ABB Power T&D Company Inc.
Relay Division
Coral Springs, FL 33065

Instruction Leaflet
I.L. 41-771G

Type ITH Relay

Effective October 1977
Supersedes I.L. 41-771F dated May 1975

* Denotes change since previous issue

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

ITH relays may be utilized as overcurrent fault detectors or as instantaneous overcurrent trip units. They are particularly suitable as fault detectors because of their 90% dropout ratio and because of their compact size. It is recommended that these units be used in fault detector applications only where the the contacts are called upon to carry only trip coil current rather than auxiliary relay or timer current. For example, a zone 1 relay may be supervised by an ITH relay, but a zone 2 relay driving a TD-5 should not (unless the TD-5 is equipped with a TX slow dropout feature to override contact bounce). Their size also makes them desirable for use in supplementing existing time-overcurrent relays or to provide a second set of instantaneous trip units.

CONTENT

The relays consist of one, three or four high drop-out instantaneous units with an equal number of operation indicators and one contactor switch. In the single unit relay the d-c indicating contactor switch is used in place of an operation indicator and contactor switch.

CONSTRUCTION

The construction of the individual units is as follows:

The High Drop-Out Instantaneous Trip Unit (ITH)

The high drop-out instantaneous trip unit is a small solenoid type device (Fig. 1). A plunger assembly (Fig. 2) rides up and down on a vertical guide rod in the center of the solenoid coil. The plunger assembly consists of a bushing which is threaded on the moving plunger and locked in place by a nut, and a silver disc which rests on a helical compression spring at the lower end of the plunger. The guide rod is fastened to the stationary core which in turn is held in place by the insulating plate on which the stationary contacts are mounted. The stationary core consists of two steel sections separated by a non-magnetic ring. This non-magnetic ring provides an air gap in which the plunger steel floats. When the coil is energized, the plunger assembly moves upward carrying the silver disc which bridges three spring type conical-shaped stationary contacts. In this position the helical spring is compressed and the plunger is free to move while the contact disc remains stationary. Thus, ac vibrations of the plunger assembly are prevented from causing contact chattering. A Micarta disc which acts as a shield for the contact plate, screws on the bottom of the guide rod and is locked in position by a small nut. The adjustable core screw in the top of the frame provides the principal means for adjusting the current operating values.

Contactor Switch

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

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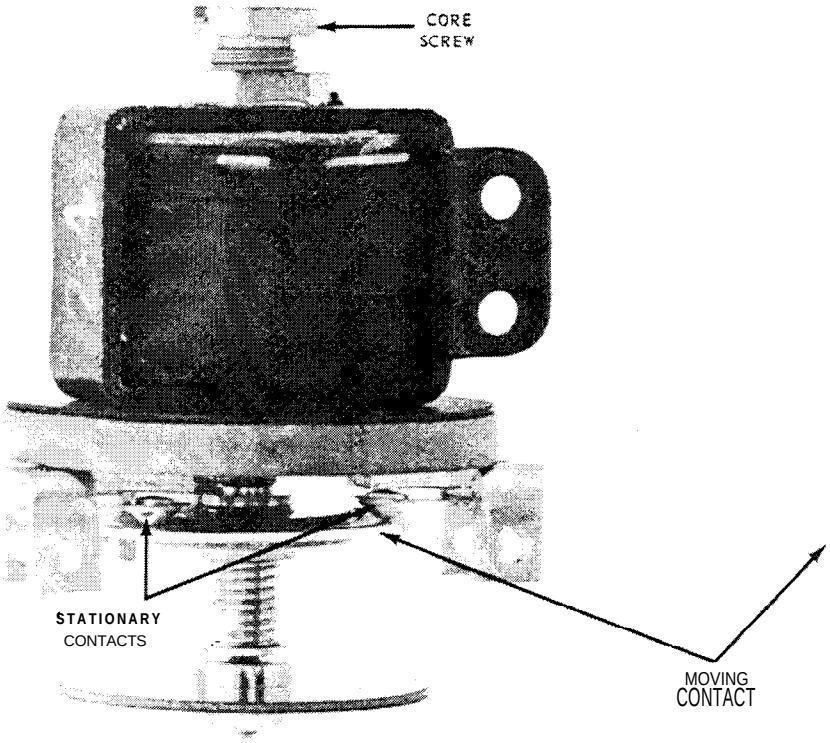
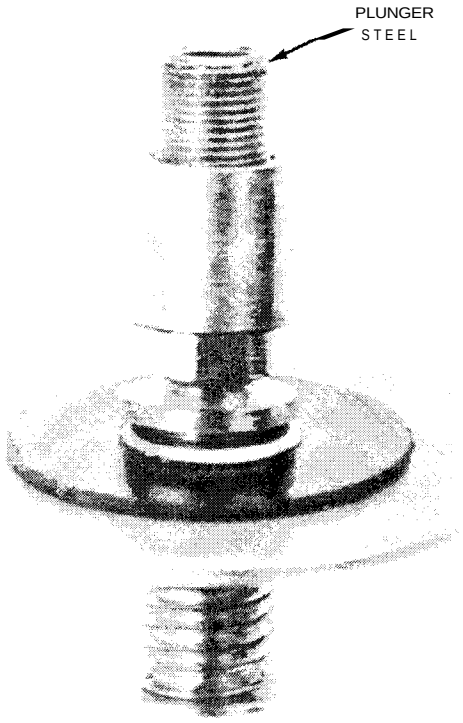


O Fig. 1 High Drop-Out *.Instananeous Trip Unit* **(ITH)**



O Fig. 2. Plunger Assembly for ITH Unit.

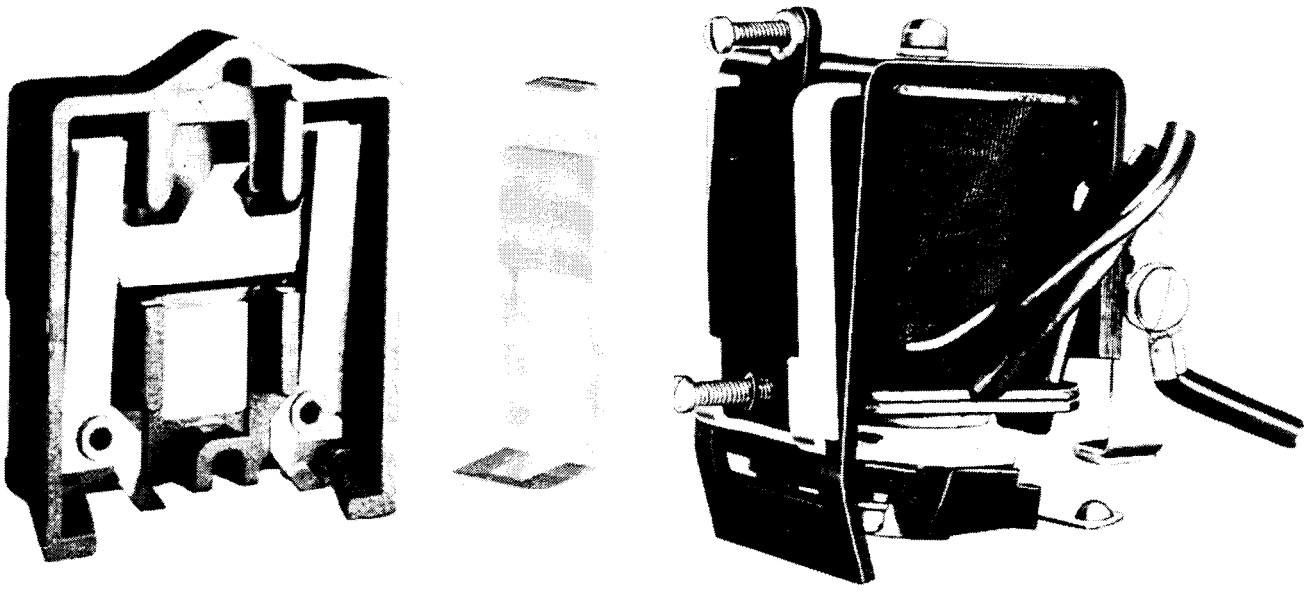


Fig. 3. *Indicating Contoctor Switch (ICS)*

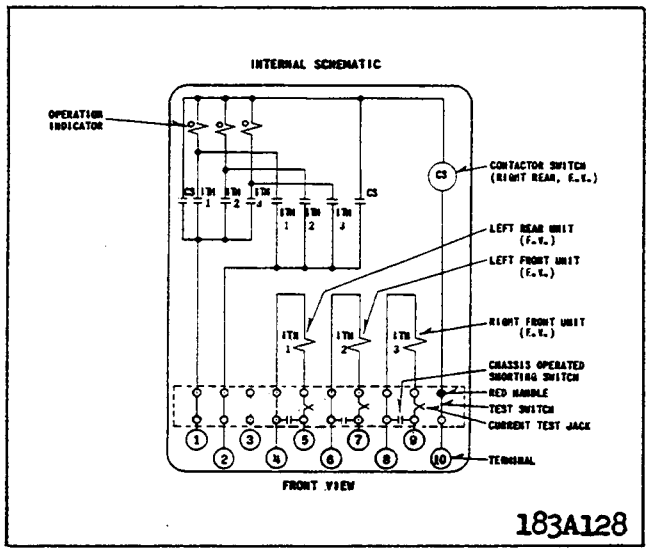


Fig. 4. Internal Schematic of the Three Unit Type ITH Instantaneous Overcurrent Relay.

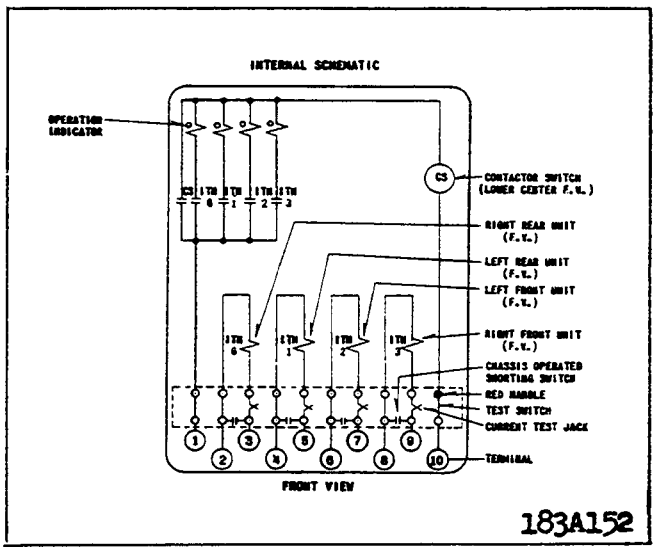


Fig. 5. Internal Schematic of the Four Unit Type ITH Instantaneous Overcurrent Relay.

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. These contacts remain closed until the trip circuit is opened by the auxiliary switch on the breaker.

Operation Indicator

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 may be reset from outside of the case.

Indicating Contactor Switch Unit (ICS)

The d-c indicating contactor switch (Fig. 3) is a small clapper type device. A magnetic armature, to which leaf-spring mounted contacts are attached, is attracted to the magnetic core upon energization of the switch. When the switch closes the moving contacts bridge two stationary contacts, completing the trip circuit. Also during this operation two fingers on the armature deflect a spring located on the front of the switch, which allows the operation indicator target to drop.

The front spring, in addition to holding the target, provides restraint for the armature and thus controls the pickup value of the switch.

OPERATION

The ITH unit is a current operated device which will pick-up within the range stamped on the side of the frame and drop-out at 90% of the pick-up current value. The position of the core screw determines the pick-up value for a particular contact gap. The 90% drop-out ratio is accomplished through the right combination of plunger steel setting, electrical pull and spring strength. The most important factor in the adjustment of the unit is the correct positioning of the plunger steel with respect to the stationary core air gap.

CHARACTERISTICS

ITH Unit

The ranges available for the instantaneous units are 0.25 - 0.5, 0.5-1.0, 1-2, 2-4, 4-8, 6-12, 8-16, and 16-32 amperes.

The unit has a nominal 2 to 1 range of pick-up adjustment with a 90% or greater drop-out ratio. The core screw at the top of the unit is used to change the setting. The maximum core screw setting is ten turns out from the fully bottomed position. At the maximum end of the range it may be necessary to increase the contact gap to obtain the desired pickup. As long as the setting of the unit is within its nominal rating the drop-out ratio will be 90% or greater.

The nominal range may be extended by increasing the contact gap with the core screw at its maximum position. The drop-out ratio for settings above the nominal range will be below 90%. For example, for a pick-up setting of three times the minimum setting, the drop-out ratio will be approximately 60%. Likewise, for a setting of four times the minimum setting, the drop-out ratio will be approximately 45%.

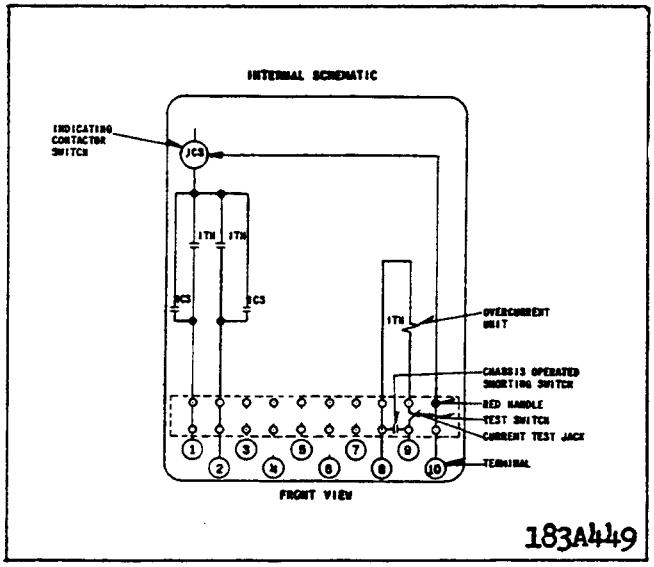


Fig. 6. Internal Schematic of the Single Unit Type ITH Instantaneous Overcurrent Relay.

The burden of this unit at minimum pick-up is 0.44 V.A. at 60 hertz.

Characteristic operating times for the unit over its nominal range are:

Less than 1 cycle at 200% of trip value
1/2 cycle at 500% of trip value
1/4 cycle at 1000% of trip value

Continuous current rating of the coil is 2 times minimum pickup value.

One second rating is approximately 30 times minimum pick-up.

Contactor Switch

The contactor switch is a d-c operated switch with a pick-up of 2.0 amperes.

Operation Indicator

The operation indicator is a d-c operated indicator with a pick-up of 95% of its rated value. The two standard indication ranges are 0.2 and 1.0 ampere.

The indicating contactor switch has two taps that provide a pick-up setting of 0.2 or 2 amperes. To change taps requires connecting the lead located in front of the tap block to the desired setting by means of a screw connection.

CONTACT CIRCUIT CONSTANTS

Resistance of 2.0 ampere Contactor Switch	0.25 ohms
Resistance of 1.0 ampere Target	0.16 ohms
Resistance of 0.2 ampere Target	2.8 ohms
Resistance of 0.2 ampere ICS tap	6.5 ohms
Resistance of 2.0 ampere ICS tap	0.15 ohms

INSTALLATION

The relay 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 rear mounting stud or studs for the type FT projection case or by means of the four mounting holews on the flange for the semi-flush type FT case. Either the stud or the mounting screws may be utilized for grounding the relay. External toothed washers are provided for use in the locations shown on the outline and drilling plan to facilitate making a good electrical connection between the relay case, its mounting screws or studs, and the relay panel. Ground Wires are affixed to the mounting screws or studs as required for poorly grounded or insulating panels. Other electrical connections may be made directly to the terminals by means of screws for steel panel mounting or to the terminal stud furnished with the relay for thick panel mounting. The terminal stud may be easily removed or inserted by locking two nuts on the stud and then turning the proper nut with a wrench.

For detail information on the FT case refer to I.L. 41-076.

SETTINGS AND CALIBRATION

ITH Unit

The unit, prior to shipment is adjusted for minimum pick-up value, that is, the lower value marked on the side of the frame. The following procedure is used when changing this setting over the indicated range where a 90% or higher drop-out ratio is desired. Connect the coil of the unit in series with an ammeter and adjustable load. Apply the desired pick-up current, then adjust the core screw until the plunger just picks up. Lock core screw securely in place.

If it is desired to set the unit for either a different drop-out ratio over the nominal range or for pick-up values above the nominal range, then the following procedure should be followed.

With the desired drop-out current applied, adjust the core screw until the plunger assembly just drops out. Then apply the desired pick-up current and adjust the Micarta contact shield until the plunger just picks up. It is recommended that the contact gap should not be made less than .013 of an inch. The contact gap may be determined by turning up the contact shield from the setting position until the contacts just close.

One turn of the shield is equal to .018 of an inch contact gap.

The factory adjustment of the position of the plunger steel provides a drop-out ratio of 90% over the nominal range, But, in the event a considerable amount of material is removed from the contacts due to repeated operations, burnishing, etc., the drop-out ratio may fall below 90%. If this occurs, the plunger steel should be screwed down to compensate for the change in the contact gap. However, if the plunger steel is changed, the relay must be recalibrated. The following procedure should be used to recalibrate the relay.

Set the core screw at ten turns up from its bottom position. Adjust the plunger steel position on the plunger until the current value at which the plunger drops-out is 90% of the maximum rated current. Then set the contact gap at 3/4 of a turn down, and adjust the core screw for pick-up. Drop-out value will normally be above 90% at this setting. If desired, the contact gap and follow may be increased by lowering the contact shield and readjusting the core screw for pick-up.

For Relays with Series Trip

This combination uses a 2.0 amp. contactor switch and either a 1.0 amp. or a 0.2 amp. operation indicator connected in series. Adjust the contactor switch and operation indicator as outlined below.

Contactor Switch

Turn the relay up-side-down. Screw up the core screw until the contact ring starts rotating. Now back off the core until the contact ring stops rotating. Back off the core screw one more turn and lock in place. Adjust the two nuts at the bottom of the switch so that there is 3/32 inch clearance between the moving contact ring and the stationary contacts in the open position. The guide rod may be used as a scale as it has 52 threads per inch, therefore, 5 turns of the nut will equal approximately 3/32 inch.

Operation Indicator

Close the main relay contacts and pass 95% of rated indicator current d-c through the trip circuit. Adjust the operation indicator by moving the flag holder such that the indicator operates with the application of the 95% current.

Combination Test

Pass 30 times indicator rating through the trip circuit. The contactor switch and indicator must operate with the application of the current and the contactor switch and indicator must not stick in the operated position when the current is interrupted.

Indicating Contactor Switch (ICS)

No setting is required on the ICS unit except the selection of the 0.2 or 2.0 ampere tap setting. This selection is made by connecting the lead located in front of the tap block to the desired setting by means of the connecting screw.

ADJUSTMENT AND MAINTENANCE

ITH Unit

Acceptance – The plunger assembly should pick-up and seal-in within ±5% and dropout at 90% or higher of the minimum pick-up current value stamped on the frame. The unit should maintain at least a 90% drop-out ratio over the nominal range. The contact gap should not be less than .013 of an inch. Contact gap is determined as described under SETTINGS.

Contactor Switch & Operation Indicator

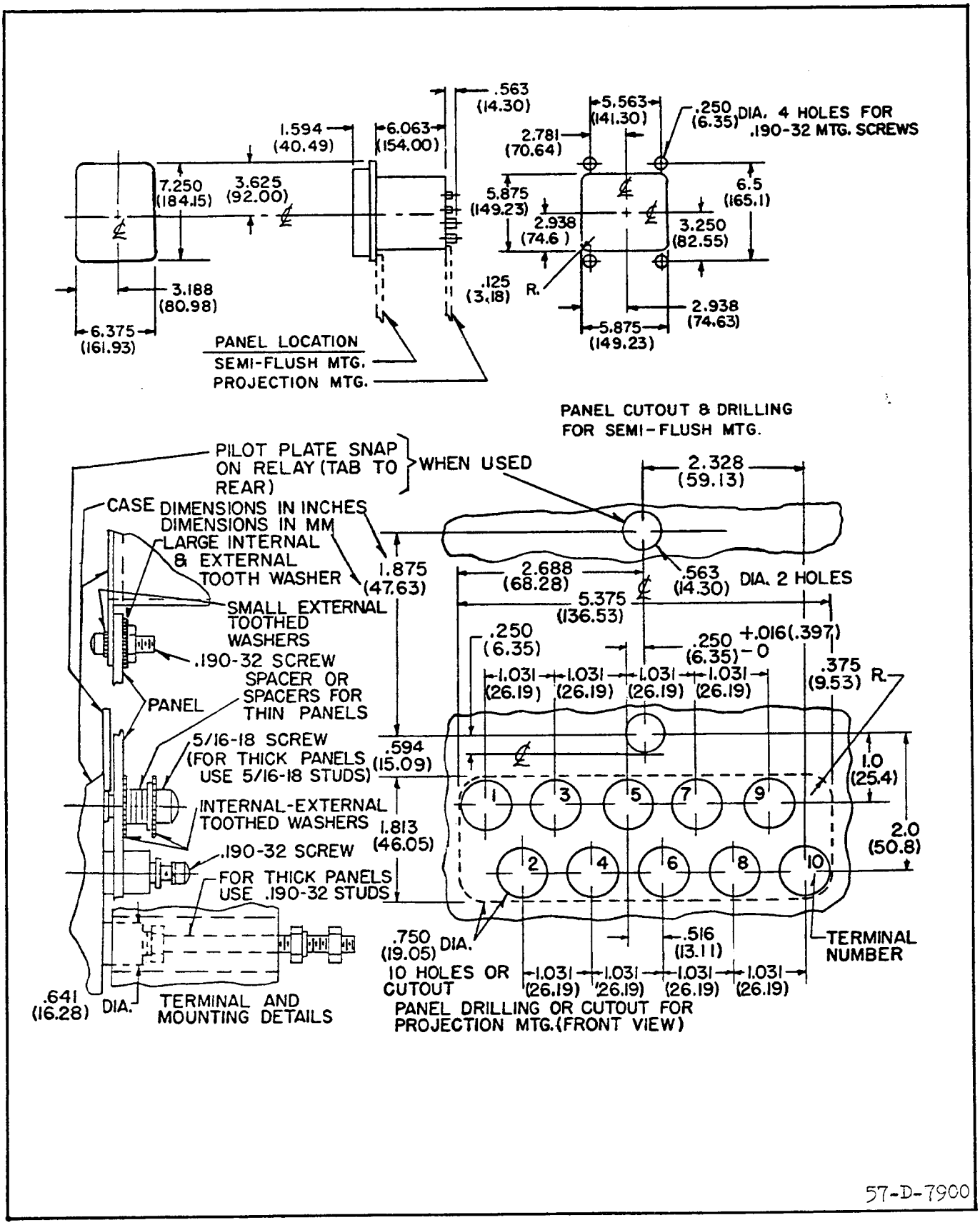
Close the main relay contacts and pass sufficient d-c current through the trip circuit to close the contacts of the contactor switch. This value of current should not be greater than the rating of the contactor switch being used. The operation indicator target should drop freely.

Indicating Contactor Switch (ICS)

Close the main relay contacts and pass sufficient d-c current through the trip circuit to close the contacts of the ICS. This value of current should not be greater than the particular ICS tap setting being used. The operation indicator target should drop freely.

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.

Repair work can be done most satisfactorily at the factory. However, interchangeable parts can be furnished to the customers who are equipped for doing repair work. When ordering parts, always give the complete nameplate data.



✪ *Fig. 7. Outline and Drilling Plan for the Type ITH Relay in the Type FT11 Case.*