Instruction Leaflet
41-241.4D

Type CWD Three Phase Watt Sensing Relay

Effective: September 1993
Supersedes I.L. 41-241.4C, Dated May 1991

(I) 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.

1.0 APPLICATION

These relays are used to initiate switching or control operations when the line watts in a particular direction rise above a preset value, or fall below a preset value. Thus the relay is a watt sensing device with high and low watt settings.

The CWD relay for the three-phase application uses phase-to-phase voltage and line current, with maximum torque occurring when the relay current leads the relay voltage by 30° at system unity power factor. The relay operates on single phase watts multiplied by $\sqrt{3}$. One CWD relay is required for balanced three phase system and three relays are required for unbalanced conditions.

2.0 CONSTRUCTION

The relay consists of an induction disc type watt sensing unit containing a phase shifter.

2.1 Product Type Unit

The electromagnet for the main element may have a tapped current coil located on the center leg of an "E" type laminated structure and two potential coils on the outer legs. Operating torque is obtained by energizing the current coil with line current and the two outer coils with line potential from the line potential transformers. Out of phase air gap fluxes necessary for operating torques are produced by a phase shifting network in conjunction with the potential coils. Maximum torque occurs when the current leads the voltage by 30 degrees. The voltage is independent of the direction of power flow. This provides a reference so that the disc can rotate in either direction depending upon magnitude of the line current. The combination of voltage and current produces an operating torque proportional to power.

When the watt sensing unit contact closes to the right this indicates that the line watts are at or above the value of watts desired. Conversely when the watt sensing unit contact closes to the left this indicates that the line watt is at or below value of watt desired.

2.2 Phase Shifter

The phase shifter network consist of a resistor in series with the potential coils.

All possible contingencies which may arise during installation, operation or maintenance, and all details and variations of this equipment do not purport to be covered by these instructions. If further information is desired by purchaser regarding this particular installation, operation or maintenance of this equipment, the local ABB representative should be contacted.

TABLE 1

Volts Line to Line	$(I_L V_{LL})$ $\sqrt{3}$ (single phase watts)	
	Range	Taps
120	20 - 120	20- 30- 40- 60- 80- 100- 120
	100 - 600	100- 150- 200- 300- 400- 500- 600
208	35 - 200	35- 50- 70- 100- 140- 175- 200
	175 - 1000	175- 250- 350- 500- 700- 875- 1000
120	10 - 60	None
	20 - 120	None
	50 - 300	None
	100 - 600	None
	150 - 900	None

3.0 CHARACTERISTICS

The type CWD relays are available in the ranges and taps listed in Table 1.

The type CWD watt sensing relay has adjustable high and low wattage contacts that can be set around a 150° arc which is calibrated in watts on non-tapped relays, or in percent of tap value watts on tapped relays. These values represent the tripping position of the moving contacts when the value of watts is applied to the relay. For the tapped relays the percent scale markings are 80, 85, 90, 95, 100, 105 and 110.

The moving contacts will assume a position corresponding to the watts applied to the relay and will stay in that position until the wattage changes. If the wattage changes either gradually or suddenly, the contact will assume a new position corresponding to the change unless the travel is limited by the setting of the adjustable contacts. If the contacts are set to close for a particular value of watts, and if a wattage of that exact amount is applied, then the relay is operating at its minimum trip point and the times on repeated operations are not repetitive within close tolerances. However, wattage appreciably greater than the wattage setting, or appreciably less than the wattage setting, result in relay timing operations which are consistent for repeated trials.

The induction unit has inverse timing; that is, the greater the change in watts, the faster the relay contact will travel.

4.0 SETTINGS

4.1 Product Unit

The CWD relay for three-phase application, senses single-phase watts. The power to operate the relay equals the three phase primary power divided by the quantity $\sqrt{3}$ times the current and potential transformer ratios. Tap value is the volt-ampere value at which the contacts close with relay current leading relay voltage by 30°.

The watt sensing unit settings can be defined either by contact settings or tap setting. The high and low watt contact settings are described under Section 3, “CHARACTERISTICS”.

Relays which are tapped have a connector screw on the terminal plate above the scale which makes connections to various turns on the operating coil. The tap setting is made by placing this screw in the desired tap as marked on the terminal plate.

5.0 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 four mounting holes on the flange for semi-flush mounting or by means of the rear mounting stud or studs for projection mounting. Either a mounting stud or the mounting screws may be utilized for grounding the relay. The electrical connections may be made directly to the terminals by means of screws for steel panel mounting or to the terminal studs furnished with the relay for thick panel mounting. The terminal studs may be easily removed or inserted by locking two nuts on the stud and then turning the proper nut with a wrench.

For detailed FT case information refer to I.L. 41-076.

⚠ CAUTION

Since the tap block screw carries operating current, be sure that the screws are turned tight.

In order to avoid opening current transformer circuits when changing taps under load, RED handles FIRST and open all switchblades. Chassis operating shorting switches on the case will short the secondary of the current transformer.

Taps may then be changed with the relay either inside or outside the case. Then reclose all switchblades making sure the RED handles are closed LAST.

6.0 ADJUSTMENTS AND MAINTENANCE

The proper adjustments to insure correct operation of this relay have been made at the factory. Upon receipt of the relay no customer adjustments, other than those covered under Section 4, "SETTINGS", should be required.

6.1 Acceptance Check

The following check of the **Current Sensing Unit** is recommended to insure that the relay is in proper working order.

a. Contact Adjustment Check

Set the left hand contact in the center of the scale and adjust the wattage until the moving contact just makes. Move the left-hand contact out of the way and bring the right-hand contact up until the contacts just make. The right pointer should be within ±1/32© of where the left-hand pointer was.

b. Calibration Check

Check the scale markings by setting either of the two contacts at a value marked on the scale, then alternately apply this wattage plus 5% and minus 5% for non-tapped relays, and plus and minus 3% for tapped relays. The under wattage contact should make at the lower wattage and break at the higher wattage. For the over wattage contact check, the contact will make for the higher wattage and break at the lower wattage.

6.2 Routine Maintenance

All relays should be inspected periodically and the time of operation should be checked at least once every year or at such other time intervals as may be dictated by experience to be suitable to the particular application. The use of phantom loads, in testing induction-type relays, should be avoided, since the resulting distorted current wave form will produce an error in operation.

All contacts should be periodically cleaned. A contact burnisher #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.

6.3 CALIBRATION

Use the following procedure for calibrating the **Watts Sensing Unit** if the relay has been taken apart for repairs or the adjustments disturbed. This procedure should not be used until it is apparent that the relay is not in proper working order. (See Section 6.1, Acceptance Check).

a. Contacts

Apply sufficient wattage to the relay, to make the disc float in the center of its travel. Move both of the adjustable contacts until they just make with the moving contact. If the two contact pointers do not meet at the same point on the scale (±1/32©), adjust the follow on both adjustable contacts. Approximately the same follow should be in each of the adjustable stationary contacts.

b. Calibration Check

The adjustment of the spring tension in calibrating the relay is most conveniently made with the damping magnet removed.

Set either of the adjustable stationary contacts in the center of its travel and apply this wattage to the relay. Wind up the spiral spring by means of the spring adjuster until the stationary contact and moving contact just make.

Check the other markings by setting the adjustable contact on these markings and applying the corresponding wattage to the relay. The contacts should make within plus or minus 5% of contact setting for non-tapped relays and plus or minus 3% of contact setting for tapped relays.

7.0 RENEWAL PARTS

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.

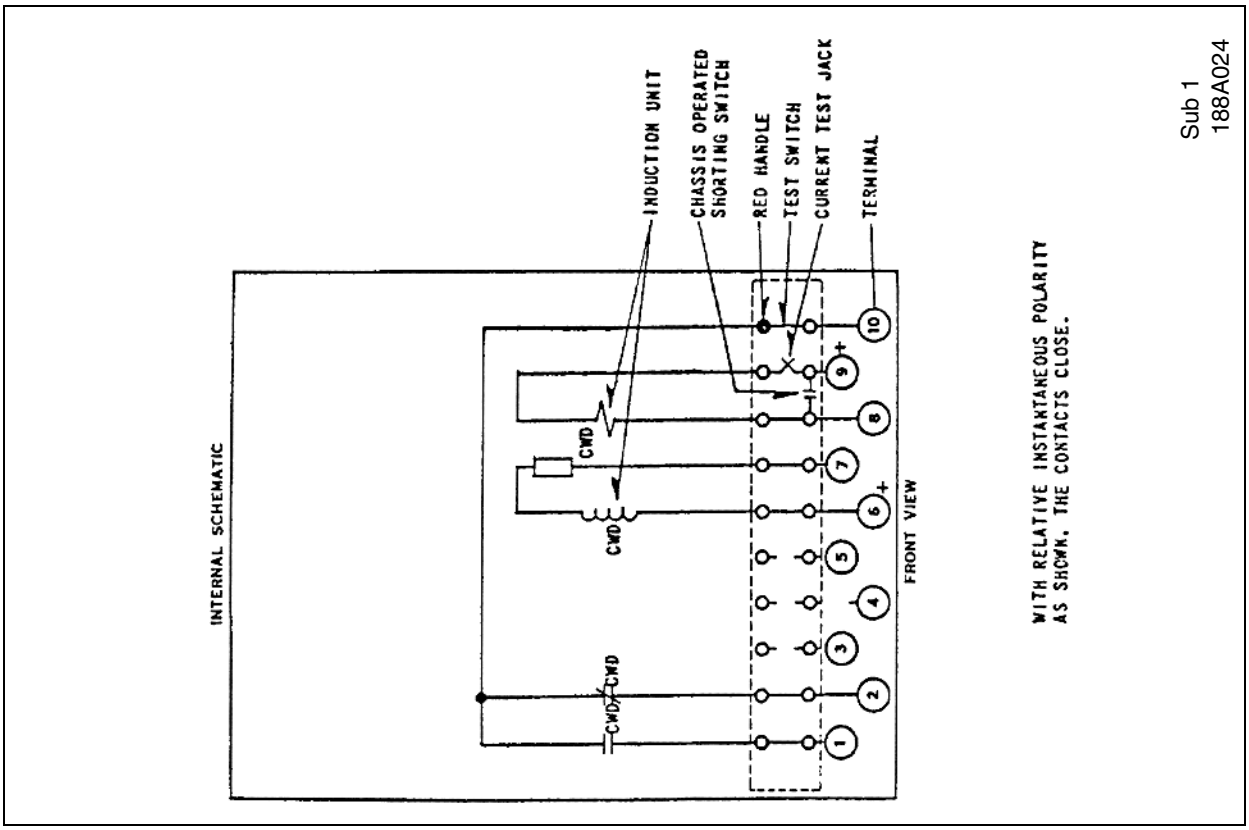

Figure 2. Internal Schematic of the Non-Tapped Type Relay In the Type FT-11 Case

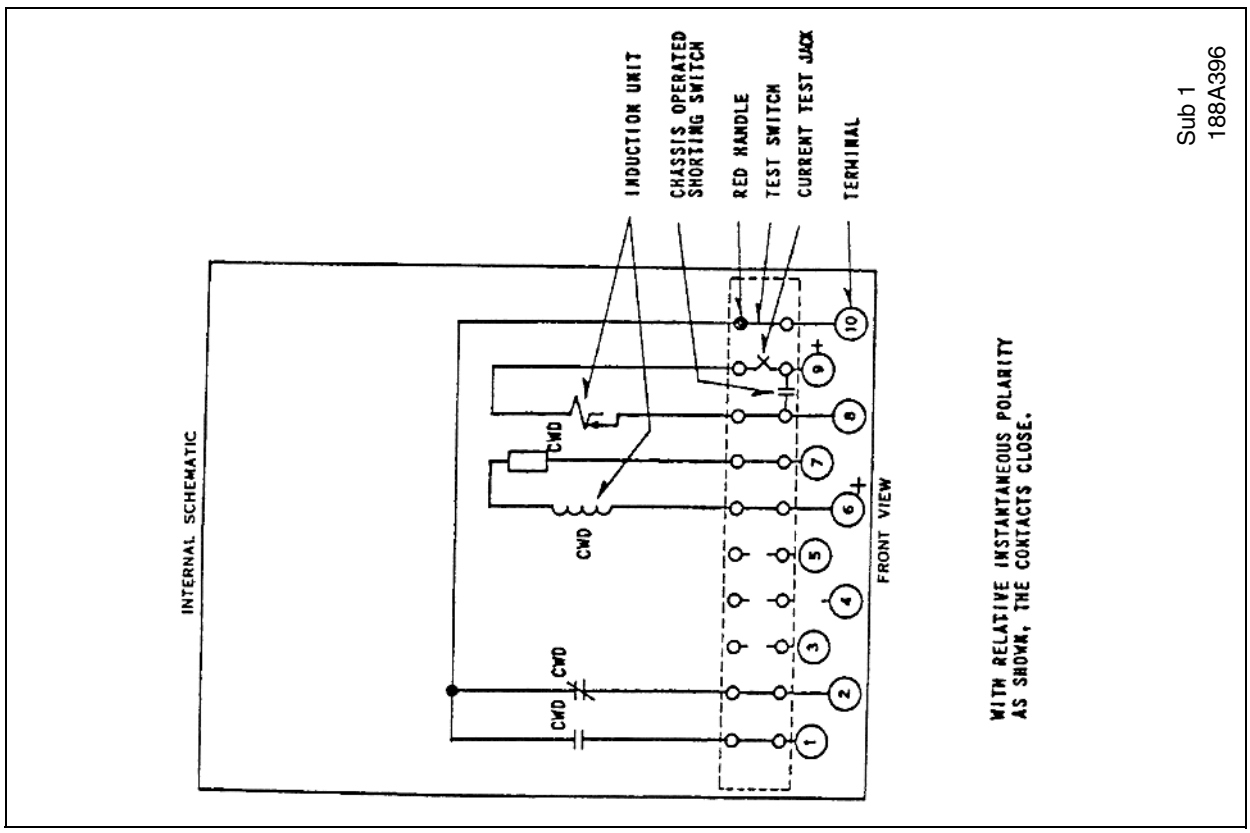

Figure 1. Internal Schematic of the Tapped Type Relay in the Type FT-11 Case

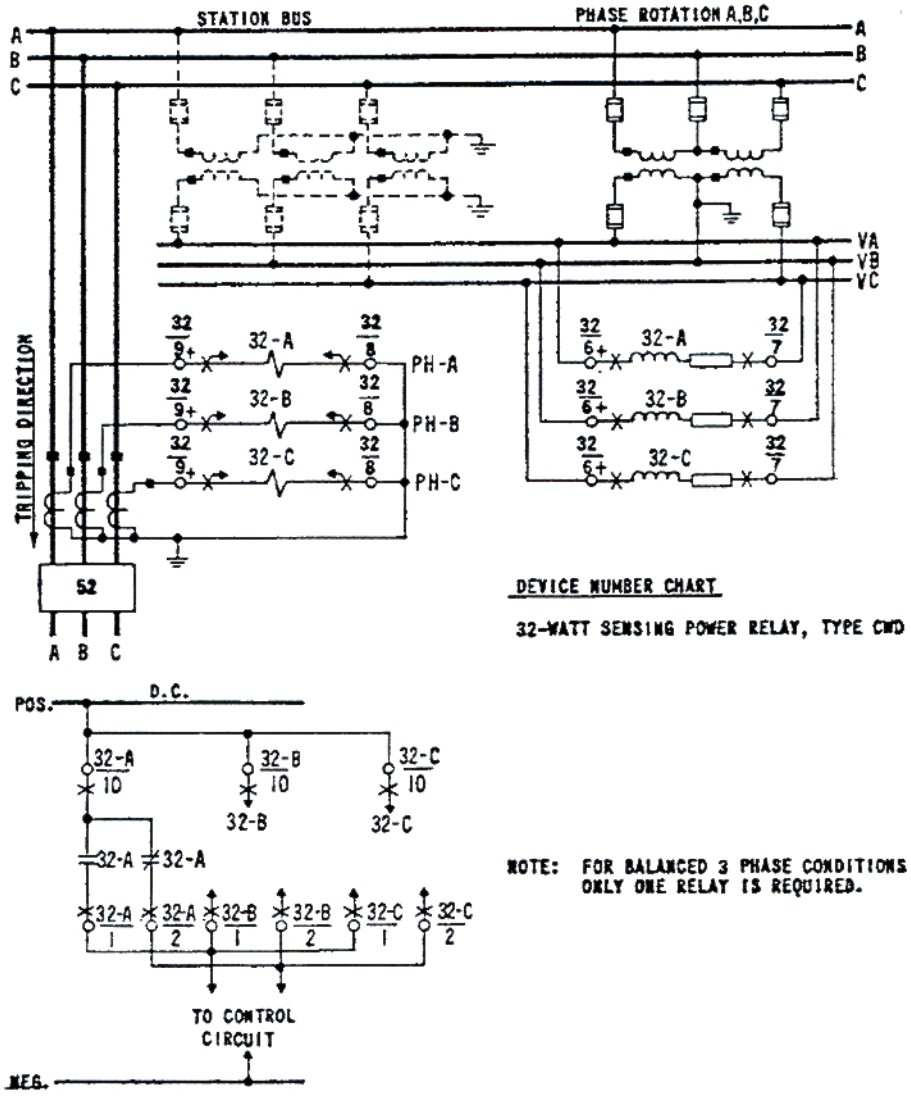

Figure 3. External Schematic of Three Type CWD Relays on a Three-Phase System.
Note: For Balanced Three Phase Conditions only One CWD Relay is required.

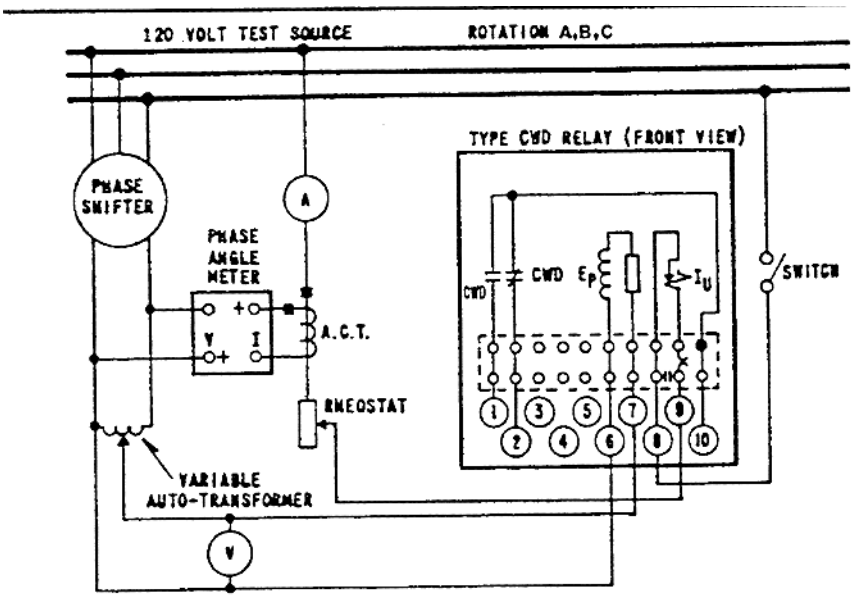

Figure 4. Diagram of Test Connections for CWD Relays.

ENERGY REQUIREMENTS

The 60 Hertz burdens of the type CWD Relay for Three-Phase Applications are as follows:

Relay Range	Potential Circuit			Current Circuits			
Watts	Voltage	Voltamperes	Current lags by	Current	Relay Tap	Voltamperes	Current lags by
10 - 60 20 - 120 50 - 300 100 - 600 150 - 900	120	20.5	68°	5 Amps	None	16.2	78°
35 - 200	208	18.8	59°	5 Amps	35	16.2	78°
100 - 600	120	20.5	68°	5 Amps	100	5.4	67°
175 - 1000	208	18.8	59°	5 Amps	175	5.4	67°

Current Coil Ratings:

	Watt Range	Continuous	1 Sec
A. Non-Tapped	10 - 60 20 - 120	5	110 Amps
	50 - 300 100 - 600 150 - 900	8 Amps	230 Amps
B. Tapped	35 - 200	5 Amps	230 Amps
	100 - 600	8 Amps	370 Amps

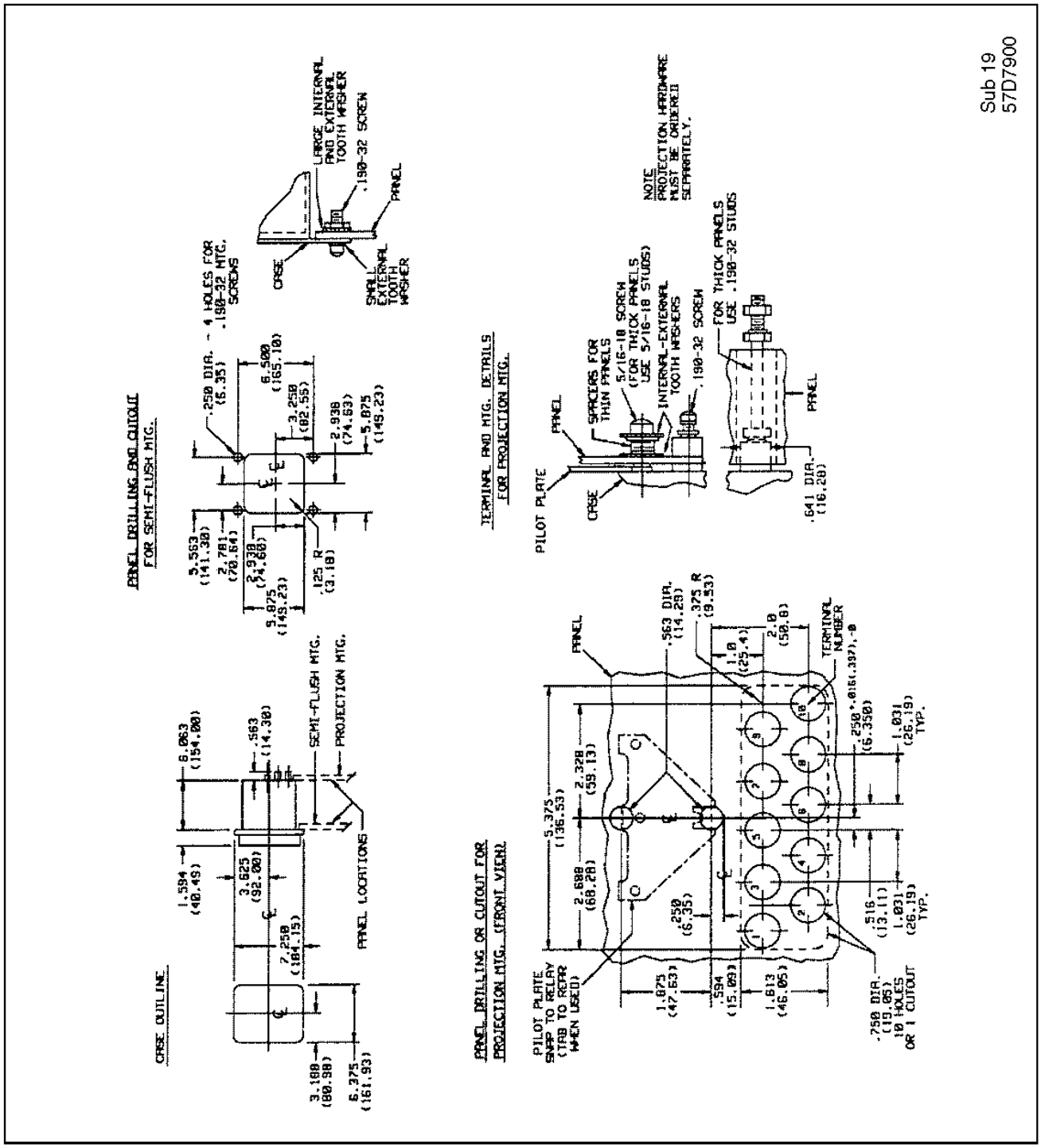

Figure 5. Outline and Drilling Plan for the Type CWD Relay in the Type FT-11 Case

IL 41-241.4 - Revision D

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