	De-Havilland DHC-8-400 B1 & B2 TRAINING MANUAL		COURSE CODE		DGM12CBXX3Q4PW	
			ISSUE	02	DATE	20 Sep 2024
			REVISION		DATE	



CHAPTER

ATA-20

STANDARD PRACTICES:

THIS MANUAL IS INTENDED FOR TRAINING PURPOSE ONLY.

Contents

Contents	3
20-00-01 Marking of the Aircraft Parts and Materials with Markers	4
20-00-06 Adhesive Tapes – Maintenance Practices	5
20-10-01 Torquing Of Aircraft Fasteners – Maintenance Practices	7
20-10-30 Safetying Devices – Maintenance Practices	16
20-10-21 Inspection of Control Cables.....	20
20-30-01 Electrostatic Discharge Sensitive Devices – Maintenance Practices	21
20-30-21: Antennas and Antenna Connectors –Maintenance Practices	23
20-30-07: Replacement of the Lens Cap Assembly and Switch Light Bulb	25

20-00-01 Marking of the Aircraft Parts and Materials with Markers

Refer to the applicable manufacturer's Material Safety Data Sheet (MSDS) for special safety data about related materials.

CAUTION: DO NOT USE A PENCIL ON THE AIRCRAFT PARTS, MATERIALS, OR ASSEMBLIES. IF YOU DO THIS, YOU WILL CAUSE DAMAGE.

CAUTION: DO NOT USE THE PERMANENT OR TEMPORARY MARKERS ON TITANIUM, PLASTICS, COMPOSITE MATERIALS, PAINTED SURFACES OR FABRIC AND UPHOLSTERY MATERIALS. IF YOU DO THIS, YOU CAN CAUSE DAMAGE.

CAUTION: DO NOT WRITE DIRECTLY ON POLYETHYLENE, OR THIN PAPER BAGS WITH THE PERMANENT OR TEMPORARY MARKERS. IF THE BAGS CONTAIN TITANIUM, PLASTICS, COMPOSITE MATERIALS, PAINTED PARTS OR FABRIC AND UPHOLSTERY MATERIALS, YOU CAN CAUSE DAMAGE TO THE PARTS.

NOTE: Use the temporary markers for temporary identification, alignment or information purposes on all parts, materials and assemblies that are not titanium, plastics, composite materials, painted surfaces or fabrics and upholstery materials. Remove the temporary identification marks from the parts with a clean lint free cloth and water.

NOTE: Use the china marker to put non-destructive testing (NDT) defect indication marks on painted surfaces.

NOTE: Use the temporary markers for temporary identification, alignment or information purposes on all parts, materials and assemblies that are not titanium, plastics, composite materials, painted surfaces or fabrics and upholstery materials.

The temporary identification marks are removed from the parts with a

clean, lint-free cloth and water.

If it is necessary to put non-destructive testing (NDT) defect indication marks on painted surfaces, the approved temporary marker in Table 20-1 is used.

The marks are removed when no longer required by solvent cleaning.

Approved permanent markers are used for permanent identification on surfaces that are not titanium, plastics, composite materials or painted surfaces.

The permanent identification marks are removed from the parts by solvent cleaning.

20-00-06 Adhesive Tapes – Maintenance Practices

20-00-06 Application of Adhesive Tapes

The maintenance procedure that follows is for the application of adhesive tape (adhesive transfer tape, adhesive tape and fastening tape).

Refer to the manufacturer's Material Safety Data Sheet (MSDS) for specific safety data on the materials used in this task.

Preparation of Parts

- (1) Obey the general shop safety precautions.
- (2) Use clean cotton gloves to prevent surface contamination. Make sure that the surfaces are clean with no contamination.
- (3) Do the procedures that follow to prepare the bonding surfaces, before you apply the tape:

Material	Cleaning Procedure
All F19 primed parts	Clean the bonding surfaces with solvent
Bare metal parts	Clean the bonding surfaces with solvent
Painted parts	1. Lightly rub the bonding surfaces with 120 to 180 grit abrasive paper. 2. Clean the bonding surfaces with solvent
Polycarbonate parts	Clean the bonding surfaces with solvent
Rubber parts	Clean the bonding surfaces with solvent
Silicone rubber parts	1. Clean the bonding surfaces with solvent 2. Lightly rub the bonding surfaces with 120 to 180 grit abrasive paper. 3. Remove unwanted material with a tack cloth

Procedure

Refer figure 20-01: Temperature and Humidity Limits

A. Bonding Area Conditions

- (1) Keep the bonding area work surfaces clean and free of surface contaminants.
 - (2) Use the temperature and humidity limits chart to maintain acceptable bonding conditions.
- NOTE:** If the relative humidity is below 30%, bonding will increase the chance for static discharge. But it will not affect the bonding quality.

B. Apply the adhesive transfer tape as follows:

- (1) Use the correct width of tape.
 - (2) Unwind approximately 6 in. (15.24 cm) of tape from the roll.
 - (3) Put the end of the adhesive side of the tape on the part at the best position to start.
- NOTE:** This is usually a straight, flat area.
- (4) Apply pressure on the end of the tape with your finger.
 - (5) Move your finger along the tape to the roll to make the tape smooth on the part.
 - (6) Continue to unwind and apply the tape, approximately 6 in. (15.24 cm) at a time, until the surface is fully covered.
 - (7) Cut the tape from the roll with a pair of scissors or a knife.
 - (8) When you apply tape around corners, if necessary, cut the tape and apply it in sections.
 - (9) Align the parts to be bonded together.
 - (10) Slowly remove the backing from the adhesive transfer tape while you push the parts together.
 - (11) Use a rubber roller along the joint to make sure there is a good bond between the tape and the bonding surfaces.

C. Apply the adhesive tape and fastening tape as follows:

- (1) Use the correct width of tape.
- (2) Cut a length of the adhesive tape that is larger than the surface to be covered.
- (3) Slowly remove the backing from the adhesive tape.
- (4) Put the end of the adhesive side of the tape on the part at the best position to start.

NOTE: This is usually a straight, flat area.

- (5) Apply pressure on the tape with your finger.
- (6) Move your finger from one end of the tape to the other to make the tape smooth on the part.
- (7) Make sure that the surface is fully covered.
- (8) When you apply tape around corners, if necessary, cut the tape and apply it in sections.
- (9) Use a rubber roller along the joint to make sure there is a good bond between the tape and the bonding surfaces.
- (10) Do not use pins or sharp objects to make a hole to remove the air bubbles.

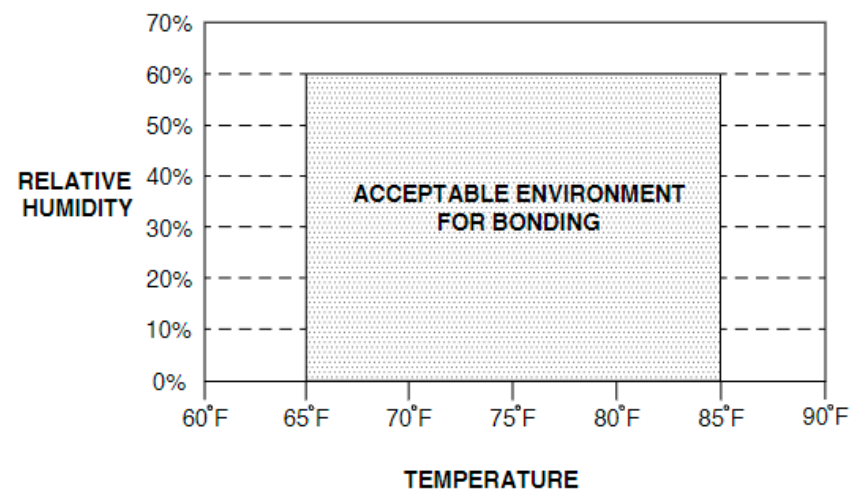


Figure 20-01: Temperature and Humidity Limits

20-10-01 Torquing Of Aircraft Fasteners – Maintenance Practices

20-10-01 Torque Standard Procedures

This standard maintenance procedure gives the instructions for the torquing of bolts, screws, nuts (referred to as “fasteners” in this procedure), connector backshells and connector adapters to a specified value with a calibrated torque wrench.

Standard Practices

- (1) While tightening and torquing, do not use lubricants or anti-seize compounds on threads.
- (2) Torque the bolts, nuts, and screws to the torque value given in the maintenance procedure.
- (3) Torque the connector backshells and connector adapters to the values given in the maintenance procedure or the wiring list.
- (4) Make sure that there is no paint, unwanted material, or corrosion on the threads of the fasteners. The parts that the fasteners connect must be smooth and clean.
- (5) Make sure that the threaded fasteners and fittings are correctly engaged.
- (6) Make sure that the torque wrench is calibrated before you use it. Turn the torque wrench with a slow and stable movement during torque procedures.
- (7) If necessary, use a torque wrench adapter and calculate the correct dial indication.
- (8) Tighten the fasteners that hold components with fay-sealed surfaces a minimum two times while the sealant cures. There must be a minimum of five minutes between the times you tighten the fasteners.
- (9) After the work with the adjustable click type torque wrench and before storage, adjust it to the lowest setting to prevent the wear of the main spring
- (10) If you use stall type power tools, give final torque with a certified tool.

NOTE: Make sure that the stall torque is less than the minimum fastener torque.

Safety Precautions

- (1) Use the torque wrench with a non-conductive or insulated handle, when there is a risk of electrical shorting or electrical shock (e.g. torquing of the intercell connectors on Ni-Cd batteries).
- (2) Use the non-conductive or insulated inspection mirror for the torque check, when there is a risk of electrical shorting or electrical shock (e.g. torquing of the intercell connectors on Ni-Cd batteries).

Installation of Bolts and Screws

Refer figure 20-02: Installation of Bolts and Screws

- (1) If specified in the maintenance procedure, apply the corrosion preventive compound to the shanks of the fasteners before installation.
- (2) Make sure that the corrosion preventive compound does not touch the threads, bearing races or other parts that move.
- (3) The threads on the fasteners must engage freely.
- (4) Do not use a lubricant or an anti-seize compound on the threads unless they are specified in a procedure.

NOTE: If specified in the procedure, apply a thin layer of MIL-T-5544 anti-seize thread compound before installation to the:

- Bearing surfaces of washers and nuts.
 - Bottom surface of the bolt heads.
 - Threads of bolts.
- (5) Install the bolts and screws at 90 degrees to the mating surfaces. Washers and nuts must have a flat fit with the mating surfaces.
 - (6) It is usually not permitted to have the threads of a fastener in a bearing or shear location (Refer figure 20-02). It is permitted to have a maximum of two threads in a bearing position in the conditions that follow:
 - The sheet thickness is more than 0.095 in. (2.4 mm).
 - The threads in a bearing position are not more than 1/4 of the sheet thickness.
 - The location is not primary aircraft structure.
 - (7) If necessary, you can use a fastener with a different grip length than the

fastener specified in the Aircraft Illustrated Parts Catalog to correct an unsatisfactory condition. The fastener must be the same specification with a grip length not more than 1/8 in. (3.17 mm) longer or shorter than the specified fastener.

(8) Many fasteners have grip lengths in increments of 1/16 in. (1.59 mm). Thus, if necessary, you can use a same-specification fastener that is a maximum of two sizes longer or shorter.

(9) If necessary, you can replace the washer below the fastener head with a thinner washer to get the correct grip length.

(10) It is not permitted to use a different grip-length fastener if:

- The specified bolt is in an attachment pattern of bolts (examples: doors, accessories, removable panels or equipment items).
- The bolt is installed in a closed receptacle where you can not see the end of the bolt extend through the threads of the receptacle (example: barrel nuts, cap nuts, heli-coils or tapped holes).

(11) Make sure that the nut does not tighten against the shank of the fastener when installed.

(12) Make sure that the shank of a fastener does not tighten against a blind tapped hole when installed.

(13) The end of a fastener must extend through the nut a minimum of 1/32 in. (0.79 mm) or 1.5 threads for flat end fasteners (Figure 201).

(14) To meet these requirements, when necessary you can use thinner washers or more washers as follows:

(a) If thinner washers or more washers are necessary, use washers of the same size, diameter, material and finish as specified in the Aircraft Illustrated Parts Catalog.

(b) You can add washers to increase the thickness a maximum of 0.062 in. (1.57 mm) more than the specified washers. Use the minimum number of washers to get the necessary thickness.

(c) The minimum permitted washer thickness for primary structure is 0.032 in (0.81 mm).

(d) Thinner washers are permitted if the fastener is tightened to a standard torque value. If the fastener has a special torque value specified in the procedure a thinner washer is not permitted.

(15) If you remove a self-locking nut, do not install it again. Replace it with a new self-locking nut. Try to turn the new self-locking nut on the fastener with your hand. Discard self-locking nuts that let the fastener turn into the self-locking part of the nut with your hand.

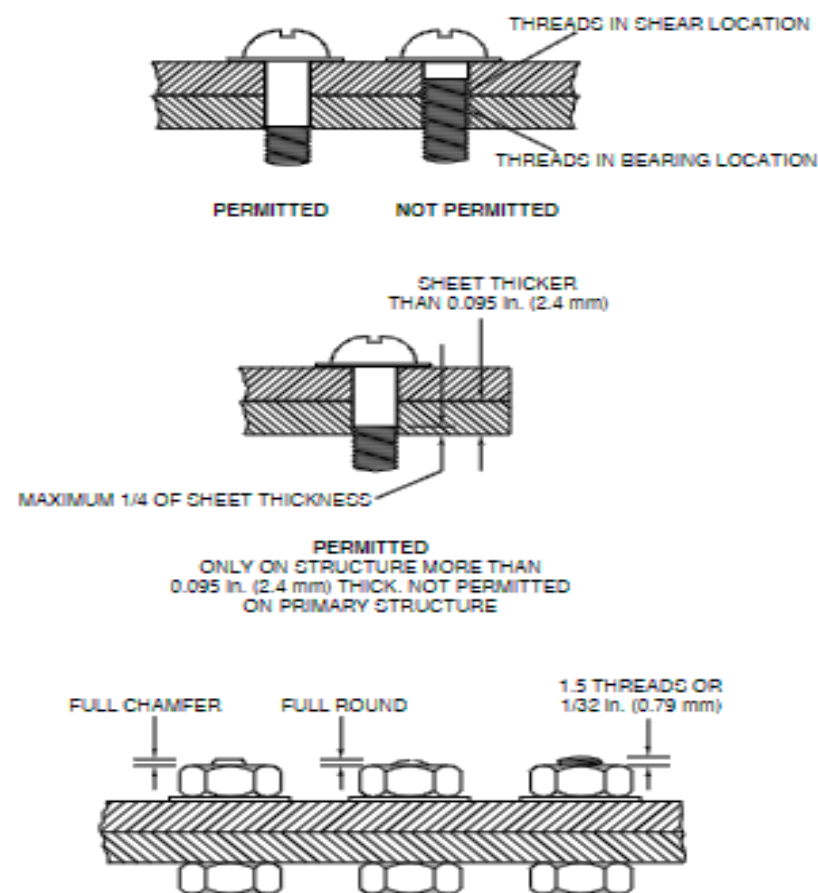


Figure 20-02: Installation of Bolts and Screws

Installation of Connector Backshells/Adapters

(1) Do not use adhesive or sealant for the connector adapter or backshells, connected with the overbraid or wire shields.

NOTE: If you use the sealant or adhesive the EMI and HIRF protection of the wire harness will be affected.

(2) For the connector adapters or backshells which have no overbraid or wire shields, assemble the backshell/adapter on the connector with the sealant (06-07) if a heat shrinkable boot is used to seal the connector.

NOTE: It is necessary to assemble the backshell on to the connector with the sealant to prevent loosening of the backshell during handling.

General Torquing Practices

(1) Use the torque wrench of the correct size and range suitable for the work. Make sure that the required torque is between 20% to 100% of the capacity of the torque wrench.

(2) Make sure that the attachments, adapters and extensions (if applicable) used are of the correct dimension.

(3) When you use the socket type extension, keep the extension in line with the fastener and hold the torque wrench correctly.

(4) When using a torque wrench with pivoted handle, hold the wrench at handle or grip area. This will prevent the increase or decrease of the effective lever length and inaccurate torque indication.

NOTE: If possible, apply the load as a pull to minimize the chance of hand injury if the wrench slips or the fasteners fails.

(5) Do not use unapproved pipes, tubes, bars or other similar tools or devices on torque wrench handles to help torquing fasteners.

(6) Read torque indicating dials and scales directly above the indicator to get accurate torque indication (to prevent parallax error).

Standard Torque Procedure

Refer figure 20-03: Torque Wrenches

Refer figure 20-04: Typical Torque Wrench Attachments, Extensions and Adapters

Refer figure 20-05: Correct Position of the Torque Wrench Attachments

Refer figure 20-06: Linear and Circular Patterns and Torque Sequences

Refer figure 20-07: Torque Correction for Extensions or Adapters

Refer figure 20-08: Identification of Torqued Fasteners

CAUTION: YOU MUST USE THE CORRECT TORQUE VALUE. IF YOU DO NOT DO THIS, YOU CAN CAUSE DAMAGE TO THE EQUIPMENT.

CAUTION: DO NOT TIGHTEN THE BOLT, NUT, SCREW AND COUPLING FITTING OR THREADED JOINT MORE THAN THE MAXIMUM RANGE FOR SPECIFIED TORQUE. OVER TORQUE CAN CAUSE DAMAGE TO THE JOINT.

CAUTION: DO NOT USE THE STANDARD TORQUE VALUES WHEN THE APPLICABLE MAINTENANCE PROCEDURE GIVES SPECIFIED VALUES. IF YOU DO THIS, YOU CAN CAUSE DAMAGE TO THE JOINT.

(1) Make sure that you torque the fasteners to the torque values given in the related maintenance procedure.

NOTE: Add the running torque of a self-locking fastener to the torque value given in the related maintenance procedure.

(2) Set the click type torque wrenches to the specified values as follows:

(a) Release the locking mechanism installed on the wrench handle.

(b) Turn the handle of the wrench to adjust it to the necessary torque value as indicated by the graduated scale.

(c) Engage the locking mechanism on the torque wrench. Again visually check the torque value on the indicator.

(3) If possible, hold the bolt and turn the nut to torque a bolt/nut combination.

(4) If it is necessary to tighten the fastener from the bolt/screw side, you must torque the fastener to the maximum specified range.

(5) To torque a castellated nut, do the steps that follow:

- (a) Torque the nut to a torque value near the minimum of the specified range.
- (b) Continue to tighten the nut until the slot in the nut aligns with the hole in the bolt.
- (c) Do not tighten the nut to more than the maximum torque value.
- (d) If you cannot get the slot to align with the hole, replace the washer or the nut. Make sure the new washer or nut is of the same type and dimension.
- (e) Safety the nut with a new cotter pin.
- (6) When you tighten a group of more than three fasteners, torque the fasteners as follows:
 - (a) Put all the fasteners in the correct location.
 - (b) Engage some threads of all the fasteners with the hand.
 - (c) Torque all the fasteners to 75% of the torque value given in the maintenance procedure and in the sequence that follows (Refer figure 20-06: Linear and Circular Patterns and Torque Sequences):
 1. For fasteners arranged in a circular pattern, torque in a criss-cross order, alternately torquing opposite fasteners.
NOTE: An approximate circular pattern is when the length is not more than the width multiplied by two.
 2. For fasteners arranged in a linear pattern, torque in a criss-cross order, starting at the middle of the pattern and working outward to the ends.
NOTE: A linear pattern is when the length is more than the width multiplied by two.
 - (d) Torque all the fasteners to 100% of the torque value given in the related maintenance procedure. Use the same sequence that you used when you initially torqued the fasteners.
 - (7) Fully torque sealed parts at least two times within the assembly life of the sealant, allowing a minimum of five minutes between each torquing operation.
 - (8) For removable parts that have formed-in-place gaskets, torque to 30% of the specified torque value at the time of installation. Final torque to the specified value after 24 hours.

If you torque a fastener to more than the maximum torque value, do the steps that follow:

- (1) Remove and discard the fasteners that you tightened to more than the maximum torque value.

NOTE: Do not loosen the fastener and torque it again.

- (2) If the fastener has two parts (a screw and a nut, or a bolt and a nut), you must remove and discard the two parts of the fastener.

C. You can torque a fastener again, if you did not torque it to more than the maximum torque value.

Do the steps that follow:

- (1) If it is necessary to torque a fastener assembly again, loosen the nut more than one full turn. Then torque it to the correct torque value.

- (2) If possible, hold the bolt and turn the nut to torque a bolt/nut combination.

- (3) If it is necessary to tighten the fastener from the bolt/screw side, you must torque the fastener to the maximum specified range.

D. If it is necessary to use the torque wrench with an attachment or adapter, do the steps follow:

- (1) Hold the attachment of the torque wrench at a 90 degree angle to the surface.

- (2) Apply a slow continuous movement to the torque wrench when you tighten a fastener.

- (3) When you use a concentric attachment, do not make a correction to the torque value.

NOTE: A concentric attachment is an attachment that is concentric with the drive square of the torque wrench.

(4) When you use an adapter that is not concentric, calculate the correct torque value indication as follows:

Multiply the specified torque value by the wrench lever length and divide by the total length.

NOTE: The torque value indication is the value that is shown on the scale of the torque wrench. The specified torque value is the torque value given in the related maintenance procedure. The wrench lever length is the distance from the center of the handle to the center of the drive square. The total length is the distance from the center of the handle to the center of the fastener.

No correction to the specified torque value is necessary if the adapter is attached at a 90 degree angle to the torque wrench.

If a torque is not specified in the maintenance procedure, do as follows:

- (1) Use a suitable wrench to tighten the fastener until the fastener head and the base of the nut rest against the parts being tightened and resistance increases sharply, then tighten a further 1/4 turn
- (2) Alternatively, it is acceptable to use the torque values specified in AMM 20-10-01-430-801.

Torquing of Connector Backshells/Adapters

- 1) Hold the connector in place with the correct holding adapter or wrench or correct mounted mating connector.
- (2) If necessary, use the soft jawed pliers or strap wrench to hold the connector in place.
- (3) Torque the connector backshells/adapters with the strap wrench fitted into a torque wrench.
- (4) When you use the strap wrench put the square peg of the torque wrench into the square hole of the strap wrench. Make sure that the handle of the two wrenches are in line.

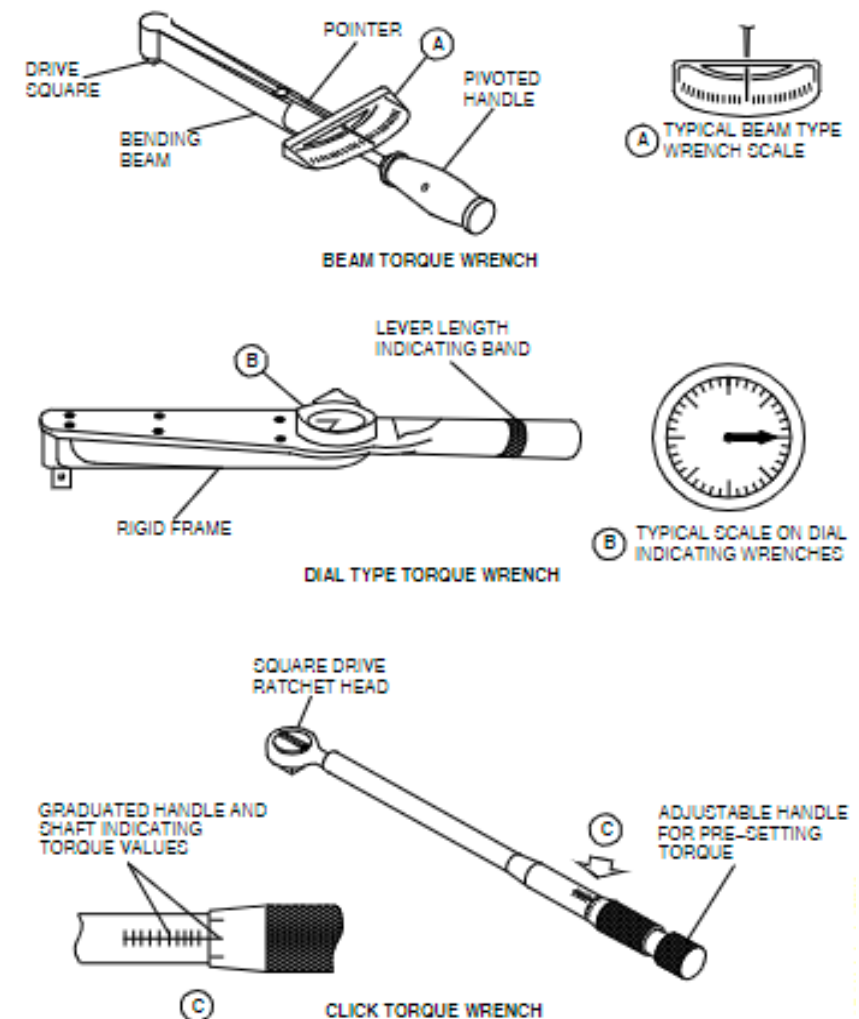
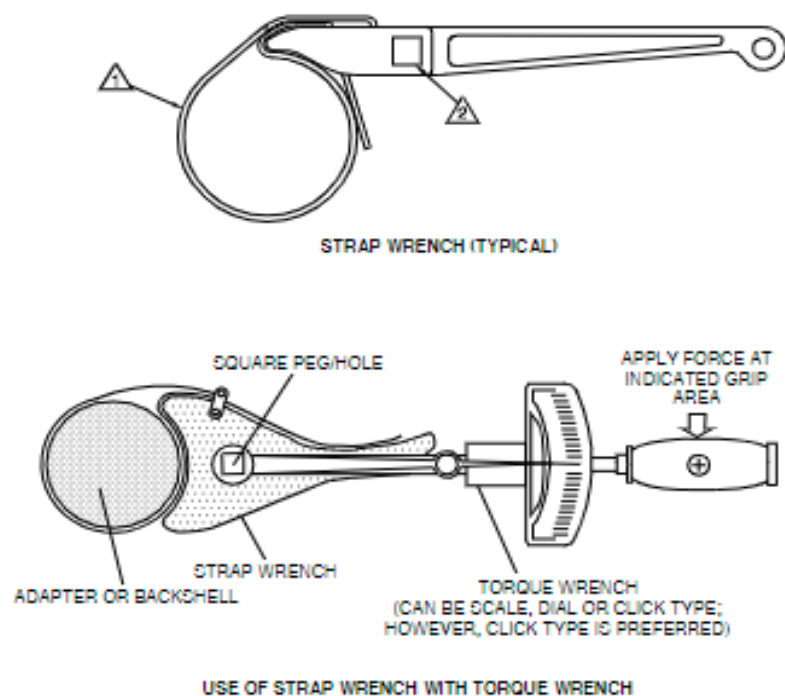


Figure 20-03: Torque Wrenches



NOTES

- 1 When torquing with a strap wrench, fit the strap over the knurled ring or grooved ring on the adapter or backshell (for example, lock ring).
- 2 Insert the square peg of the torque wrench into the square hole in the strap wrench so that the handles of the two wrenches are in line with one another.

Figure 20-03: Torque Wrenches

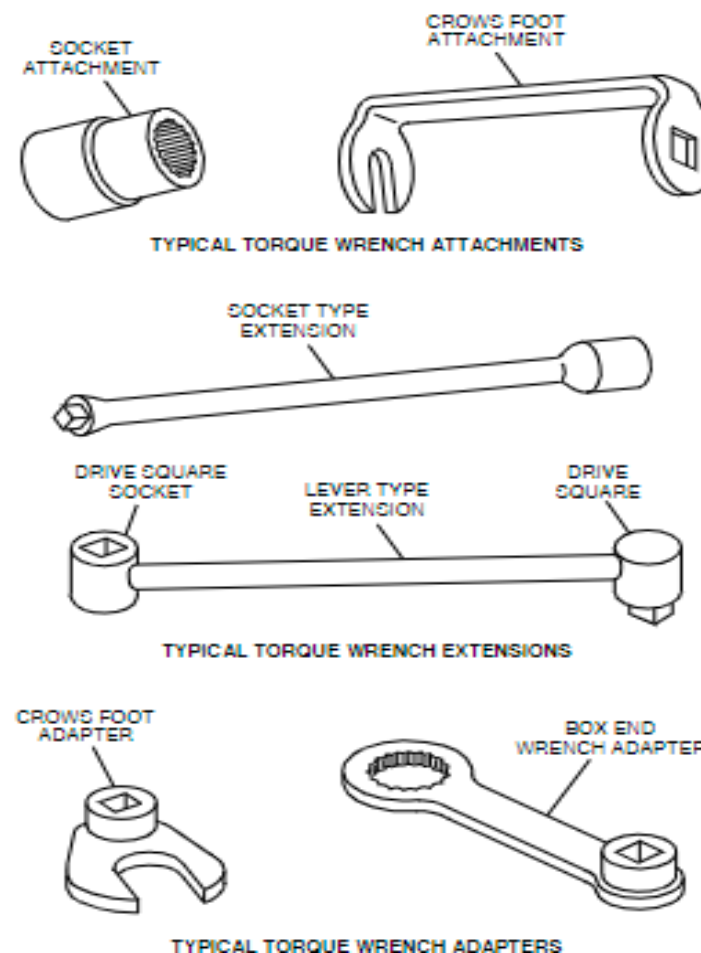


Figure 20-04: Typical Torque Wrench Attachments, Extensions and Adapters

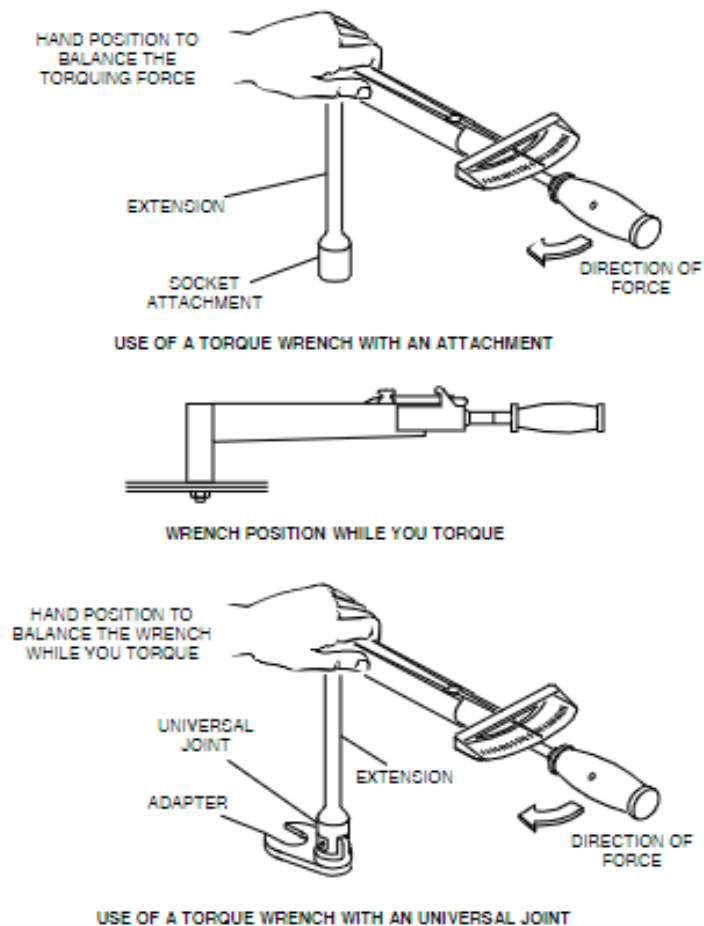


Figure 20-05: Correct Position of the Torque Wrench Attachments

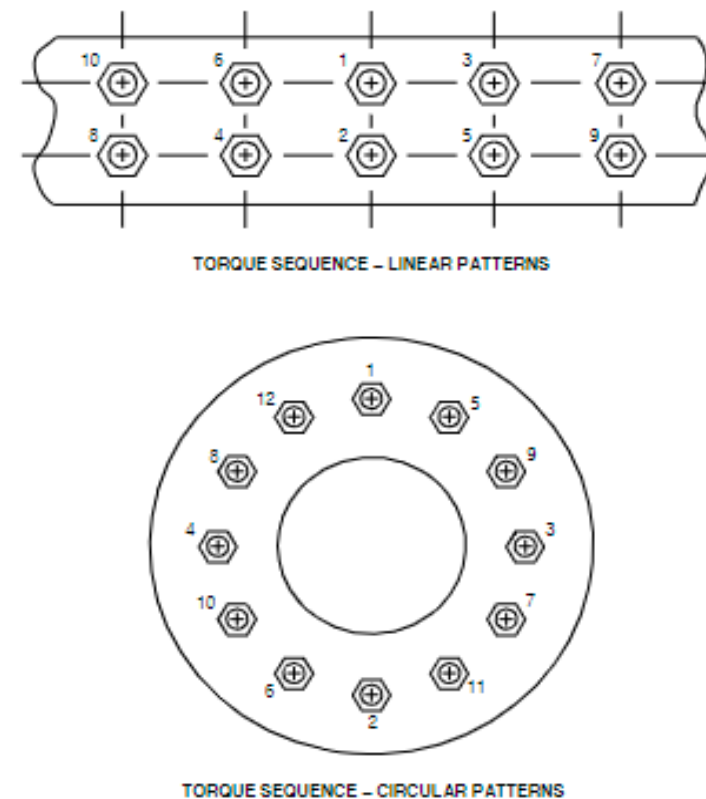


Figure 20-06: Linear and Circular Patterns and Torque Sequences

$$\text{INDICATION ON THE SCALE} = \frac{(\text{SPECIFIED TORQUE VALUE}) \times (\text{WRENCH LEVER LENGTH})}{\text{TOTAL LENGTH}}$$

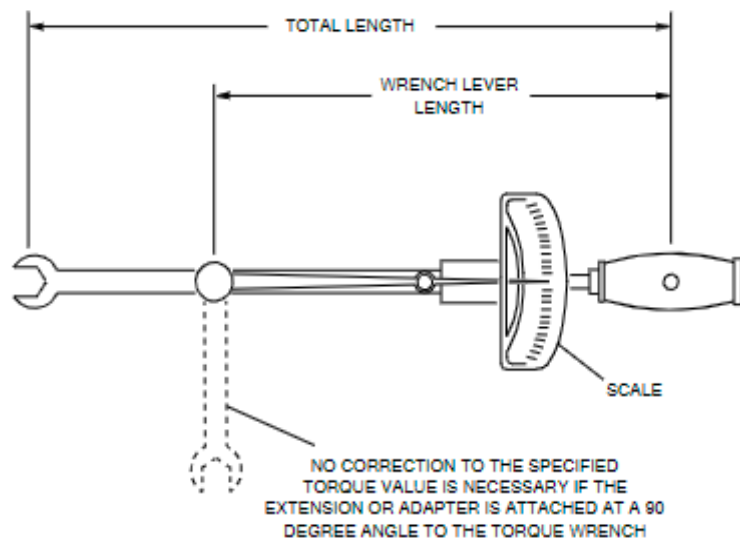
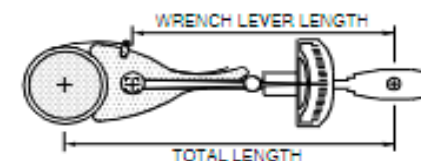
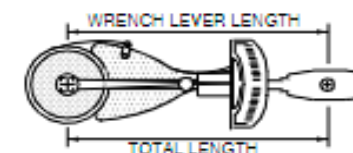


Figure 20-07: Torque Correction for Extensions or Adapters

$$\text{INDICATION ON THE SCALE} = \frac{(\text{SPECIFIED TORQUE VALUE}) \times (\text{WRENCH LEVER LENGTH})}{\text{TOTAL LENGTH}}$$



TORQUE WRENCH FITTED TO STRAP WRENCH –
TORQUE CORRECTION CALCULATION NECESSARY



TORQUE APPLIED THROUGH THE AXIS OF THE BACKSHELL –
TORQUE CORRECTION NOT NECESSARY

TORQUE CORRECTION FOR STRAP WRENCHES

Figure 20-07: Torque Correction for Extensions or Adapters

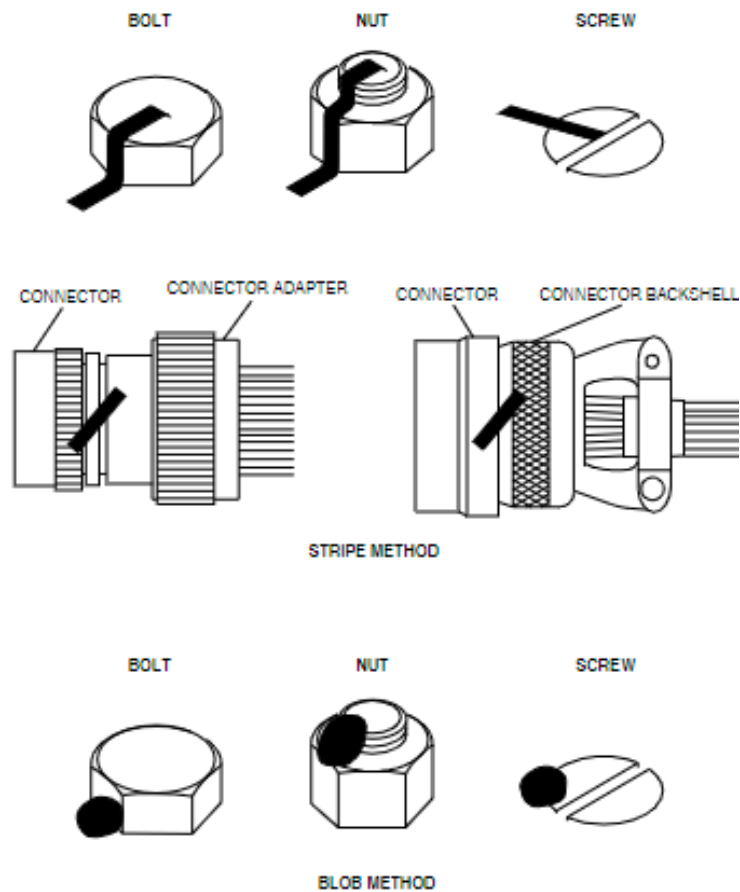


Figure 20-08: Identification of Torqued Fasteners

20-10-30 Safelying Devices – Maintenance Practices

Installation of Safelying Devices

Refer to Figure 20-09: Sheet 1 of 4 Wire Locking

Refer to Figure 20-09: Sheet 2 of 4 Wire Locking

Refer to Figure 20-09: Sheet 3 of 4 Wire Locking

Refer to Figure 20-09: Sheet 4 of 4 Wire Locking

WARNING: YOU MUST WEAR EYE PROTECTION WHEN YOU CUT THE COTTER PIN. WHEN YOU CUT THE COTTER PIN, PIECES CAN HIT YOUR EYES AND CAUSE INJURIES.

Obey the standard practices that follow:

- (1) Safety the fastener with method specified in the applicable AMM TASK. If there are no instructions for safelying the fasteners in the applicable AMM TASK, then apply this maintenance practice.
- (2) Before you safety a fastener, make sure the fastener is tight. If necessary, torque the fasteners to the torque value given in the related maintenance procedure or the standard practice (Refer to TASK 20-10-01-430-801).
- (3) Do not loosen or tight a fastener too much to accommodate the safety device.
- (4) When you install the lockwire, make sure that the lockwire applies the force in the correct direction. Do not install the lockwire in a direction that will cause the fastener to loosen.
- (5) Make sure that the lockwire is tight, but not tightened to the point that causes damage.
- (6) If there is sufficient space, use lockwire-twist pliers to twist the lockwire.
- (7) Castellated nuts must be either wire locked or cotter pinned.
- (8) Turnbuckle assemblies must be either clip locked or wire locked except in the control cables, which must be clip locked.

Obey the precautions for the safety cables installation as follows:

- (1) Do not use safety cable and ferrule more than one time. Always discard

the used safety cable and ferrule after removal.

- (2) No defect is permitted in the safety cable, before, during or after installation. Discard and change the defective safety cable with a new safety cable.
- (3) The nick, fray or kink in the safety cable is not permitted.
- (4) If this maintenance practice does not agree with the specified maintenance procedure, use the specified maintenance procedure.
- (5) Do not use the safety cable when the distance between the two termination points is more than 6.0 in. (15.2 cm).
- (6) Do not use the safety cable to wirelock the Wiggins fittings located in the fuel tank.
- (7) Always use the correct type and dimension of the safety cable.
- (8) Make sure that the crimping tool is not due for calibration.

Wire Locking:

(1) Wire locking is done to prevent the movement of structural or critical components exposed to vibration, tension, torque, etc. Use the material and gauge of the wire according to what is specified in the manuals or, when not specified in the manuals, according to the Table 1 that follows:

Application		Lock Wire	Lock Wire Diameter (Notes 1, 2 and 3)	
Area	Temperature		in	mm
Airframe	Up to 450°F (232°C)	MS20995C** (CRES)	0.020, 0.032, 0.041 or 0.047	0.51, 0.81, 1.04 or 1.19
	450 °F (232°C) and above	MS20995N** (nickel alloy)	0.020, 0.032, 0.040, or 0.051	0.51, 0.81, 1.02 or 1.30
Emergency Devices	All temperatures	MS20995CY** (copper)	0.020	0.51
Engine	All temperatures	MS20995N** (nickel alloy)	0.020, 0.032, 0.040, or 0.051	0.51, 0.81, 1.02 or 1.30
in contact with Magnesium Alloy	All temperatures	MS20995AB** (aluminum alloy)	0.032, 0.041 or 0.047	0.81, 1.04 or 1.19

Table 1: Lock Wire Selection

- (2) Cut a sufficient length of the correct lockwire to safety the fasteners.
- (3) Install the wire in such a way that the parts being locked are tightened. Make sure that the wire is tight but not over stressed. If applicable, use wire twister pliers.
- (4) In general, use the double twist method whenever wire locking is used as a safetying technique (Refer to Figure 20-09 (Sheet 1 of 4)).
- (5) Except for fasteners used to secure hydraulic or air seals, to hold hydraulic pressure or in critical areas of clutch mechanisms or superchargers, it is acceptable to use the single wire method for closely-spaced closed geometric patterns on parts in electrical systems, in shear applications or in places difficult to reach. Consider closely-spaced as a maximum of 2 in. (50.80 mm) between centers (Refer to Figure 20-09 (Sheet 2 of 4)).
- (6) Tightly tie the end of the lockwire to a tie point on the assembly or to the structure. The tie point may be a hole in the assembly or part of the structure. If the tie point is not available lockwire the connectors to each other.
- (7) Lockwire left hand threads in the opposite direction. A "twist" or "turn" of a pair of wires is defined as being produced by twisting the wires through an arc of 180 degrees (Refer to Figure 20-09 Sheet 1 and 2 of 4).
- (8) For wire locking of electrical connectors, if there are no provisions for a tie point, wire lock jam nuts of the connectors to each other. If tie points are provided, wire lock threaded connectors according to one of the methods specified in this maintenance practice. Unless otherwise specified, use MS20995C20 wire.
- (9) To wire lock bolt heads or jam nuts (including connector jam nuts) with the double twist method, carry the loops around the heads of the bolts or jam nuts of the bolts or jam nuts with the wire twisted in such a manner that the loops stay down and do not come up over the bolt heads or jam nuts and become slack (Refer to Figure 20-09 Sheet 3 of 4).
Alternatively, it is acceptable to carry the loop across the head of the bolt, instead of around it, provided there is sufficient clearance with an adjacent structure.

- (10) To wire lock closely spaced fasteners with the double twist method, do not try to safety more fasteners than can be locked using a 24 in. (61 cm) length of single wire. To wire lock widely spaced fasteners 4 to 6 in. (10 to 15 cm) apart with the double twist method, the maximum number permitted is three units in a series. Do not wire lock fasteners that are more than 6 in. (15 cm) apart unless tie points are provided on adjacent parts to shorten the span of the lock wire to 6 in. or less.
- (11) Wire lock bolts and jam nuts (including connector jam nuts) with safety wire holes drilled at an angle through the flats of the head (Refer to Figure 20-09 Sheet 3 of 4). Pass the double twist wire through the nearest lock wire hole in the next fastener head.
- (12) Unless otherwise specified, make pigtails 1/4 to 1/2 in. (6 to 12.5 mm) (3 to 6 twists) after the wire has been put through the last hole. To wire lock Wiggins fittings located in the fuel tank, make pigtails 3 twists long 1/4 in. (6 mm) maximum. Cut the end of the pigtail cleanly with a diagonal cutter and make sure the cut-off ends do not fall into any part and become a hazard. After cutting, bend the pigtail back and under in the direction that will increase the tension, to prevent it from becoming a safety hazard (Refer to Figure 20-09 Sheet 4 of 4).
- (13) Shear applications are those where it is necessary to intentionally break or shear the wire to permit the operation or actuation of emergency devices. For shear application use the lock wire and the material as specified in the manuals. If the material is not specified, use MS20995CY20 wire. Use the single wire method for shear applications.
- (14) Tighten castellated nuts to the minimum torque value and, if necessary, continue to tighten, without exceeding the maximum torque value, until a slot aligns with the hole. If more than 50 percent of the locking hole is above the nut castellation (Refer to Figure 20-09 Sheet 4 of 4), either install the necessary number of washers under the nut or use a shorter fastener (Refer to TASK 20-10-01-430-801).
- (15) To wire lock castellated nuts with the double twist method, place the loops over the nuts and around the threads (Refer to Figure 20-09 Sheet 3 of 4).
- (16) Wire lock roll pin only when specified in the manuals. Use the single wire

method to wire lock roll pins. Tie the wire through the roll pin hole and take the shortest path around the outer part of the roll pin. Bend the pigtail so that it will not interfere with the relative movement of the adjacent parts.

(17) Before you wire lock, hand tighten Wig-O-Flex couplings (do not torque Wig-O-Flex couplings). Lock the two halves of the coupling together (Refer to Figure 20-09 Sheet 4 of 4). It is not necessary to wire lock Wig-O-Flex couplings to the adjacent structure, however to wire lock one-half coupling applications which call for only one-half of the coupling to be threaded onto a valve assembly, wire lock the coupling half to the adjacent part or structure. Do not wire lock in a hole that would make the lock wire longer than necessary.

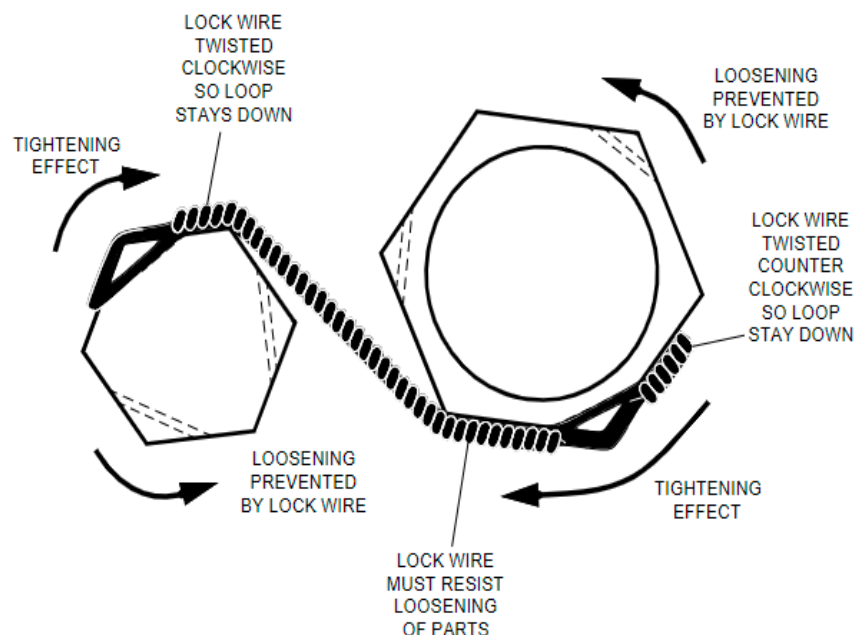
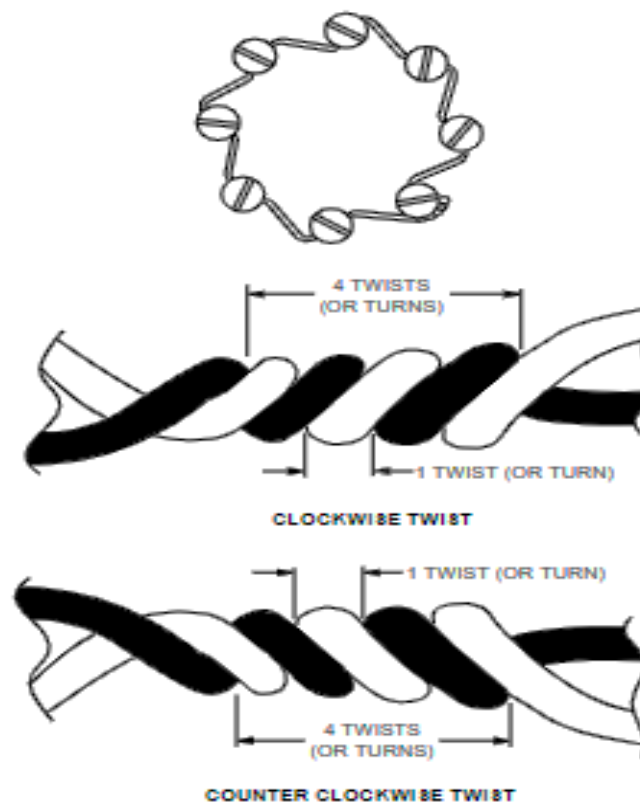


Figure 20-09: Sheet 1 of 4 Wire Locking



WIRE DIAMETER		NUMBER OF TWISTS	
INCH	MM	PER INCH	PER CM
LESS THAN 0.019	LESS THAN 0.48	11 – 14	4 – 5
0.019 – 0.026	0.48 – 0.66	9 – 12	4 – 5
0.027 – 0.042	0.69 – 1.10	7 – 10	3 – 4
0.043 – 0.065	1.10 – 1.70	5 – 8	2 – 3
MORE THAN 0.065	MORE THAN 1.70	4 – 7	2 – 3

Figure 20-09: Sheet 2 of 4 Wire Locking

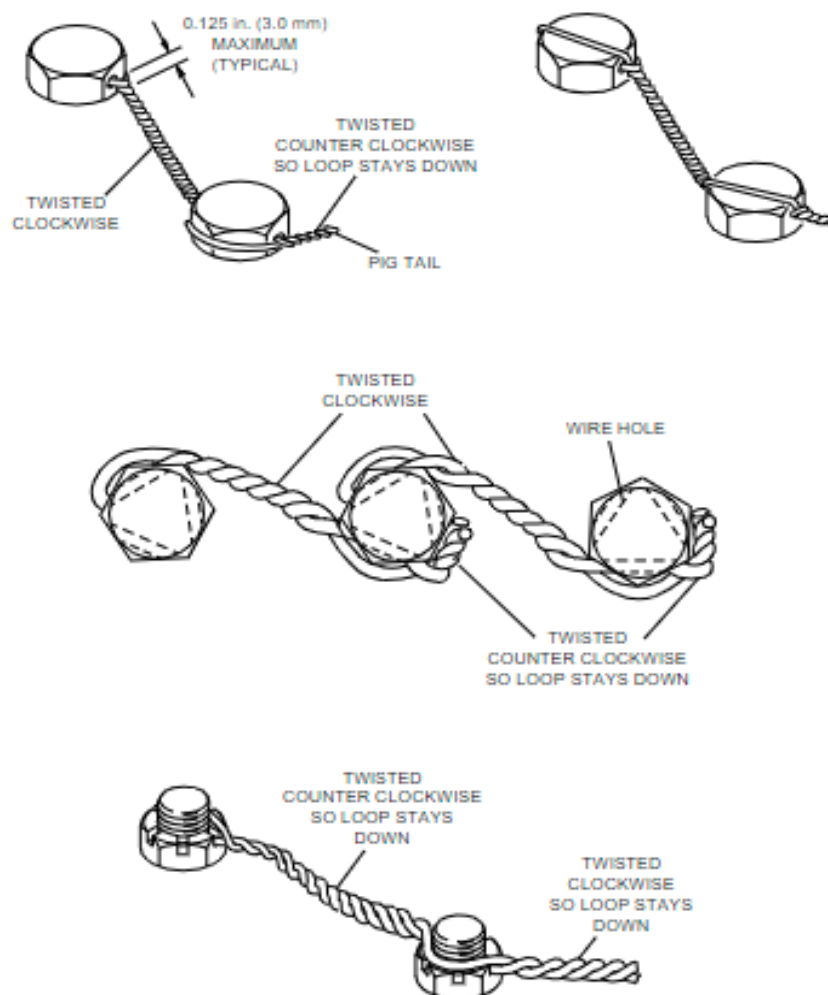


Figure 20-09: Sheet 3 of 4 Wire Locking

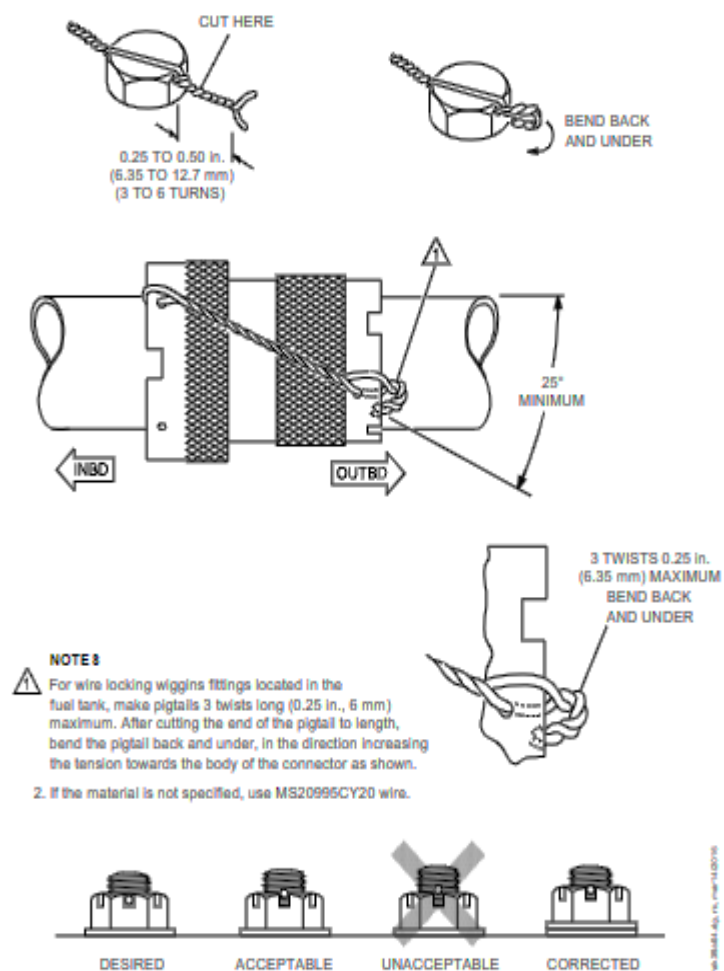


Figure 20-09: Sheet 4 of 4 Wire Locking

20-10-21 Inspection of Control Cables

Refer figure 20-10: Inspection of 7-by-19 and 7-by-7 cables.

The flight control system, the landing gear system, and the doors use these types of cables. The control cables usually wear where the cables go through fairleads, or on pulleys and quadrants.

When carbon steel cables that are corrosion resistant are made, the cable strands are plated with tin and zinc and an internal lubricant is applied by the manufacturer.

For carbon steel cables that are manufactured without an external jacket, the manufacturer also externally applies a lubricant to the cable. The lubricant will usually stay on the cable for its full service life.

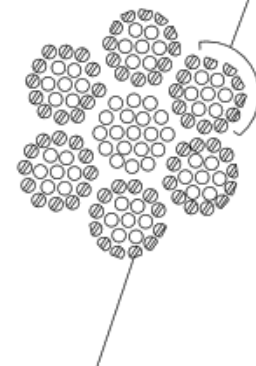
Use a thick cloth to give protection to your hands when you examine the control cables for broken wires. Broken wires can cause injuries.

CAUTION: DO NOT REMOVE THE LUBRICANT FROM THE EXTERNAL SURFACES OF THE CONTROL CABLES WITH VAPOR, STEAM, OR SOLVENTS. IF YOU DO THIS, YOU WILL REMOVE THE INTERNAL LUBRICANT FROM THE CABLE.

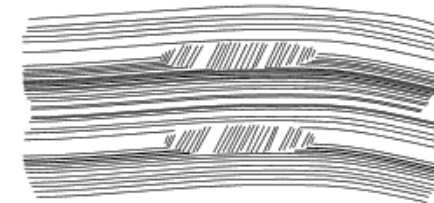
Examine the cables for damage. Replace the control cable if you see one or more of the defects that follow:

- Bends
- Kinks
- Distortion
- Wires that are not correctly twisted with the cable

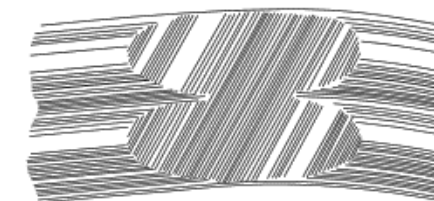
TYPICAL WORN AREA ON THE EXTERNAL SURFACE OF A CABLE



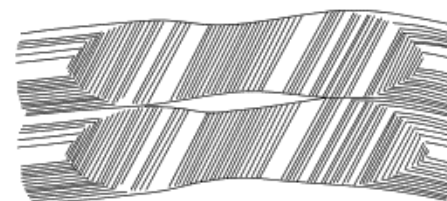
TYPICAL WIRE



WORN AREA IS LESS THAN 40% (PERMITTED)



WORN AREA IS 40% TO 50%
NOTE: WORN AREAS OF ADJACENT WIRES BECOME ONE SMOOTH SURFACE (NOT PERMITTED)



WORN AREA IS MORE THAN 59% (NOT PERMITTED)

Figure 20-10 Cable Worn out Limits

20-30-01 Electrostatic Discharge Sensitive Devices – Maintenance Practices

Refer Figure 20-11: Electrostatic Discharge Sensitive Device Symbols and Caps

An ESDS device is a component that can be internally damaged by an electrostatic discharge.

Removal of Electrostatic Discharge Sensitive Devices

Obey the electrostatic discharge safety precautions

- (1) Remove the electrical system power from the ESDS device.
- (2) Remove the necessary panels to get access to the equipment.
- (3) Make sure that the device has a typical ESDS label.

NOTE: If the ESDS device is a printed-circuit board it will have a STATIC SENSITIVE label.

- (4) If the ESDS device has a metal case, do the steps that follow:
 - (a) Disconnect the electrical wire connectors from the ESDS device.

NOTE: Make sure that you correctly identify the connectors for the installation procedure.

- (b) Make sure that you do not touch the pins in the electrical connectors on the ESDS device.
- (c) Install the conductive dust caps on the electrical connectors.

NOTE: Conductive dust caps are the colour black or gray.

- (d) Loosen the clamps that attach the ESDS device to the mounting tray.
- (e) Remove the ESDS device from the mounting tray

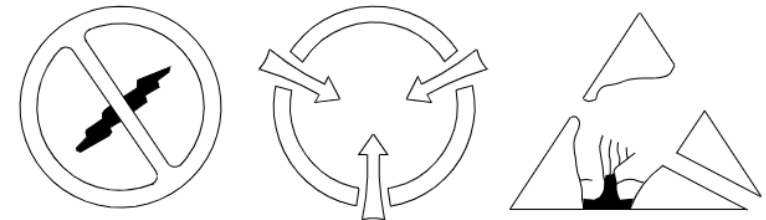


Figure 20-11 Electrostatic Discharge Sensitive Device Symbols and Caps

If the ESDS device is a printed – circuit board, do steps that follow:

Refer Figure 20-12: ESDS Handling Kit

- (a) Put the conductive work surface adjacent to the area where you will remove the printed – circuit board.
- (b) Attach the grounding cord to the conductive work surface and a good grounding point on the aircraft structure.
- (c) Attach the wrist strap to your wrist. Attach the grounding cord of the wrist strap to a good grounding point on the aircraft structure.
- (d) Attach the grounding cord of the wrist strap to a good grounding point on the aircraft structure.
- (e) Find the location of the printed – circuit board that you will remove.
- (f) Use extractors at the edges of the printed – circuit board to remove the printed – circuit board.
- (g) Immediately put the printed – circuit board in the conductive bag.
- (h) Seal the conductive bag with a cotton cord or an ESDS label.
- (i) Make sure that there is an ESDS label on the bag.
- (j) Put the printed – circuit board and the bag in a rigid container before you send it to the shop. The rigid container will prevent damage to the conductive bag.
- (k) Disconnect the wrist strap and conductive work surface from the grounding points.

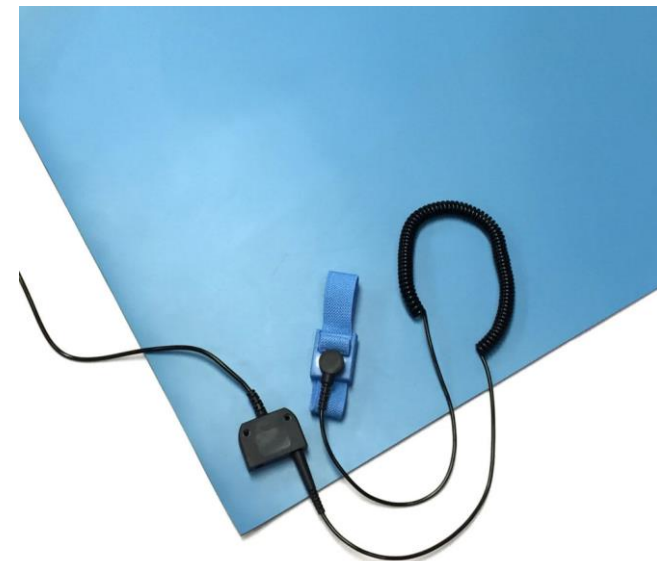
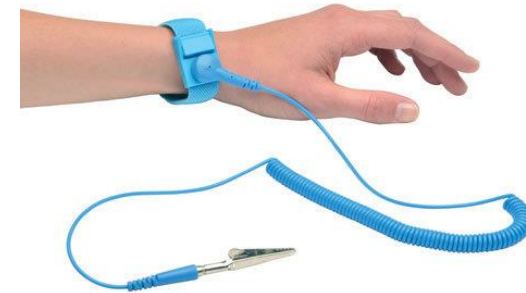
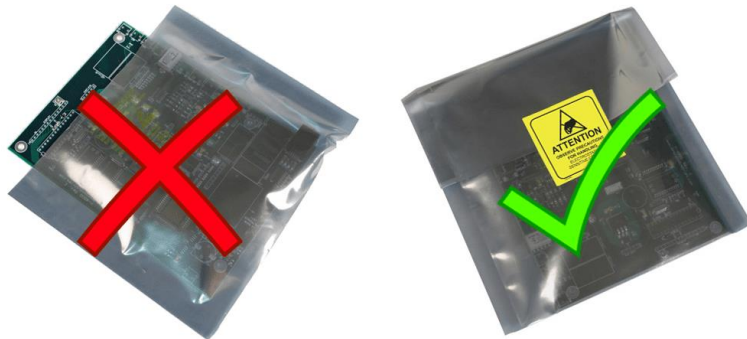


Figure 20-12 ESDS Handling Kit

20-30-21 Antennas and Antenna Connectors –Maintenance Practices

20-30-21: Installation of the Aircraft Antennas (Standard Practices)

Refer Figure 20-13: Installation of Aircraft Antenna

- (1) Make sure that the aircraft is electrically grounded.
- (2) Obey all the electrical/electronic safety precautions

Installation of the Aircraft Antennas

- (1) If the antenna is installed on the upper surface of the airframe and attached with the drainage holes, make sure that the drainage holes at the base and sides are free of sealant to let the drainage pass through the shell.
- (2) Plug and fillet seal the drainage holes on the top of the antenna with the plugs provided.
- (3) If the antenna is installed on the lower surface of the airframe and attached with the drainage holes, make sure that the drainage holes at the tip are free of sealant to let the drainage pass through the shell.
- (4) Plug and fillet seal the drainage holes on the base or sides of the antenna with the plugs provided.
- (5) Install the antenna as follows:
 - (a) Make sure that the correct antenna, fixing studs and gasket are available.
 - (b) Prepare the antenna installation area of the airframe for the bonding (Refer to TASK 51-80-00-120-801).
 - (c) For wet fit and dry fit gaskets, apply the release agent to the antenna base and the installation area of the airframe with a gasket wipe.
 - (d) Make sure that the release agent fully covers the surface.
 - (e) If you install the wet fit gasket, apply sealant (06-12) to the antenna base and the installation area of the airframe.
 - (f) Apply the sealant gradually on the surface of the antenna base and the installation area of the airframe with a wooden spatula.

NOTE: The thickness of the sealant must not be more than 0.01 in. (0.25 mm).

- (g) If you install the dry fit gasket, do not apply the sealant.
- (h) Carefully put the gasket on the antenna base. Make sure that the installation holes in the gasket align with the antenna installation holes.
- (i) If you use the HR Smith conductive dry fit sealing gasket, remove all the release paper from the mating side of the gasket to show the adhesive surface before you install the gasket.
- (j) Install the antenna with the gasket assembly on the aircraft.
- (k) Attach the antenna with the bolts.
- (l) If you use the HR Smith conductive dry fit sealing gaskets, remove all the release paper from the mating side of the gasket to show the adhesive surface before you install the antenna/gasket assembly.
- (m) Tighten the bolts to the torque specified in the AMM 20-30-21.
- (n) Clean the exposed area of the aircraft structure around the antenna with the solvent (Refer to TASK 51-27-01-110-801).
- (o) Touch up the exposed area of the aircraft structure around the antenna with the F19 primer by brush in less than 24 hours of the installation of the antenna (Refer to TASK 51-80-00-390-801).
- (p) Make sure that the primer refinishing fully applies on the applicable area.
- (q) If the paint touch up is necessary on the applicable area, coat it with an applicable top-coat paint system to match with the surrounding area.
- (r) Use the sealant (06-01A) to fillet seal around the antenna and dome seal the fixing bolts.
- (s) Let the sealant to dry for approximately 24 hours before you fly the aircraft.
- (t) Do the electrical bonding check of the antenna (Refer to TASK 51-80-00-760-814).

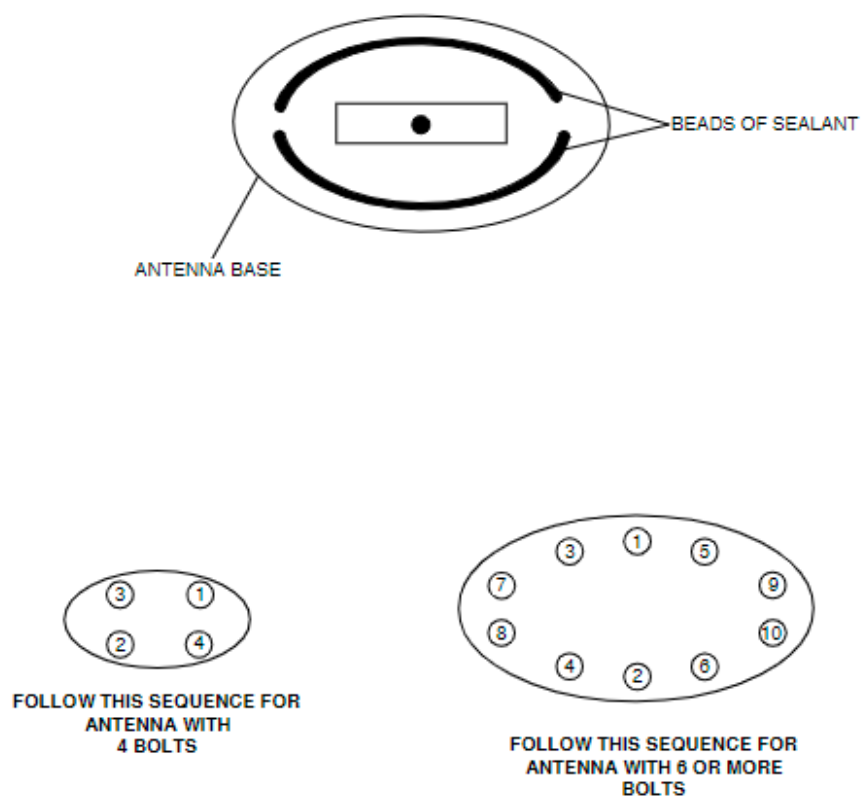


Figure 20-13: Installation of Aircraft Antenna

20–30–07 Replacement of the Lens Cap Assembly and Switch Light Bulb

Refer Figure 20-14: Lens Cap Assembly and Switch Light Bulb – Replacement

- A. Obey all the electrical safety precautions
- B. De-energize the aircraft electrical system
- C. Open, safety and tag the applicable circuit breaker

A. Replace the lens cap assembly (3) as follows:

- (1) Hold the grip (6) and remove the lens cap assembly (3) from the switch assembly (2).
- (2) Disconnect the wire bail (5) and remove the lens cap assembly (3).
- (3) Connect the wire bail (5) to the new lens cap assembly (3).
- (4) Make sure that four serviceable bulbs are installed in the lens cap assembly (3).
- (5) Install the lens cap assembly (3) on the switch assembly (2).

B. Replace the bulb (1) as follows:

- (1) Hold the grip (6) and remove the lens cap assembly (3) from the switch assembly (2) to access the bulb (1).
- (2) Carefully remove the lamp carrier (7) from the lens cap assembly (3).
- (3) Carefully remove the defective bulb (1) from the lamp carrier (7).
- (4) Carefully insert a new bulb (1) in the lamp carrier (7) and install it in the lens cap assembly (3).
- (5) Make sure that the bulbs (1) are installed correctly in the cap receptacle (4).
- (6) Install the lens cap assembly (3) on the switch assembly (2).

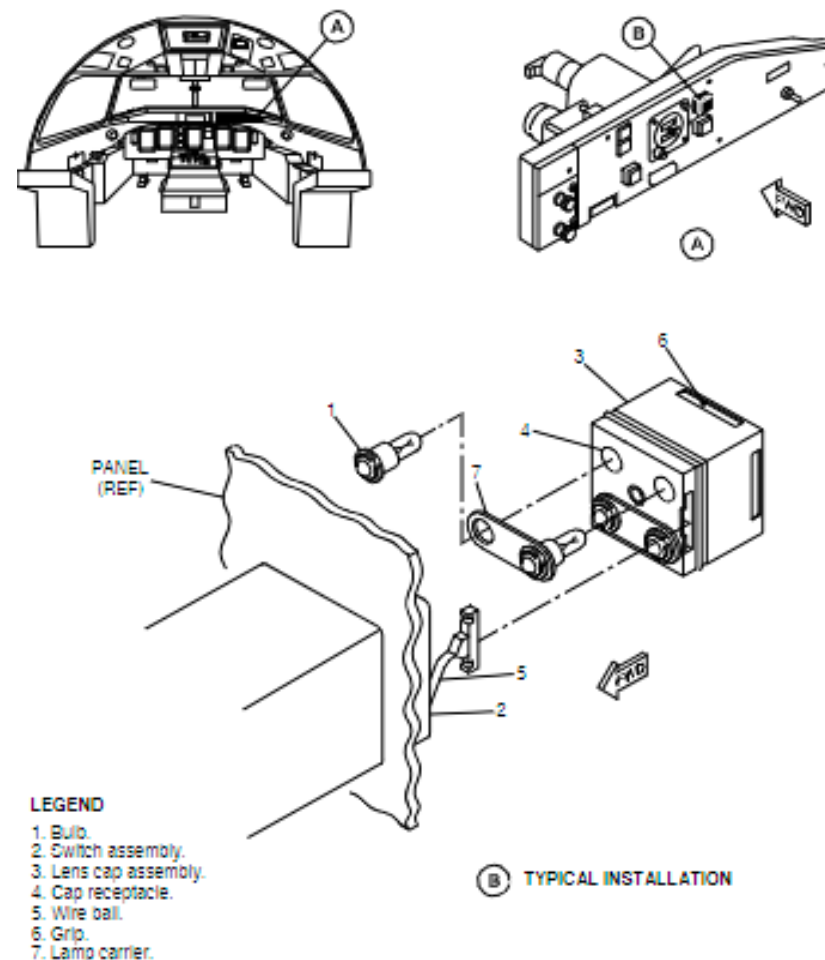


Figure 20-14: Lens Cap Assembly and Switch Light Bulb – Replacement