CATALOG SECTION 900
BULLETIN 900
May, 1980

Supersedes Bulletin 900
dated August, 1963

Southern States, Inc.

BPA and HPA

POWER FUSES
7.2 - 161 kV 100-200-300-400 AMPS

The equipment described in this bulletin performs in accordance with NEMA Standards Publication SG2-1954, paragraphs SG2-5.09, SG2-5.10, and SG2-5.11

TYPE BPA – The BPA is a heavy duty power fuse in voltage ratings from 7.2 kV through 69 kV, and continuous current ratings of 100 and 200 amperes, with interrupting capacities as high as 934,000 KVA symmetrical at 69 kV. It can be mounted in the vertical, horizontal underhung, or 45° underhung position.

A variety of fuse holders are available in 100 and 200 ampere continuous current ratings. The fuse holder should be selected on the basis of interrupting capacity required and the continuous current rating of the largest size of fuse link to be used. The fuse mounting (entire power fuse assembly less the fuse holder) has a 200 amp continuous current rating.

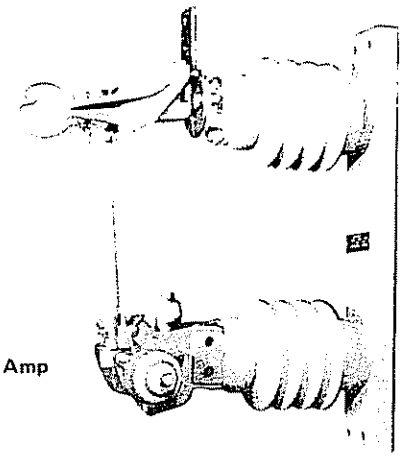


FIGURE 1
BPA 23 kV 200 Amp

Both the BPA and the HPA power fuses are available in "Vee" mountings in voltages from 34.5 kV through 69 kV, 100 and 200 continuous amperes. Refer to the factory for dimensions and weights.

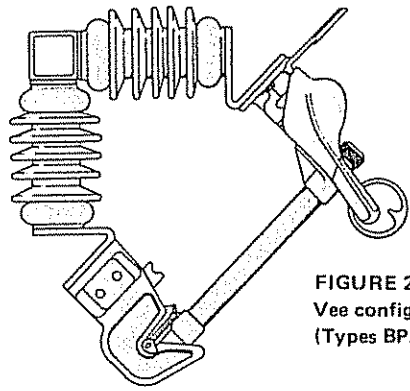


FIGURE 2
Vee configuration
(Types BPA and HPA)

TYPE HPA – The HPA is an extra-heavy duty power fuse with voltage ratings from 7.2 kV through 161 kV. The HPA is available in continuous current ratings of 100, 200, 300, and 400 amperes; and interrupting capacities as high as 3,480,000 KVA symmetrical at 161 kV. It can be mounted in the vertical, horizontal underhung, or 45° underhung position.

The HPA should be selected when interrupting capacities above those of the BPA are required, or when continuous currents are above 200 amperes, or when additional capacities are anticipated. The fuse mounting has a 400 amp continuous rating.

Both the BPA and the HPA are highly economical to use: To replace the fuse in service after an interruption requires only an inexpensive fuse link — not the entire fuse holder. See page 3.

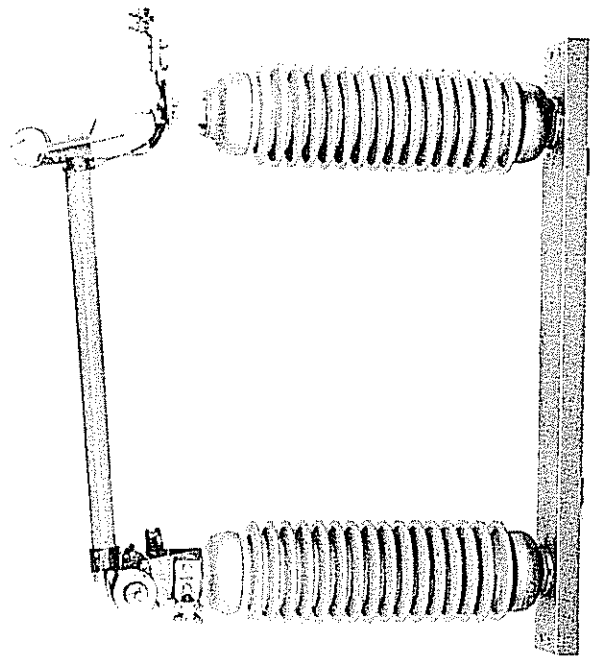


FIGURE 3
HPA 69 kV 200 Amp

Operation

Southern States' BPA and HPA will interrupt a full range of fault currents, from those just high enough to melt the fusible element to those at the maximum rating of the fuse. Using a combination of boric acid-filled auxiliary fuse tube and horn fiber lined fuse holder with expendable cap, plus ejector spring, these fuses handle both low and high faults with equal ease.

Low Current Faults

The drawings at right illustrate the interruption of a low current fault.

In figure 4-A, the fusible element melts, causing an arc in the mass of boric acid powder packed in the auxiliary fuse tube. The boric acid instantly volatilizes into steam, which cools and extinguishes the arc. Although of relatively small volume, the gas is confined by the cap at the top of the tube, and momentarily, by the sealing disc at the bottom, allowing a relatively high pressure to build up.

The ejector spring snaps the link out of the fuse tube, and the fuse holder drops out to the open position. Fault interruption is quick and efficient.

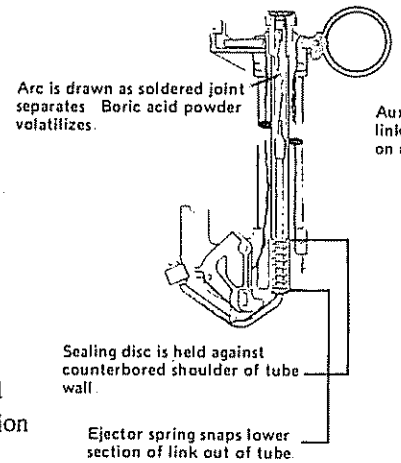


Figure 4-A Initial Stage of Low Fault

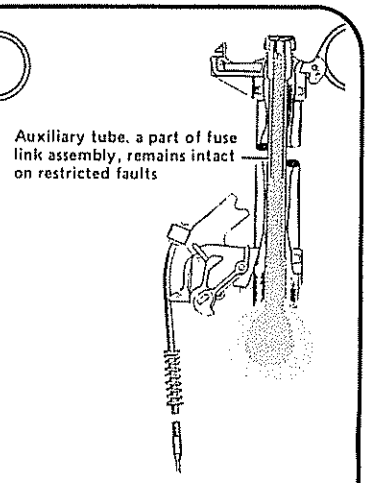


Figure 4-B Operation Completed

High Current Faults

The method of interrupting a high current fault is, in some ways, the opposite of a low current fault, in that rather than containing a small amount of gas, large volumes of it must be vented quickly. Also, the hardware must be protected from the shock of the operation. The best way to accomplish this is to vent the fuse tube from both ends; this dissipates the pressure and, at the same time, eliminates the "rocket effect" by allowing the exhaust forces to cancel each other.

In the drawings at right, figure 5-A shows the initial stage in which the sealing disc begins to clear the bore of the link. Figure 5-B shows the expulsion of the cap and the free venting from both ends of the fuse tube. The circuit is interrupted, the fuse holder swings to the open position, and the unit is ready to be re-fused.

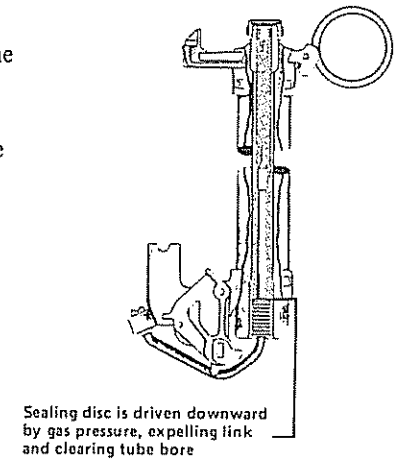


Figure 5-A Initial Stage of High Fault

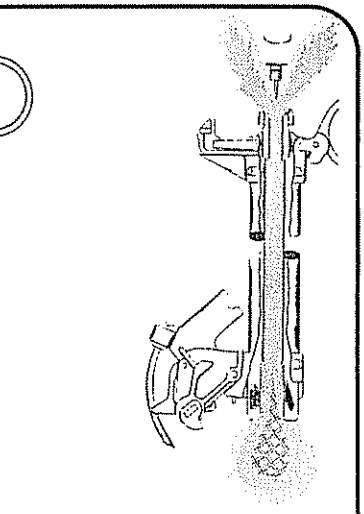


Figure 5-B Operation Completed Holder Double Vents

Corona

Above certain voltages, corona causes the formation of acid (from ozone and atmospheric nitrogen), and thus corrosion to the fuse link and fuse tube lining. To protect these parts from damage, the BPA and the HPA use a conductive shield within the fuse tube that transfers the high potential gradient from the link to the surface of the fuse tube itself. This reduces the dielectric stress to levels below which corona is initiated. The electrostatic shield is used on ratings of 46 kV and above (where corona becomes significant) and with no impairment of any performance criteria.

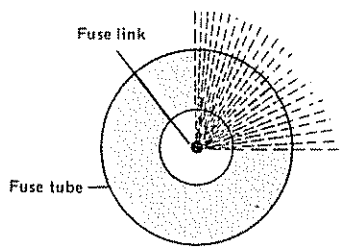


Figure 6-A — Conventional fuse assembly. Radii indicate field about fuse link.

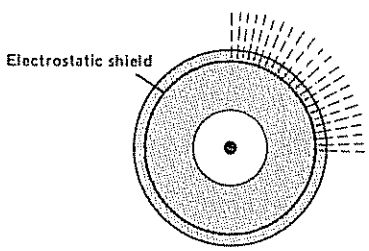


Figure 6-B — Southern States shielded tube showing transfer of field away from link.

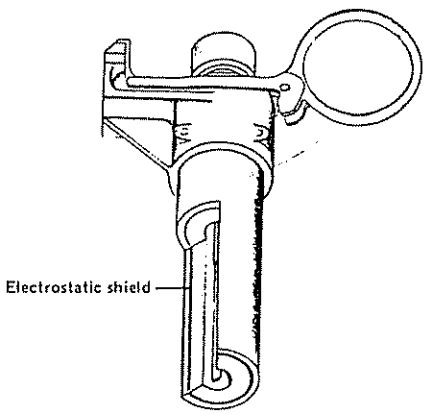


Figure 6-C — Cutaway drawing, showing shielding imbedded near outer surface of fuse tube.

AFTER FAULT INTERRUPTION YOU REPLACE ONLY THE LINK.

One of the significant advantages associated with the BPA and HPA power fuses is the low cost of restoring these units to service after an operation. A special fuse kit, developed by Southern States, makes them easy and inexpensive to re-fuse. The fuse kit consists of an expendable cap, fuse link assembly, and disposable re-fusing tool. No other parts are required.

The fuse kits are available in four speed ratios: PF (slow speed), PM (medium speed), PX (fast speed) and the EEI-NEMA Type PE. Time-current characteristic curves are available. Construction and operating principles of these links are illustrated on Page 4.

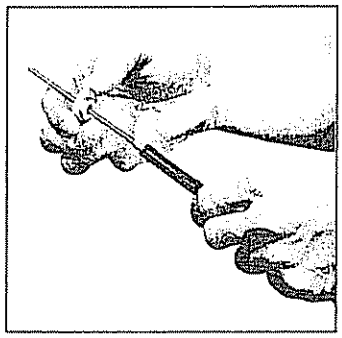
It is recommended that links be applied in fuse holders in accordance with the coordination chart at right.

LINK-HOLDER COORDINATION

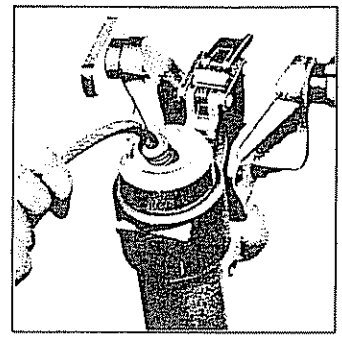
Link Rating Amperes	Fuse Holder Rating Amperes
1 - 100	100
125 - 200	200
250 - 300	300
350 - 400	400

STANDARD RE-FUSING PROCEDURE

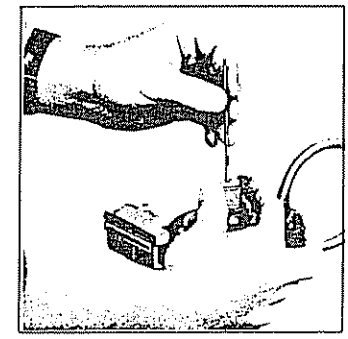
FOR FUSES RATED 100 AMPERES (FIGURE 7)



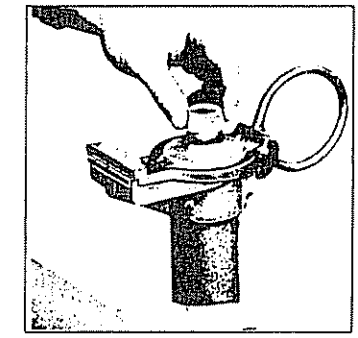
STEP 1. Install re-fusing tool in fuse link and remove button head as shown. NOTE: Re-fusing tool has left-hand thread.



STEP 2. Insert tip of re-fusing tool into lower end of fuse tube. Push link through tube until ejector spring seats on counterbored shoulder inside fuse tube.

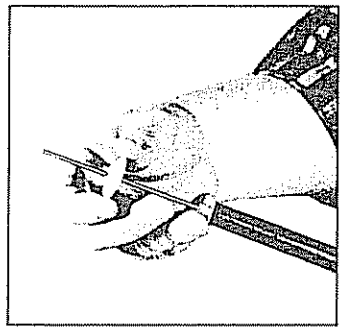


STEP 3. Pull re-fusing tool, compressing ejector spring. Screw button head onto threaded ferrule. Remove and discard re-fusing tool.

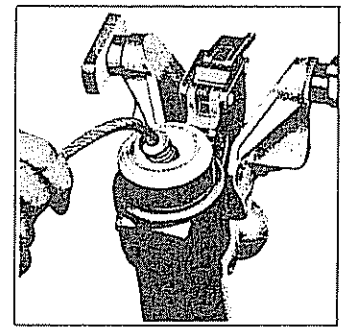


STEP 4. Screw expendable cap into place.

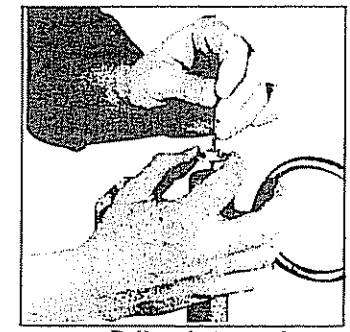
FOR FUSES RATED 200-300-400 AMPERES (FIGURE 8)



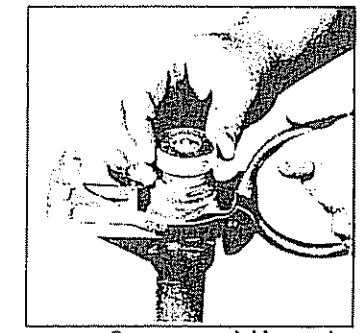
STEP 1. Install re-fusing tool in fuse link and remove buttonhead as shown. NOTE: Re-fusing tool has left-hand thread.



STEP 2. Insert tip of re-fusing tool into lower end of fuse tube. Push link through tube until ejector spring seats on counterbored shoulder inside fuse tube.

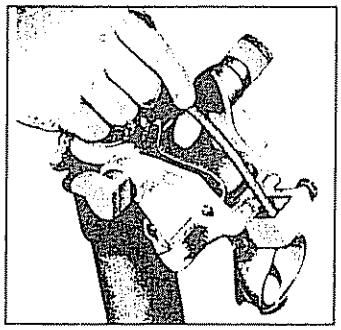


STEP 3. Pull re-fusing tool, compressing ejector spring. SPECIAL NOTE: Screw button head onto threaded ferrule in position shown. Remove and discard re-fusing tool.

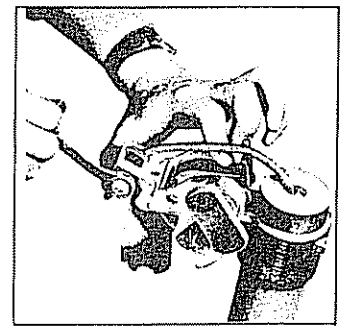


STEP 4. Screw expendable cap into place taking care not to remove silicone sealing compound applied inside cap.

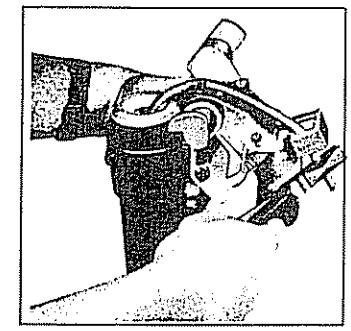
PROCEDURE FOR TERMINATING LOWER CABLE ON FUSES OF ALL RATINGS (FIGURE 9)



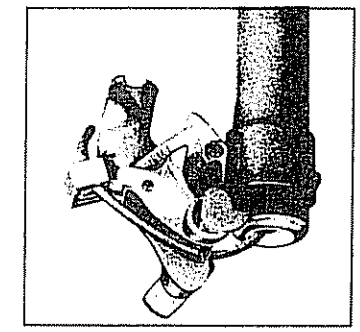
STEP 1. Insert lower end of cable under keeper in bottom fuse holder assembly. Hold link ejector in position shown.



STEP 2. Pull link tight and tighten bolt.



STEP 3. Clip off excess cable.



STEP 4. Fuse holder is now ready for service.

BPA

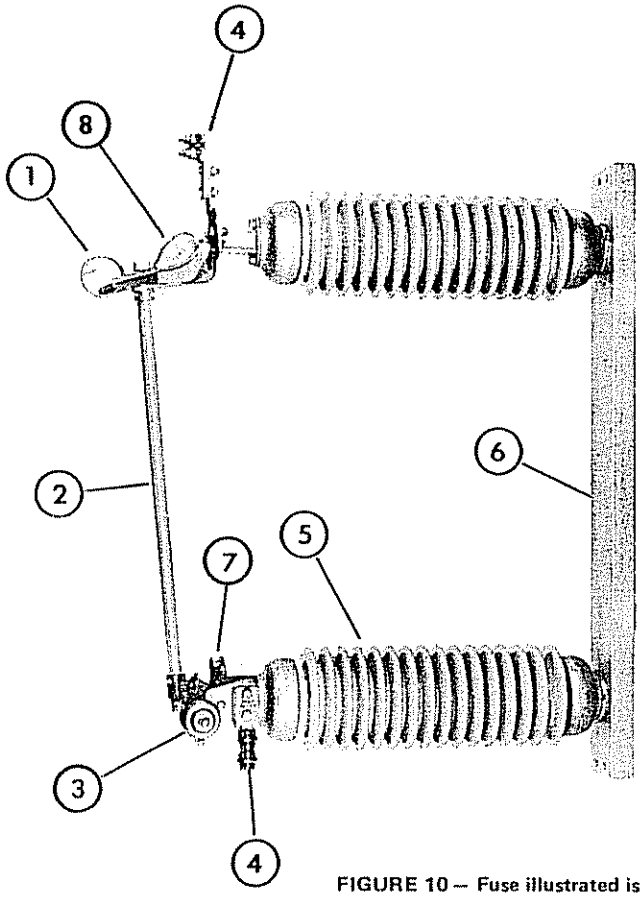


FIGURE 10 — Fuse illustrated is a BPA 69 kV, 100 amp.

Voltage: 7.2 - 69 kV
Continuous Current: 100 and 200 Amperes
Fuse Mounting Continuous Current: 200 Amperes
I. C. at 69 kV (KVA symmetrical): 934,000

(1) Extra large operating eye for convenience.
(2) All fuse tubes are high strength fibreglass. Within type and voltage rating, all fuse holders are interchangeable.
(3) Self-locking hinge assembly with snubber.
(4) Terminal connectors available at extra cost (Refer to factory). Terminal pads have two 9/16" holes on 1-3/4" centers. Lower terminal connectors can be bolted to either side of hinge.
(5) NEMA cap and pin, or post insulators as specified.
(6) Galvanized steel channel base unless otherwise specified.
(7) Socket for removing fuse holder will accommodate standard hooksticks, but due to increased control when lifting, Southern States recommends its bayonet head hookstick.
(8) Sleet hood fully encloses upper contacts, enhances operation in ice. Widely flaired guides insure perfect closing, even when the lineman stands well to one side.

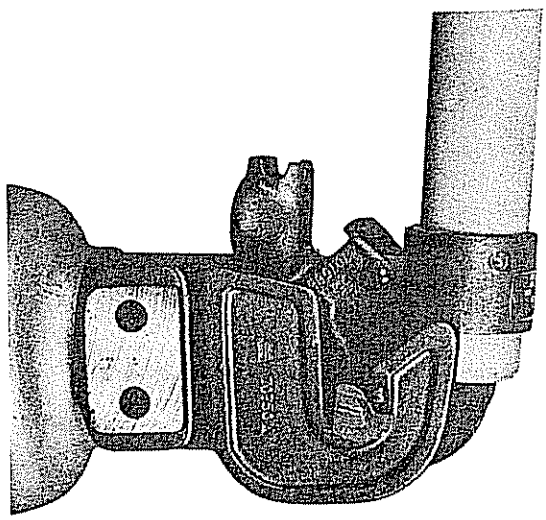


FIGURE 11

HINGE — The hinge on both the BPA and HPA is self-locking to insure that interrupting shocks are carried by the hinge hardware. It also retains the holder in the hinge throughout its operation. A hookstick socket makes removal of the fuse holder easy.

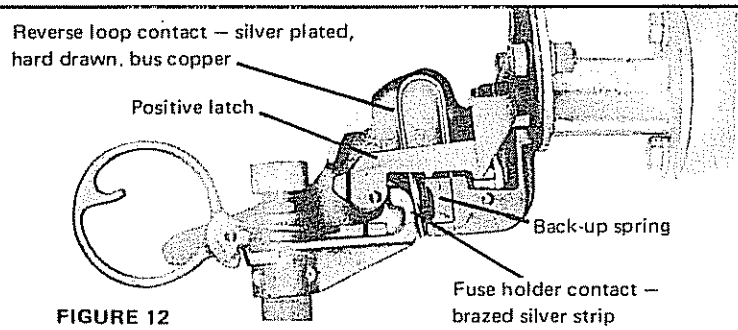


FIGURE 12

CONTACTS — Amplitact® reverse loop contacts are used on both the jaw and the hinge. Basically the same as the highly successful design used on Southern States high voltage air switches, the contacts take advantage of the EMF generated during faults to increase the pressure across the current transfer points, greatly adding to contact security. All Southern States power fuse contacts are silver-to-silver.

The upper contacts are enclosed to enhance operation in ice, and widely flared guides insure precise, positive latching by the lineman when closing the fuse.

The cutaway view illustrates the upper contact member. This configuration is common to both the power fuses, with the HPA differing from the BPA only in the use of dual contact leaves and heavier construction. When closed, the power fuse is positively latched, and only an interruption or a pull on the operating eye can open it. The operating eye is extra large for convenient hookstick operation.

HPA

Voltage: 7.2 - 161 kV
Continuous Current: 100, 200, 300, and 400 Amps
Fuse Mounting Continuous Current: 400 Amperes
I. C. at 161 kV (KVA symmetrical): 3,480,000

(1) Extra large operating eye for convenience.

(2) All fuse tubes are high strength fibreglass. Within type and voltage rating, all fuse holders are interchangeable.

(3) Self-locking hinge assembly with snubber.

(4) Terminal connectors available at extra cost (Refer to factory). Terminal pads have two 9/16" holes on 1-3/4" centers. Lower terminal connectors can be bolted to either side of hinge.

(5) NEMA cap and pin, or post insulators as specified.

(6) Galvanized steel channel base unless otherwise specified.

(7) Socket for removing fuse holder will accommodate standard hooksticks, but due to increased control when lifting, Southern States recommends its bayonet head hookstick.

(8) Sleet hood fully encloses upper contacts, enhances operation in ice. Widely flaired guides insure perfect closing, even when the lineman stands well to one side.

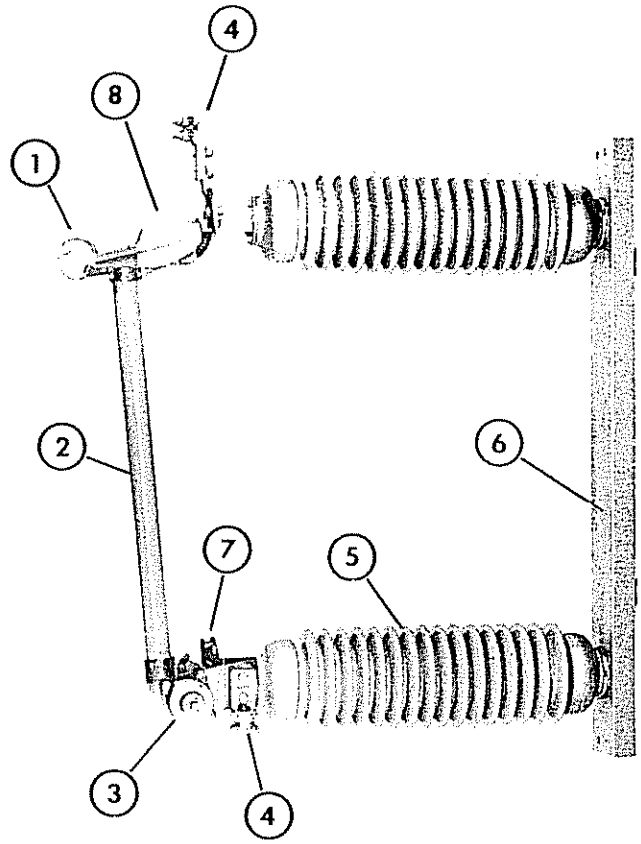
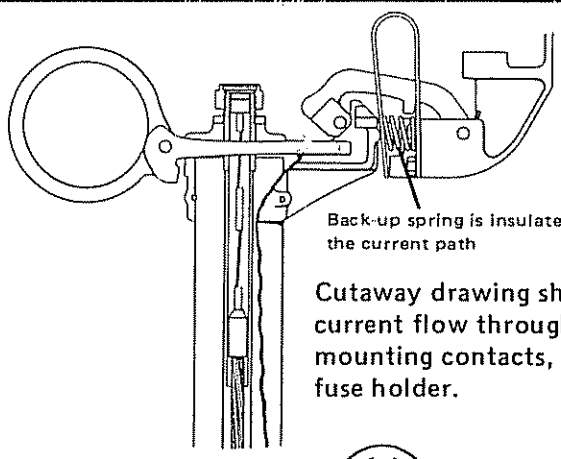
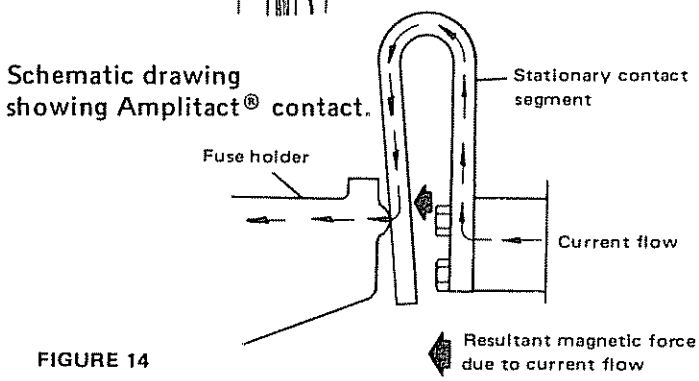


FIGURE 13 – Fuse illustrated is an HPA 69 kV, 200 amp.



Cutaway drawing showing current flow through mounting contacts, and fuse holder.



Schematic drawing showing Amplitact® contact.

FIGURE 14

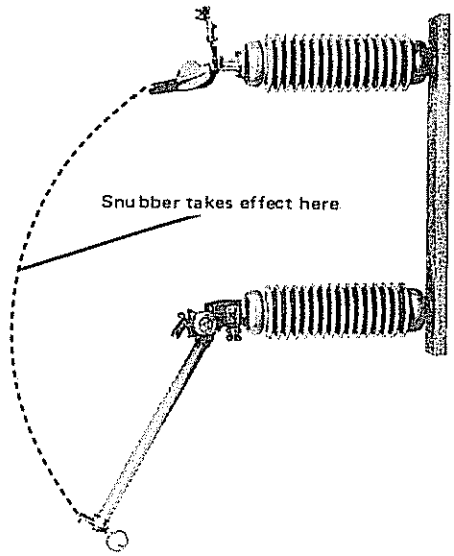
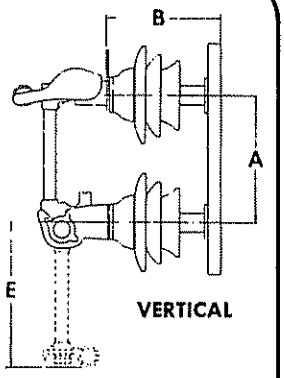
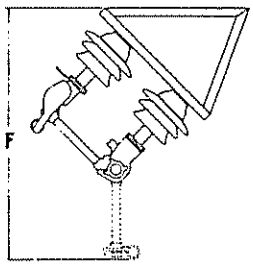


FIGURE 15

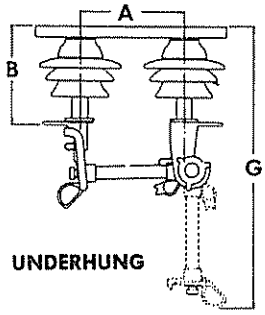
SNUBBER – Both the BPA and the HPA have a snubber to cushion the shock on the fuse hardware and insulator when the fuse holder swings to an inverted position. The snubber, which is adjustable in the field, takes effect only after the upper contacts have moved well beyond the restrike distance.



VERTICAL



45° UNDERHUNG



UNDERHUNG

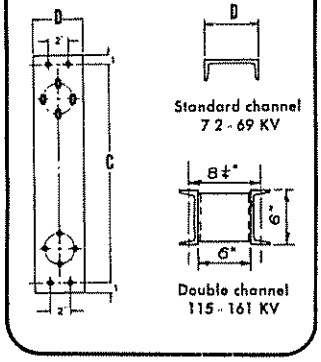
DIMENSIONS IN INCHES

kV	A		B		C		D		E		F		G		H	
	BPA	HPA	BPA	HPA	BPA	HPA	BPA	HPA	BPA	HPA	BPA	HPA	BPA	HPA	BPA	HPA
7.2	13	13	9-1/2	9-5/8	18	18	4	4	17	17	38-1/8	38-7/8	31-5/8	32-1/2		
14.4	15	15	12	12-1/8	21	21	4	4	19	19	43-3/4	44-1/2	36-1/8	37		
23	18	18	14	14-1/8	24	24	4	4	22	22	50-1/4	51	41-1/8	42		
34.5	24	24	17-1/8	17-1/4	30	30	5	5	28	28	62-5/8	63-3/8	50-1/8	51		47-3/4
46	30	30	20-1/8	20-1/4	39	39	5	5	34	34	75	75-3/4	59-1/4	60-1/8		56-5/8
69	39	39	32	32-1/8	51	51	6	5	40	40	96-7/8	97-5/8	77	77-7/8		74-1/8
115		59		55		66				52-5/8		141-1/4		116-3/4		113
138		65		60-1/2		78				58-5/8		155-3/8		128-1/4		124-1/2
161		67		69-1/2		74-3/4				60-5/8		166-1/4		139-1/4		135-1/2

DIMENSIONS IN METERS

kV	A		B		C		D		E		F		G		H	
	BPA	HPA	BPA	HPA	BPA	HPA	BPA	HPA	BPA	HPA	BPA	HPA	BPA	HPA	BPA	HPA
7.2	0.330	0.330	0.241	0.244	0.457	0.457	0.102	0.102	0.432	0.432	0.968	0.987	0.803	0.826		
14.4	0.381	0.381	0.305	0.308	0.533	0.533	0.102	0.102	0.483	0.483	1.111	1.130	0.918	0.940		
23	0.457	0.457	0.356	0.359	0.610	0.610	0.102	0.102	0.559	0.559	1.276	1.295	1.045	1.067		
34.5	0.610	0.610	0.435	0.438	0.762	0.762	0.127	0.127	0.711	0.711	1.591	1.610	1.273	1.295		1.213
46	0.762	0.762	0.511	0.514	0.991	0.991	0.127	0.127	0.864	0.864	1.905	1.925	1.505	1.527		1.438
69	0.991	0.991	0.813	0.816	1.295	1.295	0.152	0.152	1.016	1.016	2.461	2.480	1.956	1.978		1.883
115		1.499		1.397						1.337		3.588		2.966		2.870
138		1.651		1.537						1.489		3.947		3.258		3.162
161		1.702		1.765						1.530		4.197		3.537		3.442

STANDARD BASE DIMENSIONS



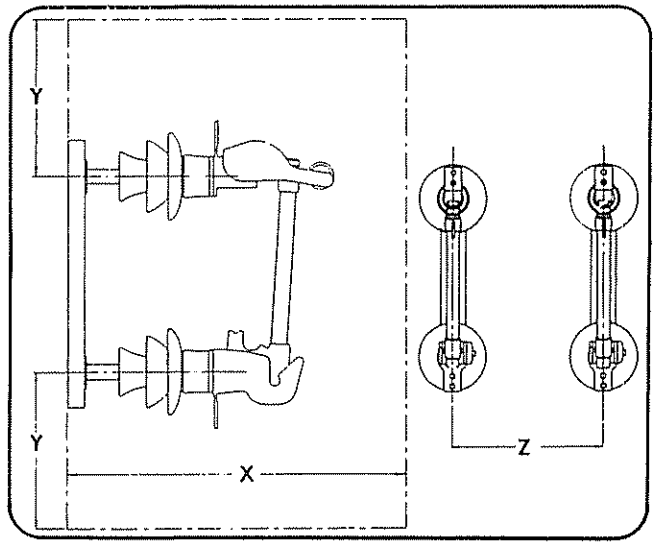
TYPE BPA

kV	Continuous Ratings Amperes	POUNDS			KILOGRAMS		
		Net	Ship	Holder	Net	Ship	Holder
7.2	100-200	61	81	8	27.7	36.7	3.7
14.4	100-200	74	94	8	33.6	42.7	3.7
23	100-200	92	112	8	41.8	50.8	3.7
34.5	100-200	127	152	9	57.6	68.9	4.1
46	100-200	160	195	9	72.6	88.4	4.1
69	100-200	267	317	9	121.1	143.8	4.1
TYPE HPA							
7.2	100-200-300	67	87	10	30.3	39.4	4.5
7.2	400	69	89	12	31.2	40.3	5.4
14.4	100-200-300	80	100	10	36.2	45.3	4.5
14.4	400	82	102	12	37.1	46.2	5.4
23	100-200-300	98	118	10	44.4	53.5	4.5
23	400	101	121	13	45.8	54.9	5.9
34.5	100-200-300	133	158	11	60.3	71.7	4.9
34.5	400	136	161	14	61.7	73.1	6.3
46	100-200-300	169	199	14	76.7	90.2	6.3
46	400	171	201	16	77.6	91.1	7.2
69	100-200-300	276	328	16	125.1	148.8	7.2
69	400	280	330	17	126.9	149.7	7.7
115	100-200	642	692	20	291.1	313.8	9.8
138	100-200	687	737	22	311.6	334.2	9.9
161	100-200	836	911	25	379.1	413.1	11.3

Dimensions and Weights

Recommended Mounting Clearance
Phase to Phase and Phase to Ground

kV RATING	INCHES			METERS		
	X	Y	Z	X	Y	Z
7.2	40	44	36	1.02	1.12	0.91
14.4	47	46	36	1.19	1.17	0.91
23	56	48	48	1.42	1.22	1.22
34.5	66	51	60	1.68	1.30	1.52
46	78	64	72	1.98	1.37	1.83
69	106	65	84	2.69	1.65	2.13
115	160	80	120	4.06	2.03	3.05
138	190	88	145	4.83	2.24	3.68
161	207	94	168	5.26	2.39	4.27



SUGGESTED HOOKSTICK LENGTHS

HEIGHT* OF MOUNTED FUSE	UNDERHUNG MOUNTED FUSES (kV)					VERTICALLY MOUNTED FUSES (kV)		45° UNDERHUNG MOUNTED FUSES (kV)					
	7.5-15	23-46	69	115-138	161	7.5-69	115-161	7.5-34.5	46	69	115	138	161
12'	8'					10'							
14'	10'	10'				12'	14'	10'					
16'	12'	12'	10'			14'	16'	12'	10'				
18'	14'	14'	12'			16'	18'	14'	12'	12'			
20'			14'	12'				16'	14'	14'			
22'				14'	14'				16'	16'	14'		
24'				16'	16'						16'	14'	
28'												16'	16'

*Underhung and 45° underhung: Distance from ground to mounting surface. Vertical: Ground to center line of lower insulator

Chart of Catalog Numbers and Ratings for BPA and HPA Power Fuses

(Note: if there is no part number shown for a specific mounting this mounting is not available for this type power fuse)

Type BPA Power Fuses

Nominal Voltage Rating	Continuous Current Rating	Interrupting Capacity Amps Asymmetrical	Vertical Mounting		45 Degree Underhung Mounting		Horizontal Underhung Mounting	
			Complete Fuse Assembly	Fuse Holder Only	Complete Fuse Assembly	Fuse Holder Only	Complete Fuse Assembly	Fuse Holder Only
7.2 kV	100 Amps	20,000	41010312	42010312	41011712	42011712	41012712	42012712
7.2 kV	200 Amps	20.000	41010423	42010423	41011823	42011823	41012823	42012823
14.4 kV	100 Amps	16.000	41010313	42010313	41011713	42011713	41012713	42012713
14.4 kV	100 Amps	25.000	41010413	42010413	41011813	42011813	41012813	42012813
14.4 kV	200 Amps	25.000	41010424	42010424	41011824	42011824	41012824	42012824
23 kV	100 Amps	12.500	41010314	42010314	41011714	42011714	41012714	42012714
23 kV	100 Amps	25.000	41010414	42010414	41011814	42011814	41012814	42012814
23 kV	200 Amps	25.000	41010425	42010425	41011825	42011825	41012825	42012825
34.5 kV	100 Amps	10.000	41010315	42010315	41011715	42011715	41012715	42012715
34.5 kV	100 Amps	20.000	41010415	42010415	41011815	42011815	41012815	42012815
34.5 kV	200 Amps	20.000	41010426	42010426	41011826	42011826	41012826	42012826
46 kV	100 Amps	8,000	41010316	42010316	41011716	42011716	41012716	42012716
46 kV	100 Amps	16.000	41010416	42010416	41011816	42011816	41012816	42012816
46 kV	200 Amps	16.000	41010427	42010427	41011827	42011827	41012827	42012827
69 kV	100 Amps	12.500	41010417	42010417	41011817	42011817	41012817	42012817
69 kV	200 Amps	12.500	41010428	42010428	41011828	42011828	41012828	42012828

Type HPA Power Fuses

Nominal Voltage Rating	Continuous Current Rating	Interrupting Capacity Amps Asymmetrical	Vertical Mounting		45 Degree Underhung Mounting		Horizontal Underhung Mounting	
			Complete Fuse Assembly	Fuse Holder Only	Complete Fuse Assembly	Fuse Holder Only	Complete Fuse Assembly	Fuse Holder Only
7.2 kV	100 Amps	20,000	41100312	42100312	41101712	42101712	41102712	42102712
7.2 kV	200 Amps	20.000	41100323	42100323	41101723	42101723	41102723	42102723
7.2 kV	300 Amps	20.000	41100334	42100334	41101734	42101734	41102734	42102734
7.2 kV	400 Amps	20.000	41100445	42100445	41101845	42101845	41102845	42102845
14.4 kV	100 Amps	25.000	41100313	42100313	41101713	42101713	41102713	42102713
14.4 kV	200 Amps	25.000	41100324	42100324	41101724	42101724	41102724	42102724
14.4 kV	300 Amps	25.000	41100335	42100335	41101735	42101735	41102735	42102735
14.4 kV	400 Amps	25.000	41100446	42100446	41101846	42101846	41102846	42102846
23 kV	100 Amps	31.500	41100314	42100314	41101714	42101714	41102714	42102714
23 kV	200 Amps	31.500	41100325	42100325	41101725	42101725	41102725	42102725
23 kV	300 Amps	31.500	41100336	42100336	41101736	42101736	41102736	42102736
23 kV	400 Amps	31.500	41100447	42100447	41101847	42101847	41102847	42102847
34.5 kV	100 Amps	31.500	41100315	42100315	41101715	42101715	41102715	42102715
34.5 kV	200 Amps	31.500	41100326	42100326	41101726	42101726	41102726	42102726
34.5 kV	300 Amps	31.500	41100337	42100337	41101737	42101737	41102737	42102737
34.5 kV	400 Amps	31.500	41100448	42100448	41101848	42101848	41102848	42102848
46 kV	100 Amps	25.000	41100316	42100316	41101716	42101716	41102716	42102716
46 kV	100 Amps	40.000	41100416	42100416	41101816	42101816	41102816	42102816
46 kV	200 Amps	25.000	41100327	42100327	41101727	42101727	41102727	42102727
46 kV	200 Amps	40.000	41100427	42100427	41101827	42101827	41102827	42102827
46 kV	300 Amps	25.000	41100338	42100338	41101738	42101738	41102738	42102738
46 kV	300 Amps	40.000	41100438	42100438	41101838	42101838	41102838	42102838
46 kV	400 Amps	40.000	41100449	42100449	41101849	42101849	41102849	42102849
69 kV	100 Amps	20.000	41100317	42100317	41101717	42101717	41102717	42102717
69 kV	100 Amps	31.500	41100417	42100417	41101817	42101817	41102817	42102817
69 kV	200 Amps	20.000	41100328	42100328	41101728	42101728	41102728	42102728
69 kV	200 Amps	31.500	41100428	42100428	41101828	42101828	41102828	42102828
69 kV	300 Amps	20.000	41100339	42100339	41101739	42101739	41102739	42102739
69 kV	300 Amps	31.500	41100439	42100439	41101839	42101839	41102839	42102839
69 kV	400 Amps	31.500	41100450	42100450	41101850	42101850	41102850	42102850
115 kV	100 Amps	16.000	41100318	42100318	41105518	42101718	41103118	42102718
115 kV	100 Amps	25.000	41100418	42100418	41105618	42101818	41103218	42102818
115 kV	200 Amps	16.000	41100329	42100329	41105529	42101729	41103129	42102729
115 kV	200 Amps	25.000	41100429	42100429	41105629	42101829	41103229	42102829
138 kV	100 Amps	12.500	41100319	42100319	41105519	42101719	41103119	42102719
138 kV	100 Amps	20.000	41100419	42100419	41105619	42101819	41103219	42102819
138 kV	200 Amps	12.500	41100330	42100330	41105530	42101730	41103130	42102730
138 kV	200 Amps	20.000	41100430	42100430	41105630	42101830	41103230	42102830
161 kV	100 Amps	12.500	41100320	42100320	41105520	42101720	41103120	42102720
161 kV	100 Amps	20.000	41100420	42100420	41105620	42101820	41103220	42102820
161 kV	200 Amps	12.500	41100331	42100331	41105531	42101731	41103131	42102731
161 kV	200 Amps	20.000	41100431	42100431	41105631	42101831	41103231	42102831

Note: Southern States can supply live part adapter kits (jaw assembly, hinge assembly, fuse holder) to replace existing competitor's power fuses, allowing the existing insulators and base to be reused. These Southern States power fuse live parts would then offer the same advantages as a complete new installation of a Southern States power fuse assembly. i.e the capability for the fuse holder to accommodate 3 full fault operations prior to fuse holder replacement (vs replacing the fuse holder after every fault as is required on the competition's power fuses)

Chart of Available Fuse Kits by Speed Ratio and Amperage for Southern States Types BPA and HPA Power Fuses

PF and PFA=slow speed
PM and PMA=medium speed
PX and PXA=fast speed
PE and PEA=NEMA-EEI standard speed

Note: if there is a blank space under a specific speed and amperage rating this indicates that speed ratio, amperage rating combination is not available.

Speed Ratios				kV Ratings					
PF	PM	PX	PE	7.2 kV	14.4 kV	23 kV	34.5 kV	46 kV	69 kV
ampere	ratings	shown	below						
			1	72001	15001	23001	34001	46001	69001
2	2		2	72002	15002	23002	34002	46002	60002
3	3	3	3	72003	15003	23003	34003	46003	69003
5	5	5	5	72005	15005	23005	34005	46005	69005
			7	72007	15007	23007	34007	46007	69007
	8	8		72008	15008	23008	34008	46008	69008
10	10	10	10	72010	15010	23010	34010	46010	69010
	12.5	12.5		72012.5	15012.5	23012.5	34012.5	46012.5	69012.5
15	15	15	15	72015	15015	23015	34015	46015	69015
20	20	20	20	72020	15020	23020	34020	46020	69020
	25	25	25	72025	15025	23025	34025	46025	69025
30	30	30	30	72030	15030	23030	34030	46030	69030
40	40	40	40	72040	15040	23040	34040	46040	69040
50	50	50	50	72050	15050	23050	34050	46050	69050
60	60	60		72060	15060	23060	34060	46060	69060
			65	72065	15065	23065	34065	46065	69065
75	75	75		72075	15075	23075	34075	46075	69075
			80	72080	15080	23080	34080	46080	69080
100	100	100	100	72100	15100	23100	34100	46100	69100
125	125	125	125	72125	15125	23125	34125	46125	69125
150	150	150	150	72150	15150	23150	34150	46150	69150
200	200	200	200	72200	15200	23200	34200	46200	69200
250	250	250		72250	15250	23250	34250	46250	69250
300	300	300		72300	15300	23300	34300	46300	69300
	350			72350	15350	23350	34350	46350	69350
	400			72400	15400	23400	34400	46400	69400

Note: The PM speed ratio is not available at 2 amperes at 46 kV and 69 kV.

Speed Ratios				kV Ratings		
PFA	PMA	PXA	PEA	115 kV	138 kV	169 kV
ampere	ratings	shown	below			
			1	115001	138001	161001
2			2	115002	138002	161002
3	3	3	3	115003	138003	161003
5	5	5	5	115005	138005	161005
			7	115007	138007	161007
	8	8		115008	138008	161008
10	10	10	10	115010	138010	161010
	12.5	12.5		115012.5	138012.5	161012.5
15	15	15	15	115015	138015	161015
20	20	20	20	115020	138020	161020
	25	25	25	115025	138025	161025
30	30	30	30	115030	138030	161030
40	40	40	40	115040	138040	161040
50	50	50	50	115050	138050	161050
60	60	60		115060	138060	161060
			65	115065	138065	161065
75	75	75		115075	138075	161075
			80	115080	138080	161080
100	100	100	100	115100	138100	161100
125	125	125	125	115125	138125	161125
150	150	150	150	115150	138150	161150
200	200	200	200	115200	138200	161200