



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

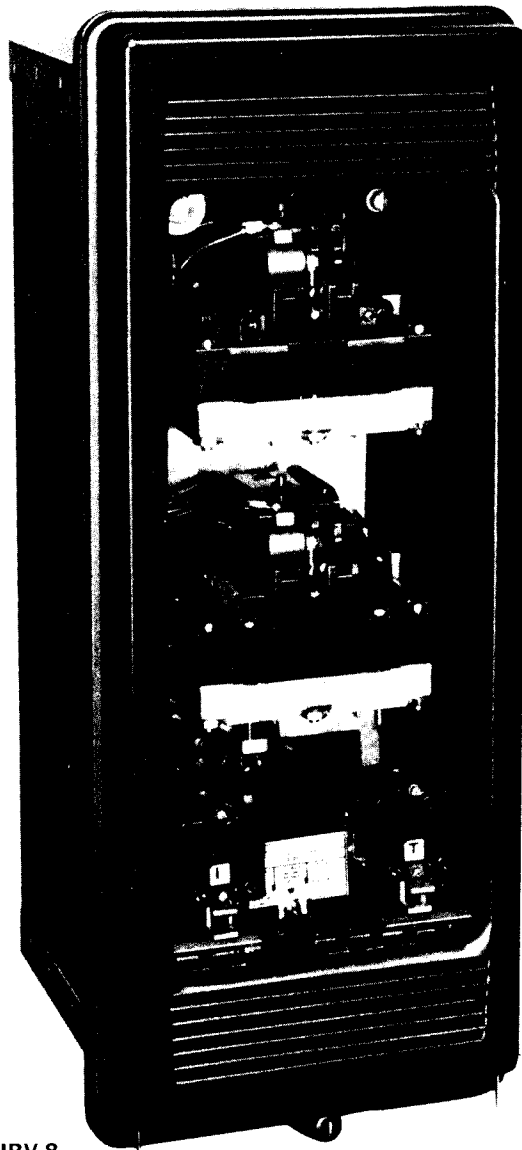
Descriptive Bulletin
41-132E

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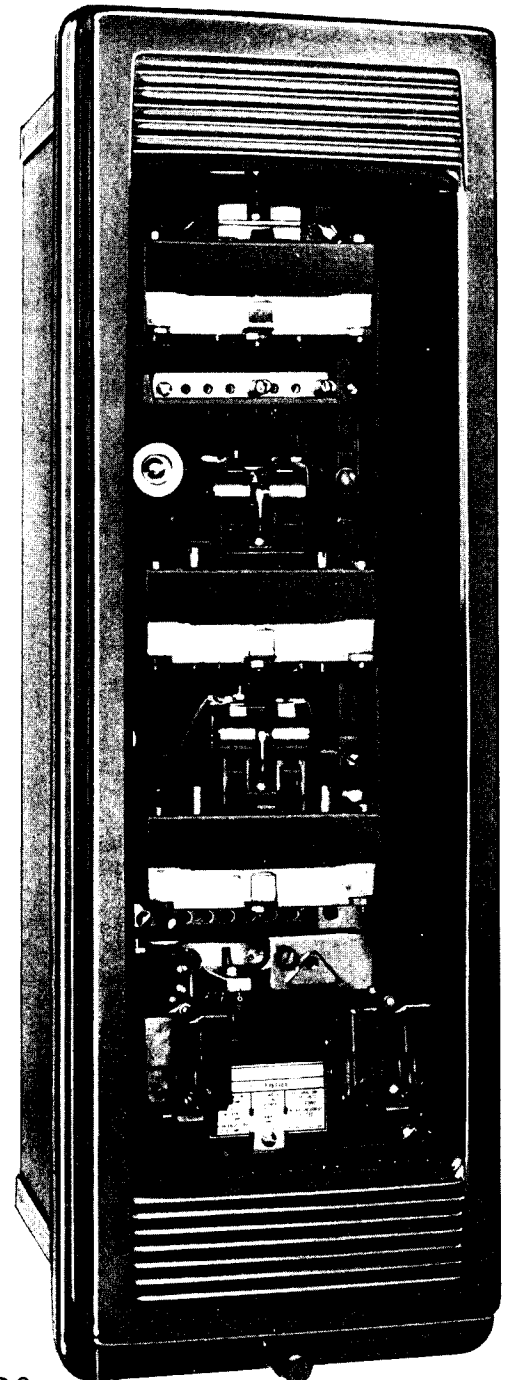
September, 1990
Supersedes DB 41-130B, pages 1-12,
dated September, 1989
Mailed to: E, D, C/41-100A

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

Types IRC, IRP, IRD, IRQ and IRV Directional Overcurrent Relays



IRV-8



IRD-9

Application

Ground Relays – Current and/or Voltage Polarization

The IRP, IRC and IRD line of relays are ground directional overcurrent relays. The time overcurrent and instantaneous overcurrent units are directionally controlled.

The IRC relays are current polarized; IRP relays are voltage polarized; and IRD relays are dual polarized; that is, they can be polarized from a potential source, from a local ground current source or from both simultaneously.

Ground Relays – Negative Sequence

The type IRQ line of relays have a directional unit which operates on negative-sequence current and voltage while the overcurrent unit operates zero-sequence current. Negative-sequence filters connected between the directional unit and the current and voltage transformers supply the negative-sequence current and voltage.

IRQ relays are intended for use at locations where present equipment or system conditions do not permit the use of conventional types of directional ground relays operating entirely on zero-sequence current and voltage.

A typical application of IRQ relays would be at an ungrounded substation on a grounded system where only two voltage transformers are available or where the potential transformers are on the low side of a wye-delta or delta-wye power transformer bank.

The IRQ relay is much less susceptible to mutual problems associated with adjacent lines.

Phase Relays

The IRV line of relays are phase directional overcurrent relays. The time overcurrent and instantaneous overcurrent units are directionally controlled.

IRV relays are polarized by positive sequence phase-to-phase voltage.

Construction
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Settings
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Characteristics

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Selector Guide

Protection	Directional Unit Polarization	Time Characteristics							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	IRV-2	IRV-5	IRV-6	IRV-7	IRV-8	IRV-9	IRV-11	FT-31	67
Ground Fault Detection	Current Polarized by residual current	IRC-2	IRC-5	IRC-6	IRC-7	IRC-8	IRC-9	IRC-11	FT-31	67N
	Voltage Polarized by residual voltage	IRP-2	IRP-5	IRP-6	IRP-7	IRP-8	IRP-9	IRP-11	FT-31	67N
	Voltage and/or Current Polarized by voltage source, or local ground current source; or both simultaneously	IRD-2	IRD-5	IRD-6	IRD-7	IRD-8	IRD-9	IRD-11	FT-41	67N
	Voltage and current Polarized by negative sequence voltage and current	IRQ-2	IRQ-5	IRQ-6	IRQ-7	IRQ-8	IRQ-9	IRQ-11	FT-42	67N

Construction

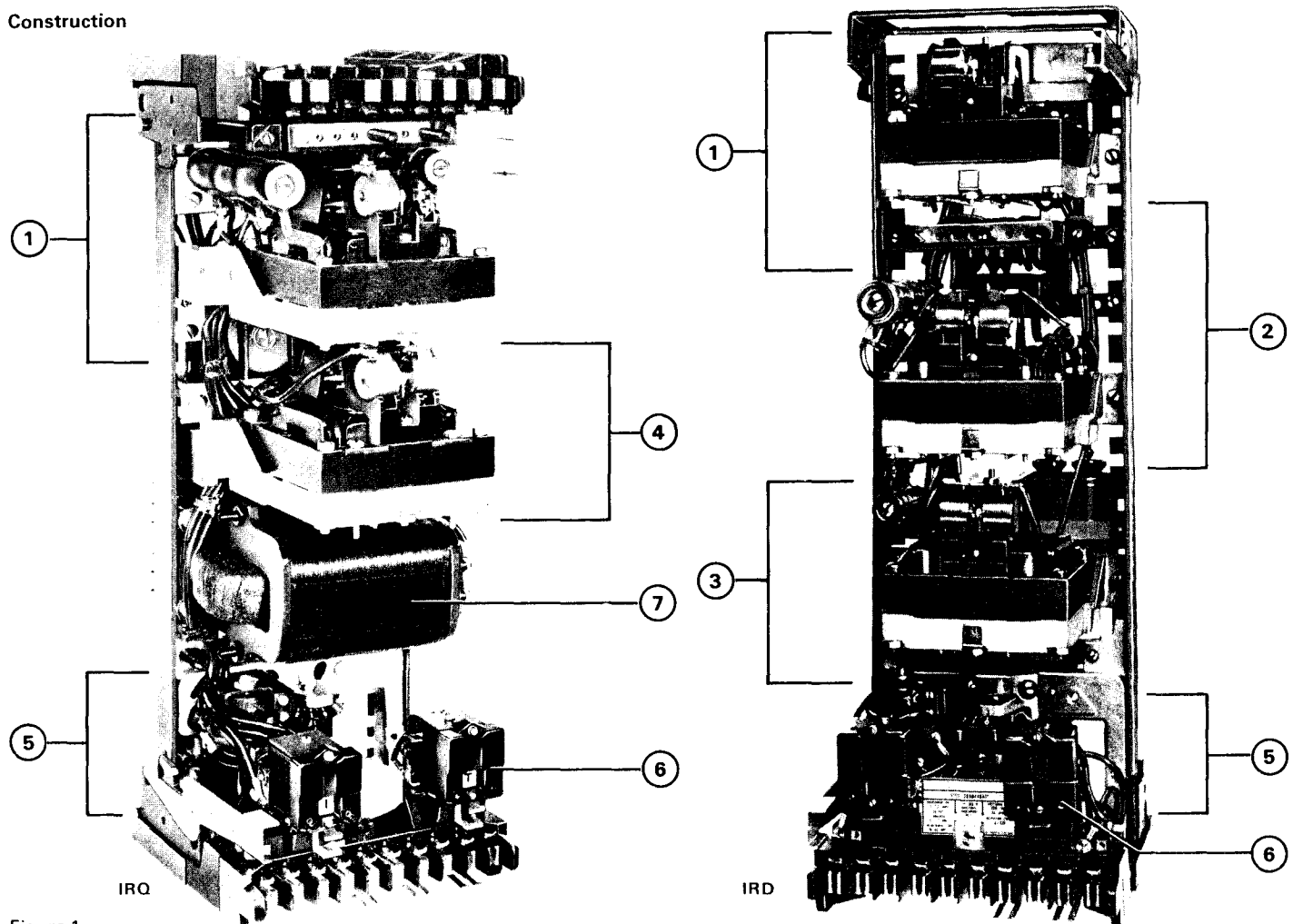


Figure 1

(1) Instantaneous Overcurrent Unit (I)

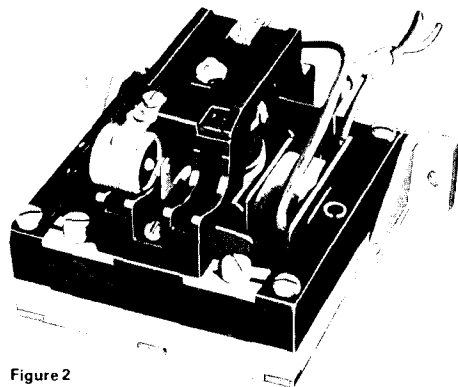


Figure 2

IRC, IRP, IRD, IRQ Ground Relays

This unit is a product type induction cylinder operating as a result of the interaction of two out-of-phase air gap fluxes. The unit is free of vibrations at heavy currents and provides fast, trouble-free reliable operation.

Each of the two pairs of pole windings are energized by ground current from the operating circuit. A capacitor is series-connected with one pair of pole windings to obtain the desired time-phase relationship between the current in the two pairs of coils in order to develop the necessary rotational torque.

As shown in figures 5, 6, 7 and 9, the normally closed contact of the directional unit is connected across one pair of pole windings of the instantaneous overcurrent unit. This contact shunts the operating current around the pole windings, preventing the instantaneous overcurrent unit from developing rotational torque.

Under fault conditions, the short on the in-

stantaneous overcurrent unit coils is removed, allowing the unit to commence closing its contacts almost simultaneously with the directional unit contact, providing high speed operation.

A saturating transformer, having taps on its primary winding, is used to feed the instantaneous overcurrent unit. Tap value current is the minimum current required to just close the relay contacts.

Use of the tapped transformer supplies the same amount of energy to the overcurrent unit for any tap setting at any given multiple of tap current. Consequently, the unit has a constant burden and torque level throughout its entire range, as well as one time curve for the full range. See figure 11.

A non-linear resistor (Varistor) connected across the secondary winding of the transformer and overcurrent unit coils reduces the voltage peaks applied to the phase shifting capacitor and the overcurrent unit.

IRV Phase Relay

The design of the instantaneous overcurrent unit of the IRV phase relay is similar to the ground relays except it receives its energy from the phase current transformers. Also, as shown in figure 8, the capacitor phase shifting circuit is controlled by the normally open contact of the directional unit. This contact also controls operation of the auxiliary switch (telephone relay) which in turn torque-controls the time overcurrent unit.

(2) Zero Sequence Current Polarized Directional Unit (D)

(3) Zero Sequence Voltage Polarized Directional Unit (D)

(4) Negative Sequence (Current and Voltage) Polarized Directional Unit (D)

The directional unit is also a product type induction cylinder unit similar in construction to the instantaneous overcurrent unit. The electromagnet has two series-connected operating coils mounted opposite to each other.

Interaction of the fluxes generated results in rotation of the cylinder. The directional unit requires no settings.

Refer to Figures 10, 12 and 13 for operating time values.

(5) Time Overcurrent Unit (CO)

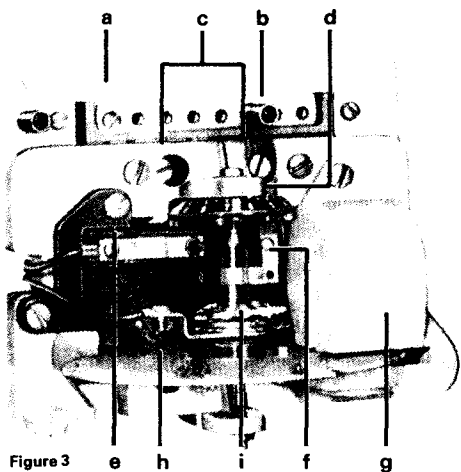


Figure 3

A main tapped coil is placed in the center leg of an "E" type laminated magnetic structure on types -5, -6, -7, -8, and -9. Flux produced by this coil returns through the two outer legs of the electromagnet. A shading coil on the left leg of the electromagnet creates an out-of-phase flux which reacts with the main coil flux in the air gap of the electromagnet to cause disc rotation in the contact closing direction.

Electromagnet for types -2 and -11 are similar in construction, except both outer legs have windings to produce the necessary out-of-phase fluxes required for contact-closing rotational torque.

a. Tap Block

Indicates minimum current required to just close the relay contacts.

b. Tap Screw

Two supplied. When changing taps, the spare is inserted into the new position prior to removal of the previous setting tap screw. This prevents open circuiting of the associated current transformers.

c. Magnetic Plugs

May be screwed into or out of the magnetic circuit to control saturation and to adjust calibration at high currents. Damping magnet and spring adjustments permits calibration at low currents.

d. Time Dial

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

e. Stationary Contact

Made of pure silver. Will close 30 amperes at 250 volts dc. Has sufficient wipe to assure positive contact. In fast breaker reclosing schemes which require quick-opening relay contacts, the metal plate is reversed, holding the stationary contact fixed against the backstop. On double trip relays, adjustment of 1/64" (.3969 mm) contact follow or "wipe" is obtained by use of a vernier adjusting screw on the stationary contact plate.

f. Moving Contact

Also pure silver. It is clamped to the insulated section of the induction disc shaft. Contacts will close 30 amperes at 250 volts dc.

g. Damping Magnet

A high strength Alnico damping magnet is used to control operating time of the relay at low current values.

h. Induction Disc

Spiral shaped to compensate for the spring windup throughout moving contact travel, i.e., provides accurate pickup at any disc position.

i. Spring Adjuster

Used to set the minimum trip current of the relay, and to provide in-between tap pickup adjustment, when desired.

(6) Indicating Contactor Switch (ICS) (Partially Disassembled)

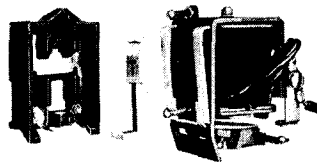


Figure 4

Dc operated. Has a clapper type magnetic armature to which leaf-spring contacts are attached.

When energized, the moving contacts bridge the stationary contacts, completing the trip circuit. The ICS contacts are connected in parallel with the main relay contacts, relieving them of carrying heavy trip currents.

During operation, an operation indicator target drops. The target is orange color, and highly visible.

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 relay, the 0.2 amp tap is recommended. The 2.0 amp tap is used on 24 or 48 volt dc circuits.

(7) Negative Sequence Filter

This filter is fed by negative sequence current and negative sequence voltage, and consists of reactors and resistors connected as shown in figure 9. (IRQ relays only.)

(8) Auxiliary Switch (Telephone Relay)

A dc switch with a tapped resistor is used to allow use on 24, 48, 125, or 250 Vdc systems.

Operation of auxiliary switch is controlled by the directional unit (D) which in turn directionally controls the time overcurrent unit (CO). When sufficient power is flowing in the trip direction, auxiliary switch will operate and permit the time overcurrent unit to operate.

The IRV relays have a second contact on the auxiliary switch unit which will seal in the coil through the break contact of the I unit. This relieves the make contact of the directional unit (D) from carrying the auxiliary switch coil current. The break contact of the D unit breaks this seal-in by shorting the auxiliary switch coil. The break contact of the instantaneous overcurrent unit (I) also breaks the seal-in of the auxiliary switch coil to prevent tripping on reversed faults where the directional unit was preclosed on load current.

Internal Wiring (Front View)

IRC-2, IRC-5, IRC-6, IRC-7, IRC-8, IRC-9, IRC-11 for Ground Fault Detection ① (FT-31 Case)

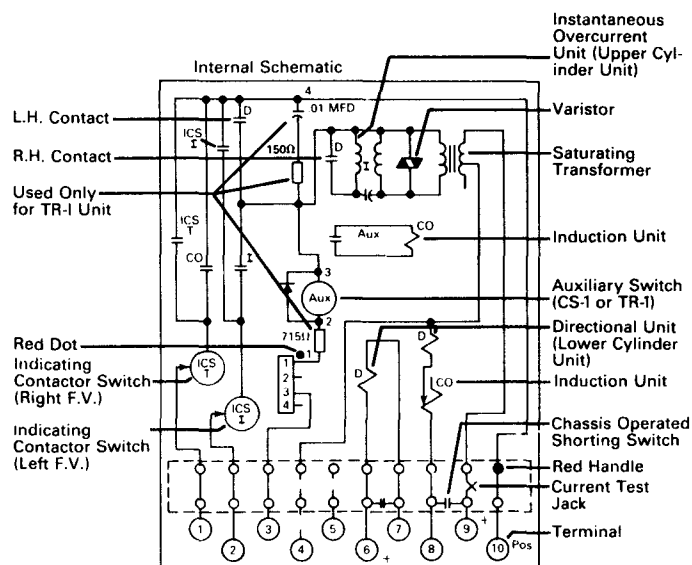


Figure 5

184A034

IRP-2, IRP-5, IRP-6, IRP-7, IRP-8, IRP-9, IRP-11 for Ground Fault Detection ① (FT-31 Case)

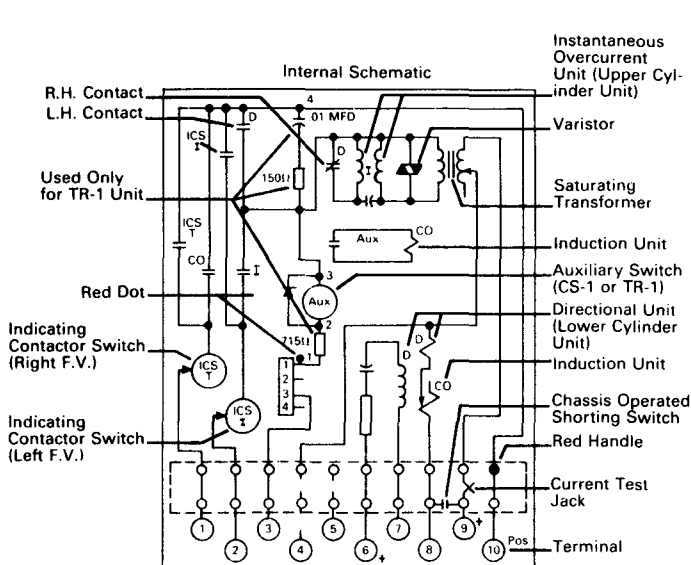


Figure 6

184A033

IRD-2, IRD-5, IRD-6, IRD-7, IRD-8, IRD-9, IRD-11 for Ground Fault Detection ① (FT-41 Case)

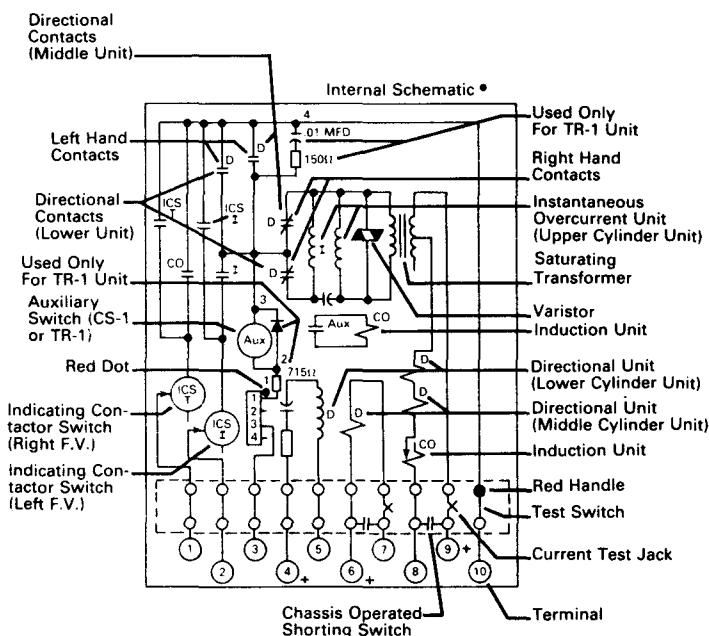


Figure 7

184A020

IRV-2, IRV-5, IRV-6, IRV-7, IRV-8, IRV-9, IRV-11 for Phase Fault Detection ① (FT-31 Case)

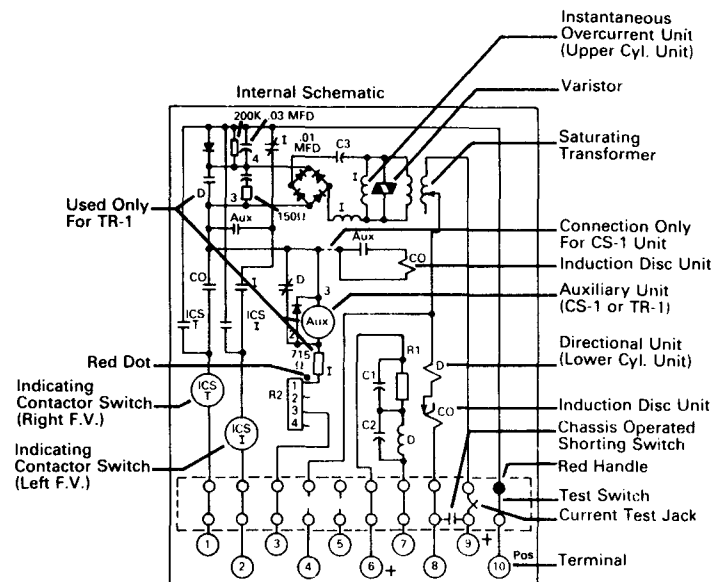


Figure 8

185A421

① With Instantaneous Polarity as Shown (+), Open Directional Contacts Close.

**IRQ-2, IRQ-5, IRQ-6, IRQ-7, IRQ-8, IRQ-9, IRQ-11
for Ground Fault Detection (FT-42 Case)**

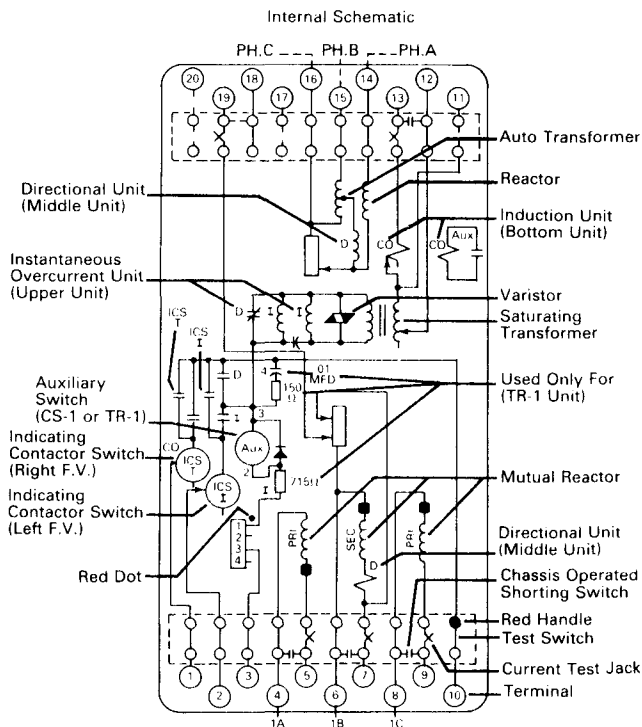


Figure 9

185A096

Relay Settings

The instantaneous and time-overcurrent units require setting, whereas the directional unit does not.

On both overcurrent units, the tap selected determines the minimum pickup or contact-closing current of the unit. Selective time dial settings on the time-overcurrent unit can be determined by referring to the time current curves in the appropriate Instruction Leaflet.

Telephone Relay Operating Time

Operating time of the telephone relay auxiliary switch is approximately 7 milliseconds.

Telephone Relay Coil Resistance (Ohms)

DC resistance is 1500 ohms.

Typical Time Curves

IRC, IRD, IRP Directional Unit

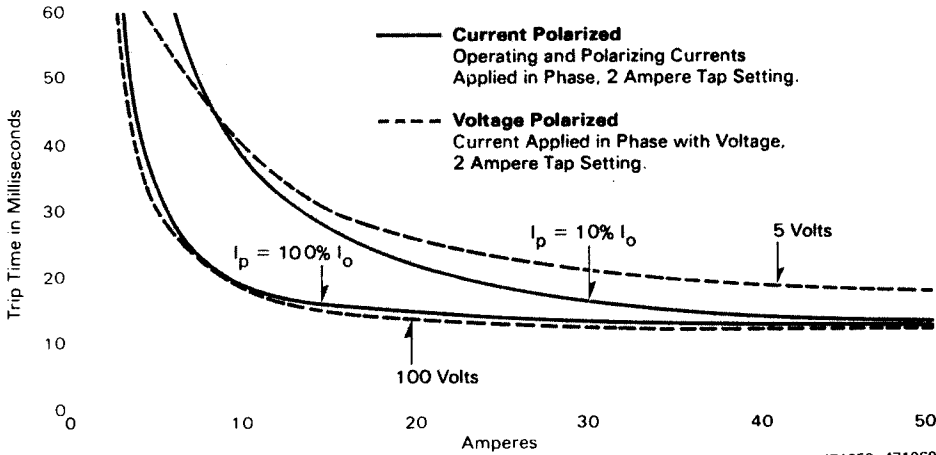


Figure 10

IRC, IRP, IRD, IRQ, IRV Instantaneous Overcurrent Unit

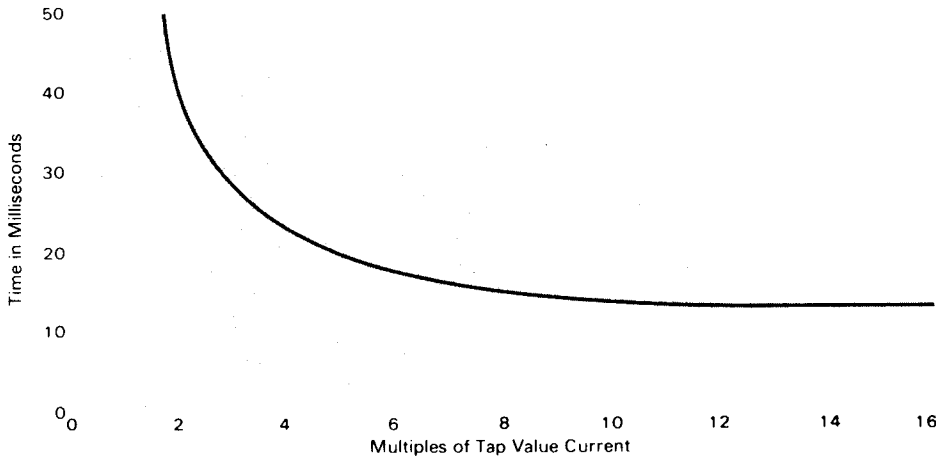


Figure 11

IRV Directional Unit

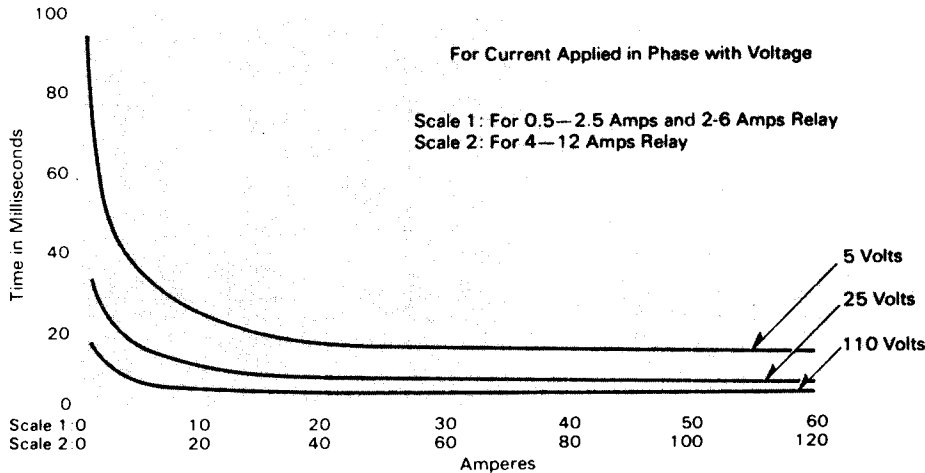


Figure 12

IRQ Directional Unit

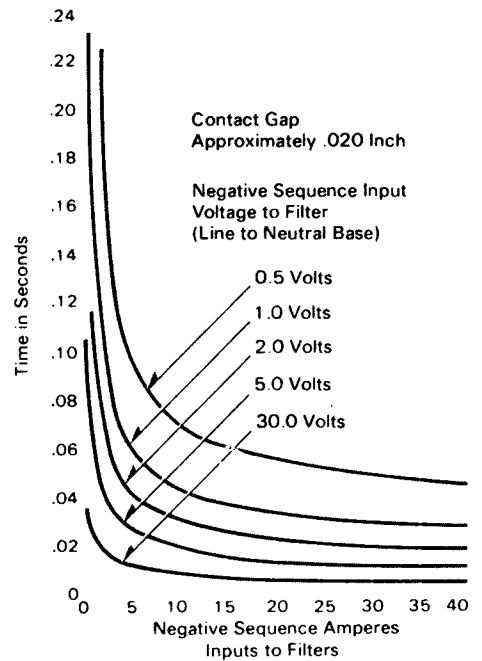


Figure 13

Sensitivity Curve

IRQ Directional Unit

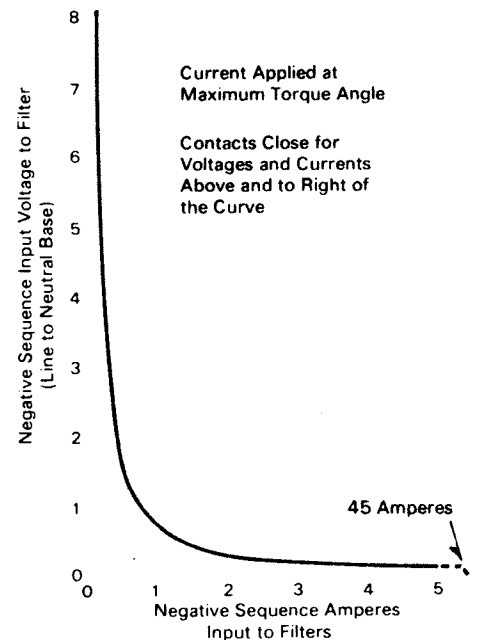


Figure 14

Type IRC for Ground Fault Detection

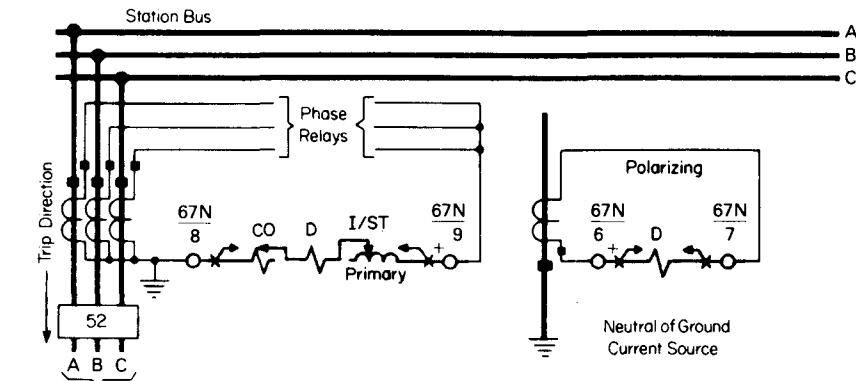


Figure 15

289B507

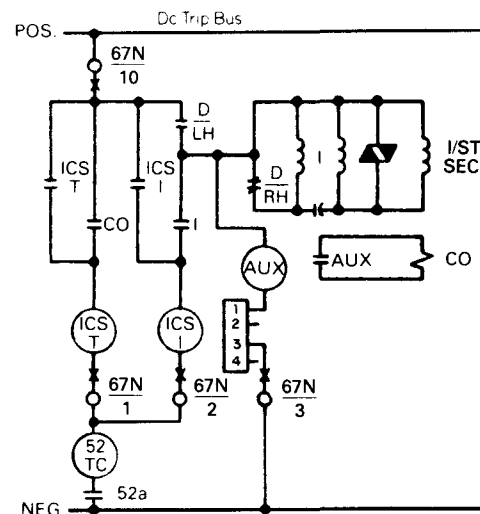
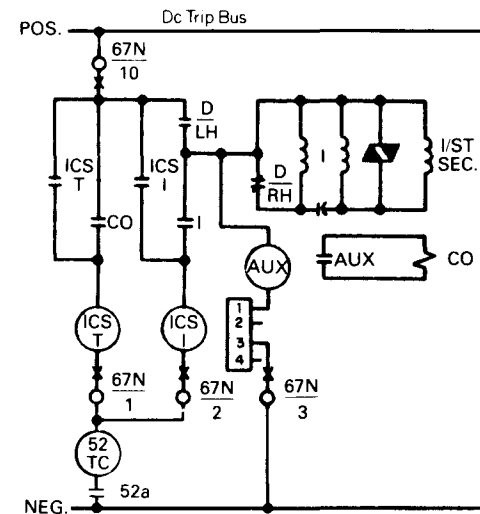


Figure 16

289B506



Station Bus

Phase Relays

67N 8

CO D/U D/L I/ST 67N 9

Primary

52

A B C

67N 6+ D/U 7

I_p

Neutral of Ground Current Source

When Not Used, Jumper Terminals 4 and 5

Main Potential Transformer

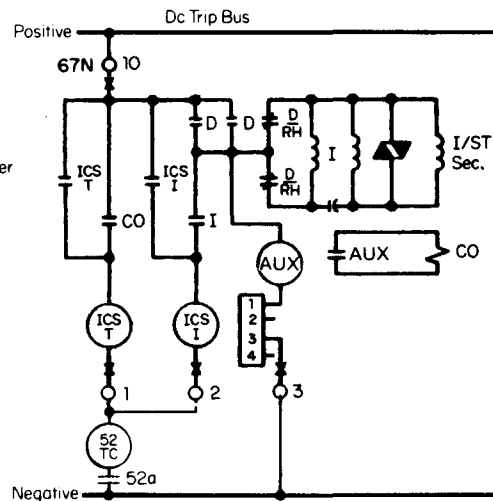
Auxiliary Potential Transformer

67N 5 D/L +4

A B C G

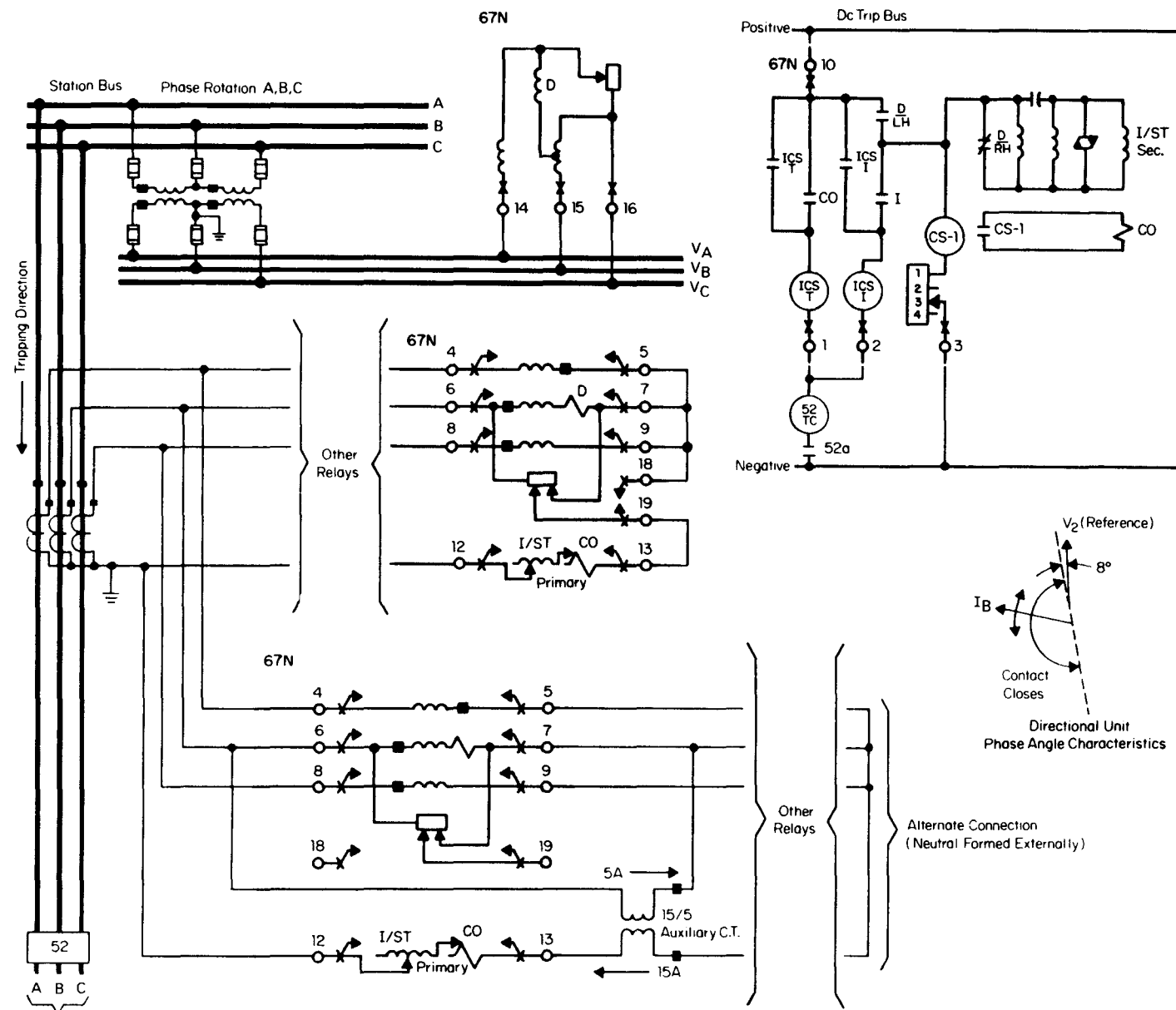
Figure 17

289B508



External Wiring, Continued

Type IRQ for Ground Fault Detection



Device Number Chart

67N — Directional Overcurrent Negative Sequence Ground Relay, Type IRQ

D — Directional Unit

—Instantaneous-Overcurrent Unit

CO —Time-Overcurrent Unit

I/ST — Saturating Transformer for Instantaneous Overcurrent Unit

ICS — Indicating Contactor Switch

CS-1 —Auxiliary Contactor Switch

52 —Power Circuit Breaker

52a —Breaker Auxiliary Contact

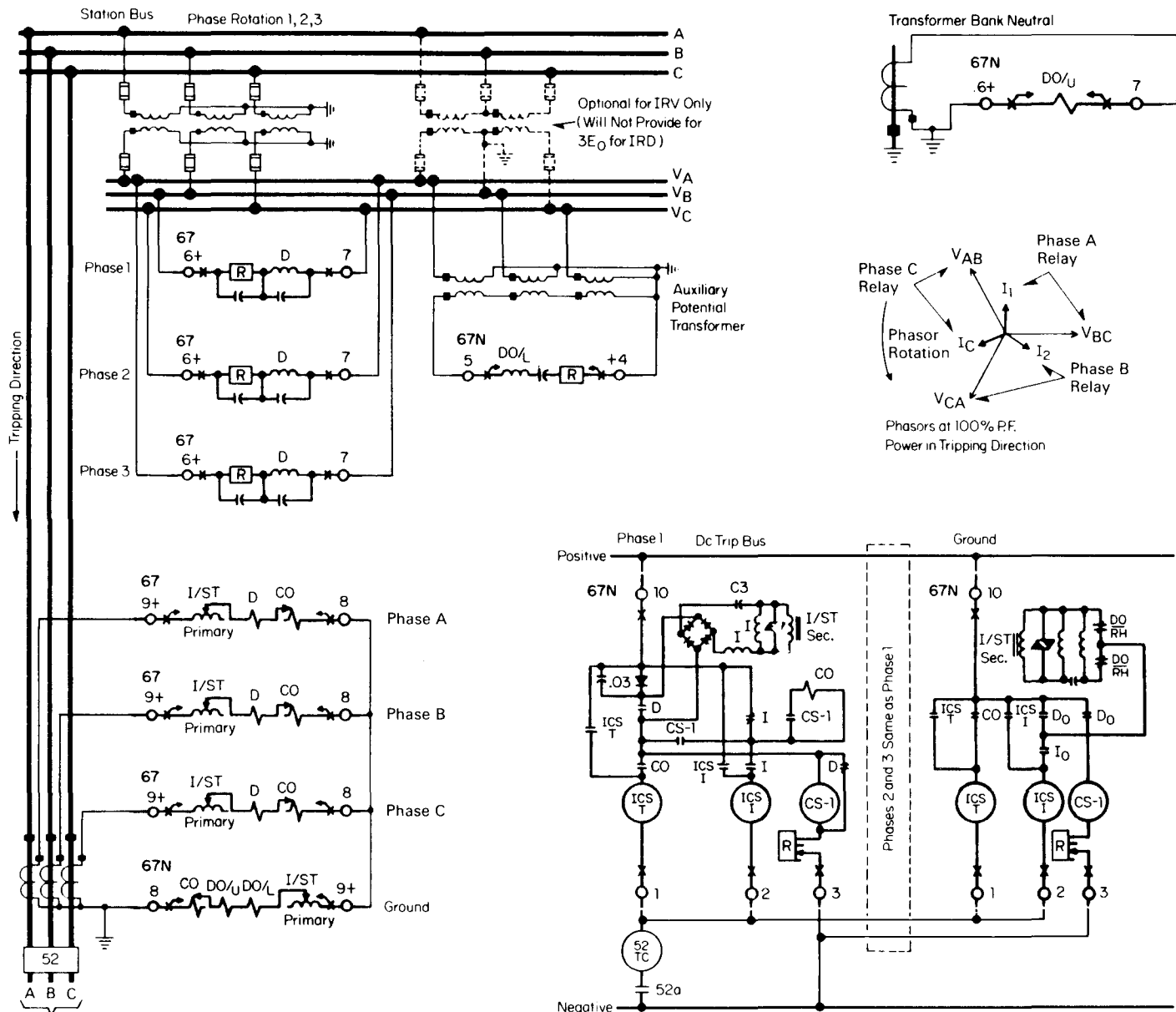
52TC—Breaker Trip Coil

Figure 18

290B551

External Wiring, Continued

Types IRV and IRD for Phase and Ground Fault Detection



Device Number Chart

67 —Phase Directional Overcurrent Relay, Type IRV

67N —Ground Directional Overcurrent Relay, Type IRD
(Both 67 and 67N)
CO —Time Overcurrent Unit
I, I₀ —Instantaneous o/c Unit
D, D₀ —Directional Unit
CS1 —Auxiliary Switch
ICS/T —Indicating Contactor Switches
ICS/I —Saturing Transformer for Inst. o/c Unit

52 —Power Circuit Breaker
a —Breaker Auxiliary Contact
TC —Breaker Trip Coil

Figure 19

290B747

September, 1990

Characteristics: IRC, IRP, IRD, IRV
Burden Data and Thermal Capacities, Instantaneous – Overcurrent Unit (I) Ratings

Range	Amps Continuous	1-Second ①	Range	Amps Continuous	1-Second ①
0.5-2	5	100	4-16	10	200
1-4	8	140	10-40	10	200
2-8	8	140	20-80	10	200

① Thermal capacities for short times other than 1 second may be calculated on the basis of time being inversely proportional to the square of the current.

Volt-Ampere Burden See Instr. Leaflets 41-133 and 133.3

Burden Data and Thermal Capacities, Directional Unit (D)
(a) Polarizing Circuit

Relay Type	Burden in Volt-Amps ①		P.F. Angle ②	Rating	1-Second	30-Second
	@ 120 V	@ 5 A		Continuous		
IRC		1.45	8° Lag		230 Amp	
IRP	11.2		28° Lead	120 Volts		208 Volts ③
IRD (Current Unit)		1.45	8° Lag		230 Amp	
IRD (Voltage Unit)	11.2		28° Lead	120 Volts		208 Volts ③
IRV	12.5		15° Lead	132 Volts		

① Voltages taken with Rectox type voltmeter.

② Degrees current lags or leads voltage @ 120 V on voltage polarized units & @ 5 A on current polarized units.

③ 10 second rating is 345 Volts.

(b) Operating circuit, See Instruction Leaflets 41-133 for IRC, IRD, IRP relays & 41-133.3 for IRV relays.

(c) Directional Unit Sensitivity

Relay Type	Tap Range in Amps	Minimum Pickup		Phase Angle
		Volts	Amps	
IRC, IRD Current Unit	0.5-2.5	...	0.5	I _o leading I _p by 40°
	2-6	...	0.57	in phase
	4-12	...	1.0	I _o leading I _p by 40°
		...	1.3	in phase
IRP, IRD Voltage Unit	0.5-2.5	1	2	I lagging V by 60°
	2-6	1	4	I in phase with V
	4-12	1	4	I lagging V by 60°
		1	8	I in phase with V
IRV Voltage Unit	0.5-2.5	1.2	2	I leading V by 30°
	2-6	1.2	2.3	I in phase with V
	4-12	1.2	4	I leading V by 30°
		1.2	4.6	I in phase with V



Characteristics: IRQ ①

Burden data for the Sequence Filter and the Directional Unit

A. Current Burden at 60 hertz

Phase	Continuous Rating, Amps	1-Second Rating, Amps	Watts at 5 Amps	Volt-Amperes at 5 Amps	Power Factor Angle
Positive Sequence Current Applied (no output current to the directional unit)					
1	10	150	5.4	7.5	44° Lag
2	10	150	5.5	5.5	0°
3	10	150	.35	1.28	74° Lag
Zero Sequence Currents Applied					
1	..	...	4.66	5.5	32°
2	..	...	4.92	5.0	10°
3	..	...	3.30	3.7	27°

B. Voltage Burden at 60 hertz Positive Sequence Currents Applied, See IL 41-133.2

**C. Instantaneous Overcurrent Unit
Operating Current Circuit – 60 hertz**

Range	Continuous Rating (Amperes)	One Second Rating † (Amperes)
0.5-2	5	100
1-4	8	140
2-8	8	140
4-16	10	200
10-40	10	200
20-80	10	200

† Thermal capacities for short times other than one second may be calculated on the basis of time being inversely proportional to the square of the current.

① Characteristics apply to complete IRQ relay, not to individual units.

Shipping Weights and Carton Dimensions

Relay Type	Flexitest Case Type	Weight: Pounds (kg)		Domestic Shipping Carton Dimensions: Inches (cm)
		Net	Shipping	
IRC	FT-31	32 (14.5)	30 (13.6)	8 x 10 x 21 (20.3 x 25.4 x 53.3)
IRP	FT-31	23 (10.4)	30 (13.6)	8 x 10 x 21 (20.3 x 25.4 x 53.3)
IRD	FT-41	27 (12.2)	34 (15.4)	8 x 10 x 21 (20.3 x 25.4 x 61)
IRV	FT-31	26 (11.8)	33 (14.9)	8 x 10 x 21 (20.3 x 25.4 x 53.3)
IRQ	FT-42	29 (13.2)	36 (16.3)	8 x 10 x 21 (20.3 x 25.4 x 61)

Further Information

List Prices: PL 41-020

Technical Data: TD 41-025

Instructions:

- Type IRC, IRD and IRP, IL 41-133
- Type IRQ, IL 41-133.2
- Type IRV, IL 41-133.3

Renewal Parts:

- Type IRC, RPD 41-940
- Type IRD, RPD 41-941
- Type IRP, RPD 41-942
- Type IRQ, RPD 41-943
- Type IRV, RPD 41-944

Flexitest Case Dimensions: DB 41-076

Contactors Switches: DB 41-081

Other Protective Relays:

- Application Selector Guide, TD 41-016



December, 1990
Supersedes TD 41-020, Types IRC, IRP,
IRD, IRQ and IRV on pages 29-34,
dated November, 1987
Mailed to: E, D, C/41-100A

For Phase or Ground Fault Detection –
Transmission Lines and Feeder Circuits

Types IRC, IRP, IRD, IRQ and IRV Directional Overcurrent Relays

Overcurrent, Directional, Single Phase, With Directional Instantaneous Trip Unit For Ground Fault Protection (Device Number: 67N)

Type, Time Curve and Contacts	Application	Indicating Contactor Switch③	Current Range: Amps Ac		Relay Data			
			Time Unit	Instantaneous Trip	Internal Schematic	Style Number	Case Size	
IRC-2① Short Spst-cc	Ground Fault Detection	0.2/2.0 amp dc	0.5-2.5	2-8 4-16 10-40 20-80	184A034	289B435A09 289B435A10 289B435A11 289B435A12	FT-31	
				4-16 10-40 20-80		289B435A13 289B435A14 289B435A15		
	Current Polarized 230 amps/1 sec		2-6 4-12	10-40 20-80		289B435A17 289B435A18		
				10-40 20-80				
IRC-5① Long Spst-cc	Ground Fault Detection	0.2/2.0 amp dc	0.5-2.5	2-8 4-16 20-80	184A034	289B523A09 289B523A10 289B523A11	FT-31	
				4-16 10-40 20-80		289B523A13 289B523A14 289B523A15		
	Current Polarized 230 amps/1 sec		2-6 4-12	10-40 20-80		289B523A17 289B523A18		
				10-40 20-80				
IRC-6① Definite Spst-cc	Ground Fault Detection	0.2/2.0 amp dc	0.5-2.5	2-8 4-16 10-40 20-80	184A034	289B436A09 289B436A10 289B436A11 289B436A12	FT-31	
				4-16 10-40 20-80		289B436A13 289B436A14 289B436A15		
	Current Polarized 230 amps/1 sec		2-6 4-12	10-40 20-80		289B436A17 289B436A18		
				10-40 20-80				
IRC-7① Moderately inverse Spst-cc	Ground Fault Detection	0.2/2.0 amp dc	0.5-2.5	2-8 4-16 10-40 20-80	184A034	289B437A09 289B437A10 289B437A11 289B437A12	FT-31	
				4-16 10-40 20-80		289B437A13 289B437A14 289B437A15		
	Current Polarized 230 amps/1 sec		2-6 4-12	10-40 20-80		289B437A17 289B437A18		
				10-40 20-80				
IRC-8① Inverse Spst-cc	Ground Fault Detection	0.2/2.0 amp dc	0.5-2.5	2-8 4-16 10-40 20-80	184A034	289B438A09 289B438A10 289B438A11 289B438A12	FT-31	
				4-16 10-40 20-80		289B438A13 289B438A14 289B438A15		
	Current Polarized 230 amps/1 sec		2-6 4-12	10-40 20-80		289B438A17 289B438A18		
				10-40 20-80				

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 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 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.



Overcurrent, Directional, Single Phase, With Directional Instantaneous Trip Unit, Continued
For Ground Fault Protection, Continued

Type, Time Curve and Contacts	Application	Indicating Contactor Switch ^③	Current Range: Amps Ac		Relay Data		
			Time Unit	Instantaneous Trip	Internal Schematic	Style Number	Case Size
IRC-9 ^① Very inverse Spst-cc	Ground Fault Detection	0.2/2.0 amp dc	0.5-2.5	2-8 4-16 10-40 20-80	184A034	289B439A09 289B439A10 289B439A11 289B439A12	FT-31
				2-6 4-16 10-40 20-80		289B439A13 289B439A14 289B439A15	
	Current Polarized 230 amps/1 sec		4-12 10-40 20-80	289B439A17 289B439A18			
IRC-11 ^① Extremely inverse Spst-cc	Ground Fault Detection	0.2/2.0 amp dc	0.5-2.5	2-8 4-16 10-40 20-80	184A034	289B931A09 289B931A10 289B931A11 289B931A12	FT-31
				2-6 4-16 10-40 20-80		289B931A13 289B931A14 289B931A15	
	Current Polarized 230 amps/1 sec		4-12 10-40 20-80	289B931A17 289B931A18			
IRD-6 ^{①②} Definite Spst-cc	Ground Fault Detection	0.2/2.0 amp dc	0.5-2.5	2-8 4-16 10-40 20-80	184A020	289B446A09 289B446A10 289B446A11 289B446A12	FT-41
				2-6 4-16 10-40 20-80		289B446A13 289B446A14 289B446A15	
	Current and Voltage Polarized 230 amps/1 sec 208 volts/30 sec		4-12 10-40 20-80	289B446A17 289B446A18			
IRD-7 ^{①②} Moderately inverse Spst-cc	Ground Fault Detection	0.2/2.0 amp dc	0.5-2.5	2-8 4-16 10-40 20-80	184A020	289B447A09 289B447A10 289B447A11 289B447A12	FT-41
				2-6 4-16 10-40 20-80		289B447A13 289B447A14 289B447A15	
	Current and Voltage Polarized 230 amps/1 sec 208 volts/30 sec		4-12 10-40 20-80	289B447A17 289B447A18			
IRD-8 ^{①②} Inverse Spst-cc	Ground Fault Detection	0.2/2.0 amp dc	0.5-2.5	2-8 4-16 10-40 20-80	184A020	289B448A09 289B448A10 289B448A11 289B448A12	FT-41
				2-6 4-16 10-40 20-80		289B448A13 289B448A14 289B448A15	
	Current and Voltage Polarized 230 amps/1 sec 208 volts/30 sec		4-12 10-40 20-80	289B448A17 289B448A18			
IRD-9 ^{①②} Very inverse Spst-cc	Ground Fault Detection	0.2/2.0 amp dc	0.5-2.5	2-8 4-16 10-40 20-80	184A020	289B449A09 289B449A10 ^⑤ 289B449A11 ^⑤ 289B449A12	FT-41
				1-4 1-4 2-8 4-16 10-40 20-80		289B449A35 289B449A34 289B449A16 289B449A33 289B449A32	
	Current and Voltage Polarized 230 amps/1 sec 208 volts/30 sec		2-6 4-16 10-40 20-80	289B449A13 289B449A14 289B449A15			
			4-12 10-40 20-80	289B449A17 289B449A18			

⑤ 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".

② See potential polarizing transformers, page 18.

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 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 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.

Overcurrent, Directional, Single Phase, With Directional Instantaneous Trip Unit, Continued
For Ground Fault Protection, Continued

Type, Time Curve and Contacts	Application	Indicating Contactor Switch ^③	Current Range: Amps Ac		Relay Data		
			Time Unit	Instantaneous Trip	Internal Schematic	Style Number	Case Size
IRD-11 ① ② Extremely Inverse Spst-cc	Ground Fault Detection	0.2/2.0 amp dc	0.5-2.5	2-8 4-16 10-40 20-80	184A020	289B932A09 289B932A10 289B932A11 289B932A12	FT-41
	Current and Voltage Polarized		2-6	4-16 10-40 20-80		289B932A13 289B932A14 289B932A15	
	230 amps/1 sec 208 volts/30 sec		4-12	10-40 20-80		289B932A17 289B932A18	
IRP-7 ① ② Moderately inverse Spst-cc	Ground Fault Detection	0.2/2.0 amp dc	0.5-2.5	2-8 4-16 20-40 20-80	184A033	289B442A09 289B442A10 289B442A11 289B442A12	FT-31
	Voltage Polarized		2-6	1-4 4-16 10-40 20-80		289B442A16 289B442A13 289B442A14 289B442A15	
	208 volts/30 sec		4-12	10-40 20-80		289B442A17 289B442A18	
IRP-8 ① ② Inverse Spst-cc	Ground Fault Detection	0.2/2.0 amp dc	0.5-2.5	2-8 4-16 10-40 20-80	184A033	289B443A09 289B443A10 289B443A11 289B443A12	FT-31
	Voltage Polarized		2-6	4-16 10-40 20-80		289B443A13 289B443A14 289B443A15	
	208 volts/30 sec		4-12	10-40 20-80		289B443A17 289B443A18	
IRP-9 ① ② Very inverse Spst-cc	Ground Fault Detection	0.2/2.0 amp dc	0.5-2.5	5-2 2-8 4-16 10-40 20-80	184A033	289B444A16 289B444A09 289B444A10 289B444A11 289B444A12	FT-31
	Voltage Polarized		2-6	4-16 10-40 20-80		289B444A13 289B444A14 289B444A15	
	208 volts/30 sec		4-12	10-40 20-80		289B444A17 289B444A18	
IRP-11 ① ② Extremely inverse Spst-cc	Ground Fault Detection	0.2/2.0 amp dc	0.5-2.5	2-8 4-16 10-40 20-80	184A033	289B933A09 289B933A10 289B933A11 289B933A12	FT-31
	Voltage Polarized		2-6	4-16 10-40 20-80		289B933A13 289B933A14 289B933A15	
	208 volts/30 sec		4-12	10-40 20-80		289B933A17 289B933A18	

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

② See potential polarizing transformers, page 18.

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 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 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.



Overcurrent, Directional and Time, With Directional Instantaneous Trip Unit, Continued
For Phase Fault Protection (Device Number: 67)

Type, Time Curve and Contacts	Application	Indicating Contactor Switch	CS-1 Auxiliary Switch	Control Circuit: Volts Dc	Current Range: Amps Ac		Relay Data		
					Time Unit	Instantaneous Trip	Internal Schematic	Style Number	Case Size
IRV-2 ①	Phase Fault Detection	0.2/2.0 amp dc 2 ICS units per relay	48/125/250 volts dc	48/125/250	0.5-2.5	1-4 2-8 4-16 10-40 20-80	185A421	290B089A18 290B089A09 290B089A10 290B089A11 290B089A12	FT-31
Short									
Spst-cc	Voltage Polarized				2-6	4-16 10-40 20-80		290B089A13 290B089A14 290B089A15	
	120 Volts 60 Hertz				4-12	4-16 10-40 20-80		290B089A19 290B089A16 290B089A17	
IRV-6 ①	Phase Fault Detection	0.2/2.0 amp dc 2 ICS units per relay	48/125/250 volts dc	48/125/250	0.5-2.5	1-4 2-8 4-16 10-40 20-80	185A421	290B091A18 290B091A09 290B091A10 290B091A11 290B091A12	FT-31
Definite									
Spst-cc	Voltage Polarized				2-6	4-16 10-40 20-80		290B091A13 290B091A14 290B091A15	
	120 Volts 60 Hertz				4-12	4-16 10-40 20-80		290B091A19 290B091A16 290B091A17	
IRV-7 ①	Phase Fault Detection	0.2/2.0 amp dc 2 ICS units per relay	48/125/250 volts dc	48/125/250	0.5-2.5	1-4 2-8 4-16 10-40 20-80	185A421	290B092A18 290B092A09 290B092A10 290B092A11 290B092A12	FT-31
Moderately inverse									
Spst-cc	Voltage Polarized				2-6	4-16 10-40 20-80		290B092A13 290B092A14 290B092A15	
	120 Volts 60 Hertz				4-12	4-16 10-40 20-80		290B092A19 290B092A16 290B092A17	
IRV-8 ①	Phase Fault Detection	0.2/2.0 amp dc 2 ICS units per case	48/125/250 volts dc	48/125/250	0.5-2.5	1-4 2-8 4-16 10-40 20-80	185A421	290B093A18 290B093A09 290B093A10 290B093A11 290B093A12	FT-31
Inverse									
Spst-cc	Voltage Polarized				2-6	4-16 10-40 20-80		290B093A13 290B093A14 290B093A15	
	120 Volts 60 Hertz				4-12	4-16 10-40 20-80		290B093A19 290B093A16 290B093A17	
IRV-9 ①	Phase Fault Detection	0.2/2.0 amp dc 2 ICS units per case	48/125/250 volts dc	48/125/250	0.5-2.5	1-4 2-8 4-16 10-40 20-80	185A421	290B094A18 290B094A09 290B094A10 290B094A11 290B094A12	FT-31
Very Inverse									
Spst-cc	Voltage Polarized				2-6	4-16 10-40 20-80		290B094A13 290B094A14 290B094A15	
	120 Volts 60 Hertz				4-12	4-16 10-40 20-80		290B094A19 290B094A16 290B094A17	

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

Overcurrent, Directional and Time, With Directional Instantaneous Trip Unit, Continued
For Phase Fault Protection, Continued

Type, Time Curve and Contacts	Application	Indicating Contactor Switch	CS-1 Auxiliary Switch	Control Circuit: Volts Dc	Current Range: Amps Ac		Relay Data		
					Time Unit	Instantaneous Trip	Internal Schematic	Style Number	Case Size
IRV-11 ①	Phase Fault Detection	0.2/2.0 amp dc 2 ICS units per relay	48/125/250 volts dc	48/125/250	0.5-2.5	1-4 2-8 4-16 10-40 20-80	185A421	290B095A18 290B095A09 290B095A10 290B095A11 290B095A12	FT-31
Extremely inverse									
Spst-cc	Voltage Polarized				2-6	4-16 10-40 20-80		290B095A13 290B095A14 290B095A15	
	120 Volts 60 Hertz				4-12	4-16 10-40 20-80		290B095A19 290B095A16 290B095A17	

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

Overcurrent, Directional, Negative Sequence, With Directional Instantaneous Trip Unit
For Ground Fault Protection (Device Number: 67N)

Type, Time Curve and Contacts	Application	Indicating Contactor Switch③	Current Range: Amps Ac	Relay Data				
				Time Unit	Instantaneous Trip	Internal Schematic	Style Number	Case Size
IRQ-2	Ground Detection	0.2/2.0 amp dc	0.5-2.5	2-8 4-16 10-40 20-80		185A096	774B233A09 774B233A10 774B233A11 774B233A12	FT-42
Short								
Spst-cc				2-6	4-16 10-40 20-80		774B233A13 774B233A14 774B233A15	
				4-12	10-40 20-80		774B233A16 774B233A17	
IRQ-5	Ground Detection	0.2/2.0 amp dc	0.5-2.5	2-8 4-16 10-40 20-80		185A096	774B234A09 774B234A10 774B234A11 774B234A12	FT-42
Long								
Spst-cc				2-6	4-16 10-40 20-80		774B234A13 774B234A14 774B234A15	
				4-12	10-40 20-80		774B234A16 774B234A17	
IRQ-6	Ground Detection	0.2/2.0 amp dc	0.5-2.5	2-8 4-16 10-40 20-80		185A096	774B235A09 774B235A10 774B235A11 774B235A12	FT-42
Definite								
Spst-cc				2-6	4-16 10-40 20-80		774B235A13 774B235A14 774B235A15	
				4-12	10-40 20-80		774B235A16 774B235A17	

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(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 on order.


Overcurrent, Directional, Negative Sequence, With Directional Instantaneous Trip Unit
 For Ground Fault Protection, Continued

Type, Time Curve and Contacts	Application	Indicating Contactor Switch ^③	Current Range: Amps Ac		Relay Data		
			Time Unit	Instantaneous Trip	Internal Schematic	Style Number	Case Size
IRQ-7 Moderately inverse Spst-cc	Ground Detection	0.2/2.0 amp dc	0.5-2.5	2-8	185A096	774B236A09	FT-42
				4-16		774B236A10	
				10-40		774B236A11	
				20-80		774B236A12	
			2-6	4-16		774B236A13	
				10-40		774B236A14	
				20-80		774B236A15	
				10-40		774B236A16	
			4-12	20-80		774B236A17	
				2-8		774B237A09	
				4-16		774B237A10	
				10-40		774B237A11	
IRQ-8 Ground Detection	Ground Detection	0.2/2.0 amp dc	0.5-2.5	2-8	185A096	774B237A09	FT-42
				4-16		774B237A10	
				10-40		774B237A11	
				20-80		774B237A12	
			2-6	4-16		774B237A13	
				10-40		774B237A14	
				20-80		774B237A15	
				10-40		774B237A16	
			4-12	20-80		774B237A17	
				1.0 amp dc		774B237A22	
				0.5-2.5		848A617	
				10-40		774B237A22	
IRQ-9 Very inverse Spst-cc	Ground Fault Detection	0.2/2.0 amp dc	0.5-2.5	5-2	185A096	774B238A19	FT-42
				2-8		774B238A09	
				4-16		774B238A10	
				10-40		774B238A11	
				20-80		774B238A12	
			2-6	4-16		774B238A13	
				10-40		774B238A14	
				20-80		774B238A15	
				10-40		774B238A16	
			4-12	20-80		774B238A17	
				2-8		774B238A19	
				4-16		774B238A10	
				10-40		774B238A11	
				20-80		774B238A12	
			2-6	4-16		774B238A13	
				10-40		774B238A14	
				20-80		774B238A15	
				10-40		774B238A16	
			4-12	20-80		774B238A17	

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:
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 (2) 1.0 amp dc, without taps.

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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 on order.

Potential Polarizing Transformers, Single Phase (Product Bulletin 42-871 for dimensions)④

Volt-amps	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 wye/broken delta	9626A06G01
		200	115	66.5				9626A06G02
		200	115	115				9626A06G03

④ Refer to LVIT Sales, Low Voltage Instrument Transformer Division, Pinetops, NC, for price and shipment.

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