Effective: January 1996
Supersedes I.L. 41-101.1 Dated September 1963

(|) Denotes Change

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 2 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 0.30 seconds plus breaker time is recommended; however, for those who wish to consider using a shorter interval, the impulse margin times of Table 1 should be used.

Table 1:

Disc Unit Type	T_{IM} Impulse Margin Time - Seconds
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 Figure 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:

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

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

T_I = Minimum impulse time during which sufficient inertia is supplied to the disc to eventually cause the disc to coast closed, following deenergization; based upon test at same setting and current as used to determine T_{OP}.

For example, in Figure 2, assume that the CO-8 relay is energized at 7.8 times tap current, with a #2 time dial setting. From published curve, T_{OP} = 0.53 seconds. From test data,

$\frac{T_I}{T_{OP}} = 0.947$; this means that the relay must be deenergized before 0.947 x 0.53 = 0.50 seconds to prevent eventual closure.

From equation (1), T_{IM} = 0.53 (1-0.947) = 0.028 secs. An analysis of and calculations from test data of the various disc units in the manner just illustrated resulted in the representative data of Table 1.

A Relay I curve in Figure 2, producing a delay of time O-Z, would make no allowance for the following:

a) Error in fault current calculations
b) CT errors
c) Setting errors
d) Relay operating time variations
e) Changes caused by system growth

By exercising extreme care, a coordinating time interval as low as 0.15 secs. plus breaker time is possible.

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 Power T&D Company Inc. representative should be contacted.

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Figure 1. *Operation of Protected Relay I, should be delayed to permit the protecting Relay II, to clear fault 1.*

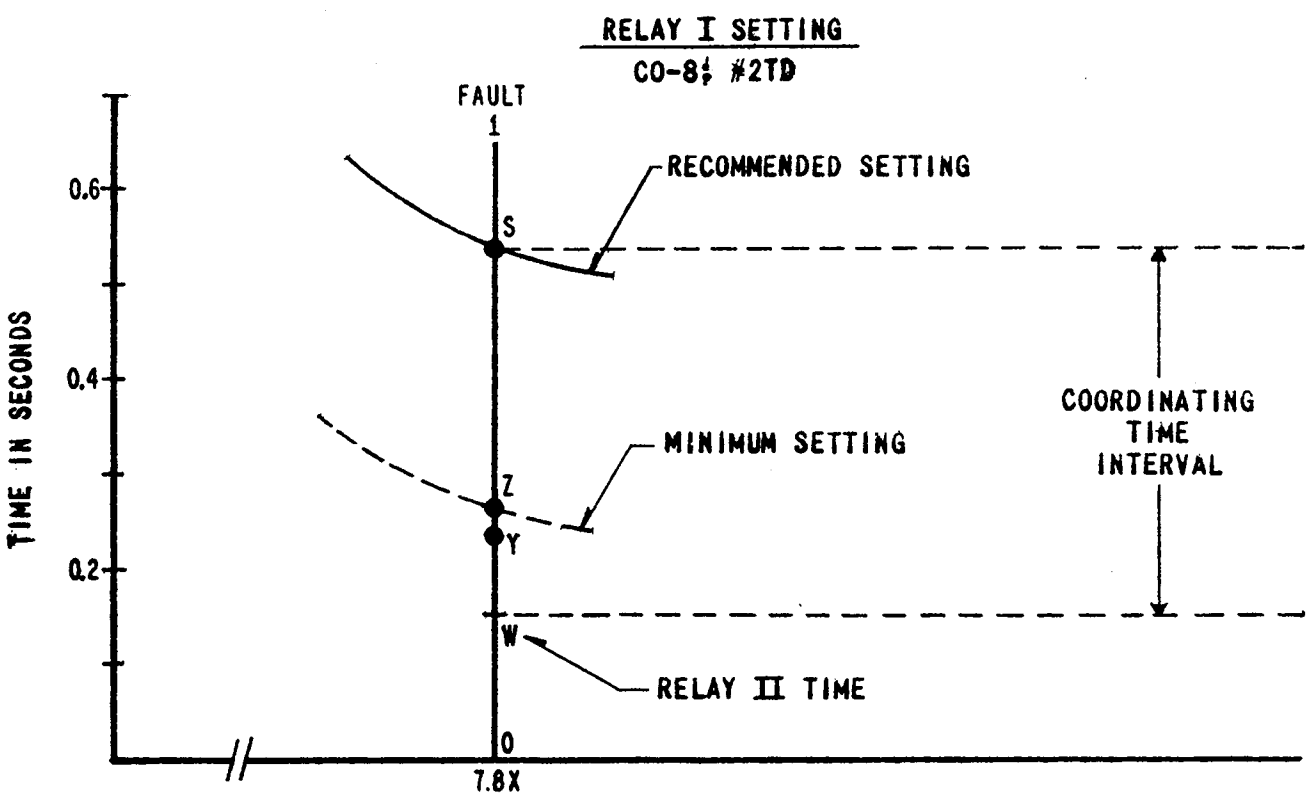

Figure 2. *If Relay I is set to operate in time, Z, allowance is made for coasting but no allowance is made for errors and relay timing variations.*

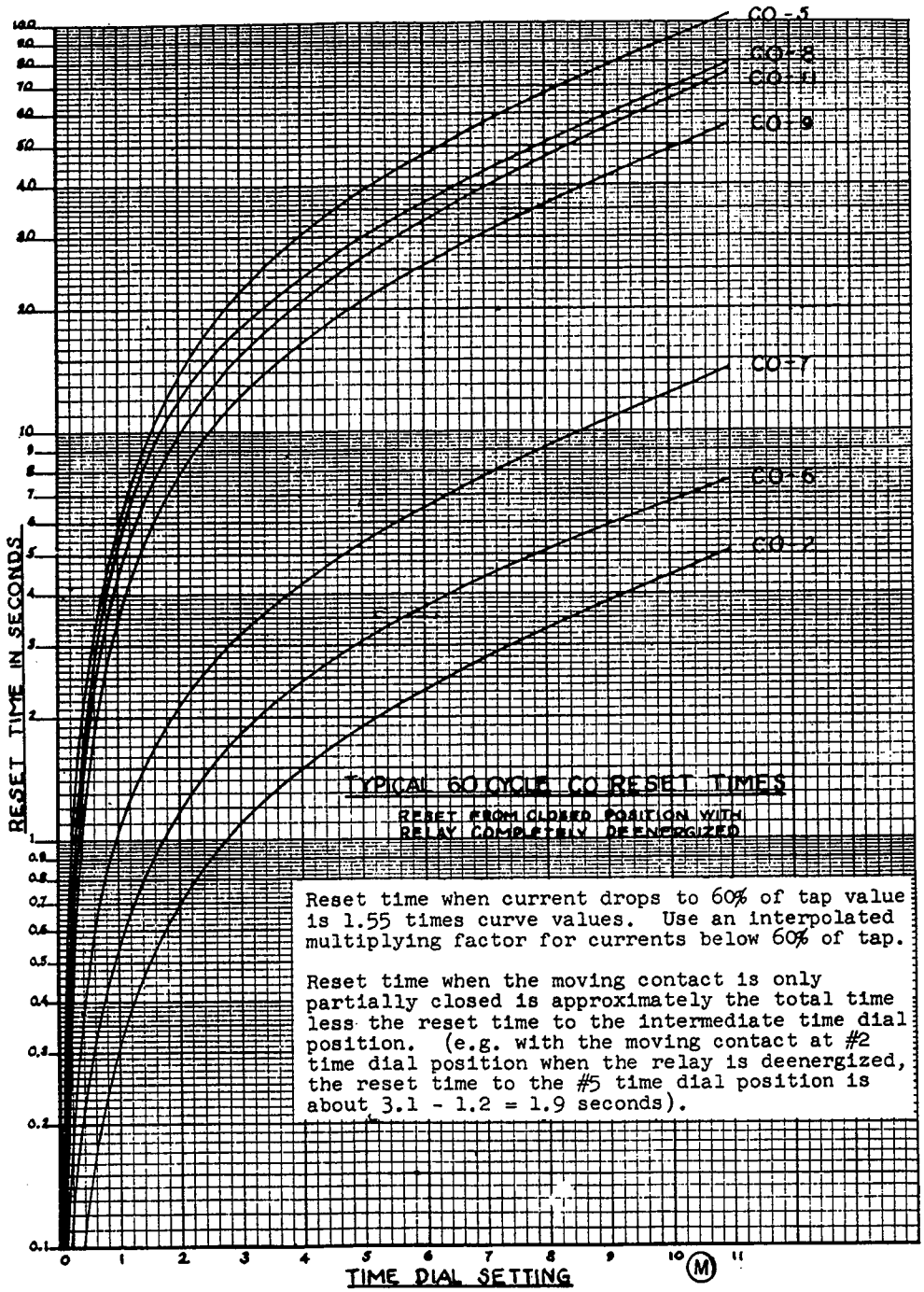

Figure 3. Curve No. 471081

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