OHIOBRASS B

TRANSIT CATALOG NO. 76

MANSFIELD · OHIO U·S·A

Catalog 76

OHIO BRASS PRODUCTS FOR ELECTRIC TRANSIT SYSTEMS

All specifications in this catalog are subject to change without notice.

THE OHIO BRASS COMPANY

MANSFIELD, OHIO, U.S.A. 44902

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INTRODUCTION

This catalog of Ohio Brass products for electric transit systems is a complete revision and condensation of O-B's Transit Catalog No. 25. During the years since publication of the previous catalog, the sweeping changes which have occurred in the electric transit field have obsoleted large portions of O-B's original comprehensive offering of specialized equipment for trolley coaches and light rail vehicles.

Engineering and production divisions at Ohio Brass, however, have retained in the new catalog those products which are needed to maintain, repair, rebuild or expand existing systems. In many instances, options formerly offered are replaced by a product with universal application.

The catalog section describing Special Work Assemblies has been discontinued since detailed information on overhead design is no longer considered pertinent to transit customers. Special Work Assemblies are, however, still being supplied by Ohio Brass on negotiated orders.

Rail bonds as a product line have been discontinued by Ohio Brass and all listings have been eliminated from this catalog.

The table of contents on the opposite page has been included to provide a general guide to the divisions of this catalog. The final pages in the catalog are devoted to a numerical index of all parts listed by catalog number, while the alphabetical index gives page numbers for individual parts according to the nomenclature by which they are known in the transit industry.

All orders should include both the catalog number and the descriptive name. O-B's price sheets list terms and conditions applicable to all orders.

The Ohio Brass Company 380 North Main Street Mansfield, Ohio 44902

WARRANTY

The Ohio Brass Company warrants all products sold by it to be merchantable (as such term is defined in the Uniform Commercial Code) and to be free from defects in material and workmanship. Buyer must notify the Company promptly of any claim under this warranty. The Buyer's exclusive remedy for breach of this warranty shall be the repair or replacement, F.O.B. factory, at the Company's option, of any product defective under the warranty which is returned to the Company within one year from the date of shipment. NO OTHER WARRANTY, WHETHER EXPRESS OR ARISING BY OPERATION OF LAW, COURSE OF DEALING, USAGE OF TRADE OR OTHERWISE IMPLIED, SHALL EXIST IN CONNECTION WITH THE COMPANY'S PRODUCTS OR ANY SALE OR USE THEREOF. The Company shall in no event be liable for any loss of profits or any consequential or special damages incurred by Buyer. The Company's warranty shall run only to the first purchaser of a product from the Company's distributor or from an original equipment manufacturer reselling the Company's product, and is non-assignable and non-transferable and shall be of no force and effect if asserted by any person other than such first purchaser.



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Use – Well established as a basic insulating unit in many exacting industrial, mining and transit applications. Particularly suitable for crane work as it is available with two different lower stud lengths. Used as secondary insulation with insulated hangers on grounded structures. Spool 16835 serves as the insulating unit in a number of O-B hangers.

Design Features – Consists of O-B Dirigo insulation molded around a stud and boss thimble (see section view). O-B Dirigo insulations have been developed to result in well-balanced characteristics for the particular service involved.

Electrical and Mechanical Values – All Dirigo spools are given an electrical test of 16 000 volts. Mechanically, the spools are rated at a minimum breaking strength of 10 000 pounds. Cantilever rating is 3000 inch-pounds. Maximum operating temperature is 250 degrees Fahrenheit. All spools are subjected to routine tests to assure uniform quality.

Material – All Dirigo spools have fixed $\frac{1}{2}$ -inch steel studs at the lower end and a $\frac{1}{2}$ -inch steel boss at the upper end.

Upper Studs $-\frac{5}{6}$ -inch threaded studs or bolts of any length can be used in the upper bosses of Dirigo spools. Some of the O-B studs of various lengths and projections are listed below.

Dirigo Spool Insulators

Catalog Number	Lower Stud Length	Net Weight Lbs. per 100
16835 20560	¹¹ / ₁₆ Inch 1¼ Inch	

Studs for Dingo Spool insulators						
Catalog Number	Stud Length	Upper Stud Projection	Net Weight Lbs. per 100			
15576 22483 22836	17/8 Inch		10			

Stude for Divise Creek Inculators



PLASTIC SHELLS

Use – For use with O-B Dirigo spool insulators. Sheds chemically active water in unusually damp locations and minimizes harmful effects of deposits in heavily contaminated areas.

Design Features – Molded of sun- and weather-resistant polyethylene. Shell slips over Dirigo spool which is then attached in the usual manner.

Catalog Number	Description	Net Weight Lbs. per 100
22406	Plastic Hanger Shell	. 4

22406



TYPE AGC TANGENT SPAN HANGER With Adjustable Clamp



Type AGC tangent hangers consist of a replaceable Dirigo insulator housed in a metal shell, forming an air gap so spaced that flashover will take place at a voltage considerably below the dielectric strength of the insulator and yet high enough to prevent flashover from surge voltages of a magnitude generally encountered in street railway service. This hanger has excellent leakage characteristics because of the dry spot secured by the long overlap of the hanger shell.

The Type AGC hanger attaches to the span wire by a clamp. It is an all-purpose hanger suitable for both span construction and as an insulator for pulloff wires which must be carried across trolley wires.

The renewable insulating unit used in this hanger is an improved type having high dielectric and mechanical strength. By the design and arrangement of the metal parts, as shown in the cross section view on page 4, the surface most vital to electrical properties of the insulator is now located at the top where it is well protected by the hanger



Renewable Dirigo Insulating Unit 16835

shell. Severe damage to the dielectric at the lower end of the insulator could be experienced without affecting either mechanical or electrical strength.

The insulating unit is assembled in the hanger shell by a %-inch bolt and shakeproof lockwasher. No auxiliary insulation is required between hangers.

Vertical adjustment up to 14 degrees to compensate for span wire sag is obtained by movement of the clamp on the 5%-inch top stud. This stud threads into both the hanger shell and the insulating unit, making a rigid assembly of these parts which can be rotated to obtain horizontal alignment of ear or clamp with trolley wire.

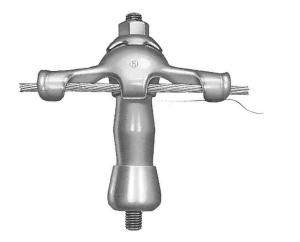
Clamp will take span wires from $\frac{3}{16}$ to $\frac{1}{2}$ inch. Length clamp castings: top, $\frac{4}{2}$ inches; bottom, $\frac{13}{4}$ inches. Height bottom of insulator to center of span wire, $\frac{2}{2}$ inches.

Shell and clamp parts are malleable iron. Stud, hex nut and cup washer are of steel. All metal parts are hot-dip galvanized.

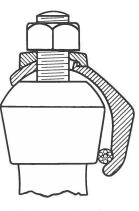
Catalog Number	Description	Net Weight Lbs. per 100
19360	Hanger Complete	300
16835	Dirigo Insulator Only	95
21550	Top Clamp Only	40



TYPE W TANGENT SPAN HANGER With Adjustable Yoke







Illustrating How Yoke Clamps on Span Wire

The Type W tangent span hanger is equipped with a clamp-type yoke for span wire attachment. It is an allpurpose hanger suitable for both span construction and as an insulator for pulloffs which must be carried across trolley wires.

The yoke casting has a clamp in the center, which tightly clamps the span wire to the end casting of the wood insulating member when the nut on the top stud is tightened. The outrigger arms on the yoke also bear against the span wireforming a limited snubbing action. Yoke will clamp span wires from 1/4 to 3/4 inch.

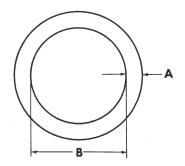
The span yoke is adjustable up to 14 degrees from the horizontal to compensate for span sag and to obtain vertical alignment of the insulating member. This member can be rotated for alignment of clamp with the trolley wire. After vertical and horizontal alignment are obtained, the hanger is locked in position by a %-inch hex nut.

Hanger should be installed with the opening in the yoke arms facing traffic.

Diameter of wood, 1¼ inches; length of clear insulation, 2½ inches; height, bottom of insulating member to center of span wire, 4¼ inches; length of yoke casting, 6½ inches. The insulator end fittings and yoke are malleable iron. All metal parts are hot-dip galvanized. Routine mechanical test on insulator unit, 5000 pounds.

The wood insulating unit is painted gray for good appearance and maximum protection.

Catalog Number	Description	Net Weight Lbs. per 100
20847 21278 21549	Hanger Complete, %-Inch Stud Insulating Unit Only, %-Inch Stud Yoke Only	170



BULL RINGS

O-B bull rings are made of steel, hot-dip galvanized.

Ultimate strength: 5%-inch stock, 18 000 pounds; 34-inch stock, 25 000 pounds.

Catalog Number	A Dimension Inches	B Dimension Inches	Net Weight Lbs. per 100
18562	5/8	3	110
18567	3⁄4	3	162



TYPE N-1 ROUND TOP HANGERS 750 Volts – Span Type



Insulation is completely enclosed and protected by the malleable iron shell. Outrigger arms are extra heavy for resistance to blows from wild trolley.

serves to reinforce the insulation.

Forged stud is molded directly into insulation. A washer

Stud, washer and shell are hot-dip galvanized. The shell is 31/2 inches in diameter at lower edge.

forms a broad bearing surface for boss of trolley ear and

			Net
Catalog		Std.	Wt. Lbs.
Number	Description	Pkg.	per 100
3144	Type N-1 Hanger, with %-Inch Stud	50	250

TYPE N SINGLE AND DOUBLE CURVE HANGERS 750 Volts



Type N-1 Single Curve

not break them.

Type N-1 single and double curve hangers are so designed

that it is not necessary to remove arms in order to install

ears, facilitating construction work and ear replacement.

Arms are of steel, and blows from dewired trolley poles will

411/16"

Type N-1 Double Curve



Type N-2 Single Curve

Type N-2 single curve hanger is equipped with a short malleable iron arm. It has some advantage in weight, but arm must be removed to install ear.

Hanger bodies are supplied with %-inch plain stud. All metal parts are hot-dip galvanized.

Catalog Number	Description	Net Weight Lbs. per 100	
11651 16221 11650	Type N-1 Double Curve Hanger Type N-1 Single Curve Hanger Type N-2 Single Curve Hanger	300	
	Hanger Bodies Only, with Bolts and Cotters		
11652 11653	Single Curve Double Curve	170 208	
Other Parts			
16220 16223 11654	Short Steel Arm Only, for Type N-1 Double Curve Hanger Long Steel Arm Only, for Type N-1 Single Curve Hanger Malleable Iron Arm Only, for Type N-2 Single Curve Hanger	130	



TYPE G SINGLE AND DOUBLE CURVE HANGERS 750 Volts



Nos. 10437 and 10438 Single Curve

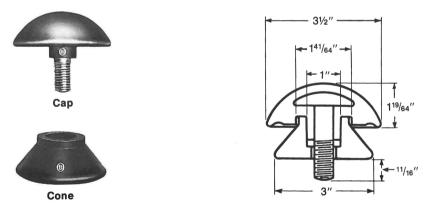


Nos. 10442 and 10443 Double Curve

Holes for span wire are 9/16 inch in diameter. All metal parts are hot-dip galvanized.

Catalog Number	Description	Net Weight Lbs. per 100
10437	Type G Single Curve Hanger, 5/8-Inch Stud, Plain Cone	250
10438	Type G Single Curve Hanger, %-Inch Stud, Lock Cone	250
10441	Casting Only, for Single Curve Hanger	138
10442	Type G Double Curve Hanger, 5/8-Inch Stud, Plain Cone	300
10443	Type G Double Curve Hanger, 5/8-Inch Stud, Lock Cone	
10446	Casting Only, for Double Curve Hanger	200

TYPE G INSULATOR CAPS AND CONES 750 Volts



Made of O-B composition insulation and used interchangeably with Type G hangers and with all standard cap and cone hanger bodies of other makes.

Stud in cap is made of forged steel, hot-dip galvanized. The insulator cone is listed below both plain and recessed for use with steel lockwasher.

The lock cone prevents the cap from working loose in service when used with lockwasher. Lower face has a recess into which is molded a steel disc to provide bearing surface for a lockwasher.

Catalog Number	Description	Std. Pkg.	Net Wt. Lbs. per 100
5440	Insulator Cap, with 5%-Inch Stud	50	75
5441	Insulator Cone, Plain, for %-Inch Stud	50	26
5442	Insulator Cone, Lock, for %-Inch Stud	50	38



SINGLE AND DOUBLE CURVE PULLOVER YOKES Type A – Without Insulators



5%"

14072

14073

Type A-1 pullover yokes have clevis on each end. Opening in clevis is \Re_6 -inch, and will take any standard O-B Hi*Lite strain insulator. Furnished complete with clevis bolts and cotters.

Type A-2 pullover yokes have ³/₄-inch eye on each end instead of clevis and are intended for use with porcelain strain insulators, which are usually located far enough from the casting to avoid damage by wild trolley pole. This type is neater in appearance, is lighter in weight, and has fewer parts than the clevis type.

All parts are hot-dip galvanized.

Catalog Number	Description	Net Weight Lbs. per 100
12788 12790	Type A-1 – With Clevis Type A-1 Single Curve Yoke, 5⁄k x 2¼-Inch Stud Type A-1 Double Curve Yoke, 5⁄k x 2¼-Inch Stud Type A-2 – With Eye	
14072 14073	Type A-2 Single Curve Yoke, 5% x 21/4-Inch Stud Type A-2 Double Curve Yoke, 5% x 21/4-Inch Stud	

CATENARY CURVE PULLOVER For Shoe or Pantograph Operation

The versatile O-B catenary curve pullover Number 54520 can be used as a completely new installation or combined with single pullover yoke already in the air. A Type A-2 yoke at the top of the assembly is attached to the messenger wire with a clamp. An inverted Type A-2 yoke installed on the

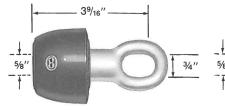
contact wire with a Type HS trolley clamp easily clears pantograph. Eyes of upper and lower yokes attach to the pullover wire by means of a cable looped through a strain insulator. A cable clamp between insulator and yoke eyes keeps the cable in proper alignment.

PULLOVER ASSEMBLIES

		I OLLOVEIT AGGEMIDELEG	
	atalog		Net Weight
N	umber	Description	Lbs. Each
54	4520-3001	Two Single Curve Pullovers, Clamp, 5/8-Inch Steel	
-			7 75
-		Stud, Strain Insulator, HS Trolley Clamp	7.75
54	4520-3002	enang, ie nien eteel etaal etaan niedlatelij	
		HS Trolley Clamp	4.65
		$\Pi $ $\Pi $ $\forall t \Theta $	
		1/4" Cable	
		C 1/4" Cable Clamp	
		() () () () () () () () () () () () () (
C	atalog		Net Weight
		Description	
		em Description	Lbs. Each
14	4072	A Single Curve Pullover	1.55
21	1550	3 Clamp	0.4
		C 5%-11 N.C. Steel Stud	1.0
31	1502	D Strain Insulator	1.25
19	9438	E HS Trolley Clamp	1.5
			Page

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DIRIGO STRAIN INSULATORS – 750 Volts





22479 - With 5%-Inch Boss and Eye

22481 -- With 5%-Inch Boss and Clevis

33/4"-

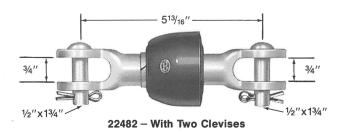


22478 – With Eye and Clevis

Use – For guy and span wire insulation, and may also be used for deadending.

Design Features – A complete line of strain insulators utilizing the O-B Dirigo spool insulator No. 16835 which has been used in many exacting industrial, mining and transit applications. This spool offers mechanical and electrical values greatly in excess of insulators previously used for this service.

Mechanical and Electrical Values – All Dirigo spools are given an electrical test of 16 000 volts. Mechanically, the strain insulator assemblies are rated at a minimum break-



51/2"

ß

22480 - With Two Eyes

3⁄4′′

ing strength of 10 000 pounds. The spool has a cantilever rating of 3000 inch-pounds. The maximum operating temperature is 250-degrees Fahrenheit. All insulators are subjected to routine tests to assure uniform quality.

Material—The basic spool insulator has a fixed 5%-inch stud on one end and a 5%-inch tapped boss on the other end. Removable eyes, clevises, and studs are used in the assemblies and can be ordered separately, which simplifies the stocking problem (if insulators with various combinations of fittings are frequently required).

Dirigo Strain Insulators

Catalog Number	Description	Net Weight Lbs. per 100
22479 In 22480 In 22481 In	sulator with Eye and Clevis sulator with %-Inch Boss and Eye sulator with Two Eyes sulator with %-Inch Boss and Clevis sulator with Two Clevises	126 166
5%" TAPPED BOSS 125/3; 125/3; 4 23%" 5%"-11 THD. U.S.	$\frac{34''}{16''}$ $\frac{98''}{11'+1'+1'}$ $\frac{34''}{11'+1'+1}$ $\frac{34''}{11'+1'+1'+1'+1}$ 2	— 1%" — ↓ 5%″ 2483 – Stud
16835 – Dirigo Insul		
	Parts	

Catalog Number	Description	Net Weight Lbs. per 100
15573	Clevis with Rivet and Cotter	50
15575	Eye	30
16835	Dirigo Insulator Only	95
22483	5% x 15∕8-Inch Stud	

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MARATHON TROLLEY EARS For Wheel Operation on Round Trolley Wire



The sides of the improved Marathon ear are machine tapered at each end to provide for smooth transition of the collector from wire to ear. Because of flat side lip construction, an exclusive O-B development, a smoother underrun can be obtained as the lips are more easily peened around the wire. This feature also improves side clearance.

Full lip section is retained in the underrun for over 50 per cent of the ear length, amply protecting the wire and

increasing the service life of the ear.

The ear is cast solid and the wire groove in the lips is accurately milled to size. The metal used is a high-grade bronze mixture. It is extremely tough, not brittle, and has exceptionally high strength and long life.

Size of boss, $\frac{5}{4}$ inch. Boss is $1\frac{1}{4}$ inches in diameter. Height, top of trolley wire to top of boss, $1\frac{7}{32}$ inches.

	Marathon Ears	
Catalog Number	Description	Net Weight Lbs. per 100
	Length 9 Inches	
14728	Bronze, for 0 Round Wire	70
14729	Bronze, for 2/0 Round Wire	75
	Length 12 Inches	
14441	Bronze, for 2/0 Round Wire	94
	Length 15 Inches	
14444	Bronze, for 2/0 Round Wire	106
14445	Bronze, for 3/0 Round Wire	125
14446	Bronze, for 4/0 Round Wire	131

MARATHON FEEDER EARS



The improved Marathon feeder ears are identical with the improved Marathon ears except for the feeder lugs. No. 14739 has a projection on the web with a $^{13}/_{32}$ " diameter hole to which a terminal connector can be bolted. For ear re-

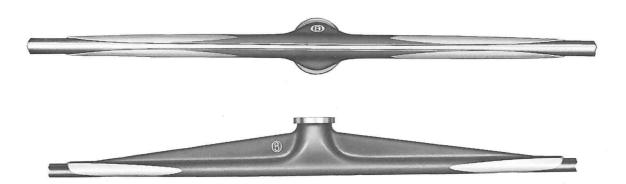
placement it is only necessary to remove the bolt and replace ear. This type ear provides an exceptionally good connection as it has a large contact surface. Marathon feeder ears are made in 15-inch length only.

Marathon Feeder Ears - Length 15 Inches

Catalog Number	Description	Net Weight Lbs. per 100
14739	Bronze, for 4/0 Round Wire	145



TYPE AS TROLLEY EARS For Carbon Shoe Operation on Round Trolley Wire Length – 15 Inches



Type AS ears are designed to provide the smoothest possible round wire suspension for carbon shoe operation. The low rate of wear which is characteristic of the carbon shoe collector permits comparatively thin lips with good side clearance. Lips are tapered on bottom and side for smooth and quiet transition for the shoe.

This length provides maximum protection to the trolley wire in straight-line operation. Size of boss, 5% inch. Made of bronze.

Catalog Number	Description	Net Weight Lbs. per 100
19448	Type AS Ears for 2/0 Round Wire	. 106
19449	Type AS Ears for 3/0 Round Wire	. 125
19450	Type AS Ears for 4/0 Round Wire	. 135

STRIPPING TOOL



Facilitates removal of ears from trolley wire. When pointed end is placed between wire and lips of ear, a few blows of a hammer will open lips sufficiently to strip ear from wire. Forged steel.

Catalog Number	Description	Net Weight Lbs. Each
8123	Stripping Tool	2.5

TYPE C TROLLEY WIRE SPLICERS For Wheel and Carbon Shoe Operation



Narrow underrun provides unusual clearance for collector. Lips are tapered for smooth approach and leave. Metal is so distributed that splicer is not top-heavy.

Installation is easy. Wire enters in straight line, without forming. Holes permit visual inspection to determine if wire

is properly seated against barrier at center of splicer.

Set-screws are set far enough apart to give plenty of wrench room. Size for 2/0 splicer, $3\% \times 7\%$ inch; for 3/0 and 4/0 splicers, $3\% \times 1$ inch. Can be used efficiently on either new or badly worn wire. Made of bronze. Length, 20 inches.

Catalog Number	Description	Net Weight Lbs. per 100
12473	For 0 and 2/0 Round and Grooved Wire	205
12474	For 3/0 Round and Grooved Wire	225
12475	For 4/0 Round and Grooved Wire	235
Can be suppl	ind for combinations of round and grooved wire	

Can be supplied for combinations of round and grooved wire.

TYPE C SPLICING EARS For Wheel and Carbon Shoe Operation



Similar to the splicer listed above except provided with a boss for attachment to a hanger. Made of bronze. Length,

21 inches; height over-all, 2 inches. Boss is 5% inch.

Catalog Number	Description	Net Weight Lbs. per 100
12478	For 0 and 2/0 Round and Grooved Wire	262
12480	For 3/0 Round and Grooved Wire	271
12482	For 4/0 Round and Grooved Wire	300
Can be sup	pplied for combinations of round and grooved wire.	

CLARK TROLLEY WIRE SPLICERS For Wheel and Carbon Shoe Operation



A strong, substantial design for railway service. Lips close tightly around wire and give a smooth underrun. Made of high-strength bronze. Distance between centers of wire openings at top, 5 inches. Length, 15 inches. Setscrews, $\frac{1}{2} \times 1\frac{1}{4}$ inches.

Catalog Number	Description	Net Weight Lbs. per 100
13200	For 0 and 2/0 Round and Grooved Wire	155
13201	For 3/0 Round and Grooved Wire	160
13202	For 4/0 Round and Grooved Wire	160



BULLDOG TROLLEY WIRE SPLICERS For Wheel, Shoe or Pantograph Operation



This splicer is designed to attach to the top lobe of grooved wire so perfect clearance is given for the collector.

To install, the wires are inserted from each end and then the set-screws are tightened as noted below. The outer screws are added to dampen vibration. The downward pressure of the set-screws is largely relieved by the angle setting. This splicer can be depended upon to hold permanently up to the breaking strength of either copper or the higher-strength bronze wires. rigidity of the lips which fit into the wire groove, a specially developed high-strength bronze alloy is used. This alloy also permits minimum weights which reduce hard spots.

Length of splicer, 10 inches. Holding set-screws, $7/_{16} \times 3/_{4}$ inch. Dampener screw, $1/_{4} \times 1/_{2}$ inch.

INSTALLATION NOTE: After seating on wire, tighten inner set-screw 1¹/₄ turns and outer set-screw 1 turn. Small stainless steel dampener screw should be tightened just enough to seat wire firmly in wire groove.

Since the holding power of this splicer is dependent on

Catalog Number	Description	Net Weight Lbs. per 100
16607	For 2/0 Grooved Wire	95
16608	For 3/0 Grooved Wire	98
16685	For 4/0 Grooved Wire	120
54944-3001	For Splicing 2/0 to 4/0 Grooved Wire	120

TYPE D TROLLEY WIRE SPLICERS For Wheel and Carbon Shoe Operation



Combines great strength and long life with good clearance for collector. Lips are side tapered for smooth underrun. Has strength sufficient to break any copper, alloy or steel trolley wire with which it can be used.

The ends of the wires are bent back over the splicer on

top and are always in sight for visual inspection from the ground.

Made of bronze. Distance between centers, wire openings at top of splicer, 2 inches. Length, 20 inches. Setscrews, $\frac{1}{2} \times 1$ inch.

Catalog Number	Description	Net Weight Lbs. per 100
13178 13179 13180	For 0 and 2/0 Round and Grooved Wire For 3/0 Round and Grooved Wire For 4/0 Round and Grooved Wire	260



O-B HIGH-SPEED SPLICER For Use With Grooved Wire For Pantograph



O-B's high-speed splicer for use with grooved wire is a device especially designed to provide high strength, smooth underrun, quick installation, longer life and improved operation of pantograph.

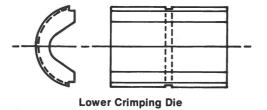
Installation is achieved by using O-B crimping dies listed below and an Alcoa Model 12A compressor or Burndy Model Y35 or Y39.

Installation forces hardened stainless steel pins into the wire to exactly the proper depth. Uniform penetration is obtained, at the same time maintaining the full section of the wire. Pins force the displaced metal to flow into the splice groove. Set screws at each end dampen vibrations.

Special high-strength bronze is used, with a mechanical ultimate greater than that of the highest strength bronze wire.

Models are available for 3/0, 4/0 and 300 MCM, 336.4 MCM and 350 MCM grooved wire. For satisfactory installation, it's important to use correct splicer for specific wire size.

Catalog Number	Description	Length Inches	Net Weight Lbs. Each
15889	High-speed Splicer for Use With 3/0 Grooved Wire	9	1.75
15890	High-Speed Splicer for Use With 4/0 Grooved Wire		
16146	High-Speed Splicer for Use With 300 MCM, 336.4 MCM and 350 MCM	10%	



Parts



Upper Crimping Die

Catalog Number	Description	Net Weight Lbs. Each

1-80



DETROIT CLAMPS For Shoe Collection or Pantograph

Trolley clamps are 17% inches high with 5%-inch boss. 4-inch clamps are equipped with three steel screws; 71%-inch clamps have four steel screws.

Number	Wire Size	Length Inches	Material	Net Weight Lbs. Each
13407	No. 6–No. 2			
	Round	4	Bronze	0.40
8912	No. 1, 1/0-2/0			
	Round	4	Bronze	0.44
8920	1/0-4/0 Grooved		Malleable	
	and Figure 8	4	Iron	0.57
10971	2/0-4/0 Grooved			
	and Figure 8	71⁄4	Bronze	1.00
10972	2/0-4/0 Grooved		Malleable	
	and Figure 8	71⁄4	Iron	0.92
13302	2/0-4/0 Grooved			
	and Figure 8	71⁄4	Bronze	1.15



Trolley Clamp with Boss



Feeder Clamp without Boss

B

TYPE-L2 HOLLOW-SCREW CLAMP For Trolley Wire



Two hollow screws tighten jaws which grip wire tightly. Jaws are 3-inches long, 1%-inches high, boss %-inch. Jaws and boss are cast of malleable iron, hot-dip gal-vanized. Hollow screws are made of bronze.

Number		et Weight .bs. Each
16227	2/0 to 6/0 Grooved, Figure	
	8 and No. 9 Section	. 0.49
16228	Hexagon Wrench	. 0.18



TYPE HS TROLLEY CLAMPS For Shoe Collector or Pantograph



A modern design for both tangent and curve employing tongue-and-groove construction for correct alignment of clamping pieces, which insures an even grip on the trolley wire the full length of each clamp. This construction permits working to closer tolerances on the clamp jaws to obtain a more effective fit in the wire grooves, resulting in higher strength, better side clearance and vertical alignment.

Clamps can always be installed from outside of the wires as screws with hex holes make it possible to insert the wrench from either end. The ⁹/₁₆-inch diameter bronze hollow screws have high gripping power. They are self-locking and will not loosen in service. Each end of the hex hole in the screw is countersunk to facilitate easy insertion of the wrench.

This clamp should not be used for trolley wheel operation as the open center is adapted only to shoe or pantograph collection.

Malleable iron, hot-dip galvanized. Overall length of end clamp castings, 4½ inches. Height overall, 1% inches. 5%-inch boss.

Catalog Number	Description	Net Weight Lbs. per 100
19438	Clamp, 12 Inches Long, for All Grooved Wire	150
19440	Clamp, 14 Inches Long, for All Grooved Wire	170
19442	Hollow-Screw Wrench	12

TYPE HS FEEDER CLAMPS For Shoe Collector or Pantograph Used With Types PH-1 and PH-7 Feeder Hangers



Same as Type HS trolley clamp except that one clamp casting is made of a high-conductivity bronze and is provided with a projection for bolting to feeder taps as listed on page 24.

TYPE HSP FEEDER CLAMPS For Shoe Collector or Pantograph Used With Types PH-4 and PH-5 Feeder Hangers



Same as Type HS trolley clamp except body casting is bronze for feeding through boss.

Catalog Number	Description	Net Weight Lbs. per 100
19439	Type HS Feeder Clamp, 12 Inches Long, 5%-Inch Boss	160
19441	Type HS Feeder Clamp, 14 Inches Long, 5%-Inch Boss	
21088	Type HS Feeder Clamp Casting with Lug	
19879	Type HSP Feeder Clamp, 12 Inches Long	
19880	Type HSP Feeder Clamp, 14 Inches Long	
19442	Hollow-Screw Wrench	

Clamps shown on this page can be supplied for any size or shape of trolley wire used in other countries.



TIPS FOR ENDS OF FROG AND CROSSOVER PANS

The Types T and TR tips fit the ends of all live frogs and crossovers and the clevis ends of live spacers. Bolts for attachment are not supplied as they are included with the clevis ends. The length of underrun of the Type T tip is 4³/₄ inches; Type TR, 7 inches.

> TYPE T TIP FOR GROOVED WIRE For Carbon Shoe and Pantograph



Type T tips anchor the wire against the wire-size runners of O-B special work, requiring no bend and holding the wire by its top lobe only. When installed, the running surface is smooth and continuous from plain wire to runner. No obstruction to the smooth passage of the collector is present, either in the form of projections below the wire or at the sides into the area of necessary side clearance. Not recommended for combined LRV and trolley coach operation. See listing of Type TR tip.

The tip casting is made of high-strength bronze. Two 7_{16} x 34-inch steel cup-point set-screws anchor the wire, and a 1/4 x 1/2-inch stainless steel set-screw at the end serves to dampen wire vibration.

Catalog Number	Description	Net Weight Lbs. per 100
16831	For 2/0 Grooved Wire	. 80
16832	For 3/0 Grooved Wire	. 80
18210	For 4/0 Grooved Wire	. 90

TYPE TR TIP FOR ROUND AND GROOVED WIRE For Carbon Shoe



A round wire tip must necessarily encircle the wire but, through special design, a smooth running surface and good side clearances have been maintained.

For combined LRV and trolley coach operation, in which side wear on wire and tip is severe due to the scraping action of the rigid LRV collector. The Type TR tip is recommended for use with grooved as well as round wire because the wire anchorage is well above the field of accentuated side wear.

The tip casting is made of tough, long-wearing bronze of exceptionally high strength. Two $^{7}/_{16}$ x 1-inch steel cuppoint set-screws anchor the wire.

Catalog Number	Description	Net Weight Lbs. per 100
19345	For 2/0 Round and Grooved Wire	. 165
19346	For 3/0 Round and Grooved Wire	. 165
18211	For 4/0 Round Wire	. 110



TIPS FOR ENDS OF NO-BO INSULATORS AND LIVE SPACERS

These fittings are similar to those in the preceding listing except that, in this case, they are of clevis design to engage the tongue ends of No-Bo insulators and live spacers. Type TC is for grooved wire only; Type TCR, for round and grooved wire. All are supplied complete with two steel clevis end bolts with nuts and lockwashers.

The length of underrun of the Type TC tip is 71/4 inches; Type TCR, 95/8 inches.

TYPE TC TIP FOR GROOVED WIRE For Carbon Shoe and Pantograph



Catalog Number	Description	Net Weight Lbs. per 100
17795 17796 17797	For 2/0 Grooved Wire For 3/0 Grooved Wire For 4/0 Grooved Wire	133

TYPE TCR TIP FOR ROUND AND GROOVED WIRE For Carbon Shoe

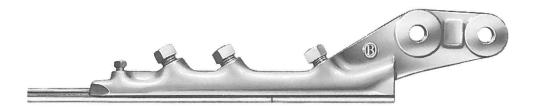


Catalog Number	Description	Net Weight Lbs. per 100
19347 19348 17800	For 2/0 Round and Grooved Wire For 3/0 Round and Grooved Wire For 4/0 Round Wire	. 215

Ohio Brass invites inquiries on tips to fit other wire sizes or wire other than American Standard. **Installation Note:** After seating on wire, tighten inner set-screw one and one quarter turns, and outer set screw one turn. Small dampener screw should be tightened just enough to seat wire firmly in wire groove. Lips of Types TR and TCR tips must be peened smoothly around the trolley wire.



TYPE TL TIPS For Grooved Wire For Carbon Shoe or Pantograph



The Type TL anchor tips for grooved trolley wire are similar to the Type T except they are long enough to permit insertion of a three-inch plug of free wire at the inner or pan end of the tip. This plug can be renewed at low cost when a worn fitting must be replaced, eliminating the necessity of splicing-in a new length of trolley wire. A set-screw is provided to seat the free wire firmly against lips of tip.

Tips are made of high-strength bronze. Underrun length is 7³/₄ inches. Set-screw for seating free wire is the same size as the anchor screws.

Catalog Number	Description	Net Weight Lbs. per 100
22433	For 2/0 Grooved Wire	. 122
22434 23720-3003	For 3/0 Grooved Wire For 4/0 Grooved Wire	

TYPE TCL TIPS For Grooved Wire For Carbon Shoe or Pantograph



The Type TCL anchor tips for grooved trolley wire are the same as the Type TL except they are of clevis design to engage the tongue ends of No-Bo insulators and live spacers. Underrun length is 8% inches.

Catalog Number	Description	Net Weight Lbs. per 100
	For 2/0 Grooved Wire For 4/0 Grooved Wire	





Lips are tapered at side and bottom to form a smooth, gradual approach and leave.

In installing, tips are placed upside down with ends pointing toward center of frog or other device. They are then forced over and down into position for peening lips around wire. Tips in 2/0 and 3/0 size only are equipped with side lugs which are bent back to engage lugs on the leg or runner of the overhead device, locking the tip in position. Thus locked, there is less chance of wire fatigue. Length of lips, 6 inches.

Catalog Number	Description	Net Weight Lbs. per 100
16521	For 2/0 Round and Grooved Wire	. 75
16522	For 3/0 Round and Grooved Wire	. 75
12581	For 4/0 Round and Grooved Wire	. 70

TYPE SR RENEWABLE BRONZE TIPS For Carbon Shoe Operation



Lips have a 3½-inch taper at side and bottom to provide an easy transition of the carbon shoe from wire to runner. Narrow cross section affords ample side clearance. Construction of lips makes smooth peening possible and easy.

The Type SR tip is attached to the clevis end of runner by two $^{7}/_{16}$ x 1½-inch bolts. The tip is first installed in an upright position by the back bolt. It is then turned down over the wire, forcing the wire into the bottom of clevis groove on

the familiar cam principle, after which the other bolt is inserted and the lips peened around the wire. In this rugged design all up and down movement of the tip is eliminated. Wire vibration is absorbed in the limited flexibility afforded by the tip body and is not concentrated at any one point.

Length of lips, 8 inches. Bolts for attachment are supplied with the overhead devices with which the Type SR tip is used.

Catalog Number	Description	Net Weight Lbs. per 100
20748	For 2/0 Round and Grooved Wire	130
20652	For 3/0 Round and Grooved Wire	125
20749	For 4/0 Round and Grooved Wire	120



TYPE T STRAIN CLAMPS For Wheel, Shoe or Pantograph



Single



Double, with Boss

The Type T single strain clamp is used to anchor wire in one direction only. Double clamp is used to anchor wire in both directions.

High-strength bronze jaws clamp on the upper lobe of grooved trolley wire with hollow bronze screws. The trolley wire is then anchored with $\frac{7}{16} \times 1^{34}$ -inch steel set-screws, which work on the same principle as a Bulldog splicer.

Length of wire groove: single clamp, 7¹/₄ inches; double clamp with boss, 12 inches. All clamps fit all grooved trolley wire.

Catalog Number	Description	Net Weight Lbs. per 100
16907	Type T Single Strain Clamp	
17700 19442	Type T Double Strain Clamp with 5%-Inch Boss	



TROLLEY WIRE DEADEND CLAMPS



For deadending round or grooved contact wire. Made of bronze with stainless steel chuck for holding wire in place. Chuck is serrated on inside to give grip on wire and tapered on outside to fit into a tapered hole in body. Clevis fitted with $\frac{1}{2}$ -inch rivet, hot-dip galvanized, and cotter. Clevis opening, $\frac{13}{16}$ inch.

Catalog Number	Description	Net Weight Lbs. per 100
15961	For 3/0 Round Wire	
15962	For 3/0 Grooved Wire	115
15963	For 4/0 Round Wire	115
15964	For 4/0 Grooved Wire	115

WEDGE GRIPS



Wire is held firmly by two wedges, although it may be released by a few blows on outer end of wedges. Opening in clevis, $^{11}/_{16}$ inch. Diameter rivet, $\frac{5}{16}$ inch. Will take 0 to $\frac{4}{0}$ round or grooved wire or $\frac{5}{16}$ to $\frac{1}{2}$ -inch strand.

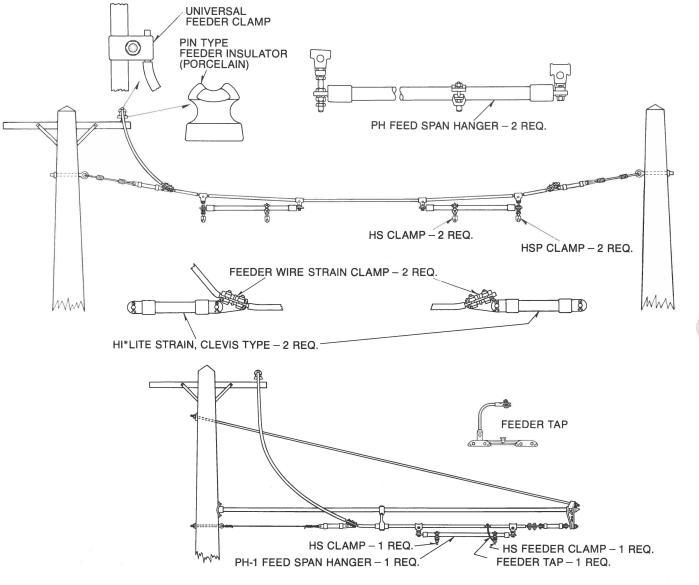
Catalog Number	Description	Net Weight Lbs. per 100
12634	Malleable Iron, Hot-Dip Galvanized	210



MATERIALS FOR FEEDER CONSTRUCTION

Feeder cables are heavy and bulky. Their installation is greatly improved and simplified by the many ingenious O-B fittings intended for this class of service. Both appearance

and performance are enhanced by use of these specialized feeder materials.





Low-cost installation, low maintenance and good appearance feature this type of hanger, which utilizes the feeder cable as the supporting span.

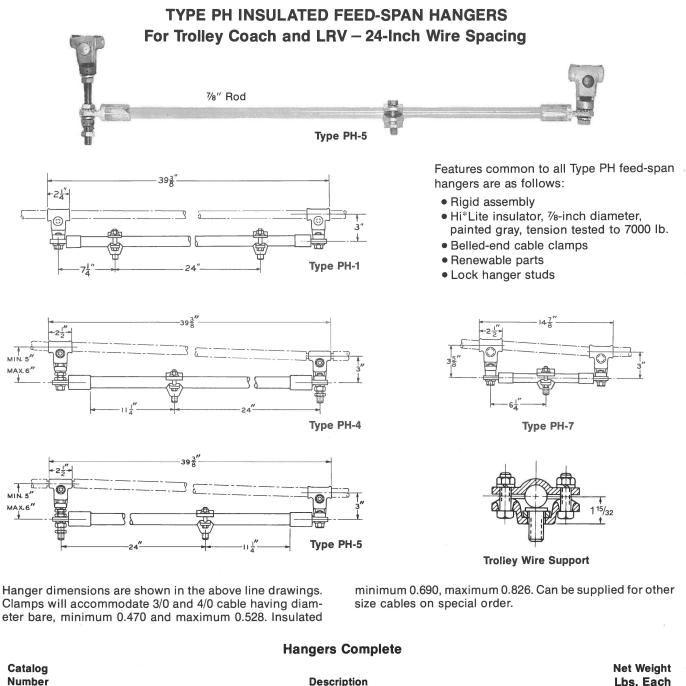
Electrical feeding of the group classified as Types PH-4 and PH-5 is accomplished by a bronze clamp attached to the bared feeder cable from which current flows to the trolley wire through a bronze stud and the Type HSP feeder clamp listed on page 15. The other cable clamp is malleable iron and fits over the cable insulation. Insulation between polarities consists of the cable insulation and approximately 10 inches of fiberglass. The negative clamp and stud assembly is adjustable to compensate for span sag and insure horizontal and vertical alignment of trolley wires. The Type PH-1 is used tor suspending and insulating trolley wires from the feeder cable span of pole brackets, providing a uniform separation of trolley wires from end of bracket for both positive and negative feed points. Electrical feeding with this type hanger is through a feeder tap as shown on page 24 and the Type HS feeder clamp shown on page 15. Because the span is short, no adjustment for angularity is provided.

Type PH-7 is for the suspension of single trolley wires from negative feeder cable where LRV are operated between trolley coach lanes. It is designed to compensate for span sag. Supplementary insulation, such as the insulating unit No. 16835, is recommended for this hanger.

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MIN



Number	Description	Lbs. Each
54999-3001	Type PH-1, Non-Adjustable, Positive or Negative, for Trolley Coach	6.1
54937-3001	Type PH-4, Adjustable, Positive, for Trolley Coach	6.8
54936-3001	Type PH-5, Adjustable, Negative, for Trolley Coach	6.8
55011-3001	Type PH-7, Adjustable, for LRV	5.0
	-	

Parts

54980-6385	Hi*Lite Insulator Only for Types PH-1, PH-4 and PH-5 Hangers	
54980-6125	Hi*Lite Insulator Only for Type PH-7 Hanger	1.7
19873	Cable Clamp Complete, M.I.Galv., for insulated Cable 0.690 to 0.826-In. O.D.	1.0
19914	Cable Clamp Complete, Bronze, for Bare Cable 0.470 to 0.528-In. O.D.	1.2
54962-3003	Trolley Wire Support Assembly	1.0
21418	Stud Assembly, Bronze – 31/4 Inches for Type PH-4	0.4
21417	Stud Assembly, Bronze – 6 ³ /16 Inches for Type PH-5	0.7



MATERIALS FOR FEEDER CONSTRUCTION

FLEXIBLE FEEDER TAP



A ready-made feeder tap consisting of a rubber insulated flexible cable which has a bronze clamp on one end for attachment to the feeder, and a copper terminal at the other end to engage the lug of a feeder ear. This terminal is provided with a bolt and lockwasher. Cable is cold pressed into the terminals, which insures good conductivity. The clamp will accommodate feeder ranging from 2/0 to 4/0 in size.

Advantages over the usual field make-up are a more

uniform and reliable feed-in connection, better appearance, longer life, and a saving in installation time. The tap is for use only in conjunction with O-B feeder span construction illustrated on page 22, and Type PH feed span hanger listed on page 23. This tap, however, can be made to order in any length desired.

Length, from center of terminal bolt to center of feeder wire. 14 inches.

Tap is complete with terminal bolt, nut and lockwasher.

Catalog		Net Weight
Number	Description	Lbs. per 100
17708	3/0 Super-Flexible (App. 4200 Wires)	165



UNIVERSAL FEEDER CLAMPS For Combinations from 2/0 to 1 000 000 Cmil

In this design, one pair of clamp castings serves as an efficient mechanical tap between all sizes of main-line and cross-span solid or stranded feeder within the range from 2/0 to 1 000 000 Cmil. For some of the combinations of small feeders, one casting must be turned end for end.

Careful consideration has been given to the current-carrying capacity of these clamps, not only in the bronze alloy selected but in the heavy sections and the provision of a 1/2 x 21/2-inch steel bolt with lockwasher to insure a tight joint.

Clamping length, 1¹/₂ inches. See illustration on page 22 for application.

Catalog Number	Description	Net Weight Lbs. per 100
18547	Universal Feeder Clamp for all combinations from 2/0 to 1 000 000 Cmil	. 110





17707

FEEDER-SPAN SUPPORTS

These supports were designed for the type of cross-span feeder construction employing parallel support and feeder spans. They also have been found useful for many special applications in supporting and insulating a lead cable from a parallel span wire.

Diameter of hole in spool is 7/8 inch. The clamp accommodates 1/4-inch to 3/8-inch span wire. Support No. 17706 is generally used in cross-span feeder construction.

Castings are of malleable iron. All metal parts are hot-dip galvanized.

Catalog Number

17706

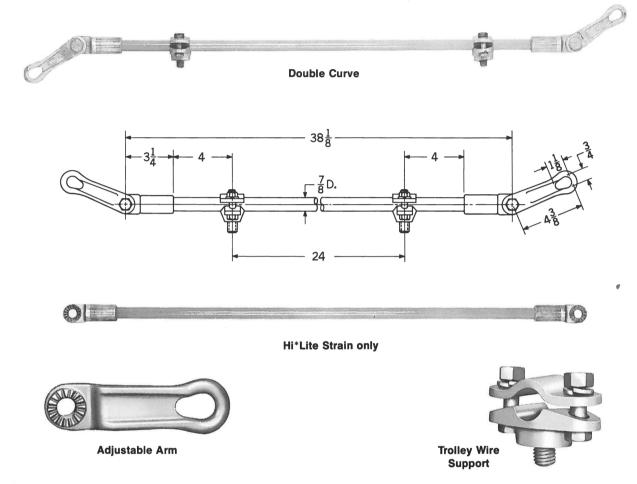
Number	Description	Lbs. per 100
	Insulated Feeder Support, 3-inch Cable Separation, Complete	
17707	Split Porcelain Spool Only (Two Halves)	35

THE OHIO BRASS COMPANY

Net Weight



TYPE PH CURVE HANGER ASSEMBLIES WITH ADJUSTABLE ARMS 24-Inch Wire Spacing



The Type PH curve hanger assembly is equipped with separable, adjustable pulloff arms. The serrated eye to which this arm attaches is an integral part of the Hi*Lite strain end casting.

The trolley wire supports are made in two pieces so they may be removed and reused if the insulating member is broken. %-inch hanger studs are centered under the insulating member and are provided with lockwashers so that a tight joint can be maintained between the ears and supports. Single-curve hangers are identical to the double hangers except that one adjustable arm is omitted.

The Hi*Lite insulation between the positive and negative wires is 24 inches. Adjustable arm and end castings are malleable iron. All metal parts are hot-dip galvanized. Insulating members are painted gray for maximum weather protection.

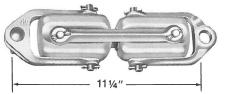
The Hi*Lite strain insulator is tension proof tested to 7000 pounds.

Hanger Assemblies Complete

Catalog Number	Description	Net Weight Lbs. per 100
54962-3001	Double Curve	
54962-3002	Single Curve	543
	Parts	
54986-4001	Adjustable Arms Only	
54980-6385	Hi*Lite Strain Insulator Only	300
54962-3003	Trolley Wire Support Assembly	100



TYPE JB PORCELAIN STRAIN INSULATOR ASSEMBLIES





Clevis Fitting 15278

Insulator Assembly 15277





Intermediate Fitting 15280

Design Features – Consists of two Type JB wet ware porcelain insulators (31504) interlocked with an intermediate fitting. Flexible bronze saddles are provided for use between bolts and insulators to increase the bearing area and distribute the strain evenly.

Material – Clevis with $^{13}/_{16}$ -inch opening; $\frac{5}{16}$ -inch steel rivet and eye fitting with $^{11}/_{16}$ -inch eye are made of malleable iron. All parts are hot-dip galvanized.

Catalog Number	Description	Net Weight Lbs. Each
15277	Insulator Assembly Complete	7.3
15278	Clevis Fitting Only	1.3
15279	Eye Fitting Only	1.0
15280	Intermediate Fitting Only	1.8

TYPE JB STRAIN INSULATORS

Type JB strain insulators are made of the highest grade wet ware porcelain. They are rugged and not susceptible to mechanical breakage. Holes are straight, making assembly easy even with stiff guy strand.

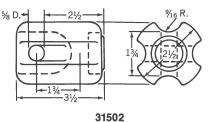
Mechanical strength ratings are values developed with hard drawn copper or mild steel cable.

Type of strand and method of attachment will have a marked influence on the strength developed.

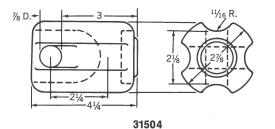
These insulators are intended primarily for guy or span wire insulation. They may also be used for low-voltage deadends.

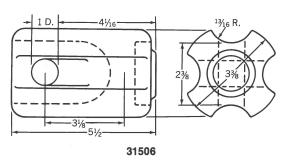


Catalog Number	31502	31504	31506	
Dry Flashoverkilovolts	25	30	35	
Wet Flashoverkilovolts	14	16	18	
Leakage Distanceinches	15⁄8	17⁄8	21⁄4	
Rated Ultimate Strengthpounds	10,000	12,000	20,000	
Packed Weight per 100pounds	125	200	375	
No. in Standard Package	50	50	25	



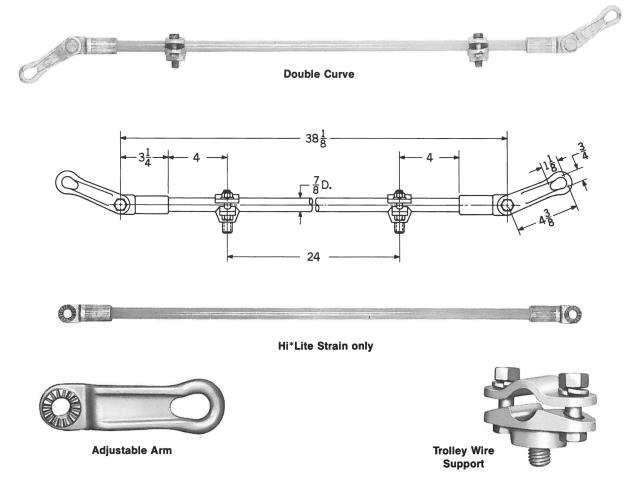








TYPE PH CURVE HANGER ASSEMBLIES WITH ADJUSTABLE ARMS 24-Inch Wire Spacing



The Type PH curve hanger assembly is equipped with separable, adjustable pulloff arms. The serrated eye to which this arm attaches is an integral part of the Hi*Lite strain end casting.

The trolley wire supports are made in two pieces so they may be removed and reused if the insulating member is broken. 5%-inch hanger studs are centered under the insulating member and are provided with lockwashers so that a tight joint can be maintained between the ears and supports. Single-curve hangers are identical to the double hangers except that one adjustable arm is omitted.

The Hi*Lite insulation between the positive and negative wires is 24 inches. Adjustable arm and end castings are malleable iron. All metal parts are hot-dip galvanized. Insulating members are painted gray for maximum weather protection.

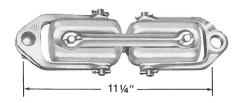
The Hi*Lite strain insulator is tension proof tested to 7000 pounds.

Hanger Assemblies Complete

Catalog Number	Description	Net Weight Lbs. per 100
54962-3001	Double Curve	600
54962-3002	Single Curve	543
	Parts	
54986-4001	Adjustable Arms Only	57
54980-6385	Hi*Lite Strain Insulator Only	300
54962-3003	Trolley Wire Support Assembly	100



TYPE JB PORCELAIN STRAIN INSULATOR ASSEMBLIES



Insulator Assembly 15277

Eye Fitting 15279



Clevis Fitting 15278

Intermediate Fitting 15280

Design Features – Consists of two Type JB wet ware porcelain insulators (31504) interlocked with an intermediate fitting. Flexible bronze saddles are provided for use between bolts and insulators to increase the bearing area and distribute the strain evenly.

Material – Clevis with ${}^{13}\!/_{16}$ -inch opening; 5_{8} -inch steel rivet and eye fitting with ${}^{11}\!/_{16}$ -inch eye are made of malleable iron. All parts are hot-dip galvanized.

Catalog Number	Description	Net Weight Lbs. Each
15277	Insulator Assembly Complete	7.3
15278	Clevis Fitting Only	1.3
15279	Eye Fitting Only	1.0
15280	Intermediate Fitting Only	1.8

TYPE JB STRAIN INSULATORS

Type JB strain insulators are made of the highest grade wet ware porcelain. They are rugged and not susceptible to mechanical breakage. Holes are straight, making assembly easy even with stiff guy strand.

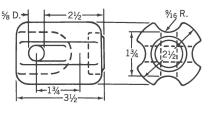
Mechanical strength ratings are values developed with hard drawn copper or mild steel cable.

Type of strand and method of attachment will have a marked influence on the strength developed.

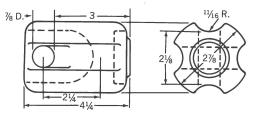
These insulators are intended primarily for guy or span wire insulation. They may also be used for low-voltage deadends.



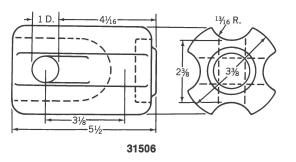
Catalog Number	31502	31504	31506
Dry Flashoverkilovolts	25	30	35
Wet Flashoverkilovolts	14	16	18
Leakage Distanceinches	15⁄8	17⁄8	21⁄4
Rated Ultimate Strengthpounds	10,000	12,000	20,000
Packed Weight per 100pounds	125	200	375
No. in Standard Package	50	50	25











Page 26 Catalog 76

LOW-VOLTAGE FEEDER DEADEND CLAMP AND FEEDER STRAIN CLAMP ASSEMBLIES

The feeder deadend clamp assembly is for use with lowvoltage feeder cables, concentric or rope lay, of any size between 4/0 and 1 000 000 Cmil. Its compactness permits installation from pole, making the use of ladders or staging unnecessary. Design allows easy disassembly or assembly in the field. Made in two sizes, for 500 000 to 700 000 Cmil and 750 000 to 1 000 000 Cmil respectively.

Feeder cable may be cut off and deadended in the deadend clamp, or carried through for jumper connection to another feeder below or on either side, or above by using the strain clamp.

Clamp clevis of the deadend assembly is in line with center of cable. This permits a straight pull from feeder to pole or other structure and avoids any kinking or bending of cable under strain. An eye placed at outer end of the clamp provides for pulley block attachment to facilitate installation.

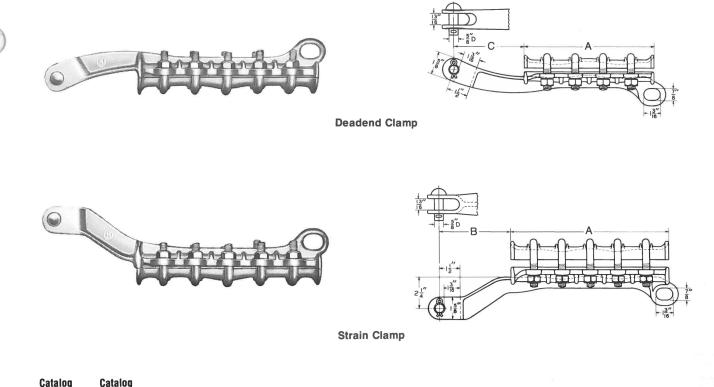
Slip strength values of both deadend and strain clamps are, in order of size, 4000, 7000 and 9000 pounds. Ultimate strength of insulation, either fiberglass or porcelain, exceeds 9000 pounds.

Insulation may be either porcelain or Hi*Lite. Hi*Lite insulation consists of a single fiberglass strain insulator, eye and clevis type, with five inches of clear insulation.

The porcelain insulator assembly consists of two interlocked wet ware porcelain strain insulators, and an eye fitting for attachment to clevis of clamp, an intermediate fitting between the insulators, and a clevis fitting for attachment to eyebolt in supporting structure. Flexible bronze saddles are furnished with each fitting for insertion between bolts and insulators, increasing the bearing area and distributing the strain evenly.

Clamp and fittings are of malleable iron, hot-dip galvanized.

The feeder strain clamp assembly differs from the deadend assembly only in having the clevis end of the clamp offset, permitting the feeder to be carried straight through so the clamp may be used in a strain or semitension position.



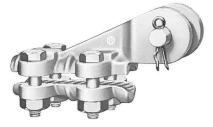
Number Deadend			ns	Cable Size Cir. mils		Cable Diameter Inches		Number of	Net Weight Lbs. per	
Clamp	Clamp	Α	В	C	Minimum	Maximum	Minimum	Maximum	U-Bolts	100
	16164	73⁄4	51⁄8		4/0	350 000	0.52	0.69	3	500
15275	15332	91⁄4	51⁄8	51⁄8	500 000	700 000	0.70	0.97	4	740
15276	15333	11¼	51⁄8	51⁄8	750 000	1 000 000	0.97	1.16	5	930



FEEDER WIRE STRAIN CLAMPS



Strain Clamp with Eye



Strain Clamp with Clevis

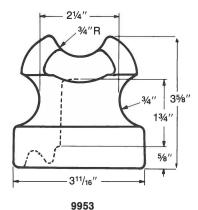
Each half has spiral grooves corresponding to the arrangement of the cable strands, giving great holding power. Hole in eye, ¹¹/₁₆-inch diameter. Thickness of eye, ⁷/₁₆-inch. Clevis

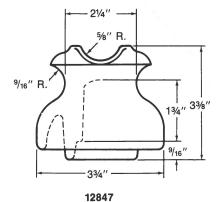
opening, ³/₄-inch. Rivet, ¹/₂-inch x 1³/₄-inches. Length jaws, 3¹/₂ inches. Malleable iron. All parts are hot-dip galvanized.

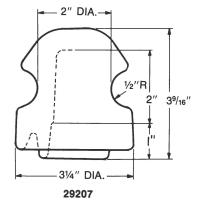
By the use of clamp No. 10571, it is possible to carry a cross-span feeder up to the main feeder, as shown in the illustration on page 22, eliminating one tap.

Catalog	Description	Net Weight
Number	Strain Clamp with Eye	Lbs. per 100
10571 10572 20556	For No. 1/0 Solid to 500 000 Cmil Bare Stranded Cable For 500 000 to 1 000 000 Cmil Bare Stranded Cable For 1 250 000 to 1 590 000 Cmil Bare Stranded Cable	260
	Strain Clamp with Clevis	
22798	For No. 1/0 Solid to 500 000 Cmil Bare Stranded Cable	200
22799	For 500 000 to 1 000 000 Cmil Bare Stranded Cable	285
22800	For 1 250 000 to 1 590 000 Cmil Bare Stranded Cable	450

SMALL PINTYPE INSULATORS 7200-Volt Typical Application







Catalog Number

129/7

20207

0052

CHARACTERISTICS

CHARACTERISTICS	9923	12047	29207	
Dry Flashoverkilovolts	50	50	35	
Wet Flashoverkilovolts	25	25	20	
Leakage Distanceinches	4	5	4	
Dry Arcing Distance inches	31⁄4	33⁄8	21⁄4	
Mechanical Strength, Approximate pounds	3000	2500	3000	
Diameter of Pin Hole, Porcelain Threadinches	1	1	1	
Minimum Length Pin inches	4	4	4	
Net Weight per 100 pounds	170	145	120	
Packed Weight per 100 pounds	180	156	130	
Number in Standard Package	50	50	50	

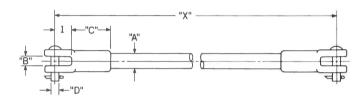


HI*LITE STRAIN INSULATORS

The Hi*Lite strain insulators are made with the same highquality epoxy-fiberglass rod used in O-B's high-voltage line of insulators. The eye and clevis ends are of malleable iron. The tapped ends are of cold drawn steel. All end fittings are hot-dip galvanized. The end fittings are swaged to the ends of the fiberglass rod. After assembly, the exposed fiberglass rod is coated with gray alkyd paint for protection from weather. Both %-inch and %-inch rod are used. The %-inch is used in proximity to frogs and crossovers for greater impact resistance to flying trolley poles. Both sizes are prooftested to 7000 pounds tension. Units can be furnished in virtually any length; however, the minimum recommended insulating length is 5 inches for 600-V to 750-V trolley systems.

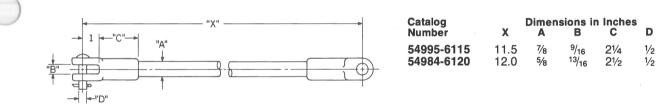
To order, specify catalog number, length X in inches, and end fitting combination. The X lengths listed below are minimum, and longer lengths can be ordered.

TWO CLEVISES IN SAME PLANE

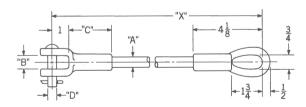


Catalog Number	x	Dimens A	sions in B	Inches C	D	Wt. Lbs. Per 100
53693-3001	261/2	5⁄8	¹¹ /16	25/8	3⁄4	260
53693-3002	211⁄4	5⁄8	^{11/} 16	25/8	3⁄4	210
54960-6115	11.5	7⁄8	9/16	21⁄4	⁷ /16*	261
54975-6120	12.0	7⁄8	¹³ /16	21/2	1/2	261
54985-6120	12.0	5⁄8	¹³ /16	21/2	1/2	198
*Bolt, Nut an	d Lock	washe	er			

TWO CLEVISES AT RIGHT ANGLES

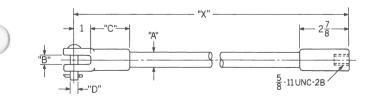


CLEVIS AND EYE AT RIGHT ANGLES



Catalog		Wt. Lbs.				
Number	X	Α	В	C	D	Per 100
54961-6128	12.8	5⁄8	^{13/} 16	21⁄2	1⁄2	146

CLEVIS AND TAPPED END



Catalog Number	x	Dimen A	sions ii B	s D	Net Wt. Lbs. Per 100		
54964-6111	11.1	7⁄8	^{9/} 16	21⁄4	1/2	208	
54983-6118	11.8	5⁄8	^{13/} 16	21⁄2	1/2	148	

Net

Net

Wt. Lbs.

Per 100

261

198



FLEXIBLE CURVE SEGMENTS

Curve segments simplify curve construction and improve overhead appearance by reducing the number of pulloffs required. Designs now available have increased their practical range of application to all curves including those of very long radius.

Flexibility

All O-B curve segments have a flexible end construction to enable the segment to conform to slight variations in angularity which may develop in construction or result from wire shifting. This feature has real value as it helps to maintain a smooth approach and avoid a sharp transition of the shoe collectors, as would be the case if absolute rigidity is maintained to the end of the segment. And change of direction would then come in the trolley wire where a sharp bend would occur. The necessity of end pulloffs for alignment is eliminated.

Renewability

All parts of O-B segments: strain plates, strain bars, runners, guards, Hi*Lite strains and tips are renewable. In the event of wear or damage on any part, it can be replaced without the necessity of renewing the assembly, a saving in time and cost.

Application

The Type C-2 segment is generally favored within the angle range from 13 to 47 degrees. Its outstanding advantages are ease of installation and adjustability which enable two segments to cover the entire range of angularity from 13 to 47 degrees. The number of stock items is reduced and the range of application greatly increased.

Of the clamp segments Type DL and Type DR, those in the lower angle range up to and including 13 degrees have had the widest application. For the higher speeds which are usually obtained on long radius-low angle curves, the smooth underrun of the clamp-type segment is desirable. The long runner length per degree of curvature of these segments provides assurance of dependable operation.

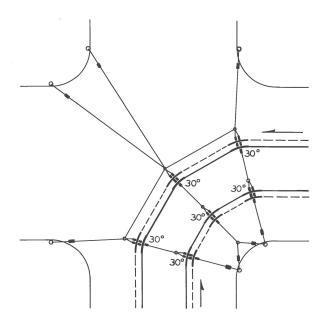
Types C-2, DL and DR segments provide an ample factor of safety for the maximum speed at which coaches may operate within the limits set by the comfort and safety of passengers and city traffic regulations.

	lange		11310113						
A A A = Tangent Dimension B = Angle of Segment									
Type of Segment C-2 DR	10 35.97 54.15	15 48.17 54.33			Dimensions egree Inter 30 55.13 55.26		40 56.17 56.29	45 56.83 56.96	
DL				2 9.03		ent Dimen n 2 Degree 6 27.02	sions Intervals 8 36.05	10 45.13	
*For intermediate angles, proportion	al dimens	ions will b	e sufficien	tly accura	ate for prac	ctical appli	cation.		

Tangent Dimensions



TYPICAL CURVE SEGMENT APPLICATIONS For Trolley Coach



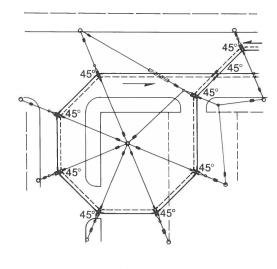


Figure 2 A closed loop made of eight 45-degree units.

Figure 1

A simple two-way curve with six 30-degree units.

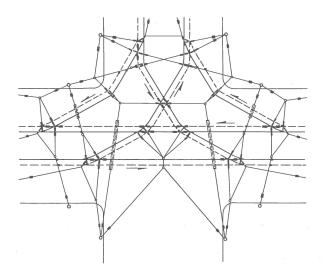
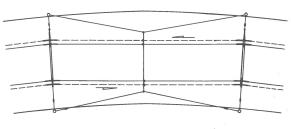


Figure 3

A typical intersection layout using 30-degree segments.

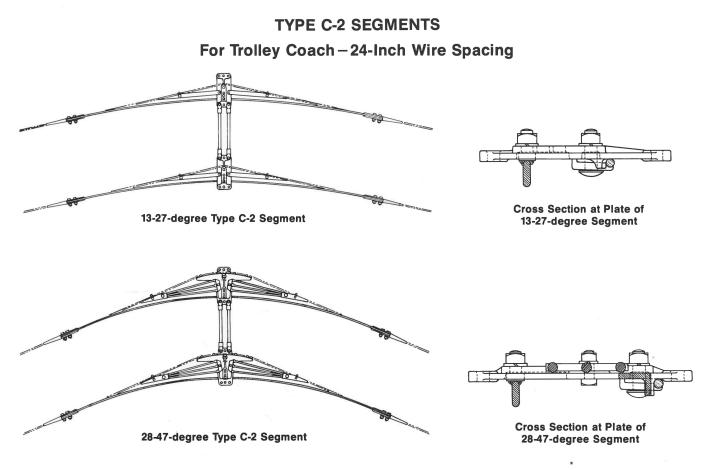




Low-angle curve segments. Complete data are not available as to the maximum distance apart curve segments can be placed on long-radius curves. Observation discloses, however, that longitudinal spans greater than 70 feet oscillate transversely to the extent that trolley wire fatigue may occur near, or at ends, of curve segment runners. Steady or dampener spans, as shown in the illustration above, are frequently inserted between curve segments to break up harmonic vibrations. These spans are not located centrally but are a few feet off center.

360





Type C-2 segments provide dependable operation at the comparatively high speeds necessary for revenue routes. In addition to this fundamental requirement, they are light in weight and easy to install.

The light weight of the Type C-2 segment is accomplished largely by carrying the trolley wire through without cutting, utilizing the wire as a strain member. This construction eliminates the heavy struts which are otherwise necessary and simplifies adjustment for alignment. Bronze approach tips of thin cross section are tapered to supply a smooth transition from wire to runner. The tip seats the wire firmly in the bottom of the clevis end by the familiar cam principle. It is first attached in an upright position at the inner bolt, then rotated downward over the wire and outer bolt installed. Lips are then peened around wire (Fig. 1).

Type C-2 segments are shipped in sections for ease in handling and installing. The assembly consisting of the strain plates and connecting Hi*Lite strain insulators (Fig. 5) is installed first. After the trolley wires are strung, tensioned and clamped to strain plates, the runners (Fig. 4) are bolted to the strain plates and attached to the wire. Anti-trapping guards (Fig. 6) are then attached. Any part of a Type C-2 segment may be renewed separately, reducing cost of maintenance.

Three sizes of the Type C-2 segment accommodate angles from 5 to 47 degrees. Adjustment is in 5-degree steps and intermediate angles are obtained by flexible end construction. Adjustment is obtained by attaching runners to holes in strain plates which are marked with the desired angle setting. This adjustable feature simplifies ordering and stocking and accommodates changes in angle which often become necessary during construction.

Type C-2 segments employ two Hi*Lite strain insulators between strain plates. Strain insulators for pulloff attachments to pole and between segments are not supplied as a part of curve segments. A double pulloff is recommended as providing a higher factor of safety.

Anchor adapters are used to anchor the trolley wire where it is necessary to attach a Type C-2 segment to a special work assembly. The adapter attaches to the clevis of the segment and is available with either a clevis end (Fig. 2) or a tongue end (Fig. 3).

Strain plates, clamps and anchor adapters are of malleable iron. Length wire seat of strain plate for 28- to 47degree segment, 18 inches; 13- to 27-degree, 4½ inches; 5- to 12-degree, 4¼ inches. Diameter pulloff eyes, $^{21}/_{32}$ inch. Runners are of flat steel bar $\frac{3}{4} \times 1\frac{3}{4}$ inches with rounded running surface. Clevis ends of runners are equipped with two $^{7}/_{16} \times 1\frac{1}{2}$ -inch steel bolts for attachment of trolley wire tips. All ferrous parts are hot-dip galvanized.

Hi*Lite members are painted gray for good appearance and maximum protection.



TYPE C-2 SEGMENTS



Figure 1

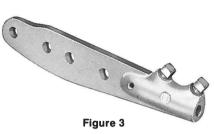
Type SR tip, designed to carry trolley wire straight through.

50



Figure 2

Clevis anchor adapter to join any tongue-end device.

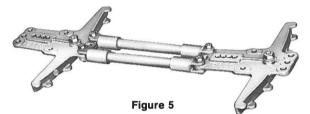


Tongue-end anchor adapter to join any clevis-end device.

and account of the

Figure 4

Replaceable runner for 28-47-degree segments. No other part but the runner need be changed in the event wear makes such replacement necessary.



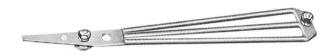


Figure 6

Plate assembly for 28-47-degree segment. This unit goes into the air first and becomes a permanent part of the overhead structure.

Anti-trapping guard. This guard is applicable to the 28-47-degree segment only.

Segments Complete

Catalog Number	Description	Degree Angle	Wire Size Round & Grooved	Runner Length* Feet	Net Wt. Each Lbs.
21370	Type C-2 Segment Complete with Tips		2/0	8	58
21372	Type C-2 Segment Complete with Tips	28-47	2/0	9	80
22079	Type C-2 Segment Complete with Tips		2/0	8	46
22301-3014	Type C-2 Segment Complete with Tips		4/0	8	46
22302-3005	Type C-2 Segment Complete with Tips		4/0	8	58
22303-3005	Type C-2 Segment Complete with Tips	28-47	4/0	9	80
	Runners Only, Complete With Clevis Bolts				
21375	Runner only without Tips (Fig. 4)	5-12		8	15
21376	Runner only without Tips (Fig. 4)			8	15
21377	Runner only without Tips (Fig. 4)			9	17
*Not includin	ig tips.				
	Other Parts				
20290	Strain Plate (Fig. 5)	5-12			7.0
20291	Strain Plate (Fig. 5)				7.0
20293	Strain Plate (Fig. 5)				
20294	Guard, R.H. (Fig. 6)				
20295	Guard, L.H. (Fig. 6)				1.5
20296	Guard, R.H. (Fig. 6)				5.0
20297	Guard, L.H. (Fig. 6)				
20748	Type SR Tip, 2/0 Rd. & Grvd., 8-inch Lips (Fig. 1)				1.3
20749	Type SR Tip, 4/0 Rd. & Grvd., 8-inch Lips (Fig. 1)				
54960-6160	Hi*Lite Strain Insulator (Fig. 5)				
54960-6175	Hi*Lite Strain Insulator (Fig. 5)				
	Adapters				
19434	Anchor Adapter with Tongue for 2/0 to 4/0 Rd. & Grvd. Wire (Fig. 2)				5.0
19435	Anchor Adapter with Clevis, Length of Underrun 37/8 inch				

Type C-2 Segments are also available for 3/0 round or grooved wire

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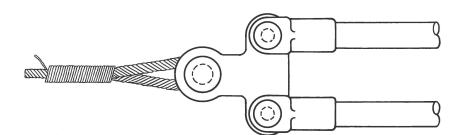


TYPE S INSULATOR YOKE



This yoke can be applied to advantage in installing all types of segments in span construction, attaching to the two outside pulloff Hi*Lite strains as shown in accompanying drawing. It serves to space these insulators apart, equalizing strain on each. Time required to install is reduced and appearance improved.

Diameter of pulloff eyes, ^{9/16} inch. Clevis opening, ^{13/16} inch. Spacing between centers of eyes, 2³/₄ inches. Casting is malleable iron. All parts are hot-dip galvanized.



Catalog Number	Description	Net Weight Lbs. Each
21089	Type S Insulator Yoke Complete with % x 2-Inch Clevis Bolt and ³ / ₁₆ x 1-Inch Cotter	1.5



CLAMP-TYPE CURVE SEGMENTS For Grooved Wire Only – 24-Inch Wire Spacing

O-B clamp-type curve segments attach to the upper lobe of grooved wire, leaving the lower lobe a free-running surface for the collector and providing a smooth, quiet underrun.

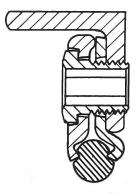
All parts of O-B clamp segments are separable and replaceable, a major convenience in installation, stocking and repairing. The runners have sufficient flexibility at the ends to compensate for small variations in angularities and to obtain alignment with trolley wires.

Strain insulators for pulloff attachment to pole or between segments are not supplied as a part of these segments. Double pulloff is recommended as providing a greater factor of safety.

Wire slings, No. 20659, replace clamps during stringing and tensioning of the trolley wire. Their use facilitates wire installation. They are not a part of the segment and must be ordered separately.

All metal parts are hot-dip galvanized. Insulating members are painted gray for good appearance and maximum protection.

Listing of runners covers angle-iron units only. Clamps must be ordered separately.



Cross Section View of Clamp



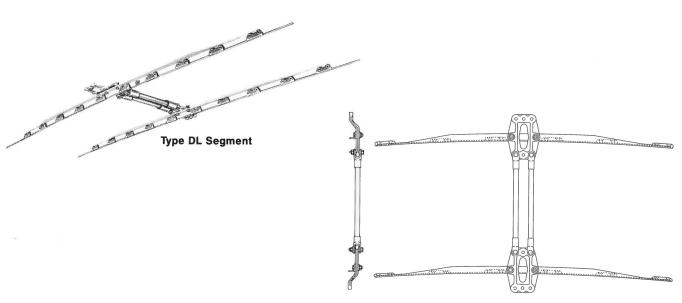
Wire Sling



CLAMP-TYPE SEGMENTS Type DL Segments – 2 Degrees to 10 Degrees

These segments have a length of nine inches per degree of curvature. They consist of formed lengths of steel angle iron to which are welded 5%-inch studs for bolting to the strain plates; high-strength bronze clamps 334 inches long, which attach to the angle iron and to the trolley wire by means of two hexagonal-hole bronze hollow screws; mal-

leable iron strain plates and two Hi*Lite strain spacers. Angle iron is 1½ x 1½ x 3 /₁₆-inch for two-degree angle only. For all other angles of these segments, 1½ x 1 /₂ x 3 /₁₆-inch angle iron is employed. Pulloff holes in strain plates are 9 /₁₆-inch in diameter.



Type DL Segment

TYPE DL SEGMENTS For 2/0 and 3/0 Grooved Wire

Catalog Number		Runner		No. Clamps	Net Weight Lbs. Each	
	Runner	Length	Degree	per		Runner
Complete	Only	Inches	Angle	Runner	Complete	Only
20609	20600	18	2	3	20.0	2.2
20610	20601	27	3	4	22.0	2.8
20611	20602	36	4	5	25.0	4.0
20612	20603	45	5	6	28.0	5.0
20613	20604	54	6	6	30.4	6.2
20614	20605	63	7	7	33.6	7.4
20615	20606	72	8	8	36.4	8.4
20616	20607	81	9	9	39.6	9.6
20617	20608	90	10	10	42.8	10.8

Parts for Type DL Segments

Catalog Number	Description	Net Weight Lbs. per 100
54960-6175	Hi*Lite Strain Spacer, Clevis Each End	287
19772	Strain Plate	360
19774	Clamp Assembly, Complete with Hollow Screws	40
19637	Hex-Hole Hollow Screw, Diameter 9/16-Inch, Bronze	3
19442	Hollow-Screw Wrench	12
	Wire Sling	
20659	Steel, for All Clamp-Type Segments	16

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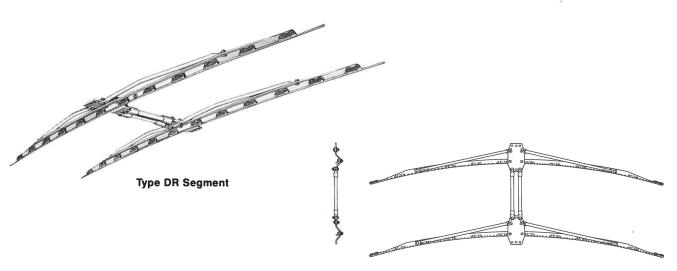


CLAMP-TYPE SEGMENTS Type DR Segments – 11 Degrees to 47 Degrees

The Type DR segments employ $1\frac{1}{4} \times 1\frac{1}{2} \times \frac{3}{16}$ -inch angle iron runners and are otherwise similar to the Type DL segments except that strain plate is of steel and strain bars are used to provide the necessary rigidity under load. Pulloff

holes in strain plate are ²¹/₃₂-inch diameter.

All Type DR segments are nine feet long and employ 12 clamp assemblies on each runner.



Type DR Segment

Catalog Number		Degree	Net Weight Pounds Each		
Complete	Runner Only	Angle	Complete	Runner Only	
20592	20584	11-13	73	13	
20593	20585	14-17	73	13	
20594	20586	18-22	73	13	
20595	20587	23-27	73	13	
20596	20588	28-32	73	13	
20597	20589	33-37	73	13	
20598	20590	38-42	73	13	
20599	20591	43-47	73	13	

Type DR Segments For 2/0 and 3/0 Grooved Wire

Parts for Type DR Segments

Catalog Number	Description	Net Weight Lbs. per 100
54960-6160	Hi*Lite Strain Spacer, Clevis Each End	
	with 7/16 x 2-Inch Hex-Head Machine Bolt, Nut and Lockwasher	280
20582	Strain Plate	800
20583	Strain Bar Assembly, ¾-Inch Pipe	
19774	Clamp Assembly, Complete with Hollow Screws	40
19637	Hex-Hole Hollow Screw, Diameter %16 Inch, Bronze	3
19442	Hollow-Screw Wrench	

Wire Sling

 20659
 Steel, for All Clamp-Type Segments
 16

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POLE BRACKETS Type B (Wood Pole) G **Uninsulated Guide Casting** B Е (For Strand) (For Eyebolt) Type BF (Wood Pole) **Insulated Guide Casting** ഫ С E G Type S (Steel Pole) **Uninsulated Guide Casting** В Type SF (Steel Pole) G **Insulated Guide Casting** D de c F

Types B, BF, S and SF pole brackets, in lengths not to exceed 20 feet, are suitable for the following types of trolley coach or LRV construction:

1. All tangent.

- 2. All conventional curve.
- 3. All segment used where pole is outside of curve.
- 4. All segment of 12-degree angle and lower used where pole is inside of curve and where tension of trolley wire does not exceed 3000 pounds, i.e., maximum compression load does not exceed 1200 pounds. If bracket length exceeds 16 feet, safe loading is 50 pounds less for each foot of additional length.

Page 38 Catalog 76



POLE BRACKETS

Brackets employ 1½- or 2-inch steel pipe with $7/_{16}$ - and ½-inch steel support rods. Each support rod is equipped with four nuts, one round washer and one beveled washer. The pole end of the rod has two inches of thread; the outer end, six inches. The pipe is held into a pole casting by the tension of the support rod and the lower support wire. Holes in the pole casting are for ½-inch lag screws, not supplied here. The lower support wire is recommended $5/_{16}$ -inch regular grade steel strand. No wire or cable is supplied. Eyebolts are equipped with nuts and washers. All castings are malleable iron. All ferrous parts are hot-dip galvanized.

The Types B and S brackets use an uninsulated guide casting. Types BF and SF brackets are similar except that an insulated guide is supplied to carry the feeder cable to the feed-in point. The insulated guide uses a split porcelain spool with a 7_{8} -inch hole diameter. Center of pipe to center of spool: for $1\frac{1}{2}$ -inch pipe, $6\frac{3}{8}$ inches; for 2-inch pipe, $7\frac{1}{4}$ inches.

To order, specify length of pipe arm. 2-inch pipe can be supplied in lengths from 10 feet to 16 feet in increments of one foot. $1\frac{1}{2}$ -inch pipe is normally supplied in 9- or 10-foot lengths.

Catalog Number	ltem *	Description	Net Weight Lbs. per 100
11810	A	Pole Casting for Wood Pole, 11/2-Inch Arm	152
11811	A	Pole Casting for Wood Pole, 2-Inch Arm	230
20087-300X	A	Pole Clamp for Steel Pole (Size to be specified on order) 2-Inch Arm only	
20876-300X	A	Pole Clamp for Steel Pole (Size to be specified on order) 11/2-Inch Arm only	
11816	В	Guide Casting Assembly, 11/2-Inch Arm	160
11817	В	Guide Casting Assembly, 2-Inch Arm	180
12591	С	Insulated Guide Assembly, 11/2-Inch Arm	198
12592	C	Insulated Guide Assembly, 2-Inch Arm	216
14244	D	Outer Span Holder for Eyebolt, 11/2-Inch Arm	188
14245	D	Outer Span Holder for Eyebolt, 2-Inch Arm	240
11821	D	Outer Span Holder for Strand, 11/2-Inch Arm	230
11822	D	Outer Span Holder for Strand, 2-Inch Arm	260
11933	E	Eyebolt Assembly, 1/2 x 6 Inches	50
21346	F	Eyebolt Assembly for Wood Pole, 1/2 x 16 Inches	120
24117-300X	F	Pole Clamp for Steel Pole (Size to be specified on order)	
11823	G	7/16-Inch Support Rod Assembly for Wood Pole, 10'6" for 9-Foot Arm	580
21042	G	1/2-Inch Support Rod Assembly for Steel Pole, 9'5" for 9-Foot Arm	550
11824	G	7/16-Inch Support Rod Assembly for Wood Pole, 11'6" for 10-Foot Arm	640
21043	G	1/2-Inch Support Rod Assembly for Steel Pole, 10'6" for 10-Foot Arm	600
21344	G	1/2-Inch Support Rod Assembly for Wood Pole, 13'8" for 12-Foot Arm	950
21044	G	1/2-Inch Support Rod Assembly for Steel Pole, 12'6" for 12-Foot Arm	700
21341	G	1/2-Inch Support Rod Assembly for Wood Pole, 14'8" for 13-Foot Arm	1030
21045	G	1/2-Inch Support Rod Assembly for Steel Pole, 13'7" for 13-Foot Arm	750
21343	G	1/2-Inch Support Rod Assembly for Wood Pole, 15'8" for 14-Foot Arm	1100
21046	G	1/2-Inch Support Rod Assembly for Steel Pole, 14'7" for 14-Foot Arm	800
21342	G	1/2-Inch Support Rod Assembly for Wood Pole, 16'9" for 15-Foot Arm	1160
21047	G	1/2-Inch Support Rod Assembly for Steel Pole, 15'8" for 15-Foot Arm	850
21345	G	¹ / ₂ -Inch Support Rod Assembly for Wood Pole, 17'9" for 16-Foot Arm	1230
21048	G	1/2-Inch Support Rod Assembly for Steel Pole, 16'8" for 16-Foot Arm	900

Parts

*Refer to page 38.

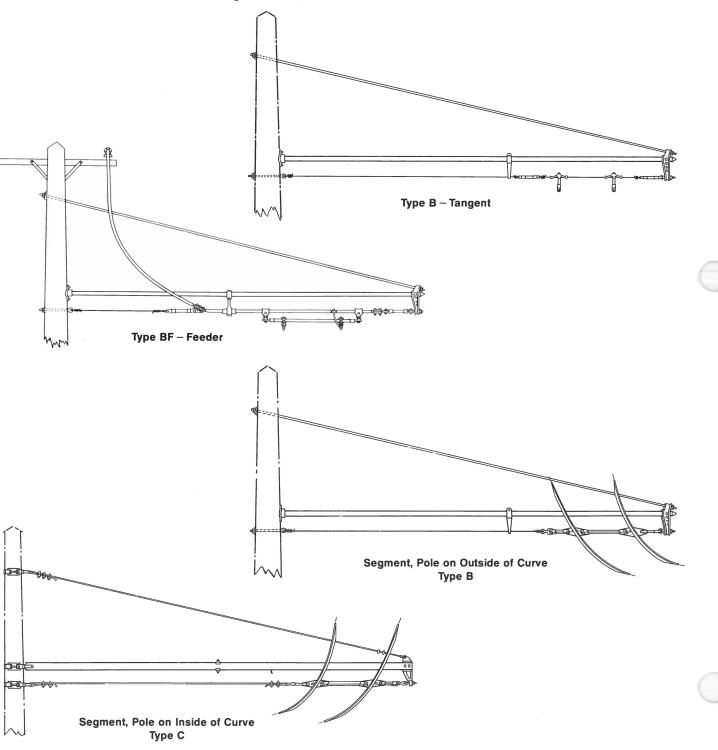


POLE BRACKETS

Pole brackets are used extensively in trolley coach overhead construction. Principal application is to one-way revenue loops and to exceptionally wide streets. The number of applications has increased with use and standard brackets are now available for tangent, feeder and both conventional and segment curve construction.

For appearance, and for reduction in weight and cost, the

spacing of trolley wires from the curb in bracket construction is usually less than in span construction. The majority of installations employ 14-foot brackets which spaces the positive wire approximately 11 feet from the curb. In most cases, this spacing is feasible because brackets are generally used in districts away from traffic congestion.





FEED-IN INSULATORS



For Pole Brackets – Long Spacing

For use on Type B pole bracket as insulated guide casting where feeder wire is carried through in place of ordinary strand.

Malleable iron castings are same length as bracket castings so that tap is carried across in a straight horizontal line. Metal parts are hot-dip galvanized.

Only one bolt is used to hold the two castings together. Installed easily and quickly. Insulation is split porcelain spool with hole 7/8-inch diameter.

Distance center pipe to center porcelain spool No. 12591, 6% inches; No. 12592, 7¹⁄₄ Inches.

Description

For 1½-Inch Pipe

For 2-Inch Pipe

Catalog Number

1	2591	
1	2592	



Catalog Number 4462 4463

For Pole Brackets – Short Spacing

Is shorter than the insulator listed above and carries feeder wire separately along pole bracket arm. Insulation is porcelain with an opening %-inch in diameter. Metal parts are hot-dip galvanized.

Distance center pipe to center spool: No. 4462, 21/4 inches; No. 4463, 21/2 inches.

Description	Net Weight Lbs. per 100
For 1½-Inch Pipe For 2-Inch Pipe	



Ν 3.

FEED-IN HANGER

This hanger will take wire up to 9/16-inch diameter. Lower face is 1%-inch diameter providing good contact with ear. Galvanized machine bolt, 5% x 134 inches. A 5%-inch lockwasher is provided.

Catalog Number	Description	Net Weight Lbs. per 100
197	Syracuse Feed-In Hanger, Bronze	85



Net Weight

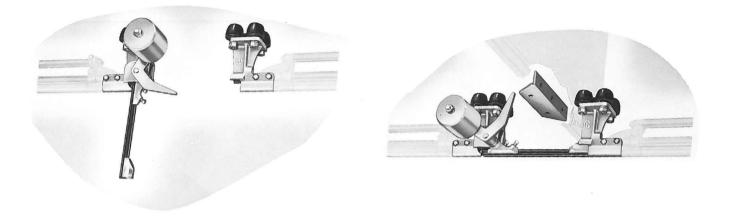
Lbs. per 100

198

216



DOOR ENTRANCE TROLLEY BRIDGE



Bridge open

This device bridges the gap in the trolley wire necessary for the opening and closing of rolling or sectional overhead doors. Applicable to all forms of electric transit operation employing overhead trolley wires.

Clevis ends are provided on support members for the attachment of No-Bo insulators Number 55025-3001 on page 44. Clevis end tips for anchoring the trolley wire to these insulators are listed on page 17. No-Bo insulators and anchor tips are not a part of this listing and must be ordered separately.

Inside the barn the movable runner, counter weight and trip lever are rigidly assembled to a shaft which rotates on needle bearings. Closing of door forces the runner into the open position. A trip plate, which fastens to the bottom of the door, trips lever as the door opens, returning runner to closed position. Underrun alignment is obtained by a

Bridge closed

wedge-shaped casting on the free end of the movable runner which centers in an opening in the outer support casting. Provision is made for oiling of bearings.

The movable runner is made from universal bar as listed on page 80. It is regularly supplied in 15%-inch length overall unless otherwise specified. Overall length of bridge complete is 25 inches. Height from bottom of underrun to top of insulating units is 8½ inches.

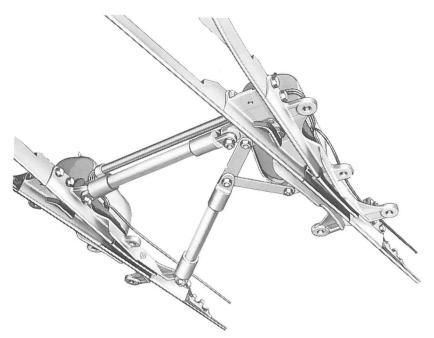
Four composition insulating units, %-inch tap and stud, Number 20560, page 4, are employed for attaching each support member to the barn structure. Center spacing of these units is 2% inches.

Support castings, runner end castings and trip lever are of malleable iron. Other metal parts are steel. Ferrous parts are hot-dip galvanized.

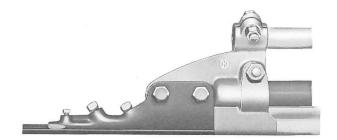
Catalog		Net Weight
Number	Description	Lbs. Each
22460	Door Entrance Trolley Bridge	. 58
24001-3002	Bearing End Assembly, without insulators or weight	
24001-3003	Runner End Assembly, without insulators	. 6
24001-3004	Runner Assembly	. 2



NARROW UNDERRUN SPECIAL WORK



Illustrating the smooth, level underrun of an O-B electric frog assembly. Note how the underrun forms a continuous level path for the trolley coach current collectors throughout the assembly. There are no high or uneven spots at points where trolley wires and spacers are joined to the frog pans.



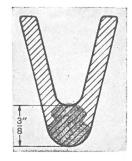
Transition from wire to special work devices is accomplished by standard anchor tips. Note how the underrun of the No-Bo insulator conforms in size and shape to the trolley wire.

O-B narrow underrun trolley coach overhead fittings have brought a high degree of operating efficiency to modern carbon shoe current collection. The underruns of all special work devices simulate closely the size, shape and smoothness of trolley wire. Ample side clearance is provided to fit the groove in carbon inserts.

Underruns are designed to form a smooth path whenever they join in assembly. This is accomplished by two-bolt tongue and clevis connections. Anchor bolt holes are jig drilled and then checked with master gauges. And, to insure perfect alignment, each part is precision machined.

All parts necessary to make up special work assemblies are standardized so they are interchangeable with parts of

Cross-section of O-B special work runner superimposed on cross-section of grooved trolley wire. Note the %-inch thickness of the wearing metal, and how it simulates trolley wire in size and contour.



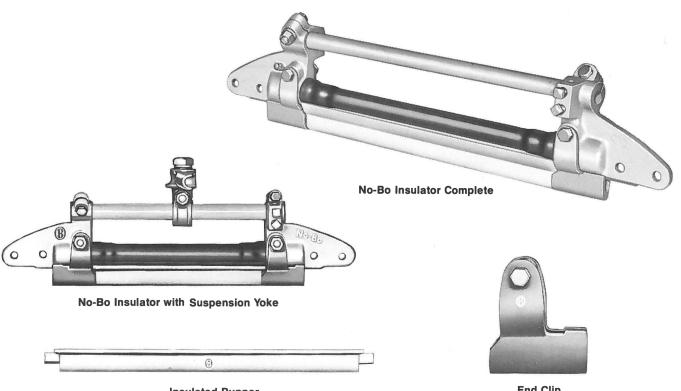
other assemblies. Tongue ends are standard for all insulators and clevis ends for all frog and crossover pans.

Standard tongue and clevis anchor tips butt the grooved wire flush to the underruns of all frog and crossover pans. These tips grip the wire by its upper lobe only, leaving the lower lobe free from any encircling devices. There are no high spots to encounter and a level, unbroken path for the current collector is a result.

Before shipment, the underrun of each trolley coach overhead fitting is smoothed by hand and then waxed. Moreover, all special work devices are assembled complete before partial disassembly for shipment. This is done to make sure all joining parts match perfectly and that underruns are in exact alignment.



NO-BO INSULATORS



Insulated Runner

End Clip

No-Bo insulators are ruggedly constructed and versatile in application. Under extreme tension they are strong enough to break the toughest trolley wire without affecting the insulating or mechanical qualities of the device.

The end castings develop a leverage under wire tension that puts the lower beam under tension and the upper beam under compression. Therefore, the complex opposing stresses that induce warpage in a single member are eliminated.

To insure adequate strength, both tension and compression members consist of a fiberglass rod. For arc protection, the tension beam is covered with a shrink-fit rubber tube.

The insulated runner is made of molded glass-melamine which has excellent wear and arc resistance.

Another important feature of the No-Bo is its universal

application. One No-Bo is used as an insulated spacer, an insulated approach and, with the addition of a separable suspension, as a section insulator. This reduces stock requirements to a minimum.

The long unit is standard for all turnout and crossover assemblies, except between adjustable crossovers above 57 degrees where restricted space requires the crossovers on page 69. The short unit can be used where reduced electrical clearances permit. A separable yoke and suspension assembly permits suspension of the No-Bo from span wires.

Contact wire is attached to the ends of the No-Bo by means of clevis tips, ordered separately from page 17. The No-Bo is also compatible with clevis ends of frogs, crossovers and live spacers.

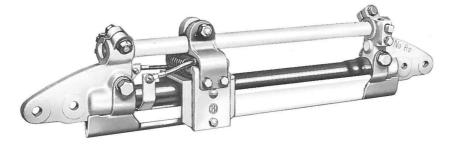
Catalog Number	Description	Insulation Length, In.	Underrun Length, In.	Net Weight Lbs. Each
55025-3001	Long No-Bo Complete	141/2	193⁄4	10.2
55025-3002	Long No-Bo with Suspension Yoke	141/2	193⁄4	12.0
55025-3003	Short No-Bo Complete	10	151⁄4	9.6
55025-3004	Short No-Bo with Suspension Yoke	10	151⁄4	11.4
55025-3005	Yoke and Suspension Assembly			
	Complete			1.8
22484	Long Insulated Runner	141/2		1.0
17178	Short Insulated Runner	10		0.6
55024-4001	End Clip			0.6



0-1-1----

TYPE B NO-BO INSULATOR With Magnetic Arc Blowout

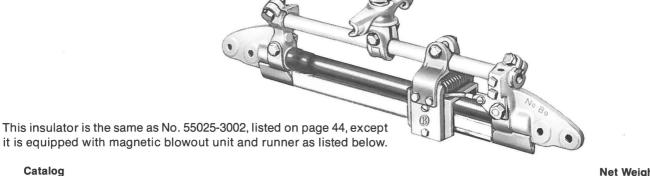
For use as Insulated Approach or Insulated Spacer



This insulator is the same as No. 55025-3001, listed on page 44, except equipped with magnetic blowout unit and runner as listed below.

Catalog Number	Description	
55030-3001	Type B No-Bo Insulator with Magnetic Arc Blowout	13.0

TYPE B NO-BO SECTION INSULATOR With Magnetic Arc Blowout



Number	Description	Net Weight Lbs. Each
55030-3002	Type B No-Bo Section Insulator with Magnetic Arc Blowout	14.8

EQUIPPING OF INSULATORS NOW IN SERVICE

55033-30	 Long No-Bo insulators Nos. 55025-3001 and service can be equipped with magnetic arc be addition of the blowout unit and insulated below. 55030-3003 	blowout by the
Catalog Number	Description	Net Weight Lbs. Each
55030-3003	Type B Magnetic Arc Blowout Unit	3.8

Type B Insulated Runner, 14¼-Inch Underrun

THE OHIO BRASS COMPANY

55033-3001

0.72



FROGS AND CROSSOVERS

Design objectives of smooth underrun, simplicity of construction, a minimum of parts and ease of installation are successfully combined in these devices.

With the exception of the 8-degree trailing frog, the overall length of all frogs is the same regardless of type. This is an advantage in that all parts other than the frogs of special work assemblies of similar turnout angle and radius are identical, requiring a minimum of materials for maintenance.

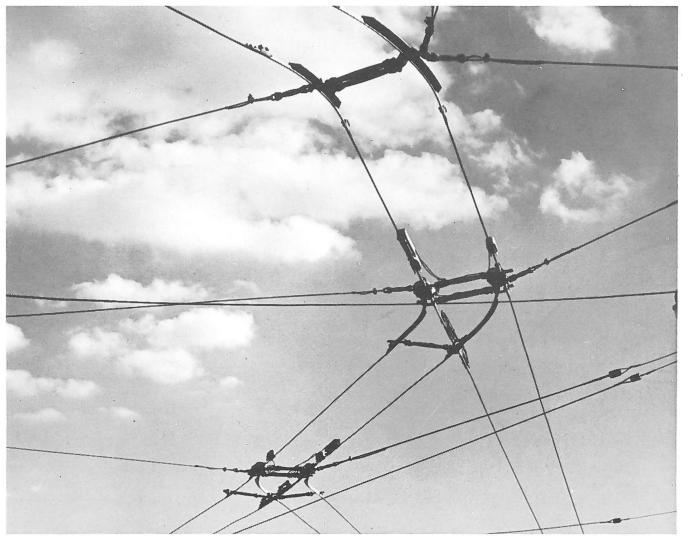
Another maintenance advantage of O-B frogs is that the same pan and runner castings serve to make up all movable runner frogs. Pan assemblies Nos. 19656 and 19657, used with mechanical reset frogs, have two oilless bushings. Assemblies Nos. 20343 and 20344, only one. All pans, however, are drilled for two bushings and are interchangeable by removing or adding a bushing.

For silent operation, movable runners of O-B frogs bear against rubber bumpers. On frog runners, a round bumper is cemented into a recess on each side of the free end.

All devices have exactly the same clevis end construction, including two bolts and lockwashers for rigid attachment to the tongues of tips, spacers or No-Bo insulators. Clevis end bolts are threaded to a depth of only % inch so the threaded portion will not bear against casting. As holes in castings are jig drilled, use of bolts with longer threading results in misalignment and an uneven underrun.

NOTE:

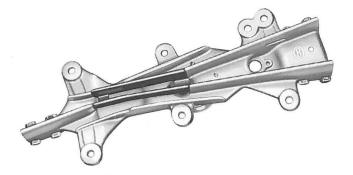
Where light rail vehicles (LRV) have been introduced to regular streetcar routes where frogs and crossovers are still needed, the pantograph or bow collectors will ride through some of the frogs or crossovers. Others will require special attention to assure a smooth underrun. Please advise us of any special applications so we can assure that the material we furnish you will be compatible with your current collectors.





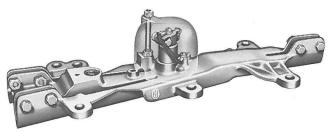
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TYPE TS-2 SPRING FROGS – 12 DEGREE For Carbon Shoe – Without Anchor Tips



For use at points where positive operation in one direction only is required, such as at wyes, loops and turnouts. The runner is held in the positive direction by a coil spring enclosed in the cover.

Double tongue construction provides a continuous wire-sized running surface for the collector in any direction taken. Collector may trail or back through frog from either main line or turnout. A flexible copper shunt between shaft



of movable runner and frog pan prevents arcing damage to bearings.

Castings are malleable iron except movable runner which is of hard dense bronze. Cover for protection of mechanism on top of frog is aluminum.

Length overall, 25 inches. Length from leaving end to intersection, 17% inches.

Frogs Complete

Catalog Number	Description	Net Weight Lbs. Each
20134	Right Hand Frog, Main Line Positive	
20135	Right Hand Frog, Turnout Positive	18
20136	Left Hand Frog, Main Line Positive	
20137	Left Hand Frog, Turnout Positive	
20660	V Frog, Right Hand Positive	18
20661	V Frog, Left Hand Positive	18

TYPE TR TRAILING FROGS – 12 DEGREE For Carbon Shoe – Without Anchor Tips

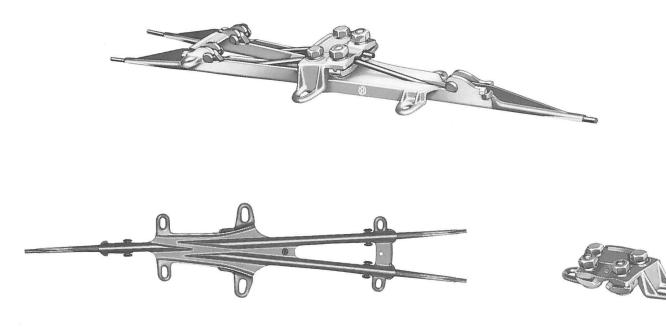
The Type TR frog is the same as the Type TS-2 except the spring is omitted, leaving the runner free to align with collector movement trailing from either straight line or curve position.

Frogs Complete

Catalog Number	Description	Net Weight Lbs. Each
22271 22272	Right Hand Frog	18
22273	Left Hand Frog	
	Parts for TS-2 and TR Frogs	
19662	Movable Runner Only, for R.H. and V Frogs	1.5
19663	Movable Runner Only, for L.H. and V Frogs	1.5
20343	R.H. Pan Castings Only	15.5
20344	L.H. Pan Castings Only	15.5
20658	V Pan Castings Only	15.5
21508	Lever with 3% x 11/2-Inch Machine Bolt	
21509	Cover	0.8
21510	Cover Stud	
21467	Shunt	0.07
18261	Spring	0.03



DUPLEX TROLLEY FROGS For Wheel Operation – Without Tips



A modern design overlapping-runner trolley frog, with a detachable suspension yoke which holds the trolley wires in fixed position in the span independently of the frog body or pan. The suspension yoke with clamps becomes a permanent part of the overhead line. The frog body only is replaced when necessary, without disturbing the supporting span or trolley wires, in exactly the same operating position as the original unit, eliminating the necessity of adjustments.

Supplied in 10- and 8-degree angles, either of which may be used for both entering and trailing operations. Present general practice is 10-degree for entering, 8-degree for trailing operation. Smoother, more positive trailing operation is obtained with the 8-degree angle frog, because this angle more nearly approaches that of the current collector. Individual wire clamps are attached to suspension yoke by %-inch bolts. The yoke is attached to frog body by two %-inch bolts. Only the two bolts and the cam tips are removed when replacing the frog, the yoke and trolley wires remaining in position. After the original installation is made, the suspension need never be disturbed during the life of the trolley wires.

Runners are designed to insure a continuous, smooth passage for the collector. Their liberal height, narrow cross section and extended overlap at the center of the pan guide the collector through the frog without a break in contact.

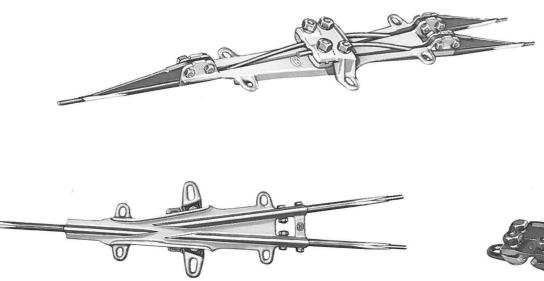
Frog body, yoke and clamps are malleable iron. All parts are hot-dip galvanized. Length overall, 10-degree, 25 inches; 8-degree, 29 inches. See page 19 for listing of cam tips required for these frogs.

Catalog Description Net Weig					
Catalog Number	10-Degree				
21623	R.H. for 2/0 Round and Grooved and 3/0 Round Wire	10.25			
21625	L.H. for 2/0 Round and Grooved and 3/0 Round Wire	10.25			
21627	V for 2/0 to 4/0 Round and Grooved Wire	10.25			
	8-Degree				
21632	R.H. for 2/0 Round and Grooved and 3/0 Round Wire	11.75			
Yoke Only					
16969	With Clamps and Bolts	2.5			

Frogs without Yoke



TYPE SR FROGS For Carbon Shoe Operation – Without Tips





The Type SR frog employs the same separable yoke as the duplex listed on page 48, but the pan differs to meet the requirements of carbon shoe collection. Runners are narrow and are carried to center of pan for positive guidance. Long sloping ramps gradually transfer the collector from groove to flanges through runner junction, preventing damage to the carbon insert.

Separable yoke is the same as used with the duplex frog,

an advantage to those operators changing from wheel to carbon shoe collection. All frogs, with or without yoke, are supplied complete with clevis end bolts.

All castings are of malleable iron. All metal parts are hot-dip galvanized. Overall length of underrun: 10-degree, 22 inches.

See page 19 for listing of Type SR tips required for these frogs.

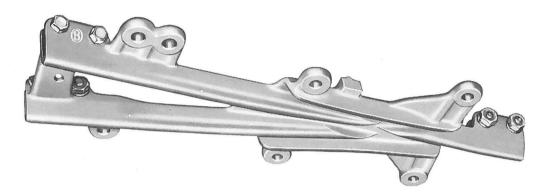
Frogs without Yoke

10-Degree

Catalog Number	Description	Net Weight Lbs. Each		
20770 20771	R.H. for 2/0 to 4/0 Round and Grooved Wire L.H. for 2/0 to 4/0 Round and Grooved Wire			
20751	V for 2/0 to 4/0 Round and Grooved Wire			
Yoke Only				
16969	With Clamps and Bolts	2.5		



TYPE T FROGS Without Anchor Tips



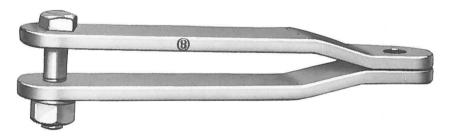
Type T frog is for trailing operation only. Runners extend to center of pan. Collectors travel through the centers of these pans on their flanges, protecting the O-B renewable insert of trolley shoes and assuring smooth, positive operation. Overall length, 12-degree, 25 inches; 8-degree, 36 inches.

Length from entering end to intersection: 12-degree, 20 inches; 8-degree, 31 inches. Pulloff eyes are 1/2 inch thick. ¹⁷/₃₂ inch in diameter.

Castings are of malleable iron. All parts are hot-dip galvanized.

Catalog Number	Description	Net Weight Lbs. Each
16797 16798 18170 18171	12-Degree Right Hand 12-Degree Left Hand 8-Degree Right Hand 8-Degree Left Hand	12.0 18.5

FROG SPACER LINKS For Use in R.H. and L.H. Double Pan Frog Assemblies



Used as illustrated on succeeding pages in order that only one length Hi*Lite strain is necessary between frog pans.

Consists of two formed steel straps, 1/4-inch thick and 11/4-inch wide, forming a clevis with 9/16-inch opening at one end and 15/32-inch diameter eye at other end. Clevis attaches to eye of frog and eye to clevis of strain insulator. Supplied with a $7/_{16}$ x 2-inch machine bolt, nut and lockwasher.

Length from center of clevis bolt to center of eye: No. 21028, 61/2 inches; No. 20813, 13 inches.

All parts are hot-dip galvanized.

Catalog Number	Description	Net Weight Lbs. Each
21028 20813	Link For 12-Degree Frogs	

SINGLE PAN ELECTRIC FROGS WITH MECHANICAL RESET For LRV Trolley Coach Intersections

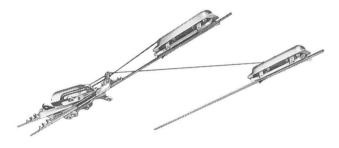
Electric frogs provide fast, smooth and positive operation with a minimum of wear on wire, collectors and fittings. They are recommended for all dual operation turnouts.

Each of the three types of frogs in the following listings is electrically operated in one direction only. Runners are reset to the other direction mechanically by a reset deflector in the same manner as described for double pan frogs Type TER-2 and Selectric-2.

For silent operation, movable runners are equipped with rubber bumpers.

TYPE VSE-2 SINGLE PAN ELECTRIC FROG Without Anchor Tips

Operation is independent of power application. Electrical and mechanical operation, physical equipment, and arrangement of contactors are exactly the same as described



for Selectric-2 frog, listed on page 52, except that the Type VSE-2 frog employs only one frog pan instead of two. Only complete frogs are listed below. See pages 53 and 54 for listing of parts.

Light rail vehicles can operate only in direction as mechanically reset.

The Type VSE-2 frog is regularly supplied with two contactors in order to provide maximum protection from shock to linemen and from lightning damage to coil. On special order, it can also be supplied with only one contactor, placed in the negative wire, the other side of coil being grounded to pan. Parts are identical except for the omission of one lead wire and contactor and the addition of a ground connection.

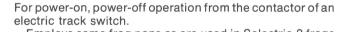
TYPE VTER-2 SINGLE PAN ELECTRIC FROG Without Anchor Tips



For power-on, power-off operation remote from intersection. Electrical and mechanical operation and physical equipment are exactly similar to the Type TER-2, listed on page 55, except that the Type VTER-2 frog employs only one contactor and one frog pan instead of two. Only complete frogs are listed below. See pages 56 and 57 for listing of parts.

Light rail vehicles can operate to both straight line and turnout.

TYPE VTEC-2 SINGLE PAN ELECTRIC FROG Without Anchor Tips



Employs same frog pans as are used in Selectric-2 frogs listed on page 52. Only complete frogs are listed below. See pages 53 and 54 for listing of parts.

Light rail vehicles can operate to both straight line and turnout.

Frogs Complete

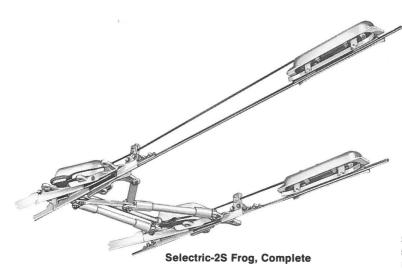
Catalog Number	Description	Net Weight Lbs. Each	Catalog Number	Description	Net Weight Lbs. Each
19909	Type VSE-2S, R.H., reset to S.L.	41	20272	Type VTER-2C, R.H., reset to Curve	39
19911	Type VSE-2S, L.H., reset to S.L.	41	20273	Type VTER-2C, L.H., reset to Curve	39
19910	Type VSE-2C, R.H., reset to Curve	41	20266	Type VTEC-2S, R.H., reset to S.L.	29
19912	Type VSE-2C, L.H., reset to Curve.	41	20268	Type VTEC-2S, L.H., reset to S.L.	29
20270	Type VTER-2S, R.H., reset to S.L.	39	20267	Type VTEC-2C, R.H., reset to Curve	29
20271	Type VTER-2S, L.H., reset to S.L.	39	20269	Type VTEC-2C, L.H., reset to Curve	29

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SELECTRIC-2 FROGS – 12 DEGREE Electrically Operated Without Anchor Tips – 24-Inch Wire Spacing



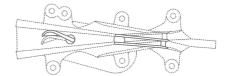
Although this type of frog is electrically operated, operation is independent of power application and is automatically controlled by the relative position of the collectors on the contact wires as determined by the position of the coach. It may be used only with crossovers of 23-degree, and higher, angles. Lower angle turnouts do not stagger collectors sufficiently to insure correct operation.

The Selectric-2 frog is simple in construction with attendant low cost of maintenance. Actuation is electrical in one direction only by means of one voltage coil on each frog pan wired to two contactors. As the collectors pass under the frogs in this direction, deflectors mechanically reset runners for operation in the other direction. Mechanical setting to straight line is usually preferred because of higher speeds; similar setting to curve being specified only when most coach movement is in that direction. Means are provided for holding runners in position as set electrically, or by mechanical reset. Mechanical reset position of runners cannot be changed by mechanical action of collectors.

Selectric-2 frogs with mechanical reset to straight line



Wire Support



Solid lines show position of runner and deflector as set electrically to straight line, and dotted lines as mechanically reset to turnout.

are designated in the following listing as Selectric-2S. Frogs with mechanical reset to curve are designated as Selectric-2C.

Selectric-2 frogs can be used in combined LRV and trolley coach operation, providing LRV operation is in mechanical reset direction only. Coaches and light rail vehicles may trail or back through this frog from either main line or curve. However, backing through from direction of electrical setting will change setting of runner to that direction.

Connector wires between pans are enclosed in a protective insulation conduit. Conduit is supported above pans by clamps attached to the end castings of the Hi*Lite strain spacer. Oilless bushings insure free movement of runners and deflectors.

For silent operation, movable runners are equipped with rubber bumpers.

Overall length, not including contactors, 25 inches. Length from leaving end to intersection 17³/₄ inches. Overall length of contactors, 18 inches. All castings are malleable iron. Ferrous parts are hot-dip galvanized.

·····				
Catalog Number	Description	Net Weight Lbs. Each		
19779	Selectric-2S Frog Assembly R.H., Reset to Straight Line, 2/0 to 4/0 Grooved	74		
19780	Selectric-2S Frog Assembly L.H., Reset to Straight Line, 2/0 to 4/0 Grooved	74		
19781	Selectric-2C Frog Assembly R.H., Reset to Curve, 2/0 to 4/0 Grooved	74		
19782	Selectric-2C Frog Assembly L.H., Reset to Curve, 2/0 to 4/0 Grooved	74		
20707	Selectric-2R Frog Assembly V, Reset to Right, 2/0 to 4/0 Grooved	74		
20708	Selectric-2L Frog Assembly V, Reset to Left, 2/0 to 4/0 Grooved	74		

Froas Complete

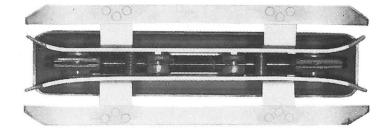


CONTROL CONTACTOR For Shoe and Pantograph on LRV

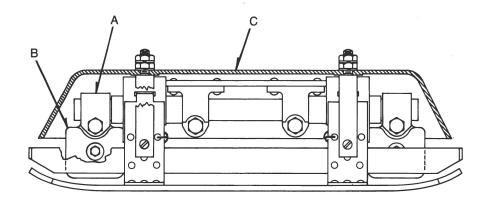
Control contactor suitable for use with pantograph as well as shoe. Two bronze coil springs between hinged contact bar assemblies provide even contact pressure on the shoe collector.

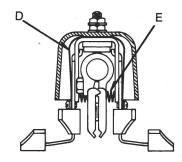
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Catalog Number		Net Wei Lbs. Ead	-
54671-3001	Control Contactor Complete for 2/0, 3/0		
	and 4/0 Grooved Wire	. 8.0	





Parts

Catalog Number	Item	Description	Net Weight Lbs. Each
23772-4001	Α	Body	. 0.35
23772-4002	В	Clamp, Bronze	. 0.20
22404	С	Cover, Fiberglass	. 1.13
22400	D	Shunt, Copper	. 0.04
22543	Е	Spring, Bronze	

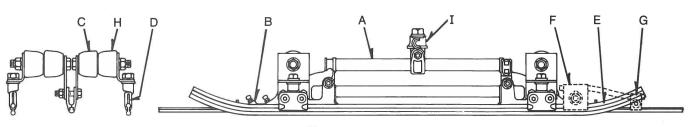
SECTION INSULATOR For Shoe and Pantograph on LRV

Section insulator with sturdy construction-noncommutating. Can be converted to commutation section insulator with addition of clamps and 4/0 flexible copper jumper between contact wire and gliders.

Numbers 54674-3003, -3004 and -3005 supplied with Number 17797 Type TC clevis tips for 4/0 grooved wire. Type TC clevis tips for 2/0 or 3/0 grooved wire can be supplied on request.



Catalog Number	Description	Net Weight Lbs. Each
54674-3003	Section Insulator for Shoe and Pantograph	
	on Light Rail Vehicle, Noncommutating	30.0
54674-3004	Section Insulator for Shoe and Pantograph	
	on Light Rail Vehicle, Commutating	31.5
54674-3005	Section Insulator for Shoe and Pantograph	
	on Light Rail Vehicle, Commutating,	
	with Suspension Yoke	33.3



NUMBER 54674-3005

Parts

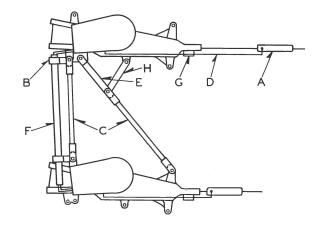
Catalog Number	Item	Description	Net Weight Lbs. Each
55025-3001	Α	Long No-Bo Section Insulator	10.2
17795	В	Type TC Clevis Tip for 2/0 Grooved Wire	1.4
17796	В	Type TC Clevis Tip for 3/0 Grooved Wire	1.4
17797	В	Type TC Clevis Tip for 4/0 Grooved Wire	1.4
16835-2000	С	Insulator Spools	
18554-2000	D	Support for Spacer Bar	1.0
54676-4001	E	Runner, Copper	
13509-3003	F	Clamp, Bronze	
14964-3004	G	Clamp, Bronze	0.2
20560-2000	Н	Insulator Spools	
55025-3005	I	Yoke Assembly	1.8

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SELECTRIC-2 FROGS – 12 DEGREE Electrically Operated Without Anchor Tips – 24-Inch Wire Spacing

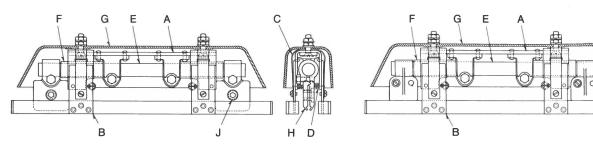


Parts

Catalog Number	Item	Description	Net Weight Lbs. Each
22549	А	Voltage Contactor, 2/0 to 4/0 Grooved	6.0
21473	В	Tube Support, Steel, with 1/4 x 1/2-Inch Rd. Hd. Brass Mach. Screw	2.0
54960-6175	С	Hi*Lite Strain Spacers	3.0
21470	D	Set Insulated Lead Wires Complete	
21028	E	Link, Steel, with 7/16 x 2-Inch Mach. Bolt, R.H. & L.H. Frogs only	1.4
21474	F	Insulator Tube for Lead Wires	
18663	G	Insulated Lead Wire Support	0.3
21893	н	Guard	0.7

Note: The above listings include contactors for grooved wire only. If desired for use on universal bar, please specify on inquiry or order.

VOLTAGE CONTACTORS



FOR GROOVED WIRE

FOR UNIVERSAL BAR

Catalog Number	Item	Description	Net Weight Lbs. Each
22549 22550		Voltage Contactor Complete for 2/0, 3/0 and 4/0 Grooved Wire	
		Parts	
22547	Α	Bracket Complete with Terminal Screws, Steel	1.3
22398	В	Contact Bar Assembly, Steel	0.8
22400	С	Shunt, Bronze	0.04
22543	D	Coil Spring, Bronze	0.05
22548	E	Insulator Rod, ¾-Inch Dia., Phenol Canvas	0.27
21540	F	Insulator Sleeve, Fiber	0.02
22404	G	Cover, Fiberglass	1.13
22405	н	Clamp, Bronze, Complete with Screws, for Grooved Wire	0.65
19637	J	Hex-Hole Hollow Screw, %16-Inch Dia., Bronze	0.03
21558	K	Clamp, Bronze, Complete with Screws, for Universal Bar	0.3

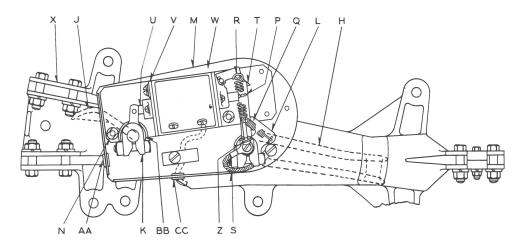
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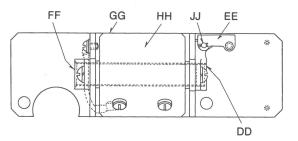


SELECTRIC-2 FROGS – 12 DEGREE **Electrically Operated** Without Anchor Tips – 24-Inch Wire Spacing



Parts

Net Wt. Net Wt. Catalog Catalog Number Item Description Number Item Description Lbs. Each Lbs. Each 19662 Movable Runner, Bronze, 20288 R 0.03 н Spring, Bronze R.H. and V..... 1.5 21467 S Shunt 0.07 21468 Movable Runner, Bronze, 19663 н Т Lever, Bronze 0.16 19666 L.H. 1.5 U Plunger, Steel – Stainless 19664 J Reset Deflector, Bronze, Steel Links 0.65 19659 V Coil Unit Complete R.H. (for R.H. Frogs Reset with Coil to S.L.; L.H. Frogs, Reset to 4.0 Curve; V Frogs, Reset to L.H.) 22430 W Cover, Fiberglass 0.6 1.6 19665 J Reset Deflector, Bronze, 19656 Х Pan, R.H., M.I., with Oilless L.H. (for L.H. Frogs, Reset to **Bushings and Clevis End** S.L.; R.H. Frogs, Reset to Bolts 15.5 Curve; V Frogs, Reset to R.H.) 19657 0.6 Х Pan, L.H., M.I., with Oilless 21462 Κ Reset Lever, Bronze, with 3/8 Bushings and Clevis End x 11/2-Inch Mach. Bolt 0.34 Bolts 15.5 21463 20657 L Lever Stop, Bronze, with 3/8 Х Pan, V, M.I., with Oilless x 11/2-Inch Mach. Bolt 0.33 **Bushings and Clevis End** Cover Bottom, Steel 22432 Μ 0.6 Bolts 15.5 Ζ 21465 Ν Cover Support Stud, Steel, 21559 Spring Bracket, Steel 0.03 ⁹/16" Diam. 0.25 21542 AA Rubber Grommet 0.01 21466 Ρ Pin, Steel, ³/₁₆-Inch Diam. 21501 BB Oilless Bushing 0.45 with ¹/₁₆ x ¹/₂-Inch Cotter 0.01 21543 CC Rubber Grommet 0.01 16012 Q Spring, Steel 0.02



Coil Unit, No. 19659

Coil Unit

Catalog Number	Item	Description	Net Weight Lbs. Each
21477 21475 21476 21545 20359 21483	DD EE FF GG HH JJ	Flange, Bronze Rocker Assembly, Steel Plunger Tube with Flange Coil Stand Only without Coil, Steel Voltage Coil Pin, ⁵ / ₃₂ -Inch Diam., Steel	0.05 0.17 1.4 1.8

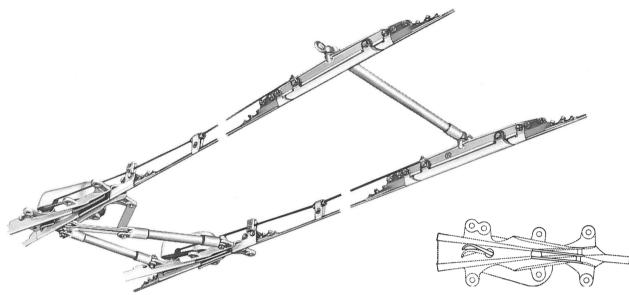
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TYPE TER-2 ELECTRIC FROGS – 12 DEGREE "Power-On" – "Power-Off" – Remote Control Without Anchor Tips – 24-Inch Wire Spacing



Type TER-2 Frog Installation

The Type TER-2 frog is controlled by "power-on," "poweroff" application and is adapted to locations where traffic conditions make it desirable to select direction of travel before reaching the intersection. Contactors may be inserted in the trolley wires as far ahead of the frogs as desired.

Runners are set by power application in one direction by one power coil and one power contactor for each polarity. As collectors pass under the frogs in this direction, deflectors mechanically reset runners for "power-off" operation in the other direction. Mechanical setting to straight line is usually preferred because of higher speeds, similar setting to curve being specified only when most coach movement is in that direction or to comply with local standards for power application.

There is no electrical connection between the frog pans of the Type TER-2 frog. Light rail vehicles operate either to straight line or curve, without disturbing setting for trolley coaches. Light rail vehicles or coaches may trail or back through from either direction.

Provision is made for holding frog runners in position as

Solid lines show position of runner and deflector as set electrically to straight line, and dotted lines as mechanically reset to turnout.

set, either electrically or by mechanical reset. Spring tension in the locking mechanism is adjusted at the factory to prevent operation by auxiliary currents up to 48 amperes. Tension may be increased to offset auxiliary currents up to 60 amperes. A separate spring holds the frog runner in mechanical reset positon. This setting cannot be changed by mechanical action of the collectors.

Oilless bushings insure free movement of runners and deflectors. Flexible copper shunts prevent arcing damage to bearing surfaces. For silent operation, movable runners are equipped with rubber bumpers.

The power contactor has a tongue on each end for attachment of a clevis-end trolley wire anchor tip. The center runner is insulated from the body casting and is separated from the end clips by air gaps. Underrun length, 22 inches. A %-inch boss is provided on the body casting for attachment of the insulated spacer.

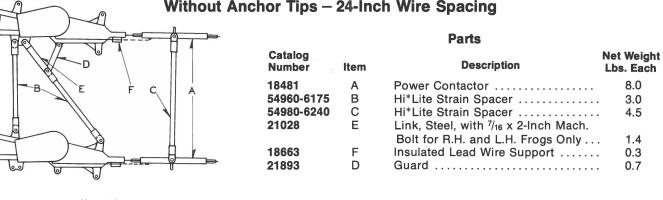
Length overall of frog pans, 25 inches. Length from leaving end to intersection, 17% inches. All castings are malleable iron. Ferrous parts are hot-dip galvanized.

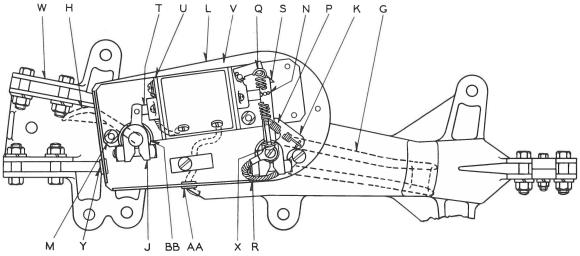
Frogs Complete

Catalog Number	Description	Net Weight Lbs. Each
19775	Type TER-2S Frog Assembly with Contactors, R.H. Power to Curve	82
19776	Type TER-2S Frog Assembly with Contactors, L.H. Power to Curve	82
19777	Type TER-2C Frog Assembly with Contactors, R.H. Power to Straight Line	82
19778	Type TER-2C Frog Assembly with Contactors, L.H. Power to Straight Line	82
20709	Type TER-2R Frog Assembly with Contactors, V Power to Right	82
20710	Type TER-2L Frog Assembly with Contactors, V Power to Left	82



TYPE TER-2 ELECTRIC FROGS – 12 DEGREE "Power-On" - "Power-Off" - Remote Control Without Anchor Tips – 24-Inch Wire Spacing





Parts

Catalog Number	Item	Description	Net Weight Lbs. Each
19662	G	Movable Runner, Bronze, R.H. and V	1.5
19663	G	Movable Runner, Bronze, L.H	1.5
19664	Н	Reset Deflector, Bronze, R.H. (for use on R.H. Frogs, Reset to S.L.;	
		L.H. Frogs, Reset to Curve; V Frogs, Reset to L.H.)	0.6
19665	Н	Reset Deflector, Bronze, L.H. (for use on L.H. Frogs, Reset to S.L.;	
		R.H. Frogs, Reset to Curve; V Frogs, Reset to R.H.)	0.6
21462	J	Reset Lever, Bronze, with 3/8 x 11/2-Inch Mach. Bolt	0.34
21463	ĸ	Lever Stop, Bronze, with 3/8 x 11/2-Inch Mach. Bolt	
22432	L	Cover Bottom, Steel	
21465	М	Cover Support Stud, 9/16-Inch Diam., Steel	0.25
21466	N	Pin, 3/16-Inch Diam., with 1/16 x 1/2-Inch Cotter, Steel	0.01
16012	Р	Spring, Steel	0.02
20288	Q	Spring, Bronze	
21467	R	Shunt	
21468	S	Lever, Bronze	
19666	т	Plunger, Steel, with Stainless Steel Links	
19658	U	Coil Unit, Complete with Coil	
22430	V	Cover, Fiberglass	
19656	W	Pan, R.H., M.I., Complete with Oilless Bushings and Clevis End Bolts	
19657	W	Pan, L.H., M.I., Complete with Oilless Bushings and Clevis End Bolts	
20657	W	Pan, V, M.I., Complete with Oilless Bushings and Clevis End Bolts	
21559	X	Spring Bracket, Steel	
21542	Y	Rubber Grommet	
21543	AA	Rubber Grommet	
21501	BB	Oilless Bushing	0.45

8.0

3.0

4.5

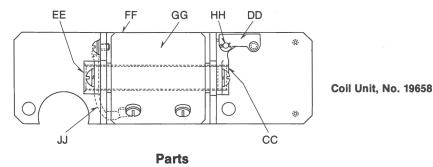
1.4

0.3

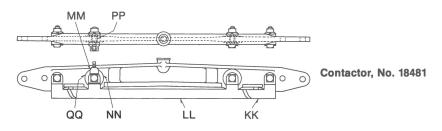
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TYPE TER-2 ELECTRIC FROGS – 12 DEGREE "Power-On" - "Power-Off" - Remote Control Without Anchor Tips – 24-Inch Wire Spacing



Catalog			Net Weight
Number	ltem	Description	Lbs. Each
21477	CC	Flange, Bronze	0.13
21475	DD	Rocker Assembly, Steel	0.05
21476	EE	Plunger Tube with Flange	
21545	FF	Coil Stand Only without Coil, Steel	1.4
19660	GG	Power Coil	1.8
21483	нн	Pin, ⁵ / ₃₂ -Inch Diam., Steel	0.01
21585	JJ	Shunt	



Pa	rts

ltem	Description	Net Weight Lbs. Each
KK	Arcing Clip, Bronze	0.4
LL	Runner, M.I	1.3
MM	Terminal, Bronze, with Set-Screw	
NN	Insulator Washer, 1%16-Inch O.D., 1/32-Inch Thick	0.01
PP	Insulator Bushing, %-Inch O.D	0.01
QQ	Insulator Washer, 11/16-Inch O.D., 1/8-Inch Thick	0.01
	KK LL MM NN PP	KK Arcing Clip, Bronze LL Runner, M.I. MM Terminal, Bronze, with Set-Screw NN Insulator Washer, 1%16-Inch O.D., 1/32-Inch Thick PP Insulator Bushing, 5%-Inch O.D.

INSULATED LEAD WIRE CLAMP For Grooved Wire Only For use with Type TER-2 Frogs

For use in carrying lead wires above trolley wires from frogs to contactors. Attaches to upper lobe of 2/0 to 4/0 grooved wire. Phenolic paper tube insulation, 1/2-inch inside diameter. Malleable iron jaw castings are held together by a bronze hollow screw with hex hole.

Length of trolley contact, 11/4 inches. Height, center of trolley to center of insulating tube, 21/2 inches. Length of tube, 21/4 inches.

Clamps are usually spaced six feet apart.

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Lbs. per 100 50

Number	Description
19655	Insulated Lead Wire Clamp, 2/0 to 4/0 Grooved Wire
See listing of	Type HSP clamps on page 15 for catalog reference on hollow screw wrench.

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Catalog

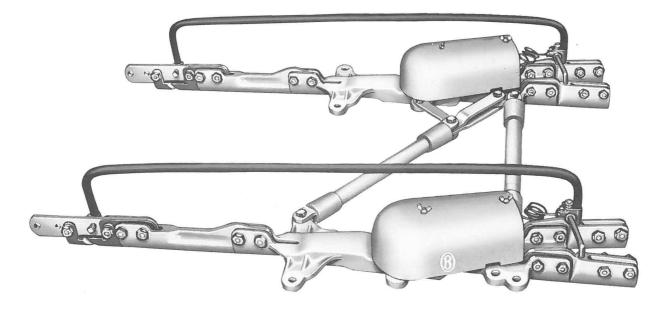
Page 57 Catalog 76

Net Weight

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TYPE TE-2 ELECTRIC FROGS – 12 DEGREE Without Anchor Tips – 24-Inch Wire Spacing



Type TE-2 electric frog provides for selective operation, either main line or turnout. No separate contactors are necessary as these are an integral part of the device. The frog pans are not connected electrically as each has its own series coil and operating mechanism. Each frog consists of two frog pans complete with mechanism, control insulators, Hi*Lite strain spacers, aluminum covers and jumpers.

The standard setting for operation of R.H. and L.H. frogs is "power-off" for straight line, "power-on" for turnout. If reverse setting is required, it should be specified on order. To reverse setting on the job, turn coil unit end for end and move position of spring stud to opposite boss, reversing direction of spring pull.

Movable runners are held in straight line "power-off" position by spring tension which is adjusted at the factory to prevent change to turnout position by auxiliary currents of 40 amperes or less. Spring tension can be increased in the field to offset auxiliary loads up to 50 amperes.

Two types of control insulators are used, one type for approach and one for leaving ends of frogs. The approach control insulator No. 18484 has a tongue on each end. The tongue of the insulated end attaches to clevis end of approach spacer. The outer tongue is for attachment to a Type TC or TCR clevis tip. As an arc is broken on this insulator, the metal clip on each side of the air gap is made renewable so that a smooth underrun can be maintained. All burning takes place on the metal clips and cannot damage the insulation. Spacers are interposed between control insulators and frogs at entering end to allow ample time for operation. As an arc is not broken at leaving ends of frog, the leaving control insulator No. 18520 does not require a renewable runner and is more simple in design. The insulated tongue end attaches to frog leg, and clevis at other end is for attachment of a Type T or TR tongue tip or of a live spacer with tongue end.

Trailing operation or backing through is possible from either main line or turnout.

Flexible copper shunts between runner shafts and frog pans prevent arcing damage to bearing surfaces. For silent operation, movable runners are equipped with rubber bumpers.

Length overall underrun, 43 inches. Length from leaving end to intersection, 22¹/₄ inches. All castings are malleable iron. All ferrous parts are hot-dip galvanized.

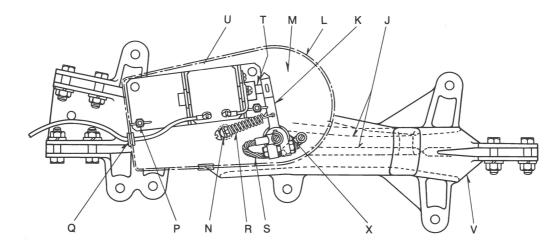
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Catalog Number	Description	Net Weight Lbs. Each
20228	Right Hand, Power to Right	80
20229	Left Hand, Power to Left	80
21339	V, Power to Left	80
21340	V, Power to Right	80

Frogs Complete



TYPE TE-2 ELECTRIC FROGS – 12 DEGREE Without Anchor Tips – 24-Inch Wire Spacing

В	A F			Parts	
		Catalog Number	item	Description	Net Weight Lbs. Each
		17239	Α	Type TC Live Spacer, M.I.	. 2.5
	1	18520	В	Leaving Control Insulator, M.I.	. 2.0
СН		21492	С	Jumper Terminal, Bronze, with Set-Screws .	
		21493	D	End Jumper, Live, 3/0 Round	. 0.28
	/	21494	E	Jumper, Insulated, 3/0 Round	. 2.25
G	E	18484	F	Approach Control Insulator, M.I.	. 3.0
		54960-6175	G	Hi*Lite Strain Spacer	. 3.0
		21028	Н	Link, Steel, with 7/16 x 2-Inch Machine Bolt .	. 1.4
		21893	J	Guard	. 0.7



Parts

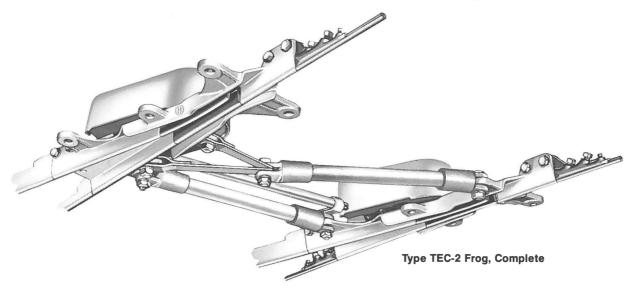
		Parts	
Catalog Number	ltom	Beneriction	Net Weight
Number	Item	Description	Lbs. Each
19662	J	Movable Runner, Bronze, R.H. and V	1.5
19663	J	Movable Runner, Bronze, L.H	1.5
21487	K	Lever, Bronze, with ¾ x 1½-Inch Mach. Bolt	0.43
21489	L	Cover Bottom, Steel	0.57
21488	М	Cover, Aluminum	1.8
21490	N	Spring Support Stud, Steel, ½-Inch Diam.	0.11
21491	Р	Cover Support Stud, Steel, ½-inch Diam	0.24
21543	Q	Rubber Grommet	0.01
18264	R	Spring, Bronze	0.03
21467	S	Shunt	0.07
20040-3002	Т	Plunger, Steel, with Stainless Steel Links	
20003-3005	U	Coil Unit	2.2
20343	V	Pan, R.H., M.I., Complete with Oilless Bushing and Clevis End Bolts	15.0
20344	V	Pan, L.H., M.I., Complete with Oilless Bushing and Clevis End Bolts	
20658	V	Pan, V, M.I., Complete with Oilless Bushing and Clevis End Bolts	
21501	Х	Oilless Bushing	

			Parts	
	Catalog Number	Item	Description	Net Weight Lbs. Each
	20002-3002	Y	Coil Stand, Steel, without Coil	
	19660 21476	AA	Coil Plunger Tube with Flange, Bronze	1.0 0.18
Y Z AA	21470	~~	Flunger lube with Flange, profize	0.16

Coil Unit, No. 20003-3005



TYPE TEC-2 ELECTRIC FROGS – 12 DEGREE For use with Electric Track Switch Contactor Without Anchor Tips – 24-Inch Wire Spacing



The Type TEC-2 electric frog is operated by "power-on" – "power-off" application in conjunction with an electric track switch. Each frog pan has two voltage coils, the two pans being electrically inter-connected and operated from the track switch circuit changer. Coaches or light rail vehicles may trail or back through this frog from either straight line or curve.

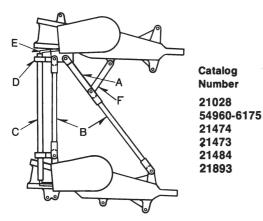
An insulated terminal block is provided on each pan for attachment of leads. Connecting wires between pans are colored for identification and are enclosed in a protective insulation conduit. Conduit is supported above pans by clamps attached at the ends of the Hi*Lite strain spacer.

Oilless bushings insure free movement of runners. Flexible copper shunts between runner shafts and frog pans prevent arcing damage to bearing surfaces.

For silent operation, movable runners are equipped with rubber bumpers.

Length overall, 25 inches. Length from leaving end to intersection 17³/₄ inches. All castings are malleable iron. Ferrous parts are hot-dip galvanized.

Frogs Complete				
Catalog Number	Description	Net Weight Lbs. Each		
19999 20000	Frog Complete, Right Hand Frog Complete, Left Hand			

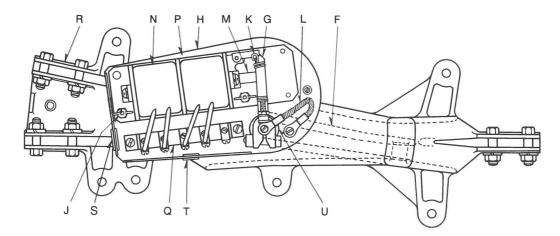


Parts

ltem	Description	Net Weight Lbs. Each
Α	Link, Steel, with 7/16 x 2-Inch Mach. Bolt	. 1.4
в	Hi*Lite Strain Spacer	. 3.0
С	Insulator Tube for Lead Wires	. 0.3
D	Tube Support, Steel, with 1/4 x 1/2-Inch Mach. Screw	. 2.0
Е	Set Lead Wires, Complete	. 0.44
F	Guard	. 0.7

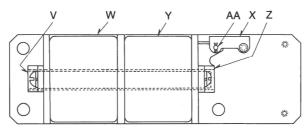


TYPE TEC-2 ELECTRIC FROGS – 12 DEGREE For use with Electric Track Switch Contactor Without Anchor Tips – 24-Inch Wire Spacing



Parts

Catalog Number	Item	Description	Net Weight Lbs. Each
19662	F	Movable Runner, Bronze, R.H.	1.5
19663	F	Movable Runner, Bronze, L.H	1.5
21478	G	Lever, Bronze, with % x 11/2-Inch Mach. Bolt	0.43
22431	н	Cover Bottom, Steel	0.54
21465	J	Cover Support Stud, 9/16-Inch Diam., Steel	
18667	К	Coil Spring, Bronze	0.03
21467	s L	Shunt	
19016	М	Plunger, Steel, with Stainless Steel Links	
20262	N	Coil Unit, Complete with Coils	5.5
22430	Р	Cover, Fiberglass	2.0
22266	Q	Terminal Block Assembly	0.43
20343	R	Pan, R.H., M.I., Complete with Oilless Bushing and Clevis End Bolts	
20344	R	Pan, L.H., M.I., Complete with Oilless Bushing and Clevis End Bolts	15.0
21542	S	Rubber Grommet	0.01
21543	Т	Rubber Grommet	0.01
21501	U	Oilless Bushing	



Coil Unit, No. 20262

Parts

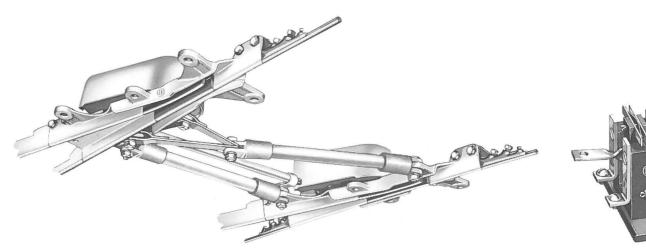
Catalog Number	Item	Description	Net Weight Lbs. Each
21486	V	Plunger Tube with Flange	0.18
21546	W	Coil Stand Only, without Coil, Steel	2.0
21475	х	Rocker Assembly, Steel	
19365	Y	Coil	
21482	Z	Flange, Bronze	0.2
21483	AA	Pin, ⁵ / ₃₂ -Inch Diam., Steel	

Type TEC-2 frogs also available in V shape if desired.

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TYPE TEP-2 ELECTRIC FROGS – 12 DEGREE For Push-Button Control Without Anchor Tips – 24-Inch Spacing



Type TEP-2 Frog, Complete

Type TEP-2 Light Switch

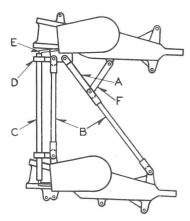
The Type TEP-2 frog is suitable for use in any pushbutton circuit. It is similar in all respects to the Type TEC-2 frog, listed on page 60, except that each pan is provided with a double-throw light switch, operated through mechanical connection to the runner and to the solenoid plunger.

O-B supplies the frogs only for push-button operation. Control layout and panel are, however, readily available from manufacturers well equipped to provide this type of service and material.

For silent operation, movable runners are equipped with rubber bumpers.

Length overall, 25 inches. Length from leaving end to intersection, 17¾ inches. All castings are malleable iron. Ferrous parts are hot-dip galvanized.

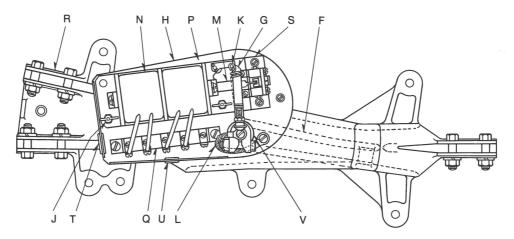
	Frogs Complete	
Catalog Number	Description	Net Weight Lbs. Each
20005 20006	Frog Complete, Right Hand Frog Complete, Left Hand	



		Parts	
Catalog Number	ltem	Description	Net Weight Lbs. Each
21028 54960-6175 21474 21473	A B C D	Link, Steel, with ⁷ / ₁₆ x 2-Inch Mach. Bolt Hi*Lite Strain Spacer Insulator Tube for Lead Wires Tube Support, Steel, with ¹ / ₄ x ¹ / ₂ -Inch Mach. Screw	. 3.0 . 0.3 . 2.0
21484 21893	E F	Set Lead Wires, Complete	

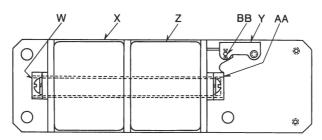


TYPE TEP-2 ELECTRIC FROGS – 12 DEGREE For Push-Button Control Without Anchor Tips – 24-Inch Spacing



Parts

Catalog Number	Item	Description	Net Weight Lbs. Each
19662	S F	Movable Runner, Bronze, R.H.	1.5
19663	F	Movable Runner, Bronze, L.H	1.5
21478	G	Lever, Bronze, with 3/4 x 11/2-Inch Mach. Bolt	0.43
22431	н	Cover Bottom, Steel	0.54
21465	J	Cover Support Stud, 9/16-Inch Diam., Steel	0.25
18667	K	Coil Spring, Bronze	0.03
21467	L	Shunt	
19016	Μ	Plunger, Steel, with Stainless Steel Links	
20262	N	Coil Unit, Complete with Coils	5.5
22430	Р	Cover, Fiberglass	2.0
22266	Q	Terminal Block Assembly	
20343	R	Pan, R.H., M.I., Complete with Oilless Bushing and Clevis End Bolts	
20344	R	Pan, L.H., M.I., Complete with Oilless Bushing and Clevis End Bolts	
21894	S	Light Switch	1.0
21542	Т	Rubber Grommet	0.01
21543	U	Rubber Grommet	
21501	V	Oilless Bushing	0.45



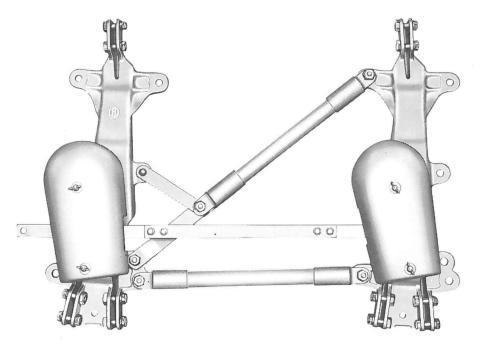
Coil Unit, No. 20262

Parts

Item	Description	Net Weight Lbs. Each
W	Plunger Tube with Flange	0.18
Х		
Y	Rocker Assembly, Steel	0.05
Z	Coil	1.5
AA		
BB	Pin, ⁵ / ₃₂ -Inch Diam., Steel	0.01
	W X Y Z AA	W Plunger Tube with Flange X Coil Stand Only, without Coil, Steel Y Rocker Assembly, Steel Z Coil AA Flange, Bronze

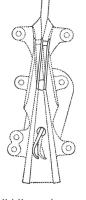
Type TEP-2 frogs also available in V shape if desired.

TYPE TH-2 MECHANICAL RESET HAND-OPERATED FROGS Rope Pull – 12 Degree Without Anchor Tips – 24-Inch Wire Spacing



For selective operation at points where direction alternates frequently between straight line and turnout, or where major coach movement is in one direction only.

Standard runner setting is for direction in which there will be the most operation. Rope pull sets runners in the other direction in which they are held by spring tension. Collectors contacting deflectors at leaving end of frog return the runners to reset positon. As no weights are necessary, rope can be hung so operator can reach it without leaving coach. Coaches may trail or back through these



Solid lines show position of runner and deflector as set by rope pull to straight line, and dotted lines as mechanically reset to turnout.

frogs without changing runner setting.

The frogs listed are for rope pulloff to the right. Can be supplied for rope pulloff to the left if specified on order, or direction of pull can be changed in the field by reversal of parts. For silent operation, movable runners are equipped with rubber bumpers.

Length overall, 25 inches. Length from leaving end to intersection, 17% inches. All ferrous parts are hot-dip galvanized.

	· · · · · · · · · · · · · · · · · · ·	
Catalog Number	Description	Net Weight Lbs. Each
21024	Type TH-2S, R.H., Rope Pull to Curve, Reset to S.L.	58
21025	Type TH-2C, R.H., Rope Pull to S.L., Reset to Curve	58
21026	Type TH-2S, L.H., Rope Pull to Curve, Reset to S.L.	58
21027	Type TH-2C, L.H., Rope Pull to S.L., Reset to Curve	58
21275	Type TH-2R, V, Rope Pull to Left, Reset to Right	58
21276	Type TH-2L, V, Rope Pull to Right, Reset to Left	58

Frogs Complete

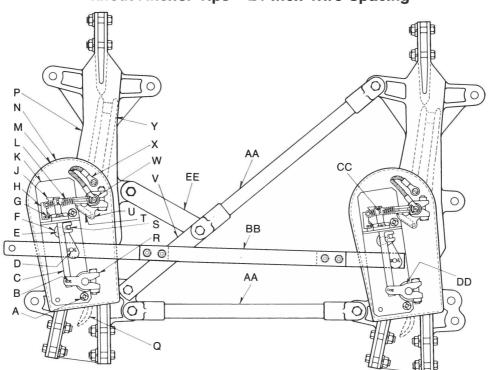
Parts

Catalog Number	Item	Description	Net Weight Lbs. Each
21491	А	Support, 1/2-Inch Diameter, Steel	0.24
21471	В	Pin, 3/16-Inch Diameter, with Cotters, Steel	0.01
21496	С	Link, Bronze	
21503	D	Pin, 1/4-Inch Diameter, with Cotters, Steel	0.02
21499	E	Stud, 9/16-Inch Diameter, Steel	0.11
21495	F	Lever, Bronze	

THE OHIO BRASS COMPANY

TYPE TH-2 MECHANICAL RESET HAND-OPERATED FROGS Rope Pull – 12 Degree

Without Anchor Tips – 24-Inch Wire Spacing



Parts (continued)

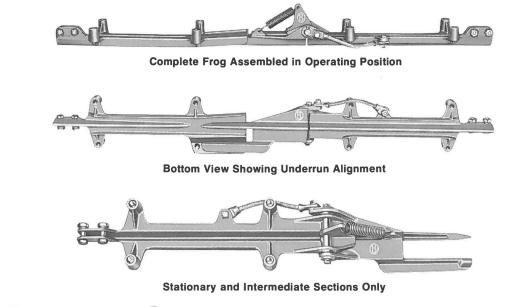
Net Weight

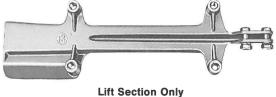
Number	ltem	Description	Lbs. Each
21483	G	Pin, ⁵ / ₃₂ -Inch Diameter, Steel	0.01
21475	Н	Rocker Assembly, Steel	0.05
21468	J	Lever, Bronze	0.16
21547	K	Bracket Assembly, Steel	1.4
20288	L	Spring Assembly, Bronze	0.03
21500	M	Cover Bottom, Steel	0.46
21497	N	Cover, Fiberglass	1.75
19656	Р	Pan, R.H., M.I., with Oilless Bushings and Clevis End Bolts	15.5
19657	Р	Pan, L.H., M.I., with Oilless Bushings and Clevis End Bolts	15.5
20657	Р	Pan, V, M.I., with Oilless Bushings and Clevis End Bolts	15.5
19664	Q	Reset Deflector, Bronze (for Use on R.H. Frogs, Reset to S.L.;	
		L.H. Frogs, Reset to Curve; V, Reset to Left)	0.6
19665	Q	Reset Deflector, Bronze (for Use on L.H. Frogs, Reset to S.L.;	•
		R.H. Frogs, Reset to Curve; V, Reset to Right)	0.6
21462	R	Reset Lever, Bronze, with % x 11/2-Inch Machine Bolt	0.34
21498	S	Pin, ¼-Inch Diameter, Steel	0.03
16012	Т	Spring, Steel	0.02
21463	U	Lever Stop, Bronze, with ¾ x 1½-Inch Machine Bolt	0.33
21028	V	Link, Steel, with 7/16 x 2-Inch Machine Bolt	1.4
21559	W	Spring Bracket, Steel	0.03
21467	Х	Shunt	0.07
19662	Y	Movable Runner, Bronze, R.H. and V Reset to Right	1.5
19663	Y	Movable Runner, Bronze, L.H. and V Reset to Left	1.5
54960-6175	AA	Hi*Lite Strain Spacer	3.0
21094	BB	Connecting Rod Assembly, Hi*Lite Insulation (for R.H. Frogs,	
04400		Reset to S.L. and Curve; and V Frogs, Reset to Left)	1.6
21190	BB	Connecting Rod Assembly, Hi*Lite Insulation (for L.H. Frogs,	
01400	~~	Reset to S.L. and Curve; and V Frogs, Reset to Right)	1.6
21466	CC	Pin ³ / ₁₆ -Inch Diameter, with Cotters, Steel	0.01
21501	DD	Oilless Bushing	0.45
21893	EE	Guard	0.7

Catalog



TYPE L VERTICAL LIFT BRIDGE FROG For Trolley Coach or LRV Without Anchor Tips





Cross Section of Lift and Intermediate Sections in Engaged Position

Frog is made in three sections: lift, stationary and intermediate. As bridge descends, a V-shape groove of the lift section engages a guide of the intermediate section, centering the runner which is held in close contact by spring tension. Minimum overlap of runner is 1½ inches; maximum, 5½ inches. Provision has been made for slight lateral and vertical variations from center line.

Stationary and intermediate sections are assembled as a unit which must be mounted in the same plane as the lift section. Runners of both units must be in alignment with trolley wire.

Frog pans are usually mounted on wood planks, with barn hangers providing secondary insulation. The four mounting bosses on each pan are tapped 5% inch.

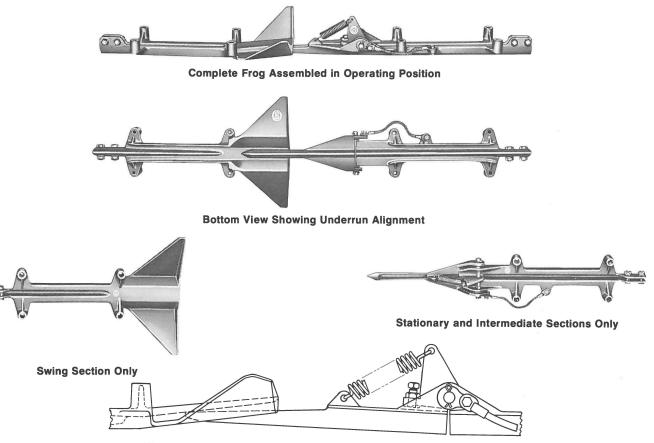
The stationary section No. 21426 includes clevis end bolts, shunt bolt, washers and adjustment screw which may be used to regulate height of intermediate section. Intermediate section No. 21428 includes shunt cap screw and washer. Lift section No. 21427 includes clevis end bolts and washers. A flexible copper shunt prevents arcing and pitting at hinged joint.

Length overall, minimum, 51³/₄ inches, maximum, 55³/₄ inches. Runner length, stationary section, 22 inches; intermediate section, 12³/₄ inches; lift section, 16¹/₄ inches. Height, bottom of runner to top of boss, $2^7/_{16}$ inches. Castings, hinge pin and spring are of bronze. Bolts, cap-screw, washers and cotters are of steel, galvanized.

Catalog Number	Description	Net Weight Lbs. Each
21425	Type L Frog Complete	26.0
	Parts	
21426	Stationary Section Only	11.0
21427	Lift Section Only	10.0
21428	Intermediate Section Only	
21429	Hinge Pin, 5% Inch With 3/16 x 1-Inch Cotters	0.5
21430	Shunt	0.2
14708	Spring	0.3



TYPE SW SWING BRIDGE FROG For Trolley Coach or LRV Without Anchor Tips



Wing of Swing Section Deflects Intermediate Runner into Position

Frog is suitable for either swing or revolving bridge. Intermediate section is hinged with spring to stationary section. Wings on swing section deflect runner of intermediate section into place as the bridge swings into position from either side. Minimum overlap of runners is 1½ inches, maximum, 5½ inches. Provision has been made for slight lateral and vertical variations from center line.

Stationary and intermediate sections are assembled as a unit, which must be mounted in the same plane as the swing section. Runners of both units must be in alignment with trolley wire. Frog pans are usually mounted on wood planks, with barn hangers providing secondary insulation. The four mounting bosses on each pan are tapped % inch.

Length overall, minimum 53% inches; maximum, 57%

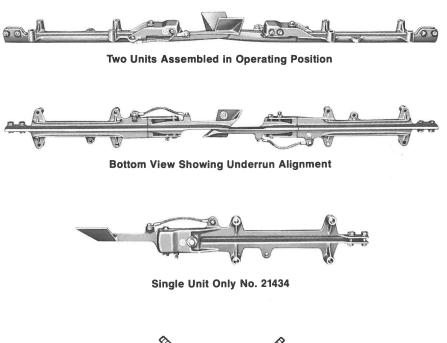
inches. Length underrun, stationary section, 22 inches; swing, $24\frac{1}{2}$ inches; intermediate, $14\frac{3}{6}$ inches. Height from bottom of runner to top of boss, $2\frac{7}{16}$ inches. Wing spread, 14 inches.

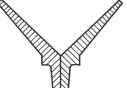
The stationary section No. 21426 includes clevis end bolts, shunt bolt and washer, and adjustment screw which can be used to regulate height of intermediate section. Swing section No. 21432 includes clevis end bolts and washers. Intermediate section No. 21433 includes shunt cap screw and washer. A flexible copper shunt prevents arcing damage to hinge pin. Castings, hinge pin and spring are of bronze. Bolts, screws, washers and cotters are of steel, galvanized.

Catalog Number	Description	Net Weight Lbs. Each
21431	Type SW Frog Complete	29.0
	Parts	
21426	Stationary Section Only	11.0
21432	Swing Section Only	12.5
21433	Intermediate Section Only	4.5
21429	Hinge Pin, 5/4 inch, with 3/16 x 1-Inch Cotters	0.5
21430	Shunt Only	
14708	Spring Only	



TYPE B BASCULE BRIDGE FROGS For Trolley Coach or LRV Without Anchor Tips





Cross Section Showing Engagement of Movable Runners

Frog is suitable for either single or double leaf bascule bridges. Two of these frogs are required for the bridging of each trolley wire. Wing face on each movable runner guides half runner sections into engagement to form full runner section, as shown in cross-section line drawing. Compression springs hold sections in close contact.

Minimum overlap of runners is $1\frac{1}{2}$ inches, maximum, $5\frac{1}{2}$ inches. Maximum lateral variation from center line approximately one inch. Contour of runners permits a reasonable variation in vertical alignment.

Frogs must be mounted in same plane, usually on wood planks with barn hangers forming secondary insulation. The four mounting bosses are tapped $\frac{5}{10}$ inch.

Height, bottom of runner to tops of bosses, 2%16 inches.

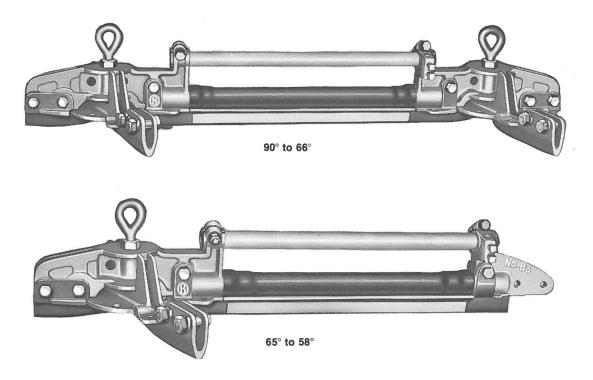
Pan section, No. 21435, includes clevis end bolts; a $\frac{3}{8} \times 3\frac{1}{2}$ -inch machine bolt with bushing and washers; compression spring; a $\frac{5}{16} \times 1$ -inch machine bolt and washer for shunt attachment; and a $\frac{3}{8} \times 1$ -inch set-screw with jam nut. Movable runner section, No. 21436, includes round washer and $\frac{3}{16} \times 1$ -inch cotter for attachment of stem to shaft of pan, and a $\frac{5}{16} \times \frac{3}{4}$ -inch cap-screw and washer for shunt attachment. The flexible shunt prevents arcing between castings.

Underrun length: frog complete, 34% inches; pan section, 22 inches; movable runner section, 12% inches. Castings, bushings, round washers and spring are bronze. Shunt is copper. All other parts are steel, galvanized.

Catalog Number 21434	Description Type B Frog Complete (Single Unit Only)	Net Weight Lbs. Each 15.0	
Parts			
21435 21436 21437	Pan Section Only Movable Runner Section Only Spring Only	3.0	
21430	Shunt Only	0.2	



NO-BO INSULATED CROSSOVER UNITS



These units are necessary to provide standard long No-Bo insulation between trolley wires at crossing angles from 90 to 58 degrees and still maintain approximately 24-inch spacing between trolley wires.

Angularity may be adjusted as desired, and then all moving parts locked by a $\frac{1}{2} \times 5\frac{1}{4}$ -inch eyebolt and lock nut. The eyebolt threads into a boss on the pan casting. Length of underrun for 90 to 66 degrees, $35\frac{1}{4}$ inches; for 65 to 58 degrees, $27\frac{1}{2}$ inches.

All castings are malleable iron, hot-dip galvanized, except end clip of bronze. The underrun is completely renewable and all runner parts are common to other devices with the exception of arcing tip No. 55036-4001.

Catalog Number	Description	Net Weight Lbs. Each
55028-3001 55029-3001	Crossover Unit, 90 to 66 Degrees Crossover Unit, 65 to 58 Degrees	
	Parts	
18797 22484 55024-4001 18795 55036-4001	Pan Assembly Complete with Bolts, Nuts and Washers Insulated Runner End Clip Outer Arcing Tip Inner Arcing Tip	1.0 0.5 0.9



TYPE T LIVE RIGID CROSSOVERS Without Anchor Tips



23°, No. 16799

Collectors travel through the centers of these pans on their flanges, protecting the renewable insert of trolley shoes and assuring smooth, positive operation.

Runners of individual crossovers are of equal length except angles of 70- to 85-degree and No. 18615 in 90-degree, in which one runner is short in order to employ long insulation between crossovers in assemblies and still maintain approximately 24-inch spacing. Application of these crossovers must be determined by reference to parts listings for assemblies with which they are used.

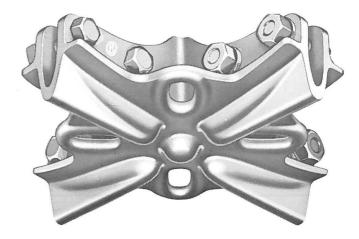
Runners have 3/2 inch of solid wearing metal on their running face. Simple, strong one-piece construction. Light in weight.

Castings are malleable iron, hot-dip galvanized, complete with steel bolts for attachment of tips, spacers, or insulated approaches.

(

90°, No. 18615

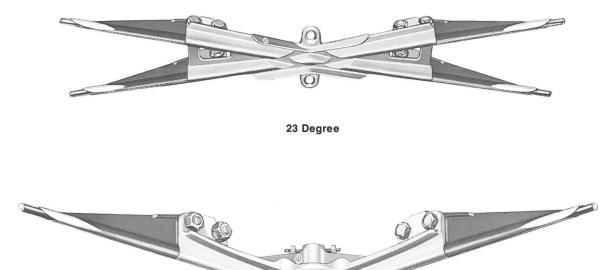
Catalog Number	Description	Net Weight Lbs. Each
17774	17-Degree Crossover	
16799	23-Degree Crossover	10.25
17775	27-Degree Crossover	10.0
16800	30-Degree Crossover	9.25
16865	45-Degree Crossover	9.25
18937	50-Degree Crossover	11.0
18938	60-Degree Crossover	10.0
20500	70-Degree Crossover, R.H	8.5
20501	70-Degree Crossover, L.H	8.5
18615	90-Degree Crossover	
17701	90-Degree Crossover	6.25



90°, No. 17701



TYPE SR LIVE RIGID CROSSOVERS For Carbon Shoe Operation Without Tips



The two most common crossing angles, 23 and 90 degrees, are provided for in this listing. Should rigid crossovers in other angles be required, the Type T trolley coach cross-overs, as listed on page 70, may be specified.

The SR crossover can be installed at a trolley wire crossing after the wire is strung and may be replaced without disturbing the trolley wire.

Where light rail vehicles have been introduced to street-

car routes, the pantograph will ride through the 23-degree crossover. The 90-degree crossover can be used in this application only if there is sufficient bow in the pantograph to avoid snagging the crossing wire.

Castings are of malleable iron. All metal parts are hot-dip galvanized. See page 19 for listing of Type SR tips required for these crossovers.

Catalog Number	Description	Net Weight Lbs. Each
	23 Degree – Length Overall, 18 Inches	
20764	For 2/0 to 4/0 Round and Grooved Wire	9.8
	90 Degree – Length Overall, 18 Inches	
20750	For 2/0 to 4/0 Round and Grooved Wire	12.0

90 Degree

TYPE TA AND TYPE TAS TITE-LOCK ADJUSTABLE CROSSOVERS Without Anchor Tips

Similar in general design. Both adjustable from 40 to 90 degrees. Only essential difference is that one leg of TAS is short to provide more space for full-length No-Bo insulation between crossover pans. Pan assemblies and arcing tips which support them are renewable.

Angularity may be adjusted, and then all moving parts locked by means of a $\frac{1}{2} \times 5\frac{1}{4}$ -inch eyebolt and lock nut. The eyebolt threads into a boss on the pan casting.

Collectors travel through the centers of these pans on their flanges, assuring smooth, positive operation.

All runners are 15-inches long overall, except one runner of Type TAS which is 12½-inches long. This short runner measures 7½ inches from center to one end and 5 inches to the other end, the latter being shorter to accommodate long insulation between wires. All castings are malleable iron, hot-dip galvanized.



Туре ТА



Arcing Tip

Catalog Number	Description	Net Weight Lbs. Each	
16905	Type TA Live Adjustable Crossover, Complete	12.0	
Renewable Parts			
18797 18794	Pan Assembly Complete with Bolts, Nuts and Lockwashers	5.0 0.75	

Type TA

Type TAS



Type TAS



Arcing Tip for Long Leg

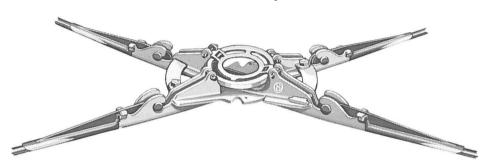


Arcing Tip for Short Leg

Catalog Number	Description	Net Weight Lbs. Each
18169	Type TAS Live Adjustable Crossover, Complete	13.25
	Renewable Parts	
18797 18794 18795	Pan Assembly Complete with Bolts, Nuts and Lockwashers Arcing Tip for Long Leg Arcing Tip for Short Leg	0.75



TYPE E LIVE ADJUSTABLE CROSSOVERS For Wheel Operation Without Tips



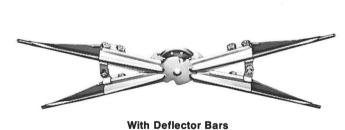
Pan and cross runner castings interlock and are held together without the use of screws or bolts. Deflector bars, to prevent trapping of dewired trolley, are used only for angles from 30 to 60 degrees.

It is not necessary to cut wires to install; simply lay wires in place, insert compression ring at center and attach renewable tips.

All castings are of malleable iron, hot-dip galvanized. Height overall, 3¹/₈ inches. Length overall, 18¹/₂ inches. For 2/0 to 4/0 round and grooved wire. See page 19 for listing of cam tips required for these crossovers.

Catalog Number	Description	Net Weight Lbs. Each
21662 21664	Type E Live Adjustable Crossover with Deflector Bars Comparison Type E Live Adjustable Crossover without Deflector Bars Comparison	

TYPE SR LIVE ADJUSTABLE CROSSOVERS For Carbon Shoe Operation Without Tips



Crossovers are adjustable from 30 to 90 degrees. Deflector bars provide protection against trapping of dewired trolley

on crossing angles between 30 and 60 degrees. For cross-

ing angles above 60 degrees, the deflector bars are

All castings are of malleable iron. All metal parts are hot-dip galvanized. Overall length, 18¼ inches.

Without Deflector Bars

For 2/0 to 4/0 round and grooved wire.

See page 19 for listing of Type SR tips required for these devices.

Catalog Number	Description	Net Weight Lbs. Each
20753 20754	Type SR Live Adjustable Crossover with Deflector Bars Type SR Live Adjustable Crossover without Deflector Bars	
	Parts	
20807 20358	Pan Only, with Clevis Bolts Deflector Sets (Two Castings and One Bolt)	6.5 0.45

omitted.

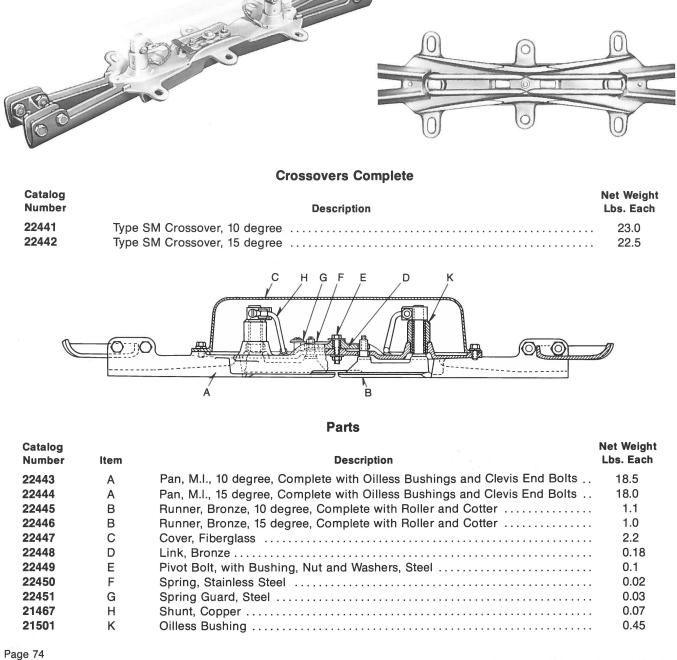
TYPE SM MECHANICAL CROSSOVERS For Carbon Shoe, Wheel, LRV Pantograph Without Anchor Tips

Type SM crossovers provide a separate underrun for each direction of operation so that heavier travel in one direction will not impair the smoothness of operation in the other direction. A continuous underrun assures positive guidance on the groove of the collector in each direction of travel. The crossovers are suitable for operation by either shoe or wheel collectors of standard width.

Double tongue runners are pivotally mounted at each

end of crossover and linked together at their inner ends. They are normally held in neutral position by spring tension to reduce the amount of movement. Runner tongues are aligned for the direction of travel desired by collector pressure against the flange of the crossover.

Pan castings are malleable iron, hot dip galvanized. Movable runners are bronze castings. Length overall of pans: 10 degree, 33 inches; 15 degree, 28 inches.



Catalog 76

THE OHIO BRASS COMPANY

TYPE CH INSULATED ADJUSTABLE SPACERS For Use Between Rigid Crossovers 24-Inch Wire Spacing



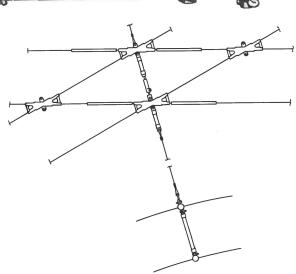
Useful as a rigid connection between crossovers in order to preserve the desired spacing between crossover pans when it is found necessary to pull the assembly into alignment or to carry curve pulloff through the crossover assembly to the pole. Cannot be used between pan castings of adjustable crossover.

Only two lengths are necessary, one for 70- to 90-degree crossovers and one for crossovers from 10 to 65 degrees. Each spacer has four-inch adjustment.

The Type CH spacer consists of a Hi*Lite strain insulator with clevis and threaded boss; a threaded stud pinned to boss with a cotter to prevent loosening in service; a turnbuckle casting with split end and bolt provision for tightening after adjustment; and a clevis stud, threaded full length.

Spacing of crossovers may be adjusted without disturbing clevis attachment.

Hi*Lite insulation is painted gray. Length of clear insulation: No. 54964-6111, 5 inches; No. 54964-6195, 13% inches. Clevis of Hi*Lite strain has $\frac{9}{16}$ -inch opening and is equipped with a $\frac{1}{2}$ -inch round-head rivet and cotter. Clevis of stud has $\frac{3}{4}$ -inch opening and is supplied with a $\frac{7}{16}$ x 2-inch round-head rivet and cotter.

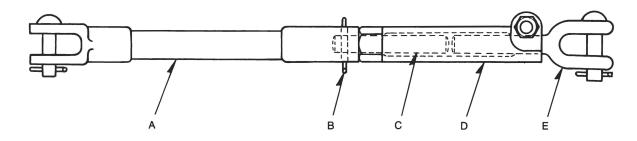


Length clevis pin centers No. 54982-3001, closed, 19¹/₈ inches; open, 23¹/₈ inches. Length clevis pin centers No. 54982-3002, closed, 27⁵/₈ inches; open, 31⁵/₈ inches.

All castings are malleable iron. Ferrous parts are hot-dip galvanized.

Spacers Complete

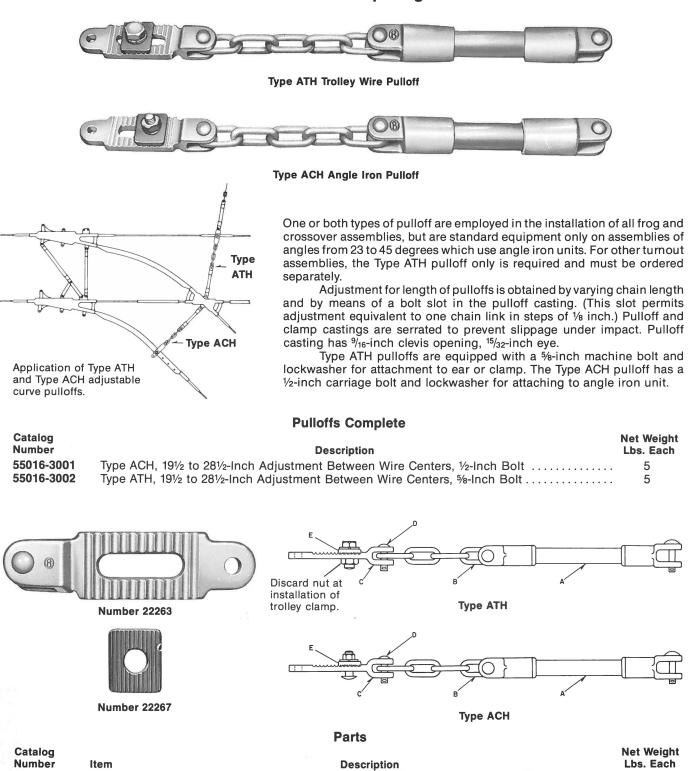
Catalog Number		Net Weight Lbs. Each
54982-3001 54982-3002	For 10- to 65-Degree Crossovers For 70- to 90-Degree Crossovers	



Parts

Catalog Number	ltem	Description	Net Weight Lbs. Each
54964-6111	Α	Hi*Lite Strain Unit Only for 10 to 65 Degrees	2.25
54964-6195	Α	Hi*Lite Strain Unit Only for 70 to 90 Degrees	
	В	Cotter, Steel, 1/8 x 11/2 Inches	0.01
21602	С	Stud, Steel, 5/8 x 33/4 Inches, for 10 to 65 Degrees	
21603	С	Stud, Steel, 5/8 x 51/2 Inches, for 70 to 90 Degrees	
21601	D	Turnbuckle, M.I., with 7/16 x 11/2 Inch Mach. Bolt, Threaded 5/8 Inch	1.1
21600	Е	Clevis Stud, Steel Forging, 5% x 45% Inch, Threaded 215/16 Inches	

ADJUSTABLE CURVE PULLOFFS 24-Inch Wire Spacing



Number	Item	Description	Lbs. Each
54995-6115	Α	Hi*Lite Strain Insulator, 1¼ x 5-Inch Insulation, Clevis Each End	2.65
22264	В	Steel Chain, 6 Link	0.6
22263	С	Pulloff Casting, M.I., with Clevis Bolt and Cotter	1.3
13688	D	Clevis Bolt, 7/16 x 1%-Inch, Without Cotter, Steel	0.14
22267	E	Clamp Casting, Bronze	

THE OHIO BRASS COMPANY



TYPE AH ADJUSTABLE-CURVE PULLOFF ASSEMBLIES 24-Inch Wire Spacing

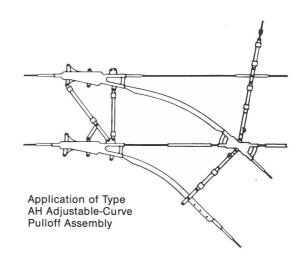


Employed in the installation of all double frog and crossover assemblies, but standard equipment only on assemblies of angle from 23- to 45-degree which employ angle iron runners. For these assemblies, as illustrated in drawing, the Type AH pulloff serves only for pulloff across tangent wire. Pulloff to angle iron runner employs a Type CH spacer 54982-3001 attaching to a separable strap which is a part of the runner. For turnout assemblies less than 23-degree angle, two Type AH pulloffs are required and must be ordered separately.

Pulloff assembly 54982-3003 only is used as standard equipment in turnout assemblies. Other adjustment ranges are necessary occasionally, depending upon pole locations.

Pulloff assembly 54982-3003 is made up of strain strap assembly 21199 and Type CH spacer assembly 54982-3001, listed on page 75. Assemblies for other adjustment ranges are exactly the same except for length of stud attaching to Hi*Lite strain. Turnbuckle permits adjustment without disturbing end attachments.

Strap 21199 is $1\frac{1}{2}$ inches wide. Pulloff eyes are $\frac{9}{16}$ -inch diameter. All castings are of malleable iron. Ferrous parts are hot-dip galvanized.



		Pulloff Assemblies Complete	
Catalog Number	0454	Description	Net Weight Lbs. Each
54982-3003 54982-3004	21% to 231⁄4 to	25%-Inch Adjustment	5.5 5.7
		Parts	
Catalog Number	Item	Description	Net Weight Lbs. Each
21199	А	Strap, Steel, with %-Inch Stud and Lockwasher	1.0
54964-6111	В	Hi*Lite Strain Unit Only	2.25
	С	Cotter, Steel, 1/8 x 11/2 Inch	0.01
21602	D	Stud, Steel, 5% x 334 Inch, for 215% to 255%-Inch Adjustment	0.32
01600	D		0.5

Stud, Steel, 5% x 51/2 Inch, for 231/4 to 271/4-Inch Adjustment

Turnbuckle, M.I., with 7/16 x 11/2-Inch Mach. Bolt

Clevis Stud, Steel Forging, 5/8 Inch, L.H. Thread

THE OHIO BRASS COMPANY

D

Е

F

21603

21601

21600

0.5

1.1

0.8



TYPE T LIVE SPACERS Tongue and Tongue



These spacers are used in place of short lengths of trolley wire in forming special work assemblies. They are made of $\frac{3}{8}$ x 1-inch round edge flat steel bar to which steel tongues are welded. All spacers are hot-dip galvanized.

Minimum underrun length to which these spacers can be

made is 5 inches. However, special Type T Spacers can be supplied in shorter lengths, if desired.

The following listing is for the purpose of showing the lengths and weights of spacers employed in standard special work assemblies.

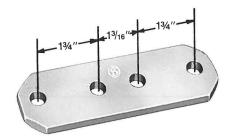
Catalog Number	Length Underrun Inches	Net Wt. Lbs. Each	Catalog Number	Length Underrun Inches	Net Wt. Lbs. Each
21204	71/2	2.0	16786	451⁄4	6.4
16795	87⁄8	2.2	19132	453/4	6.43
18256	101⁄8	2.5	19133	471/2	6.48
16794	11	2.6	18146	48	6.5
18257	121⁄4	2.75	21086	48%	6.6
18258	141⁄2	3.0	19134	503⁄4	6.6
16792	151⁄4	3.12	21213	51 ¹³ / ₁₆	6.7
18259	171⁄8	3.25	16950	521/4	6.75
21205	187⁄8	3.6	19135	531⁄4	7.0
16868	193/4	3.75	21087	553/8	7.2
16790	207/8	3.8	19257	581/2	7.5
16789	23¾	4.0	18152	621/2	8.0
19125	241⁄8	4.1	17705	661⁄4	8.5
19126	26¾	4.4	21023	663⁄4	8.6
16788	28	4.5	21113	681/4	8.8
19127	30	4.6	18151	701⁄2	9.0
16787	32	4.75	21085	74¾	9.2
19128	34	5.0	18150	75	9.25
18144	36	5.4	18149	781⁄2	9.5
19129	397⁄8	5.8	21207	92	11.2
18145	401/2	6.0	18147	105	12.25
19130	41 ¼	6.1	21206	1061/4	12.6
19131	421/2	6.3			



Employed only in frog and crossover assemblies having insulation in curve. Made of steel %-inch thick, 1%-inch wide, hot-dip galvanized. Holes are $9/_{16}$ -inch diameter.

Catalog Number	Description	Net Weight Lbs. Each
21109	Length Between Hole Centers, 16 ¹ / ₁₆ Inches	2.3
21110	Length Between Hole Centers, 15 ¹ / ₁₆ Inches	2.0

BRACE



Used to join one frog or crossover pan flush to another. $^{15\!/_{32}}$ inch holes.

Catalog Number	Description	Net Weight Lbs. Each
18232	Pan Connector, Steel, Galvanized	1.0



TYPE TC LIVE SPACERS Tongue and Clevis

00

Steel



Malleable Iron

These spacers are used in place of short lengths of trolley wire in forming special work assemblies. Steel spacers are $\frac{3}{2} \times 1$ -inch round edge flat bar, to which tongue and clevis are welded. All spacers are hot-dip galvanized. Minimum

underrun length is 61/2 inches.

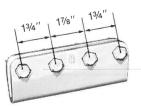
The following listings are for the purpose of showing the lengths and weights of spacers employed in standard special work assemblies.

				Steel				
Catalog Number	Length Underrun Inches	Net Weight Lbs. Ea.	Catalog Number	Length Underrun Inches	Net Weight Lbs. Ea.	Catalog Number	Length Underrun Inches	Net Weight Lbs. Ea.
19110	81⁄4	2.3	19115	22	4.0	21252	345⁄8	5.4
19111	101⁄4	2.7	19116	223⁄4	4.1	19122	35	5.1
21232	107/16	2.8	19117	24	4.2	18619	36 ³ /16	5.3
21215	11 ¹⁵ / ₁₆	3.0	21218	24 ⁹ /16	4.3	21361	361/2	5.6
17703	121/8	3.3	18617	251/2	4.3	19123	37	5.5
21216	13 ⁵ / ₁₆	3.2	19118	261/2	4.4	18626	407/16	5.8
19114	14¼	3.4	19119	271/2	4.45	21880	43	5.9
21227	15	3.4	18625	281/2	4.5	21231	447/16	6.2
19124	151/2	3.45	21219	291/8	4.6	18620	44 ¹³ / ₁₆	6.0
18143	165⁄8	3.5	21225	31	4.8	21224	45%16	6.3
21226	17 ⁷ / ₁₆	3.6	19120	311/2	4.7	21250	483⁄4	6.7
18624	21	3.8	21251	317⁄8	5.0	18628	53	7.0
*19255	21	3.8	17704	327/16	4.8	18627	57	7.25
† 19256	21	3.8	21220	33	5.2	21222	721/8	9.0
21217	211/2	3.9	19121	337/8	4.9	18630	851/4	10.0
*Right hand	curved.					21221	867/16	10.5

+Left hand curved.

Ma	llea	ble	Iron
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Catalog Number	Length Underrun Inches	Turnout	Degree Angle	Net Weight Lbs. Ea.
17702	43⁄8			1.8
18939	53/4			2.0
18618	7			2.2
17239	91⁄4			2.5
20985	7	R.H.	3	2.2
20986	7	L.H.	3	2.2
21111	7	R.H.	5	2.2
21112	7	L.H.	5	2.2



No. 21584



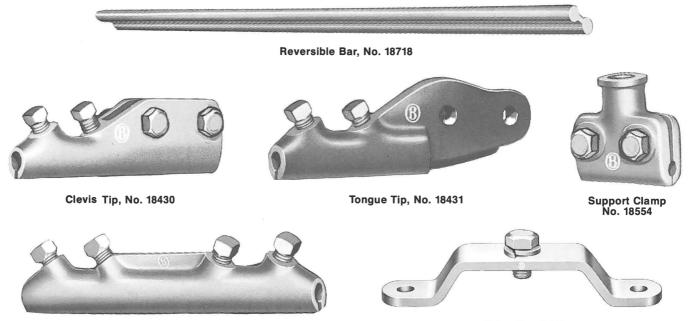
TYPE CC LIVE SPACERS Clevis and Clevis

Spacer 21584 is of malleable iron and is employed to join two No-Bo insulators in series. Spacer 21461 is formed of steel and serves as part of long-radius frog and crossover assemblies for 30-degree turnouts. All Type CC spacers are supplied complete with clevis end bolts. All parts are hot-dip galvanized.

Catalog Number	Length Underrun Inches	Net Weight Lbs. Each		
21584	61⁄2	2.2		
21461	91⁄2	3.0		



UNIVERSAL SPACER BARS AND FITTINGS



Splicer, No. 18553

The universal spacer serves the same purpose as the live spacers listed on pages 78 and 79 and provides the same collector clearance. It fills the need for a rigid spacer which can be made up quickly on the ground for emergency requirements, such as repairing a damaged intersection assembly and last minute changes in angles of crossing. It is often substituted for short lengths of trolley wire between intersection assemblies and is extensively used as the trolley for barn and subway overhead.

Stock problems are simplified by the use of the universal spacer. Instead of carrying a stock of each of the numerous lengths of Types T and TC spacers, supplied as a part of the original intersection assemblies, the occasional replacements necessary can be made by carrying a few universal spacer bars and tips.

Universal spacer bar is copper, 1-inch high with %-inch diameter lobes. As the lobe dimensions are identical, when one side becomes worn the bar may be reversed, forming a new full-size underrun. Universal bar is supplied in 18-foot lengths. It is light in weight and can be formed readily to any curvature desired.

Tips for joining bar to ends of special work are of two types: one with tongue, to fit clevis ends of all live pans; the other with clevis, to fit tongue ends of insulated spacers. The complete spacer may be made up with tongue on each Yoke, No. 19113

end or with tongue and clevis, depending upon application. The bar is inserted in the tip from the end and is anchored by means of set-screws which are set at an angle in order to provide maximum holding power. These set-screws should be tightened 11/4 turns after seating against the bar.

Splicers and intermediate supports are available for extra-long spacers. The bars are inserted in the splicer from each end and butted together in the center, after which the set-screws are tightened in the usual manner. The support is a clamp which grips the upper lobe of spacer bar. It has a $\frac{5}{16}$ -inch boss and is $\frac{23}{16}$ -inches high from center of bar groove to top of boss. The yoke attaches to support where it is necessary to pull off across spacer bar.

All fittings are of malleable iron except yoke which is steel, and tongue tip which is high-strength bronze. All ferrous parts are hot-dip galvanized. Set-screws in tips and splicers are $7_{16} \times 1$ inch. Length of bar groove: tongue tip, 37_{8} inches; clevis tip, 6 inches; splicer, 71_{2} inches. Yoke measures 71_{2} inches between centers of pulloff eyes which are 9_{16} inch in diameter; height, 17_{32} inches.

Unless exact use can be determined before ordering, it is suggested that the first order for this material call for twice as many tips with tongue end as with clevis end, as there are usually more applications employing the tongue end tips.

Catalog Number	Description	Net Weight Lbs. per 100
Number	Description	Lbs. per 100
18718	Universal Spacer Bar Only (Supplied in 18-Foot Lengths)	1650
18431	Universal Spacer Tip with Tongue	100
18430	Universal Spacer Tip with Clevis	
18553	Universal Spacer Splicer	
18554	Universal Spacer Support Clamp	100
19113	Universal Spacer Yoke with 5/8-Inch Stud	113



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