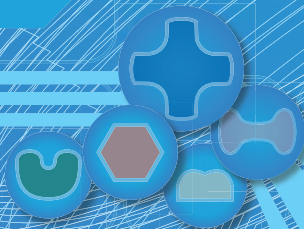




**ASTRO TOOL CORP.**  
CONNECTOR ASSEMBLY TOOLING



**TOOLING GUIDE**

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At Astro, we know that quality, timely delivery and competitive pricing are what our customers demand and deserve. When your job requires crimping tools, insertion and removal tools or connector service kits, please remember that Astro has the tools of your trade. Our greatest asset is always our people, and everyone at Astro is dedicated to just one goal: customer satisfaction.

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- Pneumatic Crimp Tools
- MIL-Spec Tool Kits
- Custom Tool Kits
- Free Cross Reference Services

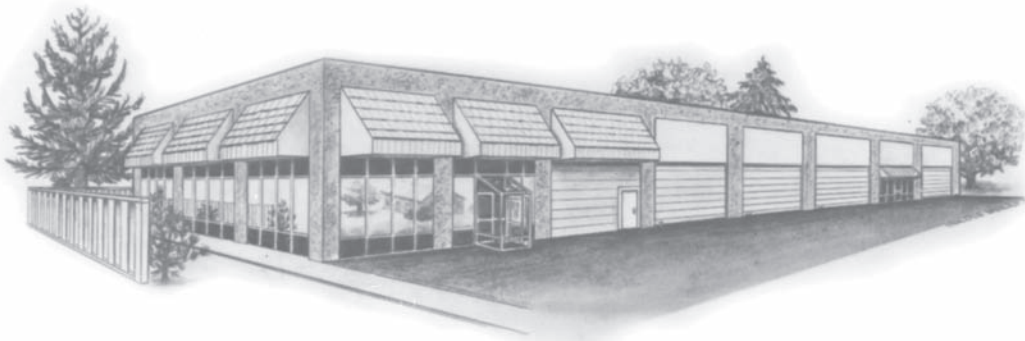
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### NOTICE

The tooling suggested herein may or may not cover a user's specific contract or manufacturing requirements. It is the user's responsibility to carry out sufficient testing to verify the suitability of the Astro product selected for the specific requirements of each particular application.

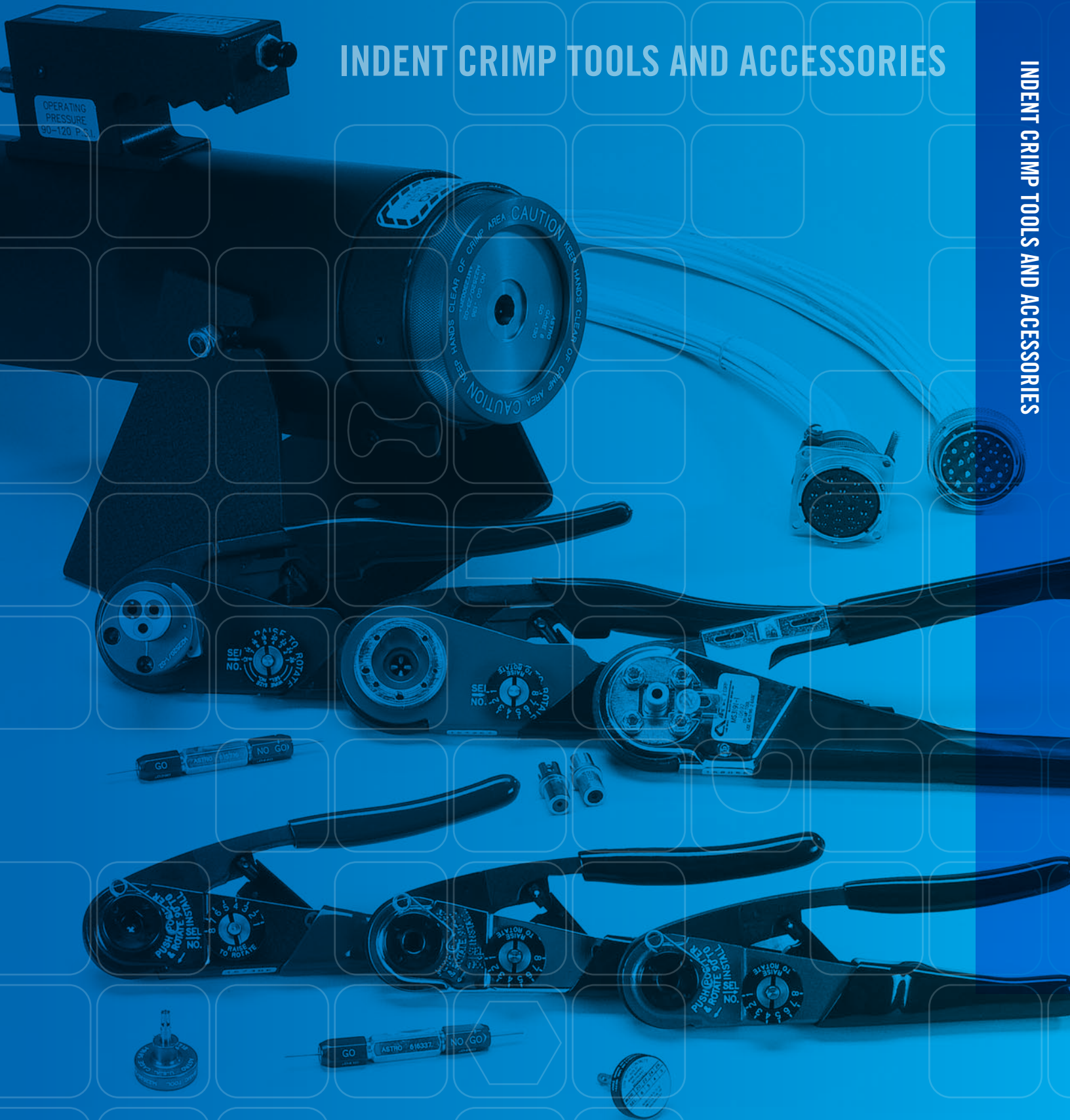
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# INDENT CRIMP TOOLS AND ACCESSORIES

INDENT CRIMP TOOLS AND ACCESSORIES





# Crimping Pin and Socket Contacts

## CRIMPING

Crimping may be defined as the art of joining a conductor to a pin or socket contact by controlled compression and displacement of metal. It has been used for many years.

In a good crimp joint, there is a mutual metal flow causing symmetrical distortion of wire strands and contact material. The mil cross-sectional area is but slightly reduced and all voids are practically eliminated. Such a joint is similar to a cold weld. Mechanical strength and good electrical continuity are established. Because of the new environments to which electrical connectors are subjected, there has been a drastic change in thinking relative to the use of precision crimp joints in preference to solder.

## CRIMPING CONFIGURATIONS

There are many different types of crimps employed today. These range from the terminal fold-over tab type of crimp to the single indent crimp, the dual indenter crimp, the three indenter crimp, hex crimps, and, finally, the MIL standard four indenter crimp. The four indenter crimp (Fig. 1) provides the most uniform displacement of wire and contact material. The wire strands and the contact material are formed together in a solid mass with little or no reduction of the mil area of the wire strands. A minimum of voids exists and very little extrusion of the wire strands takes place.

The four indenter crimp principle has been used to produce a variety of impressions, the most common being the “bathtub” and “octadent” (also called double indent) (Fig. 2) The octadent configuration has been chosen by the Military for use in the M22520/1 and /2 tools.

## CRIMPING CHARACTERISTICS

Connectors utilizing crimping contacts usually permit the removal of these contacts several times so that modification, circuit changes, or replacement of contacts may be made with little difficulty and with the same quality assurance as in production line assembly. Crimping may be accomplished either with hand tools, power tools, or automated power tools. Repeatability of the crimp operation is characteristic provided precision crimping tools are employed. These tools must be capable of being gaged to insure that proper crimp depths are maintained. Inspection holes in each contact permit quality control personnel to view the wire strand ends thereby assuring that the conductor is properly positioned in the crimp barrel.

## MIL-DTL-22520

This specification covers all the requirements for crimping tools used on removable type contacts in electrical connectors.

## CRIMP DEPTH DETERMINATION

Having resolved an indenter design, the determination of crimp depth range must be established for each application. There are many factors which contribute to the selection of the proper indenter setting. These are primarily related to contact material and dimensions as well as wire type and size.

The proper crimp depth for a given contact is the one that yields the best mechanical and electrical joint. To determine this setting, many contacts of the same type are crimped though a range of indenter settings from too loose to too tight. The crimped contacts are then subjected to tensile and voltage drop tests.

## WIRE PREPARATION

Proper wire preparation also plays an important part in making a good crimp joint. There are two popular methods of wire stripping — mechanical and thermal. During the mechanical stripping process, extreme care must be taken to avoid nicking or removing wire strands, otherwise a loss of tensile strength will result. Conversely, if the insulation is not completely removed, erratic values may be obtained. Heat stripping eliminates the danger of nicking strands. However, depending on the type of insulation being stripped, too much heat can cause actual charring of the insulation or decompose the insulation with the evolution of corrosive gases which react with the conductor platings. There is also a possibility of local annealing of the conductor. Too little heat can deposit an insulation film which can act as a lubricant. Any of these conditions can affect tensile results. Wire preparation is, therefore, another area that requires control if proper tensiles are to be achieved with a wire-contact combination.

Before making a tensile test it is also important that the stripped length of the wire be checked to ensure that the wire extends all the way into the contact wire barrel. During the tensile test it is necessary for the uncrimped end of the wire to be held in such a way that the pull force is evenly distributed to all the strands.

## TENSILE TESTING

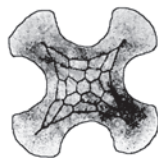
Tensile testing is a controlled pull test on the crimp joint to determine its mechanical strength. It is a destructive test which usually results in wire breakage in the crimped barrel, the wire pulling out of the crimped barrel, or wire breakage outside of the crimped area. The method and device used to conduct this test have a direct bearing on the results obtained. Per specification, the testing device pulls at the rate of one inch per minute. During the tensile test, the wire is elongating. The breakage or separation point, therefore, is associated with not only the pull force but also the rate of increase of this force.

Tensile curves are plotted for each contact and wire combination. They will usually differ, depending on the type of wire, plating, size of wire, and variations in contact design and material. A desirable tensile range must be determined for each of these combinations.

## MILLIVOLT DROP

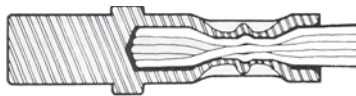
Millivolt drop tests are performed across the crimp joint to determine the electrical characteristics. The test current is passed through the contacts and voltage drop is measured from a point on the shoulder of the contact to a point on the wire. Voltage drop values under the maximum allowable indicate a good electrical joint.

FIG 1



4-Indenter Crimp  
Cross-section  
Across Axis

FIG 2



Octadent Crimp —  
Horizontal Cross-section



## VISUAL INSPECTION

Each contact is inspected under a microscope to make certain the indenture does not crack or tear the base metal, or cause excessive distortion of the contact.

## CONTROLLING CRIMP DEPTH

From the tensile curves, a known crimp depth range is established. It is imperative, therefore, that the crimp tool settings be within the established tolerance.

To insure full closure of the tool handles and positive bottoming, it is necessary that tools be cycle controlled. This is accomplished by the use of a precision ratchet device which releases the handles at the positive bottoming position within specification tolerances. This release point and positive bottoming are applicable to all contact sizes.

## MEASURING CRIMP DEPTH (GAGING)

Too loose a crimp setting will result in wire pullout and high millivolt drop (high resistance). Too tight a setting will nick the wire strands causing low tensiles and wire breakage within the contact.

Positive bottoming tools can readily be gaged by selecting gage pins dimensioned to the end limits of the known crimp range of a given contact.

## AXIAL DEFORMATION

During the crimping process considerable force is applied and material displacement takes place, which may result in axial deformation of the contact. The following factors contribute to axial deformation of contacts:

1. Contact material and contact hardness.
2. Crimp barrel wall thickness.
3. Concentricity of conductor hole to O.D. of crimp barrel.
4. If an insulation support is included on the contact, the concentricity of this support (I.D. and O.D.) with respect to the other diameters in the contact.
5. Crimp depth - the deeper the crimp the greater the possibility of contact bending.
6. Conductor characteristics - conductor hardness, number of strands, size of wire, bunching of strands, the lay of the conductors, plating or the use of solid conductor.
7. The condition of the indenters - indenters which are not uniformly dimensioned or aligned or which have extreme variation in surface condition can cause contact bending.
8. The condition of the crimping tool - a worn crimping tool can contribute to contact bending.
9. Method of contact location and support - improperly supporting or positioning the contact in the tool can result in contact bending.
10. Method of measuring axial deformation - we have found that this is one of the least understood items relating to the crimp tool specification.

MIL-DTL-22520 is specific in defining and evaluating the axial deformation of contacts. This paragraph allows the following deformation:

FIG. 3

| Contact Size | Contact Deformation |
|--------------|---------------------|
| 20 & smaller | .011 TIR            |
| 16           | .012 TIR            |
| 12           | .012 TIR            |

The TIR allowed includes a maximum of .005 TIR assignable to the contact during its manufacture. (TIR is an abbreviation for Total Indicator Reading and is a measure of the total deviation from a true center line when the item being measured is rotated through 360 °.)

## COMPRESSION FORCES

Crimping compression forces are directly related to: A. Indenter Configuration; B. The Amount of Leverage in a Crimping Tool; C. Crimp Depth Required for Satisfactory Results; D. Contact Hardness and Contact-Conductor Combinations.

### A. Indenter Configuration

MS drawings are specific as to indenter configuration of the Class I crimping tool. It is possible to change the shape of the indenters to reduce frontal area and thus reduce crimping forces. If the reduction of compression forces was the only factor involved, a knife blade edge on an indenter, or a conical tip shape would be the most desirable configuration. But this would result in cracked contacts, damage to plating, high wire embrittlement because of the concentrated stress of a small crimp area, and would also result in marginal tensile values.

### B. The Amount of Leverage in a Crimping Tool

Leverage or linkage systems could be devised to minimize the amount of crimp compression forces. Archimedes' old adage could apply here wherein he says, "Give me a place to stand and to rest my lever on and I can move the Earth." From a practical viewpoint, however, the geometry of Class I tools under MIL-T-22520 are specific in tool length and width.

### C. Crimp Depth Required for Satisfactory Results

Another way to reduce compression forces is to vary crimp depth. MS drawings are specific in designating crimp depths. It is understandable that the less the indenters indent the lower the compression forces involved. On the other hand, if the tool does not indent as deeply as specified, the possibility exists that sub-marginal or marginal tensile values will result.

### D. Contact Hardness and Contact-Conductor Combinations

Contact material is definitely a factor contributing to high compression forces. Some contacts are made of hard material; some contacts have thick walls and some contacts are required to cover a range of conductors, all of which could involve high crimping forces. It is felt that an analysis of these conditions and an attempt to make them compatible with the crimping tool could facilitate the reduction of compression forces.

As can be seen from this brief review of crimping, many factors influence the effectiveness of a crimped joint. However, a good crimping tool compensates for many of these factors by providing proper crimp depths, resulting in termination having high tensile strength, low millivolt drop, and minimum contact deformation. With the use of a well-engineered tool, crimping becomes one of the most reliable methods of wire termination.

A glossary of connector terms is available at [www.astrotool.com](http://www.astrotool.com).





# Standard Step Adjustable Crimp Tool 615708 (M22520/1-01)



- 8 indent crimp
- Dial selectable
- Uses turret and single position heads
- Cycle controlled ratchet

| MS #.       | ASTRO TOOL # | USAGE/DESCRIPTION    | NSN.             |
|-------------|--------------|----------------------|------------------|
| M22520/3-1  | 615716       | Gage For /1-01 /2-01 | 5220-00-165-7604 |
| M22520/1-01 | 615708       | Tool Frame           | 5120-00-165-3912 |
| M22520/1-02 | 615709       | Turret               | 5120-00-016-6382 |
| M22520/1-03 | 615710       | Turret               | 5120-00-016-6554 |
| M22520/1-04 | 615711       | Turret               | 5120-00-016-7582 |
| M22520/1-05 | 615712       | Universal Positioner | 5120-00-165-3911 |
| M22520/1-06 | 615713       | Positioner           | 5120-00-016-7647 |
| M22520/1-07 | 615714       | Positioner           | 5120-00-016-7651 |
| M22520/1-08 | 615715       | Turret               | 5120-00-016-7654 |
| M22520/1-09 | 615821       | Positioner           | 5120-00-132-5039 |
| M22520/1-10 | 615822       | Positioner           | 5120-00-132-5095 |
| M22520/1-11 | 616406       | Positioner           | 5120-01-127-5231 |
| M22520/1-12 | 616407       | Turret               | 5120-01-036-9220 |
| M22520/1-13 | 616408       | Turret               | 5120-01-036-9221 |
| M22520/1-14 | 616409       | Turret               | 5120-01-036-9222 |
| M22520/1-15 | 616410       | Positioner           | 5120-01-036-9223 |
| M22520/1-16 | 620172       | Positioner           | 5120-01-075-8138 |
| M22520/1-17 | 620537       | Positioner           |                  |

The **Astro 615708** is qualified to MIL-DTL-22520/1. This dial selectable 8-step tool has extensive applications within the wire barrel sizes 12-22 and wire sizes 12-26 AWG. This tool produces an eight indent crimp configuration which provides maximum tensile strength for both MS and proprietary contacts when used with wire of various compositions.

The beauty of this tool is in the ease of its use. The operator simply has to attach the appropriate turret head, or universal positioner, to the tool and then set the selector to the desired step for the wire being used. The ratchet is designed to ensure a complete cycle of the tool. A complete and accurate crimp is obtained each and every time, with no partial crimps.

The **615708** tool is designed to be used with a turret head, a positioner or a universal head. These heads are easily attached with the use of built in hex socket screws. A data plate is permanently attached to each head. The data plate lists the contacts, for which the head was designed, along with selector settings that correspond to the wire being used.

Astro recommends that all of its tools be gaged periodically, to assure accurate calibration. A gage 615716 (M22520/3-1) is available for this purpose. See page 9.

The **615708** tool is 9¼ inches long and weighs approximately 20 ounces.

The **615708** is available in a pneumatic version, P/N APC708, on page 23.

An adjustable positioner is available, P/N 615712 and 615712-1.

**A wide variety of Turret Heads and Positioners are available, in addition to those listed. Please contact factory for additional information.**

Turret and Positioner Selection Charts for MIL-C-39029/AS39029 Contacts on page 9.



# Miniature Step Adjustable Crimp Tool 615717 (M22520/2-01)



- 8 indent crimp
- Dial selectable
- Uses bayonet positioners
- Cycle controlled ratchet

The MIL-DTL-22520/2 qualified **Astro 615717** miniature 8-step adjustable hand crimping tool's 8-indent crimp configuration provides excellent results on contacts sizes 20-28 and wire sizes 20-32 AWG.

A wide variety of MS and proprietary contacts and wire compositions can be crimped by simply attaching a positioner in the bayonet-type socket and adjusting the selector to one of the eight preselected settings. The tool is equipped with a positive ratchet that requires the completion of the crimp cycle to ensure the integrity of each crimp.

Astro offers a wide variety of positioners to accommodate various mil-spec and proprietary contacts. Each positioner has a data plate which provides the correct crimp depth setting for the contact and wire combination. Astro also offers two adjustable positioners (615179 & 615179-1) that allow you to adjust the crimp location according to your specific needs. Custom positioners are available upon request.

Astro recommends the periodic gaging of all its tools. A gage (615716, M22520/3-1) is available for this purpose.

The **615717** is 7½ inches long and weighs 11 ounces.

The **615717** is available in a pneumatic version, P/N 621100, on page 26.

For ultra precise crimps on miniature and subminiature contacts with very thin wire barrel dimensions, Astro offers the 620613. This tool is built from the same tool frame as the 615717 (M22520/2-01) and utilizes the same positioners.

**A wide variety of Positioners are available, in addition to those listed. Please contact factory for additional information.**

| MS #.       | ASTRO TOOL #. | DESCRIPTION | NSN              |
|-------------|---------------|-------------|------------------|
| M22520/2-01 | 615717        | Tool Frame  | 5120-00-165-3910 |
| M22520/2-02 | 615718        | Positioner  | 5120-00-165-3913 |
| M22520/2-03 | 615719        | Positioner  | 5120-00-016-7657 |
| M22520/2-04 | 615720        | Positioner  | 5120-00-017-3640 |
| M22520/2-05 | 615721        | Positioner  | 5120-00-017-3742 |
| M22520/2-06 | 615722        | Positioner  | 5120-00-017-3809 |
| M22520/2-07 | 615723        | Positioner  | 5120-00-017-3827 |
| M22520/2-08 | 615724        | Positioner  | 5120-00-017-3921 |
| M22520/2-09 | 615725        | Positioner  | 5120-00-017-3927 |
| M22520/2-10 | 615726        | Positioner  | 5120-00-017-3932 |
| M22520/2-11 | 615727        | Positioner  | 5120-00-017-3934 |
| M22520/2-12 | 615729        | Positioner  | 5120-00-017-3935 |
| M22520/2-13 | 616031        | Positioner  | 5120-00-132-6939 |
| M22520/2-14 | 616032        | Positioner  | 5120-00-132-6962 |
| M22520/2-15 | 616033        | Positioner  | 5120-00-132-6978 |
| M22520/2-16 | 616034        | Positioner  | 5120-00-132-7868 |
| M22520/2-17 | 616035        | Positioner  | 5120-00-132-7893 |
| M22520/2-18 | 616036        | Positioner  | 5120-00-132-7894 |
| M22520/2-19 | 616037        | Positioner  | 5120-00-132-7872 |
| M22520/2-20 | 616038        | Positioner  | 5120-00-132-9004 |
| M22520/2-21 | 616039        | Positioner  | 5120-00-133-0029 |
| M22520/2-22 | 615448        | Positioner  | 5120-01-106-3737 |
| M22520/2-23 | 616191        | Positioner  | 5120-01-117-3905 |
| M22520/2-24 | 616260        | Positioner  | 5120-00-348-7531 |
| M22520/2-25 | 616411        | Positioner  | 5120-00-132-6932 |
| M22520/2-26 | 616412        | Positioner  | 5120-00-133-3263 |
| M22520/2-27 | 616413        | Positioner  |                  |
| M22520/2-28 | 616414        | Positioner  | 5120-00-124-3678 |
| M22520/2-29 | 616415        | Positioner  | 5120-00-124-3682 |
| M22520/2-30 | 616416        | Positioner  | 5120-01-117-3905 |
| M22520/2-31 | 616417        | Positioner  |                  |
| M22520/2-32 | 620261        | Positioner  |                  |
| M22520/2-33 | 615257        | Positioner  |                  |
| M22520/2-34 | 620499        | Positioner  |                  |
| M22520/2-35 | 620517        | Positioner  |                  |
| M22520/2-36 | 616429        | Positioner  |                  |

**Positioner Selection Charts for MIL-C-39029/AS39029 Contacts on page 9.**



# Intermediate Step Adjustable Tool 616336 (M22520/7-01)



- 8 indent crimp
- Dial selectable
- Cycle controlled ratchet
- Lightweight and easy to use
- Uses bayonet positioners

The **Astro 616336** is qualified to MIL-DTL-22520/7.

This tool is an 8-Step Selectable with varying applications within the wire barrel sizes 16-22 and wire sizes 16-28 AWG.

The **616336** produces an 8 indent crimp configuration, which provides excellent results on MS and proprietary contacts and wire of various compositions.

The **616336** tool is designed to be used with a positioner that features easy attachment with a bayonet socket mount. A data plate is permanently attached to each positioner. This data plate provides the correct selector setting to be used for each contact and wire combinations. This helps to eliminate error in choosing the proper crimp depth.

Astro recommends that all of its tools be gaged periodically to assure accurate calibration. A gage 616337 (M22520/3-3) is available for this purpose. See page 9.

The **616336** tool is 7¼ inches long and weighs approximately 11 ounces.

The **616336** is available in a pneumatic version, P/N 621101, on page 26.

An adjustable positioner is available P/N 642020.

**A wide variety of Positioners are available, in addition to those listed. Please contact factory for additional information.**

| MS #.       | ASTRO TOOL # | USAGE/DESCRIPTION | NSN.             |
|-------------|--------------|-------------------|------------------|
| M22520/7-01 | 616336       | Tool Frame        | 5120-00-133-1747 |
| M22520/7-02 | 616327       | Positioner        | 5120-00-133-1769 |
| M22520/7-03 | 616328       | Positioner        | 5120-00-133-1770 |
| M22520/7-04 | 616329       | Positioner        | 5120-00-133-1772 |
| M22520/7-05 | 616330       | Positioner        | 5120-00-133-1778 |
| M22520/7-06 | 616331       | Positioner        | 5120-00-133-1781 |
| M22520/7-07 | 616332       | Positioner        | 5120-00-133-1782 |
| M22520/7-08 | 616333       | Positioner        | 5120-00-133-1785 |
| M22520/7-09 | 616334       | Positioner        | 5120-00-133-1790 |
| M22520/7-10 | 616335       | Positioner        | 5120-00-133-1792 |
| M22520/7-11 | 620083       | Positioner        | 5120-01-122-1201 |
| M22520/7-12 | 620084       | Positioner        | 5120-01-112-2925 |
| M22520/7-13 | 620085       | Positioner        | 5120-01-110-4472 |
| M22520/3-3  | 616337       | Gage              | 5220-00-338-0378 |

Positioner Selection Charts for MIL-C-39029/AS39029 Contacts on page 9.





# Turret and Positioner Selection Charts for MIL-C-39029 / AS39029 Contacts

## For M22520/1-01, M22520/2-01, M22520/7-01 Crimp Tools

PRODUCT LISTINGS

### Contacts for Connector Family: MIL-C-5015 (MS 3450 Series/rear-release Type) and MIL-C-83723 Series II

| Military Part #  | BIN Code | Supersedes Military Part #    | Positioner/<br>Turret Part # | Astro Tool # | Style | Mating End<br>Size | Wire<br>Barrel Size | Type/<br>Class |
|------------------|----------|-------------------------------|------------------------------|--------------|-------|--------------------|---------------------|----------------|
| M39029/30-16S-16 | 217      | MS3163-16S-16<br>M83723-30T17 | M22520/1-02                  | 615709       | SKT   | 16S                | 16                  | A/B            |
| M39029/29-16-16  | 212      | MS3162-16-16<br>M83723-29T16  | M22520/1-02                  | 615709       | PIN   | 16                 | 16                  | A/B            |
| M39029/30-16-16  | 218      | MS3163-16-16<br>M83723-30T16  | M22520/1-02                  | 615709       | SKT   | 16                 | 16                  | A/B            |
| M39029/29-12-12  | 213      | MS3162-12-12<br>M83723-29T12  | M22520/1-02                  | 615709       | PIN   | 12                 | 12                  | A/B            |
| M39029/30-12-12  | 219      | MS3163-12-12<br>M83723-30T12  | M22520/1-02                  | 615709       | SKT   | 12                 | 12                  | A/B            |

### Contacts for Connector Families: MIL-C-26482 Series II, MIL-C-81703 Series III, MIL-C-83723 Series III, MIL-C-83733

| Military Part # | BIN Code | Supersedes Military Part # | Positioner/<br>Turret Part # | Astro Tool #  | Style | Mating End<br>Size | Wire<br>Barrel Size | Type/<br>Class |
|-----------------|----------|----------------------------|------------------------------|---------------|-------|--------------------|---------------------|----------------|
| M39029/4-20-20  | 110      | M83723-33B20               | M22520/2-02<br>M22520/1-02   | 615718 615709 | PIN   | 20                 | 20                  | A/B            |
| M39029/5-20-20  | 115      | M83723-34B20               | M22520/2-02<br>M22520/1-02   | 615718 615709 | SKT   | 20                 | 20                  | A/B            |
| M39029/4-16-16  | 111      | M83723-33B16               | M22520/1-02                  | 615709        | PIN   | 16                 | 16                  | A/B            |
| M39029/5-16-16  | 116      | M83723-34B16               | M22520/1-02                  | 615709        | SKT   | 16                 | 16                  | A/B            |
| M39029/4-16-20  | 112      | -                          | M22520/1-02                  | 615709        | PIN   | 16                 | 20                  | A/B            |
| M39029/5-16-20  | 117      | -                          | M22520/1-02                  | 615709        | SKT   | 16                 | 20                  | A/B            |
| M39029/4-12-12  | 113      | M83723-34B12               | M22520/1-02                  | 615709        | PIN   | 12                 | 12                  | A/B            |
| M39029/5-12-12  | 118      | -                          | M22520/1-02                  | 615709        | SKT   | 12                 | 16                  | A/B            |
| M39029/4-12-16  | 111      | -                          | M22520/1-02                  | 615709        | PIN   | 12                 | 16                  | A/B            |
| M39029/5-12-16  | 119      | M83723-34B16               | M22520/1-02                  | 615709        | SKT   | 12                 | 16                  | A/B            |

### Contacts for Connector Family: MIL-C-26500

| Military Part # | BIN Code | Supersedes Military Part # | Positioner/<br>Turret Part # | Astro Tool #     | Style | Mating End<br>Size | Wire<br>Barrel Size | Type/<br>Class |
|-----------------|----------|----------------------------|------------------------------|------------------|-------|--------------------|---------------------|----------------|
| M39029/31-241   | 241      | MS24254-20P                | M22520/2-02<br>M22520/1-02   | 615718<br>615709 | PIN   | 20                 | 20                  | A/B            |
| M39029/32-260   | 260      | MS24255-20S                | M22520/2-02<br>M22520/1-02   | 615718<br>615709 | SKT   | 20                 | 20                  | A/B            |
| M39029/31-229   | 229      | MS24253-16P                | M22520/1-02                  | 615709           | PIN   | 16                 | 16                  | A/B            |
| M39029/32-248   | 248      | MS24255-16S                | M22520/1-02                  | 615709           | SKT   | 16                 | 16                  | A/B            |
| M39029/31-235   | 235      | MS24254-12P                | M22520/1-02                  | 615709           | PIN   | 12                 | 12                  | A/B            |
| M39029/32-254   | 254      | MS24255-12S                | M22520/1-02                  | 615709           | SKT   | 12                 | 12                  | A/B            |



# Turret and Positioner Selection Charts for MIL-C-39029 / AS39029 Contacts

## For M22520/1-01, M22520/2-01, M22520/7-01 Crimp Tools

### Contacts for Connector Family: MIL-C-24308

| Military Part # | BIN Code | Supersedes Military Part # | Positioner/<br>Turret Part # | Astro Tool # | Style | Mating End<br>Size | Wire<br>Barrel Size | Type/<br>Class |
|-----------------|----------|----------------------------|------------------------------|--------------|-------|--------------------|---------------------|----------------|
| M39029/64-369   | 369      | M24308/11-1                | M22520/2-08                  | 615724       | PIN   | 20                 | 20                  | A/A            |
| M39029/63-368   | 368      | M24308/10-1                | M22520/2-08                  | 615724       | SKT   | 20                 | 20                  | A/A            |

### Contacts for Connector Family: MIL-C-5015 (MS3400 Series/Front-Release Type)

| Military Part # | BIN Code | Supersedes Military Part # | Positioner/<br>Turret Part # | Astro Tool # | Style | Mating End<br>Size | Wire<br>Barrel Size | Type/<br>Class |
|-----------------|----------|----------------------------|------------------------------|--------------|-------|--------------------|---------------------|----------------|
| M39029/44-288   | 288      | MS90453-16-16              | M22520/1-02                  | 615709       | PIN   | 16                 | 16                  | A/B            |
| M39029/45-295   | 295      | MS90454-16-16              | M22520/1-02                  | 615709       | SKT   | 16                 | 16                  | A/B            |
| M39029/44-287   | 287      | MS90453-16-22              | M22520/1-02                  | 615709       | PIN   | 16                 | 22                  | A/B            |
| M39029/45-294   | 294      | MS90454-16-22              | M22520/1-02                  | 615709       | SKT   | 16                 | 22                  | A/B            |
| M39029/44-290   | 290      | MS90453-12-12              | M22520/1-02                  | 615709       | PIN   | 12                 | 12                  | A/B            |
| M39029/45-297   | 297      | MS90454-12-12              | M22520/1-02                  | 615709       | SKT   | 12                 | 12                  | A/B            |
| M39029/44-289   | 289      | MS90453-12-16              | M22520/1-02                  | 615709       | PIN   | 12                 | 16                  | A/B            |
| M39029/45-296   | 296      | MS90454-12-16              | M22520/1-02                  | 615709       | SKT   | 12                 | 16                  | A/B            |

### Contacts for Connector Family: MIL-C-38999 Series I, III, IV

| Military Part # | BIN Code | Supersedes Military Part # | Positioner/<br>Turret Part # | Astro Tool #     | Style | Mating End<br>Size | Wire<br>Barrel Size | Type/<br>Class |
|-----------------|----------|----------------------------|------------------------------|------------------|-------|--------------------|---------------------|----------------|
| M39029/56-348   | 348      | MS27655-22D<br>MS27490-22D | M22520/2-07                  | 615723           | SKT   | 22                 | 22D                 | A/B            |
| M39029/56-349   | 349      | MS27490-22M                | M22520/2-07                  | 615723           | SKT   | 22                 | 22M                 | A/B            |
| M39029/56-350   | 350      | MS27490-22                 | M22520/2-07                  | 615723           | SKT   | 22                 | 22                  | A/B            |
| M39029/56-351   | 351      | MS27655-20<br>MS27490-20   | M22520/2-10<br>M22520/1-04   | 615726<br>615711 | SKT   | 20                 | 20                  | A/B            |
| M39029/56-352   | 352      | MS27655-16<br>MS27490-16   | M22520/1-04                  | 615711           | SKT   | 16                 | 16                  | A/B            |
| M39029/56-353   | 353      | MS27655-12<br>MS27490-12   | M22520/1-04                  | 615711           | SKT   | 12                 | 12                  | A/B            |

### Contacts for Connector Family: MIL-C-26482 Series I

| Military Part # | BIN Code | Supersedes Military Part # | Positioner/<br>Turret Part # | Astro Tool #     | Style | Mating End<br>Size | Wire<br>Barrel Size | Type/<br>Class |
|-----------------|----------|----------------------------|------------------------------|------------------|-------|--------------------|---------------------|----------------|
| M39029/31-240   | 240      | MS3192A20-20A              | M22520/2-02<br>M22520/1-02   | 615718<br>615709 | PIN   | 20                 | 20                  | A/A            |
| M39029/32-259   | 259      | MS3193A20-20A              | M22520/2-02<br>M22520/1-02   | 615718<br>615709 | SKT   | 20                 | 20                  | A/A            |
| M39029/31-228   | 228      | MS3192-16-16A              | M22520/1-02                  | 615709           | PIN   | 16                 | 16                  | A/A            |
| M39029/32-247   | 247      | MS3193-16-16A              | M22520/1-02                  | 615709           | SKT   | 16                 | 16                  | A/A            |
| M39029/31-234   | 234      | MS3192-12-12A              | M22520/1-02                  | 615709           | PIN   | 12                 | 12                  | A/A            |
| M39029/32-253   | 253      | MS3193-12-12A              | M22520/1-02                  | 615709           | SKT   | 12                 | 12                  | A/A            |



# Turret and Positioner Selection Charts for MIL-C-39029 / AS39029 Contacts

## For M22520/1-01, M22520/2-01, M22520/7-01 Crimp Tools

PRODUCT LISTINGS

| Contacts for Connector Family: MIL-C-28840 |          |                            |                              |              |       |                    |                     |                |
|--------------------------------------------|----------|----------------------------|------------------------------|--------------|-------|--------------------|---------------------|----------------|
| Military Part #                            | BIN Code | Supersedes Military Part # | Positioner/<br>Turret Part # | Astro Tool # | Style | Mating End<br>Size | Wire<br>Barrel Size | Type/<br>Class |
| M39029/83-450                              | 450      | M39029/83-20-22            | M22520/34-02                 | 620636       | PIN   | 20                 | 22                  | A/B            |
| M39029/83-451                              | 451      | M39029/83-20-28            | M22520/34-02                 | 620636       | PIN   | 20                 | 28                  | A/B            |
| M39029/84-452                              | 452      | M39029/84-20-22            | M22520/34-02                 | 620636       | SKT   | 20                 | 22                  | A/B            |
| M39029/84-453                              | 453      | M39029/84-20-28            | M22520/34-02                 | 620636       | SKT   | 20                 | 28                  | A/B            |

| Contacts for Connector Families: MIL-C-38999 Series I, II, III, IV, MIL-C-83733, MIL-C-24308, and MIL-C-55302/68/69/71/72/75 |          |                                           |                              |                  |       |                    |                     |                |
|------------------------------------------------------------------------------------------------------------------------------|----------|-------------------------------------------|------------------------------|------------------|-------|--------------------|---------------------|----------------|
| Military Part #                                                                                                              | BIN Code | Supersedes Military Part #                | Positioner/<br>Turret Part # | Astro Tool #     | Style | Mating End<br>Size | Wire<br>Barrel Size | Type/<br>Class |
| M39029/58-360                                                                                                                | 360      | MS27494-22D<br>MS27493-22D<br>M24308/13-1 | M22520/2-09                  | 615725           | PIN   | 22                 | 22D                 | A/B            |
| M39029/57-354                                                                                                                | 354      | MS27492-22D<br>MS27491-22D<br>M24308/12-1 | M22520/2-06                  | 615722           | SKT   | 22                 | 22D                 | A/B            |
| M39029/58-361                                                                                                                | 361      | MS27494-22M<br>MS27493-22M                | M22520/2-09                  | 615725           | PIN   | 22                 | 22M                 | A/B            |
| M39029/57-355                                                                                                                | 355      | MS27492-22M<br>MS27491-22M                | M22520/2-06                  | 615722           | SKT   | 22                 | 22M                 | A/B            |
| M39029/58-362                                                                                                                | 362      | MS27494-22<br>MS27493-22                  | M22520/2-09                  | 615725           | PIN   | 22                 | 22                  | A/B            |
| M39029/57-356                                                                                                                | 356      | MS27492-22<br>MS27491-22                  | M22520/2-06                  | 615722           | SKT   | 22                 | 22                  | A/B            |
| M39029/58-363                                                                                                                | 363      | MS27494-20<br>MS27493-20                  | M22520/2-10<br>M22520/1-04   | 615726<br>615711 | PIN   | 20                 | 20                  | A/B            |
| M39029/57-357                                                                                                                | 357      | MS27492-20<br>MS27491-20                  | M22520/2-10<br>M22520/1-04   | 615726<br>615711 | SKT   | 20                 | 20                  | A/B            |
| M39029/58-364                                                                                                                | 364      | MS27494-16<br>MS27493-16                  | M22520/1-04                  | 615711           | PIN   | 16                 | 16                  | A/B            |
| M39029/57-358                                                                                                                | 358      | MS27492-16<br>MS27491-16                  | M22520/1-04                  | 615711           | SKT   | 16                 | 16                  | A/B            |
| M39029/58-365                                                                                                                | 365      | MS27494-12<br>MS27493-12                  | M22520/1-04                  | 615711           | PIN   | 12                 | 12                  | A/B            |
| M39029/57-359                                                                                                                | 359      | MS27492-12<br>MS27491-12                  | M22520/1-04                  | 615711           | SKT   | 12                 | 12                  | A/B            |

**BIN** (Basic identification number) code color bands, reading in sequence from wire barrel end of the contact. Each digit of the BIN code shall be designated on the contact by a color band in accordance with the following:

0-Black 2-Red 4-Yellow 6-Blue 8-Gray

1-Brown 3-Orange 5-Green 7-Violet 9-White

For contacts not listed above, please consult factory for proper tooling.





# Heavy Duty Pneumatic Crimp Tool AMT23B (M22520/23-01)



- 8 indent crimp configuration
- Designed with safety in mind
- Meets all MIL-DTL-22520/23 requirements
- No extra booster required for large contacts
- Interchangeable dies and locators

The **AMT23B** takes all the work out of crimping those large contacts. Using interchangeable dies and locators, this tool crimps contact sizes 8 through 0000. The steady, uniform crimp force, provided by the air logic function delay, crimps even the largest of these contacts without cracking them. Unlike similar tools, **Astro's AMT23B** crimps its full range without using a booster adapter.

The **AMT23B** is designed with operator safety in mind. The air logic function delay allows adequate time to remove fingers from the crimp area before crimping begins.

This tool is easily portable and weighs less than 19 pounds. It operates on 80-120 P.S.I. and requires a regulated, filtered and lubricated air supply for optimal function. Astro offers the 11413 air regulator for this purpose. The tool comes with a ½ inch diameter air coupler for convenient quick disconnect.

NOTE: ASTRO WILL CUSTOM DESIGN DIES AND LOCATORS FOR YOUR SPECIAL REQUIREMENTS. WE ALSO OFFER A WIDE RANGE OF GAGES FOR USE WITH THIS TOOL. PLEASE CONSULT THE FACTORY FOR FURTHER DETAILS.

## CHANGING DIES AND LOCATORS



1. Unscrew Retainer Ring.



2. Pull off Indenter Die Assembly by hand.



3. Pull out the Locator by hand.

# AMT23B (M22520/23-01) Die & Locator Selection Chart

| M22520/23-01 INTERCHANGEABLE DIES AND LOCATORS |                   |            |
|------------------------------------------------|-------------------|------------|
| MIL #                                          | DESCRIPTION       | ASTRO #    |
| M22520/23-01                                   | Crimp Tool        | AMT23B     |
| M22520/23-02                                   | Die Assy. #8      | AMT23002DA |
| M22520/23-03                                   | Die Assy. #6      | AMT23003DA |
| M22520/23-04                                   | Die Assy. #4      | AMT23004DA |
| M22520/23-05                                   | Die Assy. #1/0    | AMT23005DA |
| M22520/23-06                                   | Die Assy. #2/0    | AMT23006DA |
| M22520/23-07                                   | Die Assy. #4/0    | AMT23007DA |
| M22520/23-09                                   | Locator #8        | AMT23009L  |
| M22520/23-10                                   | Locator #6        | AMT23010L  |
| M22520/23-11                                   | Locator #4        | AMT23011L  |
| M22520/23-12                                   | Locator #4,4N,4G  | AMT23012L  |
| M22520/23-13                                   | Locator #1/0      | AMT23013L  |
| M22520/23-14                                   | Locator #1/0,1/0N | AMT23014L  |
| M22520/23-15                                   | Locator #2/0,2/0N | AMT23015L  |
| M22520/23-16                                   | Locator #4/0,4/0N | AMT23016L  |

| DIE ASSEMBLY GAGING LIMITS |              |                   |       |
|----------------------------|--------------|-------------------|-------|
| Part #                     | Contact Size | Die Gaging Limits |       |
|                            |              | GO                | NO GO |
| AMT23002DA                 | 8            | .130              | .136  |
| AMT23003DA                 | 6            | .171              | .178  |
| AMT23004DA                 | 4            | .195              | .202  |
| AMT23005DA                 | 0            | .325              | .332  |
| AMT23006DA                 | 00           | .351              | .358  |
| AMT23007DA                 | 0000         | .425              | .432  |

| GAGES    |              |
|----------|--------------|
| GAGE #   | DIE ASSEMBLY |
| AMTG2302 | AMT23002DA   |
| AMTG2303 | AMT23003DA   |
| AMTG2304 | AMT23004DA   |
| AMTG2305 | AMT23005DA   |
| AMTG2306 | AMT23006DA   |
| AMTG2307 | AMT23007DA   |

| CONTACT LOCATORS |              |               |               |
|------------------|--------------|---------------|---------------|
| Part #           | Contact Size | MS Contact #  |               |
| AMT23009L        | 8            | M39029/29-8-8 | M39029/29-214 |
|                  |              | M39029/30-8-8 | M39029/30-220 |
|                  |              | MS90453-8-8   | M39029/44-291 |
|                  |              | MS90454-8-8   | M39029/45-298 |
| AMT23010L        | 6            | MS90559-11    | M39029/48-317 |
|                  | 6N           | MS90559-12    | M39029/48-318 |
|                  | 6G           | MS90559-14    | M39029/48-319 |
|                  | 6            | MS90560-7     | M39029/49-329 |
|                  | 6G           | MS90560-8     | M39029/49-330 |
| AMT23011L        | 4            | M39029/29-4-4 | M39029/29-215 |
|                  |              | M39029/30-4-4 | M39029/30-221 |
|                  |              | MS90453-4-4   | M39029/44-292 |
|                  |              | MS90454-4-4   | M39029/45-299 |
| AMT23012L        | 4            | MS90559-8     | M39029/48-320 |
|                  | 4N           | MS90559-9     | M39029/48-321 |
|                  | 4G           | MS90559-13    | M39029/48-322 |
|                  | 4            | MS90560-5     | M39029/49-331 |
|                  | 4G           | MS90560-9     | M39029/49-332 |
| AMT23013L        | 1/0          | M39029/29-0-0 | M39029/29-216 |
|                  |              | M39029/30-0-0 | M39029/30-222 |
|                  |              | MS90453-0-0   | M39029/44-293 |
| AMT23014L        | 1/0          | MS90559-5     | M39029/48-323 |
|                  | 1/0N         | MS90559-6     | M39029/48-324 |
|                  | 1/0          | MS90560-3     | M39029/49-333 |
| AMT23015L        | 2/0          | MS90559-3     | M39029/48-325 |
|                  | 2/0N         | MS90559-4     | M39029/48-326 |
|                  | 2/0          | MS90560-2     | M39029/49-334 |
| AMT23016L        | 4/0          | MS90559-1     | M39029/48-327 |
|                  | 4/0N         | MS90559-2     | M39029/48-328 |
|                  | 4/0          | MS90560-1     | M39029/49-335 |

# Miniature Adjustable Crimp Tool 612596 (MS3198-1)

- 8 indent crimp
- Uses bayonet-style positioners
- Dial selectable
- Cycle controlled

The **Astro 612596** meets performance requirements for MS3198-1 and M22520/34-01. This lightweight compact tool uses MS3198, M22520/34, M22520/2 and proprietary bayonet-style positioners to crimp most pin and socket contacts smaller than size 20 to wires size 20 AWG and smaller.

The **612596** is step-adjustable to eight preselected crimp depths. The correct crimp depth is determined by using the data plate located on each positioner. This tool utilizes the same positive ratchet found on other Astro crimpers, which requires the completion of a crimp cycle before the handles will return to their open position. This feature ensures the integrity of every crimp.

Astro recommends the periodic gaging of all its crimping tools. For this purpose Astro offers the M22520/3-1 (615716) gage with the tool in the number 8 selector position. For use on M22520/34-01 applications Astro recommends using the M22520/35 (621064) gage with the crimp depth selector set on the number 6 setting.



**For contacts not listed, please consult factory for proper tooling.**

## Contacts for Connector Families: MIL-C-26482 Series II, MIL-C-81703 Series III, MIL-C-83723 Series III, MIL-C-83733

| Military Part #                        | BIN Code           | Supersedes Military Part #                    | Style: Pin or Socket | Mating End Size | Wire Barrel Size | Positioner/Turret Part # | Astro Positioner # |
|----------------------------------------|--------------------|-----------------------------------------------|----------------------|-----------------|------------------|--------------------------|--------------------|
| M39029/4-110                           | 110                | M83723-33B20<br>M39029/4-20-20                | PIN                  | 20              | 20               |                          |                    |
| M39029/5-115                           | 115                | M83723-34B20<br>M39029/5-20-20                | SKT                  | 20              | 20               | M22520/2-02              | 615718             |
| M39029/9-132<br>THRU<br>M39029/9-136   | 132 THRU<br>136    | M39029/9-20-20C1<br>THRU M39029/9-20-20C5     | PIN                  | 20              | 20               | MS3198-1P<br>MS3198-1PA  | 612759<br>613382   |
| M39029/10-138<br>THRU<br>M39029/10-142 | 138<br>THRU<br>142 | M39029/9-20-20C1<br>THRU<br>M39029/10-20-20C5 | SKT                  | 20              | 20               |                          |                    |

## Contacts for Connector Family: MIL-C-28840

| Military Part # | BIN Code | Supersedes Military Part # | Style: Pin or Socket | Mating End Size | Wire Barrel Size | Positioner/Turret Part # | Astro Positioner # |
|-----------------|----------|----------------------------|----------------------|-----------------|------------------|--------------------------|--------------------|
| M39029/83-450   | 450      | M39029/83-20-22            | PIN                  | 20              | 22               | M22520/34-02             | 620636             |
| M39029/83-451   | 451      | M39029/83-20-28            | PIN                  | 20              | 28               | M22520/34-02             | 620636             |
| M39029/84-452   | 452      | M39029/84-20-22            | SKT                  | 20              | 22               | M22520/34-02             | 620636             |
| M39029/84-453   | 453      | M39029/84-20-28            | SKT                  | 20              | 28               | M22520/34-02             | 620636             |

## Contacts for Connector Family: MIL-C-21097

| Military Part # | BIN Code | Supersedes Military Part # | Style: Pin or Socket | Mating End Size | Wire Barrel Size | Positioner/Turret Part # | Astro Positioner # |
|-----------------|----------|----------------------------|----------------------|-----------------|------------------|--------------------------|--------------------|
| M39029/9-01     | --       | ----                       | SKT                  | 20              | 20               | MS3196-4P                | 613023             |



# 612596 (MS3198-1) Positioner Selection Charts

| Contacts for Connector Families: MIL-C-38999 Series I, II, III, IV, MIL-C-83733, MIL-C-24308 & MIL-C-55302/68/69/71/72/75 |          |                                           |                      |                 |                  |                              |                    |
|---------------------------------------------------------------------------------------------------------------------------|----------|-------------------------------------------|----------------------|-----------------|------------------|------------------------------|--------------------|
| Military Part #                                                                                                           | BIN Code | Supersedes Military Part #                | Style: Pin or Socket | Mating End Size | Wire Barrel Size | Positioner/<br>Turret Part # | Astro Positioner # |
| M39029/58-360                                                                                                             | 360      | MS27494-22D<br>MS27493-22D<br>M24308/13-1 | PIN                  | 22              | 22D              | M22520/2-09                  | 615725             |
| M39029/58-361                                                                                                             | 361      | MS27494-22M<br>MS27493-22M                | PIN                  | 22              | 22M              | MS3196-8P                    | 613642             |
| M39029/58-362                                                                                                             | 362      | MS27494-22<br>MS27493-22                  | PIN                  | 22              | 22               |                              |                    |
| M39029/57-354                                                                                                             | 354      | MS27492-22D<br>MS27491-22D<br>M24308/12-1 | SKT                  | 22              | 22D              | M22520/2-06                  | 615722             |
| M39029/57-355                                                                                                             | 355      | MS27492-22M<br>MS27491-22M                | SKT                  | 22              | 22M              | MS3196-6P                    | 613640             |
| M39029/58-363                                                                                                             | 363      | MS27494-20<br>MS27493-20                  | PIN                  | 20              | 20               | M22520/2-10<br>MS3196-9P     | 615726<br>613643   |
| M39029/57-357                                                                                                             | 357      | MS27492-20<br>MS27491-20                  | SKT                  | 20              | 20               | M22520/2-10<br>MS3196-9P     | 615726<br>613643   |

| Contacts for Connector Family: MIL-C-38999 Series I, III, IV |          |                            |                      |                 |                  |                              |                    |
|--------------------------------------------------------------|----------|----------------------------|----------------------|-----------------|------------------|------------------------------|--------------------|
| Military Part #                                              | BIN Code | Supersedes Military Part # | Style: Pin or Socket | Mating End Size | Wire Barrel Size | Positioner/<br>Turret Part # | Astro Positioner # |
| M39029/56-349                                                | 349      | MS27490-22M                | SKT                  | 22              | 22M              | M22520/2-07                  | 615723             |
| M39029/56-350                                                | 350      | MS27490-22                 | SKT                  | 22              | 22               | MS3198-7P                    | 613641             |
| M39029/56-351                                                | 351      | MS27655-30<br>MS27490-20   | SKT                  | 20              | 20               | M22520/2-10<br>MS3196-9P     | 615726<br>613643   |

| Contacts for Connector Family: MIL-C-81511 Series I & II |          |                            |                      |                 |                  |                              |                    |
|----------------------------------------------------------|----------|----------------------------|----------------------|-----------------|------------------|------------------------------|--------------------|
| Military Part #                                          | BIN Code | Supersedes Military Part # | Style: Pin or Socket | Mating End Size | Wire Barrel Size | Positioner/<br>Turret Part # | Astro Positioner # |
| M39029/46-303                                            | 303      | MS90460 A23-22             | PIN                  | 23              | 22               | MS3196-2PA<br>MS3196-2P      | 613381<br>612760   |
| M39029/46-304                                            | 304      | MS90460 B23-22             | SKT                  | 23              | 22               |                              |                    |
| M39029/47-313                                            | 313      | MS90461 A23-22             | PIN                  | 23              | 22               |                              |                    |
| M39029/47-314                                            | 314      | MS90461 B23-22             | SKT                  | 23              | 22               |                              |                    |

| Contacts for Connector Family: MIL-C-26500 |          |                            |                      |                 |                  |                                      |                          |
|--------------------------------------------|----------|----------------------------|----------------------|-----------------|------------------|--------------------------------------|--------------------------|
| Military Part #                            | BIN Code | Supersedes Military Part # | Style: Pin or Socket | Mating End Size | Wire Barrel Size | Positioner/<br>Turret Part #         | Astro Positioner #       |
| M39029/31-241                              | 241      | MS24254-20P                | PIN                  | 20              | 20               | M22520/2-02<br>MS3196-1P, MS3196-1PA | 615718<br>612759, 613382 |
| M39029/32-260                              | 260      | MS24255-20S                | SKT                  | 20              | 20               | M22520/2-02<br>MS3198-1P, MS3198-1PA | 615718<br>612759, 613382 |

**BIN** (Basic identification number) code color bands, reading in sequence from wire barrel end of the contact. Each digit of the BIN code shall be designated on the contact by a color band in accordance with the following:

0-Black 2-Red 4-Yellow 6-Blue 8-Gray  
1-Brown 3-Orange 5-Green 7-Violet 9-White



# Standard Self-Adjusting Crimp Tool MS3191



- 4 or 8 indent
- Cycle controlled ratchet
- No dial adjustment required

| Description    | MS Designation | Astro Cat. # |
|----------------|----------------|--------------|
| Frame Assembly | MS3191-A       | 11210        |
| Crimp Tool     | MS3191-1       | 10692        |
| Crimp Tool     | MS3191-2       | 11234        |
| Positioner     | MS3191-20A     | 11062        |
| Positioner     | MS3191-16A     | 2520-3       |
| Positioner     | MS3191-12A     | 2520-4       |
| Positioner     | MS3191-20B     | 10854-1      |
| Positioner     | MS3191-16B     | 10854-2      |

The **MS3191** series of tools still continue to set a standard of excellence for crimping tools. This series of crimping tools is one of the easiest to use. Simply selecting the proper positioner determines the crimp depth, crimp location and point of ratchet release.

The four or eight indent crimp provides a uniform displacement of wire and contact material, on contact sizes 12-20 and wire sizes 12-26 AWG.

As with all Astro pin and socket crimp tools, the **MS3191** series tools can be ordered with a variety of indenter configurations, including octadent (tool part number: 612600).

A large selection of positioners is available for this tool. If we do not have a positioner to meet your special needs, Astro will custom design and

manufacture positioners for you. Various tool-positioner combination packages are available. Extra positioners are conveniently stored in the tool handle. (See chart for details.)

A gage kit (part number ATK 6000 [MS3196-2]) is available for the recommended periodic gaging.

This tool weighs approximately 20 ounces and is 9½ inches long.

The following MS contacts can be crimped with the MS3191-A frame assembly when used with the positioners specified:

**For Locators in addition to those listed please consult factory.**

| Crimp Tool Assembly Part No . | Consists of         |                                        |
|-------------------------------|---------------------|----------------------------------------|
|                               | Crimp Tool Frame    | Positioners                            |
| MS3191-1<br>(10692)           | MS3191-A<br>(11210) | MS3191-20A<br>MS3191-16A<br>MS3191-12A |
| MS3191-2<br>(11234)           | MS3191-A<br>(11210) | MS3191-20B<br>MS3191-16B               |

| Astro Locator Part # . | Locator MS Designation |
|------------------------|------------------------|
| 11062                  | MS3191-20A             |
| 2520-3                 | MS3191-16A             |
| 2520-4                 | MS3191-12A             |
| 10854-1                | MS3191-20B             |
| 10854-2                | MS3191-16B             |
| 3538-3                 | MS3191-20C             |
| 11045-1                | MS3191-22D             |
| 11045-2                | MS3191-16D             |



# 8-Step Adjustable Crimp Tool EUS309



- 8 indent crimp
- Dial selectable
- Cycle controlled ratchet
- Lightweight and easy to use
- Uses bayonet positioners

## Gaging Information (Dimension in Inches)

| Selector Setting # | Go Size<br>.0001 | No Go Size<br>.0001 |
|--------------------|------------------|---------------------|
| 1                  | .0360            | .0410               |
| 2                  | .0450            | .0500               |
| 3                  | .0520            | .0570               |
| 4                  | .0610            | .0660               |
| 5                  | .0690            | .0740               |
| 6                  | .0760            | .0810               |
| 7                  | .0860            | .0950               |
| 8                  | .1000            | .1100               |

The **ASTRO EUS309** is used to crimp powered D sub contacts but is not limited to this function.

It is an 8 step adjustable crimp tool, cycled controlled and capable of crimping wire barrel sizes 12-20. Its crimp range is slightly larger than that of the 615708 (M22520/1-01) and utilizes the same basic components.

It has a distinctive red look and is the same size and weight as the 615708 (9¼ inches long, approximately 20 ounces).

Various turrets and single head positioners are available upon consulting the factory.

Astro recommends periodic gaging with a P/N EUS309-G.

# Mil Spec Crimp Tool Selection Charts

| VENDOR (CAGE)<br>CONNECTOR<br>SERIES AND<br>TYPE                                                                             | BASIC<br>CONNECTOR<br>PART # | CONTACT PART # | PIN<br>OR<br>SKT | COLOR BANDS |     |     | BIN<br>CODE | CONTACT SIZE  |                | WIRE<br>RANGE<br>OR<br>CABLE | CONTACT<br>GAGE | CRIMP<br>TOOL            | ACCESSORY               | INSTALLATION<br>TOOL                             | REMOVAL<br>TOOL                                     | REMOVAL<br>TOOL<br>(UNWIRED<br>CONTACTS) |        |
|------------------------------------------------------------------------------------------------------------------------------|------------------------------|----------------|------------------|-------------|-----|-----|-------------|---------------|----------------|------------------------------|-----------------|--------------------------|-------------------------|--------------------------------------------------|-----------------------------------------------------|------------------------------------------|--------|
|                                                                                                                              |                              |                |                  | 1st         | 2nd | 3rd |             | MATING<br>END | WIRE<br>BARREL |                              |                 |                          |                         |                                                  |                                                     |                                          |        |
| MIL-C-5015<br><br>MS 3400"<br>SERIES<br><br>CIRCULAR<br><br><br>THREADED<br>COUPLING<br><br><br>FRONT<br>RELEASE<br>CONTACTS | MS3400 ( )                   | M39029/44-287  | P                | RED         | GRA | VIO | 287         | 16            | 22             | 22-26                        | AT 0016         | 615708<br>--OR<br>616336 | 615709<br>(BLUE)        | ATML 1701                                        | ATML 1901B                                          | ATML 1901B                               |        |
|                                                                                                                              |                              | M39029/45-294  | S                | RED         | WHI | YEL | 294         |               |                |                              |                 |                          |                         |                                                  |                                                     |                                          |        |
|                                                                                                                              |                              | MS3401 ( )     | M39029/44-288    | P           | RED | GRA | GRA         | 288           | 16             | 16                           |                 |                          | 16-20                   |                                                  |                                                     |                                          | 616328 |
|                                                                                                                              |                              |                | M39029/45-295    | S           | RED | WHI | GRN         | 295           |                |                              |                 |                          |                         |                                                  |                                                     |                                          |        |
|                                                                                                                              | MS3402 ( )                   | M39029/44-289  | P                | RED         | GRA | WHI | 289         | 12            | 16             | 16-20                        | AT 0012         | 615708                   | 615709<br>(YELLOW)      | ATML 1702                                        | ATML 1902B                                          | ATML 1902B                               |        |
|                                                                                                                              |                              | M39029/45-296  | S                | RED         | WHI | BLU | 296         |               |                |                              |                 |                          |                         |                                                  |                                                     |                                          |        |
|                                                                                                                              | MS3404 ( )                   | M39029/44-290  | P                | RED         | WHI | BLK | 290         | 12            | 12             | 12-14                        |                 |                          |                         |                                                  |                                                     |                                          |        |
|                                                                                                                              |                              | M39029/45-297  | S                | RED         | WHI | VIO | 297         |               |                |                              |                 |                          |                         |                                                  |                                                     |                                          |        |
|                                                                                                                              | MS3406( )                    | M39029/44-291  | P                | RED         | WHI | BRN | 291         | 8             | 8              | 8-10                         | --              | AMT23B                   | AMT23002DA<br>AMT23009L | --                                               | ATML 1903B                                          | ATML 1903B                               |        |
|                                                                                                                              |                              | M39029/45-298  | S                | RED         | WHI | GRA | 298         |               |                |                              |                 |                          |                         |                                                  |                                                     |                                          |        |
|                                                                                                                              | MS3408 ( )                   | M39029/44-292  | P                | RED         | WHI | RED | 292         | 4             | 4              | 4-6                          |                 |                          | AMT23004DA<br>AMT23011L | --                                               | ATML 1904B                                          | ATML 1904B                               |        |
|                                                                                                                              |                              | M39029/45-299  | S                | RED         | WHI | WHI | 299         |               |                |                              |                 |                          |                         |                                                  |                                                     |                                          |        |
|                                                                                                                              | MS3409 ( )                   | M39029/44-293  | P                | RED         | WHI | ORN | 293         | 0             | 0              | 0-2                          |                 |                          | AMT23005DA<br>AMT23013L | --                                               | ATML 1905B                                          | ATML 1905B                               |        |
|                                                                                                                              |                              | M39029/45-300  | S                | ORN         | BLK | BLK | 300         |               |                |                              |                 |                          |                         |                                                  |                                                     |                                          |        |
| MIL-C-5015<br><br>MS3450"<br>SERIES<br><br>CIRCULAR<br><br>THREADED<br>COUPLING<br><br><br>REAR<br>RELEASE<br>CONTACTS       | MS3450 ( )                   | M39029/30-217  | S                | RED         | BRN | VIO | 217         | 16S           | 16             | 16-20                        | AT 0016         | 615708                   | 615709<br>(BLUE)        | ATML 08207B<br>OR ATR<br>1105 OR<br>M81969/14-03 | ATML 08208B<br>OR<br>ATR 2112<br>OR<br>M81969/14-03 | M81969/30<br>HANDLE<br>WITH<br>ATML 3006 |        |
|                                                                                                                              |                              | M39029/29-212  | P                | RED         | BRN | RED | 212         | 16            | 16             |                              |                 | OR<br>616336             | 616328                  |                                                  |                                                     |                                          |        |
|                                                                                                                              | MS3451 ( )                   | M39029/30-218  | S                | RED         | BRN | GRA | 218         | 12            | 12             | 12-14                        | AT 0012         | 615708                   | 615709<br>(YELLOW)      | ATR 1153 OR<br>M81969/14-04<br>OR<br>ATML 08209B | ATR 2160 OR<br>M81969/14-04<br>OR<br>ATML 08210B    | M81969/30<br>HANDLE<br>WITH<br>ATML 3007 |        |
|                                                                                                                              |                              | M39029/29-213  | P                | RED         | BRN | ORN | 213         |               |                |                              |                 |                          |                         |                                                  |                                                     |                                          |        |
|                                                                                                                              | MS3452( )                    | M39029/30-219  | S                | RED         | BRN | WHI | 219         | 8             | 8              | 8-10                         | --              | AMT23B                   | AMT23002DA<br>AMT23009L | --                                               | ATML 1501 OR<br>M81969/29-02                        | --                                       |        |
|                                                                                                                              |                              | M39029/29-214  | P                | RED         | BRN | YEL | 214         |               |                |                              |                 |                          |                         |                                                  |                                                     |                                          |        |
|                                                                                                                              | MS3454 ( )                   | M39029/30-220  | S                | RED         | RED | BLK | 220         | 4             | 4              | 4-6                          |                 |                          | AMT23004DA<br>AMT23011L | --                                               | ATML 1502<br>M81969/29-03                           | --                                       |        |
|                                                                                                                              |                              | M39029/29-215  | P                | RED         | BRN | GRN | 215         |               |                |                              |                 |                          |                         |                                                  |                                                     |                                          |        |
|                                                                                                                              | MS3456 ( )                   | M39029/30-221  | S                | RED         | RED | BRN | 221         | 0             | 0              | 0-2                          |                 |                          | AMT23005DA<br>AMT23013L | --                                               | ATML 1503 OR<br>M81969/29-04                        |                                          |        |
|                                                                                                                              |                              | M39029/29-216  | P                | RED         | BRN | BLU | 216         |               |                |                              |                 |                          |                         |                                                  |                                                     |                                          |        |
|                                                                                                                              | MS3459 ( )                   | M39029/30-222  | S                | RED         | RED | RED | 222         |               |                |                              |                 |                          |                         |                                                  |                                                     |                                          |        |

**BIN** (Basic identification number) code color bands, reading in sequence from wire barrel end of the contact. Each digit of the BIN code shall be designated on the contact by a color band in accordance with the following:

0-Black 2-Red 4-Yellow 6-Blue 8-Gray  
1-Brown 3-Orange 5-Green 7-Violet 9-White



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# Mil Spec Crimp Tool Selection Charts

| VENDOR (CAGE)<br>CONNECTOR<br>SERIES AND<br>TYPE                                                                                                                                                                                                       | BASIC<br>CONNECTOR<br>PART #                                                                                                            | CONTACT<br>PART # | PIN<br>OR<br>SKT | COLOR BANDS |     |     | BIN<br>CODE | CONTACT SIZE  |                | WIRE<br>RANGE OR<br>CABLE | CONTACT<br>GAGE | CRIMP<br>TOOL                          | ACCESSORY                                       | INSTALLATION<br>TOOL                                 | REMOVAL<br>TOOL                                      | REMOVAL TOOL<br>(UNWIRED<br>CONTACTS)             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------|-------------|-----|-----|-------------|---------------|----------------|---------------------------|-----------------|----------------------------------------|-------------------------------------------------|------------------------------------------------------|------------------------------------------------------|---------------------------------------------------|
|                                                                                                                                                                                                                                                        |                                                                                                                                         |                   |                  | 1st         | 2nd | 3rd |             | MATING<br>END | WIRE<br>BARREL |                           |                 |                                        |                                                 |                                                      |                                                      |                                                   |
| MILITARY<br>SPECS<br><br>MIL-C-38999<br><br>CIRCULAR<br><br>REAR<br>RELEASE<br><br>CONTACTS<br><br>SERIES I<br><br>SCOOP-<br>PROOF<br><br>BAYONET<br><br>COUPLING<br><br><br><br><br>SERIES II<br><br>LOW<br>SILHOUETTE<br><br>BAYONET<br><br>COUPLING | SERIES I<br><br>MS27466 ( )<br><br>MS27467 ( )<br><br>MS27468 ( )<br><br>MS27496 ( )                                                    | M39029/58-360     | P                | ORN         | BLU | BLK | 360         | 22            | 22D            | 22-28                     | AT 0022         | 615717<br>or<br>616336                 | 615725<br>or<br>616332                          | ATML 0801B<br><br>OR<br><br>M81969/14-01<br>(GREEN)  | ATML 0802B<br><br>OR<br><br>M81969/14-01<br>(WHITE)  | ATK 2005<br><br>WITH<br>(BLACK)<br>ATK2005-22D-1  |
|                                                                                                                                                                                                                                                        |                                                                                                                                         |                   | LS               | ORN         | YEL | GRA | 348         |               |                |                           |                 | 615717<br>or<br>616336                 | 615723<br>or<br>616330                          |                                                      |                                                      |                                                   |
|                                                                                                                                                                                                                                                        |                                                                                                                                         |                   | SS               | ORN         | GRN | YEL | 354         |               |                |                           |                 | 615717<br>or<br>616336                 | 615722<br>or<br>616331                          |                                                      |                                                      |                                                   |
|                                                                                                                                                                                                                                                        |                                                                                                                                         |                   | P                | ORN         | BLU | BRN | 361         | 22            | 22M            | 24-28                     |                 | 615717<br>or<br>616336                 | 615725<br>or<br>616332                          |                                                      |                                                      |                                                   |
|                                                                                                                                                                                                                                                        | MS27653 ( )<br><br>MS27654 ( )<br><br>MS27656 ( )<br><br>MS27661 ( )                                                                    | M39029/56-349     | LS               | ORN         | YEL | WHI | 349         |               |                |                           |                 | 615717<br>or<br>616336                 | 615723<br>or<br>616330                          |                                                      |                                                      |                                                   |
|                                                                                                                                                                                                                                                        |                                                                                                                                         |                   | SS               | ORN         | GRN | GRN | 355         |               |                |                           |                 | 615717<br>or<br>616336                 | 615722<br>or<br>616331                          |                                                      |                                                      |                                                   |
|                                                                                                                                                                                                                                                        |                                                                                                                                         |                   | P                | ORN         | BLU | RED | 362         | 22            | 22             | 22-26                     |                 | 615717<br>or<br>616336                 | 615725<br>or<br>616332                          |                                                      |                                                      | ATK 2005<br><br>WITH (BROWN)<br>ATK 2005-22-1     |
|                                                                                                                                                                                                                                                        |                                                                                                                                         |                   | LS               | ORN         | GRN | BLK | 350         |               |                |                           |                 | 615717<br>or<br>616336                 | 615723<br>or<br>616330                          |                                                      |                                                      |                                                   |
|                                                                                                                                                                                                                                                        | SERIES II<br><br>MS27472 ( )<br><br>MS27473 ( )<br><br>MS27474 ( )<br><br>MS27479 ( )                                                   | M39029/57-356     | SS               | ORN         | GRN | BLU | 356         |               |                |                           |                 | 615717<br>or<br>616336                 | 615722<br>or<br>616331                          |                                                      |                                                      |                                                   |
|                                                                                                                                                                                                                                                        |                                                                                                                                         |                   | P                | ORN         | BLU | ORN | 363         | 20            | 20             | 20-24                     | AT 0020         | 615708<br>or<br>615717<br>or<br>616336 | 615711<br>(RED)<br>or<br>615726<br>or<br>616333 | ATML 0805B<br><br>OR<br><br>M81969/14-10<br>(RED)    | ATML 0806B<br><br>OR<br><br>M81969/14-10<br>(ORANGE) | ATK 2005<br><br>WITH (RED)<br>ATK 2005-20-1       |
|                                                                                                                                                                                                                                                        |                                                                                                                                         |                   | LS               | ORN         | GRN | BRN | 351         |               |                |                           |                 |                                        |                                                 |                                                      |                                                      |                                                   |
|                                                                                                                                                                                                                                                        |                                                                                                                                         |                   | SS               | ORN         | GRN | VIO | 357         |               |                |                           |                 |                                        |                                                 |                                                      |                                                      |                                                   |
|                                                                                                                                                                                                                                                        |                                                                                                                                         |                   |                  |             |     |     |             |               |                |                           |                 |                                        |                                                 |                                                      |                                                      |                                                   |
|                                                                                                                                                                                                                                                        | SERIES III<br><br>D38999/20 ( )<br><br>D38999/24 ( )<br><br>D38999/26 ( )<br><br>D38999/29 ( )<br><br>D38999/30 ( )                     | M39029/58-364     | P                | ORN         | BLU | YEL | 364         | 16            | 16             | 16-20                     | AT 0016         | 615708<br>or<br>616336                 | 615711<br>(BLUE)<br>or<br>616329                | ATML 0807BB<br><br>OR<br><br>M81969/14-03<br>(BLUE)  | ATML080B<br><br>OR<br><br>M81969/14-03<br>(WHITE)    | ATK 2005<br><br>WITH (BLUE) ATK<br>2005-16-1      |
|                                                                                                                                                                                                                                                        |                                                                                                                                         |                   | LS               | ORN         | GRN | RED | 352         |               |                |                           |                 |                                        |                                                 |                                                      |                                                      |                                                   |
|                                                                                                                                                                                                                                                        |                                                                                                                                         |                   | SS               | ORN         | GRN | GRA | 358         |               |                |                           |                 |                                        |                                                 |                                                      |                                                      |                                                   |
|                                                                                                                                                                                                                                                        |                                                                                                                                         |                   |                  |             |     |     |             |               |                |                           |                 |                                        |                                                 |                                                      |                                                      |                                                   |
|                                                                                                                                                                                                                                                        | SERIES IV<br><br>D38999/40 ( )<br><br>D38999/42 ( )<br><br>D38999/44 ( )<br><br>D38999/46 ( )<br><br>D38999/47 ( )<br><br>D38999/49 ( ) | M39029/58-365     | P                | ORN         | BLU | GRN | 365         | 12            | 12             | 12-14                     | AT 0012         | 615708                                 | 615711<br>(YELLOW)                              | ATML 0809B<br><br>OR<br><br>M81969/14-04<br>(YELLOW) | ATML 0810B<br><br>OR<br><br>M81969/14-04<br>(WHITE)  | ATK 2005<br><br>WITH<br>(YELLOW)<br>ATK 2005-12-1 |
|                                                                                                                                                                                                                                                        |                                                                                                                                         |                   | LS               | ORN         | GRN | ORN | 353         |               |                |                           |                 |                                        |                                                 |                                                      |                                                      |                                                   |
|                                                                                                                                                                                                                                                        |                                                                                                                                         |                   | SS               | ORN         | GRN | WHI | 359         |               |                |                           |                 |                                        |                                                 |                                                      |                                                      |                                                   |
|                                                                                                                                                                                                                                                        |                                                                                                                                         |                   |                  |             |     |     |             |               |                |                           |                 |                                        |                                                 |                                                      |                                                      |                                                   |
|                                                                                                                                                                                                                                                        |                                                                                                                                         |                   |                  |             |     |     |             |               |                |                           |                 |                                        |                                                 |                                                      |                                                      |                                                   |
|                                                                                                                                                                                                                                                        |                                                                                                                                         |                   |                  |             |     |     |             |               |                |                           |                 |                                        |                                                 |                                                      |                                                      |                                                   |

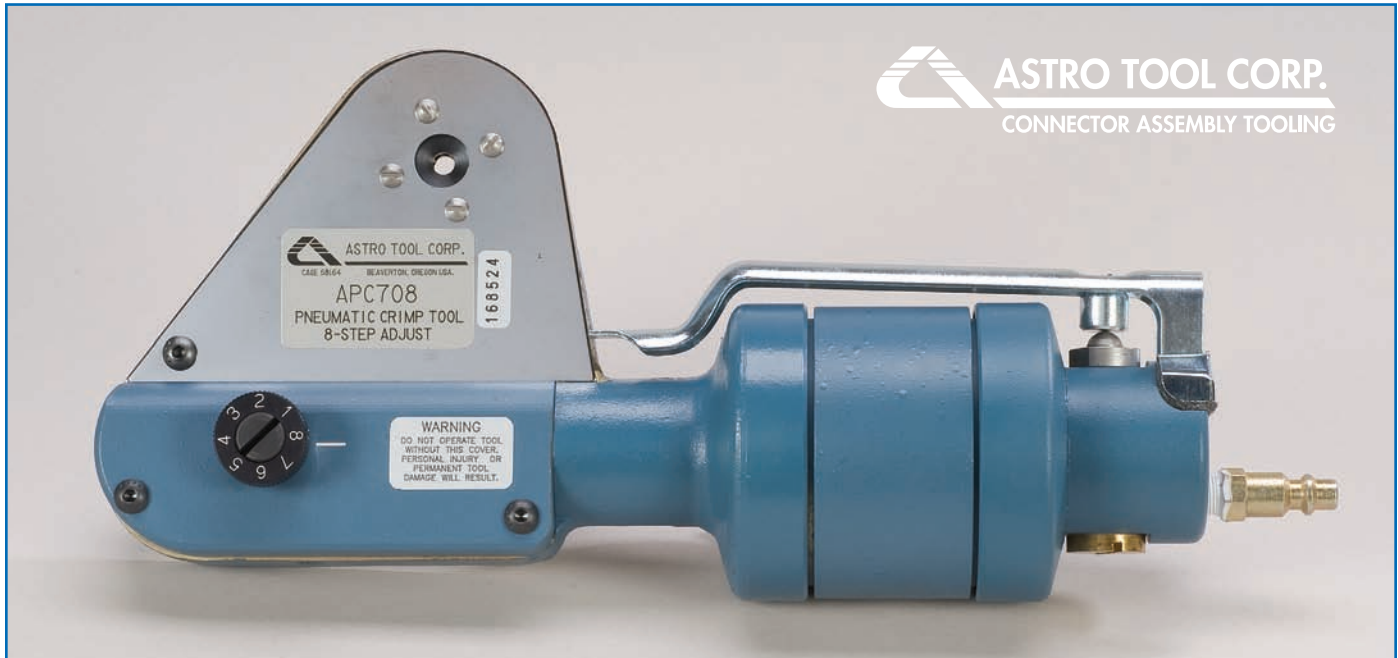


| VENDOR (CAGE)<br>CONNECTOR<br>SERIES AND<br>TYPE                                                                    | BASIC<br>CONNECTOR<br>PART # | CONTACT<br>PART # | PIN<br>OR<br>SKT | COLOR BANDS |     |     | BIN<br>CODE | CONTACT SIZE  |                | WIRE<br>RANGE<br>OR<br>CABLE | CONTACT<br>GAGE | CRIMP<br>TOOL | ACCESSORY  | INSTALLATION<br>TOOL | REMOVAL<br>TOOL | REMOVAL TOOL<br>(UNWIRED<br>CONTACTS) |
|---------------------------------------------------------------------------------------------------------------------|------------------------------|-------------------|------------------|-------------|-----|-----|-------------|---------------|----------------|------------------------------|-----------------|---------------|------------|----------------------|-----------------|---------------------------------------|
|                                                                                                                     |                              |                   |                  | 1st         | 2nd | 3rd |             | MATING<br>END | WIRE<br>BARREL |                              |                 |               |            |                      |                 |                                       |
| MIL-C-83723<br><br>SERIES II<br><br>CIRCULAR<br><br>THREADED<br><br>COUPLING<br><br>REAR<br>RELEASE<br><br>CONTACTS | M83723/17 ( )                | M39029/29-212     | P                | RED         | BRN | RED | 212         | 16            | 16             | 16-20                        | AT 0016         | 615708        | 615709     | ATML 08207B          | ATML 08208B     | M81969/30                             |
|                                                                                                                     | M83723/18 ( )                | M39029/30-217     | S                | RED         | BRN | VIO | 217         | 16S           |                |                              |                 |               |            | OR                   | OR              | HANDLE                                |
|                                                                                                                     | M83723/19 ( )                | M39029/30-218     | S                | RED         | BRN | GRA | 218         | 16            |                |                              |                 |               |            | M81969/14-03         | M81969/14-03    | WITH                                  |
|                                                                                                                     | M83723/20 ( )                | M39029/85-454     | P                | YEL         | GRN | YEL | 454         |               |                |                              |                 |               |            | OR                   | OR              | ATML 3006                             |
|                                                                                                                     | M83723/21 ( )                | M39029/85-455     | P                | YEL         | GRN | GRN | 455         |               |                |                              |                 |               |            | ATR 1105             | ATR 2112        | (BLUE)                                |
|                                                                                                                     | M83723/22 ( )                | M39029/85-456     | P                | YEL         | GRN | BLU | 456         |               |                |                              |                 |               |            |                      |                 |                                       |
|                                                                                                                     | M83723/23 ( )                | M39029/85-457     | P                | YEL         | GRN | VIO | 457         |               |                |                              |                 |               |            |                      |                 |                                       |
|                                                                                                                     | M83723/24 ( )                | M39029/86-462     | S                | YEL         | BLU | RED | 462         |               |                |                              |                 |               |            |                      |                 |                                       |
|                                                                                                                     | M83723/52 ( )                | M39029/86-463     | S                | YEL         | BLU | ORN | 463         |               |                |                              |                 |               |            |                      |                 |                                       |
|                                                                                                                     | M83723/53 ( )                | M39029/86-464     | S                | YEL         | BLU | YEL | 464         |               |                |                              |                 |               |            |                      |                 |                                       |
|                                                                                                                     |                              | M39029/86-465     | S                | YEL         | BLU | GRN | 465         |               |                |                              |                 |               |            |                      |                 |                                       |
|                                                                                                                     |                              | M39029/29-213     | P                | RED         | BRN | ORN | 213         | 12            | 12             | 12-14                        | AT 0012         |               |            | ATML 08209B          | ATML 08210B     | M81969/30                             |
|                                                                                                                     |                              | M39029/30-219     | S                | RED         | BRN | WHI | 219         |               |                |                              |                 |               |            | OR                   | OR              | HANDLE                                |
|                                                                                                                     |                              | M39029/85-458     | P                | YEL         | GRN | GRA | 458         |               |                |                              |                 |               |            | M81969/14-04         | M81969/14-04    | WITH                                  |
|                                                                                                                     |                              | M39029/85-459     | P                | YEL         | GRN | WHI | 459         |               |                |                              |                 |               |            | OR                   | OR              | ATML 3007                             |
|                                                                                                                     |                              | M39029/85-460     | P                | YEL         | BLU | BLK | 460         |               |                |                              |                 |               |            | ATR 1153             | ATR 2160        | (YELLOW)                              |
|                                                                                                                     |                              | M39029/85-461     | P                | YEL         | BLU | BRN | 461         |               |                |                              |                 |               |            |                      |                 |                                       |
|                                                                                                                     |                              | M39029/86-466     | S                | YEL         | BLU | BLU | 466         |               |                |                              |                 |               |            |                      |                 |                                       |
|                                                                                                                     |                              | M39029/86-467     | S                | YEL         | BLU | VIO | 467         |               |                |                              |                 |               |            |                      |                 |                                       |
|                                                                                                                     |                              | M39029/86-468     | S                | YEL         | BLU | GRA | 468         |               |                |                              |                 |               |            |                      |                 |                                       |
|                                                                                                                     |                              | M39029/86-469     | S                | YEL         | BLU | WHI | 469         |               |                |                              |                 |               |            |                      |                 |                                       |
|                                                                                                                     |                              | M39029/29-214     | P                | RED         | BRN | YEL | 214         | 8             | 8              | 8-10                         | --              | AMT23B        | AMT23002DA | NOT<br>NEEDED        | M81969/29-02    |                                       |
|                                                                                                                     |                              | M39029/30-220     | S                | RED         | RED | BLK | 220         |               |                |                              |                 |               | AMT23009L  |                      |                 |                                       |
|                                                                                                                     |                              | M39029/29-215     | P                | RED         | BRN | GRN | 215         | 4             | 4              | 4-6                          | --              |               | AMT23004DA |                      | M81969/29-03    |                                       |
|                                                                                                                     |                              | M39029/30-221     | S                | RED         | RED | BRN | 221         |               |                |                              |                 |               | AMT23011L  |                      |                 |                                       |
|                                                                                                                     |                              | M39029/29-216     | P                | RED         | BRN | BLU | 216         | 0             | 0              | 0-2                          | --              |               | AMT23005DA |                      | M81969/29-04    |                                       |
|                                                                                                                     |                              | M39029/30-222     | S                | RED         | RED | RED | 222         |               |                |                              |                 |               | AMT23013L  |                      |                 |                                       |

# Mil Spec Crimp Tool Selection Charts

| VENDOR (CAGE)<br>CONNECTOR<br>SERIES AND<br>TYPE                                        | BASIC<br>CONNECTOR<br>PART # | CONTACT<br>PART # | PIN<br>OR<br>SKT | COLOR BANDS |     |     | BIN<br>CODE | CONTACT SIZE  |                | WIRE<br>RANGE<br>OR<br>CABLE | CONTACT<br>GAGE | CRIMP<br>TOOL                                                       | ACCESSORY                                                            | INSTALLATION<br>TOOL | REMOVAL<br>TOOL | REMOVAL<br>TOOL<br>(UNWIRED<br>CONTACTS)                     |
|-----------------------------------------------------------------------------------------|------------------------------|-------------------|------------------|-------------|-----|-----|-------------|---------------|----------------|------------------------------|-----------------|---------------------------------------------------------------------|----------------------------------------------------------------------|----------------------|-----------------|--------------------------------------------------------------|
|                                                                                         |                              |                   |                  | 1st         | 2nd | 3rd |             | MATING<br>END | WIRE<br>BARREL |                              |                 |                                                                     |                                                                      |                      |                 |                                                              |
| MIL-C-83723<br>SERIES III<br><br>BAYONET<br>COUPLING<br><br>REAR<br>RELEASE<br>CONTACTS | M83723/71 ( )                | M39029/4-110      | P                | BRN         | BRN | BLK | 110         | 20            | 20             | 20-24                        | AT 0020         | 615708                                                              | 615709                                                               | ATML 08205B          | ATML 08206B     | M81969/30                                                    |
|                                                                                         | M83723/72 ( )                | M39029/5-115      | S                | BRN         | BRN | GRN | 115         |               |                |                              |                 |                                                                     |                                                                      | OR                   | OR              | HANDLE<br>WITH<br>ATML 3005<br><br>(RED)                     |
|                                                                                         | M83723/73 ( )                | M39029/9-132      | P                | BRN         | ORN | RED | 132         |               |                |                              |                 |                                                                     |                                                                      | M81969/14-11         | M81969/14-11    |                                                              |
|                                                                                         | M83723/74 ( )                | M39029/9-133      | P                | BRN         | ORN | ORN | 133         |               |                |                              |                 |                                                                     |                                                                      | OR                   | OR              |                                                              |
|                                                                                         | M83723/75 ( )                | M39029/9-134      | P                | BRN         | ORN | YEL | 134         |               |                |                              |                 |                                                                     |                                                                      | ATR 1078             | ATR 2080        |                                                              |
|                                                                                         | M83723/76 ( )                | M39029/9-135      | P                | BRN         | ORN | GRN | 135         |               |                |                              |                 |                                                                     |                                                                      |                      |                 |                                                              |
|                                                                                         | M83723/76 ( )                | M39029/9-136      | P                | BRN         | ORN | BLU | 136         |               |                |                              |                 |                                                                     |                                                                      |                      |                 |                                                              |
|                                                                                         | M83723/77 ( )                | M39029/10-138     | S                | BRN         | OEN | GRA | 138         |               |                |                              |                 |                                                                     |                                                                      |                      |                 |                                                              |
|                                                                                         | M83723/78 ( )                | M39029/10-139     | S                | BRN         | OEN | WHI | 139         |               |                |                              |                 |                                                                     |                                                                      |                      |                 |                                                              |
|                                                                                         | M83723/84 ( )                | M39029/10-140     | S                | BRN         | YEL | BLK | 140         |               |                |                              |                 |                                                                     |                                                                      |                      |                 |                                                              |
|                                                                                         | M83723/85 ( )                | M39029/10-141     | S                | BRN         | YEL | BRN | 141         |               |                |                              |                 |                                                                     |                                                                      |                      |                 |                                                              |
|                                                                                         | M83723/86 ( )                | M39029/10-142     | S                | BRN         | YEL | RED | 142         |               |                |                              |                 |                                                                     |                                                                      |                      |                 |                                                              |
|                                                                                         | M83723/87 ( )                | M39029/4-112      | P                | BRN         | BRN | RED | 112         | 16            | 20             | 20-24                        | AT 0016         |                                                                     |                                                                      | ATML 08207B          | ATML 08208B     | ATML 3006                                                    |
|                                                                                         | M83723/91 ( )                | M39029/5-117      | S                | BRN         | BRN | VIO | 117         |               |                |                              |                 |                                                                     |                                                                      | OR                   | OR              |                                                              |
|                                                                                         | M83723/92 ( )                | M39029/4-111      | P                | BRN         | BRN | BRN | 111         | 16            | 16             | 16-20                        |                 |                                                                     |                                                                      | M81969/14-03         | M81969/14-03    |                                                              |
|                                                                                         | M83723/95 ( )                | M39029/5-116      | S                | BRN         | BRN | BLU | 116         |               |                |                              |                 |                                                                     |                                                                      | OR                   | OR              |                                                              |
|                                                                                         | M83723/96 ( )                |                   |                  |             |     |     |             |               |                |                              |                 |                                                                     |                                                                      | ATR 1105             | ATR 2112        |                                                              |
|                                                                                         | M83723/97 ( )                |                   |                  |             |     |     |             |               |                |                              |                 |                                                                     |                                                                      |                      |                 |                                                              |
|                                                                                         | M83723/98 ( )                | M39029/4-113      | P                | BRN         | BRN | ORN | 113         | 12            | 12             | 12-14                        | AT 0012         |                                                                     |                                                                      | ATML 08209B          | ATML 08210B     | ATML 3007                                                    |
|                                                                                         |                              | M39029/5-118      | S                | BRN         | BRN | GRA | 118         |               |                |                              |                 |                                                                     |                                                                      | OR                   | OR              | ATML 3006                                                    |
|                                                                                         |                              |                   |                  |             |     |     |             |               |                |                              |                 |                                                                     |                                                                      | M81969/14-04         | M81969/14-04    |                                                              |
|                                                                                         |                              |                   |                  |             |     |     |             |               |                |                              |                 |                                                                     |                                                                      | OR ATR 1153          | OR ATR 2160     |                                                              |
|                                                                                         |                              | M39029/4-114      | P                | BRN         | BRN | YEL | 114         | 12            | 16             | 16-20                        |                 |                                                                     |                                                                      | M81969/14-03         | M81969/14-03    |                                                              |
|                                                                                         |                              | M39029/5-119      | S                | BRN         | BRN | WHI | 119         |               |                |                              |                 |                                                                     |                                                                      |                      |                 |                                                              |
|                                                                                         |                              | M39029/7-126      | P                | BRN         | RED | BLU | 126         | 12 SHIELDED   |                |                              |                 | INNE<br>CONTACT<br><br>615717<br><br>OUTER<br>CONTACT<br><br>620175 | INNER<br>CONTACT<br><br>616413<br><br>OUTER<br>CONTACT<br><br>620294 | M81969/14-03         | M81969/14-03    | M81969/30<br><br>HANDLE<br>WITH<br><br>ATML 3007<br>(YELLOW) |
|                                                                                         |                              | M39029/7-127      | P                | BRN         | RED | VIO | 127         |               |                |                              |                 |                                                                     |                                                                      |                      |                 |                                                              |
|                                                                                         |                              | M39029/7-128      | P                | BRN         | RED | GRA | 128         |               |                |                              |                 |                                                                     |                                                                      |                      |                 |                                                              |
|                                                                                         |                              | M39029/8-129      | S                | BRN         | RED | WHI | 129         |               |                |                              |                 |                                                                     |                                                                      |                      |                 |                                                              |
|                                                                                         |                              | M39029/8-130      | S                | BRN         | ORN | BLK | 130         |               |                |                              |                 |                                                                     |                                                                      |                      |                 |                                                              |
|                                                                                         |                              | M39029/8-131      | S                | BRN         | ORN | BRN | 131         |               |                |                              |                 |                                                                     |                                                                      |                      |                 |                                                              |

# Pneumatic Crimp Tool APC708 (Functional Equivalent to M22520/1-01)



| MS #.       | ASTRO TOOL # | USAGE/DESCRIPTION    | NSN.             |
|-------------|--------------|----------------------|------------------|
| M22520/3-1  | 615716       | Gage For /1-01 /2-01 | 5220-00-165-7604 |
| M22520/1-02 | 615709       | Turret               | 5120-00-016-6382 |
| M22520/1-03 | 615710       | Turret               | 5120-00-016-6554 |
| M22520/1-04 | 615711       | Turret               | 5120-00-016-7582 |
| M22520/1-05 | 615712       | Universal Positioner | 5120-00-165-3911 |
| M22520/1-06 | 615713       | Positioner           | 5120-00-016-7647 |
| M22520/1-07 | 615714       | Positioner           | 5120-00-016-7651 |
| M22520/1-08 | 615715       | Turret               | 5120-00-016-7654 |
| M22520/1-09 | 615821       | Positioner           | 5120-00-132-5039 |
| M22520/1-10 | 615822       | Positioner           | 5120-00-132-5095 |
| M22520/1-11 | 616406       | Positioner           | 5120-01-127-5231 |
| M22520/1-12 | 616407       | Turret               | 5120-01-036-9220 |
| M22520/1-13 | 616408       | Turret               | 5120-01-036-9221 |
| M22520/1-14 | 616409       | Turret               | 5120-01-036-9222 |
| M22520/1-15 | 616410       | Positioner           | 5120-01-036-9223 |
| M22520/1-16 | 620172       | Positioner           | 5120-01-075-8138 |
| M22520/1-17 | 620537       | Positioner           |                  |

- Portable or bench-mounted
- Cycle controlled ratchet

## 8-Step Adjustable Manual Feed Pneumatic Crimping Tool APC708

The **APC708**, 8-Step Adjustable Manual Feed Pneumatic Crimping Tool is a fast, versatile, pneumatically actuated four indenter tool for crimping MS style or proprietary circular contacts. This tool accommodates all turret head assemblies used with the M22520/1-01 crimping tool. The tool is capable of accommodating contact sizes 12 to 26 and wire sizes 12 to 30 AWG.

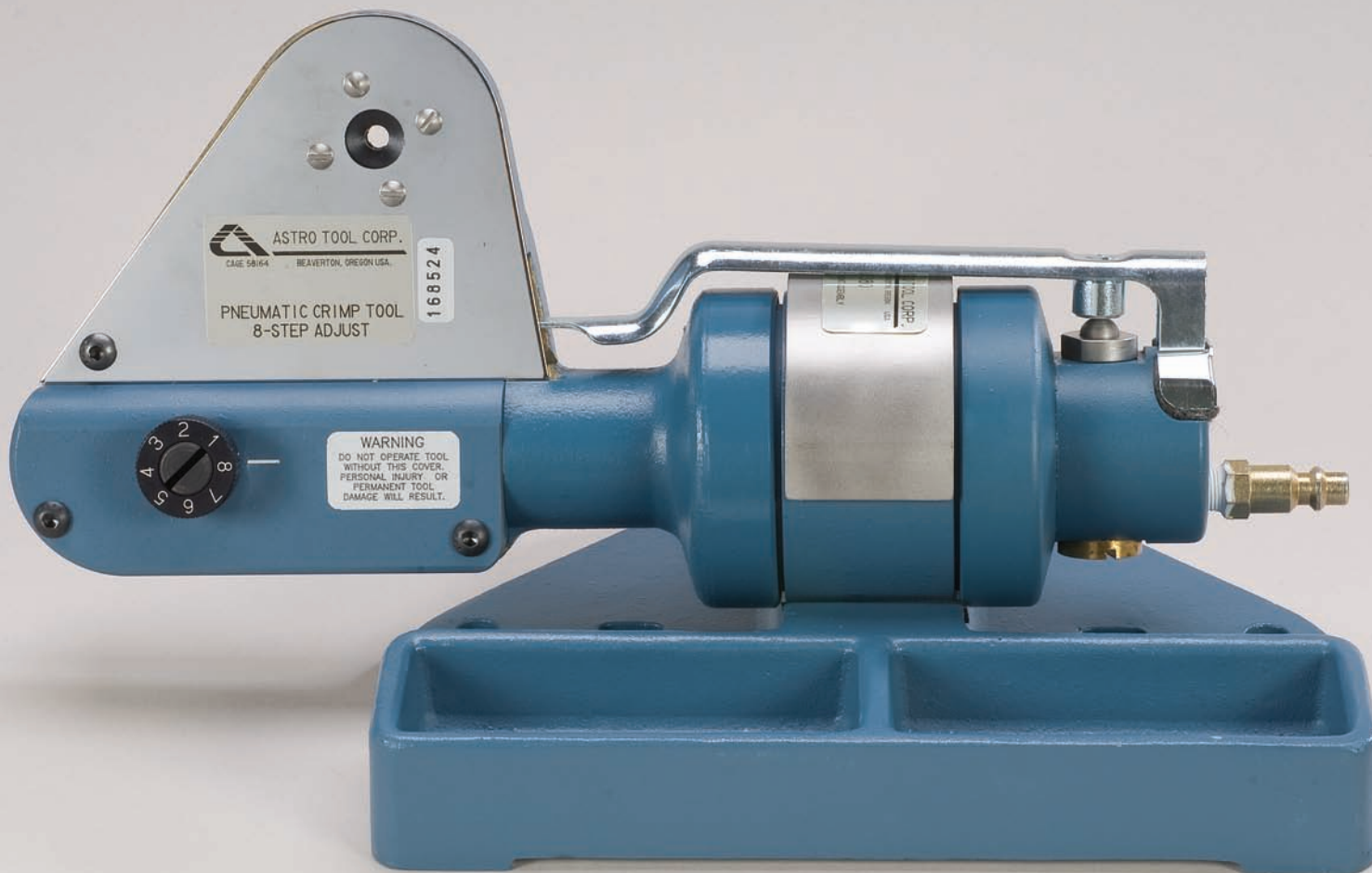
Astro manufactures the ATK6002 gaging kit with the gaging pin assemblies for each selector setting. Contact the factory for price and availability.

Tool can be either hand held or mounted on an optional bench mount (P/N 11380). The tool can be actuated by the tool trigger or a foot pedal assembly (P/N 11380-2). (The bench mount and foot pedal can be purchased together as P/N 11380-3). Using these accessories leaves the operator's hands free for inserting and removing contacts and wire.

This tool operates on 80-120 P.S.I. Astro recommends a filtered, regulated and lubricated air supply for optimal performance. Astro offers the 11413 air regulator for this purpose.



# Pneumatic Crimp Tools for Circular Contacts



- Portable or bench-mounted
- Cycle controlled ratchet
- Foot pedal assembly available

Astro's line of **Pneumatic Crimp Tools** is designed for moderate volume production. These tools are available for a wide range of contact sizes, from 8 through 26 and wire sizes 8 through 30 AWG.

The externally and internally adjustable tools are just an example of what we can offer. The multi-function tool can also be equipped with D2 indenters for medical applications and specific crimp ranges.

Tool can be either hand held or mounted on an optional bench mount (P/N 11380). The tool can be actuated by the tool trigger or a foot pedal assembly (P/N 11380-2). (The bench mount and foot pedal can be purchased together as P/N 11380-3). Using these accessories leaves the operator's hands free for inserting and removing contacts and wire.

These tools operate on 80-120 P.S.I. Astro recommends a filtered, regulated and lubricated air supply for optimal performance. Astro offers the 11413 air regulator for this purpose.



### Internally Adjusted

The internally adjusted line of crimp tools is designed for adjustments by qualified personnel only. This tool features an adjustment knob located inside the front cover plate of the tool. Once set by qualified personnel, the tool is not adjustable by the assembly line operator, thus helping to eliminate operator error. The tool operates with replaceable, single position locators. When using these locators, the internally adjustable tools can crimp a wire range of 8-30 AWG. The internally adjusted tools can be adapted to accept the MS3191-4 and M22520/1 turrets by ordering a 620754 turret adaptor assembly.

Standard internally adjustable tool: 612871

Mini tip tool: part number 612768.

4 indent style tool: part number 11221.

4 indent style tool with 3 locators: part number 10967.

3212 (20 GA.)      3213 (16 GA.)      3214 (12 GA.)

### Externally Adjusted

The externally adjustable line of tools is designed to accept MS3191-4 and M22520/1 style turret head assemblies. These tools have a micrometer style adjustment knob which allows them to be adjusted and set to crimp depths ranging from .015 to .085 inches in increments of .001. The dial indicator on this style of tool has three sets of numbers. One set indicates crimp depth in thousandths of an inch. One set corresponds to the selector knob settings on the M22520/1-01 (615708) tool. The third set corresponds to the selector settings on the MS3191-4 (612179) tool. These multi-selector readings allow the tool to be used easily with the data for crimp settings located on all Mil-Spec turrets. In its turret-operated configuration these tools crimp contact sizes 12 through 26 and wire sizes 12 through 30 AWG.

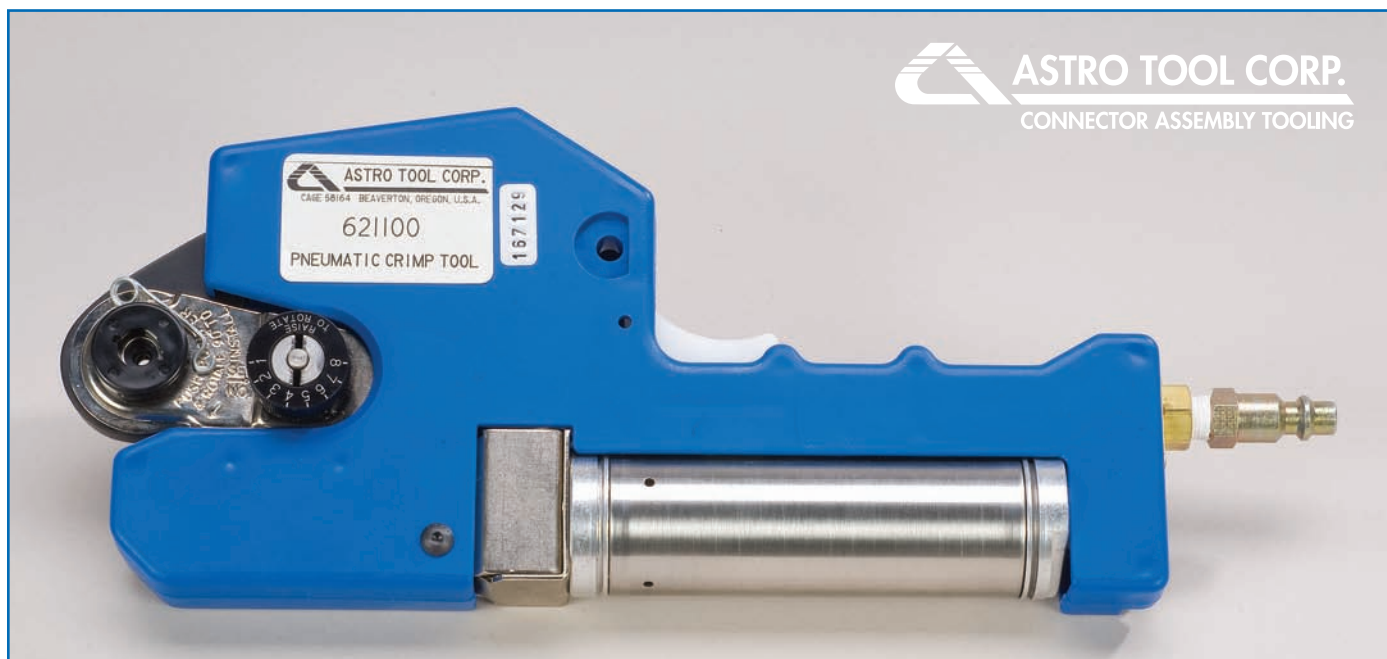
Standard externally adjustable tool: 612141

This tool can be adapted for use with locators by ordering the 615161 slide strap adaptor assembly.

A tool with a mini tip indenter is available under part number 615250.

| Locators for MS Applications |                |                                                                                                             |
|------------------------------|----------------|-------------------------------------------------------------------------------------------------------------|
| Contact Size                 | Locator Part # | Contacts Accommodated (Ref.)                                                                                |
| 20                           | 3212           | MS 3190 MS 24254                                                                                            |
| 16                           | 3213           | MS 3192 MS 3193 MS 24225 NAS 1662 NAS 1663 MS 18134                                                         |
| 12                           | 3214           | MS 18136 M39029/4 M39020/5                                                                                  |
| 20                           | 11568-1        | MS 17803 MS 17807                                                                                           |
| 16                           | 11568-1        | MS 17804 MS 17808 M39029/34 M39029/35                                                                       |
| 22                           | 612507         | MS 27491-22, 22D, 22M MS 27492-22, 22D, 22M MS 27493-22, 22D, 22M MS 27494-22, 22D, 22M M39029/57 M39029/58 |
|                              | 613264         | M39029/56 MS 27490-22, 22D, 22M                                                                             |
| 20                           | 7005626        | M39029/56 M39029/57 M39029/58 MS 27490-20 MS27491-20 MS27492-20 MS27493-20 MS27494-20                       |
| 16                           | 7008289        | M39029/58 MS 27493-16 MS 27494-16                                                                           |
|                              | 7008300        | M39020/56 M39029/57 MS 27490-16 MS 27491-16 MS 27492-16                                                     |
| 12                           | 7008290        | M39029/56 M39029/57 M39029/58 MS 27490-12 MS 27491-12 MS 27492-12 MS 27493-12 MS 27494-12                   |

# Portable Intermediate and Miniature Pneumatic Tools



- Conforms to performance requirements of MIL-DTL-22520
- Portable or bench-mounted operation
- Eliminates operator fatigue and reduces carpal tunnel syndrome problems

The intermediate and miniature portable pneumatic crimping tools, **621100** and **621101**, provide all the features of the M22520/2-01 and the M22520/7-01.

Reduced operator fatigue and reduced carpal tunnel syndrome occurrences make these tools ideal for assembly line operation. Both tools can be used as portable units or can be bench mounted (part number **621102**) and used with an optional foot pedal (part number **620372**). If both bench mount and foot pedal are desired, order part number **620925**.

The **621100** is color coded blue to match the M22520/2-01 and accepts all /2 positioners.

The **621101** uses the standard M22520/7 positioners and is color coded green to match the /7 tool.

Both tools feature the eight step adjustable selector found on the M22520 8-indent style crimping tools. Operating procedures for these tools are identical to the hand operated models.

Both the **621100** and **621101** operate at 80-120 PSI and require a lubricated, regulated and filtered air supply. Astro offers the 11413 regulator for this purpose.

We always recommend the periodic gaging of our tools. The gages for these tools are as follows:

**621100:** Use the 615716 (M22520/3-01) GAGE

**621101:** Use the 616337 (M22520/3-03) GAGE

These tools are each 10 ½ inches long and weigh approximately 32 ounces.



# CRIMP TOOLS FOR MEDICAL AND ELECTRONICS APPLICATIONS

CRIMP TOOLS FOR MEDICAL AND ELECTRONICS APPLICATIONS



# Standard Microcrimp Tools 612548, 612548-2, 612548SS, 621205



This tool has been especially designed for small increment, close tolerance adjustments.

This cycle controlled tool also features a micrometer type adjusting knob, providing continuously variable adjustments for precise crimp depths.

The **612548** can be adjusted and set at crimp depths ranging from .025-.075 inches, allowing settings to be adjusted within .001 inch.

This tool, using a locator, can crimp most pin and socket contacts #12 and smaller and can crimp wire sizes #12-26 AWG.

The **612548** is 9 inches long and weighs approximately 16 ounces.

Astro offers a version of the **612548**, which is modified to accept M22520/1 and MS3191 style turrets. Order p/n 612548-2.

An adjustable positioner is available for **612548**, P/N 613384.

The **612548SS** has specially hardened indenters for crimping stainless steel applications.

- 8 indent crimp
- Micro adjustable
- Cycle controlled ratchet
- Ejector locator operation
- Adjustable within .001 inch

The **612548** tools can be adjusted and set at crimp depths ranging from .025-.075 inches, allowing settings to be adjusted within .001 inch.



| ASTRO LOCATOR # | SIZE |
|-----------------|------|
| 2421            | 20   |
| 2422            | 16   |
| 2423            | 12   |
| 11570-1         | 20   |
|                 | 16   |
| 7009880         | 20   |
| 7010394         | 16   |
| 7010395         | 12   |
| 3240            | 20   |
| 613327          | 22   |
|                 | 16   |
| 615092          | 20   |
| 615091          | 16   |
| 615090          | 12   |

For additional locators consult factory.



# Miniature Microcrimp Tools 612118, 612118-1, 612118SS



- 8 indent crimp
- Micro adjustable
- Cycle controlled ratchet
- Ejector locator operation
- Adjustable within .0005 inch

| ASTRO LOCATOR # | SIZE |
|-----------------|------|
| 612473          | 20   |
| 612512          | 20   |
| 613325          | 20   |
| 612955          | 22   |
| 612510          | 20   |
| 613194          | 22   |
| 612521          | 22   |
| 613192          | 22   |
| 615759          | 22   |
| 615832          | 20   |
| 615758          | 22   |
| 615834          | 20   |
| 612513          | 20   |
| 614352          | 22   |
| 613117          | -    |

For additional locators consult factory.

The **Astro 612118** conforms to all requirements of MIL-DTL-22520.

This cycle controlled tool features a micrometer type adjusting knob, providing continuously variable adjustment, for precise crimp depths. The **612118** can be adjusted and set at crimp depths ranging from .015-.043 inches, with increment settings of .0005 inch.

This tool can crimp most micro-miniature pin and socket contacts #20 and smaller to wire sizes #20-#30 AWG. For ease of loading sub-miniature contacts, Astro has designed an easy load mechanism that is built into this special line of locators.



The **612118** tool is 7¼ inches long and weighs 11 ounces. Its small size permits crimping in confined areas.

Custom locators are available upon request.

The **612118** is available in a modified version, allowing it to accept M22520/2 and MS3198 style positioners. This version is ordered as part #612118-1.

612118SS has specially hardened indenters for crimping stainless steel applications.

Adjustable positioners for this tool are 612490 & 613408.

The **612118** can be adjusted and set at crimp depths ranging from .015-.043 inches, with increment settings of .0005 inch.

# Metric Microcrimp Tool 621205



- Cycle controlled
- Micro adjustable
- Adjustable within .0007 inch

Astro's **621205 Metric Microcrimp Tool** is the answer to crimping circular Harting pin and socket contacts. It is a fast, versatile, manually operated, octadent tool for crimping circular pin and socket contacts.

The **621205** provides continuously variable crimp depth adjustment to optimum settings over a range of contact and wire combinations. Although mostly used in Harting applications, the micro adjustable feature allows the customer to select the precise crimp depth no matter the

use and selected need. Locating options are available once need is determined; consult the factory for your specific needs.

The **621205** is adjustable in a range of 1.0 mm to 2.0 mm. Settings to within .02 mm increments are possible for precision crimping.

For long life and optimum performance, this tool should be kept clean and handled carefully, as any other precision instrument.

The **621205** is adjustable in a range of 1.0 mm to 2.0 mm. Settings to within .02 mm increments are possible for precision crimping.



# Micro Thread Crimp Tool 615466, 615466-1, 615466-8



- 4 or 8 indent crimp
- Micro thread adjustable
- Cycle controlled ratchet

The **Astro micro-thread adjustable hand crimping tools** are equipped with an adjustable limit screw which controls the proper crimping depth for contact size and wire range. These tools are designed to crimp contact sizes 12 through 20 AWG. Crimp depth is determined by loosening the lock nut and adjusting the limit screw. A gage is used to check for the desired indenter opening. The lock nut is then tightened, locking in the desired depth.

These tools use the same locators as Astro's standard size microcrimp adjustable tool (612548).

The 615466 tool is 9 inches long and weighs approximately 19 ounces.

Astro will design the micro-thread adjustable tool with a variety of locators or indenter types to fit your specific needs. Please consult the factory for further information.

# Special Purpose Crimp Tools



- Easy to operate
- Built in positioner
- Small and light weight
- Precision Crimp Depth
- Full cycle ratchet
- Less operator error

The Astro Special Purpose Crimp Tool eliminates operator error caused by improper depth adjustment or incorrect positioner selection. This precision crimp tool meets the performance requirements of the **M22520** tools and was designed for miniature and sub-miniature contacts. The tools are light weight, easy to operate and the built in positioner cannot be adjusted improperly or lost. Astro uses a commonly accepted color coding system for this line of tools that results in easy assembly line identification. This tool is set at the factory to your

precise specifications and is non adjustable. This eliminates operator error and ensures that accurate crimps are obtained every time. These crimpers are designed to handle 20-32 AWG.

Cost is always a factor in the selection of tooling. These tools will not only save money, initially, but additional savings will be realized by time saved in production and quality control.

Let Astro help you design a tool to fit your special production needs.

**Also available in Pneumatic versions.**





# C-FRAME DIE CRIMP TOOLS

C-FRAME DIE CRIMP TOOLS



# Multi-Purpose C-Frame Crimping Tools 620175 (M22520/5-01), 620215 (M22520/10-01)



- Interchangeable dies
- Positive ratchet

Utilizing an extensive variety of interchangeable single, double, and triple hexagonal dies these MIL-DTL-22520 qualified tools can be used to crimp a wide range of MS and proprietary coaxial and triaxial connectors and contacts.

Astro also manufactures dies for many other crimping purposes. These include, but are not limited to, insulated and uninsulated terminal lugs, end caps and wire splicing. Astro can design and manufacture die sets for many other applications.

The interchangeable dies facilitate a large cost savings over single purpose crimpers. Instead of buying a different tool for each application, only separate dies are needed.

The **620175** and **620215** C-frame crimping tools, like other Astro crimpers, are simple to use.

1. Select the proper die.
2. Insert it into the crimp tool (the die will be firmly held in place by the internal spring clips built into each tool).

The positive ratchet in these tools will not allow the handles to retract until the tool has been fully cycled. This eliminates incomplete or partial crimps.

The **620175** is 11 inches long and weighs 22 ounces.

The **620215** is 9 inches long and weighs 11 ounces.

The 620175 (/5-01) tool is also available in a pneumatic version, P/N 621200, on page 36.

**Astro has a large selection of die configurations available, in addition to those listed. As well as calibration gages.**

| M22520/10-01 DIES |              |                  |        |        |        |        |
|-------------------|--------------|------------------|--------|--------|--------|--------|
| Military Part #   | Astro Tool # | NSN              | A Hex. | Length | B Hex. | Length |
| M22520/10-02      | 620285       | 5120-00-116-3275 | .091   | .270   | -      | -      |
| M22520/10-03      | 620288       | 5120-00-116-3283 | .255   | .325   | -      | -      |
| M22520/10-04      | 620286       | 5120-00-116-3003 | .138   | .090   | .118   | .270   |
| M22520/10-05      | 620289       | 5120-00-116-3276 | .128   | .325   | .105   | .325   |
| M22520/10-06      | 620216       | 5120-00-116-4807 | .160   | .400   | -      | -      |
| M22520/10-07      | 620290       | 5120-00-116-3278 | .213   | .325   | .178   | .325   |

Astro also offers blank dies for your prototyping needs.

# M22520/5-01 Interchangeable Hex Dies

| Military Part # | Astro Tool # | NSN              | A Hex. | Length  | B Hex. | Length |
|-----------------|--------------|------------------|--------|---------|--------|--------|
| M22520/5-02     | 620560       | -                | .091   | .090    | .068   | .270   |
| M22520/5-03     | 620291       | 5120-00-133-0534 | .128   | .325    | .105   | .325   |
| M22520/5-04     | 620292       | 5120-00-133-0537 | .138   | .090    | .118   | .270   |
| M22520/5-05     | 620293       | 5120-00-133-0577 | .213   | .325    | .178   | .325   |
| M22520/5-06     | 620294       | 5120-00-133-0579 | .128   | .094    | -      | -      |
| M22520/5-07     | 620295       | 5120-00-133-0580 | .255   | .325    | -      | -      |
| M22520/5-08     | 620296       | 5120-00-133-0581 | .128   | .375    | -      | -      |
| M22520/5-09     | 620365       | 5120-00-133-0582 | .178   | .400    | .068   | .093   |
| M22520/5-10     | 620297       | 5120-00-133-0583 | .160   | .400    | -      | -      |
| M22520/5-11     | 620366       | 5120-00-133-0584 | .213   | .400    | .068   | .093   |
| M22520/5-13     | 620367       | 5120-00-133-0585 | .255   | .400    | .068   | .093   |
| M22520/5-15     | 620528       | 5120-00-133-0586 | .263   | .400    | .068   | .093   |
| M22520/5-17     | 620298       | 5120-00-133-0597 | .118   | .375    | -      | -      |
| M22520/5-19     | 620299       | 5120-00-116-3159 | .255   | .400    | .213   | .400   |
| M22520/5-21     | 620300       | 5120-00-116-3284 | .475   | .400    | -      | -      |
| M22520/5-23     | 620301       | 5120-00-133-0618 | .384   | .400    | -      | -      |
| M22520/5-25     | 620368       | 5120-00-133-0622 | .429   | .400    | .100   | .120   |
| M22520/5-27     | 620302       | 5120-00-133-0640 | .532   | .400    | -      | -      |
| M22520/5-29     | 620371       | 5120-00-116-3285 | .324   | .400    | .100   | .120   |
| M22520/5-31     | 620303       | 5120-00-133-0642 | .501   | .400    | -      | -      |
| M22520/5-33     | 620304       | 5120-00-116-3158 | .343   | .400    | .105   | .400   |
| M22520/5-35     | 620305       | 5120-00-116-3156 | .324   | .400    | .128   | .400   |
| M22520/5-37     | 620306       | 5120-00-116-3136 | .314   | .400    | .151   | .400   |
| M22520/5-39     | 620307       | 5120-00-116-3134 | .309   | .400    | .160   | .400   |
| M22520/5-41     | 620308       | 5120-00-116-3135 | .290   | .400    | .178   | .400   |
| M22520/5-43     | 620309       | 5120-00-116-3106 | .268   | .400    | .197   | .400   |
| M22520/5-45     | 620310       | 5120-00-116-3088 | .231   | .400    | .218   | .400   |
| M22520/5-47     | 620311       | 5120-00-133-0643 | .359   | .400    | -      | -      |
| M22520/5-49     | 620312       | 5120-00-133-0644 | .401   | .400    | -      | -      |
| M22520/5-51     | 620313       | 5120-00-116-3040 | .431   | .400    | -      | -      |
| M22520/5-53     | 620314       | 5120-00-116-3160 | .454   | .400    | -      | -      |
| M22520/5-55     | 620315       | 5120-00-133-0653 | .324   | .400    | -      | -      |
| M22520/5-57     | 620369       | 5120-00-133-0676 | .213   | .400    | .100   | .120   |
| M22520/5-59     | 620370       | 5120-00-133-0683 | .255   | .400    | .100   | .120   |
| M22520/5-61     | 620316       | 5120-00-116-3004 | .429   | .400    | -      | -      |
| M22520/5-63     | 620317       | 5120-00-133-0533 | .263   | .400    | .091   | .270   |
| M22520/5-100    | 620617       | 5120-00-126-0860 |        | Special |        |        |
| M22520/5-101    | 620618       | 5120-01-081-4213 |        |         |        |        |
| M22520/5-102    | 630000       | 5120-01-081-4212 |        |         |        |        |
| M22520/5-103    | 630001       | 5120-01-082-8985 |        |         |        |        |
| M22520/5-104    | 630003       |                  |        |         |        |        |

NOTE: Also available Die #620836 Combination of M22520/5-102 and M22520/5-103. We have listed above military dies available. This is only a partial listing of dies available from Astro. Please consult factory with your specific application requirement.



# Pneumatic Hex Die Crimper 621200, 621500



- Cost effective
- Increases productivity
- Uses standard M22520/5 dies
- Lightweight and fully portable
- Helps reduce operator fatigue and carpal tunnel syndrome

Use **DIE SELECTION CHART** on page 35.

Astro offers two portable, pneumatic versions of the **M22520/5-01** hand die crimp tool. The 621200 has a 2" bore for standard applications, and the 621500 has a 3.5" bore for heavier duty applications.

The **621200 & 621500** are trigger or foot pedal actuated and operate at 32 cycles per minute. These sturdy, lightweight crimpers offer increased productivity, reduced operator fatigue and reduced carpal tunnel syndrome.

Using standard **M22520/5** dies, the full cycling feature of these tools consistently produces quality crimps while delivering over one ton of crimping force at the die face.

Weighing just over five pounds this versatile system can be easily moved from station to station.

Designed with safety in mind, these tools have a cover over the crimping area to help prevent the accidental crimping of fingers.

Both the **621200 & 621500** require 80-120 PSI and a regulated, filtered and lubricated air supply. For this purpose Astro offers the 11413 air regulator. These tools can be easily adapted for field use by simply attaching an air cylinder.

The **621500** pneumatic C-frame crimp tool is fitted with a larger pneumatic cylinder for applications that require crimping larger gages and/or harder materials. This 3.5" cylinder delivers approximately an 80% increase of power (crimp die force) over the standard **621200** tool with no noticeable increase in cycle time.

## Accessories for 621200 & 621500

621201 Benchmount only

621202 Swivel Mount with Foot Switch

621224 Foot Switch only



# CT Terminal Die Crimping Tools 11707-1 (MS90413-1A), 11545



- Meets all performance requirements for M22910 and M22520
- Permanently attached dies
- Cycle controlled

The Astro **11707-1** (miniature) and **11545** (standard) crimping tools are versatile and easy to use.

Among their many applications, these durable, all-steel tools crimp MS-25036 terminal lugs, MS25181 splices, MS25274 endcaps and other types of fittings.

The **11545** (standard) crimps 12-10 through 26-24.

The **11707-1** (miniature) crimps 16-14 through 26-24. The 11707-1 is especially useful in hard to reach places where space is limited.

Both the **11707-1** and **11545** have selector knob adjustments, allowing a choice of precise crimp settings over a wide range of applications.

These tools are equipped with retractable locators for the positioning of terminal lugs and wire. When crimping splice fittings the locator can be easily adjusted to its retracted position. The same inline die system combined with the positioner ratchet found in Astro's other C-Frame tools are featured in these terminal crimping tools.

Astro recommends the periodic gaging of all its tools, p/n 612406 for gaging the **11545** and 621069 for **11707-1**.

The **11707-1** is 8 ½ inches long and weighs 14 ounces.

The **11545** is 10 ½ inches long and weighs 29 ounces.

# AMT4001 Crimp Tool for Terminals (M22520/40 Ref\*)



The height of the insulation crimp barrel can be adjusted to accommodate different insulation diameters.



- Cycle controlled
- Wire sizes 22 through 14
- Adjustable insulation barrel

Astro's **AMT4001** crimp tool is a fast, manually operated tool for crimping AS7928 (MIL-T-7928) Ring Terminals and Splices for wire sizes 22 through 14 (terminal and splice color codes Small Yellow, Red, White/Clear, and Blue).

The **AMT4001** provides a ratchet controlled crimp to ensure full crimp force/closure is applied. The handles will not open until they have been fully closed and the crimp completed.

The tool is equipped with a locator to hold terminals and splices in place for crimping.

The **AMT4001** is 10 ¾ inches long, and weighs approximately 1.48 lbs. For long life and optimum performance, this tool should be kept clean and handled carefully, as any other precision instrument.

Gages are available for checking calibration.

\* Confirm qualification status with Astro Tool Customer Service.

Blue-White = Large Cavity  
Red-Yellow = Small Cavity

| MS25036 Terminals |              |
|-------------------|--------------|
| Terminal P/N      | Crimp Cavity |
| MS25036-143       | Red-Yellow   |
| MS25036-144       | Red-Yellow   |
| MS25036-145       | Red-Yellow   |
| MS25036-146       | Red-Yellow   |
| MS25036-147       | Red-Yellow   |
| MS25036-159       | Red-Yellow   |
| MS25036-148       | Red-Yellow   |
| MS25036-101       | Red-Yellow   |
| MS25036-102       | Red-Yellow   |
| MS25036-149       | Red-Yellow   |
| MS25036-103       | Red-Yellow   |
| MS25036-150       | Red-Yellow   |
| MS25036-104       | Red-Yellow   |
| MS25036-105       | Red-Yellow   |
| MS25036-151       | Red-Yellow   |
| MS25036-152       | Blue-White   |
| MS25036-106       | Blue-White   |
| MS25036-107       | Blue-White   |
| MS25036-153       | Blue-White   |
| MS25036-108       | Blue-White   |
| MS25036-154       | Blue-White   |
| MS25036-109       | Blue-White   |
| MS25036-110       | Blue-White   |
| MS25036-155       | Blue-White   |

| MS17143 Terminals |              |
|-------------------|--------------|
| Terminal P/N      | Crimp Cavity |
| MS17143-1         | Red-Yellow   |
| MS17143-2         | Blue-White   |
| MS17143-4         | Red-Yellow   |
| MS17143-5         | Blue-White   |
| MS17143-7         | Red-Yellow   |
| MS17143-8         | Blue-White   |
| MS17143-10        | Red-Yellow   |
| MS17143-11        | Blue-White   |
| MS17143-13        | Red-Yellow   |
| MS17143-14        | Blue-White   |
| MS17143-16        | Red-Yellow   |
| MS17143-17        | Blue-White   |
| MS17143-19        | Red-Yellow   |
| MS17143-20        | Blue-White   |
| MS17143-22        | Red-Yellow   |
| MS17143-23        | Red-Yellow   |
| MS17143-24        | Red-Yellow   |
| MS17143-25        | Red-Yellow   |
| MS17143-26        | Red-Yellow   |
| MS17143-27        | Red-Yellow   |
| MS17143-28        | Red-Yellow   |
| MS17143-109       | Blue-White   |
| MS17143-110       | Blue-White   |
| MS17143-155       | Blue-White   |



# CH Hex Die Crimping Tools 612648 (M22910/7-01), 613214



These tools are the forerunners of the M22520/5 and M22520/10. Due to their ongoing popularity and reliability we continue to offer them as an integral part of our tool line.

These all steel, C-frame crimping tools feature interchangeable, pop-in hex dies for either MS or proprietary applications including BNC, TNC and N series RF connectors. Astro will design dies for special applications upon request.

The **612648** (standard) and **613214** (miniature) tools are easy to use. Simply install the proper interchangeable die set and squeeze the handles. The positive bottoming of the inline die system, along with the cycle controlled ratchet assures perfect uniform crimping.

The **612648** (standard) is 10½ inches long and weighs approximately 27 ounces.

The **613214** (miniature) is 9½ inches long and weighs approximately 15 ounces.

**The dies listed are a portion of what is manufactured for your application requirements. Please consult the factory.**

- All steel construction
- Interchangeable dies
- Cycle controlled

| 612648 SINGLE HEX |           |
|-------------------|-----------|
| HEX DIMENSION     | DIE SET # |
| .082              | 613317    |
| .093              | 613218    |
| .100 x .175 wide  | 614242    |
| .105              | 612734    |
| .112              | 612948    |
| .128              | 612778    |
| .151              | 612981    |
| .151 x .275 wide  | 613622    |
| .156 x .095 wide  | 613461    |
| .160              | 612661    |
| .165              | 613545    |
| .172              | 612195    |
| .178              | 612742    |
| .183              | 613456    |
| .195              | 613125    |
| .198 x 3/16 wide  | 613967    |
| .197              | 612746    |

| 612648 SINGLE HEX   |           |
|---------------------|-----------|
| HEX DIMENSION       | DIE SET # |
| .197 (closed frame) | 612746    |
| .202                | 613313    |
| .213                | 612763    |
| .218                | 612971    |
| .232 x 3/16 wide    | 913968    |
| .231                | 612748    |
| .240                | 613455    |
| .255                | 612766    |
| .263                | 613573    |
| .268                | 612676    |
| .272 x 3/16 wide    | 613801    |
| .290 x .400 wide    | 612893    |
| .309                | 612978    |
| .296 x 3/16 wide    | 612308    |
| .314                | 612899    |
| .324                | 612989    |
| .327                | 614325    |

| 612648 SINGLE HEX  |           |
|--------------------|-----------|
| HEX DIMENSION      | DIE SET # |
| .333               | 613292    |
| .343               | 612992    |
| .359 (M22910/7-19) | 613369    |
| .372               | 613289    |
| .384 (M22910/7-20) | 613396    |
| .401 (M22910/7-21) | 613394    |
| .415               | 613452    |
| .425               | 614326    |
| .429               | 612807    |
| .431 (M22910/7-22) | 613377    |
| .440               | 612943    |
| .454 (M22910/7-23) | 613375    |
| .475 (M22910/7-24) | 613373    |
| .501 (M22910/7-25) | 613398    |
| .532 (M22910/7-26) | 613378    |

## NOTE

Blank die assembly (unhardened) 615135. All dies .400" wide unless otherwise noted. The 612648 frame and military dies are available in kit form: (M22910/6-1) 613437.

# CH Hex Die Crimping Tools 612648 (M22910/7-01), 613214 (continued)

| 612648 DOUBLE HEX |       |       |       |             |           |
|-------------------|-------|-------|-------|-------------|-----------|
| A HEX             | WIDTH | B HEX | WIDTH | MS #        | DIE SET # |
| .068              | .125  | .100  | .125  |             | 613550    |
| .068              | .090  | .213  | .400  |             | 613869    |
| .069              | .093  | .213  | .400  |             | 612700    |
| .096              | .090  | .251  | .400  |             | 613870    |
| .096              | .125  | .384  | .400  |             | 613872    |
| .096              | .125  | .431  | .400  |             | 613871    |
| .080              | .093  | .215  | .400  |             | 612880    |
| .084              | .400  | .244  | .400  |             | 613569    |
| .100              | .400  | .197  | .400  |             | 613788    |
| .100              | .125  | .324  | .400  |             | 613146    |
| .100              | .125  | .415  | .400  |             | 613148    |
| .100              | .125  | .429  | .400  |             | 613802    |
| .102              | .400  | .255  | .400  |             | 612823    |
| .102              | .093  | .255  | .400  |             | 613842    |
| .102              | .400  | .268  | .400  |             | 612804    |
| .105              | .400  | .128  | .400  |             | 612665    |
| .105              | .400  | .160  | .400  |             | 613759    |
| .105              | .400  | .328  | .400  |             | 613249    |
| .105              | .400  | .343  | .400  | M22910/7-11 | 613399    |
| .105              | .400  | .429  | .400  |             | 613207    |
| .112              | .400  | .128  | .400  |             | 612962    |
| .120              | .400  | .197  | .400  |             | 613779    |
| .128              | .400  | .160  | .400  |             | 612481    |

| 612648 DOUBLE HEX |       |       |       |             |           |
|-------------------|-------|-------|-------|-------------|-----------|
| A HEX             | WIDTH | B HEX | WIDTH | MS #        | DIE SET # |
| .128              | .400  | .178  | .400  |             | 612720    |
| .128              | .400  | .213  | .400  |             | 613279    |
| .128              | .400  | .255  | .400  |             | 612820    |
| .128              | .400  | .324  | .400  | M22910/7-12 | 613392    |
| .151              | .400  | .160  | .400  |             | 613212    |
| .151              | .400  | .255  | .400  |             | 612791    |
| .151              | .400  | .314  | .400  | M22910/7-13 | 613389    |
| .160              | .400  | .195  | .400  |             | 613730    |
| .160              | .400  | .268  | .400  |             | 613729    |
| .160              | .400  | .309  | .400  | M22910/7-14 | 613387    |
| .178              | .400  | .197  | .400  |             | 612912    |
| .178              | .400  | .231  | .400  |             | 612663    |
| .178              | .400  | .268  | .400  |             | 613178    |
| .178              | .400  | .290  | .400  | M22910/7-15 | 613386    |
| .178              | .400  | .324  | .400  |             | 613209    |
| .197              | .400  | .268  | .400  | M22910/7-16 | 613371    |
| .197              | .400  | .309  | .400  |             | 612762    |
| .213              | .400  | .250  | .400  |             | 612997    |
| .213              | .400  | .255  | .400  | M22910/7-17 | 613367    |
| .213              | .400  | .290  | .400  |             | 612673    |
| .218              | .400  | .231  | .400  | M22910/7-18 | 613365    |
| .218              | .400  | .290  | .400  |             | 612787    |
| .255              | .400  | .268  | .400  |             | 612797    |

| 612648 TRIPLE HEX  |           |
|--------------------|-----------|
| HEX DIMENSION      | DIE SET # |
| .067 x .177 x .212 | 612876    |
| .068 x .178 x .213 | 614234    |
| .105 x .128 x .151 | 613233    |
| .105 x .128 x .197 | 612310    |
| .105 x .128 x .178 | 612784    |
| .105 x .128 x .202 | 613189    |
| .105 x .134 x .202 | 612972    |
| .105 x .151 x .255 | 612892    |
| .112 x .128 x .213 | 612841    |
| .112 x .160 x .197 | 613184    |
| .128 x .160 x .213 | 612825    |
| .128 x .160 x .218 | 612886    |

| 613214 SINGLE HEX |           |
|-------------------|-----------|
| Hex Dimension     | Die Set # |
| .087              | 614243    |
| .093              | 614245    |
| .100              | 614414    |
| .105              | 613812    |
| .107              | 613035    |
| .112              | 614342    |
| .118              | 613845    |
| .128              | 613848    |
| .151              | 613003    |
| .160              | 613847    |
| .166              | 612494    |

| 613214 SINGLE HEX |           |
|-------------------|-----------|
| Hex Dimension     | Die Set # |
| .178              | 613849    |
| .197              | 613810    |
| .213              | 613851    |
| .218              | 613005    |
| .231              | 613846    |
| .255              | 613850    |
| .268              | 613009    |
| .290              | 613011    |
| .300              | 613099    |
| .309              | 613013    |

## NOTE

Blank die assembly (unhardened) - 613599.

All dies .375" wide unless otherwise noted.





# TOOL KITS

TOOL KITS



# Astro Connector Service Kits for Maintenance and Production



**Astro kit containers** are constructed of molded plastic, fiberglass or metal depending upon varying applications or customer preference.

- Military aircraft kits
- General aviation kits
- Commercial aircraft kits
- Installation and removal tool kits

Let Astro's experience and in-depth knowledge take the guesswork out of your service kit requirements. It's difficult for you to have all the answers, so Astro has done the work for you. Our research team has years of experience in kit design. Let Astro put that knowledge to work for you!

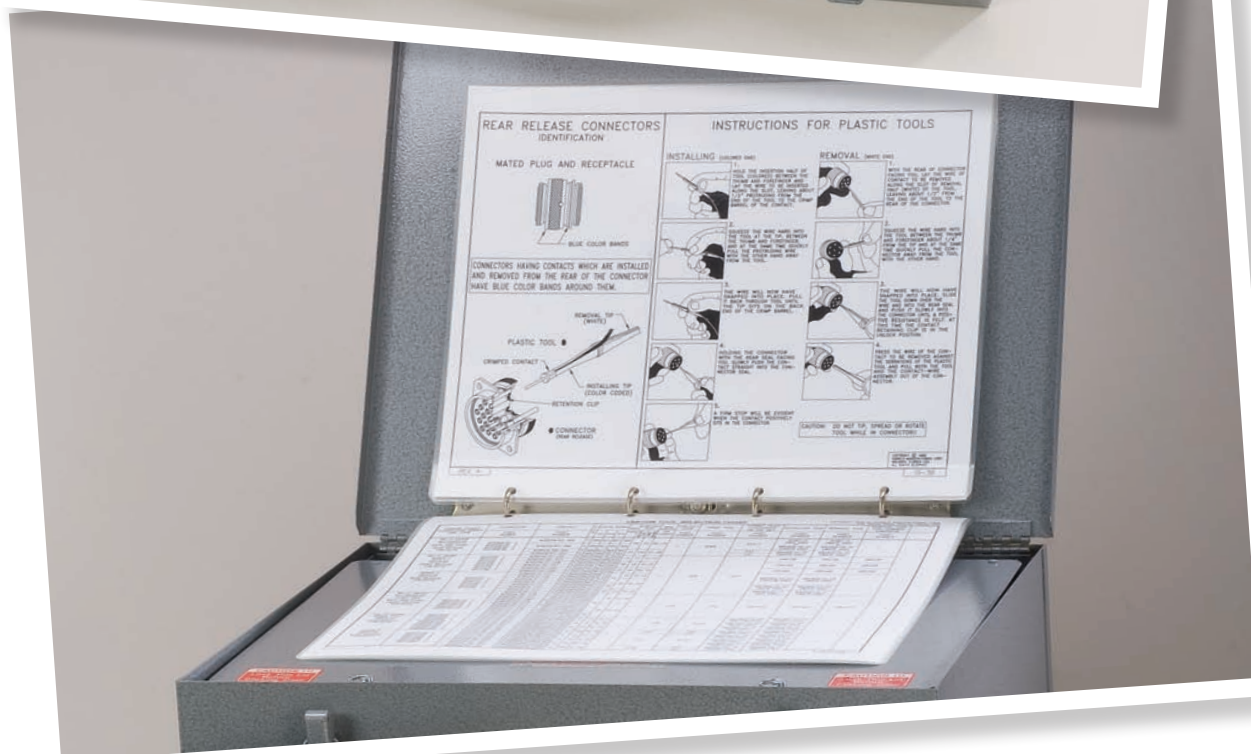
Astro offers customized crimping tool kits for a wide variety of applications. Many kits are designed for specific aircraft or system maintenance while others cover a particular connector series or other special customer needs.

Kits are not only a convenient way to keep all your tools together, but they keep the information that you require for your connector wiring repair at your fingertips.

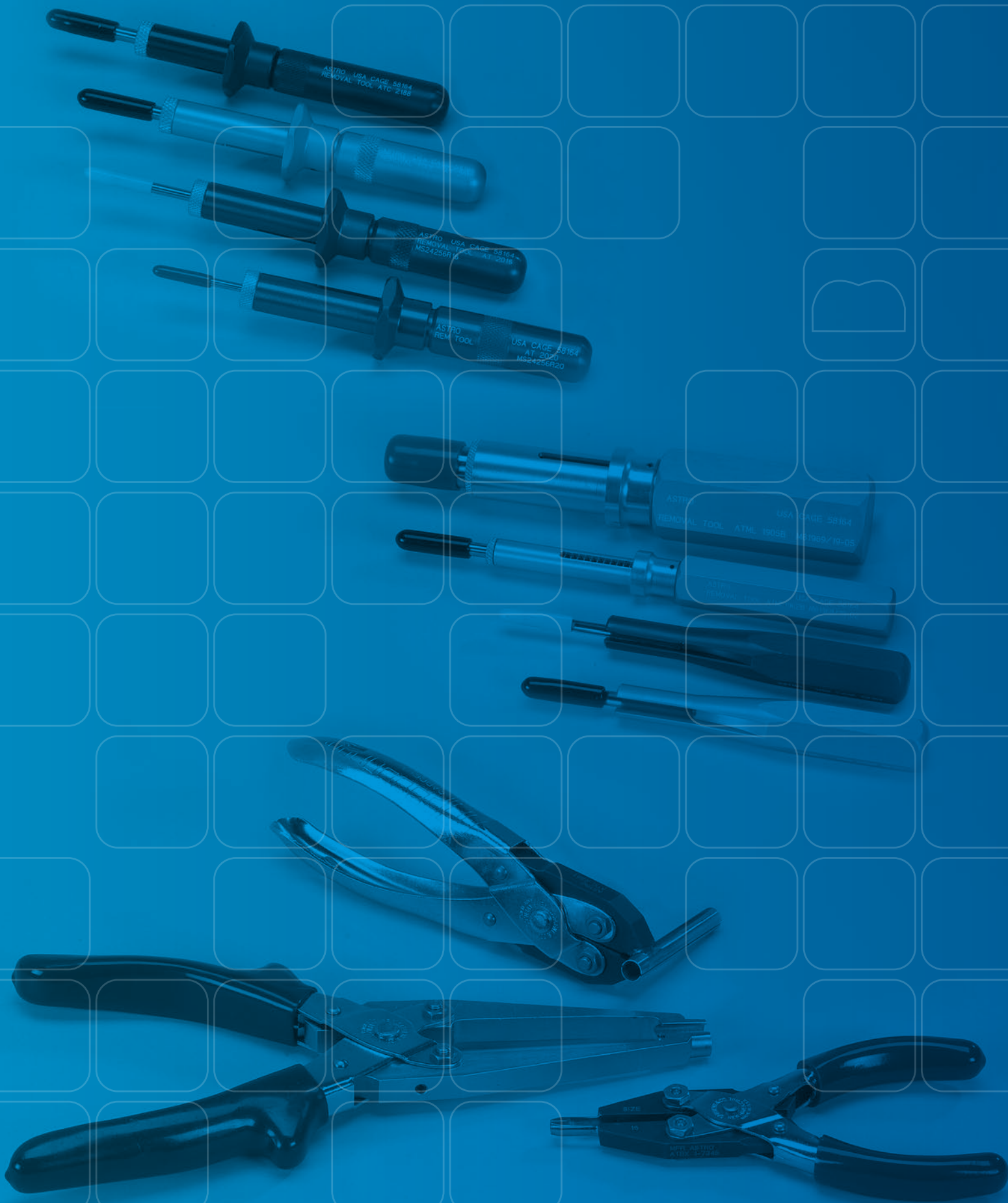
Whether you are buying individual tools or complete service kits, Astro is in the connector assembly tool business to serve you and to make your job faster and easier.



Components are contained in foam cavities, for protection and ease of identification. Contents charts, corresponding to each foam cavity, identify components stored in that location.



Each kit contains instruction sheets that detail application and explain how each tool is used. Tool selection sheets further add to the ease of kit use by referencing tool requirements for each connector series covered by the kit. All reference sheets in each kit are coated to protect against the elements.





# CONTACT INSERTION AND REMOVAL TOOLS



## INSERTION AND REMOVAL TOOLS ARE ASTRO'S HERITAGE...

Astro is dedicated to serving the connector tooling needs of the electronics industry. We, therefore, top off our product package with a wide variety of contact insertion and removal tools.

Although we supply both plastic and metal tools, we recommend the use of the metal tools because of their durability. When used properly, they are more cost effective because they withstand thousands of contact insertion and removal cycles. The trend toward metal tools is actively encouraged by most departments of the government.

Astro insertion and removal tools are of proven high quality and reliability. In addition to the tools listed in the reference table, we have many more for other connector applications. Consult our factory for details.

Illustrated on the following page are typical rear and front release retention methods found in today's connectors.

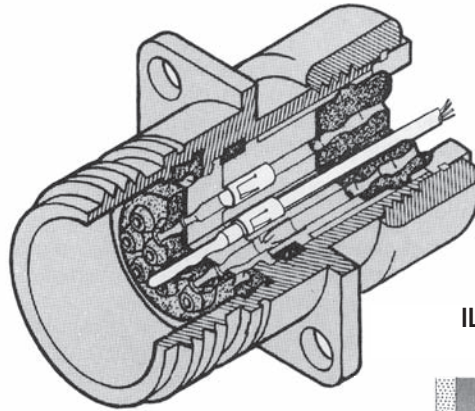
# Pin Locking and Releasing Methods

## ILL A

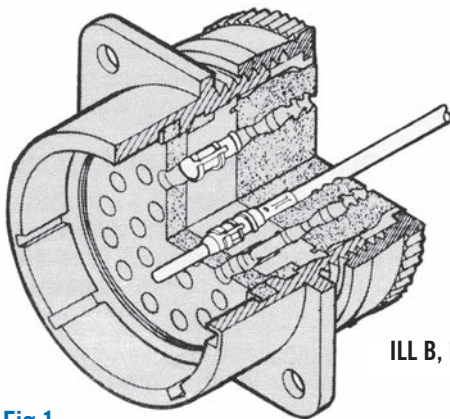
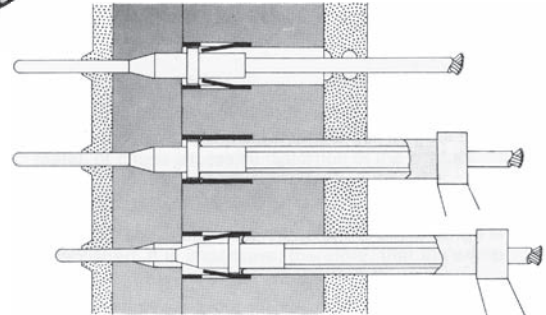
### REAR RELEASE NAS 1599, MIL-C-38999 RETENTION METHOD

These clips are one-piece, stamped metal parts, rolled into a tubular shape with large tines deflected inwardly. These tines lock securely behind the shoulder of the contact, assuring positive contact retention. To remove, insert removal tool, firmly seat on shoulder of contact pushing locking tines back, and then pull on wire and tool together. This will pull the contact and tool out as a unit.

See Illustrations 2, 10, & 17 for service tools on pages 80, 81, & 83.



ILL A, FIG 1



ILL B, FIG 1

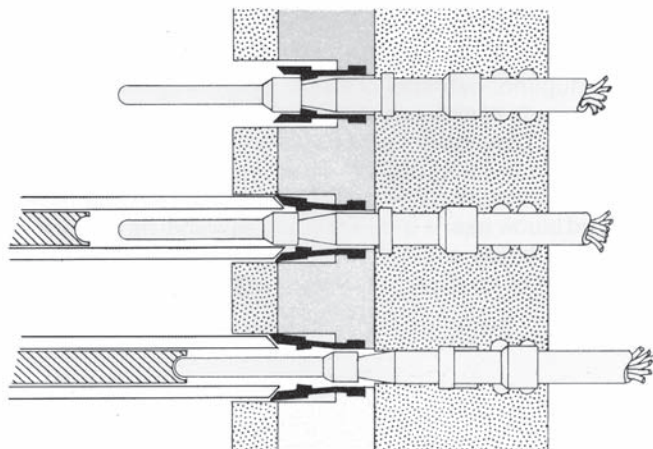
## ILL B

Front release used in MIL-C-5015, MIL-C-26482, 26500 and 26636 type connectors for service tools.

See illustrations: 5 & 6 for removal and 2, 26, & 27 for installation of contacts on pages 80 & 86.

## ILL B, Fig 1

MIL-C-26482, 26500, 26636 & 5015 cutaway front release.



A. Contact in "locked" position.

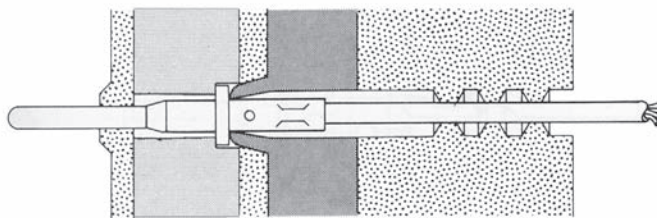
B. Tool probe shown opening retaining clip.

C. While clip is open, plunger moves contact out of the rear of connector.

**ILL C****GANG RETENTION MIL-C-81511, SERIES 1 & 2**

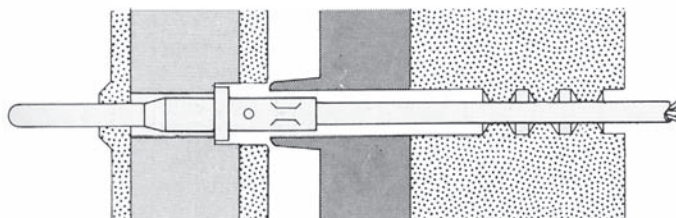
Using a rear locking screw, the retention plate may be “locked” by compressing it to the dielectric, (fig. 1) or “unlocked” by backing the nut out, releasing the locking plate. In an unlocked position (fig. 2), contacts may be inserted or removed with proper tooling.

See tooling illustrations 3 & 7 for removal and illustration 4 for insertion on pages 80 & 81.

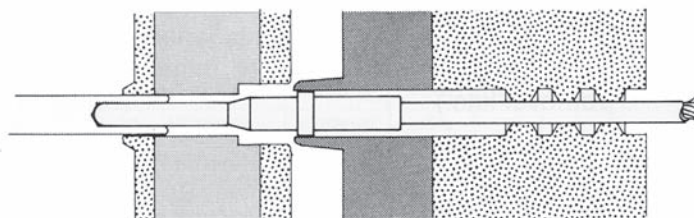
**ILL C, FIG 1**

Locked

LOCKING PLATE

**ILL C, FIG 2**

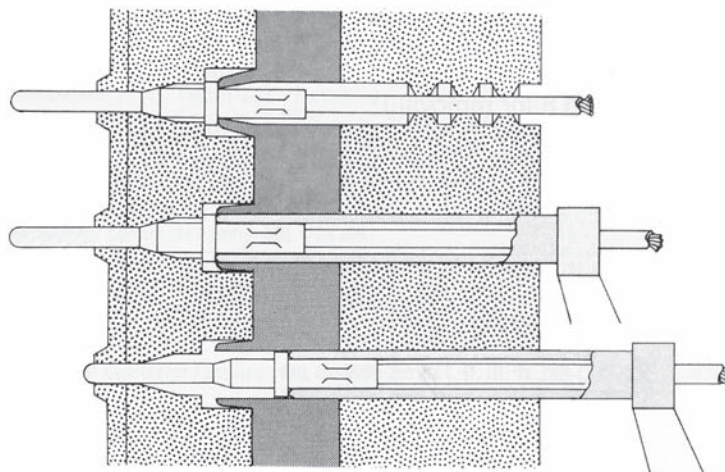
Unlocked

**ILL C, FIG 3**

Contact being removed.

**ILL D****MIL-C-81511, SERIES 3 & 4**

Rear release connectors using molded dielectric locking clips. These contacts are removed by using a rear removal tool. See tool illustrations 10 & 30 for removal and illustrations 2 & 30 for insertion. See pages 80, 81, & 86.



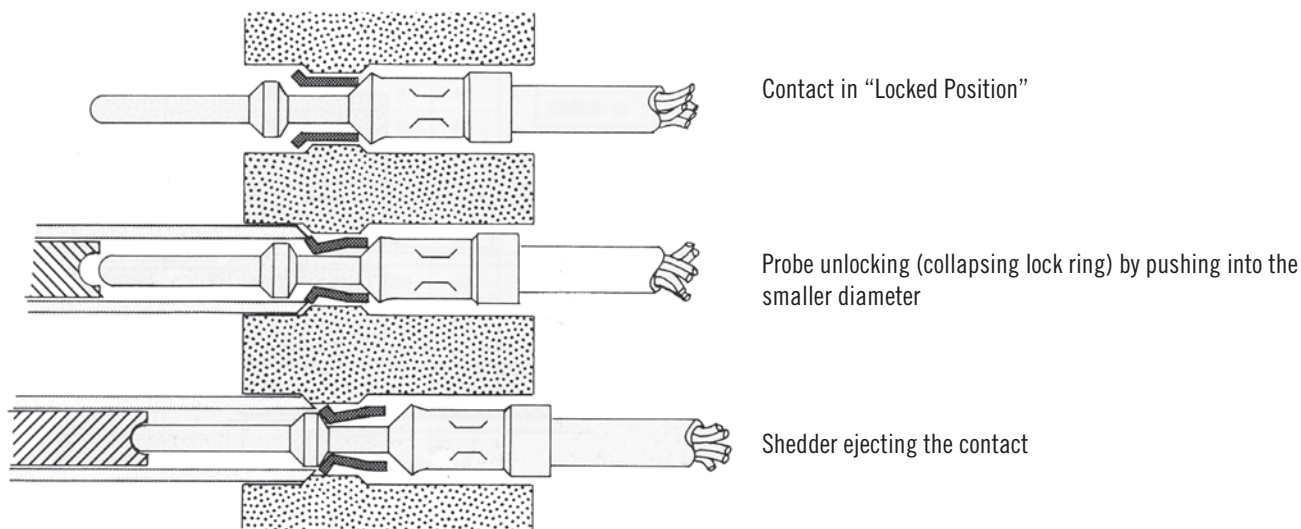


# Pin Locking and Releasing Methods

## ILL E

### FRONT RELEASE

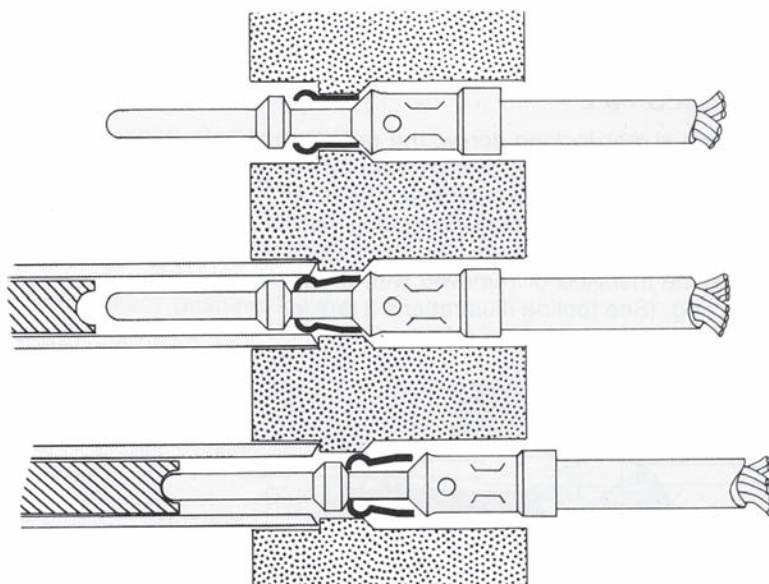
This locking mechanism is carried on the contact. It is pushed into the small diameter of the dielectric, collapsing the locking clip and permitting the contact to be removed. See tool illustration 8 on page 81. This locking method is common with Hughes Aircraft in sizes 22, 20, & 16.



## ILL F

### FRONT RELEASE CONNECTORS

Similar to Hughes locking clips, these are found in some Winchester connectors. The clip is expanded in a "locked" position. To remove contact, insert tool, probe will collapse the clip and unlock the contact. The shedder (plunger) will follow through ejecting the contact. For contact insertion see tool illustrations 1 & 2 on page 80, and illustration 8 for removal on page 81.

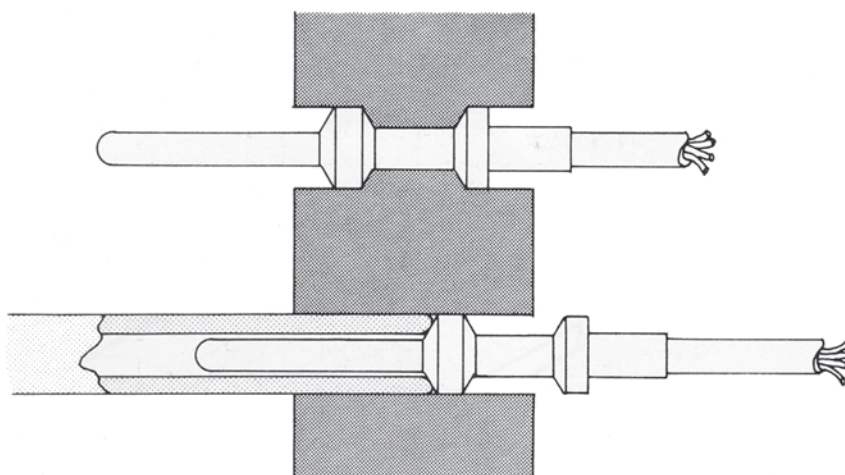




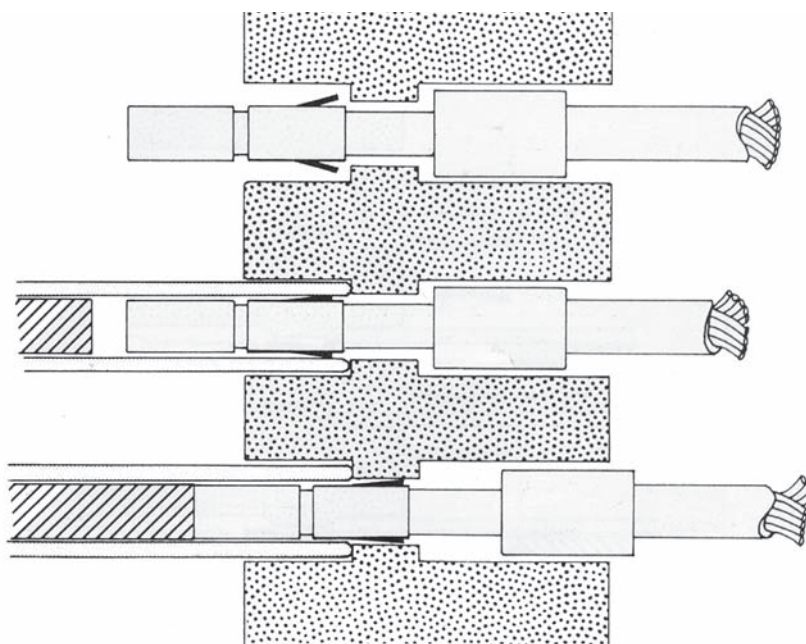
**ILL G****INTERFERENCE LOCK CONNECTORS**

Used by Cannon, Bendix, and Amphenol, the contacts are inserted and removed by force using the proper tooling.

See tool illustrations 12 and 13 for insertion tools and illustrations 14 & 15 for insertion/removal kits on page 82.

**ILL H****FRONT RELEASE—  
WINCHESTER, AMP  
AND ELCO CONNECTORS**

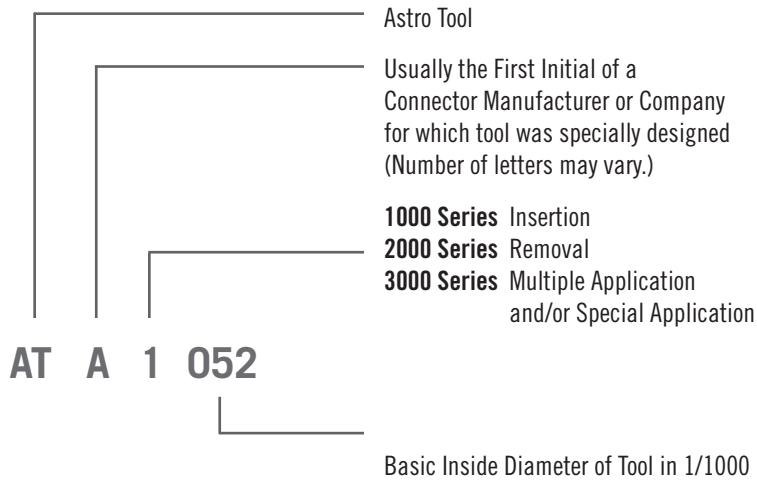
The contacts may be held in by a locking clip or spear action. Some contacts of this nature are machined with a locking clip attached, while others are stamped with the spur-lock made into them.



# Insertion and Removal Tool Selection Charts

## How to Read Selection Charts

For ATA 1052



## CHART ABBREVIATIONS

|                  |                                          |
|------------------|------------------------------------------|
| <b>I/R</b>       | Insertion or Removal designation column  |
| <b>I</b>         | Insertion Tool                           |
| <b>R</b>         | Removal Tool                             |
| <b>I &amp; R</b> | Insertion & Removal Tool                 |
| <b>R/F</b>       | Rear or Front Release designation column |
| <b>R</b>         | Rear Release                             |
| <b>F</b>         | Front Release                            |
| <b>R &amp; F</b> | Rear and Front Release                   |
| <b>ILL</b>       | Illustration reference number            |
| <b>GA</b>        | Gage designation                         |
| <b>NAATT</b>     | Not Available At This Time               |

**ASTRO WILL DESIGN CUSTOM INSERTION AND REMOVAL TOOLS TO FIT YOUR NEEDS.**

| TOOL IDENTIFICATION NUMBERS |               | I/R   | R/F | USAGE/<br>DESCRIPTION                                  | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|---------------|-------|-----|--------------------------------------------------------|------|------|---------------------|
| AIRBORN                     | ASTRO TOOL #  |       |     |                                                        |      |      |                     |
| TIR 1610                    | ATIR 1610     | I & R | R   | Metal Tool, Tweezer                                    | 10   | 22   | WTK                 |
|                             | ATIR 1610-L   | I & R | R   | Modified version of ATIR 1610 .62 tips                 | 10   | 22   | WTK                 |
| TR 1883                     | ATR 1883      | I & R | R   | Metal Tool, Tweezer-Straight                           | 10   | 22   | WTK                 |
| TR 1886                     | ATR 1886      | I & R | R   | Metal Tool, Tweezer-.455 ext.                          | 10   | 22   | WTK482              |
| 2597                        | See ATIR 1610 | I & R | R   | TIR 1610 (Same as TIR1610)                             | 10   | 22   | WTK                 |
| 2598                        | See ATIR 1883 | I & R | R   | TR 1883 (Same as TR1883)                               | 10   | 22   | WTK                 |
|                             | AT 4000       | I     | R   | Pins & Sockets                                         | 2    | 22   | TW                  |
|                             | AT 4001       | I     | R   | Pins & Sockets                                         | 2    | 20   | TW                  |
|                             | AT 4002       | I     | R   | Comparable to ATH 1094                                 | 2    | 16   | TM                  |
|                             | AT 4003       | I     | R   | Deep Insertion                                         | 2    | 20   | W                   |
|                             | AT 4004       | I     | R   | Deep Insertion MRS, MRE, MRA, Jogged                   | 2    | 16   | C, M, R             |
|                             | AT 5000       | R     | F   | Pins & Sockets, Metal Spring-Loaded Probe Tool         | 8    | 22   | TW                  |
|                             | AT 5001       | R     | F   | Pins & Sockets, Metal Spring-Loaded Probe Tool         | 8    | 20   | TW                  |
|                             | AT 5001-S     | R     | F   | Pins Only, Metal Spring-Loaded Probe Tool              | 8    | 20   | TW                  |
|                             | AT 5002       | R     | F   | Comparable to ATH 2102, Metal Spring-Loaded Probe Tool | 8    | 16   | TM                  |



# Listed by Contact Manufacturer

| TOOL IDENTIFICATION NUMBERS |               | I/R   | R/F   | USAGE/<br>DESCRIPTION                    | ILL. | GAGE   | CONNECTOR<br>SERIES |
|-----------------------------|---------------|-------|-------|------------------------------------------|------|--------|---------------------|
| AMPHENOL                    | ASTRO TOOL #  |       |       |                                          |      |        |                     |
| 294-27                      | ATA 1079 or   | I     | R     | Pins & Sockets                           | 2    | 20     | 348                 |
|                             | ATA 1080      | I     | R     | Pins & Sockets                           | 4    | 20     | 348                 |
| 294-28                      | ATA 2042 or   | R     | F     | Pins Only                                | 3    | 20     | 348                 |
|                             | ATA 2348-20   | R     | F     | Pins & Sockets                           | 9    | 20     | 348                 |
| 294-29                      | ATA 2038 or   | R     | F     | Sockets Only                             | 7    | 20     | 348                 |
|                             | ATA 2048 or   | R     | F     | Pins & Sockets                           | 9    | 20     | 348                 |
| 294-30                      | ATA 1102 or   | I     | R     | Pins & Sockets                           | 2    | 16     | 348                 |
|                             | ATA 1104      | I     | R     | Pins & Sockets                           | 4    | 16     | 348                 |
| 294-31                      | ATA 2065 or   | R     | F     | Pins Only                                | 3    | 16     | 348                 |
|                             | ATA 2348-16   | R     | F     | Pins & Sockets                           | 9    | 16     | 348                 |
| 294-32                      | ATA 2060 or   | R     | F     | Sockets Only                             | 7    | 16     | 348                 |
|                             | ATA 2348-16   | R     | F     | Pins & Sockets                           | 9    | 16     | 348                 |
| 294-33                      | ATA 1159 or   | I     | R     | Pins & Sockets                           | 2    | 12     | 348                 |
|                             | ATA 1158 or   | I     | R     | Pins & Sockets                           | 4    | 12     | 348                 |
|                             | ATA1159-S     | I     | R     | Modified version of ATA 1159, Straight   | 1    | 12     | 348                 |
| 294-34                      | ATA 2120 or   | R     | F     | Pins Only                                | 3    | 12     | 348                 |
|                             | ATA 2348-12   | R     | F     | Pins & Sockets                           | 9    | 12     | 348                 |
| 294-35                      | ATA 2093 or   | R     | F     | Sockets Only                             | 7    | 12     | 348                 |
|                             | ATA2348-12    | R     | F     | Pins & Sockets                           | 9    | 12     | 348                 |
| 294-39                      | ATA 3069      | I & R | F & R | Tool Kit                                 | 15   | 16     | 69                  |
| 294-40                      | ATA 3095      | I & R | F & R | Tool Kit                                 | 15   | 12     | 69                  |
| 294-48                      | ATA 2125      | R     | R     | Metal Tool, Rear Release, Plunger        | 6    | 16     | 84, 94              |
| 294-58                      | ATA 2085      | R     | F     | Short Metal Tool, Front Release, Plunger | 6    | 20     | 84, 94              |
| 294-66                      | ATA 3050      | I     | R     | Tool, Double-Ended Tip, Dual Purpose     | 9    | 16, 20 | 84                  |
| 294-72                      | AT 1000-12 or | I     | R     | Metal Tool, Joggled                      | 2    | 12     | 48, 217             |
|                             | ATA 1144      | I     | R     | Metal Interchangeable Probe Tool         | 26   | 12     | 48, 217             |
| 294-73                      | AT 2012       | R     | F     | Metal Tool, Front Release, Plunger       | 6    | 12     | 48, 217             |
| 294-88                      | AT 1000-20 or | I     | R     | Metal Tool, Joggled                      | 2    | 20     | 48, 217             |
|                             | ATA 1086      | I     | R     | Metal Interchangeable Probe Tool         | 26   | 20     | 48, 217             |
| 294-89                      | AT 2020       | R     | F     | Metal Tool, Front Release, Plunger       | 6    | 20     | 48, 217             |
| 294-96                      | AT 1000-16 or | I     | R     | Metal Tool, Joggled                      | 2    | 16     | 48, 217             |
|                             | ATA 1101      | I     | R     | Metal Interchangeable Probe Tool         | 26   | 16     | 48, 217             |
| 294-97                      | AT 2016       | R     | F     | Metal Tool, Front Release, Plunger       | 6    | 16     | 48, 217             |
| 294-108                     | ATA 1080 and  | I     | R     | Metal Joggled Tool                       | 2    | 20     | M83723              |
|                             | ATA 2080      | R     | R     | Metal Tool, Tweezer Tool                 | 10   | 20     | M83723              |
| 294-109                     | ATA 1107 and  | I     | R     | Metal Joggled Tool                       | 2    | 16     | M83723              |
|                             | ATA 2112      | R     | R     | Metal Tool, Tweezer Tool                 | 10   | 16     | M83723              |
| 294-110                     | ATA 1160 and  | I     | R     | Metal Joggled Tool                       | 2    | 12     | M83723              |
|                             | ATA 2160      | R     | R     | Metal Tool, Tweezer Tool                 | 10   | 12     | M83723              |

# Insertion and Removal Tool Selection Charts

LISTED BY CONTACT MANUFACTURER

| TOOL IDENTIFICATION NUMBERS |              | I/R | R/F | USAGE/<br>DESCRIPTION                  | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-----|-----|----------------------------------------|------|------|---------------------|
| AMPHENOL                    | ASTRO TOOL # |     |     |                                        |      |      |                     |
| 294-123                     | ATD 1035     | I   | R   | Metal Tool, Joggled                    | 2    | 22   |                     |
| 294-127                     | ATA 2255     | R   | F   | #2 Shielded Contacts                   | 6    | Coax | 48                  |
| 294-128                     | ATA 1189     | I   | R   | #2 Shielded Contacts                   | 4    | 8    | 94                  |
| 294-152                     | ATC 2040 and | R   | F   | Pins & Sockets                         | 9    | 20   | 67, 906             |
|                             | ATA 1075     | I   | R   | Insertion tool for above               | 1    | 20   | 67, 906             |
| 294-155                     | ATA 2040 and | R   | F   | Pins & Sockets                         | 9    | 22   | 17                  |
|                             | ATA 1040     | I   | R   | Insertion tool for above               | 1    | 22   | 17                  |
| 294-189                     | ATA 2185     | R   | F   | #10 Contacts                           | 6    | 10   | 213                 |
| 294-190                     | ATA 1175     | I   | R   | #10 Contacts                           | 4    | 10   | 213                 |
| 294-192                     | ATF 1101 or  | I   | R   | Metal Long-Slot Tool                   | 27   | 16   | 246                 |
|                             | ATF 1105     | I   | R   | Comparable                             | 2    | 16   | 246                 |
| 294-219                     | ATF 2115     | R   | F   | Metal Tool, Front Release, Plunger     | 5    | 16   | 246                 |
| 294-229                     | ATF 1144 or  | I   | R   | Metal Long-Slot Tool                   | 27   | 12   | 246                 |
|                             | ATF 1160     | I   | R   | Comparable                             | 2    | 12   | 246                 |
| 294-230                     | ATF 2162     | R   | F   | Metal Tool, Front Release, Plunger     | 5    | 12   | 246                 |
| 294-235                     | ATF 1558 or  | I   | R   | Metal Long-Slot Tool                   | 27   | 0    | 246                 |
|                             | ATF 1554     | I   | R   | Comparable                             | 2    | 0    | 246                 |
| 294-236                     | ATF 1378 or  | I   | R   | Metal Long-Slot Tool                   | 27   | 4    | 246                 |
|                             | ATF 1359     | I   | R   | Comparable                             | 2    | 4    | 246                 |
| 294-237                     | ATF 1260 or  | I   | R   | Metal Long-Slot Tool                   | 27   | 8    | 246                 |
|                             | ATF 1256     | I   | R   | Comparable                             | 2    | 8    | 246                 |
| 294-238                     | ATA 2254     | R   | F   | Coaxial 94-621                         | 6    | Coax | 94                  |
| 294-239                     | ATF 2336     | R   | F   | Metal Tool, Front Release, Plunger     | 5    | 4    | 246                 |
| 294-240                     | ATF 2252     | R   | F   | Metal Tool, Front Release, Plunger     | 5    | 8    | 246                 |
| 294-241                     | ATF 2518     | R   | F   | Metal Tool, Front Release, Plunger     | 5    | 0    | 246                 |
| 294-278                     | ATA 1052 or  | I   | R   | Pins & Sockets                         | 2    | 22   | 348                 |
|                             | ATA 1051 or  | I   | R   | Pins & Sockets                         | 4    | 22   | 348                 |
|                             | ATA 1052-S   | I   | R   | Modified Version of ATA 1052, straight | 1    | 22   | 348                 |
| 294-280                     | ATA 2079     | R   | F   | Metal Tool, Front Release, Plunger     | 6    | 20   | 213                 |
| 294-286                     | ATA 2030 or  | R   | F   | Pins Only                              | 3    | 23   | 348                 |
|                             | ATA2348-22   | R   | F   | Pins & Sockets                         | 9    | 23   | 348                 |
| 294-287                     | ATA 2026 or  | R   | F   | Sockets Only                           | 7    | 23   | 348                 |
|                             | ATA 2348-22  | R   | F   | Pins & Sockets                         | 9    | 23   | 348                 |
| 294-296                     | ATSE 2070    | R   | F   | MIL-C-28840                            | 5    | 20   | 213                 |
| 294-465                     | ATA 1114     | I   | R   | Tip for ATA 3069 Kit (16-A)            | 15   | 16   | 69                  |
| 356-400-1, 3                | ATA 1040     | I   | R   | Pins & Sockets Min-Rac, Relia-Tac      | 1    | 22   | 17                  |
| 356-400-5, 6, 7, 8          | ATA 2040     | R   | F   | Pins & Sockets Min-Rac                 | 9    | 22   | 17                  |
| 356-400-11                  | ATA 1033     | I   | R   | Pins & Sockets Min-Rac, Wire Form      | 1    | 22   | 17                  |



# Listed by Contact Manufacturer

| TOOL IDENTIFICATION NUMBERS |               | I/R   | R/F   | USAGE/<br>DESCRIPTION                                        | ILL. | GAGE       | CONNECTOR<br>SERIES |
|-----------------------------|---------------|-------|-------|--------------------------------------------------------------|------|------------|---------------------|
| AMPHENOL                    | ASTRO TOOL #  |       |       |                                                              |      |            |                     |
| 356-400-1, 3                | ATA 1040      | I     | R     | Pins & Sockets Min-Rac, Relia-Tac                            | 1    | 22         | 17                  |
| 356-400-5,6, 7, 8           | ATA 2040      | R     | F     | Pins & Sockets Min-Rac                                       | 9    | 22         | 17                  |
| 356-400-11                  | ATA 1033      | I     | R     | Pins & Sockets Min-Rac, Wire Form                            | 1    | 22         | 17                  |
| 356-400-12                  | ATA 2029      | R     | F     | Sockets, Min-Rac, 220-501                                    | 1    | 22         | 17                  |
| 356-400-13                  | ATA 2033      | R     | F     | Pins Minc-Rac, Wire Form                                     | 1    | 22         | 17                  |
|                             | ATA 2033-L    | R     | F     | Pins-Librascope, Long Tip                                    | 1    | 22         | 17                  |
| 356-400-2                   | ATA 1109      | I     | R     | Pins & Sockets Mini-Rac, Wire Form                           | 9    | 22         |                     |
| 356-400-15, 14              | ATA 2032      | R     | F     | Pins & Sockets Min-Rac, Wire Form                            | 9    | 22         | 17                  |
| 356-400-11, 12, 13          | ATA 3032      | I & R | R & F | Tool Kit, Min-Rac, 220-501                                   | 15   | 22         | 17                  |
| 494-1 Handles               | ATA 3482      | I & R | R & F | Tool, Double-Ended Tip-Filter Pins                           | 9    | 20         | 482                 |
| 494-1-2 Insertion<br>Tip    | ATA 1186      | I     | R     | Straight Coaxial                                             | 1    | Coax       |                     |
| 494-1-3 Removal<br>Tip      | ATA 2073      | R     | F     | Stamped Contacts                                             | 6    | 20         | M                   |
|                             | ATA 2112      | R     | F     | Pins & Sockets                                               | 6    | 16         | M                   |
|                             | ATA 3035      | I & R | R & F | Tool Kit, Pins & Sockets, Min-Rac, Wire Form                 | 15   | 22         | 17                  |
| 200-4000-240-20             | ATA 3120      | I & R | R & F | Contact Clip Removal & Replacement                           | --   | 16         | 5015                |
| 11-3695                     | ATBX 2-3695   | R     | F     | Tool Kit                                                     | 14   | 12, 16     | AN/MS               |
| 11-3696                     | ATBX 2-3696   | R     | F     | Tip Only                                                     | 25   | 12         | AN/MS               |
| 11-3697                     | ATBX 2-3697   | R     | F     | Tip Only, Pins                                               | 25   | 16         | AN/MS               |
| 11-3698                     | ATBX 2-3698   | R     | F     | Tip Only, Sockets                                            | 25   | 12, 16     | AN/MS               |
| 11-6147-1                   | ATBX 3-6147-1 | --    | --    | Connector Plier                                              | --   | --         |                     |
| 11-6781                     | ATBX 1-6781   | I     | R     | Plier for Pygmy CE Connector                                 | 12   | 16         | CE                  |
| 11-6782                     | ATBX 1-6782   | I     | R     | Plier for Pygmy CE Connector                                 | 12   | 20         | CE                  |
| 11-6783                     | ATBX 2-6783   | R     | F     | Tip, CE Pygmy Pins                                           | 25   | 20         | CE                  |
| 11-6784                     | ATBX 2-6784   | R     | F     | Tip, CE Pygmy Sockets                                        | 25   | 20         | CE                  |
| 11-6900                     | ATBX 2-6900   | R     | F     | Tool Kit, CE Pygmy                                           | 14   | 16, 20     | CE                  |
| 11-6911                     | 0148-0141     |       |       | Handle & Cap Only                                            | 14   | --         |                     |
| 11-7082                     | ATBX 1-7082   | I     | R     | Solderless Contacts                                          | 12   | 12         | AN/MS               |
| 11-7260                     | ATBX 2-7260   | R     | F     | Tool Kit, CE Contacts incl.                                  | 14   | 12, 16, 20 | AN/MS & CE          |
| 11-7345                     | ATBX 1-7345   | I     | R     | Plier for 75, 81 & 85 Connector                              | 12   | 16         | AN/MS               |
| 11-7401-12                  | ATA 1144 or   | I     | R     | MS24254 & MS24255 CONTACTS, Metal Interchangeable Probe Tool | 26   | 12         | AN/MS               |
|                             | AT 1000-12    | I     | R     | Metal Tool Joggled                                           | 2    | 12         | AN/MS               |
| 11-7401-16                  | ATA 1101 or   | I     | R     | MS24254 & MS24255 CONTACTS, Metal Interchangeable Probe Tool | 26   | 16         | AN/MS               |
|                             | AT 1000-16    | I     | R     | Metal Tool Joggled                                           | 2    | 16         | AN/MS               |
| 11-7401-20                  | ATA 1086 or   | I     | R     | MS24254 & MS24255 CONTACTS, Metal Interchangeable Probe Tool | 26   | 20         | AN/MS               |
|                             | AT 1000-20    | I     | R     | Metal Tool Joggled                                           | 2    | 20         | AN/MS               |
| 11-7736                     | ATBX 1-7736   | I     | R     | Angled Pliers (214000 Series)                                | 13   | 16         | AN/MS               |
| 11-7763                     | ATBX 1-7763   | I     | R     | Angled Pliers (214000 Series)                                | 13   | 12         | AN/MS               |
| 11-7837                     | ATBX 2-8250   | R     | F     | Tool Kit                                                     | 14   | 8, 12, 16  | AN/MS               |

# Insertion and Removal Tool Selection Charts

LISTED BY CONTACT MANUFACTURER

| TOOL IDENTIFICATION NUMBERS |                | I/R | R/F | USAGE/<br>DESCRIPTION                      | ILL. | GAGE      | CONNECTOR<br>SERIES |
|-----------------------------|----------------|-----|-----|--------------------------------------------|------|-----------|---------------------|
| AMPHENOL/BENDIX             | ASTRO TOOL #   |     |     |                                            |      |           |                     |
| 11-7880-8                   | ATBX 2291      | R   | F   | Coaxial                                    | 6    | 8         | SE/MS               |
| 11-7880-12                  | AT 2012        | R   | F   | MS24254 & MS24255 CONTACTS                 | 6    | 12        | SE/MS               |
| 11-7880-16                  | AT 2016        | R   | F   | MS24254 & MS24255 CONTACTS                 | 6    | 16        | SE/MS               |
| 11-7880-20                  | AT 2020        | R   | F   | MS24254 & MS24255 CONTACTS                 | 6    | 20        | SE/MS               |
| 11-8107-16                  | ATBX 1-8107-16 | I   | R   | Pliers, SE Contacts                        | 12   | 16        | SE                  |
| 11-8107-20                  | ATBX 1-8107-20 | I   | R   | Pliers, SE Contacts                        | 12   | 20        | SE                  |
| 11-8154-1                   | ATBX 2288      | R   | F   | Coaxial Contacts                           | 6    | 8         | SE                  |
| 11-8220                     | ATBX 1-8220    | I   | R   | Coaxial                                    |      | 8         | AN/MS               |
| 11-8250                     | ATBX 2-8250    | R   | F   | Tool Kit                                   | 14   | 8, 12, 16 | AN/MS               |
| 11-8251                     | ATBX 2-8251    | R   | F   | Tip Only, Sockets                          | 14   | 8         | AN/MS               |
| 11-8252                     | ATBX 2-8252    | R   | F   | Tip Only, Pins                             | 14   | 8         | AN/MS               |
| 11-8475                     | ATBX 2-8475    | R   | F   | Tool Kit                                   | 14   | 12, 16    | AN/MS               |
| 11-8860-1                   | ATBX 1133      | I   | R   | Coaxial contacts 10 PT-CE                  | 2    | Coax      | CE                  |
| 11-8860-2                   | ATBX 1160      | I   | R   | Coaxial contacts 10 PT-CE                  | 2    | Coax      | CE                  |
| 11-8860-3                   | ATBX 1203      | I   | R   | Coaxial contacts 10 PT-CE                  | 2    | Coax      | CE                  |
| 11-8860-4                   | ATBX 1231      | I   | R   | Coaxial contacts 10 PT-CE                  | 2    | Coax      | CE                  |
| 11-8860-5                   | ATBX 1253      | I   | R   | Coaxial contacts 10 PT-CE                  | 2    | Coax      | CE                  |
| 11-8369-4                   | ATBX 1231      | I   | R   | Coaxial contacts 10 PT-CE                  | 2    | Coax      | CE                  |
| 11-8674-12                  | ATBX 1154      | I   | R   | Metal Tool, Joggled                        | 2    | 12        | JT                  |
|                             | ATBX 1154-90   | I   | R   | Metal Tool, 90 Degree Angle                | 1    | 12        | JT                  |
|                             | ATBX 1157      | I   | R   | Metal Tool, Tweezer Tool                   | 10   | 12        | JT                  |
| 11-8674-16                  | ATBX 1103      | I   | R   | Metal Tool, Pencil Style                   | 24   | 16        | JT                  |
|                             | ATR 1107       | I   | R   | Metal Tool, Joggled                        | 2    | 16        | JT                  |
|                             | ATBX 1108      | I   | R   | Metal Tool, Tweezer Tool                   | 10   | 16        | JT                  |
| 11-8674-20                  | ATBX 1070      | I   | R   | Metal Tool, Pencil Style                   | 24   | 20        | JT                  |
|                             | ATBX 1071      | I   | R   | Metal Tool, Straight Style                 | 1    | 20        | JT                  |
|                             | ATBX 1073      | I   | R   | Metal Tool, Offset                         | 2    | 20        | JT                  |
|                             | ATBX 1072      | I   | R   | Metal Tool, Tweezer Tool                   | 10   | 20        | JT                  |
|                             | ATBX 1075      | I   | R   | Metal Tool, Tweezer Tool, .75 tip length   | 10   | 20        | JT                  |
| 11-8674-22                  | ATBX 1057      | I   | R   | Metal Tool, Pencil Style                   | 24   | 22        | JT                  |
|                             | ATBX 1055      | I   | R   | Metal Tool, Offset                         | 2    | 22        | JT                  |
|                             | ATBX 1055-S    | I   | R   | Metal Tool, Special                        | 1    | 22        | JT                  |
|                             | ATBX 1058      | I   | R   | Metal Tool, Tweezer Tool                   | 10   | 22        | JT                  |
|                             | ATBX 1059      | I   | R   | Metal Tool, Tweezer Tool, .260 of Straight | 10   | 22        | JT                  |



| TOOL IDENTIFICATION NUMBERS |               | I/R | R/F | USAGE/<br>DESCRIPTION                                        | ILL. | GAGE  | CONNECTOR<br>SERIES |
|-----------------------------|---------------|-----|-----|--------------------------------------------------------------|------|-------|---------------------|
| AMPHENOL/BENDIX             | ASTRO TOOL #  |     |     |                                                              |      |       |                     |
| 11-8674-24                  | ATBX 1046     | I   | R   | Metal Tool, Pencil Style                                     | 24   | 22M/D | JT                  |
|                             | ATBX 1046-90  | I   | R   | Metal Tool, 90 Degree Angle                                  | 24   | 22M/D | JT                  |
|                             | ATBX 1046-135 | I   | R   | Metal Tool, 45 Degree Angle                                  | 24   | 22M/D | JT                  |
|                             | ATBX 1049     | I   | R   | Metal Tool, Offset                                           | 2    | 22M/D | JT                  |
|                             | ATBX 1049-S   | I   | R   | Metal Tool, Special                                          | 2    | 22M/D | JT                  |
|                             | ATBX 1052     | I   | R   | Metal Tool for .052 dia. wire                                | 2    | 22D   | JT                  |
|                             | ATBX 1048     | I   | R   | Metal Tool, Tweezer Tool                                     | 10   | 22M/D | JT                  |
|                             | ATBX 1051     | I   | R   | Metal Tool, Tweezer Tool, .055 dia. wire                     | 10   | 22M/D | JT                  |
| 11-8675-12                  | ATBX 2155     | R   | R   | Metal Tool, Tweezer Tool                                     | 10   | 12    | JT                  |
| 11-8675-16                  | ATBX 2103     | R   | R   | Metal Tool, Tweezer Tool                                     | 10   | 16    | JT                  |
| 11-8675-20                  | ATBX 2070     | R   | R   | Metal Tool, Tweezer Tool                                     | 10   | 20    | JT                  |
|                             | ATBX 2075     | R   | R   | Metal Tool, Tweezer Tool, .75 Tip Length                     | 10   | 20    | JT                  |
| 11-8675-22                  | ATBX 2057     | R   | R   | Metal Tool, Tweezer Tool                                     | 10   | 22    | JT                  |
|                             | ATBX 2058     | R   | R   | Metal Tool, Tweezer Tool, Long Tip                           | 10   | 22    | JT                  |
| 11-8675-24                  | ATBX 2046     | R   | R   | Metal Tool, Tweezer Tool                                     | 10   | 22M/D | JT                  |
|                             | ATBX 2048     | R   | R   | Metal Tool, Tweezer Tool, .560 Tip Length                    | 10   | 22M/D | JT                  |
| 11-8794-12                  | ATBX 1159     | I   | R   | Metal Tool, Tweezer Tool, Straight                           | 10   | 12    | JT                  |
| 11-8794-16                  | ATBX 1109     | I   | R   | Metal Tool, Tweezer Tool, Straight                           | 10   | 16    | JT                  |
| 11-8794-20                  | ATBX 1078     | I   | R   | Metal Tool, Tweezer Tool, Straight                           | 10   | 20    | JT                  |
| 11-8794-22                  | ATBX 1060     | I   | R   | Metal Tool, Tweezer Tool, Straight                           | 10   | 22    | JT                  |
| 11-8794-24                  | ATBX 1054     | I   | R   | Metal Tool, Tweezer Tool, Straight                           | 10   | 22M/D | JT                  |
| 11-8795-12                  | ATBX 2160     | R   | R   | Metal Tool, Tweezer Tool, Straight                           | 10   | 12    | JT                  |
| 11-8795-16                  | ATBX 2109     | R   | R   | Metal Tool, Tweezer Tool, Straight                           | 10   | 16    | JT                  |
| 11-8795-20                  | ATBX 2073     | R   | R   | Metal Tool, Tweezer Tool, Straight                           | 10   | 20    | JT                  |
| 11-8795-22                  | ATBX 2059     | R   | R   | Metal Tool, Tweezer Tool, Straight                           | 10   | 22    | JT                  |
| 11-8795-24                  | ATBX 2050     | R   | R   | Metal Tool, Tweezer Tool, Straight                           | 10   | 22M/D | JT                  |
|                             | ATBX 2047     | R   | R   | Metal Tool, Tweezer Tool, Modified Version of ATBX 2050      | 10   | 22M/D | JT                  |
| 11-8952                     | ATBX 2052     | R   | R   | Metal Tool, Tweezer Tool, Oversize Wire, Min.                | 10   | 22M/D | JT                  |
| 11-8953-1                   | ATBX 1053     | I   | R   | Modified version of ATBX 1048,<br>.375 Long Straight Section | 10   | 22M/D | JT                  |
| 11-10050-1                  | ATX 2014      | R   | R   | Unwired Contacts                                             | 16   | 22D   | JT                  |
| 11-10050-2                  | ATX 2004      | R   | R   | Unwired Contacts                                             | 16   | 22    | JT                  |
| 11-10050-3                  | ATX 2003      | R   | R   | Unwired Contacts                                             | 16   | 20    | JT                  |
| 11-10050-4                  | ATX 2002      | R   | R   | Unwired Contacts                                             | 16   | 16    | JT                  |

# Insertion and Removal Tool Selection Charts

LISTED BY CONTACT MANUFACTURER

| TOOL IDENTIFICATION NUMBERS |              | I/R | R/F | USAGE/<br>DESCRIPTION                         | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-----|-----|-----------------------------------------------|------|------|---------------------|
| AMPHENOL/MATRIX             | ASTRO TOOL # |     |     |                                               |      |      |                     |
| 90-0001-022                 | ATM 1046     | I   | R   | Mini-Mate                                     | 23   | 22   |                     |
|                             | ATM 1046-135 | I   | R   | Modified version of ATM 1046, 45 degree angle | 23   | 22   |                     |
| 90-0002-022                 | ATM 2052     | R   | F   | Mini-Mate, Metal Spring-Loaded Probe Tool     | 8    | 22   |                     |
| 258-6018-16                 | ATR 2112     | R   | R   | Metal Tool, Tweezer                           | 10   | 16   |                     |
| 258-6019-16                 | ATR 1107     | I   | R   | Metal Tool, Joggled                           | 2    | 16   |                     |
| 259-6002-20                 | ATR 2080     | R   | R   | Metal Tool, Tweezer                           | 10   | 20   |                     |
| 5000-026-22                 | ATRX 2052    | R   | R   | Metal Tool, Tweezer                           | 10   | 22   |                     |
| 6500-001-20                 | ATR 1080 and | I   | R   | Metal Tool, Joggled                           | 2    | 20   |                     |
|                             | ATR 2080     | R   | R   | Metal Tool, Tweezer                           | 10   | 20   |                     |
| 6500-001-16                 | ATR 1107 and | I   | R   | Metal Tool, Joggled                           | 2    | 16   |                     |
|                             | ATR 2112     | R   | R   | Metal Tool, Tweezer                           | 10   | 16   |                     |
| 6500-001-12                 | ATR 1160 and | I   | R   | Metal Tool, Joggled                           | 2    | 12   |                     |
|                             | ATR 2160     | R   | R   | Metal Tool, Tweezer                           | 10   | 12   |                     |
| 6500-018-0                  | ATC 2565     | R   | R   | 5015 Connector, Rear Release                  | 19   | 0    |                     |
| 6500-018-4                  | ATC 2426     | R   | R   | 5015 Connector, Rear Release                  | 19   | 4    |                     |
| 6500-018-8                  | ATC 2281     | R   | R   | 5015 Connector, Rear Release                  | 19   | 8    |                     |
| 6500-028-12                 | ATC 2157     | R   | R   | Modified version of ATR 2160, straight        | 10   | 12   |                     |
| 6500-028-16                 | ATC 2106     | R   | R   | Modified version of ATR 2112, straight        | 10   | 16   |                     |
| 6500-028-20                 | ATC 2079     | R   | R   | Modified version of ATR 2080, straight        | 10   | 20   |                     |
| 6500-029-12                 | ATR 2160     | R   | R   | PLASTIC Tweezer, 70 degree angle              | 10   | 12   |                     |
| 6500-029-16                 | ATR 2112-L   | R   | R   | PLASTIC Tweezer, 70 degree angle              | 10   | 16   |                     |
| 6500-029-20                 | ATR 2080     | R   | R   | PLASTIC Tweezer, 70 degree angle              | 10   | 20   |                     |
| 6500-030-12                 | ATGH 1160    | I   | R   | Straight In-Line, PLASTIC                     | 1    | 12   |                     |
| 6500-030-16                 | ATGH 1112    | I   | R   | Straight In-Line, PLASTIC                     | 23   | 16   |                     |
| 6500-030-20                 | ATGH 1079    | I   | R   | Straight In-Line, PLASTIC                     | 23   | 20   |                     |
| 6500-045-20                 | ATC 1071 and | I   | R   | Metal Comparable for Hydraulic Research       | 23   | 20   |                     |
|                             | ATC 2076     | R   | R   | Metal Comparable for Hydraulic Research       | 10   | 20   |                     |
|                             | ATM 1050     | I   | R   | Special Close 90 degree Bend                  | 23   | 22   |                     |





| TOOL IDENTIFICATION NUMBERS |              | I/R | R/F | USAGE/<br>DESCRIPTION                                         | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-----|-----|---------------------------------------------------------------|------|------|---------------------|
| BOEING                      | ASTRO TOOL # |     |     |                                                               |      |      |                     |
|                             | ATBO 1053    | I   | R   | Special Plier Repair Tool for m39029/11-22 & 12-22            | 13   | 22   |                     |
|                             | ATBO 1054    | I   | R   | Modified version of ATC 1054, 1.1 Long Tip<br>(CIT DPXMA22-1) | 2    | 22   |                     |
|                             | ATBO 1070    | I   | R   | Contact BACC47DT&S                                            | -    | 20   |                     |
|                             | ATBO 1075    | I   | R   | NAS 1599 Connector                                            | -    | 20   |                     |
|                             | ATBO 1075-L  | I   | R   | Modified version of ATBO 1075, Longer Tip                     | -    | 20   |                     |
|                             | ATBO 1081    | I   | R   | Contact BACC47DT&S                                            | -    | 16   |                     |
|                             | ATBO 1081-L  | I   | R   | Modified version of ATBO 1081, Longer Tip                     | -    | 16   |                     |
|                             | ATBO 1082    | I   | R   | NAS 1599 Connector                                            | 2    | 20   |                     |
|                             | ATBO 1105    | I   | R   | Metal Tool, Tweezer Tool                                      | 10   | 16   |                     |
| ST 2342A-T1                 | ATBO 1107    | I   | R   | Metal Tool, Joggled "Horses Head"                             | 2    | 16   |                     |
|                             | ATBO 1108    | I   | R   | Arbor Press                                                   | 2    | 16   |                     |
|                             | ATBO 1108-90 | I   | R   | Modified version of ATBO 1108, 90 Degree Angle                | 1    | 16   |                     |
| ST 2342A-T5                 | ATBO 1154    | I   | R   | Metal Tool, Joggled "Horses Head"                             | 2    | 12   |                     |
|                             | ATBO 2054    | R   | R   | Special Boeing Tool (CET DPXMA22)                             | 2    | 22   |                     |
|                             | ATBO 2073    | R   | R   | Hypertronics Connector, Metal Spring-Loaded Probe Tool        | 8    | 20   | K65                 |
|                             | ATBO 2082    | R   | R   | NAS 1599 -- Oversize Wire                                     | 2    | 20   |                     |
| ST 2342PB                   | ATBO 2342-PB | I   | R   | Handle inserts wire wrap contacts                             | -    | -    |                     |
|                             | ATBO 2342-PB |     |     | (Replaceable tips for basic tool listed below)                |      |      |                     |
|                             | /1           | I   | R   | Original Tip                                                  | -    | 22   |                     |
|                             | /2           | I   | R   | Modified .050 I.D.                                            | -    | 22   |                     |
|                             | /3           | I   | R   | Modified ATC 1054 Tip                                         | -    | 22   |                     |
|                             | /4           | I   | R   | Modified to .062 I.D.                                         | -    | 22   |                     |

## CHART ABBREVIATIONS

**I/R** Insertion or Removal designation column  
**I** Insertion Tool  
**R** Removal Tool  
**I & R** Insertion & Removal Tool  
**R/F** Rear or Front Release designation column

**R** Rear Release  
**F** Front Release  
**R & F** Rear and Front Release  
**ILL** Illustration reference number  
**GA** Gage designation  
**NAATT** Not Available At This Time

# Insertion and Removal Tool Selection Charts

LISTED BY CONTACT MANUFACTURER

| TOOL IDENTIFICATION NUMBERS |              | I/R   | R/F | USAGE/<br>DESCRIPTION                                                       | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-------|-----|-----------------------------------------------------------------------------|------|------|---------------------|
| BURNDY/FCI                  | ASTRO TOOL # |       |     |                                                                             |      |      |                     |
| J-1276-1                    |              | I & R | R   | YHMM-22-1 Pins, plastic tip,<br>recommended ATB 3062-2                      | -    | 2    | YHMM                |
| J-1276-3                    | ATB 3062-2   | I & R | R   | YHMM-22-1 Pins, plastic tip                                                 | 29   | 2    | YHMM                |
| J-1276-4                    | ATB 3062-4   | I & R | R   | YHMM-22-1 Pins, plastic tip (Longer Handle)                                 | 29   | 2    | YHMM                |
| RTM-12-5                    | ATA 1144 or  | I     | R   | MIL-C-26500, Metal Interchangeable Probe Tool                               | 26   | 12   | HYFEN               |
|                             | AT 1000-12   | I     | R   | MIL-C-26500, Metal Tool, Joggled                                            | 2    | 12   | HYFEN               |
| RTM-12-8                    | ATBX 1157    | I     | R   | MIL-C-38999, Metal Tool, Joggled                                            | 10   | 12   | JT                  |
| RTM-16-2V                   | ATA 1101     | I     | R   | MIL-C-26482, Metal Interchangeable Probe Tool                               | 26   | 16   | HYFEN               |
| RTM-16-4                    | ATBX 1108    | I     | R   | MIL-C-38999, Metal Tool, Tweezer                                            | 10   | 16   | JT                  |
| RTM-20-5                    | ATB 1064 or  | I     | R   | MIL-C-26482, 26500, 26636, Metal Interchangeable Probe Tool                 | 26   | 20   | HYFEN               |
|                             | ATB 1067 or  | I     | R   | Modified version of ATB 1064, Long Tip, Metal Interchangeable<br>Probe Tool | 26   | 20   | HYFEN               |
|                             | ATB 1068     | I     | R   | Modified version of ATB 1067, Joggled                                       | 2    | 20   | HYFEN               |
| RTM-20-5PI                  | ATB 1067-R   | I     | R   | Tip to fit Burndy RTM-20-5                                                  | 25   | 20   | HYFEN               |
| RTM-20-17                   | ATBX 1072    | I     | R   | MIL-C-38999, Metal Tool, Tweezer                                            | 10   | 20   | JT                  |
| RTM-22-1                    | ATBX 1058    | I     | R   | MIL-C-38999, Metal Tool, Tweezer                                            | 10   | 22   | JT                  |
| RTM-24-3                    | ATBX 1053    | I     | R   | MIL-C-38999, Metal Tool, Tweezer                                            | 10   | 24   | JT                  |
| RTM-20-16                   | AT1000-20    | I     | R   | Metal Tool, Joggled                                                         | 2    | 20   |                     |
| RX-8-1                      | ATH 2202     | R     | F   | Metal Tool, Coaxial                                                         | 6    | 8    |                     |
| RX-12-7                     | AT 2012      | R     | F   | MIL-C-26636, 26482                                                          | 6    | 12   | HYFEN               |
| RX-12-9                     | ATBX 2155    | R     | R   | MIL-C-38999                                                                 | 10   | 12   | JT                  |
| RX-16-7-V1                  | ATB 2114     | R     | F   | Modified MS24256R-16, Revision E                                            | 6    | 16   | HYFEN               |
| RX-16-7-V2                  | ATB 2114     | R     | F   | Modified MS24256R-16, Revision E                                            | 6    | 16   | HYFEN               |
| RX-16-8                     | AT 2016      | R     | F   | MIL-C-26482                                                                 | 6    | 16   | HYFEN               |
| RX-16-9                     | ATBX 2103    | R     | R   | MIL-C-38999                                                                 | 10   | 16   | JT                  |
| RX-20-10                    | ATB 2088     | R     | F   | MIL-C-26500, 26636, Metal Spring-Loaded Probe Tool                          | 8    | 20   | HYFEN               |
| RX-20-24                    | AT 2020      | R     | F   | MIL-C-26482                                                                 | 6    | 20   | HYFEN               |
| RX-20-24V3                  | ATB 2080     | R     | F   | MIL-C-26482 (MS24256R-20, Revision E) Modified                              | 6    | 20   | HYFEN               |
| RX-20-24V5                  | ATB 2080     | R     | F   | MIL-C-26482 (MS24256R-20, Revision E) Modified                              | 6    | 20   | HYFEN               |
| RX-20-36                    | ATBX 2070    | R     | R   | MIL-C-38999                                                                 | 10   | 20   | JT                  |
| RX-22-1                     | ATBX 2057    | R     | R   | MIL-C-38999                                                                 | 10   | 22   | JT                  |
| RX-24-3                     | ATBX 2046    | R     | R   | MIL-C-38999                                                                 | 10   | 22D  | JT                  |
|                             | ATB 1035     | I     | R   | Unwired Contact 28-91-S-9000                                                | 1    | 22   |                     |
|                             | ATB 1043     | I     | R   | Unwired Contact 39029/18-20-20                                              | 1    | 20   |                     |
|                             | ATB 1044     | I     | R   | Unwired Contact 2749420                                                     | 1    | 20   |                     |
|                             | ATB 1066     | I     | R   | Unwired Contact 0641-1-1631                                                 | 1    | 16   |                     |

| TOOL IDENTIFICATION NUMBERS |              | I/R | R/F | USAGE/<br>DESCRIPTION | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-----|-----|-----------------------|------|------|---------------------|
| COLLINS RADIO               | ASTRO TOOL # |     |     |                       |      |      |                     |
| 372-8091-010                | ATC 2026     | R   | F   | Tuning Fork Contacts  | 11   | --   |                     |
| 372-8091-060                | ATC 1032     | I   | R   | Tweezer, Filter Pins  | 30   | --   |                     |



| TOOL IDENTIFICATION NUMBERS |              | I/R | R/F | USAGE/<br>DESCRIPTION          | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-----|-----|--------------------------------|------|------|---------------------|
| CONTINENTAL                 | ASTRO TOOL # |     |     |                                |      |      |                     |
| 2512                        | AT 5002      | R   | F   | Metal Spring-Loaded Probe Tool | 8    | 16   | 25                  |
| 2534                        | AT 4002      | I   | R   | Metal Tool, Joggled            | 2    | 16   | 25                  |
| 2558                        | ATBX 1057    | I   | R   | Metal Tool, Pencil Style       | 24   | 22   | 25                  |
| 2559                        | ATCL 2061    | R   | F   | Metal Spring-Loaded Probe Tool | 8    | 22   | 25                  |

| TOOL IDENTIFICATION NUMBERS |                 | I/R | R/F | USAGE/<br>DESCRIPTION                                          | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|-----------------|-----|-----|----------------------------------------------------------------|------|------|---------------------|
| DELPHI/HUGHES               | ASTRO TOOL #    |     |     |                                                                |      |      |                     |
| TD-202-IT-000               | AT 4003         | I   | R   | Deep Insertions G. D. Pomona                                   | 2    | 20   | W                   |
| TE-022-RT-001               | ATH 2027        | R   | F   | PC Connector Jack Pins, Metal Spring-Loaded Probe Tool         | 8    | 22   | EMS                 |
| TG-22-IT                    | ATH 1053        | I   | R   | Metal Tool, Tweezer                                            | 10   | 22D  | W                   |
| TG-22-RT                    | ATH 2053        | R   | R   | Metal Tool, Tweezer                                            | 10   | 22D  | W                   |
| THM-22-B000                 | ATBX 2046       | R   | R   | Metal Tool, Tweezer                                            | 10   | 22M  | W                   |
| TM-016-IT-001               | AT 4002 or 4004 | I   | R   | Joggled Push-In Style                                          | 2    | 16   | C-M-R               |
| TM-016-IT-003               | AT 4004         | I   | R   | Deep Insertion-MRS-MRE-MRA                                     | 2    | 16   | MR                  |
| TM-016-RT-001               | AT 5002         | R   | F   | MRP Connector, Pins & Sockets, Metal Spring-Loaded Probe Tool  | 8    | 16   | MR                  |
| TM-016-RT-006               | ATH 2103        | R   | F   | Pins & Sockets                                                 | 6    | 16   | M                   |
| TR-22D-IT                   | ATH 1050        | I   | R   | Metal Tool, Tweezer #1035415                                   | 10   | 22D  | W                   |
| TR-22D-RT                   | ATH 2050        | R   | R   | Metal Tool, Tweezer #1035416A                                  | 10   | 22D  | W                   |
| TU-016-IT-002               | ATH 1102        | I   | R   | Contacts UP 16Y16C000                                          | 2    | 16   | U                   |
| TU-016-RT-000               | ATH 2120        | R   | F   | Universal Contacts, Metal Spring-Loaded Probe Tool             | 8    | 16   | U                   |
| TU-016-RT-006               | ATH 2121        | R   | F   | Pins & Sockets                                                 | 6    | 16   | U                   |
| TU-020-IT-002               | ATH 1067        | I   | R   | UR-UTE-UTS                                                     | 1    | 20   | U                   |
| TU-020-RT-002               | AT 5001-S       | R   | F   | URS-UTE-UTS, Metal Spring-Loaded Probe Tool                    | 8    | 20   | U                   |
| TU-020-RT-006               | ATH 2088        | R   | F   | Pins & Sockets                                                 | 6    | 20   | U                   |
| TU-180-RT-000               | ATH 2221        | R   | F   | Co-ax RG 180/U                                                 | 6    | 8    | U                   |
| TU-195-RT-000               | ATH 2206        | R   | F   | Co-ax RG 195/U                                                 | 6    | 8    | U                   |
| TW-020-IT-000               | AT 4001         | I   | R   | Pins & Sockets                                                 | 2    | 20   | W                   |
| TW-020-RT-002               | AT 5001         | R   | F   | WMS-WMW-O-Line, Metal Spring-Loaded Probe Tool                 | 8    | 20   | W                   |
| TW-020-RT-006               | ATH 2088        | R   | F   | Pins & Sockets                                                 | 6    | 20   | W                   |
| TW-022-IT-000               | ATH 1046        | I   |     |                                                                |      | 22   | W                   |
| TW-022-IT-001               | AT 4000         | I   | R   | Pins & Sockets                                                 | 2    | 22   | W                   |
| TW-022-IT-007               | ATH 1052        | I   | R   | Pins & Sockets                                                 | 23   | 22   | W                   |
| TW-022-RT-001               | AT 5000         | R   | F   | WSS 0244 P08-RN-549, Metal Spring-Loaded Probe Tool            | 8    | 22   | W                   |
| TW-022-RT-006               | ATH 2052        | R   | F   | Pins & Sockets, Metal Spring-Loaded Probe Tool                 | 8    | 22   | W                   |
| 652636                      | AT 5000         | R   | F   | WSS 0244P08 -Airborn, Metal Spring-Loaded Probe Tool           | 8    | 22   | W                   |
| 722698-328                  | AT 5002         | R   | F   | Pins & Sockets -Documented, Metal Spring-Loaded Probe Tool     | 8    | 16   | MR                  |
| 722698-329                  | ATAMP 3070      |     |     | Transfer Tool Termipoint Clib                                  | 21   |      |                     |
| 722699-224                  | ATH 3260        |     |     | Forming Tool Microelectronic Leads                             | 20   |      |                     |
| 722699-224-1                | ATH 3261        |     |     | Forming Pliers-To form leads before Insertion on circuit board | 20   |      |                     |
| 722699-224-2                | ATH 3262        |     |     | Forming Pliers-To form leads before Insertion on circuit board | 20   |      |                     |
| 722699-224-3                | ATH 3263        |     |     | Forming Pliers-To form leads before Insertion on circuit board | 20   |      |                     |

# Insertion and Removal Tool Selection Charts

LISTED BY CONTACT MANUFACTURER

| TOOL IDENTIFICATION NUMBERS |              | I/R | R/F | USAGE/<br>DESCRIPTION                                     | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-----|-----|-----------------------------------------------------------|------|------|---------------------|
| DELPHI/HUGHES               | ASTRO TOOL # |     |     |                                                           |      |      |                     |
|                             | ATH 1031     | I   | R   | Special for General Dynamics                              | 1    | 22   |                     |
|                             | ATH 1033     | I   | R   | Special for General Dynamics                              | 2    | 22   |                     |
|                             | ATH 1054     | I   | R   | Metal Tool                                                | 23   | 22   |                     |
|                             | ATH 1094     | I   | R   | MIL-C-22857                                               | 1    | 16   |                     |
|                             | ATH 2089     | R   | F   | URS-UTE-UTS-Deep, Metal Spring-Loaded Probe Tool          | 8    | 20   | U                   |
|                             | ATH 2102     | R   | F   | MIL-C-22857, Metal Spring-Loaded Probe Tool               | 8    | 16   |                     |
|                             | ATH 3037-12  |     |     | Contact Guide 12" Long used on rear insert 22 GA contacts | 22   |      |                     |
|                             | ATH 3037-18  |     |     | Contact Guide 18" Long used on rear insert 22 GA contacts | 22   |      |                     |

| TOOL IDENTIFICATION NUMBERS |              | I/R | R/F | USAGE/<br>DESCRIPTION                         | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-----|-----|-----------------------------------------------|------|------|---------------------|
| DEUTSCH                     | ASTRO TOOL # |     |     |                                               |      |      |                     |
| 15513-12                    | ATA 1144     | I   | R   | MIL-C-26636, Metal Interchangeable Probe Tool | 26   | 12   | DD, DTK, DPK        |
| 15513-16                    | ATA 1101     | I   | R   | MIL-C-26636, Metal Interchangeable Probe Tool | 26   | 16   | DD, DTK, DPK        |
| 15513-20                    | ATA 1086     | I   | R   | MIL-C-26636, Metal Interchangeable Probe Tool | 26   | 20   | DD, DTK, DPK        |
| 81515-20                    | ATD 1061 and | I   | R   | MIL-C-81511, Series III & IV                  | 2    | 20   |                     |
|                             | ATD 2062     | R   | F   | MIL-C-81511, Series III & IV                  | 10   | 20   |                     |
| 81515-16                    | ATD 1094 and | I   | R   | MIL-C-81511, Series III & IV                  | 2    | 16   |                     |
|                             | ATD 2094     | R   | F   | MIL-C-81511, Series III & IV                  | 10   | 16   |                     |
| 81517-23                    | ATD 2044     | R   | R   | Metal Tool                                    | 17   | 22   |                     |
| 81517-20                    | ATD 2058     | R   | R   | Metal Tool                                    | 17   | 20   |                     |
| 81517-16                    | ATD 2090     | R   | R   | Metal Tool                                    | 17   | 16   |                     |
| 81517-12                    | ATD 2150     | R   | R   | Metal Tool                                    | 17   | 12   |                     |
| M-15513-12                  | ATA 1159     | I   | R   | 800 Series                                    | 2    | 12   | DS, MDR, DA         |
| M-15513-16                  | ATR 1107     | I   | R   | 800 Series                                    | 2    | 16   | DS, MDR, DA         |
| M-15513-20                  | ATD 1081 or  | I   | R   | 800 Series                                    | 2    | 20   | DS, MDR, DA         |
|                             | ATD 1081-S   | I   | R   | Modified version of ATD 1081 Straight         | 1    | 20   |                     |
| M-15513-25                  | ATD 1206     | I   | R   | Coaxial & 8 GA, Metal Long-Slot Tool          | 27   | 8    |                     |
| M-15514-12                  | AT 2012      | R   | F   | MIL-C-26636                                   | 6    | 12   | DD, DTK, DPK        |
| M-15514-16                  | AT 2016      | R   | F   | MIL-C-26636                                   | 6    | 16   | DD, DTK, DPK        |
| M-15514-20                  | AT 2020      | R   | F   | MIL-C-26636                                   | 6    | 20   | DD, DTK, DPK        |
| M-15514-25                  | ATA 2254     | R   | F   | 800 Series                                    | 6    | Coax | DD, DTK, DPK        |
| M-15515-12                  | ATD 2191 or  | R   | F   | Pins & Sockets                                | 17   | 12   | DS                  |
|                             | ATD 2190     | R   | F   | Pins & Sockets                                | 6    | 12   | DS                  |
| M-15515-16                  | ATD 2127 or  | R   | F   | Connector #6820                               | 17   | 16   | DS                  |
|                             | ATD 2128     | R   | F   | Connector #6820                               | 6    | 16   | DS                  |
| M-15515-20                  | ATD 2097 or  | R   | F   | Pins & Sockets                                | 17   | 20   | DS                  |
|                             | ATD 2095     | R   | F   | Pins & Sockets, Spring Loaded                 | 6    | 20   | DS                  |
| M-15515-22P/S               | ATD 2040     | R   | F   | Metal Tool                                    | 23   | 22   | DS                  |





| TOOL IDENTIFICATION NUMBERS |                                             | I/R | R/F | USAGE/<br>DESCRIPTION                                      | ILL. | GAGE          | CONNECTOR<br>SERIES |
|-----------------------------|---------------------------------------------|-----|-----|------------------------------------------------------------|------|---------------|---------------------|
| DEUTSCH                     | ASTRO TOOL #                                |     |     |                                                            |      |               |                     |
| M-15513-12                  | ATA 1159                                    | I   | R   | 800 Series                                                 | 2    | 12            | DS, MDR, DA         |
| M-15513-16                  | ATR 1107                                    | I   | R   | 800 Series                                                 | 2    | 16            | DS, MDR, DA         |
| M-15513-20                  | ATD 1081 or                                 | I   | R   | 800 Series                                                 | 2    | 20            | DS, MDR, DA         |
|                             | ATD 1081-S                                  | I   | R   | Modified version of ATD 1081 Straight                      | 1    | 20            |                     |
| M-15513-25                  | ATD 1206                                    | I   | R   | Coaxial & 8 GA, Metal Long-Slot Tool                       | 27   | 8             |                     |
| M-15514-12                  | AT 2012                                     | R   | F   | MIL-C-26636                                                | 6    | 12            | DD, DTK, DPK        |
| M-15514-16                  | AT 2016                                     | R   | F   | MIL-C-26636                                                | 6    | 16            | DD, DTK, DPK        |
| M-15514-20                  | AT 2020                                     | R   | F   | MIL-C-26636                                                | 6    | 20            | DD, DTK, DPK        |
| M-15514-25                  | ATA 2254                                    | R   | F   | 800 Series                                                 | 6    | Coax          | DD, DTK, DPK        |
| M-15515-12                  | ATD 2191 or                                 | R   | F   | Pins & Sockets                                             | 17   | 12            | DS                  |
|                             | ATD 2190                                    | R   | F   | Pins & Sockets                                             | 6    | 12            | DS                  |
| M-15515-16                  | ATD 2127 or                                 | R   | F   | Connector #6820                                            | 17   | 16            | DS                  |
|                             | ATD 2128                                    | R   | F   | Connector #6820                                            | 6    | 16            | DS                  |
| M-15515-20                  | ATD 2097 or                                 | R   | F   | Pins & Sockets                                             | 17   | 20            | DS                  |
|                             | ATD 2095                                    | R   | F   | Pins & Sockets, Spring Loaded                              | 6    | 20            | DS                  |
| M-15515-22P/S               | ATD 2040                                    | R   | F   | Metal Tool                                                 | 23   | 22            | DS                  |
| M-15515-25                  | ATD 2250                                    | R   | F   | Coaxial, Metal Spring-Loaded Probe Tool                    | 6    | 8             | DSM                 |
| M-15570-12                  | ATR 1160 and                                | I   | R   | Metal Tool, Joggled                                        | 2    | 12            | JTA                 |
|                             | ATR 2160                                    | R   | R   | Metal Tool, Tweezer                                        | 10   | 12            | JTA                 |
| M-15570-16                  | ATR 1107 and                                | I   | R   | Metal Tool, Joggled                                        | 2    | 16            | JTA                 |
|                             | ATR 2112                                    | R   | R   | Metal Tool, Tweezer                                        | 10   | 16            | JTA                 |
| M-15570-20                  | ATR 1080 and                                | I   | R   | Metal Tool, Joggled                                        | 2    | 20            | JTA                 |
|                             | ATR 2080                                    | R   | R   | Metal Tool, Tweezer                                        | 10   | 20            | JTA                 |
| M-15570-22                  | ATD 2048                                    | R   | R   | Metal Tool                                                 | 23   | 22            | RSM-RTK             |
| M-15570-22-1                | ATD 1035 and                                | I   | R   | Metal Tool, Joggled                                        | 2    | 22            | RSM-RTK             |
|                             | ATD 2047                                    | R   | R   | Metal Tool, Tweezer                                        | 10   | 22            | RSM-RTK             |
|                             | ATD 1035-135                                | I   | R   | Joggled version of ATD 1035, 45 degree angle               | 2    | 22            | RSM-RTK             |
| M-15571                     | ATK 2115                                    | R   | R   | NAS 1599, Unwired Contacts                                 | 17   | 12, 16,<br>20 | JTA                 |
| M83723-31-12, 16<br>& 20    | SEE THE NATIONAL AEROSPACE STANDARD SECTION |     |     |                                                            |      |               |                     |
|                             | ATD 1020                                    | I   | R   | RTK Connector Twist Pin                                    | 1    | 22            | RTK                 |
|                             | ATD 3312                                    |     |     | Wire comb, 6" taper flap,<br>modified version of ATWC 3312 | --   | --            |                     |
|                             | ATDL 2050                                   | R   | R   | MIL-C-38999, tweezer                                       | 10   | 22D           |                     |

| TOOL IDENTIFICATION NUMBERS |              | I/R | R/F | USAGE/<br>DESCRIPTION                               | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-----|-----|-----------------------------------------------------|------|------|---------------------|
| ELCO                        | ASTRO TOOL # |     |     |                                                     |      |      |                     |
| 061742-04                   | ATD 1081     | I   | R   | Metal Tool, Joggled                                 | 2    | 20   |                     |
| T-06-1877-02                | ATE 2057     | R   | R   | D11890977 Connector, Metal Spring-Loaded Probe Tool | 8    | 20   |                     |

# Insertion and Removal Tool Selection Charts

LISTED BY CONTACT MANUFACTURER

| TOOL IDENTIFICATION NUMBERS |              | I/R | R/F | USAGE/<br>DESCRIPTION       | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-----|-----|-----------------------------|------|------|---------------------|
| FLIGHT CONN.                | ASTRO TOOL # |     |     |                             |      |      |                     |
|                             | ATF 1101     | I   | R   | Metal Long-Slot Tool        | 27   | 16   |                     |
| 716-1227-000                | ATF 1105     | I   | R   | Joggled version of ATF 1101 | 2    | 16   |                     |
|                             | ATF 1144     | I   | R   | Metal Long-Slot Tool        | 27   | 12   |                     |
| 712-1229-000                | ATF 1160     | I   | R   | Joggled version of ATF 1144 | 2    | 12   |                     |
| 708-1258-000                | ATF 1256     | I   | R   | Version of ATF 1260         | 2    | 8    |                     |
|                             | ATF 1260     | I   | R   | Metal Long-Slot Tool        | 27   | 8    |                     |
| 704-1260-000                | ATF 1359     | I   | R   | Joggled version of ATF 1378 | 2    | 4    |                     |
|                             | ATF 1378     | I   | R   | Metal Long-Slot Tool        | 27   | 4    |                     |
| 700-1262-000                | ATF 1554     | I   | R   | Joggled version of ATF 1558 | 2    | 0    |                     |
|                             | ATF 1558     | I   | R   | Metal Tool                  | 27   | 0    |                     |
| 716-1168-000                | ATF 2115     | R   | F   | Front Release               | 5    | 16   |                     |
| 712-1172-000                | ATF 2162     | R   | F   | Front Release               | 5    | 12   |                     |
| 708-1138-000                | ATF 2255     | R   | F   | Front Release               | 5    | 8    |                     |
| 704-1134-000                | ATF 2336     | R   | F   | Front Release               | 5    | 4    |                     |
| 700-1130-000                | ATF 2518     | R   | F   | Front Release               | 5    | 0    |                     |



| TOOL IDENTIFICATION NUMBERS |              | I/R   | R/F | USAGE/<br>DESCRIPTION                                      | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-------|-----|------------------------------------------------------------|------|------|---------------------|
| G & H TECHNOLOGY            | ASTRO TOOL # |       |     |                                                            |      |      |                     |
| 847-101-COTO-1 & -2         | ATGH 1055    | I & R | R   | Single Tip, No Wire Slot                                   | 23   | 22   | 847/848             |
| 847-101-COTO-3 & -4         | ATGH 1081    | I & R | R   | Single Tip, No Wire Slot                                   | 23   | 20   | 847/848             |
| 847-101-COTO-5 & -6         | ATGH 1104    | I & R | R   | Single Tip , No Wire Slot                                  | 23   | 16   | 847/848             |
| 847-101-COTO-7 & -10        | ATGH 2057    | I & R | R   | Single Tip                                                 | 23   | 22   | 847/848             |
| 847-101-COTO-8 & -11        | ATGH 2081    | I & R | R   | Single Tip                                                 | 23   | 20   | 847/848             |
| 847-101-COTO-9 & -12        | ATGH 2105    | I & R | R   | Single Tip                                                 | 23   | 16   | 847/848             |
| 866-1078-COTO-3             | ATGH 2048    | I & R | R   | Single Tip , Straight with Slot                            | 23   | 22   | 866                 |
| 866 -1078-COTO-4            | ATGH 1070    | I & R | R   | Single Tip, Straight                                       | 23   | 20   | 866                 |
| 882-94                      | ATGH 2110    | R     | R   | Metal Tool, Tweezer                                        | 10   | 16   |                     |
| 885-277-COTO-001            | ATGH 2051    | R     | R   | MIL-C-38999, Breech Lok                                    | 10   | 22D  |                     |
| 885-277-COTO-002            | ATGH 2078    | R     | R   | MIL-C-38999, Breech Lok                                    | 10   | 20   |                     |
| 885-277-COTO-003            | ATGH 2109    | R     | R   | MIL-C-38999 , Breech Lok                                   | 10   | 16   |                     |
| 998-062                     | ATGH 1079    | I     | R   | NAS 1599 Connectors                                        | 23   | 20   | 843                 |
| 998-063                     | ATGH 2079    | R     | R   | NAS 1599 Connectors                                        | 23   | 20   | 843                 |
| 998-102                     | ATGH 1112    | I     | R   | NA S 1599 Connectors                                       | 23   | 16   | 843                 |
| 998-103                     | ATGH 1160    | I & R | R   | NAS 1599 Connectors                                        | 1    | 12   | 843                 |
| 998-104                     | ATGH 1190    | I & R | R   | NAS 1599 Connectors                                        | 1    | 8    | 843                 |
| 998105                      | ATGH 1079    | I & R | R   | NAS 1599 Connectors                                        | 23   | 20   | 843                 |
| 998-142-001                 | ATGH 2330    | R     | R   | Coaxial, Metal Long-Slot Tool                              | 27   | Coax |                     |
| 998-145-001                 | ATGH 1050    | I     | R   | Metal Tool, Tweezer                                        | 10   | 22   | 847/848             |
| 998-145-002                 | ATGH 2052    | R     | R   | Metal Tool, Tweezer                                        | 10   | 22   | 847/848             |
| 998-145-003                 | ATGH 1076    | I     | R   | Metal Tool, Tweezer                                        | 10   | 20   | 847/848             |
| 998-145-004                 | ATGH 2076    | R     | R   | Metal Tool, Tweezer                                        | 10   | 20   | 847/848             |
| 998-145-005                 | ATGH 1101    | I     | R   | Metal Tool, Tweezer                                        | 10   | 16   | 847/848             |
| 998-145-006                 | ATGH 2101    | R     | R   | Metal Tool, Tweezer                                        | 10   | 16   | 847/848             |
|                             | ATGH 1071    | I & R | R   | Modified for Lockheed S-2406-30                            | 23   | 20   |                     |
|                             | ATGH 1077    | I     | R   | Modified version of ATBX 1072 .66 tip length , MIL-C-38999 | 10   | 20   |                     |
|                             | ATGH 1109    | I     | R   | Modified version of ATBX 1108 .66 tip length , MIL-C-38999 | 10   | 16   |                     |
|                             | ATGH 2049    | R     | R   | Metal Tool, Tweezer                                        | 10   | 22   | 847/848             |
|                             | ATGH 2054    | R     | R   | Metal Tool, Tweezer                                        | 10   | 22   | 847/848             |
|                             | ATGH 2075    | R     | R   | Metal Tool, Tweezer                                        | 10   | 20   | 847/848             |
|                             | ATGH 2077    | R     | R   | Metal Tool, Tweezer                                        | 10   | 20   | 847/848             |
|                             | ATGH 2080    | R     | R   | Modified version of ATBX 2070 .66 tip length, MIL-C-38999  | 10   | 20   |                     |
|                             | ATGH 2103    | R     | R   | Metal Tool, Tweezer                                        | 10   | 16   |                     |
|                             | ATGH 2104    | R     | R   | NAS1599, 15° tip angle                                     | 10   | 16   |                     |
|                             | ATGH 2108    | R     | R   | Modified version of ATBX 2103 .66 tip length, MIL-C-38999  | 10   | 16   |                     |
|                             | ATGH 2160    | R     | R   | Metal Tool, Tweezer                                        | 10   | 12   |                     |

# Insertion and Removal Tool Selection Charts

LISTED BY CONTACT MANUFACTURER

| TOOL IDENTIFICATION NUMBERS |              | I/R | R/F | USAGE/<br>DESCRIPTION                    | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-----|-----|------------------------------------------|------|------|---------------------|
| ITT/CANNON                  | ASTRO TOOL # |     |     |                                          |      |      |                     |
| CET 4                       | ATC 2234     | R   | F   | Push out, Pins & Sockets                 | 9    | 4    | RX                  |
| CET 8                       | ATC 2150     | R   | F   | Push out, Pins & Sockets                 | 9    | 8    | RX                  |
| CET 8-2                     | ATC 2281     | R   | R   | MS3483-1 (Ref. 5015)                     | 19   | 8    | 5015                |
| CET 12                      | ATC 2092     | R   | F   | Impact Tool, Ring-Lok Connector          | 22   | 12   | KMBA                |
| CET 12-1A                   | ATC 2105     | R   | F   | Push out, Pins & Sockets                 | 9    | 12   | CA/RX               |
| CET 12-2                    | ATC 2105     | R   | F   | Push out, Pins & Sockets                 | 9    | 12   | MS-E, EX-G          |
| CET 12-4                    | ATR 2160     | R   | R   | Metal Tool, Tweezer, NAS 1599            | 10   | 12   |                     |
| CET 12-16                   | 0159-0051    |     |     | Tip Only, Delrin                         |      |      |                     |
| CET 16                      | ATC 2062     | R   | F   | Impact Tool, Ring-Lok DPGM               | 22   | 16   | KMBA                |
| CET 16-3A                   | ATC 2070     | R   | F   | Push out, Pins & Sockets                 | 9    | 16   | CA/RX               |
| CET 16-4                    | ATC 2070     | R   | F   | Push out, Pins & Sockets                 | 9    | 16   | MS-E, EX-G          |
| CET 16-9                    | ATR 2212     | R   | R   | MIL-C-83723                              | 10   | 16   |                     |
| CET 16-21                   | ATML 3006    |     |     | Tip Only, Delrin                         |      |      |                     |
| CET 16KJ                    | ATBX 2103    | R   | R   | MIL-C-38999                              | 10   | 16   | KJ                  |
| CET 20-3                    | ATC 2040-L   | R   | F   | Push out, Pins & Sockets (Long Tip)      | 9    | 20   | RX                  |
| CET 20-4                    | ATC 2040     | R   | F   | Push out, Pins & Sockets                 | 9    | 20   | KPTM                |
| CET 20-5A                   | ATC2046      | R   | F   | Impact Tool DDSMF Ring-Lok               | 22   | 20   | D*SM                |
| CET 20-8                    | ATR 2080     | R   | R   | Metal Tool, Tweezer, NAS 1664            | 10   | 20   |                     |
| CET 20-11                   | ATC 2071     | R   | R   | Metal Tool, Tweezer                      | 10   | 20   | D*C                 |
| CET 20-11, 20HD             | ATC 2076     | R   | R   | Metal Tool, Tweezer, DCB-DPX-DDCE        | 10   | 20   | DD                  |
| CET 20-24                   | ATML 3005    |     |     | Tip Only, Delrin                         |      |      |                     |
| CET 20-A                    | ATC 2046-L   | R   | F   | Impact Tool Ring-Lok, Long Tip           | 22   | 20   | DPGM                |
| CET 20-D                    | ATC 2071     | R   | R   | Metal Tool, Tweezer                      | 10   | 20   | D*C                 |
| CET 20-D-1                  | ATC 2073     | R   | R   | Metal Tool, Tweezer (Dwg. #995-0001-768) | 10   | 20   |                     |
| CET 20KJ                    | ATBX 2070    | R   | R   | MIL-C-38999                              | 10   | 20   | KJ                  |
| CET 22KJ                    | ATBX 2057    | R   | R   | MIL-C-38999                              | 10   | 22   | KJ                  |
| CET 22M-KJ                  | ATBX 2046    | R   | R   | MIL-C-38999                              | 10   | 22M  | KJ                  |
| CET C1                      | ATC 2170     | R   | F   | Impact Tool                              | 22   | 20   |                     |
| CET C4                      | ATC 2200     | R   | F   | Impact Tool                              | 22   | Coax | DPXMS               |
| CET C6B                     | ATC 2188     | R   | F   | D Miniature Coax                         | 6    | Coax | DPXA26              |
| CET C11                     | ATC 2276     | R   | F   | D Sub-Miniature                          | 6    | Coax |                     |
| CET DPKB 22                 | ATC 2053     | R   | R   | Metal Tool, Tweezer                      | 10   | 22   | DPK                 |
| CET DPKB 22<br>Revision C   | ATC 2054     | R   | R   | Metal Tool, Tweezer                      | 10   | 22   | DPK                 |
| CET FRF-0                   | ATF 2518     | R   | F   | MIL-C-5015, Front Release                | 5    | 0    |                     |
| CET FRF-4                   | ATF 2336     | R   | F   | MIL-C-5015, Front Release                | 5    | 4    |                     |
| CET FRF-8                   | ATF 2252     | R   | F   | MIL-C-5015, Front Release                | 5    | 8    |                     |
| CET FRF-12                  | ATF 2162     | R   | F   | MIL-C-5015, Front Release                | 5    | 12   |                     |
| CET FRF-16                  | ATF 2115     | R   | F   | MIL-C-5015, Front Release                | 5    | 16   |                     |
| CET KPSE 20A                | AT 2020      | R   | F   | MIL-C-26500, 26482, 26636                | 6    | 20   |                     |





# Listed by Contact Manufacturer

| TOOL IDENTIFICATION NUMBERS |              | I/R | R/F | USAGE/<br>DESCRIPTION                                            | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-----|-----|------------------------------------------------------------------|------|------|---------------------|
| ITT/CANNON                  | ASTRO TOOL # |     |     |                                                                  |      |      |                     |
| CET P-CTA                   | ATC 2035     | R   | F   | Centi Lok 2DD Pins                                               | 1    | 22   | DD                  |
| CET S-CTA                   | ATC 2036     | R   | F   | Centi Lok 2DD Sockets                                            | 1    | 22   | DD                  |
| CET TF                      | ATC 2026     | R   | F   | Tuning Fork Contacts                                             | 11   | --   |                     |
| CET VE-0                    | ATC 2565     | R   | R   | MIL-C-5015, Rear Release                                         | 19   | 0    |                     |
| CET VE-4                    | ATC 2426     | R   | R   | MIL-C-5015, Rear Release                                         | 19   | 4    |                     |
| CET VE-8                    | ATC 2281     | R   | R   | MIL-C-5015, Rear Release                                         | 19   | 8    |                     |
| CET VE-12                   | ATC 2184     | R   | R   | MIL-C-5015, Rear Release                                         | 10   | 12   |                     |
| CET VE-16                   | ATC 2136     | R   | R   | MIL-C-5015, Rear Release                                         | 10   | 16   |                     |
| CIET 12                     | ATR 1160     | I   | R   | Metal Tool, NAS 1664 for NAS 1599                                | 2    | 12   | KV/PV/DPK           |
|                             | ATR 2160     | R   | R   | Metal Tool, NAS 1664 for NAS 1599                                | 10   | 12   | KV/DPK/PV           |
| CIET 16                     | ATR 1107     | I   | R   | Metal Tool, NAS 1664 for NAS 1599                                | 2    | 16   | DPXME               |
|                             | ATR 2112     | R   | R   | Metal Tool, NAS 1664 for NAS 1599                                | 10   | 16   | DPXME               |
| CIET 20                     | ATR 1080     | I   | R   | Metal Tool, NAS 1664 for NAS 1599                                | 2    | 20   | DPXME               |
|                             | ATR 2080     | R   | R   | Metal Tool, NAS 1664 for NAS 1599                                | 10   | 20   | DPXME               |
| CIET 20-18                  | ATC 1081     | I   | R   | Metal Tool, Joggled                                              | 2    | 20   | D*C                 |
|                             | ATC 2076     | R   | R   | Metal Tool, Tweezer                                              | 10   | 20   | D*C                 |
| CIET 20HD                   | ATC 1076     | I   | R   | Metal Tool, Tweezer                                              | 10   | 20   | D*RA                |
|                             | ATC 2076     | R   | R   | Metal Tool, Tweezer                                              | 10   | 20   | D*RA                |
| CIET 20HDL                  | ATC 2076-L   | R   | R   | Metal Tool, Tweezer, Long Tip                                    | 10   | 20   | DPXME               |
| CIET CK-1                   | ATC 3050     | R   | R   | Metal Tool                                                       | 3    | 22   | DPX                 |
| CIET 22                     | ATC 1054     | I   | R   | Metal Tool, Joggled                                              | 2    | 22   | DPX2MA              |
|                             | ATC 2053     | R   | R   | Metal Tool, Tweezer (ref. ATC 2054)                              | 10   | 22   | CENTI-K             |
|                             | ATC 2053-70  | R   | R   | Modified version of ATC 2053 (70 degree angle)                   | 10   | 22   |                     |
|                             | ATC 1054-S   | I   | R   | Modified version of ATC 1054 (straight)                          | 1    | 22   |                     |
| CIT 4                       | ATC 1377     | I   | R   | Metal Tool, Straight                                             | 1    | 4    | RX                  |
| CIT 8                       | ATC 1265     | I   | R   | Metal Tool, Straight                                             | 1    | 8    | RX                  |
| CIT 12                      | ATC 1160     | I   | R   | DP*M, DPS, MS-E, KMBA Connector                                  | 2    | 12   | RX                  |
| CIT 12-1                    | ATC 1160     | I   | R   | RX Contacts                                                      | 2    | 12   | RX                  |
| CIT 12-2                    | ATC 1160     | I   | R   | RX Contacts                                                      | 2    | 12   | RX                  |
| CIT 16                      | ATC 1111     | I   | R   | Ring-Lok DP*M, KMB, SRC                                          | 2    | 16   | RX                  |
| CIT 16-1                    | ATC 1111     | I   | R   | Ring-Lok DP*M, KMB, SRC                                          | 2    | 16   | RX                  |
| CIT 16-2                    | ATC 1111-1   | I   | R   | Ring-Lok DP*M, KMB, SRC, Long Tip                                | 2    | 16   | RX                  |
| CIT 16-9                    | ATC 1112     | I   | R   | Ring-Lok DP*M, KMB, SRC                                          | 2    | 16   | RX                  |
| CIT 16KJ                    | ATBX 1108    | I   | R   | MIL-C-38999                                                      | 10   | 16   | KJ                  |
| CIT 20                      | ATA 1086     | I   | R   | DP*M, KQ, KR, KTM, MIL-C-26636, Metal Interchangeable Probe Tool | 26   | 20   | SRC                 |
| CIT 20-2                    | ATC 1079     | I   | R   | DSM                                                              | 2    | 20   | BFRX                |
| CIT 20-5A                   | ATC 1084     | I   | R   | KPTM                                                             | 2    | 20   | KPTM                |
| CIT 20-18                   | ATC 1081     | I   | R   | 038894-0018                                                      | 2    | 20   | KPTM                |
| CIT 20A                     | ATC 1055     | I   | R   | DDSMI                                                            | 2    | 20   | D                   |
| CIT 20D                     | ATC 1072     | I   | R   | DPXME-20 H.D.                                                    | 2    | 20   | D                   |



# Insertion and Removal Tool Selection Charts

LISTED BY CONTACT MANUFACTURER

| TOOL IDENTIFICATION NUMBERS |              | I/R   | R/F   | USAGE/<br>DESCRIPTION              | ILL. | GAGE  | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-------|-------|------------------------------------|------|-------|---------------------|
| ITT/CANNON                  | ASTRO TOOL # |       |       |                                    |      |       |                     |
| CIT 20KJ                    | ATBX 1072    | I     | R     | MIL-C-38999                        | 10   | 20    | KJ                  |
| CIT 22KJ                    | ATBX 1058    | I     | R     | MIL-C-38999                        | 10   | 22    | KJ                  |
| CIT 22M-KJ                  | ATBX 1048    | I     | R     | MIL-C-38999                        | 10   | 22M/D | KJ                  |
| CIT C2                      | ATC 1156     | I     | R     | DP*M                               | 2    | COAX  | DP                  |
| CIT CTA-1                   | ATC 1046     | I     | R     | Metal Tool, Tweezer                | 10   | 22    | CTA                 |
| CIT DPKB                    | ATC 1053     | I     | R     | DPKB                               | 2    | 22    | DPKB                |
| CIT DPX2MA22                | ATC 1054     | I     | R     | DPX                                | 2    | 22    | DPX                 |
| CIT DPXMA22-1               | ATC 1052     | I     | R     | DPXMA                              | 2    | 22    | DPXMA               |
| CIT PS-CTA-22               | ATC 1046     | I     | R     | Tweezer, Pins & Sockets            | 10   | 22    | D                   |
| CIT SS-14                   | ATCS 1105    | I     | R     | Super Seal Connector               | 1    | 20    | SS                  |
| CIT TF/FP                   | ATC 1032     | I     | R     | Metal Tool, Tweezer, Filter Pins   | 30   | --    | --                  |
|                             | ATC 1071     | I     | R     | D*C Connectors                     | 23   | 20    | D*                  |
|                             | ATC 1080     | I     | R     | Equivalent NSN 5120-00-409-5217    | 1    | 20    |                     |
| CET-CTA-2                   | ATC 3035     | I & R | F & R | Tool Kit, Centi Lok Pins & Sockets | 15   | 22    | DD                  |

| TOOL IDENTIFICATION NUMBERS |              | I/R | R/F | USAGE/<br>DESCRIPTION                                                                  | ILL. | GAGE     | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-----|-----|----------------------------------------------------------------------------------------|------|----------|---------------------|
| KLIXON                      | ASTRO TOOL # |     |     |                                                                                        |      |          |                     |
|                             | ATK 1052     | I   | R   | Klixon circuit breaker contacts                                                        | 1    |          |                     |
|                             | ATK 1130     | I   | R   | Insertion Kit - MIL-C-26482, 26500, 26636 connectors, Metal Interchangeable Probe Tool | 26   | 12,16,20 |                     |
|                             | ATK 2115     | R   | R   | Removal Kit for unwired contacts, NAS 1599                                             | 17   | 12,16,20 |                     |
|                             | ATK 2120     | R   | F   | Removal Kit-MIL-C-26482, 26500, 26636 connectors, Metal Interchangeable Probe Tool     | 26   | 12,16,20 |                     |

| TOOL IDENTIFICATION NUMBERS |              | I/R | R/F | USAGE/<br>DESCRIPTION                                                        | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-----|-----|------------------------------------------------------------------------------|------|------|---------------------|
| LOCKHEED                    | ASTRO TOOL # |     |     |                                                                              |      |      |                     |
| L525C19-24                  | ATL 1112     | I   | R   | Tip used with L525C19-44 Handle                                              | 25   | 16   |                     |
| L525C19-28                  | ATL 2097     | R   | F   | Tip used with L525C19-44 Handle                                              | 25   | 12   |                     |
| L525C19-32                  | ATL 2095     | R   | F   | Tip used with L525C19-44 Handle                                              | 25   | 12   | 69                  |
| L525C19-40                  | ATL 1108     | I   | R   | Tip used with L525C19-44 Handle                                              | 25   | 20   |                     |
| L525C19-42                  | ATL 1105     | I   | R   | Tip used with L525C19-44 Handle                                              | 25   | 20   |                     |
| L525C19-58                  | ATL 2040     | R   | F   | Tip used with L525C19-44 Handle                                              | 25   | 20   | 69                  |
| L525C19-59                  | ATL 2064     | R   | F   | Tip used with L525C19-44 Handle                                              | 25   | 16   | 69                  |
| L525C19-68                  | ATL 2044     | R   | F   | Tip used with L525C19-44 Handle                                              | 25   | 20   |                     |
| L525C19-69                  | ATL 2062     | R   | F   | Tip used with L525C19-44 Handle                                              | 25   | 16   |                     |
| L525C19-86                  | ATL 1154     | I   | R   | Tip used with L525C19-44 Handle                                              | 25   | 12   |                     |
| LITTON                      | ATL 2048     | R   | R   | MIL-C-38999 with wire wrap pins for wrapped contacts (Developed for Litton). | -    | 22M  |                     |



# Listed by Contact Manufacturer

| TOOL IDENTIFICATION NUMBERS |              | I/R | R/F | USAGE/<br>DESCRIPTION                 | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-----|-----|---------------------------------------|------|------|---------------------|
| MASTER SPEC..               | ASTRO TOOL # |     |     |                                       |      |      |                     |
|                             | ATMS 2050    | R   | R   | Modified version of ATBX 2046, Tip .8 | 10   | 22M  |                     |
| 800-P2                      | ATMS 2062    | R   | R   | Indicator light case contacts         | -    | 22   |                     |
|                             | ATMS 2073    | R   | R   | Unwired contacts NAS 1599             | 17   | 20   |                     |
|                             | ATMS 2101    | R   | R   | Unwired contacts NAS 1599             | 17   | 16   |                     |
|                             | ATMS 2148    | R   | R   | Unwired contacts NAS 1599             | 17   | 12   |                     |
|                             | ATMS 90562-1 | R   | F   | MIL-C-22992, Class L Connector        | -    | 4/0  |                     |
|                             | ATMS 90562-2 | R   | F   | MIL-C-22992, Class L Connector        | -    | 2/0  |                     |
|                             | ATMS 90562-3 | R   | F   | MIL-C-22992, Class L Connector        | -    | 1/0  |                     |
|                             | ATMS 90562-4 | R   | F   | MIL-C-22992, Class L Connector        | -    | 2    |                     |
|                             | ATMS 90562-5 | R   | F   | MIL-C-22992, Class L Connector        | -    | 4    |                     |
|                             | ATMS 90562-6 | R   | F   | MIL-C-22992, Class L Connector        | -    | 6    |                     |
|                             | ATMS 3115    | R   | F   | MIL-C-38300 Ultra-mate Connector      | -    | 16   |                     |
|                             | ATMS 3080    | R   | F   | MIL-C-38300 Ultra-mate Connector      | -    | 20   |                     |

| TOOL IDENTIFICATION NUMBERS |              | I/R | R/F | USAGE/<br>DESCRIPTION | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-----|-----|-----------------------|------|------|---------------------|
| MOLEX                       | ASTRO TOOL # |     |     |                       |      |      |                     |
| HT 2285                     | ATMO 2081    | R   | F   | 20 GA rolled contacts | 6    | 20   |                     |
| HT 2038                     | ATMO 2124    | R   | F   | 16 GA rolled contacts | 6    | 16   |                     |

| TOOL IDENTIFICATION NUMBERS |              | I/R | R/F | USAGE/<br>DESCRIPTION                           | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-----|-----|-------------------------------------------------|------|------|---------------------|
| NAT'L. AERO                 | ASTRO TOOL # |     |     |                                                 |      |      |                     |
| NAS 1664-12                 | ATR 1160 and | I   | R   | Single Tip Tool                                 | 2    | 12   |                     |
|                             | ATR 2160     | R   | R   | Metal Tool, Tweezer                             | 10   | 12   |                     |
|                             | ATR 1160-135 | I   | R   | Modified Version of ATR 1160, 45 degree angle   | 2    | 12   |                     |
|                             | ATR 1153     | I   | R   | Metal Tool, Tweezer                             | 10   | 12   |                     |
|                             | ATR 2160-S   | R   | R   | Modified Version of ATR 2160, straight          | 10   | 12   |                     |
| NAS 1664-16                 | ATR 1107 and | I   | R   | Single Tip Tool                                 | 2    | 16   |                     |
|                             | ATR 2112     | R   | R   | Metal Tool, Tweezer                             | 10   | 16   |                     |
|                             | ATR 1107-135 | I   | R   | Modified Version of ATR 1107, 45 degree angle   | 2    | 16   |                     |
|                             | ATR 1105     | I   | R   | Metal Tool, Tweezer                             | 10   | 16   |                     |
|                             | ATR 2112-L   | R   | R   | Same as ATR 2112                                | 10   | 16   |                     |
|                             | ATR 2112-LS  | R   | R   | Modified Version of ATR 2112, long tip-straight | 10   | 16   |                     |
| NAS 1664-20                 | ATR 1080 and | I   | R   | Single Tip Tool                                 | 2    | 20   |                     |
|                             | ATR 2080     | R   | R   | Metal Tool, Tweezer                             | 10   | 20   |                     |
|                             | ATR 1080-135 | I   | R   | Modified Version of ATR 1080, 45 degree angle   | 2    | 20   |                     |
|                             | ATR 1078     | I   | R   | Metal Tool, Tweezer                             | 10   | 20   |                     |
|                             | ATR 2080-S   | R   | R   | Modified Version of ATR 2080, straight          | 10   | 20   |                     |
|                             | ATR 2109     | R   | R   | MS3162 contacts, tip extension to one inch      | 10   | 16   |                     |

# Insertion and Removal Tool Selection Charts

LISTED BY CONTACT MANUFACTURER

| TOOL IDENTIFICATION NUMBERS |              | I/R | R/F | USAGE/<br>DESCRIPTION          | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-----|-----|--------------------------------|------|------|---------------------|
| POSITRONICS                 | ASTRO TOOL # |     |     |                                |      |      |                     |
| 9081                        | ATG 2103     | R   | F   | Metal Spring-Loaded Probe Tool | 8    | 16   |                     |
| 9099                        | AT 4004      | I   | R   | Metal Tool, Joggled            | 2    | 16   |                     |

| TOOL IDENTIFICATION NUMBERS |              | I/R | R/F | USAGE/<br>DESCRIPTION    | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-----|-----|--------------------------|------|------|---------------------|
| S.A.E.                      | ASTRO TOOL # |     |     |                          |      |      |                     |
| M81969/33-01                | ATSE 1077    | I   | R   | MIL-C-28840              | 2    | 20   |                     |
| M81969/33-02                | ATSE 1078    | I   | R   | MIL-C-28840              | 1    | 20   |                     |
| M81969/34-01                | ATSE 2071    | R   | F   | MIL-C-28840              | 5    | 20   |                     |
|                             | ATSE 2070    | R   | F   | MIL-C-28840              | 5    | 20   |                     |
| T10149-0                    | ATC 2565     | R   | R   | MIL-C-5015, Rear Release | 19   | 0    |                     |
| T10149-4                    | ATC 2426     | R   | R   | MIL-C-5015, Rear Release | 19   | 4    |                     |
| T10149-8                    | ATC 2281     | R   | R   | MIL-C-5015, Rear Release | 19   | 8    |                     |
| T10149-12                   | ATSE 2166    | R   | R   | MIL-C-5015, Rear Release | 10   | 12   |                     |
| T10149-16                   | ATSE 2109    | R   | R   | MIL-C-5015, Rear Release | 10   | 16   |                     |
| T10150-0                    | ATF 1554     | I   | R   | MIL-C-5015, Rear Release | 2    | 0    |                     |
| T10150-4                    | ATF 1359     | I   | R   | MIL-C-5015, Rear Release | 2    | 4    |                     |
| T10150-8                    | ATF 1256     | I   | R   | MIL-C-5015, Rear Release | 2    | 8    |                     |
| T10150-12                   | ATSE 1158-B  | I   | R   | MIL-C-5015, Rear Release | 2    | 12   |                     |
| T10150-16                   | ATSE 1108    | I   | R   | MIL-C-5015, Rear Release | 2    | 16   |                     |
| T10438                      | ATSE 1077    | I   | R   | MIL-C-28840              | 1    | 20   |                     |
|                             | ATSE 1080    | I   | R   | Metal Tool, Joggled      | 2    | 20   |                     |
|                             | ATSE 2049    | R   | R   | Metal Tool, Tweezer      | 10   | 22   |                     |
|                             | ATSE 2112    | R   | R   | 5015 connector, Tweezer  | 10   | 16   |                     |

| TOOL IDENTIFICATION NUMBERS |              | I/R | R/F | USAGE/<br>DESCRIPTION                  | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-----|-----|----------------------------------------|------|------|---------------------|
| TRANSITRON                  | ASTRO TOOL # |     |     |                                        |      |      |                     |
| PCD 91-023                  | ATT 1059     | I   | R   | Metal Tool, Straight                   | 1    | 22   |                     |
|                             | ATT 1060-B   | I   | R   | Metal Tool, Straight                   | 1    | 22   |                     |
|                             | ATT 1060-SGA | I   | R   | Metal Tool, Tweezer                    |      |      |                     |
| PCD 91-021                  | ATT 2059     | R   | R   | Metal Tool, Tweezer                    | 10   | 22   |                     |
|                             | ATT 2059-S   | R   | R   | Modified version of ATT 2059, straight | 10   | 22   |                     |
|                             | ATT 2060-S   | R   | R   | Metal Tool, Tweezer, Straight          | 10   | 22   |                     |



# Listed by Contact Manufacturer

IDENTIFICATION INFORMATION

| TOOL IDENTIFICATION NUMBERS |                | I/R | R/F | USAGE/<br>DESCRIPTION                                                               | ILL. | GAGE   | CONNECTOR<br>SERIES |
|-----------------------------|----------------|-----|-----|-------------------------------------------------------------------------------------|------|--------|---------------------|
| TYCO/AMP                    | ASTRO TOOL #   |     |     |                                                                                     |      |        |                     |
| 20823-2                     | AT 2016        | R   | F   | Metal Tool, Front Release, Plunger                                                  | 6    | 16     | 2017                |
| 20823-3                     | AT 2020        | R   | F   | Metal Tool, Front Release, Plunger                                                  | 6    | 20     | 2017                |
| 200826-1                    | AT 1000-20     | I   | R   | Metal Tool, Joggled                                                                 | 2    | 20     | 2017                |
| 200826-2                    | AT 1000-16     | I   | R   | Metal Tool, Joggled                                                                 | 2    | 16     | 2017                |
| 305141-1                    | ATAMP 2302     | R   | F   | Coaxial                                                                             | 6    | Coax   |                     |
| 305183-0                    | A 305183       | R   | F   | AMP 16, 20                                                                          | 17   | 16, 20 | M, W                |
| 305183-2                    | ATAMP 2103     | R   | F   | Metal Spring-Loaded Probe Tool                                                      | 8    | 20     |                     |
| 91002-1                     | ATAMP 1085     | I   | R   | Series M, Type 3                                                                    | 1    | 20, 16 | M                   |
| 91039-1                     | ATSE 1078      | I   | R   | MIL-C-28840                                                                         | 1    | 20     | Sub 20              |
| 91040-1                     | ATSE 2070      | R   | F   | MIL-C-28840                                                                         | 5    | 20     | Sub 20              |
| 91040-7                     | ATF 2518       | R   | F   | MIL-C-5015                                                                          | 5    | 0      |                     |
| 91066-1                     | ATC 1054 and   | I   | R   | Metal Tool, Joggled                                                                 | 2    | 22     | RME                 |
|                             | ATC 2053       | R   | R   | Metal Tool, Tweezer Tool                                                            | 10   | 22     | RME                 |
| 91066-2, 4                  | ATC 1071 and   | I   | R   | Metal Straight Probe Tool                                                           | 23   | 20     | RME                 |
|                             | ATC 2071       | R   | R   | Metal Tool, Tweezer Tool                                                            | 10   | 20     | RME                 |
| 91066-3                     | ATR 1107 and   | I   | R   | Metal Tool, Joggled                                                                 | 2    | 16     | RME                 |
|                             | ATR 2112       | R   | R   | Metal Tool, Tweezer Tool                                                            | 10   | 16     | RME                 |
| 91067-1                     | ATBX 1048 and  | I   | R   | Metal Tool, Tweezer Tool                                                            | 10   | 22D    |                     |
|                             | ATBX 2046      | R   | R   | Metal Tool, Tweezer Tool                                                            | 10   | 22D    |                     |
| 91067-2                     | ATBX 1055 and  | I   | R   | Metal Tool, Tweezer Tool                                                            | 10   | 22     |                     |
|                             | ATBX 2057      | R   | R   | Metal Tool, Tweezer Tool                                                            | 10   | 22     |                     |
| 91067-3                     | ATC 1076-L and | I   | R   |                                                                                     | 10   | 20     |                     |
|                             | ATC 2076-L     | R   | R   |                                                                                     | 10   | 20     |                     |
| 91074-1                     | ATAMP 2250     | R   | R   | Metal Tool, Tweezer Tool                                                            | 10   | Coax   | RM #5               |
|                             | ATA 2073       | R   | F   | Metal Tool, Front Release, Plunger                                                  | 6    | 20     | M                   |
|                             | ATA 2112       | R   | F   | Metal Tool, Front Release, Plunger                                                  | 6    | 16     | M                   |
| 202476-6                    | ATAMP 1231     | I   | R   | Connector #202476-6                                                                 | 1    |        |                     |
|                             | ATAMP 3040     |     |     | Miniclip Transfer Tool for .025 Square Pins                                         | 21   |        |                     |
|                             | ATAMP 3070     |     |     | Transfer Tool Kit-transfers AMP terminal clips from gun to terminal's single wires. | 21   |        |                     |

| TOOL IDENTIFICATION NUMBERS |              | I/R | R/F | USAGE/<br>DESCRIPTION                          | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-----|-----|------------------------------------------------|------|------|---------------------|
| U.S.<br>COMPONENTS          | ASTRO TOOL # |     |     |                                                |      |      |                     |
| R.T.2260                    | ATBX 2046    | R   | R   | Metal Tool, Tweezer                            | 10   | 22D  |                     |
|                             | ATUS 1050    | I   | R   | #2260 contacts                                 | 23   | 22   |                     |
|                             | ATUS 2052    | R   | F   | Pins & Sockets, Metal Spring-Loaded Probe Tool | 8    | 22   |                     |





# Insertion and Removal Tool Selection Charts

LISTED BY CONTACT MANUFACTURER

| TOOL IDENTIFICATION NUMBERS |              | I/R | R/F | USAGE/<br>DESCRIPTION                                          | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-----|-----|----------------------------------------------------------------|------|------|---------------------|
| VEAM/WINCHESTER             | ASTRO TOOL # |     |     |                                                                |      |      |                     |
| 107-1001                    | ATW 2104     | R   | F   | Metal Spring-Loaded Probe Tool                                 | 8    | 16   | MRAC                |
| 107-1005                    | AT 5002      | R   | F   | Comparable to ATH 2102, Metal Spring-Loaded Probe Tool         | 8    | 16   | MRAC                |
| 107-1007                    | ATW 2055     | R   |     | Flat contacts 8617                                             | 11   | --   |                     |
| 107-1011                    | ATW 1055     | I   | R   | Proto at Litton                                                | 1    | 22   | SREC                |
| 107-1012                    | ATCL 2061    | R   | F   | Winchester 4040-4024, Metal Spring-Loaded Probe Tool           | 8    | 22D  | SREC                |
| 107-1015                    | ATH 1094     | I   | R   | MIL-C-22857                                                    | 1    | 16   | MRAC                |
| 107-1026                    | ATS 2133     | R   | F   | Submarine Connector                                            | 6    | 16   |                     |
|                             | ATWC 3032    | --  | --  | Wire comb, 8" long, hook on one end, blade on other            | --   | --   |                     |
|                             | ATWC 3312    | --  | --  | 12" long phenolic 5/16" dia., point on one end, blade on other | --   | --   |                     |

| TOOL IDENTIFICATION NUMBERS |              | I/R | R/F | USAGE/<br>DESCRIPTION                                                  | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-----|-----|------------------------------------------------------------------------|------|------|---------------------|
| VIKING                      | ASTRO TOOL # |     |     |                                                                        |      |      |                     |
| 000407-0003                 | ATV 1086     | I   | R   | Metal Tool, Straight                                                   | 1    | 20   |                     |
| 000407-0004                 | ATV 2073     | R   | F   | Metal Spring-Loaded Probe Tool                                         | 8    | 20   |                     |
| 000407-0006                 | AT 2016      | R   | F   | Miniature relay sockets                                                | 6    | 16   |                     |
| 000407-0027                 | ATA 1101 or  | I   | R   | MIL-R-6106, Metal Long-Slot Tool                                       | 27   | 16   |                     |
|                             | AT 1000-16   | I   | R   | MIL-R-6106                                                             | 2    | 16   |                     |
| 000407-0031                 | ATV 2052     | R   | F   | Metal Spring-Loaded Probe Tool                                         | 8    | 22   |                     |
| 000407-0603                 | ATV 2073     | R   | F   | Revision B, Metal Spring-Loaded Probe Tool                             | 8    | 20   |                     |
| 980-0007-002                | ATR 1107 and | I   | R   | NAS 1599 metal tools                                                   | 2    | 16   |                     |
|                             | ATR 2112     | R   | R   | NAS 1599 metal tools                                                   | 10   | 16   |                     |
|                             | ATV 2075     | R   | F   | Modified version of ATV 2073 I.D. .075, Metal Spring-Loaded Probe Tool | 8    | 20   |                     |
|                             | ATV3125      | R   | F   | Impact Tool                                                            | 22   | 20   |                     |

| TOOL IDENTIFICATION NUMBERS |              | I/R | R/F | USAGE/<br>DESCRIPTION | ILL. | GAGE | CONNECTOR<br>SERIES |
|-----------------------------|--------------|-----|-----|-----------------------|------|------|---------------------|
| VIRGINIA PANEL              | ASTRO TOOL # |     |     |                       |      |      |                     |
| 166223                      | ATVP 2101    | R   | F   | Locktite Extraction   | --   | 20   |                     |
| 223848                      | ATVP 1120-2  | I   | R   | Locktite 12           | 1    | 20   |                     |
| 223849                      | ATVP 1120-1  | I   | R   | Locktite 14-20 AWG    | 1    | 20   |                     |
| 223850                      | ATVP 1120-3  | I   | R   | Locktite 22-24 AWG    | 1    | 20   |                     |



# Insertion and Removal Tool Selection Charts

## Insertion and Removal Tool Selection Charts listed by Military Standard

LISTED BY MILITARY STANDARD

| TOOL IDENTIFICATION NUMBERS |      |               |                                                 |      | I/R | COMMENTS                                      |
|-----------------------------|------|---------------|-------------------------------------------------|------|-----|-----------------------------------------------|
| MILITARY STANDARD           | ILL. | ASTRO TOOL #  | ASTRO FUNCTIONAL ALTERNATIVE                    | ILL. |     |                                               |
| MS3156-16                   | 28   | SEE M81969/1  | ATR 1107 and                                    | 2    | I   | Used on MIL-C-81659 Series II                 |
|                             |      |               | ATR 2112                                        | 10   | R   |                                               |
| MS3156-20                   | 28   | SEE M81969/1  | ATC 1072 and                                    | 2    | I   |                                               |
|                             |      |               | ATC 2076                                        | 10   | R   |                                               |
| MS3156-22                   | 28   | SEE M81969/1  | ATC 1054 and                                    | 2    | I   |                                               |
|                             |      |               | ATC 2053                                        | 10   | R   |                                               |
| MS3159-12                   | 17   | ATD 2150      |                                                 | 17   | R   | MIL-C-81511 Series III & IV, Unwired contacts |
| MS3159-16                   | 17   | ATD 2090      |                                                 | 17   | R   |                                               |
| MS3159-20                   | 17   | ATD 2058      |                                                 | 17   | R   |                                               |
| MS3159-22                   | 17   | ATD 2044      |                                                 | 17   | R   |                                               |
| MS3159-12A                  | 17   | 0214-1251     |                                                 | 17   | R   | Tip Only                                      |
| MS3159-16A                  | 17   | 0214-1641     |                                                 | 17   | R   | Tip Only                                      |
| MS3159-20A                  | 17   | 0214-2031     |                                                 | 17   | R   | Tip Only                                      |
| MS3159-22A                  | 17   | 0214-2251     |                                                 | 17   | R   | Tip Only                                      |
| MS3165-16                   | 28   | SEE M81969/29 | ATC 2136                                        |      |     |                                               |
| MS3165-8                    | 28   | SEE M81969/29 | ATC 2281                                        | 19   | R   | MIL-C-5015 Rear Release Contacts              |
| MS3165-4                    | 28   | SEE M81969/29 | ATC 2426                                        | 19   | R   |                                               |
| MS3165-0                    | 28   | SEE M81969/29 | ATC 2565                                        | 19   | R   |                                               |
|                             |      |               |                                                 |      |     |                                               |
| MS3323-12                   | 4    | ATA 1158      | ATA 1159                                        | 2    | I   | MIL-C-81511 Series I & II Pins & Contacts     |
| MS3323-16                   | 4    | ATA 1104      | ATA 1102                                        | 2    | I   |                                               |
| MS3323-20                   | 4    | ATA 1080      | ATA 1079                                        | 2    | I   |                                               |
| MS3323-22                   | 4    | ATA 1051      | ATA 1052                                        | 2    | I   |                                               |
| MS3342-12                   | 3    | ATA 2120      | ATA 2348-12*                                    | 9    | R   | MIL-C-81511 Series I & II Pins                |
| MS3342-16                   | 3    | ATA 2065      | ATA 2348-16*                                    | 9    | R   |                                               |
| MS3342-20                   | 3    | ATA 2042      | ATA 2348-20*                                    | 9    | R   |                                               |
| MS3342-23                   | 3    | ATA 2030      | ATA 2348-22*                                    | 9    | R   |                                               |
| MS3344-12                   | 7    | ATA 2093      | ATA 2348-12*                                    | 9    | R   | MIL-C-81511 Series I & II Sockets             |
| MS3344-16                   | 7    | ATA 2060      | ATA 2348-16*                                    | 9    | R   |                                               |
| MS3344-20                   | 7    | ATA 2038      | ATA 2348-20*                                    | 9    | R   |                                               |
| MS3344-23                   | 7    | ATA 2026      | ATA 2348-22*                                    | 9    | R   |                                               |
|                             |      |               | * ATA 2348XX tool removes both pins and sockets |      |     |                                               |
| MS3347-12                   | 28   | SEE M81969/14 | ATR 1160 and                                    | 2    | I   | NAS 1599 Connector Series                     |
|                             |      |               | ATR 2160                                        | 10   | R   |                                               |
| MS3347-16                   | 28   | SEE M81969/14 | ATR 1107 and                                    | 2    | I   |                                               |
|                             |      |               | ATR 2112                                        | 10   | R   |                                               |
| MS3347-20                   | 28   | SEE M81969/14 | ATR 1080 and                                    | 2    | I   |                                               |
|                             |      |               | ATR 2080                                        | 10   | R   |                                               |

Verify QPL status (if required) at time of purchase.



# Insertion and Removal Tool Selection Charts

LISTED BY MILITARY STANDARD

## CHART ABBREVIATIONS

**I/R** Insertion or Removal designation column  
**I** Insertion Tool  
**R** Removal Tool

**I & R** Insertion & Removal Tool  
**R/F** Rear or Front Release designation column  
**R** Rear Release

**F** Front Release  
**R & F** Rear and Front Release  
**ILL** Illustration reference number  
**GA** Gage designation  
**NAATT** Not Available At This Time

| TOOL IDENTIFICATION NUMBERS |      |              |                              |      | I/R | COMMENTS                                                         |
|-----------------------------|------|--------------|------------------------------|------|-----|------------------------------------------------------------------|
| MILITARY STANDARD           | ILL. | ASTRO TOOL # | ASTRO FUNCTIONAL ALTERNATIVE | ILL. |     |                                                                  |
| MS3448-001                  | 17   | ATK 2115     |                              | 17   | R   | NAS 1599 Unwired contacts                                        |
| MS3448-001A                 | 17   | 0161-0031    |                              | 17   | R   | Tip Only                                                         |
|                             | 17   | ATMS 2073    |                              | 17   | R   | Single Tip Tool                                                  |
| MS3448-001B                 | 17   | 0160-0041    |                              | 17   | R   | Tip Only                                                         |
|                             | 17   | ATMS 2101    |                              | 17   | R   | Single Tip Tool                                                  |
| MS3448-001C                 | 17   | 0159-0051    |                              | 17   | R   | Tip Only                                                         |
|                             | 17   | ATMS 2148    |                              | 17   | R   | Single Tip Tool                                                  |
| MS3483-1 (or size 8)        | 19   | ATC 2281     |                              | 19   | R   | MIL-C-5015 Rear Release Contacts                                 |
| MS3483-2 (or size 4)        | 19   | ATC 2426     |                              | 19   | R   |                                                                  |
| MS3483-3 (or size 0)        | 19   | ATC 2565     |                              | 19   | R   |                                                                  |
| MS17805                     | 1    | ATH 1094     | AT 4002                      | 2    | I   | MIL-C-22857 Connector Series                                     |
| MS17806                     | 7    | ATH 2102     | AT 5002                      | 8    | R   |                                                                  |
| MS18278-1                   | 19   | NONE         | ATC 1072 and                 | 2    | I   | MIL-C-24308 Connector Series                                     |
|                             |      |              | ATC 2076                     | 10   | R   |                                                                  |
| MS24256A-12                 | 27   | ATA 1144     | AT 1000-12                   | 2    | I   | MIL-C-26482, 265000 & 26636 Connectors                           |
| MS24256A-16                 | 27   | ATA 1101     | AT 1000-16                   | 2    | I   |                                                                  |
| MS24256A-20                 | 27   | ATA 1086     | AT 1000-20                   | 2    | I   |                                                                  |
| MS24256B-20                 | 27   | ATB 1064     | ATB 1067 or                  | 1    | I   |                                                                  |
|                             |      |              | ATB 1068                     | 1    | I   |                                                                  |
| MS24256K                    | 26   | ATK 1130     |                              |      | I   |                                                                  |
| MS24256R-12                 | 6    | AT 2012      |                              |      | R   |                                                                  |
| MS24256R-16                 | 6    | AT 2016      |                              |      | R   |                                                                  |
| MS24256R-20                 | 6    | AT 2020      |                              |      | R   |                                                                  |
| MS24256RH-16                | --   | ATMS 3115    |                              | --   | R   |                                                                  |
| MS24256RH-20                | --   | ATMS 3080    |                              | --   | R   | MIL-C-38300 ultra-mate Connectors                                |
| MS27495A-12                 | 10   | ATBX 1157    | ATBX 1154                    | 2    | I   |                                                                  |
| MS27495A-16                 | 10   | ATBX 1108    | ATR 1107                     | 2    | I   | MIL-C-38999 Connectors - "S" designates straight in-line version |
| MS27495A-20                 | 10   | ATBX 1072    | ATBX 1073                    | 2    | I   |                                                                  |
| MS27495A-22                 | 10   | ATBX 1058    | ATBX 1055                    | 2    | I   |                                                                  |
| MS27495A-22D                | 10   | ATBX 1048    | ATBX 1049                    | 2    | I   |                                                                  |
| MS27495A-22M                | 10   | ATBX 1048    | ATBX 1049                    | 2    | I   |                                                                  |
| MS27495A-12-S               | 10   | ATBX 1159    |                              |      | I   |                                                                  |
| MS27495A-16-S               | 10   | ATBX 1109    |                              |      | I   |                                                                  |
| MS27495A-20-S               | 10   | ATBX 1078    |                              |      | I   |                                                                  |
| MS27495A-22-S               | 10   | ATBX 1060    |                              |      | I   |                                                                  |
| MS27495A-22D-S              | 10   | ATBX 1054    |                              |      | I   |                                                                  |
| MS27495A-22M-S              | 10   | ATBX 1054    |                              |      | I   |                                                                  |

Verify QPL status (if required) at time of purchase.



| TOOL IDENTIFICATION NUMBERS |      |               |                              |      | I/R   | COMMENTS                                                                         |
|-----------------------------|------|---------------|------------------------------|------|-------|----------------------------------------------------------------------------------|
| MILITARY STANDARD           | ILL. | ASTRO TOOL #  | ASTRO FUNCTIONAL ALTERNATIVE | ILL. |       |                                                                                  |
| MS27495R-12                 | 10   | ATBX 2155     |                              |      | R     | MIL-C-38999 Connectors - "S" designates straight in-line version                 |
| MS27495R-16                 | 10   | ATBX 2103     |                              |      | R     |                                                                                  |
| MS27495R-20                 | 10   | ATBX 2070     |                              |      | R     |                                                                                  |
| MS27495R-22                 | 10   | ATBX 2057     |                              |      | R     |                                                                                  |
| MS27495R-22D                | 10   | ATBX 2046     |                              |      | R     |                                                                                  |
| MS27495R-22M                | 10   | ATBX 2046     |                              |      | R     |                                                                                  |
| MS27495R-12-S               | 10   | ATBX 2160     |                              |      | R     |                                                                                  |
| MS27495R-16-S               | 10   | ATBX 2109     |                              |      | R     |                                                                                  |
| MS27495R-20-S               | 10   | ATBX 2073     |                              |      | R     |                                                                                  |
| MS27495R-22-S               | 10   | ATBX 2059     |                              |      | R     |                                                                                  |
| MS27495R-22D-S              | 10   | ATBX 2050     |                              |      | R     |                                                                                  |
| MS27495R-22M-S              | 10   | ATBX 2050     |                              |      | R     |                                                                                  |
| MS27509                     | 28   | NONE          | Use MS27495 series tools     | 10   | I & R | MIL-C-38999 Connectors - plastic double-ended tool                               |
| MS27534                     | 28   | SEE M81969/14 | Use MS27495 series tools     | 10   | I & R | MIL-C-38999 Connectors - plastic double-ended tool                               |
| M83723-12                   | 28   | SEE M81969/14 | ATR 1160 and                 | 2    | I     | Astro Metal Equivalents for Plastic Tools                                        |
|                             |      |               | ATR 2160                     | 10   | R     |                                                                                  |
| M83723-16                   | 28   | SEE M81969/14 | ATR 1107 and                 | 2    | I     |                                                                                  |
|                             |      |               | ATR 2112                     | 10   | R     |                                                                                  |
| M83723-20                   | 28   | SEE M81969/14 | ATR 1080 and                 | 2    | I     |                                                                                  |
|                             |      |               | ATR2080                      | 10   | R     |                                                                                  |
| MS90455-0                   | 27   | ATF 1558      | ATF 1554                     | 2    | I     | MIL-C-005015 Connectors                                                          |
| MS90455-4                   | 27   | ATF 1378      | ATF 1359                     | 2    | I     |                                                                                  |
| MS90455-8                   | 27   | ATF 1260      | ATF 1256                     | 2    | I     |                                                                                  |
| MS90455-12                  | 27   | ATF 1144      | ATF 1160                     | 2    | I     |                                                                                  |
| MS90455-16                  | 27   | ATF 1101      | ATF 1105                     | 2    | I     |                                                                                  |
| MS90456-0                   | 5    | ATF 2518      |                              | 5    | R     | MIL-C-005015 Series 3400<br>& MIL-C-81659 (16 GA only)<br>front release contacts |
| MS90456-4                   | 5    | ATF 2336      |                              | 5    | R     |                                                                                  |
| MS90456-8                   | 5    | ATF 2252      |                              | 5    | R     |                                                                                  |
| MS90456-12                  | 5    | ATF 2162      |                              | 5    | R     |                                                                                  |
| MS90456-16                  | 5    | ATF 2115      |                              | 5    | R     |                                                                                  |
| MS90562-1                   | --   | ATMS 90532-1  |                              | --   | R     | MIL-C-22992, Class I Connector,<br>MS90566, MS90559 & MS90560                    |
| MS90562-2                   | --   | ATMS 90532-2  |                              | --   | R     |                                                                                  |
| MS90562-3                   | --   | ATMS 90532-3  |                              | --   | R     |                                                                                  |
| MS90562-4                   | --   | ATMS 90532-4  |                              | --   | R     |                                                                                  |
| MS90562-5                   | --   | ATMS 90532-5  |                              | --   | R     |                                                                                  |
| MS90562-6                   | --   | ATMS 90532-6  |                              | --   | R     |                                                                                  |

Verify QPL status (if required) at time of purchase.

# Plastic Insertion & Removal Tool Selection Charts

LISTED BY MIL #

## Plastic Insertion and Removal Tool Selection Charts listed by MIL#

### CHART ABBREVIATIONS

**I/R** Insertion or Removal  
designation column  
**I** Insertion Tool  
**R** Removal Tool

**I & R** Insertion & Removal Tool  
**R/F** Rear or Front Release  
designation column  
**R** Rear Release

**F** Front Release  
**R & F** Rear and Front Release  
**ILL** Illustration reference number  
**GA** Gage designation  
**NAATT** Not Available At This Time

| MIL #       | MANUFACTURERS P/N              | COLOR CODE    | SIZE | APPLICATION REFERENCE  | ASTRO TOOL METAL EQUIVALENT |
|-------------|--------------------------------|---------------|------|------------------------|-----------------------------|
| MIL-C-83723 | 83723/31-12                    | Yellow - Ins. |      | 83723                  | ATML 08209B                 |
|             |                                | White - Rem.  |      | 83723                  | ATML 08210B                 |
|             | 83723/31-16                    | Blue - Ins.   |      | 83723                  | ATML 08207B                 |
|             |                                | White - Rem.  |      | 83723                  | ATML 08208B                 |
|             | 83723/31-20                    | Red - Ins.    |      | 83723                  | ATML 08205B                 |
|             |                                | White - Rem.  |      | 83723                  | ATML 08206B                 |
|             | 83723/31-22                    | Brown - Ins.  |      | 83723                  | ATBX 1058                   |
|             |                                | White - Rem.  |      | 83723                  | ATBX 2057                   |
|             | 83723/31-22D                   | Black - Ins.  |      | 83723                  | ATBX 1048                   |
|             |                                | White - Rem.  |      | 83723                  | ATBX 2046                   |
| MIL-I-81969 | M81969/1-01*                   | Green - Ins.  | 22   | MIL-C-24308            | ATC 1054                    |
|             |                                | White - Rem.  |      | MIL-C-81659 Series II  | ATC 2053                    |
|             | M81969/1-02*                   | Red - Ins.    | 20   | MIL-C-24308            | ATC 1076-L                  |
|             |                                | White - Rem.  |      | MIL-C-81659 Series II  | ATC 2076-L                  |
|             | M81969/1-03*                   | Blue - Ins.   | 16   | MIL-C-81659 Series II  | ATR 1105                    |
|             |                                | White - Rem.  |      |                        | ATR 2112                    |
|             | M81969/1-04*                   | Green - Ins.  | 22D  | MIL-C-24308            | --                          |
|             |                                | White - Rem.  |      |                        |                             |
|             | * Plastic body with metal tips |               |      |                        |                             |
|             | M81969/14-01                   | Green - Ins.  | 22D  | MIL-C-38999            | ATML 0801B (Ins.)           |
|             |                                | White - Rem.  |      |                        |                             |
|             |                                |               |      | MIL-C-24308            | ATML 0802B (Rem.)           |
|             |                                |               |      | MIL-C-83733            |                             |
|             |                                |               |      | MIL-T-81714            |                             |
|             |                                |               |      | MIL-C-55302/68/69      |                             |
|             | M81969/14-02                   | Red - Ins.    | 20   | MIL-C-38999            | ATML 0805B (Ins.)           |
|             |                                | White - Rem.  |      |                        |                             |
|             |                                |               |      |                        | ATML 0806B (Rem.)           |
|             |                                |               |      |                        | ATR 1078 (Ins.)             |
|             |                                |               |      | MIL-C-26482 Series II  | ATR 2080 (Rem.)             |
|             |                                |               |      | MIL-C-81703 Series III | ATML 08205B (Ins.)          |

| MIL #       | MANUFACTURERS P/N | COLOR CODE    | SIZE | APPLICATION REFERENCE      | ASTRO TOOL METAL EQUIVALENT |
|-------------|-------------------|---------------|------|----------------------------|-----------------------------|
| MIL-I-81969 | M81969/14-02      |               |      | MIL-C-83723 Series I & III | ATML 08206B (Rem.)          |
|             |                   |               |      | MIL-C-83733                |                             |
|             |                   |               |      | MIL-T-81714 (Size 20 & 22) |                             |
|             | M81969/14-03      | Blue - Ins.   | 16   | MIL-C-38999                | ATML 0807B (Ins.)           |
|             |                   | White - Rem.  |      |                            | ATML 0808B (Rem.)           |
|             |                   |               |      | MIL-C-5015 (MS3450 Series) | ATR 1105 (Ins.)             |
|             |                   |               |      | MIL-C-26482 Series II      | ATR 2112 (Rem.)             |
|             |                   |               |      | MIL-C-81703 Series III     | ATML 08207B (Ins.)          |
|             |                   |               |      | MIL-C-83723                | ATML 08208B (Rem.)          |
|             |                   |               |      | MIL-T-81714                |                             |
|             |                   |               |      | MIL-C-83733                |                             |
|             |                   |               |      | MIL-C-81659                |                             |
|             | M81969/14-04      | Yellow - Ins. | 12   | MIL-C-38999                | ATML 0809B (Ins.)           |
|             |                   | White - Rem.  |      |                            | ATML 0810B (Rem.)           |
|             |                   |               |      | MIL-C-5015 (MS3450 Series) | ATR 1153 (Ins.)             |
|             |                   |               |      | MIL-C-81703 Series III     | ATR 2160 (Rem.)             |
|             |                   |               |      | MIL-T-81714 Series III     | ATML 08209B (Ins.)          |
|             |                   |               |      | MIL-C-83723                | ATML 08210B (Ins.)          |
|             |                   |               |      | MIL-C-83723                |                             |
|             |                   |               |      | MIL-C-26482 Series II      |                             |
|             |                   |               |      | MIL-C-81659                |                             |
|             | M81969/14-05      | Gray - Ins.   | 10   | MIL-C-38999                | ATML 0811B (Ins.)           |
|             |                   | White - Rem.  |      |                            | ATML 0812B (Rem.)           |

Verify QPL status (if required) at time of purchase.





| MIL #       | MANUFACTURERS P/N | COLOR CODE    | SIZE | APPLICATION REFERENCE                 | ASTRO TOOL METAL EQUIVALENT |
|-------------|-------------------|---------------|------|---------------------------------------|-----------------------------|
| MIL-I-81969 | M81969/14-06      | Red - Rem.    | 8    | MIL-C-83723                           | ATML 0813B (Ins.)           |
|             |                   |               |      | MIL-C-5015                            | ATML 0814B (Rem.)           |
|             |                   |               |      | Suggested Application                 | Suggested ATML 1501         |
|             |                   |               |      |                                       |                             |
|             | M81969/14-07      | Blue - Rem.   | 4    | MIL-C-83723                           | Suggested ATML 1502         |
|             |                   |               |      | MIL-C-5015                            |                             |
|             | M81969/14-08      | Yellow - Rem. | 0    | MIL-C-83723                           | Suggested ATML 1503         |
|             |                   |               |      | MIL-C-5015                            |                             |
|             | M81969/14-09      | Brown - Ins.  | 22   | MIL-C-55302/169, MIL-C-55302/171 only | ATML 0803B (Ins.)           |
|             |                   | White - Rem.  |      |                                       | ATML 0804B (Rem.)           |
|             | M81969/14-10      | Red - Ins.    | 20   | MIL-C-38999                           | ATML 0805B (Ins.)           |
|             |                   | Orange-Rem.   |      |                                       | ATML 0806B (Rem.)           |
|             | M81969/14-11      | Red - Ins.    | 20   | MIL-C-26482 Series II                 | ATML 08205B (Ins.)          |
|             |                   | White - Rem.  |      | MIL-C-81703 Series III                | ATML 08206B (Rem.)          |
|             |                   |               |      | MIL-C-83723 Series I & III            |                             |
|             |                   |               |      | MIL-C-83733                           |                             |
|             |                   |               |      | MIL-T-81714 (Size 20 & 22)            |                             |
|             | M81969/14-12      | Green - Rem.  | 8    | MIL-C-38999                           | ATML 0813B (Ins.)           |
|             |                   |               |      |                                       | ATML 0814B (Rem.)           |
|             | M81969/29-01      | Blue - Rem.   | 16   | MIL-C-5015                            | Suggest ATC 2136            |
|             | M81969/29-02      | Red - Rem.    | 8    | MIL-C-5015                            | ATC 2281                    |
|             | M81969/29-03      | Blue - Rem.   | 4    | MIL-C-5015                            | ATC 2426                    |
|             | M81969/29-04      | Yellow - Rem. | 0    | MIL-C-5015                            | ATC 2565                    |
|             | M81969/39         | Green - Ins.  |      | MIL-C-24308                           | Suggest ATC 1072            |
|             |                   | White - Rem.  |      | (Size 20)                             | Suggest ATC 2076            |

| MIL #     | MANUFACTURERS P/N | COLOR CODE    | SIZE | APPLICATION REFERENCE | ASTRO TOOL METAL EQUIVALENT |
|-----------|-------------------|---------------|------|-----------------------|-----------------------------|
| M81969/29 | MS3165-0          |               |      | MIL-C-5015            | ATC 2565                    |
|           | MS3165-4          |               |      | MIL-C-5015            | ATC 2426                    |
|           | MS3165-8          |               |      | MIL-C-5015            | ATC 2281                    |
| M81969/14 | MS27534-12        | White - Rem.  |      | MIL-C-38999           | ATBX 2155                   |
|           |                   | Yellow - Ins. |      | MIL-C-38999           | ATBX 1157                   |
|           | MS27534-16        | White - Rem.  |      | MIL-C-38999           | ATBX 2103                   |
|           |                   | Blue - Ins.   |      | MIL-C-38999           | ATBX1108                    |
|           | MS27534-20        | White - Rem.  |      | MIL-C-38999           | ATBX 2070                   |
|           |                   | Red - Ins.    |      | MIL-C-38999           | ATBX 1072                   |
|           | MS27534-22        | White - Rem.  |      | MIL-C-38999           | ATBX 2057                   |
|           |                   | Brown - Ins.  |      | MIL-C-38999           | ATBX 1058                   |
|           | MS27534-22D       | White - Rem.  |      | MIL-C-38999           | ATBX 2046                   |
|           |                   | Black - Ins.  |      | MIL-C-38999           | ATBX 1048                   |
|           | MS27534-22M       | White - Rem.  |      |                       |                             |
|           |                   | Black - Ins.  |      | MIL-C-38999           | ATBX 1048                   |
|           | NAS 1664-12       | Yellow - Ins. |      | NAS 1599 Connector    | ATR 1160                    |
|           |                   | White - Rem.  |      | NAS 1599 Connector    | ATR 2160                    |
|           | NAS 1664-16       | Blue - Ins.   |      | NAS 1599 Connector    | ATR 1107                    |
|           |                   | White - Rem.  |      | NAS 1599 Connector    | ATR 2112                    |
|           | NAS 1664-20       | Red - Ins.    |      | NAS 1599 Connector    | ATR 1080                    |
|           |                   | White - Rem.  |      | NAS 1599 Connector    | ATR 2080                    |

LISTED BY MIL #

Verify QPL status (if required) at time of purchase.

# Plastic Insertion & Removal Tool Selection Charts

LISTED BY MANUFACTURER

## Plastic Insertion and Removal Tool Selection Charts listed by Manufacturer

| MANUFACTURER      | MANUFACTURERS P/N | COLOR CODE    | APPLICATION REFERENCE | ASTRO TOOL METAL EQUIVALENT |
|-------------------|-------------------|---------------|-----------------------|-----------------------------|
| AMPHENOL          | 294-108           | Red - Ins.    | NAS 1664-20           | ATR 1080                    |
|                   |                   | White - Rem.  | NAS 1664-20           | ATR 2080                    |
|                   | 294-109           | Blue - Ins.   | NAS 1664-16           | ATR 1107                    |
|                   |                   | White - Rem.  | NAS 1664-16           | ATR 2112                    |
|                   | 294-110           | Yellow - Ins. | NAS 1664-12           | ATR 1160                    |
|                   |                   | White - Rem.  | NAS 1664-12           | ATR 2160                    |
| AMPHENOL / BENDIX | MS27534-22D       | Black - Ins.  | JT/LJT, MIL-C-38999   | ATBX 1048                   |
|                   |                   | White - Rem.  | JT/LJT, MIL-C-38999   | ATBX 2046                   |
|                   | MS27534-22        | Brown - Ins.  | JT/LJT, MIL-C-38999   | ATBX 1058                   |
|                   |                   | White - Rem.  | JT/LJT, MIL-C-38999   | ATBX 2057                   |
|                   | MS27534-20        | Red - Ins.    | JT/LJT, MIL-C-38999   | ATBX 1072                   |
|                   |                   | White - Rem.  | JT/LJT, MIL-C-38999   | ATBX 2070                   |
|                   | MS27534-16        | Blue - Ins.   | JT/LJT, MIL-C-38999   | ATBX 1108                   |
|                   |                   | White - Rem.  | JT/LJT, MIL-C-38999   | ATBX 2103                   |
|                   | MS27534-12        | Yellow - Ins. | JT/LJT, MIL-C-38999   | ATBX 1157                   |
|                   |                   | White - Rem.  | JT/LJT, MIL-C-38999   | ATBX 2155                   |
| AMPHENOL / MATRIX | 6500-001-12       | Yellow - Ins. |                       | ATR 1160                    |
|                   |                   | White - Rem.  |                       | ATR 2160                    |
|                   | 6500-018-0        | Yellow-Rem.   | MS3165-0              | ATC 2565                    |
|                   | 6500-018-4        | Blue - Rem.   | MS3165-0              | ATC 2426                    |
|                   | 6500-018-4        | Red - Rem.    | MS3165-0              | ATC 2281                    |
|                   | 6500-028-12       | White - Rem.  | NAS 1599 Connector    | ATR 2157                    |
|                   | 6500-029-12       | White - Rem.  | NAS 1599 Connector    | ATR 2160                    |
|                   | 6500-030-12       | Yellow - Ins. | NAS 1599 Connector    | ATGH 1160                   |
|                   | 6500-028-16       | White - Rem.  | NAS 1599 Connector    | ATR 2106                    |
|                   | 6500-029-16       | White - Rem.  | NAS 1599 Connector    | ATR 2112                    |
|                   | 6500-030-16       | Blue - Ins.   | NAS 1599 Connector    | ATGH 1112                   |
|                   | 6500-028-20       | White - Rem.  | NAS 1599 Connector    | ATR 2080                    |
|                   | 6500-029-20       | White - Rem.  | NAS 1599 Connector    | ATR 2080                    |
|                   | 6500-030-20       | Red - Ins.    | NAS 1599 Connector    | ATGH 1079                   |
|                   | 6500-045-20       | Green - Ins.  |                       | ATC 1071                    |
|                   |                   | White - Rem.  |                       | ATC 2076                    |
| BURNDY/FCI        | RXT 22-10         | Red - Ins.    |                       | ATR 1080                    |
|                   |                   | White - Rem.  |                       | ATR 2080                    |
|                   | RXT 16-1          | Blue - Ins.   |                       | ATR 1107                    |
|                   |                   | White - Rem.  |                       | ATR 2112                    |
|                   | RXT 12-1          | Yellow - Ins. |                       | ATR 1160                    |
|                   |                   | White - Rem.  |                       | ATR 2160                    |
| DEUTSCH           | 81515-23          | Yellow - Ins. | 81511 3 & 4           | ATD 1049                    |
|                   |                   | White - Rem.  | 81511 3 & 4           | ATD 2047                    |
|                   | 81515-20          | Red - Ins.    | 81511 3 & 4           | ATD 1061                    |
|                   |                   | White - Rem.  | 81511 3 & 4           | ATD 2062                    |
|                   | 81515-16          | Blue - Ins.   | 81511 3 & 4           | ATD 1094                    |
|                   |                   | White - Rem.  | 81511 3 & 4           | ATD 2094                    |
|                   | M15570-12         | Yellow - Ins. | 83723                 | ATR 1160                    |
|                   |                   | White - Rem.  | 83723                 | ATR 2160                    |
|                   | M15570-16         | Blue - Ins.   | 83723                 | ATR 1107                    |
|                   |                   | White - Rem.  | 83723                 | ATR 2112                    |

| MANUFACTURER    | MANUFACTURERS P/N | COLOR CODE    | APPLICATION REFERENCE | ASTRO TOOL METAL EQUIVALENT |
|-----------------|-------------------|---------------|-----------------------|-----------------------------|
| DEUTSCH (con't) | M15570-20         | Red - Ins.    | 83723                 | ATR 1080                    |
|                 |                   | White - Rem.  | 83723                 | ATR 2080                    |
|                 | M15570-22         | Green - Ins.  | 83723                 | ATC 1054                    |
|                 |                   | White - Rem.  | 83723                 | ATD 2048                    |
|                 | M15570-22-1       | Yellow - Ins. | 83723                 | ATD 1035                    |
|                 |                   | White - Rem.  | 83723                 | ATD 2047                    |
| ITT/CANNON      | CET-0-1           |               | MIL-C005015 Series    | ATC 2565                    |
|                 | CET-4-8           |               | MIL-C005015 Series    | ATC 2526                    |
|                 | CET-8-2           |               | MIL-C005015 Series    | ATC 2281                    |
|                 | CET-12-4          |               | DPD                   | ATR 2160                    |
|                 | CET-16-9          |               | DPJ                   | ATR 2112                    |
|                 | CET-20-8          | Red - Rem.    | 83723-20              | ATR 2080                    |
|                 | CET-20-11         | Green - Rem.  | D*MA                  | ATC 2071                    |
|                 | CET-20-11HD       | Green - Rem.  | D*MA                  | ATC 2076                    |
|                 | CET-20-14         |               | DF D*MA               | ATR 2080                    |
|                 | CET-C8            |               | MIL-C005015 Series    | ATC 2281                    |
|                 | CIET 12           | Yellow - Ins. | NAS 1664-12           | ATR 1160                    |
|                 |                   | White - Rem.  | NAS 1664-12           | ATR 2160                    |
|                 | CIET 16           | Blue - Ins.   | NAS 1664-16           | ATR 1107                    |
|                 |                   | White - Rem.  | NAS 1664-16           | ATR 2112                    |
|                 | CIET 20           | Red - Ins.    | NAS 1664-20           | ATR 1080                    |
|                 |                   | White - Rem.  | NAS 1664-20           | ATR 2080                    |
|                 | CIET 20-18        | - Ins.        | D*C                   | ATC 1081                    |
|                 |                   | White - Rem.  | D*C                   | ATC 2076                    |
|                 | CIET 20HD         | - Ins.        | D*C                   | ATC 1076                    |
|                 |                   | White - Rem.  | D*C                   | ATC 2076                    |
|                 | CIET 20HDL        | - Ins.        | D*C                   | ATC 1076-L                  |
|                 |                   | White - Rem.  | D*C                   | ATC 2076-L                  |
|                 | CIET 22           | Yellow - Ins. | DPX*MA                | ATC 1054                    |
|                 |                   | White - Rem.  | DPX*MA                | ATC 2053                    |
|                 | CIET 22D          |               | 38999                 |                             |
|                 |                   |               | 38999                 |                             |
| TRANSITRON      | 91-021            | White - Rem.  |                       | ATT 2059                    |
|                 | 91-023            | Green - Ins.  |                       | ATT 1059                    |
| TYCO/AMP        | 91066-1           | Black - Ins.  | MS3156-22             | ATC 1054                    |
|                 |                   | White - Rem.  | MS3156-22             | ATC 2053                    |
|                 | 91066-4           | Red - Ins.    | MS3156-20             | ATC 1071                    |
|                 |                   | White - Rem.  | MS3156-20             | ATC 2071                    |
|                 | 91066-3           | Blue - Ins.   | MS3156-16             | ATR 1107                    |
|                 |                   | White - Rem.  | MS3156-16             | ATR 2112                    |
|                 | 91067-1           | Black - Ins.  | MS27534-22M           | ATBX 1048                   |
|                 |                   | White - Rem.  | MS27534-22M           | ATBX 2046                   |
|                 | 91067-2           | Yellow - Ins. | MS27534-22            | ATBX 1055                   |
|                 |                   | White - Rem.  | MS27534-22            | ATBX 2057                   |

Verify QPL status (if required) at time of purchase.



## Special Service Tools for Connectors

LISTED BY ASTRO TOOL #

| VARIOUS SPECIAL TOOLS FOR CONNECTORS |                                   |                                                                                                          |
|--------------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------|
| ASTRO TOOL #                         | NOMENCLATURE                      | USAGE                                                                                                    |
| ATA 3120                             | Wire Contact Clip                 | Insertion & removal clip for 16 GA.                                                                      |
| ATAMP 3040                           | Miniclip Transfer Tool            | Transfers terminal clips for .025 square pins.                                                           |
| ATAMP 3070                           | Transfer Tool Kit HAC #722698-329 | Transfers AMP terminal clips from gun to terminal's single wires.                                        |
| ATBX 3050                            | Special Removal Tool              | Special rear release tool for 22M/D contact using .060 dia. wire.                                        |
| ATBX 3-6147-1                        | Special Connector Plier           | Assembly & disassembly of connectors.                                                                    |
| ATC 2046-100                         | Compliant Pin Tool                | Insertion/removal of compliant pins                                                                      |
| ATD 3312                             | Wire Comb                         | Six inch long phenolic 5/16" diameter with a point on one end and a blade on the other end.              |
| ATH 3037-12                          | Contact Guide                     | Twelve inch long guide used on rear insert 22 GA contacts.                                               |
| ATH 3037-18                          | Contact Guide                     | Eighteen inch long guide used on rear insert 22 GA contacts.                                             |
| ATH 3260, 3261, 3262, & 3263         | Forming Plier                     | Forms jogged leads for flatpack circuits while removing from carrier - HAC P/N 772699-224, -1, -2, & -3. |
| ATWC 3032                            | Wire Comb                         | Eight inch long metal comb with a hook on one end and a blade on the other end.                          |
| ATWC 3312                            | Wire Comb                         | Twelve inch long phenolic 5/16" diameter with a point on one end and a blade on the other end.           |

| METAL UNWIRED CONTACT TOOL |                            |                                            |
|----------------------------|----------------------------|--------------------------------------------|
| ASTRO TOOL #               | NOMENCLATURE               | USAGE                                      |
| ATX 2001                   | Metal Unwired Contact Tool | MIL-C-38999 Uncrimped Contacts             |
| ATX 2002                   | Metal Unwired Contact Tool | MIL-C-38999 Uncrimped Contacts             |
| ATX 2003                   | Metal Unwired Contact Tool | MIL-C-38999 Uncrimped Contacts             |
| ATX 2004                   | Metal Unwired Contact Tool | MIL-C-38999 Uncrimped Contacts             |
| ATX 2005                   | Metal Unwired Contact Tool | MIL-C-38999 Uncrimped Contacts             |
| ATX 2006                   | Metal Unwired Contact Tool | NAS-1599 Uncrimped Contacts                |
| ATX 2007                   | Metal Unwired Contact Tool | NAS-1599 Uncrimped Contacts                |
| ATX 2008                   | Metal Unwired Contact Tool | NAS-1599 Uncrimped Contacts                |
| ATX 2009                   | Metal Unwired Contact Tool | Deutsch RSM & RTK Uncrimped Contacts       |
| ATX 2010                   | Metal Unwired Contact Tool | Cannon D*C Uncrimped Contacts              |
| ATX 2011                   | Metal Unwired Contact Tool | Cannon CK, DPX2MA, DPKB Uncrimped Contacts |
| ATX 2012                   | Metal Unwired Contact Tool | Douglas 2022B Uncrimped Contacts           |
| ATX 2013                   | Metal Unwired Contact Tool | G & H Tech. Uncrimped Contacts (ATGH 2054) |
| ATX 2014                   | Metal Unwired Contact Tool | MIL-C-38999 Uncrimped Contacts             |

| RETENTION TEST TOOLS                                                                                                                                                                                    |                     |                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|---------------------------------------------------------------|
| ASTRO TOOL #                                                                                                                                                                                            | NOMENCLATURE        | USAGE                                                         |
| ATC 3074                                                                                                                                                                                                | Retention Test Tool | Tests contact retention in 22 GA Connector.                   |
| ATC 3075                                                                                                                                                                                                | Retention Test Tool | Tests contact retention in 20 GA Connector.                   |
| ATC 3076                                                                                                                                                                                                | Retention Test Tool | Tests contact retention in 16 GA Connector.                   |
| ATC 3077                                                                                                                                                                                                | Retention Test Tool | Tests contact retention in 12 GA Connector.                   |
| The above Retention Test Tool are designed to universally cover MIL-C-5015, MIL-C-26482, MIL-C-26500, MIL-C-38999, MIL-C-81511, MIL-C-83723, MIL-C-81703. Consult the factory for special applications. |                     |                                                               |
| ATC 3078                                                                                                                                                                                                | Retention Test Tool | Tests pin and socket contact retention in co-axial connector. |



# Mil-I-81969 Cross Reference Chart

LISTED BY MIL DOCUMENT

## MIL-I-81969 Cross Reference Chart

### CHART ABBREVIATIONS

**I/R** Insertion or Removal  
designation column  
**I** Insertion Tool  
**R** Removal Tool

**I & R** Insertion & Removal Tool  
**R/F** Rear or Front Release  
designation column  
**R** Rear Release

**F** Front Release  
**R & F** Rear and Front Release  
**ILL** Illustration reference number  
**GA** Gage designation  
**NAATT** Not Available At This Time

| CURRENT DOCUMENT                                              | ASTRO TOOL # | I/R   | ILL. | GAGE | SUPERSEDED DOCUMENT          |
|---------------------------------------------------------------|--------------|-------|------|------|------------------------------|
| MIL-I-81969/1-01                                              | M81969/1-01  | I & R | 28   | 22   | MS3156-22                    |
| MIL-I-81969/1-02                                              | M81969/1-02  | I & R | 28   | 20   | MS3156-20,<br>MS24308/18-2   |
| MIL-I-81969/1-03                                              | M81969/1-03  | I & R | 28   | 16   | MS3156-16,<br>MS24308/18-3   |
| MIL-I-81969/1-04                                              | M81969/1-04  | I & R | 28   | 22D  | MS24308/18-1                 |
| <b>FOR ASTRO'S METAL EQUIVALENTS OF /1 TOOLS SEE PAGE 73.</b> |              |       |      |      |                              |
| MIL-I-81969/2-01                                              | ATML 0201    | I     | 4    | 23   | MS3323-22                    |
| MIL-I-81969/2-02                                              | ATML 0202    | I     | 4    | 20   | MS3323-20                    |
| MIL-I-81969/2-03                                              | ATML 0203    | I     | 4    | 16   | MS3323-16                    |
| MIL-I-81969/2-04                                              | ATML 0204    | I     | 4    | 12   | MS3323-12                    |
| MIL-I-81969/3-01                                              | ATML 0301    | R     | 7    | 23   | MS3344-23                    |
| MIL-I-81969/3-02                                              | ATML 0302    | R     | 7    | 20   | MS3344-20                    |
| MIL-I-81969/3-03                                              | ATML 0303    | R     | 7    | 16   | MS3344-16                    |
| MIL-I-81969/3-04                                              | ATML 0304    | R     | 7    | 12   | MS3344-12                    |
| MIL-I-81969/3-05                                              | ATML 0305    | R     | 3    | 23   | MS3344-23                    |
| MIL-I-81969/3-06                                              | ATML 0306    | R     | 3    | 20   | MS3344-20                    |
| MIL-I-81969/3-07                                              | ATML 0307    | R     | 3    | 16   | MS3344-16                    |
| MIL-I-81969/3-08                                              | ATML 0308    | R     | 3    | 12   | MS3344-12                    |
| MIL-I-81969/4-01                                              |              | R     |      |      | MIL-C-55302/106              |
| MIL-I-81969/4-02                                              |              | R     |      |      |                              |
| MIL-I-81969/5-01                                              |              | I     |      |      | MIL-C-55302/105              |
| MIL-I-81969/6-01                                              |              | R     |      |      | MIL-C-21097/18C              |
| MIL-I-81969/7-01                                              |              | I & R |      |      | MIL-C-21097/12B              |
| MIL-I-81969/8-01                                              | ATML 0801B   | I     | 10   | 22M  | MS27495A22M,<br>M55302/79-01 |
| MIL-I-81969/8-02                                              | ATML 0802B   | R     | 10   | 22M  | MS27495R22M,<br>M55302/79-02 |
| MIL-I-81969/8-03                                              | ATML 0803B   | I     | 10   | 22   | MS27495A22                   |
| MIL-I-81969/8-04                                              | ATML 0804B   | R     | 10   | 22   | MS27495R22                   |
| MIL-I-81969/8-05                                              | ATML 0805B   | I     | 10   | 20   | MS27495A20                   |
| MIL-I-81969/8-06                                              | ATML 0806B   | R     | 10   | 20   | MS27495R20                   |
| MIL-I-81969/8-07                                              | ATML 0807B   | I     | 10   | 16   | MS27495A16                   |
| MIL-I-81969/8-08                                              | ATML 0808B   | R     | 10   | 16   | MS27495R16                   |
| MIL-I-81969/8-09                                              | ATML 0809B   | I     | 10   | 12   | MS27495A12                   |
| MIL-I-81969/8-10                                              | ATML 0810B   | R     | 10   | 12   | MS27495R12                   |
| MIL-I-81969/8-11                                              | ATML 0811B   | I     | 10   | 10   |                              |
| MIL-I-81969/8-12                                              | ATML 0812B   | R     | 10   | 10   |                              |

| CURRENT DOCUMENT                                                        | ASTRO TOOL # | I/R   | ILL. | GAGE | SUPERSEDED DOCUMENT                                       |
|-------------------------------------------------------------------------|--------------|-------|------|------|-----------------------------------------------------------|
| MIL-I-81969/8-13                                                        | ATML 0813B   | I     | 10   | 8    |                                                           |
| MIL-I-81969/8-14                                                        | ATML 0814B   | R     | 10   | 8    |                                                           |
| MIL-I-81969/8-205                                                       | ATML 08205B  | I     | 10   | 20   |                                                           |
| MIL-I-81969/8-206                                                       | ATML 08206B  | R     | 10   | 20   |                                                           |
| MIL-I-81969/8-207                                                       | ATML 08207B  | I     | 10   | 16   |                                                           |
| MIL-I-81969/8-208                                                       | ATML 08208B  | R     | 10   | 16   |                                                           |
| MIL-I-81969/8-209                                                       | ATML 08209B  | I     | 10   | 12   |                                                           |
| MIL-I-81969/8-210                                                       | ATML 08210B  | R     | 10   | 12   |                                                           |
| MIL-I-81969/9-01                                                        |              | R     |      |      | MIL-C-55302/28-01                                         |
| MIL-I-81969/10-01                                                       |              | I     |      |      | MIL-C-55302/86                                            |
| MIL-I-81969/10-02                                                       |              | R     |      |      |                                                           |
| MIL-I-81969/11-01                                                       |              | R     |      |      | MIL-C-28731/22                                            |
| MIL-I-81969/12-01                                                       | ATML 1201    | I & R | 10   | 22   | --                                                        |
| MIL-I-81969/11-01                                                       |              | R     |      |      | MIL-C-28731/22                                            |
| MIL-I-81969/12-01                                                       | ATML 1201    | I & R | 10   | 22   | --                                                        |
| MIL-I-81969/12-02                                                       | ATML 1202    | I & R | 10   | 22   | --                                                        |
| MIL-I-81969/13-01                                                       | ATML 1301    | I     |      |      | MIL-C-28731/21                                            |
| MIL-I-81969/14-01                                                       | M81969/14-01 | I & R | 28   | 22D  | MS27534-22D                                               |
| MIL-I-81969/14-02                                                       | M81969/14-02 | I & R | 28   | 20   | NAS 1664-20,<br>MS3447-20,<br>M83723/31-20,<br>MS27534-20 |
| MIL-I-81969/14-03                                                       | M81969/14-03 | I & R | 28   | 16   | NAS 1664-16,<br>MS3447-16,<br>M83723/31-16,<br>MS27534-16 |
| MIL-I-81969/14-04                                                       | M81969/14-04 | I & R | 28   | 12   | NAS 1664-12,<br>MS3447-12,<br>M83723/31-12                |
| MIL-I-81969/14-05                                                       | M81969/14-05 | I & R | 28   | 10   |                                                           |
| MIL-I-81969/14-06                                                       | M81969/14-06 | R     | 28   | 8    |                                                           |
| MIL-I-81969/14-07                                                       | M81969/14-07 | R     | 28   | 4    |                                                           |
| MIL-I-81969/14-08                                                       | M81969/14-08 | R     | 28   | 0    |                                                           |
| MIL-I-81969/14-09                                                       | M81969/14-09 | I & R | 28   | 22   |                                                           |
| MIL-I-81969/14-10                                                       | M81969/14-10 | I & R | 28   | 20   |                                                           |
| MIL-I-81969/14-11                                                       | M81969/14-11 | I & R | 28   | 20   |                                                           |
| MIL-I-81969/14-12                                                       | M81969/14-12 | R     | 28   | 8    |                                                           |
| <b>FOR ASTRO'S METAL EQUIVALENTS OF /14 TOOLS SEE PAGE 73 &amp; 74.</b> |              |       |      |      |                                                           |



| CURRENT DOCUMENT  | ASTRO TOOL # | I/R   | ILL. | GAGE   | SUPERSEDED DOCUMENT |
|-------------------|--------------|-------|------|--------|---------------------|
| MIL-I-81969/15-01 | ATML 1501    | R     | 19   | 8      | MS3483-1            |
| MIL-I-81969/15-02 | ATML 1502    | R     | 19   | 4      | MS3483-2            |
| MIL-I-81969/15-03 | ATML 1503    | R     | 19   | 0      | MS3483-3            |
| MIL-I-81969/16-01 | M81969/16-01 | I & R | 28   | 20     | MS3160-20           |
| MIL-I-81969/16-02 | M81969/16-02 | I & R | 28   | 16     | MS3160-16           |
| MIL-I-81969/16-03 | M81969/16-03 | I & R | 28   | 12     | MS3160-12           |
| MIL-I-81969/16-04 | M81969/16-04 | I & R | 28   | 22     | MS3160-22           |
| MIL-I-81969/17-01 | ATML 1701    | I     | 27   | 16     | MS90455-16          |
| MIL-I-81969/17-02 | ATML 1702    | I     | 27   | 12     | MS90455-12          |
| MIL-I-81969/17-03 | ATML 1703    | I     | 27   | 20     | MS90455-A20         |
| MIL-I-81969/17-04 | ATML 1704    | I     | 27   | 16     | MS90455-A16         |
| MIL-I-81969/17-04 | ATML 1704    | I     | 27   | 16     | MS90455-A16         |
| MIL-I-81969/17-05 | ATML 1705    | I     | 27   | 12     | MS90455-A12         |
| MIL-I-81969/17-06 | ATML 1706    | I     | 27   | 8      | MS90455-8           |
| MIL-I-81969/17-07 | ATML 1707    | I     | 27   | 4      | MS90455-4           |
| MIL-I-81969/17-08 | ATML 1708    | I     | 27   | 0      | MS90455-0           |
| MIL-I-81969/17-09 | ATML 1709    | I     | 27   | 20     | MS90455-B20         |
| MIL-I-81969/18-01 | ATML 1801    | I     | 1    | 16, 20 | MS17805             |
| MIL-I-81969/18-02 | ATML 1802    | I     | 1    | 22     |                     |
| MIL-I-81969/19-01 | ATML 1901    | R     | 5    | 16     | MS90456-16          |
| MIL-I-81969/19-02 | ATML 1902    | R     | 5    | 12     | MS90456-12          |
| MIL-I-81969/19-03 | ATML 1903    | R     | 5    | 8      | MS90456-8           |
| MIL-I-81969/19-04 | ATML 1904    | R     | 5    | 4      | MS90456-4           |
| MIL-I-81969/19-05 | ATML 1905    | R     | 5    | 0      | MS90456-0           |
| MIL-I-81969/19-06 |              |       |      |        |                     |
| MIL-I-81969/19-07 | ATML 1907    | R     | 6    | 20     | MS24256-R20         |
| MIL-I-81969/10-01 |              | I     |      |        | MIL-C-55302/86      |
| MIL-I-81969/10-02 |              | R     |      |        |                     |
| MIL-I-81969/11-01 |              | R     |      |        | MIL-C-28731/22      |
| MIL-I-81969/12-01 | ATML 1201    | I & R | 10   | 22     | --                  |
| MIL-I-81969/19-08 | ATML 1908    | R     | 6    | 16     | MS24256-R16         |
| MIL-I-81969/19-09 | ATML 1909    | R     | 6    | 12     | MS24256-R12         |
| MIL-I-81969/19-10 | ATML 1910    | R     | --   | 20     | MS24256-RH20        |
| MIL-I-81969/19-11 | ATML 1911    | R     | --   | 16     | MS24256-RH16        |

| CURRENT DOCUMENT                                               | ASTRO TOOL # | I/R   | ILL. | GAGE   | SUPERSEDED DOCUMENT       |
|----------------------------------------------------------------|--------------|-------|------|--------|---------------------------|
| MIL-I-81969/20-01                                              | ATML 2001    | R     | 7    | 16, 20 | MS17806                   |
| MIL-I-81969/20-02                                              | ATML 2002    | R     | --   | 22     | --                        |
| MIL-I-81969/21-01                                              | ATML 2101    | I & R | --   | --     | --                        |
| MIL-I-81969/22-01                                              | ATML         | R     | --   | 16, 20 | --                        |
| MIL-I-81969/23-01                                              | ATML         | I     | --   | 16, 20 | --                        |
| MIL-I-81969/23-02                                              | ATML         | I     | --   | 16, 20 | --                        |
| MIL-I-81969/23-03                                              | ATML         | I     | --   | 16, 20 | --                        |
| MIL-I-81969/23-04                                              | ATML         | I     | --   | 16, 20 | --                        |
| MIL-I-81969/24-01                                              |              | R     | --   | --     | --                        |
| MIL-I-81969/25-01                                              |              | I & R |      | 18     |                           |
| MIL-I-81969/25-02                                              |              | I & R |      | 18     |                           |
| MIL-I-81969/25-03                                              |              | I & R |      | 16     |                           |
| MIL-I-81969/25-04                                              |              | I & R |      | 16     |                           |
| MIL-I-81969/25-05                                              |              | I & R |      | 16     |                           |
| MIL-I-81969/25-06                                              |              | I & R |      | 16     |                           |
| MIL-I-81969/26-01                                              |              | R     |      | --     | --                        |
| MIL-I-81969/27-01                                              | ATML 2701    | R     | --   | 4/0    | MS90562-1                 |
| MIL-I-81969/27-02                                              | ATML 2702    | R     | --   | 2/0    | MS90562-2                 |
| MIL-I-81969/27-03                                              | ATML 2703    | R     | --   | 1/0    | MS90562-3                 |
| MIL-I-81969/27-04                                              | ATML 2704    | R     | --   | 2      | MS90562-4                 |
| MIL-I-81969/27-05                                              | ATML 2705    | R     | --   | 4      | MS90562-5                 |
| MIL-I-81969/27-06                                              | ATML 2706    | R     | --   | 6      | MS90562-6                 |
| MIL-I-81969/28-01                                              | ATML 2801    | R     | --   | 5, 9   | MS3178-001                |
| MIL-I-81969/28-02                                              | ATML 2802    | R     | --   | 12     | MS3178-002                |
| MIL-I-81969/28-03                                              | ATML 2803    | R     | --   | 8      | --                        |
| MIL-I-81969/29-01                                              | M81969/29-01 | R     | --   | 16     | MS3165-16                 |
| MIL-I-81969/29-02                                              | M81969/29-02 | R     | --   | 8      | MS3165-8,<br>M83723/32-08 |
| MIL-I-81969/29-03                                              | M81969/29-03 | R     | --   | 4      | MS3165-4,<br>M83723/32-04 |
| MIL-I-81969/29-04                                              | M81969/29-04 | R     | --   | 0      | MS3165-0,<br>M83723/32-00 |
| <b>FOR ASTRO'S METAL EQUIVALENTS OF /29 TOOLS SEE PAGE 74.</b> |              |       |      |        |                           |

Verify QPL status (if required) at time of purchase.



# Mil-I-81969 Cross Reference Chart

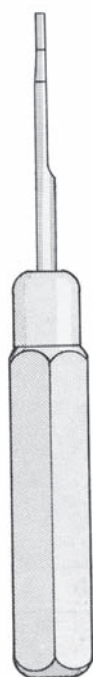
LISTED BY MIL DOCUMENT

| CURRENT DOCUMENT                                                                                            | ASTRO TOOL # | I/R | ILL. | GAGE   | SUPERSEDED DOCUMENT |
|-------------------------------------------------------------------------------------------------------------|--------------|-----|------|--------|---------------------|
| MIL-I-81969/30B-01                                                                                          | ATML 3001B   | R   | 17   | 22     | MS3159-22           |
| MIL-I-81969/30B-02                                                                                          | ATML 3002B   | R   | 17   | 20     | MS3159-20           |
| MIL-I-81969/30B-03                                                                                          | ATML 3003B   | R   | 17   | 16     | MS3159-16           |
| MIL-I-81969/30B-04                                                                                          | ATML 3004B   | R   | 17   | 12     | MS3159-12           |
| MIL-I-81969/30B-05                                                                                          | ATML 3005B   | R   | 17   | 20     | MS3448-001A         |
| MIL-I-81969/30B-06                                                                                          | ATML 3006B   | R   | 17   | 16     | MS3448-001B         |
| MIL-I-81969/30B-07                                                                                          | ATML 3007B   | R   | 17   | 12     | MS3448-001C         |
| MIL-I-81969/30B-08                                                                                          | ATML 3008B   | R   | 17   | 22D    |                     |
| MIL-I-81969/30B-09                                                                                          | ATML 3009B   | R   | 17   | 22M    |                     |
| MIL-I-81969/30B-10                                                                                          | ATML 3010B   | R   | 17   | 22     |                     |
| MIL-I-81969/30B-11                                                                                          | ATML 3011B   | R   | 17   | 20     |                     |
| MIL-I-81969/30B-12                                                                                          | ATML 3012B   | R   | 17   | 16     |                     |
| MIL-I-81969/30B-13                                                                                          | ATML 3013B   | R   | 17   | 12     |                     |
| MIL-I-81969/30B-19                                                                                          | ATML 3019B   | R   | 17   | 22D-12 |                     |
| MIL-I-81969/30B-20                                                                                          | ATML 3020B   | R   | 17   | --     |                     |
| MIL-I-81969/30B-21                                                                                          | ATML 3021B   | R   | 17   | 22     |                     |
| MIL-I-81969/30B-22                                                                                          | ATML 3022B   | R   | 17   | 20     |                     |
| MIL-I-81969/30B-23                                                                                          | ATML 3023B   | R   | 17   | 16     |                     |
| MIL-I-81969/30B-24                                                                                          | ATML 3024B   | R   | 17   | 12     |                     |
| MIL-I-81969/30B-25                                                                                          | ATML 3025B   | R   | 17   | 20     |                     |
| MIL-I-81969/30B-26                                                                                          | ATML 3026B   | R   | 17   | 16     |                     |
| MIL-I-81969/30B-27                                                                                          | ATML 3027B   | R   | 17   | 12     |                     |
| MIL-I-81969/30B-28                                                                                          | ATML 3028B   | R   | 17   | 22D    |                     |
| MIL-I-81969/30B-29                                                                                          | ATML 3029B   | R   | 17   | 22M    |                     |
| MIL-I-81969/30B-30                                                                                          | ATML 3030B   | R   | 17   | 22     |                     |
| MIL-I-81969/30B-31                                                                                          | ATML 3031B   | R   | 17   | 20     |                     |
| MIL-I-81969/30B-32                                                                                          | ATML 3032B   | R   | 17   | 16     |                     |
| MIL-I-81969/30B-33                                                                                          | ATML 3033B   | R   | 17   | 12     |                     |
| MIL-I-81969/30B-34                                                                                          | ATML 3034B   | R   | 17   | 22-12  |                     |
| MIL-I-81969/30B-35                                                                                          | ATML 3035B   | R   | 17   | 20-12  |                     |
| MIL-I-81969/30B-36                                                                                          | ATML 3036B   | R   | 17   | 22D-12 |                     |
| NOTE: ATML 30567 is available as a set consisting of a handle and 1 each of ATML 3005, ATML 3006, ATML 3007 |              |     |      |        | MS3448-001          |

| CURRENT DOCUMENT  | ASTRO TOOL # | I/R   | ILL. | GAGE | SUPERSEDED DOCUMENT |
|-------------------|--------------|-------|------|------|---------------------|
| MIL-I-81969/31-01 |              |       |      |      | MS3178-20-1         |
| MIL-I-81969/31-02 |              | I     |      |      | MS3178-20-2         |
| MIL-I-81969/31-03 |              | R     |      |      | MS3178-20-3         |
| MIL-I-81969/31-04 |              | R     |      |      | MS3178-20-4         |
| MIL-I-81969/31-05 |              | I     |      |      | MS14035-02          |
| MIL-I-81969/31-06 |              | I     |      |      | MS14035-03          |
| MIL-I-81969/31-07 |              | R     |      |      | MS14035-01          |
| MIL-I-81969/31-08 |              | I     |      |      | MS14036-01          |
| MIL-I-81969/31-09 |              | I     |      |      | MS14036-02          |
| MIL-I-81969/21-10 |              | I     |      |      | MS14036-03          |
| MIL-I-81969/32-01 |              | R     |      |      |                     |
| MIL-I-81969/33-01 | ATML 3301    | I     |      |      |                     |
| MIL-I-81969/33-02 | ATML 3302    | I     |      |      |                     |
| MIL-I-81969/34-01 | ATML 3401    | R     |      |      |                     |
| MIL-I-81969/38-01 |              |       |      |      |                     |
| MIL-I-81969/38-02 |              |       |      |      |                     |
| MIL-I-81969/38-03 |              |       |      |      |                     |
| MIL-I-81969/38-04 |              |       |      |      |                     |
| MIL-I-81969/38-05 |              |       |      |      |                     |
| MIL-I-81969/38-06 |              |       |      |      |                     |
| MIL-I-81969/38-07 |              |       |      |      |                     |
| MIL-I-81969/38-08 |              |       |      |      |                     |
| MIL-I-81969/38-09 |              |       |      |      |                     |
| MIL-I-81969/38-10 |              |       |      |      |                     |
| MIL-I-81969/38-11 |              |       |      |      |                     |
| MIL-I-81969/38-12 |              |       |      |      |                     |
| MIL-I-81969/38-13 |              |       |      |      |                     |
| MIL-I-81969/38-14 |              |       |      |      |                     |
| MIL-I-81969/38-15 |              |       |      |      |                     |
| MIL-I-81969/38-16 |              |       |      |      |                     |
| MIL-I-81969/38-17 |              |       |      |      |                     |
| MIL-I-81969/38-18 |              |       |      |      |                     |
| MIL-I-81969/39-01 | M81969/39-01 | I & R | 28   | 20   |                     |

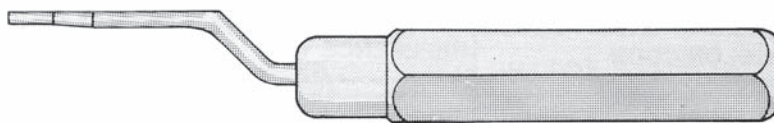
Verify QPL status (if required) at time of purchase.





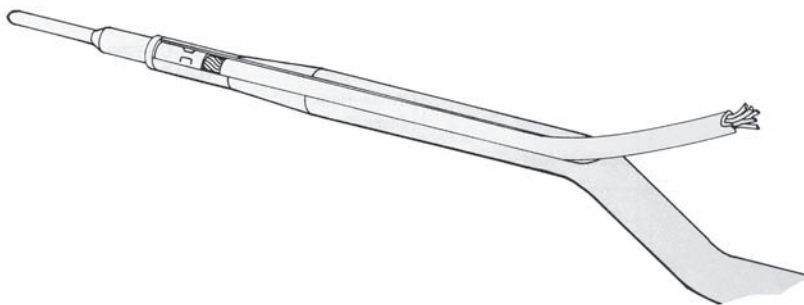
## INSERTION TOOLS

Straight (ILL. 1) and jogged tools (ILL. 2) hold contact and wire in line with center or side of the tool handle. Tool sizes are "0" to "24" gage. Handles are color coded aluminum. Tools range from 4 1/2" to 6" long with replaceable tips.



ILL 2

ILL 1

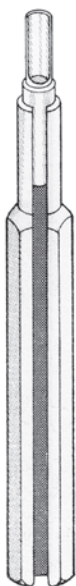


## FRONT REMOVAL, REAR INSERTION TOOLS

Both front removal (ILL. 3) and rear insertion (ILL. 4) Military Standard tools offer a convenient and practical approach to servicing the MIL-C-81511, Series 1 & 2 connectors. Tools are color coded for contact size with half-inch hex metal handles.



ILL 3

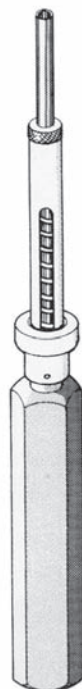


ILL 4

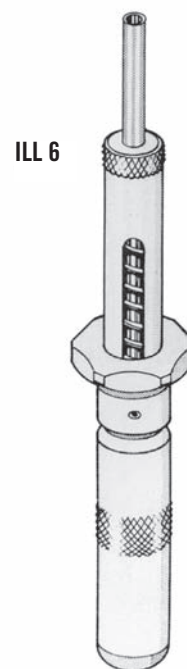
## FRONT RELEASE

Front release connectors are easily serviced with these military spec removal tools. Handles are color coded for contact size. Replaceable tips are available.

REF: MIL-C-005015, MIL-C-26482, MIL-C-26500, and MIL-C-26636 Connectors.

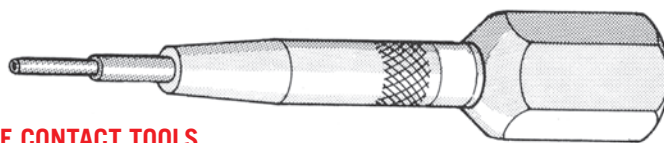


ILL 5



ILL 6

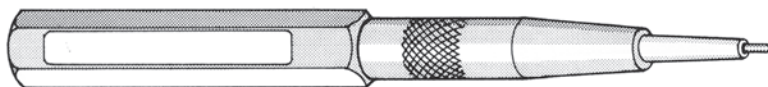
# Insertion & Removal Tool Illustrations



ILL 8

## FRONT REMOVAL SPRING-LOADED PROBE CONTACT TOOLS

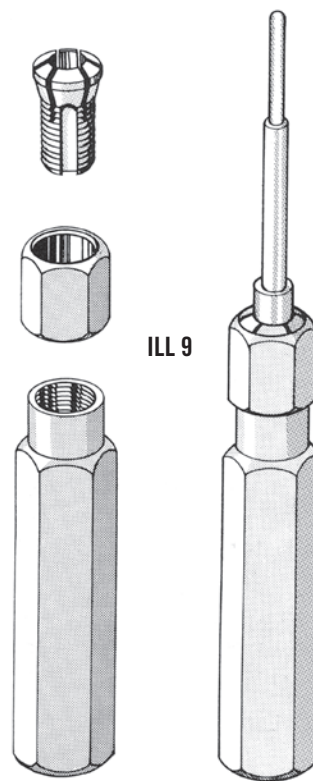
Employing the floating tip concept, these tools offer quality, as well as ease in operation. Body and handle are anodized aluminum alloy and color coded. Replaceable tips are available and require no special insertion tools.



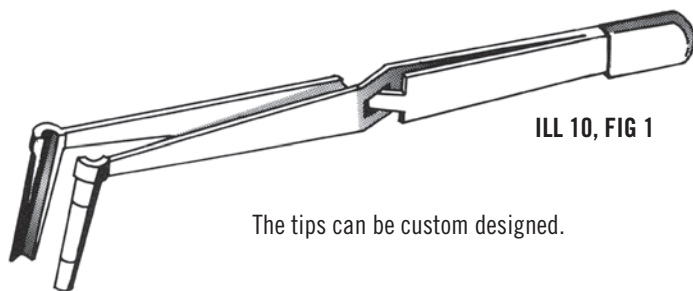
ILL 7

## INTERFERENCE FIT CONTACTS

A collect grip in the handle allows for a multi-purpose tool. The tips can be set to remove both pins and sockets or insert multi-sized contacts by reversing the replaceable tip. Handles are aluminum alloy and color coded. Sizes are from 1/8" diameter to 1/4" diameter.



ILL 9

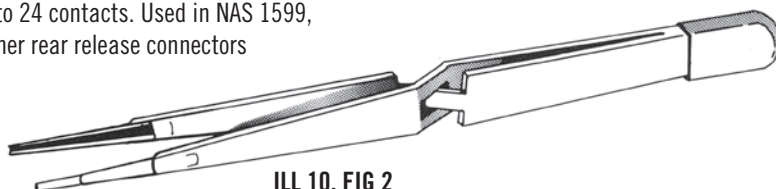


ILL 10, FIG 1

The tips can be custom designed.

## REAR REMOVAL AND INSERTION TWEEZERS

Tools are for sizes 8 to 24 contacts. Used in NAS 1599, MIL-C-38999 and other rear release connectors

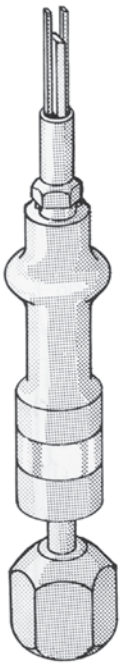


ILL 10, FIG 2

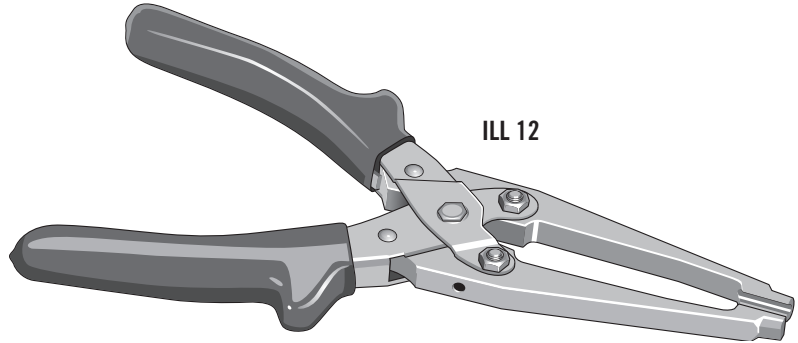
The tips can be custom designed.

### FLAT CONTACT REMOVAL TOOLS

Tool is used in the Elco, Winchester, Tri-Star and Collins Radio connectors. Tool slides down both sides of contact from front and releases locking clip (spur). Shedder then ejects contact out of the rear.



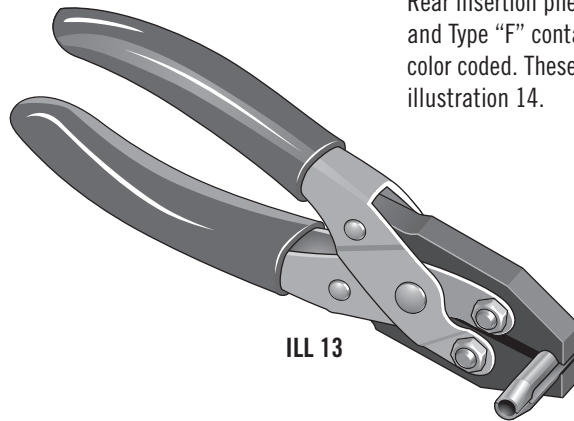
ILL 11



ILL 12

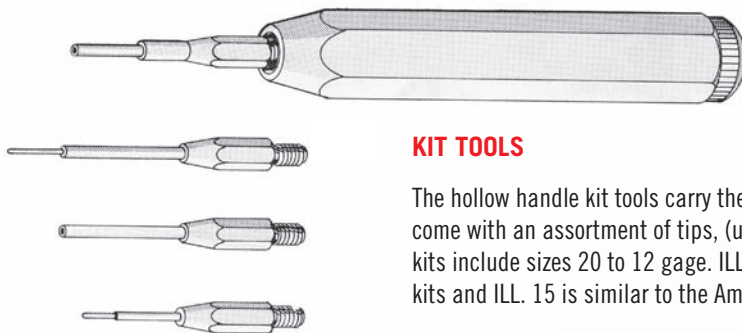
### INSERTION PLIERS

Rear insertion pliers are for Amphenol/Bendix, CE, SE, AN/MS and Type "F" contacts in sizes 12, 16, & 20 gage. Handles are color coded. These pliers are used in conjunction with kits in illustration 14.



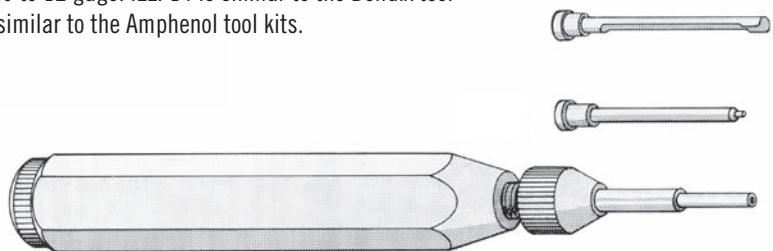
ILL 13

ILL 14



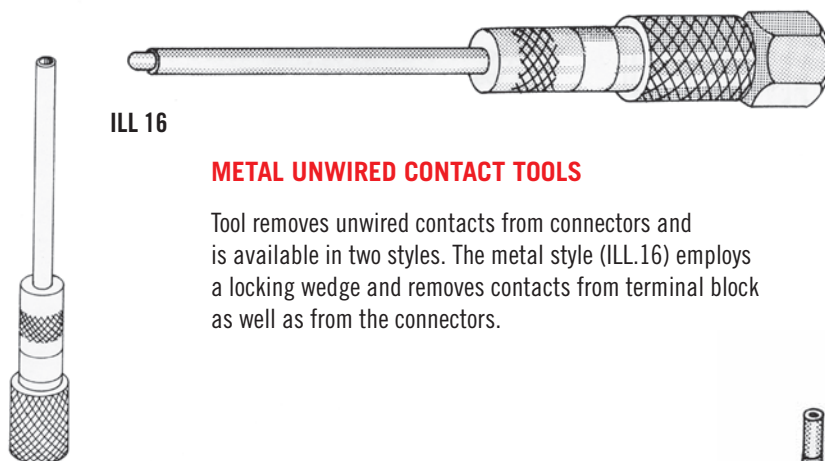
### KIT TOOLS

The hollow handle kit tools carry the tips inside the handle and come with an assortment of tips, (usually 3 to 5 per kit). Various kits include sizes 20 to 12 gage. ILL. 14 is similar to the Bendix tool kits and ILL. 15 is similar to the Amphenol tool kits.



ILL 15

# Insertion & Removal Tool Illustrations



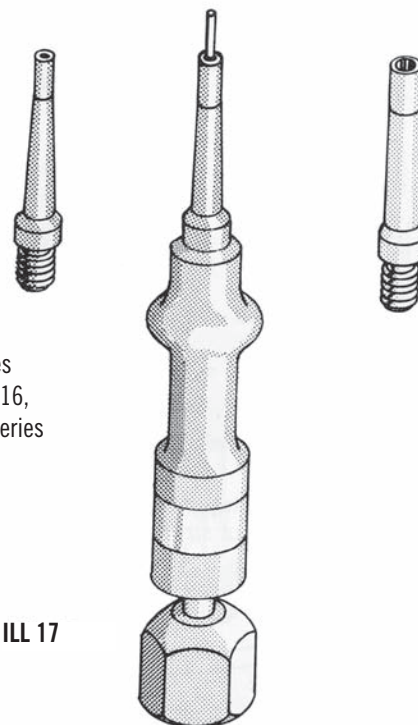
ILL 16

## METAL UNWIRED CONTACT TOOLS

Tool removes unwired contacts from connectors and is available in two styles. The metal style (ILL.16) employs a locking wedge and removes contacts from terminal block as well as from the connectors.



The Military Standard tools (ILL.17) use plastic probes which are interchangeable and available in sizes 12,16, 20 (MS3448-001 kit) and 12 through 22 (MS3159), series NAS 1599 and MIL-C-81511, Series 3 and 4.



ILL 17

## RETENTION TEST TOOL

This tool is designed to test contacts in connectors to verify a properly “locked in” condition after insertion. These tools impose a controlled spring pressure against pin or socket contacts and will displace when not properly locked.

Each tool has interchangeable probes for testing either pin or socket contacts and three sizes of compression springs (light, medium or heavy, covering from 1 ½ to 18 lbs). Tool is easily adjusted to any requirement. Design features a “visual check” with an indicator button showing when full compression is reached.



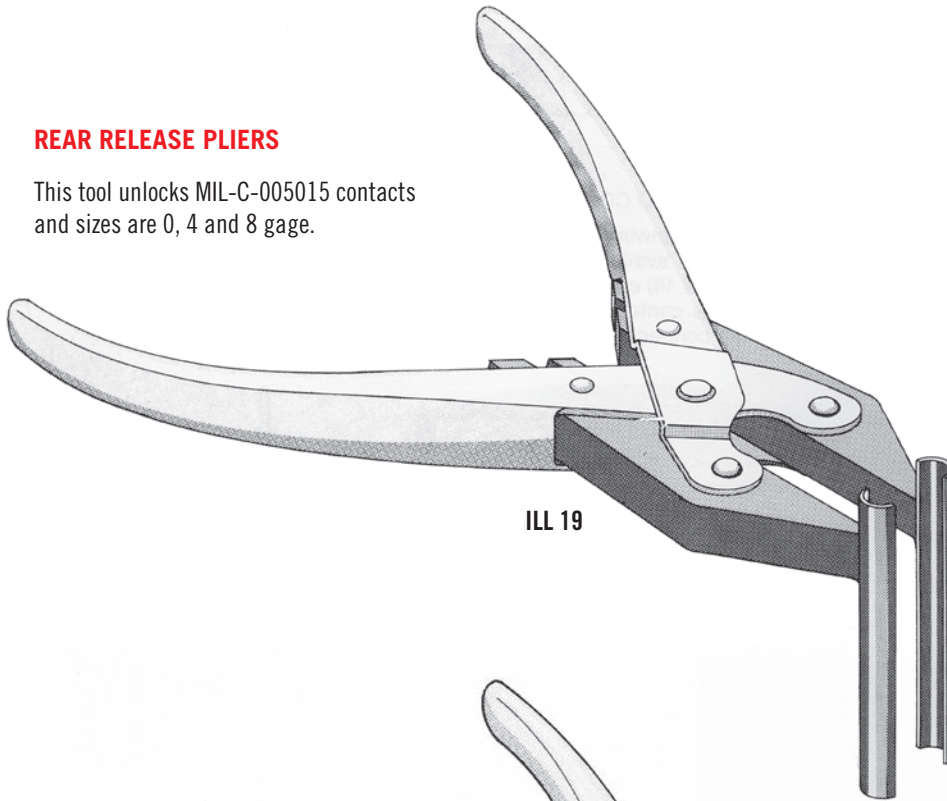
ILL 18





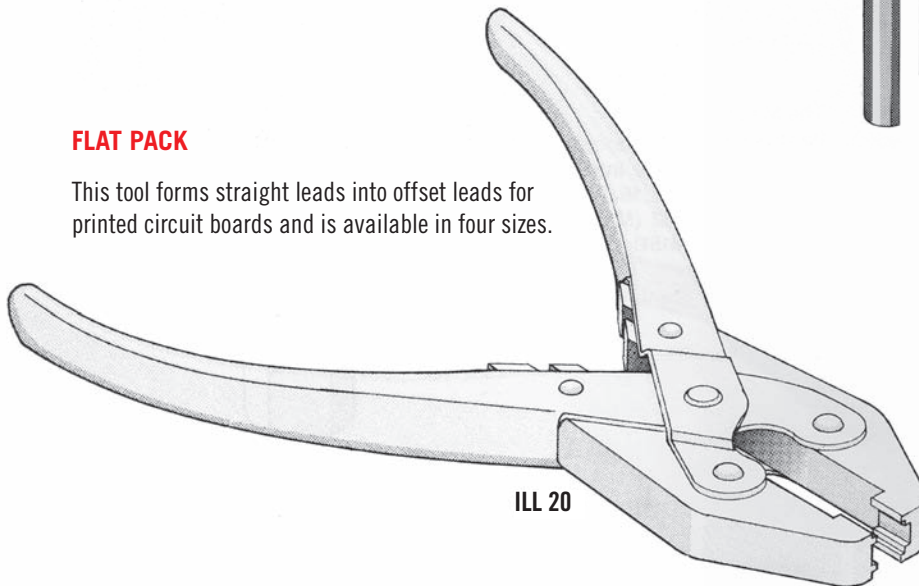
### REAR RELEASE PLIERS

This tool unlocks MIL-C-005015 contacts and sizes are 0, 4 and 8 gage.



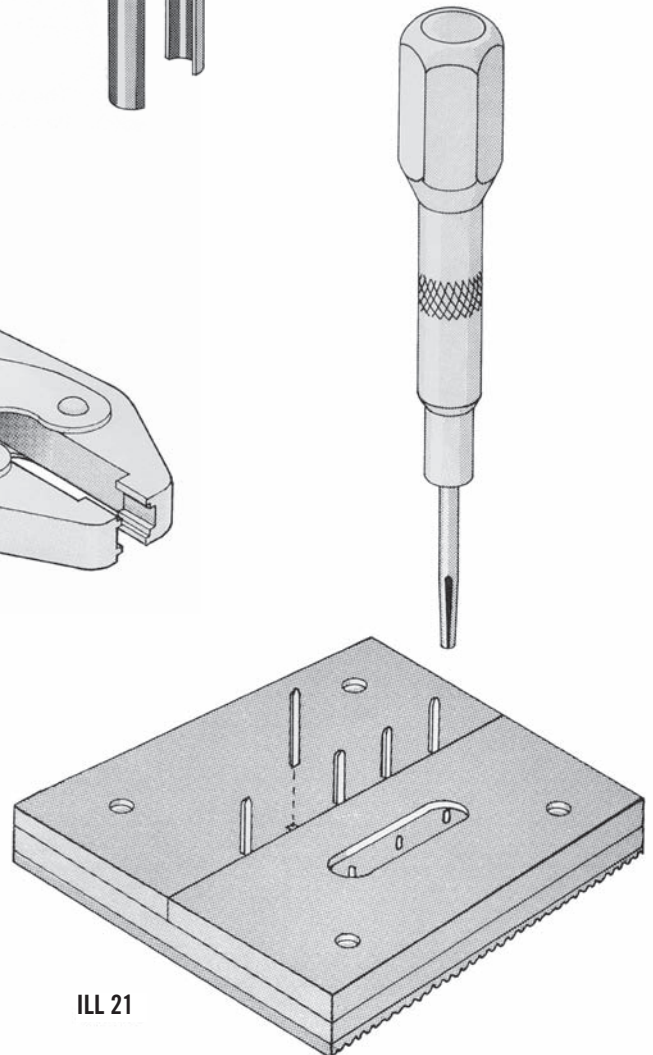
### FLAT PACK

This tool forms straight leads into offset leads for printed circuit boards and is available in four sizes.



### TRANSFER KITS

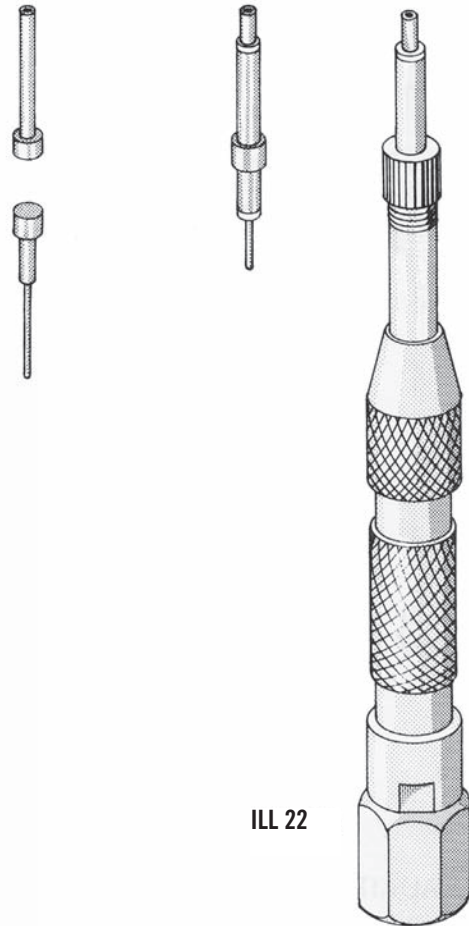
This tool is designed to move the wired clips from one pin to another with ease. Two sizes are available; .025 square and .058 x .028 pins kits.



# Insertion & Removal Tool Illustrations

## IMPACT TOOLS

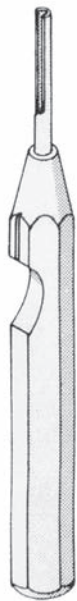
Tool is used mainly on Cannon's "Ring-Lok" contacts. The contacts are "snapped" out by the impact tool. Sizes are coax to 20 gage and remove both pin and socket contacts. The probes are replaceable and handles are color coded.



## INSERTION AND REMOVAL TOOLS

This tool uses 3/8" hex aluminum handle and is used in the smaller gage sizes. Tips are normally straight, from 1" to 4" long.

Delrin handles with 20° offset tips work well when inserting 16 to 22M contacts in the MIL-C-38999 connectors.



ILL 23



ILL 24

ILL 22

## TIPS

Replacement tips come in many shapes and sizes.

Lockheed (figure A)

Bendix (figure B)

Burndy (figure C)

ILL 25



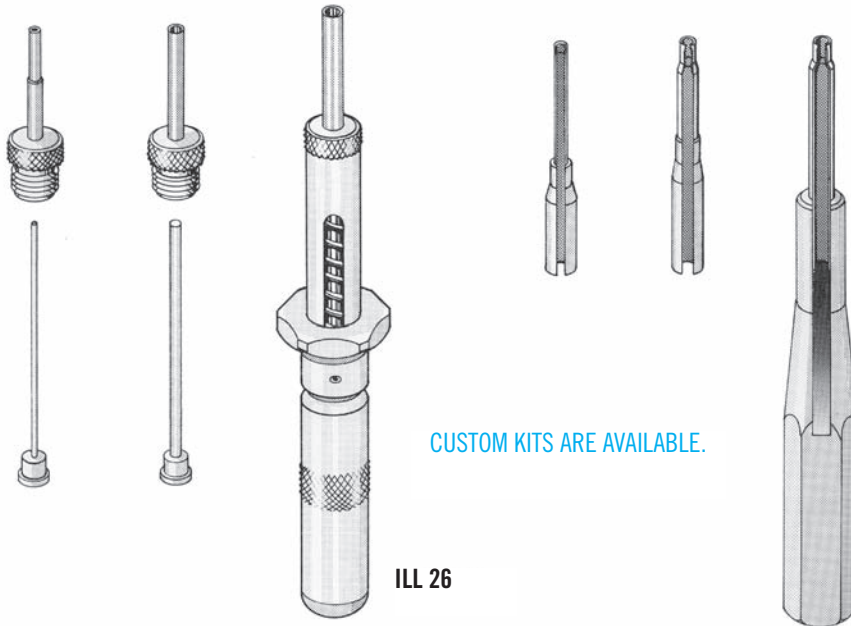
FIG C



FIG A



FIG B



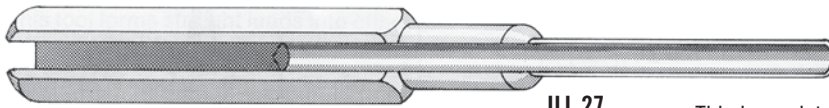
CUSTOM KITS ARE AVAILABLE.

### INTERCHANGEABLE PROBE REMOVAL KIT

Common handle and 3 tips for sizes 12, 16 and 20 gage contacts, with shedders for MIL-C-26482, 26500 and 26636 connectors.

### INTERCHANGEABLE PROBE INSERTION KIT

Common handle and 3 tips for sizes 12, 16 and 20 gage contacts for MIL-C-26482, 26500 and 26636 connectors.



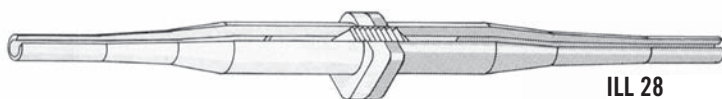
ILL 27

This long-slot tool illustrates the standard for MIL-C-005015 insertion tools. Modified versions are available on request.

### PLASTIC TOOLS vs. ASTRO METAL TOOLS

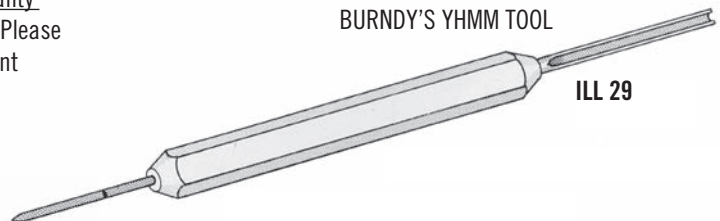
Plastic tools are used throughout the industry. Astro Tool Corp's policy is to give our customers the greatest savings for the best quality tools we can manufacture. Metal tools, although initially more costly, offer a quality product and a lower tooling cost in servicing electrical connectors. Please refer to our cross-reference lists for any plastic to metal replacement equivalents you may need.

The tools are available in two basic lengths with a metal or plastic insertion foot.

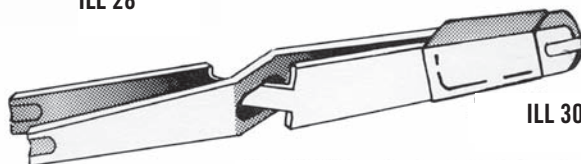


ILL 28

BURNDY'S YHMM TOOL



ILL 29



ILL 30

COLLIN'S RADIO FILTER PIN  
INSERTION TOOL

# APPENDIX



**ASTRO TOOL CORP.**  
CONNECTOR ASSEMBLY TOOLING



# Terms & Conditions of Sale

(a) **APPLICABLE TERMS AND CONDITIONS:** These Terms and Conditions exclusively control any sale between ATC and purchaser. If purchaser fails to object in writing to ATC's Terms and Conditions within ten (10) days of receipt of these Terms and Conditions, then Purchaser's acceptance of the goods will be deemed an acceptance of the terms and conditions set forth herein. ATC expressly rejects any pre-printed terms and conditions set forth in any of purchaser's forms. Any proposed terms and conditions proposed by purchaser not contained in a pre-printed form shall not be binding upon ATC unless such terms and conditions are expressly agreed upon by ATC in writing.

(b) **CHANGES:** If the purchaser at any time changes within the general scope of any order and if any such changes cause an increase or decrease in the cost of, or the time required for the performance of any purchase order or any other order affected by such change, an equitable adjustment in the price, the delivery schedule or both shall be made and such order shall be modified accordingly.

(c) **SHIPMENT:** Shipment generally will be accomplished FOB ATC's plant. Notwithstanding this, if ATC prepays the transportation charges purchaser will be obligated to reimburse ATC upon receipt of invoice for the prepaid transportation charges. Any Special or abnormal packaging required will be included in the unit price of the item to be delivered or as a separate line item.

(d) **DELIVERY:** Delivery will be accomplished within the time specified on the face of the acknowledgment or if no time is specified within the normal lead time necessary for ATC to deliver its products in question. Anything to the contrary notwithstanding, ATC shall not be liable to any reasonable delay in production or delivery. In the event a delay in production or delivery occurs beyond a reasonable period of time, which delay is occasioned by fire, strikes, civil or military authority, war, hostility, riots, government action, energy crises, parental leave, or by other causes beyond the control of ATC or without its fault or negligence, the failure of date or dates of delivery of the products ordered hereunder shall be extended for a period of time lost by reason of any such delay.

(e) **PAYMENTS:** In the event any payments of purchaser under any order are not made in a timely manner ATC may either: (1) declare purchaser's performance in breach and terminate any other order for default, (2) withhold future shipments under any order until delinquent payments are made, (3) deliver future shipments under any order on a C.O.D. or cash in advance basis even after the delinquency is cured, (4) charge interest on the delinquency at a rate of 2% per month or the maximum rate permitted by law, if lower, for each month or part thereof of the delinquency in payment plus applicable storage charges or inventory carrying charges, if any, or (5) combine any of the above rights and remedies as a practicable and permitted by law. Nothing herein shall waive any other rights or remedies of ATC permitted by law or set forth in this or any other order between purchaser and ATC and all rights and remedies set forth herein shall be considered cumulative with all other available rights and remedies.

(f) **MATERIAL SHORTAGES AND ALLOCATIONS:** In the event ATC is unable to obtain in a timely manner material sufficient to fulfill all of its orders on hand, ATC shall have the right as a result of said material shortages to equitably allocate lesser quantities of the products to be delivered to all purchasers on the proportionate basis. Unless specifically agreed in writing to the contrary, purchaser agrees to accept partial shipments.

(g) **INSPECTIONS:** The purchaser shall inspect and accept any products delivered immediately after purchaser takes custody of such products. In the event the products do not meet the drawings, designs, and/or specifications, the purchaser shall notify ATC of such noncompliance in writing and give ATC a reasonable opportunity to correct any such noncompliance. The purchaser shall be deemed to have accepted any products delivered and to have waived any such noncompliance in the event a written notification that the products delivered do not comply with the drawings, design, and/or specifications, is not received by ATC within 15 days after the purchaser takes custody of the products delivered.

(h) **INSOLVENCY:** ATC may cancel the whole or any part of any order in the event of the suspension of purchaser's business, insolvency of purchaser, the institution, by the purchaser or others, of bankruptcy reorganization, arrangement of liquidation proceedings involving or affecting the purchaser or any assignment for the benefit of creditors of purchaser or receivership that purchaser places itself in or may be placed in. Such cancellation shall be deemed a cancellation for default of purchaser.

(i) **RIGHT TO COMMUNICATE:** If purchaser is a reseller of ATC products, ATC shall have the absolute right to freely communicate with purchaser's customers concerning the reasons for delay or non-delivery of ATC product. If purchaser is on credit hold for any reason, ATC shall have the absolute right to furnish ATC product directly to purchaser's customer. Purchaser waives all right to claim that such communications and actions are slanderous, libelous, defamatory or constitute interference with a business arrangement.

(j) **SPECIAL TOOLING:** Title to dies, tools, jigs, fixtures, patterns or any other type of special tooling shall remain vested in ATC, whether or not paid for or amortized over the products manufactured under any other purchaser.

(k) **TAXES:** Unless otherwise specifically stated in writing by ATC, prices quoted by ATC do not include sums necessary to cover any taxes or duties including but not limited to Federal, State, Municipal excise, sales or use taxes or import duties upon the production, sale, distribution, or delivery of equipment or furnishing of service hereunder. Any taxes or duties that are due and owing shall be paid by the purchaser. Accordingly, ATC reserves the right to revise any contract between itself and others to include any and all taxes or duties that may become due and ATC may involve purchaser for said additional amount. This cause shall survive the acceptance and complete performance of any order.





(l) **SET-OFF:** All moneys owed under any order shall be due and payable at Beaverton, Oregon and the purchaser is prohibited from setting off said sums due ATC under this order form sums, whether liquidated or not, that are or may be due the purchaser which arise out of a different transaction with ATC, its divisions, subsidiaries or affiliates.

(m) **VENUE:** Washington County, Oregon shall be the proper venue for any actions arising out of or because of the breach of any agreement entered into with ATC.

(n) **ATTORNEYS' FEES AND SUIT COSTS:** Should ATC have to initiate legal action to collect any moneys owed arising out of any contract, or should ATC be sued by a customer under any contract, then if ATC prevails in whole or in part, customer agrees to pay ATC's attorneys' fees, witness fees, and court costs.

(o) **TITLE:** Title to the goods shall pass to the purchaser on identification of the goods to the contract. Purchaser grants ATC a security interest in the goods identified on this document, to secure payment of the purchase price, including all amounts that come due under the Sale Document.

(p) **NON-WAIVER:** No course of dealing or failure of ATC to strictly enforce any term, right or condition of any contract shall be construed as a waiver of such term, right or condition.

(q) **CHOICE OF LAW:** The construction, interpretation and performance of any agreements entered into and all transactions under such agreements shall be governed by the laws of the State of Oregon.

(r) **CANCELLATION COSTS:** In the event of cancellation of any order by purchaser, purchaser shall be liable for reasonable cancellation costs which shall not exceed the contract price for the items canceled.

(s) **RISK OF LOSS:** Purchaser shall be liable for any loss which occurs after goods leave their F.O.B. point which shall be Factory, Beaverton, Oregon, unless otherwise stated on the reverse side of this document.

(t) **ERRORS SUBJECT TO CORRECTION:** All typographical, stenographic and arithmetical errors are subject to correction.

(u) **LIABILITY FOR PATENT INFRINGEMENT:** If goods are made to purchaser's specifications or design, purchaser assumes liability for patent and copyright infringement and agrees to hold ATC harmless from any actions arising out of any alleged infringement.

(v) **RESPONSIBILITY FOR SAFETY TRAINING:** Purchaser and end users stipulate and agree that tampering with, or the improper or unsafe operation of ATC products, especially power actuated products, can cause severe bodily injury or death. Purchaser and end users agree to assume complete and sole responsibility for fully training and continually supervising each of their operators in the proper use and safe operation of all products from ATC.



## Limited Warranty and Limitations of Liability

(w) **LIMITED WARRANTY:** ATC warrants each new product sold by it to be free from defects in material and workmanship under normal use and service. ATC's obligation under this warranty is limited to the free correction or, at ATC's option, the refund of the purchase price of any such product which proves defective in normal service within ninety (90) days after delivery to the first user, provided that the product is returned to ATC with all transportation charges prepaid and which shall appear to ATC's satisfaction, after ATC's inspection, to have been defective in material or workmanship, it being understood that ATC products are not consumer products. This warranty shall not cover any damage to any product which, in the opinion of ATC, was caused by normal wear, misuse, improper operation, tampering, neglect, or accident. This warranty is in lieu of all other warranties express or implied. No warranty, express or implied, is made or authorized to be made or assumed with respect to products of Astro Tool Corporation other than those herein set forth.

(x) **LIMITATION OF LIABILITY:** ATC IS NOT LIABLE FOR CONSEQUENTIAL OR SPECIAL DAMAGES OF ANY NATURE OR KIND RESULTING FROM THE USE, OR MISUSE OF ANY OF ITS PRODUCTS. OWNERS AND USERS OF ATC PRODUCTS ASSUME FULL RESPONSIBILITY FOR INSTRUCTING THEIR EMPLOYEES IN THE PROPER AND SAFE USE OF SUCH PRODUCTS.

(y) **SEVERABILITY:** If any provision herein is held to be in violation of any Federal, State or Local statute or regulation of illegal or unenforceable for any reason, said provision shall be self-deleting without affecting the validity of the remaining provisions.

(z) **TOOLING OR TOOLING COMBINATIONS SUGGESTED BY ATC** may or may not cover a user's specific contract manufacturing requirements. It is the user's responsibility to conduct sufficient testing to validate the suitability of the ATC product(s) selected for the specific requirements of each particular application. ATC DISCLAIMS ANY LIABILITY DIRECT OR CONSEQUENTIAL ARISING FROM USER'S FAILURE TO CARRY OUT SUCH VALIDATION TESTING.

## Certificate of Conformance

Astro Tool Corporation certifies that documentary evidence in the form of test reports and inspection records on this material and/or associated processes indicating conformance to applicable specifications are on file and available for review, by appointment, at its home office. The parts so submitted meet dimensional, functional and quality requirements as covered by the applicable purchase order, part numbers and/or specifications.

**CERTIFICATES OF CONFORMANCE:** A standard Certificate of Conformance is printed on the back of invoices and packing lists. There will be an additional charge for additional and/or non-standard Certificates of Conformance.

## Certificate of Calibration/Inspection

The parts so submitted by Astro Tool Corporation meet dimensional, functional and quality requirements as covered by the applicable purchase order, part numbers and/or specifications. The quality system meets ISO9001/AS9000. ATC's metrology system is maintained according to ANSI/NCSL Z540-1-1994 and uses test equipment and material traceable to N.I.S.T.



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