



## SPECIAL CO RELAYS

### CO RELAYS WITH 2.5 - 10 AMP RANGE

CO2, 5, 6, 7, 8, 9, 11 relays are available with 2.5 amp to 10 amp range. The taps available are 2.5, 3.0, 3.75, 4.5, 5.5, 6.7, 8.0, 10.0 amps.

Since these relays have eight taps instead of the standard seven taps, a special tap plate and a Nylon mounting screw are used. The nylon screw keeps the tap plate in position while the tap screw is being changed to a new value. The nylon screw can be mounted in any of the eight positions.

The ratings and burden data for the 2.5 to 10 amp relays are given in the following tables.

### COIL RATINGS AND BURDEN DATA

#### Relay Type CO-2

Tap Setting	2.5	3.0	3.75	4.5	5.5	6.7	8.0	10
Continuous Current Amps.	4.0	4.4	4.9	5.4	5.9	6.5	7.1	8.0
* 1 Second Current Amps.	135	135	135	135	135	135	135	135
P.F. Angle at Tap Value	57°	54°	51°	48°	45°	43°	40°	35°
VA Burden at Tap Value	5.3	5.5	5.8	5.9	6.2	7.0	7.5	8.0
VA Burden at 3 x Tap Value	41	45	47	49	53	60	67	78
VA Burden at 10x Tap Value	290	345	350	380	450	520	620	850
VA Burden at 20x Tap Value	1000	1050	1160	1350	1450	1600	1750	1900

#### Relay Type CO-5, CO-6

Tap Setting	2.5	3.0	3.75	4.5	5.5	6.7	8.0	10
Continuous Current Amps.	9.5	10.5	12	13.5	15	16.5	17.5	20
* 1 Second Current Amps.	290	290	290	290	290	290	290	290
P.F. Angle at Tap Value	66°	65.5°	65°	64°	63°	61.5°	59.5°	57°
VA Burden at Tap Value	3.5	3.6	3.75	3.9	3.94	4.1	4.2	4.4
VA Burden at 3 x Tap Value	20.3	20.4	21.4	22.1	23.1	24.8	25.6	28
VA Burden at 10x Tap Value	103	106	110	119	132	152	174	207
VA Burden at 20 x Tap Value	275	292	345	390	493	541	616	791

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.

#### ADJUSTMENT OF CONTACTOR SWITCH

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 rode may be used as a scale as it has 52 threads per inch, therefore, 5 turns of the nuts will equal approximately 3/32 inch.

The contactor switch should operate at rated current , and should not stick closed after upto 15 times rated current has been passed through the contactor switch coil.

The rating of the contactor switch used will be shown on the nameplate as I.C.S. amps. For example if a 2 amp. contactor switch and 0.2/2 amp I.C.S. are used, the Relay Nameplate will be marked I.C.S. 2 Amperes.

#### CONTACTOR SWITCH COIL DATA

<u>Coil Rating</u>	<u>Continuous Current</u>	<u>1 Second Current</u>	<u>Coil Resistance</u>
* 0.2 amp	0.3 amp	4 amp	32 ohms
0.5 amp	0.75 amp	12 amp	4 ohms
1.0 amp	1.5 amp	25 amp	1 ohm
* 2.0 amp	3 amp	50 amp	0.25 ohm

\* One of these two coils is normally used to supplement the standard 0.2 - 2.0 amp I.C.S. unit.

#### RELAY SCHEMATIC DIAGRAMS

	With SPST Contacts	With DPST Contacts
Relay without I. I. T	307-A-351	307-A-352
Relay with I. I. T	307-A-353	307-A-354

INTERNAL SCHEMATICS

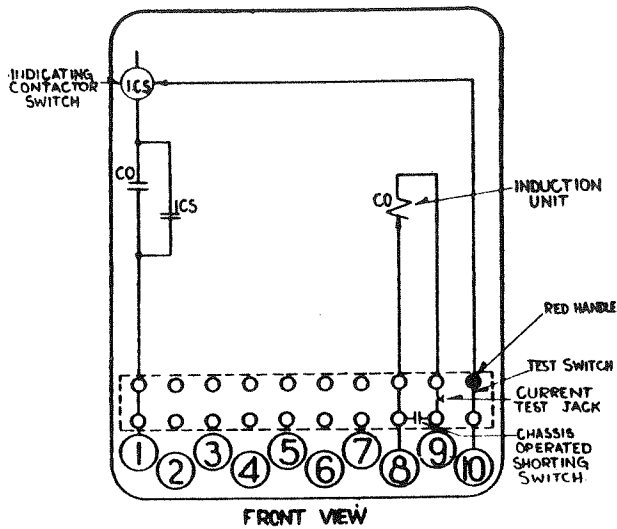


Figure 1 - Type CO - Single Trip in FT-11 Case (Dwg. 57-D-4523)

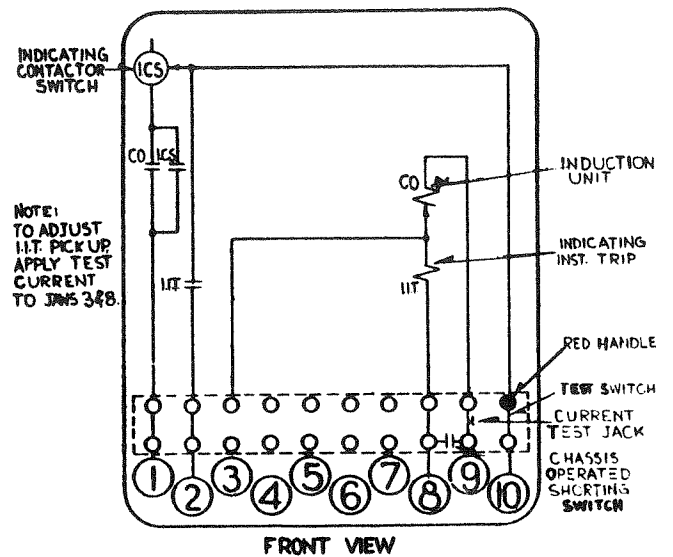


Figure 2 - Type CO - Single Trip with Inst. Trip in FT-11 Case (Dwg. 57-D-4523)

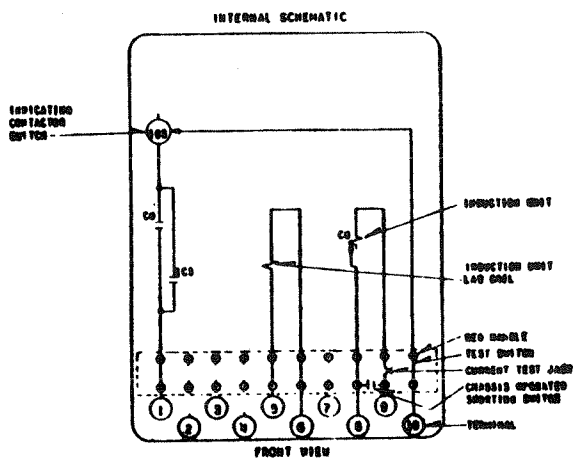


Figure 3 - Type CO Single Trip with External Torque Control in Type FT-11 Case (Dwg. 57-D-4527)

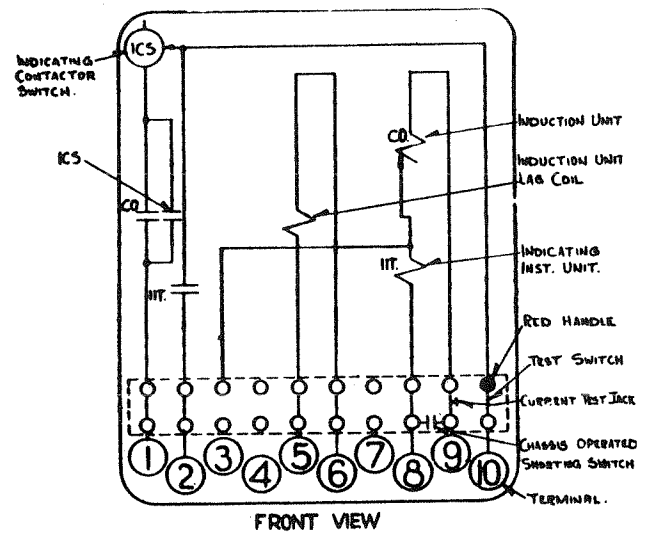


Figure 4 - Type CO - Single Trip Unit and External Torque Control in Type FT-11 Case (Dwg. 57-C-4529)

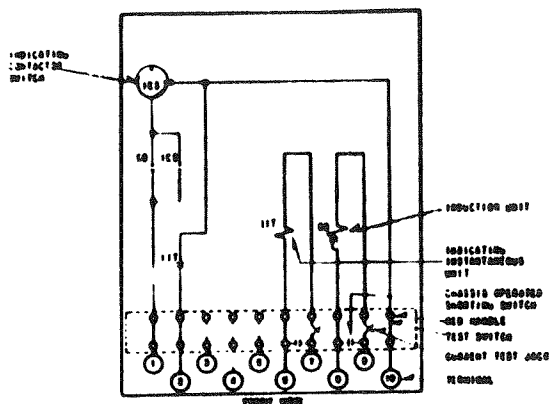
INTERNAL SCHEMATICS

Figure 9 - Type CO - Single Trip with Instantaneous Trip Unit - on Two Separate Terminals in Type FT-11 Case (Dwg. 184-A-014)

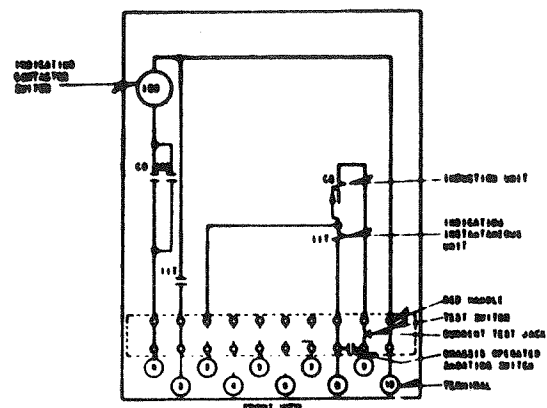


Figure 10 - Type CO - Single Trip with Instantaneous Trip Unit in Type FT-11 Case (Dwg. 183-A-884)

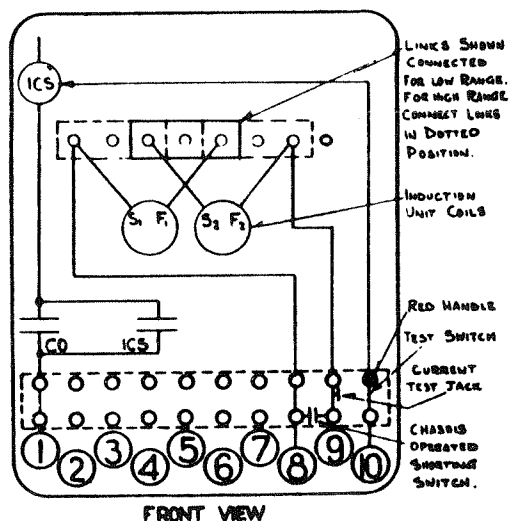


Figure 11 - Type CO - Double Range - In Type FT-11 Case (Dwg. 306-A-807)

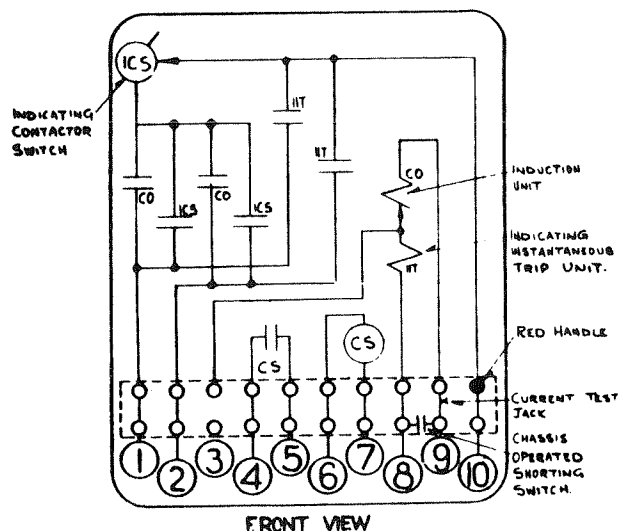


Figure 17 - Type CO - DPST with ICS, I.I.T. and Extra Contactor Switch in Type FT-11 Case (Dwg. 306-A-808)

# INTERNAL SCHEMATICS

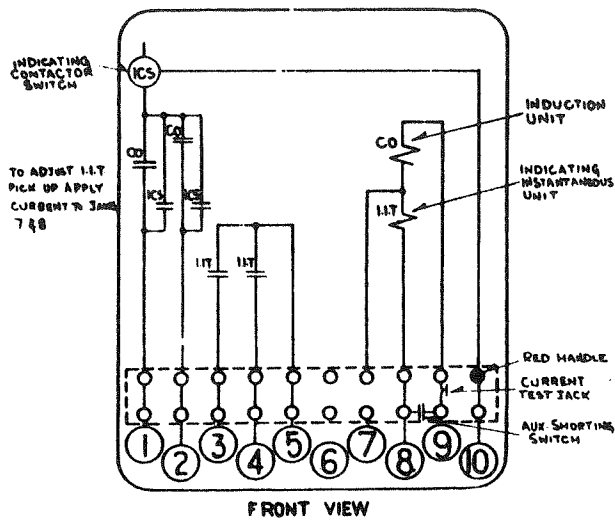


Figure 17 – Type CO Relay DPST With Two Indicating Instantaneous Contacts (Dwg. 307-A-212)

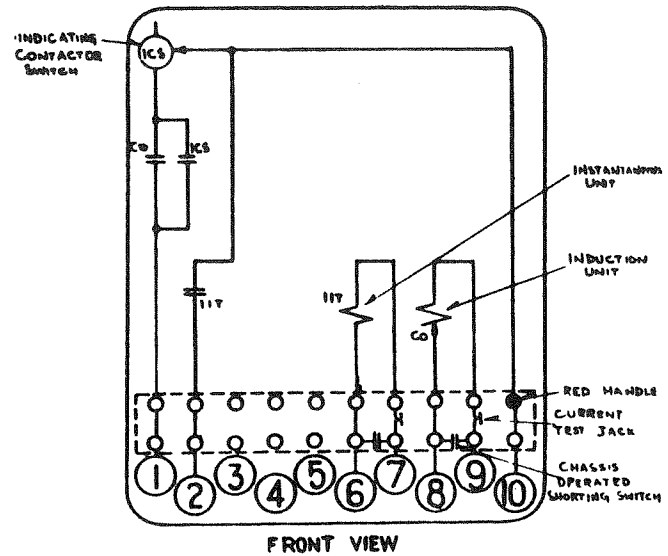


Figure 18 – Type CO Relay SPST With Instantaneous Unit (Dwg. 307-A-213)

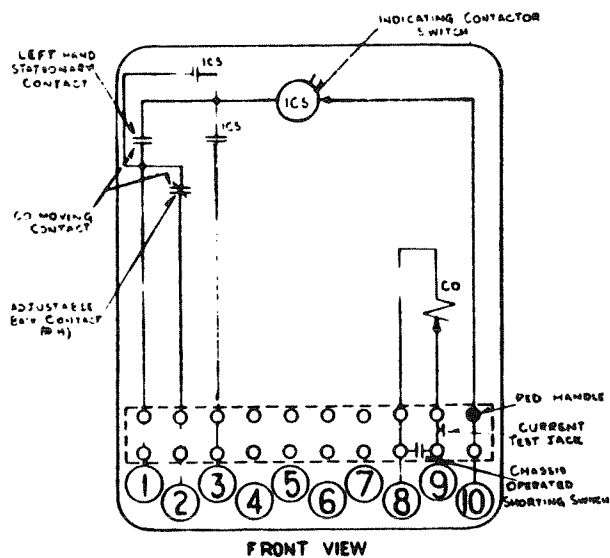


Figure 19 – Type CO Relay with Adjustable Back Contact (Dwg. 307-A-214)

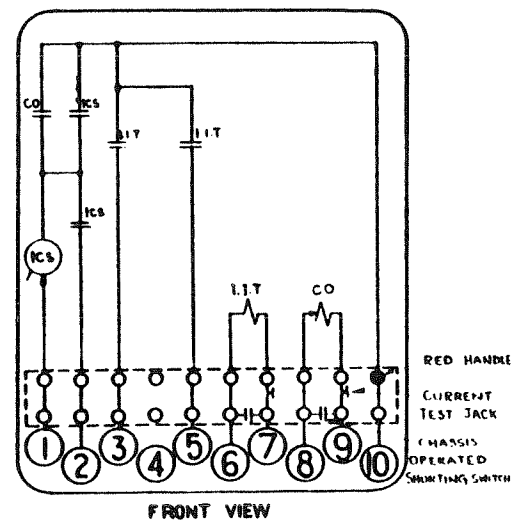


Figure 20 – Type CO Relay with I.I.T. Coil on Separate Terminals (Dwg. 307-A-215)

INTERNAL SCHEMATICS

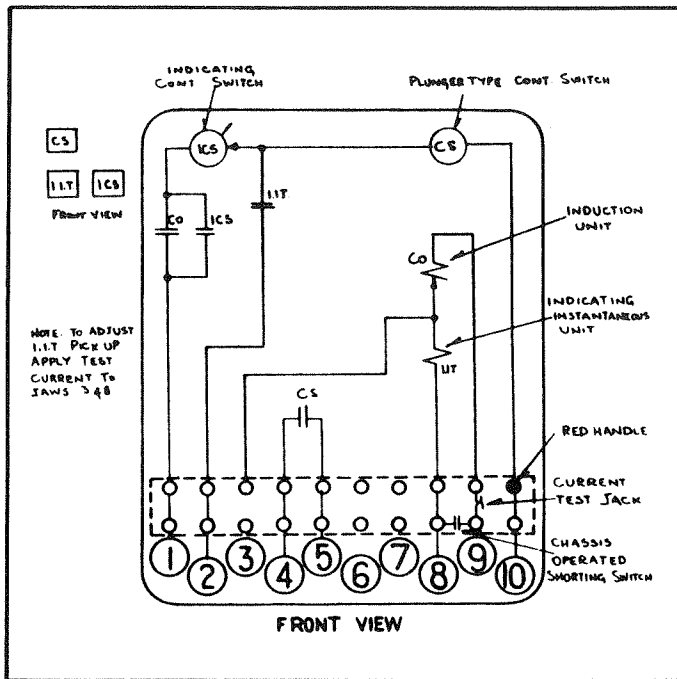


Figure 25 - Type CO - SPST with IIT and Extra CS to Provide Electrically Separated Alarm Contacts in FT-11 Case (Dwg. 307-A-353)

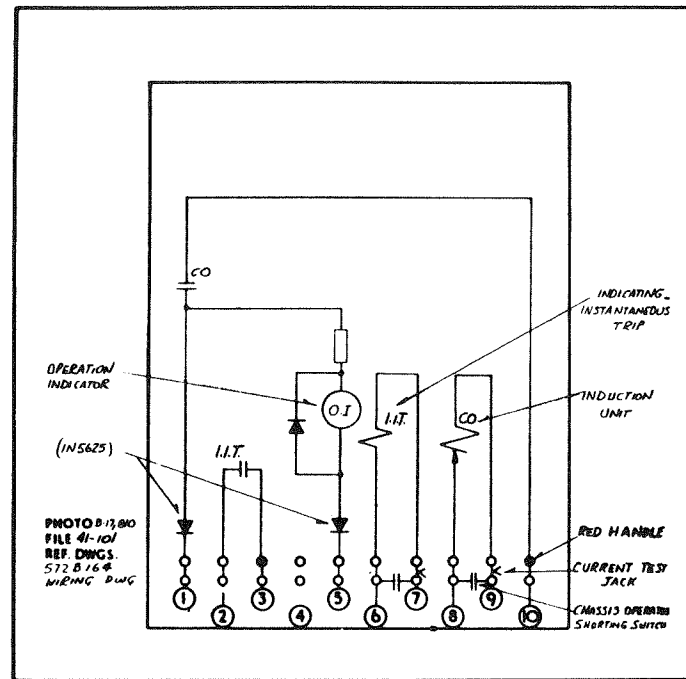


Figure 26 - CO Relay with Voltage Operated Operation Indicator (Dwg. 3064-A-67)

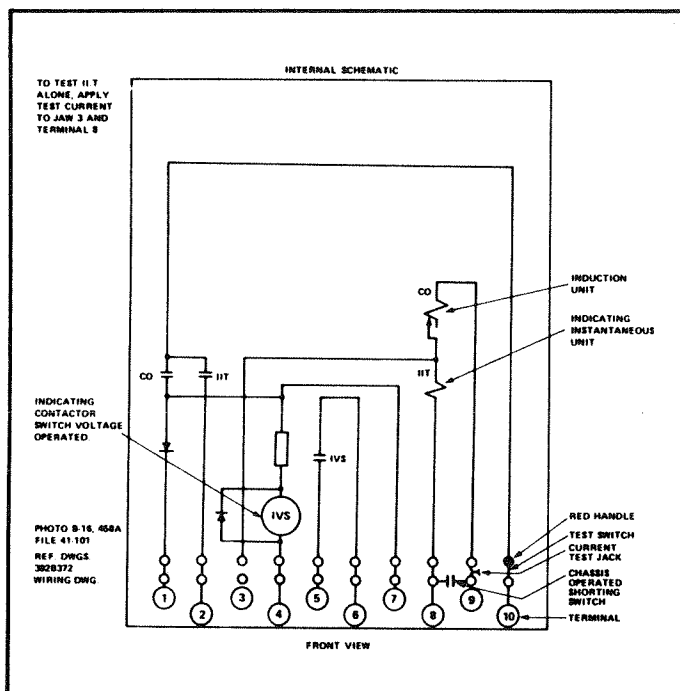


Figure 27 - CO Relay with IIT and Non-sealing IVS in FT-11 Case (Dwg. 307-A-427)

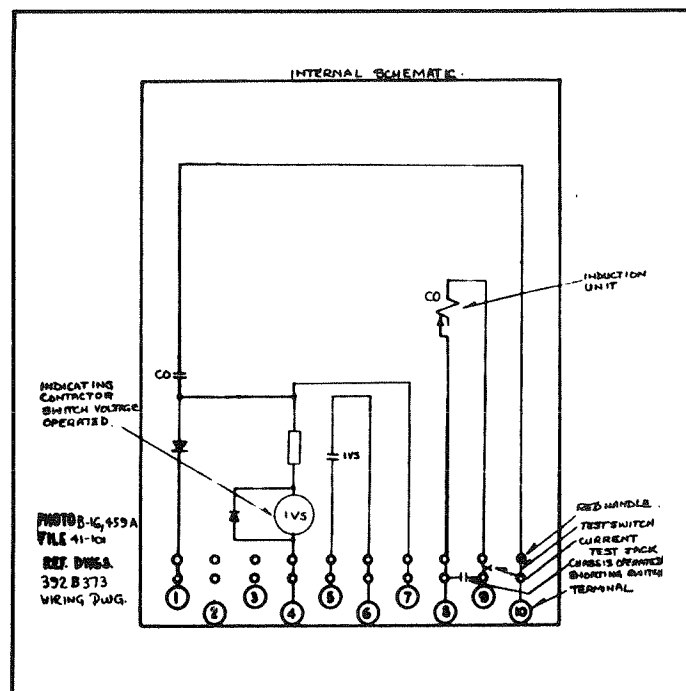
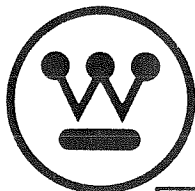


Figure 28 - CO Relay with Non-sealing IVS in FT-11 Case (Dwg. 307-A-428)



# INSTALLATION • OPERATION • MAINTENANCE I N S T R U C T I O N S

## TYPE CO RELAY COORDINATION AND IMPULSE MARGIN TIME

These instructions define the significance of the impulse or coasting characteristic of CO units upon the time-coordination of two relays.

Relay I operating time in figure 1 should be delayed sufficiently for fault 1, to allow Relay II to complete its operation and breaker II to clear the fault. At the instant that fault 1 is cleared, the disc of relay I will be moving towards the closed position; therefore, the disc will coast for a while after being deenergized. Allowance for coasting must be included in the coordinating time interval, which is time S-W in figure 2, where O-W is the relay II operating time.

A coordinating time interval of 0.3 seconds plus breaker time is recommended; however, for those who wish to consider using a shorter interval, the impulse margin times of Table I should be used.

TABLE I

Disc Unit Type	<u>T<sub>IM</sub></u>
	<u>Impulse Margin Time - Seconds</u>
CO-2	0.05
CO-6	0.06
CO-7	0.05
CO-8	0.03
CO-9	0.03
CO-11	0.03

In Fig. 2 the interval, Y-Z, of 0.03 seconds is the impulse margin time. Its significance will now be explained.

Impulse margin time,  $T_{IM}$  is defined as:

$$T_{IM} = T_{OP} - T_I \quad (1)$$

where  $T_{OP}$  = operating time from time-current curves at some time-dial & tap-multiple setting.

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FIG. 1 OPERATION OF PROTECTED RELAY, I, SHOULD BE DELAYED TO PERMIT THE PROTECTING RELAY, II, TO CLEAR FAULT 1.

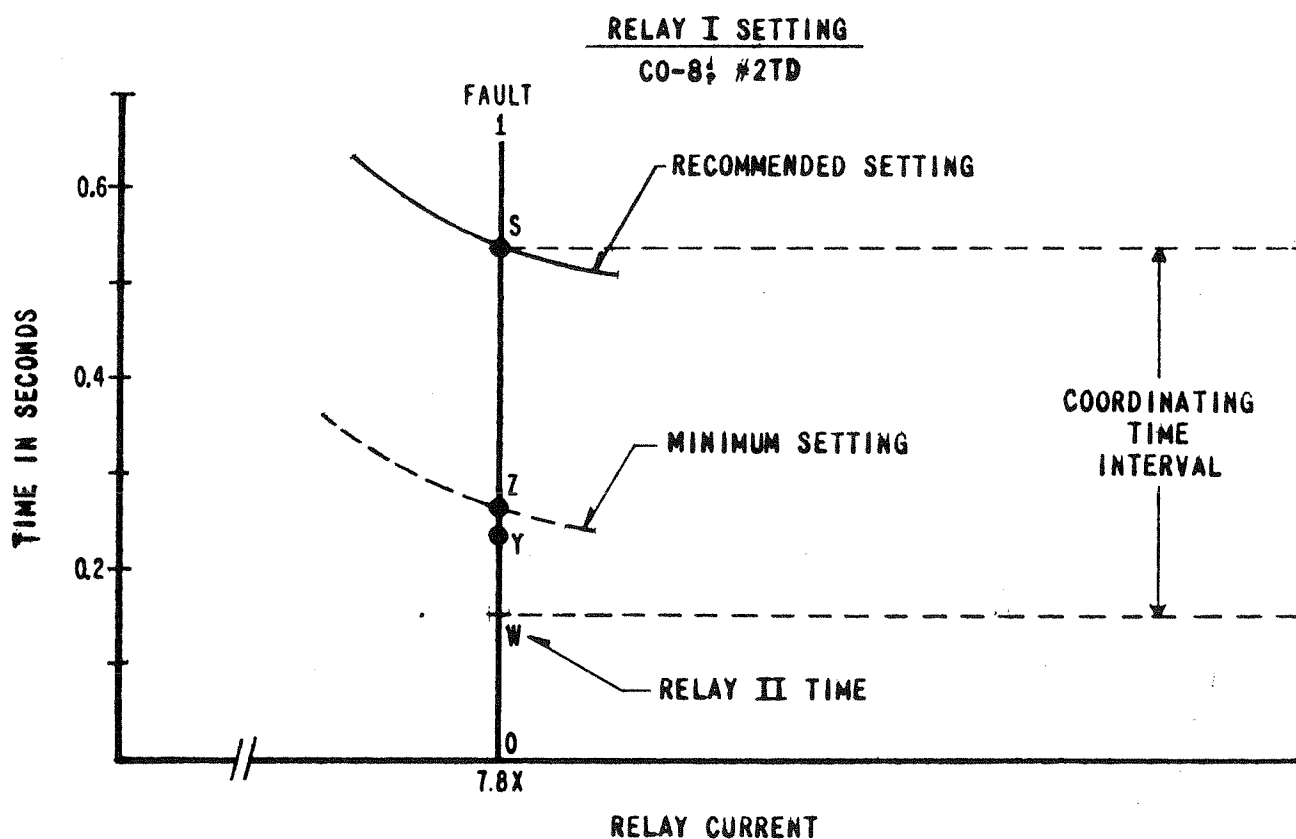


FIG. 2 - IF RELAY I IS SET TO OPERATE IN TIME, Z, ALLOWANCE IS MADE FOR COASTING BUT NO ALLOWANCE IS MADE FOR ERRORS AND RELAY TIMING VARIATIONS.