

Magnum IEC Low Voltage Air Circuit Breakers

Product Focus



Introduction

Overview	3
One Family	4
Higher Performance	5
Drawout Cassettes	6

Functions and Characteristics

Overview	7
Characteristics Table	8
Design and Testing Standards	10
Nameplate Identification	11
Installation and Use	12
Circuit Breaker Features	13
Trip Units and Communication	20
Fixed Circuit Breakers	36
Drawout Circuit Breakers	37
Phasing on Double-wide Breakers	39
Accessory Devices	40
Breaker Lock OFF Devices	46

Application and Installation Information

Ambient Temperature	48
Bus Bar Recommendations	48
Altitude Rating Factors	49
Watts Loss Data	49
Electrical Clearances	50
Enclosure	50

Ordering Information

Factory Configured Breakers	51
Factory Configured Cassettes	60
Field Option Kits for Cassettes	62
Field Option Kits for Circuit Breakers	63
Miscellaneous Accessories	67

Appendix

Engineering Data Reference Chart	68
Trip Unit Curves	69
Connection Diagrams	82
Dimensional Drawings	88

May 2003

Magnum **The New Standard in Low Voltage Air Circuit Breakers**

Cutler-Hammer Low Voltage Air Circuit Breakers have set the industry standard for over three decades. When **reliability** and **customer service** are paramount, Cutler-Hammer is the clear choice for IEC applications

There is a new generation of Cutler-Hammer Air Circuit Breakers that are **smaller with higher performance and more versatility.**

Magnum

Magnum Low Voltage Air Circuit Breakers are designed for **ultimate application flexibility**, with the needs of both the power distribution equipment user and the low voltage panel assembler in mind.

For **maximum safety**, a modern, **through-the-door** design permits access to the breaker levering system, trip unit, controls, and indicators with the door closed.

High withstand and **interrupting** ratings provide for maximum selectivity and system coordination to meet the needs of the high available fault currents on today's electrical power distribution systems.

A **compact and modular** family of breaker frame sizes makes the design of compact, economical and versatile enclosures a reality.

Field installable accessories minimize inventory and permit fully certified field installation of current sensors, rating plugs, trip units and accessories.



Three Frame Sizes in One Family

Magnum circuit breakers are available in a family of **three physical frame sizes**, with the same basic height and depth, differing only in width.

The **MWN narrow** frame is the highest performing power circuit breaker of its size and rating class. Continuous current ratings are available from 800 to 2000 amperes. Withstand and interrupting ratings are available from 40 to 65 kA at 690Vac. The MWN compact size allows for application in compact enclosures of many types.



The **MWI standard** frame is ideally suited for the construction of vertically stacked modular IEC Switchgear and Switchboards. Continuous current ratings are available from 800 to 3200 amperes in the same frame with uniform 125 mm pole center spacing. Withstand ratings are available to 85 kA at 690 Vac and interrupting ratings to 100 kA at 440 Vac for improved system coordination and service continuity.



The **MWI double-wide** frame is ideal for application as main and tie breakers in high capacity power distribution systems. Continuous current ratings are available in 4000, 5000, and 6300 amperes. Withstand and interrupting ratings are available to 100 kA at 690Vac for maximum system coordination with down stream devices.



May 2003

Highest Levels of Performance

Magnum circuit breakers have the **highest levels of performance.**

Higher interrupting capacity allows Magnum to be applied on newer power distribution systems with higher available fault currents.

Higher short time (withstand) current ratings along with selective (LS) Digitrip RMS trip units results in total selectivity between main, feeder, and branch circuit breakers.

**MWN
Narrow**
**Interrupting
up to
65 kA**



**Short Time
up to
65 kA**

**MWI
Standard**
**Interrupting
up to
100 kA**



**Short Time
up to
85 kA**

**MWI
Double-wide**
**Interrupting
up to
100 kA**



**Short Time
up to
100 kA**

Performance Family

**Magnum MWN
Narrow Frame
800 - 2000 A.**

**Magnum MWI
Standard Frame
800 - 3200 A.**

**Magnum MWI
Double-wide Frame
4000 - 6300 A.**

Continuous Current (A)

Icu at 690Vac 800 1000 1250 1600 2000 2500 3200 4000 5000 6300

40 kA	■	■	■								
50 kA	■	■	■	■	■						
65 kA	■	■	■	■	■						
65 kA	■	■	■	■	■	■	■				
85 kA	■	■	■	■	■	■	■				
100 kA ①	■	■	■	■	■	■	■				
85 kA								■	■		
100 kA								■	■	■	

① Note: Icu is 100kA at 440 Vac and 85 kA at 690 Vac.

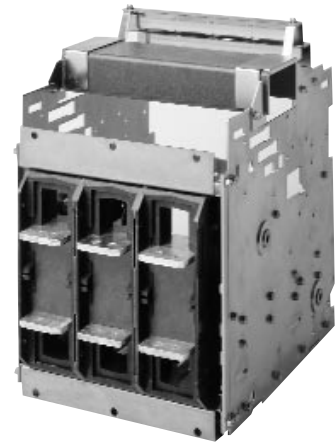
Simplified Construction with Three Drawout Cassettes

The **MWN narrow frame** drawout circuit breaker is available in a **compact cassette** with horizontal primary stabs and terminals, making it ideal for single-high, compact enclosures. Optional vertical adapter kits are available for applications where bus bar termination in the vertical plane or multiple stacking of breakers is preferred.

MWN Narrow Frame Cassette



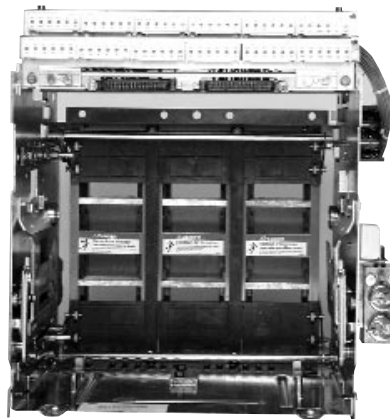
Front View (with circuit breaker)



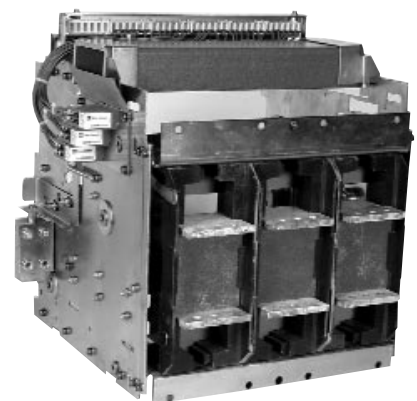
Rear View

The **MWI standard frame** mates to a standard size cassette with horizontal primary stabs and terminals. Uniform 125 mm pole center spacing makes the cassette ideal for applications that require stacking of multiple circuit breakers in a single enclosure structure. Optional vertical adapter kits are available where bus bar termination in the vertical plane is preferred.

MWI Standard Frame Cassette



Front View



Rear View

The **MWI double-wide** frame circuit breaker uses a double-wide cassette designed to accommodate a maximum rating of 6300A. Horizontal primary stabs and terminals are provided as standard. Optional vertical adapter kits are available where bus bar termination in the vertical plane is preferred. Single enclosure structure as well.

May 2003

Introduction

The Magnum Low Voltage Air Circuit Breaker affords customers the opportunity to meet the increasingly complex requirements of modern distribution systems. It is designed and tested for use in low voltage power distribution assemblies applied at nominal voltages of 220/415, 440, and 500/690 volts ac. Magnum is available in drawout and fixed circuit breaker mounting configurations. High interrupting ratings up to 100kA without fuses and continuous current ratings from 800 through 6300 amperes are covered by three different frame sizes.

Magnum circuit breakers are witnessed and certified with a KENMA-KEUR Mark, and are built and tested in an ISO 9000 certified facility. The circuit breakers meet or exceed all applicable EN and IEC standards including:

- IEC 947-2 Category B
- BS/EN 60947-2
- Suitable in IEC 947-1/439-1 Low Voltage Switchgear

Controls and indicators are functionally grouped on the circuit breaker's front cover. The through-the-door drawout design permits easy and safe access to the front cover controls, as well as the trip unit and racking device.

Magnum circuit breakers utilize one of a family of microprocessor-based Digitrip electronic, rms sensing and programmable trip units to provide system selectivity, advanced coordination and communications.

Functional and Flexible

- Rigid frame of high strength engineered thermoset composite resins
- Compact and lightweight
- Rugged, maintainable construction
- Three frame sizes
- Four position drawout or fixed mounting configurations
- Through-the-door drawout construction
- Common height, depth and door cutout
- Spring stored energy mechanism
- Electrical or manual operation (field convertible)
- Field installable accessories.

Performance Plus

- Designed and tested to IEC Standards
- Ten continuous current frame sizes (800 through 6300A without fans)
- High interrupting ratings
- High withstand ratings
- Rated for 100% continuous operation in enclosure
- 3 cycle closing

Intelligence Systems

- Digitrip microprocessor-based true rms sensing trip units
- Protection and coordination
- Energy monitoring and power quality
- Communications
- Protective relay features
- Integral testing
- Hand held test kit

Special Application Circuit Breakers

- Non-automatic circuit breakers - a non-automatic circuit breaker does not include a trip unit, sensors or overcurrent release.
- 1100 Vac air circuit breakers.
- Contact Cutler-Hammer for other special applications.

Functional Techniques

- Patented "Heal-Toe" contact structure
- Improved contact material
- "C" Loop current path
- Braided current path connections
- Sealed, removable arc chambers

Reliability, Maintenance and Safety

- Front accessible and dedicated secondary wiring
- Finger proof secondary contacts
- Drawout rail construction
- Front mounted, plug-in accessories
- Accessory viewing windows
- Proven operating mechanism
- Fewer individual parts
- Mechanical main contact wear indicator
- One piece removable arc chutes and covers
- Insulating and isolating arc chambers
- Replaceable current path structures, current sensors and trip units

**MWN
Narrow
Frame**

**MWI
Standard
Frame**

Magnum Characteristics, Dimensions and Weights (continued on next page)

Magnum Frame		Narrow Frame (MWN)			Standard Frame (MWI)			
		800	800	800	800	–	800	800
		1000	1000	1000	1000	–	1000	1000
		1250	1250	1250	1250	–	1250	1250
		–	1600	1600	1600	–	1600	1600
		–	2000	2000	–	2000	2000	2000
					–	2500	2500	2500
					–	3200	3200	3200
Interrupt Ratings at 690Vac Icu/lcs (kA rms)		40/40	50/50	65/65	65/65	65/65	85/85	100/85 ④
Withstand Rating Icw 1-sec/3-sec (kA rms)		40/–	50/– ③	65/40	65/–	65/50	85/65	85/65
Maximum Break Time (msec)		30			30			
Maximum Closing Time (msec)		50			50			
Circuit Breaker Dimensions (mm) ⑤								
Fixed	Height	425.7			425.7			
	Depth	371.9			371.9			
	Width (3-pole)	317.7			410.2			
	Width (4-pole)	413			537.2			
Drawout	Height	524.3			524.3			
	Depth	474.2			474.2			
	Width (3-pole)	336			431.8			
	Width (4-pole)	431.3			558.8			
Circuit Breaker Weight (kg) ⑤								
Fixed	3-pole	43			58 to 68			
	4-pole	54			72 to 86			
Drawout	3-pole	48			70 to 86			
	4-pole	62			88 to 112			
Cassette	3-pole	28			53 to 56			
	4-pole	32			55 to 68			
Non-Auto Switch Characteristics								
Maximum Interrupt Ratings at 690Vac Icu/lcs (kA rms)		40/40	50/50	65/65	65/65	65/65	85/85	⑦
Withstand Ratings Icw 1-sec/3-sec (kA rms)		40/–	50/– ③	65/40	65/–	65/50	85/65	⑦
Continuous Current Range (Amps)		to 1250	to 2000	to 2000	to 1600	2000	to 2000	–
Close and Latch Current (kA Peak) ⑥		43	55	69	55	69	69	–
Maximum Continuous Current Range (Amps)		–	–	–	–	2500 & 3200	2500 & 3200	–
Close and Latch Current (kA Peak) ⑥		–	–	–	–	110	110	–

① Circuit breakers equipped with integral trip units have a making current release set to trip instantaneously at 25 x I_n peak current to prevent closing on a fault current exceeding that magnitude.

② Magnum ACBs carry an IT rating at 440 Vac per EN60947-2 Annex H. Contact Cutler-Hammer for 690 Vac IT applications.

③ The Icw 1-sec/3-sec rating is 50/30 kA for 2000 amp MWN 50kA breaker.

④ Standard frame circuit breakers rated 100kA are equipped with a high instantaneous trip set to protect above 85kA rms. Icu is 100kA and Ics is 85kA at 440 Vac. Icu and Ics are 85kA at 690 Vac.

⑤ The approximate weights and dimensions shown are based on horizontal terminals.

⑥ Close and latch ratings are applicable only to non-automatic switches. Non-automatic switches should be applied with a suitable external overcurrent device with instantaneous trip to protect above the published close and latch rating.

⑦ The maximum available instantaneous interrupting rating for the standard frame non-automatic switch is 85kA.

**MWI
Double-wide
Frame**



(continued from previous page)

Magnum Frame		Double-wide Frame MWI		
		4000	4000	4000
			5000	5000
			6300	6300
Circuit Breaker Characteristics ① ② Continuous Current Rating Amps at 40°C				
Interrupt Ratings at 690Vac Icu/Ics (kA rms)		65/65	85/85	100/100
Withstand Rating Icw 1-sec/3-sec (kA rms)		65/-	85/-	100/-
Maximum Break Time (msec)		40		
Maximum Closing Time (msec)		70		
Circuit Breaker Dimensions (mm) ⑤				
Fixed	Height	425.7		
	Depth	371.9		
	Width (3-pole)	886.5		
	Width (4-pole)	1120		
Drawout	Height	524.3		
	Depth	474.2		
	Width (3-pole)	909		
	Width (4-pole)	1036		
Circuit Breaker Weight (kg) ⑤				
Fixed	3-pole	107.5	125.2	
	4-pole	144.7	163.3	
Drawout	3-pole	138.8	157.4	
	4-pole	166	200	
Cassette	3-pole	90.3	96.2	
	4-pole	113.4	120.7	
Non-Auto Switch Characteristics				
Maximum Interrupt Ratings at 690Vac Icu/Ics (kA rms)		65/65	85/85	100/100
Withstand Ratings Icw 1-sec/3-sec (kA rms)		65/-	85/-	100/-
Continuous Current Range (Amps)		to 4000	to 4000	to 4000
Close and Latch Current (kA Peak) ⑥		138	138	138
Maximum Continuous Current Range (Amps)		-	5000 & 6000	5000 & 6000
Close and Latch Current (kA Peak) ⑥		-	217	217

The Magnum air circuit breaker was designed and tested to meet the requirements of the world market. It is a 100% rated device, designed to carry 100% of its nameplate current rating in an enclosure without derating at a 40°C ambient.

Circuit Breakers are built and tested to applicable standards, including:

- International EN 60947-2 Category B

Circuit Breakers are also suitable for use in:

- IEC 947-1/439-1 Low Voltage Switchgear

Relative to the pollution degree, Magnum circuit breakers conform to the requirements of Clause 6 of IEC 947-2. This states that unless otherwise stated, the circuit breaker is intended for installation under environmental conditions of Pollution Degree 3.

ISO 9001

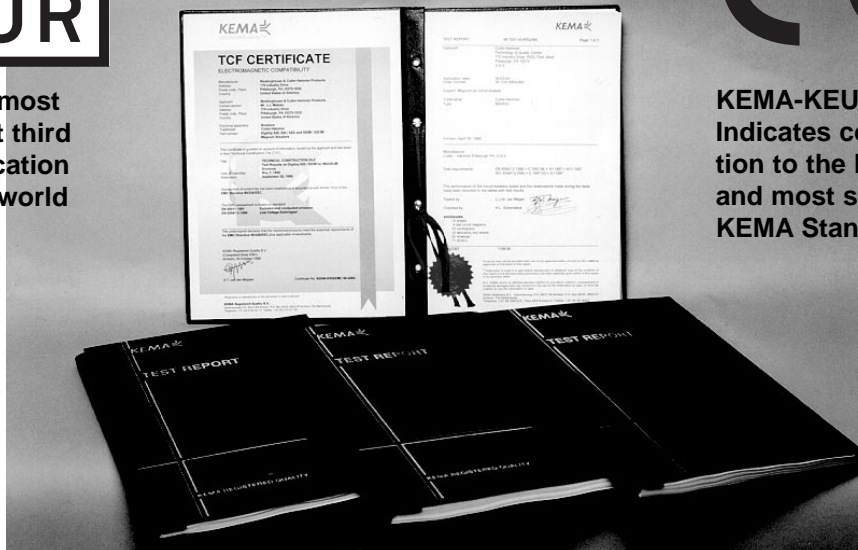
- Magnum Air Circuit Breakers are designed to ISO 9001

ISO 9002

- Magnum Air Circuit Breakers are manufactured in an ISO 9002 Facility



KEMA—Foremost independent third party certification body in the world



KEMA-KEUR Mark Indicates certification to the highest and most stringent KEMA Standards

**Magnum...
...The Only KEMA-KEUR Certified Air Circuit Breaker**

KEMA-KEUR Certification

- Product Test Certification—All 4 EN 60947-2 Test Sequences
- Manufacturing Location Certification
- Ongoing compliance ensured with spot facility and field product checks

May 2003

Nameplate Identification

Magnum low voltage power circuit breakers must be applied within their nameplate ratings. Nameplates are prominently displayed on the front of the circuit breaker, and provide important information relative to that specific circuit breaker.

A Magnum circuit breaker is easily identified by its specific designation.

Magnum Designation Example

M W I C 3 2		
Circuit Breaker Type	Interrupting Capacity	Frame Size
<i>MWI - Standard and Double Wide Frames</i>	4 - 40,000 5 - 50,000 6 - 65,000	08 - 800 Amps 10 - 1000 Amps 12 - 1250 Amps
<i>MWN - Narrow Frame</i>	8 - 85,000 C - 100,000 ① E - 150,000	16 - 1600 Amps 20 - 2000 Amps 25 - 2500 Amps 32 - 3200 Amps 4N - 4000 Amps 5N - 5000 Amps 6N - 6300 Amps

① Reserved for future breaker

Typical Magnum DS Nameplate

A **Magnum** LV Air Circuit Breaker

B **MWI832**

C **IEC 60947-2 Category B**

Frame = 3200A **3 Pole** **50/60 Hz**

U_i	1000V	
U_{imp}	8000V	
U_e	380/440V	480/690V
I_{cs}	85kA	85kA
I_{cu}	85kA	85kA
I_{cw}/1 sec	85kA	85kA

D

E **Accessories**

Motor Operator **220 - 250 VAC** **50/60 Hz**

OTS/Bell Alarm

Trip Unit Power **240 VAC** **50/60 Hz**

Aux Switches **2A / 2B**

Spring Release Latch Check Switch

G.O.#: SAMPLE It: 001 Seq: 001

Cust P.O.: SAMPLE

02/12/02 12:10:06

CAT#: MWI8323LEA 32CVR PRR2Y NHLWX

Installation and Operating Instructions: I.B. 2C13060

Made in USA

A Low voltage power circuit breaker family name

B Breaker family designation number

C Breaker frame size in amperes

D Interrupting capacity rating

E Factory Equipped Accessories

Sized to Simplify

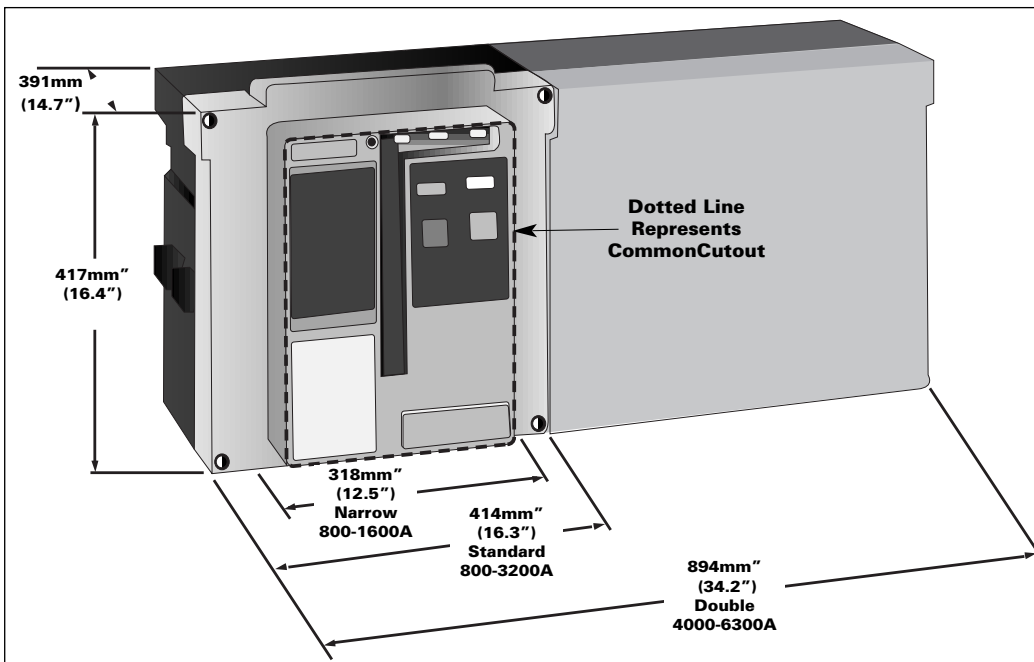
Magnum low voltage power circuit breakers are designed for simplified installation and use.

- Three physical frame sizes through 6300 amperes
 - More circuit breakers per square centimeters
 - Increased ratings in less space
 - Installation economy of time, material and space

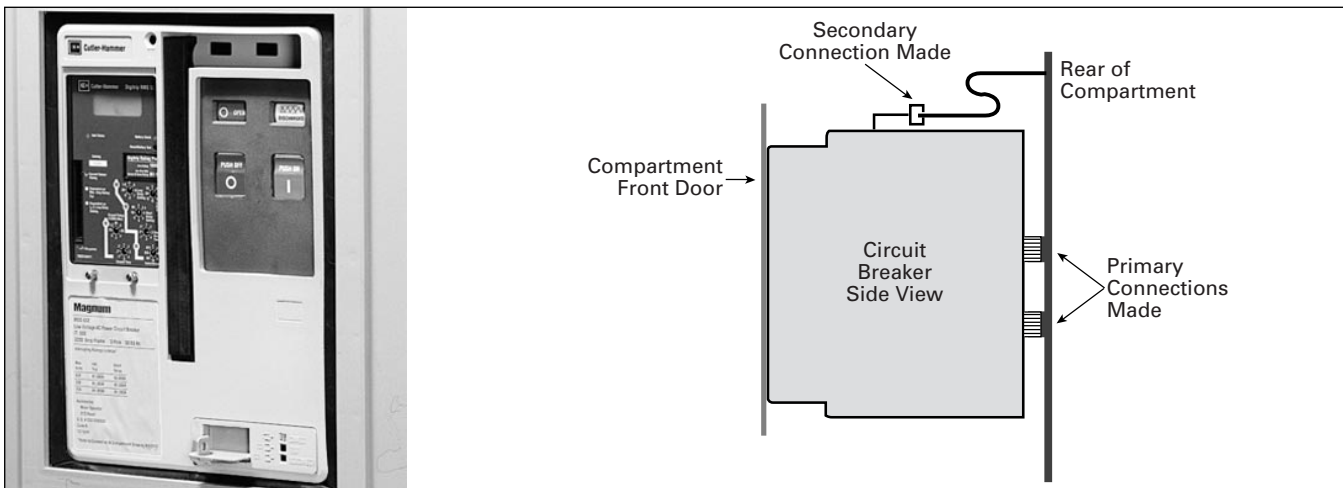
- Four position drawout and fixed mountings
 - Customer flexibility
- Fixed mounting with horizontal or vertical bus bar connections
 - Accommodate different bus configurations
- Through-the-door drawout
 - Clear access to trip unit, controls and indicators

- Closed door circuit breaker levering
- DISCONNECT, TEST and CONNECT with door closed
- Common height, depth and door cutout
 - Installation ease and economy
- Zero clearance mounting with drawout cassette
 - Vertical stacking economy

Common Height, Depth and Cutout (3-Pole Illustration)



Through-The-Door Drawout (Connect Position Shown)



Summary

Rigid Frame Housing

Magnum circuit breakers use a rigid frame housing construction of engineered thermoset composite resins. This material is strong and lightweight having a strength to weight ratio twice that of steel. In addition to high strength structural properties, this material has excellent dielectric characteristics and resists arc tracking.

The 3-piece construction provides support while isolating and insulating power conductors:

- ① A 2-piece case encloses current paths and arc chambers. The chambers act to channel arc gases up and out during interruption.
- ② The operating mechanism and accessories sit on the front of the

case and are covered by an insulating front cover. Only the cover needs to be removed to access the mechanism or add accessories.

The overall strength and rigidity of the design also contributes to higher performance capabilities:

- Higher Withstand
- Higher Interrupting

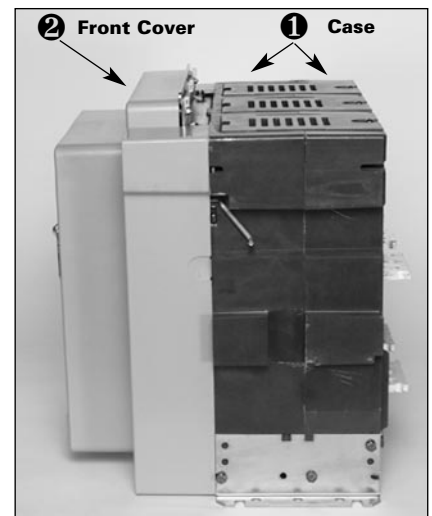
The Magnum rigid frame housing design allows for precise construction, eliminating the need for adjustments. The significantly reduced frame deflection during operation along with stiff component mounting results in a longer life operating mechanism.

Operating Panel

The Magnum front cover (next page) contains a convenient operating panel with clear words and symbols

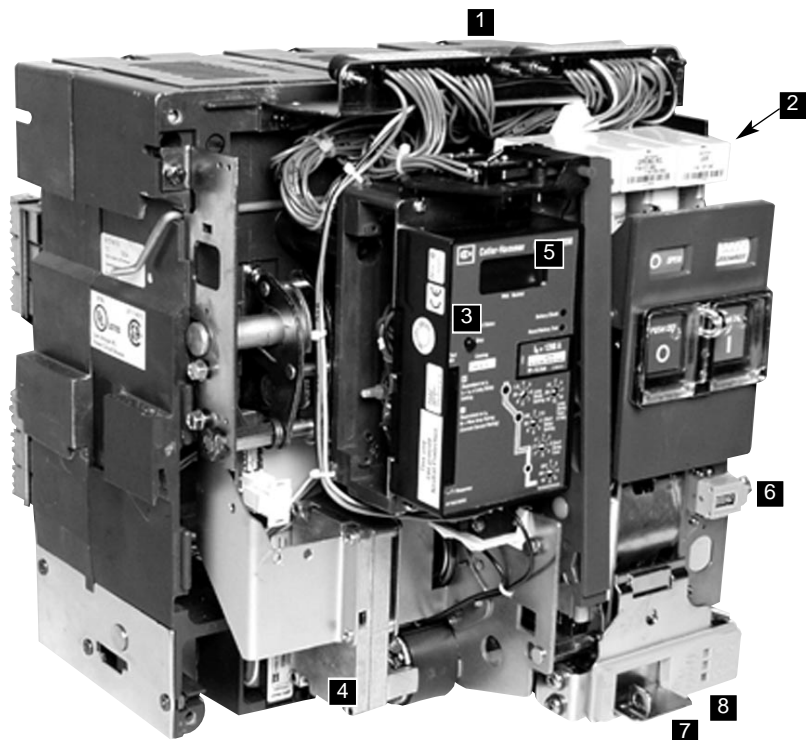
indicating functions and guiding operations. Field installable accessory items can be identified by name and rating through viewing windows. An optional padlockable cover limits access to the "ON" and "OFF" push-buttons. Complete access to the "ON" pushbutton can be prevented with an optional prevent close cover.

Magnum Rigid Frame Construction

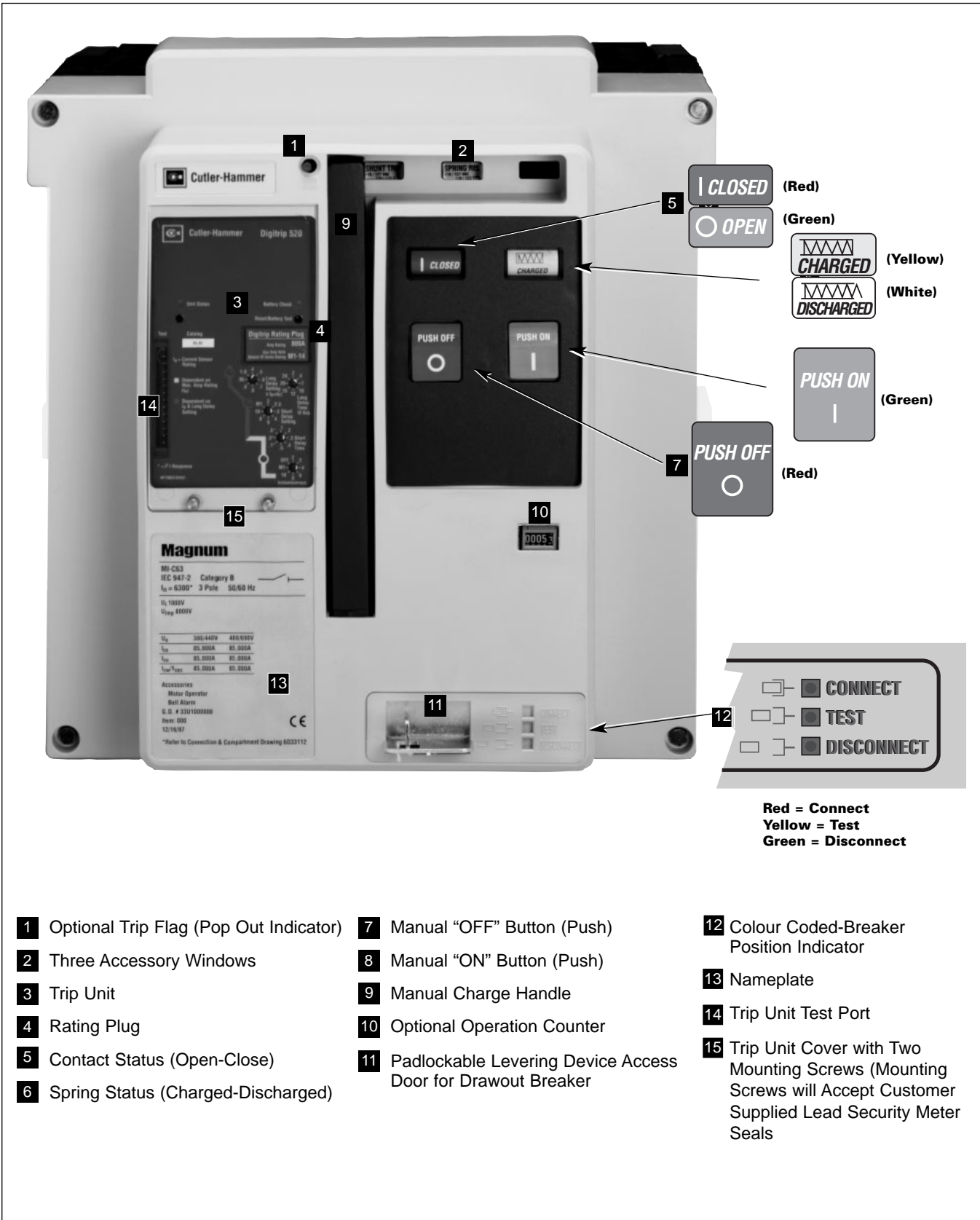


Magnum Front Accessible Operating Mechanism and Accessories

- ① Secondary Wiring Points
- ② Field Installable Accessories (3 maximum)
- ③ Trip Unit
- ④ Electric Charging Motor
- ⑤ Manual Charge Handle
- ⑥ Operations Counter (optional)
- ⑦ Padlockable Levering Device Access Door
- ⑧ Breaker Position Indicator



Magnum Drawout Circuit Breaker Front Cover



- 1** Optional 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** Colour 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)

May 2003

Main Contact System

Single Contact Finger

The performance characteristics of the Magnum air circuit breaker are primarily attributed to the contact design and its movement. A single contact finger is the focal point of the moving contact. This single contact performs both the main and arcing contact functions on different parts of the same finger.

A complete movable contact assembly is merely a combination of a number of single contact fingers. The exact number of contact fingers required depends upon the frame size and interrupting rating of the circuit breaker.

The braided connectors (flexible shunts) used to attach each contact finger serve several important purposes:

- Eliminate bolted joints reducing hot spots
- Reduce required mounting space for primary contacts
- Allow contact finger motion for "Heel - Toe" rocking

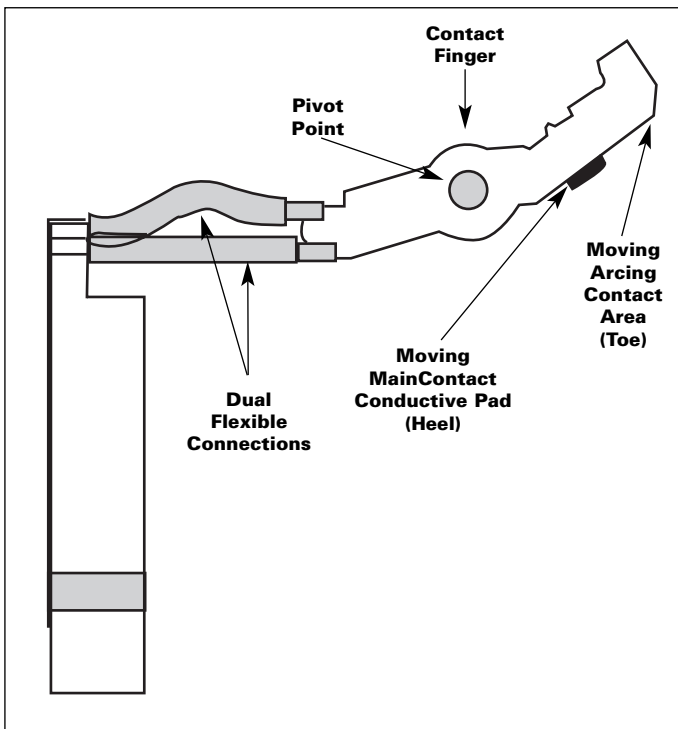
Heel-Toe Action

The "Heel-Toe" movement of the contact fingers is a critical factor in the efficiency of the Magnum main contact system. The main contact portion can be viewed as the "Heel" and the arcing portion the "Toe." Its movement is similar to the rocking of a foot forward and backward from

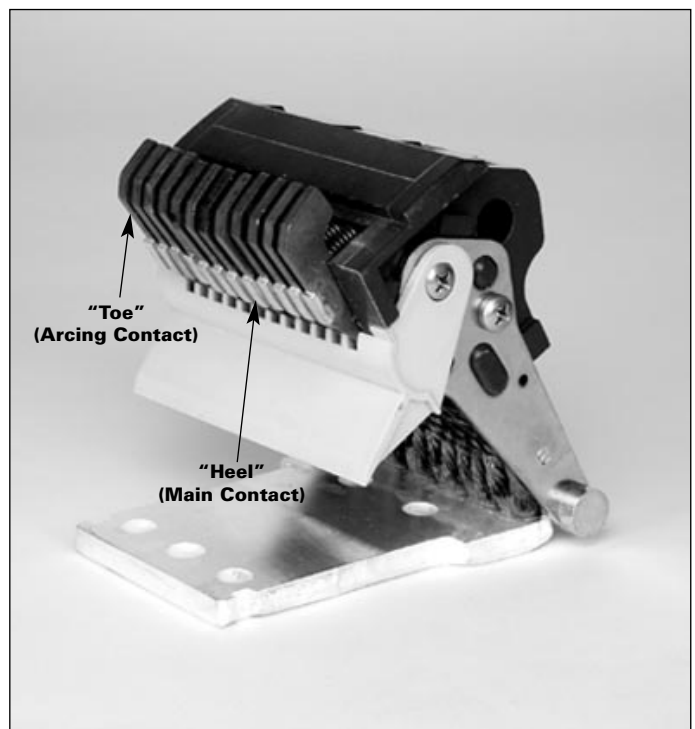
heel to toe and toe to heel. When the circuit breaker is closed, the "Heel" (main contact portion) is in contact with the stationary contact and carrying current. At the same time, the "Toe" (arcing contact portion) is separated from the stationary arcing contact. A compact "C Loop" current path permits electromagnetic forces, primarily produced as a result of a fault current, to supplement the closing contact forces provided by the operating mechanism. This helps to accomplish two important things:

- Operating mechanism does not have to be as large or heavy
- Higher short time ratings (withstand) are achievable

Graphic of Single Magnum Contact Finger



Magnum Standard Frame (12 Finger) Contact Assembly



Integral Arc Runner

The integral arc runner serves a dual purpose:

- Functions as circuit breaker' fixed arcing contact
- Functions as a critical part of the arc chute

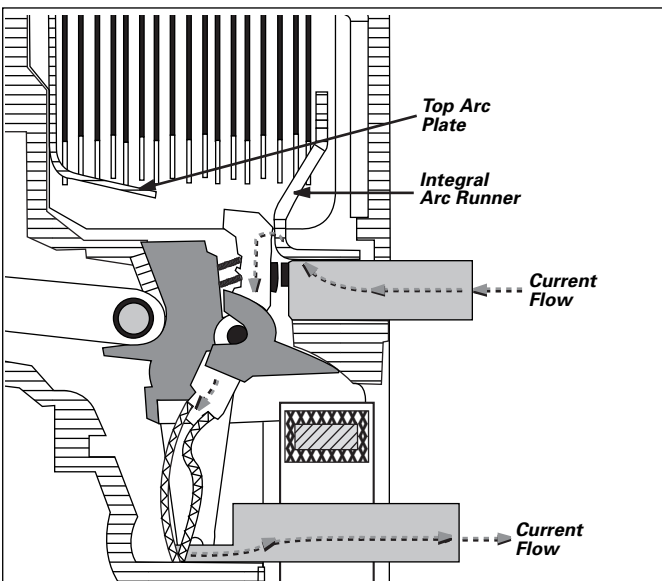
Contact Wear Indicator

A contact wear indicator provided for each primary contact structure permits their condition to be determined. This is accomplished by viewing the contacts while in the **closed position only**.

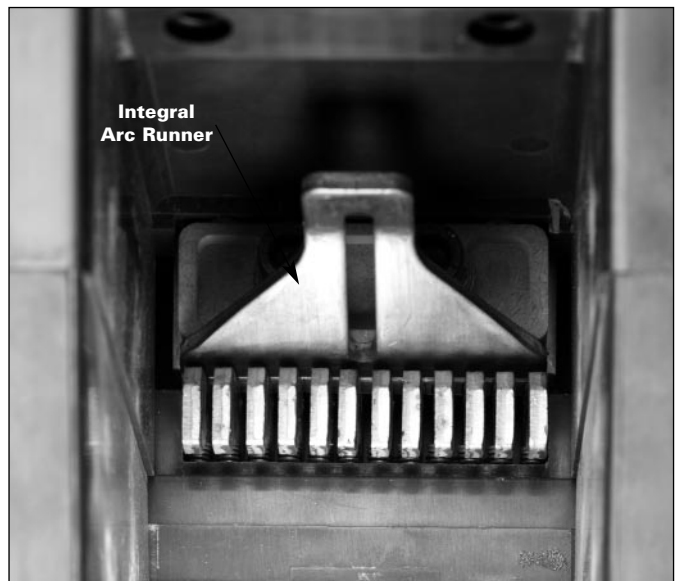
The contact wear indicator is the relative position of the individual

contact fingers to a narrow, **side-to-side ledge** inside the arc chamber. When the contacts are in good condition, the narrow ledge is covered by the back end of the contacts and not visible. When the narrow ledge becomes visible with the primary contacts closed, contact replacement is indicated.

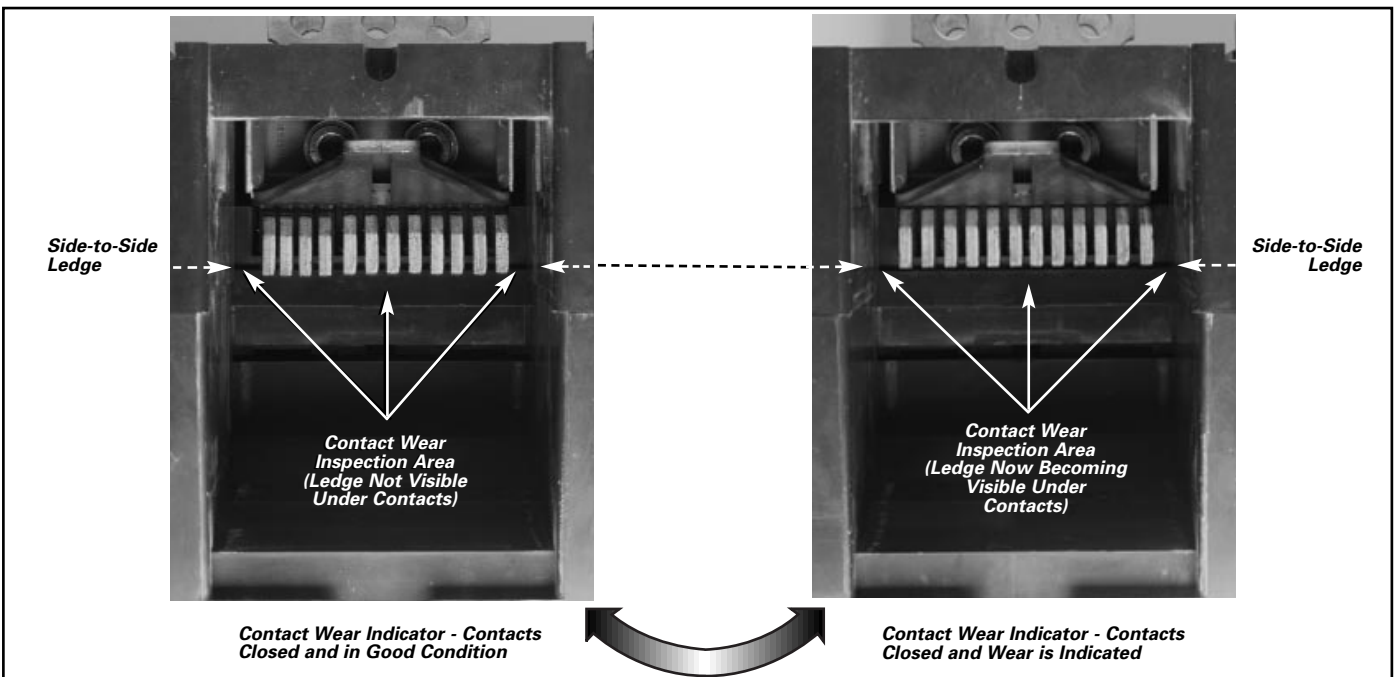
Magnum Arc Running System (Crosssectional View)



Integral Arc Runner Viewed from Top of Circuit Breaker



Contact Wear Indication



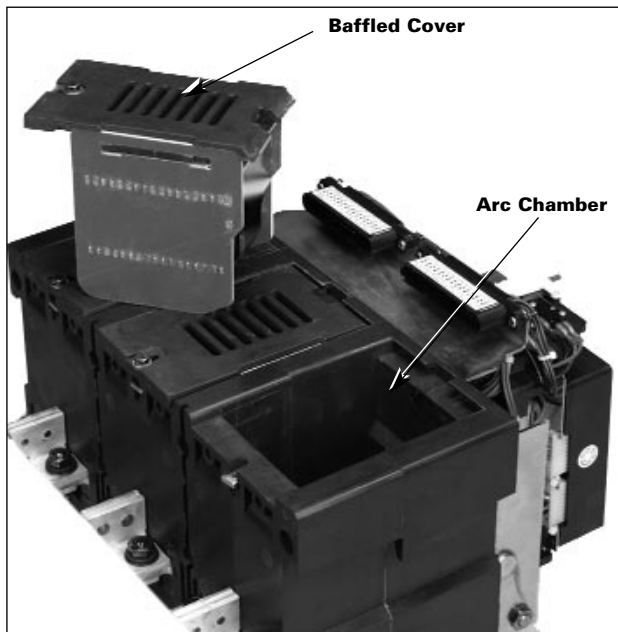
May 2003

Arc Chambers

Arc chambers, one per pole, are used to insulate and isolate each pole from one another, from the rest of the circuit breaker, and from operating personnel.

Arc Chute

Enclosed within each arc chamber is an arc chute which mounts over each set of primary contacts. Alternating V-shaped arc chute plates effectively attract the arc and interrupt it. Each arc chute has a baffled cover to assist with the speed and efficiency of the interruption.

Partial Top Rear View Breaker (One Arc Chute Removed)**Arc Chute (Bottom View)**

Manual Operation

On manually operated circuit breakers, the closing spring is charged manually. This is accomplished through the use of the front mounted spring-charge handle. It takes from 5 to 7 downward strokes on the handle to complete the charging process.

Standard manually operated circuit breakers are closed and opened by hand using the front mounted Manual "ON" and Manual "OFF" buttons respectively. Access to these buttons can be limited by the use of an optional, padlockable cover. Complete access to the "ON" button can be prevented with an optional prevent close cover. Spring and primary contact status indicator windows are located just above the pushbuttons.

Optional electrically operated devices are available to automatically close or trip open manually operated circuit breakers, and are field installable.

An optional motor operator is used to charge the closing spring automatically. It can be field installed in a manually operated circuit breaker. Manual circuit breakers are pre-wired for this addition.

Electrical Operation

The closing spring is charged automatically by the optional motor operator. It can also be manually charged.

Manual "ON" and Manual "OFF" buttons are also provided as described under manual operation.

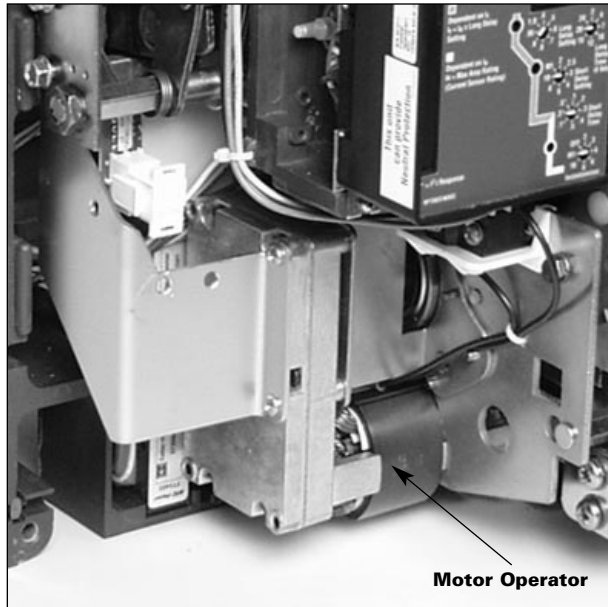
Through the use of a mechanical anti-pump feature, an open circuit breaker only accepts one attempt to reclose even if the close command continues, preventing motor operator burnout.

A standard circuit breaker with electrical operation also has optional electrically operated devices available to automatically close or trip open the circuit breaker.

Magnum Circuit Breaker Being Manually Charged



Motor Operator Installed



May 2003

Breaker Secondary Connectors (Black)

Magnum secondary connectors provide reliable low impedance connections for up to 60 terminal points of breaker control wiring. The secondary connectors are black in color and consist of 2 blocks, each with 30 terminal points. The terminals receive plug-in type pin and socket wire terminals. Terminal points have dedicated locations to receive the breaker accessory devices and to facilitate standardized automated testing of the control wiring and accessories during breaker manufacturing. Labels are provided on the blocks to assist the customer in terminal point identification and use.

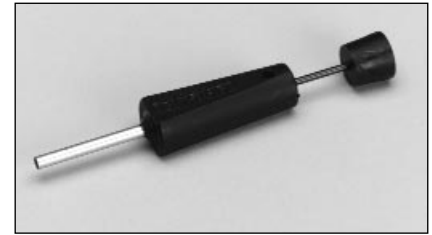
The dedicated secondary connectors make it easy to add accessories (like shunt trips, spring release devices, etc.) to the breaker at the point of use with field option kits. Wiring removal from breaker secondary connector is easily accomplished using an extraction tool (AMP part number 305183).

Secondary Terminal Blocks (White)

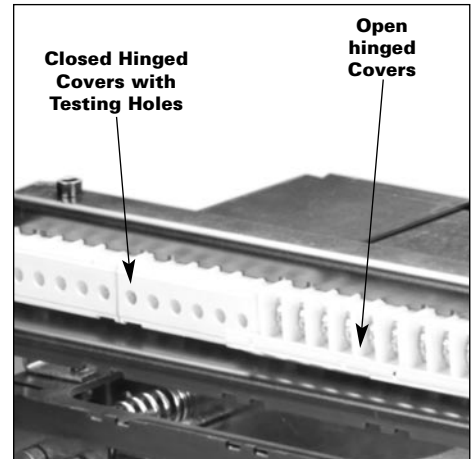
White secondary terminal blocks can be provided mounted at the top front of the breaker for customer use. The 6-point terminal blocks have hinged IP20 finger-proof covers and are designed to terminate various customer wire terminals including ring type terminals. Up to 72 terminal block points can be accommodated for Standard and Double frame breakers. Up to 48 terminal block points can be accommodated for Narrow Frame breakers.

Wire kits and terminal block kits are available for use by the panel assembler to custom configure the black breaker secondary connectors to the white terminal blocks. As an option, factory pre-wired cassettes are available for drawout circuit breakers.

Secondary Wiring Removal Tool



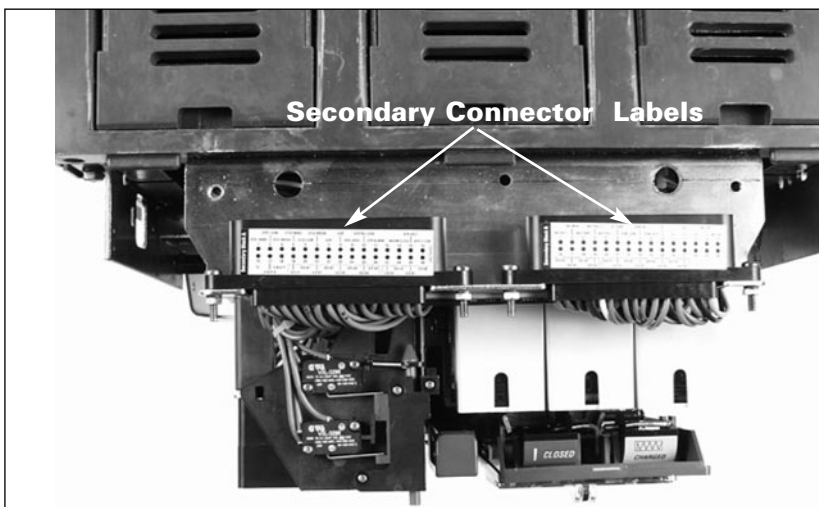
Mounted Secondary Terminal Blocks



Secondary Terminals and Terminal Wires



Top View Secondary Connectors Charged



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

Digitrip RMS

Trip Unit Summary

Magnum circuit breakers can use any one of a family of microprocessor-based, true rms sensing Digitrip RMS electronic trip units:

- Digitrip RMS 220
- Digitrip RMS 520i
- Digitrip RMS 520Mi
- Digitrip RMS 520MCi
- Digitrip RMS 1150i

The trip units themselves are self powered; no external power is required to operate the protective systems. Current signal levels and the control power are derived from integrally mounted torroidal wound current sensors. The use of torroidal wound sensors reduces magnetizing currents, resulting in improved metered value accuracy over a broad range of sensor ratings.

Common Features

All trip units have a green light emitting diode (LED), labeled *Status*, which blinks approximately once each second to indicate that the trip unit is operating normally. This same *Status* LED will blink at a faster rate if the trip unit is in a pick-up or overload condition.

Trip units are interchangeable in the field, except for Model 520MC and Model 1150. Contact Cutler-Hammer for interchangeability details.

A functional local test of a major portion of every trip unit's electronic circuitry and the circuit breaker's mechanical tripping action can be verified through the trip unit's test receptacle. Every test receptacle is supplied with a test receptacle cover. This is accomplished using a Digitrip Test Kit which provides a secondary injection test. A small hand held functional Test Kit can also be used to check circuitry and mechanical tripping functions. In addition, the model 1150 trip unit has an integral testing system.

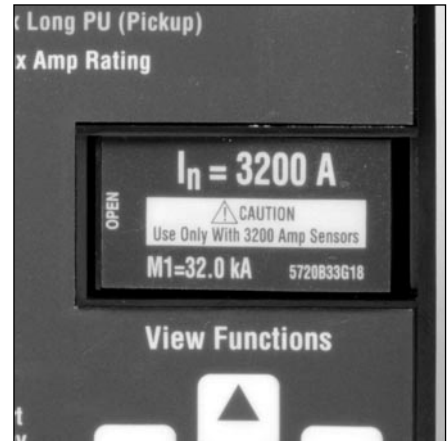
All trip unit models, except for model 220, have red LEDs on the face of the trip unit to indicate the cause for an automatic trip operation, for example earth fault, overload or short circuit. They flash red to make the indication. A battery in the trip unit maintains the trip indication until the Reset/Battery Test button is pushed. The battery is satisfactory if its LED lights green when the Battery Check button is pushed.

A clear, tamper-proof, plexiglass cover sits on the front of the circuit breaker over the trip unit. This cover allows the settings to be viewed but not changed, except by authorized personnel. The cover is held in place by two cover screws. Security is insured by the insertion of a standard meter seal through the holes in both of the cover retention screws.

Magnum Hand Held Tester



Rating Plug Installed in Digitrip 1150



Rating Plugs

All Magnum circuit breaker trip units use a fixed type rating plug. Rating plugs are available in ampere ratings of 200 through 6300 amperes. The current rating of the rating plug must match the current rating of the integrally mounted current sensors. Therefore, the continuous current rating of the circuit breaker cannot be changed by only changing the rating plug.

The rating plug performs a number of functions:

- It tells the trip unit what the rating is of the current sensors. A label on the rating plug clearly states that the rating plug and current sensors must have the same rating.
- It determines the maximum instantaneous setting which is a function of the current sensor rating.

Lifting the rating plug lid will expose a small battery which supplies power for the trip unit's cause of trip LEDs.

If the rating plug is removed from the trip unit, the circuit breaker will open (trip) if it is carrying current. The rating plug should always be secured in position when the circuit breaker is in use.

May 2003

Digitrip 220 ①

The **Digitrip 220 Trip Unit** is designed to provide basic overcurrent protection with maximum economy. The Model 220 is available on Narrow and Standard Frame Magnum Circuit Breakers up to 3200 amperes. Product features include:

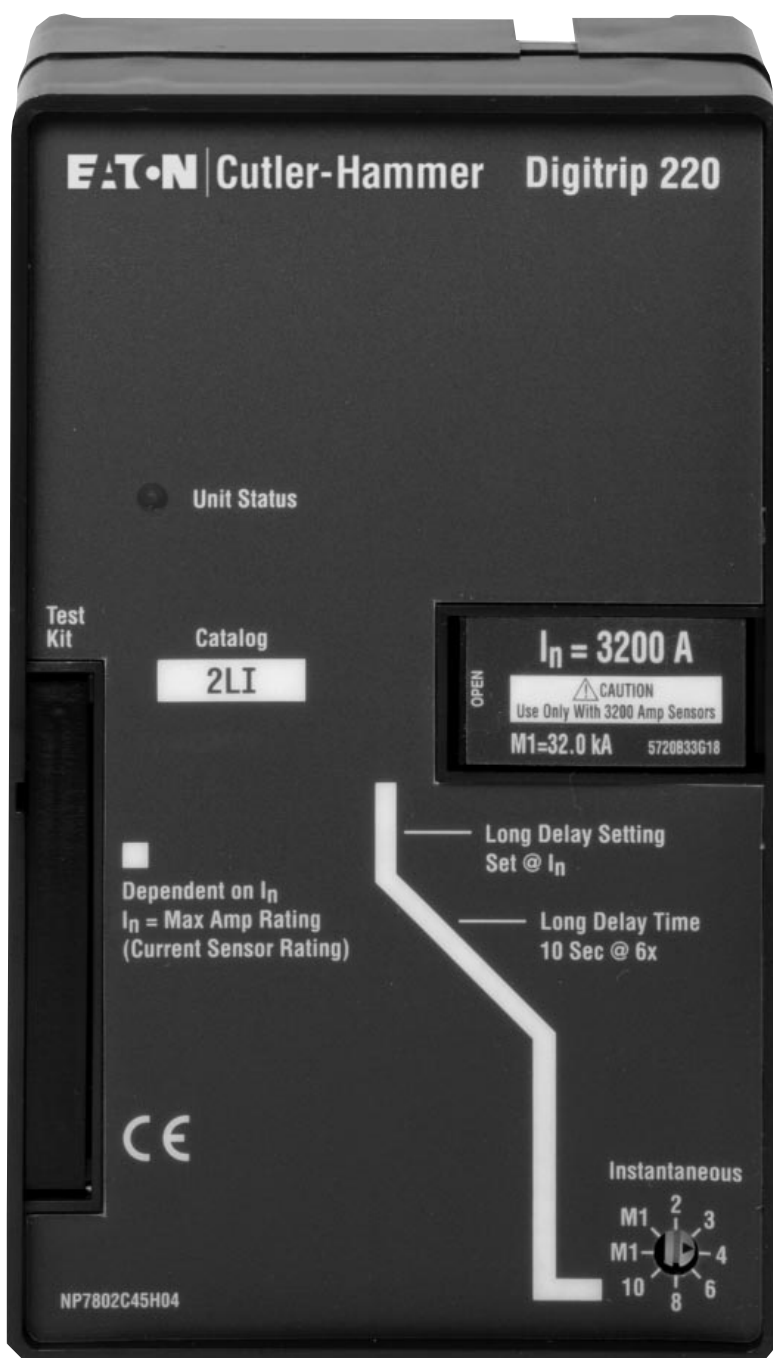
- **LI Protection Option**
- **Unit Status LED (Green) Indicator**
- **Microprocessor-Based True RMS Sensing**
- **Long Delay Pick-up Setting** fixed at I_n
- **Long Delay Time Setting** fixed at 10 seconds at $6xI_n$
- **Long Time (Thermal) Memory Trip**
- **Overtemperature Trip** when temperature exceeds 85°C
- **Instantaneous Pick-up** adjustable from 2x to 10x I_n and M1
- **Neutral Protection**
- **Test Port** with cover to receive Hand Held Tester

① **Note:****The Digitrip 220+ is coming soon.**

The Digitrip 220+ will replace the Digitrip 220 Trip Unit some time in late 2003. The Digitrip 220+ Trip Unit will have the following features when it is phased into production:

- **The Long Delay Pick-up Setting will be changed to** adjustable from 0.4 to 1.0 I_r
- **The Long Delay Time Setting will be changed to adjustable** from 2 to 24 seconds at $6 \times I_r$
- **LED (Red) Trip Indicators will be added** for Long Delay and Instantaneous Trip Functions
- **Battery Included to Power Cause of Trip LEDs**
- **Reset/Battery Test Pushbutton**

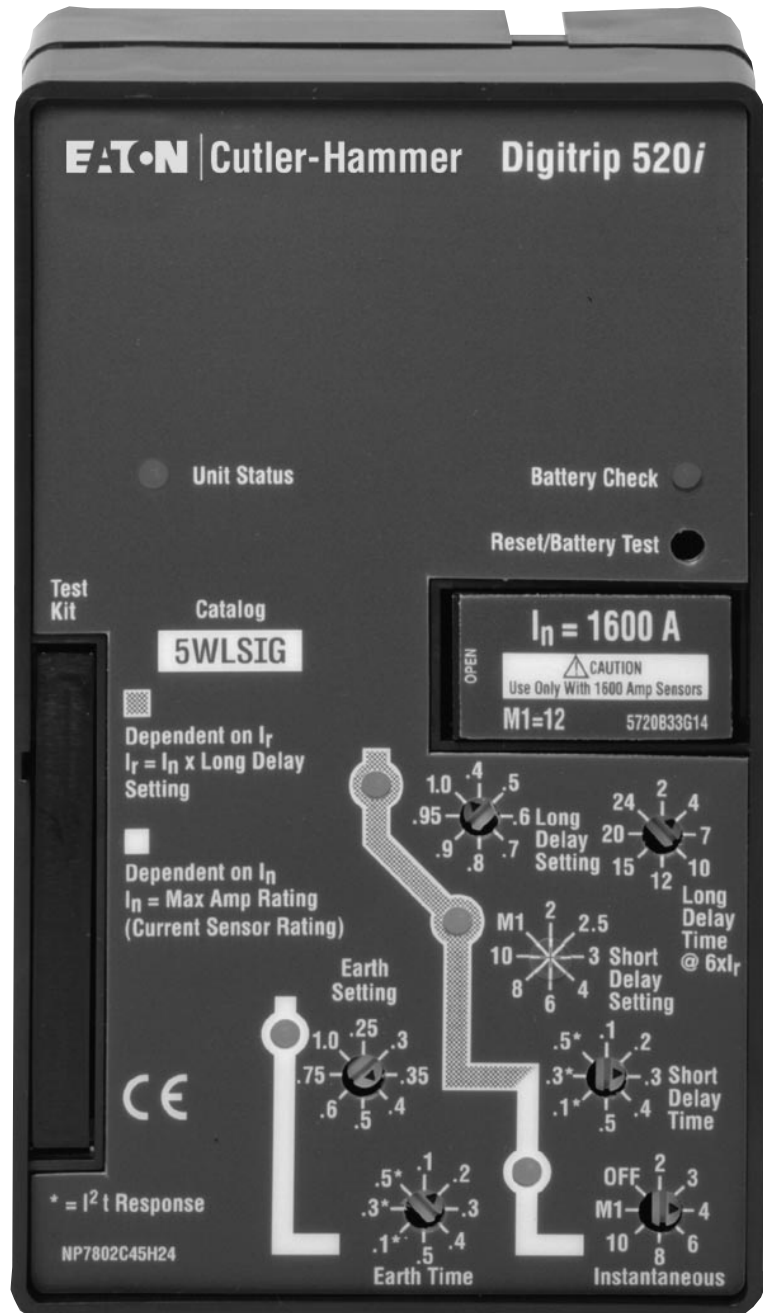
Contact Cutler-Hammer for the future availability of the Digitrip 220+ Trip Unit.



Digitrip 520 and 520i

The **Digitrip 520 Trip Unit** is a versatile trip unit with added features designed to provide increased flexibility in overcurrent protection and coordination. The Model 520 is available on all Magnum Circuit Breakers. Product features include:

- **LSI and LSI^g Protection Options** with adjustable Instantaneous Off Setting
- **Unit Status LED (Green)**
- **Microprocessor-Based True RMS Sensing**
- **Long Delay Pick-up Setting** adjustable from 0.4 to 1.0 I_r
- **Long Delay Time Setting** adjustable from 2 to 24 seconds at 6 x I_r
- **Long Time (Thermal) Memory Trip**
- **Overtemperature Trip** when temperature exceeds 85°C
- **Short Delay Pick-up setting** adjustable from 2 to 10 I_r and M1
- **Short Delay Time Setting** adjustable flat response from 0.1 to 0.5 seconds and I^2t Response at 0.1, 0.3 and 0.5 seconds
- **Adjustable Instantaneous Pick-up Settings**, Off, 2x to 10x I_n and M1
- **Earth Pick-up Setting** adjustable from .25 to 1.0 x I_n
- **Neutral Protection (Model LSI Trip Unit)**
- **Earth Time Setting** adjustable flat response from 0.1 to 0.5 seconds and I^2t Response at 0.1, 0.3 and 0.5 seconds
- **Zone Interlocking of Short Time and Earth Fault Time Delay Functions**
- **Test Port with Cover** to receive Hand Held Tester
- **LED (Red) Trip Indicators** for Long Delay, Short Delay, Instantaneous and Ground Fault Trip Functions
- **Battery Included to Power LEDs**
- **Reset/Battery Test Pushbutton**



May 2003

Digitrip 520M and 520Mi

The **Digitrip 520M Trip Unit** includes all the features of the 520 Trip Unit with the following additions:

- **LSI,LSIG and LSIA Protection Options** with adjustable Instantaneous Off Setting
- **4 Digit LCD Display**
- **Step Pushbutton to Scroll through the LCD Display Data:**
 - PH1 Phase 1 (A) Current
 - PH2 Phase 2 (B) Current
 - PH3 Phase 3 (C) Current
 - PH4 Neutral Current
 - PH5 Earth Current
 - HI Highest Phase Current
 - OL Overload Condition
 - HELP Trip Unit Error
 - Magnitude of Trip Current
- **Optional Earth Alarm/Power Supply Module:**
 - Powers the trip unit's 4 Digit LCD Display through the breaker secondary contacts with a customer supplied voltage source:
 - 24-48 Vdc
 - 110 Vac
 - 220 Vac
 - Provides a earth fault alarm contact (when used with LSIA)
 - Provides a earth fault trip contact (when used with LSIG)
 - Provides a High Load Alarm contact (when used with LSI)
 - Alarm Contact rating (with resistive load):
 - 0.5 Amp at 220 Vac
 - 1.0 Amp at 110 Vac
 - 1.0 Amp at 24-48 Vdc
- **High Load Indicator LED (RED) (LSI Trip Units)**

Note: If an Earth Alarm/Power Supply Module is not provided, the 4 Digit LCD Display will power up when the 3 phase currents reach approximately 20% of the sensor rating or 30% of a single phase current.



Digitrip 520MC and 520MCi

The **Digitrip 520MC Trip Unit** includes all the features of the 520M Trip Unit, but also includes ampere-based communications capability. The 520MC Trip Unit has the following additions:

■ **Communications Functions and Data:**

- **Transmit LED (Red)** indicates when trip unit is transmitting INCOM signal
- **Device Settable INCOM Address** from 001 to 999 hexadecimal
- **Bkr Status (Open, Closed, Tripped)**
- **PH1 Phase 1 (A) Current**
- **PH2 Phase 2 (B) Current**
- **PH3 Phase 3 (C) Current**
- **PH4 Neutral Current**
- **PH5 Earth Current**
- **LDPU Long Delay Pick-up**
- **SDT Short Delay Trip**
- **INST Instantaneous Trip**
- **GNDT Earth Fault Trip**
- **PLUG Plug Trip**
- **MCR Making Current Release**
- **OTEMP Over Temperature**
- **HL High Load (LSI only)**

■ **Earth Alarm/Power Supply Module is Supplied as Standard to power trip unit communications functions**

The 520MC is designed for applications where communication capability is specified with maximum economy. The 520MC Trip Unit communicates current-based information, but does not have the voltage, power, harmonic or remote control capability of the Digitrip 1150 Trip Unit. The 520MC is ideally suited for application on feeder breakers and can be used in tandem with mains and tie breakers that are equipped with the full capability of the 1150 Trip Unit.

Note: Digitrip 520MC requires PowerNet Version 3.2 or higher if PowerNet Software is used.

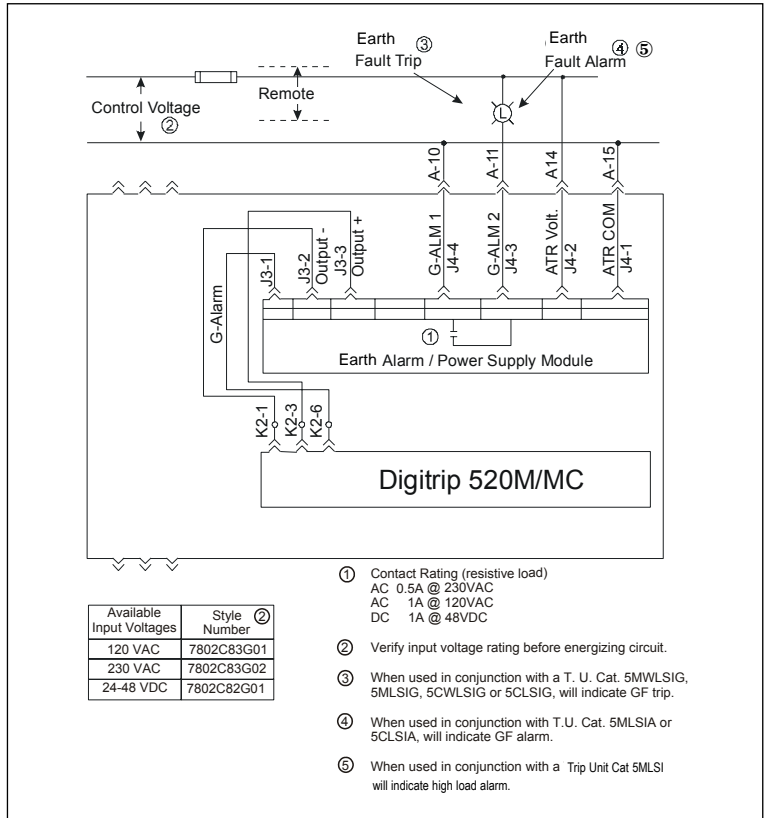


May 2003

Earth Alarm/Power Supply Module for 520M or 520MC Trip Units



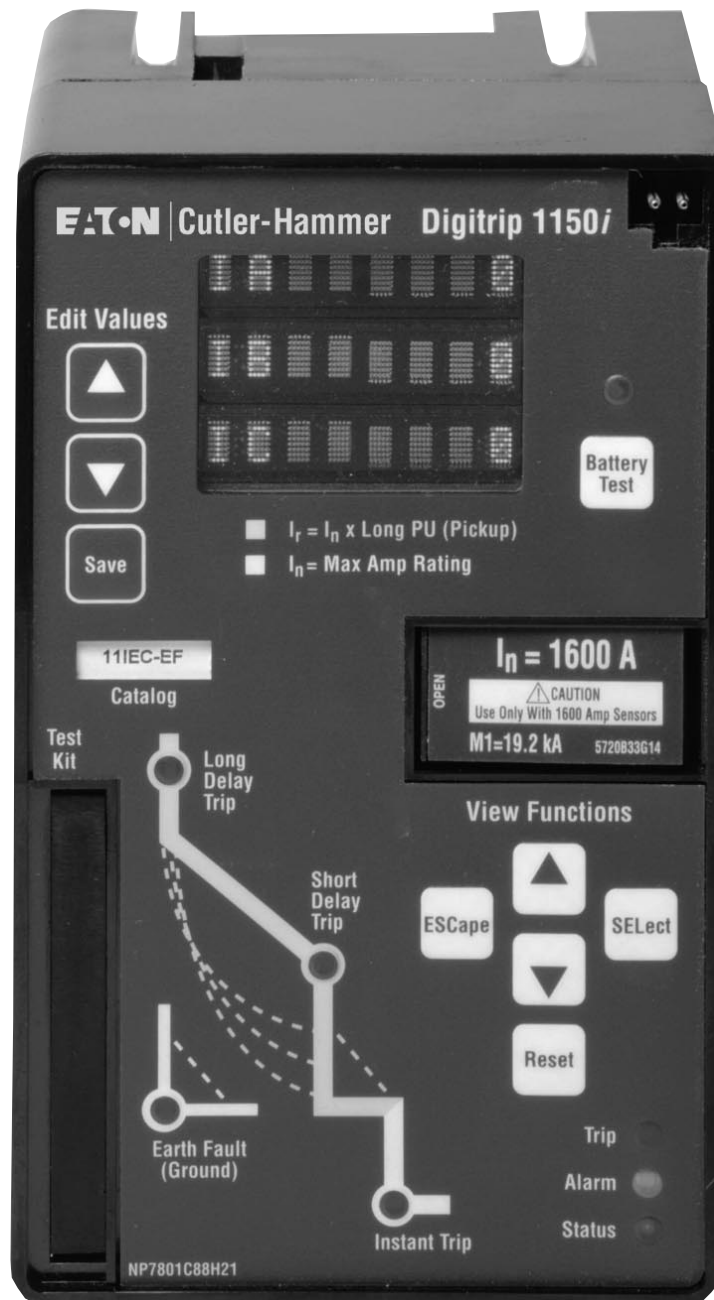
Wiring Diagram for 520M Family Models with Earth Alarm/Power Supply Module



Digitrip 1150+ and 1150i+

The **Digitrip 1150 +** is an **enhanced version of the 1150 trip unit** that provides comprehensive protection, metering, communications, relay and remote control capabilities. For a complete listing of the Digitrip 1150+ Trip Unit capabilities, refer to its Instruction Leaflet. The following is a brief first level summary of the 1150+ product features:

- **LSI,LSIG and LSIA Protection**
- **24 Character Digital LED Display**
- **Unit Status LED (Green) Indicator**
- **Programmable Protective Settings:**
 - **I²T and I⁴T Curves**
 - **IEC A Curve - Normal Inverse**
 - **IEC B Curve - Very Inverse**
 - **IEC C Curve - Extremely Inverse**
 - **Neutral Protection (Model LSI Trip Unit)**
 - **Instantaneous Off Setting**
 - **Earth Fault Trip or Alarm**
 - **Undervoltage and Overvoltage Protection (Trip or Alarm)**
 - **Underfrequency and Overfrequency Protection (Trip or Alarm)**
 - **Reverse Power (Trip)**
 - **Voltage Unbalance Protection (Trip or Alarm)**
 - **Phase Rotation (Alarm)**
- **Long Time (Thermal) Memory Trip**
- **Overtemperature Trip** when the temperature exceeds 85°C
- **View Selection Touch Pads for Local Metering Display:**
 - **Current** (1% Accuracy, Three Phase, Neutral and Earth)
 - **Voltage** L-L (1% Accuracy)
 - **Frequency** (± 0.05 Hz)
 - **Power & Energy** (2% Accuracy)
 - Kilowatts (kW)
 - Kilowatt Hours (kWH)
 - Kilovoltamperes (kVAR)
 - kVA Hours
 - Fixed 15 Minute Demand for kW, kVAR & kVA
 - Sliding 15 Minute Demand for kW or kVA



- **Power Factor** Including Min and Max
- **Power Quality Monitoring, Trip and Alarm:**
 - **Waveform Capture**
 - % Total Harmonic Distortion
 - Kilovoltamperes (kVAR)
- **Programmable Alarm Contacts**
- **Breaker Control** (Remote Open & Close via Communications)
- **Operations Counter**

- **Test Port** with cover to receive Digitrip Hand Held Tester
- **Power Receptacle** for Auxiliary Power Module to power up trip unit when breaker is in the Disconnect or Remove Position
- **Internal Self-Test**
- **Accessory Bus** for additional programmable contacts
- **Battery Included to Power LEDs**
- **Reset/Battery Test Pushbutton**

May 2003

■ Communications Functions and Data:

Communications information and functions are comprehensive.

Refer to the 1150 Trip Unit Instruction Leaflet I.L. 70C1036H03 for complete details and capabilities.

Power Relay Module

The Power Relay Module is provided with the 1150 Trip Unit to perform the following features:

Power Supply to power the trip unit's 24 Character LED display and communications functions. The power relay module requires an external customer supplied voltage source that is wired through the breaker secondary contacts. The source voltage is selected at order entry and includes the following voltage options with $\pm 10\%$ tolerance and 10VA burden.

- 24-48 Vdc
- 120 Vac
- 240 Vac

Programmable Relay Contacts

via the Digitrip 1150 Trip Unit trip and alarm programming menus:

- **Contact A:** Alarming and Tripping Relay for use with the trip unit protective functions.
- **Contact B:** Block close relay prohibits the remote closing of the circuit breaker
- **Contact C:** This latch relay will hold status upon loss of auxiliary power
- **Alarm Contact Ratings (resistive load):**
 - 0.5 Amp at 230 Vac
 - 1.0 Amp at 120 Vac
 - 1.0 Amp at 24-48 Vdc

Power Relay Module for 1150 Trip Unit



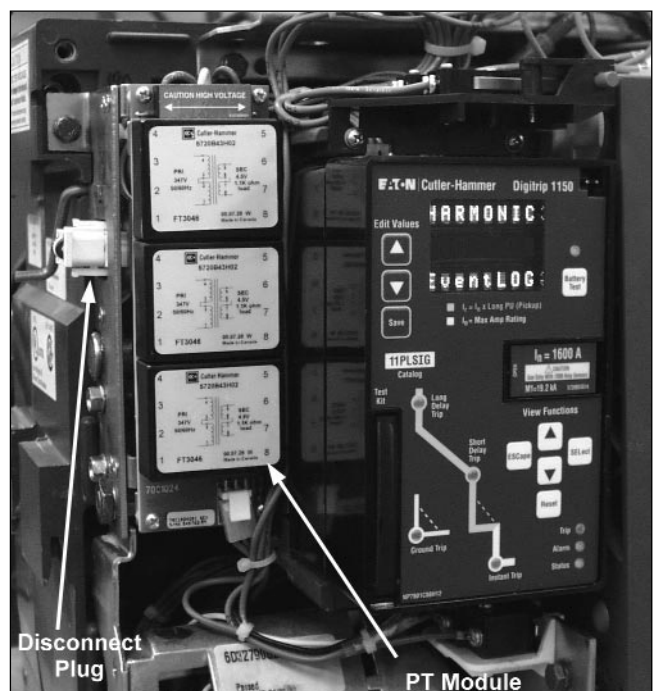
Potential Transformer (PT) Module

The PT module provides system line voltage information to the Digitrip 1150 Trip Unit. It consists of a 3-phase, 3-wire input and 3-wire output step down transformer with a wye to wye hookup. A white disconnecting plug is provided to disconnect the PT Module circuit from the line voltage during dielectric testing.

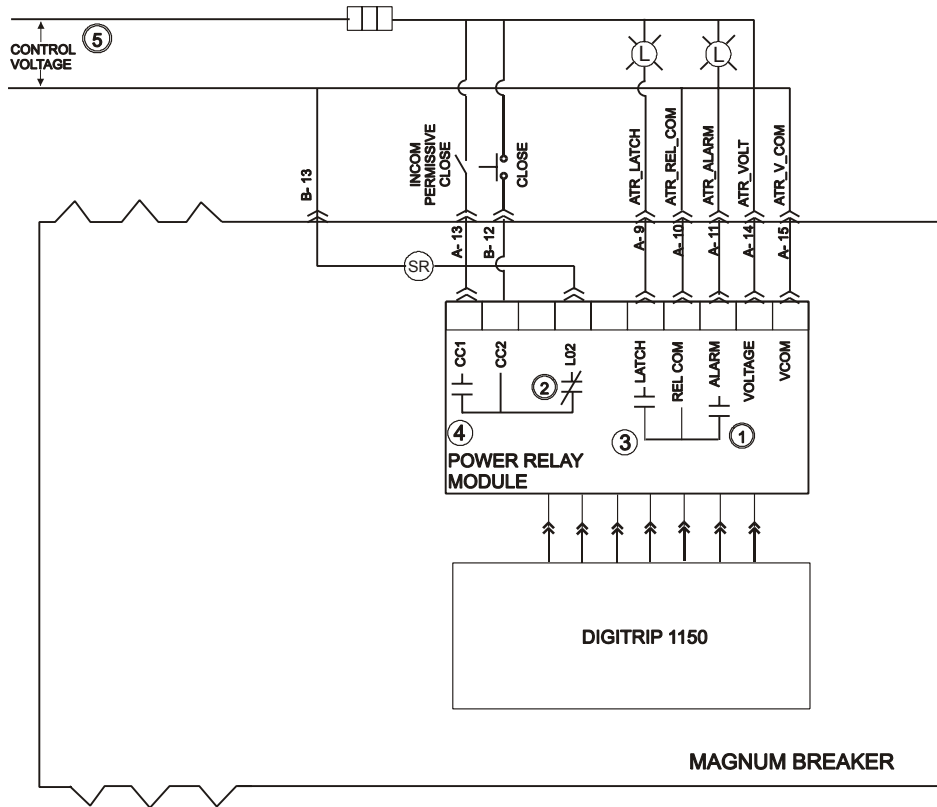
The PT Module primary input voltage connection is selected when the breaker is ordered to accommodate normal or reverse feed application. PT Module line-side or load-side voltage connections are made via hard wire termination to the breaker upper or lower conductors.

The normal convention is that the breaker line side is the upper conductors, with power flowing through the breaker from top to bottom. In reverse feed applications, the bottom conductors are the line side with power flowing through the breaker from bottom to top. In this case the trip unit will indicate REVERSE POWER, but the reading can be made an absolute value by installing a jumper from B3 to B7 on the breaker secondary contacts.

PT Module with Dielectric Disconnect Plug



Power Relay Module Connection to 1150 Trip Unit



Available Input Voltage for Power / Relay Module ^⑤	Style Number
110 VAC +/- 10%	70C1002G01
220 VAC +/- 10%	70C1002G02
24 - 48 VDC +/- 10%	70C1005G01 or 70C1005G02

Notes:

1. This relay contact is programmed via Digitrip 1150 as Relay A.
2. This relay contact is programmed via Digitrip 1150 as Relay B. Block Close will prohibit the remote closing of the circuit breaker.
3. This relay contact is programmed via Digitrip 1150 as Relay C. This relay will hold contact status on loss of Auxiliary Power.
4. Contact rating (resistive load)
 - AC 0.5A @ 230 VAC
 - AC 1A @ 110 VAC
 - DC 1A @ 48 VDC
5. Verify Input voltage rating before energizing circuit.

May 2003

Accessory Bus

The accessory bus feature on the Digitrip 1150 Trip Unit permits the application of additional discrete programmable relay contacts by the use of one or more Digital Relay Modules. The accessory bus is brought out from the trip unit to secondary terminals A17 and A18 for external connections to the Digital Relay Modules via twisted pair communications cable.

Digital Relay Module

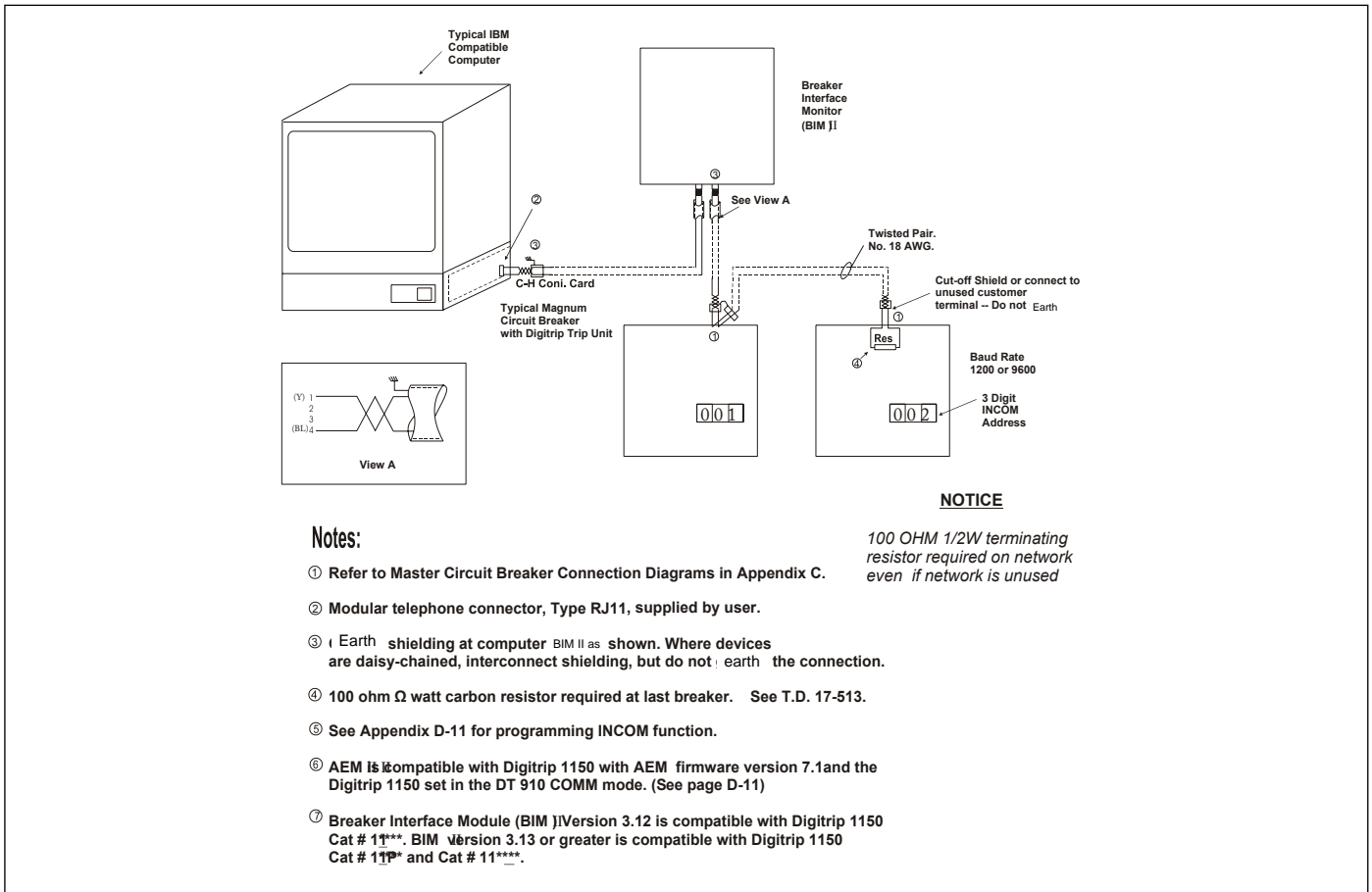
The Digital Relay Module is mounted by DIN Rail, separate from the circuit breaker. Up to 4 Digital Relay Modules (addresses 001 to 004) can be applied per circuit breaker. Each Digital Relay Module has relays with form C contacts rated at 10 amps maximum at 250 Vdc. A control voltage source of 120 Vac ±20% or 38-125 Vdc is required to power each unit.

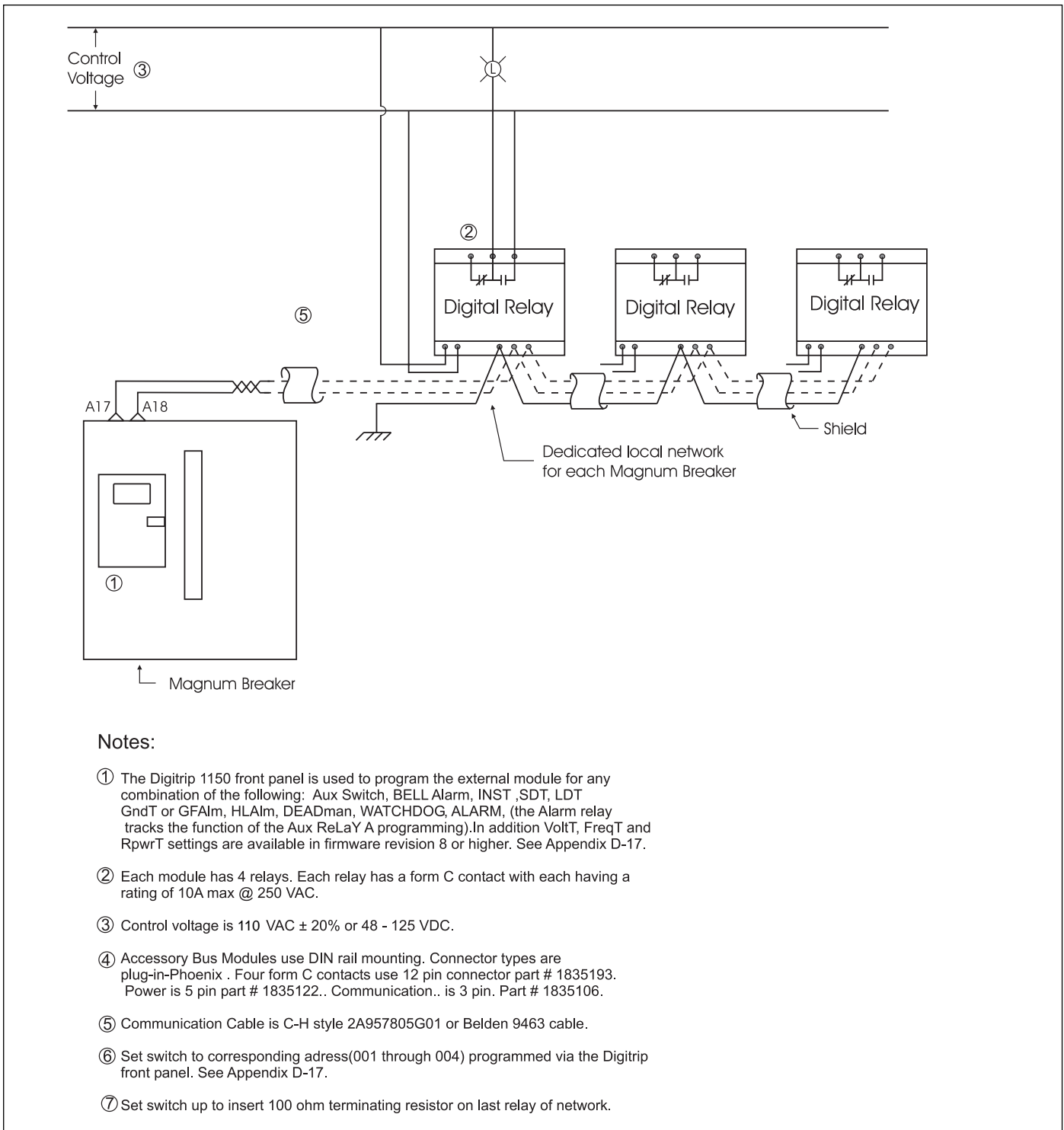
Programming

The Digitrip 1150 Trip Unit can be programmed to drive the Digital Relay Module relay contacts for any combination of the following:

- Auxiliary Switch
- Bell Alarm
- Long Delay Trip
- Short Delay Trip
- Instantaneous Trip
- Earth Fault Trip
- Earth Fault Alarm
- High Load Alarm
- Deadman
- Watchdog

INCOM Network with Remote Master Computer BIM II



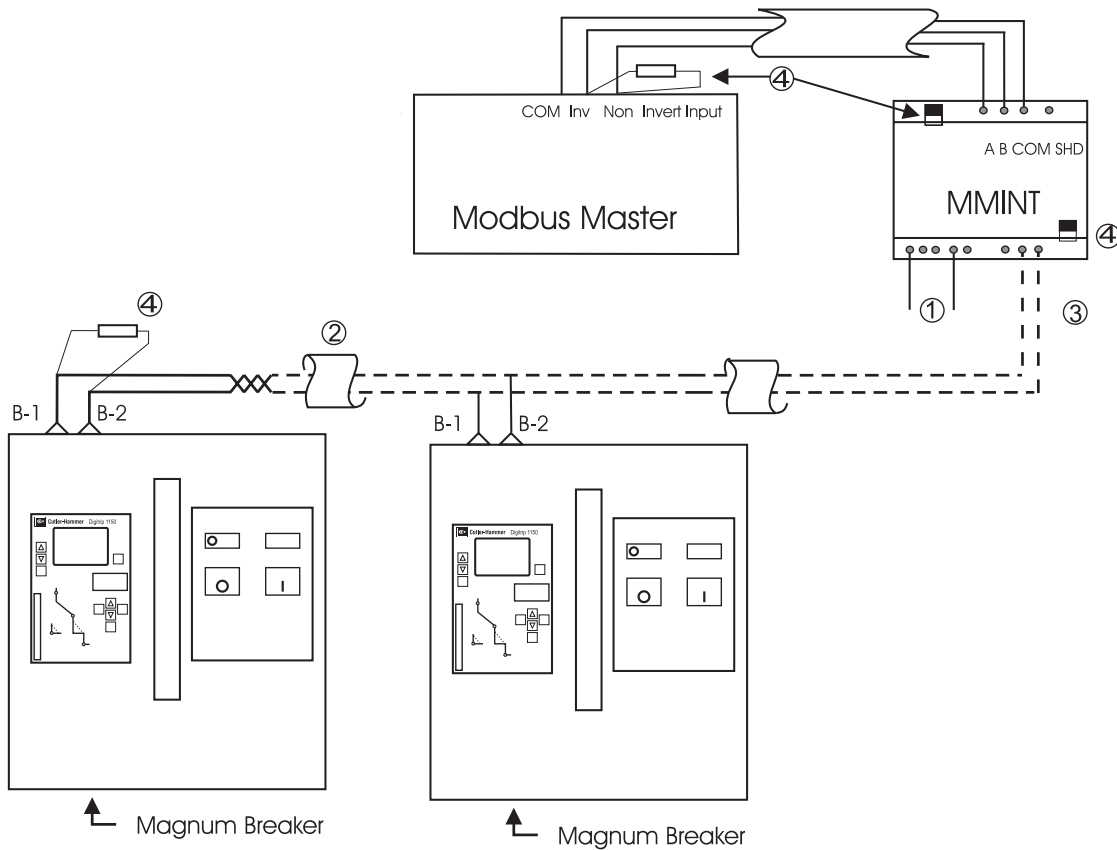
Digital Relay Accessory Module

MODBUS TRANSLATOR Wiring

The Digitrip 1150 in a Magnum Breaker can communicate its data using Modbus RTU protocol by employing a mMINT device to act as a translator from INCOM communication to MODBUS communications. A Modbus master device is shown wired to gather data and can provide control logic to open and close breakers.

The mMINT module CAT # MMINT use DIN rail mounting. Connector types are plug-in-Phoenix. Power is 5 pin. INCOM network uses a 3 pin. The RS-485 MODBUS uses a 4 pin connector which consist of signals A, B, COMmon and SHIELD.

Three Baud rates of 1200, 9600 or 19200 are selectable via programming switch for the MODBUS network. The INCOM Baud rate is fixed at 9600 Baud.



Notes:

- ① Control voltage is 110 VAC ± 20% or 48 - 125VDC.
- ② Communication Cable is C-H style 2A957805G01 or Belden 9463 cable.
- ③ The overall network will support up to 32 devices with any addresses from 1 to 247
- ④ Terminating resistor is 121 ohm 1 watt. Use the mMINT switches to insert these terminators at the mMINT device.

Trip Unit Summary Table

TRIP UNIT TYPE		DIGITRIP 220 ^②	DIGITRIP 520i	DIGITRIP 520Mi	DIGITRIP 520Mci	DIGITRIP 1150i ^③
Ampere Range		200A-3200A	200A-6300A	200A-6300A	200A-6300A	200A-6300A
Interrupting Rating at 690V		40 through 100kA	40 through 100kA	40 through 100kA	40 through 100kA	40 through 100kA
rms Sensing		Yes	Yes	Yes	Yes	Yes
PROTECTION AND COORDINATION						
Protection	Ordering Options	LI	LSI, LSIG	LSI, LSIG, LSIA	LSI, LSIG, LSIA	LSI, LSIG, LSIA
	Fixed Rate Plug (I_N)	Yes	Yes	Yes	Yes	Yes
	Overtemperature Trip	Yes	Yes	Yes	Yes	Yes
Long Delay	Long Delay Pickup	1.0 x (I_N) Fixed ^②	0.4-1.0 x (I_N)	0.4-1.0 x (I_N)	0.4-1.0 x (I_N)	0.4-1.0 x (I_N)
	Long Delay Time I^2t at 6 x I_r	10 seconds ^②	2-24 Seconds	2-24 Seconds	2-24 Seconds	2-24 Seconds
Protection (L)	Long Delay Time I^4t	No	No	No	No	1-5 Seconds
	Long Delay Thermal Memory	Yes	Yes	Yes	Yes	Yes
	High Load Alarm	No	No	No	No	0.5 - 1.0 x (I_N)
Short Delay	Short Delay Pickup	No	200-1000% x (I_N) and M1	200-1000% x (I_N) and M1	200-1000% x (I_N) and M1	200-1000% x (I_N) and M1
	Short Delay Time I^2t at 8 x I_r	No	100-500 ms	100-500 ms	100-500 ms	100-500 ms
Protection (S)	Short Delay Time Flat	No	100-500 ms	100-500 ms	100-500 ms	100-500 ms
	Short Delay Time ZSI	No	Yes	Yes	Yes	Yes
Instantaneous Protection (I)	Instantaneous Pickup	200-1000% x (I_N)	200-1000% x (I_N) and M1	200-1000% x (I_N) and M1	200-1000% x (I_N) and M1	200-1000% x (I_N) and M1
	Making Current Release	Yes	Yes	Yes	Yes	Yes
	Off Position	No	Yes	Yes	Yes	Yes
Earth Fault Protection (G)	Earth Fault Alarm	No	No	Yes	Yes	Yes
	Earth Fault Pickup	No	25-100% x (I_N)	25-100% x (I_N)	25-100% x (I_N)	24-100% x (I_N)
	Earth Fault Delay I^2t at .625 x I_N	No	100-500 ms	100-500 ms	100-500 ms	100-500 ms
	Earth Fault Delay Flat	No	100-500 ms	100-500 ms	100-500 ms	100-500 ms
	Earth Fault ZSI	No	Yes	Yes	Yes	Yes
Earth Fault Thermal Memory		No	Yes	Yes	Yes	Yes
Neutral Protection (N)		Yes	Model LSI Only	Model LSI Only	Model LSI Only	Model LSI Only
SYSTEM DIAGNOSTICS						
Cause of Trip LEDs		No ^②	Yes	Yes	Yes	Yes
Magnitude of Trip Information		No	No	No	Yes	Yes
Remote Signal Contacts		No	No	Yes	Yes	Yes
Programmable Contacts		No	No	No	No	Yes
SYSTEM MONITORING						
Digital Display		No	No	4 Char. LCD	4 Char. LCD	24 Char. LED
Current (%) Full Scale Sensor		No	No	Yes	Yes	Yes +/- 1%
Voltage (%) L to L		No	No	No	No	Yes
Power and Energy (%)		No	No	No	No	Yes
Apparent Power kVA and Demand		No	No	No	No	Yes
Reactive Power kVAR		No	No	No	No	Yes
Power Factor		No	No	No	No	Yes
Crest Factor		No	No	No	No	Yes
Power Quality - Harmonics		No	No	No	No	Yes
% THD		No	No	No	No	Yes
SYSTEM COMMUNICATIONS						
Type		No	No	No	INCOM/PowerNet	INCOM/PowerNet/Trip Link
Power Supply		N/A	N/A	PRM in Breaker	PRM in Breaker	PRM in Breaker
ADDITIONAL FEATURES						
Trip Log (3 Events)		No	No	No	No	Yes
Electronic Operations Counter		No	No	No	No	Yes
Testing Method ^①		Test Set	Test Set	Test Set	Test Set	Integral and Test Set
Waveform Capture		No	No	No	No	Yes

I_N = Rating Plug and Sensor Rating

I_r = Long Delay Pickup Setting

① Test set for secondary injection

② Model 220⁺ will be available in the second half of 2003. Long Delay Pickup will be adjustable 0.4-1.0 x (I_N), Long Delay time will be adjustable 2-24 seconds. Cause of Trip Indicators with Battery Back-up will be added. Contact Cutler-Hammer for availability.

③ Model 1150i⁺ will be available in the second half of 2003. Over and Undervoltage Alarm or Trip, Over and Underfrequency Alarm or Trip, Voltage Unbalance Alarm or Trip, Reverse Power Trip, and Phase Rotation Alarm will be added. Contact Cutler-Hammer for availability.

Current Sensor

Toroidally wound current sensors are installed at the rear of the circuit breaker on the lower horizontal terminals. They are available in ampere ratings of 200 through 6300 amperes, and must match the current rating of the installed rating plug.

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 open (trip) the circuit breaker.

The current rating of the installed sensors can be easily viewed from the rear of the circuit breaker through small viewing windows. The viewing windows are part of the sensor cover plate which is removed to change the sensors.

Neutral current sensors are 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 on the circuit breaker.

Rating Plugs and Matching Sensors

Ratings (Amperes)		
200	800	2500
250	1000	3000
300	1200	3200
400	1250	4000
600	1600	5000
630	2000	6300

Note: Refer to Tables 3.4, 3.5 and 3.6 in the section entitled *Circuit Breaker Catalog Number* for the availability of sensor and rating plug ratings for specific circuit breaker frame sizes.

Neutral Sensor (unmounted)



Mechanical Trip Flag Pop-Out Indicator

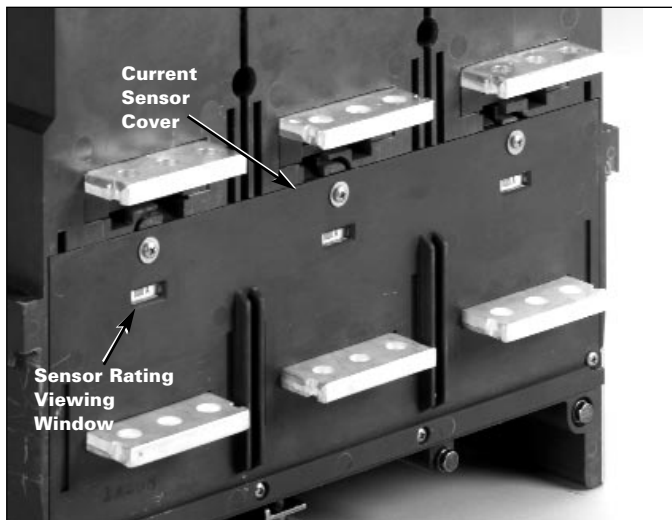
The mechanical trip flag pop-out indicator is an overcurrent indication feature that can be supplied as an option on Magnum Circuit Breakers with integral trip units. This device is located just above the trip unit on the breaker's front faceplate. In the event the trip unit trips the breaker on an overcurrent condition, the red trip flag releases and pops out to give local visual indication. This trip indication is in addition to any LED trip indication provided by the trip unit.

The red flag can be reset by manually pushing it back in. The circuit breaker can be re-closed, even if the flag is not reset. An optional Overcurrent Trip Switch (OTS) is available in the event that an electrical lock-out is required on an overcurrent trip condition.

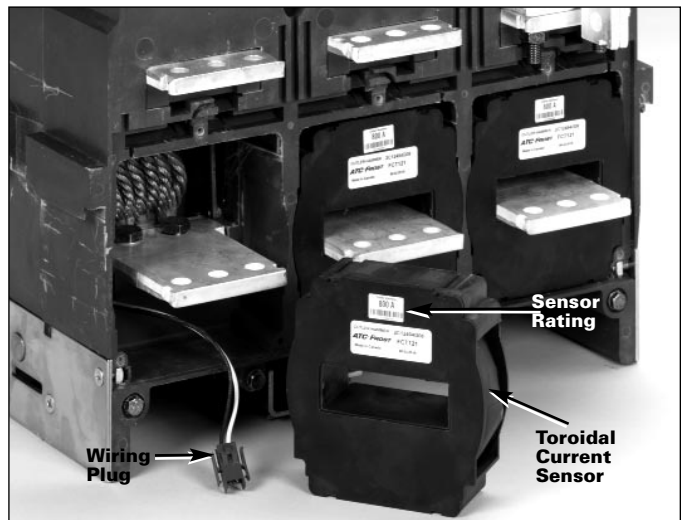
Making Current Release

The Making Current Release (MCR) is a standard safety feature provided on all Magnum Circuit Breakers that are equipped with integral trip units. The MCR provides an instantaneous trip when closing on a fault current which exceeds a specified magnitude. The MCR is non-adjustable and preset

Current Sensor Cover in Place Over Sensors



Current Sensor Cover and One Sensor Removed



to trip the breaker when the peak instantaneous current exceeds $25 \times I_n$ (I_n is established by the breaker's current sensors and rating plug).

The MCR is enabled for only the first two cycles following the circuit breaker closing operation. When the MCR trips the breaker, the red trip flag of the mechanical indicator will pop out and the red Instantaneous LED of the trip unit will flash if the breaker is so equipped.

Bell Alarm/Overcurrent Trip Switch (OTS)

The Bell Alarm/Overcurrent Trip Switch (OTS) is an overcurrent indication feature that can be supplied as an option on Magnum Circuit Breakers with integral trip units. The OTS is physically mounted on the Mechanical Trip Flag Pop-out Indicator. The OTS Switch includes 2 Form C contacts that are wired to the breaker secondary terminals as shown in the Magnum breaker connection diagram. These contacts are available for external wiring to provide remote trip indication or for electrical lock-out of a circuit breaker as required.

In the event the trip unit trips the breaker on an overcurrent condition, the red flag of the Mechanical Trip Flag Pop-out Indicator releases and pops out and the OTS contacts change state. The OTS Switch can be reset by manually pushing in the red trip flag. When the trip flag is reset, the OTS Switch contacts return to their normal state.

High Instantaneous Trip

Magnum Circuit Breakers that are rated 100kA and manufactured in the Standard Frame with 800 to 3200 ampere continuous current ratings (MWIC08 to MWIC32) are equipped with a high instantaneous trip. This instantaneous trip system consists of small air core sensors (one per phase) which produce a signal and transmit it back to the trip unit. When the fault current approaches the 85kA withstand rating of the circuit breaker,

Digitrip RMS 1150 Programmable Trip Unit Installed



the trip unit trips the breaker instantaneously. This allows the breaker to be applied on a power distribution system with a 100kA available fault current while maintaining selectivity up to 85kA.

Long Time Memory (LTM)

Long Time Memory (Thermal Memory) is a standard feature on Magnum Circuit Breakers supplied with integral trip units. The thermal memory function provides overtemperature protection on load circuits against the effects of repeated overload conditions. If a breaker is closed soon after an overload trip and the current again exceeds the Long Delay Setting, the LTM reduces the time to trip to allow for the fact that the load circuit temperature is higher than normal due to the previous overload condition. If the breaker continues

to be closed into repeated overload conditions, the breaker will trip in successively shorter times to allow for the cooling of the load circuit. When the overload condition returns to normal, the LTM function begins to slowly reset and will fully reset back to the normal Long Delay Time setting after about 10 minutes, provided that another overload is not experienced.

In some applications, for example fire pump, electric welders or during primary injection current testing, it may be desirable to defeat the LTM. This can be accomplished at the trip unit by moving a jumper located inside the cavity behind the test port cover located at the front of the trip unit to the Inactive position. The LTM can be reactivated by returning the jumper to the Active position.

May 2003

Over-Temperature Trip

Magnum Circuit Breakers equipped with integral trip units have an over-temperature trip function provided as a standard feature. The over-temperature trip is designed to trip the breaker when the internal temperature of the trip unit exceeds 85°C. This is the approximate manufacturer's published maximum temperature rating for the trip unit electronic components. An 85°C temperature inside the trip unit indicates that there are much higher temperatures and potentially significant heating problems elsewhere on the circuit breaker.

When the over-temperature function trips the breaker, the red trip flag of the mechanical indicator will pop-out and the red Long Time Delay LED of the trip unit will flash if the breaker is so equipped.

Ground Fault Provisions and Protective Schemes

As a standard feature, **Magnum** Circuit Breakers are internally wired with provisions for ground fault protection. However, ground fault protection is provided only if the breaker is equipped with a trip unit with optional LSI protection.

Ground fault protection can be easily added to breakers not originally equipped with a ground fault trip unit. For example, an LSI trip unit can simply be changed out with a like model trip unit that has LSI protection. Modifications to the circuit breaker internal wiring are generally not required as long as the trip unit changeout is with a like model trip unit.

To provide for maximum application flexibility, breaker ground fault provisions are wired out to the breaker secondary terminals for external use. The secondary terminals can be easily configured to accommodate the most common ground fault schemes, including:

NOTE: For detailed wiring diagrams that describe all ground fault sensing options and wiring connections, refer to the Trip Unit Instruction Leaflet.

Residual Sensing

Residual sensing is the standard or default wiring configurations provided. It is also the most common mode of ground fault sensing used in 3-pole and 4-pole breaker applications. One current sensor per pole on each phase conductor is provided internal to the circuit breaker. When 3-pole breakers are applied on 3 phase, 4 wire systems, an external sensor matched to the breaker sensor ratio is mounted on the Switchgear neutral bus and wired to the breaker secondary contacts to connect all sensors in the residual circuit.

Source Ground Sensing

Source ground sensing is commonly found on 3 pole breakers applied as a main breaker on single-ended radial or on double-ended systems where a mid-point grounding electrode is employed.

To configure a breaker for source ground sensing, a shorting jumper is applied to breaker secondary contacts B6 and B7 to defeat the residual sensing mode. An external current sensor is mounted directly on the bonding conductor to ground to measure the ground current flowing in the grounding electrode conductor and all other grounding conductors. The sensor is then wired to the breaker secondary contacts B4 and B5.

NOTE: The secondary current rating of the sensors must be 1 ampere.

Zero Sequence Sensing

Zero sequence sensing is applied on main and feeder breakers, and other breakers employed in zone interlocking ground protection schemes.

To configure a breaker for zero sequence sensing, a shorting jumper is applied to breaker secondary contacts B6 and B7 to defeat the residual sensing mode. Zero sequence sensors with 1000:1 and 100:1 ratios are available for mounting in the switchgear cable compartment. The sensor internal window dimensions are 114 x 342 mm (4.5 x 13.5 inches) for accommodating power cables. The zero sequence sensors are wired to breaker secondary contacts B4 and B5.

Multiple Source/Multiple Ground

Multiple Source/Multiple Ground sensing schemes are also possible on systems with multiple sensors.

Zone Interlocking

Zone Selective Interlocking is a standard feature provided on

Magnum Circuit Breakers that are supplied with Digitrip 520i or higher trip units. The trip unit Short Time and Ground Fault Time Delay Zone Interlock function is wired out to breaker secondary terminals B8 and B9 for customer use.

The zone interlock function provides for hard-wired selective circuit breaker coordination in the power distribution system. When employed, breaker secondary terminals B8 and B9 are connected to establish zones of downstream and upstream breakers using 3 wires: Zin, Zout, and a common wire to establish the zone.

NOTE: For detailed wiring diagrams that describe zone selective interlocking schemes and wiring connections, refer to the trip unit instruction leaflet.

In the event that a fault current on the system exceeds the trip unit Short Time or Ground Fault pick-up settings or the Short Delay Setting 2xI_r is exceeded, the breaker nearest to the fault trips instantaneously. At the same time the trip unit sends a logic signal to the connected upstream trip unit to restrain it from tripping immediately and follow its protective delay settings. Coordination is maintained, the breaker closest to the fault trips first and power is only selectively disrupted.

NOTE: If zone interlocking is not employed, it may be defeated by installing a shorting jumper across breaker secondary terminals B8 and B9.

Installing a jumper in this manner defeats the zone interlock function and tells the trip unit to follow its set Short Time and Ground Fault Time protective delays. If breaker secondary terminals B8 and B9 are left as open circuit, the trip unit Short Time and Ground Fault Time Delay functions will trip instantaneously if the system fault current exceeds the pick up setting.

Fixed Mounted Circuit Breakers

Magnum fixed mounted circuit breakers are commonly applied in specialty power distribution enclosures and switchboards manufactured by Low Voltage Power Assemblers.

The fixed circuit breaker construction is simple and economic because there are no drawout system components. The breaker bolts directly to the enclosure main bus, which allows for efficient current transfer under loaded conditions. This improves thermal management and provides for the design of compact enclosures with shallow depth.

Full visual and physical access to the circuit breaker trip unit, controls, and indicators is available through the compartment front panel. A door frame and escutcheon kit is available as an option to provide a finished trim to the front panel cutout. Extensive accessorization capability of the breaker is retained, including trip units, internal accessories, lock-off devices, and mechanical interlocks.

Primary Terminations

Horizontal pre-drilled terminal pads are provided as a standard feature for use in terminating the breaker to the enclosure bus. Optional vertical adapters can be factory installed or are available as field option kits to provide the capability to terminate the enclosure bus in the vertical plane. Field option kits are also available for front connected applications.

Secondary Connections

Two black 30-pin AMP connector blocks are located at the top front of the breaker to receive up to 60 points of external secondary wiring. A secondary connection terminal kit is included with each fixed breaker to provide for several wiring options.

The most economic solution is to terminate external wiring directly to the black AMP connector blocks.

Catalog Number MWK40 wire bundle kits with 30 wires 40 inches long can be purchased for this purpose. The wire bundles can also be self-fabricated by the enclosure manufacturer, provided the proper AMP terminal and crimping tool are used.

If the benefit of front accessible dedicated terminal blocks at the top front of the breaker is desired, the terminal block mounting bracket included in the secondary connection terminal kit can be used. Catalog Number MSECBK white terminal block kits can be purchased and assembled to the mounting bracket. Catalog Number MSECWR wire kits can be purchased to connect the white terminal block to the black AMP connector block points.

Mounting Feet

Metal mounting feet are provided as a standard feature for use in securely bolting the breaker to the enclosure.

Closeup of Fixed Circuit Breaker's Connection Possibilities



Fixed Circuit Breaker (front view)



May 2003

Drawout Circuit Breakers

Magnum drawout circuit breakers are commonly applied in specialty power distribution enclosures, switchgear and switchboards manufactured by Low Voltage Panel Assemblers.

The Magnum drawout circuit breaker construction is a through-the-door design. Full visual and physical access to the trip unit and all breaker controls and indicators is available through the compartment front panel. For maximum safety, circuit breaker levering can be performed with the compartment door closed. When the circuit breaker is in the OPEN position, a padlockable access door can be raised to receive the levering device. No special device is required. Levering can be accomplished with a common 10 mm size square drive and ratchet. When inserted, the levering device holds the levering access door open. As long as the access door is raised open, the breaker is held in the "trip-free" condition. The breaker can be levered to three positions in the cell compartment. Colour coded position indicators are provided on the breaker front panel to provide positive indication of each position:

- Green = DISCONNECT
- Yellow = TEST
- Red = CONNECT.

Secondary Disconnect Contacts

The breaker secondary disconnecting contacts engage or disconnect with the cassette secondary contacts as the breaker is levered into or out of the TEST position.

Primary Disconnecting Contacts

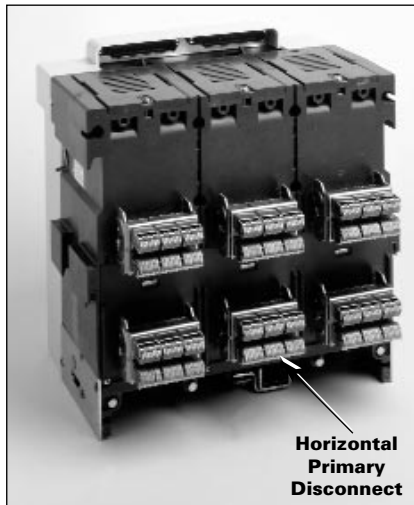
The primary disconnecting contacts (finger clusters) engage or disconnect with the cell compartment bus stabs as the breaker is levered into or out of the CONNECT position.

The primary disconnecting contacts are mounted on the rear of the breaker so that they can be easily inspected or replaced. All breaker frames have horizontal primary disconnects.

Circuit Breaker Being Levered

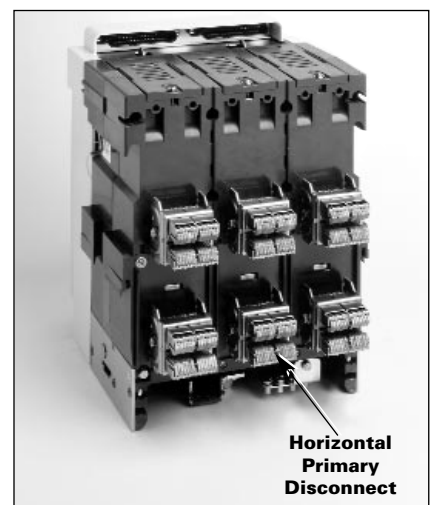


Rear View Standard Frame Breaker



Horizontal Primary Disconnect

Rear View Narrow Frame Breaker



Horizontal Primary Disconnect

Drawout Cassette

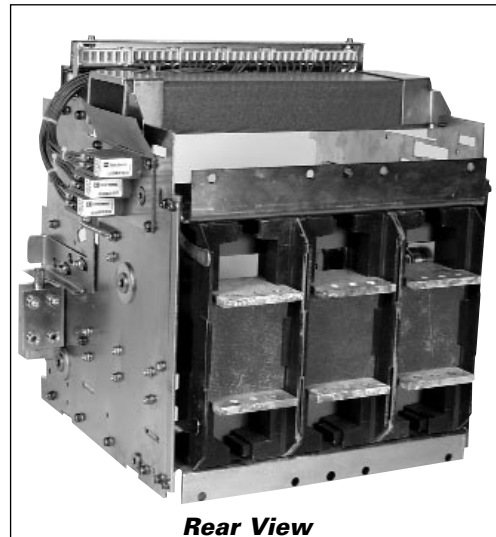
A drawout circuit breaker is used in combination with a fixed drawout cassette. The cassette provides for all the required fixed drawout features as well as fixed primary and secondary connections. Mounting locations for cell (TOC) switches, primary safety shutters and various key interlocks are part of the cassette design.

The cassette has built in horizontal stabs and primary terminals. Optional bolt-on 90 degree adapters are available to rotate the primary terminals on the rear of the cassette to a vertical orientation; these can be used on either the line, load or both primary connection.

It should be noted that short circuit currents create very large electro-magnetic forces on the bus bars which must be adequately supported by the assembly builder. Outline drawings for each cassette give minimum distances from the rear of the cassette wherein adequate bus bar supports must be provided. The design of these supports depends upon the bus bar configuration and short circuit rating and is the responsibility of the assembly builder.

The cassette's drawout extension rails can be padlocked to prevent a circuit breaker from being inserted during maintenance periods. In addition, the cassette includes all required safety interlocks which function with the circuit breaker's interlock system to insure safe operation.

An arc hood is positioned above where the circuit breaker's arc chutes will be allowing for zero clearance mounting when vertically stacked in an assembly. Mounting holes are provided at the rear and in the floor of the cassette for secure mounting in an assembly.

Narrow Frame Breaker and Cassette**Standard Frame Cassette**

May 2003

Phasing on Double-Wide Frame Breakers

Magnum circuit breakers manufactured in the double-wide frame have two available phasing configurations which must be confirmed when the breaker is ordered.

The phasing convention is determined facing the front of the breaker from left to right. For 4-pole applications, the neutral is located on the left and is rated 100% of the breaker continuous current rating. The following phasing configurations are available:

3-Pole AABCC

4-Pole NNAABCC

3-Pole ABCABC

4-Pole NNABCABC

The type of phasing selected depends on how the circuit breaker will be applied in the enclosure and the type of Cutler-Hammer power distribution enclosure that it will be applied in.

AABCC or NNAABCC Phasing

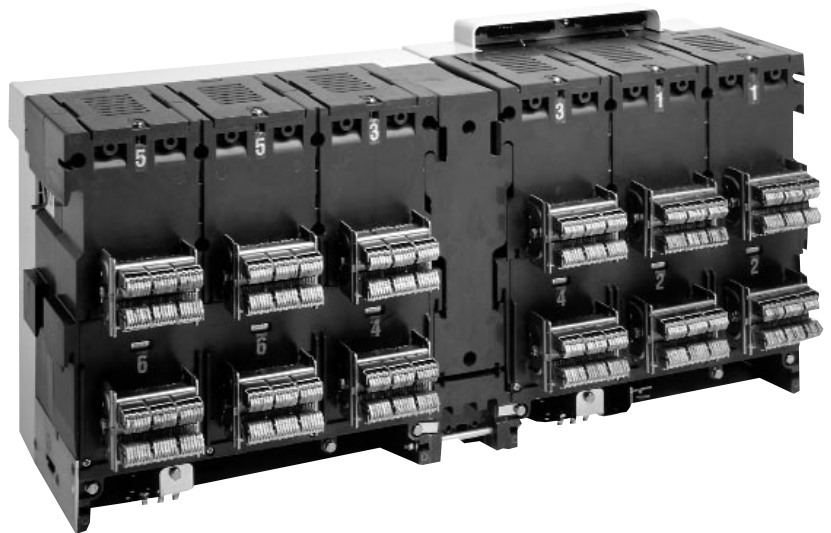
AABCC phasing is the convention commonly used in IEC Switchboards using Magnum Circuit Breakers.

The AABCC convention is recommended for most switchgear assembler manufacturing their own power distribution enclosures. It is ideal for applications where the breaker is mounted single high (one breaker in a structure).

ABCABC or NNAABCABC Phasing

ABCABC phasing is available, but not common in IEC Switchgear Applications. Contact Cutler-Hammer for more information.

Magnum Double-Wide Frame Breaker with AABCC Phasing (front and rear views)



Accessory Devices

A variety of accessory devices are available for use with Magnum 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.

Magnum 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 Magnum 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 1). 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

Shunt Trip (ST) - The ST (Shunt Trip Device, Figures 2 and 3) is an optional accessory device that is mounted internal to the circuit breaker. The ST acts to electrically open the circuit breaker when its trip coil is energized by a rated trip voltage signal (Table 1) that is applied through the breaker secondary contacts, typically by a control switch or other similar device. The ST has a dedicated auxiliary switch with contacts that change state as the breaker opens, cutting off trip voltage signal to the trip coil.

A second shunt trip (with the same or different control voltage) can be mounted in the same space as the Undervoltage Release (UVR). When a second shunt trip is used, one of the auxiliary switch stages must be used to provide the trip coil cut off contact.



Figure 1 Through-the-Window Electrical Accessories

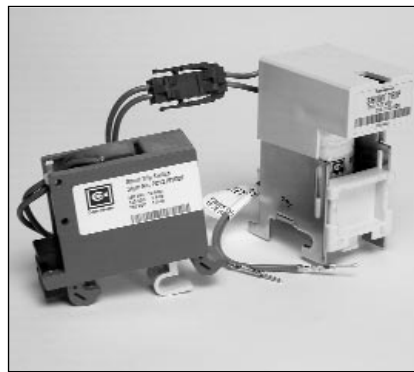


Figure 2 Shunt Trip with Cutoff Switch



Figure 3 Shunt Trip Switch Installed

Table 1 Shunt Trip Ratings

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

① Required for less than 35 ms

Spring Release (SR) - The SR (Spring Release Device, Figure 4) is an optional accessory device that is mounted internal to the circuit breaker. The SR acts to electrically close the circuit breaker when its close coil is energized by a rated close voltage signal (Table 2) applied through the breaker secondary contacts, typically by a control switch or other similar device.

The breaker must be ready to close for the SR to close the circuit breaker. The breaker stored energy springs must be fully charged and the trip latch must be in the reset (not the trip) position. If the close voltage signal is applied before these two conditions are met, the SR will not close the circuit breaker. The close voltage signal must be removed and then reapplied at a time when the breaker is ready to close.

Latch Check Switch (LCS) - The LCS (Latch Check Switch) is an optional accessory switch mounted internal to the circuit breaker that changes state when the breaker is ready to close (the closing springs are fully charged and trip latch is in the reset position). The LCS is very useful in fast transfer and automatic transfer applications when it is important that the breaker responds to close on a single close voltage signal of rated magnitude. The LCS is available in two versions:

- **Latch Check Switch Wired To Spring Release** - The LCS can be wired directly to the Spring Release Device to provide a contact closure when the breaker is ready to close. This delays the voltage signal to the Spring Release until the breaker is ready to close.

- **Latch Check Switch Wired For External Use** - The LCS can also be wired to the breaker secondary contacts. One Form C contact is provided for remote indication that the breaker is ready to close for use in breaker external customer control wiring.

Undervoltage Release - The undervoltage release is an optional device on both manually and electrically operated circuit breakers (Figure 5). 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 3).

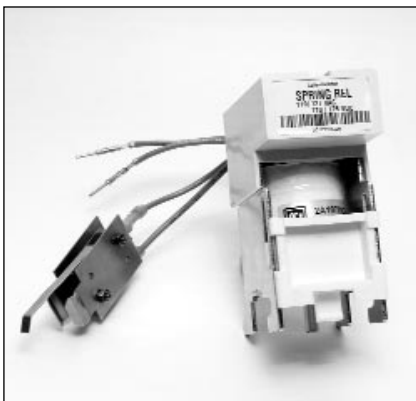


Figure 4 Spring Release with Optional Latch Switch



Figure 5 Undervoltage Release



Figure 7 Shunt Trip, Spring Release and Undervoltage Release Installed

Table 2 Spring Release Ratings

Control Voltages	Operational Voltage Range 70-110%	① Inrush Power Consumption	Closing Time (ms)
24 Vdc	17-26 Vdc	250 W	40
48 Vdc	34-53 Vdc	250 W	40
110-125 Vdc	77-138 Vdc	450 W	40
220-250 Vdc	154-275 Vdc	450 W	40
110-127 Vac	77-140 Vac	450 VA	40
208-240 Vac	146-264 Vac	450 VA	40

① Required for less than 200 ms

Table 3 Undervoltage Release

Control Voltages	Operational Voltage Range 85-110%	Dropout Volts 30-60%	① ② Inrush/Continuous Power Consumption	Opening Time (ms)
24 Vdc ①	20-26 Vdc	7-14 Vdc	250 W/18 W	70
32 Vdc ①	27-35 Vdc	10-19 Vdc	275 W/15 W	70
48 Vdc ①	41-53 Vdc	14-29 Vdc	275 W/18 W	70
110-125 Vdc ①	94-138 Vdc	33-75 Vdc	450 W/10 W	70
220-250 Vdc ①	187-275 Vdc	66-150 Vdc	450 W/10 W	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

Auxiliary Switch - An auxiliary switch is an optional accessory device that is mounted internal to the circuit breaker. Each auxiliary switch stage (Figure 6) has 2a (normally open) and 2b (normally closed) contacts wired to the breaker secondary contacts for customer use in remote indication or external electrical schemes. (See Table 4 for auxiliary switch contact ratings.) The contacts change state as the breaker opens and closes.



Figure 6 Auxiliary Switch (2A/2B)

Table 4 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

A maximum of 3 switch stages of 2a/2b contacts can be mounted in Magnum Standard and Double Frame Circuit Breakers for a total of 6a and 6b available contacts. If more than two switch stages are required on the Narrow Frame Breaker, refer the application to Cutler-Hammer. Due to the 48 point secondary terminal block limitation on the Narrow Frame Breaker, only 2 stages of 2a/2b contacts can be mounted if the full compliment of breaker internal accessories are employed. However, if the breaker is not fully accessorized, the Narrow Frame Breaker can accommodate 3 auxiliary switch stages of 2a/2b contacts.

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 (Figure 8). 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 4).

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 8 Mechanical Trip Indicator with Associated Overcurrent Trip Switch

May 2003

Motor Operator - A Motor operator is an electric motor assembly internally mounted in the circuit breaker (Figures 9 and 10). 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.

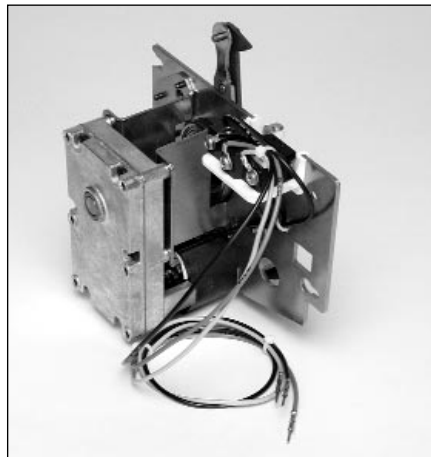


Figure 9 Motor Operator Kit

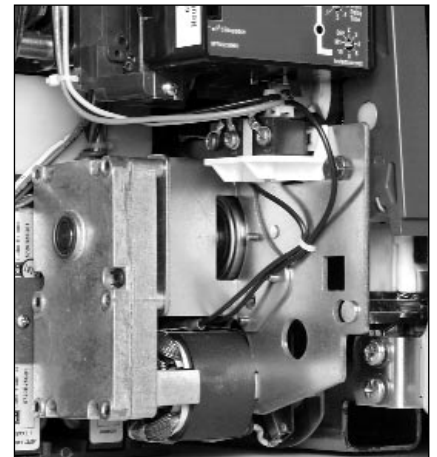


Figure 10 Motor Operator Installed in Narrow Frame Circuit Breaker

Table 5 Motor Operator

Control ① Voltages	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 50/60Hz

Mechanical Accessories

There are six optional mechanical type accessories:

- Operations Counter
- Cassette Safety Shutters
- Cassette Cell Switch
- Door Escutcheon
- Waterproof Cover
- Mechanical Interlock

Operations Counter - The operations counter is a mechanical device used to provide a record of the number of circuit operations. It is mounted in the lower right portion of the circuit breaker and can be viewed through the front cover (Figure 11).

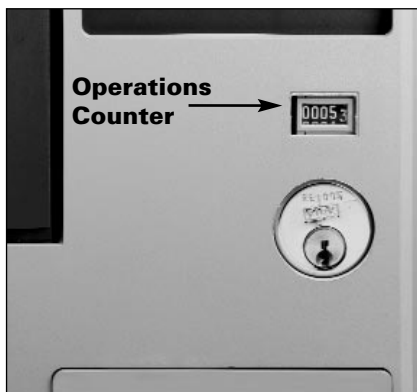


Figure 11 Operations Counter

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 12). When the circuit breaker is levered into the cassette, the shutters automatically open permitting primary connections to be made (Figure 13).

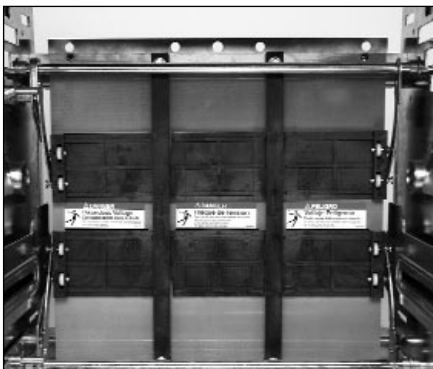


Figure 12 Safety Shutters in Closed Position

Cassette Cell Switch - The cassette cell switch (Figures 14 and 15) is also known as the cell position switch or the TOC (Truck Operated Cell) switch. The cell switch is an optional accessory that is provided in kit form for installation by the panel assembler. Up to 3 cell switch stages, each with 4 Form C contacts can be mounted on the right hand side of the cassette. (See Table 4 for cell switch contact ratings.) One stage can be mounted on each of the DISCONNECT, TEST, or CONNECT mounting locations on the cassette. The switch contacts change state when the breaker is levered into the DISCONNECT, TEST, or CONNECT positions. Wires are provided for each set of Form C contacts for termination to the breaker secondary terminal blocks (white) or other customer supplied terminal blocks in the breaker cell compartment. The contacts are generally used for remote indication or for customer use in external breaker control schemes.



Figure 14 Cell Switch (Drawout Position Indicator) Unmounted



Figure 13 Safety Shutters in Open Position

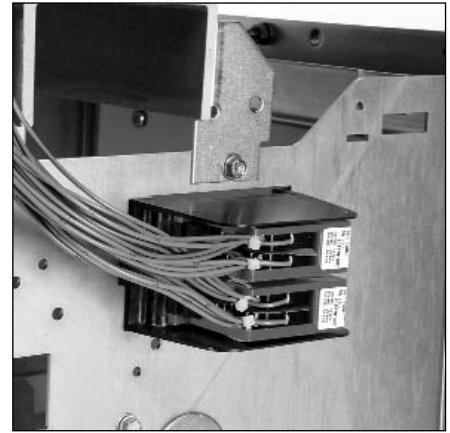


Figure 15 Cell Switches Mounted on Cassette

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 16).

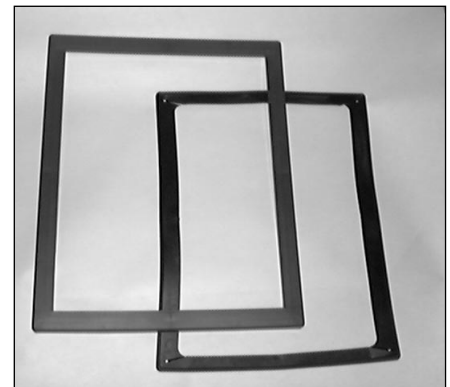


Figure 16 Door Escutcheon and Gasket

IP54 Cover - A hinged dome shaped cover attaches to the metal compartment door to provide waterproof protection for the circuit breaker (Figure 17).



Figure 17 IP54 Cover

May 2003

Mechanical Interlock - A family of mechanical interlocks are available to interlock the closing of two or three Magnum 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 which interfaces with the pole shaft and the tripper bar. The lever assemblies are interconnected with either cables or rods, depending upon the relative orientation of the breakers. Rods can be used only when the circuit breakers to be interlocked are vertically stacked. Cables can be used for any orientation of the breakers. Mechanical interlocks are available for both fixed and drawout circuit breakers and in both 2-way and 3-way versions. An illustration of a 2-way cable interlock mounted on two drawout circuit breakers is shown in Figure 18. In addition, refer to Table 6 for the possible mechanical interlock configurations.

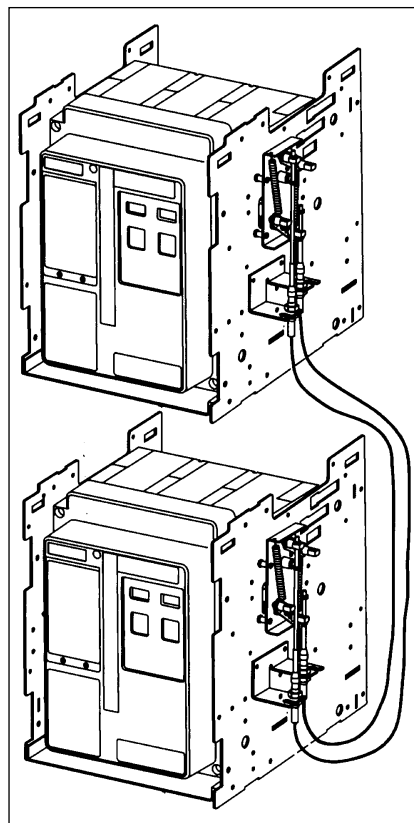


Figure 18 Cassette-Mounted 2-Way Cable Interlock

Table 6 Mechanical Interlock Configurations

Type of Interlock	Number of Breakers Interlocked	Description of Interlocks	Possible Interlock Logic
Type 2	Across 2 Breakers	One Normal Power Supply (A) One Emergency Power Supply (B)	A B 0 0 1 0 0 1
Type 31	Across 3 Breakers	Two Normal Power Supplies (A & C) One Emergency Power Supply (B) Circuit Breakers A and C can be closed if B is open. B can only be closed if A and C are open.	A B C 0 0 0 1 0 0 0 1 0 0 0 1 1 0 1
Type 32	Across 3 Breakers	Two Power Supplies (A & C) One Bus Tie Breaker (B) One or two breakers out of 3 can be closed at the same time.	A B C 0 0 0 1 0 0 0 1 0 0 0 1 1 1 0 0 1 1 1 0 1
Type 33	Across 3 Breakers	Three Power Supplies (A, B & C) Normal or Emergency, only one of which can be closed at a time.	A B C 0 0 0 1 0 0 0 1 0

Breaker Lock OFF Devices

Magnum DS Circuit Breakers are equipped with a variety of lock off devices for both the Circuit Breaker and the Drawout Cassette to maximize safety during equipment operation and maintenance.

Padlockable Levering Device

Access Door - The levering Device access door includes padlock provisions as a standard feature on all drawout circuit breakers. It is designed to receive a padlock up to 8 mm (0.312 inches) in diameter. When the access door is padlocked shut, the breaker levering tool cannot be inserted, preventing the breaker from being levered to another position (Figure 1).

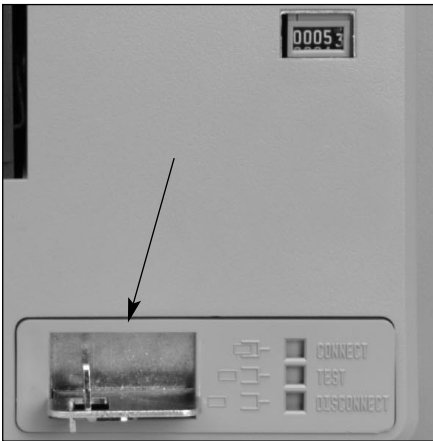


Figure 1 Closeup of Padlockable Levering Device Access Door

Access Door - The padlockable pushbutton cover is an optional factory configured or field option kit accessory that mounts on the breaker faceplate. It is available with either molded plastic or metal frames with clear plastic hinged blocking plates (Figure 2). When they are closed and padlocked, the blocking plates prevent access to the breaker PUSH OFF and PUSH ON mechanical pushbuttons. This device can also be configured with an additional plate to block only the PUSH ON pushbutton. A small hole is pre-drilled in the blocking plates to provide emergency access with a special tool as required per the National Electric Code. The padlockable pushbutton cover will receive a padlock with up to a 8 mm (0.312 inches) diameter.

Breaker OFF Key Lock Provisions

- The breaker OFF key lock is an optional accessory that allows the breaker to be locked in the OFF posi-



Figure 2 ON-OFF Pushbutton Lockable Cover Plate

tion with the key removed, preventing the breaker from being closed. It is primarily intended for use on fixed mounted circuit breakers, but can also be applied on drawout breakers (Figure 3).

When selected as a factory configured option, the breaker includes a pre-drilled hole covered with a plastic cap on the breaker front cover. A lock provisions hardware kit is shipped with the breaker to facilitate installation of a single Kirk, Castell or Ronis cylinder lock. The cylinder lock is generally provided and assembled to the breaker at the point of use by the enclosure manufacturer or customer. For existing breakers, a breaker key lock provisions field option kit is also available. To facilitate installation, a drill point mark is located on the inside of the breaker front cover to identify the drilling location for the key lock installation.



Figure 3 Cover Mounted Key Lock

Cassette Lock Provisions - The cassette lock provisions field option kit is an accessory that mounts on the side of a circuit breaker cassette (Figure 4). The customer must specify if the lock is to be located on the left or right-hand side of the cassette. When installed, the device holds the breaker trip-free when the breaker is levered to the CONNECTED position. This prevents the breaker from being closed and circuit energized.

Single or multiple cylinder Kirk, Castell or Ronis locks can be accommodated. The device can be used with commonly applied breaker interlocking schemes such as Main-Tie-Main configurations, etc.

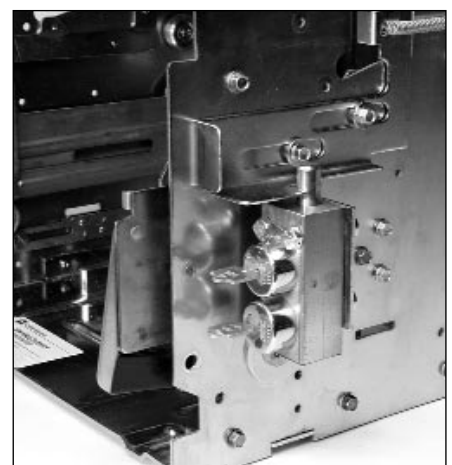


Figure 4 Cassette Mounted Key Lock

May 2003

Cassette Shutter Lock

Provisions - As a standard feature, the narrow frame cassette shutter system includes provisions to padlock the shutter in the CLOSED position when the breaker is withdrawn. The shutter lock provisions will receive a padlock with up to a 0.312 inches (8 mm) diameter.

Ambient Temperature

This table gives derating factors for circuit breakers operating in switchboards at various internal ambient temperatures. The switchboard's internal ambient should be estimated using the calculation methods of IEC 890, 1997 or an equivalent method.

Circuit Breaker Continuous Current at Different Ambients

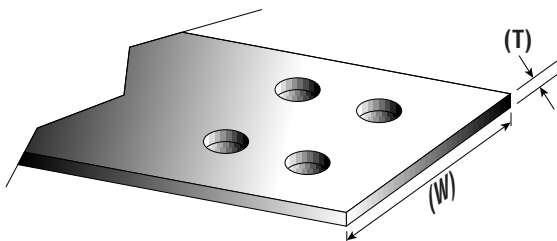
Continuous Current Current By Breaker Type (Amperes)	Ambient Temperature (°C)					
	40	45	50	55	60	70
MWN-408, 608 MWI-508, 608, 808, C08	800	800	800	800	800	800
MWN-410, 610 MWI-510, 610, 810, C10	1000	1000	1000	1000	1000	1000
MWN-412, 612	1250	1250	1250	1200	1100	1000
MWI-512, 612, 812, C12	1250	1250	1250	1250	1250	1250
MWN-516, 616	1600	1600	1600	1600	1500	1350
MWI-616, 816, C16	1600	1600	1600	1600	1600	1600
MWN-520, 620	2000	2000	2000	1900	1800	1650
MWI-620, 820, C20	2000	2000	2000	2000	2000	2000
MWI-625, 825, C25	2500	2500	2500	2500	2500	2500
MWI-632, 832, C32	3200	3150	3100	3000	2800	2550
MWI-64N, 84N, C4N	4000	4000	4000	4000	4000	4000
MWI-850, C5N	5000	5000	5000	5000	5000	5000
MWI-863, C6N	6300	6300	6200	6000	5600	5100

Bus Bar Recommendations

The bus bar sizes shown in the table are those specified in IEC 947-1 and/or used by Cutler-Hammer in their circuit breaker type testing. They are for 3 meter long bus bar with the faces vertical and painted flat black. For other bus bar configurations, larger bus bar sizes may be required or the circuit breaker may have to be derated. Refer to the table in this section entitled "Circuit Breaker Continuous Current Ratings at Different Ambients" for derating information at higher ambient temperatures. Refer to the two graphic examples below.

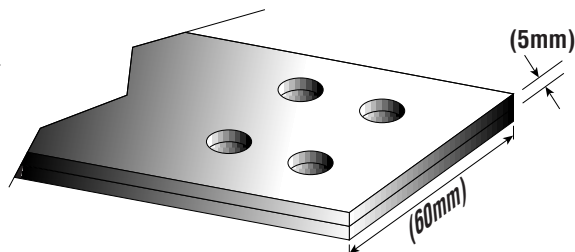
Bus Bar Sizes and Quantities

Maximum Service Current, Amperes (40°C Ambient)	Circuit Breaker Frame (MWN- & MWI-)	Recommended Bus Bar Quantities and Sizes	
		(mm)	(in)
800	08	(2) 5 x 50	(1) .25 x 3.0
1000	10	(2) 5 x 60	(2) .25 x 2.0
1250	12	(2) 5 x 80	(2) .25 x 3.0
1600	16	(2) 5 x 100	(2) .25 x 3.0
2000	20	(3) 5 x 100	(3) .25 x 3.0
2500	25	(4) 5 x 100	(4) .25 x 3.0
3200	32	(3) 10 x 100	(3) .25 x 6
4000	40	(4) 10 x 100	(4) .25 x 6
5000	50	(5) 10 x 100	(5) .25 x 6
6300	63	(6) 10 x 100	(6) .25 x 6



Example 1

T = Thickness of Bus Bar
W = Width of Bus Bar



Example 2

**Illustration of 2 5mm by 60mm Bus
Bars stacked to carry 800 amperes**

May 2003

Altitude Rating Factors

Magnum circuit breakers can be applied at their full voltage and current ratings up to a maximum altitude of 2000 meters above sea level. When installed at higher altitudes, the ratings are subject to correction factors. Short circuit current is not affected as long as the voltage is rated in accordance with the table.

Watts Loss Data

Refer to the table for Magnum resistance and watts loss data to be used in IEC 890 temperature rise calculations.

Altitude Rating Factors

Altitude (Meters)	Voltage Correction	Current Correction
2000	1.000	1.000
2150	0.989	0.998
2300	0.976	0.995
2450	0.963	0.993
2600	0.950	0.990
2750	0.933	0.987
2900	0.917	0.983
3050	0.900	0.980
3200	0.883	0.977
3350	0.867	0.973
3500	0.850	0.970
3650	0.833	0.967
3800	0.817	0.963
3950	0.800	0.960
5000	0.700	0.940

Magnum Resistance and Watts Loss Data

Circuit Breaker Frame	DC Resistance ($\mu\Omega$ /pole)	DC Resistance ($\mu\Omega$ /pole)	AC Watts Loss ^① (Total 3 Poles)	AC Watts Loss ^① (Total 3 Poles)
	Fixed	Drawout	Fixed	Drawout
MWN-408	24	60	60	150
MWN-410	24	60	95	240
MWN-412	24	60	150	370
MWN-508	24	42	60	110
MWN-510	24	42	95	170
MWN-512	24	42	150	260
MWN-516	24	42	240	420
MWN-520	18	36	280	560
MWN-608	18	36	45	90
MWN-610	18	36	70	140
MWN-612	18	36	110	220
MWN-616	18	36	180	360
MWN-620	18	36	280	560
MWI-408	24	60	60	150
MWI-608	15	33	40	85
MWI-808	12	24	35	70
MWI-C08	12	24	30	60
MWI-410	15	33	60	130
MWI-610	15	33	60	130
MWI-810	12	24	50	95
MWI-C10	12	24	50	95
MWI-412	15	33	85	185
MWI-612	15	33	90	200
MWI-812	12	24	70	140
MWI-C12	12	24	70	140
MWI-616	15	33	150	330
MWI-816	12	24	120	240
MWI-C16	12	24	120	240
MWI-620	12	24	190	330
MWI-820	12	24	190	380
MWI-C20	12	24	190	380
MWI-625	8	20	200	500
MWI-825	8	20	200	500
MWI-C25	8	20	200	500
MWI-632	8	20	320	800
MWI-832	8	20	320	800
MWI-C32	8	20	320	800
MWI-640	6	12	380	750
MWI-840	6	12	380	750
MWI-C40	6	12	380	750
MWI-850	4	10	400	1000
MWI-C50	4	10	400	1000
MWI-863	4	10	620	1550
MWI-C63	4	10	620	1550

^① Estimate based on $R_{AC}/R_{DC} = 1.30$, total loss at fully rated current.

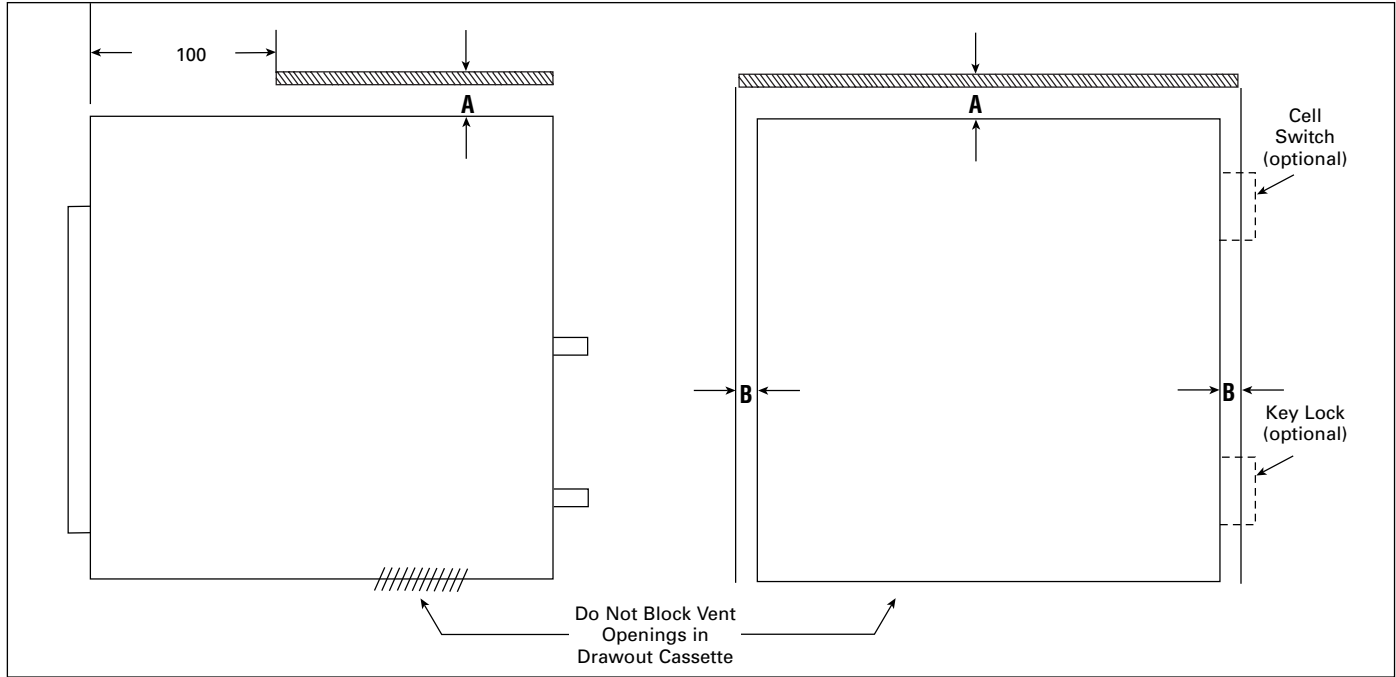
Recommended Electrical Clearances

The following electrical clearance information is provided as guidance when installing drawout or fixed circuit breakers in an enclosure. Refer to the graphic representations and the associated dimensional table.

Electrical Clearance Dimensions (mm)

Breaker Mounting	Enclosure Dimension	To Insulated Surface	To Grounded Metal Surface	With Cell Switch or Key Lock
Drawout	A	0	0	0
	B	25	25	25/75
Fixed	A	150	250	-
	B	30	70	-

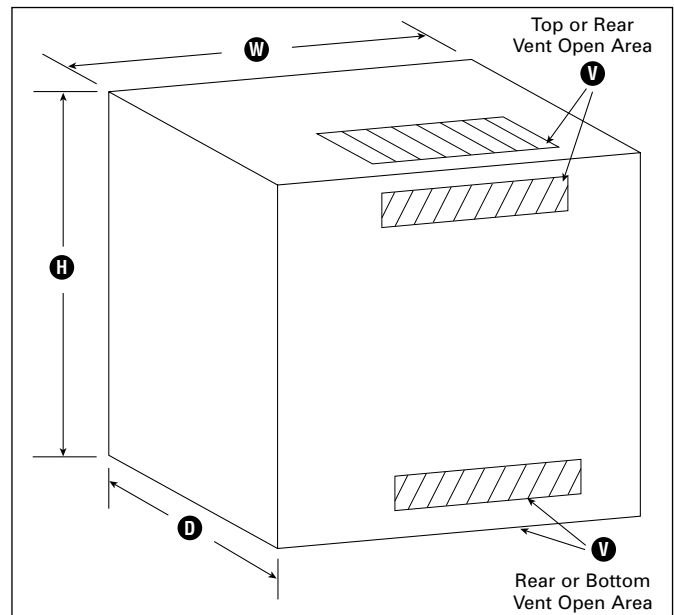
Recommended Enclosure Electrical Clearances



Recommended Enclosure Size and Ventilation

A graphic of a typical enclosure and an associated table of dimensions are provided as guidance for circuit breaker enclosure design with respect to the enclosure size and the required amount of ventilation space.

Minimum Enclosure Size and Ventilation



Recommended Enclosure/Ventilation Dimensions

W Width	Cassette Width + 75 mm
H Height	550 mm
D Depth	450 mm (Front Compartment)
V Ventilation	160 cm ² (800-3200A) 320 cm ² (4000-6300A)

May 2003

Factory Configured Circuit Breakers

Magnum Air Circuit Breakers are ordered using a 25-digit catalog numbering system that allows for maximum options and flexibility. Circuit breaker configuration is achieved by using a simple 2-step process.

Note: If the breaker is drawout construction and a cassette is required, the cassette must be configured separately.

Step 1: Select a 10-Digit Breaker Catalog Number Prefix.

Choose the breaker prefix from Tables 5.1, 5.2, 5.3 or 5.4 based on the following:

- Drawout of Fixed Construction
- Number of Poles
- Continuous Current Rating
- Magnum Frame Type
- Interrupting Rating
- Short Time Withstand
- Phasing (Double-wides only)

Step 2: Select Breaker Catalog Positions 11 through 25 to designate factory installed options as follows:

- **Catalog Positions 11 and 12** establish the sensor and rating plug ratings per Tables 5.5, 5.6 and 5.7.
- **Catalog Positions 13 and 14** establish the trip unit type per Table 5.8.
- **Catalog Position 15** establishes if an optional Shunt Trip is installed per Table 5.9.
- **Catalog Position 16** establishes if an optional Motor Operator is installed per Table 5.10.
- **Catalog Position 17** establishes if an optional Spring Release Device is installed per Table 5.11.
- **Catalog Position 18** establishes if an optional Undervoltage Release or Second Shunt Trip is installed per Table 5.12.
- **Catalog Position 19** establishes if optional Auxiliary Switches are installed per Table 5.13.

■ **Catalog Position 20** establishes if an optional OTS/Bell Alarm Switch and/or a Mechanical Trip Indicator is installed per Table 3.14.

■ **Catalog Position 21** establishes if an optional Padlockable Pushbutton Cover is installed per Table 5.15.

■ **Catalog Position 22** establishes if an optional Key Interlock Provision is installed per Table 5.16.

■ **Catalog Position 23** establishes if an optional Latch Check Switch is installed per Table 5.17 and/or designates the voltage connection if an 1150 Trip Unit is supplied.

■ **Catalog Position 24** establishes if the breaker is shipped alone or in a cassette with options per Table 5.18.

■ **Catalog Position 25** is reserved for Cutler-Hammer use per Table 5.19.



Catalog Number Character Positions																								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
M	W								A	-														X

Character Position	Description	Character Position	Description
3	Circuit Breaker Frame	16	Motor Operator for Charging Closing Spring
4	Interrupting/Withstand Rating	17	Spring Release Device (SRD)
5 & 6	Continuous Amperes and Phasing (Facing Front of Breaker)	18	Undervoltage Release (UVR) or 2nd. Shunt Trip (ST)
7	Poles and Neutral (Facing Front of Breaker)	19	Auxiliary Switch
8	Mounting Configuration and Load Terminals	20	OTS/Bell Alarm Switch and/or Mechanical Indicator
9	Nameplate Language	21	Padlock Provisions for Close & Open Buttons
10	Used by Cutler-Hammer	22	Operations Counter and/or Keylock Provisions
11 & 12	Sensor and Rating Plug Rating	23	Latch Check Switch/Trip Unit Line Voltage Connection for 1150 Trip Unit
13 & 14	Trip Unit and Protection (and External Control Voltage When Required)	24	Shipping Instructions
15	Shunt Trip (ST)	25	Used by Cutler-Hammer

Figure 5-1 Circuit Breaker 25-character Catalog Number Selections

**Table 5.1 Magnum Drawout Mounted Circuit Breakers
(First 10 Character Positions of Catalog Number)**

This selection is for a drawout circuit breaker with primary disconnecting contacts (finger clusters).

Continuous Current Rating Amps at 40°C ①	Magnum ACB Frame Type	Interrupting Rating (kA) at 690V Icu/Ics ②	Icw Withstand Rating (kA) 1-Sec/3-Sec	3-Pole Catalog Number Positions 1-10	3-Pole ③ Phasing (Left to Right)	4-Pole Catalog Number Positions 1-10	4-Pole ③ Phasing (Left to Right)
Narrow Frame Drawout Circuit Breaker ⑤							
800	Narrow	40/40	40/--	MWN4083LEA	ABC	MWN4084LEA	NABC
1000	Narrow	40/40	40/--	MWN4103LEA	ABC	MWN4104LEA	NABC
1250	Narrow	40/40	40/--	MWN4123LEA	ABC	MWN4124LEA	NABC
800	Narrow	50/50	50/--	MWN5083LEA	ABC	MWN5084LEA	NABC
1000	Narrow	50/50	50/--	MWN5103LEA	ABC	MWN5104LEA	NABC
1250	Narrow	50/50	50/--	MWN5123LEA	ABC	MWN5124LEA	NABC
1600	Narrow	50/50	50/--	MWN5163LEA	ABC	MWN5164LEA	NABC
2000	Narrow	50/50	50/30	MWN5203LEA	ABC	MWN5204LEA	NABC
800	Narrow	65/65	65/40	MWN6083LEA	ABC	MWN6084LEA	NABC
1000	Narrow	65/65	65/40	MWN6103LEA	ABC	MWN6104LEA	NABC
1250	Narrow	65/65	65/40	MWN6123LEA	ABC	MWN6124LEA	NABC
1600	Narrow	65/65	65/40	MWN6163LEA	ABC	MWN6164LEA	NABC
2000	Narrow	65/65	65/40	MWN6203LEA	ABC	MWN6204LEA	NABC
Standard Frame Drawout Circuit Breaker ⑤							
800	Standard	65/65	65/--	MWI6083LEA	ABC	MWI6084LEA	NABC
1000	Standard	65/65	65/--	MWI6103LEA	ABC	MWI6104LEA	NABC
1250	Standard	65/65	65/--	MWI6123LEA	ABC	MWI6124LEA	NABC
1600	Standard	65/65	65/--	MWI6163LEA	ABC	MWI6164LEA	NABC
2000	Standard	65/65	65/50	MWI6203LEA	ABC	MWI6204LEA	NABC
2500	Standard	65/65	65/50	MWI6253LEA	ABC	MWI6254LEA	NABC
3200	Standard	65/65	65/50	MWI6323LEA	ABC	MWI6324LEA	NABC
800	Standard	85/85	85/65	MWI8083LEA	ABC	MWI8084LEA	NABC
1000	Standard	85/85	85/65	MWI8103LEA	ABC	MWI8104LEA	NABC
1250	Standard	85/85	85/65	MWI8123LEA	ABC	MWI8124LEA	NABC
1600	Standard	85/85	85/65	MWI8163LEA	ABC	MWI8164LEA	NABC
2000	Standard	85/85	85/65	MWI8203LEA	ABC	MWI8204LEA	NABC
2500	Standard	85/85	85/65	MWI8253LEA	ABC	MWI8254LEA	NABC
3200	Standard	85/85	85/65	MWI8323LEA	ABC	MWI8324LEA	NABC
800	Standard	100/85 ④	85/65	MWIC083LEA	ABC	MWIC084LEA	NABC
1000	Standard	100/85 ④	85/65	MWIC103LEA	ABC	MWIC104LEA	NABC
1250	Standard	100/85 ④	85/65	MWIC123LEA	ABC	MWIC124LEA	NABC
1600	Standard	100/85 ④	85/65	MWIC163LEA	ABC	MWIC164LEA	NABC
2000	Standard	100/85 ④	85/65	MWIC203LEA	ABC	MWIC204LEA	NABC
2500	Standard	100/85 ④	85/65	MWIC253LEA	ABC	MWIC254LEA	NABC
3200	Standard	100/85 ④	85/65	MWIC323LEA	ABC	MWIC324LEA	NABC
Double Frame Drawout Circuit Breaker ⑤							
4000	Double	65/65	65/--	MWI64N3LEA	AABBCC	MWI64N4LEA	NNAABBCC
4000	Double	85/85	85/--	MWI84N3LEA	AABBCC	MWI84N4LEA	NNAABBCC
5000	Double	85/85	85/--	MWI85N3LEA	AABBCC	MWI85N4LEA	NNAABBCC
6300	Double	85/85	85/--	MWI86N3LEA	AABBCC	MWI86N4LEA	NNAABBCC
4000	Double	100/100	100/--	MWIC4N3LEA	AABBCC	MWIC4N4LEA	NNAABBCC
5000	Double	100/100	100/--	MWIC5N3LEA	AABBCC	MWIC5N4LEA	NNAABBCC
6300	Double	100/100	100/--	MWIC6N3LEA	AABBCC	MWIC6N4LEA	NNAABBCC

① Magnum air circuit breakers are 100% thermal rated (no de-rating necessary when properly applied in a specified enclosure)
 ② Interrupting ratings shown are also applicable at 380V/415V/440V/500V/690V unless otherwise indicated.
 ③ Phasing left to right when facing front of breaker. Neutral is rated 100% of continuous current.
 ④ Icu is 100kA at 440Vac and 85kA at 690Vac. Ics is 85kA at 690Vac and below.
 ⑤ Magnum ACBs carry an IT rating at 440Vac per EN 60947-2 Annex H. Contact Cutler-Hammer for 690Vac IT applications.

**Table 5.2 Magnum Fixed Mounted Circuit Breakers
(First 10 Character Positions of Catalog Number)**

This selection is for a fixed circuit breaker with fixed mounting feet and horizontal terminal pads for bus connections.

Continuous Current Rating Amps at 40°C ①	Magnum ACB Frame Type	Interrupting Rating (kA) at 690V Icu/Ics ②	Icw Withstand Rating (kA) 1-Sec/3-Sec	3-Pole Catalog Number Positions 1-10 ③	3-Pole Phasing ④ (Left to Right)	4-Pole Catalog Number Positions 1-10 ③	4-Pole Phasing ④ (Left to Right)
Narrow Frame Fixed Circuit Breaker ⑥							
800	Narrow	40/40	40/--	MWN4083HEA	ABC	MWN4084HEA	NABC
1000	Narrow	40/40	40/--	MWN4103HEA	ABC	MWN4104HEA	NABC
1250	Narrow	40/40	40/--	MWN4123HEA	ABC	MWN4124HEA	NABC
800	Narrow	50/50	50/--	MWN5083HEA	ABC	MWN5084HEA	NABC
1000	Narrow	50/50	50/--	MWN5103HEA	ABC	MWN5104HEA	NABC
1250	Narrow	50/50	50/--	MWN5123HEA	ABC	MWN5124HEA	NABC
1600	Narrow	50/50	50/--	MWN5163HEA	ABC	MWN5164HEA	NABC
2000	Narrow	50/50	50/30	MWN5203HEA	ABC	MWN5204HEA	NABC
800	Narrow	65/65	65/40	MWN6083HEA	ABC	MWN6084HEA	NABC
1000	Narrow	65/65	65/40	MWN6103HEA	ABC	MWN6104HEA	NABC
1250	Narrow	65/65	65/40	MWN6123HEA	ABC	MWN6124HEA	NABC
1600	Narrow	65/65	65/40	MWN6163HEA	ABC	MWN6164HEA	NABC
2000	Narrow	65/65	65/40	MWN6203HEA	ABC	MWN6204HEA	NABC
Standard Frame Fixed Circuit Breaker ⑥							
800	Standard	65/65	65/--	MWI6083HEA	ABC	MWI6084HEA	NABC
1000	Standard	65/65	65/--	MWI6103HEA	ABC	MWI6104HEA	NABC
1250	Standard	65/65	65/--	MWI6123HEA	ABC	MWI6124HEA	NABC
1600	Standard	65/65	65/--	MWI6163HEA	ABC	MWI6164HEA	NABC
2000	Standard	65/65	65/50	MWI6203HEA	ABC	MWI6204HEA	NABC
2500	Standard	65/65	65/50	MWI6253HEA	ABC	MWI6254HEA	NABC
3200	Standard	65/65	65/50	MWI6323HEA	ABC	MWI6324HEA	NABC
800	Standard	85/85	85/65	MWI8083HEA	ABC	MWI8084HEA	NABC
1000	Standard	85/85	85/65	MWI8103HEA	ABC	MWI8104HEA	NABC
1250	Standard	85/85	85/65	MWI8123HEA	ABC	MWI8124HEA	NABC
1600	Standard	85/85	85/65	MWI8163HEA	ABC	MWI8164HEA	NABC
2000	Standard	85/85	85/65	MWI8203HEA	ABC	MWI8204HEA	NABC
2500	Standard	85/85	85/65	MWI8253HEA	ABC	MWI8254HEA	NABC
3200	Standard	85/85	85/65	MWI8323HEA	ABC	MWI8324HEA	NABC
800	Standard ⑤	100/85	85/65	MWIC083HEA	ABC	MWIC084HEA	NABC
1000	Standard ⑤	100/85	85/65	MWIC103HEA	ABC	MWIC104HEA	NABC
1250	Standard ⑤	100/85	85/65	MWIC123HEA	ABC	MWIC124HEA	NABC
1600	Standard ⑤	100/85	85/65	MWIC163HEA	ABC	MWIC164HEA	NABC
2000	Standard ⑤	100/85	85/65	MWIC203HEA	ABC	MWIC204HEA	NABC
2500	Standard ⑤	100/85	85/65	MWIC253HEA	ABC	MWIC254HEA	NABC
3200	Standard ⑤	100/85	85/65	MWIC323HEA	ABC	MWIC324HEA	NABC
Double Frame Fixed Circuit Breaker ⑥							
4000	Double	65/65	65/--	MWI64N3HEA	AABBCC	MWI64N4HEA	NNAABBCC
4000	Double	85/85	85/--	MWI84N3HEA	AABBCC	MWI84N4HEA	NNAABBCC
5000	Double	85/85	85/--	MWI85N3HEA	AABBCC	MWI85N4HEA	NNAABBCC
6300	Double	85/85	85/--	MWI86N3HEA	AABBCC	MWI86N4HEA	NNAABBCC
4000	Double	100/100	100/--	MWIC4N3HEA	AABBCC	MWIC4N4HEA	NNAABBCC
5000	Double	100/100	100/--	MWIC5N3HEA	AABBCC	MWIC5N4HEA	NNAABBCC
6300	Double	100/100	100/--	MWIC6N3HEA	AABBCC	MWIC6N4HEA	NNAABBCC

① Magnum air circuit breakers are 100% thermal rated (no de-rating necessary when properly applied in a specified enclosure).

② Interrupting ratings shown are also applicable at 380V/415V/440V/500V/690V unless otherwise indicated.

③ Fixed breakers have (H) horizontal terminals. Vertical adapters (V) are priced separately.

④ Phasing Left to Right when facing front of circuit breaker - Neutral rated 100% of continuous current

⑤ Icu is 100kA at 440Vac and 85kA at 690Vac. Ics is 85kA at 690Vac and below.

⑥ Magnum ACBs carry an IT rating at 440Vac per EN 60947-2 Annex H. Contact Cutler-Hammer for 690Vac IT applications.

Special Application – 1100 Vac Air Circuit Breakers – Drawout and Fixed Mounting (Tables 5.3 and 5.4)

**Table 5.3 Basic Drawout Mounted Air Circuit Breaker
(Tested to EN 60947-2 Cat B; witnessed and certified with a KEMA-KEUR Mark)**

A Basic Drawout Mounted Air Circuit Breaker includes a manually operated breaker frame (moving portion) only with primary disconnecting contacts (finger clusters) and one current sensor per phase.

Continuous Current Rating Amps at 40°C ①	Magnum ACB Frame Type	Interrupting Rating (kA) at 690V Icu/Ics	Icw Withstand Rating (kA) 1-Sec/3-Sec	3-Pole Catalog Number	3-Pole ② Phasing (Left to Right)	4-Pole Catalog Number	4-Pole ② Phasing (Left to Right)
3200	Standard	25/25	--/--	MWK2323LEA	ABC	MWK2324LEA	NABC

① Magnum air circuit breakers are 100% thermal rated (no de-rating necessary when properly applied in a specified enclosure)
 ② Phasing left to right when facing front of breaker. Neutral is rated 100% kf continuous current.

**Table 5.4 Basic Fixed Mounted Air Circuit Breaker
(Tested to EN 60947-2 Cat B; witnessed and certified with a KEMA-KEUR Mark)**

A Basic Fixed Mounted Air Circuit Breaker includes a manually operated breaker frame only with horizontal rear terminals, one current sensor per phase, and one secondary terminal block mounting bracket.

Continuous Current Rating Amps at 40°C ①	Magnum ACB Frame Type	Interrupting Rating (kA) at 690V Icu/Ics	Icw Withstand Rating (kA) 1-Sec/3-Sec	3-Pole Catalog Number	3-Pole ② Phasing (Left to Right)	4-Pole Catalog Number	4-Pole ② Phasing (Left to Right)
3200	Standard	25/25	--/--	MWK2323HEA	ABC	MWK2324HEA	NABC

① Magnum air circuit breakers are 100% thermal rated (no de-rating necessary when properly applied in a specified enclosure)
 ② Phasing left to right when facing front of breaker. Neutral is rated 100% kf continuous current.

Tables 5.5, 5.6 and 5.7 Magnum Factory Installed Current Sensors and Rating Plugs Option for Fixed or Drawout Circuit Breakers (Character Positions 11 and 12 of Catalog Number)

Depending on the circuit breaker frame type, select current sensors and rating plugs from Tables 5.5, 5.6 or 5.7. One current sensor per phase and one rating plug are included as standard with all fixed and drawout circuit breakers unless a circuit breaker is a non-automatic switch. Select NN for character positions 11 and 12 if the circuit breaker is non-automatic (without integral trip unit protection). Select the current sensor and rating plug rating by circuit breaker frame size. For 3-pole circuit breaker earth fault applications on 3-phase, 4-wire circuits, external neutral mounted current sensors must be ordered separately.

Table 5.5 Available Current Sensors and Rating Plugs for Narrow Frame

Catalog Number Positions 11 and 12	2000A	1600 A	1250 A	1000 A	800 A
NN - None ①					
20	2000				
16	1600	1600			
13	1250	1250	1250		
12	1200	1200	1200		
10	1000	1000	1000	1000	
08	800	800	800	800	800
07	630	630	630	630	630
06	600	600	600	600	600
04	400	400	400	400	400
03	300	300	300	300	300
05	250	250	250	250	250
02	200	200	200	200	200

Table 5.6 Available Current Sensors and Rating Plugs for Standard Frame

Catalog Number Positions 11 and 12	3200 A	2500 A	2000 A	1600 A	1250 A	1000 A	800 A
NN - None ①							
32	3200						
30	3000						
25	2500	2500					
20	2000	2000	2000				
16	1600	1600	1600	1600			
13	1250	1250	1250	1250	1250		
12	1200	1200	1200	1200	1200		
10	1000	1000	1000	1000	1000	1000	
08	800	800	800	800	800	800	800
07	630	630	630	630	630	630	630
06	600	600	600	600	600	600	600
04	400	400	400	400	400	400	400
03	300	300	300	300	300	300	300
05	250	250	250	250	250	250	250
02	200	200	200	200	200	200	200

Table 5.7 Available Current Sensors and Rating Plugs for Double Frame

Catalog Number Positions 11 and 12	6300 A	5000 A	4000 A
NN - None ①			
63	6300		
50	5000	5000	
40	4000	4000	4000
32	3200	3200	3200
25		2500	2500
20			2000

① Non-Automatic Switch

Table 5.8 Factory Installed Trip Unit Option for Fixed or Drawout Circuit Breakers (Character Positions 13 and 14 of Catalog Number)

Catalog Number Positions 13 and 14	Digitrip RMS Trip Unit ①	Functions	Trip Unit Power Supply Voltage ②	Power Relay Module Alarm or Trip Contact	Available on Magnum Frame(s)
NN	Non-Automatic ⑤	3-Pole ACB	Not Applicable	None	Narrow/Standard
NN	Non-Automatic	3-Pole ACB	Not Applicable	None	Double
NN	Non-Automatic ⑤	4-Pole ACB	Not Applicable	None	Narrow/Standard
NN	Non-Automatic	4-Pole ACB	Not Applicable	None	Double
22	220	LI	Not Applicable	None	Narrow/Standard
52	520	LSI	Not Applicable	None	All Frames
5W	520i	LSIG	Not Applicable	None	All Frames
M2	520M	LSI	None ③	None	All Frames
MW	520Mi	LSIG	None ③	None	All Frames
MT	520M	LSI	24/48 Vdc	High Load Alarm	All Frames
MU	520M	LSI	120 Vac	High Load Alarm	All Frames
MV	520M	LSI	240 Vac	High Load Alarm	All Frames
MJ	520Mi	LSIG	24/48 Vdc	Earth Trip	All Frames
MK	520Mi	LSIG	120 Vac	Earth Trip	All Frames
ML	520Mi	LSIG	240 Vac	Earth Trip	All Frames
ME	520M	LSIA	24/48 Vdc	Earth Alarm	All Frames
MC	520M	LSIA	120 Vac	Earth Alarm	All Frames
MF	520M	LSIA	240 Vac	Earth Alarm	All Frames
CT	520MC LSI	LSI	24/48 VDC	High Load Alarm	All Frames
CU	520MC LSI	LSI	120 Vac	High Load Alarm	All Frames
CV	520MC LSI	LSI	240 Vac	High Load Alarm	All Frames
CJ	520MCi LSIG	LSIG	24/48 Vdc	Earth Trip	All Frames
CK	520MCi LSIG	LSIG	120 Vac	Earth Trip	All Frames
CL	520MCi LSIG	LSIG	240 Vac	Earth Trip	All Frames
CE	520MC LSIA	LSIA	24/48 Vdc	Earth Alarm	All Frames
CC	520MC LSIA	LSIA	120 Vac	Earth Alarm	All Frames
CF	520MC LSIA	LSIA	240 Vac	Earth Alarm	All Frames
1W	1150i	LSI	24/48 Vdc	Programmable ④	Standard/Double
1N	1150i	LSI	120 Vac	Programmable ④	Standard/Double
1P	1150i	LSI	240 Vac	Programmable ④	Standard/Double
1R	1150i	LSIG & LSIA	24/48 Vdc	Programmable ④	Standard/Double
1S	1150i	LSIG & LSIA	120 Vac	Programmable ④	Standard/Double
1T	1150i	LSIG & LSIA	240 Vac	Programmable ④	Standard/Double

- ① Digitrip 520MC Trip Unit requires PowerNet Software version 3.2 or higher if PowerNet is used
- ② Power Relay Module mounted integral to circuit breaker receives power from an external customer supplied source wired through the breaker secondary contacts. The external source powers the trips unit digital display (520M, 520MC and 1150), and relays
- ③ No Power Relay Module provided for 520M trip unit when this catalogue code is selected. The Digital display powered from current sensor and the circuit breaker must carry 20% rated sensor current to power digital display.
- ④ Digitrip 1150 has programmable relay trip or alarm contacts for trip unit protective and high load functions.
- ⑤ The maximum available instantaneous interrupting rating for the Magnum Standard Frame Non-Automatic Switch is 85kA when the breaker is used with a suitable external overcurrent protective device with instantaneous protection.



Digitrip 220 Trip Unit



Digitrip 520i Trip Unit



Digitrip 520Mi Trip Unit



Digitrip 520MCi Trip Unit



Digitrip 1150i Trip Unit

Table 5.9 Factory Installed Shunt Trip (ST) Option for Fixed or Drawout Circuit Breakers (Character Position 15 of Catalog Number) ①

Catalog Number Position 15	Voltage (AC: 50/60 Hz)
N	None
A	110 - 127 Vac/dc
R	208 - 250 Vac/dc
C	24 Vdc
H	48 Vdc

① Refer applications requiring capacitor trip devices to Cutler-Hammer

Table 5.11 Factory Installed Spring Release Device (SRD) Option for Fixed or Drawout Circuit Breakers (Character Position 17 of Catalog Number)

Catalog Number Position 17	Voltage (AC: 50/60 Hz)
N	None
A	110 - 127 Vac/dc
R	208 - 250 Vac/dc
C	24 Vdc
H	48 Vdc

Table 5.10 Factory Installed Motor Operator Option for Fixed or Drawout Circuit Breakers (Character Position 16 of Catalog Number)

For electrically operated circuit breakers, select a Motor Operator and Spring Release Device (SRD) and (if required) a Shunt Trip (ST).

Catalog Number Position 16	Voltage (AC: 50/60 Hz)	Motor Spring Charging Cycle Time (sec)
M	Manual Operated	None
N	110 - 125 Vac	5
P	220 - 250 Vac	5
L	24 Vdc	5
K	48 Vdc	5
W	110 - 125 Vdc	5
T	220 - 250 Vdc	5

Table 5.12 Factory Installed Undervoltage Release (UVR) or Second Shunt Trip Attachment (STA) Option for Fixed or Drawout Circuit Breakers (Character Position 18 of Catalog Number)

Catalog Number Position 18	Voltage (AC: 50/60 Hz)	UVR Release Type ① ② ③ ④
N	None	None
A	110 - 127 Vac	Instantaneous
R	208 - 240 Vac	Instantaneous
C	24 Vdc	Instantaneous
H	48 Vdc	Instantaneous
E	110 - 125 Vdc	Instantaneous
F	220 - 250 Vdc	Instantaneous
G	32 V dc	Instantaneous
X	380 - 415 Vac	Instantaneous
J	480 Vac	Instantaneous
K	600 Vac	Instantaneous
1	110 - 127 Vac	Second Shunt Trip
2	208 - 250 Vac	Second Shunt Trip
3	24 Vdc	Second Shunt Trip
4	48 Vdc	Second Shunt Trip

① Refer requests for Time Delay UVRs to Cutler-Hammer.

② Digitrip 1150 Trip Units have an integral adjustable time delay undervoltage trip function from the line voltage.

③ An external customer supplied panel mounted Time Delay Undervoltage Relay can also be applied, wired through the breaker secondary contacts to a Shunt Trip Attachment for Time Delay Undervoltage protection.

④ Each second Shunt Trip Attachment includes its own cut-off switch.

Table 5.13 Factory Installed Auxiliary Switch Option for Fixed or Drawout Circuit Breakers (Character Position 19 of Catalog Number)

Catalog Number Position 19	Contact Type	Comments
N	None	
2	2a/2b	
4	4a/4b	4a/4b maximum on Narrow Frame ①
6	6a/6b	6a/6b maximum on Double or Standard Frames ②

① Refer applications requiring 6a/6b contacts on the Narrow Frame Breaker to Cutler-Hammer.

② Except when a Second Shunt Trip Attachment is selected, which occupies a 2a/2b contact mounting position.

Table 5.14 Factory Installed Bell Alarm/OTS Switch Option for Fixed or Drawout Circuit Breakers (Character Position 20 of Catalog Number)

This option is for circuit breakers with trip units only, not available on Non-Automatic Circuit Switches.

Catalog Number Position 20	Mechanical Trip Indicator	OTS Switch with 2 Form C Contacts
E	No	No
N	Yes	No
Y	Yes	Yes

May 2003

Table 5.15 Factory Installed Padlockable Pushbutton Cover Option for Fixed or Drawout Circuit Breakers (Character Position 21 of Catalog Number)

Catalog Number Position 21	Description
N	None
M	Metal Frame (Open and Close)
P	Plastic Frame (Open and Close)
C	Block Close PB Metal Frame
H	Block Close PB Plastic Frame

Table 5.16 Factory Installed Operations Counter/Key Interlock Provisions Option for Fixed or Drawout Circuit Breakers (Character Position 22 of Catalog Number)

Catalog Number Position 22	Counter Type	Keylock Provision ①
N	No Counter	No Lock
K	No Counter	Kirk Lock
C	No Counter	Castell Lock
R	No Counter	Ronis Lock
A	Operations Counter	No Lock
Y	Operations Counter	Kirk Lock
L	Operations Counter	Castell Lock
H	Operations Counter	Ronis Lock

① Key Interlock provision includes a hole in the front cover with cap plus provisions hardware kit for customer installation of customer supplied cylinder lock.

Table 5.18 Circuit Breaker and Cassette Shipping Instructions^① (Character Position 24 of Catalog Number)

Configure the drawout cassette and cassette options using Figure 5-2 (Cassette Catalog Number Selections) and its accompanying tables.

Catalog Number Position 24	Shipment Description	Magnum ACB Frame Type	Shutters	Pre-Wired Cassette Secondary Terminal Blocks
A	Fixed or Drawout ACB Alone	All Frames	Not Applicable	Not Wired
C	Drawout ACB in Narrow Cassette	Narrow	No Shutters	Not Wired
C	Drawout ACB in Universal Cassette	Standard	No Shutters	Not Wired
P	Drawout ACB in Narrow Cassette	Narrow	No Shutters	Pre-Wired
P	Drawout ACB in Universal Cassette	Standard	No Shutters	Pre-Wired
S	Drawout ACB in Narrow Cassette	Narrow	Shutters	Not Wired
S	Drawout ACB in Universal Cassette	Standard	Shutters	Not Wired
W	Drawout ACB in Narrow Cassette	Narrow	Shutters	Pre-Wired
W	Drawout ACB in Universal Cassette	Standard	Shutters	Pre-Wired

① Double-wide and Standard cassettes ship separately from breakers

Table 5.17 Factory Installed Latch Check Switch/Metering Trip Unit Configuration Option for Fixed or Drawout Circuit Breakers (Character Position 23 of Catalog Number)

The Latch Check Switch monitors the circuit breaker trip latch and readiness to close.

Catalog Number Position 23	Latch Check Switch (LCS) Connection	Metering Trip Unit Line Voltage Connection (Applicable only when Digitrip RMS 1150 Trip Unit is selected in Catalog Positions 13 and 14)
N	None (Default)	Upper Terminal Voltage Connection
M	None	Lower Terminal Voltage Connection
L	Latch Check Switch wired to Spring Release	Upper Terminal Voltage Connection
Y	Latch Check Switch wired to Spring Release	Lower Terminal Voltage Connection
C	Latch Check Switch for External Wiring (1 Form C) ①	Upper Terminal Voltage Connection
D	Latch Check Switch for External Wiring (1 Form C) ①	Lower Terminal Voltage Connection

① Form C contact wired through circuit breaker secondary contacts for external use.

Table 5.19 Future Use By Cutler-Hammer (Character Position 25 of Catalog)

Catalog Number Position 25	Description
X	Future Factory Option

Factory Configured Drawout Cassettes

Factory configured cassettes for drawout Magnum Power Circuit Breakers are ordered using a 15-digit catalog numbering system. Cassette configuration is achieved by using a simple 2-step process.

Step 1: Select a 7-Digit Cassette Catalog Number Prefix.

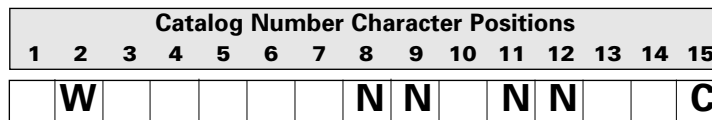
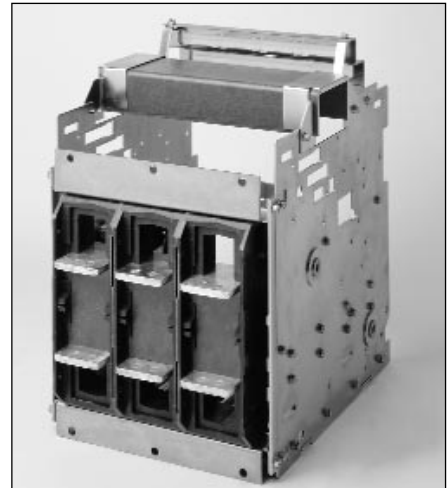
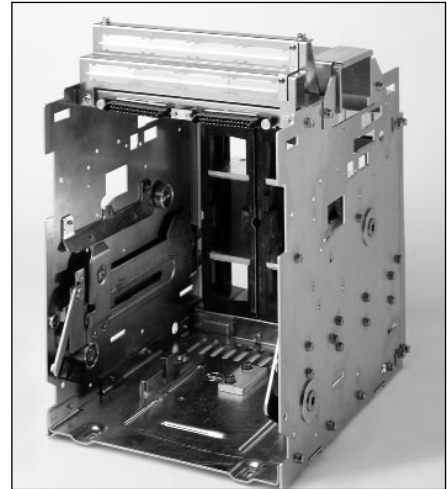
Choose the cassette prefix from Tables 5.20 and 5.21 based on the following:

- Magnum Cassette Type
- Number of Poles
- Magnum Breaker Frame Type
- Continuous Current Rating
- Magnum Frame Type

Step 2: Select Cassette Catalog Positions 8 through 15 to designate factory installed options as follows:

- **Catalog Positions 8 and 9** per Table 5.22 are reserved for a future option.
- **Catalog Position 10** establishes if optional shutters are installed per Table 5.23.
- **Catalog Positions 11 through 13** per Table 5.24 are reserved for future options.
- **Catalog Positions 14 and 15** establishes if the cassette is pre-wired per per Table 5.25.

Narrow Frame Cassette (Front and Rear Views)



Character Position	Description
1	Cassette Family
2	Future Use
3 & 4	Continuous Amperes
5	Poles
6	Rear Terminals
7	Arc Hood
8	Future Use

Character Position	Description
9	Future Use
10	Shutters
11	Future Use
12	Future Use
13	Future Use
14	Cassette Wiring
15	Cassette Shipping

Figure 5-2 Drawout Cassette 15-character Catalog Number Selections

May 2003

**Table 5.20 Cassettes for Drawout Circuit Breakers
(First 6 Character Positions of Catalog Number)**

Cassette standard features include an arc hood, provisions for secondary terminal blocks including wiring, and a cell rejection kit. Cassettes may be shipped with the circuit breaker by specifying breaker Catalog Character Position 24.

Catalog Number Positions 1 to 6	Magnum Circuit Breaker Frame Type	Poles	Continuous Current Rating (A) at 40°C
NN203H	Narrow	3 pole	800-2000
EN203H	Standard	3 pole	800-2000
EN323H	Standard	3 pole	2500-3200
EN403H	Double	3 pole	4000
EN503H	Double	3 pole	5000-6300
NN204H	Narrow	4 pole	800-2000
EN204H	Standard	4 pole	800-2000
EN324H	Standard	4 pole	2500-3200
EN404H	Double	4 pole	4000
EN504H	Double	4 pole	5000-6300

**Table 5.24 Future Cassette Option
(Positions 11 to 13 of Catalog Number)**

Catalog Number Position 11 - 13	Cassette Type
NNN	All Cassettes

**Table 5.21 Cassette Arc Hood
(Positions 7 of Catalog Number)**

Factory installed cassette arc hood option.

Catalog Number Position 7	Description
A	600 Vac Breakers
K	1100 Vac Breakers

**Table 5.25 Pre-wired Cassettes Option
(Character Positions 14 and 15 of Catalog Number)**

Pre-wired cassettes include wiring and terminal blocks mounted and wired to secondary contacts ready to receive the circuit breaker.

Catalog Number Positions 14 and 15	Voltage (AC: 50/60 Hz)	Magnum Breaker Frame	Continuous Rating (A)
NC	Unwired	All Frames	All
WC	Pre-wired	All Frames	All

**Table 5.22 Cassette Door Escutcheon and Gasket Kit Option
(Positions 8 and 9 of Catalog Number)**

Factory fitted option to ship kit with cassette.

Catalog Number Positions 8 and 9	Door Escutcheon & Gasket Kit
DN	Included
XN	Not Included

**Table 5.23 Cassette Shutters Option
(Character Position 10 of Catalog Number)**

Shutters can be factory installed or are also available as a field installation kit for customer installation.

Catalog Number Position 10	Description	Magnum ACB Frame Type	Poles	Continuous Current Rating (A) at 40°C
N	No Shutters	All Frames	3 and 4 pole	All Ratings
S	Shutters Installed	All Frames	3 and 4 pole	All Ratings

Table 5.26 Cassette Shutter Field Option Kit

Pre-wired cassettes include wiring and terminal blocks mounted and wired to secondary contacts ready to receive air circuit breaker.

Magnum Breaker Frame	Poles	Continuous Current Rating (A)	Catalog Number
Narrow	3 pole	800-2000	MDNSHTR3P
Standard	3 pole	800-3200	MISHTR332
Double	3 pole	4000-6300	MISHTR363
Narrow	4 pole	800-2000	MDNSHTR4P
Standard	4 pole	800-3200	MISHTR432
Double	4 pole	4000-6300	MISHTR463

Table 5.27 Cassette Cell Switch Field Option Kit

This is a field installable kit for use with drawout cassettes and is for customer installation. The switch changes position when the circuit breaker is levered to the CONNECT position. The kit includes the switch, mounting bracket and hardware for customer installation. The switch kit also includes pre-installed wiring for easy field installation to cassette cell secondary terminal blocks.

Magnum Breaker Frame and Cassette Types	Catalog Number	Description	Type
All	MICELLSW1	4 Form C Contacts	Switch Only
All	M4CS	4 Form C Contacts	Kit with Mounting Bracket
All	M8CS	8 Form C Contacts	Kit with Mounting Bracket
All	M12CS	12 Form C Contacts	Kit with Mounting Bracket

Table 5.28 Cassette Cell Lock Provision Field Option Kit

This is a field installable kit for use with drawout cassettes and is for customer installation. The kit includes mounting provisions for single or multi-cylinder Kirk or Castell locks provided and fitted to the cassette by the customer.

Catalog Number	Lock
MCASSPRL	Left Side
MCASSPRR	Right Side

Table 5.29 Secondary Contact Wiring Field Option Kit

This is a field installable kit for use in wiring fixed circuit breakers or drawout circuit breaker cassette secondary contacts or for adding option kits in the field. Each kit can be used to complete as many as three circuit breakers, depending on the number and type of accessories required for the the circuit breaker.

Description	Catalog Number	Kit Contents
Secondary Terminal Block Kit Secondary Terminal Wire Kit Secondary Terminal Wire Kit Secondary Terminal Repair Kit ^① with Extraction Tool	MSECBK MSECFWR MKW40 MSECTOOL	Quantity 15 6-Point Terminal Blocks with Labels Quantity 90 Wires for Connecting Secondary Blocks Quantity 30 Wires 40 Inches Long for Fixed Circuit Breaker Connecting Secondary Blocks Quantity 12 Wires, Quantity 2 6-point Terminal Blocks, and 1 Amp, Inc. Removal Tool

^① Pin Removal Tool can be purchased directly from AMP, Inc. under Part Number 3205183

Table 5.30 Shunt Trip (STA) Field Option Kit

This is a field installable kit for fixed or drawout circuit breakers. The kit includes a shunt trip attachment (STA) with plug-in wires, a cut-off switch and instructions. Refer applications requiring capacitor trip devices to Cutler-Hammer.

Voltage (AC:50/60Hz)	Catalog Number
110 - 127 Vac/dc	MST1
208 - 250 Vac/dc	MST2
24 Vdc	MST3
48 Vdc	MST4

Table 5.31 Motor Operator Field Option Kit (For Charging Closing Spring)

This is a field installable kit for fixed or drawout circuit breakers. The kit includes a motor operator assembly, which includes a motor cut-off switch and instructions.

Voltage (AC:50/60Hz)	Catalog Number
110 - 125 Vac	MMOTN
220 - 250 Vac	MMOTP
24 Vdc	MMOTL
48 Vdc	MMOTK
110 - 125 Vdc	MMOTW
220 - 250 Vdc	MMOTT

Table 5.32 Spring Release Device (SRD) Field Option Kit

This is a field installable kit for fixed or drawout circuit breakers. The kit includes spring release device (SRD) assembly with plug-in wires and instructions.

Voltage (AC:50/60Hz)	Catalog Number
110 - 127 Vac/dc	MSRA
208 - 250 Vac/dc	MSRR
24 Vdc	MSRC
48 Vdc	MSRH

Table 5.33 Latch Check Switch Field Option Kit

This is a field installable kit for fixed or drawout circuit breakers includes LCS assembly 1 Form C contact, plug-in wires and instructions.

Catalog Number	Description
MLSC1	Latch Check Switch for Wiring Internally to Spring Release
MLSC2	Latch Check Switch with 1 Form C Contact for Remote Indication

Table 5.34 Auxiliary Switch Field Option Kit

This is a field installable kit for fixed or drawout circuit breakers. Note that a maximum of 4a/4b contacts apply to the Narrow Frame and a maximum of 6a/6b apply to the Standard and Double Frames.

Switch Type	Catalog Number
2a/2b Contacts	MAUX2

Table 5.35 Undervoltage Release (UVR) Field Option Kit

This is a field installable kit for fixed or drawout circuit breakers. The kit includes an undervoltage release device and instructions.

Voltage (AC:50/60Hz)	Catalog Number	UVR Release Type ① ② ③ ④
110 - 127 Vac	MUVRA	Instantaneous
208 - 240 Vac	MUVRR	Instantaneous
24 Vdc	MUVRC	Instantaneous
48 Vdc	MUVRH	Instantaneous
110 - 125 Vdc	MUVRE	Instantaneous
220 - 250 Vdc	MUVRF	Instantaneous
32 Vdc	MUVRG	Instantaneous
380 - 415 Vac	MUVRX	Instantaneous
480 Vac	MUVRJ	Instantaneous
600 Vac	MUVRK	Instantaneous

- ① On applications requiring Time Delay Undervoltage Protection, refer requests for Time Delay UVRs to Cutler-Hammer.
- ② Digitrip 1150 Trip Units have an integral adjustable time delay undervoltage trip function from the line voltage.
- ③ An external customer supplied panel mounted Time Delay Undervoltage Relay can also be applied wired through the breaker secondary contacts to a Shunt Trip Attachment for Time Delay Undervoltage protection.
- ④ Each second Shunt Trip Attachment includes its own cut-off switch.

Table 5.36 Trip Indication Field Option Kits

These are field installable kits for fixed or drawout circuit breakers. They are for breakers with with trip units only, and not available on Non-Automatic Breakers.

Trip Indication Kit Description ①	Contacts	Catalog Number
Mechanical Pop-out Trip Indicator Kit	None	MDTRIND
Bell Alarm/Ots Kit with Mechanical Trip Indicator	2 Form C	MDTRINDBA
Bell Alarm/OTS Contact Kit ②	2 Form C	MOTS

- ① Manual Reset only.
- ② For use with breakers that have mechanical pop-out trip indicator option already installed.

Table 5.37 Operations Counter Field Option Kit

This is a field installable kit for fixed or drawout circuit breakers. It also requires a circuit breaker mechanical pop-out indicator kit, if the existing circuit breaker does not have an indicator.

Kit Type	Catalog Number
Mechanical Counter	MCOUNT

Table 5.38 Padlockable Pushbutton Cover Field Option Kit

This is a field installable kit for fixed or drawout circuit breakers. Padlocks are not included and must be provided by customer.

Cover Type ①	Catalog Number
Plastic	MCOVH
Metal	MCOVC

① The cover can be configured to block the Open and Close Pushbuttons or just the Close Pushbutton.

Table 5.39 Breaker Key Lock Provisions Field Option Kit

This is a field installable kit for fixed or drawout circuit breakers. The kit includes mounting hardware and brackets to mount single cylinder lock for locking circuit breaker in the Open position. The cylinder lock and key are not included and must be supplied by customer.

Lock Type	Catalog Number	Use With Customer Supplied Lock and Key Number
Castell	MBRLCKC	Castell # FGCL4008
Ronis	MBRLCKR	Ronis # 1104A
Kirk	MBRLCKK	Kirk Lock # KC40---10 & Key KC4

Table 5.40 Neutral Current Sensor

This is a field installable external accessory for use with fixed or drawout circuit breakers. The fourth sensor is for mounting on enclosure neutral in 3-pole circuit breaker earth fault applications on 3-phase, 4-wire systems.

Magnum Frame	Sensor Rating	Sensor Qty. Required per 3-Pole Breaker	Catalog Number
Narrow or Standard	200	1	9253C03H01
Narrow or Standard	250	1	9253C03H02
Narrow or Standard	300	1	9253C03H03
Narrow or Standard	400	1	9253C03H04
Narrow or Standard	600	1	9253C03H05
Narrow or Standard	630	1	9253C03H14
Narrow or Standard	800	1	9253C03H06
Narrow or Standard	1000	1	9253C03H07
Narrow or Standard	1200	1	9253C03H08
Narrow or Standard	1250	1	9253C03H15
Narrow or Standard	1600	1	9253C03H09
Narrow or Standard	2000	1	9253C03H10
Narrow or Standard	2500	1	9253C03H11
Narrow or Standard	3000	1	9253C03H12
Narrow or Standard	3150	1	9253C03H16
Narrow or Standard	3200	1	9253C03H13
Double	4000	2	9253C03H10
Double	5000	2	9253C03H11
Double	6300	2	9253C03H13

Table 5.41 Sensor/Rating Plug Field Change-out Kit

This is a field installable kit for changing the sensor/rating plug rating on fixed or drawout circuit breakers. Narrow and Standard Frame kits include 1 rating plug plus 3 sensors for 3-pole or 4 sensors for 4-pole circuit breakers. Double Frame kits include 1 rating plug plus 6 sensors for 3-pole or 8 sensors for 4-pole circuit breakers. The rating plug rating and the sensor rating in the kit match. The sensor ampere rating selected cannot exceed the circuit breaker frame and ampere rating. Note: For 3 pole breaker ground fault applications on 3 phase, 4 wire circuits, external mounted sensors must be ordered separately.

Magnum Frame	Sensor Rating (A)	3-Pole Catalog Number	4-Pole Catalog Number
Narrow	200	M3NRG0200	M4NRG0200
Narrow	250	M3NRG0250	M4NRG0250
Narrow	300	M3NRG0300	M4NRG0300
Narrow	400	M3NRG0400	M4NRG0400
Narrow	600	M3NRG0600	M4NRG0600
Narrow	630	M3NRG0630	M4NRG0630
Narrow	800	M3NRG0800	M4NRG0800
Narrow	1000	M3NRG1000	M4NRG1000
Narrow	1200	M3NRG1200	M4NRG1200
Narrow	1250	M3NRG1250	M4NRG1250
Narrow	1600	M3NRG1600	M4NRG1600
Narrow	2000	M3NRG2000	M4NRG2000
Standard	200	M3SRG0200	M4SRG0200
Standard	250	M3SRG0250	M4SRG0250
Standard	300	M3SRG0300	M4SRG0300
Standard	400	M3SRG0400	M4SRG0400
Standard	600	M3SRG0600	M4SRG0600
Standard	630	M3SRG0630	M4SRG0630
Standard	800	M3SRG0800	M4SRG0800
Standard	1000	M3SRG1000	M4SRG1000
Standard	1200	M3SRG1200	M4SRG1200
Standard	1250	M3SRG1250	M4SRG1250
Standard	1600	M3SRG1600	M4SRG1600
Standard	2000	M3SRG2000	M4SRG2000
Standard	2500	M3SRG2500	M4SRG2500
Standard	3000	M3SRG3000	M4SRG3000
Standard	3200	M3SRG3200	M4SRG3200
Double	2000	M3RRG2000	M4RRG2000
Double	2500	M3SRG2500	M4RRG2500
Double	3000	M3RRG3000	M4RRG3000
Double	3200	M3RRG3200	M4RRG3200
Double	4000	M3SRG4000	M4SRG4000
Double	5000	M3RRG5000	M4SRG5000
Double	6300	M3SRG6300	M4SRG6300

Table 5.42 Primary Terminal Adapter Field Option Kits

This field installation kit is for changing fixed circuit breakers or drawout cassettes from horizontal to desired configuration.

Terminal Adapter Kit Type	Magnum Frame Type	Breaker Poles	Interrupting Rating (kA)	Continuous Current (A)	Catalog Number
Vertical	Narrow	3	Up to 65	800 - 2000	MVADP320N
Vertical	Standard	3	Up to 65	800 - 1600	MVADP16
Vertical	Standard	3	Up to 100	Up to 2000	MVADP20
Vertical	Standard	3	All	2500 - 3200	MVADP32
Vertical	Double	3	All	4000	MVADP40
Vertical	Double	3	All	5000 - 6300	MVADP50
Vertical	Narrow	4	Up to 65	800 - 2000	MVADP420N
Vertical	Standard	4	Up to 65	800 - 1600	MVADP416
Vertical	Standard	4	Up to 100	Up to 2000	MVADP420
Vertical	Standard	4	All	2500 - 3200	MVADP432
Vertical	Double	4	All	4000	MVADP440
Vertical	Double	4	All	5000 - 6300	MVADP450
Front Mount	Narrow	3	Up to 65	800 - 1250	NFC312KT
Front Mount	Narrow	3	Up to 65	800 - 2000	NFC320KT
Front Mount	Standard	3	Up to 65	800 - 2500	SFNTC325
Front Mount	Standard	3	85 & 100	800 - 3200	SFNTC332
Front Mount	Double	3	All	4000	Contact C-H
Front Mount	Double	3	All	5000 - 6300	Contact C-H
Front Mount	Narrow	4	Up to 65	800 - 1250	NFC412KT
Front Mount	Narrow	4	Up to 65	1600 - 2000	NFC420KT
Front Mount	Standard	4	Up to 65	800 - 2500	SFNTC425
Front Mount	Standard	4	85 & 100	800 - 3200	SFNTC432
Front Mount	Double	4	All	4000	Contact C-H
Front Mount	Double	4	All	5000 - 6300	Contact C-H

Table 5.43 Mechanical Interlock Configurations

Reference Chart for Mechanical Interlock Kits

Type of Interlock	Number of Breakers Interlocked	Description of Interlocks	Possible Interlock Logic
Type 2	Across 2 Breakers	One Normal Power Supply (A) One Emergency Power Supply (B)	A B
			0 0
			1 0
			0 1
Type 31	Across 3 Breakers	Two Normal Power Supplies (A and C) One Emergency Power Supply (B) Circuit breakers A and C can be closed if B is open. B can only be closed if A and C are open.	A B C
			0 0 0
			1 0 0
			0 1 0
			0 0 1
			1 0 1
Type 32	Across 3 Breakers	Two Power Supplies (A and C) One Bus Tie Breaker (B) One or Two Breakers out of 3 can be closed at the same time	A B C
			0 0 0
			1 0 0
			0 1 0
			0 0 1
			1 1 0
			0 1 1
			1 0 1
Type 33	Across 3 Breakers	Three Power Supplies (A, B and C) Normal or Emergency, only one of which can be closed at a time	A B C
			0 0 0
			1 0 0
			0 1 0
			0 0 1

Table 5.44 Mechanical Interlock Assembly Kits

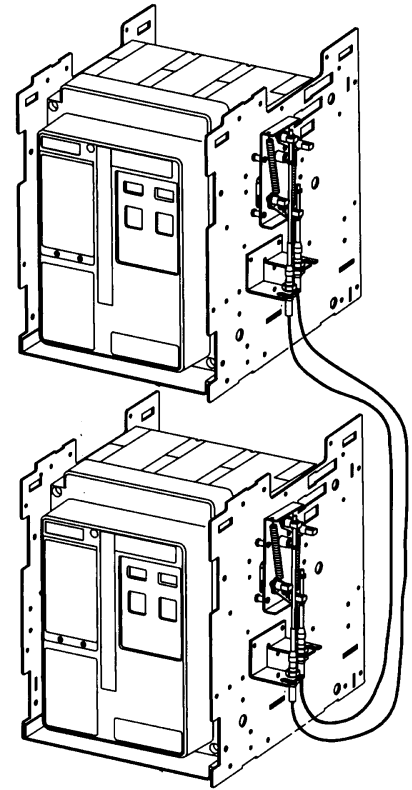
This is an external field installation kit for fixed or drawout circuit breakers. Select a Mechanical Interlock Kit and Rod or Cable Kits (Table 5.43) for complete assembly as indicated.

Configuration of Interlocked Breakers	Type of Breaker	Interlock Kit Type	Catalog Number of Kit	Comments
2 Way	Fixed	Rod Type 2	MI2FR	Kit also requires 1 Rod Kit
2 Way	Fixed	Cable Type 2	MI2FC	Kit also requires 1 Cable Kit
3 Way	Fixed	Cable Type 31	MI31FC	Kit also requires 2 Cable Kits
3 Way	Fixed	Cable Type 32	MI32FC	Kit also requires 3 Cable Kits
3 Way	Fixed	Cable Type 33	MI33FC	Kit also requires 3 Cable Kits
2 Way	Drawout	Rod Type 2	MI2DR	Kit also requires 1 Rod Kit
2 Way	Drawout	Cable Type 2	MI2DC	Kit also requires 1 Cable Kit
3 Way	Drawout	Cable Type 31	MI31DC	Kit also requires 2 Cable Kits
3 Way	Drawout	Cable Type 32	MI32DC	Kit also requires 3 Cable Kits
3 Way	Drawout	Cable Type 33	MI33DC	Kit also requires 3 Cable Kits

Table 5.45 Rod or Cable Kits

This is an external field installation kit for fixed or drawout circuit breakers. It is required for the assembly of Mechanical Interlock Assembly Kits (Table 5.42)

Kit Type	Catalog Number of Kit	Comments
Rod Type	MIR	Includes 2 Rods 910 mm long (3 feet) each
Cable Type	MIC5	Includes 2 Cables 1520 mm long (5 feet) each
Cable Type	MIC6	Includes 2 Cables 1830 mm long (6 feet) each
Cable Type	MIC8	Includes 2 Cables 2440 mm long (8 feet) each
Cable Type	MIC10	Includes 2 Cables 3050 mm long (10 feet) each



Cassette-Mounted 2-Way Cable Interlock

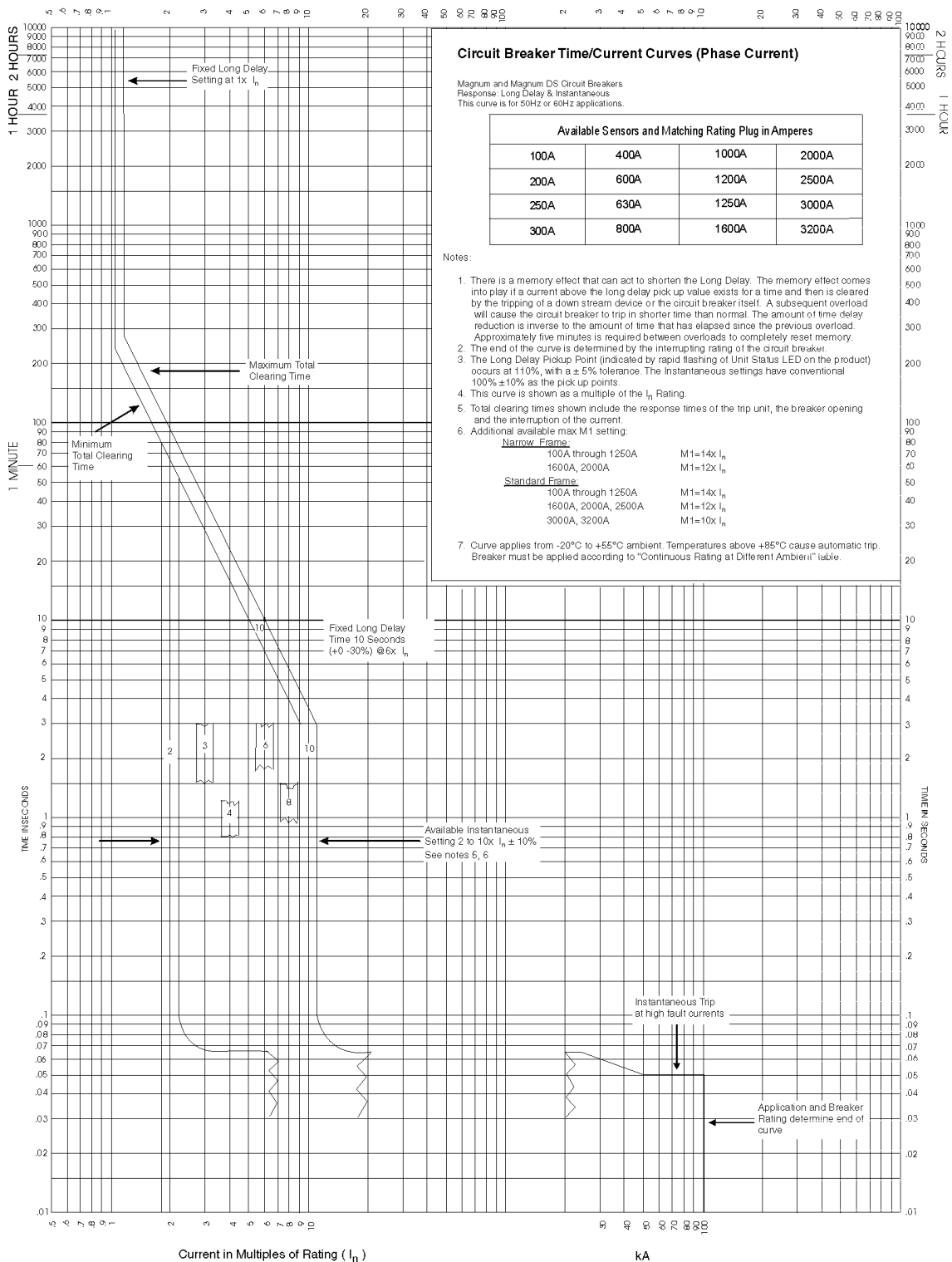
Table 5.46 Miscellaneous Accessories

Description	Catalog Number	Kit Contents/Accessory Function
Breaker Maintenance and Handling		
Levering Device	None Required	Special levering device not required. Use 10 mm socket and drive set
Lifting Yoke (3-pole Narrow Frame)	8651C91G09	Fits 3-pole Narrow Frame Circuit Breaker
Lifting Yoke (3-pole Standard Frame)	8651C91G02	Fits 3-pole Standard Frame Circuit Breaker
Lifting Yoke (3-pole Double Frame)	8651C91G05	Fits 3-pole Double Frame Circuit Breaker
Lifting Yoke (4-pole Narrow Frame)	8651C91G10	Fits 4-pole Narrow Frame Circuit Breaker
Lifting Yoke (4-pole Standard Frame)	8651C91G07	Fits 4-pole Standard Frame Circuit Breaker
Lifting Yoke (4-pole Double Frame)	8651C91G08	Fits 4-pole Double Frame Circuit Breaker
Roll on Floor Lifting Device	6727D63H20	Lifts breaker fitted with lofting yoke from above
Breaker Trip Unit Test Devices and Accessories		
Magnum Trip Unit Tester	MTST1	Hand-Held Tester for Digitrip 220, 520, 520M and 520MC Trip Units
Triplink Cable	5720B59G01	Downloads Trip Unit Settings from one Digitrip RMS 1150 Trip Unit to another
Miscellaneous Breaker and Enclosure Accessories		
Door Escutcheon and Gasket Kit	MDES	Escutcheon, Gasket and Mounting Hardware
IP54 Door Cover Kit	MDESC	IP54 Cover, Gasket and Mounting Hardware
Non-Automatic Circuit Breaker Cover	MTUNACI	Cover Trip Unit Cavity on Non-Automatic Breakers
Cassette Rejection Bracket Kit	MCELLREJBK	Circuit Breaker Cell Rejection Bracket Kit (Cassette Mounting)
Capacitor Unit for Breaker Capacitor Trip	Contact C-H	Enclosure Mounted AC Capacitor Unit for circuit breaker Capacitor Trip
Peripheral Devices		
Mmint MODBUS Translator	MMINT	Translates INCOM for up to 32 Communicating Trip Units to Modbus
Digital Relay Accessory Module	DRAM	Used with Accessory Bus on Digitrip 1150 Trip Unit

Engineering Data Reference Chart

Sections	Reference #	Product Description	For Use with or Installation of
Breaker Instruction Book	2C12060H05 2C13060H03	Magnum DS Fixed/Drawout Power Circuit Breakers (ANSI) Magnum Fixed/Drawout Power Circuit Breakers (IEC)	Installation, Operation and Maintenance Installation, Operation and Maintenance
Trip Unit IL	70C1036H03 70C1037H04 70C1080H02	Digitrip Models 1150 & 1150i Trip Units (includes 1150P) Digitrip Models 220, 220+, 520, 520i, 520Mi, 520MC & 520MCi Trip Units Ground Fault Alarm Power Supply	2A11799G40 - G44 2A11799G01 - G33 7802C83G01/G02
Breaker Accessory and Field Option Kit	2C14766H01 2C14761H01 2C14762H01 2C14760H01 2C13769H02 2C13769H01 2C12769H01 2C12769H02 2C12865H01 2A11851H10 2C12895H01 2C13761H01 2C13763H01 2C13760H01 2C13766H01 2C13795H03 2C13820H01 2C14763H01 2C14764H01 2C14765H01 2C12894H01 2C14767H01 2C13764H01	Breaker Auxiliary Switch Field Option Kit Breaker Spring Release Field Option Kit Breaker Shunt Trip Field Option Kit Breaker Undervoltage Release Field Option Kit Breaker Motor Operator Field Option Kit (For Narrow, Standard & Double Frame) Breaker Motor Operator Field Option Kit (For Standard & Double Frame Only) Latch Check Switch for use with Spring Release Field Option Kit Latch Check Switch (accessible) Field Option Kit Charging Handle Replacement Kit Center Pull Handle Replacement Parts Kit Pushbutton Cover Field Option Kit Breaker Kirk Key Interlock Provision Field Option Kit Breaker Castell Key Interlock Provision Field Option Kit Breaker Ronis Key Interlock Provision Field Option Kit Breaker Pop-out Trip Indicator with Switches Field Option Kit Fixed Breaker Secondary Terminal Mounting Bracket Field Option Kit Front Mounted Standard Terminal Field Option Kit 800-1600A Vertical Adapter Field Option Kit 2000A Vertical Adapter Field Option Kit 3000-3200A Vertical Adapter Field Option Kit Door Escutcheon with Gasket Field Option Kit Breaker Operations Counter Field Option Kit Non-Auto Breaker Trip Unit Cover Field Option Kit	2A11796 2A11792 2A11791 2A11793 2A11794G41 - G46 2A11794G22 - G35 2C13797G01 2C13797G02 2A10892 2A11851 2C12890 2C12891G01 2C12891G02 2C12891G03 1B93491 2C13794 2A10820 2A11795G01, G11 & G41 2A11795G02, G12 & G42 2A11795G48, G49, G53, G54, G56 G58 2C12893 2A10890 2A11797
Cassette Accessory and Field Option Kit	2C12093H01 2C12093H02 2C13768H01 2C13765H01 2C13860H01 2C14691H01 2C14694H01 2C14694H02 2C14696H01	3 Pole ANSI Cassette Shutters Field Option Kit 4 Pole ANSI Cassette Shutters Field Option Kit IEC 800-3200A Cassette Shutters Field Option Kit IEC 4000-6300A Cassette Shutters Field Option Kit Cassette Universal Bus Adapter Field Option Kit Cassette Key Interlock Provision Field Option Kit ANSI Cassette Cell Switch Field Option Kit IEC Cassette Cell Switch Field Option Kit Cassette CT Shorting & Jumper Block Field Option Kit	2C12998 2C12998 1B93096 1B93098 2A10670 1B93091 1B93090 2C13793 1B93094
Miscellaneous Accessories	2C12766H01 2C12767H01 2C12768H01 2C12860H01 2C12861H01 2C12862H01 2C12863H01 2C12864H01 2C13790H01 2C14695H01 2C12896H01 2C12896H02 2C12898H01	Fixed Breaker 2-Way Cable Interlock Field Option Kit Fixed Breaker 2-Way Rod Interlock Field Option Kit Drawout Breaker 2-Way Rod Interlock Field Option Kit Drawout Breaker 2-Way Cable Interlock Field Option Kit Drawout Breaker MI31 3-Way Cable Interlock Field Option Kit Fixed Breaker MI31 3-Way Cable Interlock Field Option Kit Drawout Breaker MI32 3-Way Cable Interlock Field Option Kit Fixed Breaker MI32 3-Way Cable Interlock Field Option Kit Secondary Wiring Kit to 6 Point Termination Block Field Option Kit 6 Point Terminal Block Field Option Kit Drawout Breaker 1100V Arc Hood Barrier Field Option Kit Fixed Breaker 1100V Arc Hood Barrier Field Option Kit Fixed Breaker Arc Hood Barrier Field Option Kit	2A11857G02, 2A11858G01 2A11856G02, 2A11859G02 2A11856G01, 2A11859G01 2A11857G01, 2A11858 2A11857G03/G07, 2A11858 2A11857G04/G08, 2A11858 2A11857G05, 2A11858 2A11857G06, 2A11858 1B93093 1B93092 2A10800G02 2A10800G12 2C12898
Renewal Parts Kit	2C12760H01 2C12761H01 2C12762H01 2C12763H01 2C12764H01 2C12866H01 2C12867H01 2C13762H01 2C12061H02 2C12897H01 2C12899H01 2C13767H01 2C15860H01	Breaker Stationary Contact Replacement Kit Breaker Moving Contact Replacement Kit Breaker Secondary Disconnect Block Replacement Kit Breaker Terminal Block Replacement Kit Breaker Accessory Tray Replacement Kit Levering Mechanism Assembly Replacement Kit Levering Door Mechanism Assembly Replacement Kit Breaker Current Sensor & Rating Plug Replacement Kit Hatchet Assembly Replacement Parts Kit Drawout 2500-3200A Breaker Vertical Adapter Replacement Kit Drawout Breaker Standard/Double Frame Rejection Bracket Replacement Kit Cassette Standard/Double Frame Rejection Bracket Replacement Kit Drawout Breaker Narrow Frame Rejection Bracket Replacement Kit	2A10896 2C12761 2A10899 2A10854 2A10891 2A10855 2A10894 2A11798 2A11855 2A11795G48-49 & G53-54 2A11893G01, G02 1B92695G01, G02 & G51 2A11893G92-G94

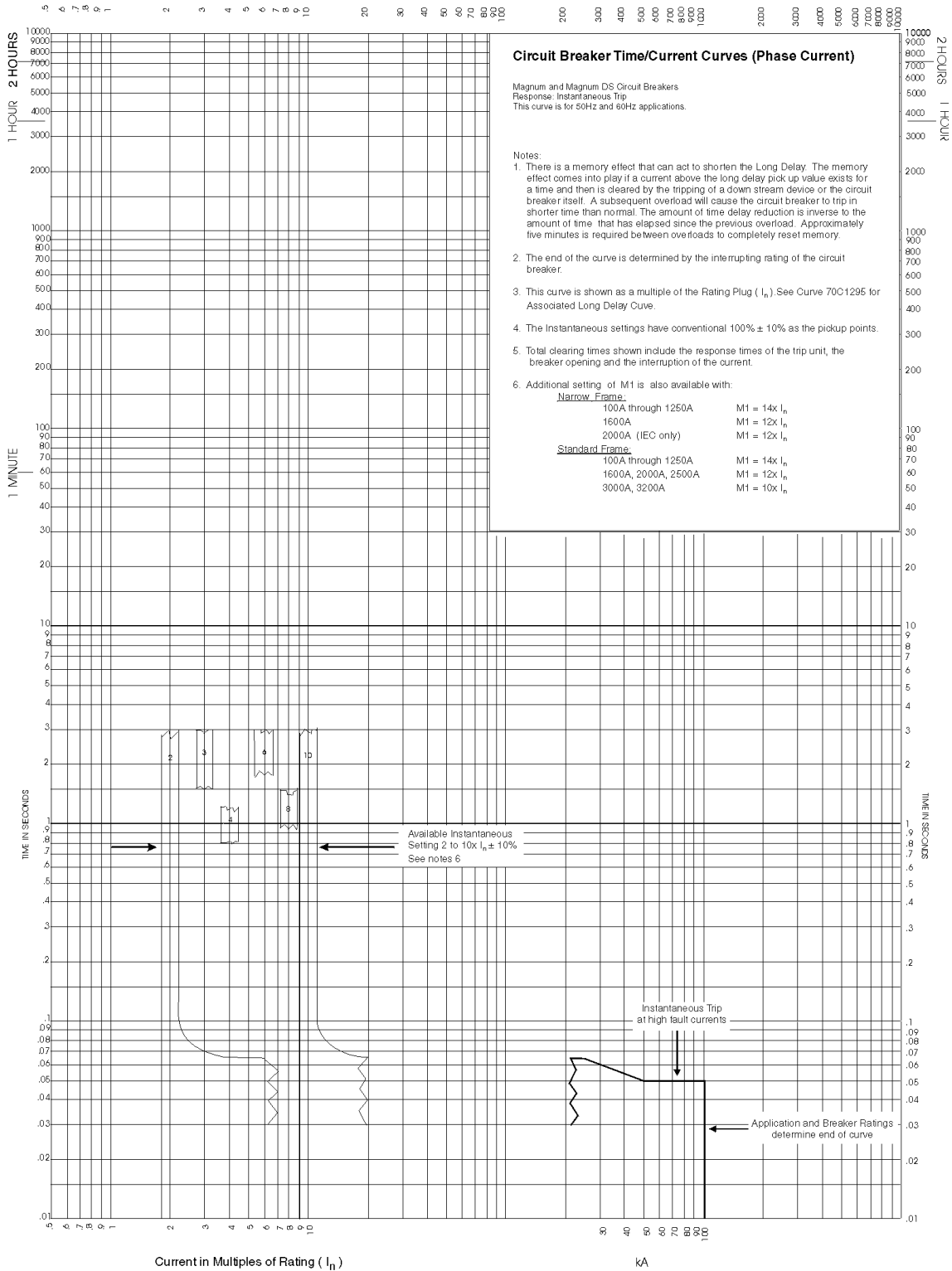
Digitrip 220 - Long Delay & Instantaneous Curves



Dwg. No: 70C1010
April 2003

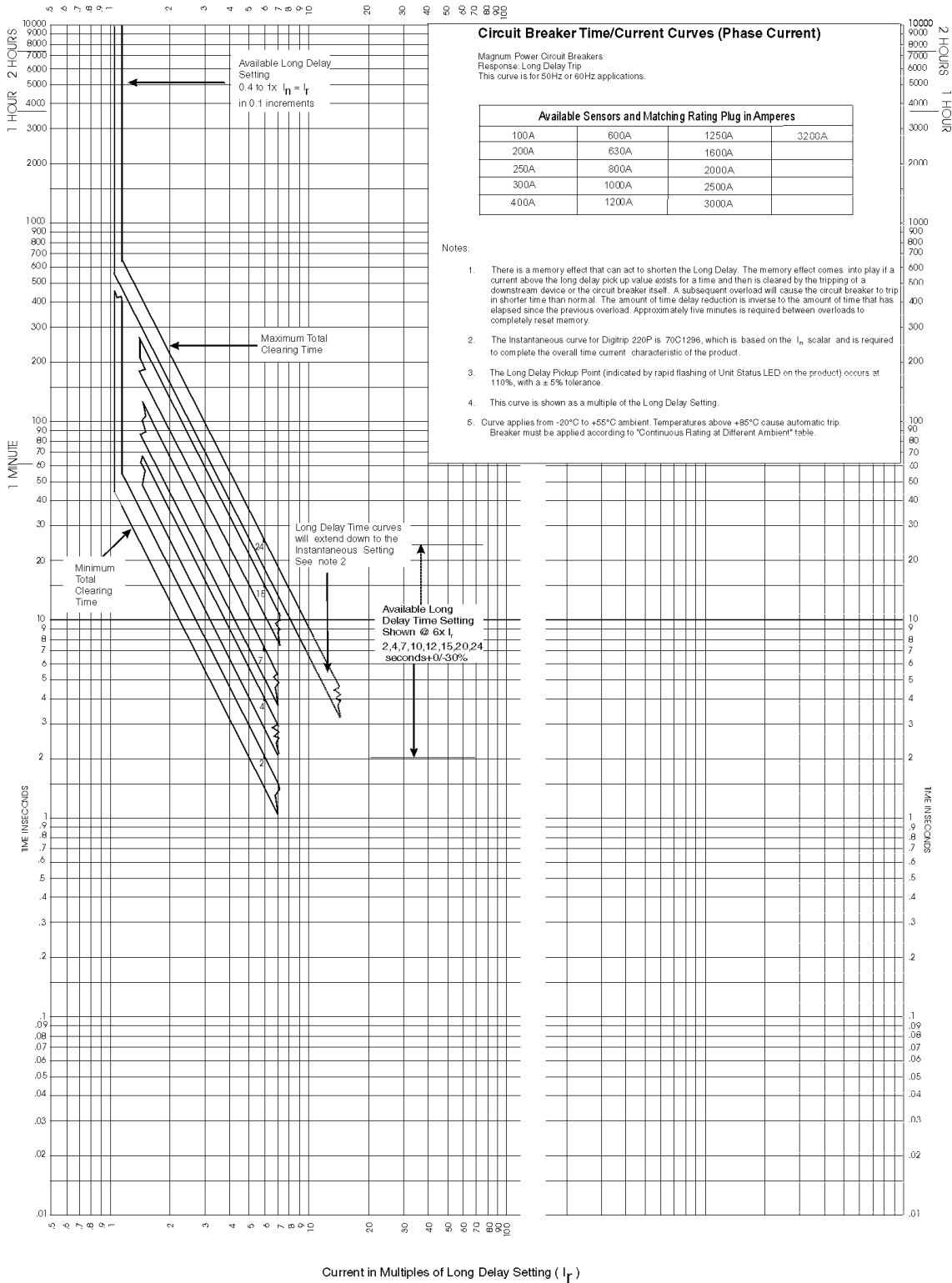
EATON | Cutler-Hammer

Digitrip 220+ Instantaneous Curve



Dwg. No: 70C1296
April 2003

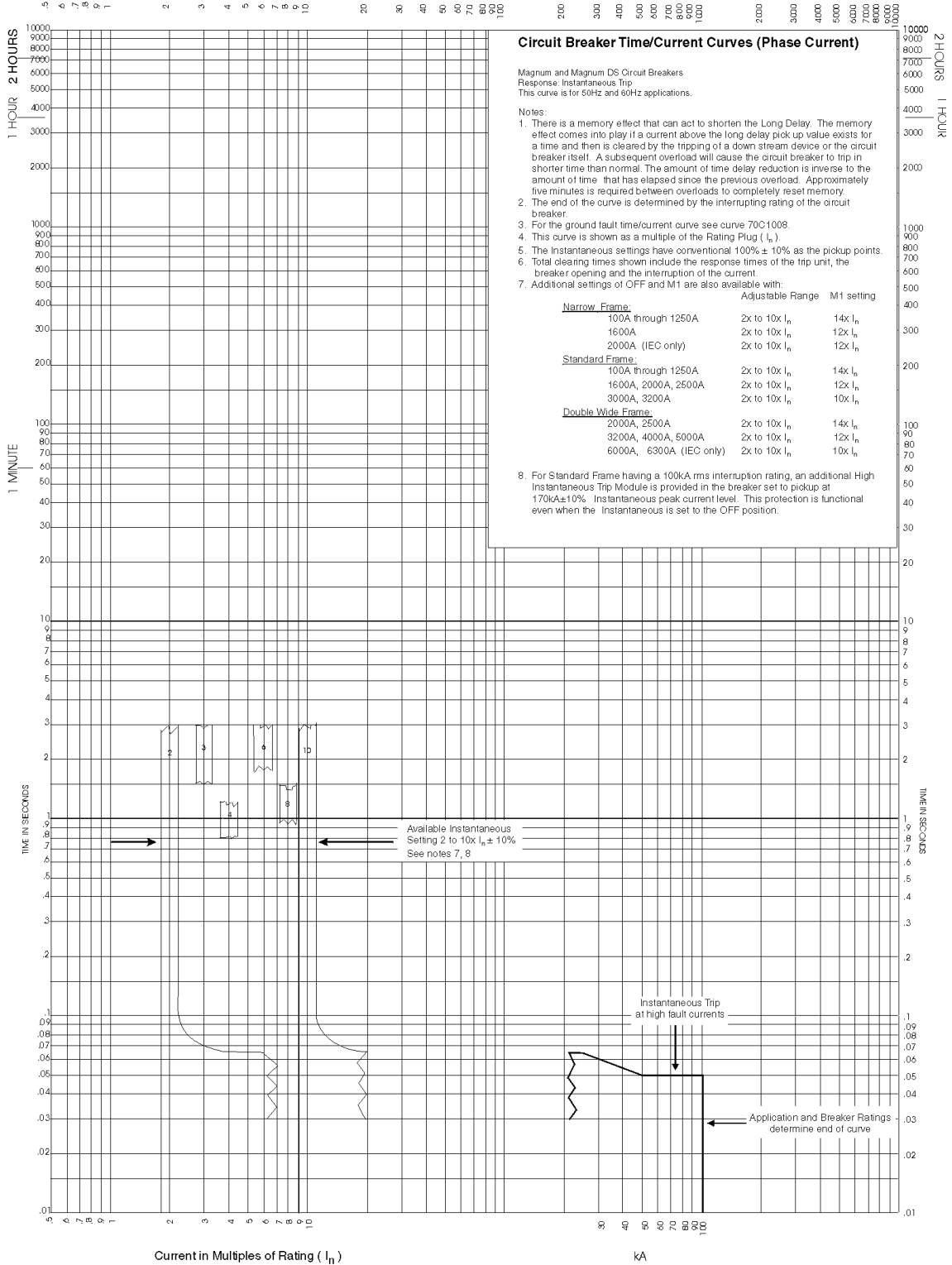
Digitrip 220+ Long Delay Curves



Dwg No: 70C1295
April 2003

EATON | Cutler-Hammer

Digitrip 520 / 520M / 520MC / 520i / 520Mi / 520MCi Instantaneous Curve



Circuit Breaker Time/Current Curves (Phase Current)

Magnum and Magnum DS Circuit Breakers
Response: Instantaneous Trip
This curve is for 50Hz and 60Hz applications.

Notes:

1. There is a memory effect that can act to shorten the Long Delay. The memory effect comes into play if a current above the long delay pickup value exists for a time and then is cleared by the tripping of a downstream device or the circuit breaker itself. A subsequent overload will cause the circuit breaker to trip in shorter time than normal. The amount of time delay reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately five minutes is required between overloads to completely reset memory.
2. The end of the curve is determined by the interrupting rating of the circuit breaker.
3. For the ground fault time/current curve see curve 70C1008.
4. This curve is shown as a multiple of the Rating Plug (I_n).
5. The instantaneous settings have conventional $100\% \pm 10\%$ as the pickup points.
6. Total clearing times shown include the response times of the trip unit, the breaker opening and the interruption of the current.
7. Additional settings of OFF and M1 are also available with:

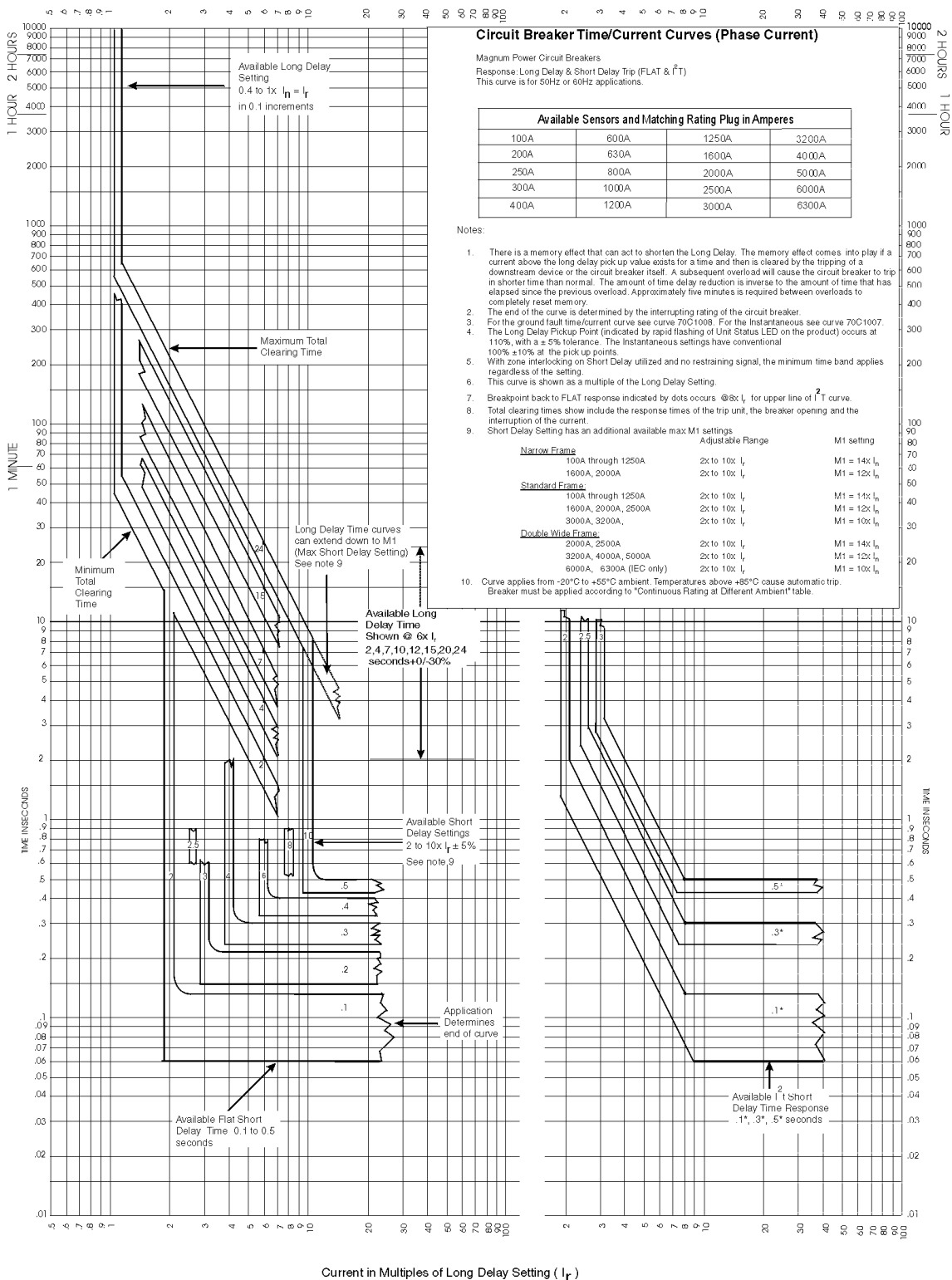
	Adjustable Range	M1 setting
Narrow Frame		
100A through 1250A	2x to 10x I_n	14x I_n
1600A	2x to 10x I_n	12x I_n
2000A (IEC only)	2x to 10x I_n	12x I_n
Standard Frame		
100A through 1250A	2x to 10x I_n	14x I_n
1600A, 2000A, 2500A	2x to 10x I_n	12x I_n
3000A, 3200A	2x to 10x I_n	10x I_n
Double Wide Frame		
2000A, 2500A	2x to 10x I_n	14x I_n
3200A, 4000A, 5000A	2x to 10x I_n	12x I_n
6000A, 6300A (IEC only)	2x to 10x I_n	10x I_n

8. For Standard Frame having a 100kA rms interruption rating, an additional High Instantaneous Trip Module is provided in the breaker set to pickup at $170kA \pm 10\%$ Instantaneous peak current level. This protection is functional even when the Instantaneous is set to the OFF position.

Dwg. No: 70C1007
April 2003

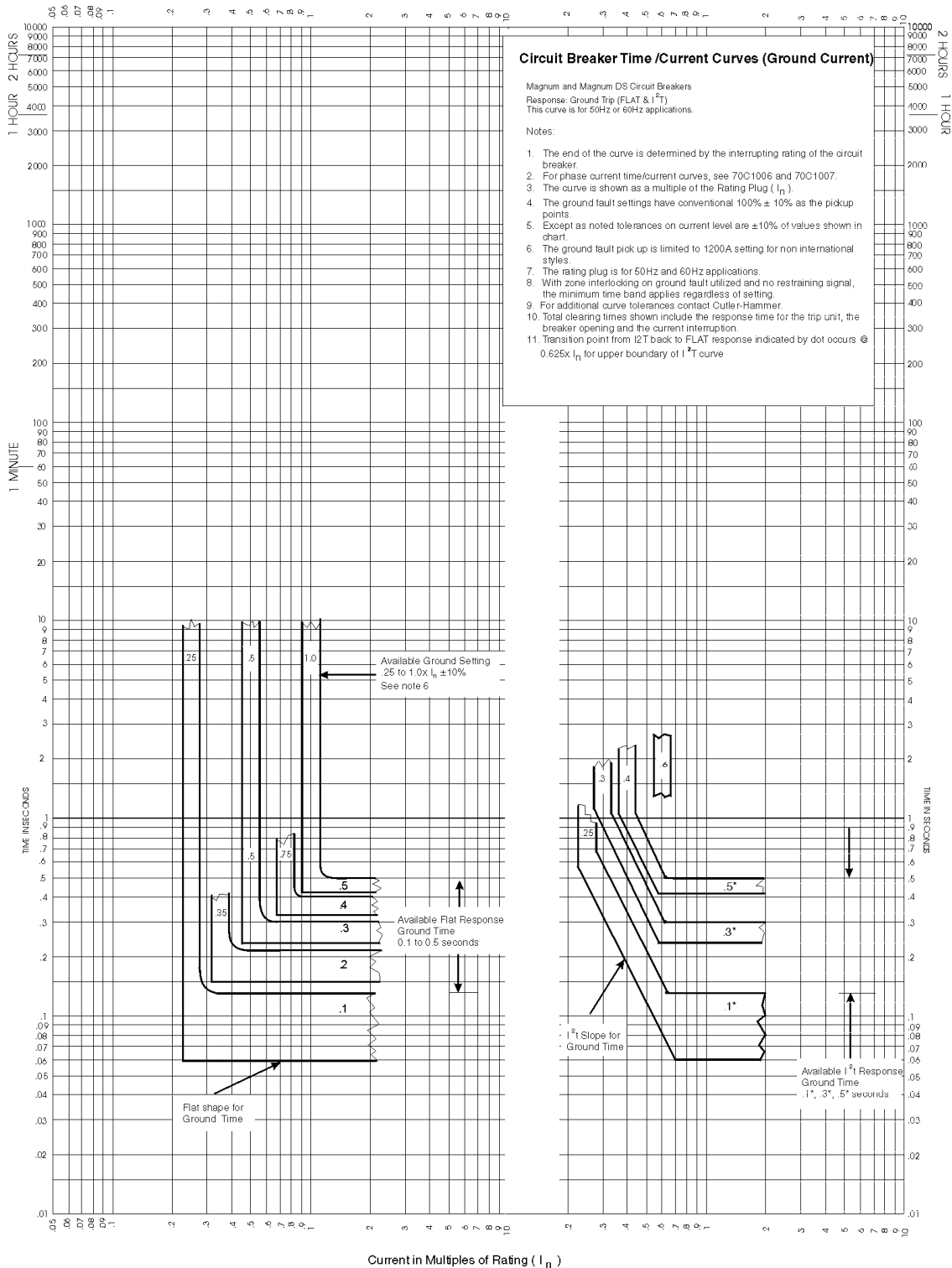
EATON Cutler-Hammer

Digitrip 520 / 520M / 520MC / 520i / 520Mi / 520MCi - Long Delay & Short Delay Curves

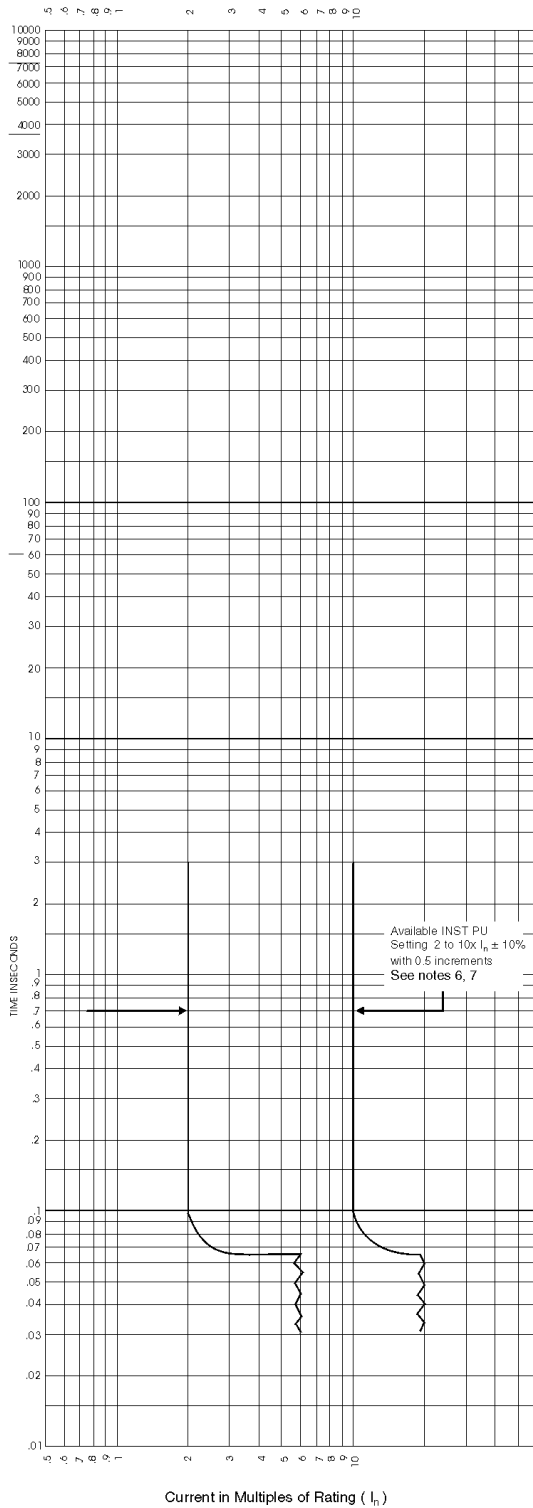


Dwg No: 70C1006
 April 2003

Digitrip 520 / 520M / 520MC / 520i / 520Mi / 520MCi - Ground Curve



Dwg. No: 70C1008
April 2003

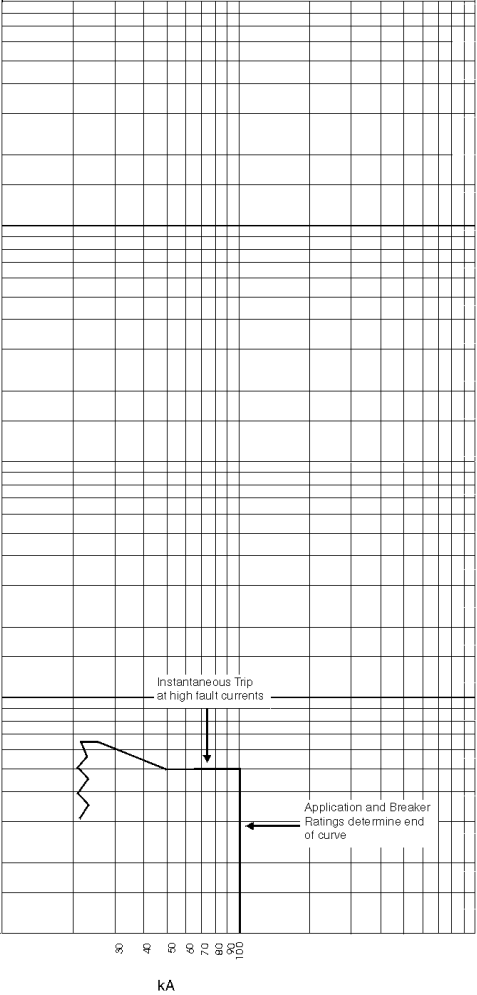


Circuit Breaker Time/Current Curves (Phase Current)
 Magnum and Magnum DS Circuit Breakers
 Response: Instantaneous Trip
 This curve is for 50Hz or 60Hz applications.

Notes:

- There is a memory effect that can act to shorten the Long Delay. The memory effect comes into play if a current above the Long Delay Pickup value exists for a time and then is cleared by the tripping of a downstream device or the circuit breaker itself. A subsequent overload will cause the circuit breaker to trip in shorter time than normal. The amount of time delay reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately five minutes is required between overloads to completely reset memory.
- The end of the curve is determined by the interrupting rating of the circuit breaker.
- This curve is shown as a multiple of the Rating Plug (I_n).
- The instantaneous settings have conventional $100\% \pm 10\%$ as their pick up points.
- Total clearing times shown include the response times of the trip unit, the breaker opening and the interruption of the current.
- Additional settings of OFF is also available

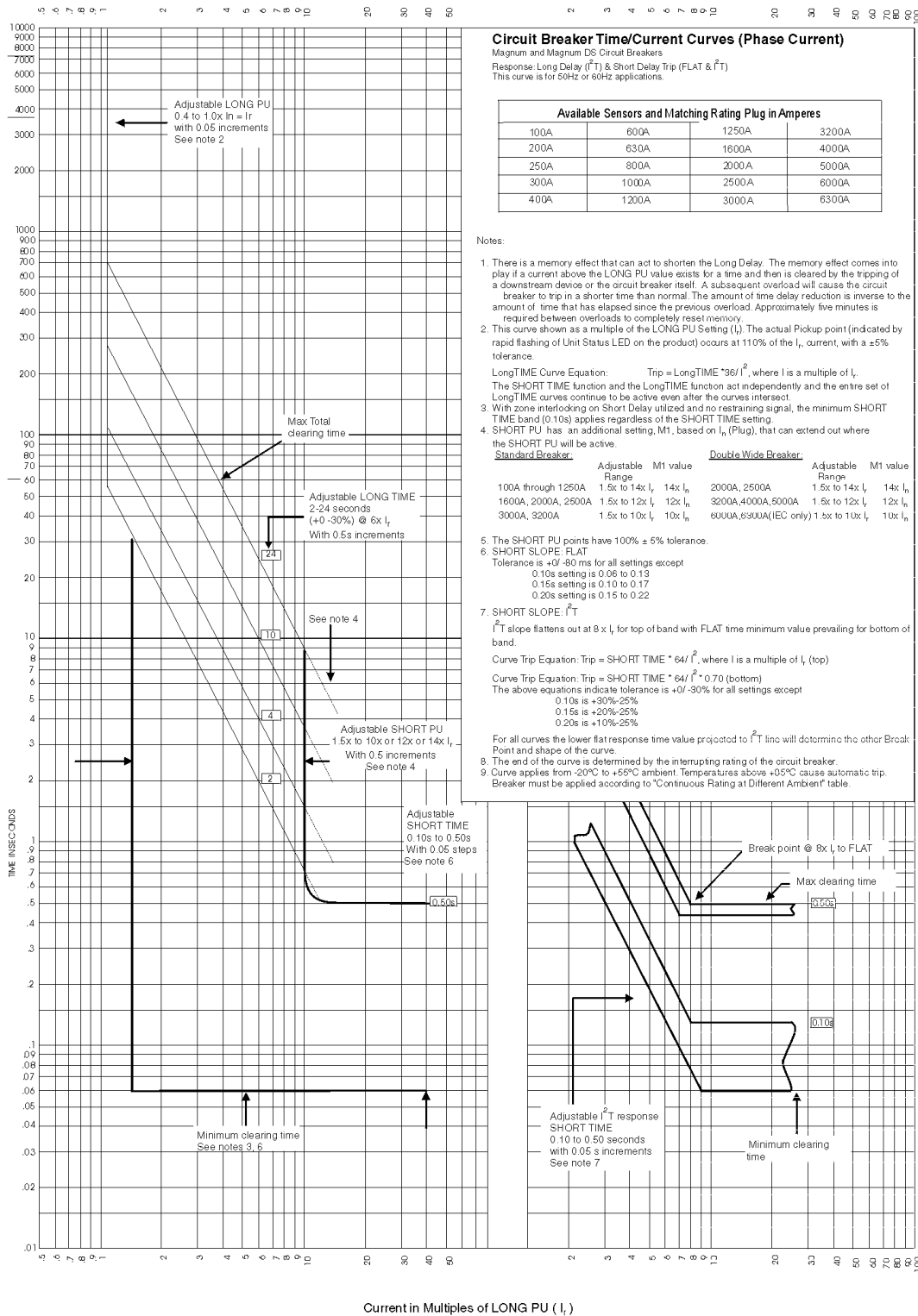
<u>Standard Frame:</u>	Adjustable Range
100A through 1250A	2x to 14x I_n
1600A, 2000A, 2500A	2x to 12x I_n
3000A, 3200A	2x to 10x I_n
<u>Double Wide Frame:</u>	
2000A, 2500A	2x to 14x I_n
3200A, 4000A, 5000A	2x to 12x I_n
6000A, 6300A (IEC only)	2x to 10x I_n
- For breakers rated 3200A and less having a 100kA rms interruption rating, an additional High Instantaneous Trip Module is provided in the breaker set to trip at a 170kA $\pm 10\%$ instantaneous peak current level. This protection is functional even when the Instantaneous is set to the OFF position.



Dwg. No: 70C1043
 April 2003

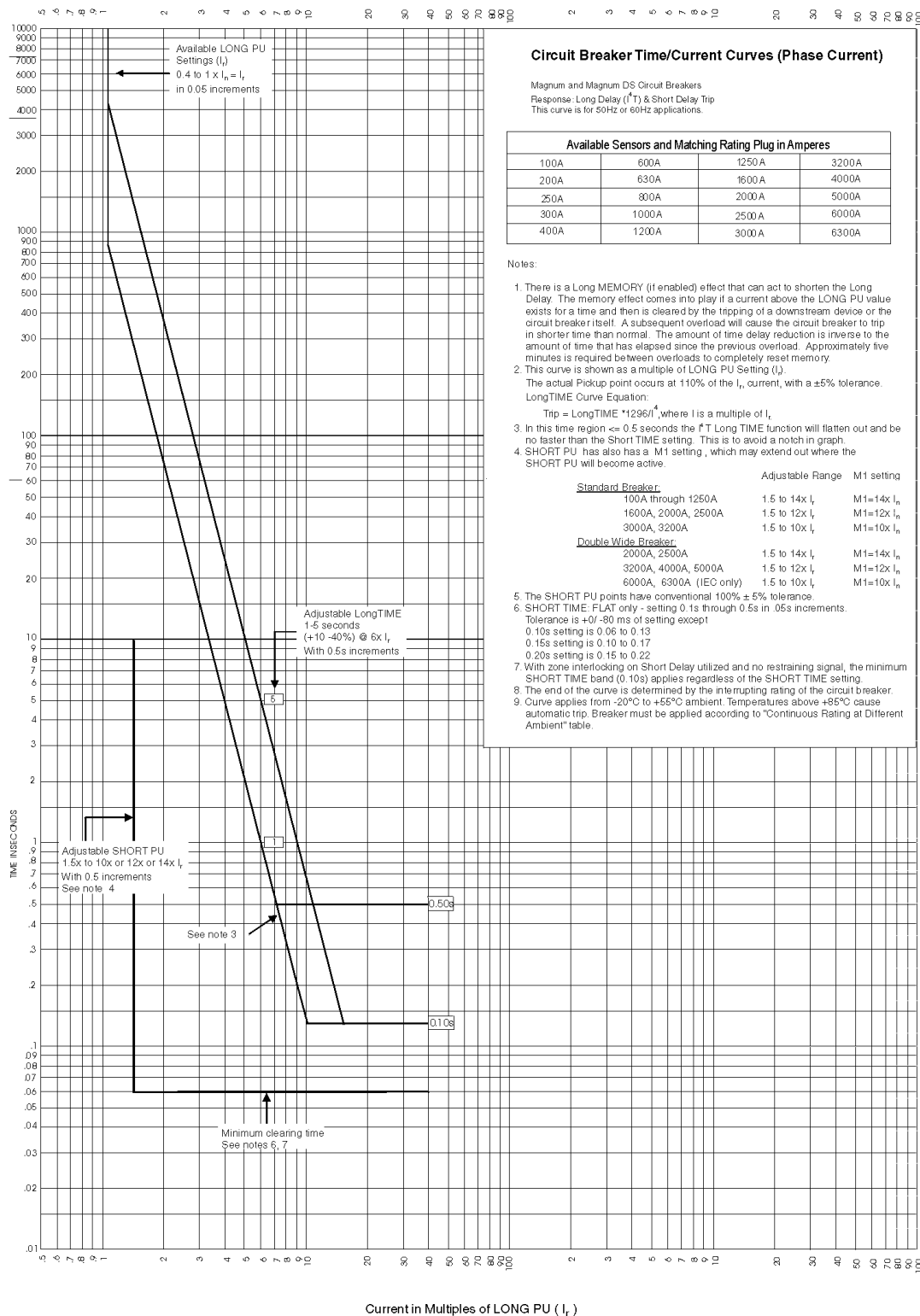
Digitrip 1150 / 1150i - I²T Curves

Range: 2-24 seconds @ 6x I_r



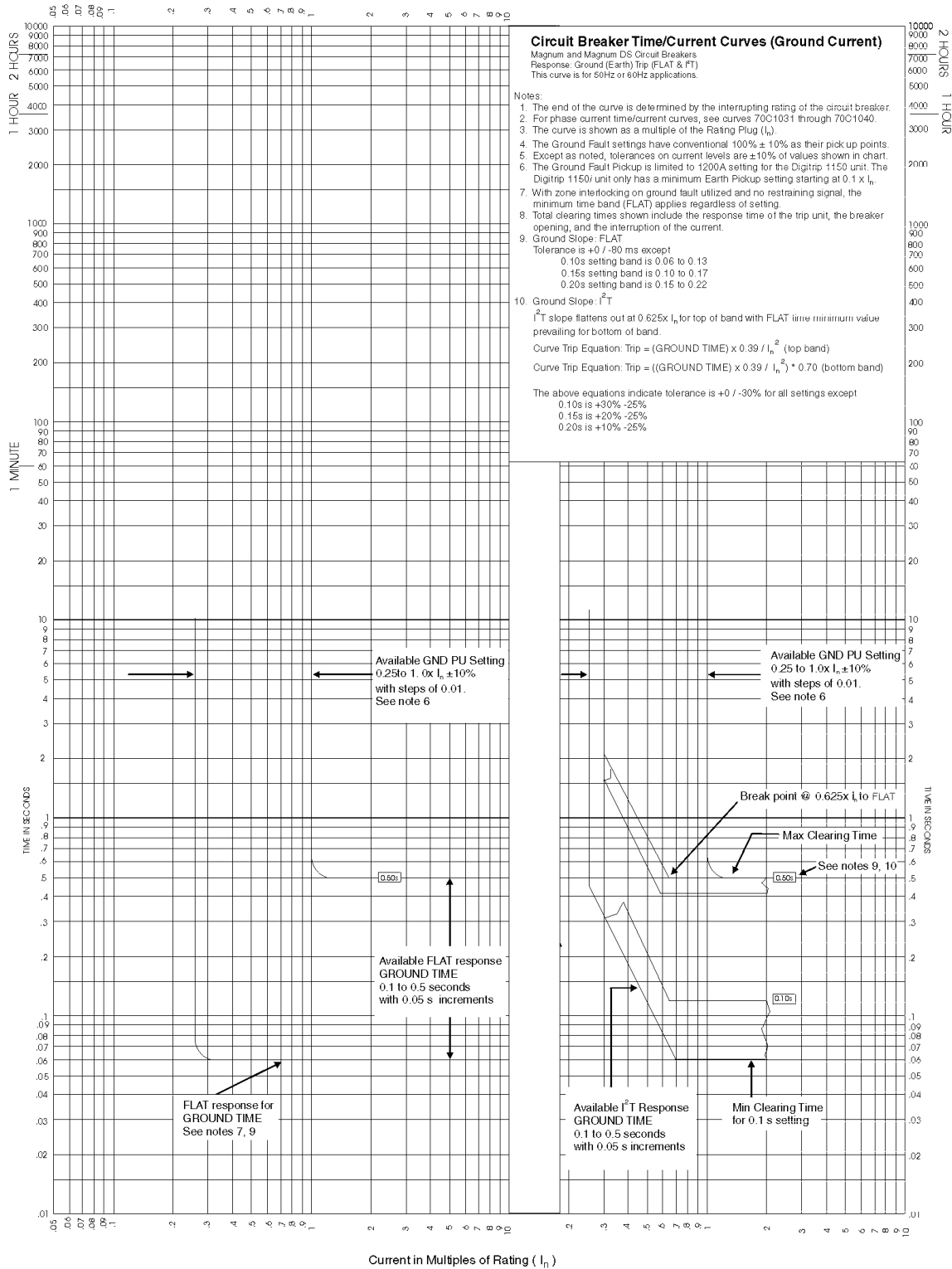
Dwg. No: 70C1034
 April 2003

Digitrip 1150 / 1150i - I²T Curves
Range: 1-5 seconds @ 6x I_r



Dwg. No: 70C1035
April 2003

Digitrip 1150 / 1150i- Ground (Earth) Curve



Circuit Breaker Time/Current Curves (Ground Current)

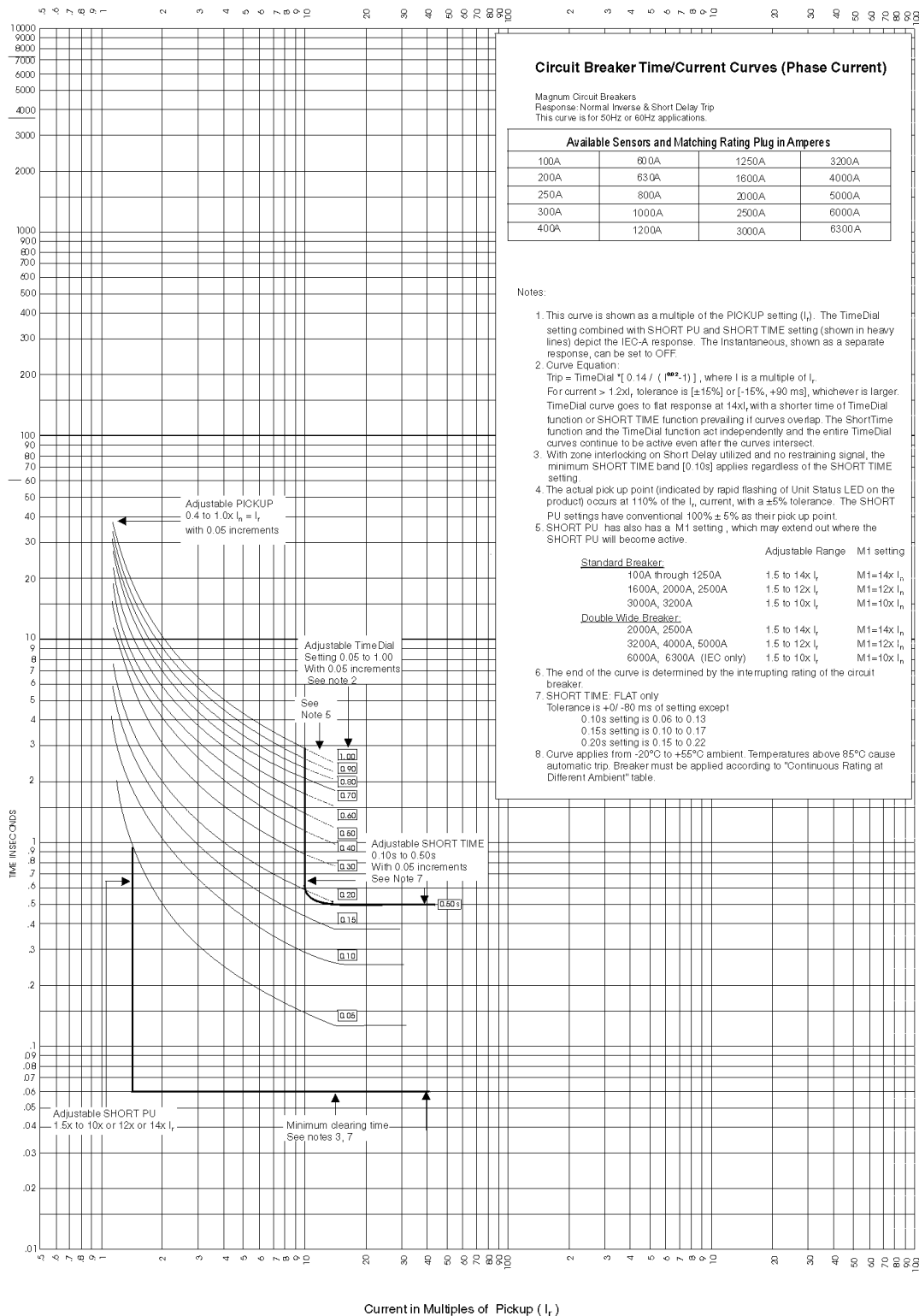
Magnum and Magnum DS Circuit Breakers
 Response: Ground (Earth) Trip (FLAT & FT)
 This curve is for 50Hz or 60Hz applications.

Notes:

1. The end of the curve is determined by the interrupting rating of the circuit breaker.
 2. For phase current time/current curves, see curves 70C1031 through 70C1040.
 3. The curve is shown as a multiple of the Rating Plug (I_n).
 4. The Ground Fault settings have conventional $100\% \pm 10\%$ as their pick up points.
 5. Except as noted, tolerances on current levels are $\pm 10\%$ of values shown in chart.
 6. The Ground Fault Pickup is limited to 1200A setting for the Digitrip 1150 unit. The Digitrip 1150i unit only has a minimum Earth Pickup setting starting at $0.1 \times I_n$.
 7. With zone interlocking on ground fault utilized and no restraining signal, the minimum time band (FLAT) applies regardless of setting.
 8. Total clearing times shown include the response time of the trip unit, the breaker opening, and the interruption of the current.
 9. Ground Slope: FLAT
 Tolerance is $+0 / -80$ ms except
 0.10s setting band is 0.06 to 0.13
 0.15s setting band is 0.10 to 0.17
 0.20s setting band is 0.15 to 0.22
 10. Ground Slope: I^2T
 I^2T slope flattens out at $0.625 \times I_n$ for top of band with FLAT time minimum value prevailing for bottom of band.
 Curve Trip Equation: Trip = ((GROUND TIME) $\times 0.39 / I_n^2$) (top band)
 Curve Trip Equation: Trip = ((GROUND TIME) $\times 0.39 / I_n^2$) * 0.70 (bottom band)
- The above equations indicate tolerance is $+0 / -30\%$ for all settings except
 0.10s is $+30\% -25\%$
 0.15s is $+20\% -25\%$
 0.20s is $+10\% -25\%$

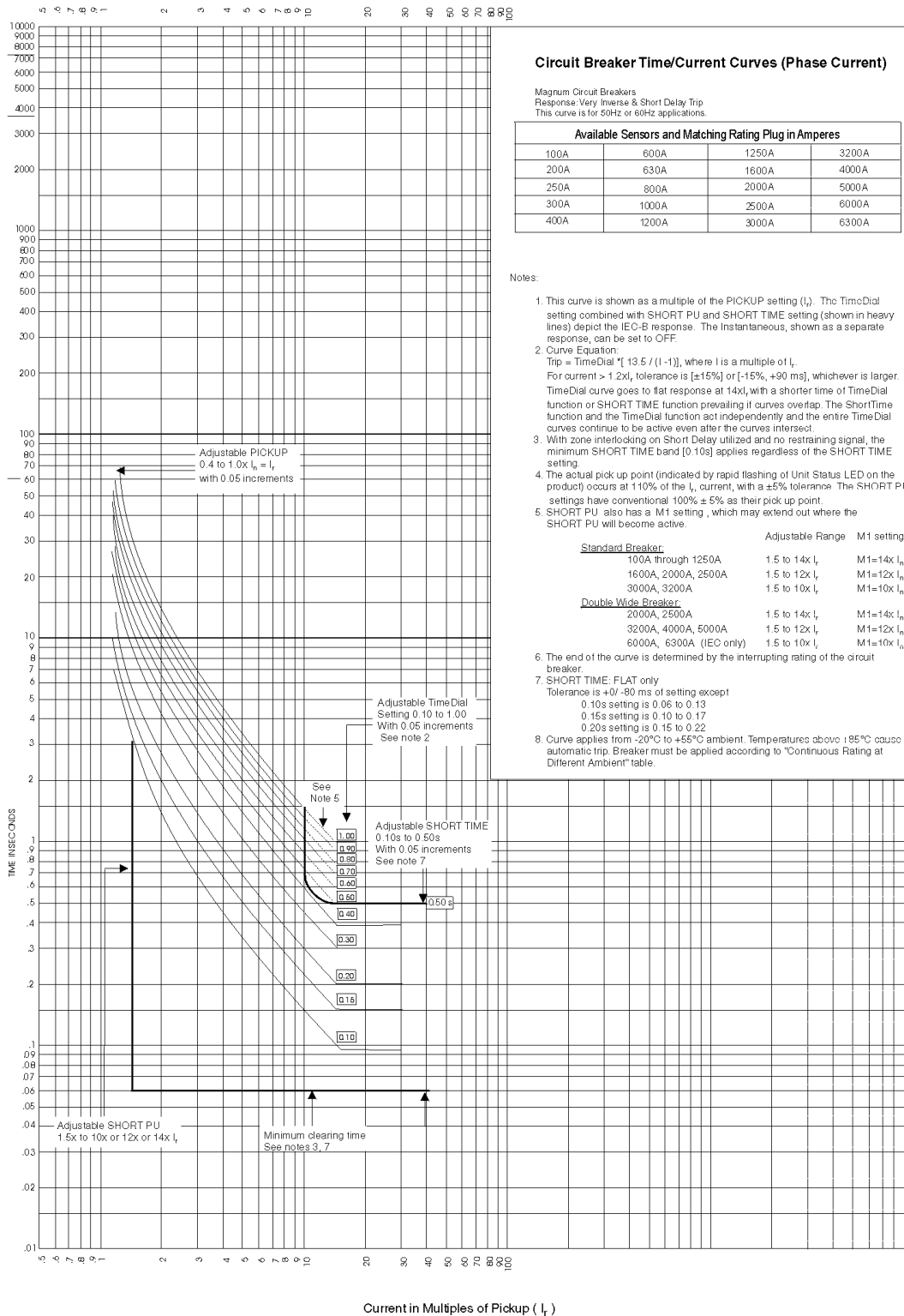
Dwg. No: 70C1041
 April 2003

Digitrip 1150/- IEC Curves
IEC-A (Normal Inverse)



Dwg. No: 70C1031
April 2003

Digitrip 1150i - IEC Curves
IEC-B (Very Inverse)



Circuit Breaker Time/Current Curves (Phase Current)

Magnum Circuit Breakers
Response Very Inverse & Short Delay Trip
This curve is for 50Hz or 60Hz applications

Available Sensors and Matching Rating Plug in Amperes			
100A	600A	1250A	3200A
200A	630A	1600A	4000A
250A	800A	2000A	5000A
300A	1000A	2500A	6000A
400A	1200A	3000A	6300A

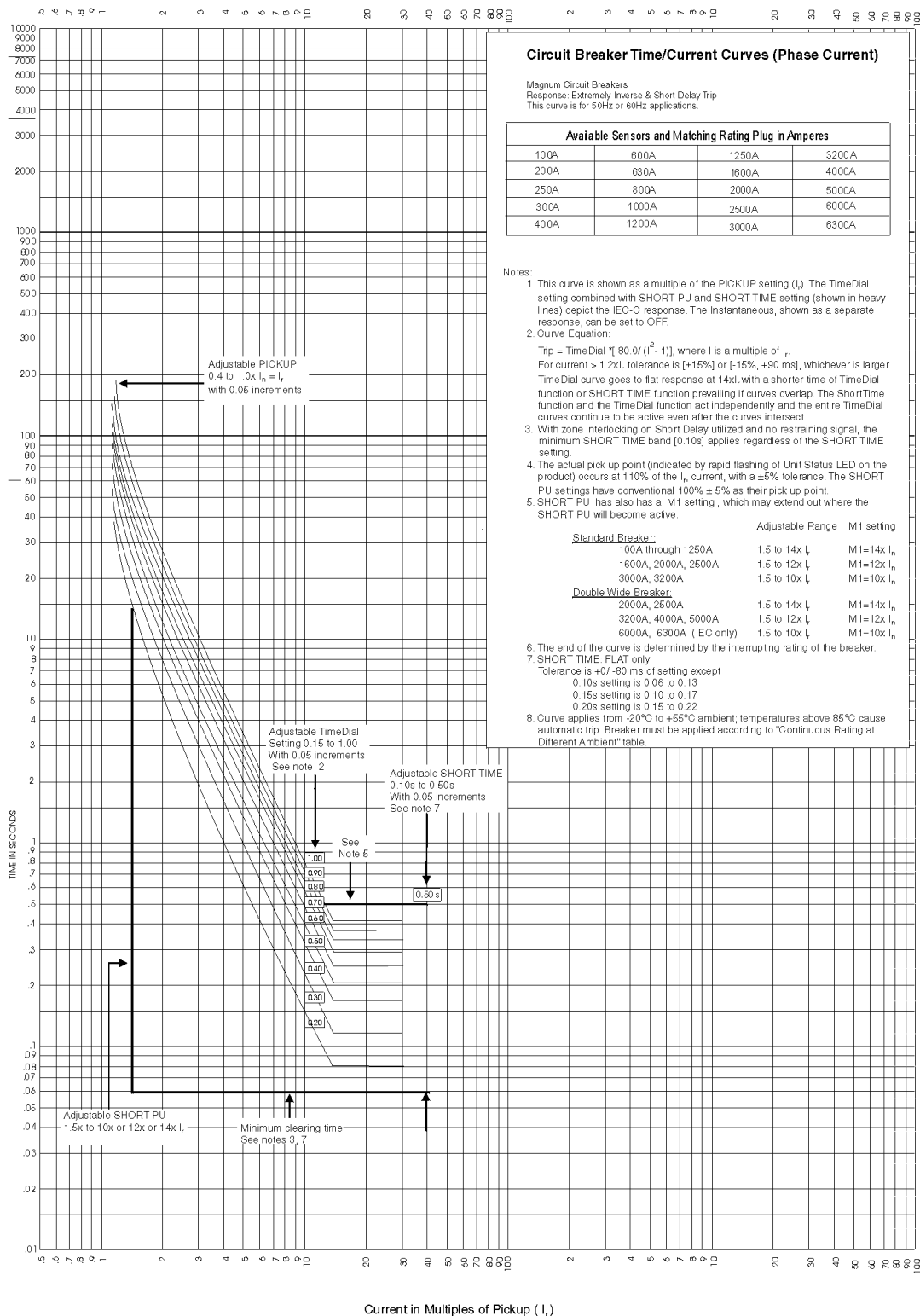
Notes:

- This curve is shown as a multiple of the PICKUP setting (I_p). The TimeDial setting combined with SHORT PU and SHORT TIME setting (shown in heavy lines) depict the IEC-B response. The Instantaneous, shown as a separate response, can be set to OFF.
- Curve Equation
 $Trip = \text{TimeDial} * [13.5 / (I - 1)]$, where I is a multiple of I_p .
 For current $> 1.2x I_p$, tolerance is $\pm 15\%$ or $[-15\%, +90 \text{ ms}]$, whichever is larger. TimeDial curve goes to flat response at $14x I_p$, with a shorter time of TimeDial function or SHORT TIME function prevailing if curves overlap. The ShortTime function and the TimeDial function act independently and the entire TimeDial curves continue to be active even after the curves intersect.
- With zone interlocking on Short Delay utilized and no restraining signal, the minimum SHORT TIME band (0.10s) applies regardless of the SHORT TIME setting.
- The actual pick up point (indicated by rapid flashing of Unit Status LED on the product) occurs at 110% of the I_p current, with a $\pm 5\%$ tolerance. The SHORT PU settings have conventional $100\% \pm 5\%$ as their pick up point.
- SHORT PU also has a M1 setting, which may extend out where the SHORT PU will become active.

	Adjustable Range	M1 setting
Standard Breaker:		
100A through 1250A	1.5 to $14x I_p$	M1= $14x I_p$
1600A, 2000A, 2500A	1.5 to $12x I_p$	M1= $12x I_p$
3000A, 3200A	1.5 to $10x I_p$	M1= $10x I_p$
Double Wide Breaker:		
2000A, 2500A	1.5 to $14x I_p$	M1= $14x I_p$
3200A, 4000A, 5000A	1.5 to $12x I_p$	M1= $12x I_p$
6000A, 6300A (IEC only)	1.5 to $10x I_p$	M1= $10x I_p$
- The end of the curve is determined by the interrupting rating of the circuit breaker.
- SHORT TIME: FLAT only
 Tolerance is $\pm 0.80 \text{ ms}$ of setting except
 0.10s setting is 0.06 to 0.13
 0.15s setting is 0.10 to 0.17
 0.20s setting is 0.15 to 0.22
- Curve applies from -20°C to $+55^\circ\text{C}$ ambient. Temperatures above $+85^\circ\text{C}$ cause automatic trip. Breaker must be applied according to "Continuous Rating at Different Ambient" table.

Dwg. No: 70C1032
April 2003

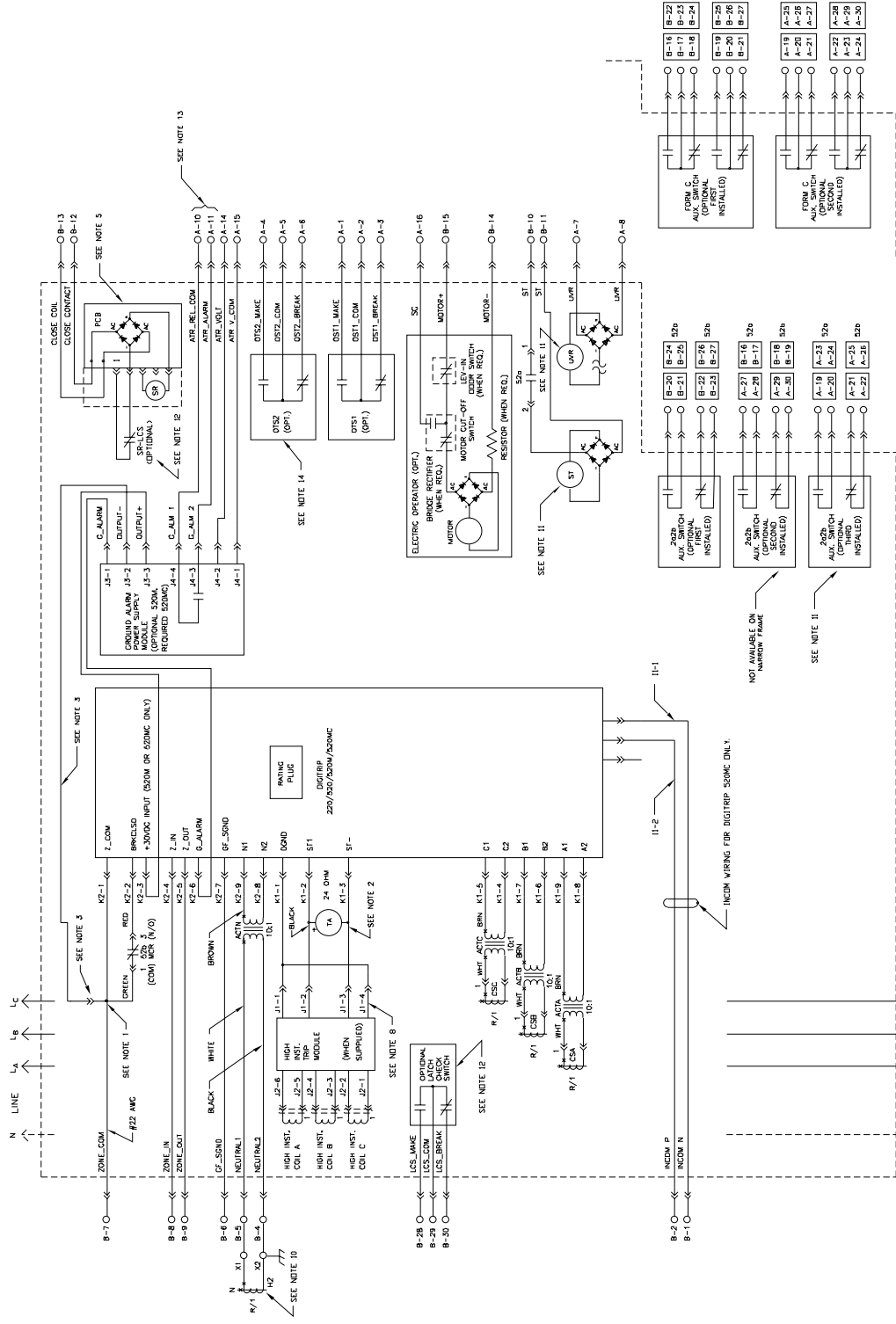
**Digitrip 1150/- IEC Curves
IEC-C (Extremely Inverse)**



Dwg. No: 70C1033
April 2003

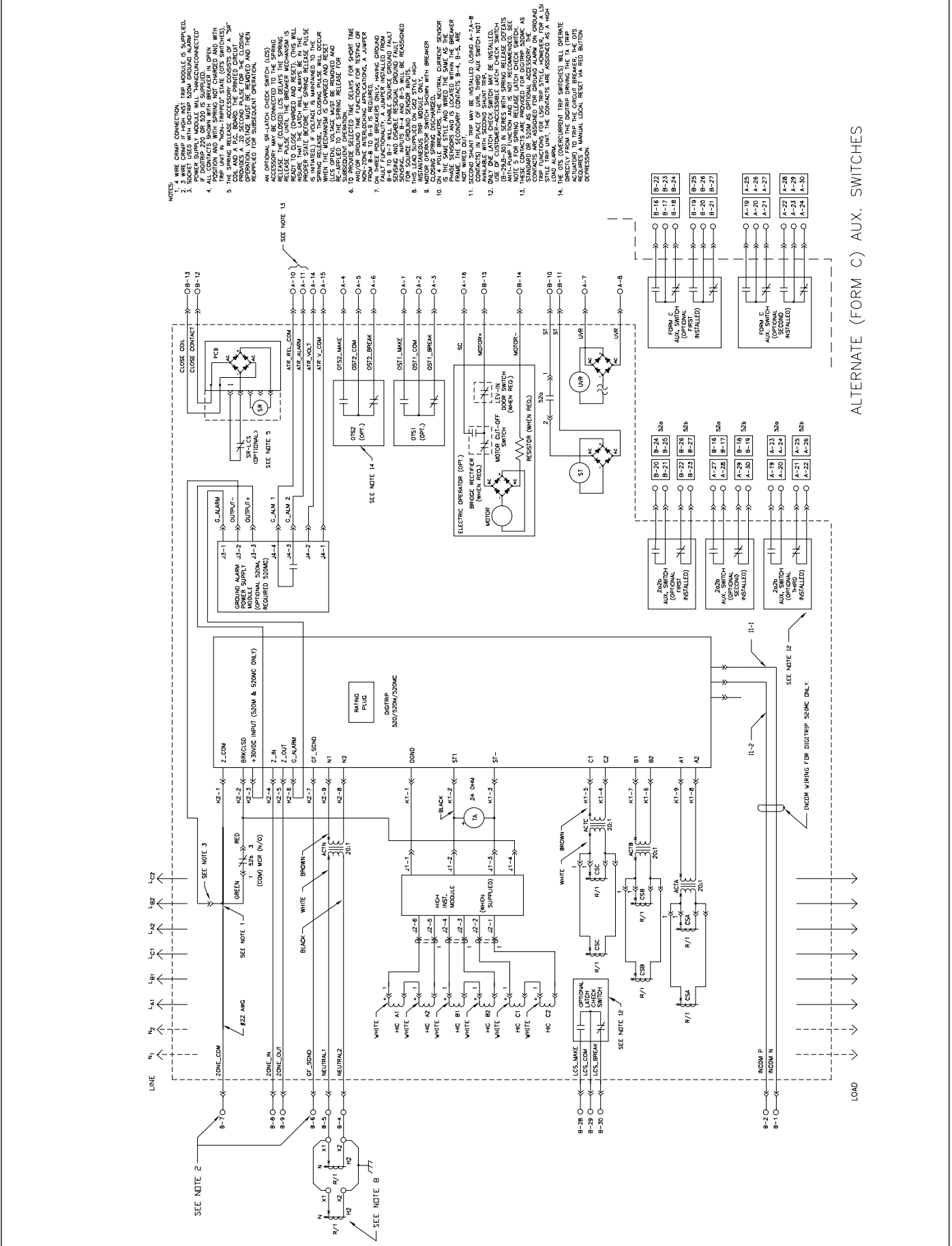
Connection Diagram Digitrip 220/520/520i/520M/520Mi/520MC/520MCi (100-3200A)

- NOTES:
1. WIRE CRIMP CONNECTION: THIS MODULE IS SUPPLIED WITH A POWER SUPPLY MODULE WHICH WILL "MATE" UNCONNECTED PINS 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.



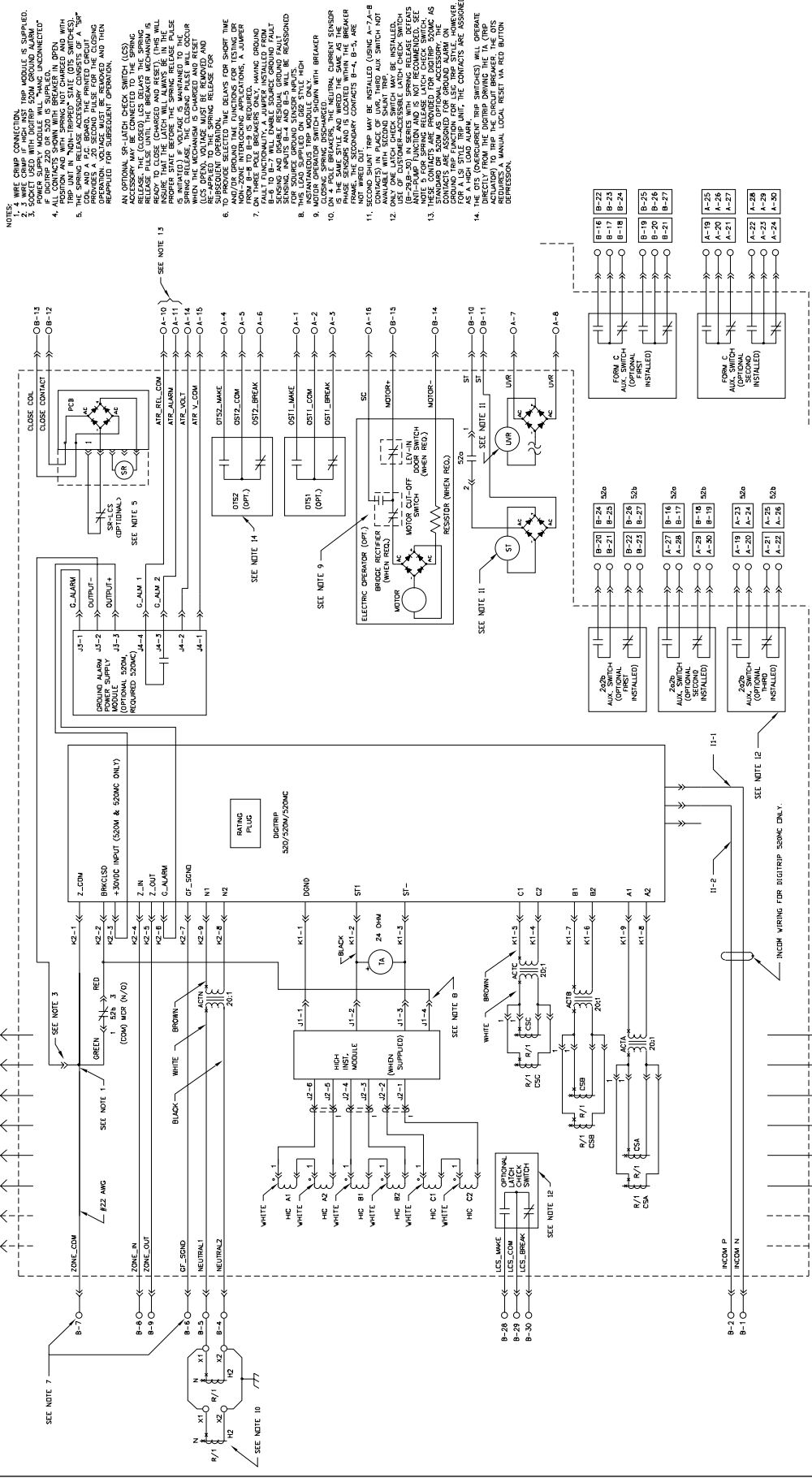
ALTERNATE (FORM C) AUX. SWITCHES

Connection Diagram Digtrip 520/520i/520M/520Mi/520MC/520McI (5000A ABCABC Phasing)



ALTERNATE (FORM C) AUX. SWITCHES

Connection Diagram Digtrip 520/520i/520M/520Mi/520MC/520MCi (500A AABCC Phasing)



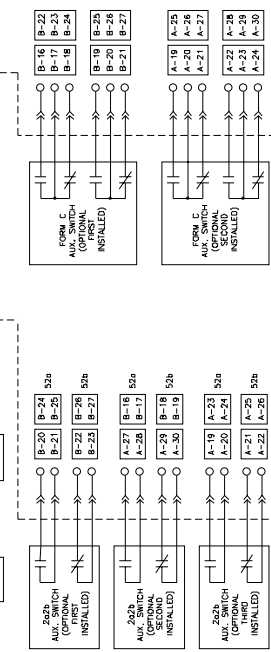
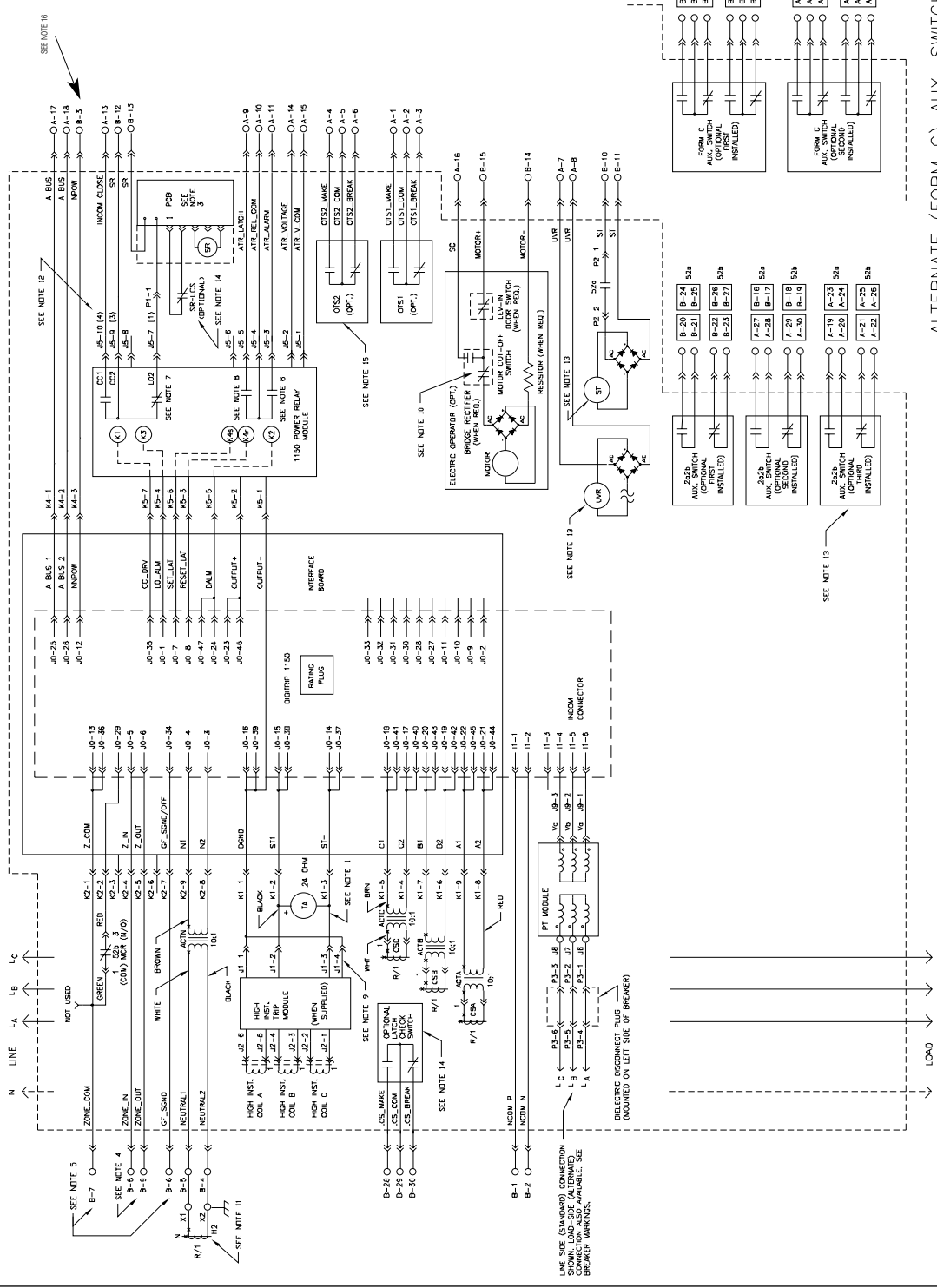
- NOTES:
1. WIRE CRIMP CONNECTIONS MUST BE USED UNLESS OTHERWISE SPECIFIED.
 2. WIRE CRIMP MUST NOT BE USED UNLESS OTHERWISE SPECIFIED.
 3. SOCKET USED WITH DGT50P 520M GROUND ALARM OPTION MUST BE INSTALLED IN THE BREAKER MOUNTING POSITION AND WIRING MUST BE CHECKED FOR PROPER POSITIONING AND WIRING MUST BE CHECKED FOR PROPER POSITIONING.
 4. TRIP UNIT IN "NON-TRIPPED" STATE (OTS SWITCHES), COIL AND P.C. BOARD, THE PRINTED CIRCUIT BOARD, AND THE P.C. BOARD MUST BE REPAIRED OR REPLACED AS NECESSARY.
 5. REPAIRS TO THE SPRING RELEASE MECHANISM MUST BE PERFORMED BY A QUALIFIED PERSON.
 6. AN OPTIONAL SP-LATCH CHECK SWITCH (LCS) RELEASES THE SPRING RELEASE MECHANISM AND PROVIDES VISUAL INDICATION OF THE SPRING RELEASE PULSE UNTIL THE BREAKER MECHANISM IS IN THE "TRIPPED" STATE. THE SPRING RELEASE PULSE WILL NOT OCCUR UNTIL THE BREAKER MECHANISM IS IN THE "TRIPPED" STATE. THE SPRING RELEASE PULSE WILL OCCUR WHEN THE BREAKER MECHANISM IS IN THE "TRIPPED" STATE.
 7. THE SPRING RELEASE MECHANISM MUST BE REPAIRED OR REPLACED AS NECESSARY.
 8. THE SPRING RELEASE MECHANISM MUST BE REPAIRED OR REPLACED AS NECESSARY.
 9. THE SPRING RELEASE MECHANISM MUST BE REPAIRED OR REPLACED AS NECESSARY.
 10. THE SPRING RELEASE MECHANISM MUST BE REPAIRED OR REPLACED AS NECESSARY.
 11. THE SPRING RELEASE MECHANISM MUST BE REPAIRED OR REPLACED AS NECESSARY.
 12. THE SPRING RELEASE MECHANISM MUST BE REPAIRED OR REPLACED AS NECESSARY.
 13. THE SPRING RELEASE MECHANISM MUST BE REPAIRED OR REPLACED AS NECESSARY.
 14. THE SPRING RELEASE MECHANISM MUST BE REPAIRED OR REPLACED AS NECESSARY.

ALTERNATE (FORM C) AUX. SWITCHES

May 2003

Connection Diagram Digitrip 1150, 1150i (100-3200A)

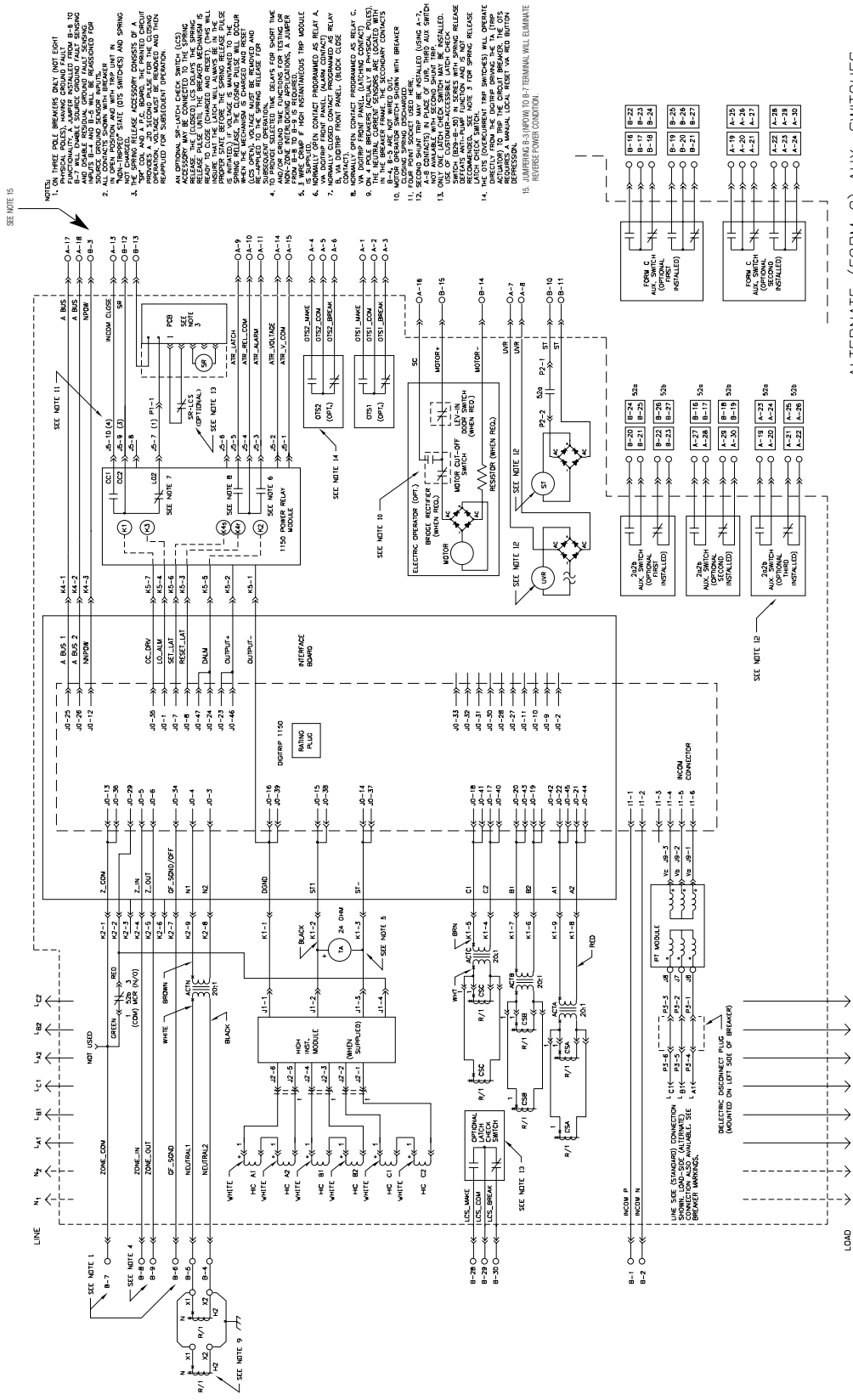
1. WIRE CRAMP F HIGH INST TRIP MODULE IS SUPPLIED. OPEN POSITION AND WITH TRIP UNIT IN "NON-TRIPPED" STATE (OTS SWITCHES AND SPRING NOT CHARGED).
2. COIL AND A P.C. BOARD, THE PRINTED CIRCUIT PROVIDES VOLTAGE MUST BE REMOVED AND THEN REAPPLIED FOR SUBSEQUENT OPERATION.
3. AN OPTIONAL SR-LATCH CHECK SWITCH (LCS) ACCESSORY (LCS) BELAYS THE SPRING RELEASE PULSE UNTIL THE BREAKER MECHANISM IS READY TO CLOSE (CHARGED AND RESET). INITIATED, THE VOLTAGE IS MAINTAINED TO THE SPRING RELEASE CHARGED AND RESET (LCS OPEN). VOLTAGE MUST BE REAPPLIED TO THE SPRING RELEASE FOR SUBSEQUENT OPERATION.
4. TO PROVIDE SELECTED TIME DELAYS FOR SHORT TIME NON-ZONE INTERLOCKING APPLICATIONS, A NUMBER FROM 1 TO 15 CAN BE PROGRAMMED INTO THE TRIP MODULE.
5. ON THREE POLE BREAKERS ONLY, HAVING GROUND FAULT RESIDUAL GROUND FAULT SENSING INPUTS B-4 AND B-5, MULTIPLE SOURCE GROUND FAULT SENSING AND DEBIASING IS AVAILABLE THROUGH THE TRIP MODULE.
6. NORMALLY OPEN CONTACT PROGRAMMED AS RELAY A.
7. NORMALLY CLOSED CONTACT PROGRAMMED AS RELAY B.
8. VIA DIGTRIP FRONT PANEL, LATCHING CONTACT C.
9. TRIP MODULE MOUNTED ON 100 STILE HIGH INSTANTANEOUS MOTOR OPERATOR SWITCH WITH CLOSING SPRING.
10. ON 2 POLE BREAKERS, THE NEUTRAL CURRENT SENSOR IS SENSOR AND ARE LOCATED WITHIN THE BREAKER FRAME.
11. FOUR POINT SOCKET USED HERE. B-5 ARE NOT WIRED OUT.
12. SECOND SHUNT TRIP MAY BE INSTALLED (USING A-7-A-8 AVAILABLE WITH SECOND SHUNT TRIP AUX SWITCH NOT INSTALLED).
13. USE OF CUSTOMER-ACCESSIBLE LATCH CHECK SWITCH (B-20-B-20) IN SERIES WITH SPRING RELEASE DEFERS TRIP ACTUATION TO TRIP THE CIRCUIT BREAKER. THE OTS ACTUATOR TO TRIP THE CIRCUIT BREAKER, THE OTS DEPRESSION, MANUAL LOCAL RESET VIA RED BUTTON (REVERSE POWER CONDITION).



ALTERNATE (FORM C) AUX. SWITCHES

LINE SIDE (STANDARD) CONNECTION SHOWN. LOAD-SIDE (ALTERNATE) CONNECTION SHOWN. SEE BREAKER WARNINGS.

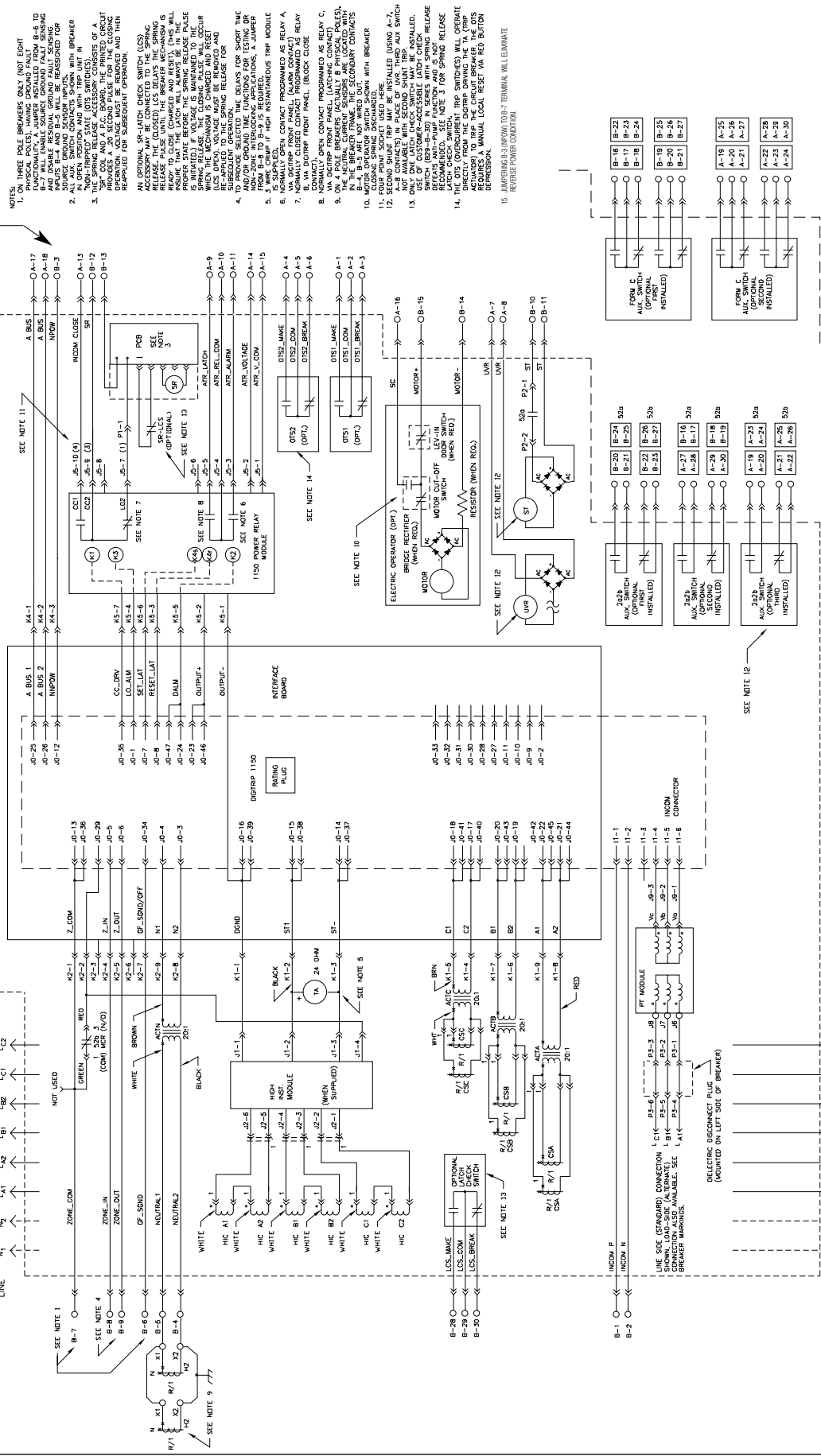
Connection Diagram Digitrip 1150/1150i (5000A ABCABC Phasing)



ALTERNATE (FORM C) AUX. SWITCHES

May 2003

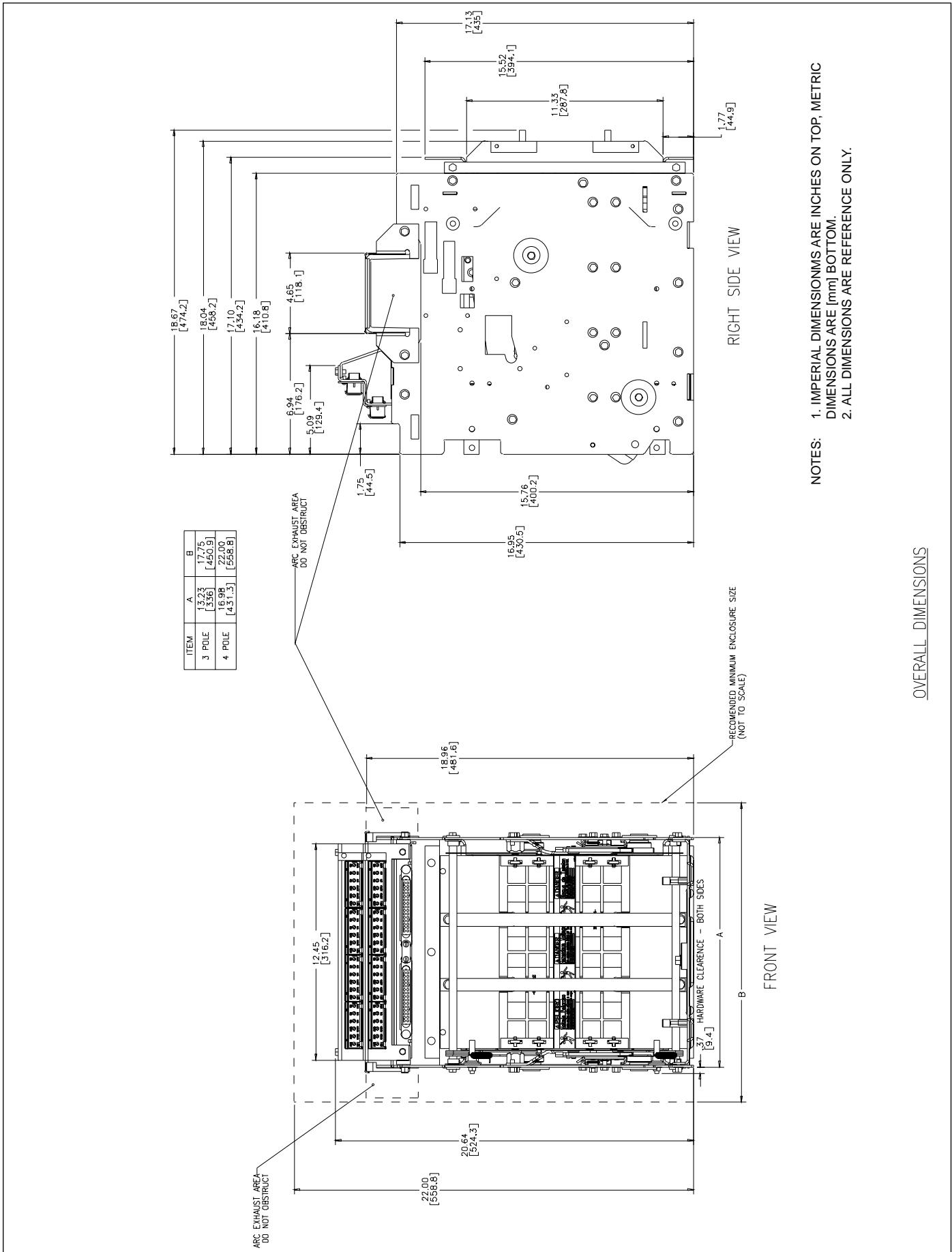
Connection Diagram Digitrip 1150/1150i (5000A AABCC Phasing)



- NOTES:
- ON THREE POLE BREAKERS ONLY (NOT EIGHT FUNCTIONAL), THE LATCH JUMPER INSTALLED FROM B-6 TO B-7 WILL PREVENT SOURCE GROUND FAULT SENSING. IN THIS CASE, THE JUMPER SHOULD BE INSTALLED FROM B-5 AND B-6. B-5 AND B-6 WILL BE REQUIRED FOR THE OPEN PROTECTION AND THE MECHANISM TO BE RE-APPLIED TO THE SPRING RELEASE PLATE FOR THE CLOSING PROTECTION AND THE MECHANISM TO BE RE-APPLIED TO THE SPRING RELEASE FOR THE CLOSING PROTECTION.
 - ALL AUX. SWITCH CONTACTS SHOWN WITH BREAKER. ON OPEN PROTECTION AND THE MECHANISM TO BE RE-APPLIED TO THE SPRING RELEASE PLATE FOR THE CLOSING PROTECTION AND THE MECHANISM TO BE RE-APPLIED TO THE SPRING RELEASE FOR THE CLOSING PROTECTION.
 - THE SPRING RELEASE ACCESSORY CONTACTS OF A BREAKER MUST BE WIRING FOR THE CLOSING PROTECTION AND THE MECHANISM TO BE RE-APPLIED TO THE SPRING RELEASE FOR THE CLOSING PROTECTION AND THE MECHANISM TO BE RE-APPLIED TO THE SPRING RELEASE FOR THE CLOSING PROTECTION.
 - OPTIONAL LATCH CHECK SWITCH (LCS) ACCESSORY MAY BE CONNECTED TO THE SPRING RELEASE PLATE (CLOSED) CONTACTS WHICH WILL BE READY TO CLOSE (CHARGED AND RESET). THIS WILL PREVENT THE BREAKER FROM RE-CLOSING UNLESS THE PROPER STATE BEFORE THE SPRING RELEASE PLATE IS INITIATED. VOLTAGE SHOULD BE MAINTAINED TO THE MECHANISM TO BE RE-APPLIED TO THE SPRING RELEASE FOR THE CLOSING PROTECTION AND THE MECHANISM TO BE RE-APPLIED TO THE SPRING RELEASE FOR THE CLOSING PROTECTION.
 - TO BROUKE SELECTED THE DELAYS FOR SHORT TIME AND/OR GROUND TIME FUNCTIONS FOR TESTING OR FROM B-8 TO B-9 IS REQUIRED. WORK, A JUMPER FROM B-8 TO B-9 IS REQUIRED.
 - NORMALLY OPEN CONTACT PROGRAMMED AS RELAY A.
 - NORMALLY OPEN CONTACT PROGRAMMED AS RELAY B.
 - NORMALLY OPEN CONTACT PROGRAMMED AS RELAY C.
 - ON A POLE BREAKERS (ACTUALLY 6 PHYSICAL POLES), THE MECHANISM SHOULD BE INSTALLED WITH CONTACTS B-4, B-5, B-6, B-7 ARE NOT WIRED OUT.
 - CLOSING SPRING DISCHARGED.
 - SECOND SHUNT TRIP MAY BE INSTALLED (USING A-7, A-8 CONTACTS) IN PLACE OF UVR, THIRD AUX SWITCH (SEE NOTE 14). CHECK SWITCH MAY BE INSTALLED.
 - BREKETS ANTI-PUMP FUNCTION AND IS NOT INSTALLED. NOTE 5 FOR SPRING RELEASE LATCH CHECK SWITCH.
 - CONTACTS FROM THE DIGITRIP SHOULD BE WIRING AS DIRECTED TO THE CIRCUIT BREAKER THE DIS (ACTUATOR) TO TRIP THE CIRCUIT BREAKER. THE DIS IS PROGRAMMED TO TRIP THE CIRCUIT BREAKER. THE DIS IS PROGRAMMED TO TRIP THE CIRCUIT BREAKER.
 - JUMPER B-3 (UPWARD) TO A-7 TERMINAL WILL ELIMINATE REVERSE POWER CONDITION.

ALTERNATE (FORM C) AUX. SWITCHES

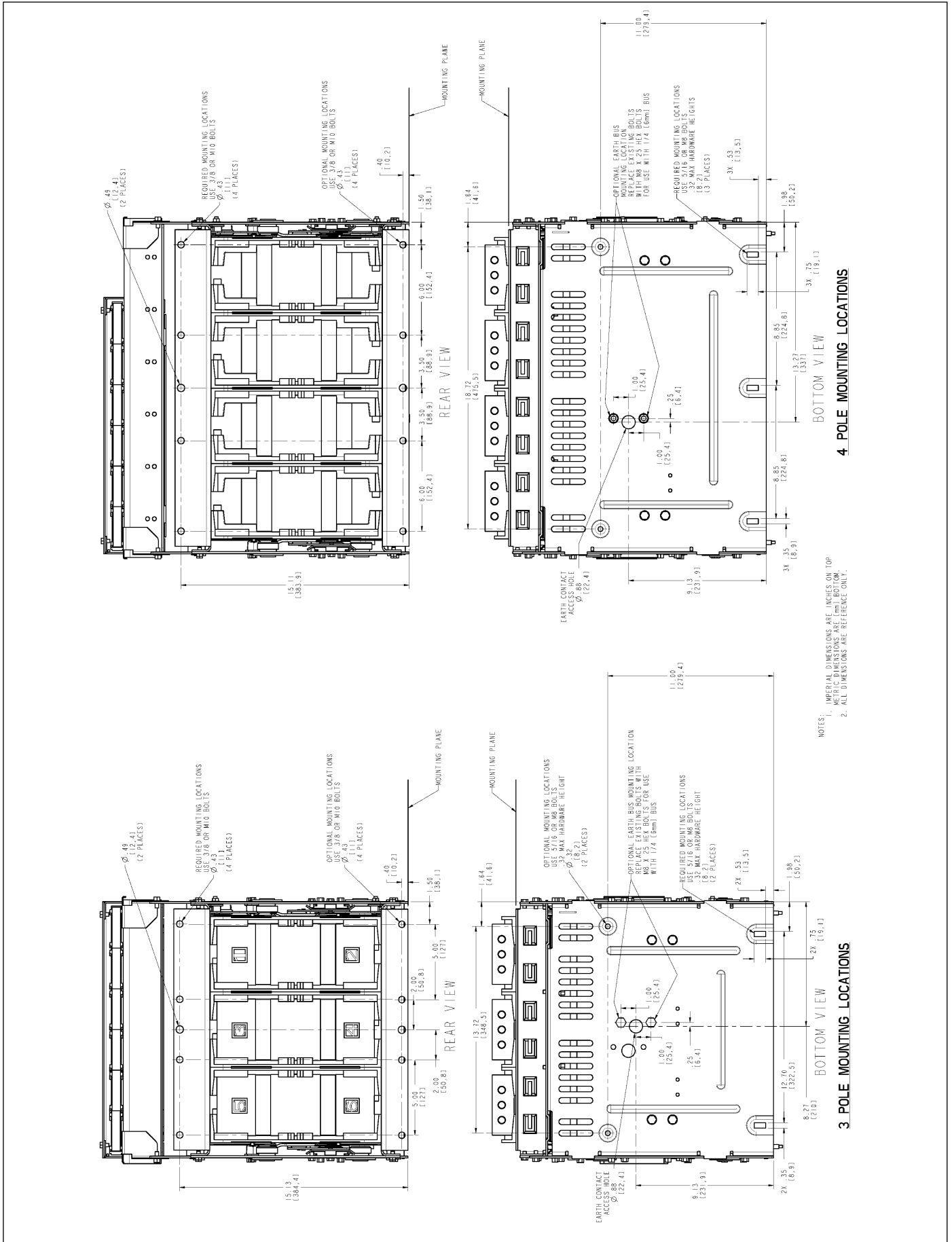
Narrow Frame Cassette Overall Dimensions (3 and 4 pole, 800-2000A)



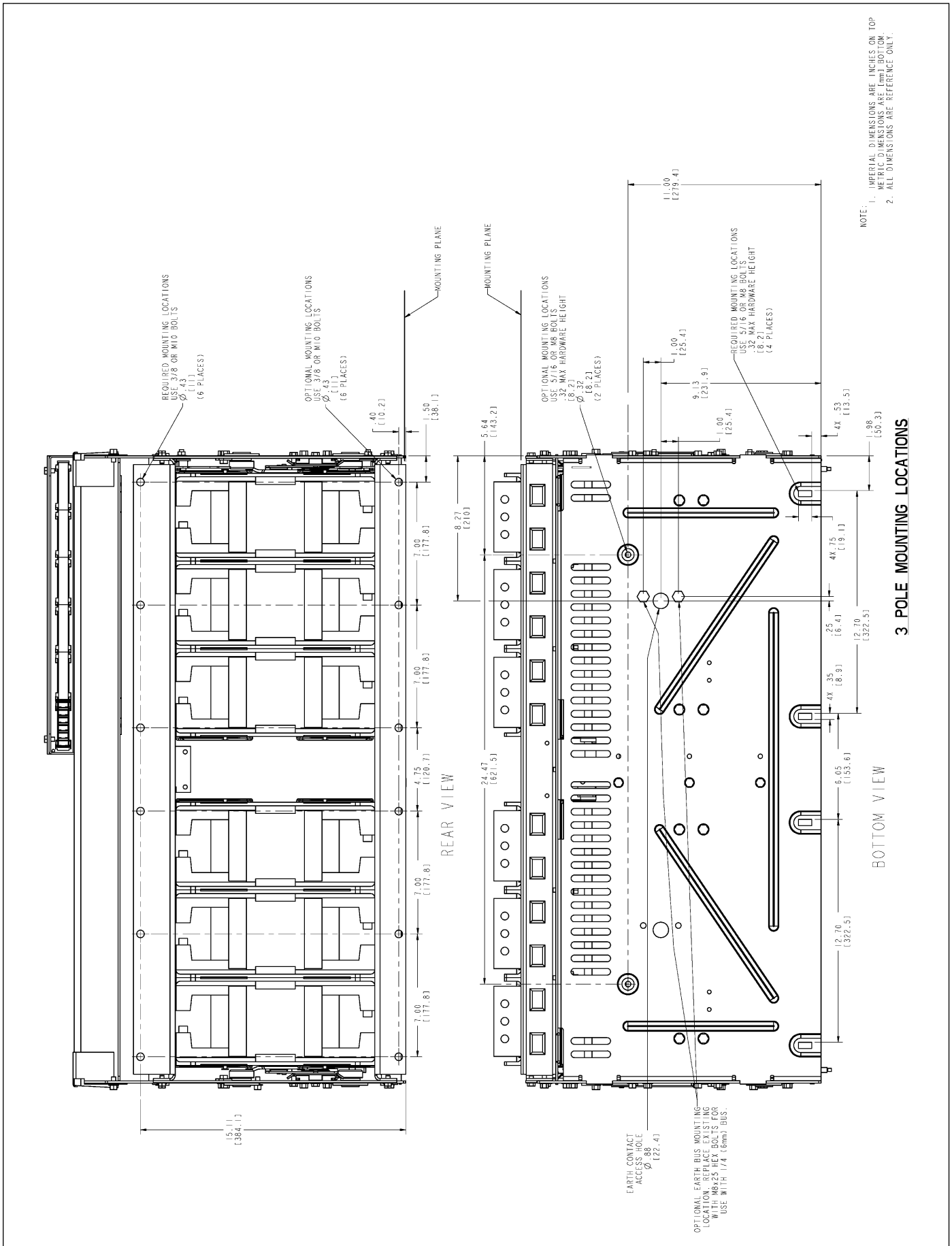
NOTES: 1. IMPERIAL DIMENSIONS ARE INCHES ON TOP, METRIC DIMENSIONS ARE [mm] BOTTOM.
2. ALL DIMENSIONS ARE REFERENCE ONLY.

May 2003

Standard Frame Cassette Overall Dimensions (3 and 4 pole, 800-3200A)

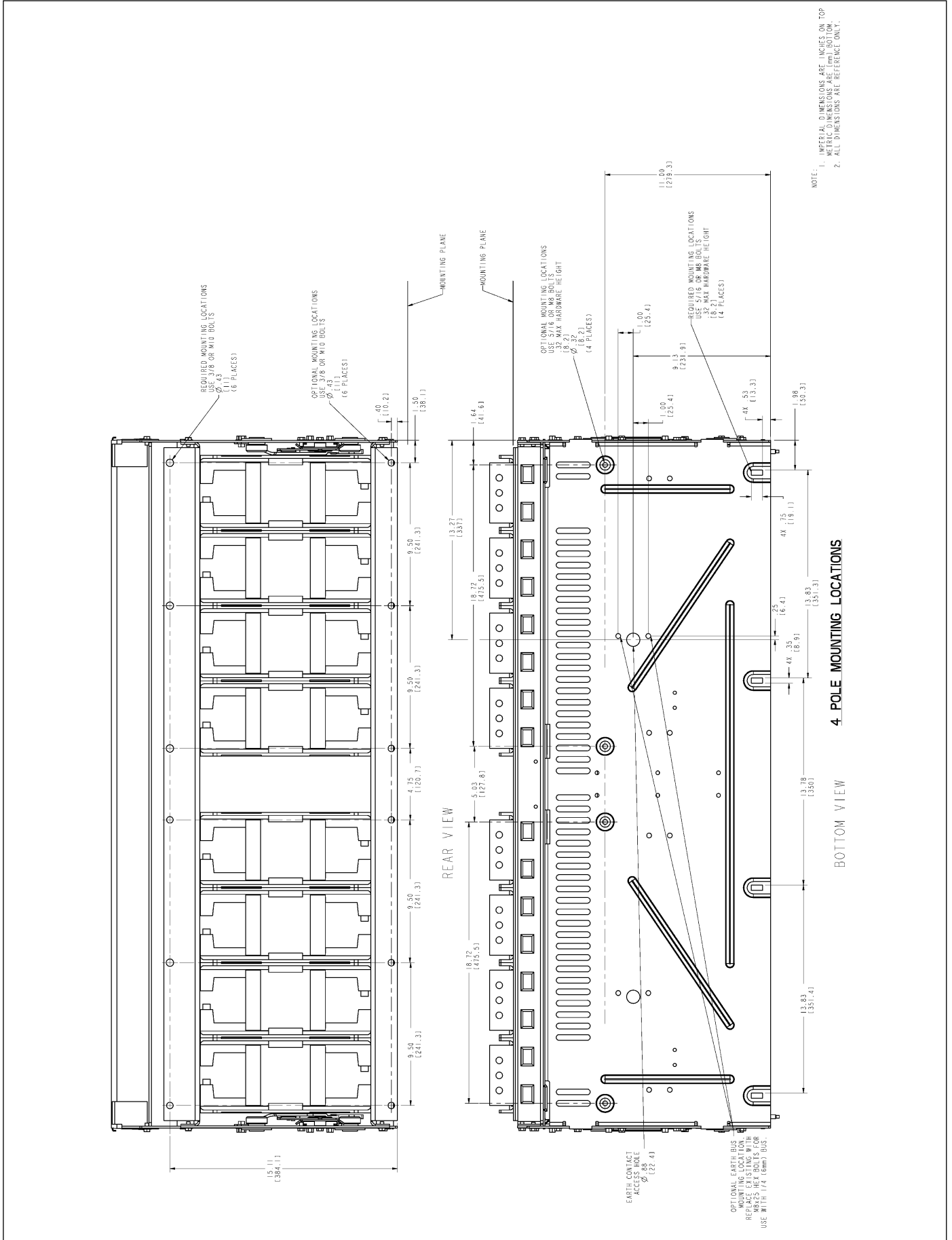


Double Wide Frame Cassette Overall Dimensions (3 pole, 4000-6300A)

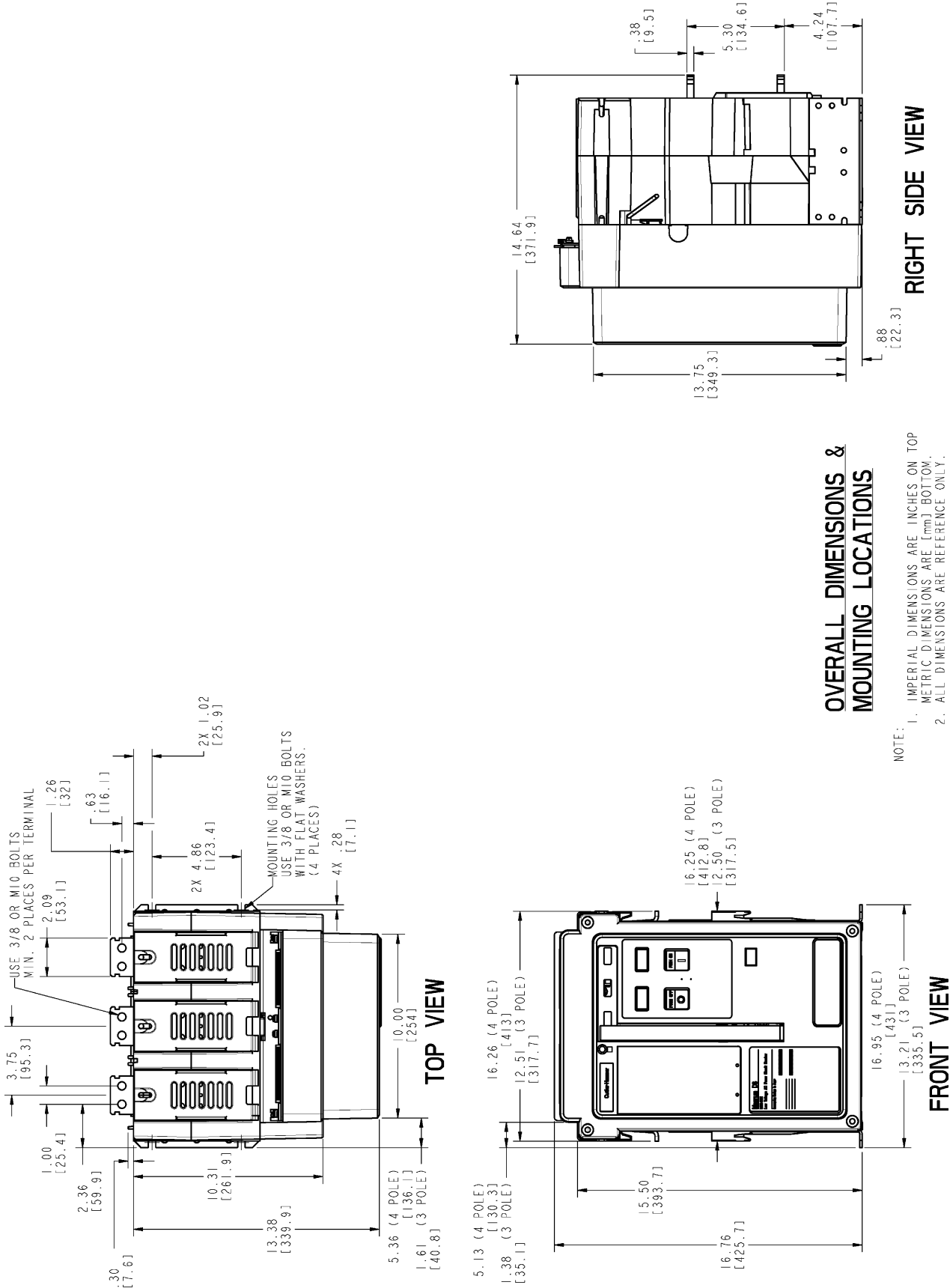


May 2003

Double Wide Frame Cassette Overall Dimensions (4 pole, 4000-6300A)



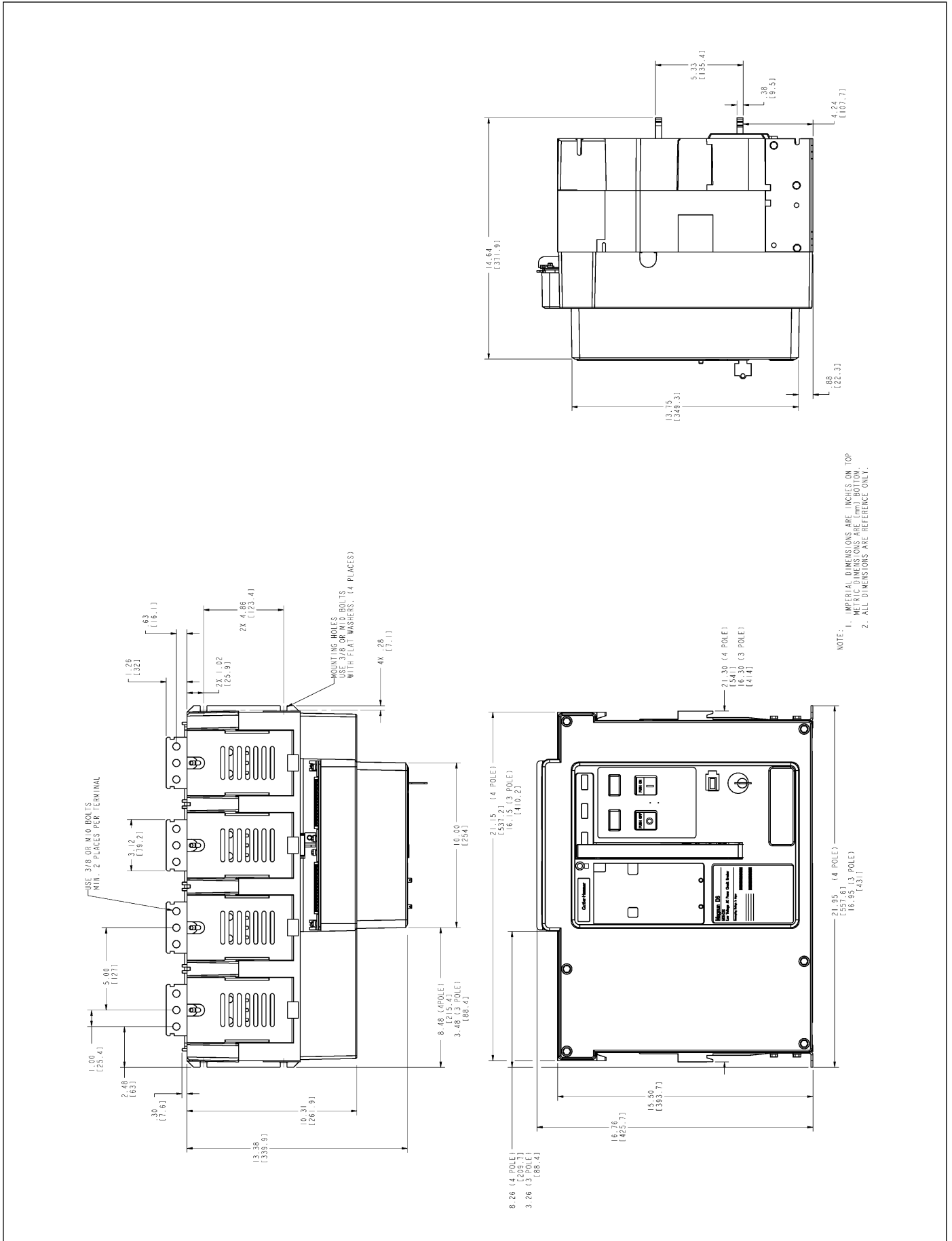
Narrow Frame Fixed Overall Dimensions (3 and 4 pole, 800-2000A)



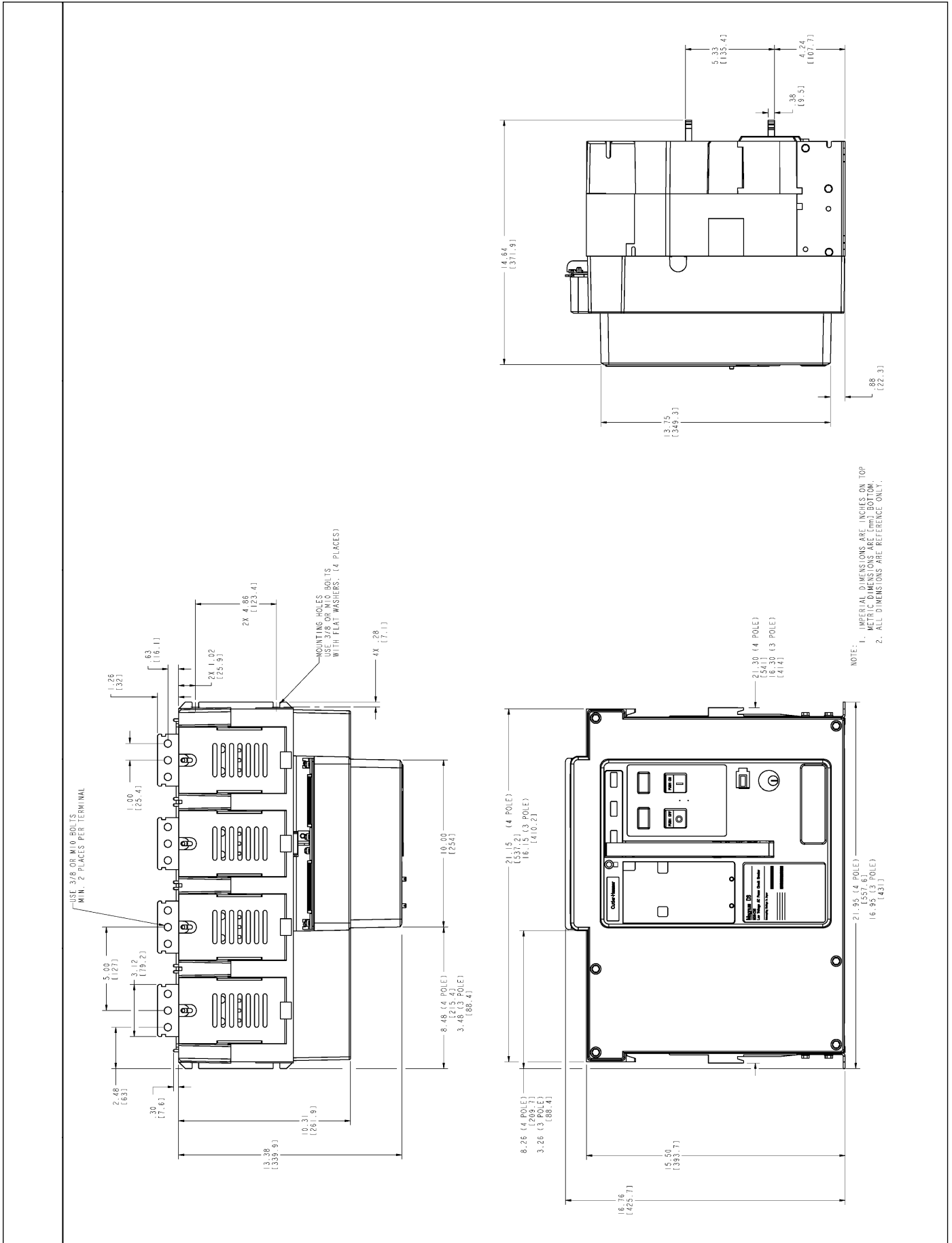
OVERALL DIMENSIONS & MOUNTING LOCATIONS

NOTE:
 1. IMPERIAL DIMENSIONS ARE INCHES ON TOP METRIC DIMENSIONS ARE [mm] BOTTOM.
 2. ALL DIMENSIONS ARE REFERENCE ONLY.

Standard Frame Fixed Overall Dimensions (3 and 4 pole, 800-1600A)

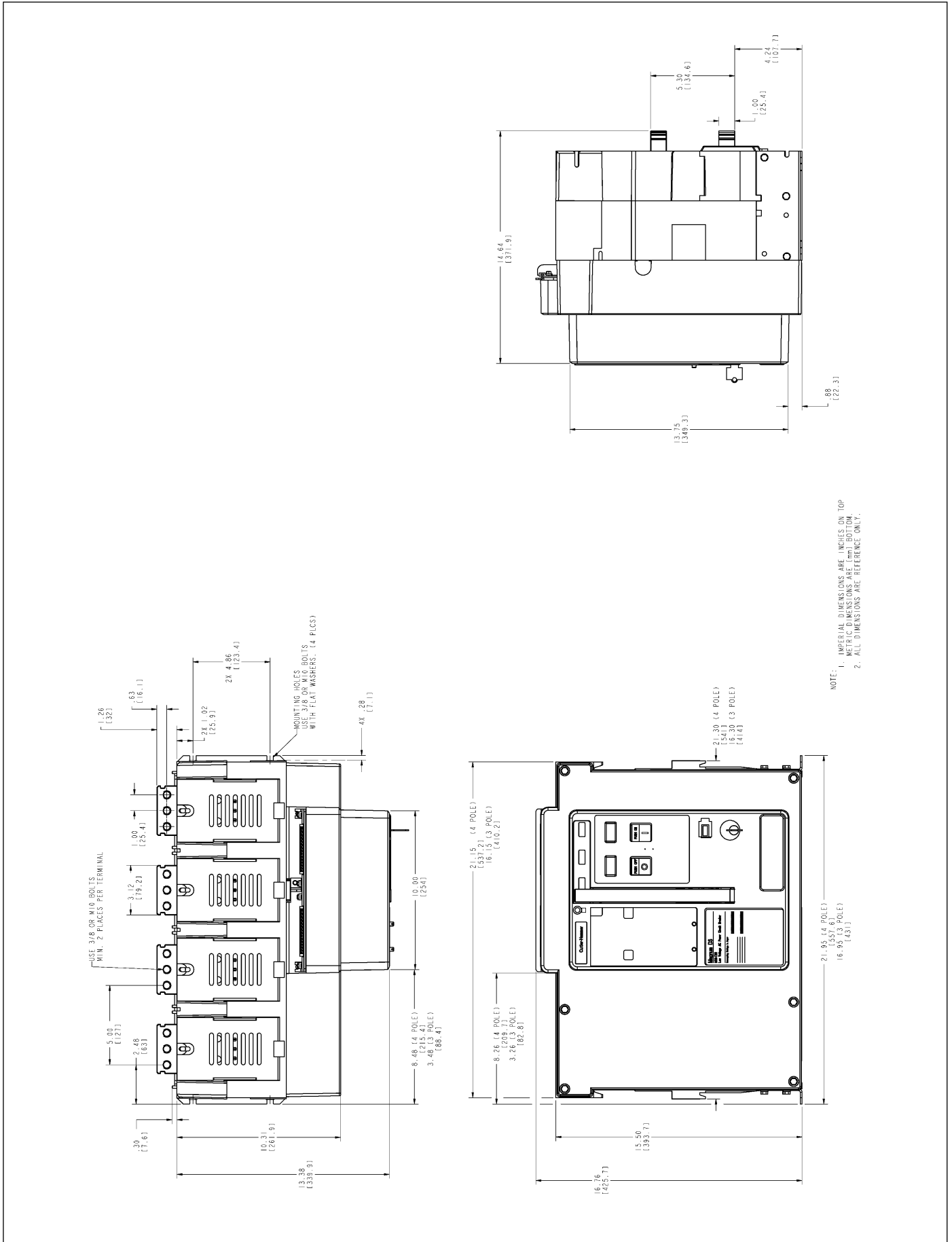


Standard Frame Fixed Overall Dimensions (3 and 4 pole, 2000A)



May 2003

Standard Frame Fixed Overall Dimensions (3 and 4 pole, 3200A)



Double Wide Frame Fixed Overall Dimensions (3 and 4 pole, 4000-6300A)

