AMPOWER* Wave Crimp Connector System

NOTE
All numerical values are in metric units [with U.S. customary units in brackets]. Dimensions are in millimeters [and inches]. Unless otherwise specified, dimensions have a tolerance of ±0.13 [±.005] and angles have a tolerance of ±2°. Figures and illustrations are for identification only and are not drawn to scale.

1. INTRODUCTION

This specification covers design recommendations for use of the AMPOWER wave crimp connector system as a power distribution medium. The system consists of pre-assembled cable/connector assemblies and printed circuit (pc) board header assemblies. The cable/connector assemblies can be produced in any length and in a variety of configurations. The pc board header assemblies are available for right-angle and vertical mount applications with either solder tine contacts or ACTION PIN* contacts. Currently, only cable assemblies and board mount headers are available. Some components are available separately as replacement parts.

When corresponding with personnel, use the terminology provided in this specification to facilitate your inquiries for information. Basic terms and features of this product are provided in Figure 1.

Four-Cable Drawer Connector

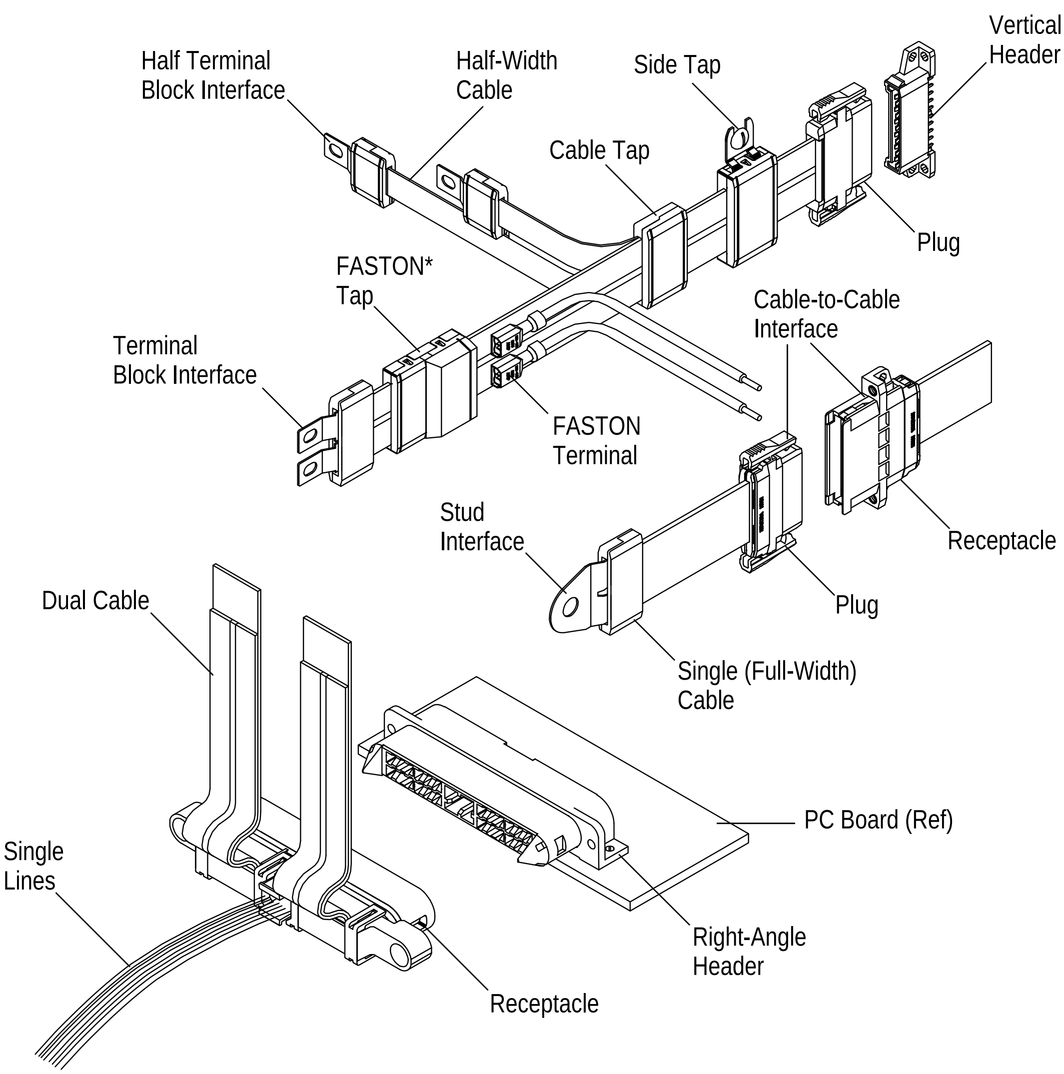


Figure 1

2. REFERENCE MATERIAL

2.1. Revision Summary

Revisions to this instruction sheet include:

- Updated application specification to corporate requirements
- Added Paragraph 3.3,B and Figure 16

2.2. Customer Assistance

Reference Product Base Part Number 765315 and Product Code 2842 are representative of AMPOWER wave crimp connector system. Use of these numbers will identify the product line and help you to obtain product and tooling information. Such information can be obtained through a local Representative, by visiting our website at www.te.com, or by calling PRODUCT INFORMATION at the number at the bottom of page 1.

2.3. Drawings

Customer Drawings for product part numbers are available from the service network. The information contained in Customer Drawings takes priority if there is a conflict with this specification or with any other technical documentation supplied.

2.4. Manuals

Manual 402-40 can be used as a guide to soldering. This manual provides information on various flux types and characteristics with the commercial designation, flux removal procedures, and a guide for information on soldering problems.

2.5. Instructional Material

Instruction Sheets (408-series) provide product assembly instructions or tool setup and operation procedures. Documents available which pertain to this product are:

408-2636-1 Replacement Tool 380392-8 for ACTION PIN Contacts
408-9185 Contact Removal Tool 58209-1 for ACTION PIN Contacts
408-9848 Insertion Tool Assembly 765423-1

2.6. Specifications

Product Specifications (108-series) provide product performance and test results. Documents available that pertain to this product are:

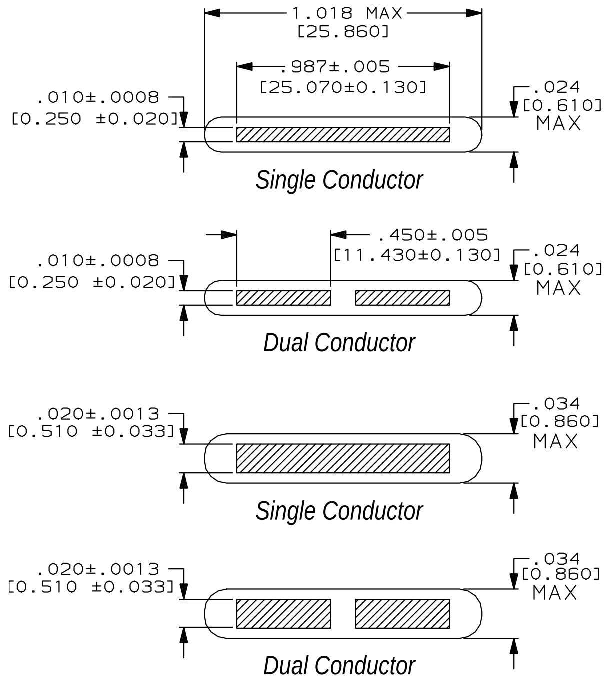
108-1308 Separable interface (full- and half-width)
108-1313 Terminal block interface
108-1315 Tap interface, cable
108-1319 Drawer connector
108-1387 Tap interface, .250 FASTON tab
108-1391 Tap interface, side
108-1403 Right-angle self-aligning header
108-1408 Cable-to-cable interface
108-1410 ACTION PIN header
108-1436 Cable-to-cable drawer connector
108-1479 ACTION PIN self-aligning connector

3. REQUIREMENTS

3.1. Cable

A. Size

All terminations of this system are one- or two-conductor channels depending on the choice of dual or single (full-width) cable. This system is based on the use of commercially available flat insulated copper cable as characterized in Figure 2.



CIRCULAR MILS (PER CONDUCTOR)	APPROX AWG
12,566	9
5,729	13
25,133	6
11,459	10

CABLE THICKNESS	RESISTANCE (Milliohms)‡	
	SINGLE	DUAL
0.51 [.020]	.456	.996
0.25 [.010]	.912	2.030

‡ The dc resistance of a 304.8 [12] long conductor when measured at 25°C [77°F] and 10 amps shall be less than this.

Figure 2

B. Folds

Folding of cables to route conductors for specific applications is a process inherent to this system. When re-routing or changing folds, it is permissible to refold a cable at right angles to an original fold only once.

NOTE
To determine the flex life of flat cable in a specific application, call PRODUCT INFORMATION at the number at the bottom of page 1 and request the Tech Brief for flat cable service loops.

C. Splits

Splitting of dual conductor cables is done in order to route conductors to non-adjacent points. Terminal block and plug interfaces are available to accommodate this capability. See Figure 3.

Dual Cable Application *Dual Cable with Terminal Block Interfaces (Ref)*

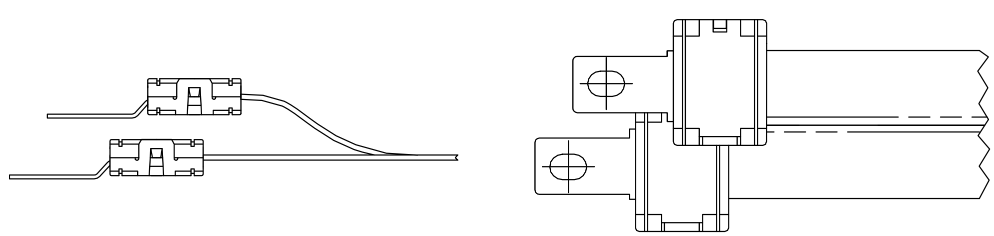


Figure 3

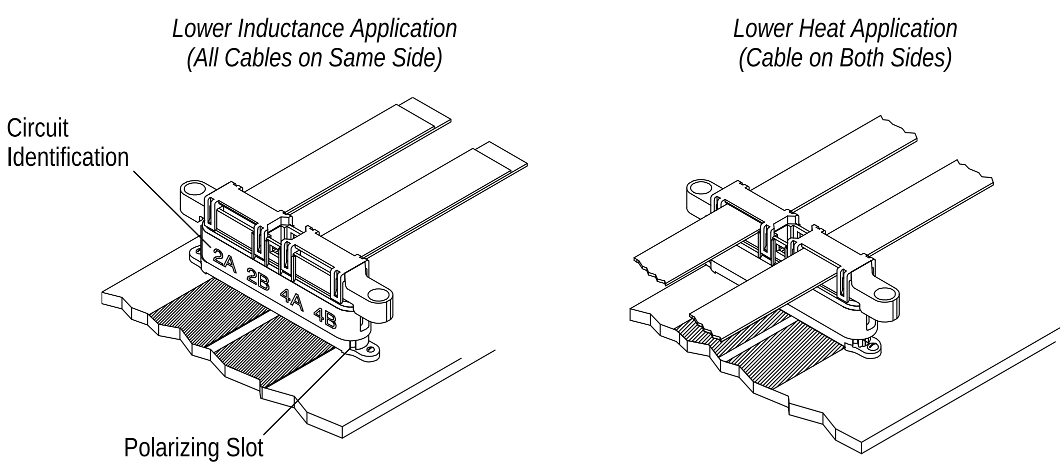
D. Routing

Proper cable support should be provided at critical points to minimize effects of vibration and other mechanical stresses. Cable assemblies can be provided with two or more cables held together by cable ties (for minimum inductance).

It is suggested that where multiple conductors are overlaid, a sequence of assembly be provided to manufacturing and assembly personnel.

Self-aligning receptacles accept multiple cables, which can be combinations of single and dual conductors, that are 0.25 [.010] and 0.51 [.020] thick. Cables may extend from the same side (lower inductance) or opposite sides (lower heat) of the connector with the strain relief holding them in position as shown in Figure 4.

CAUTION
Like any other insulated conductor, cables should be protected from sharp objects such as burred metal, screws, welds, etc.



Note: Circuit identifications A and B do not appear on the housing.

Figure 4

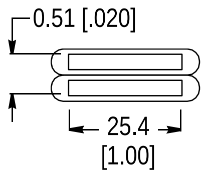
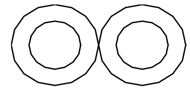
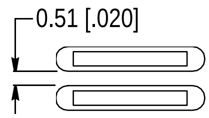
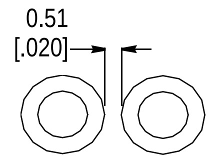
E. Impedance Characteristics

Digital systems present transient current demands to supply systems. These transient current demands will create voltage transients at the load as a function of the series inductance of the distribution circuit. These current transients will also complicate the power supply regulation circuitry.

These effects can be reduced in a power distribution network. The use of flat cable is a known means of reducing cable inductance. Calculated electrical parameters of AMPOWER flat cables compared with those of round solid conductors are shown in Figure 5.

Flat cables placed as close together as possible exhibit a characteristic impedance of approximately 3 ohms and an inductance of 17 nanohenries per meter. The flat conductors are separated by 0.36 [.014] of dielectric. Round wires of equivalent conductor area placed as close together as possible exhibit a characteristic impedance of 75 ohms and an inductance of over 300 nanohenries per meter. The round wire conductors are separated by a total of 1.61 [.064] of dielectric.

Inductance of a co-planar dual cable pair circuits is nearly identical to that of two proximate insulated wires.

ELECTRICAL PARAMETER	FLAT CABLE  0.51 [.020] 25.4 [1.00]	ROUND CABLE 	FLAT CABLE  0.51 [.020]	ROUND CABLE  0.51 [.020]
Air Gap Between Cables	0	0	0.51 [.020]	0.51 [.020]
Conductor (Size 6 AWG)	0.51 [.020]	4.12 [.162]	0.51 [.020]	4.12 [.162]
Insulation Thickness	0.18 [.007]	0.18 [.007]	0.18 [.007]	0.81 [.032]
C (nF/m)	1.6853	.05659	.37638	.04344
C_O(nF/m)	.6606	.03459	.28364	.03065
$E_{R\ eff}$	2.5512	1.6363	1.3269	1.4165
L (nH/m)	16.932	323.39	39.435	364.77
Z_O (ohms)	3.17	75.59	10.24	91.64

Notes: Insulation Dielectric Constant = 2.6 $E_{R\ eff} = C/C_O$
Where C = Free Space Capacitance of Wire Configuration

Figure 5

3.2. Lubrication

In order to assure the required durability of the AMPOWER contacts, the plug of the separable interface is lubricated and therefore, should not be exposed to solvents.

3.3. PC Board

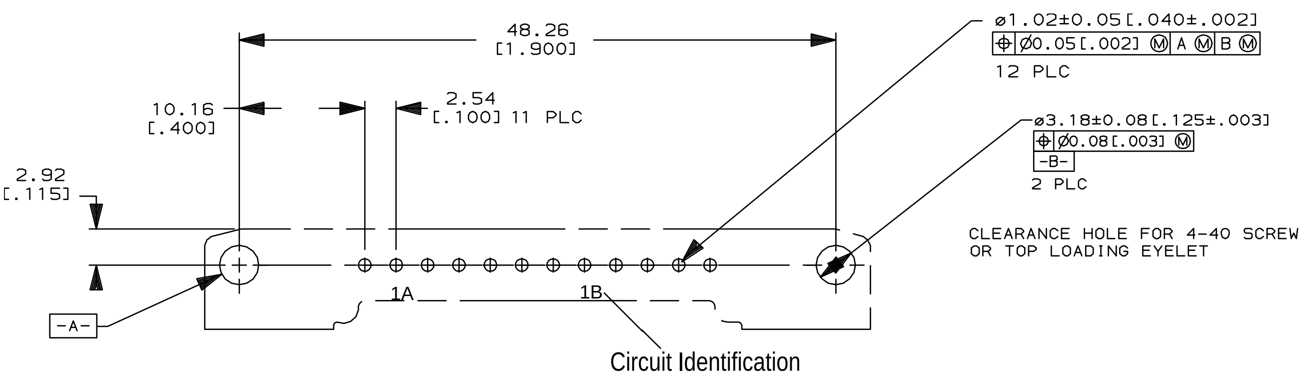
A. Layout

Right-angle and vertical mount headers are available with contacts on 2.54 [.100] centers and accommodate solder or press-fit applications. Pc board layouts are shown in Figures 6 thru 9.

Vertical mount self-aligning drawer headers feature an offset (0.72 [.030]) flange that provides polarization to the pc board during assembly. Pc board layouts are shown in Figures 10, 12, 14, and 15.

Self aligning, horizontal mount drawer headers are shown in Figures 11 and 13.

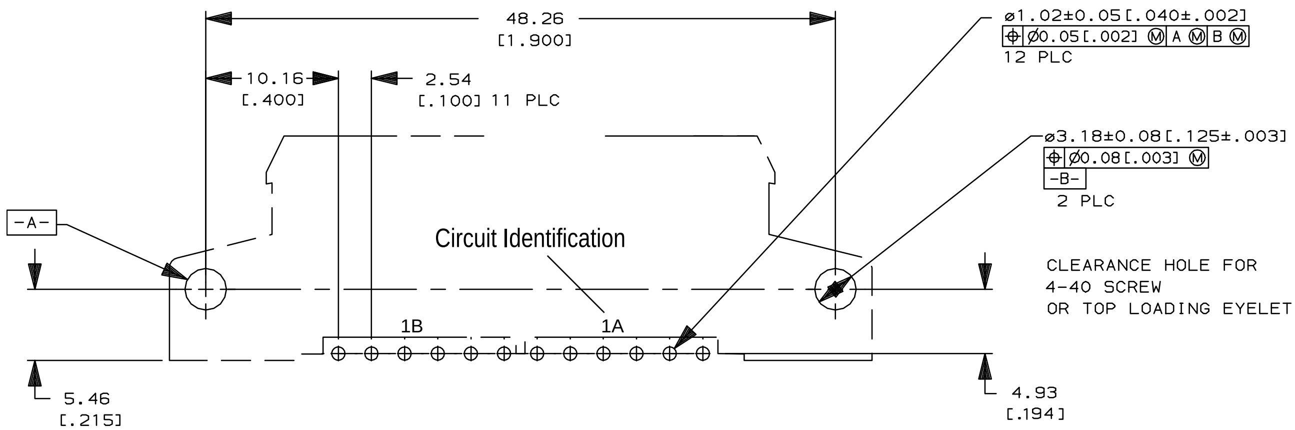
Single (Full-Width) Cable Vertical Mount Header



Note: Circuit identification does not appear on housing.

Figure 6

Single (Full-Width) Cable Horizontal Mount Header



Note: Circuit identification does not appear on housing.

Figure 7

Dual (Half-Width) Cable Vertical Mount Header

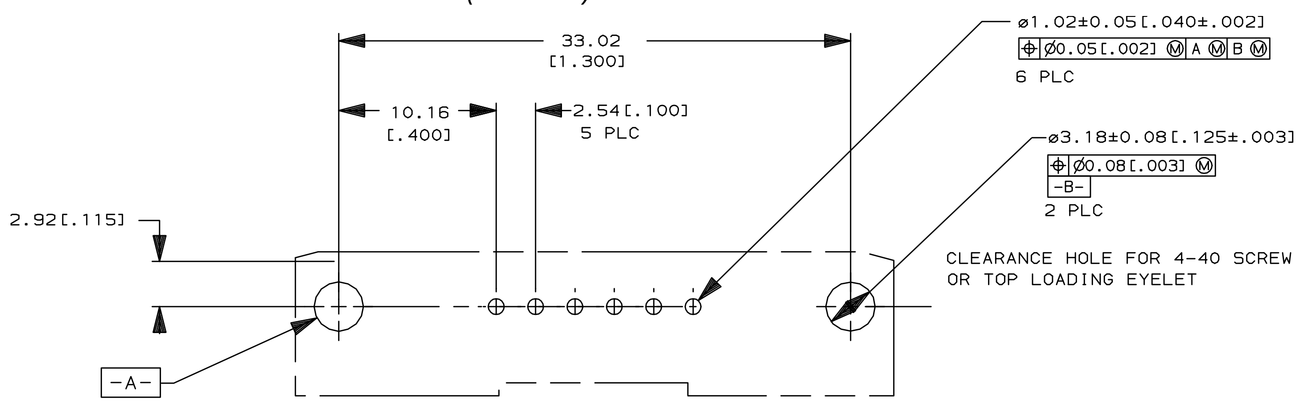


Figure 8

Dual (Half-Width) Cable Horizontal Mount Header

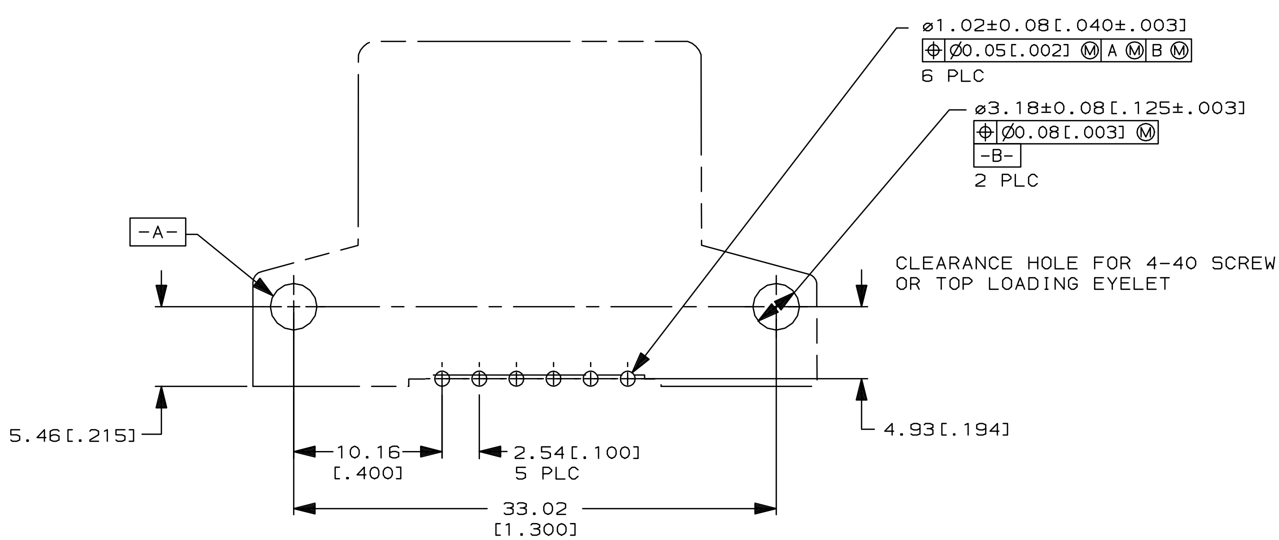
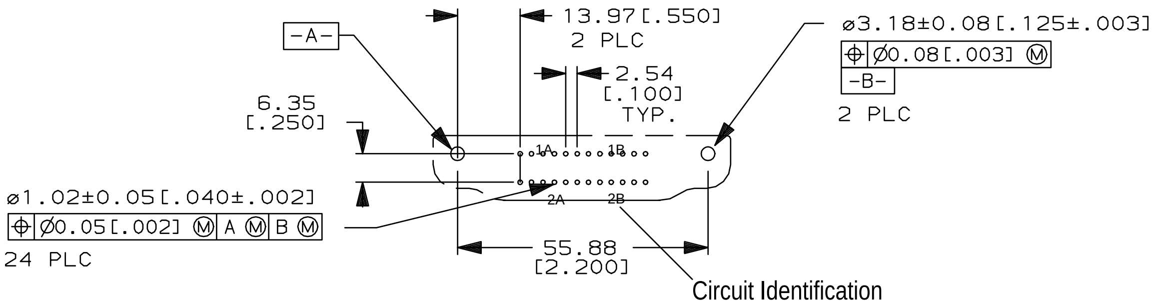


Figure 9

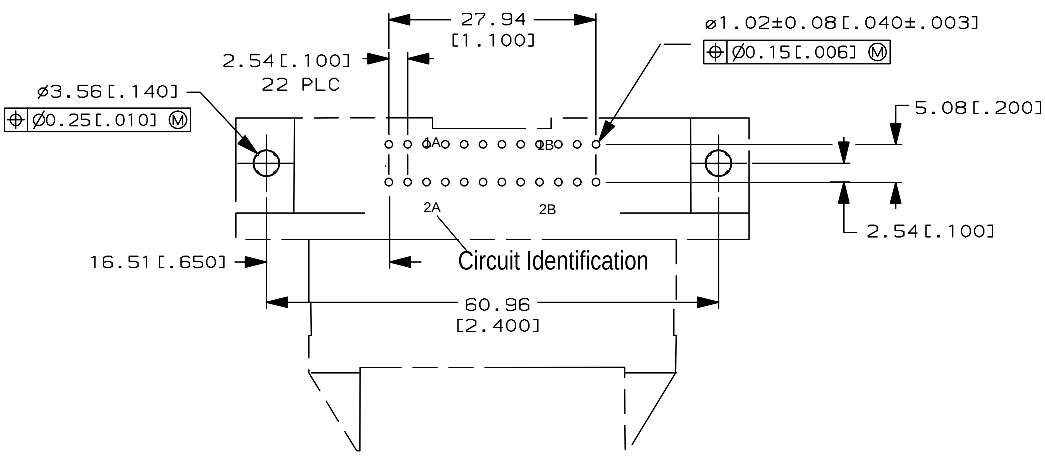
Two-Cable Self-Aligning Vertical Mount Header



Note: Circuit identifications A and B do not appear on housing.

Figure 10

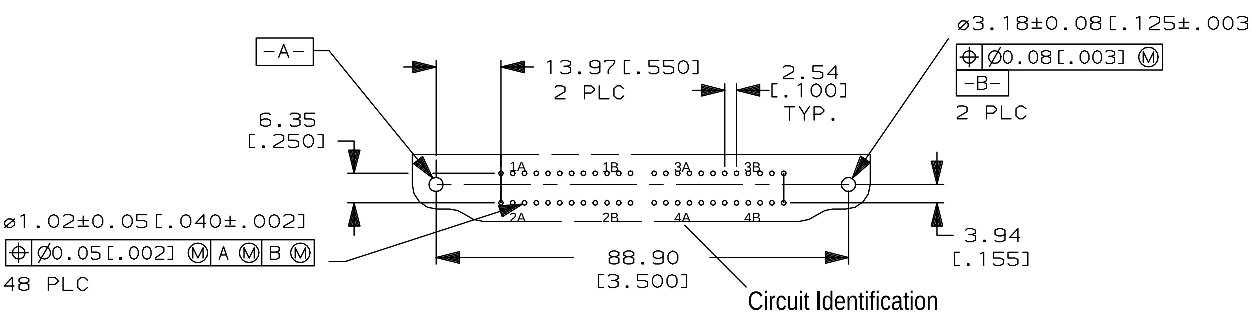
Two-Cable Self-Aligning Horizontal Mount Header



Note: Circuit identifications A and B do not appear on housing.

Figure 11

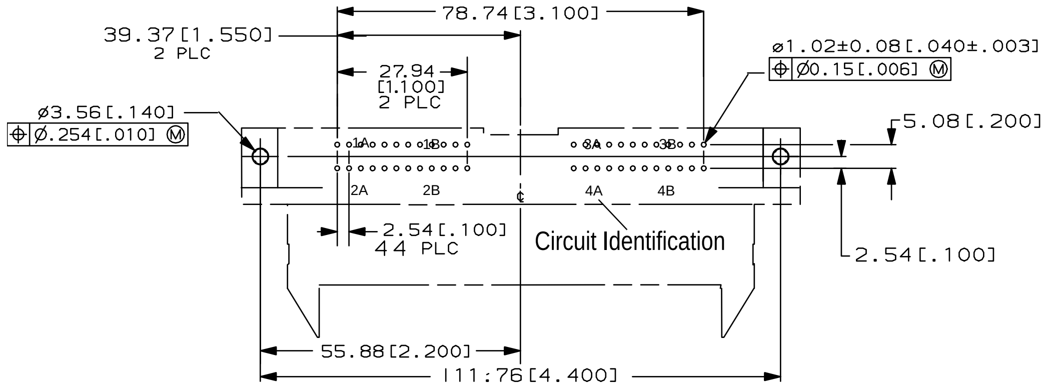
Four-Cable Self-Aligning Vertical Mount Header



Note: Circuit identifications A and B do not appear on housing.

Figure 12

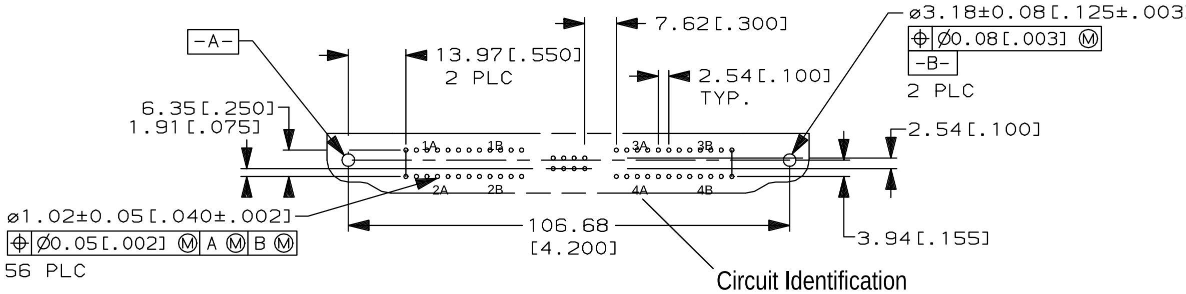
Four-Cable Self-Aligning Horizontal Mount Header With Forty-Eight Sense Lines



Note: Circuit identifications A and B do not appear on housing.

Figure 13

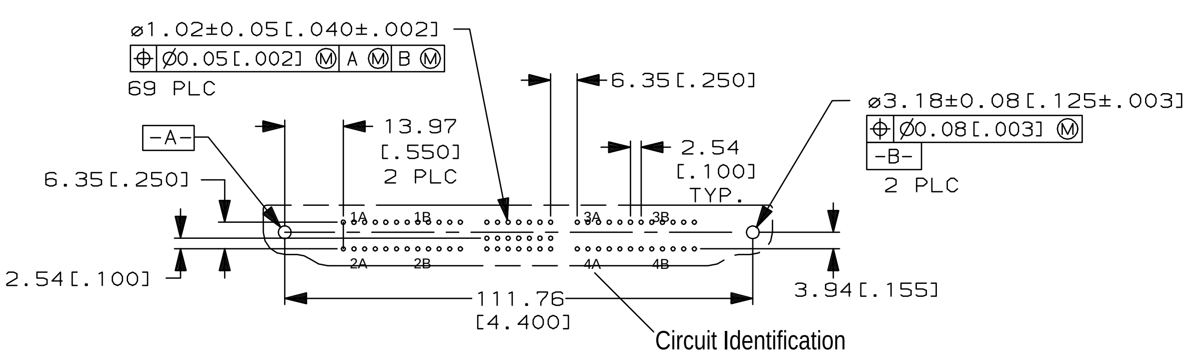
Four-Cable Self-Aligning Vertical Mount Header With Eight Sense Lines



Note: Circuit identifications A and B do not appear on housing.

Figure 14

Four-Cable Self-Aligning Vertical Mount Header With Twenty-One Sense Lines

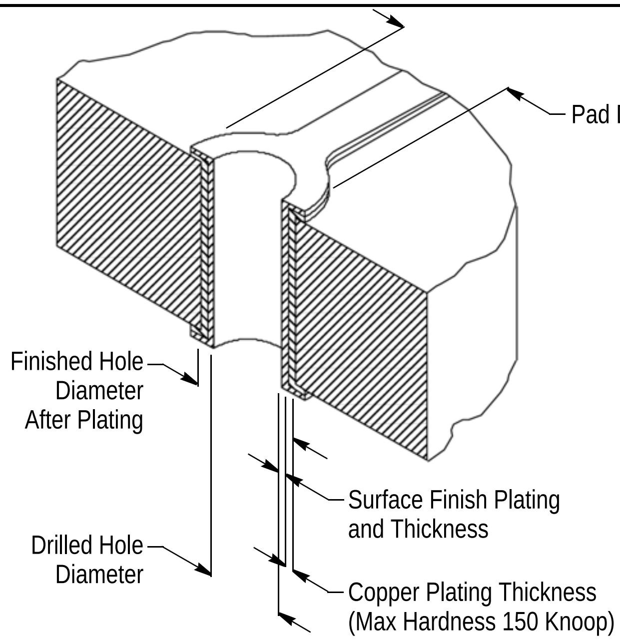


Note: Circuit identifications A and B do not appear on housing.

Figure 15

B. Contact Holes

The contact holes must be drilled and plated through to specific dimensions. The plating type and thickness and finished hole size must be as stated to provide unrestricted insertion of the contacts. See Figure 16.



SURFACE FINISH PLATING	THICKNESS
Hot Air Solder Leveling (HASL) Tin-Lead (SnPb)	0.008 [.0003] Min
Immersion Tin (Sn)	0.0005 [.000020] Min
Organic Solderability Preservative (OSP)	0.0002-0.0005 [.000008-.000020]
Immersion Silver (Ag)	0.0001 [.000004] Min
Immersion Gold (Au) Over Nickel (Ni)	0.0001-0.0005 [.000004-.000020] Au 0.004-0.005 [.00005-.00020] Ni

HEADER ASSEMBLY CONTACT TYPE	PC BOARD HOLE			PC BOARD PAD DIAMETER (Min)
	DIAMETER		COPPER PLATING THICKNESS	
	DRILLED	FINISHED (After Plating)		
ACTION PIN	1.151-1.201 [.0453-.0473] For Immersion Ag Plating 1.125-1.176 [.0443-.0463] For All Other Platings	1.04 [.041] Ref For Immersion Ag Plating 1.02 [.040] For All Other Platings	0.03-0.08 [.001-.003]	1.57 [.062]
	0.874-0.925 [.0344-.0364]	0.80 [.031]		
Solder Type	1.125-1.176 [.0443-.0463]	0.99 [.039]	0.03-0.08 [.001-.003]	Finished Hole Diameter Plus 0.51 [.020]

Figure 16

3.4. Polarization

All separable interfaces have polarization design features that prevent inadvertent rotation of mating connectors.

3.5. Cover

The cover has no mechanical function relative to crimp performance. It must be kept securely in place as shown in Figure 17.

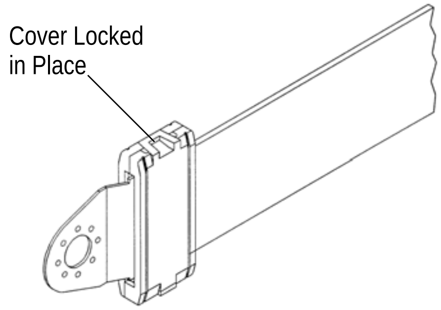


Figure 17

3.6. Panel Cutout

The panel for self-aligning connectors must be cut out to the dimensions given in Figure 18.

Panel Cutout for Self-Aligning Connectors

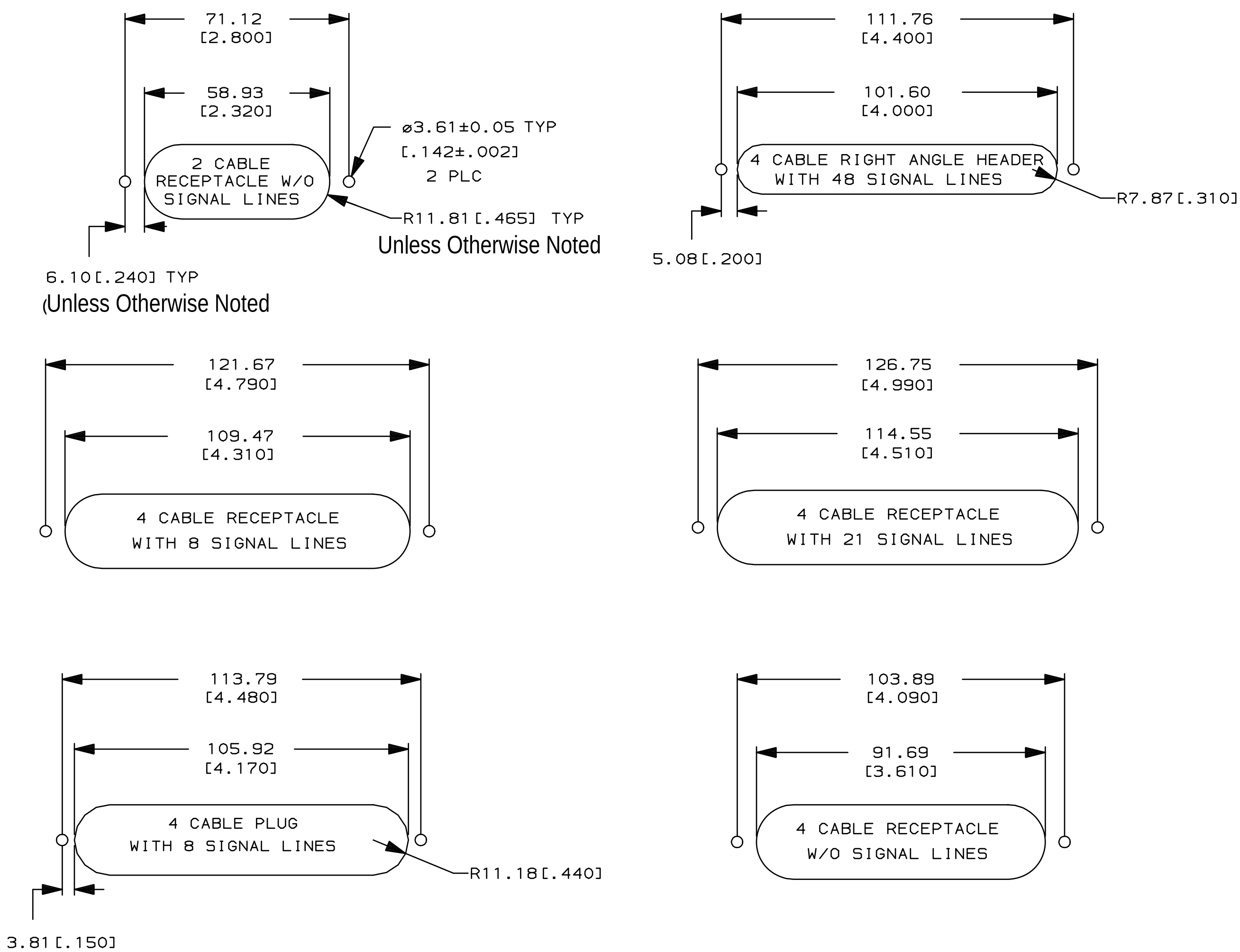


Figure 18

3.7. Mounting Hardware

A. Header

Header flange holes accept No. 4 standard pan head, round head, or socket head machine screws in combination with nuts and washers as desired. They are also compatible with top-activated, metal hold-down eyelets. Each eyelet is designed to be activated with a force of 88.96 N [20 lbf] and provides retention to the pc board through the soldering operation. After filling with solder, it provides mechanical stability to the header. Refer to Figure 19.

An optional cover for protection of exposed header leads is also shown in Figure 19.

Activation tooling is given in Section 5.

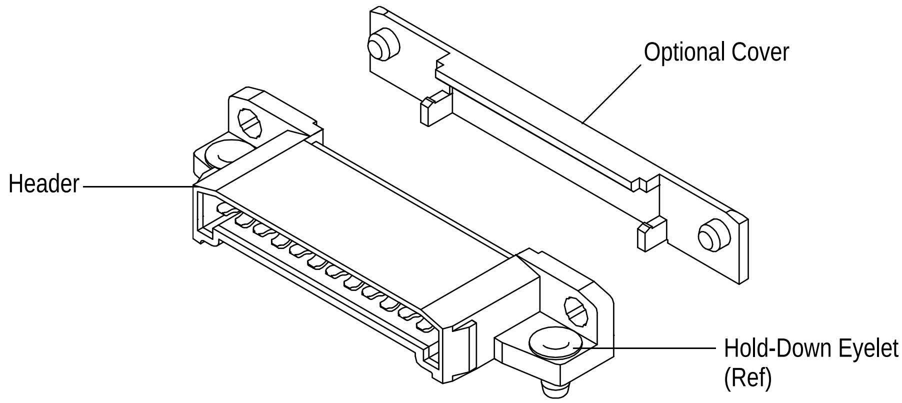


Figure 19

B. Receptacle (Self-Aligning Connector Only)

The receptacle, together with its mounting hardware and recommended panel cutout, are designed to permit 4.06 [.160] total diametric motion during mating. This is accomplished by the controlled fit between the receptacle mounting hole and the diameter of the shoulder screws that secure it. See Figure 20.

Torque recommendations are given in Figure 21.

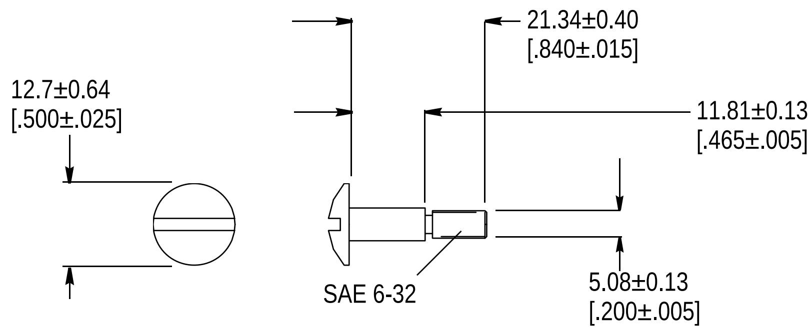


Figure 20

C. Stud and Terminal Block Interconnection

The interface tab must be secured with a washer and a screw or a bolt and nut to assure that the high-current interface is not degraded. Sufficient torque must be applied to studs or screws to ensure the long-term integrity of the interface. UL (Underwriters Laboratories Inc.) Specification 486A, “Wire Connectors and Soldering Lugs for Use with Copper Conductors,” contains the torque values given in Figure 21.

STUD/SCREW SIZE	TORQUE (Nm [ft-lb]
No. 8	2 [1.5]
No. 10	3 [2.0]
¼ inch or Less	8 [8.0]
$^{5}/_{16}$ inch	15 [11.0]
$^{3}/_{8}$ inch	25 [19.0]
$^{7}/_{16}$ inch	41 [30.0]
½ inch	54 [40.0]
$^{9}/_{16}$ to $^{5}/_{8}$ inch (or Larger)	75 [55.0]

Figure 21

3.8. Connector Engagement

A. Full Engagement

The distance between the header or plug and the receptacle mounting surfaces at full engagement of the housings is given in Figure 22.

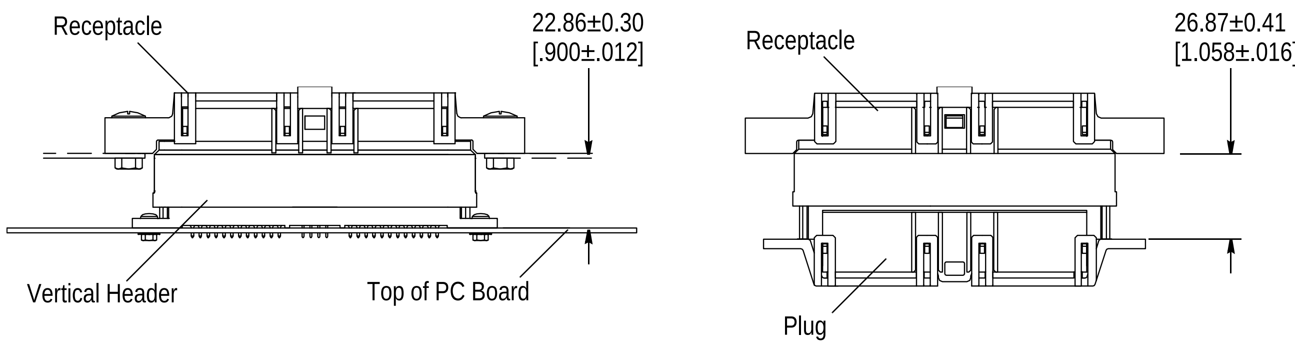
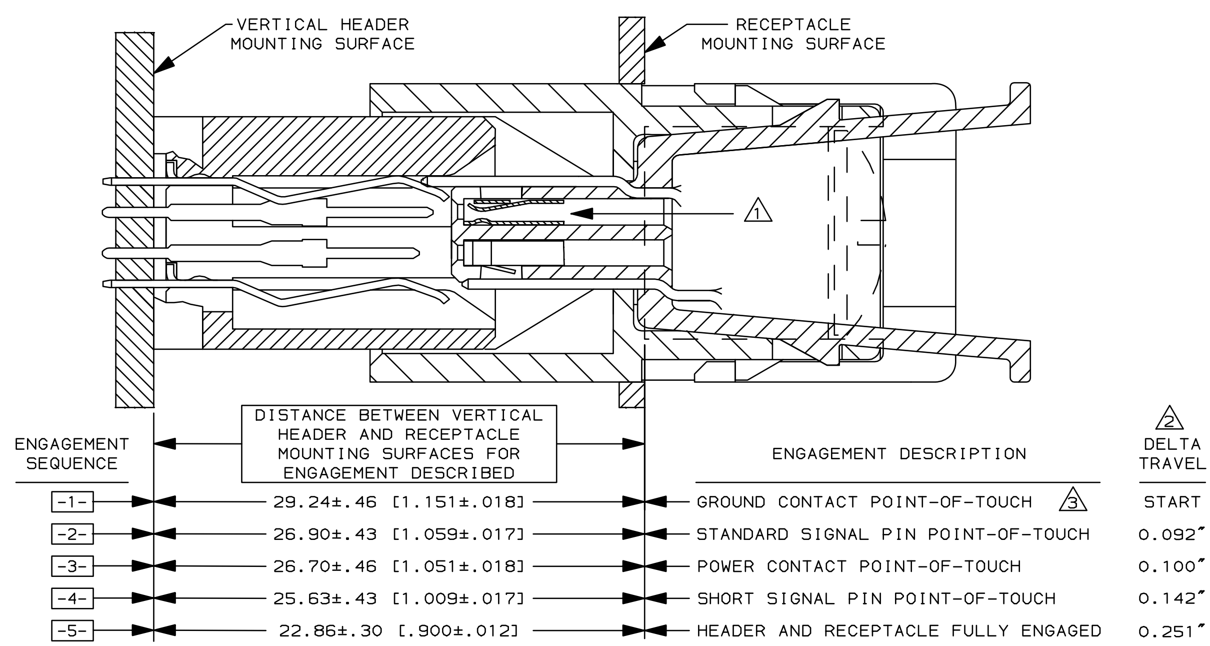


Figure 22

B. Sequential Engagement

Self-aligning drawer connectors are designed to provide sequential mating. Three sequences are represented by: GROUND, STD-SIGNAL/POWER, and SHORT-SIGNAL. The distances and tolerances between the vertical header and receptacle mounting surfaces at each engagement position is given in Figure 23.

Either power or ground contacts may be used on each single (full-width) cable, but they cannot be mixed on the same cable. These can be used to ensure mate first, break last engagement and are suitable for software controlled “hot mate” applications. See Figure 23.



1. MINI-TANDEM SIGNAL SOCKET ILLUSTRATED IS ROTATED 90° FROM ACTUAL TO SHOW POINT-OF-TOUCH.
2. TO DETERMINE THE DESCRIBED DISTANCES FOR PLUG CONNECTORS AND RECEPTACLES START WITH THE FULLY ENGAGED DISTANCE FROM FIGURE 21 AND APPLY THE DELTA TRAVEL DISTANCES.
3. GROUND CONTACT POINT-OF-TOUCH IS SHOWN IN ILLUSTRATION.

Figure 23

3.9. Soldering

A. Process

Established soldering guidelines are given in Manual 402-40.

B. Flux Selection

Header solder tails should be fluxed with a non-activated rosin flux (25% white rosin,75% isopropyl alcohol) prior to soldering. Flux selection must be based on compatibility with other components used on the pc board assembly. All silver solder tails should be fluxed with mildly activated rosin prior to soldering. Refer to Test Specification 109-11, "Solderability Dip Test".

C. Cleaning

After soldering, removal of fluxes, residues, and activators is necessary. Consult with the supplier of the solder and flux for recommended cleaning solvents. A list of common cleaning solvents that will not affect the connectors at the times and temperatures specified is given in Figure 24.

CLEANER		TIME (Minutes)	TEMPERATURE (Maximum)
NAME	TYPE		
ALPHA 2110	Aqueous	1	132°C [270°F]
BIOACT EC-7	Solvent	5	100°C [212°F]
Butyl CARBITOL	Solvent	1	Ambient Room
Isopropyl Alcohol	Solvent	5	100°C [212°F]
KESTER 5778	Aqueous		
KESTER 5779	Aqueous		
LONCOTERGE 520	Aqueous		
LONCOTERGE 530	Aqueous		
Terpene	Solvent		

Figure 24

D. Drying

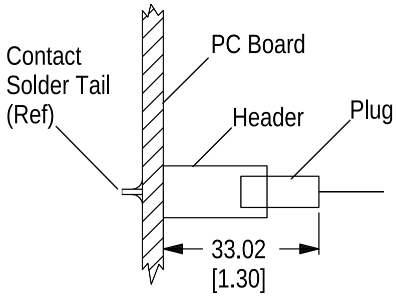
When drying cleaned assemblies and pc boards, make certain that temperature limitations of -13° to 41°C [55° to 105°F] are not exceeded. Excessive temperatures may cause housing degradation.

3.10. Designer Guidelines for Resistance

Resistance values for connectors terminated to 25.4 [1.00] wide cable are provided in Figure 25.

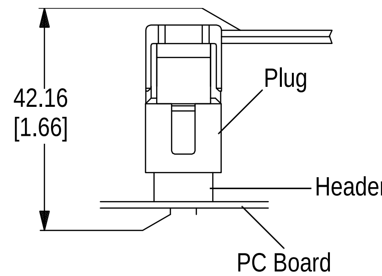
ALPHA, BIOACT, CARBITOL, LONCOTERGE, and KESTER are trademarks of their respective owners.

Separable Board Interface



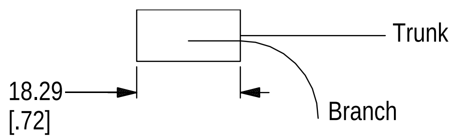
CABLE THICKNESS	R-TOTAL (Milliohms)	
	SINGLE	DUAL
0.51 [.020]	.225	.450
0.25 [.010]	.250	.500

Self-Aligning Connector



CABLE THICKNESS	R-TOTAL (Milliohms)	
	SINGLE	DUAL
0.51 [.020]	.250	.500
0.25 [.010]	.280	.560

Tap Interface

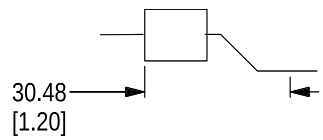


CABLE THICKNESS	R-TRUNK (Milliohms)	
	SINGLE	DUAL
0.51 [.020]	.035	.070
0.25 [.010]	.070	.140

CABLE THICKNESS	R-BRANCH (Milliohms)	
	SINGLE	DUAL
0.51 [.020]☐	.080	.120
0.25 [.010]☐	.150	.300
0.25 [.010]❖	.175	.350

☐ 0.51 [.020] Main Cable
❖ 0.25 [.010] Main Cable

Terminal Block Interface



CABLE THICKNESS	R-TOTAL (Milliohms)	
	SINGLE	DUAL)
0.51 [.020]	.055	.110
0.25 [.010]	.080	.160

Note: All dimensions are between electrical measurement points.

Figure 25

3.11. Current Carrying Capability

This information is provided as a guideline to users attempting to predict application performance of the AMPOWER wave crimp connector system. Responsibility for performance in specific applications rests with the system designer.

The curves in Figures 26 thru 31 illustrate actual measured values of current and temperature generated with components of the AMPOWER wave crimp connector system in still air. It is important to recognize that this information results from specific configurations as noted earlier and is intended to isolate the particular component indicated. Variation in the specified configuration will act to improve or degrade the performance characterized here.

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NOTE
Where cable is referred to as DUAL, the data refers to one-half width (11.43 [.450]) conductor. Single (full width) (25.4 [1.00]) capacity is obtained by doubling the current indicated.

CAUTION
The performance indicated is not de-rated. Actual measurements of initial conditions are represented. All components represented in Figures 27 through 31 were evaluated as singular components. The current capacity of an assembly may be lower.

A. Single and Multiple Cable

Still air temperature rise is measured on a single long cable suspended horizontally 50.8 [2.00] above a pc board reference surface, which is at room temperature.

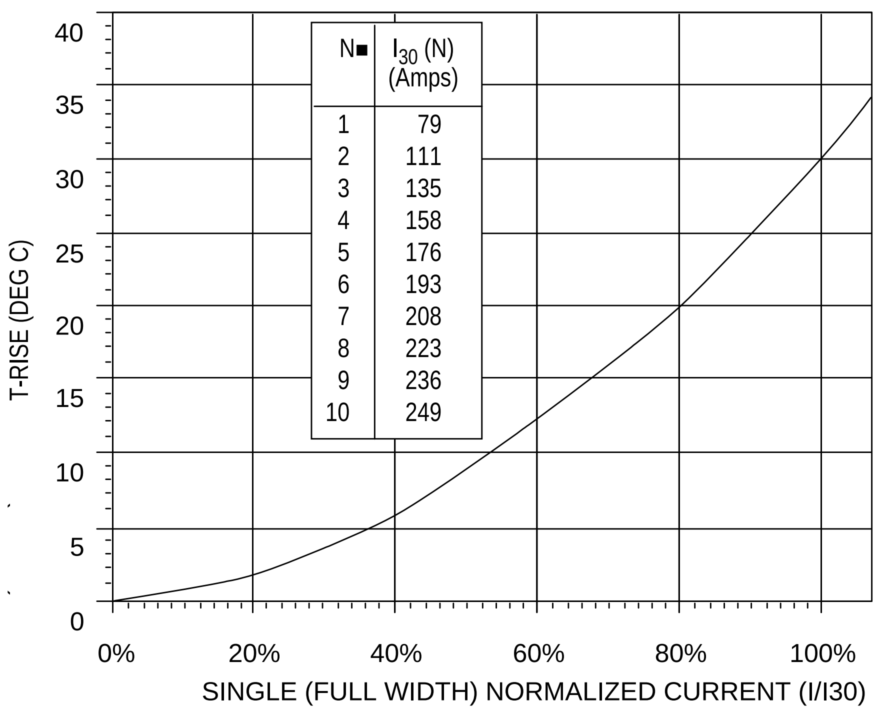
The temperature rise in a long cable results from an equilibrium between internal Joule heating and external heat loss through the cable surface. There is no axial heat flow. T-rise data for a particular long cable may be successfully scaled to other flat geometries by requiring that the total cable dissipation at a particular temperature be equivalent to the surface area of the new cable configuration.

This leads to some useful rules-of-thumb:

1. Single cable current capacity is proportional to the square root of conductor thickness.
2. Individual conductor current capacity in a stack of identical cables is inversely proportional to the square root of the number of cables in the stack. This rule is effective for stacks up to about six or eight cables. Beyond that range, a more accurate prediction requires taking the sidewall area of the stack into account.

NOTE
Figure 26 assumes that a 30°C [86°F] temperature rise is the maximum desirable. The table indicates the total current which can be carried by increasing thickness in increments of 0.25 [.010]. The curve shows the actual temperature of the stack when the total applied current is only a percentage of the level required for a rise of 30°C [86°F].

Universal Stacked Cable T-Rise Curve



N■	I_{30} (N) (Amps)
1	79
2	111
3	135
4	158
5	176
6	193
7	208
8	223
9	236
10	249

■ N = Number of 0.25 [.010] thick conductors

Figure 26

Stud and Terminal Block Interface

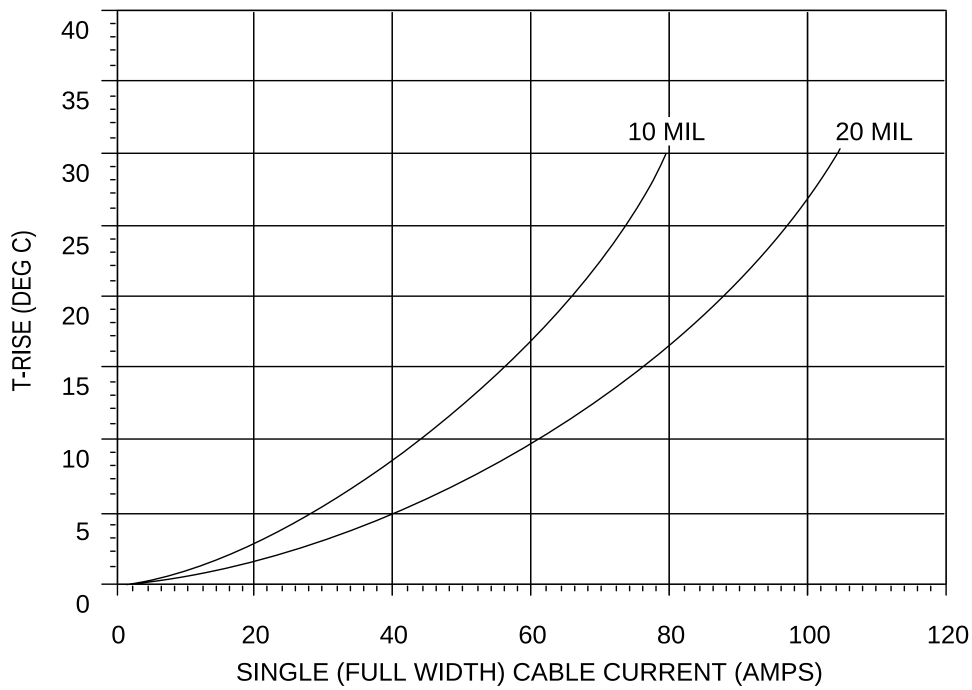


Figure 27

Cable Tap Interface

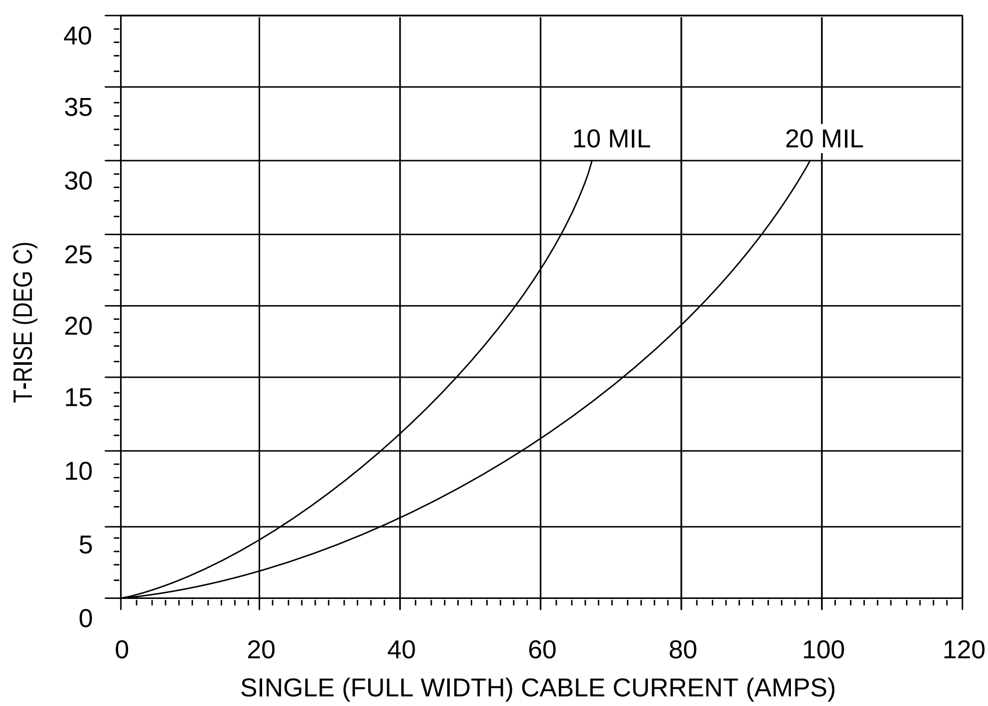


Figure 28

Plug or Header Terminated to 0.51 [.020] Flat Cable and Mounted on PC Board

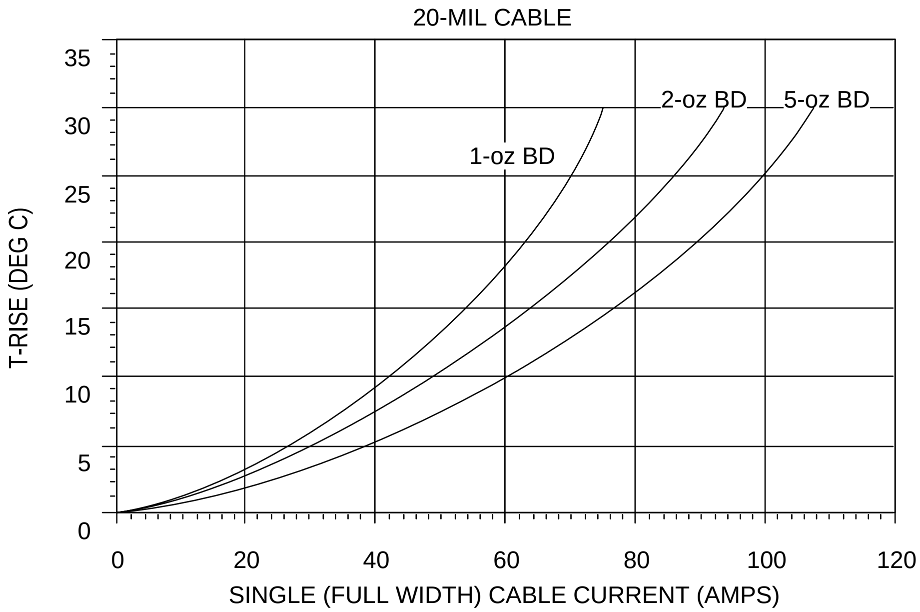


Figure 29

Plug or Header Terminated to 0.25 [.010] Flat Cable and Mounted on PC Board

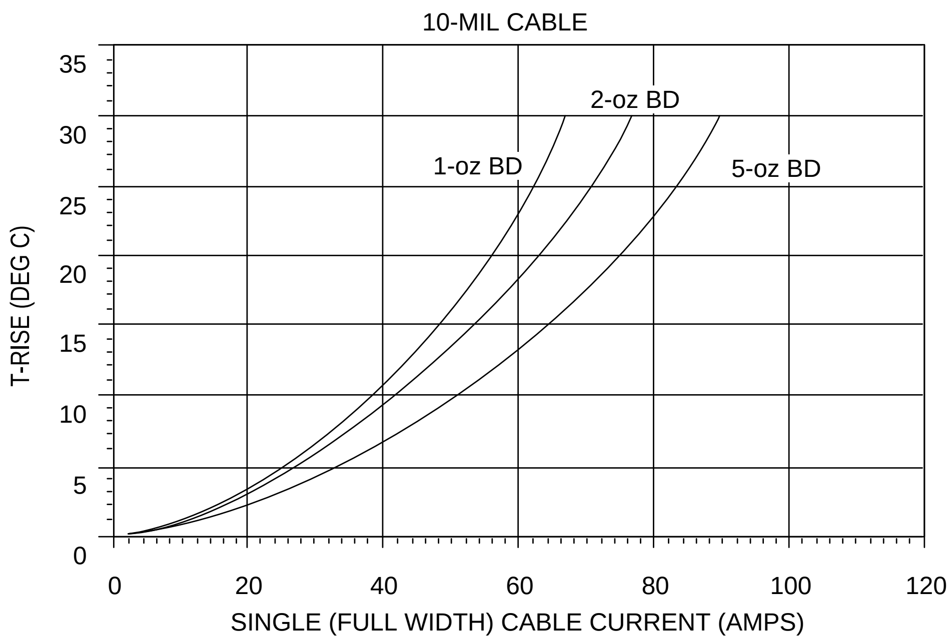
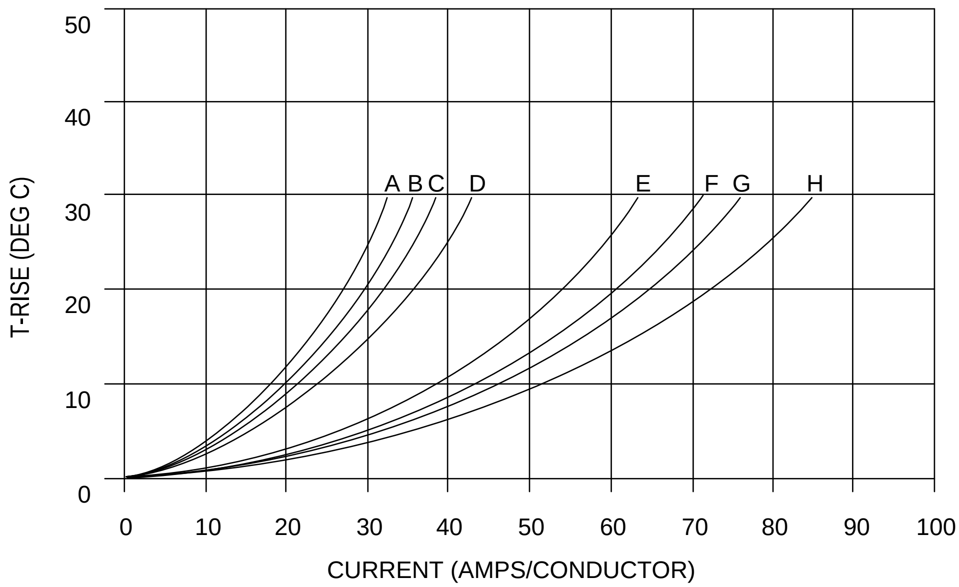


Figure 30

Current Carrying Capability of Self-Aligning Connectors



Legend

A 0.25 [.010] Dual Conductor with Cables Together
B 0.25 [.010] Dual Conductor with Cables Separated
C 0.51 [.020] Dual Conductor with Cables Together
D 0.51 [.020] Dual Conductor with Cables Separated
E 0.25 [.010] Single Conductor with Cables Together
F 0.25 [.010] Single Conductor with Cables Separated
G 0.51 [.020] Single Conductor with Cables Together
H 0.51 [.020] Single Conductor with Cables Separated

Figure 31

B. Separable Interface

A measured T-rise data for a header and plug mounted on a pc board and interfaced to 0.25 [.010] and 0.51 [.020] flat cable is shown in Figures 29 and 30.

The performance of vertically- and horizontally-mounted headers is nearly identical. These tests were carried out on vertical headers using dual cable with both circuits carrying equal current. Single (full width) cable current is the sum of the two channel currents. Test details are provided in the applicable Product Specification (108-Series), but the basic geometry is a 88.9 x 304.8 x1.52 [3.50 x 12 x .06] FR4, single-sided pc board with a header soldered to the foil at each end. The board is mounted horizontally in still air, 50.8 [2.0] above a reference surface and is fed with cables that are 609.6 [24] long. Larger test boards yield higher performance, but are unwieldy for product qualification. A long foil board that is 28 g [1 oz],127 [5] wide is an approximate current capacity match for 20-mil single (full width) cables and is a plausible measurement standard. Separable interface testing on a 142 g [5 oz], 139.7 x 609.6 [5.5 x 24] board yields a 30°C [86°F] interface T-rise at 110 amperes. The temperature of the pc board foil near the header solder tails is below that of the connector interface except on 28 g [1 oz] foil where the foil can run 5°C [9°F] warmer at an interface temperature of 30°C [86°F].

Solder tine temperature values are required by the board designer to ensure that board traces remain within an acceptable margin of the board temperature limit during continuous operation. The solder tine temperature is determined in large measure by the board foil geometry and thickness and variations do not follow in direct one-to-one relationship in the separable interface temperature.

C. Self-Aligning Drawer Connector

The temperature rise for a fixed current is related to the cable routing as illustrated in Figure 31.

Connectors represented by this data have all circuits loaded in series. Headers were mounted by through-hole solder attachment to 2.36 [.093] thick, double sided 141.75 g [5.0 oz] pc boards. Maximum current of 344 amps requires 4 [.157] x 0.51 [.020] cables in the separated configuration. This involves 283.5 g [10 oz] of copper with current distribution in all directions from the centrally mounted header.

Sense (Signal) Line Modules

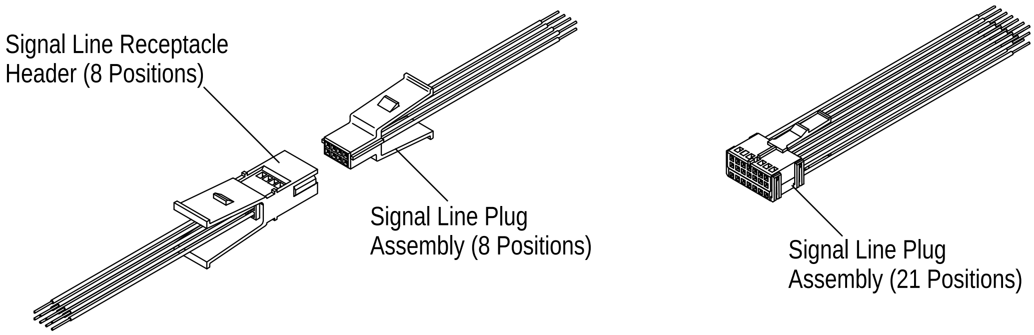


Figure 32

3.12. Signal Module

The self-aligning connector is available with 8 and 21 remote sense lines. These discrete lines are terminated with Mini Tandem spring contacts used in modules that are plugged into housings. See Figure 32.

3.13. Component Spacing

Spacing between mid cable and end cable components can be no less than 44.45 [1.75]. Minimum spacing between mid cable terminations is 24.13 [.950] (or 44.45 [1.750] centerline pitch). Exceptions are FASTON taps, which require 57.15 [2.225] centerline pitch and reverse taps shown in Figure 33.

A. Tap Connector

Tap connectors can be attached to the trunk cable to form a branch line. The minimum distance between tap connectors is provided in Figure 33.

Cable Tap Minimum Spacing

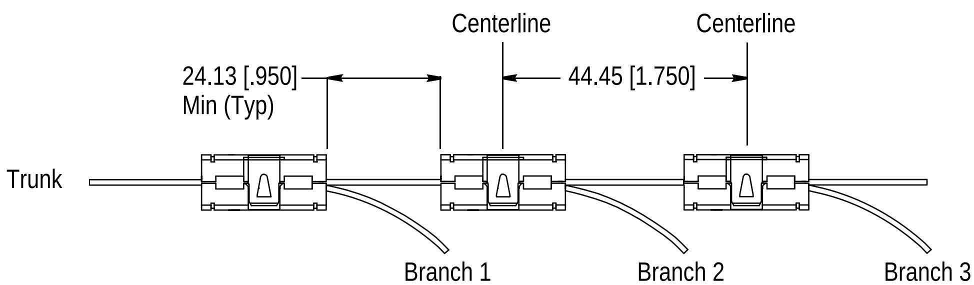


Figure 33

B. Side Tap

Side taps can be attached to the cable in-line with each other or in reverse of each other. The minimum spacing between taps required by the termination equipment used to attach the taps is given in Figure .

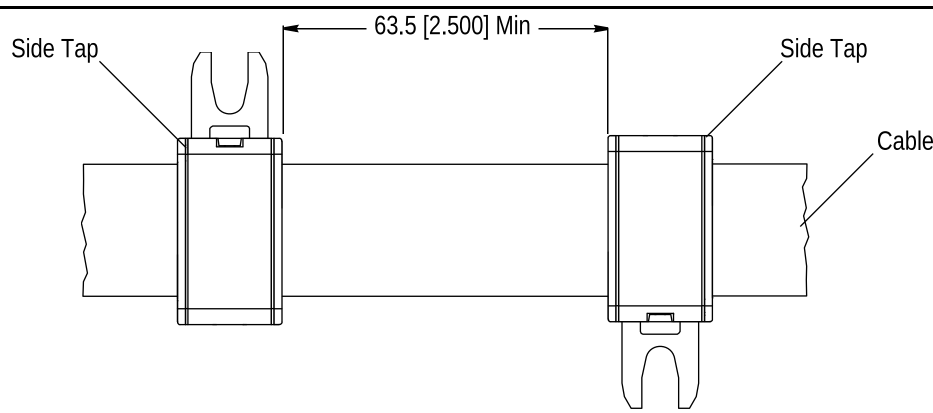


Figure 34

4. QUALIFICATIONS

Assemblies of AMPOWER wave crimp connector system are Recognized by Underwriters Laboratories Inc. (UL) in File E28476, E13288, and E53799 and Certified by CSA International in File LR 7189, A-149,358, and LR 16455 Class 5852.

5. TOOLING

Tooling available for this product and instructional material packaged with the tooling is given in Figure 35.

5.1. Eyelet Formation Tool

An eyelet can be formed with a push type tool designed with a handle and rod. Recommended dimensions for constructing the tool are provided.

5.2. PC Board Support

A pc board support should be used to prevent bowing of the pc board during formation of the eyelets. It should have a flat surface with holes or a channel large enough to clear the eyelet after formation.

5.3. Insertion and Extraction Tools

The insertion tool is required to insert the ACTION PIN contacts into the plated through holes of the pc board. Customer fabrication drawings are also available. The replacement tool is designed to remove ACTION PIN contacts individually from the pc board. The extraction tool can be used to remove ACTION PIN contacts from the sense line header without removing the header from the pc board.

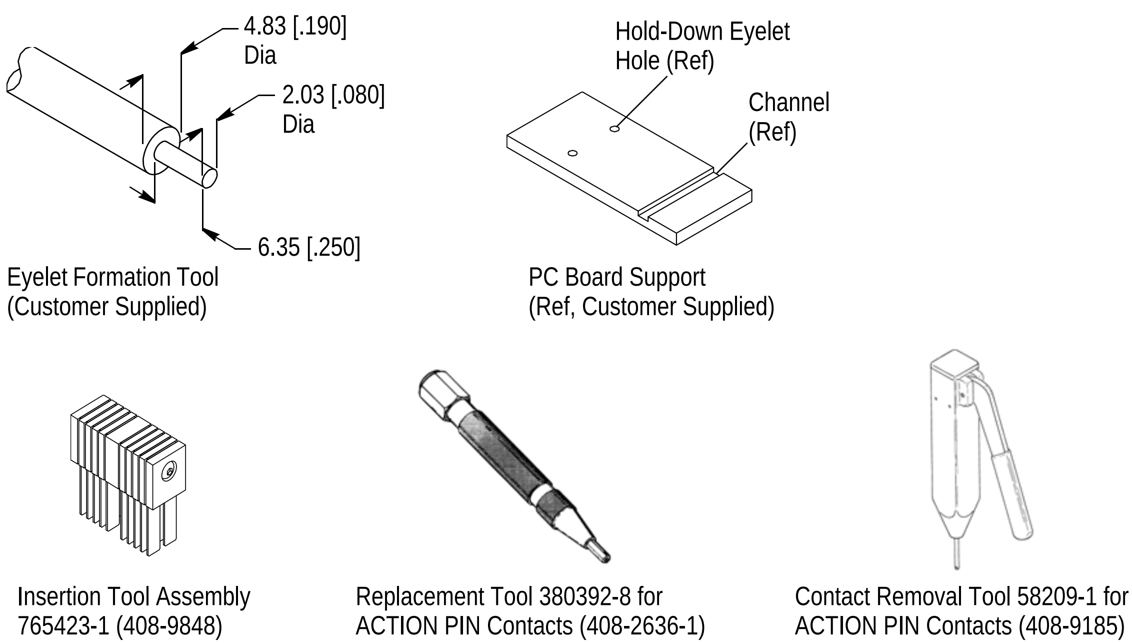


Figure 35

6. VISUAL AID

The illustration below shows a typical application of the AMPOWER wave connector crimp system. This illustration should be used by production personnel to ensure a correctly applied product. Applications which DO NOT appear correct should be inspected using the information in the preceding pages of this specification and in the instructional material shipped with the product or tooling.

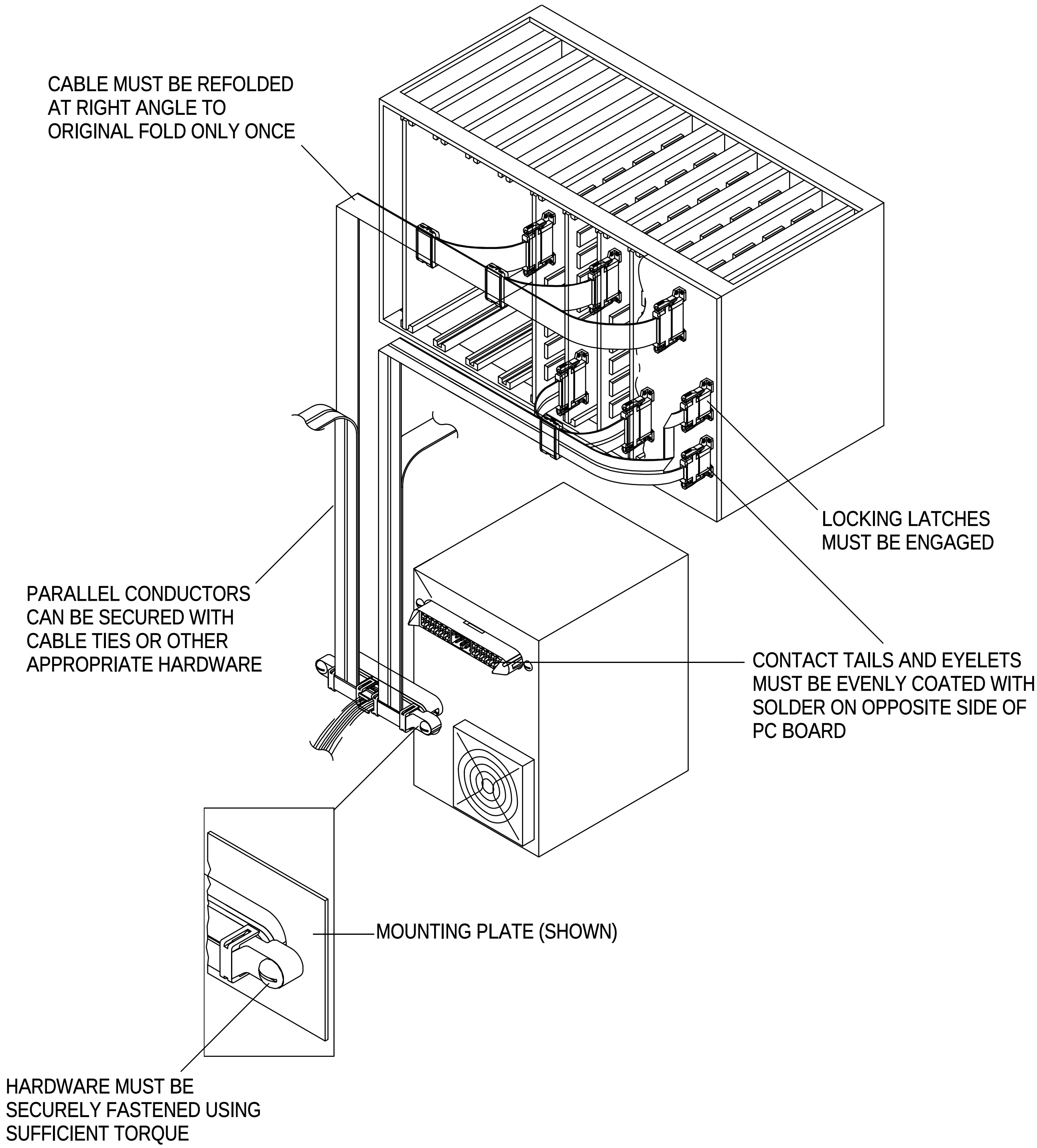


FIGURE 36. VISUAL AID