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 the requirements for the application of HD-20 Precision Formed Contacts. These contacts are available in three snap-in types: crimp, posted, and solder cup. The crimp snap-in contacts are available with or without an insulation support barrel for strain relief. The contacts accept a wire size range of 28 through 18 AWG and may be terminated to either stranded or solid wire.

After termination, these contacts are inserted into the cavities in the BACK of the connector housing and snap into place. Assembled connectors containing these contacts are available and designed to meet requirements of Military Specification MIL-C-24308.

When corresponding with TE Connectivity 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.

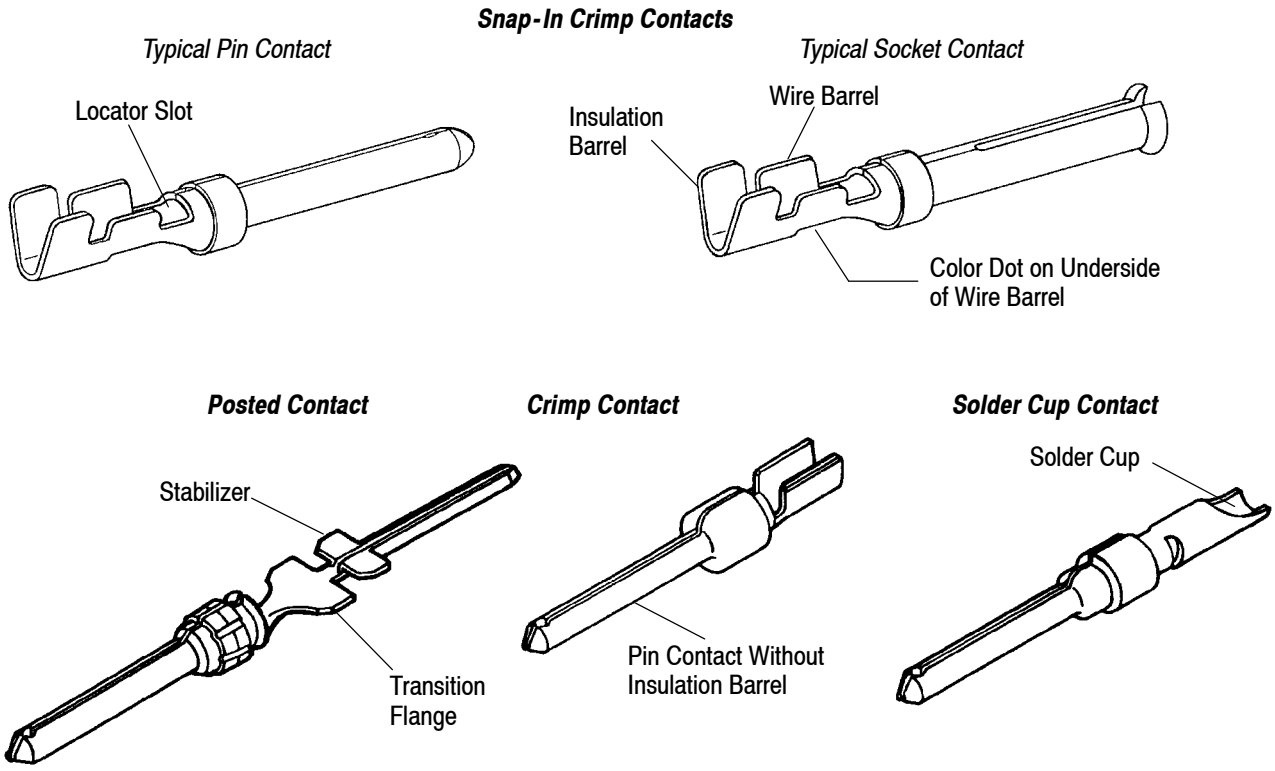


Figure 1

2. REFERENCE MATERIAL

2.1. Revision Summary

Revisions to this application specification include:

- Updated document to corporate requirements
- Corrected tensile strength for 18 AWG in table in Figure 3

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*Trademark. Other product names, logos, or company names might be trademarks of their respective owners.

2.2. Customer Assistance

Reference Product Base Part Number 66504 and Product Code 5899 are representative numbers of HD-20 Precision Formed Contacts. Use of these numbers will identify the product line and expedite your inquiries through a service network established to help you obtain product and tooling information. Such information can be obtained through a TE Representative or, after purchase, by calling Product Information at the number at the bottom of page 1.

2.3. Drawings

Customer Drawings for each product part number 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 technical documentation supplied by TE.

2.4. Manuals

Manual 402-40 is available from the service network. This manual provides information on various flux types and characteristics along with the commercial designation and flux removal procedures. A checklist is included in the manual as a guide for information on soldering problems.

2.5. Instructional Material

The following list includes available instruction sheets (408-series) that provide assembly procedures for product, operation, maintenance and repair of tooling, as well as setup and operation procedures of applicators; and customer manuals (409-series) that provides setup, operation, and maintenance of machines.

Document Number	Document Title
408-3295	Preparing Reel of Contacts for Application Tooling
408-7424	Checking Terminal Crimp Height Gaging Die Closure
408-7799	AMPLIMITE* Solder Pot Contacts (66569-3 and 66570-3)
408-8040	HD Quick-Change Applicators (Side-Feed Type) with Mechanical Feed System
408-8547	CERTI-CRIMP* II Straight Action Hand Tools
408-9404	Insertion/Extraction Tool 91285-1 and Replacement Tip Kits 543382-[ ]
408-9816	Handling of Reeled Products
409-5128	Basic AMP-O-LECTRIC* Model “K” Terminating Machine 565435-5
409-5842	AMP-O-LECTRIC Model “G” Terminating Machine 354500-[ ]
409-5852	AMPOMATOR* CLS Model III-G Lead-Making Machine 122500-[ ]
409-10012	AMP-O-MATIC* Side-Feed Stripper-Crimper III Machine No. 1320895-[ ]

3. REQUIREMENTS

3.1. Storage

A. Reeled Contacts

When using reeled contacts, store coil wound reels horizontally and traverse wound reels vertically.

B. Shelf Life

The contacts should remain in the shipping containers until ready for use to prevent deformation to the contacts and/or damage to the housings. The products should be used on a first in, first out basis to avoid storage contamination that could adversely affect signal transmissions.

C. Chemical Exposure

Do not store contacts near any chemicals listed below, as they may cause stress corrosion cracking in the components.

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

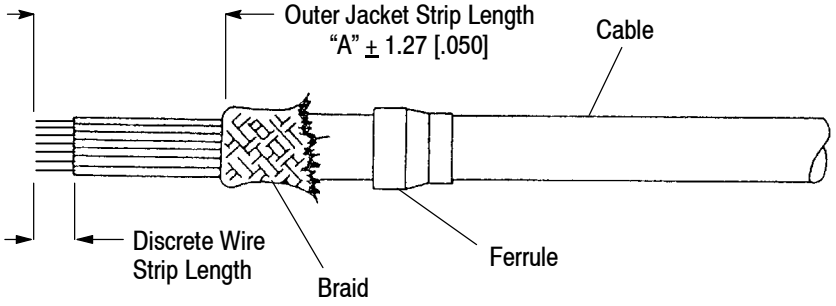
3.2. Wire Size and Preparation

The contacts will accept a wire size range of 28 to 18 AWG and may be terminated to either stranded or solid wire.

Figure 2 lists insulation stripping lengths as determined by the contact wire size range used. Also listed are acceptable wire insulation outside diameters for the contacts, and color codes used to easily identify loose-piece contacts.

CAUTION

DO NOT nick, scrape, or cut the wire conductor during the stripping operation.



OUTER JACKET STRIP LENGTH	
CONTACT POSITIONS	**"A" LENGTH**
9	33.02 [1.300]
15	
25	
37	43.18 [1.700]
50	40.64 [1.600]

DISCRETE WIRE					
CONTACT WIRE SIZE RANGE (AWG)	**COLOR CODE (ON WIRE BARREL OF LOOSE PIECE CONTACTS ONLY)**	**INSULATION DIAMETER ACCEPTED**	**STRIP LENGTH ± 0.25 [.010]**		
			MILLIMETERS	**DECIMAL INCHES**	**FRACTIONAL INCHES**
OPEN BARREL CONTACTS (With or Without Insulation Support)					
32-28	---	0.76-1.02 [.030-.040]	2.39	.094	3/32
28-24	BLUE	1.73 [.068] Max	2.77	.109	7/64
	BLACK	1.27-1.52 [.050-.060]	2.39	.094	3/32
	BLUE	0.76-1.02 [.030-.040]			
26-22	YELLOW	1.27 [.050] Max			
24-20	RED	1.73 [.068] Max	2.77	.109	7/64
		1.27-1.52 [.050-.060]	2.39	.094	3/32
22-18	GREEN	1.73 [.068] Max	2.77	.109	7/64
SOLDER-CUP CONTACTS					
18 and Smaller	None	None Specified	3.96	.156	9/64

Figure 2

3.3. Crimped Contact Requirements

Contact shall be located in desired tooling and crimped according to the instructions packaged with that tooling. See Section 5, TOOLING of this document for details on tooling options and instructional materials.

CAUTION

Wire insulation shall NOT be cut or broken during the crimping operation, nor shall the insulation be crimped into the contact wire barrel. Reasonable care should be taken by tooling operators to provide undamaged wire terminations.

A. Contact Crimp Barrel Configurations

The contact wire barrel shall be crimped to an F-crimp configuration as shown in Section X-X of Figure 3. The insulation barrel (when present) shall be crimped to an O-crimp configuration. Refer to the table in Figure 3 for crimp dimensions.

B. Contact Crimp Features

Figure 3 shows a typical contact as it should appear after crimping. Although a pin contact with insulation barrel is shown, the requirements apply equally to socket contacts and to contacts not having an insulation barrel.

1. *Crimp Location*

For optimum crimp effectiveness, the crimp must be within the area shown and must meet the crimp requirements provided in Figure 3. Effective crimp length shall be no less than the dimension given in Figure 3 and is defined as that portion of the wire barrel, excluding bellmouth(s), fully formed by the crimping tool. Instructions for adjusting, repairing, and inspecting tools are packaged with the tools.

2. *Conductor Extension*

The conductor may extend beyond the wire barrel to the maximum shown.

3. *Wire Barrel Seam*

The wire barrel seam must be closed with no evidence of loose wire strands visible in the seam.

4. *Conductor/Insulation*

The conductor and insulation must both be visible in the area between the insulation barrel and the wire barrel.

5. *Bellmouth*

Front and rear bellmouths shall be formed and adhere to the dimensions given.

6. *Cutoff Tab*

The cutoff tab shall be cut to the dimensions shown.

7. *Burrs*

The cutoff burr shall not exceed the dimensions shown.

8. *Flash*

The wire barrel flash shall not exceed the dimensions shown in Section X–X.

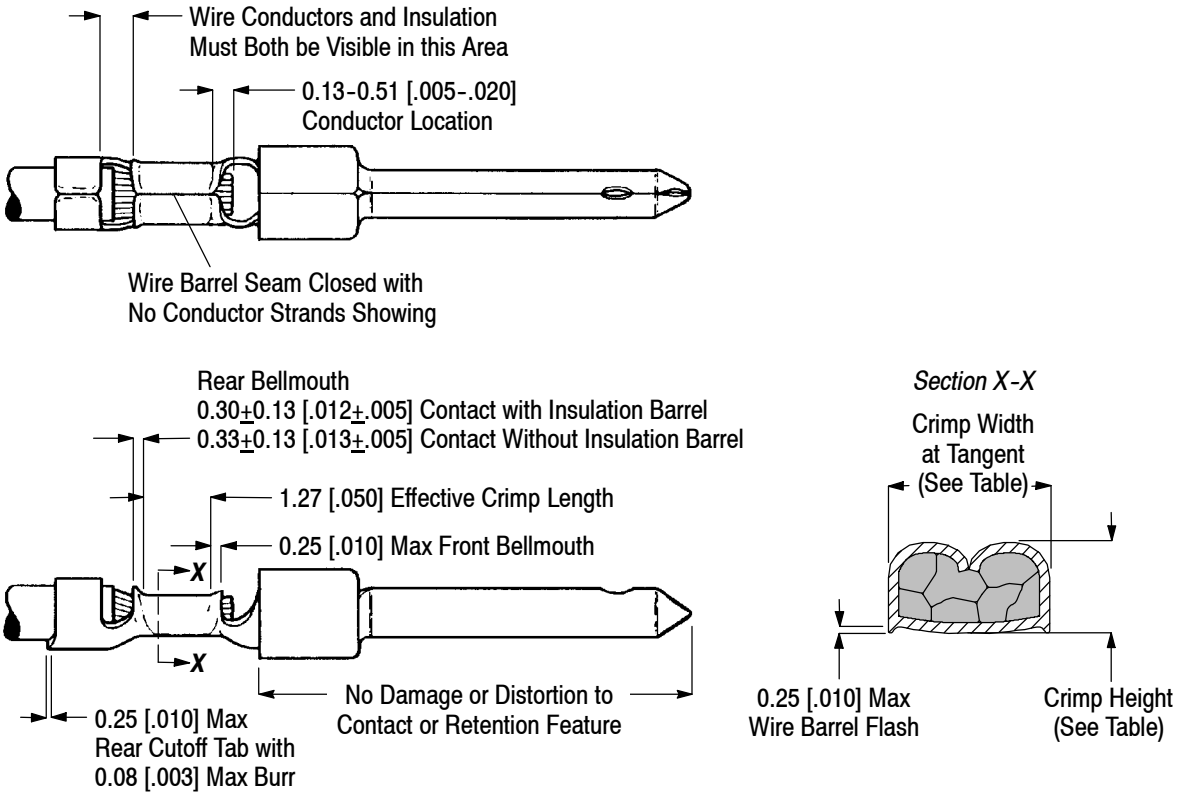


Figure 3 (cont'd)

HAND TOOL **WIRE CRIMP DIMENSIONS**

WIRE SIZE RANGE (AWG)	WIRE INSUL DIA ACCEPTED	SIZE OF WIRE APPLIED	WIRE BARREL CRIMP		INSULATION BARREL CRIMP	
			HEIGHT RANGE	WIDTH	WIDTH (Ref)	HEIGHT (Ref)
32-28	0.76-1.02 [.030-.040]	32	0.58-0.46 [.023-.018]	0.84 [.033]	1.35-1.57 [.053-.062]	0.64-1.93 [.025-.076]
		30	0.61-0.46 [.024-.018]			
		28	0.63-0.51 [.025-.020]			
28-24	1.73 [.068] Max	28	0.47-0.57 [.0185-.0225]	1.40 [.055]	---	---
		26				
		24				
	1.27-1.52 [.050-.060]	28	0.67-0.77 [.0265-.0305]	1.07 [.042]	1.40 [.055]	1.27 [.050]
		26				
		24				
	0.76-1.02 [.030-.040]	28			1.40 [.055]	0.76 [.030]
		26				
		24				
26-22	1.02-1.27 [.040-.050]	26	0.71-0.81 [.028-.032]	1.07 [.042]	1.40 [.055]	0.76 [.030]
		24				
		22	0.81-0.91 [.032-.036]			
24-20	1.73 [.068] Max	24	0.70-0.80 [.0275-.0315]	1.40 [.055]	---	---
		22				
		20				
	1.27-1.52 [.050-.060]	24			1.40 [.055]	1.27 [.050]
		22				
		20				
22-18	1.73 [.068] Max	22	0.84-0.94 [.033-.037]	1.57 [.062]	---	---
		20				
		18	1.07-1.17 [.042-.046]			

Figure 3 (cont'd)

AUTOMATIC MACHINE **WIRE CRIMP DIMENSIONS**

WIRE SIZE RANGE (AWG)	WIRE INSUL DIA ACCEPTED	SIZE OF WIRE APPLIED	WIRE BARREL CRIMP			INSULATION BARREL CRIMP	
			HEIGHT RANGE	TENSILE STRENGTH N [LB] Min	WIDTH	WIDTH (Ref)	HEIGHT (Ref)
32-28	0.76-1.02 [.030-.040]	32	0.58-0.46 [.023-.018]	8.01 [1.8]	0.84 [.033]	1.35-1.57 [.053-.062]	0.64-1.93 [.025-.076]
		30	0.61-0.46 [.024-.018]	10.01 [2.2]			
		28	0.63-0.51 [.025-.020]	11.12 [2.8]			
28-24	1.73 [.068] Max	28	0.66-0.76 [.026-.030]	12.01 [2.7]	1.07 [.042]	---	---
		26	0.71-0.81 [.028-.032]	20.02 [4.5]			
		24	0.76-0.86 [.030-.034]	35.91 [8.0]			
	1.27-1.52 [.050-.060]	28	0.64-0.69 [.025-.027]	12.01 [2.7]		1.35-1.57 [.053-.062]	1.14-1.93 [.045-.076]
		26	0.71-0.76 [.028-.030]	20.02 [4.5]			
		24	0.79-0.84 [.031-.033]	35.91 [8.0]			
	0.76-1.02 [.030-.040]	28	0.64-0.69 [.025-.027]	12.01 [2.7]		1.35-1.57 [.053-.062]	0.64-1.93 [.025-.076]
		26	0.74-0.79 [.029-.031]	20.02 [4.5]			
		24	0.79-0.84 [.031-.033]	35.91 [8.0]			
26-22	1.02-1.27 [.040-.050]	26	0.71-0.81 [.028-.032]	20.02 [4.5]	1.07 [.042]	1.35-1.57 [.053-.062]	0.64-1.93 [.025-.076]
		24	0.76-0.86 [.030-.034]	35.91 [8.0]			
		22	0.86-0.97 [.034-.038]	53.38 [12.0]			
24-20	1.73 [.068] Max	24	0.76-0.86 [.030-.034]	35.91 [8.0]	1.40 [.055]	---	---
		22	0.76-0.86 [.030-.034]	53.38 [12.0]			
		20	0.76-0.86 [.030-.034]	88.96 [20.0]			
	1.27-1.52 [.050-.060]	24	0.76-0.86 [.030-.034]	35.91 [8.0]		1.35-1.57 [.053-.062]	1.14-1.93 [.045-.076]
		22	0.76-0.86 [.030-.034]	53.38 [12.0]			
		20	0.76-0.86 [.030-.034]	88.96 [20.0]			
22-18	1.73 [.068] Max	22	0.84-0.94 [.033-.037]	53.38 [12.0]	1.57 [.062]	---	---
		20	0.89-0.99 [.035-.039]	88.96 [20.0]			
		18	1.07-1.17 [.042-.046]	120.10 [27.0]			

Figure 3 (end)

3.4. Crimped Contact Straightness

A. Twist or Roll

The crimped wire and insulation barrels must be aligned with the un-crimped portion of the contact to within the limit shown in Figure 4.

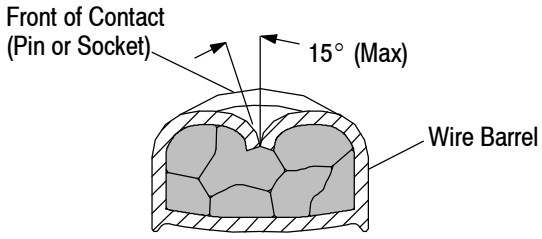
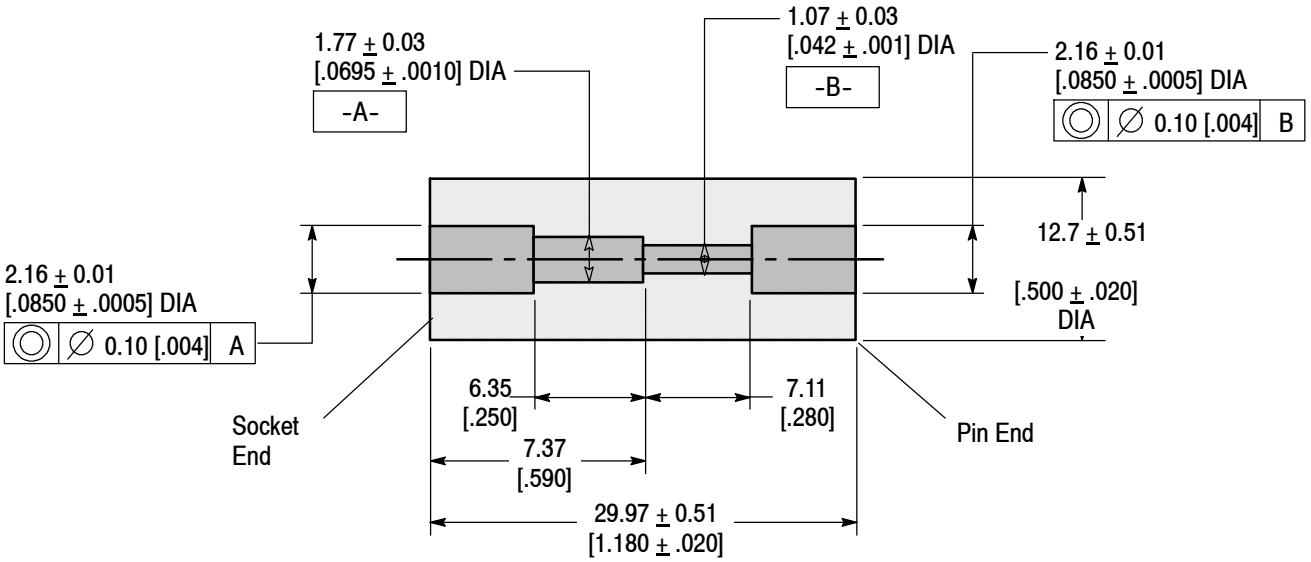


Figure 4

B. Straightness

Test questionable contacts using a straightness gage manufactured to the specifications of Figure 5. To be considered acceptable for use, a contact must fully enter the gage without binding.



NOTES: Material . . . . . Tool Steel, AISI Type 01 or 02
Hardness . . . . . Rockwell B99 Maximum
Finish . . . . . Black Oxide

Figure 5

3.5. Solder Cup Contacts

Observe the guidelines and procedures described in Instruction Sheet 408-7799 when solder cup contacts are required. Solder, clean, and dry all wire leads to contacts according to the following:

A. Flux Selection

Wire lead and contact wire barrel interior shall be fluxed prior to soldering using a mildly active rosin. Flux must be compatible with manufacturing, safety, and health guidelines.

B. Cleaning

After cleaning, removal of fluxes, residues, and activators is mandatory. Cleaning procedures and solvents depend on the type of flux used. See Figure 6.

DANGER

Consideration must be given to toxicity and other safety and health requirements as recommended in the Material Safety Data Sheet supplied by the solder cleaning solvent manufacturer.

CLEANER		TIME (Minutes)	TEMPERATURES (Maximum)	
NAME	TYPE		CELSIUS	FAHRENHEIT
Alpha 2110	Aqueous	1	132	270
Bioact EC-7	Solvent	5	100	212
Butyl Carbitol	Solvent	1	Room Ambient	
Isopropyl Alcohol	Solvent	5	100	212
Kester 5778	Aqueous	5	100	212
Kester 5779	Aqueous	5	100	212
Loncoterge 520	Aqueous	5	100	212
Loncoterge 530	Aqueous	5	100	212
Terpene Solvent	Solvent	5	100	212

Figure 6

C. Drying

When drying cleaned assemblies, DO NOT exceed recommended temperature limitations. Excessive temperatures may cause degradation of the connector used as a stabilizer during the soldering process.

D. Soldering Guideline

Manual 402–40 is available upon request and can be used as a guide in soldering. This manual gives various flux types and characteristics, commercial designation, and flux removal procedures. A checklist is included in the manual to aid in obtaining information pertaining to soldering problems.

3.6. Posted Contacts

Pin and socket contacts having 0.64 mm [.025 in.] square technology posted aft ends are available to fit HD–20 connectors. Posts 3.18 mm [.125 in.], 4.78 mm [.188 in.], 10.80 mm [.425 in.], and 16.54 mm [.651 in.] in length are offered, allowing a variety of mating or grounding options. When inserting posted contacts into housings, be careful to hold the contact by the transition flange. See Figure 1.

3.7. Repair/Replace

Use Insertion/Extraction Tool 91285–1 (Instruction Sheet 408–9404) to remove individual contacts from housings for replacement or for relocation to another housing cavity. Damaged or worn contacts may be replaced provided there is sufficient slack, after restripping the wire, to insert the new contact.

CAUTION

DO NOT re-use damaged or worn contacts. Instead, replace them with new contacts and discard the old ones.

4. QUALIFICATION

No qualifications or approvals are required for HD–20 Precision Formed Contacts.

5. TOOLING

HD–20 Precision Formed Contacts can be terminated to wire using hand, semi–automatic, or automatic crimping tools. Recommended tooling, and instructional material, is provided in Figure 7.

All hand tools and applicators include integral dies. The automatic machines that hold applicators are also listed in the table along with related documentation.

NOTE

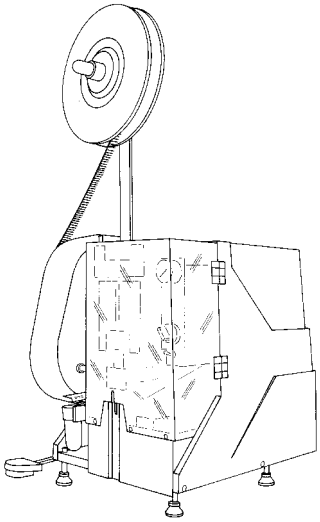
The Model "K" AMP-O-LECTRIC Terminating Machine 565435-5 has been superseded by the Model "G" Terminating Machine 354500-1 for new applications. For existing applications, the Model "K" is still recommended because of the large number of installed machines.

Alpha, Bioact, Butyl Carbitol, Kester, and Loncoterge are trademarks of their respective owners.

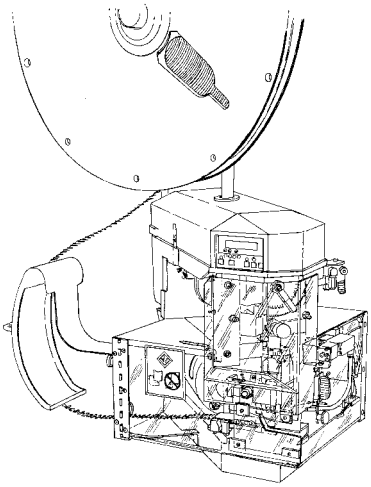
WIRE SIZE RANGE (AWG)	WIRE INSULATION DIAMETER ACCEPTED	HAND TOOL (408-8547)	APPLICATOR▪▪ (408-8040)	AUTOMATIC MACHINE	MACHINE DOCUMENT
32-28	0.76-1.02 [.030-.040]	---	680659-2	354500-1	409-5842
				565435-5	409-5128
28-24	1.73 [.068] Max	91548-1	466506-2	565435-5	409-5128
			466903-1	1320895-1	409-10012
	1.27-1.52 [.050-.060]	91549-1	466758-2	354500-1	409-5842
				565435-5	409-5128
			466963-1	1320895-1	409-10012
	0.76-1.02 [.030-.040]	91503-1 or 91549-1	466423-1	122500-2, -3	409-5852
				356500-1, -2	409-5878
			466423-2	354500-1	409-5842
				565435-5	409-5128
			466901-1	1320895-1	409-10012
26-24	1.02-1.27 [.040-.050]	91525-1	567036-1	122500-2, -3	409-5852
				356500-1, -2	409-5878
				662700-[ ]	409-5884
				1213400-1, -2	409-5878
22			567036-2	354500-1	409-5842
				565435-5	409-5128
24-20	1.73 [.068] Max	91548-1	466505-1	122500-2, -3	409-5852
				356500-1, -2	409-5878
			466505-2	354500-1	409-5842
				565435-5	409-5128
			466902-1	1320895-1	409-10012
	1.27-1.52 [.050-.060]	91503-1	466422-1	122500-2, -3	409-5852
				356500-1, -2	409-5878
			466422-2	354500-1	409-5842
				565435-5	409-5128
			466900-1	1320895-1	409-10012
22-20	1.73 [.068] Max	91513-1	567033-1 or 567033-2	122500-2, -3	409-5852
				356500-1, -2	409-5878
				662700-[ ]	409-5884
				1213400-1, -2	409-5878
18				354500-1	409-5842
				565435-5	409-5128

▪▪ In order to use the same applicator in the AMPOMATOR CLS IV Lead-Making Machine and the AMP-O-LECTRIC Terminating Machine, the feed cam and wire stripper must be changed. See the Customer Manuals supplied with these machines.

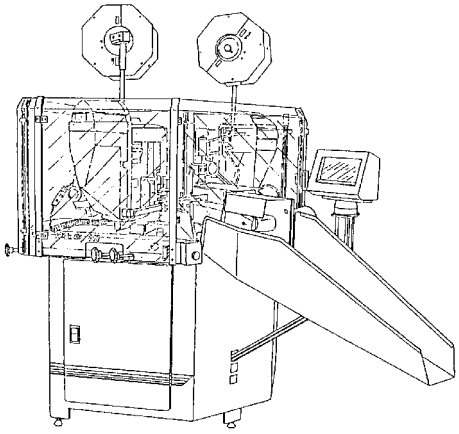
Figure 7 (cont'd)



AMP-O-MATIC Side Feed
Stripper-Crimper Model III
Machine 1320895-[ ]
(409-10012)

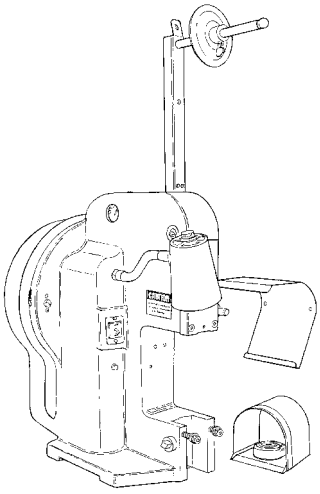


AMP-O-LECTRIC Model “G”
Terminating Machine
354500-[ ] (409-5842)

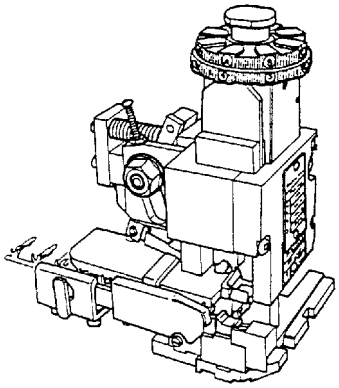


AMPOMATOR CLS IV+ Lead-Making Machine (409-5878)

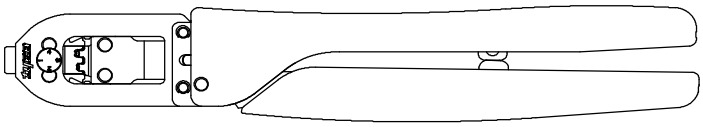
AMPOMATOR CLS Model III-G Lead-Making Machine
122500-[ ] (409-5852)



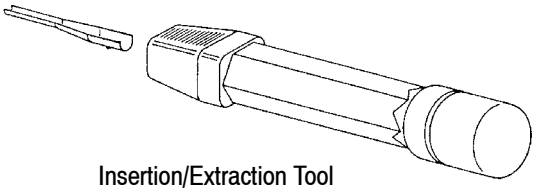
Basic AMP-O-LECTRIC Model “K”
Terminating Machine 565435-5
(409-5128)



HD Quick Change Applicators
(408-8040)



Typical Hand Tool
(408-8547)



Insertion/Extraction Tool
91285-1 and Replacement Tip
Kits 543382-[ ] (408-9404)

Figure 7 (end)

6. VISUAL AID

Figure 8 shows a typical application of HD-20 Precision Formed Contacts. 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.

NOTE: CRIMPED CONTACT WITH INSULATION BARREL SHOWN; SAME REQUIREMENTS ALSO APPLY TO CONTACTS WITHOUT INSULATION BARREL

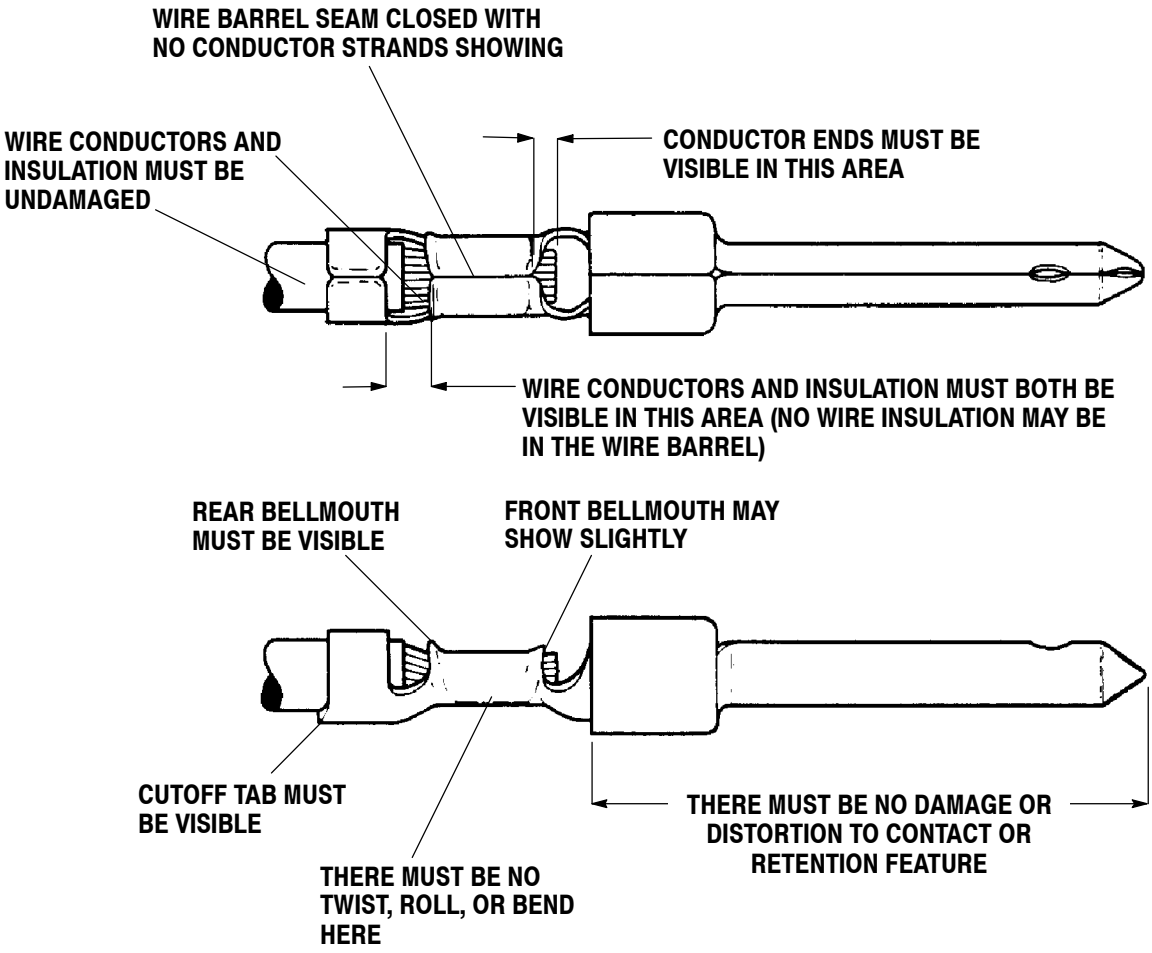


FIGURE 8. VISUAL AID