10/09 AWB1230-1605 Effective October 2009

Operation and maintenance of IZM low voltage air circuit breakers

IZM40

IZM97, IZM32, IZME40

IZM93, IZM20

Purpose

This instruction leaflet is expressly intended to cover the installation, operation, and maintenance of IZM air circuit breakers. These circuit breakers may be supplied as part of complete switchboard assemblies or as separate components. This manual applies only to the circuit breaker and (if drawout) its mating cassette. IZM circuit breakers may also be supplied as fixed-mounted devices. In the case of fixed versions of IZM circuit breakers, certain sections of this leaflet, referring to such items as position interlocks and the drawout mechanism, will not apply.

Trip units associated with IZM air circuit breakers will be addressed in a general manner in this leaflet. Specific trip unit details and time-current characteristic curves are covered in separate documents specific to the trip units.

IZM circuit breaker accessory items are discussed briefly in this leaflet. Field installation instructions for such items, however, are covered in individual instruction leaflets specific to the accessory. This information is also available from the Moeller Web site at www.moeller.net/de/support.

For application information, consult Moeller or see applicable Product Guides, Technical Documents, Application Publications, and/or Industry Standards.

Safety

All safety codes, safety standards, and/or regulations must be strictly observed in the installation, operation, and maintenance of this equipment.

⚠ WARNING

THE WARNINGS AND CAUTIONS INCLUDED AS PART OF THE PROCEDURAL STEPS IN THIS LEAFLET ARE FOR PERSONNEL SAFETY AND PROTECTION OF EQUIPMENT FROM DAMAGE. AN EXAMPLE OF A TYPICAL WARNING LABEL HEADING IS SHOWN ABOVE TO FAMILIARIZE PERSONNEL WITH THE STYLE OF PRESENTATION. THIS WILL HELP TO ENSURE THAT PERSONNEL ARE ALERT TO WARNINGS. IN ADDITION, CAUTIONS ARE ALL UPPERCASE AND BOLDFACE.

All possible contingencies that may arise during installation operation or maintenance, and all details and variations of this equipment do not purport to be covered by these instructions. If further information is desired by purchaser regarding particular installation, operation, or maintenance of particular equipment, contact the local Moeller representative.

EATON
Powering Business Worldwide

MOELLER
An Eaton Brand

Contents

List of figures

Description **Page**

List of figures (continued)

Description **Page**

List of tables

Description **Page**

Section 1: Introduction

General information

The IZM air circuit breaker is a fixed or drawout air circuit breaker design using an electronic tripping system. It is designed and tested for use at nominal voltages of 380–440 Vac and 500–690 Vac. IZM circuit breakers are available in physical frame sizes with continuous current ratings from 800–6300A and interrupting capacities from 42–150 kA. The physical frame sizes have common height and depth dimensions, differing only in width (**Figure 1**). The circuit breaker nameplate provides complete rating information. All IZM circuit breakers are 100 percent rated, and are built and tested in an ISO® 9002 certified facility to applicable IEC standards (**Table 1**, **Figure 2**, and **Figure 3**). In addition, the IZM circuit breaker carries a full third-party KEMA certification for both short circuit and endurance test requirements.

IZM circuit breakers use a rigid frame housing of engineered thermoset composite resins that has high-strength structural properties, excellent dielectric characteristics, and arc-tracking resistance.

The drawout IZM circuit breaker is a through-the-door design having three breaker positions with the compartment door closed (CONNECT, TEST, DISCONNECT) and one position out of its compartment on extension rails (REMOVE). The operating mechanism is a two-step stored energy mechanism, either manually or electrically operated.

When withdrawn on captive compartment cassette extension rails, IZM circuit breakers can be inspected, accessory items added, and minor maintenance performed. The inside of the compartment can also be inspected with the circuit breaker on its extension rails.

⚠ NOTICE

PLEASE READ AND UNDERSTAND THESE INSTRUCTIONS BEFORE ATTEMPTING TO UNPACK, INSTALL, OPERATE, OR MAINTAIN THIS EQUIPMENT. STUDY THE BREAKER AND ITS MECHANISM CAREFULLY BEFORE ATTEMPTING TO OPERATE IT ON AN ENERGIZED CIRCUIT.

⚠ WARNING

IZM CIRCUIT BREAKERS SHOULD NOT UNDER ANY CIRCUMSTANCES BE APPLIED OUTSIDE THEIR NAMEPLATE RATINGS. OPERATION OUTSIDE OF THESE RATINGS COULD RESULT IN DEATH, BODILY INJURY, OR PROPERTY DAMAGE.

Safety features

IZM circuit breakers and associated drawout equipment are manufactured with built-in interlocks and safety-related features. They are provided to reduce hazards to operating personnel and provide proper operating sequences.

Figure 1. Family of IZM Low Voltage Air Fixed and Drawout Circuit Breakers (800–6300A)

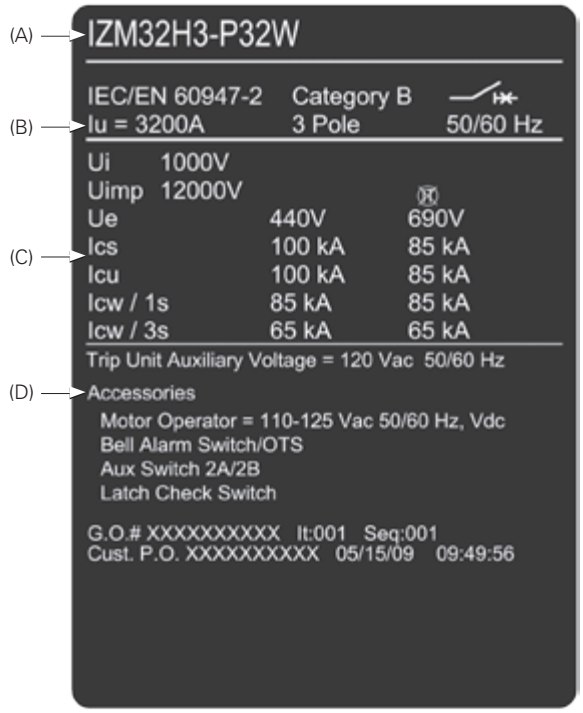
Table 1. IZM Circuit Breaker Ratings

Maximum Amperes	Breaker Designation	$I_{cs} = I_{cu}$ (kA) ①	I_{cw} 1s/3s (kA)
800	IZM93, IZM20	50	50/NA
800	IZM93, IZM20	65	65/40
800	IZM97, IZM32	40	40/NA
800	IZM97, IZM32	65	65/50
800	IZM97, IZM32	85	85/65
800	IZM97, IZM32	100 ③	85/65
1250	IZM93, IZM20	50	50/NA
1250	IZM93, IZM20	65	65/40
1250	IZM97, IZM32	40	40/NA
1250	IZM97, IZM32	65	65/50
1250	IZM97, IZM32	85	85/65
1250	IZM97, IZM32	100 ②	85/65
1600	IZM93, IZM20	50	50/NA
1600	IZM93, IZM20	65	65/40
1600	IZM97, IZM32	65	65/50
1600	IZM97, IZM32	85	85/65
1600	IZM97, IZM32	100 ②	85/65
2000	IZM93, IZM20	50	50/30
2000	IZM93, IZM20	65	65/40
2000	IZM97, IZM32	65	65/50
2000	IZM97, IZM32	85	85/65
2000	IZM97, IZM32	100 ③	85/65
2500	IZM97, IZM32	65	65/50
2500	IZM97, IZM32	85	85/65
2500	IZM97, IZM32	100 ②	85/65
3200	IZM97, IZM32	65	65/50
3200	IZM97, IZM32	85	85/65
3200	IZM97, IZM32	100 ②	100/65
4000	IZM97, IZME40 ③	65	—
4000	IZM97, IZME40 ③	85	—
4000	IZM99, IZM63 ③	100 ②	—
4000	IZM99, IZM63	65	65/NA
4000	IZM99, IZM63	85	85/65
4000	IZM99, IZM63	100	100/85
5000	IZM99, IZM63	85	85/65
5000	IZM99, IZM63	100	100/85
6300	IZM99, IZM63	85	85/65
6300	IZM99, IZM63	100	100/85

① All ratings at 690 Vac.

② $I_{cu} = I_{cs}$ = 85 kA at 690 Vac. $I_{cu} = I_{cs}$ = 100 kA at 440 Vac.

③ Standard width breaker (not IZM99 or IZM63).



(A) Low Voltage Air Circuit Breaker Family Name
(B) Breaker Family Size in Amperes
(C) Interrupting Capacity Rating
(D) Factory Equipped Accessories

Figure 2. Typical IZM Nameplate

⚠ WARNING

TYPE IZM CIRCUIT BREAKERS ARE ROBUST AND ARE PROVIDED WITH SAFETY FEATURES. NEVERTHELESS, THE VOLTAGES, CURRENTS, AND POWER LEVELS AVAILABLE IN AND AROUND THIS EQUIPMENT WHEN IT IS IN OPERATION ARE EXTREMELY DANGEROUS AND COULD BE FATAL. UNDER NO CIRCUMSTANCES SHOULD INTERLOCKS AND OTHER SAFETY FEATURES BE MADE INOPERATIVE, AS THIS MAY RESULT IN DEATH, BODILY INJURY, OR PROPERTY DAMAGE.

Safe practices

To protect personnel associated with the installation, operation, and maintenance of this equipment, the following practices must be followed:

1. Only qualified electrical personnel familiar with the equipment, its operation, and the associated hazards should be permitted to work on the equipment. Additionally, only qualified personnel should be permitted to install or operate the equipment.
2. Always be certain that the primary and secondary circuits are de-energized or the circuit breaker is removed to a safe work location before attempting any maintenance.
3. For maximum safety, only insert a completely assembled breaker into an energized cell.
4. Always ensure that drawout circuit breakers are in one of their designed cell positions, such as CONNECT, TEST, DISCONNECT, or REMOVE. A circuit breaker permitted to remain in an intermediate position could result in control circuits being improperly connected, resulting in electrical failures.

Qualified personnel

For the purpose of operating and maintaining low voltage air circuit breakers, a person should not be considered qualified if the individual is not thoroughly trained in the operation of the circuit breaker and how it interfaces with the assembly in which it is used. In addition, the individual should have knowledge of the connected loads.

For the purpose of installing and inspecting circuit breakers and their associated assembly, a qualified person should also be trained with respect to the hazards inherent to working with electricity and the proper way to perform such work. The individual should be able to de-energize, clear and tag circuits in accordance with established safety practices.

Other publications and documentation

In addition to this instruction manual, other printed information and documentation is available and supplied as appropriate. This additional information can include, but not necessarily be limited to, an instruction manual for a specific electronic trip unit, instruction leaflets for accessory items, renewal parts information, necessary dimensional drawings and a product (application) guide.

Section 2: Receiving, handling, and installation

General information

IZM air circuit breakers, when supplied as part of an assembly, may be shipped already installed in their respective breaker compartments. Receiving and handling of this equipment is addressed in an assembly instruction manual supplied with the assembled equipment. This instruction manual applies to only the circuit breakers.

Suggested tools

A large number of different tools are not required to properly install and maintain IZM circuit breakers. The following tools are, however, suggested:

- Flat-blade screwdriver
- Phillips head screwdriver
- 3/8-inch socket (ratchet) wrench
- 10 mm socket
- 17 mm socket
- Secondary wiring removal tool

Unpacking circuit breaker

Before beginning to unpack new IZM circuit breakers, read and understand these directions. Following the directions will ensure that no damage is caused.

Shipping containers should be inspected for obvious signs of rough handling and/or external damage incurred during the transportation phase. Record any observed damage for reporting to the transportation carrier and Moeller, once the inspection is completed. All reports and claims should be as specific as possible and include the order number and other applicable nameplate information.

Every effort is made to ensure that IZM circuit breakers arrive at their destination undamaged and ready for installation. Care should be exercised, however, to protect the breakers from impact at all times. Do not remove protective packaging until the breakers are ready for inspection, testing, and/or installation.

When ready to inspect and install the IZM circuit breaker, carefully remove the banding straps and lift off the cardboard box. Remove any additional packing material and internally packed documentation. The circuit breaker and/or cassette are mounted to a wooden shipping pallet.

On drawout circuit breakers shipped without a cassette, two shipping clamps hook into the breaker side plates and are held to the pallet with four lag screws (**Figure 3**). Remove the lag screws and clamps. Save the screws and clamps for future shipment of the breaker. On empty cassettes, remove the four or five lag screws and/or machine screws that pass through the floorpan of the cassette holding it to the wooden pallet. On drawout breakers shipped in a cassette, first remove the breaker from the cassette using the levering mechanism and drawout rails. After the breaker is removed, the machine screws passing through the floorpan can be removed. On fixed breakers, remove the lag screws passing through the mounting feet that hold the breaker to the pallet.

Circuit breakers are designed to be easily lifted from the wooden pallet using an appropriate lifting yoke and overhead or portable lifting device.

Figure 3. Shipping Clamps for Drawout Circuit Breaker

Storing circuit breaker

If it is necessary to store a circuit breaker before installation, do so in its original shipping container. Keep the circuit breaker in a clean dry place. Ensure there is ample air circulation and heat, if necessary, to prevent condensation. It is very important that the circuit breaker not be exposed to dirt or moisture.

⚠ NOTICE

A CIRCUIT BREAKER THAT HAS BEEN STORED FOR ANY LENGTH OF TIME SHOULD BE OPERATED A MINIMUM OF FIVE TIMES BEFORE IT IS PLACED IN SERVICE.

Lifting circuit breaker

⚠ CAUTION

DO NOT ATTEMPT TO LIFT CIRCUIT BREAKERS WITH ORDINARY CRANE HOOKS, ROPES, CHAINS, OR OTHER SUCH DEVICES. FAILURE TO FOLLOW THIS CAUTION COULD RESULT IN DAMAGE TO VITAL PARTS, SUCH AS ARC CHUTES, BARRIERS, AND WIRING OR THE ENTIRE CIRCUIT BREAKER.

To closely examine, install, or just become more familiar with the circuit breaker, carefully lift and place the circuit breaker on a solid work surface capable of handling the circuit breaker's weight (**Table 2**) or on the captive drawout extension rails of the breaker compartment. This is accomplished by using the appropriate lifting yoke and lifter. The lifting yoke consists of two steel hooks specially shaped to hook under the integral molded lifting handles on both sides of the circuit breaker (**Figure 14**). Every effort should be made during lifting to minimize circuit breaker swing and tilt.

If the circuit breaker is to be lifted onto compartment extension rails, follow the instructions on page 11 "Installing drawout circuit breaker."

Circuit breaker inspection

All circuit breakers, once removed from their shipping containers, should be visually inspected for any obvious damage.

The current rating of the rating plug installed in the trip unit should match the current rating of the sensors mounted on the lower primary stabs of the circuit breaker. Check to make sure that this match exists. The rating plug rating can be viewed from the front of the circuit breaker (**Figure 17**). The sensor rating can be viewed through the viewing windows at the rear of the circuit breaker (**Figure 4**). Sensors and rating plugs can be easily changed as described in Section 6.

Table 2. Basic Circuit Breaker Weights

		Weights (kg)			
		Fixed		Drawout	
IZM Product Typecoding		3-Pole	4-Pole	3-Pole	4-Pole
IZM91B…06…	IZMX16B…06…	15.23	20.14	38.65	47.17
IZM91B…08…	IZMX16B…08…	15.23	20.14	38.65	47.17
IZM91B…10…	IZMX16B…10…	15.23	20.14	38.65	47.17
IZM91B…12…	IZMX16B…12…	15.23	20.14	38.65	47.17
IZM91B…16…	IZMX16B…16…	15.23	20.14	38.65	47.17
IZM91N…06…	IZMX16N…06…	15.23	20.14	38.65	47.17
IZM91N…08…	IZMX16N…08…	15.23	20.14	38.65	47.17
IZM91N…10…	IZMX16N…10…	15.23	20.14	38.65	47.17
IZM91N…12…	IZMX16N…12…	15.23	20.14	38.65	47.17
IZM91N…16…	IZMX16N…16…	15.23	20.14	38.65	47.17
IZM91H…06…	IZMX16H…06…	15.23	20.14	38.65	47.17
IZM91H…08…	IZMX16H…08…	15.23	20.14	38.65	47.17
IZM91H…10…	IZMX16H…10…	15.23	20.14	38.65	47.17
IZM91H…12…	IZMX16H…12…	15.23	20.14	38.65	47.17
IZM91H…16…	IZMX16H…16…	15.23	20.14	38.65	47.17
IZM95B…20…	IZMX40B…20…	15.23	20.14	38.65	47.17
IZM95B…25…	IZMX40B…25…	15.23	20.14	38.65	47.17
IZM95B…32…	IZMX40B…32…	15.23	20.14	38.65	47.17
IZM95B…40…	IZMX40B…40…	15.23	20.14	38.65	47.17
IZM95N…20…	IZMX40N…20…	15.23	20.14	38.65	47.17
IZM95N…25…	IZMX40N…25…	15.23	20.14	38.65	47.17
IZM95N…32…	IZMX40N…32…	15.23	20.14	38.65	47.17
IZM95N…40…	IZMX40N…40…	15.23	20.14	38.65	47.17
IZM95H…20…	IZMX40H…20…	15.23	20.14	38.65	47.17
IZM95H…25…	IZMX40H…25…	15.23	20.14	38.65	47.17
IZM95H…32…	IZMX40H…32…	15.23	20.14	38.65	47.17
IZM95H…40…	IZMX40H…40…	15.23	20.14	38.65	47.17
IZM93B…08…	IZM20B…08…	43.00	54.00	48.00	62.00
IZM93B…10…	IZM20B…10…	43.00	54.00	48.00	62.00
IZM93B…12…	IZM20B…12…	43.00	54.00	48.00	62.00
IZM93B…16…	IZM20B…16…	43.00	54.00	48.00	62.00
IZM93B…20…	IZM20B…20…	43.00	54.00	48.00	62.00
IZM93N…08…	IZM20N…08…	43.00	54.00	48.00	62.00
IZM93N…10…	IZM20N…10…	43.00	54.00	48.00	62.00
IZM93N…12…	IZM20N…12…	43.00	54.00	48.00	62.00
IZM93N…16…	IZM20N…16…	43.00	54.00	48.00	62.00
IZM93N…20…	IZM20N…20…	43.00	54.00	48.00	62.00
IZM97B…08…	IZM32B…08…	58.00	72.00	70.00	88.00
IZM97B…10…	IZM32B…10…	58.00	72.00	70.00	88.00
IZM97B…12…	IZM32B…12…	58.00	72.00	70.00	88.00
IZM97B…16…	IZM32B…16…	58.00	72.00	70.00	88.00
IZM97B…20…	IZM32B…20…	63.00	78.00	75.00	94.00
IZM97B…25…	IZM32B…25…	68.00	86.00	86.00	112.00
IZM97B…32…	IZM32B…32…	68.00	86.00	86.00	112.00
IZM97N…08…	IZM32N…08…	68.00	86.00	80.00	102.00

Basic Circuit Breaker Weights (continued)

		Weights (kg)			
		Fixed		Drawout	
IZM Product Typecoding		3-Pole	4-Pole	3-Pole	4-Pole
IZM97N…10…	IZM32N…10…	68.00	86.00	80.00	102.00
IZM97N…12…	IZM32N…12…	68.00	86.00	80.00	102.00
IZM97N…16…	IZM32N…16…	68.00	86.00	80.00	102.00
IZM97N…20…	IZM32N…20…	68.00	86.00	80.00	102.00
IZM97N…25…	IZM32N…25…	70.00	89.00	88.00	115.00
IZM97N…32…	IZM32N…32…	70.00	89.00	88.00	115.00
IZM97H…08…	IZM32H…08…	68.00	86.00	80.00	102.00
IZM97H…10…	IZM32H…10…	68.00	86.00	80.00	102.00
IZM97H…12…	IZM32H…12…	68.00	86.00	80.00	102.00
IZM97H…16…	IZM32H…16…	68.00	86.00	80.00	102.00
IZM97H…20…	IZM32H…20…	68.00	86.00	80.00	102.00
IZM97H…25…	IZM32H…25…	70.00	89.00	88.00	115.00
IZM97H…32…	IZM32H…32…	70.00	89.00	88.00	115.00
IZM97S…	IZM32S…	70.00	89.00	88.00	115.00
IZM97B…40…	IZME40B…40…	107.50	144.70	138.80	166.00
IZM97N…40…	IZME40N…40…	107.50	144.70	138.80	166.00
IZM97H…40…	IZME40H…40…	107.50	144.70	138.80	166.00
IZM40N…40…	IZM40N…40…	83.00	105.00	98.00	121.00
IZM40H…40…	IZM40H…40…	83.00	105.00	98.00	121.00
IZM99N…40…	IZM63N…40…	107.50	144.70	138.80	166.00
IZM99N…50…	IZM63N…50…	125.20	163.30	157.40	200.00
IZM99N…63…	IZM63N…63…	125.20	163.30	157.40	200.00
IZM99H…40…	IZM63H…40…	107.50	144.70	138.80	166.00
IZM99H…50…	IZM63H…50…	125.20	163.30	157.40	200.00
IZM99H…63…	IZM63H…63…	125.20	163.30	157.40	200.00

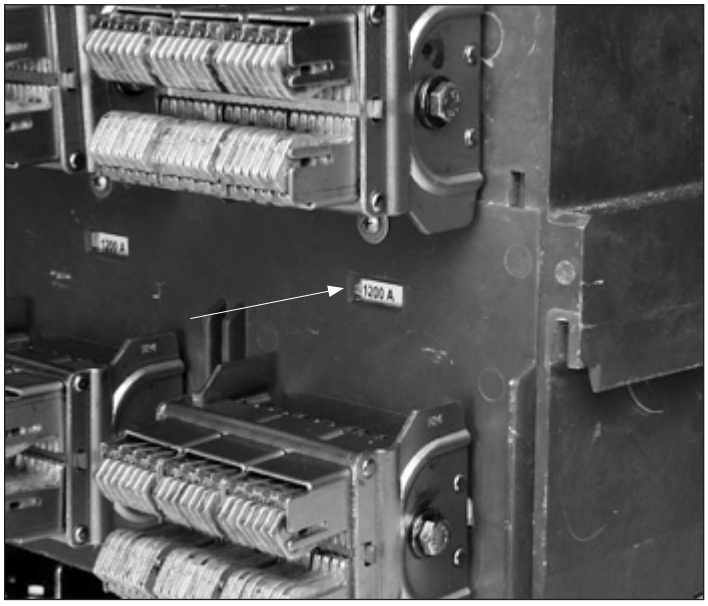


Figure 4. Rear View Showing Current Sensor Rating Through Viewing Window

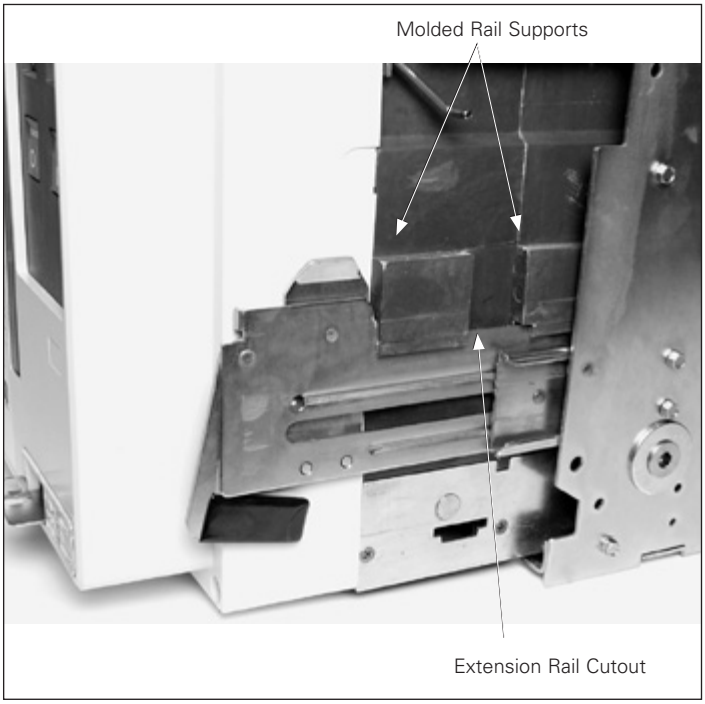


Figure 5. One Side of Drawout Circuit Breaker Properly Seated on Extension Rail

Adapting cassette

Drawout circuit breaker cassettes are built and shipped in a "basic" configuration that can be adapted in the field to mate with specific circuit breakers. Specifically, the rejection interlock must be configured to the specific circuit breaker to be mated with the cassette, and the automatic secondary connections may have to be installed or upgraded. These operations are described in the following sections.

Rejection interlocks

Within any one physical frame size, IZM drawout circuit breakers come in a variety of continuous current and interruption ratings, some of which are incompatible with others. Double-wide circuit breakers also come with several phase sequence options that are also incompatible. To prevent the insertion of circuit breakers with (1) inadequate interrupting capability, (2) with physically incompatible primary disconnects, or (3) with an incompatible phase sequence, rejection interlock key plates are provided on both the circuit breaker and cassette. The key plate on the circuit breaker is pre-assembled at the factory; but the cassette-side rejection plate and key pattern must be assembled and installed by the switchboard builder.

⚠ CAUTION

DO NOT DISABLE REJECTION INTERLOCKS. DOING SO AND USING A LOWER CAPACITY CIRCUIT BREAKER IN AN INCOMPATIBLE CASSETTE COULD RESULT IN AN ELECTRICAL FAULT THAT COULD RESULT IN DEATH, BODILY INJURY, AND/OR EQUIPMENT DAMAGE.

The rejection interlocks are steel pins in the floor of the circuit breaker cassette. As the circuit breaker is pushed into the structure, the mating pins on the bottom of the circuit breaker move past a set of corresponding pins in the cassette if the circuit breaker and cassette are compatible. If the circuit breaker and the cassette are mismatched, the rejection pins will block the insertion of the circuit breaker into the cassette before the levering-in mechanism is engaged.

Before attempting to push the circuit breaker into the DISCONNECT position, compare the positioning of rejection interlock pins in the cassette with **Table 3** and **Figure 6** and the information supplied on the circuit breaker's nameplate. Proceed if the circuit breaker and cassette are compatible.

Installing secondary jumpers

On drawout circuit breakers, the automatic secondary connector between the circuit breaker and cassette can be ordered either fully populated or depopulated (without terminal blocks and jumper wires installed); these parts can be ordered separately and installed by the customer. If the necessary connections are not pre-installed, please contact a Moeller representative for further assistance. These kits can also be used to add additional secondary wiring to upgrade circuit breakers in the field.

Installing drawout circuit breaker

In structures equipped for drawout circuit breakers, a bolted-in cassette with movable extension rails supports the circuit breaker. The extension rails must first be pulled all the way out. Once the rails are fully extended, the circuit breaker can be carefully placed on the extension rails.

⚠ CAUTION

IT IS IMPORTANT TO TAKE GREAT CARE WHEN PLACING A DRAWOUT CIRCUIT BREAKER ON ITS EXTENSION RAILS. IF THE CIRCUIT BREAKER IS NOT PROPERLY SEATED ON THE EXTENSION RAILS, IT COULD FALL FROM THE RAILS, CAUSING EQUIPMENT DAMAGE AND/OR BODILY INJURY.

Carefully lower the circuit breaker down onto the extension rails. Be certain that the circuit breaker's four molded drawout rail supports are fully seated in the extension rail cutouts on both sides (**Figure 5**). **Do not remove the lifting yoke from the circuit breaker until it is properly seated on the rails.**

Once the circuit breaker is on the extension rails and the lifting yoke is removed, proceed with the rest of the circuit breaker installation.

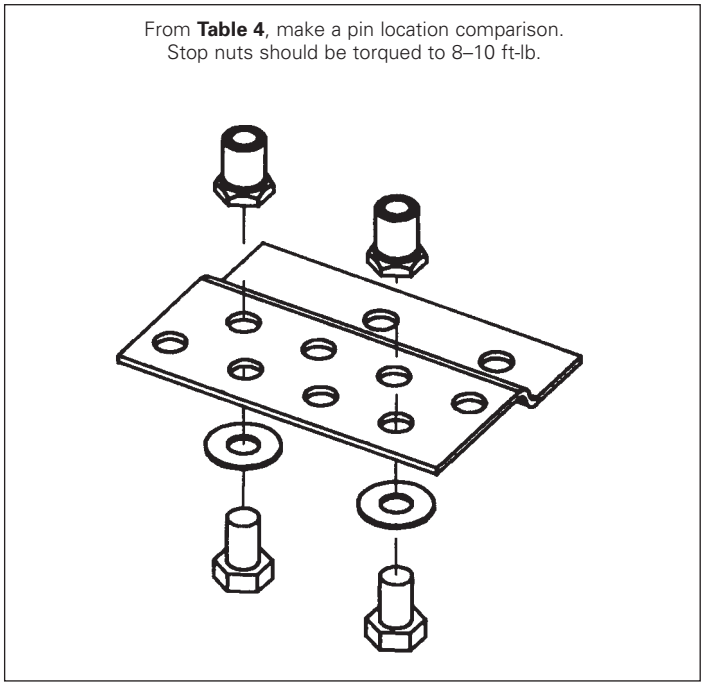


Figure 6. Cassette Rejection Interlock Pin Positioning/Installation

Table 3. Rejection Interlock Pin Locations

	Pin Locations							
Cell For:	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
IZM93, IZM20		X		X				
IZM93, IZM20		X		X	X			
IZM93, IZM20		X		X	X	X		
IZM97, IZM32		X		X	X	X		
IZM97, IZM32		X		X	X	X	X	
IZM97, IZM32		X		X	X	X	X	X
IZM97, IZME40			X	X	X	X		
IZM97, IZME40			X	X	X	X	X	
IZM97, IZME40			X	X	X	X	X	X
IZM99, IZM63		X		X		X		
IZM99, IZM63, IZM40		X		X	X			
IZM99, IZM63		X		X		X		
IZM99, IZM63, IZM40		X		X	X			
IZM99, IZM63		X		X		X	X	
IZM99, IZM63, IZM40		X		X	X		X	
IZM99, IZM63			X	X		X		
IZM99, IZM63			X	X	X			
IZM99, IZM63			X	X		X	X	
IZM99, IZM63			X	X	X		X	

Circuit breaker positioning

The IZM drawout circuit breaker has four normal positions:

- REMOVE (withdrawn) (**Figure 7**)
- DISCONNECT (**Figure 8**)
- TEST (**Figure 9**)
- CONNECT (**Figure 10**)

The REMOVE position is a position outside the compartment on the cassette's drawout rails where the circuit breaker is not engaged with the levering mechanism. The DISCONNECT, TEST, and CONNECT, positions are reached by means of the levering mechanism.

With the breaker solidly positioned on the cassette's extension rails and levering-in mechanism in the DISCONNECT position, carefully and firmly push the circuit breaker into the compartment as far as it will go. The outer (recessed) portion of the circuit breaker faceplate should align with the GREEN target line (labelled DISC) on the inside top-left wall of the cassette (**Figure 11**).

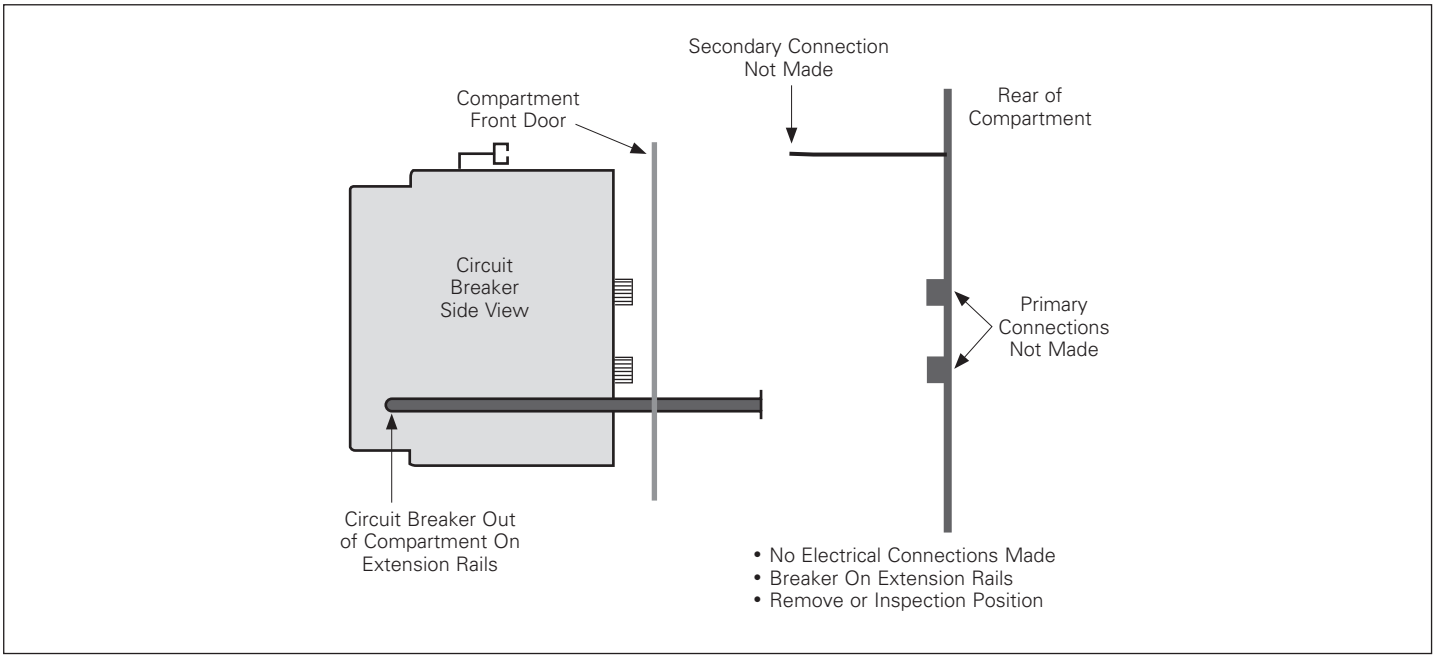


Figure 7. REMOVE Position

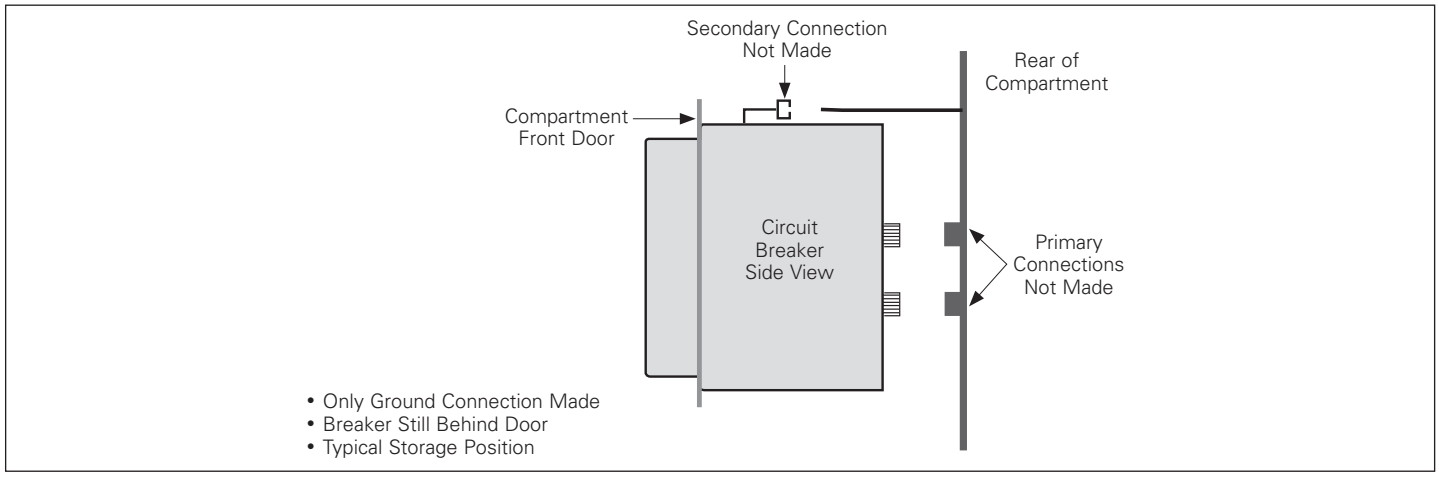


Figure 8. DISCONNECT Position

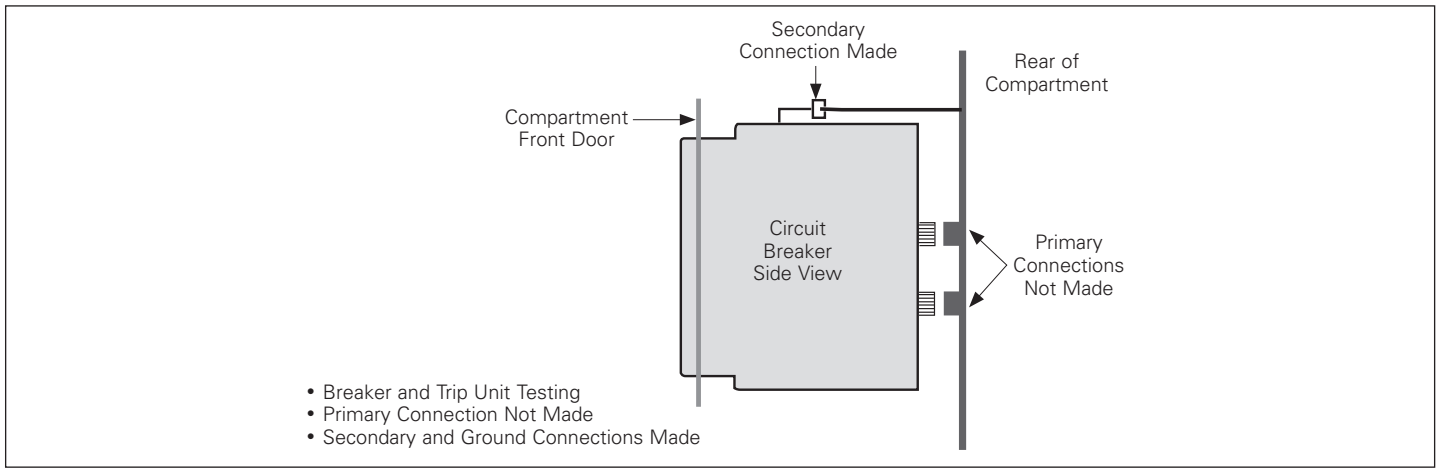


Figure 9. TEST Position

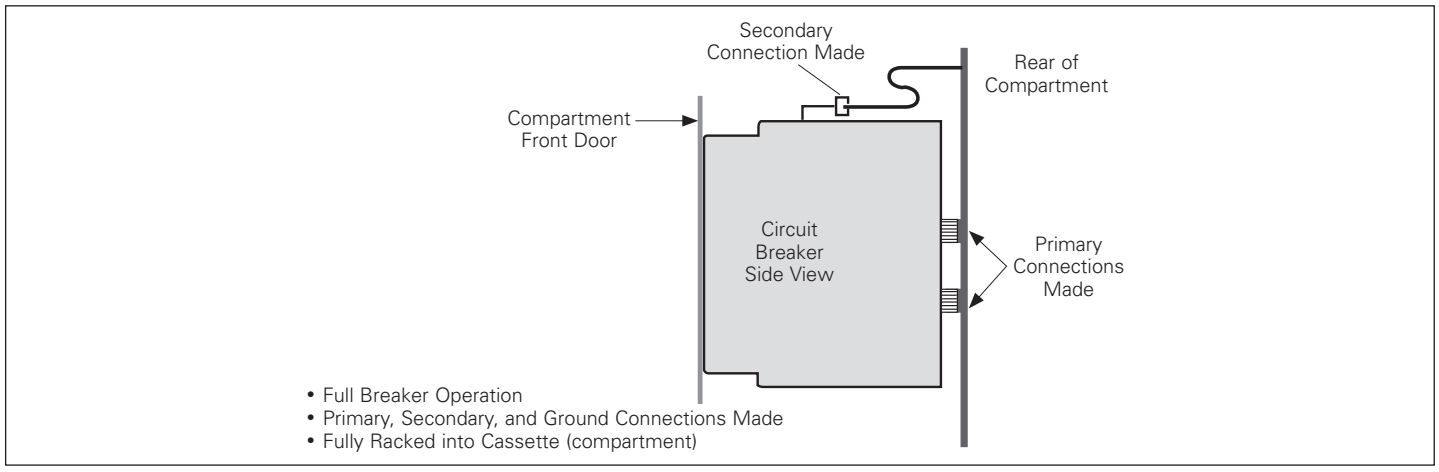


Figure 10. CONNECT Position

⚠ CAUTION

MAKE CERTAIN THAT THE CIRCUIT BREAKER IS FULLY INSERTED INTO ITS COMPARTMENT BEFORE ANY ATTEMPT IS MADE TO LEVER THE CIRCUIT BREAKER. ATTEMPTING TO LEVER THE CIRCUIT BREAKER IN BEFORE IT IS FULLY POSITIONED INSIDE ITS COMPARTMENT CAN RESULT IN DAMAGE TO BOTH THE CIRCUIT BREAKER AND THE COMPARTMENT.

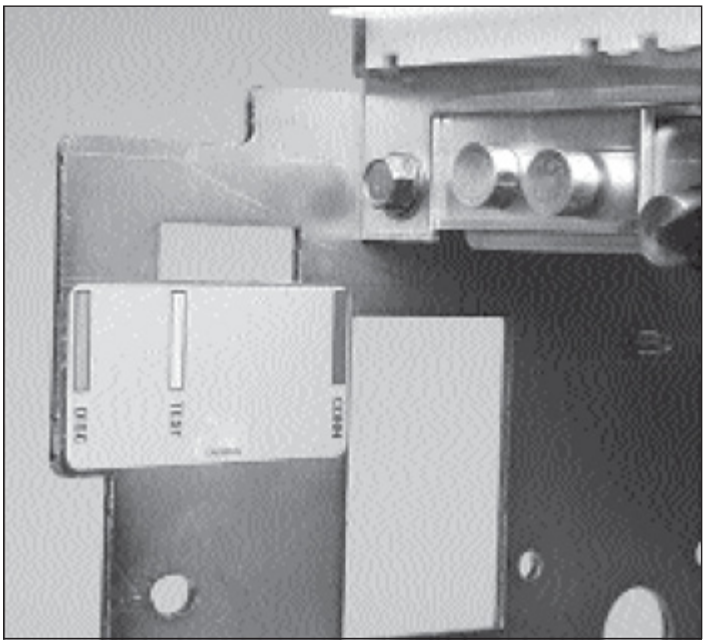


Figure 11. Cassette Label Showing DISCONNECTED, TEST, and CONNECTED Position of Recessed Cover

Levering circuit breaker

The circuit breaker is now ready to be levered. With the circuit breaker OPEN, the levering device access door can be raised. The levering device is hand operated using a standard 3/8-inch square drive and ratchet, which is not provided (**Figure 12**). As long as the levering access door is raised, the circuit breaker is held trip-free. Begin by rotating the levering-in screw to the full counterclockwise (DISCONNECT) position.

Close the compartment door and begin levering the breaker into its different positions using a clockwise ratcheting motion. The circuit breaker can be levered with the compartment door open or closed, but it is advisable to close the door prior to levering. The position of the circuit breaker within its compartment is indicated by color-coded position indicators (red = Connect, yellow = Test, green = Disconnect) (**Figure 12**). When the circuit breaker is levered fully to the DISCONNECT or CONNECT position, the levering shaft hits a hard stop; do not exceed 34.2 Nm of torque or the levering mechanism may be damaged. To remove the circuit breaker from its compartment, follow the procedure just described using a counterclockwise ratcheting motion.

⚠ NOTICE

THE CIRCUIT BREAKER MECHANISM IS INTERLOCKED SUCH THAT CHARGED CLOSING SPRINGS ARE AUTOMATICALLY DISCHARGED IF THE CIRCUIT BREAKER IS LEVERED INTO OR OUT OF THE CELL. DISCHARGE TAKES PLACE BETWEEN THE DISCONNECT AND TEST POSITION.

Figure 12. Levering Position Indication

Fixed circuit breaker

The IZM fixed-type circuit breaker differs from the drawout version in that it has no levering device, primary disconnects, and secondary disconnects (**Figure 13**). In addition, a fixed circuit breaker does not have a standard feature to hold the breaker in a trip-free position. Fixed circuit breakers can be mechanically interlocked using either the optional key interlock (that is mounted through the front panel) or with optional cable interlocks that operate on the tripper bar (**Figure 14**).

Circuit breaker terminals have holes for making bolted horizontal primary bus connections. Adapters are available for making vertical primary bus connections. Secondary connections can be made through standard terminal blocks or a special connector compatible with the drawout circuit breaker's type secondary connector. Both secondary connection devices are mounted at the top front of the circuit breaker.

The fixed circuit breaker frame has two mounting feet, one on each side, to permit the fixed circuit breaker to be securely mounted. Each mounting foot has two slotted mounting holes that are used to bolt the circuit breaker securely in place. Use either M10 or 3/8-inch bolts for this purpose. Refer to the dimensional drawings referred to in Section 5 "Fixed circuit breakers" for circuit breaker and bus stab dimensions.

Figure 13. Typical Fixed IZM Circuit Breaker

⚠ NOTICE

REFER TO THE CIRCUIT BREAKER WEIGHTS IN TABLE 2 TO ENSURE THAT THE PANEL ON WHICH A FIXED CIRCUIT BREAKER IS TO BE MOUNTED IS CAPABLE OF SUPPORTING THE WEIGHT.

Circuit breaker operation

Circuit breakers should be operated manually and/or electrically before they are put into service. This can be done during the installation process or some later date prior to startup. To check circuit breaker operation, follow the operational procedures outlined in Section 3 for both manually operated and electrically operated circuit breakers.

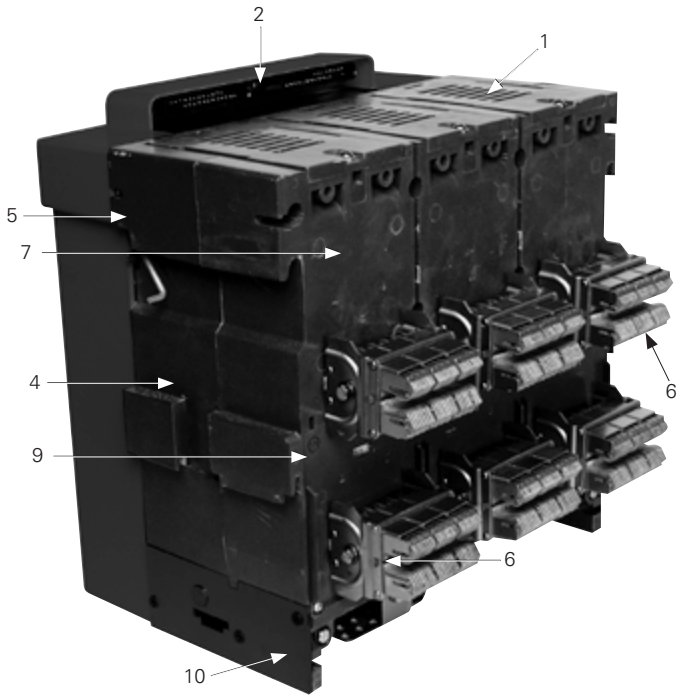
Section 3: Circuit breaker description and operation

Introduction

IZM circuit breakers are available in physical frame sizes and in both drawout and fixed mounting configurations (**Figure 14** and **Figure 15**). A majority of features are common to both configurations, and will be discussed in this section. The mounting features unique to the drawout and fixed configurations will be covered individually in Sections 4 and 5 respectively.

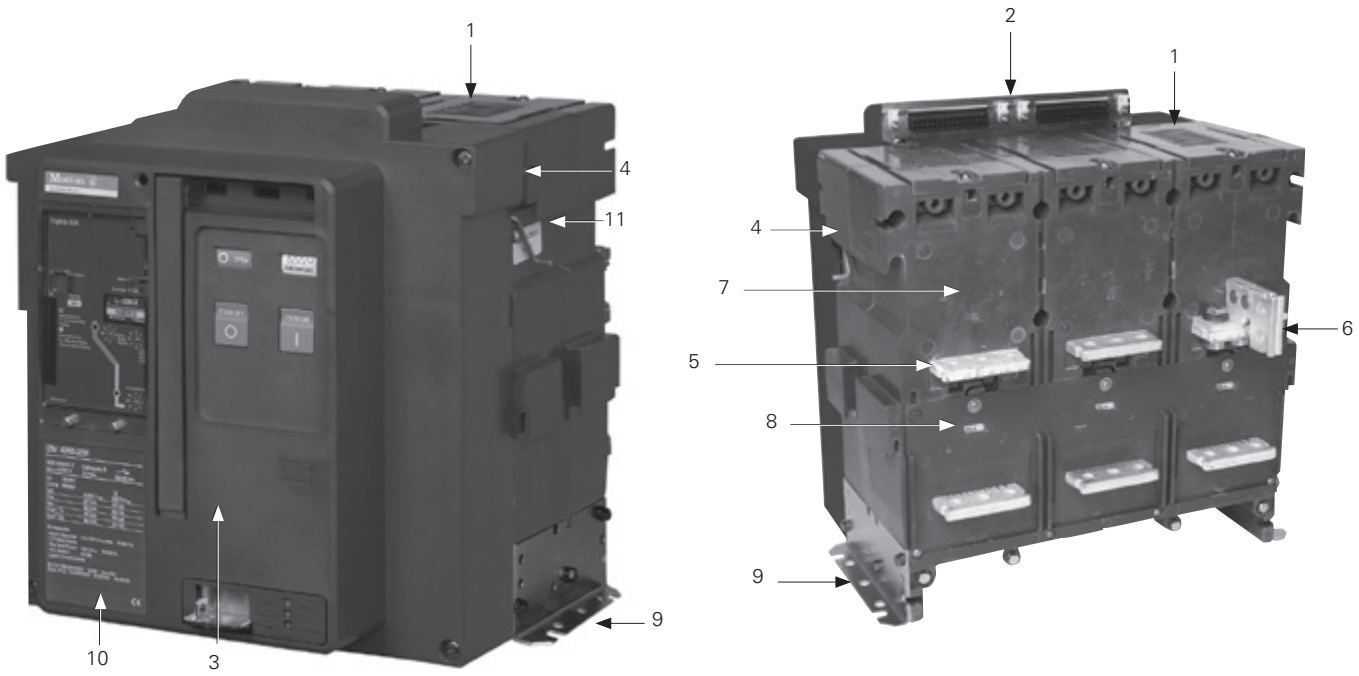
Controls and indicators for both drawout and fixed circuit breakers are functionally grouped on the front of the circuit breaker. The front escutcheon (faceplate) is common for the frame sizes that cover all continuous current ratings through 6300A.

IZM99 and IZM63 frame circuit breakers utilize six (or eight) sets of rear primary connections; these circuit breakers are available from the factory with several different phase sequences. The phase sequence is also labeled on the rear of the circuit breaker (**Figure 16**). For drawout breakers, phase sequence labels are also supplied with the cassette and must be applied by the switchgear builder. Circuit breakers with different phase sequences are not interchangeable. Drawout breakers with differing phase sequence are prevented from insertion into the cassette by properly assembled rejection key plates (see "Rejection interlocks" on page 11).



1–Baffled Arc Chute Cover
2–Secondary Disconnects (contacts)
3–Faceplate (front cover)
4–Drawout Rail Supports
5–Integral Lifting Handle
6–Primary Disconnect Finger Cluster
7–Arc Chamber
8–Tripper Bar
9–Sensor Rating Viewing Window
10–Levering Device Bearing Plate
11–Padlockable Levering Device Access Door
12–Circuit Breaker Nameplate

Figure 14. Typical Drawout Circuit Breaker Features (Front and Rear Views)



1–Baffled Arc Chute Cover
2–Secondary Disconnect
3–Faceplate (front cover)
4–Integral Lifting Handle
5–Fixed Horizontal Primary Terminal
6–Fixed Primary Terminal
(with optional vertical adapter)
7–Arc Chamber
8–Sensor Rating Viewing Window
9–Mounting Foot
10–Circuit Breaker Nameplate
11–Tripper Bar

Figure 15. Typical Fixed Circuit Breaker Features (Front and Rear Views)

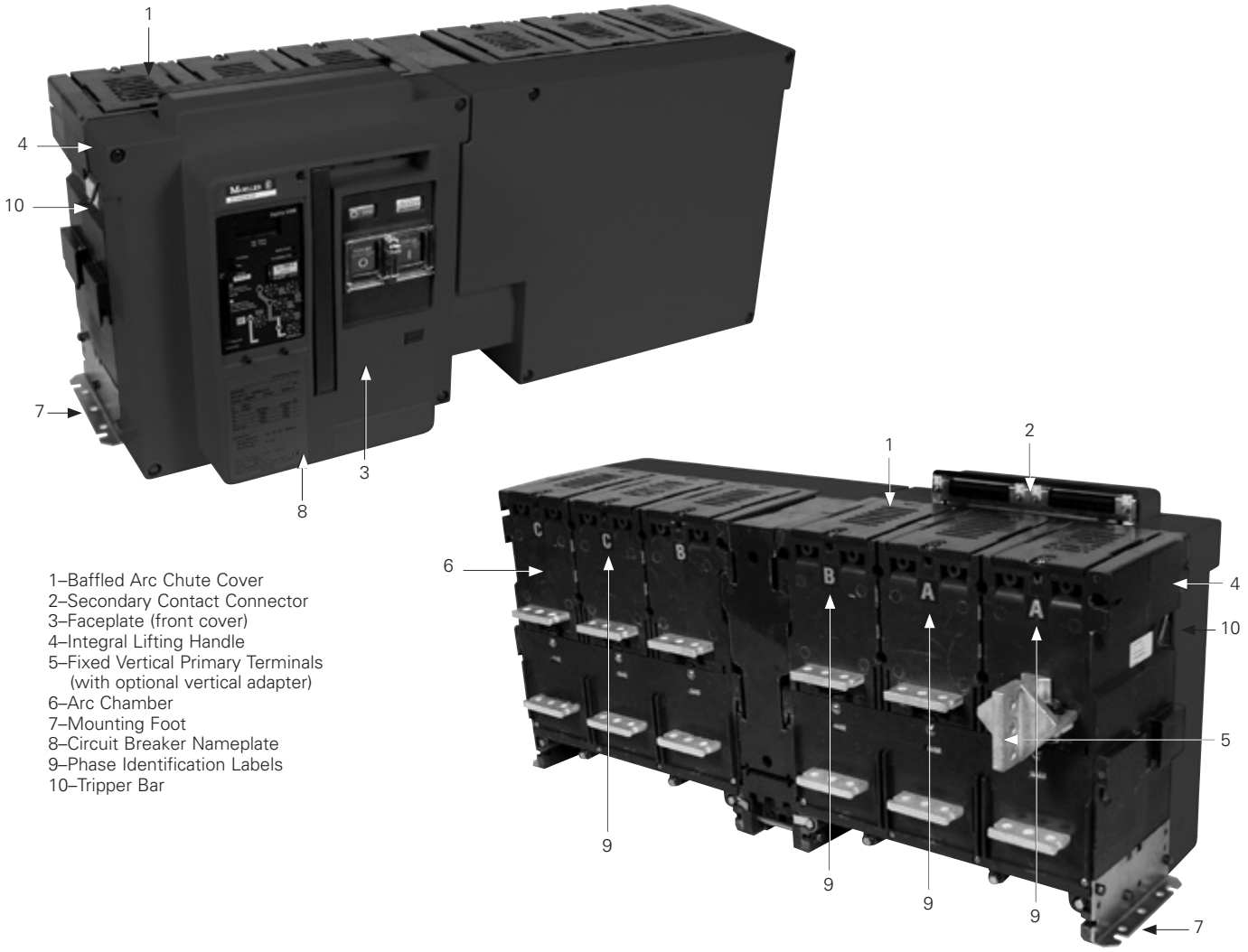
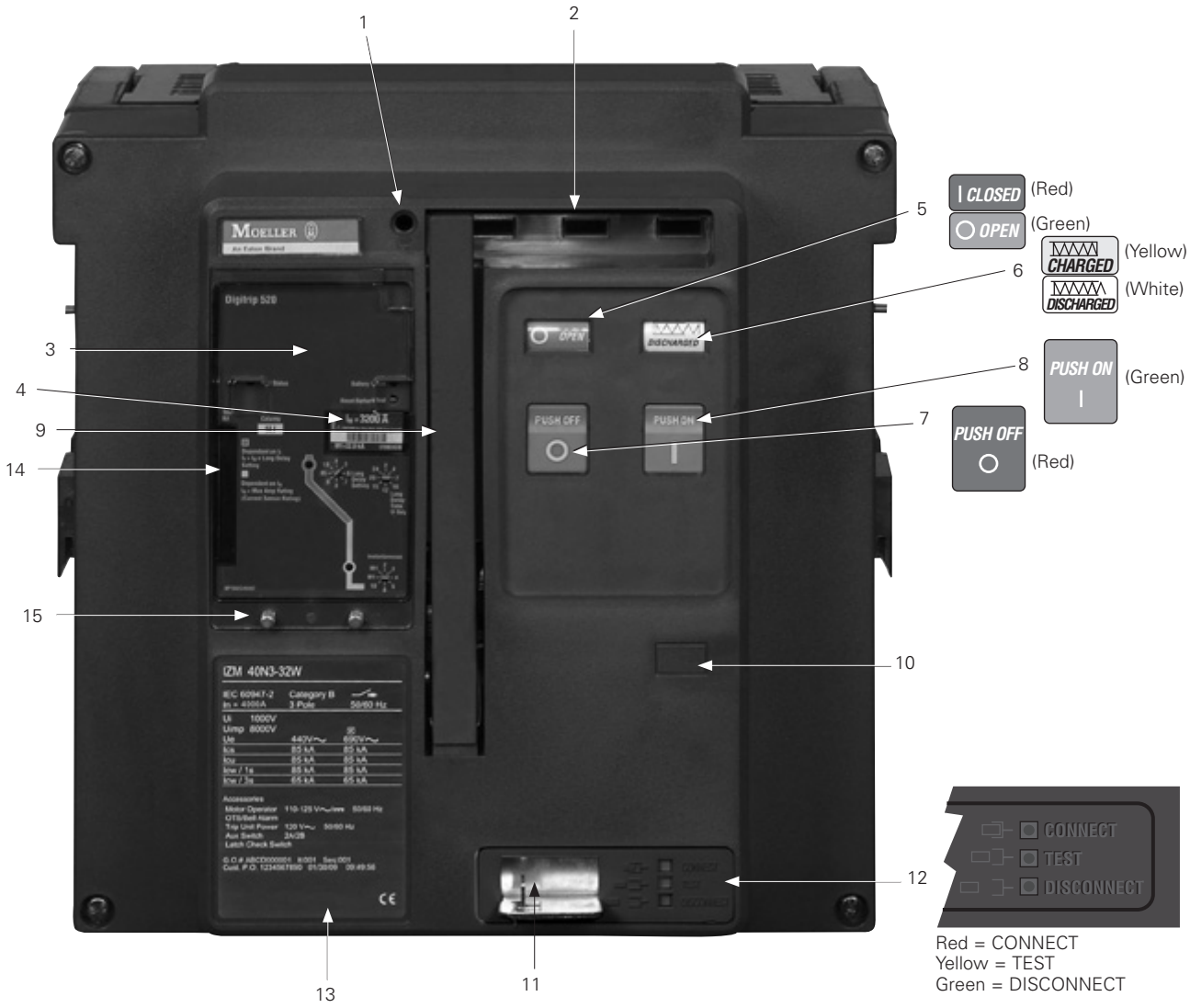


Figure 16. Typical IZM63 and IZM99 Standard Frame Fixed Circuit Breaker Features (Front and Rear Views)



1–Trip Flag (pop-out indicator)
2–Three Accessory Windows
3–Trip Unit
4–Rating Plug
5–Contact Status (open-close)
6–Spring Status (charged-discharged)
7–Manual OFF Button (push)
8–Manual ON Button (push)
9–Manual Charge Handle
10–Optional Operation Counter
11–Padlockable Levering Device Access Door for Drawout Breaker
12–Color-Coded Breaker Position Indicator
13–Nameplate
14–Trip Unit Test Port
15–Trip Unit Cover with Two Mounting Screws (mounting screws will accept customer-supplied lead security meter seals)

Figure 17. Typical IZM Drawout Circuit Breaker Front Cover

Basic circuit breaker assembly

IZM circuit breakers use a rigid frame housing construction of engineered thermoset composite resins. This construction provides high-strength structural properties, excellent dielectric characteristics, and resistance to arc tracking.

The three-piece construction approach provides support while isolating and insulating power conductors (**Figure 18**):

1. A two-piece engineered thermoset composite resin case encloses current paths and arc chambers. The chambers act to channel arc gases up and out of the circuit breaker during interruption.
2. The operating mechanism sits on the front of the case and is electrically isolated and insulated from current contact structures. It is covered by an insulating front cover.

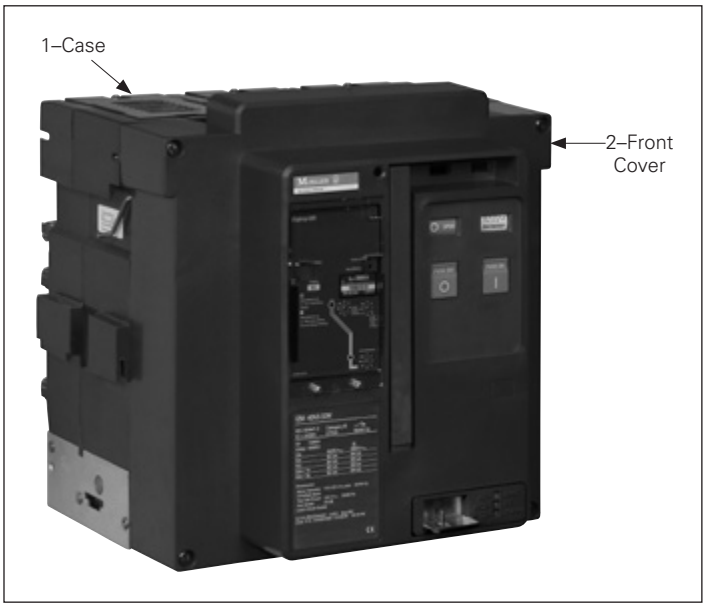


Figure 18. Typical IZM Construction (Front View)

Pole units

A current-carrying pole unit is individually enclosed and rigidly supported by the case. The individual chambers provide for pole unit isolation and insulation from one another. Each pole unit has one primary contact assembly, which consists of a moving portion and a fixed portion. The exact design configuration depends upon the breaker's frame size. IZM63 and IZM99 circuit breakers use two pole units and arc chute assemblies connected mechanically and electrically in parallel to form each phase.

Primary moving contacts

Depending upon the frame size, each primary moving contact assembly is comprised of multiple individual copper contact fingers connected to the load conductor through flexible braided connectors (**Figure 19**). Two flexible connectors are used to connect each finger to the load conductor. The number of fingers used depends upon the circuit breaker's continuous and short-circuit current ratings (**Figure 20** and **Figure 21**). On some ratings, fingers are removed and replaced with spacers.

The single contact finger performs both the main and arcing contact functions on different parts of the same finger (**Figure 19**). A highly conductive alloy pad is part of the contact finger and functions as the moving main contact, and is called the "Heel." The tip of the same contact finger functions as the moving arcing contact, and is called the "Toe."

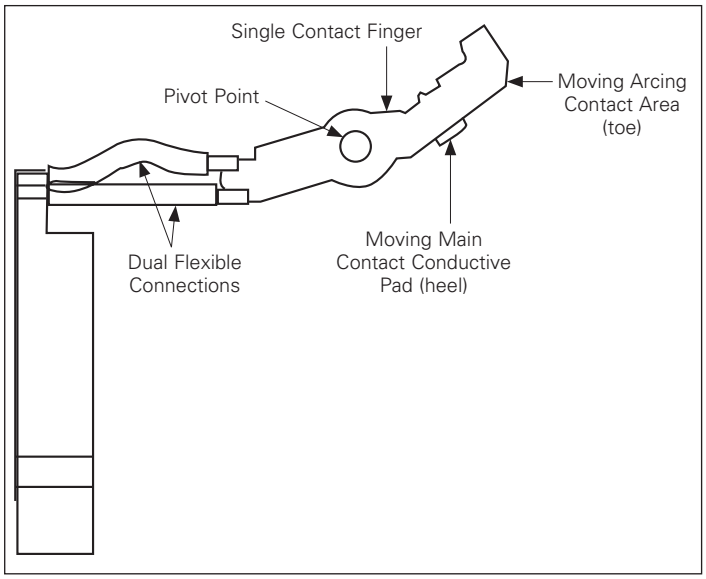


Figure 19. Features of IZM Moving Conductor Assembly

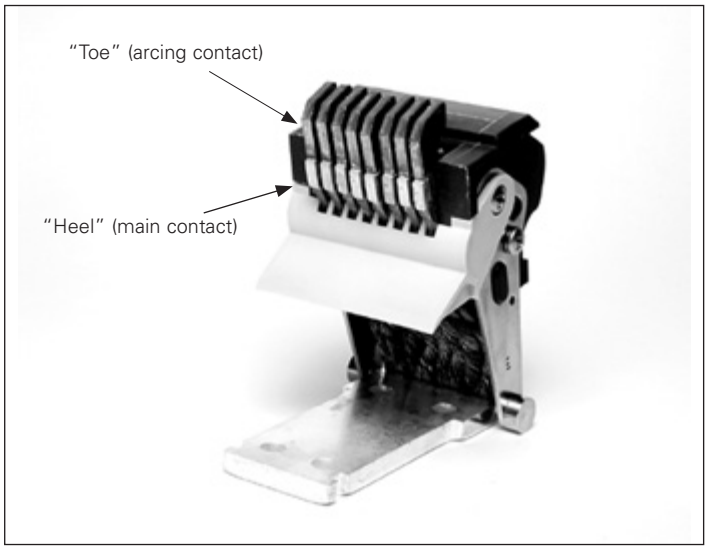


Figure 20. IZM93 and IZM20 (Eight-Finger) Moving Conductor Assembly

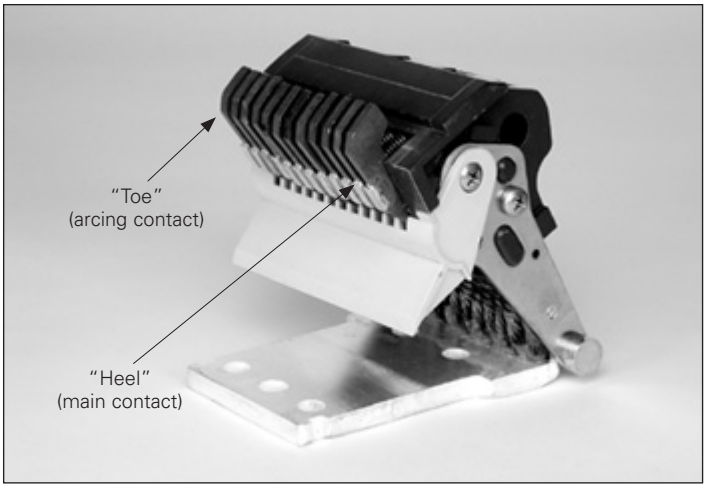


Figure 21. IZM97 and IZM32 (12-Finger) Moving Conductor Assembly

Primary stationary contacts

The primary stationary contact is a combination of two items (**Figure 22**). One is a conductive pad mounted on the line conductor that functions as the stationary main contact. The other is an arc runner, also connected to the line conductor. The integral arc runner serves a dual purpose:

- Fixed arcing contact
- Part of the arc chute

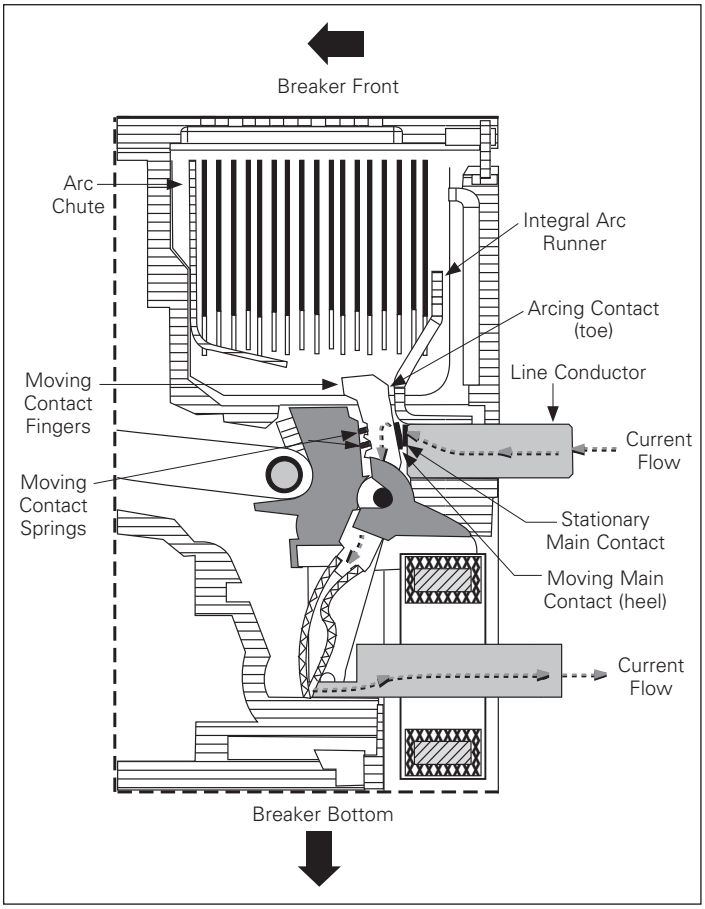


Figure 22. Partial Cross-Sectional View (Shown in Closed Position)

Operating mechanism

The IZM operating mechanism is based on the proven cam and spring design. It is easily accessed by removing four cover screws and the front cover (**Figure 23**). The mechanism is a two-step stored energy mechanism. Potential energy is stored to close the circuit breaker. Sufficient energy to open the circuit breaker remains available after a closing operation.

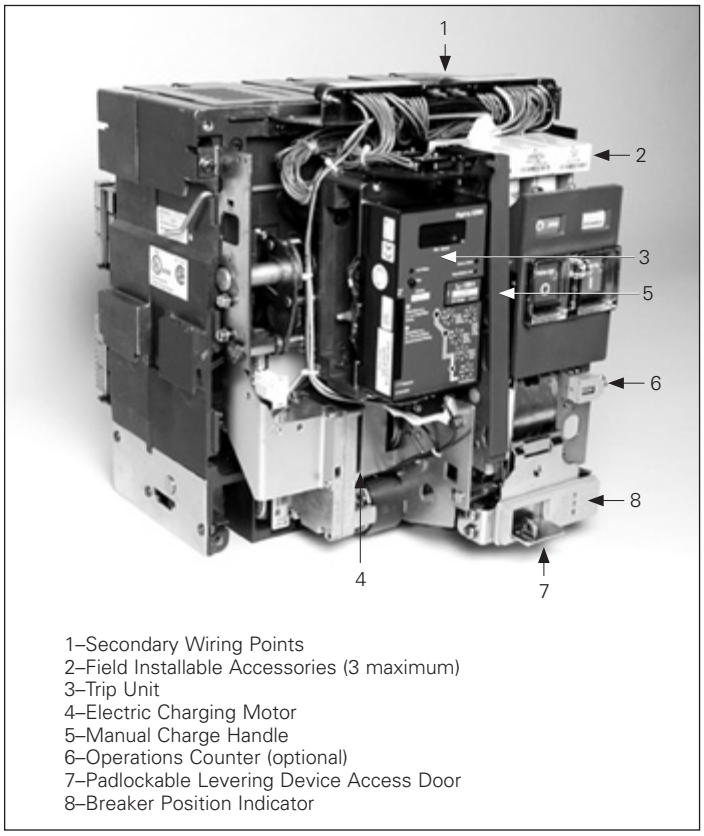


Figure 23. Electrically Operated Drawout Circuit Breaker with Front Cover Removed

Manual operation

On manually operated circuit breakers, the closing spring can only be charged manually. To manually charge the spring, insert one finger in the recess behind the charging handle and pull out. This permits a gloved hand to grasp the handle and begin charging. It takes from five to seven downward strokes on the charging handle to complete the manual charging process. It is possible to manually recharge the spring immediately after closing the circuit breaker and before it has been tripped open.

Standard manually operated circuit breakers are closed and opened by hand using the Manual ON and Manual OFF buttons respectively located on the front of the circuit breaker (**Figure 17**). Performing either operation is accomplished by pressing and releasing the appropriate button. Access to these pushbuttons can be limited by the use of an optional, padlockable cover. In addition, complete access to the ON button can be prevented with an optional prevent close cover. The status of the springs and the primary contacts is always indicated in an indicator window just above the pushbuttons.

Electrically operated optional devices are available to automatically close or trip a manually operated circuit breaker. An electrical spring release is available to close a manually operated circuit breaker. Two optional devices, a shunt trip, and an undervoltage release, are available to automatically trip (open) a manually operated circuit breaker. These optional devices can be installed easily in the field. For more details on these devices, refer to "Accessory devices" on page 34 in this manual.

An electrical operator that is used to charge the closing spring automatically can be added to a manually operated circuit breaker in the field. Manually operated circuit breakers are pre-wired to accept this addition.

Electrical operation

For electrically operated circuit breakers, the springs are normally charged through the use of an electrical operator (**Figure 24**). The springs can, however, be charged manually as just described in the previous paragraph.

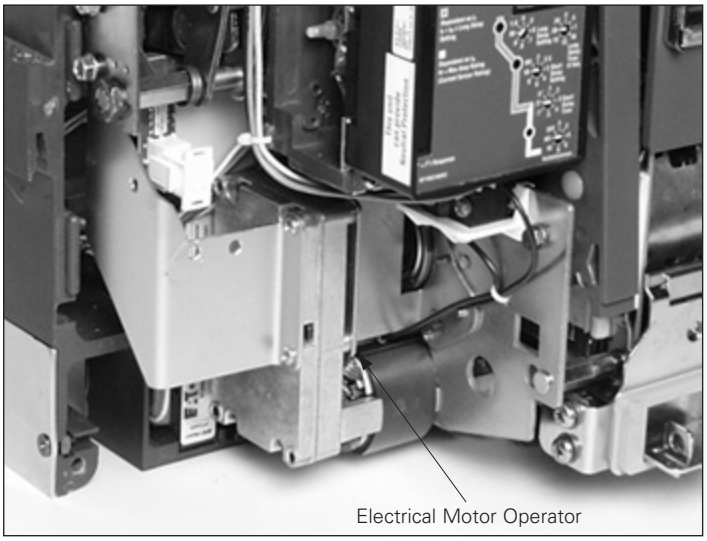


Figure 24. Electrical Motor Operator to Charge Closing Spring

Like the manually operated circuit breaker in the previous paragraph, electrically operated circuit breakers can also be manually closed and opened through the use of the front-mounted Manual ON and Manual OFF buttons.

An electrically operated circuit breaker from the factory is also equipped as standard with a spring release to close the circuit breaker electrically. An optional shunt trip and undervoltage release are also available to trip (open) an electrically operated circuit breaker. Refer to "Accessory devices" on page 34 for more details on both standard and optional devices.

Anti-pump feature

The IZM circuit breaker has both mechanical and electrical anti-pump features. If the circuit breaker is closed on a fault condition (and trips open while the CLOSE signal is maintained), using either the mechanical pushbutton or the electrical close coil, it will not make another attempt to close until the close command is removed and reapplied.

Note: If the close signal is applied prematurely (before the breaker is completely charged and latched), the close command will be ignored until it is removed and reapplied.

For electrical closing, a Latch Check Switch (LCS) option is available (see "Plug-in electrical accessories" on page 34) that will block the application of the electrical close command until the breaker is ready to close.

Arc chambers

The IZM circuit breaker uses arc chambers to insulate and isolate individual poles from one another, from the rest of the circuit breaker, and from operating personnel. Arc chambers are molded and integral parts of the circuit breaker frame. Enclosed within each arc chamber is an arc chute that mounts over each set of primary contacts.

After the main contacts part, any remaining current is driven to the arcing contacts (**Figure 25**). Magnetic action draws the arc to the arc chute. As the arcing contacts separate, the moving arcing contacts discharge into the arc chute plates while the integral arc runner also helps to draw the arc into the arc chute (**Figure 26**).

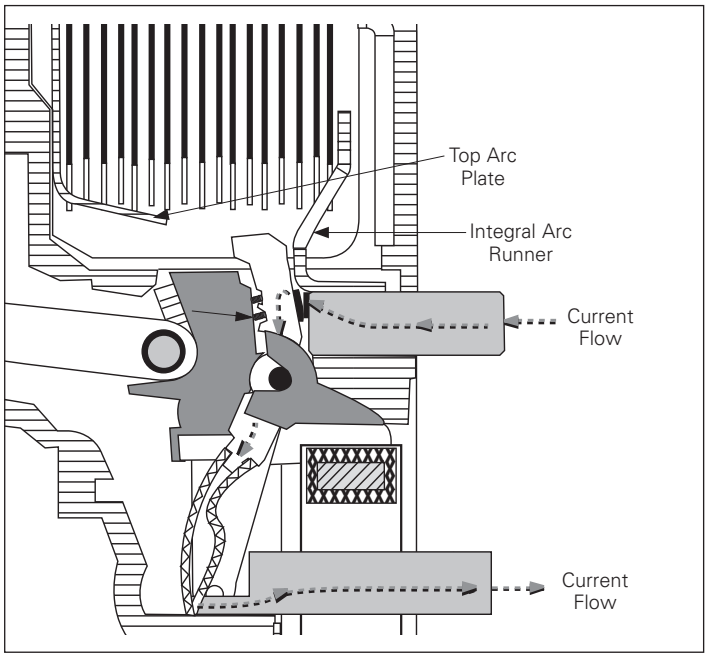


Figure 25. Cross-Section of Conductor and Arc Control System

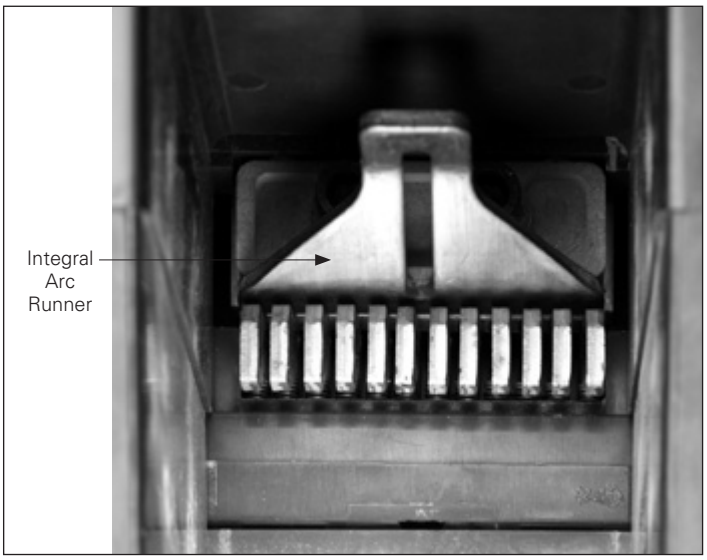


Figure 26. Integral Arc Runner Viewed From Top of Arc Chamber (Arc Chute Removed, Circuit Breaker Closed)

Arc chute

The IZM arc chute mounts down over the arcing contact. Alternating V-shaped arc chute plates attract the arc and interrupt it. The top arc plate, which is a part of the arc chute itself, also helps to attract the arc away from the moving arcing contact and up into the arc chute's V-shaped plates (**Figure 27**).

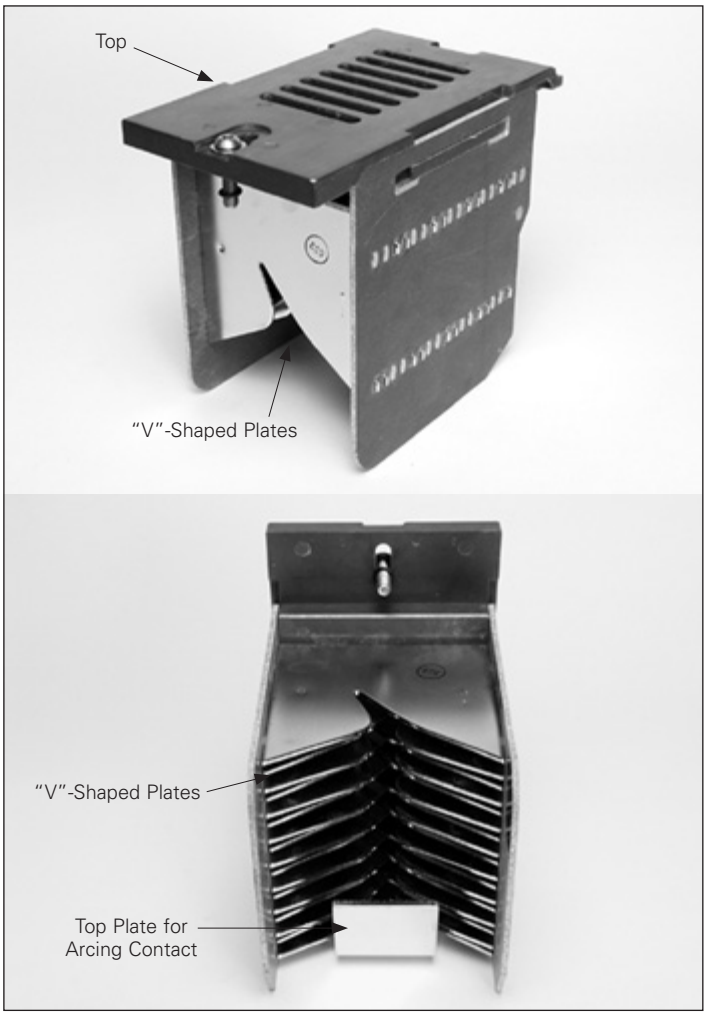


Figure 27. IZM Arc Plate Assembly

Arc chute components are assembled in an insulating jacket that is removable from the top of the circuit breaker, as previously described in "Lifting circuit breaker" on page 9. Each arc chute has a baffled top cover.

Electronic tripping system

The IZM circuit breaker uses a three-part tripping system (**Figure 28**):

- Microprocessor-based trip unit
- Current sensors
- Trip actuator

All three parts of the tripping system are discussed here, except that the trip unit itself is not discussed in detail. For detailed information pertaining to the different trip unit models available with IZM circuit breakers, refer to the specific instruction leaflet dedicated to the trip units (AWB1230-1608 and AWB1230-1609).

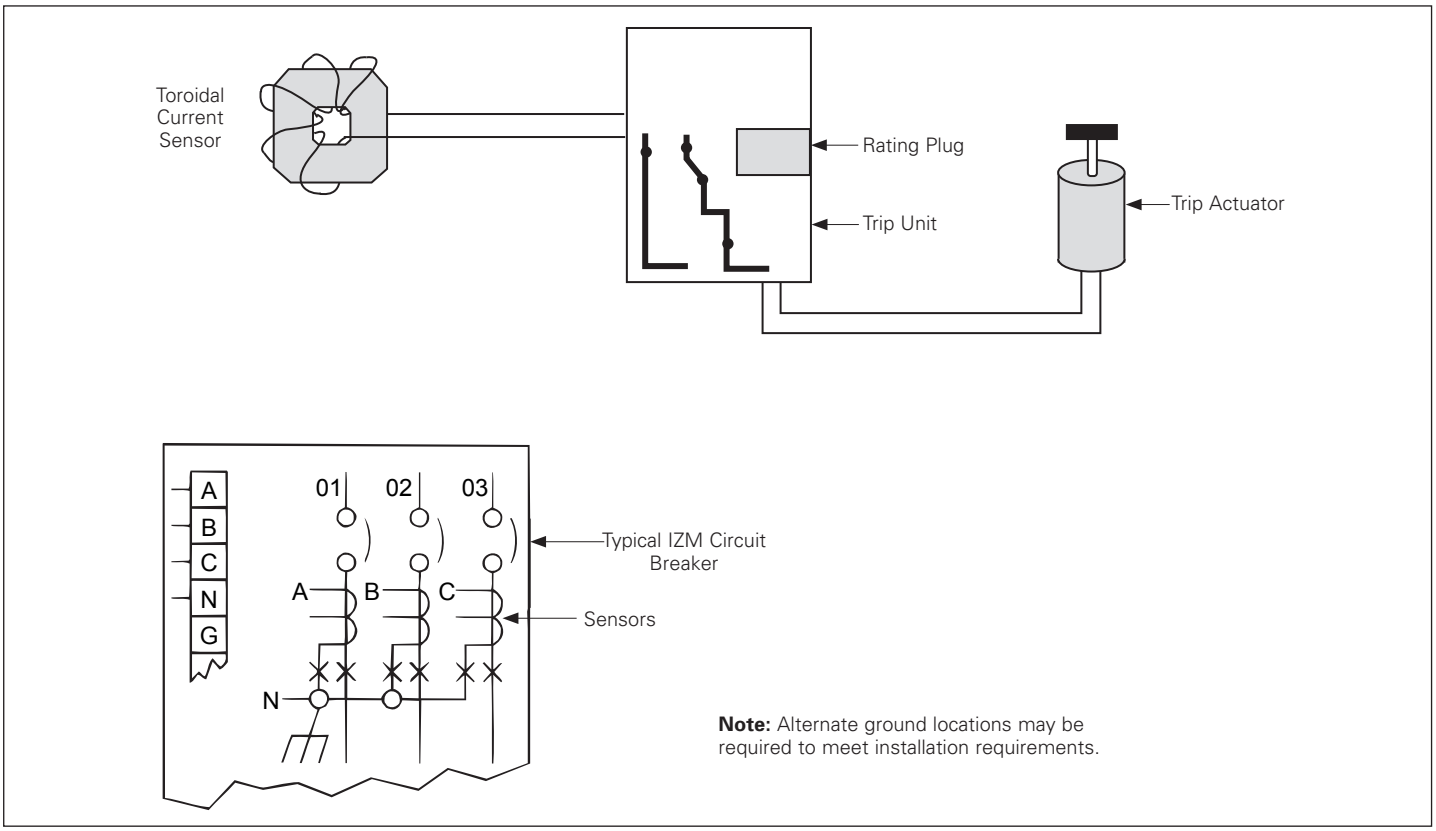


Figure 28. Pictorial Diagram of Typical Current Sensing, Processing, and Tripping System

Microprocessor-based trip unit

IZM circuit breakers use any one of a family of Digitrip™ RMS trip units whose main features are summarized in **Table 4**.

Table 4. IZM Digitrip Trip Units

Functions	520L*i*	520*i*	520M*i* ①	520MC*i* ①	1150*i* ①
LSIG protection	No	Yes	Yes	Yes	Yes
Disable (I)	No	Yes	Yes	Yes	Yes
GF protection	No	Yes	Yes	Yes	Yes
GF alarm	No	No	Yes	Yes	Yes
Display	No	No	Yes ②	Yes ②	Yes ③
Programmable	No	No	No	No	Yes
Metering	No	No	Yes ④	Yes ④	Yes
Power and energy values	No	No	No	No	Yes
Power quality	No	No	No	No	Yes
Communication	No	No	No	Yes	Yes

① Available control voltages are 24–48 Vdc, and 120 and 240 Vac.

② One-line, (four characters per line) LCD display.

③ Three-line, (eight characters per line) LED display.

④ Phase, neutral, ground, and high load current only.

All the electronic trip units are self-powered with regard to their protective functions. Current signal levels and the tripping energy are derived from the current sensors integrally mounted in the circuit breaker. Control power is required to operate certain optional display and metering functions.

A functional local test of a major portion of the trip unit's electronic circuitry and the circuit breaker's mechanical tripping action can be verified through the trip unit's test receptacle (**Figure 29**). This is accomplished using a Digitrip Test Kit that provides a secondary injection test that simulates the current sensors. A small hand-held IZM functional Test Kit can also be used to check circuitry and mechanical tripping functions (**Figure 30**).

When the circuit breaker is shipped from the factory, the trip unit's protective functions are normally set at minimum values. For specific overload tripping characteristics and time/current curves to coordinate with a load or system, refer to the trip unit instruction book.

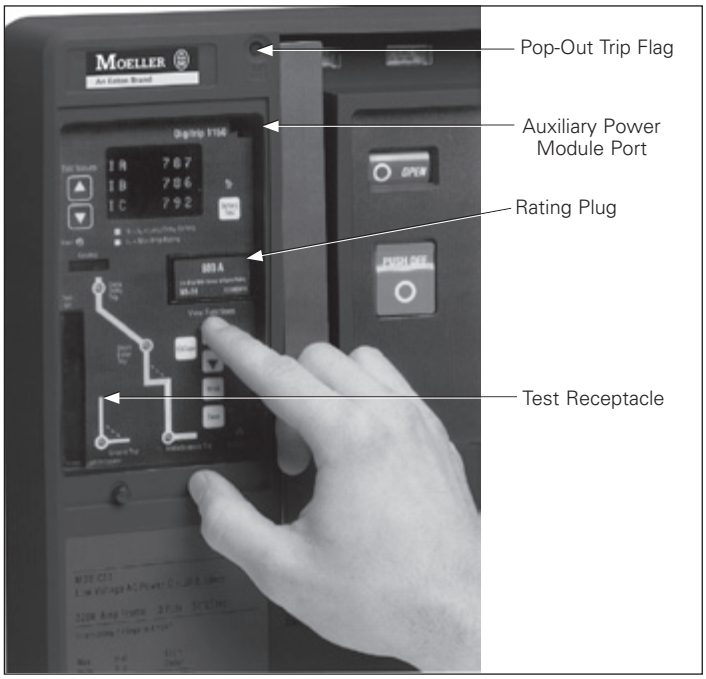


Figure 29. Digitrip RMS 1150 Programmable Trip Unit Installed in IZM Circuit Breaker

Figure 30. Hand-Held Tester

Rating plug

All IZM circuit breaker trip units use a fixed type rating plug. The current rating of the rating plug must match the current rating of the integrally mounted current sensors (**Figure 29**). The rating plug performs several functions:

1. It tells the trip unit what the rating is of the current sensors. A label on the front of the rating plug clearly indicates that the rating plug and sensors must have the same rating.
2. It determines the maximum instantaneous setting that is a function of the current sensor rating.
3. When it is required that the maximum ground fault pickup value not exceed 1200 amperes, a properly matched rating plug accomplishes this requirement for higher ampere sensors by incorporating circuitry to identify that level by sensor rating.

If the rating plug is removed from the trip unit, the circuit breaker will trip if it is carrying current. Make certain the rating plug is secured in position with its retaining screw. **Do not torque the retaining screw beyond 0.1 Nm.**

Refer to **Table 5** for a tabulation of the available rating plugs.

Current sensors

Three toroidally wound current sensors are installed at the rear of the circuit breaker on the lower terminals (**Figure 31**). The sensors produce an output current proportional to the load current. Under preselected conditions of current magnitude and time, the sensors furnish the trip unit with a signal and the energy required to trip the circuit breaker.

External neutral current sensors are also available for customer installation. The additional sensor is not supplied with the circuit breaker and must be ordered separately. They are wired to the trip unit through the secondary contacts of the circuit breaker.

Refer to **Table 5** for a tabulation of the available current sensor ratings.

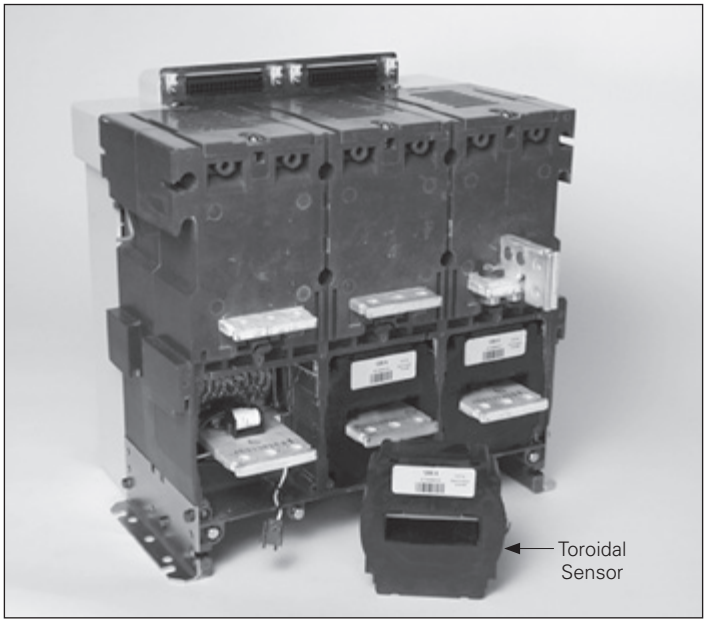


Figure 31. Replaceable Current Sensors Shown with Bottom Adapters and Cover Plate Removed

Table 5. IZM Current Sensors and Matching Rating Plugs

Current Rating in Amperes		
200	1000	–
250	–	3200
300	1250	4000
400	1600	5000
–	2000	6300
630	2500	
800	3000	

Trip actuator

The trip actuator is a small cylindrically shaped electromagnetic device that acts mechanically to trip the circuit breaker in response to a signal from the trip unit. In general, it is comprised of a permanent magnet, a spring-loaded rod to produce the mechanical tripping, and a lever for resetting the actuator after tripping occurs. The electronic trip unit provides a pulse that counteracts the effect of the permanent magnet, releasing the spring-loaded rod to act mechanically. The device is reset when the circuit breaker opens.

Mechanical trip flag

A red, pop-out mechanical trip indicator is an optional IZM feature. It is located above the trip unit on the breaker's front faceplate (**Figure 29**). It operates by releasing and popping out any time the circuit breaker trips due to an overcurrent condition.

Note: The mechanical trip indicator **will not prevent the breaker from being reclosed**.

The indicator is reset manually by pushing it back in. If the indicator is not reset, the circuit breaker will operate normally, but future mechanical trip indication will be lost.

An optional overcurrent trip switch (bell alarm) that operates off the position of the mechanical trip indicator is also available. The switch is reset when the trip indicator is reset.

On optional Digitrip models with LED cause-of-trip indicators, these indicators should also be reset (by pushing momentarily) after the cause of the fault has been diagnosed; this will preserve the internal battery. On trip units equipped for communication, the LED reset function can be performed remotely using INCOM™ commands.

Making current release

All IZM circuit breaker trip units have a making current release function. This safety feature prevents the circuit breaker from being closed and latched on a faulted circuit. The non-adjustable release is preset at a peak instantaneous current of 25 x I_n; this corresponds to an rms current of 11 x I_n with maximum asymmetry.

The making current release is enabled only for the first two cycles following a circuit breaker closing operation. The making current release will trip the circuit breaker instantaneously, release the mechanical (pop-out) indicator, and flash the instantaneous LED trip indicator, if so equipped.

High-instantaneous trip option

The high-instantaneous trip option is installed in 800 to 3200A IZM circuit breakers with a 100 kA interrupting capacity. In general, the high-instantaneous trip is comprised of three small air core sensors, one in each phase, which produce a signal and transmit it back to the trip unit when the 85 kA withstand rating of the circuit breaker is exceeded. The result is an instantaneous trip by the circuit breaker. This high instantaneous trip option permits the 800–3200A IZM circuit breakers to be applied where a 100 kA fault is possible, while selectivity up to 85 kA is maintained.

Voltage taps

On circuit breakers with Digitrip 1150 trip units, potential taps are required to monitor the three-phase voltages. Voltage taps may be placed on either the line (top) or load (bottom) terminals of the breaker at the factory. **Figure 32** illustrates line-side voltage taps.

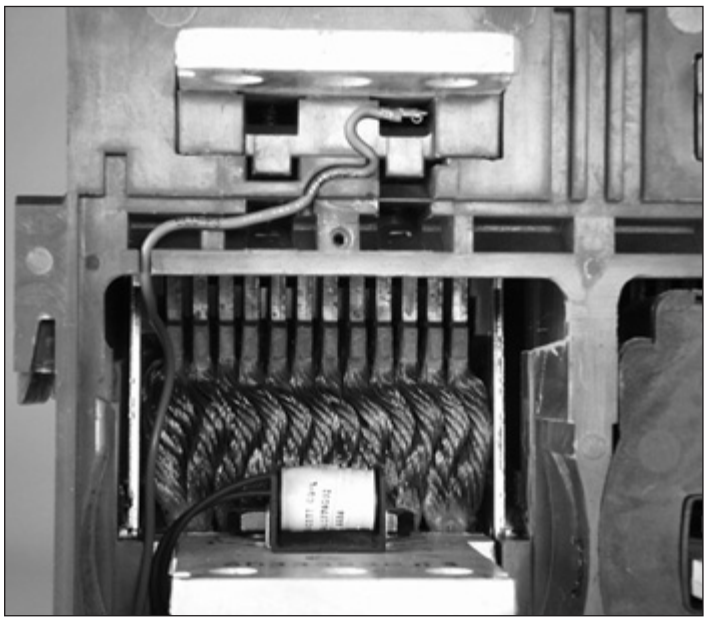


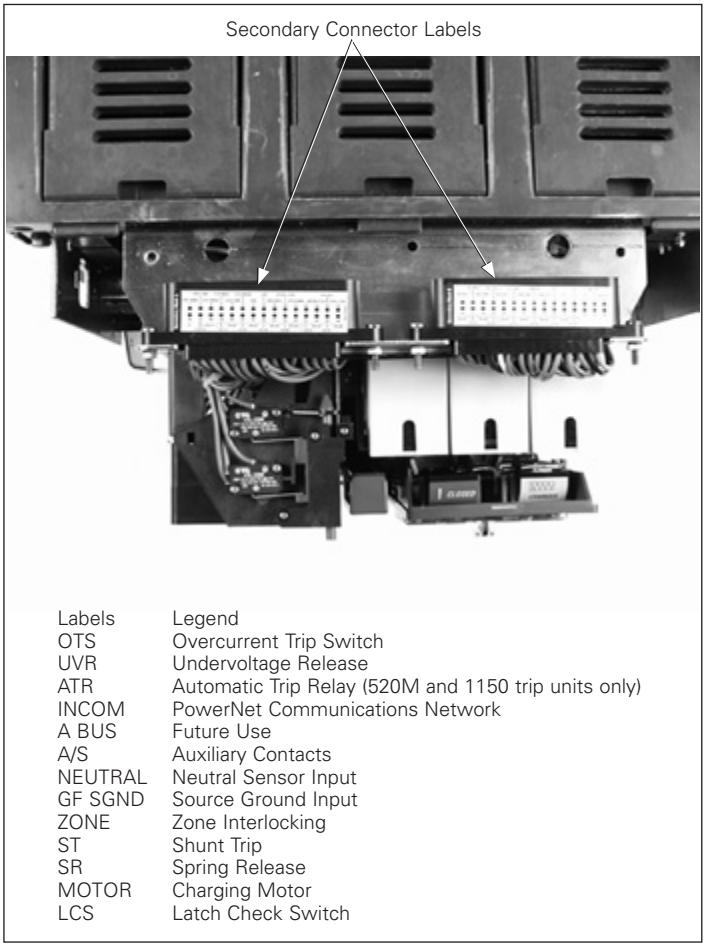
Figure 32. Line-Side Voltage Tap for 1150 Trip Unit

Secondary contacts and connection diagrams

A maximum of 60 secondary wiring connection points are available on the standard frame circuit breaker (48 on narrow frame), each dedicated to a specific function.

The wiring points are finger safe with no more than two wires per terminal.

Up to two secondary contact plug-in connectors (AMP), each with 30 secondary points, are mounted on the top rear portion of the circuit breaker. The plug-in connectors are protected by a molded hood (**Figure 34**). How many connectors are mounted depends upon a number of considerations, such as whether the circuit breaker is electrically or manually operated and how many features are required. When the front cover of the circuit breaker is removed, the top of each plug-in connector is exposed. A label on each connector identifies the wiring points (**Figure 33**).



Labels	Legend
OTS	Overcurrent Trip Switch
UVR	Undervoltage Release
ATR	Automatic Trip Relay (520M and 1150 trip units only)
INCOM	PowerNet Communications Network
A BUS	Future Use
A/S	Auxiliary Contacts
NEUTRAL	Neutral Sensor Input
GF SGND	Source Ground Input
ZONE	Zone Interlocking
ST	Shunt Trip
SR	Spring Release
MOTOR	Charging Motor
LCS	Latch Check Switch

Figure 33. Top View Secondary Connectors

Figure 34. Secondary Connector Protective Hood

Drawout type circuit breakers—Compatible secondary plug-in connectors are mounted on the top front portion of the drawout cassette (**Figure 35**). These connectors match and plug into the circuit breaker mounted connectors. Contact points are wired from the cassette's plug-in connectors to cassette mounted terminal blocks. The terminal blocks are also mounted on the top front portion of the cassette. The secondary terminals have finger-proof hinged covers with small holes for probe testing.

Fixed type circuit breakers—There are two secondary connection options:

1. Without terminal block—If a terminal block for customer use is not required, the circuit breaker is supplied with both plug-in connectors (male and female) just described in the two previous paragraphs. The plug-in connectors are joined and attached to the top portion of the circuit breaker. The customer can plug secondary wiring with crimp-on connectors into the back of the plug-in connectors; subsequently the connections to the circuit breaker can be quickly joined or separated as required.
2. With terminal block—For those customers preferring to wire to a terminal block, terminal blocks with finger-proof hinged covers are added to the secondary configuration just described for a fixed circuit breaker "without a terminal block." The terminal blocks are wired to the plug-in connectors and also permanently attached to the upper rear portion of the circuit breaker.

A standard tool is available from the plug-in connector manufacturer (AMP) to facilitate the removal of secondary wiring from a plug-in connector, or contact Moeller for assistance (**Figure 36**). The connector halves must be separated to use this tool.

Connection diagrams

The connection diagrams for all IZM circuit breakers using Digitrip RMS trip units are shown in **Figure 37** through **Figure 42**.

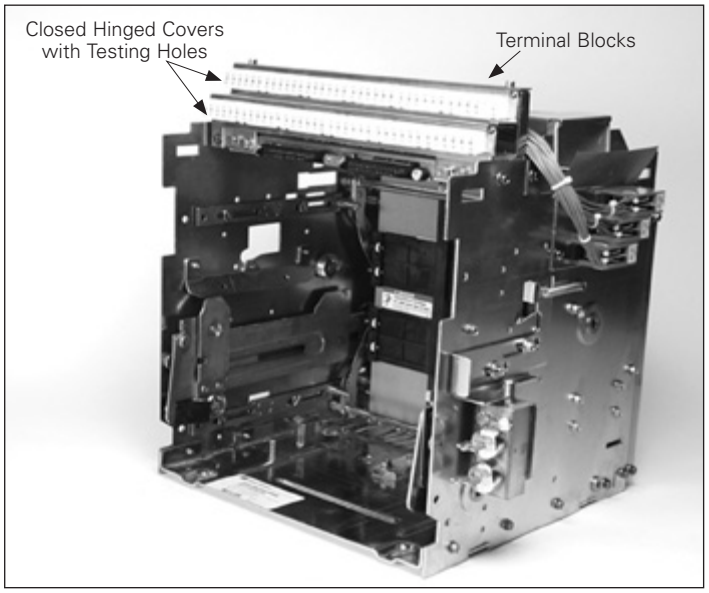


Figure 35. Cassette-Mounted Secondary Wiring

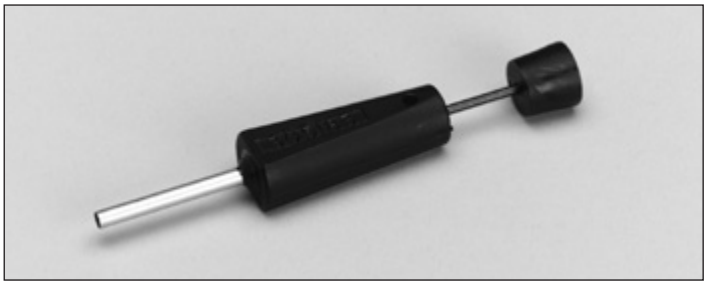
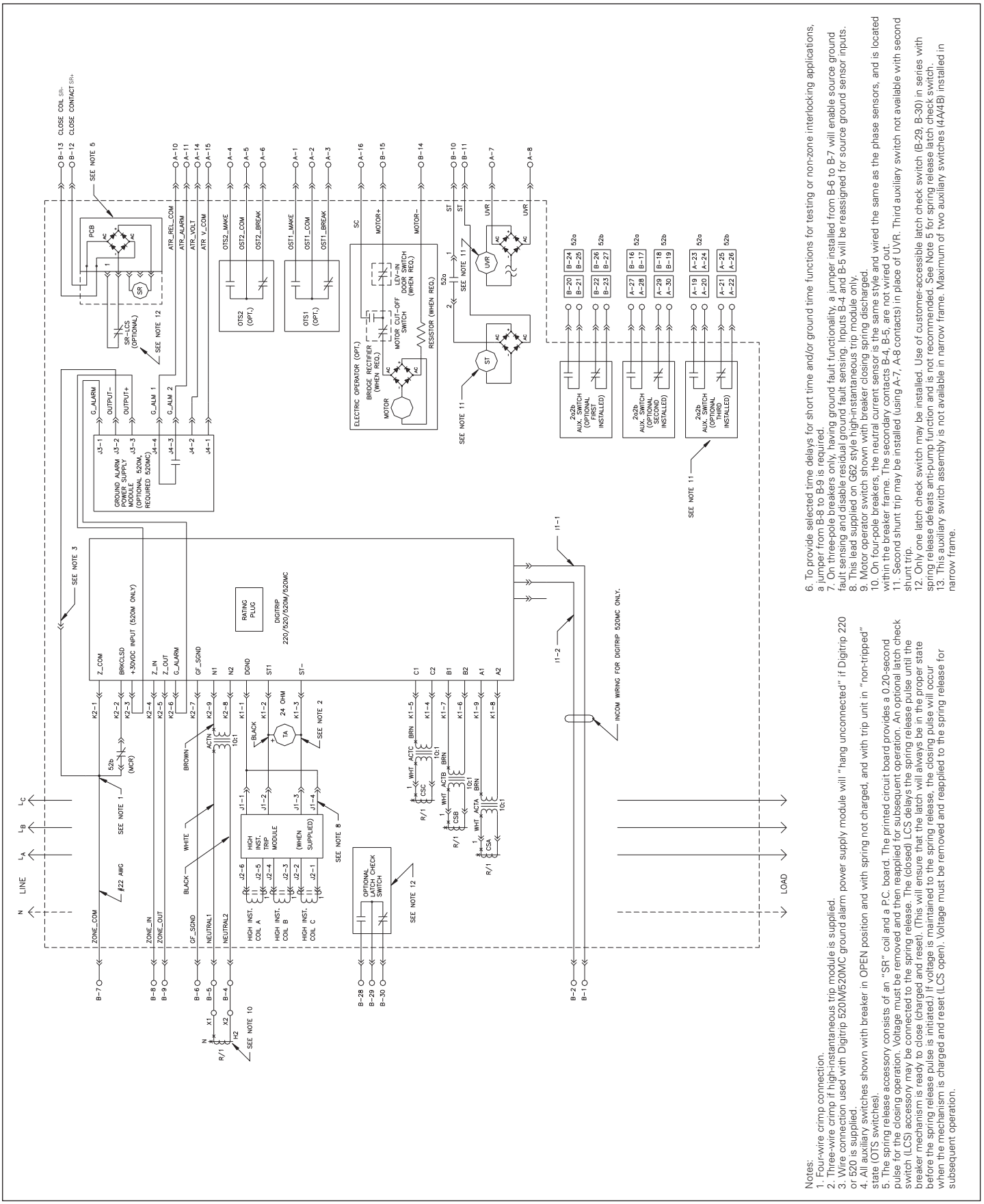
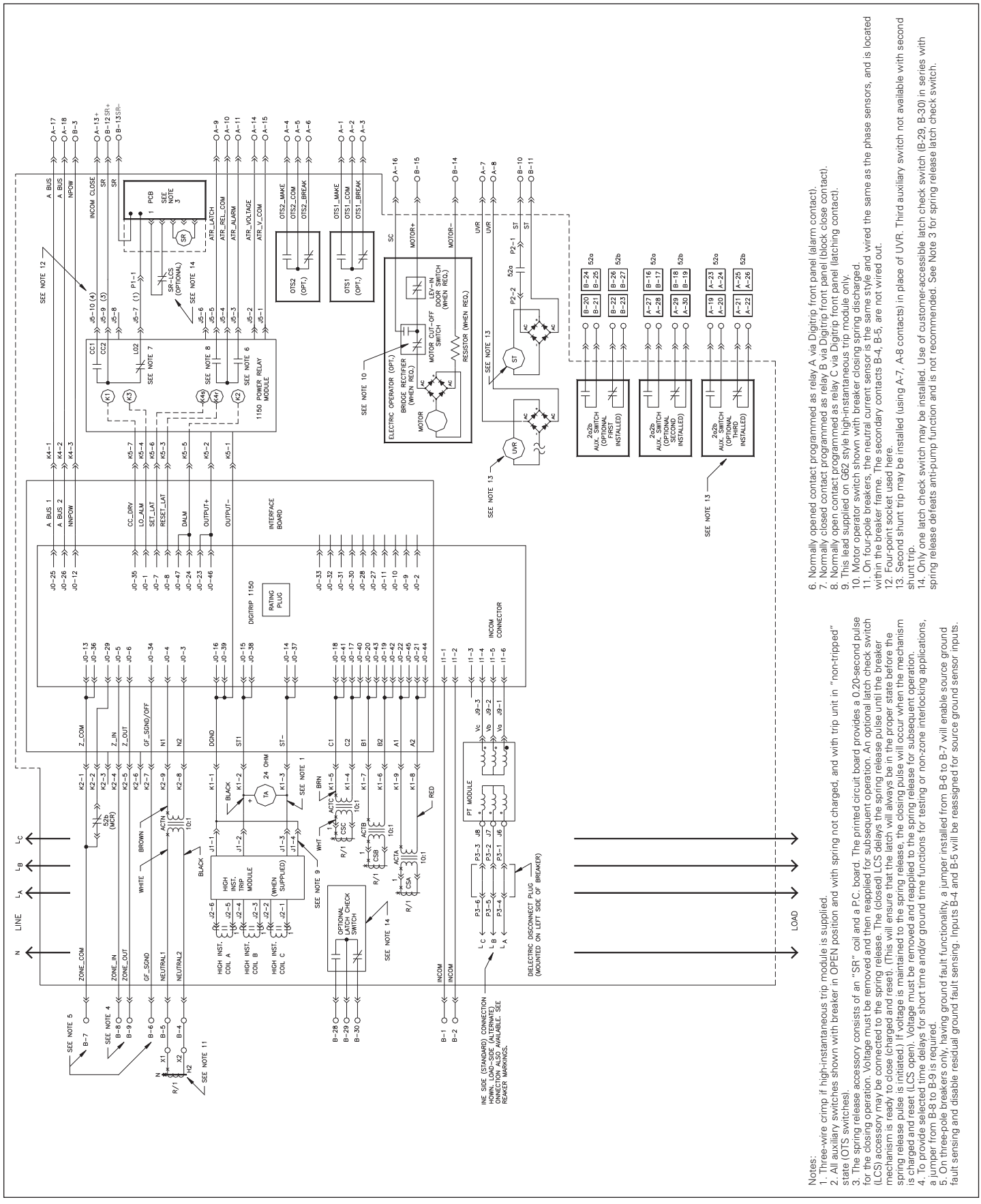


Figure 36. AMP Secondary Wiring Removal Tool



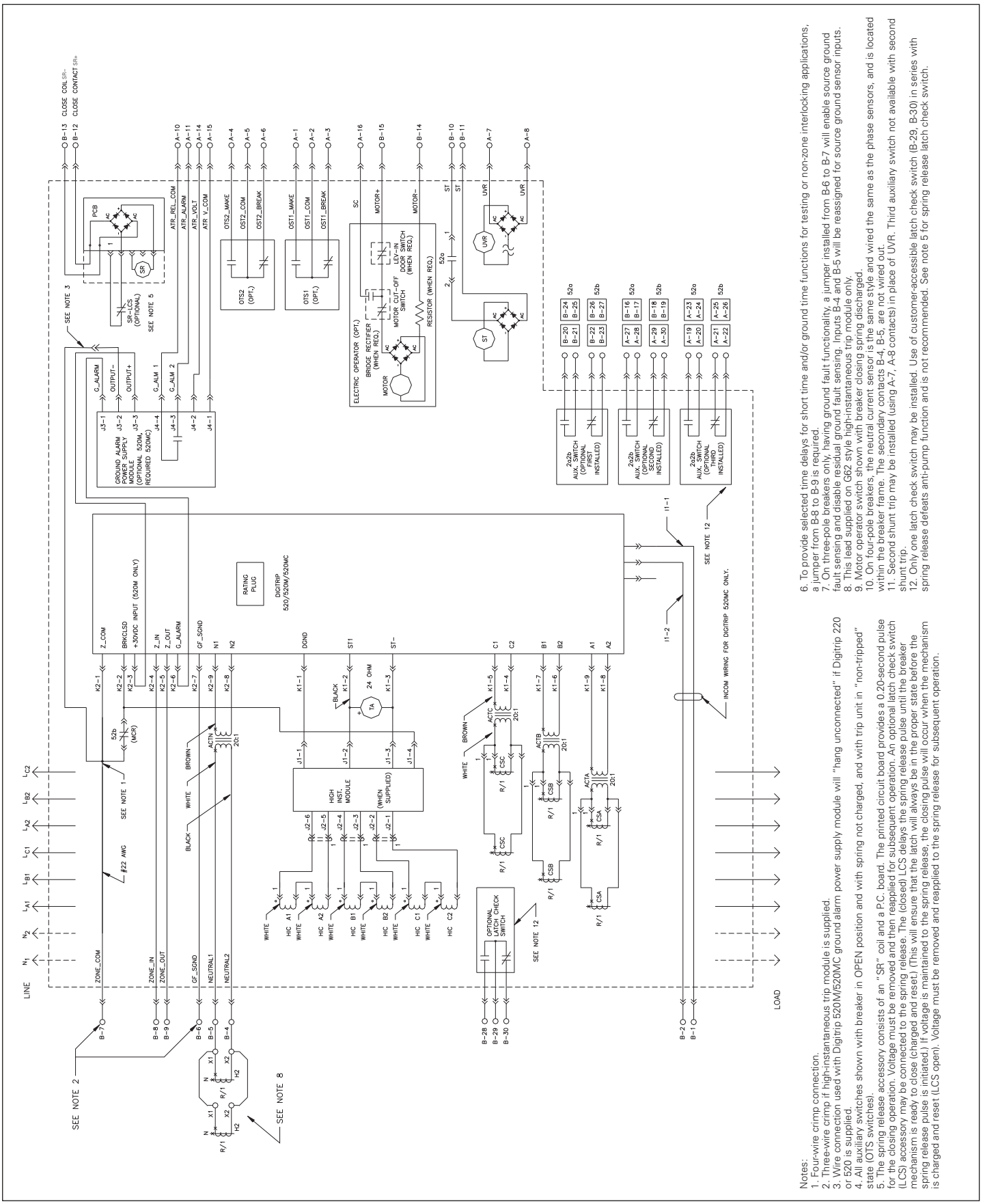
Notes:
1. Four-wire crimp connection.
2. Three-wire crimp if high-instantaneous trip module is supplied.
3. Wire connection used with Digitrip 520M/520MC ground alarm power supply module will "hang unconnected" if Digitrip 220 or 520 is supplied.
4. All auxiliary switches shown with breaker in OPEN position and with spring not charged, and with trip unit in "non-tripped" state (OTS switches).
5. The spring release accessory consists of an "SR" coil and a P.C. board. The printed circuit board provides a 0.20-second pulse for the closing operation. Voltage must be removed and then reapplied for subsequent operation. An optional latch check switch (LCS) accessory may be connected to the spring release. The (closed) LCS delays the spring release pulse until the breaker mechanism is ready to close (charged and reset). (This will ensure that the latch will always be in the proper state before the spring release pulse is initiated.) If voltage is maintained to the spring release, the closing pulse will occur when the mechanism is charged and reset (LCS open). Voltage must be removed and reapplied to the spring release for subsequent operation.
6. To provide selected time delays for short time and/or ground time functions for testing or non-zone interlocking applications, a jumper from B-8 to B-9 is required.
7. On three-pole breakers only, having ground fault functionality, a jumper installed from B-6 to B-7 will enable source ground fault sensing and disable residual ground fault sensing. Inputs B-4 and B-5 will be reassigned for source ground sensor inputs.
8. This lead supplied on G62 style high-instantaneous trip module only.
9. Motor operator switch shown with breaker closing spring discharged.
10. On four-pole breakers, the neutral current sensor is the same style and wired the same as the phase sensors, and is located within the breaker frame. The secondary contacts B-4, B-5, are not wired out.
11. Second shunt trip may be installed (using A-7, A-8 contacts) in place of UVR. Third auxiliary switch not available with second shunt trip.
12. Only one latch check switch may be installed. Use of customer-accessible latch check switch (B-29, B-30) in series with spring release defeats anti-pump function and is not recommended. See Note 5 for spring release latch check switch.
13. This auxiliary switch assembly is not available in narrow frame. Maximum of two auxiliary switches (4A4B) installed in narrow frame.

Figure 37. Connection Diagram for IZM93 and IZM20, and IZM97 and IZM32 Frame with Digitrip 220/520/520M/520MC (Type A, V, U Trip Units)



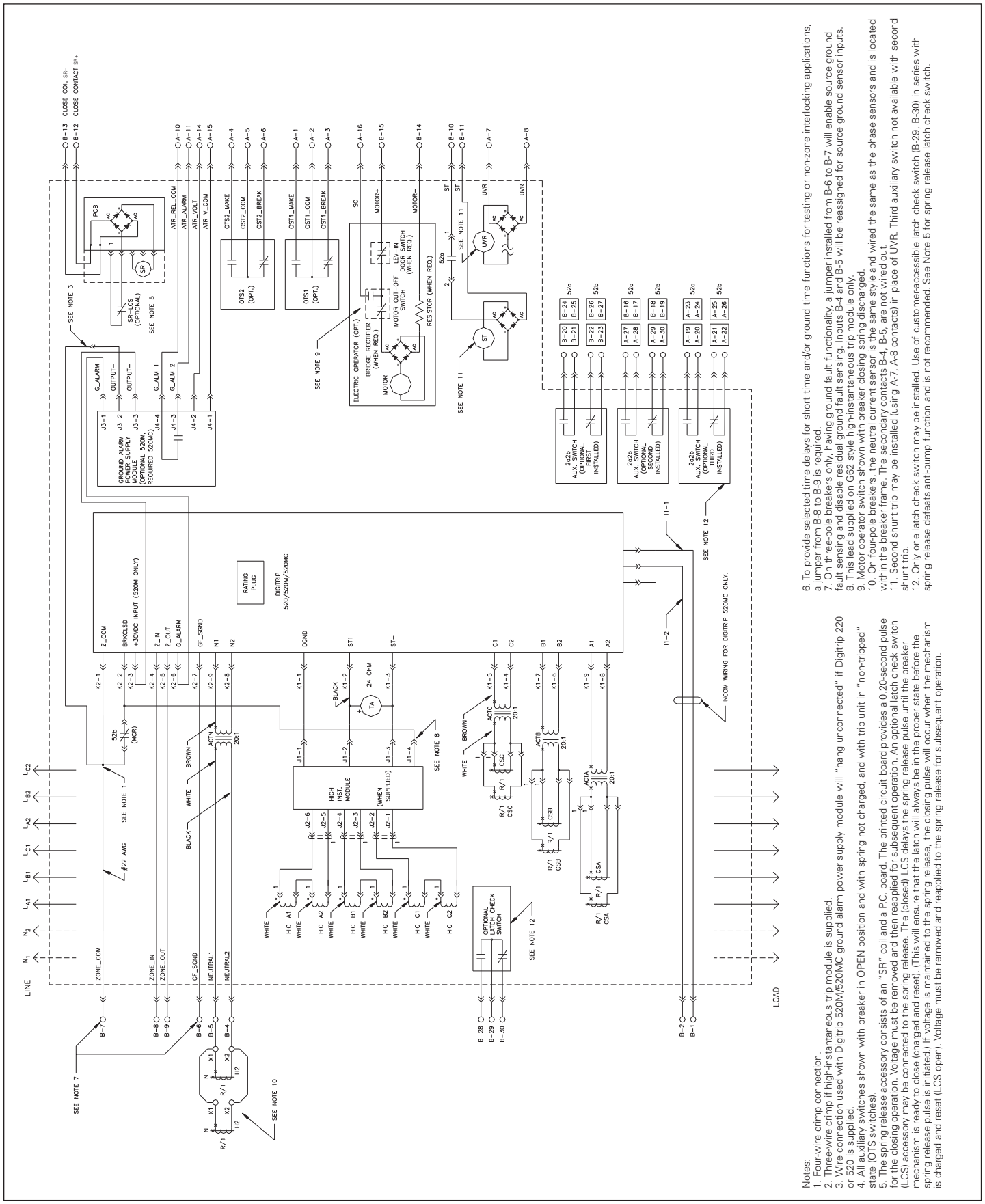
Notes:
1. Three-wire crimp if high-instantaneous trip module is supplied.
2. All auxiliary switches shown with breaker in OPEN position and with spring not charged, and with trip unit in "non-tripped" state (OTS switches).
3. The spring release accessory consists of an "SR" coil and a P.C. board. The printed circuit board provides a 0.20-second pulse for the closing operation. Voltage must be removed and then reapplied for subsequent operation. An optional latch check switch (LCS) accessory may be connected to the spring release. The (closed) LCS delays the spring release pulse until the breaker mechanism is ready to close (charged and reset). (This will ensure that the latch will always be in the proper state before the spring release pulse is initiated.) If voltage is maintained to the spring release, the closing pulse will occur when the mechanism is charged and reset (LCS open). Voltage must be removed and reapplied to the spring release for subsequent operation.
4. To provide selected time delays for short time and/or ground time functions for testing or non-zone interlocking applications, a jumper from B-8 to B-9 is required.
5. On three-pole breakers only, having ground fault functionality, a jumper installed from B-6 to B-7 will enable source ground fault sensing and disable residual ground fault sensing. Inputs B-4 and B-5 will be reassigned for source ground sensor inputs.
6. Normally opened contact programmed as relay A via Digitrip front panel (alarm contact).
7. Normally closed contact programmed as relay B via Digitrip front panel (block close contact).
8. Normally open contact programmed as relay C via Digitrip front panel (latching contact).
9. This lead supplied on G62 style high-instantaneous trip module only.
10. Motor operator switch shown with breaker closing spring discharged.
11. On four-pole breakers, the neutral current sensor is the same style and wired the same as the phase sensors, and is located within the breaker frame. The secondary contacts B-4, B-5, are not wired out.
12. Four-point socket used here.
13. Second shunt trip may be installed (using A-7, A-8 contacts) in place of UVR. Third auxiliary switch not available with second shunt trip.
14. Only one latch check switch may be installed. Use of customer-accessible latch check switch (B-29, B-30) in series with spring release defeats anti-pump function and is not recommended. See Note 3 for spring release latch check switch.

Figure 38. Connection Diagram for IZM97 and IZM32 Frame with Digitrip 1150 (Type P Trip Unit)



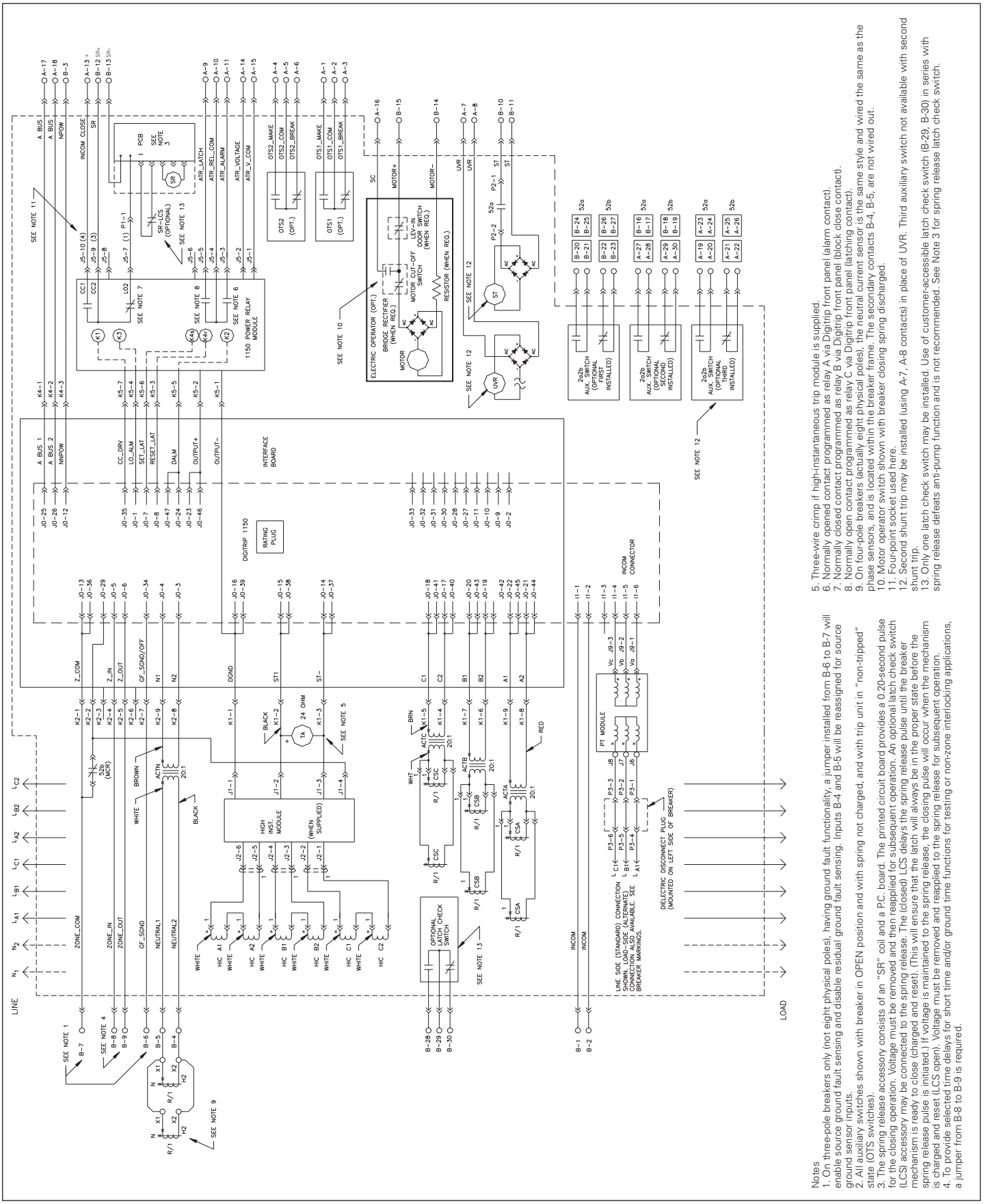
Notes:
1. Four-wire crimp connection.
2. Three-wire crimp if high-instantaneous trip module is supplied.
3. Wire connection used with Digitrip 520M/520MC ground alarm power supply module will "hang unconnected" if Digitrip 220 or 520 is supplied.
4. All auxiliary switches shown with breaker in OPEN position and with spring not charged, and with trip unit in "non-tripped" state (OTS switches).
5. The spring release accessory consists of an "SR" coil and a P.C. board. The printed circuit board provides a 0.20-second pulse for the closing operation. Voltage must be removed and then reapplied for subsequent operation. An optional latch check switch (LCS) accessory may be connected to the spring release. The (closed) LCS delays the spring release pulse until the breaker mechanism is ready to close (charged and reset.) (This will ensure that the latch will always be in the proper state before the spring release pulse is initiated.) If voltage is maintained to the spring release, the closing pulse will occur when the mechanism is charged and reset (LCS open). Voltage must be removed and reapplied to the spring release for subsequent operation.
6. To provide selected time delays for short time and/or ground time functions for testing or non-zone interlocking applications, a jumper from B-8 to B-9 is required.
7. On three-pole breakers only, having ground fault functionality, a jumper installed from B-6 to B-7 will enable source ground fault sensing and disable residual ground fault sensing. Inputs B-4 and B-5 will be reassigned for source ground sensor inputs.
8. This lead supplied on G62 style high-instantaneous trip module only.
9. Motor operator switch shown with breaker closing spring discharged.
10. On four-pole breakers, the neutral current sensor is the same style and wired the same as the phase sensors, and is located within the breaker frame. The secondary contacts B-4, B-5, are not wired out.
11. Second shunt trip may be installed (using A-7, A-8 contacts) in place of UVR. Third auxiliary switch not available with second shunt trip.
12. Only one latch check switch may be installed. Use of customer-accessible latch check switch (B-29, B-30) in series with spring release defeats anti-pump function and is not recommended. See note 5 for spring release latch check switch.

Figure 39. Connection Diagram for IZM99 and IZM63 Frame with Digitrip 520/520M/520MC with ABCABC Configuration (Type A, V, U Trip Units)



Notes:
1. Four-wire crimp connection.
2. Three-wire crimp if high-instantaneous trip module is supplied.
3. Wire connection used with Digitrip 520M/520MC ground alarm power supply module will "hang unconnected" if Digitrip 220 or 520 is supplied.
4. All auxiliary switches shown with breaker in OPEN position and with spring not charged, and with trip unit in "non-tripped" state (OTS switches).
5. The spring release accessory consists of an "SR" coil and a P.C. board. The printed circuit board provides a 0.20-second pulse for the closing operation. Voltage must be removed and then reapplied for subsequent operation. An optional latch check switch (LCS) accessory may be connected to the spring release. The (closed) LCS delays the spring release pulse until the breaker mechanism is ready to close (charged and reset). (This will ensure that the latch will always be in the proper state before the spring release pulse is initiated.) If voltage is maintained to the spring release, the closing pulse will occur when the mechanism is charged and reset (LCS open). Voltage must be removed and reapplied to the spring release for subsequent operation.
6. To provide selected time delays for short time and/or ground time functions for testing or non-zone interlocking applications, a jumper from B-8 to B-9 is required.
7. On three-pole breakers only, having ground fault functionality, a jumper installed from B-6 to B-7 will enable source ground fault sensing and disable residual ground fault sensing. Inputs B-4 and B-5 will be reassigned for source ground sensor inputs.
8. This lead supplied on G62 style high-instantaneous trip module only.
9. Motor operator switch shown with breaker closing spring discharged.
10. On four-pole breakers, the neutral current sensor is the same style and wired the same as the phase sensors and is located within the breaker frame. The secondary contacts B-4, B-5, are not wired out.
11. Second shunt trip may be installed (using A-7, A-8 contacts) in place of UVR. Third auxiliary switch not available with second shunt trip.
12. Only one latch check switch may be installed. Use of customer-accessible latch check switch (B-29, B-30) in series with spring release defeats anti-pump function and is not recommended. See Note 5 for spring release latch check switch.

Figure 40. Connection Diagram for IZM99 and IZM63 Frame with Digitrip 520/520M/520MC with AABBCC Configuration (Type A, V, U Trip Units)



Notes
1. On three-pole breakers only (not eight physical poles), having ground fault functionality, a jumper installed from B-6 to B-7 will enable source ground fault sensing and disable residual ground fault sensing. Inputs B-4 and B-5 will be reassigned for source ground sensor inputs.
2. All auxiliary switches shown with breaker in OPEN position and with spring not charged, and with trip unit in "non-tripped" state (OTS switches).
3. The spring release accessory consists of an "SR" coil and a P.C. board. The printed circuit board provides a 0.20-second pulse for the closing operation. Voltage must be removed and then reapplied for subsequent operation. An optional latch check switch (LCS) accessory may be connected to the spring release. The (closed) LCS delays the spring release pulse until the breaker mechanism is ready to close (charged and reset). (This will ensure that the latch will always be in the proper state before the spring release pulse is initiated.) If voltage is maintained to the spring release, the closing pulse will occur when the mechanism is charged and reset (LCS open). Voltage must be removed and reapplied to the spring release for subsequent operation.
4. To provide selected time delays for short time and/or ground time functions for testing or non-zone interlocking applications, a jumper from B-8 to B-9 is required.
5. Three-wire crimp if high-instantaneous trip module is supplied.
6. Normally opened contact programmed as relay A via Digitrip front panel (alarm contact).
7. Normally closed contact programmed as relay B via Digitrip front panel (block close contact).
8. Normally open contact programmed as relay C via Digitrip front panel (latching contact).
9. On four-pole breakers (actually eight physical poles), the neutral current sensor is the same style and wired the same as the phase sensors, and is located within the breaker frame. The secondary contacts B-4, B-5, are not wired out.
10. Motor operator switch shown with breaker closing spring discharged.
11. Four-point socket used here.
12. Second shunt trip may be installed (using A-7, A-8 contacts) in place of UVR. Third auxiliary switch not available with second shunt trip.
13. Only one latch check switch may be installed. Use of customer-accessible latch check switch (B-29, B-30) in series with spring release defeats anti-pump function and is not recommended. See Note 3 for spring release latch check switch.

Figure 41. Connection Diagram for IZM99 and IZM63 Frame with Digitrip 1150 with ABCABC Configuration (Type P Trip Unit)

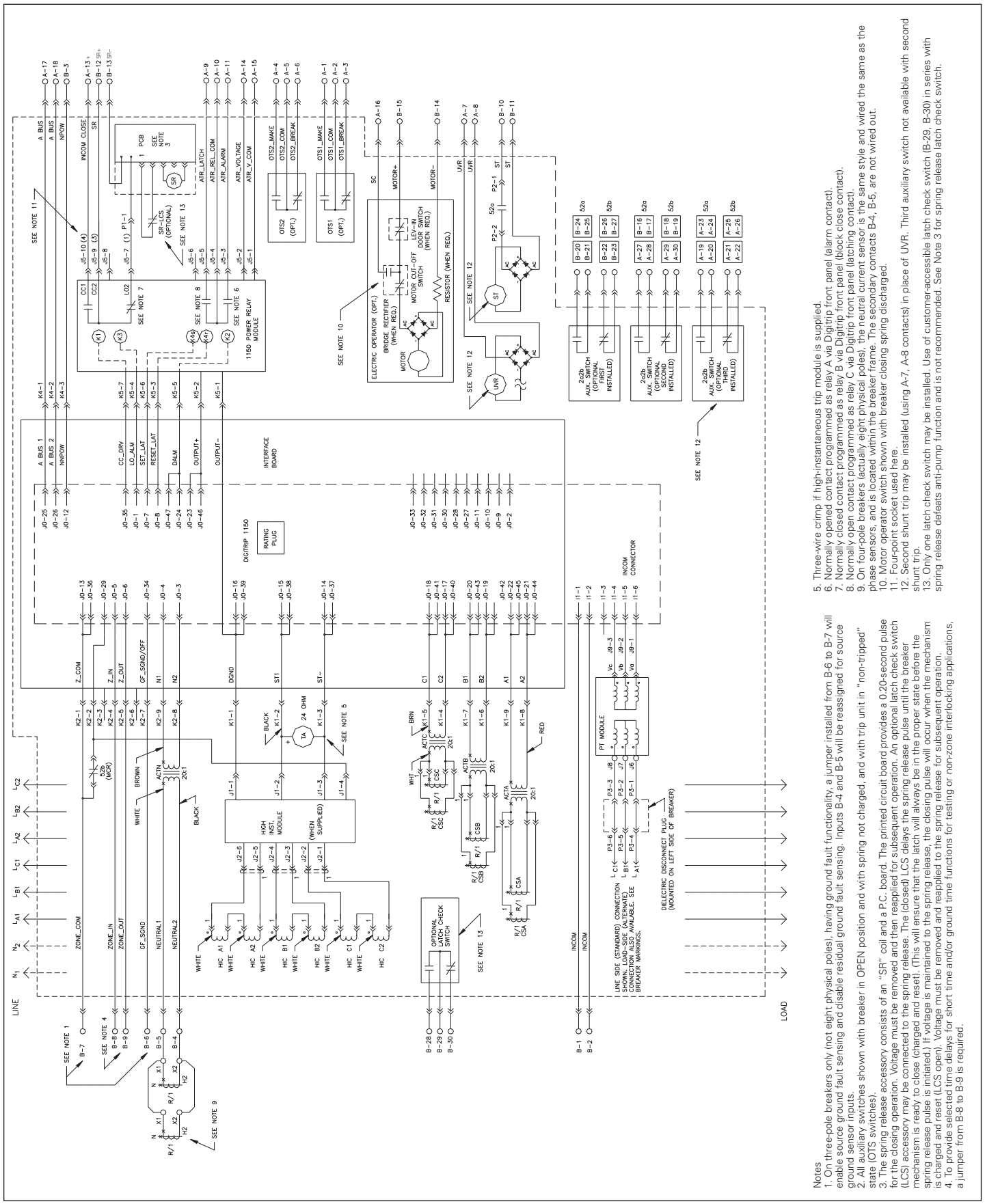


Figure 42. Connection Diagram for IZM99 and IZM63 Frame with Digitrip 1150 with AABBCC Configuration (Type P Trip Unit)

Accessory devices

A variety of accessory devices are available for use with IZM circuit breakers. Unless otherwise stated, they are all considered optional devices in the sense that they are not provided as standard on a manually operated circuit breaker. Available accessories are identified here and discussed in general terms. For more detailed information and/or installation instructions, refer to individual instruction leaflets dedicated to the accessories.

IZM circuit breaker accessories are designed to fit all frame sizes. The accessories fall into one of three categories:

- Plug-in electrical
- Internal electrical
- Mechanical

Plug-in electrical accessories

There are four IZM plug-in electrical accessories. Three can be viewed for identification by name and rating through viewing windows located in the right front of the circuit breaker (**Figure 43**). All four are plug-in type and can be factory installed or field installed.

The four plug-in accessories are:

- Shunt trip (ST)
- Spring release (SR)
- Undervoltage release (UVR)
- Auxiliary switch (AUX)

Shunt trip—The shunt trip is an optional device on circuit breakers (**Figure 44** and **Figure 45**). It opens the circuit breaker instantaneously when its coil is energized by a voltage input (**Table 6**). A total of two shunt trips can be mounted on a IZM circuit breaker.

Table 6. Shunt Trip Ratings

Control Voltages	Operational Voltage Range 70–100%	Inrush Power Consumption ①	Opening Time (ms)
24 Vdc	17–26 Vdc	250W	35
48 Vdc	34–53 Vdc	250W	35
110–125 Vdc	77–138 Vdc	450W	35
220–250 Vdc	154–275 Vdc	450W	35
110–127 Vdc	77–140 Vdc	450W	35
208–240 Vdc	146–264 Vdc	450W	35

① Required for less than 35 ms.

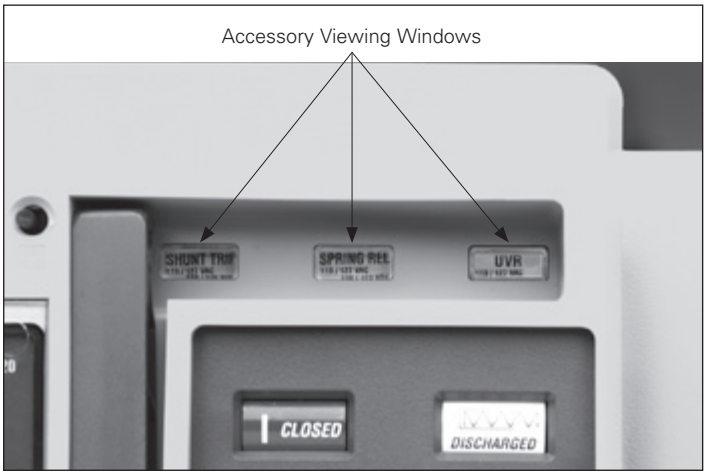


Figure 43. Through-the-Window Electrical Accessories

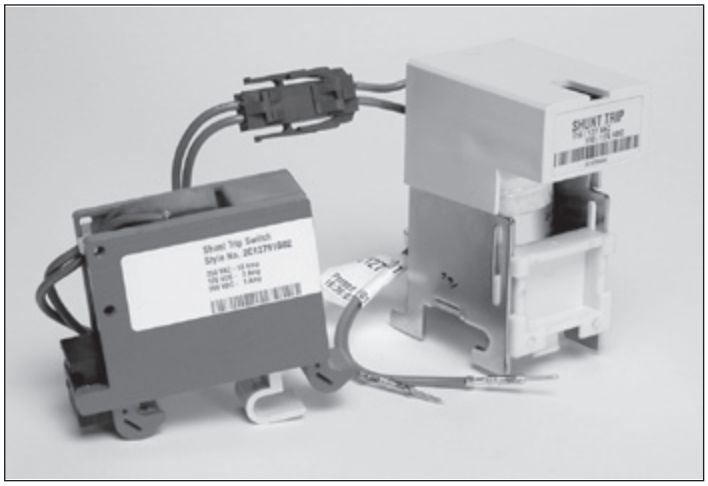


Figure 44. Shunt Trip with Cutoff Switch

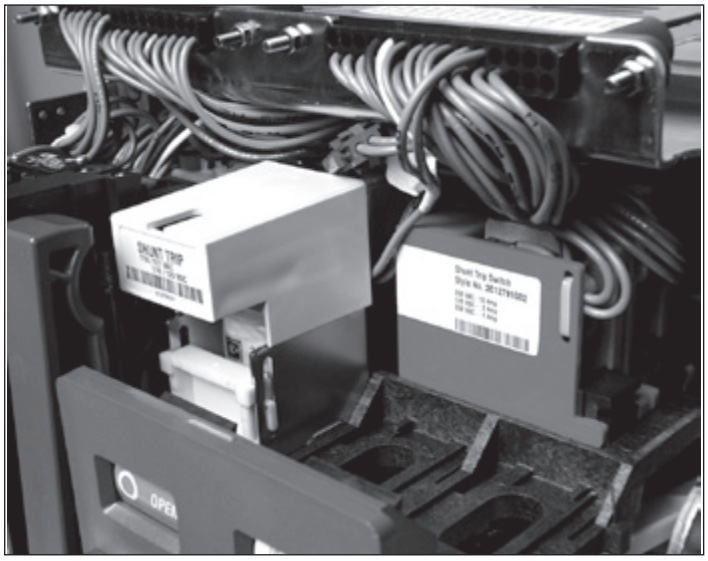


Figure 45. Shunt Trip Switch Installed

Spring release—The spring release is an optional device (**f**). It remotely closes the circuit breaker when the coil is energized by a voltage input (**Table 7**). The closing spring must be fully charged and the trip latch reset (not held in the tripped position) for the SR to operate. If these two conditions are not met, the close signal will be ignored until it is removed and re-applied.

An optional latch check switch (LCS) can also be installed to delay application of power to the Spring Release coil until the circuit breaker is "ready to close." The LCS will not permit energization of the spring release until the breaker is fully charged and the trip latch is reset. Two versions of the LCS are available. One version is wired internally to the shunt trip coil control circuit. On the other version, the LCS switch contacts are brought out through the secondary contacts for integration into external control schemes.

Note: Placing the (externally accessible) LCS directly in series with the ST coil is **not** recommended as this will override the "anti-pump" feature of the electrical charging/closing system.

Table 7. Spring Release Ratings

Control Voltages	Operational Voltage Range 80–110%	Inrush Power Consumption ①	Closing Time (ms)
24 Vdc	19–26 Vdc	250W	40
48 Vdc	38–53 Vdc	250W	40
110–125 Vdc	88–138 Vdc	450W	40
220–250 Vdc	176–275 Vdc	450W	40
110–127 Vdc	88–140 Vdc	450W	40
208–240 Vdc	166–264 Vdc	450W	40

① Required for less than 200 ms.

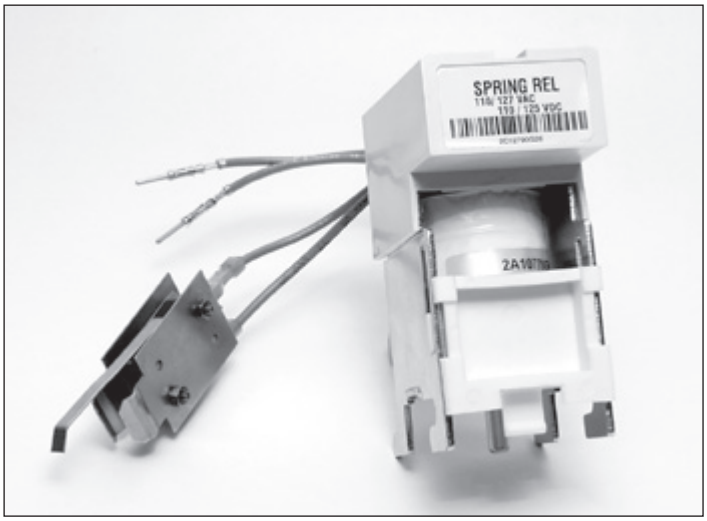


Figure 46. Spring Release with Optional Latch Switch

Undervoltage release—The undervoltage release is an optional device on both manually and electrically operated circuit breakers (**Figure 47**). It opens the circuit breaker when its supply voltage falls to between 35–60% of rated voltage. If the release is not energized to 85% of its supply voltage, the circuit breaker cannot be closed electrically or manually (**Table 8**).

Auxiliary switch—An auxiliary switch is an optional device providing remote electrical indication if the circuit breaker is open or closed (**Figure 49**). Up to three auxiliary switches can be mounted in the circuit breaker. Each switch has two normally open ("a") and two normally closed ("b") contacts for a total of 12 available contacts (**Table 1**).

Table 8. Undervoltage Release

Control Voltages	Operational Voltage Range 85–110%	Dropout Volts 30–60%	Inrush/Continuous Power Consumption ①②	Opening Time (ms)
24 Vdc ①	20–26 Vdc	7–14 Vdc	250W/18W	70
32 Vdc ①	27–35 Vdc	10–19 Vdc	275W/15W	70
48 Vdc ①	41–53 Vdc	14–29 Vdc	275W/18W	70
110–125 Vdc ①	94–138 Vdc	33–75 Vdc	450W/10W	70
220–250 Vdc ①	187–275 Vdc	66–150 Vdc	450W/10W	70
110–127 Vac ②	94–140 Vac	33–76 Vac	450 VA/10 VA	70
208–240 Vac ②	177–264 Vac	62–144 Vac	400 VA/10 VA	70
380–415 Vac ②	323–457 Vac	114–249 Vac	480 VA/10 VA	70
480 Vac ②	408–528 Vac	144–288 Vac	400 VA/10 VA	70
600 Vac ②	510–660 Vac	180–360 Vac	400 VA/10 VA	70

① Required for 200 ms.

② Required for 400 ms.

Table 9. Auxiliary Switch, Overcurrent Trip Switch, and Cell Switch Contact Ratings

Control Voltages	Contact Rating Inductive Load (Amperes)
250 Vac	10
125 Vdc	0.5
250 Vdc	0.25

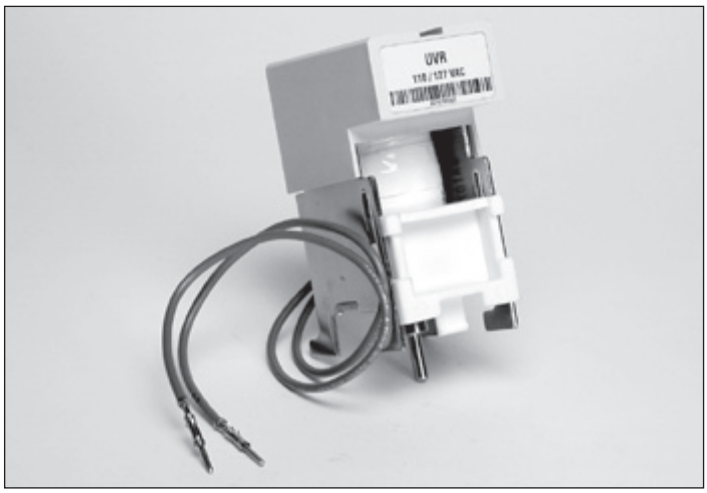


Figure 47. Undervoltage Release

Figure 48. Shunt Trip, Spring Release, and Undervoltage Release Installed

Figure 49. Auxiliary Switch (2A/2B)

Internal electrical accessories

Other electrical accessories are mounted inside the circuit breaker. They can be factory or site installed. There are two different internally mounted accessories:

- Overcurrent trip switch (bell alarm)
- Motor operator

Overcurrent trip switch (bell alarm)—An overcurrent trip switch (bell alarm) is an optional device that is used with an optional pop-out indicator (see "Mechanical accessories" on page 37 and **Figure 50**). It provides an electrical indication when a circuit breaker trips as a result of the trip unit reacting to an overcurrent condition. Opening as a result of a circuit breaker's manual open button, shunt trip or undervoltage release does **not** cause the overcurrent trip switch to operate. The overcurrent trip switch has (2a 2b) Form C contacts (**Table 9**).

The status of the contacts changes when the trip indicator pops out. This permits the switch to be used as an alarm or in conjunction with a spring release to block a subsequent remote electrical closing signal.

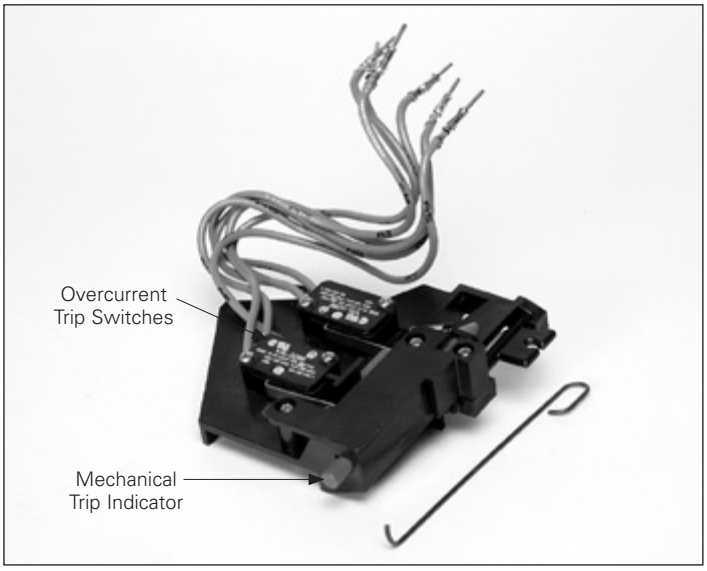


Figure 50. Mechanical Trip Indicator with Associated Overcurrent Trip Switch

Motor operator—A Motor operator is an electric motor assembly internally mounted in the circuit breaker (**Figure 51** and **Figure 52**). It charges the closing springs electrically for remote or local operation. The motor operator can be factory or site installed (**Table 10**).

To convert a manually operated circuit breaker to an electrically operated circuit breaker, a motor operator kit is available.

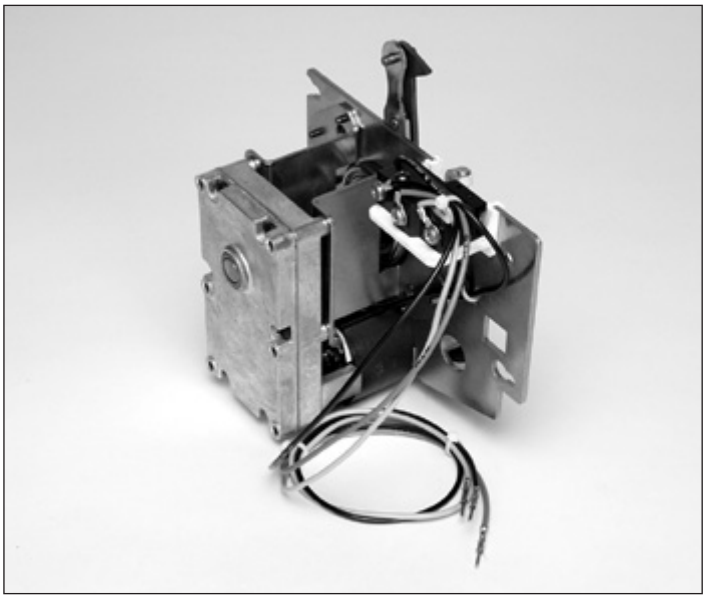


Figure 51. Motor Operator Kit

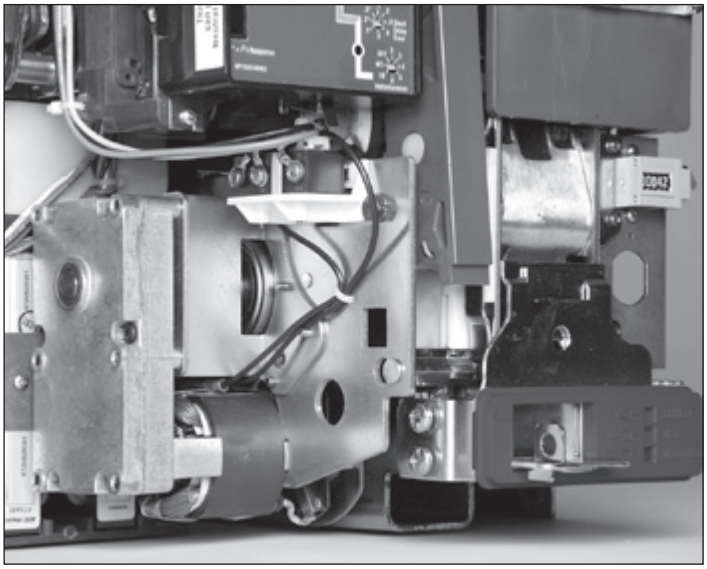


Figure 52. Motor Operator Installed in IZM93 an IZM20 Frame Circuit Breaker

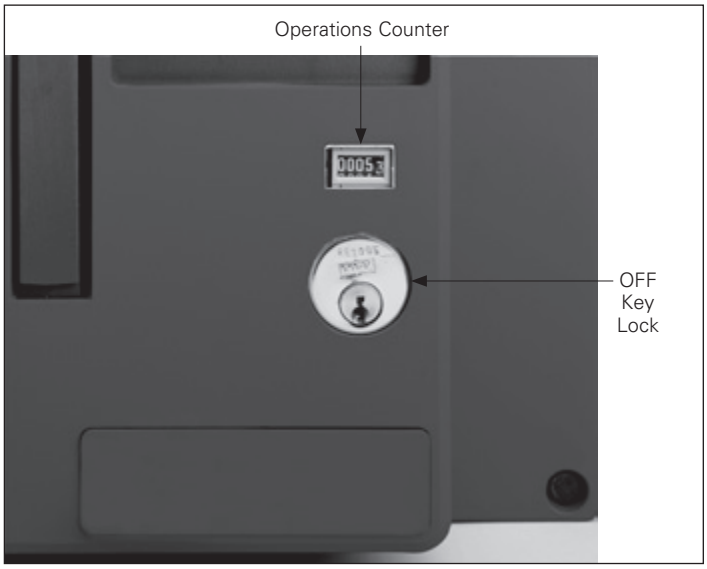


Figure 53. Cover-Mounted Key Lock and Operations Counter

Mechanical accessories

There are 11 optional mechanical type accessories:

- Operations counter
- Off key lock
- Cassette lock
- Pushbutton cover
- Prevent close cover
- Cassette safety shutters
- Cassette cell switch
- Door escutcheon
- Waterproof cover
- Mechanical interlock
- Mechanical (pop-out) trip indicator

Operations counter—The operations counter is a mechanical device used to provide a record of the number of circuit breaker open-close operations. It is mounted in the lower right portion of the circuit breaker and can be viewed through the front cover (**Figure 53**).

Off key lock—The off key lock secures the circuit breaker in the OFF position. It is mounted in the lower right portion of the circuit breaker and can be viewed through the front cover (**Figure 53**). The customer supplies the key lock. The provisions available are for Kirk, Castell, Ronis, or CES.

Cassette lock—A cassette-mounted lock can be used in conjunction with different interlocking schemes (such as main-tie-main) (**Figure 54**). The lock holds the circuit breaker trip-free in the CONNECTED position, preventing it from being closed.

Up to three lock cylinders can be installed on one cassette. Moeller supplies the lock provisions only. The customer is responsible for the locks, which can be Kirk or Castell.

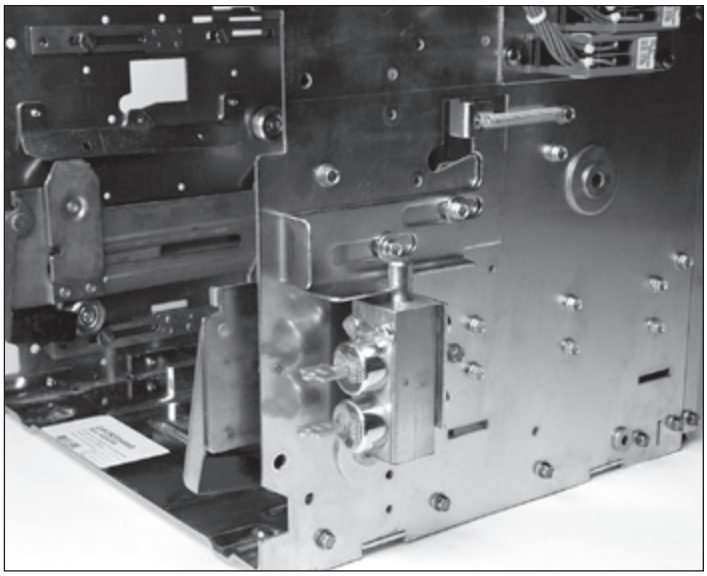


Figure 54. Cassette-Mounted Key Lock

Table 10. Motor Operator

Control Voltages ①	Operational Voltage Range 85–110%	Running Current (A. Avg.)	Typical Inrush Current	Power Consumption (Watts or VA)	Maximum Charging Time (Seconds)
24 Vdc	20–26	12.0	300% of Running	300	5
48 Vdc	41–53	5.0	500% of Running	250	5
110–125 Vdc	94–138	2.0	600% of Running	250	5
220–250 Vdc	187–225	1.0	600% of Running	250	5
110–127 Vac	94–140	2.0	600% of Running	250	5
208–240 Vac	177–264	1.0	600% of Running	250	5

① AC voltages are 50/60 Hz.

Pushbutton cover—A padlockable cover is available to limit access to the ON and OFF pushbuttons (**Figure 55**). It can be installed with either or both pushbutton covers in place.

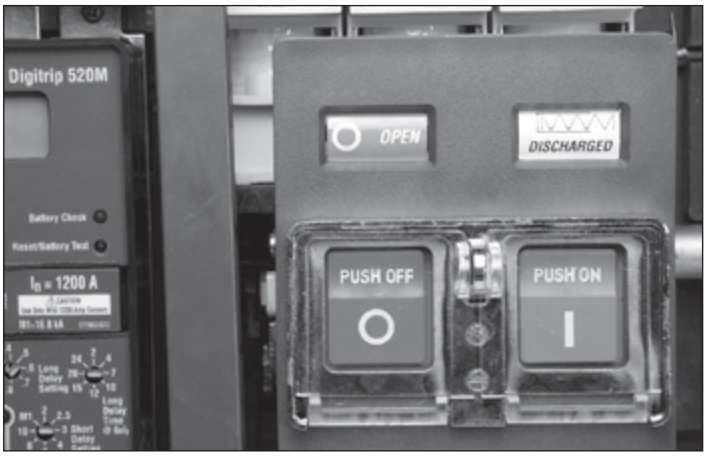


Figure 55. ON-OFF Pushbutton Lockable Cover Plate

Prevent close cover—Complete access to the ON pushbutton can be prevented by adding the prevent close cover to the pushbutton cover.

Cassette safety shutters—Automatically operated insulating type safety shutters are available for use with the drawout cassette. When the drawout circuit breaker is levered from the CONNECT position, the shutters automatically close to cover the fixed primary contacts (**Figure 56**). When the circuit breaker is levered into the cassette, the shutters automatically open permitting primary connections to be made (**Figure 57**).

Figure 56. Safety Shutters in CLOSED Position

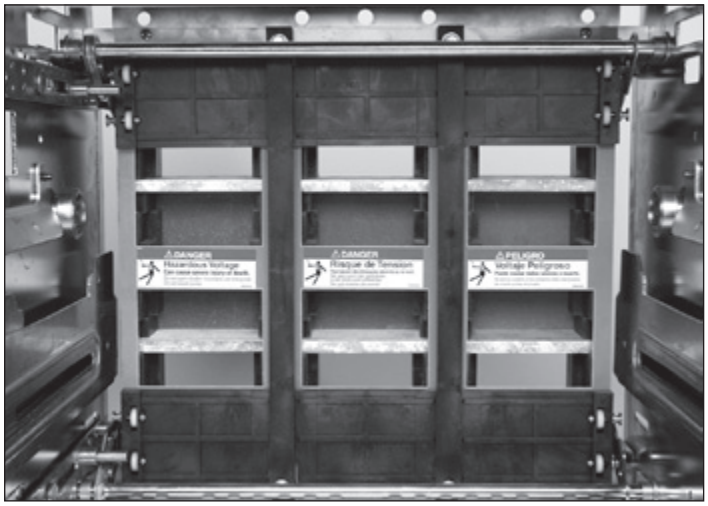


Figure 57. Safety Shutters in OPEN Position

Cassette cell switches—The cassette cell switches are compartment position switches for drawout circuit breakers. They are available in 4 change-over contact configuration, and mount on the right side of the cassette (**Figure 58** and **Figure 59**). Refer to the ratings in **Table 9** for cell switch contact information. One or more cell switches can be mounted to operate at the WITHDRAWN, TEST, or CONNECT position.

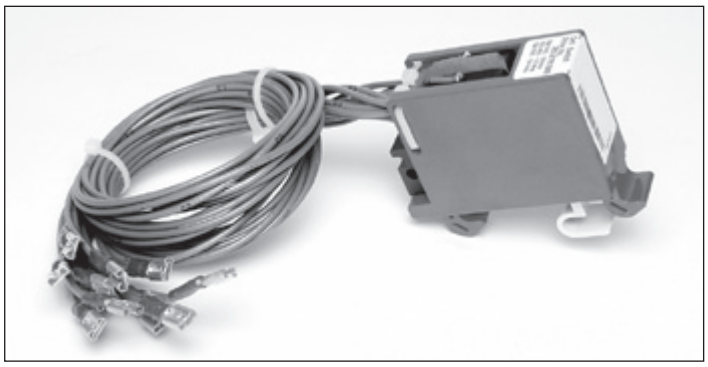


Figure 58. Cell Switch (Drawout Position Indicator) Unmounted

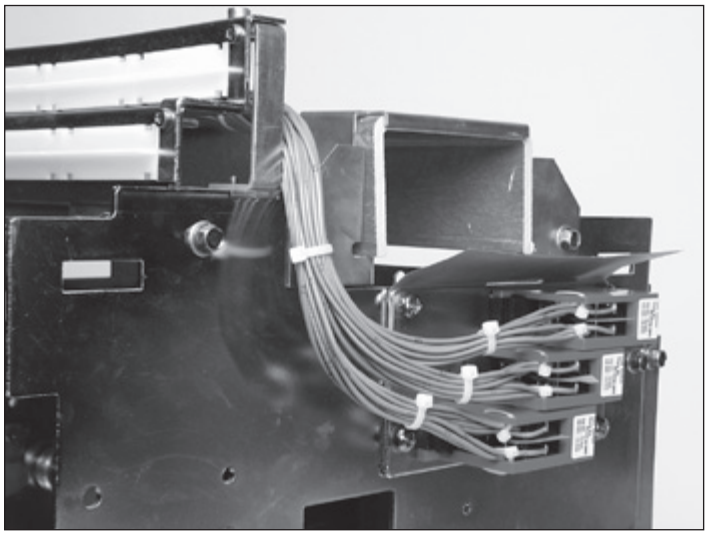


Figure 59. Cell Switches Mounted on Cassette

Door escutcheon—The door escutcheon is a molded frame used to seal the space between the circuit breaker and the compartment door cutout. It is supplied with a mounting gasket (**Figure 60**).

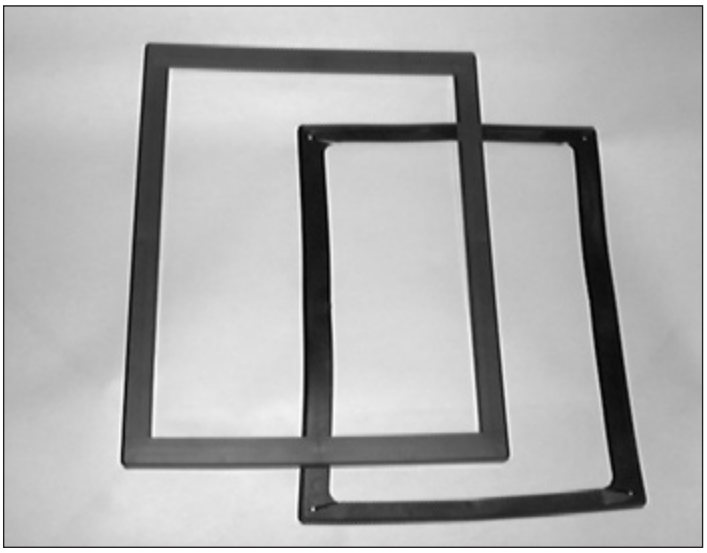


Figure 60. Door Escutcheon and Gasket

IP54 waterproof cover—A hinged dome-shaped waterproof cover attaches to the metal compartment door to provide waterproof protection for the circuit breaker.

Mechanical interlock—A family of mechanical interlocks are available to interlock the closing of two or three IZM circuit breakers. The mechanical interlock holds one or more circuit breakers tripped (prevents closure) when others are closed. A lever assembly is mounted on each breaker that interfaces with the pole shaft and the tripper bar. The lever assemblies are interconnected with either cables, depending upon the relative orientation of the breakers. Cables can be used for any orientation of the breakers. Mechanical interlocks are available for both fixed and drawout circuit breakers and in both two-way and three-way versions. An illustration of a two-way cable interlock mounted on two drawout circuit breakers is shown in **Figure 61**.

Mechanical (pop-out) trip indicator—A red, pop-out mechanical trip indicator is an IZM feature. It is located above the trip unit on the breaker's front faceplate (**Figure 29**). It operates by releasing and popping out any time the circuit breaker trips due to an overcurrent condition.

Note: The mechanical trip indicator will not prevent the breaker from being reclosed.

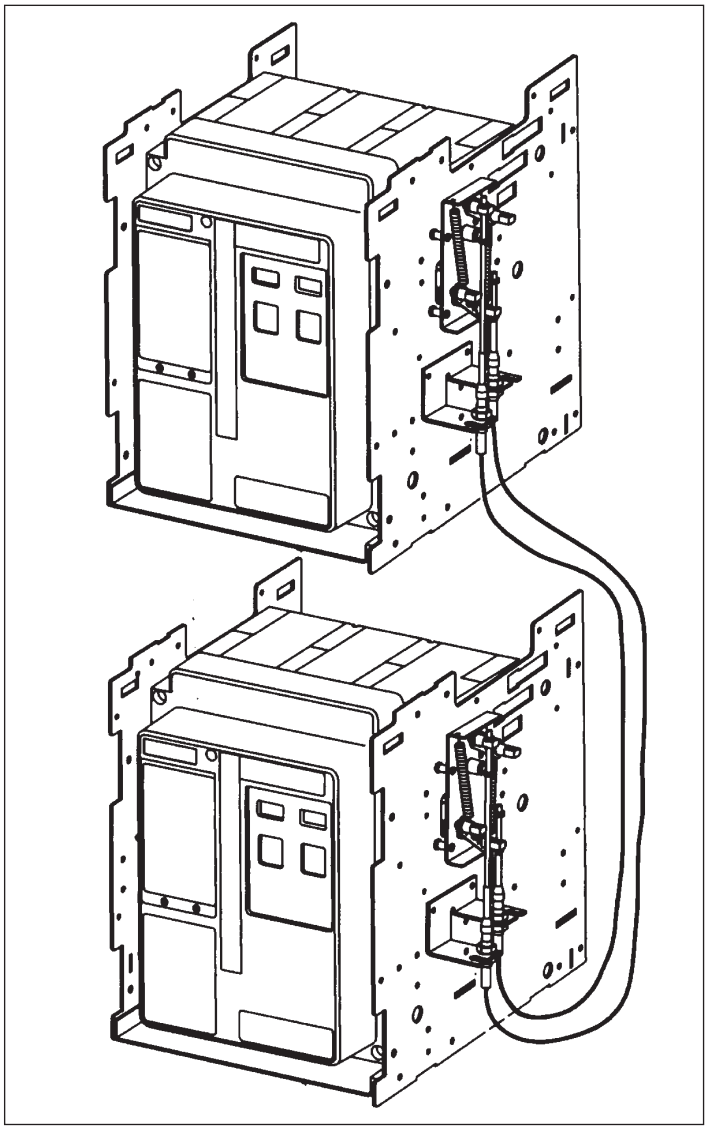


Figure 61. Cassette-Mounted Two-Way Cable Interlock

Section 4: Drawout circuit breaker and cassette

General

Section 3 discussed topics and features common to all IZM circuit breakers, no matter what the mounting configuration. In this section, features unique to the drawout configuration not covered elsewhere, including the drawout cassette, are covered. Drawings and dimensions associated with all circuit breakers, drawout cassettes and any appropriate primary bus connections can be found in a separate document. The installation and levering of a drawout circuit breaker were discussed in Section 2. If necessary, review that information, since it will not be repeated here.

Drawout cassette

A drawout circuit breaker is used in combination with a fixed drawout cassette (**Figure 62**); the drawout circuit breaker is equipped with automatic primary disconnects (**Figure 63**). The cassette provides all of the necessary interfaces to the drawout circuit breaker, including automatic primary and secondary connections. For the IEC circuit breaker, a cassette style using horizontal stabs and horizontal customer bus bar terminals is available as standard (**Figure 64**). The cassette terminal connections can be adapted to vertical bus bar connections with a variety of optional vertical adapters.

Mounting locations for cell (TOC) switches, safety shutters, mechanical interlocks, and key interlocks are provided on the cassette.

Drawout circuit breaker dimensions

The IZM drawout circuit breaker connects to the fixed primary stabs of the drawout cassette through the primary finger clusters attached to the rear of the circuit breaker. Three different frame sizes cover all IZM circuit breakers from an overall dimensional standpoint. Circuit breaker drawings can be found in a separate document.

Drawout cassette dimensions

Cassette drawings provide all the dimensional information required for all mounting configurations and can also be found in a separate document. Review carefully for a specific installation.

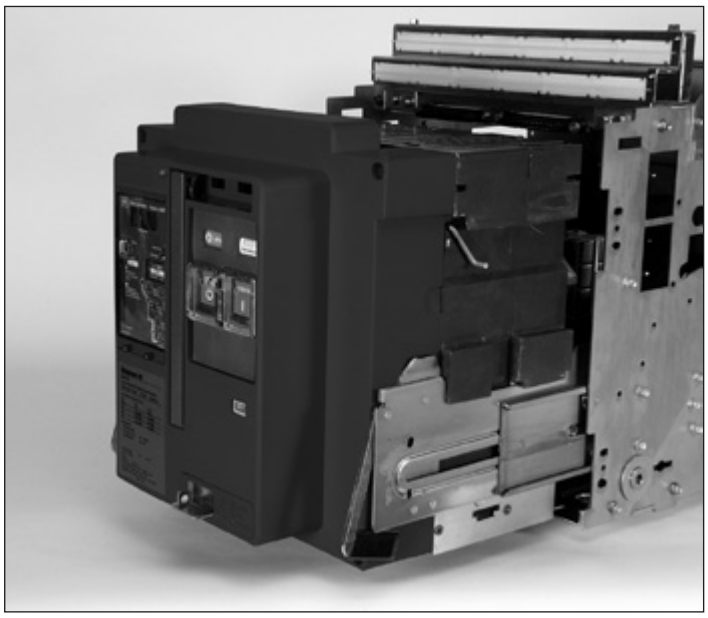


Figure 62. Drawout Circuit Breaker in Cassette

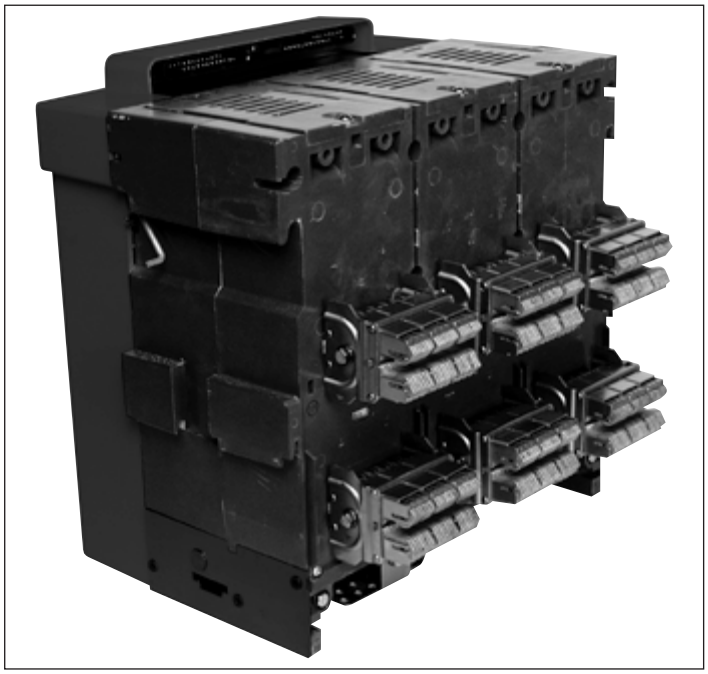
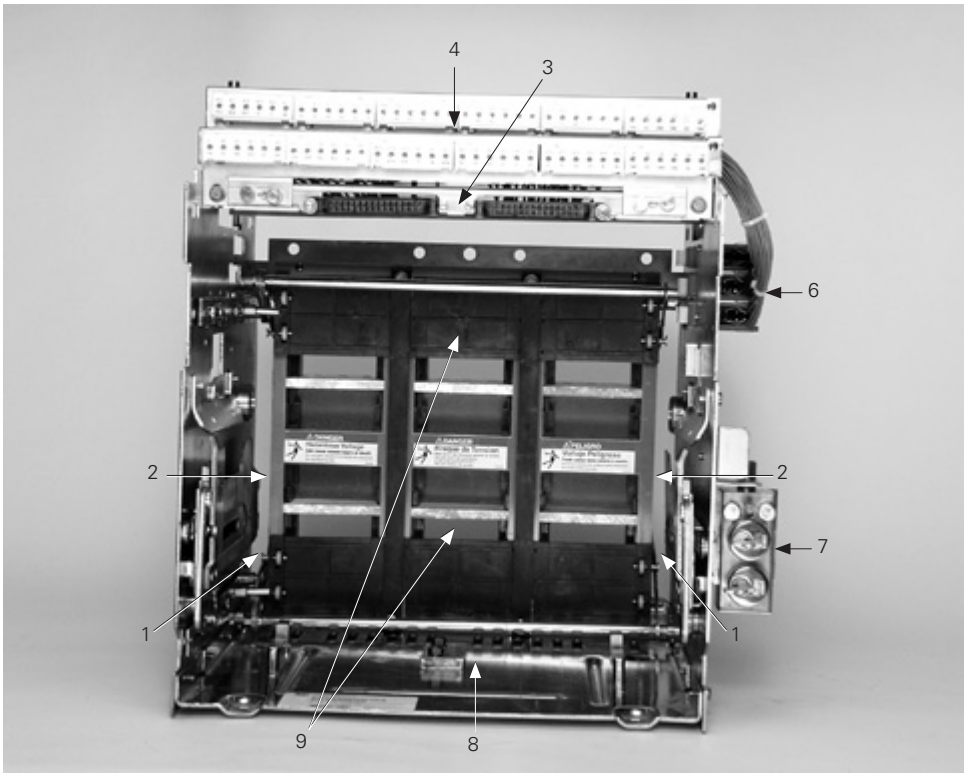
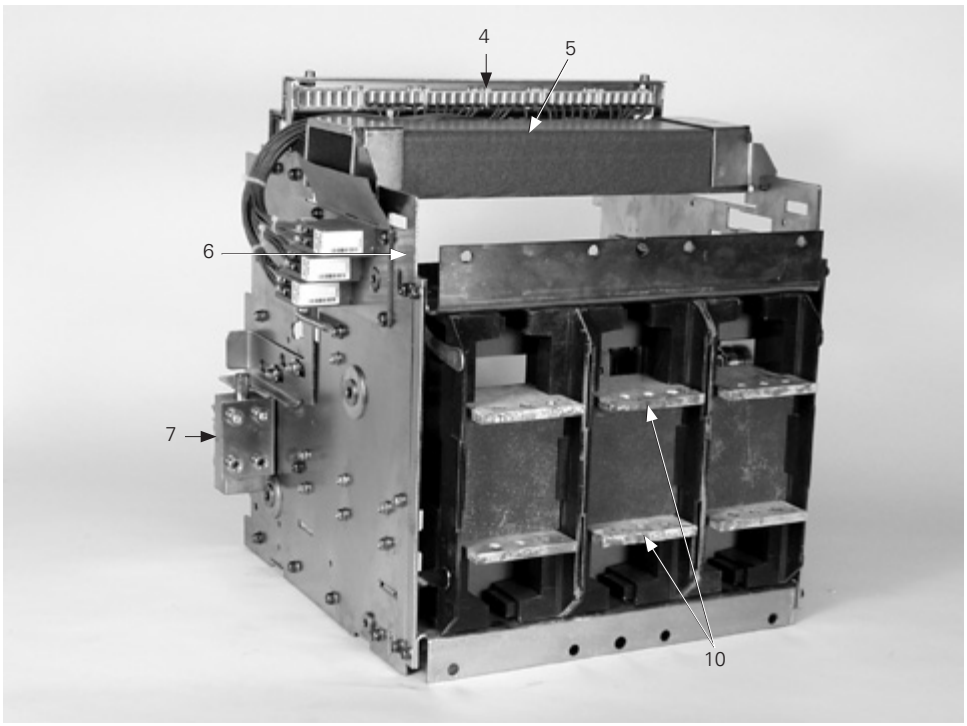


Figure 63. Drawout Circuit Breaker with Automatic Primary Disconnects



Front View



Rear View

1. Extension Rails
2. Extension Rail Cutout
3. Secondary Plug-in Connectors
4. Secondary Terminal Blocks
5. Arc Hood
6. Optional Cell (TOC) Switch
7. Optional Key Interlock
8. Earthing Bar
9. Open Safety Shutters
10. Primary Terminals

Figure 64. Drawout Cassette Features (Front and Rear Views)

Section 5: Fixed circuit breaker

General

Section 3 discussed topics and features common to all IZM circuit breakers, no matter what the mounting configuration. In this section, features unique to the fixed configuration not covered elsewhere are covered. Drawings and dimensions associated with all fixed circuit breakers and any appropriate primary bus connections can be found in a separate document. The installation of a fixed circuit breaker was discussed in Section 2. If necessary, review that information, since it will not be repeated here.

Fixed circuit breaker dimensions

The standard fixed circuit breaker is supplied with horizontally mounted primary connections (**Figure 37**). Optional vertical primary adapters are available for different bus configurations.

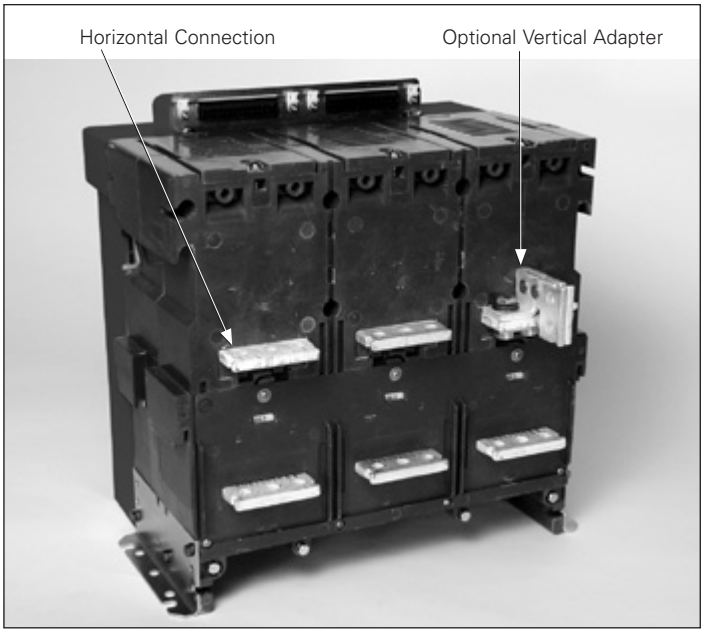


Figure 65. Fixed Circuit Breaker with Available Vertical Adapter

Section 6: Inspection and maintenance

General

⚠ WARNING

FAILURE TO INSPECT, CLEAN, AND MAINTAIN CIRCUIT BREAKERS CAN REDUCE EQUIPMENT LIFE OR CAUSE THE EQUIPMENT NOT TO OPERATE PROPERLY UNDER FAULT CONDITIONS. THIS COULD RESULT IN EQUIPMENT DAMAGE, BODILY INJURY, OR EVEN DEATH.

⚠ CAUTION

INSPECTION AND MAINTENANCE PROCEDURES SHOULD BE CARRIED OUT ONLY BY PERSONNEL FAMILIAR WITH THE HAZARDS ASSOCIATED WITH WORKING ON POWER CIRCUIT BREAKERS. ADDITIONALLY, THEY SHOULD BECOME FAMILIAR WITH THE SPECIFICS ASSOCIATED WITH TYPE IZM CIRCUIT BREAKERS AS PRESENTED IN THIS INSTRUCTION BOOK.

IZM circuit breakers are "top of the line" equipment. This means they are manufactured under a high degree of quality control, with the best available materials and with a high degree of tooling for accuracy and parts interchangeability. Design tests and actual installation experience show them to have durability well beyond minimum standards requirements. However, because of the variability of application conditions and the great dependence placed upon these circuit breakers for protection and the assurance of service continuity, inspection and maintenance activities should take place on a regularly scheduled basis.

Since maintenance of these circuit breakers consists mainly of keeping them clean, the frequency of scheduled inspection and maintenance depends to some degree on the cleanliness of the surroundings. Cleaning and preventive measures are a part of any good maintenance program. Plant operating and local conditions can vary to such an extent that the actual schedule should be tailored to the conditions. When the equipment is subject to a clean and dry environment, cleaning is not required as frequently as when the environment is humid with a significant amount of dust and other foreign matter.

It is recommended that maintenance record sheets be completed for the equipment. Careful and accurate documentation of all maintenance activities provides a valuable historical reference on equipment condition over time.

General cleaning recommendations

Circuit breaker cleaning activities should be a part of an overall activity that includes the assembly in which the circuit breaker is installed. Loose dust and dirt can be removed from external surfaces using an industrial quality vacuum cleaner and/or lint-free cloth. Unless otherwise indicated, never use high-pressure blowing air, since dirt or foreign objects can be driven into areas, such as the breaker mechanism, where additional friction sources could create problems. Never use a wire brush to clean any part of the circuit breaker.

Table 11. Inspection Frequency

Breaker Frame Size	Interval (Breaker Cycles) ①
800A and below	1750
Between 800 and 3200A	500
4000A and above	250

① Breaker cycle = one no load open/close operation.

When to inspect

Do not wait for specific scheduled periods to visually inspect the equipment, if there are earlier opportunities. If possible, make a visual inspection each time a circuit breaker compartment door is opened, and especially when a circuit breaker is withdrawn on its compartment extension rails. This preventive measure could help to avoid future problems.

Industry standards for this type of equipment recommend a general inspection and lubrication after the number of operations listed in **Table 11** of this section. This should also be conducted at the end of the first six months of service, if the number of operations has not been reached.

After the first inspection, inspect at least once a year. If these recommended inspections show no maintenance requirements, the period may be extended to a more economical point. Conversely, if the recommended inspection shows, for instance, a heavy accumulation of dirt or other foreign matter that might cause mechanical, insulation, or other electrical damage, the inspection and maintenance interval should be decreased.

What to inspect

What to inspect and to what extent is dictated by the nature of the maintenance function. Routine inspections require one type of observation. Inspections following a known high-level fault require more detailed inspections.

A drawout type circuit breaker should first be withdrawn from its compartment onto the compartment's extension rails. When the inspection is complete, the circuit breaker can be levered to the TEST position to check the electrical operations of the circuit breaker. During the levering out and levering in of the circuit breaker, be aware for any signs that would indicate that this process is not working properly.

During the inspection of fixed type circuit breakers, bus systems supplying the fixed circuit breakers **should be de-energized** for convenience and safety.

For functional testing of the trip unit, refer to the separate detailed instruction book dedicated to the trip unit.

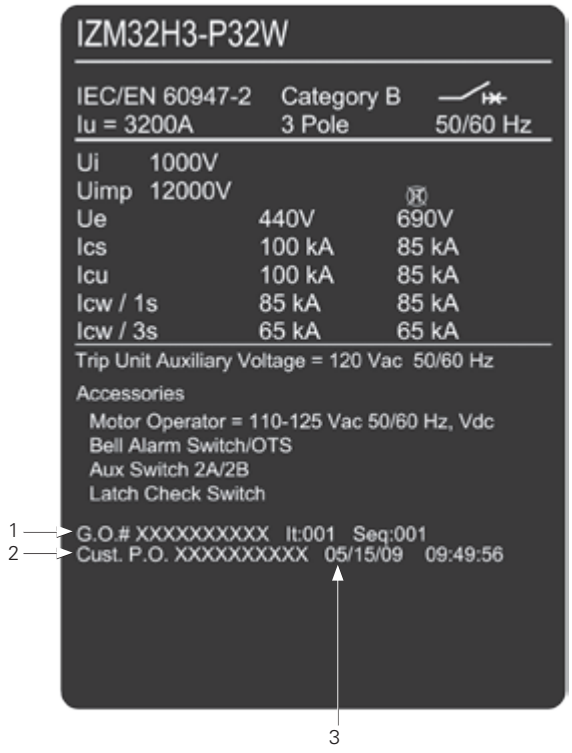
Once the circuit breaker has been cleaned, visually inspect it for any signs of damage, missing or loose parts, and unusual wear. Be especially alert for foreign matter that must be removed. On drawout circuit breakers, inspect the primary disconnect finger clusters for signs of wear and erosion. Make appropriate corrections to anything found out of order.

Functional field testing

⚠ NOTICE

BEFORE DOING ANY WORK ON DRAWOUT TYPE CIRCUIT BREAKERS, MAKE SURE THE BREAKER IS LEVERED OUT TO THE TEST OR DISCONNECT POSITION. DURING THE LEVERING OUT AND LEVERING IN OF THE CIRCUIT BREAKER, BE AWARE OF ANY SIGNS THAT WOULD INDICATE THAT THE LEVERING PROCESS IS NOT WORKING PROPERLY. IF WORKING ON A FIXED CIRCUIT BREAKER, BUS SYSTEMS SHOULD BE DE-ENERGIZED FOR CONVENIENCE AND SAFETY. THE CIRCUIT BREAKER SHOULD BE SWITCHED TO THE OFF POSITION AND THE MECHANISM SPRINGS DISCHARGED.

Moeller recommends that the following functional tests be performed on IZM circuit breakers as part of any maintenance procedure. The circuit breaker should be removed from service and Moeller notified if the circuit breaker fails to perform any of these tests successfully. Please be prepared to provide the number of operations the circuit breaker has to date as well as the following nameplate information (see **Figure 65**).



1. G.O.#: It: Seq:
2. Cust. P.O.:
3. Date of Manufacture

Figure 66. IZM Nameplate Information

Manual operation functional test

Charge the breaker mechanism springs either using the charging handle or the motor operator. Press the ON pushbutton to close the breaker manually and verify closing by noting the state of the indicating flag. Charge the breaker mechanism springs either using the charging handle or the motor operator. If using the motor operator, disconnect power to it to prevent automatic recharging. Press the OFF pushbutton to manually open the breaker. Press the ON pushbutton to manually close the breaker. Is the breaker closed? Press the OFF pushbutton to manually open the breaker. Is the breaker open? Repeat this entire described test procedure three times.

Electrical operation functional test

This test procedure is based on the assumption that the breaker is equipped with optional shunt trip and spring release accessories. If one accessory is missing, substitute the manual button to replace the accessory's function.

Charge the breaker mechanism springs either using the charging handle or the motor operator. Close the breaker by applying rated voltage to the spring release accessory and verify closing by noting the state of the indicating flag. Charge the breaker mechanism springs either using the charging handle or the motor operator. If using the motor operator, disconnect power to it to prevent automatic recharging. Open the breaker by applying rated voltage to the shunt trip accessory. Close the breaker using the spring release accessory. Is the breaker closed? Open the breaker using the shunt trip accessory. Is the breaker open? Repeat this entire described test procedure three times.

Trip unit overload functional test

This test uses the Digitrip 1150 self test function, the Digitrip Test Kit, or the hand-held IZM Functional Test Kit. Review test kit instructions for the trip unit. Instruction leaflet, Section 1.2 or 1.3 applies for instantaneous test procedures or Paragraph 5.2.1 "1150 Self Testing, Trip Mode" in the trip unit instruction leaflet AWB1230-1608.

Charge the breaker mechanism springs either using the charging handle or the motor operator. Press the ON pushbutton to close the breaker manually and verify closing by noting the state of the indicating flag. Charge the breaker mechanism springs either using the charging handle or the motor operator. If using the motor operator, disconnect power to it to prevent automatic recharging. Trip the breaker with a trip unit test. Verify that the trip indicator pop-out button (if so equipped) is "out" and then reset it. Press the ON pushbutton to manually close the breaker. Is the breaker closed? Trip the breaker with a trip unit test. Verify that the trip indicator pop-out button (if so equipped) is "out" and then reset it. Repeat this entire described test procedure three times. Reset the blinking red cause-of-trip LED on the trip unit by pressing the Reset/Battery Test pushbutton.

Arc chute inspection

When a circuit breaker experiences a high-level fault or during regularly scheduled maintenance periods, the circuit breaker's arc chutes and arc chambers should be inspected for any kind of damage or dirt. Be especially alert for signs of significant erosion of the V-shaped plates inside the arc chute.

Arc chutes fit inside the arc chambers and down over the primary contacts. Each arc chute is held in place by one top-inserted screw (**Figure 67**). Begin by removing the arc chute screws and all three arc chutes. Turn each arc chute upside down to visually inspect the inside (**Figure 68**).

Since the arc chutes are removed, this is an ideal time to inspect primary contacts for wear using the circuit breaker's contact wear indicators. The details associated with primary contact inspection are presented in the next paragraph.

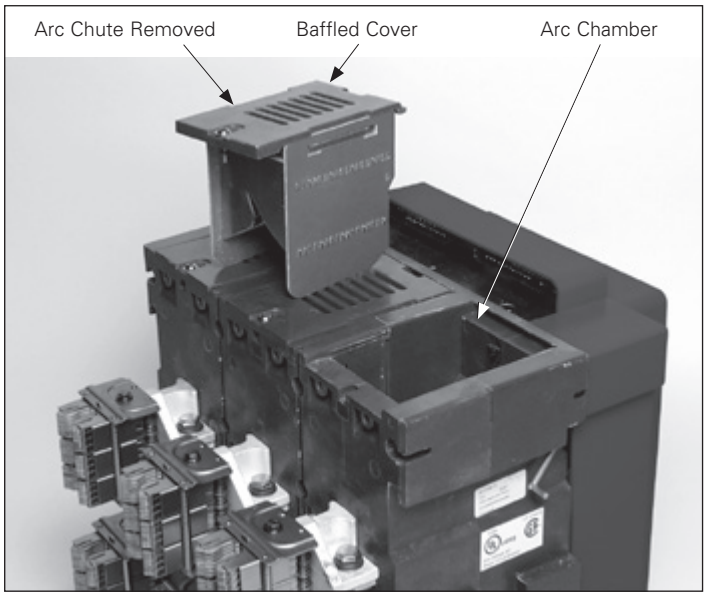


Figure 67. Top Rear View of Circuit Breaker with One Arc Chute Removed

Figure 68. Bottom View of Arc Chute

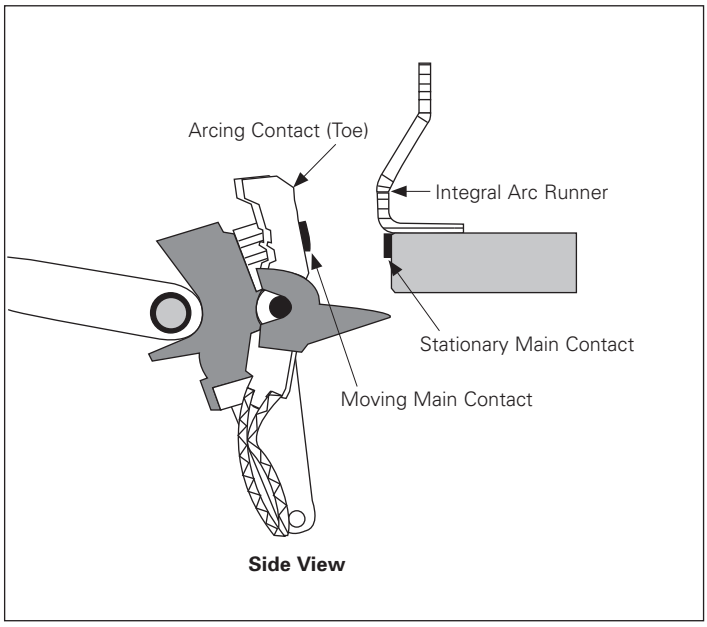


Figure 70. Contact Inspection Area with Circuit Breaker Open

⚠ WARNING

ARC CHUTES MUST ALWAYS BE SECURED PROPERLY IN PLACE BEFORE A CIRCUIT BREAKER IS INSTALLED IN A CIRCUIT BREAKER COMPARTMENT. FAILURE TO DO THIS COULD RESULT IN EQUIPMENT DAMAGE, BODILY INJURY, OR EVEN DEATH.

When the inspections are complete, position each arc chute down over its respective set of primary contacts, and secure in place with the screw removed earlier. Torque the arc chute screws to 35–45 in-lb (4–5 Nm).

Primary contact inspection

With the arc chutes removed, visually inspect each primary contact structure for signs of wear and/or damage. The primary contacts with the circuit breaker open can be viewed by looking directly down into the arc chamber (**Figure 69** and **Figure 70**).

Figure 69. Primary Contacts with Circuit Breaker Open (Not Used for Contact Wear Inspection)

A contact wear indicator is provided for each primary contact and indicates whether or not the contact should be replaced. Inspection of the contacts using the contact wear indicators is conducted only with the circuit breaker closed (**Figure 71**).

⚠ NOTICE

WHEN MAKING A CONTACT WEAR INSPECTION, ALWAYS MAKE THE INSPECTION BY LOOKING STRAIGHT DOWN INTO THE ARC CHAMBER FOR THE PROPER PERSPECTIVE. VIEWING THE CONTACT WEAR AREA FROM AN ANGLE COULD DISTORT THE VIEW.

The contact wear indicator is the relative position of the individual contact fingers to a narrow, side-to-side ledge inside the arc chamber. The ledge is actually part of the arc chamber. When the circuit breaker is closed and the contacts are in good condition, the narrow ledge is covered by the back end of the contacts (**Figure 71**). If the back end of the contacts do not totally cover the ledge, the contacts should be replaced.

⚠ WARNING

ARC CHUTES MUST ALWAYS BE SECURED PROPERLY IN PLACE BEFORE A CIRCUIT BREAKER IS INSTALLED IN A CIRCUIT BREAKER COMPARTMENT. FAILURE TO DO THIS COULD RESULT IN EQUIPMENT DAMAGE, BODILY INJURY, OR EVEN DEATH.

Once the inspection is complete, be sure the arc chutes are properly replaced as previously described in “Functional field testing” on page 43.

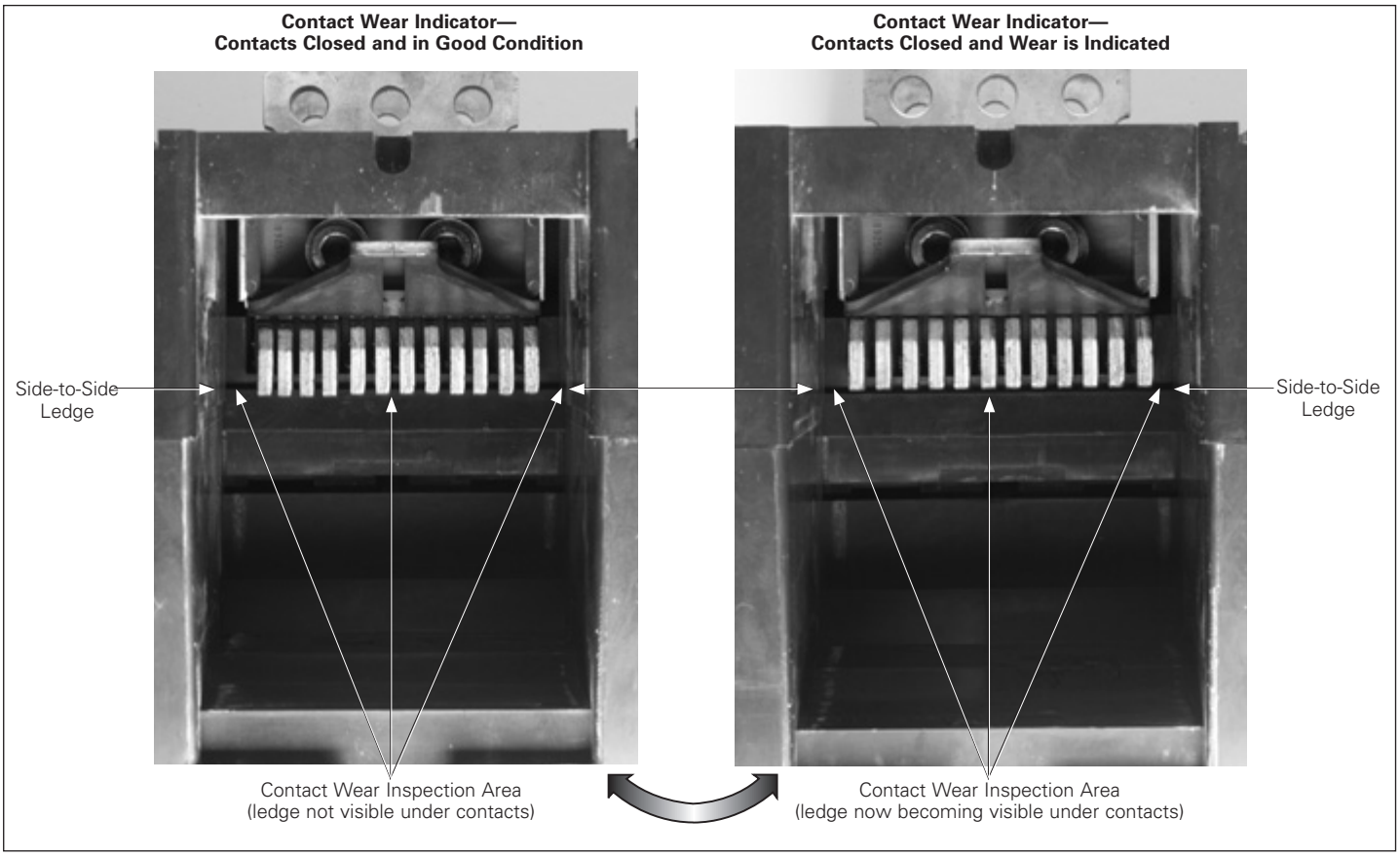


Figure 71. Use of Contact Wear Indicator with Circuit Breaker Closed

Circuit breaker modifications and changes

The topics discussed here will relate to those actions that can be taken in the field to change, update, maintain, or repair an IZM circuit breaker. This information does not, however, include most accessory devices. Their installation is covered by separate instruction leaflets dedicated to the individual devices. The tasks described here do not, under ordinary circumstances, require any assistance beyond the appropriate instructional material. If further assistance is required, however, contact your Moeller representative.

Rating plug replacement

⚠ NOTICE

IF A RATING PLUG IS NOT INSTALLED IN THE TRIP UNIT, THE TRIP UNIT WILL TRIP WHEN ENERGIZED. ALSO REMEMBER THAT THE TRIP UNIT'S RATING PLUG AND THE CIRCUIT BREAKER'S CURRENT SENSORS MUST HAVE MATCHING RATINGS.

To remove the rating plug from the trip unit, open the small rating plug door located on the right side of the trip unit (**Figure 46**). The trip unit's battery cavity is also located behind this door. Use a 1/8-inch wide screwdriver to remove the M4 screw holding the rating plug in position. Pull the door to release the rating plug from the trip unit.

Figure 72. Trip Unit Rating Plug Location

To install a new rating plug, insert the rating plug into the cavity where the other rating plug was removed. Make sure the three pins on the rating plug are aligned with the sockets in the cavity. The rating plug should fit with a slight insertion force.

⚠ CAUTION

TO PREVENT DAMAGE TO THE RATING PLUG, DO NOT FORCE IT INTO THE MOUNTING CAVITY.

Use the same 1/8-inch screwdriver to tighten the M4 screw and secure the rating plug in the trip unit. The maximum torque on the mounting screw is 15 in-oz (0.1 Nm). Close the rating plug door.

Current sensor replacement

⚠ NOTICE

REMEMBER THAT THE TRIP UNIT'S RATING PLUG AND THE CIRCUIT BREAKER'S CURRENT SENSORS MUST HAVE MATCHING RATINGS.

The three current sensors are installed at the rear of the circuit breaker on the lower terminals. A cover with sensor rating viewing windows covers the sensors and is held in place with screws (**Figure 73**). Remove the cover by removing the screws.

Figure 73. Current Sensor Cover in Place Over Sensors

If the circuit breaker is a drawout configuration, the lower primary disconnect finger clusters and the vertical adapters must first be removed from frame sizes up to 2500A. On the 3200A frame, both the upper and lower primary disconnects and vertical adapters must be removed. Each primary disconnect finger cluster is removed by loosening the two hex-head bolts with a 10 mm wrench. These bolts do not have to be completely removed to slide the primary disconnects off of the terminals. Remove the vertical adapters next from the circuit breaker terminals by removing the two or three 10 mm bolts holding them in place (**Figure 74**).

The current sensors are removed by pulling them off of the terminals and unplugging the wiring plugs from the sensors (**Figure 74**).

Install new current sensors by connecting the wiring plugs to the sensors and sliding the sensors over the terminals. Reinstall the cover over the sensors and secure in place with the screws previously removed.

Reinstall the previously removed vertical adapters to the terminals using the removed hardware and **40 ft-lb (55 Nm)** of tightening torque. Make sure the vertical adapters are square to the rear housing. Slip the primary disconnects on to the vertical adapters. Make sure the primary disconnects are fully inserted on to the vertical adapters. Tighten the two retention bolts to **40 in-oz (5 Nm)** of torque. Properly engaged and secured retention bolts should engage the slots or holes in the vertical adapters.

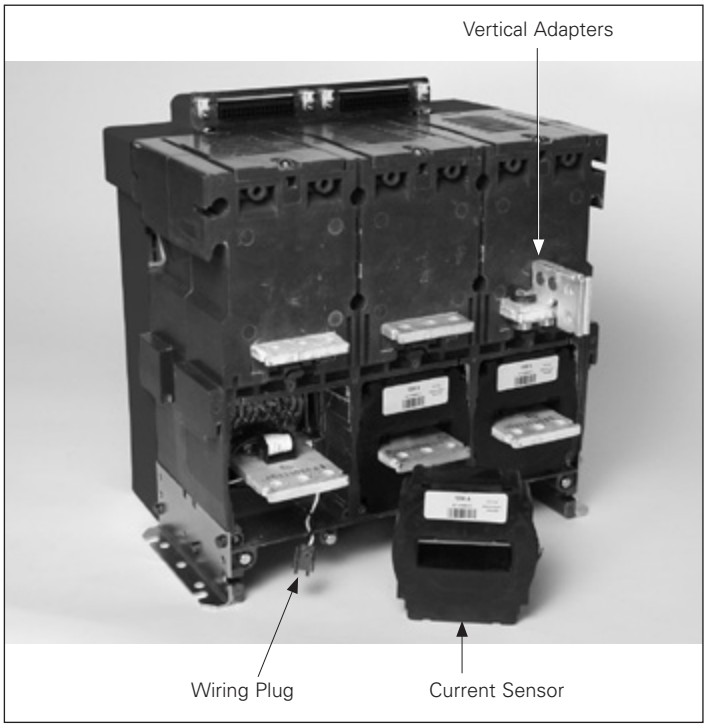


Figure 74. One Current Sensor Shown Removed and Disconnected

Section 7: Troubleshooting

Introduction

Table 12 will help to determine the probable causes of simple circuit breaker problems and possible corrective actions. Possible problems associated with the electronic trip unit are covered in a companion publication, Moeller AWB1230-1609. If the problem cannot be resolved with the aid of one or both of these guides, contact the Moeller service center for more in-depth assistance.

Table 12. Circuit Breaker Troubleshooting Guide

Symptom	Probable Cause	Corrective Actions
The circuit breaker *trips* open (red fault trip indicator button is out and/or fault indicator LED is lighted) when closed on a load current	Rating plug not installed and load current through the breaker	Install rating plug that corresponds to current sensors
	Repeated closing on transient (in-rush) current with thermal memory active	Wait for circuit breaker (and loads) to cool before re-closing
	An overload or fault current condition	Use status and fault indicators to help locate and remove overload or fault condition
Circuit breaker *opens* (fault trip indicator button is *not* out)	Undervoltage release operates; voltage too low or zero	Check and correct the UVR supply voltage (85–110% rated voltage)
	Shunt trip operates	Check control signal(s) to shunt trip; correct if necessary
	Trip latch is defective	Inspect latch condition and engagement before closing; consult Moeller service center
Circuit breaker cannot be opened remotely, but can be opened locally	Shunt trip control signal absent or too low	Check supply voltage exceeds 70% of rated voltage when signal is applied to shunt trip
	Shunt trip is faulty or improperly installed	Remove front cover; check voltage supplied to shunt trip; make sure shunt trip is seated and retainer snapped into place. Check for shunt trip motion; replace shunt trip if faulty
	Secondary contact wiring problem	Make sure electrical pin and socket connectors are properly seated in molded plug. Verify proper wiring
Circuit breaker cannot be opened locally	OPEN pushbutton locked	Remove lock
	Faulty mechanism or main contacts welded	Contact Moeller service center
Circuit breaker makes no attempt to close with either local (manual) or remote controls; springs do not discharge	Closing spring not fully charged (check SPRING CHARGED indicator)	Charge spring manually; check voltage to electrical operator; replace electrical operator if faulty
	If equipped with undervoltage release, undervoltage release is not energized or is faulty	Unplug undervoltage release from mounting deck and retry closing operation; if OK, check release (>85%); replace undervoltage release if faulty
	Circuit breaker locked in OPEN position	Check reason for lock
	Drawout position interlock is operating; levering screw	Make sure that circuit breaker is at a position that permits closure; door is *open* and check that shutter (door) over the levering screw is fully closed
	Circuit breaker interlocked with another circuit breaker or device	Check for presence of an interlocking scheme (cable interlock or key interlock); check to see if interlocked circuit breaker is CLOSED
Circuit breaker cannot be closed remotely (can be closed locally)	Spring release (closing) coil supply voltage low or spring release faulty	Check power supply voltage; replace spring release if faulty
	Secondary contact wiring problem	Make sure electrical pin and socket connectors are properly seated in molded plug. Verify proper wiring
	Spring release closing coil signal blocked	Clear Digitrip 1150 relay contact
Circuit breaker cannot be closed locally (but can be closed remotely)	Opening and/or closing pushbuttons locked	Check reason for lock
Circuit breaker does not recharge electrically but will recharge manually	Charging motor supply voltage absent or too low (<85%)	Check charging motor electrical circuit voltage (check under load)
	Charging motor faulty	Replace charging motor assembly
Drawout circuit breaker will not lever-in	Circuit breaker will not fully enter cell (cell rejection code plate)	Circuit breaker ratings do not correspond to the cassette requirements
	Levering-in screw not in fully DISCONNECT position at insertion	Rotate levering-in screw counterclockwise to DISCONNECT position, then insert breaker fully into cassette
	Levering-in screw in DISCONNECT position but not pushed in far enough	Push circuit breaker in as far it will go, cover should be flush with front of cassette side plate
	Protective boots covering stationary disconnects	Remove boots
	Shutter jammed or locked	Clear problem

Section 8: Renewal parts

General

All renewal parts and/or spare parts recommendations for IZM circuit breakers are supplied in the Moeller catalogue, not this instruction manual. Refer to the most recent version of this documentation for specific assistance.

When ordering parts, always specify, if known, the part name and SAP-No. and /or typecode. If the SAP-No. and /or typecode is not known, it would help to refer to a pictorial and/or graphic reference. Also include the circuit breaker type, General Order number and other information as shown on the nameplate on the front cover of the circuit breaker (**Figure 2** and **Figure 17**).

Some detailed parts shown in the figures in this manual may only be available as a part of a sub-assembly. Certain parts may not be available at all for field installation. Some parts in the figures are illustrated just to show their function and location in the assembly. The Renewal Parts Documentation indicates which parts are available and in what form. For additional information, visit the Moeller Web site at www.moeller.net/de/support.

10/09 AWB1230-1605
Effective October 2009

Operation and maintenance of IZM low voltage air circuit breakers

Moeller GmbH
Industrieautomation

Änderungen vorbehalten
Subject to alterations
10/09 AWB1230-1605EN / Z8700
Moon/Doku/Heng
Printed in USA (10/09)

Powering Business Worldwide

An Eaton Brand