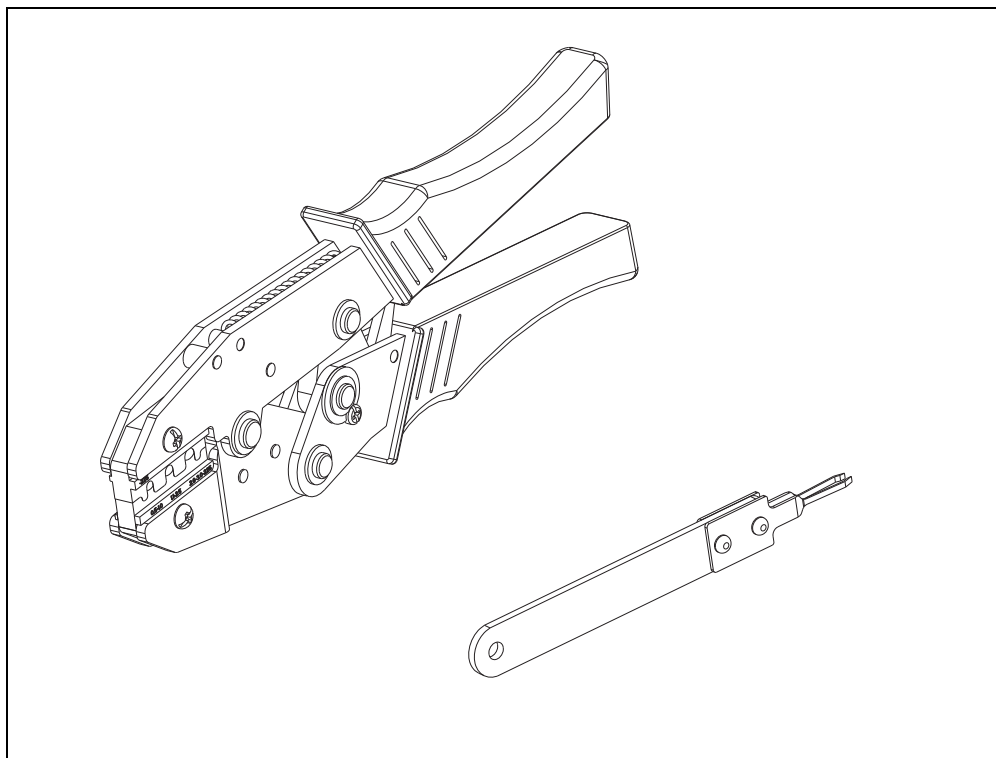


Mounting and maintenance Instruction book

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1 Introduction

These instructions are to be used as a reference tool for the vehicle manufacturer's design, production, and service personnel.

The user of these instructions should have basic knowledge in the handling of electronic equipment.

Warnings

Sections marked with a symbol in the left margin, must be read and understood by everyone using the system, carrying out service work, or making changes to hardware and software.

The different symbols used in this manual are defined below.



WARNING

Sections labeled *WARNING* with a caution symbol in the left margin, indicate that a hazardous situation exists. We use warnings, marked with the warning symbol, in two ways.

- As a strong recommendation about work practices when using the product in the machine (e.g. routines when updating an application). This use is common to the term 'hazardous situation', that a person is exposed to a hazard.
- As a way of pointing out important information for the machine designer that in some way relates to safety. This includes the design of the physical machine, and also the application program being developed for the control system.

Not all document sections that contain information about safety are marked with a warning symbol (there would be warnings everywhere). Failure to comply with the recommendations can cause unintentional, and unexpected behavior of the control system. This can potentially cause death, serious injury or property damage.



NOTICE

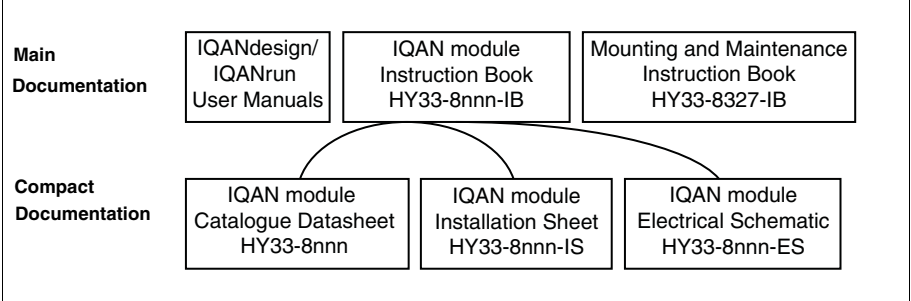
Sections labeled *NOTICE* with a notice symbol in the left margin, indicate there is important information about the product. Ignoring this could result in less than optimal performance, or damage to the product.

Contact the manufacturer if there is anything you are not sure about or if you have any questions regarding the product and its handling or maintenance.

The term "manufacturer" refers to Parker Hannifin Corporation.

Overview of relevant documentation

The following publications are relevant for users of this product.
The main documentation contains information that is not found elsewhere.
The additional documentation contains product information in a compact format, for details on the information found in those documents, consult this manual.



The IQAN module documentation system.

2 Precautions

Work on the hydraulics control electronics may only be carried out by trained personnel who are well-acquainted with the control system, the machine and its safety regulations.

**WARNING**

Make sure that you have sufficient knowledge before designing, modifying or servicing the control system.

Read the relevant sections of this document before conducting any work on the control system.

**WARNING**

The controller units are not field repairable.

**NOTICE**

As much as possible of the welding work on the chassis should be done before the installation of the system. If welding has to be done afterwards, the electrical connections on the system must be disconnected from other equipment. The negative cable must always be disconnected from the battery before disconnecting the positive cable. The ground wire of the welder shall be positioned as close as possible to the place of the welding. The cables on the welding unit shall never be placed near the electrical wires of the control system.

Start-up, maintenance, and diagnostics

For all personnel carrying out installation, commissioning, maintenance or troubleshooting.

**WARNING**

Work on the hydraulics control electronics may only be carried out by trained personnel who are well-acquainted with the control system, the machine and its safety regulations.

Before you start,

Read section "Start-up".

Additional information for service

The respective installed product instruction books.

Additional information for diagnosing the system

Read section "System diagnostics", and see "Appendix B", in the installed product instruction books.

3 Wiring components

Wire for mobile electronics



NOTICE

Always use stranded wire, never use solid conductor wire.

Stranded wire is flexible and can withstand vibration and movements typical to machines.

Recommended wire

Machine manufacturers and wire harness fabricators have their own specifications for wire and cable used on equipment. The following information is general in nature and is not a requirement for the IQAN installation to work properly. It represents "good practice" guidelines for service technicians unfamiliar with electronic controls wiring.

The wire will agree with FLRY according to DIN 72551

- FL=automotive
- R=reduced insulation thickness
- Y=PVC insulator material

This specification of wire is sometimes called automotive type TXL. It has the following characteristics:

- Conductor: Stranded copper wire - bare is preferred.
- Insulator: DIN ISO 6722, class A (PVC).
- Temp. range: -40 to +105 °C.



NOTICE

If there is a risk of prolonged contact with oil.

Use cabling with sheathing and insulators in oil-resistant material, e.g. PUR or PTFE.

Signal wires

For signal transmission (I/O) and communication purposes, use wire with a cross sectional area of 0,75 mm² (AWG 18). The stranding should be 19x0,23 (19x30). The wire outer Ø will be nominal 1,9 mm (.075") and the insulator thickness 0,30 mm (.012").

Power supply wires

For modules that do not have high power outputs (>1A), wire with a cross sectional area of 0,75 mm² (AWG 18) may be used. The stranding should be 19x0,23 (19x30). The wire outer Ø will be nominal 1,9 mm (.075") and the insulator thickness 0,30 mm (.012").

For +BAT or -BAT on modules with high power outputs, use wire with a cross sectional area of 2,00 mm² (AWG 14). The stranding should be 19x0,35 (19x27). The wire outer Ø will be nominal 2,8 mm (.110") and the insulator thickness 0,45 mm (.018").

CAN-bus

The conductors for CAN-H and CAN-L should be a twisted pair, 40 twists per meter. This is made to minimize the risk of EMI interference. Shielded cables must not be used. The maximum length of the bus between modules is 100 meters (325 ft.). The recommended nominal length is 40 meters (130 ft.).

CAN-bus terminator

The end of the CAN bus must be terminated. Termination is usually done inside the IQAN expansion units, determined by the use of an idTag. Some modules may not have this feature and require a terminating resistor. If the terminator is not bought from the manufacturer, it must have a resistance of 120 ohms. The resistor must be able to handle a power loss of 8 watts in case of a short-circuit between chassis and +24 Vdc.

Connectors

The connectors in IQAN systems are of two main types:

- Deutsch transportation connectors.
- AMP/Tyco automotive connectors.

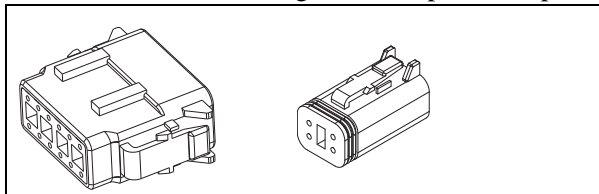
The AMP connectors use two sizes of pins, JPT (Junior Power Timer) and MT (Micro Timer) pins.

The following connector descriptions and crimping information will be general in nature, for more detailed AMP/Tyco connector and crimping information, please visit the AMP/Tyco website, www.tycoelectronics.com.

For Deutsch connector and crimping information, please visit the Deutsch website, www.deutschipd.com.

Deutsch connectors

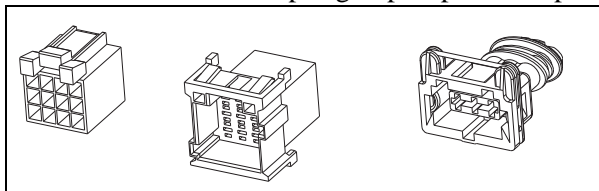
The IQAN modules that are equipped with Deutsch connectors use either DT or DTM types. These are keyed and equipped with a locking mechanism. The lock for the connectors is either a single or dual plastic clip.



Deutsch connectors, IQAN-MD3, IQAN-LST/LSL, sensors

AMP/Tyco connectors

There are a few non-automotive AMP connectors used for IQAN products. These are keyed and equipped with a locking mechanism. The lock for the non-automotive connectors are either a spring clip or plastic clip.

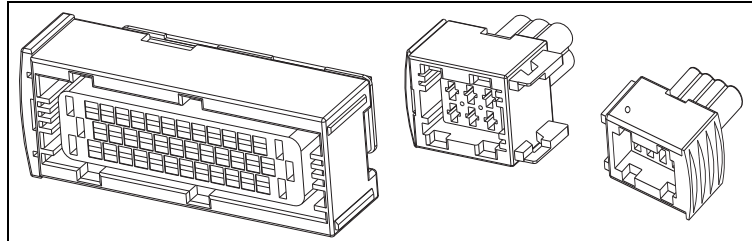


AMP connectors, IQAN-LM/LL, IQAN-SP

AMP/Tyco connectors with latch

The AMP automotive connectors used on most IQAN modules also are keyed and equipped with a locking mechanism. The automotive connector locking mechanism consists of a different coloured sliding latch, mounted on one end of the connector.

This type of locking mechanism helps to press the plug and receptacle of the connectors together. This minimizes risk of damage to the pins.



AMP connectors with a sliding latch, IQAN-MDL/X_2/TOC8, IQAN-MDM, IQAN-LSL/LST.

Mating and unmating connectors



CAUTION

Risk of damage to the units' electronics.

Do not mate / un-mate while units are under power.

Mate the latched connectors as follows:

- 1 Pull out the wire harness mounted connector's sliding latch.
- 2 Check that the connectors and pins are clean and undamaged. The pins should all appear to be flush with the mounting face. If any pins are recessed, push the corresponding wire from the back of the connector to seat the pin properly.
- 3 Verify that only one face seal (if used) is installed in the module's connector.
- 4 Put the two connectors together so that the keying passes into the corresponding track. Wiggle the connector to ensure that all pins and their mates are aligned.
- 5 Push the latch in while applying force to the connector shell, so that the two connectors are pressed together. The more pins the connectors contain, the greater the power which is required to push in the latch.



NOTICE

Do not rely on the latch alone to assemble the connector!

The force applied by the latch on the keys could damage the module's connector.

- 6 Push in the latch completely so that the plastic hooks secure the latch position.

Unmate the latched connectors as follows:

- 1 Pull out the connector's latch while also pulling the connector away from the module. The more pins the connectors contain, the greater the power required to pull the latch apart. The connectors remain locked together until the latch is pulled out to the maximum extent. It is not possible to pull the connectors apart before the latch is pulled all of the way out.
- 2 Check that the connectors and pins are undamaged. Check carefully the plastic hooks which secure the latch in its pushed-in position.
- 3 Damaged connectors must be changed.

4 Mounting

For mounting instructions for the respective modules, see the installation sheet that is packed with the unit upon delivery. See also the separate instruction books for each unit.



WARNING

Risk of unexpected and uncontrolled movements.

An incorrectly located or mounted harness can be affected by radio signals which can interfere with the system's functions.

Locating the harness



NOTICE

Install the harness per the following guidelines:

- Protect the harness against radio signals which can interfere with the system's functions. Avoid putting the control system's harness close to communications equipment, antennas, generators or other high-frequency electrical interference sources. Note that antenna cables can also interfere with the system. Separate the cabling from the antenna cable.
- Separate the control system's current supply from the communication equipment's current supply.
- Locate the harness so that, as much as possible, it is shielded by sheet metal with good electrical connection to the battery's negative terminal. Place the harness in beams or channels enclosed by sheet. If this is not possible, locate the harness in the in-most corner of the channel. If there are no beams or channels, locate the harness towards sheet metal surfaces.
- Protect the harness against mechanical wear.
- Avoid free-hanging cables. Free-hanging cables must be placed so there is no risk that it can be folded or crushed.
- When the harness passes sharp edges, the harness must be protected with an edge list or lead-in wire. An opening through a bulkhead is an example of an edge.

Attaching the harness



NOTICE

Fix the harness to the machine per the following guidelines:

- Use a conduit or loom to hold the wires/cables together.
- Fix the harness with binding tape, clips, glue or another type of fastener. The distance between the fastening points must be adapted so that the harness is free from vibrations to the frame.
- When movement is required, the length of the cabling is adapted so that a bend is formed. The radius should be as big as possible. The cabling must not be in danger of being fully stretched. The radius in the bend of the cabling must not be less than the is recommended by the manufacturer, (e.g.20 times the diameter of the cabling).

5 Tools

The following tools, which are available in the IQAN toolkit, or equivalent tools recommended by the connector's manufacturer, should be used:

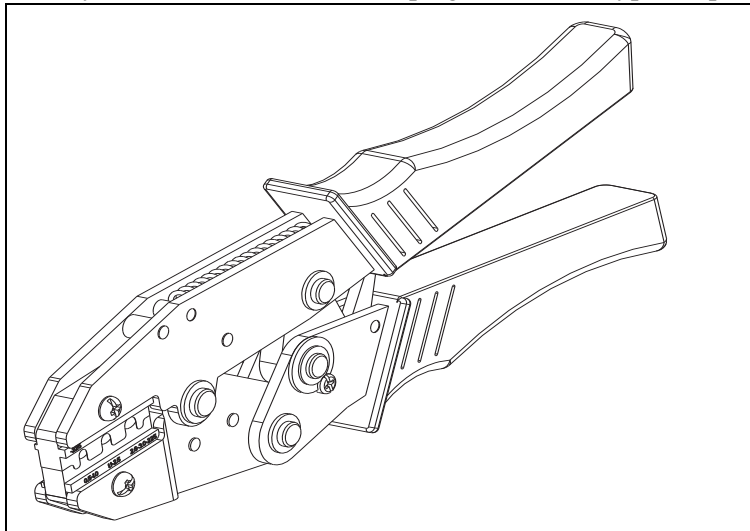
- Different models of crimping tool adapted to crimping of the different types of pins.
- Extraction tools adapted to the removal of the different types of pins.
- Miscellaneous wire preparation tools and common service tools.

Crimping tools

The crimping tools are used to fix the pins to the conductor and insulator of the individual wires.

Amp/Tyco crimping tools

The crimping tools in the IQAN toolkit are designed to work with AMP/Tyco connectors used in IQAN modules. In some cases the insulator has a single wire seal installed which is attached and held by crimping the pin. They are color coded to identify which is used for the crimping of different types of pin.

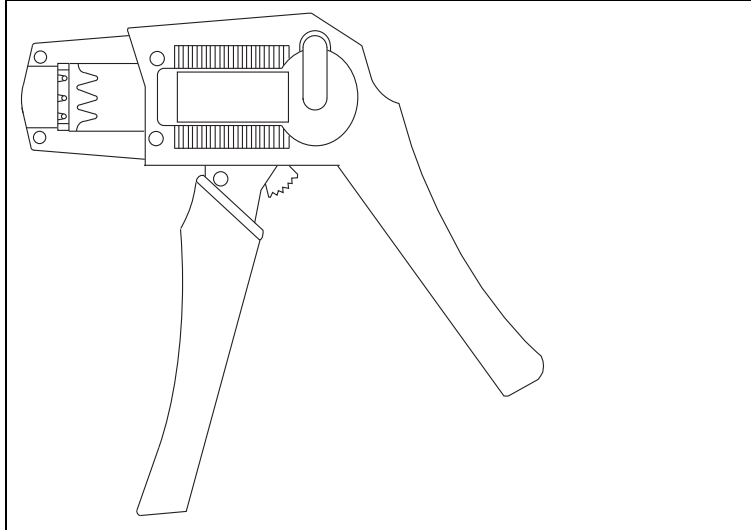


Example of an IQAN crimping tool for AMP/Tyco connectors.

- Red - for crimping Junior Power Timer pins with individual wire seals.
- Yellow - for crimping Junior Power Timer pins without seals.
- Blue - for crimping Micro Timer pins with individual wire seals.

Deutsch crimping tool

Deutsch connectors have an integral seal in the housing through which the wires are routed. The recommended contacts for Deutsch connectors are the *stamped and formed* type. Solid contacts are also available for Deutsch connectors and may be used at your discretion. The stamped and formed type of pins are preferred because the crimped pin is mechanically engaged to both the conductor and the insulator of the wire.



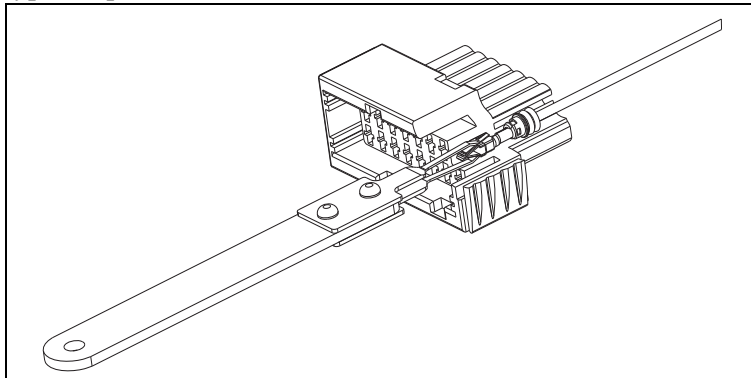
DTT-20-02 crimping tool for Deutsch stamped and formed terminals.

Extraction tools

The extraction tool is used to remove the pins from the connector.

AMP/Tyco extraction tools.

The extraction tools in the IQAN toolkit are for AMP/Tyco connector JPT and MT pins. The tools are color coded to identify which is used for the removal of different types of pin..



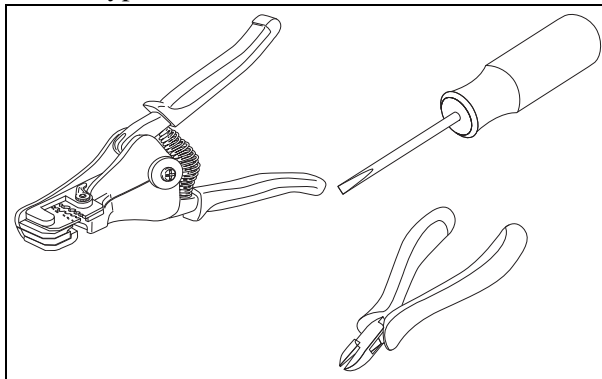
Using the yellow IQAN extraction tool.

- Red - for single locking tab Timer pins (e.g. 2 position sensor connector).
- Yellow - for double locking tab Junior Power Timer pins.
- Blue - for double locking tab Micro Timer pins.

For Deutsch extraction tools and instructions, please refer to the manufacturer's literature.

Miscellaneous tools

The typical service kit will already contain the other tools needed to work on a machine's wiring harness. It is recommended to check and be sure that a wire stripping tool and wire cutter are also include with the usual screwdrivers, pliers and wrenches of various types..



Miscellaneous tools

IQAN tools usage

Using the chart below you can easily find the correct colour of tool from the IQAN tool kit that is used with AMP/Tyco connectors.

Connector kit part no.	Used with module or part	Pin type / Wire size	Crimping tool	Extraction tool
5031007	temp. sensor	JPT / 0.75-1 mm ² (18 AWG)	Red	Red
5031022	-MDM, -LF1	JPT / 0.75-1 mm ² (18 AWG)	Red	Yellow
5031016	-XP, -XS (phased out)	MT / 0.75-1 mm ² (18 AWG) JPT / 1.50-2 mm ² (14 AWG)	Blue Yellow	Blue Yellow
5031048	-LL (phased out), -LM	JPT / 0.75-1 mm ² (18 AWG)	Yellow	Yellow
5031063	-MDL2, -MC2, -XA2, -XS2, -XT2, -XP2, -TOC8	MT / 0.75-1 mm ² (18 AWG) JPT / 1.50-2 mm ² (14 AWG)	Blue Red	Blue Yellow
5031086	-SP, -ST	JPT / 0.75-1 mm ² (18 AWG)	Red	Red
5031097, 5031098	-LSL, -LST	JPT / 0.75-1 mm ² (18 AWG)	Red	Yellow
5031105	-TOC2	JPT / 0.75-1 mm ² (18 AWG)	Red	Yellow
IQAN tool kit	Parker no. 5031061^a			

a.The IQAN tool kit description is found in the 'IQAN accessories' datasheet.

6 Assembly

Crimping pins on cable

Considerations

Consider the following when mounting connector pins on the harness wires:

- The crimping of the cable in the connector pin fulfills two functions, to provide a good electrical connection and to secure the cable mechanically in the connector.
- A poorly crimped connector pin can work for a while, but will eventually cause sporadic functional errors. This type of error can be difficult to identify.
- Use recommended tools. Using tools other than those from Parker or the connector manufacturer, or using them improperly, can lead to poorly crimped pins.

Connector wire sealing

Most of the IQAN module connectors require the use of seals where the cable enters the housing.

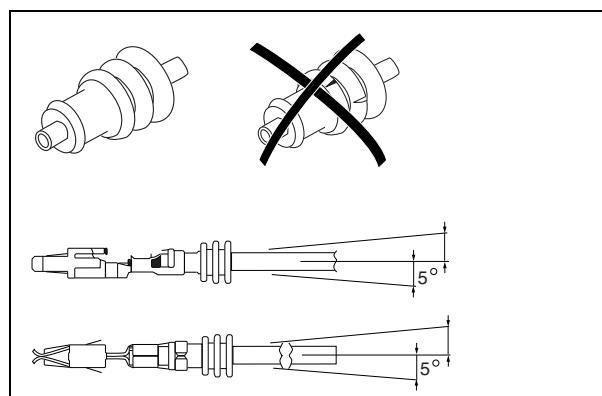
Seals are used where the cables are exposed to a harsh environment and there is a risk that water might enter the cavities of the connector. The silicone seals prevent corrosion and retain their sealing properties even under conditions of heavy vibrations and changes in temperature. The seals make the connector less sensitive to moisture and impurities. The individual wire seals in combination with the face seal (installed in the module's connector), create a connection that is weathertight.

Deutsch connector seals accommodate all of the connector wires and are part of the housing.

Amp/Tyco seals are mounted together with the pin. This is called single wire sealing because each wire has an individual seal. This type of seal cannot be added after the pin is crimped.

For satisfactory sealing, the following conditions must be fulfilled:

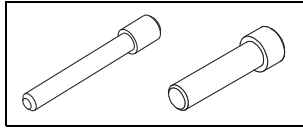
- the seals must be faultless. Check for cracks and other damage before mounting
- the cable's angle out from the seal must not deviate by more than 5 degrees.



What to look for when seals are used.

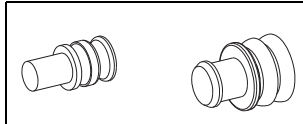
Plugging unused connector positions

Deutsch connectors have plastic plugs that are pressed into the unused wire positions in the seal on the back of the connector..



Deutsch DTM and DT plugs

Silicone plugs are used to seal off empty (unused) cavities in an AMP/Tyco weather-proof automotive connector. The plug should be pushed into the cavity until it stops or about 3-5 mm (.12"-.20").



MT and JPT cavity plugs



NOTICE

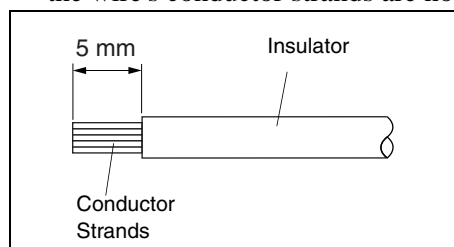
Unused wire positions must be plugged.

Not using plugs to seal empty wire positions will cause the connector to not meet its environmental specification.

Mounting the connector

Mount the connector as follows:

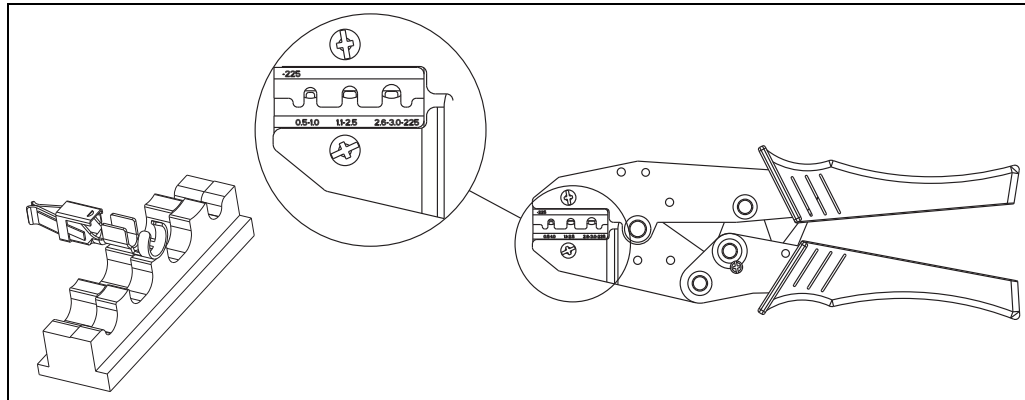
- 1 Select wire, pin, connector and tool as per the table in the product's instructions.
- 2 Ensure that the correct crimping tool is used, see the table in the product's instructions.
- 3 Put the seal, if one is used, on the wire's insulation and slide back far enough so it is out of the way.
- 4 Using a stripping tool, strip 4.5-5.0 mm (.18"-.20") wire insulation. Make sure that the wire's conductor strands are not damaged.



Strip the insulator from the wire.

- 5 Move the seal, if a seal is used on the wire, to the stripped end, positioned so that it is flush with the insulator or 1 mm max. of the insulation can be seen.

6 Open the crimping tool. Place the pin into the correct die slot.



Correct pin positioning in the crimping tool die.

- 7 Partially close the tool until the pin is held in place.
- 8 Insert the stripped wire into the pin. Visually verify that the seal or insulator is far enough into the pin to be captured by the mechanical connection 'wings'.
- 9 Close the tool until the ratchet releases. The ratchet is released when the tool clicks and the tool handles open when you loosen your grip.
- 10 Remove the crimped pin, making sure that the following applies:
 - the whole of the pin's electrical connection goes around the stripped conductor
 - the mechanical connection of the pin must attach around the cable's insulator or the silicone seal, and thereby also around the cable's insulation



CAUTION

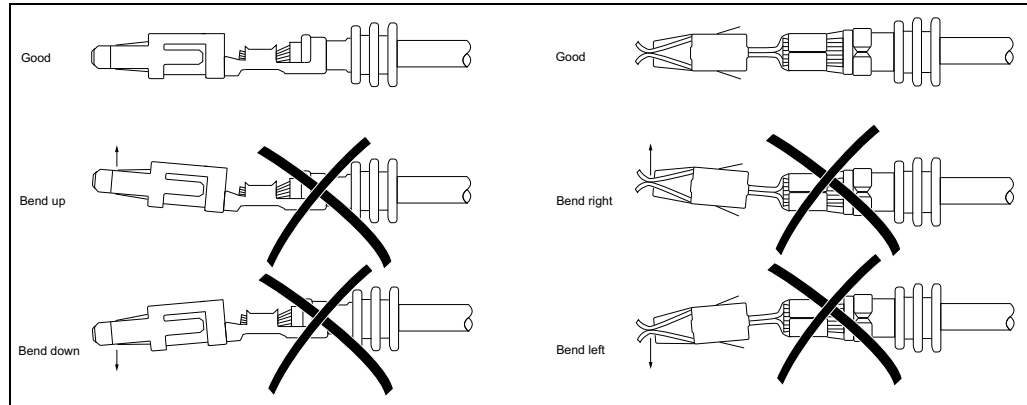
Risk of damage to the units' electronics due to electrostatic discharge (ESD).

Dissipate static electricity before handling any system components (wire harness, modules) by touching a grounded metal object, such as an unpainted portion of the equipment's metal chassis.

Inspection for proper crimping

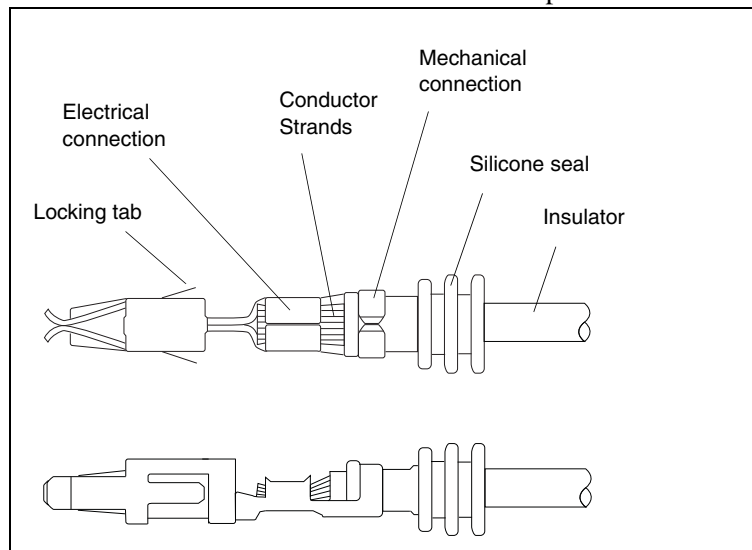
A proper crimp will have the following characteristics:

- The conductor will be tightly held with no loose strands outside of the electrical connection.
- The insulator will be tightly held but not cut or pierced by the mechanical connection. If a seal is installed, the seal will be tightly held but not cut or damaged.
- The pin will be aligned with the wire; not bent up, down or to the side.



The pin must be aligned.

- The conductor will be visible on both sides of the electrical connection.
- 1 mm max. of the insulator will be visible past the mechanical connection.



Good crimp example with terminology.

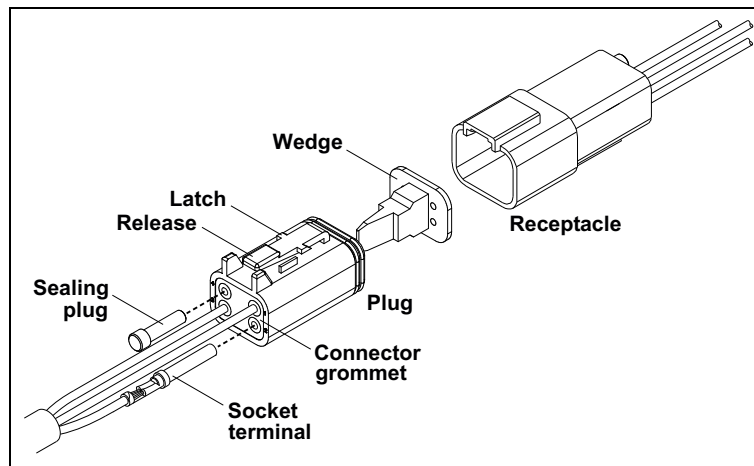
Building the connectors

Once you have crimped pins onto the ends of your wires, you are ready to assemble the pins into the plastic housing of the connector.

Deutsch assembly

Locate the wire that you want to install into the connector, it is usually easiest to start in the center of connectors that have a large number of wire positions.

- 1 Grasp the wire approximately 25 mm (1") behind the crimped pin or socket.
- 2 Hold the Deutsch housing so that the rear grommet is facing you.
- 3 Push the pin straight into the grommet until a "click" is felt. Pull gently to confirm that the pin is properly locked into place.
- 4 When all of the pins are installed, insert the wedge into the opposite side of the housing.



Exploded view of Deutsch connector.

Deutsch disassembly

- 1 Remove the wedge with either a pair of long nose pliers or a small, regular screwdriver (depending on gender of the housing).
- 2 To remove the terminals, pull gently on the desired wire back away from the grommet. At the same time, release the plastic locking finger inside of the housing by moving it away from the terminal with a screwdriver.



NOTICE

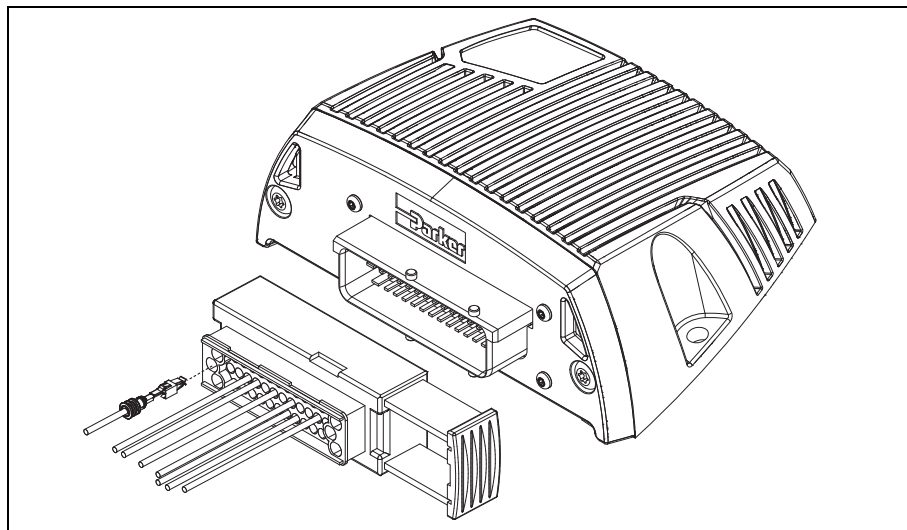
Hold the rear seal in place.

Removal of the wire could pull the seal out of the housing.

AMP assembly

Locate the wire that you want to install into the connector, it is usually easiest to start in the center of connectors that have a large number of wire positions.

- 1 Grasp the wire just behind the silicone seal (if installed) or the crimped pin.
- 2 Hold the AMP housing so that the rear face with the round holes is facing you.
- 3 Push the pin and seal into the correct position on the connector until the locking tabs engage.
- 4 When all wires are in place in the connector housing, visually inspect the pin orientation by looking at the mating face. All pins should be aligned horizontal to the long axis of the housing. If any are tilted, they must be removed and reinstalled.



Assembling a pin into an AMP connector.

- 5 For 42 position AMP housings a shroud may be installed. Carefully bend the wire bundle so that the wires orient to 90 degrees without being forced sideways against the seals. Slide the shroud onto the channels to lock in place.



NOTICE

Use a wire tie to fix the harness to the shroud.

A wire tie is recommended to prevent the stressing of individual wires and affecting the seals.

AMP disassembly

- 1 Remove the shroud if the connector has one installed.
- 2 To remove the pins, take the correct extractor tool and insert it from the front of the housing to deflect the pin's locking tabs. Then, pull gently on the desired wire from the back of the housing.

7 Maintenance

This chapter gives instructions for two types of maintenance:

- **Corrective maintenance.** This comprises cleaning, repair and exchange of spare parts and should be carried out when required. Corrective maintenance may be in response to a fault notification presented on the master display. In other instances it is required because of observing a change in the function of the equipment or wear and damage to the harness or modules.
- **Periodical maintenance.** Should be carried out regularly according to instructions from the machine manufacturer.



CAUTION

Risk of damage to the units' electronics due to electrostatic discharge (ESD).

During operation

- Be alert for functional faults in the control system.
- On suspicion of a faulty function, the control system must immediately be examined by technicians.
- Watch for error messages shown on the control system's display.
- Pay attention to the lever movements feeling slow, gaps, or if the lever movements feel uneven.



WARNING

Risk of unexpected and uncontrolled movements.

Damaged or faulty lever units must be changed.

Regular inspection

- Check that the harness, conductor splices and connectors have not been damaged. The harness should not show signs of abrasion. Connectors should be tightly mated. Damaged parts must be serviced by technicians.
- Check that the expansion units are undamaged, clean and free of obstructions so that the cooling fins can ventilate the excess heat away.
- Check that any free-hanging harness sections cannot be folded or crushed.
- Check that any control levers' bellows are undamaged, that no cracking is visible and that the bellows have not loosened. Damaged bellows mean worsened protection against dirt and moisture inside the control lever's mechanics and electronics, which leads to increased wear and shortened length of life.

Cleaning

When required, the control system's units and harness must be cleaned.

As a general rule, wipe the master display units with a clean cloth, slightly damped in a mild soap solution.

Outdoor rated expansion units may be washed with a hose.

See the separate instruction books for each unit for more detailed information.

7 Start-up

Start-up procedures

This chapter contains instructions for action to be taken in connection with the initial start.



WARNING

Risk of injury!

If the control system is not fitted properly, the machine could move uncontrollably. The machine's engine shall not be started before the control system is completely fitted and its signals are verified.

Starting the control system

Start the control system as follows:

- Prior to start, all modules and cables are to be fitted correctly.
- Check fuses, i.e. make sure that the supply voltage to the modules is equipped with the correct fuse.
- Make sure that connections for supply voltage and return lines are correct in the cable's conductor joint.
- Make sure an emergency stop is installed.
The emergency stop should disconnect the supply voltage to all modules. Alternatively, the emergency stop may also shut off the diesel engine or a dump valve, and with that, depressurize the hydraulic system.

Prepare for system start



WARNING

Make sure no one is in dangerous proximity to the vehicle to avoid injuries when it starts.

Prepare for the initial system start as follows:

- The engine for the hydraulic system's pump shall be in off position.
- Make sure that all connectors are properly connected.
- Turn on the control system.
- Make sure that voltage is being supplied to all modules; the power/status diode shall be illuminated on all modules. Also, make sure that the master is in contact with all modules by reading the master's display.
- Make sure the emergency stop is functioning properly.

Start the system

Start the system as follows:

- Start the engine for the hydraulic system's pump, assuming that the above mentioned inspections have been carried out and shown correct values.

Calibrate and adjust input and output signals according to the instructions related to the master menu system and check each and every output function carefully.



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