INSTRUCTIONS

CARRIER-CURRENT AUXILIARY RELAYS

TYPES

BCA11A  BCA11M
BCA11B  BCA12A
BCA11C  BCA12C

IN

UNIVERSAL AND DRAWOUT CASES

GENERAL ELECTRIC
SCHENECTADY, N.Y.

11-43
CARRIER CURRENT AUXILIARY RELAYS

TYPES

BCA11A     BCA11M
BCA11B     BCA12A
BCA11C     BCA12C

GENERAL INFORMATION

Application

The various types of BCA relays covered by this instruction book are
designed for application, in conjunction with the GCX, GFC, and HDX relays,
in a protective scheme using carrier current with distance relay backup.

Construction

The BCA relays covered by these instructions all include a receiver
unit and a receiver alarm unit, and additional units, as described below,
for such functions as out-of-step blocking and cut-off, phase directional
auxiliary, and test auxiliary. A detailed description of each type is given
later. All the relays, except the 12BCA11B7 & 8, and the BCA11M, are avail-
able in either the universal or drawout case. The 12BCA11B7 & 8 and BCA11M
are available in universal case only.

Drawout Case

In the drawout case the electrical connections between the relay units
and the case are made through stationary molded inner and outer blocks be-
tween which nests a removable connecting plug which completes the circuits.
The outer block attached to the case has the studs for external connections
and the inner block has terminals for the internal connections.

The relay units are mounted in a steel framework called the cradle with
all leads being terminated at the inner block. This cradle is held firmly
in the case with a latch at both top and bottom and by two guide pins at the
back of the case. The connecting plug besides making the electrical con-
nections between the respective blocks of the cradle and case also locks the
latch in place. The cover, which is drawn to the cradle by thumbscrews,
holds the connecting plug in place.

To drawout the cradle the cover must first be removed. Then the con-
necting plug can be withdrawn. After this the latch can be released and
the cradle easily drawn out. To replace the cradle, the reverse order is
followed.

A separate testing plug can be inserted in place of the connecting
plug to test the relay in place on the panel either from its own source
of voltage or from other sources. Or, the cradle can be drawn out and
the relay replaced by another which has been tested in the laboratory.

Type BCA11A Relay

The BCA11A relay contains the following units: A polarized receiver
unit, a polarized receiver alarm unit, out-of-step blocking and cut-off
units, a receiver blocking unit, a phase directional unit, and a test auxiliary unit.

Each of the two polarized units consists of an Alnico permanent magnet; two silicon steel side plates, fitted with fixed and movable pole pieces; a Mumetal strip armature; a silicon steel armature supporting bracket; an operating coil and a set of contacts. The Alnico magnet is clamped between the two side plates and sets up a strong magnetic field across the air gap between the pole pieces, which are arranged on the inner surfaces of the side plates above the magnet. The L-shaped armature support bracket has one end clamped between the upper ends of the side plates, above the pole pieces, and is centered between nonmagnetic shims which fix its magnetic potential midway between that of the pole pieces. The bracket extends backward and has the rear end bent down to support the rear end of the armature strip. The bent-down end is slotted and drilled to receive a slotted positioning cylinder in which the rear end of the armature strip is inserted. The armature strip extends forward and is centered in the air gap between the pole pieces by rotation of the positioning cylinder. A single clamping screw serves to secure both the armature and the cylinder after the proper adjustment has been made. The front end of the armature is free to move laterally under the influence of the operating coil and an insulating fork attached to it transmits the motion to the contacts which are mounted on the front of the relay. The armature travel is limited by the edges of a metal plate attached to the armature striking the inside surfaces of the side plates. The plate also serves to support the contact operating fork. The operating coil is supported around the armature at the rear.

Since the armature is held at the rear end only, it will behave like a cantilever beam. When the front end is deflected laterally the stiffness of the beam will tend to return it to the rest position midway between the poles. The magnetic field however, has the opposite effect. When the armature is midway between the poles it is in a position of magnetic equilibrium since it is attracted equally by both poles. If it is slightly displaced toward one pole, however, the pull of that pole is increased while that of the other is decreased and the armature will tend to move farther in the direction of the displacement. In the polarized unit these two effects are balanced against each other so that very little force is required to move the armature. This balance is adjusted by means of the movable pole pieces. If the pole pieces are both screwed out away from the armature the magnetic field will be weakened and the armature stiffness effect will predominate. If both pole pieces are screwed in close to the armature the magnetic field effect will predominate and the armature will snap over to one side or the other when it is displaced past midposition. The normal adjustment of the poles is one which requires the least force to move the armature without this snap over action.

When a direct current is passed through the operating coil the armature is magnetized and the interaction with the permanent magnet field in the air gap produces a force tending to displace the armature. This force is proportional to the product of the magnetic pole strength produced in the armature multiplied by the air gap flux density. Since the air gap field is very strong little armature magnetism, and hence little current in the operating coil, is required to deflect the armature with sufficient force to operate the contacts. This means that the polarized relay unit is a very sensitive low burden device.
In the BCA11A relay, the two polarized units are used for carrier alarm and carrier receiving. The alarm unit and the restraining winding of the receiver unit are energized by the carrier signal. The receiver unit has been adjusted at the factory to pick up at .007 amperes and drop out at .004 ampere. The alarm unit has been adjusted to pick up at .010 ampere and drop out at .004 ampere.

The "A" and "B" units known as the out-of-step blocking units are standard telephone type auxiliary relays with copper slugs at the heel end of the armature to provide a time delay dropout. The two relays are cascaded to secure a total dropout time of approximately 1.2 secs. The contacts of "A" control unit "B" and the contacts of "B" block tripping during out-of-step conditions.

The "C", or block cut-off unit, is a standard telephone type relay instantaneous in operation. Its function is to cut off carrier-current and allow tripping in the event that an internal fault occurs during out-of-step conditions.

The test unit T is a standard instantaneous telephone relay used in conjunction with the carrier test circuit to give an indication of the carrier circuit operation and the condition of the carrier-current transmitter and receiver.

The receiver blocking unit RB is a telephone type relay with an armature end slug for time delay. It has been adjusted at the factory for three cycle pickup and four cycle drop-out. Its purpose is to prevent false tripping during transient line disturbances caused by the clearing of external faults.

The directional auxiliary unit SX is a telephone relay adjusted for a high speed pickup of less than 5 milli-seconds. Its coil is operated by the GCX directional starting units and its contacts stop carrier transmission and remove voltage from the holding winding of the receiver unit as dictated by the directional unit.

The other BCA relays covered by this instruction book are basically similar to the BCA11A with the exceptions indicated in the following paragraphs:

Type BCA11B:

This relay is the same as the BCA11A except that the polarity of the receiver unit coil has been reversed to adapt the relay to pilot systems where the trip coils are connected to negative.

Type BCA11C:

This relay is the same as BCA11A except that the out-of-step blocking and block cut-off units have been omitted.

Type BCA11M:

This relay is similar to the 12BCA11B7 or 8 except that the series resistor for the receiver holding coil has been mounted externally.
Type BCA12A:

This relay is similar to the BCA1A and BCA1B except that only the carrier receiver and carrier alarm units are furnished. The auxiliary relays are included in other cases.

Type BCA12C:

This relay is similar to the BCA12A except that the receiver unit is furnished with one circuit-opening and one circuit-closing contact.

Ratings

These relays are all available for either 125 volt or 250 volt d-c operation.

Burdens

The resistances of all unit coils and resistors are given on the internal connection diagrams at the back of this instruction book.

SHIPPING - UNPACKING

Immediately upon receipt of the relay, an examination should be made for any damage sustained during shipment. If injury or rough handling is evident a damage claim should be filed at once with the transportation company and the nearest General Electric Sales Office should be notified.

INSTALLATION

Location and Mounting

The relay should be mounted on a vertical surface in a location reasonably free from excessive heat, moisture, dust and vibration. The relay case may be grounded if desired, using at least No. 12B & S gauge copper wire or equivalent. The panel drilling references are given in the table under connections.

Connections

The internal connections, outlines, and panel drilling for the models covered by this instruction book are listed in the following table:

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<td>Fig. 2 &amp; Fig. 1</td>
<td>Fig. 4 &amp; Fig. 3</td>
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ADJUSTMENTS AND TESTS

The relay was adjusted at the factory to obtain the proper characteristics. It is advisable not to disturb these adjustments. If, for any reason, the adjustments have been disturbed the following points should be observed in restoring them:

(1) Mechanical Adjustment Polarized Units

The armatures should move freely from side to side. (Armature travel is limited by the edges of the wide metal piece on the armature, which supports the contact operating fork, striking the inside surfaces of the side plates.) Care should be taken to see that the armature air gaps are free of iron filings.

Each contact should be adjusted to have approximately 0.015" gap when the armature is in the contact-opening position and the edge of the contact-operating fork should clear the contact brush by approximately 0.015" when the armature is in the contact closing position. This applies to both circuit-opening and circuit-closing contacts. Each contact should have a pressure of 5 grams when closed. The contacts may be roughly adjusted by rotating the contact assembly on its mounting stud and a fine adjustment obtained by turning the stationary contact screw.

(2) Electrical Tests Polarized Units

These tests should be checked with the cover on the relay, since the change in stray magnetic leakage flux caused by the presence of the steel cover affects the pick-up and drop-out values.

If the pick-up current is only a little off the desired value it can be adjusted by means of the spiral armature spring located at the front of the unit just in back of the contacts. This spring is adjusted by inserting a screwdriver in the slot of its spindle and turning it to right or left until the desired pick-up is obtained.

If the pick-up or drop-out values are considerably different from the desired values it may be necessary to adjust the movable pole pieces. This is accomplished by loosening the clamp screws at the top front edge of the two side plates and turning the poles by means of a short piece of stiff brass wire (No. 42 gauge = 0.0935" diameter or smaller) inserted in the capstan holes drilled in the pole pieces. The effects of various pole adjustments are as follows:

a. - Moving both poles to the right biases the armature to the left, raising pick-up and lowering drop-out. Moving both poles to the left has the opposite effect.

b. - Moving both poles in toward the armature reduces the ratio of drop-out to pick-up and increases the snap action of the armature motion. Moving both poles out away from the armature has the opposite effect.

c. - In general, moving the left pole has more effect on pick-up and the right more effect on drop-out.
The clamping screws should be retightened after each pole adjustment.

3. Adjustments on the telephone relay units

The telephone-type relay units included in the relays covered by this instruction book have been adjusted for 80 per cent pickup with time settings as given under the description of individual units. Normally these relay units should not require readjustment. If, however, it becomes necessary to change the pickup or time delay the following points must be observed:

In the unexcited position of the relay unit normally closed contacts should be making with a .005" wipe and all normally open contacts should have a gap of .015" minimum. When the relay unit is operated by hand the circuit closing contacts should make with .005" wipe and the circuit opening contacts should have a gap of .015" minimum.

The pickup time may be increased by increasing the armature gap; this is accomplished by bending the contact operating arm. This adjustment also increases the pickup value.

The dropout time may be adjusted by means of the brass residual screw in the armature. Turning the screw in decreases the dropout time. The dropout time may also be varied slightly by increasing the wipe of the circuit closing contacts.

MAINTENANCE

An operation test and mechanical inspection of the relay and its connections should be made at least once every six months. The clamping screws in the side plates and tailpiece should be checked for tightness and the contacts inspected for pressure, wipe, gap and cleanliness.

If the contacts require cleaning, file lightly with a clean, fine, thin file. Do not use crocus or emery cloth as they tend to embed insulating particles in the contact surfaces.

RENEWAL PARTS

When ordering renewal parts, address the nearest sales office of the General Electric Company, specify the quantity required, the name of the part wanted and the complete nameplate data, including the serial number when used. If possible give the General Electric Company's requisition number on which the relay was furnished.
FIG. 1 - OUTLINE, PANEL DRILLING, AND INTERNAL CONNECTIONS FOR MODELS 12BCA11A1, 2, 5, & 6 and 12BCA11B1, 2, 5, & 6 RELAYS IN THE UNIVERSAL CASE. (K-6154604)
FIG. 2 - ELEMENTARY DIAGRAM FOR MODELS 12BCA11A1, 2, 5, & 6 and 12BCA11B1, 2, 5 & 6 RELAYS IN THE UNIVERSAL CASE (K-6154819)
FIG. 3 - OUTLINE & PANEL DRILLING FOR DRAWOUT CASE,
TWO UNIT - DOUBLE END. (K-6174674)
FIG. 4 - ELEMENTARY DIAGRAM (BACK VIEW) FOR MODELS 12BCA11A1, 2, 5, & 6 and 12BCA11B1, 2, 5, & 6 RELAYS IN THE DRAWOUT CASE. (K-6154818)
FIG. 5 - ELEMENTARY DIAGRAM FOR MODELS 12BCA11A3&4 AND 12BCA11B3&4 IN THE DRAWOUT CASE. (K-6154770)
FIG. 6 - ELEMENTARY DIAGRAM FOR MODELS 12B611A3&4 AND 12B611B3&4 RELAYS IN THE UNIVERSAL CASE.

(K-6154769)
FIG. 7 - OUTLINE, PANEL DRILLING, AND INTERNAL CONNECTIONS OF TYPES BCA12A AND BCA12B RELAYS IN THE UNIVERSAL CASE. (K-6154909)
FIG. 8 - OUTLINE & PANEL DRILLING FOR DRAWOUT CASE,
ONE UNIT - DOUBLE END.  (K-6174072)
NOTE
WITH POLARITY OF TERMINALS
4 & 7 AS SHOWN RECEIVER
CONTACTS OPEN & ALARM
CONTACTS CLOSE.

FIG. 9 - INTERNAL CONNECTIONS (BACK VIEW) FOR TYPES
BCA12A and BCA12B RELAYS IN THE DRAWOUT CASE.
(K-6154910)
FIG. 10 - OUTLINE, PANEL DRILLING, AND ELEMENTARY INTERNAL CONNECTIONS FOR TYPE BCA11C RELAY IN THE UNIVERSAL CASE. (K-6209053)
FIG. 11 - ELEMENTARY INTERNAL CONNECTIONS OF THE TYPE 5C11C RELAY IN THE DRAWOUT CASE. (K-6209054)
FIG. 12 - OUTLINE, PANEL DRILLING, AND ELEMENTARY DIAGRAM FOR THE TYPE BCA12C RELAY IN THE UNIVERSAL CASE. (K-6209168)
NOTE
WITH POLARITY OF TERMINALS 4 & 7 AS SHOWN RECEIVER CONTACTS OPEN & ALARM CONTACTS CLOSE.

FIG. 13 - INTERNAL CONNECTIONS FOR THE BCA12C RELAY IN THE DRAWOUT CASE.
(K-6209169)
FIG. 14 - OUTLINE, PANEL DRILLING, AND ELEMENTARY DIAGRAM OF MODELS 12BGA11B7 & 8 RELAY IN THE UNIVERSAL CASE. (K-6209046)
FIG. 15 - OUTLINE, PANEL DRILLING, AND ELEMENTARY DIAGRAM OF THE TYPE BCA11M RELAY IN UNIVERSAL CASE. (K-6306844)
WHEN SERVICE IS REQUIRED

The facilities of our engineering departments and factories are available to purchasers of G-E apparatus through G-E service shops and sales offices, a list of which is given below.

When it is necessary to renovate, repair, or change apparatus to meet a new operating condition or a new application, the facilities of the nearest G-E service shop are at your disposal. Each of them is equipped to turn out work of the same high quality, both as to workmanship and materials, as at the factory. If it is necessary that the work be done on the customer’s premises, the service shop is prepared to send trained, competent, and dependable men who will do it promptly and efficiently. Similarly, the sales office nearest you will be glad to help you with any engineering problems that may be involved.

SERVICE SHOPS

Atlanta, Ga. ................................................. 496 Glenn Street, Southwest
Buffalo, N.Y. .................................................. 318 Urban Street
Charleston, W.Va. ......................................... 306 MacCorkle Avenue, Southeast
Chicago, Ill. .................................................... 634 South Clark Street
Cincinnati, Ohio ........................................... 315 West Third Street
Cleveland, Ohio ........................................... 1461 Woodland Avenue
Dallas, Texas .................................................. 1101 North Lamar Street
Detroit, Mich. ............................................... 950 Third Avenue
Houston, Texas ............................................. 1512 Live Oak Street
Kansas City, Mo. ............................................ 819 East Nineteenth Street
Los Angeles, Calif. ......................................... 755 Banning Street
Milwaukee, Wis. ........................................... 940 West St. Paul Avenue
Minneapolis, Minn. ........................................ 234 Third Avenue, North
New York, N. Y. ........................................... 416 West Thirtieth Street
Philadelphia, Pa. .......................................... 429 North Seventeenth Street
Pittsburgh, Pa. ............................................. 6519 Penn Avenue
St. Louis, Mo. .............................................. 1110 Delmar Boulevard
Salt Lake City, Utah ....................................... 141 South Third West Street
San Francisco, Calif. ..................................... 361 Bryant Street
Seattle, Wash. ............................................. 1508 Fourth Avenue, South
West Lynn, Mass. ......................................... 920 Western Avenue

Special service divisions are also maintained at the following Works of the Company: Erie, Pa.; Ft. Wayne, Ind.; Pittsfield, Mass.; Schenectady, N. Y.; and West Lynn, Mass. (West Lynn Works)

SALES OFFICES (Address nearest office)

 Akron, Ohio ................................................. 325 South Main Street
Albany, N. Y. ............................................... 187 Spring Street, Northwest
Baltimore, Md. .............................................. 39 West Lexington Street
Bangor, Me. ................................................... 115 Franklin Street
Binghamton, N. Y. ......................................... 19 Chenango Street
Birmingham, Ala. ........................................... 600 North Eighteenth Street
Bluefield, W. Va. ........................................... Appalachian Building
Boston, Mass. ............................................... 140 Federal Street
Buffalo, N. Y. .............................................. 1 West Genesee Street
Butte, Mont. .................................................. 20 West Granite Street
Cedar Rapids, Iowa ........................................ 233 Second Street, Southeast
Charleston, W. Va. ........................................ 306 MacCorkle Avenue, Southeast
Charlotte, N. C. ............................................ 260 South Tryon Street
Chattanooga, Tenn. ........................................ 612 Georgia Avenue
Chicago, Ill. .................................................. 726 Woodland Avenue
Cincinnati, Ohio ........................................... 4900 Woodland Avenue
Cleveland, Ohio ........................................... 46 South Third Street
Dallas, Texas ............................................... 1501 North Lamar Street
Dayton, Ohio .................................................. 611 Pershing Avenue
Denver, Colo. ............................................... 450 Seventeenth Street
Des Moines, Iowa .......................................... 415 West Sixth Avenue
Detroit, Mich. .............................................. 700 Antoinette Street
Duluth, Minn. ............................................... 14 West Superior Street
El Paso, Texas ............................................. 109 North Oregon Street
Erie, Pa. ..................................................... 10 East Twelfth Street
Evansville, Ind. ........................................... 123 Northwest Fourth Street
Fargo, N. Dak. .............................................. 111 Jacobson Building
Fort Wayne, Ind. ......................................... 127 West Berry Street
Fort Worth, Texas ......................................... 408 West Seventh Street
Hartford, Conn. ............................................ 410 Asylum Street
Honolulu, Hawaii .......................................... 1312 Live Oak Street
Indianapolis, Ind. ........................................ 110 North Illinois Street
Jackson, Mich. ............................................. 212 Michigan Avenue, West
Jacksonville, Fla. ......................................... 237 West Forty-seventh Street
Kansas City, Mo. ......................................... 106 West Fourteenth Street
Kansas City, Mo. ......................................... 602 South Gay Street
Los Angeles, Calif. ....................................... 215 North Vignes Street
Louisville, Ky. ............................................. 890 South Fourth Street
Memphis, Tenn. ............................................ 8 North Third Street
Milwaukee, Wis. .......................................... 940 West St. Paul Avenue
Minneapolis, Minn. ....................................... 234 Third Avenue, North
Nashville, Tenn. ........................................... 744 Broad Street
New Haven, Conn. ........................................ 129 Church Street
New Orleans, La. .......................................... 627 Gravier Street
New York, N. Y. ........................................... 970 Lexington Avenue
Niagara Falls, N. Y. .................................... 253 Second Street
Oklahoma City, Okla. .................................... 110 North Robinson Street
Omaha, Neb. ............................................... 409 South Seventeenth Street
Philadelphia, Pa. ........................................ 1403 Locust Street
Phoenix, Ariz. ............................................. 435 West Madison Street
Pittsburgh, Pa. ............................................ 353 Smithfield Street
Portland, Ore. ............................................. 111 Westminster Street
Reading, Pa. ............................................... 31 North Sixth Street
Richmond, Va. ............................................. 301 East Franklin Street
Roanoke, Va. ............................................... 202 South Jefferson Street
Rochester, N. Y. ........................................... 50 East Avenue
Salt Lake City, Utah ..................................... 200 South Main Street
San Antonio, Texas ....................................... 681 Sixth Avenue
San Diego, Calif. ......................................... 821 Second Avenue
San Francisco, Calif. ................................... 255 Montgomery Street
Seattle, Wash. ............................................. 202 State Street
Schenectady, N. Y. ....................................... 355 Riverside Avenue
Springfield, Mass. ........................................ 607 East Adams Street
Springfield, Ill. ............................................ 1387 Main Street
Syracuse, N. Y. ............................................ 138 South Salina Street
Tacoma, Wash. .............................................. 1019 Pacific Avenue
Toledo, Ohio ............................................... 420 Madison Avenue
Tulsa, Okla. .................................................. 409 South Boston Street
Washington, D. C. ....................................... 325 S. Fifteenth Street
Waterbury, Conn. ........................................ 20 North Main Street
Wichita, Kan. .............................................. 102 South Broadway
Worcester, Mass. .......................................... 25 East Boardman Street
Youngstown, Ohio ......................................... 25 East Boardman Street

Canada: Canadian General Electric Company, Ltd., Toronto
G-E products can also be obtained through Agents and Distributors located in principal cities and towns.

Hawaii: W. A. Ramsay, Ltd., Honolulu