HUBBELL TIPS & NEWS

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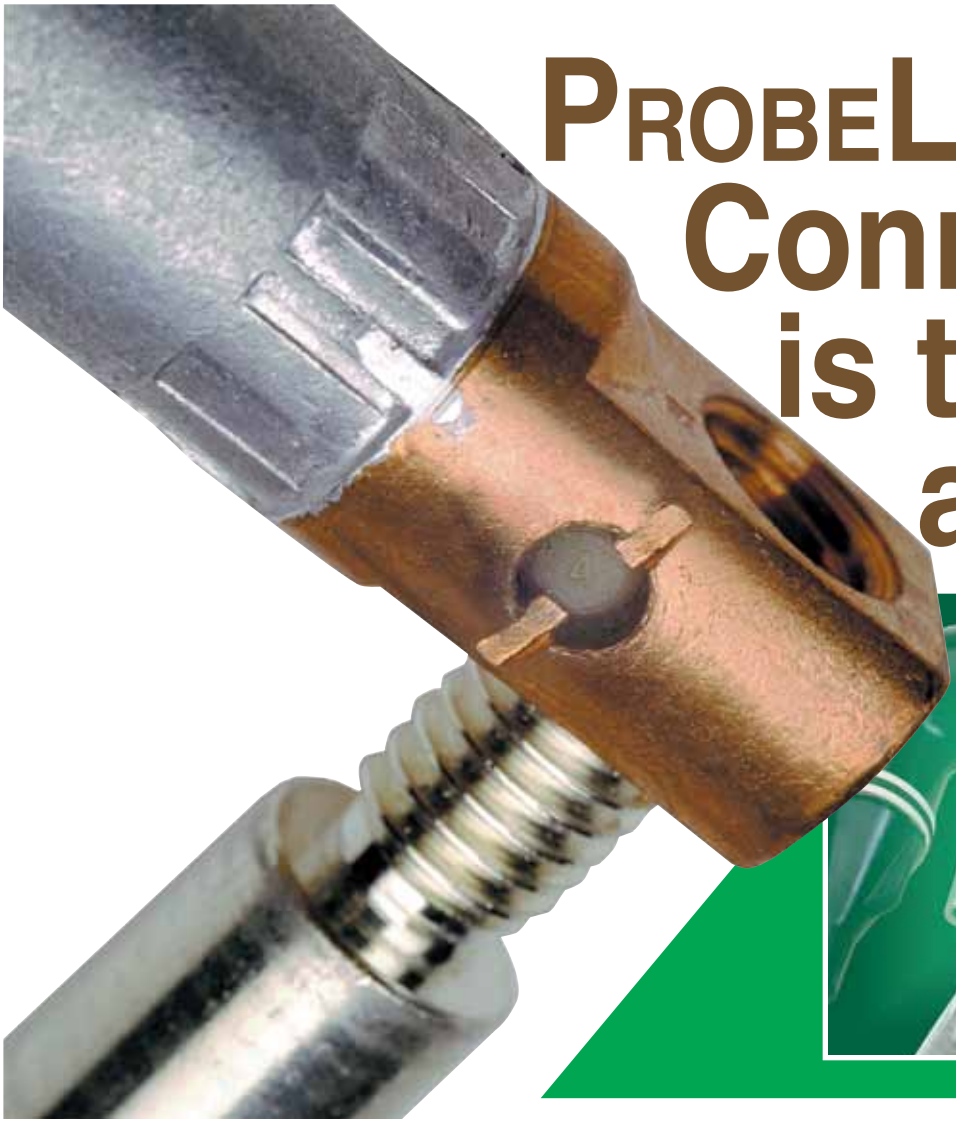
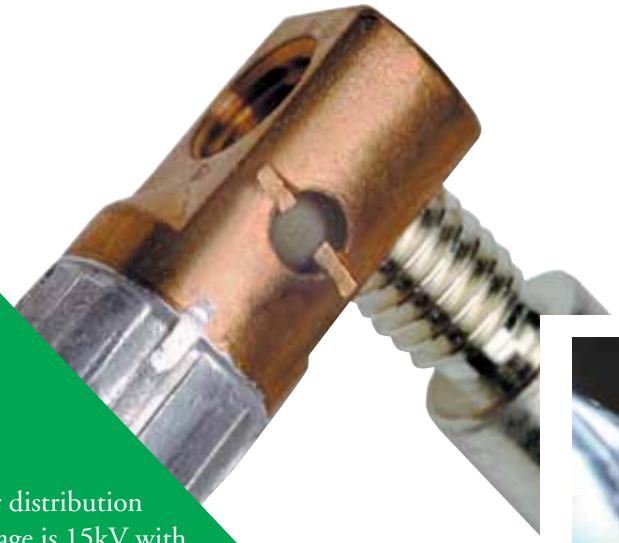


PROBELOK® Connector is the answer!

CAROLINA CO-OP AVOIDS ELBOW OVERHEATING

BY:
Steve McCachern
Energy United
Statesville, NC

Two old established Co-ops have merged together, Cresent Electric Co-op and Davidson Electric Membership Corporation, forming a new utility in North Carolina called Energy United. Our headquarters in Statesville is located just 32 miles north of Charlotte, NC. This close proximity makes our service area for residential homes very desirable. We serve many of the rapidly growing areas in the Piedmont of North Carolina including Statesville, Cornelius and Huntersville. (Huntersville is less than 15 miles from the Charlotte Airport.)



Our distribution voltage is 15kV with a maximum current of usually less than 160 amps in our underground developments. The rapid growth of our area naturally caused problems. One subdivision grew rapidly and loads increased quickly. Several interruptions occurred on 3-way junctions and loadbreak elbows in our switching cabinets. On removal and inspection of these products, it was very obvious that over-heating had occurred in the probe/connector area in some of the cabinets. To support this, we found discolored and extruded cable insulation. In most cases the material inside the bushing swelled causing a problem for the lineman to separate the elbow from the bushing. We concluded that the crimp barrel and probe connection possibly was never properly tongued, or they became loosened causing a high resistance connection which led to the over heating situation and eventual failure.

Due to several similar outages in one subdivision, we were concerned about the rest of these connections. We infrared tested the remaining junctions and found many other hot spots. We have made several changes. One of them was switching to the Hubbell 15kV elbow with the ProbeLok® Connector. Testing done by Hubbell indicated the crimp barrel/elbow probe threaded connection, loosened one full turn, would adequately carry up to 200 amps, and not overheat. We have replaced all the junctions and installed over 80 Hubbell elbows with PROBELOK Connectors. We feel that with this change, we have eliminated a weak link in our distribution system but most importantly, also will provide more reliable service to our customers.

For more information, contact your Hubbell Power Systems representative, fax 573-682-8714 or e-mail hpsliterature@hps.hubbell.com.

FREE 2000/2001 WALL CALENDARS!

For your free 2000-2001 wall calendar, fax 573-682-8714 or e-mail hpsliterature@hps.hubbell.com. Please specify quantity.

Fargo GDW Wedge Type Deadend

THE COST-CUTTING ALTERNATIVE TO BOLTED DEADEND CLAMPS

Fargo offers you the smart way to terminate overhead conductors. It's quick. Easy. Cost effective. Our wedge-type clamp has no bolts to slow installers down. Simply lock the jaws of the deadend open, insert the conductor between the jaws and tap the back of the jaws to lock the conductor in place. You're done! Installation complete. No special tools or skills. No opportunity for tightening errors. argo offers you the smart way to terminate overhead conductors. It's quick. Easy. Cost effective. Our wedge-type clamp has no bolts to slow installers down. Simply lock the jaws of the deadend open, insert the

Application Table

Conductor Size	Fargo Catalog No.
No. 4 thru 1/0 ACSR	GDW-010A
No. 4 thru 4/0 ACSR	GDW-040A
4/0 thru 556.5 ACSR	GDW-556A
4/0 thru 795 ACSR	GDW-795A

conductor through the deadend is eliminated. Once contact between clamp and conductor is realized, the applied spring tension holds the conductor securely.

With Fargo GDW series deadends, the wedge action of the deadend develops the full tension of the #4AWG through 556.5 kcmil and 795 kcmil conductor to which deadends are applied.

Because Fargo GDW deadend jaws accept a wide range of conductors, you minimize inventory with aluminum or plated aluminum jaws that accommodate aluminum and copper conductors.

Savings Proof

In 1995, a major utility did a study of its use of the wedge type deadend compared to bolted deadends. The utility calculated its annual savings at $36,626. ■

Cost Analysis

Bolted Deadend Clamp analysis

based on bolted deadend usage in 1995

Conductor Size	Unit Cost	*Installation Time	Installation Cost	Total Cost Per Deadend	1995 Usage	1995 Cost
No. 2 ACSR	$ 4.32	**15 min.	$14.25	$18.57	6603	$122,617.71
3/0 ACSR	$ 6.33	**15 min.	$14.25	$20.58	662	$ 13,623.96
336.4 ACSR	$ 6.98	20 min.	$19.00	$25.98		
350 AL	$ 6.98	20 min.	$19.00	$25.98	2570	$ 66,768.60
500 AL	$ 6.98	20 min.	$19.00	$25.98		
556.5 ACSR	$13.97	20 min.	$19.00	$32.97	660	$ 21,760.20
795 AL	$13.97	20 min.	$19.00	$32.97	48	$ 1,582.56

Total Cost Per Year — $226,353.03

* A composite labor rate of $57.00 was used for the analysis.

** The installation time associated with No. 2 ACSR and 3/0 ACSR is slightly less because these two clamps do not have to be taken apart to insert the conductor.

Cost Analysis

Fargo Deadend Clamp analysis

based on usage of bolted deadend in 1995

Conductor Size	Unit Cost	*Installation Time	Installation Cost	Total Cost Per Deadend	Estimated Yearly Usage	Estimated Yearly Cost
No. 2 & 3/0 ACSR	$12.00	3 min.	$2.85	$14.85	7265	$107,885.25
336.4 ACSR 350 A 500 A 556.5 ACSR	$22.00	3 min.	$2.85	$24.85	3230	$ 80,265.50
795 A	$30.00	3 min.	$2.85	$32.85	48	$ 1,576.80

Total Cost Per Year — $189,727.55

* A composite labor rate of $57.00 was used for the analysis.

For more information, contact your Hubbell Power Systems representative, fax 573-682-8714 or e-mail hpsliterature@hps.hubbell.com.

Tools for any way you tackle temporary hot-line jumpering

Three tools give you options for fuse protection, loadbreak or sectionalizing

You may need all three of these tools for day-to-day hot-line maintenance and construction jobs on your distribution system. Each provides a solution for different circumstances. But all three are proven performers for efficient energized work procedures with temporary jumpers or taps.

Temporary Cutout Tools

With a stud at the lower end for a temporary tap jumper and an integral clamp at the top for the primary conductor, this tool provides fuse protection. Its cutout hot parts are mounted on a bushing of orange 1¼"-diameter Epoxiglas® pole fitted with EPDM-rubber skirts.

For operation by a portable loadbreak tool, hooks are provided on the upper contact sleet shield. The fusetube should be fitted with a fuselink rated no higher than 100 amps.

For fuse protection up to 100 amps. Temporary Cutout Tools

Available in ratings for 15 kV and 27 kV systems, these tools offer interrupt capacities of 10,000 and 8,000 amps, respectively.

For loadbreak op up to 300 amps Temporary Load Disconnect Tools

Temporary Load Disconnect Tools

As a temporary means of connecting and disconnecting equipment under load, this tool does not have a fuse and does not provide protection for fault or overcurrent conditions. An arc-chute interrupter gives the tool excellent loadbreak capability, up to 300 amps for either the 8.3/15 kV or 15/27 kV model. Cutout components, clamp and stud for jumper connections are similar to those of the Temporary Cutout Tools.

Properly operated by an insulated disconnect stick, loadbreaking is independent of the stick speed. For a clearly visible break, the disconnect blade hangs at near vertical.

Installed with a bypass jumper in parallel with a permanent tap, the tap may be removed and the load dropped or reconnected by the tool. ■

Ideal for temporary sectionalizing

Tension Puller Switching Tool C400-1907 pulls up to 4,000 lb. (1,800 kg.) and is rated for up to 35 kV phase-to -phase systems, 600 amps continuous, 150 kV BIL.

Tension Puller Switching Tool

More than two tools in one, this jack-screw ratcheting puller features a removable disconnect switch mounted on an 1½"-diameter Epoxiglas® pole. The polymer-skirted switch permits sectionalizing when operated by an approved portable loadbreak tool. A ½"-diameter bypass stud at each end of the switch accepts jumper clamps up to 3" wide.

For operation by rubber-glove or hot-stick methods, the puller comes with handling rings and a large selector switch on the ratchet wrench.

The switch removes simply to convert the tool to a standard tension puller.

For more information, contact your Hubbell Power Systems representative, fax 573-682-8714 or e-mail hpsliterature@hps.hubbell.com.

Aluminum conduit standoffs

Without drilling, selection accommodates a wide range of configurations

Adjust to field requirements

For down-the-pole mounting of conduits, the size and arrangement you need likely are among this assortment.

Better yet, the unit's design keeps field assembly simple and totally adjustable. It starts with your choice of two bracket sizes for either 6 or 9 inches of standoff space from the pole face.

Conduit straps are available for sizes from 1 through 3½ inches in ½-inch increments plus 4-, 5- and 6-inch diameters. Each strap comes with a pair of bolts, lockwashers and nuts.

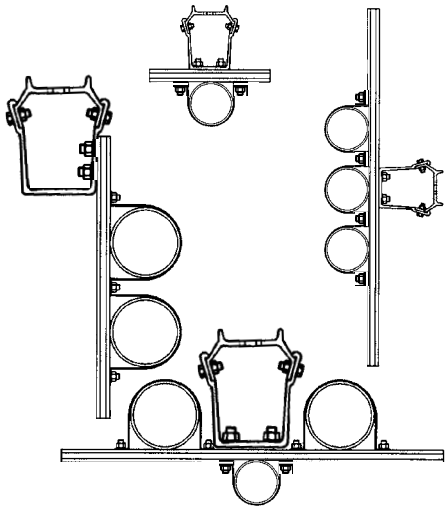
What makes the mounting so friendly is how the T-slot captures the mounting bolts for the standoff bracket and conduit straps. Positioning them on the T-slot is infinitely adjustable.

The only drilling required is for the pole throughbolt. Driving a lag bolt completes the mounting.

Popular-size kits with brackets

As many as four 6" conduits may be mounted on one of the six standard stock numbers. Each combines a bracket (6" or 9") and 4-way T-slot (12", 24" or 36" length).

Typical Installations:



Custom 4- and 2-way sizes, too

Each side of the 4-way T-slot extrusions offered captures ½-inch bolt heads. In addition to the kits above, 4-way T-slots are available in 12", 24", 36", 48", 60" and 120" lengths.

For more custom applications, 2-way T-slot extrusions capture ½-inch bolt heads on one side and ⅝-inch bolt heads on the other. They are available in the same six lengths as the 4-way T-slots. ■

For more information, contact your Hubbell Power Systems representative, fax 573-682-8714 or e-mail hpsliterature@hps.hubbell.com.

High-strength, heat-treated 6061-T6 aluminum alloy
T-slot extrusions and standoff brackets team up with aluminum straps and galvanized-steel bolts, washers and nuts.

Standard Constr

Chance Tension Screw Anchors ar

Proven and preferred methods in the electric utility industry long have included Chance tension anchors and foundation piles. They are unchallenged for their savings of time and materials.

For the same benefits, they now have been accepted in an ever-expanding arena of applications, some of which "border" on power industry turf.

Application-specific Products

For tension loads such as guying, the PISA® (Power Installed Screw Anchor) Anchor, with separate rod and helix, excels in performance and economies. For compression loads such as underpinning, sitework tiebacks and soil nailing, the SS (Square Shaft) anchor, with integral central member and helix or multiple helices, is the leader. For heavier compression and overturning loads as imposed by lighting standards and tower bases, HS (High-Strength) and T/C (Tension/Compression) anchors with pipe shafts meet the gamut of these demanding challenges.

Pre-engineered, Chance anchor systems are standard constuction practices.

RUCTION PRACTICES

nd Compression Foundation Piles

Determine Strength on Each Site

As you install it, a Chance screw anchor "tells" you how much it can hold, because there is a correlation between installation torque required and an anchor's capacity in that soil.

This relationship gives a scientific approach to anchor selection for a geotechnical engineer armed with soil strata information about a job site. It gives logic to real-world field adjustments for the inevitable plan changes.

Chance anchor systems are not only pre-engineered in general. They also deliver customizing capabilities for each situation through an extensive selection of products developed for practicality in a wide array of settings.

Variables to anchor selection for any certain site include shaft size, length, extensions, helix quantity and size(s). Chance application engineers term it "designing an anchor," the process of finding the combination to best serve load criteria and site conditions.

The World-Class anchoring science Chance built by experience has arrived on the Building World scene. ■

For more information, contact your Hubbell Power Systems representative, fax 573-682-8714 or e-mailhpsliterature@hps.hubbell.com.

PROTECTA*LITE™

System is the Answer

Protect Your Transmission & Distribution from Lightning Induced Outages

The task is simple. Reduce lightning interruptions. The results are spectacular thanks to the Ohio Brass Protecta*Lite System.

Use on unshielded lines or as supplemental protection for shielded lines. Here's how it works. The Protecta*Lite System consists of a metal-oxide surge arrester in parallel with the line insulation. During a surge, the arrester limits voltage across the insulation to a value below the insulator flashover voltage. Lightning surge current is diverted to ground in a controlled manner and service is not interrupted. It's that simple. The result is improved service reliability and less costly maintenance.

It works on all voltages above 2.4kV. You can order the Protecta*Lite System with an insulator assembly or as an arrester alone.

Use on new construction or in retrofit applications. Use with post or suspension insulators.

EASY

The PROTECTA*LITE System is the Easy Way to Protect Your System

It's an economical, proven method to increase performance based on Ohio Brass Arresters capable of discharging high energy strokes and remaining in service.

Cost may be 50 to 75 percent less than the cost of installing overhead shield wire on an existing 69kV line.

The average life expectancy is in excess of that of the typical transmission line. Quick installation.

or HARD

Other Methods are Costly & Unreliable

Other Method 1.
Installing a well grounded overhead shield wire with an adequate shield angle:
Expensive:
Operating losses high. Replace shield wire every 20 to 25 years because of corrosion. Mechanical failures not uncommon. Grounding is critical.

Other Method 2.
Improving grounds on transmission lines protected with and overhead shield wire:
Expensive:
Can run up to $1,500 to $2,000 per structure. May need to be done repeatedly.

Other Method 3.
Adding extra insulation:
Not cost effective. Poor results.

For more information, contact your Hubbell Power Systems representative, fax 573-682-8714 or e-mail hpsliterature@hps.hubbell.com.

Utility Combines Chance D7 Switch & Ohio Brass Protecta*Lite™ System

To Meet Line Requirements, Provide Lightning Protection and Cut Costs

By:

Joe Campbell
Director of Operations & Engineering
Elizabethton Electric System
Elizabethton, TN

We decided to use the Chance D7 Overhead Switch combined with the Ohio Brass Protecta*Lite Insulator/Arrester System to help us overcome several problems we faced on construction of one of our lines. The line's construction configurations were vertical and deadend.

In the review process for selecting the D7 Switch, we found it to be very suitable for the steel poles we were using on the line. The mounting bracket on the switch fits the smaller top of steel poles much better than other options. Because the D7 is unitized, installation is more economical. Installation takes about two to four hours compared to the high installation costs of non-unitized switches that can take up to eight hours to install.

Because of concerns about lightning interruptions, we decided to use the Ohio Brass (OB) Protecta*Lite System in conjunction with the switches to provide the lightning protection we wanted.

The Protecta*Lite System is an arrester/insulator combination that protects service by reducing interruptions caused by insulation flashovers initiated by lightning. The Protecta*Lite System offers an inexpensive insurance policy when weighed against the cost of an outage. By using the D7 Switches in conjunction with the OB insulators and arresters (Protecta*Lite System), we overcame the particular problem of using pole-mounted arresters on vertical construction adjacent to riser poles.

Installation crews saved about an hour in labor using the Protecta*Lite System compared to alternate methods. Savings amounted to $100 per mounting. The savings were significant in helping us decide to use the OB insulator/arrester combinations for the lightning protection.

When we consider the two to four hour installation time for Chance unitized D7 Switches compared to the eight hours that non-unitized switches can take, and we combine the OB Protecta*Lite System savings at $100 per mounting, we achieved substantial cost savings on the project.

Dealing with the products of one supplier (Hubbell) was a plus for us. ■

For more information, contact your Hubbell Power Systems representative, fax 573-682-8714 or e-mail hpsliterature@hps.hubbell.com.

INSIDE THE AR SWITCH

Pint-size interrupter has giant capability to make loadbreak possible

'SHOCK-ABSORBER' FUNCTION

Absolute elegance of design is not too strong a description of the AR Switch Interrupter. It is the "shock absorber" that performs the load break function in the AR's three-phase switching action.

Without it, Distribution Automation could not advance at the needed pace.

A CLOSE-UP LOOK AT THE INSIDES

To see how the interrupter delivers all this benefit takes a view inside the interrupter. Simple but precise, its design entails the careful form, fit and function of every select component.

By design, the interrupter provides circuit interruption for the AR Switch without external arc or flame. The arc-quenching trailer and liner are designed to coordinate with the housing and muffler geometries. These components develop the de-ionizing gases during load breaking which are required for dielectric recovery.

For lasting strength and corrosion resistance, all parts of the operating mechanism are of stainless steel. Current transfer efficiency is assured with secure connections (other than

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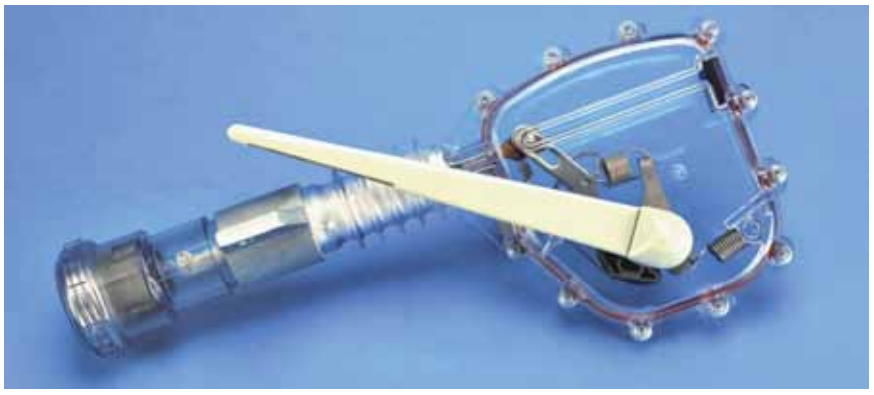
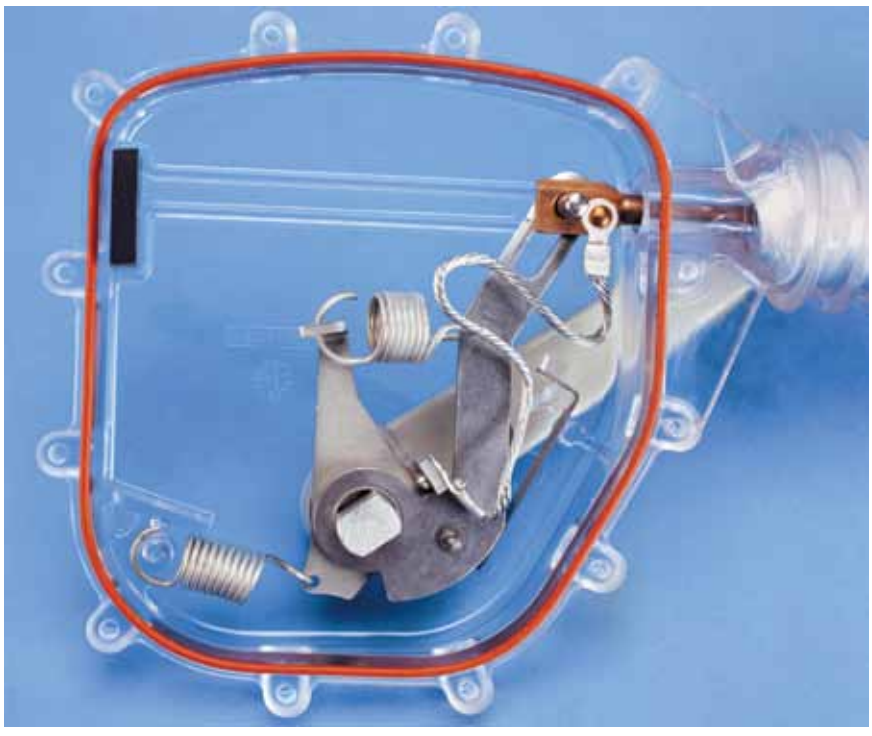




the moving contact). Designed for durability and high performance, the current-breaking contacts are of silver-tungsten.

External atmospheric protection

AR Switch interrupter housings are manufactured from a high strength polyurethane material for strength, weatherability and resistance to ultra-violet radiation. The housing design integrates multiple functions. The enclosure is sealed from the outdoor environment by gaskets at each mating interface.

Built and tested for dependability

The interrupter incorporates a self re-setting mechanism to ensure that the interrupter is in the circuit and ready to operate for each switch opening.

Extensive testing has been conducted to ensure proper operation under a variety of circuit conditions, as well as varying environmental conditions.

Operating sequence

When the AR Switch is in the closed position, current flow is through the copper switch blade and the silver-to-silver contacts. There is no current flow through the interrupter.

As the switch is opened, current is transferred to the interrupter. This transfer is accomplished before the main contacts fully separate. As the switch continues to be opened, the interrupter contacts are driven apart. Arc interruption is accomplished by thermal interaction of the arc on the specifically designed arc trailer and liner within the interrupter. This interaction creates de-ionizing gases, that along with the unique interrupter housing design ensures a high rate of recovery of the internal dielectric strength for rapid, positive, circuit interruption. The exhaust following current interruption is quietly vented through the specially designed muffler.

. . . continued on next page . . .

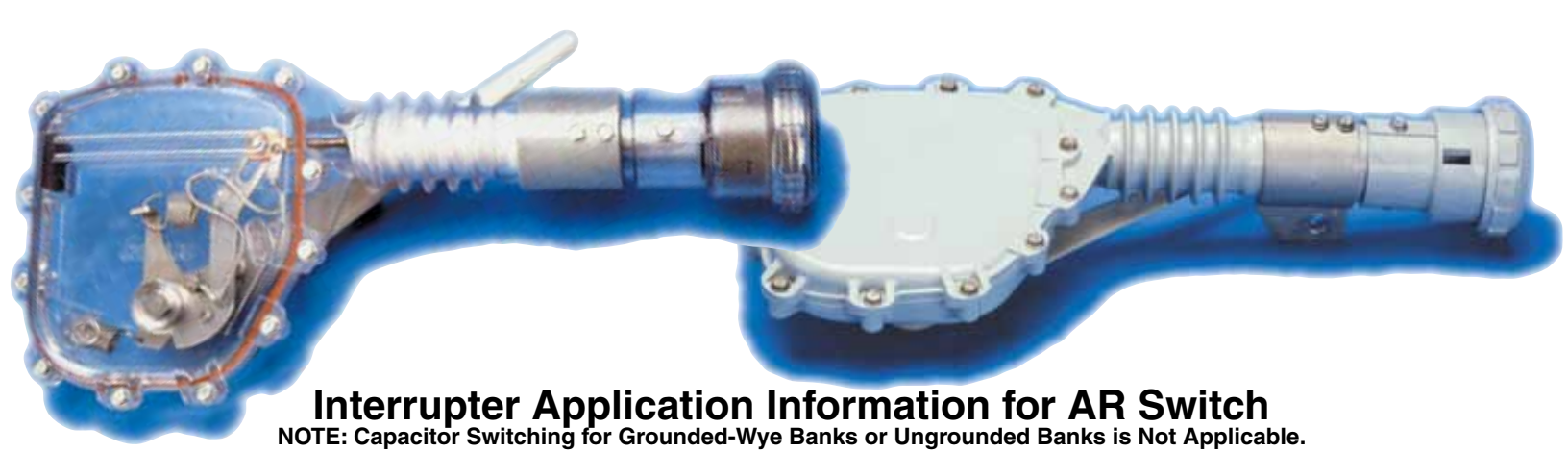
Opening Sequence: Switch Blade and Interrupter

1 Switch blade in closed position

2 As switch blade is opened, current is transferred to the Interrupter before the main contacts fully separate

3 Current is fully transferred to the Interrupter and arc interruption is accomplished by thermal interaction of the arc on the specifically designed arc trailer and liner within the interrupter

4 Switch is fully opened and the Interrupter self-resets



Interrupter Application Information for AR Switch

NOTE: Capacitor Switching for Grounded-Wye Banks or Ungrounded Banks is Not Applicable.

Maximum System[1] Three-Phase Voltage	Interrupting[3] Life (Operations)		Line Charging (Amps)		Cable Charging (Amps)		Loop[6] Switching (Amps)	Magnetizing[7] Current (KVA)
	600 A	900 A	Grounded[4]	Ungrounded	Shielded[5]	Unshielded[4]		
17.1 kV	50	10	10	N/A	20	10	600	2500
29 kV	20	10	10	N/A	20	10	600	2500
38 kV[2]	20	10	10	N/A	10[4]	10	600	2500

[1] This chart applies to the Hubbell Type AR Switch and interrupter for application on these maximum system voltages. Ratings established by testing to IEEE 1247.

[2] For application on three-phase 4-wire solidly grounded wye systems with wye connected loads only.

[3] Rated number of load switching operations at the specified currents.

[4] Maximum recovery voltage of 24.4kV.

[5] Maximum recovery voltage of 16.7kV.

[6] Maximum recovery voltage of 5.8kV (20% of 29kV).

[7] Will switch up to 2500 KVA based on load current testing per IEEE 1247.

[8] Switching combinations of capacitor banks, unloaded lines and cables is **not recommended.**

[9] **N/A means not available at time of printing or not applicable. Consult factory.**

It is the "shock absorber" that performs the load break function!

The AR Switch closing sequence assures that current is picked up by the copper-tungsten fault-closing contacts on the blade and stationary contacts. Current is never picked up by the main current carrying contacts, or by the interrupter. The interrupter is self re-setting and the interrupter pick up arm is simply moved into proper position during blade closing.

AR Switch application flexibility

The Hubbell AR (Automation-Ready) Switch was designed to meet today's needs and the growth of Distribution Automation.

It's available for 14.4kV, 25kV and 34.5kV (grounded wye) systems. And in four mounting configurations: Horizontal, vertical, phase-over-phase and delta, to meet a variety of distribution feeder line configurations. All AR Switches are fully rated for 900 ampere continuous current and 900 ampere interrupting current.

The switch has a one-time fault-closing rating of 25,000 amperes rms asymmetrical and a three-time duty rating of 20,000 amperes rms asymmetrical.

Best operating ease, ice breaking

The AR Switch takes *the lowest torque required in the industry to open and close a switch of this kind* — no more than 50 ft.-lb. for one of the torsional operating varieties! This is an advantage of the AR's unique four-link overtoggle operating mechanism. It also speeds field installation by eliminating any need to adjust the control assembly. And it gives the operator a "snap" feedback, positive assurance of blade closing.

For switches installed in icy weather conditions, AR Switch mechanical and electrical operation is ensured, even with ice buildup of up to ¾ inch — *the highest level in the industry.*

Automation-ready design

The AR Switch can be purchased as a standard switch and upgraded for Distribution Automation in the future, or ordered as a complete automated switch today. Bracket extensions are available for mounting line sensors (sensors can be provided as specified by the user).

The Chance Motor Operator is available in rotating and reciprocating models. It can be provided with a mounting panel for an RTU and communication package or complete with the user-specified RTU/communication package, fully installed and tested. For more information, refer to Chance catalog section 14C. ■

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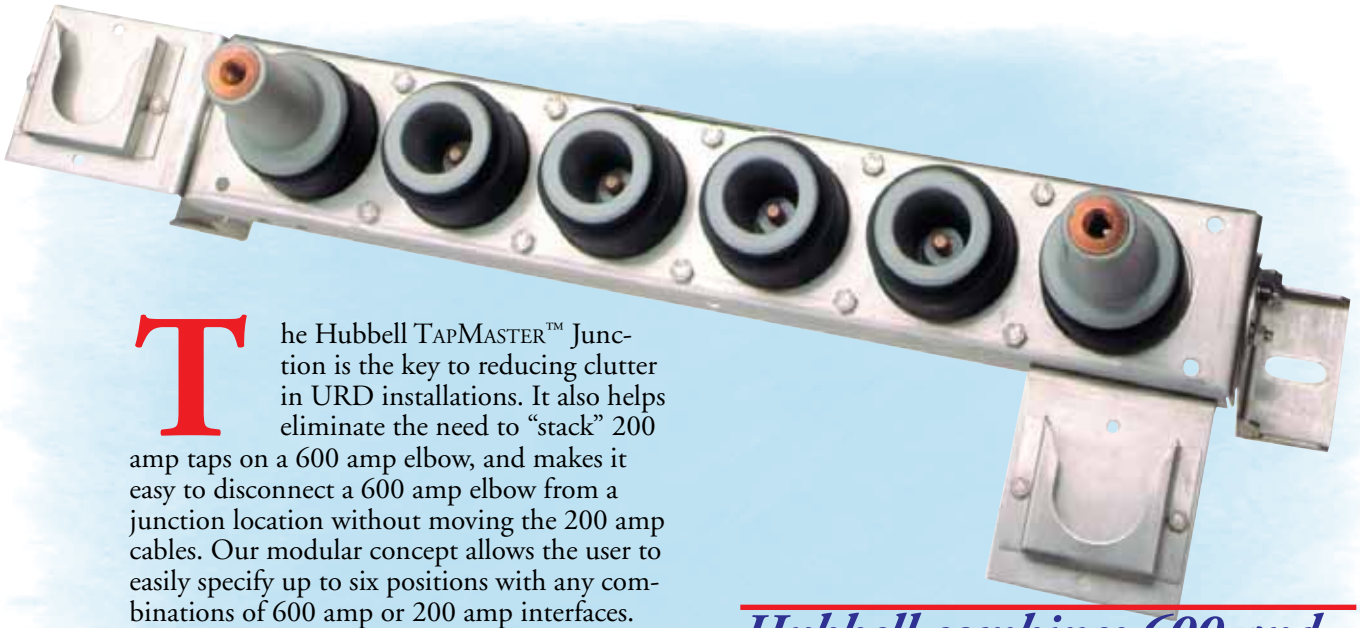

The Hubbell TapMaster™ Junction is the key to reducing clutter in URD installations. It also helps eliminate the need to "stack" 200 amp taps on a 600 amp elbow, and makes it easy to disconnect a 600 amp elbow from a junction location without moving the 200 amp cables. Our modular concept allows the user to easily specify up to six positions with any combinations of 600 amp or 200 amp interfaces. The mounting bracket allows positioning upward or downward to accept connecting cables. A feature previously available only in smaller 200 amp designs.

The need for special loadbreak reducing tap products that must be installed in 600 ampere elbows or extenders can be eliminated along with the need for special tools and assembly procedures. ■

Hubbell combines 600 and 200 amp connections (up to six) in one junction. ANY combination.

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Your suggestions and editorial or photographic contributions are invited and may be submitted to **HUBBELL TIPS & NEWS.**
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