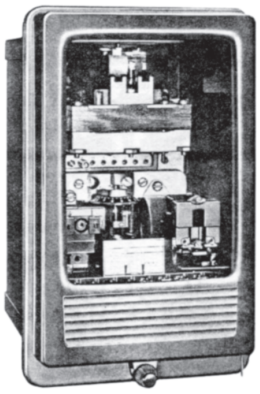
ABB Power T&D Company Inc.
Power Automation & Protection Division
Coral Springs, FL
Allentown, PA

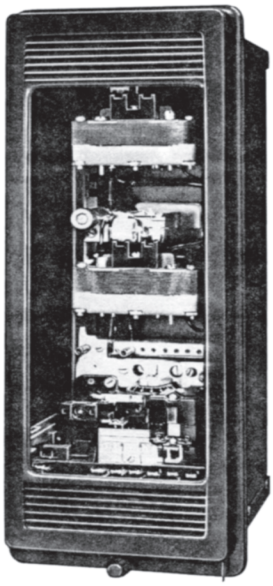
April 1998
Supersedes DB 41-131E
dated August 1991
Mailed to: E, D, C/41-100A

For Phase and Ground Fault
Detection On Transmission
Lines and Feeder Circuits
Device Number : 67, 67N

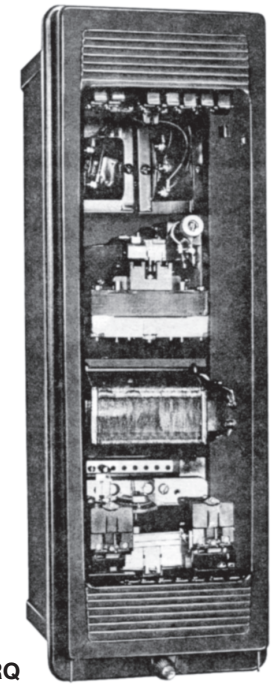
Types CR, CRC, CRP, CRD and CRQ Directional Overcurrent Relays



Type CR-9



Type CRD-8



Type CRQ

APPLICATION

Types CR, CRC, CRP, CRD

These relays are used to disconnect transmission and feeder circuits when the current through them in a given direction exceeds a predetermined value.

Type CRQ

This relay provides overcurrent ground detection. The directional unit operates on negative sequence current and voltage and the overcurrent unit operates on residual or ground current.

The CRQ is applicable for ground protection at an ungrounded substation on grounded systems where only two potential transformers are available, or where the potential transformers are on the delta side of a wye-delta or delta-wye power transformer bank.

Selector Guide

Protection Desired	Directional Unit Polarization	Time Characteristic							Flexitest Case Type	Device Number
		Short	**Long**	**Definite**	**Moderately Inverse**	**Inverse**	**Very Inverse**	**Extremely Inverse**		
Phase Fault Detection	**Voltage Polarized** By System Line-To-Line Voltage	CR-2	CR-5	CR-6	CR-7	CR-8	CR-9	CR-11	FT-21	67
Ground Fault Detection	**Current Polarized** By Residual Current	CRC-2	CRC-5	CRC-6	CRC-7	CRC-8	CRC-9	CRC-11	Ft-21	67N
	Voltage Polarized By Residual Voltage	CRP-2	CRP-5	CRP-6	CRP-7	CRP-8	CRP-9	CRP-11	FT-21	67N
	Voltage And/Or Current Polarized By Voltage Source Or Local Ground Current Source, Or Both Simultaneously	CRD-2	CRD-5	CRD-6	CRD-7	CRD-8	CRD-9	CRD-11	FT-31	67N
	Voltage and Current Polarized By Negative Sequence Voltage and Current	CRQ-2	CRQ-5	CRQ-6	CRQ-7	CRQ-8	CRQ-9	CRQ-11	Ft-42	67N

Type CR-9

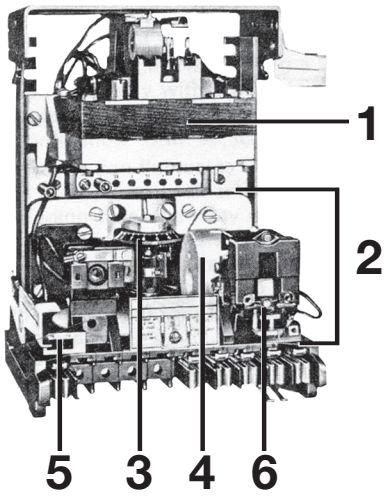


Fig. 1

Type CRD-8

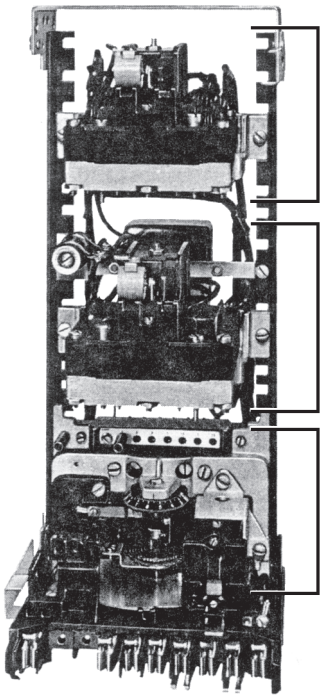


Fig. 2

Type CRQ-9

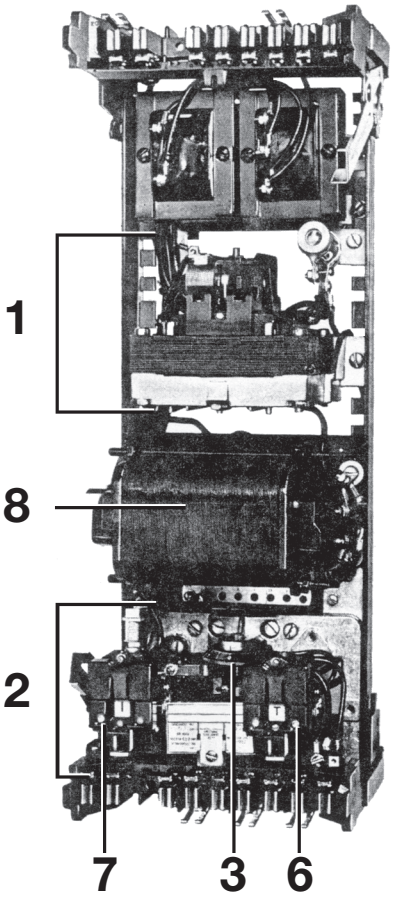


Fig. 3

1 Directional Unit (D)

Induction cylinder type unit. Operates on the interaction between the polarizing circuit flux and the operating circuit flux. At 20 amperes operating current with 120 volts, 60 hertz applied, the operate time of this unit is approximately 10 milliseconds.

2 Overcurrent Unit (CO)

The electromagnets for these relays have a main tapped coil located on the center leg of an "E" type laminated structure that produces a flux which divides and returns through the outer legs. A shading coil causes the flux through the left leg to lag the main pole flux. The out-of-phase fluxes produced in the air gap cause a contact closing torque.

3 Time Dial

Indicates initial position of the moving contact over a 270° range. It is indexed from position 1/2 (minimum time) to position 11 (maximum time).

4 Damping Magnet

5 Induction Disc

6 Indicating Contactor Switch (ICS)

Dc operated. A target drops to indicate a tripping operation. Taps on the front of the unit provide connection for either 0.2 (left) or 2.0 (right) amperes dc pickup operation. When using a 125 or 250 volt dc auxiliary WL switch, the 0.2 ampere tap is used. The 2.0 ampere tap is used on 24 or 48 volt dc circuits.

7 Indicating Instantaneous Trip

Ac operated and adjustable over a range of 1 to 4 times minimum pickup.

8 Negative Sequence Filter

The current and voltage filters consist of reactors and resistors connected together as shown in the figures 13 & 14.

OPERATION

Characteristic Time Curve Selection

When the generation is fixed at a constant value and fault current variation is primarily due to the location of the fault along a line, the selection of a relay with a more inverse time characteristic is desirable to obtain selective coordination with adjacent relays. When the generation fluctuates within large limits such as day time peak and night time low, the tripping time of a relay with an inverse characteristic becomes too dependent on the magnitude of the fault current to permit a smooth coordination so that the relay with definite minimum time is the preferred choice.

Example of Settings For A Loop Protection

Figure 4 illustrates a loop system with one generating station equipped with overcurrent relays and four substations equipped with directional overcurrent relays. Arrows indicate the direction overcurrent must flow to trip the relays and the time values represent the operating time of the relays as determined by the dial position.

Considering a fault at M, current will flow to the fault from substations B and C. The 0.35 second relay will trip at substation C and 0.85 second relay will trip at substation B. While the same fault current flows though the 0.6 second relay at Station D, and the 0.85 second relay at station E, the 0.35 second relay at station C will operate and close its contacts before the 0.6 relay at D, or the 0.85 relay at E can trip.

Time Dial

Time dial settings determine the operating time of the relay.

Spring Adjuster

By rotation of the spring adjuster, it is possible to obtain continuous pickup current values between the tap settings, thus permitting a precise time coordination.

SETTINGS

Tap Range

Taps available

0.5	0.6	0.8	1.0	1.5	2.0	2.5
2	2.5	3	3.5	4	5	6
4	5	6	7	8	10	12

The current range selected depends upon the fault current available at the protected line, as determined by a system study. The lower tap range (0.5 -2.5 amperes) is usually applied for ground fault protection, since phase faults result in higher currents requiring 2-6 or 4-12 amp range.

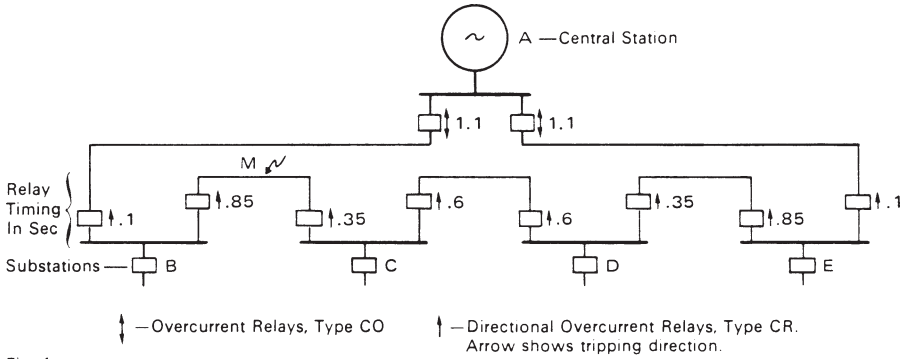


Fig. 4

Internal Wiring Diagrams (Front View)
With relative Instantaneous Polarity as shown the Directional Unit Contacts close.

CR-2, CR-5, CR-6, CR-7, CR-8, CR-9, CR-11 Phase Relay With IIT, Spst, FT-21 Case

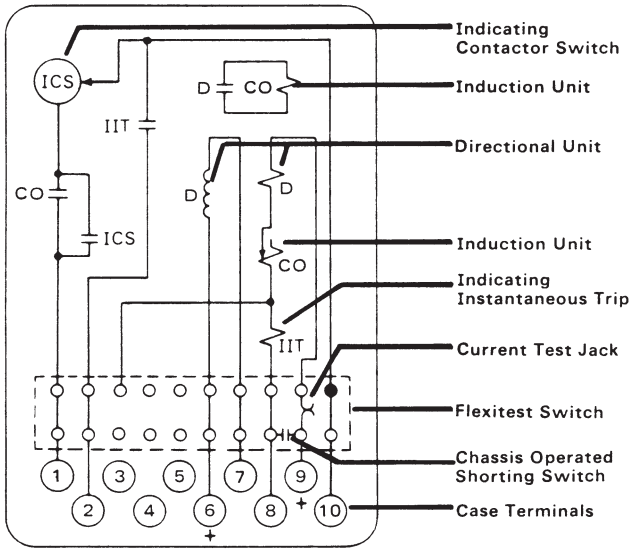


Fig. 5 57D4520

CR-2, CR-5, CR-6, CR-7, CR-8, CR-9, CR-11 Phase Relay, Dpst, FT-21 Case

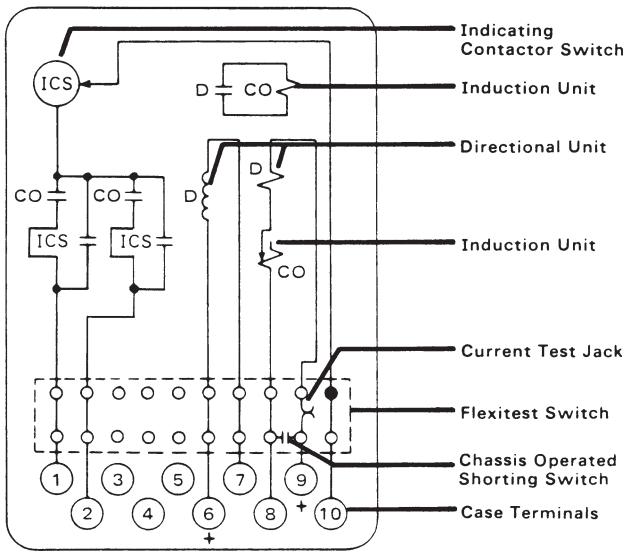


Fig. 6 57D4547

Internal Wiring Diagrams (Front View)
With Relative Instantaneous Polarity as shown the Directional Unit Contacts close.

CRC-2, CRC-5, CRC-6, CRC-7, CRC-8, CRC-9,
CRC-11 Ground Relay With IIT, Spst, FT-21 Case

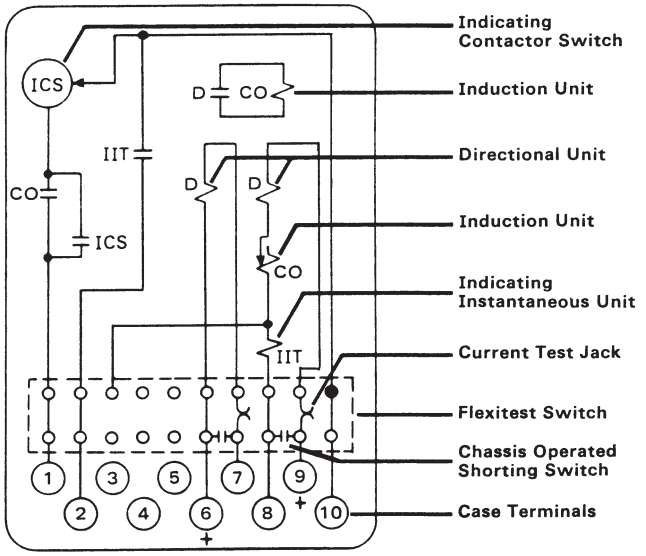


Fig. 7 57D4540

CRC-2, CRC-5, CRC-6, CRC-7, CRC-8, CRC-9,
CRC-11 Ground Relay, Dpst, FT-21 Case

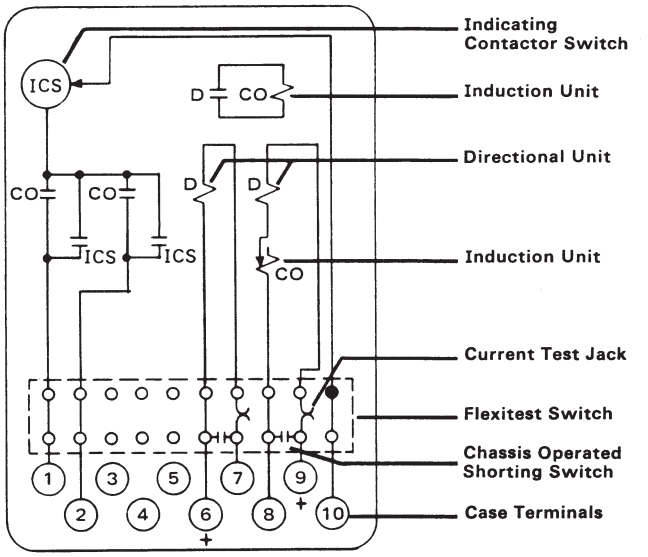


Fig. 8 57D4543

CRD-2, CRD-5, CRD-6, CRD-7, CRD-8, CRD-9,
CRD-11 With IIT, Spst, FT-31 Case

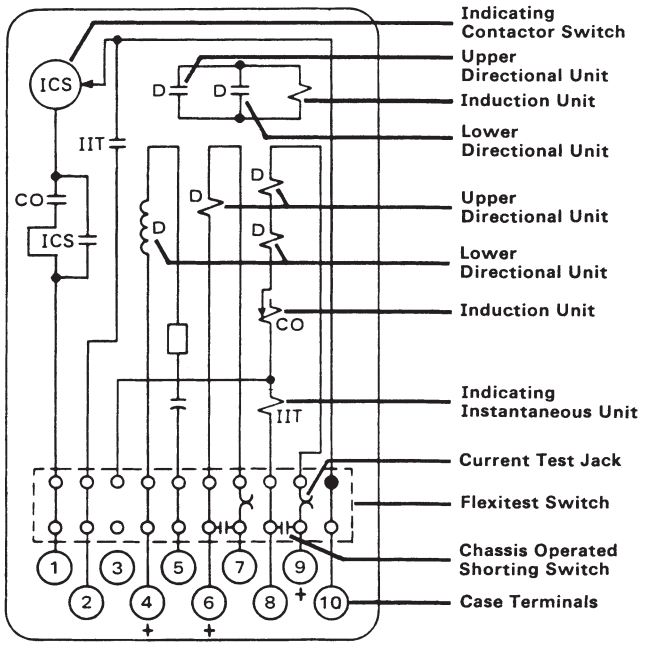


Fig. 11 57D4560

CRD-2, CRD-5, CRD-6, CRD-7, CRD-8, CRD-9,
CRD-11 Dpst, FT-31 Case

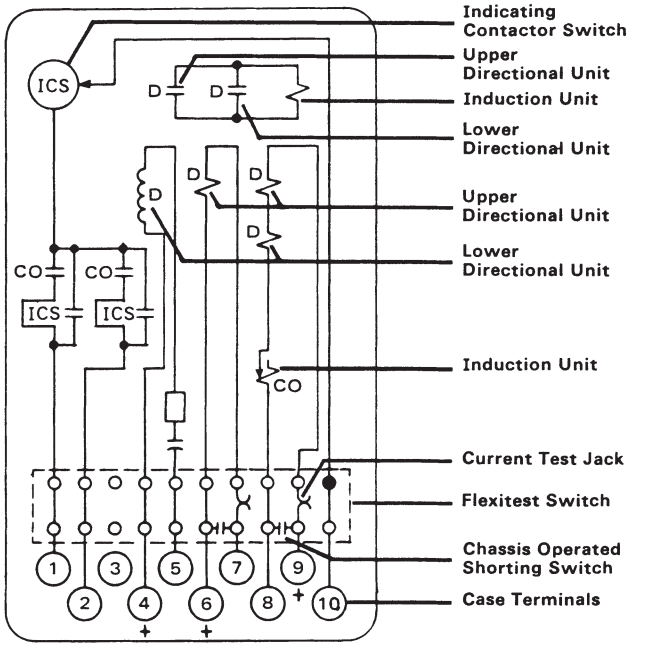


Fig. 12 57D4559

CRP-2, CRP-5, CRP-6, CRP-7, CRP-8, CRP-9, CRP-11 Ground Relay With IIT, Spst, FT-21 Case

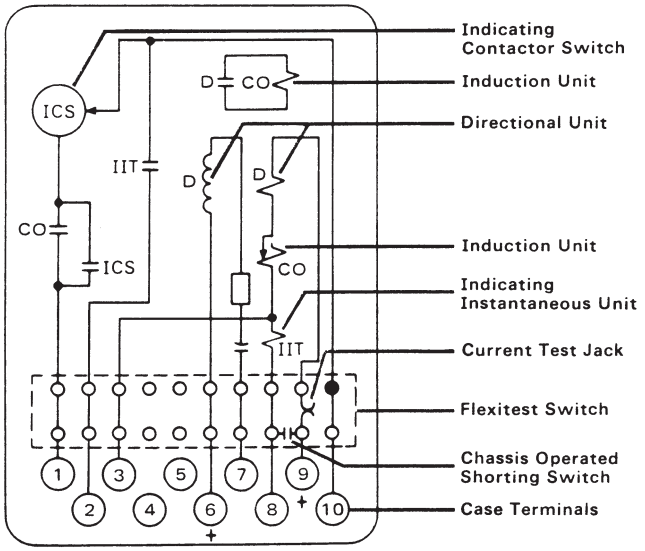


Fig. 9 57D4546

CRP-2, CRP-5, CRP-6, CRP-7, CRP-8, CRP-9, CRP-11 Ground Relay, Dpst, FT-21 Case

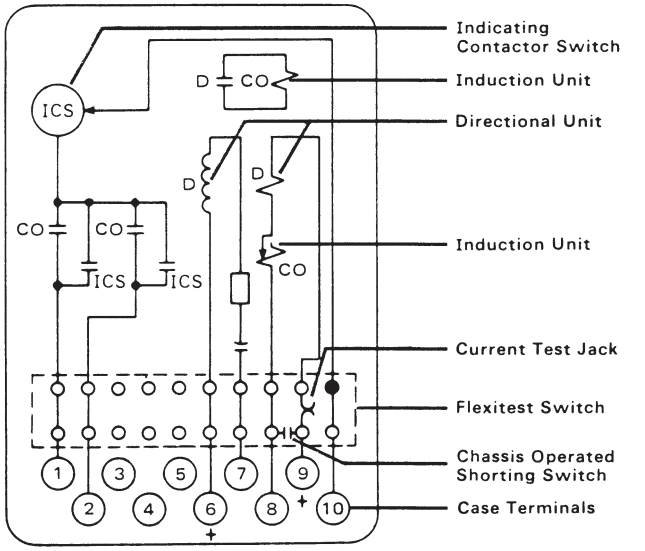


Fig. 10 57D4541

CRQ-2, CRQ-5, CRQ-6, CRQ-7, CRQ-8, CRQ-9, CRQ-11 With IIT, Spst, FT-42 Case

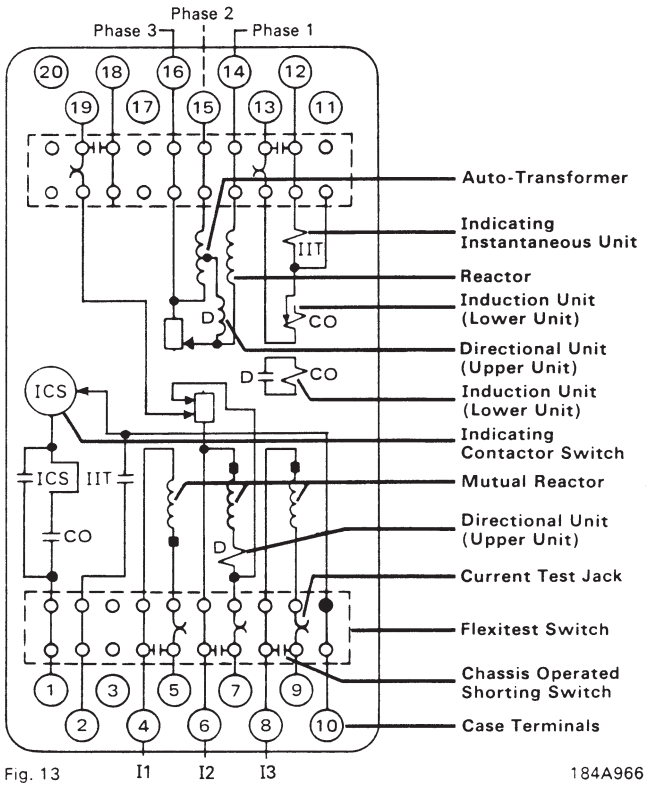


Fig. 13 184A966

CRQ-2, CRQ-5, CRQ-6, CRQ-7, CRQ-8, CRQ-9, CRQ-11 Dpdt, FT-42 Case

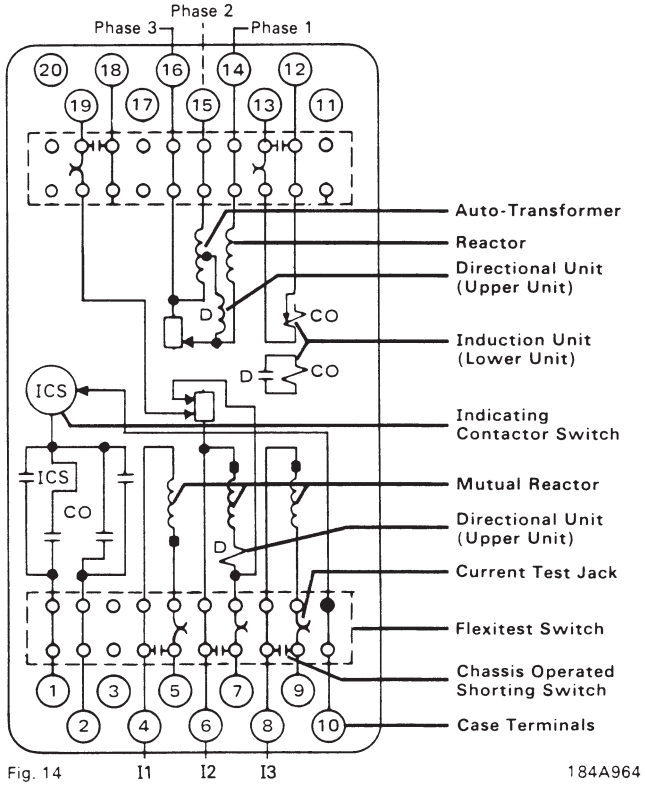


Fig. 14 184A964

CHARACTERISTICS

Time

The time characteristics of the time overcurrent relays are designated by specific numbers:

Characteristic	Number
Short Time	2
Long Time	5
Definite Time	6
Moderately Inverse Time	7
Inverse Time	8
Very Inverse Time	9
Extremely Inverse Time	11

The relays are generally available in the following overcurrent current ranges:

Range	Taps						
0.5-2.5	0.5	0.6	0.8	1.0	1.5	2.0	2.5
2-6	2	2.5	3	3.5	4	5	6
4-12	4	5	6	7	8	10	12

Relays may have either or single or double circuit closing contacts for tripping either one or two circuit breakers

Indicating Instantaneous Trip (IIT)

Relays are available with IIT units having the following current ranges.

0.5-2.0 amp	10-40 amps
1-4 amps	20-80 amps
2-8 amps	40-160 amps

The operating time of this unit is approximately one cycle at 3 times pickup setting.

Trip Circuit

The main contacts will safely close 30 amperes at 250 volts dc and the seal-in contacts of the Indicating Contactor Switch (ICS) will safely carry this current long enough to trip a circuit breaker.

The IIT Contacts also will carry 30 amperes at 250 volts dc and carry this current long enough to trip a circuit beaker.

TRIP-CIRCUIT CONSTANTS

Indicating Contactor Switch

0.2 amp tap	6.5 ohms dc resistance
2.0 amp tap	0.15 ohms dc resistance

DIRECTIONAL UNIT (D)

CR Relay

This voltage polarized relay is intended for phase fault protection. The directional unit has its maximum torque when the current leads the voltage by approximately 30°. The directional unit minimum pickup is 1 volt and 4 amperes at its maximum torque angle for the 4 to 12 ampere range relays and 1 volt and 2 amperes for the 2 to 6 ampere and 0.5 to 2.5 ampere range relays.

The directional unit should be connected using the current in one-phase wire and the potential across the other two-phase wires. This connection is commonly referred to as the 90° connection. When utilizing the 90° connection, the maximum torque of the relay occurs when the fault current lags its 100% power factor position by approximately 60°. See Figure 17.

Negative Sequence Directional Unit Sensitivity Curve

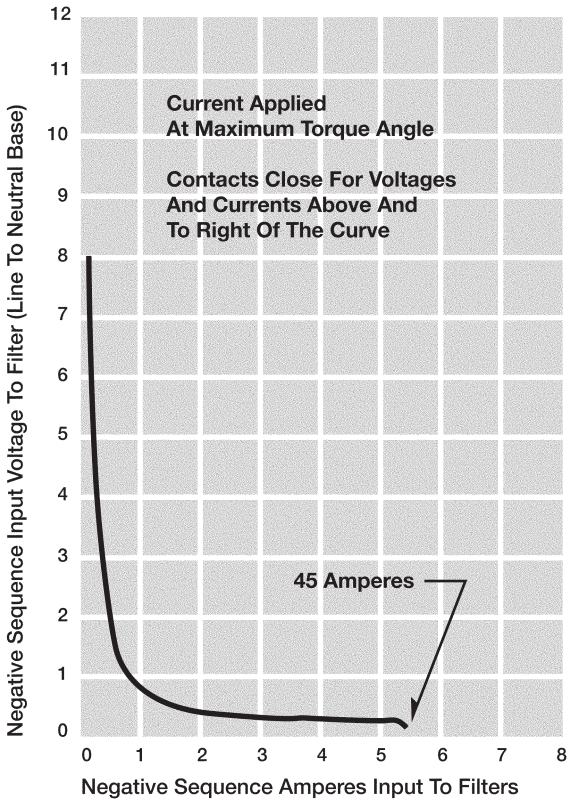


Fig. 15 184A996

Negative Sequence Directional Unit Time Curve

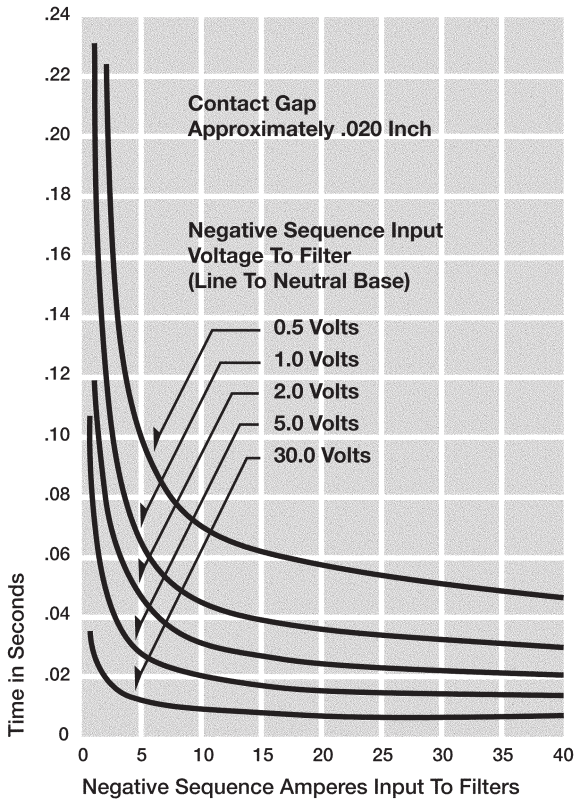


Fig. 16 184A995

CRC Relay

This current polarized relay is intended for ground fault protection and operates on residual current. See Figure 18. The type CRC has its maximum torque when the operating current leads the polarizing current by approximately 40°. The directional unit minimum pickup is 0.5 ampere in each winding in phase for the 0.5 to 2.5 ampere and 2 to 6 ampere range relays.

CRP Relay

This voltage polarized relay is intended for ground fault protection and has its maximum torque when the current lags the voltage by approximately 60°. The shifting of the maximum torque angle is accomplished by the use of an internally mounted phase shifter as illustrated in Figure 10.

The CRP operates on residual voltage and residual current. See Figure 19.

The directional unit minimum pickup is 1 volt and 2 amperes at its maximum torque angle for the 0.5 to 2.5 ampere and the 2 to 6 ampere range relays.

CRD Relay

Dual polarized, the CRD is intended for ground fault protection. It can be polarized from a potential source, from a local ground source or from both simultaneously.

The CRD utilizes the directional unit of the Type CRC in conjunction with the directional unit and phase shifting mechanism of the CRP. The directional contacts are connected in parallel to torque control a common overcurrent unit. See Figure 12 .

The current-polarized directional unit of the CRD operates on residual currents, while the potential polarized directional unit operates on residual voltage and residual current. See Figure 20.

For the 0.5 to 2.5 ampere and the 2 to 6 ampere range relays, the minimum pickup of the current polarized unit is 0.5 ampere in each winding in-phase and the minimum pickup for the voltage polarized unit is 1 volt and 2 amperes with the current lagging by voltage by 60°.

CRQ Relay

The directional unit minimum pickup is approximately 0.76 volt-amperes (e.g., 0.19 volt and 4 amperes) in terms of negative sequence quantities applied at the relay terminals at the maximum torque angle of approximately 98° (current leading voltage). A typical sensitivity curve for the negative sequence directional unit is shown in figure 15.

The time vs. current characteristic for the directional unit is shown in Figure 16.

Burden Data (All Burdens at 60 Hertz)

Type CRQ
Current Burden

The Current Burden of the relay with positive sequence currents applied (no output currents to the directional unit) is as follows:

Phase	Continuous Rating: Amps	One Second Rating: Amps	Watts at 5 Amps	Volt- Amps at 5 Amps	Power Factor Angle
1	10	150	5.4	7.5	44° Lag
2	10	150	5.4	5.5	0°
3	10	150	0.35	1.29	74° Lag

Current burden of the relay with zero sequence currents is as follows:

Phase	Watts at 5 Amps	Volt-Amps at 5 Amps	Power-Factor Angle
1	4.66	5.5	32°
2	4.92	5.0	10°
3	3.30	3.7	27°

Voltage Burden

Voltage burden of the CRQ with position sequence applied (no output voltage to the directional unit) is as follows:

Potential Transformer Across Phase	Volts	Watts	Volt-Amps	Power Factor Angle
Burden Values on Three Star Connected Potential Transformers Values at Star Voltage of 66.4 volts (115 Volts Delta)				
1	115	0	26.8	90° Lag
2	115	0.2	0.3	48° lag
3	115	23.2	27.0	30° Lag
Burden Values on Two Open-Delta Potential Transformers. Values at 115 Volts				
12	115	-23.2	46.5	120° lag
23	115	46.6	46.6	0°
23	115	0.10	'0.48	58° lag
31	115	23.2	46.5	60° lag
31	115	23.2	46.6	60° lag
12	115	'0.50	'0.52	2° Lead
Burden Values on Three Delta Connected Transformers. Values at 115 Volts				
31	115	15.4	31.0	60° lag
12	115	-7.8	15.6	120° lag
23	115	15.6	15.6	0°

Burden Date, Continued
Directional Unit
Operating Circuit

Relay Type	Ampere Range	Burden in Volt Amperes ①				Power Factor Angle ②	Continuous Rating In Amps	1-Second Rating In Amps ③
		At Minimum Tap Value Current	At 3 Times Minimum Tap Value Current	At 10 Times Minimum Tap Value Current	At 20 Times Minimum Tap Value Current			
CR	0.5-2.5	0.03	0.23	2.8	11.5	35.5	10	230
	2-6	0.44	4.08	48.0	182.0	34.5	10	230
	4-12	0.53	5.0	59.2	236.0	25.0	12	280
CRC	0.5-2.5	0.033	0.30	3.3	14.2	44.0	10	230
	2-6	0.58	5.28	58.0	240.0	42.5	10	230
	4-12	0.64	6.12	70.0	272.0	xxx	12	280
CRP	0.5-2.5	0.03	0.23	2.8	11.5	34.5	10	230
	2-6	0.44	4.08	48.0	182.0	34.5	10	230
	4-12	0.48	4.62	53.6	216.0	xxx	12	280
CRD	0.5-2.5	0.07	0.59	6.6	26.0	45.0	10	230
	2-6	1.04	9.9	106.0	420.0	45.0	10	230
	4-12	1.16	10.8	121.2	472.0	xxx	12	280

Polarizing Circuit

Relay	Burden In Volt -Amperes①		Power Factor Angle ⑥	Thermal Rating		
	At 120 Volts	At 5 Amps		1 Second	30 Seconds	Continuous
CR	11.5	xxx	58° Lag	xxx	xxx	xxx
CRC CRD④	xxx	1.45	8° Lag	230 Amps	xxx	208 volts
CRP CRD⑤	11.2	xxx	28° Lead	xxx	208 Volts	xxx

Minimum Pickup Value

Relay Type	Tap Range In Amps	Minimum Pickup		Phase Angle
		Volts	Amps	
CR Voltage Unit	0.5-2.5	1	2	I leading V by 30°
	2-6	1	2.3	I in phase with V
	4-12	1	4	I leading V by 30°
		1	4.6	I leading V by 30°
CRC CRD Current Unit	0.5-2.5	xxx	0.5	I_0 leading I_P by 40°
	2-6	xxx	0.65	in phase
	4-12	xxx	1.0	I_0 leading I_P by 40°
		xxx	1.3	in phase
CRP CRD Voltage Unit	0.5-2.5	1	2	I lagging by 60°
	2-6	1	4	I in phase with V
	4-12	1	4	I leading V by 60°
			8	I in phase with V

① Voltage taken with rectifier type voltmeter
② Degree current lags voltage at tap value current
③ Thermal capacities for short time other than one-second may be calculated on the basis of time being inversely proportional to the square of the current. For example, on the 0.5 to 2.5 amp range, the one-second rating is 88 amps. To obtain the 0.5 second ratings time-overcurrent unit (CO), the appropriate formula is $1^3t=K$ where K is the square of the one-second rating in amperes:

$$I^3t = (88)^3 = 7744$$
$$t = 0.5$$
$$0.5\, I^2 = 7744$$
$$I^2 = 15488$$
$$I = \sqrt{15488} = 124.4$$

④ Current Unit
⑤ Voltage Unit
⑥ Degrees operating current leads or lags (as indicated) polarizing voltage or polarizing current.

External Wiring Diagrams

CR Relay For Phase Protection

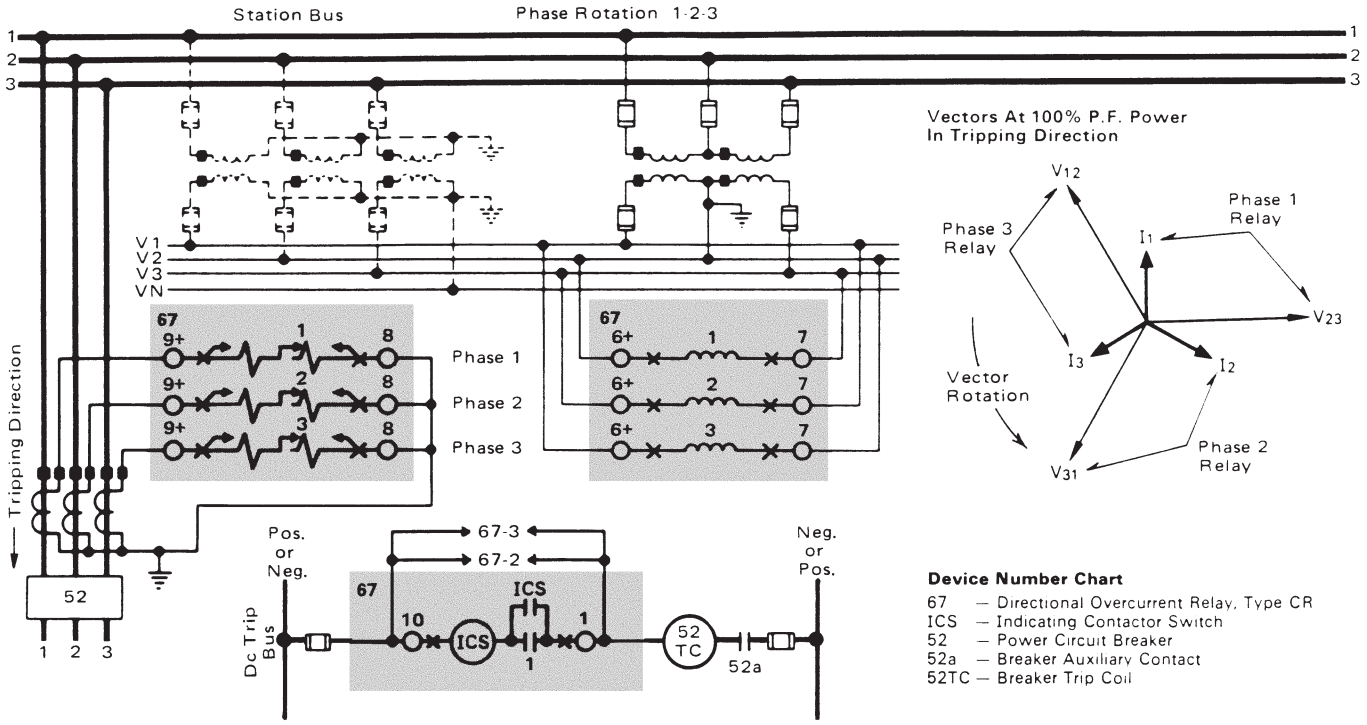


Fig. 17

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CR For Ground Fault Protection

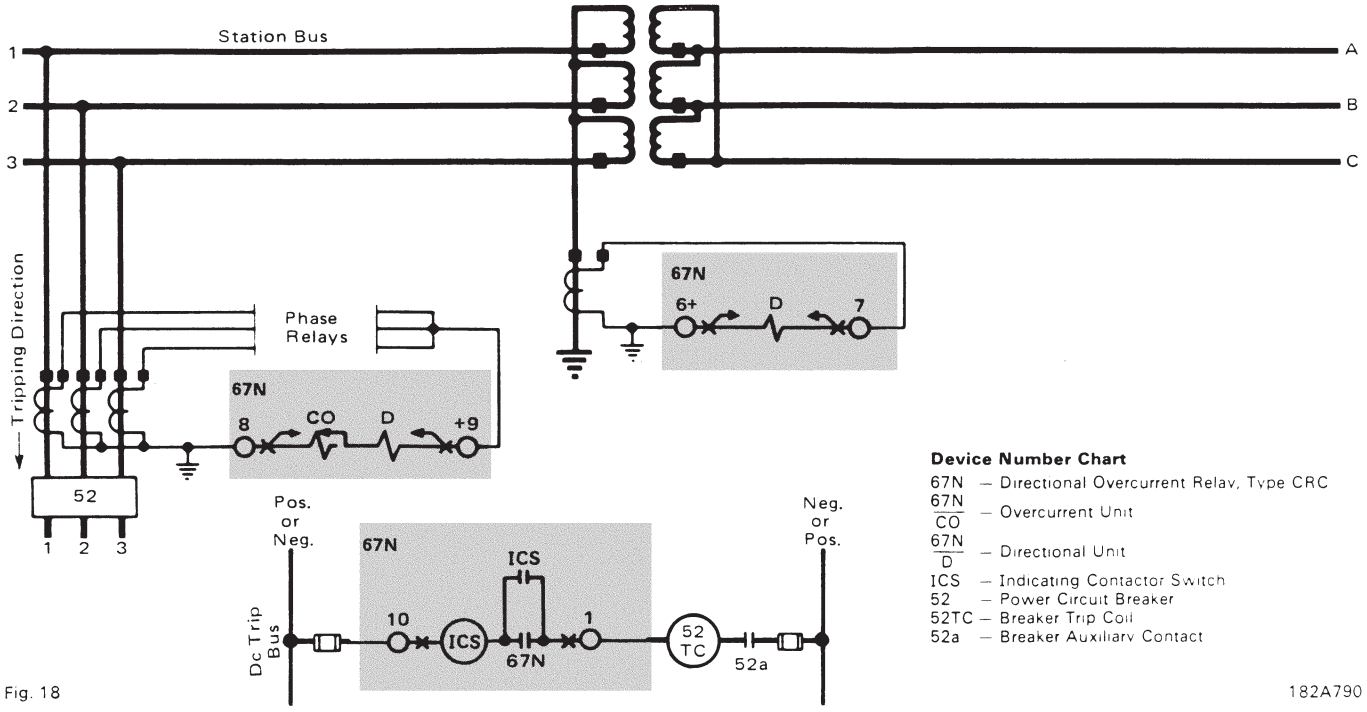

Fig. 18

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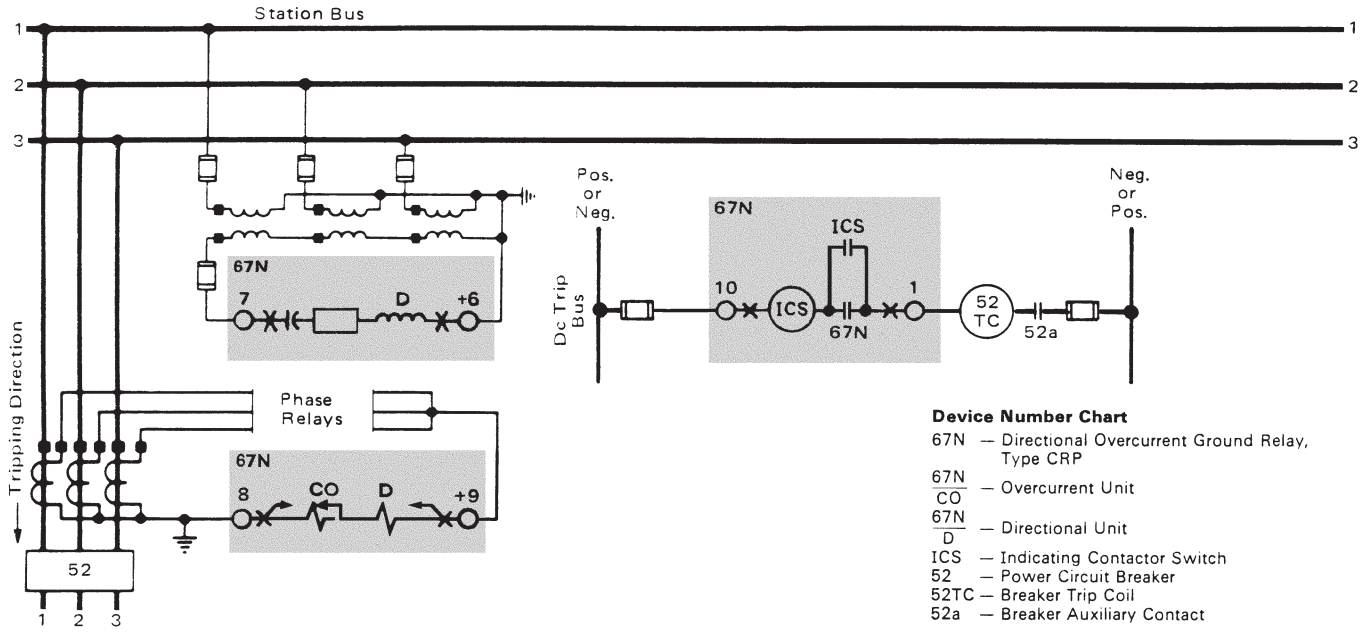
External Wiring Diagrams (Continued)
CRP For Ground Fault Protection



Device Number Chart

67N — Directional Overcurrent Ground Relay, Type CRP
67N/CO — Overcurrent Unit
67N/D — Directional Unit
ICS — Indicating Contactor Switch
52 — Power Circuit Breaker
52TC — Breaker Trip Coil
52a — Breaker Auxiliary Contact

Fig. 19

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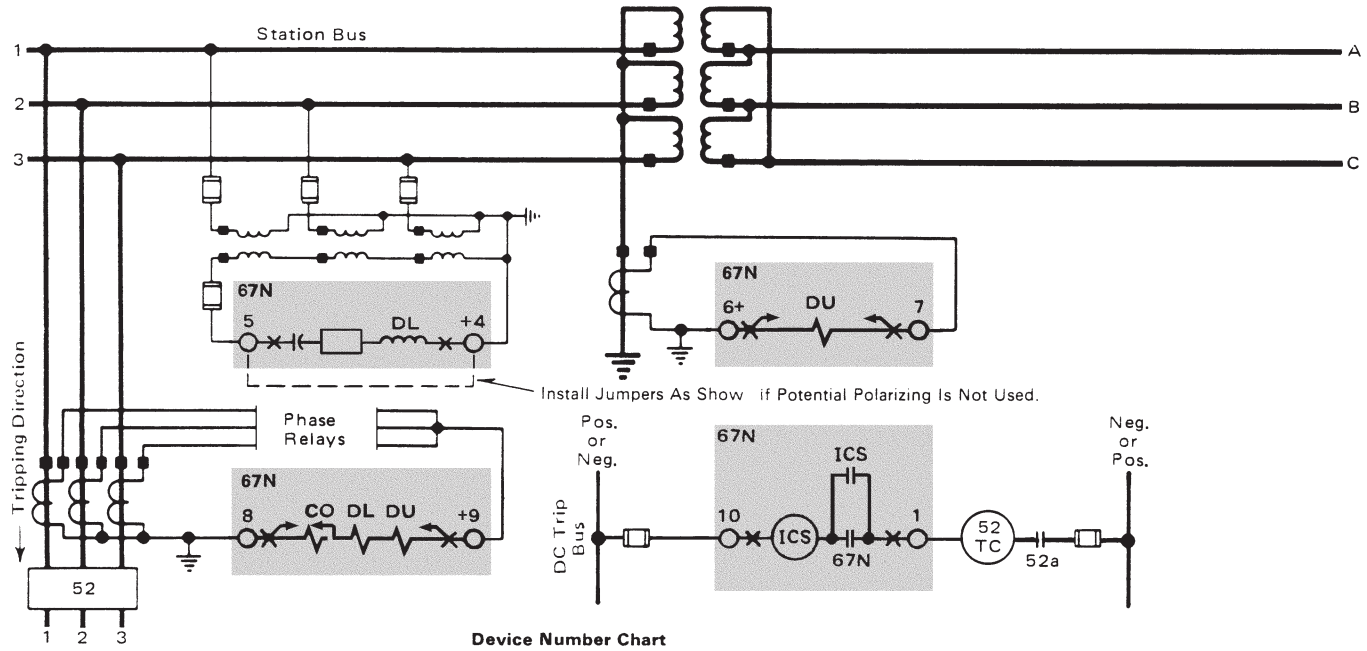
CRD For Ground Fault Detection



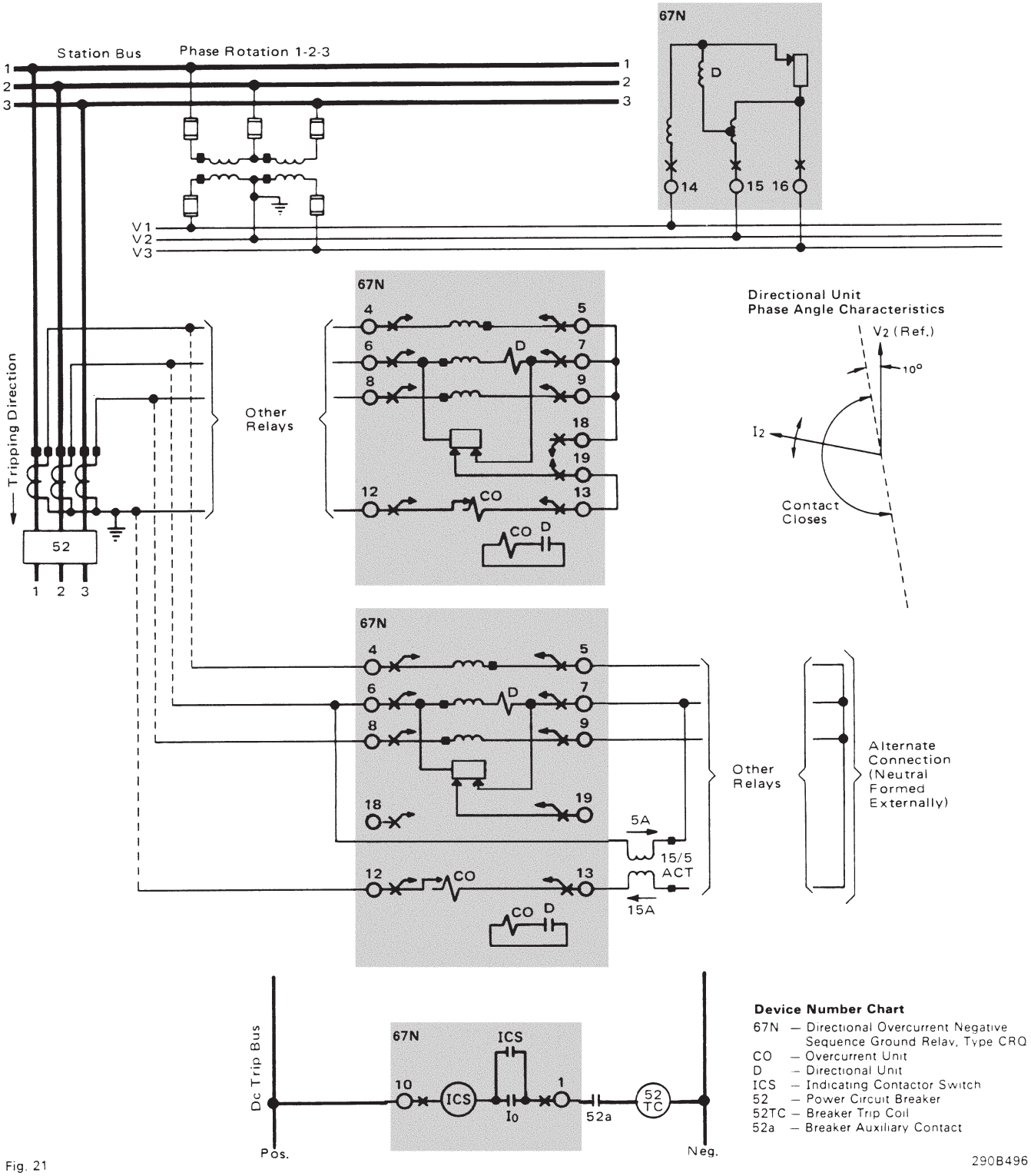
Device Number Chart

67N — Directional Overcurrent Ground Relay, Type CRD
67N/CO — Overcurrent Unit
67N/DL — Lower Directional Unit
67N/DU — Upper Directional Unit
ICS — Indicating Contactor Switch
52 — Power Circuit Breaker
52TC — Breaker Trip Coil
52a — Breaker Auxiliary Contact

Fig. 20

182A791

CRQ For Ground Fault Detection



Device Number Chart

67N — Directional Overcurrent Negative Sequence Ground Relay, Type CRQ
CO — Overcurrent Unit
D — Directional Unit
ICS — Indicating Contactor Switch
52 — Power Circuit Breaker
52TC — Breaker Trip Coil
52a — Breaker Auxiliary Contact

Fig. 21

290B496

Shipping Weights and Carton Dimensions

Relay Type	Flexitest Case Type	Weight: Lbs. Approx		Domestic Shipping Carton Dimensions: Inches
		Net	Shipping	
CR	FT-21	13	16	8 x 10 x 15
CRC	FT-21	14	17	8 x 10 x 15
CRP	FT-21	14	17	8 x 10 x 15
CRD	FT-31	20	27	8 x 10 x 21
CRQ	FT-42	29	36	8 x 10 x 24

Auxiliary Current Transformers

Used to form neutral with negative sequence relays, Types CRQ, KRQ, IRQ, see P.B. 42-850

Style Number	List Price
7881A01GO1 (5/5) Ⓢ	Refer to ABB Power T&D Company, Inc
7881A01GO1 (10/5) Ⓢ	Low Voltage Instrument Transformers
7881A01GO1 (115/5) Ⓢ	Pinetops, NC 27864

Ⓢ Denotes item available from stock

Potential Polarizing Transformers, Single Phase (Product Bulletin 42-871 for dimensions) ⑤

Volt-Amp	Frequency Hertz	Primary Volts		Secondary Volts	Compensated at:		Connections Primary/Secondary	Style Number
		Line-to-Line	line-to-Neutral		Volt-amps	Power factor		
50	50/60	115	66.5	115	25	100%	Connect	9626A06GO1
		200	115	66.5			wye/broken delta	9626A06GO2
		200	115	115				9626A06GO3

⑤ Refer to LVIT sales, Low Voltage Instrument Transformer Division, Pinetops, NC. for price and shipment.

FURTHER INFORMATION

List Prices: PL 41-020

Technical Data: TD 41-025

Instructions:
Type CR, CRC, CRP, CRD, IL 41-131
Type CRQ, IL 41-163.2

Renewal Part: RPD 41-921

Flexitest Case Dimensions: DB 41-076

Contactor Switches: DB 41-081

Other Protective Relays:
Application Selector Guide, TD 41-016

Overcurrent, Directional, Single Phase, 60 Hertz

Type and Time Curve	Type of Protection	Contacts	Operation Indicator or Indicating Contactor Switch ③	Current Range Amps Ac Time Unit	IIT Unit ④	Relay Data Internal Schematic	Style Number	Case Size
For Phase Fault Protection (Device Number 67)								
CR-6 ①	Phase	Spst-cc	0.2/2.0 amp dc	0.5-2.5	None	57D4549	288B563A12	**FT-21**
				2-6			1875 555	
Definite	132 volts ac			4-12			1875 556	
	continuous			0.5-2.5	2-8	57D4520	288B563A13	
					4-16		288B563A14	
					10-40		288B563A15	
					20-80		288B563A16	
					40-160		288B563A21	
				2-6	4-16	57D4520	1875 557	
					10-40		1875 558	
					20-80		288B563A22	
					40-160		288B563A23	
				4-12	10-40	57D4520	1875 559	
					20-80		1875 560	
CR-7 ①	Phase	Spst-cc	0.2/2.0 amp dc	0.5-2.5	None	57D4549	288B571A12	**FT-21**
				2-6			1875 567	
Moderately	132 volts ac			4-12			1875 568	
Inverse	continuous			0.5-2.5	2-8	57D4520	288B571A13	
					4-16		288B571A14	
					10-40		288B571A15	
				2-6	4-16	57D4520	1875 569	
					10-40		1875 570	
				4-12	10-40	57D4520	1875 571	
					20-80		1875 572	
					40-160		288B571A21	
CR-8 ①	Phase	Spst-cc	0.2/2.0 amp dc	0.5-2.5	None	57D4549	288B571A12	**FT-21**
				2-6			1875 579 Ⓢ	
Inverse	132 volts ac			4-12			1875 580 Ⓢ	
	continuous			0.5-2.5	2-8	57D4520	288B574A13	
					4-16		288B574A14	
					10-40		288B574A15	
					20-80		288B574A16	
				2-6	4-16	57D4520	1875 581	
					10-40		1875 582	
				4-12	4-16	57D4520	288B574A22	
					10-40		1875 5783	
					20-80		1875 584	
					40-160		1956 011	

Ⓢ 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 (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 are 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 ranges 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.

④ IIT: Indicating Instantaneous Trip rated per ranges shown in price tables. Unit is nondirectional, adjustable, and has target actuated when coil is energized at or above pickup setting. Unit has a dropout ratio of 65% at minimum setting and 90% at maximum setting.

Overcurrent, Directional, Single Phase, 60 Hertz, Continued

Type and Time Curve	Type of Protection	Contacts	Operation Indicator or Indicating Contactor Switch ③	Current Range Amps Ac Time Unit	IIT Unit ④	**Relay Data** Internal Schematic	Style Number	Case Size
For Phase Fault Protection (Device Number: 67N, DB 41-131E), Continued								
CR-9 ①	Phase	Spst-cc	0.2/2.0	0.5-2.5	None	57D4549	288B563A12	**FT-21**
			amp dc	2-6			1875 591Ⓢ	
Very	132 volts ac			4-12			1875 592Ⓢ	
Inverse	continuous			0.5-2.5	2-8	57D4520	288B563A13	
					4-16		288B563A14	
					10-40		288B563A15	
				2-6	4-16	57D4520	1875 593	
					10-40		1875 594	
				4-12	10-40	57D4520	1875 595	
					20-80		1875 596	
CR-11 ①	Phase	Spst-cc	0.2/2.0	0.5-2.5	None	57D4549	288B940A09	**FT-21**
			amp dc	2-6			288B940A10	
Extremely	132 volts ac			4-12			288B940A11	
Inverse	continuous			0.5-2.5	2-8	57D4520	288B940A012	
					4-16		288B940A013	
					10-40		288B940A014	
				2-6	10-40	57D4520	288B940A016	
					20-80		288B940A017	
				4-12	10-40	57D4520	288B940A015	
For Ground Fault Protection (Device Number: 67N, DB 41-131E)								
CRC-6 ①	Ground	Spst-cc	0.2/2.0	0.5-2.5	None	57D4539	1876 952	**FT-21**
			amp dc	2-6			1876 953	
Definite	Current			0.5-2.5	4-16	57D4540	1876 954	
	Polarized				10-40		1876 955	
	230 amp/1 sec			2-6	4-16	57D4540	1876 956	
					10-40		1876 957	
CRC-7 ①	Ground	Spst-cc	0.2/2.0	0.5-2.5	None	57D4539	1875 597	**FT-21**
			amp dc	2-6			1875 598	
Moderately	Current			0.5-2.5	4-16	57D4540	1876 964	
Inverse	Polarized				10-40		1875 599	
	230 amp/1 sec			2-6	4-16	57D4540	1876 965	
					10-40		1875 600	
					40-160		1878 777	
CRC-8 ①	Ground	Spst-cc	0.2/2.0	0.5-2.5	None	57D4539	1875 601	**FT-21**
			amp dc	2-6			1875 602	
Inverse	Current			0.5-2.5	4-16	57D4540	1876 966	
	Polarized				10-40		1875 603	
	230 amp/1 sec				20-80		288B582A21	
				2-6	4-16	57D4540	1876 967	
					10-40		1875 604	
CRC-9 ①	Ground	Spst-cc	0.2/2.0	0.5-2.5	None	57D4539	1875 605	**FT-21**
			amp dc	2-6			1875 606	
Very				0.5-2.5	4-16	57D4540	1876 968	
Inverse					10-40		1875 607	
				2-6	4-16	57D4540	1876 969	
					10-40		1875 608	
CRC-11 ①	Ground	Spst-cc	0.2/2.0	0.5-2.5	None	57D4539	289B370A09	**FT-21**
			amp dc	2-6			289B370A10	
Extremely	Current			4-12			289B370A11	
Inverse	Polarized			0.5-2.5	2-8	57D4540	289B370A13	
	230 amp/1 sec				4-16		289B370A14	
					10-40		289B370A15	
					20-80		289B370A16	
				2-6	2-8	57D4540	289B370A17	
					4-16		289B370A18	
					10-40		289B370A19	
					20-80		289B370A20	
				4-12	4-16	57D4540	289B370A21	
					10-40		289B370A22	
					20-80		289B370A23	
					40-160		289B370A24	

Ⓢ ① ③ ④ footnotes, see page 13.

Overcurrent, Directional, Single Phase, 60 Hertz, Continued

Type and Time Curve	Type of Protection	Contacts	Operation Indicator or Indicating Contactor Switch ③	Current Range Amps Ac Time Unit	IIT Unit ④	**Relay Data** Internal Schematic	Style Number	Case Size
For Ground Fault Protection (Device Number: 67N, DB 41-131E), Continued								
CRP-7 ①②	Ground	Spst-cc	0.2/2.0 amp dc	0.5-2.5	None	57D4545	1875 561	**FT-21**
				2-6			1875 562	
Moderately Inverse	Voltage Polarized 208 volt/30 sec			0.5-2.5	4-16	57D4546	1875 563	
					10-40		1875 564	
				2-6	4-16	57D4546	1875 565	
					10-40		1875 566	
CRP-8 ①②	Ground	Spst-cc	0.2/2.0 amp dc	0.5-2.5	None	57D4545	1875 573	**FT-21**
				2-6			1875 574	
Inverse	Voltage Polarized 208 volt/30 sec			0.5-2.5	4-16	57D4546	1875 575	
					10-40		1875 576	
					20-80		288B573A22	
					40-160		288B573A23	
				2-6	4-16		1875 577	
					10-40		1875 578	
					20-80		1878 818	
CRP-9 ①②	Ground	Spst-cc	0.2/2.0 amp dc	0.5-2.5	None	57D4545	1875 585	**FT-21**
				2-6			1875 586	
Very Inverse	Voltage Polarized 208 volt/30 sec			0-5-2.5	4-16	57D4546	1875 587	
					10-40		1875 588	
					20-80		1956 014	
				2-6	4-16		1875 589	
					10-40		1875 590	
CRP-11 ①	Ground	Spst-cc	0.2/2.0 amp dc	0-5-2.5	None	57D4545	1878 843	**FT-21**
				2-6			1955 393	
Extremely Inverse	Voltage Polarized 208 volt/30 sec			4-12			1955 394	
				05-2.5	2-8	57D4546	289B311A17	
					4-16		289B311A18	
				2-6	1-4	57D4546	289B311A23	
					2-8		289B311A26	
					4-16		289B311A19	
					10-40		289B311A20	
					40-160		289B311A25	
				4-12	2-8		289B311A24	
					10-40		289B311A21	
					20-80		289B311A22	
CRD-6 ①②	Ground	Spst-cc	0.2/2.0 amp dc	0.5-2.5	None	57D4561	1876 796	**FT-31**
				2-6			1876 797	
Definite	Current and Voltage Polarized 208 volt/30 sec 230 amp/1 sec			4-12			1876 798	
				0.5-2.5	2-8	57D4560	1876 799	
					4-16		1876 800	
				2-6	4-16	57D4560	1876 801	
					10-40		1876 802	
				4-12	10-40	57D4560	1876 803	
					20-80		1876 804	
CRD-7 ①②	Ground	Spst-cc	0.2/2.0 amp dc	0.5-2.5	None	57D4561	1876 805	**FT-31**
				2-6			1876 806	
Moderately Inverse	Current and Voltage Polarized 208 volt/30 sec 230 amp/1 sec			4-12			1876 807	
				0.5-2.5	2-8	57D4560	1876 808	
					4-16		1876 809	
					10-40		288B597A23	
				2-6	4-16	57D4560	1876 810	
					10-40		1876 811	
				4-12	10-40	57D4560	1876 812	
					20-80		1876 813	

① ③ ④ footnotes, see page 13.

② See potential polarizing transformers, page 12.

Overcurrent, Directional, Single Phase, 60 Hertz, Continued

Type and Time Curve	Type of Protection	Contacts	Operation Indicator or Indicating Contactor Switch ③	Current Range Amps Ac		Relay Data		
				Time Unit	IIT Unit ④	Internal Schematic	Style Number	Case Size
For Ground Fault Protection (Device Number: 67N, DB 41-131E) Continued								
CRD-8 ①②	Ground	Spst-cc	0.2/2.0 amp dc	0.5-2.5	None	57D4561	1876 814	**FT-31**
				2-6			1876 815	
Inverse	Current and			4-12			1876 816	
	Voltage			0.5-2.5	2-8	57D4560	1876 817	
	Polarized				4-16		1876 818	
	208 volt/30 sec				10-40		288B601A24	
					20-80		288B601A25	
	230 amp/1 sec			2-6	4-16	57D4560	1876 819	
					10-40		1876 820	
					20-80		1878 933	
				4-12	10-40	58D4560	1876 821	
					20-80		1876 822	
CRD-9 ①②	Ground	Spst-cc	0.2/2.0 amp dc	0.5-2.5	None	57D4561	1876 823	**FT-31**
				2-6			1876 824	
Very	Current and			4-12			1876 825	
Inverse	Voltage			0.5-2.5	2-8	57D4560	1876 826	
	Polarized				4-16		1876 827	
	208 volt/30 sec			2-6	4-16	57D4560	1876 828	
					10-40		1876 829	
	230 amp/1 sec			4-12	10-40		1876 830	
					20-80		1876 831	
CRD-11 ①②	Ground	Spst-cc	0.2/2.0 amp dc	0.5-2.5	None	57D4561	1955 395	**FT-31**
				2-6			1955 396	
Extremely	Current and			4-12			1955 397	
Inverse	Voltage			0.5-2.5	2-8	57D4560	289B230A17	
	Polarized				4-16		289B230A18	
				2-6	4-16	57D4560	289B230A19	
					10-40		289B230A20	
				4-12	10-40		289B230A21	
					20-80		289B230A22	

Overcurrent, Directional, Negative Sequence

Type and Time Curve	Contacts	Indicating Contactor Switch ③	Current Range Amps Ac		Relay Data		
			Time Unit	Instantaneous Trip: IIT Unit ④	Internal Schematic	Style Number	Case Size
For Ground Fault Protection (Device Number: 67N, DB 41-131E)							
CRQ-9 ⑤	Spst-cc	0.2/2.0	0.5-2.5	None	184A965	774B230A09	**FT-42**
			2-6			774B230A10	
Very			4-12			774B230A11	
Inverse			0.5-2.5	2-8	184A966	774B230A12	
				4-16		774B230A13	
				10-40		774B230A14	
				20-80		774B230A15	
			2-6	4-16	184A966	774B230A16	
				1-40		774B230A17	
				20-80		774B230A18	
			4-12	10-40		774B230A19	
				20-80		774B230A20	

① ③ ④ footnotes, see page 13.
② See potential polarizing transformers, page 12.
⑤ See auxiliary current transformers, page 12.

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