INSTRUCTIONS

for the Installation, Care and Operation of Circuit Breakers and Accessories

CAPACITOR TRIP DEVICE FOR
POWER CIRCUIT BREAKER

BOOK BWX-6495

These instructions are not intended to cover all details or variations that may be encountered in connection with the installation, operation, and maintenance of this equipment.
Should additional information be desired contact the Allis-Chalmers Mfg. Company.

ALLIS-CHALMERS MFG. CO.

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INSTRUCTIONS COVERING CAPACITOR TRIP DEVICE FOR POWER CIRCUIT BREAKER

APPLICATION

A capacitor trip device may be used to trip both small and medium size power circuit breakers in place of a battery. Its principal application is with small (rectifier equipped) solenoid operated breakers installed in isolated locations, or in unattended substations, where elimination of the expense of a battery with its maintenance is desired. The inconvenience of frequent visits to check the battery will be eliminated also.

The capacitor trip device may be used with pneumatically or hydraulically operated breakers installed in similar locations.

In installations of this class the capacitor trip device may be charged from the same step-down transformer that is used to energize the breaker's closing rectifier, the air compressor, or the oil pump motor where these are used. Obviously,this step-down transformer should be connected to the line side of the breaker.

Practically any modern indoor or frame mounted outdoor breaker of Allis-Chalmers manufacture can be arranged for tripping from a capacitor trip device. This trip device is not recommended for use with floor mounted outdoor breakers.

Application of the capacitor trip device to existing breakers originally shipped with D.C.trip coils should be first checked with the Allis-Chalmers Mfg.Co.,Boston Works. Some breakers are not suitable for operation from capacitor trip devices until changes in their trip mechanism have been made as the latch load on a trip mechanism must be light for this method of tripping.

The capacitor trip device will function satisfactorily in place of a battery with any of the usual protective relay combinations provided one keeps in mind that the energy available is small. The principal limitations are the length of wire run, number of terminals, and the number of relays and other devices, which can be connected across the capacitor without causing excessive leakage current. A high leakage current will reduce the charge on the capacitor . If very high, it may overload the rectifier and cause eventual failure.

As a general rule for outdoor installations, the capacitor trip device, relays and control switch should all be mounted on the breaker. If it is necessary to trip from a remote point, an interposing relay should be used. An obvious limitation for capacitor trip is that it will not function after the line has been de-energized for a minute or two. If for any reason it is necessary to trip a breaker when the line is de-energized, or to trip instantly after it is energized, a battery should be used for tripping. Full A.C. control voltage must be available for at least 10-12 cycles to charge capacitor sufficiently to insure a positive trip. In practice, application of capacitor trip is usually confined to the simpler protective schemes . For complicated and expensive relay combinations, a battery is customary.

DESCRIPTION: The capacitor trip device furnished is a recent model designed to provide more trip energy in less space and at lower voltage than the older model. The rather high voltage of approximately 500 on the capacitor of the previous model was objected to in some applications and finding space for it has been a problem on some recent switchgear designs . The present device consists essentially of a 400 microfarad, 300 volt, electrolytic capacitor of high quality, a selenium rectifier and a transformer mounted in a small case. There are two versions of this device. One is applied to outdoor breakers, and some indoor breakers, and the other is used for indoor breakers on metal clad switchgear. Both have the same size case. For outdoor breakers, the device is provided with a neon lamp and a toggle switch. The neon lamp glows when the capacitor is charged above about 100 volts. In the "On" position the toggle switch connects the transformer to A.C.supply, and the capacitor charges. In the "Off" position the switch both disconnects the transformer from the supply and discharges the capacitor through a resistor. On indoor breakers used in metal clad switchgear, the neon light would not be visible and the switch would be inaccessible. Both are therefore, omitted.

OPERATION: Figure 1 shows an Elementary Diagram and Internal connection Diagram for the devices used with outdoor breakers. When an A.C. source is connected to terminals marked 10 and 25 and the toggle switch is in the "On" position, the capacitor is charged thru the rectifier. The transformer steps down the 230 volt supply to provide about 155 volts A.C., or a peak of approximately 215 volts D.C. at the capacitor. The trip circuit is connected across terminals 10A and 25 as shown. Control switch or protective relay contact then discharges the capacitor thru the trip coil and trips the breaker.

MAINTENANCE : Under normal conditions a capacitor trip device may be expected to function for the life of a breaker without attention; however, accidents can occur and periodic inspections should, therefore, be made. A short in the trip wiring will burn out the rectifier. A partial insulation failure may increase leakage current to a value which will damage the rectifier.

A loose connection is also a possible cause of failure to operate . Such difficulties rarely occur, but are nevertheless possible and an occasional check is desirable.

The best routine check is to trip the breaker from the capacitor during regular scheduled breaker inspections. If the breaker trips, no further test is necessary except that connections should be checked to make certain none are loose.

Before touching any wiring, be sure the capacitor has been discharged.

If the breaker does not trip, check the charge on the capacitor with high resistance (20,000 ohms per volt) D.C. voltmeter. The meter should read close to 215 volts if the A.C. supply is 230. If the capacitor is charged, the trouble is probably in the trip circuit which should be carefully checked.

If the capacitor is not charged, the rectifier has probably been damaged and should be replaced as it is the component most easily injured by overcurrent. In case of a short in the trip circuit, the transformer and capacitor may also be damaged. The damage to components may be evident by visual inspection. If there is any question, the following test may be made.

Isolate the rectifier from the circuit and apply six volts D.C. in series with the rectifier and a D.C. milliammeter. (Four dry cells will serve as the D.C. source.) The meter should read 10 milliamps or more with polarity in the forward direction and very close to zero with the polarity reversed.

The transformer will usually be open circuited if it is damaged and may be checked for continuity with an ohmeter. Another test is to disconnect the rectifier and capacitor from the transformer and connect an A.C. voltmeter across the out-put terminals. With 230 volts on the incoming terminals, the out-put as measured by the voltmeter should be approximately 155 volts.

If there is any doubt about the capacitor, it is best to check with a capacitor analyzer.

Before replacing any components, the trip circuit should be carefully checked for possible shorts or grounds which may have been the original cause of the trouble. A test of circuit insulation with a 500 volt megger should show one megohm or more.

TECHNICAL DATA:

1. Capacitors are 400 microfarad, 300 volt.

2. Time to charge to about 60% of full voltage is 10-12 cycles. Sixty per cent of full charge is enough to trip.

3. Time to discharge to 50% of full voltage with the A.C. supply disconnected is considerably more than one minute.

4. The D.C. voltage on a fully charged capacitor is about 215 when the A.C. supply is 230.

5. The minimum voltage to trip varies with the application, but is about 50% or less for most cases.

LIST OF COMPONENTS

Spare or replacement components may be ordered from the following list by description and code number. Serial NO. of breaker with which capacitor trip device is used should also be stated if possible.

	ALLIS -CHALMERS CODE NO.
Capacitor 400 mfd. 300 volt.	W-663-102
Rectifier, Selenium.	W-665-203
Transformer, Auto 110/220/330 v.60 cyc.	W-669-604
Resistor, 200 Ohm 40 watt.	W-655-404
Toggle Switch.	W-666-803
Neon Pilot Lamp.	W-654-215
Lens for Pilot Lamp.	W-654-216
Receptacle for Pilot Lamp.	W-654-217
Resistor for Pilot Lamp-2.2Meg.	W-655-107

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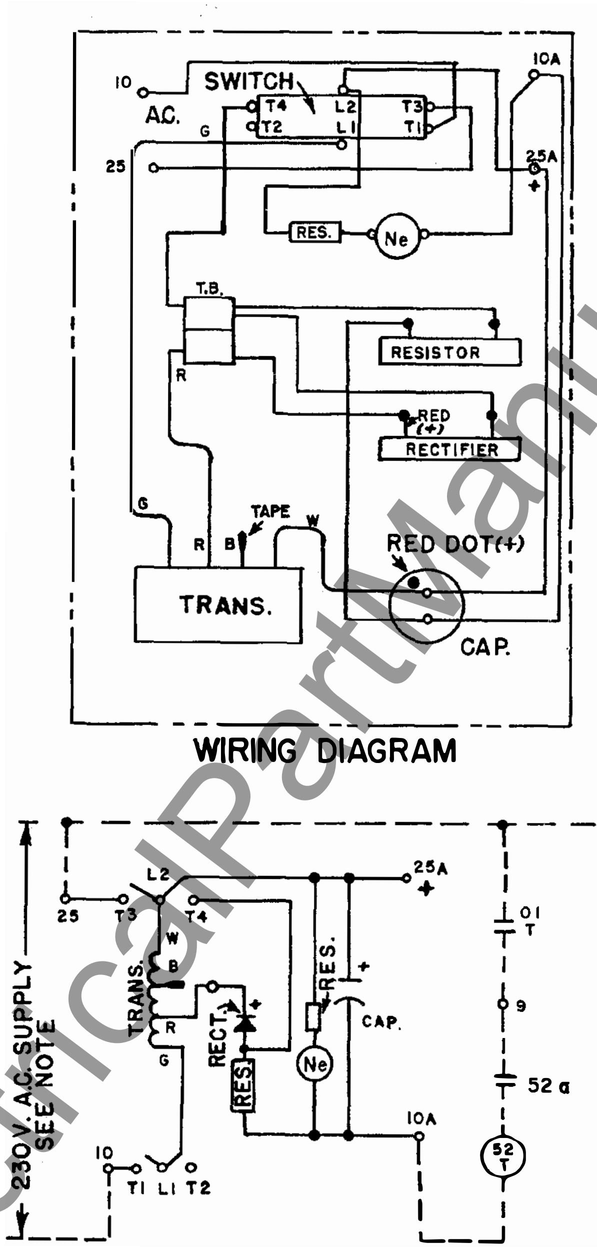


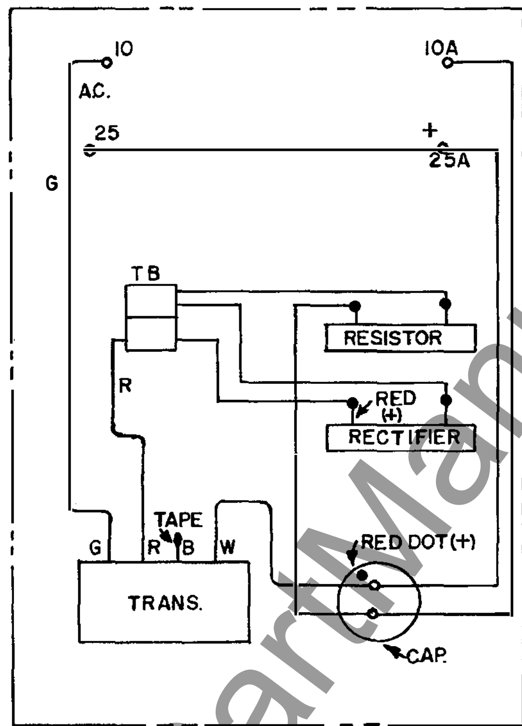
ELEMENTARY DIAGRAM

NOTE - FOR 115 V. SUPPLY INTERCHANGE RED AND GREEN TRANS. LEADS.

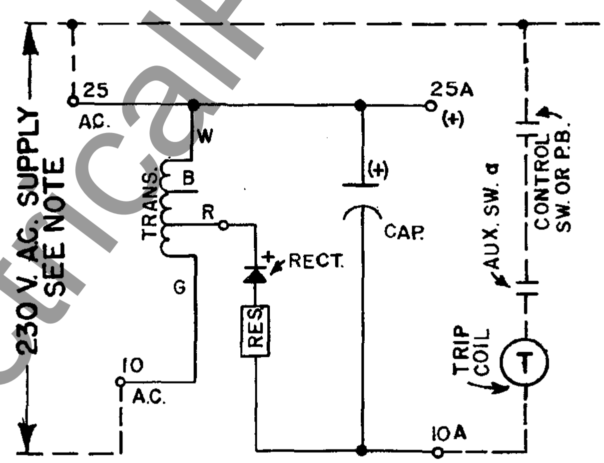
FIG. 1

TYPICAL CAPACITOR TRIP DEVICE WITH SWITCH AND LIGHT

9-12-57 71-206-338



WIRING DIAGRAM



ELEMENTARY DIAGRAM

NOTE- FOR 115 V. SUPPLY
INTERCHANGE GREEN
AND RED TRANS. LEADS

FIG. 2

TYPICAL CAPACITOR TRIP DEVICE
CONNECTION DIAGRAM

9-12-57 71-206-339

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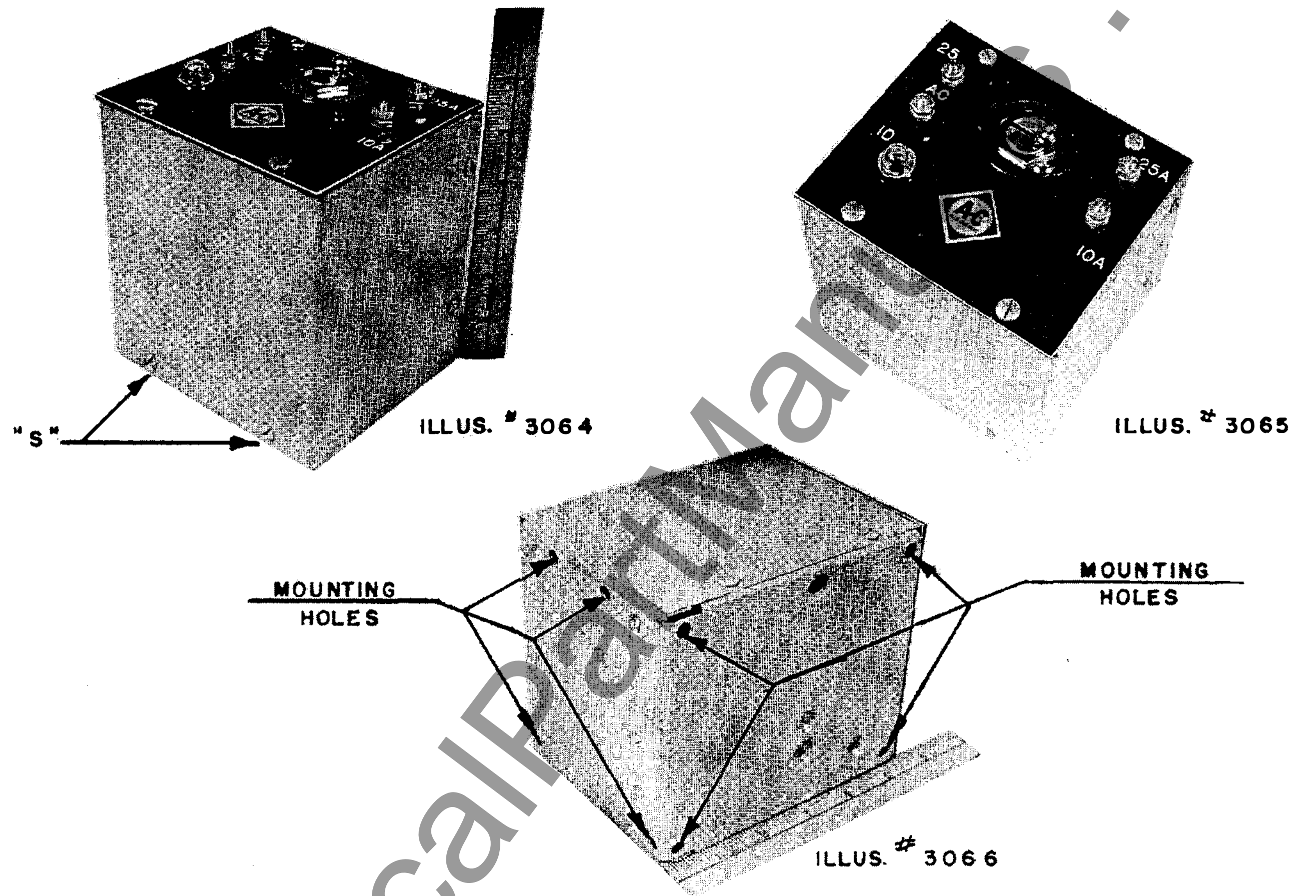

FIG. 3

CAPACITOR TRIP DEVICE

TO OBTAIN ACCESS TO COMPONENTS REMOVE SCREWS MARKED "S" LOOSEN OTHER SCREWS, AND THEN SLIDE OFF "U" SHAPED COVER.

DEVICE MAYBE MOUNTED ON EITHER FACE OF "L" SHAPED BASE BY MEANS OF HOLES SHOWN