OPS-74-4036

Elec-Trak®
ELECTRIC TRACTORS

service manual

Model ER8-36

RIDER MOWER

CONTENTS

ER8-36 THEORY OF OPERATION

A basic explanation of the ER8 circuitry is usually helpful in making the detailed theory easier to understand. The block diagram in Fig. 1 is a simplified representation of the entire rider circuitry. Notice how the function blocks are interconnected.

After the house voltage is fed into the charger, it is changed to an appropriate d-c voltage and is then fed to the power pack to recharge the cells. The connecting line returning to the charger indicates that a sample of battery condition is used by the charger to properly meter charger output current.

The mower is also powered by the power pack, but manual switching must be performed to operate the mower. The line drawn from the manual switch switching block to the automatic control block represents the control of all other manual switches. These include the key switch, mower switch, seat switch, and neutral switch. All of these switches deliver commands to the drive motor or mower.

Successful troubleshooting of the Elec-Trak Rider requires an understanding of the electric circuits and mechanics involved in normal operation. Major areas that usually require instruction are: 1) start circuit, 2) PTO circuit, and 3) the charger. These three areas will be discussed individually, but with attention directed to the overall tractor response. The troubleshooting sketch should be closely followed during the explanation.

Start Circuit

The ER8 start circuit is relatively simple compared to the E15 or E20 tractors. Refer to Fig. 2 and notice that with the seat switch closed and the transmission in neutral, as soon as the key switch is turned to "ON" the L coil is energized. The neutral switch is physically mounted on the transmission housing and is actuated when the shift lever is moved to the neutral position.

When the L coil is energized, the two normally open contacts close. Contacts "A" bypass the neutral switch and "seal-in" the voltage to the L coil; the transmission may now be placed in gear allow-

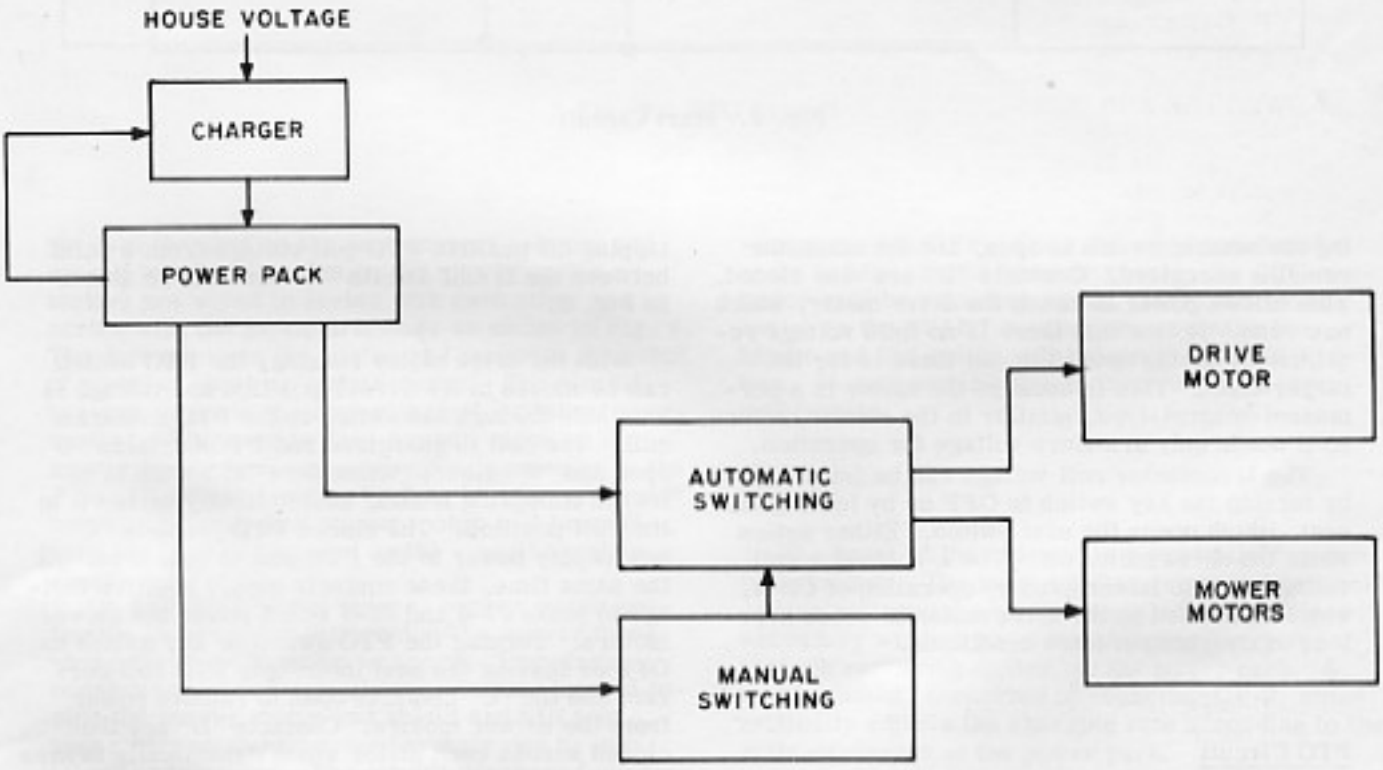

Fig. 1. ER-8 Block Diagram

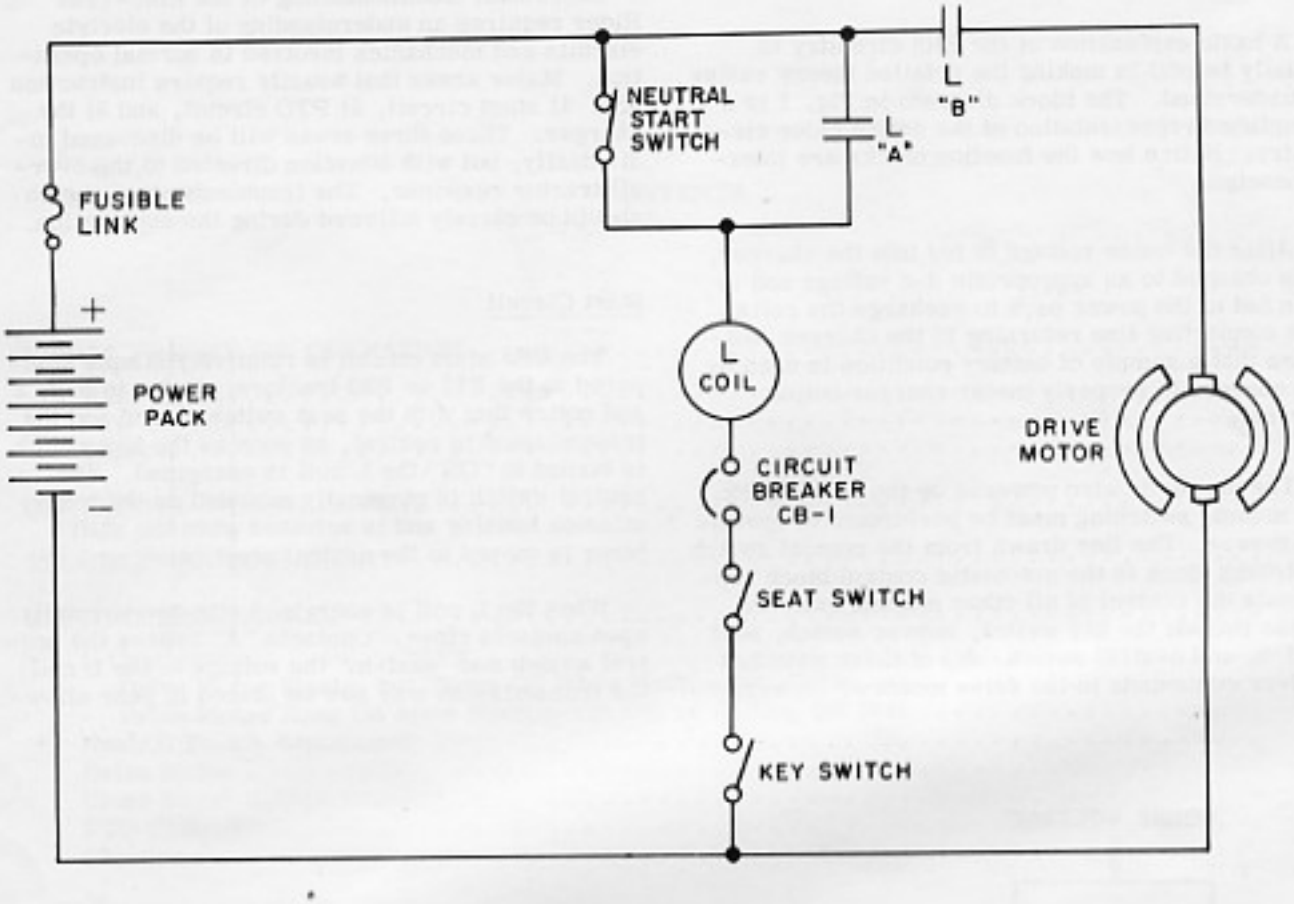

Fig. 2. Start Circuit

ing the neutral switch to open, and the contactor remains energized. Contacts "B" are also closed. This allows power to reach the drive motor, which now runs. Notice that there is no field voltage required for motor operation, as there is for the larger units. This is because the motor is a permanent-magnet-type, similar to the mower motors, so it needs only armature voltage for operation.

The L contactor coil voltage can be interrupted by turning the key switch to OFF or by leaving the seat, which opens the seat switch. Either action shuts the drive motor off. The L contactor coil voltage is also interrupted by operation of CB-1, which is located in the drive motor to sense overload or overtemperature conditions.

PTO Circuit

The PTO circuit requires that the L contactor be supplied voltage before its PTO contactor can be energized, so in normal operation the drive motor will be running before the mower motors can be started. This feature is accomplished by tapping off positive PTO coil voltage from a point between the L coil and its "A" contacts as shown in Fig. 3.

With the drive motor running, the PTO switch can be moved to its START position and voltage is available through the switch to the PTO contactor coil. The coil is energized and PTO contacts "D" open and "C" close. When the PTO switch is released its spring loading automatically moves it to its RUN position. The closed PTO contacts "C" now supply power to the PTO coil to seal it in. At the same time, these contacts supply positive voltage to jacks J1-3 and J2-3 which power the mower motors. Turning the PTO switch or key switch to OFF or leaving the seat interrupts PTO coil current and the "C" contacts open to remove power from the mower motors. Contacts "D" are then closed across each motor which dynamically brakes their rotation very rapidly. To restart the motor, the PTO switch first must be moved to the START position to seal-in the PTO coil.

The ER8 uses a fuse and circuit breaker for protection of each mower motor. On 26ER8AA models,

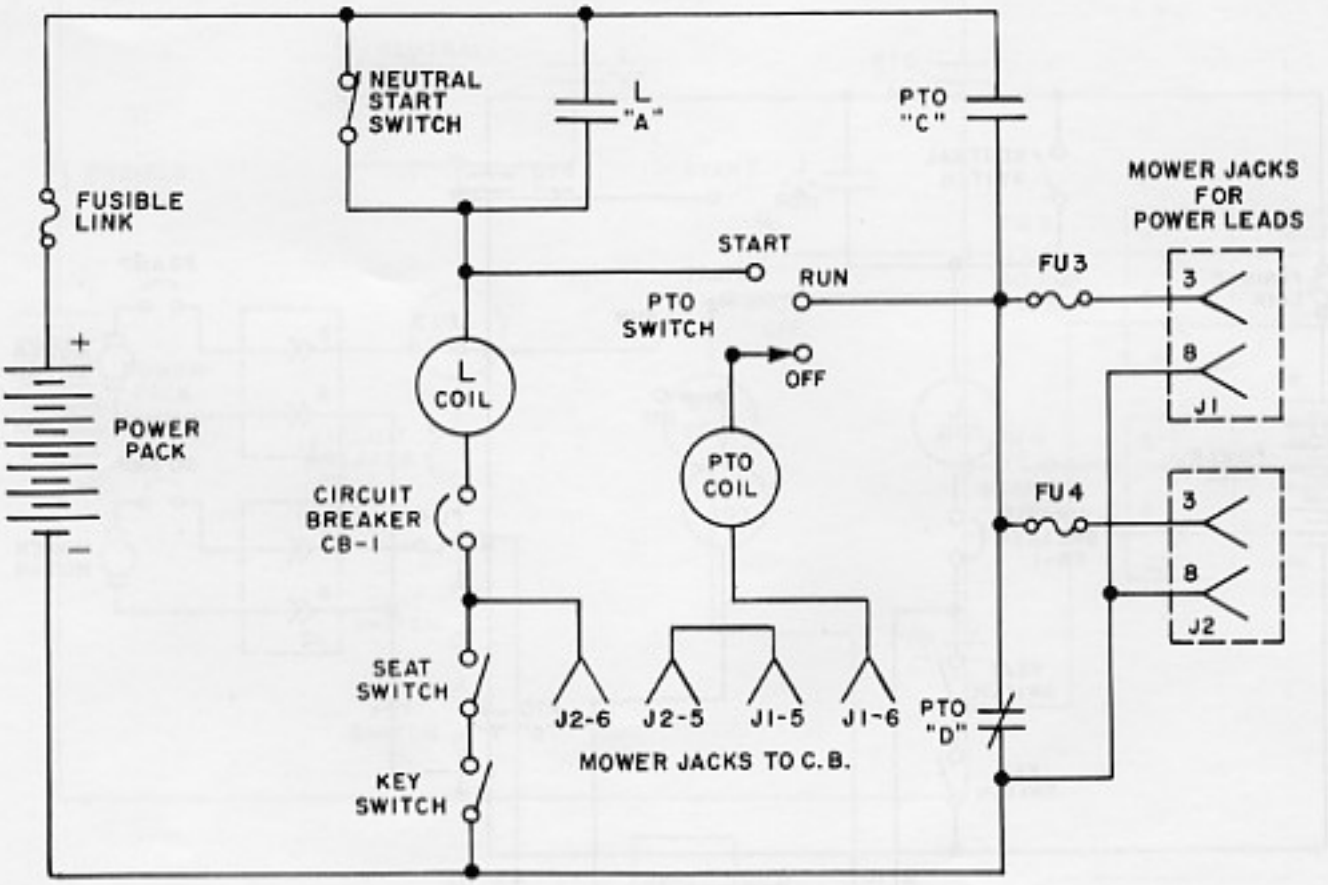

Fig. 3. PTO Circuit

the fuse (located on the seat support column) and circuit breaker (located on the mower motor exterior) are wired in series with each other and in series with the motor armature as shown in Fig. 4. The fuse protects the wiring and motor in the event of a wiring short or stalled motor. The circuit breaker protects the motor against sustained overloading. These units have jumper wires on the mower motor harnesses providing continuity to the PTO coil. In the event of a fuse blowing or circuit breaker tripping that mower motor will turn off until the fuse is replaced or the circuit breaker resets itself.

On 26ER8BA model riders, mower motor protection is somewhat different. The mower fuses share the same function as above. The circuit breakers used are actually thermostats located inside the mower motor end shield and will trip under excessive motor temperature due to sustained overloading. The circuit breakers (one for each motor) are wired in series with each other and in series with the PTO coil (see Fig. 5). If a circuit breaker opens, then PTO coil current is interrupted, the PTO contactor turns off and both mower motors turn off – just as if the PTO switch were turned to OFF. Once the overheated motor cools and its circuit breaker resets, the PTO contactor may be turned on again. Move the mower switch to the START position then release the handle and the switch will return to its RUN position. Mower motors should then run in their normal fashion.

Charger

The heart of the charger is a specially designed transformer. The input winding receives household or line voltage through the timer contacts. The secondary winding provides charging current, through rectifying diodes, to the power pack. A third winding, connected to capacitor CP-2, automatically adjusts the charging rate according to the state-of-charge of the power pack.

A more detailed explanation may be appropriate with the use of Fig. 6. Line voltage is applied to the primary winding through a normally open switch. The switch is closed when the timer knob is turned to its proper "Start" position, which

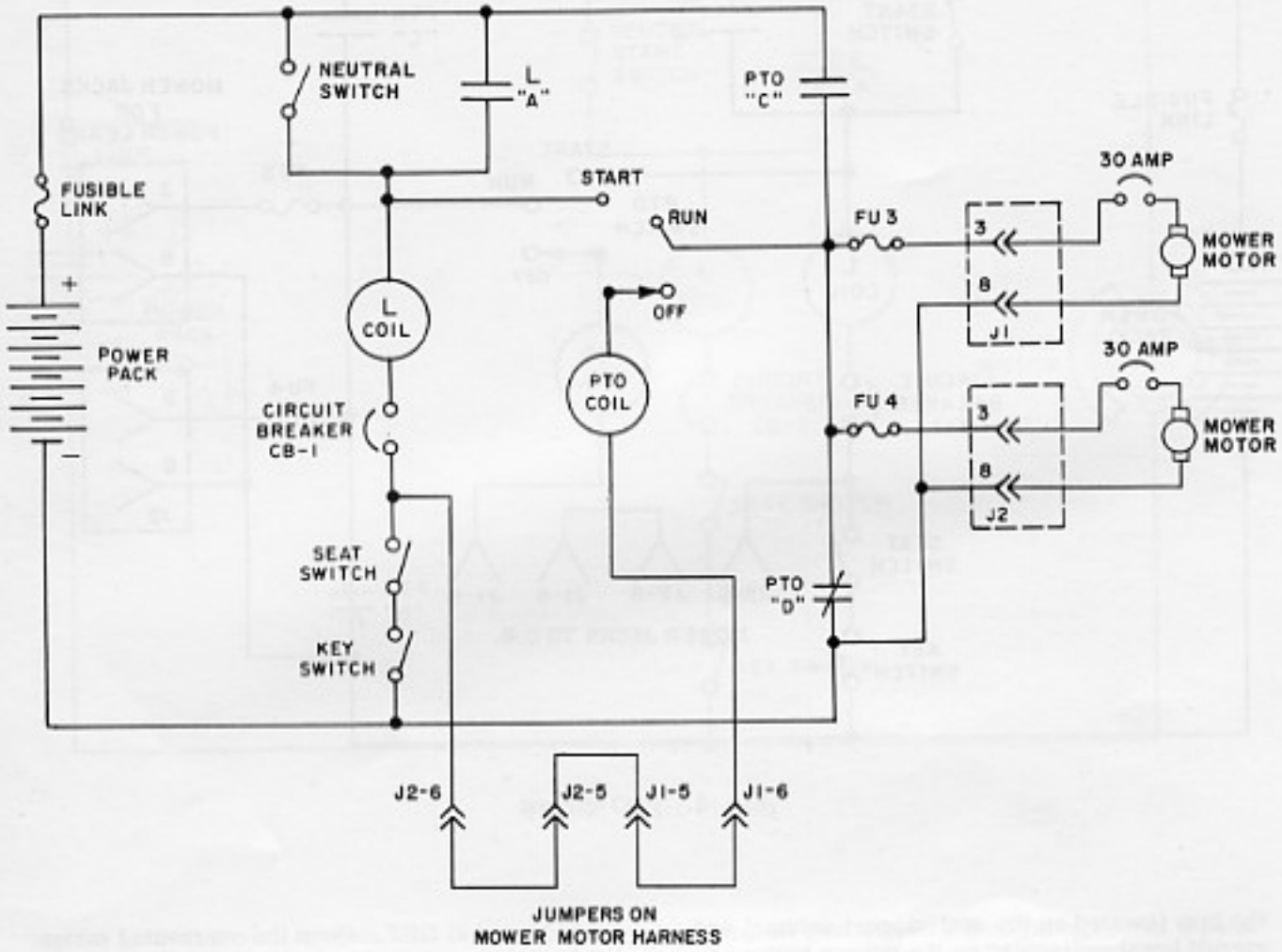

Fig. 4. 26ER8AA PTO Circuit

starts the timer motor and puts the charger into operation. The timer motor drives a cam which causes the contacts to open when the proper amount of time has elapsed.

The secondary winding reduces the line voltage to a usable charging level which is then full-wave rectified by the action of diodes CR4 and CR5. The diodes accept the 60-Hertz sine wave as an input from the secondary winding and output a pulsating positive d-c voltage which charges the power packs. The third winding, in conjunction with capacitor CP2, causes the charger to supply a high current when the power pack is deeply discharged and very low current when the power pack nears its full charge state.

WARNING: SINCE THE ER8 RIDER IS NOT EQUIPPED WITH A POWER DISCONNECT, THE BATTERY CLAMP TERMINATING WIRE NUMBER 2 MUST BE LIFTED FROM THE POSITIVE POST OF BATTERY B1 BEFORE PROCEEDING WITH SERVICING OF THE RIDER UNLESS VOLTAGE MEASUREMENTS MUST BE MADE! SEE FIG. 7.

CONTINUITY MEASUREMENTS

When making continuity measurements there must be no power in the circuit and one end of the circuit under test must be disconnected if additional circuitry interfers with the test. The circuit under test has good continuity if the meter indicates zero ohms on a properly "zeroed" R x 10 setting.

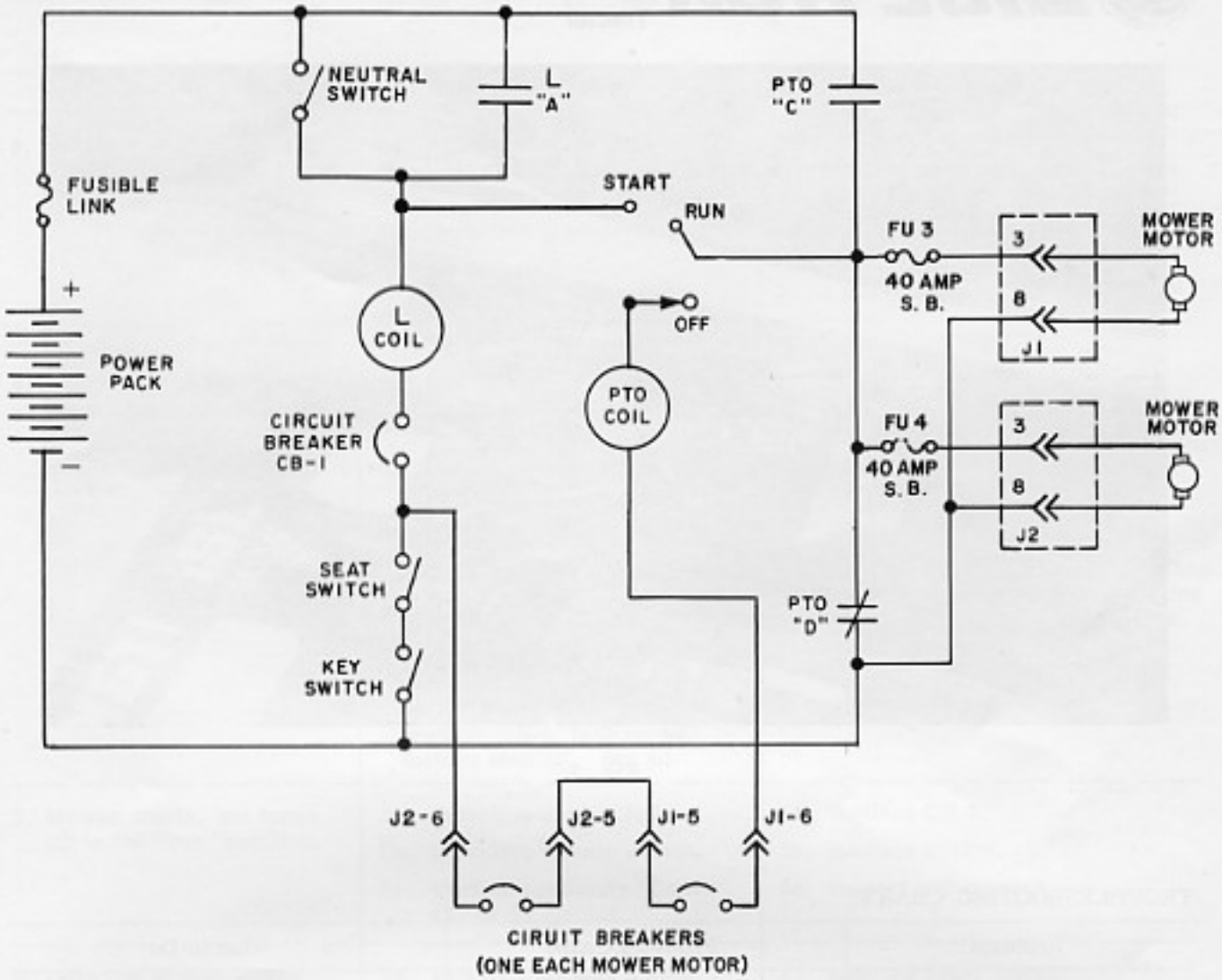

Fig. 5. 26ER8BA PTO Circuit

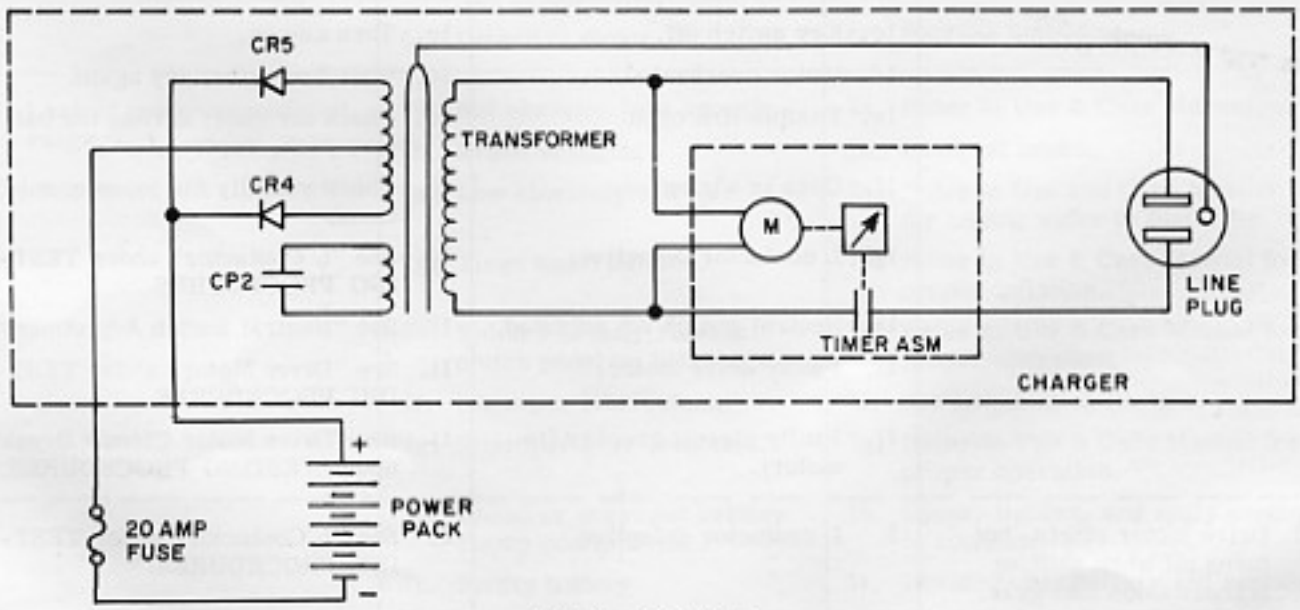

Fig. 6. Charger

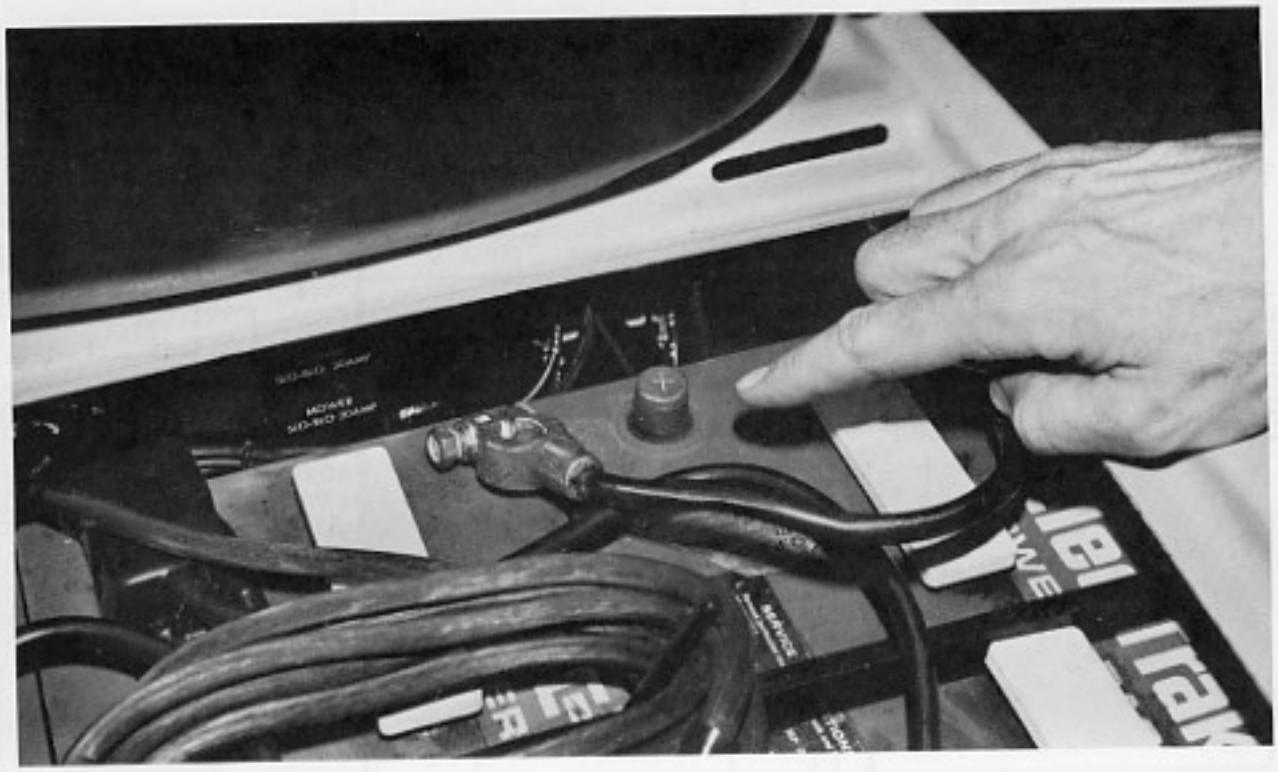

Fig. 7

TROUBLESHOOTING CHART

Problem	Probable Cause	What to Do
1. Drive motor does not start.	1a. Transmission not in neutral.	1a. Place transmission in neutral.
	1b. Seat switch not closed.	1b. Depress seat switch.
	1c. Key switch off.	1c. Turn key on.
	1d. Motor overheated.	1d. Wait 5 minutes, try again.
	1e. Fusible link open.	1e. Check for short across the battery pack, replace link.
	1f. Open in wiring.	1f. Check visually for loose connections.
	1g. L contactor defective.	1g. See "L Contactor" under TESTING PROCEDURES.
	1h. Neutral switch not adjusted.	1h. See "Neutral Switch Adjustment".
	1i. Faulty drive motor.	1i. See "Drive Motor" under TESTING PROCEDURES.
	1j. Faulty circuit breaker (in motor).	1j. See "Drive Motor Circuit Breaker" under TESTING PROCEDURES.
2. Drive motor starts, but turns off when shifting transmission into gear.	2. L contactor defective.	2. See "L Contactor" under TESTING PROCEDURES.