TUBING (TEMPORARY) - REPAIR

EFFECTIVITY: ALL

1. General

CAUTION:
- ONLY DO THE TEMPORARY REPAIR IF IT IS NOT POSSIBLE TO DO THE PERMANENT REPAIR (AMM TASK 20-10-03-300-801-A/800).
- THESE INSTRUCTIONS ARE NOT APPLICABLE TO THE RIGID TUBES INSTALLED BETWEEN THE PCU AND THE ACTUATORS OF THE RUDDER SYSTEM OR TO THE TUBES DOWNSTREAM OF THE HYDRAULIC CONTROL MODULE OF THE NOSE-LANDING-GEAR WHEEL-STEERING SYSTEM.
- HYDRAULIC TUBES INSTALLED BETWEEN THE FRONT AND REAR PRESSURE BULKHEADS MUST BE REPAIRED WITH NO SEPARABLE FITTINGS ONLY.
- THIS IS A TEMPORARY REPAIR THAT MUST BE REPLACED BY A PERMANENT REPAIR (AMM TASK 20-10-03-300-801-A/800) AT THE NEXT SCHEDULED CHECK.

A. This Section gives the necessary instructions for the temporary replacement of the damaged rigid tubes of the hydraulic system with flexible hoses.

B. The flexible hoses must be resistant to the phosphate-ester-base hydraulic fluid (SAE AS 1241A type-IV).

NOTE: There are many possible repair techniques, and the conditions of their use are out of control of Embraer. Thus, the airline must make the selection of the best applicable procedure.

C. Refer to AMM MPP 06-41-01/100, AMM MPP 06-41-02/100, AMM MPP 06-42-00/100, AMM MPP 06-43-00/100, and AMM MPP 06-44-00/100 for the access to the tubes.

D. The procedures in this section are given in the sequence below. The tasks identified with (♦) are part of the Scheduled Maintenance Requirements Document (SMRD).

TASK NUMBER	*DESCRIPTION*	*EFFECTIVITY*
20-10-06-300-801-A	TUBING - TEMPORARY REPAIRS	ALL

TASK 20-10-06-300-801-A
EFFECTIVITY: ALL

2. TUBING - TEMPORARY REPAIRS

A. General

(1) This procedure gives the instructions on temporary repair of tubes.

B. References

REFERENCE	*DESIGNATION*
AMM TASK 12-13-01-600-801-A/300	HYDRAULIC SYSTEM RESERVOIR - FLUID LEVEL CHECK
AMM TASK 12-13-01-600-802-A/300	HYDRAULIC SYSTEM RESERVOIR - REPLENISHMENT
AMM TASK 20-10-03-400-801-A/400	TUBING - INSTALLATION
AMM TASK 29-10-00-860-801-A/200	HYDRAULIC SYSTEM - PRESSURIZATION WITH HTS
AMM TASK 29-10-00-860-803-A/200	HYDRAULIC SYSTEM - BLEED OF AIR
AMM TASK 32-00-01-910-801-A/200	LG SAFETY PIN - INSTALLATION AND REMOVAL

C. Zones and Accesses

Not Applicable

D. Tools and Equipment

ITEM	*DESCRIPTION*	*PURPOSE*	*QTY*
GSE 015	Kit, field repair	For tubing repair	
Commercially available	Saw	To cut the hose	
Commercially available	Caliper rule or feeler gages	To measure the clearance	
Commercially available	Torque wrench (torque ranges - refer to Tables 401 and 402 of the TASK 20-10-03-000-801-A)	For temporary tubing repair	
Commercially available	Crowfoot wrenches (Dimensions : 7/16"; 1/2"; 9/16"; 5/8"; 11/16"; 13/16"; 7/8"; 15/16"; 1"; 11/16"; 1 1/8"; 1 3/16"; 1 1/4"; 1 5/16"; 1 3/8", 1 1/2"; 1 5/8"; 1 13/16"; 1 7/8" and 1 15/16")	For temporary tubing repair	

E. Auxiliary Items

ITEM	*DESCRIPTION*	*PURPOSE*	*QTY*
Commercially available	Cloth, lint free	Cleaning equipment	AR

F. Consumable Materials

SPECIFICATION (BRAND)	*DESCRIPTION*	*QTY*
SAE AS 1241A type IV	Phosphate-ester-base hydraulic fluid	AR
MEP 13-073	Cleaning solvent (Rhodiasolve E-23)	AR

G. Expandable Parts

Not Applicable

H. Persons Recommended

QTY	*FUNCTION*	*PLACE*
1	Does the task	On damaged tubing

I. Preparation

SUBTASK 841-002-A

(1) Make sure that the aircraft is safe for maintenance.

(2) On the circuit breaker panel, open the ELEC PUMP 1 and (or) ELEC PUMP 2 circuit breaker(s) and attach a DO-NOT-CLOSE tag to it (them).

(3) Make sure that the pressure in the related system is fully released.

(4) Make sure that the safety pins of the landing gears are installed, if the removal procedure is near them (AMM TASK 32-00-01-910-801-A/200).

(5) The flexible hose must obey these requirements:

(a) Operating pressure at or above 3000 psi.

(b) Inside diameter not less than that of the damaged tube.

(c) Sufficient length to replace the damaged tube, and obey the satisfactory slack, flexing, twisting, bending, clearance, and support requirements (Figure 801).

1 Slack - Hose assemblies must not cause a mechanical load on the hose. Hoses will change length from + 2 to - 4 percent when pressurized. Have sufficient slack or bend to make allowance for change in length.

2 Flexing - When hose assemblies are in a location with much vibration of flexing, there must be sufficient slack between rigid fittings. Flexure must not occur at the hose end -fitting(s). The hose must stay straight for a minimum of two hole diameters from the end-fitting(s). Do not install the clamp at locations that will keep it to a limit or prevent hose flexure.

3 Twisting - Hoses must be installed without twisting to prevent possible rupture of the hose or loosening of the attaching nuts. Use of swivel connections at one or both ends will release twist stresses.

4 Bending - To prevent sharp bends in the hose assemblies, use elbow fittings, hose with elbow-type end fittings, or the correct bend radii see (Table 801).

5 Clearance - The hose assemblies must be away from all other lines, equipment, and adjacent structure in all operation conditions. Hoses must obey the minimum clearance requirements see (Table 802). Specially, be careful to the installations with the 45° and 90° fittings concerning to clearance.

6 Support - The hose assemblies must be held not to permit deflection of rigid lines because of possible relative motion that can occur. Use sufficient clamps to follow the contour of the structure to prevent hose abrasive wear, kinking, and knots during flexure. At a minimum, clamps must be at the locations where the tube clamps were. The hose must not be rigidly held by tight, rigid clamp around its outside diameter. If the hose between rigid connections must move longitudinally, clamps must be of a type that will not cause wear on the hose casing. The supports must be at the tube, not at the hose.

(6) Open applicable access doors/panels to get access to the damaged tube(s).

CAUTION: TUBE ENDS SHOULD BE REASONABLY SQUARE.

(7) Remove the damaged tube or, if applicable, use GSE 015 to cut the damaged region tube.

(8) Use GSE 015 to remove deburrs.

CAUTION: DO NOT LET LINES OR FITTINGS STAY WITHOUT CAPS. DIRT CAN CAUSE SYSTEM CONTAMINATION, DAMAGE TO COMPONENTS, AND LEAKAGE.

(9) Install protection caps at the system fittings.

(10) Clean the fluid leaked with a cloth and cleaning solvent (Rhodiasolve E-23).

(11) Do a check on flexible hose ends and fittings for cleanliness, defects, and contamination that can decrease sealing effectiveness.

Table 801 - MINIMUM INTERNAL BENDS RECOMMENDED FOR AEROQUIP FLEXIBLE HOSES

FLEXIBLE HOSE INSIDE DIAMETER (IN)	(AEROQUIP) MINIMUM BEND RADII MEASURED AT FLEXIBLE HOSE INTERNAL BEND (IN)
1/4	1.50
3/8	2.50
1/2	2.88
5/8	3.25
3/4	3.88

NOTE: For hoses from other manufacturers, contact them to obtain the minimal bend radii.

Table 802 - MINIMUM CLEARANCE RECOMMENDED FOR FLEXIBLE HOSES

FLEXIBLE HOSES CLEARANCE TO	MINIMUM CLEARANCE (IN)
Static Rigid Parts	0.25
Movable Rigid Parts	0.50
Movable Flexible Parts	1.00

J. Temporary Repair Tubing (Figure 802) (Figure 803)

SUBTASK 360-002-A

(1) Choose the adequate sleeves, fitting assembly and hose part numbers, according to the table below:

Table 803 - TUBE MATERIAL X HOSE KITS

Tube		Hose Kit		
		Fitting	Hoses	
Material	Diameter (IN)	Permaswage Sleeves (Part Number)	Fitting Assembly (Part Number)[1]	Aeroquip Hose
Aluminum Alloy 6061-T6; or CRES 21-6-9; or CRES 304 1/8 HARD; or 3AL-2.5V CWSR TI Alloy	1/4	D10008-04	AE18926E AE18882E AE18884E	AE246-4
	5/16	D10007-05, and D10006J05, and MS21916-5-4		
	3/8	D10008-06	AE18926G AE18882G AE18884G	AE246-6
	1/2	D10008-08	AE18926H AE18882H AE18884H	AE246-8
	5/8	D10008-10	AE18926J AE18882J AE18884J	AE246-10

[1] Choose the adequate fitting for each situation.

(2) Install the sleeves on the tubes.

NOTE: Use the manufacturer's procedures to install the sleeves.

CAUTION: MAKE SURE THAT THE HOSE LENGTH IS ADEQUATE TO PREVENT STRETCH.

(3) Measure the distance end to end and determine the adequate length of the hose.

(4) With the aid of a saw, cut the hose.

(5) Install the socket to the hose, as follows (Figure 802):

(a) Put the socket onto the hose before you put the socket sleeve into the hose end.

(b) Push in the socket sleeve between the inner hose and the steel braid.

(c) Push the socket sleeve against a flat surface until the inner hose touches the socket-sleeve stop.

(d) Repeat the steps above to install the socket to the other hose end.

CAUTION:
- OVERTORQUE CAN DAMAGE THE FITTINGS AND CAUSE LEAKAGE.
- FOR AEROQUIP FITTING ASSEMBLIES, MAKE SURE THAT A CLEARANCE OF 0.6 TO 1.2 mm IS AVAILABLE (FIGURE 802, DET. A). USE A CALIPER RULE OR FEELER GAGES TO MEASURE THE CLEARANCE.

(6) Install the nipple assemblies to the socket-hose assembly (Figure 802).

NOTE: Use a hand-vise or crowfoot wrench to hold the socket-hose assembly.

CAUTION:
- TOO MUCH TORQUE CAN CAUSE DAMAGE TO THREADS OF MATING PARTS. BEFORE TORQUE IS APPLIED, HOLD THE UNION OR FITTING WITH THE CORRECT WRENCH.
- DO NOT USE A TIGHTENING NUT TO PULL THE FLEXIBLE HOSE INTO ALIGNMENT.
- MAKE SURE THAT THE FLEXIBLE HOSE IS NOT TWISTED BEFORE AND AFTER TORQUE APPLICATION.

(7) If the diameter of the tube that you repair is 5/16 in, do as follows (Figure 803):

(a) Install the unions to the nipple-socket-hose assembly.

(b) Install the union-nipple-socket-hose assembly to the nuts.

(8) If the diameter of the tube that you repair is other than 5/16 in, do as follows (Figure 803):

(a) Install the nipple-socket-hose assembly to the sleeves.

NOTE: Refer to AMM TASK 20-10-03-400-801-A/400 to apply the correct torques.

CAUTION:
- THE HOSE AND CONNECTIONS MUST NOT HAVE LEAKS.
- ALL REQUIREMENTS FOR SLACK, FLEXING, TWISTING, BENDING, CLEARANCE, AND SUPPORT MUST BE OBEYED.

(9) Do a check on the hose and connections to make sure that there are no leaks and that all requirements for slack, flexing, twisting, bending, clearance, and support are obeyed.

K. Follow-on

SUBTASK 842-002-A

(1) Do a check on the fluid level in the hydraulic system reservoir (AMM TASK 12-13-01-600-801-A/300), if necessary, fill it (AMM TASK 12-13-01-600-802-A/300).

(2) On the circuit breaker panel, close the ELEC PUMP 1 and (or) ELEC PUMP 2 circuit breaker(s) and remove the DO-NOT-CLOSE tag from it (them).

(3) Pressurize the related system (AMM TASK 29-10-00-860-801-A/200) and do a check for leaks at the hydraulic line you worked on.

NOTE: Most of the hydraulic lines can be pressurized on ground by pressurizing the related hydraulic system (1 or 2). Guidance in the AMM Part I and/or SSM can be used for more determination on the pressurization requirements for the related line. All the safety and preparation procedures must be followed as given in the AMM before you apply the pressurization procedures.

(4) If you found leaks, after you repair them, do a check of the fluid level in the hydraulic system again.

(5) Do the bleed of air from the related hydraulic system (AMM TASK 29-10-00-860-803-A/200).

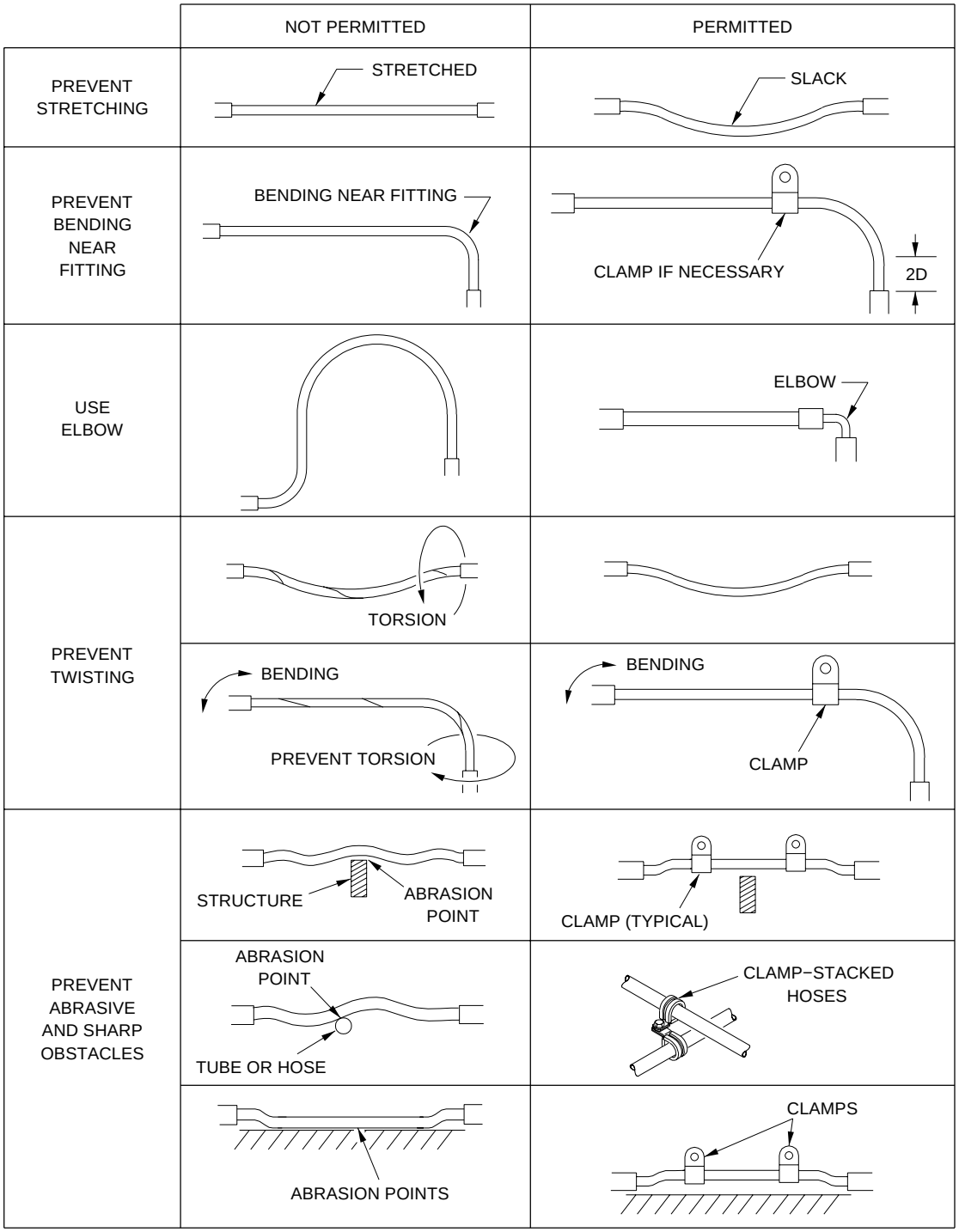
(6) Remove all tools, materials, and equipment from the work area.

(7) Make sure the area is clean.

(8) Close applicable access doors/panels.

EFFECTIVITY: ALL

Cautions to Temporary Hose Installation
Figure 801



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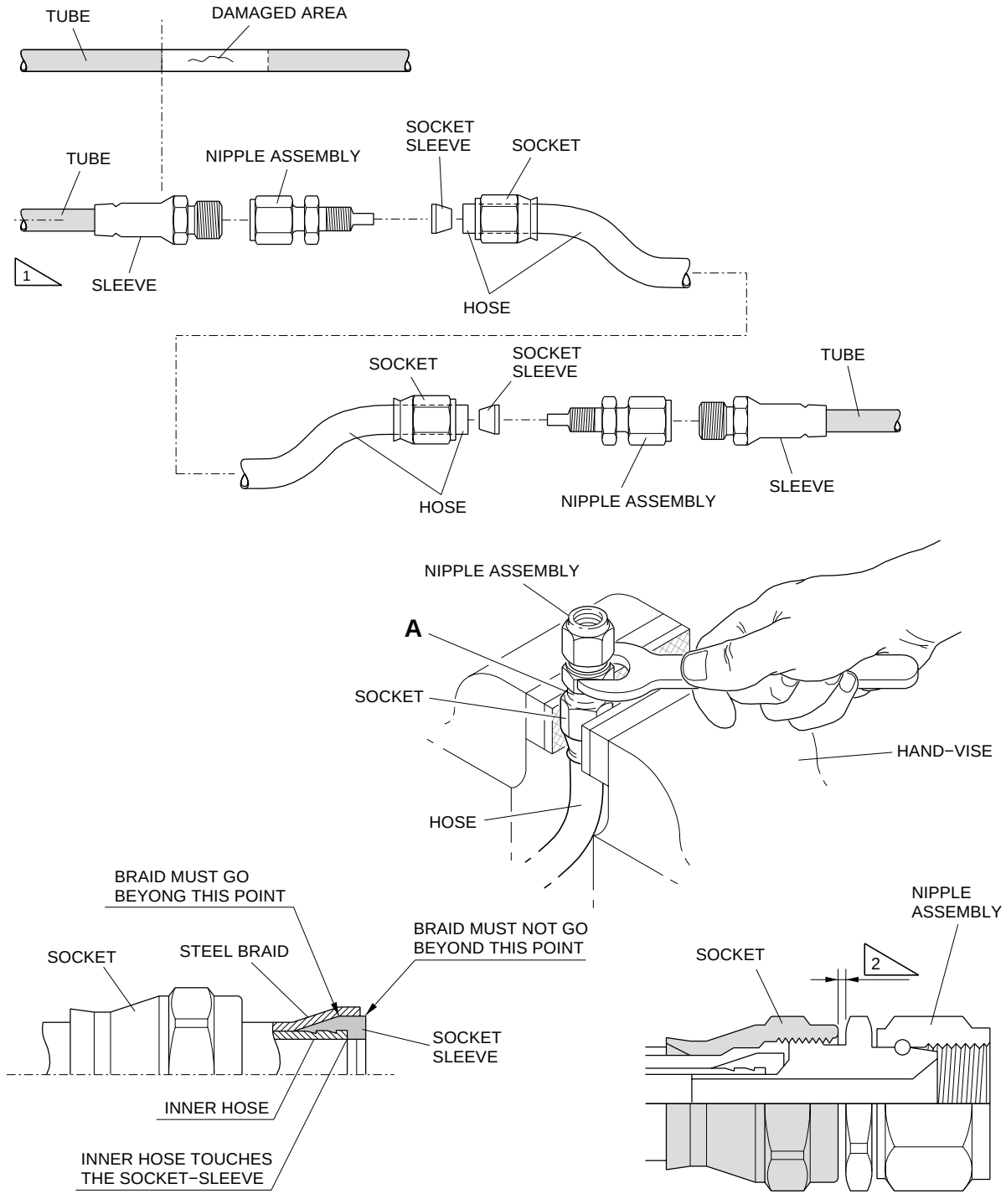
EFFECTIVITY: ALL

Hose Installation for Temporary Repair
Figure 802



1 TYPICAL ASSEMBLY.

2 FOR AEROQUIP FITTING ASSEMBLIES, MAKE SURE THAT THIS DISTANCE IS BETWEEN 0.6 AND 1.2 mm.

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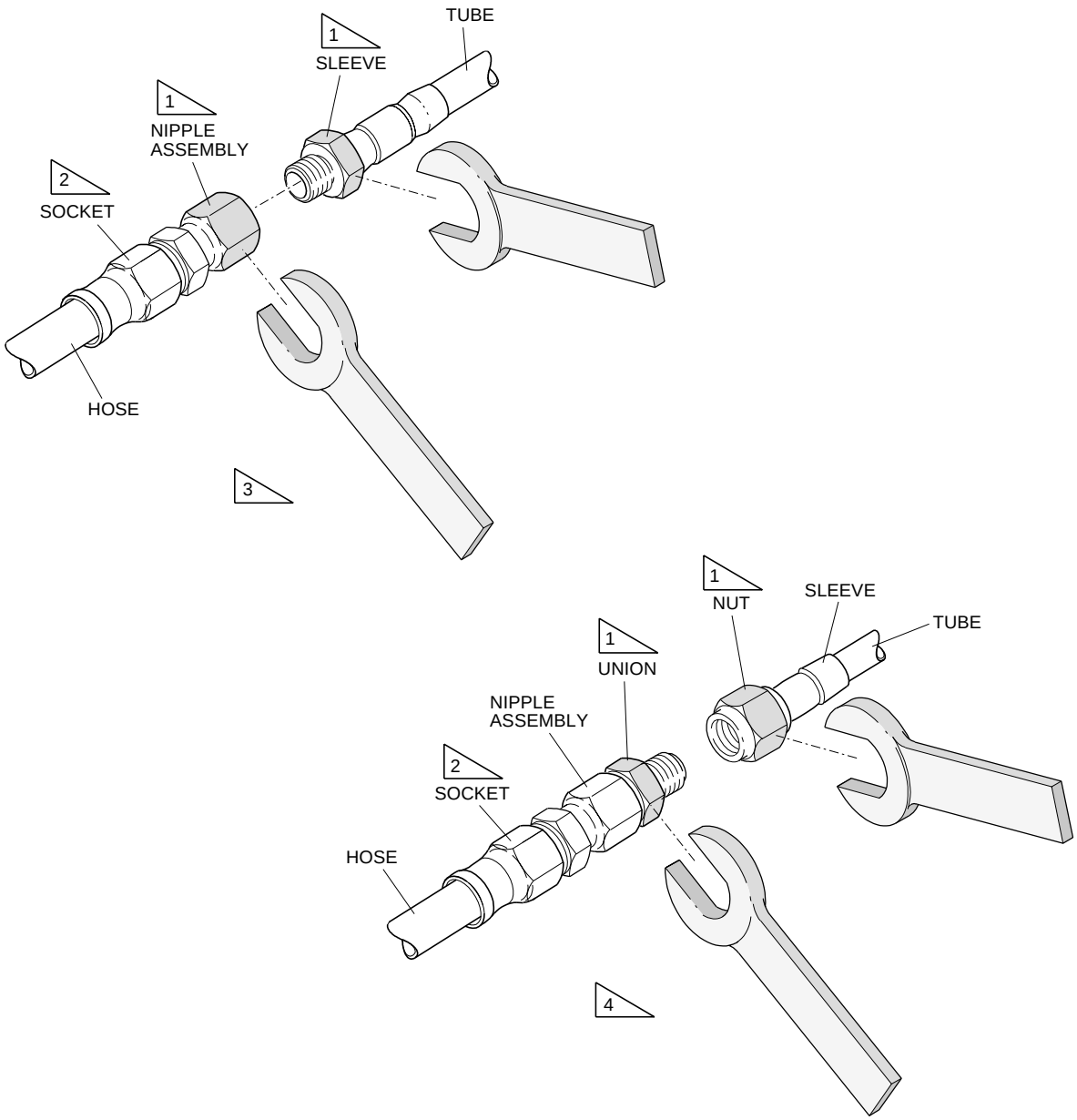
EFFECTIVITY: ALL

Hose Assembly Installation
Figure 803



1 APPLY REQUIRED TORQUE ONLY TO THE HIGHLIGHTED POINTS.
REFER TO TASK 20−10−03−400−801−A
TO OBTAIN THE TORQUE VALUES.

2 DO NOT APPLY TORQUE TO THIS POINT.

3 INSTALLATION FOR TUBE DIAMETER OTHER THAN 5/16 IN.

4 INSTALLATION FOR 5/16 IN − DIAMETER TUBE.

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