

# ***Electrobar V-Bar***

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Conductor Bar System

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# **Instruction Manual**



**MAGNETEK**  
UNCOMMON POWER

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## ***DANGER, WARNING, CAUTION, and NOTE* Statements**

*DANGER, WARNING, CAUTION, and Note* statements are used throughout this manual to emphasize important and critical information. You must read these statements to help ensure safety and to prevent product damage. The statements are defined below.



### **DANGER**

*DANGER* indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.



### **WARNING**

*WARNING* indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



### **CAUTION**

*CAUTION* indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It may also be used to alert against unsafe practices.

*NOTE:* A *NOTE* statement is used to notify people of installation, operation, programming, or maintenance information that is important, but not hazard-related.

## Disclaimer of Warranty

Magnetek hereafter referred to as Company, assumes no responsibility for improper use of supplied product by untrained personnel. Product should only be installed or repaired by a trained technician who has read and understands the contents of this manual. Improper installation or service can lead to unexpected, undesirable, or unsafe operation or performance. This may result in damage to equipment or personal injury. Company shall not be liable for economic loss, property damage, or other consequential damages or physical injury sustained by the purchaser or by any third party as a result of such operation or service. Company neither assumes nor authorizes any other person to assume for Company any other liability in connection with the sale or use of this product.



### **WARNING**

Many tests and procedures outlined in this manual involve exposure to components that operate at potentially lethal voltage levels. To eliminate this hazard, service personnel must ensure that the incoming three-phase AC power has been disconnected, locked out and tagged.

# Disconnecting Means/Overcurrent Protection

*NOTE: Magnetek recommends using the following Disconnecting Means and Overcurrent Protection guidelines as published in the 1996 National Electrical Code, copyright 1999.*

## Disconnecting Means

**610.31. Runway Conductor Disconnecting Means.** A disconnecting means having a continuous ampere rating not less than that computed in sections 610-14(e) and (f) shall be provided between the runway contact conductors and the power supply. Such disconnecting means shall consist of a motor circuit switch, circuit breaker, or molded case switch.

This disconnecting means shall:

- (1) Be readily accessible and operable from the ground or floor level.
- (2) Be arranged to be locked in the open position.
- (3) Open all ungrounded conductors simultaneously.
- (4) Be placed within view of the crane or hoist and the runway contact conductors.

**610.32. Disconnecting Means for Crane and Monorail Hoists.** A motor circuit switch or circuit breaker arranged to be locked in the open position shall be provided in the leads from the runway contact conductors or other power supply on all cranes and monorail hoists. Where disconnecting means is not readily accessible from the crane or monorail hoist operating station, means shall be provided at the operating station to open the power circuit to all motors of the crane or monorail hoists.

**610.33. Rating of Disconnecting Means.** The continuous ampere rating of the switch or circuit breaker required by Section 610-32 shall not be less than 50 percent of the combined short-time ampere rating of the motors, nor less than 75 percent of the sum of the short-time ampere rating of the motors required for any single motion.

## Overcurrent Protection

The use of overcurrent Protection shall be provided in accordance with NEC Standard 610-41 through 610-43. Excerpts from 1996 National Electrical Code, copyright 1999.

**610-41. Feeders, Runway Conductors.** The runway supply conductors and main contact conductors of a crane or monorail shall be protected by an overcurrent device(s) that shall not be greater than the largest rating or setting of any branch circuit protective device, plus the sum of the nameplate ratings of all the other loads with application of the demand factors from Table 610-14(e).

**610-42 Branch-Circuit, Short Circuit Ground Fault Protection.** Branch circuits shall be provided as follows:

**(a) Fuse or Circuit Breaker Rating.** Crane, hoist, and monorail hoist motor branch circuits shall be protected by fuses or inverse-time circuit breakers having a rating in accordance with Table 430-152. Taps to control circuits shall be permitted to be taken from the load side of a branch-circuit protective device, provided each tap and piece of equipment is properly protected.

**(b) Taps to Brake Coils.** Taps to brake coils do not require separate overcurrent protection.

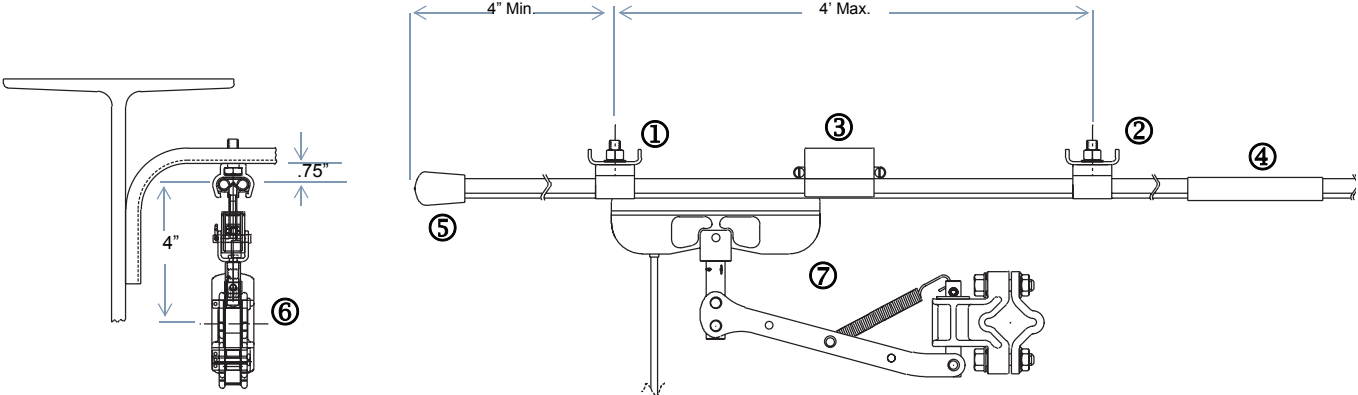
**610-43 Motor and Branch-Circuit Overload Protection.** Each motor, motor controller, and branch circuit conductor shall be protected from overload by one of the following means:

- (1) A single motor shall be considered as protected where the branch-circuit overcurrent device meets the rating requirement of Section 610-42.
- (2) Overload relay elements in each ungrounded circuit conductor, with all relay elements protected from short circuit by the branch-circuit protection.
- (3) Thermal sensing devices, sensitive to motor temperature or to temperature and current, that are thermally in contact with the motor winding(s). A hoist or trolley is considered to be protected if the sensing device is connected in the hoist's upper limit switch circuit so as to prevent further hoisting during an overload condition of either motor.

**Please reference the National Electrical Code (NEC) for exemptions or additional information on disconnecting means and overcurrent protection.**

# System Layout

## Inverted V-Bar - Figure A



- ① **Mounting Bracket**
- ② **Hanger**
- ③ **Power Feed**
- ④ **Joint Cover**
- ⑤ **End Cover**
- ⑥ **Collector Post**
- ⑦ **Collector**

# Conductor Application and Support Spacing

Determine if the system is to be horizontal mount (bottom entry) or vertical mount (side entry). The following table shows the appropriate support spacing V-bar.

System	Mounting	V-Bar Sections Every
90 Amp	Horizontal Mount	4 feet
	Vertical Mount	4 feet
110 Amp	Horizontal Mount	4 feet
	Vertical Mount	4 feet

Determine the maximum ambient temperature at the conductor system elevation:

- Under 160° F: use standard PVC insulating covered system
- 160°F–280°F: use high heat insulating covered system
- Over 280°F: consult the factory

Determine the conductor system required. Refer to *Engineering Data* section:

- Conductor ampacity considerations
- Voltage drop considerations
- Expansion considerations (standard rail and building expansion) (*Refer to Expansion Sections on page 10*).

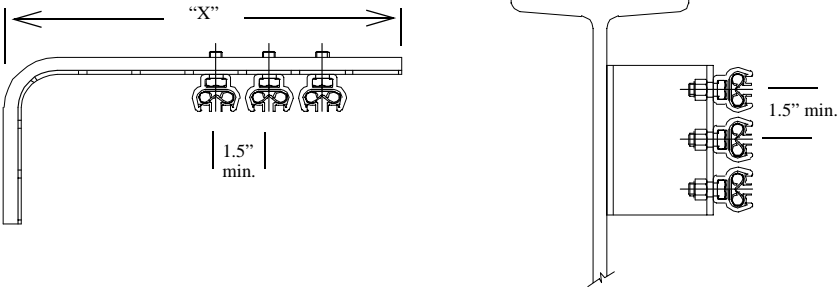
# Installing Mounting Brackets

1. Install mounting brackets (channels, angles, tees, etc.) at the required spacing (see *Conductor Application and Support Spacing* section on page 6).
1. The brackets should be pre-punched or drilled to accept  $\frac{3}{8}$ " hanger mounting bolts. The minimum distance from the web to the first hanger clamp is 3".

## Web Mounting Brackets- Figure B

Web Mount Bracket X-Dimension

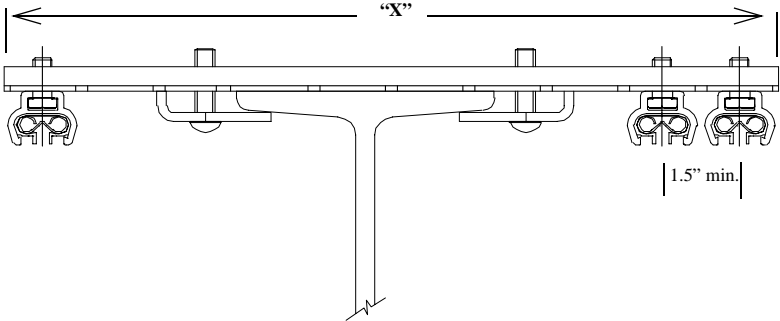
Bracket	X-Dimension
BKS-W15	11"
BKS-W18	14"
BKS-W24	20"



## Flange Mounting Brackets - Figure C

Flange Mount Bracket X-Dimension

Bracket	X Dimension
BKS-F15	15"
BKS-F18	18"
BKS-F24	24"



# Hanger Assembly

- 1.) Install hanger clamps securely to mounting brackets leaving clamping bolts loose.
- 2.) Make sure conductor bar openings are straight along runway path.

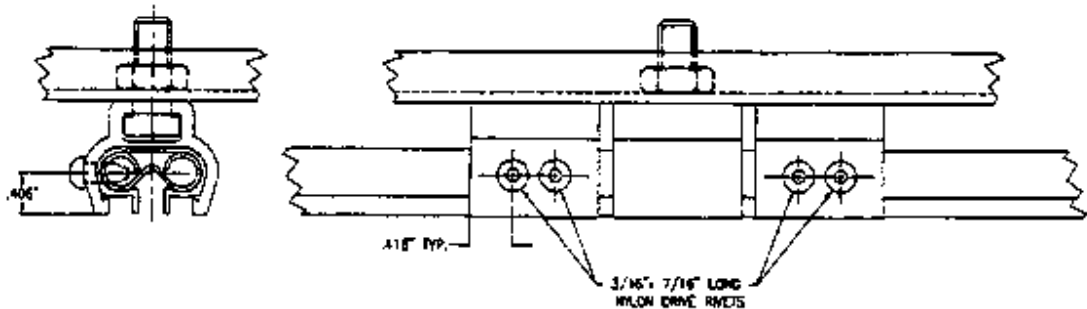
*NOTE: Snap-in type hangers do not have clamping bolts. Maximum hex nut torque for nylon hanger is 65 inch pounds. Use steel bolt hanger on all high temperature cover applications.*



# Anchor Hangers

*NOTE: Anchor hangers should be used at the midpoint between expansion gaps (see page 10) and at the midpoint on all other systems. Anchor hangers should also be used where conductor movement must be restricted. Install anchor hangers according to the following directions.*

## Anchor Hanger Drawings - Figure D



**Universal V-Bar**

## V-HA for Inverted V-Bar Systems: (see Figure A, page 5)

- 1.) Insert conductor section into the clamp assembly. Install an Anchor Hanger on both sides of a hanger clamp assembly.
- 2.) Drill two 3/16" holes through the hanger and through one side of the conductor section, using the pre-drilled holes in the anchor hanger as a guide. Use caution not to drill through to the running surface on the V-bar.
- 3.) Drive the nylon drive rivets into the hanger and conductor bar section.

### Important Notes about Anchor Hangers

*NOTE: Begin with the conductor run that is the closest to the runway beam or support structure, then work to the outside run.*

*NOTE: Installation of anchor hangers for the Inverted V-Bar systems requires additional care to insure that the nylon rivet does not interfere with the collector contact surface of the conductor.*

*NOTE: Maximum hex nut torque for nylon hanger is 65 inch pounds.*

## Joint Covers

1. Center joint cover over joint assembly.
2. Install insulating joint cover over each connected joint by snapping joint cover over conductor bar splice joint.

*NOTE: Splice joints should be no less than 6" from mounting bracket.*

## Power Feeds

1. Install center power feed at joint.
2. The power feed clamps over top diameter of the conductor bar at the joint.
3. Tighten the power feed half firmly over conductor bar.
4. Install feed cable into power feed cable connector (connector will vary on type of rating on power feed).

### Power Feed Wire/Connection

Power feed cables must be sized to meet the ampere demands of the conductor bar and be connected to the power feed assembly using a properly sized connector. See below for Minimum Feed Cable Size for each conductor amperage rating. Reference NEC Table 610-14 for minimum cable sizing.

<b>Conductor Bar</b>	<b>Min. Feed Cable Size</b>
90 Amp	4 AWG
110 Amp	2 AWG

*NOTE: Check local electrical codes for any additional specifications and/or restrictions.*

*NOTE: Power feed cables must be supported from the top to prevent vertical loading on the conductor bar.*

5. Install power feed cover halves over power feed assembly with hardware provided

## End Covers

1. Remove connector pins (if any) from conductor bar end.
1. Slide end covers over exposed conductor ends.

# Expansion Sections

1. Install expansion sections (if required - see table below) before installing conductor sections.
  - Galvanized steel conductors—every 150 feet. (e.g: 1 in center of 300’ run)
  - Copper systems—every 100 feet.(e.g: 1 in center of 200’ run)
  - All systems—at building expansion areas.

<b>Electrobar V-Bar</b>		
90 Amp & 110 Amp		
Conductor Length	Anchors Required	Expansions Required
Up to 299’	1	0
300’ to 449’	2	1
450’ to 599’	3	2
600’ to 749’	4	3
750’ to 999’	5	4

*NOTE: For outdoor applications, additional expansions may be required. Please consult the factory.*

2. Snap or slide the conductors into the hangers. When clamp-type hangers are used, tighten the clamping bolt only after the conductor sections are joined.
3. To join conductor sections, clean any dirt or oil on connector pins and join conductor sections using the connector tool. File any rough joints. Joints should be completely closed.

## Expansion Gap Installation

- Expansion gap assemblies must be supported at the gap location.
- A 10-foot expansion gap assembly is installed in the same manner as other 10-foot sections of conductor bar.
- For shipping purposes, the gap has been completely closed and must be adjusted according to the ambient temperature. Maximum hex nut torque is 65 inch pounds.

*NOTE: Two sets of anchor hangers are supplied with each expansion assembly. The hangers must be installed to control expansions.*

## Expansion Gap Settings

The actual gap setting for each ELECTROBAR expansion section is determined by the expected temperature variance and the ambient temperature at the time of installation. Set the gaps according to the following chart.

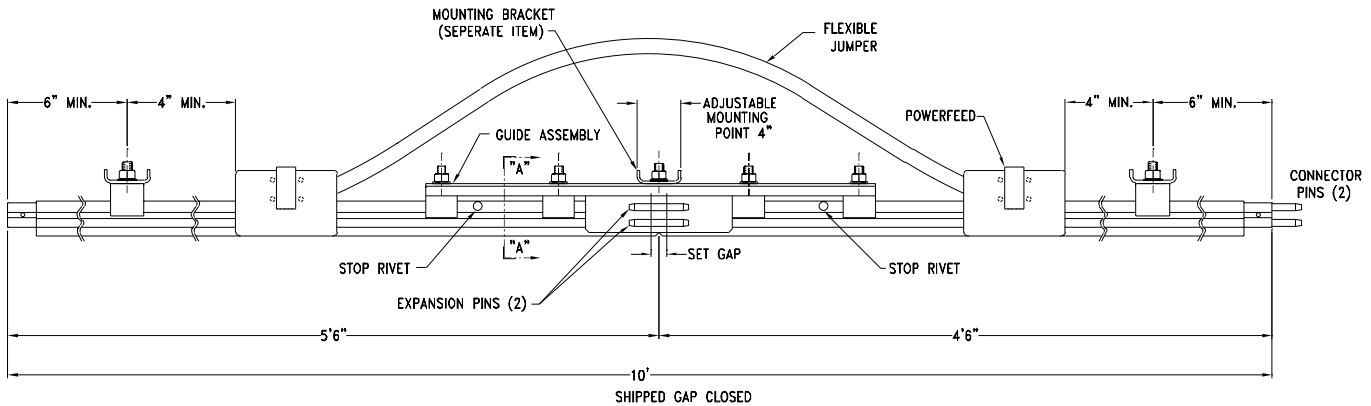
Operating Minimum	Temperatures Maximum	Ambient Temperature	Gap Width Setting
0°F	100°F	25°F	1.5”
		50°F	1.0”
		75°F	0.5”
25°F	125°F	50°F	1.5”
		75°F	1.0”
		100°F	0.5”
50°F	150°F	75°F	1.5”
		100°F	1.0”
		125°F	0.5”

# Anchoring Requirements

All ELECTROBAR Conductor Bar Systems must be anchored to permit controlled expansion and contraction of the conductor bar. Anchor all systems according to the following chart. Two anchor hangers are provided with each ELECTROBAR 10ft. expansion section. Purchase anchor hangers separately for systems without expansion sections.

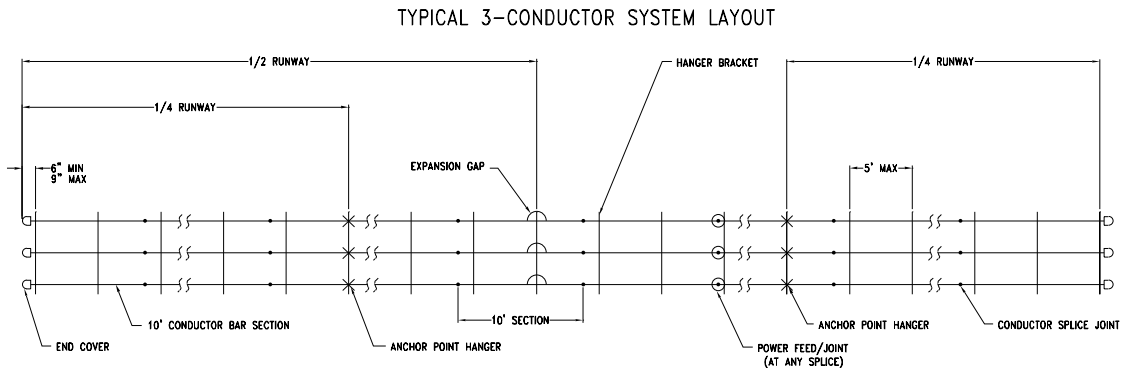
Type of System	Anchor Point Locations
All Conductor Bar Systems WITHOUT Expansion sections	Place anchors at MIDPOINT of EACH conductor run
All Conductor Bar Systems with ONE set of Expansion Sections	Place anchors at MIDPOINT between the expansion sections and EACH end of the runway
All Conductor Bar Systems with MULTIPLE (2 or more) Expansion Sections on each Conductor Run	Place anchors the same as with one expansion section and ALSO at MIDPOINT between EACH expansion section

**Figure E - Expansion Section**



# Typical Three-Conductor System Layout

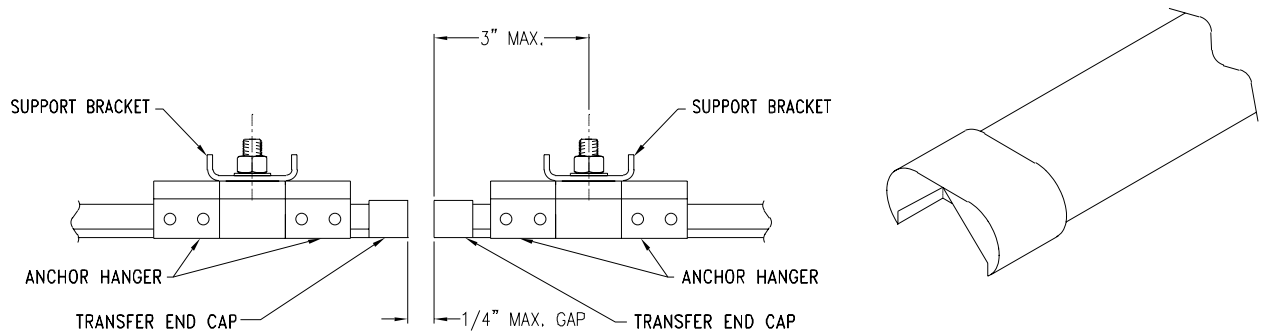
**System Layout - Figure F**



# Transfer Caps

- 1.) Install conductor support brackets with anchor clamps as shown (see separate instructions for anchor clamps).
- 2.) Drill ends of conductor bars with 19/64" drill to accommodate transfer cap pins.
- 3.) Tap in transfer cap with rubber mallet.
- 4.) File or de-burr any rough edges along collector tracking surfaces.
- 5.) Align opposing conductor runs and anchor to prevent movement during vibration or collector transfer.

**V-Bar Transfer Cap - Figure G**



# Collector Information

1. Mount collector assemblies on 1” square collector mounting post. Be sure that the collector mounting post is securely fastened to the moving equipment which is to be electrified. The distance from the center line of the mounting post to the bottom of the conductor bars should be 4” to 4 1/4”.
2. The following alignment adjustments should be made as necessary:
  - For horizontal mount applications, the collector mounting post should be parallel to the ground  $\pm 2^\circ$ , and each collector should be in line with conductor running surface.
  - For vertical mount applications, the collector mounting post should be perpendicular to the ground  $\pm 2^\circ$ , and each collector should be in line with conductor running surface (special vertical mount collectors are required).
  - The collector contact shoes should not be cocked at an angle, but should enter the conductor bar contact points at right angles and be able to move along the conductor run unrestricted.
  - Collector contact shoe must be seated securely in shoe holder.
  - Collector head must be free to articulate. Leave sufficient slack in pigtail lead wire (high-stranded flexible cable is required).

## Dimensions and Mounting Methods

Application	Recommended	Minimum
Collectors Adjacent	1.50”	1.50”
Collectors Staggered	1.50”	1.50”
Expansions Used	3.00”	3.00”

*NOTE: All Magnetek Electromotive Systems mounting brackets have 3/8” x 1 1/4” slots punched on 1 1/2” c/c over the length of the brackets.*

# Final Inspection

Final inspection of all components should be made, including the following *important* items:

- Make sure the conductor bar runs are straight. Adjust any hanger clamps which are not straight and replace any conductor bar which may have been bent or damaged.
- **No *Hot* bare metal parts should be exposed. Make sure insulating covers, joint covers, power feed covers, and end covers are securely in place to prevent any accidental contact by personnel.**
- Run the equipment back and forth several times along the entire system length to make sure the system functions properly.
- File any conductor joints that are uneven or not smooth.
- Make sure the conductors are able to *float*, except at anchor points, to allow for expansion and contraction due to temperature variations.
- Make sure there is no excessive ambient heat. Heat shields might need to be installed near furnaces, etc.

# Special Applications and Field Instructions

## Curved Conductor Systems

(Web mounted V-Bar System is recommended)

- Conductor bar sections may be field bent for 48" or greater radius. Form conductors around curved web of monorail beam.
- Factory bent conductor sections are available for less than 48" radius (minimum radius is 36").
- Conductor supports should be located not more than 2 feet apart on curves.
- It is **not** recommended to have a splice or power feed in curve sections.
- Special collectors are required for curved systems. Please consult the factory.

## Field Cutting of Conductor Bar Sections

- Cut ends squarely with metal cutting band saw or hack saw.
- If cut conductor section is to be joined with another conductor section, cut insulating cover back 1" from end of conductor. Leave insulating cover flush with end of conductor if transfer cap is to be installed.
- Drill ends of cut conductors as follows:
  - For 90 Amp conductors, use 19/16" drill.
  - For 110, 250 and 350 Amp conductors, use 1/4" drill.

*Note: Special connector pins are available when connecting two different size conductor bar sections. Consult the factory for more information.*

  - For transfer caps, use 19/64" drill.
- De-burr ends of conductors.