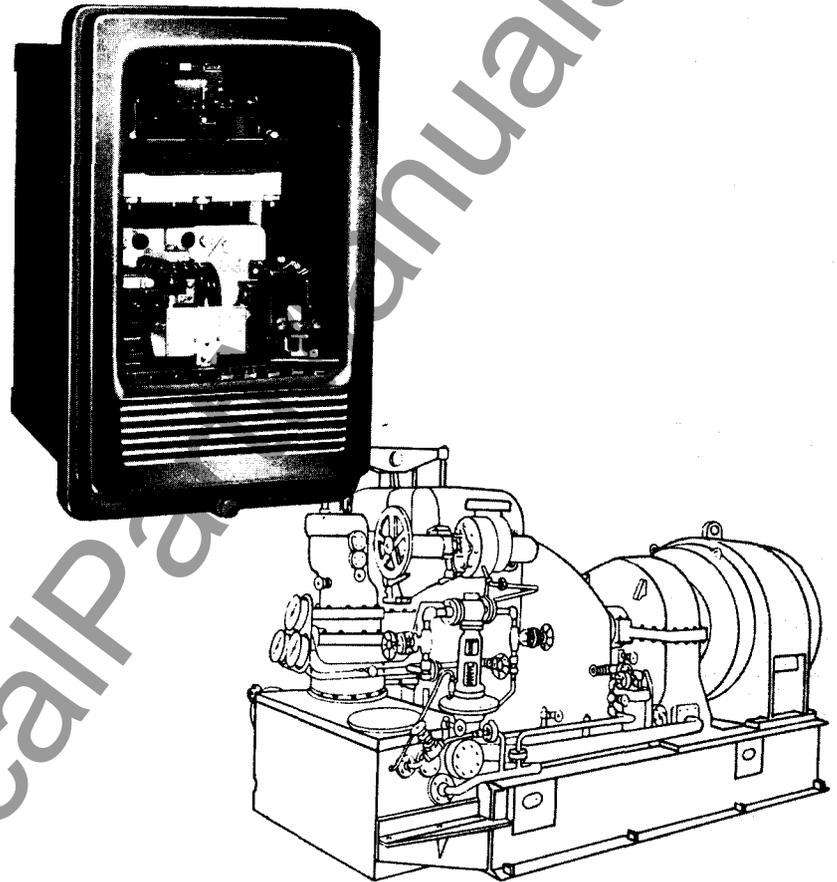


July, 1991
Supersedes DB 41-250, pages 1-4,
dated January, 1968
Mailed to: E, D, C/41-200A

For Anti-Motoring Protection of
Generators and Prime Movers

Device Number: 32

Type CRN-1 Single Phase Reverse Power Relay



Application

The CRN-1 relay detects reverse power flow into ac generators. Its use is recommended in cases where the connected system has sufficient capacity to "motor" the generator upon loss of input to the prime mover (steam turbine, hydraulic turbine, or diesel engine). The protection afforded is primarily for the prime mover, rather than for the generator.

With the CRN-1 relay on the system, steam turbines are protected against overheating should low steam flow occur; and hydraulic turbines are protected against blade cavitation, in case of low water flow.

The CRN-1 also provides three phase protection for reverse magnetization of power transformers when utility tie is interrupted

The CRN-1 relay operates to initiate an alarm or tripping circuit. In this way, a single phase relay affords three phase protection. It is energized by a single-phase line current and a line-to-line voltage using either wye or delta potential transformers.

Features

Single-phase relay provides three-phase protection from "motoring" of generators, or reverse magnetization of power transformers when utility tie is interrupted.

Trip timing adjustable over a range of 2 to 40 seconds.

Low burden, high efficiency timer unit produces high torque and positive contact action.

Ratings Available

120 or 208 volts line-to-line.

Construction and Operation

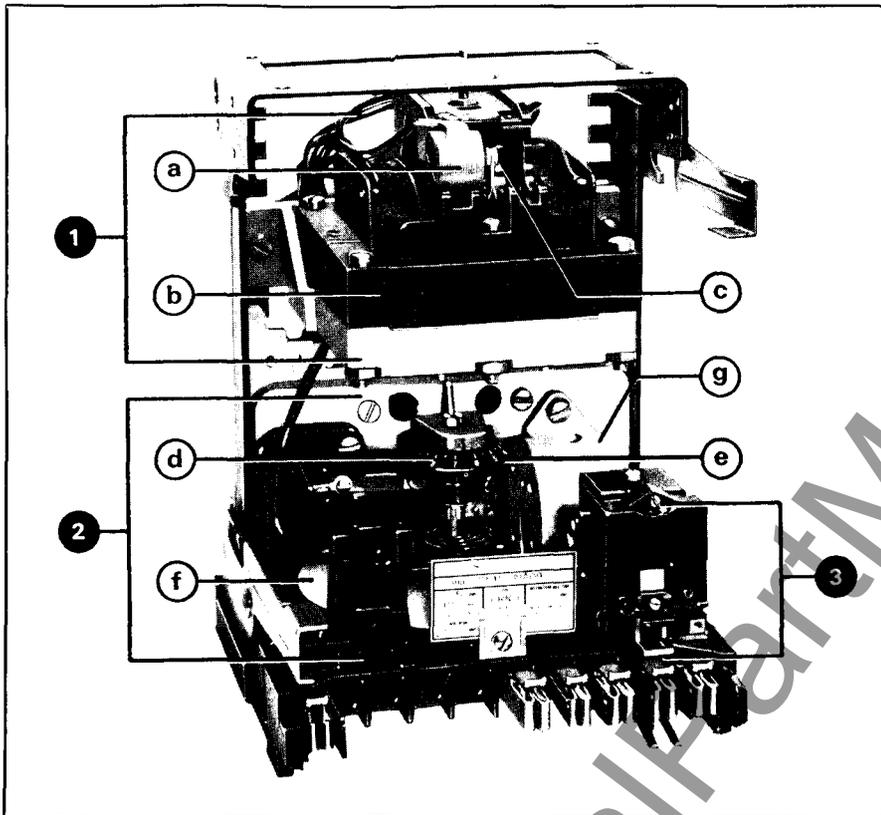


Fig. 1

The CRN-1 consists of a sensitive directional unit which directionally controls a voltage-operated timing unit. Sensitivity of the directional unit is .02 ampere at rated voltage. The timing unit can be adjusted over a 2 to 40 second range.

Torque

Maximum torque occurs in the directional unit when operating current leads polarizing voltage by 30°. Using the 30° connection (Figure 4, page 4) maximum torque occurs at 100% power factor on the system.

Minimum Reverse Power Required to Drive Prime Mover at Synchronous Speed Upon Loss of Input Energy

Machine	Percent of Nameplate Kw Rating
Steam Turbine	3
Hydraulic Turbine	.2-2
Diesel Engine	25

1 Directional Unit (D)

Product type. Operates as a result of interaction of flux created by operating circuit current and polarizing circuit voltage.

a Stationary Contact

Made of silver-cadmium oxide. Attached to molded supporting bridge. Electrical connection is through the spiral spring of the moving contact.

b Laminated Electromagnet

Has two series-connected polarizing coils mounted on alternate sides, and two series-connected operating coils on remaining opposite sides.

c Moving Contact

Made of silver-cadmium oxide. Includes a contact carrying arm, spiral spring, rotatable shaft, and cylinder assembly.

2 Timer Unit (T)

Induction disc design. "E" unit has high efficiency and low burden, and produces high torque which results in positive contact action. Main coil is connected in series with the directional unit contact, and can only operate when power flow is in "trip" direction, and above the pickup ratings of both the timer and directional units. Timer picks up at 54% of rated voltage and will withstand 110% of rating continuously.

d Time Dial

Indicates initial position of moving contact of timer unit. Dial is indexed from ½ (minimum time) to 11 (maximum time). See time curves, page 3.

e Timer Moving Contact

Made of pure silver and connected via spiral spring to spring adjuster assembly.

f Induction Disc

Spiral shaped to compensate for spring windup throughout moving contact travel. Provides accurate pickup at any disc position.

g Damping Magnet

High strength Alnico. Dampens the induction disc

3 Indicating Contactor Switch

Indicates tripping action by appearance of letter "T" in target area.

The main relay contacts will close 30 amperes at 250 volts dc, and the ICS contacts will safely carry this current long enough to trip a circuit breaker.

Front located taps provide connection for either 0.2 (left) or 2.0 (right) ampere dc minimum pickup setting.

When the CRN-1 energizes a WL relay rated 125 or 250 volts dc, the 0.2 tap is recommended. The 2.0 tap is used on 24 or 48 volt dc circuits.

Characteristics

Contact Closing Time

Contact closing time is approximately proportional to time-dial settings and inversely proportional to the applied timer voltage.

Burden Data (60 Hertz)

Unit	Coil	Burden At:	Volt-Amperes	Power Factor ^①
Directional	Voltage Current	Rated Voltage	3.5	60°
		5 Amperes	5.5	47°
Timer	Voltage	Rated Voltage	6.5	73°

① Degrees current lags voltage.

Directional Unit Sensitivity

Rating: Volts	Minimum Pickup Values ^②		Phase Angle Relationship
	Volts	Amperes	
120 or 208	Rated	.020	I leading V by 30° ^③ I in phase with V
	Rated	.023	

② Energization quantities are input quantities at the relay terminals.

③ Maximum torque angle.

ICS Unit

Tap in Amps:	Ohms: Dc	Ampere Rating	
		Continuous	1-Second
0.2	6.4	0.4	11.5
2.0	0.15	3.2	88.0

Settings

Internal connections are per Figure 3. The only setting required is the time-delay setting of the timer or induction-disc unit.

For correct operation, the CRN-1 should be connected so that maximum torque occurs with unity power factor on the power system.

Since the directional unit has a 30° maximum torque characteristic, external connections should be made as shown in Figures 4 and 5.

Time Curves

CRN-1 120-Volt Relay

(Proportional Values Apply for 208-Volt Type)

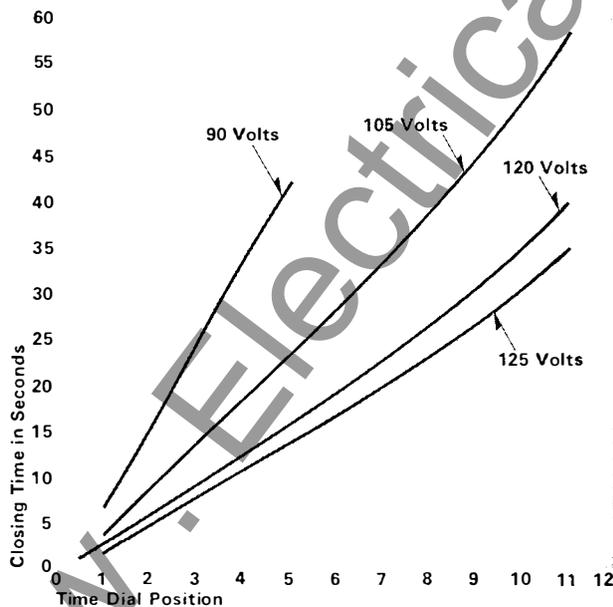


Fig. 2

Internal Wiring

Spst-cc (Dash Line, dpst-cc), FT-21 Case

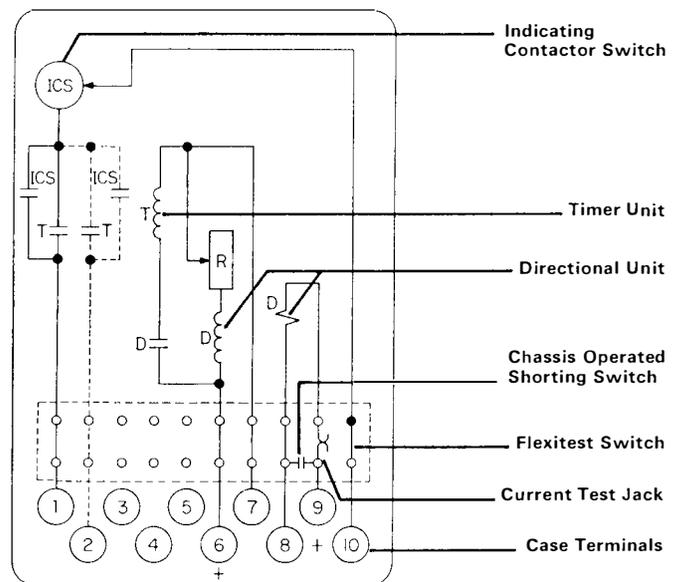


Fig. 3

Spst-cc 184A404, Dpst-cc 184A405

**External Wiring Diagrams
For Reverse Power Protection**

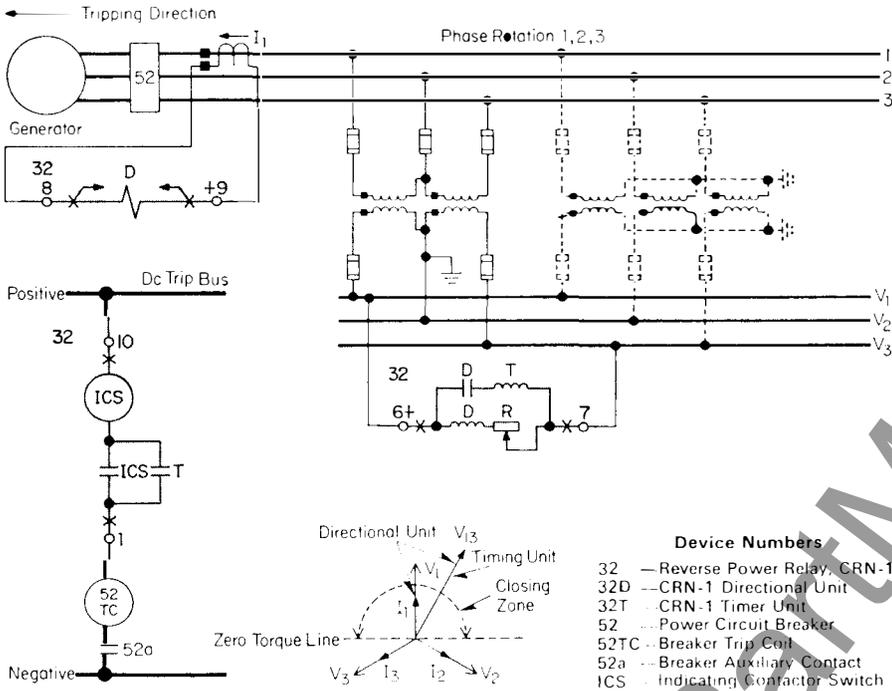


Fig. 4 184A466

To Prevent Reverse Magnetization When Utility Tie is Removed From the Local System

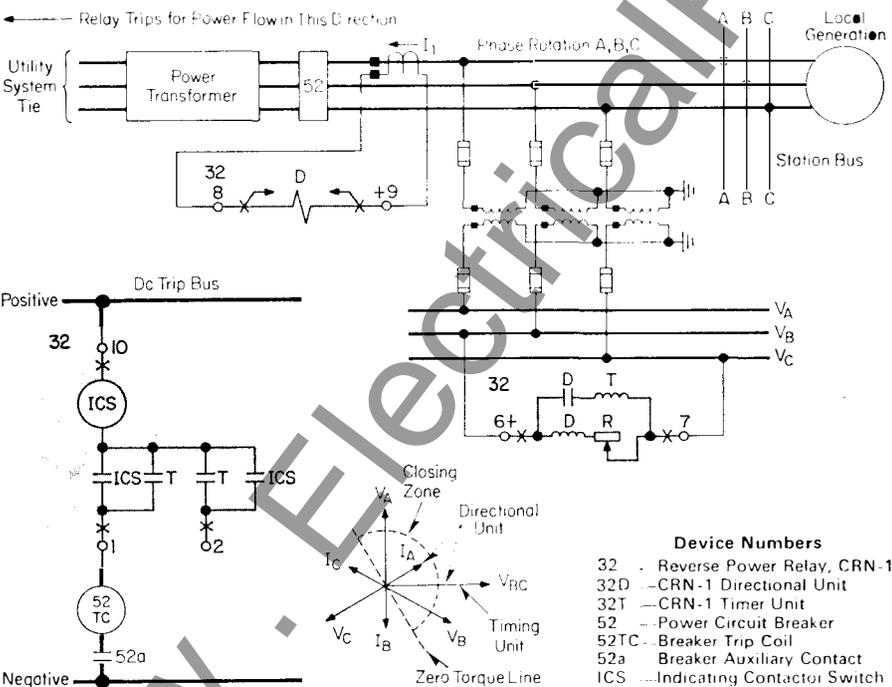


Fig. 5 849A137

**Shipping Weights
and Carton Dimensions**

Flexitest Case Type	Weight: Lbs.		Domestic Shipping Carton Dimensions: Inches
	Net	Shipping	
FT-21	12	16	9 x 12 x 13

Further Information

List Prices: PL 41-020
 Technical Data: TD 41-025
 Instructions: IL 41-251.2
 Flexitest Case Dimensions: DB 41-075
 Renewal Parts: RPD 41-922
 Other Protective Relays:
 Application Selector Guide, 41-016



July, 1991
 Supersedes TD 41-020, Type CRN-1 on
 page 60, dated November, 1987
 Mailed to: E, D, C/41-200A

For Anti-Motoring Protection of Generators and
 Prime Movers

Type CRN-1 Single Phase Reverse Power Relay

Reverse Power (Device Number: 32)

Type and Time Curve	Contacts	Indicating Contactor Switch ③	Volts Line-to-Line	Relay Data		
				Internal Schematic	Style Number	Case Size
CRN-1 ①	Spst-cc	0.2/2.0 amps dc	120	184A404	290B038A09③	FT-21
			208			
Inverse	Dpst-cc		120	184A405	290B038A10	
			208			

③ Denotes item available from stock.

① 50-Hertz relays and auxiliaries can be supplied at same price. Order "Similar to Style Number, except 50 Hertz".

③ ICS: Indicating Contactor Switch (dc current operated) having seal-in contacts and indicating target which are actuated when the ICS coil is energized at or above pickup current setting. Suitable for dc control voltages up to and including 250 volts dc. Two current ranges available:

- (1) 0.2/2.0 amps dc, with tapped coil.
- (2) 1.0 amp dc, without taps.

Rating of ICS unit used in specific types of relays is shown in price tables. All other ratings must be negotiated.

When ac current is necessary in a control trip circuit, the ICS unit can be replaced by an ACS unit.

The ACS unit may be supplied in place of an ICS unit at no additional cost. Specify system voltage rating on order.