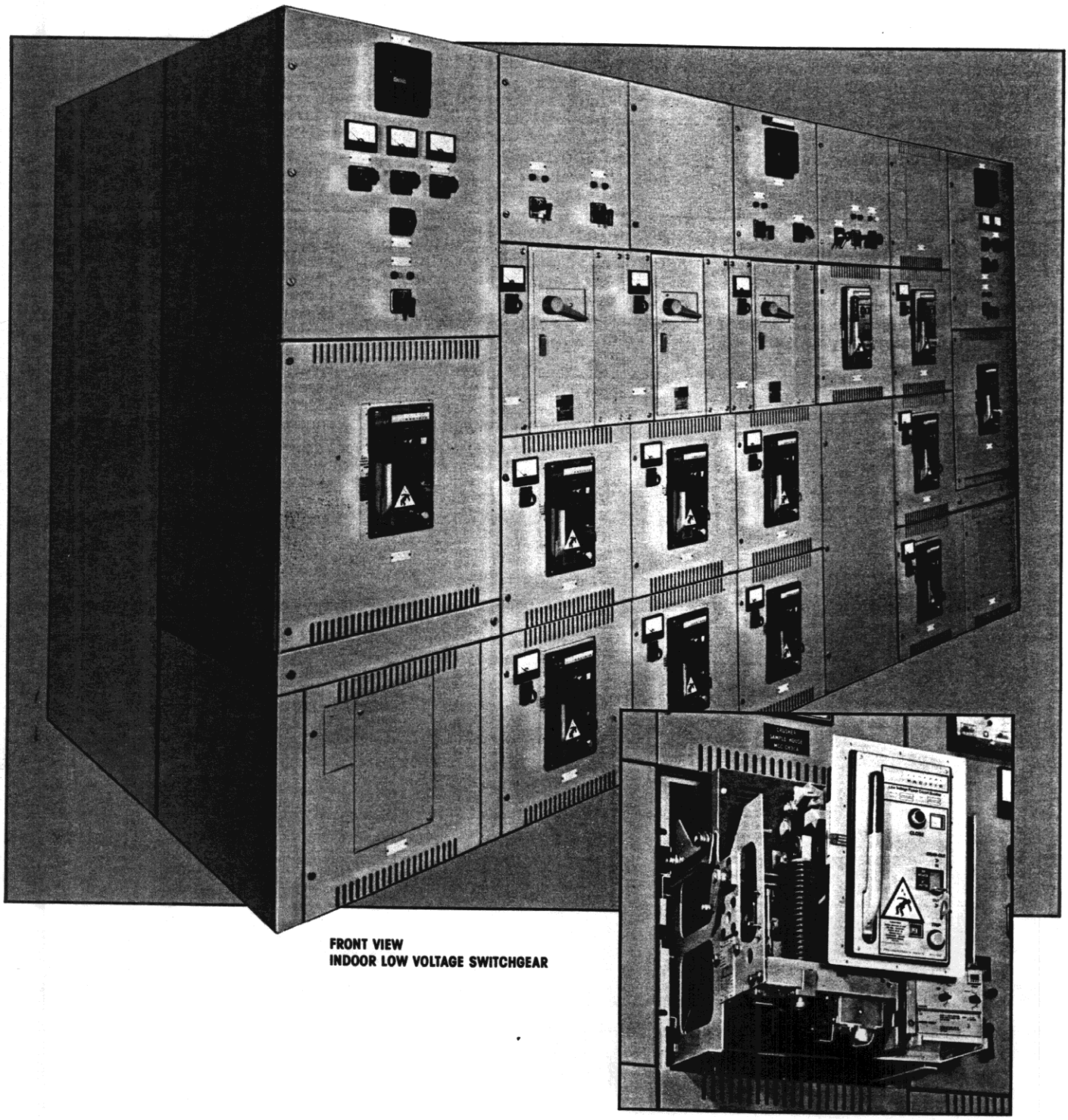
FPS4 Low Voltage Switchgear

Featuring the New Type FPS4 AC Power Circuit Breakers with Solid State Overcurrent Relays



FRONT VIEW
INDOOR LOW VOLTAGE SWITCHGEAR

CLASS 6010

TYPE FPS4

FPS4 Low Voltage Switchgear

Featuring the New Type FPS4 AC Power Circuit Breakers with Solid State Overcurrent Relays

TABLE OF CONTENTS

GENERAL DESCRIPTION

Federal Pacific low voltage switchgear utilizes advanced design concepts to provide maximum protection to distribution equipment with optimum safety to operating personnel. The equipment is specifically designed for use in industrial plants, commercial buildings, and utility companies where a high degree of service continuity and reliability are required. The systems can be applied at ratings ranging from 70 amperes through 3200 amperes at voltages from 240 to 600 volts AC and interrupting ratings up to 85,000 amperes symmetrical. Significant design innovations enable Federal Pacific to produce reliable metal-enclosed switchgear and permit considerable flexibility in its application. All Federal Pacific Type FPS4 circuit breakers feature a unique "Power-Grip" design. These breakers are equipped with a stored energy mechanism mechanically trip-free in any position of the closing cycle, and a fully adjustable solid state trip device with current sensors. The drawout breakers are equipped with a three position drawout mechanism which is operable with the enclosure door closed, thus allowing for safe operating techniques and maintenance.

Every switchgear unit is completely assembled and wired prior to shipment. Proper testing and quality control procedures insure compliance with the user's requirements and applicable industry standards.

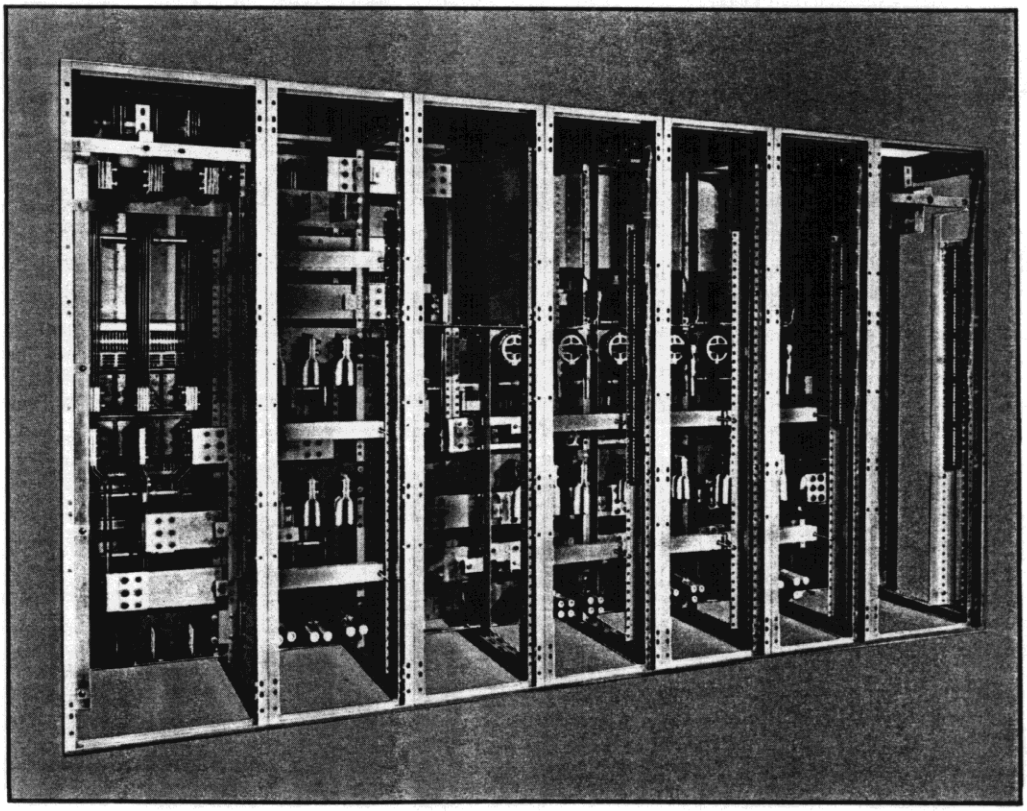


FIGURE I
TYPICAL VIEW OF BUS AND CABLE COMPARTMENT (FRONT VIEW SHOWN ON COVER)

FPS4 Low Voltage Switchgear

Featuring the New Type FPS4 AC Power Circuit Breakers with Solid State Overcurrent Relays

FEATURES:

ENERGY CONSERVING OPERATING MECHANISM. The FPS4 breaker is equipped with a spring-charged stored energy mechanism and may be provided to operate electrically or manually.
The operating mechanism is mechanically trip free in any position of the closing cycle. The closing spring of the mechanism operates in compression and is armed by means of a ratchet gear assembly.

COMPRESSION SPRINGS. Compression type springs are used in the mechanism because of their proven reliability.

SLOW-CLOSING. The stored energy system has been designed to permit slow-closing of the main control structure for maintenance and inspection purposes.

"POWER-GRIP" CONTACT DESIGN. The contact structure, applying a unique "Power Grip" design, utilizes electromagnetic forces to create a "blow-on" effect which greatly increases the capability of the entire contact structure to carry high momentary currents.

ADJUSTABLE SOLID STATE TRIP DEVICE. An adjustable solid state overcurrent device is standard equipment on all breakers with sensors. The devices are available in six models (Figure 19) to perform different functions as required.

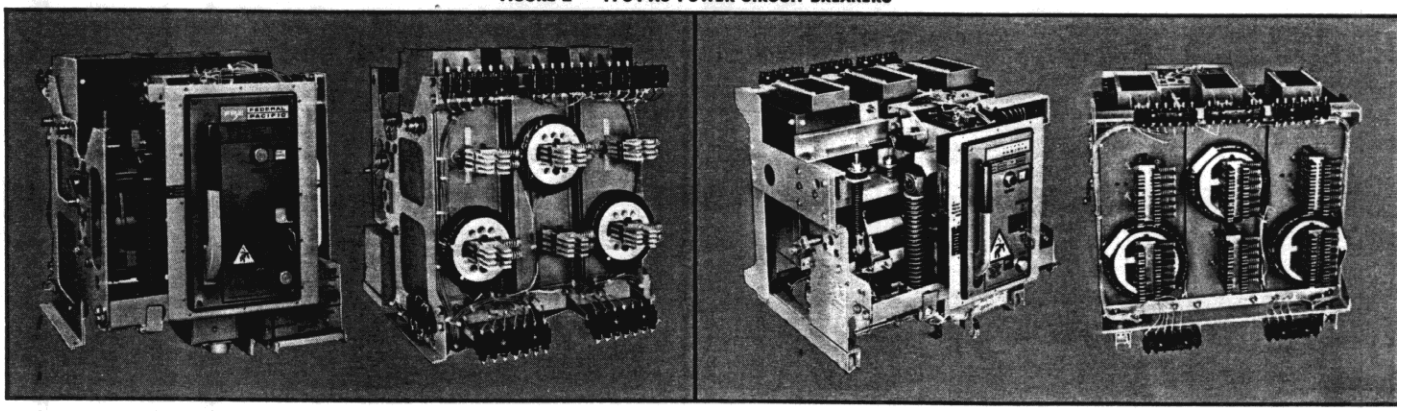
EMERGENCY OPERATION. The FPS4 electrically-operated breakers have provision for emergency manual charging. They can be charged manually by operation of the charging lever on the breaker front cover.

OPTIONAL EQUIPMENT:

- Alarm switch, hand reset
- Auxiliary switch, 4 contact
- Electrical lockout
- Selective (short time delay) trip
- Shunt close (for manually operated breakers)
- Shunt trip (for manually operated breakers, necessary auxiliary switch included)
- Undervoltage trip, instantaneous
- Undervoltage trip, time delay
- Operation counter
- Key interlock
- Integrally mounted current limiting fuses*

*Fuses for 2000 and 3200 ampere circuit breakers are located in a separate compartment on an interlocked drawout carriage.

FIGURE 2 — FPS4 AC POWER CIRCUIT BREAKERS



FRONT VIEW REAR VIEW

FPS4-30-800 AMP CIRCUIT BREAKER
(FPS4-50-1600 AMP AND 2000 AMP SIMILAR)

FRONT VIEW REAR VIEW

FPS4-75-3200 AMP CIRCUIT BREAKER

TABLE I
FPS4 STANDARD BREAKER RATINGS

AC VOLTAGE RATING 60 HERTZ	BREAKER TYPE	MAXIMUM BREAKER RATING IN AMPERES	SHORT-CIRCUIT RATING (rms symmetrical amperes)	
			INSTANTANEOUS TRIP	SHORT-DELAY TRIP
600V	FPS4-30	800A	30,000	30,000
	FPS4-50	1600A	50,000	50,000
	FPS4-50	2000A	50,000	50,000
	FPS4-75	3200A	65,000	65,000
480V	FPS4-30	800A	30,000	30,000
	FPS4-50	1600A	50,000	50,000
	FPS4-50	2000A	50,000	50,000
	FPS4-75	3200A	65,000	65,000
240V	FPS4-30	800A	42,000	30,000
	FPS4-50	1600A	65,000	50,000
	FPS4-50	2000A	65,000	50,000
	FPS4-75	3200A	85,000	65,000

FPS4 Low Voltage Switchgear

TYPE FPS4

Featuring the New Type FPS4 AC Power Circuit Breakers with Solid State Overcurrent Relays

- **THREE POSITION DRAWOUT.** Type FPS4 breakers can be moved from the "connected," "test," or "disconnected" positions without opening the cell door. The drawout shutter is freed by pushing the manual trip button to open the breaker. The shutter can then be lifted and a racking handle inserted into the racking screw and turned counter-clockwise until the "test" position is reached. The "disconnect" position is reached by additional turns of the handle. At the end of the travel, a stop prevents further withdrawal of the breaker.

- **TELESCOPING ROLLOUT RAILS.** Breakers can be completely withdrawn from the cell for examination, maintenance, or replacement by unlocking the safety latches and pulling the breaker out. Telescoping rollout rails rigidly attached to the breaker cell provide support for the breaker to roll in and out. A positive stop at the end of the rails prevents further travel after the breaker has completely cleared the enclosure. The breaker can be lifted from the rails by the lifting device.

FIGURE 3
CONNECTED POSITION

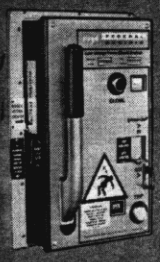


FIGURE 4
TEST POSITION

FIGURE 5
DISCONNECTED POSITION

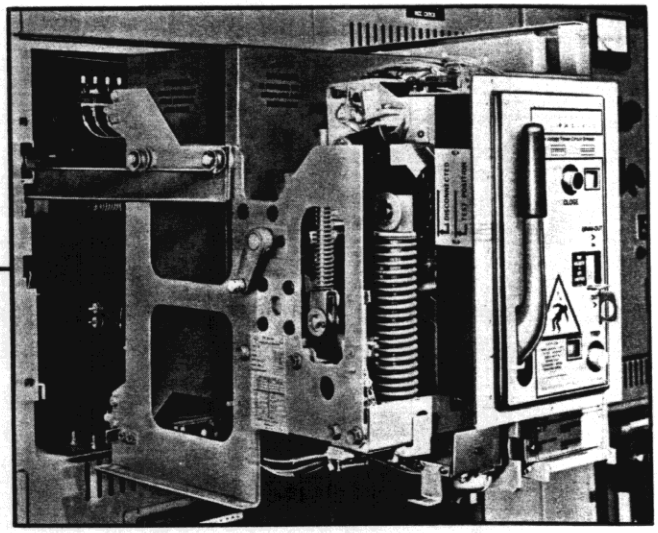


FIGURE 6
WITHDRAWN POSITION

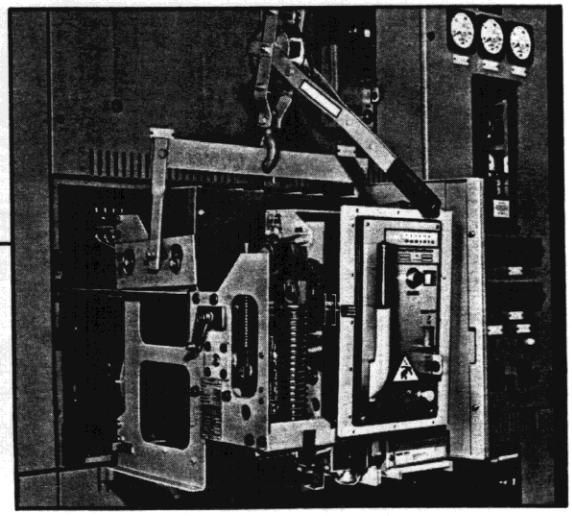


FIGURE 7
LIFTING DEVICE

FPS4 Low Voltage Switchgear

Featuring the New Type FPS4 AC Power Circuit Breakers with Solid State Overcurrent Relays

CONSTRUCTION:
Federal Pacific low voltage switchgear is modern in appearance and design, and incorporates the latest methods in fabrication and assembly techniques.

- **BREAKER CELLS.** Circuit breaker cells are made of formed sheet steel and are fixture welded to insure accurate alignment for interchangeability of circuit breakers. Only two standard sizes are required to house the complete breaker range from 800A to 3200A.

AUXILIARY EQUIPMENT. Auxiliary cells for housing equipment such as potential transformers, fuses, and relays are similar in construction to breaker cells. The equipment is barriered from other sections of the switchgear.

- **DOORS.** Each breaker cell door is rigidly constructed to provide safe closed door racking in the "connected," "test," and "disconnected" positions.

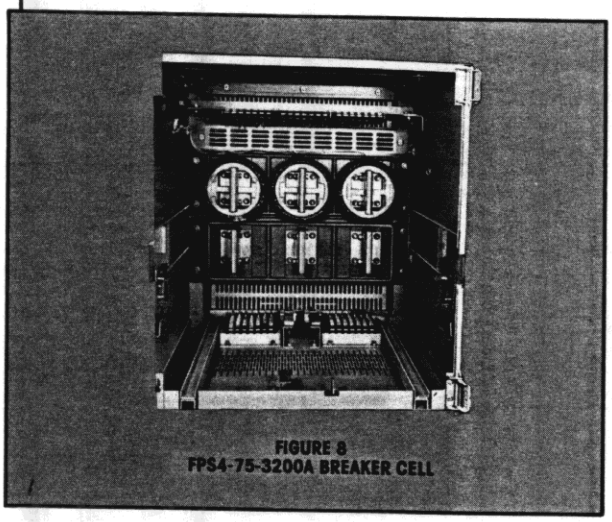


FIGURE 8
FPS4-75-3200A BREAKER CELL

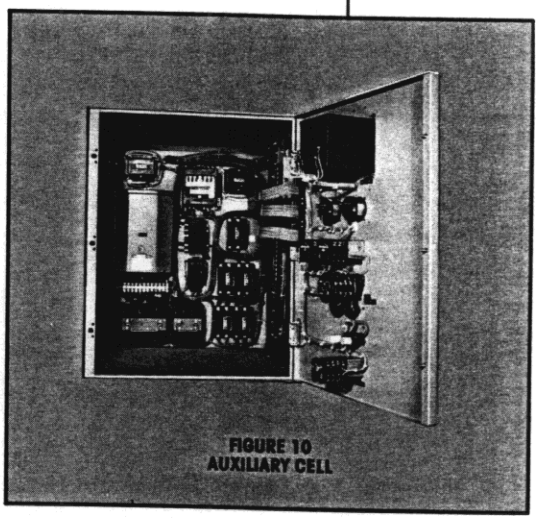


FIGURE 10
AUXILIARY CELL

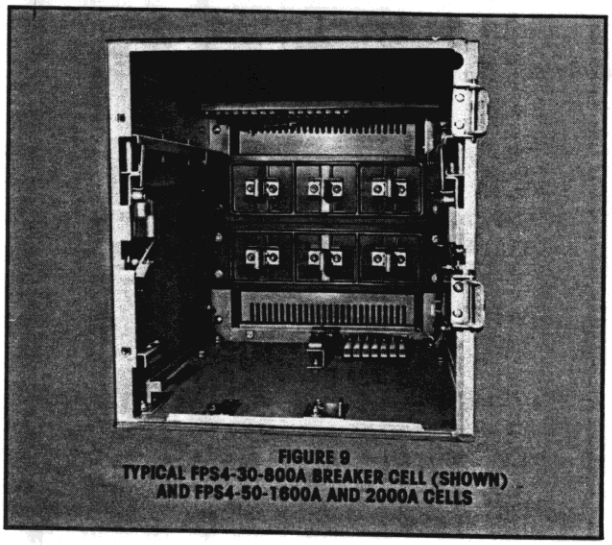


FIGURE 9
TYPICAL FPS4-30-800A BREAKER CELL (SHOWN) AND FPS4-50-1600A AND 2000A CELLS

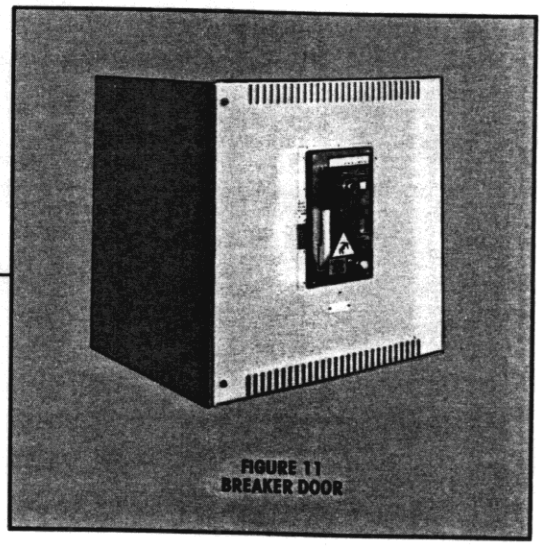


FIGURE 11
BREAKER DOOR

FPS4 Low Voltage Switchgear

TYPE FPS4

Featuring the New Type FPS4 AC Power Circuit Breakers with Solid State Overcurrent Relays

CLASS 6010

● **FRAMES.** A welded frame construction provides a strong steel framework for the switchgear bus and cable compartment. The top and rear of this compartment, as well as the side on an end unit, is provided with removable steel covers. A rear door is supplied as an option.

● **BUS SYSTEMS.** Bus joints are tin plated (silver optional) for maximum conductivity and bolted to allow flexibility for adjustment to achieve optimum alignment. The bus bars are securely braced to withstand the shocks and magnetic stresses caused by fault currents capable of being produced by the system in which the switchgear is installed. The main bus is stacked vertically with the longest axis in the same plane. This arrangement presents a more compact and mechanically stronger design. Bus connections are easily accessible for inspection and maintenance. Insulated bus is available as an option to allow optimum safety during operation and maintenance.

ISOLATION BARRIERS. Isolation barriers are supplied between the line and load sides of the tie breaker bus. When specified, isolation barriers are available for maximum safety and protection between the main bus and the cable compartments.

● **TERMINAL BLOCKS.** Terminal blocks for control circuits are located where they are accessible from the rear of the switchboard. Terminal blocks can be mounted on both sides of the cable compartment.

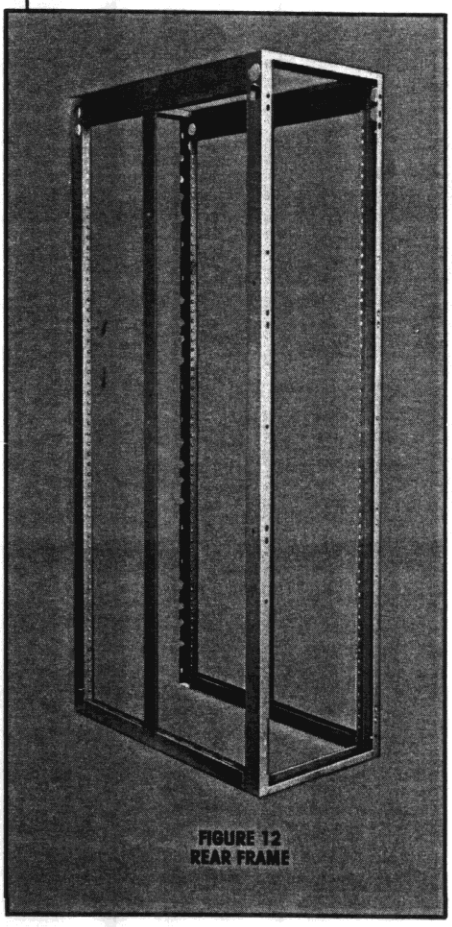


FIGURE 12
REAR FRAME

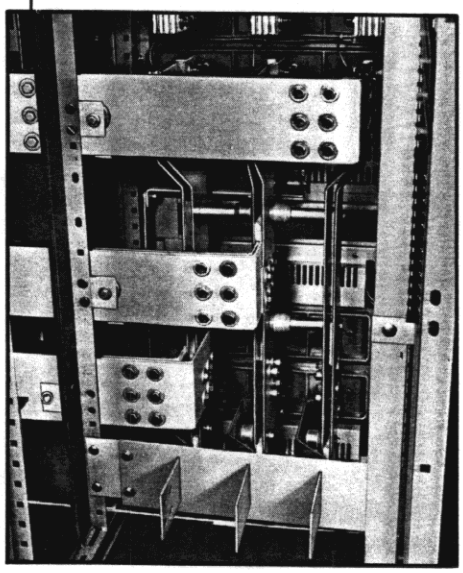


FIGURE 13
TYPICAL BUS SYSTEM ASSEMBLY

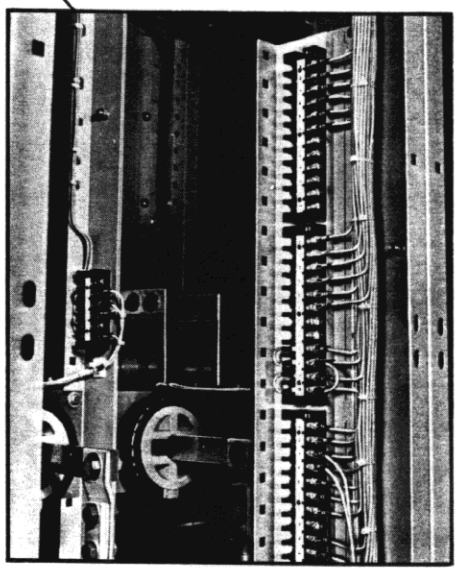


FIGURE 14
TERMINAL BLOCKS

Featuring the New Type FPS4 AC Power Circuit Breakers with Solid State Overcurrent Relays

OUTDOOR CONSTRUCTION

Outdoor protected aisle switchgear includes an assembly similar to indoor low voltage equipment with an outdoor weatherproof protective housing enclosing the switchgear and work aisle. This arrangement makes operation, meter and instrument reading, inspection, checking, and breaker interchange possible in any kind of weather.

Access doors are provided at both ends of the aisle. Both doors are equipped with panic-bar door latches which can be opened from the inside in an emergency even though locked on the outside.

Additions can be made in the future to either end of the equipment.

The bottom portion of the base is sprayed with a corrosion resistant undercoat. The completed assembly may be installed on grouted channel sills or on piers.

Lights, controlled by three-way switches at both doors, are provided in the work aisle for illumination.

Receptacles are provided for added convenience.

Space heaters are supplied in the equipment to minimize condensation. Ventilation of the work aisle and the switchgear is provided by louvers in the access doors and hinged rear panels. Louvers to the exterior are covered with filters which can be removed for cleaning and maintenance.

Optional equipment includes:

—exhaust and pressure fans.
—radiant, strip, and suspension electric heaters.
—fluorescent lighting.
—insulated aisle interior.

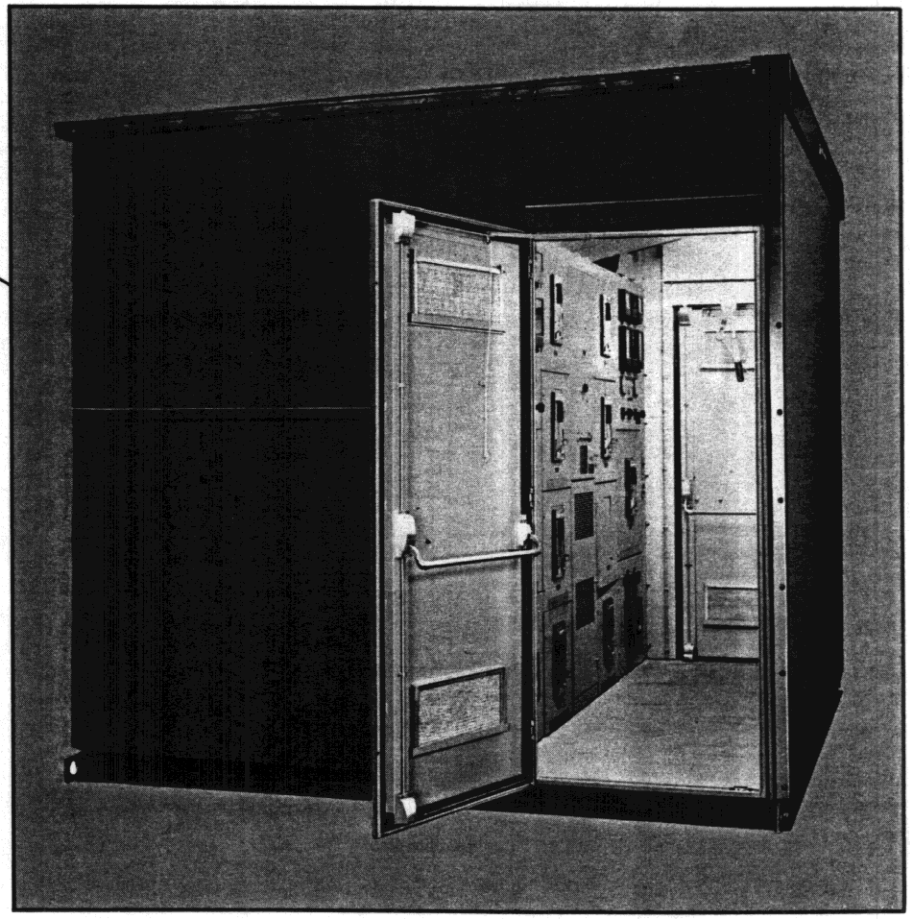


FIGURE 15
WALK-IN ASSEMBLY

FPS4 Low Voltage Switchgear

TYPE FPS4

Featuring the New Type FPS4 AC Power Circuit Breakers with Solid State Overcurrent Relays

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DIMENSIONAL DRAWINGS

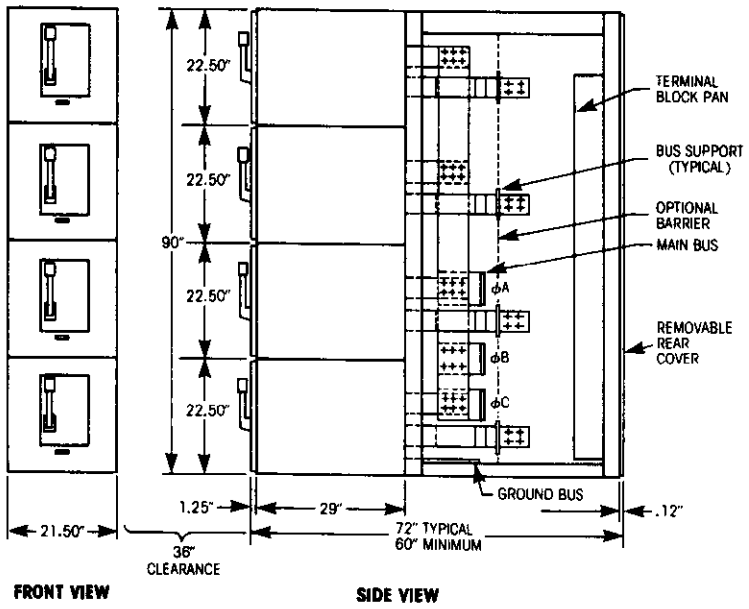

FIGURE 16
FPS4-30 AND FPS4-50
AC POWER CIRCUIT BREAKERS

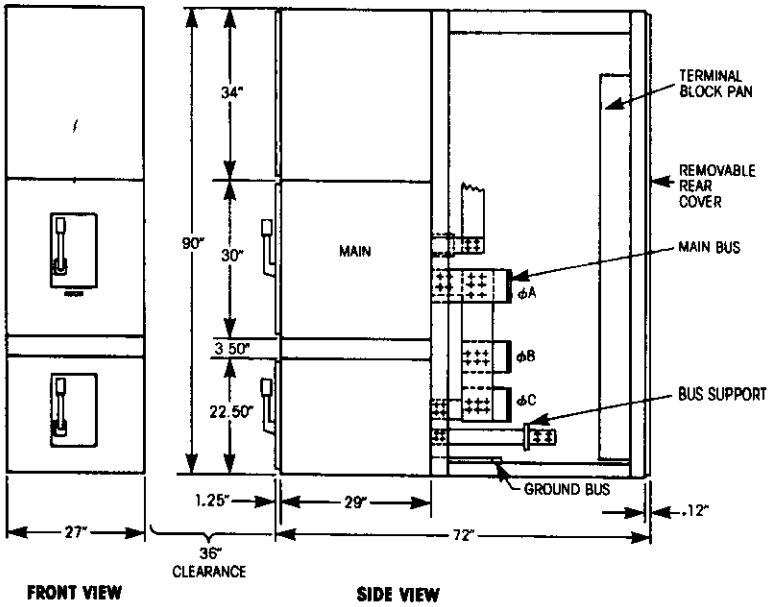

FIGURE 17
FPS4-75 MAIN AC POWER CIRCUIT BREAKER

NOTES APPLYING TO DIMENSION DRAWINGS

1. Terminal blocks can be mounted top or bottom.
2. External primary connections may be brought in at top or bottom.
3. Potential transformers generally are located on rear barrier of instrument section and are included when specified.
4. Current transformers will be furnished when specified.
5. Extensions will be added to load side of breaker to bring cable connections to rear of board, when specified.
6. Cable cleats will be provided.
7. Special bus requirements can be met by extending the rear structure in 6-inch steps and/or adding a bus transition section to the switchgear assembly.

**Featuring the New Type FPS4
AC Power Circuit Breakers with
Solid State Overcurrent Relays**

DIMENSIONAL DRAWINGS

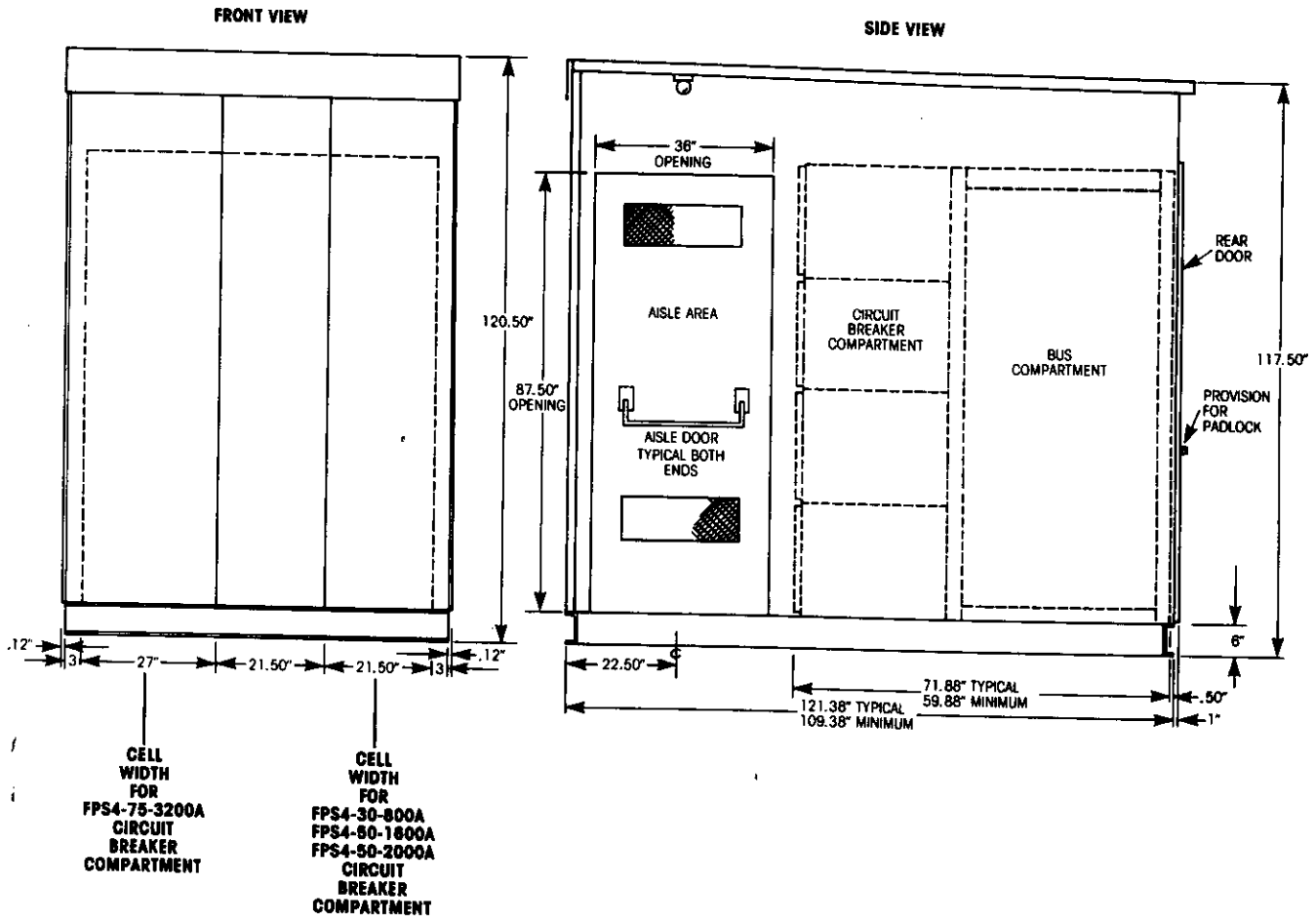

**FIGURE 18
STEEL OUTDOOR HOUSING
(TYPICAL)**

FPS4 Low Voltage Switchgear

TYPE FPS4

Featuring the New Type FPS4 AC Power Circuit Breakers with Solid State Overcurrent Relays

TABLE II — CIRCUIT BREAKER CURRENT SENSOR RATINGS

Current Sensor			Long Time Pick-Up Amperes					Short Time Pick-Up Amperes						Instantaneous Pick-Up Amperes						Ground Fault Pick-Up Amperes		
Catalog Number	Tap Selection	Lead Color Code (Red is Common)	.7X	.8X	.9X	.95X	1X	2X	3X	4X	6X	8X	10X	4X	5X	6X	8X	10X	12X	.2X	.5X	.75X
800 AMPERE FRAME																						
	70	Green	49	56	63	67	70	140	210	280	420	560	700	280	350	420	560	700	840	14	35	52.5
	90	Black	63	72	81	86	90	180	270	360	540	720	900	360	450	540	720	900	1080	18	45	67.5
	100	White	70	80	90	95	100	200	300	400	600	800	1000	400	500	600	800	1000	1200	20	50	75
	125	Green	87.5	100	112.5	119	125	250	375	500	750	1000	1250	500	625	750	1000	1250	1500	25	62.5	93.75
	150	Black	105	120	135	143	150	300	450	600	900	1200	1500	600	750	900	1200	1500	1800	30	75	112.5
	175	White	122.5	140	157.5	166	175	350	525	700	1050	1400	1750	700	875	1050	1400	1750	2100	35	87.5	131.25
	200	Green	140	160	180	190	200	400	600	800	1200	1600	2000	800	1000	1200	1600	2000	2400	40	100	150
	225	Black	157.5	180	202.5	214	225	450	675	900	1350	1800	2250	900	1125	1350	1800	2250	2700	45	112.5	168.75
	250	White	175	200	225	238	250	500	750	1000	1500	2000	2500	1000	1250	1500	2000	2500	3000	50	125	187.5
	300	Green	210	240	270	285	300	600	900	1200	1800	2400	3000	1200	1500	1800	2400	3000	3600	60	150	225
	350	Black	245	280	315	333	350	700	1050	1400	2100	2800	3500	1400	1750	2100	2800	3500	4200	70	175	262.5
	400	White	280	320	360	380	400	800	1200	1600	2400	3200	4000	1600	2000	2400	3200	4000	4800	80	200	300
	500	Green	350	400	450	475	500	1000	1500	2000	3000	4000	5000	2000	2500	3000	4000	5000	6000	100	250	375
	600	Black	420	480	540	570	600	1200	1800	2400	3600	4800	6000	2400	3000	3600	4800	6000	7200	120	300	450
	800	White	560	640	720	760	800	1600	2400	3200	4800	6400	8000	3200	4000	4800	6400	8000	9600	160	400	600
1600 AMPERE FRAME																						
	100	White	70	80	90	95	100	200	300	400	600	800	1000	400	500	600	800	1000	1200	20	50	75
	125	Green	87.5	100	112.5	119	125	250	375	500	750	1000	1250	500	625	750	1000	1250	1500	25	62.5	93.75
	150	Black	105	120	135	143	150	300	450	600	900	1200	1500	600	750	900	1200	1500	1800	30	75	112.5
	175	White	122.5	140	157.5	166	175	350	525	700	1050	1400	1750	700	875	1050	1400	1750	2100	35	87.5	131.25
	200	Green	140	160	180	190	200	400	600	800	1200	1600	2000	800	1000	1200	1600	2000	2400	40	100	150
	225	Black	157.5	180	202.5	214	225	450	675	900	1350	1800	2250	900	1125	1350	1800	2250	2700	45	112.5	168.75
	250	White	175	200	225	238	250	500	750	1000	1500	2000	2500	1000	1250	1500	2000	2500	3000	50	125	187.5
	300	Green	210	240	270	285	300	600	900	1200	1800	2400	3000	1200	1500	1800	2400	3000	3600	60	150	225
	350	Black	245	280	315	333	350	700	1050	1400	2100	2800	3500	1400	1750	2100	2800	3500	4200	70	175	262.5
	400	White	280	320	360	380	400	800	1200	1600	2400	3200	4000	1600	2000	2400	3200	4000	4800	80	200	300
	500	Green	350	400	450	475	500	1000	1500	2000	3000	4000	5000	2000	2500	3000	4000	5000	6000	100	250	375
	600	Black	420	480	540	570	600	1200	1800	2400	3600	4800	6000	2400	3000	3600	4800	6000	7200	120	300	450
	800	White	560	640	720	760	800	1600	2400	3200	4800	6400	8000	3200	4000	4800	6400	8000	9600	160	400	600
	1000	Green	700	800	900	950	1000	2000	3000	4000	6000	8000	10000	4000	5000	6000	8000	10000	12000	200	500	750
	1200	Black	840	960	1080	1140	1200	2400	3600	4800	7200	9600	12000	4800	6000	7200	9600	12000	14400	240	600	900
	1600	White	1120	1280	1440	1520	1600	3200	4800	6400	9600	12800	16000	6400	8000	9600	12800	16000	19200	320	800	1200
2000 AMPERE FRAME																						
	2000	White	1400	1600	2000	2200	2800	4000	6000	8000	12000	16000	20000	8000	10000	12000	16000	20000	24000	400	1000	1600
3200 AMPERE FRAME																						
	800	Green	420	540	800	880	1120	1600	2400	3600	4800	6000	2400	3000	3600	4800	6000	7200	120	300	450
	800	Black	560	720	800	880	1440	1600	2400	3600	4800	6400	8000	3200	4000	4800	6400	8000	9600	160	400	600
	1000	White	700	900	1000	1100	1350	2000	3000	4000	6000	8000	10000	4000	5000	6000	8000	10000	12000	200	500	750
	1200	Green	840	1080	1200	1320	1560	2400	3600	4800	7200	9600	12000	4800	6000	7200	9600	12000	14400	240	600	900
	1600	Black	1120	1440	1600	1760	2080	3200	4800	6400	9600	12800	16000	6400	8000	9600	12800	16000	19200	320	800	1200
	2000	White	1400	1800	2000	2200	2600	4000	6000	8000	12000	16000	20000	8000	10000	12000	16000	20000	24000	400	1000	1500
	2500	Green	1750	2250	2500	2750	3250	5000	7500	10000	15000	20000	25000	10000	12500	15000	20000	25000	30000	500	1250	1875
	3000	Black	2100	2700	3000	3300	3900	6000	9000	12000	18000	24000	30000	12000	15000	18000	24000	30000	36000	600	1500	2250
	3200	White	2240	2880	3200	3520	4160	6400	9600	12800	19200	25600	32000	12800	16000	19200	25600	32000	38400	640	1600	2400

*Set current sensor tap rating on trip device indicator.

NOTES:

1. The current sensor in the neutral bus must be identical to the sensors in each of the phase lines.
2. The current sensors must be carefully connected for proper polarity as indicated in Figures 22 and 23.
3. The nominal secondary current of the breaker current sensors is 2 amperes.

SIMPLIFIED BREAKER RATING CHANGE. The continuous rating of the circuit breaker may be readily changed. Refer to table II above and note the range of tapped current transformers available. All taps are factory wired to a readily accessible terminal block. The desired operating tap is selected at this terminal block and wired to the solid state overcurrent unit. Each overcurrent unit is supplied with an adjustable current transformer tap setting display window which permits revising the visible tap setting when any change is made.

It should be noted that the selected maximum tap rating of a sensor should never exceed the continuous current frame rating of the breaker. Also, this rating should not be exceeded by the "Long Time Pick-up Amperes" setting of the solid state trip device.

**Featuring the New Type FPS4
AC Power Circuit Breakers with
Solid State Overcurrent Relays**

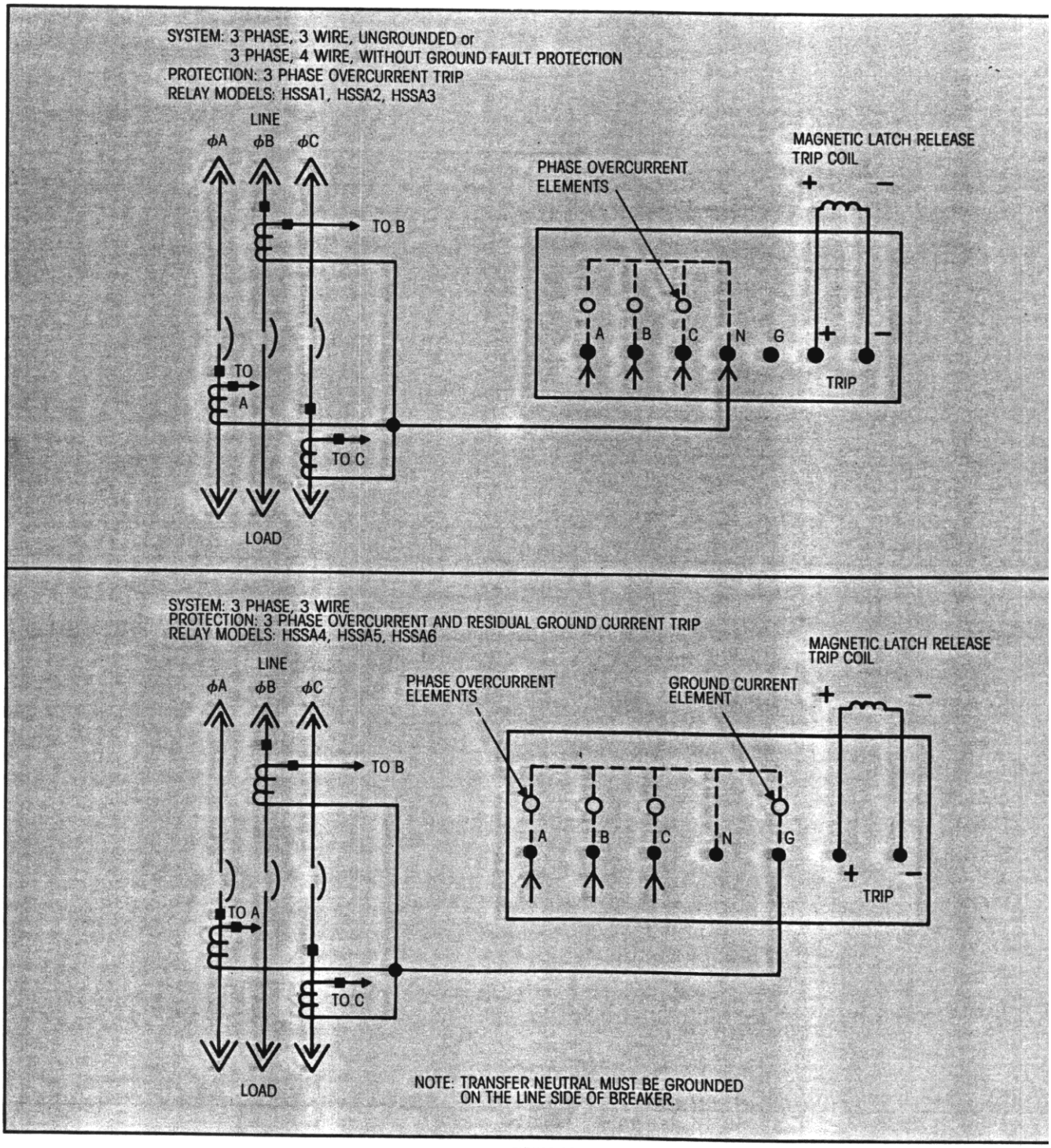

FIGURE 22
CURRENT CONNECTIONS TO HSSA RELAY