

High-Performance Modular Plug Connectors



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 [$\pm .005$] and angles have a tolerance of $\pm 2^\circ$. Figures are for identification only.

1. INTRODUCTION

This specification covers the requirements for application of high performance modular plug connectors for voice and data applications. The modular plugs are available in unshielded or shielded with 8 positions on 1.02 [.040] centerline spacing. These modular plugs are also available in line and keyed housing styles. The modular plugs contain terminals that accept solid or stranded cable.

Each modular plug consists of a housing and a load bar. Each modular plug features an internal primary strain relief to protect the modular plug-to-cable interface from damage when subjected to pulling or bending forces. These modular plugs are terminated using the insulation piercing technique. The modular plugs are available in loose piece for terminating with manual or pneumatically-powered tools.



NOTE

High-performance modular plug connectors are intended to be used for Category 5e system applications when terminated in accordance with the requirements given in this document. These requirements comply with standards developed by Telecommunications Industry Association and Electronic Industries Alliance (TIA/EIA).

Basic terms and features of this product are provided in Figure 1.

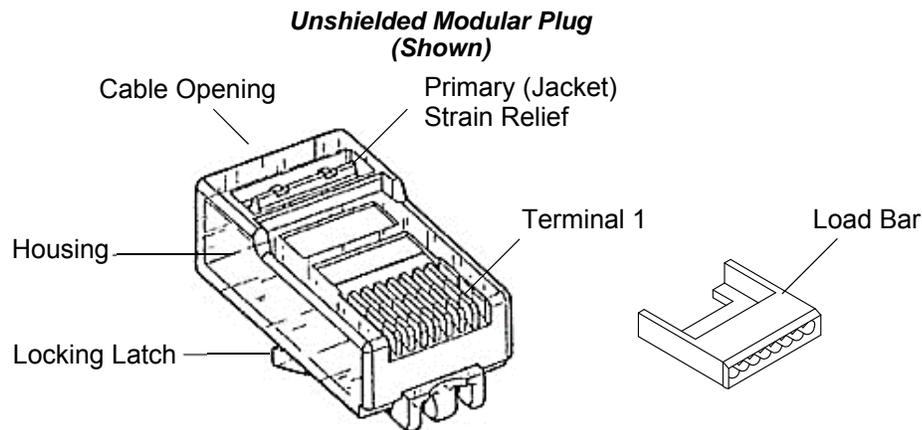


Figure 1

2. REFERENCE MATERIAL

2.1. Revision Summary

Revisions to this application specification include:

- Revised 2.3 to call out new Product Spec.
- Removed UL rating from paragraph 3.1
- Removed 4,6, and 10 position from paragraph 3.3

2.2. Customer Assistance

Reference product catalog series and drawing number:

- MP-5E_ _ Customer drawing number 2843004

This catalog series represents standard conductor modular plug connectors. Use this information to obtain catalog number/ material number and tooling information.

2.3. Specifications

Product Specification 108-131013 provides product performance and test information.

2.4. Instructional Material

Instruction sheets (408-series) provide product assembly instructions or tooling setup and operation procedures and customer manuals (409-series) provide machine setup and operating procedures. Instructional material that pertains to this product is:

408-4389	Crimp Height Gage 904170-1
408-9743	Terminating Modules 856196-[] for Use with Modular Plug Dual Terminators 1320840-[]
408-9767	Modular Plug Hand Tools (Premium Grade) 231652-[]
408-9919	Modular Plug Single Terminators 354711-[] and Tooling Kits 354714-[]
409-10010	Modular Plug Dual Terminators 1320840-[]

3. REQUIREMENTS

3.1. Material

Modular plug housings are made of flame retardant polycarbonate. The terminals are made of phosphor bronze under-plated with nickel; terminal area is plated with gold or palladium nickel and gold. Shields are made of brass plated with tin or nickel or stainless steel plated with nickel. External strain reliefs are made of brass plated with tin and under-plated with copper.

3.2. Storage

A. Ultraviolet Light

Prolonged exposure to ultraviolet light may deteriorate the chemical composition used in the product material.

B. Shelf Life

The product should remain in the shipping containers until ready for use to prevent deformation to components. The product should be used on a first in, first out basis to avoid storage contamination that could adversely affect performance.

3.3. Chemical Exposure

Do not store product near any chemical listed below as they may cause stress corrosion cracking in the material.

Alkalies	Ammonia	Citrates	Phosphates	Citrates	Sulfur Compounds
Amines	Carbonates	Nitrites	Sulfur Nitrites		Tartrates

3.4. Cable Selection and Preparation

A. Selection

The modular plugs accept the wire described in the following.

MODULAR PLUG	WIRE		
	TYPE	SIZE (AWG)	INDIVIDUAL INSULATION OUTSIDE DIAMETER
Standard Conductor	Solid	23-24	0.89-0.99 [.035-.039]
Standard Conductor	Stranded	24-26	0.89-0.99 [.035-.039]

8-position plugs accept cable having an overall round jacket diameter of:

Round: 4.83 [.190] to 5.59 [.220]

B. Preparation

Unshielded Cable

Proper strip length is necessary to properly insert the cable into the modular plugs. The strip length for the cable is given in Figure 2.



NOTE

Reasonable care must be taken not to nick or cut the cable conductor insulation during the stripping operation.

Shielded Cable

This cable must be prepared according to the following. Refer to Figure 2.

- (a) Insert a blade tip between the shield and jacket. Slit the jacket 25.4 [1.0] back from the end. The conductor insulation must not be nicked.
- (b) Pull the jacket away from the shield, and fold it back over the cable. Cut off the slit portion of the jacket. Care shall be taken not to cut the shield. The conductors enclosed by the shield should extend 25.4 [1.0].
- (c) Find the overlap seam in the shield, and pull the shield away from the conductors while being careful not to damage the shield.
- (d) Fold the shield back over the cable.
- (e) Trim the shield to approximately 9.52 [3/8] in length. Form the shield smoothly around the outside of the cable. Make sure that the conductive surface of the shield is exposed; if it is not, form another fold.
- (f) Bend the drain wire back tightly across the center of the cable shield on the side of the cable that will face the locking latch side of the modular plug when the cable is inserted. Trim the drain wire to the same length as the cable shield.

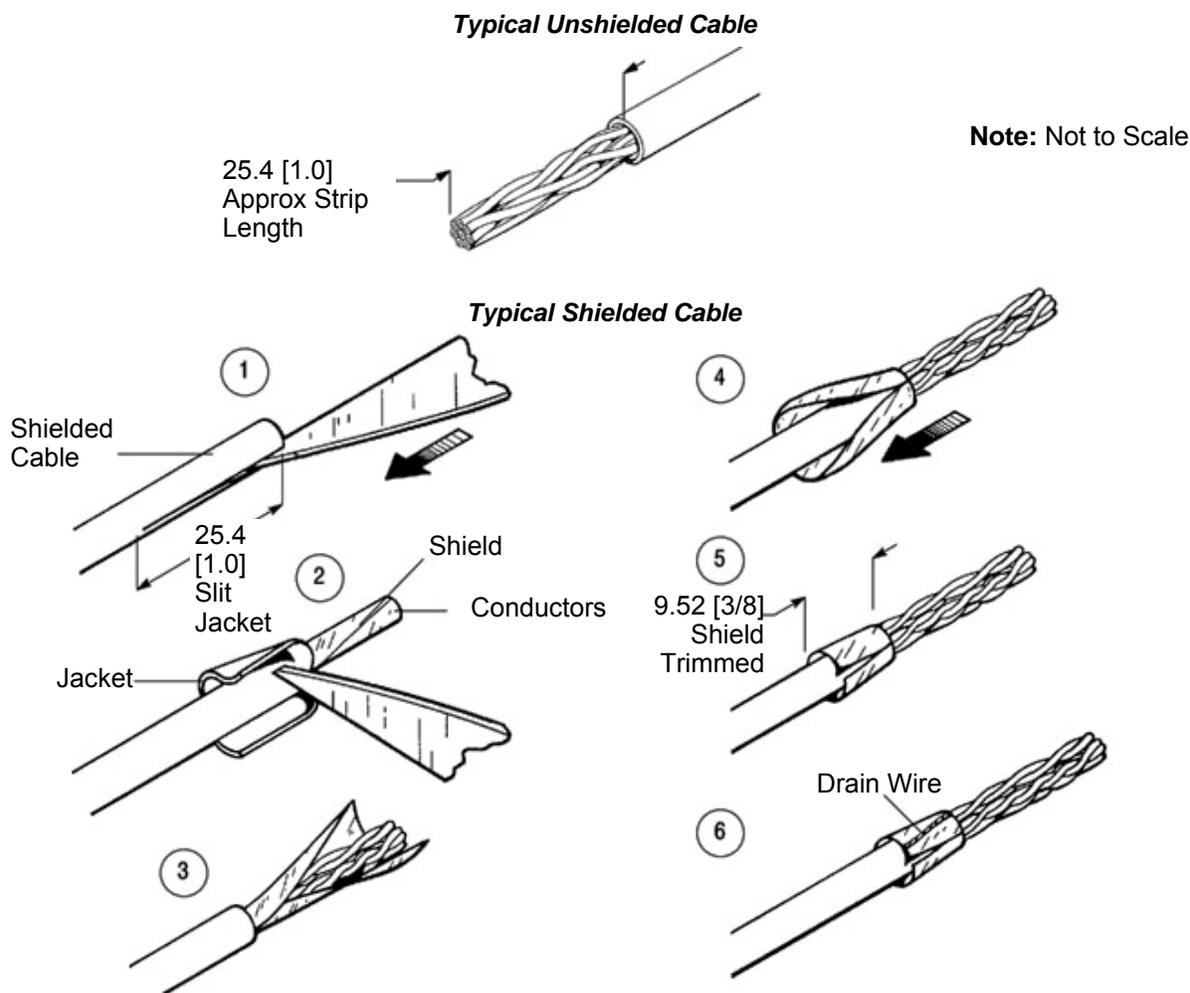


Figure 2

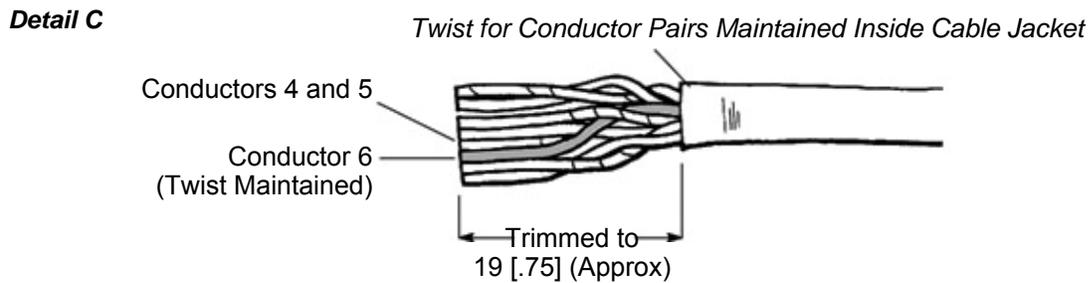
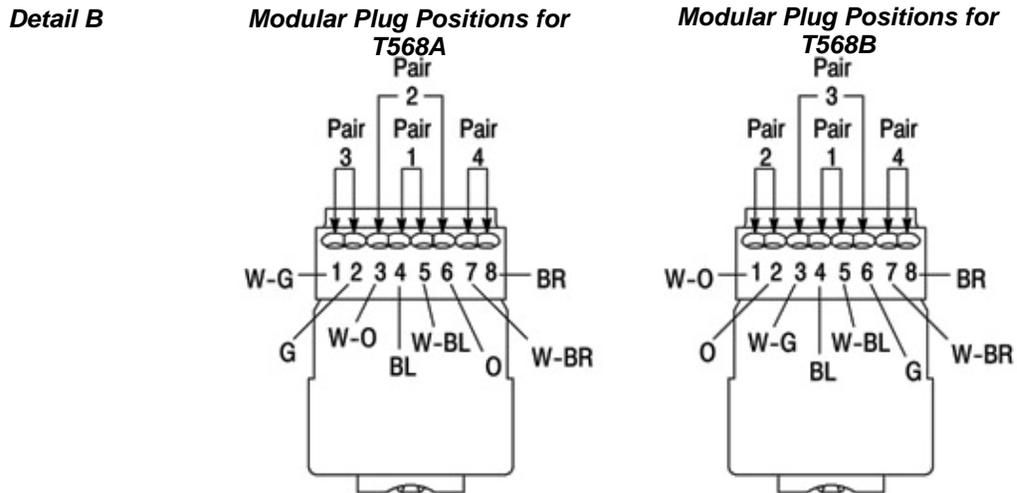
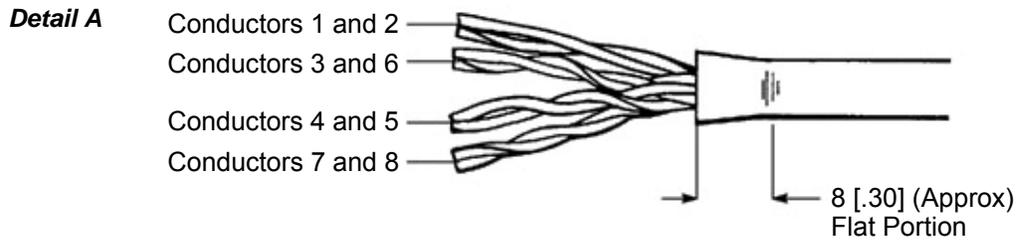
C. Conductor Arrangement

1. The conductors must be grouped in pairs according to the desired electrical schematic (T568A or T568B) given in figure 3, and the conductor pairs must be arranged in the sequence shown in figure 3, Detail A.
2. The end of the cable jacket must be squeezed so that approximately 8 [.30] of the jacket flattens and the conductor pairs are side-by-side. The sequence of the conductor pairs should extend into the flat portion of the cable jacket. Refer to figure 3, Detail A.
3. While holding the end of the cable jacket, the conductor pairs must be untwisted and arranged in the modular plug positions for the chosen electrical schematic (T568A or T568B) as shown in Figure 3, Detail B. It is critical that the conductor pairs do not untwist inside the cable jacket. Conductor 6 must be crossed over conductors 4 and 5. It is extremely important that the twist for conductor 6 be maintained as it crosses over top of conductors 4 and 5. Refer to figure 3, Detail C.
4. Maintaining the proper orientation of the conductors, the conductors must be trimmed evenly-leaving approximately 19 [.75] from the end of the jacket to the tips of the conductors. See figure 3, Detail C.



NOTE

It is recommended to maintain twist on any conductor pair outside the cable jacket if it can be achieved with conductor pairs remaining in the chosen electrical schematic.



CONDUCTOR PAIR NUMBER	CONDUCTOR COLOR CODE (Abbreviation)		CONDUCTOR NUMBER FOR ELECTRICAL SCHEMATIC (See Note)	
	OPTION 1	OPTION 2	T568A	T568B
1	White-Blue (W-BL)	Green (G)	5	5
	Blue (BL)■	Red (R)	4	4
2	White-Orange (W-O)	Black (BK)	3	1
	Orange (O)	Yellow (Y)	6	2
3	White-Green (W-G)	Blue (BL)	1	3
	Green (G)■	Orange (O)	2	6
4	White-Brown (W-BR)	Brown (BR)	7	7
	Brown (BR)■	Slate (S)	8	8

■ A white marking is acceptable.

Note: Because of their identical pair groupings, cables arranged according to either T568A or T568B may be used interchangeably provided both ends are arranged with the same pin/pair scheme.

Figure 3

3.5. Termination Requirements

A. Conductor Location

1. The conductors must be fully inserted into the load bar in the proper orientation. The floor of the load bar between the cable notch and conductor constraining area may be used to bring the 8-conductor tips into the same plane (this can be an aid for inserting the conductors into the load bar). The edge of the cable jacket should rest against the notch of the load bar. The conductors must be trimmed evenly and square to the front edge of the load bar so that approximately 5 [.20] of each conductor protrudes from the front of the load bar. Refer to *Figure 4, Detail A*.
2. The load bar must be slid toward the tips of the conductors so that approximately 1 [.04] of each conductor is exposed. The conductors must not extend too far into the load bar; otherwise, the load bar will twist and become deformed. Refer to *Figure 4, Detail B*.

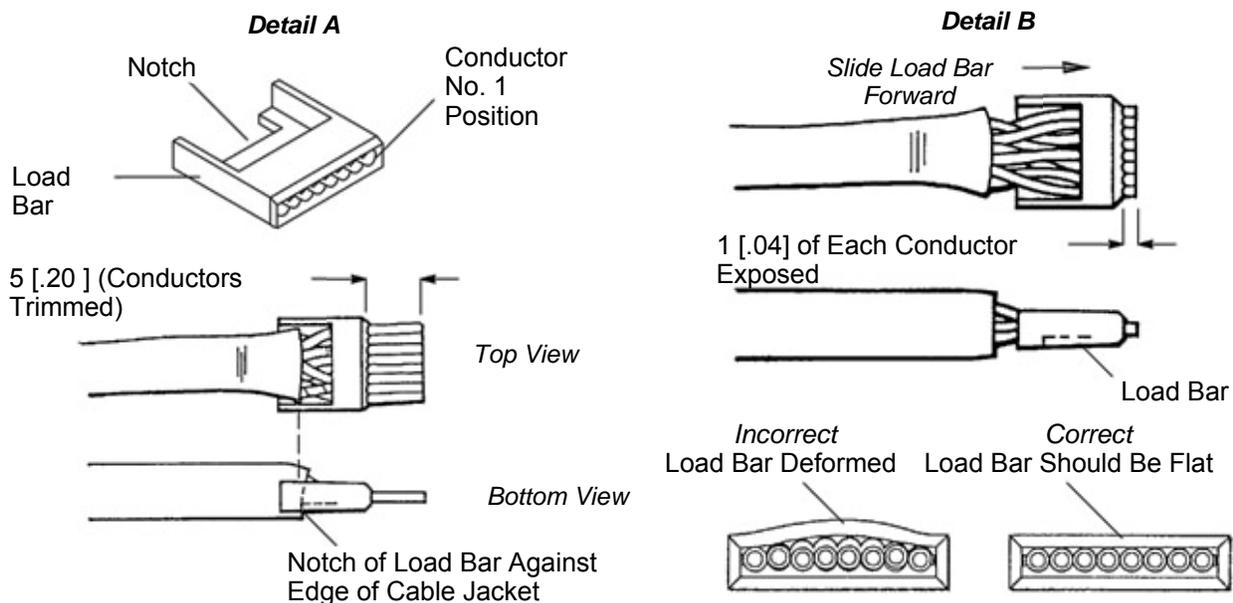


Figure 4

3. The load bar must be fully inserted into the mating feature within the housing of the modular plug. See Figure 5, Detail A. The conductors must be completely inserted and bottomed in the wire circuits and clearly visible through the front of the housing. See *Figure 5, Detail B*.



NOTE

If the conductors are not bottomed in the wire circuits, the load bar must be removed, conductors re-trimmed, and the conductors re-inserted. If the conductors are too short, the conductors must be re-stripped.

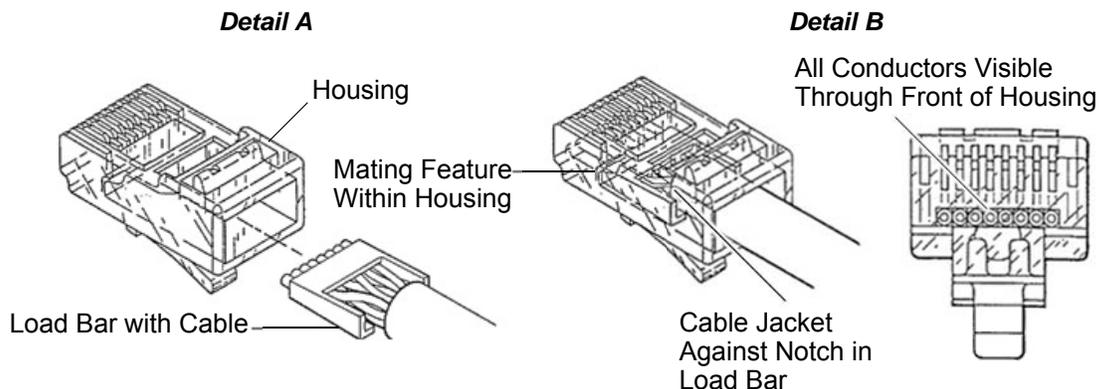


Figure 5

4. After termination, it is preferred that all conductors are bottomed against the end of the wire entry circuits. If individual conductors are not completely inserted in the housing, they must be inserted at least past the terminal and into the reference zone to ensure a proper electrical interface. Refer to *Figure 6*.

B. Crimp Height

The crimp height shall be measured from the top of the terminals to the bottom of the housing (not including locking tab) and must be within the dimension provided in *Figure 6*.



NOTE

All terminals must be at approximately the same height. A crimp height gage is available for measuring modular plug crimp height (refer to Section 5 for part number and description).

C. Internal Strain Reliefs

The primary strain relief must be fully engaged on the cable jacket. The primary strain relief must be fully engaged to isolate the termination area from external forces applied to the cable. It is acceptable for the primary strain relief to cut into the jacket as long as the conductor insulation is not compromised. See *Figure 6*.



NOTE

For unshielded modular plug, the primary strain relief can be visually inspected through the side of the housing.

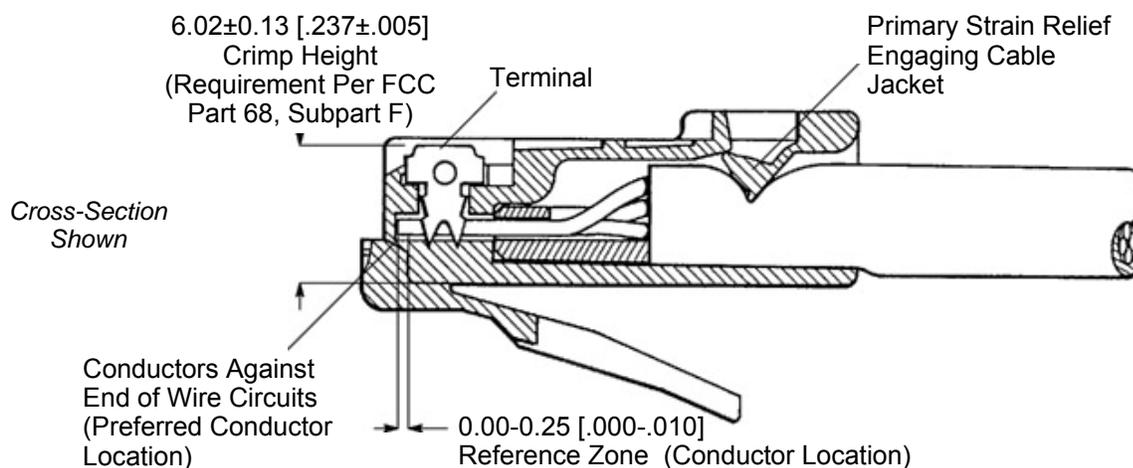


Figure 6

3.6. Ancillary Items

A. External Strain Relief



NOTE

The external strain relief can only be used with select 8- and 10-position (shielded and unshielded) modular plugs.

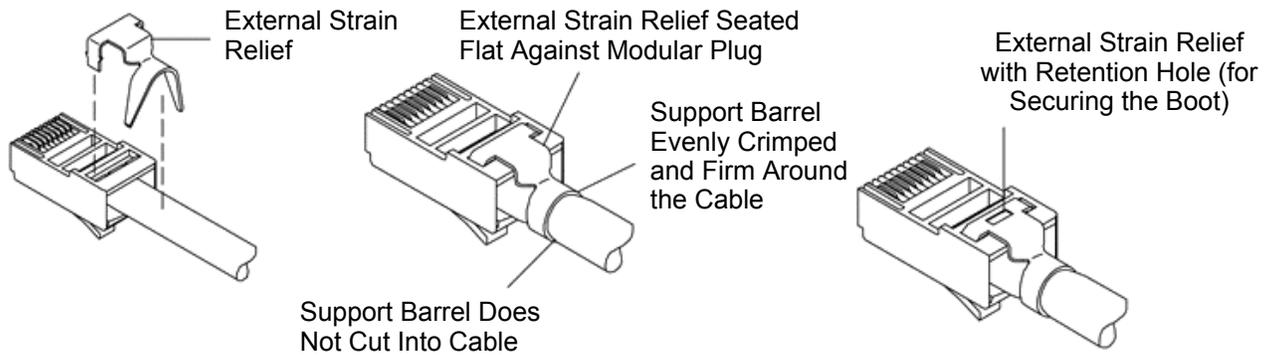
The external strain relief provides a secure grip (360° wrap) on the cable jacket for extraordinary strain relief on the cable and a redundant low impedance ground path to equipment. For shielded modular plugs, the external strain relief also provides a secure grip on the foil shield and a chassis ground through the modular plug shield. If a boot is used, an external strain relief containing a retention hole for securing the boot is available (the boot must be installed after the external strain relief with retention hole).



NOTE

Using the boot and the external strain relief with retention hole will provide optimum strain relief performance.

Assembly of the external strain relief onto the modular plug must meet the requirements given in *Figure 7*.

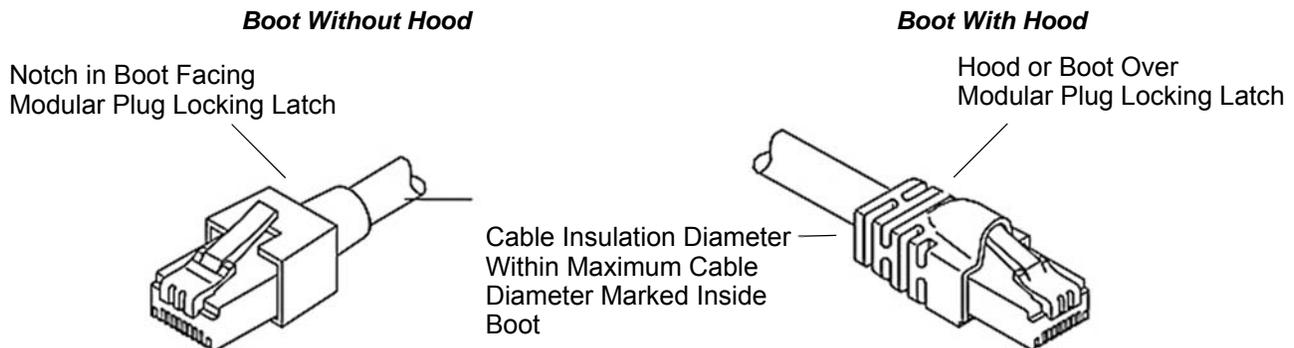


B. Boot

Figure 7

A boot is used to prevent the cable from kinking and bending too sharp at the modular plug cable opening. The boot is available with or without a hood. The hooded boot also prevents the modular plug locking latch from snagging other locking latches or cables.

The boots are available to fit cable insulation diameters of 5.33 [.210] through 6.35 [.250] for modular plugs. The maximum cable diameter is marked on the inside of each boot. Some boots are colored to provide a color-coded cable configuration to ensure appropriate connections. Others are transparent to allow cable color to show through. The boot must be installed, small diameter end first, onto the cable before the stripping procedure. Boots are made of elastomer polyolefin or flame redarded PolyCarbonate. Refer to Figure 8.



Slim Line Boot with Color Clip Option

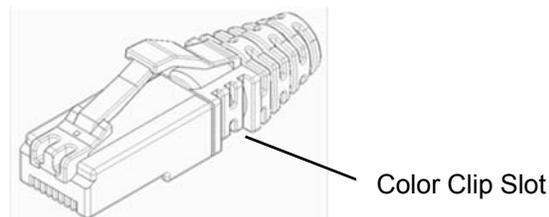


Figure 8

3.7. Mating

The modular plug must be inserted into the mating jack until it bottoms. When fully inserted, the modular plug locking tab will engage the jack housing and prevent the connectors from separating. The connectors will not unmate unless the modular plug locking latch is fully depressed. After mating, there will be a small amount of axial movement (travel) between the mated modular plug and jack, and with some combinations, depending on tolerance variations between original equipment manufacturers (OEM), could be up to 0.76 [0.030].

3.8. Repair

These modular plugs cannot be repaired; damaged modular plugs must be removed and discarded. The cable must be cut from the modular plug and re-terminated onto a new modular plug.

4. QUALIFICATION

Standard and small conductor high-performance modular plug connectors are Component Recognized by Underwriters Laboratories Inc. (UL) in File E81956 (DUXR2/DUXR8)

5. TOOLING

Tooling part numbers and instructional material packaged with the tooling are shown in figure 9.

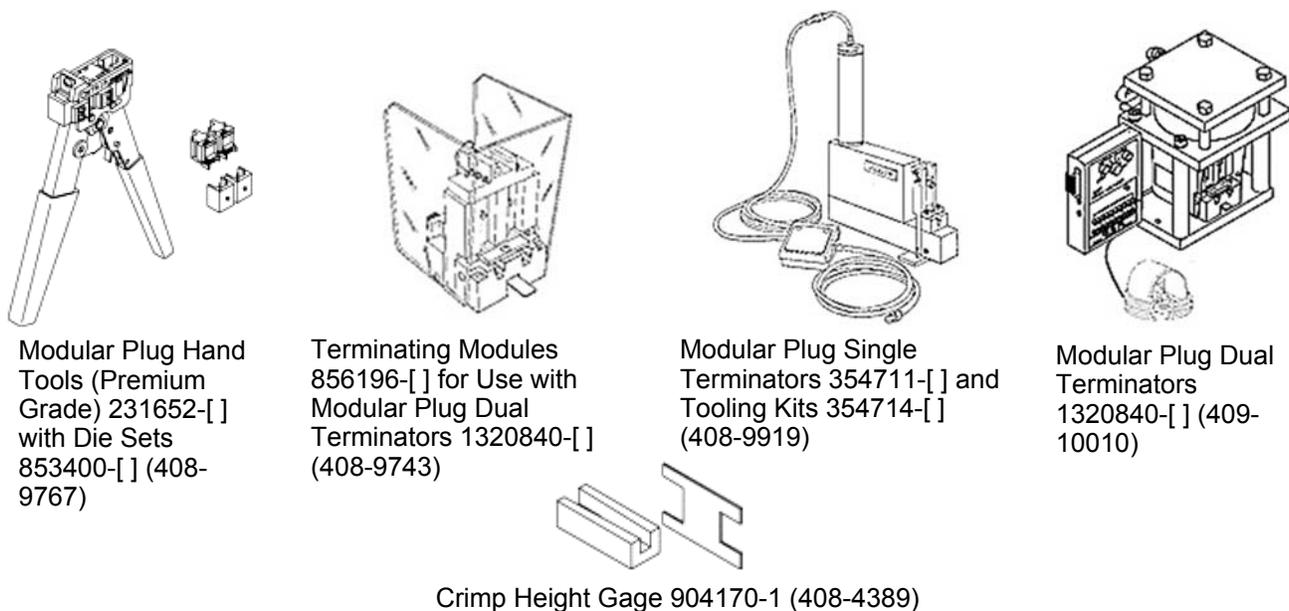


Figure 9

5.1. Hand Tools

The premium grade modular plug hand tool terminates these modular plugs to all types of cable indicated in this document. The tool also cuts and strips unshielded flat oval cable. This tool is designed for field application, installation, and repair.

5.2. Terminators

The terminators are pneumatically powered, bench-mounted tools controlled by a foot valve to terminate modular plugs to create a cable assembly. Terminating modules fit interchangeably into the dual terminators. During termination, the dual terminators test the assembly for electrical circuit continuity. The single terminators require a specific tooling kit to terminate one modular plug style and does not provide testing. These tools provide for high-volume applications.

5.3. Crimp Height Gage

The crimp height gage is used to measure the crimp height of the terminated modular plug. The gage consists of a connector nest and a GO/NO-GO spanner.

6. VISUAL AID

The illustration below shows a typical application of standard and small conductor high performance modular plug connectors. 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.

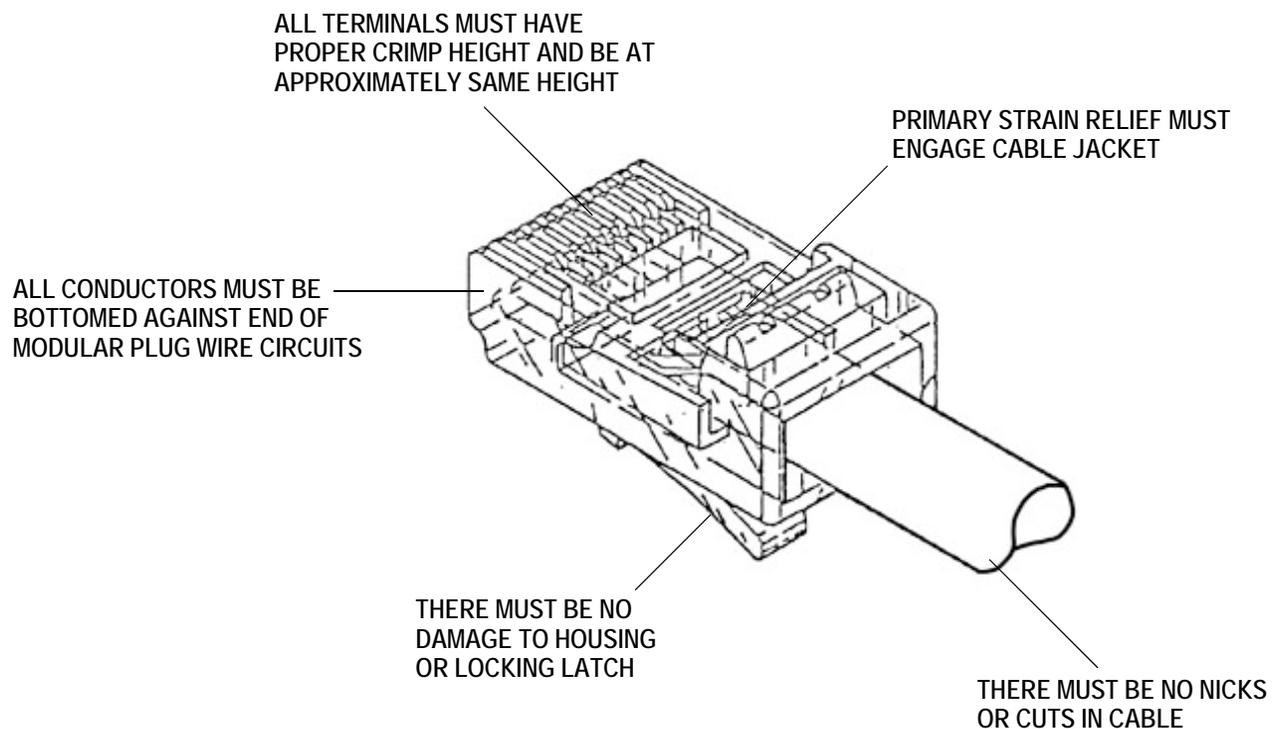


Figure 10