INSTRUCTIONS







General Purpose Battery Chargers

TYPES

RS-945-A

RS-946-

RS-960-

Automatic Charge Controls

DL-3276910

DL-3276911

Filter Reactor

DL-3276912

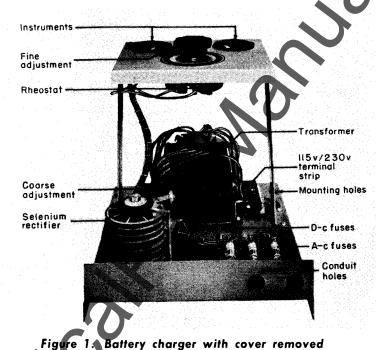
GENERAL E ELECTRIC

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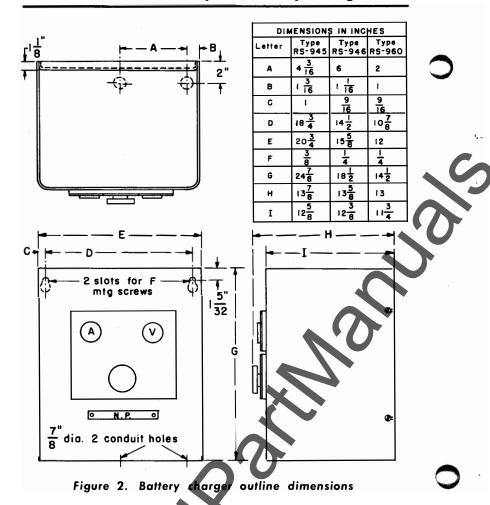
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GENERAL PURPOSE BATTERY CHARGERS

The selenium rectifier units, Types RS-945-A, RS-946-A, and RS-960-A were designed specifically for battery charging. They can also be used on resistive and inductive loads. The design of each component has been carefully considered and coordinated to provide a light weight, easily serviced, dependable rectifier unit. An exterior view of one of the battery chargers is shown on the cover. An interior view of one of the battery chargers is shown in Figure 1.



These instructions do not purport to cover all details or variations in equipment nor to provide for every possible confine ency 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 purposes, the matter should be referred to the General Electric Company.



RECEIVING AND HANDLING

Immediately upon receipt of the battery charger, it should be inspected for damage in transportation. This should include a visual inspection, looking for bent or deformed panels, broken terminal blocks, or any other evidence of rough handling. Claims for transportation damages should be made against the transportation company.

DESCRIPTION

Casing

- 1. The front panel and casing assembly are made of 1/16-inch steel plate to provide a sturdy protective enclosure for the internal parts. The outline dimensions for the various type battery chargers are shown in Figure 2.
- 2. The back panels are made of 1/16-inch or 1/8-inch steel sheet in order to provide necessary strength for the support of the transformer and other components.
- 3. A perforated screen is provided at the top and bottom of the unit allowing free passage of air to cool the components but not permitting objects larger than 1/4-inch in diameter to be inserted.
- 4. The casing is attached to the back plate by means of a slot and screw device so that it may be readily removed for changing fuses.
- 5. The casing is phosphatized to prevent rust and corrosion of the base metal and given a baked enamel finish to provide a tough protective coating.

Rectifier Stacks

- 1. Selenium rectifiers of our own design and manufacture are used because of long life expectancy and high efficiency.
- 2. Connection is made to the selenium rectifier by means of a screw-type terminal.

Transformer

- 1. Transformers are of our own design and manufacture to meet A.I.E.E. Specifications.
 - 2. Formex*, or paper cotton insulation is used.
- 3. Taps are brought out to standard terminal blocks for maximum flexibility with minimum trouble.
- 4. These chargers are designed for use on either 115 or 230 volts and either 50-or 60-cycle sources of supply.

* Reg. Trade-mark of General Electric Company

GEJ-2309 General Purpose Battery Chargers

Variable Resistance

- 1. The variable resistance was chosen to provide ample capacity for the voltage drops required.
- 2. In the larger capacity units, a micro-adjustment is provided to obtain fine variation of the charging current.

Instruments

These units are provided with moving coil type instruments of 2-percent accuracy.

Fusing

- 1. The unit has two d-c line fuses to protect the unit against reverse connection. These fuses may be removed if the customer desires to completely disconnect the charger from the battery circuit.
- 2. An a-c fuse is provided on the input to the stacks to protect against overloading the transformer.

Cell Selection and Charging Rate Adjustment

- 1. Cell selection is made by means of a Jones terminal strip mounted on the back casing.
- 2. The charging rate adjustment is made by means of a rheostat mounted on the front panel. Charging rate adjustment is normally from 20 percent of full rated current to full rated current; and on the 1- and 2-amp models, when used with a 12 cell and 24 cell load, the adjustment is from 2 percent of rated load to full rated load.

An oblique view of one of the bettery chargers with its cover removed is shown in Figure 3.

INSTALLATION

The chargers should be installed in a dry, reasonably cool location, preferably where the ambient temperature does not exceed 95F. The ac supply should be connected through a fuse disconnect switch and then to the correct terminals of the terminal board (Figure 4).

For 115-volt operation, connect terminals 1 to 3 and 2 to 4. For 230-volt operation, connect terminal 2 to 3.

The a-c line should in each case be connected to 1 and 4.

A jumper should be placed between A1 and A2 unless this unit is used with an automatic control. See wiring diagram (Figure 5).

The load leads should be connected to the terminals marked PLUS and MINUS. If the load is a battery, check to see that the number of cells corresponds to that given on the nameplate and connect plus terminal on unit to plus terminal on battery and negative terminal on unit to negative terminal on battery

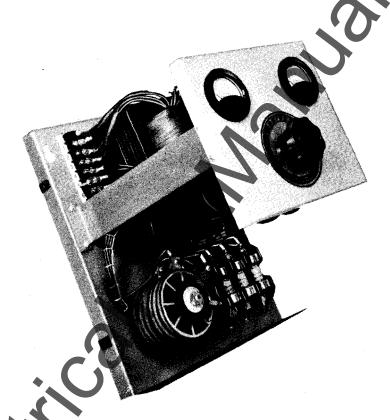


Figure 3. Battery charger with cover removed, oblique view

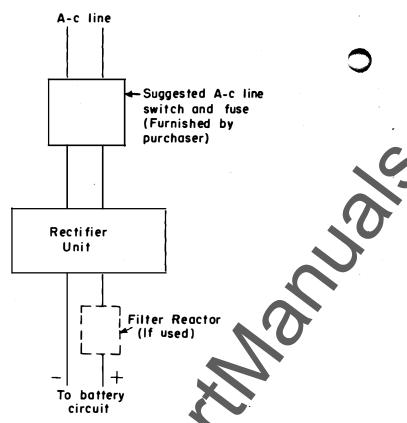


Figure 4. Battery charger installation diagram

OPERATION

Refer to wiring diagram (Figure 5). If the load is a battery, the voltmeter will show a reading as soon as the battery is connected to the plus and minus terminals.

BEFORE TURNING ON A-C POWER, MAKE SURE THAT THE RHEOSTAT IS IN THE MAXIMUM VOLTAGE POSITION. (TURN THE RHEOSTAT CLOCKWISE UNTIL IT REACHES THE STOP.)

Adjust the tap on the terminal strip (coarse voltage adjustment) until the desired amount of current is flowing. The proper tap is the one that gives just a little bit more charging current than that desired. Final adjustment is made by means of the rheostat on the front panel.

NEVER ATTEMPT TO OBTAIN MAXIMUM RATED CURRENT OUTPUT WITH THE RHEOSTAT RESISTANCE ALL IN.

For maintaining the condition of lead acid batteries by the "floating" method of charge, a voltage of approximately 2.15 volts per cell should be maintained. A change in the direct current will not cause an immediate change in the charge voltage.

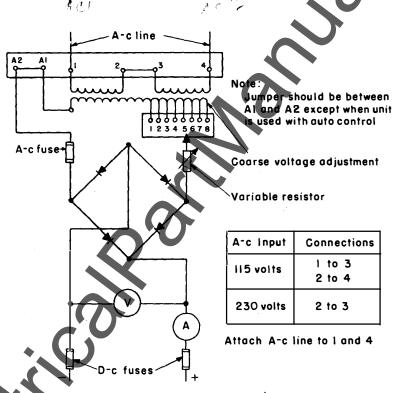


Figure 5. Battery charger wiring diagram

GEJ-2309 General Purpose Battery Chargers

Consequently, it is important that the voltage be read a day or two after a rate adjustment. A value of direct current will finally be found, by trial and error, which produces steady state conditions. This value will be equal to the average drain on the battery plus the losses. The charging rate should not exceed the maximum direct-current rating stamped on the nameplate.

If the load is of a resistive or an inductive nature, the rectifier will deliver approximately 2 volts for each lead cell shown on the rectifier nameplate. For example, 24 volts for a 12-cell charger, or 48 volts for 24 cells.

If the charger fails to operate, check the fuses. If one has blown, investigate the cause and remedy it. Then replace the blown fuse with a good fuse of the same capacity.

Usually the trouble is a reverse battery connection, or ar overload in current.

From time to time as the stack ages, the resistance may have to be decreased or the coarse voltage adjustment advanced one step in order that the charging rate may be maintained.

SUPPLEMENTARY EQUIPMENT

Automatic Charge Control

These units can be made completely automatic in operation with the addition of an automatic charge control. The addition of this control should prolong the life of the battery by maintaining proper state of charge; however, it is essential that periodic inspection be made to insure normal operation.

Filter Reactor

A filter reactor is available for communication charging equipment or where low ripple is desired.

AUTOMATIC CHARGE CONTROLS

Automatic charge controls DL-3276910 and DL-3276911 were designed specifically for the rectifier units Type RS-945-A, RS-946-A, and RS-960-A. These controls will satisfactorily operate on many other types of equipment. The design of each component has been carefully considered and co-ordinated to provide a lightweight, easily serviced, dependable control unit. An exterior view of an automatic charge control is shown in Figure 6. As oblique view of an automatic charge control with its cover removed is shown in Figure 7.

DESCRIPTION

Casing

1. The front casing assembly is made of 1/16-inch steel plate to provide a sturdy protective enclosure for the internal parts.

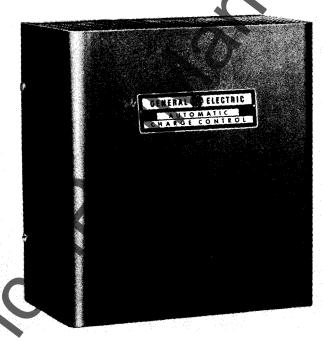


Figure 6. Automatic charge control, exterior view

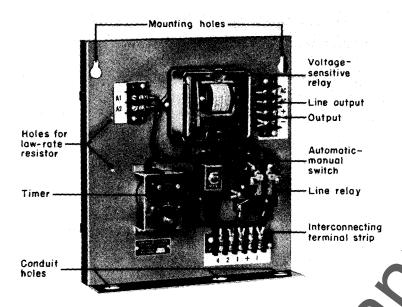


Figure 7. Automatic charge control with cover removed

The outline dimensions for the automatic charge controls are shown in Figure 8.

- 2. The back panel is made of 1/16-inch steel sheet in order to provide necessary strength for support of the components.
- 3. A perforated screen is provided at the top and bottom of the unit allowing free passage of air to cool the components, but not permitting objects larger than 1/4-inch in diameter to be inserted.
- 4. The casing is attached to the back plate by means of a slot and screw device so that it may be readily removed to change the function of the control.
- 5. The casing is phosphatized to prevent rust and corrosion of the base metal and given a baked enamel finish to provide a tough protective coating.

Voltage-sensitive Relay

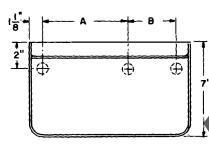
These units are equipped with an Exide TVR relay to control the amount of charge given the battery.

Motor Switch

The motor switch controls the operation of the TVR relay.

Contactor Relay

In control DL-3276910, a relay is provided of sufficient capacity to operate any unit which does not draw more than 12 amperes from the line. In larger control DL-3276911, a 50-ampere contactor is provided.



Dimensions in inches		
Letter	DL-3276910 OL-3276911	
A	6	8 <u>t</u>
В	3 2	5
С	113/4	15 <u>3</u>
D	10 5/8	14 5
E	13	141

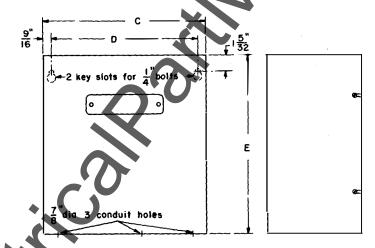


Figure 8. Automatic charge control outline dimensions

INSTALLATION

Used with Type RS-945-A, RS-946-A, or RS-960-A

Check the a-c supply connection to the rectifier unit when using the automatic charge control with Type RS-945-A, RS-946-A, or RS-960-A. (See Figure 5.)

For 115-volt operation, connect terminals 1 to 3 and 2 to 4. For 230-volt operation, connect terminal 2 to 3.

The a-c line should be disconnected from the rectifier unit and connected to the automatic charge control unit. Disconnect the battery, and place the (+) lead on the positive terminal of the charge control and the (-) lead on the negative terminal of

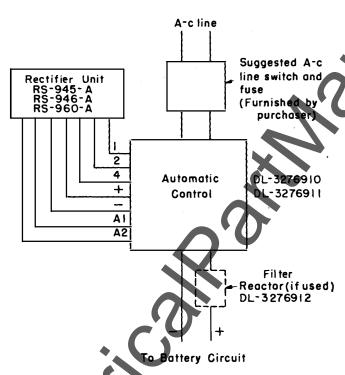


Figure 9. Automatic charge control installation diagram (with 85–945, 946, and 960 type chargers)

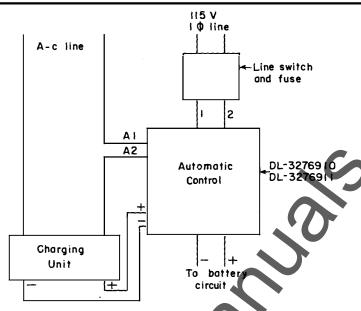
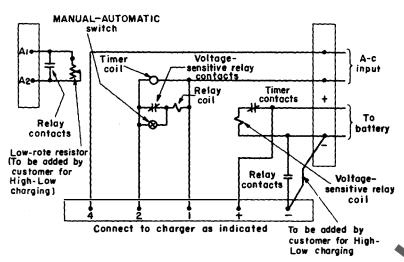


Figure 10. Automatic charge control installation diagram (with other type chargers)

the charge control. Terminals 1, 2, 4, PLUS, MINUS, A1, and A2, on the automatic charge control, should be connected to similarly identified terminals on the battery charger. (See Figure 9.) Be sure jumper has been removed between A1 and A2 on the battery charger when used with automatic charge control.

Used with Other Type Chargers

When using the automatic charge control with any charging unit other than Type RS-945-A, RS-946-A, or RS-960-A, connect the output of the charging unit to the PLUS and MINUS terminals of the control as indicated in Figure 10. Connect the battery to the other set of PLUS and MINUS terminals on the control. Apply 115 volts to terminals 1 and 2 on the automatic charge control. (The terminals marked A-C INPUT and 4 are not used in this type of operation.) Connect one of the a-c lines to terminal A1, then connect from terminal A2 to the charger. The other a-c line goes directly to the charger.



Note: For On-Off operation:

- Remove jumper between battery minus and charger minus.
- 2.Disconnect low-rate resistor between A1 and A2.

Figure 11. Automatic charge control schematic wiring diagram

ADJUSTMENT

High-Low Charging

The automatic charge control is not equipped for the High-Low charging system. To set up for that type charging, insert a resistor as indicated on schematic wiring diagram (Figure 11) and a jumper between negative terminals as illustrated. Consult "How to Choose the Correct Battery Charger" for the proper size of resistor or refer particular problem to the Lighting and Rectifier Divisions, General Electric Company, West Lynn, Mass.

After inserting proper parts to adjust the high rate, place the MANUAL-AUTOMATIC switch in the MANUAL position. Turn on the power and adjust the charging rate to the proper value using the adjustment on the rectifier unit. To make the low adjustment, put the MANUAL-AUTOMATIC switch in the AUTOMATIC position and connect the control to a battery sufficiently charged to cause the voltage-sensitive relay to pick

up. Vary the amount of resistance (connected to A1 and A2) until the desired low-rate charge is obtained. This low-rate charging current should be slightly under the average continuous drain on the battery.

On-Off Charging

The automatic charge control is set up for On-Off charging. To adjust, put the MANUAL-AUTOMATIC switch in the MANUAL position. Adjust the charging rate by means of the controls on the rectifier unit. When the MANUAL-AUTOMATIC switch is put in the AUTOMATIC position, the charger is set up for On-Off type charging.

OPERATION

High-Low Charging

Refer to schematic wiring diagram (Figure 11). When the rectifier unit and the automatic charge control are properly connected, 115 volts is applied between terminals 1 and 2. This serves to energize the timer which operates continuously. Once every hour the timer contacts open for a short period of time and then close again. When the contacts close, the coil of the voltage- sensitive relay is exposed to the battery voltage. If it is low, the voltage-sensitive relay does not pick up. Since the contacts on the voltage- sensitive relay are normally closed, the relay coil picks up allowing power to flow to the rectifier unit and allowing the output of the rectifier unit to go to the battery. If the voltage is sufficiently high for the voltage-sensitive relay to pick up, it opens the contacts in series with the relay coil and therefore the relay does not pick up. In this case, current flowing to the rectifier unit must pass through the low-rate resistor causing a voltage drop and therefore a reduced charging current to the battery.

On-Off Charging

The charging current must pass through the contactor or relay points before flowing to the battery. Also, the a-c line current must pass through the contactor or relay points. If the voltage-sensitive relay fails to pick up, the relay or contactor picks up, allowing power to flow to the rectifier unit and allowing

the output of the rectifier unit to go to the battery. If the voltage is sufficiently high for the voltage-sensitive relay to pick up, it opens the contact in series with the relay coil and therefore the relay does not pick up. In this case, both the a-c line and the d-c line are open, so that no power can flow to the charger, or from the charger to the battery. In addition, the battery cannot pump back power into the rectifier unit.

Manual Charging

When the MANUAL-AUTOMATIC switch is placed in the MANUAL position, it shorts out the voltage-sensitive relay contacts which means that the relay or contactor is always energized and therefore the rectifier unit always feeds through to the battery.

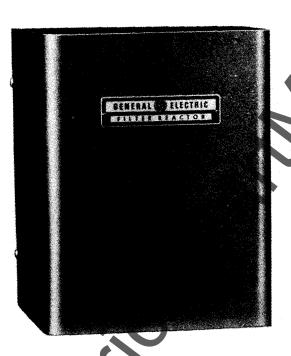


Figure 12 Filter reactor, exterior view

FILTER REACTOR

DESCRIPTION

A filter reactor is available for use with all chargers of less capacity than 33 lead acid cells and 14 amperes or less maximum d-c charging rate. An exterior view of filter reactor DL-3276912 is shown in Figure 12. See Figure 13 for outline dimensions.

The reactor is provided with two terminals by which it can be connected in series with the battery load. The terminals are not polarized and the reactor may be inserted in either output read. An interior view of the filter reactor is shown in Figure 14.

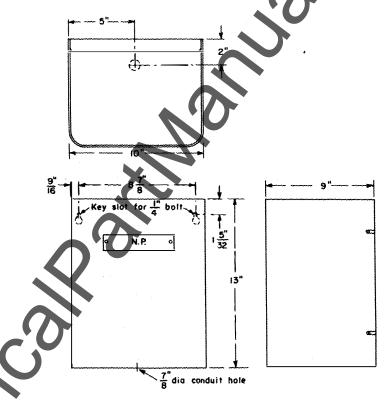


Figure 13. Filter reactor outline dimensions

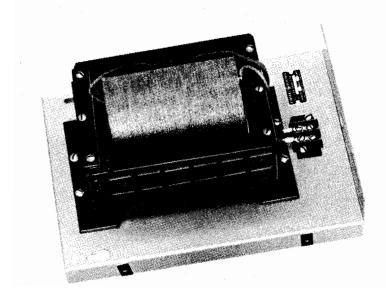


Figure 14. Filter reactor with cover removed

HOW TO SELECT THE CORRECT CHARGING METHOD

Manual Charging

For control applications it is customary to use the so-called "low-gravity" type of battery having a full charge specific gravity of from 1.200 to 1.220. With such a battery, it has been found that if a potential of 2.15 volts per cell is continuously impressed at the terminals, the battery will be maintained in fully charged condition. When steady state is reached, the charging current will be a very low trickle rate, only slightly higher than the internal losses. At normal room temperature, the rate is usually something less than one percent of the eight-hour ampere rating of the particular battery.

With a steady load applied to the battery, it may be "floated" at 2.15 volts per cell, in which case the charging equipment sup-

plies a steady load current plus the trickle rate. If the charging equipment can be designed to maintain a constant voltage of 2.15 volts per cell, the correct charging current will be maintained automatically. Conversely, if by the process of trial and error, the correct charging current is determined and maintained, then the correct "floating" voltage will result. This is a manual charging system. In general, this method of charging is satisfactory where there is a continuously maintained load on the battery, or where the load varies only slightly.

Intermittent charging at a rate somewhat higher than the Automatic Charging by On-Off Method average discharge rate is both feasible and practical within certain boundaries. Here the equipment must provide means to start the charge at periodic intervals, usually once every hour. A voltage-sensitive device responds to the battery voltage and terminates the charge when the "gassing" voltage is reached.

This method takes advantage of the innerent characteristic of a lead storage battery which produces a sharp rise in charging

voltage when the "gassing" point is reached. Battery life is governed, to a large extent, by the number of cycles of charge and discharge which the battery must endure. Long life for a control battery is contingent largely on operating in a manner that will require a minimum of "working". When the On-Off method's employed, this "working" is equal to the average discharge of the battery, in ampere-hours, during that portion of the hourly period when the charger is turned off. When the charge is restored, at the beginning of the next hourly period, it will stay on until it has replaced the energy discharged from the

The On-Off method of charging is limited in application to battery during the previous "Off" period. ituations where the average "working" of the battery for a formal one-hour period does not exceed one percent of the eighthour rating in ampere-hours and preferably one-half of one percent.

It is obvious that if an appreciable steady load is applied to High-Low Method of Charging the battery, the "working" during the "Off" period may well

exceed the safe value of one-half of one percent of its amperehour rating. In this case, the High-Low method of charging may be employed. Here the higher charging rate is started in the same manner as for the On-Off method. The voltage-sensitive device functions when the battery voltage reaches approximately 2.31 volts per cell, but instead of cutting off the charge completely, it reduces it to a low charging rate which has been pre-set at a value slightly below the average discharge rate of the battery under the particular conditions of operation.

In this case the "working" of the battery is the difference between the ampere-hours taken by the load and the amperehours supplied by the low-rate charge. By adjusting the low-rate charge to a value very slightly under the average load, it is easily possible to obtain the ideal operating point where the "working" of the battery is kept well within one-half of one percent of its ampere-hour rating.

In order to assure satisfactory operation with any of the previously described methods of intermittent charging (On-Off or High-Low), the net charging rate to the battery should be not less than 15% or more than 50% of the eight-hour rating of the battery in amperes. Best results will be obtained with a net charge rate between 20% and 35% of the eight-hour rating

RENEWAL PARTS

When ordering Renewal Parts, give the catalog number and rating of the unit as shown on the nameplate, a description of

If further information is desired, apply to the dealer, or write to Lighting and Rectifier Department Company, West Lynn, Mass. General Electric

Man Clectical Part Manuals country

LIGHTING AND RECTIFIER DEPARTMENT GENERAL ELECTRIC

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7-51 (1M)