



**ASTRO TOOL CORP.**

**Your Connection for Aerospace and Medical Tooling**

Connector Assembly Tooling for Aerospace and Telecommunication  
Ultra Precision Medical Crimping Tools

# **TOOLING GUIDE**

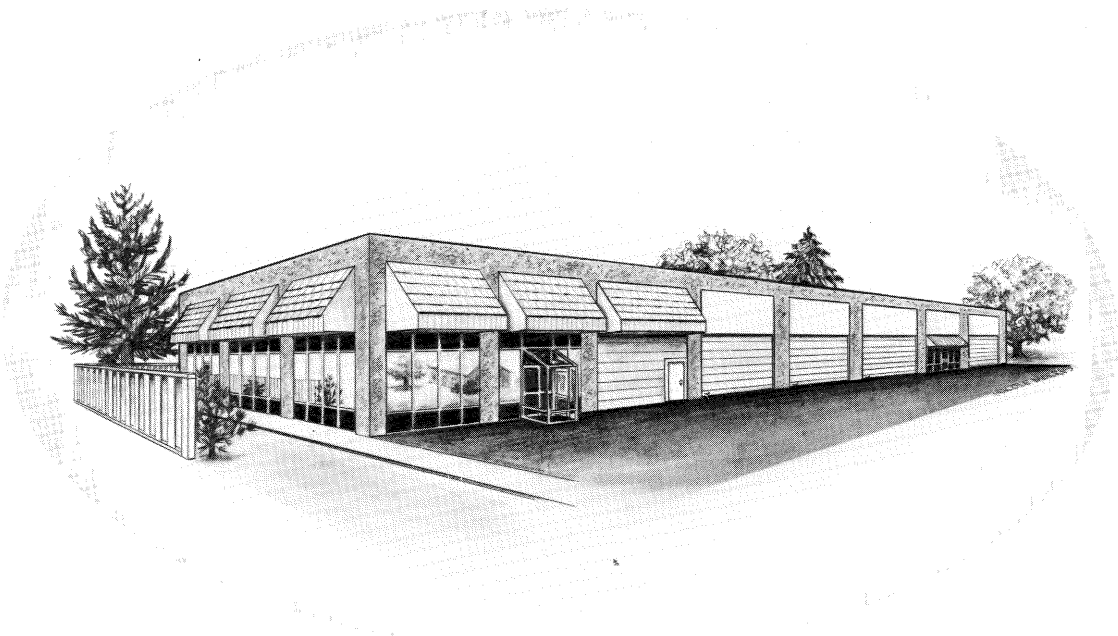
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# **ASTRO TOOL CORP. TOOLS AND SERVICES**

**ASTRO CRIMP TOOL PRODUCTS**

**ASTRO INSERTION AND REMOVAL TOOLS**

**CUSTOM DESIGNING FOR ALL  
SPECIAL TOOLING REQUIREMENTS**

**PNEUMATIC CRIMP TOOLS**

**MIL-SPEC TOOL KITS**

**CUSTOM TOOL KITS**

**FREE CROSS REFERENCE SERVICE**

## **IMPORTANT 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.



## GLOSSARY OF TERMS

**ADAPTER** An intermediate device to provide for attaching special accessories or to provide special mounting means.\*

**AMBIENT TEMPERATURE** The temperature of the environment, usually air, surrounding a connector.\*

**ANTI-ROTATION, CONNECTOR** A cylindrical connector design which provides keying or locking provisions to maintain positive orientation for accessory hardware.

**AXIAL DISPLACEMENT** The incremental difference between an initial position and a final position resulting from a force applied along the axis of a component.

**BACK-MOUNTED** A connector mounted from the inside of a panel or box with its mounting flange inside the equipment.\*

**BARREL, CONDUCTOR** The section of the terminal, splice or contact that accommodates the stripped conductor.\*

**BARREL, INSULATION** The section of the terminal, splice or contact that accommodates the conductor insulation.\*

**BARREL CHAMFER** Bevel at the end of the conductor barrel for easier entry of the conductor.\*

**BARRIER** A partition of electrically nonconductive material which increases the electrical path between adjacent electrical circuits or an electrical circuit from ground.

**BASIS METAL** Metal from which the connector components are made and on which one or more metals or coatings may be deposited.\*

**BAYONET COUPLING, ROTARY** A quick coupling device for mating connectors utilizing pins on a connector and ramps on the mating connector. Mating and unmating is accomplished by rotating the coupling ring.\*

**BELLED MOUTH (BELLMOUTH)** The flared or wide entrance of a terminal splice or contact barrel to permit easier insertion of the conductor.\*

**BODY, CONNECTOR** The main portion of a connector to which contacts and other components are attached. This term is not used with connec-

tors incorporating nonintegral shells in their construction.\*

**BOOT** A form placed around the wire terminations of a multiple contact connector as a protective housing or as a container for potting compound.\*

**BRAID** Flexible conductor made of a woven or braided assembly of fine wires.\*

**BUNDLE** A group of wires fastened or held together by an auxiliary means such as straps, ties, clamps or flexible wrappings (jackets) or sheaths. Also called "cable."

**BUSING** The joining of two or more circuits.\*

**BUTTING DIES** Crimping dies so designed that the nest and indenter touch at the end of the crimping cycle. (Also called bottoming dies.)\*

**CABLE ADAPTER** (See ADAPTER.)\*

**CABLE CLAMP** A mechanical clamp attached to the cable side of the connector to support the cable or wire bundle, provide strain relief, and absorb vibration and shock otherwise transmitted by the cable to the contact/wire connection.\*

**CABLE SEALING CLAMP** A device consisting of a gland nut and sealing member designed to seal around a single jacket cable.\*

**CABLE SHIELDING CLAMP** A device consisting of a sealing member and cable support designed to terminate the screen (shield) of an electrical cable.\*

**CIRCUMFERENTIAL CRIMP** The type of crimp where the crimping dies completely surround a barrel resulting in symmetrical indentations in the barrel.\*

**CLOSED ENTRY** A contact or contact cavity design in the insert or body of the connector which limits the size or position of the mating contact or printed circuit board to a predetermined dimension.\*

**COLOR CODING** A system of identification of terminals and related devices.\*

**CONDUCTOR** An electric current-carrying material; the conductive element in an electrical wire.

\*DEFINED AS PER MILITARY STANDARD 1353

## GLOSSARY OF TERMS

**CONDUCTOR STOP** A device on a terminal, splice, contact or tool used to prevent excessive extension of the conductor barrel.\*

**CONNECTOR, ELECTRICAL** A device, either a plug or a receptacle, used to terminate or connect the conductors of individual wires or in cables and which provides a means to continue the conductors to a mating connector or printed circuit board.\*

**CONNECTOR SET, ELECTRICAL** Two or more separate connectors, plug connector and receptacle connector, designed to be mated together. The set may include mixed connectors mated together, such as one connector plug and one dummy connector receptacle, connector receptacle and one dummy electrical plug.\*

**CONTACT** The conductive element in a connector which makes actual contact for the purpose of transferring electrical energy.\*

**CONTACT AREA** The area in contact between two conductors, two contacts, or a conductor and a contact permitting the flow of electricity.\*

**CONTACT ARRANGEMENT** The number, spacing and arrangement of contacts in a connector.\*

**CONTACT ENGAGING AND SEPARATING FORCE** Force needed to either engage or separate mating contacts.\*

**CONTACT, FEMALE** (See SOCKET CONTACT)

**CONTACT, FLOAT** The overall side play and/or angular displacement of contacts within the insert cavity.\*

**CONTACT, HERMAPHRODITIC** (See HERMAPHRODITIC CONTACT)

**CONTACT, MALE** (See PIN CONTACT)

**CONTACT RESISTANCE** Electrical resistance of a pair of engaged contacts. Resistance may be measured in ohms or millivolt drop at a specified current over the engaged contacts.\*

**CONTACT RETAINER** A device either on the contact or in the insert to retain the contact in an insert or body.\*

**CONTACT RETENTION** The axial load in either direction which a contact can withstand without

being dislodged from its normal position within an insert or body.\*

**CONTACT SEPARATION FORCE** The force required to separate a pair of fully mated contacts.

**CONTACT SIZE** An assigned number denoting the size of the contact engaging end.\*

**CONTACT WIPE** The distance of travel (electrical engagement) made by one contact with another during its engagement or separation or during mating or unmating of the connector halves.\*

**COUPLING NUT** (See COUPLING RING)\*

**COUPLING RING** That portion of a plug which aids in the mating or unmating of a plug and receptacle and holds the plug to the receptacle.\*

**COUPLING TORQUE** The force required to rotate a coupling ring or jackscrew to fully engage a mating pair of connectors.

**COVER, ELECTRICAL CONNECTOR** An item which is specifically designed to cover the mating end of a connector for mechanical and/or environmental protection.\*

**CREEP DISTANCE** The shortest distance on the surface of an insulator separating two electrically conductive surfaces.\*

**CRIMP** The physical compression (deformation) of a contact barrel around a conductor in order to make an electrical connection.\*

**CRIMPING** A pressure method of mechanically securing a terminal, splice or contact to a conductor.\*

**CRIMPING DIES** Portion of the crimping tool that shapes the crimp.\*

**CRIMPING TOOL** Mechanism used for crimping.\*

**CUTOUT, CONNECTOR** The hole, usually round or rectangular, cut in a metal panel for mounting a connector. May include holes for mounting screws or bolts.\*

**DEPTH OF CRIMP** The distance the indenter penetrates into the barrel.\*

**DIELECTRIC** A material having electrical insulating properties.\*

\*DEFINED AS PER MILITARY STANDARD 1353

## GLOSSARY OF TERMS

**DISCONNECT** A reusable conductive device designed to be separated from its mated part.

**DUMMY CONNECTOR ASSEMBLY, ELECTRICAL** Two or more electrical dummy connectors having a common mounting or mounted on each other, each one capable of being independently replaced. Excludes items which are furnished as mated pairs or sets.\*

**DUMMY CONNECTOR, PLUG** A connector device designed to mate with a receptacle connector to perform protective, environmental and/or electrical shorting functions.

**DUMMY CONNECTOR, RECEPTACLE** A connector receptacle which does not have provisions for attaching conductors. It is generally used for storage of a cable assembly connector plug.\*

**DUST COVER** (See COVER, ELECTRICAL CONNECTOR.)\*

**ENVIRONMENTALLY SEALED** A device that is provided with gaskets, seals, grommets, potting or other means to keep out moisture, dirt, air or dust which might reduce its performance. Does not include nonphysical environments such as RF and radiation.\*

**EXTRACTION TOOL** A device used for removing removable contacts from a connector. A device used for removing taper pins from taper pin receptacles.\*

**FERRULE** A short tube. Used to make connections to shielded or coaxial cables. Also used in connectors to reduce transmission of torque to grommet.\*

**FLANGE, CONNECTOR** A projection extending from or around the periphery of a connector with provisions to permit mounting the connector to a panel.\*

**FRONT MOUNTED** A connector mounted on the outside of a panel or box with its mounting flange outside the equipment.\*

**FULL CYCLING CONTROL** Controls placed on the crimping cycle of crimping tools forcing the tool to be closed to its fullest extent completing the crimping cycle before the tool can be opened.\*

**GANG DISCONNECT** A connector that permits the rapid and simultaneous connection and disconnection of two or more electrical circuits.\*

**GROUNDING CONDUCTOR** A conductor which provides a current return path from an electrical device to ground.

**GRID SPACED** When contacts in a multiple contact connector are spaced in a geometric pattern.\*

**GROMMET, CONNECTOR** An elastomeric seal used on the cable side of a connector to seal the connector against moisture, dirt and air.\*

**HARNESS** A group of wires or cables routed together with attached connectors and components and secured in a manner to provide a preshaped electrical wire or cable assembly.

**HERMAPHRODITIC CONNECTOR** A connector design which utilizes pin and socket contact in a balanced arrangement such that both mating connectors are identical. The contacts may also be hermaphroditic, and may be arranged as male and female contacts as for pins and sockets. Hermaphroditic contacts may also be used in a manner such that one half of each contact mating surface protrudes beyond the connector interface and both mating connectors are identical.\*

**HERMAPHRODITIC CONTACT** A contact design which is neither pin or socket and which mates with other contact of the same design.\*

**HOUSING, CONNECTOR** Connector less insert, but with insert-retaining and positioning hardware required by standard construction.\*

**INDENTOR** That part of a crimping die, usually the moving part, which indents or compresses the contact barrel.\*

**INSERT, ELECTRICAL CONNECTOR** An insulating element with or without contact(s), designed to position and support contacts in a connector.\*

**INSERT RETENTION FORCE** The maximum allowable force which, if applied to the mating face of a connector insert, does not displace the insert permanently from its normal position in the connector housing or jeopardize or damage the insert or connector housing retention provision.

**INSERTION TOOL** A device used to insert contacts into a connector. A device used to insert taper pins into taper pin receptacles.\*

**INSPECTION HOLE** A hole placed at one end of a barrel to permit visual inspection to see that the

\*DEFINED AS PER MILITARY STANDARD 1353

## GLOSSARY OF TERMS

conductor has been inserted to the proper depth in the barrel prior to crimping.\*

**INSULATION SUPPORT** The portion of a barrel similar to an insulation grip except that it is not compressed around the conductor insulation.\*

**INTERFACE** The two surfaces on the contact side of mating connectors or plug-in component (e.g., relay) and receptacle, which face each other when mated.\*

**INTERFACIAL SEAL** A sealing of mated connectors over the whole area of the interface to provide sealing around each contact.\*

**JACKET** The outermost layer of insulating material of a cable or wire.\*

**JACKSCREW (SCREWLOCK)** A screw attached to one half of a two piece multiple contact connector used to draw and hold both halves together and to separate them.\*

**KEY** A short pin or other projection which slides in a mating slot, hole, groove or keyway to guide two parts being assembled. Generally used in shell-enclosed connectors to obtain polarization.\*

**KEYWAY** A slot or groove in which a key slides.\*

**LOCATOR** (See STOP PLATE) Device for positioning terminals, splices or contacts in crimping dies.\*

**LOCKING SPRING** (See CONTACT RETAINER.)\*

**MATE** The joining of two connectors.\*

**MOLD, POTTING, ELECTRICAL CONNECTOR** An item, solid or split, designed to be used as a hollow form into which potting compound is injected and allowed to cure or set to seal the back of an electrical connector. The potting may eliminate the need for a back shell of the connector. The form may or may not be removable after potting.\*

**NEST** The portion of a crimping die which supports the barrel during crimping.\*

**NICK (NOTCH)** A cut or notch in conductor strands or insulation.\*

**OPERATING TEMPERATURE** The maximum internal temperature resistant capabilities of a connector in continuous service.\*

**PANEL** The side or front of a piece of equipment, usually metal, on which connectors are mounted.\*

**PERIPHERAL SEAL** A seal provided around the periphery of connector inserts to prevent the ingress of fluids or contaminants at the perimeter of mated connectors.

**PIGTAIL** A short wire extending from an electric or electronic device to serve as a jumper or ground connection.\*

**PIN CONTACT** A contact having an engagement end that enters the socket contact.\*

**PLATING** The overlaying of a thin coating of metal on metallic components to improve conductivity, provide for easy soldering or prevent rusting or corrosion.\*

**PLUG CONNECTOR** An electrical fitting with pin, socket, or pin and socket contacts, constructed to be affixed to the end of a cable, conduit, coaxial line, cord, or wire for convenience in joining with another electrical connector(s), and not designed to be mounted on a bulkhead, chassis or panel.\*

**POLARIZE** The arrangement of mating connectors such that the connector can be mated in only one way.\*

**POLARIZING PIN, KEY OR KEYWAY** A device incorporated in a connector to accomplish polarization.\*

**POST INSULATE** To insulate a connection after assembly.\*

**POTTING** The permanent sealing of the cable end of a connector with a compound or material to exclude moisture and/or to provide a strain relief.\*

**POTTING FORM** (Not preferred — see MOLD, POTTING, ELECTRICAL CONNECTOR.)\*

**PRE-INSULATE** The insulation of a connector prior to assembly of the contact or terminal on the conductor.\*

**PRE-TINNED** Solder applied to either or both the contact and conductor prior to soldering.\*

**PULL-OUT FORCE** Force necessary to separate a conductor from a contact or terminal, or a contact from a connector, by exerting a tensile pull.\*

\*DEFINED AS PER MILITARY STANDARD 1353

## GLOSSARY OF TERMS

**QUICK DISCONNECT** A type of connector or splice which permits relatively rapid locking and unlocking of mating parts.\*

**RACK** A type of structure used to house electronic components which permits convenient removal of portions of equipment.\*

**RAM** The moving portion of the head of a crimping tool.\*

**RANGE, WIRE** The sizes of conductors accommodated by a particular barrel. Also the diameters of wires accommodated by a sealing grommet.\*

**RATCHET CONTROL** A device to ensure the full crimping cycle of a crimping tool.\*

**RECEPTACLE, CONNECTOR** An electrical fitting with contacts constructed to be electrically connected to a cable, coaxial line, cord, or wire to join with another electrical connector(s), and is designed to be mounted on a bulkhead, wall, chassis, or panel.\*

**SCOOP-PROOF** Scoop-proof means that because of the connector long shell design, it is impossible for the mating plug connector to inadvertently be cocked into the mating receptacle and damage the pins or electrically short the contacts.\*

**SCREWLOCK** (See JACKSCREW.)\*

**SEALING PLUG** An accessory used to fill open, nonwired cavities in a connector grommet to prevent the entry of moisture or fluids or foreign particulate contaminants into the connector.

**SERRATIONS** Deformation of the inside surface of a conductor barrel to provide better gripping of the conductor or on the outside of the connector body to provide better gripping of the connector.\*

**SERVICE LIFE** A period of time which a device is expected to perform satisfactorily.\*

**SERVICE RATING** The maximum voltage or current which a connector is designed to carry continuously.\*

**SHELL, ELECTRICAL CONNECTOR** The outside case of a connector into which the dielectric material and contacts are assembled.\*

**SHIELD, ELECTRICAL CONNECTOR** An item especially designed to be placed around that portion

of a connector which contains the facilities for attaching wires or cables. It is used for shielding against electrical interference or mechanical injury and usually has provisions for passage of the wire or cable.\*

**SHIELDED CABLE** A cable or group of wires enclosed within a conductive shield to minimize the interference effects of internal or external circuits.

**SHROUD, INSULATION** (See INSULATION SUPPORT.)\*

**SOCKET CONTACT** A contact having an engagement end that will accept entry of a pin contact.\*

**SOLDER CUP** The end of a terminal or contact in which the conductor is inserted prior to being soldered.\*

**SOLDER EYE** A solder type contact provided with a hole at its end through which a wire can be inserted prior to being soldered.\*

**SOLDERLESS CONNECTION** The joining of two metals by pressure means without the use of solder, braze or any method requiring heat.\*

**STOP PLATE** (See LOCATOR) A device attached to a crimping tool to properly locate a terminal, splice or contact in the tool prior to crimping.\*

**STRAIN RELIEF** A technique involving devices or methods of termination or installation which reduce mechanical stresses from being transmitted to the conductor termination.

**STRAIN RELIEF CLAMP** (See CABLE CLAMP.)\*

**STRIP** To remove insulation from a conductor.\*

**STRIPPER** A tool or chemical used to remove insulation material from wire or cable.

**THREADED COUPLING** A means of coupling mating connectors by engaging threads in a coupling ring with threads on a receptacle shell.\*

**UMBILICAL CONNECTOR** A connector used to connect cables to a rocket or missile prior to launching and which is unmated from the missile at the time of launching.\*

**WIPING ACTION** (See CONTACT WIPE) Action of two electrical contacts which come in contact by sliding against each other.\*

\*DEFINED AS PER MILITARY STANDARD 1353

## GLOSSARY OF TERMS

**WIRE SIZE** A numerical designation for a conductor, usually expressed in terms of American Wire Gage (AWG), based on the approximate circular mil area of the conductor.

**WORK CURVE** A graph which plots the pull out force, indent force and relative conductivity of a crimp joint as a function of various depths of crimping.\*

**WORKING VOLTAGE** (See SERVICE RATING)  
Maximum voltage at which a connector is rated to operate.\*

\*DEFINED AS PER MILITARY STANDARD 1353

NOTE: This Glossary of Terms is taken from the Encyclopedia of Connectors.

# 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.

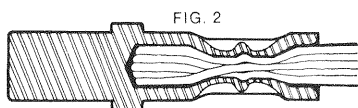
## CRIMPING CONFIGURATIONS

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 indent crimp, the three indent crimp, hex crimps, and, finally, the MIL standard 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 has taken 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

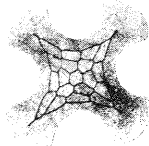
Connectors utilizing crimping contacts usually permit the removal of these contacts several times so that modification, circuit changes, or replacement of contacts may be made with little difficulty and with the same quality assurance as in production line assembly.



Octadent Crimp — Horizontal Cross-section

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.

FIG. 1



4-Indenter Crimp  
Cross-section  
Across Axis

## MIL-C-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 determining this setting, many contacts of the same type are crimped through 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 insure 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 asso-

## CRIMPING PIN AND SOCKET CONTACTS

ciated 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 within the maximum allowable indicate a good electrical joint.

### 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 neck 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 pot 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-C-22520 is specific in defining and evaluating the axial deformation of contacts. This paragraph allows the following deformation:

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

FIG. 3

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. Indentor 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. Indentor 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 embrit-



## CRIMPING PIN AND SOCKET CONTACTS

tlement 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 submarginal or marginal tensile values will result.

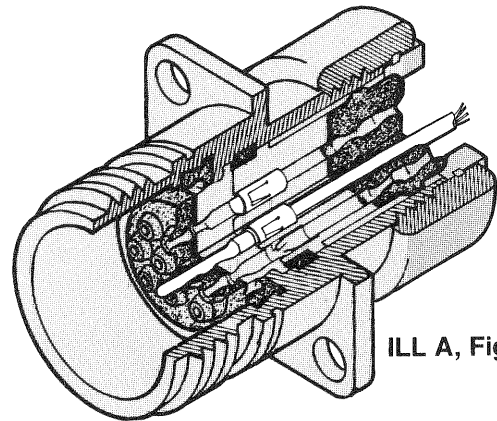
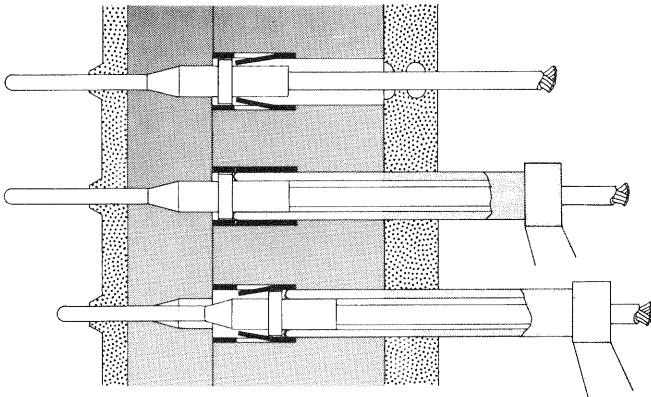
### D. Contact Hardness and Contact-Conductor Combinations

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.

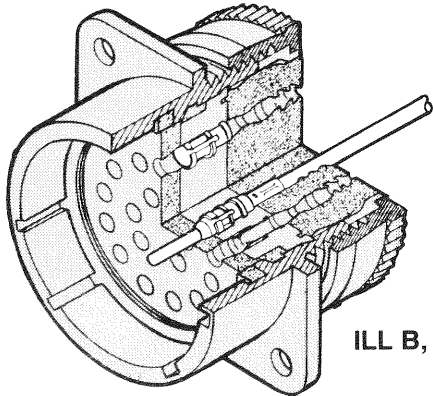
As can be seen from this brief review of crimping, many factors influence the effectiveness of a crimped joint. However, a good crimping tool compensates for many of these factors by providing proper crimp depths resulting in termination having high tensile strength, low millivolt drop, and minimum contact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

**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, 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.)



**ILL A, Fig 1**



**ILL B, Fig 1**

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

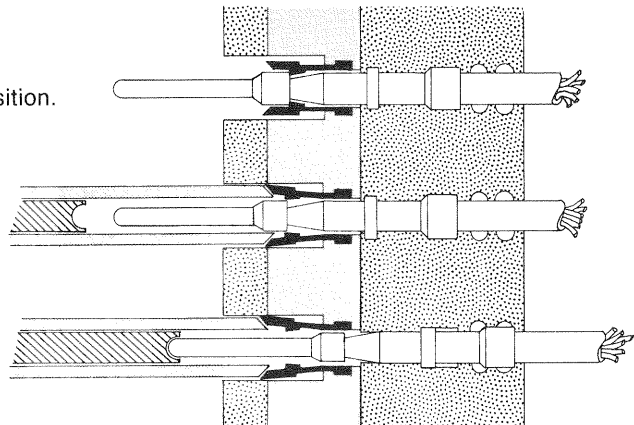
**ILL B**

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.

A. Contact in "locked" position.

B. Tool probe shown opening retaining clip.

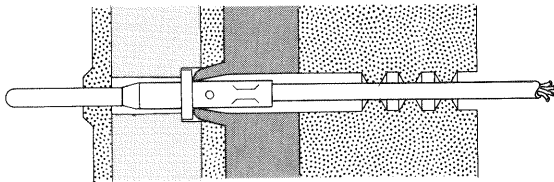
C. While clip is open, plunger moves contact out of the rear of connector.



**ILL C**

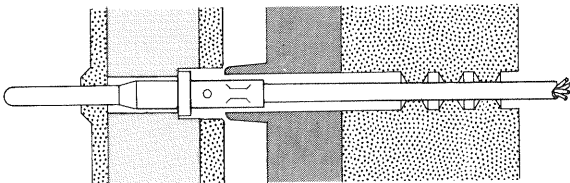
**GANG RETENTION MIL-C-81511, SERIES 1 & 2**

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 installed or removed with proper tooling. (See tooling illustrations 3 & 7 for removal and illustration 4 for installation.)

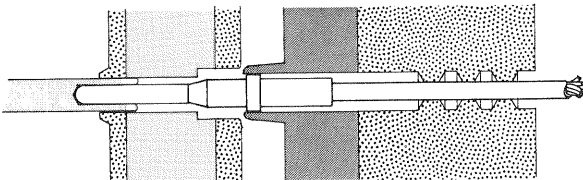


**ILL C, Fig 1** LOCKED

LOCKING PLATE



**ILL C, Fig 2** UNLOCKED

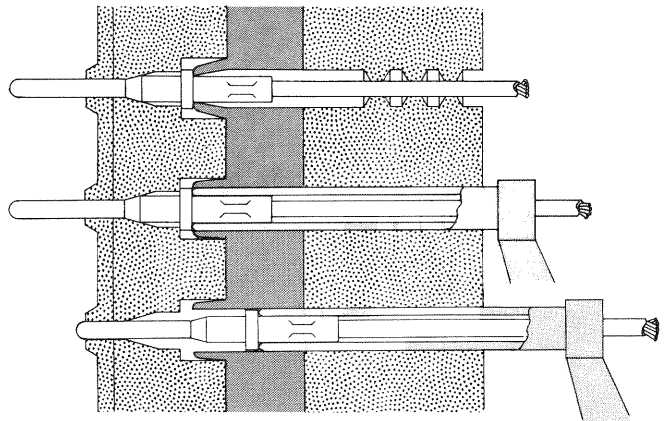


**ILL C, Fig 3** CONTACT BEING REMOVED

**ILL D**

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

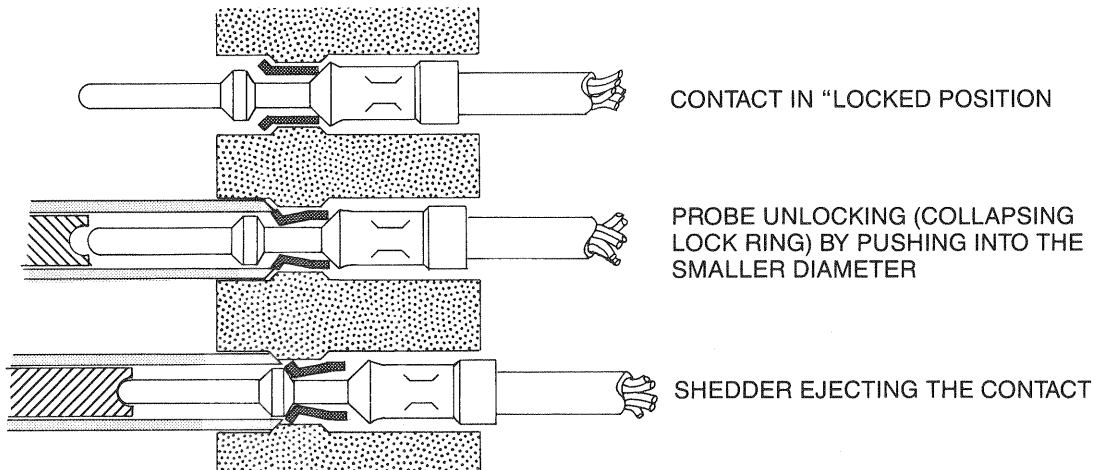
Rear release connectors using molded dielectric locking clips. These contacts are removed by using a rear removal tool. (See tool illustrations 10 & 30 for removal and illustrations 2 & 30 for installation.)



**ILL E**

**FRONT RELEASE**

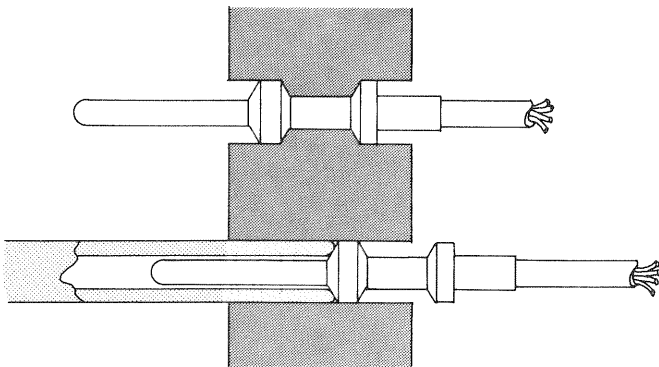
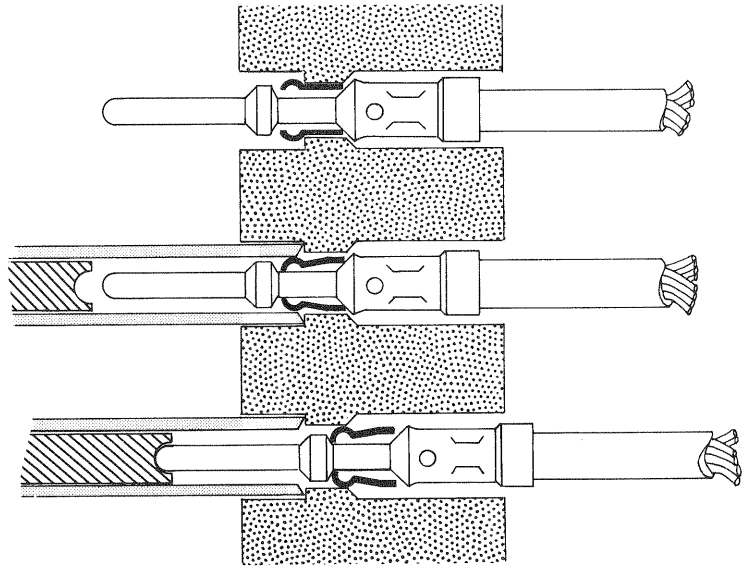
This locking mechanism is carried on the contact. It is pushed into the small diameter of the dielectric, collapsing the locking clip and permitting the contact to be removed. (See tool illustration 8.) This locking method is common with Hughes Aircraft in sizes 22, 20, & 16.



**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 and contact. (For contact installation see tool illustrations 1 & 2, and illustration 8 for removal.)



**ILL G**

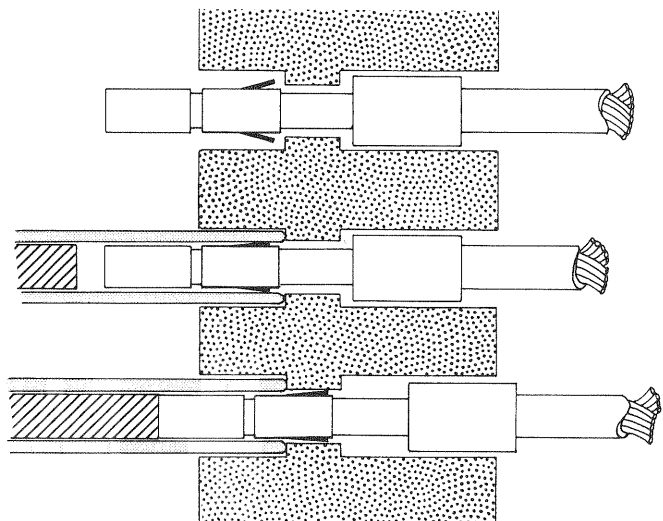
**INTERFERENCE LOCK CONNECTORS**

Used by Cannon, Bendix, and Amphenol, the contacts are installed and removed by force using the proper tooling. (See tool illustrations 12 & 13 for installation tools and illustrations 14 & 15 for installation/removal kits.)

**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.



# TURRETS AND/OR POSITIONERS USED WITH M22520/1-01 & M22520/2-01

## CRIMP TOOLS FOR MIL-C-39029 Contacts

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

MILITARY PART NUMBER	BIN CODE	SUPERSEDES MILITARY PART NUMBER	POSITIONER/TURRET PART NUMBER	ASTRO CATALOG NUMBER	STYLE	MATING END SIZE	WIRE BARREL SIZE	TYPE/CLASS
M39029/4-20-20	110	M83723-33820	M22520/2-02 M22520/1-02	615718 615709	PIN	20	20	A/B
M39029/5-20-20	115	M83723-34820	M22520/2-02 M22520/1-02	615718 615709	SKT	20	20	A/B
M39029/4-16-16	111	M83723-33816	M22520/1-02	615709	PIN	16	16	A/B
M39029/5-16-16	116	M83723-34816	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	M83723-34812	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	M83723-34816	M22520/1-02	615709	SKT	12	16	A/B

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

MILITARY PART NUMBER	BIN CODE	SUPERSEDES MILITARY PART NUMBER	POSITIONER/TURRET PART NUMBER	ASTRO CATALOG NUMBER	STYLE	MATING END SIZE	WIRE BARREL SIZE	TYPE/CLASS
M39029/31-240	240	MS3192A20-20A	M22520/2-02 M22520/1-02	615718 615709	PIN	20	20	A/A
M39029/32-259	259	MS3193A20-20A	M22520/2-02 M22520/1-02	615718 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

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

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 Families: MIL-C-5015 (MS 3450 Series/Rear-Release Type) and MIL-C-83723 Series II

M39029/30-165-16	217	MS3163-16S-16 M83723-30T17	M22520/1-02	615709	SKT	16S	16	A/B
M39029/29-16-16	212	MS3162-16-16 M83723-29T16	M22520/1-02	615709	PIN	16	16	A/B
M39029/30-16-16	218	MS3163-16-16 M83723-30T16	M22520/1-02	615709	SKT	16	16	A/B
M39029/29-12-12	213	MS3162-12-12 M83723-29T12	M22520/1-02	615709	PIN	12	12	A/B
M39029/30-12-12	219	MS3163-12-12 M83723-30T12	M22520/1-02	615709	SKT	12	12	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

M39029/58-360	360	MS27494-22D MS27493-22D M24308/13-1	M22520/2-09	615725	PIN	22	22D	A/B
M39029/57-354	354	MS27492-22D MS27491-22D M24308/12-1	M22520/2-06	615722	SKT	22	22D	A/B
M39029/58-361	361	MS27494-22M MS27493-22M	M22520/2-09	615725	PIN	22	22M	A/B
M39029/57-355	355	MS27492-22M MS27491-22M	M22520/2-06	615722	SKT	22	22M	A/B
M39029/58-362	362	MS27494-22 MS27493-22	M22520/2-09	615725	PIN	22	22	A/B
M39029/57-356	356	MS27492-22 MS27491-22	M22520/2-06	615722	SKT	22	22	A/B
M39029/58-363	363	MS27494-20 MS27493-20	M22520/2-10 M22520/1-04	615726 615711	PIN	20	20	A/B
M39029/57-357	357	MS27492-20 MS27491-20	M22520/2-10 M22520/1-04	615726 615711	SKT	20	20	A/B
M39029/58-364	364	MS27494-16 MS27493-16	M22520/1-04	615711	PIN	16	16	A/B
M39029/57-358	358	MS27492-16 MS27491-16	M22520/1-04	615711	SKT	16	16	A/B
M39029/58-365	365	MS27494-12 MS27493-12	M22520/1-04	615711	PIN	12	12	A/B
M39029/57-359	359	MS27492-12 MS27491-12	M22520/1-04	615711	SKT	12	12	A/B

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

M39029/31-241	241	MS24254-20P	M22520/2-02 M22520/1-02	615718 615709	PIN	20	20	A/B
M39029/32-260	260	MS24255-20S	M22520/2-02 M22520/1-02	615718 615709	SKT	20	20	A/B
M39029/31-229	229	MS24254-16P	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

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

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-28840

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 Family: MIL-C-38999 Series I, III, IV

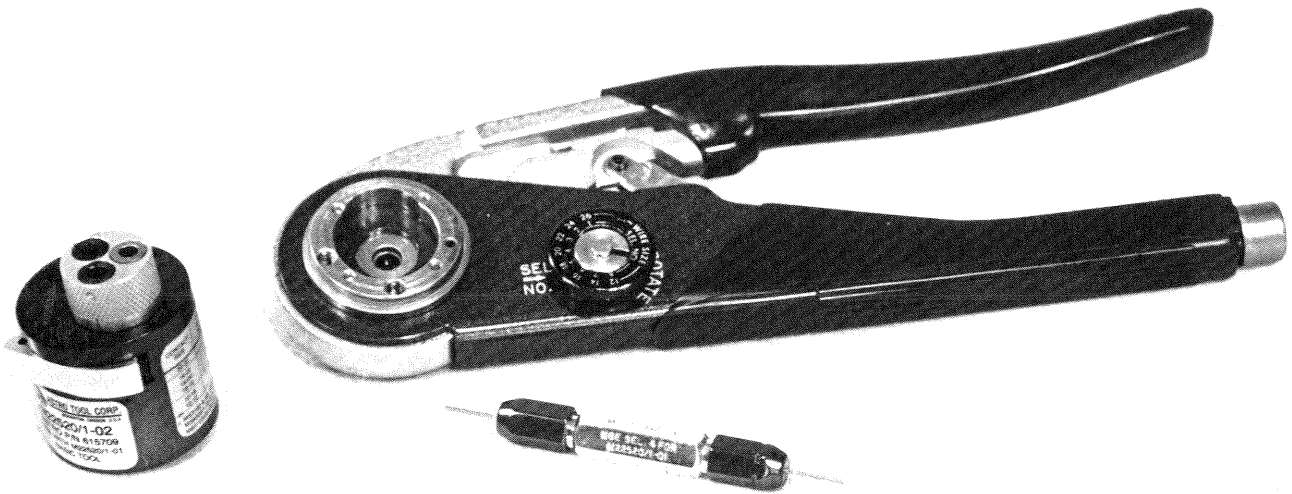
M39029/56-348	348	MS27655-22D MS27490-22D	M22520/2-07	615723	SKT	22	22D	A/B
M39029/56-349	349	MS27490-22M	M22520/2-07	615723	SKT	22	22M	A/B
M39029/56-350	350	MS27490-22	M22520/2-07	615723	SKT	22	22	A/B
M39029/56-351	351	MS27655-20 MS27490-20	M22520/2-10 M22520/1-04	615726 615711	SKT	20	20	A/B
M39029/56-352	352	MS27655-16 MS27490-16	M22520/1-04	615711	SKT	16	16	A/B
M39029/56-353	353	MS27655-12 MS27490-12	M22520/1-04	615711	SKT	12	12	A/B

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

•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 STEP ADJUSTABLE CRIMP TOOL 615708 (M22520/1-01)



- **8 indent crimp**
- **Cycle controlled ratchet**

- **Uses turret and single position heads**
- **Dial selectable**

The Astro 615708 is qualified to MIL-C-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 8 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 insure 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 (M22520/3-1, Astro #615716) is available for this purpose.

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

Tool available in a pneumatic version P/N APC708.

615712 and 615712-1 adjustable positioners available.

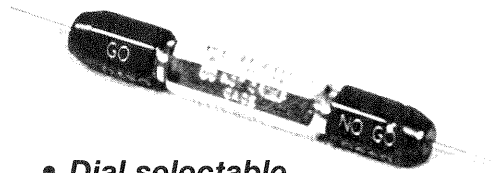
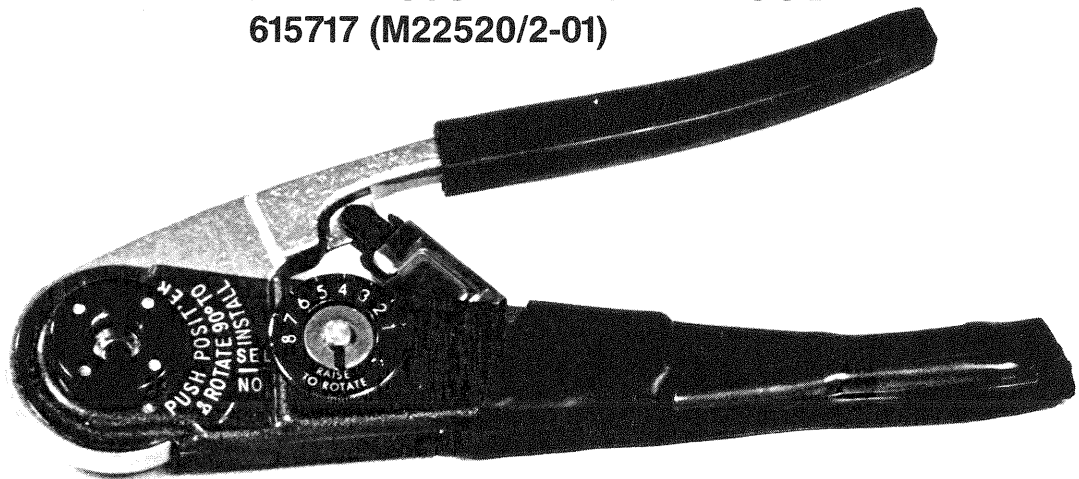
Consult factory for details.


**ASTRO TOOL CORP.**

MS NO.	ASTRO TOOL #.	DESCRIPTION	NSN	CONTACTS ACCOMMODATED
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	MS3162, MS3163, MS3192, MS3193, MS18134, MS18136, MS24254, MS24255, MS90453, MS90454, M39029/1-101, -102, -103, M39029/2 -105, -106, M39029/3-108, -109, M39029/4-110, -111, -112, -113, -114, M39029/5-115, -116, -117, -118, -119, M39029/9-132, -133, -134, -135, -136, M39029/10-138, -139, -140, -141, -142, M39029/11-146, M39029/12-150, M39029/29-212, -213, M39029/30-217, -218, -219, M39029/31-223, -224, -226, -227, -228, -229, -230, -231, -232, -233, -234, -235, -236, -237, -238, -239, -240, -241, -448, M39029/31-242, -243, -244, -245, -246, -247, -248, -249, -250, -251, -252, -253, -254, -255, -256, -257, -258, -259, -260, -449 M39029/44-287, -288, -289, -290, M39029/45-294, -295, -296, -297, M39029/85-454, -455, -456, -457, -458, -459, -460, -461, M39029/86-462, -463, -464, -465, -466, -467, -468, -469, -510, -511, -512, -513, M39029/92-532, -533, -534, -535, -536, M39029/93-539, M39029/94-543
M22520/1-03	615710	Turret	5120-00-016-6554	MS17803, MS17804, MS17807, MS17808, 0512814 Basic Type P&M, M21097/9-01, M39029/34-271, -272, -273, M39029/35-274, -275, -276, M39029/36-277, -278, M39029/37-279, -280
M22520/1-04	615711	Turret	5120-00-016-7582	MS27490-12, MS27490-16, MS27490-20, MS27491-12, MS27491-16, MS27491-20, MS27492-12, MS27492-16, MS27492-20, MS27493-12, MS27493-16, MS27493-20, MS27494-12, MS27494-16, MS27494-20, M39029/56-351, -352, -353, M39029/57-357, -358, -359, M39029/58-363, -364, -365, M39029/87-474, -475, -476, -477, M39029/87-478, -479, -480, -481, M39029/88-486, -487, -488, -489, -490, -491, 492, -493, M39029/89-498, -499, -500, -501, -502, -503, -504, -505
M22520/1-05	615712	Universal Positioner	5120-00-165-3911	Other Than Military Standard Contacts
M22520/1-06	615713	Positioner	5120-00-016-7647	Alternate 0S12814 Type M
M22520/1-07	615714	Positioner	5120-00-016-7651	MS18232-1, MS18233-1, M39029/40-281, M39029/41-282
M22520/1-08	615715	Turret	5120-00-016-7654	MS3343 (A&B), MS90460 (A&B), MS9046 (A&B), M39029/33-266, -268, -270, M39029/46-306, -308, -310, M39029/47-316, -337, -339
M22520/1-09	615821	Positioner	5120-00-132-5039	M39029/16-170, M39029/18-180
M22520/1-10	615822	Positioner	5120-00-132-5095	M39029/17-175
M22520/1-11	616406	Positioner	5120-01-127-5231	M39029/11-147, M39029/12-151
M22520/1-12	616407	Turret	5120-01-036-9220	M39012/16-0501, -0502, -0-503, M39012/17-0501, -0502, -0503, M39012/18-0501, -0502, -0503, M39012/19-0501, -0502, -0503, M39012/20-0501, -0502, -0503, M39012/26-0501, -0502, -0503, M39012/27-0501, 0502, 0503, M39012/28-0501, -0502, -0503, M39012/29-0501, -0502, -0503, M39012/30-0501, -0502, -0503
M22520/1-13	616408	Turret	5120-01-036-9221	M39012/1-0501, -0502, -0503, M39012/2-0501, -0502, -0503, -0511, -0512, -0513, M39012/5-0501, -0502, -0503, M39012/39-0501, 0503
M22520/1-14	616409	Turret	5120-01-036-9222	M39012/3-0501, -0502, -0503, M39012/35-0501, -0503, M39012/36-0501, -0503, M39012/38-0501, -0503, M39012/40-0501, -0503
M22520/1-15	616410	Positioner	5120-01-036-9223	M39012/55-3502, -4502, M39012/57-3502, -4502, M39012/58-4502, M39012/59-3502, -4502
M22520/1-16	620172	Positioner	5120-01-075-8138	MS27492-12, M39029/57-359
M22520/1-17	620537	Positioner		M39029/69-384, -385, -386, M39029/70-387, -388, -389

**A wide variety of Turret Heads and Positioners are available. Please contact factory for additional information.**

## MINIATURE STEP ADJUSTABLE CRIMP TOOL 615717 (M22520/2-01)



- **8 indent crimp**
- **Uses bayonet positioners**

- **Dial selectable**
- **Cycle controlled ratchet**

The MIL-C-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 positioner in the bayonet-type socket and adjusting the selector to one of the 8 preselected settings. The tool is equipped with a positive ratchet that requires the completion of the crimp cycle to insure the integrity of each crimp.

Astro offers a wide variety of positioners (see opposite page) 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 also available in a pneumatic version. See page 39.

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.



## ASTRO TOOL CORP.

MS NO.	ASTRO TOOL #.	DESCRIPTION	NSN	CONTACTS ACCOMMODATED
M22520/2-01	615717	Tool Frame	5120-00-165-3910	
M22520/2-02	615718	Positioner	5120-00-165-3913	MS3192-20-20, MS3193-20-20, MS24254-20P, MS24254-20S, MS18134-20, MS18136-20, M39029/4-110, M39029/5-115, M39029/9-132, -133, -134, -135, -136, M39029/10-138, -139, -140, -141, -142, M83723/33-20, M83723/34-20, M39029/31-223, -224, -225, -226, -227, -240, -241, -448, M39029/32-242, -243, -244, -245, -246, -259, -260, -449, M39029/92-532
M22520/2-03	615719	Positioner	5120-00-016-7657	MS3343-23-22 (A&B), MS3343-23-28 (A&B), MS90460-23-22 (A&B), MS90460-23-28 (A&B), MS90461-23-22 (A&B), MS90461-23-28 (A&B), M39029/33-262, -264, M39029/46-302, -304, M39029/47-312, -314
M22520/2-04	615720	Positioner	5120-00-017-3640	Inner P&S, MS18232-1, MS18233-1, MS18265-1, MS18265-2, MS18266-1, MS18266-2, M39029/40-281, M39029/41-282, M39029/42-283, -284, M39029/43-285, -286
M22520/2-05	615721	Positioner	5120-00-017-3742	M21097/9-01
M22520/2-06	615722	Positioner	5120-00-017-3809	MS27491-22, MS27491-22M, MS27491-22D, MS27492-22, MS27492-22M, MS27492-22D, M24308/12-1, M39029/57-354, -355, -356, M39029/89-494, -495, -496, -497, M39029/92-531
M22520/2-07	615723	Positioner	5120-00-017-3827	MS27490-22, MS27490-22M, MS27490-22D, M39029/56-348, -349, -350, M39029/88-482, -483, -484, -485
M22520/2-08	615724	Positioner	5120-00-017-3921	M24308/10-1, M24308/11-1, M39029/11-145, M39029/12-149, M39029/63-368, M39029/64-369, M39029/67-374, -375, -376, -377, -378, M39029/68-379, -380, -381, -382, -383, M39029/93-538, M39029/94-542
M22520/2-09	615725	Positioner	5120-00-017-3927	MS27493-22, MS27493-22M, MS27493-22D, MS27494-22, MS27494-22M, MS27494-22D, M24308/13-1, M39029/58-360, -361, -362, M39029/87-470, -471, -472, -473
M22520/2-10	615726	Positioner	5120-00-017-3932	MS27490-20, MS27491-20, MS27492-20, MS27493-20, MS27494-20, M39029/56-351, M39029/57-357, M39029/58-363, M39029/87-474, -475, -476, -477, M39029/88-486, -487, -488, -489, M39029/89-498, -499, -500, -501
M22520/2-11	615727	Positioner	5120-00-017-3934	M39029/1-100, -101, M39029/2-104, -105, M39029-107, -108
M22520/2-12	615729	Positioner	5120-00-017-3935	Inner Pin and Socket M39029/65-370, -371, M39029/66-372, -373
M22520/2-13	616031	Positioner	5120-00-132-6939	M39029/16-166, -167, M39029/18-176, -177
M22520/2-14	616032	Positioner	5120-00-132-6962	M39029/16-168, M39029/18-178
M22520/2-15	616033	Positioner	5120-00-132-6978	M39029/16-169, M39029/18-179
M22520/2-16	616034	Positioner	5120-00-132-7868	M39029/17-171, -172
M22520/2-17	616035	Positioner	5120-00-132-7893	M39029/17-173
M22520/2-18	616036	Positioner	5120-00-132-7894	M39029/17-174
M22520/2-19	616037	Positioner	5120-00-132-7872	M39029/15-22-22, M39029/15-22-28
M22520/2-20	616038	Positioner	5120-00-132-9004	M39029/15-164
M22520/2-21	616039	Positioner	5120-00-133-0029	M39029/15-165

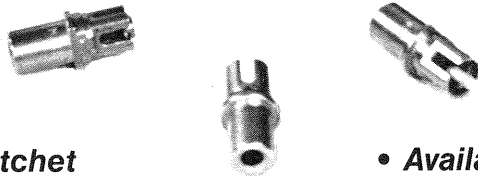
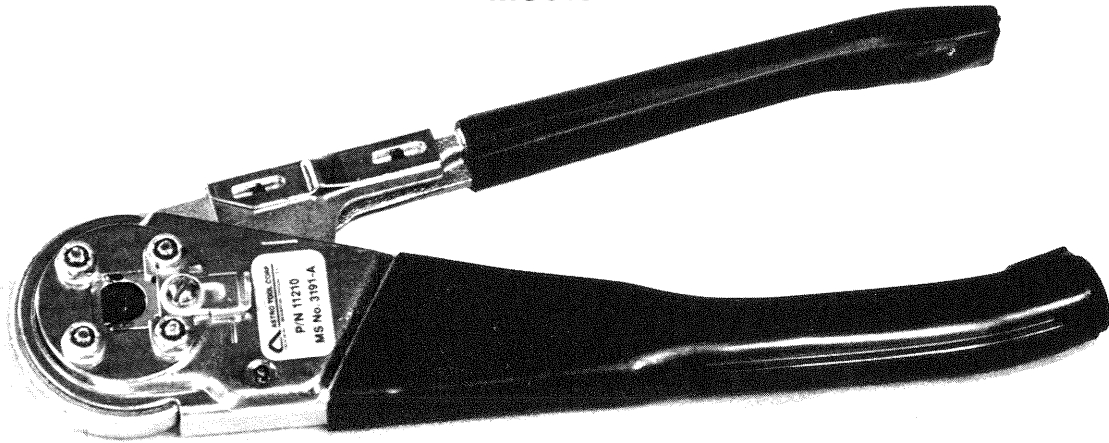
**A wide variety of Positioners are available, in addition to those listed above.**

## ASTRO TOOL CORP.

MS NO.	ASTRO TOOL #	DESCRIPTION	NSN	CONTACTS ACCOMMODATED
M22520/2-22	615448	Positioner	5120-01-106-3737	10215913 (Army-Redstone)
M22520/2-23	616191	Positioner	5120-01-117-3905	M39029/11-144, M39029/12-148, M39029/93-537, M39029/94-541
M22520/2-24	616260	Positioner	5120-00-348-7531	Inner P&S FSCM98230, ONO89558, M39029/54-343, M39029/55-345
M22520/2-25	616411	Positioner	5120-00-132-6932	M39029/6-121, -122, -123, -124, -125, M39029/13-153, -154, -155, -156, -157, M39029/14-159, -160, -161, -162, -163
M22520/2-26	616412	Positioner	5120-00-133-3263	M39029/6-120, M39029/13-152, M39029/14-158
M22520/2-27	616413	Positioner		Inner Pin and Socket, M39029/7-126, -127, -128, M39029/8-129, -130, -131
M22520/2-28	616414	Positioner	5120-00-124-3678	Inner Pin and Socket, M39029/19-181, M39029/20-184, M39029/21-187
M22520/2-29	616415	Positioner	5120-00-124-3682	Inner Pin and Socket, M39029/19-182, -183, M39029/20-185, -186, M39029/21-188, -189
M22520/2-30	616416	Positioner	5120-01-117-3905	Inner Contact M83733/13, M83733/14, M39029/50-340, M39029/51-341
M22520/2-31	616417	Positioner		Inner Pin and Socket MS27535-8, MS27536-8, M39029/59-366, M39029/60-367
M22520/2-32	620261	Positioner		Inner Pin and Socket, M39029/1-507, M39029/25-204, -205, -206, M39029/26-207, -208, -209
M22520/2-33	615257	Positioner		Inner Pin and Socket, M39029/54-342, M39029/55-344
M22520/2-34	620499	Positioner		Inner Pin and Socket, M39029/27-210, -402, -403, -404, -405, -406, -407, -408, M39029/28-211, -409, -410, -411, -412, -413, -414, -415, M39029/75-416, -417, -419, -420, -421, -422, -423
M22520/2-35	620517	Positioner		Inner Pin and Socket, M39029/76-424, -425, -426, -427, M39029/77-428, -429, -430, -431, M39029/78-432, -433, -434, -435
M22520/2-36	616429	Positioner		M28804/9-1, M28804/10-1

**A wide variety of Positioners are available, in addition to those listed above.**

## MS3191



- **Cycle Controlled Ratchet**
- **No dial adjustments required**

- **Available in 4 or 8 indent**

The MS3191 still continues to set a standard of excellence for crimping tools. This series of crimping tools continues to be 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 can be ordered with a variety of indentor configurations, including octadent (tool part number: 612600).

A large selection of positioners are available for this tool. Astro will custom design and manufacture positioners for your own special needs. 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 periodic gaging that is recommended.

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

The MS Designations, Astro Catalog Numbers, and National Stock Numbers of the MS 3191-type tools and positioners are listed below:

Description	MS Designation	Astro Cat. No.
Frame Assembly	MS 3191-A	11210
Crimp Tool	MS 3191-1	10692
Crimp Tool	MS 3191-2	11234
Positioner	MS 3191-20A	11062
Positioner	MS 3191-16A	2520-3
Positioner	MS 3191-12A	2520-4
Positioner	MS 3191-20B	10854-1
Positioner	MS 3191-16B	10854-2

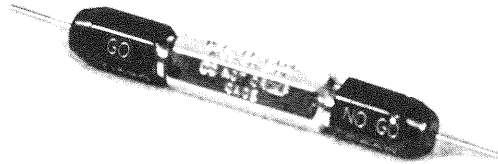
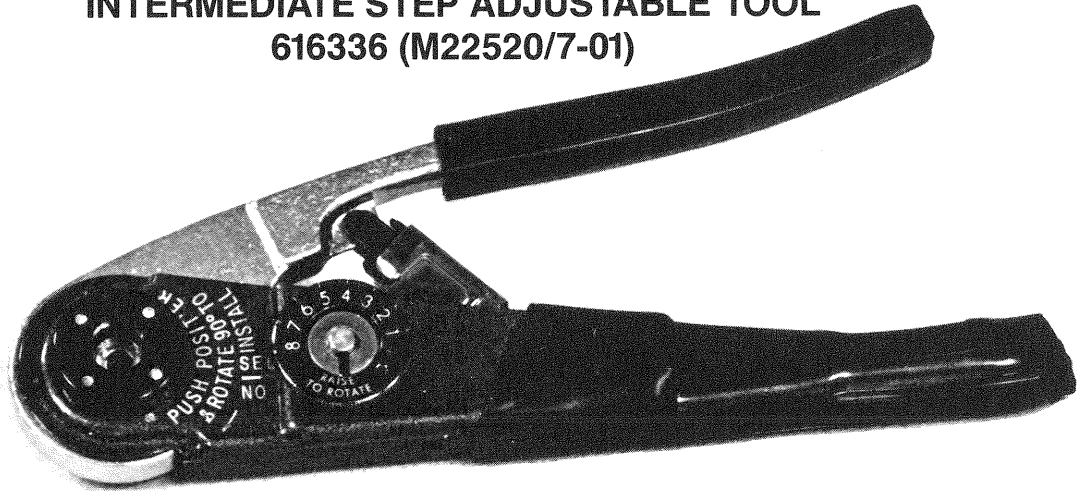
The following MS contacts can be crimped with the MS 3191-A frame assembly when used with the positioners specified:

Astro Positioner Part No.	Positioner MS Designation	Contacts Accommodated (Ref.)	
11062	MS 3191-20A	MS 3190	MS 24254
2520-3	MS 3191-16A	MS 3192	MS 24255
2520-4	MS 3191-12A	MS 3193	MS 18134
10854-1	MS 3191-20B	NAS 1662	MS 18136
10854-2	MS 3191-16B	MS17803	MS 17807
3538-3	MS 3191-20C	MS17804	MS 17808
11045-1	MS 3191-22D	MS 21097/9-01	
11045-2	MS 3191-16D	OS 12814	
		TYPE P & M	

For Locators in addition to those listed please consult factory.

Crimp Tool Assembly Part No.	Consists of	
	Crimp Tool Frame	Positioners
MS 3191-1 (10692)	MS 3191-A (11210)	MS 3191-20A MS 3191-16A MS 3191-12A
MS 3191-2 (11234)	MS 3191-A (11210)	MS 3191-20B MS 3191-16B

**INTERMEDIATE STEP ADJUSTABLE TOOL  
616336 (M22520/7-01)**



- **8 indent crimp**
- **Cycle controlled ratchet**
- **Dial selectable**

- **Lightweight and easy to use**
- **Uses bayonet positioners**

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

This tool is dial 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 (M22520/3-3, Astro #616337) is available for this purpose.

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

The tool is also available in a pneumatic version. See page 39.

An adjustable positioner is available P/N 642020.

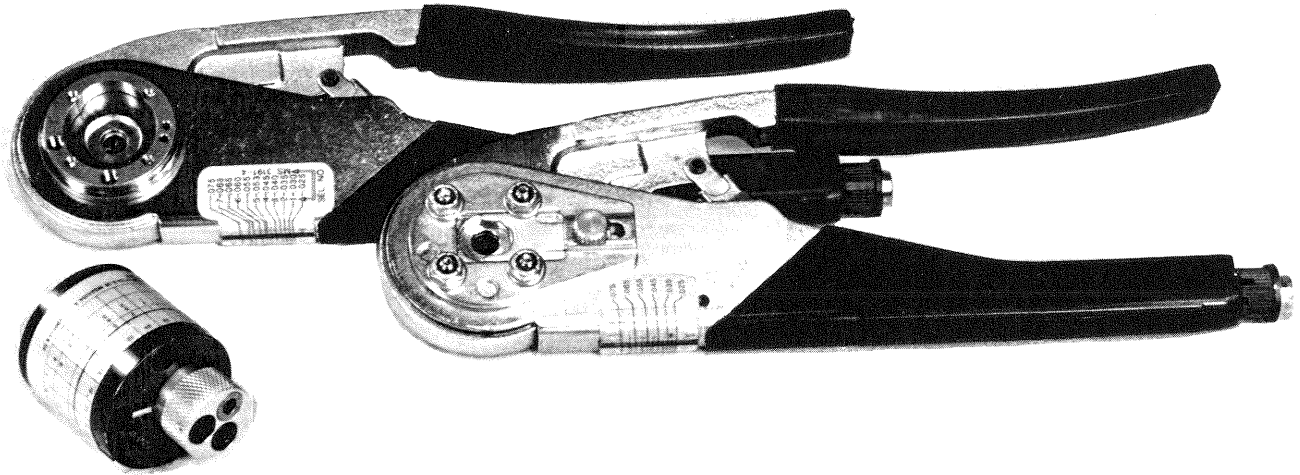
## ASTRO TOOL CORP.

MS NO.	ASTRO TOOL #.	DESCRIPTION	NSN	CONTACTS ACCOMMODATED
M22520/7-01	616336	Tool Frame	5120-00-133-1747	
M22520/7-02	616327	Positioner	5120-00-133-1769	MS3192A20A, MS3193A20A, MS24254-20P, MS24255-20S, M83723/33B20, M83723/34B20, NAS1662-20, NAS1663-20, M39029/4-110, M39029/5-115, M39029/11-145, M39029/12-149, M39029/31-223, -224, -225, -226, -227, -240, -241, -448, M39029/32-242, -243, -244, -245, -246, -259, -260, -449, M39029/92-532, M39029/93-538, M39029/94-542
M22520/7-03	616328	Positioner	5120-00-133-1770	MS3192-16A, MS3193-16A, MS24254-16P, MS24255-16S, M39029/4-111, -112, M39029/5-116, -117, M39029/11-146, M39029/12-150, M39029/29-212, M39029/31-228, -229, -230, -231, -232, -233, M39029/32-247, -248, -249, -250, -251, -252, M39029/85-454, -455, -456, -457, M39029/86-462, -463, -464, -465, -510, -511, -512, -513, M39029/92-533, -534, M39029/93-539, M39029/94-543
M22520/7-04	616329	Positioner	5120-00-133-1772	MS27490-16, MS27491-16, MS27492-16, MS27493-16, MS27494-16, M39029/56-352, M39029/57-358, M39029/58-364, M39029/87-478, -479, -480, -481, M39029/88-490, -491, -492, -493, M39029/89-502, -503, -504, -505
M22520/7-05	616330	Positioner	5120-00-133-1778	MS27490-22, -22M, -22D, M39029/56-348, -349, -350, M39029/88-482, -483, -484, -485
M22520/7-06	616331	Positioner	5120-00-133-1781	MS27491-22, -22M, -22D, MS27492-22, -22M, -22D, M39029/57-354, -355, -356, M39029/89-494, -495, -496, -497
M22520/7-07	616332	Positioner	5120-00-133-1782	MS27493-22, -22M, -22D, MS27494-22, -22M, -22D, M39029/58-360, -361, -362, M39029/87-470, -471, -472, -473
M22520/7-08	616333	Positioner	5120-00-133-1785	MS27490-20, MS27491-20, MS27492-20, MS27493-20, MS27494-20, M39029/56-351, M39029/57-357, M39029/58-363, M39029/87-474, -475, -476, -477, M39029/88-486, -487, -488, -489, M39029/89-498, -499, -500, -501
M22520/7-09	616334	Positioner	5120-00-133-1790	MS3343-20-20 (A&B), MS90460-20-20 (A&B), MS90461-20-20 (A&B), M39029/33-266, M39029/46-306, M39029/47-316
M22520/7-10	616335	Positioner	5120-00-133-1792	MS3343-16-16 (A&B), MS90460-16-16 (A&B), MS90461-16-16 (A&B), M39029/33-268, M39029/46-308, M39029/47-337
M22520/7-11	620083	Positioner	5120-01-122-1201	M39029/22-190-191, M39029/101-551, -552
M22520/7-12	620084	Positioner	5120-01-112-2925	M39029/22-192, M39029/101-553
M22520/7-13	620085	Positioner	5120-01-110-4472	M39029/22-193, M39029/101-554
M22520/3-3	616337	Gage	5220-00-338-0378	

**For additional positioners consult factory.**

## STANDARD MICROCRIMP TOOL

612548  
612548-2  
612548SS



- **Micro adjustable**
- **Cycle controlled ratchet**
- **8-indent crimp**

- **Ejector locator operation**
- **Adjustable within .001 inch**

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 within .001 inch.

This tool, using a locator, can crimp most pin and socket contacts #12 and smaller and to 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.

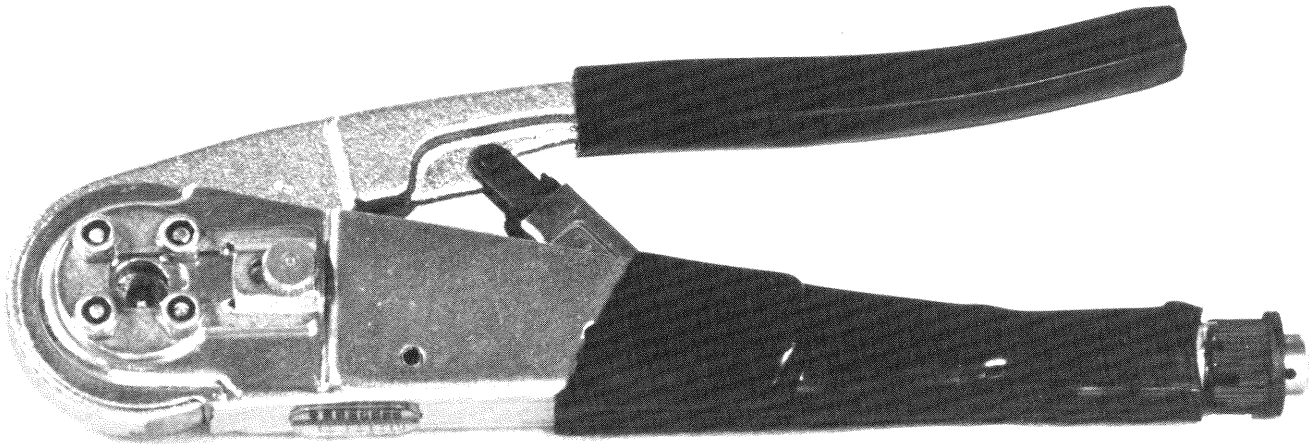

**ASTRO TOOL CORP.**
**612548 LOCATORS**

<b>ASTRO LOCATOR #</b>	<b>SIZE</b>	<b>CONTACTS ACCOMMODATED</b>
2421	20	MS3190, MS3192, MS3193, MS24254, MS24255, MS18134, MS18136, NAS1662, NAS1663, M83723/33-20, M83723/34-20, M39029/4-110, M39029/5-115, M39029/31-223, -224, -225, -226, -227, -240, -241, -448, M39029/32-242, -243, -244, -245, -246, -259, -260, -449
2422	16	MS3190, MS3192, MS3193, MS24254, MS24255, NAS1662, NAS1663, MS90453, MS90454, M39029/4-111, M39029/5-116, M39029/31-228, -229, -230, -231-232, -233, M39029/32-247, -248, -249, -250, -251,-252, M39029/44-287, -288, M39029/45-294, -295
2423	12	MS3190, MS3192, MS3193, MS24254, MS24255, NAS1662, NAS1663, MS90453,MS90454, M39029/4-113, M39029/5-118, M39029/31-234, -235, -236, -237, -238, -239, M39029/32-253, -254, -255, -256, -257, -258, M39029/44-290, M39029/45-297
11570-1	20	MS17803, MS17804, MS17807, MS17808, M39029/34-271, -272, -273, M39029/35-274, -275, -276,
	16	M39029/36-277, -278, M39029/37-279, -280
7009880	20	MS27490-20, MS27491-20, MS27492-20, MS27493-20, MS27494-20, M39029/56-351, M39029/57-357, M39029/58-363, M39029/87-474, -475, -476, -477, M39029/88-486, -487, -488, -489
7010394	16	MS27490-16, MS27491-16, MS27492-16, MS27493-16, MS27494-16, M39029/56-352, M39029/57-358, M39029/58-364, M39029/87-478, -479, -480, -481, M39029/88-490, -491, -492, -493
7010395	12	MS27490-12, MS27491-12, MS27492-12, MS27493-12, MS27494-12, M39029/56-353, M39029/57-359, M39029/58-365
3240	20	M21097/9-01P
613327	22	OS12814 TYPE P & M
	16	OS12814 TYPE P & M
615092	20	M39029/46-306, M39029/47-316
615091	16	M39029/46-308, M39029/47-337
615090	12	M39029/46-310, M39029/47-339

**For additional Locators consult factory.**

## MINIATURE MICROCRIMP TOOL

612118  
612118-1  
612118SS



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

The Astro 612118 conforms to all requirements of MIL-C-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.

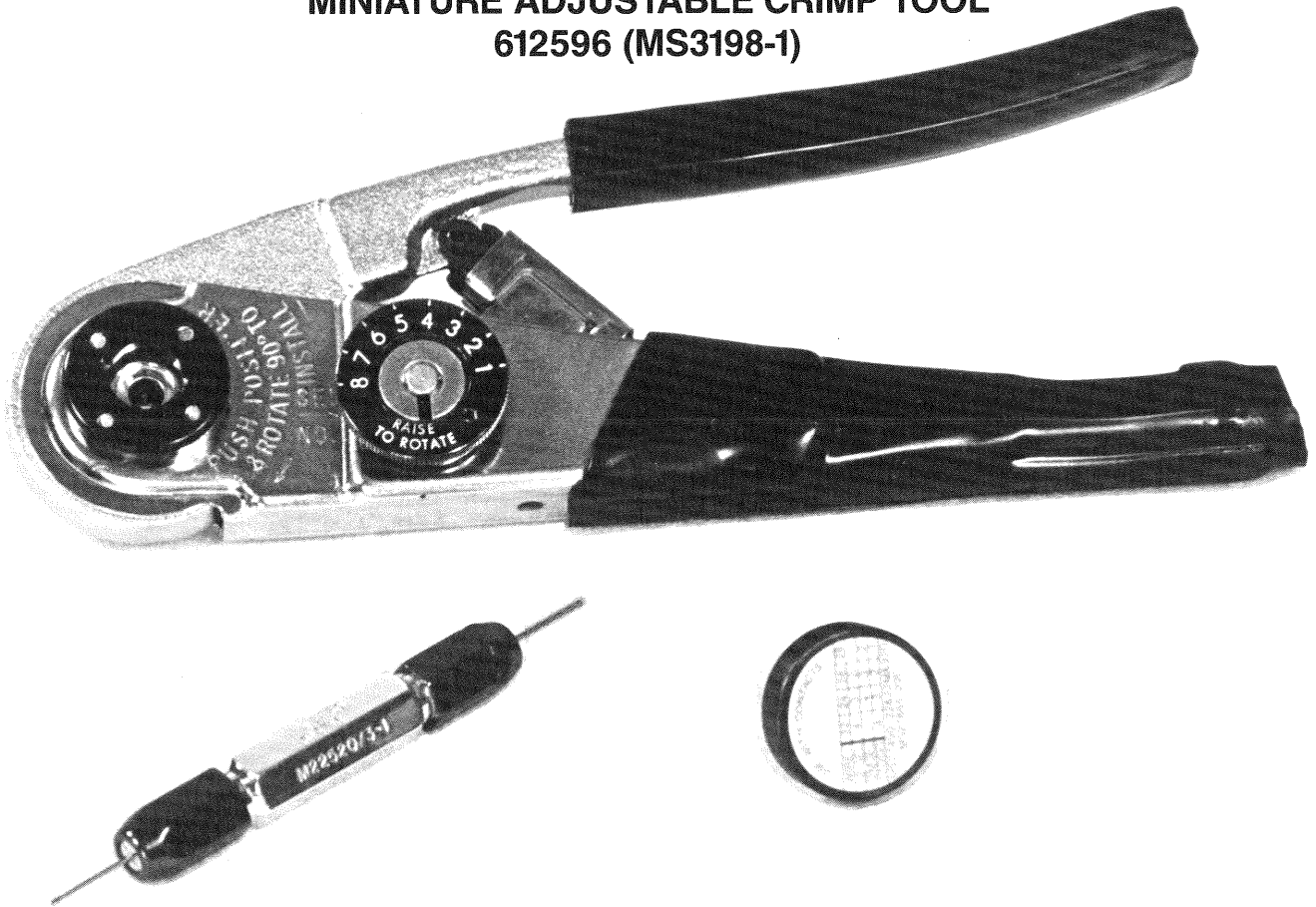



**ASTRO TOOL CORP.**
**612118 LOCATORS**

ASTRO LOCATOR NO.	SIZE	CONTACTS ACCOMMODATED
612473	20	MS3190, MS3192, MS3193, MS24254, MS24255, MS18134, MS18136, NAS1662, NAS1663, M83723/33B20, M83723/34B20, M39029/4-110, M39029/5-115, M39029/11-145, M39029/12-149, M39029/31-223, -224, -225, -226, -227, -240, -241, -448, M39029/32-242, -243, -244, -245, -246, -259, -260, -449, M39029/92-532, M39029/93-538, M39029/94-542
612512	20	MS17803, MS17804, MS17807, MS17808, M39029/34-271, M39029/35-274
613325	20	M21097/9-01
612955	22	MS90460, MS90461, M39029/46-302, -304, M39029/47-312, -314
612510	20	MS27490, MS27491, MS27492, MS27493, MS27494, M39029/56-351, M39029/57-357, M39029/58-363
613194	22	MS27490, M39029/56-348, -349, -350
612521	22	MS27491, MS27492, M39029/57-354, -355, -356
613192	22	MS27493, MS27494, M39029/58-360, -361, -362
615759	22	M39029/16-166, -167, M39029/18-176, -177
615832	20	M39029/16-168, M39029/18-178
615758	22	M39029/17-171, -172
615834	20	M39029/17-173
612513	20	M24308/10-1, M24308/11-1, M39029/11-145, M39029/12-149, M39029/63-368, M39029/64-369
614352	22	MS3343-23-22, MS3343-23-28, M39029/33-262, -264
613117	—	MS18232, MS18233, MS18265-1, -2, MS18266-1, -2, M39029/40-281, M39029/41-282, M39029/42-283, M39029/43-285, -286

**For additional locators consult factory.**

## MINIATURE ADJUSTABLE CRIMP TOOL 612596 (MS3198-1)



- **8-indent crimp**
- **Cycle controlled**

- **Dial selectable**
- **Uses bayonet-style positioners**

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 each crimp cycle before the handles will return to their open position. This feature insures 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.

## Miniature Adjustable Crimp Tool 612596 (MS3198-1)

### POSITIONER SELECTION CHARTS

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

MILITARY PART NUMBER	BIN CODE	SUPERSEDES MILITARY PART NUMBER	STYLE: PIN or SOCKET	MATING END SIZE	WIRE BARREL SIZE	POSITIONER/ TURRET PART NUMBER	ASTRO TOOL #
M39029/4-110	110	M83723-33B20 M39029/4-20-20	P	20	20	M22520/2-02	615718
M39029/5/115	115	M83723-34B20 M39029/5-20-20	S	20	20		
M39029/9-132 THRU M39029/9-136	132 THRU 136	M39029/9-20-20C1 THRU M39029/9-20-20C5	P	20	20	MS3198-1P	612759
M39029/10-138 THRU M39029/10-142	138 THRU 142	M39029/9-20-20C1 THRU M39029/10-20-20C5	S	20	20	MS3198-1PA	613382

Contacts for Connector Family: MIL-C-28840

MILITARY PART NUMBER	BIN CODE	SUPERSEDES MILITARY PART NUMBER	STYLE: PIN or SOCKET	MATING END SIZE	WIRE BARREL SIZE	POSITIONER/ TURRET PART NUMBER	ASTRO TOOL #
M39029/83-450	450	M39029/83-20-22	P	20	22	M22520/34-02	620636
M39029/83-451	451	M39029/83-20-28	P	20	28	M22520/34-02	620636
M39029/84-52	452	M39029/84-20-22	S	20	22	M22520/34-02	620636
M39029/84-453	453	M39029/84-20-28	S	20	28	M22520/34-02	620636

Contacts for Connector Family: MIL-C-26500

MILITARY PART NUMBER	BIN CODE	SUPERSEDES MILITARY PART NUMBER	STYLE: PIN or SOCKET	MATING END SIZE	WIRE BARREL SIZE	POSITIONER/ TURRET PART NUMBER	ASTRO TOOL #
M39029/31-241	241	MS24254-20P	P	20	20	M22520/2-02 MS3196-1P MS3196-1PA	615718 612759 613382
M39029/32-260	260	MS24255-20S	S	20	20	M22520/2-02 MS3198-1P MS3198-1PA	615718 612759 613382

### TOOL WITH TYPICAL POSITIONER

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 NUMBER	BIN CODE	SUPERSEDES MILITARY PART NUMBER	STYLE: PIN or SOCKET	MATING END SIZE	WIRE BARREL SIZE	POSITIONER/ TURRET PART NUMBER	ASTRO TOOL #
M39029/58-360	360	MS27494-22D MS27493-22D M24308/13-1	P	22	220	M22520/2-09	615725
M39029/58-361	361	MS27494-22M MS27493-22M	P	22	22M		
M39029/58-362	362	MS27494-22 MS27493-22	P	22	22	MS3196-8P	613642
M39029/57-354	354	MS27492-22D MS27491-22D M24308/12-1	S	22	22D	M22520/2-06	615722
M39029/57-355	355	MS27492-22M MS27491-22M	S	22	22M	MS3196-6P	613640
M39029/58-363	363	MS27494-20 MS27493-20	P	20	20	M22520/2-10 MS3196-9P	615726 613643
M39029/57-357	357	MS27492-20 MS27491-20	S	20	20	M22520/2-10 MS3196-9P	615726 613643

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

MILITARY PART NUMBER	BIN CODE	SUPERSEDES MILITARY PART NUMBER	STYLE: PIN or SOCKET	MATING END SIZE	WIRE BARREL SIZE	POSITIONER/ TURRET PART NUMBER	ASTRO TOOL #
M39029/56-349	349	MS27490-22M	S	22	22M	M22520/2-07	615723
M39029/56-350	350	MS27490-22	S	22	22	MS3198-7P	613641
M39029/56-351	351	MS27655-30 MS27490-20	S	20	20	M22520/2-10 MS3196-9P	615726 613643

Contacts for Connector Family: MIL-C-81511 Series I & II

MILITARY PART NUMBER	BIN CODE	SUPERSEDES MILITARY PART NUMBER	STYLE: PIN or SOCKET	MATING END SIZE	WIRE BARREL SIZE	POSITIONER/ TURRET PART NUMBER	ASTRO TOOL #
M39029/46-303 M39029/46-304	303 304	MS90460 A23-22 MS90460 B23-22	P S	23	22	MS3196-2PA	613381
M39029/47-313 M39029/47-314	313 314	MS90461 A23-22 MS90461 B23-22	P S	23	22		

Contacts for Connector Family: MIL-C-21097

MILITARY PART NUMBER	BIN CODE	SUPERSEDES MILITARY PART NUMBER	STYLE: PIN or SOCKET	MATING END SIZE	WIRE BARREL SIZE	POSITIONER/ TURRET PART NUMBER	ASTRO TOOL #
M21097/9-01	—	—	S	20	20	MS3196-4P	613023

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

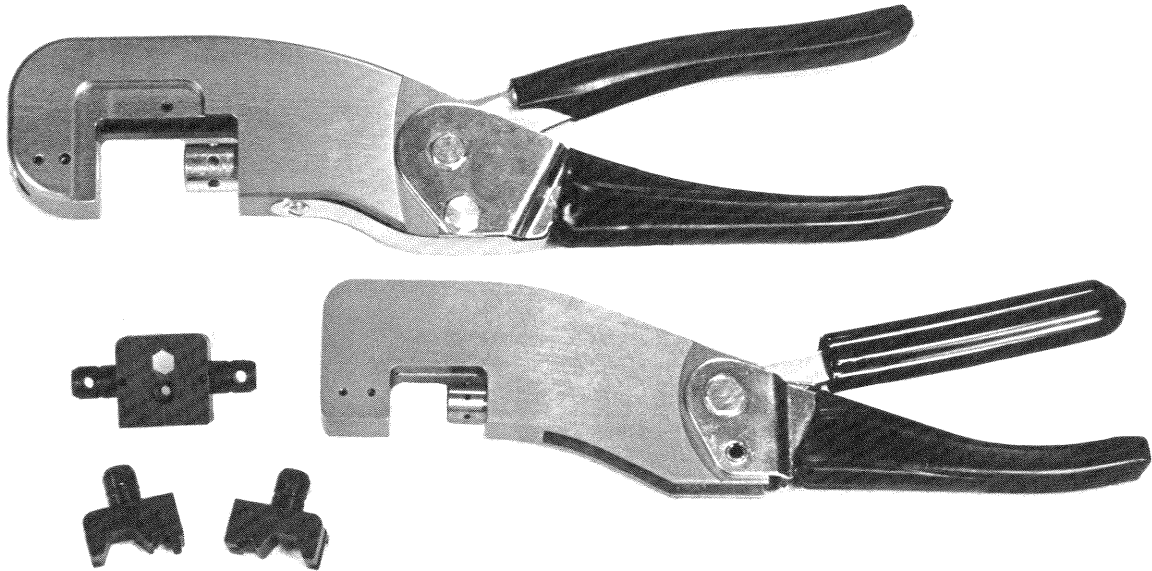
\* BIN (basic identification number) code color bands, reading in sequence from wire barrel end of contact. Each digit of the BIN code shall be designated on the contact by a color band in accordance with the following:

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

## 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 (see opposite page) these MIL-C-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 are, like other Astro crimpers, 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.

Astro also manufactures a pneumatic version of the C-frame crimping tool. See page 42.

Astro has a large selection of die configurations & calibration gages available.

## M22520/5-01 INTERCHANGEABLE HEX DIES

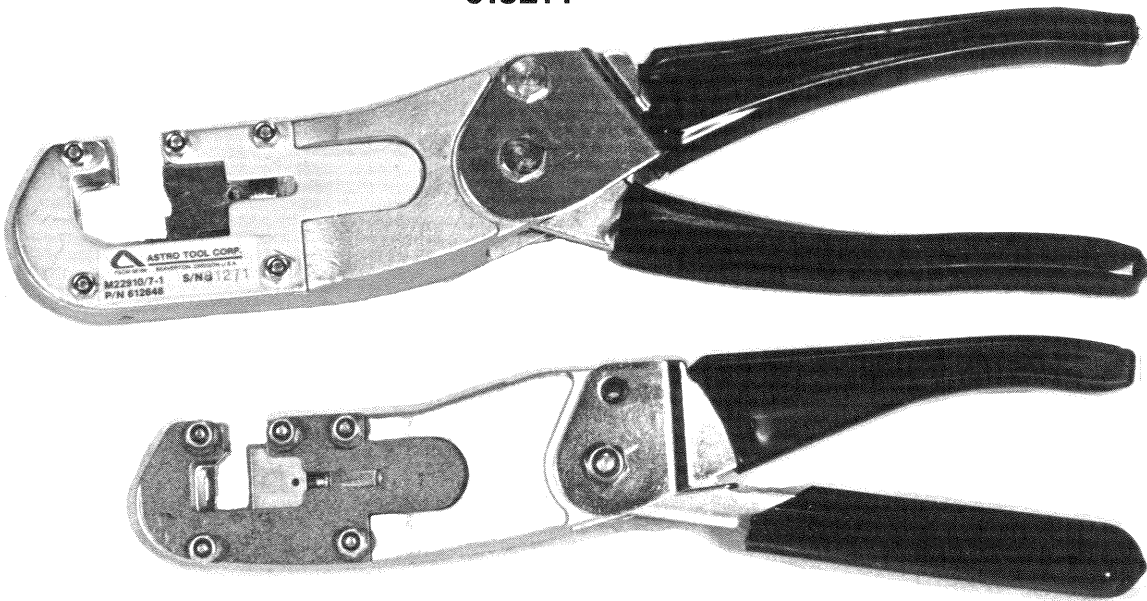
Military Part No.	Astro Tool #	NSN	A Hex.	Length	B Hex.	Length
M22520/5-02	620560		.091	.090	.068	.270
M22520/5-03	620291	5120-00-133-0534	.128	.325	.105	.325
M22520/5-04	620292	5120-00-133-0537	.138	.090	.118	.270
M22520/5-05	620293	5120-00-133-0577	.213	.325	.178	.325
M22520/5-06	620294	5120-00-133-0579	.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					

## M22520/10-01 INTERCHANGEABLE HEX DIES

Military Part No.	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

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.

**CH HEX DIE CRIMPING TOOLS**  
**612648 (M22910/7-01)**  
**613214**



- **Cycle controlled**
- **Interchangeable dies**

- **All steel construction**

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.

# Hex Dies for CH Crimping Tools

For 612648

NOTE: 1. Blank die assembly (unhardened) 615135. 2. All dies .400" wide unless otherwise noted.  
The 612648 frame and military dies are available in kit form: (M22910/6-1) 613437.

## SINGLE HEX

HEX DIMENSION	DIE SET #	HEX DIMENSION	DIE SET #	HEX DIMENSION	DIE SET #
.082	613317	.202	613313	.372	613289
.093	613218	.213	612763	.384 (M22910/7-20)	613396
.100 x .175 wide	614242	.218	612971	.401 (M22910/7-21)	613394
.105	612734	.232 x 3/16 wide	613968	.415	613452
.112	612948	.231	612748	.425	614326
.128	612778	.240	613455	.429	612807
.151	612981	.255	612766	.431 (M22910/7-22)	613377
.151 x .275 wide	613622	.263	613573	.440	612943
.156 x .095 wide	613461	.268	612676	.454 (M22910/7-23)	613375
.160	612661	.272 x 3/16 wide	613801	.475 (M22910/7-24)	613373
.165	613545	.290 x .400 wide	612893	.501 (M22910/7-25)	613398
.172	612195	.309	612978	.532 (M22910/7-26)	613378
.178	612742	.296 x 3/16 wide	612308		
.183	613456	.314	612899		
.195	613125	.324	612989		
.198 x 3/16 wide	613967	.327	614325		
.197	612746	.333	613292		
		.343	612992		
.197 (closed frame)	612746	.359 (M22910/7-19)	613369		

## DOUBLE HEX

A Hex	Width	B Hex	Width	MS #	Die Set #	A Hex	Width	B Hex	Width	MS #	Die Set #
.068	.125	.100	.125		613550	.128	.400	.178	.400		612720
.068	.090	.213	.400		613869	.128	.400	.213	.400		613279
.069	.093	.213	.400		612700	.128	.400	.255	.400	M22910/7-12	612820
.096	.090	.251	.400		613870	.128	.400	.324	.400		613392
.096	.125	.384	.400		613872	.151	.400	.160	.400		613212
.096	.125	.431	.400		613871	.151	.400	.255	.400		612791
.080	.093	.215	.400		612880	.151	.400	.314	.400	M22910/7-13	613389
.084	.400	.244	.400		613569	.160	.400	.195	.400		613730
.100	.400	.197	.400		613788	.160	.400	.268	.400		613729
.100	.125	.324	.400		613146	.160	.400	.309	.400	M22910/7-14	613387
.100	.125	.415	.400		613148	.178	.400	.197	.400		612912
.100	.125	.429	.400		613802	.178	.400	.231	.400		612663
.102	.400	.255	.400		612823	.178	.400	.268	.400		613178
.102	.093	.255	.400		613842	.178	.400	.290	.400	M22910/7-15	613386
.102	.400	.268	.400		612804	.178	.400	.324	.400		613209
.105	.400	.128	.400		612665	.197	.400	.268	.400	M22910/7-16	613371
.105	.400	.160	.400		613759	.197	.400	.309	.400		612762
.105	.400	.328	.400		613249	.213	.400	.250	.400		612997
.105	.400	.343	.400	M22910/7-11	613399	.213	.400	.255	.400	M22910/7-17	613367
.105	.400	.429	.400		613207	.213	.400	.290	.400		612673
.112	.400	.128	.400		612962	.218	.400	.231	.400	M22910/7-18	613365
.120	.400	.197	.400		613779	.218	.400	.290	.400		612787
.128	.400	.160	.400		612481	.255	.400	.268	.400		612797

## TRIPLE HEX

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

For 613214

NOTE: 1. Blank die assembly (unhardened)—613599. 2. All dies .375" wide unless otherwise noted.

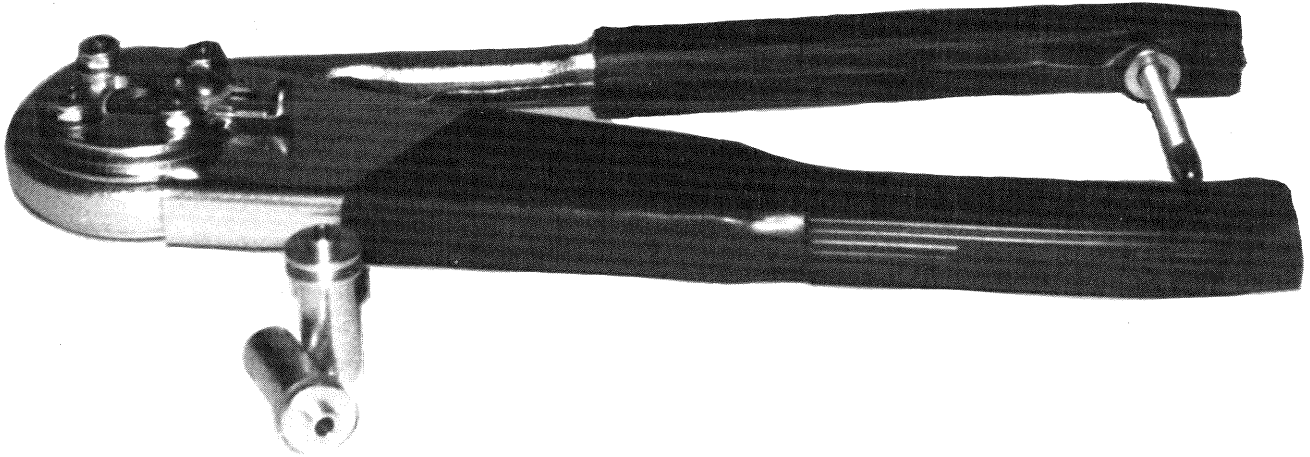
## SINGLE HEX

HEX DIMENSION	DIE SET #	HEX DIMENSION	DIE SET #	HEX DIMENSION	DIE SET #
.087	614243	.128	613848	.218	613005
.093	614245	.151	613003	.231	613846
.100	614414	.160	613847	.255	613850
.105	613812	.166	612494	.268	613009
.107	613035	.178	613849	.290	613011
.112	614342	.197	613810	.300	613099
.118	613845	.213	613851	.309	613013

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

## MICRO-THREAD ADJUSTABLE CRIMP TOOL

615466  
615466-1  
615466-8



- *Cycle controlled ratchet*
- *Micro-thread adjustable*

- *Available in 4 or 8 indent*

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.

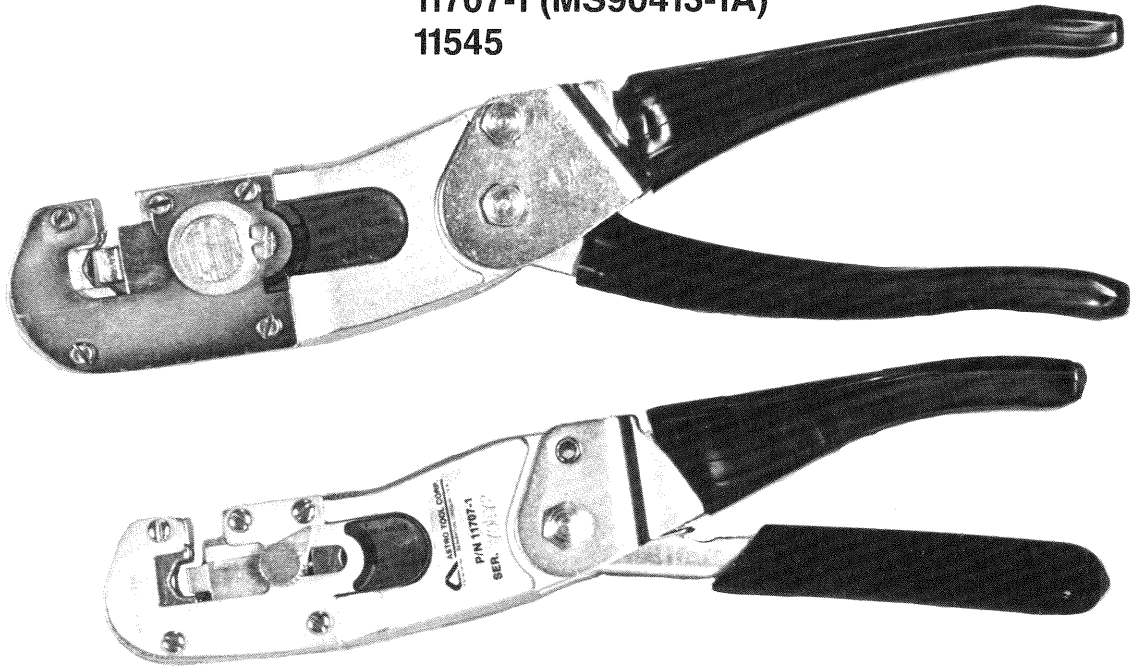
These tools use the same locators as Astro's standard size microcrimp end adjustable tool (612548).

This tool is 9 inches long and weighs 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.



**CT TERMINAL DIE CRIMPING TOOLS**  
**11707-1 (MS90413-1A)**  
**11545**



- **Cycle controlled**
- **Permanently attached dies**

- **Meets all performance requirements for M22910 and M22520**

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 are 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.

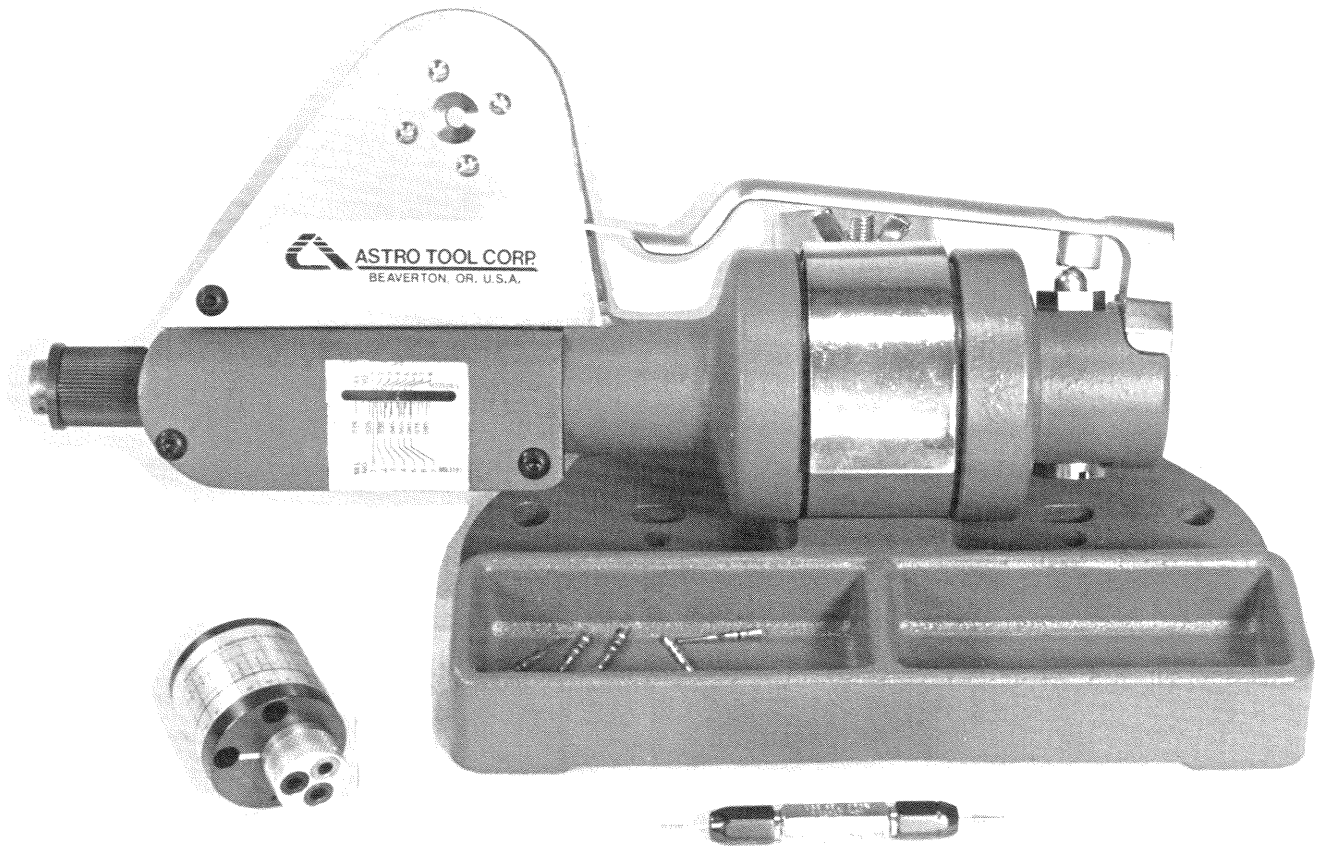
These tools are equipped with retractable locator for the positioning of terminal lugs and wire. When crimping splice fittings the locator can be easily adjusted to its retracted position. The same in line die system combined with the positioner ratchet found in Astro's other C-Frame tools are featured 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 8½ inches long and weighs 14 ounces.

The 11545 is 10½ inches long and weighs 29 ounces.

**PNEUMATIC CRIMP TOOLS**  
**External or Internal Adjustable**  
**(for Circular Contacts)**



• *Cycle controlled ratchet*

• *Portable or bench-mounted*

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.

\* Externally Adjusted \*  
612141

The externally adjustable tool is designed to accept MS3191-4 and M22520/1 style turret head assemblies. The tool has a micrometer style adjustment knob which allows it to be adjusted and set to crimp depths ranging from .015 to .085 inches in increments of .001. The dial indicator on this 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. 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.

## PNEUMATIC CRIMP TOOLS CONTINUED

### External or Internal Adjustable (for Circular Contacts)

\* Internally Adjusted \*  
612871

This 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 tools will crimp wire sizes 8 through 30. The internally adjusted tools can be adapted to accept the MS3191-4 and M22520/1 turrets by ordering a 620754 turret adaptor assembly.

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.)

Both tools can be either hand held or mounted on an optional bench mount and foot pedal assembly (part number 11380-3). Using this assembly leaves the operator's hands free for inserting and removing contacts and wire.

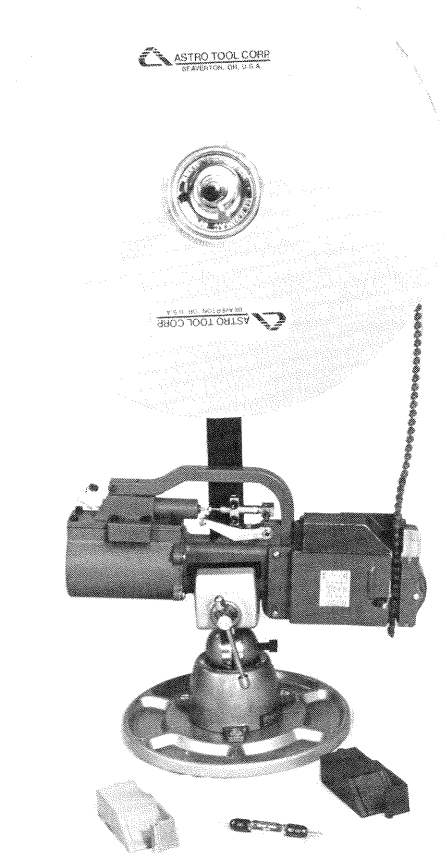
These tools operate on 80-120 P.S.I. Astro recommends a filtered, regulated and lubricated air supply for optimal performance. Astro offers the 11413 air regulator for this purpose.

Locators for MS Applications		
Contact Size	Locator Part No.	Contacts Accommodated (Ref.)
20	3212	MS 3190 MS 24254
16	3213	MS 3192 MS 3193 MS 24225
12	3214	NAS 1662 MS 18134 NAS 1663 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 MD 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

Part No.	Color	Contacts Accommodated (Ref.)
MS 3191-3T M22520/1-02	Black Blue	MS 3192, MS 3193, MS 18134 MS 18136, MS 24254, MS 24255, M 39029/01, M 83723/33, M 83724/34, M 39029/4, M 39029/5
MS 3191-5T M22520/1-03	Green Blue	MS 17803, MS 17804, MS 17807, MS 17808, OS-12814 BASIC Type 'P' and 'M', MIL-C-21097/9-01, M 39029/34, M 39029/35
MS 3191-6T (Adjustable) M22520/1-05 (Adjustable)	Gold Blue	MS 3190, MS 3192, MS 3193, MS 24254, MS 24255, MS 18134, MS 18136, MS 17803, MS 17804, MS 17807, MS 17808, OS-12814, MS 27490, MS 27491, MS 27492, MS 27493, MS 27494. Other than Military Standard Contacts. M 39029/4, M 39029/5
MS 3191-7T M22520/1-07	* Alum- inum Blue	MS 18232 and MS 18233, OUTER PIN AND SOCKET, RG 178/U and RG 196/U Cables
MS 3191-8T M22520/1-06	* Alum- inum	Alternate OS-12814 Type 'M'
MS 3191-9T M22420/1-04	Black Blue	MS 27490, MS 27491, MS 27492, MS 27493, MS 27494, M 39029/56, M 39029/57, M 39029/58
M22520/1-08	Blue	MS 3343 (A & B) MS 90460 (A & B) MS 90461 (A & B) M 39029/46, M 39029/47
M22520/1-09	Blue	M 39029/16, M 39029/18
M22520/1-10	Blue	M 39029/17

\* Turrets indicated as "Aluminum" in color are finished in clear anodize.

## CARRIER FED PNEUMATIC TOOLS



- **614019-1 (Standard 8-indent)**
- **11148 (4-indent)**
- **620472 (mini tip 8-indent)**

- **Meets all performance requirements of MIL-C-22520**

These Astro cycle controlled carrier fed tools are rapid cycling, versatile tools designed for crimping mil-spec and proprietary contacts.

The 614019-1 produces an 8-indent crimp configuration on contact sizes 12-20 and wire sizes 12-28.

The 11148 accommodates the same size contacts and wire as the 614019-1, but produces a 4-indent crimp.

The 620472 produces an 8-indent crimp configuration and is specially adapted for crimping contact sizes 22 and smaller.

The operator simply inserts a pre-stripped wire into the contact and actuates the tool by either pressing the trigger or by means of an optional foot pedal (p/n 620372), the tool then crimps the contact and cycles the next contact into crimping position. Crimp depth is determined by selecting the proper color coded, interchangeable, snap-in block.

A bench mount assembly, p/n 11151, is available which incorporates an arm for mounting a 15 inch reel with a capacity of 2000 contacts.

Molded polyethylene carriers, in a continuous belt, feed contacts to the crimp station of the tool. The carriers act as locators for correct crimp location on the contact. The carriers are color coded for easy identification for both mil-spec and proprietary applications. Besides mil-spec applications listed, Astro has carriers to accommodate a large variety of proprietary contacts. Call the factory for information or your particular application.

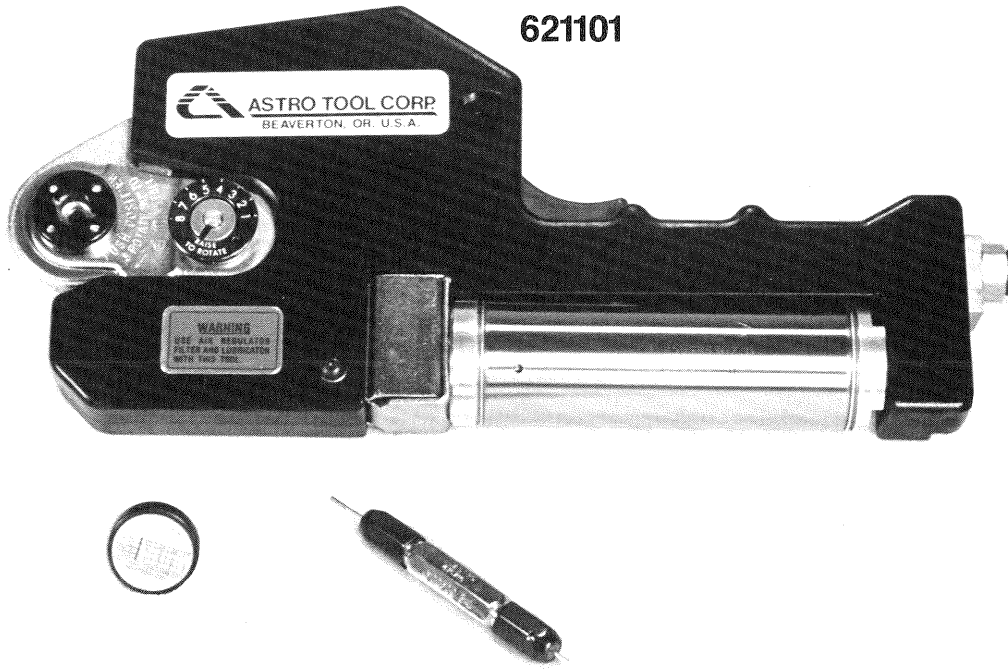
These tools operate at 80-120 PSI and require a lubricated, regulated and filtered air supply. Astro offers an air pressure regulator, p/n 11413 for this purpose.

NOTE: Astro can load customer supplied contacts into the carriers and install them on reels upon customer request.

## PORTABLE INTERMEDIATE AND MINIATURE TOOLS

621100

621101



- **Conforms to performance requirements of MIL-C-22520.**
- **Portable or bench mount 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 1/2 inches long and weigh approximately 32 ounces.

## HEAVY DUTY PNEUMATIC CRIMP TOOL AMT23B (M22520/23-01)



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

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 90-120 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 1/2 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.

## 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

Part Number	Contact Size	MS Contact Number
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 6N 6G 6 6G	MS90559-11 M39029/48-317
		MS90559-12 M39029/48-318
		MS90559-14 M39029/49-319
		MS90560-7 M39029/49-329
		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 4N 4G 4 4G	MS90559-8 M39029/48-320
		MS90559-9 M39029/48-321
		MS90559-13 M39029/48-322
		MS90560-5 M39029/49-331
		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
		MS90454-0-0 M39029/45-300
AMT23014L	1/0 1/0N 1/0	MS90559-5 M39029/48-323
		MS90559-6 M39029/48-324
		MS90560-3 M39029/49-333
AMT23015L	2/0 2/0N 2/0	MS90559-3 M39029/48-325
		MS90559-4 M39029/48-326
		MS90560-2 M39029/49-334
AMT23016L	4/0 4/0N 4/0	MS90559-1 M39029/48-327
		MS90559-2 M39029/48-328
		MS90560-1 M39029/49-335

Part Number	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

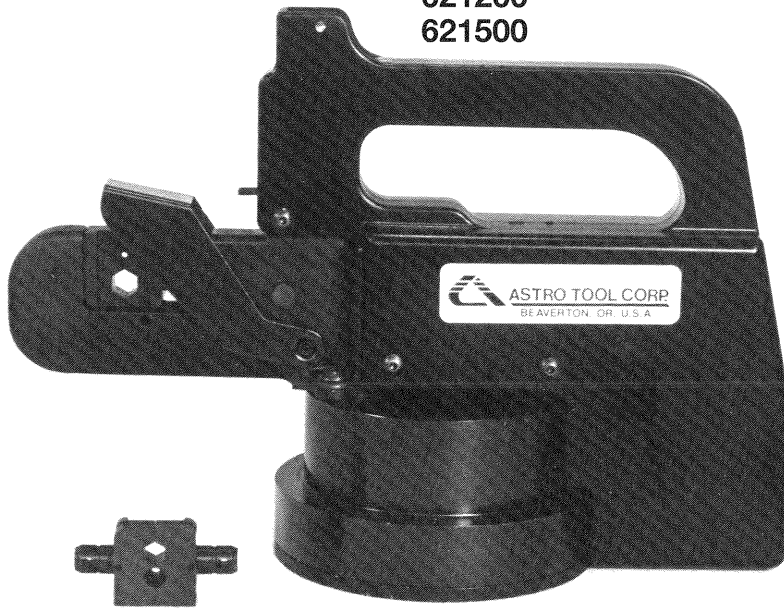
GAGES	
GAGE #	DIE ASSEMBLY
AMTG2302	AMT23002DA
AMTG2303	AMT23003DA
AMTG2304	AMT23004DA
AMTG2305	AMT23005DA
AMTG2306	AMT23006DA
AMTG2307	AMT23007DA



## PNEUMATIC HEX DIE CRIMPER

621200

621500



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

Astro's 621200 portable hex die crimping tool meets basic MIL-C-22520/5 requirements.

The 621200 is trigger or foot pedal (p/n 621224) actuated and operates at 32 cycles per minute. Increased productivity, reduced operator fatigue & reduced carpal tunnel syndrome are among the many advantages of this sturdy lightweight crimper.

Using standard M22520/5 dies, the full cycling feature of this tool 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 the tool has a cover over the crimping area to help prevent the accidental crimping of fingers.

The 621200 requires 80-120 PSI and a regulated, filtered and lubricated air supply. For this purpose Astro offers the 11413 air regulator. The tool can be easily adapted for field use by simply attaching an air cylinder.

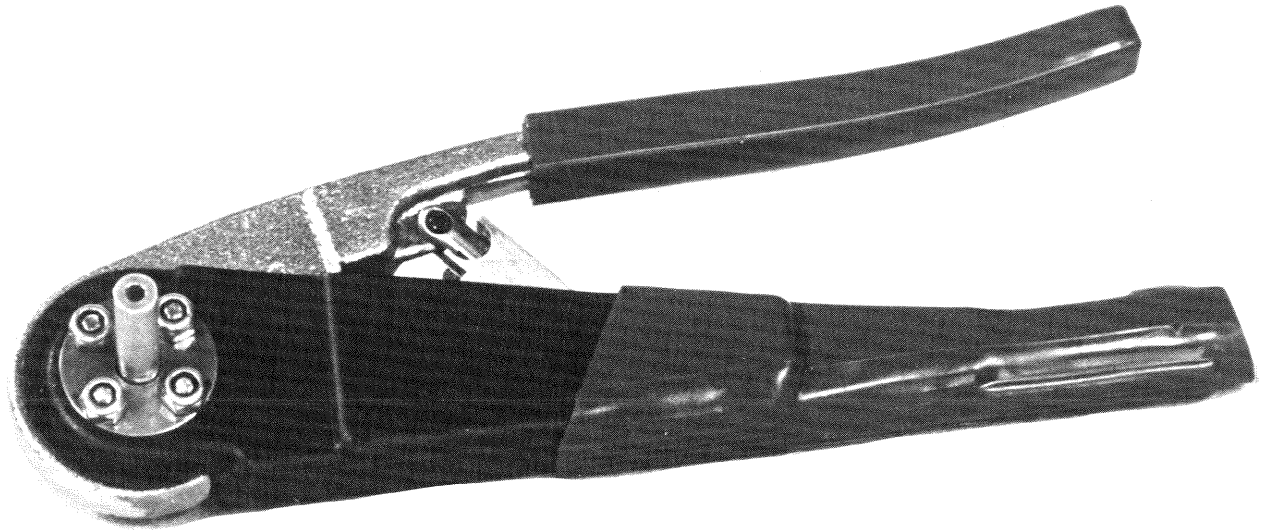
621201 Benchmount only

621202 Swivel Mount with Foot Switch

621224 Foot Switch only



## SPECIAL PURPOSE CRIMP TOOLS



- **Easy to Operate**
- **Small and Light Weight**
- **Full Cycle Ratchet**

- **Built in Positioner**
- **Precision Crimp Depth**
- **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 insures that accurate crimps are obtained every time. These crimpers are designed to handle 20-32 AWG.

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

Let Astro help you design a tool to fit your special production needs.  
Also available in a Pneumatic version.

## ASTRO CONNECTOR SERVICE KITS



- **Military aircraft**
- **Commercial aircraft**

- **General aviation**
- **Installing and removal tool**

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.

Astro kit containers are constructed of molded plastic, fiberglass or metal depending upon varying applications or customer preference. 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 covered with a coating to protect against the elements.

Kits are not only a convenient way to keep all your tools together but 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.

# ASTRO TOOL CORP.

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

# ASTRO TOOL CORP.

VENDOR (CAGE) CONNECTOR SERIES AND TYPE	BASIC CONNECTOR PART NUMBER	CONTACT PART NUMBER	PIN OR SKT	COLOR BANDS			BIN CODE	CONTACT SIZE		WIRE RANGE OR CABLE	CONTACT GAGE	CRIMP TOOL	ACCESSORY	INSTALLING TOOL	REMOVAL TOOL	REMOVAL TOOL (UNWIRED CONTACTS)
				1st	2nd	3rd		MATING END	WIRE BARREL							
MIL-C-26482 SERIES 1 CIRCULAR BAYONET COUPLING FRONT RELEASE CONTACTS	MS3120 ( )	M39029/31-240	P	RED	YEL	BLK	240	20	20-24	AT 0020	615708 or 615717 or 616336	615709 (RED) 615718 616327	ATML 1703B	ATML 1906B	ATML 1906B	
	MS3121 ( )	M39029/32-259	S	RED	GRN	WHI	259	20	20-24	AT 0020	615708 or 615717 or 616336	615709 (RED) 615718 616327	ATML 1703B	ATML 1906B	ATML 1906B	
	MS3122 ( )	M39029/31-228	P	RED	RED	GRA	228	16	16-20	AT 0016	615708 or 616336	615709 (BLUE) 616328	ATML 1704B	ATML 1901B	ATML 1901B	
	MS3124 ( )	M39029/31-228	P	RED	RED	GRA	228	16	16-20	AT 0016	615708 or 616336	615709 (BLUE) 616328	ATML 1704B	ATML 1901B	ATML 1901B	
	MS3126 ( )	M39029/32-247	S	RED	YEL	VIO	247	12	12-14	AT 0012	615708	615709 (YELLOW)	ATML 1705B	AMTL 1902B	AMTL 1902B	
	MS3127 ( )	M39029/31-234	P	RED	ORN	YEL	234	12	12-14	AT 0012	615708	615709 (YELLOW)	ATML 1705B	AMTL 1902B	AMTL 1902B	
	MS3128 ( )	M39029/32-253	S	RED	GRN	ORN	253	12	12-14	AT 0012	615708	615709 (YELLOW)	ATML 1705B	AMTL 1902B	AMTL 1902B	
	MS3470 ( )	M39029/4-110	P	BRN	BRN	BLK	110	20	20-24	AT 0020	615708 or 615717 or 616336	615709 (RED) 615718 616327	ATR 1078 OR M81969/14-11 (RED)	ATR 2080 OR M81969/14-11 (WHITE)	M81969/30 HANDLE WITH ATML 3005 (RED)	
	MS3471 ( )	M39029/5-115	S	BRN	BRN	GRN	115	20	20-24	AT 0020	615708 or 615717 or 616336	615709 (RED) 615718 616327	ATR 1078 OR M81969/14-11 (RED)	ATR 2080 OR M81969/14-11 (WHITE)	M81969/30 HANDLE WITH ATML 3005 (RED)	
MIL-C-26482 SERIES 2 CIRCULAR BAYONET COUPLING REAR RELEASE CONTACTS	MS3472 ( )	M39029/4-111	P	BRN	BRN	BRN	111	16	16-20	AT 0016	615708 or 616336	615709 (BLUE) 616328	ATML 08207B OR ATR 1105 OR M81969/14-03 (BLUE)	ATML 08208B OR ATR 2112 OR M81969/14-03 (WHITE)	M81969/30 HANDLE WITH ATML 3006 (BLUE)	
	MS3474 ( )	M39029/4-111	P	BRN	BRN	BRN	111	16	16-20	AT 0016	615708 or 616336	615709 (BLUE) 616328	ATML 08207B OR ATR 1105 OR M81969/14-03 (BLUE)	ATML 08208B OR ATR 2112 OR M81969/14-03 (WHITE)	M81969/30 HANDLE WITH ATML 3006 (BLUE)	
	MS3475 ( )	M39029/5-116	S	BRN	BRN	BLU	116	16	20-24	AT 0016	615708 or 616336	615709 (BLUE) 616328	ATML 08207B OR ATR 1105 OR M81969/14-03 (BLUE)	ATML 08208B OR ATR 2112 OR M81969/14-03 (WHITE)	M81969/30 HANDLE WITH ATML 3006 (BLUE)	
	MS3476 ( )	M39029/4-112	P	BRN	BRN	RED	112	16	20-24	AT 0016	615708 or 616336	615709 (BLUE) 616328	ATML 08207B OR ATR 1105 OR M81969/14-03 (BLUE)	ATML 08208B OR ATR 2112 OR M81969/14-03 (WHITE)	M81969/30 HANDLE WITH ATML 3006 (BLUE)	
	MS3476 ( )	M39029/5-117	S	BRN	BRN	VIO	117	16	20-24	AT 0016	615708 or 616336	615709 (BLUE) 616328	ATML 08207B OR ATR 1105 OR M81969/14-03 (BLUE)	ATML 08208B OR ATR 2112 OR M81969/14-03 (WHITE)	M81969/30 HANDLE WITH ATML 3006 (BLUE)	
	MS3476 ( )	M39029/4-113	P	BRN	BRN	ORN	113	12	12-14	AT 0012	615708	615709 (YELLOW)	ATML 08209B OR ATR 1153 OR M81969/14-04 (YELLOW)	ATML 08210B OR ATR 2160 OR M81969/14-04 (WHITE)	M81969/30 HANDLE WITH ATML 3007 (YELLOW)	
	MS3476 ( )	M39029/5-118	S	BRN	BRN	GRA	118	12	12-14	AT 0012	615708	615709 (YELLOW)	ATML 08209B OR ATR 1153 OR M81969/14-04 (YELLOW)	ATML 08210B OR ATR 2160 OR M81969/14-04 (WHITE)	M81969/30 HANDLE WITH ATML 3007 (YELLOW)	
	MS3476 ( )	M39029/4-114	P	BRN	BRN	YEL	114	12	16-20	AT 0012	615708	615709 (YELLOW)	ATML 08209B OR ATR 1153 OR M81969/14-04 (YELLOW)	ATML 08210B OR ATR 2160 OR M81969/14-04 (WHITE)	M81969/30 HANDLE WITH ATML 3007 (YELLOW)	
	MS3476 ( )	M39029/5-119	S	BRN	BRN	WHI	119	12	16-20	AT 0012	615708	615709 (YELLOW)	ATML 08209B OR ATR 1153 OR M81969/14-04 (YELLOW)	ATML 08210B OR ATR 2160 OR M81969/14-04 (WHITE)	M81969/30 HANDLE WITH ATML 3007 (YELLOW)	

# ASTRO TOOL CORP.

VENDOR (GAGE) CONNECTOR SERIES AND TYPE	BASIC CONNECTOR PART NUMBER	CONTACT PART NUMBER	PIN OR SKT	COLOR BANDS			BIN CODE	CONTACT SIZE		WIRE RANGE OR CABLE	CONTACT GAGE	CRIMP TOOL	ACCESSORY	INSTALLING TOOL	REMOVAL TOOL	REMOVAL TOOL (UNWIRED CONTACTS)			
				1st	2nd	3rd		MATING END	WIRE BARREL										
MILITARY SPECIFICATION MIL-C-38999	SERIES I MS27466 ( ) MS27467 ( ) MS27468 ( ) MS27496 ( ) MS27498 ( ) MS27505 ( ) MS27515 ( ) MS27652 ( ) MS27653 ( ) MS27654 ( ) MS27656 ( ) MS27661 ( )	M39029/58-360	P	ORN	BLU	BLK	360					615717 OR 616336	615725 OR 616332	ATML 0801B OR M81969/14-01 (GREEN)	ATML 0802B OR M81969/14-01 (WHITE)	ATK 2005 WITH (BLACK) ATK 2005-22D-1			
		M39029/56-348	LS	ORN	YEL	GRA	348	22	22D	22-28			615717 OR 616336	615723 OR 616330					
		M39029/57-354	SS	ORN	GRN	YEL	354						615717 OR 616336	615722 OR 616331					
		M39029/58-361	P	ORN	BLU	BRN	361						615717 OR 616336	615725 OR 616332					
		M39029/56-349	LS	ORN	YEL	WHI	349	22	22M	24-28	AT 0022		615717 OR 616336	615723 OR 616330					
		M39029/57-355	SS	ORN	GRN	GRN	355						615717 OR 616336	615722 OR 616331					
		M39029/58-362	P	ORN	BLU	RED	362						615717 OR 616336	615725 OR 616332			ATK 2005 WITH (BROWN) ATK 2005-22-1		
		M39029/56-350	LS	ORN	GRN	BLK	350	22	22	22-26			615717 OR 616336	615723 OR 616330	ATML 0803B	ATML 0804B			
		M39029/57-356	SS	ORN	GRN	BLU	356						615717 OR 616336	615722 OR 616331					
		M39029/58-363	P	ORN	BLU	ORN	363						615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1		
LOW SILHOUETTE	SERIES II MS27472 ( ) MS27473 ( ) MS27474 ( ) MS27479 ( ) MS27480 ( ) MS27481 ( ) MS27484 ( ) MS27497 ( ) MS27500 ( ) MS27504 ( ) MS27508 ( ) MS27513 ( ) MS27664 ( )	M39029/56-351	LS	ORN	GRN	BRN	351	20	20	20-24	AT 0020		615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1		
		M39029/57-357	SS	ORN	GRN	VIO	357						615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1		
		M39029/58-364	P	ORN	BLU	YEL	364						615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1		
		M39029/56-352	LS	ORN	GRN	RED	352	16	16	16-20	AT 0016		615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1		
		M39029/57-358	SS	ORN	GRN	GRA	358						615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1		
		M39029/58-365	P	ORN	BLU	GRN	365						615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1		
		M39029/56-353	LS	ORN	GRN	ORN	353	12	12	12-14	AT 0012		615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1		
		M39029/57-359	SS	ORN	GRN	WHI	359						615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1		
		BAYONET COUPLING	SERIES III D38999/20 ( ) D38999/24 ( ) D38999/26 ( ) D38999/29 ( ) D38999/30 ( )	M39029/58-366	P	ORN	BLU	YEL	364					615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1	
				M39029/56-352	LS	ORN	GRN	RED	352	16	16	16-20	AT 0016		615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1
M39029/57-358	SS			ORN	GRN	GRA	358						615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1		
M39029/58-365	P			ORN	BLU	GRN	365						615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1		
M39029/56-353	LS			ORN	GRN	ORN	353	12	12	12-14	AT 0012		615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1		
M39029/57-359	SS			ORN	GRN	WHI	359						615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1		
BAYONET COUPLING	SERIES IV D38999/40 ( ) D38999/42 ( ) D38999/44 ( ) D38999/46 ( ) D38999/47 ( ) D38999/49 ( )			M39029/58-366	P	ORN	BLU	YEL	364					615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1	
				M39029/56-352	LS	ORN	GRN	RED	352	16	16	16-20	AT 0016		615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1
				M39029/57-358	SS	ORN	GRN	GRA	358						615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1
				M39029/58-365	P	ORN	BLU	GRN	365						615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1
		M39029/56-353	LS	ORN	GRN	ORN	353	12	12	12-14	AT 0012		615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1		
		M39029/57-359	SS	ORN	GRN	WHI	359						615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1		
		BAYONET COUPLING	SERIES IV D38999/40 ( ) D38999/42 ( ) D38999/44 ( ) D38999/46 ( ) D38999/47 ( ) D38999/49 ( )	M39029/58-366	P	ORN	BLU	YEL	364					615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1	
				M39029/56-352	LS	ORN	GRN	RED	352	16	16	16-20	AT 0016		615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1
				M39029/57-358	SS	ORN	GRN	GRA	358						615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1
				M39029/58-365	P	ORN	BLU	GRN	365						615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1
M39029/56-353	LS			ORN	GRN	ORN	353	12	12	12-14	AT 0012		615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1		
M39029/57-359	SS			ORN	GRN	WHI	359						615708 OR 615717 OR 616336	615711 (RED) 615726 616333	ATML 0805B OR M81969/14-10 (RED)	ATML 0806B OR M81969/14-10 (ORANGE)	ATK 2005 WITH (RED) ATK 2005-20-1		

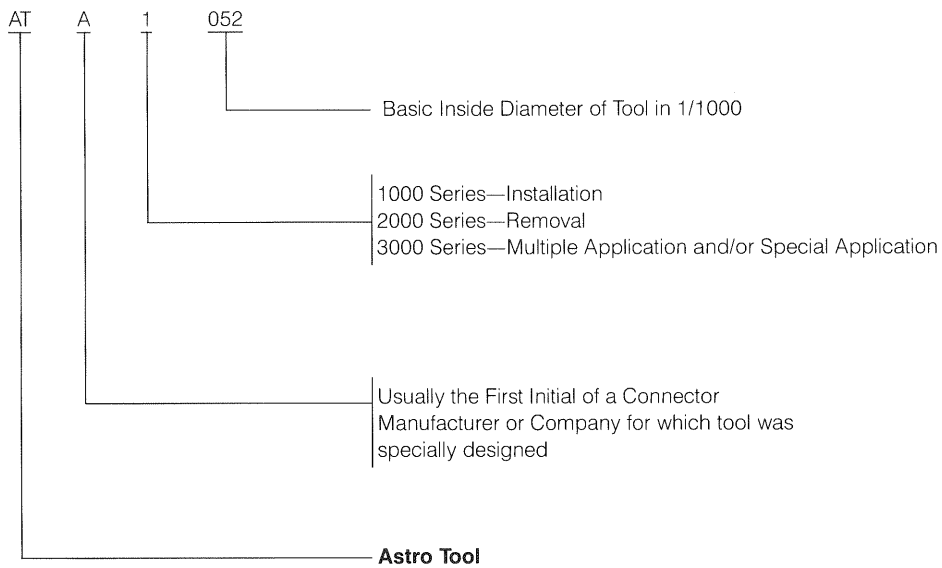
# ASTRO TOOL CORP.

VENDOR (CAGE) CONNECTOR SERIES AND TYPE	BASIC CONNECTOR PART NUMBER	CONTACT PART NUMBER	PIN OR SKT	COLOR BANDS			BIN CODE	CONTACT SIZE		WIRE RANGE OR CABLE	CONTACT GAGE	CRIMP TOOL	ACCESSORY	INSTALLING TOOL	REMOVAL TOOL	REMOVAL TOOL (UNWIRED CONTACTS)
				1st	2nd	3rd		MATING END	WIRE BARREL							
MIL-C-83723 SERIES II CIRCULAR THREADED COUPLING REAR RELEASE CONTACTS	M8372317 ( )	M39029/29-212	P	RED	BRN	RED	212	16								
	M8372318 ( )	M39029/30-217	S	RED	BRN	VIO	217	16S								
	M8372319 ( )	M39029/30-218	S	RED	BRN	GRA	218									
	M8372320 ( )	M39029/85-454	P	YEL	GRN	YEL	454									
	M8372321 ( )	M39029/85-455	P	YEL	GRN	GRN	455									
	M8372322 ( )	M39029/85-456	P	YEL	GRN	BLU	456	16	16-20	AT 0016				ATML 08207B OR M81969/14-03 OR ATR 1105	ATML 08208B OR M81969/14-03 OR ATR 2112	M81969/30 HANDLE WITH ATML-3006 (BLUE)
	M8372323 ( )	M39029/85-457	P	YEL	GRN	VIO	457									
	M8372324 ( )	M39029/86-462	S	YEL	BLU	RED	462									
	M8372362 ( )	M39029/86-463	S	YEL	BLU	ORN	463									
	M8372363 ( )	M39029/86-464	S	YEL	BLU	YEL	464									
		M39029/86-465	S	YEL	BLU	GRN	465									
		M39029/29-213	P	RED	BRN	ORN	213									
		M39029/30-219	S	RED	BRN	WHI	219									
		M39029/85-458	P	YEL	GRN	GRA	458									
		M39029/85-459	P	YEL	GRN	WHI	459									
		M39029/85-460	P	YEL	BLU	BLK	460									
	M39029/85-461	P	YEL	BLU	BRN	461		12	12-14	AT 0012			ATML 08209B OR M81969/14-04 OR ATR 1153	ATML 08210B OR M81969/14-04 OR ATR 2160	M81969/30 HANDLE WITH ATML-3007 (YELLOW)	
	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	8-10	—			AMT23002DA AMT23009L	M81969/29-02		
	M39029/30-220	S	RED	RED	BLK	220										
	M39029/29-215	P	RED	BRN	GRN	215		4	4-6	—			AMT23004DA AMT23011L	M81969/29-03		
	M39029/30-221	S	RED	RED	BRN	221								NOT NEEDED		
	M39029/29-216	P	RED	BRN	BLU	216		0	0-2	—			AMT23005DA AMT23013L	M81969/29-04		
	M39029/30-222	S	RED	RED	RED	222										


**ASTRO TOOL CORP.**

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

## ASTRO TOOL IDENTIFICATION INFORMATION



### MIL SPEC NUMBERS MEET GOVERNMENT STANDARDS

EXCEPTION: The exception to the above code will include the military spec tools, Bendix tools and Astro Tool numbers preceded by only two alphabetic digits.

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

<b>ASTRO TOOL CORP.</b>							
TOOL IDENTIFICATION NUMBERS		I/R	R/F	USAGE/DESCRIPTION	ILL.	GAGE	CONNECTOR SERIES
AIRBORNE	ASTRO TOOL #						
TIR 1610	<b>ATIR 1610</b>	I & R	R	Metal Tweezer	10	22	WTK
	<b>ATIR 1610-L</b>	I & R	R	Modified version of ATIR 1610.62 tips	10	22	WTK
TR 1883	<b>ATR 1883</b>				10	22	WTK
TR 1886	<b>ATR 1886</b>				10	22	WTK482
2597	<b>See ATIR 1610</b>				10	22	WTK
2598	<b>See ATR 1883</b>				10	22	WTK
		<b>ABBREVIATIONS</b>					
		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			2	12	
		F — Front Release			2	16	
		R/F — Rear and Front Release			2	20	
		ILL — Illustration reference number			6	12	
		GA — Gage designation			6	16	
		NAATT — Not Available At This Time			6	20	
	<b>AT 400</b>	I	R	Pins & Sockets	2	22	TW
	<b>AT 4001</b>	I	R	Pins & Sockets	2	20	TW
	<b>AT 4002</b>	I	R	Functional Equivalent to ATH 1094	2	16	TM
	<b>AT 4003</b>	I	R	Deep Insertion G.D. Pomona	2	20	W
	<b>AT 4004</b>	I	R	Deep Insertion MRS, MRE, MRA Joggled Push In	2	16	C,M,R
	<b>AT 5000</b>	R	F	Pins & Sockets	8	22	TW
	<b>AT 5001</b>	R	F	Pins & Sockets	8	20	TW
	<b>AT5001-S</b>	R	F	Pins Only	8	20	TW
	<b>AT 5002</b>	R	F	Functional Equivalent to ATH 2102	8	16	TM




**ASTRO TOOL CORP.**

TOOL IDENTIFICATION NUMBERS		I/R	R/F	USAGE/DESCRIPTION	ILL.	GAGE	CONNECTOR SERIES
AIRBORN	ASTRO TOOL #						
TIR 1610	ATIR 1610	I & R	R	Metal 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 Tweezer–Straight	10	22	WTK
TR 1886	ATR 1886	I & R	R	Metal Tweezer–.455 ext.	10	22	WTK482
2597	See ATIR 1610	I & R	R	See TIR 1610	10	22	WTK
2598	See ATR 1883	I & R	R	See TR 1883	10	22	WTK
				<b>MIL-C-26482, MIL-C-26636</b> <b>MIL-C-26500, MIL-C-81703</b>			
	AT 1000-12	I	R	Metal Tool, Joggled	2	12	
	AT 1000-16	I	R	Metal Tool, Joggled	2	16	
	AT 1000-20	I	R	Metal Tool, Joggled	2	20	
	AT 2012	R	F	Metal Tool (MS24256R12)	6	12	
	AT 2016	R	F	Metal Tool (MS24256R16)	6	16	
	AT 2020	R	F	Metal Tool (MS24256R20)	6	20	
	AT 4000	I	R	Pins & Sockets	2	22	TW
	AT 4001	I	R	Pins & Sockets	2	20	TW
	AT 4002	I	R	Functional Equivalent to ATH 1094	2	16	TM
	AT 4003	I	R	Deep Insertion G.D. Pomona	2	20	W
	AT 4004	I	R	Deep Insertion MRS, MRE, MRA Joggled Push In	2	16	C,M,R
	AT 5000	R	F	Pins & Sockets	8	22	TW
	AT 5001	R	F	Pins & Sockets	8	20	TW
	AT 5001-S	R	F	Pins Only	8	20	TW
	AT 5002	R	F	Functional Equivalent to ATH 2102	8	16	TM
<b>AMP</b>	<b>ASTRO TOOL #</b>						
				<b>MIL-C-26500 &amp; MIL-C-26482</b> <b>CONNECTORS</b>			
20823-2	AT 2016	R	F	Metal Tool	6	16	2017
20823-3	AT 2020	R	F	Metal Tool	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	Co-axial	6	Coax	
305183-0	A 305183	R	F	AMP 16,20	17	16,20	M,W
305183-2	ATAMP 2103	R	F	Metal 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	
				<b>MIL-C-81659, SERIES 2</b>			
91066-1	{ ATC 1054	I	R	Metal Functional Equivalent	2	22	RME
	{ ATC 2053	R	R	Metal Functional Equivalent	10	22	RME
91066-2, 4	{ ATC 1071	I	R	Metal Functional Equivalent	23	20	RME
	{ ATC 2071	R	R	Metal Functional Equivalent	10	20	RME
91066-3	{ ATR 1107	I	R	Metal Functional Equivalent	2	16	RME
	{ ATR 2112	R	R	Metal Functional Equivalent	10	16	RME
				<b>MIL-C-38999</b>			
91067-1	{ ATBX 1048	I	R	Metal Functional Equivalent	10	22D	
	{ ATBX 2046	R	R	Metal Functional Equivalent	10	22D	
91067-2	{ ATBX 1055	I	R	Metal Functional Equivalent	10	22	
	{ ATBX 2057	R	R	Metal Functional Equivalent	10	22	
91067-3	{ ATC 1076-L	I	R		10	20	
	{ ATC 2076-L	R	R		10	20	
91074-1	ATAMP 2250	R	R	Metal Tweezer	10	Coax	RM #5



# ASTRO TOOL CORP.

TOOL IDENTIFICATION NUMBERS		I/R	R/F	USAGE/DESCRIPTION	ILL.	GAGE	CONNECTOR SERIES
AMP	ASTRO TOOL #						
	ATA 2073	R	F	Metal Tool	6	20	M
	ATA 2112	R	F	Metal Tool	6	16	M
202476-6	ATAMP 1231	I	R	Connector #202476-6	1		
	ATAMP 3040			Miniclip Transfer Tool for .025 Square Pins Transfer Tool Kit—transfers AMP terminal clips from gun to terminal's single wires.	21		
	ATAMP 3070				21		
AMPHENOL	ASTRO TOOL #						
				<b>MIL-C-81511, SERIES 1 &amp; 2 CONNECTORS</b>			
294-27	{ ATA 1079 or ATA 1080	I	R	Pins & Sockets	2	20	348
		I	R	Pins & Sockets	4	20	348
294-28	{ ATA 2042 or ATA 2348-20	R	F	Pins Only	3	20	348
		R	F	Pins & Sockets	9	20	348
294-29	{ ATA 2038 or ATA 2348-20	R	F	Sockets Only	7	20	348
		R	F	Pins & Sockets	9	20	348
294-30	{ ATA 1102 or ATA 1104	I	R	Pins & Sockets	2	16	348
		I	R	Pins & Sockets	4	16	348
294-31	{ ATA 2065 or ATA 2348-16	R	F	Pins Only	3	16	348
		R	F	Pins & Sockets	9	16	348
294-32	{ ATA 2060 or ATA 2348-16	R	F	Sockets Only	7	16	348
		R	F	Pins & Sockets	9	16	348
294-33	{ ATA 1159 or ATA 1158 or ATA 1159-S	I	R	Pins & Sockets	2	12	348
		I	R	Pins & Sockets	4	12	348
		I	R	Modified version of ATA 1159, straight	1	12	358
294-34	{ ATA 2120 or ATA 2348-12	R	F	Pins Only	3	12	348
		R	F	Pins & Sockets	9	12	348
294-35	{ ATA 2093 or ATA 2348-12	R	F	Sockets Only	7	12	348
		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	6	16	84, 94
294-58	ATA 2085	R	F	Short Metal Tool	6	20	84, 94
294-66	ATA 3050	I	R	Tool, Double-Ended Tip	9	16, 20	84
				<b>MIL-C-26482, MIL-C-26636, MIL-C-26500, MIL-C-81703</b>			
294-72	{ AT 1000-12 or ATA 1144	I	R	Metal Tool, Joggled	2	12	48, 217
		I	R	Metal Tool	26	12	48,217
294-73	AT 2012	R	F	Metal Tool	6	12	48, 217
294-88	{ AT 1000-20 or ATA 1086	I	R	Metal Tool, Joggled	2	20	48, 217
		I	R	Metal Tool	26	20	48, 217
294-89	AT 2020	R	F	Metal Tool	6	20	48, 217
294-96	{ AT 1000-16 or ATA 1101	I	R	Metal Tool, Joggled	2	16	48, 217
		I	R	Metal Tool	26	16	48,217
294-97	AT 2016	R	F	Metal Tool	6	16	48, 217
				<b>NAS 1664 (REF. NAS 1599)</b>			
294-108	{ ATR 1080 ATR 2080	I	R	Metal Functional Equivalent	2	20	M83723
		R	R	Metal Functional Equivalent	10	20	M83723
294-109	{ ATR 1107 ATR 2112	I	R	Metal Functional Equivalent	2	16	M83723
		R	R	Metal Functional Equivalent	10	16	M83723
294-110	{ ATR 1160 ATR 2160	I	R	Metal Functional Equivalent	2	12	M83723
		R	R	Metal Functional Equivalent	10	12	M83723


**ASTRO TOOL CORP.**

TOOL IDENTIFICATION NUMBERS		I/R	R/F	USAGE/DESCRIPTION	ILL.	GAGE	CONNECTOR 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	R	F	Pins & Sockets	9	20	67, 906
	{ ATA 1075	I	R	Installing tool for above	1	20	67, 906
294-155	{ ATA 2040	R	F	Pins & Sockets	9	22	17
	{ ATA 1040	I	R	Installing 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
<b>MIL-C-5015</b>							
294-192	{ ATF 1101 or	I	R	Metal Tool	27	16	246
	{ ATF 1105	I	R	Functional Equivalent	2	16	246
294-219	ATF 2115	R	F	Metal Tool	5	16	246
294-229	{ ATF 1144 or	I	R	Metal Tool	27	12	246
	{ ATF 1160	I	R	Functional Equivalent	2	12	246
294-230	ATF 2162	R	F	Metal Tool	5	12	246
294-235	{ ATF 1558 or	I	R	Metal Tool	27	0	246
	{ ATF 1554	I	R	Functional Equivalent	2	0	246
294-236	{ ATF 1378 or	I	R	Metal Tool	27	4	246
	{ ATF 1359	I	R	Functional Equivalent	2	4	246
294-237	{ ATF 1260 or	I	R	Metal Tool	27	8	246
	{ ATF 1256	I	R	Functional Equivalent	2	8	246
294-238	ATA 2254	R	F	Co-axial 94-621	6	Coax	94
294-239	ATF 2336	R	F	Metal Tool	5	4	246
294-240	ATF 2252	R	F	Metal Tool	5	8	246
294-241	ATF 2518	R	F	Metal Tool	5	0	246
<b>MIL-C-81511, SERIES 1 &amp; 2</b>							
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	6	20	213
294-286	{ ATA 2030 or	R	F	Pins Only	3	23	348
	{ ATA 2348-22	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
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						
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 tip	ATA 1186	I	R	Straight Co-axial	1	Coax	
494-1-3 Removal 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


**ASTRO TOOL CORP.**

TOOL IDENTIFICATION NUMBERS		I/R	R/F	USAGE/DESCRIPTION	ILL.	GAGE	CONNECTOR SERIES
BENDIX	ASTRO TOOL #						
11-3695	ATBX 2-3695	R	F	<b>AN/MS &amp; TYPE F CONTACTS</b> 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	<b>AN/MS &amp; TYPE F CONTACTS</b> 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 AT 1000-12	I	R	<b>MIL-C-23216 &amp; MS3190 PYGMY SE CRIMP-TYPE CONTACTS</b> MS24254 & MS24255 Contacts	26	12	AN/MS
11-7401-16	{ATA 1101 or AT 1000-16	I	R	Joggled Tool	2	12	AN/MS
11-7401-20	{ATA 1086 or AT 1000-20	I	R	MS24254 & MS24255 Contacts	26	16	AN/MS
		I	R	Joggled Tool	2	16	AN/MS
		I	R	MS24254 & MS24255 Contacts	26	20	AN/MS
		I	R	Joggled Tool	2	20	AN/MS
11-7736	ATBX 1-7736	I	R	<b>AN/MS &amp; TYPE F CONTACTS</b> 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
11-7880-8	ATBX 2291	R	F	<b>SE &amp; MS CONTACTS</b> Co-axial	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	Co-axial Contacts	6	8	SE
11-8220	ATBX 1-8220	I	R	<b>AN/MS &amp; TYPE F CONTACTS</b> Co-axial		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
11-8660-1	ATBX 1133	I	R	Co-axial contacts 10 PT-CE	2	Coax	CE
11-8660-2	ATBX 1160	I	R	Co-axial contacts 10 PT-CE	2	Coax	CE
11-8660-3	ATBX 1203	I	R	Co-axial contacts 10 PT-CE	2	Coax	CE
11-8660-4	ATBX 1231	I	R	Co-axial contacts 10 PT-CE	2	Coax	CE
11-8660-5	ATBX 1253	I	R	Co-axial contacts 10 PT-CE	2	Coax	CE
11-8369-4	ATBX 1231						


**ASTRO TOOL CORP.**

TOOL IDENTIFICATION NUMBERS		I/R	R/F	USAGE/DESCRIPTION	ILL.	GAGE	CONNECTOR SERIES
BENDIX	ASTRO TOOL #						
				<b>MIL-C-38999</b>			
11-8674-12	ATBX 1154	I	R	Joggled	2	12	JT
	ATBX 1154-90	I	R	90° Angle	1	12	JT
	ATBX 1157	I	R	Tweezer (Direct Equivalent)	10	12	JT
11-8674-16	ATBX 1103	I	R	Pencil Style	24	16	JT
	ATR 1107	I	R	Joggled	2	16	JT
	ATBX 1108	I	R	Tweezer (Direct Equivalent)	10	16	JT
11-8674-20	ATBX 1070	I	R	Pencil Style	24	20	JT
	ATBX 1071	I	R	Straight Style	1	20	JT
	ATBX 1073	I	R	Offset	2	20	JT
	ATBX 1072	I	R	Tweezer (Direct Equivalent)	10	20	JT
	ATBX 1075	I	R	Tweezer, .75 tip length	10	20	JT
11-8674-22	ATBX 1057	I	R	Pencil Style	24	22	JT
	ATBX 1055	I	R	Offset	2	22	JT
	ATBX 1055-S	I	R	Special	1	22	JT
	ATBX 1058	I	R	Tweezer (Direct Equivalent)	10	22	JT
	ATBX 1059	I	R	Tweezer, .260 of straight	10	22	JT
11-8674-24	ATBX 1046	I	R	Pencil Style	24	22M/D	JT
	ATBX 1046-90	I	R	90° Angle	24	22M/D	JT
	ATBX 1046-135	I	R	45° Angle	24	22M/D	JT
	ATBX 1049	I	R	Offset	2	22M/D	JT
	ATBX 1049-S	I	R	Special	2	22M/D	JT
	ATBX 1052	I	R	Tool for .052 dia. wire	2	22D	JT
	ATBX 1048	I	R	Tweezer (Direct Equivalent)	10	22M/D	JT
	ATBX 1051	I	R	Tweezer, .055 dia. wire	10	22M/D	JT
				<b>MIL-C-38999, M39029/4 &amp; 5 CONTACTS</b>			
11-8675-12	ATBX 2155	R	R	Tweezer	10	12	JT
11-8675-16	ATBX 2103	R	R	Tweezer	10	16	JT
	ATBX 2070	R	R	Tweezer	10	20	JT
11-8675-20	ATBX 2075	R	R	Tweezer, .75 Tip Length	10	20	JT
	ATBX 2057	R	R	Tweezer	10	22	JT
11-8675-22	ATBX 2058	R	R	Tweezer, Long Tip	10	22	JT
	ATBX 2046	R	R	Tweezer	10	22M/D	JT
11-8675-24	ATBX 2048	R	R	Tweezer, .560 Tip Length	10	22M/D	JT
11-8794-12	ATBX 1159	I	R	Tweezer, Straight	10	12	JT
11-8794-16	ATBX 1109	I	R	Tweezer, Straight	10	16	JT
11-8794-20	ATBX 1078	I	R	Tweezer, Straight	10	20	JT
11-8794-22	ATBX 1060	I	R	Tweezer, Straight	10	22	JT
11-8794-24	ATBX 1054	I	R	Tweezer, Straight	10	22M/D	JT
11-8795-12	ATBX 2160	R	R	Tweezer, Straight	10	12	JT
11-8795-16	ATBX 2109	R	R	Tweezer, Straight	10	16	JT
11-8795-20	ATBX 2073	R	R	Tweezer, Straight	10	20	JT
11-8795-22	ATBX 2059	R	R	Tweezer, Straight	10	22	JT
11-8795-24	ATBX 2050	R	R	Tweezer, Straight	10	22M/D	JT
	ATBX 2047	R	R	Tweezer, Modified Version of ATBX 2050	10	22M/D	JT
11-8952	ATBX 2052	R	R	Tweezer, Oversize Wire, Min.	10	22M/D	JT
11-8953-1	ATBX 1053	I	R	Modified version of ATBX 1048, .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
11-10050-5	ATX 2001	R	R	Unwired Contacts	16	12	JT
11-10050-6	ATX 2005	R	R	Unwired Contacts	16	22M	JT
	ATBX 1028	I	R	Unwired Contacts, reversible Quill—3 Dimensions	9	20,22, & 22M/D	JT


**ASTRO TOOL CORP.**

TOOL IDENTIFICATION NUMBERS		I/R	R/F	USAGE/DESCRIPTION	ILL.	GAGE	CONNECTOR SERIES
BENDIX	ASTRO TOOL #						
	ATBX 1073-5	I	R	Special Tool For Lockheed	1	20	
	ATBX 11-6784	R	F	See ATBX 2-6784			
	ATBX 3050	I & R	R	Special tool using .060 diameter wire	2	22M/D	JT
<b>BOEING</b>	<b>ASTRO TOOL #</b>						
	ATBO 1053	I	R	Special Plier Repair Tool for M39029/11-22 & 12-22	13	22	
	ATBO 1054	I	R	Mod. version of ATC 1054, 1.1 Long Tip (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	Tweezer	10	16	
ST 2342A-T1	ATBO 1107	I	R	Horses Head	2	16	
	ATBO 1108	I	R	Arbor Press	2	16	
	ATBO 1108-90	I	R	Modified version of ATBO 1108, 90° Angle	1	16	
ST 2342A-T5	ATBO 1154	I	R	Horses Head	2	12	
	ATBO 2054	R	R	Special Boeing Tool (CET DPXMA22)	2	22	
	ATBO 2073	R	R	Hypertronics Connector	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 (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	
<b>BURNDY</b>	<b>ASTRO TOOL #</b>						
J-1276-1		I & R	R	YHMM-22-1 Pins, plastic tip, recommend 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 AT 1000-12	I	R	MIL-C-26500	26	12	HYFEN
RTM-12-8	ATBX 1157	I	R	MIL-C-26500, Joggled	2	12	HYFEN
RTM-16-2V	ATA 1101	I	R	MIL-C-38999	10	12	JT
RTM-16-4	ATBX 1108	I	R	MIL-C-26482	26	16	HYFEN
	ATB 1064 or	I	R	MIL-C-38999	10	16	JT
RTM-20-5	ATB 1067 or	I	R	MIL-C-26482, 26500, 26636	26	20	HYFEN
	ATB 1068	I	R	Modified version of ATB 1064, Long Tip	26	20	HYFEN
RTM-20-5PI	ATB 1067-R	I	R	Modified version of ATB 1067, Joggled	2	20	HYFEN
RTM-20-17	ATBX 1072	I	R	Tip to fit Burndy RTM-20-5	25	20	HYFEN
RTM-22-1	ATBX 1058	I	R	MIL-C-38999	10	20	JT
RTM-24-3	ATBX 1053	I	R	MIL-C-38999	10	22	JT
RTM-20-16	AT1000-20	I	R	MIL-C-38999, Tweezer	10	24	JT
		I	R		2	20	





# ASTRO TOOL CORP.

TOOL IDENTIFICATION NUMBERS		I/R	R/F	USAGE/DESCRIPTION	ILL.	GAGE	CONNECTOR SERIES
BURNDY	ASTRO TOOL #						
RX-8-1	ATH 2202	R	F	Metal Tool, Co-Axial	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	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	
<b>CANNON</b>	<b>ASTRO TOOL #</b>						
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 Tweezer NAS 1599	10	12	
CET 12-16	0159-0051			Tip only, Delrin			
CET 16	ATC 2062	R	F	Impact Tool, Ring-Lock 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 2112	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	Pins & Sockets (Long Tip)	9	20	RX
CET 20-4	ATC 2040	R	F	Pins & Sockets	9	20	KPTM
CET 20-5A	ATC 2046	R	F	Impact Tool DDSMF Ring-Lok	22	20	D*SM
CET 20-8	ATR 2080	R	R	Metal Tweezer NAS 1664	10	20	
CET 20-11	ATC 2071	R	R	Metal Tweezer	10	20	D*C
CET 20-11, 20HD	ATC 2076	R	R	Metal 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 Tweezer	10	20	D*C
CET 20-D-1	ATC 2073	R	R	Metal 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


**ASTRO TOOL CORP.**

TOOL IDENTIFICATION NUMBERS		I/R	R/F	USAGE/DESCRIPTION	ILL.	GAGE	CONNECTOR SERIES
CANNON	ASTRO TOOL #						
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 Tweezer	10	22	DPK
CET DPKB 22 Revision C	ATC 2054	R	R	Metal 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	
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 Equivalent to NAS 1664 for NAS 1599	2	12	KV/PV/DPK
	{ ATR 2160	R	R	Metal Equivalent to NAS 1664 for NAS 1599	10	12	KV/DPK/PV
CIET 16	{ ATR 1107	I	R	Metal Equivalent to NAS 1664 for NAS 1599	2	16	DPXME
	{ ATR 2112	R	R	Metal Equivalent to NAS 1664 for NAS 1599	10	16	DPXME
CIET 20	{ ATR 1080	I	R	Metal Equivalent to NAS 1664 for NAS 1599	2	20	DPXME
	{ ATR 2080	R	R	Metal Equivalent to NAS 1664 for NAS 1599	10	20	DPXME
CIET 20-18	{ ATC 1081	I	R	Metal Equivalent, Tool	2	20	D*C
	{ ATC 2076	R	R	Metal Equivalent, Tweezer	10	20	D*C
CIET 20HD	{ ATC 1076	I	R	Metal Equivalent, Tool	10	20	D*RA
	{ ATC 2076	R	R	Metal Equivalent, Tweezer	10	20	D*RA
CIET 20HDL	ATC 2076-L	R	R	Metal 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 Equivalent, Tool	2	22	DPX2MA
	{ ATC 2053	R	R	Metal Equivalent, Tweezer (ref. ATC 2054)	10	22	CENTI-K
	ATC 2053-70	R	R	Modified version of ATC 2053 (70° angle)	10	22	
	ATC 1054-S	I	R	Modified version of ATC 1054 (straight)	1	22	
CIT 4	ATC 1377	I	R	Metal Tool	1	4	RX
CIT 8	ATC 1265	I	R	Metal Tool	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




**ASTRO TOOL CORP.**

TOOL IDENTIFICATION NUMBERS		I/R	R/F	USAGE/DESCRIPTION	ILL.	GAGE	CONNECTOR SERIES
CANNON	ASTRO TOOL #						
CIT 16KJ	<b>ATBX 1108</b>	I	R	MIL-C-38999	10	16	KJ
CIT 20	<b>ATA 1086</b>	I	R	DP*M, KQ, KR, KTM, MIL-C-26636	26	20	SRC
CIT 20-2	<b>ATC 1079</b>	I	R	DSM	2	20	BFRX
CIT 20-5A	<b>ATC 1084</b>	I	R	KPTM	2	20	KPTM
CIT 20-18	<b>ATC 1081</b>	I	R	038894-0018	2	20	KPTM
CIT 20A	<b>ATC 1055</b>	I	R	DDSMI	2	20	D
CIT 20D	<b>ATC 1072</b>	I	R	DPXME-20 H.D.	2	20	D
CIT 20KJ	<b>ATBX 1072</b>	I	R	MIL-C-38999	10	20	KJ
CIT 22KJ	<b>ATBX 1058</b>	I	R	MIL-C-38999	10	22	KJ
CIT 22M-KJ	<b>ATBX 1048</b>	I	R	MIL-C-38999	10	22M/D	KJ
CIT C2	<b>ATC 1156</b>	I	R	DP*M	2	Coax	DP
CIT CTA-1	<b>ATC 1046</b>	I	R	Metal Tweezer	10	22	CTA
CIT DPKB	<b>ATC 1053</b>	I	R	DPKB	2	22	DPKB
CIT DPX2MA22	<b>ATC 1054</b>	I	R	DPX	2	22	DPX
CIT DPXMA22-1	<b>ATC 1052</b>	I	R	DPXMA	2	22	DPXMA
CIT PS-CTA-22	<b>ATC 1046</b>	I	R	Tweezer, Pins & Sockets	10	22	D
CIT SS-14	<b>ATCS 1105</b>	I	R	Super Seal Connector	1	20	SS
CIT TF/FP	<b>ATC 1032</b>	I	R	Metal Tweezer, Filter Pins	30	-	
CET-CTA-2	<b>ATC 1071</b>	I	R	D*C Connectors	23	20	D*
	<b>ATC 1080</b>	I	R	Equivalent NSN 5120-00-409-5217	1	20	
	<b>ATC 3035</b>	I & R	F/R	Tool Kit, Centi Lok Pins & Sockets	15	22	DD
	<b>ATC 3074*</b>			Retention Test Tool for contact retention in 22 GA connector	18		
	<b>ATC 3075*</b>			Retention Test Tool for contact retention in 20 GA connector	18		
	<b>ATC 3076*</b>			Retention Test Tool for contact retention in 16 GA connector	18		
	<b>ATC 3077*</b>			Retention Test Tool for contact retention in 12 GA connector	18		
	<b>ATC 3078*</b>			Retention Test Tool Kit for pins & socket contact retention in co-axial connectors	18		
* Retention Test Tools are made for various connector series. The base gauge sizes are given with the tool numbers. We will make custom Retention Test Tools for your MIL-C- connector application.							
<b>CONTINENTAL</b>	<b>ASTRO TOOL #</b>						
2512	<b>AT 5002</b>	R	F	Metal Tool	8	16	25
2534	<b>AT 4002</b>	I	R	Metal Tool	2	16	25
2558	<b>ATBX 1057</b>	I	R	Metal Tool	24	22	25
2559	<b>ATCL 2061</b>	R	F	Metal Tool	8	22	25
<b>COLLINS</b>	<b>ASTRO TOOL #</b>						
372-8091-010	<b>ATC 2026</b>	R	F	Tuning Fork Contacts	11	-	
372-8091-060	<b>ATC 1032</b>	I	R	Tweezer, Filter Pins	30	-	
<b>DEUTSCH</b>	<b>ASTRO TOOL #</b>						
15513-12	<b>ATA 1144</b>	I	R	MIL-C-26636	26	12	DD, DTK, DPK
15513-16	<b>ATA 1101</b>	I	R	MIL-C-26636	26	16	DD, DTK, DPK
15513-20	<b>ATA 1086</b>	I	R	MIL-C-26636	26	20	DD, DTK, DPK
81515-20	<b>{ATD 1061</b>	I	R	MIL-C-81511, Series 3 & 4	2	20	
	<b>{ATD 2062</b>	R	F	MIL-C-81511, Series 3 & 4	10	20	
81515-16	<b>{ATD 1094</b>	I	R	MIL-C-81511, Series 3 & 4	2	16	
	<b>{ATD 2094</b>	R	F	MIL-C-81511, Series 3 & 4	10	16	


**ASTRO TOOL CORP.**

TOOL IDENTIFICATION NUMBERS		I/R	R/F	USAGE/DESCRIPTION	ILL.	GAGE	CONNECTOR SERIES
DEUTSCH	ASTRO TOOL #						
				<b>MIL-C-81511, SERIES 3 &amp; 4 UNWIRED CONTACTS</b>			
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 ATD 1081-S	I	R	800 Series	2	20	DS, MDR, DA
M-15513-25	ATD 1206	I	R	Modified version of ATD 1081 Straight	1	20	
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 ATD 2190	R	F	Pins & Sockets	17	12	DS
	{ATD 2127 or ATD 2128	R	F	Pins & Sockets	6	12	DS
M-15515-16	{ATD 2097 or ATD 2095	R	F	Connector #6820	17	16	DS
		R	F	Connector #6820	6	16	DS
M-15515-20		R	F	Pins & Sockets	17	20	DS
		R	F	Pins & Sockets, Spring Loaded	6	20	DS
M-15515-22P/S	ATD 2040	R	F	Metal Tool	23	22	DSM
M-15515-25	ATD 2250	R	F	Co-axial	6	8	
M-15570-12	{ATR 1160 ATR 2160	I	R	NAS 1664 (REF. NAS 1599) Metal Functional Equivalent	2	12	JTA
		R	R	Metal Functional Equivalent	10	12	JTA
M-15570-16	{ATR 1107 ATR 2112	I	R	Metal Functional Equivalent	2	16	JTA
		R	R	Metal Functional Equivalent	10	16	JTA
M-15570-20	{ATR 1080 ATR 2080	I	R	Metal Functional Equivalent	2	20	JTA
		R	R	Metal Functional Equivalent	10	20	JTA
M-15570-22	ATD 2048	R	R	Metal Functional Equivalent	23	22	RSM-RTK
M-15570-22-1	{ATD 1035 ATD 2047	I	R	Metal Functional Equivalent	2	22	RSM-RTK
		R	R	Metal Functional Equivalent	10	22	RSM-RTK
	ATD 1035-135	I	R	Modified version of ATD 1035, 45° angle	2	22	RSM-RTK
M-15571	ATK 2115	R	R	NAS 1599, Unwired Contacts	17	12, 16, 20	JTA
M83723-31-12, } 16 & 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, modified version of ATWC 3312	-	-	
	ATDL 2050	R	R	MIL-C-38999, tweezer	10	22D	
<b>ELCO</b>							
	ASTRO TOOL #						
061742-04	ATD 1081	I	R	Metal Tool	2	20	
T-06-1877-02	ATE 2057	R	R	D11890977 Connector	8	20	


**ASTRO TOOL CORP.**

TOOL IDENTIFICATION NUMBERS		I/R	R/F	USAGE/DESCRIPTION	ILL.	GAGE	CONNECTOR SERIES
FLIGHT CONN.	ASTRO TOOL #						
716-1227-000 712-1229-000 708-1258-000 704-1260-000 700-1262-000	<b>ATF 1101</b>	I	R	<b>MIL-C-005015</b> Metal Tool	27	16	
	<b>ATF 1105</b>	I	R	Modified version of ATF 1101	2	16	
	<b>ATF 1144</b>	I	R	Metal Tool	27	12	
	<b>ATF 1160</b>	I	R	Modified version of ATF 1144	2	12	
	<b>ATF 1256</b>	I	R	Modified version of ATF 1260	2	8	
	<b>ATF 1260</b>	I	R	Metal Tool	27	8	
	<b>ATF 1359</b>	I	R	Modified version of ATF 1378	2	4	
	<b>ATF 1378</b>	I	R	Metal Tool	27	4	
	<b>ATF 1554</b> <b>ATF 1558</b>	I I	R R	Modified version of ATF 1558 Metal Tool	2 27	0 0	
716-1168-000 712-1172-000 708-1138-000 704-1134-000 700-1130-000	<b>ATF 2115</b>	R	F	<b>MIL-C-005015, SERIES 3400 &amp; MIL-C-81659</b> Front Release	5	16	
	<b>ATF 2162</b>	R	F	Front Release	5	12	
	<b>ATF 2255</b>	R	F	Front Release	5	8	
	<b>ATF 2336</b>	R	F	Front Release	5	4	
	<b>ATF 2518</b>	R	F	Front Release	5	0	
<b>G &amp; H TECH.</b>	<b>ASTRO TOOL #</b>						
847-101-COTO-1 & -2	<b>ATGH 1055</b>	I/R	R	Single Tip, No Wire Slot	23	22	847/848
847-101-COTO-3 & -4	<b>ATGH 1081</b>	I/R	R	Single Tip, No Wire Slot	23	20	847/848
847-101-COTO-5 & -6	<b>ATGH 1104</b>	I/R	R	Single Tip, No Wire Slot	23	16	847/848
847-101-COTO-7 & -10	<b>ATGH 2057</b>	I/R	R	Single Tip	23	22	847/848
847-101-COTO-8 & -11	<b>ATGH 2081</b>	I/R	R	Single Tip	23	20	847/848
847-101-COTO-9 & -12	<b>ATGH 2105</b>	I/R	R	Single Tip	23	16	847/848
866-1078-COTO-3	<b>ATGH 1048</b>	I & R	R	Single Tip, Straight with Slot	23	22	866
866-1078-COTO-4	<b>ATGH 1070</b>	I & R	R	Single Tip, Straight	23	20	866
882-94	<b>ATGH 2110</b>	R	R	Metal Tweezer	10	16	
885-277-COTO-001	<b>ATGH 2051</b>	R	R	MIL-C-38999, Breech Lok	10	22D	
885-277-COTO-002	<b>ATGH 2078</b>	R	R	MIL-C-38999, Breech Lok	10	20	
885-277-COTO-003	<b>ATGH 2109</b>	R	R	MIL-C-38999, Breech Lok	10	16	
998-062	<b>ATGH 1079</b>	I	R	NAS 1599 Connectors	23	20	843
998-063	<b>ATGH 2079</b>	R	R	NAS 1599 Connectors	23	20	843
998-102	<b>ATGH 1112</b>	I	R	NAS 1599 Connectors	23	16	843
998-103	<b>ATGH 1160</b>	I & R	R	NAS 1599 Connectors	1	12	843
998-104	<b>ATGH 1190</b>	I & R	R	NAS 1599 Connectors	1	8	843
998-105	<b>ATGH 1079</b>	I & R	R	NAS 1599 Connectors	23	20	843
998-142-001	<b>ATGH 2330</b>	R	R	Co-axial	27	Coax	
998-145-001	<b>ATGH 1050</b>	I	R	Metal Tweezer	10	22	847/848
998-145-002	<b>ATGH 2052</b>	R	R	Metal Tweezer	10	22	847/848
998-145-003	<b>ATGH 1076</b>	I	R	Metal Tweezer	10	20	847/848
998-145-004	<b>ATGH 2076</b>	R	R	Metal Tweezer	10	20	847/848
998-145-005	<b>ATGH 1101</b>	I	R	Metal Tweezer	10	16	847/848
998-145-006	<b>ATGH 2101</b>	R	R	Metal Tweezer	10	16	847/848


**ASTRO TOOL CORP.**

TOOL IDENTIFICATION NUMBERS		I/R	R/F	USAGE/DESCRIPTION	ILL.	GAGE	CONNECTOR SERIES
G & H TECH.	ASTRO TOOL #						
	ATGH 1071 ATGH 1077 ATGH 1109 ATGH 2049 ATGH 2054 ATGH 2075 ATGH 2077 ATGH 2080	I & R I I R R R R R	R R R R R R R R	Modified for Lockheed S-2406-30 Modified version of ATBX 1072 .66 tip length, MIL-C-38999 Modified version of ATBX 1108 .66 tip length, MIL-C-38999 Metal Tweezer Metal Tweezer Metal Tweezer Metal Tweezer Modified version of ATBX 2070 .66 tip length, MIL-C-38999	23 10 10 10 10 10 10 10	20 20 16 22 22 20 20 20	847/848 847/848 847/848 847/848
	ATGH 2103 ATGH 2104 ATGH 2108 ATGH 2160	R R R R	R R R R	Metal Tweezer NAS1599, 15° tip angle Modified version of ATBX 2103 .66 tip length, MIL-C-38999 Metal Tweezer	10 10 10 10	16 16 16 12	
<b>HUGHES</b>	<b>ASTRO TOOL #</b>						
TD-202-IT-000 TE-022-RT-001 TG-22-IT TG-22-RT THM-22-B000	AT 4003 ATH 2027 ATH 1053 ATH 2053 ATBX 2046	I R I R R	R F R R R	Deep Insertions G. D. Pomona P.C. Connector Jack Pins Metal Tweezer Metal Tweezer Metal Tweezer	2 8 10 10 10	20 22 22D 22D 22M	W EMS W W W
TM-016-IT-001 TM-016-IT-003 TM-016-RT-001 TM-016-RT-006 TR-22D-IT TR-22D-RT	AT 4002 or 4004 AT 4004 AT 5002 ATH 2103 ATH 1050 ATH 2050	I I R R I R	R R F F R R	Joggled Push-In Style Deep Insertion—MRS-MRE-MRA MRP Connector, Pins & Sockets Pins & Sockets Metal Tweezer #1035415 Metal Tweezer #1035416A	2 2 8 6 10 10	16 16 16 16 22D 22D	C-M-R MR MR M W W
TU-016-IT-002 TU-016-RT-000 TU-016-RT-006 TU-020-IT-002 TU-020-RT-002 TU-020-RT-006 TU-180-RT-000 TU-195-RT-000	ATH 1102 ATH 2120 ATH 2121 ATH 1067 AT 5001-S ATH 2088 ATH 2221 ATH 2206	I R R I R R R R	R F F R F F F F	Contacts UP 16Y16C000 Universal Contacts Pins & Sockets UR-UTE-UTS URS-UTE-UTS Pins & Sockets Co-ax RG 180/U Co-ax RG 195/U	2 8 6 1 8 6 6 6	16 16 16 20 20 20 8 8	U U U U U U U U
TW-020-IT-000 TW-020-RT-002 TW-020-RT-006 TW-022-IT-000 TW-022-IT-001 TW-022-IT-007 TW-022-RT-001 TW-022-RT-006	AT 4001 AT 5001 ATH 2088 ATH 1046 AT 4000 ATH 1052 AT 5000 ATH 2052	I R R I I I R R	R F F R R R F F	Pins & Sockets WMS-WMW-O-Line Pins & Sockets Pins & Sockets Pins & Sockets Pins & Sockets WSS 0244 P08-RN-549 Pins & Sockets	2 8 6 22 2 23 8 8	20 20 20 22 22 22 22 22	W W W W W W W W
652636 722698-328 722698-329 722699-224 722699-224-1 722699-224-2 722699-224-3	AT 5000 AT 5002 ATAMP 3070 ATH 3260 ATH 3261 & ATH 3262 & ATH 3263 &	R R	F F	WSS 0244P08—Airborn Pins & Sockets—Documented Transfer Tool Termipoint Clib Forming Tool Microelectronic Leads { Forming Pliers—To form leads before installing on circuit board	8 8 21 20 20	22 16	W MR


**ASTRO TOOL CORP.**

TOOL IDENTIFICATION NUMBERS		I/R	R/F	USAGE/DESCRIPTION	ILL.	GAGE	CONNECTOR SERIES
HUGHES	ASTRO TOOL #						
	ATH 1031	I	R	Special for General Dynamics	1	22	U
	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	8	20	
	ATH 2102	R	F	MIL-C-22857	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		
	ASTRO TOOL #						
	ATIR 1610	I & R	R	Metal Tweezer/AIRBORN	10	22	WTK
	ATIR 1610-L	I & R	R	Modified version of ATIR 1610 to .62 tips/AIRBORN	10	22	WTK
	ASTRO TOOL #						
KLIXON	ASTRO TOOL #						
	ATK 1052	I	R	Klixon circuit breaker contacts	1		
	ATK 1130	I	R	Installing Kit—MIL-C-26482, 26500, 26636 connectors	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	26	12,16,20	
	ASTRO TOOL #						
LOCKHEED	ASTRO TOOL #						
L525C19-24	ATL 1112	I	R	Tip used with L525C19-44 Handle	25	16	69
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	
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	
L525C19-59	ATL 2064	R	F	Tip used with L525C19-44 Handle	25	16	
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	
	ASTRO TOOL #						
MASTER SPEC.	ASTRO TOOL #						
800-P2	ATMS 2050	R	R	Modified version of ATBX 2046, Tip .8	10	22M	
	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	
	ATMS90562-1	R	F	MIL-C-22992, Class L Connector	—	4/0	
	ATMS90562-2	R	F	MIL-C-22992, Class L Connector	—	2/0	
	ATMS90562-3	R	F	MIL-C-22992, Class L Connector	—	1/0	
	ATMS90562-4	R	F	MIL-C-22992, Class L Connector	—	2	
	ATMS90562-5	R	F	MIL-C-22992, Class L Connector	—	4	
	ATMS90562-6	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	


**ASTRO TOOL CORP.**

TOOL IDENTIFICATION NUMBERS		I/R	R/F	USAGE/DESCRIPTION	ILL.	GAGE	CONNECTOR SERIES
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° angle	23	22	
90-0002-022	ATM 2052	R	F	Mini-Mate	8	22	
				<b>NAS 1599 CONNECTOR— NAS 1664 PLASTIC TOOLS</b>			
258-6018-16	ATR 2112	R	R	Metal Tweezer	10	16	
258-6019-16	ATR 1107	I	R	Joggled Tool	2	16	
259-6002-20	ATR 2080	R	R	Metal Tweezer	10	20	
5000-026-22	ATBX 2052	R	R	Metal Tweezer	10	22	
6500-001-20	{ATR 1080	I	R	Metal Functional Equivalent	2	20	
	{ATR 2080	R	R	Metal Functional Equivalent	10	20	
6500-001-16	{ATR 1107	I	R	Metal Functional Equivalent	2	16	
	{ATR 2112	R	R	Metal Functional Equivalent	10	16	
6500-001-12	{ATR 1160	I	R	Metal Functional Equivalent	2	12	
	{ATR 2160	R	R	Metal Functional Equivalent	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	ATR 2157	R	R	Modified version of ATR 2160, straight	10	12	
6500-028-16	ATR 2106	R	R	Modified version of ATR 2112, straight	10	16	
6500-028-20	ATR 2079	R	R	Modified version of ATR 2080, straight	10	20	
				<b>PLASTIC NAS 1664 EQUIVALENTS</b>			
6500-029-12	ATR 2160	R	R	Tweezer, 70° angle	10	12	
6500-029-16	ATR 2112-L	R	R	Tweezer, 70° angle	10	16	
6500-029-20	ATR 2080	R	R	Tweezer, 70° angle	10	20	
6500-030-12	ATGH 1160	I	R	Straight In-Line	1	12	
6500-030-16	ATGH 1112	I	R	Straight In-Line	23	16	
6500-030-20	ATGH 1079	I	R	Straight In-Line	23	20	
6500-045-20	{ATC 1071	I	R	{ Metal functional equivalent for	23	20	
	{ATC 2076	R	R	{ Hydraulic Research	10	20	
	ATM 1050	I	R	Special Close 90° Bend	23	22	
<b>MOLEX</b>	<b>ASTRO TOOL #</b>						
HT 2285	ATMO 2081	R	F	20 GA rolled contacts	6	20	
HT 2038	ATMO 2124	R	F	16 GA rolled contacts	6	16	
<b>NAT'L. AERO</b>	<b>ASTRO TOOL #</b>						
NAS 1664-12	{ATR 1160	I	R	Single Tip Tool	2	12	
	{ATR 2160	R	R	Metal Tweezer	10	12	
	ATR 1160-135	I	R	Modified version of ATR 1160, 45° angle	2	12	
	ATR 1153	I	R	Metal Tweezer	10	12	
	ATR 2160-S	R	R	Modified version of ATR 2160, straight	10	12	
NAS 1664-16	{ATR 1107	I	R	Single Tip Tool	2	16	
	{ATR 2112	R	R	Metal Tweezer	10	16	
	ATR 1107-135	I	R	Modified version of ATR 1107, 45° angle	2	16	
	ATR 1105	I	R	Metal 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	I	R	Single Tip Tool	2	20	
	{ATR 2080	R	R	Metal Tweezer	10	20	
	ATR 1080-135	I	R	Modified version of ATR 1080, 45° angle	2	20	
	ATR 1078	I	R	Metal 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	

Note: All above N.A.S. Tools Reference NAS 1599 Connector and MIL-C-83723





# ASTRO TOOL CORP.

TOOL IDENTIFICATION NUMBERS		I/R	R/F	USAGE/DESCRIPTION	ILL.	GAGE	CONNECTOR SERIES
POSITRONICS	ASTRO TOOL #						
9081	ATG 2103	R	F	Metal Tool	8	16	
9099	AT 4004	I	R	Metal Tool	2	16	
<b>S.A.E.</b>							
	<b>ASTRO TOOL #</b>						
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	2	20	
	ATSE 2049	R	R	Metal Tweezer	10	22	
	ATSE 2112	R	R	5015 connector, Tweezer	10	16	

<b>TRANSITRON</b>	<b>ASTRO TOOL #</b>						
PCD 91-023	ATT 1059	I	R	Metal tool	1	22	
	ATT 1060-B	I	R	Metal tool	1	22	
	ATT 1060-SGA	I	R	Metal Tweezer			
PCD 91-021	ATT 2059	R	R	Metal Tweezer	10	22	
	ATT 2059-S	R	R	Modified version of ATT 2059 straight	10	22	
	ATT 2060-S	R	R	Metal Tweezer, Straight	10	22	
<b>U.S. COMPONENTS</b>							
	<b>ASTRO TOOL #</b>						
R.T.2260	ATBX 2046	R	R	Metal Tweezer	10	22D	
	ATUS 1050	I	R	#2260 contacts	23	22	
	ATUS 2052	R	F	Pins & Sockets	8	22	
<b>VIKING</b>							
	<b>ASTRO TOOL #</b>						
000407-0003	ATV 1086	I	R	Metal Tool	1	20	
000407-0004	ATV 2073	R	F	Metal Tool	8	20	
000407-0006	AT 2016	R	F	Miniature relay sockets	6	16	
000407-0027	ATA 1101 or	I	R	MIL-R-6106	27	16	
	AT 1000-16	I	R	MIL-R-6106	2	16	
000407-0031	ATV 2052	R	F	Metal Tool	8	22	
000407-0603	ATV 2073	R	F	Revision B	8	20	
980-0007-002	ATR 1107	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	8	20	
	ATV 3125	R	F	Impact Tool	22	20	


**ASTRO TOOL CORP.**

TOOL IDENTIFICATION NUMBERS		I/R	R/F	USAGE/DESCRIPTION	ILL.	GAGE	CONNECTOR 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	
<b>WINCHESTER</b>	<b>ASTRO TOOL #</b>						
107-1001	ATW 2104	R	F	Metal Tool	8	16	MRAC
107-1005	AT 5002	R	F	Functional Equivalent ATH 2102	8	16	MRAC
107-1007	ATW 2025	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	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 one end, blade on other	-	-	
	ATWC 3312	-	-	12" long phenolic 5/16" dia., point one end, blade on other	-	-	
	<b>ASTRO TOOL #</b>						
	ATX 2001	R		MIL-C-38999 Uncrimped Contacts	16	12	
	ATX 2002	R		MIL-C-38999 Uncrimped Contacts	16	16	
	ATX 2003	R		MIL-C-38999 Uncrimped Contacts	16	20	
	ATX 2004	R		MIL-C-38999 Uncrimped Contacts	16	22	
	ATX 2005	R		MIL-C-38999 Uncrimped Contacts	16	22M	
	ATX 2006	R		NAS 1599 Uncrimped Contacts	16	12	
	ATX 2007	R		NAS 1599 Uncrimped Contacts	16	16	
	ATX 2008	R		NAS 1599 Uncrimped Contacts	16	20	
	ATX 2009	R		Deutsch RSM & RTK Uncrimped Contacts	16	22	
	ATX 2010	R		Cannon D*C Uncrimped Contacts	16	20	
	ATX 2011	R		Cannon CK, DPX2MA, DPKB Uncrimped Contacts	16	22	
	ATX 2012	R		Douglas 2022B Uncrimped Contacts	16	20, 22	
	ATX 2013	R		G & H Tech. Uncrimped Contacts (ATGH 2054)	16	22	
	ATX 2014	R		MIL-C-38999 Uncrimped Contacts	16	22D	




**ASTRO TOOL CORP.**

SPECIAL SERVICE TOOLS		USAGE
ASTRO TOOL #	NOMENCLATURE	
ATA 3120	Wire Contact Clip	Insertion & removal clip for 16 GA.
ATAMP 3040 ATAMP 3070	Miniclip Transfer Tool Transfer Tool Kit HAC #722698-329	Transfers terminal clips for .025 square pins. Transfers AMP terminal clips from gun to terminal's single wires.
ATBX 3050 ATBX 3-6147-1	Special Removal Tool Special Connector Plier	Special rear release tool for 22M/D contact using .060 dia. wire. Assembly & disassembly of connectors.
ATC 2046-100 ATC 3074 ATC 3075 ATC 3076 ATC 3077 ATC 3078	Compliant Pin Tool Retention Test Tool Retention Test Tool Retention Test Tool Retention Test Tool Retention Test Tool	Insertion/removal of compliant pins. Tests contact retention in 22 GA Connector. Tests contact retention in 20 GA Connector. Tests contact retention in 16 GA Connector. Tests contact retention in 12 GA Connector. Tests pin and socket contact retention in co-axial connector.
The above numbers cover basic sizes. There are many variations of each number depending on the connector series and application. Consult factory for special application.		
ATD 3312	Wire Comb	Six inch long phenolic 5/16" diameter with a point on one end, a blade on the other end.
ATH 3037-12 ATH 3037-18	Contact Guide Contact Guide	Twelve inch long guide used on rear insert 22 GA contacts. Eighteen inch long guide used on rear insert 22 GA contacts.
ATH 3260, 3261, 3262 & 3263	Forming Plier	Forms joggled leads for flatpack circuits while removing from carrier—HAC P/N 772699-224, -1, -2, & -3.
ATWC 3032 ATWC 3312	Wire Comb Wire Comb	Eight inch long metal comb with a hook on one end, a blade on the other end. Twelve inch long phenolic 5/16" diameter with a point on one end, a blade on the other end.


**ASTRO TOOL CORP.**

TOOL IDENTIFICATION NUMBERS							
MILITARY STANDARD	ILL.	ASTRO TOOL #	ASTRO FUNCTIONAL ALTERNATIVE	ILL.	I/R	COMMENTS	
MS3156-16	28	SEE M81969/1	{ ATR 1107 and ATR 2112	2	I	Used on MIL-C-81659 Series 2	
MS3156-20	28	SEE M81969/1		10	R		
MS3156-22	28	SEE M81969/1		2	I		
			{ ATC 1072 and ATC 2076	10	R		
			{ ATC 1054 and ATC 2053	2	I		
				10	R		
MS3159-12	17	ATD 2150		17	R	MIL-C-81511 Series 3 & 4, 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			MIL-C-5015 Rear Release Contacts	
MS3165-8	28	SEE M81969/29	ATC 2281	19	R		
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 1 & 2 Pins & Sockets	
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 1 & 2 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 1 & 2 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							
MS3447-12	28	SEE M81969/14	{ ATR 1160 and ATR 2160	2	I	NAS 1599 Connector Series	
MS3447-16	28	SEE M81969/14		{ ATR 1107 and ATR 2112	10		R
MS3447-20	28	SEE M81969/14	{ ATR 1080 and ATR 2080	2	I		
				10	R		
MS3448-001	17	ATK 2115		17	R	NAS 1599 Unwired contacts	
MS3448-001A	17	0161-0031		17	R	Tip Only	
MS3448-001B	17	ATMS 2073		17	R	Single Tip Tool	
MS3448-001C	17	0160-0041		17	R	Tip Only	
		ATMS 2101		17	R	Single Tip Tool	
		0159-0051		17	R	Tip Only	
		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 ATC 2076	2	I	MIL-C-24308 Connector Series	
				10	R		


**ASTRO TOOL CORP.**

TOOL IDENTIFICATION NUMBERS						COMMENTS
MILITARY STANDARD	ILL.	ASTRO TOOL #	ASTRO FUNCTIONAL ALTERNATIVE	ILL.	I/R	
MS24256A-12	27	ATA 1144	AT 1000-12	2	I	MIL-C-26482, 26500 & 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 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	MIL-C-38300 ultra-mate Connectors
MS24256RH-20	-	ATMS 3080		-	R	
MS27495A-12	10	ATBX 1157	ATBX 1154	2	I	MIL-C-38999 Connectors-"S" designates straight in-line version
MS27495A-16	10	ATBX 1108	ATR 1107	2	I	
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	
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 ATR 2160	2 10	I R	Astro Metal Equivalents for Plastic Tools
M83723-16	28	SEE M81969/14	{ ATR 1107 and ATR 2112	2 10	I R	
M83723-20	28	SEE M81969/14	{ ATR 1080 and ATR 2080	2 10	I 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	


**ASTRO TOOL CORP.**

TOOL IDENTIFICATION NUMBERS					I/R	COMMENTS
MILITARY STANDARD	ILL.	ASTRO TOOL #	ASTRO FUNCTIONAL ALTERNATIVE	ILL.		
MS90456-0	5	ATF 2518		5	R	MIL-C-005015 Series 3400 & MIL-C-81659 (16 GA only) 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 90562-1		-	R	MIL-C-22992, Class L Connector, MS90566, MS90559 & MS90560 Contacts
MS90562-2	-	ATMS 90562-2		-	R	
MS90562-3	-	ATMS 90562-3		-	R	
MS90562-4	-	ATMS 90562-4		-	R	
MS90562-5	-	ATMS 90562-5		-	R	
MS90562-6	-	ATMS 90562-6		-	R	


**ASTRO TOOL CORP.**

CURRENT DOCUMENT	ASTRO TOOL #	I/R	ILL.	GAGE	SUPERCEDED DOCUMENT
MIL-I-81969/1-01	<b>M81969/1-01</b>	I/R	28	22	MS3156-22
MIL-I-81969/1-02	<b>M81969/1-02</b>	I/R	28	20	MS3156-20, M24308/18-2
MIL-I-81969/1-03	<b>M81969/1-03</b>	I/R	28	16	MS3156-16, M24308/18-3
MIL-I-81969/1-04	<b>M81969/1-04</b>	I/R	28	22D	M24308/18-1
*For Astro's Metal Equivalents See Page 79					
MIL-I-81969/2-01	<b>ATML 0201</b>	I	4	23	MS3323-22
MIL-I-81969/2-02	<b>ATML 0202</b>	I	4	20	MS3323-20
MIL-I-81969/2-03	<b>ATML 0203</b>	I	4	16	MS3323-16
MIL-I-81969/2-04	<b>ATML 0204</b>	I	4	12	MS3323-12
MIL-I-81969/3-01	<b>ATML 0301</b>	R	7	23	MS3344-23
MIL-I-81969/3-02	<b>ATML 0302</b>	R	7	20	MS3344-20
MIL-I-81969/3-03	<b>ATML 0303</b>	R	7	16	MS3344-16
MIL-I-81969/3-04	<b>ATML 0304</b>	R	7	12	MS3344-12
MIL-I-81969/3-05	<b>ATML 0305</b>	R	3	23	MS3342-23
MIL-I-81969/3-06	<b>ATML 0306</b>	R	3	20	MS3342-20
MIL-I-81969/3-07	<b>ATML 0307</b>	R	3	16	MS3342-16
MIL-I-81969/3-08	<b>ATML 0308</b>	R	3	12	MS3342-12
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	<b>ATML 0801B</b>	I	10	22M	MS27495A22M, M55302/79-01
/8-02	<b>ATML 0802B</b>	R	10	22M	MS27495R22M, M55302/79-02
/8-03	<b>ATML 0803B</b>	I	10	22	MS27495A22
/8-04	<b>ATML 0804B</b>	R	10	22	MS27495R22
/8-05	<b>ATML 0805B</b>	I	10	20	MS27495A20
/8-06	<b>ATML 0806B</b>	R	10	20	MS27495R20
/8-07	<b>ATML 0807B</b>	I	10	16	MS27495A16
/8-08	<b>ATML 0808B</b>	R	10	16	MS27495R16
/8-09	<b>ATML 0809B</b>	I	10	12	MS27495A12
/8-10	<b>ATML 0810B</b>	R	10	12	MS27495R12
/8-11	<b>ATML 0811B</b>	I	10	10	
/8-12	<b>ATML 0812B</b>	R	10	10	
/8-13	<b>ATML 0813B</b>	I	10	8	
/8-14	<b>ATML 0814B</b>	R	10	8	
/8-205	<b>ATML 08205B</b>	I	10	20	
/8-206	<b>ATML 08206B</b>	R	10	20	
/8-207	<b>ATML 08207B</b>	I	10	16	
/8-208	<b>ATML 08208B</b>	R	10	16	
/8-209	<b>ATML 08209B</b>	I	10	12	
/8-210	<b>ATML 08210B</b>	R	10	12	


**ASTRO TOOL CORP.**

CURRENT DOCUMENT	ASTRO TOOL #	I/R	ILL.	GAGE	SUPERCEDED DOCUMENT
MIL-I-81969/9-01		R			MIL-C-55302/28-01
MIL-I-81969/10-01 MIL-I-81969/10-02		I R			MIL-C-55302/86
MIL-I-81969/11-01		R			MIL-C-28731/22
MIL-I-81969/12-01 MIL-I-81969/12-02	ATML 1201 ATML 1202	I/R I/R	10 10	22 22	- -
MIL-I-81969/13-01	ATML 1301	I			MIL-C-28731/21
MIL-I-81969/14-01 MIL-I-81969/14-02  /14-03  /14-04 /14-05 /14-06 /14-07 /14-08 /14-09 /14-10 /14-11 /14-12	M81969/14-01 M81969/14-02  M81969/14-03  M81969/14-04 M81969/14-05 M81969/14-06 M81969/14-07 M81969/14-08 M81969/14-09 M81969/14-10 M81969/14-11 M81969/14-12	I/R I/R  I/R  I/R I/R R R R I/R I/R I/R R	28 28  28  28 28 28 28 28 28 28 28 28 28	22D 20  16  12 10 8 4 0 22 20 20 8	MS27534-22D NAS 1664-20, MS3447-20, M83723/31-20, MS27534-20 NAS 1664-16, MS3447-16, M83723/31-16, MS27534-16 NAS 1664-12, MS3447-12, M83723/31-12, - -
*For Astro's Metal Equivalents See Page 83					
MIL-I-81969/15-01 /15-02 /15-03	ATML 1501 ATML 1502 ATML 1503	R R R	19 19 19	8 4 0	MS3483-1 MS3483-2 MS3483-3
MIL-I-81969/16-01 /16-02 /16-03 /16-04	M81969/16-01 M81969/16-02 M81969/16-03 M81969/16-04	I/R I/R I/R I/R	28 28 28 28	20 16 12 22	MS3160-20 MS3160-16 MS3160-12 MS3160-22
MIL-I-81969/17-01 /17-02 /17-03 /17-04 /17-05 /17-06 /17-07 /17-08 /17-09	ATML 1701 ATML 1702 ATML 1703 ATML 1704 ATML 1705 ATML 1706 ATML 1707 ATML 1708 ATML 1709	I I I I I I I I I	27 27 27 27 27 27 27 27 27	16 12 20 16 12 8 4 0 20	MS90455-16 MS90455-12 MS24256-A20 MS24256-A16 MS24256-A12 MS90455-8 MS90455-4 MS90455-0 MS24256-B20
MIL-I-81969/18-01 /18-02	ATML 1801 ATML 1802	I I	1 1	16,20 22	MS17805
MIL-I-81969/19-01 /19-02 /19-03 /19-04 /19-05 /19-06 /19-07 /19-08 /19-09 /19-10 /19-11	ATML 1901 ATML 1902 ATML 1903 ATML 1904 ATML 1905  ATML 1907 ATML 1908 ATML 1909 ATML 1910 ATML 1911	R R R R R  R R R R R	5 5 5 5 5  6 6 6 - -	16 12 8 4 0  20 16 12 20 16	MS90456-16 MS90456-12 MS90456-8 MS90456-4 MS90456-0  MS24256-R20 MS24256-R16 MS24256-R12 MS24256-RH20 MS24256-RH16

**ASTRO TOOL CORP.**

CURRENT DOCUMENT	ASTRO TOOL #	I/R	ILL.	GAGE	SUPERCEDED DOCUMENT
MIL-I-81969/20-01 /20-02	ATML 2001 ATML 2002	R R	7	16,20 22	MS17806
MIL-I-81969/21-01	ATML 2101	I/R	-		-
MIL-I-81969/22-01		R	-	16,20	-
MIL-I-81969/23-01 /23-02 /23-03 /23-04		I I I I		16,20 16,20 16,20 16,20	- - - -
MIL-I-81969/24-01		R			-
MIL-I-81969/25-01 /25-02 /25-03 /25-04 /25-05 /25-06		I/R I/R I/R I/R I/R		18 18 16 16 16 16	
MIL-I-81969/26-01		R			-
MIL-I-81969/27-01 /27-02 /27-03 /27-04 /27-05 /27-06	ATML 2701 ATML 2702 ATML 2703 ATML 2704 ATML 2705 ATML 2706	R R R R R R	- - - - - -	4/0 2/0 1/0 2 4 6	MS90562-1 MS90562-2 MS90562-3 MS90562-4 MS90562-5 MS90562-6


**ASTRO TOOL CORP.**

CURRENT DOCUMENT	ASTRO TOOL #	I/R	ILL.	GAGE	SUPERCEDED DOCUMENT
MIL-I-81969/28-01	<b>ATML 2801</b>	R	-	5,9	MS3178-001
/28-02	<b>ATML 2802</b>	R	-	12	MS3178-002
/28-03	<b>ATML 2803</b>	R	-	8	-
MIL-I-81969/29-01	<b>M81969/29-01</b>	R	-	16	MS3165-16
/29-02	<b>M81969/29-02</b>	R	-	8	MS3165-8, M83723/32-08
/29-03	<b>M81969/29-03</b>	R	-	4	MS3165-4, M83723/32-04
/29-04	<b>M81969/29-04</b>	R	-	0	MS3165-0, M83723/32-00
*For Astro's Metal Equivalents See Page 83					
MIL-IO-81969/30B-01	<b>ATML 3001B</b>	R	17	22	MS3159-22
/30B-02	<b>ATML 3002B</b>	R	17	20	MS3159-20
/30B-03	<b>ATML 3003B</b>	R	17	16	MS3159-16
/30B-04	<b>ATML 3004B</b>	R	17	12	MS3159-12
/30B-05	<b>ATML 3005B</b>	R	17	20	MS3448-001A
/30B-06	<b>ATML 3006B</b>	R	17	16	MS3448-001B
/30B-07	<b>ATML 3007B</b>	R	17	12	MS3448-001C
/30B-08	<b>ATML 3008B</b>	R	17	22D	
/30B-09	<b>ATML 3009B</b>	R	17	22M	
/30B-10	<b>ATML 3010B</b>	R	17	22	
/30B-11	<b>ATML 3011B</b>	R	17	20	
/30B-12	<b>ATML 3012B</b>	R	17	16	
/30B-13	<b>ATML 3013B</b>	R	17	12	
/30B-19	<b>ATML 3019B</b>	R	17	22D-12	
/30B-20	<b>ATML 3020B</b>	R	17	--	
/30B-21	<b>ATML 3021B</b>	R	17	22	
/30B-22	<b>ATML 3022B</b>	R	17	20	
/30B-23	<b>ATML 3023B</b>	R	17	16	
/30B-24	<b>ATML 3024B</b>	R	17	12	
/30B-25	<b>ATML 3025B</b>	R	17	20	
/30B-26	<b>ATML 3026B</b>	R	17	16	
/30B-27	<b>ATML 3027B</b>	R	17	12	
/30B-28	<b>ATML 3028B</b>	R	17	22D	
/30B-29	<b>ATML 3029B</b>	R	17	22M	
/30B-30	<b>ATML 3030B</b>	R	17	22	
/30B-31	<b>ATML 3031B</b>	R	17	20	
/30B-32	<b>ATML 3032B</b>	R	17	16	
/30B-33	<b>ATML 3033B</b>	R	17	12	
/30B-34	<b>ATML 3034B</b>	R	17	22-12	
/30B-35	<b>ATML 3035B</b>	R	17	20-12	
/30B-36	<b>ATML 3036B</b>	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
MIL-I-81969/31-01					MS18137-20-1
/31-02		I			MS18137-20-2
/31-03		R			MS18137-20-3
/31-04		R			MS18137-20-4
MIL-I-81969/31-05		I			MS14035-02
/31-06		I			MS14035-03
/31-07		R			MS14035-01
/31-08		I			MS14036-01
/31-09		I			MS14036-02
/31-10		I			MS14035-03




**ASTRO TOOL CORP.**

CURRENT DOCUMENT	ASTRO TOOL #	I/R	ILL.	GAGE	SUPERCEDED DOCUMENT
MIL-I-81969/32		R			
MIL-I-81969/33-01 /33-02	<b>ATML 3301</b> <b>ATML 3302</b>	I I		20 20	
MIL-I-81969/34-01	<b>ATML 3401</b>	R		20	
MIL-I-81969/38-01 /38-02 /38-03 /38-04 /38-05 /38-06 /38-07 /38-08 /38-09 /38-10 /38-11 /38-12 /38-13 /38-14 /38-15 /38-16 /38-17 /38-18					
MIL-I-81969/39-01	<b>M81969/39-01</b>	I/R	28	20	


**ASTRO TOOL CORP.**

PLASTIC INSTALLATION & REMOVAL TOOLS			APPLICATION REFERENCE	ASTRO TOOL METAL EQUIVALENT
MANUFACTURER	MANUFACTURERS P/N	COLOR CODE		
<b>AMP</b>				<b>ASTRO</b>
	91066-1	{ Black-Ins. White-Rem.	MS3156-22 MS3156-22	ATC 1054 ATC 2053
	91066-4	{ Red-Ins. White-Rem.	MS3156-20 MS3156-20	ATC 1071 ATC 2071
	91066-3	{ Blue-Ins. White-Rem.	MS3156-16 MS3156-16	ATR 1107 ATR 2112
	91067-1	{ Black-Ins. White-Rem.	MS27534-22M MS27534-22M	ATBX 1048 ATBX 2046
	91067-2	{ Yellow-Ins. White-Rem.	MS27534-22 MS27534-22	ATBX 1055 ATBX 2057
<b>AMPHENOL</b>				<b>ASTRO</b>
	294-108	{ Red-Ins. White-Rem.	NAS 1664-20 NAS 1664-20	ATR 1080 ATR 2080
	294-109	{ Blue-Ins. White-Rem.	NAS 1664-16 NAS 1664-16	ATR 1107 ATR 2112
	294-110	{ Yellow-Ins. White-Rem.	NAS 1664-12 NAS 1664-12	ATR 1160 ATR 2160
<b>BENDIX</b>				<b>ASTRO</b>
	MS27534-22D	{ Black-Ins. White-Rem.	JT/LJT,MIL-C 38999 JL/LJT,MIL-C 38999	ATBX 1048 ATBX 2046
	MS27534-22	{ Brown-Ins. White-Rem.	JT/LJT,MIL-C 38999 JL/LJT,MIL-C 38999	ATBX 1058 ATBX 2057
	MS27534-20	{ Red-Ins. White-Rem.	JT/LJT,MIL-C 38999 JT/LJT,MIL-C 38999	ATBX 1072 ATBX 2070
	MS27534-16	{ Blue-Ins. White-Rem.	JT/LJT,MIL-C 38999 JT/LJT,MIL-C 38999	ATBX 1108 ATBX 2103
	MS27534-12	{ Yellow-Ins. White-Rem.	JT/LJT,MIL-C 38999 JT/LJT,MIL-C 38999	ATBX 1157 ATBX 2155
<b>BURNDY</b>				<b>ASTRO</b>
	RXT 22-10	{ Red-Ins. White-Rem.		ATR 1080 ATR 2080
	RXT 16-1	{ Blue-Ins. White-Rem.		ATR 1107 ATR 2112
	RXT 12-1	{ Yellow-Ins. White-Rem.		ATR 1160 ATR 2160


**ASTRO TOOL CORP.**

PLASTIC INSTALLATION & REMOVAL TOOLS			APPLICATION REFERENCE	ASTRO TOOL METAL EQUIVALENT
MANUFACTURER	MANUFACTURERS P/N	COLOR CODE		
<b>CANNON</b>				<b>ASTRO</b>
	CET-0-1		MIL-C-005015 Series	<b>ATC 2565</b>
	CET-4-8		MIL-C-005015 Series	<b>ATC 2526</b>
	CET-8-2		MIL-C-005015 Series	<b>ATC 2281</b>
	CET-12-4		DPD	<b>ATR 2160</b>
	CET-16-9		DPJ	<b>ATR 2112</b>
	CET-20-8	Red-Rem.	83723-20	<b>ATR 2080</b>
	CET-20-11	Green-Rem.	D*MA	<b>ATC 2071</b>
	CET-20-11HD	Green-Rem.	D*MA	<b>ATC 2076</b>
	CET-20-14		DFD*MA	<b>ATR 2080</b>
	CET-C8		MIL-C-005015 Series	<b>ATC 2281</b>
	CIET 12	{ Yellow-Ins. White-Rem.	NAS 1664-12	<b>ATR 1160</b>
	CIET 16	{ Blue-Ins. White-Rem.	NAS 1664-12	<b>ATR 2160</b>
	CIET 20	{ Red-Ins. White-Rem.	NAS 1664-16	<b>ATR 1107</b>
	CIET 20-18	{ -Ins. White-Rem.	NAS 1664-16	<b>ATR 2112</b>
	CIET 20HD	{ -Ins. White-Rem.	NAS 1664-20	<b>ATR 1080</b>
	CIET 20HDL	{ -Ins. White-Rem.	NAS 1664-20	<b>ATR 2080</b>
	CIET 22	{ Yellow-Ins. White-Rem.	D*C	<b>ATC 1081</b>
	CIET 22D		D*C	<b>ATC 2076</b>
			D*C	<b>ATC 1076</b>
			D*C	<b>ATC 1076</b>
			D*C	<b>ATC 2076</b>
			D*C	<b>ATC 1076-L</b>
			D*C	<b>ATC 2076-L</b>
			DPX*MA	<b>ATC 1054</b>
			{ 38999 38999	<b>ATC 2053</b>
				<b>ATBX 1049</b>
				<b>ATBX 2046</b>
<b>DEUTSCH</b>				<b>ASTRO</b>
	81515-23	{ Yellow-Ins. White-Rem.	81511 3 & 4	<b>ATD 1049</b>
	81515-20	{ Red-Ins. White-Rem.	81511 3 & 4	<b>ATD 2047</b>
	81515-16	{ Blue-Ins. White-Rem.	81511 3 & 4	<b>ATD 1061</b>
	M15570-12	{ Yellow-Ins. White-Rem.	81511 3 & 4	<b>ATD 2062</b>
	M15570-16	{ Blue-Ins. White-Rem.	83723	<b>ATD 1094</b>
	M15570-20	{ Red-Ins. White-Rem.	83723	<b>ATD 2094</b>
			83723	<b>ATR 1160</b>
			83723	<b>ATR 2160</b>
			83723	<b>ATR 1107</b>
			83723	<b>ATR 2112</b>
			83723	<b>ATR 1080</b>
			83723	<b>ATR 2080</b>
	M15570-22	{ Green-Ins. White-Rem.	83723	<b>ATC 1054</b>
	M1557022-1	{ Yellow-Ins. White-Rem.	83723	<b>ATD 2048</b>
			83723	<b>ATD 1035</b>
			83723	<b>ATD 2047</b>


**ASTRO TOOL CORP.**

PLASTIC INSTALLATION & REMOVAL TOOLS			APPLICATION REFERENCE	ASTRO TOOL METAL EQUIVALENT
MANUFACTURER	MANUFACTURERS P/N	COLOR CODE		
<b>MATRIX</b>				<b>ASTRO</b>
	6500-001-12	{ Yellow-Ins. { White-Rem.		ATR 1160
	6500-018-0	Yellow-Rem.	MS3165-0	ATR 2160
	6500-018-4	Blue-Rem.	MS3165-4	ATC 2565
	6500-018-8	Red-Rem.	MS3165-8	ATC 2426
				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. { White-Rem.		ATC 1071
				ATC 2076
<b>TRANSITRON</b>				<b>ASTRO</b>
	91-021	White-Rem.		ATT 2059
	91-023	Green-Ins.		ATT 1059
<b>MIL-C</b>				<b>ASTRO</b>
	83723/31-12	{ Yellow-Ins. { White-Rem.	83723	ATML 08209B
	83723/31-16	{ Blue-Ins. { White-Rem.	83723	ATML 08210B
	83723/31-20	{ Red-Ins. { White-Rem.	83723	ATML 08207B
	83723/31-22	{ Brown-Ins. { White-Rem.	83723	ATML 08208B
	83723/31-22D	{ Black-Ins. { White-Rem.	83723	ATML 08205B
			83723	ATML 08206B
			83723	ATBX 1058
			83723	ATBX 2057
			83723	ATBX 1048
			83723	ATBX 2046


**ASTRO TOOL CORP.**

PLASTIC INSTALLATION & REMOVAL TOOLS					
MIL #	PART NUMBER	COLOR CODE	SIZE	APPLICATION	ASTRO TOOL METAL EQUIVALENT
MIL-I	M81969/1-01	Green-Ins. White-Rem.	22	MIL-C-24308 MIL-C-81659 Series II	ATC 1054 ATC 2053
*Plastic body with metal tips	M81969/1-02	Red-Ins. White-Rem.	20	MIL-C-24308 MIL-C-81659 Series II	ATC 1076-L ATC 2076-L
	M81969/1-03	Blue-Ins. White-Rem.	16	MIL-C-81659 Series II	ATR 1105 ATR 2112
	M81969/1-04	Green-Ins. White-Rem.	22D	MIL-C-24308	-


**ASTRO TOOL CORP.**

PLASTIC INSTALLATION & REMOVAL TOOLS			SIZE	APPLICATION	ASTRO TOOL METAL EQUIVALENT
MIL #	PART NUMBER	COLOR CODE			
	M81969/14-01	Green-Ins. White-Rem.	22D	MIL-C-38999 MIL-C-24308 MIL-C-83733 MIL-T-81714 MIL-C-55302/68/69	<b>ATML 0801B (Ins.)</b> <b>ATML 0802B (Rem.)</b>
	M81969/14-02	Red-Ins. White-Rem.	20	MIL-C-38999	<b>ATML 0805B (Ins.)</b> <b>ATML 0806B (Rem.)</b>
				MIL-C-26482 Series II MIL-C-81703 Series III MIL-C-83723 Series I & III MIL-C-83733 MIL-T-81714 (Size 20 & 22)	<b>ATR 1078 (Ins)</b> <b>ATR 2080 (Rem)</b> <b>ATML 08205B (Ins.)</b> <b>ATML 08206B (Rem.)</b>
	M81969/14-03	Blue-Ins. White-Rem.	16	MIL-C-38999	<b>ATML 0807B (Ins)</b> <b>ATML 0808B (Rem)</b>
				MIL-C-5015 (MS3450 Series) MIL-C-26482 Series II MIL-C-81703 Series III MIL-C-83723 MIL-T-81714 MIL-C-83733 MIL-C-81659	<b>ATR 1105 (Ins)</b> <b>ATR 2112 (Rem)</b> <b>ATML 08207B (Ins.)</b> <b>ATML 08208B (Rem.)</b>


**ASTRO TOOL CORP.**

PLASTIC INSTALLATION & REMOVAL TOOLS			SIZE	APPLICATION	ASTRO TOOL METAL EQUIVALENT
MIL #	PART NUMBER	COLOR CODE			
	M81969/14-04	Yellow-Ins. White-Rem.	12	MIL-C-38999	ATML 0809B (Ins.) ATML 0810B (Rem.)
				MIL-C-5015 (MS3450 Series) MIL-C-81703 Series III MIL-T-81714 Series III MIL-C-83733 MIL-C-83723 MIL-C-26482-Series II MIL-C-81659	ATR 1153 (Ins.) ATR 2160 (Rem.) ATML 08209B (Ins.) ATML 08210B (Ins.)
	M81969/14-05	Gray-Ins. White-Rem.	10	MIL-C-38999	ATML 0811B (Ins.) ATML 0812B (Rem.)
	M81969/14-06	Red-Rem.	8	MIL-C-83723 MIL-C-5015	ATML 0813B (Ins.) ATML 0814B (Rem.)
				Suggested Application	Suggest ATML 1501
	M81969/14-07	Blue-Rem.	4	MIL-C-83723 MIL-C-5015	Suggest ATML 1502
	M81969/14-08	Yellow-Rem.	0	MIL-C-83723 MIL-C-5015	Suggest ATML 1503
	M81969/14-09	Brown-Ins. White-Rem.	22	MIL-C-55302/169, /171 only	ATML 0803B (Ins.) ATML 0804B (Rem.)
	M81969/14-10	Red-Ins. Orange-Rem.	20	MIL-C-38999	ATML 0805B (Ins.) ATML 0806B (Rem.)
	M81969/14-11	Red-Ins. White-Rem.	20	MIL-C-26482 Series II MIL-C-81703 Series III MIL-C-83723 Series I & III MIL-C-83733 MIL-T-81714 (Size 20, 22)	ATML 08205B (Ins.) ATML 08206B (Rem.)
	M81969/14-12	Green-Rem.	8	MIL-C-38999	ATML 0813B (Ins.) ATML 0814B (Rem.)


**ASTRO TOOL CORP.**

PLASTIC INSTALLATION & REMOVAL TOOLS			SIZE	APPLICATION	ASTRO TOOL METAL EQUIVALENT
MIL #	PART NUMBER	COLOR CODE			
	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. White-Rem.		MIL-C-24308 (Size 20)	Suggest: { ATC 1072 ATC 2076




**ASTRO TOOL CORP.**

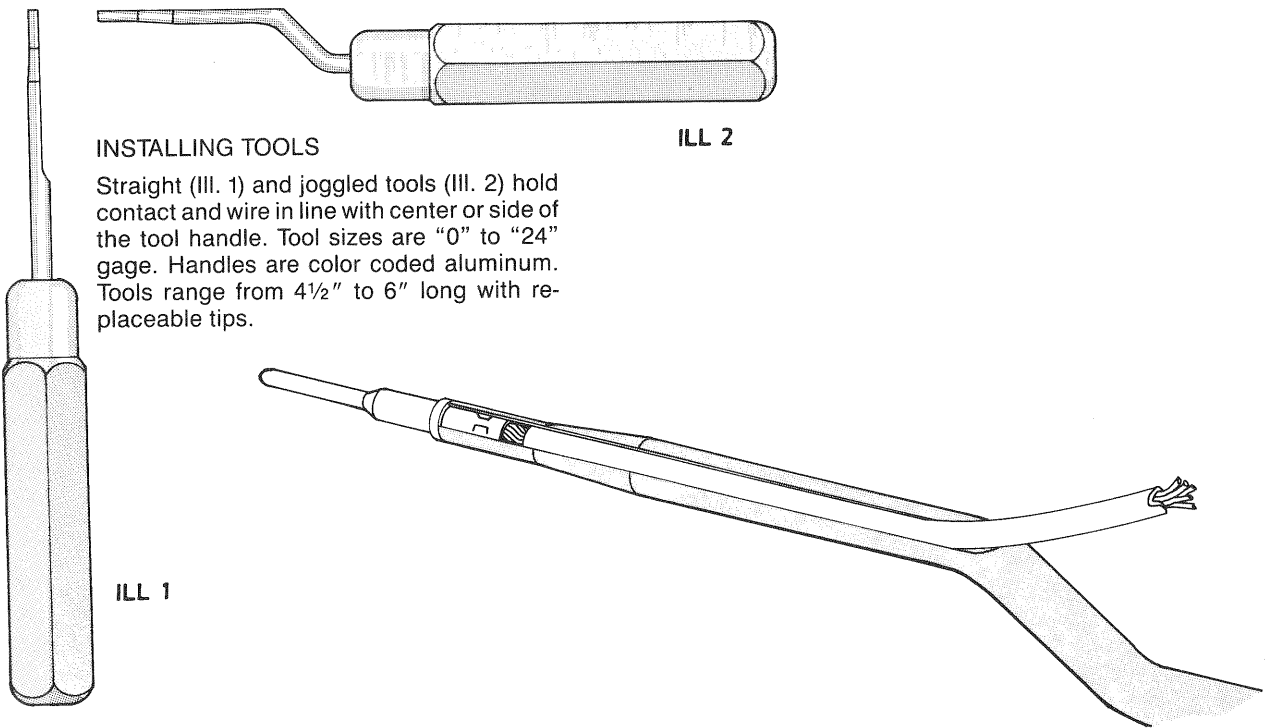
PLASTIC INSTALLATION & REMOVAL TOOLS			APPLICATION REFERENCE	ASTRO TOOL METAL EQUIVALENT
MIL #	SUPERCEDED P/N	COLOR CODE		
MIL-I				ASTRO
M81969/29	MS3165-0		MIL-C-5015	ATC 2565
	MS3165-4		MIL-C-5015	ATC 2426
	MS3165-8		MIL-C-5015	ATC 2281
M81969/14	MS27534-12	{ White-Rem. { Yellow-Ins.	MIL-C-38999 MIL-C-38999	ATBX 2155 ATBX 1157
	MS27534-16	{ White-Rem. { Blue-Ins.	MIL-C-38999 MIL-C-38999	ATBX 2103 ATBX 1108
	MS27534-20	{ White-Rem. { Red-Ins.	MIL-C-38999 MIL-C-38999	ATBX 2070 ATBX 1072
	MS27534-22	{ White-Rem. { Brown-Ins.	MIL-C-38999 MIL-C-38999	ATBX 2057 ATBX 1058
	MS27534-22D	{ White-Rem. { Black-Ins.	MIL-C-38999 MIL-C-38999	ATBX 2046 ATBX 1048
	MS27534-22M	{ White-Rem. { Black-Ins.	MIL-C-38999	ATBX 1048
				ASTRO
	NAS 1664-12	{ Yellow-Ins. { White-Rem.	NAS 1599 Connector NAS 1599 Connector	ATR 1160 ATR 2160
	NAS 1664-16	{ Blue-Ins. { White-Rem.	NAS 1599 Connector NAS 1599 Connector	ATR 1107 ATR 2112
	NAS 1664-20	{ Red-Ins. { White-Rem.	NAS 1599 Connector NAS 1599 Connector	ATR 1080 ATR 2080

**INSTALLING TOOLS**

Straight (Ill. 1) and joggled 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 4½" to 6" long with replaceable tips.

**ILL 2**

**ILL 1**



**FRONT REMOVAL, REAR INSTALLATION TOOLS**

Both front removal (Ill. 3) and rear installation (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.

**FRONT RELEASE**

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

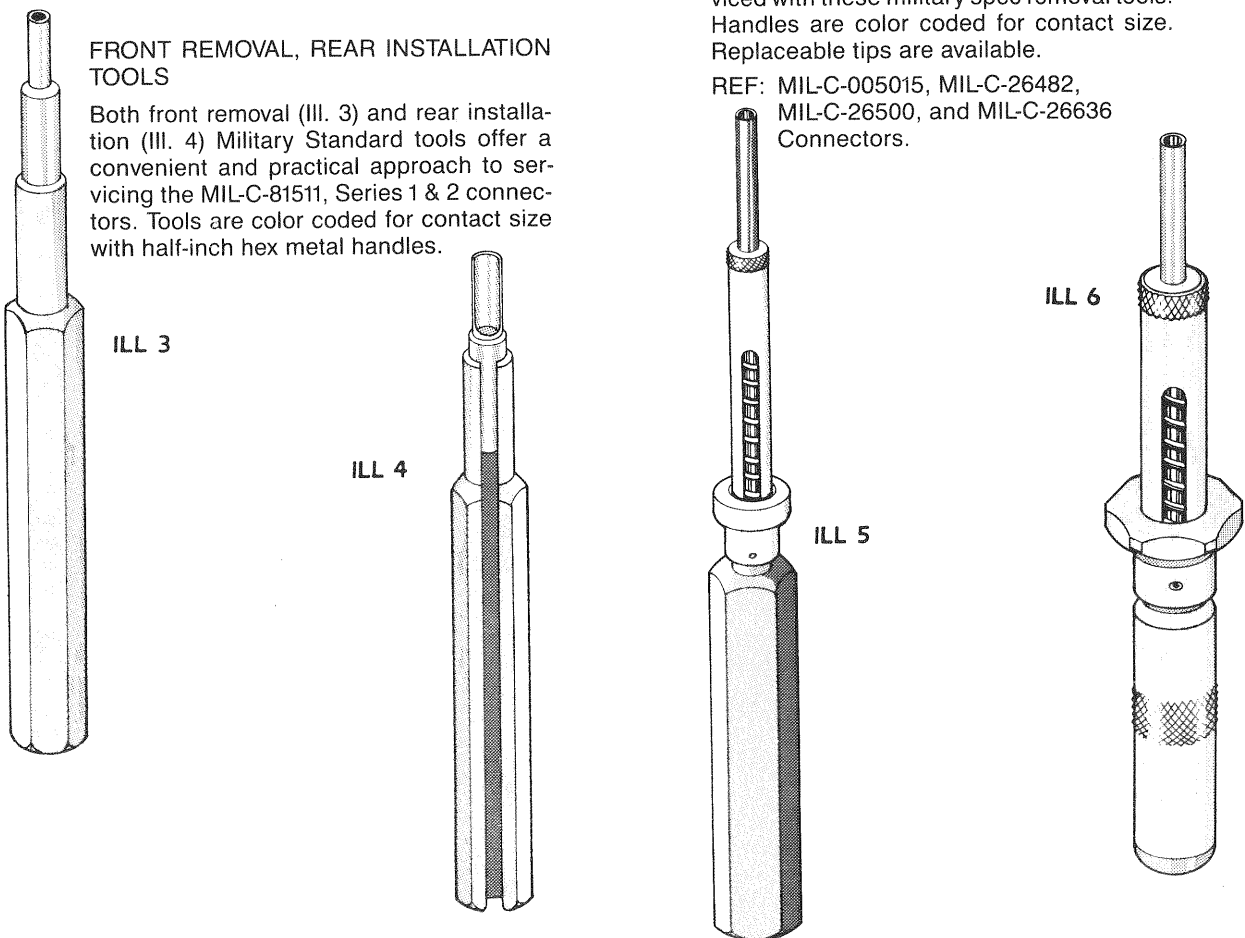
REF: MIL-C-005015, MIL-C-26482, MIL-C-26500, and MIL-C-26636 Connectors.

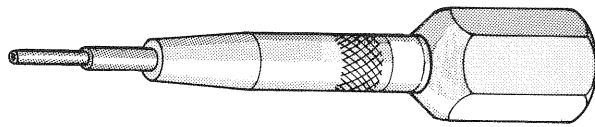
**ILL 3**

**ILL 4**

**ILL 5**

**ILL 6**

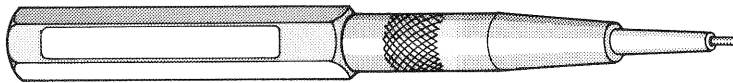




ILL 8

**FRONT REMOVAL 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 installing tools.

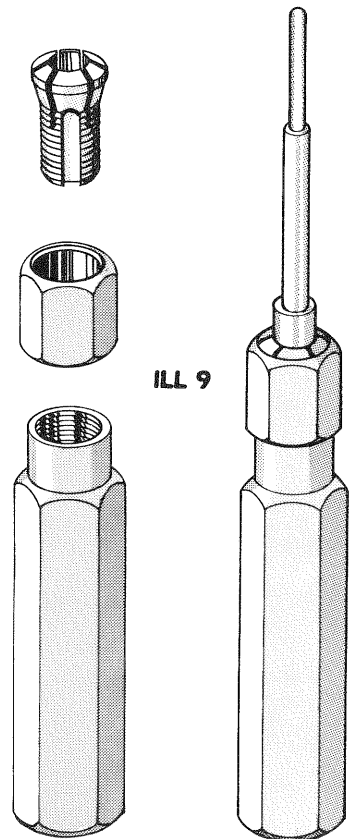


ILL 7

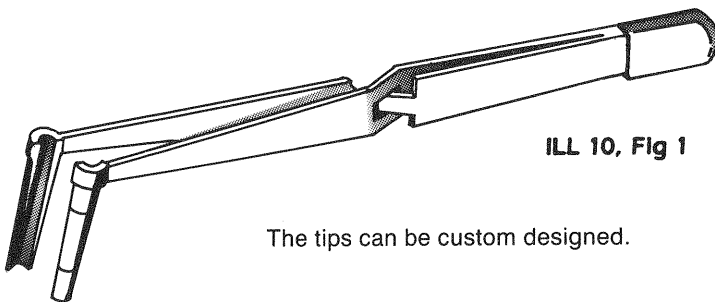
**INTERFERENCE FIT CONTACTS**

Utilizing a collet handle allows a dual-purpose tool. The tips can be set to remove both pins and sockets or install 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

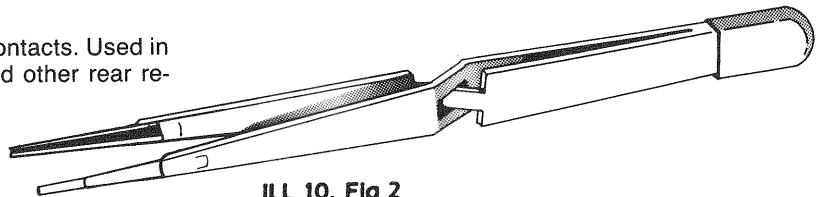


ILL 10, Fig 1

The tips can be custom designed.

**REAR REMOVAL AND INSTALLATION TWEEZERS**

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

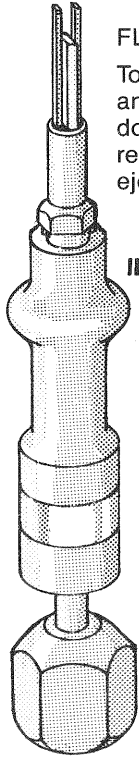


ILL 10, Fig 2

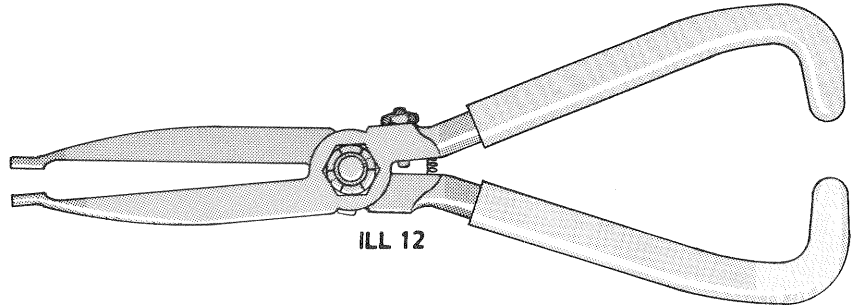
The tips can be custom designed.

**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.



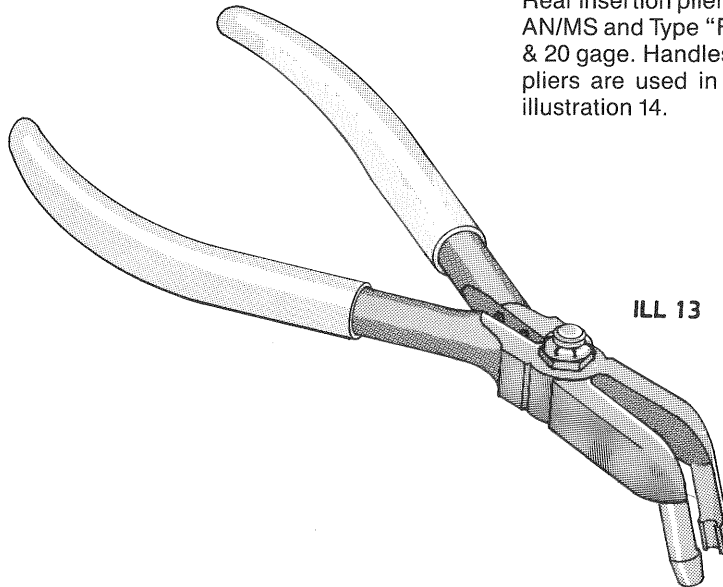
**ILL 11**



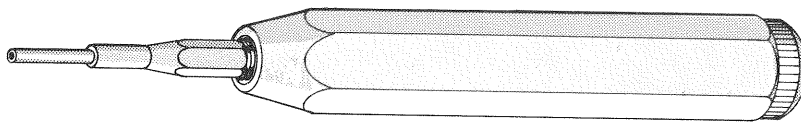
**ILL 12**

**INSTALLATION PLIERS**

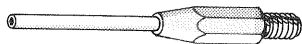
Rear insertion pliers are for Bendix, CE, SE, AN/MS and Type "F" contacts in sizes 12, 16 & 20 gage. Handles are color coded. These pliers are used in conjunction with kits in illustration 14.



**ILL 13**



**ILL 14**

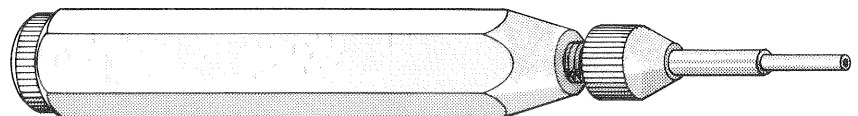


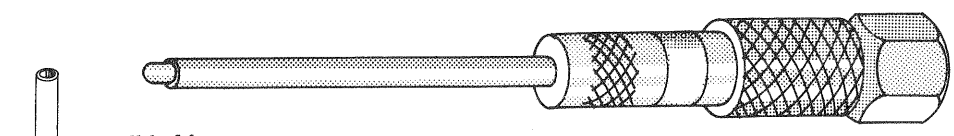
**KIT TOOLS**

The hollow handle kit tools carry the tips inside the handle and comes 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**

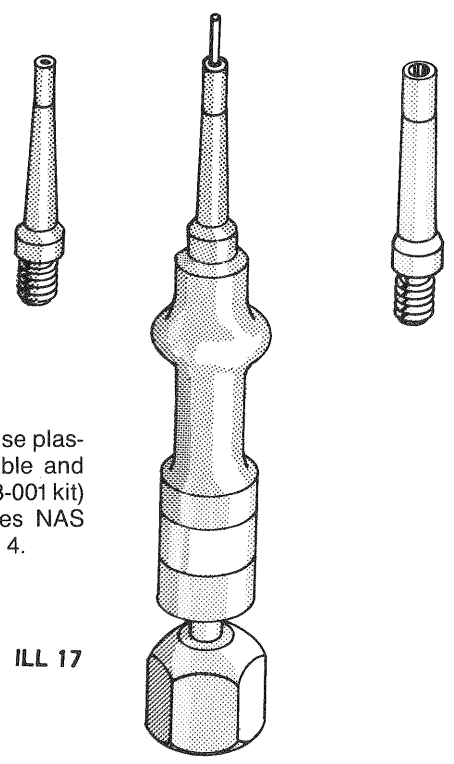
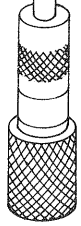




ILL 16

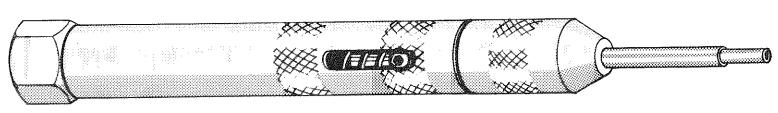
**METAL UNWIRED CONTACT TOOLS**

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 the connectors.



ILL 17

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.

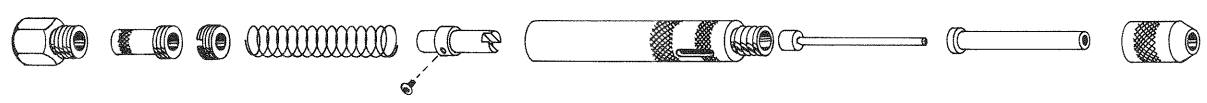


ILL 18

**RETENTION TEST TOOL**

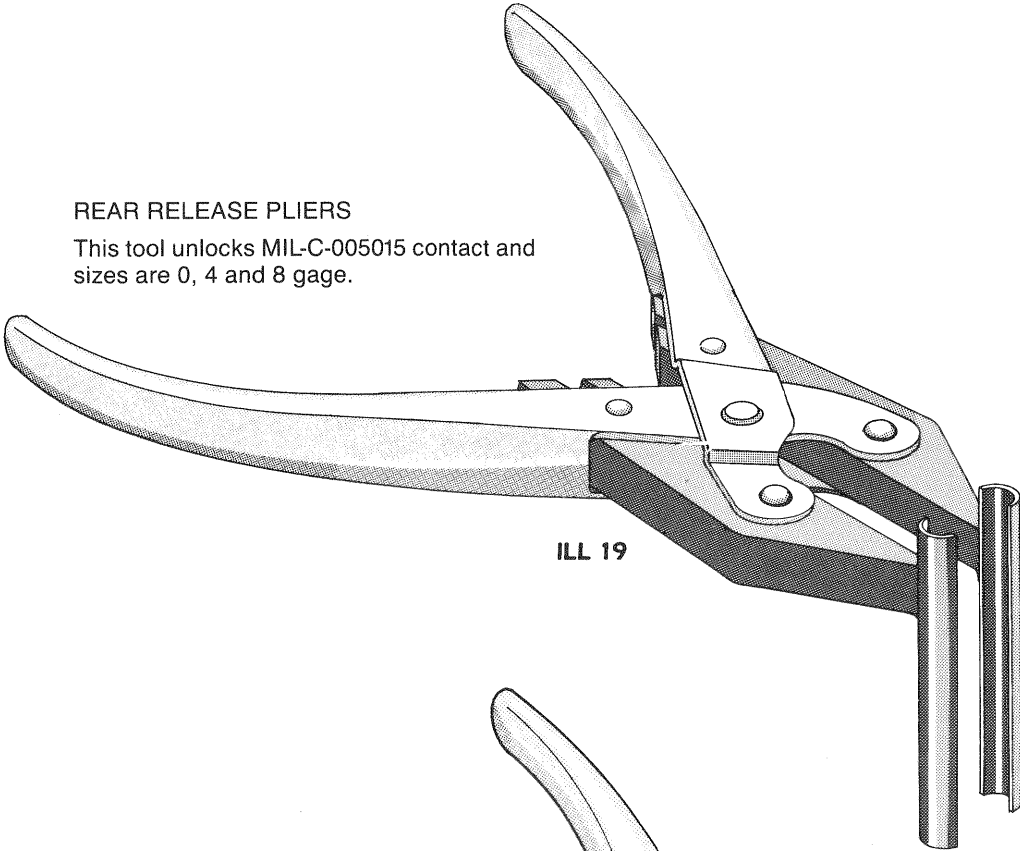
This tool is designed to test contacts in connectors to verify a properly "locked in" condition after insertion. These tools impose a controlled spring pressure against pin or socket contacts and will displace when not properly locked.

Each tool has interchangeable probes for testing either pin or socket contacts and three sizes of compression springs (light, medium or heavy, covering from 1½ 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.



**REAR RELEASE PLIERS**

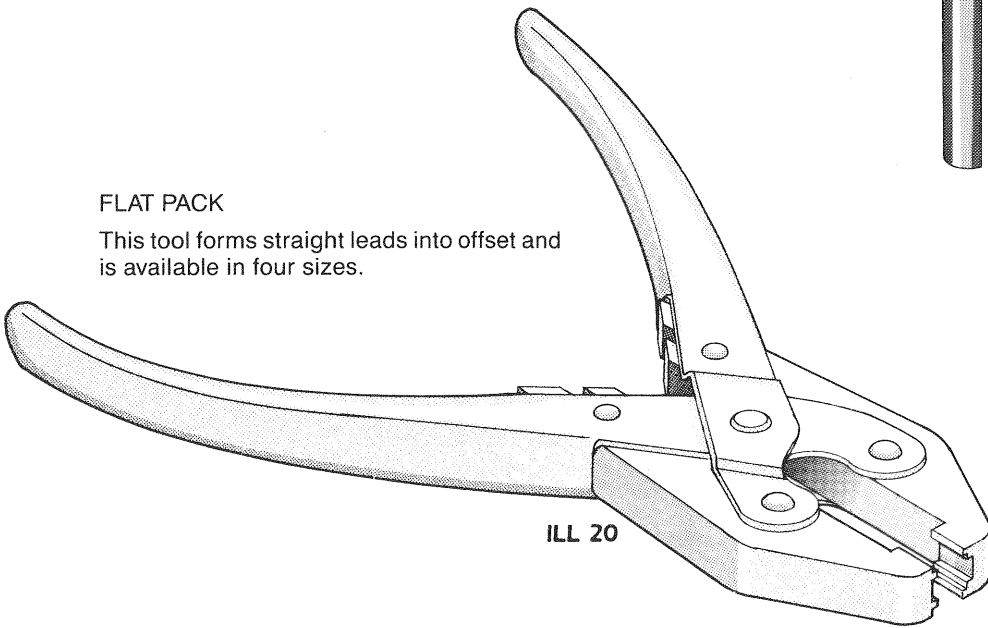
This tool unlocks MIL-C-005015 contact and sizes are 0, 4 and 8 gage.



**ILL 19**

**FLAT PACK**

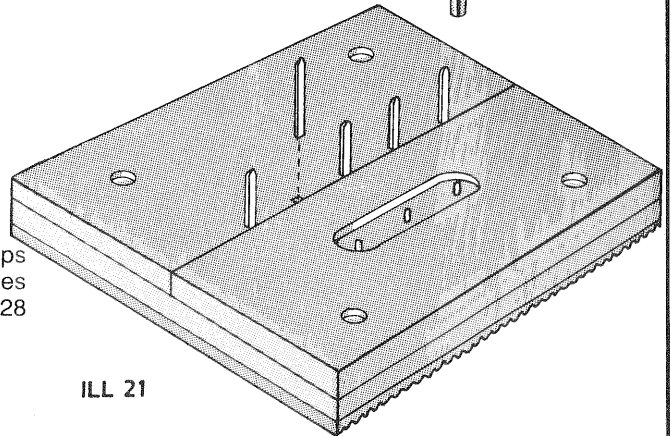
This tool forms straight leads into offset and is available in four sizes.



**ILL 20**

**TRANSFER KITS**

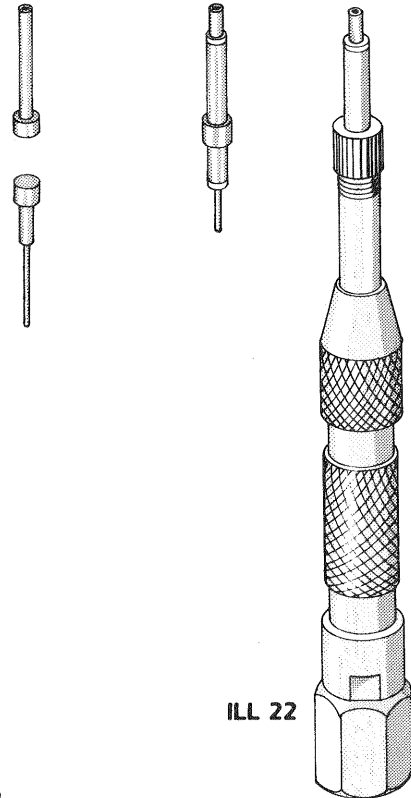
This tool is designed to move the wired clips from one pin to another with ease. Two sizes are available; .025 square and .058 x .028 pins kits.



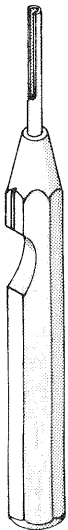
**ILL 21**

**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.



**ILL 22**

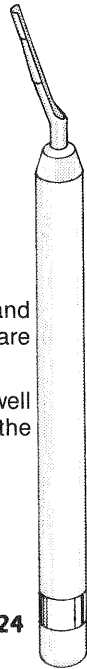


**INSERTION AND REMOVAL TOOLS**

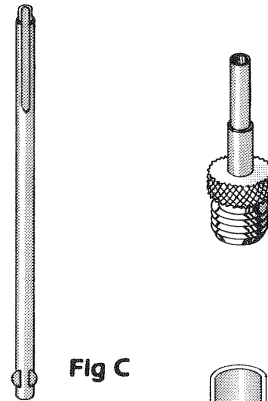
This tool uses 3/8 hex aluminum handle and is used in the smaller gage sizes. Tips are normally straight from 1" to 4" long.

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

**ILL 23**



**ILL 24**



**Fig C**

**TIPS**

Replacement tips come in many shapes and sizes.

Lockheed (figure A)

Bendix (figure B)

Burdny (figure C)

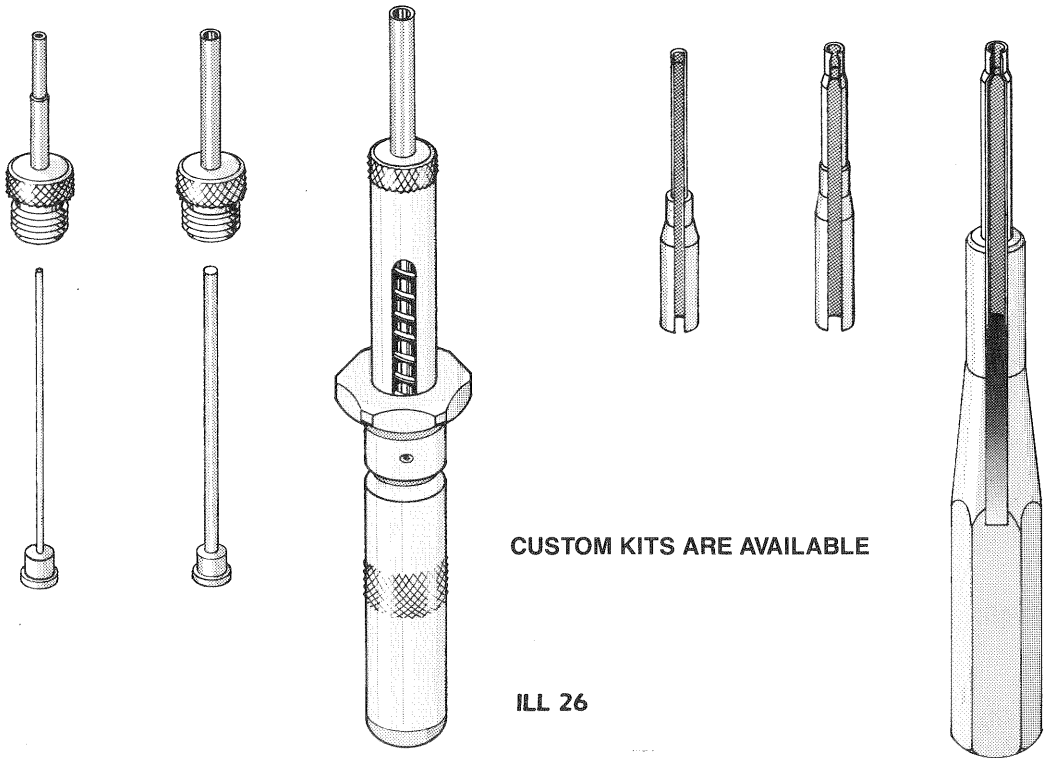
**ILL 25**



**Fig A**



**Fig B**



CUSTOM KITS ARE AVAILABLE

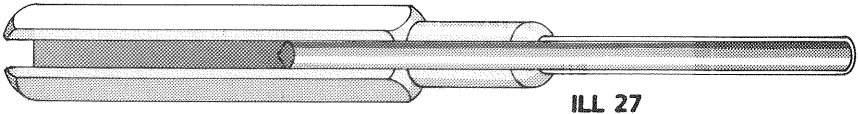
ILL 26

**REMOVAL KIT**

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

**INSTALLING KIT**

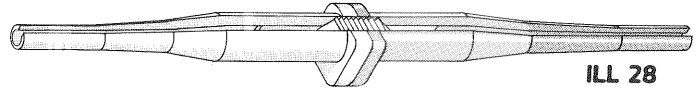
Common handle and 3 tips for sizes 12, 16 and 20 gage for MIL-C-26482, 26500 and 26636 connectors.



ILL 27

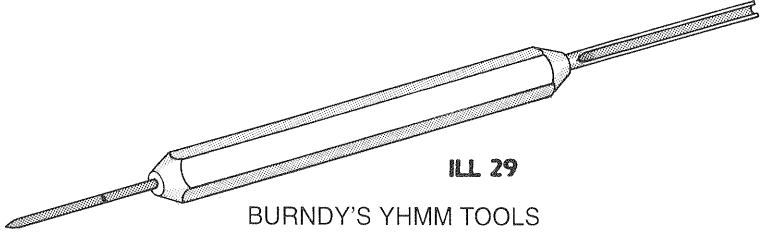
This tool illustrates the standard for MIL-C-005015 installing tools and modified versions are available on request.

**PLASTIC TOOLS vs. ASTRO METAL TOOLS**



ILL 28

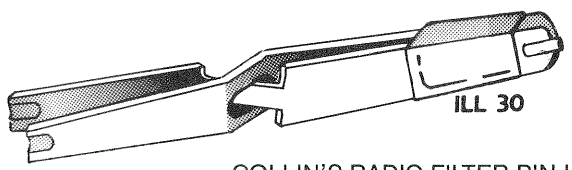
Plastic tools are used throughout the industry. Astro Tool Company's policy is to give our customers the greatest savings for the best quality tools we can manufacture. Metal tools, although initially more costly, offer a quality product and a lower tooling cost in servicing electrical connectors. Please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



ILL 29

**BURNDY'S YHMM TOOLS**

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



ILL 30

**COLLIN'S RADIO FILTER PIN INSTALLING TOOL**



## TERMS & CONDITIONS OF SALE

(a) **APPLICABLE TERMS AND CONDITIONS:** The acknowledgment of any order by Astro Tool Corp., hereinafter referred to as "ATC" or any performance by ATC pursuant to any order shall constitute the purchaser's acceptance of ATC's terms and conditions and the prices set forth by ATC and any order is expressly conditioned upon the applicability of ATC's terms exclusively. No terms or conditions stated by the purchaser shall be binding on ATC unless such terms or conditions are expressly accepted in writing by ATC prior to commencement of performance under this order.

(b) The failure of ATC to specifically object to any or all terms and conditions suggested by the purchaser shall not be deemed an acceptance of any such terms and conditions which are in conflict with, inconsistent with or in addition to the terms and conditions set forth herein and the purchaser, upon ATC's commencement of performance under any order, shall be deemed to have withdrawn any such terms and conditions which conflict with, are inconsistent with or are in addition to the terms and conditions set forth herein.

(c) **CHANGES:** If the purchaser at any time makes 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 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.

(d) **SHIPMENT:** Shipment generally will be accomplished F.O.B. 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.

(e) **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 for 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 crisis, parental leave, the failure of ATC's suppliers to make timely delivery of material or components or where such delay is occasioned by other causes beyond the control of ATC or without its fault or negligence, then the date or dates for delivery of the products ordered hereunder shall be extended for a period equal to the time lost by reason of any such delay.

(f) **PAYMENTS:** In the event of 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 delinquency in payment plus applicable storage charges, or inventory carrying charges, if any, or (5) combine any of the above rights and remedies as is 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.

(g) **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 a proportionate basis. Unless specifically agreed in writing to the contrary, purchaser agrees to accept partial shipments.

(h) **NO RETURNS ACCEPTED WITHOUT PRIOR AUTHORIZATION. PLEASE CALL 503-642-9853 FOR AUTHORIZATION.**

(i) **INSPECTION:** 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, designs, and/or specifications, is not received by ATC within 15 days after the purchaser takes custody of the products delivered.

(j) **INSOLVENCY** ATC may cancel the whole or any part of any order in the event of the suspension of the purchaser's business, insolvency of purchaser, the institution, by 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.

(k) **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 order for purchaser.

(l) **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 services 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 invoice purchaser for said additional amount. This clause shall survive the acceptance and complete performance of any order.

(m) **SET-OFF:** All monies 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 from 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.

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

(o) **ATTORNEYS' FEES AND SUIT COSTS:** Should ATC have to initiate legal action to collect any monies 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 attorney's fees, witness fees, and court costs.

(p) **TITLE:** Title to the goods shipped by ATC shall not pass to purchaser until said goods have been paid for in full.

(q) **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.

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

(s) **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 cancelled.

(t) **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.

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

(v) **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.

## LIMITED WARRANTY & LIMITATION OF LIABILITY

(w) **LIMITED WARRANTY:** ATC warrants each new product sold by ATC to be free from defects in material and workmanship under normal use and service. The sole obligation and liability of ATC under this warranty is limited to, at its option, the repair of, the refund of the purchase price of, or the replacement at its factory of any such product which proves defective within 90 days after delivery to the first end user, and is found to be defective in material or workmanship by ATC inspection.

(x) In no case shall this warranty be effective unless delivery to the end user occurs within 180 days after delivery by ATC to the original purchaser, and written notice of any defect shall have been given to ATC within 30 days from the date such defect is first discovered.

(y) Products for warranty consideration shall be returned with all transportation charges prepaid to ATC. Products repaired or replaced under this limited warranty are warranted for the unexpired portion of the original warranty and shall be returned F.O.B. factory, Beaverton, Oregon.

(z) ATC disclaims any liability whether under this warranty or otherwise for any failure of its products which is caused, in whole or in part, by the use in or with that product of component parts not manufactured by ATC, or if said failure has, in the opinion of ATC inspection, been caused by tampering, misuse, neglect, improper storage, normal wear and tear or improper operation.

(aa) The terms of this limited warranty are the sole and exclusive warranty terms that shall have any force and effect in this order and such terms are in lieu of all other warranties express or implied including, but not limited to, the implied warranties of or merchantability and fitness for a particular purpose, which are herewith expressly excluded. NO WARRANTY, EXPRESS OR IMPLIED, IS MADE OR AUTHORIZED TO BE MADE OR ASSUMED WITH RESPECT TO THE PRODUCTS OF ATC OTHER THAN THAT HEREIN SET FORTH.

(bb) **LIMITATION OF LIABILITY:** Other than the liability set forth in the above express warranty applicable to the products sold to the purchaser, ATC SHALL NOT BE LIABLE FOR CONSEQUENTIAL, INCIDENTAL, SPECIAL, OR OTHER TYPES OF DAMAGES AND EXPRESSLY EXCLUDES AND DISCLAIMS SUCH DAMAGES RESULTING FROM OR CAUSED BY THE USE, OPERATION, FAILURE, MALFUNCTION OR DEFECTS OF ANY PRODUCTS SOLD TO THE PURCHASER AND THROUGH PURCHASER TO ANY OTHER PURCHASER OR END USERS UNDER THIS OR ANY OTHER ORDER, IT BEING UNDERSTOOD THAT THE PRODUCTS SOLD HEREUNDER ARE NOT CONSUMER PRODUCTS.

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

## CERTIFICATE OF CONFORMANCE

ASTRO TOOL CORP. 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 AT ITS HOME OFFICE.

THE PARTS SO SUBMITTED MEET DIMENSIONAL, FUNCTIONAL AND QUALITY REQUIREMENTS AS COVERED BY THE APPLICABLE ORDER, PART NUMBERS AND/OR SPECIFICATIONS.

## CERTIFICATE OF CALIBRATION/INSPECTION

CALIBRATION OF ASTRO TOOL CORP. INSPECTION EQUIPMENT IS IN ACCORDANCE WITH MIL-STD-45662.

THE ACCURACY OF INSPECTION GAGING EQUIPMENT USED IN THE CALIBRATION AND/OR TESTING IS TRACEABLE TO THE NATIONAL BUREAU OF STANDARDS.

ITEMS SHIPPED HAVE BEEN DULY INSPECTED AND FOUND TO MEET ALL APPLICABLE STANDARDS AND/OR SPECIFICATIONS.