POWELL

IB-DU1001 Metal-Enclosed Cable Bus

Maintenance and Installation for Metal-Enclosed Cable Bus Systems

Powered by Safety®

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Contents

⚠ CAUTION

BEFORE ANY ADJUSTMENT, SERVICING, PARTS REPLACEMENT, OR ANY OTHER ACT IS PERFORMED REQUIRING PHYSICAL CONTACT WITH THE ELECTRICAL WORKING COMPONENTS OR WIRING OF THIS EQUIPMENT, THE POWER SUPPLY MUST BE DISCONNECTED.

I. Introduction

This manual provides general instructions and information about Delta/Unibus metal enclosed cable bus systems. Always refer to drawings and information included with each order for specific instructions. All relevant information provided should be read thoroughly before proceeding with any activity related to the installation, maintenance, or operation of the bus system.

All work must be performed and supervised by responsible personnel who are thoroughly trained and knowledgeable in all aspects of installation, maintenance, and operation of bus systems. These instructions are intended to provide general information related specifically to the installation of cable bus systems and do not include all the procedures and precautions that must be allowed to insure the safety of both personnel and equipment.

This entire installation manual should be read prior to proceeding with installation of the cable bus duct system. Please direct any questions to Delta/Unibus.

II. Description

A. General

Delta/Unibus cable bus systems are custom designed for each specific application.

Generally, cable bus systems are supplied for field assembly. Field assembled systems, known as "D.Y." systems, are normally supplied complete with cable, all necessary components and prefabricated housing sections. These are shipped separately to the job site for installation by the customer.

This manual applies for either system except the INSTALLATION chapter, which refers to field assembled and field loaded "D.Y." systems only. For factory terminated systems Delta/Unibus will provide an addendum describing the specifics of field installation.

The cable bus system is complete, and includes all necessary components for the duct housing, such as horizontal and vertical elbows, wall and floor penetrations, expansion joints, termination boxes, etc. and when specified, all cable and terminating materials.

B. Conductors

Copper or aluminum cables are selected based on customer specification requirements. Cables supplied are single conductor, stranded, shielded or unshielded, and insulated for 100%, 133%, or 173% level to meet each installations specific requirement.

Standard construction is in compliance with the current issues of ANSI C37.23-1987 and the NEC Code NFPA70. Standard design is based on a maximum conductor temperature of 90°C, continuous operation, in an ambient temperature of 40°C.

Terminations are provided with compression type, double indent terminal lugs having plated contact areas. Copper termination lugs are electrically silver plated and aluminum lugs are tin plated.

Bolted connection kits for aluminum conductors are provided with conical washers which ensure maintenance of contact pressure.

C. Cable Support Block System

Cables are supported in the bus housing by specially designed non-toxic, specially treated maple blocks or custom molded glass reinforced polyester blocks. Cable support blocks and bolting hardware are shipped loose for field installation as described in the INSTALLATION section and listed under CABLE LOADING.

D. Enclosure

Highly corrosion resistant aluminum enclosures, which minimize power losses, are standard. Per customer request, housing may also be steel or stainless steel, or as required to meet specific requirements.

Finish may be natural, painted or galvanized as required by customer specifications and requirements.

Ordinarily, cable bus enclosures are ventilated with open top and bottom covers for indoor and outdoor installations. Per customer request, duct enclosures may be non-ventilated with screened breathers in bottom covers.

The cable bus duct is supplied in sections up to 18 feet long, built to fit the installation conditions. Wherever practical, elbows and offset enclosures are factory assembled into a bus section to minimize field handling and assembly.

E. Bus Supports

All duct housing supports are field installed at locations as shown on layout drawings. All supports supplied are identified to match support locations shown on layout drawings. A complete line of steel or aluminum structural supports are available. Indoor trapeze type, outdoor single or double column, wall mounted knee brace, and lattice type trusses are the most frequently used. Outdoor structural steel supports are hot-dipped galvanized after fabrication or primed and painted after fabrication. Indoor supports are normally primed and painted.

III. Receiving and Storage

A. Shipping

Crating suitable for shipment via common carrier motor freight and indoor storage is standard. Special crating for export shipments or outdoor storage is available. Observe markings on the crate which may indicate special procedures. A complete set of installation drawings together with a bill of materials and installation manual is shipped with each bus system. Auxiliary items such as splice kits, wall seal and firestop materials, termination kits, etc. are packed and shipped separately.

B. Receiving

Prior to acceptance of a shipment, a complete visual inspection should be performed for any signs of possible shipping damage. Any such indications must be noted on the shipping papers when accepting delivery. The equipment should be inspected for concealed shipping damage as soon as practicable. If any indication is found, notify the carrier immediately and arrange for his inspection. The damaged equipment should remain in its crate as received until the carrier's inspection is completed. Photographs should be taken to support the claim. Contact your Delta/Unibus representative immediately so that corrective action can be initiated.

If the terms of the shipment are FOB plant, it is the buyer's responsibility to file a claim with the carrier. If the terms are FOB destination, then Delta/Unibus will file a claim with the carrier. In all cases, it is the buyer's responsibility to follow proper receiving procedures. Incoming materials should be carefully checked against the shipping manifest to verify that no shipping losses have occurred, and against the bills of material to verify that all items have been received. Shortages should immediately be reported to the carrier and your Delta/Unibus representative.

C. Unloading

Bus systems can be unloaded utilizing fork-lift trucks or other devices. Lifting slings with a spreader bar are suggested for safe handling. (See Figures 1 & 2)

Shipping crates must not be stacked.

D. Storage

Bus systems as shipped must be protected from the weather at all times. Tarpaulins can be used to provide temporary protection.

For storage periods of 90 days or less, the bus, with proper protection, may be stored in outdoor areas that are marked and designated for storage. This area is to be well drained, gravel covered or paved, and reasonably remote from construction areas and traffic.

Items shall be placed on pallets or shoring to allow for air circulation and to avoid trapping water. A weatherproof covering shall be applied in such a manner that it protects the equipment yet allows for air circulation to minimize condensation. The equipment shall be inspected bimonthly and corrective action taken as required.

For storage periods longer than 90 days, the bus shall be placed in a weathertight, well ventilated building. The floor shall be well drained. The area shall be provided with uniform heating and temperature control or its equivalent to prevent condensation and corrosion.

Failure to store and protect bus components properly can cause serious damage and **WILL VOID THE WARRANTY.**

Special precautions should be followed for the handling and storage of cable. THE CABLE MANUFACTURER INSTRUCTIONS SHOULD STRICTLY BE FOLLOWED.

Figure 1 Bus Unloading

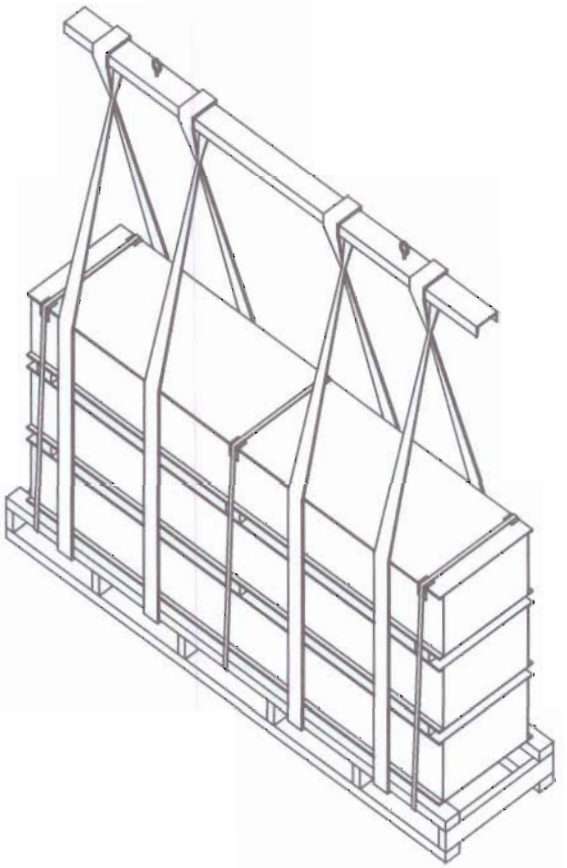
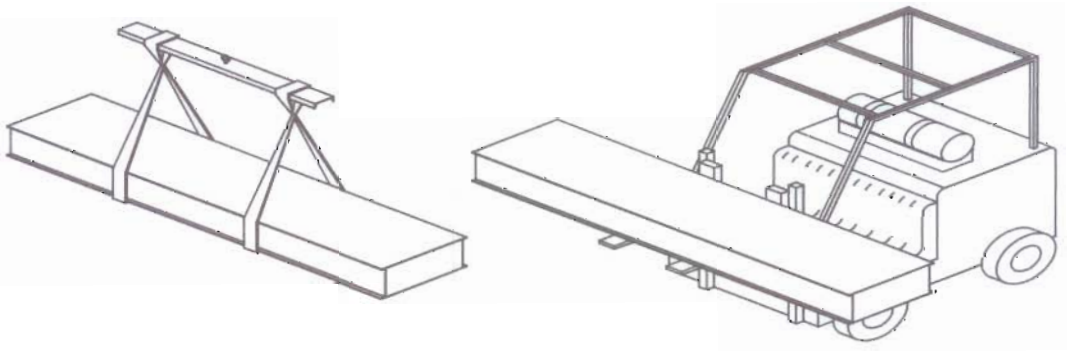


Figure 2 Lifting & Maneuvering Bus Section



Some basic requirements are:

1. Unloading should be accomplished so that equipment does not contact the cable surface.
2. Reels of cable should not be dropped from any height.
3. If a reel is rolled to move, it should be rolled in the direction indicated by arrows painted on the reel heads. Be sure that no object contacts the cable surface at any time.
4. Store in a clean dry environment on a firm flat surface.
5. Cable ends are sealed prior to shipment. If these seals are cut off, new tape seals must be applied to prevent entry of moisture into the cable.

IV. Installation

A. Installation Drawings

A set of specific, detailed installation drawings is provided for each bus system. An understanding of the organization of these drawings is the key to insuring a fast, trouble-free installation. The bus layout drawings and bills of material are the primary drawings which reference and coordinate all the other drawings and procedures. Each section of bus is uniquely identified on the layout drawing by a section number. This identification is marked on each bus section, and the corresponding layout drawings provided with the project can be used to determine the method of installation of the bus equipment in the field.

B. Erection

To begin installation of the bus duct, deliver the housing sections to the installation location in the original crating, if possible. Typical methods of lifting individual bus sections are illustrated in Figure 2. It is recommended that erection of the duct housing begin at a 'fixed' point such as an equipment connection end. (See typical drawings included in Appendix A; and Fig. A2) After the duct housing is in position, it is secured to the supporting structure by hold down clips and connected to equipment. (See Figure A8)

All housing splices are provided with joiner strips for bottom covers. The bottom cover joiner strips should be installed as each housing section is positioned. (See Figure A7)

The side rail splice plates should also be installed at this time. (See Figure A3)

After the housing is installed, the top covers which have been factory installed, such as at elbows and special sections, should be removed to facilitate cable installation.

These covers should be identified and stored carefully, since they may not be interchangeable, and must be reinstalled in their original position.

C. Alignment

The entire run of bus duct should be installed and adjusted at all terminating equipment BEFORE laying the cable and final torquing of connecting bolts. Any adjustments to obtain proper alignment should be distributed evenly throughout the bus system. If necessary, a small amount of additional adjustment can be obtained by using the mounting slots provided in splice plates, end flanges and wall seal flanges to adjust the position of those accessories. (Refer to Figures A1, A2, A3, A4)

It is important that during installation all the necessary actions are taken to protect the bus from the weather and the entry of dirt or other contaminants.

Installation of tap boxes and termination boxes should be made only after carefully reading installation notes shown on detail drawings.

Particular attention should be given to elimination of moisture and pollutants inside the enclosures.

D. Assembly

Appendix A contains exploded view drawings which show the construction and assembly details of standard components. These drawings are supplemented with the installation drawings provided for every bus system.

It is very important that assemblies be correct in all respects. Small details such as the position and orientation of blocks and bolting hardware must be observed. Proper procedures help insure a trouble free installation and a long service life.

E. Cable Loading

After duct housing erection is completed and the housing secured to the structural support, the lower row of cable support blocks can be installed and attached to the factory installed support brackets (See Figure A9 for installation aids). Use the 5/16" hardware provided for fastening the support blocks to the brackets. Tighten these bolts to 10 ft. pounds.

Upon completion of this, the lower row of cables can be pulled into the housing and laid into the bottom blocks. Cable interleaving instructions should be followed as outlined in the installation drawings included with your cable bus duct. It is suggested that each cable be tagged or marked as installed in some manner, identifying each cable at both ends. (such as A1, C1, B2, etc.)

The middle support blocks should then be installed. Press the blocks together by hand and tighten the 5/16" side mounting bolts to 10 ft. pounds securing the blocks to the side aluminum support brackets. Continue installing cable and support blocks noting interleaving instructions.

After laying the first row of cables, install the middle block tightening the side mounting bolts prior to laying the second row of cable. After all the cable is laid in the cable bus duct, the top blocks should be installed in the same manner.

CAUTION: Excessive clamping forces must be avoided to prevent pinching & damage to the cable insulation.

Finally, tighten all 5/16" side mounting bolts to aluminum brackets to 10 ft. pounds.

F. Cable Phasing and Interleaving

During the cable loading, special attention must be made to the cable phasing position and interleaving as shown on detail drawings supplied for each installation.

G. Weatherseal and Firestop Assemblies

Custom designed, split seal plates are furnished per each specific system requirement.

These seal plates should be installed in place, one layer at a time, in the same manner as the cable support blocks as the cables are loaded.

Firestop assemblies are installed in the same manner, i.e., built up as the cables are loaded.

These seal and firestop assemblies should be installed following detailed instructions provided for each bus system and typical instruction drawings in Appendix A. (See Figure A2, A5, A6)

H. Cable Support Grips

In vertical sections over 20 feet in height, flexible cable support grip assemblies are used to furnish additional support to the cables. These assemblies should be installed following the detailed instruction drawings supplied for each installation.

I. Duct Housing Top Covers

Following cable installation, top covers should be installed starting with elbows and special sections where covers had been pre-installed by the factory. When expansion joints are provided, install the special factory built overlapping covers before the remaining straight section covers are installed.

Top covers for straight housing sections may be shipped partially secured to the enclosure or loose. Covers are sized for the section.

To fasten the covers, first position and clamp the cover in place. TEK screws (which are self drilling and tapping) are then applied on 6 inch centers along each side. Apply to the center of the side member flange. Pilot holes for these TEK screws are not required but can be used if desired using a 1/8" drill bit.

Top cover joiner strips should be installed at each cover joint before securing covers (See Fig. A8). Joiner strips are not secured to side rails. These strips are held in place by top cover penetrating the grooves. Covers for vertical sections are installed with the louvered openings facing down.

J. Termination

All the necessary cable lugs, hardware and termination kits are furnished unless specified otherwise.

Cable terminations to customer equipment must be performed in strict compliance with termination detail drawings and instructions supplied by the manufacturer of the cable termination kits (tape or shrink). Particular attention should be paid to minimum cable bending radius and clearance requirements.

Where shielded cables are used, the field must ground one end only of each cable shield. Normally these shield grounds are made at the switchgear end using ground connectors provided for that purpose. See termination detail drawings provided with the job for further details.

Prior to making final connections, a check must be made for correct phasing by ringing out each cable and verifying the cable tags.

Following this, each cable and its termination must be given a high voltage DC hipot field acceptance test at 80% of the factory voltage following practices outlined by the cable manufacturer. These tests should be conducted by qualified personnel from the standpoint of safety and data interpretation.

K. Grounding

The bus housing must be properly grounded. Since the type and number of facilities required to establish adequate grounding can vary considerably depending on location, the responsibility for the design, installation, and verification of the grounding can not be assumed by Delta/Unibus. Ground pads, with or without cable lugs, can be provided on the bus housings at convenient locations for connection to station ground. The bus housing can be used to establish ground continuity in many applications. It is important that the housing splice plates, which are designed to provide a low resistance connection between adjacent bus sections, be properly installed (See Fig. A3). A continuous insulated or bare cable for neutral use or grounding is also an available option. Flexible ground continuity connections which are provided at bus expansion joints should be inspected for tightness or damage. (See Figure A4)

L. Special Field Caution Note

During the entire process of installation, particular attention must be given to safeguard cable integrity (conductor, insulation and shielding).

Delta/Unibus can not be responsible for any failure of the system due to damage which has occurred to the cables from the time of receiving to the time of completion (energizing).

V. Operation and Maintenance

A. Operation

The cable bus systems described in this manual are self cooled systems which have no moving components. A long reliable service life is assured by carefully following the simple installation and maintenance procedures outlined in this manual.

The bus should never be energized with the presence of heavy contamination on the interior surfaces of the bus.

All covers must be securely in position at all times during the operation of the bus. Any dented or damaged housings must be carefully inspected and corrective action taken before energizing the bus. The bus system is not intended to be a walkway and this type of activity must be avoided.

B. Maintenance

Field experience has verified that retorquing of conductor connection hardware is not required on a routine basis. Nevertheless, it is customary to schedule desired maintenance and/or proof tests to coincide with planned major shutdowns.

These tests should include:

1. A visual check to spot any damage or changes in operational conditions.
2. Check for any equipment installed near the busway that may cause damage by external heating, corrosive fumes or physical stresses.
3. Check for signs of overheating at terminations, etc., or deterioration in insulating material. Be sure to eliminate conditions of overheating or deterioration.
4. Check for missing or broken parts, free movement, accumulation of dust, dirt or foreign matters, etc. Clean and replace as required.
5. New gaskets are recommended when re-installing gasketed covers that have been removed for gasketed maintenance proof tests.
6. "Megohmeter Test" the system before re-energizing using a 1000-1500 volt megohmeter. If desired, the system can be given a DC hipot test at 75% of the field acceptance test value following procedures as outlined by the cable manufacturer. However, often it is impossible or impractical to conduct these tests since the conductors must be disconnected at each end and the terminations could be damaged in the process.

C. Spare Parts

The Delta/Unibus metal enclosed bus system has been designed to eliminate any components that might require periodic routine replacement. There are no moving parts. Accordingly it is not necessary for users to maintain a stock of spare parts.

The procedures described under MAINTENANCE may result in need for some miscellaneous materials such as gaskets, cover mounting hardware, insulating materials and touch up paint. Replacement parts can be ordered directly from Delta/Unibus. Please have the Delta/Unibus order number or drawing number available when ordering parts.

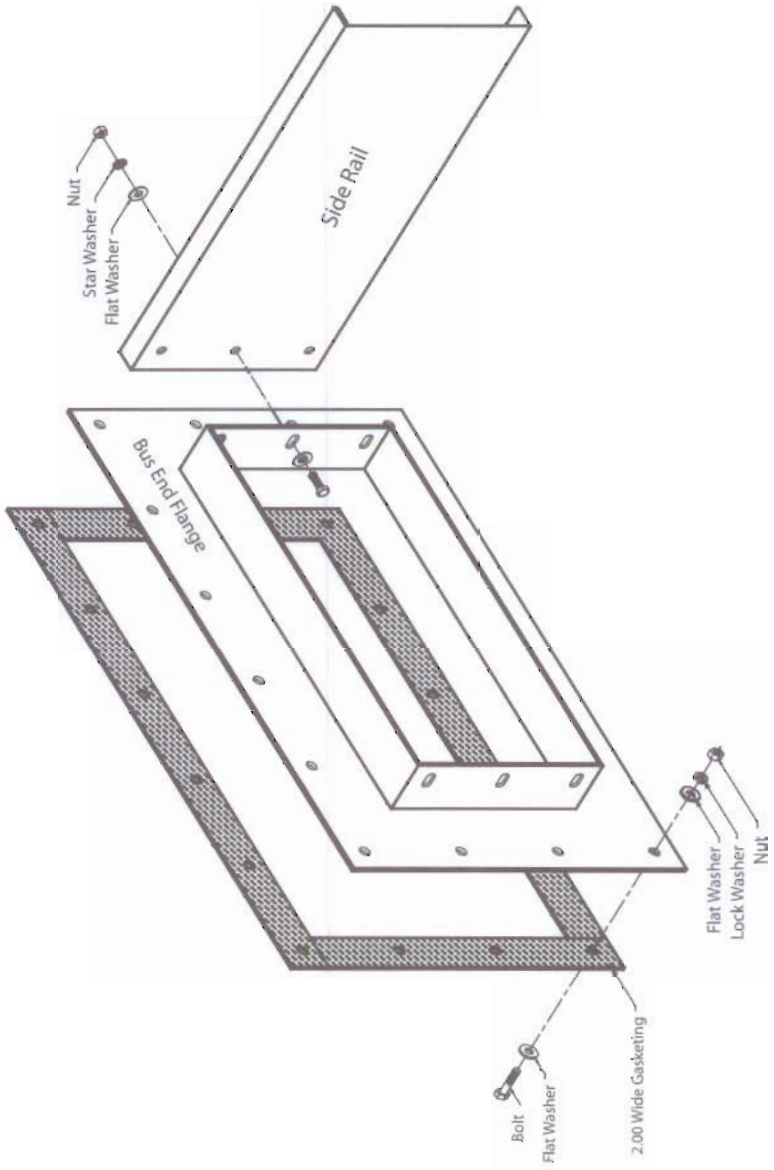
D. Field Service

Contact either your Delta/Unibus sales representative or the Delta/Unibus plant for further assistance. Trained field service engineers are available to provide on-site assistance when desired.

Delta/Unibus can not be responsible for any modifications made to any bus system without its expressed written authorization.

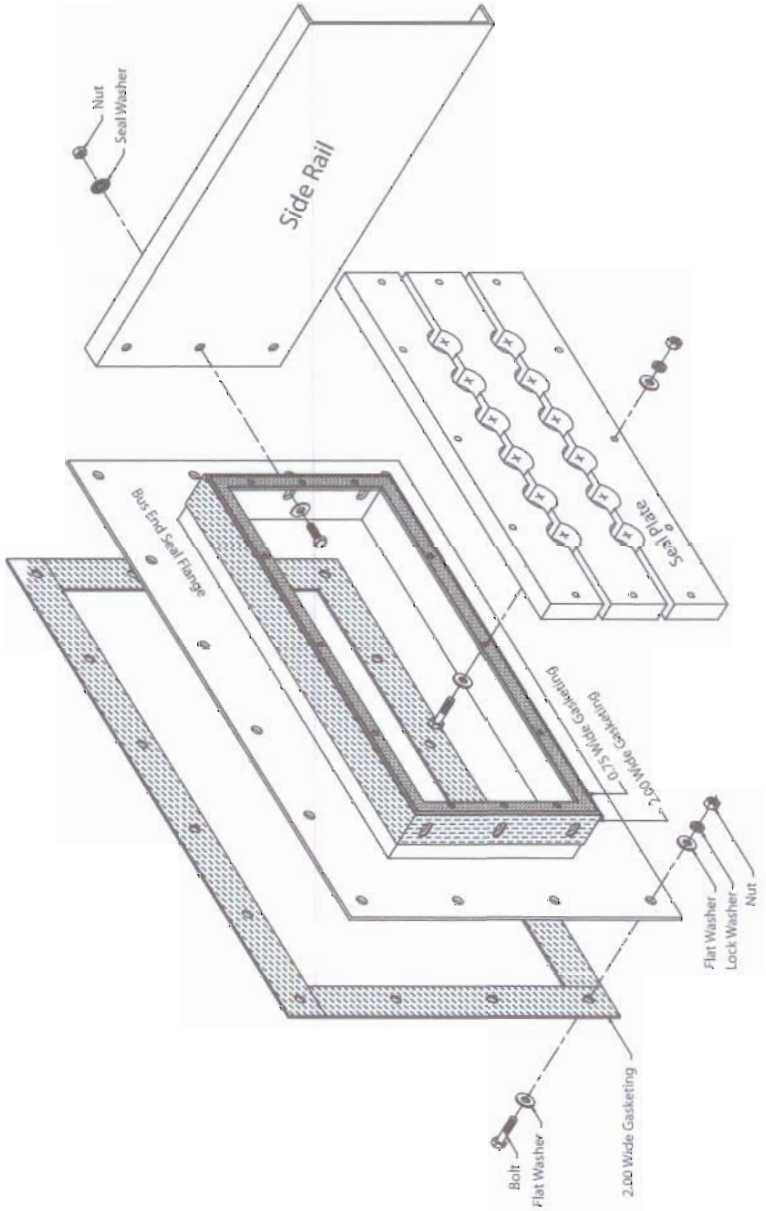
VI. Appendix

A1



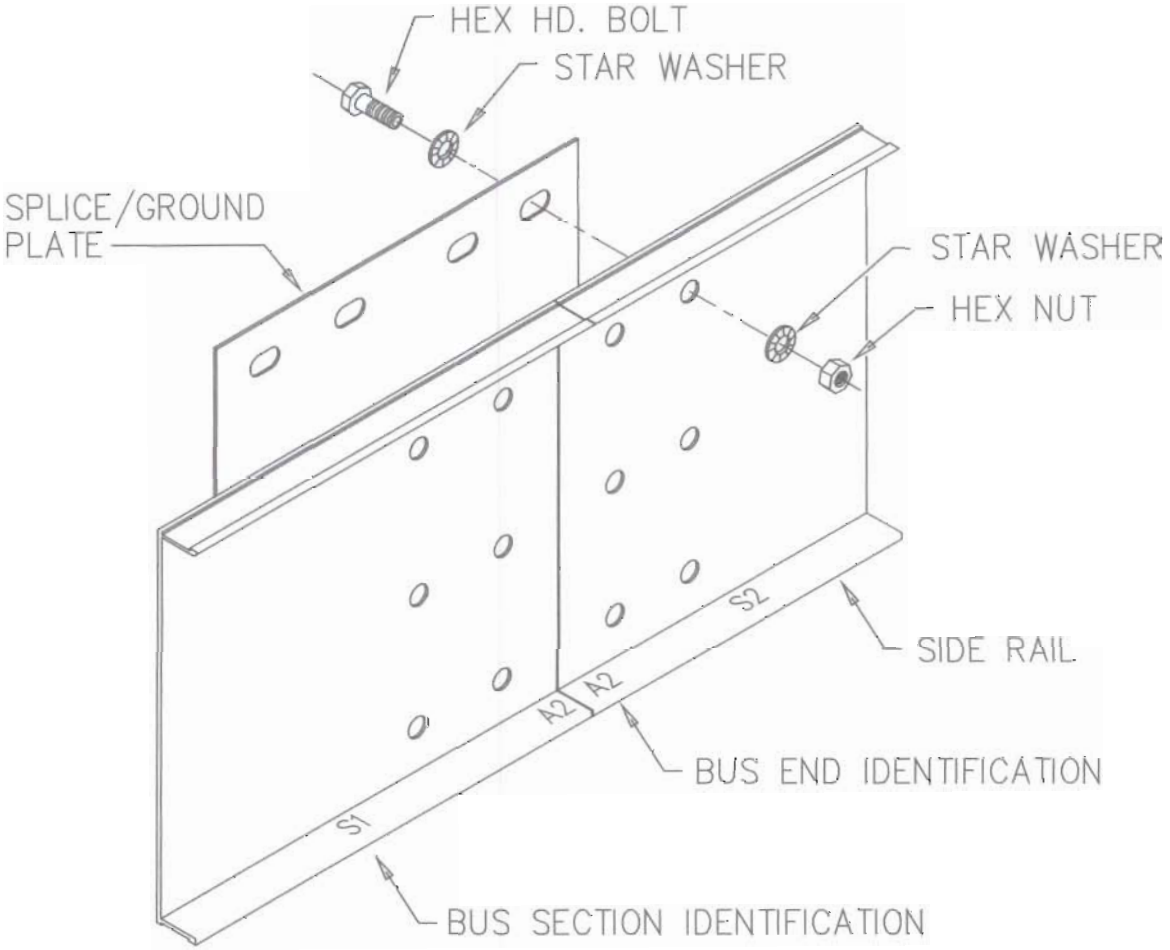
Flange Attachment Assembly without Bus End Seal

A2



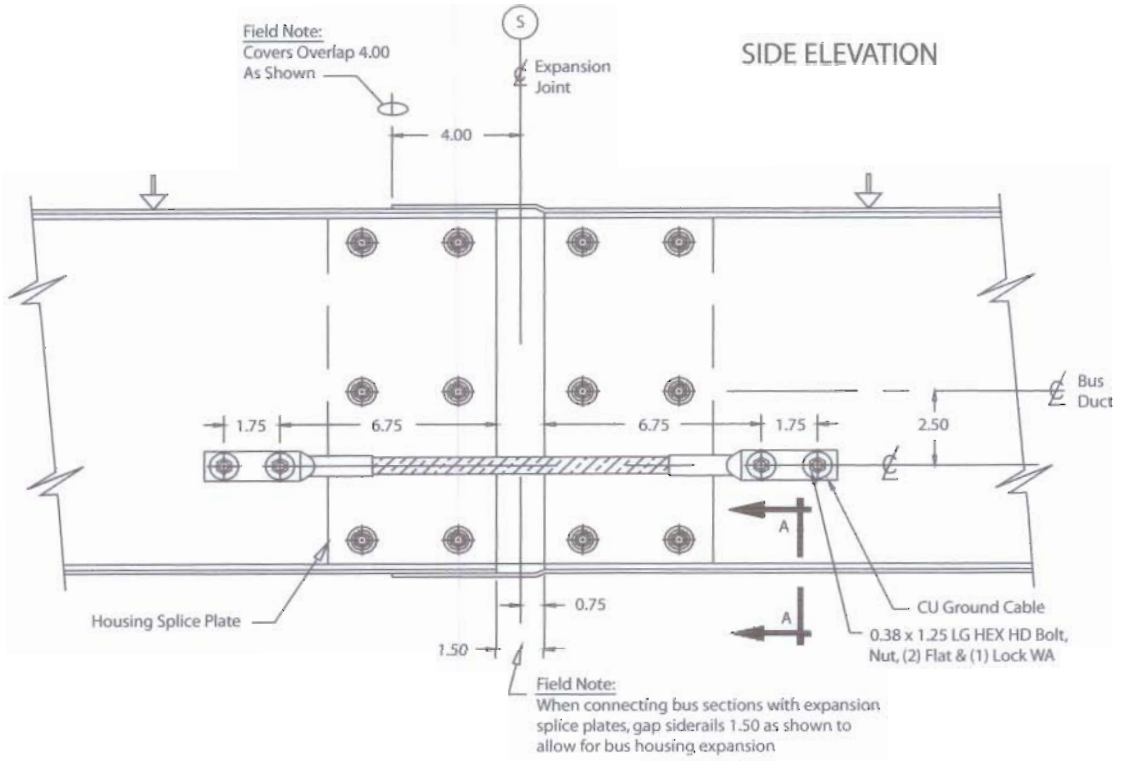
Flange Attachment Assembly with Bus End Seal

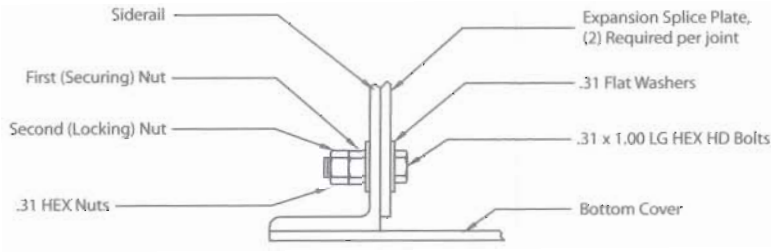
A3



Splice Ground Plate Side Rail Assembly

A4





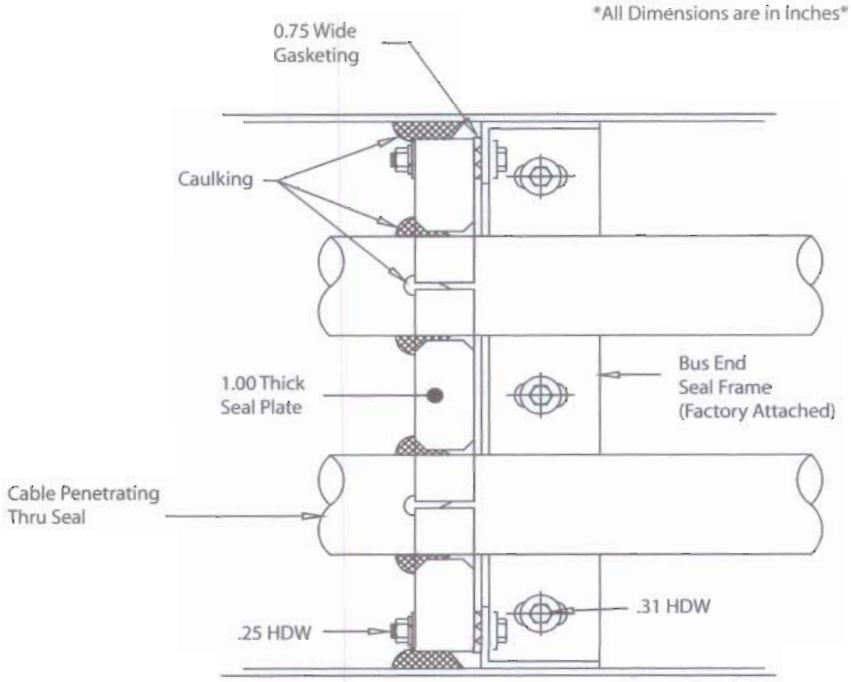
View A-A
(enlarged)

Field Notes:
Install splice plates and hardware as shown in view A-A. Completely tighten first (securing) nut, then while holding the first in place, tighten second (locking) nut firmly against first nut, locking assembly. Do not back off the nuts after teh assembly has been locked. Complete the assembly securing the first nut while backing off the bolt approximately 1/3 turn.

Expansion Joint

A5

All Dimensions are in Inches



Installation Instructions

1) Factory Attached seal frame to cable duct with .31 hardware

2) Apply .75 gasketing to seal frame

3) Install seal plate (with .25 HDW provided) and cables layer by layer

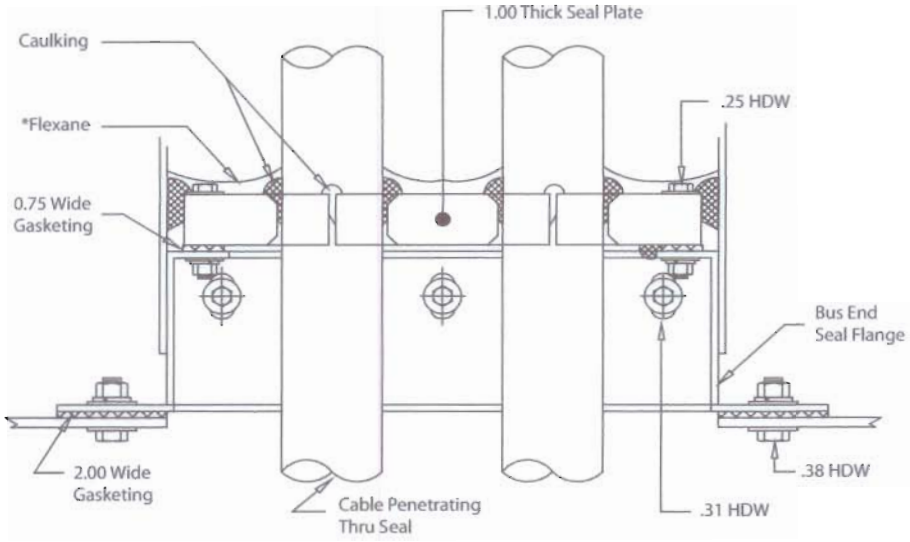
NOTE: After cables have been terminated and mounted to equipment terminals, complete seal as follows:

4) Thoroughly caulk all openings and cracks around cables and seal plate with material provided. Seal is now complete.

Horizontal Bus Duct Seal Field Instructions

A6

All Dimensions are in Inches



Installation Instructions

1) Install bus end seal flange to cable duct with .31 hardware provided

2) Mount Flange to mating equipment housing with .38 hardware and 2.00 wide gasketing provided

3) Apply .75 gasketing to flange

4) Install seal plate (with .25 HDW provided) and cables, layer by layer

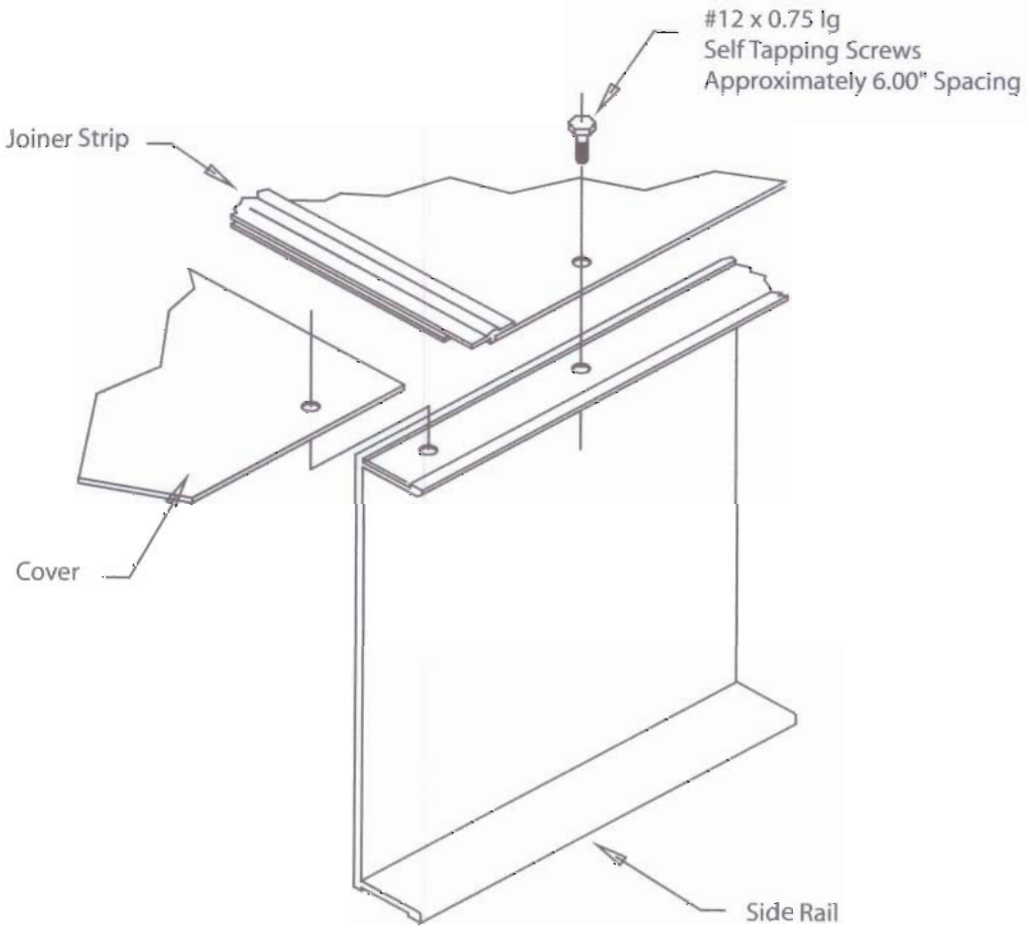
Note: After cables have been terminated and mounted to equipment terminals, complete seal as follows:

5) Thoroughly caulk all openings and cracks around cables and seal plate with material provided. Seal is now complete.

6) For outdoor applications only:
Mix "Flexane" liquid per manufacturer's instructions and pour over top of seal plate to a thickness of .19 to .25 inch.
Note: Allow RTV or equal 24 hours to cure before applying flexane.

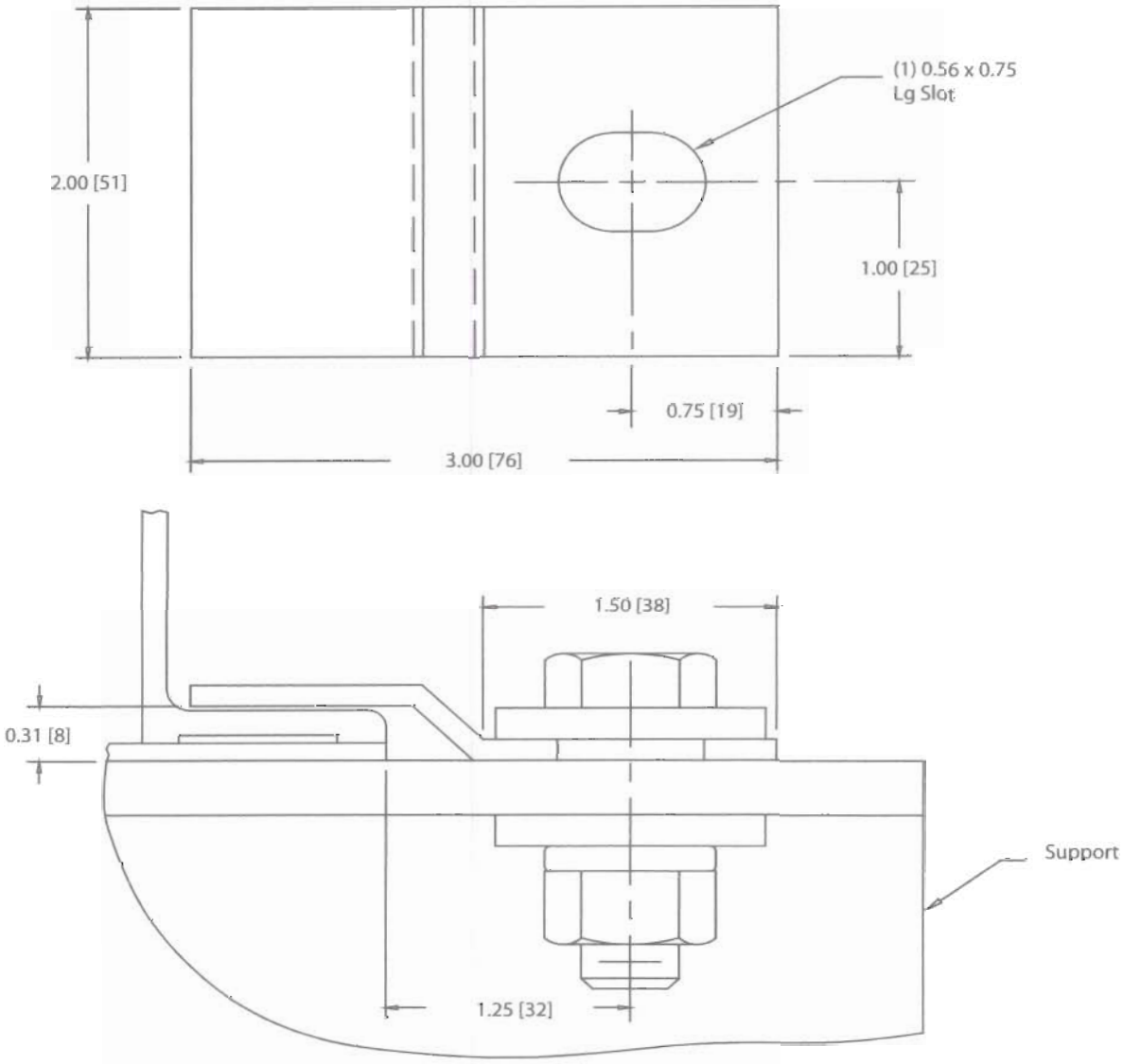
Vertical Cable Bus Duct Seal Field Instructions

A7



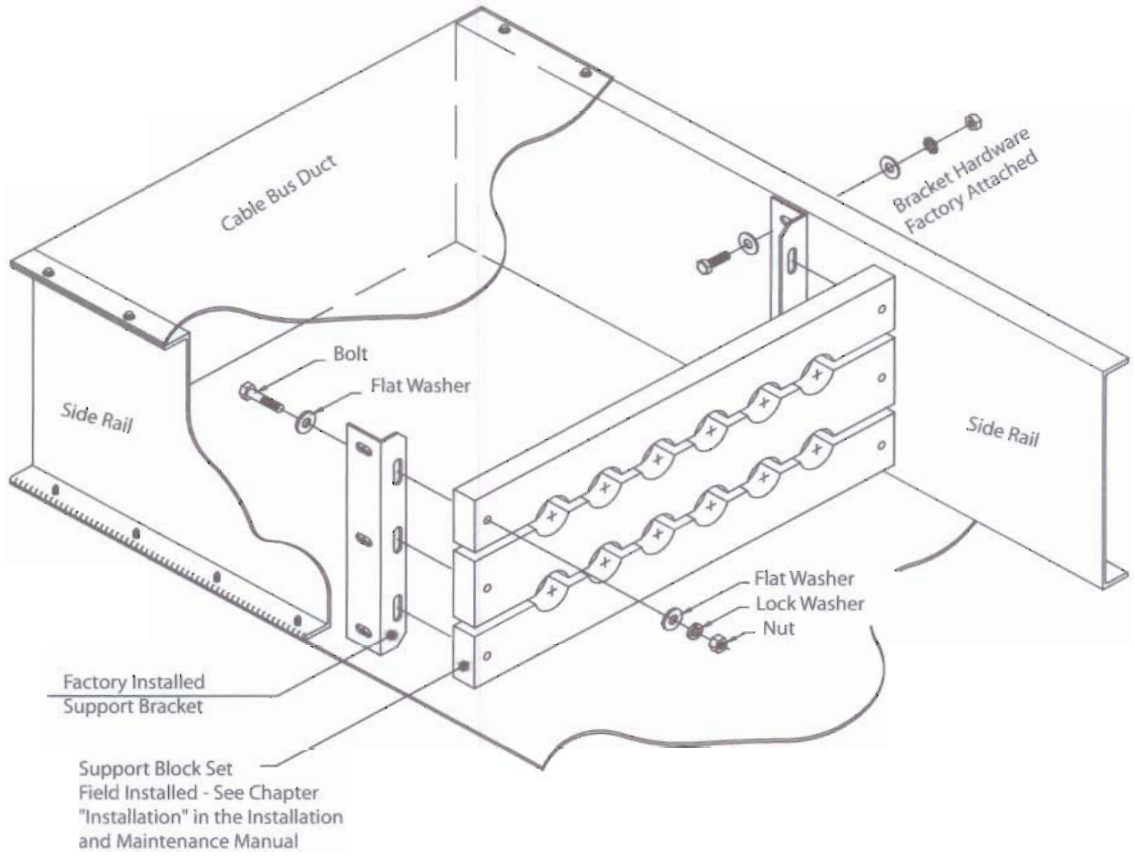
Cover Joiner Strip Assembly

A8



Hold Down Clip and Mounting Detail

A9



Cable Support Block Mounting Assembly

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