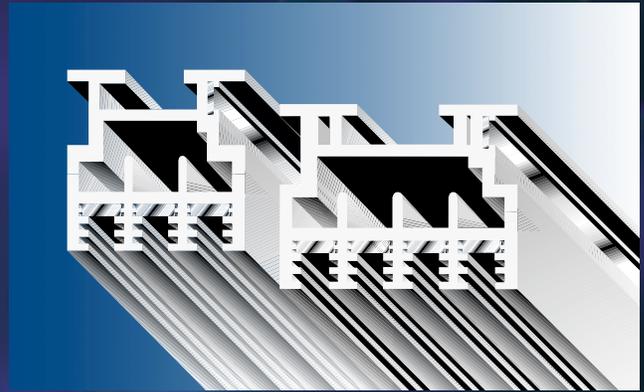


# **TRI-BAR / FOUR-BAR**

JOINT-FREE CONDUCTOR BAR SYSTEMS



## **Quality, Reliable Power Supply to Moving and Stationary Equipment**

Products, Components and Accessories

# **SAFETY TROLLEY**

A DIVISION OF UNIVERSAL ELECTRIC CORPORATION

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*For nearly forty years, quality trolley conductor bar and busway systems have been manufactured by U-S Safety Trolley Corporation. Today, innovations have expanded the company to serve a wider range of electrical needs under a new name — Universal Electric Corporation. Only the name has changed. The service, quality products and good people remain the same.*

# TRI-BAR/FOUR-BAR

JOINT-FREE CONDUCTOR BAR SYSTEMS

## Tri-Bar/Four-Bar Conductor Bar Systems

### The Tri-Bar/Four-Bar Solution

#### Popular applications include:

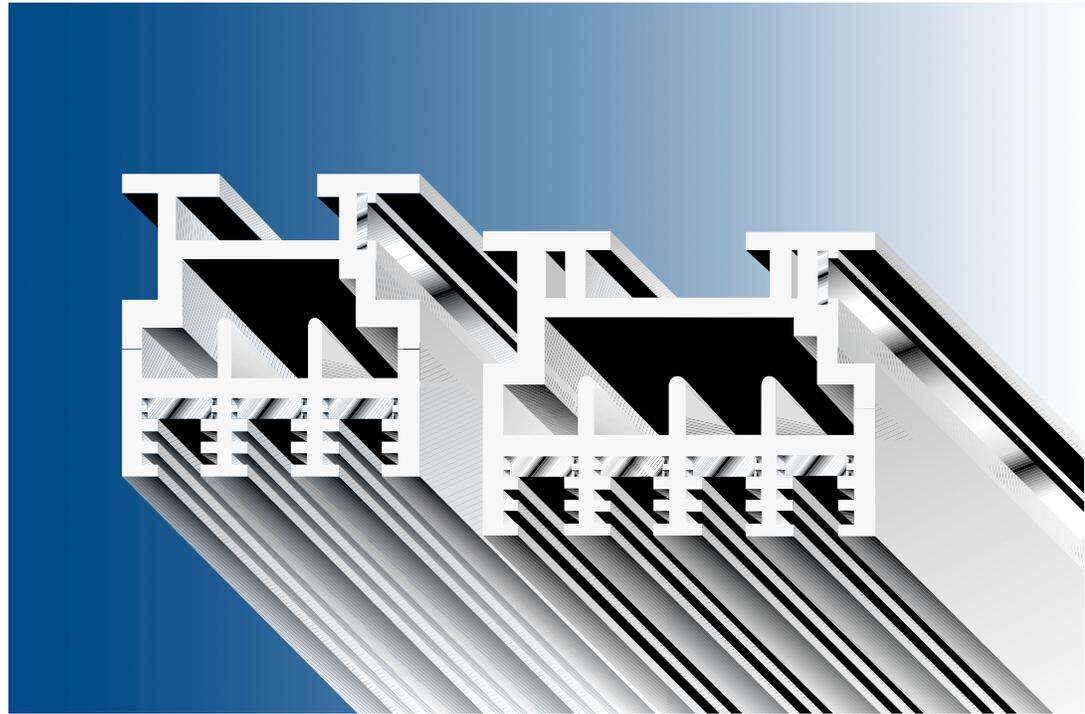
- Electrification for Overhead Cranes
- Hoists
- Monorails
- Storage Systems
- Assembly Lines
- Moving Equipment
- Elevators
- Trolley Busway Systems for the Garment and Light Manufacturing Industries
- Amusement Park Rides

#### General Information

Tri-Bar & Four-Bar systems are the superior designed systems with no joints in the solid copper conductors and a multi-conductor modular housing. Joint-free copper conductors are cut to length for each job requirement and shipped in a coil.

Tri-Bar & Four-Bar systems have a wide variety of useful applications for business and industry, including electrification for cranes, hoists, conveyor burn-in lines, automated moving equipment, material handling equipment, ASRS stacker cranes, hangar doors, elevators, transfer cars, amusement rides, etc.

Installation is fast and easy. The insulated housings come in standard 20 foot lengths (or 6 meters), and interlock. Then the conductors slide easily into the housing slots from one end.



Because of its unique design, it outperforms and outlasts other systems. This means it is a better value to the user.

Since there are no joints in the conductors, the most common source of trouble is gone. As a result, the system eliminates downtime and problems inherent in other systems.

#### Tri-Bar

3 pole, 600 volts  
50, 100 and 125 ampere copper

#### Four-Bar

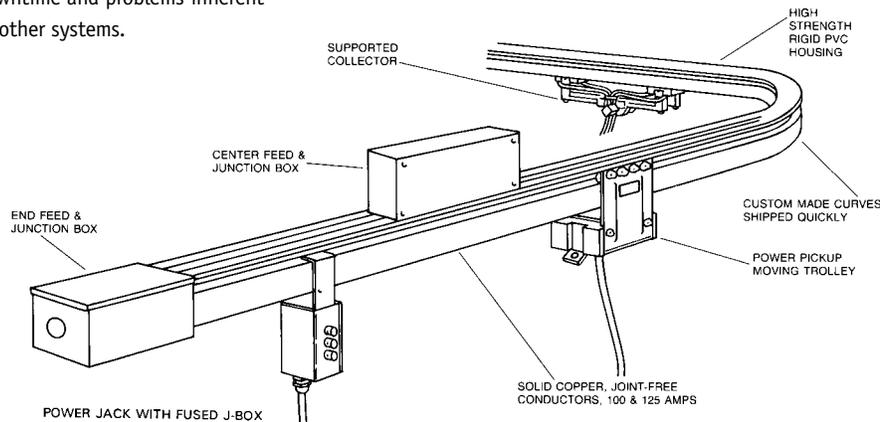
4 pole, 600 volts  
50, 100 and 125 ampere copper

#### Tri-Bar with Ground

3 pole plus ground, 600 volts  
50, 100 and 125 ampere copper

#### Four-Bar with Ground

4 pole plus ground, 600 volts  
50, 100 and 125 ampere copper



# TRI-BAR/FOUR-BAR

JOINT-FREE CONDUCTOR BAR SYSTEMS

## 2 Features

### Joint-Free Design

The feature of continuous, joint-free, electrical conductors for the entire length of the run eliminates the weakest part of any electrical systems — the joints. One-piece copper conductors are cut to each job requirement and shipped in a coil. Don't settle for less. Demand top quality, joint-free Tri-Bar & Four-Bar systems for your electrification needs.

### Reliable

Tri-Bar/Four-Bar is the solution for these problems:

- Downtime due to arcing
- Loose joints
- Pitted steel bars
- Expansion
- Misalignment

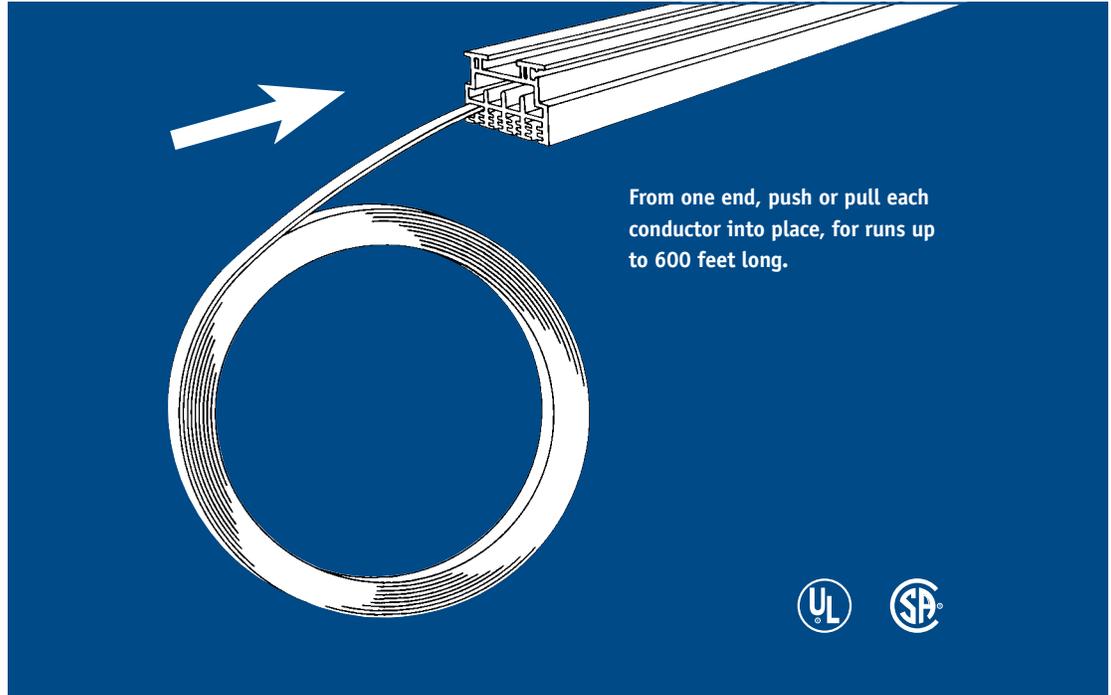
### Bill of Material

For a 190 foot long runway requiring 125 ampere conductor with center feed:

190 ft.	125-TBH	Conductor
1	CF-3	Center Feed
1	C125-3	Collector
10	HB-1	Hanger Bolt
29	SHB-1	Sliding Hanger Bolt
1 pr.	EP-3	End Piece
2	EC-3	End Cap
1	JBCF-3	Junction Box

### Solid Copper Bars

Used for ultimate electrical efficiency, quality and reliability. Other systems use steel conductors which oxidize, causing poor electrical contact.



### Compact

A single housing for up to 5 conductors keeps space requirements to a minimum. Multiple runs can be stacked side by side.

### Safe

The housing of Tri-Bar & Four-Bar systems are made of an insulated, high impact PVC compound, providing safety as well as rugged durability of the system.

### UL Listed and CSA Recognized

UL and CSA Ampere Ratings are:

	Continuous	Intermittent
"100" Series	80	120
"125" Series	100	150

### Fast Shipments

Complete systems can be shipped out quickly, from stock to meet your delivery requirements. Custom-made systems to your drawings can also be shipped with short lead times.

### Variety of Trolley/Taps

Supported collectors from 35 to 125 amps are available, as well as Power Pickup trolleys from 15 to 50 amps, which are self supported on the housing. Stationary Power Jacks for 15 or 25 amp loads are available for power take off to machines, lighting, etc.

### Ideal for Signals, Controls, etc.

The joint-free design makes data transmission for signals and communication much more reliable. The conductors can also

be segmented as needed for automated motion control, test zones and isolated power segments.

### Fast and Easy to Install

Tri-Bar & Four-Bar systems have fewer parts. This means the system installs faster and easier than other systems, thus reducing installation cost. Installation is accomplished with pocket tools.

*Step 1.* Mount the housings for the full length required

*Step 2.* Push-pull each pre-cut length of conductor through empty slot in housing

*Step 3.* Connect feed wires

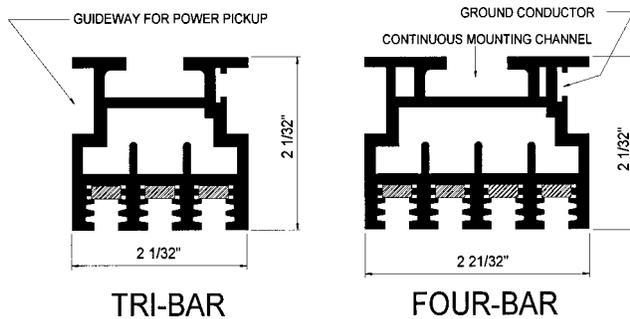
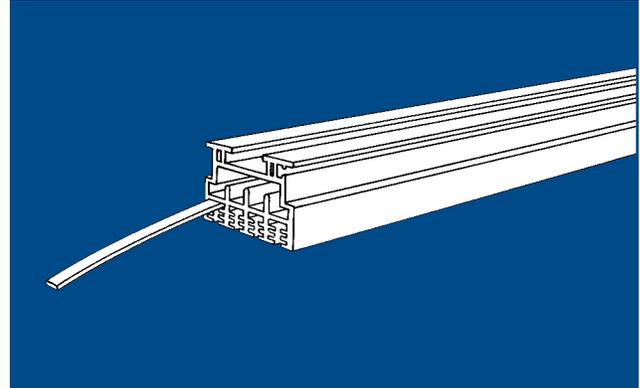
# TRI-BAR/FOUR-BAR

JOINT-FREE CONDUCTOR BAR SYSTEMS

## Systems Components

### Insulated Housings and Conductor

Catalog #	Description	Lb./ft.
50-TBH	Tri-Bar 50 amp. Copper	1.1
100-TBH	Tri-Bar 100 amp. Copper	1.1
125-TBH	Tri-Bar 100 amp. Copper	1.1
100-TBHG	Tri-Bar/Ground 100 amp.	1.3
125-TBHG	Tri-Bar/Ground 125 amp.	1.3
50-FBH	Four-Bar 50 amp. Copper	1.3
100-FBH	Four-Bar 100 amp. Copper	1.6
125-FBH	Four-Bar 125 amp. Copper	1.6
100-FBHG	Four-Bar/Ground 100 amp.	1.6
125-FBHG	Four-Bar/Ground 125 amp.	1.6



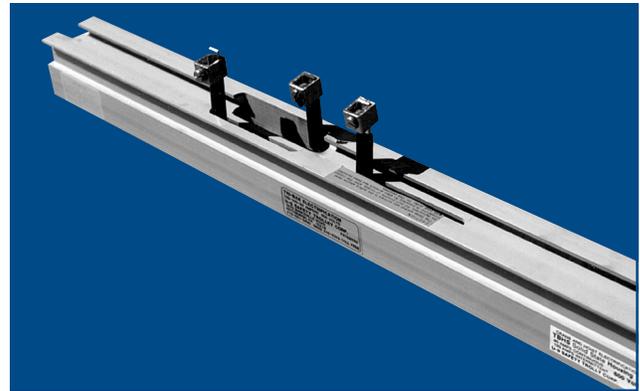
### Insulated Housings and Conductor

Specify the total system length required. Housings are supplied in 20 foot lengths, with the last section cut as required for the correct system total. Conductors are cut to the length of the system, and supplied in coils, about 30 inches in diameter. Specify a conductor straightener tool for lengths over 50 feet.

### Center Feed/Splice Section

Catalog #	Description	Lb./ft.
CF-3	Tri-Bar Center Feed	3
CF-4	Four-Bar Center Feed	4
SS-3	Tri-Bar Splice	3
SS-4	Four-Bar Splice	4

Note: Center feeds are optional. End feed systems have wire connection lugs provided at no extra cost.



### Center Feed/Splice Section

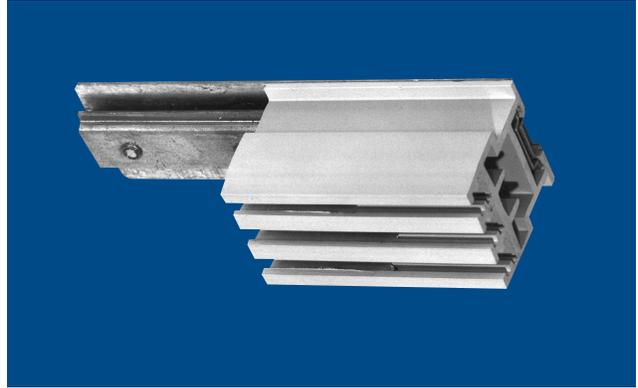
Supplied in 2 foot sections, or can be installed in longer sections if requested. Splices are only needed if extending a system or runs over 600 feet long.

# TRI-BAR/FOUR-BAR

JOINT-FREE CONDUCTOR BAR SYSTEMS

## End Piece

Catalog #	Description	Lb./ft.
EP-3	For Tri-Bar	1
EP-4	For Four-Bar	1

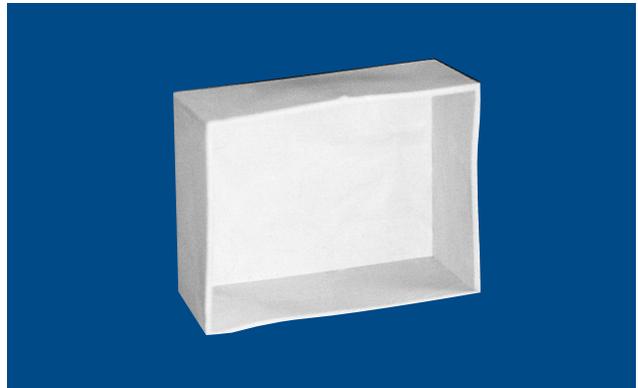


## End Piece

Installed at the end of every conductor run to insulate conductors.

## End Cap

Catalog #	Description	Lb./ft.
EC-3	For Tri-Bar	.2
EC-4	For Four-Bar	.2

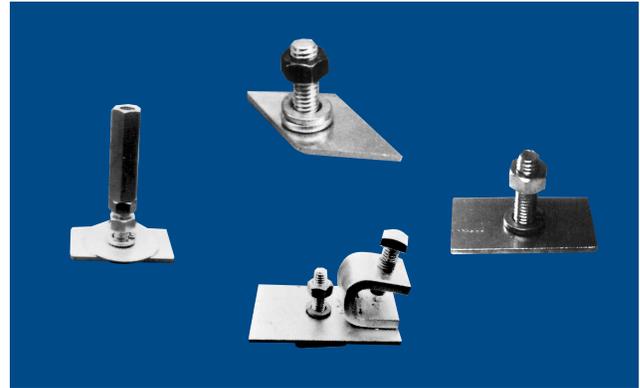


## End Cap

Used at end of conductor run with end piece.

**Hanger Bolts**

<b>Catalog #</b>	<b>Description</b>	<b>Stud</b>
HB-1	Fixed Hanger, twist-in	5/16"
SHB-1	Sliding Hanger, twist-in	5/16"
HB-2	Fixed Hanger, 2" long	5/16"
SHB-2	Sliding Hanger, 2" long	5/16"
RHB-2	Rod Mount Hanger	3/8"
BHB-2	Fixed Hanger & Beam Clamp	Clamp
BSHB-2	Sliding Hanger & Beam Clamp	Clamp
CHB-2	Fixed Hanger & Ceiling Mount	3/8"
CSHB-2	Sliding Hanger & Ceiling Mount	3/8"

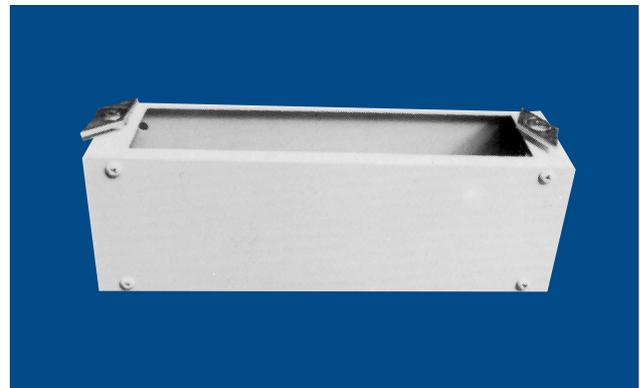


**Hanger Bolts**

A variety of hangers are available, including types that twist-in, slide-in from end, threaded rod coupler hangers, beam clamp and ceiling bracket hangers. One stationary hanger bolt is used per housing section. Sliding hanger bolts are used at the other support points, approximately 5 feet apart, for expansion. See page 9 about expansion.

**Junction Box**

<b>Catalog #</b>	<b>Description</b>	<b>Lb./ft.</b>
JBEF3	Tri-Bar End Feed	3
JBCF3	Tri-Bar Center Feed	3
JBEF4	Four-Bar End Feed	3
JBCF-4	Four-Bar Center Feed	3



**Junction Box**

Used to enclose end feed or center feed connections. Metal box has removable side and bolts to fasten it to the system.

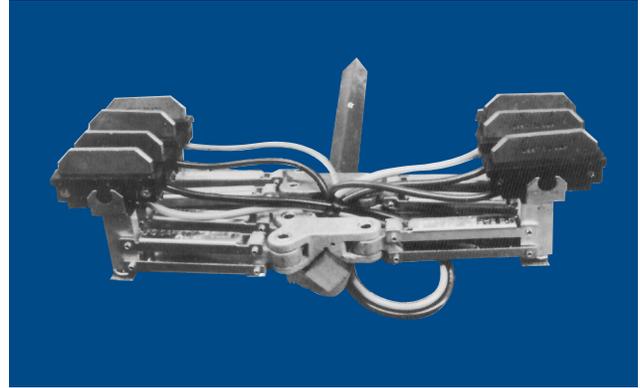
## TRI-BAR/FOUR-BAR

JOINT-FREE CONDUCTOR BAR SYSTEMS

### Supported Collector

Catalog #	Type	Rating	Lb.
C35-2	Two-Bar	35 A	2
C70-2	Two-Bar	70 A	2
C35-3	Tri-Bar	35 A	3
C70-3	Tri-Bar	70 A	3
C125-3	Tri-Bar	125 A	3
C35-4	Four-Bar	35 A	4
C70-4	Four-Bar	70 A	4
C125-4	Four-Bar	125 A	4

Abrasive cleaning shoes available



### Supported Collector

Mounts on a 1 inch square bar. Handles 4 inch horizontal and 4.5 inch vertical misalignment. 3 or 4 contact shoe assemblies mount on one base. Can be side mounted and used on curves.

### Power Jack

Catalog #	Description	Rating
PJ315G2	Tri-Bar & Tri-Bar/Ground	3P/Gd. 600V
PJ315G2-JB	Above Item with J-Box	3P/Gd. 600V
PJ315G2-1F	Above Item with 1 Fuse	3P/Gd. 300V
PJ315G2-3F	Above Item with 3 Fuses	3P/Gd. 300V
PJ415G	Four-Bar & Four-Bar/Ground	4P/Gd. 600V
PJ415G-JB	Above Item with J-Box	4P/Gd. 600V
PJ415G-1F	Above Item with 1 Fuse	1P/Gd. 300V
PJ415G-3F	Above Item with 3 Fuses	3P/Gd. 300V

Variations on Power Jacks and attachments available, including receptacles, alternate boxes, and 25 amp units. Consult factory.



### Power Jack

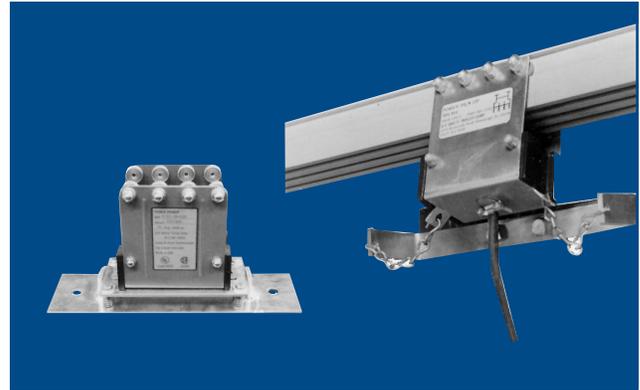
Stationary power tap rated at 15 amp. Squeeze handles and clip unit onto standard system. Molded J-box and type ABC fuses shown.

**Power Pickup**

Catalog #	Type	Rating	Lb.
PP3-15-2PD	Two-Bar	15A 2P	1.5
PP3-30-2PD	Two-Bar	30A 2P	1.5
PP3-15-3PD	Tri-Bar	15A 3P	1.5
PP3-30-3PD	Tri-Bar	30A 3P	1.5
PP3-15-3PDG	Tri-Bar/Ground	15A 3P/Gd.	1.8
PP3-30-3PDG	Tri-Bar/Ground	30A 3P/Gd.	1.8
PP4-15-4PD	Four-Bar	15A 4P	2
PP4-30-4PD	Four-Bar	30A 4P	2
PP4-15-4PDG	Four-Bar/Ground	15A 4P/Gd.	2.3
PP4-30-4PDG	Four-Bar/Ground	30A 4P/Gd.	2.3

**Standard Options:**

- 40 and 50 amp Power Pickups
- Pulling Yoke, cat. no. PY-1 (order separately)
- Unit with compact J-box area, omit "D" to cat. no.
- Fuses: (1, 2, or 3) Type ABC (250V), add 1F, 2F or 3F
- Receptacles: 1 or 2, 15A, 125V, add 1R or 2R
- Abrasive cleaning shoes



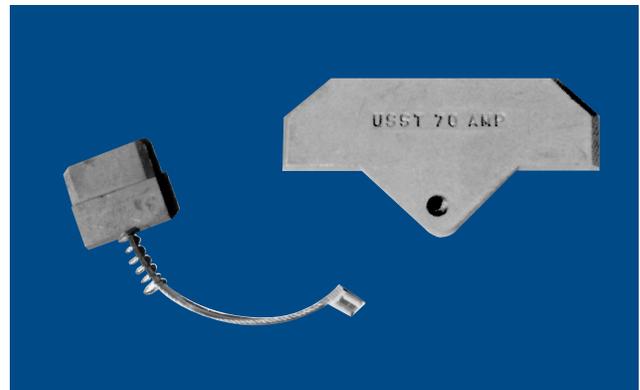
**Power Pickup**

The Power Pickup is a self-supported collector which rolls on bearings which are captive on the track. Ideal for hoists, monorails, conveyors, assembly lines, test lines, work benches and tables, cutting rooms, etc. Internal wiring box area is built into the unit. Variations on Power Pickups are available for many needs.

**Collector Shoes**

Catalog #	Rating	Type
2211	15 A	Power Pickup
2191	35/70 A	Collector
2197	125 A	Collector

Many variations available including abrasive shoes, 40 and 50 amp Power Pickup shoes, etc. Consult factory.



**Collector Shoes**

Replacement shoe for collector and Power Pickup. Shoe is copper with graphite. No lubricant required. Typical shoe life is thousands of miles, and is much higher in good environments.

# TRI-BAR/FOUR-BAR

JOINT-FREE CONDUCTOR BAR SYSTEMS

## 8 Accessories

Some other items for spare parts and special requirements are shown below. Consult factory for details.

### Accessories

Catalog #	Item	Description
100C 125C	Conductor only	100 or 125 amp copper bar available for spare part requirements
TBHS-20 FBHS-20	Tri-Bar, Four-Bar Housing only	Insulated housing only, for spare part requirements. 20 ft. standard length
ASB-1	Aluminum Support Bar	Supports weight loads up to 200 pounds per 5 foot space, or used for added rigidity. Mounts to housing.
PS-1	Polarizing Strip	Used to prevent "backwards" installation of taps, out of polarity.
EG-3 EG-4	Entrance Guide	Attaches to end of housing when Power Pickup is to enter/exit continually.
-DIS	Disengagable Spring Base for Power Pickup	Use to support Power Pickup on disengaging applications, along with E6-3, E6-4. Handles 2 inch alignment.

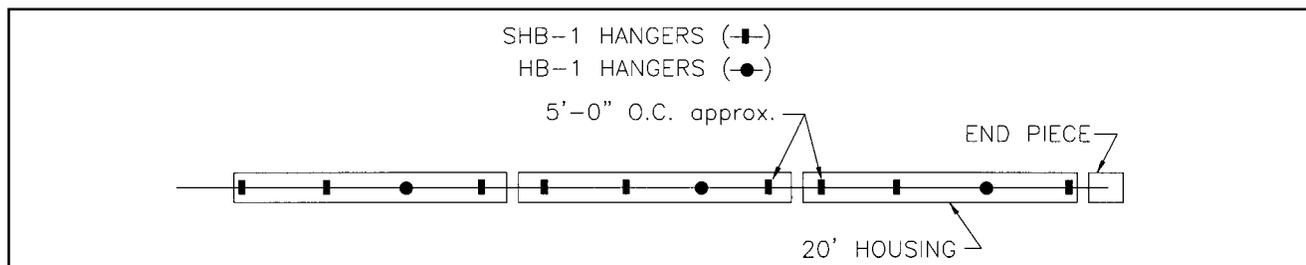
### Temperature Range and Expansion

Tri-Bar & Four-Bar is recommended for temperatures from 0°F (-18°C) to 130°F (55°C). For extreme temperature conditions, consult factory. Where there are variations in temperature of over 20°F, expansion of the conductor must be considered. A 20 foot section of housing will expand about 1/4 inch per 50°F. On crane bridges and runways install an HB-1 hanger bolt near the center of each 20 foot section of housing and use sliding hanger bolts SHB-1 at all other locations.

There must be a space between each plastic housing to provide for expansion. The approximate opening between 20 foot sections for an application with 30° to 100°F temperature range:

100°F	0
65°F	3/16 inch
30°F	3/8 inch

An expansion joint section may be required in systems that have expansion provisions in the supporting structure. The initial gap setting is determined by the ambient temperature at the time of setting of the gap. If the temperature is at the lower portion of the ambient, the gap should be approximately 3/4 inch. If the temperature is near the maximum, the gap should be 1/8 inch. Other settings are proportional. On runways with expansion sections, use the 125 ampere collector.

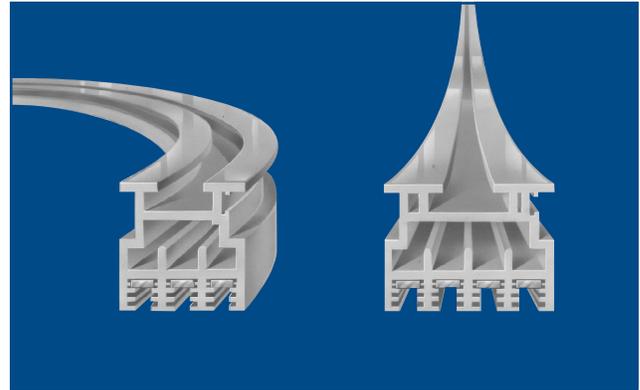


**Systems with Curves, Closed Loops, Switches, Transfers and Disengageable Trolleys**

The unique modular design of Tri-Bar/Four-Bar systems gives it capabilities not found in any other conductor systems. This makes it the best choice for special requirements of all types, including the following:

**Curves**

Just about any type of curve can be made for custom requirements, including 90 degree, 180 degree, circles, any arc length and degrees, any radius 18 inches (450 mm) or over, horizontal or vertical bends, "S" curves, dog-legs, curve-straight combos, bars facing in, out or down, angle cut, even helix curves! If you have any type of curve requirements, Tri-Bar/Four-Bar is the ultimate solution at low prices and quick deliveries.



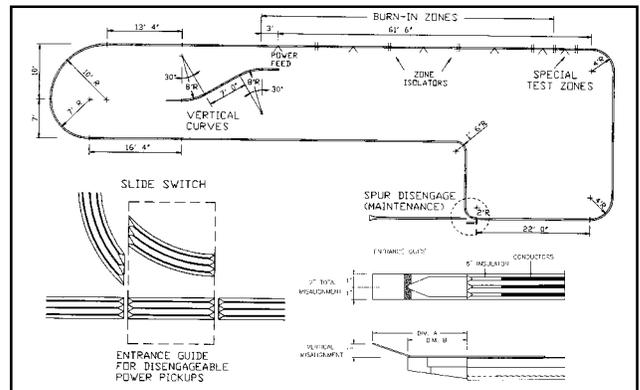
**Loop Systems**

Tri-Bar/Four-Bar system provide "spike-free" power, superior reliability and durability. The normal procedure is to submit a sketch giving curve and straightaway dimensions, and any special requirements, such as power feed locations, isolated zones, switch locations, etc. Simple loops may be described over the telephone.

Each system is custom made to your requirements. Pieces will be cut, bent, and labelled at the factory for easy installation. Many companies large and small have used Tri-Bar/Four-Bar for their loop requirements for years. Some of those companies include: G.E., Whirlpool, Frigidaire, Heil Quaker, Roper, White Machine, Black & Decker, IBM, Zenith, Hewlett Packard, Sun Microsystems, Ford, Disney World, Six Flags, as well as many smaller shops.

**Zones and Segments**

The conductors can be divided into as large or small zones as desired. The copper is cut to the length specified, positioned in the housing slots, and nylon insulators are positioned on each side of the zone. Center feed connections are made to the segment if desired.



**Switches and Transfers**

Slide, tongue and other types of switches are easily handled. The ends of the housing on either side of the gap at a switch are tapered, to accept a normal total misalignment of 1/4 inch (6 mm).

**Disengageable Systems**

Entrance guides are installed on the end(s) of a system where the Power Pickups enter/exit system continually. Power Pickups can be manually fed on the system, or mounted on bases which support the unit while disengaged, and automatically funnel onto the housing, allowing up to 2 inches (50 mm) of misalignment.

10 **Pallet Electrification**

The Hot Pallet Electrification system is designed to provide a sliding electrical contact to electrified pallets on burn-in and testing conveyor lines. Universal Electric Corporation offers two basic systems: Busway and Discrete.

**Hot Pallet Busway System**

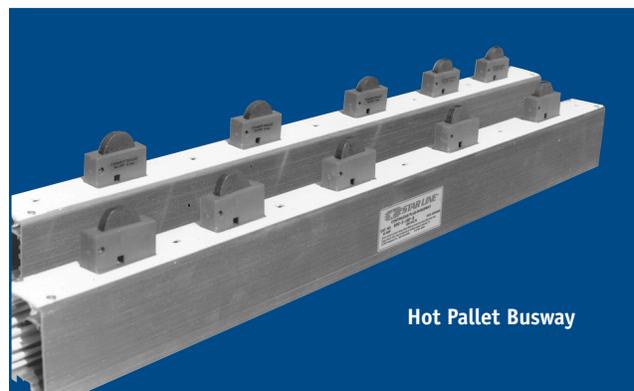
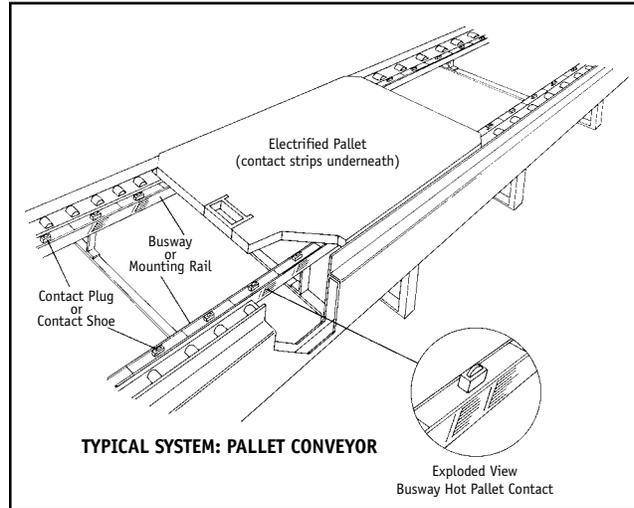
Busway systems offer maximum convenience and ease of maintenance. Continuous plug-in busway accepts contact plugs at any location. Quick-plug feature allows insertion and removal of contacts with a simple 90 degree turn. The snap-in closure strip seals the busway from dust and debris while locking the contact plug into place. System is completely modular and is easily fitted to conveyor line sections. See the Starline Track Busway brochure for a complete description of the busway.

**Discrete Hot Pallet Contacts**

Discrete contact shoes offer maximum flexibility. They require minimal space, and mount with two screws. Size and mounting arrangement allows direct replacement of other brands. Length of wire lead is selectable. Contact shoe is rated at 15 amperes. A sensor module that mounts to the contact shoe and signals the presence of the pallet is available. This module fastens directly to the contact shoe and is used in systems that require safety interlocking.

**Features**

- Easiest to maintain
- Extremely versatile
- Retrofits to most existing conveyor systems
- Quick plug feature for easy maintenance
- American made
- Plug rating:  
15 amps, 600 volts
- Busway rating:  
60 amps, 600 volts  
1, 2, 3 or 4 poles  
U.L. Listed





# TRI-BAR/FOUR-BAR

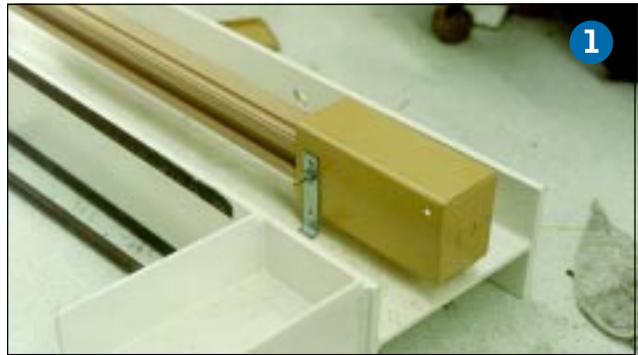
JOINT-FREE CONDUCTOR BAR SYSTEMS

## 12 Installation Procedure in Pictures

Please contact our factory with questions prior to installation. Tri-Bar/Four-Bar is the competitive “asked for” electrification.

Easy to install, as these pictures illustrate:

- Step 1. Weld or bolt brackets to runway girder.
- Step 2. Install empty housings on brackets. Insulating sleeves interlock for safety and reliability.
- Step 3. Push or pull conductors in the housing slots.
- Step 4. Install the power feed box and make final connections to power supply.





Four-Bar is ideal for the ultimate reliability for overhead crane runways. This steel company uses Four-Bar on seven runways in this plant.



The Four-Bar provides continuous copper bars, joint-free for the entire runway length. Four conductors take up only 2 5/8 inch of horizontal space.



Four-Bar is used on the bridge of this crane for main power and control lines.



Four-Bar is perfectly formed to any curve, switch and transfer requirement. Systems are custom fabricated to customer requirements.



Eliminate low hanging, unsightly festoon cords and tag lines, with compact Tri-Bar on this light duty crane, at this electronics manufacturer.



The Power Pickup on this light duty crane runway feeds power to the bridge track. The drag on the manually pulled hoist is negligible.



This trench-mounted Tri-Bar withstands dirt, oil and moisture to electrify a steel coil transfer car.



10 control lines require less than 7 inches of space for this steel slab grinder, using Tri-Bar and Four-Bar. Universal's Span-Guard, shown, provide the main power.



A corrugated products manufacturer had trouble with festoon systems failing on their transfer cars due to air contaminants and frozen trolleys.



Four-Bar replaced the festoon systems on four transfer car runways in this plant, as well as additional runs in a second plant. Owners are happy with the trouble-free performance of the Four-Bar.



This monorail system shows a Tri-Bar entrance guide and a Power Pickup on a disengageable base. The hoist is entering an electrified zone for a hoisting area.



This automated warehouse uses Tri-Bar and Four-Bar on stacker cranes which moves many order picks each day.



Tri-Bar and Four-Bar systems are used on many amusement park rides to power moving cars. EPCOT's Spaceship Earth uses Four-Bar track for power and sound, as well as several other rides at that attraction. Each curve was fabricated to the designer's drawings.



The Tri-Bar and Four-Bar conductors are supplied in coils, and inserted in the housing slots from one end of the run. Long runs are coiled on a cross for added stability and to use with payoff stands.



Moving and rotating machinery, such as this stretch wrapping machine, use Tri-Bar circles, bent to specification.



The key to superior performance is eliminating joints in the conductors. The copper conductors come in coils, as shown, and are slid into the housing from one end of the conductor system.



Most major appliance makers use Four-Bar for their production of all major appliances. This refrigerator assembly line uses Four-Bar loop systems to power vacuum pumps and do burn-in testing. Power Pickups have run millions of cycles around the track.



Another appliance manufacturer has 166 moving carriers for evacuation and burn-in testing on a loop. Another brand of conductor rail was replaced after giving trouble ever since it was installed. Four-Bar has operated with total satisfaction.



Air Force One, the fleet of planes and helicopter for the President, are parked in this hangar building. Four-Bar supplies power to open and close the hangar doors.



Most commercial airlines use Four-Bar on their hangar building doors, such as these new buildings. Since most buildings are very large, the joint-free conductors make a big difference in improved reliability.



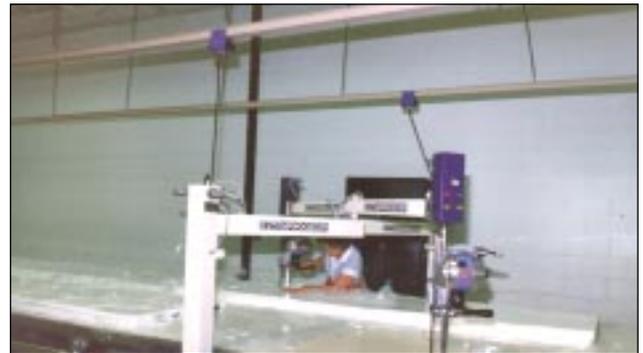
In the garment industry, cloth spreading machines have sensitive electronics which rely on Four-Bar's smooth power signal for trouble free performance. The seller of the machines will only guarantee satisfactory operation if Four-Bar is used with the machines.



The service elevator on the Statue of Liberty uses a vertical run of Four-Bar for power. Important features are reliability and compactness for this 245 foot high run.



Sewing rooms use stationary Power Jacks which plug into the Four-Bar runs overhead. Machines can be added or relocated quickly and easily.



Electric cutting knives, such as these on servo arms, use a Power Pickup on an overhead run of Four-Bar. Power Pickups have minimal resistance when being pulled, which is essential for following the patterns.

# TRI-BAR/FOUR-BAR

JOINT-FREE CONDUCTOR BAR SYSTEMS

## 16 Design and Engineering Data

### Motor Terminal Amperes at Full Load

#### Direct Current Amperes

H.P.	115V	230V	2-Wire 550V
1	9.6	4.8	2.0
2	17.1	8.5	3.6
3	25.0	12.5	5.2
5	40	20	8.3
7-1/2	58	29	12.0
10	76	38	16.0
15	112	56	23
20	148	74	31
25	184	92	38
30	220	110	46
40	292	146	61
50	360	180	75
60	430	215	90
75	536	268	111
100	...	355	148
125	...	443	184
150	...	534	220
200	...	712	295

#### Single-Phase AC Amperes

H.P.	115V	230V
1	16	8
7-1/2	20	10
2	24	12
3	34	17
5	56	28
7-1/2	80	40
10	100	50

#### Three-Phase AC Induction-Type Squirrel-Cage & Wound Rotor Amperes

H.P.	110V	220V	440V	550V
1	7	3.5	1.8	1.4
2	13	6.5	3.3	2.6
3	...	9	4.5	4
5	...	15	7.5	6
7-1/2	...	22	11	9
10	...	27	14	11
15	...	40	20	16
20	...	52	26	21
25	...	64	32	26
30	...	78	39	31
40	...	104	52	41
50	...	125	63	50
60	...	150	75	60
75	...	185	93	74
100	...	246	123	98
125	...	310	155	124
150	...	360	180	144
200	...	480	240	192

#### NOTES:

For full-load currents of 208 volt motors, increase the corresponding 220 volt motor full-load current by 6 percent.

80 percent P.F. values.

Practical application of these values: 60% for light duty. 90% for average duty. 120% heavy duty.

**Circuit Length for One Volt Drop for Indicated Currents**

Conductor Size	Current in Amperes									
	10	20	30	40	50	60	75	100	125	
	<b>Length of Circuit (Runway Feet)</b>									
	<b>Three Phase 60 HZ A.C.</b>									
50	120	60	40	30	23					
100	220	110	73	55	44	37	29	22		
125	290	145	97	72	58	48	39	29	23	
	<b>Single Phase 60 HZ A.C.</b>									
50	100	50	33	25	20					
100	191	86	64	48	38	32	25	19		
125	252	126	84	63	48	38	32	25	19	
	<b>Direct Current</b>									
50	100	50	33	25	20					
100	202	101	67	50	40	34	27	20		
125	270	135	90	67	54	45	36	27	22	

**Chart Explanation**

The conductor of 100 ampere capacity will carry 50 amperes 44 feet for a one volt drop on a 3 phase circuit. If a drop of 6 volts is permissible, the permissible length is 44 x 6 or 264 feet.

For other currents, multiply the length in the table by the ratio of the current in the table to the new current. For example: The table shows circuit length of 29 feet for the 100 ampere conductor carrying 75 amperes for a one volt drop. If the conductor carries 85 ampere the length is 29 x 75/85 or 26 feet.

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Universal Electric Corporation warrants all products sold by it to be free from defects in material or workmanship. The Company's liability on this warranty shall be limited to the repair or replacement, of any product which is returned to the Company, freight prepaid, within one year of the date of shipment and which is found by the Company to be defective in material or workmanship. This warranty does not cover expenses for the removal or reinstallation. The purchaser will be responsible for the cost of removing and reinstalling the defective part or its replacement and all labor and material and all other costs connected therewith. The Company's warranty does not apply to the life, performance or maintenance of the Company products or any consequential damage, loss of profits or other losses, charges or expenses which might be claimed as a result of the use, misuse, or failure of its products. No further warranty, either expressed or implied or by operation of law, shall exist in connection with the sale or use of any of the Company's products. Installation labor requirements and quality of workmanship are the responsibility of the Buyer.

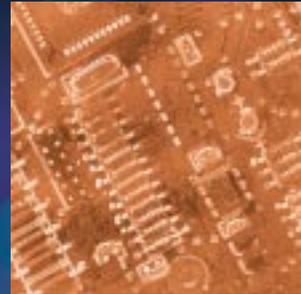
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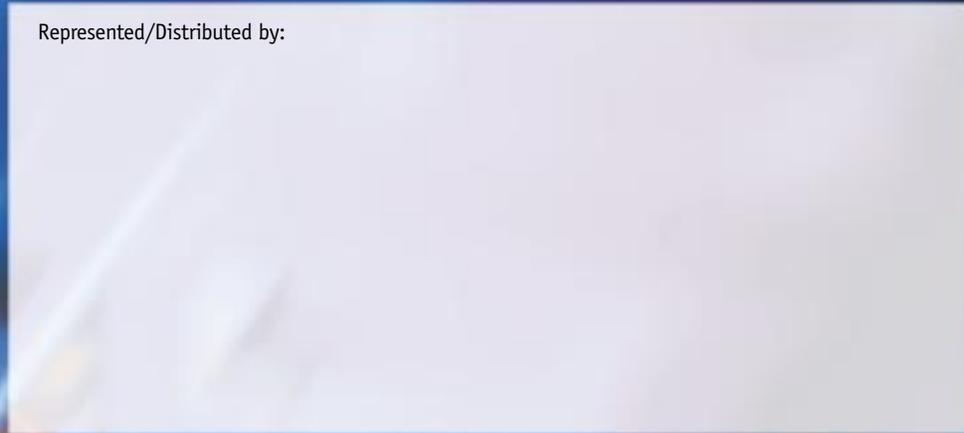


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