GEK-28897B

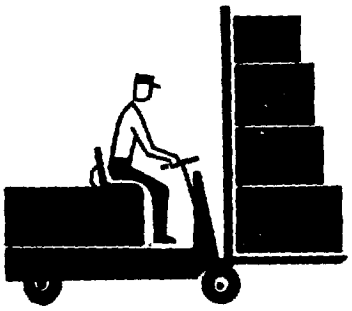
OPERATING & MAINTENANCE

INSTRUCTIONS

Model 110
Model 210
Model 310

IC 4483F

SCR CONTROL for ELECTRIC VEHICLES



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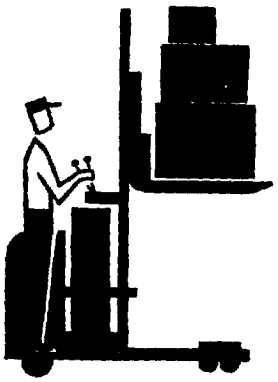
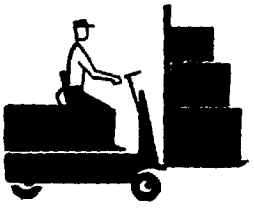




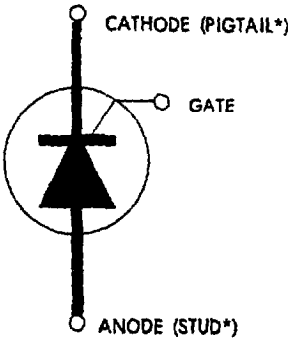
The information contained herein is intended to assist truck users and dealers in the servicing of SCR control furnished by the General Electric Company. It does not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance.

Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purpose, the matter should be referred to the truck manufacturer through his normal service channels, not directly to General Electric Company.

GENERAL ELECTRIC

WHAT IS AN SCR?

Since the heart of the control is a silicon controlled rectifier (SCR), a general understanding of the characteristics of the device will be helpful. The SCR is a semi-conductor rectifier used as a latching switch; i.e., it may assume either a conducting or nonconducting state (On or Off).



The SCR can be turned on by a momentary application of control current to the gate. To turn it off, it is necessary in addition to removing the turn-on signal from the gate, either to remove all power from the SCR or to apply momentary reverse voltage between cathode and anode.

* Typical of SCR as used in GE control for electric vehicles.

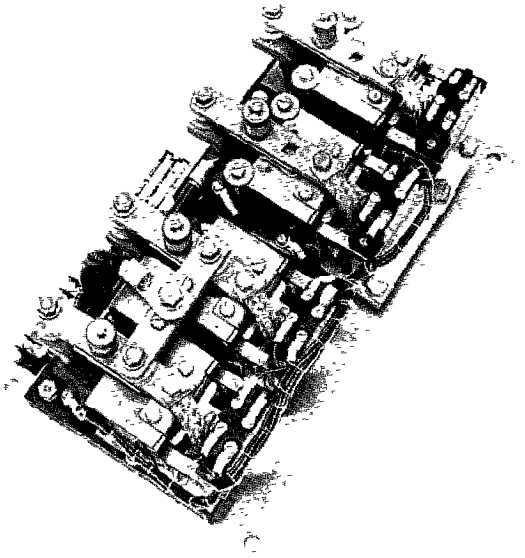


Fig. 2. Typical magnetic panel consisting of forward, reverse, bypass, and pump contactors

PHOTOS OF CONTROL

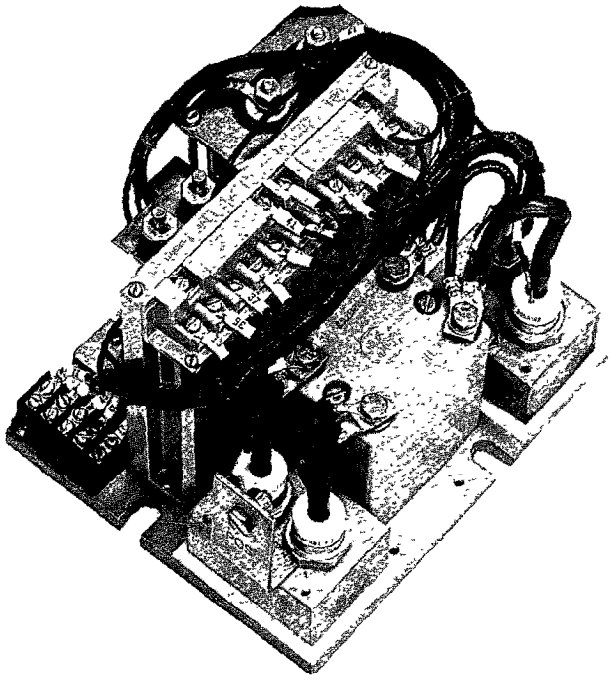


Fig. 1. Typical SCR static panel

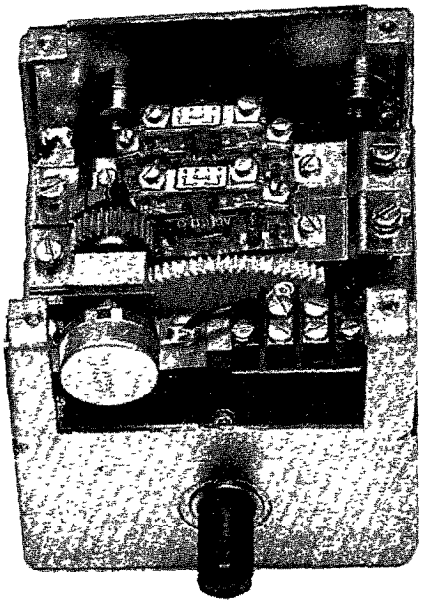


Fig. 3. Typical foot-operated accelerator switch with cover removed showing speed control potentiometer and control interlocks

CARD 1

- CURRENT LIMIT – The current-limit section of Card 1 provides protection to the motor and control by limiting currents during acceleration and stall. This circuit is sensitive to load current and overrides the oscillator under heavy loads so as to limit the pulse frequency (thus the average current) to a value based on the maximum rating of 1 REC. Because of the flyback current through 3 REC, the motor current usually runs 2 to 3 times this current-limit value. The CURRENT LIMIT is adjustable by means of a trimpot on Card 1.

- OSCILLATOR – The oscillator section of the card has two adjustable modes and one fixed feature. With the accelerator pot at maximum resistance, the CREEP SPEED can be adjusted with a trimpot on the card. With the accelerator pot at minimum resistance, the TOP SCR SPEED is set by means of a trimpot on the card. The fixed feature is controlled acceleration. When the accelerator is set for maximum speed and the directional switch is closed, the controlled acceleration provides a gradual build-up of pulses, thus giving a smooth acceleration to top SCR speed. This feature also provides a smooth reacceleration during a plugging reversal of direction.

- PLUGGING – Slowdown is accomplished when reversing by providing a small amount of retarding torque for deceleration. If the truck is moving and the direction lever is moved from forward to reverse, the motor field is reversed. During the 1 REC off time the motor armature, driven by the inertia of the truck, acts as a generator. This generated current passes through 4 REC and the resistor 1 RS. A signal taken across 4 REC and 1 RS is fed to Card 1 to control the field current and provide a soft stopping action. The distance or severity of the reversal is set by means of a PLUGGING trimpot on the card.

- 1A TIMER – A time-delay pickup of 1A is provided by a circuit in Card 1. This allows the truck to accelerate through the SCR range before 1A picks up even if the accelerator 1A switch is closed immediately. This time delay is set by means of a 1A TIME trimpot on Card 1. An additional feature of the timer circuit is that 1A is rendered inoperative any time plugging is in process.

1A CONTACTOR (By-pass contactor around the SCR control) – The 1A contactor is used to provide top truck speed, torque, and efficiency when called for. The 1A contactor is picked up when the accelerator is moved to its extreme end of travel.

THERMAL PROTECTOR – A thermal protector (TP) is mounted on the heat sink between 1 REC and 2 REC. This is a temperature sensitive device which increases resistance with an increase in temperature. During the normal operating range, the thermal protector has a resistance of approximately 50 ohms. If the temperature of the 1 REC heat sink exceeds 80 C, the resistance of the thermal protector increases. Being in series with the accelerator potentiometer, this increased resistance decreases the speed of the truck. The truck will operate at a reduced speed until the temperature reaches a safe value, then full SCR power will be available.

Other functions and equipment available with SCR control for electric vehicles and their instruction references are:

IC4484 PULSE MONITOR TRIP .... (GEK-28898)
IC4484 FIELD-WEAKENING SYSTEM (GEK-28899)
IC4484 AUXILIARY PLUGGING
CONTROL (FREQUENCY) ..... (GEK-28900)
IC3012BH ACCELERATOR MASTER
SWITCH ..... (GEK-8073)

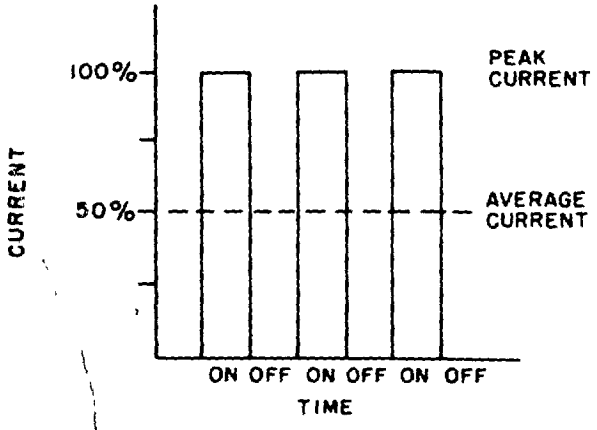


Fig. 5. Battery current

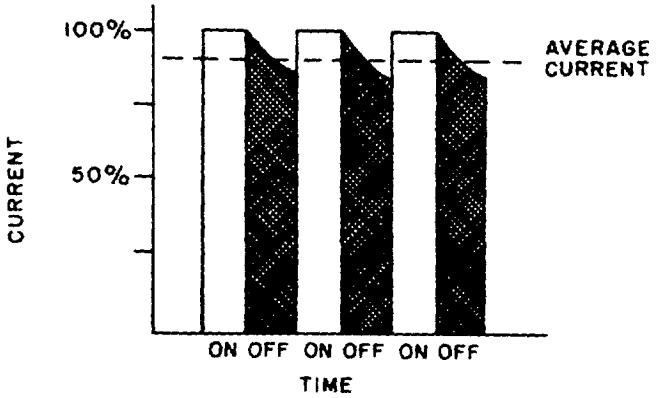


Fig. 6. Motor current

GENERAL MAINTENANCE INSTRUCTIONS

The SCR control, like all electrical apparatus, does have some thermal losses. The semiconductor junctions have finite temperature limits above which these devices may be damaged. For these reasons, normal maintenance should guard against any action which will expose the components to excessive heat, such as steam cleaning; or which will reduce the heat dissipating ability of the control, such as restricting air flow.

The following DO'S and DONT'S should be observed:

- Any controls that will be used in altitudes of 5000 feet or over and in ambients of 100 F (40 C) or over should be brought to the attention of the truck manufacturer.
- All external components having inductive coils must be filtered. Refer to vehicle manufacturer for specifications.
- The control should not be steam cleaned. In dusty areas, use low pressure air to blow off the control. In oily or greasy areas, a mild solution of detergent or denatured alcohol can be used to wash off the control and then blow completely dry with low pressure air. The control can also be cleaned with Freon TF* degreaser.
- For the SCR panel to be most effective, it must be mounted against the frame of the truck. The truck frame, acting as an additional heat sink, will give improved truck performance by keeping the SCR Control package cooler. The use of a heat transfer grease (such as Dow Corning #340) is recommended.
- Terminal boards and other exposed SCR control parts should be kept free of dirt and paint which might change the effective resistance between points.
- The truck should not be plugged when the truck is jacked up and the drive wheels are in a free wheeling position. This can create excessive voltages that can be harmful to the control.

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* Registered trademark of the E. I. duPont de Nemours & Company

TROUBLE-SHOOTING INSTRUCTIONS

The pulsing of the main SCR is too fast for conventional instruments to measure. When the control is functioning properly, a low hum can be heard.

Malfunctions of the SCR will generally fall into one of two categories. They are either no power (Table 1) or full power (Table 2), when operating in the SCR control range.

These simple and easy-to-follow tables outline the various symptoms and the corrective action to be taken.

The same device designations have been maintained on different controls but the wire numbers may vary. Refer to the elementary and wiring diagram for your specific control. The wire numbers shown on the elementary diagram will have identical numbers on the corresponding wiring diagrams for a specific truck, but these numbers may be different from the numbers referenced in this publication. Wire numbers may be preceded with a "G" to distinguish GE numbers from truck manufacturer's wires.

Before proceeding, visually check for loose wiring, maladjusted linkage to accelerator switch, signs of overheating of components, etc. Before touching electrical components, disconnect the battery and discharge capacitor 1C. Reconnect the battery as needed for the specific check.

Tools and test equipment required are: 36-volt test battery, 3-volt battery, 3-volt lamp (or BRIGHT STAR No. 1618CT circuit continuity tester), clip leads, volt-ohm meter (20,000 ohms per volt) and general hand tools.

TABLE 1

Failures Which Cause No Motor Torque With SCR Control

SYMPTOMS	WHAT TO DO
1A. Contactors do not pick up. No control voltage from positive to negative.	• Check power fuses. • Check battery connector. • Check battery for low specific gravity and connections for looseness or broken fittings.
1B. Contactors do not pick up. Control volts present from positive to negative and of correct polarity.	• For these tests, if Pulse Monitor Trip is used, connect a jumper from point 5 (wire 23) to point 1 (wire 13) on the card. • (See NOTE 1) Connect jumper from control positive (load side of control fuse) to positive side of F or R coil. If device does not pick up, check coil for continuity. Also jumper negative to opposite terminal to check for opens in negative connections. • (See NOTE 1) With jumper on control positive move other end to wire 8 on F interlock or 6 on R interlock. Coils should pick up. This proves F and R normally closed electrical interlocks. • (See NOTE 1) Using jumper continue to check remaining components in circuit such as directional switch, brake switch, seat switch and key switch by moving end of jumper to positive side of each of these devices.
1C. Contactors close. No power and no SCR hum with accelerator in SCR range.	• (See NOTE 1) With F or R picked up and wire 45 at point 8 disconnected at SCR terminal board, check for control volts at SCR terminal board, positive (wire 41) to negative (wire 13). If voltage is zero at this point, check F or R (normally open interlocks) and 1A coil for continuity. If polarity is reversed, check battery connections. • (See NOTE 1) With F or R picked up and wire 45 at point 8 disconnected at SCR terminal board, check for control volts positive at point 6 (wire 32) to negative (wire 13). If there is zero volts at this point, check: FUB, F or R power tips, and continuity of wiring and motor from battery positive to 1 REC heat sink. *NOTE* 1: *Drive wheels should be off the floor.*

SYMPTOMS	WHAT TO DO
1C. (Continued)	• (See NOTE 1) Check 1C capacitor volts point 13 (wire 31) to negative (wire 13). Must be over 1/2 battery volts to pulse. If near zero, check 1C and 5 REC for shorted condition (see 4H).
	• (See NOTE 1) With F or R picked up and wire 45 disconnected from SCR terminal board, measure approximately 6 volts from (wire 4) to negative (wire 13) with accelerator pot near creep speed. Volts will drop to near zero as accelerator is moved toward full speed. If readings are not correct, check thermal protector (see 4J).
	• If the above tests will produce no voltage change, place a jumper between wires 4 and 13. This bypasses the accelerator and the truck should now run at top SCR speed. If top speed is obtained, check accelerator pot per Table 4I. If control fails to operate, turn creep speed trim pot clockwise. If volts from terminal 15 to 14 are not zero, check wiring. If volts from terminal 9 to 1 are not zero, remove wire from terminal 9 and recheck. If still not zero replace card.
1D. Contactors close, but very little power, and barely audible SCR hum.	• Check 1 REC for an open condition in the conducting direction (see 4H).
1E. Contactors close. Very little or no power with slow SCR pulsing, even when accelerator is in top SCR position.	• (See NOTE 1) Check for battery volts from terminal 14 to 1, and zero volts from terminal 14 to 15. Check volts from terminal 9 to 1. If more than one volt, replace card.
	• (See NOTE 1) Check creep speed setting on card. Also if current limit is full counterclockwise speed will be slow.
1F. Contactors close. Very little power with a normal SCR hum.	• Check 3 REC for open condition (see 4G). If 3 REC is found to be open, check 1, 2, and 5 REC for proper operation.
	• Check 4 REC for short (see 4G).

NOTE 1: *Drive wheels should be off the floor.*

TABLE 2

Failures Which Cause Full Motor Torque With SCR Control

WARNING: Drive wheels should be off the floor.

SYMPTOMS	WHAT TO DO
2A. Contactors close. Full SCR speed immediately with audible hum.	• Check potentiometer for proper resistance (see 4I). • Check for grounds in wires 29 and 4 or shorted accelerator pot. • Check creep speed setting on card.
2B. Contactors close. Full speed immediately with no audible hum.*	• Check for welded power tips on 1A contactor. • Check for open gate in 5 REC (see 4H). • Check 5 REC for open condition (see 4H). • Check continuity of wiring from 2 REC cathode thru IX, to 1C thru T3, T4 to 5 REC anode, and 5 REC cathode to 1 REC cathode. • Check capacitor 1C (see 4H). • Check 1 REC for short (see 4H). • Check for open 2 REC (see 4H). • Check for open gate in 2 REC (see 4H). • Check 2 REC for shorted condition in the conducting direction (see 4H).

* If truck is equipped with a Pulse Monitoring Trip and it fails to shut down the control on the above faults, check Pulse Monitoring Trip per GEK-28898.

TABLE 3

Misoperation Of Special Features

SYMPTOMS	WHAT TO DO
3A. SCR control operates but the 1A contactor fails to operate.	• Check resistance of 1A coil. If resistance is much different from other contactor coils, replace coil. (see GEH-3101 or GEH-3074.) • (See NOTE 1) Jumper negative to SCR terminal board (wire 45). 1A should pick up after approximately 1 second delay. This checks the timer section of Card 1. • If the two above tests check good, then check 1A switch in accelerator for proper operation.
3B. Failures in FW circuit.	• See GEK-28899.
3C. Severe reversal, or too soft reversal.	• Check settings of plugging trimpot on Card 1 (see 6Ad). • Check 4 REC (see 4G). • Check continuity of wires 5 and 9.
3D. Severe plug at beginning and end of plug.	• See Table 6 Bg.

NOTE 1: *Drive wheels should be off the floor.*

NOTE 2: *When the auxiliary plugging control card is used.*

TABLE 4

Checking Components

WARNING: BEFORE TOUCHING ELECTRICAL COMPONENTS, DISCONNECT THE BATTERY AND DISCHARGE CAPACITOR 1C.

4A. CARD 1

Cannot be tested with a VOM. Card should be considered operative until all checks under Table 1 or 2 have been performed depending upon symptoms. If checks in Table 1 or 2 do not result in location of defective parts, change Card 1.

4B. FIELD WEAKENING CARD (if used)

See GEK-28899.

4C. PULSE MONITOR TRIP (if used)

See GEK-28898.

4D. CAPACITOR 1C

Disconnect battery and discharge capacitor. Disconnect leads to one side of capacitor. Measure ohms through the capacitor using the RX10,000 scale. Meter should read zero ohms and then swing to above 100,000 ohms. Replace capacitor if above reading is not obtained.

4E. CONTACTORS F, R, 1A, FW AND P

a) 100-ampere contactors (see GEH-3101)

b) 200-ampere contactors (see GEH-3074)

NOTE: Control is arranged so that F and R do not normally break current. Contactor 1A drops out ahead of F or R.

4F. CONTACTOR COIL AND ACCESSORY FILTER

(7, 8, 9, and 12 REC)

On some magnetic panels, the contactor coils will either be varnish tape-wound or encapsulated. For the varnish tape-wound type, a separate filter is required and will be mounted adjacent to the coil. The encapsulated coil contains the necessary filtering and is not visible from the exterior of the device.

a) Separate Filter (Typical Cat. No. 148B6203G14)

These are varistors and should be checked as follows: Disconnect battery and discharge capacitor 1C. Disconnect the leads to the filter block. Connect a 36-volt d-c test battery in series with the varistor and a volt-ohm meter set on the 1ma. scale as shown in Figure 7. If the varistor is good, there will be a noticeable deflection of the meter needle when the leads are touched to the filter block terminals. If no deflection is obtained, replace the filter block.

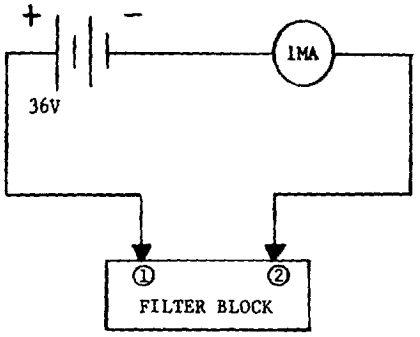


Fig. 7

b) Integral Coil Filter

When this filter fails, it will be evident by a severe cracking of the coils in the vicinity of the coil terminals.

4G. RECTIFIERS

When checking diodes, disconnect battery and discharge capacitor 1C to prevent burning out the ohmmeter. When replacing rectifiers, refer to Table 5.

3 and 4 REC: Disconnect pigtail. 3 and 4 REC are diodes with about 7 to 12 ohms in the conducting direction (+ ▶| −) measured on the RX1 scale, and 50,000 ohms or higher, in the nonconducting direction (− ▶| +) measured on the RX10,000 scale.

15 and 16 REC: Disconnect one lead. Check same as 3 and 4 REC above.

4H. SCR'S (1 REC, 2 REC, 5 REC)

These are silicon control rectifiers. Before checking, disconnect battery and discharge capacitor 1C. Disconnect pigtail of 1 and 2 REC or the negative lead to terminal of 5 REC. Disconnect gate leads of SCR's at the card terminal board.

To check an SCR, it is necessary to have a 3-volt battery and a 3-volt lamp. (A test flashlight such as a BRIGHT STAR No. 1618CT circuit continuity tester is excellent for this test.)

Connect the plus lead to the stud (1), connect negative lead to the pigtail (3) as shown in Figure 8.

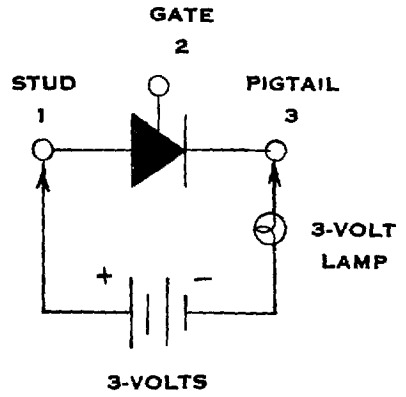


Fig. 8

a) The lamp should not light. If the lamp does light, the SCR is shorted and must be replaced.

b) If check (a) was satisfactory, test the SCR for its ability to be turned on by the gate. Touch gate (point 2) to point 1. If gate is operative, the lamp should come on and must remain on when the gate is removed.

c) If lamp cannot be lit under step (b) the SCR is open and must be replaced.

NOTE: If you do not have a test light to check the SCR's as described above, they may be checked for shorts or opens by use of the VOM.

a) Measure resistance from stud to pigtail (RX100 scale). If SCR is shorted (less than 100 ohms), it must be replaced.

b) Measure resistance from gate lead (white lead) to pigtail and then from pigtail to gate lead (RX1 scale). If resistance reads either less than 5 ohms (shorted) or more than 50,000 ohms (open), replace the SCR.

c) If available, try in known good control.

When reassembling SCR's, refer to Table 5.

4I. POTENTIOMETER IN ACCELERATOR

To check operation of the potentiometer, disconnect battery and disconnect wire 29 from thermal protector or SCR terminal board. Connect VOM from wire 29 to negative 13 with scale set to RX100. With accelerator in creep-speed position, the ohm reading should be 3,500 to 6,600 ohms; with accelerator in top-speed position, reading should be 200 ohms or less. If these readings are not obtained, loosen pinion gear clamp and adjust rotation of pot shaft relative to accelerator shaft or replace.

With wires disconnected as above, check for resistance of 1 megohm or higher from pot wires to truck frame.

For additional information, refer to GEK-8073.

4J. THERMAL PROTECTOR (TP)

Remove both connections from TP and with a VOM read approximately 10-50 ohms terminal to terminal, if heat sink is at room temperature. Set VOM to highest ohm scale and check pins to heat sink, reading should be infinity.

4K. FILTER BLOCK (HF)

To check, disconnect all wires from filter block. With VOM on RX10,000 scale, touch the leads to the filter terminals to charge the filter. After a few seconds, reverse the meter leads and touch the filter terminals. The VOM needle will deflect and return to infinity. If this capacitor action is not observed, replace the filter block.

TABLE 5

Replacement Of Semiconductors

When replacing semiconductors such as 1, 2, 3, 4 and 5 REC, it is not necessary to torque these devices to a specific value. However, the device should be screwed into the heat sink and tightened to a snug fit.

The use of a heat transfer grease (such as GE Versilube G-350-M or equivalent) is recommended.

TABLE 6

Tuneup For New Or Mistuned Card 1

IMPORTANT NOTES

1. Panels are factory adjusted for a particular motor and truck and should not need adjustment when used with this motor and truck. However, checks and/or touchup adjustments may be made per Table 6A.

2. The TOP SCR SPEED setting is a factory made and sealed setting! Under normal conditions, this setting should not be touched.

   If setting is required, the complete tuneup procedure, Table 6B, must be followed.

3. If the panels are used to control motors or trucks for which they were not factory adjusted, the settings may be out of optimum adjustment to the extent that they do interact and the complete tuneup procedure, Table 6B, must be followed.

4. All adjustments are such that CW rotation increases function being adjusted.

5. Connect the shunt, the millivoltmeter and the voltmeter to measure battery current and motor volts. Connect the shunt and millivoltmeter between battery negative and 1 REC (or between truck receptacle and battery plug). Connect voltmeter between battery positive and T2 on the SCR panel. Connect a jumper from wire 4 (terminal 5 of Card 1) to negative (pigtail of 1 REC).

   NOTE: Be sure to insulate or wrap the jumper connection to wire 4 to prevent accidental contact of this point to the truck frame. If this point touches the truck frame, it will damage the control card.

   Jack up the truck so that the drive wheels are free to rotate.

   If a brake interlock is used, jumper it out so that power and brakes can be applied at the same time.

6. Equipment required:

   50-millivolt d-c shunt*

   50-millivolt d-c meter (d'Arsonval movement)

   50-volt d-c meter (d'Arsonval movement) (250 volt scale needed for 72V)

   Battery with equal or greater ampere-hour capacity than used on truck, charged to 1250 or higher specific gravity.

*Typical Shunt Ratings	SCR Model
200 amperes	110
300 or 400 amperes	210
400 or 500 amperes	310

   NOTE: Shunt rating must be greater than current to be measured. Best results are obtained when reading is between half and full scale on meter. If a shunt of too high a rating is used (i. e., a 500-ampere rating to read 100 amperes), it will be hard to read and the accuracy of the reading will be poor.

7. Check that the ohms in accelerator potentiometer are less than 200 ohms in top SCR range (see Table 4I). Refer to Figure 3 for potentiometer locations.

TABLE 6A

Checking Of Card Settings

Checks and/or minor touchup adjustments can be made without following complete tuneups as given in Table 6B.

a) CREEP SPEED

With truck jacked up, apply brakes (refer to Note 5, Table 6). Measure motor volts from positive (wire 5) to T2 (wire 1) as F or R contactor closes. Volts should be per Table 6Be. Increasing creep speed increases stiffness at the end of a plug and stiffens controlled acceleration.

b) TOP SCR SPEED

Refer to Note 5, Table 6.

Check TOP SCR SPEED by first moving the accelerator until the F or R contactor operate. Do not move accelerator to the point where 1A picks up.

Apply brakes until battery current reads per the value as given in Table 6Be and read motor volts to see if it falls within values given in Table 6Be.

Disconnect shunt, voltmeter, and jumper to wire 4.

c) CURRENT LIMIT

Refer to Note 5, Table 6.

Check CURRENT LIMIT by first moving the accelerator until the F or R contactor operate. Do not move accelerator to the point where 1A picks up.

Apply brakes until wheels come to a STANDSTILL (the wheels must not be turning) and read current to see if it falls below the maximum rating given in Table 6Be and within the rating specified by the truck manufacturer.

NOTE: DO NOT STALL the motor for more than 5 to 10 seconds at a time. Allow time for motor cooling between stalls. Do not operate motor at high speeds or plug the motor with wheels jacked up.

Disconnect shunt, voltmeter, and jumper to wire 4.

d) STATIC PLUGGING

With truck on the ground, plug truck from top speed. If stopping distance is not as desired, adjust plugging trimpot. If plug is too stiff near end of plug, see table 6Bg.

e) 1A TIMER

With truck on the ground check operation on a full acceleration. If 1A contactor picks up too early or if truck is sluggish, adjust trimpot to obtain desired operations.

TABLE 6B

Tuneup Procedure

COMPLETE ALL STEPS a through f.

a) Turn CURRENT-LIMIT trimpot fully clockwise.

b) Turn PLUGGING trimpot fully clockwise. (Steps a and b prevent any interaction when setting the speed adjustment.)

c) Turn AUXILIARY trimpot fully counterclockwise.

d) CREEP SPEED

Refer to Table 6Aa.

e) TOP SCR SPEED

Refer to Note 5, Table 6.

Check TOP SCR SPEED by first moving the accelerator until the F or R contactor operate. Do not move accelerator to the point where 1A picks up.

Apply the brakes until battery current is about 70 to 80 percent of the full-field loaded level amperes.

Typical Battery Current	SCR Model
45 - 50 amperes	110
75 - 80 amperes	210
120 - 130 amperes	310

Adjust the TOP SCR SPEED trimpot until the voltmeter reads motor volts as indicated below:

Battery Volts	Creep Speed Motor Volts	Top Speed Motor Volts	CURRENT LIMIT AMPERES (MAXIMUM)		
			Model 110	Model 210	Model 310
12	0.4 - 0.6	7 - 9	100	200	300
18	0.6 - 0.9	13 - 15	100	200	300
24	0.8 - 1.2	17 - 20	100	200	300
36	1.2 - 1.8	25 - 31	100	200	300
48	1.6 - 2.4	34 - 41	100	185	300
72	2.4 - 3.6	50 - 61	NA	150	300

f) CURRENT LIMIT

Turn the current limit trimpot fully counterclockwise.
Check to be sure the plugging trimpot is turned fully clockwise.
Depress the accelerator until F or R operate but not the 1A contactor.
Apply the brakes until the wheels come to a standstill and remain at a standstill.
Slowly turn the CURRENT LIMIT TRIMPOT in a clockwise direction until the current reaches a value as shown in the above table, or as specified by the truck manufacturer.

NOTE: The current limit values as given in the table above represent the typical maximum values that we suggest for each control when operated on a given voltage and these values must not be exceeded.

Since these controls are used on a variety of types and sizes of trucks for various applications, it is common for the truck manufacturer to set the current limit at some value below the maximum. For this reason it is recommended that you obtain the actual current limit setting for your particular truck from the truck manufacturer.

NOTE: DO NOT STALL the motor for more than 5 to 10 seconds at a time. Allow time for motor cooling between stalls. Do not operate motor at high speeds or plug the motor with wheels jacked up.

After setting the correct value, disconnect meter and remove jumper from wire 4.

g) STATIC PLUGGING

To adjust the static plugging, the truck should be in its normal running condition and on the ground. Turn the PLUGGING trimpot fully counterclockwise. This will give the longest distance for stopping. Adjust trimpot until desired stopping distance is obtained.

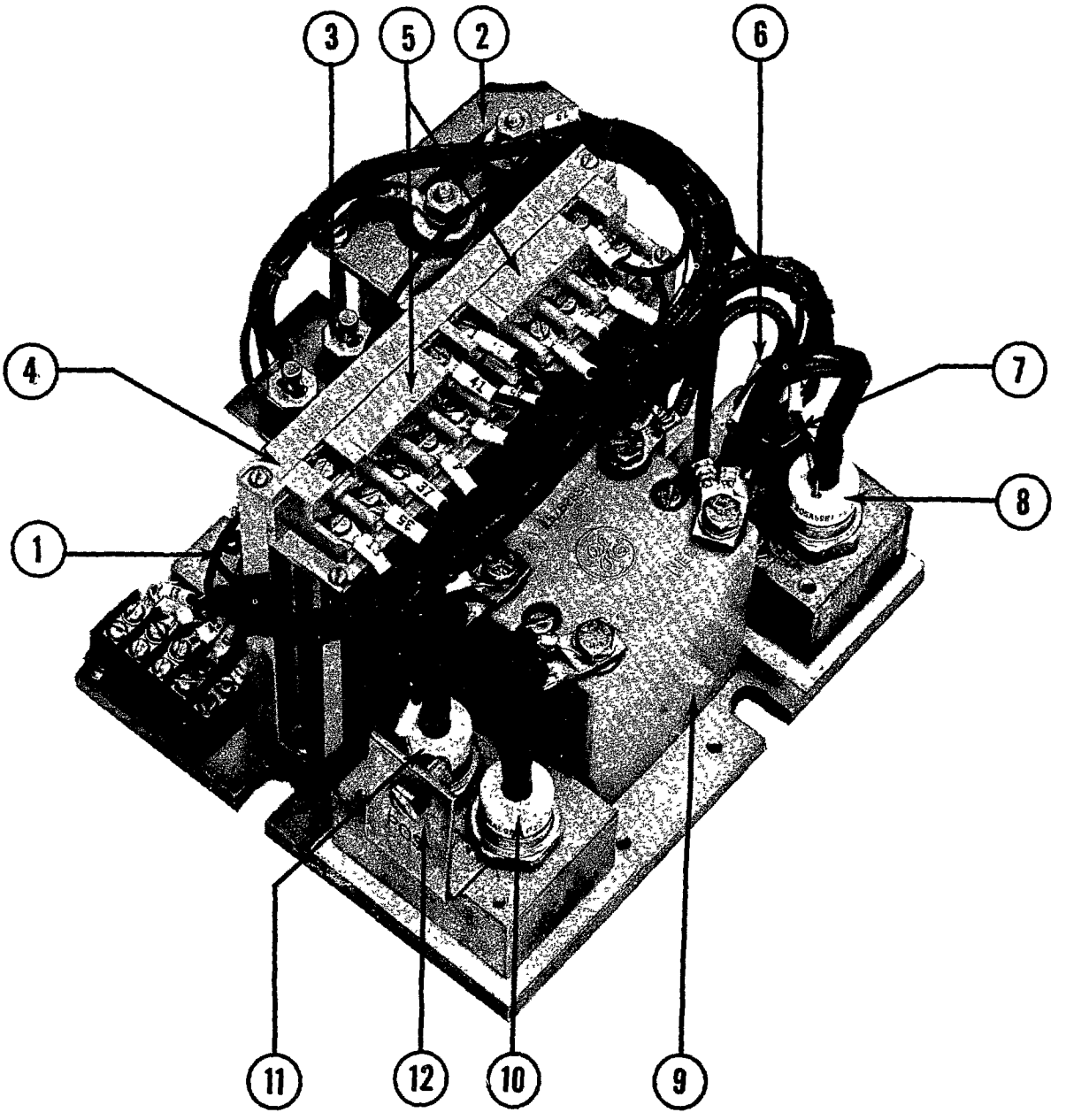
When using the plug trimpot to adjust to the desired stopping distance, if the truck develops too much torque near the end of the plug, the plug trimpot (RH6) may be turned CCW to obtain the desired torque near the end of the plug, and the aux. trimpot (RH5) turned CW as needed to regain the desired plugging distance.

h) 1A TIMER

The 1A TIMER is factory set at approximately 1 second on all models.
Check truck performance. If the 1A contactor picks up too early, resulting in jerky operation, turn the 1A Timer trimpot CW to increase time delay, to a value that provides desired operation.

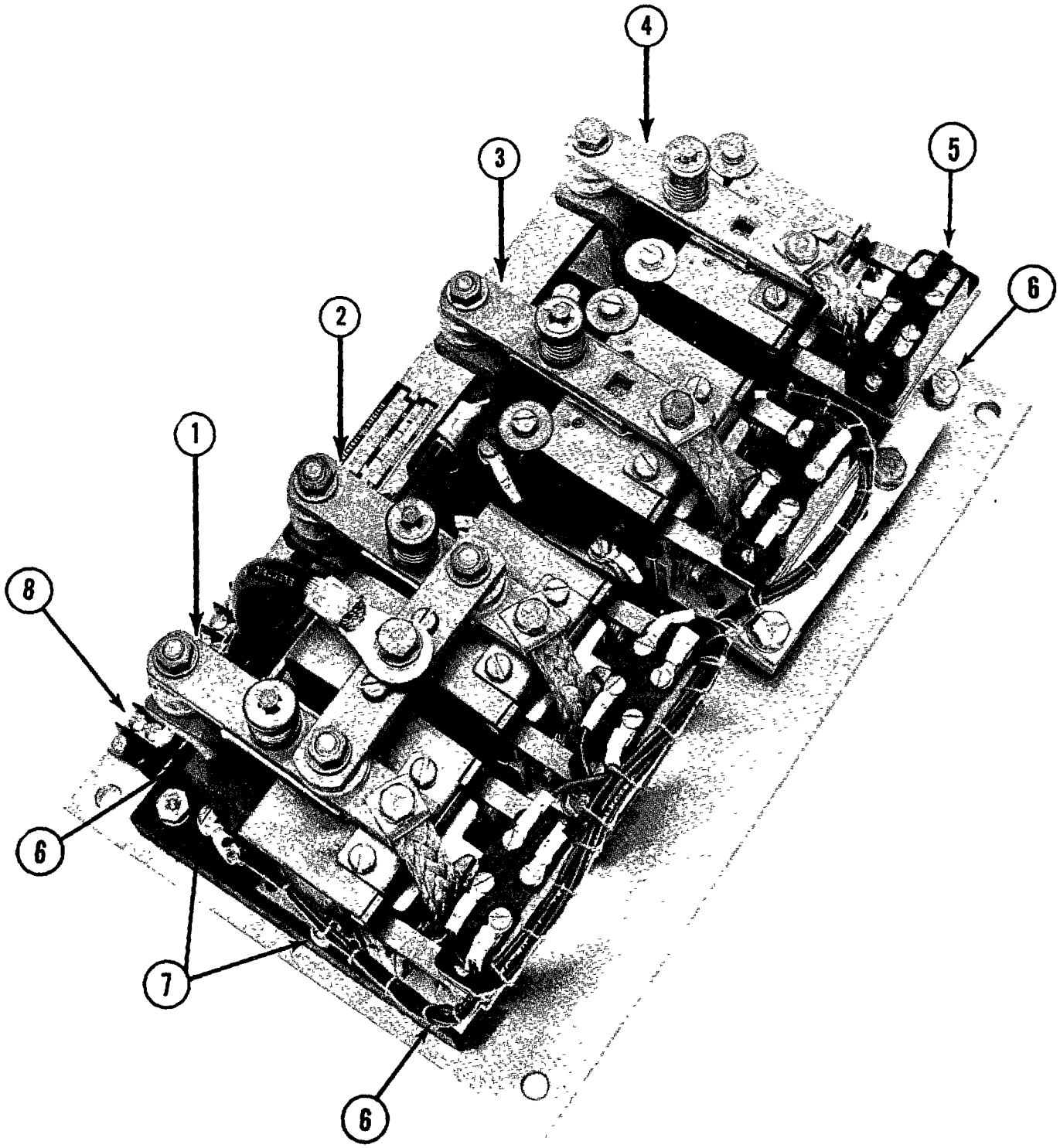
TYPICAL PHYSICAL ARRANGEMENT AND IDENTIFICATION OF COMPONENTS

(Refer to wiring diagram furnished with truck for precise arrangement of components.)



(1) CHARGING SCR (5 REC)
(2) COMMUTATING CAPACITOR (1C)
(3) CONTROL CIRCUIT FUSES
(4) OSCILLATOR CARD
(5) OSCILLATOR CARD ADJUSTMENTS
(6) TURN-OFF SCR (2 REC)
(7) THERMAL PROTECTOR
(8) MAIN SCR (1 REC)
(9) PULSE TRANSFORMER
(10) FLY-BACK DIODE (3 REC)
(11) PLUGGING DIODE (4 REC)
(12) PLUGGING SENSOR

Fig. 9. Typical SCR static panel



(1) FORWARD CONTACTOR (F)
(2) REVERSE CONTACTOR (R)
(3) BY-PASS CONTACTOR (1A)
(4) PUMP CONTACTOR (P)
(5) INTERLOCK SWITCHETTES
(6) CUSTOMER POWER CONNECTIONS
(7) COIL TERMINALS
(8) CUSTOMER CONTROL CONNECTIONS

Fig. 10 Typical SCR magnetic panel

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