

**INERTIA**  
**ENGINEERING**



# HIGH VOLTAGE SWITCHGEAR & AUTOMATION EQUIPMENT

## SECTION 3 Overhead Transmission Switches

CAT. NO: 040930G  
May, 2008



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## OVERHEAD TRANSMISSION SWITCHES

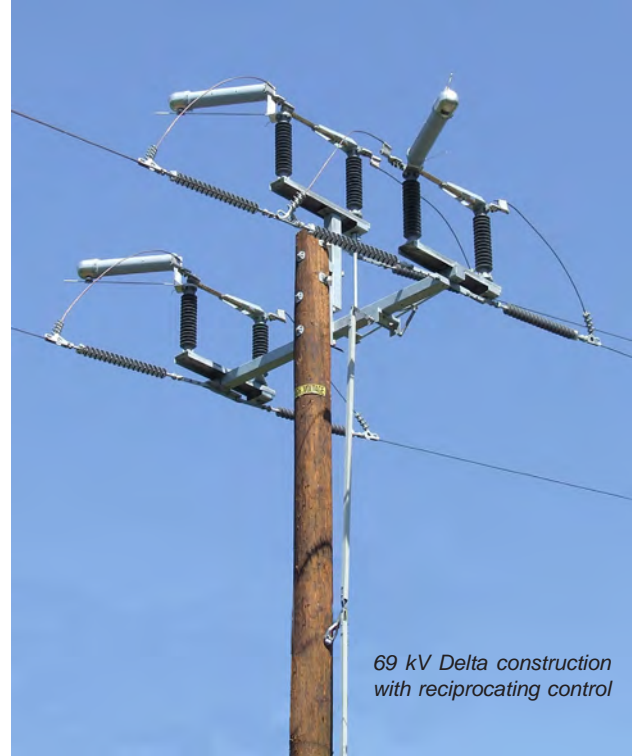
•	<b>LineBOSS™ 46 kV &amp; 69 kV Sidebreak GOAB Switch</b>	3.28
•	<b>LBS 46 kV - 69 kV Faxback Form</b>	3.29
•	<b>Air-BreakSwitch Attachment (Loadbreak) Information</b>	3.30
•	<b>LBS 46 kV - 69 kV Feature/Benefit Overview</b>	3.31
•	<b>LBS 46 kV - 69 kV Specification Elements</b>	3.32
•	<b>LBS 46 kV - 69 kV Configuration Drawings</b>	
	9223M LBS4 (48 kV) SINGLE PHASE, dimensions.	3.33
	9232M LBS 48 kV HORIZONTAL, Upright dimensions.	3.34
	9222M LBS 48 kV HORIZONTAL (Center Mount) dimensions.	3.35
	9224M LBS 48 kV VERTICAL (Phase-over-Phase) dimensions.	3.36
	9237M LBS 48 kV TAP (1, 2 & 3-way) dimensions.	3.37
	9403M LBS 48 kV DELTA Configuration, dimensions.	3.38
	7000M LBS6 (72.5 kV) SINGLE PHASE, dimensions.	3.39
	9215M LBS6 (72.5 kV) HORIZONTAL, (Center Mount) dimensions	3.40
	9210M LBS6 (72.5 kV) VERTICAL (Phase over Phase), dimensions	3.41
	9212M LBS6 (72.5 kV) VERTICAL, Twin Circuit, dimensions	3.42
	9221M LBS6 (72.5 kV) DELTA Configuration, dimensions	3.43
	9370M LBS6 (72.5 kV) VERTICAL Outboard with reciprocating control	3.44
	9390M LBS6 (72.5 kV) RISER dimensions	3.45
	9515M LBS6 (72.5 kV) TIERED OUTBOARD dimensions	3.46

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INERTIA Engineering and Machine Works, Inc. adapted the industry leading design features of its distribution class G.O.A.B. switches, to produce an extremely high quality and cost effective, unitized side-break style transmission switch.

The ease of installation that unitized distribution class switches provide is now available for transmission class switches. The phase units are shipped as completely factory assembled and adjusted units. The actual configuration is delivered fully unitized or modularized for fast, simple and easy field installation.

The LineBOSS 46 kV-69 kV sidebreak switches are the lowest "cost to own" switches available today. Fully unitized or modular switches are hung on the pole in hours, not days. These switches also provide lower operating costs. Unbalanced conductor load or seasonal temperature changes can create line sag leading to contact misalignment on other style switches. This maintenance headache is eliminated by the LineBOSS sidebreak switch. Custom phase bases are available for installation on a wide variety of structures.



69 kV Delta construction  
with reciprocating control

### STANDARD FEATURES

- Unitized or modular construction on aluminum or steel crossarms for fast and easy installations
- Factory adjusted, ready to mount with minimal, if any, field assembly required
- Available with silicone (std.) or porcelain insulators
- Reverse loop, silver plated copper jaw contacts
- Maintenance-free, sealed, stainless steel ball bearings
- Meets all applicable NEMA and ANSI standards
- All ferrous components are hot dip galvanized
- Tinned copper two-hole and four-hole terminal pads

### STANDARD CONFIGURATIONS

- Horizontal, center mount
- Vertical, phase over phase
- Delta, triangular/pole top
- Twin Circuit
- Tap Switch: one-way, two-way and three-way

### SPECIFICATIONS

Voltage Class: 46 kV (48 kV max.) & 69 kV (72.5 kV max.)

Current Class: 600, 900 and 1200 A, continuous

Momentary current: 600 A: 40,000 A-rms, 10 cycles  
25,000 A-rms, 3 seconds

900 A: 51,000 A-rms, 10 cycles  
32,000 A-rms, 3 seconds

1200 A: 70,000 A-rms, 10 cycles  
44,000 A-rms, 3 seconds

Continuous current ratings tested to IEEE C37.32-1996

### INTERRUPTER/LOADBREAK RATINGS (maximum)

#### High Speed Whip Ratings:

Voltage	Line Charging	Magnetizing
46 kV	18 A-rms (70 miles)	15 A-rms (70 MVA xfmr)
69 kV	18 A-rms (70 miles)	10 A-rms (70 MVA xfmr)

AmpVac Interrupters:	V	V2	V3
<i>All currents are in Amps</i>	46 kV*	69 kV*	46 kV 46 kV 69 kV
Interrupting Current	1500	1500	2000 2000 2000
Parallel Break Current	1500	1500	2000 2000 2000
Line Charging Current	7 **	3 **	450 600 70
Magnetizing Current	7 **	3 **	700 800 600

\* Recovery voltage below 38 kV. \*\* For higher rating check with factory.

# LineBOSS™ Selection Guide (46 kV-72.5 kV)

LineBOSS™ Unitized Sidebreak Line Switch

## L61SVSC1133

**Voltage Class:**

48.0 kV (250 kV BIL) = 4  
72.5 kV (350 kV BIL) = 6

**Current Rating:**

600 A (ANSI: 30°C rise) = 6  
900 A (ANSI: 30°C rise) = 9  
1200 A (ANSI: 30°C rise) = 1

**Insulator Type**

Silicone rubber = S (std.)  
Porcelain ..... = P

**Interrupter Type**

No Interrupter . . . . . = X  
Arc Horn . . . . . = A  
Arc Whip, Quick Break = Q  
Hi-speed Whip, HSW = S  
Vacuum Bottles: 1-Gap = V  
2-Gap = V2  
3-Gap = V3

**Crossarm Type**

Galv. Steel = S ("SX" for heavy duty arm)  
Aluminum = A ("AX" for heavy duty arm)  
Customer specified loading (call factory)

**Mounting Configurations**

Horizontal Upright = H  
Horiz. Center-mount = C  
Riser . . . . . = R  
Vertical (phase over phase) = V  
Vertical (tiered outboard) = B  
Delta (pole top) = D  
Twin Circuit . . . . . = T  
Tap Switch: 1-way = 1W  
2-way = 2W  
3-way = 3W

**Ctrl. Rod Length** (10' sect.)

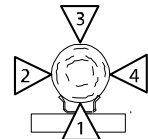
30 feet (standard) = 3  
specify alternate = \_\_\_  
Insulated section = B  
(equal to switch BIL)

**Control Rod Type**

Reciprocating  
1" galvanized pipe = 4  
¾" galvanized pipe = 3  
1 ¾" square fiberglass = 1  
Torsional  
1½" galvanized pipe = 6

**Control Location**

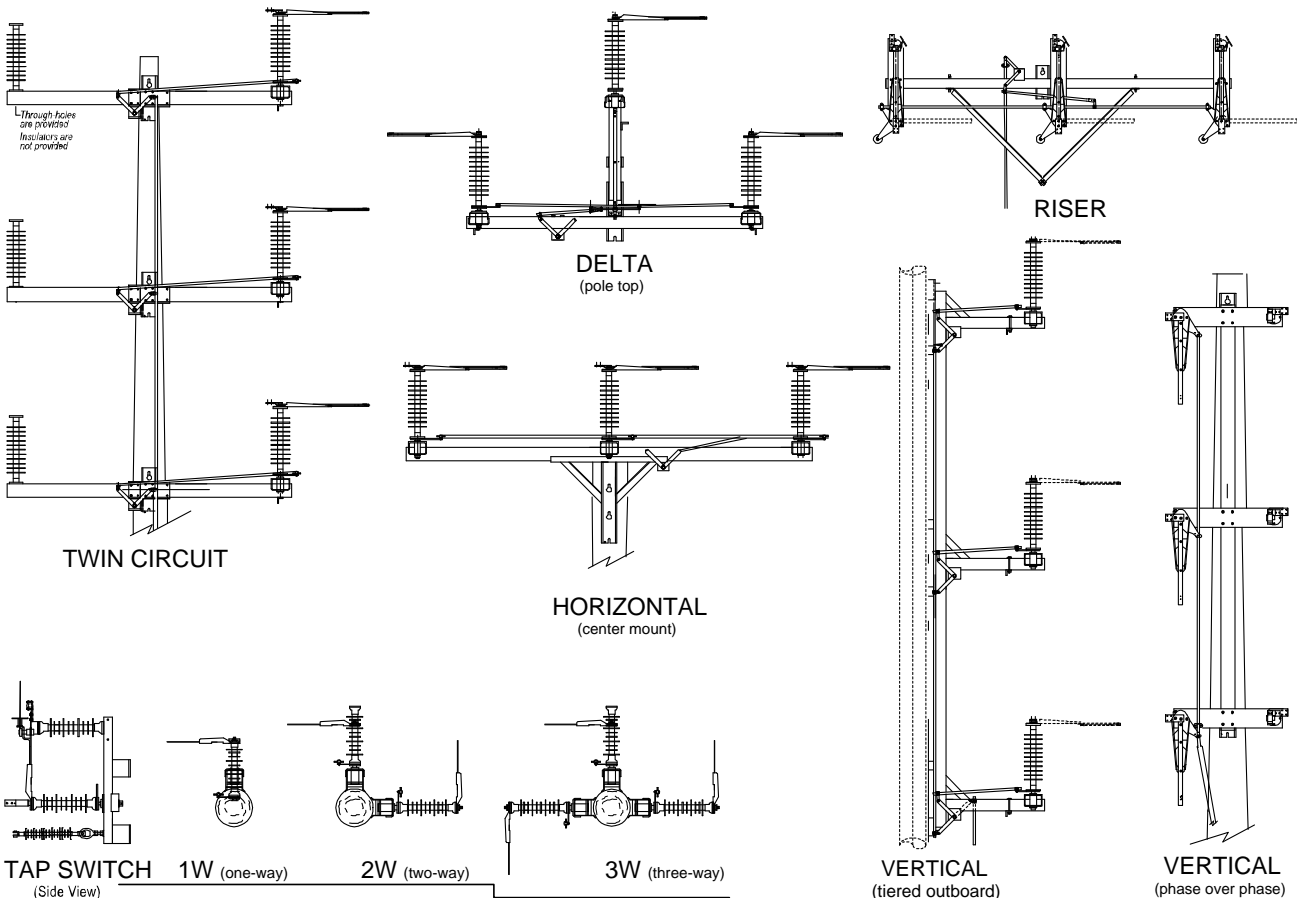
Specify the quadrant by number, where the control is to be located



**Control Mechanism**

Reciprocating handle = 1  
Torsional handle = 2  
Add "C" for counterclockwise to open

Note: Consult the factory for any options not listed, including; arrestors, sensors, support brackets etc.  
A Fax-back form can be found on the next page. Copy, fill-out and fax it back with your requirements.



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Company Name \_\_\_\_\_  
 Address 1 \_\_\_\_\_  
 Address 2 \_\_\_\_\_  
 City \_\_\_\_\_ State/Zip code \_\_\_\_\_

Contact Name \_\_\_\_\_  
 Telephone Number \_\_\_\_\_  
 Facsimile Number \_\_\_\_\_  
 E-mail address \_\_\_\_\_

Make copies of this form to transmit your switch requirements. If you have your own standard's drawing, please fill out the customer information and send it with this fax form.

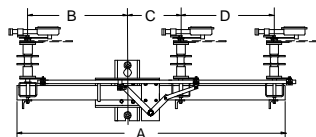
Step 1. Voltage Class \_\_\_\_\_ kV Continuous Current rating (ANSI): \_\_\_\_\_ Amps

Step 2. Insulator type (circle one): Silicone Porcelain

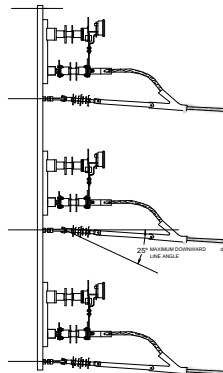
Step 3. Interrupter type: None ArcHorn ArcWhip Hi-speed Whip AmpVac V2 V3

Step 4. Select the configuration (circle one) and specify spacing dimensions, if necessary:

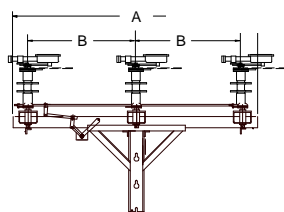
"A" \_\_\_\_\_ "B" \_\_\_\_\_ "C" \_\_\_\_\_ "D" \_\_\_\_\_ "E" \_\_\_\_\_



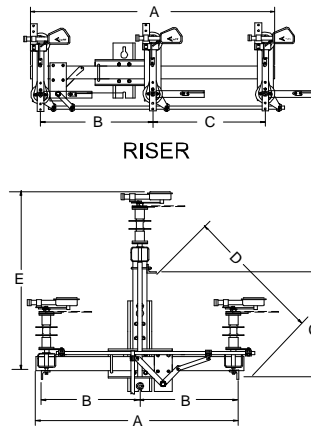
HORIZONTAL Upright Underarm



TAP SWITCH

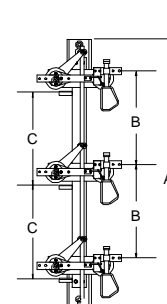


HORIZONTAL, Center mount

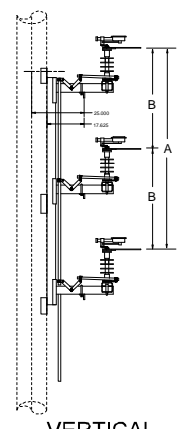


RISER

DELTA, Triangular/Pole top



VERTICAL  
Phase-over-phase



VERTICAL  
Tiered outboard

Step 5. Select Crossarm type:  Galvanized Steel  Aluminum

Step 6. Select the control mechanism (circle): Reciprocating (↑↓) Torsional (↻) Clockwise or Counterclockwise  
*to open; viewed looking down on the handle*

① LineBOSS switches are ANSI rated switches. The LineBOSS Lx6xxxx is rated 600 Amps continuous current per the ANSI C37.30 temperature rise test requirements, and for 900 Amp continuous current per the IEEE 1247 temperature rise test requirements. The LineBOSS Lx9xxxx is rated 900 Amps continuous current per the ANSI C37.30 temperature rise test requirements. The LineBOSS Lx1xxxx is rated 1200 Amps continuous current per the ANSI C37.30 temperature rise test requirements. Momentary current ratings (10 cycle) are: Lx6xxxx 600 A (ANSI C37.30) = 40 kA  
 Lx9xxxx 900 A (ANSI C37.30) = 51 kA  
 Lx1xxxx 1200 A (ANSI C37.30) = 70 kA

Step 7. Select control rod (circle one): Galvanized pipe: 1" 1½" other \_\_\_\_\_  
Fiberglass: 1¾" square other \_\_\_\_\_

Step 8. Select control rod length (circle one): 30 ft. 40 ft. other \_\_\_\_\_

Step 9. Select additional accessories and modifications (check off and write in)

- Provision for Neutral (4-wire)
- Pole mounting bands
- Substation mounting: Specify base mounting dimensions or furnish drawing.
- Surge Arrestor brackets:  set of 3 arrester brackets  set of 6 arrester brackets
- Extension links:  set of 6; each 6" long  set of 6; each 14" long  "Y" Ball Clevis
- Terminals:  Terminal paddle for fired wedge connectors \_\_\_\_\_ (specify size)
  - Terminals, 2-hole copper NEMA pad #2-500 kcmil ( 600 & 900 A switch) Specify: \_\_\_\_\_
  - Terminals, 4-hole copper NEMA pad 500-750 kcmil (1200 A switch) Specify: \_\_\_\_\_
  - Terminals, other; \_\_\_\_\_ (specify size)
- Sensor Brackets; 1 set of 3 brackets
- Current/Voltage Sensors, 3 each of . . . .  Current  Voltage  Current/Voltage
- Fiberglass section in pipe control rod:  1¾" square fiberglass
- Station post insulator in control rod section
- Intermediate control rod guides  Swing-arm type
- Bonded handle  Grounding connector on crossarm \_\_\_\_\_ AWG range
- Key Interlock - single key for circuit switching safety ("locked open")
- Crossarm Braces  Galvanized Steel
- Lifting points  Single  Double

**Notes/Sketches**



**ArcHorn** (not an interrupter)**LineBOSS™ Selection Guide suffix “A”**

The Arc Horn is not an interrupter and has no ratings. It is used as an arc deflecting mechanism to save the life of switch blades and contact clips. The ArcHorn, also known as “sacrificial arcing horn”, is the first point of contact during switch closing operations. The initial making current during a closing operation creates small arcs; pitting the arc horns. This “sacrificial” mechanism prevents degradation of the main contacts. The Arc Horn is used to redirect the arc resulting from residual or stored charge left in a line after a down-line circuit is opened. Arc Horns will not prevent damage from the inadvertent opening of a loaded switch.

**ArcWhip****LineBOSS™ Selection Guide suffix “Q”**

The ArcWhip is similar to an Arc Horn, but unlike Arc Horns, the ArcWhip has a small interrupting rating between 10 and 20 amps. ArcWhips can clear arcs from residual energy stored in capacitor banks, transformers or conductors. ArcWhips are only in the current path during switch opening operations. They have an average life of 150 open operations.

**ArcChute** (Delrin “Clapper”)**LineBOSS™ Selection Guide suffix “H”**

The ArcChute Interrupter is a minimal load-breaking device that utilizes air break technology. The arc is quenched as the two Delrin arc chute plates close and the arc whip breaks away establishing the required metal-to-metal open gap. Arc Chute interrupters are widely used for line charging and magnetizing current interrupting. Full loadbreak and parallel breaking currents up to 150 amps at 21 kV or 20 amps at 34.5kV are common applications. Arc Chute interrupters are only in the current path during the opening process and have an average life of 150 operations.

**AmpVac™****LineBOSS™ Selection Guide suffix “V”**

The AmpVac is an enclosed vacuum bottle interrupter where no gases are vented to the atmosphere. The AmpVac interrupter has much higher interruption capabilities than other load break devices. Single contact AmpVac interrupters break loads up to 1500 amps at 35 kV. Single vacuum bottle interrupters may be used at reduced voltages for parallel or loop switching applications as long as the peak recovery voltage does not exceed 38 kV. The mechanical and electrical life of the AmpVac is 5000 operations at full load. The AmpRupter was tested to IEEE 1247-1998 .

## High Speed Whip

### LineBOSS™ 46 kV - 69 kV Selection Guide suffix “S”

The HSW, high speed whip Interrupters are used to interrupt line charging current at system voltages up to 72.5 kV. They can also interrupt transformer magnetizing current at system voltages up to 72.5 kV. These interrupters are designed for 5000 open operations.



### LineBOSS™ 46 kV - 69 kV Selection Guide suffix “V2” & “V3”

The V2 and V3 vacuum Interrupters are a two-gap and three-gap load-breaking devices, respectively that utilize vacuum bottle technology. V2 vacuum interrupters with two vacuum bottles in series can break loads up to 2000 Amps at 48 kV. V3 vacuum interrupters with three vacuum bottles in series can break loads up to 2000 Amps at 72.5 kV. Vacuum bottle interrupters are not in the current path during the switch closing operation, and have no fault closing capabilities. The mechanical and electrical life of the V3, 3-Gap vacuum interrupter is 5000 operations at full load.

**V2 (2-gap vacuum Interrupter)**

**V3 (3-gap vacuum Interrupter)**

### Vacuum Bottle Interrupter Applications:

Type of Switching	AmpVac, 1-Gap Vacuum Interrupter					V2, 2-Gap		V3, 3-Gap	
	15.5 kV	25.8 kV	38.0 kV*	48.3 kV*	72.5 kV *	38.0 kV	48.3 kV	48.3 kV	72.5 kV
Loadbreak, 70% PF	1500 A	1500 A	1500 A	1500 A	1500 A	2000 A	2000 A	2000 A	2000 A
Parallel Break < 30% PF	1500 A	1500 A	1500 A	1500 A	1500 A	2000 A	2000 A	2000 A	2000 A
Cable Charging	1500 A	950 A	100 A	7 A**	3 A**	600 A	450 A	600 A	70 A
Magnetizing	1500 A	1000 A	300 A	7 A**	3 A**	700 A	700 A	800 A	600 A
Capacitor Bank,(grnd. neut.)	1500 A	950 A	100 A	7 A**	3 A**	600 A	700 A	800 A	600 A

\* Recovery voltage between source and load must be less than 38 kV, immediately.  
 \*\* Higher current rating available with use of a voltage limiter; Consult the factory for details.

### Interrupter Attachment Device Applications:

Switching Type	ArcHorn	ArcWhip	ArcChute	Hi-speed whip
Line Charging	NA	<72.5 kV : 2.5 A (10 miles)	<72.5 kV : 2.5 A (10 miles)	72.5 kV : 18 A (70 miles)
Magnetizing	NA	<72.5 kV : 3500 kVA xfmr	<72.5 kV : 3500 kVA xfmr	46 kV-72.5 kV : 70 MVA xfmr



*Unitized transmission switches install with the speed and ease of distribution switches and provide years of maintenance-free operation.*

*Specify these features for the lowest installed, lowest operating cost switch.*

**FEATURES**

**BENEFITS**



**Unitized/Modular Switches**

The LineBOSS™ 46 kV and 69 kV switches come from the factory with each phase unit completely unitized and adjusted. When the switch configuration calls for partial assembly, the LBS switch is broken down into easily assembled modules. The locations of the modules are fixed, requiring very little, if any, adjustment.

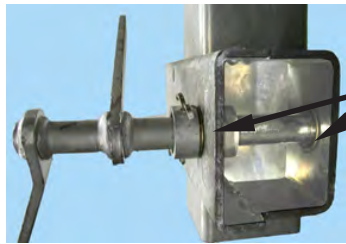
Benefit: Greatly reduced installed cost with minimal field assembly and adjustment of the switch.



**Interlocking phase base design with through-hole mounting bolts.**

The LBS 46 kV and 69 kV phase units have an interlocking design that securely clamps and locates each phase unit on the crossarm. Secure phase bases result in minimal movement over the life of the switch. Adjustments to the switch are virtually eliminated. The through-bolt fastening assures that user specified phase spacing is met without additional field measurements or adjustments.

Benefit: Reduced installed cost due to minimal assembly  
Reduced maintenance cost through secure clamping



**Stainless steel/brass bearings in the bellcrank**

Bearings in the bellcrank mechanism reduce the force required to operate the switch and eliminate corrosion caused by plated metal-to-metal abrasion and wear.

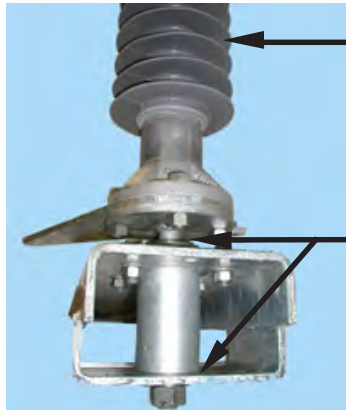
Benefit: The ease of operation reduces risk of injury to personnel operating the switch and also translates into greater switch life.



**Busbar grade copper contact components.**

Inertia uses busbar grade copper contact components as they are structurally and electrically superior to cast contact materials. Cast aluminum and copper bronze contact castings are 34-36% conductive and often contain unseen surface irregularities and voids that create 'hot spots'. Busbar grade C110 copper is 99% conductive and is many times smoother to provide better connection surfaces and is not subject to porosity.

Benefit: Reduced operating cost due to a cooler running switch. Longer service life with reduced energy loss.



**ANSI TR2xx series, 3" (46kV) & 5" (69kV) bolt circle station post insulators are provided in silicone or porcelain.**

The LBS switches are offered with silicone or porcelain, three inch (3") and five inch (5") bolt circle station post insulators. Silicone insulators are standard, with porcelain available as a lower cost alternate.

Benefit: Silicone insulated switches are lighter and easier to install with minimal chance of damage when uncrating and erecting. Porcelain insulators provide a lower cost option.

**Sealed stainless steel ball bearings on rotating stacks**

The rotating insulators pivot on double sealed stainless steel ball bearings at both the top and bottom of the phase base providing smooth maintenance-free operation of the switch throughout its life.

Benefit: Total operating cost of the switch is reduced as less site visits are required for maintenance.

## SPECIFICATION ELEMENTS 46 kV & 72.5 kV RATED SWITCHES

Catalog Description: 46 kV (48.5 kV maximum) or 69 kV (72.5 kV maximum) GANG OPERATED LOAD-BREAK OVERHEAD SWITCH (Vertical, Horizontal, Delta (pole top), Riser, Twin circuit, Tiered outboard and Tap)

- Nominal voltage: (46 kV or 69 kV), continuous current rating: (600, 900 or 1200 A)
- Insulators: Silicone rubber station post, BIL rating 46 kV: 250 kV BIL, 69 kV: 350 kV BIL
- Switch bearings: Sealed stainless steel ball bearings on all rotating insulators.
- Contacts: Silver-plated copper busbar blades with reverse loop contacts. N.E.M.A. terminal pads shall be tin-plated copper busbar. Cast alloys are not acceptable for current path components.
- The switch shall provide means to attach line current/voltage sensors.
- All ferrous components shall be hot dip galvanized.
- Loadbreak shall be self-resetting; where the tripping speed of the loadbreak is independent of the switch operating speed.
- Switch base (crossarm) is to be hot dipped galvanized steel or aluminum. Pole clearance spacing can be specified by the customer.
- Operating rod: specify type and length of control rod, and insulated section, if required (see selection guide).
- The gang operated sidebreak style switch shall be capable of seamless automation with a reciprocating motor operator. It shall be available with the motorized switch operator replacing the manual handle.
- Switch phases shall be completely factory assembled. The switch configuration shall be either fully factory unitized and adjusted, or be modularized including factory assembled phase units for easy field assembly.
- Crossarms shall have predrilled galvanized locating/mounting holes as prescribed by customer specified phase spacings.
- Testing performed in accordance with standards: ANSI/IEEE C37.32-1996, ANSI/IEEE C37.71-1984 and IEC 265-1,1983.

### Switch Ratings

Voltage Class: 46 kV (48 kV max.) & 69 kV (72.5 kV max.)

Momentary current:

600 Amp: 40 kA-rms, 10 cycles 25 kA-rms, 3 sec.

900 Amp: 51 kA-rms, 10 cycles 32 kA-rms, 3 sec.

1200 Amp: 70 kA-rms, 10 cycles 44 kA-rms, 3 sec.

Current Class: 600, 900 and 1200 A, continuous current per IEEE C37.32-1996

### Loadbreak Device Ratings

ArcWhip: Voltage	Cable Charging	Line Charging
48.3 kV	15 A-rms	3500 kVA
72.5 kV	15 A-rms	3500 kVA

ArcChute: Voltage	Cable Charging	Line Charging
48.3 kV	15 A-rms	3500 kVA
72.5 kV	15 A-rms	3500 kVA

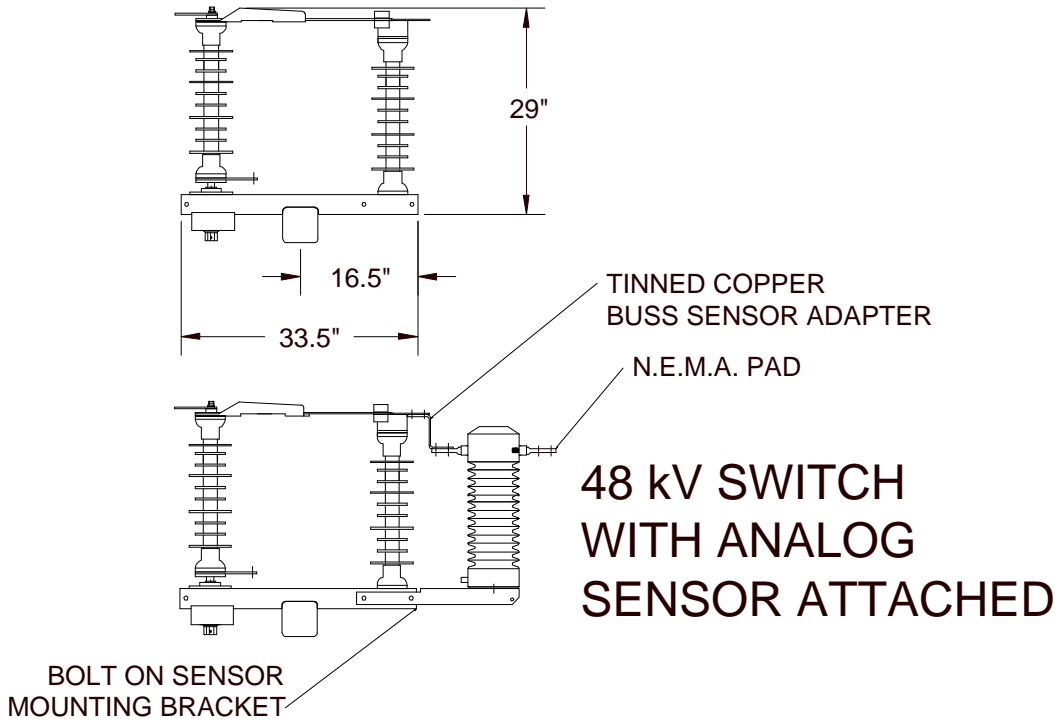
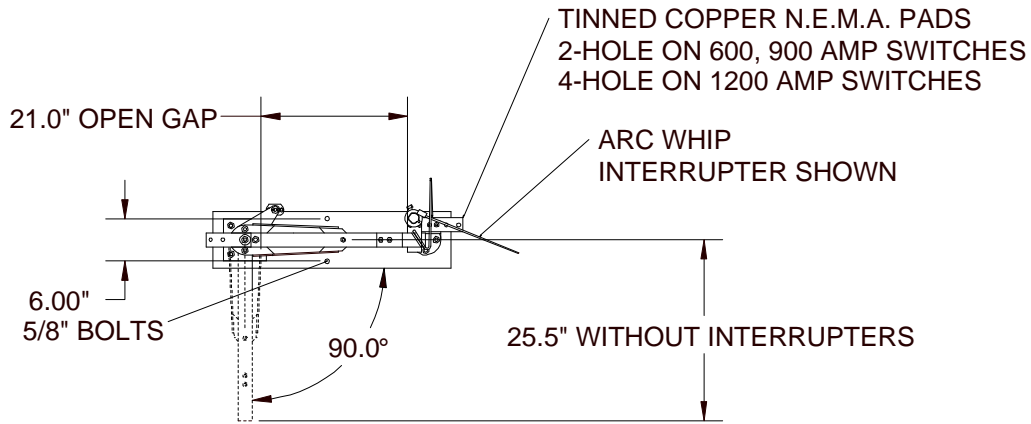
HS Whip: Voltage	Cable Charging	Line Charging
48.3 kV	25 A-rms	70 MVA
72.5 kV	20 A-rms	70 MVA

### Vacuum Bottle Interrupter Applications:

Type of Switching	AmpVac, 1-Gap Vacuum Interrupter					V2, 2-Gap		V3, 3-Gap	
	15.5 kV	25.8 kV	38.0 kV*	48.3 kV*	72.5 kV*	38.0 kV	48.3 kV	48.3 kV	72.5 kV
Loadbreak, 70% PF	1500 A	1500 A	1500 A	1500 A	1500 A	2000 A	2000 A	2000A	2000 A
Parallel Break < 30% PF	1500 A	1500 A	1500 A	1500 A	1500 A	2000 A	2000 A	2000 A	2000 A
Cable Charging	1500 A	950 A	100 A	7 A**	3 A**	600 A	450 A	600 A	70 A
Magnetizing	1500 A	1000 A	300 A	7 A**	3 A**	700 A	700 A	800 A	600A
Capacitor Bank, (grnd. neut.)	1500 A	950 A	100 A	7 A**	3 A**	600 A	700 A	800 A	600 A

\* Recovery voltage between source and load must be less than 38 kV, immediately.

\*\* Higher current rating available with use of a voltage limiter; Consult the factory for details.



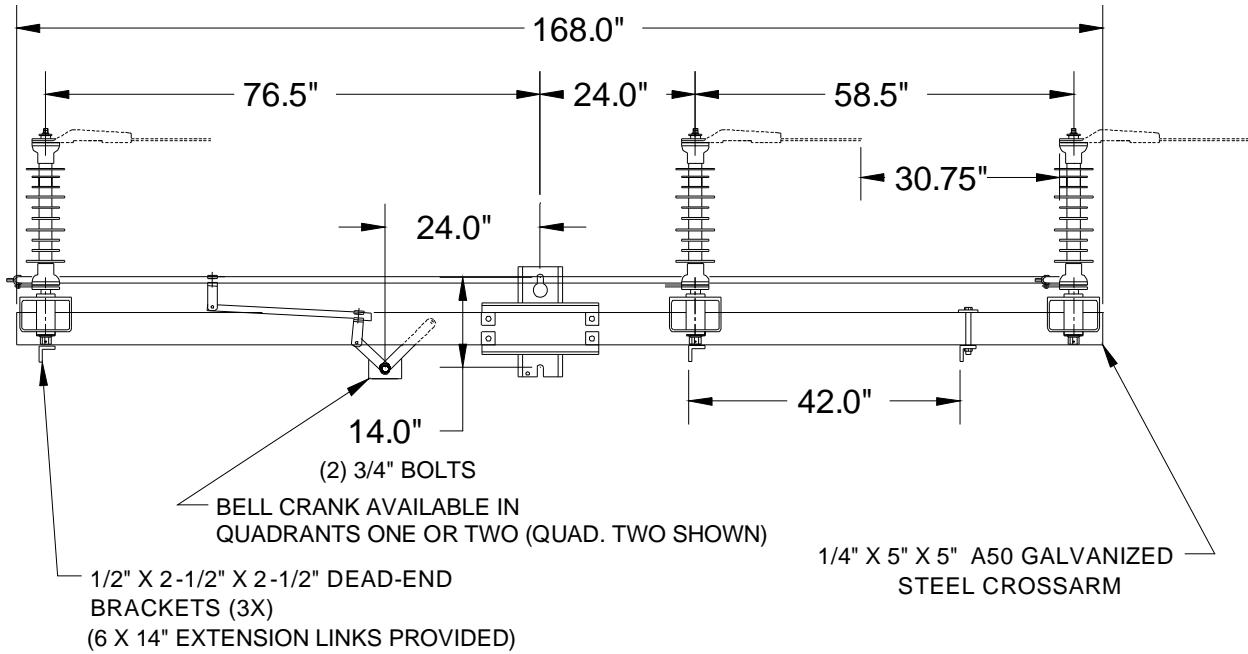
ALL LBS4 SERIES SWITCHES USE SEALED, STAINLESS STEEL BALL BEARINGS.  
 ALL CURRENT CARRYING COMPONENTS & CONTACTS SILVER PLATED C110 COPPER  
 ALL FERROUS COMPONENTS ARE HOT DIP GALVANIZED.  
 NO ALUMINUM OR COPPER CAST COMPONENTS USED.

SWITCH RATINGS	
Voltage Class: 48 kV nom. (48.5 kV max.) 250 kV BIL	
Current Class: 600, 900 and 1200 Amps, continuous	
Momentary Current Rating:	
600 A Continuous:	40,000 Amps, 10 cycles 25,000 Amps, 3 seconds
900 A Continuous:	51,000 Amps, 10 cycles 32,000 Amps, 3 seconds
1200 A Continuous:	70,000 Amps, 10 cycles 44,000 Amps, 3 seconds

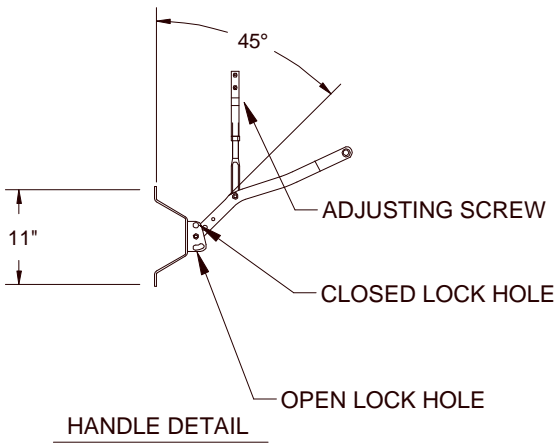
This drawing is for illustrative purposes only and therefore; may, or may not reflect the current revision of this drawing. Please request the current revision from the factory.



Material:		Description:	
Finish:		LBS4 (48 kV) SINGLE PHASE Dimensions.	
Scale:	None	Drawing No:	Revision:
Drawn by:			
Date:	09/22/01	<b>9223M</b>	<b>0</b>



NOTE: RECIPROCATING CONTROL MECHANISM SHOWN.  
TORSIONAL "SWING HANDLE" CONTROLS ARE AVAILABLE.



**SWITCH RATINGS**

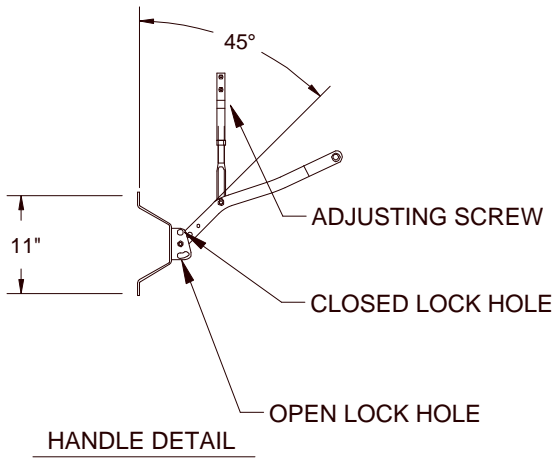
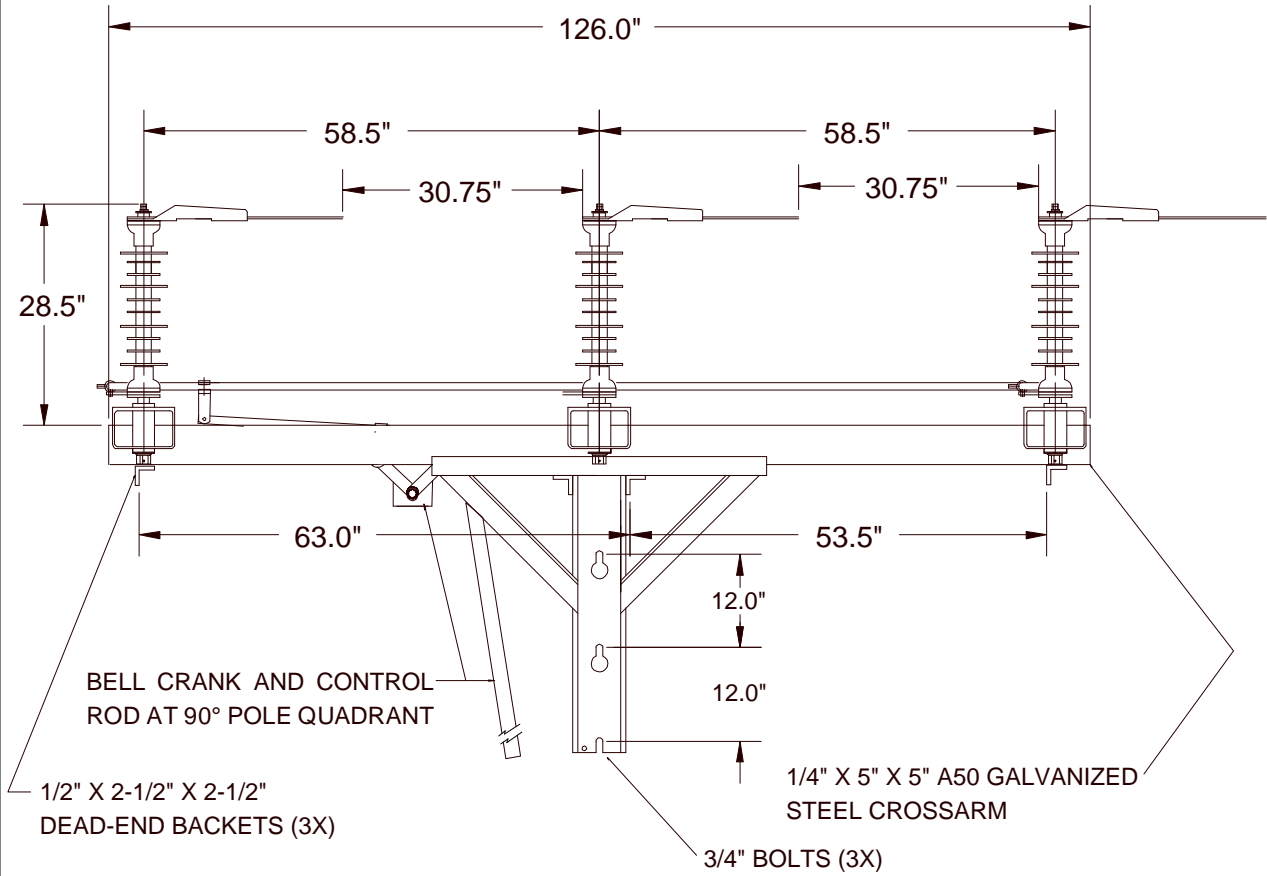
Voltage Class: 48 kV nom. (48.5 kV max.) 250 kV BIL	
Current Class: 600, 900 and 1200 Amps, continuous	
Momentary Current Rating:	
600 A Continuous:	40,000 Amps, 10 cycles 25,000 Amps, 3 seconds
900 A Continuous:	51,000 Amps, 10 cycles 32,000 Amps, 3 seconds
1200 A Continuous:	70,000 Amps, 10 cycles 44,000 Amps, 3 seconds

This drawing is for illustrative purposes only and therefore; may, or may not reflect the current revision of this drawing. Please request the current revision from the factory.



Material:	
Finish:	
Scale:	None
Drawn by:	
Date:	10/16/01

Description: LBS, 48 kV, Horizontal, Upright Dimensions	
Drawing No:	Revision:
<b>9232M</b>	<b>0</b>



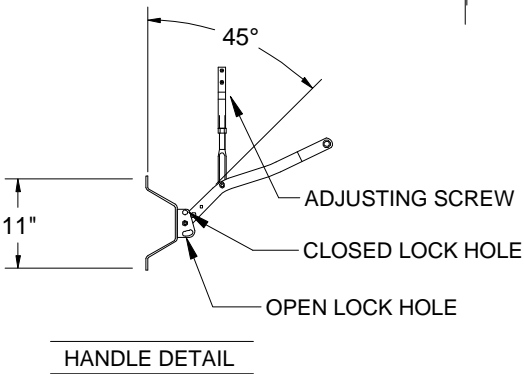
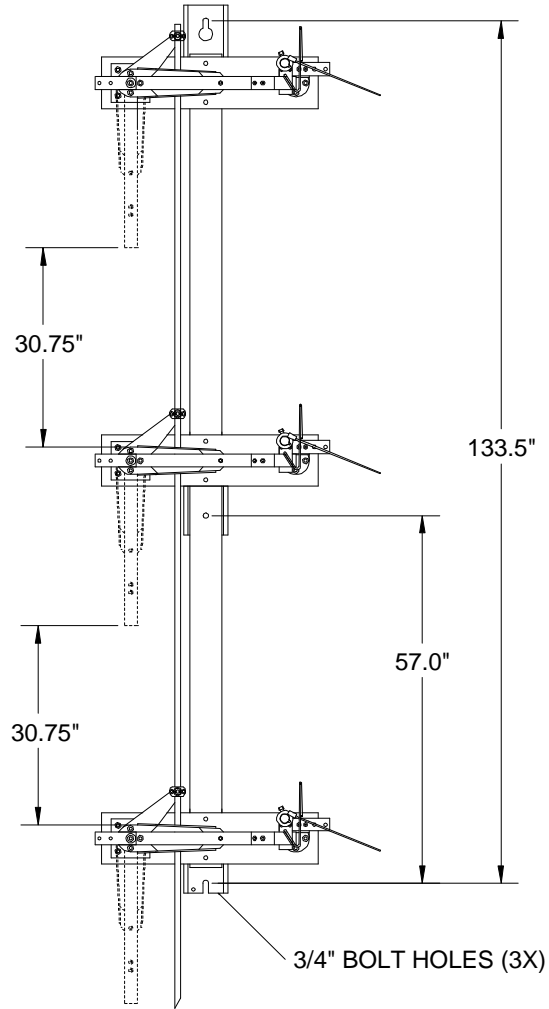
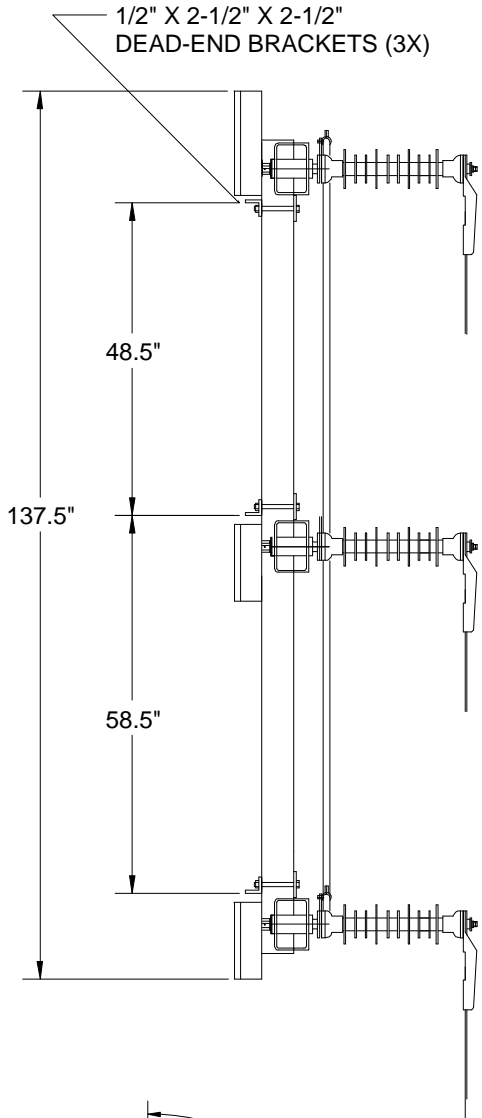
SWITCH RATINGS	
Voltage Class: 48 kV nom. (48.5 kV max.) 250 kV BIL	
Current Class: 600, 900 and 1200 Amps, continuous	
Momentary Current Rating:	
600 A Continuous:	40,000 Amps, 10 cycles 25,000 Amps, 3 seconds
900 A Continuous:	51,000 Amps, 10 cycles 32,000 Amps, 3 seconds
1200 A Continuous:	70,000 Amps, 10 cycles 44,000 Amps, 3 seconds

NOTE: RECIPROCATING CONTROL MECHANISM SHOWN.  
TORSIONAL "SWING HANDLE" CONTROLS ARE AVAILABLE.

This drawing is for illustrative purposes only and therefore; may, or may not reflect the current revision of this drawing. Please request the current revision from the factory.

	Material:		Description:	
	Finish:		LBS 48 kV Horizontal (centermount) Dimensions	
	Scale:	None	Drawing No:	Revision:
	Drawn by:		<b>9222M</b>	<b>0</b>
	Date:	09/22/01		





SWITCH RATINGS	
Voltage Class: 48 kV nom. (48.5 kV max.) 250 kV BIL	
Current Class: 600, 900 and 1200 Amps, continuous	
Momentary Current Rating:	
600 A Continuous:	40,000 Amps, 10 cycles 25,000 Amps, 3 seconds
900 A Continuous:	51,000 Amps, 10 cycles 32,000 Amps, 3 seconds
1200 A Continuous:	70,000 Amps, 10 cycles 44,000 Amps, 3 seconds

PHASE OVER PHASE (VERTICAL) SWITCHES ARE AVAILABLE WITH RECIPROCATING (UP AND DOWN) CONTROL MECHANISMS, ONLY.

This drawing is for illustrative purposes only and therefore; may, or may not reflect the current revision of this drawing. Please request the current revision from the factory.

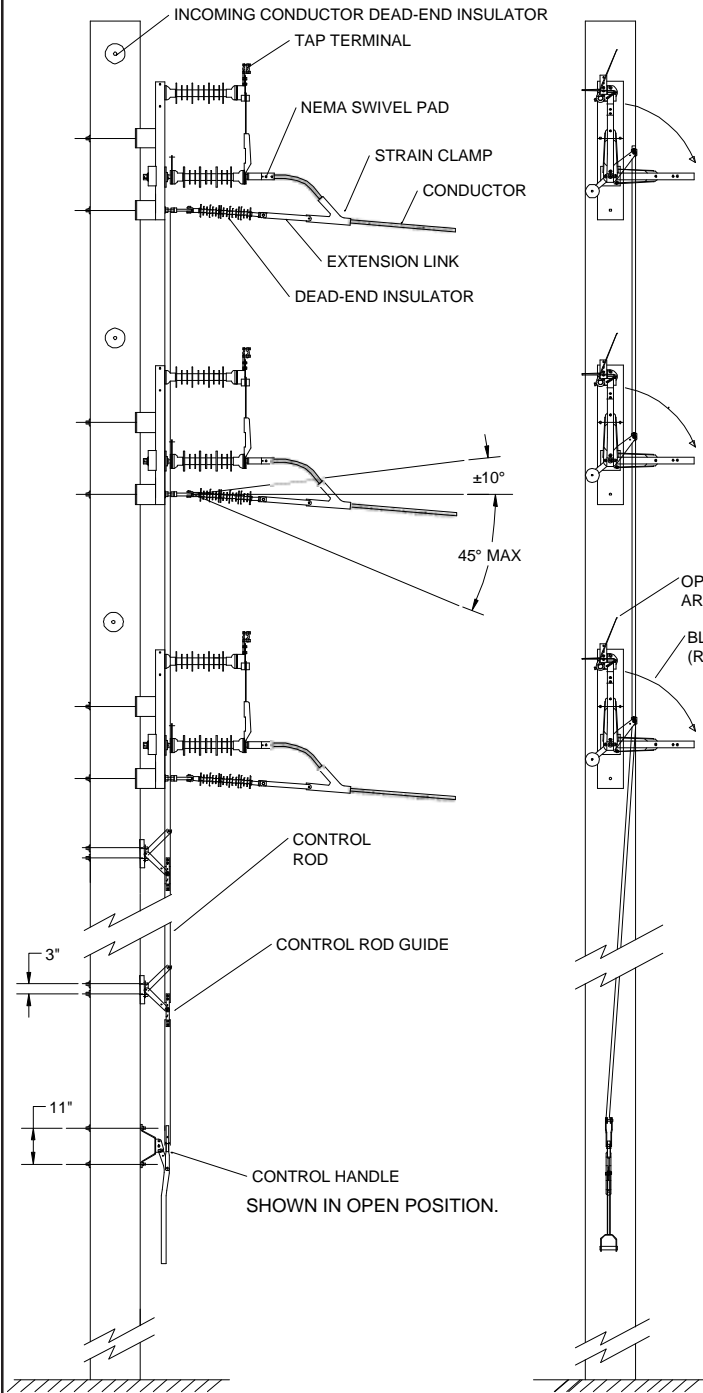


Material:	
Finish:	
Scale:	None
Drawn by:	
Date:	09/22/01

Description:	LBS, 48 kV, Vertical (Phase-over-Phase) Dimensions
Drawing No:	9224M
Revision:	0

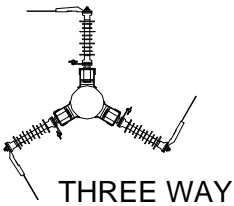
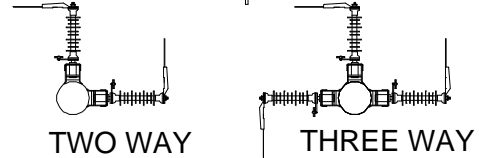
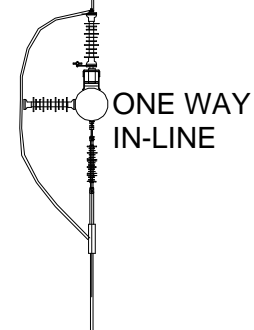
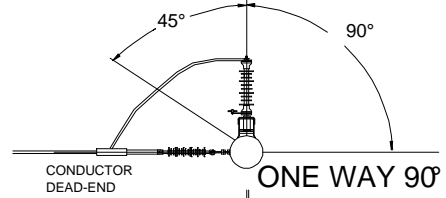
# LineBOSS™ TAP SWITCH Configurations

THE VERTICALLY MOUNTED TAP SWITCH IS A GANG OPERATED POLE MOUNTED SWITCH WHICH CAN BE USED IN VARIOUS CONSTRUCTION APPLICATIONS. RIGHT HAND (SHOWN) AND LEFT HAND OPERATING MODELS ARE ADAPTABLE TO EXTREME HORIZONTAL AND VERTICAL LINE ANGLES. TIN PLATED COPPER BUSS "TEES" AND BOLTED CONDUCTOR CLAMPS ARE AVAILABLE FOR CONNECTING TWO, THREE AND FOUR-WAY SWITCH CONFIGURATIONS.



Switch dead-end conductor can dead-end to the pole at up to  $45^\circ$  on this side.

Switch dead-end conductor can dead-end to the pole at up to  $90^\circ$  on this side.



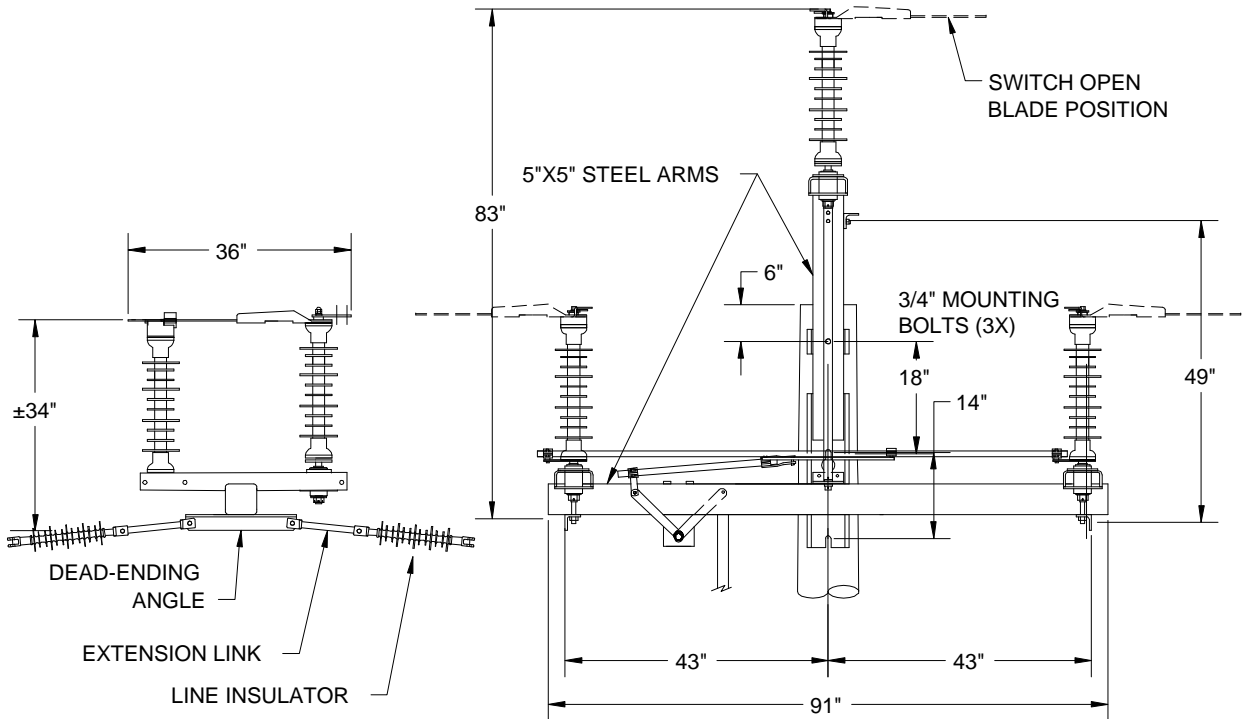
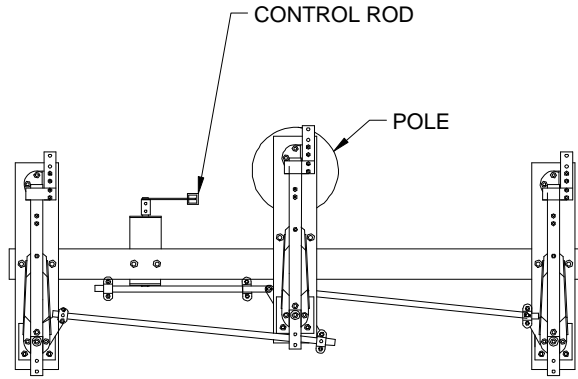
SWITCH RATINGS	
Voltage Class: 48 kV nom. (48.5 kV max.) 250 kV BIL 69 kV nom. (75.5 kV max.) 350 kV BIL	
Current Class: 600, 900 and 1200 Amps, continuous	
Momentary Current Rating:	
600 A Continuous:	40,000 Amps, 10 cycles 25,000 Amps, 3 seconds
900 A Continuous:	51,000 Amps, 10 cycles 32,000 Amps, 3 seconds
1200 A Continuous:	70,000 Amps, 10 cycles 44,000 Amps, 3 seconds

This drawing is for illustrative purposes only and therefore; may, or may not reflect the current revision of this drawing. Please request the current revision from the factory.



Material:	
Finish:	
Scale:	None
Drawn by:	
Date:	11/14/01

Description:	LBS 48-69 kV, LineBOSS™ Tap Switch Dimensions
Drawing No:	9237M
Revision:	0



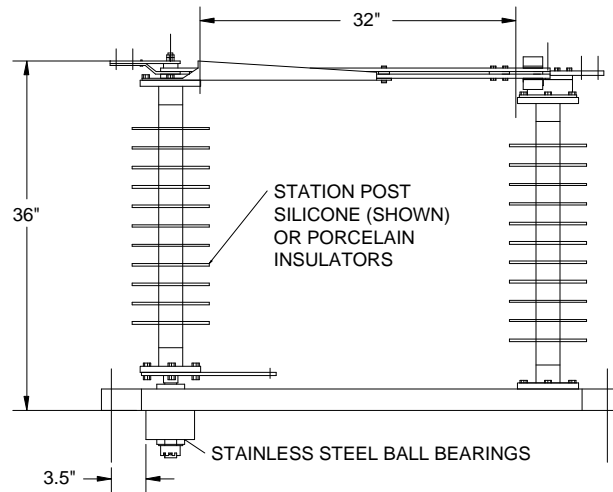
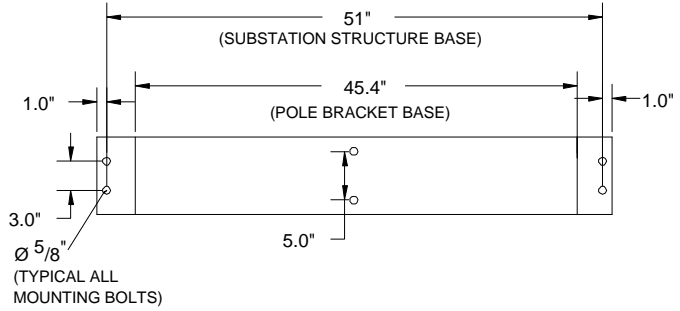
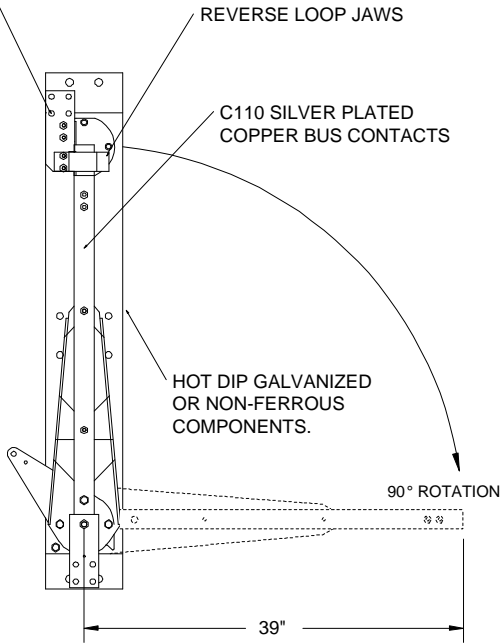
TYPICAL DEAD END OR THROUGH LINE CONNECTION

SWITCH RATINGS	
Voltage Class: 48 kV nom. (48.5 kV max.) 250 kV BIL	
Current Class: 600, 900 and 1200 Amps, continuous	
Momentary Current Rating:	
600 A Continuous:	40,000 Amps, 10 cycles 25,000 Amps, 3 seconds
900 A Continuous:	51,000 Amps, 10 cycles 32,000 Amps, 3 seconds
1200 A Continuous:	70,000 Amps, 10 cycles 44,000 Amps, 3 seconds

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	Material:		Description: LBS 48 kV, LineBOSS™ DELTA configuration Dimensions
	Finish:		
	Scale:	None	Drawing No: <b>9403M</b>
	Drawn by:		
	Date:	11/14/01	

TINNED COPPER N.E.M.A. TERMINAL PADS  
 600 AMP, 2, 9/16" HOLES  
 900 AMP, 2, 9/16" HOLES  
 1200 AMP, 4, 9/16" HOLES (SHOWN)



INSULATORS: PORCELAIN OR SILICONE RUBBER: 350 KV B.I.L.  
 ARC WHIP QUICK BREAKS ARE AVAILABLE UPON REQUEST.

**SWITCH RATINGS**

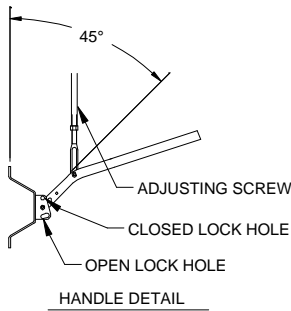
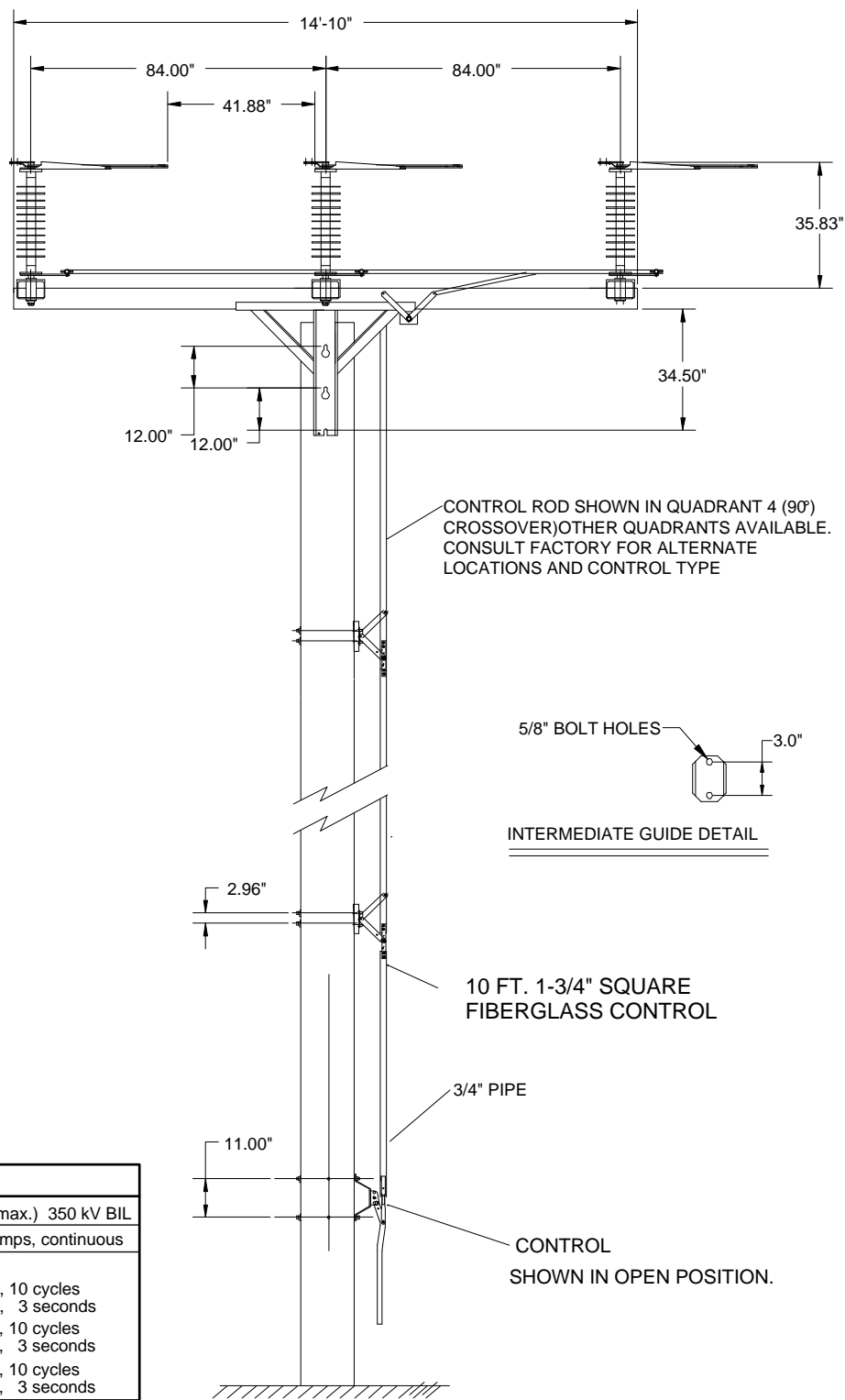
Voltage Class: 69 kV nom. (72.5 kV max.) 350 KV BIL	
Current Class: 600, 900 and 1200 Amps, continuous	
Momentary Current Rating:	
600 A Continuous:	40,000 Amps, 10 cycles 25,000 Amps, 3 seconds
900 A Continuous:	51,000 Amps, 10 cycles 32,000 Amps, 3 seconds
1200 A Continuous:	70,000 Amps, 10 cycles 44,000 Amps, 3 seconds

This drawing is for illustrative purposes only and therefore; may, or may not reflect the current revision of this drawing. Please request the current revision from the factory.



Material:	
Finish:	
Scale:	None
Drawn by:	
Date:	06/07/01

Description: LBS6 (72.5 kV) Single Phase Unit, Dimensions	
Drawing No: <b>7000M</b>	Revision: <b>0</b>

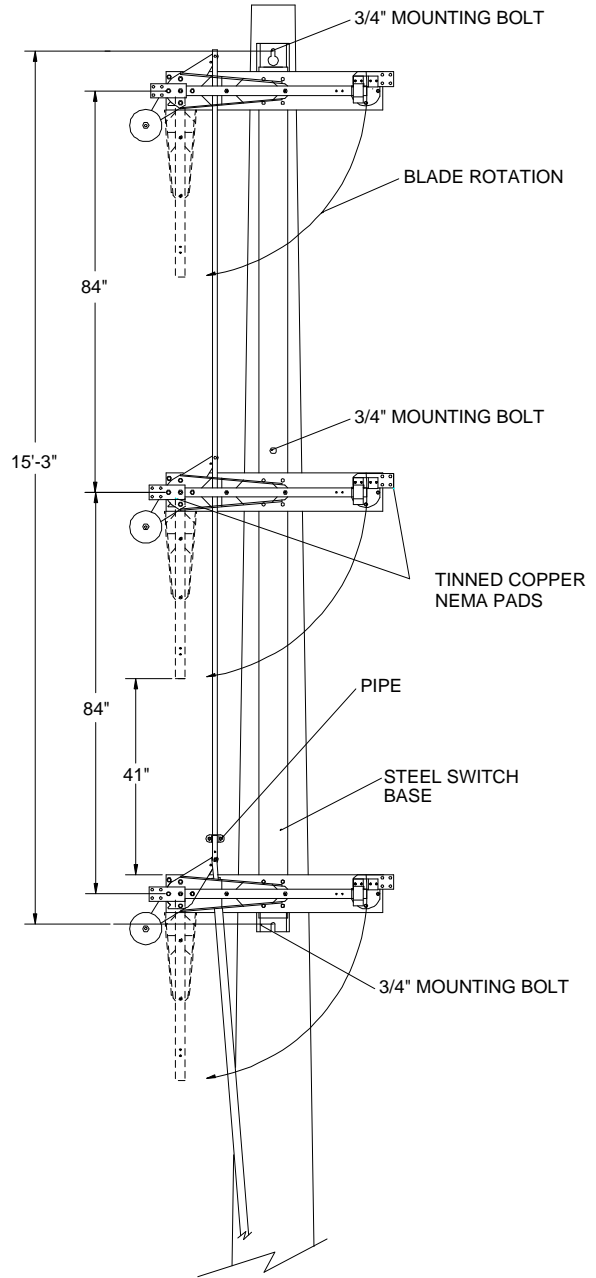
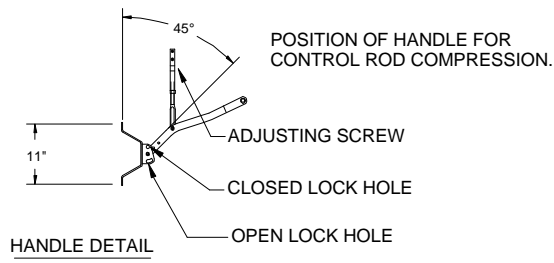
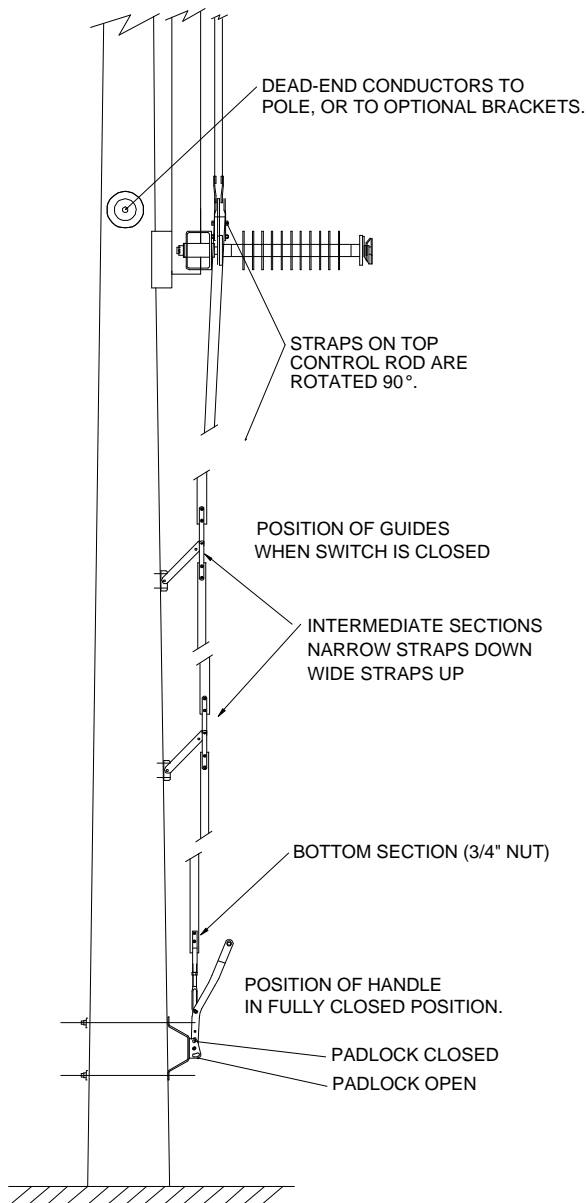


SWITCH RATINGS	
Voltage Class: 69 kV nom. (72.5 kV max.) 350 kV BIL	
Current Class: 600, 900 and 1200 Amps, continuous	
Momentary Current Rating:	
600 A Continuous:	40,000 Amps, 10 cycles 25,000 Amps, 3 seconds
900 A Continuous:	51,000 Amps, 10 cycles 32,000 Amps, 3 seconds
1200 A Continuous:	70,000 Amps, 10 cycles 44,000 Amps, 3 seconds

This drawing is for illustrative purposes only and therefore; may, or may not reflect the current revision of this drawing. Please request the current revision from the factory.

	Material:		Description:	
	Finish:		LBS6 (72.5 kV) Horizontal, Pole Top Configuration Dimensions	
	Scale:	None	Drawing No:	
	Drawn by:		Revision:	
	Date:	06/27/01	<b>9215M</b>	
			<b>3</b>	

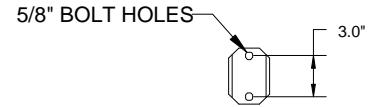
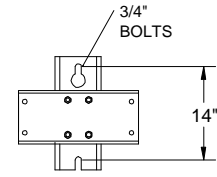
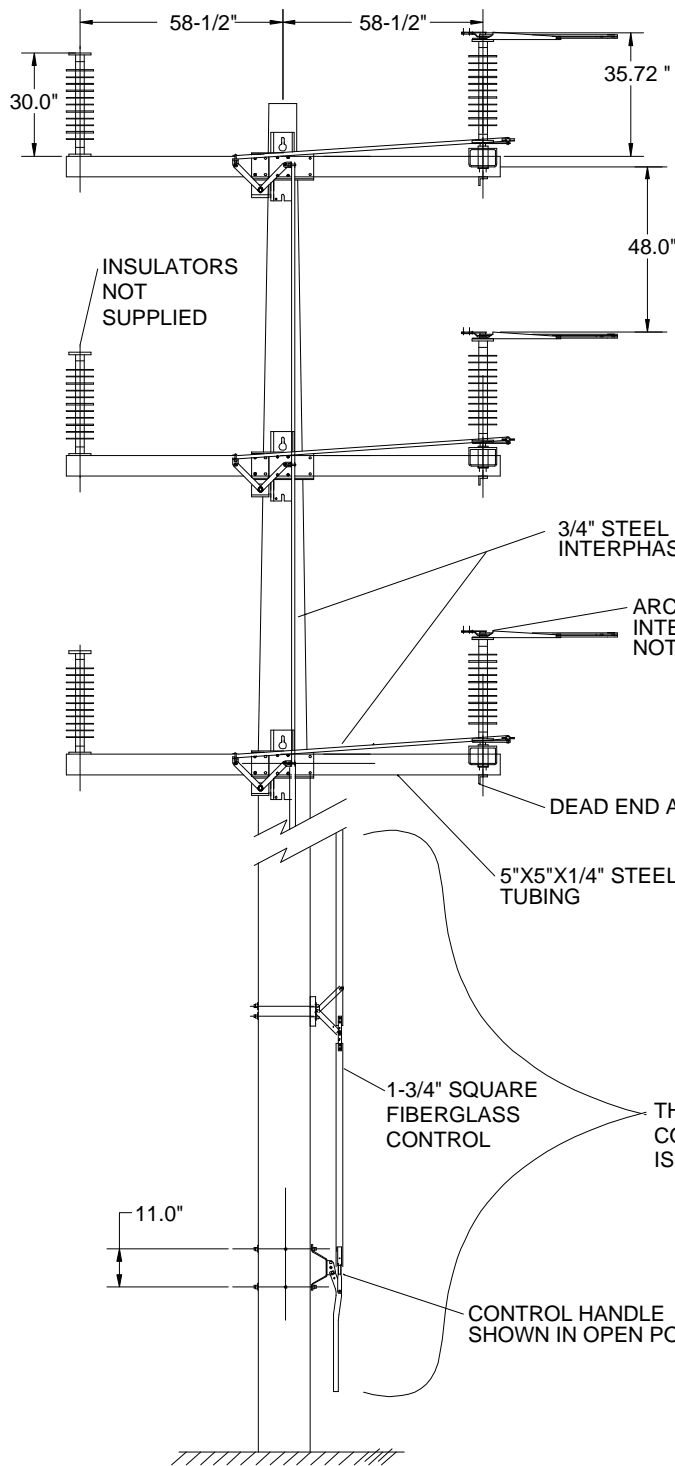




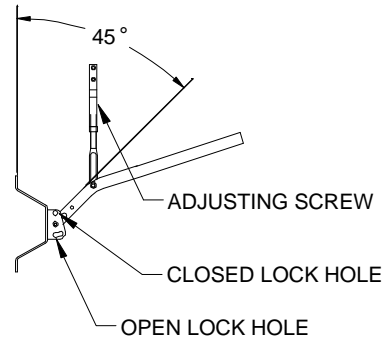
<b>SWITCH RATINGS</b>	
Voltage Class: 69 kV nom. (72.5 kV max.) 350 kV BIL	
Current Class: 600, 900 and 1200 Amps, continuous	
Momentary Current Rating:	
600 A Continuous:	40,000 Amps, 10 cycles 25,000 Amps, 3 seconds
900 A Continuous:	51,000 Amps, 10 cycles 32,000 Amps, 3 seconds
1200 A Continuous:	70,000 Amps, 10 cycles 44,000 Amps, 3 seconds

This drawing is for illustrative purposes only and therefore; may, or may not reflect the current revision of this drawing. Please request the current revision from the factory.

	Material:		Description: LBS6 (72.5 kV) Vertical (phase-over-phase) with Square Fiberglass Control Rod
	Finish:		
	Scale:	None	Drawing No: <b>9210M</b>
	Drawn by:		
	Date:	04/09/01	
			Revision: <b>0</b>



INTERMEDIATE GUIDE DETAIL



HANDLE DETAIL

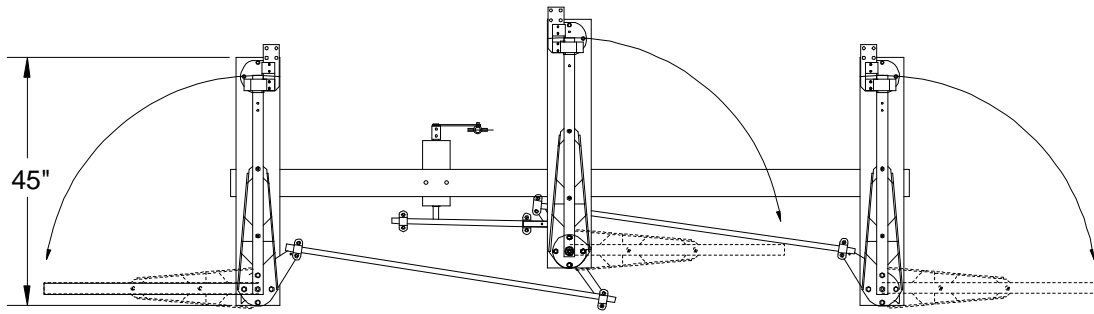
SWITCH RATINGS	
Voltage Class: 69 kV nom. (72.5 kV max.) 350 kV BIL	
Current Class: 600, 900 and 1200 Amps, continuous	
Momentary Current Rating:	
600 A Continuous:	40,000 Amps, 10 cycles 25,000 Amps, 3 seconds
900 A Continuous:	51,000 Amps, 10 cycles 32,000 Amps, 3 seconds
1200 A Continuous:	70,000 Amps, 10 cycles 44,000 Amps, 3 seconds

This drawing is for illustrative purposes only and therefore; may, or may not reflect the current revision of this drawing. Please request the current revision from the factory.

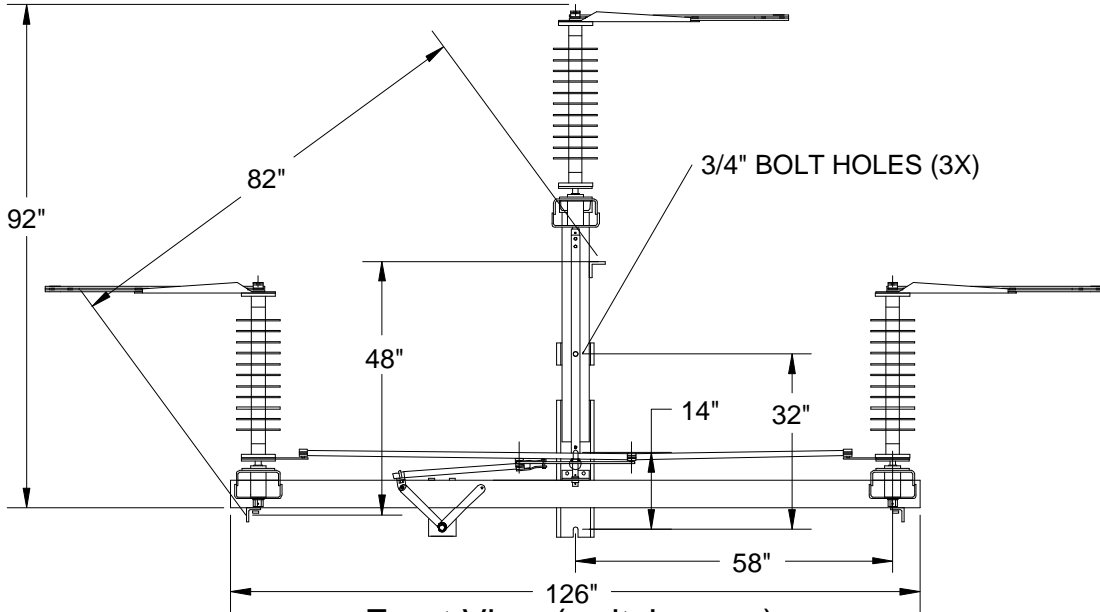


Material:	
Finish:	
Scale:	None
Drawn by:	
Date:	06/27/01

Description: LBS6 (72.5 kV) Vertical (phase-over-phase), Twin Circuit Dimensions	
Drawing No:	Revision:
<b>9212M</b>	<b>01</b>

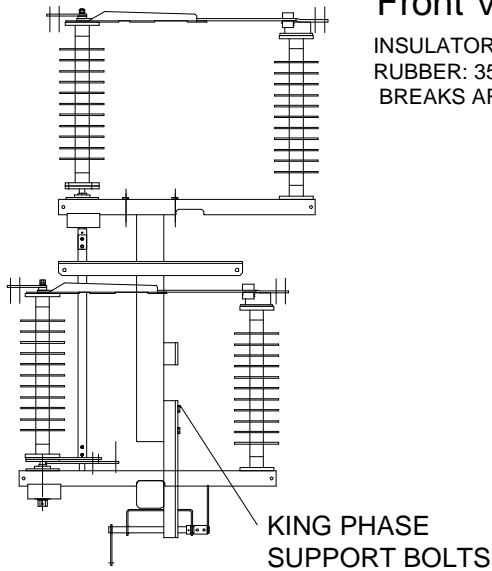


Top View



Front View (switch open)

INSULATORS: PORCELAIN OR SILICONE  
 RUBBER: 350 KV B.I.L. ARC WHIP QUICK  
 BREAKS ARE AVAILABLE UPON REQUEST.



Side View (switch closed)

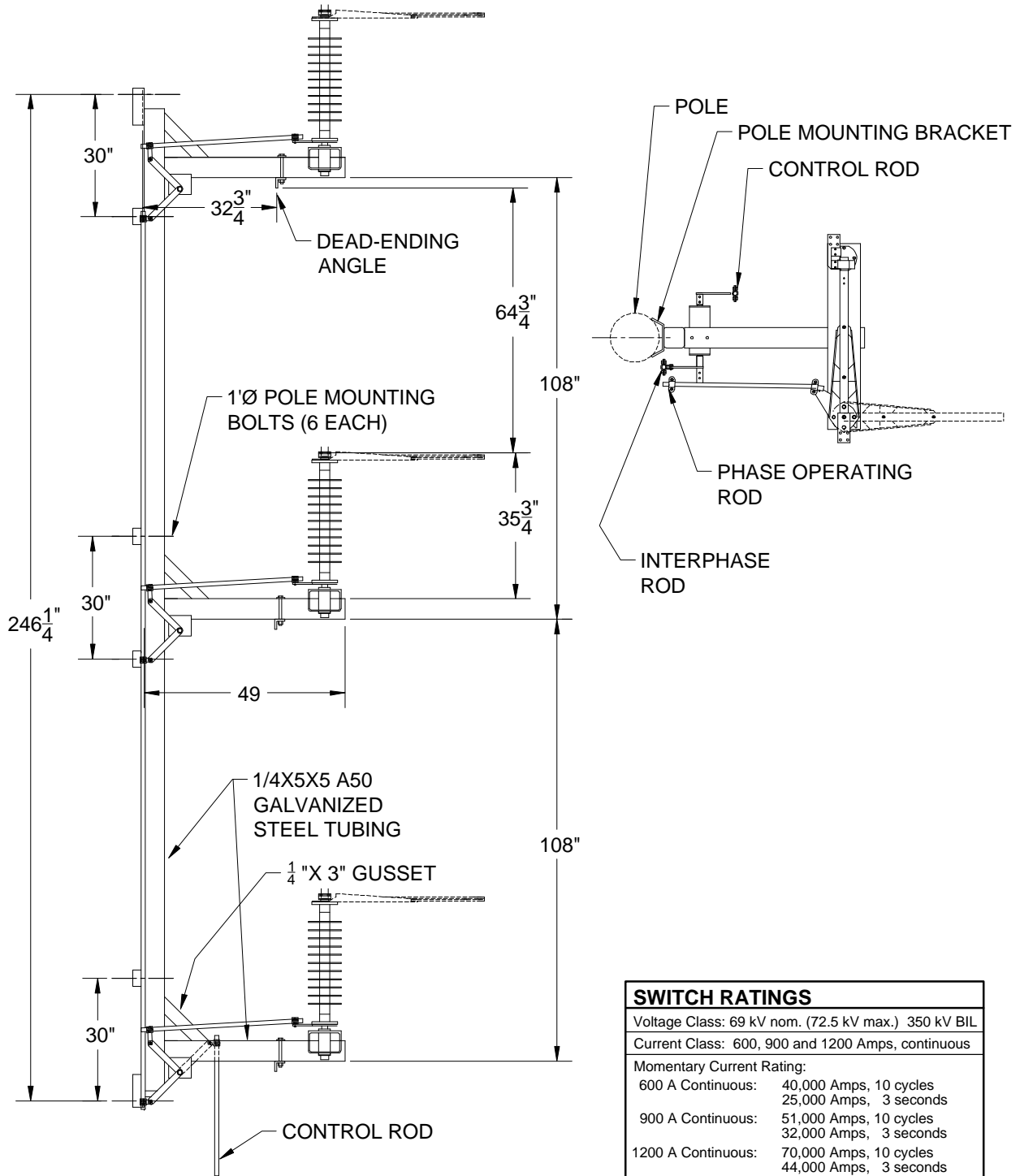
SWITCH RATINGS	
Voltage Class: 69 kV nom. (72.5 kV max.) 350 kV BIL	
Current Class: 600, 900 and 1200 Amps, continuous	
Momentary Current Rating:	
600 A Continuous:	40,000 Amps, 10 cycles 25,000 Amps, 3 seconds
900 A Continuous:	51,000 Amps, 10 cycles 32,000 Amps, 3 seconds
1200 A Continuous:	70,000 Amps, 10 cycles 44,000 Amps, 3 seconds

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Material:	
Finish:	
Scale:	None
Drawn by:	
Date:	08/22/01

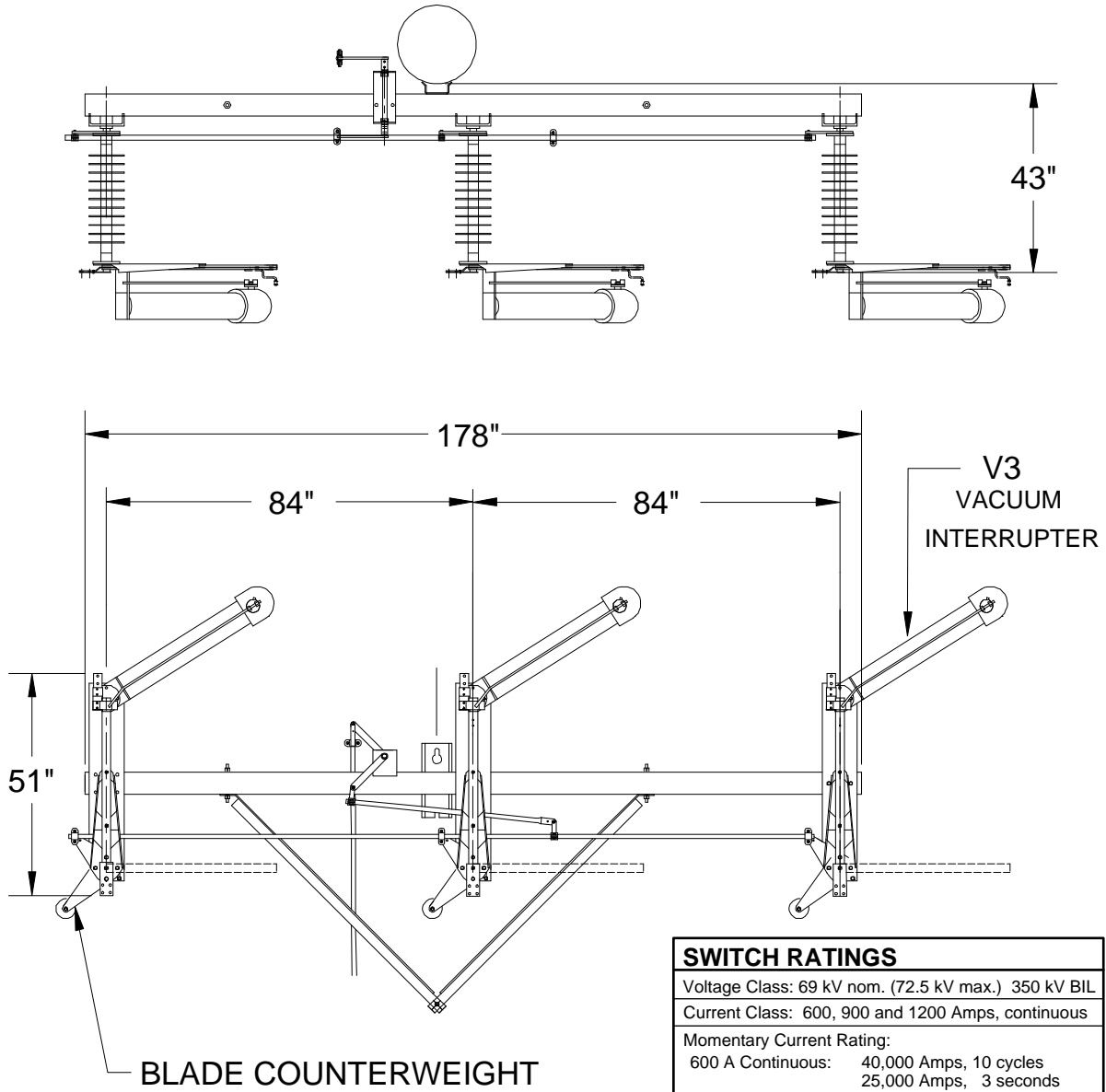
Description: LBS6 (72.5 kV) Delta (triangular) Configuration with Reciprocating Control	
Drawing No:	Revision:
<b>9221M</b>	<b>01</b>



SWITCH RATINGS	
Voltage Class: 69 kV nom. (72.5 kV max.) 350 kV BIL	
Current Class: 600, 900 and 1200 Amps, continuous	
Momentary Current Rating:	
600 A Continuous:	40,000 Amps, 10 cycles 25,000 Amps, 3 seconds
900 A Continuous:	51,000 Amps, 10 cycles 32,000 Amps, 3 seconds
1200 A Continuous:	70,000 Amps, 10 cycles 44,000 Amps, 3 seconds


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	Material:		Description: LBS6 (72.5 kV) Vertical Outboard with Reciprocating Control
	Finish:		
	Scale:	None	Drawing No: <b>9370M</b>
	Drawn by:		
	Date:	03/03/04	
			Revision: <b>0</b>

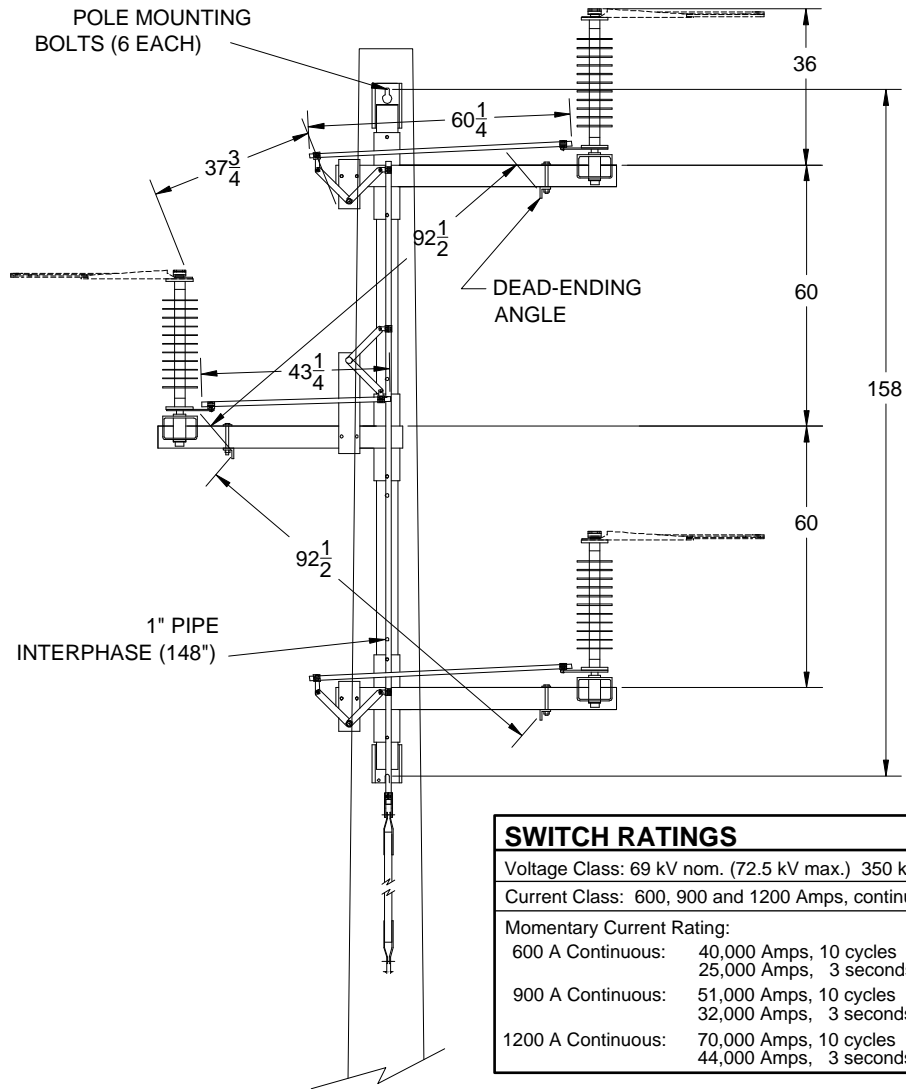
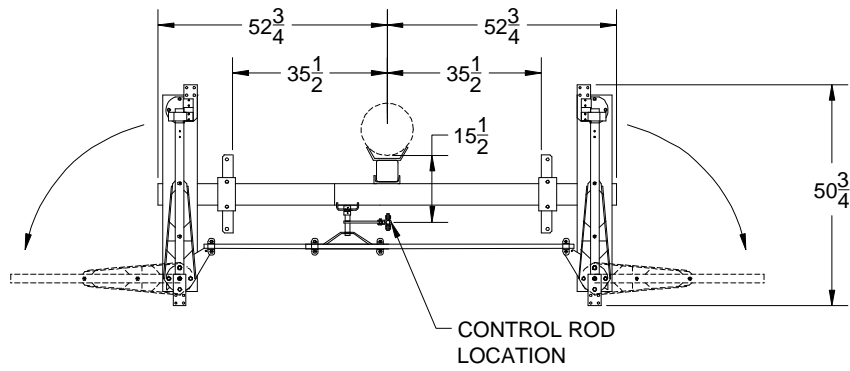


SWITCH RATINGS	
Voltage Class: 69 kV nom. (72.5 kV max.) 350 kV BIL	
Current Class: 600, 900 and 1200 Amps, continuous	
Momentary Current Rating:	
600 A Continuous:	40,000 Amps, 10 cycles 25,000 Amps, 3 seconds
900 A Continuous:	51,000 Amps, 10 cycles 32,000 Amps, 3 seconds
1200 A Continuous:	70,000 Amps, 10 cycles 44,000 Amps, 3 seconds

This drawing is for illustrative purposes only and therefore; may, or may not reflect the current revision of this drawing. Please request the current revision from the factory.

	Material:		Description: LBS6 (72.5 kV) RISER SWITCH
	Finish:		
	Scale:	None	Drawing No: <b>9390M</b>
	Drawn by:		
	Date:	09/15/04	Revision: <b>0</b>





SWITCH RATINGS	
Voltage Class: 69 kV nom. (72.5 kV max.) 350 kV BIL	
Current Class: 600, 900 and 1200 Amps, continuous	
Momentary Current Rating:	
600 A Continuous:	40,000 Amps, 10 cycles 25,000 Amps, 3 seconds
900 A Continuous:	51,000 Amps, 10 cycles 32,000 Amps, 3 seconds
1200 A Continuous:	70,000 Amps, 10 cycles 44,000 Amps, 3 seconds

This drawing is for illustrative purposes only and therefore; may, or may not reflect the current revision of this drawing. Please request the current revision from the factory.



Material:	
Finish:	
Scale:	None
Drawn by:	
Date:	03/10/06

Description: LBS6 (72.5 kV) TIERED OUTBOARD 2 RIGHT, 1 LEFT	
Drawing No:	Revision:
<b>9515M</b>	<b>2</b>