Westinghouse

Type TK Timing Relay

INSTRUCTIONS FOR INSTALLATION AND OPERATION

APPLICATION

The type TK timing relay is an a-c. relay suitable for applications which require a definite time-delay between the closing of an a-c. circuit and the closing or opening of other circuits, either a-c. or d-c. through the contacts of the relay. Accurate time-settings of from a few seconds to fifty minutes can be obtained in the same relay, and even with the longest time setting the relay will reset practically instantaneously. Two sets of main contacts—one single-pole double-throw and one single-pole single-throw—are provided, and these contacts can be adjusted to operate either simultaneously or sequentially. A "sealing-in" auxiliary contact can also be provided for applications where it is desired to start a timing operation by momentary closure of an external switch.

Typical applications are found in automatic control circuits for generators and motors, in connection with the operation of large rectifier and other thermionic tubes, as a part of the control for voltage regulators and tap-changing transformers, and in various types of industrial control.

INSTALLATION

Inspect relay for any damage that might have occurred in shipment. When removing the blocking from under the contactor armature, make sure that the armature is not shifted off its bearings. Rotate the tripping disc mechanism counter-clockwise and allow to reset to make sure that it returns to zero positively. Check for any apparent friction by slowly rotating the largest gear of the gear train, which is located directly under the shaft with the marking grooves at the top of relay. Mounting studs and terminal details are contained in a small cloth bag packed with the relay.

The tripping disc mechanism is at the top of the relay and the synchronous motor at the bottom. The relay should be mounted in an approximately level position as viewed from both front and side. Any appreciable variation from a level position will affect the operating characteristics of the relay.

CONSTRUCTION AND OPERATION

The type TK relay consists essentially of a synchronous motor, a gear train arranged to provide three different ratios, a clutch interposed in the gear train to permit quick resetting when the relay is de-energized, a contactor which carries the main contacts and operates the clutch, and a tripping mechanism adjustable for time delay.

The motor for driving the gear train is located on the back plate of the gear train assembly in the lower right-hand corner. It runs at a sub-synchronous speed of 600 R.P.M. The motor bearings are of the self-sealed, self-lubricating type and require no attention.

The gear train is assembled as a separate unit and consists of two brass bearing plates fastened together at the corners by brass posts. The gear shafts run at low speeds and require no lubrication. The three different speeds are obtained by changing the location of a sliding gear assembly. This assembly consists of two gears on a hub that is free to slide on the clutch shaft and can be locked in any desired position with a setscrew. The hub is moved to the position where the larger gear is opposite the arrow on the index plate corresponding to the desired time scale. The mesh of the gear teeth should be inspected and the hub shifted slightly if necessary to secure a full mesh, and then the setscrew should be tightened securely.

The maximum time settings available for the three gear positions are: 30 seconds, 5 minutes and 50 minutes. The smallest subdivision on the 30 second scale is 1 second, and the smallest subdivision on the 5 and 50 minute scales is 0.1 and 1 minute respectively.

The motor may require as much as 2 or 3 seconds to reach synchronous speed after being energized. This lag will not be noticeable on the intermediate or slow speed settings, but if very accurate timing is desired with the gears in the high speed position the scale setting should be approximately 1 second less than the desired time.

The clutch consists of two aluminum discs with serrated faces, which are normally kept separated by a helical spring assembled between the two plates. The rear plate is fastened to the shaft with the shifting gears; the front plate is a loose fit on this shaft and has fastened to it the pinion that drives the tripping mechanism. When the relay is energized, these two plates are pressed together, the serrations on their faces mesh, and power is transmitted from the motor, through the gear train, to the tripping mechanism.

The contactor is of the clapper type. At the top of the armature is fastened the

bronze spring arm which presses against the front half of the clutch and pushes it into mesh. The sealing-in contact, when used, is operated by an insulating button attached to this same spring arm. The motor and contactor coil are connected together so that as soon as the clutch is operated, the motor also is energized. The armature carries the two moving contacts, which, as well as the stationary contacts, are silver, and will carry 12 amperes continuously and 20 amperes for 1 minute. The contacts will interrupt a non-inductive a-c. circuit carrying 20 amperes at 115 V. or 15 amperes at 230 volts.

The trip mechanism is fastened to the front plate of the gear train assembly. While the armature and clutch spring move in when energized, the two moving contacts that the armature carries are prevented from moving by the two Micarta latch arms. This means that the back contact on the left-hand side, and the motor circuit, which is the back contact on the right-hand side, will remain closed until the arms are tripped up and the moving fingers released. This is accomplished by the pins on the two discs pushing down the latch arm levers.

Each disc has an index mark on its edge. These marks are located to coincide with the zero on the scale plate when the trip pins have reached a point where they will just trip the Micarta latch arms and release the contact fingers. To set for a predetermined trip time, first shift gears to the ratio wanted. Then loosen the thumb nut locking the trip discs and rotate them so the index is on the desired scale marking, and tighten the thumb nut. The disc nearest the scale plate will trip the left finger only; the disc that is nearest the front will trip both contact fingers. To set the contact fingers for sequential operation the left finger must trip first, as the motor is in series with the back contacts on the right-hand side. When this finger is tripped, it opens the motor circuit.

In making these settings the trip disc should not be rotated so that the trip pins are holding the Micarta arms part way up. Under this condition, it is possible that when the relay is energized, the moving contacts might bounce under these arms and close the front contacts instantaneously. The minimum setting obtainable without partially raising the latch arm is approximately one division on the 30 second scale.

The tripping discs will reset from the position of maximum travel in much less than one second. When the relay is de-energized, the clutch is released at once, so that in re-setting the trip mechanism does not have to operate through the gear train.

On relays rated at 230 volts, 60 cycles, or higher the contactor coil has a tap brought out at the proper place to act as an auto-transformer to supply 115 volts for the motor.

One type TK relay is provided with a sealing in contact, which closes the moment the relay is energized. When connected according to the wiring diagram, this contact energizes the relay, and keeps it energized, by the momentary closure of an external contact or switch (such as a push button). The relay can be deenergized then only by interrupting the supply circuit by means of some other contact or switch.

MAINTENANCE AND RENEWAL

Due to the close tolerances held in manufacture, no attempt should be made to repair the motor in case of damage. It should be returned to the factory for repair or a complete new motor ordered as a replacement.

The silver contacts are large enough to permit dressing with a fine file if they should become pitted due to breaking heavy currents. Any other part that may be damaged can be replaced by advising the factory of the Style No. of the relay and giving a description of the part. However, if very extensive repairs are required, it is most satisfactory to return the complete relay to the factory unless the customer is well equipped for repair work of this nature and carries a stock of renewal parts on hand.

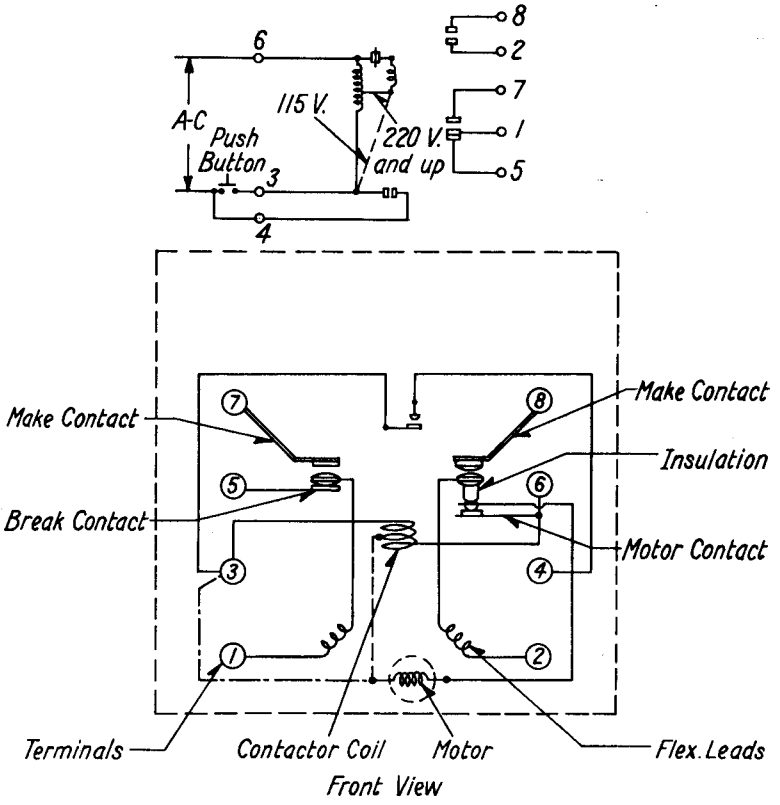

Fig. 1 - Westinghouse Type TK Timing Relay A-C. With Sealing Contact - Wiring Diagram

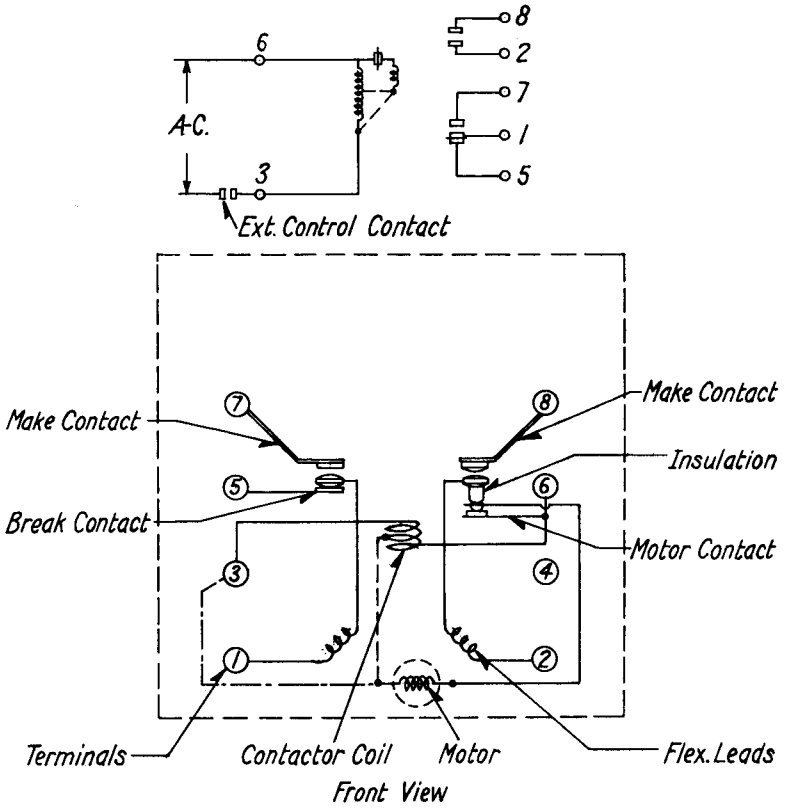

Fig. 2 - Westinghouse Type TK Timing Relay A-C. With Ext. Control Switch - Wiring Diagram

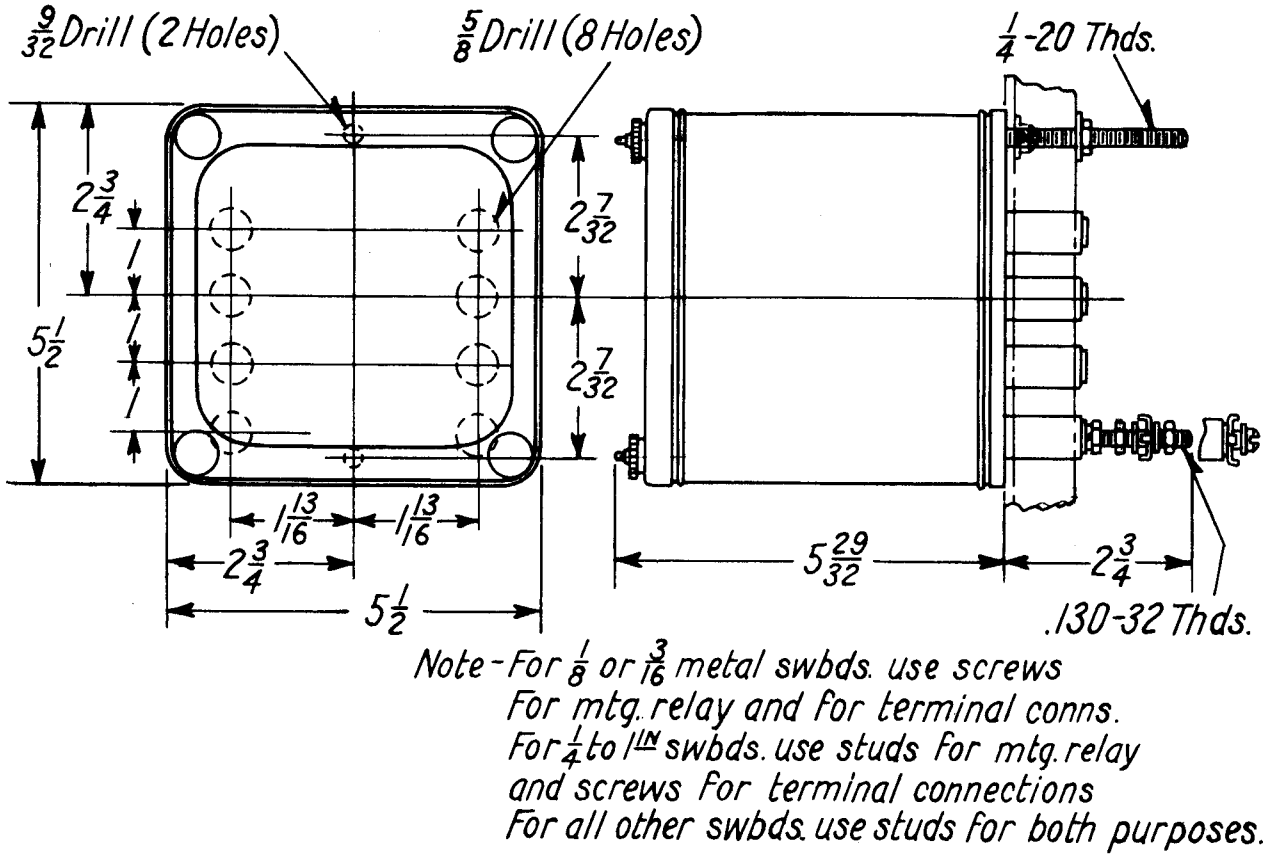

Fig. 3 - Westinghouse Type TK Timing Relay - Outline and Drilling Plan

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