INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE CAM

PERCENTAGE DIFFERENTIAL RELAY

CAUTION Before putting relays into service, remove all blocking which may have been inserted for the purpose of securing the parts during shipment, make sure that all moving parts operate freely, inspect the contacts to see that they are clean and close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The type CAM Relay is a percentage differential relay of the induction type designed for the differential protection of a regulating transformer.

CONSTRUCTION AND OPERATION

The type CAM Relay has two electromagnets in the relay acting upon a common disc as shown in Figure 1. The rear electromagnet is the operating electromagnet, which tends to rotate the disc clockwise as viewed from the top and thus close the contacts. The front electromagnet furnishes restraint, tending to prevent the contacts from closing. Both electromagnets are energized from small transformers, T_O and T_R. These are saturating transformers so designed as to control the time curve as well as the percentage characteristic. Part of the magnetic circuit of the right-hand transformer, T_R, has an air gap in order to properly proportion the restraint circuit with respect to the operating circuit.

The relay element is provided with a time lever in order that the time of operation may be varied as required to provide satisfactory operation on magnetizing inrush. Two damping magnets are provided, one on either side of the disc, to slow the operation of the relay disc.

The operation indicator is a small solenoid coil connected in the trip circuit. When the coil is energized, a spring-restrained armature releases the white target which falls by gravity to indicate completion of the trip circuit. The indicator is reset from outside of the case by a push rod in the cover or cover stud.

The d-c. contactor switch in the relay is a small solenoid type switch. A cylindrical plunger with a silver disc mounted on its lower end moves in the core of the solenoid. As the plunger travels upward, the disc bridges three silver stationary contacts. The coil is in series with the main contacts of the relay and with the trip coil of the breaker. When the relay contacts close, the coil becomes energized and closes the switch contacts. This shunts the main relay contacts, thereby relieving them of the duty of carrying tripping current. The contacts remain closed until the trip circuit is opened by the auxiliary switch on the breaker.

CHARACTERISTICS

The typical operating characteristics of the relay are shown by Figures 3 and 4. As shown by Figure 3, the relay operates at a minimum of one ampere in the operating circuit when no current is flowing in the restraint circuit. At 5 amperes restraint, the operating current required is 5.75 amperes, representing a 15% unbalance. At higher restraint current values, the relay characteristic has a slight "flare" as indicated by the curve.

The time curve of the relay at the No. 5 time lever setting with no restraint current is shown by Figure 4. The time of operation is approximately proportional to the time lever setting.

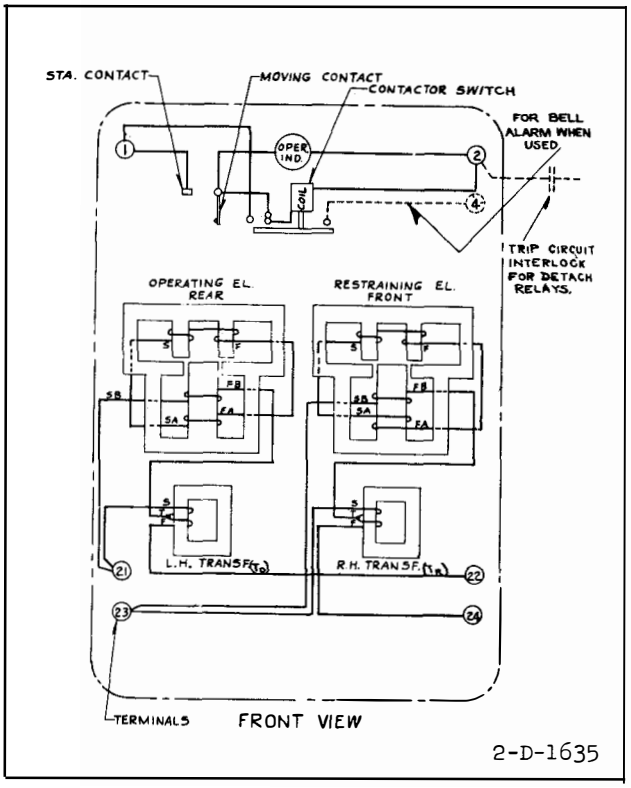

Fig. 1—Internal Schematic of the Type CAM Relay in the Standard Case.

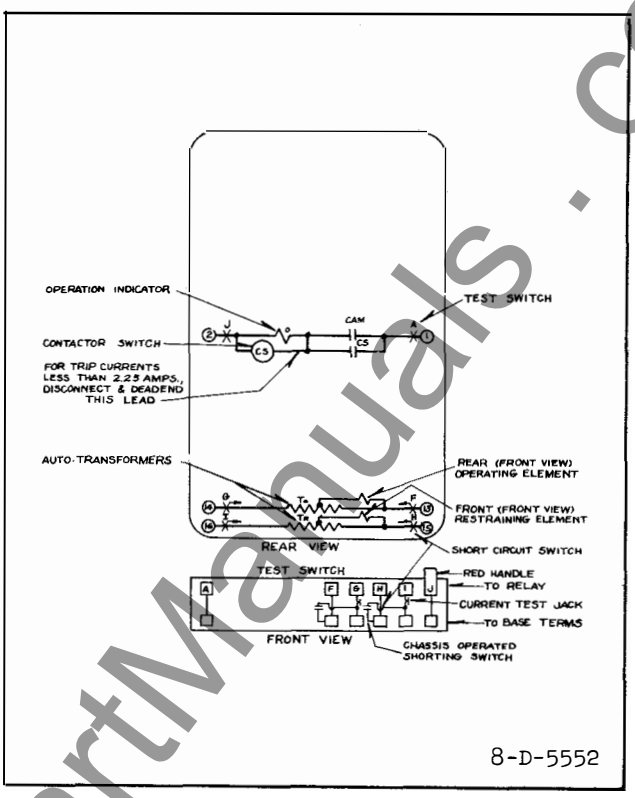

Fig. 2—Internal Schematic of the Type CAM Relay in the Type FT Case.

INSTALLATION

The relays should be mounted on switchboard panels or their equivalent in a location free from dirt, moisture, excessive vibration and heat. Mount the relay vertically by means of the two mounting studs for the standard cases and the type FT projection case or by means of the four mounting holes on the flange for the semi-flush type FT case. Either of the studs or the mounting screws may be utilized for grounding the relay. The electrical connections may be made direct to the terminals by means of screws for steel panel mounting or to terminal studs furnished with the relay for ebony-asbestos or slate panel mounting. The terminal studs may be easily removed or inserted by locking two nuts on the studs and then turning the proper nut with a wrench.

ADJUSTMENTS AND MAINTENANCE

The proper adjustments to insure correct operation of this relay have been made at the factory and should not be disturbed after receipt by the customer. If the adjustments have been changed, the relay taken apart for repairs, or if it is desired to check the adjustments at regular maintenance periods, the instructions below should be followed.

All contacts should be cleaned periodically. A contact burnisher S#182A836H01 is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended, because of the danger of embedding small particles in the face of the soft silver and thus impairing the contact.

A diagram of test connections is given in Figure 6. This may be used for checking the minimum operating current as well as other points on the operating curve. The only adjustment which can be made is that for spring tension to control the minimum tripping point. The adjustment for other points on the curve has been made at the factory by varying the amount and type of punchings in the two small transformers, and should not be disturbed. In

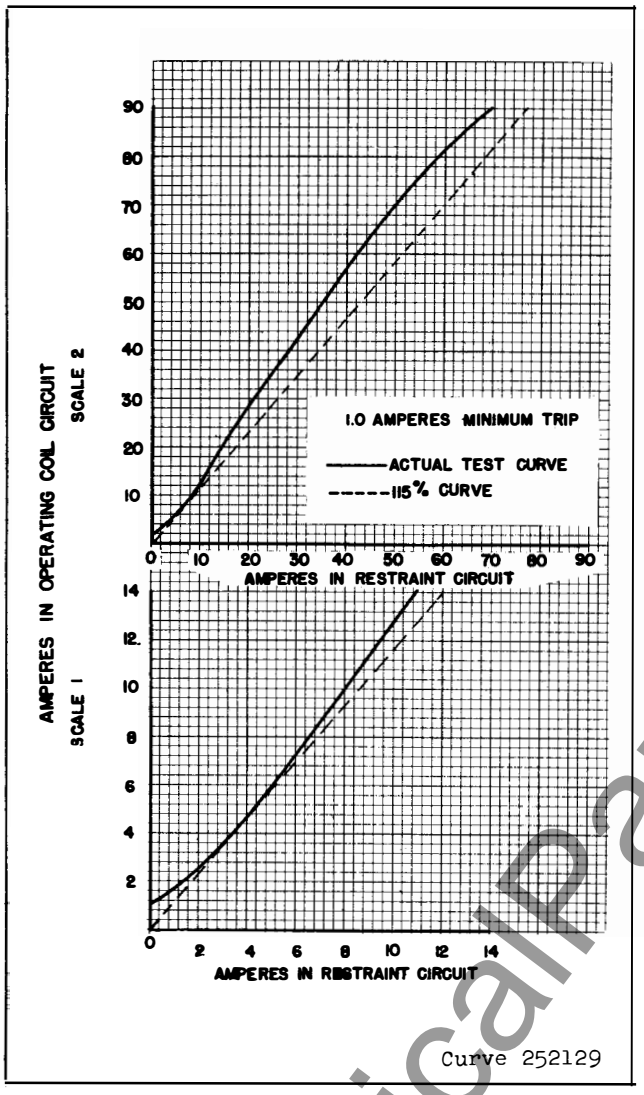

Fig. 3—Typical Operating Curves of the Type CAM Relay.

checking the minimum tripping point, see that the moving contact resets the full 180° to the No. 10 time lever position when the relay is totally deenergized. If it does not, look for foreign particles in the air gaps of the electromagnets and permanent magnets, or other sources of friction.

Contactor Switch

Adjust the stationary core of the switch for a clearance between the stationary core and the moving core of 1/64" when the switch is picked up. This can be done by turning the relay up-side-down or by disconnecting the switch and turning it up-side-down. Then screw up the core screw until the moving core starts rotating. Now, back off the core screw until the moving core stops rotating. This indicates the points where the play in the assembly is taken up, and where the moving core just separates from the stationary core screw. Back off the core screw approximately one turn and lock in place. This prevents the moving core from striking and sticking to the stationary core because of residual magnetism. Adjust the contact clearance for 3/32" by means of the two small nuts on either side of the Micarta disc. The switch should pick up at 2 amperes d-c. Test for sticking after 30 amperes have been passed through the coil.

Operation Indicator

Adjust the indicator to operate at 0.25 ampere d-c gradually applied by loosening the two screws on the underside of the assembly, and moving the bracket forward or backward. If the two helical springs which reset the armature are replaced by new springs, they should be weakened slightly by stretching to obtain the 0.25 ampere calibration. The coil resistance is approximately 2.8 ohms.

ENERGY REQUIREMENTS

The burden of the relay is variable depending upon the amount of current flowing, and is best shown by Figure 5.

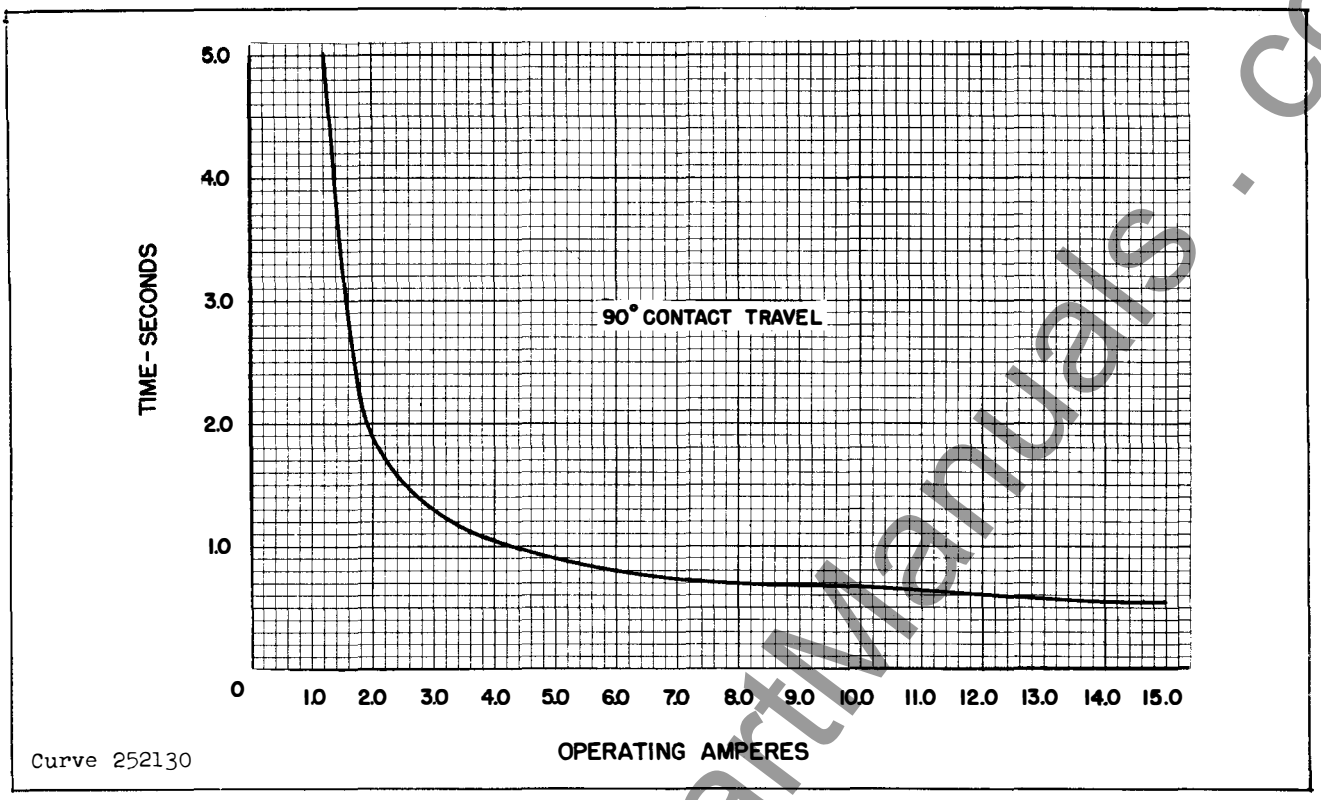

Fig. 4—Typical Time Curve of the Type CAM Relay.

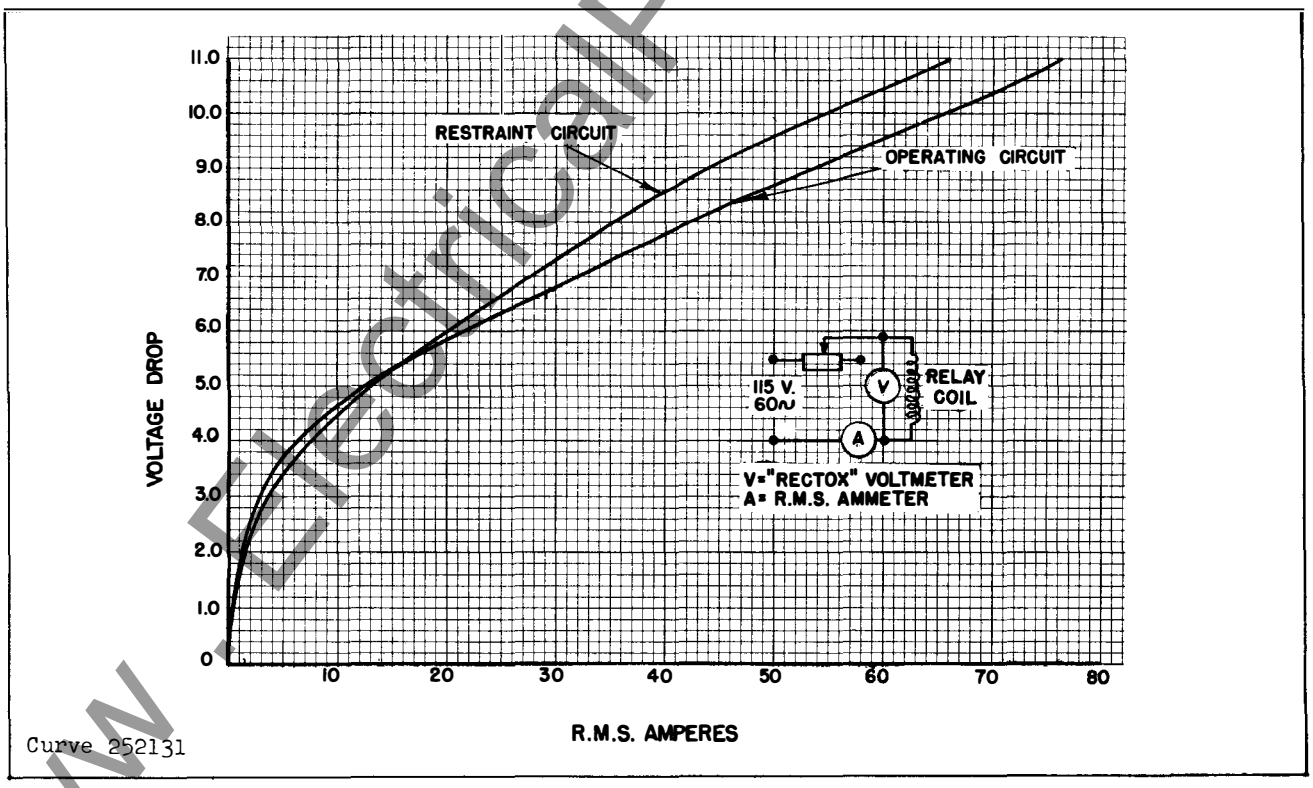

Fig. 5—Typical Burden Curve of the Type CAM Relay.

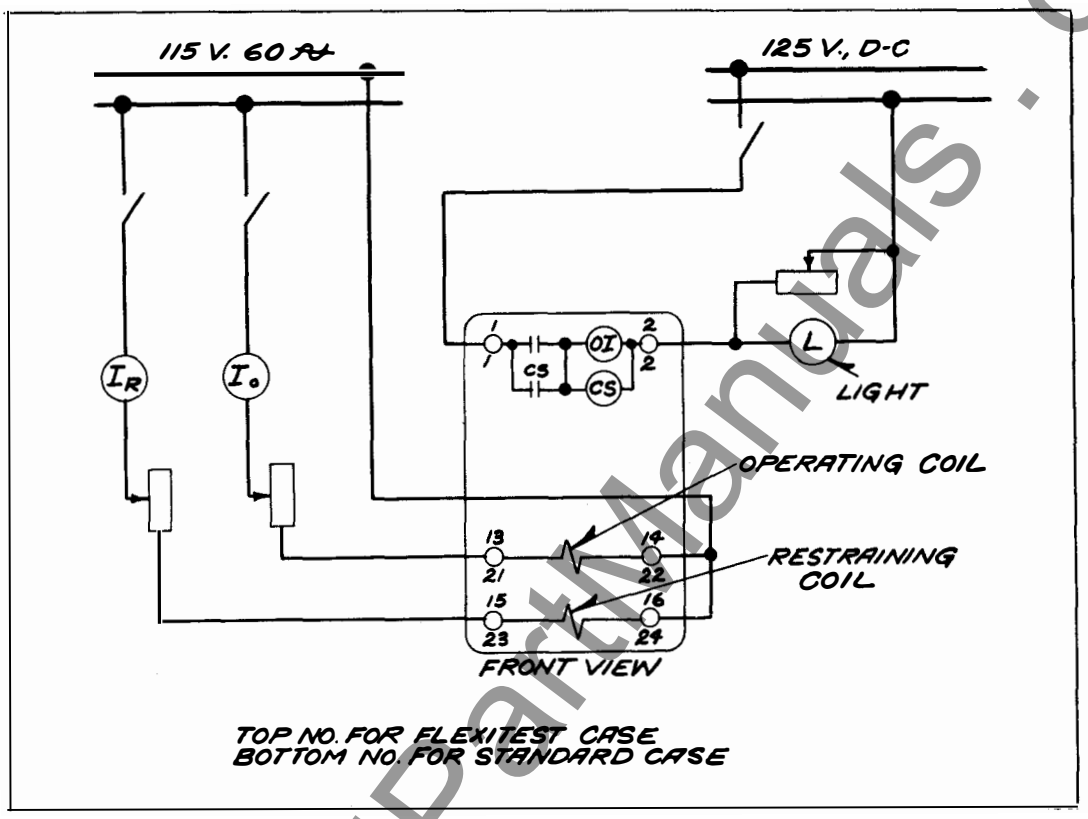

Fig. 6—Diagram of Test Connections of the type CAM Relay.

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