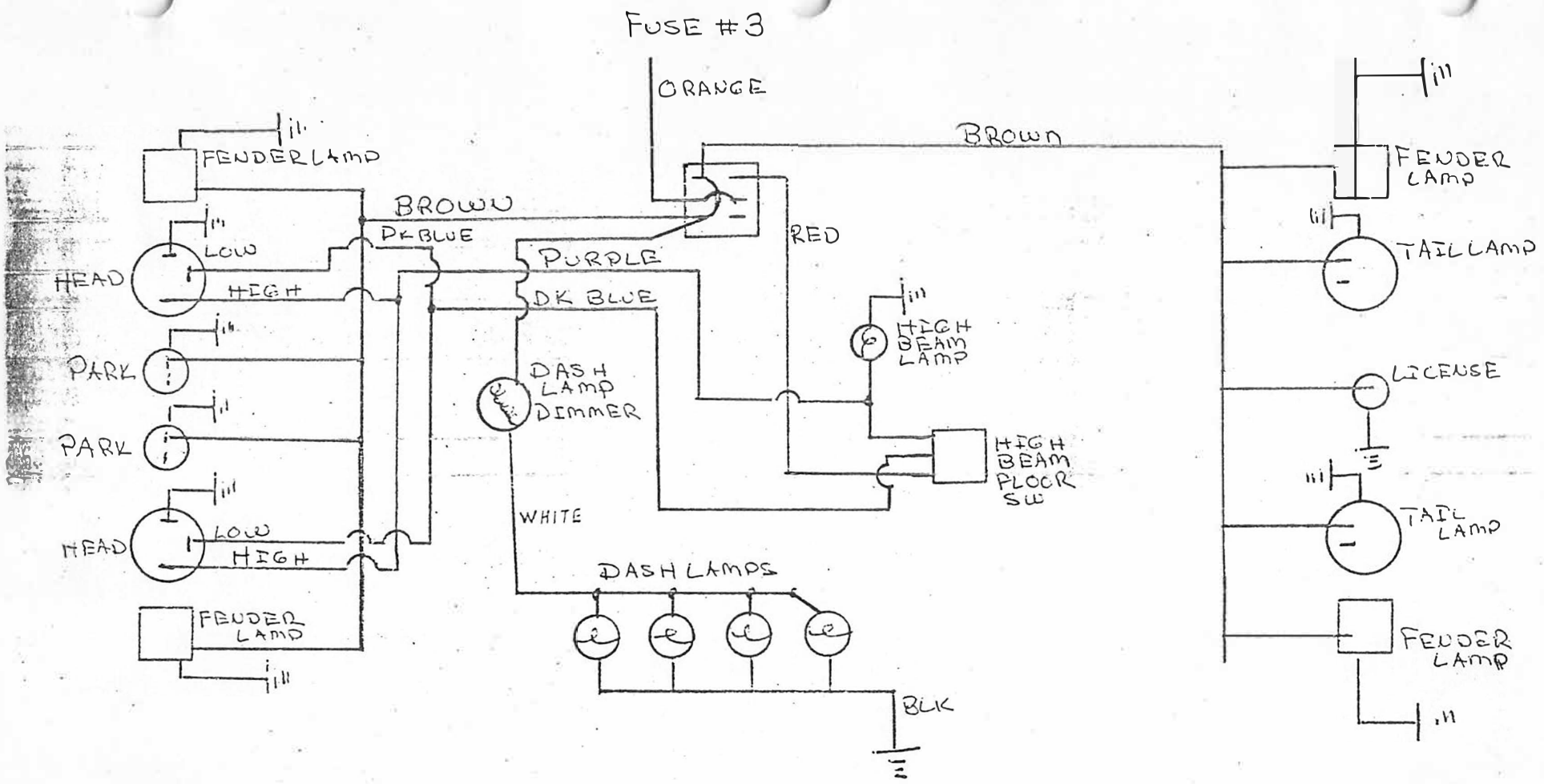
48 VOLT CHARGING CIRCUIT

2/2/76
S. DELANEY



WIRING - LOW POWER CONTROLLER

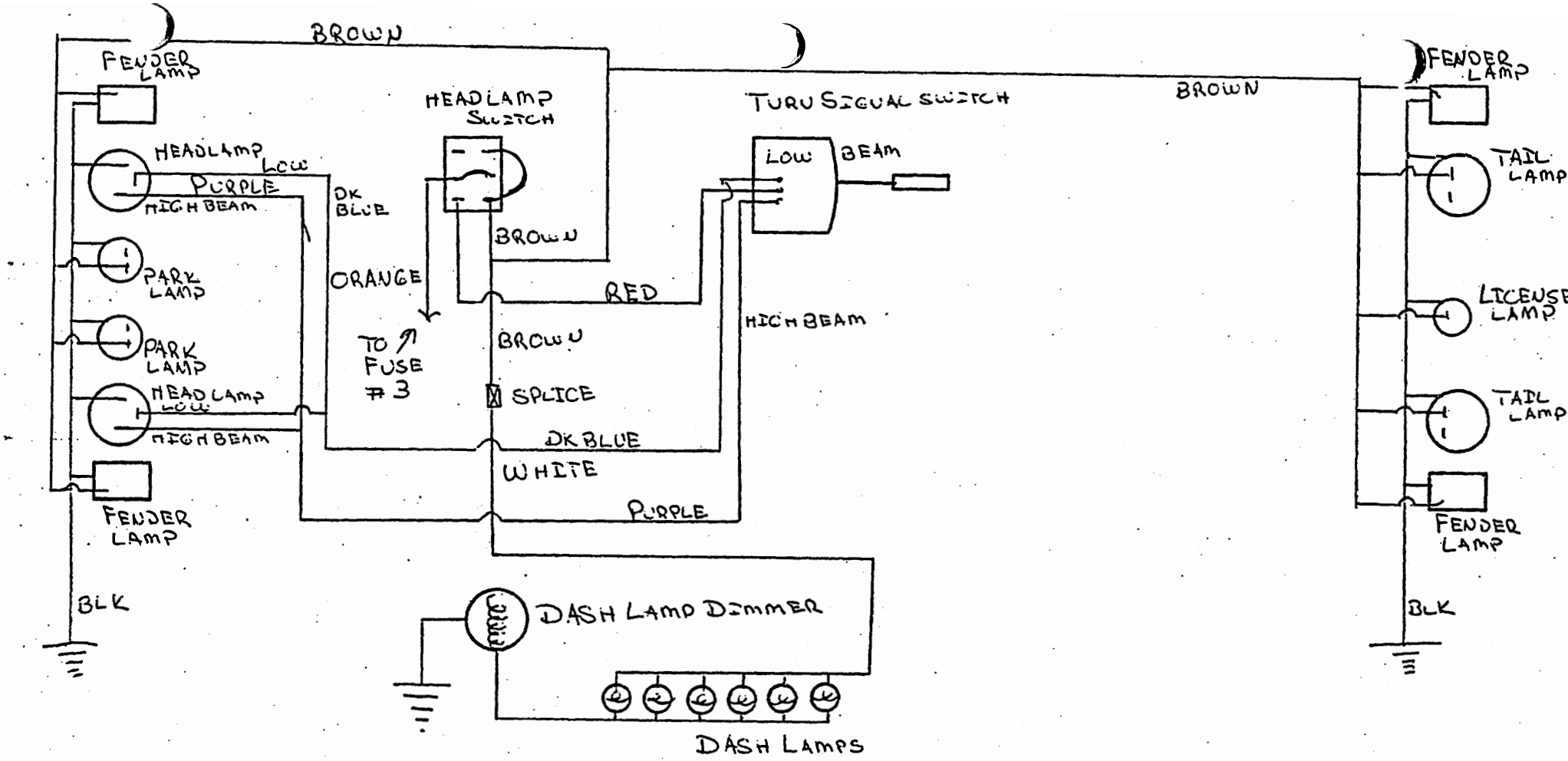
212176
G. DELANEY



HEAD LAMP CIRCUIT - EARLY PROD. VEH.

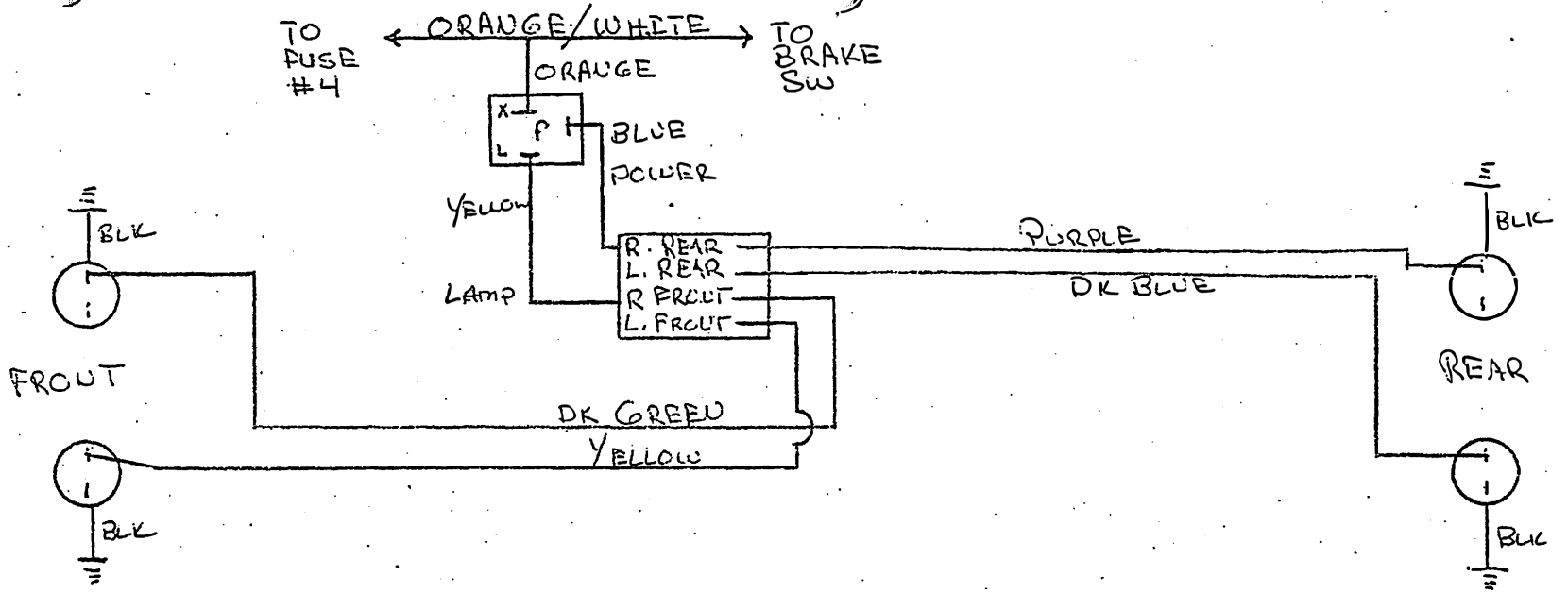
REAR ROOF LAMPS, IF EQUIPT. NOT SHOWN

2/3/76
J. DELANEY



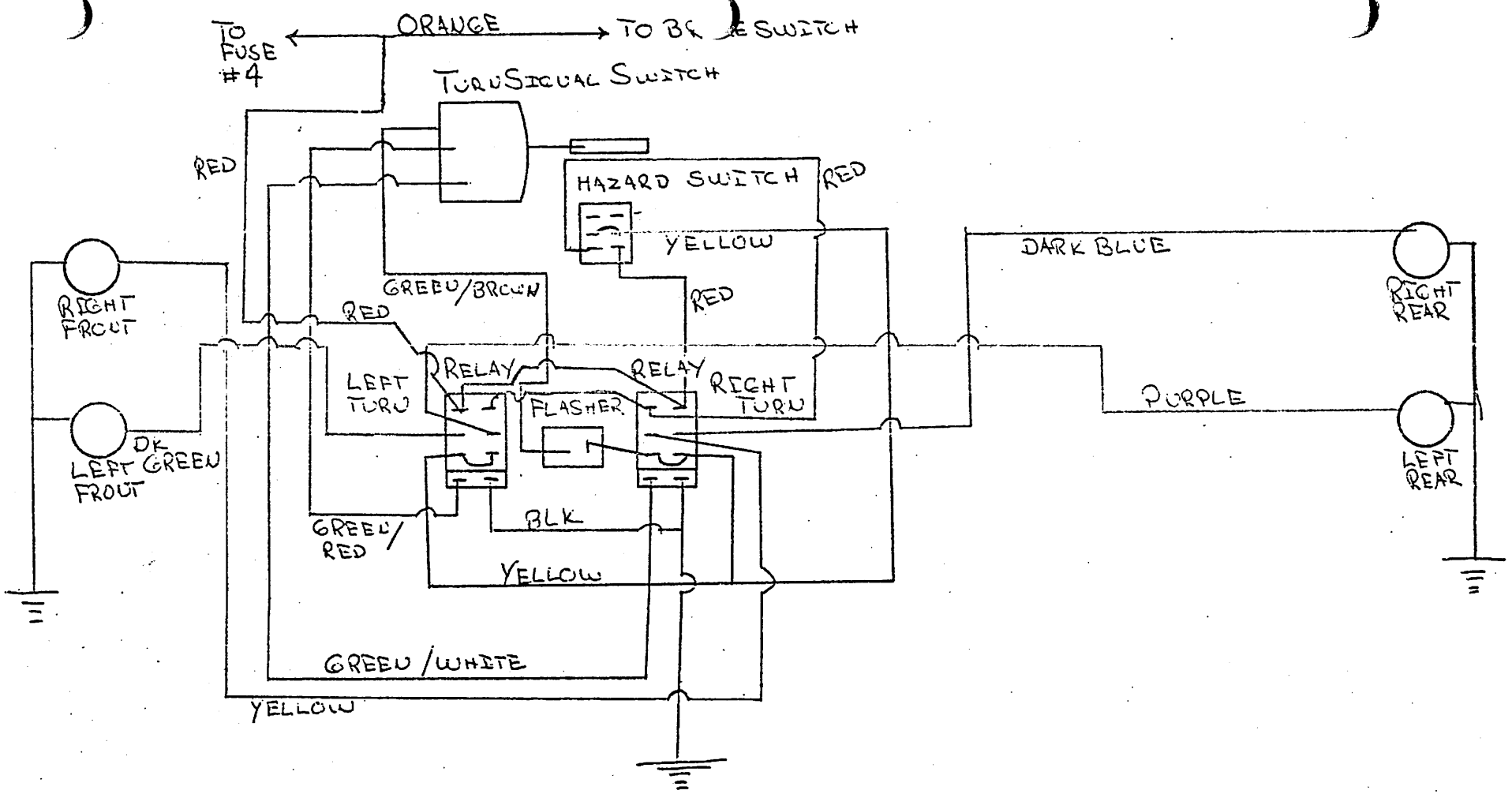
HEAD LAMP CIRCUIT - VEHICLES ABOVE # 1751

7/2/76
C DELANEY



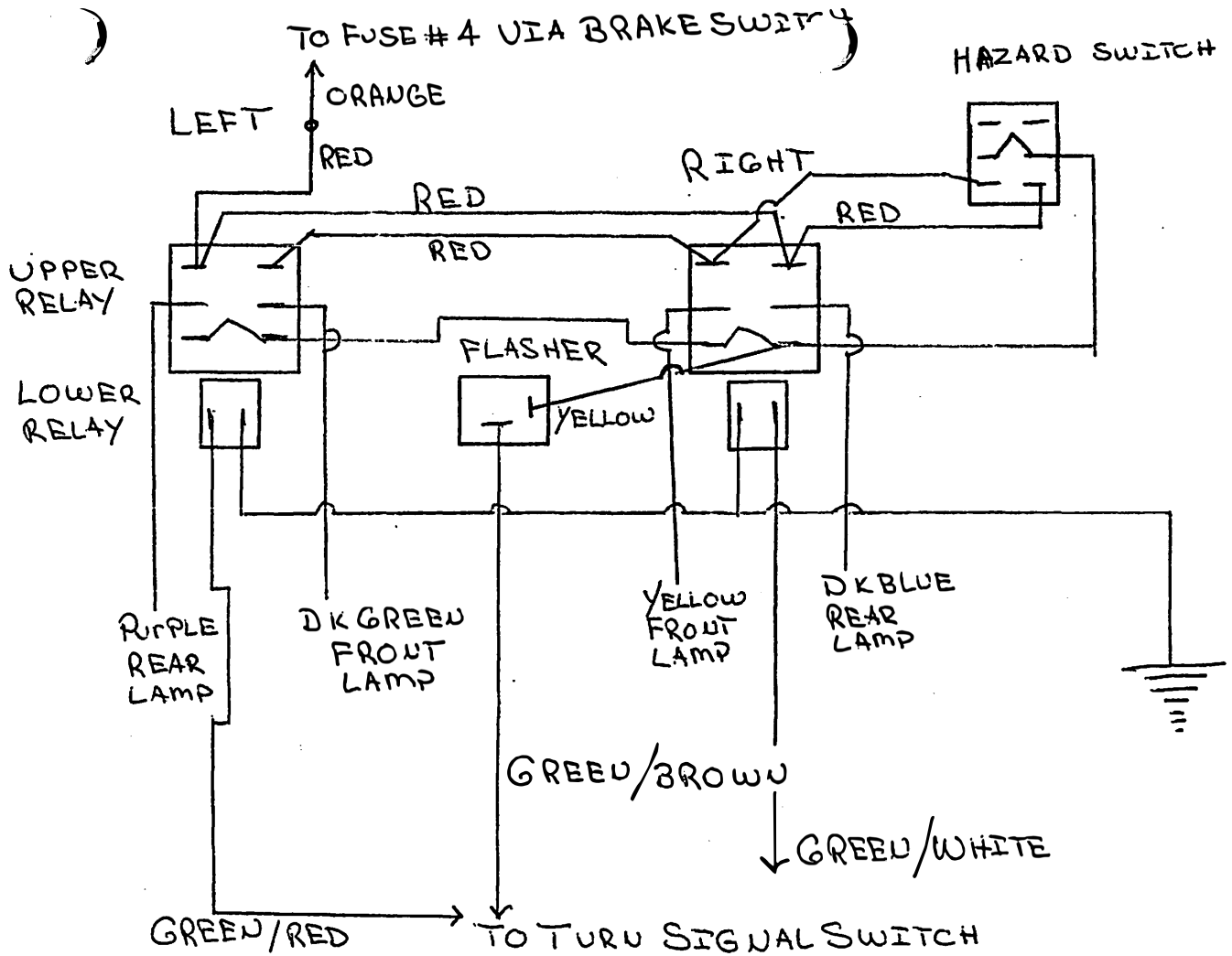
TURN SIGNALS - EARLY PROD.

2/2/76
G. DELANEY



TURN SIGNAL CIRCUIT - VEHICLES ABOVE # 1751

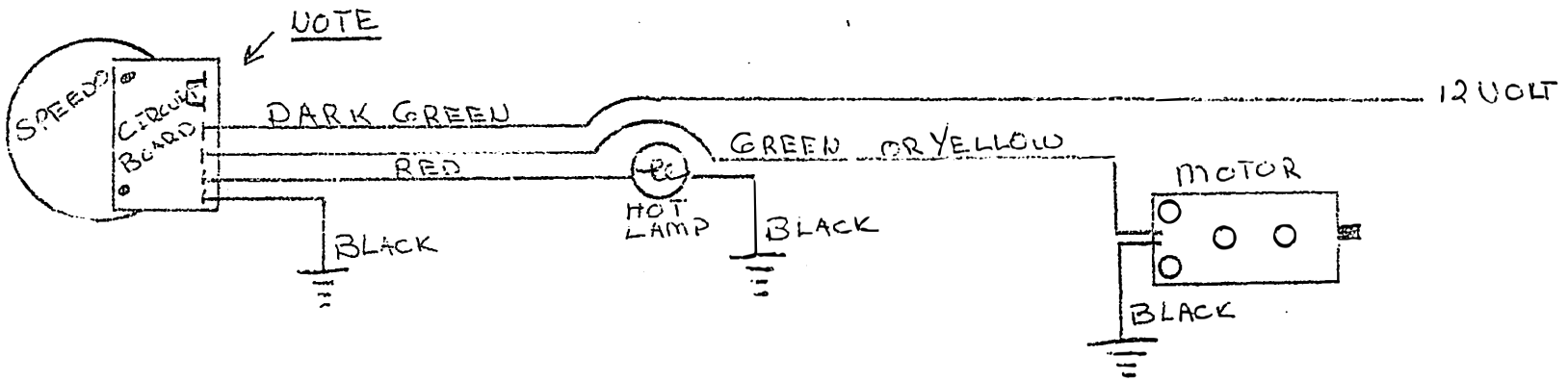
2/2/76



TURN SIGNAL RELAY CIRCUIT

VEHICLES ABOVE #1751

2/2/76
G. DELANEY

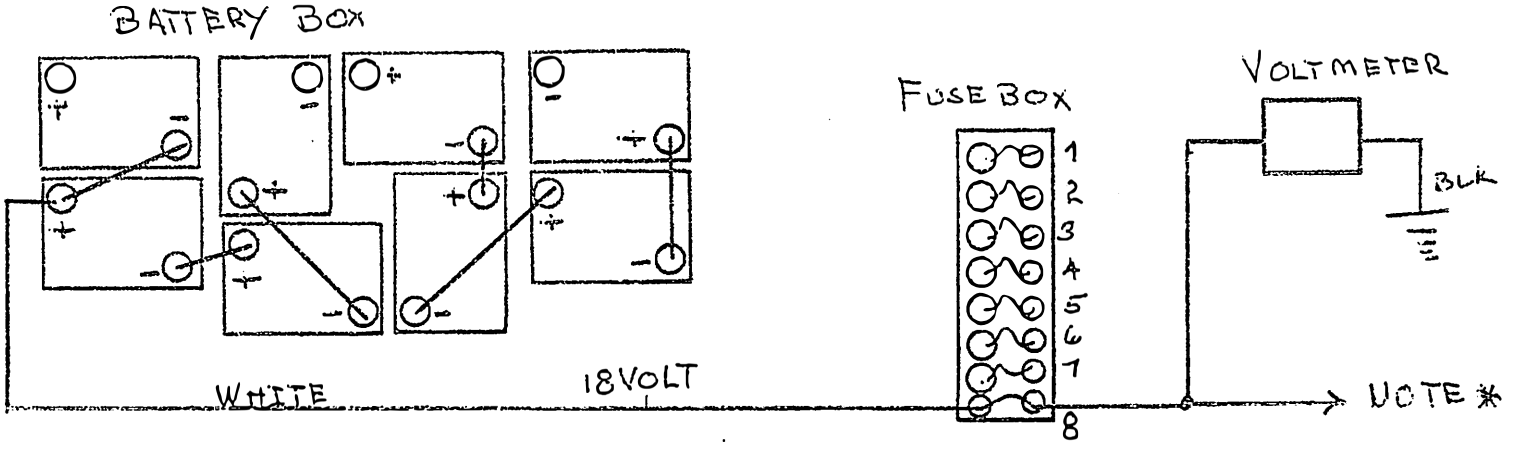


MOTOR OVERHEAT CIRCUIT

NOTE

CIRCUIT BOARD TOP TWO TERMINALS USED FOR VEHICLES WITH DRUM BRAKE WARNING LAMP SYSTEM.

3/2/76
G. DELANEY

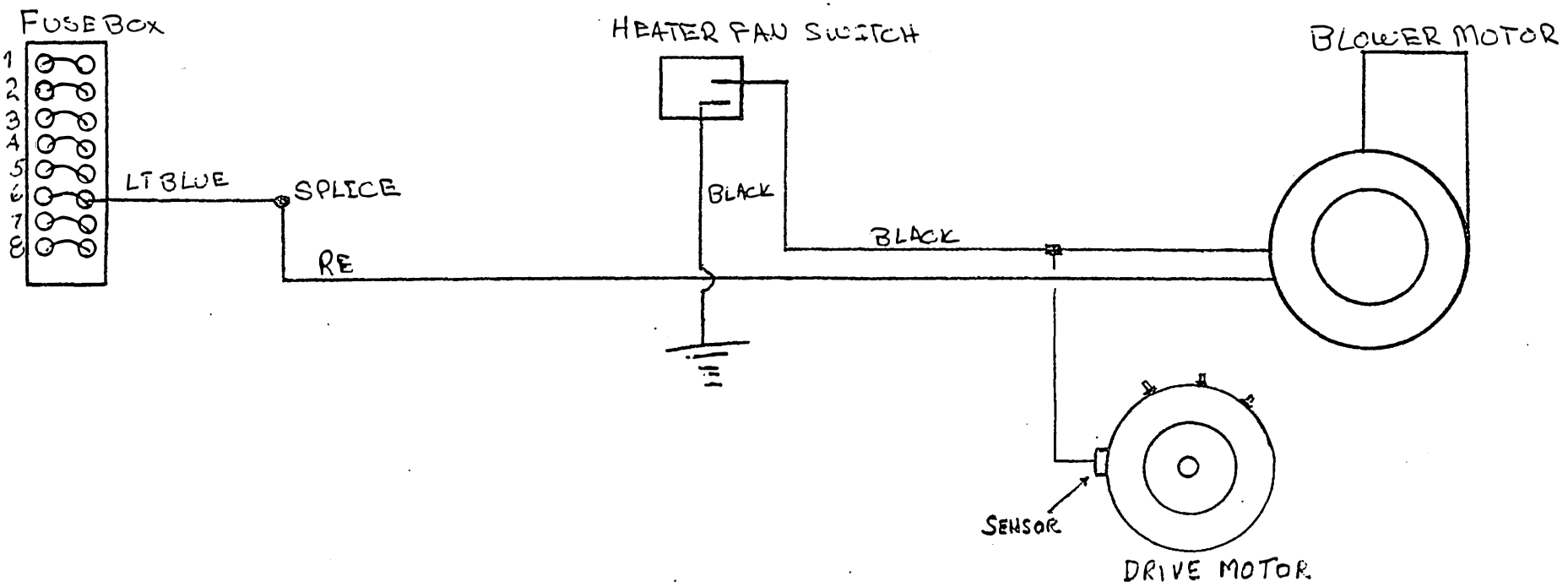


VOLTMETER CIRCUIT

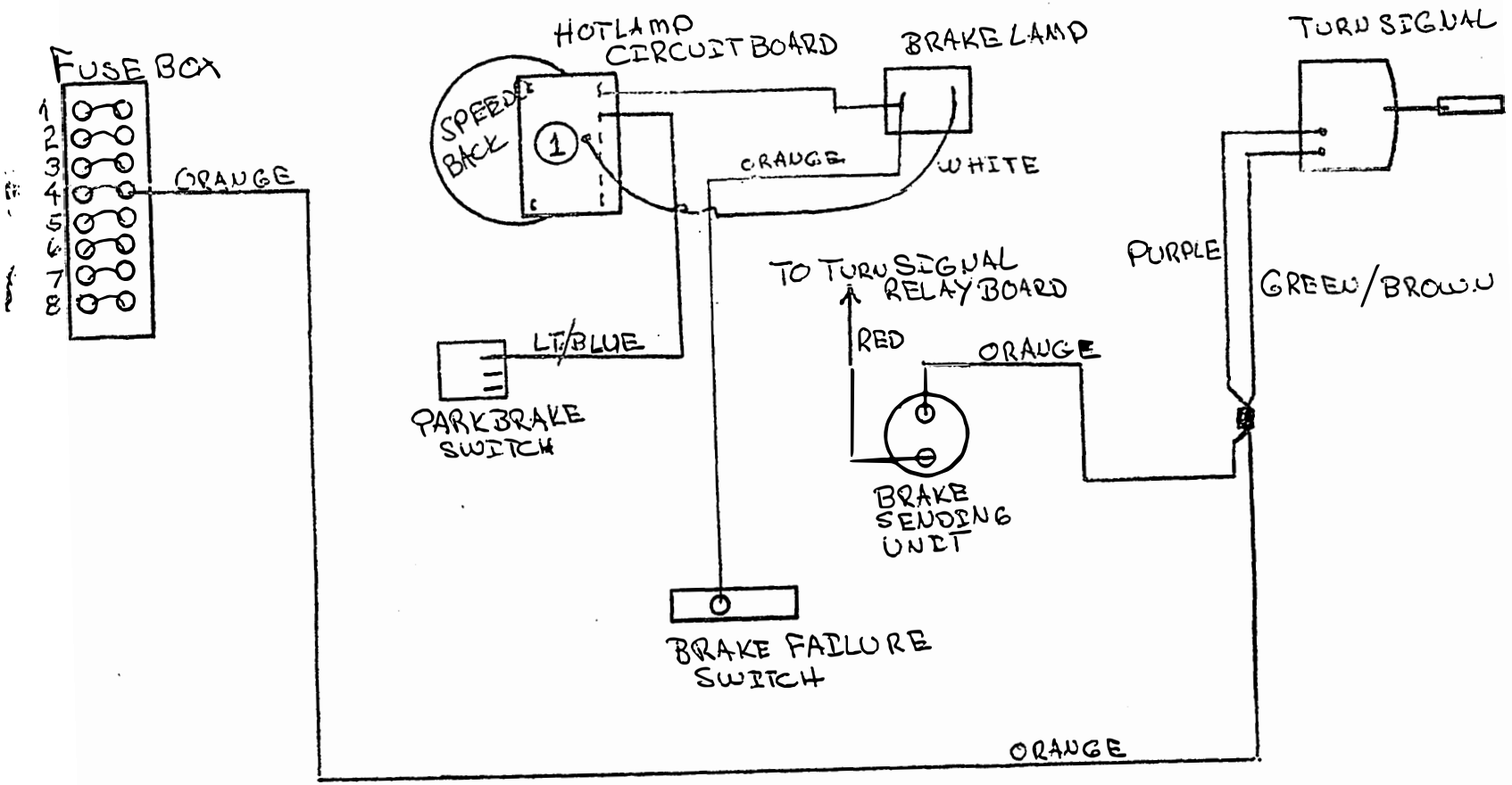
*NOTE

18 VOLT TAP FOR HORN ON VEHICLES BELOW #1751, ALSO FOR VEHICLES WITH DELCO WIPER MOTOR. THIS LINE GOES TO VOLTAGE STEP DOWN RESISTOR

2/2176
G. DELANEY



BLOWER MOTOR CIRCUIT FACTORY INSTALLED

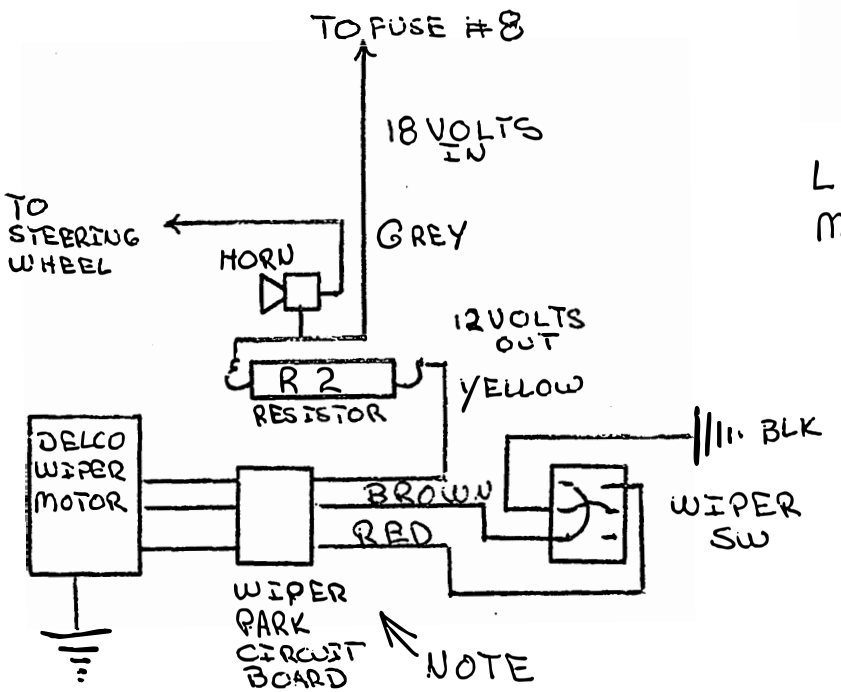


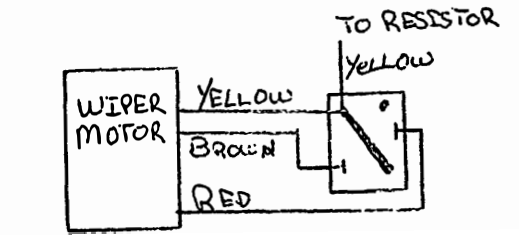
(1) WHITE WIRE SOLDERED TO TERMINAL ON CARD

BRAKE FAILURE/SENDING UNIT CIRCUIT

VEHICLES WITH DUAL MASTER CYL. ONLY

2/2/76
G. DELANEY





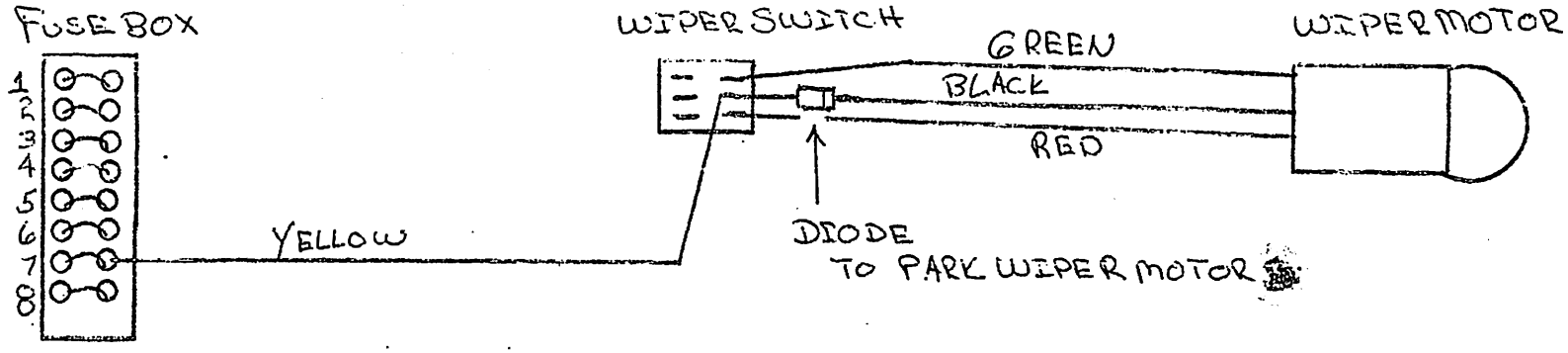
LATE PROD. WITH DELCO MOTOR ONLY

WIPER MOTOR CIRCUIT - DELCO MOTOR ONLY

NOTE

CIRCUIT BOARD USED ON FIRST 1250 VEHICLES (APPROX). LATER VEHICLES USED IMPROVED SWITCH ON DASH.

2/2/76
G. DELANEY

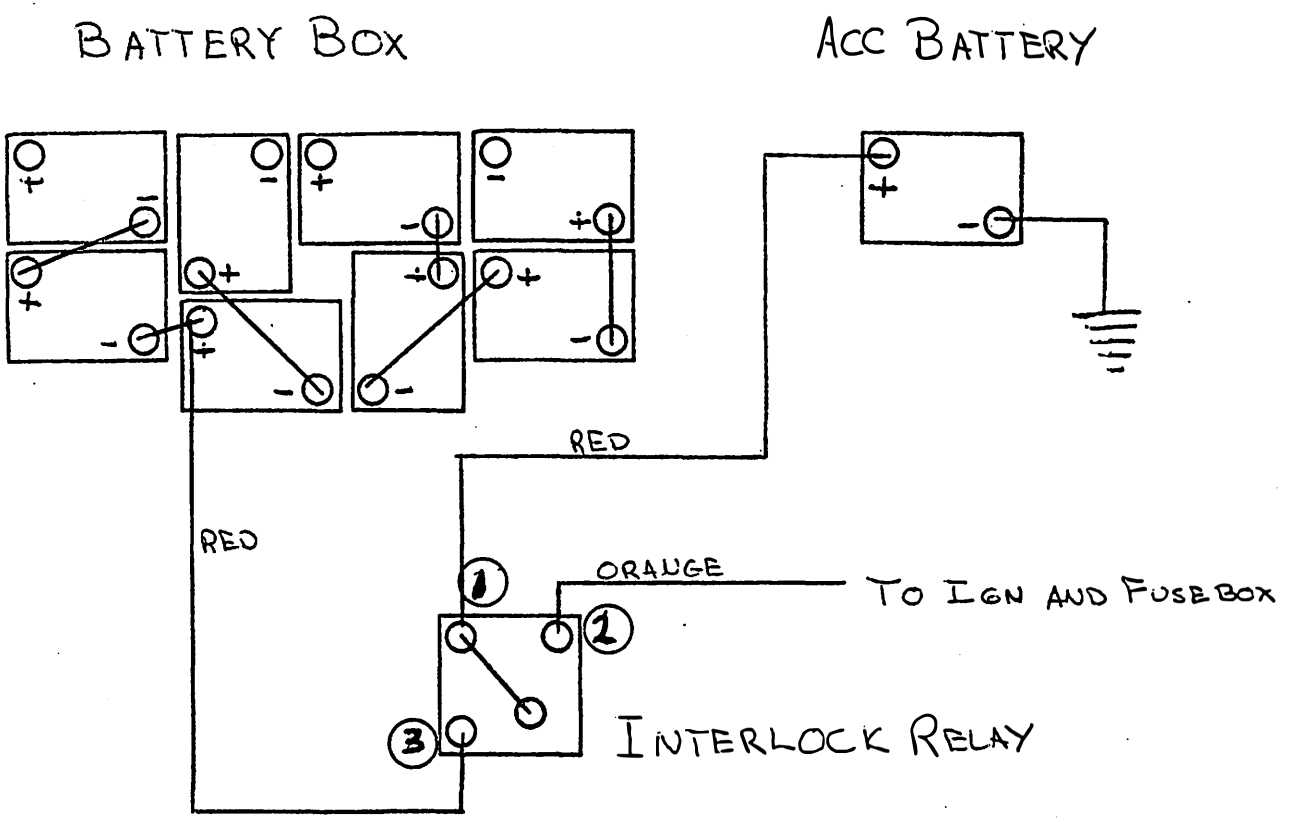


LATE PROD WIPER MOTOR CIRCUIT

TYPE - AMERICAN BOSCH.

2/3/76
DELANEY

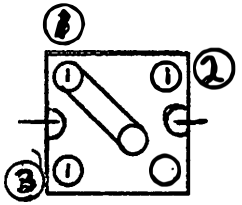
ACCESSORY BATTERY CIRCUIT



① ACC BATTERY TO CENTER CONNECTION OF INTERLOCK
② CONNECTION FOR NORMAL VEHICLE OPERATION
③ CONNECTION FOR CHARGING BATTERIES

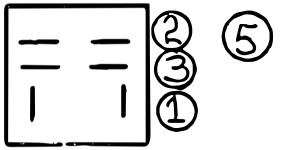
2/2/76
G. DELANEY

INTERLOCK RELAY CONNECTIONS FOR ACC BATTERY



LATE PROD RELAY
LESTOR CHARGER

INTERNAL RELAY
AUTOMATIC CHARGER



EARLY PROD. RELAY
ALL 36 VOLT GOULD
AND EARLY 48 VOLT LESTER

① CENTER CONNECTION
RELAY FLAPPER FOR ACC BATT

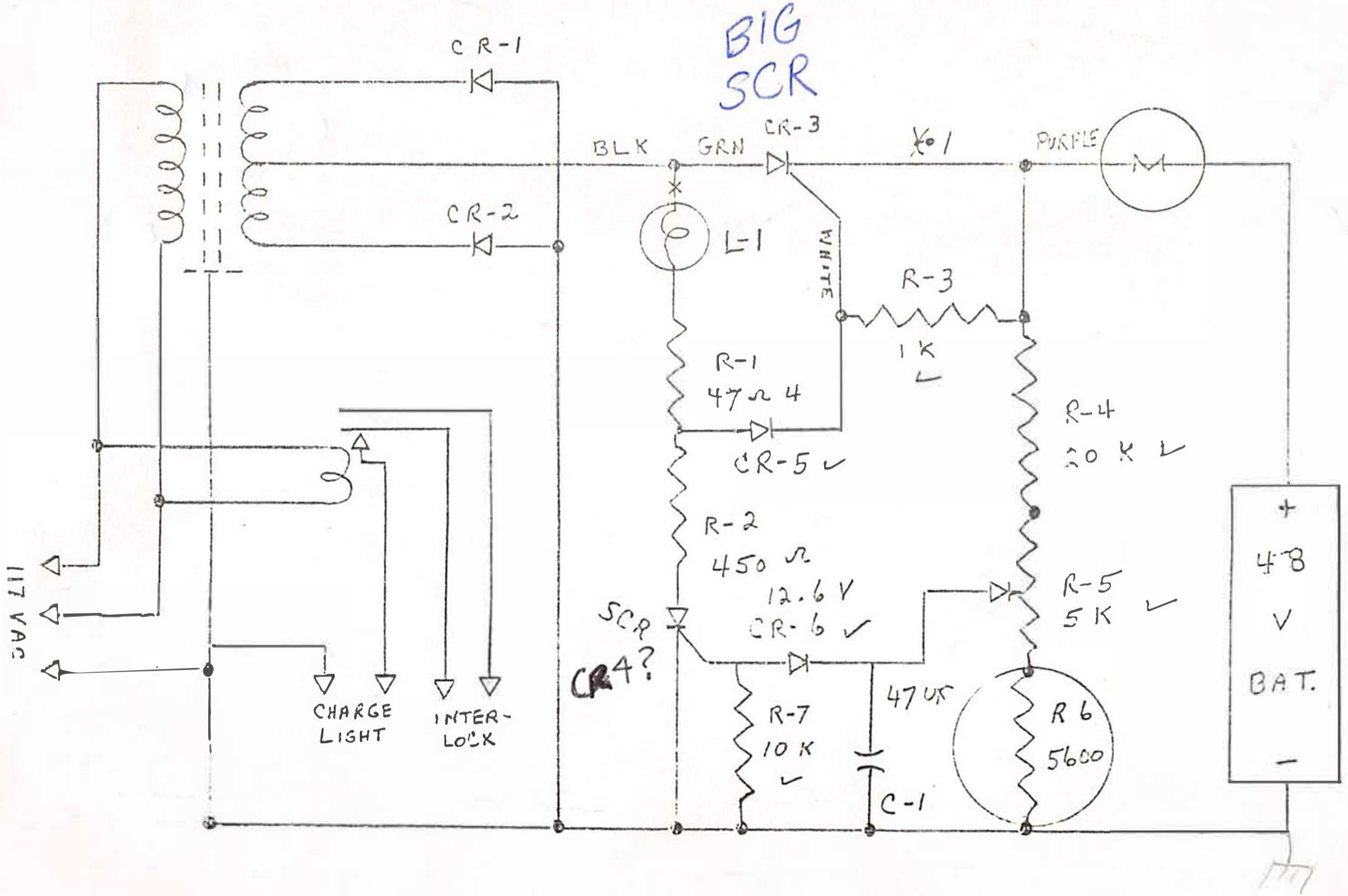
② UPPER CONTACT CONNECTION
FOR ORANGE WIRE TO FUSEBOX

③ LOWER CONTACT CONNECTION
FOR RED WIRE FROM BATTERY BOX

④ YELLOW WIRE LEAD
CONNECTION FOR
CHARGE LAMP.

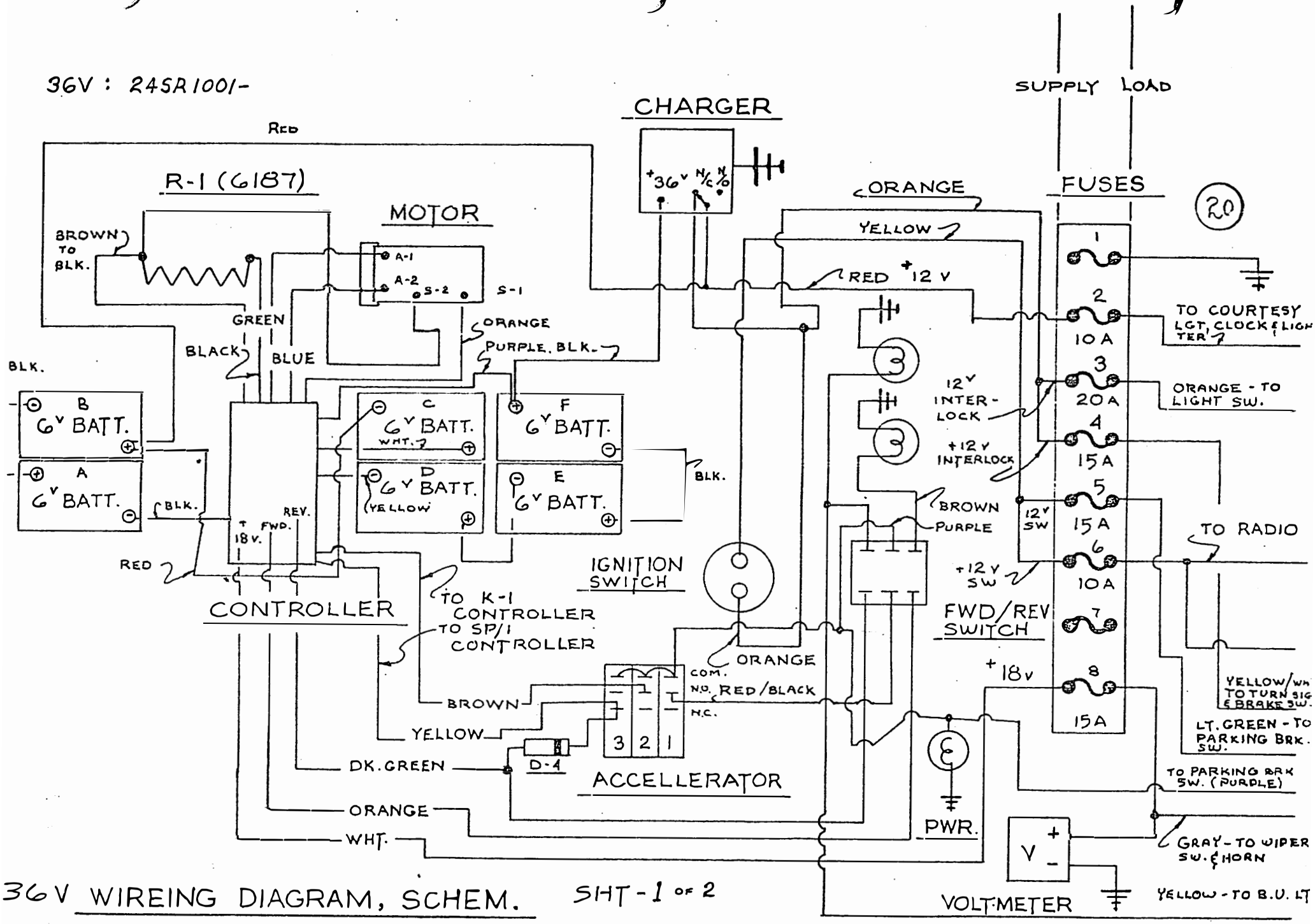
⑤ MAKE JUMPER WIRE
ACROSS BOTH ① TERMINALS
AND USE ALL FOUR HARNESS
WIRES.

7/2/76
DELANEY



VANGUARD AUTOMATIC CHARGER CIRCUIT

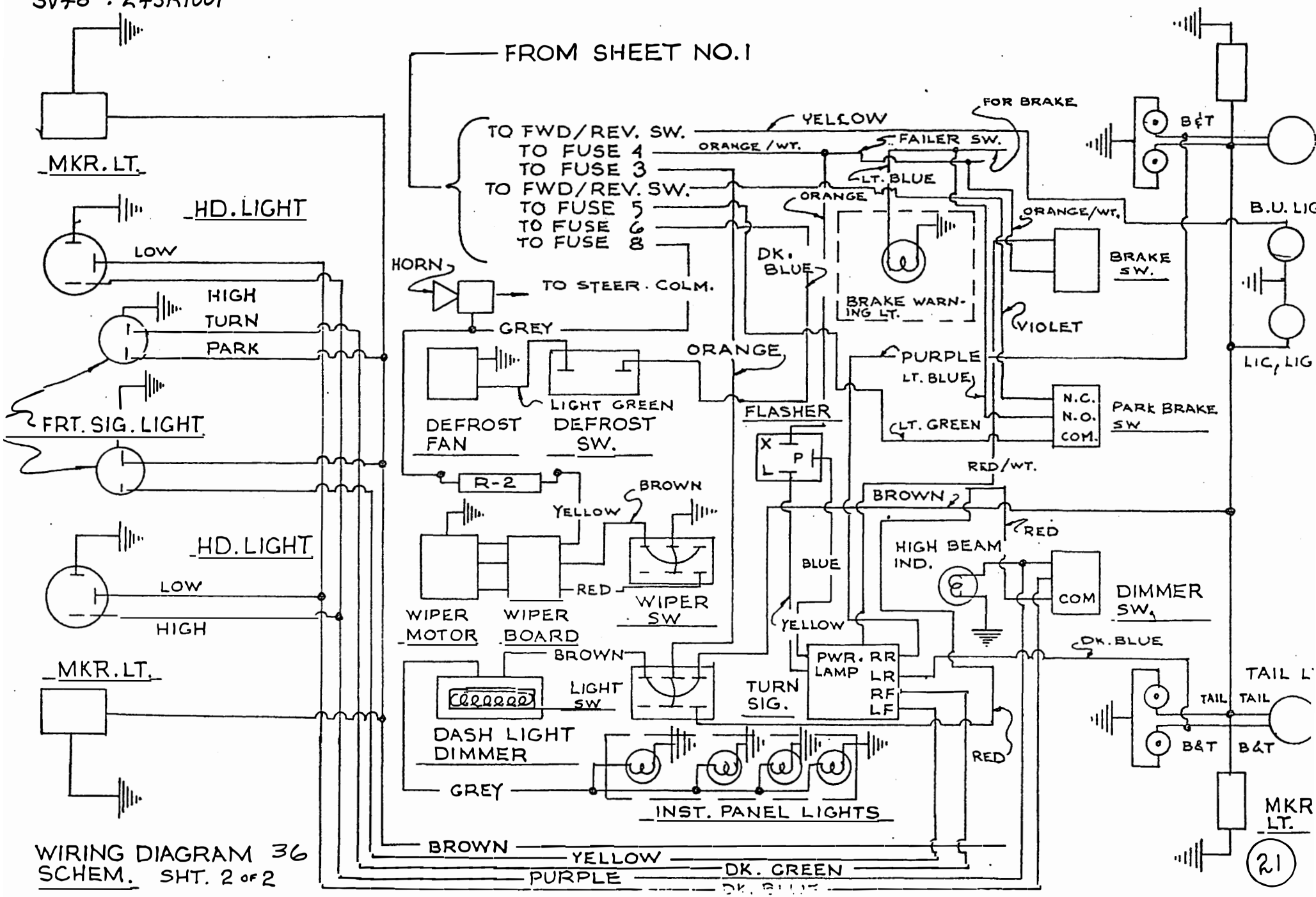
36V : 245R1001-



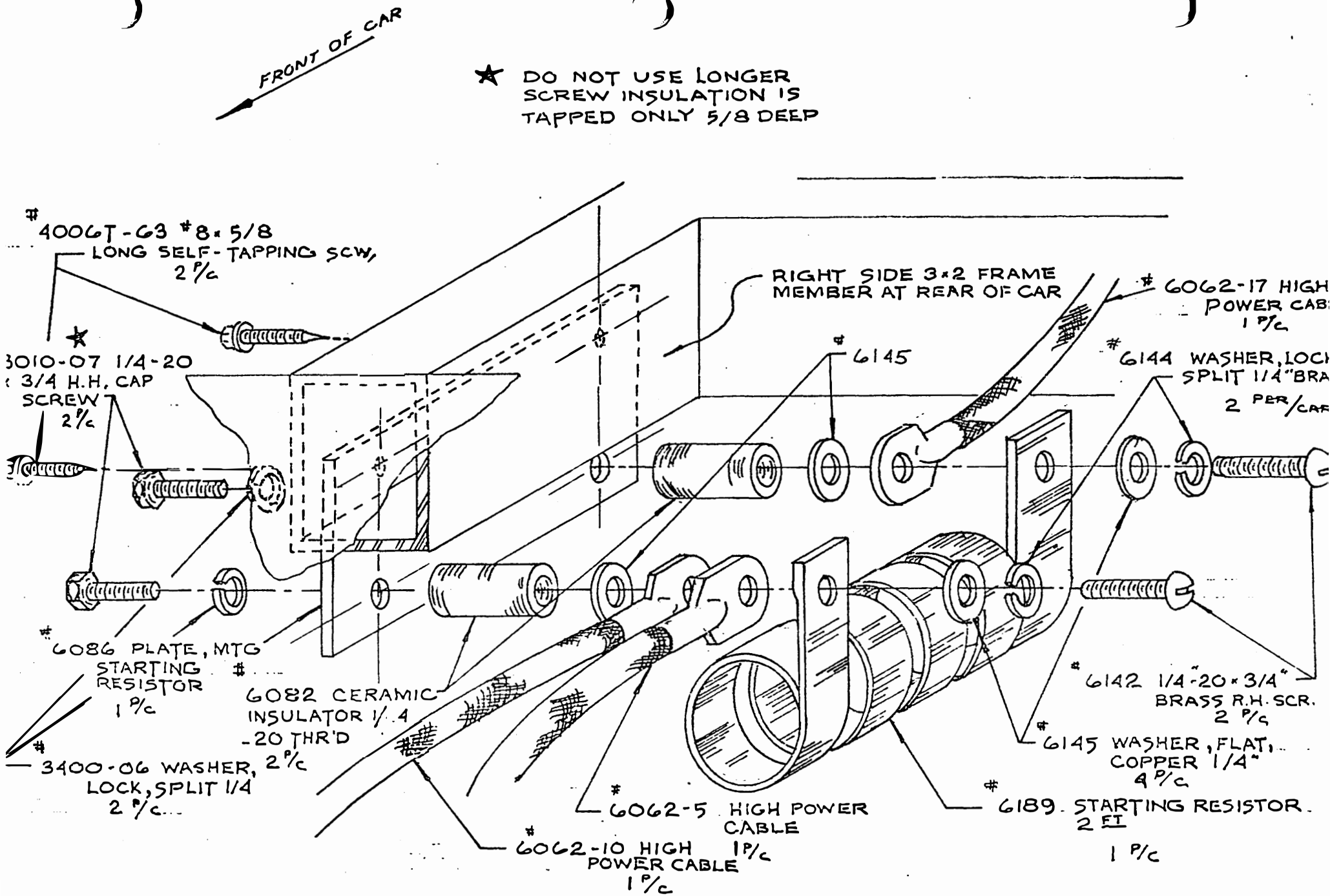
36V WIREING DIAGRAM, SCHEM. SHT-1 OF 2

(20)

36V 24SR1001-
SV48 : 24SR1001-



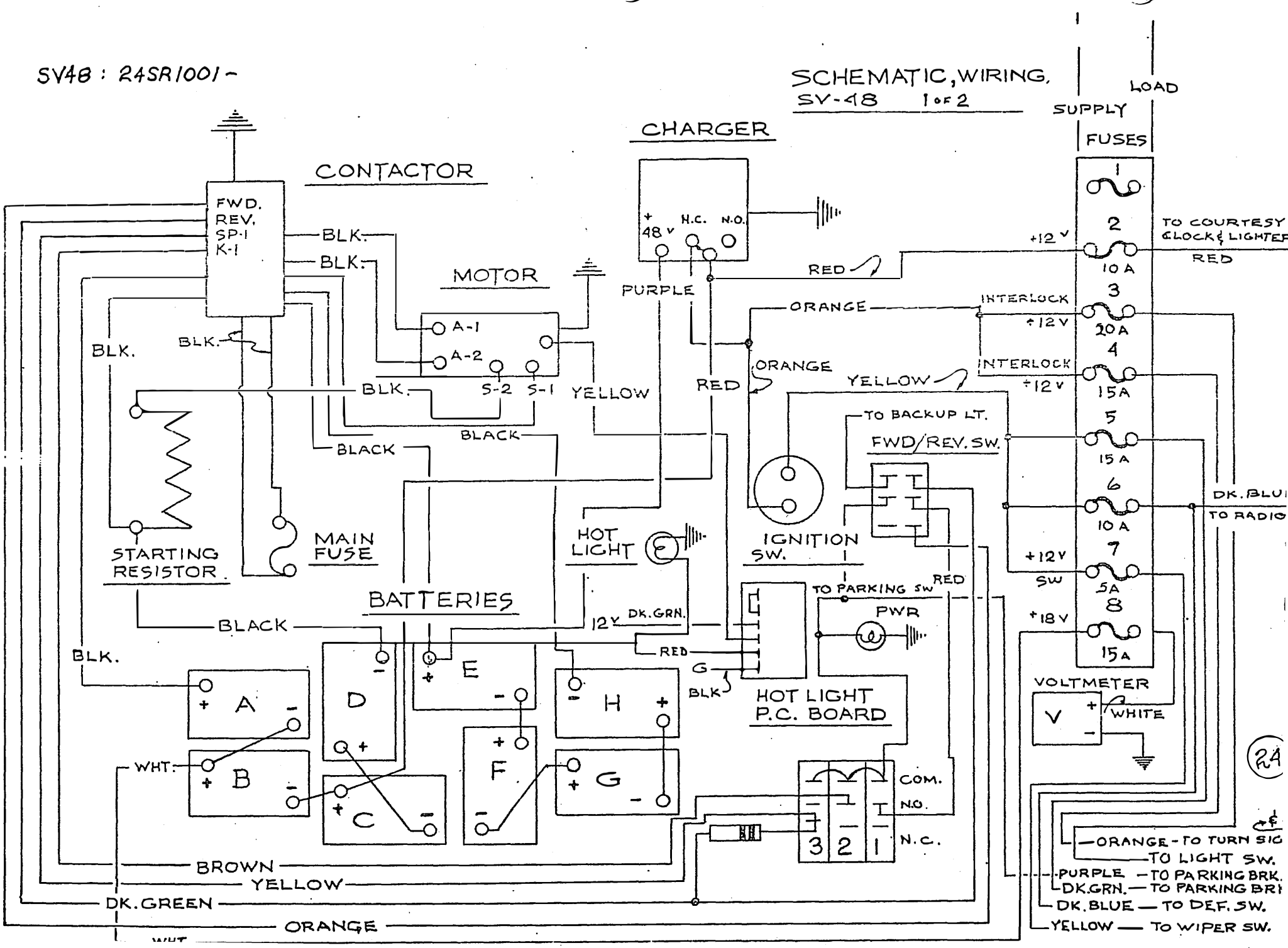
WIRING DIAGRAM 36
SCHEM. SHT. 2 OF 2

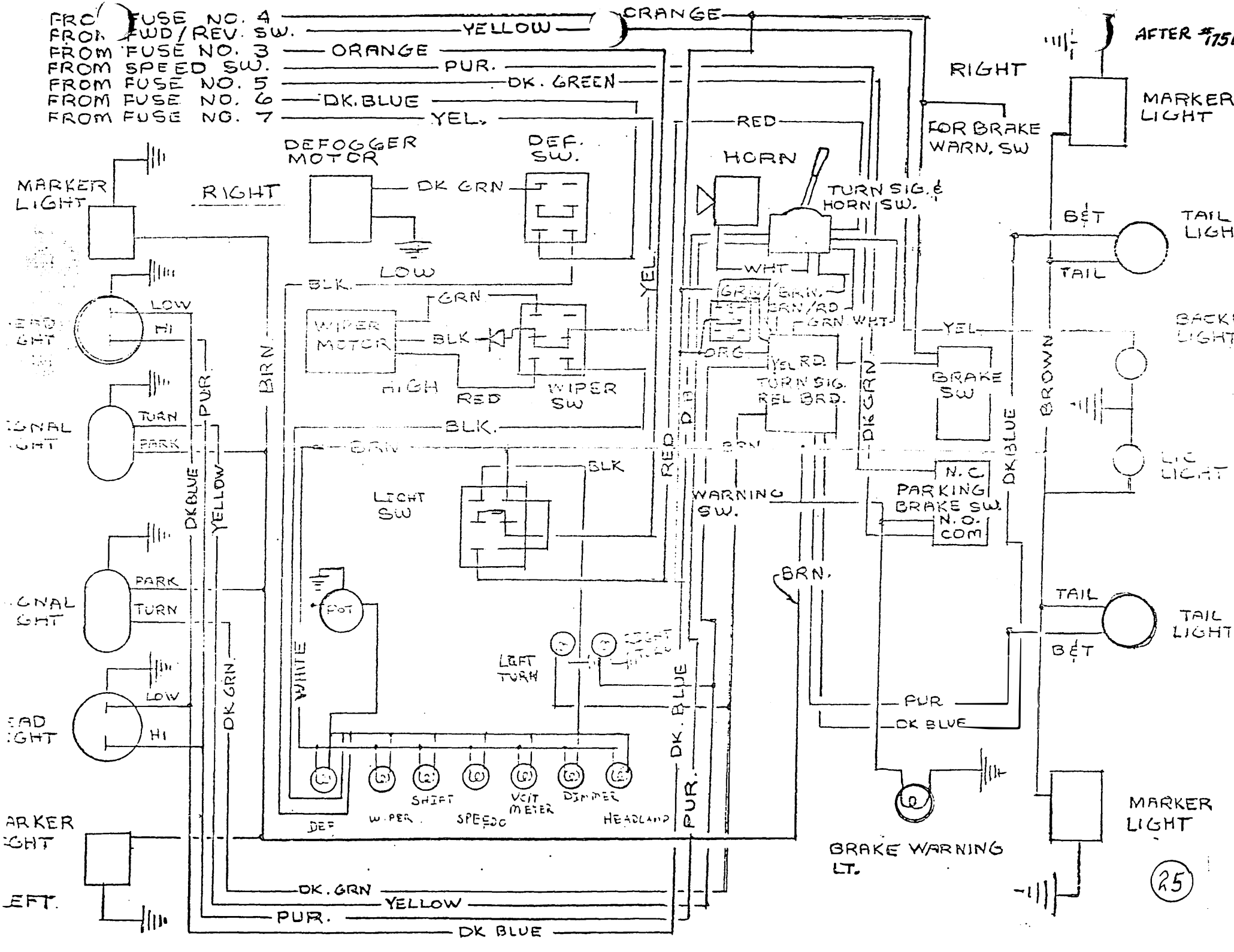


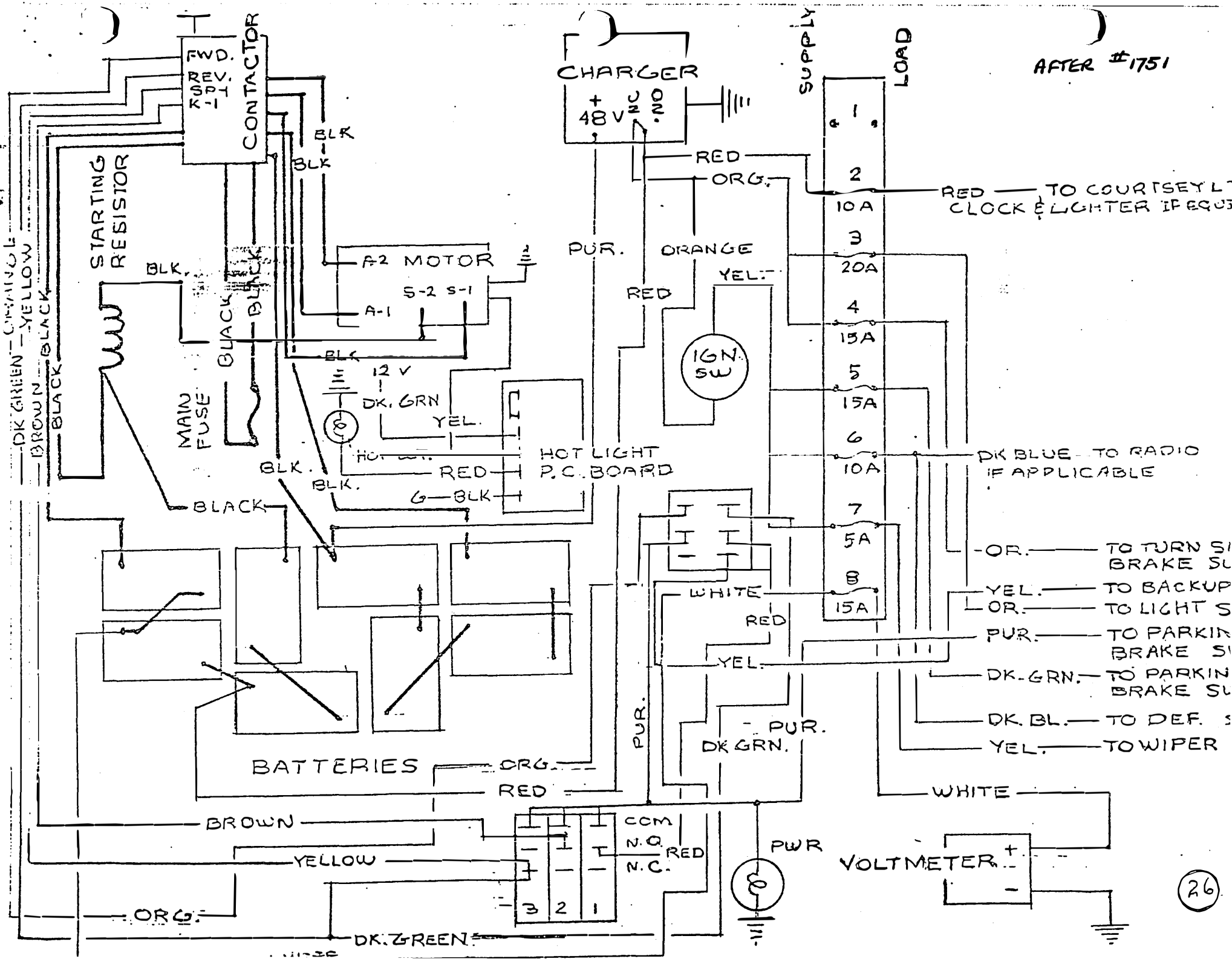
STARTING RESISTOR ASS'Y
SV-48

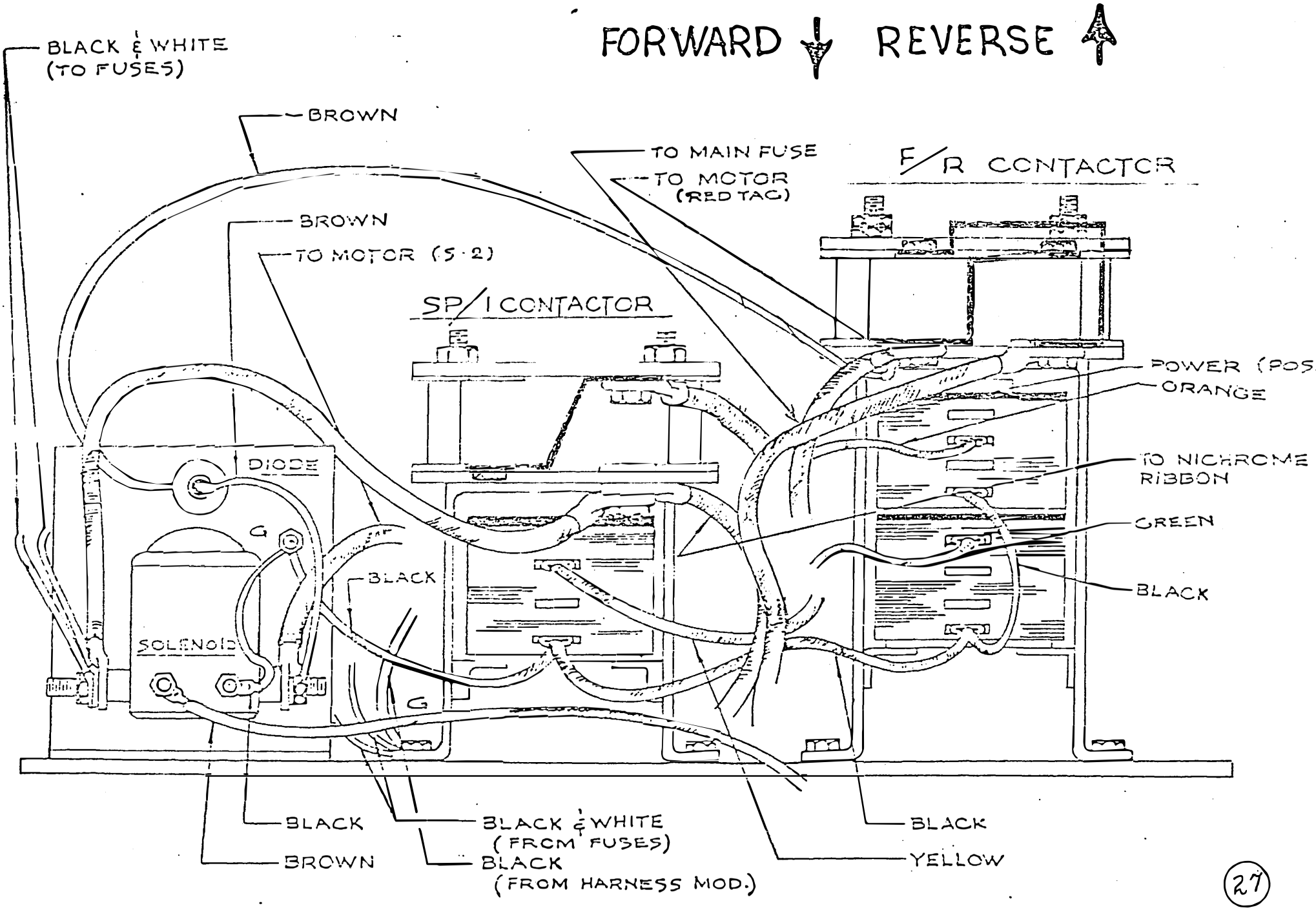
SV48 : 24SR1001 -

SCHEMATIC, WIRING, SV-48 1 OF 2

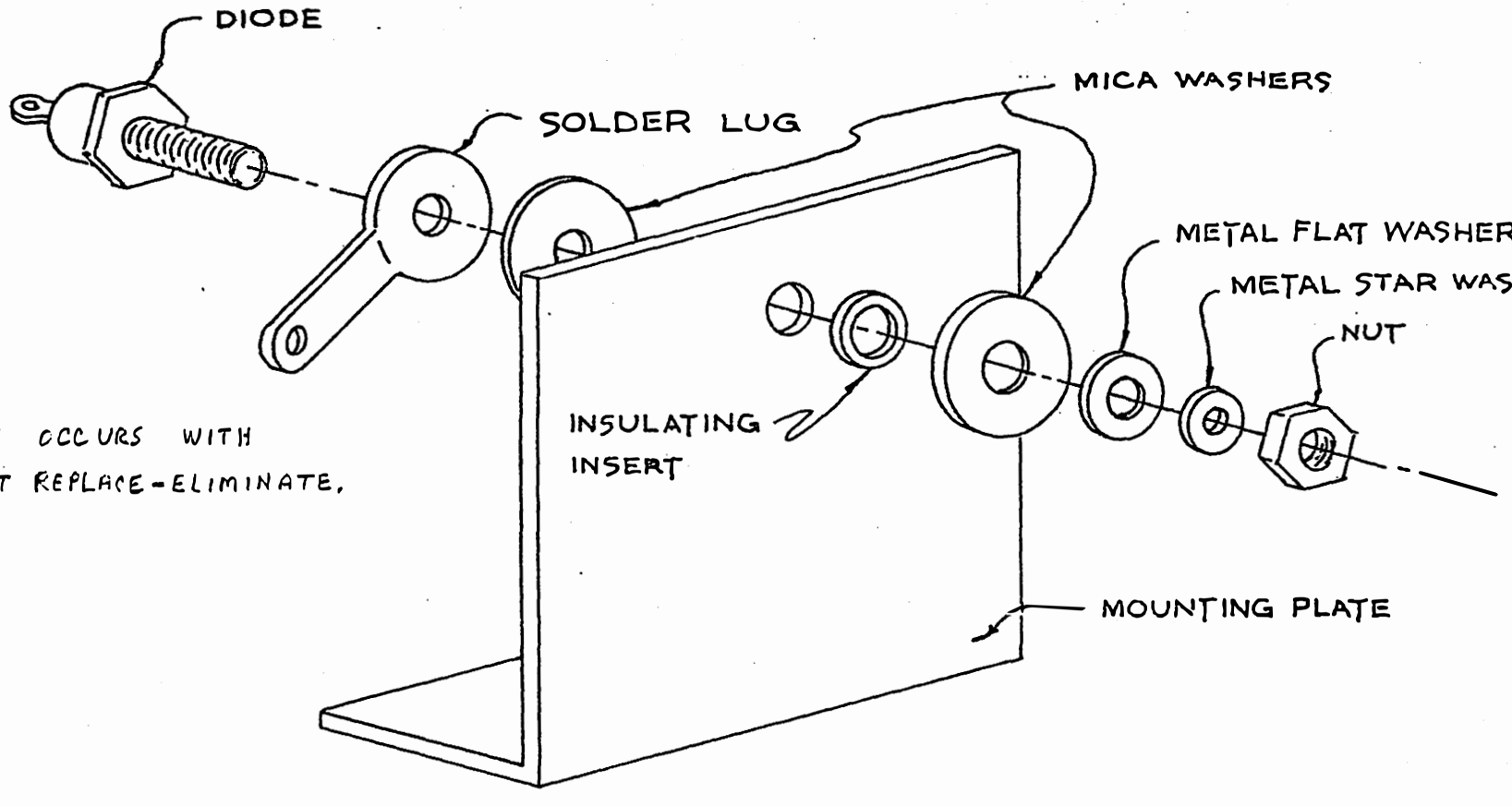



FROM FUSE NO. 4
FROM FWD/REV. SW.
YELLOW
ORANGE
FROM FUSE NO. 3
ORANGE
FROM SPEED SW.
PUR.
FROM FUSE NO. 5
DK. GREEN
FROM FUSE NO. 6
DK. BLUE
FROM FUSE NO. 7
YEL.
AFTER #1751
RIGHT
MARKER LIGHT
FOR BRAKE WARN. SW
RED
DEFOGGER MOTOR
DEF. SW.
DK GRN
HORN
TURN SIG. & HORN SW.
MARKER LIGHT
RIGHT
LOW
BLK.
GRN
WIPER MOTOR
BLK
HIGH
RED
WIPER SW
YEL
WHT
GRN/BRN.
GRN/RD
GRN WHT
YEL
ORG
YEL RD.
TURN SIG. REL BRD.
BRAKE SW
BET
TAIL LIGH
TAIL
BACK LIGHT
BRN
DK GRN
DK BLUE
BROWN
LIC LIGHT
LOW
HI
TURN
PARK
PUR
BRN
DK BLUE
YELLOW
BLK.
BRN
LIGHT SW
BLK
RED
DK BLUE
WARNING SW.
N.C
PARKING BRAKE SW.
N.O.
COM
PARK
TURN
POT
WHITE
DK GRN
LOW
HI
LEFT TURN
BRN.
TAIL
TAIL LIGHT
BET
PUR
DK BLUE
DK. BLUE
PUR.
DEF
WIPER
SHIFT
SPEEDO
VOLT METER
DIMMER
HEADLAND
MARKER LIGHT
BRAKE WARNING LT.
DK. GRN
YELLOW
PUR.
DK BLUE
25


AFTER #1751
FWD.
REV.
SPT
K-1
CONTACTOR
STARTING RESISTOR
CHARGER
+ 48V -
SUPPLY
LOAD
A2 MOTOR
A-1
S-2 S-1
MAIN FUSE
12 V
DK. GRN
YEL.
HOT LIGHT P.C. BOARD
IGN. SW
RED
ORG.
PUR.
ORANGE
BLK.
BLACK
1
2
10A
3
20A
4
15A
5
15A
6
10A
7
5A
8
15A
RED — TO COURTSEY L
CLOCK & LIGHTER IF EQU
DK BLUE — TO RADIO
IF APPLICABLE
OR. — TO TURN SI
BRAKE SU
YEL. — TO BACKUP
OR. — TO LIGHT S
PUR. — TO PARKIN
BRAKE SU
DK. GRN. — TO PARKIN
BRAKE SU
DK. BL. — TO DEF.
YEL. — TO WIPER
WHITE
BATTERIES
BROWN
YELLOW
ORG.
DK. GREEN
COM
N.O.
N.C.
PWR
VOLTMETER
DK GRN.
DK. GREEN — ORANGE — YELLOW — BROWN — BLACK

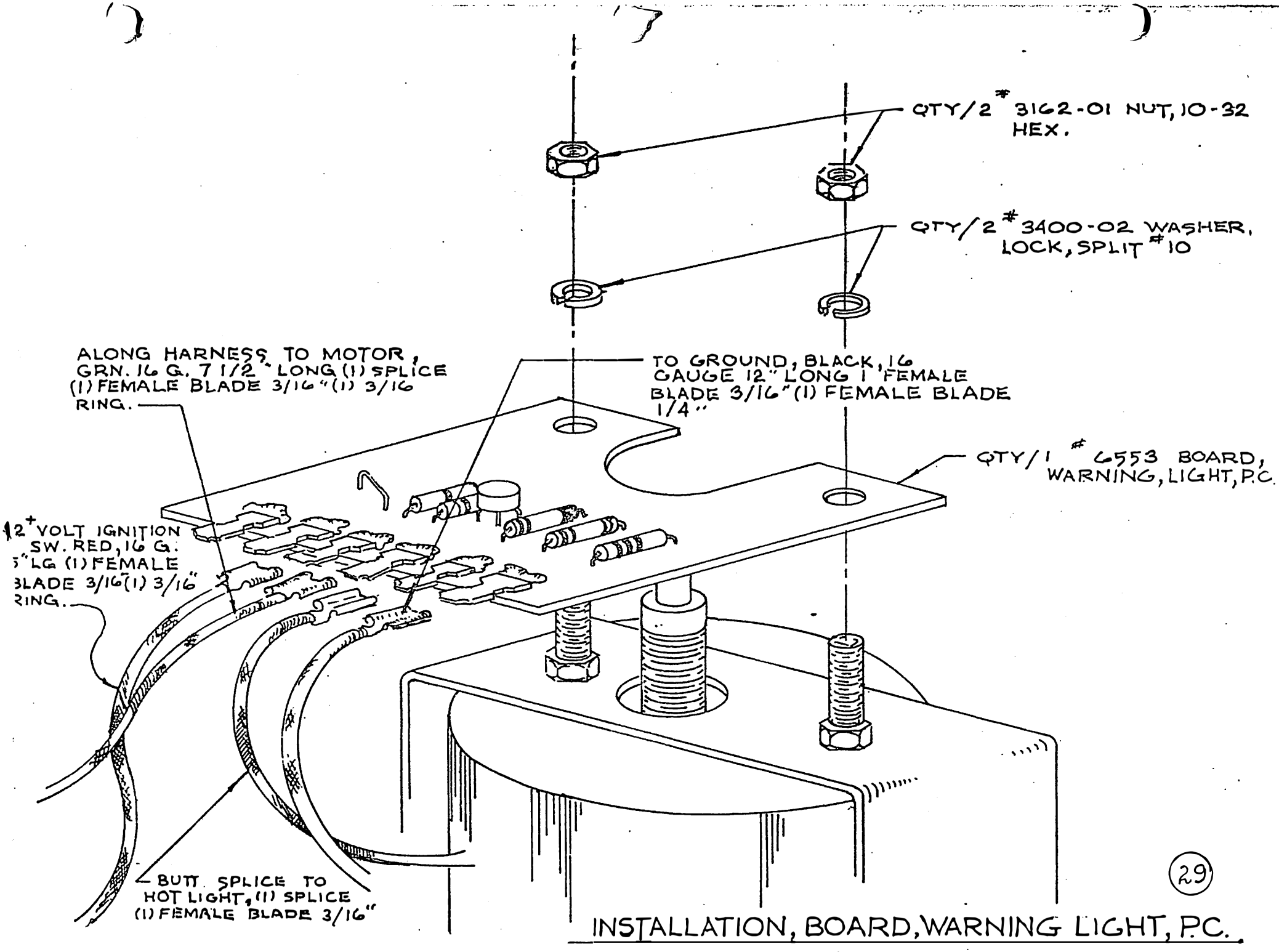


CONT. WIRING DIAGRAM, L/P



IF TROUBLE OCCURS WITH DIODE, DO NOT REPLACE - ELIMINATE.

DIODE MOUNTING ASS'Y (KIT)



INSTALLATION, BOARD, WARNING LIGHT, P.C.