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ENGINE STANDARD PRACTICES - MAINTENANCE PRACTICES

1. General
   A. These are approved procedures for the engine. Other approved procedures used in the engine buildup are in Chapter 20, Airframe Standard Practices.

TASK 70-00-00-912-021-N00

2. Maintenance Procedures
   A. Requirements

S 912-048-N00

CAUTION: DO NOT USE WIRE BUNDLES, TUBES, DUCTS, AND OTHER ENGINE COMPONENTS FOR YOUR SUPPORT. DAMAGE TO THE EQUIPMENT CAN OCCUR.

(1) Use approved ladders and platforms when you do maintenance on the engine.

S 912-049-N00

(2) Before you remove the parts, identify their locations for correct installation.
   (a) If the part is scored, burned, or has other unwanted conditions, tag the part for inspection or repair.

S 912-050-N00

(3) When you do work on the engine, you must obey these very important precautions.
   (a) Make sure no dust, dirt, lockwires, nuts, washers, or other unwanted materials go into the engine.
      1) Seal all openings with plugs or caps.
   (b) Use the correct plugs or caps to seal the open ends of the tubes.

NOTE: Always install the dust caps on the tube ends and not in the tubes. When you install the tubes, make sure you remove the dust caps from the tubes. The caps can cause a blockage in the line.

S 912-051-N00

(4) Obey the steps that follow to keep unwanted objects out of the engine:

(a) Parts that contain asbestos.

NOTE: At one time, some engine parts contained asbestos fibers and it is possible that some of these parts continue in service. Refer to that commercial engine service bulletins for a listing of parts that once contined asbestos. In some parts, the material that contains asbestos may be within an adhesive. It is important to use correct precautions during work with these parts. Operators must obey all local regulations and employer work policies when parts that contain asbestos are handled or discarded.

NOTE: The asbestos used in Pratt & Whitney engine parts was usually encapsulated and will not release dust unless the parts are ground, sanded, drilled, scraped, cut, or broken. While it is our experience that these operations do not usually generate asbestos at levels in excess of permissible exposure limits, operators must use all applicable precautions when handling such parts.

CAUTION: DO NOT PUT TOOLS, FASTENERS, OR OTHER SMALL OBJECTS NEAR THE JOINT BETWEEN THE INNER SOUND-ABSORBING SEGMENTS ON THE REAR-CASE STRUTS OF THE FAN EXIT. SMALL OBJECTS CAN FALL THROUGH THIS JOINT AND INTO THE PORT OF THE 2.5 BLEED VALVE.

(b) When items fall into the engine, stop the assembly procedure.
1) Find the fallen items.

(c) Before you install a part, make sure it is fully clean.

(d) To use a fiber-optic scope to find and remove the unwanted objects, do these steps:
1) Use tape to attach a small plastic tube approximately 0.375-0.50 inch (9.5-12.7 mm) in diameter to the side of the fiber-optic scope.
a) Align the ends of the tube and fiber-optic scope.
b) When you attach the tape, make sure the fiber-optic scope stays flexible.
2) Use tape to attach the small plastic tube to the hose of a vacuum cleaner.
3) Remove the object by suction.

(e) To use a magnet to remove magnetic objects, attach a magnet to a flexible cable.

(f) Also you can use double-sided adhesive tape on the end of a flexible cable.

S 912-052-N00

(5) Do not install lockwires, lockwashers, tablocks, key washers (tab type or cup type), or cotter pins which are not new.

S 912-053-N00

(6) Do these steps to install the lockwire and cotter pins.
   (a) Use only lockwires and cotter pins made of corrosion resistant steel.
   (b) Make sure all the lockwire and cotter pins fit tight in their holes.
   (c) Install a cotter pin with the head in the castellated part of the nut.
   (d) Bend one end of the pin above the stud or the bolt.
   (e) Bend the other end down until it is flat against the nut.
   (f) Use lockwire to attach the bushing plugs to the assembly boss or case.
      1) Do not use lockwire to attach the plug to the bushing.

S 912-054-N00

(7) Replace all the gaskets, packings, and rubber parts each time you remove one.
   (a) Make sure the new parts which are not metal (such as oil seals) show no sign of deterioration.
   (b) If there is no lubricant on the gasket, put a layer of lubricant (PMC 9652) on the gasket surfaces.

      NOTE: This will make sure that the gasket will not bond.

S 912-055-N00

CAUTION: MAKE SURE THAT THE PROTECTION LAYER ON COVERED TOOLS IS NOT DAMAGED. BARE TOOLS CAN CAUSE DAMAGE TO THE ENGINE PARTS.

(8) Prevent scratches and nicks on very important areas of the engine (such as compressor and turbine disks).
   (a) Make sure the tool surfaces that touch these areas have a layer of protection.

S 912-056-N00

(9) If parts have a layer of corrosion preventive compounds, remove the compound.

S 912-060-N00

(10) On tubes with an attached ferrule and a loose nut, tighten the seal retaining nut at the attached ferrule end of the tube first.

S 912-104-N00
(11) Storage Of Kevlar-Wrapped Fan Containment Cases

CAUTION: MAKE SURE THAT YOU KEEP MOISTURE AWAY FROM THE KEVLAR BELT AROUND THE ENGINE FAN CONTAINMENT CASE. KEVLAR ABSORBS MOISTURE AND DAMAGE TO THE KEVLAR BELT WILL OCCUR.

(a) Put the correct covers on engines to keep out moisture when you move an engine or during temporary storage outdoors.

TASK 70-00-00-912-022-N00

3. Stainless Steel Bolts with Decreased Pitch Diameters

A. Requirements

S 912-057-N00
(1) The engine manufacturer puts bolts that have threads with decreased pitch diameters in the hot sections of the engines.

S 912-058-N00
(2) These threads help the bolts and nuts to move freely during the removal.

S 912-059-N00
(3) This is the usual procedure in locations where temperatures are mor than 500°F (260°C).

TASK 70-00-00-912-099-N00

4. Removal of Broken Bolts or Studs (SPOP 416)

A. General
(1) This task gives the instructions on how to remove bolts and/or studs by a mechanical method.
(2) Always obey the specific procedures and limits in the AMM maintenance task.

B. Procedure

S 322-100-N00
(1) Drill a hole into the end of the broken bolt and/or stud.

NOTE: Refer to the tool manufacturer's instructions for the correct size drill.

S 432-101-N00
(2) Put an extraction tool into the drilled hole and lock into position.
(a) Turn the extraction tool in a counterclockwise direction to remove the broken bolt.

S 162-102-N00

(3) Tap the threads if necessary to clean or chase the threads.

S 212-103-N00

(4) Examine the threads for damage or an oversize condition.

TASK 70-00-00-912-023-N00

5. Rubber Preformed Packings

A. When you install the packings, do these steps:

S 912-032-N00

CAUTION: PUT A THIN LAYER OF LUBRICANT ON THE PACKINGS BEFORE YOU INSTALL THEM. THIS WILL PREVENT DAMAGE TO THE PACKINGS THAT CAN CAUSE AN ENGINE MALFUNCTION OR FAILURE.

(1) Lubricate packings to the limits that follow:

Engine System	Preformed Packing Material	Material Specification	Lubrication Specification
Fuel	Fluorosilicone	AMS 7273	PWA 521, Type II, PS 161, or PMC 9609
Oil or Fuel	Fluorocarbon	AMS 7276 AMS 7278 AMS 7280	PWA 521, Type II

Air, Water And Alcohol	Silicone Rubber	AMS 3301 AMS 3302 AMS 3303 AMS 3304 AMS 3305 AMS 3315 AMS 3320 AMS 3332 AMS 3334 AMS 3335 AMS 3336 AMS 3338 AMS 3345 AMS 3346 AMS 3356 AMS 3357 AMS 3358 AMS 7267	PMC 9609 White Petrolatum (see Note below)

NOTE: Use only a small amount of white petrolatum (PMC 9606) on the silicone packings used in air systems. Hot air can move this lubricant into downstream components and cause contamination. Never use Engine Oil (PWA 521) on the silicone packings.

(a) Lubricating Oil Mixture (PS 161)

Materials	Make-Up
Engine Oil (PWA 521) Bolt Lubricant (PMC 9866)	50% (Volume) 50% (Volume)

1) Put the necessary quantity of bolt lubricant (PMC 9866) in a container.
2) Add the necessary quantity of engine oil (PWA 521).
3) Mix the lubricants.

S 912-025-N00

(2) Do these steps to install the preformed packings made of silicone rubber:
(a) Always use new packings at each assembly.
(b) Check the package for a date.
1) This date is called the shelf life.
(c) Do not use packings that have gone past the shelf life date.
(d) If there is no date on the package, then there is no shelf life.
(e) Examine the packings for deterioration or damage before you install the parts.

(f) Apply the lubricant in the specified quantity on the rings before assembly.

NOTE: Use only the lubricants specified for the O-ring preformed packing material and be sure that the O-ring has the lubricant material fully on it.

(g) Make sure that the grooves and mating faces of the engine parts are clean, smooth, and not damaged before you install packings.

NOTE: Be sure that there is no damage or sharp edges that could cause damage to the seal during installation or that could cause a leak.

(h) Push or slide the packing into position.
1) Do not twist the packing when it is installed.

(i) Do not install the packings on engine parts that are hot.

NOTE: Hot parts will cause damage to a packing.

(j) Use an approved tool to install the packings on a part which has more than one packing groove (this is to prevent damage to the packing).

(k) You must align the mating parts correctly when you put the parts together, and make sure that you do not cut the packing.
1) Always push the parts with packings straight on to the mating part when they are installed.
2) This will make sure that the part does not twist when you installed, and it will prevent subsequent damage to the packing.

TASK 70-00-00-912-026-N00

6. Antigall and Antiseize Compounds

A. General
(1) This task gives the general instructions for the application of the approved antigalling and antiseize compounds.
(2) Use very high pressure lubricants to prevent galling on highly stressed surfaces during installation. Apply the lubricant to splined drives, case snaps, bearing journals, and other parts.
(3) Apply antiseize compound to the threads of the fittings when you assemble parts in the hot section.

NOTE: This will makes it easier for you to remove the fittings.

(4) You can use penetrating oil to make it easier to disassemble the part.

B. References
(1) 70-50-00/201, Standard Torque

C. Consumable Materials
(1) Lubricating - Oil (MIL-L-6081) (PMC 9852) (P03-002)
(2) Grease (PMC 9630) (P04-005)

(3) Grease (PMC 9631) (P04-006)
(4) Lubricant - Dry Film (PMC 9934) (P06-001)
(5) Antigalling - Compound (PWA 586) (P06-003)
(6) Antiseize - Compound (PMC 9523) (P06-009)
(7) Antiseize - Lubricant (PWA 541) (P06-017)
(8) Antigalling - Compound (PWA 36035) (P06-036)
(9) Antigallant - Compound (PWA 36545-3) (P06-038)
(10) Antiseize - Paste (PWA 36246) (P06-054)

D. Procedure

S 602-077-N00

CAUTION: APPLY THE CORRECT TYPE OF ANTIGALLING AND ANTISEIZE COMPOUND. IF YOU APPLY THE INCORRRECT LUBRICANT, DAMAGE TO THE ENGINE CAN OCCUR.

CAUTION: APPLY ANTIGALLING AND ANTISEIZE COMPOUNDS IN A THIN, EQUAL LAYER. FULLY REMOVE ALL THE UNWANTED MATERIAL. IF YOU APPLY TOO MUCH LUBRICANT MATERIAL, IT CAN GET INTO PARTS AND AREAS WHERE IT CAN CAUSE A MALFUNCTION. DAMAGE TO THE ENGINE CAN OCCUR.

(1) You must obey the specific procedures and limits in the specific AMM maintenance tasks.

S 012-078-N00
(2) Use can use penetrating oil to make it easier to disassemble the part.

S 642-079-N00
(3) Use very high pressure lubricants to prevent galling on highly stressed surfaces during installation.
(a) Apply the lubricant to splined drives, case snaps, bearing journals, various case joints, and other parts.

S 642-080-N00
(4) Apply antiseize compound to the threads of the fittings when you assemble parts in the hot section.

NOTE: This will makes it easier for you to remove the fittings.

S 642-091-N00
(5) Antigalling Compound (PWA 586) is approved for threaded parts and mating faces of threaded and other parts in the hot section.
(a) Apply the antigalling compound to the parts as follows:
1) For bolts, brackets, nuts and nut plates that are treated with molybdenum disulfide type dry film lubricants, such as PWA 36545-3 (Antigallant Molydebnum).
2) It is possible that the parts may show yellowish white residue after the thermal exposure.

3) If this occurs, it is because the molydebnum disulfide lubricant in the antigalling oxidizes to a molydebnum trioxide compound.
4) This oxidation can start at the temperatures as low as 750°F (398.9°C), but it can proceed rapidly at the temperatures over 900°F (482.2°C).
5) The molydebnum trioxide is not detrimental to the structural integrity or functionality of the parts.

NOTE: Pratt and Whitney laboratory analysis has also demonstrated that this compound is not corrosive.

(b) For best results, apply the antigalling compound and bake it on the surface. Wet antigalling compound which is not baked on the surface is permitted, but does not last as long.

S 642-081-N00

(6) Antigalling compound (PWA 586) and antigalling compound (PWA 36035) can lubricate the mating surfaces and threads parts.
(a) Antigalling compound (PWA 586) that is baked on gives the best results, but it is permitted to apply wet with a brush without baking.
(b) Wet application does not have a long effect as baked.
(c) You must remove unwanted compound after assembly.
(d) Antigalling compound (PWA 36035) (P06-036) is a wet application that air dries without preparation or baking.
1) Remove the unwanted compound after assembly.

S 642-083-N00

(7) Antigalling compound (PWA 550) (P06-021) can lubricate the mating surfaces of titanium and some nickel alloy parts.

S 642-084-N00

(8) Dry film lubricant (PMC 9934) in a volatile-carrier can lubricate ball sockets and close fitting parts (bearing races, spacers, and seals on hubs and shafts). This lubricant is not approved for use on magnesium alloy parts.

S 642-085-N00

(9) Extreme-pressure grease (PMC 9630) can lubricate all interference fit splines.

S 642-086-N00

(10) Grease (PMC 9631) can lubricate accessory spline-drives with a loose fit (external to the engine without other means of lubrication).

S 642-093-N00

CAUTION: DO NOT USE ANITSEIZE COMPOUND IN LOCATIONS WHERE TEMPERATURES ARE MORE THAN 800°F (427°C). THE ANTISEIZE COMPOUND IS NOT STABLE AT THESE TEMPERATURES.

CAUTION: DO NOT USE ANTISEIZE COMPOUND (PMC 9523) ON THE THE STUDS IN ALUMINUM AND MAGNESIUM CASES BECAUSE IT CAN CAUSE INTERFERENCE FIT STUDS TO BACK OUT OF THE HOLES.

(11) Antiseize compound
  (a) Powder form (PMC 9523) is for dry applications.
    1) Do not use this application unless it is specified in the manual .
    2) Remove all unwanted compound after assembly.
  (b) Antiseize compound lubricant (PWA 541) is a mix of antiseize compound (PMC 9523) and lubricating oil (PMC 9852).
    1) Make the antiseize compound as follows:

Antiseize compound (PMC 9523)	77 - 83% by weight
Lubricating oil (PMC 9852)	17 - 23% by weight

    2) Fully mix the lubricant until the lubricant is smooth and there are no lumps, cakes, skins, or powder.
    3) Keep the lubricant in a closed container to keep out the contamination.

S 642-090-N00

(12) Antiseize paste (PWA 36246) can be applied wet with a brush without preparation or baking.
  (a) Remove the unwanted compound after assembly.

E. Torque Specifications

S 912-027-N00

(1) The torque values include limits for parts lubricated with specified antiseize compounds (Ref 70-50-00).

F. Limits on how to use the compounds.

S 912-034-N00

CAUTION: BE CAREFUL WHEN YOU APPLY ANTIGALL AND ANTISEIZE COMPOUNDS. APPLY THE COMPOUND IN A THIN SMOOTH LAYER. REMOVE THE COMPOUND WHICH IS NOT NECESSARY. DO NOT GET THE COMPOUND ON PARTS, HOLES, OR SURFACES WHERE IT CAN CAUSE A MALFUNCTION OR FAILURE OF THE ENGINE.

CAUTION: DO NOT USE AN ANTISEIZE COMPOUND IN LOCATIONS WHERE TEMPERATURES ARE MORE THAN 800°F (427°C). THE ANTISEIZE COMPOUND IS NOT STABLE AT THESE TEMPERATURES.

DO NOT USE AN ANTISEIZE COMPOUND ON STUDS IN ALUMINUM AND MAGNESIUM PARTS.

(1) Unless it is specified, do not use antiseize or antigall compounds at these locations:
(a) All face-splines
(b) All the main rotor disk, hub, and spacer snaps
(c) Conical-seats
(d) Fuel-fittings.

TASK 70-00-00-602-094-N00

7. Application of Penetrating Oils (SPOP 427)

A. General
(1) This task gives the general instructions for the use of approved penetrating oils on engine parts.
(2) Always obey the specific procedures and limits in the specified AMM maintenance tasks.
(3) Use penetrating oils or fluids to make the disassembly of parts easier.

B. References
(1) 70-11-13/201, Degreasing of Parts by Solvent Wiping

C. Consumable Materials
(1) Penetrating Oil (PMC 9534) (P03-007)
(2) Penetrating Fluid (PMC 9545) (P03-015)
(3) Penetrating Fluid (PMC 9503) (P03-016)
(4) Penetrating Oil (SPMC 188) (P03-017)

D. Procedural Instructions

S 642-097-N00

(1) Apply one of these oils or fluids to the necessary area(s):

NOTE: These oils and fluids are specifically for aluminum, magnesium, titanium, steel, nickel, single crystal, and cobalt alloys parts.

(a) (P03-007) Penetrating Oil (PMC 9534)
(b) (P03-015) Penetrating Fluid (PMC 9545)

(c) (PO3-016) Penetrating Fluid (PMC 9503)
(d) (PO3-017) Penetrating Oil (SPMC 188).

S 112-098-N00
(2) After the disassembly, clean the remaining penetrating oil or fluid.
(a) To remove it, do this task: Degreasing of Parts by Solvent Wiping (AMM 70-11-13/201).

TASK 70-00-00-912-029-N00

8. Sealing Compounds

A. General
(1) You can use sealing compounds to give more protection against small leaks on some surfaces (parts with threads, metal-to-metal parts, and mating parts with gaskets).
(2) Make sure you fully clean the mating surfaces.
(a) Remove all the unwanted materials (oil, grease, or gasket materials).
(3) Apply the sealing compound in a very thin layer to the two mating surfaces.
(4) Install the parts.
(5) Remove the unwanted sealing compound from the area.
(a) This will prevent damage to the engine.

B. Consumable Materials
(1) Sealing compound medium grade (PWA 36000-3). You can use it on threaded fittings.
(2) Sealing compound light grade (PWA 36000-4). You can use it on metal-to-metal mating surfaces.
(3) Silicone rubber sealant. You can use it on fittings with threads (does not apply to silicone rubber or electrical connectors). Use this material on gasket surfaces to reduce bond to mating surfaces, or to prevent small leakage. Also you can use it on metal-to-metal mating surfaces.
(4) Sealing compound (PMC 9925) and (PMC 9929). You can use it on fittings with threads and metal-to-metal mating surfaces.
(5) Sealing compound (PMC 9931 or PWA 36002). You can use it on threaded-permanent plugs and inserts.
(6) Gasket lubricant (PMC 9652) and extreme-pressure grease (PMC 9630). You can use it on gasket surfaces to reduce bond, or to prevent small leakage.

C. Limits on the sealing compounds.

S 912-035-N00

CAUTION: DO NOT USE A SEALING COMPOUND AS AN ALTERNATIVE TO CORRECT PART FINISH, GOOD ASSEMBLY PROCEDURE, OR CORRECT DIMENSIONS. FAILURE OF THE EQUIPMENT CAN OCCUR.

(1) Unless it is a specified material, do not use sealing compounds at these locations:
(a) All the connections in the engine fuel-system.

(b) All the assemblies that have splines.
(c) All the oil seal rings that are metal.
(d) All the carrier grooves for the oil ring.
(e) All parts that rub together when the engine operates.

TASK 70-00-00-702-062-N00

9. Preparation of Blue Dye Oil System Leak Check Solution

A. General

(1) This task gives the general instructions to make up the PS 197 Blue Dye Solution used in oil system leak check.

B. Equipment

(1) (No specific) Container, Mixing

C. Consumable Materials

(1) D00524 Oil, Engine Lubricating
(2) C00070 Dye Solution, Blue

D. Procedure

S 282-063-N00

(1) Always obey the specific procedures and limits in the AMM maintenance task.

Materials	Make-Up	Operating Limits
Dye, Blue Material No. (C00070)	5 — 6 milliliters	150 ± 40 ppm
Oil, Engine Lubricating Material No. (D00524)	10 gallons (37.85 liters)	

NOTE: When the engine is first refilled with non-dyed oil, the non-dyed oil will mix with the remaining (that is, residual) dyed oil. The color of this mixture will likely be darker than the non-dyed oil that was just added. The color of various oil brands can be different. This color change is permitted and is not a negative indication of the condition of the lubrication system.

E. Preparation Instructions

S 282-064-N00
(1) Add the specified amount of Engine Lubrication oil (Material No. D0028) to the mixing container.

NOTE: The selection of base oil (Approved D00524, Type II) will make it easier for the operator to see the blue color of the dyed oil. Pratt & Whitney experience finds that light color D00524, Type II base oils are more easily detected with the Blue Dye (Material No. C00070).

S 282-065-N00
(2) Add the specified amount of Blue Dye (Material No. C00070).

NOTE: It is necessary to put blue dye (material No. 05-459) through a five-micron or less membrane filter six weeks or less before you mix it with engine lubricating oil (Material No. P03-001) for PS 197.

S 112-076-N00
(3) Stir to mix.

F. Precaution Instructions

NOTE: This solution is organic.

S 112-067-N00
(1) Do not permit the solution to touch the skin, eyes, nose, or throat.

S 112-068-N00
(2) Do not take this solution internally.

S 112-069-N00
(3) Be sure to wash fully after handling and before you drink or smoke.

S 112-070-N00
(4) Keep this solution away from food.

S 112-071-N00
(5) Do not breathe the dust, vapors, mists, or gases.

S 112-072-N00
(6) Use this solution with sufficient ventilation.

S 112-073-N00
(7) Keep this solution away from heat or flames; toxic mixtures can occur.

S 112-074-N00
(8) Be sure to wear the necessary safety equipment.

S 112-075-N00
(9) Keep this solution away from oxidizers.

TASK 70-00-00-912-031-N00

10. Potable Water Quality Specifications

A. General

(1) The quality specifications for potable water suitable for engine gas path cleaning are as follows:

Physical	Maximum Permissible Levels
Color	15 units
pH	6.4 - 8.5
Temperature	75°F (24°C)
Total Dissolved Solids	500 mg/l
Threshold Odor Number	2
Turbidity	5 units

Inorganic	Milligrams/Liter
Arsenic	0.05
Barium	1.0
Cadmium	0.01
Chlorides	250
Chromium	0.05
Copper	1.0
Cyanide	0.2
Fluoride	2.0
Iron	0.3
Lead	0.05
Magnesium	125
Manganese	0.05
Mercury	0.002
Nitrite Nitrogen	1.0 (as N)
Nitrite plus Nitrate Nitrogen	10.0 (as N)
Selenium	0.01
Silver	0.05
Sodium	20
Sulfate	250
Zinc	5.0

ENGINE STANDARD PRACTICES - APPROVED REPAIRS

1. General
   A. This procedure gives the instructions to replace a damaged tube nut when a thrust wire attaches the nut to the tube.
   B. There are two tasks in this procedure:
      (1) External tubes - tube nut and thrust wire.
      (2) Captured tubes - tube nut and thrust wire.

TASK 70-00-00-918-005-N00

2. External Tubes - Tube Nut and Thrust Wire (Fig. 801)
   A. Equipment
      (1) PWA 21411 Anvil
      (2) Bantam Bully Air Hammer — Superior Pneumatic and Manufacturing Div. of Herbrand Tool Co. Cleveland, OH

   B. Access
      (1) Location Zone
          410 No. 1 Power Plant
          420 No. 2 Power Plant

   C. Procedure

      S 028-006-N00
      (1) Remove the tube nut.
          (a) Remove the damaged tube from the engine.
          (b) Put a temporary plug in the tube ferrule or fitting to keep machine chips or dirt out of the tube.
          (c) Remove the thrust wire from the tube nut.
              1) If the tube nut has a thrust wire with a large rectangular or circular end, hold the drilled end and pull the thrust wire out of the nut.
                 a) Remove the worn or damaged tube nut from the tube.

2) If the thrust wire is damaged or too tight, cut the tube nut off the end of the tube.
3) If the tube nut has a plain thrust wire, cut the tube nut off the end of the tube.

(d) If it is necessary, cut the tube nut off the end of the tube.
1) Support the tube nut on a hard work surface or in a soft-jaw vise.

CAUTION: BE CAREFUL WITH THE CUT-OFF WHEEL NOT TO CAUSE DAMAGE TO THE FERRULE OR FITTING ON THE TUBE. IF YOU DAMAGE THE FERRULE OR FITTING, THE TUBE MUST BE REPLACED.

2) At a location a small distance outboard of the thrust wire, cut around the tube nut with a high speed cut-off wheel until you see the thrust wire.
3) Remove the thrust wire and nut from the tube.

S 428-009-N00

(2) Install a new tube nut and thrust wire.
(a) Put the new tube nut onto the tube ferrule or fitting and support the nut on a work bench or in a soft-jaw vise.
(b) Use a strong light or a small test wire to be sure that the thrust wire hole in the tube nut will let the wire go against (but not into) the radius on the ferrule or fitting.

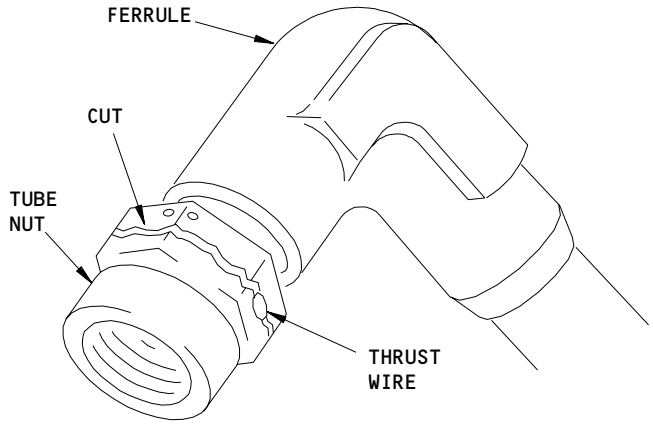
CAUTION: BE CAREFUL THAT THE TUBE NUT IS IN THE CORRECT POSITION BEFORE YOU INSTALL THE THRUST WIRE. IF THE TUBE NUT IS NOT IN THE CORRECT POSITION, THE THRUST WIRE WILL NOT GO INTO THE TUBE NUT.

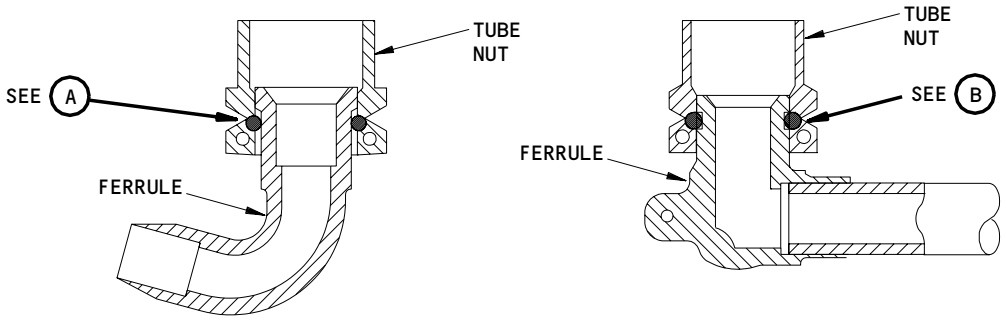
(c) Install the thrust wire into the tube nut.
1) Some thrust wires go into their holes very easily and it will only be necessary to tap the wire into position (use a non-ferrous material, for example, a brass mallet).
2) For tight thrust wires, use the air hammer and anvil.

NOTE: With this type of power tool do not bend the thrust wire or push the thrust wire against the tube ferrule or fitting.

3) For thrust wire with a large rectangular or circular end, assemble the thrust wire so that the shoulder touches the tube nut.

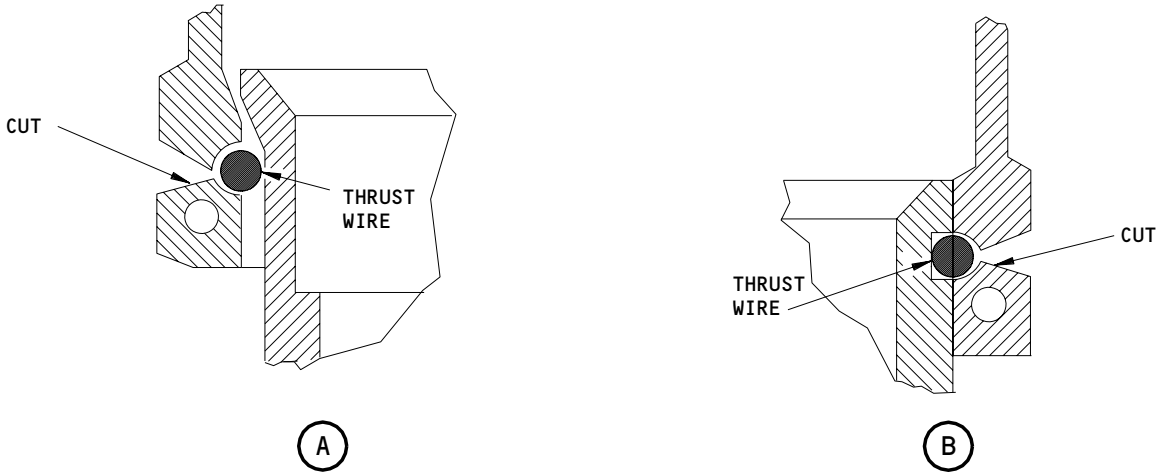
NOTE: These thrust wires have a lockwire hole through their head. Use the end of the lockwire from the torqued nut to safety the thrust wire in position.





TYPE 1 TYPE 2

DETAIL OF TUBE NUT AFTER CUT



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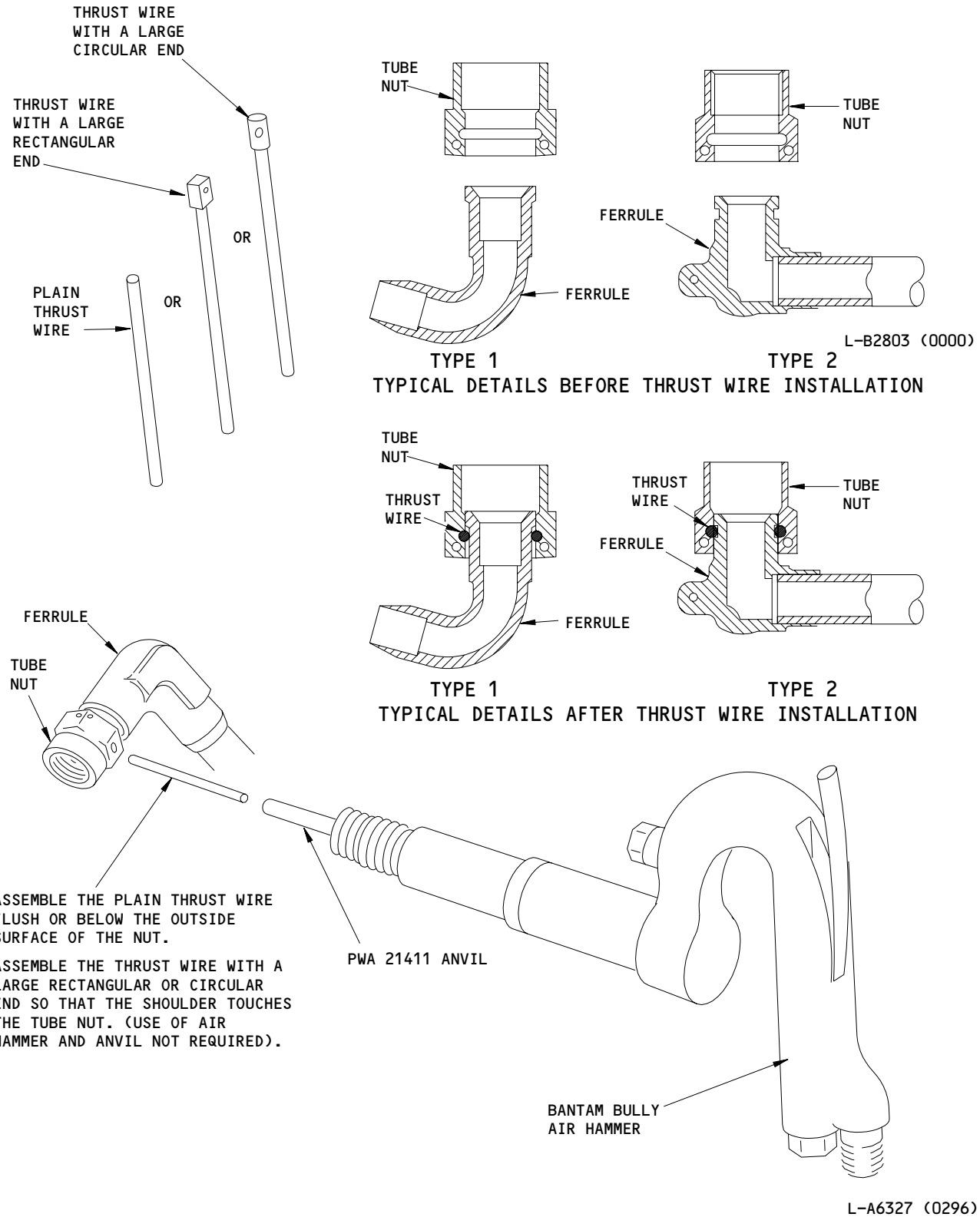
Thrust Wire Installation
Figure 801 (Sheet 1)



Thrust Wire Installation
Figure 801 (Sheet 2)

4) For plain thrust wire, assemble the thrust wire flush or below the outside surface of the tube nut.
5) The installation is complete and correct if the thrust wire holds the nut on the tube and the nut turns smoothly.
6) Remove the plug from the tube and make sure that the tube has no damage or internal blockage.

TASK 70-00-00-918-010-N00

3. Captured Tubes - Tube Nut and Thrust Wire (Fig. 801)

A. Equipment

(1) PWA 21411 Anvil
(2) Bantam Bully Air Hammer — Superior Pneumatic and Manufacturing Div. of Herbrand Tool Co. Cleveland, OH

B. Access

(1) Location Zone
410 No. 1 Power Plant
420 No. 2 Power Plant

C. Procedure

S 028-011-N00

(1) Remove the tube nut.
(a) Disconnect the mating tube from the damaged tube nut.
(b) Cover all of the openings to protect them from foreign object damage.
(c) Remove the thrust wire from the tube nut.
1) If the tube nut has a thrust wire with a large rectangular or circular end, hold the drilled end and pull the thrust wire out of the nut.
a) Remove the worn or damaged tube nut from the tube.
2) If the thrust wire is damaged or too tight, cut the tube nut off the end of the tube.
3) If the tube nut has a plain thrust wire, cut the tube nut off the end of the tube.
(d) If it is necessary, cut the tube nut off the end of the tube.

CAUTION: BE CAREFUL WITH THE CUT-OFF WHEEL NOT TO CAUSE DAMAGE TO THE FERRULE OR FITTING ON THE TUBE. IF YOU DAMAGE THE FERRULE OR FITTING, THE ENGINE MUST BE REMOVED FROM SERVICE TO REPLACE THE DAMAGED TUBE.

1) At a location a small distance outboard of the thrust wire, cut around the tube nut with a high speed cut-off wheel until you see the thrust wire.
2) Remove the thrust wire and nut from the tube.

S 428-012-N00

(2) Install a new tube nut and thrust wire.
   (a) Put the new tube nut onto the tube ferrule or fitting.
   (b) Use a strong light or a small test wire to be sure that the wire hole in the tube nut will let the wire go against (but not into) the radius on the ferrule or fitting.

CAUTION: BE CAREFUL THAT THE TUBE NUT IS IN THE CORRECT POSITION BEFORE YOU INSTALL THE THRUST WIRE. IF THE TUBE NUT IS NOT IN THE CORRECT POSITION, THE THRUST WIRE WILL NOT GO INTO THE TUBE NUT.

CAUTION: SUPPORT THE NEW TUBE NUT WITH AN OPPOSITE FORCE WHEN YOU INSTALL THE THRUST WIRE. THIS WILL PREVENT DEFORMATION OF THE TUBE DURING THE INSTALLATION OF THE THRUST WIRE.

   (c) Install the thrust wire into the tube nut.
      1) Some thrust wires go into their holes very easily and it will only be necessary to tap the wire into position (use a non-ferrous material, for example, a brass mallet).
      2) For tight thrust wires, use the air hammer and anvil.

         NOTE: With this type of power tool do not bend the thrust wire or push the thrust wire against the tube ferrule or fitting.

      3) For thrust wire with a large rectangular or circular end, assemble the thrust wire so that the shoulder touches the tube nut.

         NOTE: These thrust wires have a lockwire hole through their head. Use the end of the lockwire from the torqued nut to safety the thrust wire in position.

      4) For plain thrust wire, assemble the thrust wire flush or below the outside surface of the tube nut.
      5) The installation is complete and correct if the thrust wire holds the nut on the tube and the nut turns smoothly.
      6) Remove the covers from the openings and make sure that the tube has no damage or internal blockage.

ANODIZE TOUCH-UP SPOP 42 - MAINTENANCE PRACTICES

TASK 70-11-01-392-002-N00

1. Anodize Touch-Up Solution (PS-607)

A. Consumable Materials

(1) G00367 Crocus Cloth P-C-458 - (AMM 70-30-00)
(2) G00692 Emery Cloth No. 400 - (AMM 70-30-00)
(3) B00546 Aluminum Chromate Conversion Salt (PMC 1631) - (AMM 70-30-00)
(4) G00838 Wetting Agent ARP No. 2 - (AMM 70-30-00)
(5) G00768 Demineralized Water (PMC 1737) - (AMM 70-30-00)
(6) B00188 Perchlorethylene (PMC 9015) - (AMM 70-30-00)

B. References

(1) AMM 70-30-00/201, Consumable Materials

C. Prepare for the Anodize Touch-Up Procedure

S 392-001-N00

(1) Do the steps which follow to prepare the solution.
(a) Fill a container one-half full with demineralized water. Make sure there is not more than 10 ppm of chlorine in the solution.
(b) Add the salt at a rate of 4 ounces for each gallon of water (30 grams for every liter of water).
(c) Add wetting agent at a rate of 2 milliliters for each gallon of water (0.53 mililiters for each liter of water).
(d) Mix the solution.
(e) Fill the container full with demineralized water which has no more than 10 ppm of chlorine.
(f) Discard the solution after 14 days.

NOTE: The salt can be weighed before and then kept in a dry container until it is to be used. At that time, add the demineralized water and the wetting agent

D. Apply the Anodize Touch-Up Solution (SPOP 42 - AMS 2473)

S 392-003-N00

(1) Do these steps to apply the anodize touch-up solution
(a) Clean the area with one or more of these items: perchlorethylene, emery cloth, or crocus cloth.
(b) Use a cloth or a brush to apply a thin layer of anodize touch-up solution (PS-607) to the surface.
1) If the solution does not keep the surface moist, do these steps:
a) Remove the solution with a clean cloth.

b) Clean the area again.
c) Apply the anodized touch-up solution again.

(c) Let the solution dry.
(d) Blend the surface to make the brown color as constant as possible.
(e) Do an inspection to make sure the surface has a layer of the solution (brown color).

BALL AND ROLLER BEARINGS - MAINTENANCE PRACTICES

1. General
   A. The procedure that follows is used when the ball or roller bearings are removed and installed

TASK 70-11-02-912-003-N00

2. Ball or Roller Bearing (SP0P 429)
   A. Consumable Materials
      (1) Dry Film Lubricant (PMC 9934) - (AMM 70-30-00)
      (2) Oil - Engine (P03-001) (PWA 521)
      (3) Oil - Lubricating and Preservation (P03-019) (PMC 9123, MIL-PRF-6085)
      (4) Cloth - Lint Free Cotton (P05-005)
   B. References
      (1) AMM 70-30-00/201, Consumable Materials
   C. Ball or Roller Bearing Installation

S 912-006-N00

CAUTION: DO NOT TOUCH ENGINE BEARINGS WITH YOUR BARE HANDS. USE GLOVES TO PROTECT THE ENGINE BEARINGS. IF YOU DO NOT OBEY THIS CAUTION, DAMAGE TO THE BEARING CAN OCCUR.

(1) Use the steps that follow when you install the ball or roller bearings.
   (a) A clean pair of gloves must be worn when you touch the bearings. The gloves must be made of an approved lintfree material.
   (b) When you install the inner races of the bearings on the mating shafts, it will be necessary to increase the temperature of the inner race.
      1) If the bearing is of a type that can be removed, remove the inner race from the bearing and put it fully into a hot oil bath.
      2) If the bearing is of a type that can not be removed, put the full bearing into a hot oil bath.

3) Increase the temperature of the bearing components in the controlled hot oil bath to the necessary temperature.
4) Do a check of the dimensions of the shafts and bearing races before the temperature of the bearing is increased.
5) This will make sure that the bearing races and shafts are installed correctly.
6) Hot oil tanks used to increase the temperature of the bearings must be kept closed when not in use.
7) This will keep the contamination of the oil by airborne dirt and abrasive material to a minimum.

(c) It is important to keep the area clean regardless of whether you use a hot oil bath, an oven, or an induction heat.

(d) Hot oil bath
1) This used to be the typical heating method for bearings and other parts because of the anti-corrosion characteristics of oil.
a) There are now environmental and safety concerns which make other methods a better choice.
2) Make sure that you put a cover on the tank to minimize contamination of the oil by airborn dirt and abrasive.
a) It is important to change the oil and clean the tank regularly, as necessary.
b) It is not permitted to let the bearings stay on the bottom of the tank because they can become dirty, or cause contamination and the bearing temperature will be higher than the oil temperature shown.
c) A heavy screen or a series of rods which extend to 3 inches (76.20 mm) or more from the bottom of the tank will keep the bearings in the constant temperature oil.
d) This will also let the dirt go to the bottom of the tank.
3) Use clean engine oil (P03-001) (PWA 521), or lubricating and preservation oil (PMC 9123, MIL-PRF-6085) in the hot oil bath with a controlled temperature must not exceed more than 250 degree F (121 degree C).

NOTE: Engine oil P03-019 is an alternative to the engine oil P03-001.

(e) Oven
1) An oven may not increase the temperature of the part as fast as an induction heater, but there is less potential to increase the temperature of the part too much.
a) An oven gives the same amount of heat to large or complex parts, and as a result, minimum distortion and thermal stress.

2) A film of engine oil (PO3-001) (PWA 521) or lubricating and preservation oil ((PO3-019) (PMC 9123, MIL-PRF-6085) must be on each part before you put in the oven.
   a) The engine oil (PO3-001) (PWA 521) or lubricating and preservation oil (PO3-019) (PMC 9123, MIL-PRF-6085) prevents corrosion before and after you assemble the parts.
3) The oven temperature must not exceed more than 250 degree F (121 degree C).

(f) Induction heat.
1) A film of engine oil (PO3-001) (PWA 521) or lubricating and preservation oil ((PO3-019) (PMC 9123, MIL-PRF-6085) must be on each part before the induction heater is used to increase the temperature of the part.
   a) The engine oil (PO3-001) (PWA 521) or lubricating and preservation oil ((PO3-019) (PMC 9123, MIL-PRF-6085) prevents corrosion before and after you assemble the parts.
2) An induction heater increases the temperature of the part quickly and it does not have the environmental concerns of the hot oil bath, but you must know how to get the correct temperature which is based on the mechanic experience.
3) Make sure that you follow the manufacturer's instructions, warnings, and cautions.
   a) Pratt and Whitney has induction heater experience with units (Models TIH 020, TIH 050, TIH 100, and TIH 120) supplied by SKF Industries, units (Models 1x and 4x) supplied by Eddytherm and units (Foucault 22 ESD Swing Arm (PWA 89127)) by Foucault International Corporation (Refer to the Supplier Source Code List).

Registered Trademark	Supplier Code
Eddytherm	C4298 and 75957
Foucault	EQ032
SKF	2M749

4) Magnetism can cause by induction heaters; therefore, after an induction heating you must make sure to examine the bearings for the remaining magnetism as follows.
   a) If you think the ball and roller bearings contain unwanted megnetic particles.
   b) Limits for the remaining megnetism.
   c) You must demagetize the bearing parts that you can not separate from other part when you assemble the parts.
   d) You must slowly turn the inner and outer races in opposite directions when the bearing goes through demagnetizer.
   e) Demagnetize each bearing one component at a time.

f) The bearing components that you have removed must be kept together.
g) Remove the bearing from the demagnetizer.

5) The induction heater most often contains degaussing feature, but it may be inoperative (no indicating device to define if or when the degausser is functional, or if there is a degausser feature).
6) The bearing temperature must not exceed more than 250 degree F (121 degree C).
a) Make sure that you wear clean lint-free gloves when you touch heated bearings.

S 412-007-N00

(2) Installation

(a) Do these steps to move the bearings.
1) Do not touch the bearing with your bare hand.
2) Wear a clean gloves on your hands.
3) Put the bearing on a piece of clean bearing paper.
4) Separate the outer race from the inner race.
5) For bearing parts that are separate, make sure that the serial numbers on the inner and outer races are the same.

(b) Before you install the main bearings, make sure that you wipe all of the unwanted oil from the journals of the shafts, hub, or gear with a clean lint-free cotton cloth.
1) Apply a thin layer of lubricant.
2) Do not apply force when you assembly the parts.
3) If the parts do not assemble easily, disassemble the parts and examine the parts for burrs or other interference.

(c) When you install the roller bearings, do these steps below.
1) Turn the rollers to the outer race.
2) This will show that the rollers are free to move.

(d) Make sure the manufacturer's number, which is attached on the bearing races, is pointed at you as it is installed.

(e) Large spanner nuts which attach the main bearings or the seals to the shafts and housing frequently have small burrs at the spanner slots.
1) If you install the nuts in the opposite position, burrs will cause damage to the faces of the bearings or the seals, and it can cause incorrect torques.
2) If you find spanner nuts with burrs, you must remove the burrs.

(f) If you use prepackaged bearings, you must remove or seal the bearings when you clean the bearing assembly.

APPLICATION OF EPOXY PRIMER AND ALUMINIZED EPOXY ENAMEL (SPOP 148) - MAINTENANCE PRACTICES

TASK 70-11-03-912-004-N00

1. Application of Epoxy Primer and Aluminized Epoxy Enamel

A. General

(1) This task gives the general instructions to apply (touch-up) epoxy primer and aluminized epoxy enamel.

B. References

(1) AMM 70-30-00/201, Consumable Materials

(2) AMM 70-11-13/201, Degreasing of Parts by Solvent Wiping (SPOP 208)

C. Equipment

(1) Mixing Container (Graduated) - STD-193

(2) Mixing Sticks

(3) Paint Gun, Paint Spray Gun with Interchangable Nozzles - STD-1133

(4) Heat Gun, 180°F (82.2°C) Maximum Output Temperature - STD-442

(5) Air, Filtered - 0 to 150 psig Regulated Air Source, STD-3940

D. Consumable Materials

(1) (P05-037) Aluminized Epoxy Enamel (PWA 569)

(2) (P05-063) Solvent Reducer (PWA 36050)

(3) (P05-076) 400 Grit Abrasive Paper

(4) (P05-255) Masking Tape

(5) (P05-482) Solvent Reducer (PWA 36106)

(6) (P05-483) Aluminized Epoxy Enamel (PWA 36569)

(7) (P11-065) Acetone (PMC 1914)

(8) (P18-020) Epoxy Primer (PWA 36519-1) or (PWA 36519-2)

(9) (P18-024) Epoxy Primer (PWA 36568)

E. Procedure

S 842-003-N00

(1) Do the steps that follow to prepare the part.

WARNING: DO NOT GET THE SOLVENT IN YOUR MOUTH, EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM IT. PUT ON GOGGLES, AND GLOVES WHEN YOU USE IT. KEEP IT AWAY FROM SPARKS, FLAMES, AND HEAT. IT IS POISONOUS AND FLAMMABLE. THE SOLVENT CAN CAUSE INJURIES TO PERSONNEL, AND DAMAGE TO EQUIPMENT.

(a) Always obey the specified procedures and limits in the maintenance tasks.

(b) Clean the part by solvent wiping (SPOP 208) (AMM 70-11-13/201).

(c) Rub the surface lightly with (P05-076) 400 grit abrasive paper.

(d) Clean the repair area again by solvent wiping.

(e) Apply the (PO5-255) masking tape to the area where you will not paint.

S 842-002-N00

(2) Prepare the applicable (P18-020) epoxy primer (PWA 36519-1 or PWA 36519-2) or (P18-024) epoxy primer (PWA 36568) as follows:

NOTE: The work life of the (P18-020) Epoxy Primer (PWA 36519-1 or PWA 36519-2) or (P18-024) Epoxy Primer (PWA 36568) mixture is approximately four hours at 60°-80°F (16°-27°C).

(a) Record the time and the date.

CAUTION: DO NOT MIX DIFFERENT PAINT SYSTEMS OR MATERIALS FROM DIFFERENT MANUFACTURERS.

(b) Mix the applicable epoxy primer.
1) For (P18-020) Epoxy Primer (PWA 36519-1 or PWA 36519-2):

NOTE: The (P18-020) Epoxy Primer comes in green (PWA 36519-1) or black (PWA 36519-2). You can use either suffix when no suffix is specified, but PWA 36519-2 is preferred because it does not contain MEK and is less dangerous than PWA 36519-1.

a) Mix the primer (base) until there is no solid material left on the bottom of the container.
b) Mix three parts by volume of the primer (base) with one part by volume of the curing solution.
c) If necessary, dilute the green (P18-020) Epoxy Primer Mixture (PWA 36519-1) with (P11-065) Acetone (PMC 1914) as follows:
<1> Four parts by volume of primer to one part by volume of acetone.

NOTE: It is not necessary to dilute the black epoxy primer (PWA 36519-2).

For (P18-020) epoxy primer (PWA 36519-1 or PWA 36519-2), it is permitted to decrease the volume of solvent for applications by brush.

d) Mix the solution fully.

2) For (P18-024) Epoxy Primer (PWA 36568)

NOTE: The (P18-024) Epoxy Primer (PWA 36568) is a dark gray primer. This primer does not contain MEK and is less dangerous than the green PWA 36519-1.

a) Mix the primer (base) until there is no solid material remaining on the bottom of the container.

b) Mix seven parts by volume of the primer base with one part by volume of the curing solution.

NOTE: You do not have to dilute the solution.

S 372-006-N00

(3) Apply a thin coat of the (P18-020) Epoxy Primer (PWA 36519-1 or PWA 36519-2) or (P18-024) Epoxy Primer (PWA 36568) to the repair area with a standard paint gun and filtered air supply.

NOTE: More than one layer of the (P18-020) Epoxy Primer (PWA 36519-1 or PWA 36519-2) or (P18-024) Epoxy Primer (PWA 36568) can be necessary.

S 372-013-N00

(4) Let the epoxy primer dry for 5-10 minutes between layers.

S 372-007-N00

(5) Let the (P18-020) epoxy primer (PWA 36519-1 or PWA 36519-2) or (P18-024) epoxy primer (PWA 36568) dry for one hour or more.

S 372-008-N00

(6) Prepare the applicable (P05-037) Aluminized Epoxy Enamel (PWA 569) or (P05-483) Aluminized Epoxy Enamel (PWA 36569) as follows:

(a) For (P05-037) aluminized epoxy enamel (PWA 569) do as follows:

NOTE: The work life of the (P05-037) aluminized epoxy enamel (PWA 569) mixture is approximately eight hours at 60°-80°F (16°-27°C).

1) Record the time and the date.

2) Mix the enamel base until there is no solid material left on the bottom of the container.

3) Mix one part by volume of the enamel (base) with one part by volume of the curing solution.
4) If necessary, add (PO5-063) solvent reducer (PWA 36050) to the (PO5-037) aluminized epoxy enamel (PWA 569) mixture.
5) Let the (PO5-037) aluminized epoxy enamel (PWA 569) mixture become stable for one hour before you use the mixture.

(b) For (PO5-483) Aluminized Epoxy Enamel (PWA 36569)

NOTE: The work life of the (PO5-483) aluminized epoxy enamel (PWA 36569) mixture is approximately four hours at 60°–80°F (16°–27°C).

1) Record the time and the date.
2) Mix the enamel (base) until there is no solid material left on the bottom of the container.
3) Mix three parts by volume of the enamel (base) with one part by volume of the curing solution.
4) If necessary, add (PO5–482) solvent reducer (PWA 36106) to the (PO5-483) Aluminized Epoxy Enamel (PWA 36569) mixture.
5) Let the (PO5-483) Aluminized Epoxy Enamel (PWA 36569) mixture become stable for 15 minutes before you use the mixture.

S 372-009-N00

(7) Apply one layer of the (PO5-037) aluminized epoxy enamel (PWA 569) or (PO5-483) aluminized epoxy enamel (PWA 36569) mixture to the repair area with a paint gun and filtered air supply.

S 882-010-N00

(8) Dry the (PO5-037) aluminized epoxy enamel (PWA 569) or (PO5-483) aluminized epoxy enamel (PWA 36569) with a heat gun as follows:
(a) For (PO5-037) aluminized epoxy enamel (PWA 569).
1) Dry the (PO5-037) aluminized epoxy enamel (PWA 569) with a heat gun at 140°–180°F (60°–82°C) for one hour.
(b) For (PO5-483) aluminized epoxy enamel (PWA 36569).
1) Dry the (PO5-483) aluminized epoxy enamel (PWA 36569) for a minimum of 24 hours at room temperature to dry the enamel sufficiently for handling purposes only.
2) Dry the (PO5-483) aluminized epoxy enamel (PWA 36569) for seven days for full chemical resistance.

S 022-011-N00

(9) Carefully remove the masking tape.

S 212-012-N00

(10) Examine the repair area for full coverage of the aluminized epoxy enamel.

ASSEMBLY AND INSTALLATION OF FITTINGS - MAINTENANCE PRACTICES

1. General
   A. This procedure gives the steps for the assembly and installation of three fitting types. They are the flexible, the elbow, and the positioning type fittings.

TASK 70-11-04-402-004-N00

2. Assembly and Installation of Fittings
   A. Consumable Materials
      (1) D00504 Petrolatum - White (PMC 9609)
   B. References
      (1) AMM 70-50-00/201, Standard Torque Values
   C. Install the Flexible-Type Fittings

S 432-001-N00

CAUTION: BEFORE YOU TIGHTEN THE TUBE COUPLING NUTS, MAKE SURE THAT YOU ALIGN THE ELBOWS CORRECTLY. THE TUBE ENDS MUST MOVE FREELY AND ALIGN WITH THE ELBOWS. IF YOU DO NOT ALIGN THE TUBE AND FITTINGS CORRECTLY, DAMAGE CAN OCCUR.

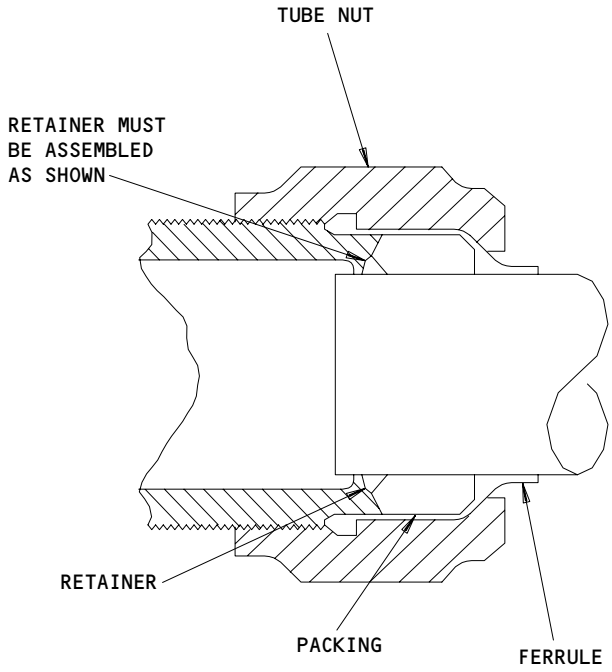
      (1) Assemble the flexible-type fittings for the oil and fuel tubes (Fig. 201).
         (a) Lubricate the packing and fitting threads with a thin layer of engine oil or petrolatum.
         (b) Assemble the flexible fittings.
         (c) Make sure the packing touches the bottom and the tube is aligned.
         (d) Tighten the tube nut (AMM 70-50-00/201).
   D. Install the Elbow-Type Fittings

S 432-002-N00

      (1) Do the steps in Figure 202 to install the elbow-type fittings.
   E. Install the Positioning-Type Fitting

S 432-003-N00

      (1) Do the steps in Figure 202 to install the positioning-type fittings.

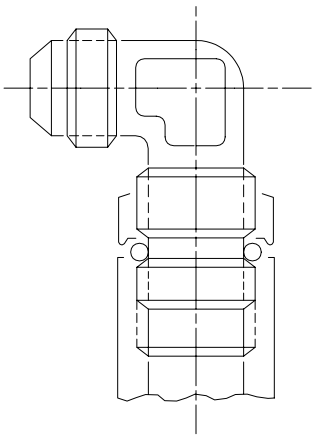


CAUTION: IF RETAINER IS NOT USED THE PACKING OR SEAL MAY PROTRUDE BETWEEN THE TUBE AND THE CONNECTOR AND THE PIECES OF THE RUBBER MAY ENTER THE SYSTEM.

ASSEMBLY OF FLEXIBLE FITTING
PACKING AND RETAINER

L-71050

Flexible Fitting Installation
Figure 201



ASSEMBLY OF POSITIONING TYPE THREADED FITTINGS

STEP 1

COAT PACKING, PACKING RETAINER, AND EXTERNAL THREAD OF FITTING SPARINGLY WITH PETROLATUM OR FLUID TO BE USED IN LINE AND ASSEMBLY NUT, PACKING RETAINER, AND PACKING ONTO FITTING AS SHOWN. WORK PACKING RETAINER INTO COUNTERBORE OF NUT. TIGHTEN UNTIL PACKING IS PUSHED FIRMLY AGAINST FIRST LOWER THREAD OF FITTING.

STEP 2

INSTALL FITTING INTO BOSS AT SAME TIME KEEP NUT TURNING WITH FITTING UNTIL PACKING CONTACTS BOSS AS SHOWN (RECOGNIZED BY SUDDEN TORQUE INCREASE). WHILE HOLDING NUT STATIONARY TURN FITTING 1 1/2 TURNS. POSITION FITTING BY NOT TURNING MORE THAN ONE TURN.

STEP 3

WHILE HOLDING FITTING STATIONARY TIGHTEN NUT AGAINST BOSS THEN LOCKWIRE. OBTAIN METAL-TO-METAL CONTACT BETWEEN NUT AND BOSS WITHOUT EXCEEDING RECOMMENDED TORQUE. EXTRUSION OF PACKING OR PACKING RETAINER NOT PERMISSIBLE.

L-71051

Positioning Type Flexible Fitting Installation
Figure 202

IDENTIFICATION OF HARDWARE MATERIAL - MAINTENANCE PRACTICES

1. General
   A. These engines use a permanent type of material code identification.
   B. During an engine assembly, you must monitor the material specifications for the nuts and bolts used in the hot section of the engine.
   C. In the hot section, use only heat-resistant alloys.
   D. You must install the correctly identified parts that are serviceable in their correct locations.

TASK 70-11-05-902-001-N00

2. Identification of Hardware Material
   A. Material Code Identification

S 912-002-N00

CAUTION: USE THE PARTS THAT HAVE NO IDENTIFICATION (OR THAT HAVE ONLY THE MANUFACTURER'S IDENTIFICATION) ONLY IN THE LOW TEMPERATURE AREAS OF THE ENGINES. REFER TO THE P&W MANUAL FOR THE PART NUMBERS AND MANUFACTURER'S CODE IDENTIFICATION.

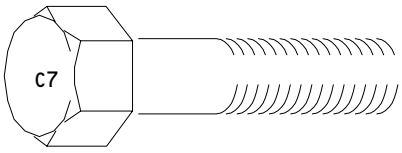
(1) The letter code (Prefix)
   (a) The letter C identifies corrosion resistant steel.
   (b) The letter H identifies the heat-resistant alloys that you must use in the hot section.
   (c) The letter T identifies titanium alloys.
   (d) The letter S identifies common temperature range alloys.

NOTE: The letter S replaces E for common temperature range materials.

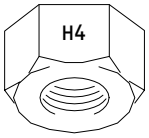
S 912-005-N00

(2) An E comes before the code identification when the part is a standard AN, MS or AS part (with a 6 number part numbers).

NOTE: Pratt & Whitney does not make parts with the letter E.



BOLT CODE IDENTIFICATION



NUT CODE IDENTIFICATION

L-71049

Bolt and Nut Code Identification
Figure 201

S 912-015-N00
(3) The number code (Suffix)
(a) A number follows this letter code (examples: C1, and H17).

S 912-016-N00
(4) The location of the material code identification follows (Fig. 201):
(a) On bolts, look on the top of the head.
(b) On nuts, look on one side of the nut.

S 912-007-N00
(5) New code identification
(a) The new identification numbers are added to this table.
(b) The letter B or P gives a temporary P&W identification until a S, C, H, or T number shows.

S 912-008-N00

CAUTION: DO NOT ASSEMBLE A PART WITH THE IDENTIFICATION C IN A LOCATION FOR A PART WITH THE IDENTIFICATION H. ALSO PREVENT THE OPPOSITE PROCEDURE. DO NOT USE NUTS, BOLTS OR OTHER PARTS WITH CADMIUM PLATE IN THE HOT SECTION OF THE ENGINE. DO NOT USE THESE PARTS WITH TITANIUM PARTS. THIS WILL PREVENT DAMAGE TO THE ENGINE.

(6) This procedure prevents the assembly of incorrect parts.

S 912-009-N00
(7) During the removal, put together all parts that have the same code letters to prevent a mixture of parts.

S 912-010-N00
(8) Do not mix the parts from different engines when you remove the parts and clean them.
(a) When the manufacturer assembles an engine, they can use alternative parts.

S 912-011-N00
(9) Do not mix the hardware items from the different engines when you install the items on the engine.

S 912-013-N00
(10) Table with Common Temperature Range, Corrosion-Resistant, Heat-Resistant, Titanium or Titanium Alloy, and Special Materials follow:

MATERIALS FOR COMMON TEMPERATURE RANGES			
Material Specification	Code	Material Specification	Code
AMS 6282, AMS 6320, AMS 6357 (was S6), AMS 6535	S1	AMS 5121	S20
		AMS 6324	S21
AMS 7225	S2	AMS 6328	S22
AMS 4121, AMS 4135, AMS 4153 (was S15)	S3	AMS 6350, AMS 6370, AMS 6371 (was S28)	S23
AMS 5061	S4	AMS 6352 (non-current), AMS 6365, AMS 6372	S24
AMS 5045	S5		
AMS 6280, AMS 6281, AMS 6355 (was S26), AMS 6530, AMS 6550	S7	AMS 6323	S28
		AMS 6381, AMS 6382	S30
AMS 5024	S9	AMS 6412, AMS 6413	S31
AMS 5040	S10	AMS 6440, AMS 6441	S32
AMS 6322, AMS 6323, AMS 6325, AMS 6327 (was S8), AMS 6358 (was S27)	S11	AMS 4500	S33
		AMS 6359, AMS 6415	S34
		AMS 6300 (non-current)	S36
AMS 4037, AMS 4120, AMS 4152 (was S14)	S12	AMS 6304 (was PWA 722, P5), AMS 7454, AMS 7455 AMS 7458	S37
AMS 4045, AMS 4122, AMS 4139, AMS 4154 (was S16)	S13	AMS 6418	S38
		AMS 6485	S39
AMS 5060	S17	AMS 4003	S40
AMS 5062	S18	AMS 4150	S41
AMS 5120	S19	AMS 4352	S42

CORROSION RESISTANT MATERIALS			
Material Specification	Code	Material Specification	Code
AMS 5640	C1	AMS 5513, AMS 5560, AMS 5565, AMS 5566, AMS 5639	C10
AMS 5628	C2		
AMS 5515, AMS 5516, AMS 5517, AMS 5518, AMS 5519, AMS 5636 (was C5), AMS 5637, AMS 7472	C3	AMS 5738	C12
		AMS 5630	C13
		AMS 5643	C14
AMS 7228	C4	AMS 5625 (was P10)	C15
AMS 5354, AMS 5508 AMS 5616, AMS 7470	C6	AMS 5506, AMS 5620 (was P3), AMS 5621	C16
AMS 5610	C7		
AMS 5504 (was C11), AMS 5612, AMS 5613,	C8	AMS 5644 (inactive)	C17
		AMS 5743	C18
AMS 5624	C9		

HEAT RESISTANT MATERIALS			
Material Specification	Code	Material Specification	Code
AMS 7229	H1	AMS 5649	H17
AMS 7232	H2	AMS 5532, AMS 5768	H18
AMS 5526, AMS 5527 (inactive), AMS 5721 (inactive), AMS 7476	H3	AMS 5525, AMS 5731, AMS 5732, AMS 5734, AMS 5736, AMS 5737, AMS 7481	H19 (Knurl)
AMS 5642	H4	AMS 5511, AMS 5647	H20
AMS 5512, AMS 5571, AMS 5646	H5	AMS 5754 (was P19)	H21
AMS 5733 (inactive) (was PWA 746)	H6	AMS 5530, AMS 5750 (inactive)	H22
AMS 5510, AMS 5557, AMS 5559, AMS 5570, AMS 5576, AMS 5645	H7	AMS 5545, AMS 5712, AMS 5713, AMS 7469	H23
AMS 5524, AMS 5648	H8	AMS 5551 (inactive), AMS 5756 (inactive), AMS 5757 (inactive)	H24
AMS 5540, AMS 5580, AMS 5665	H9	AMS 5660, PWA 1003 (was PWA 1002, P11)	H25
AMS 5521, AMS 5572, AMS 5651	H11	AMS 5706, AMS 5708 (was PWA 90), AMS 5709 (was P15), AMS 7471, PWA 686, PWA 687 (was CF236,P18), AMS 5707 (was PWA 1004)	H26
AMS 5522 (inactive), AMS 5652	H12		
AMS 5542, AMS 5667 (was H10), AMS 5668	H14	AMS 5759	H27
Chromel	H15	AMS 5662, PWA 1009	H28
Alumel	H16	AMS 5666 (was P28)	H29

TITANIUM OR TITANIUM ALLOY			
Material Specification	Code	Material Specification	Code
AMS 4921 (was P8)	T1	AMS 4927	T4
AMS 4923	T2	AMS 4928 (was PWA 682, P12), AMS 4967, AMS 7461	T5
AMS 4925	T3	AMS 4929	T6

SPECIAL MATERIAL			
Material Specification	Code	Material Specification	Code
ASTM A 193 GRADE B7	B7	AMS 7461	P24
ASTM A 193 GRADE B16	B16	PWA 91	P25
ASTM A 453 GRADE B660	B660	PWA 1006, PWA 1008, PWA 1013	P26
AMS 6302 (inactive)	P9	AMS 7236	P27
PWA 1202	P20	PWA 92, AMS 5828	P29
PWA 1010	P21	AMS 5758	P30
AMS 7477	P23		

S 912-014-N00

CAUTION: DURING THE REMOVAL OF THE PARTS THAT HAVE J THREADS, IDENTIFY THESE PARTS AND KEEP THESE PARTS TOGETHER. YOU CAN DAMAGE THE ENGINE, IF YOU INSTALL AN INCORRECT PART WHERE A J THREAD IS NECESSARY.

(11) Nuts and bolts with J threads are used in many locations on the engine.
   (a) The J threads have a full radius at the bottom on the threads and a larger minor diameter.

(b) The J threads have a longer life, better stressed extension property, and more tension strength.

(c) Nuts and bolts with the J threads and nuts and bolts with the usual threads are the same when you look at them.

1) Nuts and bolts have part numbers to show that they have the J threads.

NOTE: Nuts or bolts smaller than 0.200 inch (5.080 mm) in the length by 0.050 inch (1.270 mm) in the width have no part numbers.

2) A blue dye is used on the nuts and bolts with the J thread at the first engine assembly.

NOTE: The blue dye will burn off during the operation of the engine or will go away when you clean the engine.

FLUORESCENT PENETRANT INSPECTION (SPOP 70) - MAINTENANCE PRACTICES

1. General
   A. This procedure gives the instructions to make an inspection with fluorescent penetrant on airplane parts. The penetrant shows the cracks in the parts when they are put below an ultraviolet light.
   B. This procedures gives the instructions to make an inspection with fluorescent penetrant on a small area on a part (such as boss, weld repair area, grind out, and mix area).
   C. This procedures gives the general instructions and the approved materials for the fluorescent penetrant inspection (local application) normal or high or ultra high sensitivity.
   D. Do not apply the fluorescent penetrant inspection procedures on a large area on a part (such as flange, seal, and knife-edge).
   E. When performs the fluorescent penetrant inspection, do not use force when you use cloth or paper towel to remove penetrant from a defect area.

TASK 70-11-06-232-001-N00

2. Fluorescent Penetrant Inspection
   A. Equipment
      (1) Light - Ultraviolet
      (2) Meter - Ultraviolet Light
      (3) Meter - White Light
   B. Consumable Materials
      (1) B00062 Acetone, Phenol-free (PMC 9008) (P11-032)
      (2) B00130 Alcohol, Isopropyl (PMC 9094) (P11-014)
      (3) G01659 Applicator - Cotton, GG-A-616
      (4) G00371 Brush - Soft Bristled
      (5) G00834 Cloth - Cotton, Lint-free
      (6) Developer, Dry (PMC 4357) (P05-034) (Deleted, use P05-237)
      (7) Developer, Fluorescent Penetrant, Nonaqueous (PMC 4357) (P05-237)
      (8) Developer, Fluorescent Penetrant, Powder (PMC 4356) (P05-469)
      (9) Penetrant, Fluorescent, Post-Emulsified (High) (PMC 4353) (P05-032)
      (10) Penetrant, Fluorescent, Post-Emulsified (Normal) (PMC 4352) (P05-234)
      (11) Penetrant, Fluorescent, Post-Emulsified (Ultra High) (PMC 4354) (P05-235)
      (12) Penetrant, Fluorescent, Water Washable (High) (PMC 4360) (P05-236)

(13) Penetrant, Fluorescent, Water Washable (Normal) (PMC 4351) (P05-424)
(14) Penetrant, Fluorescent, Cleaner/Remover (PMC 4366) (P11-042)

(15) B00666 Solvent - Methyl Propyl Ketone (MPK)
(16) G00270 Tape - Masking

C. Reference

(1) AMM 70-11-13/201, Degreasing of Parts by Solvent Wiping (SPOP 208)

D. Procedure

S 212-011-N00

(1) General Inspection Instructions.

NOTE: You must always follow the specific procedures and limnits when you perform this task.

WARNING: DO NOT GET THE SOLVENT IN YOUR MOUTH, OR EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM THE SOLVENT. WEAR PROTECTIVE SPLASH GOGGLES AND GLOVES WHEN YOU USE THE SOLVENT. KEEP THE SOLVENT AWAY FROM SPARKS, FLAME, AND HEAT. THE SOLVENT IS POISONOUS AND FLAMMABLE AND IT CAN CAUSE INJURY TO PERSONS OR DAMAGE TO THE EQUIPMENT.

REFER TO THE MANUFACTURER'S MATERIAL SAFETY DATA SHEETS FOR CONSUMABLE MATERIAL INFORMATION (HAZARDOUS INGREDIENTS, PHYSICAL/CHEMICAL CHARACTERISTICS, FIRE, EXPLOSION, REACTIVITY, HEALTH HAZARD DATA, PRECAUTIONS FOR SAFE HANDLING, USE AND CONTROL MEASURES).

CAUTION: DO NOT USE A VISIBLE DYE PENETRANT ON AN ENGINE PART BEFORE YOU MAKE AN INSPECTION OF THE PART WITH FLUORESCENT PENETRANT. FLUORESCENT PENETRANTS AND VISIBLE DYE PENETRANTS ARE NOT COMPATIBLE. THE ABSORPTION OF VISIBLE DYE PENETRANT WILL MASK INDICATIONS AND DECREASE THE SENSITIVITY OF THE FLUORESCENT PENETRANT INSPECTION.

DURING INSPECTION, DO NOT WEAR EYE GLASSES THAT HAVE LENSES WHICH BECOME DARK IN THE UV LIGHT. THESE GLASSES DECREASE YOUR VISION.

(a) Always use the "ultra" high sensitivity (level 4) penetrant when you do the fluorescent penetrant inspection (SPOP 70) on major rotating parts (fan blades; compressor blades, drums, disks, airseals, hubs, turbine disks, and seal plates (full ring and segment cases), and shaft).

(b) In some tasks the "ultra" high sensitivity penetrant is not specified on these major rotating parts. Service experience shows that "ultra" high sensitivity penetrant must be used (instead of high) on all major rotating parts.

S 102-015-N00

(2) Cleaning Instructions.
   (a) Wipe the inspection area with a clean cloth.
   (b) Soak the cloth with solvent wiping to remove the unwanted material (refer to SPOP 208, AMM 70-11-13/201).
   (c) Do not let the solvent run over or flood on any surface.

S 202-016-N00

(3) Inspection Instructions.
   (a) If it is necessary, mask the area adjacent to the inspection area with Masking Tape to prevent the entry of penetrant.
   (b) Apply one of these penetrants with a brush, cloth, or cotton swab.
      1) Penetrant (Normal) (PO5-208), (PO5-234)
      2) Penetrant (High) (PO5-032), (PO5-236)
      3) Penetrant (Ultra-High) (PO5-235)
      4) Use a penetrant with the sensitivity (normal, high or ultra high) given in the source procedure.
      5) Apply the penetrant for 20 to 60 minutes maximum.
      6) Do not mix different types or brands of penetrant.
      7) For the normal penetrants:
         a) Fluorescent penetrant (Post-Emulsified) (PMC 4352) (PO5-234).
         b) Fluorescent penetrant (Water Washable) (PMC 4351) (PO5-424).
      8) For the high penetrants:
         a) Fluorescent penetrant (Post-Emulsified) (PMC 4353) (PO5-232).
         b) Fluroscent penetrant (Water Washable) (PMC 4360) (PO5-236).
      9) For the ultra high penetrants:
         a) Fluorescent penetrant (Post-Emulsified) (PMC 4354) (PO5-235).

(c) Drain the penetrant for 20 - 60 minutes maximum.
(d) Wipe the surfaces with a cloth or paper towel and with a solvent (refer to SPOP 208, AMM 70-11-13/201) to remove the surface penetrant.
(e) If it is necessary, use the solvent only to moisten the wiper.
(f) Do not let the solvent run over or flood on any surface.

NOTE: It is very important to prevent too much solvent wiping, which can remove too much penetrant from the part.

(g) Use the ultraviolet lights to make sure that there is no more penetrant on the surface.
(h) Very lightly apply one of the developers as follow.
1) Fluorescent penetrant developer (Nonaqueous) (PMC 4357) (PO5-237).
a) Apply a constant thickness of nonaqueous developer, sufficient to see the color of the part.
2) Dry developer (PMC 4356) (PO5-469).

CAUTION: DO THIS INSPECTION IN A DARK AREA WITH THE WHITE LIGHT NO MORE THAN 2 FOOTCANDLES AT THE INSPECTION SURFACE. TO MAKE THE AREA DARK, YOU CAN COVER IT WITH A BLACK SHEET. TOO MUCH WHITE LIGHT WILL PREVENT A GOOD INSPECTION.

(i) Let the developer absorb the penetrant for 10 minutes minimum.
(j) Examine the part under ultraviolet light for indications of fluorescent penetrant.
(k) If a surface has a moderately fluorescent background, or if you are not sure of a surface, do the procedure that follows:
1) Make a soft brush moist with one of these materials.
a) Solvent (P11-005)
b) Alcohol (P11-014)
c) Acetone (P11-032)
d) Solvent (P11-038)
e) Solvent (P11-039)

2) Lightly apply the material to the inspection surface.
3) The material must not run over or flood on any surface.
4) Let the solvent evaporate from the surface.
5) Examine the surface with ultraviolet light again.
6) If you see an indication immediately, examine it immediately.
7) If you do not see an indication immediately, then apply the dry or nonaqueous developer to the surface area.
   a) Apply a constant thickness of nonaqueous developer, sufficient to see the color of the part.
   b) Let the developer absorb the penetrant for 10 minutes minimum, and then examine the evaluation area again under the ultraviolet light.
   c) Examine the surface and make sure that no cracks are allows unless specify differently by the inspection procedures.
8) Use this evaluation procedure only one time for an indication.

S 002-017-N00

(4) Remove the developer from the part.

NOTE: Removal of the developer is necessary only if there is interference with a subsequent process or part function.

(a) If necessary for the part areas that collect the developer, blow off the remaining developer from the surface.
(b) For the part areas that collect the dry developer, flush and clean the area with hot water.
(c) If you use a nonaqueous developer, remove and wipe out the developer from the surface (AMM 70-11-13/201).

MARKING OF PARTS - MAINTENANCE PRACTICES

TASK 70-11-07-932-001-N00

1. Identification of Engine Components with Marks

A. General

(1) When you put a mark on a part, an assembly, or a weld, all these conditions are necessary:

(a) You can see the mark clearly usually with no aid to the eye.

(b) The mark will stay on the part.

(c) You can read the mark clearly usually with no aid to the eye.

(d) The part will operate correctly.

(e) You apply the mark with procedures which have the approval of Pratt & Whitney.

(f) Where there are unusual area or surface limits, a maximum of 3.5X magnification is permitted to get the necessary readability.

(g) The location of a mark must be as specified in the Service Bulletin or AMM maintenance task.

NOTE: Be sure to apply the mark only on a surface that will not move relative to a surface that touches it after you assemble the parts.

(2) Unless specified differently, when you re-identify, re-apply, and/or relocate a part again make sure that the new mark is in almost the same location or adjacent to the initial mark.

NOTE: Where re-identification or corrective marks are specified, removal of all or part of the old marking may be necessary. In these cases, use an approved marking method to draw a wavy line, loop, flat oval, or X's through the character(s) or symbol(s) to be removed.

(3) When you mark a part, use the limits given below for the dimensions of the letters and numbers:

(a) Use characters in a mark which are 0.060-0.160 inch (1.5-4.1 mm) in height.

(b) In special cases, when the mark is a function of the size or configuration of the part, characters not less than 0.016 inch (0.406 mm) nor more than 0.500 inch (12.700 mm) in height are permitted.

(c) If the surface specified for a mark will get a surface treatment coating (for example, paint), you must apply the mark before you apply the coating. Use an approved permanent marking method that will show through the final surface treatment.
1) If none of the specified marking methods will show through the coating, then it is permitted to use the applicable step to make the mark after you apply the coating:
a) On external surfaces, apply the mark with ink and a stamp, and then apply a full layer of (P07-001) Lacquer (PMC 1641) on the mark.
b) On internal surfaces, apply the mark by the applicable step:
- If permitted by the repair instructions, apply the mark by the vibration peen method.
- Apply the mark with ink and a stamp, and then apply a full layer of transparent (P05-040) Varnish (AMS 3132) on the mark.

(d) Do not put a mark on a part with electric or hand arc scribing which makes the letters and numbers with an electric arc between the instrument and the surface.

NOTE: In electric arc scribing (for example, hand arc scribing), the characters are made by the action of an electric arc between a surface and an electrode (scriber).

(e) Because of corrosion, do not put a mark on a part with acid etching.

NOTE: In acid etching, the characters are made by the action of an acid on the surface of the part.

(f) Do not use a soapstone to put a mark on the engine parts.

CAUTION: DO NOT USE THE VIBRATION PEENING, ETCH, OR MECHANICAL METHODS TO APPLY MARKS TO THE MATING SURFACES OF PARTS. YOU CAN DO THESE PROCEDURES ONLY WHEN SPECIFIED IN THE APPLICABLE MANUAL SECTION. THIS WILL PREVENT DAMAGE TO THE MATING SURFACES PARTS.

(g) If you must identify the offset holes in mating parts, use these steps:
1) Wherever the vibration peen method is approved, identify offset holes in mating parts with a vibration peened "X" mark adjacent to the offset hole as long as the condition or operation of the part is not changed.
2) If a different procedure is given for that specified area, use that procedure.

B. References
(1) AMM 70-00-00/201, Maintenance Practices

(2) AMM 70-11-13/201, Degreasing of Parts by Solvent Wiping (SPOP 208)
(3) AMM 70-30-00/201, Consumable Material

C. Consumable Materials
(1) (PO5-018) Pencil (PMC 4059)
(2) (PO5-022) Dye - Layout and Identification, LOX Compatible (Purple) (PMC 4062)
(3) (PO5-025) Ink (PMC 4021-1) Deleted

NOTE: PO5-025 is replaced by PO5-411.

(4) (PO5-026) Black Metal Marking Ink (PMC 4057-1)
(5) (PO5-040) Varnish - Phenolic Resin, Corrosion-Preventive (AMS 3132)
(6) (PO5-045) Red Marker Pen (PMC 4092-2 - Replaced by PMC 4050-12 (Red) in PO5-423)
(7) (PO5-048) White Ink (PMC 4027 - Deleted; use PMC 4057-2)

NOTE: PO5-048 is not available; use PO5-049.

(8) (PO5-049) White Metal Marking Ink (PMC 4057-2)
(9) (PO5-232) Metal Marking Crayon (Soft) (PMC 4058)
(10) (PO5-366) Dye, Layout and Identification (PMC 4039)
(11) (PO5-408) White Marker (Felt Tip) (SPMC 198-1)
(12) (PO5-409) Black Marker (Metal Tip) (SPMC 198-2)
(13) (PO5-410) Yellow Marker (Felt Tip) (SPMC 198-3)
(14) (PO5-411) Black Stamping Ink (PMC 4021)
(15) (PO5-412) White Stamping Ink (PMC 4027 - Deleted; use PMC 4057-2)

NOTE: PO5-412 is not available; use PO5-049).

(16) (PO5-413) Black Marking Ink (PMC 4500)
(17) (PO5-414) Black Marker (Extra Fine Point) (PMC 4557)
(18) (PO5-415) Black, Trace Element Certified (TEC) Marking Pen (PMC 4556)
(19) (PO5-416) White Chalk (Low Dust) (PMC 4552)
(20) (PO5-417) Marking Pen (White or Yellow Paint) (PMC 4554)
(21) (PO5-418) Dye, Layout and Identification (Blue) (PMC 4504)

(22) (PO5-419) Dye, Layout and Identification (Red) (PMC 4503)

CAUTION: DO NOT USE FELT TIP MARKER (PO5-423) ON ANODIZED OR FINISHED SURFACES OF ALUMINUM ALLOY GAS TURBINE ENGINE PARTS. THIS MARKER DOES NOT CLEAN EASILY FROM ALUMINUM ALLOYS AND IT CAN CAUSE DAMAGE TO THE PARTS.

(23) (PO5-423) Felt Tip Marker (PMC 4050)
(24) (PO5-441) White Metal Marking Ink (PMC 4057-10)
(25) (PO5-465) Green Metal Marking Ink (PMC 4057-5)
(26) (PO5-470) High Purity Marker (Blue) (PMC 4563-1)
(27) (PO5-471) High Temperature Marker (Blue) (PMC 4563-2)
(28) (PO5-472) High Purity, Black, Trace Element Certified Marker (PMC 4564).
(29) (PO5-477) High Temperature Marker (Blue) (PMC 4563-3)
(30) (PO7-001) Lacquer (PMC 1641)

D. Procedures to Apply Marks

S 932-007-N00

CAUTION: THE MARK MUST NOT CHANGE THE CONDITION OR THE OPERATION OF THE PART. ONLY USE THE APPLICABLE PROCEDURE TO MAKE THE MARKS. THIS WILL PREVENT DAMAGE TO THE PART.

(1) The steps that follow give instructions on the different types of marks which you can apply to the surface of a part.
   (a) Marks made with ink do not change the surface as mechanical methods do.

      NOTE: Usually, ink stamping, when used as a temporary marking method can be applied to a surface which after assembly does not move in relation to a surface that it touches (for example, a contact surface).

      1) Make sure the ink does not cause damage to the surface of the part.
      2) You can apply an ink mark to all surfaces of the part which do not touch and move against a different surface.

E. Permanent Marks on Engine Components

S 932-008-N00

(1) Use this procedure to put a permanent mark on parts for identification when you touch, keep, and assemble parts.
   (a) Permanent methods of marking are those in which marking is legible during the normal service life of the part.

(b) Permanent markings must not extend onto any radius, chamfer, sharp edge, bead, or fillet adjacent to the specified marking surface.

S 932-009-N00

(2) Procedures to apply marks.

(a) Metal Stamping

1) Characters are produced by forcible displacement of material.

a) Hammer - characters are made one at a time or in groups by a force applied mechanically or manually.

b) Press - characters are produced individually or in groups by a force applied as you steadily increase the controlled pressure.

c) Roll - characters are made as the part or the tool or both the part and the tool turn when they touch each other under a controlled force.

2) Stamps used for marking must make fillets and radii at all intersecting surfaces of the characters.

3) Parts marked by this method must have the marking area sufficiently back-supported to prevent dangerous stresses.

4) This method is not permitted if the hardness of the part at the time of marking is higher than Rockwell C45 or equivalent.

5) If the metal is raised more than 0.001 inch (0.025 mm) by this method of marking, it is necessary to carefully remove it.

NOTE: It is necessary to remove all raised metal around the characters on the surfaces of bearings that touch.

(b) Vibration Peen Method

1) Characters are made by vibrations from a radius-tipped, conical tool.

a) Manual - tool is manually guided and has one tip.

b) Mechanical - tool is mechanically guided and has one or more tips that can make one or more full characters at the same time.

2) This method is not usually permitted if the hardness of the part at the time of marking is higher than Rockwell C45 or equivalent. It can be used on parts harder than Rockwell C45 when specifically permitted.

NOTE: The vibration peen method can be an alternative to use on those parts that had drag impression or roll marking.

(c) Engraving

1) Characters are made by a manually or mechanically guided cutter or grinder that turns.

(d) Brand

1) Characters are made by burning or displacing non-metallic material with a hot tool.

(e) Drag Impression

1) Characters are made by moving material with a radius-tipped conical tool by dragging across the part surface. This tool moves mechanically and turns freely.

(f) Blast

1) Characters are made when an abrasive material hits the characters in the stencil area.

S 932-011-N00

(3) Marking Depth

(a) The table that follows gives the maximum marking depths.

Applied Marking Method	Maximum Marking Depth
Metal Stamp, Hammer	0.010 inch (0.254 mm)
Metal Stamp, Press and Roll	0.006 inch (0.152 mm)
Vibration Peen, Manual and Mechanical	0.006 inch (0.152 mm)
Engrave, Manual and Mechanical	0.003 inch (0.076 mm)
Brand	0.010 inch (0.254 mm)
Drag Impression	0.003 inch (0.076 mm)
Blast	0.0005 inch (0.013 mm)

F. Temporary Marks on Engine Components

S 932-012-N00

(1) Use this procedure to put a temporary mark on parts for correct identification during the usual handling, inspection, and storage of items before final assembly and use.

S 932-013-N00

CAUTION: USE ONLY THE APPROVED MATERIALS SPECIFIED IN THE PMC'S FOR MARKING.

CAUTION: DO NOT APPLY TEMPORARY MARKS WHICH CAN KEEP A LAYER OF CARBON, ZINC, COPPER, OR LEAD ON THE SURFACES. THESE LAYERS CAN CAUSE THE FATIQUE STRENGTH OF THE MATERIAL TO BE DECREASED AT HIGH TEMPERATURES. IF ONE OF THESE PROCEDURES WAS USED, REMOVE THE MARK BY SPOP 208, DEGREASING OF PARTS BY SOLVENT WIPING (AMM 70-11-13/201).

CAUTION: DO NOT APPLY MARKS TO THE SURFACES OF CARBON SEAL PLATES OR TO MATING SURFACES OF FINISHED MACHINED PARTS. MARKING MATERIAL REMAINING ON THESE PARTS COULD CAUSE INCORRECT RESULTS DURING DIMENSIONAL INSPECTION AND ASSEMBLY.

(2) Marking Methods

(a) Ink Marking

1) Marks made with ink do not change the surface as mechanical methods do.

NOTE: Usually, ink stamping, when used as a temporary marking method can be applied to a surface which after assembly does not move in relation to a surface that it touches (for example, a contact surface).

S 932-014-N00

(3) Marking Materials

(a) This material is used to highlight stamped or vibration peened part numbers during inspection and is approved to use on all gas turbine engine alloys if you remove the material after the inspection is completed:

1) Chalk

a) (P05-416) White Chalk (Low Dust) (PMC 4552)

(b) These materials are approved to use on steel, stainless steel, cobalt-base alloys, aluminum, magnesium, titanium, titanium alloys, and on nickel-base alloys other than nickel superalloys (for example, PWA 1422 or PWA 1480) unless specified differently below:
   1) Crayons
      a) (PO5-232) Metal Marking Crayon (Soft) (PMC 4058)
   2) Dye, Layout and Identification
      a) (PO5-022) Dye - Layout and Identification, LOX Compatible (Purple) (PMC 4062)
      b) (PO5-366) Dye, Layout and Identification (PMC 4039)
      c) (PO5-418) Dye, Layout and Identification (Blue) (PMC 4504)
      d) (PO5-419) Dye, Layout and Identification (Red) (PMC 4503)

(c) Inks (Applied by a brush or stamp)
   1) (PO5-026) Black Metal Marking Ink (PMC 4057-1)

      NOTE: The above ink is also approved to use on aluminide coated or PWA 286 coated or ceramic coated parts and on nickel superalloys (for example, PWA 1422 and PWA 1480).

   2) (PO5-049) White Metal Marking Ink (PMC 4057-2)

      NOTE: The above ink is also approved to use on aluminide coated or PWA 286 coated parts and on nickel superalloys (for example, PWA 1422 and PWA 1480).

   3) (PO5-411) Black Stamping Ink (For Marking on Non-porous Surfaces with a Rubber Stamp) (PMC 4021)

      NOTE: The above ink is also approved to use on PWA 73, overlay, aluminide, and ceramic coated parts.

   4) (PO5-413) Black Marking Ink (PMC 4500)

5) (PO5-441) White Metal Marking Ink (PMC 4057-10)

NOTE: The above ink is also approved to use on aluminide coated or PWA 286 coated parts.

6) (PO5-465) Green Metal Marking Ink

NOTE: The above ink is also approved to use on nickel superalloys (for example, PWA 1422 and PWA 1480).

(d) Markers

1) (PO5-408) White Marker (Felt Tip) (SPMC 198-1)
2) (PO5-409) Black Marker (Metal Tip) (SPMC 198-2)
3) (PO5-410) Yellow Marker (Felt Tip) (SPMC 198-3)
4) (PO5-414) Marker, Extra Fine Point (Black) (PMC 4557)
5) (PO5-423) Felt Tip Marker (PMC 4050)

NOTE: The above marker is also approved for other applications (see notes below). This does not always include all markers available for a given suffix.

NOTE: The Marks-A-Lot markers for PMC 4050-1 (black/chisel point) and PMC 4050-4 (black/fine point) are also approved to use on nickel superalloys and on ceramic coatings.

NOTE: The Sharpie markers for PMC 4050-4 (black/fine point) and all markers for PMC 4050-17 (black/bold fine point), PMC 4050-7 (red/fine point), PMC 4050-12 (red/extra fine point), PMC 4050-15 (red/ultra fine point), and PMC 4050-18 (red/bold fine point) are also approved to use on ceramic and overlay and aluminide coatings.

NOTE: All PMC 4050-6 (blue/fine point) and all PMC 4050-16 (blue/ultra fine point) markers are approved to use on aluminide coatings.

NOTE: The felt tip marker (PO5-423) is not approved to use on Alloy C titanium alloy.

6) (PO5-470) Marker, High Purity (Blue) (PMC 4563-1)
7) (PO5-471) Marker, High Temperature (Blue) (PMC 4563-2)

8) (PO5-472) Marker - High Purity, Black, Trace Element Certified (PMC 4564)
9) (PO5-477) Marker, High Temperature (Blue) (PMC 4563-3)

(e) Pencils
1) (PO5-018) Metal Marking Pencil (Hard) (PMC 4059)

(f) Pens
1) (PO5-415) Black, Trace Element Certified (TEC) Marking Pen (PMC 4556)
2) (PO5-417) Marking Pen (White or Yellow Paint) (PMC 4554)
3) (PO5-045) Felt Tip Marking Pen (Red) (PMC 4092-2).

NOTE: The above pen is replaced by (PO5-423) Red Felt Tip Marker (PMC 4050-12).

DENICKING (BLENDING) AND BUFFING/POLISHING OF PARTS (SPOP 532 & 533) - MAINTENANCE PRACTICES

1. General
   A. This procedure includes two tasks that follow:
      (1) Denicking (Blending) and Buffing/Polishing of Titanium Parts (SPOP 532)
      (2) Denicking (Blending) and Buffing/Polishing of Steel, Nickel, Cobalt, Aluminum, and Magnesium Alloy Parts (SPOP 533)

   TASK 70-11-08-322-001-N00

2. Denicking (Blending) and Buffing/Polishing of Titanium Parts (SPOP 532)
   A. General
      (1) This task gives the general instructions for denicking (blending) and buffing/polishing of titanium parts. This procedure gives the steps for blending and buffing of titanium parts.
      (2) Blending General Guidelines
         (a) Blending is an operation that is used to remove nicks, scratches, high metal, and other surface irregularities by intentional removal of base metal.
         (b) Make sure that the part you will blend is crack-free.
            1) If necessary do the Fluorescent Penetrant Inspection (AMM 70-11-06/201).
         (c) Manual or mechanical methods are used to produce shallow and smooth surface depressions that reduce the stress concentration from the damaged area by the distribution of the stress concentration over larger, more tolerant areas.
         (d) Non-toleranced enclosed area defined in blend repairs are to corners, points of tangency between surfaces, or at points opposite one of these locations.
            1) Enclosed area will assume a tolerance of +0.125 inch (+3.175 mm) in all directions unless adjacent areas are specified as areas where blending is not permitted.
         (e) It is better to blend sharp impact damage that is within acceptable limits than it is to accept that damage.
            1) The sharper the impact, the better it is to blend the damaged area.

(f) It is recommended that you make one single blend when the adjacent damage is so close together that the minimum length-to-depth blend ratio cannot be done independently.
(g) The depth of the blend must be as deep as necessary to remove the damage with the repair limits specified.
(h) The best blends are the ones which are smooth, continuous, and round-bottomed that extend outboard from the damage area as much as necessary.
1) For rotating parts, the length of the blend must be a minimum of 15 times the maximum depth of the blend in all directions.
2) For non-rotating parts, the length of the blend must be a minimum of 10 times the maximum depth of the blend in all directions.
(i) For local damage in the form of raised material, manual blending (that is, blending by hand) is the preferred method. Refer to the Manual Blending steps.
(j) When blending on a cylindrical surface, blend in the circumferential direction.
(k) Blend engine radial members in a radial direction.
(l) For parts that are smaller than 1.75 inches (44.45 mm) in length, the Manual Blending procedure that follows is recommended.

B. References
(1) AMM 70-11-06/201, Fluorescent Penetrant Inspection (SPOP 70)

C. Equipment
(1) Pneumatic Hand Tool
(2) (P05-058) Brush - Stiff Bristle, Non-Metallic - Tampico GA55-1
(3) Files

D. Consumable Materials
(1) Crocus Coated Cloth - Abrasive
(2) (P05-421) Scrub Pad (PMC 4095)
(3) (P05-422) Scrub Pad (PMC 4435)
(4) Emery Cloth
(5) (P05-353) Cloth Wheel (Non-coated)

(6) (PO5-274) Silicon Carbide Paper (80 grit mesh) - Abrasive
(7) (PO5-274) Silicon Carbide Abrasive (120 Grit) - Waterproof
(8) (PO5-274) Silicon Carbide Sandpaper (180 Grit) - Wet/Dry
(9) Aluminum Oxide Coated Cloth - 80 grit Abrasive (ANSI B74.18)
(10) Aluminum Oxide Paper - 120 Grit Abrasive
(11) Aluminum Oxide Paper - 180 Grit Abrasive
(12) (PO5-426) Compound - Polishing (PMC 3022)
(13) (PO5-427) Compound - Polishing (PMC 3023)
(14) (PO5-066) Compound - Polishing Buffing (PMC 3061)
(15) (PO5-384 Compound - Silicon Carbide Deburring (PMC 3088)

E. Procedure - General Denicking and Buffing Instructions

S 322-030-N00

WARNING: DO NOT REWORK TITANIUM WITH AN ABRASIVE TOOL THAT HAD PREVIOUSLY BEEN USED TO REWORK ANOTHER TYPE OF METAL. TITANIUM DUST CAN BE A FIRE HAZARD. REMOVE BLEND DUST FREQUENTLY DURING REPAIR.

CAUTION: LIMITS SPECIFIED IN THIS SECTION ARE FOR GENERAL USE ONLY. ALL PART-SPECIFIC LIMITS TAKE PRECEDENCE OVER THE LIMITS THAT FOLLOW. POST-BLEND SURFACE TREATMENT REQUIREMENTS WILL BE DETAILED WITHIN THE SPECIFIC BLEND REPAIR.

CAUTION: WHEN YOU DO THIS PROCEDURE. BE SURE TO USE GOOD SHOP PRACTICES AND COMMON SENSE. ABUSIVE BLENDING CAN CAUSE DAMAGE THAT IS HARMFUL TO THE LIFE AND FUNCTION OF THE REPAIRED PART.

CAUTION: TO CONTROL DUST AND NOISE CAUSED BY BLENDING, AND TO REDUCE THE RISK OF FIRE HAZARD FROM BLENDING DUST OF CERTAIN MATERIALS, WHENEVER POSSIBLE, DO THE BLENDING OPERATION IN A VENTILATED BOOTH. CONTACT YOUR LOCAL ENVIRONMENTAL HEALTH AND SAFETY PERSONNEL FOR SPECIFIC REQUIREMENTS.

CAUTION: USE ONLY MINIMUM PRESSURE WHEN YOU APPLY BLENDING TOOL TO PARTS. EXCESSIVE PRESSURE AND SPEED WILL CAUSE SPARKS OR AN ORANGE PEEL EFFECT THAT CAN POSSIBLY BE HARMFUL TO THE PART. KEEP MATERIAL REMOVAL TO A MINIMUM. DO NOT EXCEED BLEND LIMITS.

CAUTION: CHECK THE PART FREQUENTLY FOR HEAT BUILD-UP. IF THE HEAT BUILD-UP IS TOO HOT TO TOUCH WITH YOUR HAND, LET THE PART TO DECREASE IN TEMPERATURE BEFORE YOU CONTINUE WITH THE REPAIR. OVERHEATING OF PARTS DURING BLENDING CAN CAUSE EMBRITTLEMENT.

CAUTION: DO NOT OVERHEAT THE PART BECAUSE DAMAGE CAN OCCUR.

CAUTION: BE SURE TO DRESS THE ABRASIVE TOOL BEFORE BLENDING TO GET THE BEST TOOL PERFORMANCE AND TO PREVENT MATERIAL CROSS-CONTAMINATION.

CAUTION: USE A SHIELD OR MASKING TO PROTECT OTHER SURFACES FROM DAMAGE BY ACCIDENTAL TOOL CONTACT DURING THE REPAIR.

(1) Manual Blending (Blending by Hand)
  (a) Use an abrasive stone, abrasive paper, abrasive pads, files, emery cloth, and/or crocus cloth.
    1) Manual blending can be done with more than one grade of abrasive (coarse to fine, as necessary) to remove damage and get the specified surface finish.

2) Be sure to start with the finest abrasive needed to remove the damage.

S 322-031-N00

CAUTION: DO NOT OVERHEAT PART BECAUSE DAMAGE CAN OCCUR.

(2) Mechanical Blending (Power Blending)
(a) Use a power tool (electric or air) with abrasive-impregnated wheels, stones, and/or pads.
1) The blending can be done with more than one grade of abrasive (coarse to fine, as necessary) to remove damage and to get the specified surface finish.
2) Be sure to start with the finest abrasive needed to remove the damage.
(b) Use minimum wheel pressure when you apply the blending tool to the part to prevent heat build-up.
(c) Do not let the abrasive wheels to become loaded up with particles remaining from the blending.

S 212-032-N00
(3) Visual Inspection of the Blends
(a) The surface finish of the blended area must be as smooth as, or smoother than, the initial surface. You can compare the surface finish with the adjacent non-blended surface.
(b) All transitions from blended to non-blended areas must be smooth and continuous.
(c) If the blended area intersects adjacent radii, the initial radius contour must be restored.
(d) If the blended area intersects a corner, break the sharp edges 0.003 - 0.015 inch (0.08 - 0.38 mm).

S 322-027-N00
(4) Buffing/Polishing (Optional)
(a) Buffing is an optional operation that can be used to get the necessary surface finish while blending.
1) Buff reworked area(s) with a power tool, a tampico (P05-058) brush, and polishing compound (P05-066) buffing compound (PMC 3061) or (P05-384) silicon carbide deburring compound (P05-384).

2) Use minimum pressure when you apply the buffing brush to the part to prevent heat build-up.
3) Buff engine radial members in a radial direction.
4) Buff cylindrical surfaces in a circumferential direction.

(b) Polishing is an optional operation that can be used to smooth minor scratches and burrs with fine grain abrasive paper, abrasive cloth, crocus cloth, emery cloth, (PO5-421) Scrub Pad (PMC 4095), or (PO5-422) Scrub Pad (PMC 4435).

S 322-028-N00

CAUTION: MAKE SURE YOU DO THE PROCEDURE IN THE ORDER GIVEN BELOW. DAMAGE TO THE ROTATING COMPONENT CAN OCCUR.

(5) Special Instructions for The Blending Of Rotating Parts.

NOTE: Be sure to follow all requirements in the Blending and Buffing/Polishing procedures above.

(a) In areas where shotpeening is required, on-wing blending is not allowed.
1) Blend only as specified in the specific AMM maintenance task.
(b) Blend to a sufficient depth to remove damage with an additional 0.002 - 0.003 inch (0.051 - 0.076 mm) of material within the repair limits specified.
(c) Blending must start with the coarser grades of resilient flexible abrasive impregnated wheels, brushes, or points for the initial removal of damage, but not more coarse than is necessary to remove the damage.
(d) Finish blending the part with the finer grades of abrasive until the surface is as smooth as, or smoother than the adjacent surfaces.
(e) Use grades of abrasives in the order that follows:
1) 80 mesh silicon carbide or aluminum oxide grit

2) 120 mesh silicon carbide or aluminum oxide grit
3) 180 mesh silicon carbide or aluminum oxide grit
4) Optional: Use (PO5-354) Polishing Compound (PMC 3017) or (PO5-426) Polishing Compound (PMC 3022), or (PO5-427) Polishing Compound (PMC 3023) with (PO5-353) cloth wheel (non-coated) to get a surface finish, if necessary.

TASK 70-11-08-322-015-N00

3. Denicking (Blending) and Buffing/Polishing of Steel, Nickel, Cobalt, Aluminum, and Magnesium Alloy Parts (SPOP 533)

A. General
(1) This task gives the general instructions for denicking (blending) and buffing/polishing of steel, nickel, cobalt, aluminum, and magnesium alloy parts.
(2) Blending General Guidelines
(a) Blending is an operation that is used to remove nicks, scratches, high metal, and other surface irregularities by intentional removal of base metal.
(b) Make sure that the part you will blend is crack-free.
1) If necessary do the Fluorescent Penetrant Inspection (AMM 70-11-06/201).
(c) Manual or mechanical methods are used to produce shallow and smooth surface depressions that reduce the stress concentration from the damaged area by the distribution of the stress concentration over larger, more tolerant areas.
(d) Non-toleranced enclosed area defined in blend repairs are to corners, points of tangency between surfaces, or at points opposite one of these locations.
1) Enclosed area will assume a tolerance of +0.125 inch (+3.175 mm) in all directions unless adjacent areas are specified as areas where blending is not permitted.
(e) It is better to blend sharp impact damage that is within acceptable limits than it is to accept that damage.
1) The sharper the impact, the better it is to blend the damaged area.

(f) It is recommended that you make one single blend when the adjacent damage is so close together that the minimum length-to-depth blend ratio cannot be done independently.
(g) The depth of the blend must be as deep as necessary to remove the damage with the repair limits specified.
(h) The best blends are the ones which are smooth, continuous, and round-bottomed that extend outboard from the damage area as much as necessary.
1) For rotating parts, the length of the blend must be a minimum of 15 times the maximum depth of the blend in all directions.
2) For non-rotating parts, the length of the blend must be a minimum of 10 times the maximum depth of the blend in all directions.
(i) The surface finish of the blended area must be as smooth as, or smoother than, the initial surface.
1) You can compare the surface finish with the adjacent non-blended surface.
(j) All transitions from blended to non-blended areas must be smooth and continuous.
(k) If the blended area intersects adjacent radii, the initial radius contour must be restored.
(l) If the blended area intersects a corner, break the sharp edges 0.003 - 0.015 inch (0.08 - 0.38 mm).
(m) For local damage in the form of raised material, manual blending (blending by hand) is the preferred method.
(n) When blending on a cylindrical surface, blend in the circumferential direction.
(o) Blend engine radial parts in a radial direction.
(p) For parts that are smaller than 1.75 inches (44.45 mm) in length, the manual blending procedure is recommended.

B. References
(1) AMM 70-11-06/201, Fluorescent Penetrant Inspection (SPOP 70)
(2) AMM 70-11-01/201, Anodize Touch-Up (SPOP 42)

C. Equipment
(1) Pneumatic Hand Tool

(2) Tampico Brush
(3) Files
(4) Abrasive Stone
(5) Abrasive Paper
(6) Crocus Cloth
(7) Abrasive Pads
(8) Emery Cloth
(9) Silicon Carbide or Aluminum Oxide Grit (80, 120, or 180 mesh)

D. Consumable Materials
(1) Compound - Buffing Polishing (P05-066) (PMC 3061)
(2) Cloth - Wheel (Non-Coated) (P05-353)
(3) Compound - Polishing (P05-354) (PMC 3017)
(4) Compound - Silicon Carbide Deburring (P05-384) (PMC 3088)
(5) Compound - Polishing (P05-426) (PMC 3022)
(6) Compound - Polishing (P05-027) (PMC 3023)
(7) Scrub Pad - (P05-421) (PMC 4095)
(8) Scrub Pad - (P05-422) (PMC 4435)

E. Procedure - General Denicking and Buffing/Polishing Instructions

S 122-023-N00

WARNING: MAGNESIUM DUST IS EXTREMELY FLAMMABLE. FOLLOW THE PRECAUTIONS VERY CAREFULLY TO PREVENT FIRE. BE SURE TO FREQUENTLY REMOVE BLEND DUST FROM THE PART, BLENDING AREA, AND WEAR GLOVES DURING THE REPAIR.

CAUTION: USE ONLY MINIMUM PRESSURE WHEN APPLYING BLENDING TOOLS TO PARTS. EXCESSIVE PRESSURE AND SPEED WILL CAUSE SPARKS OR AN ORANGE PEEL EFFECT THAT CAN POSSIBLY BE HARMFUL TO THE PART. KEEP MATERIAL REMOVAL TO MINIMUM. DO NOT EXCEED BLEND LIMITS.

CAUTION: CHECK THE PART FREQUENTLY FOR HEAT BUILD-UP. IF THE PART IS TOO HOT TO TOUCH WITH YOUR HAND, LET THE PART TEMPERATURE DECREASE BEFORE YOU CONTINUE WITH THE REPAIR. OVERHEATING OF PARTS DURING BLENDING CAN CAUSE EMBRITTLEMENT.

CAUTION: DO NOT OVERHEAT THE PART BECAUSE DAMAGE CAN OCCUR.

CAUTION: WHEN YOU DO THIS PROCEDURE, BE SURE TO USE GOOD SHOP PRACTICES AND COMMON SENSE. ABUSIVE BLENDING CAN CAUSE DAMAGE THAT IS HARMFUL TO THE LIFE AND FUNCTION OF THE REPAIRED PART.

CAUTION: TO CONTROL DUST AND NOISE CAUSED BY BLENDING, AND TO REDUCE THE RISK OF FIRE HAZARD FROM BLENDING DUST OF CERTAIN MATERIALS, WHENEVER POSSIBLE, DO THE BLENDING OPERATION IN A VENTILATED BOOTH. CONTACT YOUR LOCAL ENVIROMENT HEALTH AND SAFETY PERSONNEL FOR SPECIFIC REQUIREMENTS.

CAUTION: USE A SHIELD OR MASKING TO PROTECT OTHER SURFACES FROM DAMAGE BY ACCIDENTAL TOOL CONTACT DURING THE REPAIR.

CAUTION: BE SURE TO DRESS THE ABRASIVE TOOL BEFORE BLENDING TO GET THE BEST TOOL PERFORMANCE AND TO PREVENT MATERIAL CROSS-CONTAMINATION.

(1) Manual Blending (Blending by Hand)
  (a) Use an abrasive stone, abrasive paper, abrasive pads, files, emery cloth, and/or crocus cloth.
    1) Manual blending can be done with more than one grade of abrasive (coarse to fine, as necessary) to remove damage and get the specified surface finish.
    2) Be sure to start with the finest abrasive needed to remove the damage.

S 322-025-N00

CAUTION: DO NOT OVERHEAT THE PART BECAUSE DAMAGE CAN OCCUR.

(2) Mechanical Blending (Power Blending)
  (a) Use a power tool (electric or air) with abrasive-impregnated wheels, stones, and/or pads.
    1) The blending can be done with more than one grade of abrasive (coarse to fine, as necessary) to remove damage and get the specified surface finish.
    2) Be sure to start with the finest abrasive needed to remove the damage.
  (b) Use minimum pressure when you apply the blending tool to the part to prevent heat build-up.
  (c) Do not let the abrasive wheels become loaded up with any particles remaining from blending.

S 212-026-N00

(3) Visual Inspection of the Blends
  (a) The surface finish of the blended area must be as smooth as, or smoother than, the initial surface.
    1) You can compare the surface finish with the adjacent non-blended surface.
  (b) All transitions from blended to non-blended areas must be smooth and continuous.
  (c) If the blended area intersects adjacent radii, the initial radius contour must be restored.

(d) If the blended area intersects a corner, break the sharp edges 0.003-0.015 inch (0.080-0.380 mm).

S 122-018-N00

(4) Buffing/Polishing (Optional)

(a) Buffing is an optional operation that can be used to get the necessary surface finish while blending.

1) Buff the reworked area(s) with a power tool, a Tampico brush, and (P05-066) Buffing Polish Compound (PMC 3061), or (P05-384) Silicon Carbide Deburring Compound (PMC 3088).
2) Use minimum pressure when you apply the buffing brush to the part to prevent heat build-up.
3) Buff the engine radial members in a radial direction.
4) Buff the cylindrical surfaces in a circumferential direction.
5) Polishing is an optional operation that can be used to smooth minor scratches and burrs with fine grain abrasive paper, abrasive cloth, crocus cloth, emery cloth, (P05-421) Scrub Pad (PMC 4095), or (P05-422) Scrub Pad (PMC 4435).

S 122-019-N00

(5) Local Touch-up After Blending.

(a) For aluminum anodized parts.

1) To prevent corrosion damage on aluminum anodized parts after blending, do a local touch-up of the repair (refer to anodize touch-up (SP0P 42) (AMM 70-11-01/201)).

(b) For nickel-cadium plated or PWA 110 coated parts.

1) Refer to engine shop Pratt and Whitney Standard Practices Manual - SP0P 144 for disposition and repair.
a) SP0P 144 is not a typical on-wing type repair. You must measure, mix, and apply chemicals and solutions that are not normally provisioned at line stations (refer to Pratt and Whitney Standard Practices Manual (PN 585005), 70-41-03).

(c) For Magnesium parts with PWA 547 coating.

1) Refer to the engine shop Pratt and Whitney Standard Practices Manual - SP0P 155 for disposition and repair.
a) SP0P 155 is not a typical on-wing repair. You must measure, mix, and apply chemicals and solutions that are not normally provisioned at line stations (refer to the Pratt and Whitney Standard Practices Manual (PN 585005), 70-41-03).

S 122-020-N00

CAUTION: WHEN YOU BLEND ROTATING COMPONENTS, DO THE PROCEDURE IN THE ORDER GIVEN IN THE PROCEDURE TO PREVENT DAMAGE TO THE PART.

(6) Special Instructions for the Blending of Rotating Parts

NOTE: Be sure to follow all the instructions in the Blending and Buffing/Polishing procedures above.

(a) In areas where shotpeening is required, blending is not permitted.
    1) Blend only as specified in the specific AMM maintenance task.
(b) Blend to a sufficient depth to remove all damage plus an additional 0.002-0.003 inch (0.051-0.076 mm) of material within the repair limits specified.
(c) Blending must start with the coarser grades of resilient flexible abrasive-impregnated wheels, brushes, or points for the initial removal of damage, but not more coarse than it is necessary to remove the damage.
(d) Finish blending the part with the finer grades of abrasives until the surface is as smooth as, or smoother than the adjacent surfaces.
(e) Use grades of abrasives in the order that follows:
    1) Apply 80 mesh silicon carbide or aluminum oxide grit.
    2) Apply 120 mesh silicon carbide or aluminum oxide grit.
    3) Apply 180 mesh silicon carbide or aluminum oxide grit.
    4) If necessary, apply one of the optional procedure below to complete the work on these surfaces.
        a) Use polishing compound (P05-354) (PMC 3017).
        b) Use polishing compound (P05-426) (PMC 3022).
        c) Use polishing compound (P05-427) (PMC 3023) with cloth wheel (non-coated) (P05-353).

ELECTRICAL HARNESSES, LEADS, AND CABLES - MAINTENANCE PRACTICES

1. General
   A. This procedure gives instructions when you install the electrical harnesses, leads, and cables.

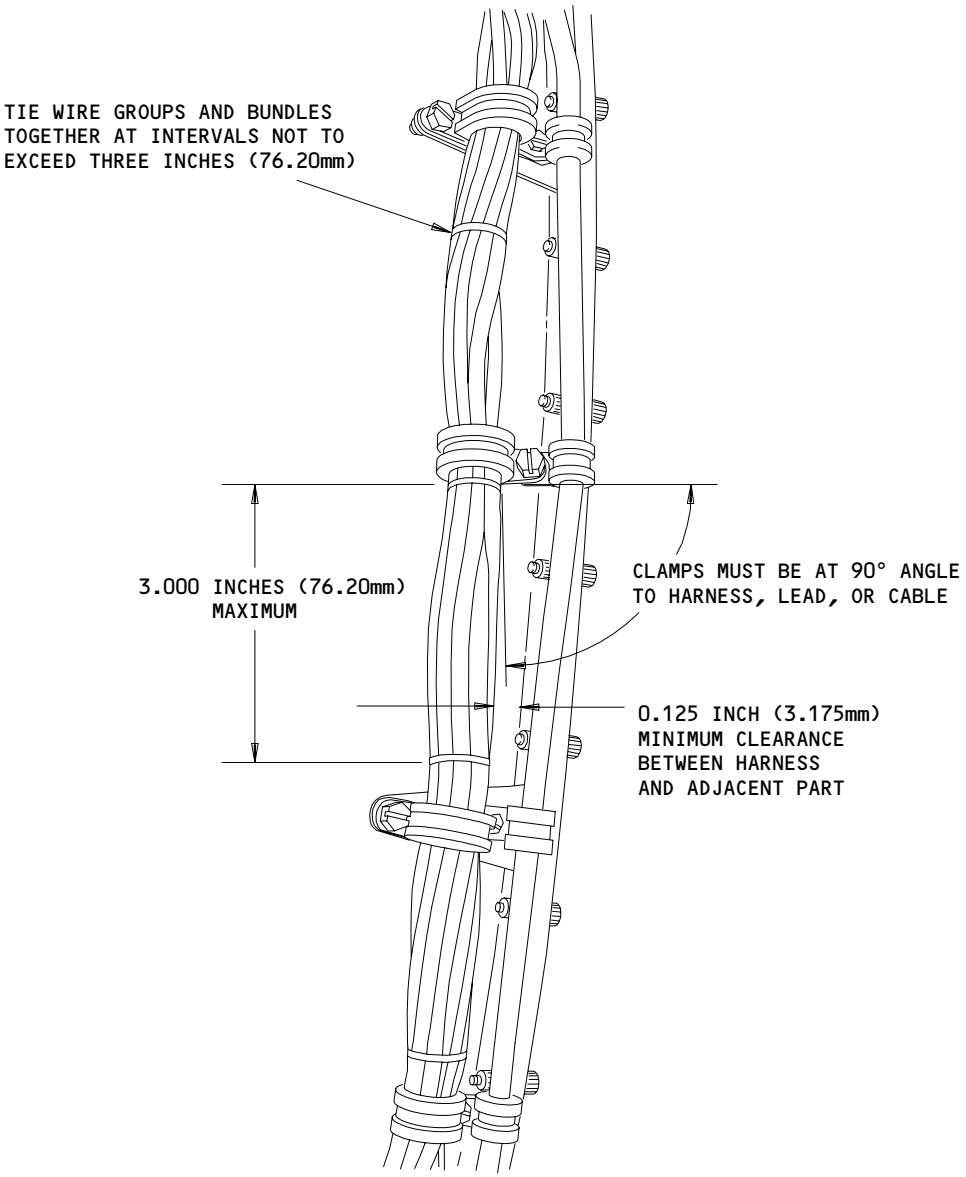
TASK 70-11-09-912-001-N00

2. Installation of Electrical Harnesses, Leads, and Cables
   A. General
      (1) This procedures contains three steps to use when you install electrical wire harnesses on the engine. The first step gives instructions to attach the lacing tape. The second step installs the chafing sleeves. Also, the third step gives instructions when you attach the wire harnesses to the engine.
   B. Access
      (1) Location Zones
          410 Left Power Plant Nacelle
          420 Right Power Plant Nacelle

   C. Install the Wire Harnesses, Leads, or Cables

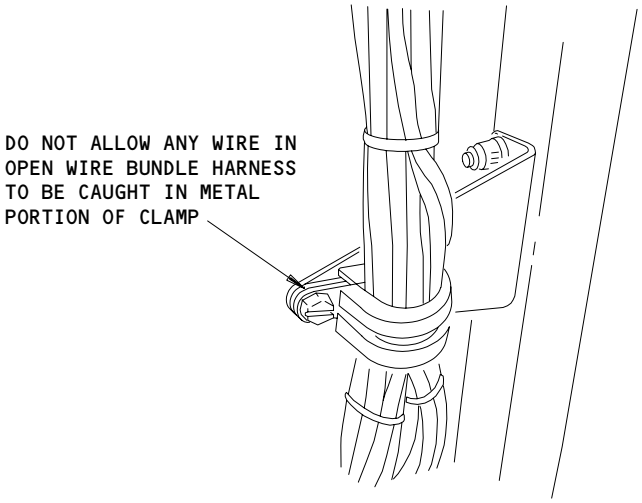
      S 912-002-N00
      (1) Do the steps that follow when you attach lacing tape (Fig. 201):
          (a) The wire harnesses must be held together at distances which are not more than 2.00 inches (50.80 mm)
          (b) Make a clove hitch with one more loop. Follow this with a square knot.
          (c) Tighten the clove hitch and the square knot. Make sure that you do not damage or bend the wire harness or the cable insulation.
          (d) If the thickness of the wire harness is more than 1.50 inches (38.10 mm) in diameter, use two layers of the lacing tape.
          (e) After you attach and tighten the tape, cut the end of the tape to make the ends 0.25-0.50 inch (6.40-12.70 mm) in length.

      S 912-003-N00
      (2) Do these steps when you use chafing sleeves (Fig. 201):
          (a) Cut the sleeve to the given length ±0.50 inches (12.70 mm).
          (b) Cut in the sleeve parallel to its length. Attach the sleeve around the wire bundle.
              1) Make sure that the ends of the sleeve make an overlap with a minimum dimension of 0.25 inches (6.40 mm) and a maximum dimension of 1.5 turns.

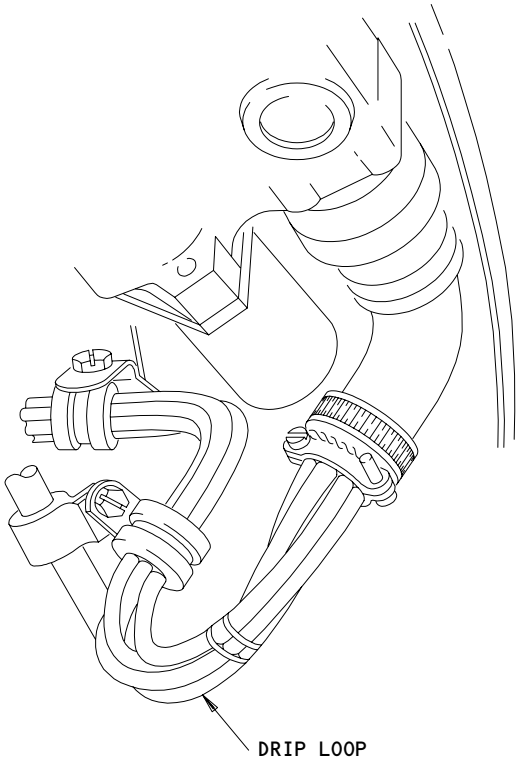


L-82641

Harness Installation
Figure 201 (Sheet 1)



L-82643



L-82642

Harness Installation
Figure 201 (Sheet 2)

(c) Attach the chafing sleeve to the wire bundle with lacing tape.
1) Make sure you apply the tape 0.05-1.50 inches (13.0-38.0 mm) from each end.
2) Apply the tape at distances not more than 3.0 inches (76.20 mm) apart.
(d) If the thickness of the wire harness is more than 1.50 inches (38.10 mm) in diameter, use two layers of lacing tape.
(e) After you attach and tighten the tape, cut the end of the tape to make the ends 0.25-0.50 inch (6.40-12.70 mm) in length.

S 912-004-N00

(3) Install the wire harness, the leads, or the cable assembly loosely on the engine.
(a) Connect the ends of the wire harness to the components.
(b) Find a position which is approximately in the middle of the wire harness where the wire harness attaches to a bracket.
(c) At this middle location, attach a clamp with the correct hardware. Tighten the clamp.

CAUTION: IF ONE OR MORE OF THESE CONDITIONS OCCUR, DAMAGE TO THE WIRE HARNESS CAN OCCUR:

- DO NOT APPLY TOO MUCH FORCE ON THE WIRE HARNESS WHEN ATTACH IT TO THE ENGINE.
- MAKE SURE YOU APPLY THE SAME FORCE ON THE WIRE BETWEEN THE CLAMP LOCATIONS.
- DO NOT APPLY TOO MUCH FORCE ON THE JUNCTIONS, THE SUPPORTS, OR THE CONNECTIONS.
- DO NOT BEND THE WIRE HARNESS BADLY NEAR CLAMPS, SUPPORTS, OR CONNECTOR BACK SHELLS.

(d) From this middle position, attach the two sides of the wire harness to the engine.
(e) When you attach the wire harness to the engine, keep the wires parallel between the clamp locations.

NOTE: If the wire harness breaks apart into one or more smaller wires, it is more important to keep the smaller wire harnesses aligned.

(f) When you attach the end of the wire harness, do these steps:
1) When a wire harness is attached to a connector, a terminal block, or a junction box, put a trap or a drip loop in the wire.
a) The trap or the drip loop keeps moisture away from the connector, the terminal block, or the junction box.
2) If the connection is sealed from water , it is not necessary to install a trap or a drip loop.

NOTE: If the connection is sealed from water, make sure you keep the wire loose sufficiently to permit you to remove the wire. Also, if the equipment is isolated from vibration, make sure the wire can move freely.

(g) After you install the harness, lead, or cable attachments, tighten the clamps.
1) Make sure the clamps are vertical to the wire.
2) Make sure that the wire harness does not turn or move in the clamp.
3) Make sure you remove all the material from the clamp ends. Also make sure you install the wires correctly in the clamp.
4) Hold the wire harnesses together at locations which are not more than 3 inches (76.20 mm) apart.
5) Look at the wire harnesses. Make sure they are correctly installed.
6) If you do not use twisted wire, make sure the wires in the wire harness are approximately parallel.
7) Make sure the wire harnesses do not touch edges or corners of other equipment or the structure.
a) Push the wire to the adjacent part. Make sure this distance is not less than 0.125 inches (3.175 mm).
8) Visually examine all the wire harnesses.
a) Look for all areas where the the harness can rub against a wire harness, clamp, or a bracket. Some of these areas are where the wires in a harness break apart, where a wire harness goes across a different wire or other engine parts.
b) If you find areas where the wire harness rubs against other components, install the chafing sleeves and the harness ties at those locations.

FIRE EXTINGUISHER AGENT TYPE	VISUAL/ BORESCOPE INSPECTION	EXTERNAL WASH	INTERNAL WASH	DISASSEMBLE/ CLEAN BY ENGINE MANUAL
WATER				
WATER	N/R	N/R	N/R	N/R
WATER FOG	N/R	N/R	N/R	N/R
GASEOUS				
ANSUL INERGEN® (N2 + Ar + CO2)	N/R	N/R	N/R	N/R
CARBON DIOXIDE	N/R	N/R	N/R	N/R
NITROGEN	N/R	N/R	N/R	N/R
SULFUR HEXAFLUORIDE (SF6)	N/R	NO	NO	YES
VAPORIZING LIQUID				
DUPONT FE-232™ (HCFC-123)	N/R	NO	NO	YES
DUPONT FE-36™ (HFC-236fa)	N/R	NO	NO	YES
DUPONT FE-227™/FM-200® (HFC-227 ea)	N/R	NO	NO	YES
GREAT LAKES FM-100 (HBFC-22B1)	N/R	N/R	N/R	N/R
HALON 1011 (HBCC-30B1)	N/R	NO	NO	YES
HALON 1202 (BFC-12B2)	N/R	NO	NO	YES
HALON 1211 (BCFC-12B1)	N/R	NO	NO	YES
HALON 1301 (BFC-13B1) - NACELLE DISCHARGE/RELEASE	N/R	N/R	N/R	N/R
HALON 1301 (BFC-13B1) - IN PRIMARY GASPATH	N/R	NO	NO	YES
HALON 2402 (BFC-114B2)	N/R	NO	NO	YES
HALOTRON® I (HCFC-123 BLEND)	N/R	NO	NO	YES
HALOTRON® II (HFC-134a + HFC-125 + CO_2)	N/R	NO	NO	YES
DRY CHEMICAL				
NFPA ABC MULTI-CLASS:				
AMMONIUM PHOSPHATE	YES	NO	NO	YES
NFPA BC MULTI-CLASS:				
PURPLE K	YES	NO	NO	YES
SODIUM BICARBONATE	YES	NO	NO	YES
NFPA CLASS D:				
FOUNDRY FLUX	YES	NO	NO	YES
ANSUL MET-L-X®	YES	NO	NO	YES
FYR-FYTER METAL FYR	YES	NO	NO	YES
M-1	YES	NO	NO	YES
PYRO-CHEM® G-1	YES	NO	NO	YES

G-08181 (0209) PW V

NOTE: REFER TO THE TEXT FOR THE FULL REQUIREMENTS.

Cleaning Requirements After Chemical Contact with Fire Extinguishing Agents, Hydraulic Fluid, Oil or Fuel (SPOP 425)
Figure 201 (Sheet 1)

FIRE EXTINGUISHER AGENT TYPE	VISUAL/ BORESCOPE INSPECTION	EXTERNAL WASH	INTERNAL WASH	DISASSEMBLE/ CLEAN BY ENGINE MANUAL
FOAM				
AQUEOUS FILM-FORMING FOAMS (AFFF):				
ANSULITE® 1%	N/R	N/R	N/R	N/R
ANSULITE® 3% (AFC-3A)	N/R	N/R	N/R	N/R
ANSULITE® PREMIUM 3% (AFC-5-A)	N/R	N/R	N/R	N/R
CHEMGUARD 3% AFFF C-303	N/R	N/R	N/R	N/R
ALL OTHER AQUEOUS FILM-FORMING FOAMS	YES	NO	NO	YES
HIGH EXPANSION FOAMS:				
ANSUL JET-X® 2 3/4%	N/R	N/R	N/R	N/R
NATIONAL FOAM HI-EX® 2%	N/R	N/R	N/R	N/R
ALL OTHER HIGH EXPANSION FOAMS	YES	NO	NO	YES
OTHER FOAM TYPES:				
PROTEIN (P, FP, OR FFFP)	YES	NO	NO	YES
SODA-ACID	YES	NO	NO	YES
TRIMETHOXYBOROXINE (TMB)	YES	NO	NO	YES
WATER-GLYCOL	YES	NO	NO	YES

G-12743 (0209) PW V

NOTE: REFER TO THE TEXT FOR THE FULL REQUIREMENTS.

Cleaning Requirements After Chemical Contact with Fire Extinguishing Agents, Hydraulic Fluid, Oil or Fuel (SPOP 425)
Figure 201 (Sheet 2)

CLEANING REQUIREMENTS AFTER CHEMICAL CONTACT WITH FIRE EXTINGUISHER AGENTS, HYDRAULIC FLUID, OIL, OR FUEL (SPOP 425) - MAINTENANCE PRACTICES

1. General

A. Always obey the specified procedures and limits in the AMM maintenance tasks.

B. This data shows you how to find the correct procedures to clean and disassemble engines if they touch:
   (1) Fire extinguisher agents
   (2) Hydraulic fluid
   (3) Oil
   (4) Fuel

C. Speak to the local Pratt & Whitney agent for the applicable procedures when the conditions that follow occur:
   (1) The engine touches a fire extinguisher agent when there is no fire (for example, during accidental operation of the fire extinguisher system).
   (2) The fire temperature was higher than the engine over-temperature limits.
   (3) The fire occurred in areas external to the burner and gaspath areas of the engine.

D. Use this data for fires which are in the burner (combustor) and turbine gaspath areas.
   (1) The temperature of these areas must not be more than the maximum permitted temperature.

E. After a fire extinguisher agent goes into the engine, do not operate the engine if Figure 201 shows that the fire extinguisher agent makes it necessary to disassemble the engine.
   (1) Some fire extinguisher agents can cause damage to engine parts at engine operational temperatures.

F. If you used the agents that follow and the fire inspections show no fire or mechanical damage, you do not have to disassemble the engine to clean the engine parts:
   (1) Carbon Dioxide
   (2) Nitrogen
   (3) Ansul Inergen

(4) Water, or Water Fog

G. For other fire extinguisher agents, it is necessary to disassemble the engine to clean the parts that touch the fire extinguisher agent.

H. Before you do maintenance work on a hangar fire extinguisher system that uses foam, remove engines from the hangar or put covers on the engines to make sure that accidental operation of the system does not cause foam to go into the engine.

I. The necessary detailed gaspath cleaning procedures (internal wash), as well as instructions for subsequent disassembly, cleaning, and inspection instructions are in the applicable maintenance manuals.

J. Operators who know of airports, test cells, or hangars that use fire extinguisher agents that are not in the list in Figure 201, must give instructions to their local Pratt & Whitney agent to send the Technical Data Sheets and Material Safety Data Sheets for these fire extinguisher agents to Pratt & Whitney Customer Service in East Hartford, Connecticut.

K. If you used fire extinguisher agents that are not specified in Figure 201 but are used at airports, in test cells and/or in hangars, you should tell their local Pratt & Whitney agent to send the Technical Data Sheets and Material Safety Data Sheets to Pratt & Whitney Customer Service in East Hartford, CT. 06108 USA.

L. The most important problem with foam or dry-chemical fire extinguisher agents in an engine is corrosion during engine operation.
   (1) These materials can cause damage to cold section and/or hot engine section parts.
   (2) These foam or dry chemical agents cause chemical reactions during engine operation.

M. Test results show as follows:
   (1) Stainless steel alloys, nickel base alloys (coated or uncoated), and cobalt base alloys are very sensitive to chemical corrosion from some types of fire extinguisher agents such as protein foams and dry chemical agents.
   (2) Chemical corrosion can occur at temperatures less than the engine operation range (approximately 1200°F (649°C)).
   (3) Titanium, aluminum, magnesium, cadmium-plated and nickel-cadmium plated low alloy steels show no corrosion from bicarbonate compounds (dry powders) at engine operation temperature levels.
   (4) Many of the foam fire extinguisher agents in the list in Figure 201, Sheet 2 cause stress corrosion cracks in titanium at the service operation temperatures in the high pressure compressor, but not at the service operation temperatures of the fan.
      (a) Clean with (SPMC 148) aqueous cleaner (P11-049) to remove foam.
   (5) Some of the aqueous film-forming foam (AFFF) and high-expansion foam chemical fire extinguisher agents in the list in Figure 201, (Sheet 2) do not cause corrosion on engine material test panels at engine operation temperatures.

(6) Figure 201, (Sheet 2) shows which AFFF and high-expansion foam agents have test results that show they are compatible with engine alloys and coatings.
(a) For other AFFF and high-expansion foam agents, it is necessary to disassemble the engine to remove the parts that touch the foam.
(b) Titanium in the high compressor can experience stress corrosion from many of the foam chemicals in Figure 201 at service operation temperatures.

N. Halon 1301 fire extinguisher agent decomposes in fires and at engine operation temperatures and results in acids that can cause stress corrosion cracks on gaspath materials when exposed to high temperatures.
(1) Turbine airfoil protective coatings degrade when exposed for a short period of time to Halon 1301 at 1800°F (982.2°C) if the Halon 1301 goes directly into the core of the engine from a ground unit.
(2) Onboard nacelle fire extinguisher systems (Halon 1301) on turbofan engines do not release directly into the core but into the nacelle compartment and do not touch the turbine airfoils.
(a) You do not have to clean the engine gaspath parts to remove Halon 1301 decomposition materials after an onboard nacelle fire extinguisher system releases Halon 1301.

O. The aqueous film-forming foams (AFFF) in Figure 201, (Sheet 2) are NFPA Class B foam fire extinguisher agents that use synthetic surfactants which are usually fluorinated.

NOTE: These foams do not contain protein foaming agents.

P. The high-expansion foams in Figure 201, (Sheet 2) are NFPA Class B foam fire extinguisher agents that expand quickly to fill closed spaces (for example, hangars).
(1) These foams usually use synthetic surfactants that are different from the synthetic surfactants in aqueous film-forming foams.

Q. The protein (P), fluoroprotein (FP), and film-forming fluoroprotein (FFFP) foams in Figure 201, (Sheet 2) are NFPA Class B foam fire extinguisher agents that use protein foaming agents.

TASK 70-11-10-802-006-N00

2. Cleaning Requirements after Chemical Contact with Fire Extinguisher Agents, Hydraulic Fluid, Oil, or Fuel (SPOP 425)

A. References
(1) AMM 70-11-12/201, Degreasing of the Engine Externals (SPOP 1)

(2) AMM 70-11-13/201, Degreasing of Parts by Solvent Wiping (SPOP 208)
(3) AMM 70-11-15/201, Potable Water Quality Specifications
(4) AMM 70-11-16/201, Degreasing of Parts by Aqueous Cleaner (SPOP 209)
(5) AMM 70-24-05/201, Cleaning of Contact Points and Wiring Harness (SPOP 6)
(6) AMM 71-00-02/401, Power Plant - Removal/Installation
(7) AMM 72-00-00/601, Engine Gaspath - Inspection/Check

B. Consumable Materials
(1) SPMC 148 Aqueous Cleaner (P11-049)

C. Clean the Engine after Chemical Contact with Fire Extinguisher Agents

S 202-007-N00
(1) Do an inspection of the engine for fire damage after a fire or after you use an onboard nacelle fire extinguisher system because of a fire warning.
(a) Turn the rotor.
1) The rotor must turn freely.

NOTE: The rotor must turn freely.

2) Listen for parts that rub against or hit other parts that they usually do not touch.

NOTE: Noises are signs of damage.

(b) Examine the external surfaces of the engine to look for fire damage.
(c) Do a borescope gaspath inspection to see which parts have damage (AMM 72-00-00/601).
(d) Remove the engine if the parts have damage (AMM 71-00-02/401).
(e) Remove the damaged parts from the engine if:
1) The check for free movement shows one or more signs of damage.
2) The visual inspection shows fire damage.
3) The borescope inspection shows fire damage.

S 202-008-N00
(2) For engines that use labyrinth seals, do this task: Oil System Contamination Inpection (AMM 72-00-00/601).

NOTE: Materials in the list in Figure 201 could enter the oil system through the labyrinth seals.

S 202-009-N00

(3) Do the steps that follow for the requirement in each column in Figure 201:

(a) Visual/Borescope Inspection

1) If column 2 reads "YES" for the material in Figure 201, do as follows:

a) Examine the external surfaces of the engine to see which parts have contamination from the material.

b) Do a borescope gaspath inspection (AMM 72-00-00/601).

NOTE: This inspection will show how much of the engine you must disassemble to remove the parts that have contamination from the material.

This inspection does not show contamination from gaseous fire extinguisher agents or vaporizing liquid fire extinguisher agents.

2) If column 2 reads "N/R" for the material in Figure 201, Sheet 1 or 2, it is permitted, but not necessary, to do a borescope inspection of the engine to look for contamination.

(b) External Wash - Figure 201, Sheet 1 or 2, Column 3

1) If column 3 reads "YES" for the material in Figure 201, Sheet 1 or 2, do as follows:

a) Do this task: Wire Harness Contact Points Cleaning (SPOP 6) (AMM 70-24-05/201).

b) Do this task: Cleaning the Exterior of the Engine (SPOP 1) (AMM 70-11-12/201).

2) If column 3 reads "NO" for the material in Figure 201, Sheet 1 or 2, do not do an external wash.

3) If column 3 reads "N/R" for the material in Figure 201, Sheet 1 or 2, it is permitted, but not necessary, to do an external wash to remove the material from the external surfaces.

(c) Internal Wash - Figure 201, Sheet 1 or 2, Column 4.

1) If column 4 reads "YES" for the material in Figure 201, Sheet 1 or 2:

a) Do this task: Potable Water Quality Specifications (Compressor Wash) (AMM 70-11-15/201).

CAUTION: DO NOT OPERATE THE ENGINE AFTER UNWANTED MATERIAL TOUCHES THE ENGINE GASPATH PARTS. IF YOU DO, THE MATERIAL COULD CAUSE DAMAGE TO THE PARTS AT ENGINE OPERATION TEMPERATURES.

2) If Column 4 reads "NO" for the material in Figure 201, Sheet 1 or 2, it is not permitted to do an internal (gaspath) wash.

NOTE: An internal wash (with clear water or with detergent) does not remove all of the foam (fire extinguisher agents) from the engine gaspath.

Dry chemicals (fire extinguisher agents) are not water-soluble. An internal wash will cause these materials to cake, bond to engine parts, and/or cause air holes and cracks to get clogged.

a) Remove and clean all parts in the engine gaspath if an internal wash was done after engine gaspath parts touch the material (AMM 70-11-16/201).

3) If column 4 reads "N/R" for the material in Figure 201, Sheet 1 or 2, it is permitted, but not necessary, to do an internal (gaspath) wash to remove the material from the engine gaspath surfaces (AMM 70-11-15/201).

(d) Disassemble/clean per engine manual (Figure 201, Sheet 1 or 2, Column 4).

1) If column 4 reads "YES" for the material in Figure 201, Sheet 1 or 2, do as follows:

CAUTION: DO NOT OPERATE THE ENGINE AFTER UNWANTED MATERIAL TOUCHES THE ENGINE GASPATH PARTS. IF YOU DO, THE MATERIAL COULD CAUSE DAMAGE TO THE PARTS AT ENGINE OPERATION TEMPERATURES.

a) Complete this procedure immediately after the parts touch the material.

b) For gaseous fire extinguisher agents or vaporizing liquid fire extinguisher agents:
<1> Disassemble the engine to remove all parts in the engine gaspath.
c) For foam or dry chemical (fire extinguisher) agents:
<1> Disassemble the engine to remove those parts on which the visual or gaspath inspection showed contamination.
<1> Clean all parts in the engine gaspath if you did a gaspath wash after the material went into the engine (AMM 70-11-16/201).
d) Do a visual inspection of all parts of the engine that touched the material.

2) If Column 4 reads "N/R" for the material in Figure 201, Sheet 1 or 2, it is permitted, but not necessary to disassemble the engine to clean the parts.

D. Cleaning After a Hydraulic Fluid Leak

S 102-010-N00

(1) After a hydraulic fluid leak, do the subsequent procedure:
(a) Complete this procedure immediately after contamination with hydraulic fluid.
(b) Do a visual inspection of the external surfaces of the engine to see which parts have contamination from hydraulic fluid.
1) Speak to the local Pratt & Whitney agent for the applicable requirements and procedures if:
a) The external surfaces show burned hydraulic fluid or fluid that bonded to the surfaces.
2) Do the steps that follow if:
a) The hydraulic fluid is wet on the external surfaces.
b) External surfaces do not show burned hydraulic fluid or fluid that is bonded to the surfaces.
(c) Do this task: Borescope Gaspath Inspection (AMM 72-00-00/601).

NOTE: This inspection shows which parts to remove that have contamination from the hydraulic fluid.

1) If the visual inspection of the external surfaces of the engine shows that:
a) The hydraulic fluid went into the engine through the bleed valves, the inlet, or the exhaust.
(d) If the gaspath surfaces show that there is contamination from hydraulic fluid:

NOTE: It is not permitted to do an internal wash to remove hydraulic fluid from the gaspath surfaces.

1) Disassemble the engine to remove those parts to clean the parts fully.

(e) Do an external wash to remove the hydraulic fluid if:
  1) The visual inspection of the external surfaces of the engine shows wet hydraulic fluid with no indication of hardened or burned hydraulic fluid.
  2) Do this task: Wire Harness Contact Points Cleaning (SPOP 6) (AMM 70-24-05/201).
  3) Do one of the subsequent procedures to clean the other external surfaces:
    a) Cleaning the Exterior of the Engine (SPOP 1) (AMM 70-11-12/201).
    b) Degreasing of Parts by Solvent Wiping (SPOP 208) (AMM 70-11-13/201).
  4) Examine the surfaces for signs of remaining hydraulic fluid or burned hydraulic fluid.

(f) If you find signs of remaining hydraulic fluid or burned hydraulic fluid, do the subsequent steps.
  1) Disassemble the engine to remove those parts that show signs of remaining hydraulic fluid or burned on hydraulic fluid.
  2) Use the applicable maintenance task to clean the parts that show signs of remaining hydraulic fluid or burned hydraulic fluid.
  3) After the parts are clean, do a visual inspection of the parts.
    a) Use the applicable AMM maintenance task for the inspection limits.

(g) Do the subsequent steps if you find hard or burned hydraulic fluid on:
  1) Part surfaces.
  2) Hydraulic fluid contamination on engine gaspath surfaces.

CAUTION: DO NOT OPERATE THE ENGINE AFTER UNWANTED MATERIAL TOUCHES THE ENGINE GASPATH PARTS. IF YOU DO, THE MATERIAL COULD CAUSE DAMAGE TO THE PARTS AT ENGINE OPERATION TEMPERATURES.

(h) Disassemble the engine to remove those gaspath parts on which the visual/borescope inspection found contamination from hydraulic fluid.

(i) Remove all parts in the engine gaspath if an internal wash was completed after engine gaspath parts touch the hydraulic fluid.

(j) Clean the parts by aqueous cleaner (SPOP 209) (AMM 70-11-16/201).

(k) After the parts are clean, do a visual inspection of all parts that had contamination from hydraulic fluid. Use the applicable AMM maintenance task for the inspection limits.

E. Cleaning After an Oil or Fuel Leak

S 102-011-N00

(1) After an oil or fuel spill, do the subsequent procedure:

(a) Do an external wash to remove the oil or fuel from the external surfaces of the engine.

1) Do this task: Wire Harness Contact Points Cleaning (SPOP 6) (AMM 70-24-05/201).

(b) Use one of the procedures in the subsequent list to clean other external surfaces:

1) Do this task: Cleaning the Exterior of the Engine (SPOP 1) (AMM 70-11-12/201).

2) Do this task: Degreasing of Parts by Solvent Wiping (SPOP 208) (AMM 70-11-13/201).

(c) Do this task: Potable Water Quality Specifications (Compressor Wash) (AMM 70-11-15/201).

GUIDELINES FOR REUSE OF DAMAGED ENGINES AND ENGINE PARTS - MAINTENANCE PRACTICES

1. General
   A. This procedure has the tasks that follow:
      (1) Abnormal Operational Circumstances - Engines and Engine Parts Unacceptable for Continued Aircraft Usage
      (2) Abnormal Operational Circumstances - Engines and Engine Parts Potentially Acceptable for Continued Aircraft Usage
      (3) Serious Operational Events
      (4) "Impacted" and "Dropped" Engines
      (5) Tailpipe Fires.
   B. The following guidelines are provided to assist owners, operators and maintenance facilities in the disposition of engines and engine parts involved in Abnormal Operational Circumstances. Abnormal Operational Circumstances are defined as accidents or other events which fall outside of the operating envelope for the engine, aircraft or engine/aircraft combination as originally certified and where inspection, refurbishment, and repair data are not addressed by FAA approved publications, i.e., engine manuals, service bulletins, etc. The data contained in these FAA approved publications normally address engine and engine parts which experience wear, deterioration, or damage through exposure to the normal day-to-day operating environment. The guidelines apply to the following engine associated abnormal operational circumstances:
      (1) Engine and Engine Parts Unacceptable for Continued Aircraft Usage.
      (2) Engines and Engine Parts Potentially Acceptable for Continued Aircraft Usage.
   C. For Abnormal Operational Circumstances not addressed by these guidelines, Pratt & Whitney considers engines and engine parts unaccceptable for continued aircraft usage unless reviewed and approved on a case-by-case basis.
   D. The guidelines are based upon Pratt & Whitney's general experience in this area and, therefore, are to be used as general guidelines. In any particular incident, however, more complete information or inspection results may require alternate action. The engine or engine parts owner should not rely upon the information in these guidelines without a thorough understanding of the damage to the engine or engine parts and its effect on engine operation. It should be understood that the following are only guidelines and that any and all responsibility for returning any engine or engine part to service remains with the engine or part owner.

E. The following are definitions of technical terms used in these guidelines:

(1) Definitions from ATA World Airlines Technical Operations Glossary (WATOG).

(a) Accident: An occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight, until such time as all such persons have disembarked, in which:

1) Any person suffers death or serious injury as a result of being in or upon the aircraft, or by direct contact with the aircraft or anything attached thereto; or

2) Any damage is caused to the property of a third party.

(b) Damage, accidental: Physical deterioration of an item caused by contact or impact with an object or influence which is not a part of the airplane, or by improper manufacturing or maintenance practices.

(2) Non-WATOG definitions used in the guidelines:

(a) Engine: Engines made by Pratt & Whitney Division of United Technologies Corporation.

(b) Engine parts: Parts sold by Pratt & Whitney and:

1) delivered as original equipment in an engine installed on an airplane,

or

2) installed in a spare engine,

or

3) sold by Pratt & Whitney as new spare parts for an engine.

NOTE: Engine parts include vendor-supplied accessories and components which are approved by Pratt & Whitney.

(c) Abnormal operational circumstances: Accidents or other events which occur outside the operation envelope for:

1) the engine,

or

2) the airplane,

or

3) the engine and airplane combination as it was initially certified, and where inspection, refurbishment, and repair data are not in FAA-approved publications such as Engine Manuals, Service Bulletins, etc.

TASK 70-11-11-912-001-N00

2. Abnormal Operational Circumstances - Engine and Engine Parts Unacceptable for Continued Aircraft Usage

A. Access

(1) Location Zones

410 No. 1 Power Plant
420 No. 2 Power Plant

B. Procedure

S 912-026-N00

(1) Pratt & Whitney considers engines and engine parts involved in the following types of circumstances unacceptable for continued aircraft usage:

NOTE: It is recognized that an aircraft could be damaged beyond economical repair without any resulting engine involvement. In such cases, the engine and engine parts can be considered "not involved" in an abnormal operational circumstance.

(a) Engines and engine parts installed in an aircraft totally destroyed by fire.
(b) Engines and engine parts totally engulfed in fire to the extent that outer cases have been heat discolored or distorted, or the engine is otherwise damaged by heat over a significant area of the engine, either external or internal.
(c) Engine and engine parts installed in an aircraft totally destroyed by impact damage.

TASK 70-11-11-912-007-N00

3. Abnormal Operational Circumstances - Engines and Engine Parts Potentially Acceptable for Continued Aircraft Usage

A. Access

(1) Location Zones

410 No. 1 Power Plant
420 No. 2 Power Plant

B. Accidents

S 912-025-N00

(1) Pratt & Whitney considers engines and engine parts involved in the following types of accidents potentially acceptable for continued aircraft usage:
(a) Engines and engine parts involved in an accident in which the nacelles and engines remain undamaged.
(b) Engines and engine parts involved in a fire wherein a portion of the aircraft was destroyed but the engines were not subjected to fire damage.

(c) Engines and engine parts involved in an accident wherein engines rotate freely, although impact damage to cases or other engine parts is evident.
(d) Partially damaged engines which will not rotate freely as a result of superficial damage to cases, etc.
(e) Engines subjected to partial or full immersion in fresh or salt water for a brief period of time.

S 212-009-N00
(2) Acceptance criteria for engines and engine parts which are involved in the types of accidents listed above:
(a) Engines and engine parts involved in accidents described in steps A.(1).(a) and A.(1).(b) can be considered "not involved" in an abnormal operational circumstance.
(b) Engines and engine parts involved in accidents described in steps A.(1).(c), A.(1).(d) and A.(1).(e) should be 100 percent disassembled and inspected.

NOTE: Owners who are unable to perform the necessary tests or who are in doubt whether to accept or reject a part should contact Pratt & Whitney for assistance.

TASK 70-11-11-912-010-N00
4. Serious Operational Events
A. Access
(1) Location Zones
410 No. 1 Power Plant
420 No. 2 Power Plant

B. Procedure

S 912-027-N00
(1) Pratt & Whitney considers engines and engine parts involved in the following types of serious operational events as potentially acceptable for continued aircraft usage provided the criteria defined are observed.
(a) Single fan blade fractures outboard of part span shroud.

NOTE: A single fan blade fracture occurring outboard of the part span shroud can cause varying degrees of engine damage. Refer to respective model engine manual for bird or object ingestion inspections and damage limits. In general, the following inspection guidelines can be applied to events where a single blade has fractured outboard of the part span shroud.

1) Check for evidence of core ingestion.
2) Inspect fan blade shrouds for evidence of shingling.
3) Inspect fan rubstrip for damage beyond limits.
4) Check fan exit guide vanes for damage.

5) Inspect engine externals for broken or cracked brackets and case flanges.
6) Borescope inspect compressor gaspath for excessive blade tip rub and blade-to-vane clash.

(b) Single blade fracture inboard of part span shroud or multiple fan blade fractures.

NOTE: A fan blade fracture inboard of the part span shroud or or multiple fractures generate a significant amount of rotor vibration. More extensive inspections with disassembly of the N1 rotor modules is required as a minimum. Further teardown is required as inspection findings dictate.

(c) Engines experiencing sudden stoppage.
1) Engines experiencing sudden stoppage usually as a result of significant ingestion or distress. In every instance of sudden stoppage, a complete engine teardown and 100 percent engine part inspection should be accomplished.

(d) Engines involved in an operational fire (burn-through, bearing compartment, etc.).
1) Engines involved in an operational fire should be completely torn down and all engine parts inspected.
2) If extinguishing agents have been applied to the engine, gaspath cleaning is to be accomplished per the appropriate engine manual, as quickly as practical, to prevent corrosion.

TASK 70-11-11-912-015-N00

5. "Impacted" and "Dropped" Engines

A. General

(1) The damage or circumstances which can result in an "Impacted" engine include impact with the ground, a collision with a service vehicle, etc. An engine dragged on the ground or against another object is considered an impacted engine. "Dropped" engines refer to engines which are dropped entirely or on either end.

B. References
(1) AMM 71-00-02/401, Power Plant
C. Access
(1) Location Zones
410 No. 1 Power Plant
420 No. 2 Power Plant

D. Procedure

S 912-028-N00
(1) Inspection requirements for impacted and dropped engines are similar and progressive in scope; that is, proceeding with further teardown is dependent on the degree of damage found at each level of inspection.
(a) For engine mounted on aircraft where pylon or nacelle damage has occurred, inspect engine mount flanges, cases, external components and plumbing, and gearbox housing and mounts. If the impact was such that debris may have entered the engine inlet, inspect engine for ingestion, and check bleed system filters and valves for debris.
1) If no damage is noted, no further action is required.
2) If damage is noted to external components and plumbing, replace damaged items.
3) If damage is noted to mount flanges, gearbox or gearbox mounts or cases, remove the engine (AMM 71-00-02/401).
4) Monitor chip detectors and oil filter on a more frequent basis during the initial return of the engine to service.
(b) For dropped engines, removal and disassembly are required.

TASK 70-11-11-912-018-N00

6. Tailpipe Fires
A. References
(1) AMM 71-00-02/401, Power Plant
B. Access
(1) Location Zones
410 No. 1 Power Plant
420 No. 2 Power Plant

C. Procedure

S 912-029-N00
(1) In general, tailpipe fires of short duration and extinguished by "motoring" the engine will probably have little detrimental effect on exhaust area engine parts (Refer to PWA Operating Instructions 190).
(a) Inspect exhaust area for signs of scorching. Any parts which exhibit scorching including fan duct acoustic liners if so equipped, should be replaced.

S 912-030-N00

(2) Engines which experience a more persistent tailpipe fire, or when starting overtemperature limits are exceeded during a tailpipe fire, present a greater potential for thermal stress. Engine removal is required (AMM 71-00-02/401).

CLEANING THE EXTERIOR OF THE ENGINE (SPOP 1)

1. General
   A. This task shows you how:
      (1) To clean the external surface of the engine.
      (2) To remove oil, grease, hydraulic fluid, and loose soil from outer surfaces or external parts.
   B. This task does not show you how to remove hard carbon particles from the engine.

TASK 70-11-12-112-013-N00

2. Cleaning the Exterior of the Engine
   A. References
      (1) AMM 70-11-13-2, Degreasing of Parts by Solvent Wiping (SPOP 208)
   B. Consumable Materials
      (1) For Assembled Engines
         (a) Method A
            1) Spray, Steam, or Foam Cleaners
               a) (P11-031) Alkali Cleaner (PMC 1284)
               b) (P11-040) Alkali Cleaner (SPMC 106)
               c) (P11-044) Alkali Cleaner (SPMC 104)
               d) (P11-045) Alkali Cleaner (SPMC 105)
               e) (P11-071) Aqueous Cleaner (SPMC 113)
               f) (P11-072) Aqueous Degreaser (SPMC 151)
               g) (P11-073) Aqueous Degreaser (SPMC 195)
               h) (P11-079) Aqueous Degreaser (SPMC 170)
               i) (P11-080) Aqueous Degreaser (SPMC 181)
               j) (P11-081) Aqueous Cleaner (SPMC 207)
               k) (P11-082) Aqueous Degreaser (SPMC 173)
            2) Gel-Type Cleaners
               a) (P11-047) Alkaline Gel Cleaner (SPMC 109)
               b) (P11-048) Alkaline Gel Cleaner (SPMC 110)
               c) (P11-069) Alkaline Gel Cleaner (SPMC 112)
               d) (P11-070) Alkaline Gel Cleaner (SPMC 159)
         (b) METHOD B
            1) (P05-421) Scrub Pad (PMC 4095)

2) (PO5-422) Scrub Pad (PMC 4435)
3) Spray or Wipe Cleaners
a) (P11-049) Aqueous Cleaner (SPMC 148-1 thru SPMC 148-4)

(2) For Disassembled Engines

NOTE: Refer to METHOD A or METHOD B above or use the consumable material as follows.

(a) Cleaner Applied by Brush
1) (P11-027) Stoddard Solvent (PMC 9001)

C. Procedure to Degrease the Exterior of the Engine by Method A or Method B

S 102-019-N00

WARNING: REFER TO THE MANUFACTURER'S MATERIAL SAFETY DATA SHEETS FOR CONSUMABLE MATERIALS INFORMATION (HAZARDOUS INGREDIENTS, PHYSICAL/CHEMICAL CHARACTERISTICS, FIRE, EXPLOSION, REACTIVITY, HEALTH HAZARD DATA, PRECAUTIONS FOR SAFE HANDLING, USE AND CONTROL MEASURES). IF YOU DO NOT USE AND HANDLE THE CHEMICALS PROPERLY, YOU CAN CAUSE DAMAGE TO EQUIPMENT.

(1) METHOD A
(a) Install covers on all openings into the engine (this includes the inlet and exhaust, all bleed openings, open fuel lines, open oil lines, breather tubes, and open electrical connectors).
(b) Clean by one of the subsequent procedures:

NOTE: Service experience shows that the gel-type cleaners are more effective than the spray, steam, and foam solutions on very dirty engines because the gel cleaners stay on the engine better than the spray, steam, and foam solutions, which drain off the engine during the soak time.

1) Use one of the solutions in the table that follows to apply with spray, steam, or foam.

Specification	Nomenclature	Maximum Concentration (Mixed with Water)
(P11-031)	Alkali Cleaner (SPMC 1284)	30% by Volume
(P11-040)	Alkali Cleaner (SPMC 106)	30% by Volume
(P11-044)	Alkali Cleaner (SPMC 104)	25% by Volume
(P11-045)	Alkali Cleaner (SPMC 105)	25% by Volume
(P11-071)	Aqueous Cleaner (SPMC 113)	20% by Volume
(P11-072)	Aqueous Degreaser (SPMC 151)	25% by Volume
(P11-073)	Aqueous Degreaser (SPMC 195)	50% by Volume
(P11-079)	Aqueous Degreaser (SPMC 170)	20% by Volume
(P11-080)	Aqueous Degreaser (SPMC 181)	25% by Volume
(P11-081)	Aqueous Cleaner (SPMC 207)	30% by Volume
(P11-082)	Aqueous Degreaser (SPMC 173)	25% by Volume

CAUTION: DO NOT USE A STEAM MACHINE TO APPLY THE GEL CLEANER. DAMAGE TO EQUIPMENT CAN OCCUR.

Specification	Nomenclature	Maximum Concentration (Mixed with Water)

2) Use one of the solutions in the table that follows to apply with spray:

NOTE: It is necessary to use a special applicator to apply the gel-type cleaner. Refer to the gel manufacturer's instructions for the correct applicator.

Specification	Nomenclature	Concentration
(P11-047)	Alkaline Gel Cleaner (SPMC 109)	As Recevied
(P11-048)	Alkaline Gel Cleaner (SPMC 110)	As Recevied
(P11-069)	Alkaline Gel Cleaner (SPMC 112)	As Recevied
(P11-070)	Alkaline Gel Cleaner (SPMC 159)	As Recevied

(c) Let the cleaner solution or gel-type cleaner stay on the engine for 10 - 20 minutes.
(d) Flush the engine fully with warm or hot water, or with steam.
(e) Remove the covers from all the openings on the engine.

S 112-016-N00

(2) METHOD B (Local Application Only). Use one of these methods:
(a) Spray or wipe with a (P11-049) aqueous cleaner (SPMC 148-1 thru SPMC 148-4), used as received. If necessary, clean with a soft non-metal brush or a pad, a (P05-421) scrub pad (PMC 4095), or a (P05-422) scrub pad (PMC 4435).

WARNING: SPOP 208 SOLVENTS ARE FLAMMABLE. KEEP THE SOLVENTS AWAY FROM HOT ENGINE PARTS. FAILURE TO DO SO CAN RESULT IN A FIRE AND CAUSE INJURY OR DEATH TO PERSONNEL.

(b) Use a non-metal brush, a scrub pad (PMC 4095), scrub pad (PMC 4435) or a clean cloth to apply solvent by (SPOP 208) (AMM 70-11-14/201).

NOTE: If engine parts are hot, let the temperature of the parts decrease to a temperature at which you can touch the parts without gloves before applying the solvent.

Specification	Nomenclature	Concentration

(c) Dry with a clean cloth.

D. Procedure to Clean the Engine External Component Parts After Removal of the Parts From the Engine

S 112-018-N00

(1) When it is necessary to clean engine external component parts after removal of the parts from the engine, do one of the subsequent procedures to clean the parts:
   (a) Do the Method A procedure above.
   (b) Do the Method B procedure above.
   (c) Do the subsequent procedure:
      1) Apply (P11-027) Stoddard Solvent (PMC 9001) to the parts with a brush in a solvent-recirculating parts washer or washer/soak tank that uses a recirculating pump to supply filtered solvent to the brush through a flexible supply hose.
      2) Dry with a clean cloth.

DEGREASING OF PARTS BY SOLVENT WIPING (SPOP 208) - MAINTENANCE PRACTICES

1. General
   A. This procedure gives the instructions for degreasing parts by wiping with solvent.

TASK 70-11-13-912-003-N00

2. Degreasing of Parts by Solvent Wiping
   A. References
      (1) AMM 70-30-00/201, Consumable Materials
   B. Consumable Materials
      (1) B00379 Isopropyl Alcohol (P11-014) or (P11-014A)
      (2) B00647 Cleaner Solvent (P11-039)
      (3) B00062 Acetone (P11-032)
      (4) B00650 Methyl Ethyl Ketone (P11-005)
      (5) B00652 Methyl Ethyl Ketone (P11-005A)
      (6) B00659 Cleaner (P11-042)
      (7) Cleaner (P11-055)
      (8) Cleaner (P11-056)
      (9) Cleaner (P11-057)
      (10) Cleaner (P11-058)
      (11) Cleaner (P11-059)
      (12) Cleaner Dielectric (P11-062)
      (13) Cleaner Handwiping (P11-063)
      (14) Cleaner (P11-064)
      (15) (P11-074) Cleaner Solvent (SPMC 213-1)
      (16) (P11-075) Cleaner Solvent Wipe (SPMC 213-2)
      (17) (P11-076) Cleaner Solvent (SPMC 216-1)
      (18) (P11-077) Cleaner Solvent Wipe (SPMC 216-2)
      (19) G00834 Cloth - Cotton, Lint-free (P05-005)
   C. Procedure

      S 112-002-N00

      (1) For Titanium and those parts that are not Titanium

LETTER CODE	MATERIAL NUMBER	DESCRIPTION	FLASHPOINT	VAPOR PRESSURE
A	P11-005A	METHYL ETHYL KETONE (REAGENT GRADE)	<140°F (60°C)	>45mm Hg
B	P11-065	ACETONE (REAGENT GRADE)	<140°F (60°C)	>45mm Hg
C	P11-042	FLUORESCENT PENETRANT CLEANER/REMOVER	<140°F (60°C)	>45mm Hg
D	P11-055	SOLVENT CLEANER	≥140°F (60°C)	≤45mm Hg
E	P11-063	HAND-WIPING SOLVENT	≥140°F (60°C)	≤45mm Hg
F	P11-062	DIELECTRIC SOLVENT	≥140°F (60°C)	≤45mm Hg
G	P11-066	HAND-WIPING SOLVENT	<140°F (60°C)	≤45mm Hg
H	P11-032	ACETONE (TECHNICAL GRADE)	<140°F (60°C)	>45mm Hg
I	P11-014A	ISOPROPYL ALCOHOL (REAGENT GRADE)	<140°F (60°C)	≤45mm Hg
J	P11-039	SOLVENT CLEANER	<140°F (60°C)	>45mm Hg
K	P11-005	METHYL ETHYL KETONE (TECHNICAL GRADE)	<140°F (60°C)	>45mm Hg
L	P11-014	ISOPROPYL ALCOHOL (TECHNICAL GRADE)	<140°F (60°C)	≤45mm Hg
M	P11-056	CLEANER SOLVENT	≥140°F (60°C)	≤45mm Hg
N	P11-057	CLEANER SOLVENT	≥140°F (60°C)	≤45mm Hg
O	P11-067	CLEANER SOLVENT	≥140°F (60°C)	≤45mm Hg
P	P11-058	CLEANER SOLVENT	<140°F (60°C)	≤45mm Hg
Q	P11-059	CLEANER SOLVENT	<140°F (60°C)	≤45mm Hg
R	P11-064	CLEANER SOLVENT	≥140°F (60°C)	≤45mm Hg
S	P11-074	CLEANER SOLVENT	<140°F (60°C)	≤45mm Hg
T	P11-075	CLEANER SOLVENT WIPES	<140°F (60°C)	≤45mm Hg
U	P11-076	CLEANER SOLVENT	<140°F (60°C)	≤45mm Hg
V	P11-077	CLEANER SOLVENT WIPES	<140°F (60°C)	≤45mm Hg

G-12605 (0807)

Solvents Approved for Use on Metallics
Figure 201

APPLICATION	SOLVENTS APPROVED TO DEGREASE METALLIC PARTS 1
FPI (LOCAL)	A B C G H I J K L P Q S T
GENERAL WIPE	A B C D E F G H I J K L M N O P Q R S T U V
PRE-ADHESIVE BONDING	A B C G I J P Q S T
PRE-PAINTING	A B C G I J P Q S T U V

1 SEE FIGURE 201 FOR SOLVENT LETTER CODES.

G-12608 (0807)

Solvents Approved To Degrease Metallic Parts
Figure 202

SPECIFICATION NUMBER	NON-METALLIC PART DESCRIPTION OF MATERIALS	SOLVENTS APPROVED TO DEGREASE NON-METALLIC PARTS 1
PWA 410	FIBERGLASS STRUCTURES, LAMINATED MOLDINGS	A B C G H I J K L P Q
PWA 411	CLOTH, GLASS, EPOXY RESIN IMPREGNATED	A B C G H I J K L P Q
PWA 446	POLYURETHANE RESIN, FOAMING	I
PWA 459	FABRIC, AROMATIC POLYAMAIDE, EPOXY RESIN IMPREGNATED	A B C G H I J K L P Q
PWA 460	LAMINATED STRUCTURES, AROMATIC POLYAMIDE FABRIC - EPOXY RESIN MATRIX	A B C G H I J K L P Q
PWA 479	MOLDING COMPOUND, POLYAMIDE, COMPOSITE	B I
PWA 628	FOAM MOLDED POLYURETHANE	I
PWA 36013	POLYURETHANE COATING, CONDUCTIVE, BLACK	I
PWA 36014	POLYURETHANE SURFACER, WHITE	I
PWA 36151	COMPOSITE AIRFOILS, CARBON FIBER REINFORCED	A B C G H I J K L P Q
PWA 36408	FABRIC, CARBON FIBER AND FIBERGLASS, POLYMIDE RESIN IMPREGNATED	B I
PWA 36414	FABRIC ALUMINUM BOROSILICATE GLASS FIBER, EPOXY RESIN IMPREGNATED	B I
PWA 36422	FABRIC, FIBERGLASS, EPOXY RESIN IMPREGNATED	A B C G H I J K L P Q
PWA 36426	MOLDING COMPOUND, POLYETHERIMIDE COMPOSITE	B
PWA 36442	FLUOROELASTOMER SHEET	I
PWA 36509	PRIMER, POLYURETHANE	I
PWA 36510	COATING, POLYURETHANE, EROSION RESISTANT	I
PWA 36516	FLUOROELASTOMER COATING	I

1 SEE FIGURE 201 FOR SOLVENT LETTER CODES.

G-12609 (0807)

Solvents Approved To Degrease Non-Metallic Parts
Figure 203

WARNING: REFER TO THE MANUFACTURER'S MATERIAL SAFETY DATA SHEETS FOR THE CONSUMABLE MATERIAL'S INFORMATION SUCH AS: HAZARDOUS INGREDIENTS, PHYSICAL/CHEMICAL CHARACTERISTICS, FIRE, EXPLOSION, REACTIVITY, HEALTH HAZARD DATA, PRECAUTIONS FOR SAFE HANDLING, USE AND CONTROL MEASURES.

WARNING: KEEP THE SOLVENTS AWAY FROM SPARKS, FLAME, AND HEAT. THE SOLVENTS ARE FLAMMABLE AND CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

WARNING: DO NOT GET SOLVENT IN YOUR MOUTH, EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM THE SOLVENT. PUT ON PROTECTIVE SPLASH GOGGLES AND GLOVES WHEN YOU USE SOLVENT. SOLVENT IS POISONOUS AND FLAMMABLE WHICH CAN CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT.

CAUTION: DO NOT USE SIZED CHEESECLOTH. IT HAS RESIN BINDERS THAT CAN DISSOLVE IN SOLVENTS AND CAUSE CONTAMINATION OF BOND SURFACES. USE SOLVENT DISPENSERS THAT SQUIRT OR POUR TO PREVENT REPEATED DIPPING AND CONTAMINATION BY WORK CLOTHS.

CAUTION: PART ASSEMBLIES THAT CONTAIN NON-METALLIC MATERIAL SHOULD NOT BE PUT FULLY INTO THE SOLVENT. THIS CAN DAMAGE SOLVENTS AND CAUSE CONTAMINATION OF BOND SURFACES ON THE PARTS.

CAUTION: METHANOL OR HALOGENATED HYDROCARBON SOLVENTS ARE NOT PERMITTED IN SPOP 208.

(a) Wipe the part with an unsized, clean, white (P05-005) Lint Free Cotton Cloth that is wet with one of these applicable solvents.

NOTE: Be sure to wear clean cotton gloves to touch clean parts before adhesive bonding.

1) See Figure 201 for descriptions and letter codes of solvents approved to use on metallic or non-metallic parts.
2) See Figure 202 for the solvents that are approved to degrease metallic parts for general wiping, for local fluorescent penetrant inspection (FPI) or before adhesive bonding or painting.

3) See Figure 203 for the solvents that are approved to degrease non-metallic parts for general wipe cleaning, or before painting or adhesive bonding.

(b) Let the parts air dry.

NOTE: Do not use compressed air to dry parts before adhesive bonding or painting. Compressed air can contain oil vapors.

REMOVAL OF EXTERNAL ENGINE CARBON (SPOP 2) - MAINTENANCE PRACTICES

1. General
   A. This procedure gives the instructions to remove the carbon from external engine parts.

TASK 70-11-14-002-001-N00

2. Removal of External Engine Carbon
   A. Consumable Materials
      (1) Cleaner - Alkaline Gel (SPMC 135) (P11-053)
      (2) Cleaner - Alkaline Gel (SPMC 1136) (P11-053)
      (3) Cleaner - Alkaline Gel (SPMC 137) (P11-053)
   B. Procedure

S 952-004-N00

(1) Mask or plug the part, if necessary.

S 112-002-N00

(2) Apply the cleaner at ambient temperature to the part.

NOTE: It is not necessary to make a solution of the alkaline gel cleaners. Use the alkaline gel cleaners at 100 percent by volume, as you receive them.

(a) Let the part soak for 10 minutes to 12 hours.

S 112-008-N00

(3) For carbon removal from tubes, pump the cleaner into the tubes.
   (a) Let the part soak for 10 minutes to 12 hours.
   (b) For a good removal of heavy carbon, soak the part in two-hours increments. Then flush with water and apply the cleaner again.

S 172-005-N00

(4) Flush the cleaner fully with cold or hot water pressure spray.

S 212-006-N00

(5) Do an inspection for removal of carbon.
   (a) If carbon is still present do steps 2 and 5 again. Maximum soak time is 24 hours.

S 842-007-N00

(6) Remove the masking or plugs from the openings on the engine.

POTABLE WATER QUALITY SPECIFICATIONS - MAINTENANCE PRACTICES

1. General
   A. This task gives the specifications for potable water for engine gaspath cleaning.

TASK 70-11-15-102-001-N00

2. Potable Water Quality Specifications (For Use In Compressor Wash or Detergent Cleaning Procedures On-wing)
   A. References
      (1) AMM 70-30-00/201, Consumable Materials
   B. Potable Water Quality Specifications for water suitable for engine gaspath cleaning (compressor wash) are as follows:

      NOTE: Maintenance manuals use potable water to rinse engine parts after detergent washing.

      Gaspath/compressor solution SPS 87 uses potable water in its mixture. Refer to AMM 70-30-00/201.

S 162-002-N00

(1) Read Table 201 to find the maximum permitted level of a property.
   (a) Water used for engine gaspath cleaning must agree with local quality specifications for potable water and with the quality specifications that follow:

      NOTE: When the local quality specifications for potable water and the quality specifications that follow do not agree, the quality specifications that follow are applicable.

Potable Water Quality Specifications
Table 201

PHYSICAL PROPERTY	PERMISSIBLE LEVEL
pH	6.0-10.0
Temperature (Approximate)	75°F (24°C)
Total Dissolved Solids	500 mg/l maximum

Potable Water Quality Specifications Table 201	
PHYSICAL PROPERTY	PERMISSIBLE LEVEL
Specific Resistance – or – Conductivity	1800 ohms-cm minimum 550 microsiemens/cm maximum
INORGANIC	
Chlorides	250.0 mg/l maximum
Fluoride	2.0 mg/l maximum

DEGREASING OF PARTS BY AQUEOUS CLEANER (SPOP 209) - MAINTENANCE PRACTICES

1. General
   A. This task shows you how to remove light oils, grease, fingerprints, dust, and soot from external parts.

      NOTE: This task is not for bearings.

TASK 70-11-16-912-001-N00

2. Degrease Parts by Aqueous Cleaner (No Rinse) (SPOP 209)
   A. Consumable Materials
      (1) Cleaner - Aqueous, SPMC 148
      (2) Cloth - Cotton, (Lint-Free)
   B. Procedure

      S 112-002-N00

      (1) Degrease Parts by Aqueous Cleaner (Aqueous spray or wipe without rinse)

      S 162-004-N00

      WARNING: REFER TO THE MANUFACTURER'S MATERIAL SAFETY DATA SHEETS FOR CONSUMABLE MATERIAL'S INFORMATION SUCH AS: HAZARDOUS INGREDIENTS, PHYSICAL/CHEMICAL CHARACTERISTICS, FIRE, EXPLOSION, REACTIVITY, HEALTH HAZARD DATA, PRECAUTIONS FOR SAFE HANDLING, USE AND CONTROL MEASURES.

      CAUTION: PARTS COATED WITH PWA 77 DIFFUSED ALUMINIDE CAN BE CLEANED ONLY WITH SPOP 209 AQUEOUS DEGREASING. THE USE OF OTHER ALKALINE CLEANERS WILL CAUSE DETERIORATION OR REMOVAL OF THIS COATING.

      CAUTION: PARTS COATED WITH PWA 110 (PWA 595) ALUMINUM COATING CAN BE CLEANED ONLY WITH SPOP 209. THE USE OF OTHER ALKALINE CLEANERS WILL CAUSE DETERIORATION OR REMOVAL OF THIS COATING.

      (2) Obey this WARNING and these CAUTIONs during all of this task.

S 162-007-N00

(3) Remove contaminaton from engine parts by one of the subsequent steps.

(a) Clean the part with a wet, clean, lint free cloth with the aqueous cleaner (SPMC 148).

1) Use the aqueous cleaner as received.
2) Do not mix the aqueous cleaner or make a solution.
3) Put the solvent on the cloth to keep unwanted material from the solvent that is used to clean.
4) Use a spray applicator to apply the aqueous cleaner on the part.

S 162-009-N00

(4) If necessary, clean the part with a soft non-metal brush or pad.

S 162-008-N00

(5) Wipe the part dry with a clean cotton cloth (lint-free).

INSTALLATION OF ENGINE TUBES (SPOP 426) - MAINTENANCE PRACTICES

1. General
   A. This procedure gives the instructions for the different type of tubes installation.
   B. There are five different methods of tubes installation in this procedure:
      (1) Installation of tubes with fixed (brazed) conical seat ferrules (37 degree) (Method A).
      (2) Installation of hose and/or tube assemblies with fixed or loose flanges ends (used with packings or seal plates) (Method B).
      (3) Installation of tubes with bolted flanges (used with crush-type gaskets) (Method C).
      (4) Installation of tubes with flexible-type fittings (used with packings and retainers) (Method D).
      (5) Installation of tubes with concentric-type fittings (double wall tubes) (Method E).

TASK 70-24-03-402-008-N00

2. Installation Of Tubes With Fixed (Brazed) Conical Seat Ferrules (37 Degree)
   A. General
      (1) This task (Method A) gives the general instructions for the correct installation of tubes with fixed (brazed) conical seat ferrules (37 degree) (Figure 201).
   B. Reference
      (1) AMM 70-50-00/201, Standard Torque Value
   C. Equipment
      (1) Torque Wrench
   D. Consumable Material
      (1) Oil or Lubricant
   E. Procedure

      S 012-009-N00
      (1) Remove all the protective covers from the tubes and mating adapters.

      S 102-077-N00
      (2) Wipe and clean the conical seats of the tube and mating adapters.

      S 202-011-N00
      (3) Examine the conical seats of the tube and the mating adapters for damage (such as nicks, burrs, or wear).
         (a) Replace the conical seats and mating adapters as necessary.

      S 642-012-N00
      (4) Apply the necessary lubricant to the tube nut threads and to the rear of the tube ferrules (nut loading surface).

S 102-013-N00
(5) Remove any excess lubricant from the tube threads and the conical seat areas.

S 402-014-N00
(6) Install the tube to the mating adapters and tighten the tube nuts hand tight only.

NOTE: Make sure that the tube nuts are handtight and that the tube conical seat is fully against the adapter conical seat. To make sure, you can tighten the nut with a wrench until you feel the seats contact and then loosen the nut 1/4 turn.

S 802-015-N00
(7) Make sure the tube is not bent and that the tube ends align with the mating adapters.

S 642-016-N00
(8) Apply the necessary lubricant to the bolt threads which attach the tube clamps.

S 822-017-N00
(9) Attach all the clamps and clamp bolts with handtight only.

S 402-018-N00
(10) Make sure the installation of the clamps and clamp bolts does not stress or load the tube.

NOTE: When you install and tighten the bolts before the tube nuts, the tube can turn on the conical seats to better align itself. This will put the tube in the final position before you can tighten the nuts and will decrease any stress on the tube adjacent to the ferrules.

S 422-019-N00
(11) Tighten the clamp bolts to the correct torque values while you make sure the clamps do not turn, twist, or bend.

S 422-020-N00
(12) While you hold the mating adapter with a wrench, tighten the tube nut at each end to the necessary torque value (AMM 70-50-00/201).

S 202-021-N00

(13) Examine the tube ends for any evidence of the tube twist or damage adjacent to the brazed ferrules.
(a) Replace the tube as necessary.

TASK 70-24-03-402-022-N00

3. Installation Of Hose and/or Tube Assemblies With Fixed or Loose Flange Ends (Used With Packings or Seal Plates)

A. General
(1) This task (Method B) gives the general instructions for the correct installation of hose and/or tube assemblies with fixed or loose flange ends (used with packings or seal plates) (Figure 202).

B. Reference
(1) AMM 70-50-00/201, Standard Torque Value

C. Equipment
(1) Torque Wrench

D. Consumable Material
(1) Oil or Lubricant

E. Procedure

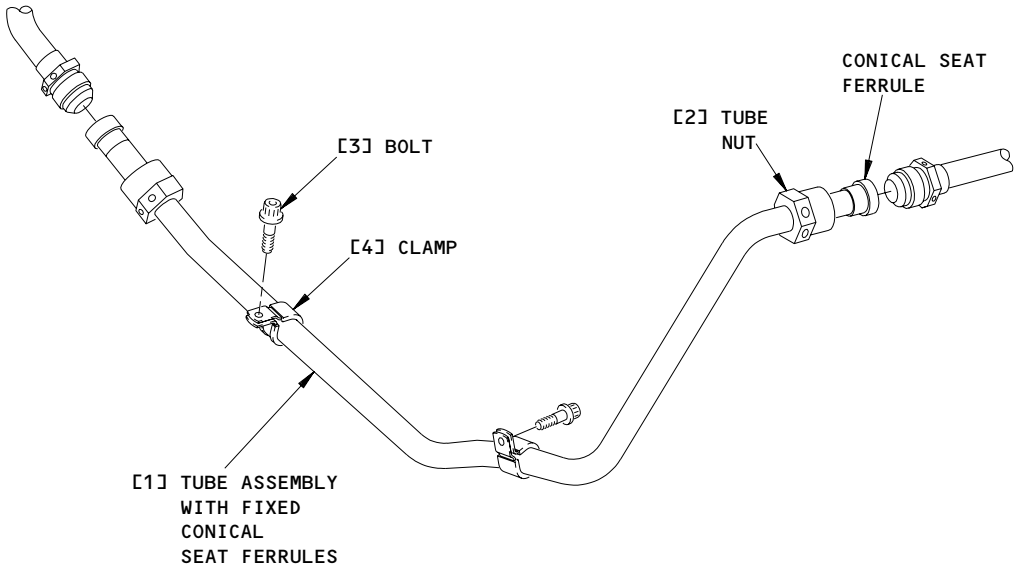
S 012-104-N00

CAUTION: MAKE SURE THAT YOU REMOVE ANY PROTECTIVE COVERS FROM INSIDE THE TUBE OPENINGS. THESE TYPES OF COVERS HAVE CAUSED IN-FLIGHT SHUTDOWN WHEN ACCIDENTALLY LEFT INSTALLED.

CAUTION: BE CAREFUL WITH ALL TUBES THAT CONTAIN A FLEX DESIGN SEGMENT. BE SURE TO REMOVE AND INSTALL A TUBE WITH A FLEX SEGMENT WITH THE SAME PRECAUTIONS USED FOR A TUBE WITHOUT A FLEX SEGMENT. DO NOT BEND THE FLEXHOSE OF A TUBE TO HELP WITH THE REMOVAL OR INSTALLATION OF AN ATTACHED COMPONENT. IF YOU BEND A FLEX SEGMENT TOO MUCH, YOU CAN CAUSE A KINK IN THE EXTERNAL WIREBRAID AND IN THE INNER POLYTETRAFLUOROETHYLENE (PTFE) TUBE AND THE TUBE COULD BREAK OR HAVE LEAKS. A FLEXHOSE KINK CAN CAUSE A LARGE DECREASE IN FATIGUE STRENGTH. LOW FATIGUE STRENGTH CAN CAUSE THE WIRES IN THE WIREBRAID TO BREAK DURING SUBSEQUENT ENGINE OPERATION.

NOTE: A flexhose kink is the result of movement of the flexhose to the point where the shape of the stainless steel wirebraid and the inner PTFE tube changes permanently from cylindrical to oval in one or more locations.

(1) Remove all the protective covers from the hose or tube and the mating adapters.



(EXAMPLE)

G-11793

Tubes Installation with Fixed (Brazed) Conical Seat Ferrules (37 Degree)
Figure 201

S 102-078-N00
(2) Wipe and clean the flange seats of the tube and the mating adapters.

S 202-025-N00
(3) Examine the flange seats of the tube and the mating adapters for damage (such as nicks, burrs, and wear).
(a) Replace the flange seats and mating adapaters as necessary.

S 642-027-N00
(4) Apply the necessary lubricant to the bolt threads which attach the tube flanges.

S 402-028-N00
(5) Install packings lubricated with the applicable lubricant.

S 402-029-N00
(6) Be careful when you install the tube and seal plates to the mating adapters with the bolts and nuts with handtight only.

S 422-030-N00
(7) If applicable, make sure that the packing engaged the mating adapters fully without damage.

S 422-031-N00
(8) Tighten the bolts and nuts at each end and loosen two turns.

S 642-032-N00
(9) Apply the lubricant to the bolt threads which attach the tube clamps.

S 422-033-N00
(10) Attach all the clamps and clamp bolts, and tighten the clamp bolts with handtight only.

S 402-034-N00
(11) Make sure the installation of the clamps and clamp bolts does not stress or load the tube.

NOTE: When you install and tighten clamp bolts before the tube end bolts, the tube can turn on the seats to better align itself. This will put the tubes in final position before you tighten the tube bolts, and will decrease any stress on the tube adjacent to the ferrules.

S 422-035-N00
(12) Tighten the clamp bolts to the correct torque value while you make sure the clamps do not turn, twist, or bend.

S 422-036-N00
(13) Tighten the bolts, and nuts at each end to the correct torque value (AMM 70-50-00/201).

S 202-038-N00
(14) Examine the tube for the damage or incorrect installation.

TASK 70-24-03-402-039-N00

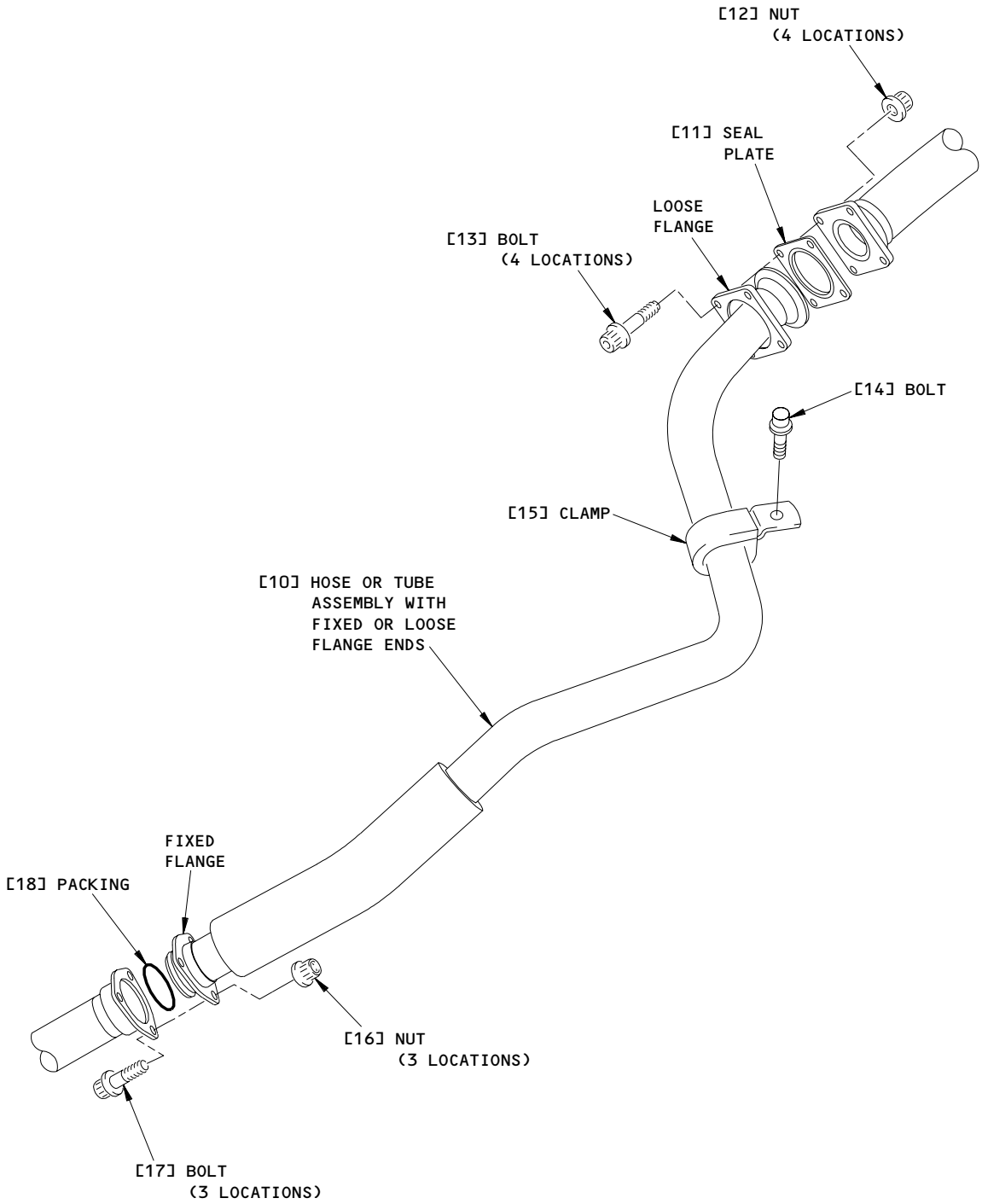
4. Installation Of Tubes With Bolted Flanges (Used With Crush-Type Gaskets)
   A. General
      (1) This task (Method C) gives the general instructions for the correct installation of the tubes with bolted flanges (used with crush-type gaskets) (Figure 203).
   B. Reference
      (1) AMM 70-50-00/201, Standard Torque Value
   C. Equipment
      (1) Torque Wrench
   D. Consumable Material
      (1) Oil or Lubricant
      (2) Blend - Paraffin Wax (PMC 9462) (P05-396)
   E. Procedure

S 012-040-N00
(1) Remove all the protective covers from the tube and mating bosses.

S 102-041-N00
(2) Wipe and clean the flange seats of the tube and mating bosses.

S 202-042-N00
(3) Examine the flange seats of the tube and the mating bosses for any burrs or damage.
(a) Replace the flange seat or mating boss as necessary.

S 642-043-N00
(4) Apply the necessary lubricant to the bolt threads which attach the tube flanges.



(EXAMPLE)

G-11794

Hose or Tube Assemblies with Fixed or Loose Flange Ends
(Used with Packings or Seal Plates)
Figure 202

S 412-044-N00
(5) Install the new gaskets to the gasket groove in the tube or mating boss flange.
(a) Use a small amount of Paraffin Wax Blend to hold the gasket in position.

S 412-045-N00
(6) Be careful when you install the tube to the mating bosses with the bolts.
(a) Tight the clamp with handtight only.

S 642-046-N00
(7) Apply the necessary lubricant to the bolt threads which attach the tube clamps.

S 422-047-N00
(8) Attach all the clamps and clamp bolts, and tighten the clamp bolts with handtight only.

S 422-048-N00
(9) Make sure the installation of the clamps and clamp bolts does not stress or load the tube.

S 422-049-N00
(10) Tighten the bolts at each end in a small increments to the necessary torque value.

S 422-050-N00
(11) Tighten all the bolts again until the same torque indication holds (AMM 70-50-00/201).

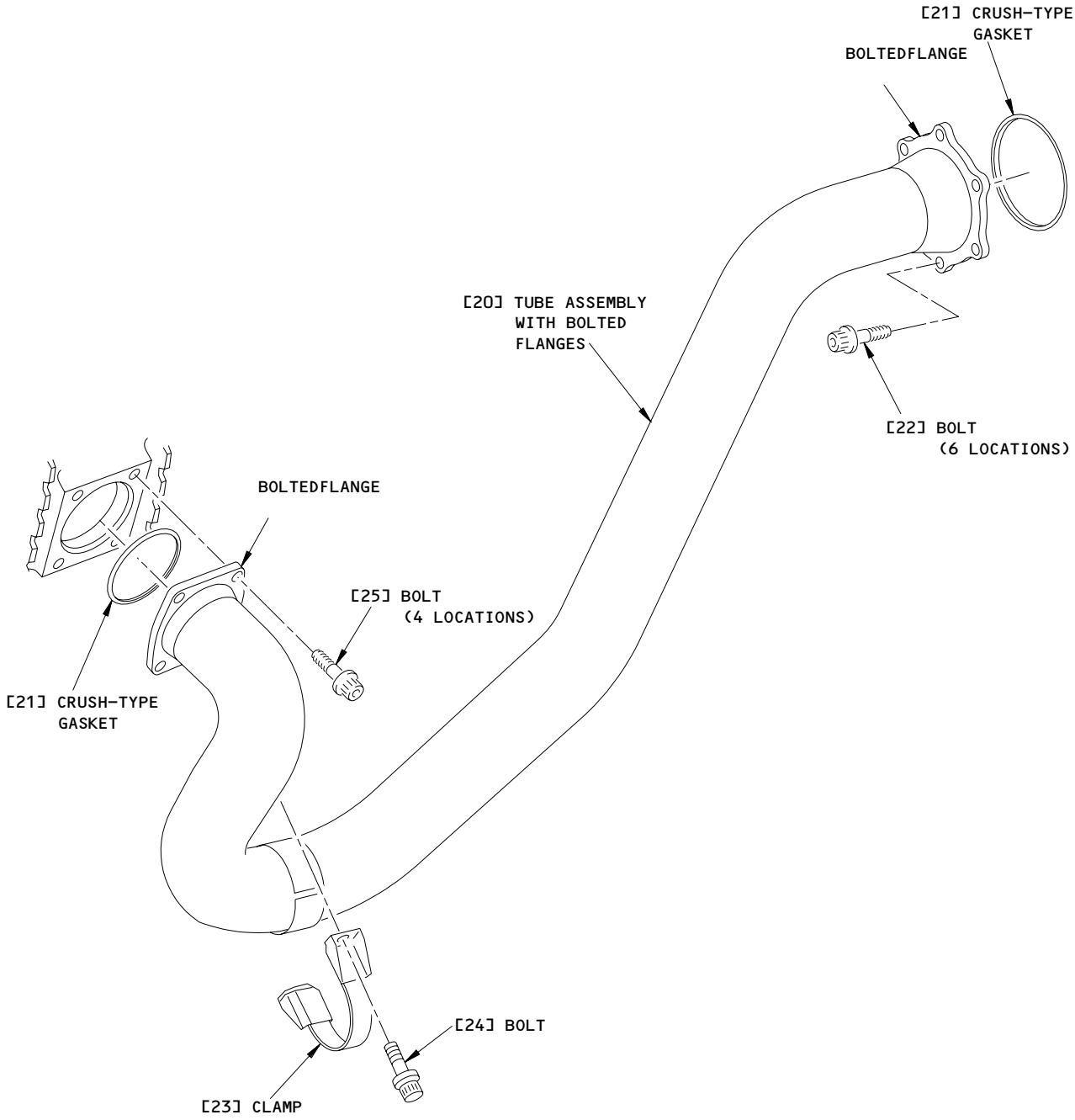
S 422-051-N00
(12) Tighten the clamp bolts to the correct torque value while you make sure the clamps does not turn, twist, or bend.

S 202-052-N00
(13) Examine the tube for damage or incorrect installation.

TASK 70-24-03-402-053-N00

5. Installation Of Tubes With Flexible-Type Fittings (Used With Packings and Retainers)

A. General
(1) This task (Method D) gives the general instructions for the correct installation of tubes with flexible-type fittings (used with packings and retainers) (Figure 204).



(EXAMPLE)

G-11795

Tubes Installation with Bolted Flanges
(Used with Crush-Type Gaskets)
Figure 203

B. Reference
   (1) AMM 70-50-00/201, Standard Torque Value
C. Equipment
   (1) Torque Wrench
D. Consumable Material
   (1) Oil or Lubricant
E. Procedure

S 012-054-N00

CAUTION: MAKE SURE THAT YOU REMOVE PROTECTIVE COVERS FROM INSIDE OF THE OF THE TUBE OPENING. THESE TYPES OF COVERS HAVE CAUSED IN-FLIGHT SHUTDOWNS IF YOU DO NOT REMOVE FROM THE ENGINE.

(1) Remove all the protective covers from the tube and mating adapters.

S 102-079-N00

(2) Wipe and clean the tube ends and mating adapters.

S 202-055-N00

(3) Examine the tube ferrules, tube ends, and mating adapters for burrs or damage.
   (a) Replace the tube and mating adapters as necessary.

S 642-059-N00

(4) Apply the lubricant to the tube nut threads.

S 012-060-N00

(5) Remove any excess lubricant from the seal areas.

S 642-058-N00

(6) Apply the necessary lubricant to the packings and retainers.

NOTE: Some of these type of tubes have loose (floating) ferrules. Make sure the ferrules are installed before you install the packings.

S 412-061-N00

CAUTION: MAKE SURE THAT YOU INSTALL A RETAINER WITH THE PACKING. IF THE RETAINER IS NOT INSTALLED, THE PACKING CAN PUSH OUT BETWEEN THE TUBE AND THE MATING ADAPTER. THIS CAN CAUSE PIECES OF PACKING MATERIAL TO GET INTO THE OIL OR FUEL SYSTEMS AND CAUSE ENGINE DAMAGE.

(7) Install the packing and retainer to each end of the tube against the ferrules.

S 422-062-N00
(8) Install the tube to the mating adapters and tighten the tube nuts with handtight only.

S 202-063-N00
(9) Make sure the tube is not bent and that the tube ends align with the adapters.

S 642-064-N00
(10) Apply the lubricant to the bolt threads which attach the tube clamps.

S 422-065-N00
(11) Attach all the clamps and clamp bolts, and tighten the clamp bolts with handtight only.

S 422-066-N00
(12) Make sure the installation of the clamps and clamp bolts does not stress or load the tube.

S 422-067-N00

CAUTION: MAKE SURE YOU PUT THE PACKING AGAINST THE FERRULE AND ALIGN THE TUBE BEFORE YOU TIGHTEN THE TUBE NUTS. THIS PROCEDURE WILL PREVENT DAMAGE TO THE TUBE AND/OR PACKING.

CAUTION: BE CAREFUL WHEN YOU TIGHTEN THE TUBE NUTS. USE THE APPLICABLE TORQUE TABLE VALUE FOR THE CORRECT LIMITS. IF YOU APPLY TOO MUCH TORQUE, IT CAN CAUSE DAMAGE TO THE TUBE AND/OR PACKING.

(13) Tighten the tube nuts to the necessary torque limit value (AMM 70-50-00/201).

NOTE: If the tube has a loose (floating) ferrule, tighten the end with the loose ferrule after you tighten the end with the brazed ferrule.

S 422-069-N00
(14) Loosen the tube nuts one turn.

S 422-070-N00
(15) Tighten the tube nuts again to the necessary torque limit value (AMM 70-50-00/201).

S 422-071-N00

(16) Tighten the clamp bolts to the correct torque value while you make sure the clamps does not turn, twist, or bend.

S 202-072-N00

(17) Examine the tube ends for any evidence of the tube twist or damage adjacent to the tube nuts.
(a) Replace the tube as necessary.

S 422-073-N00

(18) Safety the tube nuts.

TASK 70-24-03-402-074-N00

6. Installation Of Tubes With Concentric-Type Fittings (Double Wall Tubes)

A. General
(1) This task (Method E) gives the general instructions for the correct installation of the tubes with concentric-type fittings (double wall tubes) (Figure 205).

B. Reference
(1) AMM 70-50-00/201, Standard Torque Value
(2) AMM 71-00-00/501, Power Plant Adjustment/Test

C. Equipment
(1) Torque Wrench

D. Consumable Material
(1) Oil or Lubricant
(2) Blend - Paraffin Wax (PMC 9462) (P05-396)

E. Procedure

S 012-075-N00

CAUTION: MAKE SURE THAT YOU REMOVE PROTECTIVE COVERS FROM INSIDE OF THE OF THE TUBE OPENING. THESE TYPES OF COVERS HAVE CAUSED IN-FLIGHT SHUTDOWNS IF YOU DO NOT REMOVE FROM THE ENGINE.

(1) Remove all the protective covers from the tube and mating adapters.

S 102-080-N00

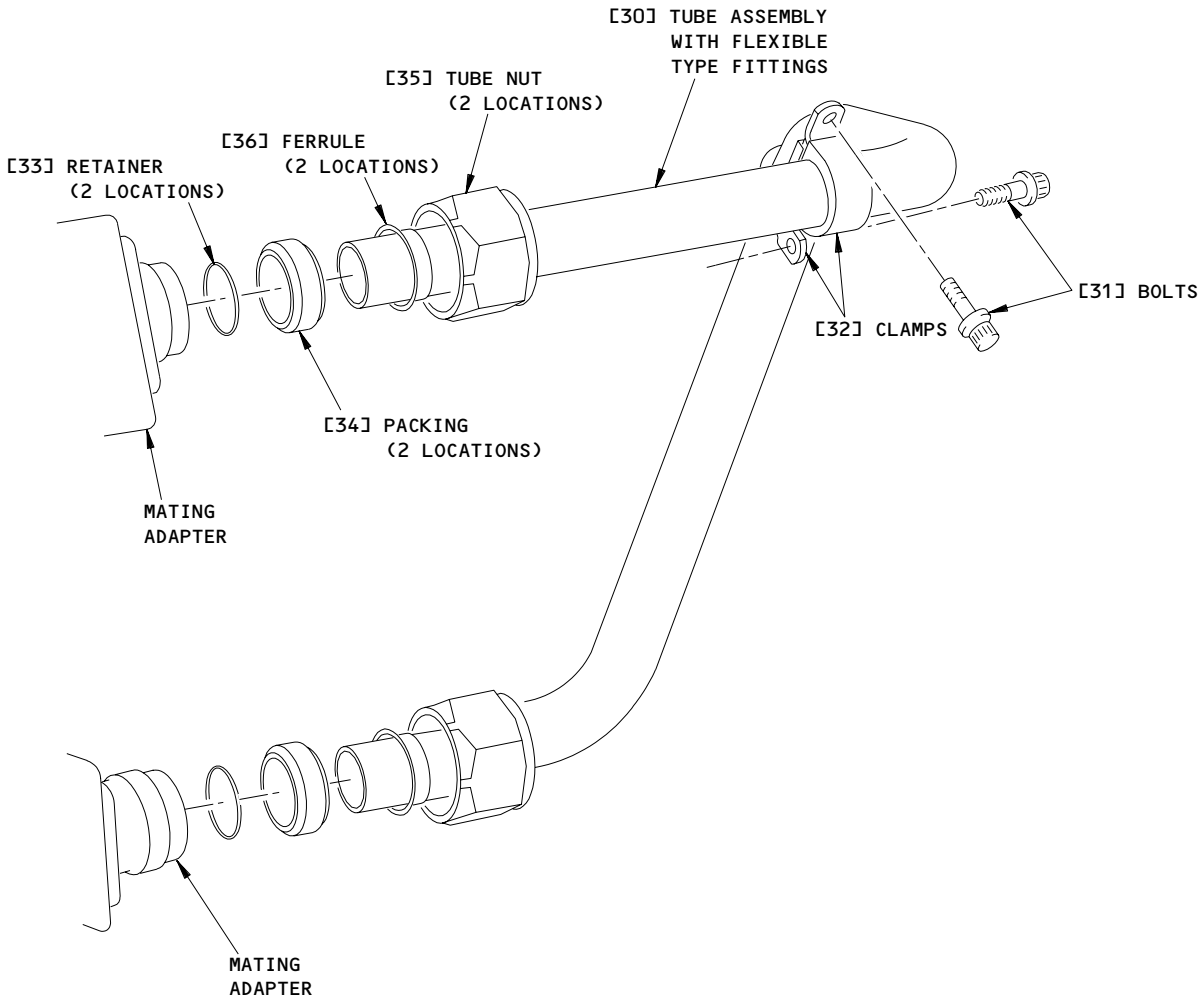
(2) Wipe and clean the tube ends and mating adapters.

S 202-081-N00

(3) Examine the tube ferrules, tube ends, and mating adapters for any burrs or damage.
(a) Replace the tube as necessary.

S 642-082-N00

(4) Apply the lubricant to the outer tube nut threads.



(EXAMPLE)

G-11796

Tubes Installation with Flexible-Type Fittings
(Used with Packings and Retainers)
Figure 204

S 642-083-N00
(5) Apply the lubricant to the inner tube nut threads.

S 012-084-N00
(6) Remove any excess lubricant from the seal areas.

S 642-085-N00
(7) Apply the lubricant to the packings.

S 412-086-N00
(8) Install the new packing into the packing groove of the inner fitting at each end of the tube.

S 422-087-N00
(9) Install the new gaskets into the groove of the outer nut at each end of the tube.
(a) Use a small amount of Paraffin Wax Blend to hold in position.

S 422-088-N00
(10) Install the tube to the mating adapters and tighten the inner tube nuts with handtight only.

NOTE: Make sure that the tube nuts are handtight and that the tube conical seat is fully against the adapter conical seat. To make sure, you can tighten the nut with a wrench until you feel the seats contact and then loosen the nut 1/4 turn.

S 202-089-N00
(11) Make sure the tube is not bent and that the tube ends align with the adapters.

S 642-090-N00
(12) Apply the lubricant to the bolt threads which attach the tube clamps.

S 422-091-N00
(13) Attach all the clamps and clamp bolts, and tighten the clamp bolts with handtight only.

S 422-092-N00
(14) Make sure the installation of the clamps and clamp bolts does not stress or load the tube.

S 422-093-N00
(15) Tighten the clamp bolts to the correct torque value while you make sure the clamp does not turn, twist, or bend.

S 422-094-N00

CAUTION: BE CAREFUL WHEN YOU TIGHTEN THE INNER TUBE NUTS. USE THE APPLICABLE TORQUE TABLE VALUE FOR THE CORRECT LIMITS. IF YOU APPLY TOO MUCH TORQUE, IT CAN CAUSE DAMAGE TO THE TUBE.

(16) Tighten the tube inner nuts to the necessary torque limits as follows (AMM 70-50-00/201):
(a) Tighten the inner nuts at each end of the tube to the specified torque while you hold the inner nut at the opposite end of the tube with the wrench.
(b) If the inner nut at both end of the tube does not maintain torque value after four times, replace the tube assembly.

S 202-096-N00
(17) Examine the inner tube ends for any evidence of the tube twist or damage adjacent to the inner tube nuts.
(a) Replace the tube nut as necessary.

S 792-097-N00
(18) Do the leak test of the inner tube connections (AMM 71-00-00/501).

S 422-098-N00
(19) Safety the inner tube nuts to the inner ferrules.

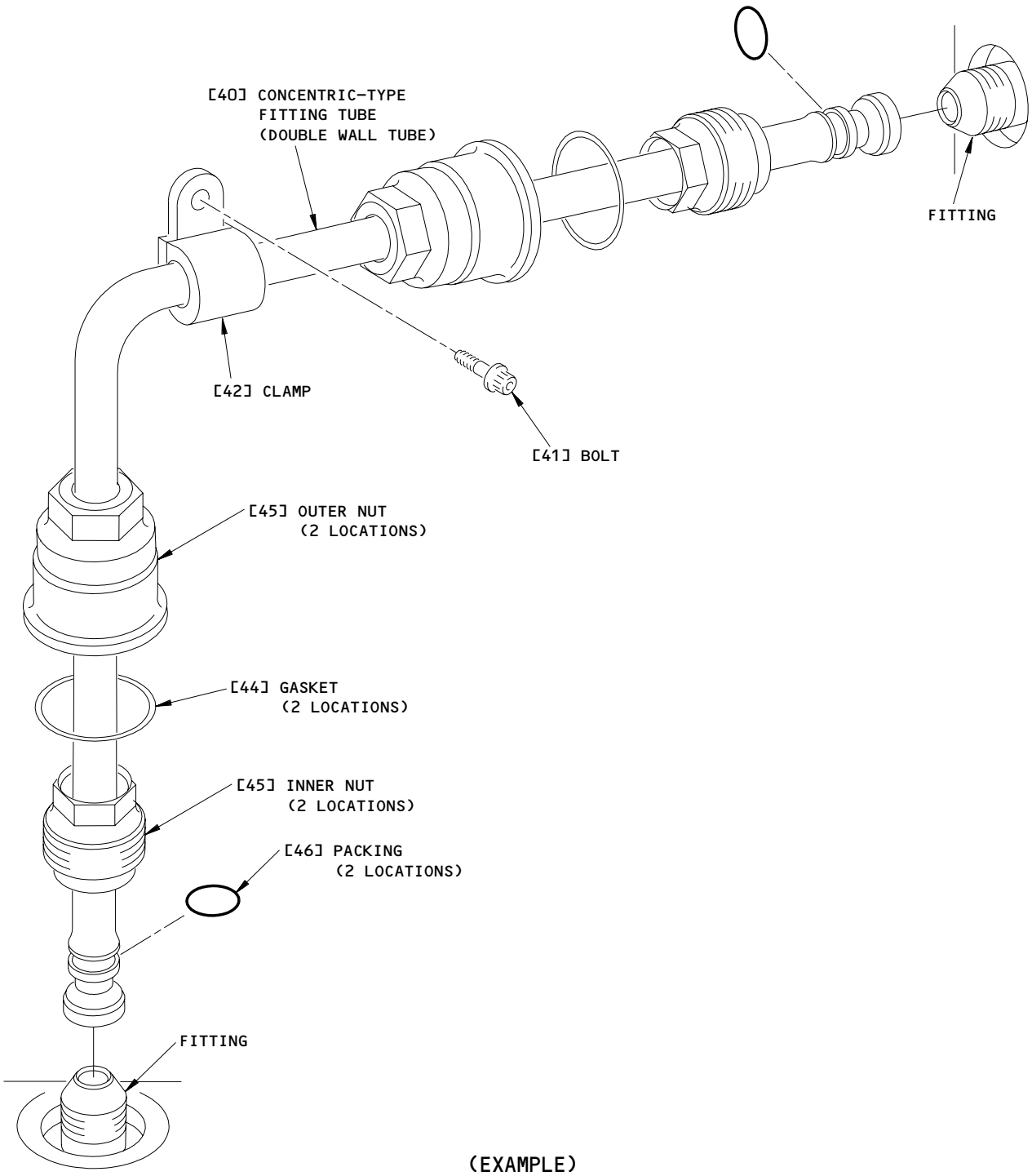
S 422-099-N00
(20) Make sure that the gaskets are installed on the outer tube nuts.

S 422-100-N00
(21) Tighten the outer tube nuts with handtight only.

S 422-101-N00
(22) Tighten the outer tube nuts to the necessary torque value limits (AMM 70-50-00/201).

S 202-102-N00
(23) Examine the outer tube ends for any evidence of the tube twist or damage adjacent to the outer tube nuts.
(a) Replace the tube nut as necessary.

S 422-103-N00
(24) Safety the tube nuts.



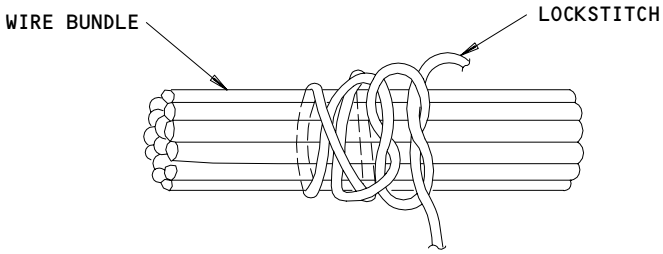
Tubes Installation with Concentric-Type Fittings
(Double Wall Tubes)
Figure 205

ELECTRICAL HARNESSES - MAINTENANCE PRACTICES

1. General
   A. This task gives three procedures: to install some lockstitch on the electrical harnesses, to tighten the electrical connectors and to clean the electrical connectors. .

   TASK 70-24-05-402-019-N00

2. Lockstitch Installation (Fig. 201)
   A. Consumable Materials
      (1) G02300 Tape, Lacing - BMS 13-54 Grade D, Type 3, or Gudebrod 718Z
   B. Access
      (1) Location Zones
          411 Left Engine
          421 Right Engine



Lockstitch Installation
Figure 201

C. Procedure

S 422-020-N00

(1) Install the lockstitch on the wire bundle.
   (a) Attach the lacing tape on the wire bundle at distances not more than 2.0 inches (50.8 mm) apart.
   (b) Use a clove hitch with an added loop followed by a square knot to make the lockstitch knot.

NOTE: The knots must be tight to the wire bundle. The knots must not cause unusual stress or damage.

   (c) If the wire bundle diameter is more than 1.5 inches (38.1 mm), attach the lacing tape two times at each location.
   (d) Cut the ends of the lacing tape to a length of 0.25-0.50 inches (6.35-12.7 mm).

TASK 70-24-05-402-023-N00

3. Tighten the Electrical Connectors

A. Equipment
   (1) Wrench, Strap - Glenair TG-70 or equivalent (commercially available)
   (2) Pliers, Soft Jawed - Glenair TG-69 or equivalent (commercially available)

B. Access
   (1) Location Zones
      410 Left Engine
      420 Right Engine

C. Procedure

S 422-030-N00

(1) For the harness connectors of the MIL-C-26500 or MIL-C-38999 series, connect the harness connectors to the receptacles as follows:
   (a) Remove the protection covers.
   (b) Examine the harness connector and the mating receptacle for bent pins and contamination.
      1) Carefully make the bent pins straight.
      2) Clean the connector, contacts and receptacle per task below:

(c) Align the connector keyways to the mating receptacle.
(d) Tighten the connector coupling nut with your hand until it is tight and you cannot see the witness (color) band.

NOTE: The witness (color) band is the first band on the receptacle. It will go out of view when you tighten the connector coupling nut.

CAUTION: USE THE CORRECT ASSEMBLY PROCEDURE AND TOOLS FOR THE HARNESS CONNECTOR INSTALLATION (AMM 70-24-05/201). IF YOU USE THE INCORRECT ASSEMBLY PROCEDURE, OR TOOLS, A DAMAGED OR LOOSE CONNECTOR CAN OCCUR. A LOOSE CONNECTOR PERMITS VIBRATION, WHICH CAUSES THE CONTACTS TO WEAR AND DECREASES THE LIGHTNING PROTECTION.

(e) Use the (Glenair TG-70) strap wrench or the (Glenair TG-69) pliers with soft jaws to tighten the connector coupling nut.
(f) Make sure the connector coupling nut is fully tight against the receptacle (metal to metal).

NOTE: The contacts are sufficiently engaged and the connector is tight when you use the tool correctly. The tool will turn on the connector coupling nut if you use too much force. This will prevent too much torque.

TASK 70-24-05-102-032-N00

4. Cleaning of the Contact Points and Wire Harness (SPOP 6)

A. Consumable Materials
(1) Alcohol, Isopropyl (PMC 9016) (P11-014A)
(2) Solvent, Cleaner (PMC 8914) (P11-055)
(3) Solvent, Cleaner (SPMC 156) (P11-056)
(4) Solvent, Cleaner (SPMC 168) (P11-057)
(5) Solvent, Cleaner (SPMC 175) (P11-058)
(6) Solvent, Cleaner (SPMC 176) (P11-059)
(7) Solvent, Cleaner (SPMC 179) (P11-060)

(8) Solvent, Dielectric (PMC 8920) (P11-053)
(9) Solvent, Cleaner (SPMC 185) (P11-064)

B. Procedure

S 102-033-N00
(1) Spray ultra-high purity Dielectric Solvent (P11-062) or Cleaner Solvent (P11-55, P11-56, P11-57, P11-58, P11-59, P11-60 or P11-064) or Isopropyl Alcohol (P11-014A) on contact points and wiring harness.

S 102-034-N00
(2) Wipe off the areas with a clean cloth.

S 102-035-N00
(3) Let the surfaces dry.
(a) If necessary, blow dry with clean air at 30 psi pressure.

TASK 70-24-05-802-036-N00

5. Application of Electical Contact Enhancer for Wiring Harnesses (SPOP 430)

A. General
(1) Electrical contact enhancer, when applied to connector contacts in connector interfaces, reduce intermittent signals that appear not correct, and/or nuisance messages.
(2) The application of contact enhancer is not an alternate to contact replacement. It is necessary to replace worn contacts as soon as the harness is at a location that will permit the replacement of worn or damaged contacts.

B. Consumable Materials
(1) Enhancer, Electrical Contact (P11-068) (SPOP 205)

C. Procedure

S 022-040-N00
(1) Disconnect the connector.

S 112-037-N00
(2) Clean and dry the connectors by SPOP 6.

S 112-038-N00
(3) Apply one small drop of SPMC 205 electrical contact enhancer to each electrical contact (pin or socket) in one of the mating pair of electrical connectors.

NOTE: It is permitted, but not necessary, to apply SPMC 205 contact enhancer to both pins and sockets of the mating connectors.

(a) Allow the liquid to flow downward on each contact to get a thin film on the contact.

(b) Do not apply SPMC 205 to the igniter high tension lead contacts or the EGT harness or EGT junction box connections.

NOTE: These connections could exceed the 425° F (218° C) decomposition temerature of the SPMC 205.

(c) If the ambient temperature is to cold for the contact enhancer solution to flow, dilute the enhancer solution with PMC 9016 isopropyl alcohol in the proportion up to 4:1 (that's four parts of alcohol to one part of contact enhancer).

(d) If the contact enhancer is diluted, permit the part to dry for one hour minimum before you make the connection.

S 422-039-N00

(4) Attach the mating connectors.

CONSUMABLE MATERIALS - MAINTENANCE PRACTICES

TASK 70-30-00-912-001-N00

1. Consumable Materials

A. General

(1) Make sure you know the precautions before you use the materials in the table that follows.

(2) These precautions tell you how to:

- BE CAREFUL WHEN YOU TOUCH THE MATERIAL
- KEEP THE MATERIAL SAFELY
- DISCARD THE MATERIAL SAFELY

If you do not obey the precautions, you can cause an injury to you or you may become sick.

(3) The table that follows shows the consumable materials used on the engine. If more data is necessary for a consumable material, refer to 20-30-00. Also, for an equivalent or alternative material, refer to 20-30-00.

CONSUMABLE MATERIALS

TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Abrasive	Paper, Silicon Carbide Waterproof, P-P-101 (PW Ref P05-076)	400 Grit	Local Purchase
Abrasive	Paper, Silicon Carbide (PW Ref P05-146)	120 Grit	McMaster-Carr Supply Co. 600 County Line Rd. Elmhurst, IL 60126 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Abrasive	Paper, Silicon Carbide (PW Ref P05-153)	240 Grit	Local Purchase
			McMaster-Carr Supply Co. 600 County Line Rd. Elmhurst, IL 60126 USA
			Macalaster Bicknell Co. of Conn. Inc. 181 Henry St. New Haven, CT 06510 USA
Acetone	Phenol-free PMC 9008-1,-2,-5, -6,-7 (PW Ref P11-032)	*[5]	Local Purchase
	PMC 9008-3,-4	R-504 (Aerosol) *[5]	Met-L-Chek Co. 1639 Euclid Street Santa Monica, CA 90404
Acetone	Phenol-free PMC 9008-8	SW420053 *[5]	Contec Inc 525 Locust Grv Spartanburg, SC 29303 - 3483
		#1003-0911 (Presaturated Wipers)	Telesto Industrie, LLC 3718 Highway 90 Liberty, TX 77575
Acetone	PMC 1914 (PW Ref P11-065)	(Reagent Grade, A.C.S.) *[8]	LOCAL EMD Chemicals, Inc. 480 Democrat Road Gibbstown, NJ 08027 USA
		JT Baker 9006-05 (Liquid)	Mallinckrodt Baker Inc 222 Red School LN Phillipsburg, NJ 08865 - 2219

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
		PC0048A-3	Brand-Nu Lab. Inc. 377 Research Parkway Meriden, CT 06450-7155
		SW420030	Contec Inc 525 Locust Grv Spartanburg, SC 29303 - 3483
		#1004-0911 (Prestaturated Wipers) TX8346	Telesto Industrie, LLC 3718 Highway 90 Liberty, TX 77575 ITW Texwipe 300 B Route 17 South Mahwah, NJ07430 USA
		AX0116	EMD Chemicals, Inc. 480 Democrat Road Gibbstown, NJ 08027 USA
Adhesive	Neoprene PWA 36027 (PW Ref P08-005)	Scotch Grip Rubber Adhesive No. 1300	3M, ITSD Aerospace 3211 E Chestnut Expressway P.O. Box 300 M 3M Center Springfield, MO 65802
Adhesive	Paste, Epoxy, Non-Thixotropic, Aluminum-filled PWA 457-1 (PW Ref P08-016)	EA 934 NA	Henkel Loctite Corp. P.O. Box 312 2850 Willow Pass Rd. Bay Point, CA 94565 USA
Adhesive	Paste, Epoxy, Thixotropic, Aluminum-filled PWA 457-5 (PW Ref P08-044)	EA 9392	Henkel Loctite Corp. P.O. Box 312 2850 Willow Pass Rd. Bay Point, CA 94565 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Adhesive	Film, Epoxy Scrim Supported Aluminum-filled PWA 477 (PW Ref P08-049)	Hysol EA9628 Supported	Henkel Loctite Corp. P.O. Box 312 2850 Willow Pass Rd. Bay Point, CA 94565 USA
Adhesive	Epoxy Paste (PW Ref: P08-053)	Hysol EA 956	Henkel Loctite Corp. (Was: Dexter Corp. Dexter Adhesive & Coating Systems) P. O. Box 312 2850 Willow Pass Road Bay Point, CA 94565-0031 USA
Adhesive	Epoxy Paste (PW Ref: P08-054)	Hysol EA 9390	Henkel Loctite Corp. (Was: Dexter Corp. Dexter Adhesive & Coating Systems) P. O. Box 312 2850 Willow Pass Road Bay Point, CA 94565-0031 USA
Adhesive	Promoter - Air Drying, Water based (Used with P08-046 for bonding to metal surfaces) (PW Ref: P08-055)	PR 182 Pink	PRC-DeSoto International, Inc. (Aerospace) 5454 San Fernando Road P.O. Box 1800 Glendale, CA 91209 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Adhesive (PMC 3091)	Precoat for Greaseless Compound	Ad-Lea-Sive, (ADL-3) PW Ref: P05-064	Jacksonlea (A Unit of Jason, Inc.) 1715 E. Conover Boulevard Conover, NC 28613 USA
Adhesive/ Sealant	PWA 36751-1 Liquid Adhesive and curing agent (PW Ref P08-050)	Dapco No. 18-4F *[6]	D. Aircraft Products 1191 N. Hawk Circle Anaheim, CA 92807 USA Adchem, Inc. 369 Progress Drive Suite 101 Manchester, CT 06040 USA FMI Paint & Chemicals 158 Hartford Road Manchester, CT 06040 USA
	PWA 36751-2 Liquid Sealant and curing agent (PW Ref P08-050)	Dapco 2030 *[6]	
Agent	Curing Epoxy Resin (Amine Type) PWA 422-1	Epon Curing Agent "U" or Epicure 328212	Shell Oil Co. P.O. Box 2463 1 Shell Plaza Houston, TX 77001 USA
Agent (PWA 466)	Resin and Curing Agent Liquid Epoxy	Epi-cure 3282 P08-036	FMI Paint & Chemicals (Was: FMI Chemical Corp.) 158 Hartford Road Manchester, CT 06040 USA
			Miller-Stephenson Chemical Co., Inc. 55 Backus Avenue Danbury, CT 06813 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Agent	Liquid Epoxy Resin (Medium Viscosity) PWA 421-2 (PW Ref P08-002)	Epon No. 828	Shell Oil Co. P.O. Box 2463 1 Shell Plaza Houston, TX 77001 USA
			Miller-Stephenson Chemical Co., Inc. 55 Backus Avenue Danbury, CT 06813 USA
			FMI Paint & Chemicals 158 Hartford Road Manchester, CT 06040 USA
Agent	Wetting PWC 1632 (PW Ref P05-030)	ARP No. 2	MacDermid, Inc. 245 Freight Street Waterbury, CT 06702 USA
Agent	Wetting PMC 1610 (PW Ref P05-152)	Alconox	Alconox, Inc. Suite 200 9 E. 40th St. New York, NY 10016 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Alcohol	Denatured Ethanol (PW Ref P11-009) Specific Gravity 60/60F: 0.800-0.820 Flash Point: 30 °F (-1 °C), minimum Boiling Range: Initial Boiling Point: 165 °F (74 °C) minimum 95% Over: 175 °F (79 °C), maximum Water: 5.0%, maximum Vapor Pressure at 68 °F (20 °F): 45 mm Hg maximum *[2]	PMC 9009 -1 Thru -6 (AMS 3002) PMC 9009-7 A405P-4	Local Purchase Fisher Scientific Comp Global Exports 3970 Johns Creek Court, Suite 500 Suwanee, GA 30024-1297 USA
Alcohol	Isopropyl, TT-I-735: PMC 9094 (PW Ref P11-014)	Technical Grade 99% Minimum: (Liquid) #1001-0911 (Saturated Wipers) R-503 (Aerosol)	Local Purchase Telesto Industrie, LLC 3718 Highway 90 Liberty, TX 77575 Met-L-Check Company 1639 Euclid Street Santa Monica, CA 90404 - 3770
Alcohol	Isopropyl, PMC 9094 -9	SW420034 (Presaturated Wipers) *[4]	Contec Inc 525 Locust Grv Spartanburg, SC 29303 - 3483
Alcohol	Isopropyl, PMC 9016, -1 Thru -6, -8	Reagent Grade, or Semi-grade	LOCAL

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Alcohol	Isopropyl, PMC 9016, –7	SW420034	Contec Inc 525 Locust Grv Spartanburg, SC 29303 - 3483
Alcohol	Isopropyl, PMC 9016 (PW Ref P11–014A)	(Deleted, See PW Ref P11–078)	
Alkaline Gel	Carbon, Remover (PW Ref P11–053)	SPMC 136 Turco 5805	Henkel Aerospace Div. of Henkel Technologies, Surface Treatments 32100 Stephenson Highway Madison Heights, MI 48071
		SPMC 137 Cee–Bee Alko	McGean, Cee–Bee Aviation Products 2910 Harvard Avenue Cleveland, OH 44105 USA
Alodine	Brush (PW Ref P05–127)	No. 1200 (Touch–up)	Henkel Surface Tech. 32100 Stephenson Hwy Madison Heights, MI 48071 USA
Alodine	Chromate Conversion Salts, Aluminum PMC 1631 (PW Ref P05–029)	Iridite No. 14–2 Compound	MacDermid, Inc. 245 Freight Street Waterbury, CT 06702 USA
Applicator	Wood, cotton–tip (PW Ref P05–069)	5–5–405	Chesebrough–Pond's, Inc. 33 Benedict Place Greenwich, CT 06830 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Beeswax	PW Ref P06-015	DELETED - Refer to Beeswax (PW Ref P05-395)	
Beeswax	PMC 9463 (PW Ref P05-395) *[9]	White Beeswax S.P. 422	Strahl And Pitsch, Inc. 230 Great E. Neck Road West Babylon, NY 11704
		W-27 Beeswax (Yellow - Natural)	Fisher Scientific Co. 2000 Park Lane Pittsburgh, PA 15275 USA Fisher Scientific Co. Global Exports 3970 Johns Creek Court, Suite 500 Suwanee, GA 30024-1297
		Beeswax (Yellow - Natural)	The Kindt-Collins Co. 12651 Elmwood Avenue Cleveland, OH 44111-5911
		Beeswax S.P. 6 Yellow	Strahl And Pitsch, Inc. 230 Great E. Neck Road West Babylon, NY 11704
Bonding	Preventative, Teflon S PWA 36038 (PW Ref P05-137)	No. 954-101	E.I. duPont de Nemours, Co., Inc. Fabrics & Finishes Dept. 1007 Market St. 308 E. Lancaster Ave. Wilmington, DE 19898 USA
Brush	Short, Bristle Nylon (PW Ref P05-126)		Local Purchase

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Brush	Plater's Tampico GA 55-1 (PW Ref P05-058)	8313	Stanley Home Products, Inc. 116 Pleasant St. East Hampton, MA 01027
		M-904	Solo-Horton Brushes, Inc. 122 Summer Street Torrington, CT 06780 USA
Brush	Soft Bristle, Nonmetallic (PW Ref P05-067)		Local Purchase
Cable	Safety (PW Ref P05-291)	C30B AS3510-0212C AS3510-0218C AS3510-0221C AS3510-0224C 0.032 Inch (0.813 mm) Diameter	Bergen Cable Technologies Inc. 343 Kaplan Drive Fairfield, NJ 07004 USA
Chalk	White PMC 4552 (PW Ref P05-416)	No. 1402 Crayola Anti-Dust	Binney and Smith, Inc. P.O. Box 431 1100 Church Lane Easton, PA 18042 USA
Chamois Skin	(PW Ref P05-070)		Local Purchase

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Cheesecloth	Bleached, New, Woven, Unsized GA 100-2 (PW Ref P05-038)	100% Cotton, 12 X 18 Inches (Minimum) to 20 X 40 Inches (Maximum), 40 X 32 Yarns/Inch	John R. Lyman Co. 60 Depot Street Chicopee, MA 01013 USA
			CCP Industries, Inc. 670 Alpha Drive Highland Heights, OH 44143 USA
Clay	Molding, Gray (PW Ref P05-143)	Crayola, 1 lb. (0.45 kg) Package	Binney and Smith Inc. P.O. Box 431 1100 Church Lane Easton, PA 18042 USA
		700619 Plasteline 1 lb. (0.45 kg) Package	The Craftint Mfg. Co. P.O. Box 1568 Augusta, GA 30903 USA
Cleaner	Alkali (PW Ref P11-041)	SPMC 107 (Deleted) *[15]	
Cleaner	Alkali (General Purpose) SPMC 104 (PW Ref P11-044)	Cee-Bee A-7X7	McGean, Cee-Bee Aviation Products 2910 Harvard Avenue Cleveland, OH 44105 USA
Cleaner	Alkali (General Purpose) SPMC 105 (PW Ref P11-045)	Turco 5948 DPM	Henkel Aerospace Div. of Henkel Technologies, Surface Treatments 32100 Stephenson Highway Madison Heights, MI 48071

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Cleaner	Alkaline Gel SPMC 109 (PW Ref P11-047)	Turco 5948 DPM Thick	Henkel Aerospace Div. of Henkel Technologies, Surface Treatments 32100 Stephenson Highway Madison Heights, MI 48071
Cleaner	Alkaline Gel SPMC 110 (PW Ref P11-048)	Aviawash Green Gel	Chemetall GmbH Trakehner Strasse 3 D-60487 Frankfurt am Main, Germany
			Chemetall Plc 65 Denbigh Road Bletchley Milton Keynes, MK1 1PB United Kingdom
			Chemetall Oakite 50 Valley Road Berkeley Heights, NJ 07922 USA
			Chemetall Oakite 16961 Knott Avenue La Mirada, CA 90638 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Cleaner (SPMC 112)	Alkaline Gel (Ref RW P11-069)	Ardox 1900B	Chemetall Plc 65 Denbigh Road Bletchley Milton Keynes, MK1 1PB United Kingdom
Cleaner (P11-031)	Alkali (General Purpose)	Blue Gold Industrial Cleaner PW Ref PMC 1284	Modern Chemical Inc. P.O. Box 368 7023 Centennial Rd. Jacksonville, AR 72078 USA
Cleaner	Alkali SPMC 106 (PW Ref P11-040)	Blue Gold Spray Washer	Modern Chemical Inc. P.O. Box 368 7023 Centennial Rd. Jacksonville, AR 72078
Cleaner, Gaspath (SPMC 87-1)	Solvent (Deleted. No longer available)	Ardrox 6343 PW Ref P11-021	Chemetall Plc. 65 Denbigh Road Bletchley Milton Keynes, MK1 1PB,UK
Cleaner, Gaspath (SPMC 87-2)	Solvent (Deleted. No longer available)	Ardrox 6345 PW Ref P11-021	Chemetall Plc. 65 Denbigh Road Bletchley Milton Keynes, MK1 1PB,UK

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Cleaner, Gaspath (SPMC 87-3)	Solvent (Deleted. No longer available)	Ardrox 252-L PW Ref P11-021	Chemetall Plc. 65 Denbigh Road Bletchley Milton Keynes, MK1 1PB,UK
		SPMC 87-4 B & B 3100 Solvent type	B & B Tritech, Inc. 875 West 20th Street Hialeah, FL 33010 USA
		SPMC 87-5 B & B TC100 Detergent type	B & B Tritech, Inc. 875 West 20th Street Hialeah, FL 33010 USA
		SPMC 87-6 Cee-Bee R-674 Solvent type	McGean, Cee-Bee Aviation Products 2910 Harvard Avenue Cleveland, OH 44105 USA
		SPMC 87-7 Penair M5704A Solvent type	Penetone Corp., Subsidiary of West Chemical Products, Inc. 74 Hudson Avenue Tenafly, NJ 07670 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
		SPMC 87-9A ECT R-MC (Part No. 4070 Pre-mixed) Detergent Type	ECT, Inc. Bridgeport Business Park 401 East 4th St., Building 20 Bridgeport, PA 19405 USA
		SPMC 87-9B ECT R-MC (Part No. 4072 Concentrate) Detergent Type	ECT, Inc. Bridgeport Business Park 401 East 4th St., Building 20 Bridgeport, PA 19405 USA
		SPMC 87-10A Ardrox 6367 Detergent type	Chemetall (See addresses above in SPMC 87-1) Chemetall Plc 65 Denbigh Road Bletchley Milton Keynes, MK1 1PB United Kingdom
		SPMC 87-10B Ardrox 6368 Detergent type	Chemetall (See addresses above in SPMC 87-1) Chemetall Plc 65 Denbigh Road Bletchley Milton Keynes, MK1 1PB United Kingdom

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
		SPMC 87-11A Turco 6783-3 Detergent type	Henkel Aerospace Div. of Henkel Technologies, Surface Treatments 32100 Stephenson Highway Madison Heights, MI 48071
		SPMC 87-11B Turco 6783-10 Detergent type	Henkel Aerospace Div. of Henkel Technologies, Surface Treatments 32100 Stephenson Highway Madison Heights, MI 48071
		SPMC 87-11C Turco 6783-50 Detergent type	Henkel Aerospace Div. of Henkel Technologies, Surface Treatments 32100 Stephenson Highway Madison Heights, MI 48071
		SPMC 87-12 Turco T-5884 Solvent type	Henkel Aerospace Div. of Henkel Technologies, Surface Treatments 32100 Stephenson Highway Madison Heights, MI 48071

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
		SPMC 87-13 ZOK 27 Detergent type	Zokman Products, Inc. 1220 E. Gump Road Fort Wayne, IN 46845 USA
			Airworthy, Ltd. Elsted Station Elsted, Midhurst West Sussex, GU29 OJT United Kingdom
		SPMC 87-14 Turbo-K Detergent type	Turbo-K, Ltd. 31 Meadow Close London Colney AL2 1RH, England
Cleaner	Aqueous (PW Ref: P11-049)	SPMC 148-1 Turco 6780	Henkel Aerospace Div. of Henkel Technologies, Surface Treatments 32100 Stephenson Highway Madison Heights, MI 48071 USA
		SPMC 148-2 Ardrox 6077 Window Cleaner Plus	Chemetall GmbH Trakehner Strasse 3 D-60487 Frankfurt am Main, Germany
			Chemetall Plc 65 Denbigh Road Bletchley Milton Keynes, MK1 1PB United Kingdom
			Chemetall Oakite 50 Valley Road Berkeley Heights, NJ 07922 USA
			Chemetall Oakite 16961 Knott Avenue La Mirada, CA 90638 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
		SPMC 148-3 MAG-CHEM Evasol	MagChem, Inc. 1271 Ampere Boucherville, Quebec, J4B 5Z5 Canada -OR- Socomor Finishing Tech. Zone Industrielle du Prat R.P. 3707 56037 Vannes, Cedex, France
		SPMC 148-4 MC Spray & Wipe	Modern Chemical Inc. P.O. Box 368 7023 Centennial Rd. Jacksonville, AR 72078 USA
Cleaner	Aqueous SPMC 149 (PW Ref P11-050)	Refer to SPMC 148-2 (PW Ref P11-049)	
Cleaner	Aqueous SPMC 207 (PW Ref P11-081)	Ardrox 6376	Chemetall Gmbh Trakehner Strasse 3 D-60487 Frankfurt am Main, Germany
			Chemetall Plc 65 Denbigh Road Bletchley Milton Keynes, MK1 1PB, United Kingdom

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
			Chemetall Oakite (Was: Oakite Products, Inc.) 50 Valley Road Berkeley Heights, NJ 07922 USA
			Chemetall Oakite 16961 Knott Avenue La Mirada, CA 90638-6015 USA
Cleaner/ Remover	Fluorescent Penetrant PMC 4366 (PW Ref P11-042)	Magnaflux SKC-S	Magnaflux Corp. Division of Illinois Tool Works, Inc. 3624 W. Lake Avenue Glenview, IL 60025 USA
Cloth	Abrasive (PW Ref P05-101)	P-C-451	Local Purchase
Cloth	Aluminum Oxide (PW Ref P05-138)	No. 300 or Finer	Local Purchase

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Cloth	Cotton, Lint-Free (PW Ref P05-005)		Local Purchase
Cloth	Crocus (PW Ref P05-080)	400 Grade	Local Purchase
Cloth	Crocus (PW Ref P05-081)	800 Grade	Local Purchase
Cloth	Crocus (PW Ref P05-061)	P-C-458 1.500 inch (38.100 mm) Width	Local Purchase
Cloth	Emery, (PW Ref P05-104)	240 Grit	Local Purchase
Cloth	Emery (PW Ref P05-062)	No. 400	Local Purchase
Cloth	Emery (PW Ref P05-139)	No. 100 - 200	Local Purchase
Cloth	Glass AMS 3824 (PW Ref P05-150)	Style 108, 120, 7781, Volan Finish	BGF Industries, Inc. P.O. Box 592 401 Amherst Avenue Altavista, VA 24517 USA
		Style 120, F50 Finish	Hexcel Corp. 1913 N. King Street Seguin, TX 78155 USA
		Glass Cloth, Finish for Resin Laminates	Local Purchase

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Cloth	Grit, Non-metallic (PW Ref P05-131)	90 Grit	Local Purchase
Cloth	Organic Fiber AMS 3902 (PW Ref P05-134)	Style 285	BGF Industries, Inc. P.O. Box 592 401 Amherst Avenue Altavista, VA 24517 USA
		Style 243	Fabric Development, Inc. 1217 Mill Street Quakertown, PA 18951 USA
		HK 285	Hankuk Fiber Glass, Ltd. Miryang KyungNam, South Korea

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Cloth	Wire PWA 1170-3 (PW Ref P05-182)	Wire: AMS 5690; Weave: Plain Dutch; Warp: Nominal Wire Diameter = 0.0055 in. (0.14 mm); Nominal Wire Count = 50 / in. Fill: Nominal Wire Diameter = 0.0045 in. (0.114 mm) Nominal Wire Count = 250 /in.	Gerard Daniel Worldwide - Europe Mountmahon Industrial Estate Abbeyfeale, Limerick,Ireland
			G. K. D. Kufferath & Co. P.O. Box 101155 Metallweberstrasse 46 5160 Duren, Germany
			Paul GmbH & Co. P.O. Box 1228 Industriegebiet West 36396 Steinau an der Strasse, Germany
			Sefar America, Inc. 111 Calumet Street Depew, NY 14043 - 3734
			G. Bopp & Co. AG Bachmannweg 20 CH - 8046 Zurich, Switzerland
Cloth	Abrasive Impregnated Nylon, Fine Silicon Carbide GA814-3 (PW Gef P05-214)	Type S Fine Scotch - Brite Cleaning And Finishing Sheets	Minnesota Mining And Mfg. Co., Industrial Tape And Specialties Div. 3M Center St. Paul, MN 55144-1000
Coating	Clear PMC 1641 (PW Ref P05-041) Deleted - Refer to	Crystal Clear Acrylic Spray (No. 1303) P07-001	The Sherwin Williams Co. Krylon Products Group 101 Prospect Avenue Cleveland, OH 44115 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Coating	Conversion (PW Ref P05-079)	MIL-C-5541 Class 3 (Latest Revision)	Local Purchase
Coating	Conversion Aluminum Chromate SPMC 206 (PW Ref P05-084)	Alodine 1200S	Local Purchase
Coating	Conversion (PW Ref P05-095)	MIL-C-5541 Class 1A (Latest Revision)	Local Purchase
Coating	Polyurethane Erosion Resistant PWA 36510 (PW Ref P05-154)	Chemglaze M331 and Chemglaze M201	Lord Corp., Chemical Products Div. 2000 W. Grandview Blvd. Erie, PA 16514 USA
Coating	Polyurethane PWA 36013 (PW Ref P05-053)	Laminar X-500 Black Conductive Resin Plus Pigment Component (8-B-6A) and Hardener Component (50-C-3A), supplied in separate containers	AKZO Nobel Aerospace Coatings, Inc. 1 E. Water Street Waukegan, IL 60085 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Coating	Polyurethane Surfacer PWA 36014 (PW Ref P05-054)	Laminar X-500 White Surfacer Resin Plus Pigment Component (8-W-5) And Hardener Component (50-C-3)	AKZO Nobel Aerospace Coatings, Inc. 1 E. Water Street Waukegan, IL 60085 USA
Coating	Fluoroelastomer Protective PWA 36516-4 (PW Ref P05-372)	PELSEAL 2112 (Black) Accelerator #4	Pelmor Laboratories Inc. 401 Lafayette St. Newtown, PA 18940 - 0309
	PWA 36516-3	PLV 2038 (White) Accelerator #4	Pelmor Laboratories Inc. 401 Lafayette St. Newtown, PA 18940 - 0309
	PWA 36516-5	PLV 3111 (Black) Accelerator #4	Pelmor Laboratories Inc. 401 Lafayette St. Newtown, PA 18940 - 0309
	PWA 36516-6	PLV 3018 (Black) Accelerator #4	Pelmor Laboratories Inc. 401 Lafayette St. Newtown, PA 18940 - 0309
Coating	Ablative Silicone Rubber PWA 36752-2 (PW Ref P05-121)	MA-25S Type II	Lockheed Martin Space Systems Co. 13800 Old Gentilly Rd - MS 2300 P.O. Box 29304 New Orleans, LA 70129 USA
Coating (Varnish) AMS 3132	Phenolic Resin, Corrosion Preventive (PW Ref P05-040)	69X0545 Compound	Stanchem, Inc. 401 Berlin Street East Berlin, CT 06023 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Compound	Antigalling PWA 550-3 (PW Ref P06-021)	Hi-T 650	Sandstrom Products Co. 224 South Main St. Port Byron, IL 61275 USA
		Lubri-Bond HT	E/M Co., Div. of Morgan Chemical Products, Inc. 100 Cooper Circle Peachtree City, GA 30269
Compound	Antigalling PWA 586 (PW Ref P06-003)	Loctite C-200	Henkel Loctite Corp. 1001 Trout Brook Crossing Rocky Hill, CT 06067 USA
		Kaylube No. 3	Fairchild Fasteners - Fullerton Operations 800 S. State College Blvd Fullerton, CA 92831 USA
Compound	Antigalling PWA 474 PWA-IM-5525 (PW Ref P06-022) (Supersedes PW Ref P06-057, PWA 36247)	Dow Corning DC 3400A	Dow Corning Corp. 2914 Patterson Street Greensboro, NC 27407 USA
		Ecoalube 642	E/M Co., Div. of Morgan Chemical Products, Inc. 100 Cooper Circle Peachtree City, GA 30269
Compound	Antiseize, Thread Lubricant PWA 36001 PMC 9940 (PW Ref P06-023)	Silver Goop	Swagelock Co. 29500 Solon Road Solon, OH 44139 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Compound (PWA 36053 -1)	Antiseize P06-043	NEVER-SEEZ Pure Nickel Special	Bostik, Inc. 211 Boston Street Middleton, MA 01949 USA EOE, Inc. 585 Fourth Street P. O. Box 177 Troy, NY 12181 USA
Compound (PWA 36246 -1)	Antiseize Paste	Tiodize T8E	Tiodize Co., Inc. 5858 Engineer Drive Huntington Beach, CA 92649 USA
Compound (PWA 36246 -2)	Antiseize Paste	Molykote P-37	Dow Corning Corp. 2200 West Salzburg Road Midland, MI 48640-8531 USA
Compound	Antiseize (PW Ref P06-026)	93173-22	Local Purchase
Compound	Antiseize (PW Ref P06-028)	LED Plate No. 250	Armite Laboratories 1560 Superior Ave - Suite A4 Costa Mesa, CA 92627 USA
Compound	Antiseize PMC9566 (-1, -2, -3, -4) (PW Ref P06-055)	C5-A Copper Based Antiseize	Henkel Loctite Corp. 1001 Trout Brook Crossing Rocky Hill, CT 06067-3582
Compound	Cleaning, Burnishing (PW Ref P05-172)	BCS C-883	BCS Co., Inc. 763 Thompson Road Thompson, CT 06277 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Compound (P05-476)	Coating	Aluminum, Inorganic Binder (PW Ref: 36595)	Coatings for Industry, Inc. 319 Township Line Road Souderton, PA 18964-1905
Compound	Lapping (PW Ref P05-072)	No. 302 1/2	U.S. Products Co. 518 Melwood Ave. Pittsburgh, PA 15213 USA
Compound	Lapping (400 grain size) PMC 3013 (PW Ref P05-077)	Clover Silicon Carbide Grease Mix (39523 or 39525)	Henkel Loctite Corp. 1001 Trout Brook Crossing Rocky Hill, CT 06067 USA
Compound	Lapping PMC 3013 (PW Ref P05-078)	See PW Ref P05-077	
Compound	Lapping (PW Ref P05-082)	1200 Grit	Local Purchase
Compound	Lapping (PW Ref P05-083)	1800 Grit	Local Purchase

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Compound	Sealing PWA 544 (a mixture of PWA 1324 nickel powder and PMC 4718 Bentonite powder in a PMC 1817 aqueous sodium silicate solution)	56.0 - 56.5% by weight PWA 1324 Nickel Powder: Metco 56F-NS Vertex VPC-23 Thermotec 18976 -Plus- 2.9 - 3.0% by weight PMC 4718 Bentonite Powder: Catalog No. B-235 -Plus- Remainder: PMC 1817-1 Aqueous Sodium Silicate Solution (40 - 41 degrees Baume) -Or- PMC 1817-2 Aqueous Sodium Silicate Solution, 37% (SS338-1)	 Sulzer Metco (US) Inc. 1101 Prospect Avenue Westbury, NY 11590 USA Metco, Inc. Special Metals Corp. 4317 Middle Settlement Rd New Hartford, NY 13413 Eutectic Corp. 40-40 172nd Street Flushing, NY 11358 USA Fisher Scientific Co. Global Exports 3970 Johns Creek Court, Suite 500 Suwanee, GA 30024 USA Local Purchase Fisher Scientific Co. Global Exports 3970 Johns Creek Court, Suite 500 Suwanee, GA 80124 USA
Compound	Polishing (PW Ref P05-171)	BCS 0745	BCS Co., Inc. 763 Thompson Road Thompson, CT 06277 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Compound (PWC 3022)	Polishing Greaseless, Coarse	Greaseless Compound Grade 3022-1 PW Ref: P05-426	JacksonLea (A Unit of Jason, Inc.) 1715 E. Conover Boulevard Conover, NC 28613 USA
Compound (PMC 3048)	Polishing, Medium Fine, Greaseless	Grade E PW Ref P05-065	JacksonLea (A Unit of Jason, Inc.) 1715 E. Conover Boulevard Conover, NC 28613 USA
Compound (PMC 3061)	Polishing Buffing	No. 418 PW Ref P05-066	JacksonLea (A Unit of Jason, Inc.) 1715 E. Conover Boulevard Conover, NC 28613 USA
		No. 50	SCI Corp. 812 East Broadway Streator, IL 61364 USA
Compound	Potting Epoxy PWA 603 (PW Ref P08-021)	Eccobond SF-40 (White)	Emerson & Cuming Specialty Polymers 869 Washington St. Canton, MA 02021 USA
Compound	Potting, Epoxy (PW Ref P08-030) (Two component type)	EC3524 B/A PWA 36756	3M, ITSD Aerospace P.O. Box 300M 3211 E Chestnut Expr. Springfield MO 65802 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Compound	Silicone Rubber (High Temperature Resistant) (PW Ref P09-021)	PWA 407 Eccolite 82 SI RS W Visilox V-622 PWA 29166 Kit for Rubber, PWA 407 (1 gallon + catalyst)	Grace NV Englewood Cliffs, Nijverheidsstraat 7 B-2260 Sesterlo, Belgium Pratt & Whitney Large Commercial Engines Spare Parts Sales 400 Main St. East Hartford, CT 06108
Compound	Wet Abrasive PMC 3067 (PW Ref P05-164)	Novaculite No. 325	Malvern Minerals Co. P.O. Box 1246 Hot Springs National Park, AZ 71902 USA
Compound	Corrosion Preventive (PW Ref P05-088)	MIL-C-16173 Grade 2 (latest revision)	Local Purchase
Compound	Corrosion Preventive (PW Ref P05-129)	AMS 3072 (P03-019 is an alternate that is more readily available)	
Compound	Corrosion Preventive MIL-C-15074 (latest revision): PMC 9118 (PW Ref P05-238)	Cosmoline 1104 Rustilo FN	Houghton International, Inc. P.O. Box 930 Madison & Van Burien Ave. Valley Forge, PA 19482 Castrol Industrial Inc. 775 Louis Drive P.O. Box 2809 Warmister, PA 18974 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Compound	Vapor, Blast (PW Ref P05-086)	Novaculite No. 625	Malvern Minerals Co. P.O. Box 1246 Hot Springs National Park, AZ 71902 USA
Compound	Sealing PMC 9926 (PW Ref P04-008)	Dow Corning No. 4	Dow Corning Corp. 2200 W. Salzburg Road Midland, MI 48640-8531 USA
Compound	Sealing and Coating Compound Corrosion Inhibitive MIL-S-81733 (Latest Revision)	AC-665 B-2 AC-665 C-12 (PW Ref P09-013) Type IV-12 Class 1 Grade A	Advanced Chemistry & Technology Inc 7341 Anaconda Ave Garden Grove, CA 92841 - 2921
Compound	Sealing Polysulfide (T) Rubber. Alternate to P08-046)	AMS 3265 AC-665 C-12 (PW Ref P09-013)	PRC-DeSoto International, Inc. A PPG Industries Company 823 East Gate Drive Mount Laurel, NJ 08054 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Compound	Thread Locking and Retaining (Specify Grade) (PW Ref P09-002)	PWA 549-1: Loctite Grade 609 Green - Retaining PWA 549-2: Loctite Grade 640 Green - Retaining PWA 549-3: Loctite Grade 635 Green - Retaining PWA 549-4: Loctite Grade 222 Purple - Thread Lock PWA 549-5: Loctite Grade 242 Blue - Thread Lock	Henkel Loctite Corp. 1001 Trout Brook Crossing Rocky Hill, CT 06067 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
		PWA 549-6: Loctite Grade 271 Red - Thread Lock PWA 549-7: Loctite Grade 290 Green - Thread Lock PWA 549-8: Loctite Grade 567 Off-white - Thread Lock PWA 549-9: Loctite Grade 272 Red - Thread Lock PWA 549-10: Loctite Grade 620 Green - Retaining (can be substituted for PWA 549-2)	

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Compound	Jointing PWA 36000 (Supersedes PWA 36000-3) (PW Ref P09-005)	Hylomar Advanced Formulation, methylene chloride-free (replaces -3 suffix which has been discontinued) *[12]	Antwerp Lion Oil Works N.V. VLAMSE KAAI 2-5 Antwerpen, Belgium Power in Motion 16A Montesano Road Fairfield, NJ 07004 USA Valco Cincinnati, Inc. 411 Circle Freeway Drive Cincinnati, OH 45246 USA Aviall Services, Inc. 2750 Regent Boulevard Dallas, TX 75261-9048 USA
Compound	Sealing PWA 36003-4 (PW Ref P09-006)	(Replaced by PWA 36000, PW Ref P09-005)	
Compound	Sealing PMC 9925 (PW Ref P09-007)	(Replaced by PWA 36002, PW Ref P09-008)	
Compound	Sealing PWA 36002 (PW Ref P09-008)	Gasket Sealant No. 2	Henkel Loctite Corp. 1001 Trout Brook Crossing Rocky Hill, CT 06067 USA
Compound	Sealing PMC 9929 (PW Ref P09-009)	Parker O-Lube	Parker-Hannifin Corp. O-Ring Division 2360 Palumbo Drive P.O. Box 11751 Lexington, KY 40512 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Compound	Adhesive Precoat for Greaseless Compound, PMC 3091 (PW Ref P05-064)	Ad-Lea-Sive	Jacksonlea Div. of Jason, Inc. 121 Mattatuck Heights Waterbury, CT 06705 USA
Cord	Nylon (PW Ref P05-105)	MIL-T-713, Type P (latest revision)	Local Purchase
Crayon	Metal Marking (Soft) PMC 4058-6 (PW Ref P05-232)	Red, 02059	Sanford Corp. 2711 Washington Blvd Bellwood, IL 60104 USA
Crayon	Metal Marking (Soft) PMC 4058-8	White, 02412 or 02060	Sanford Corp. 2711 Washington Blvd Bellwood, IL 60104 USA
Crayon	Metal Marking (Soft) PMC 4058-10 (PW Ref P05-232)	Orange, 02094	Sanford Corp. 2711 Washington Blvd. Bellwood, IL 60104 USA
Crayon	Metal Marking (Soft) PMC 4058-11 (PW Ref P05-232)	Yellow, #73	Dixon Ticonderoga Co. (World Headquarters) 195 International Pkwy Heathrow, FL 32746 USA
Degreaser	Aqueous SPMC 170 (PW Ref P11-079)	Ardrox 6333A	Chemetall GmbH Trakehner Strasse 3 D-60487 Frankfurt am Main, Germany

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
			Chemetall Plc 65 Denbigh Road Bletchley Milton Keynes, am Main, Germany MK1 1PB, United Kingdom
			Chemetall Oakite (Was: Oakite Products, Inc.) 50 Valley Road Berkeley Heights, NJ 07922 USA
			Chemetall Oakite 16961 Knott Avenue La Mirada, CA 90638-6015 USA
Degreaser	Aqueous SPMC 181 (PW Ref: P11-080)	CEE-BEE Super Bee 300LF	McGean, Cee-Bee Aviation Products (Was: McGean-Rohco, Inc. Cee-Bee Chemical Div.) 2910 Harvard Avenue Cleveland, OH 44105 USA
Degreaser	Aqueous SPMC 173 (PW Ref: P11-082)	CEE-BEE Super Bee 300LFG	McGean, Cee-Bee Aviation Products (Was: McGean-Rohco, Inc. Cee-Bee Chemical Div.) 2910 Harvard Avenue Cleveland, OH 44105 USA
Dehydrator (Dessicant)	Desiccant MIL-D-3464 (PW Ref P15-01)	SPM 214	Local Purchase

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Developer	Dry, Fluorescent Penetrant PMC 4356 (PW Ref P05-034)	(Deleted, See PW Ref P05-237)	
Developer	Fluorescent Penetrant, Non-aqueous PMC 4357 (PW Ref P05-237)	ZP9F	Magnaflux Corp. Div. of Illinois Tool Works, Inc. 3624 W. Lake Avenue Glenview, IL 60025 USA
		D701	Marktec Corp. 3-10, Sanno 2-Chome OHTA-KU Tokyo, Japan
		NAD	Turco Products, Inc. Div. of Henkel Surface Technologies Corp. 3300 Montreal Industrial Way Tucker, GA 30084 USA
		D100	Sherwin, Inc. 5530 Borwick Avenue South Gate, CA 90280 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
		9D1B	Chemetall GmbH Trakehner Strasse 3 D-60487 Frankfurt am Main, Germany Chemetall Plc 65 Denbigh Road Bletchley Milton Keynes, MK1 1PB United Kingdom Microwave Engineering Corp. 1551 Osgood St. North Andoved, MA. 01845 - 1041 Chemtall Oakite 50 Valley Road Berkeley Heights, NJ. 07922 Chemetall Oakite 16961 Knott Avenue La Mirada, CA 90638 USA
		Chemetall	Chemetall GMBH P. O. Box 800170 Frankfurt, Germany Chemtall Chemical Products Inc. 50 Valley Road Berkeley Heights, NJ. 07922
		D70	Met-L-Chek Co. 1639 Euclid Street Santa Monica, CA 90404

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
		LD3	Ely Chemical Co., Ltd. Lisle Lane Ely CB7 4A5, United Kingdom
		F-4S(NT)1	Eishin Kagaku Co., Ltd. 1-2-13, Higashi-Shinbashi, Minato-Ku Tokyo, Japan-105
Developer	Fluorescent Penetrant, Powder PMC 4356 (PW Ref P05-469)	Chemetall Oakite 9D4A	Chemetall GmbH Trakehner Strasse 3 D-60487 Frankfurt am Main, Germany Chemetall Plc 65 Denbigh Road Bletchley Milton Keynes, MK1 1PB United Kingdom Chemetall Oakite 50 Valley Road Berkeley Heights, NJ 07922 Chemetall Oakite 16961 Knott Avenue La Mirada, CA 90638-6015
		Ely Chemical PD3	Ely Chemical Co., Ltd. Lisle Lane Ely CB7 4A5, United Kingdom
		Magnaflux ZP4B	Magnaflux Corp. Div. of Illinois Tool Works, Inc. 3624 W. Lake Avenue Glenview, IL 60025 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
		Marktec D700	Marktec Corp. 3-10, Sanno 2-Chome OHTA-KU Tokyo, Japan
		Met-L-Chek D72A	Met-L-Chek Co. 1639 Euclid Street Santa Monica, CA 90404
		Sherwin D90G	Sherwin, Inc. 5530 Borwick Avenue South Gate, CA 90280 USA
		F-5D/1	Eishin Kagaku Co., Ltd. 1-2-13, Higashi-Shinbashi, Minato-Ku Tokyo, Japan-105
Developer	Wet (PW Ref P05-033)	(Deleted)	
Dye PMC 4062	Layout and Identification,	Micro Supreme Layout Dye, Purple (PW Ref P05-022)	Pyramid Plastics, Inc. Tolber Div. 220 West 5th Street Hope, AR 71801-5212 USA Tel: (870) 722-5739 Fax: (870) 777-8056

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Dye	Layout (PW Ref P05-090)	DX100	ITW Dykem/Dymon 805 E. Old 56 Hwy Olathe, KS 66061 USA
Dye PMC 4039-1	Layout and Identification	Purple LM-170 (PW Ref: P05-366)	Carco, Inc. P. O. Box 13859 10333 Shoemaker Street Detroit, MI 48213 USA
Dye PMC 4039-2	Layout and Identification	Blue Dykem Spray Steel Blue Part #80000 (PW Ref: P05-366)	ITW Dykem 805 East Old 56 Highway Olathe, KS 66061 USA
Dye PMC 4503	Layout and Identification (Red) (PW Ref P05-419)	Dykem Steel Red Layout Fluid (80496)	ITW Dykem 805 East Old 56 Highway Olathe, KS 66061 USA
Dye PMC 4504	Layout and Identification (Blue) (PW Ref P05-418)	Dykem Steel Blue Part No. 80600) (930 ml) or Part No. 80400 (8 oz.)	ITW Dykem 805 East Old 56 Highway Olathe, KS 66061 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Dye	Blue PMC 4513 (PW Ref P05-459) *[11]	Oil Blue B liquid Dye	Octel Starreon, LLC 8375 S. Willow Street - 5th Floor Littleton, CO 80124
Dye	Red PMC 4470 (PW Ref P05-240)	Oil Red HF Liquid Dye	Octel Starreon, LLC 8375 S. Willow Street - 5th Floor Littleton, CO 80124 USA
Enhancer	Electrical Contact SPMC 205 (PW Ref P11-068)	Stabilant 22	D W Eletronchemicals, Ltd 97 Newkirk RD N, Unit 3 Richmond Hill, Ontario Canada L4C 3G4
Epoxy	Polyamide, Clear (PW Ref P05-100)	MIL-C-22750 (latest revision)	Local Purchase
Epoxy	Enamel, Aluminized PWA 569 (PW Ref P05-037)	Enamel Base 529K002, Curing Solution 910-357, Solvent 020 x 324	PRC-Desoto International, Inc. A PPG Industries Company 823 East Gate Drive Mount Laurel, NJ 08054

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Enamel (PWA 36569) P05-483	Aluminized Epoxy, Room Temperature Curing, Chromate-Free, Low Volatile Organic Content	Enamel Base (IP-715A Base) plus Curing Solution (IP-715B Catalyst)	Indestructible Paint, Inc. 66 Erna Avenue Midford, CT 06460-3115 USA Indestructible Paint, Inc. 1 Independence Drive Monroe, CT 06468 USA
Fabric	Polyamide AMS 3902 (PW Ref P05-149)	Style 281 or 285	BGF Industries, Inc. 401 Amherst Avenue P.O. Box 592 Altavista, VA 24517 USA
Fabric	Fiberglass, Epoxy Resin Impregnated	Cycom306/7781 PWA 36437 (PW Ref P08-047)	CYTEC Engineered Matls. (Was: BASF Corp.) 1440 N. Kraemer Blvd. Anaheim, CA 92806 USA
Fabric	Fiberglass, Epoxy Resin Impregnated	Cycom 950/120 PWA 36406 (PW Ref P08-048)	CYTEC Engineered Matls. 1300 Revolution Street Havre De Grace, MD 21078-3800 USA
Ferrule	Safety Cable (PW Ref P05-292)	F30BB50 AS3510-02F 0.032 Inch (0.813 mm) Diameter	Bergen Cable Technologies, Inc. 343 Kaplan Drive Fairfield, NJ 07004 USA
Film, Release PMC 9977	-1, -3, -5, & -9 (PW Ref P05-268)	A4000 (Perforated) A5000P (Perforated)	Airtech International Inc 5700 Skylab Road Huntington Beach, CA 92647 - 2055

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
	-2, -4, -6, thru -8, & -10	A4000 (Non-perforated) A5000 (Non-perforated)	Airtech International Inc 5700 Skylab Road Huntington Beach, CA 92647 - 2055
Film (P05-474)	Polyimide	Kapton 200-HN (0.002 inch thick) PW Ref: PWA 36071-2)	DuPont Company Electronics Department U. S. Route 23, South & DuPont Road P. O. Box 89 Circleville, OH 43113 USA
Fluid	Calibrating PMC 9041 (PW Ref P03-003)	MIL-C-7024, Type II (latest revision)	Local Purchase
Fluid, Penetrating (Oil Type)	PMC 9503, -1 & -3 PMC 9503, -2	Aerokroil Kroil	Kano Laboratories Inc 1000 East Thompson LN Nashville, TN 37211-2627
Fluid, Penetrating (Oil Type) (PMC 9545)		Knock'er Loose 03020 Aerosol - Or - 03021, 03022, 03023 Bulk - Or - Technician Grade Aerosol 401712, 401724	CRC Industries Inc. 885 Louis Dr. Warminster, PA. 18974 - 0586

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Fluid (PMC 9569)	Leak Detector, Liquid Type PMC 2277 (PW Ref P05-007)	Snoop Liquid Leak Detector	Swagelok Co. 29500 Solon Road Solon, OH 44139 USA
Fluid	Magnetic Particle (PW Ref P05-091)	MIL-T-6868 (latest revision)	Local Purchase
Flux	Brazing, Low Temperature AMS 3410 (PW Ref P05-107)	O-F-499	Englehard Corp. 101 Wood Avenue Iselin, NJ 08830 USA
			Handy & Harmon 555 Theodore Frend Ave. Rye, NJ 10580 USA
			Local Purchase
Flux	Brazing, High Temperature AMS 3411 (PW Ref P05-108)		Englehard Corp. 101 Wood Avenue Iselin, NJ 08830 USA
			Handy & Harmon 555 Theodore Frend Ave. Rye, NJ 10580 USA
			Local Purchase
Flux	Rosen, Mildly Activated (PW Ref P05-117)	MIL-F-14256 (latest revision) Alpha No. 611	Cookson Electronic Assembly Materials Group 600 Rt. 440 Jersey City, NJ 07304
Flux	Rosen (PW Ref P05-118)	No. 1554	Cookson Electronic Assembly Materials Group 600 Rt. 440 Jersey City, NJ 07304

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Gas	Nitrogen (Water-pumped) PMC 2214 (PW Ref P05-068)		BOC Gases 575 Mountain Avenue Murray Hill, NJ 07974 USA Praxair-Industrial Gases 175 E. Park Drive P.O. Box 44 Tonawanda, NY 14151 USA AGA Gas, Inc. 3300 Lakeside Avenue Cleveland, OH 44114 USA Praxair-Industrial Gases Old Ridgebury Road Danbury, CT 06817 USA
Glass	Milled (PW Ref P05-147)	Owens-Corning	Owens-Corning Fiberglass Corp. Fiberglass Tower - T/11 One Owens Corning Parkway Toledo, OH 45659 USA
Grease	MISC 254 (PW Ref P04-002)	Krytox, 240AC	E.I. duPont de Nemours & Co., Inc. 1007 Market Street P.O. Box 1635 Wilmington, DE 19899 USA
Grease	(PW Ref P04-007)	MIL-G-81322 (latest revision) Thrust Reverser System Lubricant	Mobil Oil Co. Interstate 10 P.O. Box 3311 Beaumont, TX 77704 USA
Grease	(PW Ref P04-003)	"Aero" Lubriplate, Lubriplate 930AA, or Mo-Lith No, 2	Fiske Bros. Refining Co. 129 Lockwood St. Newark, NJ 07105 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Grease	PMC 9631 (PW Ref P04-006)	Plastilube No.3	Sulflo, Inc. 1158 Erie Avenue No. Tonawanda, NY 14120
Grease	Aircraft and Instrument, Gear and Actuator Screw (PW Ref P04-001)	MIL-G-23827 (latest revision)	Exxon Mobil Corp. 3225 Gallows Road Room 4W917 Fairfax, VA 22037 USA
Grease	Extreme Pressure PMC 9630 (PW Ref P04-005)	Lubriplate No. 1200-2	Fiske Bros. Refining Co. 129 Lockwood St. Newark, NJ 07105 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Grit	Aluminum Oxide PMC 3052-7 (No. 240) (PW Ref P05-130)	Duralum	Washington Mills Electro Minerals Corp. 20 North Main Street No. Grafton, MA 14302 USA
		BFA	Great Lakes Minerals, LLC 1101 Port Road, Suite B Wurtland, KY 41144 USA
		Aluminum Oxide Powder	Treibacher Corp 2000 College Avenue Niagara Falls, NY 14302
		Polishing Grain RHT	Washington Mills Electro Minerals Corp. 20 North Main Street No. Grafton, MA 01536 USA
		Aluminum Oxide	Micro Abrasives Corp. 720 Southampton Road P.O. Box 669 Westfield, MA 01086 USA
		Alundum Grain E1	Saint-Gobain Abrasives, Inc. 1 New Bond Street P.O. Box 15137 Worchester, MA 01615 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Grit	Silicon Carbide (No. 120) PMC 3053-34 (PW Ref P05-071)	SAS Carbonite K Coating	Treibacher Corp. 2000 College Avenue P.O. Box 1438 Niagara Falls, NY 14302
		Silicone Carbide 5348 Coating	Saint-Gobain Abrasives, Inc. 1 New Bond Street P.O. Box 15137 Worchester, MA 01615 USA
		SILCARIDE C-6/SK	Washington Mills Electro Minerals Corp. 20 North Main Street No. Grafton, MA 01536 USA
		GLI-SiC	Great Lakes Minerals, LLC 1101 Port Road, Suite B Wurtland, KY 41144 USA
Grit	Silicon Carbide PMC 3053-31 (No. 60 grit) or PMC 3053-32 (No. 80 grit) (PW Ref P05-144)	SAS Carbonite Coating	Treibacher Corp. 2000 College Avenue P.O. Box 1438 Niagara Falls, NY 14302
		Silicone Carbide 5348 Coating	Saint-Gobain Abrasives, Inc. 1 New Bond Street P.O. Box 15137 Worchester, MA 01615 USA
		SILCARIDE C-6/SK	Washington Mills Electro Minerals Corp. 20 North Main Street No. Grafton, MA 01536 USA
		GLI-SiC	Great Lakes Minerals, LLC 1101 Port Road, Suite B Wurtland, KY 41144 USA
Heptane	(PW Ref P11-030)		Local Purchase

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Hydraulic	Fluid Aerospatiale Spec. NSA 307.110 (PW Ref P02-001)	Hyjet IV or IVA	Chevron Chemical Co., Agriculture Chemical Div. 575 Market Street San Francisco, CA 94119
		Skydrol 500/84, Skydrol LD4	Monsanto Co. 800 N. Linbergh Blvd. St. Louis, MO 63166 USA
Hydraulic	Fluid (PW Ref P02-002)	MIL-H-6083 (latest revision)	Local Purchase
Hydraulic	Fluid (PW Ref P02-003)	BMS 3-11	The Boeing Company 7755 E. Marginal Way P.O. Box 3707 Seattle, WA 98124 USA
Ice	Dry (PW Ref P05-102)	BB-C-104	Local Purchase
Ink	Black (PW Ref P05-021)	Tex-Rite Instant Dry 400-1 (Black)	Tex-Rite Products Co. 10333 Shoemaker Street Detroit, MI 48213 USA
Ink (PMC 4021)	Black Stamping (For marking non porous surfaces with a rubber stamp.	1250, Black PW Ref P05-025	Rubber Stamps Unlimited, Inc. 334 South Harvey Plymouth, MI 48170 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Ink PMC 4057-1	Metal Marking	No. 9 Black SF (PW Ref P05-026)	Phillips Process Co., Inc. 20 Magnolia Street Rochester, NY 14608-2931 USA
		Marking Ink No. 977-9	Local Purchase
Ink	Metal Marking PMC 4057-5 (PW Ref P05-465)	No. 9 Green SF	Phillips Process Co., Inc. 20 Magnolia Street Rochester, NY 14608-2931 USA
Ink	Metal Marking (PW Ref P05-441) (PMC 4057-10)	Koh-I-Noor White Drawing Ink #9065-D	KOH-I-NOOR Professional Products Group Chartpak, Inc. 1 River Road Leeds, MA 01053
Ink	Metal Marking PMC 4057-11 (PW Ref P05-466) (Deleted - Refer to PMC 4057-2)	White Metal Marking Ink No. 977-9	
Ink	(PW Ref P05-027)	Carter No. 415 (Black)	Avery Dennison 50 Pointe Drive Brea, CA 92821 USA
Ink	Black Stamping PMC 4021 (For Marking on Non-Porous Sufaces) (PW Ref P05-411)	Permanent Stamp Pad Ink No. 58757	Sanford Corp. 2711 Washington Blvd. Bellwood, IL 60104 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Ink	Red (PW Ref P05-046)	Tex-Rite Instant Dry 400-2	Tex-Rite Products Co. 10333 Shoemaker Street Detroit, MI 48213 USA
Ink	Purple (PW Ref P05-047)	Tex-Rite Instant Dry 400-7	Tex-Rite Products Co. 10333 Shoemaker Street Detroit, MI 48213 USA
Ink	White PMC 4057-2 (PW Ref P05-049)	White Metal Marking Ink No. 977-9	American Marking Systems, Inc. 2741 Paxton Street Harrisburg, PA 17111 USA
Ink	Temporary Marking PMC 4500 (PW Ref P05-413)	16-2000 VideoJet Ink (Black)	Videojet Technologies, Inc. 1500 Mittel Blvd. Wood Dale, IL 60191 USA
Jelly	Petroleum (PW Ref P06-007)	Vaseline	Chesebrough-Pond's, Inc. 33 Benedict Place Greenwich, CT 06830 USA
Kerosene	PMC 9021 (PW Ref P11-003)	VV-K-211	Local Purchase
Lacquer	PMC 9021 (PW Ref P07-001)	Crystal Clear Acrylic Spray (No. 1303)	The Sherwin-Williams Co., Krylon Products Group 101 Prospect Street Cleveland, OH 44115 USA
Leak Detector	Liquid Type PMC 2277 (PW Ref P05-007)	Snoop Liquid Leak Detector	Swagelok Co. 29500 Solon Road Solon, OH 44139 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Lockwire	(PW Ref P05-110)	MS-9226-03	Local Purchase
Lockwire	(PW Ref P05-289)	AS3214-02 0.031 Inch (0.787 mm) Dia.	Local Purchase
Lubricant	Bolt (If unavailable, use P03-001) PMC 9866 (PW Ref P06-019)	Kendall All-Oil Lube SAE 250 (If no longer available, use any remaining supply)	WITCO Chemical Co. Kendall Refining Co. Div. 77 N. Kendall Ave. Bradford, PA 16701
Lubricant	Molydenum Disulfide Powder PMC 9523 (PW Ref P06-009)	Molykote Z Powder	Dow Corning Corp. 2200 W. Salzburg Road Midland, MI 48640-8531 USA
Lubricant	(Deleted) Use P06-053, Sealing Ring Lubricant or P03-001, Engine Oil.	(PW Ref: PWA 36511)	
Lubricant, Aircraft Turbine Engine, (PWA 521)	Synthetic Base	Type I, (Latest Revision) MIL-PRF-7808, Grade 3 Type II (Latest Revision) MIL-PRF-23699, All Classes	

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Lubricant	High Temperature (PW Ref P06-018) (Refer to PW Ref P06-003)	Kaylube 3	Fairchild Fasteners - Fullerton Operations 800 S. State College Blvd Fullerton, CA 92831 USA
Lubricant	Antiseizing Compound, PWA 541 (A mixture of Molybdenum Disulfide Powder and Grade 1010 Oil) (PW Ref P06-017)	Molybdenum Disulfide Powder: Dow Corning Z Moly-Powder	Dow Corning Corp. 2200 W. Salzburg Road Midland, MI 48640-8531 USA
		Grade 1010: Brayco 460	Castrol Industrial Americas 1001 West 31st Street Downers Grove, IL 60515
		Grade 1010: Royco 481	Anderol, Inc. P.O. Box 518 215 Merry Lane E. Hanover, NJ 07936 USA
		Grade 1010: Winsor L110-A	Fuchs Lubricants Co. P.O. Box 328 281 Silver Sands Road East Haven, CT 06512 USA
Lubricant	Flourinated Grease PWA 36230 (PW Ref P06-059)	Krytox 283 AD High Temp and Anti-Corrosion Grease	E.I. duPont deNemours Co. Chemical and Pigment Dept 1007 Market St. Wilmington, DE 19898 USA
Lubricant	Compound (Antigallant) PWA 587 (PW Ref P06-005)	Dow Corning G-N Metal Assembly Paste	Dow Corning Corp. 2200 W. Salzburg Road Midland, MI 48640-8531 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Lubricant	Silicone PWA 36022 (PW Ref P06-052)	Dow Corning 41, Extreme High Temperature Bearing Grease	Dow Corning Corp. 2200 W. Salzburg Road Auburn, MI 48611 USA
Lubricant	Silicone Sealing Ring (PW Ref: P06-053) PWA 36500	Ultrachem Assembly Fluid #1 ROYCO HF825	Dow Corning Corp. 2200 W. Salzburg Road Midland, MI 48640-8531 USA Anderol, Inc. (Was: Royal Lubricants Co., Inc.) 215 Merry Lane P. O. Box 518 E. Hanover, NJ 07936-0518 USA
Lubricant	(PW Ref P06-027)	Aerolubriplate	Fiske Brothers Refining Co. 129 Lockwood St. Newark, NJ 07105 USA
Lubricant	Bolt, Molybdenum Disulfide, DOD-L-25681 (Superseding MIL-L-25681) (PW Ref P06-020)	Chemsol Royco 81MS Stock # 9150005437220 Braycoto 868	Chemsol Inc. 8423 Boettner Road Bridgewater, MI 48115 Indestructible Paint, Inc. 1 Independence Drive Monroe, CT 06468 USA S D B Consultants LTD 401 Whitney Avenue, Suite 120 Gretna, LA 70056-2500 Air BP Lubricants Division of BP Products North America Inc. Parsippany, NJ 07054-4406

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Lubricant	Nickel Antiseize (PW Ref P06-031)	No. 77184	Henkel Loctite Corp. 1001 Trout Brook Crossing Rocky Hill, CT 06067 USA
Lubricant	Spray Type, Low Temperature PMC 1714 (PW Ref P06-004)	Everlube 620C	E/M Co., Div. of Morgan Chemical Products, Inc. 100 Cooper Circle Peachtree City, GA 30269
Lubricant	Solid Film (Air Cure) (PW Ref P06-012)	Lubribond A	Electrofilm, Inc. 25395 Rye Canyon Road Valencia, CA 91355 USA
Lubricant	Solid Film (Air Cure) (PW Ref P06-013)	MIL-L-23398 (latest revision) 3402C Bonded Lube	Dow Corning Corp. 2200 W. Salzburg Road Midland, MI 48640-8531 USA
Lubricant	Gasket PMC 9652 (PW Ref P06-014)	Gredag R-3	Acheson Colloids Co., Div. of Acheson Industries, Inc. 1600 Washington Ave. P.O. Box 611747 Port Huron, MI 48061 USA
Lubricant	Dry Film PMC 9934-1 (PW Ref P06-001)	dgf-123 (CFC-free) Stock No. K5200	Miracle Power Products Corp. 1101 Belt Line St. Cleveland, OH 44109 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Lubricant	Metal Cutting PMC 9264 (PW Ref P06-058)	PMC 9264-1: Accu-Lube LB-2000 (Product Code LB2000)	ITW Fluid Products Group 3624 West Lake Ave. Glenview, IL 60025 USA
		PMC 9264-2: Accu-Lube (Product Code 79037)	ITW Fluid Products Group 3624 West Lake Ave. Glenview, IL 60025 USA
		PMC 9264-3: Accu-Lube (Product Code 79042)	ITW Fluid Products Group 3624 West Lake Ave. Glenview, IL 60025 USA
		PMC 9264-4: Accu-Lube (Product Code 79030)	ITW Fluid Products Group 3624 West Lake Ave. Glenview, IL 60025 USA
		PMC 9264-5: Accu-Lube (Product Code 79026)	ITW Fluid Products Group 3624 West Lake Ave. Glenview, IL 60025 USA
		PMC 9264-6: Accu-Lube LB-9000 (Product Code LB-9055)	ITW Fluid Products Group 3624 West Lake Ave. Glenview, IL 60025 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Marker	Felt Tip SMPC 198-1 (PW Ref P05-408)	Action Marker Pens, Hi Purity P729	Mark-Tex Corp 160 West Forest Ave. Englewood, NJ 07639 USA
Marker	Metal Tip SMPC 198-2 (PW Ref P05-409)	Action Marker Pens, Hi Purity P747	Mark-Tex Corp 160 West Forest Ave. Englewood, NJ 07639 USA
Marker	Extra Fine Point Black PMC 4557 (PW Ref P05-414)	Pilot SC-UF or SCA-UF Dixon Redisharp	Pilot Corp. of America 60 Commerce Drive Trumbull, CT 06611-5403 Dixon Ticonderoga Co. 195 International Parkway Heathrow, FL 32746 USA
Marker	Felt Tip, Rapid Drying (PW Ref P05-423) *[16]	PMC 4050-1 (Black, Chisel Point) Deluxe Marker #10101 or King Size Marker #15101 or TEC #13501 Broad Tip or Magnum 44 #44101	Sanford Corp. 2711 Washington Blvd. Bellwood, IL 60104

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
		PMC 4050-2 (Black, Chisel Point) Deluxe Marker #10103 or Magnum 44 #44103 or King Size Marker #15103	Sanford Corp. 2711 Washington Blvd. Bellwood, IL 60104
		PMC 4050-2 (Blue, Chisel Point) Marks-A-Lot (08886 or 17886) Magnum 44 #44103 or King Size Marker #15103. (Discontinued; use remaining supplies)	Avery Dennison (For Orders) (Was: Dennison Mfg. Co., Identification Systems Div.) 50 Pointe Drive Brea, CA 92821-3699 USA
		PMC 4050-3 (Red, Chisel Point) Deluxe Marker #10102 or Magnum 44 #44102 or King Size Marker #15102	Sanford Corp. 2711 Washington Blvd. Bellwood, IL 60104
	*[16] *[18]	PMC 4050-4 (Black, Fine Point) TEC #13401 Fine Tip or Sharpie 30000 Series - Black (Product Code #30001)	Sanford Corp. 2711 Washington Blvd. Bellwood, IL 60104
	*[16] *[18]	PMC 4050-4 (Black, Fine Point) Dixon Redi-Sharp	Dixon Ticonderoga Co. (World Headquarters) 195 International Parkway Heathrow, FL 32746 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
		PMC 4050-5 (Green, Fine Point) Deluxe Marker #10104	Sanford Corp. 2711 Washington Blvd. Bellwood, IL 60104
	*[17]	PMC 4050-6 (Blue, Fine Point) Sharpie 30000 Series - Blue (Product Code #30003)	Sanford Corp. 2711 Washington Blvd. Bellwood, IL 60104 USA
	*[18]	PMC 4050-7 (Red, Fine Point) Sharpie 30000 Series - Red (Product Code #30002)	Sanford Corp. 2711 Washington Blvd. Bellwood, IL 60104 USA
		PMC 4050-8 (Green, Fine Point) Carter's Permanent Marker or Marks-A-Lot	Avery Dennison 50 Pointe Drive Brea, CA 92821 USA
		PMC 4050-9 (Red, Chisel Point) Carter's Permanent Marker or Marks-A-Lot	Avery Dennison 50 Pointe Drive Brea, CA 92821 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
		PMC 4050-10 (Yellow, Fine Point) Sharpie 30000 Series (Product Code #30005)	Sanford Corp. 2711 Washington Blvd. Bellwood, IL 60104 USA
		PMC 4050-11 (Black, Extra Fine) Sharpie 35000 Series (Product Code #35001)	Sanford Corp. 2711 Washington Blvd. Bellwood, IL 60104 USA
	*[18]	PMC 4050-12 (Red, Extra Fine) Sharpie 35000 Series (Product Code #35002)	Sanford Corp. 2711 Washington Blvd. Bellwood, IL 60104 USA
		PMC 4050-13 (Blue, Extra Fine) Sharpie 35000 Series (Product Code #35003)	Sanford Corp. 2711 Washington Blvd. Bellwood, IL. 60104 USA
		PMC 4050-14 (Black, Ultra Fine) Sharpie 37000 Series (Product Code #37001)	Sanford Corp. 2711 Washington Blvd. Bellwood, IL. 60104 USA
	*[18]	PMC 4050-15 (Red, Ultra Fine) Sharpie 37000 Series (Product Code #37002)	Sanford Corp. 2711 Washington Blvd. Bellwood, IL. 60104 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
		PMC 4050-16 (Blue, Ultra Fine) Sharpie 37000 Series (Product Code #37003)	Sanford Corp. 2711 Washington Blvd. Bellwood, IL. 60104 USA
	*[18]	PMC 4050-17 (Black, Bold/ Fine) Sharpie 33000 Series (Product Code #33001)	Sanford Corp. 2711 Washington Blvd. Bellwood, IL. 60104 USA
	*[18]	PMC 4050-18 (Red, Bold/Fine) Sharpie 33000 Series (Product Code #33002)	Sanford Corp. 2711 Washington Blvd. Bellwood, IL. 60104 USA
		PMC 4050-19 (Blue, Bold/Fine) Sharpie 33000 Series (Product Code #33003)	Sanford Corp. 2711 Washington Blvd. Bellwood, IL. 60104 USA
		PMC 4050-20 Black, Fine Tip TEC #13401	Sanford Corp. 2711 WashingtonBlvd. Bellwood, IL. 60104 USA
		PMC 4050-21 TEC #13501 Broad Tip *[7]	
		PMC 4050-22 (Metallic Silver, Fine Tip)	Sanford Corp. 2711 Washington Blvd. Bellwood, IL. 60104 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Marker	Felt Tip PMC 4421 (PW Ref P05-425)	(Replaced by PMC 4050, PW Ref P05-423)	
Marking Pen	Permanent, Trace Element Certified (TEC) PMC 4556-1 (PW Ref P05-415)	(Deleted Replaced by PMC 4050-20, PW Ref P05-423)	
Marking Pen	Paint PMC 4554 (PW Ref P05-417)	63613 White and 63605 Yellow	Sanford Corp. 2711 Washington Blvd Bellwood, IL 60104 USA
Marker	High Purity (Blue) PMC 4563-1 (PW Ref: P05-470)	High Purity Action Marker 44 (44534) Medium Tip	ITW Dykem (Was: Dykem Co.) 805 East Old 56 Highway Olathe, KS 66061 USA
Marker	High Temperature (Blue) PMC 4563-2 (PW Ref P05-471)	High Temperature Action Marker 44 (44094) Medium Tip	ITW Dykem (Was: Dykem Co.) 805 East Old 56 Highway Olathe, KS 66061 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Marker	High Temperature (Blue) PMC 4563-3 (PW Ref P05-471)	High Temperature Action Marker 33 - Fine Tip (Special Order)	ITW Dykem (Was: Dykem Co.) 805 East Old 56 Highway Olathe, KS 66061 USA
Marker	High Purity (Black) Trace Element Certified PMC 4564 (PW Ref P05-472)	High Purity Fine Line 33 (33404)	ITW Dykem/Dymon (Was: Dykem Co.) 805 East Old 56 Highway Olathe, KS 66061 USA
Methylene Chloride	(PW Ref P11-029)	MIL-D-6998 (latest revision)	Local Purchase
Methyl Propyl Ketone	(MPK)		Local Purchase
Methyl Ethyl Ketone	(MEK)	Technical Grade	Local Purchase
Mold Release (PMC 1104)	Agent for Silicone (Water-Based)	Perma-Mold 2580W	Chem Trend Inc. 1445 W. Mcpherson Park Dr. Howell, MI. 48843 - 3947

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Mold Release (PWA 36007 -1) (Aerosol)		MS-122AD or MS-122XD (Solvent Based) *[3] (PW Ref: P05-133)	Miller-Stephenson Chemical Co., Inc. 55 Backus Ave. Danbury, CT. 06813 USA
Mold Release (PWA 36007 -2) (Aerosol)		MS-143DF (Solvent-Based) *[3]	Miller-Stephenson Chemical Co. Inc. 55 Backus Av. Danbury, CT. 06810-0000
Muscovite	Wet Ground (PW Ref P05-114)	No. 12	Suflex, Inc. A Div. of Quin-T 55 Main Street New Market, NH 03857 USA
Nitrogen (PMC 2214)			Linde Gas LLC 6055 Rockside Woods Blvd Cleveland, OH 44101 - 4737
Oil	Gage Lubricant and Penetrating Oil PMC 9534 (PW Ref P03-007)	Marvel Mystery Oil	Marvel Oil Co., Inc. 331-337 N. Main St. Port Chester, NY 10573

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Oil	Preservation, Fuel System PMC 9852 (PW Ref P03-002)	MIL-PRF-6081, Grade 1010 (latest revision) (except viscosity at -40 deg F (-40 deg C) may be 3300 cs maximum):	
		Royce 481	Anderol, Inc. 215 Merry Lane P.O. Box 518 E. Hanover, NJ 07936 USA
		Winsor L110-A	Fuchs Lubricants Co. 281 Silver Sands Road P.O. Box 328 E. Haven, CT 06512 USA
		Brayco 460	Castrol Industrial Americas 1001 West 31st Street Downers Grove, IL 60515
Oil	Lubricating (PW Ref P03-010)	STP Oil Treatment	STP Corp. 5300 Broken Sound Blvd NW Boca Raton, FL 33431 USA
Oil	Mineral Seal PMC 9002	Renosolv 0L5MS	Fuchs Lubricants Co. 281 Silver Sands Road P.O. Box 328 East Haven, CT 06512 USA
Oil	Lubricating (PW Ref P03-004)	MS0240	Hamilton Sundstrand Corp. 4747 Harrison Avenue Rockford, IL 61125 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Oil	Lubricating Molybdenum Disulfide, Silicone Base (PW Ref P03-005)	MIL-L-25681 (latest revision)	Bel-Ray Co., Inc. 1201 Bowan Avenue Wall, NJ 077149 USA
Oil	Lubricating (Low Temperature) PMC 9851 (PW Ref P03-006)	MIL-L-7870 (latest revision) Instrument Oil	Exxon Mobil Corp. 3225 Gallows Road - Room 4W917 Farifax, VA 22037 USA
Oil	Lubricating (PW Ref P03-009)	MIL-L-23699 (latest revision)	Local Purchase
Oil	Corrosion Preventive, Thin Film, Fingerprint Removing, AMS 3065 (PW Ref P05-035)	(Deleted)	
Oil	Lubricating, Turbine Engine PWA 521	See Pratt & Whitney Service Bulletin No. 238	
Oil (PMC 9123)	Lubricating and Preservation, Aircraft Instrument and Bearings, Low Volatility	MIL-PRF-6085	LOCAL

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Oil (PWA 521)	Lubricant, Aircraft Turbine Engine, (Synthetic Base)	Type I, (Latest Revison) MIL-PRF-7808, Grade 3	Not Listed
		Type II, (Latest Revison) MIL-PRF-23699, All Classes	Not Listed
Pad	Scrub PMC 4095 (PW Ref P05-421)	Scotch Brite #7447 General Purpose Pads	3M Co., Abrasive Systems Division, 3M Center, Building 0223-06-N-01 Saint Paul, MN 55144-1000 USA
		Norton #747 Non-woven Pad	Saint-Gobain Ceramics & Plastics, Inc. (DBA Saint-Gobain Ceramic Materials) 1 Bond Street P.O. Box 15137 Worchester, MA 01615-0137
		54902	Weiler Brush Co. 1 Wildwood Drive RD 1 P.O. Box 149 Cresco, PA 18326 USA
Pad	Scrub PMC 4435 (PW Ref P05-422)	Scotch Brite #7448 Ultra Fine Pads	3M Co., Abrasive Systems Division 3M Center, Building 0223-06-N-01 Saint Paul, MN 55144-1000 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Paint	(Red-Color No. 11136)	MIL-PRF-85285 Type I FED STD-595	LOCAL
Paper	Abrasive (PW Ref P05-132)	Light Grade 0	Local Purchase
Paper	Abrasive, Silicone Carbide (PW Ref P05-253)	180 Grit	Tyrolit North America, Inc. 12 Union St. Westborough, MA 01581 USA
Paper	Aluminum Oxide (PW Ref P05-094)		Local Purchase
Paper	Emery (PW Ref P05-055)	#200-325 Grit	Local Purchase
Paper	Emery (PW Ref P05-056)	60 Grit	Local Purchase
Paper	Kraft Light Duty, PMC 4127 (PW Ref P05-203)	40 lb. Kraft Paper	Local Purchase
Paper	Kraft, Medium Duty PMC 4128 (PW Ref P05-155)		Local Purchase
Paper	Polishing (PW Ref P05-098)	4/0	Local Purchase

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Pen	(PW Ref P05-044)	Marks-A-Lot	Avery Dennison 50 Pointe Drive Brea, CA 92821 USA
Pen	Marker PMC 4092 (PW Ref P05-045)	PMC 4092-1: (Replaced by PMC 4050-7, PW Ref P05-423) PMC 4092-2: (Replaced by PMC 4050-12, PW Ref P05-423)	
Pencil	Metal Marking PMC 4059 (PW Ref P05-018)	PMC 4059-2 (Blue): Stock No. 02443 for Prismacolor Verithin 741 -Or- Stock No. 20044 for Col-Erase 1276 -Or- Stock No. 03332 for Prismacolor Thick Lead 901	Sanford Corp. 2711 Washington Blvd. Bellwood, IL 60104 USA
		PMC 4059-3 (Green): Stock No. 03341 for Prismacolor Thick Lead 910 -Or- Stock No. 20046 for Col-Erase 1278	Sanford Corp. 2740 Washington Blvd. Bellwood, IL 60104 - 1940

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
		PMC 4059-5 (Pink): Stock No. 03357 for Prismacolor Thick Lead 929	Sanford Corp. 2711 Washington Blvd. Bellwood, IL 60104 USA
		PMC 4059-6 (Red): Stock No. 03351 for Prismacolor Thick Lead 922 -Or- Stock No. 00750 for Prismacolor Verithin 750 -Or- Stock No. 20045 for Col-Erase 1277 -Or- Stock No. 20066 for Col-Erase 1297	Sanford Corp. 2711 Washington Blvd. Bellwood, IL 60104 USA
		PMC 4059-7 (Silver): Stock No. 02460 for Prismacolor Verithin 753 -Or- Stock No. 03375 for Prismacolor Thick Lead 949	Sanford Corp. 2711 Washington Blvd. Bellwood, IL 60104 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
		PMC 4059-8 (White): Stock No. 02429 for Prismacolor Verithin 734 -Or- Stock No. 03365 for Prismacolor Thick Lead 938 -Or- Stock No. 20055 for Col-Erase 1286	Sanford Corp. 2711 Washington Blvd. Bellwood, IL 60104 USA
		PMC 4059-9 (Yellow): Stock No. 03346 for Prismacolor Thick Lead 916 -Or- Stock No. 02431 for Prismacolor Verithin 735	Sanford Corp. 2711 Washington Blvd. Bellwood, IL 60104 USA
		PMC 4059-10 (Red): Stock No. 00750 for Prismacolor Verithin 750	Sanford Corp. 2711 Washington Blvd. Bellwood, IL 60104 USA
		PMC 4059-11 (Orange): Stock No. 02435 for Prismacolor Verithin 737 -Or- Stock No. 03348 for Prismacolor Thick Lead 918	Sanford Corp. 2711 Washington Blvd. Bellwood, IL 60104 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
		PMC 4059-12 (Dark Green) Stock No. 20046 for Col-Erase 1278	Sanford Corp. 2740 Washington Blvd. Bellwood, IL 60104 - 1940
Pencil	Glazed Surfaces, Marking MISC 41 (PW Ref P05-023)	(Deleted, Use PMC 4058, PW Ref P05-232)	
Penetrant	Fluorescent, Water Washable, Normal Sensitivity (Level 2) (PW Ref P05-424)	PMC 4351-1 Ely Chemical 4455	Ely Chemical Co., Ind. Lisle Lane Ely CB7 4A5, United Kingdom
		PMC 4351-2 Magnaflux ZL60D	Magnaflux Corp. Div. of Illinois Tool Works, Inc. 3624 W. Lake Avenue Glenview, IL 60025 USA
		PMC 4351-3 Sherwin HM406	Sherwin, Inc. 5530 Borwick Avenue South Gate, CA 90280 USA
		PMC 4351-4 Marktec P121	Marktec Corp. 3-10, Sanno 2-Chome OHTA-KU Tokyo, Japan
		PMC 4351-5 (Deleted)	

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
		PMC 4351-6 Chemetall 970-P24	Chemetall GmbH Trakehner Strasse 3 D-60487 Frankfurt am Main, Germany Chemetall Plc 65 Denbigh Road Bletchley Milton Keynes, MK1 1PB United Kingdom Chemetall Oakite 50 Valley Road Berkeley Heights, NJ 07922 USA Chemetall Oakite 16961 Knott Avenue La Mirada, CA 90638 USA
		PMC 4351-7 Met-L-Chek FP-922	Met-L-Chek Co. 1639 Euclid Street Santa Monica, CA 90404

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Penetrant	Fluorescent, Post-Emulsified, High Sensitivity (Level 3) (PW Ref P05-032)	PMC 4353-1 600	Ely Chemical Co., Ltd. Lisle Lane Ely CB7 4A5, United Kingdom
		PMC 4353-2 ZL27A	Magnaflux Corp. Div. of Illinois Tool Works, Inc. 3624 W. Lake Avenue Glenview, IL 60025 USA
		PMC 4353-3 RC65	Sherwin, Inc. 5530 Borwick Avenue South Gate, CA 90280 USA
		PMC 4353-4 P230	Marktec Corp. 3-10, Sanno 2-Chome OHTA-KU Tokyo, Japan
		PMC 4353-5 (Deleted)	
		PMC 4353-6 985-P13	Chemetall GmbH Trakehner Strasse 3 D-60487 Frankfurt am Main, Germany Chemetall Plc 65 Denbigh Road Bletchley Milton Keynes, MK1 1PB United Kingdom Chemetall Oakite 50 Valley Road Berkeley Heights, NJ 07922 USA Chemetall Oakite 16961 Knott Avenue La Mirada, CA 90638 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
		PMC 4353-7 FP95A(M)	Met-L-Chek Co. 1639 Euclid Street Santa Monica, CA 90404
		PMC 4353-8 F-6A/1P	Eishin Kagaku Co., Ltd. 1-2-13, Higashi- Shinbashi, Minato-Ku Tokyo, Japan
Penetrant	Fluorescent, Post- Emulsified, Normal Sensitivity (Level 2) (PW Ref P05-234)	PMC 4352-1 555	Ely Chemical Co., Ltd. Lisle Lane Ely CB7 4A5, United Kingdom
		PMC 4352-2 ZL2C	Magnaflux Corp. Div. of Illinois Tool Works, Inc. 3624 W. Lake Avenue Glenview, IL 60025 USA
		PMC 4352-3 RC50	Sherwin, Inc. 5530 Borwick Avenue South Gate, CA 90280 USA
		PMC 4352-4 P220	Marktec Corp. 3-10, Sanno 2-Chome OHTA-KU Tokyo, Japan
		PMC 4352-5 (Deleted)	

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
		PMC 4352-6 985-P12	Chemetall GmbH Trakehner Strasse 3 D-60487 Frankfurt am Main, Germany Chemetall Plc 65 Denbigh Road Bletchley Milton Keynes, MK1 1PB United Kingdom Chemetall Oakite 50 Valley Road Berkeley Heights, NJ 07922 USA Chemetall Oakite 16961 Knott Avenue La Mirada, CA 90638 USA
		PMC 4352-7 FP93A(m)	Met-L-Chek Co. 1639 Euclid Street Santa Monica, CA 90404
		PMC 4352-8 F-5-SP/1P	Eishin Kagaku Co., Ltd. 1-2-13, Higashi- Shinbashi, Minato-Ku Tokyo, Japan

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Penetrant	Fluorescent, Post-Emulsified, Ultra-High Sensitivity (Level 4) (PW Ref P05-235)	PMC 4354-1 668A	Ely Chemical Co., Ltd. Lisle Lane Ely CB7 4A5, United Kingdom
		PMC 4354-2 ZL37	Magnaflux Corp. Div. of Illinois Tool Works, Inc. 3624 W. Lake Avenue Glenview, IL 60025 USA
		PMC 4354-3 RC77	Sherwin, Inc. 5530 Borwick Avenue South Gate, CA 90280 USA
		PMC 4354-4 P240	Marktec Corp. 3-10, Sanno 2-Chome OHTA-KU Tokyo, Japan
		PMC 4354-5 (Deleted)	
		PMC 4354-6 985-P14	Chemetall GmbH Trakehner Strasse 3 D-60487 Frankfurt am Main, Germany Chemetall Plc 65 Denbigh Road Bletchley Milton Keynes, MK1 1PB United Kingdom Chemetall Oakite 50 Valley Road Berkeley Heights, NJ 07922 USA Chemetall Oakite 16961 Knott Avenue La Mirada, CA 90638 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
		PMC 4354-7 FP97A(M)	Met-L-Chek Co. 1639 Euclid Street Santa Monica, CA 90404
		PMC 4354-8 F-6A-SP/1P	Eishin Kagaku Co., Ltd. 1-2-13, Higashi- Shinbashi, Minato-Ku Tokyo, Japan
Penetrant	Fluorescent, Water Washable (PW Ref P05-208)	PMC 4350-1 thru -7 (Deleted) Use P05-424	
Penetrant	Fluorescent, Water Washable, High Sensitivity (Level 3) (PW Ref P05-236)	PMC 4360-1 446	Ely Chemical Co., Ltd. Lisle Lane Ely CB7 4A5, United Kingdom
		PMC 4360-2 ZL67	Magnaflux Corp. Div. of Illinois Tool Works, Inc. 3624 W. Lake Avenue Glenview, IL 60025 USA
		PMC 4360-3 HM604	Sherwin, Inc. 5530 Borwick Avenue South Gate, CA 90280 USA
		PMC 4360-4 P130	Marktec Corp. 3-10, Sanno 2-Chome OHTA-KU Tokyo, Japan
		PMC 4360-5 (Deleted)	

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
		PMC 4360-6 970-P25E	Chemetall GmbH Trakehner Strasse 3 D-60487 Frankfurt am Main, Germany Chemetall Plc 65 Denbigh Road Bletchley Milton Keynes, MK1 1PB United Kingdom Chemetall Oakite 50 Valley Road Berkeley Heights, NJ 07922 USA Chemetall Oakite 16961 Knott Avenue La Mirada, CA 90638 USA
		PMC 4360-7 FP-923	Met-L-Chek Co. 1639 Euclid Street Santa Monica, CA 90404
		PMC 4360-8 F-4A-C/1P	Eishin Kagaku Co., Ltd. 1-2-13, Higashi- Shinbashi, Minato-Ku Tokyo, Japan

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Perchlor-ethylene	PMC 9015 (PW Ref P11-012)	O-T-236	Local Purchase
Petrolatum	White PMC 9609 (PW Ref P06-002)	White Fonoline or White Protopet 1S	Sonneborn, LLC 575 Corporate Drive Suite 415 Mahwah, NJ 07430 USA
		Vaseline	Chesebrough-Ponds, Inc. 33 Benedict Place Greenwich, CT 06830 USA
		Penreco Regent or Penreco Snow	Penreco, Div. of Pennzoil - Quaker State Co. 138 Petrolia Street Karns City, PA 16041 USA
Primer	PWA 549-5 (PW Ref P18-002)	Type No. 242 (Locquic Primer T)	Henkel Loctite Corp. 1001 Trout Brook Crossing Rocky Hill, CT 06067 USA
Primer	Silicone Rubber PWA 556 (an approved alternate to PWA 36466) (PW Ref P05-015) (PW Ref P18-009)	DC-1200 (Red or Clear - use Red when indicating color is necessary)	Dow Corning Corp. 2200 W. Salzburg Road Midland, MI 48640-8531 USA AGC, Inc. 106 Evansville Avenue Meriden, CT 06450 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Primer	Epoxy Polyamide (PW Ref P18-001)		Kop-Coat, Inc. 5431 District Blvd. Los Angeles, CA 90040
Primer (P18-018)	Epoxy, Corrosion Inhibiting (PW Ref 36515)	44-GN-36 (Preferred) - or - 44-GM-54	Deft, Inc. 17451 Von Karmen Avenue Irvine, CA 92614 USA
Primer	Strontium Chromate (PW Ref P18-004)	Type A-136-2CP	Ameritex Chemical and Coatings Co., Inc. 801 E. Lee Street Irving, TX 75060 USA
Primer	Zinc Chromate (PW Ref P18-003) (Alternate to P18-023)	FED-TT-P-1757 AMS 3110 (Alternate to AMS 3117)	Local Purchase Randolph Products Co. 701 12th Street Carlstadt, NJ 07072 USA
Primer AMS 3117	Zinc Molybdate (PW Ref P18-023)	(Light Yellow)	Local
			Randolph Products Co., Inc. 33 Haynes Circle Chicopee, MA 01020 USA
	TT-P-645B		Local
			The Sherwin-Williams Company 2390 Arbor Boulevard Dayton, OH 45439 USA
			Randolph Products Co., Inc. 33 Haynes Circle Chicopee, MA 01020 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Primer, Epoxy (PWA 36568)	Room Temperature Curing - Chromate Free, Low Volatile Organic Compound Content	Primer Base (IP-714A Base) Curing Solution (IP-714B Catalyst) (PW Ref P18-024)	Indestructible Paint, Inc. 66 Erna Avenue Midford, CT 06460-3115 USA 06460-3115 USA
Primer, Epoxy	P18-020	PWA 36519-1 EEAE 152 A/B Eco-prime PWA 36519-2 EWAE 118 A/B ECO-prime	PRC-DeSoto International, Inc., PPG Aerospace Div. 823 East Gate Drive, Unit 4 Mount Laurel, NJ 08054-1202 USA
Release Agent	Fluoro-carbon (PW Ref P05-113)		Miller-Stephenson Chemical Co., Inc. 55 Backus Avenue Danbury, CT 06813 USA
Release	Mold (When PWA 36007 is specified, use PWA 36007-1 or -3. When -1 is specified, use -1, -2 or -3, as applicable. See P05-355 for a water-based alternative.) (PW Ref P05-133)	PWA 36007-1 (Aerosol): MS122N/C02 (Solvent-based) PWA 36007-2 (Liquid): MS143DF (Solvent-based) PWA 36007-3 (Liquid): RCTW 9080 (Water-based; Preferred for environmental reasons)	Miller-Stephenson Chemical Co., Inc. 55 Backus Avenue Danbury, CT 06813 USA Miller-Stephenson Chemical Co., Inc. 55 Backus Avenue Danbury, CT 06813 USA Chem-Trend, Inc. 1445 West McPherson Park Drive P.O. Box 860 Howell, MI 48844 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Agent PMC 1108	Mold Release (For Composite Parts, Water Base)	Watershield (PW Ref: P05-355)	Zyvax, Inc. 1388 NW 2nd Avenue Suite 5 P. O. Box 825 Boca Raton, FL 33429-0825 USA
Rod	Abrasive Rubberized (PW Ref P05-050)	0.375 OD x 6 inch (9.525 OD x 152.400 mm) 0066XF	Cratex Mfg. Co., Inc. 328 Encinitas Blvd - Suite 200 Encinitas, CA 92024 USA
Rust Inhibitor	(PW Ref P05-106)	NR-40	Enthone-OMI, Inc. 350 Frontage Road West Haven, CT 06516 USA
Salts	Chromate Conversion, Aluminum PMC 1631 (PW Ref P05-029)	Iridite No. 14-2 Compound	MacDermid, Inc. 245 Freight Street Waterbury, CT 06702 USA
Sealant	Silicone Rubber PMC 9926 (PW Ref P09-003)	DC-4	Dow Corning Corp. 2200 W. Salzburg Road Midland, MI 48640-8531 USA
Sealant	Silicone Rubber PWA 36029-1 (use when PWA 36029 is specified without a suffix) (PW Ref P09-029)	Silicone Rubber Sealant - Catalog No. 732 (Paste)	Dow Corning Corp. 2200 W. Salzburg Road Midland, MI 48640-8531 USA Dow Corning S.A. Parc Ind. Zone C Seneffe, Belgium

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Sealant	(PW Ref P09-017)	Scotch Seal Temper Proof Sealant No. 1252	3M Company Tape and Specialties Div. 3M Center, Bldg 220-7E-01 St. Paul, MN 55144 USA
Sealant	(PW Ref P09-018)	RTV DC 3145	Dow Corning Corp. 2200 W. Salzburg Road Midland, MI 48640-8531 USA
Sealant	Silicone Rubber, Flame Resistant PWA 36751-1 (PW Ref P09-019)	Dapco No. 18-4F	D. Aircraft Products 1191 N. Hawk Circle Anaheim, CA 92807 USA Adchem, Inc. 369 Progress Drive Suite 101 Manchester, CT 06040 USA FMI Paint & Chemicals 158 Hartford Road Manchester, CT 06040 USA
Sealant	Silicone Rubber PWA 36029-1 (Use when PWA 36029 is specified without a suffix) (PW Ref P09-029)	Silicone Rubber Sealant - Catalog No. 732 (Paste)	Dow Corning Corp. 2200 W. Salzburg Road Midland, MI 48640-8531 USA Dow Corning S.A. Parc Ind. Zone C Seneffe, Belgium Dow Corning Corp. 760 Hodgenville Road Elizabethtown, KY 42701

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Sealant	Silicone Rubber PWA 36003-1 (Use when PWA 36003 is specified without a suffix) (PW Ref P09-014) without a suffix) (PW Ref P09-014)	RTV-159 (Red)	GE Silicones (Was: General Electric Co., Silicone Sales Dept.) ATTENTION: Customer Service 260 Hudson River Road Waterford, NY 12188 USA
Sealant	Silicone Rubber PWA 36003-2	RTV-157 (Gray)	Momentive Performance Materials, Inc. (Bought out General Electric Co., Rubber & Fluid Products Dept.) 260 Hudson River Road Waterford, NY 12188 USA
Sealant	Compund (PW Ref P09-035)	MIL-S-83430 Class B 1/2 PR-1750, Class B (Latest Revision)	Local Purchase
Sealant	Silicone Rubber PWA 36028 (PW Ref P09-051)	RTV630	GE Silicones (Was General Electric, Inc.) Attn: Customer Service 260 Hudson River Road Waterford, NY 12188 USA
Slurry	(PW Ref P11-016)	Sol 795	Local Purchase
Solder	FED-QQ-S-571-SB5 (PW Ref P05-116)	Kester No. 955	Kester Solder Div. of Litton Systems, Inc. 4201 Wrightwood Ave. Chicago, IL 60639 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Solder	(PW Ref P05-119)	FED-QQ-S-571-Sn50	Kester Solder Div. of Litton Systems, Inc. 4201 Wrightwood Ave. Chicago, IL 60639 USA
Solder	(PW Ref P05-120)	FED-QQ-S-571-Sn63	Kester Solder Div. of Litton Systems, Inc. 4201 Wrightwood Ave. Chicago, IL 60639 USA
Solution	Chromate Conversion Salts, Aluminum, PMC 1794 (PW Ref P05-028)	Alodine #600	Henkel Surface Technologies 32100 Stephenson Hwy Madison Heights, MI 48071 USA
Solution	Chromate Conversion Salts, Aluminum, PMC 1794 (PW Ref P05-028)	Alodine #600	Henkel Surface Technologies 32100 Stephenson Hwy Madison Heights, MI 48071 USA
Solution, Cleaning (P11-002)	(Deleted) *[13]		

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Solution, Cleaning (P11-037)	(Deleted)		
Solution, Cleaning (P11-038)	(Deleted) *[14]		
Solvent Stoddard	Petroleum, MIL-PRF-680 PMC 9001 (PW Ref P11-027)	Flash Point, TCC Type II, 141°F - 199°F (60°C - 93°C) or Flash Point, TCC Type III, 200°F - 241°F (93°C - 116°C)	Local Purchase Local Purchase
Solvent	Trichlorethylene PMC 9004 (PW Ref P11-013)	O-T-634, Type II	Local Purchase
Solvent	Trichloro-trifluorethane PMC 9087 (Deleted, use PMC 9094 (P11-014)) (PW Ref P11-006)	Freon TF	

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Solvent	(PW Ref P11-024)	Butyl Cellosolve	Danbury Union Carbide Corp. 39 Old Ridgebury Road Danbury, CT 06817 USA
Solvent	Chemical (PW Ref P05-085)	Dioxane	Local Purchase
Solvent	Reducer PWA 36050 (PW Ref P05-063)	Thinning Agent 020x324	PRC-DeSoto International, Inc. PPG Industries Div. 823 East Gate Drive, Unit 4 Mount Laurel, NJ 08054-1202 USA
Solvent Reducer (PWA 36106)	P05-482	IP-715 Solution Reducer	Indestructible Paint, Inc. 66 Erna Avenue Midford, CT 06460-3115 USA Indestructible Paint, Inc. 1 Independence Drive Monroe, CT 06468 USA
Solvent	Cleaner PMC 8914 (PW Ref P11-055)	Envirosol 655 PMC 8914-1: Aerosol PMC 8914-2: 1 gallon (3.79 liter) container	Fine Organics Corp. 205 Main Street Lodi, NJ 07644 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Solvent	Cleaner PMC 9060 (PW Ref P11-039)	DeSoClean 45	PRC-DeSoto International Inc. 823 East Gate Drive Mount Laurel, NJ 08054
Solvent	Cleaner SPMC 156 (PW Ref P11-056)	MAG-CHEM TekSol	MagChem, Inc. 1271 Ampere Boucherville, Quebec Canada, J4B 2X3 - Or - Socomor Finishing Tech. Zone Industrielle du Prat R.P. 3707 56037 Vannes, Cedex, France
Solvent	Cleaner SPMC 168 (PW Ref P11-057)	Aviation C.I.C. Remover	CRC Industries, Inc. 885 Louis Drive Box 5000 Warminster, PA 18974 USA
Solvent	Cleaner SPMC 175 (PW Ref P11-058)	Quantum 2000 (CE-SX-94)	Selig Industries 1420 Seaboard Industrial Blvd. Atlanta, GA 30318 USA
Solvent	Cleaner SPMC 176 (PW Ref P11-059)	Isoblast (GB-SX-94)	Selig Industries 1420 Seaboard Industrial Blvd. Atlanta, GA 30336 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Solvent	Cleaner SPMC 179 (PW Ref P11-060)	CRC Precision Plus Cleaner	CRC Industries, Inc. 885 Louis Drive Box 5000 Warminster, PA 18974 USA
Solvent	Cleaner SPMC 185 (PW Ref: P11-064)	Cynergy (L-SX-94)	Selig Industries 1420 Seaboard Industrial Boulevard Atlanta, GA 30318 USA
Solvent	Cleaner SPMC 213-1	Skysol Wipe Solvent	Magnus Chemicals LTD 190 Industrial Blvd Boucherville, Canada J4B 2X3 Socomor Satelecom Business Directions ZI DU Prat P.O. Box BP 3707 Vannes, France 56000
Solvent	Wipe, Cleaner SPMC 213-2	Skysol Wipe	Magnus Chemicals LTD 190 Industrial Blvd Boucherville, Canada J4B 2X3

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
		Solvent Presaturated Wipes	Contec Inc 525 Locust Grv Spartanburg, SC 29303 - 3483
Solvent	Cleaner SPMC 216-1	Lotoxane	Reabrook LTD T/A Arrow Chemicalspeter Raos Rawdon Road Moira Swadlincote, UK DE12 6DA
		Fast	Atlanco of South Carolina 2 Bomar Street Inman, SC 29349
Solvent	Wipe, Cleaner SPMC 216-2	Lotoxane	Reabrook LTD T/A Arrow Chemicalspeter Raos Rawdon Road Moira Swadlincote, UK DE12 6DA
		Fastwipes	Atlanco of South Carolina 2 Bomar Street Inman, SC 29349

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Solvent	Cleaning PMC 9010 140°F Flash Point (PW Ref P11-004)	ARDROX 5412	Chemetall GmbH Trakehner Strasse 3 D-60487 Frankfurt am Main, Germany Chemetall Plc 65 Denbigh Road Bletchley Milton Keynes, MK1 1PB United Kingfdon Chemetall Oakite 50 Valley Road Berkeley Heights, NJ 07922 USA Chemetall Oakite 16961 Knott Avenue La Mirada, CA 90638 USA
		SAFETY-KLEEN Premium Solvent #6605	Safety-Kleen Corp. 1301 Gervais Blvd. - Suite 300 Columbia, SC 29201 USA
		Solvent 142 3% Aromatics Maximum	Ashland Chemical Co., A Div. of Ashland Oil, Inc. P.O. Box 2219 Columbus, OH 43216 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Solvent	Methyl Propyl Ketone (MPK)		Local Purchase
Solvent	Methyl Ethyl Ketone (MEK) PMC 1820 (PW Ref P11-005A)	ACS Reagent Grade	Local Purchase
Solvent	Methyl Ethyl Ketone (MEK) PMC 9076 *[1]	Technical Grade Wt. = 6.7 lbs/gal (804 g/l)	Local Purchase
Solvent	Chlorothene NU (PW Ref P11-007)	O-T-620	Dow Corning Corp. 2200 W. Salzburg Road Midland, MI 48640-8531 USA
Solvent	(PW Ref P11-017)	Oakite 33	Chemetall Oakite 50 Valley Rd. Berkeley Heights, NJ 07922 USA
Solvent	Trichloroethane, 1,1,1 (PW Ref P11-028)	O-T-620	Local Purchase
Solvent	(PW Ref P11-033)	Safety Kleen Solvent Part Cleaner	Safety-Kleen Corp. 1301 Gervais Street Suite 300 Columbia, SC 29201 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Solvent	Degreasing/ Carbon (PW Ref P11-034)	Ardrox 6118 (Medium)	Chemetall GmbH Trakehner Strasse 3 D-60487 Frankfurt am Main, Germany Chemetall Plc 65 Denbigh Road Bletchley Milton Keynes, MK1 1PB United Kingdom Chemetall Oakite 50 Valley Road Berkeley Heights, NJ 07922 USA Chemetall Oakite 16961 Knott Avenue La Mirada, CA 90638 USA
Solvent	Degreasing/ Carbon (PW Ref P11-035)	Ardrox 666 (Heavy)	Chemetall GmbH Trakehner Strasse 3 D-60487 Frankfurt am Main, Germany Chemetall Plc 65 Denbigh Road Bletchley Milton Keynes, MK1 1PB United Kingdom Chemetall Oakite 50 Valley Road Berkeley Heights, NJ 07922 USA Chemetall Oakite 16961 Knott Avenue La Miranda, CA 90638 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Staining Color	(PW Ref P05-089)	Prussian Blue	ITW Dykem/Dymon 805 East Old 56 Hwy Olathe, KS 66061 USA
Stone	Hard Arkansas (PW Ref P05-096)	SS-S-736, Type I	Local Purchase
Stone	Aloxite Resinoid (PW Ref P05-097)	Grade AF-3-K-B Yellow Moonstone	Local Purchase
Stop-Off	PMC 1642 (PW Ref P05-112)	Green Stop-Off (Liquid)	Wall Colmonoy Corp. 30261 Stephenson Hwy Madison Heights, MI 48071 USA
Sponge	Silicone Rubber, 0.40 inch thick (1.016 mm)	PW Ref: P05-303 AMS 3195	Kirkhill-TA Company (DBA SFS Division) 300 E Cypress Street Brea, CA 92821-4007 USA
Sponge	Silicone Rubber, 0.80 inch thick (2.032 mm)	PW Ref: P05-304 AMS 3195	Kirkhill-TA Company (DBA SFS Division) 300 E Cypress Street Brea, CA 92821-4007 USA
Tape	(PW Ref P05-141)	PN 190 L0F 21G	Western Filament, Inc. 630 Hollingsworth St. Grand Junction, CO 81505 USA
Tape	Adhesive (Double Sided) (PW Ref P05-012)	Parmacel 94, 96, 306, ED8112, ED8117, or ST8117	Permacel, A Nitto Denko Co. U.S. Highway 1 P.O. Box 671 New Brunswick, NJ 08903

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Tape	Fiberglass Insulating (PW Ref P05-111)	No. 69	3M Company Tape and Specialties Div. 3M Center, Bldg 220-7E-01 St. Paul, MN 55101 USA
Tape	Heat Reflective (Aluminum Foil Backed, Glass Cloth Laminated) PMC 4235 (PW Ref P05-135) 36 Yard Rolls, Width as follows: -1, -6: 1/2 inch -2, -7: 1 inch -3, -8: 2 inches -4, -9: 4 inches -5, -10: 1/4 inch -11: 1/8 inch -12: 3 inch	-1 thru -12: No. 363	3M Company 3M Center - Building 225-3S-20 St. Paul, MN 55144 USA
		No. 390	Lamart Corp. 16 Richmond Street Clifton, NJ 07011 USA
		No. 407	Dewal Industries, Inc. 15 Ray Trainor Drive P.O. Box 372 Saunderstown, RI 02874
		P-100	Permacel, A Nitto Denko Co. US Highway 1 P.O. Box 671 New Brunswick, NJ 08903
		No. 2925-7	Saint-Gobain Performance Plastics 150 Dey Road Wayne, NJ 07470 USA
		-6 thru -11: No. C642	Saint-Gobain Performance Plastics 150 Dey Road Wayne, NJ 07470 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Tape (PMC 4001)	Masking Tape (Cloth Backing)	tesa 53958	Matsumoto & Co. LTD 2-5-29 Nishi- Howmachi Nishi-Ku Osaka, Japan
		Shurtape PC-622	Shurtape Technologies, LLC. 1506 Highland Avenue NE. Hickory, NC. 28601 USA
Tape (PMC 4273)	High Temperature Glass Cloth Length = 36 or 60 Yard Witdh as follows: -1 = 1/4 inch -2 = 1/2 inch -3 = 1.0 inch -4 = 2.0 inch -5 = 4.0 inch -6 = 6.0 inch -7 = 4.0 inch -8 = 3.0 inch	All Dash numbers except -7: PW Ref P05-136 #361 Glass Cloth Tape	Minnesota Mining and Mfg Co. Industrial Tape And Specialties Div. 3M Center St. Paul, MN 55101
		Permacel #212	Johnson and Johnson Permacel Division U.S. Highway 1 P.O. Box 671 New Brunswick, NJ 08903
		#497	CS Hyde Company, Inc. 1351 N Milwaukee Avenue Lake Villa, Illinois 60046

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Tape	Insulating (Glass Cloth, Adhesive) (PW Ref P05-074)	No. 27	3M Company Tape and Specialties Div. 3M Center, Bldg 220-7E-01 St. Paul, MN 55144 USA
Tape	Lacing (PW Ref P05-245)	BMS13-54 Grade D, Type 3 or Gudebrod 718Z	Gudebrod, Inc. 274 Shoemaker Road Pottstown, PA 19464 USA
Tape	Magic Mending (PW Ref P05-004)		
Tape (PMC 4188)	Fiberglass Polyester Film	PW Ref P05-145 Scotch #8402 or #8403	Minnesota Mining and Mfg Co., Industrial Tape And Specialties Div. 3M Center St. Paul, MN 55101
		Tuck #21	Tuck Industries, Inc. LeFevre Lane New Rochelle, NY 10801
Tape	Masking	PW Ref P05-255 Scotch #8402 or #8403	Minnesota Mining and Mfg Co., Industrial Tape And Specialties Div. 3M Center St. Paul, MN 55101
Tape (PMC 4141)	Moisture Resistant, Green	PW Ref P05-099 Mystik 5863	Borden Chemicals Mystik Tape Div. 60 Happ Rd. Northfield, IL 60093

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
		Permacel No. 691	Johnson and Johnson Permacel Division U.S. Highway 1 P.O. Box 671 New Brunswick, NJ 08903
		Arno No. C505	Ludlow Corp. Packaging Division 111 Mosher St. Molyoke, MA 01040
		Johns-Manville No. 353	Johns-Manville Sales Corp. North Main Manville, NJ 08835
		Seamless No. 70E	Seamless Rubber Co. New Haven, CT 06508
		Tuck No. 91B	Tuck Industries, Inc. LeFevre Lane New Rochelle, NY 10801
		Kendall No.231 or Polyken No. 222	The Kendall Co. Polyken Division 1 Federal St. Boston, MA 02110
		NC-43	National Tape Corp. P.O. Box 23237-Tr New Orleans, LA 70123

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
		CE-1	Armak Industrial Parks 1 Altman Drive Rutherford, NJ 07070
		CP 13B	Chatfield Paper Corp. 3265 Colerain P.O. Box 239 Cincinnati, OH 45214
Tape, Water Resistant (PMC 4141 -1 thru -5	Adhesive (ASTM-D-5486 Type IV), Olive Drab (PW Ref P05-099)	AC50	Intertape Polymer Group, Inc. 317 Kendall Ave Marysville, MI 48040-1911 USA
			Intertape Polymer Management Corp. 3647 Cortez Road West Bradenton, FL 34210-3169
		P-691	Shurtape Technologies LLC 1506 Highland Avenue NE Hickory, NC 28601 USA
		Polyken 231	Polyken Technologoies, A Div. of the Kendall Co. (Was: The Kendall Co., Polyken Div.) 15 Hampshire Street Mansfield, MA 02048 USA
(PMC 4141) -1 thru -6		Tesa 53910	TTI 5825 Carnegie Boulevard Charlotte, NC 28209 USA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Tape, (PWA 36745)	Adhesive Transfer P05-231	Densil 4078K Adhesive Transfer	Flexcon Co., Inc. 1 Flexcon Industrial Park Spencer, MA 01562 USA
		P-691	Permacel Company U S Hwy 1 S 621 US Highway 1 North Brunswick, NJ 08902 - 9601
Tape	Pressure Sensitive Flat Black	#250 PW Ref P05-087	Minnesota Mining and Mfg Co Industrial Tape Div. 3M Center St. Paul, MN 55101
Tape PMC 4096	Pressure Sensitive Polyester (PW Ref: P05-437)	Flashbreaker 1 0.002 inch (0.0508 mm) thick Flashbreaker 2 0.003 inch (0.0762 mm) thick Flashtape 1 0.002 inch (0.0508 mm) thick	Airtech International, Inc. 5700 Skylab Road Huntington Beach, CA 92647-2055 USA Richmond Aircraft 13503 Pumice St Norwalk, CA 90650

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Tape	Fluorocarbon, Pressure Sensitive PMC 4467, -1:	Teflease MG2	Airtech International Inc 5700 Skylab Road Huntington Beach, CA 92647 - 2005
		TM6115	Taconic Plastics LTD Coon Brook Road Petersburg, NY 12138 - 9715
	-2:	Tooltec CSC	Airtech International Inc 5700 Skylab Road Huntington Beach, CA 92647 - 2005
		TM6115-03	Taconic Plastics LTD Coon Brook Road Petersburg, NY 12138 - 9715
	-3 thru -27, -30 thru -37:	TM6115	
	-28:	Tooltec CA5	Airtech International Inc 5700 Skylab Road Huntington Beach, CA 92647 - 2005
Tape	Silicone Glass Cloth	Scotch #361 PW Ref P05-142	Minnesota Mining and Mfg Co. Industrial Tape Div. 3M Center St. Paul, MN 55101
Tape (MISC 256)	Skived TFE	Skived TFE #827	Fornas Engineering Co., Inc Glendale, CA

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Tape	Teflon	6 Mil PW Ref P05-125	CHR Industries Inc. An Amoco Co.ve 407 East St. New Haven, CT 06509
Tape	Tie	PN 190L0F21GIG/A PW Ref P05-057	Electrical Specialties Co. 345 Swift Ave. South San Francisco,CA 94080
Tape, Masking (Crepe Paper Backing)	PMC 4000-1 Thru -8 and -10 (PW Ref P05-376)	PG-500	Armak Co Tape Div 317 Kendall Ave Marysville, MI 48040-1911
	Length: 60 Yards;	PG-16	
	Width/Suffix: 1/8 Inch: (-1, -11, -21)	Clipper Tape 7100	Cantech Industries Inc 2222 Eddie Williams Rd Johnson City, TN 37601
	1/4 Inch: (-2, -12, -22)	P-791	Permacel Company U S Hwy 1 S 621 US Highway 1 North Brunswick, NJ 08902 - 9601
	3/8 Inch: (-3, -13, -23) 1/2 Inch: (-4, -14, -24) 3/4 Inch: (-5, -15, -25) 7/8 Inch: (-6, -16, -26)	#2505 Utility Paper Type or Tartan Brand No. 200 Paper Tape	Minnesota Mining and Mfg Co., Industrial Tape And Specialties Div. 3M Center St. Paul, MN 55101

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Tape, Masking (Crepe Paper Backing)	PMC 4000-1 Thru -8, -10, -20 1 Inch: (-7, -17, -27) 2 Inch: (-8, -18, -28)	PG-21	Armak Co Tape Div 317 Kendall Ave Marysville, MI 48040 - 1911
	PMC 4000-9 4 Inch: (-9, -19, -29) 1-1/2 Inch (10, -20, -30)	PG-500	
	PMC 4000-21 Thru -30 (PW Ref P05-376)		Minnesota Mining and Mfg Co., Industrial Tape And Specialties Div. 3M Center St. Paul, MN 55101
Tape Masking (PMC 4188)	Polyester Film (Mylar) (P05-145)	No. 594 Blue Poly Flexible Tape 24-06BL115	Echo Engineering & Production Supplies, Inc. (DBA Echo Supply) 5406 W 78th Street Indianapolis, IN 46268-4149 USA
Tape	Scotch Magic Mending Tape #810		Minnesota Mining and MFG Co Industrial Tape and Specialties #3M CTR Saint Paul, MN 55144-1000
Tape	Polyurethane (PW Ref P05-473) PMC 4121-8	Scotch 8663 (Black)	Minnesota Mining and MFG Co Industrial Tape and Specialties Div. #3M CTR Saint Paul, MN 55144-1000 USA
Ties	Twist	PW Ref P05-124	Local Purchase

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Top Coat (PWA 36753)	Silicone Rubber	Moldkote 190-2A PW Ref P05-123	Hastings Plastics Co. 1704 Colorado Ave. Santa Monica, CA 90904
Water (PMC 1737)	Demineralized	PW Ref P05-060	Local Purchase
Wax (PMC 9552)	Paraffin	PW Ref P05-059	Exxon Co. P.O. Box 2180 Houston, TX 77001
Wax (PMC 9552)	Paraffin	Parvan 1300	Exxon Mobil Copporation 3225 Gallows Road - RM 5D2116 ATTN Richard L. Phegley/ Kris DAS Fairfax, VA 22037 - 0001
Wax (PMC 9462)	Paraffin Blend (PW Ref P05-396) *[10]	Schaefer No. 7 Wax (1 lb. (0.45 kg) slab)	Schaefer Machine Co., Inc. 200 Commercial Drive Deep River, CT 06417
Webbing	Nylon, Aluminum Oxide	MIL-A-9962 PW Ref P05-093	Local Purchase
Wheel	Nylon, Abrasive Bonded Aluminum Oxide	MIL-W-81319 Class 2, Type I PW Ref P05-092	Local Purchase
Wheel	Buffing	GGG-W-301 PW Ref P05-075	Local Purchase
Wipers	Cotton (Lint free)	PW Ref P05-017	Local Purchase

CONSUMABLE MATERIALS			
TYPE	DESCRIPTION	DESIGNATION	MANUFACTURER AND ADDRESS
Wire	Electrical (White)	MIL-W-22759/ 11-16-9 PW Ref P05-103	Local Purchase
Wire	Welding, AMS 5802	UNS #N19907 PW Ref P05-467	U.S. Welding 3579 Highway 50 East Carson City, NV 89701 USA
			Local Purchase
Wire	Welding, AMS 5823	UNS #S41780 PW Ref P05-468	U.S. Welding 3579 Highway 50 East Carson City, NV 89701 USA
Wire PWA 36947	Nickel-Chromium/ Aluminum Alloy PWA 36947	Type: 73MXC PW Ref P05-478 Type: Pomet 886	TAFA, Inc. 146 Pembroke Road Concord, NH 03301-5706 USA Polymet Corp. 10073 Commerce Park Drive Cincinnati, OH 45246-1333 USA
Wire (P05-475)	Welding, Titanium	Titanium PW Ref: PWA 1281	U.S. Welding 3579 Highway 50 East Carson City, NV 89701 USA
Wool	Stainless Steel Pad (Without Soap)	PW Ref P05-073	Local Purchase

*[1] NOTE: By the Aerospace National Emission Standards for Hazardous Air Pollutants (NESHAP), PMC 9076 (MEK) is not to be ordered/purchased in Middletown or East Hartford without prior EHS approval. For environmentally safer alternate, refer to PMC 9060.

*[2] NOTE: Per the Aerospace National Emission Standards for Hazardous Air Pollutants (NESHAP), procure only denatured alcohol with a vapor pressure of 45 mm Hg or less at 68 degree F (20.0 degree C). Do not denature with methanol.

*[3] NOTE: When PWA 36007 is specified, use PWA 36007-1. When PWA 36007-1 is specified, use PWA 36007-1, or -2 as applicable. See P05-355 for a water based alternative.

*[4] NOTE: PMC 9094-9 must meet the requirements of the latest issue of AMS 3819 (Cloths, Cleaning for Aircraft Primary and secondary Structural Surfaces).

*[5] NOTE: Do not use PMC 9008 for bonding applications where reagent-grade solvent is required. For those applications, PMC 1914 must be used.

*[6] NOTE: When PWA 36751 is specified, PWA 36751-1 must apply. PWA36751-1 is used as filler material for sealing gaps in firewall structures. Compound is applied over a primer. PWA 36751-2 is used as a flame retardant coating and a cryogenic sealant.

*[7] NOTE: Sanford Corporation TEC #13501 Broad Tip (was PMC 4050-21) is not available. It is permitted to use remaining supplies.

*[8] NOTE: It is permitted to substitute semiconductor grade acetone for reagent grade. Semiconductor grade is a higher purity chemical.

*[9] NOTE: The alternative to P05-395 Beeswax is P05-396 Paraffin Wax which is softer and more pliable.

*[10] NOTE: P05-396 Paraffin Wax Blend is softer and more pliable than P05-395 Beeswax or P05-059 Paraffin Wax and can be used as an alternative to these materials.

*[11] NOTE: For blue dye (PMC 4513) preparation, do the Preparation of Blue Dye Oil System Leck Check Solution (AMM 70-00-00/201).

*[12] NOTE: When PWA 36000 is specified with or without a suffix, use PWA 36000. The suffixes that indicated viscosity have been discontinued.

*[13] NOTE: For wipe procedures, replace P11-002 with one of the solvents in Engine Cleaning Requirements After Contamination (SPOP 425) - Maintenance Practices (AMM 70-11-10/201). To clean wiring harnesses, replace P11-002 with SPOP 6 in Electrical Harnesses - Maintenance Practices (AMM 70-24-05/201).

*[14] NOTE: For wipe procedures, replace P11-038 with one of the solvents in Degreasing of Parts by Solvent Wiping (SPOP 208) - Maintenance Practices (AMM 70-11-13/201).

*[15] NOTE: For wipe procedures, replace P11-041 with one of the solvents in Degreasing of Parts by Aqueous Cleaner (SPOP 209) - Maintenance Practices (AMM 70-11-16/201).

*[16] NOTE: PMC 4050-1 and -4 approved for use on nickel superalloys and ceramic coatings.

*[17] NOTE: PMC 4050-6 approved for use on aluminide coatings.

*[18] NOTE: PMC 4050-4, -7, -12, -15, -17 and -18 approved for use on ceramic, overlay, and aluminide coatings.

KEY WASHERS - MAINTENANCE PRACTICES

1. General
   A. Use key washers to lock fasteners. This procedure contains the data for two types of key washers. They are the tab washer and the cup washer.

TASK 70-41-01-402-001-N00

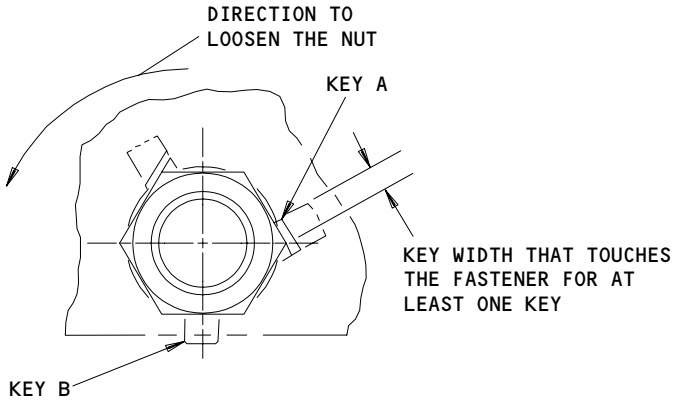
2. Install the Tab Type
   A. General
      (1) This procedure tells you how to bend the keys or elliptical areas of single-hole or multiple-hole tab washers.
      (2) Use the tab washer only one time.
      (3) Put the keys at the largest possible distance from the axis of the part that you will lock.
   B. Consumable Materials
      (1) Marking Pencil (PMC 4059-7)
   C. Install the Tab Washer (Fig. 201)

S 422-002-N00

      (1) Do these steps when you install the tab washer:
         (a) Key without bends:
            1) Bend a minimum of one key to the necessary clearance (VIEW D).
               a) For fasteners with thread dimensions of not more than 0.3125 inch (7.938 mm), bend the key to a maximum clearance of 0.010 inch (0254 mm).
               b) For fasteners with thread dimensions larger than 0.3125 inch (7.938 mm), bend the key to a maximum clearance of 0.020 inch (0.508 mm).
            2) Make sure that a minimum of 75 percent of the width of the key A touches the flat side of the fastener (VIEW A).

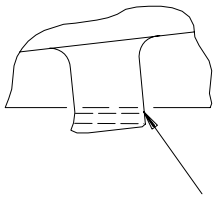
               NOTE: Measure the width of the key at the bottom of the key.

            3) Bend the remaining keys to an easy shape to make sure that you will not use the tab washer again.
         (b) Keys with bends:
            1) New tab washers that have a key with a bend must have the necessary clearance from the adjacent surface (VIEW A).
               a) Make sure that the clearance is not more than 0.020 inch (0.508 mm) (VIEW B).



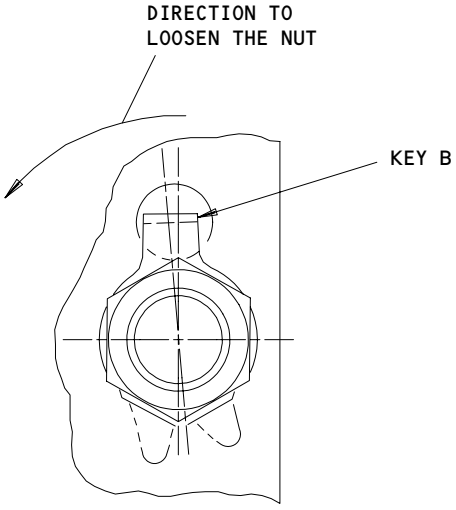
INSTALLATION OF KEY B
AGAINST AN ADJACENT SURFACE

A



B

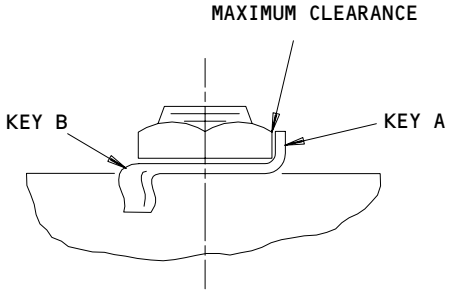
L-71052



INSTALLATION OF
KEY B IN A HOLE

C

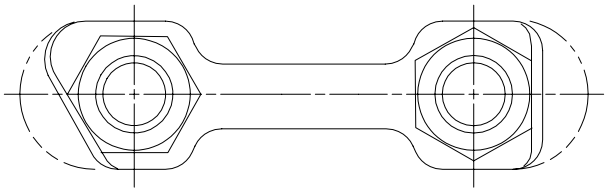
L-71053



KEY A CLEARANCE

D

L-71054



MULTIPLE-HOLE ELLIPTICAL
TAB WASHER

E

L-71055

Tab Washer Installation
Figure 201

b) You can bend the key to get this clearance.

2) When you install key B into a hole, put key B tightly against the side of the hole (VIEW C).

(c) Elliptical keys:

1) Bend the washer up across one full face of the fastener (VIEW E).

2) Bend the key to the necessary clearance (VIEW D).

a) For fasteners with thread dimensions of not more than 0.3125 inch (7.938 mm), bend the key to a maximum clearance of 0.010 inch (0254 mm).

b) For fasteners with thread dimensions larger than 0.3125 inch (7.938 mm), bend the key to a maximum clearance of 0.020 inch (0.508 mm).

(d) Multiple-hole keys:

1) For multiple-hole keys with elliptical tabs, refer to the elliptical keys.

2) For other multiple-hole keys, refer to keys without bends.

(e) Position Control:

1) Do these steps to prevent damage to the keys:

a) Use the marking pencil to make a mark on the key washer and the adjacent surface that does not turn.

NOTE: Do not make the mark on the fastener because it can turn with the key washer.

b) Look at the mark to make sure that the key washer does not turn when you tighten the fastener.

(f) Permitted Standards:

1) Correctly installed Key washers have these properties:

a) You installed a new key washer and bent the tabs with the instructions that we have given.

b) You bent the tabs on the key washer to make sure that the washer will not shake and the fastener will not loosen.

TASK 70-41-01-402-003-N00

3. Install the Cup Washer

A. General

(1) This procedure tells you how to crimp cup washers to make sure the nut cannot turn.

B. Consumable Materials

(1) Marking Pencil (PMC 4059-7)

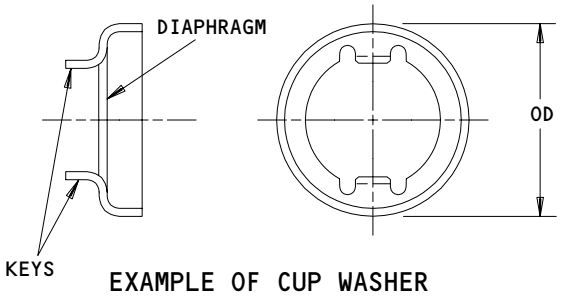
C. Install the Cup Washer (Fig. 202)

S 422-004-N00

(1) Do these steps when you install the cup washer:

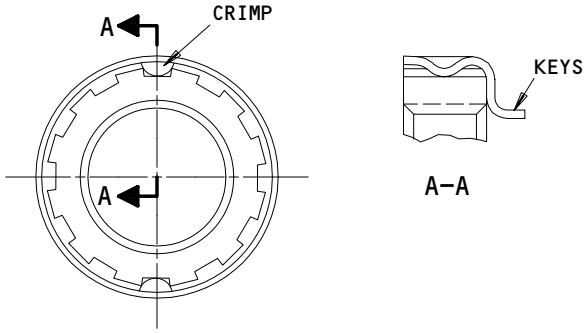
(a) You must crimp the external diameter of the cup washer in two or more locations (VIEW A through G).

(b) You must crimp the internal diameter of the internal cup washer in two or more locations (VIEW D).



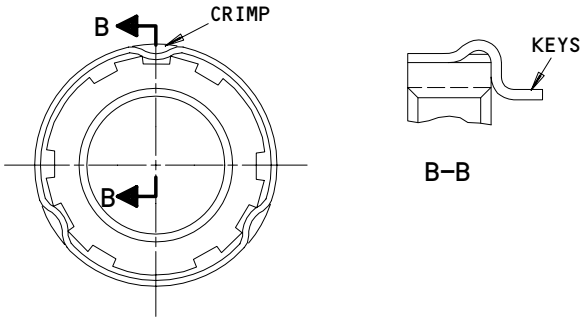
EXAMPLE OF CUP WASHER

A L-90032



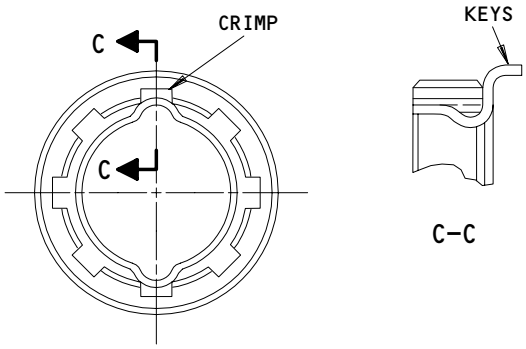
EXTERNAL CUP WASHER

B L-71347



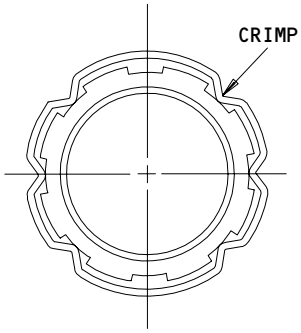
EXTERNAL CUP WASHER WITH
IRREGULAR NUT SLOTS

C



INTERNAL CUP WASHER

D L-90033



DENT CONFIGURATION FOR NUTS
WITH EIGHT SLOTS

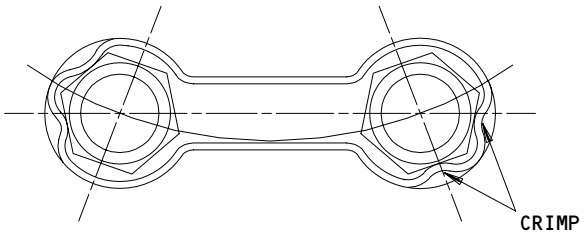
E L-90029

THREAD SIZE	MINIMUM DENTS	
	NUMBER	SEPARATION
0.000–1.500 IN. (0.00 – 38mm)	2	180° ±30° APART
1.500–2.500 IN. (38 – 64mm)	4	90° ±30° APART
2.500–4.000 IN. (64 – 102mm)	6	6 SLOT NUT 60° ±15° APART 8 SLOT NUT 67°30' ±22°31'
OVER 4.000 IN. (102mm)	8	45° ±15° APART

DENT LIMITS

TABLE A

Cup Washer Installation
Figure 202 (Sheet 1)



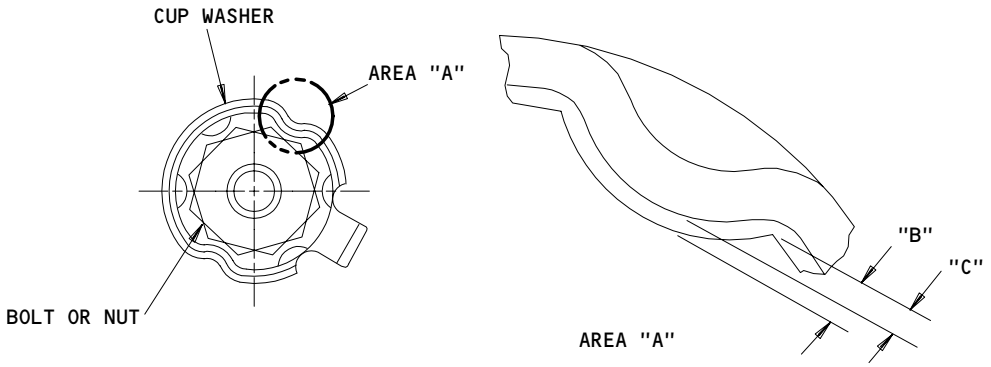
CRIMP MULTIPLE-HOLE CUP WASHERS

(F)

L-41305

SIZE	"B" (REF.)	"C" MINIMUM (0.6B) DENT LIMITS
0.190 INCH (4.826mm)	0.043 INCH (1.092mm)	0.026 INCH (0.660mm)
0.250 INCH (6.350mm)	0.042 INCH (1.067mm)	0.025 INCH (0.635mm)
0.3125 INCH (7.938mm)	0.040 INCH (1.016mm)	0.024 INCH (0.610mm)
0.375 INCH (9.525mm)	0.039 INCH (0.991mm)	0.023 INCH (0.584mm)

DENT LIMITS FOR SINGLE-TAB CUP WASHERS



SINGLE-TAB CUP WASHER

(G)

L-41306

Cup Washer Installation
Figure 202 (Sheet 2)

(c) Crimp tools:

NOTE: The crimp tool that makes the dents must have a spherical shape with a radius of not less than 0.050 inch (1.270 mm).

1) Squeeze-action crimp tool
   a) This tool makes dents on the external diameter of the cup washer and moves the cup into the slots in the nut or bolt (SECTION A-A).
   b) You must use this recommended crimp tool when you can.
2) Drift
   a) A drift tool has a ring with projections on it.
   b) Put the drift tool around the cup washer.
   c) Move the drift tool in an axial direction to make dents in the cup washer (SECTION B-B).
3) Punch

CAUTION: DO NOT USE THE PUNCH TO MAKE DENTS IN THE CUP WASHERS THAT YOU INSTALL ON FUEL INJECTOR NUTS. IF YOU USE THE PUNCH IN THESE LOCATIONS, DAMAGE TO THE FUEL INJECTOR CAN OCCUR.

   a) Hit the punch with a hammer to crimp the wall of the cup washer (VIEW B, C, D and F).

(d) The specified number of dents:
1) You must make dents in the cup washer in the correct number of locations.
   a) See TABLE A, unless a different specification applies.
2) You can find less rounded slots on the fasteners than the number of dents in TABLE A.
   a) Then crimp the cup washer in all of the available locations.
3) For cup washers with one tab, crimp the cup washer (VIEW G).
4) For eight slot nuts with a thread dimension of 2.500 - 4.000 inch (64 - 120 mm), crimp the cup washer (VIEW E).

(e) Position Control:
1) Do these steps to prevent damage to the keys:
   a) Use the marking pencil to make a mark on the cup washer and the adjacent surface that does not turn.

NOTE: Do not make the mark on the fastener because it can turn with the cup washer.

   b) Look at the mark to make sure that the cup washer does not turn when you tighten the fastener.

(f) Permitted standards:
1) Correctly installed cup washers have these properties:
   a) You installed a new cup washer with the instructions that we have given.

b) You made the dents in the cup washer as shown in (Fig. 202).

CAUTION: DO NOT USE CUP WASHERS THAT ARE SUFFICIENTLY LOOSE TO SHAKE. IF THE WASHERS ARE LOOSE, DAMAGE TO THE ENGINE CAN OCCUR.

c) A cup washer will usually feel tight, unless a fastener applies no axial force to the diaphragm of its cup washer.

NOTE: Then you can move the cup washer through the limits of the key clearance.

d) All the dents in the cup washer almost have the same shape and dimension.
e) The installation did not cause breaks, cracks, or damage to the cup washer.
f) On nuts with a rounded slot, the dents fit into the rounded slots.
g) The cup washer did not move during the installation.

LOCKWIRE - MAINTENANCE PRACTICES

1. General
   A. This procedure gives the installation instructions for these two tasks:
      (1) Lockwire
      (2) Safety cable
   B. Follow these procedures for fasteners (includes bolts, screws, nuts, and castle nuts), plugs, caps, fluid fittings, electrical connectors, pins, and rod ends.

TASK 70-41-02-912-006-N00

2. Lockwire
   A. General
      (1) After you install the lockwire, make sure it is tight. Damage to the wire can occur if it rubs against a surface. Vibration can also damage the wire.
      (2) If the part turns, the wire will turn in an opposite direction. This will keep the part tight.
      (3) If it is necessary for the wire to be loose between tension points, it will be specified in the assembly instructions.
      (4) If it is not specified, use two wires which are twisted together (double-twisted).
      (5) Use one wire in these locations:
         (a) When there is not sufficient clearance for the double-twist procedure.
         (b) Where it is recommended on small or easily damaged parts.

            NOTE: The one wire can only have the pattern or group of equivalent parts.

      (6) Pull the wire tight while you twist it.
         (a) Use approximately 7 to 10 turns for each inch.
         (b) One turn of the wire is specified as follows:
            1) If you turn the wires 180 degrees.
            2) If the wire makes one-half of a complete turn.
         (c) Make sure the wire is not twisted to much when you tighten it.
      (7) The wire must not wear on other surfaces or have tension on it.
         (a) The only tension on the wire is to keep the part tight.
         (b) Make sure the wire does not cause worn areas.
         (c) Apply too much force to the parts it touches.
      (8) After you install the lockwire, make sure there are no nicks, kinks, or damage to the wire.
         (a) Abrasions from wire twisting pliers is permitted.
         (b) If you use pliers, make sure the edges of the pliers do not cause damage to the wire.

CAUTION: DO NOT TWIST THE ENDS OF THE LOCKWIRE OFF WITH PLIERS. MAKE SURE THE ENDS OF THE WIRE DO NOT FALL INTO THE ENGINE.

(9) Cut off the unwanted wire at the end of a series.
  (a) Keep a minimum of three full turns.
  (b) Bend the wire end in the direction of the engine.
    1) The sharp ends are dangerous or can shake in the air.
(10) Do not put the wires where they can go across other wires or cause a blockage of the flow.

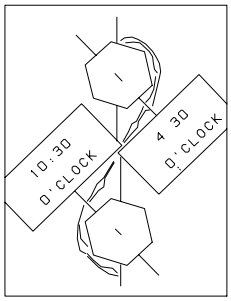
B. Lockwire Installation Procedures

S 912-002-N00

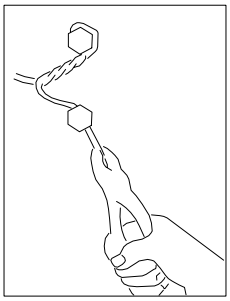
(1) Do these steps when you install the lockwire (Fig. 201).
  (a) Make sure the unit is tight.
  (b) Make sure the wire holes are in the correct position.
  (c) When there are two or more units, make sure the holes in the units align.
  (d) Do not tighten the unit too much or loosen the units to get the holes to align correctly.
    1) The holes must align when you tighten the units.
  (e) If it is not possible to get the holes to align, install a different unit.
  (f) The maximum distance between the tension points is six inches, unless it is specified differently.
  (g) Do not attach one wire to more than four units unless it is specified.
  (h) If there are more than four units in a series, and the note, "Wire Together" is specified in the procedure, do these steps:
    1) Break the sequence into groups of two, three, or four units.
    2) Attach a wire to each unit in the group.
    3) Do not attach the series with one continuous length of wire unless it is specified differently.
  (i) The maximum length of wire in a sequence is 24 inches (609.6 mm), unless it is specified differently.

CAUTION: REMOVE THE BURRS AND SHARP EDGES FROM THE DAMAGED HOLES. DAMAGE TO THE WIRE CAN OCCUR.

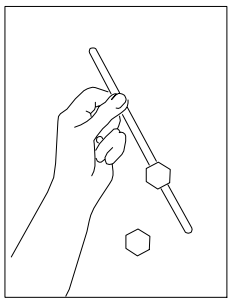
  (j) Put the lockwire through the supplied holes.
  (k) If there is no hole, do these steps:
    1) When you attach the wire to an adjacent part, make sure the wire does not cause a malfunction.
    2) If the lockwire holes are damaged, make a different hole.



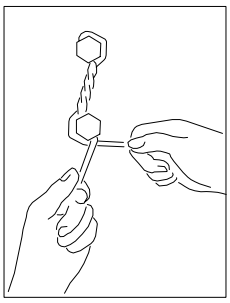
POSITION THE HOLES.



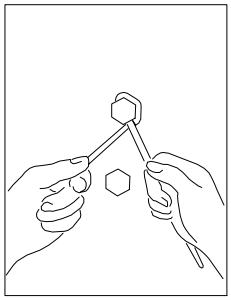
INSERT THE UPPERMOST WIRE, WHICH POINTS TOWARDS THE SECOND BOLT, THROUGH THE HOLE WHICH LIES BETWEEN THE NINE AND TWELVE O'CLOCK POSITIONS. GRASP THE END OF THE WIRE WITH A PAIR OF PLIERS AND PULL THE WIRE TIGHT.



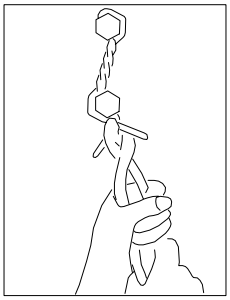
INSERT PROPER GAGE WIRE. TO DETERMINE THE PROPER WIRE TO BE USED IN CONJUNCTION WITH A PARTICULAR TIGHTENING OPERATION REFER TO THE CORRESPONDINGLY DESIGNATED ENGINE PARTS CATALOG OR ILLUSTRATED PARTS BREAKDOWN. LOCKWIRE WHICH IS SPECIALLY TREATED FOR 1800°F (982°C) APPLICATIONS HAS A DARK GRAY TO BLACK COLOR.



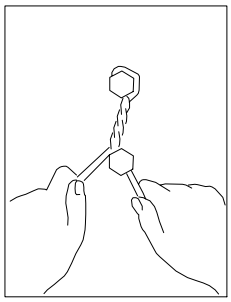
BRING THE FREE END OF THE WIRE AROUND THE BOLTHEAD IN A COUNTERCLOCKWISE DIRECTION AND UNDER THE END PROTRUDING FROM THE BOLT HOLE. TWIST THE WIRE IN A COUNTERCLOCKWISE DIRECTION.



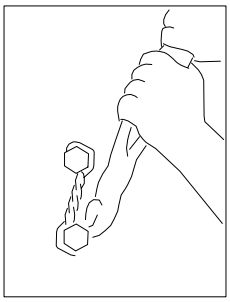
GRASP UPPER END OF THE WIRE AND BEND IT AROUND THE HEAD OF THE BOLT, THEN UNDER THE OTHER END OF THE WIRE. BE SURE WIRE IS TIGHT AROUND HEAD.



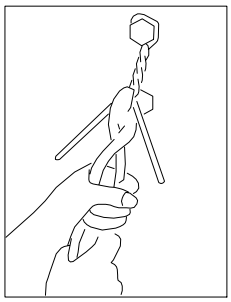
GRASP THE WIRE BEYOND THE TWISTED PORTION AND TWIST THE WIRE ENDS COUNTER-CLOCKWISE UNTIL TIGHT.



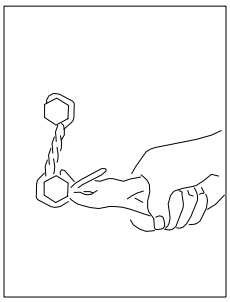
TWIST WIRE UNTIL WIRE IS JUST SHORT OF HOLE IN THE SECOND BOLT.



DURING THE FINAL TWISTING MOTION OF THE PLIERS, BEND THE WIRE DOWN AND UNDER THE HEAD OF THE BOLT.



KEEPING WIRE UNDER TENSION, TWIST IN A CLOCKWISE DIRECTION UNTIL THE WIRE IS TIGHT. WHEN TIGHTENED THE WIRE SHALL HAVE APPROXIMATELY 7-10 TWISTS PER INCH.



CUT OFF EXCESS WIRE WITH DIAGONAL CUTTERS.

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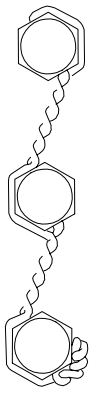
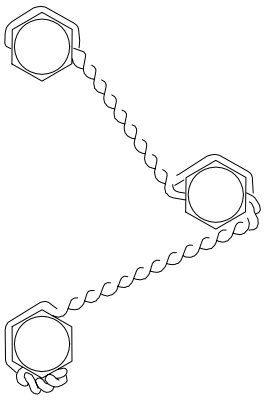
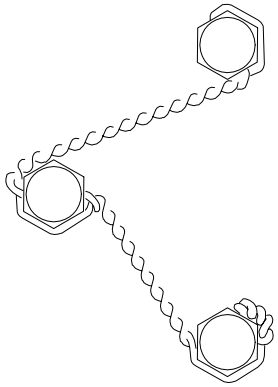
Lockwiring Procedure
Figure 201



EXAMPLE 1



EXAMPLE 2

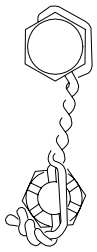


EXAMPLE 3

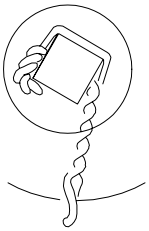
EXAMPLE 4

EXAMPLES 1,2,3, AND 4 APPLY TO ALL TYPES OF BOLTS, FILLISTER HEAD SCREWS, SQUARE HEAD PLUGS, AND OTHER SIMILAR PARTS WHICH ARE WIRED SO THAT THE LOOSENING TENDENCY OF EITHER PART IS COUNTERACTED BY TIGHTENING OF THE OTHER PART. THE DIRECTION OF TWIST-FROM THE SECOND TO THE THIRD UNIT IS COUNTERCLOCKWISE TO KEEP THE LOOP IN POSITION AGAINST THE HEAD OF THE BOLT. THE WIRE ENTERING THE HOLE IN THE THIRD UNIT WILL BE THE LOWER WIRE AND BY MAKING A COUNTERCLOCKWISE TWIST AFTER IT LEAVES THE HOLE, THE LOOP WILL BE SECURED IN PLACE AROUND THE HEAD OF THAT BOLT.

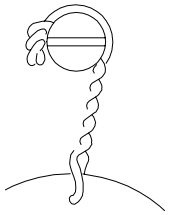
EXAMPLE 5



EXAMPLE 6

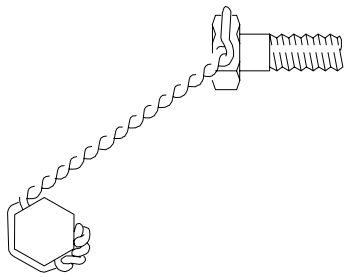


EXAMPLE 7



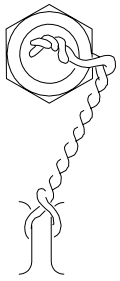
EXAMPLE 8

EXAMPLES 5,6,7 & 8 SHOW METHODS FOR WIRING VARIOUS STANDARD ITEMS. NOTE: WIRE MAY BE WRAPPED OVER THE UNIT RATHER THAN AROUND IT WHEN WIRING CASTELLATED NUTS OR ON OTHER ITEMS WHEN THERE IS A CLEARANCE PROBLEM.



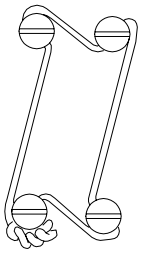
EXAMPLE 9

EXAMPLE 9 SHOWS THE METHOD FOR WIRING BOLTS IN DIFFERENT PLANES. NOTE THAT WIRE SHOULD ALWAYS BE APPLIED SO THAT TENSION IS IN THE TIGHTENING DIRECTION.



EXAMPLE 10

HOLLOW HEAD PLUGS SHALL BE WIRED AS SHOWN WITH THE TAB BENT INSIDE THE HOLE TO AVOID SNAGS AND POSSIBLE INJURY TO PERSONNEL WORKING ON THE ENGINE.

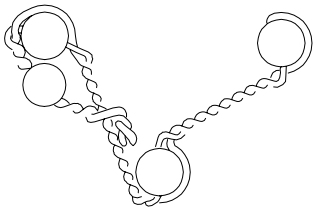


EXAMPLE 11

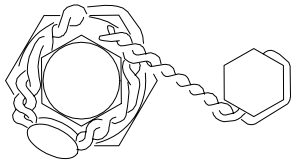
CORRECT APPLICATION OF SINGLE WIRE TO CLOSELY SPACED MULTIPLE GROUP.

L-64903

Lockwiring Examples
Figure 202 (Sheet 1)

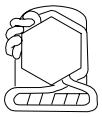


EXAMPLE 12



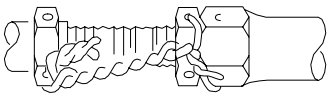
EXAMPLE 13

EXAMPLES 12 & 13 SHOW METHODS FOR ATTACHING LEAD SEAL TO PROTECT CRITICAL ADJUSTMENTS.



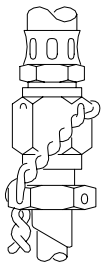
EXAMPLE 14

EXAMPLE 14 SHOWS BOLT WIRED TO A RIGHT ANGLE BRACKET WITH THE WIRE WRAPPED AROUND THE BRACKET.



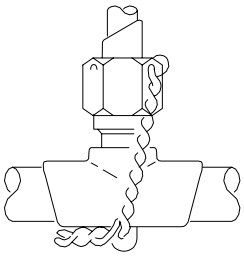
EXAMPLE 15

EXAMPLE 15 SHOWS CORRECT METHOD OF WIRING ADJUSTABLE CONNECTING ROD.

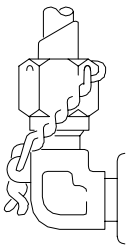


EXAMPLE 16

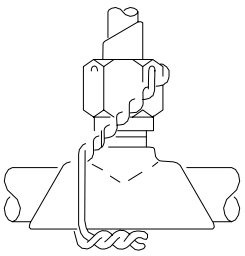
EXAMPLE 16 SHOWS CORRECT METHOD FOR WIRING THE COUPLING NUT ON FLEXIBLE LINE TO THE STRAIGHT CONNECTOR BRAZED ON RIGID TUBE.



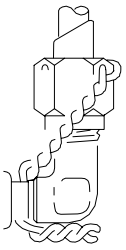
EXAMPLE 17



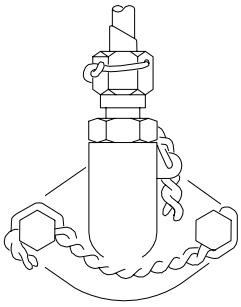
EXAMPLE 18



EXAMPLE 19



EXAMPLE 20



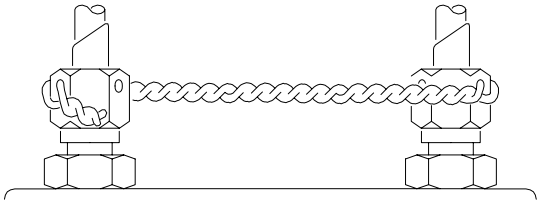
EXAMPLE 21

FITTINGS INCORPORATING WIRE LUGS SHALL BE WIRED AS SHOWN IN EXAMPLES 17 & 18. WHERE NO LOCKWIRE LUG IS PROVIDED, WIRE SHOULD BE APPLIED AS SHOWN IN EXAMPLES 19 & 20 WITH CAUTION BEING EXERTED TO ENSURE THAT WIRE IS WRAPPED TIGHTLY AROUND THE FITTING.

SMALL SIZE COUPLING NUTS SHALL BE WIRED BY WRAPPING THE WIRE AROUND THE NUT AND INSERTING IT THROUGH THE HOLES AS SHOWN.

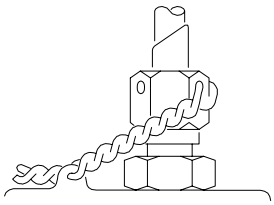
L-71350

Lockwiring Examples
Figure 202 (Sheet 2)

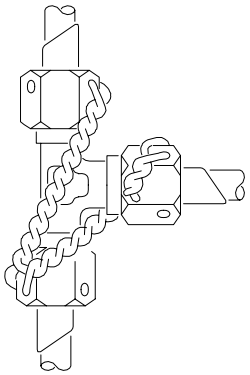


EXAMPLE 22

COUPLING NUTS ATTACHED TO STRAIGHT CONNECTORS SHALL BE WIRED AS SHOWN WHEN HEX IS AN INTEGRAL PART OF THE CONNECTOR.

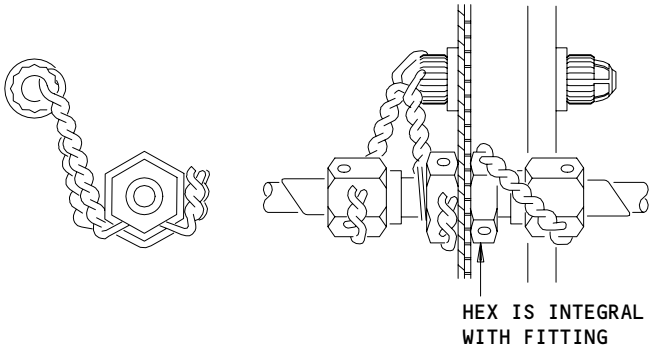


EXAMPLE 23



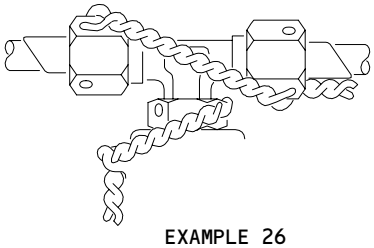
EXAMPLE 24

COUPLING NUTS ON A TEE SHALL BE WIRED AS SHOWN ABOVE SO THAT TENSION IS ALWAYS IN THE TIGHTENING DIRECTION.

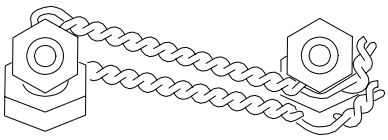


EXAMPLE 25

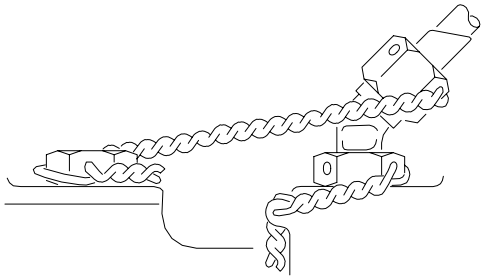
STRAIGHT CONNECTOR (BULKHEAD TYPE)



EXAMPLE 26



EXAMPLE 27



EXAMPLE 28

EXAMPLES 26, 27 & 28 SHOW THE PROPER METHOD FOR WIRING VARIOUS STANDARD FITTINGS WITH CHECK NUT WIRED INDEPENDENTLY SO THAT IT NEED NOT BE DISTURBED WHEN REMOVING THE COUPLING NUT.

L-71351

Lockwiring Examples
Figure 202 (Sheet 3)

S 912-003-N00

(2) Do these steps to find the lockwire size and specifications.

(a) AS3214-XX is AMS 5689, A1S1 321 iron base alloy, annealed wire (QQ-W-423 is equivalent). The list that follows shows the wire size by part number:

Part Number	Size
AS3214-01	0.0195 ± 0.0015 inch (0.50 ± 0.04 mm)
AS3214-02	0.0315 ± 0.0015 inch (0.80 ± 0.04 mm)
AS3214-03	0.039 ± 0.002 inch (1.00 ± 0.05 mm)
AS3214-04	0.049 ± 0.002 inch (1.25 ± 0.05 mm)

NOTE: This material is corrosion and heat resistant.

S 912-004-N00

(3) Do these steps when you apply lockwire.

(a) Use the examples in Figure 202 to install the lockwire on most of the engine components.

(b) Attach the lockwire to the bolts and screws in a sequence (Examples 1 through 4).

1) Make sure the braid twist is in the direction that pulls the loop down around the head of the part.

(c) Use the same procedure to install lockwire on the nuts of hoses, electrical couplings, and tube couplings.

(d) When a lockwire seal is specified, do these steps.

1) Attach the seal to the lockwire with a crimp.
2) Attach the loose ends of the lockwire in front of the last installed unit (Example 12).
3) Attach the loose ends to a lockwire hole not used in the last installed unit (Example 13).

(e) When you drill a thin wall between the wire hole and the outer surface of a part, do the step that follows:

1) In a thin wall section of the nut, wind the wire around the nut (Example 21).

TASK 70-41-02-912-007-N00

3. Safety Cable

A. Equipment

(1) M303, M305, or M307 Bergen Mechanical Crimper
Bergen Cable Technologies
170 Greg Street
P.O. Box 1300
Lodi New Jersey 07644 USA

B. Consumable Materials

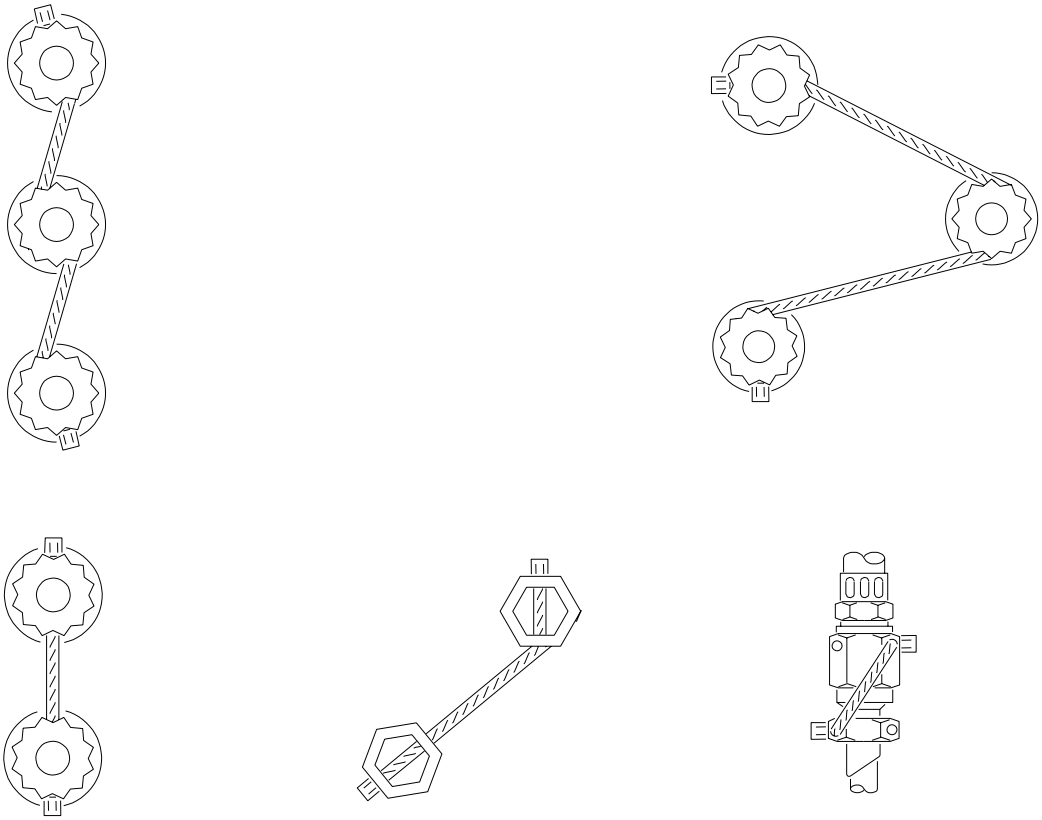
(1) G02332 Ferrule, Safety Cable (P05-292)
(2) G02335 Cable, Safety (P05-291)

C. General

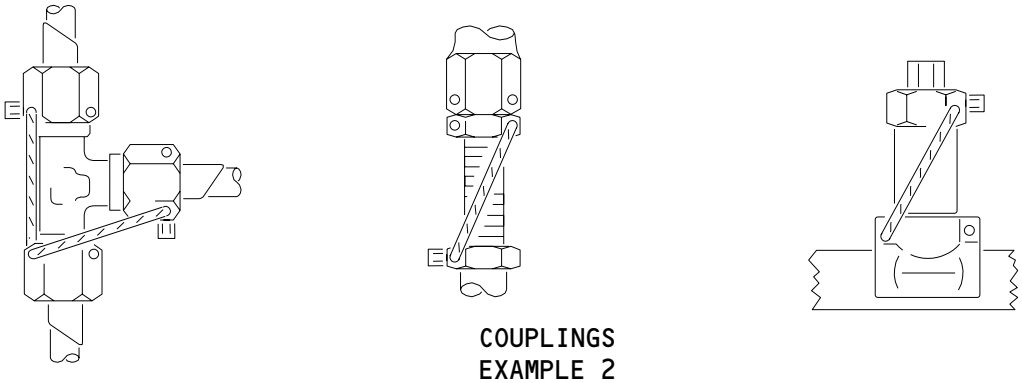
(1) For safety cable, the maximum distance between termination points is 6.00 inches (152.40 mm), unless specified differently in the assembly instructions.
(2) Any cable defect (nick, fray, kink, or other mutilation of the safety cable) found before, during, or subsequent to installation, at or between termination points, is not permitted.

CAUTION: DO NOT USE SAFETY CABLE IF THE HOLES ARE MORE THAN 0.100 INCH (2.54 MM) DIAMETER. THE FERRULES ON THE END OF THE CABLE ARE 0.106-0.108 INCH (2.692-2.743 MM) DIAMETER AND WILL FALL THROUGH HOLES LARGER THAN THIS.

(3) In all cases, you must install the safety cable through the safety cable holes on the part.
(4) Safety cable and ferrules must be new at each installation.
(a) Do not use the cables or ferrules again.
(5) Figure 203, Examples 1 through 3 show different examples of safety cable installation.
(a) The figure does not show all of the possible fasteners and related parts.
(b) Install safety cable in two (2) or three (3) bolt groups, unless specified differently in the assembly procedure.



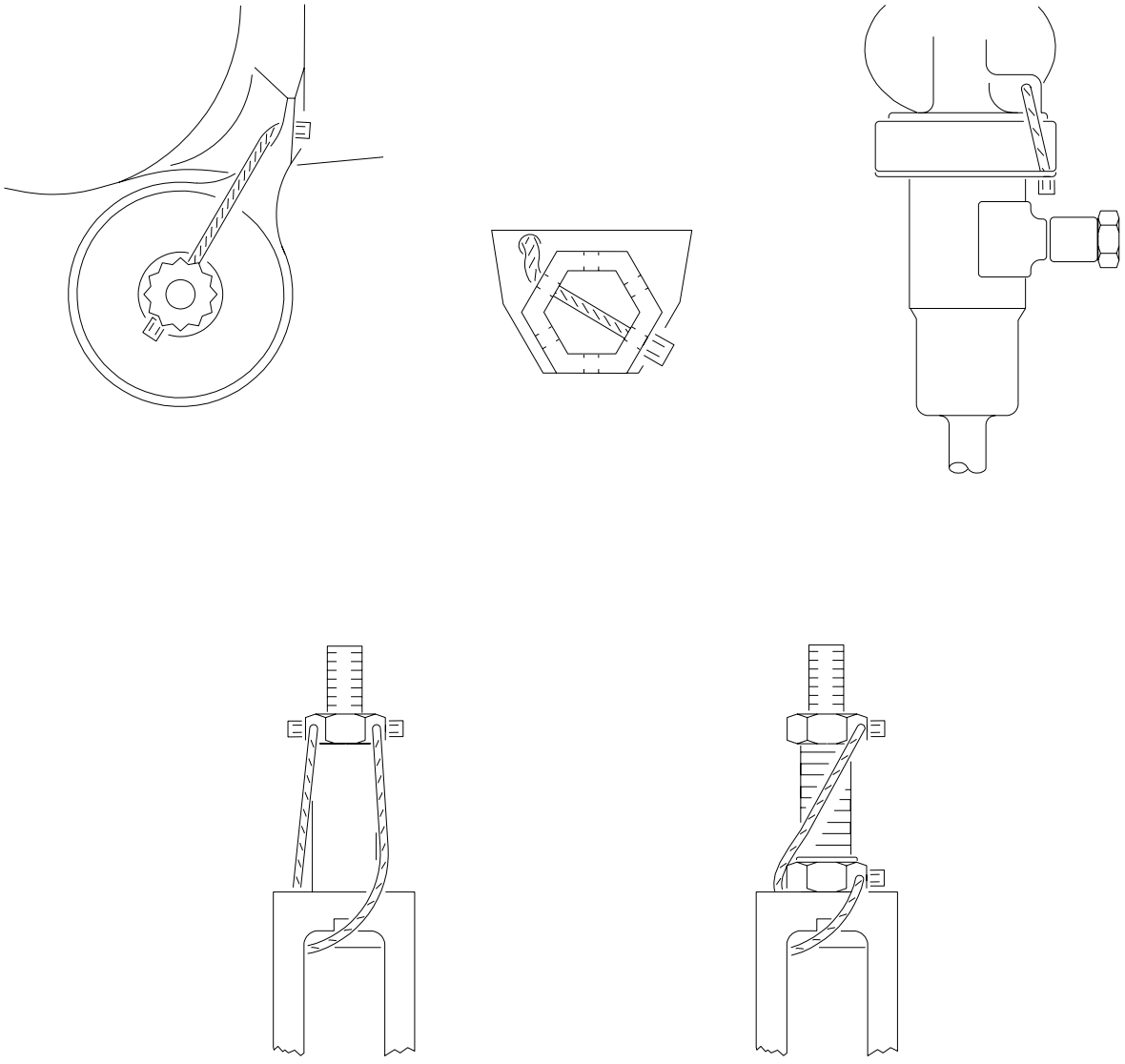
STANDARD HARDWARE
EXAMPLE 1



COUPLINGS
EXAMPLE 2

L-B4053 (0000)V

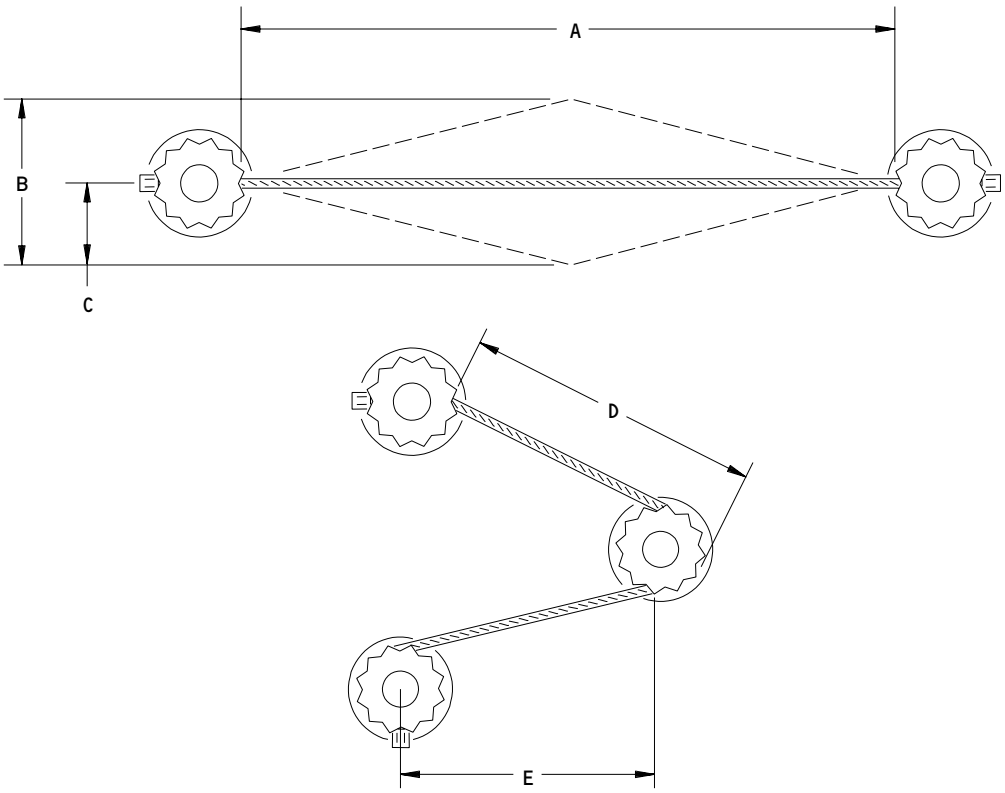
Safety Cable Installation Examples
Figure 203 (Sheet 1)



OTHER APPLICATIONS
EXAMPLE 3

L-B4054 (0000)V

Safety Cable Installation Examples
Figure 203 (Sheet 2)



FOR THREE BOLT PATTERNS
A=D+E

A INCH (mm)	B INCH (mm)	C INCH (mm)
0.5 (12.700)	0.125 (3.175)	0.062 (1.575)
1.0 (25.400)	0.250 (6.350)	0.125 (3.175)
2.0 (50.800)	0.375 (9.525)	0.188 (4.775)
3.0 (76.200)	0.375 (9.525)	0.188 (4.775)
4.0 (101.600)	0.500 (12.700)	0.250 (6.350)
5.0 (127.000)	0.500 (12.700)	0.250 (6.350)
6.0 (152.400)	0.625 (15.875)	0.312 (7.425)

FLEX LIMITS, DIMENSIONS

L-B4055 (0000)V

Safety Cable Flex Limits
Figure 204

(c) When you install safety cable to an even number of fasteners, use the two-bolt group.
(d) You must obey the basic rules of safety cable installation for all types of fasteners and related parts.

(6) Use the mechanical crimper to crimp the ferrule to the cable.
(a) The safety cable assembly must have the minimum "pull-off" load (the force necessary to pull the cable out of the ferrule).
1) See below for specific limits.

NOMINAL SAFETY CABLE DIAMETER	MINIMUM PULL-OFF LOADS
0.020 inch (0.508 mm)	30.0 lbf-in (3.390 N.m)
0.032 inch (0.813 mm)	70.0 lbf-in (7.909 N.m)

D. Safety Cable Installation Procedure

S 412-014-N00

(1) Do these steps when you install the safety cable:
(a) Do not increase or decrease the torque limits on the parts when you try to align the cable holes in the parts.
(b) Install the safety cable so that if a fastener loosens, more tension is applied to the safety cable.
1) As you thread the cable through the fasteners, try to prevent sharp turns by more than 90 degrees.
2) After you install the safety cable, make sure of these limits.
a) The maximum cable flex limits between termination points must be no more than the limit specified in Figure 204.
b) A maximum of 0.031 inch (0.787 mm) of unwanted cable is permitted to extend past the crimped ferrule.
3) Apply and crimp a lead seal to the safety cable when specified by the assembly procedure.

E. Replacement of Safety Cable With Lockwire

S 902-015-N00

(1) Where permitted, you can replace the safety cable with lockwire.

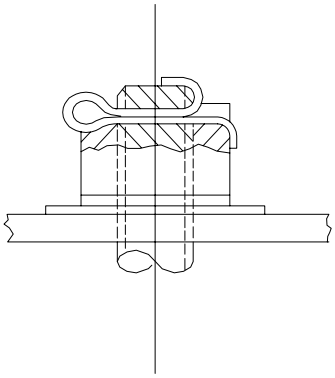
(a) See below to find the correct lockwire size for safety cable replacement.

NOMINAL SAFETY CABLE DIAMETER	LOCKWIRE REPLACEMENT
0.020 inch (0.508 mm)	AS3214-01
0.032 inch (0.813 mm)	AS3214-02

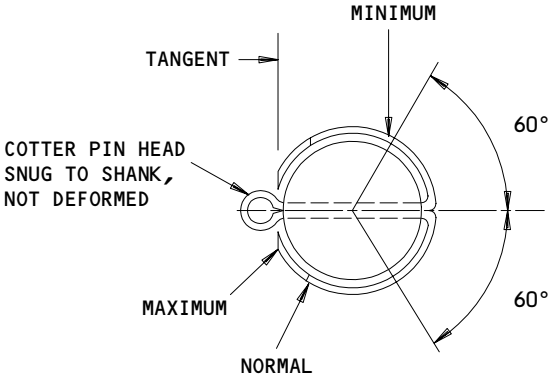
COTTER PINS - MAINTENANCE PRACTICES

TASK 70-41-03-912-001-N00

1. Cotter Pins
   A. General
      (1) Locknuts with Cotter Pins
         (a) Figure 201 shows the correct procedure for the cotter pin installation.
         (b) Before you install a cotter pin, tighten the nut to the lower side of the necessary torque range, unless specified differently. Continue to tighten the nut until the slot aligns with the hole in the bolt shank. If the slot of the nut does not align with the hole before the maximum torque value, remove the nut and assemble the nut again. If the slot continues to not align, use a new nut and do the assembly procedure again.
         (c) If 50 percent of the cotter pin diameter is above the nut castellation, install a new nut.
         (d) Install the cotter pin with the head engaged tightly in the slot of the nut. Make sure the axis of the cotter pin eye is perpendicular to the bolt shank (Figure 201). Bend the tabs until the head and the top tab tightly touch the bolt and the lower tab tightly touches the flat areas of the nut. Cut the top tab flat with the top of the bolt shank, if it is necessary for bolt clearance.
      (2) Pins which use Cotter Pins
         (a) Figure 201 shows the correct procedure to install the cotter pin in pins (clevis pins or headed pins).
         (b) Install the cotter pin with the axis of the eye in a parallel position to the shank of the clevis pin or rod end. Bend the tabs around the pin shank or rod end.



L-25172



L-25223

Cotter Pin Installation
Figure 201

RETAINING RINGS - MAINTENANCE PRACTICES

TASK 70-41-04-912-001-N00

1. Retaining Rings

A. General

(1) Always use approved retaining ring pliers when you remove or install the retaining rings. You can compress the retaining ring until the two ends come together. If you compress the retaining ring more than this, damage to the retaining ring can occur. Pull open the ends of the external retaining ring a sufficient distance to permit the removal or installation. If you pull the ends of the retaining ring open more than this distance, damage to the retaining ring can occur.

(2) Plain Retaining Rings

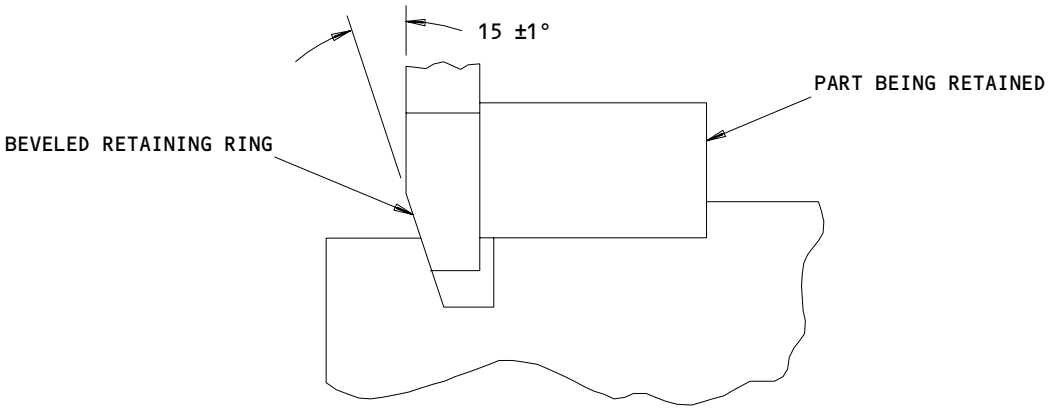
(a) The plain retaining rings can contain small rounded edges on one side and sharp edges on the opposite side. The rounded edges are caused by the stamping die. They are not a bevel. You can not put these rings in the beveled group.

(b) Install the plain retaining rings only in the grooves with the square sides. Install the side with the sharp corners away from the part(s) the retaining ring holds in its position. This lets the side with the sharp edge push on the groove.

(3) Beveled Retaining Rings (Fig. 201)

(a) The beveled retaining ring also removes the end play from the part(s) that is held. One side of the retaining ring has a 15 degree bevel which engages with a bevel on the side of the groove. Install the bevel of the ring opposite the part(s) that is held.

(b) The beveled retaining rings must be used only in beveled grooves.



L-71352

Beveled Retaining Ring Installation
Figure 201

STANDARD TORQUE VALUES - MAINTENANCE PRACTICES

1. General
   A. Use the approved torque limits, when the procedure shows no torque limits.
   B. Torque limits on the J-threads are the same as the torque limits on the usual threads.
   C. The torque limits in this section have these properties:
      (1) They give the torque limits in pound-inches and Newton meters at room temperature.
      (2) They give the angles of a turn in degrees.
      (3) They give the extension values in inches and millimeters.
   D. Unless the procedure gives a lubricant, the torque limits apply to the threads that do not have a lubricant.
   E. Let the temperatures of the part and of the adjacent areas become the same, before you tighten it.
   F. Be very careful, when you assemble the flanges and the engine sections.
      (1) Parts that connect with a click-fit must touch correctly, before you tighten them.
      (2) You must usually install the bolts at regular spaces.
      (3) You must then tighten slowly and equally, until the parts engage.
      (4) Two persons together must tighten the flange bolts that have a separation of 180 degrees.
      (5) After the engine sections touch correctly, tighten all of the bolts to 75 percent of the specified torque limit.
         (a) Tighten equally the bolts at spaces of 180 degrees, 90 degrees, and 45 degrees.
         (b) This will prevent the high loads on the bolts and flange.
         (c) Then use the same procedure, and tighten the bolts to the specified torque limits.
   G. You must apply torque slowly and equally for best possible precision.
      (1) Possibly you will not use the specified torque limits because of the material or the configuration of the part.
         (a) You must make the decision if this occurs.

TASK 70-50-00-912-026-N00

2. Torque Indication Devices
   A. You must make a check of the torque indication devices each day.

S 912-027-N00

      (1) You must calibrate the devices with weights and with a lever arm to make sure that the devices are accurate.

S 912-028-N00
(2) You must not use a torque wrench to make a check of a different torque wrench.

S 912-029-N00
(3) Some torque wrenches are sensitive to your procedure, when you hold them while you tighten a part.
(a) You must follow the manufacturer's instructions when you use the torque wrenches.

B. Extensions for a Torque Wrench (Fig. 201)

S 912-030-N00
(1) When you use an extension on a torque wrench, the effect of length changes.
(a) You must calculate the torque indication that will give you the necessary torque on the part.
(b) Use the formula that is shown in Figure 201 to get the indication of torque by the torque wrench.

TASK 70-50-00-912-001-N00

3. General Instruction For Torque

A. Consumable Materials
(1) Engine Oil (PWA 521)
(2) Anti-Galling Compound (PWA 586-3)
(3) Lubricant (High Temperature)

B. References
(1) AMM 70-11-04/201, Assembly of Flexible Type Fittings
(2) AMM 74-21-02/401, Igniter Plug

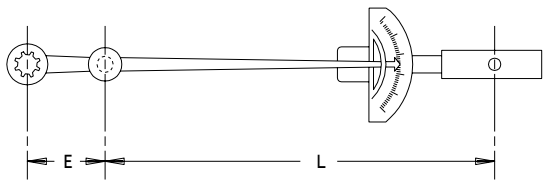
C. Torque for parts that you lubricate

NOTE: Torque values in this section apply, when you lubricate the part with the engine oil or the antiseize compound. You must lubricate one or two of the surfaces, that will rub together, when you apply the torque. Do not use the engine oil and antiseize compound on the same pair of surfaces.

S 912-002-N00
(1) Torque limits apply to the parts, that you lubricate with oil, when you use the engine oil or the equivalent.

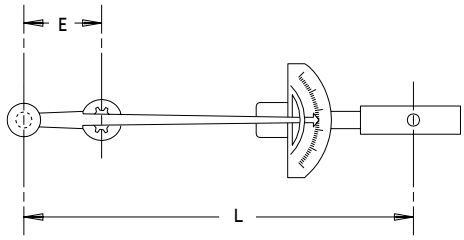
S 912-003-N00
(2) Torque limits apply to the parts, that you lubricate with the antiseize compound, when you use the wet antiseize compound or the wet high temperature lubricant.

D. Torque limits for nuts, bolts and screws (Fig. 202)



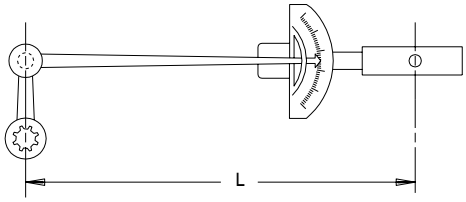
A CALCULATION OF THE INDICATED TORQUE IS NECESSARY WHEN AN EXTENSION IS USED, WHICH CHANGES THE EFFECT OF LENGTH OF A TORQUE WRENCH. USE THE FORMULA THAT FOLLOWS TO GET THE INDICATED TORQUE.

$$R = \frac{L \times T}{L + E}$$



A CALCULATION OF THE INDICATED TORQUE IS NECESSARY WHEN AN EXTENSION IS USED, WHICH CHANGES THE EFFECT OF LENGTH OF A TORQUE WRENCH. USE THE FORMULA THAT FOLLOWS TO GET THE INDICATED TORQUE.

$$R = \frac{L \times T}{L - E}$$



NO CORRECTION OF THE INDICATION OF TORQUE IS NECESSARY WHEN AN EXTENSION IS USED WHICH DOES NOT CHANGE THE EFFECT OF LENGTH OF THE TORQUE WRENCH.

LEGEND

T = NECESSARY TORQUE
E = LENGTH OF THE EXTENSION THAT HAS AN EFFECT
L = LENGTH OF THE TORQUE WRENCH
R = INDICATION OF TORQUE ON THE WRENCH

NOTES: DO NOT USE AN EXTENSION ON THE HANDLE OF THE TORQUE WRENCH.

THE LENGTH THAT CAN HAVE AN EFFECT IS STAMPED ON THE PWA EXTENSIONS, ADAPTERS, AND WRENCHES.

L-47816

EXAMPLE: A TORQUE OF 1440 POUND-INCHES (162.698 NEWTON METERS) IS NECESSARY ON A PART. YOU USE AN EXTENSION THAT HAS A LENGTH OF 3 INCHES (76.2 MILLIMETERS) FROM CENTER TO CENTER OF ITS HOLES. YOU USE A TORQUE WRENCH THAT HAS A LENGTH OF 15 INCHES (381 MILLIMETERS) FROM THE CENTER OF THE HANDLE OR THE SWIVEL PIN OF THE HANDLE TO THE CENTER OF ITS SQUARE ADAPTER.

THEN: $R = \frac{L \times T}{L + E} = \frac{15 \times 1440}{15 + 3} =$ 1200 POUND-INCHES

$R = \frac{L \times T}{L + E} = \frac{381 \times 162.698}{381 + 76.2} =$ 135.582 NEWTON METERS

WITH THE AXIS OF THE EXTENSION OR ADAPTER AND THE TORQUE WRENCH IN A STRAIGHT LINE, TIGHTEN TO AN INDICATION OF TORQUE OF 1200 POUND-INCHES (135.582 NEWTON METERS) TO SUPPLY THE NECESSARY TORQUE OF 1440 POUND-INCHES (162.698 NEWTON METERS) ON THE PART.

Calculate the Effect of an Extension for a Torque Wrench
Figure 201

THREAD DIMENSION INCH	TORQUE, POUND-INCHES					
	OIL LUBRICATED			ANTISEIZE COATED		
	MAX	MIN*		MAX	MIN*	
		TYPE I	TYPE II		TYPE I	TYPE II
0.112 -40	6	4.5	5	4.5	3.5	4
0.138 -32	11.5	8.5	10	8.5	6.5	7.5
0.164 -32	22	16	20	16.5	12.5	15
0.164 -36	24	18	22	18	13.5	16
0.190 -24	30	23**	27**	21.5	16	19.5
0.190 -32	36	24**	32**	26	19.5	23**
0.250 -20	70	50**	65**	50	37**	45**
0.250 -28	85	65**	75**	60	45**	54**
0.3125-18	150	110**	135**	105	80**	95**
0.3125-24	170	125**	150**	120	90**	110**
0.375 -16	270	200**	250**	185	140**	170**
0.375 -24	300	225**	275**	215	160**	190**
0.4375-14	425	325	375	300	225	270
0.4375-20	475	350	425	340	255	310
0.500 -13	650	500	600	450	340	400
0.500 -20	750	550	675	515	390	460

THREAD DIMENSION INCH	TORQUE, NEWTON-METERS					
	OIL LUBRICATED			ANTISEIZE COATED		
	MAX	MIN*		MAX	MIN*	
		TYPE I	TYPE II		TYPE I	TYPE II
0.112 -40	0.678	0.508	0.565	0.508	0.395	0.452
0.138 -32	1.299	0.960	1.130	0.960	0.734	0.847
0.164 -32	2.486	1.808	2.260	1.864	1.412	1.695
0.164 -36	2.712	2.034	2.486	2.034	1.525	1.808
0.190 -24	3.390	2.599**	3.051**	2.429	1.808	2.203
0.190 -32	4.067	2.712**	3.616**	2.938	2.203	2.599**
0.250 -20	7.909	5.649**	7.344**	5.649	4.180**	5.084**
0.250 -28	9.604	7.344**	8.474**	6.779	5.084**	6.101**
0.3125-18	16.948	12.428**	15.253**	11.863	9.039**	10.734**
0.3125-24	19.207	14.123**	16.948**	13.558	10.169**	12.428**
0.375 -16	30.506	22.597**	28.246**	20.902	15.818**	19.207**
0.375 -24	33.895	25.422**	31.071**	24.292	18.078**	21.467**
0.4375-14	48.019	36.720	42.369	33.895	25.422	30.506
0.4375-20	53.668	39.545	48.019	38.415	28.811	35.025
0.500 -13	73.440	56.492	67.791	50.834	38.415	45.194
0.500 -20	84.739	62.142	76.265	58.187	44.064	51.973

L-90034

* USE TYPE I MINIMUM VALUES WHEN YOU MUST ALIGN THE LOCK HOLES (COTTER PINS AND LOCKWIRE) AT THE ASSEMBLY. USE TYPE II MINIMUM VALUES WHEN IT IS NOT NECESSARY TO ALIGN THE LOCK HOLES AT THE ASSEMBLY.

** FOR THE SCREWS WITH A THREAD DIMENSION THAT IS LARGER THAN 0.164, AND WITH ONLY A SCREWDRIVER SLOT (NO EXTERNAL WRENCH SHAPE) 22 POUND-INCHES (2.486 NEWTON-METERS) MINIMUM IS PERMITTED.

Standard Nuts, Bolts, Screws, and Self-Locking Nuts on a Stud
Figure 202

S 912-004-N00

(1) Standard nuts, bolts, and screws
   (a) Torque limits in the Figure 202 for the nuts, bolts, and screws give a sufficient load without damage to the parts.
   (b) The limits are for the materials that have a minimum strength in tension of 125,000 pounds for each square inch (861844.6 kilo-Pascals).
   (c) This is the equivalent to the Rockwell C26-hardness for steel parts.

      NOTE: The torque limits apply to bolts in heli-coils if the threads engage fully.

S 912-005-N00

(2) Thin nuts, nuts with slots, and bolts that are not solid
   (a) The torque limits in the Figure 202 apply to the thin nuts and nuts with slots.
   (b) The height of the nut must be larger than 75 percent of the large diameter of the thread.
   (c) When the nut height is 40 to 75 percent of the large diameter, decrease the torque by 50 percent.
   (d) The height of nuts with slots is measured from the bottom of the nut to the bottom of the slots.
   (e) Values do not apply to bolts and screws that are not solid.

S 912-006-N00

(3) Lockwire and cotter pins
   (a) Tighten a castellated nut, a screw, or a bolt to the minimum torque limit.
   (b) Do not loosen it to install the lockwire or the cotter pin.
   (c) If you did not align the slot in the nut or the hole in the bolt, tighten and aligned it.
      1) Use no more than the maximum torque limit.
   (d) If this procedure did not align the parts, loosen the part one-half of a turn.
   (e) Tighten the part again.
   (f) When this procedure has no effect, use a new part.

E. Self-locking nuts

S 912-007-N00

(1) Free-turn locknuts (Fig. 202)

   NOTE: See the paragraph on the Torque-Check for Reuse of the Self-Locking Fasteners.

   (a) The free turn locknuts turn freely on the bolt or the stud, until they touch the mating surface.
   (b) Apply the necessary torque to operate the mechanism, that locks the nut.

(c) The Figure 202 shows the necessary torque limits.

S 912-008-N00

(2) Prevailing-torque locknut

(a) The prevailing-torque locknuts turn freely on the bolt or the stud, until the threads go into the lock part of the nut.

(b) Then the bolt pushes the deformation of the nut and holds the nut.

(c) Use the torque limits in the Figure 203, unless the nut is on a stud.

1) Then use the torque limits in the Figure 202.

NOTE: Self-locking heli-coils are equivalent to the prevailing-torque locknuts. The Figure 203 shows the torque limits for the bolts in these heli-coils.

(d) All locknuts must engage the threads of the bolt or the stud to lock correctly.

(e) It is not necessary for the bolt or the stud to extend above the end of the locknut.

1) The chamfer, that is on the end of the locknut thread, does not lock on the bolt or the stud.

F. Machine Thread Plug With a Preformed Packing Seal (MS9015) and the Tube-Boss Nipple (MS9193 or Similar)

S 912-032-N00

CAUTION: DO NOT TIGHTEN MORE THAN THE LIMIT. THIS TORQUE WILL CAUSE DAMAGE TO THE THREADS.

(1) In the Figure 204, the torque limits come from the strength of a cast aluminum or a cast magnesium.

(a) You can use these torque limits in stronger materials.

G. PWA Flexible Fittings and Sealastic-Type Fittings (Fig. 205)

S 912-010-N00

(1) The container has a mark for identification of the material and part number of each packing.

S 912-011-N00

(2) The procedure uses the standards that follow:

(a) AMS 7260 synthetic-rubber, 70-80 durometer A, packings for fuel seals.

THREAD* DIMENSION INCH	TORQUE, POUND-INCHES		TORQUE, NEWTON-METERS	
	OIL LUBRICATED MIN MAX	ANTISEIZE LUBRICATED MIN MAX	OIL LUBRICATED MIN MAX	ANTISEIZE LUBRICATED MIN MAX
0.112 -40	6- 7	5- 6	0.678- 0.791	0.565- 0.678
0.138 -32	12- 14	9- 11	1.356- 1.582	1.017- 1.243
0.164 -32	23- 26	18- 20	2.599- 2.938	2.034- 2.260
0.164 -36	25- 28	20- 22	2.825- 3.164	2.260- 2.486
0.190 -24	32- 35	24- 27	3.616- 3.954	2.712- 3.051
0.190 -32	36- 40	27- 30	4.067- 4.519	3.051- 3.390
0.216 -24	48- 54	36- 40	5.423- 6.101	4.067- 4.519
0.216 -28	50- 56	40- 44	5.649- 6.327	4.519- 4.971
0.250 -20	74- 82	55- 62	8.361- 9.265	6.214- 7.005
0.250 -28	85- 95	62- 72	9.604-10.734	7.005- 8.135
0.3125-18	160-175	115-130	18.078-19.772	12.993-14.688
0.3125-24	180-200	125-140	20.337-22.597	14.123-15.818
0.375 -16	270-300	200-220	30.506-33.895	22.597-24.857
0.375 -24	290-325	225-250	32.766-36.720	25.422-28.246

*THE PROCEDURE THAT FOLLOWS IS PERMITTED FOR THE SCREWS WITH A THREAD DIMENSION THAT IS LARGER THAN 0.164 INCH (4.166 MILLIMETERS) AND WITH ONLY A SCREWDRIVER SLOT (NO EXTERNAL WRENCH SHAPE). TIGHTEN TO 22 POUND-INCHES (2.486 NEWTON-METERS) MINIMUM, PLUS THE TORQUE THAT IS NECESSARY TO TURN THE SCREW THROUGH THE THREAD LOCK.

L-64892

Torque for the Self-Locking Nuts, Bolts, and Heli-Coils
Figure 203

(b) PWA 401 fluorocarbon rubber, 70-77 durometer C (95-100 durometer A), for oil, air, or water seals.
1) Do not use the fluorocarbon rubber at a temperature, that is more than 450°F (232°C).

S 912-012-N00
(3) Assemble the two types of flexible fittings (AMM 70-11-04/201).

S 912-013-N00
(4) Refer to the Figure 205 to tighten the tube-coupling nut.

S 912-014-N00
(5) The rubber in these flexible fittings will have less thread torque after some time.
(a) You can prevent this as follows:
1) Tighten the part to the torque limits.
2) Loosen the part.
3) Tighten the part to the torque limit.

H. Cone-Seat Connectors (Fig. 206)

S 912-015-N00
(1) Use the torque limits in the Figure 208 and Figure 209 for the cone-seat connectors (37 degree) without a gasket.

THREAD DIMENSION INCH	TORQUE, POUND-INCHES		TORQUE NEWTON-METERS	
	OIL LUBRICATED	ANTISEIZE LUBRICATED MIN MAX	OIL LUBRICATED MIN MAX	ANTISEIZE LUBRICATED MIN MAX
0.250-28	15-20	10-13	1.695-2.260	1.130-1.469
0.3125-24	35-40	23-26	3.954-4.519	2.599-2.938
0.375-24	40-50	26-33	4.519-5.649	2.938-3.728
0.4375-20	65-75	42-49	7.344-8.474	4.745-5.536
0.500-20	90-100	58-65	10.169-11.298	6.553-7.344
0.5625-18	110-120	70-80	12.428-13.558	7.909-9.039
0.625-18	150-170	95-110	16.948-19.207	10.734-12.428
0.750-16	200-225	130-145	22.597-25.422	14.688-16.383
0.8125-16	225-250	145-160	25.422-28.246	16.383-18.078
0.875-14	250-275	160-175	28.246-31.071	18.078-19.772
1.000-12	275-300	175-190	31.071-33.895	19.772-21.467
1.0625-12	375-425	240-270	42.369-48.019	27.116-30.506

L-90035

Hexhead Straight-Thread Fittings and Plugs
Figure 204

TUBE DIA INCH (mm)	THREAD DIMENSION	FOR 75 DUROMETER A PACKINGS: AMS 7260, 7267,7273, or 7276		FOR 77 DUROMETER C (100 DUROMETER A) PACKINGS: PWA401	
		TORQUE, POUND-INCHES	TORQUE, NEWTON-METERS	TORQUE, POUND-INCHES	TORQUE, NEWTON-METERS
0.125 (3.175)	0.4375-24	25-30	2.825-3.390	55-60	6.214-6.779
0.1875 (4.762)	0.500-20	25-30	2.825-3.390	55-60	6.214-6.779
0.250 (6.350)	0.625-18	25-30	2.825-3.390	55-60	6.214-6.779
0.3125 (7.938)	0.6875-16	30-35	3.390-3.954	65-70	7.334-7.909
0.375 (9.525)	0.750-16	30-35	3.390-3.954	65-70	7.344-7.909
0.4375 (11.112)	0.8125-16	45-50	5.085-5.649	90-100	10.169-11.298
0.500 (12.700)	0.875-14	55-60	6.214-6.779	110-120	12.428-13.558
0.5625 (14.288)	1.000-12	60-65	6.779-7.344	120-130	13.558-14.688
0.625 (15.875)	1.0625-12	65-70	7.344-7.909	130-140	14.688-15.818
0.750 (19.050)	1.1875-12	70-80	7.909-9.039	140-160	15.818-18.078
0.875 (22.225)	1.375-12	75-85	8.474-9.604	150-170	16.948-19.207
1.000 (25.400)	1.1500-12	100-110	11.298-12.428	200-220	22.597-24.857
1.125 (28.575)	1.625-12	100-110	11.298-12.428	200-220	22.597-24.857
1.250 (31.750)	1.750-12	100-110	11.298-12.428	200-220	22.597-24.857
1.500 (38.100)	2.125-12	100-110	11.298-12.428	200-220	22.597-24.857

L-90036

PWA Flexible Fitting Torque Limits
Figure 205

S 912-016-N00

(2) Do not tighten more than the torque limits to stop leakage.
  (a) Disassemble and examine the fitting for the nicks, burrs, and dirt.
  (b) If it is necessary, use a new part.

I. Jamnuts (Fig. 207)

S 912-017-N00

(1) Use the torque limits in the Figure 210 and Figure 211 for the steel and aluminum jamnuts (locknuts).
  (a) The tube and hose connections use these jamnuts.

S 912-018-N00

(2) Install and align the tube or the hose on the elbow fitting.
  (a) Tighten the jumnuts.

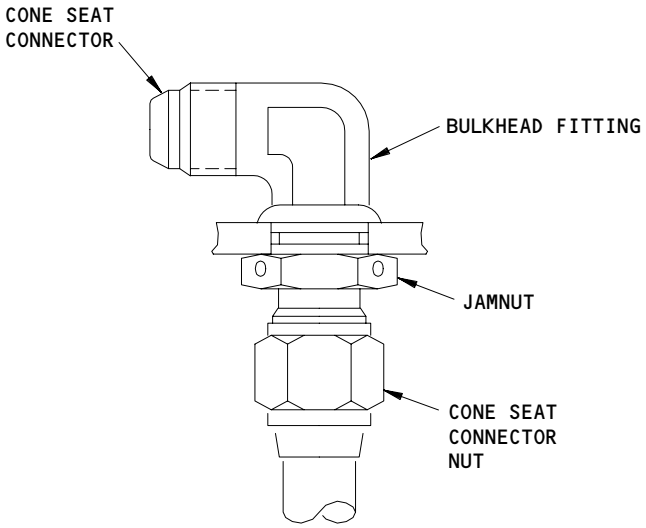
J. Asbestos-Filled Crush-Gaskets (Fig. 212)

S 912-019-N00

(1) Install the crush-gaskets with the continuous surface against the flange of the part that tightens against the seal.

S 912-020-N00

(2) Turn the part until the surfaces touch.



Cone Seat Connector and Bulkhead Fitting Jamnut
Figure 206

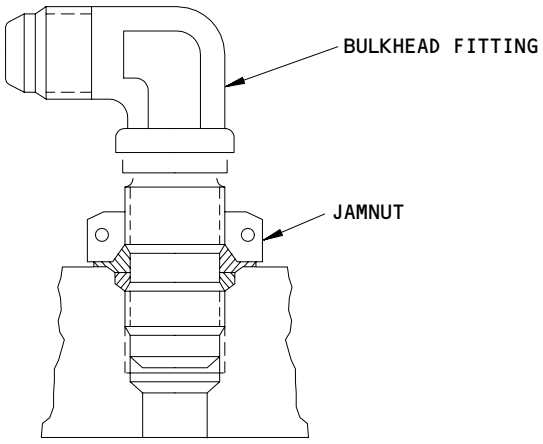
S 912-021-N00

(3) Then tighten through the turn-angle in the Figure 212 for the applicable thread pitch.

K. Ignition Components and Thermocouple System Components

S 912-022-N00

(1) Plug connectors with threads.
  (a) If it is necessary, engage the keys in the slots.
  (b) Tighten the coupling-ring by hand, until the plug is against the bottom and you can not turn the ring.
  (c) On the coupling-rings with a hexagonal shape, continue to tighten them for 45 degrees maximum.



L-71048

Preformed Packing and Jamnut Connector
Figure 207

HOSE DIMEN-SION	TUBE DIAMETER INCH	THREAD DIMENSION INCH	TORQUE, POUND-INCHES	
			STEEL AND TITANIUM FITTINGS	
			OIL LUBRICATED	ANTISEIZE LUBRICATED
-3	0.1875	0.375 -24	70- 80	50- 60
-4	0.250	0.4375-20	90- 100	65- 75
-5	0.3125	0.500 -20	135- 150	100-110
-6	0.375	0.5625-18	270- 300	200- 225
-	0.4375	0.625 -18	320- 350	225- 250
-	-	0.6875-24	320- 350	225- 250
-8	0.500	0.750 -16	450- 500	340- 375
-	0.5625	0.8125-16	550- 600	400- 450
-10	0.625	0.875 -14	650- 700	475- 525
-	-	0.875 -16	650- 700	475- 525
-	0.6875	1.000 -12	800- 900	600- 675
-	-	1.000 -14	800- 900	600- 675
-12	0.750	1.0625-12	900-1000	675- 750
-	0.875	1.1875-12	1100-1200	825- 900
-	-	1.250 -12	1150-1300	900-1000
-16	1.000	1.3125-12	1300-1400	950-1050
-	1.125	1.500 -12	1500-1600	1050-1200
-20	1.250	1.625 -12	1700-1800	1150-1300
-24	1.500	1.875 -12	2100-2200	1500-1600

L-64894

37-Degree Cone Seat Connector Torque Limits (Without Gaskets)
Figure 208

HOSE DIMEN-SION	TUBE DIAMETER INCH	THREAD DIMENSION INCH	TORQUE, POUND-INCHES	
			STEEL AND TITANIUM FITTINGS	
			OIL LUBRICATED	ANTISEIZE LUBRICATED
-3	4.762	0.375 -24	7.909-9.039	5.649-6.779
-4	6.350	0.4375-20	10.169-11.298	7.344-8.474
-5	7.938	0.500 -20	15.253-16.948	11.298-12.428
-6	9.525	0.5625-18	30.506-33.895	22.597-25.422
-	11.112	0.625 -18	36.155-39.545	25.422-28.246
-	-	0.6875-24	36.155-39.545	25.422-28.246
-8	12.700	0.750 -16	50.843-56.492	38.415-42.369
-	14.288	0.8125-16	62.142-67.791	45.194-50.843
-10	15.875	0.875 -14	73.440-79.089	53.668-59.317
-	-	0.875 -16	73.440-79.089	53.668-59.317
-	17.462	1.000 -12	90.388-101.686	67.791-76.265
-	-	1.000 -14	90.388-101.686	67.791-76.265
-12	19.050	1.0625-12	101.686-112.985	76.265-84.739
-	22.225	1.1875-12	124.283-135.582	93.212-101.686
-	-	1.250 -12	129.933-146.880	101.686-112.985
-16	25.400	1.3125-12	146.880-158.179	107.336-118.634
-	28.575	1.500 -12	169.477-180.776	118.634-135.582
-20	31.750	1.625 -12	192.074-203.373	129.933-146.880
-24	38.100	1.875 -12	237.268-248.567	169.477-180.776

L-90037

37-Degree Cone Seat Connector Torque Limits (Without Gaskets) - Metric
Figure 209

THREAD DIMENSION INCH	TORQUE, POUND-INCHES
0.250 -28	14-16
0.3125-24	22-24
0.375 -24	28-32
0.4375-20	38-42
0.500 -20	58-62
0.5625-18	70-80
0.625 -18	95-105
0.750 -16	145-155
0.8125-16	165-185
0.875 -14	190-210
1.000 -12	260-290
1.0625-12	285-315
1.1875-12	350-390
1.250 -12	380-420
1.3125-12	475-525
1.500 -12	570-630
1.625 -12	570-630
1.875 -12	570-630
2.250 -12	570-630
2.500 -12	570-630

L-90038

Jamnut Torque (Oil Lubricated)
Figure 210

THREAD DIMENSION INCH	TORQUE, NEWTON-METERS
0.250 -28	1.582-1.808
0.3125-24	2.486-2.712
0.375 -24	3.164-3.616
0.4375-20	4.293-4.745
0.500 -20	6.553-7.005
0.5625-18	7.909-9.039
0.625 -18	10.734-11.863
0.750 -16	16.383-17.513
0.8125-16	18.642-20.902
0.875 -14	21.467-23.727
1.000 -12	29.376-32.766
1.0625-12	32.210-35.590
1.1875-12	39.545-44.064
1.250 -12	42.934-47.454
1.3125-12	53.668-59.317
1.500 -12	64.401-71.180
1.625 -12	64.401-71.180
1.875 -12	64.401-71.180
2.250 -12	64.401-71.180
2.500 -12	64.401-71.180

L-90039

Jamnut Torque (Oil Lubricated) - Metric
Figure 211

S 912-023-N00

(2) Igniter plugs.

(a) You must install the igniter plugs in the engine and tighten them (AMM 74-21-02/401).

S 912-024-N00

(3) Electrical connectors of the cigarette type.

(a) You must tighten all electrical connectors of the cigarrette-type (found at the end of intermediate and high tension leads) until the connector flange touches.

(b) Approximately 140-160 pound-inches (15.818-18.078 newton-meters) of torque is necessary.

THREAD PITCH	TURN ANGLE, TOLERANCE ±5°	
	ALUMINUM ASBESTOS	COPPER ASBESTOS NICKEL ASBESTOS STEEL ASBESTOS
8 THREADS PER INCH	135°	67°
9 THREADS PER INCH	135°	67°
10 THREADS PER INCH	135°	67°
11 THREADS PER INCH	180°	90°
12 THREADS PER INCH	180°	90°
13 THREADS PER INCH	180°	90°
14 THREADS PER INCH	180°	90°
16 THREADS PER INCH	270°	135°
18 THREADS PER INCH	270°	135°
20 THREADS PER INCH	270°	135°
24 THREADS PER INCH	360°	180°
28 THREADS PER INCH	360°	180°
THESE VALUES GIVE A COMPRESSION OF APPROXIMATELY 40% FOR THE ALUMINUM-ASBESTOS AND 20% FOR THE COPPER-ASBESTOS, NICKEL-ASBESTOS, AND STEEL-ASBESTOS GASKETS.		

L-61912

Installation of Asbestos-Filled Crush-Gasket
Figure 212

S 912-034-N00

(4) Use the torque values in Fig. 213 for the nuts on a thermocouple probe terminal and the screws on a thermocouple-harness-to-lead.

S 912-035-N00

(5) Use the torque values in Fig. 214 for the nuts on a harness terminal and bus bar in a temperature junction box.

L. Torque-Check for the Reuse of the Self-Locking Fasteners (Fig. 215, 216)

S 912-025-N00

(1) Do a torque check of self-locking fasteners before reuse.
(a) Discard the fastener if the lock operation is damaged.

THREAD SIZE	TORQUE (POUND-INCHES)	TORQUE (NEWTON-METERS)
0.138-32	8-10	0.9-1.1
0.164-32	8-12	0.9-1.4
0.190-32	10-15	1.1-1.7
0.216-32	30-35	3.4-4.0
0.250-32	35-40	4.0-4.5

L-90027
L-90028

Torque Requirements for Thermocouple
Probe Terminal Nuts and Screws
Figure 213

(b) Do not repair the fastener.

S 912-031-N00

(2) Torque Limits

(a) Self-locking nuts, bolts, and heli-coils must agree with the torque limits in the Fig. 215 and Fig. 216.

(b) Use a special test for these nuts and bolts:

1) These nuts use a stainless steel, a corrosion or a heat-resistant steel, a nickel alloy, or an AMS 6304 steel.

a) Decrease by 0.003 inch (0.076 mm) the specified pitch diameter, the maximum diameter, and the minimum diameter of the test bolt threads.

THREAD SIZE	TORQUE (POUND-INCHES)	TORQUE (NEWTON-METERS)
0.164-32 0.190-32	20-25 25-30	2.3-2.8 2.8-3.4

L-90030
L-90031

Torque Requirements for Harness Terminal and Bus Bar Attaching Nuts
Figure 214

FINE THREAD SERIES			COARSE THREAD SERIES		
Mating Bolt Thread Dimension** Inch	Max Locking Torque Pound-Inches	Min Break-Away Torque Pound-Inches	Mating Bolt Thread Dimension** Inch	Max Locking Torque Pound-Inches	Min Break-Away Torque Pound-Inches
0.112 -48NF-2A	3	0.5	0.112 -40NC-2A	3	0.5
0.138 -40NF-2A	6	1.0	0.138 -40NC-2A	6	1.0
0.164 -36NF-2A	9	1.5	0.164 -32NC-2A	9	1.5
0.190 -32UNF-3A	13	2.0	0.190 -24UNC-3A	13	2.0
0.250 -28UNF-3A	30	3.5	0.250 -20UNC-3A	30	4.5
0.3125-24UNF-3A	60	6.5	0.3125-18UNC-3A	60	7.5
0.375 -24UNF-3A	80	9.5	0.375 -16UNC-3A	80	12.0
0.4375-20UNF-3A	100	14.0	0.4375-14UNC-3A	100	16.5
0.500 -20UNF-3A	150	18.0	0.500 -14UNC-3A	150	24.0

*INSTALLATION OR REMOVAL

**TORQUE-CHECK THE CADMIUM PLATED NUTS, CARBON STEEL NUTS, ALLOY STEEL NUTS AND ALUMINUM NUTS ON THESE BOLT DIMENSIONS.

L-90040

Torque Check For the Reuse of the Self-Locking Nuts, Bolts, and Heli-Coils
(At Room Temperature and Lubricated With Engine Oil)
Figure 215

FINE THREAD SERIES			COARSE THREAD SERIES		
Mating Bolt Thread Dimension** Inch	Max Locking Torque Pound-Inches	Min Break-Away Torque Pound-Inches	Mating Bolt Thread Dimension** Inch	Max Locking Torque Pound-Inches	Min Break-Away Torque Pound-Inches
0.112 -48NF-2A	0.339	0.056	0.112 -40NC-2A	0.056	0.339
0.138 -40NF-2A	0.678	0.113	0.138 -40NC-2A	0.113	0.678
0.164 -36NF-2A	1.017	0.170	0.164 -32NC-2A	0.170	1.017
0.190 -32UNF-3A	1.469	0.226	0.190 -24UNC-3A	0.226	1.469
0.250 -28UNF-3A	3.390	0.395	0.250 -20UNC-3A	0.508	3.390
0.3125 -24UNF-3A	6.779	0.734	0.3125 -18UNC-3A	0.847	6.779
0.375 -24UNF-3A	9.039	1.073	0.375 -16UNC-3A	1.356	9.039
0.4375 -20UNF-3A	11.298	1.582	0.4375 -14UNC-3A	1.864	11.298
0.500 -20UNF-3A	16.948	2.034	0.500 -14UNC-3A	2.712	16.948

*INSTALLATION OR REMOVAL

**TORQUE-CHECK THE CADMIUM PLATED NUTS, CARBON STEEL NUTS, ALLOY STEEL NUTS AND ALUMINUM NUTS ON THESE BOLT DIMENSIONS.

L-90041

Torque-Check For the Reuse of the Self-Locking Nuts, Bolts, and Heli-Coils (At Room Temperature and Lubricated With Engine Oil) - Metric
Figure 216

b) Only 0.190-32 UNF-3A, 0.190-24 UNC-3A and all larger threads must have the smaller diameters.

2) These unplated nuts use a stainless steel, a corrosion resistant-steel, a nickel alloy, or an AMS 6304 steel.
   a) These nuts have a large thread to accept a plate at assembly.
   b) Apply a silver plate to a thickness of 0.0003-0.0006 inch (0.0077-0.0152 mm).
   c) Use an unplated bolt with a standard thread to measure the torque.

3) These unplated nuts use a stainless steel, a corrosion resistant-steel, a nickel alloy, or an AMS 6304 steel.
   a) These parts are usually attached to brackets or other equivalent parts.
   b) They are not plated at the assembly.
   c) Use a bolt with a silver plate to a thickness of 0.0003-0.0006 inch (0.0077-0.0152 mm).

4) These plated bolts have a diameter of 0.190 inch (4.826 mm), or they have a larger diameter.
   a) Decrease the pitch diameter, the maximum diameter, and the minimum diameter by 0.003 inch (0.076 mm) from the class 3A limits.
   b) Bolts that have a diameter that is smaller than 0.190 inch (4.826 mm) must have the dimensions of the class 2A (Fig. 215, Fig. 216).

5) These nuts use an unplated carbon or an alloy steel.
   a) Apply a cadmium plate to a thickness of 0.0002-0.0005 inch (0.0051-0.0127 mm).
   b) Use a bolt with a cadmium plate that has the dimensions in Fig. 215 and Fig. 216.

6) Use a bolt with a cadmium plate to do a test on the unplated-aluminum nuts.
   a) The bolt must have the dimensions of Fig. 215 and Fig. 216.