WOODWARD

Product Manual 35080
(Revision -, 5/2017)
Original Instructions

3055 Hydraulic Pump/Servovalve Assembly Damaged Torque Motor Wiring Repair

Woodward P/N 9902-471 and Similar

Repair Procedure

General Precautions

Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment.

Practice all plant and safety instructions and precautions.

Failure to follow instructions can cause personal injury and/or property damage.

Revisions

This publication may have been revised or updated since this copy was produced. To verify that you have the latest revision, check manual *26455*, *Customer Publication Cross Reference and Revision Status & Distribution Restrictions*, on the *publications page* of the Woodward website:

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Proper Use

Any unauthorized modifications to or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment. Any such unauthorized modifications: (i) constitute "misuse" and/or "negligence" within the meaning of the product warranty thereby excluding warranty coverage for any resulting damage, and (ii) invalidate product certifications or listings.

Translated Publications

If the cover of this publication states "Translation of the Original Instructions" please note:

The original source of this publication may have been updated since this translation was made. Be sure to check manual *26455*, *Customer Publication Cross Reference and Revision Status & Distribution Restrictions*, to verify whether this translation is up to date. Out-of-date translations are marked with ⚠. Always compare with the original for technical specifications and for proper and safe installation and operation procedures.

Revisions— A bold, black line alongside the text identifies changes in this publication since the last revision.

Manual 35080

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Illustrations and Tables

Warnings and Notices

Important Definitions

This is the safety alert symbol used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

- **DANGER** - Indicates a hazardous situation, which if not avoided, will result in death or serious injury.
- **WARNING** - Indicates a hazardous situation, which if not avoided, could result in death or serious injury.
- **CAUTION** - Indicates a hazardous situation, which if not avoided, could result in minor or moderate injury.
- **NOTICE** - Indicates a hazard that could result in property damage only (including damage to the control).
- **IMPORTANT** - Designates an operating tip or maintenance suggestion.

⚠WARNING

Overspeed / Overtemperature / Overpressure

The engine, turbine, or other type of prime mover should be equipped with an overspeed shutdown device to protect against runaway or damage to the prime mover with possible personal injury, loss of life, or property damage.

The overspeed shutdown device must be totally independent of the prime mover control system. An overtemperature or overpressure shutdown device may also be needed for safety, as appropriate.

⚠WARNING

Personal Protective Equipment

The products described in this publication may present risks that could lead to personal injury, loss of life, or property damage. Always wear the appropriate personal protective equipment (PPE) for the job at hand. Equipment that should be considered includes but is not limited to:

- **Eye Protection**
- **Hearing Protection**
- **Hard Hat**
- **Gloves**
- **Safety Boots**
- **Respirator**

Always read the proper Material Safety Data Sheet (MSDS) for any working fluid(s) and comply with recommended safety equipment.

⚠WARNING

Start-up

Be prepared to make an emergency shutdown when starting the engine, turbine, or other type of prime mover, to protect against runaway or overspeed with possible personal injury, loss of life, or property damage.

Electrostatic Discharge Awareness

NOTICE

Electrostatic Precautions

Electronic controls contain static-sensitive parts. Observe the following precautions to prevent damage to these parts:

- **Discharge body static before handling the control (with power to the control turned off, contact a grounded surface and maintain contact while handling the control).**
- **Avoid all plastic, vinyl, and Styrofoam (except antistatic versions) around printed circuit boards.**
- **Do not touch the components or conductors on a printed circuit board with your hands or with conductive devices.**

To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward manual *82715*, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules*.

Follow these precautions when working with or near the control.

1. Avoid the build-up of static electricity on your body by not wearing clothing made of synthetic materials. Wear cotton or cotton-blend materials as much as possible because these do not store static electric charges as much as synthetics.
2. Do not remove the printed circuit board (PCB) from the control cabinet unless absolutely necessary. If you must remove the PCB from the control cabinet, follow these precautions:
   - Do not touch any part of the PCB except the edges.
   - Do not touch the electrical conductors, the connectors, or the components with conductive devices or with your hands.
   - When replacing a PCB, keep the new PCB in the plastic antistatic protective bag it comes in until you are ready to install it. Immediately after removing the old PCB from the control cabinet, place it in the antistatic protective bag.

Procedure

Purpose

This document is the procedure for adding protective heat shrink tubing to the torque motor wires that are damaged by abrasive wear against the inside surface of the torque motor cover.

Table 1. Required Tools

a. 5/32 inch SAE hex socket drive (to remove #10-32 cover socket head cap screws)
b. MIL Connector style pin insertion / extraction tool (supplied as part of 1634-019 connector)
c. Side Cutters (for trimming wire if necessary)
d. Heat Gun
e. Wire Strippers
f. Crimping Tool for MIL connector pins
g. Torque wrench capable of 31-37 in-lbs range

Table 2. Torque Motor Servo Valve Wire Bundle Protection Kits

8923-2485 KIT- L44569P22 (9902-412) Torque Motor Servo Valve Wire Bundle Protection Kit
1609-285 609.6 MM
1609-288 8 INCHES
1634-017 CONNECTOR QTY 1

8923-2490 KIT - L44569P23 (9902-413) Torque Motor Servo Valve Wire Bundle Protection Kit
1609-285 609.6 MM
1609-288 4 INCHES
1634-017 CONNECTOR QTY 1

8923-2491 KIT - L44569P24 (9902-414) Torque Motor Servo Valve Wire Bundle Protection Kit
1609-285 609.6 MM
1609-288 4 INCHES
1634-019 CONNECTOR QTY 1

Step 1

Remove the torque motor cover and inspect the wiring for abrasive damage, either on the bundle jacket or on the insulation of the individual conductors.

Note: If a conductor is exposed but has little or no damage to the strands, cover with shrink tubing. If there is damage to the strands, trim the wiring back beyond the point of damage.

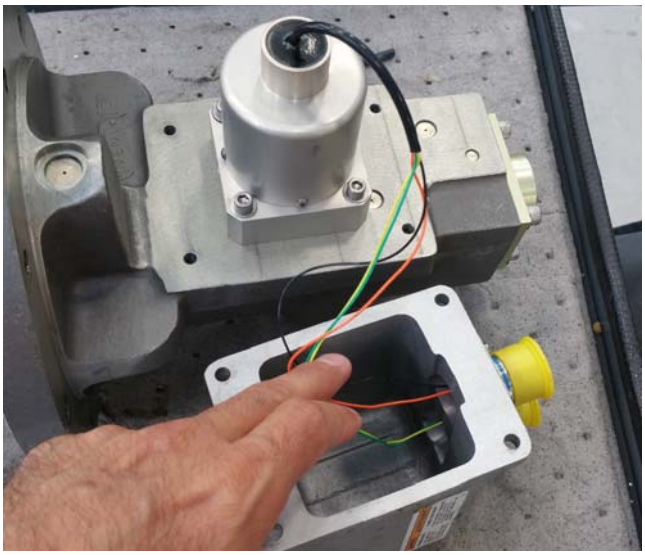


Figure 1. Torque Motor Cover Removal

Figure 2 below shows an example of some damage that has only affected the insulation.

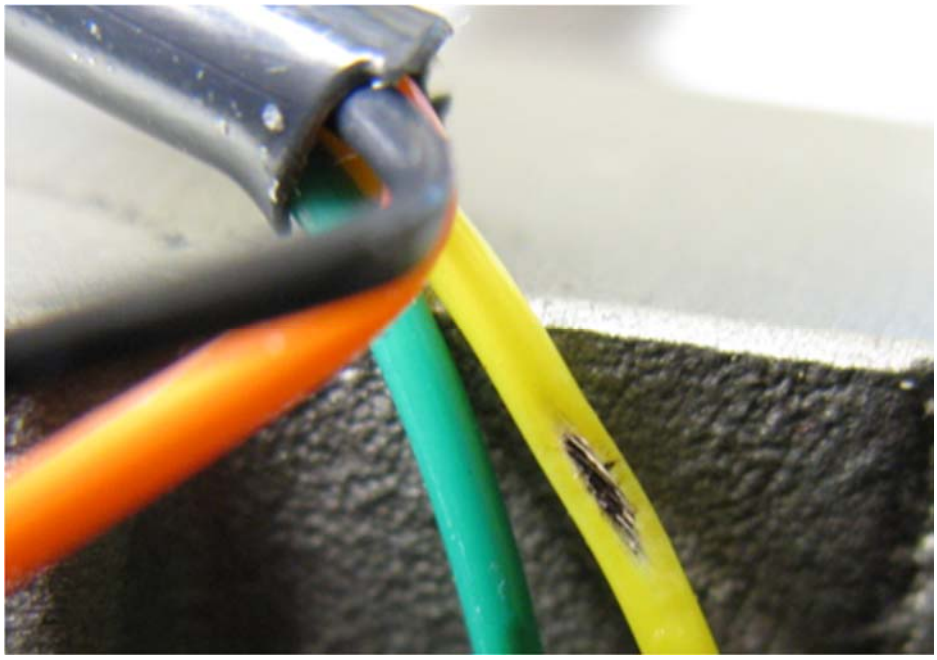


Figure 2. Example of Abrasion Damage

Depending on the type of connector, one of three types of pin extraction and installation tools will be required to remove the connector pins. The tools are supplied with the connectors and can be obtained through a variety of manufacturers.

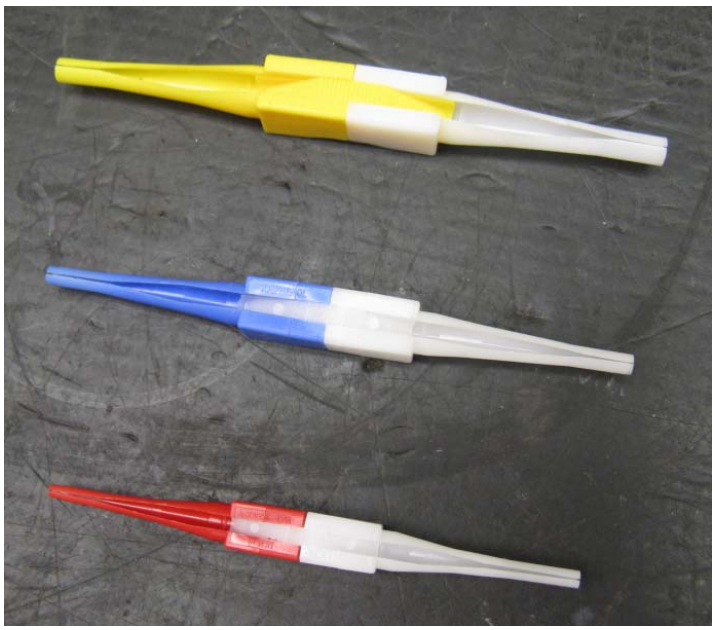
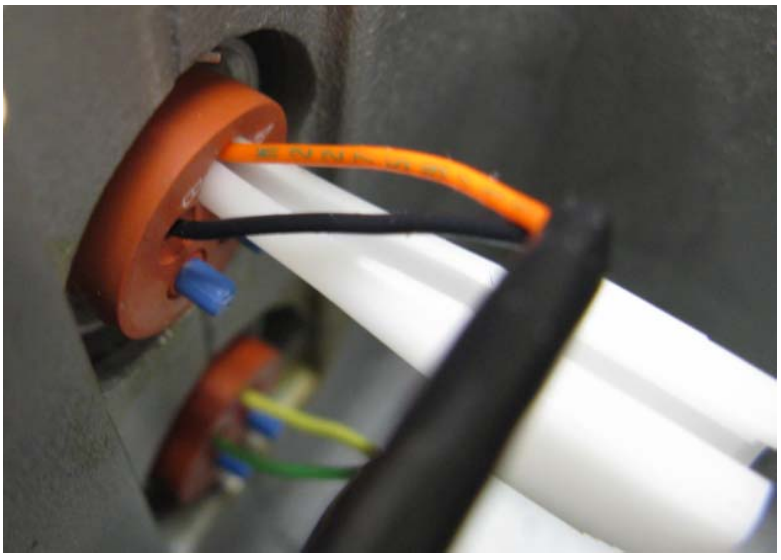


Figure 3. Connector Pin Extraction / Insertion Tool

Step 2

Using the extraction tool (white side), insert the tool into the orange grommet side of the connector until it grabs the pin. Pull the pin out and repeat this step for the other pin and the other connector. Assist removal of the pins by simultaneously pushing the front of the pin using a punch or similar flat-ended tool.



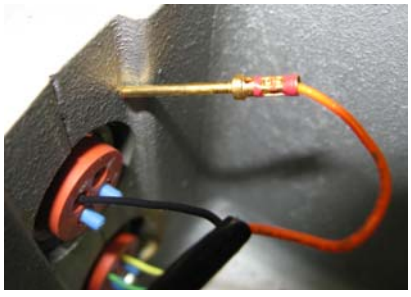


Figure 4. Connector Pin Removal/Pin Removed

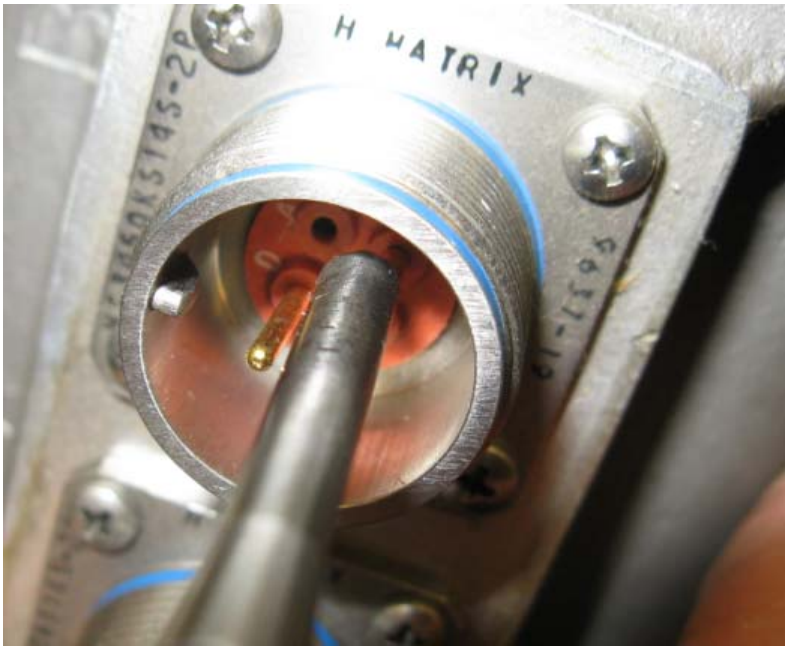


Figure 5. Pin Removal Assist with Punch

Step 3

Cut off all pins since they need to be removed in order to slide the shrink tubing up over the individual conductors. Trim back the bundle jacket (“hard sheathing”) so that there is 5.0 inches remaining.

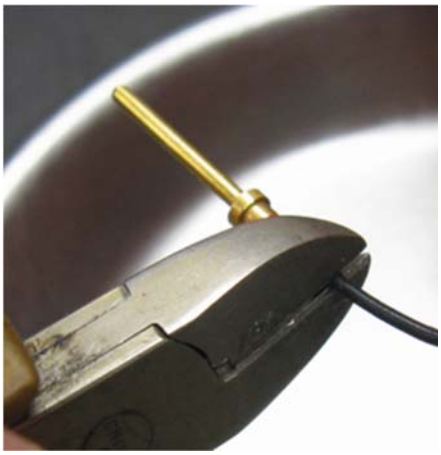


Figure 6. Remove Pins

Figure 7. Trim Back Existing Hard Bundle Sheathing

Step 4

Cut four times (4x) lengths of the small shrink sleeve (1609-285) and slide it up over one of the conductors, such that the end of the small sleeve butts up against the original bundle jacket (“hard sheathing”). About 1.0 inch of conductor should remain beyond the shrink sleeve. Using a heat gun, shrink the sleeve down over the conductor. Repeat this step for the other conductor and the other bundle (alternate torque motor type).

Figure 8. Small Heat Shrink Tubing Installed

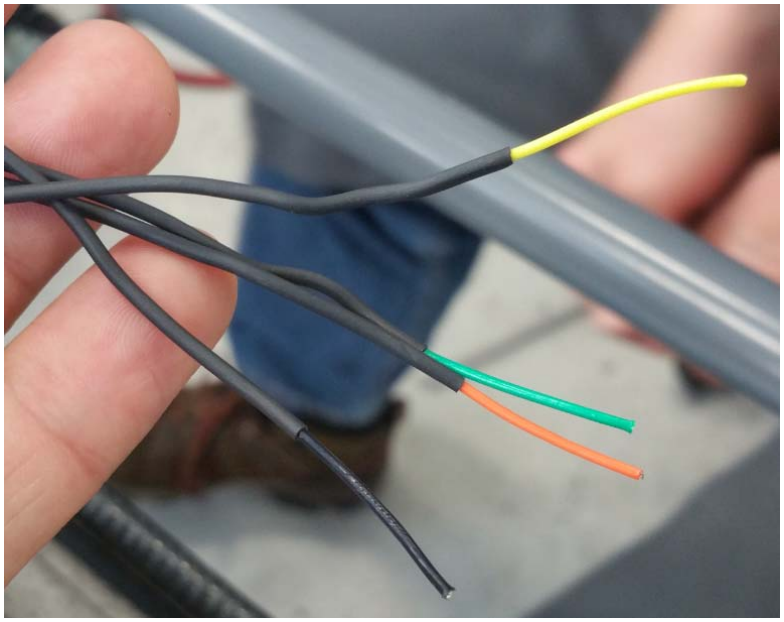


Figure 9. Approximately 1 inch of Colored Insulation Remaining

Step 5

Slide the 4-inch piece of large shrink sleeve (1609-288) up over the entire bundle, overlapping the hard sheathing by approximately ¼ inch. Using a heat gun, shrink the larger sleeve over the 4-wire bundle.

Figure 10. Large Heat Shrink Tubing Installed

Step 6

Trim back 1/4-inch from the end of each conductor in preparation for adding new pins.

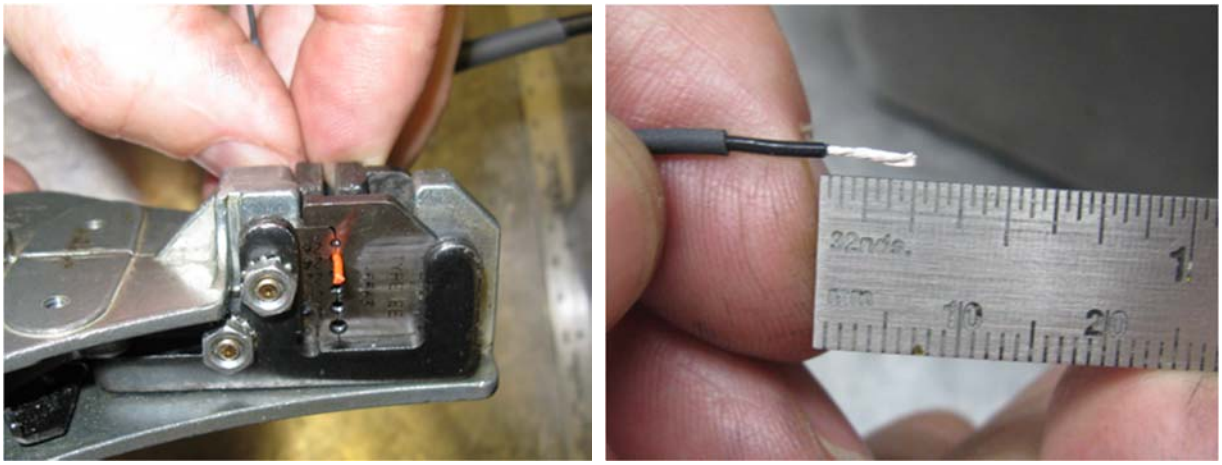


Figure 11.Stripping Wire Ends / Wire Ends Stripped (1/4”)

Step 7

The pin should fit over the bare conductor so that no bare conductor is visible out the end of the pin. The bare conductor should also be visible through the hole on the side of the pin. Using a crimping tool, crimp the pin to the end of each conductor.

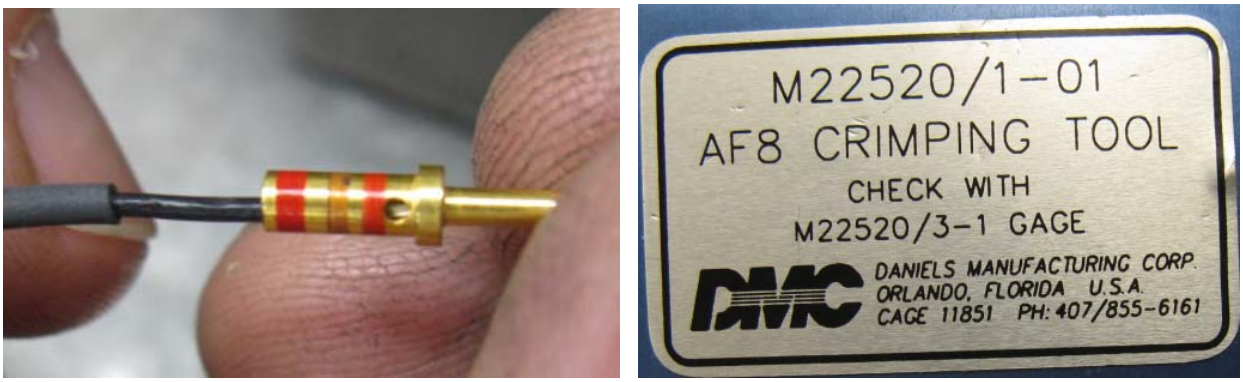


Figure 12. No Bare Wire / Standard Crimping Tool

Figure 13. Crimping the Pin to the Wire

Step 8

Using the insertion (colored) end of the pin tool, install all pins into the connectors. The pins will “snap” into place. Give each pin a slight tug (pull lightly) to ensure that each pin is installed correctly.

Figure 14. Pin Insertion Tool

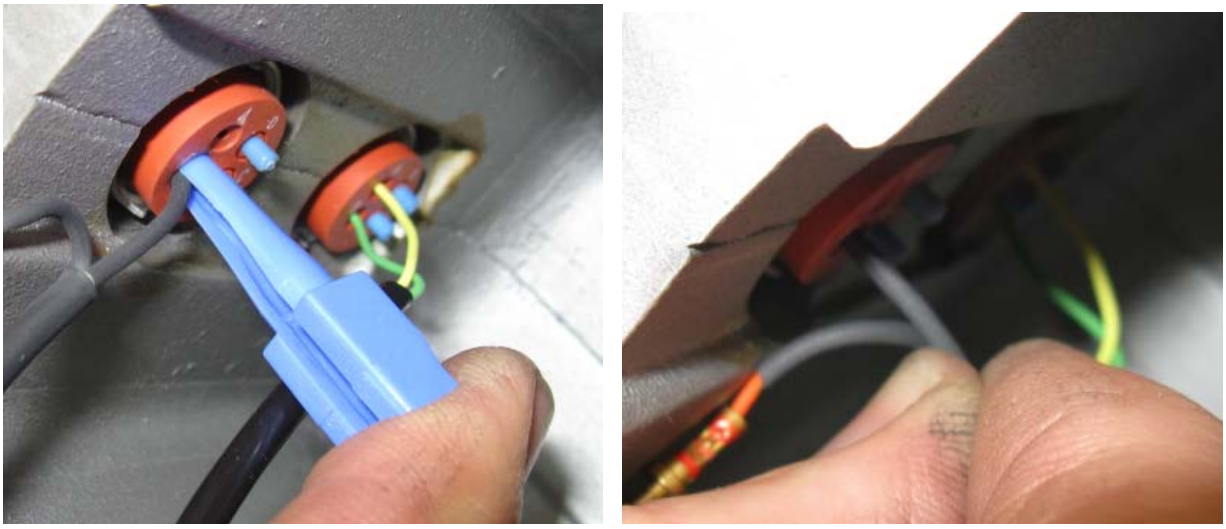


Figure 15. Approximate Insertion Depth / Pull Lightly To Ensure Proper Installation

Step 9

Reinstall Torque Motor, ensuring all O-rings are in place. Torque motor mounting screws to 31-37 in-lbs. Reinstall cover. Torque motor cover screws to 21-37 in-lbs.

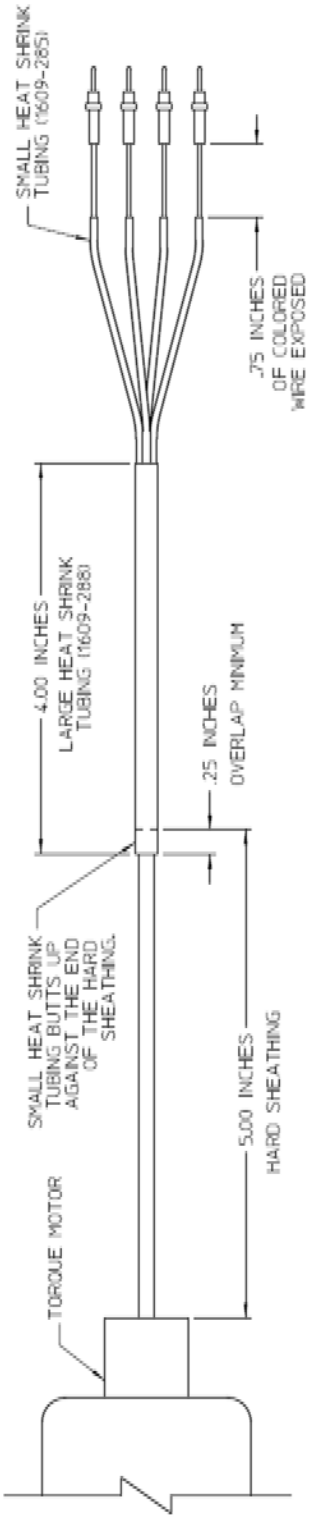


Figure 16. Overall Layout Diagram

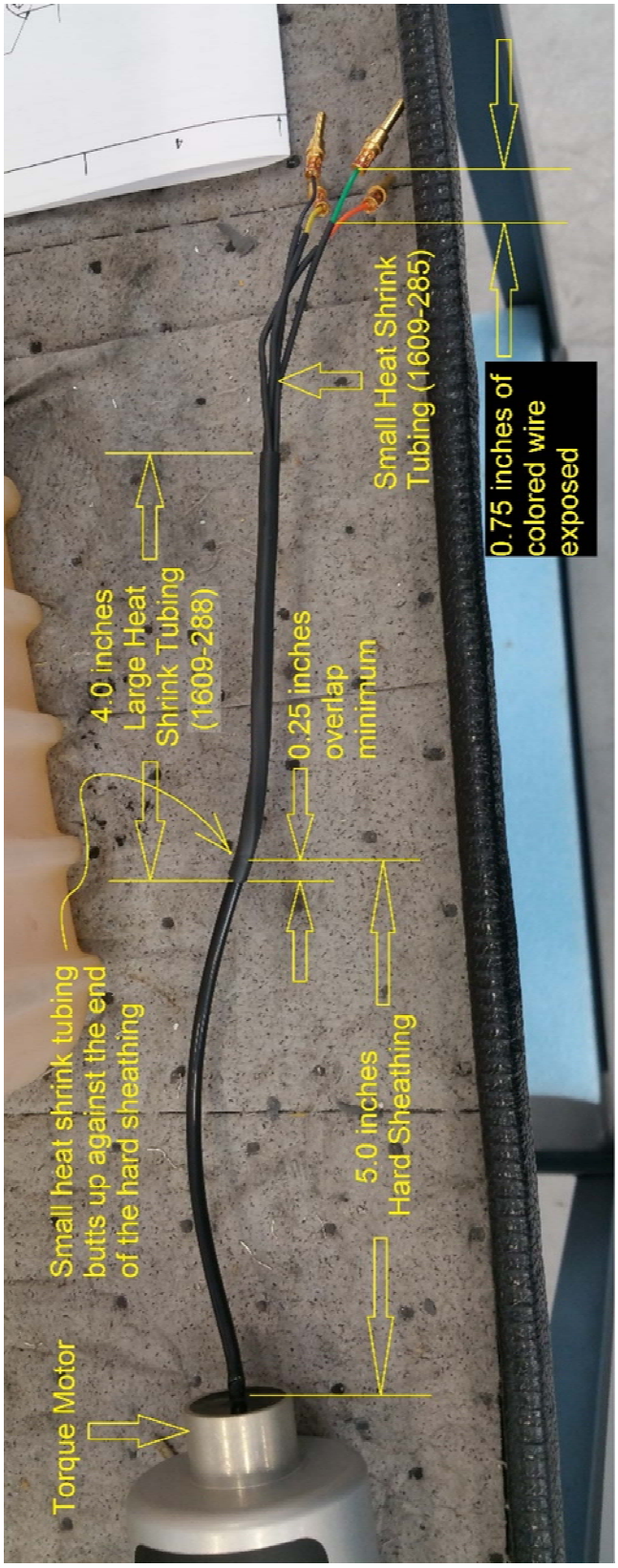


Figure 17. Completed Repair Example

Released

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

Please reference publication 35080.

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