

# SIEMENS

## SB Encased Systems Breakers, Trip Units and Accessories

Selection and Application Guide

October 1, 1999



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# General Information

**NOTE: For more information on other standard and optional trip unit features, see Siemens Electronic Trip Units for SB Encased Systems Breakers Information and Instruction Guide Bulletin IPIM-2203B and the Sentron Systems Breaker Energy Communicating Trip Unit Information and Instruction Guide Bulletin IPIM-2208A.**

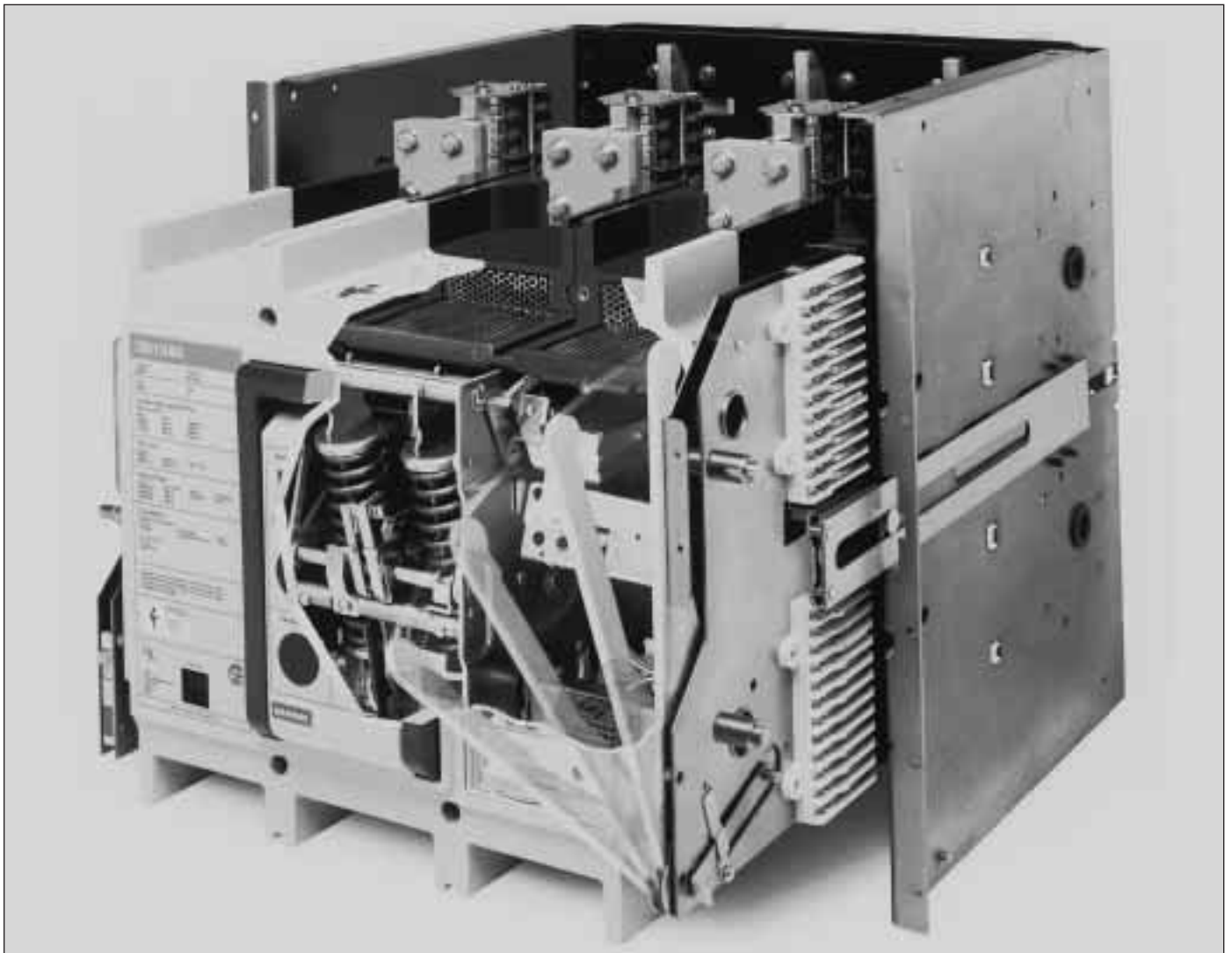
The SB breakers incorporate several installation, operation and safety features.

## **Insulated - Encased Construction**

The SB breaker's housing, internal barrier, and front cover are molded from a thermoset material with a high-dielectric strength (electrical insulation). The one piece molded case (base and housing) provides enhanced structural integrity. A midbarrier provides outer wall reinforcement, integral arc baffling, and insulation/isolation between the two compartments of the circuit breaker.

This patented construction provides a higher interrupting capacity within a smaller housing than can be achieved by more conventional construction. The electrical insulation property of the thermoset material enhances operational safety. The insulated case physically isolates and electrically insulates users from the internal high voltage contacts.

The arc chambers and main contact structure are encased in the back compartment. The trip unit, controls, springs of the stored energy mechanism, and optional internal accessories are located in the front compartment. Access to the front compartment is by the removable front cover. Since the barrier between the two compartments is made from the same insulating thermoset material as the housing, the user is physically isolated and electrically isolated from the main breaker mechanism and contacts when the front cover is removed.



Photos of 2000A Frame Shown for Illustration Purposes Only

# General Information

## Compact Size

For space-limited installations, the 1200A and 2000A frames offer a common width of 15 1/2 inches, a common depth of only 12 1/8 inches, a common mounting footprint, and common bus center lines. This compact, shallow depth (even with drawout breakers) permits stacking of six 800A or 1200A breakers or four 2000A breakers in a standard switchboard. This packaging is made possible by the insulated-encased construction and thermal performance of the SB breaker. Even when operated at 100% of the frame rating, no additional ventilation is required for the 1200A and 2000A frames.

### 1200A Size Frames

	0	1	2	3	4	5	6
0	—	✓	✓	✓	✓	✓	✓
1	✓	✓	✓	✓	✓		
2	✓	✓	✓	✓ <sup>①</sup>			
3	✓	✓					
4	✓						

Possible Number of Frames in a 90-inch Switchboard.

① Example: Three 1200A and two 2000A breaker combination is possible.

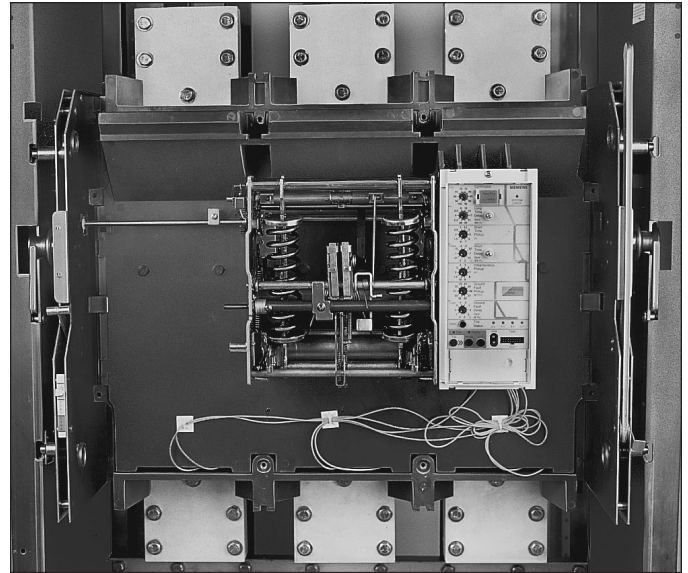
When operated at 100% of the frame rating, 4000A and 5000A frames require 66 in<sup>2</sup> of ventilation space in the top and bottom of the front cover. The 3200A frames require no additional ventilation. Detailed outline drawings of the breakers and drawout elements are included in the Outline Dimensions section starting on page 22.

## Bus Spacing and Connections

Specific installation features of SB breakers include common pole spacings and vertical connections. These pole spacings allow for a standard bus connection as specified in UL 891. Detailed outline drawings are contained in the Outline Dimensions section starting on page 22.

## Two-Step Stored Energy Mechanism

A two-step stored energy mechanism is used to close and open the breaker. Energy is initially stored in the main springs of the stored energy mechanism. When the breaker is closed, spring energy is consumed and sufficient energy is retained in the breaker to perform the tripping function. The stored energy mechanism may be charged manually (standard) or electrically (optional). Pushbutton controls allow for easy opening and closing. Color-coded indicators clearly display the opened or closed status of the circuit breaker and charged or discharged status of the stored energy mechanism. Once the breaker is closed, the mechanism can be recharged. The breaker is now prepared for a rapid open-close or open-close-open operation.



Main Stored Energy Spring in Front Compartment

## Centralized Controls

The manual charging handle, pushbutton control switches, and color-coded indicators are grouped in the central escutcheon on the front cover. The U-shaped construction of the charging handle provides for a firm grip regardless of the position of the breaker in the switchboard. For safety, the charging handle and push-to-close pushbutton are interlocked. This interlock prevents the breaker from being closed unless the charging handle is in the stowed position, the position to which it will automatically return when it is released. The interlock also prevents the breaker from being manually changed if the close button is depressed.



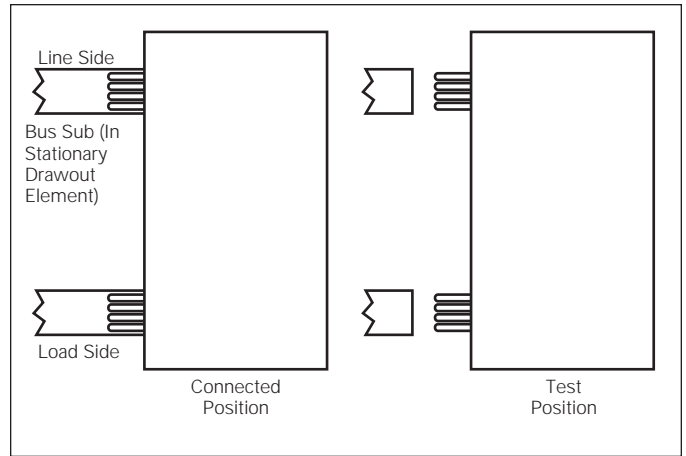
Centralized Controls and Color-Coded Indicators

# Description Stationary and Moveable Drawout Elements

## Simplified Minimum Depth Drawout Mechanism

The two elements of a drawout constructed SB Encased Systems Breaker are the stationary drawout element and the moveable drawout element. The stationary drawout element mounts from the front or bottom into a standard switchboard. Bottom mounting flanges are provided for optional mounting arrangements. The moveable drawout element mounts onto the stationary drawout element's two extension rails. This allows the moveable drawout element to be racked in and out of the stationary drawout element. For inspections, the moveable drawout element must be removed from the extension rails to a work area. Refer to page 22 for outline drawings of the two types of drawout elements.

Each moveable drawout element has four positions: (1) Connected, (2) Test, (3) Unlocked (only), and (4) Unlocked/ Withdrawn. A racking mechanism with a low-force pump handle moves the moveable drawout element between the connected, test, and unlocked positions. The pump handle is an integral part of the racking mechanism, and no auxiliary racking device or tool is required. In the unlocked position the movable drawout element is disengaged from the racking mechanism. The moveable drawout element can be easily pulled between the unlocked position and the withdrawn position. A color-coded indicator displays the position of the moveable drawout element. The integral pump handle and two levers are used to control the movement of the moveable drawout element. A single release lever automatically locks the moveable drawout element when it reaches the test or the connected position. The moveable drawout element is released to move to the next position by simply pushing and releasing the release lever.

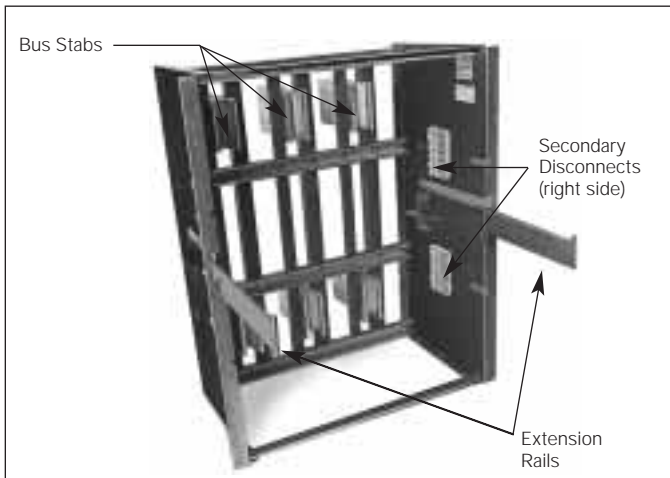


Side View Shown

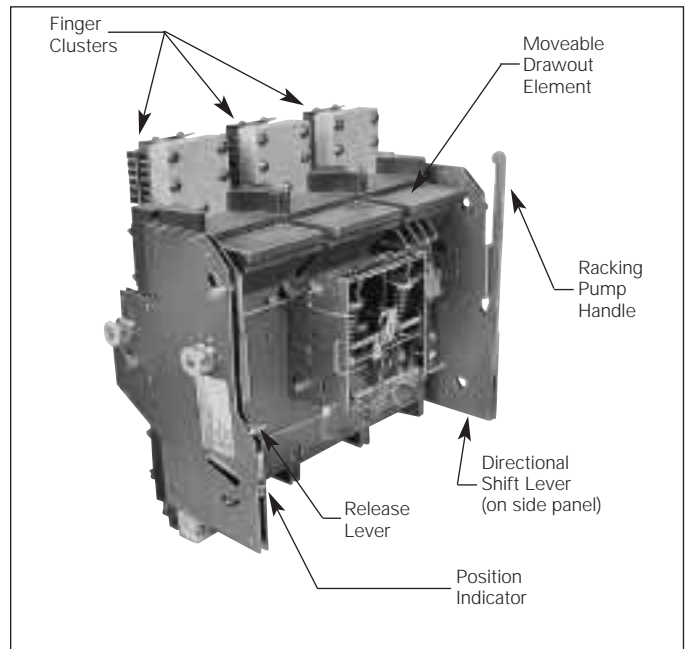
## Pushing the release lever with the SB breaker contacts closed open the breaker.

You do not have to hold the release lever to rack the moveable drawout element. A directional shift lever determines the direction the moveable drawout element will move when the pump handle is pulled or pushed.

Secondary disconnect sliding terminal blocks for terminating internal accessories are mounted on the sides of the stationary and moveable drawout elements. The secondary disconnects are mated as the moveable drawout element is moved from the withdrawn position to the unlocked position. The terminal points of the secondary disconnects are identified in the Internal and External accessories sections.



Stationary Drawout Element



Moveable Drawout Element



# How to Order SB Encased Systems Breakers<sup>①</sup>

Description	Example Catalog Number	Example Catalog Number Explanation												
<b>1. Frames</b> Select basic breaker frame catalog number from <b>Table A</b> .	<b>SBS2016DV</b>	This catalog number represents a standard interrupting rated Encased Systems Breaker "SBS", 2000 ampere frame size "20"; 1600 max ampere rating "16"; drawout mounted with vertical bus orientation "DV"												
<b>2. Drawout Mechanisms</b> Select the proper stationary drawout element (cradle) for use with breaker frame selected in Step 1. Stationary drawout mechanism is not required if fixed mounted breaker was selected in Step 1. Select from <b>Table B</b> .	<b>SBS20DFV</b>	This catalog number represents the stationary drawout element (cradle) for a 2000 ampere frame size, standard interrupting rating, drawout mounted Encased Systems Breaker with vertical bus orientation.												
<b>3. Pressure Wire/Bus Connectors</b> For <u>fixed mounted</u> breakers only, select proper terminals for cable connection; or bus connectors for rear bus bar connection. Not required if drawout mounted breaker was selected in Step 1. Select from <b>Table C</b> .		A drawout mounted breaker was selected in Step 1, therefore, terminals or bus "T" connectors are not required.												
<b>4. Trip Units</b> Select SB-EC Trip Unit or standard Type "TL" Trip Unit with proper function package from <b>Table D</b> and <b>E</b> or <b>Table L</b> respectively. Trip unit is not required for Non-Automatic Switches.	<b>SB16TP01G</b>	This catalog number represents a trip unit for a 1600 frame ampere rating Encased Systems Breaker with long and time delay, short time pickup and time time pickup delay, ground fault pickup and time delay and standard metering and alarm functions.												
<b>5. A premium type SB-EC Trip Unit requires the listed accessories shown. Refer to TABLES F, G and H.</b>  The standard Type "TL" Trip Unit does not use these accessories	<b>SBEPS</b>  <b>SBPTM480</b>  <b>SBECDAK</b>	AN SB-EC Trip Unit was selected, therefore an External Power Supply is required for communications and metering functions. One required per SB-EC Trip Unit.  One PT Module per SB-EC Trip Unit is required for metering functions. Select according to system voltage. This catalog number represents a 480V system voltage Potential Transformer.  One wiring kit per SB-EC Trip Unit is required. Select according to Breaker Frame Size and mounting configuration. This wiring kit is for a 2000 A Frame Size, Drawout mounting.												
<b>6. Rating Plugs</b> Select the proper rating plug for the breaker ampere rating from <b>Table M</b> . Rating plug is not required for Non-Automatic Switches.	<b>16SB1200</b>	This catalog number represents a 1200 ampere continuous current rating plug for a 1600 frame ampere rating breaker.												
<b>7. Electrical Operators</b> Select proper electrical operator, if required, for breaker frame size and control voltage from <b>Table N</b> .	<b>SBEO120</b>	This catalog number represents a 120 volt electrical operator for a 2000 ampere frame size Encased Systems Breaker. A Shunt Trip or Undervoltage Release should be ordered and priced separately.												
<b>8. Internal Accessories</b> List the required internal accessories catalog numbers from pages 8-12. List each catalog number and price separately.	<b>SBST120</b>  <b>SBUV480</b>  <b>SBAS6</b>	120 VAC Control Power Shunt Trip for remote open  480 Volt AC, undervoltage release  3 NO (normally open), 3 NC (normally closed) auxiliary switches												
<b>9. External Accessories</b> List the required external accessories catalog numbers from pages 9-12. List each catalog number and price separately.	<b>SBWIN</b>  <b>KISB</b> <b>SBPLD</b> <b>NB16SB</b>	Windows based function display and configuration software for PC  Kirk Key Interlock on breaker Padlocking Device on drawout Neutral Sensor for 1600 frame ampere rating breaker												
<b>10. Secondary Contact Blocks</b> Proper secondary contact blocks for external control wiring must be provided on drawout mounted breakers. Select the proper catalog numbers based on the breaker trip unit functions and internal accessories that were selected in Steps 5, 6, 7 and 8 above. Select from <b>Table P</b> . Note: Secondary contact blocks are not required on fixed mounted breakers, but control terminal blocks and mounting brackets should be ordered for secondary control wiring on fixed mount breakers. Refer to page 9, <b>Table P</b> for additional information.	<b>SBSDLT</b>  <b>SBSDRT</b>  <b>BSBDRB</b>	Secondary disconnects for this drawout breaker are required for certain trip unit functions, internal and external accessories as shown in <b>Table P</b> . This example requires the following: <table border="1" data-bbox="945 1671 1479 1885"> <thead> <tr> <th>Function/Accessory</th> <th>Contact Position</th> <th>Sliding Secondary Disconnect</th> </tr> </thead> <tbody> <tr> <td>Electrical Operator Undervoltage Release, Neutral CT, Shunt Trip</td> <td>LT</td> <td><b>SBSDLT</b></td> </tr> <tr> <td>Auxiliary Switches (3A &amp; 3B)</td> <td>RB</td> <td><b>SBSDRB</b></td> </tr> <tr> <td>SB-EC Trip Unit</td> <td>RT &amp; LB</td> <td><b>SBSDRT</b> <b>SBSDLB</b></td> </tr> </tbody> </table>	Function/Accessory	Contact Position	Sliding Secondary Disconnect	Electrical Operator Undervoltage Release, Neutral CT, Shunt Trip	LT	<b>SBSDLT</b>	Auxiliary Switches (3A & 3B)	RB	<b>SBSDRB</b>	SB-EC Trip Unit	RT & LB	<b>SBSDRT</b> <b>SBSDLB</b>
Function/Accessory	Contact Position	Sliding Secondary Disconnect												
Electrical Operator Undervoltage Release, Neutral CT, Shunt Trip	LT	<b>SBSDLT</b>												
Auxiliary Switches (3A & 3B)	RB	<b>SBSDRB</b>												
SB-EC Trip Unit	RT & LB	<b>SBSDRT</b> <b>SBSDLB</b>												

① Refer to SB Encased System Breakers Selection Guide for detailed selection information for SB breakers and related accessories.

② Refer to **Discount Schedule T** unless specified.

# Frames

**Table A: Circuit Breaker Frames**

SBA Alternate Interrupting Rating <sup>①</sup>			Drawout Breaker Element <sup>②</sup>	
Breaker Frame		Fixed Mounted Breaker	Vertical Bus <sup>③</sup>	Horizontal Bus <sup>③</sup>
Frame <sup>④</sup> Size (A)	Max Ampere Rating (A) <sup>⑤</sup>	Catalog Number	Catalog Number	Catalog Number
1200	400	SBA0804F	SBA0804DV	SBA0804DH
1200	800	SBA0808F	SBA0808DV	SBA0808DH
1200	1200	SBA1212F	SBA1212DV	SBA1212DH
2000	1200	SBA2012F	SBA2012DV	SBA2012DH
2000	1600	SBA2016F	SBA2016DV	SBA2016DH
2000	2000	SBA2020F	SBA2020DV	SBA2020DH
SBS Standard Interrupting Rating <sup>①</sup>				
1200	400	SBS0804F	SBS0804DV	SBS0804DH
1200	800	SBS0808F	SBS0808DV	SBS0808DH
1200	1200	SBS1212F	SBS1212DV	SBS1212DH
2000	1200	SBS2012F	SBS2012DV	SBS2012DH
2000	1600	SBS2016F	SBS2016DV	SBS2016DH
2000	2000	SBS2020F	SBS2020DV	SBS2020DH
3200	2500	SBS3225F	SBS3225DV	—
3200	3200	SBS3232F	SBS3232DV	—
5000	2500	SBS4025F	SBS4025DV	—
5000	3200	SBS4032F	SBS4032DV	—
5000	4000	SBS4040F	SBS4040DV	—
5000	5000	SBS5050F	SBS5050DV	—
SBH High Interrupting Rating <sup>①</sup>				
2000	800	SBH2008F	SBH2008DV	—
2000	1200	SBH2012F	SBH2012DV	—
2000	1600	SBH2016F	SBH2016DV	—
2000	2000	SBH2020F	SBH2020DV	—
3200	2500	SBH3225F	SBH3225DV	—
3200	3200	SBH3232F	SBH3232DV	—
5000	2500	SBH4025F	SBH4025DV	—
5000	3200	SBH4032F	SBH4032DV	—
5000	4000	SBH4040F	SBH4040DV	—
5000	5000	SBH5050F	SBH5050DV	—

**Non-Automatic Switches <sup>⑥</sup>**

SBN Standard Withstand Rating <sup>⑦</sup>			Drawout Switch Element <sup>②</sup>	
Breaker Frame		Fixed Mounted Breaker	Vertical Bus <sup>③</sup>	Horizontal Bus <sup>③</sup>
Frame <sup>④</sup> Size (A)	Max Ampere Rating (A) <sup>⑤</sup>	Catalog Number	Catalog Number	Catalog Number
1200	400	SBN0804F	SBN0804DV	SBN0804DH
1200	800	SBN0808F	SBN0808DV	SBN0808DH
1200	1200	SBN1212F	SBN1212DV	SBN1212DH
2000	1200	SBN2012F	SBN2012DV	SBN2012DH
2000	1600	SBN2016F	SBN2016DV	SBN2016DH
2000	2000	SBN2020F	SBN2020DV	SBN2020DH
3200	2500	SBN3225F	SBN3225DV	—
3200	3200	SBN3232F	SBN3232DV	—
5000	2500	SBN4025F	SBN4025DV	—
5000	3200	SBN4032F	SBN4032DV	—
5000	4000	SBN4040F	SBN4040DV	—
5000	5000	SBN5050F	SBN5050DV	—

① Interrupting ratings shown on following page.

② Requires additional stationary Drawout Element shown in **Table B**.

③ Primary bus connector orientation. Must match stationary drawout element selected from **Table B**. 1200 and 2000 ampere frame size bus connections may be oriented vertically or horizontally.

④ Breaker frame size refers to the physical envelope size.

⑤ Max ampere rating is determined by the current sensors in the breaker.

⑥ Trip units and rating plugs are not required for non-automated switches.

⑦ Withstanding rating is equal to the short time ratings shown on the following page.

# Ratings, Stationary Drawouts and Power Connectors

## UL Symmetrical RMS Amperes Interrupting Ratings (kA)

Optional Ratings and Application Voltages	Breaker Frame Size			
	1200A	2000A	3200A	5000A
<b>Alternate A. I. R. (kA): Blue Label "SBA"</b>				
@ 240V AC	65	85	N/A	N/A
@ 480V AC	65	65	N/A	N/A
@ 600V AC	42	50	N/A	N/A
<b>Standard A. I. R. (kA): Black Label "SBS"</b>				
@ 240V AC	100	100	150	150
@ 480V AC	100	100	100	100
@ 600V AC	50	65	85	85
<b>High A. I. R. (kA): Red Label "SBH"</b>				
@ 240V AC	N/A	200	200	200
@ 480V AC	N/A	150	150	150
@ 600V AC	N/A	100	100	100
<b>Short Time Rating</b> ① (kA), T = 0.5 Sec.	25	35	50	65

## IEC 947-2 Rating - Standard SBS

Interrupting Ratings Symmetrical RMS Amperes 50/60 Hz.	AC Voltages		Breaker Frame Size			
			1200A	2000A	3200A	5000A
415		lcu	100kA	100kA	100kA	100kA
		lcs	100kA	100kA	100kA	100kA
		lcw	25kA	35kA	50kA	65kA
690		lcu	65kA	65kA	65kA	65kA
		lcs	65kA	65kA	65kA	65kA
		lcw	25kA	35kA	50kA	65kA

## Table B: Stationary Drawout Element

Includes only the drawout mechanism or cell which must be installed in the switchboard. The appropriate Drawout Breaker Element should be selected from **Table A**.

### SBA

Breaker Frame		Stationary Drawout Element	
		Vertical Bus ②	Horiz. Bus ②
Frame Size	Ampere Rating	Catalog Number	Catalog Number
1200	400	SBA08DFV	SBA08DFH
1200	800	SBA08DFV	SBA08DFH
1200	1200	SBA12DFV	SBA12DFH
2000	1200	SBA20DFV	SBA20DFH
2000	1600	SBA20DFV	SBA20DFH
2000	2000	SBA20DFV	SBA20DFH

### SBS

1200	400	SBS08DFV	SBS08DFH
1200	800	SBS08DFV	SBS08DFH
1200	1200	SBS12DFV	SBS12DFH
2000	1200	SBS20DFV	SBS20DFH
2000	1600	SBS20DFV	SBS20DFH
2000	2000	SBS20DFV	SBS20DFH
3200	2500	SBS32DFV	—
3200	3200	SBS32DFV	—
5000	2500	SBS40DFV	—
5000	3200	SBS40DFV	—
5000	4000	SBS40DFV	—
5000	5000	SBS50DFV	—

### SBH

2000	800	SBH20DFV	—
2000	1200	SBH20DFV	—
2000	1600	SBH20DFV	—
2000	2000	SBH20DFV	—
3200	2500	SBH32DFV	—
3200	3200	SBH32DFV	—
5000	2500	SBH40DFV	—
5000	3200	SBH40DFV	—
5000	4000	SBH40DFV	—
5000	5000	SBH50DFV	—

① Withstand ratings are equal to the short time ratings.

② Primary bus connector orientation. Must match drawout breaker selected from **Table A**. 1200 and 2000 ampere frame bus connections may be oriented vertically or horizontally.



# Ratings, Stationary Drawouts and Power Connectors

**Table C: Bus Connectors and Pressure Wire Connectors**

## T-Connectors ①

For rear bus connected fixed mounted breakers, two connectors are required per pole for connecting bus bars to breaker stabs. T-connectors are rotatable 90 degrees for flexibility of bus connection on 1200 and 2000 ampere frames only.

Frame Size	Catalog Number
1200	SB12TCON
2000	SB20TCON
3200	SB32TCON
5000 (4000A Max Rating)	SB40TCON
5000	SB50TCON



## UL Listings and File Numbers

UL Listing	File Number
Trip Unit	E9896
Breaker	E9896
Drawout Assembly	E135453
Accessories	E57501

## CSA Guide Information

Description	Catalog Number
CSA Guide	LR57039

## Pressure Wire Connectors ①

For cable connected, fixed, mounted, front connected SBA rated breakers only. Two connectors are required per pole for connecting power cables to breaker stabs.



Frame Size	Connector Amp Rating	Cables per Connector	Connector Wire Range	Catalog Number
1200	800	1-3	1/0-500 kcmil Cu/Al	TA3K500SB
1200	1200	1-4	250-500 kcmil Cu/Al	TA4N8500SB
2000	2000	1-4	250-600 kcmil Cu/Al	TA4P8500SB
2000	2000	1-6	250-600 kcmil Cu/Al	TA6R600SB

① Select either T-Connectors or Pressure Wire Connectors according to application. 2 each required per pole (i.e. one for line side and one for load side).

# SB-EC Trip Units

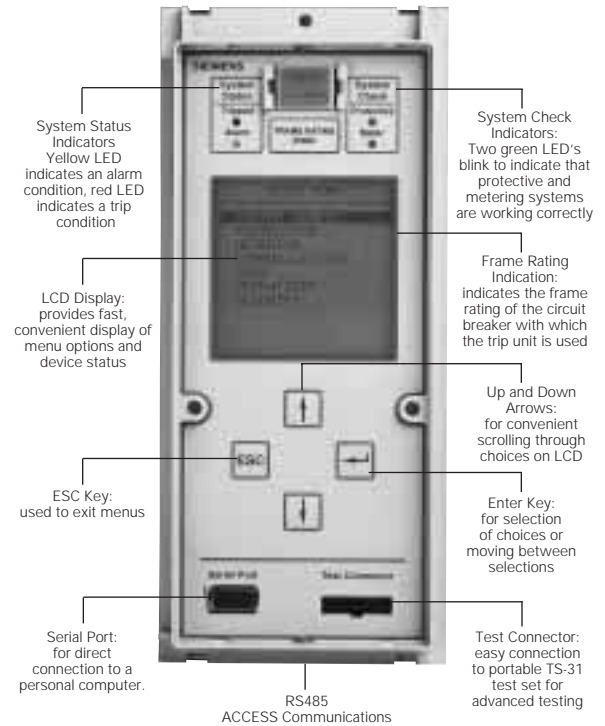
Two types of interchangeable trip units for the SB Encased Systems Breakers are available. The basic type "TL" Trip Unit features a full range of industry standard protective settings. The high-performance Systems Breaker Energy Communicating Trip Unit (SB-EC Trip Unit) offers advanced metering, protective relaying, time-stamped logs,

and power quality monitoring functions, including an integral keypad and LCD graphical display for menu-driven system configuration and real-time voltage and current waveforms displays. Both units offer unique models to provide an efficient combination of options versus cost for each application.

**Table D - SB-EC Trip Units**

Features	Models and List Prices			
	SBxxTP01	SBxxTP01G	SBxxTP02	SBxxTP02G
<b>Integral Keypad and Display</b> Voltage/Current Waveform Displays	✓	✓	✓	✓
<b>Protective Functions</b> Long Time, Short Time, Instantaneous	✓	✓	✓	✓
<b>Metering Functions</b> Volts, Amps, P.F., Frequency, Watts, VARs, VA, Crest Factor, Amp and Watt Demand, Voltage and Current Waveforms, Voltage and Current Unbalance	✓	✓	✓	✓
<b>Communications</b> PC (RS-232), ACCESS (RS-485), ZSI	✓	✓	✓	✓
<b>Counters &amp; Test Functions</b> Breaker Test (Trip/No Trip), Mechanical Counter, Interruption Level, Fault Counter	✓	✓	✓	✓
<b>Security</b> Password Protection	✓	✓	✓	✓
<b>Event Log</b> Time-stamped-10 Most Recent Alarms	✓	✓	✓	✓
<b>Trip Log</b> Time-stamped-5 Most Recent Trips	✓	✓	✓	✓
<b>Alarms</b> (Alarm Only) Overcurrent, Gnd. Overcurrent, Over Amp Demand, Over kW, Over kW Demand, Over KVAR, Over KVA, Under/Over P.F.	✓	✓	✓	✓
<b>Advanced Alarms</b> Total Harmonics			✓	✓
<b>Min./Max. Logs</b> Volt/Amp, Power, PF, Freq., %THD			✓	✓
<b>Harmonic Analysis</b> Up to 19th Per Phase, THD			✓	✓
<b>Protective Relay Functions (Alarm and/or Trip)</b> Neutral Overcurrent, Current Balance, Under/Over Voltage, Voltage Unbalance, Reverse Power, Under/Over Frequency			✓	✓
<b>Ground Fault Protection</b> Residual or Ground Return		✓		✓

**SB-EC Trip Unit**



## How To Order SB-EC Trip Units

There are four available models built around a full function overcurrent protective unit, including Communications, Basic Alarms and Logs, Metering with Waveform Displays, Operation and Fault Counters, and Security Features as standard. A Potential Transformer Module and External Power Supply are required for Communications and Metering Functions along with a Rating Plug and Auxiliary Wiring Kit for trip unit operation and must be ordered separately. The PT Module and Power Supply are external, panel mounted components. Refer to the following tables.

Example SB-EC Trip Unit Order:

**SB04TP01G Trip Unit** ① + **SBEPS Power Supply** ② + **SBPTM480 PT Module** ③ + **SBECDAK Wire Kit** ④

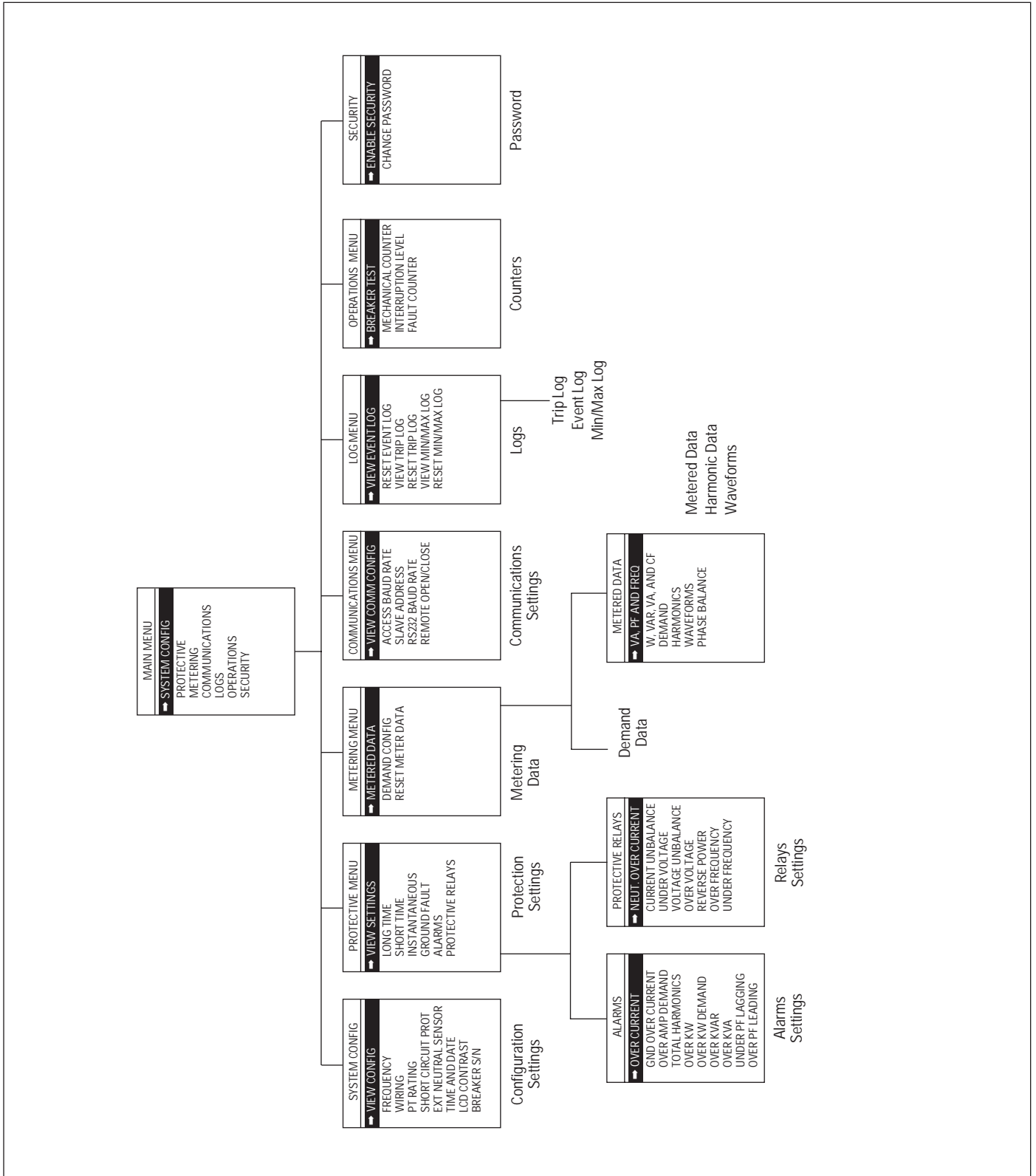
① Refer to **Tables D & E** ② Refer to **Table F** ③ Refer to **Table G** ④ Refer to **Table H**

**Table E - SB-EC Trip Unit Catalog Numbering**

Breaker Type	SB Frame Rating (A)	SB-EC Trip Unit	Trip Unit Functionally (See Table 2)	Ground Fault Protection <sup>①</sup>
SB	04	TP	01	G
SB	04 = 400 08 = 800 12 = 1200 16 = 1600 20 = 2000 25 = 2500 32 = 3200 40 = 4000 50 = 5000	TP	01 = standard model including real-time voltage and current waveform displays, overcurrent protection, metering and communications  02 = premium model including real-time voltage and current waveform displays, overcurrent protection, metering and communications + protective relay functions + min/max logs + power quality harmonic analysis	G = ground fault protection  Blank = no ground fault protection

① Residual and Ground Return sensing schemes available. Order correct Neutral Current Transformer separately for 3 phase, 4 wire systems. See page 16.

# SB-EC Menu Structure



Front Panel Menu Structure

# SB-EC Trip Unit Accessories

## Required SB-EC Trip Unit Accessories

**Table F: SB-EC External Power Supply**

Catalog Number	Input Voltage
<b>SBEPS</b>	120 VAC
<b>SBEPS24</b>	24 VDC and 48 VDC

Note: One power supply can power up to three trip units. Max wire length between trip unit and power supply is 50 feet.

**Table G: SB-EC Potential Transformer (PT) Modules**

Catalog Number	Systems Voltage (VAC)
<b>SBPTM240</b>	240
<b>SBPTM480</b>	480
<b>SBPTM600</b>	600

Note: One PT module can power up to three trip units when the line side bus is common. Max wire length between PT module and each trip unit is 50 feet.

## Additional SB-EC Trip Unit Accessories

All other SB Breaker Internal and External Accessories may be used with the SB-EC Trip Unit except the Remote Indicator Panel (type **SBRIP**), Auxiliary Power Module (type **SBAPM**), Ground Fault Monitor, (type **SBGFM**), and Plug-in Display Module (type **SBDM**).

**Table J: SB-EC Remote Open/Close and Alarm Relay Accessory**

Catalog Number	System Voltage	Additional Relay Contact
<b>SBECDMR120</b>	120 VAC	Alarm Contact
<b>SBECBA120</b>		Bell Alarm
<b>SBECDMR24</b>	24 VDC	Alarm Contact
<b>SBECBA24</b>		Bell Alarm
<b>SBECDMR48</b>	48 VDC	Alarm Contact
<b>SBECBA48</b>		Bell Alarm
<b>SBECDMR125</b>	125 VDC	Alarm Contact
<b>SBECBA125</b>		Bell Alarm

Note: This accessory is required only for remote breaker open/close operation via R5232 or RS485 communications. This accessory cannot be supplied in addition to the Bell Alarm or Display Module Relay. This accessory requires the Shunt Trip and Electric Motor Operator Accessories' control voltage to be the same as this accessory.

**Table K: SB-EC Trip Unit Retrofit Kit**

Frame Size	Catalog Number
1200, 2000, 3200	<b>SBECAKT</b>
5000	<b>SB4ECAKT</b>

Note: Field installable by Siemens Field Service personnel only. This accessory for retrofitting existing SB Breaker installations with SB-EC Trip Units. Trip Unit and required accessories should be ordered separately.

**Table H: SB-EC Wire Kit Accessories**

Catalog Number	Frame Size	Description
<b>SBECDAK</b>	1200,	Drawout
<b>SBECFAK</b>	2000	Fixed Mount
<b>SB3ECDAK</b>	3200	Drawout
<b>SB3ECFAK</b>		Fixed Mount
<b>SB4ECDAK</b>	5000	Drawout
<b>SB4ECFAK</b>		Fixed Mount

Note: Select one wire kit per trip unit according to mounting configuration. Factory wired.

## Communications

Open-protocol communications allows all SB Trip Units to be integrated into Siemens supervisory software (WinPM™ V4.0) and other popular third party energy monitoring networks. Protocol Converters are available from the Siemens ACCESS Group for connection to a variety of open and proprietary automation protocols, including Profibus DP, LonWorks, the Siemens S7 PLC, and many other third party PLCs. Refer to Bulletin IPIM-221 1A for additional information. EIA-232 communications is also available for local PC communication and trip unit configuration via Siemens SBWin™ software.

No additional accessory devices are required for integration of the SB-EC Trip Unit into the ACCESS™ Communication System. A Multiplexer/Translator (Catalog No. **MTZ**) and Expansion Plug communication components are always required for Zone Selective Interlocking and must be ordered separately. Refer to page 13-14 for additional information.

## Remote Automatic Operation

Remote, automatic open and close operation of the breaker is possible via the SB-EC Trip Unit's EIA-485 or EIA-232 communication ports or a hard-wire input. Remote operation using a communication port requires a protocol converter or Siemens WinPM™ V4.0 software for EIA-485 Networked Communications or SBWin™ software for EIA-232 PC Communications for the following required accessories. The Shunt Trip and Remote Open/Close Relay accessories are required for the remote open function, and the Electrical Operator accessory is required in addition for both remote open and close operations.

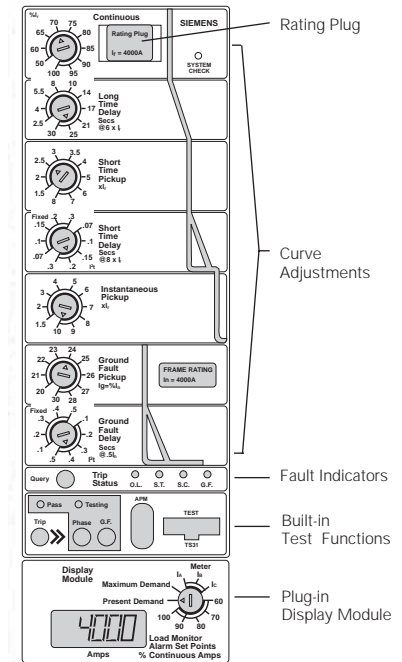
Remote, automatic operation via a hard-wire input uses the following accessories with optional control voltages available. Only the Shunt Trip Accessory is necessary for the remote open function, and the Electrical Operator is additionally required for both remote open and close operations.

# Type "TL" Trip Units

Table L: Type "TL" Trip Units

Trip Unit Function	Catalog Number					
	SB <sup>①</sup>	T <sup>②</sup>				
Adjustable Continuous Current	X	X	X	X	X	X
Adjustable Long Time Delay	X	X	X	X	X	X
Adjustable Short Time Pickup		X	X		X	X
Adjustable Short Time Delay (I <sup>2</sup> t)		X	X		X	X
Adjustable Short Time Delay (Fixed)		X	X		X	X
Adjustable Instantaneous Pickup	X	X		X		X
Adjustable Ground Fault Pickup <sup>③</sup>				X	X	X
Adjustable Ground Fault Time Delay (I <sup>2</sup> t) <sup>③</sup>				X	X	X
Adjustable Ground Fault Time Delay (Fixed) <sup>③</sup>				X	X	X
Fixed Instantaneous Override	X	X	X	X	X	X
Internal Watchdog	X	X	X	X	X	X
Integral Testing Functions	X	X	X	X	X	X
Local Trip Indication:						
Overload	X	X	X	X	X	X
Short Time		X	X		X	X
Short Circuit	X	X	X	X	X	X
Ground Fault				X	X	X
Access Communications Compatibility <sup>④</sup>	X	X	X	X	X	X
<b>Catalog Number Suffix <sup>②</sup></b>	<b>LI</b>	<b>LSI</b>	<b>LS</b>	<b>LIG</b>	<b>LSG</b>	<b>LSIG</b>

- ① Insert appropriate breaker frame ampere rating designation into catalog number. See example below.
- ② Add appropriate catalog number suffix as required. See example below.
- ③ For 3 phase, 4 wire systems, order correct 4th wire (neutral) transformer as separate item. See page 16.
- ④ Expansion Plug and Multiplexer/Translator required. See page 19.



The interchangeable trip unit system of the SB breaker showcases the latest advancements in microprocessor controlled circuit protection technology. Using the speed and power of its microprocessor to drive sophisticated digital sampling techniques, the SB trip unit measures the true heating content of the current waveform (RMS current) hundreds of times each second, effectively eliminating nuisance tripping due to the presence of harmonics and other "noise" on the system.

All standard trip units feature:

- Integral Testing Functions
- Built-in Trip Indicators
- Instantaneous "Override"
- Continuous Self-Diagnostic "Watchdog"
- System LED on front cover

Available protective function adjustments include:

- Continuous Current
- Long Time Delay
- Short Time Pickup and Delay
- Instantaneous Pickup
- Ground Fault Pickup and Delay

Choose the appropriate function package and catalog number as shown below:

**Example: S B 20 T L S G**

Breaker Frame Ampere Rating      Catalog Number Suffix

2000 ampere breaker ampere rating with:

- Adjustable Continuous Current
- Adjustable Long Time Delay
- Adjustable Short Time Pickup and Time Delay
- Adjustable Ground Fault Pickup and Time
- Delay Breaker Ampere Ratings:  
04 = 400, 08 = 800, 12 = 1200,  
16 = 1600, 20 = 2000, 25 = 2500,  
32 = 3200, 40 = 4000



# Type "TL" Trip Unit Accessories

## Plug-in Display Module

The Plug-in Display Module can be added to the type "TL" electronic trip unit only to provide digital current readout of each phase in amperes. The module also provides load monitor set points at 60, 70, 80, 90 and 100% of the continuous ampere setting. Also provided are two ampere demand functions. May be used in conjunction with the Alarm Relay on page 16 or the Bell Alarm and Alarm Relay Combination Module on page 15 for remote alarming. UL listed for field installation.

### Catalog Number SBDM



## Ground Fault Monitor

The Ground Fault Monitor can be used in type "TL" electronic trip units only supplied with or without the ground fault protection function. It allows the user to locally monitor the ground fault current in amperes without tripping the breaker. Three ground fault pickup levels based on the breaker frame ampere rating are provided for each of the three fixed ground fault time delay bands (0.1, 0.3 and 0.5 seconds). May be used in conjunction with the Alarm Relay or the Bell Alarm and Alarm Relay Combination Module. The combinations allow applications such as Ground Fault Warning only, when used with TL Trip Units without Ground Fault Protection, or may provide an alarm for Ground Fault indication at a lower level than the Ground Fault protection level set for TL Trip Units specified with Ground Fault protection. See page 15 for remote alarming. UL listed for field installation.

### Catalog Number SBGFM



## Rating Plugs

**Table M: Rating Plugs for SB-EC and Type "TL" Trip Units**  
Select the proper Rating Plug based on the maximum continuous current rating of the load served and the breaker frame ampere rating.

Breaker Max Ampere Rating	Rating Plug Ampere Rating	Catalog Number
400	200	04SB200
	225	04SB225
	250	04SB250
	300	04SB300
800	350	04SB350
	400	04SB400
	400	08SB400
	450	08SB450
800	500	08SB500
	600	08SB600
	700	08SB700
	800	08SB800
1200	600	12SB600
	700	12SB700
	800	12SB800
	1000	12SB1000
1200	1200	12SB1200
	800	16SB800
	1000	16SB1000
	1600	1200
1600		16SB1600
1000		20SB1000
1200		20SB1200
2000	1600	20SB1600
	2000	20SB2000
	1600	25SB1600
	2000	25SB2000
2500	2500	25SB2500
	1600	32SB1600
	2000	32SB2000
	3200	2500
3000		32SB3000
3200		32SB3200
4000		2000
	2500	40SB2500
	3000	40SB3000
	3200	40SB3200
4000	4000	40SB4000
	2500	50SB2500
	3000	50SB3000
	5000	3200
4000		50SB4000
5000		50SB5000
5000		50SB5000

# Internal and External Accessories

**Table N: Electrical Operators**

Electric Operators function to automatically charge the SB breaker's stored energy mechanism. Each operator includes a Remote Closing Solenoid for closing the breaker from a remote location and an electronic controller which provides anti-pump protection and remote charging capability and indication. The Closing Coil Interlock (CCX) option allows the customer to block the operation of the closing coil by adding an external electrical contact/interlock in the breaker's closing coil circuit. A Shunt Trip or Under Voltage Release should be ordered and priced separately for remote opening of the breaker. UL listed for field installation.

Electrical Operators		CCX Option	
Frame Sizes	Voltage		Catalog Number w/CCX Option
	AC	DC	
1200 2000 3200	120	—	SBEO120
	—	24	SBEO24
	—	48	SBEO48
	—	125	SBEO125
5000	120	—	SB4EO120
	—	24	SB4EO24
	—	48	SB4EO48
	—	125	SB4EO125

## Electrical Operators With Electric Close

Electric Operators with Local Electric Close provide an electric close pushbutton on the breaker escutcheon that can be electrically interlocked with an external control circuit. The Closing Coil Interlock Option is also available on operators equipped with Local Electric Close. Factory installation only. Note that "Push to Close" and "Push to Open" pushbutton operators are provided on the breaker escutcheon as standard.

## Electrical Operators with Local Electric Close

Local Electric Close		CCX Option	
Frame Sizes	Voltage		Catalog Number w/CCX Option
	AC	DC	
1200 2000 3200	120	—	SBEO120LEC
	—	24	SBEO24LEC
	—	48	SBEO48LEC
	—	125	SBEO125LEC
5000	120	—	SB4EO120LEC
	—	24	SB4EO24LEC
	—	48	SB4EO48LEC
	—	125	SB4EO125LEC

**Table P: Secondary Contact Blocks**

Contact blocks are required for secondary control wiring. Sliding Secondary Disconnects are required on drawout mounted breakers, and Control Terminal Blocks are required for fixed mounted breakers. The appropriate number and location of contact blocks should be selected from the table below based on the features

and accessories ordered on each circuit breaker. Control Terminal Blocks require a mounting bracket as shown below. All Sliding Secondary Disconnects or Control Terminal Blocks should be priced separately.

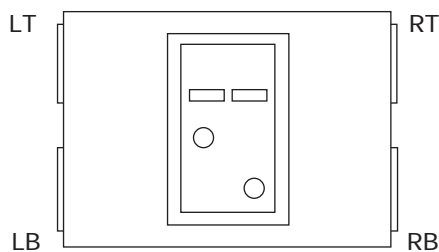
Contact Block Position	Accessory											
	Electric Operator	Remote Closing Solenoid	Shunt Trip	Under-voltage Release	Neutral Sensor	CCX Option or Remote <sup>①</sup> Indication Panel	Zone Interlock and ACCESS	Bell Alarm <sup>①</sup> or Display Module Relay or Remote Open/Close Relay	SB-EC Trip Unit External Power Supply and PT Module	Auxiliary Switches		
										1A and 1B 2A and 2B 3A and 3B	4A and 4B <sup>②</sup> 5A and 5B <sup>②</sup> 6A and 6B <sup>②③</sup>	
LT	X	X	X	X	X							
LB						X	X		X			
RT								X	X		X	
RB										X		

## Sliding Secondary Disconnects

Contact Position	Catalog Number
LT	SBSDLT
LB	SBSDLB
RT	SBSDRT
RB	SBSDRB

## Control Terminal Blocks

Contact Position	Catalog Number
LT	SBTBLT
LB	SBTBLB
RT	SBTBRT
RB	SBTB RB



Secondary Contact Block Locations

## Mounting Bracket for Terminal Block

For mounting Control Terminal Blocks to fixed mounted breakers. One bracket required for mounting locations LT and LB and a separate bracket required for mounting locations RT and RB.

## Catalog Number SBTBM

- Remote Indicator Panel, Bell Alarm, Display Module Relay and Remote Open/Close Relay are mutually exclusive accessories. Only one may be used per breaker.
- 4A and 4B, 5A and 5B, 6A and 6B auxiliary switches not available with SB-EC Trip Unit.
- 6A and 6B auxiliary switches are not available with the Bell Alarm or Alarm Relay Accessories.

# Internal and External Accessories

## Shunt Trips

Allows the breaker to be opened from a remote location. Included is an auxiliary switch for remote indication of breaker “open” or “closed” status. UL listed for field installation.

Frame Sizes	Voltage		Catalog Number
	AC	DC	
120	—	—	<b>SBST120</b>
	240	—	<b>SBST240</b>
1200 2000	480	—	<b>SBST480</b>
	—	12	<b>SBST12</b>
	—	24	<b>SBST24</b>
	—	48	<b>SBST48</b>
	—	125	<b>SBST125</b>
	3200 5000	120	—
240		—	<b>SB4ST240</b>
480		—	<b>SB4ST480</b>
—		12	<b>SB4ST12</b>
—		24	<b>SB4ST24</b>
—		48	<b>SB4ST48</b>
—		125	<b>SB4ST125</b>

## Remote Closing Solenoids (Shunt Close)

For use with manually operated breakers. Allows the breaker to be closed from a remote location if the breaker is fully charged and ready to close. Included is an auxiliary switch for remote spring charged indication. A Remote Closing Solenoid is provided at no charge on electrically operated breakers. UL listed for field installation. The factory-installed Local Electric Close option provides an electric close pushbutton on the breaker escutcheon that can be electrically interlocked with an external control circuit.

Frame Sizes	Voltage		Catalog Number	Catalog Number w/CCX Option
	AC	DC		
1200 2000	120	—	<b>SBRC120</b>	<b>SBRC120LEC</b>
	—	24	<b>SBRC24</b>	<b>SBRC24LEC</b>
	—	48	<b>SBRC48</b> ①	<b>SBRC48LEC</b> ①
	—	125	<b>SBRC125</b> ①	<b>SBRC125LEC</b> ①
3200 5000	120	—	<b>SB4RCS120</b>	<b>SB4RCS120LEC</b>
	—	24	<b>SB4RCS24</b>	<b>SB4RCS24LEC</b>
	—	48	<b>SB4RCS48</b> ①	<b>SB4RCS48LEC</b> ①
	—	125	<b>SB4RCS125</b> ①	<b>SB4RCS125LEC</b> ①

① Add “D” suffix letter for drawout application.

## Auxiliary Switches

Each pair of Auxiliary Contacts includes 1 NO and 1 NC isolated contacts. UL listed for field installation.

Frame Sizes	Contact Configuration	Catalog Number	
1200 2000	1A and 1B 2A and 2B	<b>SBAS2</b> <b>SBAS4</b>	
	3A and 3B 4A and 4B ①	<b>SBAS6</b> <b>SBAS8</b>	
	5A and 5B ① 6A and 6B ① ②	<b>SBAS10</b> <b>SBAS12</b>	
	3200 5000	1A and 1B 2A and 2B	<b>SB4AS2</b> <b>SB4AS4</b>
		3A and 3B 4A and 4B ①	<b>SB4AS6</b> <b>SB4AS8</b>
5A and 5B 6A and 6B ① ②		<b>SB4AS10</b> <b>SB4AS12</b>	

① 4A and 4B, 5A and 5B, 6A and 6B not available with the SB-EC Trip Unit

② 6A and 6B not available with Bell Alarm or Alarm Relay accessories.

## Undervoltage Releases

UL listed for field installation.

Frame Sizes	Voltage		Catalog Number
	AC	DC	
1200 2000	120	—	<b>SBUV120</b>
	240	—	<b>SBUV240</b>
	480	—	<b>SBUV480</b>
	600	—	<b>SBUV600</b>
	—	12	<b>SBUV12</b>
	—	24	<b>SBUV24</b>
	—	48	<b>SBUV48</b>
	—	125	<b>SBUV125</b>
3200 5000	120	—	<b>SB4UV120</b>
	240	—	<b>SB4UV240</b>
	480	—	<b>SB4UV480</b>
	600	—	<b>SB4UV600</b>
	—	12	<b>SB4UV12</b>
	—	24	<b>SB4UV24</b>
	—	48	<b>SB4UV48</b>
	—	125	<b>SB4UV125</b>

## Bell Alarm and Alarm Relay Combination Module

This unit is an internally mounted accessory that interfaces directly with any trip unit. In addition to all enabled SB-EC Trip Unit protective relay functions, it provides one NO Bell Alarm contact for remotely indicating that a breaker has tripped due to an overload, short circuit, short-time delay, or ground fault. The bell alarm’s contact is a latching type and remote reset capability is provided. One NO alarm relay contact is also provided for ground fault monitor or plug-in display module alarming and all SB-EC trip unit and alarm functions. Auxiliary switches 6A and 6B are not available with this accessory.

AC	Voltage		Catalog Number
	DC		
120	—		<b>SBBADMR120</b>
—	24		<b>SBBADMR24</b>
—	48		<b>SBBADMR48</b>
—	125		<b>SBBADMR125</b>

## Bell Alarms

The Bell Alarm accessory provides 1 NO and NC (Form C) alarm contact that operates only when the breaker opens automatically due to an overload, short circuit, short time delay or ground fault in addition to SB-EC Trip Unit protective relaying functions. The Alarm Relay, Remote Indicator Panel and Remote Open/Close Relay accessories cannot be supplied in addition to the Bell Alarm. If a Bell Alarm is supplied, Auxiliary Switches 6A and 6B are not available. The relay is a latching type and can be reset remotely or locally.

AC	Voltage		Catalog Number
	DC		
120	—		<b>SBBA120</b>
—	24		<b>SBBA24</b>
—	48		<b>SBBA48</b>
—	125		<b>SBBA125</b>

# Internal and External Accessories

## Alarm Relays

The Alarm Relay provides 1 NO and NC (Form C) contact. When used with the "TL" Trip Unit Display Module or Ground Fault Monitor, the relay changes state when the current set-point is exceeded. When used with the SB-EC Trip Unit, the relay changes state whenever an alarm is active. If the current falls below the set point or the alarm is no longer active, the contact returns to its normal state. The Bell Alarm, Remote Indicator Panel, and Remote Open/Close Relay accessories cannot be supplied in addition to the Alarm Relay. If the Display Module Relay is supplied, Auxiliary Switches 6A and 6B are not available.

Voltage		Catalog Number
AC	DC	
120	—	<b>SBDMR120</b>
—	24	<b>SBDMR24</b>
—	48	<b>SBDMR48</b>
—	125	<b>SBDMR125</b>

## Local Bell Alarm Reset Operator

The Local Bell Alarm Reset Operator provides a Bell Alarm reset button on the breaker escutcheon for use with the Bell Alarm, Bell Alarm and Alarm Relay Combination Module, and the Remote Open/Close Relay with Bell Alarm Contact. Factory installed only. May not be used with the Local Electric Close Operator option provided for the Electrical Operator.

**Catalog Number SBLBAR**

## Remote Indication Panels

Provides remote indication of breaker trip status for use with the Type "TL" Trip Units only. Externally mounted panels include four LED indicators: overload, short time, short circuit and ground fault. Also provided are four independent relays for remote indication, plus display module indication and relay functions. Requires a 120 volt control power source. This accessory cannot be supplied in addition to the Bell Alarm or Alarm Relay.

**Catalog Number SBRIP120**

## Neutral Current Transformers

For use with SB breakers with ground fault protective functions and being applied in three phase four wire systems incorporating standard residual ground fault sensing schemes.

Breaker Ampere Rating	Catalog Number
400	<b>N04SB</b>
800	<b>N08SB</b>
1200	<b>N12SB</b>
1600	<b>N16SB</b>
2000	<b>N20SB</b>
2500	<b>N25SB</b>
3200	<b>N32SB</b>
4000	<b>N40SB</b>
5000	<b>N50SB</b>

## Cell Position Switches

Indicate position of breaker element (connected or test) in draw-out. Available as set of 1 NO and 1 NC isolated contacts. UL listed for field installation.

Frame Sizes	Contact Configuration	Catalog Number
1200 2000	1A and 1B	<b>CEL 1</b>
	2A and 2B	<b>CEL 2</b>
	3A and 3B	<b>CEL 3</b>
	4A and 4B	<b>CEL 4</b>
3200 5000	1A and 1B	<b>4CEL1</b>
	2A and 2B	<b>4CEL2</b>
	3A and 3B	<b>4CEL3</b>
	4A and 4B	<b>4CEL4</b>

## Dead Front Shields

Mount to the front of the SB breaker to prevent inadvertent contact with live, current-carrying parts. UL listed for field installation.

Frame Sizes	Catalog Number
1200	<b>SB08DF</b>
2000	<b>SB20DF</b>
3200	<b>SB32DF</b>
5000	<b>SB40DF</b>



Dead Front Shields Installed

## Drawout Safety Shutters

Provide a sliding barrier to prevent contact with live parts when a drawout breaker is in the unlocked position or removed from the Stationary Drawout Element. Factory or field installation.

Frame Sizes	Catalog Number
1200	<b>SBSS08</b>
2000	<b>SBSS20</b>
3200	<b>SBSS32</b>
5000	<b>SBSS40</b>

## Lifting Bracket

Allows drawout SB breakers to be lifted with mechanical hoists.

Catalog Number
<b>SBLD</b> (For Drawout Mounted 1200, 2000 and 3200A Frames)
<b>SBLD4</b> (For Drawout Mounted 5000A Frame)

# Internal and External Accessories

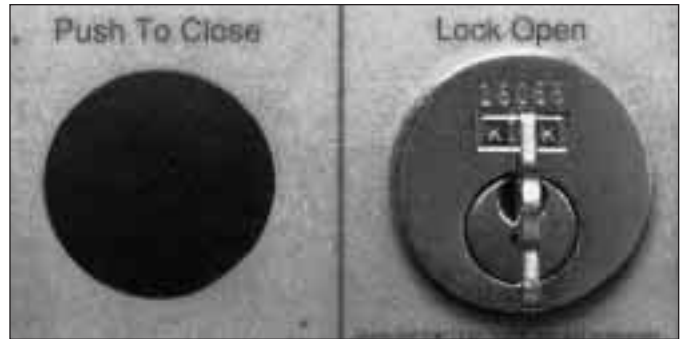
## Breaker Closing Blocking Devices

Covers the Close pushbutton on the breaker escutcheon to prevent closing breaker manually without special tool. UL listed for field installation.

Description	Catalog Number
Breaker Closing Blocking Device	<b>SBBD</b>



Closing Breaker Device is installed over the closed pushbutton switch.



Key is installed in the central escutcheon.

## Factory Mounted Key Interlocks (All Frames)

Catalog Number
<b>KISB</b> (Kirk)
<b>SISB</b> (Superior)

## Provision Only For Key Interlock

Frame Sizes	Fixed Breaker	Drawout Breaker
	Catalog Number	Catalog Number
1200	<b>KIPOF</b>	<b>8KIPOD</b>
2000	<b>KIPOF</b>	<b>20KIPOD</b>
3200	<b>32KIPOF</b>	<b>32KIPOD</b>
5000	<b>40KIPOF</b>	<b>40KIPOD</b>

## Key Interlocks

Key Interlocks can be installed at the factory or supplied by the customer. Customer supplied Key Interlocks require pre-installed factory mounted "provision only for Key Interlock" to be installed.

Factory installed interlocks are mounted in the cover of the breaker. Only one interlock can be installed per breaker. Cover-mounted Key Interlocks are not field addable.

As many as four customer supplied Key Interlock tumblers can be field installed on the "provision only for Key Interlocks." One provision must be ordered for each SB breaker requiring field installed interlocks. Order Key Interlocks from Kirk or Superior as follows:

### Fixed Breakers:

- Kirk Key Lock Type F
  - Superior Lock Type B-4003
- Both with 0.375" bolt projection, bolt extended with key removed

### Drawout Breakers:

- Kirk Key Lock Type FN
  - Superior Lock Type B-7003
- Bolt with 0.375" bolt projection, bolt extended with key removed and modified per Siemens drawing #122274

## Mechanical Interlocks

Factory installed only. Used to mechanically interlock two circuit breakers so that only one can be closed at a time but both can be open at the same time. Factory prepared breakers are required and must be ordered with the Mechanical Interlock. The interlocking is accomplished by utilizing a cable interlock system between breakers. Specify mounting of the circuit breakers as adjacent vertical or horizontal and center to center dimension.

Frame Size	Maximum Center-to-Center Distance		Maximum Center-to-Center Distance For "L12" Suffix	
	Horizontal	Vertical	Horizontal	Vertical
1200A Fixed Mount	38"	38"	110"	110"
1200A Drawout	32"	38"	104"	110"
2000A Fixed Mount	38"	38"	110"	110"
2000A Drawout	32"	36"	104"	108"
3200A Fixed Mount	38"	36"	110"	108"
3200A Drawout	32"	30"	104"	102"
5000A Fixed Mount	32"	36"	104"	108"
5000A Drawout	26"	30"	98"	102"

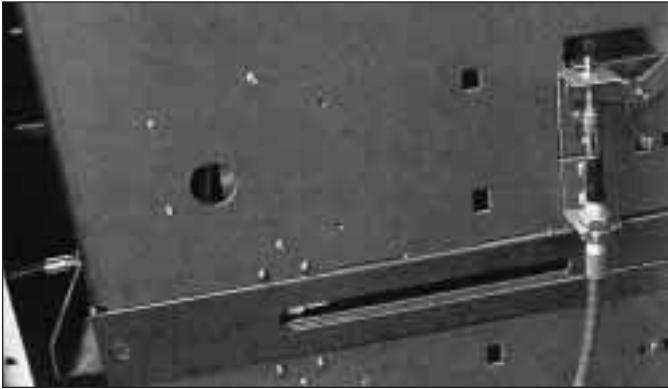


# Internal and External Accessories

## Mechanical Interlocks For Fixed Mounted Breaker

Frame Sizes	Catalog Number
1200	<b>SBMIF08</b> ①
2000	<b>SBMIF20</b> ①
3200	<b>SBMIF32</b> ①
5000	<b>SBMIF40</b> ①

① Add "LI2" suffix for extended cable length.



Mechanical Interlock

## Mechanical Interlocks For Drawout Mounted Breaker

Frame Size	Catalog Number
1200	<b>SBMID08</b> ②
2000	<b>SBMID20</b> ②
3200	<b>SBMID32</b> ②
5000	<b>SBMID40</b> ②

② Add "LI2" suffix for extended cable length.

## Breaker Padlocking Devices

Padlock on breaker allows the Open pushbutton to be padlocked in the depressed position. UL listed for field installation.

Description	Catalog Number
Padlock on Breaker	<b>SBPLB</b>

Padlock on drawout allows breaker to be padlocked in one of three drawout positions: connected, test or unlocked. UL listed for field installation.

Description	Catalog Number
Padlock on Drawout	<b>SBPLD</b>

# External Accessories and ACCESS™ Communications

## Test Kit

For field testing the SB Encased System Breaker. The test kit can test the following breaker functions by phase:

- Time
- Instantaneous
- Current Transformer Continuity
- Short Time
- Ground Fault

## Catalog Number TS31

## ACCESS™ Communications ①

All SB Circuit Breaker trip units feature two levels of communication: Zone Selective Interlocking (ZSI) and ACCESS™ System Open-protocol communications. The SB-EC Trip Unit is fully equipped for direct integration into ACCESS™ or compatible communication systems.

A Multiplexer/Translator (MTZ) and Expansion Plug are required whenever Zone Selective Interlocking is specified for any trip unit.

A Multiplexer/Translator (MTA) and Expansion Plug are required for the Type "TL" trip unit when full ACCESS™ communications is specified. The MTA also has Zone Selective Interlocking capability. Refer to Bulletin IPIM-2211A for additional information.

Siemens WinPM™ V4.0 supervisory software delivers a powerful energy management system providing sophisticated monitoring capability to a host computer and other components in the electrical distribution system at an affordable cost. It also provides process control, including peak demand, trend analysis, waveform analysis, and harmonic calculations and displays. These functions help pinpoint energy consumption, power quality issues, and the energy cost of any process. Outages and potential outages can be quickly diagnosed and plans can be generated for expansion and preventative plant maintenance. Refer to Bulletins IPIM-2211A for additional information.

Communications is accomplished via EIA-485 twisted pair wire or modem, providing communications to a remote site and allowing access to multiple plants. WinPM™ V4.0 utilizes a Windows DDE (dynamic data exchange) server that allows data exchange to other Windows software such as spreadsheets and word-processors.

Protocol Converters are available from the Siemens ACCESS group for connection to a variety of open and proprietary automation protocols as part of the ACCESS™ product line, including Profibus DP, LonWorks, the Siemens S7 PLC, and many other third party PLCs and associated networks.

The SB-EC Trip Unit's EIA-232 communications port provides additional PC communications for available trip unit data displays and trip unit configuration via Siemens SBWin™ software.

① Consult Siemens ACCESS™ Group or Bulletin IPIM-2211A for additional information on Siemens ACCESS™ components.

## SBWin™ Software

Siemens SBWin™ software provides Windows-based PC communications for displaying and storing trip unit data displays and for system configuration of SB-EC Trip Units via its EIA 232 communications port. Remote open/close operation when used with the Remote Open/Close Relay is also possible

## Catalog Number SBWIN

# External Accessories and ACCESS™ Communications

## Type “TL” Trip Unit Auxiliary Power Module

A device used to bring power into the SB breaker type “TL” electronic trip unit only so that the trip unit can be tested via the integral testing functions when the breaker is withdrawn from the Stationary Drawout Element. It is required to trip the breaker’s shunt trip when no primary power is applied to the breaker or when “bench testing” the electronic trip unit.

**Catalog Number SBAPM**

## Expansion Plug

The Expansion Plug is an electronic interface and isolation module necessary to integrate a breaker into an ACCESS System. One Expansion Plug is required for each circuit breaker in the system and is used to interface SB Breaker trip units to the Multiplex/Translator. The Expansion Plug is *always* necessary for zone interlocking or full ACCESS communications for the Type TL trip unit. An Expansion Plug is not required for ACCESS communications using the SB-EC Trip Unit but is required for zone interlocking. Factory or Siemens Field Service field installable only.

Type of Mounting	800-2000A Cat. No. ①	3200, 4000-5000A Cat. No. ①
Fixed	EPSBFMK	EPSB4FMK
Drawout	EPSBDMK	EPSB4DMK

## Communication and Zone Selective Interlocking Component Selection Guide

Required Accessory	Trip Unit and Application		
	SB-EC for ZSI ②	“TL” for ZSI	“TL” for Access Communications and/or ZSI ③
MTZ ③	X	X	
MTA ③			X
EPSBxxMK ④	X	X	
MTCsbxxCable ⑤	X	X	X

① One EP required per Trip Unit when specified.

② No additional components are required for the SB-EC Trip Unit to communicate over the ACCESS Bus.

③ The MTA can also accommodate an SB-EC Trip Unit for ZSI functionality.

④ Replace xx in catalog number with 08, 15 or 25 for required cable length of 8’, 15’ or 25’ respectively. One cable required per EP when specified.

⑤ One MTA or MTZ can accommodate eight trip units. Multiple MT’s can be connected via MTC cables.

## Cables and Connectors

ACCESS communications system components can be connected together using standard, commercially available cables and connectors. Refer to Information and Instruction Guide IPIM-2211A for specific cable and connector specifications and requirements. Cables and connectors can be ordered per the table below. Select longer length when unsure of mounting configuration.

Catalog Number	Description ①
MTCSB08	Telephone cable, 8’, used between Expansion Plug and Multiplexer/Translator
MTCSB15	Telephone cable, 15’, used between Expansion Plug and Multiplexer/Translator
MTCSB25	Telephone cable, 25’, used between Expansion Plug and Multiplexer/Translator
MTC08	Telephone cable, 8’ used between multiple Multiplexer/Translators
MTC15	Telephone cable, 15’ used between multiple Multiplexer/Translators
MTC25	Telephone cable, 25’ used between multiple Multiplexer/Translators

① Alternate cable lengths available by special order. Contact your local sales office for details.

## Multiplexer/Translator (MT)

The Multiplexer/Translator is a mini-computer that collects data from different components integrated into the ACCESS communications system and transmits the data to other components in the system. The Multiplexer/Translator can receive data from as many as eight (8) field devices and multiple Multiplexer/ Translators can be connected together as required via MTC cables.

A Multiplexer/Translator (MTZ) and Expansion Plug are required whenever Zone Selective Interlocking is specified for any trip unit.

A Multiplexer/Translator (MTA) and Expansion Plug are required for the Type “TL” trip unit when full ACCESS™ communications is specified. The MTA also has Zone Selective Interlocking capability. Refer to Bulletin IPIM-2211A for additional information.

## MT For Zone Selective Interlocking (ZSI) Only

**Catalog Number MTZ**

Always required for Zone Interlocking.

## MT Full Access Communications Plus Zone Selective Interlocking

**Catalog Number MTA**

Required for Type “TL” Trip Unit when ACCESS Communications and Zone Selective Interlocking (ZSI) is specified.

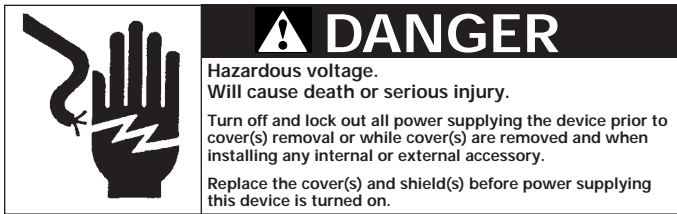
## Local Display Unit (LDU)

The LDU provides a central viewing point for up to 32 ACCESS devices, including SB Trip Units, Sensitrip MCCB Trip Units and 4300 Power Meters. The display features a 4x20 backlit LCD read-out of real-time metering and configuration data. The device is menu driven and features a “self learn” mode to automatically configure itself for the ACCESS devices on the network. Panel-mountable for switchboard applications, with simple 2-wire RS-485 communication connectivity.

Description	Catalog Number
Local Display Unit ①	LDU-100

① Available 3/99.

# External Accessories and ACCESS™ Communications System



## SB Breaker Communication

All SB Circuit Breaker trip unit feature levels of communication: Zone Selective Interlocking and ACCESS System open-protocol communications. The SB-EC Trip Unit is fully equipped for direct integration into ACCESS or compatible communication systems. It does not require a **MTA** (Multiplexer/Translator for ACCESS communications and Zone interlocking) or expansion plug (EP).

If zone selective interlocking alone is specified for a SB-EC or TL Trip Unit, a **MTZ** (Multiplexer/Translator for Zone Interlocking) and an EP are required.

If zone selective interlocking and full ACCESS communications are specified for a TL Trip Unit, a **MTA** and an EP are required.

The MT (as in **MTA** and **MTZ**) is a minicomputer that collects data from and transmits data to difference components integrated into the ACCESS communications system. The MT can support up to eight field devices. Multiple MT's can be connected, although an expansion plug may be required for each trip unit.

Siemens WinPM supervisory software (version 4.0 or later) delivers a powerful energy management system providing sophisticated monitoring capability to a host computer and other components in the electrical distribution system at affordable cost. It also provides process control, including peak demand, trend analysis, waveform analysis, and harmonic calculations and displays. These functions help pinpoint energy consumption, power quality issues, and the energy cost of any process. Outages and potential outages can be quickly diagnosed and plans can be generated for expansion and preventative plant maintenance.

**NOTE: Refer to Bulletin IPIM-2211A for additional information on the MTA and Siemens WinPM software.**

Communications is accomplished via EIA-485 twisted pair wire or modem. It provides communications to a remote site and allows access to multiple plants. WinPM uses a Microsoft Windows dynamic data exchange (DDE) server that allows data exchange to other Windows-based software such as spreadsheets and word processors.

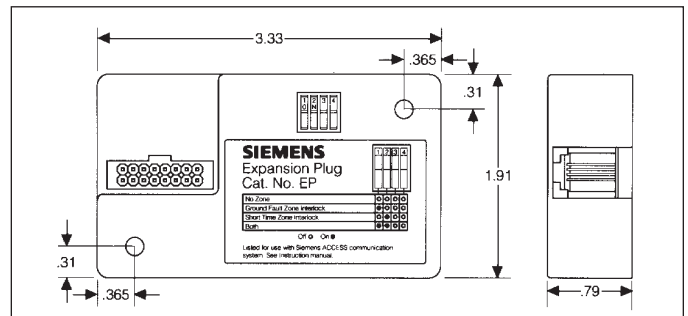
Protocol Converters are available from the Siemens ACCESS group for connecting a variety of open and proprietary automation protocols, including Profibus DP, LonWorks, Siemens S7 PLC, and many other third-party PLCs and associated networks. The SB-EC Trip Unit's EIA-2342 communications port provides additional PC communications for available trip unit data displays and trip unit configuration via Siemens SBWIN software. Remote open/close operation is also possible if a remote open/close relay is installed.

## Expansion Plug

Breaker Type	Frame Size	Mounting Type	Catalog No.
SB ICCB	1200A, 2000A	Fixed	EPSBFMK ①
		Drawout	EPSBDMK ①
SB ICCB	3200A, 5000A	Fixed	EPSB4FMK ①
		Drawout	EPSB4DMK ①
Sensitrip MCCB	ALL	ALL	EP

① Factory wired when ACCESS communications or ZSI is ordered for the SB breaker from the factory.

The EP is an electronic interface and isolation module required to integrate a breaker into an ACCESS system. When required, one expansion plug is used for each circuit breaker in the system and is used to interface trip units to a **MTZ** or **MTA**. The expansion plug is always necessary for zone interlocking or full ACCESS communications for the TL Trip Unit. It is not required for ACCESS communications with the SB-EC Trip Unit. However, an expansion plug is required for zone interlocking with the SB-EC Trip Unit.



Expansion Plug Dimension Drawing

## SB System Breakers

The following sections describe both types of SB trip units, the standard Type 'TL' unit with rotary switches, and the SB Energy-Comm (SB-EC) Trip Unit with keypad and display. Since the SB-EC Trip Unit has integral communication capability, the **MTA** device is not required to connect within an ACCESS system, however for SB-EC Trip Units in a ZSI system, and **MTZ** or **MTA** is required.

The type **EPSB** expansion plug is factory wired to the SB breaker trip unit's rear connector and also located near and wired to the SB breaker's secondary terminal block for fixed mount breakers or sliding disconnects for drawout breakers. These connections are factory wired when the SB breaker is ordered with the standard switch based type "TL" trip unit for ACCESS communications or for any trip unit with ZSI capability.

Installed ICCB SB breakers without communication capability may be field upgraded for communication capability by Siemens Field Service personnel only.

# External Accessories

## ACCESS™ Communications System

The **MTCSB** cable is used to connect an **MTA** or **MTZ** to an **EPSB** expansion plug via the SB breaker secondary terminal block or sliding disconnect.

### A. SB Breaker Zone Selective Interlocking (only)

#### 1. All SB Breaker Trip Units

##### Components Required:

- Siemens type **MTZ** — one per 8 trip units
- Siemens type **EPSB** expansion plug — one per trip unit, factory wired
- Siemens type **MTCSB** cable — one per trip unit

##### Installation:

1. When the factory-installed ZSI option is present, the **EPSB** expansion plug is already wired to the breaker and secondary control terminals. Connect an **MTCSB** cable's spade lugs from the appropriate SB breaker's secondary terminals (LB9, 10, 11 & 12) to one of eight communication inputs on the **MTZ**.
2. If multiple MT's are used, the "Com" terminal from the first MT's "SEABus Out" port must be connected to the "Com" terminal of the next MT's "SEABus In" port on each MT being used.
3. Based on the site's coordination study, configure the expansion plug's DIP switches for Short Time and/or Ground Fault ZSI per the **EP** information and Instruction Sheet.
4. Configure the **MTZ** to identify the zones for each breaker, per the site's coordination study and information and instruction sheet. Refer to figure 1 for system connections diagram.

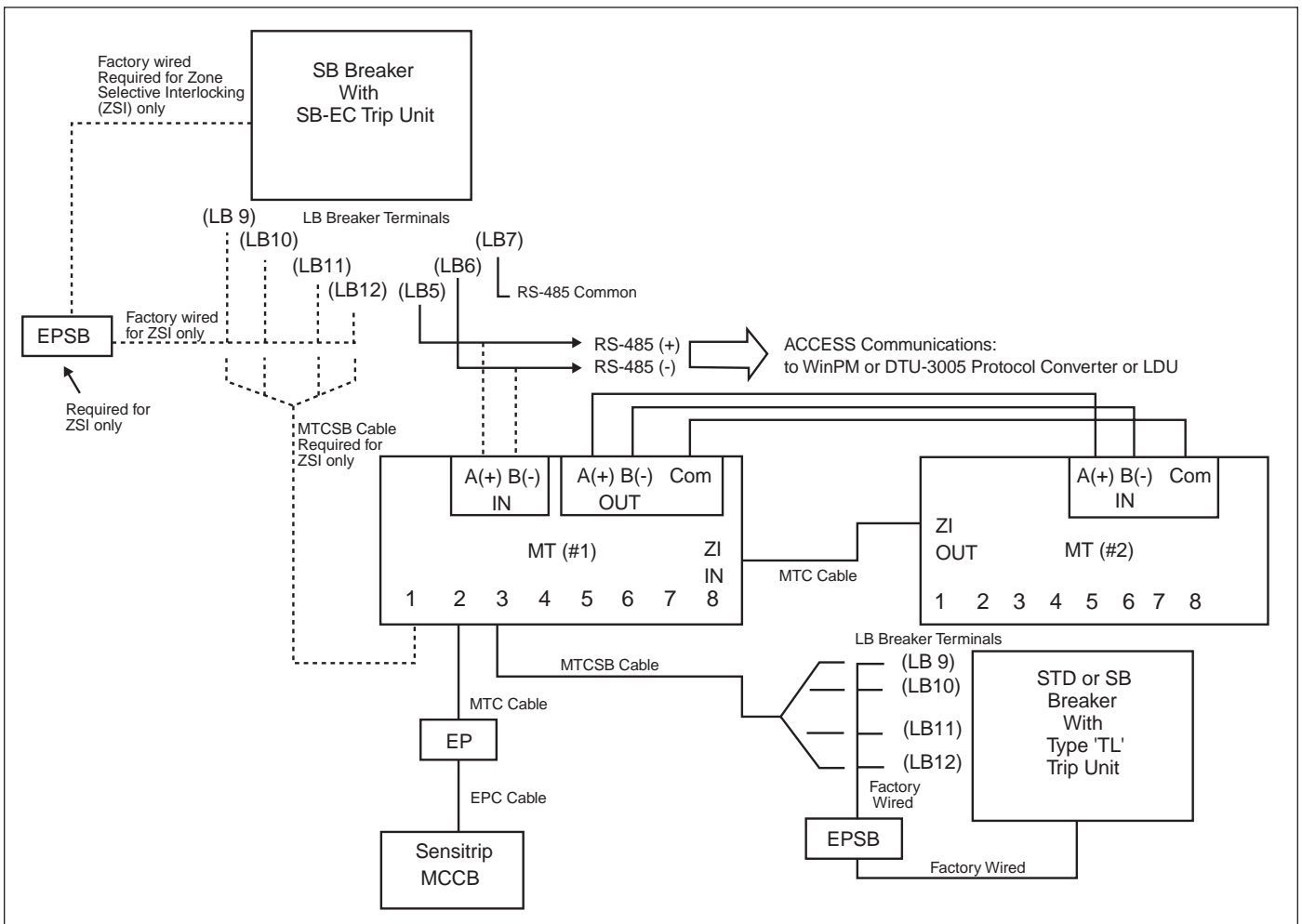
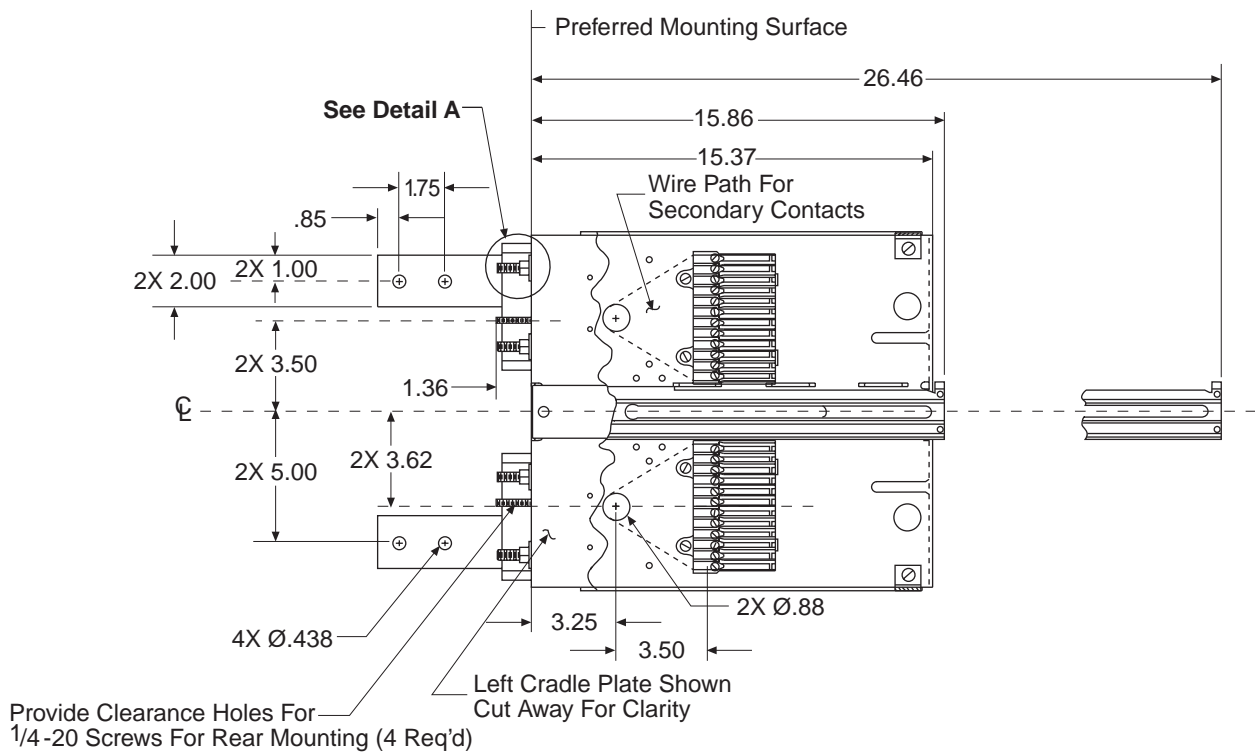
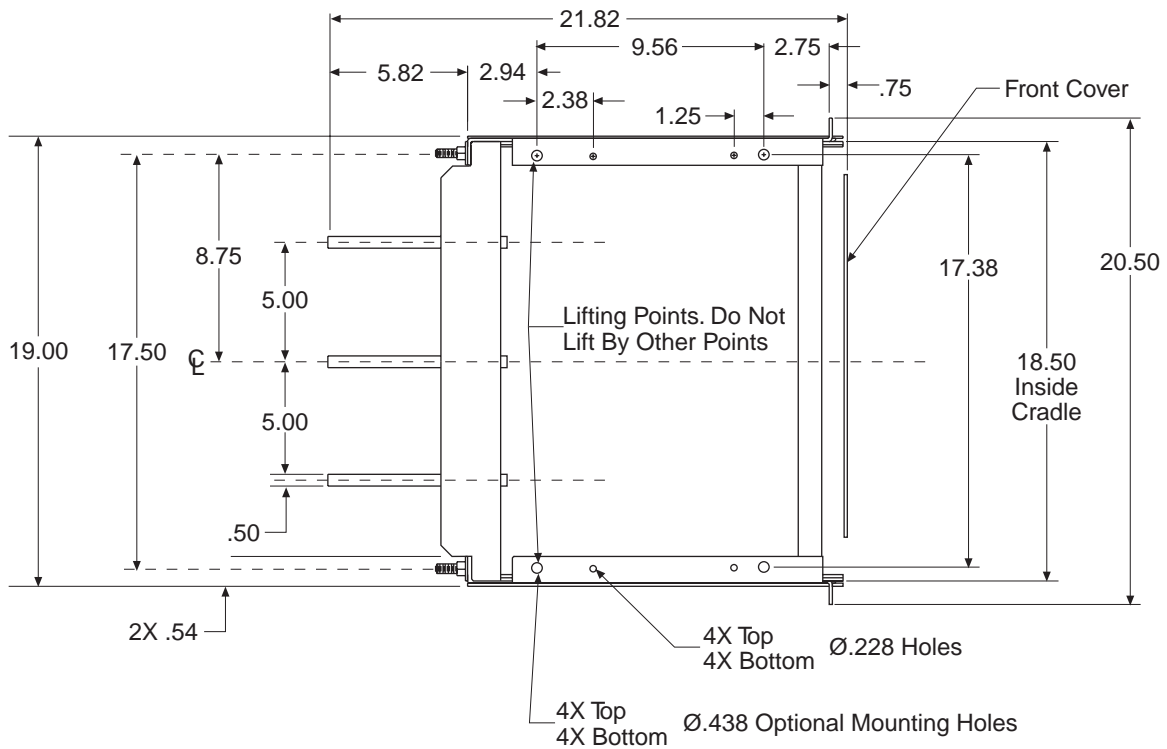


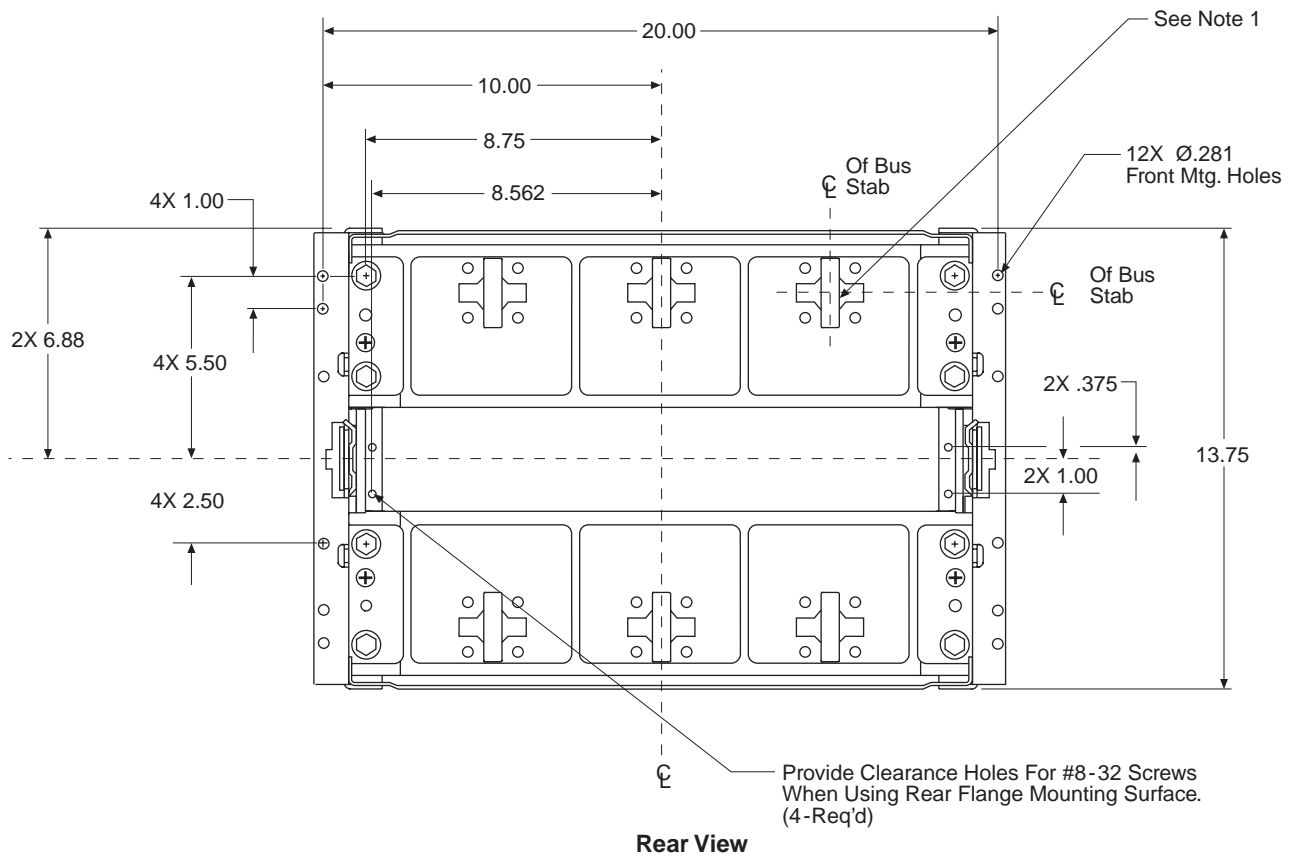
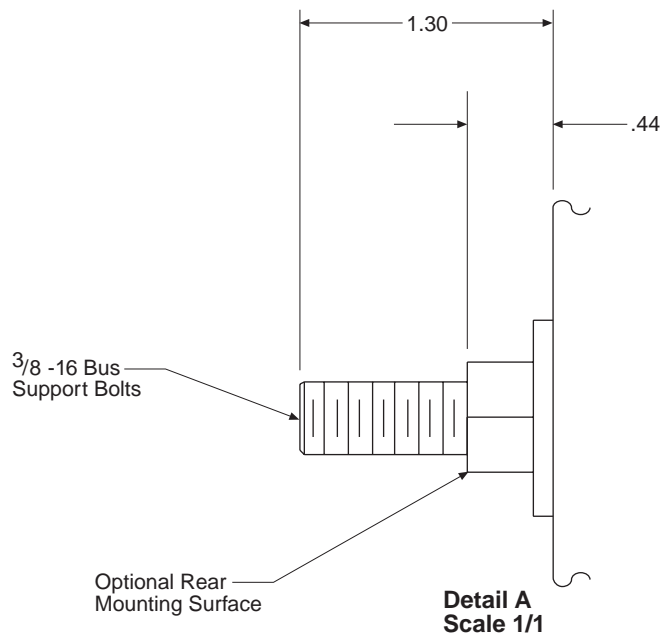
Figure 1. System Connection Diagram

# Outline Dimension Drawing 1200A Stationary Drawout Element

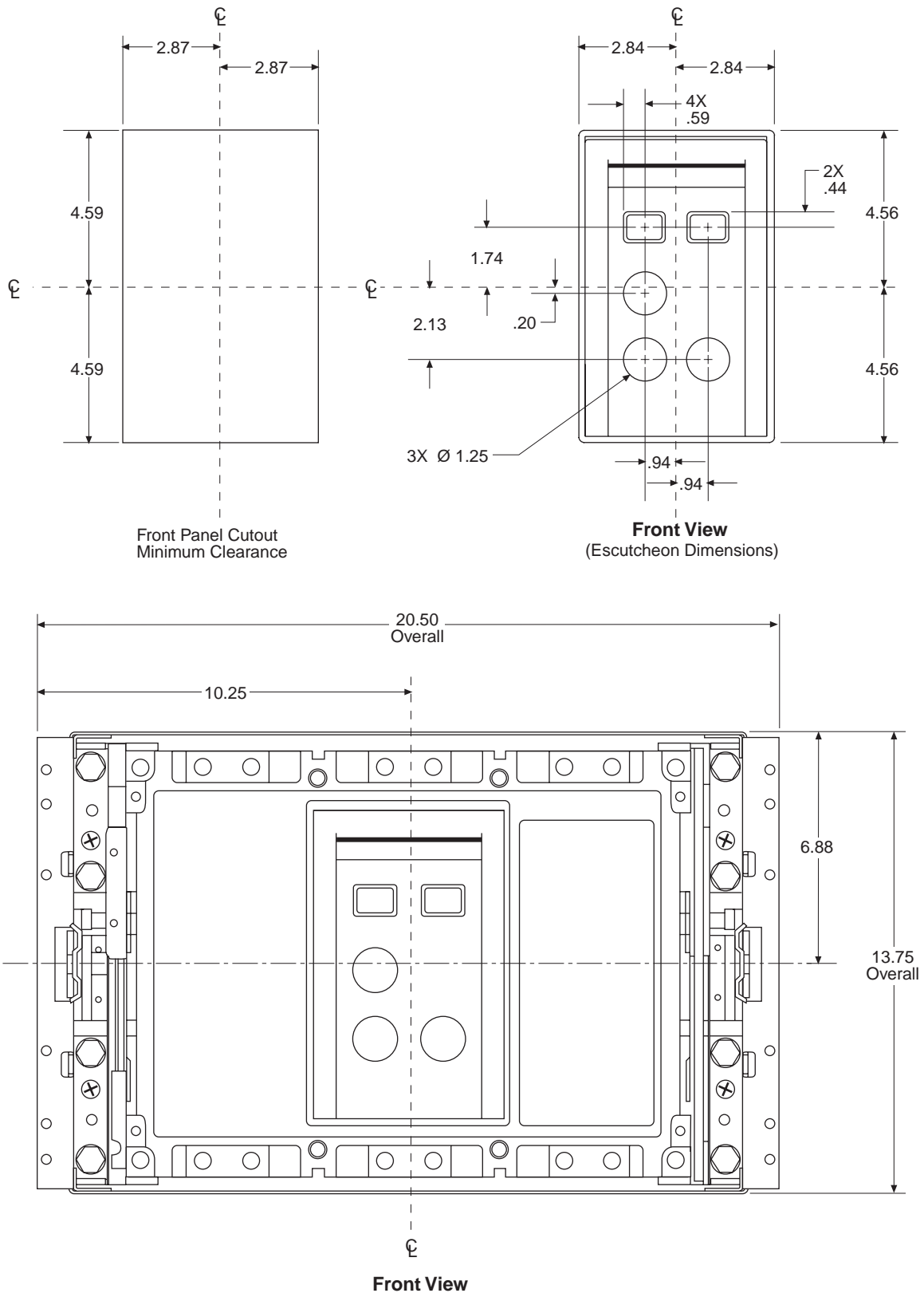




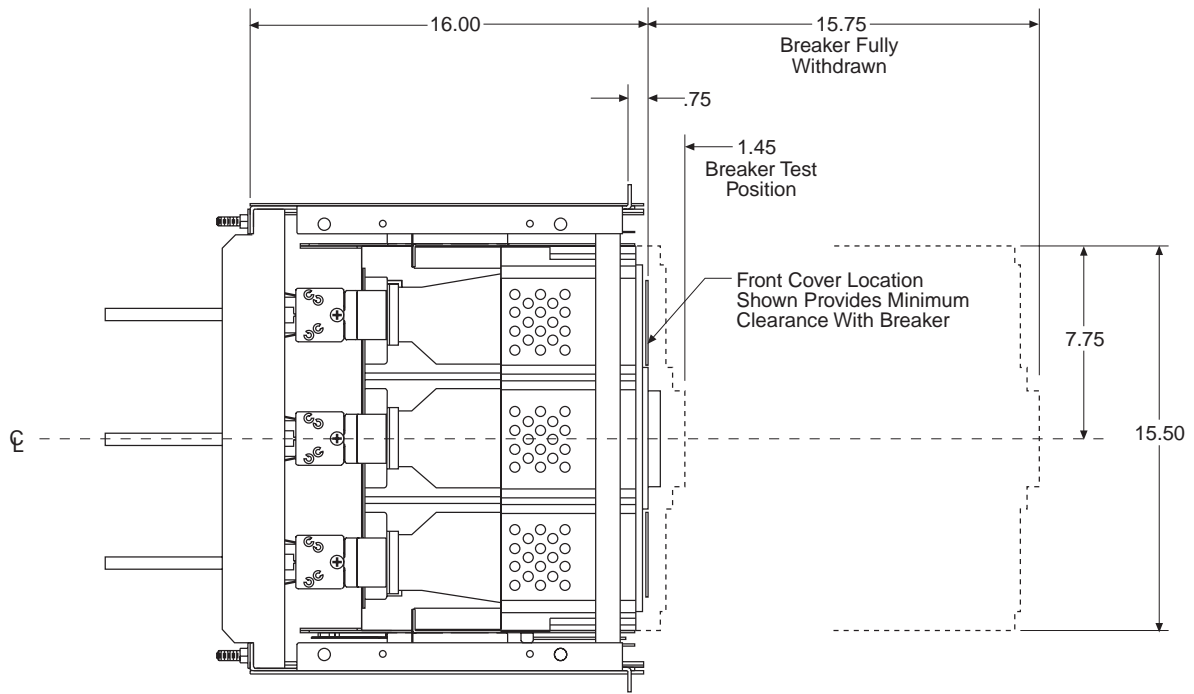
# Outline Dimension Drawing 1200A Stationary Drawout Element



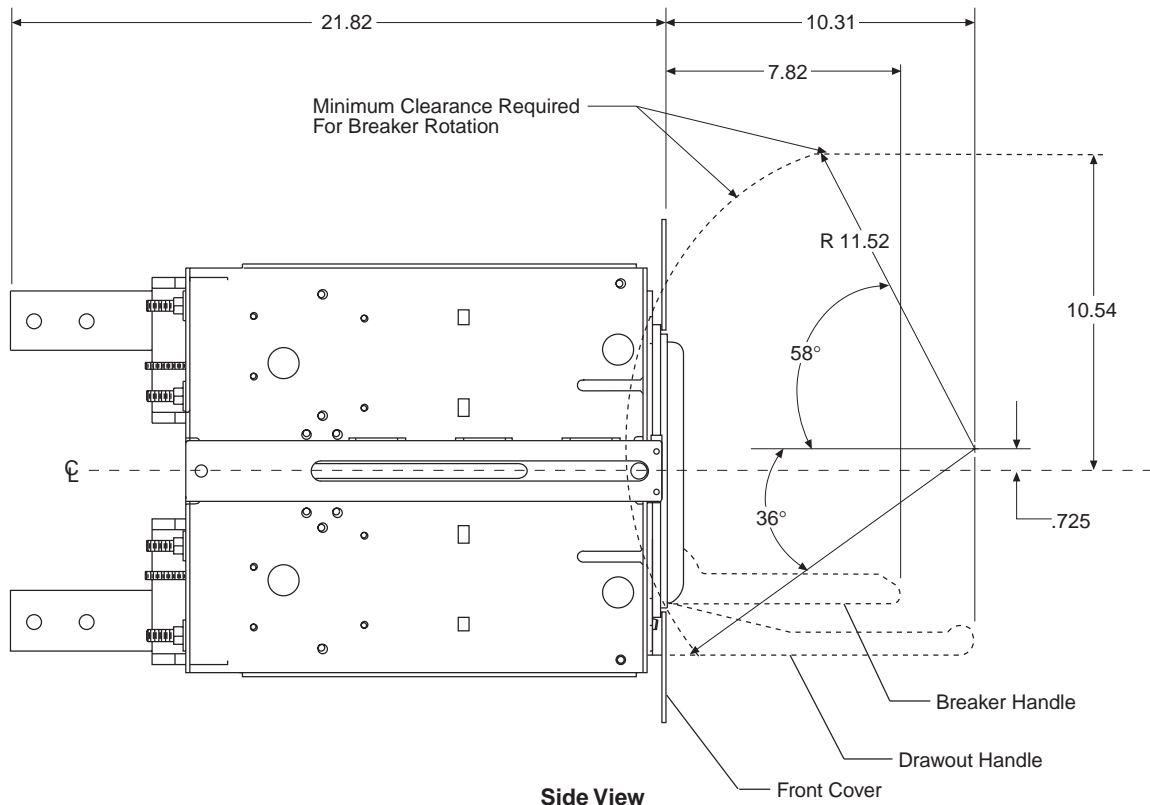
# Outline Dimension Drawing 1200A Moveable Drawout Element



# Outline Dimension Drawing 1200A Moveable Drawout Element

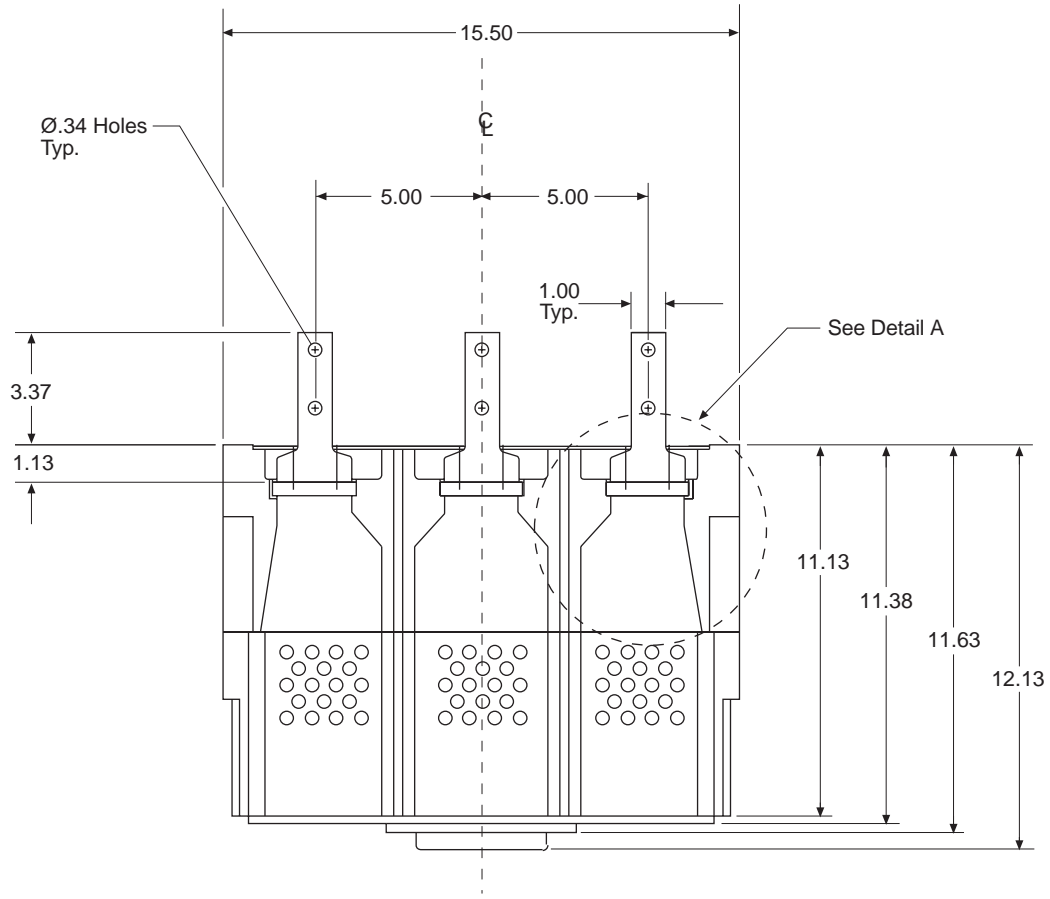


Top View

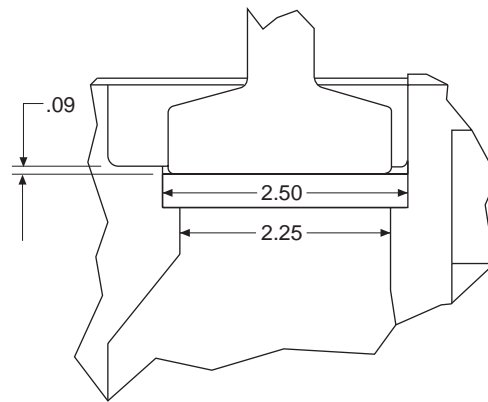


Side View

# Outline Dimension Drawing 1200A Fixed-Mounted

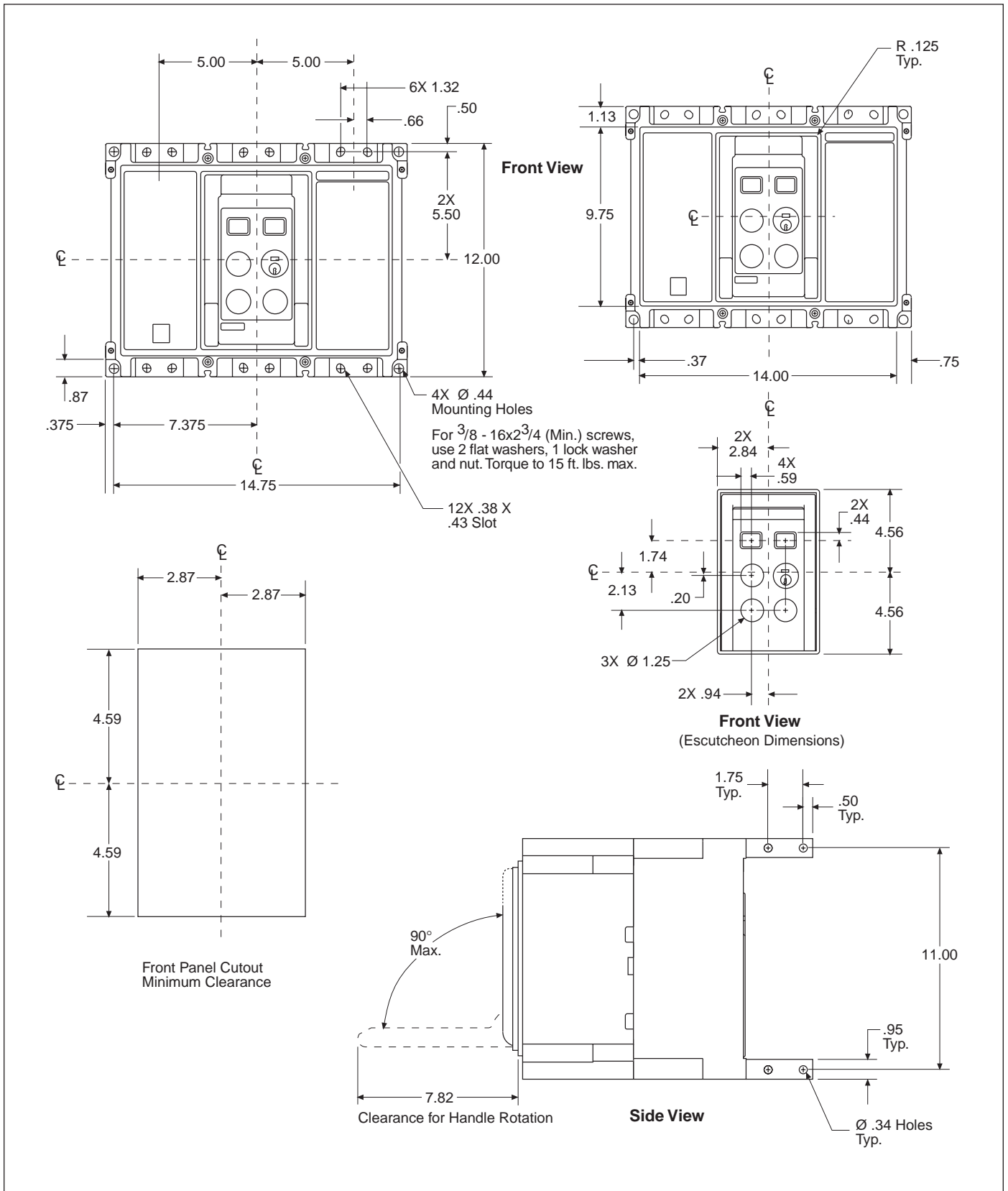


Top View



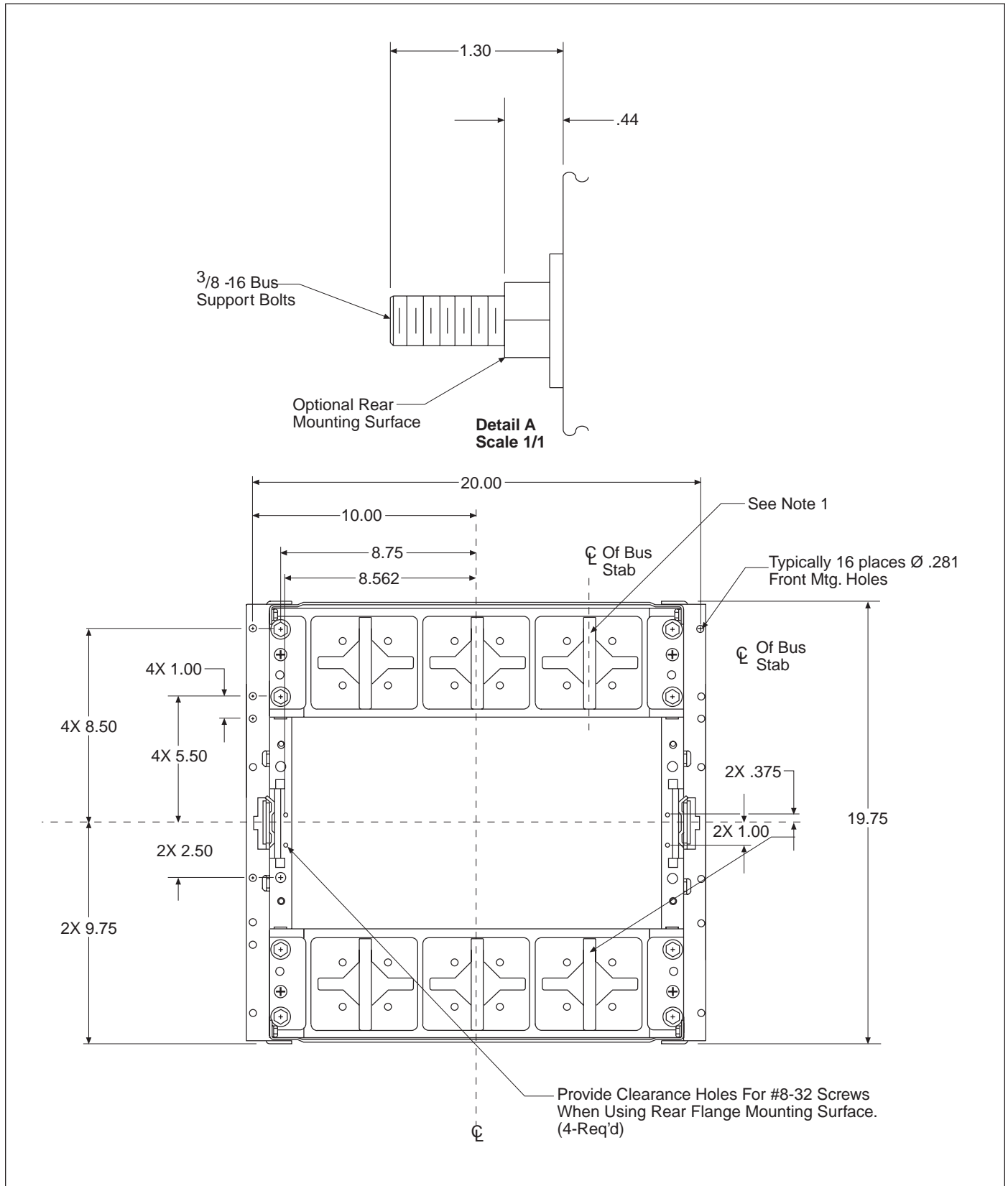
Detail A - 1/1 Scale

# Outline Dimension Drawing 1200A Fixed-Mounted

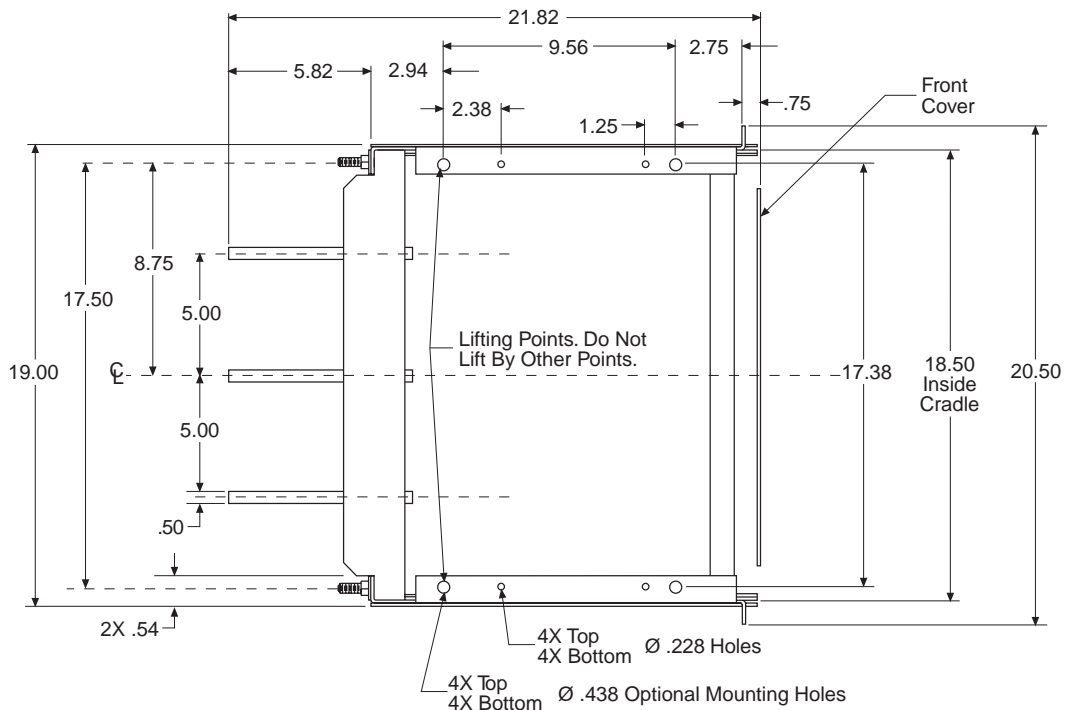




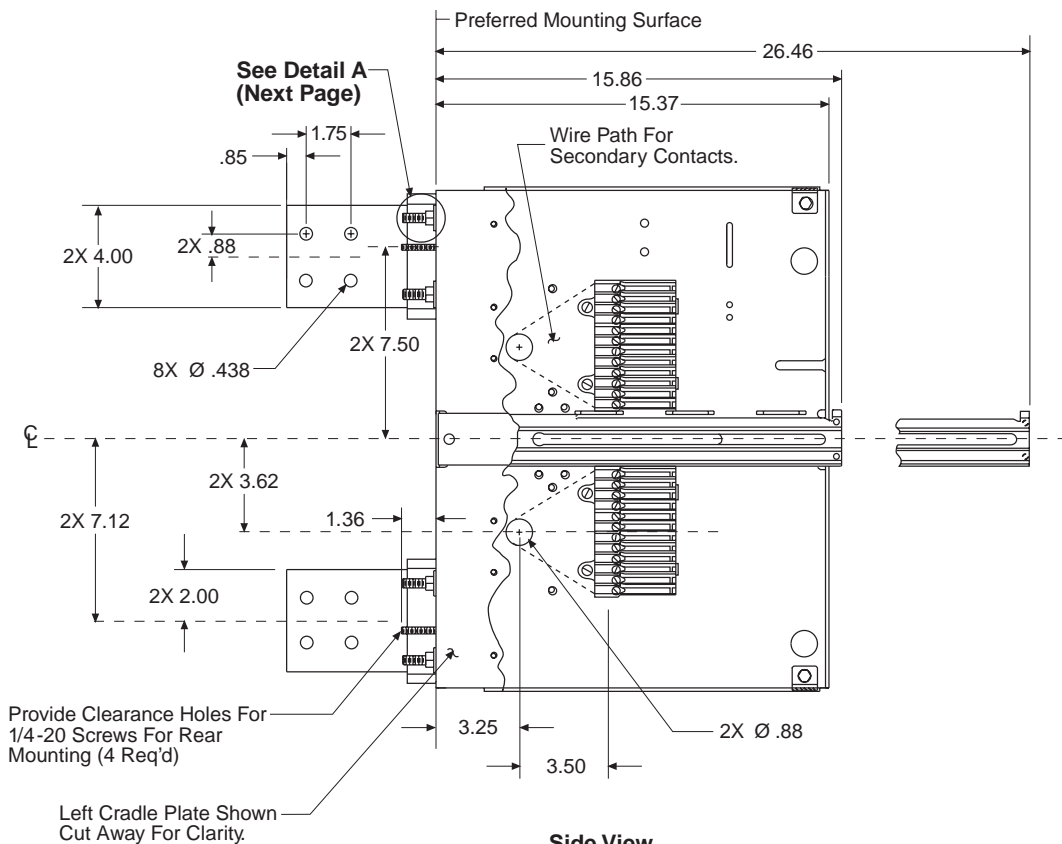
# Outline Dimension Drawing 2000A Stationary Drawout Element



# Outline Dimension Drawing 2000A Stationary Drawout Element

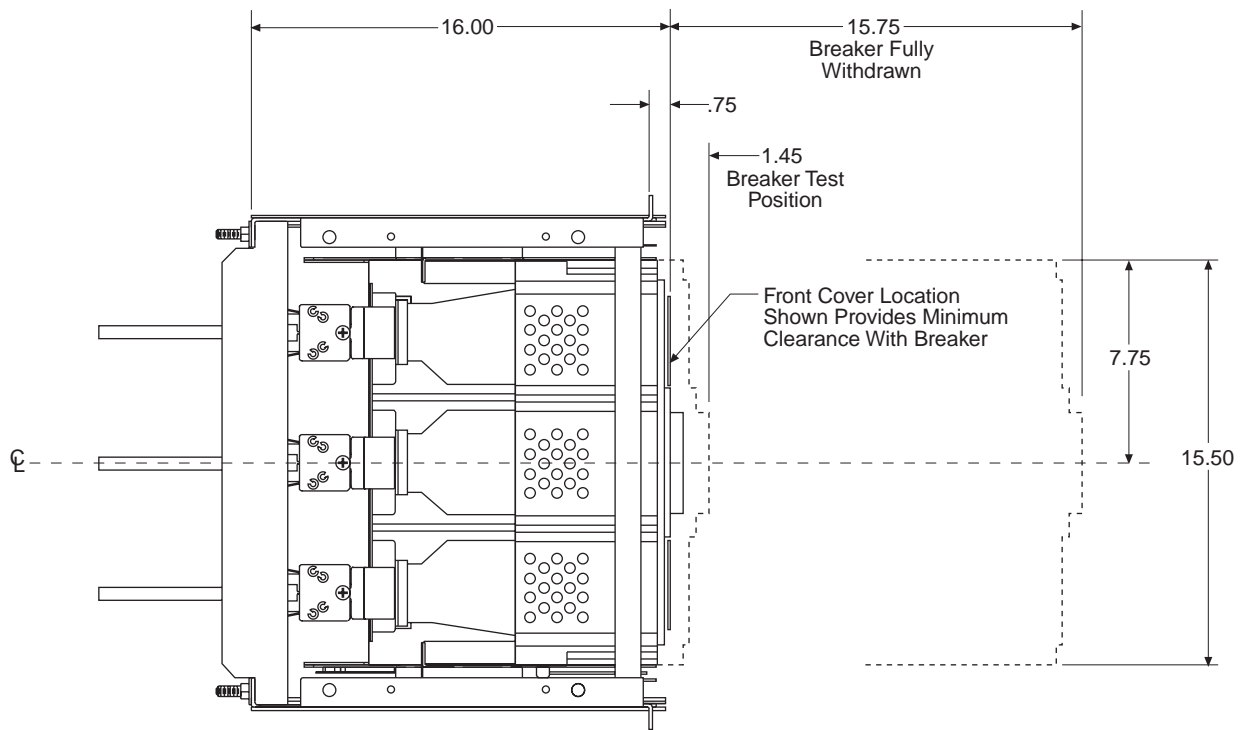


**Top View**

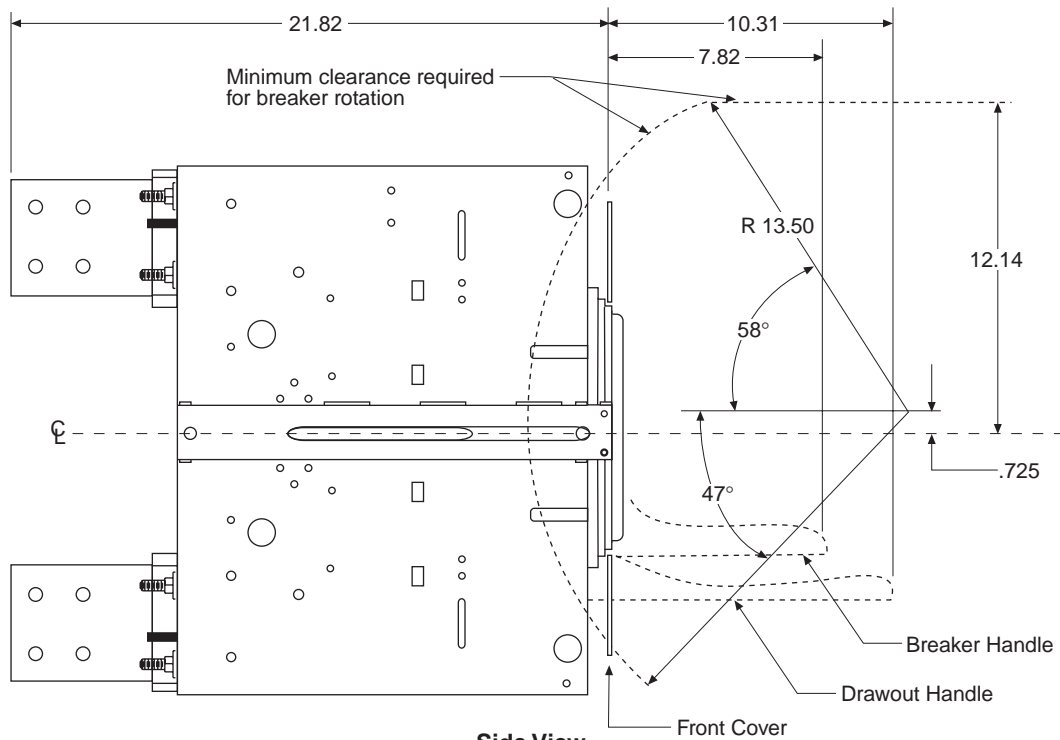


**Side View**

# Outline Dimension Drawing 2000A Moveable Drawout Element

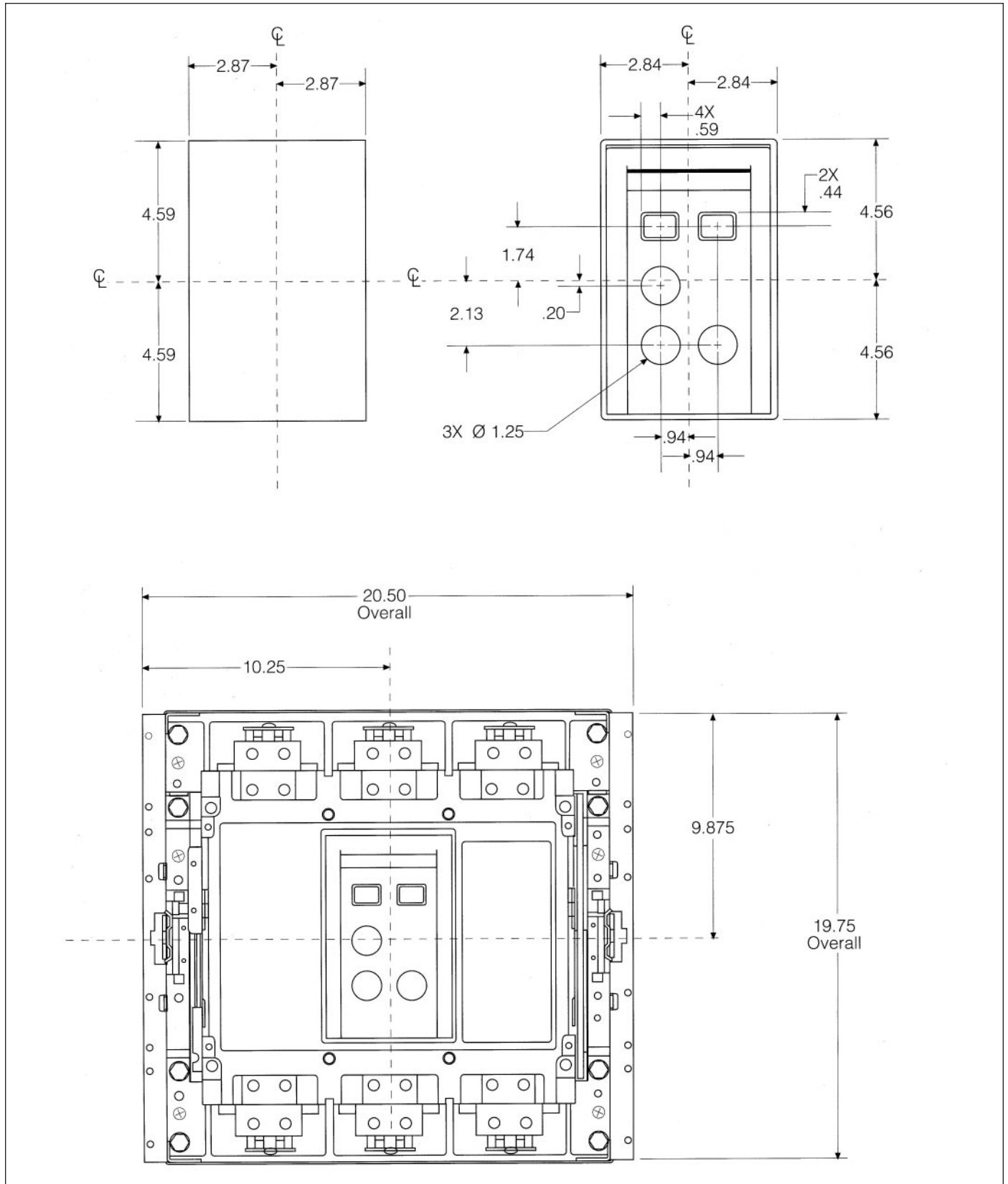


Top View

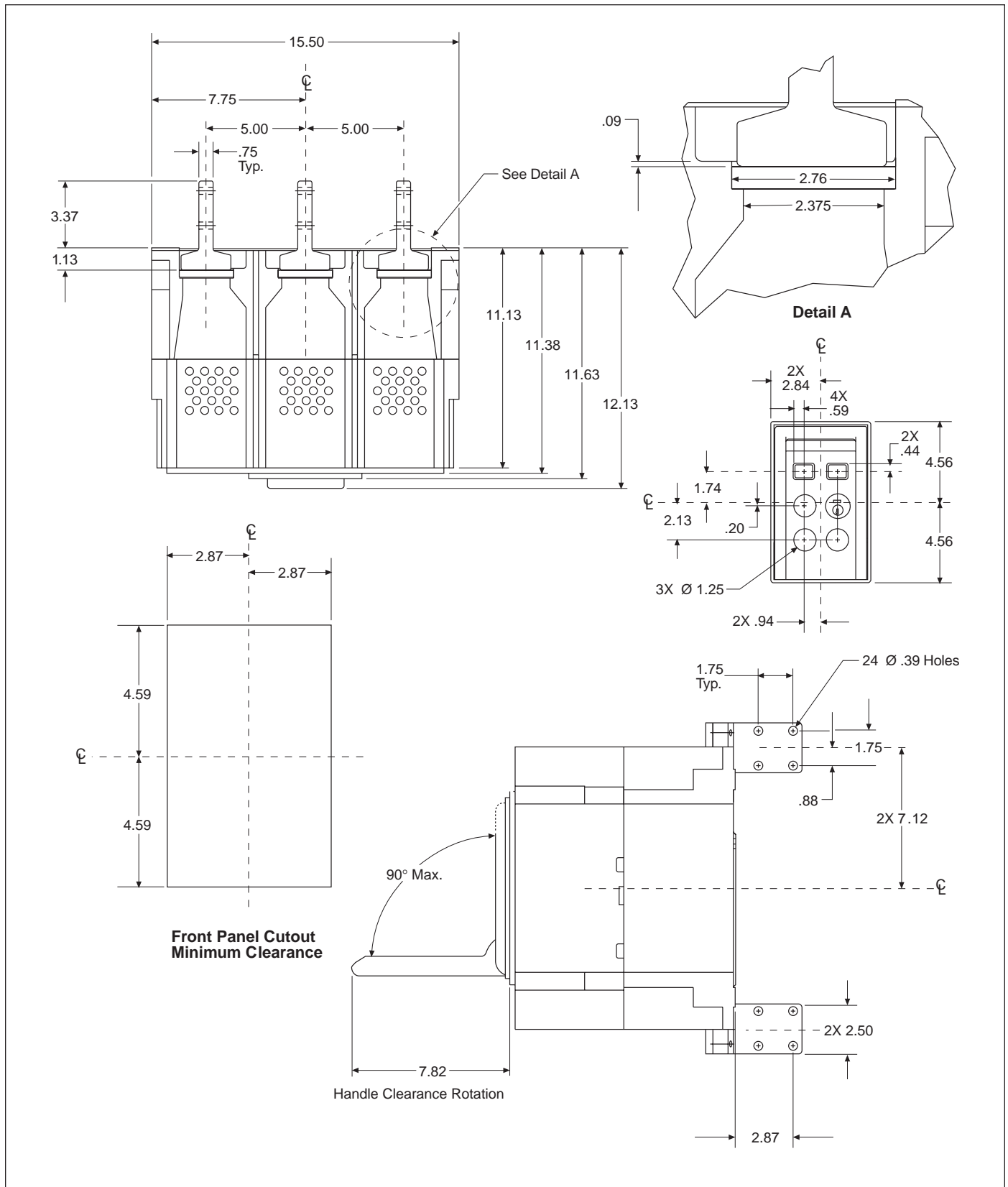


Side View

# Outline Dimension Drawing 2000A Moveable Drawout Element

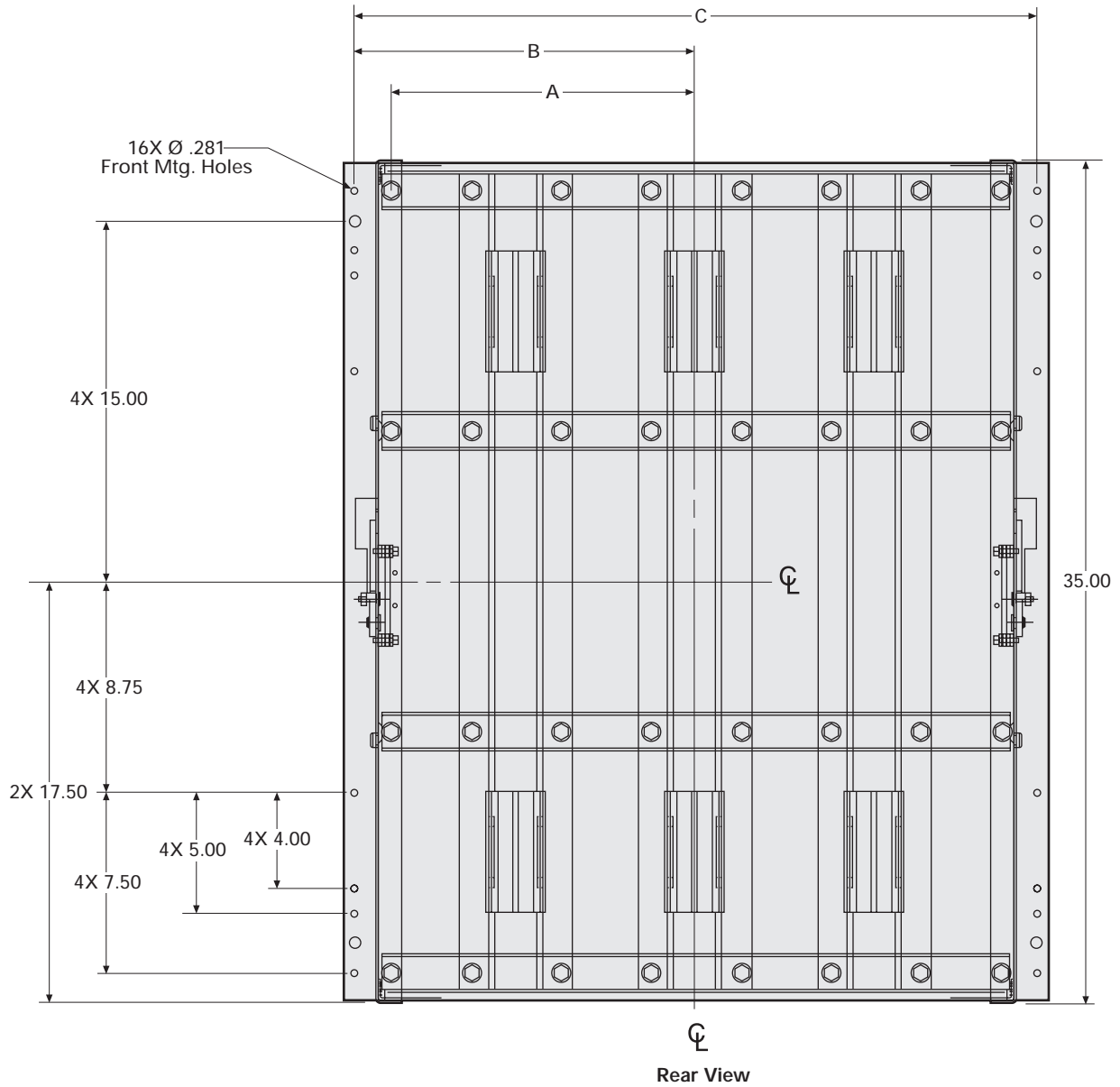


# Outline Dimension Drawing 2000A Fixed-Mounted



# Outline Dimension Drawing

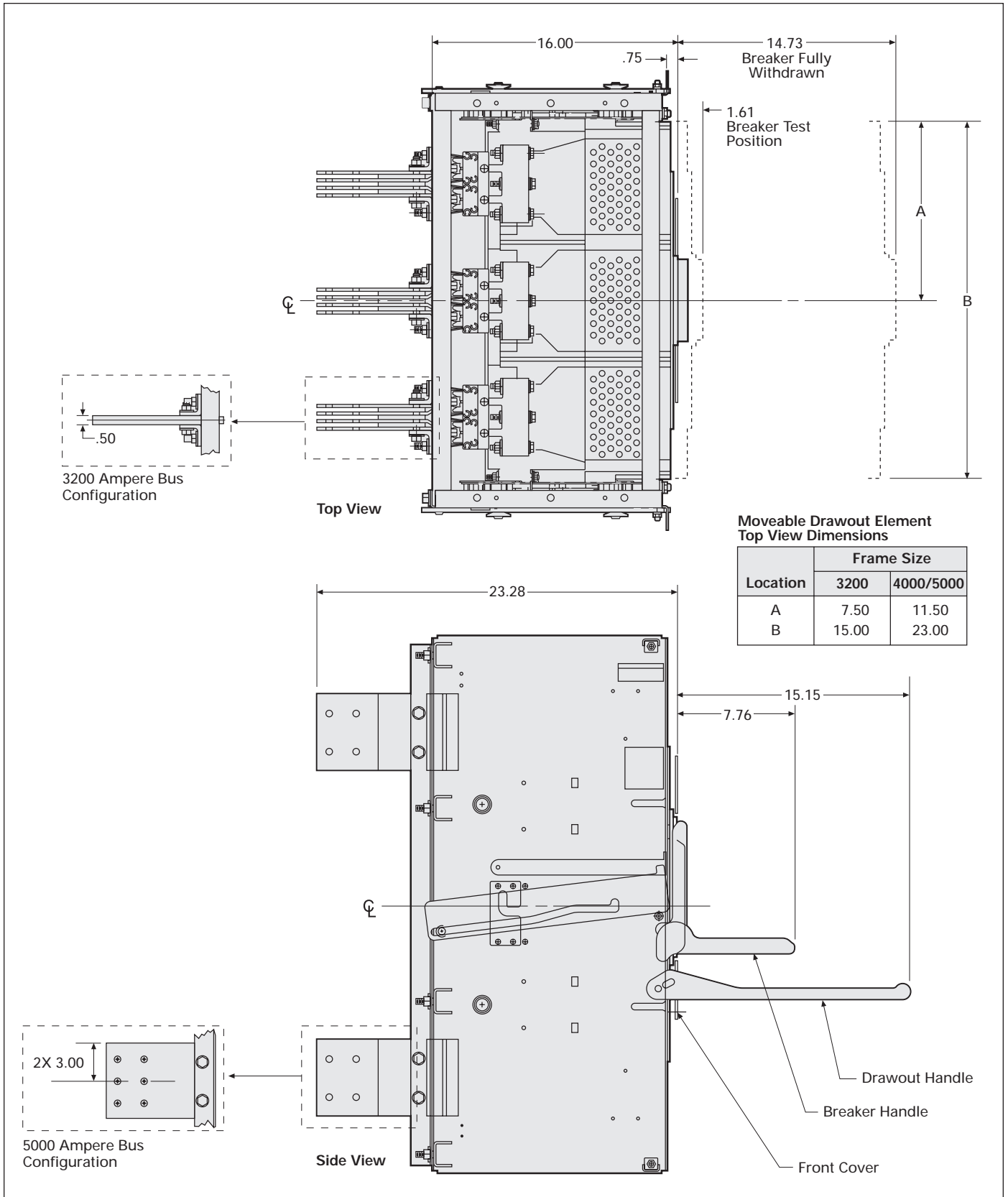
## 3200A, 4000A, and 5000A Stationary Drawout Element



**Stationary Drawout Element  
Rear View Dimensions**

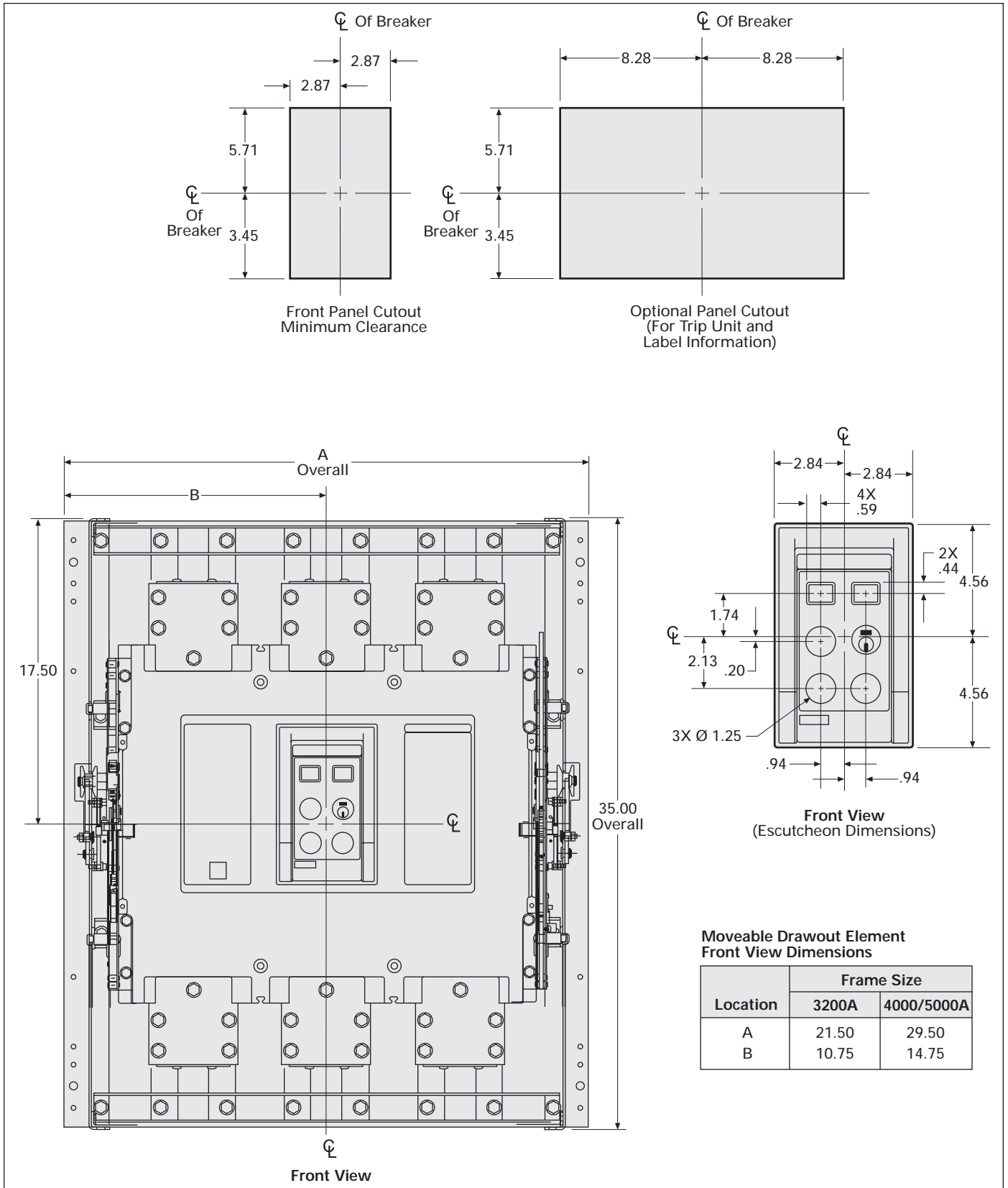
Location	Frame Size	
	3200	4000/5000
A	2X 8.75	2X 12.75
B	2X 10.25	2X 14.25
C	20.50	28.50

# Outline Dimension Drawing 3200A, 4000A, and 5000A Moveable Drawout Element



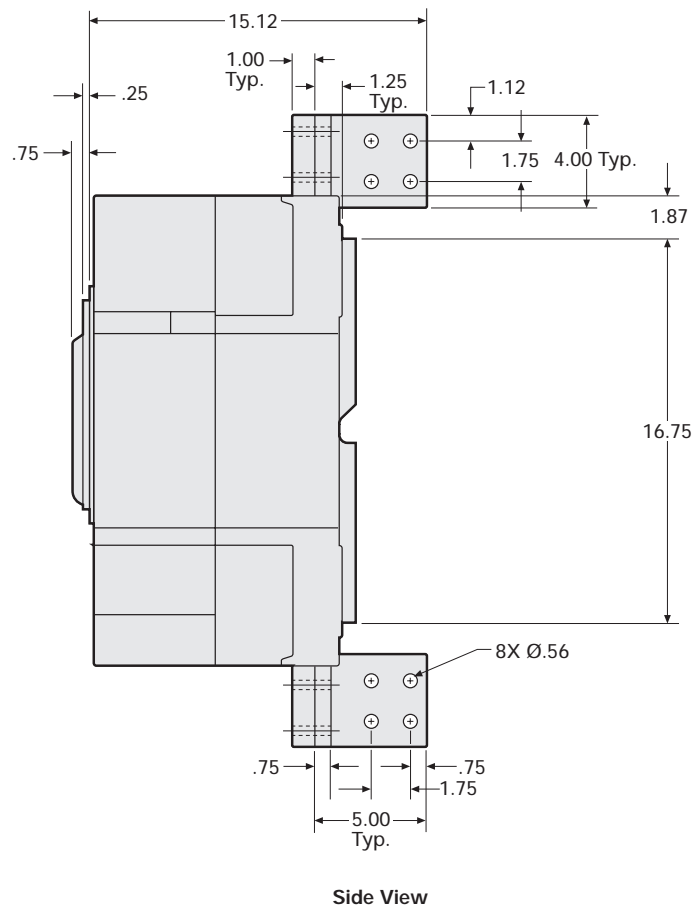
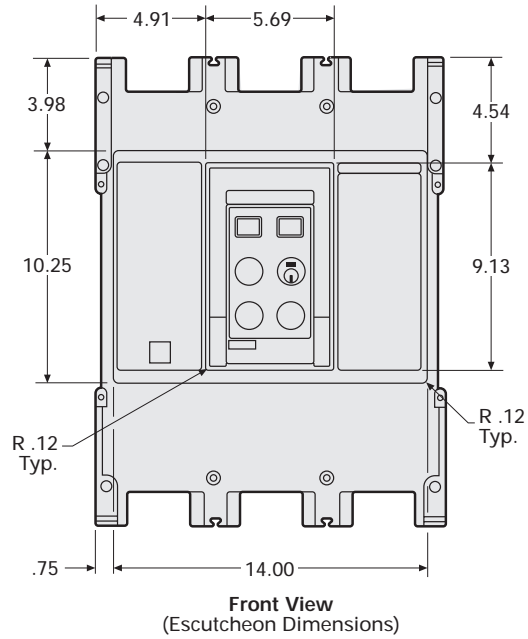


# Outline Dimension Drawing 3200A, 4000A, and 5000A Moveable Drawout Element



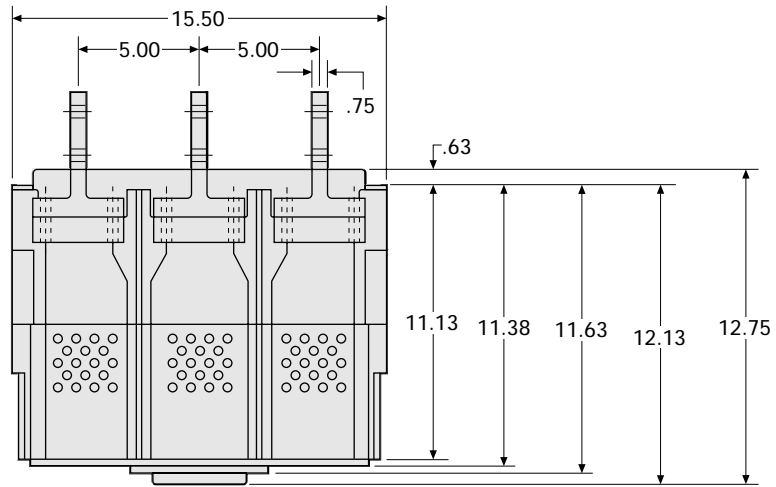
# Outline Dimension Drawing

## 3200A Fixed-Mounted

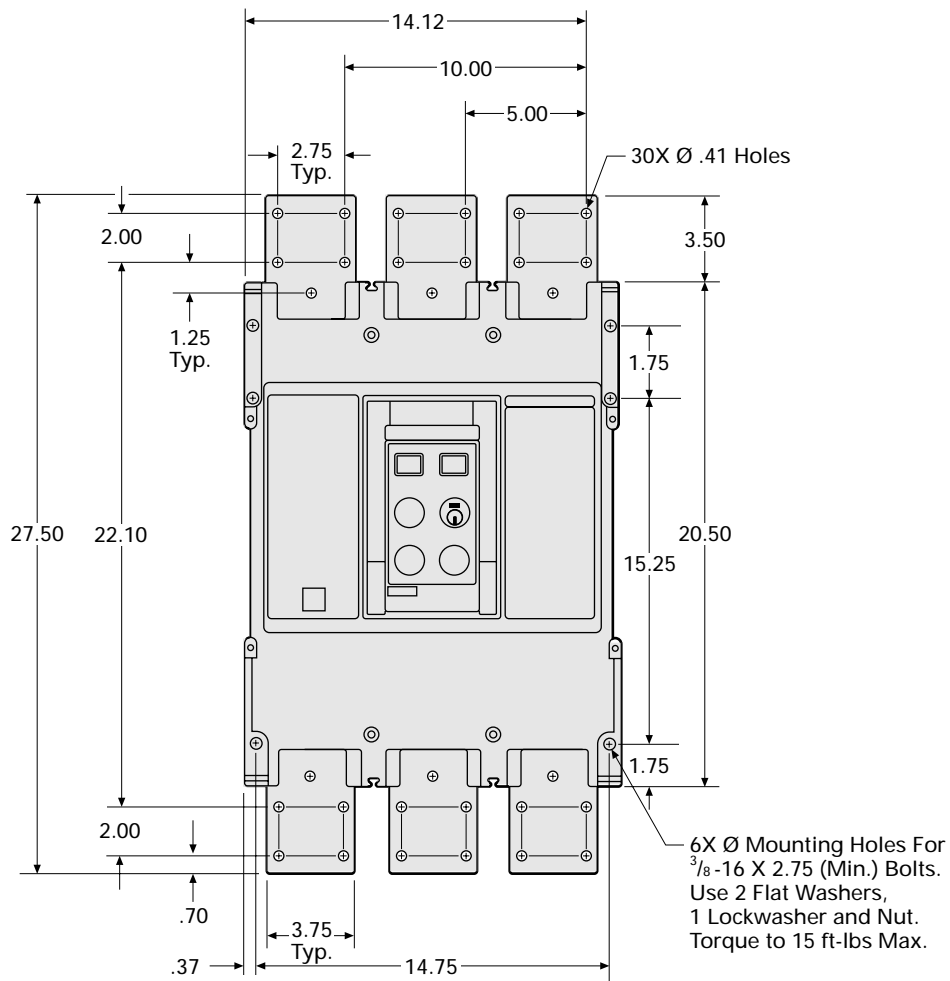


# Outline Dimension Drawing

## 3200A Fixed-Mounted

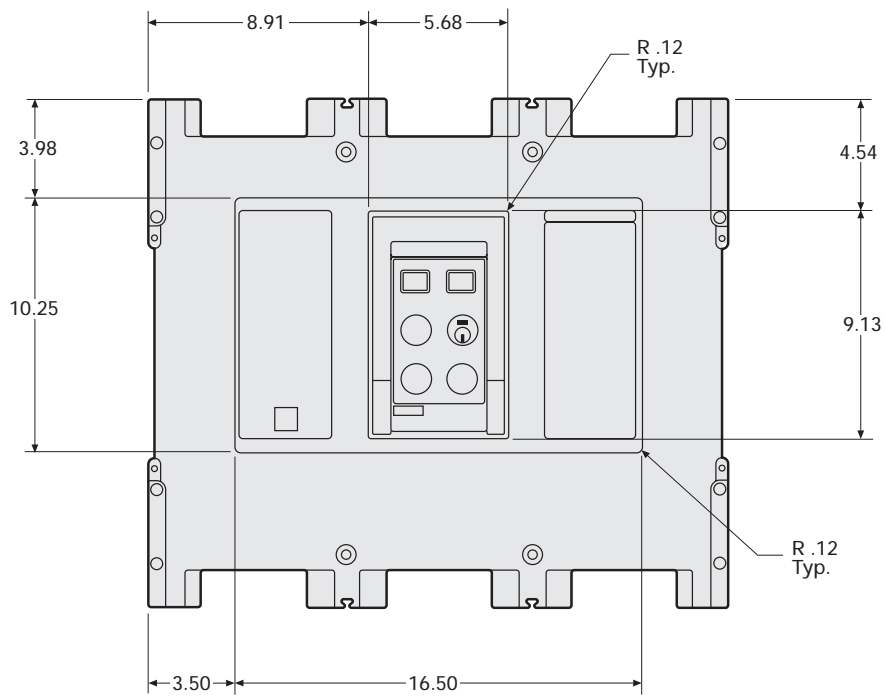


Top View

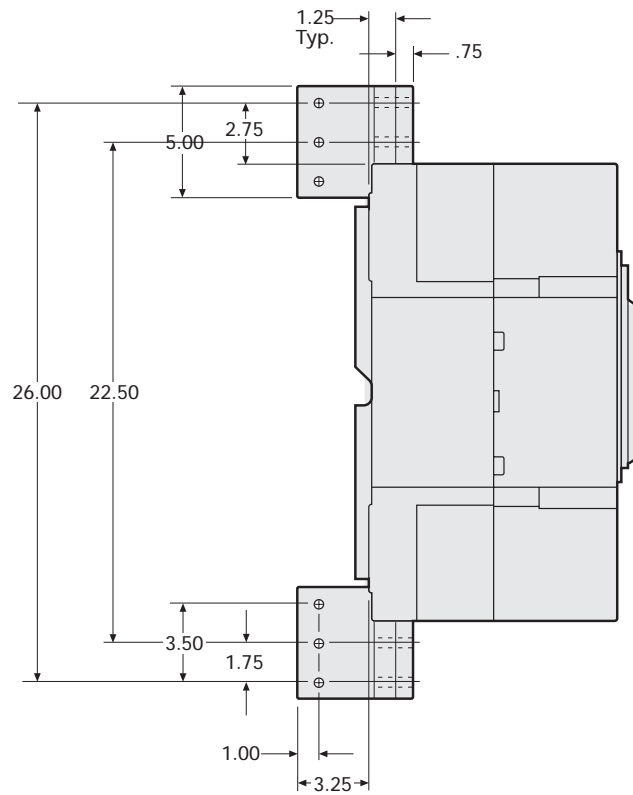


Front View

# Outline Dimension Drawing 4000A and 5000A Fixed-Mounted

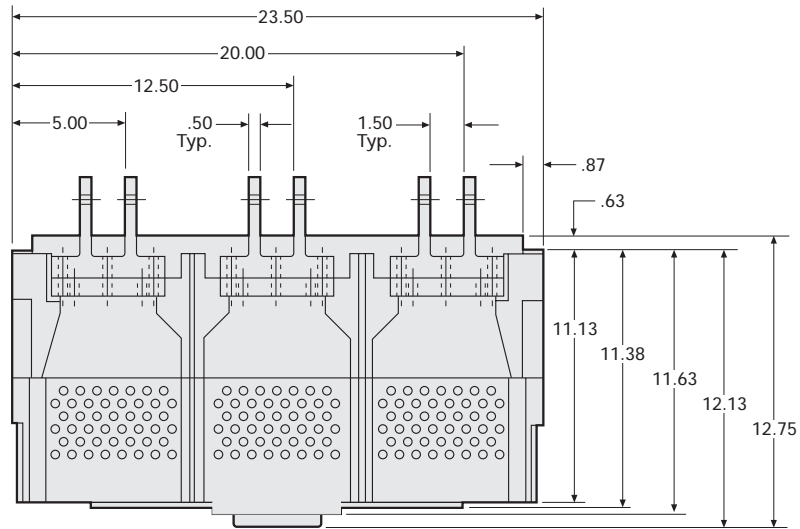


**Front View**  
(Escutcheon Dimensions)

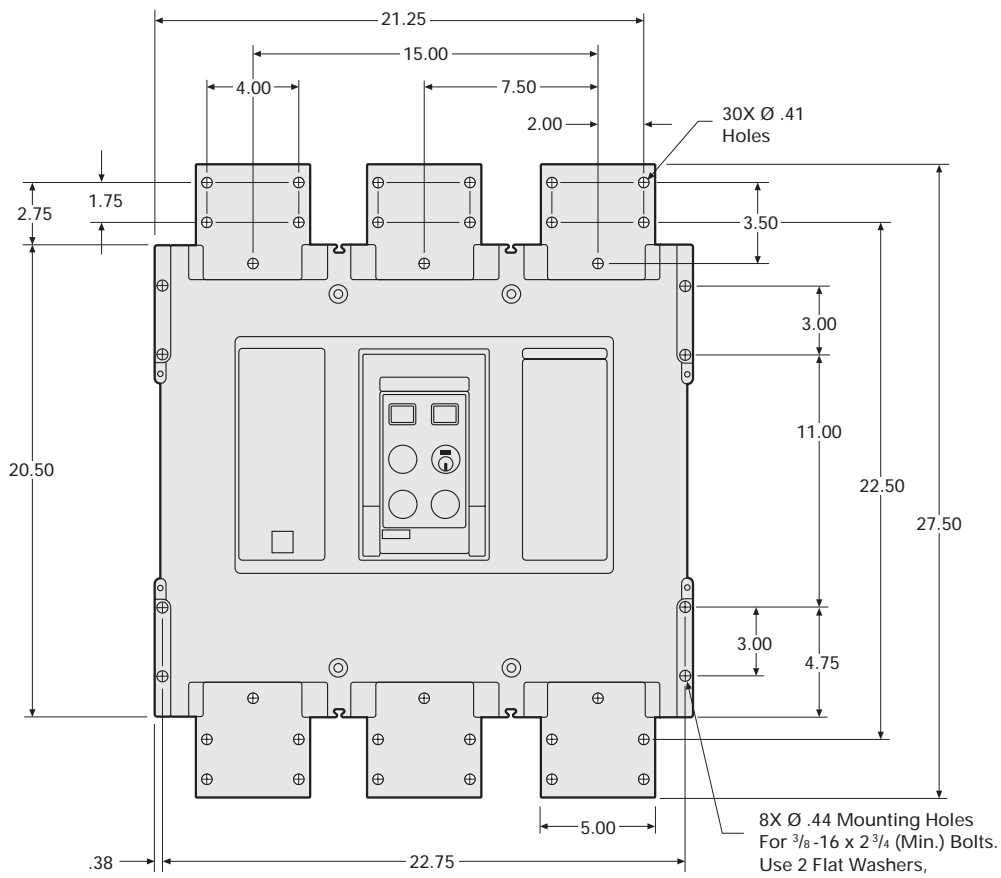


**Side View**

# Outline Dimension Drawing 4000A and 5000A Fixed-Mounted



Top View

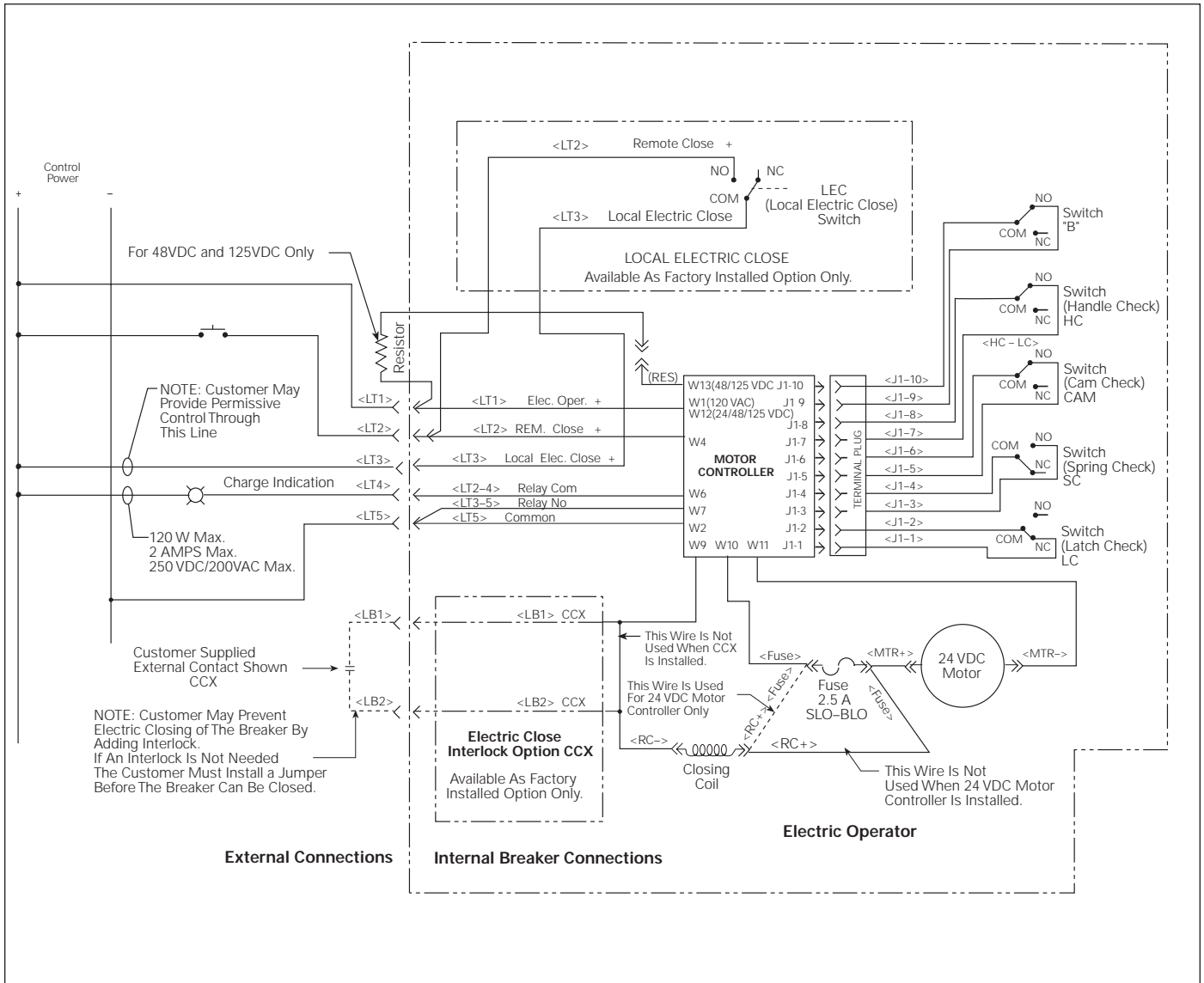


Front View

8X Ø .44 Mounting Holes  
For  $\frac{3}{8}$ -16 x  $2\frac{3}{4}$  (Min.) Bolts.  
Use 2 Flat Washers,  
1 Lockwasher and Nut.  
Torque to 15 lb. Max.

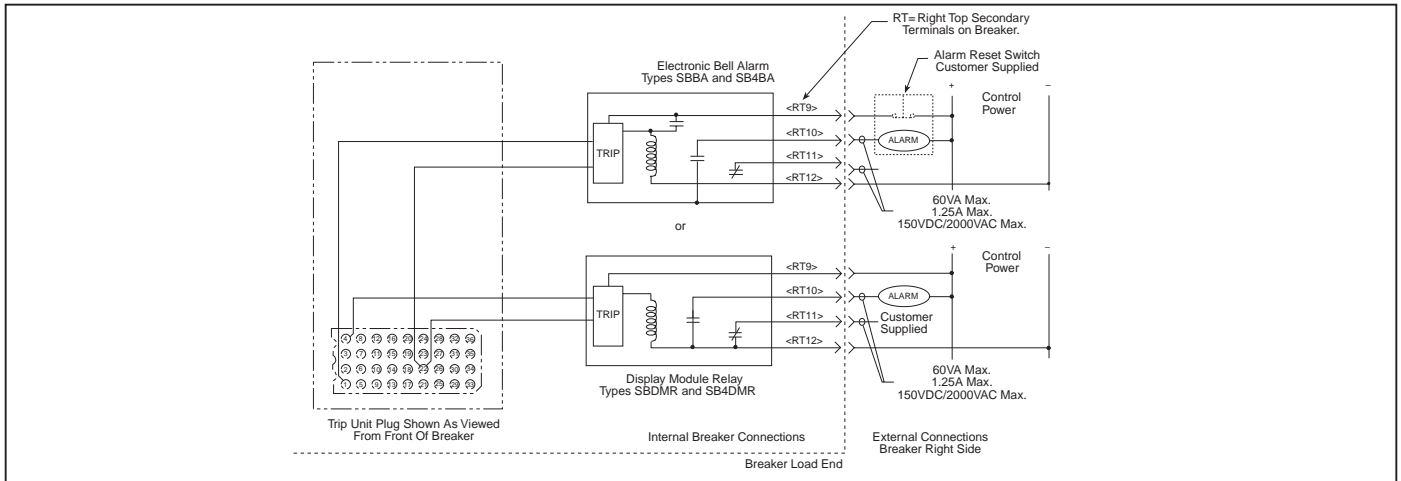
# Internal Accessories

## Electric Motor Operator and Local Electric Close

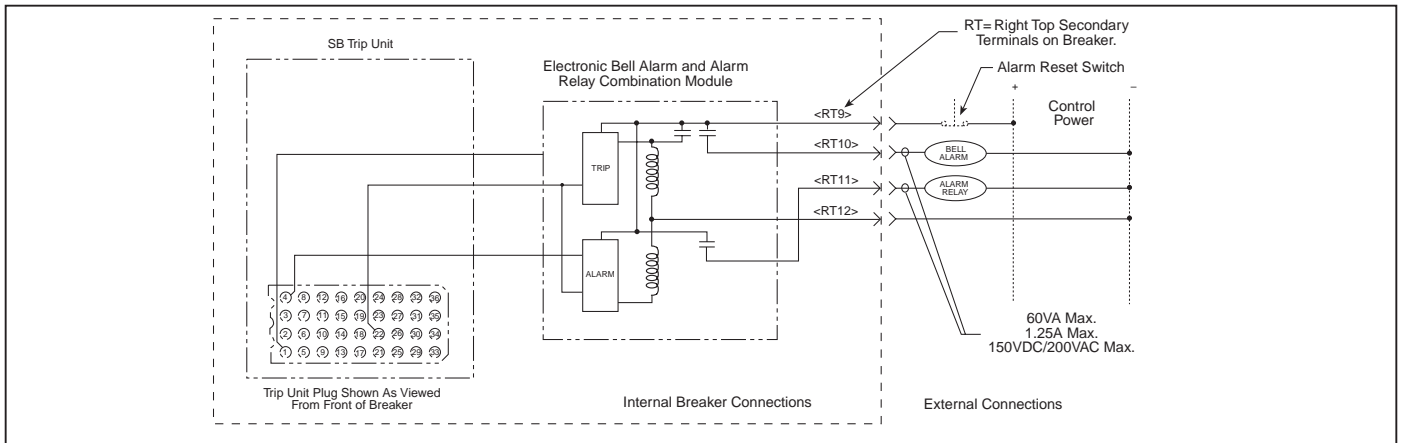


Electric Motor Operator Schematic

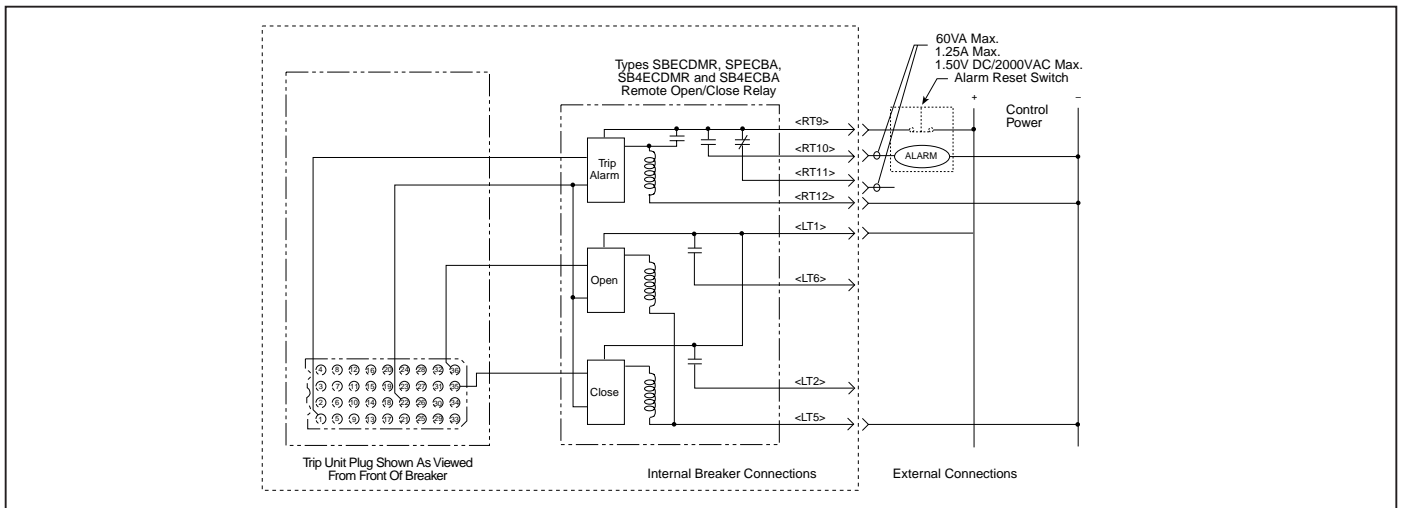
# Electrical Schematics



Electronic Bell Alarm, Display Module Relay (mutually exclusive devices)



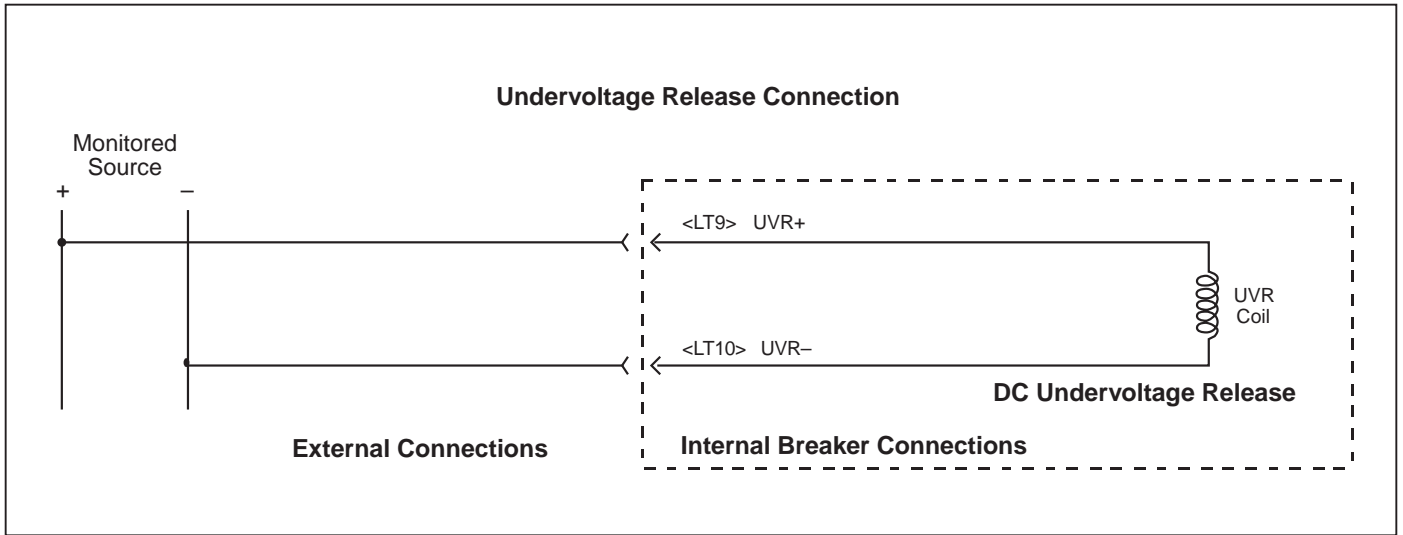
Electronic Bell Alarm and Alarm Relay Combination Module



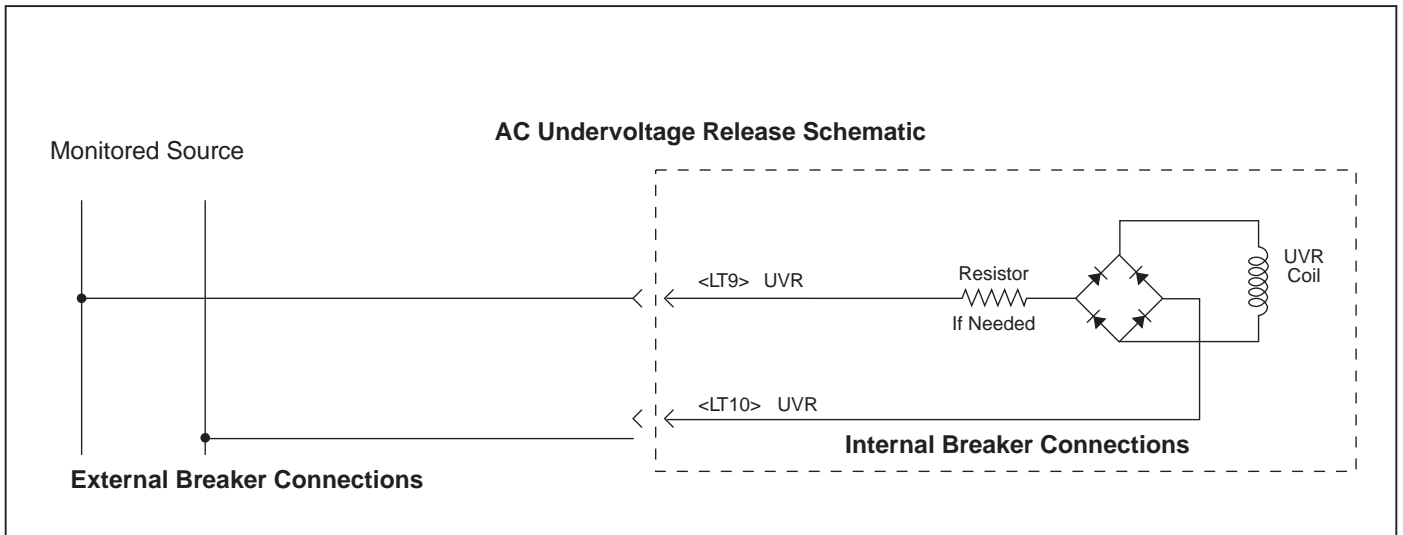
Remote Open/Close Relay



# Electrical Schematics

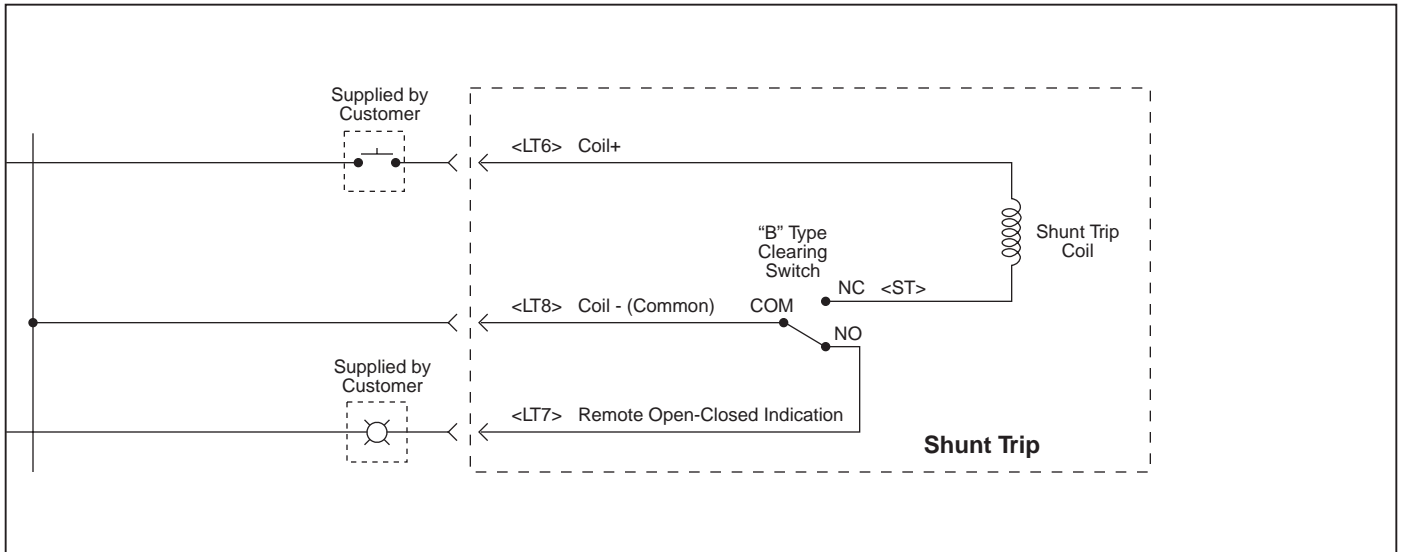


DC Undervoltage Release Solenoid Schematic

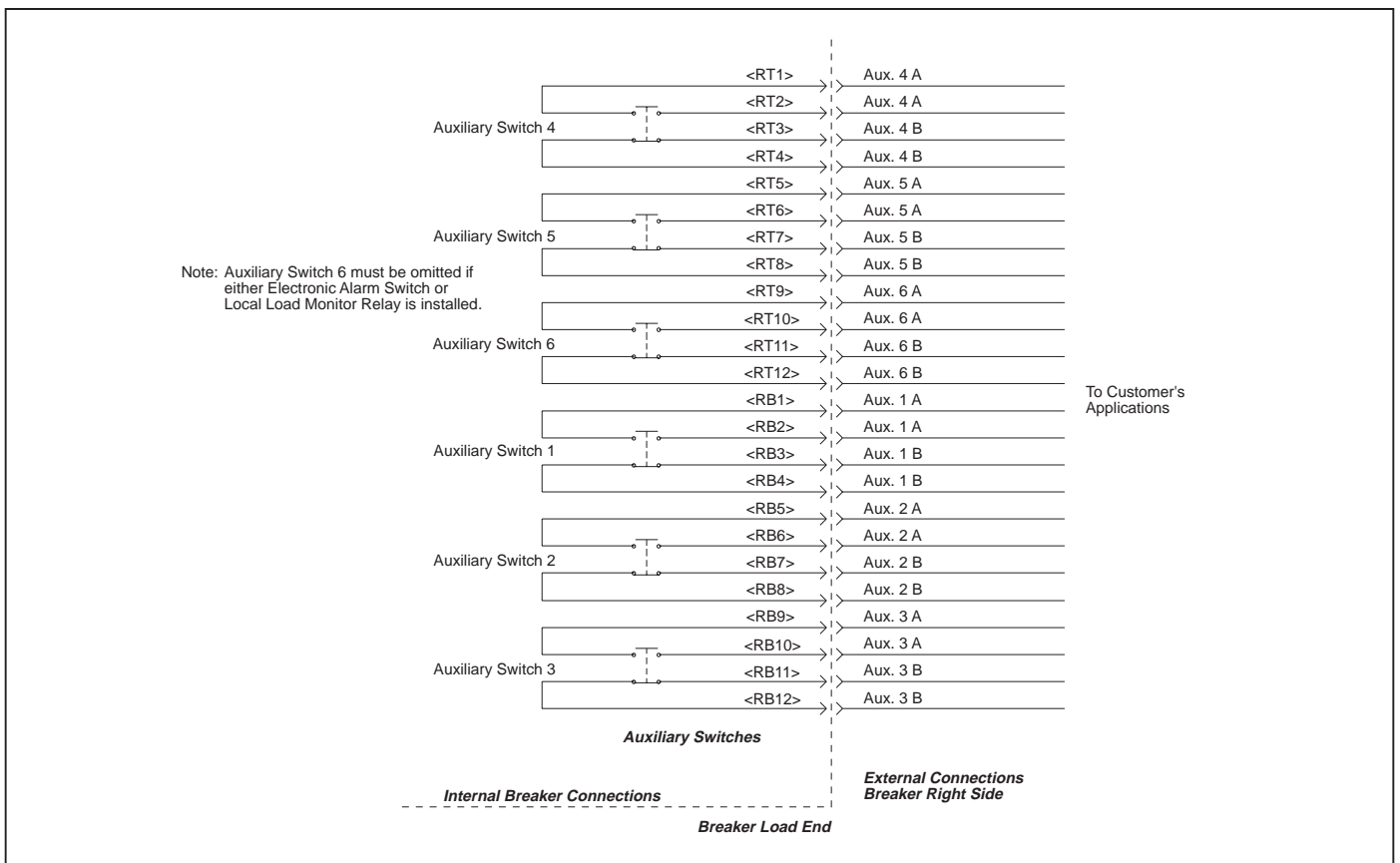


AC Undervoltage Release Solenoid Schematic

# Electrical Schematics

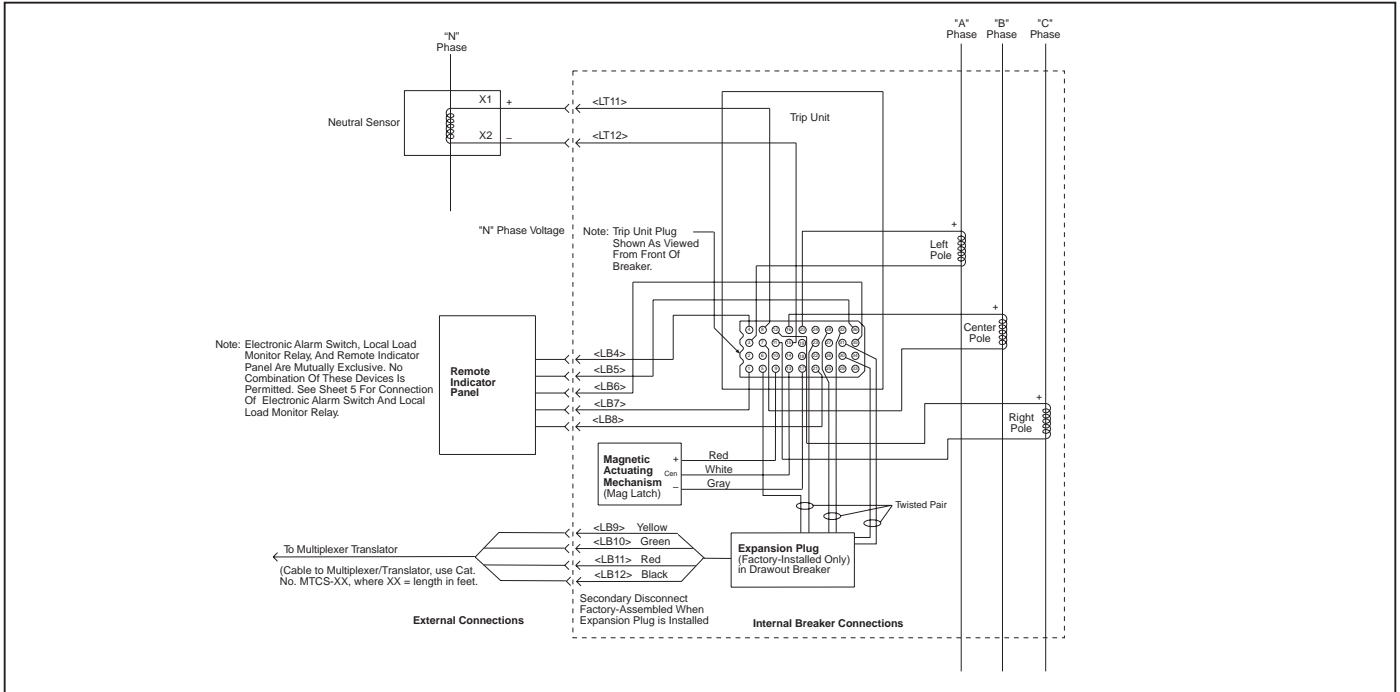


Shunt Trip Schematic

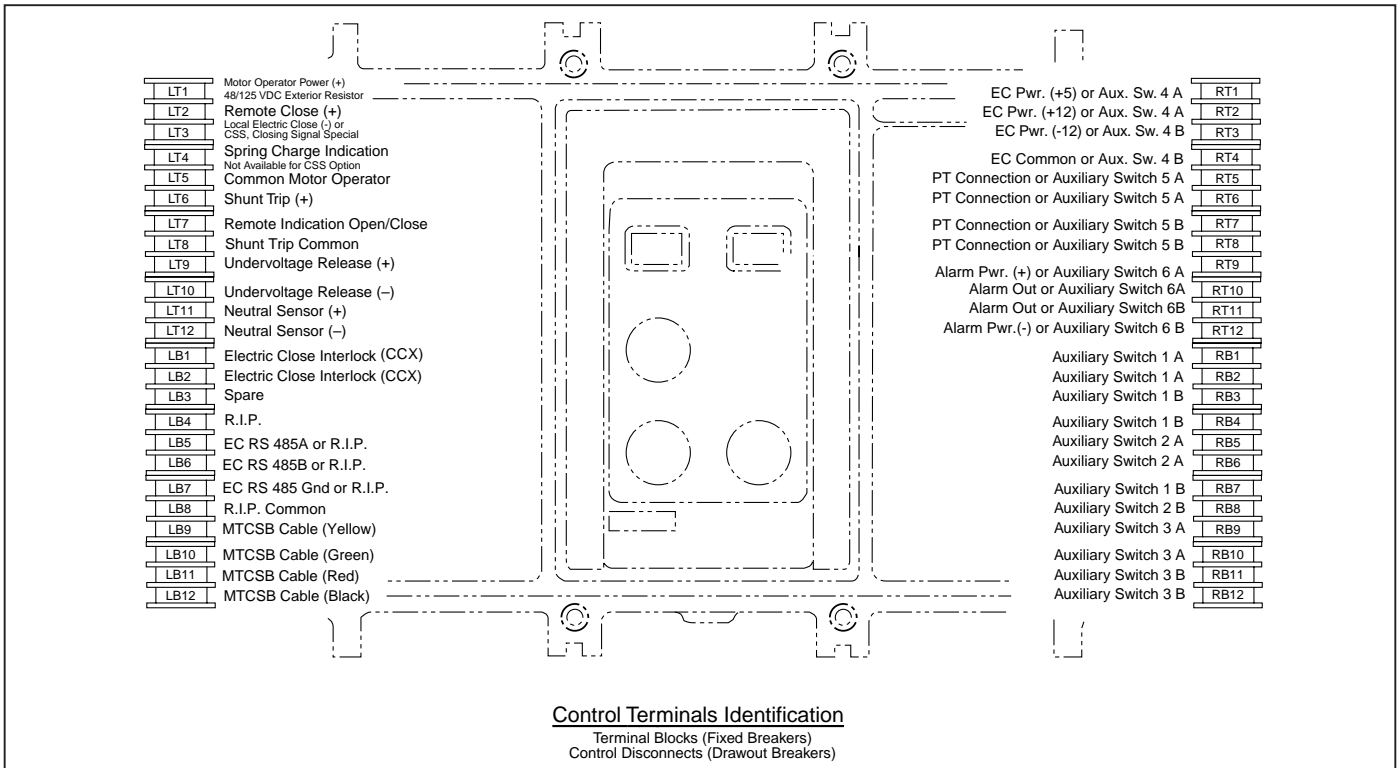


Auxiliary Switch Schematic

# Electrical Schematics



Neutral Transformer/EP/Remote Indicator Panel



Control Terminals Identification

# SB Solenoid Coil Resistances

## SHUNT TRIP SOLENOID:

SHUNT TRIP PLUNGER O.D. = 0.310 INCH

+/- 5% @ 20 degrees C

12 VDC - 3.6 ohms	120 VAC - 79.6 ohms
24 VDC - 14.2 ohms	240 VAC - 380 ohms
48 VDC - 55 ohms	480 VAC - 1163 ohms
125 VDC - 370 ohms	

SHUNT TRIP PLUNGER O.D. = 0.437 INCH

+/- 10% @ 20 degrees C

12 VDC - 4.3 ohms	120 VAC - 14 ohms
24 VDC - 9 ohms	240 VAC - 48 ohms
48 VDC - 34 ohms	
125 VDC - 225 ohms	

## UNDERVOLTAGE RELAY SOLENOIDS:

+/- 5% @ 20 degrees C

12 VDC - 117 ohms	48 VDC - 1822 ohms
24 VDC - 460 ohms	125 VDC - 11,395 ohms*

\* 125 VDC Solenoid used for all VAC UVR Applications.

## ELECTRIC OPERATOR CLOSING SOLENOIDS:

+/- 10% @ 20 degrees C

24 VDC - 1.28 ohms	120 VDC - 35 ohms
48 VDC - 5.20 ohms	125 VDC - 35 ohms

## REMOTE CLOSE SOLENOIDS:

+/- 10% @ 20 degrees C

24 VDC - 1.28 ohms	120 VDC - 14 ohms
48 VDC - 5.20 ohms	125 VDC - 35 ohms

## PRIMARY CURRENT INJECTION AND FIELD TESTING SB BREAKERS

All field testing should be in accordance with NEMA Standards Publication No. AB4.

# Insulated Case Circuit Breakers - Guide Form Specification

## SPECIFICATIONS:

### 1.01 STANDARDS

- A. The insulated case circuit breakers and all components shall be designed, manufactured and tested in accordance with the latest applicable standards, including the following:
1. Underwriters Laboratory
  2. Canadian Standards Association
  3. IEC947-2 Interrupting Ratings
  4. NEMA

### 1.02 MANUFACTURERS

- A. Siemens Energy & Automation, Inc.  
B. \_\_\_\_\_  
C. \_\_\_\_\_

### 1.03 INSULATED CASE CIRCUIT BREAKERS

- A. Circuit breakers that are used as mains, ties, feeders or emergency source shall be Siemens SB Encased Systems circuit breakers or equivalent with microprocessor-based trip units designed for true RMS sensing and with fully adjustable characteristics necessary for selective coordinated system.
- B. Frame sizes shall be:  
\_\_\_1200 \_\_\_2000 \_\_\_3200 \_\_\_5000 amperes,  
with interrupting ratings of:  
\_\_\_65kA \_\_\_85kA \_\_\_100kA \_\_\_150 kA \_\_\_200kA at 240V AC  
\_\_\_65kA \_\_\_100kA \_\_\_150kA at 480V AC  
\_\_\_42kA \_\_\_50kA \_\_\_65kA \_\_\_85kA \_\_\_100kA at 600V AC  
as shown on the single line drawing and / or switchboard schedule.
- C. Short time rating shall be 25kA for the 1200 ampere frame breakers, 35kA for the 2000 ampere frame, 50kA for the 3200 ampere frame, and 65kA for the 5000 ampere frame breakers.
- D. All breakers shall be rated for 100 percent continuous duty and approved for reverse connection.
- E. All breakers shall be:  
\_\_\_ fixed \_\_\_ drawout construction with:  
\_\_\_ manual \_\_\_ electrical operation.
- F. When a breaker is specified without an instantaneous pickup function, it shall contain an override circuit so that the breaker may be applied to its interrupting rating and provide selectivity up to its short time rating. This breaker should also contain a circuit to prevent it from being closed and latched in on a faulted system so as to minimize damage in case of severe faults.
- G. The microprocessor trip unit shall be plug-in for interchangeability in the field and interlocked such that the breaker will remain open when the trip unit is not installed. A rejection scheme shall prevent the installation of a trip unit into a breaker frame for which it is not intended.

# Insulated Case Circuit Breakers - Guide Form Specification

- H. The continuous ampere rating of the breaker shall be determined by a rating plug, which shall be inserted into the front panel of the trip unit. The trip units' adjustable continuous ampere setting shall default to the trip unit's minimum value when the rating plug is removed. A rejection scheme shall prevent the installation of a rating plug into a trip unit for which it is not intended.
- I. The breaker operating mechanism shall be a true two-step stored energy mechanism that shall provide a five cycle maximum closing time. Separate indicators shall be provided to show charged / discharged status of the mechanism and open / closed status of the breaker's contacts. The breaker mechanism shall enable to be discharged without closing the main contacts. The manual charging handle shall be interlocked with the manual close button to prevent simultaneous operation.
- J. Breakers specified as drawout shall have three positions which are: connected, test / disconnected and withdrawn. In the withdrawn position the breaker movement element shall be rotatable for ease of inspection. An indicator shall be provided to show the breaker in the connected, test / disconnected and withdrawn position. Extension rails and a lifting means shall be provided for breaker removal.
- K. Breakers with integral ground fault protection shall be provided. The adjustable ground fault pickup and delay shall have a maximum setting of 1200 amperes to meet the requirements of the National Electrical Code. The integral ground fault system shall be able to be used for either residual or ground return schemes. An integral ground fault test function shall be provided to test the circuit breaker's ground fault system.
- L. Fault indication shall be provided on the trip unit for overload, short time, short circuit and ground fault.
- M. Systems zone selective interlocking shall be provided for both the short time and ground fault functions to minimize equipment damage levels. The zone interlock system shall be compatible with Siemens Sensitrip®III solid state molded case circuit breakers and Type RL low voltage power circuit breakers.
- N. A breaker integral test function shall be provided to exercise the trip unit electronics, the circuit breaker magnetic latch and the breaker mechanism. The test system shall provide "trip" and "no trip" tests. The trip unit shall have a removable transparent cover which shall be sealable.
- O. Compact dimensions shall allow 6-high mounting of 1200 ampere frame, 4-high mounting of 2000 ampere frame, and 2-high mounting of 3200 and 5000 ampere frames in a standard 90 inch switchboard unit.
- P. Breakers shall have common mounting depth for all current rating: 400 through 5000 amperes.
- Q. Breakers shall have common width for 1200 through 2000 ampere frames.
- R. Mounting holes are outboard for ease of access and are identical for 1200 through 2000 ampere frames
- S. Breakers shall have 5 inch (127 mm) pole-spacing on 1200 through 2000 ampere frames allows direct bus-connection per UL 891 without the need for thermal testing.
- T. Breakers shall have rotatable finger clusters on drawout.
- U. Breakers shall have sliding secondary disconnects on drawout and keyed to aid installation and provide reliable operation.
- V. Breakers shall have optional terminal connectors allowing for cable connection of breakers up to 2000 amperes.
- W. The trip system described in this specification shall have the ability to have added to it, in the future, open protocol communication features, including remote monitoring of metering functions remote Open/Close control of the breaker via communications, remote breaker testing, remote trip unit configuration, and remote alarming based on metered values.
- X. When metering is specified, the trip unit shall provide integral metering functions including an integral keypad and graphical display capable of displaying real time voltage and current waveforms, volts, amps, PF, Frequency, Watts, VA, Crest Factor, Amp Demand, Watt Demand, Voltage and Current Unbalance, Mechanical & Interruption Fault Level Counters, Time-stamped Event Logs & Trip Logs.
- Y. When Alarms are specified, the trip unit shall be equipped to provide alarms based on Primary Overcurrent, Ground Overcurrent, Over Ampere Demand, Over KW, Over KW Demand, Over KVAR, Over KVA, and Over/Under PF. The alarms shall have separate adjustable pick-up and delay settings.

When Protective Relaying is specified, the trip unit shall be equipped to provide selective alarm and/or breaker tripping functions based on Neutral Overcurrent, Current Unbalance, Under/Over Voltage, Voltage Unbalance, Reverse Power, Under/Over Frequency.

# Insulated Case Circuit Breakers - Guide Form Specification

- Z. When current harmonic analysis is specified, the trip unit shall be equipped to provide digital harmonic sampling capability up to the 19th harmonic. This data shall be capable of being viewed on the trip unit display or transmitted via communications.

## 1.04 INTERNAL ACCESSORIES

- A. Provide shunt trips, bell alarms, auxiliary switches, electric motor operator, undervoltage release, remote close solenoids, as shown on the contract drawings.
- B. All available internal accessories - shunt trip, undervoltage, auxiliary switches, etc. - including the electric operator shall be UL listed and approved for field installation. The electric motor operator shall have electronic control to assure reliable charging.

## 1.05 EXTERNAL ACCESSORIES

- A. The breaker shall provide optional T-bus connectors for rear bus connected fixed mount breakers. The T-connectors shall be rotatable 90 degrees for flexibility of bus connection up to 2000 amperes.
- B. The breaker shall provide optional pressure wire connectors for breakers up to 2000 amperes.

## 1.06 ENCLOSURES

Enclosed circuit breakers shall have NEMA 1 general purpose ratings unless otherwise noted. Provide enclosures suitable for locations as indicated on the drawings.

## 1.07 FACTORY TESTING

Standard factory tests shall be performed on the equipment in accordance with the latest version of NEMA and UL standards.

## 1.08 INSTALLATION

The Contractors shall install all equipment in accordance with the contract drawings and manufacturers recommendations.

## 1.09 FIELD SETTINGS

The Contractor shall perform necessary field adjustments of the circuit breakers to place the equipment in final operating condition. The settings shall be in accordance with the approved protective device coordination study or as directed by the Engineer.



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