B757 MANUAL SUPPLEMENT - ATP 3510
SECTION 1 CHAPTER 70
CONTROL PAGE INITIAL ISSUE

A. File the attached Temporary Revision/Alerts in the Manual Supplement in ATA Chapter/Section/Subject/Page sequence

B. File this Control Page in front of the Chapter TRs/Alerts.

C. The following list shows active TRs/Alerts together with TRs/Alerts added by this control page.

Chapter Section Subject	Page	TR/Alert No.
70-12-04	201	* Boe 70-1001

D. Remove and Destroy the following TRs/Alerts:

* Indicates TRs/Alerts issued with this control page

LOCKING TECHNIQUES FOR THREADED PARTS - MAINTENANCE PRACTICES

TEMPORARY REVISION 70-1001

FILING INSTRUCTIONS

This temporary revision applies only to document D633N132. For the printed manual, file this temporary revision adjacent to the page(s) affected.

For the microfilm supplement, file this temporary revision in sequence by ATA number. Mark the microfilm cartridge to indicate that it has been changed by temporary revision(s).

This temporary revision will be incorporated in the revision dated Jan 28/01.

Revision reason: Added procedure for the installation of safety cable.

This temporary revision furnishes an advance copy of the enclosed page(s) which supersede any previously issued page(s). The information thereon is to be used until this revision is either incorporated or rescinded.

At the end of this TR there is a TR Status Report for document D633N132.

REVISED LIST OF EFFECTIVE PAGES FOR THIS DOCUMENT

PAGE	DATE	CODE	PAGE	DATE	CODE	PAGE	DATE	CODE
* 201	MAR 20/93	R02						
* 202	DEC 14/00	R02.1						
* 203	DEC 14/00	R02.101						
* 204	DEC 14/00	R01.1						
* 205	DEC 14/00	R02.1						
* 206	DEC 14/00	R02.1						
* 207	DEC 14/00	R02.1						
* 208	DEC 14/00	R02.1						
* 209	DEC 14/00	R01.101						
* 210	DEC 14/00	R02.101						
* 211	DEC 14/00	R03.101						
* 212	DEC 14/00	R01.1						
* 213	DEC 14/00	R02.1						
* 214	DEC 14/00	R02.1						
* 215	DEC 14/00	R02.1						

* INDICATES PAGE INCLUDED IN THIS TEMPORARY REVISION.

LOCKING TECHNIQUES FOR THREADED PARTS - MAINTENANCE PRACTICES

1. General

A. A correctly tightened thread fastener will be stretched and in this condition self-locking. The function of a locking device is to stay locked in the event that the bolt load is decreased. The procedure that follows gives the standard locking procedures:

(1) Double lock single hole keywasher
(2) Ring nut and cupwasher
(3) Cotter pin, split
(4) Lockwiring
(5) Pinion wire plug

TASK 70-12-04-912-001-R00

2. Double Lock Single Hole Keywasher (Fig. 201)

A. Installation

S 912-002-R00

(1) Assemble the keywasher on the threaded component and install the locating key in the drilled hole, view A.
(a) Do not use power wrenches on the fasteners where keywashers are used because this can cause extensive damage.

S 912-003-R00

(2) Do not change the preformed angle of the fishtail locking keys, bent at manufacture, before you tighten the fastener because this can result in bad out of flatness of the keywasher.
(a) This out of flatness is such that the final torque load can be insufficient to make the keywasher flat and cause damage to the fastener, view B.

S 912-004-R00

(3) After you tighten the fastener, be careful not to score the engine component when you bend the fishtail locking keys against the fastener.

S 912-005-R00

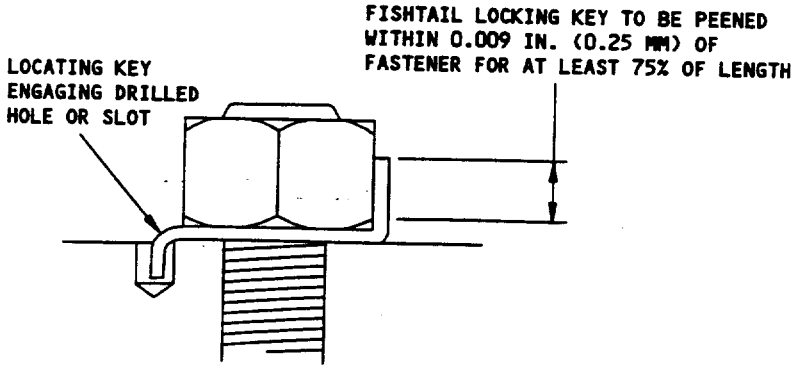
(4) After you bend the fishtail locking keys, examine them to make sure that they meet the dimensional requirements, view A.

S 912-006-R00

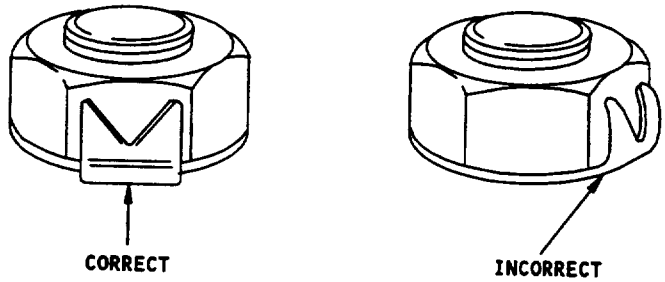
(5) Do not install a used keywasher.
(a) You must replace the keywasher with a new keywasher after its removal.

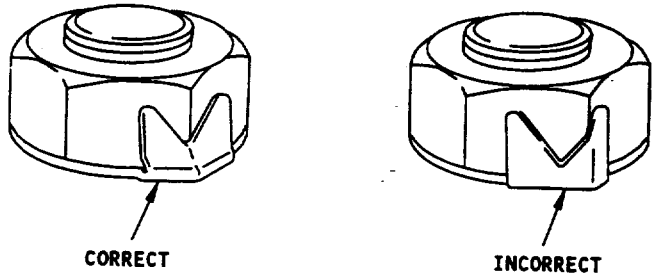
S 912-007-R00

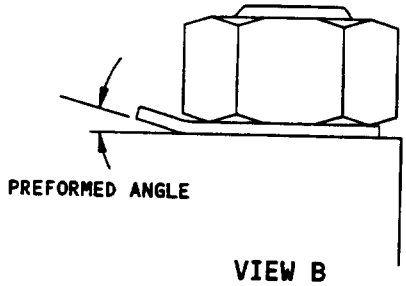
(6) When you install a double lock single hole keywasher, use view C for satisfactory and unsatisfactory conditions.



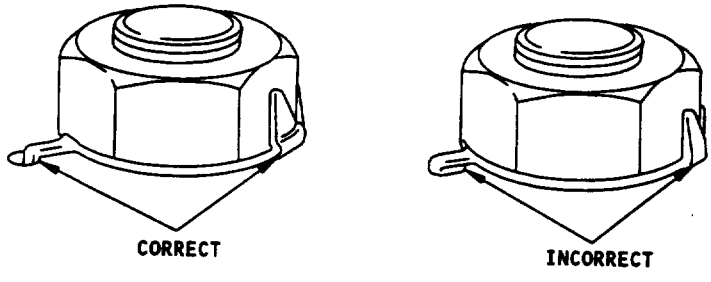
VIEW A







VIEW B



KEYWASHER - LOCKING EXAMPLES
VIEW C
94729

Double Lock Single Hole Keywashers
Figure 201

TASK 70-12-04-912-008-R00

3. Ring Nut and Cupwasher (Fig. 202)

A. Installation

S 912-009-R00

(1) Install the cupwasher on the shaft with the rim pointed out and the keys engaged in the slots in the shaft to prevent the cupwasher from turning.

S 912-010-R00

(2) Use a ring nut with the cupwasher. The ring nut has a number of locking scallops in its circumference.

S 912-011-R00

(3) Tighten the nut and peen the rim of the cupwasher which shrouds the nut into two diametrically opposite locking scallops with a spherical nose tool.

S 912-012-R00

(4) Make sure you peen the cupwasher rim into the locking scallops of the nut and not into the spannering slots.

S 912-013-R00

(5) You can use the ring nuts and cupwashers again if you do not use the locking portion of the cupwasher that was used before.

TASK 70-12-04-912-014-R00

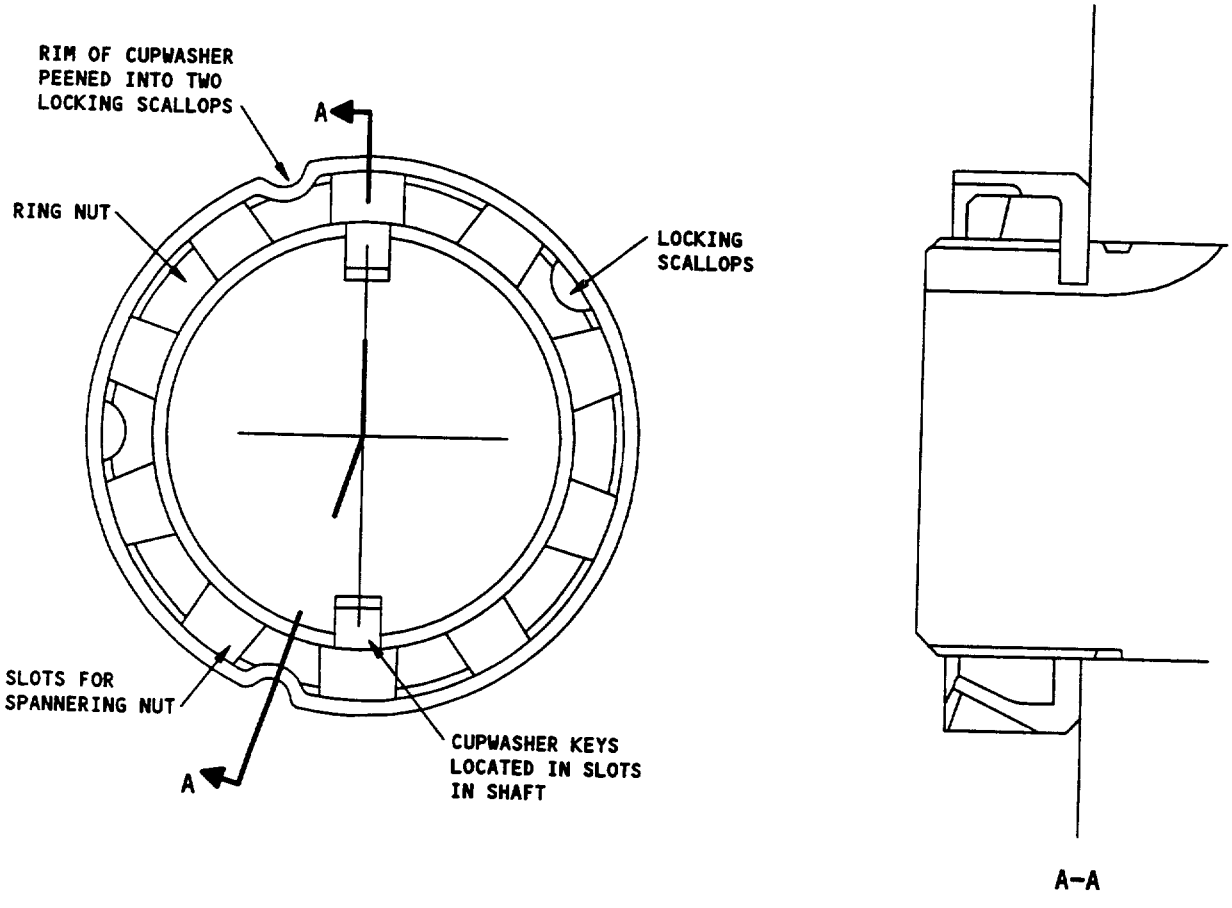
4. Split Cotter Pin

A. Installation

S 912-015-R00

(1) If you tighten the nut to the minimum torque, Fig. 203, and the split cotter pin is not aligned with the slot, you must tighten the nut more to get to the subsequent locking position.

(a) Do not loosen the nut to get to the subsequent locking position.



94730

Two-Key Cupwasher and Ring Nut on Shaft
Figure 202

(b) If the hole and slot do not align before the maximum torque value, Fig. 203, use a different nut.
(c) Do not tighten the nut more than the maximum torque value or damage to the bolt will occur.

S 912-016-R00

(2) For acceptable and unacceptable conditions when you install the split cotter pins, see Fig. 204.

S 912-017-R00

(3) Do not use the split cotter pins again.
(a) You must replace the split cotter pin after its removal.

TASK 70-12-04-912-018-R00

5. Lockwiring (Fig. 205, 206)
A. Standard Practices

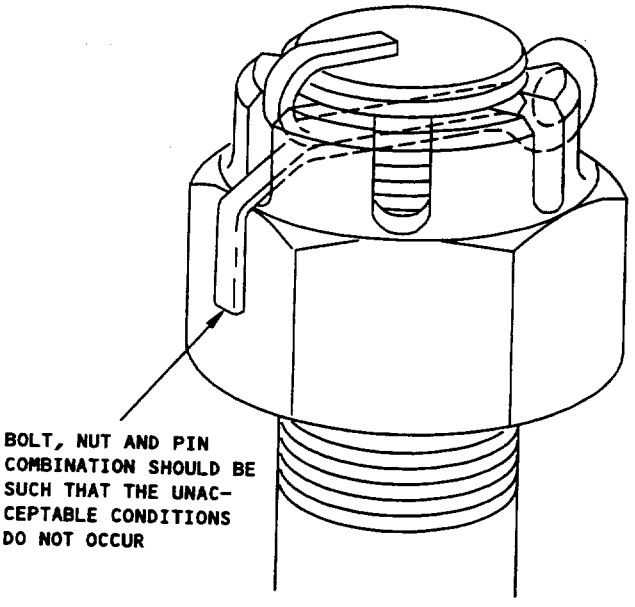
S 912-019-R00

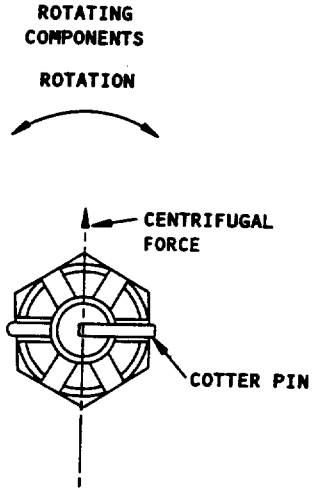
(1) The maximum span of a lockwire between tension points is 3.150 inches (80.0 mm) unless specified differently.

THREAD SIZES	MIN TORQUE		MAX TORQUE	
	Nm	lbf in	Nm	lbf in
No. 10-32	3.5	30	4.5	40
.2500-28	9	80	11.5	100
.3125-24	19	170	24	210
.3750-24	33	290	42	370

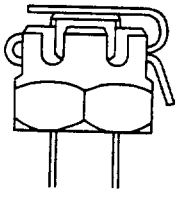
94732

Torque Values When Using Split Cotter Pins
Figure 203

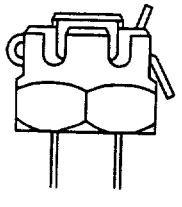




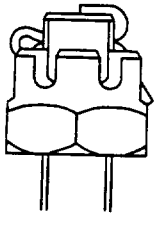
ACCEPTABLE



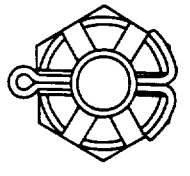
PRONGS TOO LONG - CAUSES FATIGUE FAILURE



HEAD AND UPPER PRONG NOT FIRMLY SEATED AGAINST BOLT



SPLIT COTTER PIN MORE THAN HALF ITS DIAMETER ABOVE THE NUT SLOTS

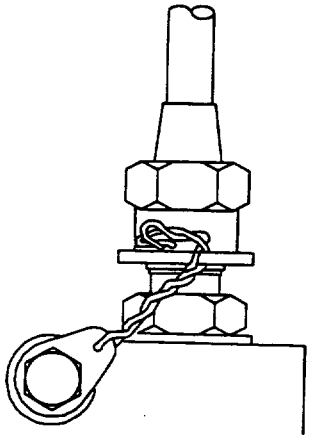


PRONG BENT AROUND CASTELLATIONS OF NUT

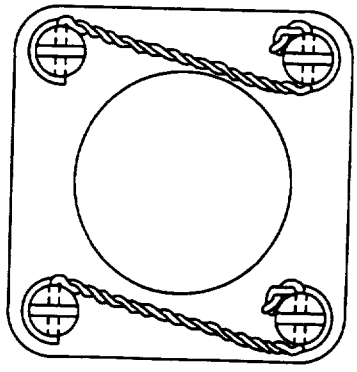
UNACCEPTABLE CONDITIONS

94731

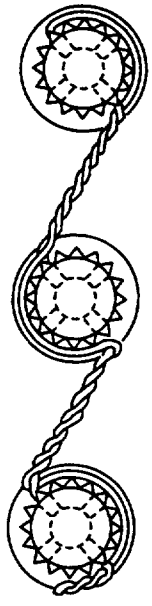
Split Cotter Pins
Figure 204



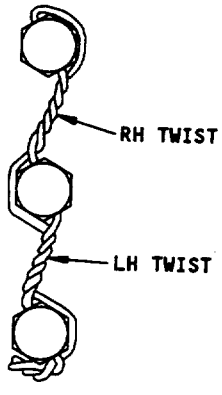
VIEW A



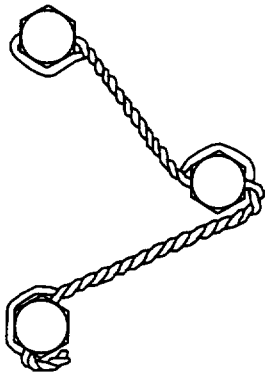
VIEW B



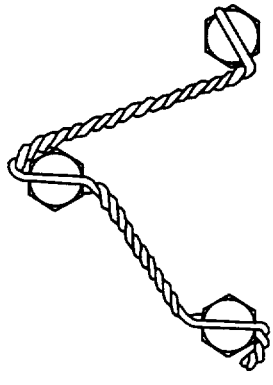
VIEW C



VIEW D

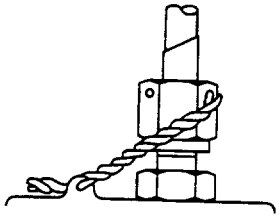


VIEW E

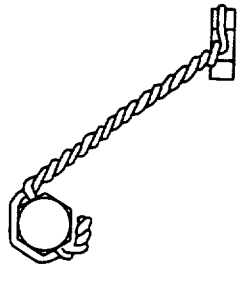


VIEW F

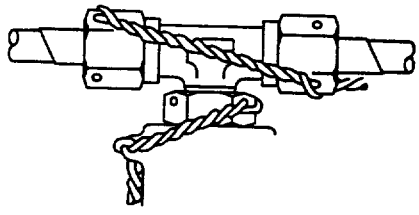
VIEW G



VIEW H



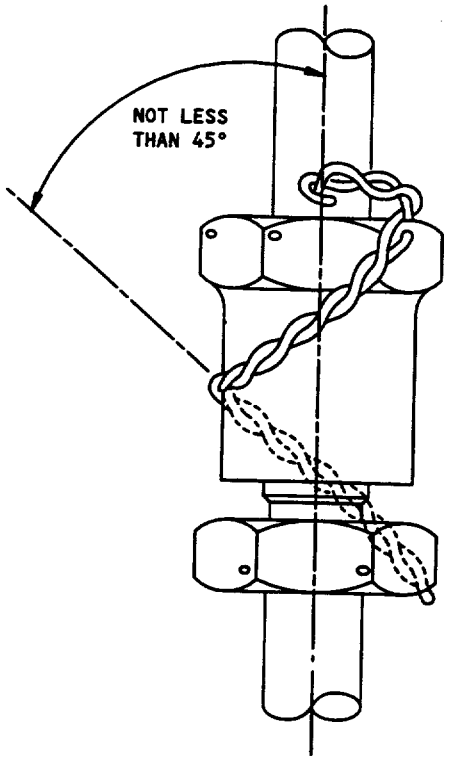
VIEW I



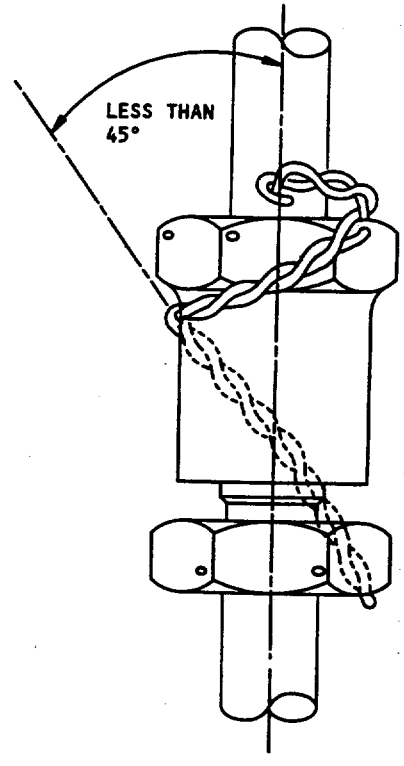
VIEW J

94733

Lockwiring Examples
Figure 205



CORRECT



INCORRECT

Lockwiring Traverses Component Being Locked
Figure 206

S 912-020-R00

(2) Where multiple groups are safetied with a lockwire, the maximum number in a series is calculated by the number of fasteners that can be safetied with a 25.5 inch (650.0 mm) single or 12.750 inch (325.0 mm) double twist length of wire.

S 912-021-R00

(3) The method of lockwire installation is as follows:

NOTE: This is given as guidance information only.

(a) Twist together two strands of wire.
(b) One twist is made by twisting the wires through an arc of 180 degrees and is equivalent to half of a complete turn.
(c) The number of twists per 1.00 inch (25.4 mm) for 0.020 inch (0.5 mm) diameter lockwire is 10 to 13.
(d) The number of twists per 1.00 inch (25.4 mm) for 0.031 inches (0.8 mm) diameter lockwire is 6 to 12.

S 912-022-R00

(4) Be careful during the operation to twist the wire.
(a) You must keep the wire under tension, but you must not stress the wire.
(b) You must not chafe the wire.
(c) You must not let the wire fatigue with vibration.
(d) Abrasions caused by commercially available wire twisting pliers are permitted, but the pliers must have rounded edges to prevent wire damage.
(e) Nicks, kinks and other damage caused by incorrect tooling are not acceptable.

S 912-023-R00

(5) Where a tube adapter is used, safety the tube union nut with a lockwire to the component, not to the adapter, view J (Fig. 205).

S 912-024-R00

(6) Use a new lockwire for each installation.

S 912-025-R00

(7) Where the wire goes across the body of the component that is being locked, see Fig. 206.

B. Installation

S 912-026-R00

(1) Examine the fasteners that you must safety and make sure they are correctly tightened.
(a) Do not tighten the fasteners more than the specified torque value to get the correct alignment of the holes.

(b) Do not loosen the fasteners after you have tighten them to get the correct alignment of the holes.
1) If it is not possible to get the correct alignment in the specified torque limit, do one of these steps:
a) Loosen the fastener and tighten it again to the specified torque range.
b) Remove the fastener and install a different fastener to the specified torque range.

S 912-027-R00

(2) In the adjacent fasteners, it is necessary that the holes are in the same relationship to each other as shown in Fig. 205.
(a) For the right-hand threads, the lockwire must be installed through the hole and have the effect of pulling the fastener clockwise, this must be the opposite for left-hand threads.

S 912-028-R00

(3) Install the lockwire through the first fastener and bend it around the head of the fastener.
(a) The direction of the wrap and twist of the strands must be such that the loop around the fastener comes below the strand extending from the hole to keep the loop down so it does not slip and leave a slack loop (Fig. 205, View C).

S 912-029-R00

(4) Twist the strands, while taut, until the twisted part is just short of the hole in the subsequent fastener.
(a) The twisted section must be a maximum of 0.125 inches (3.0 mm) from the hole in one of the fasteners.

S 912-030-R00

(5) Insert the top strand through the hole in the second fastener and follow the procedure of step (4).
(a) If there are no more than two fasteners in the series do this procedure again.

S 912-031-R00

(6) After you safety the last fastener, continue to turn the wire into a pigtail.
   (a) Make a minimum of 4 turns to make sure that the pigtail will not unravel.
   (b) Bend the wire in against the part to make sure the cut edges will not cause a snag.
   (c) Cut off the excess wire.
   (d) Discard the excess wire to prevent hazards.
   (e) Short pigtails can be necessary to prevent fatigue caused by vibration.

TASK 70-12-04-912-032-R00

6. Pinion Wire Plugs (Fig. 207)

A. Aluminum components

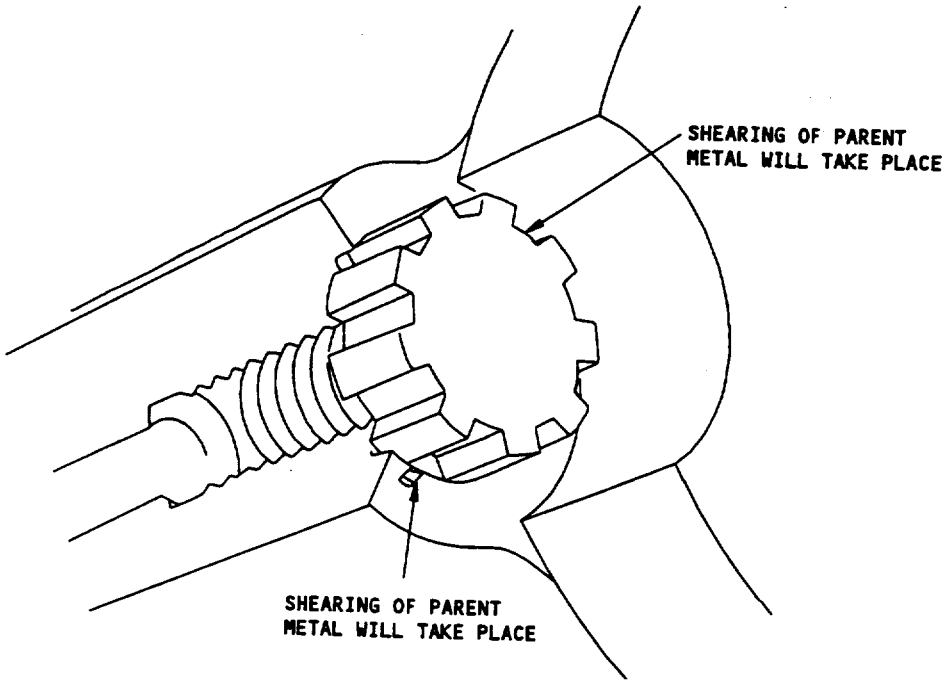
S 912-033-R00

(1) Plugs assembled in aluminum casings must be safetied by punching the surrounding metal into the two serrations of the plug.

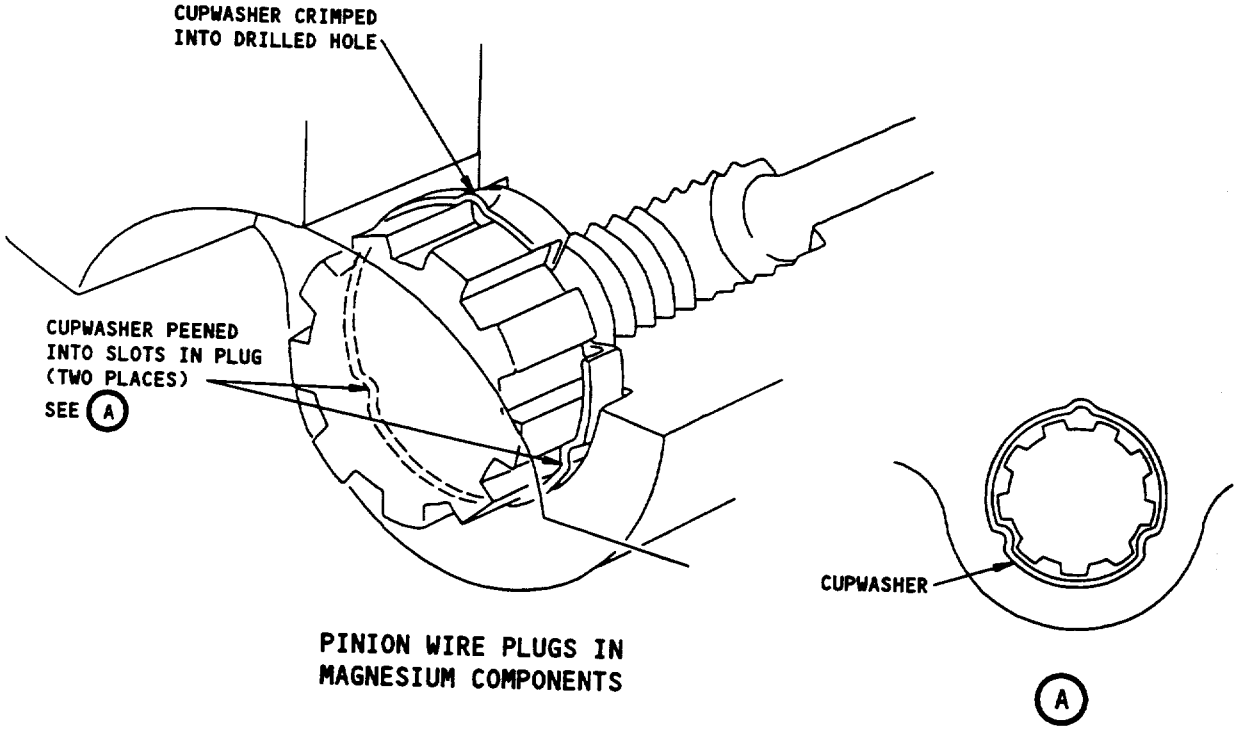
B. Magnesium components

S 912-034-R00

(1) The clearance between the pinion wire plug and the component is such that a cupwasher of the requisite type can be fitted and locked.



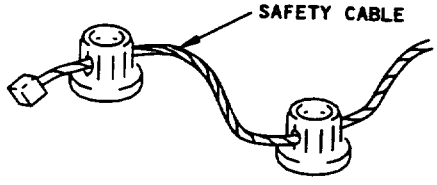
PINION WIRE PLUGS IN ALUMINUM COMPONENTS



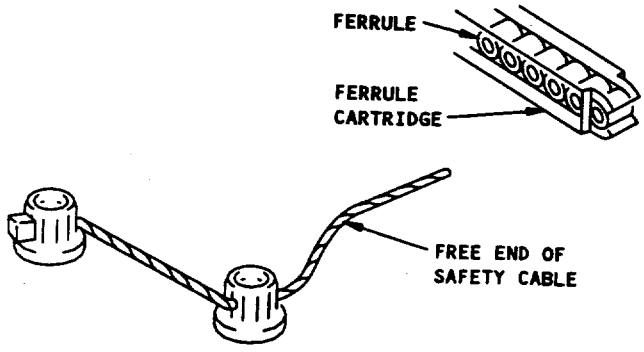
PINION WIRE PLUGS IN MAGNESIUM COMPONENTS

94735

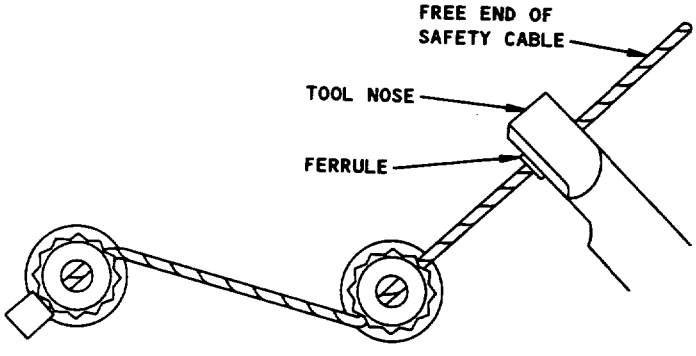
Pinion Wire Plugs
Figure 207



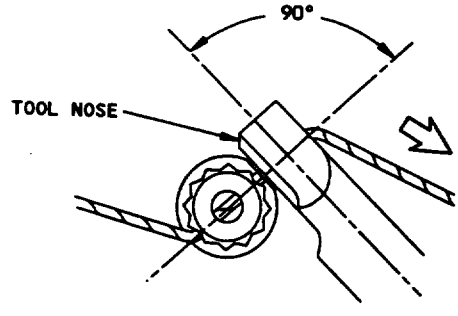
STEP 1



STEP 2



STEP 3

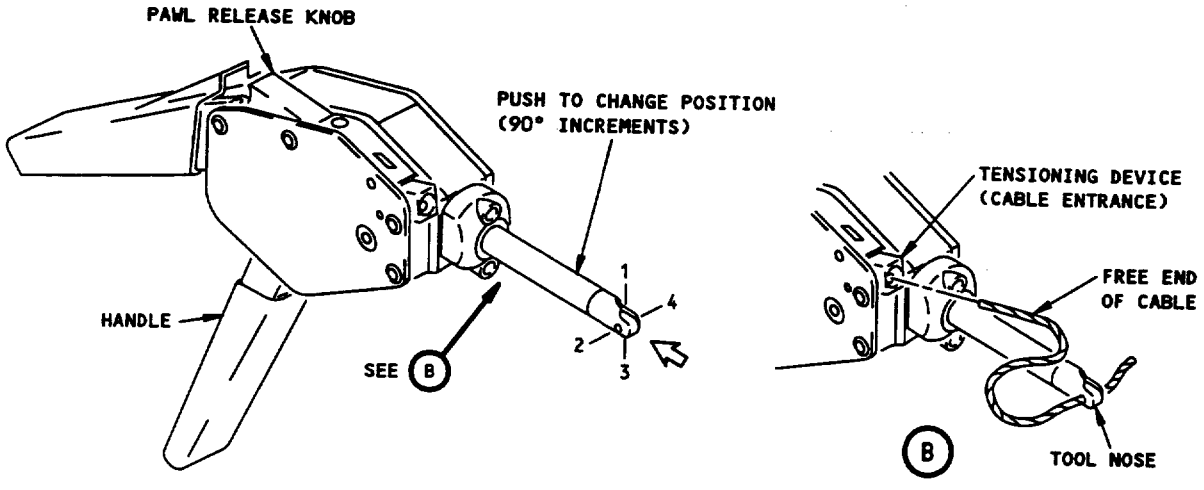


STEP 4

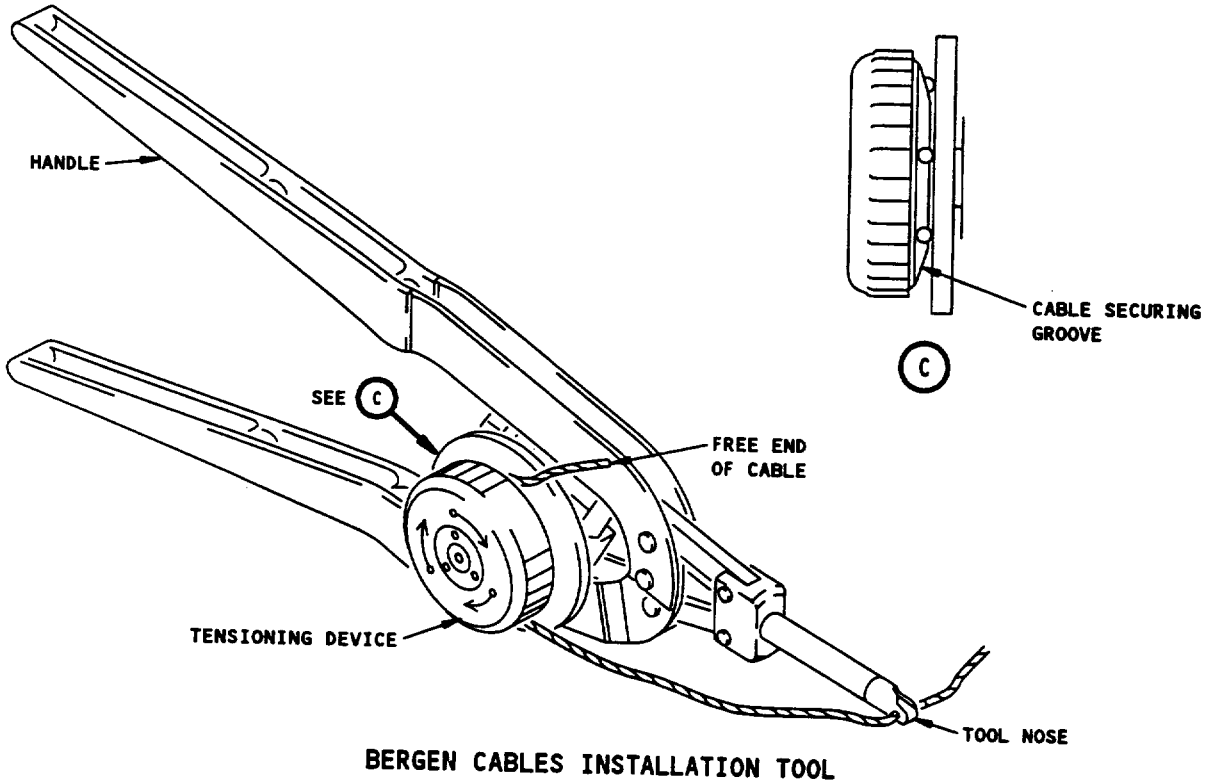
INSTALLED SAFETY CABLE
(RIGHT-HANDED THREAD ILLUSTRATED)

DEF0004361

Safety Cable Installation
Figure 208 (Sheet 1)



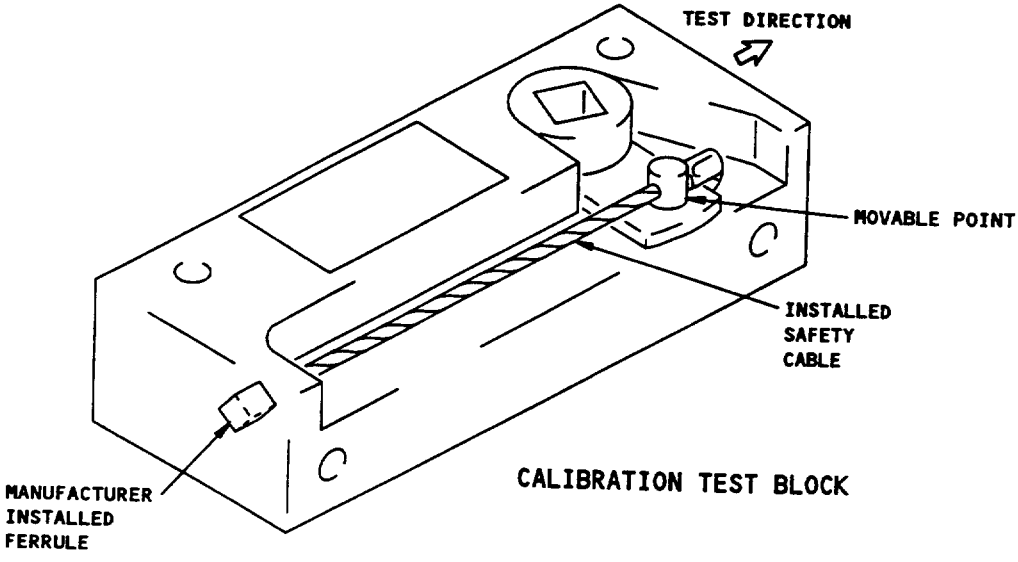
DMC INSTALLATION TOOL



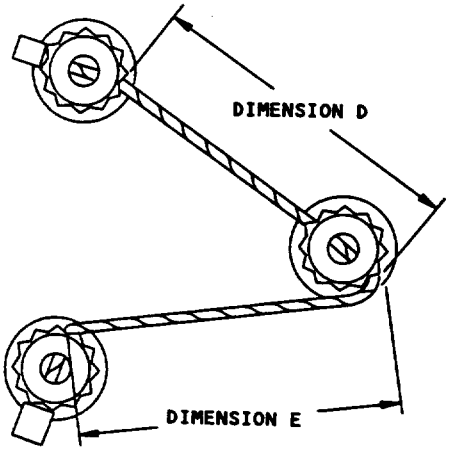
BERGEN CABLES INSTALLATION TOOL

DEE0004362

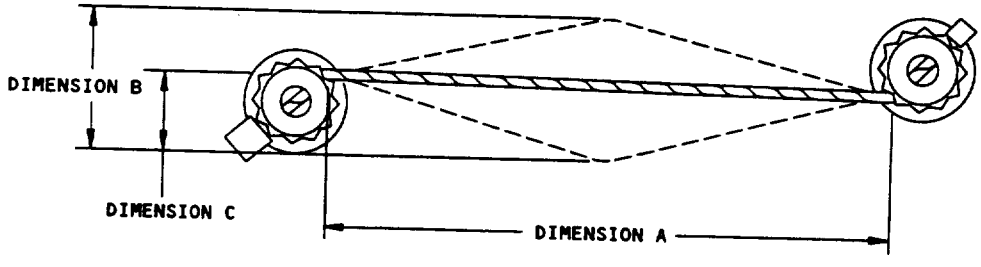
Safety Cable Installation
Figure 208 (Sheet 2)



CALIBRATION TEST BLOCK



RIGHT HANDED THREADS ILLUSTRATED



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Safety Cable Installation
Figure 208 (Sheet 3)

TEMPORARY REVISION STATUS REPORT FOR DOCUMENT D633N132

THIS LIST CONTAINS ALL TRs WITH TR DATES AFTER JAN 28/00. THIS LIST CREATED AT 2000/12/07.16:38:10 UTC

TR NUMBER	TR DATE	DATE INCORPORATED	SUBJECT
27-1001	JUN 05/00	SEP 28/00	27-81-18
28-1001	SEP 29/00	* ACTIVE	28-22-11
32-1001	OCT 26/00	* ACTIVE	32-42-11
70-1001	DEC 14/00	* ACTIVE	70-12-04
71-1001	FEB 18/00	MAY 28/00	71-51-00
72-1001	FEB 29/00	MAY 28/00	72-00-00
73-1001	JUN 26/00	SEP 28/00	73-11-06

TR NUMBER	TR DATE	DATE INCORPORATED	SUBJECT

* INDICATES TR WAS ACTIVE AT THE TIME OF THIS REPORT;
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\# INDICATES TR WAS SUPERSEDED BY THE TR LISTED.

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CONTAMINATION CAUSED BY LOW MELTING POINT ALLOYS - MAINTENANCE PRACTICES

1. General
   A. Contamination of a material by an alloy which has a low melting point can cause an intercrystalline penetration, a brittle structure and cracks. This damage could occur at some temperatures.

TASK 70-00-01-912-005-R00

2. Contamination Caused by Cadmium Plated Tools
   A. Follow these steps when you use cadmium-plated tools.

S 912-006-R00

   (1) It is possible that some cadmium can go from a tool to the surface of an engine component. For titanium components this can cause failure of the component.

S 912-007-R00

   (2) A chemical reaction between the cadmium and the titanium at some temperatures can cause failure. This can cause the titanium to become brittle and to cause cracks.

S 912-008-R00

   (3) Because of this possible chemical reaction, do not use cadmium-plated tools with titanium parts.

IDENTIFICATION OF SELF LOCKING NUTS - MAINTENANCE PRACTICES

1. General
   A. This procedure identifies the two self-locking types of twelve-point nuts.

TASK 70-00-05-912-001-R00

2. Identification of Self Locking Nuts (Fig. 201)
   A. Identification of self-locking nuts.

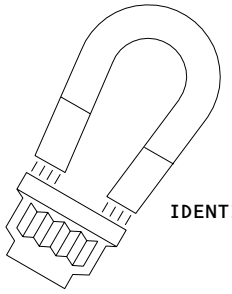
S 912-002-R00

(1) The steps that follow give instructions to identify the two different types of self-locking nuts. These two types of nuts are equivalent in geometry, but are used in different locations on the engine.
   (a) Self-locking nuts used in the hotter engine areas, where the temperatures are between 446-1202°F (230-650°C), have these properties: they are non-magnetic, silver plated and not fully knurled on the flange.
   (b) Self-locking nuts used in the colder engine areas, where the temperatures are not more than 446°F (230°C), have these properties: they are magnetic, cadmium plated, have a layer of molydenum disulphide (black), and have a flange that is not knurled.
   (c) These nuts can only be identified from each other with a magnet.
   (d) Make sure that only the correct nuts (as given in the Illustrated Parts Catalogue) are used. Also, not all low temperature areas of the engine use the cadmium plated nuts. There are low temperature areas of the engine where the high temperature, silver plated nuts must be used.

LOW TEMPERATURE NUTS ARE BLACK AND HIGH TEMPERATURE NUTS ARE BRIGHT WHEN NEW BUT –
DO NOT IDENTIFY BY COLOR AFTER USE

FITTING OF LOW TEMPERATURE NUTS IN HIGH TEMPERATURE AREAS WILL CAUSE ENGINE FAILURE

LOW TEMPERATURE NUTS UP TO 230°C



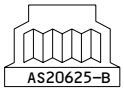
MATERIAL: – Medium carbon Ni–Cro Mo steel

FINISH: – Cadmium plate + black coating of molybdenum disulphide

IDENTIFICATION: – Nut flange has NO knurling

THESE NUTS ARE MAGNETIC

HIGH TEMPERATURE NUTS UP TO 650°C



MATERIAL: – 15% Cr – 25% Ni heat and corrosion resistant steel

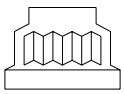
FINISH: – Silver plate

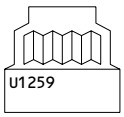
IDENTIFICATION: – Nut flange is KNURLED

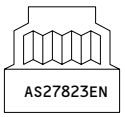
THESE NUTS ARE NOT MAGNETIC

These nuts become black after use

NUT TYPE	THREAD SIZE	ALTERNATIVE RR NUMBERS		NUT TYPE	THREAD SIZE	ALTERNATIVE RR NUMBERS		SBAC NO.
These nuts have manufacturer's code only on the flange				These nuts have part No. and/or manufacturer's code on the flange	No. 8–36	1205943	U125943	AS20623
	No. 10–32	1205924	U125924		No. 10–32	1205944	U125944	AS20624
	.250–28	1205925	U125925		.250–28	1205945	U125945	AS20625
	.3125–24	1205926	U125926		.3125–24	1205946	U125946	AS20626
	.375–24	1205927	U125927		.375–24	1205947	U125947	AS20627
	.4375–20	1205928	U125928		.4375–20	1205948	U125948	AS20628
Regular nut	.500–20	1205929	U125929	Regular nut	.500–20	1205949	U125949	AS20629
These nuts have part No. & manufacturer's code on the flange				These nuts have part No. and/or manufacturer's code on the flange	No. 8–36	1209171	U129171	AS27821
	No. 10–32	1209162	U129162		No. 10–32	1209172	U129172	AS27822
	.250–28	1209163	U129163		.250–28	1209173	U129173	AS27823
	.3125–24	1209164	U129164		.3125–24	1209174	U129174	AS27824
	.375–24	1209165	U129165		.375–24	1209175	U129175	AS27825
Deep counterbored nut				Deep counterbored nut				







31004

Identification of Self-Locking Nuts
Figure 201

FLIGHT PROFILES AND OPERATIONAL MONITORING
(GROUP 'A' PARTS) - MAINTENANCE PRACTICES

1. General
   A. This task contains two topics. The first topic is for the datum flight profile. The second topic is for the actual flight profile.
   B. The failure of a primary engine part which turns can have very dangerous effects. Such parts are identified as Group A Parts. For these parts, a mandatory life limit is given. These limits are specified in the Time Limits Manual (Ref 5-10-01). Do not use these parts for more than their life limits.
   C. The lives given in the Time Limits Manual are calculated from the approved flight profile. Operation to more than the limits of the approved flight profile can affect the approved lives of the Group 'A' parts.

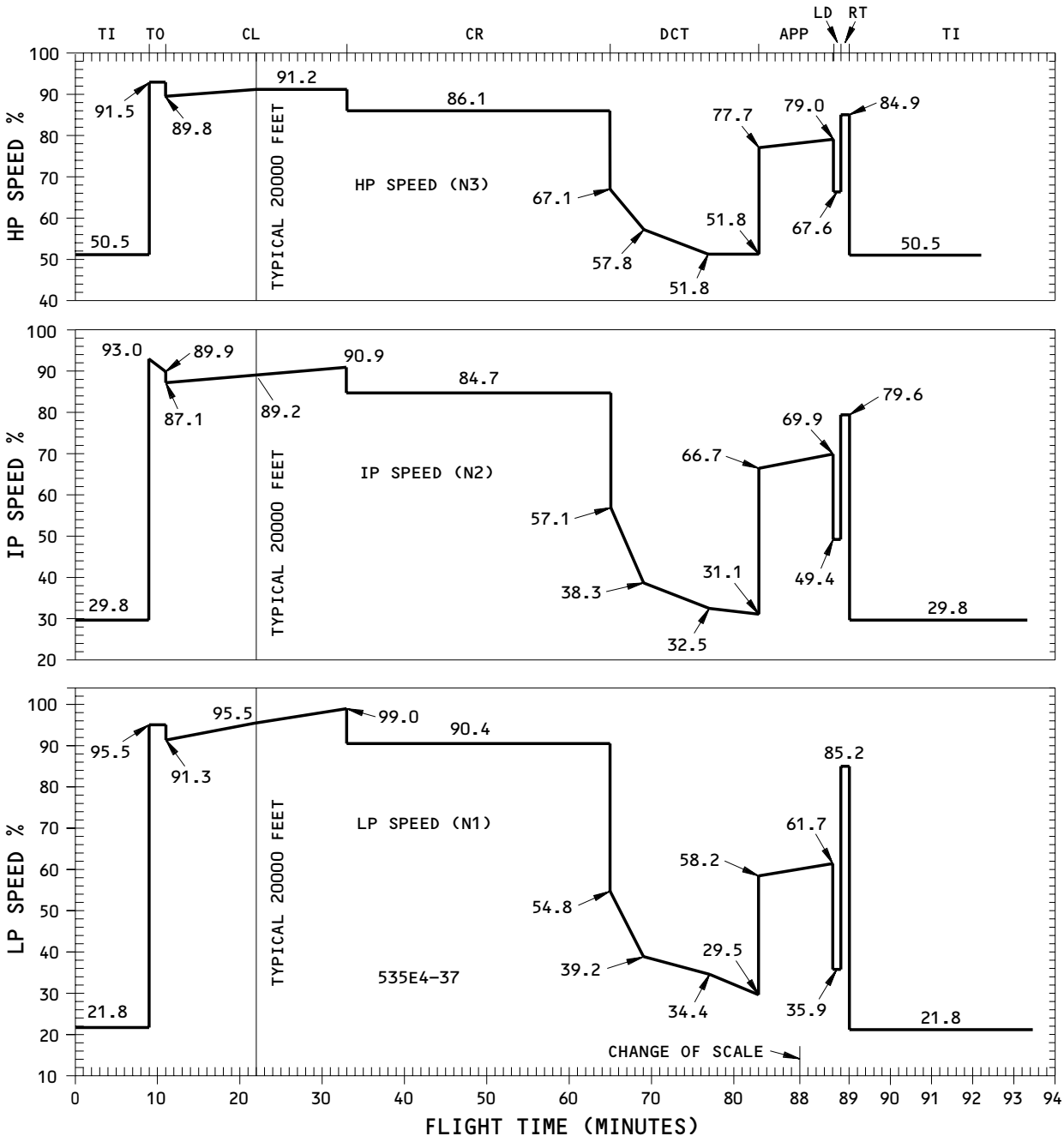
TASK 70-01-10-912-001-R00

2. Datum Flight Profiles
   A. References
      (1) 05-10-01, Rolls-Royce Time Limits Manual
   B. Prepare for the Flight Profiles and Operational Monitoring - Maintenance Practices

      NOTE: Engines should be operated so that the average shaft speeds are less than or equal to the shaft speeds given in the Flight Profile for the engine. This is recommended by Rolls-Royce for all engine marks.

      NOTE: Some operators of the 535E4-37 engines operate their engines higher than the limits of the flight profile (Fig. 201) or do not monitor their operation. As a result, there are two modes of operation for the 535E4-37. The two modes are Flight Profile 'A' and Flight Profile 'B'. You must get approval to use the life limits for Flight Profile "A" given in the Rolls-Royce Time Limits Manual by the Airworthiness Authority in the country in which the operation is registered.

      S 702-016-R00
      (1) Flight Profile 'A'
         (a) When the average maximum HP (N3) and LP (N1) speeds at takeoff and during climb are less than or equal to the limits of the approved flight profile (Fig. 201), the operator can use Flight Profile 'A'. The lives of the Group 'A' components for these engines are as given in the Time Limits Manual 05-10-01 for Flight Plan 'A'.



TI TAXI-IDLE
TO TAKE-OFF
CL CLIMB
CR CRUISE
DCT DESCENT
APP APPROACH (5 MIN. 42 SEC.)
LD LANDING (8 SEC.)
RT REVERSE THRUST (10 SEC.)

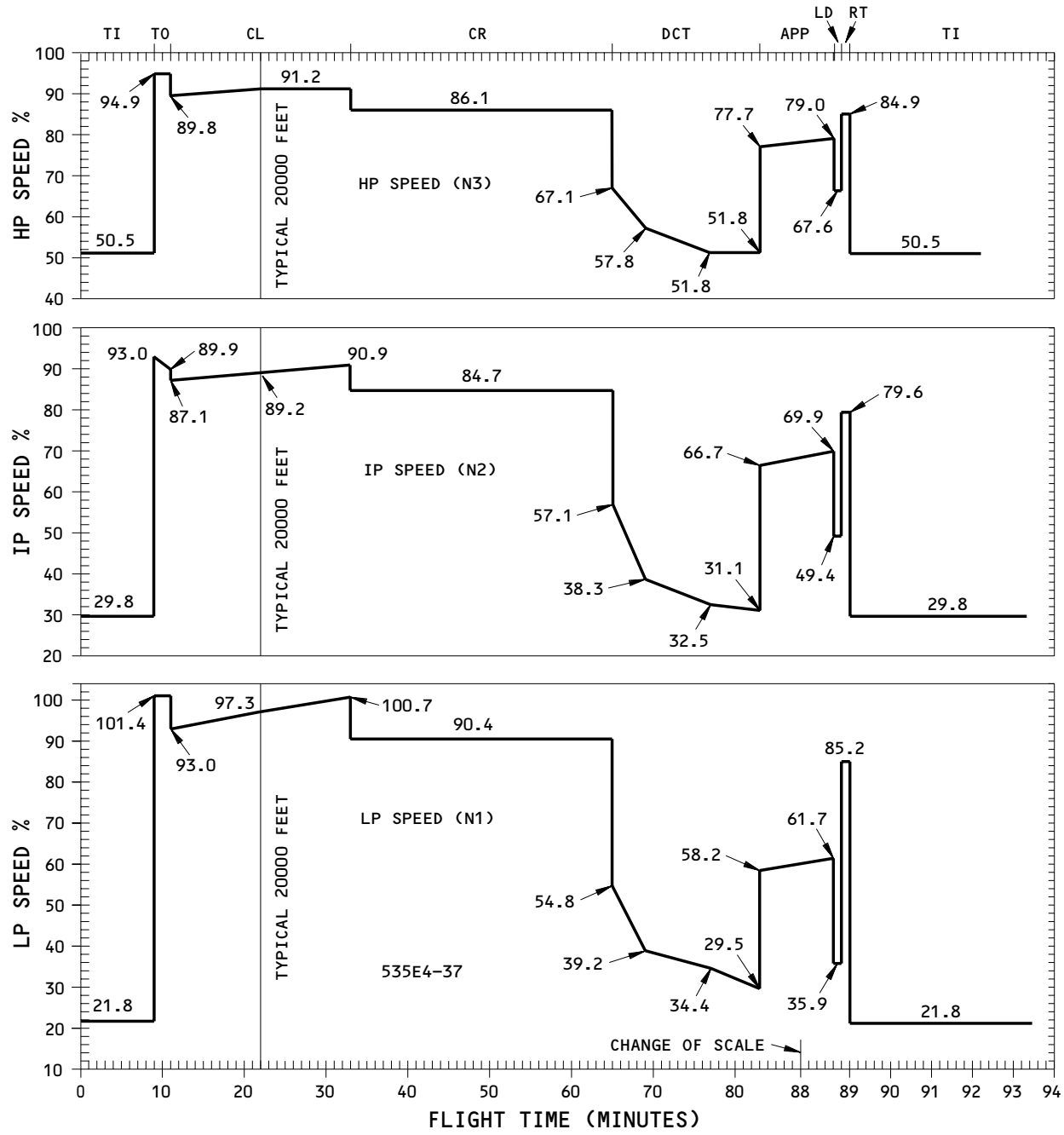
MAXIMUM AVERAGE VALUES
(RB211-535E4-37 FLIGHT PROFILE A)

DE00084793A

Datum Flight Speed Profiles
Figure 201 (Sheet 1)

EFFECTIVITY
ALL

M22521



TI TAXI-IDLE
TO TAKE-OFF
CL CLIMB
CR CRUISE
DCT DESCENT
APP APPROACH (5 MIN. 42 SEC.)
LD LANDING (8 SEC.)
RT REVERSE THRUST (10 SEC.)

MAXIMUM AVERAGE VALUES
(RB211-535E4-37 FLIGHT PROFILE B)

DEE0004749

Datum Flight Speed Profiles
Figure 201 (Sheet 2)

EFFECTIVITY
ALL

M21215

S 702-017-R00

(2) Flight Profile 'B'

(a) When the average maximum HP (N3) and LP (N1) speeds at takeoff and during climb are more than the limits of the approved flight profile (Fig. 201), or when the operator does not make a record of the fleet flight profile, the operator uses Flight Profile 'B'. The lives of the Group 'A' components for these engines are as given in the Time Limits Manual 05-10-01 for Flight Plan 'B'.

TASK 70-01-10-702-029-R00

3. Actual Flight Profile

A. To make a record of operation to Flight Profiles 'A' and 'B':

S 702-018-R00

(1) Data Quality

(a) Operators must record the data that shows the total operation of their fleet during a period of one seasonal year. The data must be collected at different times of the day or night and include all routes operated.

S 702-019-R00

(2) Data Quantity

(a) Operators must record the data as follows:

Number of Aircraft in the Fleet	Minimum Number of Flights to be Recorded Each Year
1	20
2	40
3	50
5	60

Number of Aircraft in the Fleet	Minimum Number of Flights to be Recorded Each Year
10	100
15	130
20	150
25	180
30	200

S 702-020-R00

(3) Measurement of the Data

(a) Two alternative procedures are accepted to measure the shaft speeds of the HP (N3) and LP (N1) during Takeoff and during Climb. Use the applicable procedure for the equipment installed in the airplane.

S 702-021-R00

(4) Procedure 1 - Digital Flight Data Recording (DFDR)

(a) Set the DFDR equipment to record the maximum shaft speeds of the HP (N3) and LP (N1) during Takeoff and during Climb. After the airplane lands, record the data and then find the average of the shaft speeds.

(b) Compare the average maximum shaft speeds with the values in Fig. 201. To obey Flight Profile 'A', the values must be less than or equal to the maximum values in Fig. 201. If the values are more than the maximum shaft speeds in Fig. 201, the operation is to Flight Profile 'B'.

S 702-022-R00

(5) Procedure 2 - Manual Data Capture

(a) At Takeoff, the necessary HP (N3) and LP (N1) shaft speeds are calculated from the flight log data. To calculate the shaft speeds, use the Engine Pressure Ratio (EPR) and Outside Air Temperature (O.A.T.) where A = EPR - 1.4 and B = 1.775 + (1.0065 X OAT) as follows:

1) LP (N1) speed = 75.7 + (65 X A) + (0.2333 X B)

2) HP (N3) speed = 81.41 + (27.75 X A) + (0.1133 X B)

(b) Because the Takeoff values are calculated values and not actual shaft speeds, the average of the calcul;ated shaft speed must be compared with th limits that follow. The average of the calculated shaft speeds must not be compared with Datum Flight Speed Profile (Fig, 201). If the average values are loweer than or equal to the limits that follow, the operation is Profile 'A'. If the average values are more than the limits that follow, the operation is Flight Profile 'B':

Phase	% Shaft Speed
LP (N1) Takeoff	< or = 94.6
HP (N3) Takeoff	< or = 90.4

(c) During climb, operation of the 'Manual Event' button records the HP (N3) and LP (N1) speeds. the button must be operated (during climb) at 20,000 feet. Download the data before the next flight. The values given are values of actual shaft speed.

NOTE: If you do not download the data, it will be written over on the next leg.

(d) Calculate the average of the recorded shaft speeds and compare with the data in Fig. 201. To obey Flight Profile 'A', the values must be less than or equal to the data for 'typical 20,000 feet' on the Datum Flight Speed Profile for Flight Profile A. If the average values are more than the Datum Flight Speed Profile, the operation is Flight Profile B.

S 702-023-R00

(6) Intermixing of Flight Profile 'A' and Flight Profile 'B' Operations

(a) Refer to Time Limits Manual 05-00-01 800-000.

S 702-024-R00

(7) New Operators

(a) New operators must operate to Flight Profile 'B.

(b) When sufficient data is available that shows their operation agrees with flight profile "A", the operator must contact their Airworthiness Authority to apply for approval to use the lives related to Flight Profile "A".

NOTE: In order to obey Flight Profile "A", collect data for one year's operation. This will include changes in seasonal conditions.

NOTE: After six months, if an operator thinks their fleet/sub-fleet's operation is more than the limits of Flight Profile "B", they must contact Rolls-Royce for advice and continue to monitor engine operation.

S 702-025-R00

(8) Approved Flight Profiles

(a) Copies of the approved flight profiles as sent to Rolls-Royce are available.

S 702-026-R00

(9) Date of Approval

(a) If the operation of a fleet changes between Flight Profile 'A' and 'B', the date of approval is the date on which data records began.

S 702-027-R00

(10) Monitor the Operational Flight Profile and data.

(a) The operator must calculate their flight profile flown at regular intervals to keep Flight Profile "A" status, a compliance report with support data must be sent to the operator's local Airworthiness Authority.

NOTE: If an operator thinks their fleet/sub-fleet's operation is more than the limits of Flight Profile "B", they must contact Rolls-Royce for advice and continue to monitor engine operation.

NOTE: If it is necessary for an operator to get approval for Flight Profile "A", they must follow the procedure given in paragraph "New Operators".

B. Definition of a Flight Cycle

S 912-007-R00

(1) Usual Flight

(a) A usual flight is when the Takeoff to landing of the airplanes agrees with the Datum Flight Profile for the type of engine (Fig. 201).

S 912-008-R00

(2) When you train a pilot:

(a) There is one 'flight cycle' for the initial Takeoff and landing. Also, each 'touch and go' or 'overshoot' of the airplane will increase the number of flight cycles for the engine installed at that time. The increases are as follows:

1) One 'flight cycle' for the shafts which follow:
   a) LP compressor shaft
   b) LP turbine shaft
   c) Rear stubshaft of the IP compressor rotor
   d) IP turbine shaft
2) One fifth of a 'flight cycle' for all other group 'A' parts.

C. Example

S 912-006-R00

(1) One flight which is made to train a pilot that includes one 'overshoot' and four 'touch and go'. This is the equivalent of six 'flight cycles' for the shafts specified above and two 'flight cycles' for all other group 'A' parts.

MISUSE OF MOLYBDENUM DISULFIDE LUBRICANTS - MAINTENANCE PRACTICES

TASK 70-01-11-912-004-R00

1. How to Use Molybdenum Disulfide Lubricants

A. Follow these steps when you use molybdenum disulfide lubricants.

S 912-002-R00

(1) Do not use molybdenum disulfide lubricants when temperatures will be more than 300°C (572°F). Molybdenum disulfide lubricants break down above this temperature. When the lubricant breaks down, sulfur is released. This can cause stress, corrosion, and failure before the usual time of an engine part which is lubricated with the lubricant.

S 912-003-R00

(2) Most of the bolt materials which are used in the higher temperature zones of the engine are sensitive to sulfur. Therefore, it is necessary that molydenum disulfide lubricants are used only on those parts for which they are specified in the manuals.

IDENTIFICATION, LUBRICATION AND FITTING OF RUBBER SEALING RINGS - MAINTENANCE PRACTICES

TASK 70-02-01-912-011-R00

1. Identification (Fig. 201)

A. Identification of Rubber Sealing Rings

S 912-021-R00

(1) The rubber sealing rings are identified by the part number on the envelope in which each ring is sealed. Each envelope has this minimum information on it.
   (a) Description of the part
   (b) Quantity of parts
   (c) Engine manufacturers part number
   (d) Cure date.

S 912-022-R00

(2) The storage life of a sealing ring is calculated from the cure date on the envelope.

S 912-028-R00

(3) A table of the storage periods is given in 70-61-01/201.

S 912-027-R00

(4) A year is divided into the quarters that follow for the cure date:
   (a) 1st quarter - January, February and March
   (b) 2nd quarter - April, May and June
   (c) 3rd quarter - July, August and September
   (d) 4th quarter - October, November and December

S 912-017-R00

(5) The quarter number and the year with the letter Q between them shows the cure date.
   (a) A cure date of 2Q80 shows that the cure date is in the second quarter (April, May or June) of 1980.
   (b) You can calculate the storage life from this date.

S 912-018-R00

(6) The sealing ring material is identified by the color of the ring material or by the color coding marks on the outside diameter of the ring.

S 912-019-R00

(7) A table of color codes in relation to material codes and materials is given in Fig. 201.

Base Color	Number and Color of Spots or Lines	Material Code	Material
black	1 yellow	F/E or WAD	Neoprene
black	1 yellow, 1 white	PE/FK or WAJ	Nitrile
black	1 yellow, 1 blue, 1 green	R/G or WAG	Natural Rubber
black	2 yellow	E/ORX	Nitrile
black	2 yellow, 1 blue	PE/EK or WAN	Nitrile
black	2 yellow, 2 green	VE/S or WAT	Fluorocarbon
black	3 yellow	PE/OZR or WAK	Nitrile
black	4 yellow	VE/KR or WAS	Fluorocarbon
black	part number in white ink	PE/DCR or WAL	Nitrile
black	1 white, 1 blue	PE/ELR	Nitrile
black	1 white, 2 blue	B/SK or WAB	Silicone
black	1 white, 2 green	E/PVC or WAQ	Nitrile/PVC
black	1 white, 1 blue, 1 yellow	E/XCF or WAP	Nitrile/PVC
black	1 blue, 1 green	E/ORP	Nitrile
black	1 blue, 1 white, 1 green	PE/ERS	Nitrile
black	1 blue, 1 green, 1 yellow	N/GP or WAC	Neoprene
black	2 blue	E/ORS	Nitrile
black	3 blue	N/Q	Neoprene/Nitrile
black	1 green, 1 white	PE/FR	Nitrile
black	1 green, 1 yellow	E/OR	Nitrile
black	1 green, 2 yellow	E/ORK or WAN	Nitrile
black	3 green	PE/RN	Nitrile
black	4 green	VE/HT or WAR	Fluorocarbon
brick red	2 black graphite	SE/DT	Silicone
red	1 green	GF/ST	Silicone
red	None, self-colored	E/ET	Silicone
orange	None, self-colored	SE/MP or WAH	Silicone
green	None, self-colored	SE/F	Silicone/P.T.F.E.
blue	None, self-colored	SE/G	Silicone
pale blue	None, self-colored	SE/CH or WAU	Silicone
grey	None, self-colored	SE/FM	Silicone/P.T.F.E.
brown	None, self-colored	SE/MH	Silicone
brownish red	None, self-colored	SE/DTA	Silicone
light brown	None, self-colored	WAF	Silicone
brown	None, self-colored	WAY	Fluorosilicone
brown	None, self-colored	WAZ	Fluorosilicone
red	None, self-colored	WAW	Thermo plastic I.C.I. Welvic

CAUTION: THIS SEALING RING MUST ONLY BE USED ON TRANSPORTATION PARTS

34406

Sealing Ring Identification Table
Figure 201

TASK 70-02-01-912-012-R00

2. Lubrication

A. Lubrication of Rubber Sealing Rings

S 912-023-R00

(1) The lubrication of the rubber sealing rings after they are installed, to make the assembly of a unit or part easier, is different for each system to which the ring is to be installed.

S 912-026-R00

(2) To prevent the premature swelling of sealing rings, use the recommended lubricant in small quantities immediately before you install the unit or part.

S 912-025-R00

(3) If you apply the lubricant too long before you install the unit or part, the ring can become expanded and prevent installation.

S 912-024-R00

(4) Use these lubricants to lubricate the sealing rings:

Application of sealing ring	Lubricant
Sealing rings in oil systems	Engine lubricating oil
Sealing rings in fuel systems	Liquid paraffin (B.P. or U.S.P.) or Assembly fluid
Silicone rubber seals in air systems	None
Fluorocarbon seals in air systems	Engine lubricating oil

NOTE: To prevent damage to inflexible seals manufactured in SE/DTA or WAF coded materials used in air systems, light lubrication using engine lubricating oil before fitting is permissible.

TASK 70-02-01-402-001-R00

3. Fitting

A. Do these steps to install the sealing rings:

S 432-002-R00

(1) Use new rubber sealing rings when you assemble the units or parts.

S 212-003-R00

(2) Make sure the shelf life and condition of the sealing rings are as shown in 70-61-01/201.

S 212-004-R00

(3) Make sure the grooves and mating faces, to which the sealing rings are to be installed, are clean, smooth, and free from damage.

S 212-005-R00

(4) When installed, make sure the sealing rings are not twisted and are correctly seated in the grooves.

S 432-006-R00

CAUTION: DO NOT INSTALL THE RUBBER SEAL RINGS TO A SECTION OF THE ENGINE THAT IS HOT. IF YOU INSTALL THE RUBBER SEAL RINGS TO A SECTION WHILE IT IS HOT, THE SEAL RING CAN STRETCH AND DAMAGE TO THE SEAL RING CAN OCCUR.

(5) To prevent damage to the sealing rings during the installation to the double grooved ferrules, use an applicable pilot and sleeve assembling tool.

S 432-007-R00

(6) Install the rubber sealing rings dry, unless they are manufactured from SE/DTA or WAF coded materials.

S 642-008-R00

(7) Immediately before you assemble the mating parts, lightly lubricate the outer surfaces of the sealing ring with the applicable lubricant.

S 642-009-R00

(8) Rubber sealing rings made from SE/DTA or WAF coded materials are not flexible thus, light lubrication of their full surface areas will help the installation.

S 432-010-R00

(9) Push the ferrules and tubes straight into their mating sockets to prevent damage and twist to the rubber sealing rings.

VEE BAND COUPLING CLAMPS - MAINTENANCE PRACTICES

1. General
   A. This procedure gives the removal and the installation of the the Vee band coupling clamps.
   B. Vee band coupling clamps are used with 20 degree Vee flanges to connect units and tubes. An E-type rubber seal is also installed to make an air or fluid sealed joint in ducts and tubes.
   C. All coupling clamps include a "fail-safe" device. This prevents the accidental release of the clamp and keeps the joint correct if the clamp bolts loosen or break.

TASK 70-12-02-022-001-R00

2. Remove the Vee Band Coupling Clamps
   A. Access
      (1) Location Zones
          410 Left Power Plant
          420 Right Power Plant

   B. Remove the AVICA Coupling Clamps

      S 022-002-R00
      (1) Do the steps that follow to remove the AVICA coupling clamps (Fig. 201):
          (a) Loosen the nuts (3) until they move to the top of the bolt (6).
          (b) Move the links (5) until the washer saddles (4) are clear of the lug in the free end of the top half clamp (1).
          (c) Move the bolts (6) together with the links (5) and the washer saddles (4) away from the free end of the half clamp (1).
          (d) Open the half clamps (1) and (7) then remove the clamp from the Vee flanges.

              NOTE: If the clamp is not easy to remove by hand, lightly hit the lug ends of the clamp with a soft faced mallet.

   C. Remove the PORTER Coupling Clamps

      S 022-003-R00
      (1) Do the steps that follow to remove the PORTER coupling clamps (Fig. 202).
          (a) Remove the nut (1) from the tee bolt (2).
          (b) Release the "fail safe" device. Put the strap end tongue (5) through the strap end slot (4).
          (c) Move the trunnion (3) off the bolt (2) to open the clamp, then remove the clamp.

TASK 70-12-02-422-004-R00

3. Install the Vee Band Coupling Clamps

A. Equipment

(1) Small, clean brush, to apply the lubricant

B. Consumable Materials

(1) Lubricant - Dry Film
British Spec - PL. 198
OMat No. - 4/20

(2) Oil - Engine Lubricating
OMat No. - 1011

(3) White Spirit
British Spec - B.S. 245
OMat No. - 102

(4) Stoddard Solvent
American Spec - A.S.T.M. D 484
OMat No. - 102A

(5) Trichloroethane
British Spec - B.S. 4487
OMat No. - 1/21

(6) Solution - Potassium Silicate
British Spec - NO. 66 grade
OMat No. - 7/124

(7) Paint - Yellow Marking
British Spec - PL. 168A
OMat No. - 7/84

C. Access

(1) Location Zones
410 Left Power Plant
420 Right Power Plant

D. Prepare to Install the Vee Band Coupling Clamps

S 212-005-R00

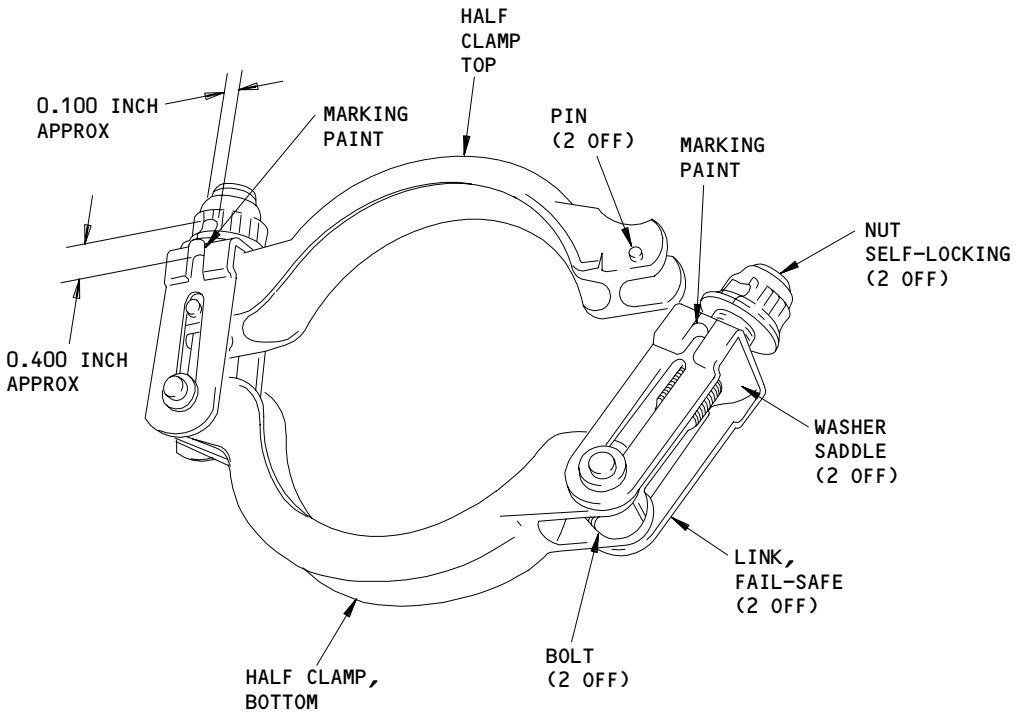
(1) Make sure the Vee flanges and the coupling clamps are clean and not damaged.

(a) Visually examine the Vee flanges and the coupling clamps for:

- corrosion
- distortion
- cracks
- scores
- burrs

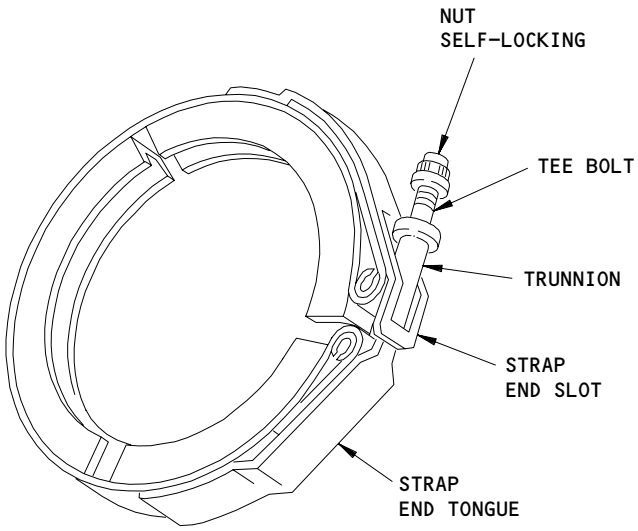
1) If found, replace the duct unit or the coupling clamps as necessary.

(b) Clean the Vee band flanges with white spirit, then wipe the Vee flanges dry with a clean cloth. When E-type seals are left in position, make sure the cleaning fluid does not go into the space between the outer legs of the seal.



AVICA

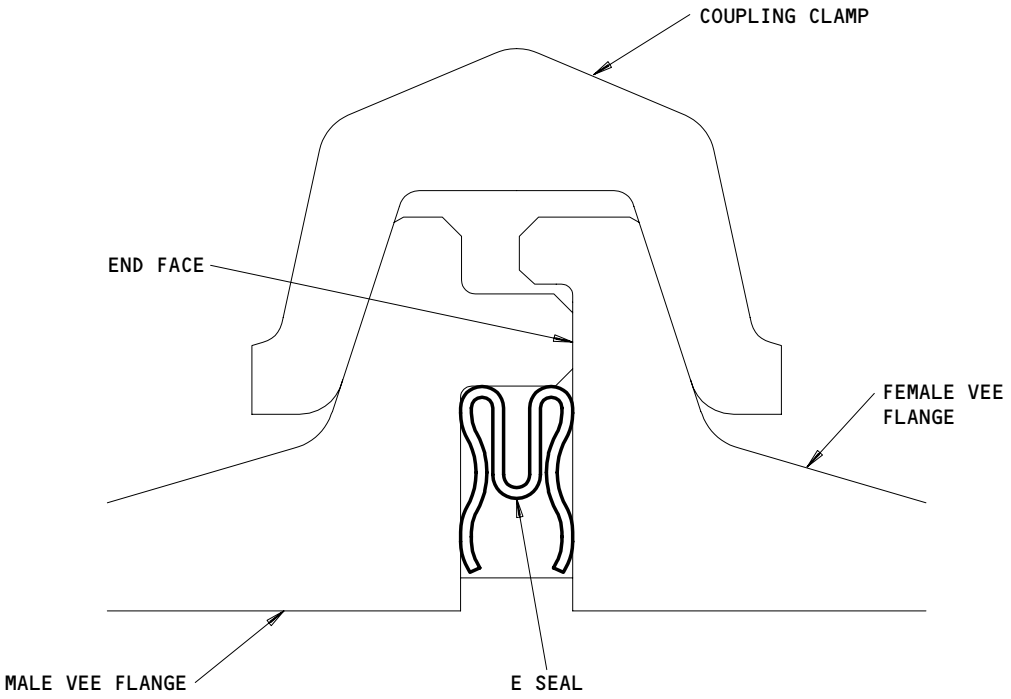
Avica Vee Band Coupling Clamp Installation
Figure 201



PORTER

24700A

Porter Vee Band Coupling Clamp Installation
Figure 202



24701

Section through Duct Joint Using E Type Seal
Figure 203

(c) Where E-type seals have been installed, visually examine the Vee flanges for silver-plating particles.
1) If found, remove the particles of silver-plating but make sure the parent metal is not damaged.
(d) Visually examine the dry film lubricant (where applicable) on the internal Vee faces of the coupling clamps for damage or wear.
1) If necessary, apply a thin layer of dry film lubricant with a brush.
(e) On clamps that are not dry film lubricated, apply a thin layer of engine oil to the internal Vee faces of the coupling clamp.

S 222-006-R00
(2) Do a check of the run down torque of the self-locking nuts on the coupling clamps.
(a) If the torque is not in standard limits, replace the self-locking nuts.

S 212-007-R00
(3) Do a check to make sure the silver-plating on the E-type seal is satisfactory, and the outer leg of the E-type seal comes out more than the end face of the male Vee flange (Fig. 202).
(a) If the seal does not come out more than the end face of the male Vee flange, or if there is more than 30 percent deterioration of the silver-plating, install a new E-type seal.

S 112-008-R00
(4) Clean the external surfaces of the flange with Stoddard solvent. Make sure the cleaning fluid does not go in the space between the legs of the seal.

E. Install the AVICA Coupling Clamps

S 422-009-R00
(1) Do the steps that follow to install the AVICA coupling clamps (Fig. 201).
(a) Make sure that the mating Vee flanges are parallel and aligned, and that they touch.
(b) Install the coupling clamp halves (1) and (7) loosely on the Vee flanges; then push the two halves in position.
(c) Move the bolts (6) together with the links (5) and the washers (4) in the slots in the top clamp half (1). At the same time, push the links (5) until the pins (2) are in their locations.
(d) Move the coupling clamp in position to let the self-locking nuts (3) be tightened. Make sure the coupling clamp does not touch any other unit or structure.
(e) Tighten the self-locking nuts (3) equally to 80.5 to 87.5 pound-inches (9.1 to 9.9 N.m.).
(f) Hit the outer periphery of the coupling clamp halves (1) and (7) with a soft faced mallet to apply the tension equally.
(g) Tighten the self-locking nuts (3) by small equal increments to 115 to 125 pound-inches (12.9 to 14.1 N.m.).

(h) To show that the torque loading procedures have been done correctly, make a mark on the coupling clamp (Fig. 203).
1) Clean the areas which will have the mark with trichloroethane.
2) Clean the areas with potassium silicate solution.
3) Apply yellow marking paint as shown in Fig. 203.

F. Install the PORTER Coupling Clamps

S 422-010-R00

(1) Do the steps that follow to install the PORTER coupling clamps (Fig. 202).
(a) Make sure that the mating Vee flanges are parallel and aligned, and that they touch.
(b) Install the coupling clamp loosely on the Vee flanges, then put the trunnion (3) on the tee bolt (2).
(c) Engage the "fail safe" device; put the strap end tongue (5) through the strap end slot (4).

NOTE: The "fail safe" device must be engaged before you get the minimum torque. Do not use more than the maximum torque to engage the "fail safe" device.

(d) Install the self-locking nut (1) to the tee bolt (2). Move the coupling clamp in position to let the self-locking nut (1) be tightened.
(e) Tighten the self-locking nut (1) to 70 to 80 pound-inches (7.9 to 10.2 N.m.).
(f) Hit the outer periphery of the coupling clamp (6) with a soft faced mallet to apply the tension equally.
(g) Tighten the self-locking nut (1) to 70-90 pound-inches (7.9-10.2 N.m.).
(h) Loosen the self-locking nut, then tighten the self-locking nut to 70-90 pound-inches (7.9-10.2 N.m.) two times. Do not change the position of the coupling clamp during this step.
(i) Examine the coupling clamp to make sure the 'fail safe' device stays engaged.

LOCKING TECHNIQUES FOR THREADED PARTS - MAINTENANCE PRACTICES

1. General
   A. A correctly tightened thread fastener will be stretched and in this condition self-locking. The function of a locking device is to stay locked in the event that the bolt load is decreased. The procedure that follows gives the standard locking procedures:
      (1) Double lock single hole keywasher
      (2) Ring nut and cupwasher
      (3) Cotter pin, split
      (4) Lockwiring
      (5) Pinion wire plug

TASK 70-12-04-912-001-R00

2. Double Lock Single Hole Keywasher (Fig. 201)
   A. Installation

S 912-002-R00

(1) Assemble the keywasher on the threaded component and install the locating key in the drilled hole, view A.
   (a) Do not use power wrenches on the fasteners where keywashers are used because this can cause extensive damage.

S 912-003-R00

(2) Do not change the preformed angle of the fishtail locking keys, bent at manufacture, before you tighten the fastener because this can result in bad out of flatness of the keywasher.
   (a) This out of flatness is such that the final torque load can be insufficient to make the keywasher flat and cause damage to the fastener, view B.

S 912-004-R00

(3) After you tighten the fastener, be careful not to score the engine component when you bend the fishtail locking keys against the fastener.

S 912-005-R00

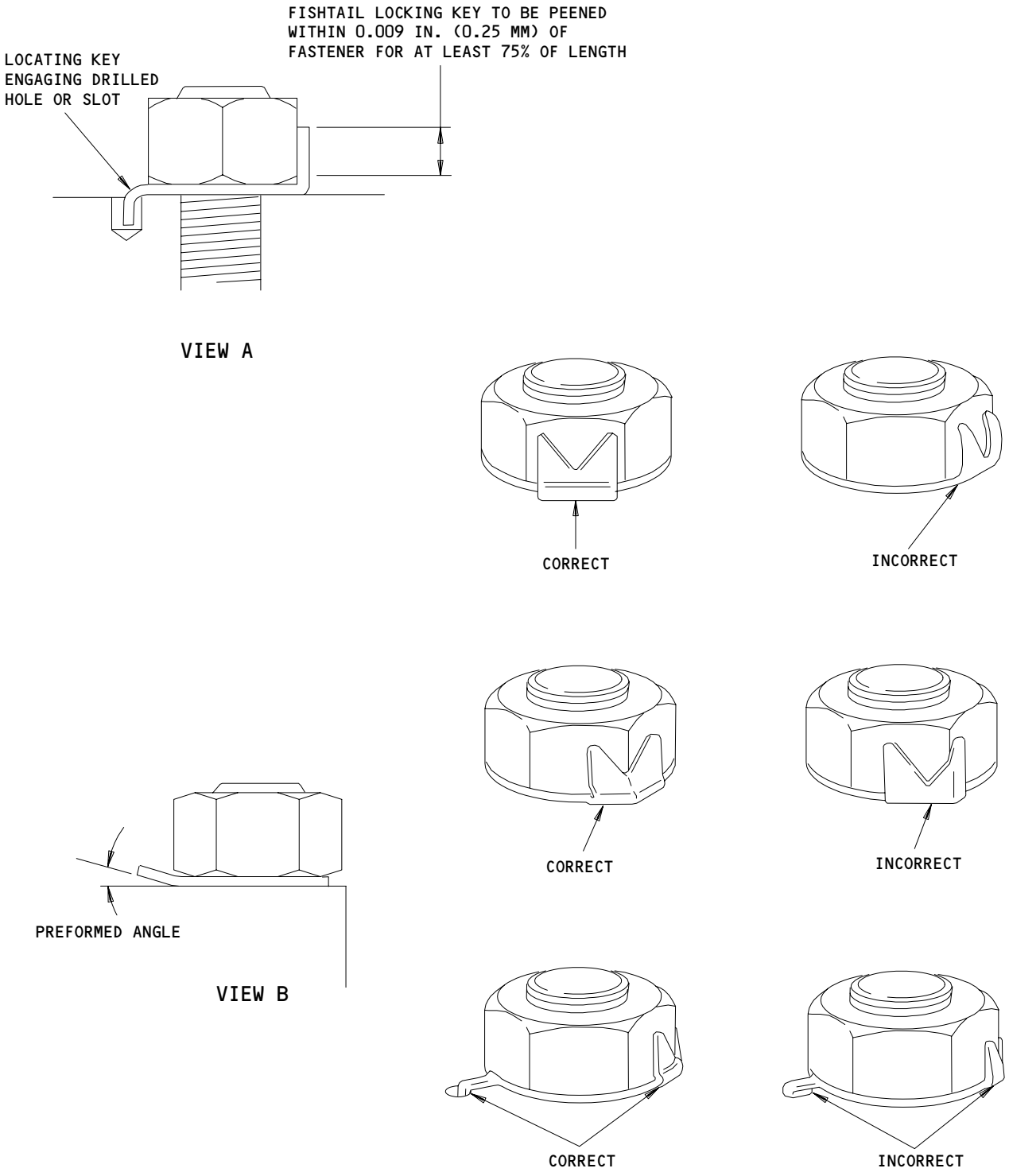
(4) After you bend the fishtail locking keys, examine them to make sure that they meet the dimensional requirements, view A.

S 912-006-R00

(5) Do not install a used keywasher.
   (a) You must replace the keywasher with a new keywasher after its removal.

S 912-007-R00

(6) When you install a double lock single hole keywasher, use view C for satisfactory and unsatisfactory conditions.



Double Lock Single Hole Keywashers
Figure 201

TASK 70-12-04-912-008-R00

3. Ring Nut and Cupwasher (Fig. 202)

A. Installation

S 912-009-R00

(1) Install the cupwasher on the shaft with the rim pointed out and the keys engaged in the slots in the shaft to prevent the cupwasher from turning.

S 912-010-R00

(2) Use a ring nut with the cupwasher. The ring nut has a number of locking scallops in its circumference.

S 912-011-R00

(3) Tighten the nut and peen the rim of the cupwasher which shrouds the nut into two diametrically opposite locking scallops with a spherical nose tool.

S 912-012-R00

(4) Make sure you peen the cupwasher rim into the locking scallops of the nut and not into the spannering slots.

S 912-013-R00

(5) You can use the ring nuts and cupwashers again if you do not use the locking portion of the cupwasher that was used before.

TASK 70-12-04-912-014-R00

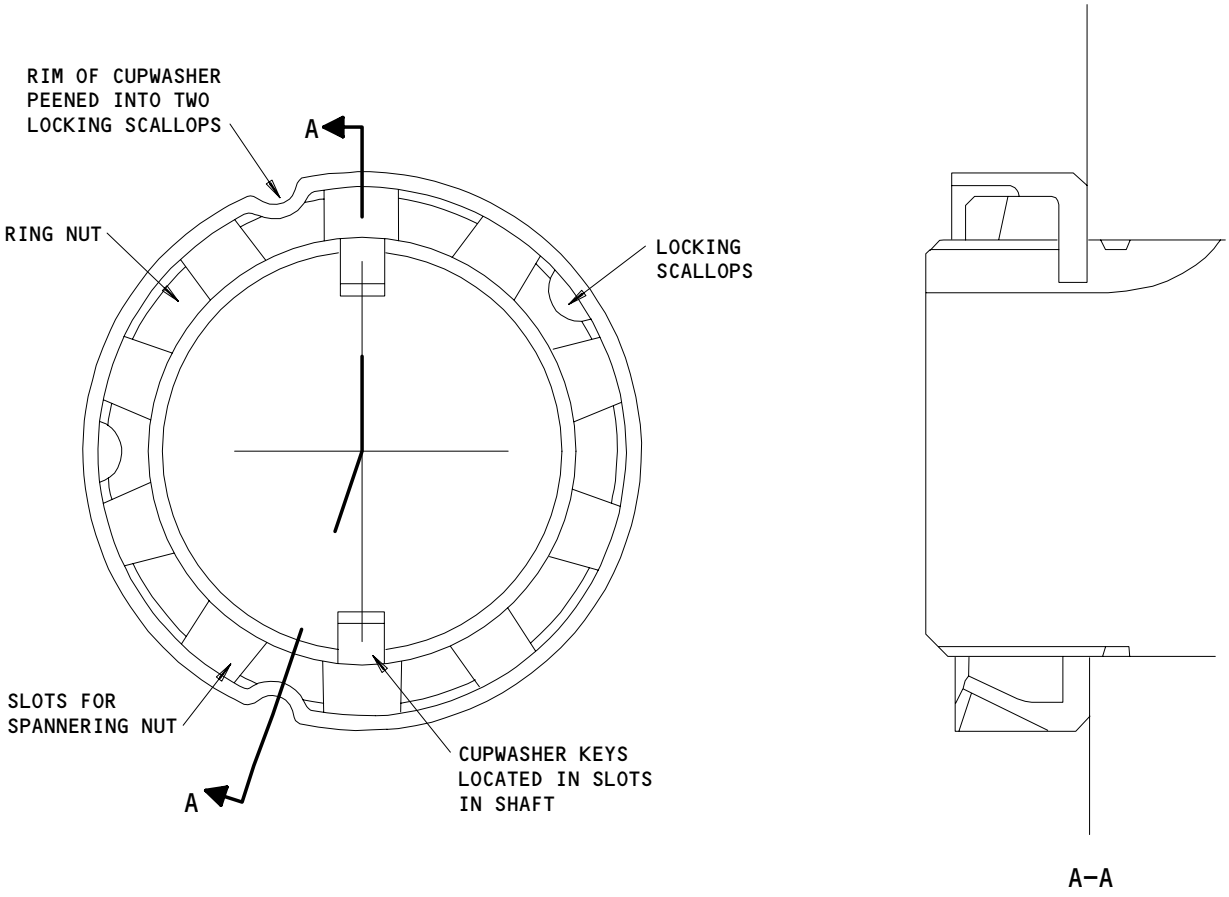
4. Split Cotter Pin

A. Installation

S 912-015-R00

(1) If you tighten the nut to the minimum torque, Fig. 203, and the split cotter pin is not aligned with the slot, you must tighten the nut more to get to the subsequent locking position.

(a) Do not loosen the nut to get to the subsequent locking position.



94730

Two–Key Cupwasher and Ring Nut on Shaft
Figure 202

(b) If the hole and slot do not align before the maximum torque value, Fig. 203, use a different nut.
(c) Do not tighten the nut more than the maximum torque value or damage to the bolt will occur.

S 912-016-R00

(2) For acceptable and unacceptable conditions when you install the split cotter pins, see Fig. 204.

S 912-017-R00

(3) Do not use the split cotter pins again.
(a) You must replace the split cotter pin after its removal.

TASK 70-12-04-912-018-R00

5. Lockwiring (Fig. 205, 206)
A. Standard Practices

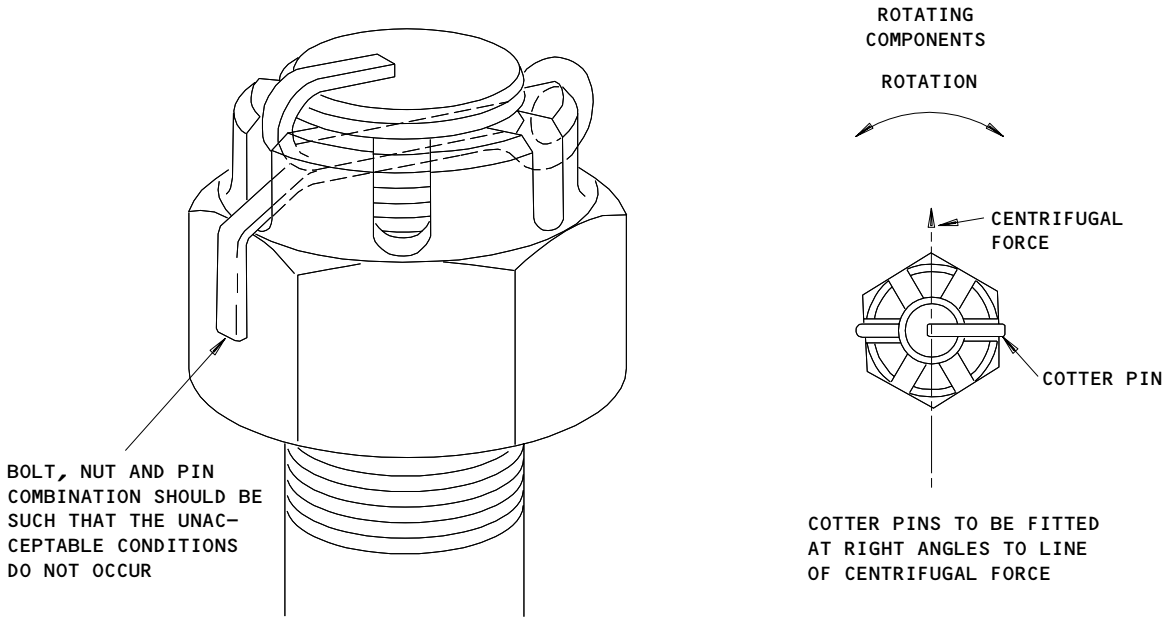
S 912-019-R00

(1) The maximum span of a lockwire between tension points is 3.150 inches (80.0 mm) unless specified differently.

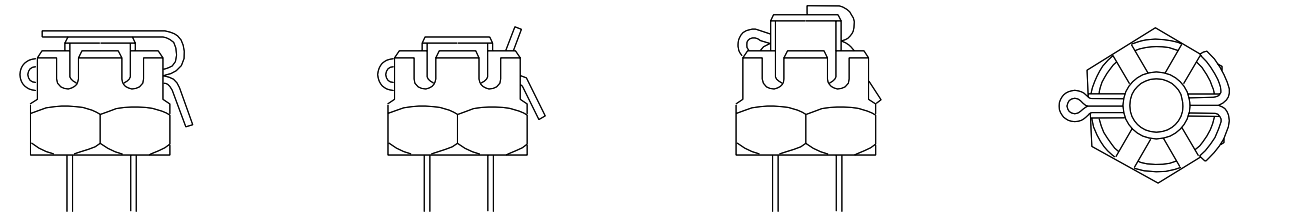
THREAD SIZES	MIN TORQUE		MAX TORQUE	
	Nm	lbf in	Nm	lbf in
No. 10-32	3.5	30	4.5	40
.2500-28	9	80	11.5	100
.3125-24	19	170	24	210
.3750-24	33	290	42	370

94732

Torque Values When Using Split Cotter Pins
Figure 203



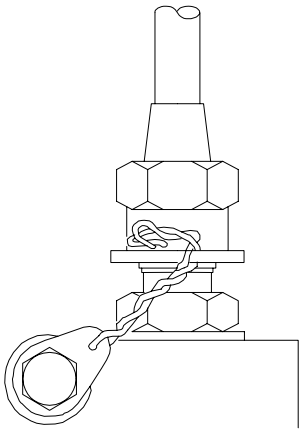
ACCEPTABLE



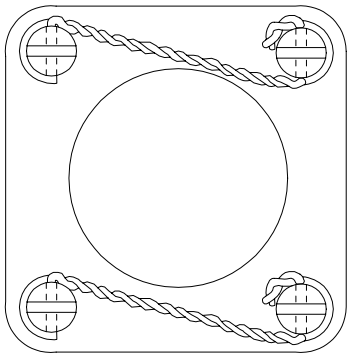
UNACCEPTABLE CONDITIONS

94731

Split Cotter Pins
Figure 204



VIEW A



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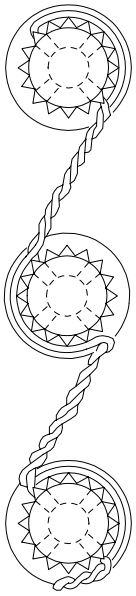

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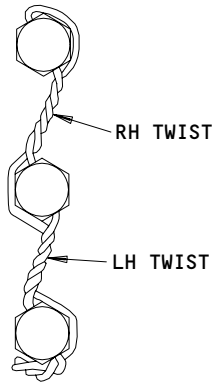

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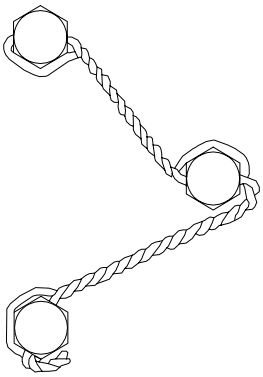

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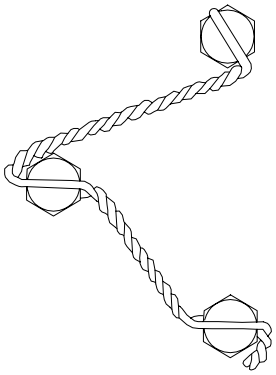
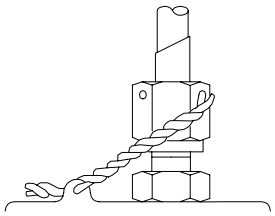
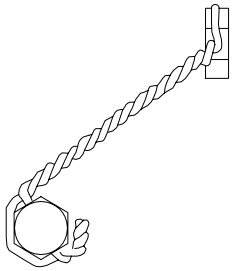


VIEW F

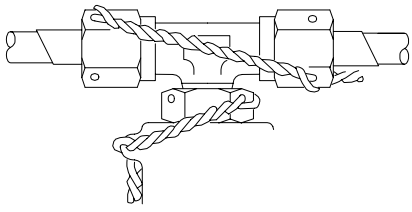
VIEW G



VIEW H



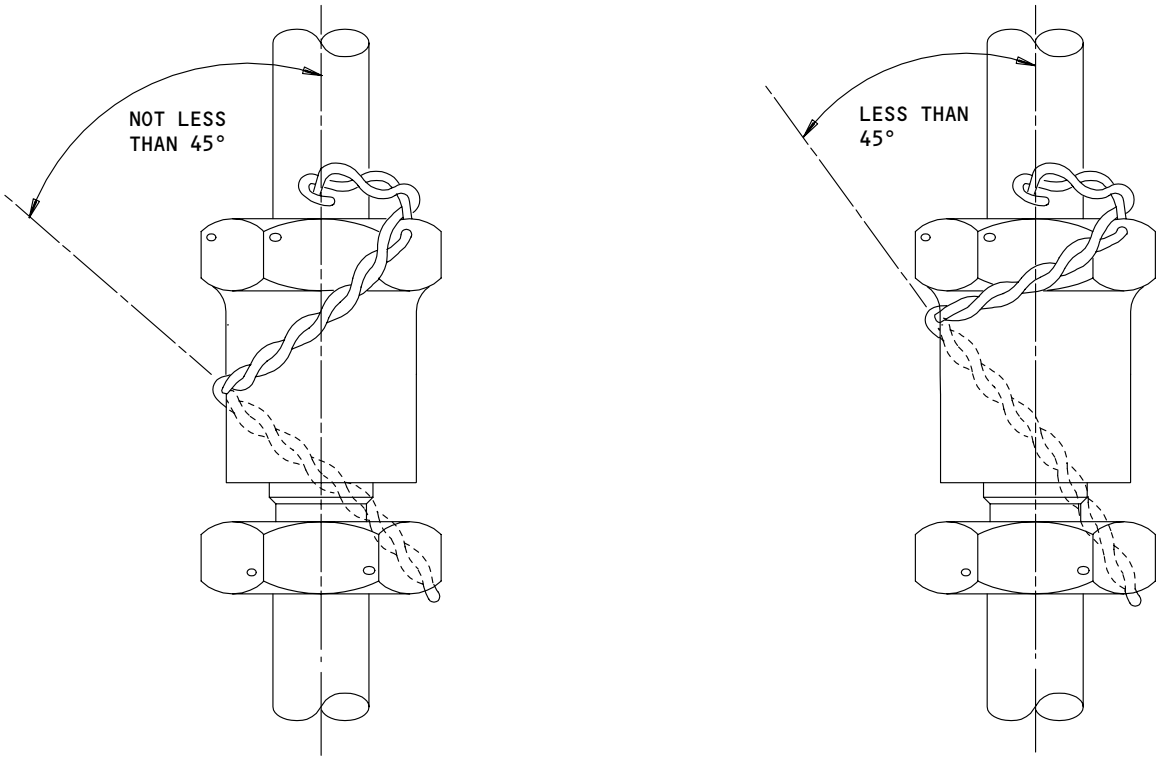
VIEW I



VIEW J

94733

Lockwiring Examples
Figure 205



CORRECT

INCORRECT

Lockwiring Traverses Component Being Locked
Figure 206

S 912-020-R00
(2) Where multiple groups are safetied with a lockwire, the maximum number in a series is calculated by the number of fasteners that can be safetied with a 25.5 inch (650.0 mm) single or 12.750 inch (325.0 mm) double twist length of wire.

S 912-021-R00
(3) The method of lockwire installation is as follows:

NOTE: This is given as guidance information only.

(a) Twist together two strands of wire.
(b) One twist is made by twisting the wires through an arc of 180 degrees and is equivalent to half of a complete turn.
(c) The number of twists per 1.00 inch (25.4 mm) for 0.020 inch (0.5 mm) diameter lockwire is 10 to 13.
(d) The number of twists per 1.00 inch (25.4 mm) for 0.031 inches (0.8 mm) diameter lockwire is 6 to 12.

S 912-022-R00
(4) Be careful during the operation to twist the wire.
(a) You must keep the wire under tension, but you must not stress the wire.
(b) You must not chafe the wire.
(c) You must not let the wire fatigue with vibration.
(d) Abrasions caused by commercially available wire twisting pliers are permitted, but the pliers must have rounded edges to prevent wire damage.
(e) Nicks, kinks and other damage caused by incorrect tooling are not acceptable.

S 912-023-R00
(5) Where a tube adapter is used, safety the tube union nut with a lockwire to the component, not to the adapter, view J (Fig. 205).

S 912-024-R00
(6) Use a new lockwire for each installation.

S 912-025-R00
(7) Where the wire goes across the body of the component that is being locked, see Fig. 206.

B. Installation

S 912-026-R00
(1) Examine the fasteners that you must safety and make sure they are correctly tightened.
(a) Do not tighten the fasteners more than the specified torque value to get the correct alignment of the holes.

(b) Do not loosen the fasteners after you have tighten them to get the correct alignment of the holes.
1) If it is not possible to get the correct alignment in the specified torque limit, do one of these steps:
a) Loosen the fastener and tighten it again to the specified torque range.
b) Remove the fastener and install a different fastener to the specified torque range.

S 912-027-R00

(2) In the adjacent fasteners, it is necessary that the holes are in the same relationship to each other as shown in Fig. 205.
(a) For the right-hand threads, the lockwire must be installed through the hole and have the effect of pulling the fastener clockwise, this must be the opposite for left-hand threads.

S 912-028-R00

(3) Install the lockwire through the first fastener and bend it around the head of the fastener.
(a) The direction of the wrap and twist of the strands must be such that the loop around the fastener comes below the strand extending from the hole to keep the loop down so it does not slip and leave a slack loop (Fig. 205, View C).

S 912-029-R00

(4) Twist the strands, while taut, until the twisted part is just short of the hole in the subsequent fastener.
(a) The twisted section must be a maximum of 0.125 inches (3.0 mm) from the hole in one of the fasteners.

S 912-030-R00

(5) Insert the top strand through the hole in the second fastener and follow the procedure of step (4).
(a) If there are no more than two fasteners in the series do this procedure again.

S 912-031-R00

(6) After you safety the last fastener, continue to turn the wire into a pigtail.
   (a) Make a minimum of 4 turns to make sure that the pigtail will not unravel.
   (b) Bend the wire in against the part to make sure the cut edges will not cause a snag.
   (c) Cut off the excess wire.
   (d) Discard the excess wire to prevent hazards.
   (e) Short pigtails can be necessary to prevent fatigue caused by vibration.

TASK 70-12-04-912-032-R00

6. Pinion Wire Plugs (Fig. 207)

A. Aluminum components

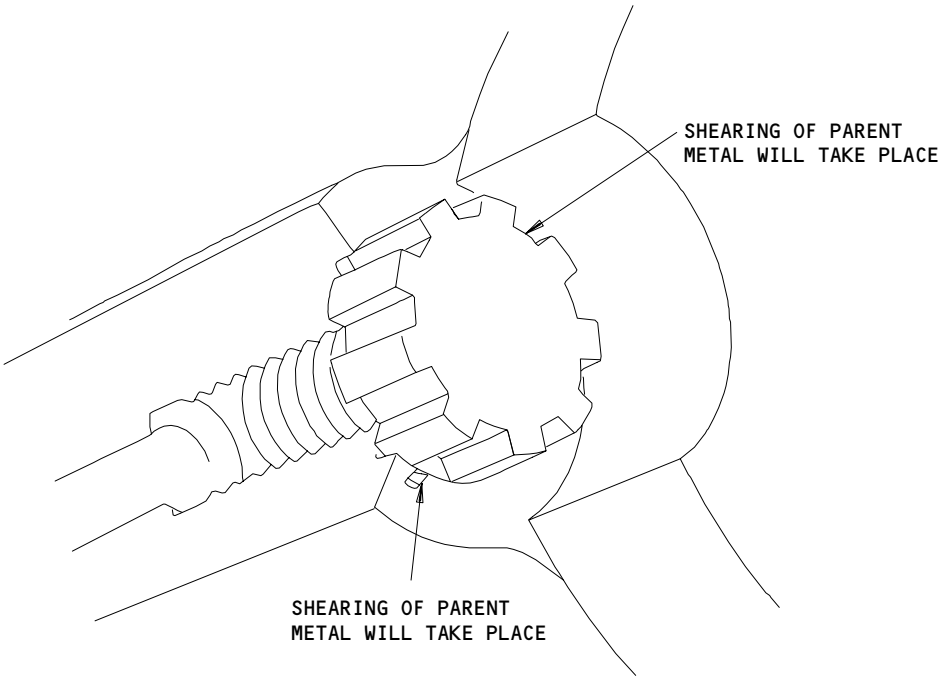
S 912-033-R00

(1) Plugs assembled in aluminum casings must be safetied by punching the surrounding metal into the two serrations of the plug.

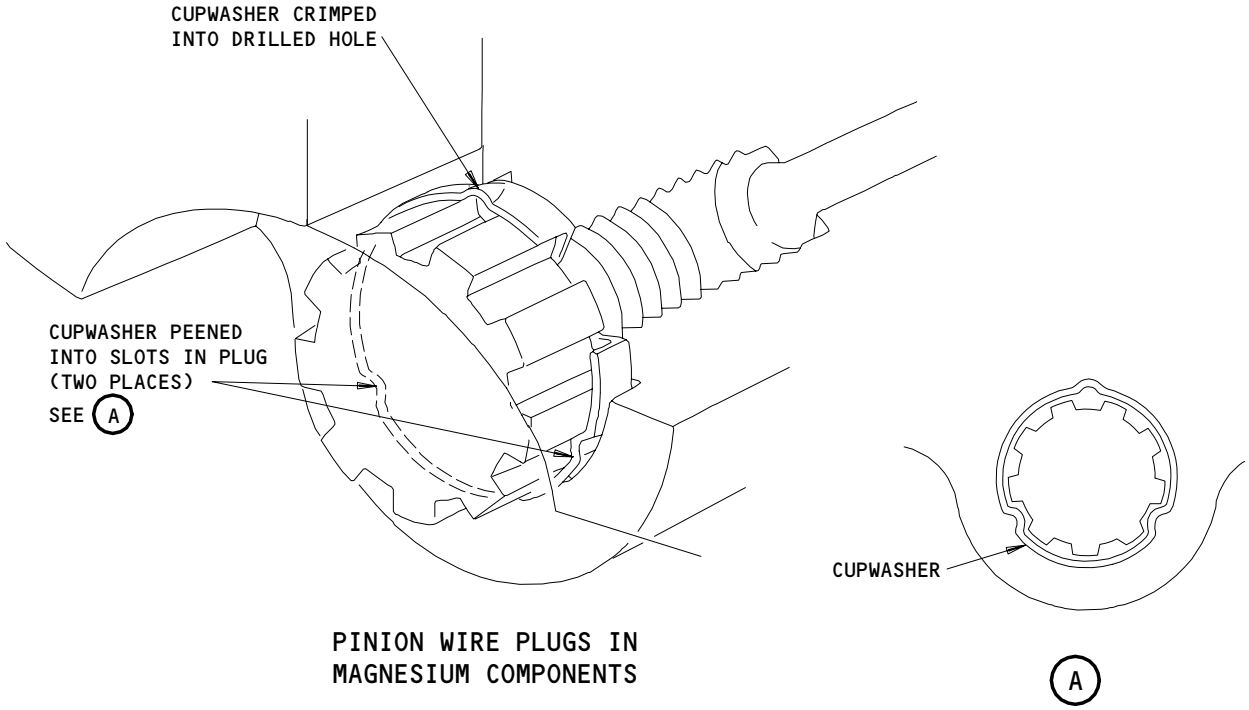
B. Magnesium components

S 912-034-R00

(1) The clearance between the pinion wire plug and the component is such that a cupwasher of the requisite type can be fitted and locked.



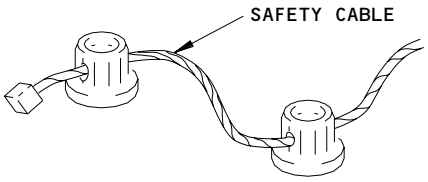
PINION WIRE PLUGS IN
ALUMINUM COMPONENTS



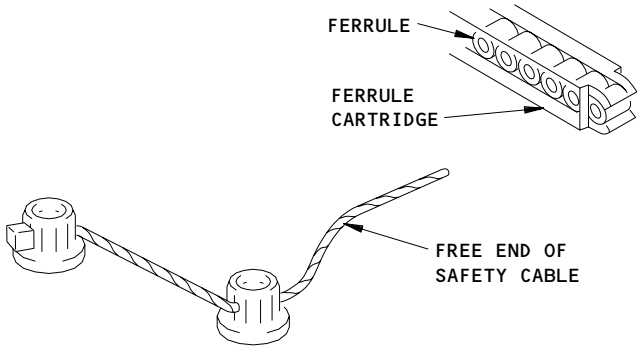
PINION WIRE PLUGS IN
MAGNESIUM COMPONENTS

94735

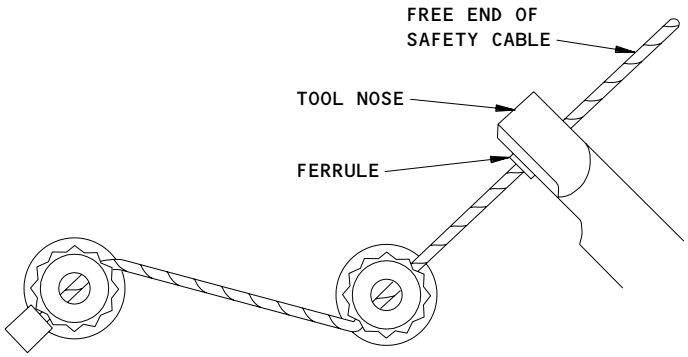
Pinion Wire Plugs
Figure 207



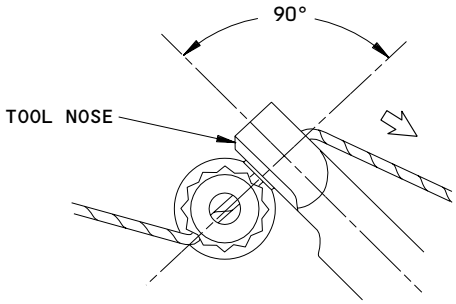
STEP 1



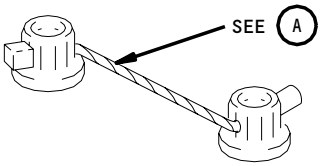
STEP 2

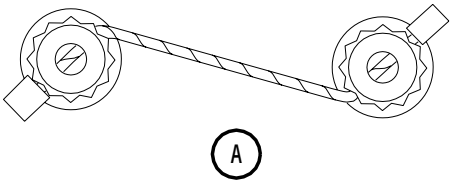


STEP 3



STEP 4

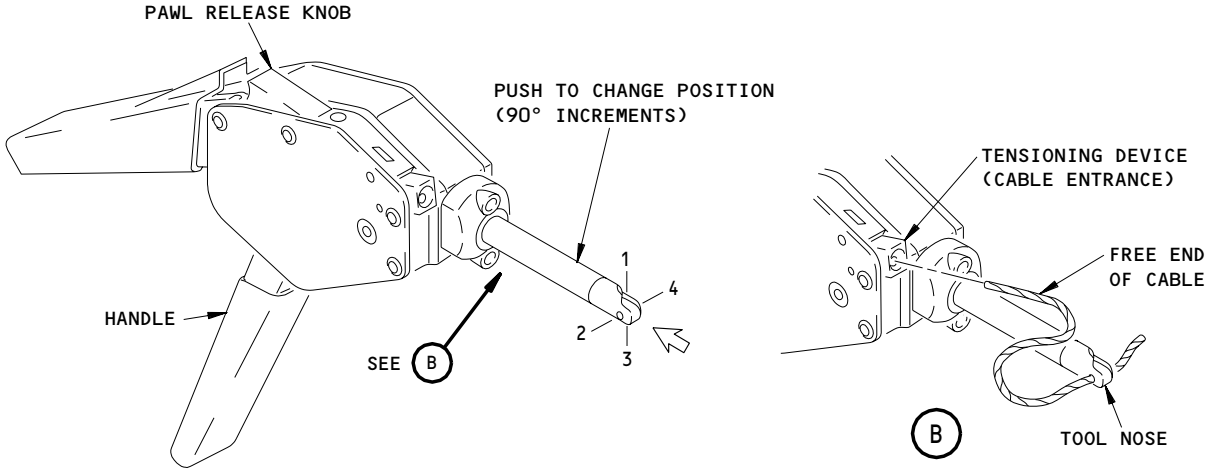




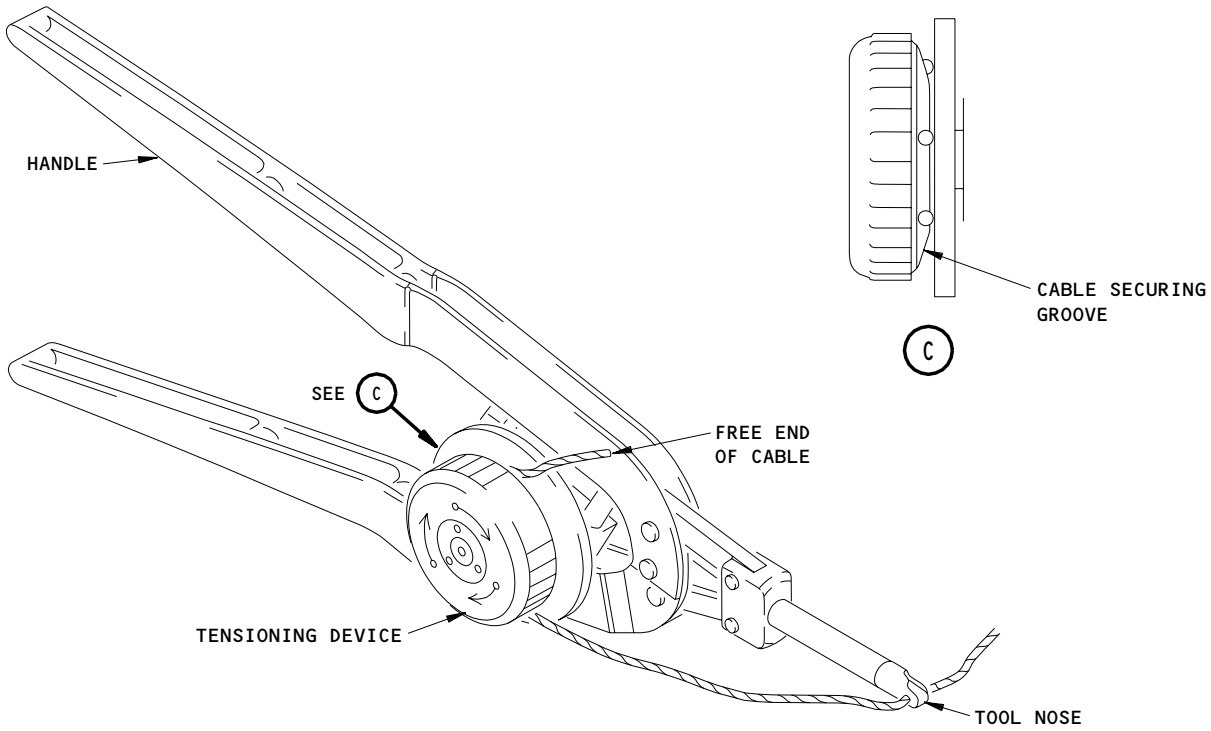
INSTALLED SAFETY CABLE
(RIGHT-HANDED THREAD ILLUSTRATED)

DEF0004361

Safety Cable Installation
Figure 208 (Sheet 1)



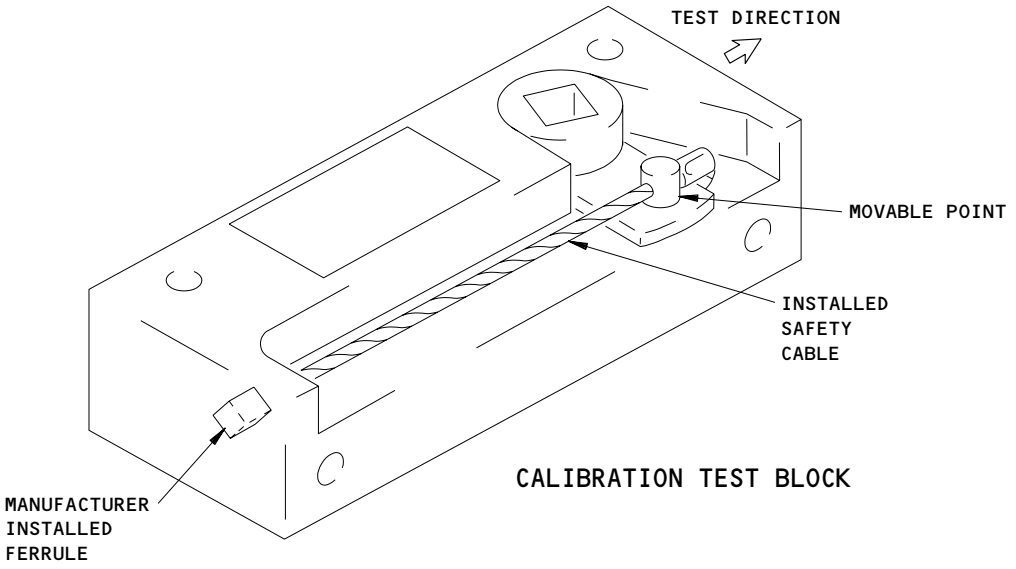
DMC INSTALLATION TOOL



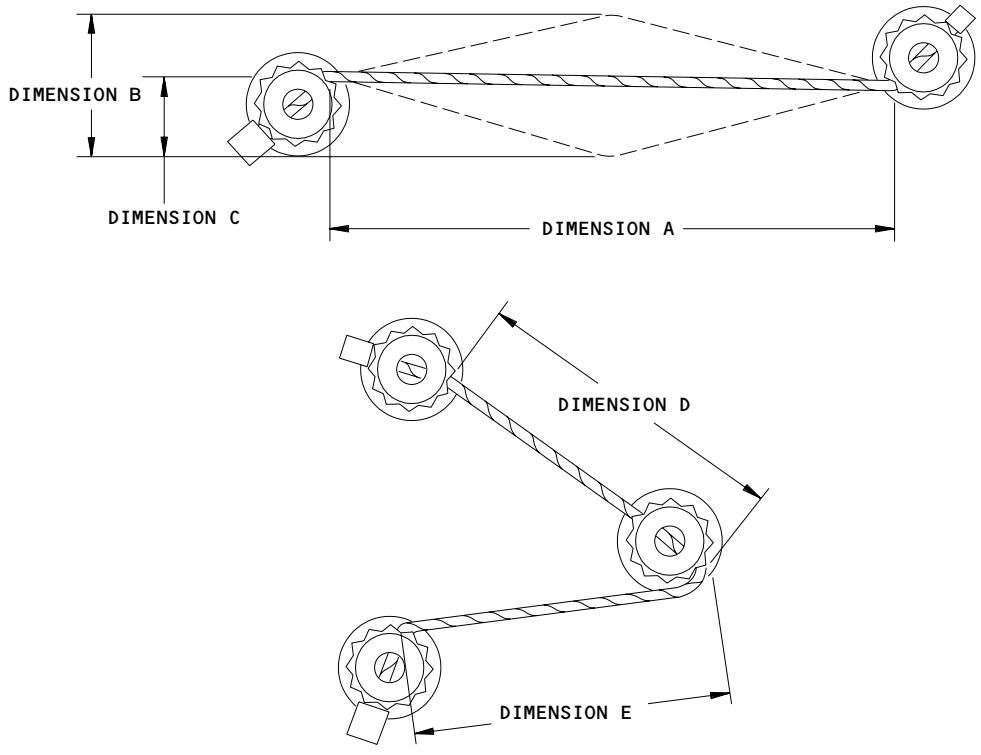
BERGEN CABLES INSTALLATION TOOL

DEE0004362

Safety Cable Installation
Figure 208 (Sheet 2)



CALIBRATION TEST BLOCK



RIGHT-HANDED THREADS ILLUSTRATED

DEE0004363

Safety Cable Installation
Figure 208 (Sheet 3)

STRIPPING AND CLEANING - MAINTENANCE PRACTICES

1. General
   A. This procedure has one task:
      (1) Non-Aqueous Liquid Degreasing (Maintenance Process 101)

   TASK 70-20-01-112-001-R00

2. Non-Aqueous Liquid Degreasing (Maintenance Process 101)
   A. General
      (1) This standard practice gives the maintenance processes which are referred to for stripping and cleaning.
      (2) Cold liquid non-aqueous degreasers such as Acetone (and the approved alternatives) are used to clean and prepare parts for:
         (a) Assembly
         (b) Inspection
         (c) Painting
         (d) Other processes
   B. Equipment
      (1) Container -- Solvent-Resistant, 5-Gallon (commercially available)
   C. Consumable Materials
      (1) B00062 Solvent, OMat 150, Acetone, O-A-51
      (2) B00669 Solvent, OMat 1/40, Isopropyl Alcohol
      or
      (3) Cleaning Solvent, OMat 1/257
      (4) B00713 Solvent, (OMat 1/257) dry cleaning, P-D-680
      (5) G02383 Cloth, (OMat 2/101) absorbent, MIL-C-24671
   D. References
      (1) AMM 20-30-02/201, Cleaners and Polishes
   E. Procedure

S 112-002-R00

WARNING: OBEY THE MANUFACTURERS HEALTH AND SAFETY DATA FOR THE SPECIFIED MATERIALS. ALSO, OBEY LOCAL REGULATIONS. IF YOU DO NOT OBEY THE SAFETY DATA, INJURIES TO PERSONNEL CAN OCCUR.

WARNING: DO NOT GET CLEANING SOLVENT OR DEGREASER IN YOUR MOUTH OR EYES, OR ON YOUR SKIN. KEEP CLEANING SOLVENT AWAY FROM SPARKS, FLAME, AND HEAT. CLEANING SOLVENT IS A POISONOUS AND FLAMMABLE SOLVENT. IT CAN CAUSE INJURIES TO PERSONNEL, AND DAMAGE TO EQUIPMENT.

(1) Clean the surfaces of the part.

NOTE: If you use the approved alternatives in 20-30-02: solvent, MIL-T-81533 is not recommended as a cold liquid degreaser because of its toxic effects.

(a) Put the degreaser into an applicable clean (capacity as applicable) or solvent-resistant container (5-gallon): Use one of the degreasers that follow:

1) Acetone
OMat 150
or
2) Isopropyl Alcohol
OMat 1/40
or
3) Cleaning Solvent
OMat 1/257
4) Solvent, P-D-680

NOTE: Only use sufficient degreaser for the operation to be done.

(b) Make a clean cloth, MIL-C-24671 moist, with the degreaser from the container.
(c) Clean the surfaces of the part with the moist cloth, MIL-C-24671:
    1) Make sure that you use a clean, moist cloth, MIL-C-24671 for each area to be cleaned.
(d) Dry the surfaces with a clean, dry cloth, MIL-C-24671.
(e) Discard the used materials.

MAINTENANCE PROCESSES - MAINTENANCE PRACTICES

1. General
   A. This procedure gives a list of maintenance processes. They are identified as follows:

Paragraph Number	RR Maintenance Process	Title
2	110	Removal of carbon particles from the LK80829, LK80830, LK80831, LK86053, UL11273, UL14909, UL16488, UL16609 and UL27870 engine drain tubes.

TASK 70-20-02-102-001-R00

2. Maintenance Process 110 - Removal of Carbon particles from these Engine Drain Tubes: LK80829, LK80830, LK80831, LK86053, UL11273, UL14909, UL16488, UL16609, and UL27870
   A. General
      (1) This procedure gives the instructions for the removal of carbon particles from the UL11273, UL14909, LK80831, LK80830, UL27870, LK80829, UL16488, UL16609, and LK86053 engine drain tubes. The drain tubes must be put fully into a carbon stripper solution to remove the carbon particles.
   B. Equipment
      (1) Tank - Mild steel, with extraction facility.
      (2) Wash Facility - Kerosine
   C. Consumable Materials
      (1) Kerosine
          British Spec - Commercial grade
          OMat No. - 101
      (2) Carbon Stripper
          British Spec - Ardrox 690
          OMat No. - 139
      (3) Inhibitor for Ardrox 690
          British Spec - Ardrox 6901
          OMat No. - 165
      (4) Bristle Brush - Local Resources
   D. Procedure

      S 112-002-R00
      (1) Prepare the carbon stripper solution.

WARNING: YOU MUST USE GLOVES, OVERALLS, FACE VISOR, AND SAFETY BOOTS WHEN YOU DO THIS PROCEDURE. MAKE SURE THE TANK EXTRACTOR IS IN OPERATION WHEN THE SOLUTION IS IN THE TANK. DO NOT BREATH THE FUMES FROM THE SOLUTION. THE FUMES CAN CAUSE DAMAGE TO YOUR LUNGS.

(a) Get the carbon stripper and the inhibitor.
(b) Mix the carbon stripper solution in the mild steel tank.
    1) Mix the fluids in these proportions:
        a) Carbon stripper - three parts by volume.
        b) Water that contains 3 percent by weight of inhibitor - one part by volume.
(c) When the carbon stripper solution is fully mixed, heat the solution to a temperature of 65 - 70 degrees C (149 - 158 degrees F).

S 112-004-R00

(2) Clean the drain tubes in kerosine.
    (a) Make sure you remove all the carbon particles that are loose.

        NOTE: Use a kerosine wash facility.

S 162-003-R00

(3) Remove the unwanted kerosine from the engine drain tubes with compressed air.

S 112-010-R00

WARNING: YOU MUST USE GLOVES, OVERALLS, FACE VISOR, AND SAFETY BOOTS WHEN YOU DO THIS PROCEDURE. MAKE SURE THE TANK EXTRACTOR IS IN OPERATION WHEN THE SOLUTION IS IN THE TANK. DO NOT BREATH THE FUMES FROM THE SOLUTION. THE FUMES CAN CAUSE DAMAGE TO YOUR LUNGS.

(4) Clean the drain tubes in the carbon stripper solution.
    (a) Put the engine drain tubes fully into the carbon stripper solution.

        NOTE: Make sure that you obey the manufacturers instructions when you use the solution.

    (b) Make sure the solution remains at a temperature of 65 - 75 degrees C (149 - 167 degrees F).

(c) Keep the drain tubes in the solution for approximately five hours.
1) If the tubes are clean before the time limit is completed, make a record of the approximate time that was necessary to remove the carbon.

NOTE: If you do this operation for each tube that is cleaned, you will get to know the time that is necessary to remove the carbon.

WARNING: YOU MUST USE GLOVES, OVERALLS, FACE VISOR, AND SAFETY BOOTS WHEN YOU DO THIS PROCEDURE. MAKE SURE THE TANK EXTRACTOR IS IN OPERATION WHEN THE SOLUTION IS IN THE TANK. DO NOT BREATH THE FUMES FROM THE SOLUTION. THE FUMES CAN CAUSE DAMAGE TO YOUR LUNGS.

(d) Remove the engine drain tubes from the solution.
1) Let the unwanted solution drain back into the tank.

NOTE: Turn the drain tubes so that all the unwanted solution is removed from the blind holes in the tube.

S 172-008-R00
(5) Flush the drain tubes in a flow of clean, cold water.
(a) Use an air/water gun to flush the drain tubes.

S 162-006-R00
(6) If the carbon particles remain in the drain tubes, use a bristle brush and compressed air to remove the particles.

S 162-007-R00
(7) Clean the engine drain tubes with clean, boiling water.
(a) Put the engine drain tubes fully into clean, boiling water.
(b) Remove the drain tubes from the boiling water.
(c) Let the tubes dry in the air.

FLUORESCENT PENETRANT INSPECTION - MAINTENANCE PRACTICES

1. General
   A. This procedure has two tasks:
      (1) Post-emulsified fluorescent penetrant inspection with solvent removers (Maintenance Process 210)
      (2) Water-washable fluorescent penetrant inspection (Maintenance Process 213)

   TASK 70-20-04-202-025-R00

2. Post-Emulsified Fluorescent Penetrant Inspection with Solvent Removers (Maintenance Process 210)
   A. General
      (1) Defects which are open to the surface can be found by fluorescent penetrant inspection. This procedure is non-destructive and uses materials which are of a medium, high or ultra high sensitivity. The medium or high sensitivity materials must be used unless the applicable inspection task tells you to use the ultra high sensitivity materials specially.
   B. Equipment
      (1) Lint-free cloth
      (2) Small brush
      (3) Portable Ultra-violet lamp which gives off UV light in the 320-400 nanometer range.
      (4) Ultra-violet light meter
      (5) Magnifying glass (X10 magnification)
   C. Consumable Materials
      (1) Fluorescent Penetrant, Medium Sensitivity, Post-Emulsified - OMat Item No. 650
      (2) Fluorescent Penetrant, High Sensitivity, Post-Emulsified - OMat Item No. 651
      (3) Fluorescent Penetrant, Ultra High Sensitivity, Post-Emulsified - OMat Item No. 652
      (4) Solvent Penetrant Remover - OMat Item No. 616
      (5) Aerosol Developer, Non Aqueous - OMat Item No. 617
      (6) Absorbent cloth, lint-free - OMat Item No. 2/101

(7) Cotton swabs

D. Procedure

S 902-039-R00

(1) If the area to be inspected is more than 144 square inches (929.0 square centimeters), reject the part.

S 842-026-R00

(2) Prepare the ultra-violet lamp for the inspection.

WARNING: YOU MUST NOT USE THE ULTRA-VIOLET LAMP IF THE ELEMENT IS OPEN BECAUSE OF DAMAGED OR BROKEN GLASS, OR IF THE FILTER IS CRACKED, BROKEN OR DEFECTIVE. IF YOU USE THE LAMP IN THIS CONDITION, YOUR EYES WILL BE DAMAGED.

(a) Examine the ultra-violet lamp to make sure that it is serviceable.
1) Then set the lamp to the ON position.
(b) Let the lamp become warm for approximately 10 minutes to make sure that it will be in a stable condition.
(c) Do a check of the light intensity.

NOTE: The lamp can be checked for light intensity before each use.

1) Hold the lamp at a distance of 15 inches (380 mm) above the light meter sensor.
a) Make sure that there is a minimum light intensity of 1000 microwatts for each square centimeter.

S 232-028-R00

WARNING: YOU MUST OBEY THE MANUFACTURERS HEALTH AND SAFETY DATA FOR THE SPECIFIED MATERIALS. YOU MUST ALSO REFER TO LOCAL REGULATIONS TO MAKE SURE THAT THE PROCEDURES ARE DONE SAFELY. IF YOU DO NOT DO THIS, AN INJURY CAN OCCUR.

CAUTION: THESE PROCEDURES MUST BE DONE BY PERSONS WHO ARE APPROVED BY THE APPLICABLE AUTHORITY. PERSONS WHO ARE NOT APPROVED CAN POSSIBLY GET AN INCORRECT RESULT WHICH CAN SUBSEQUENTLY CAUSE COMPONENT FAILURE.

CAUTION: YOU MUST USE THE MANUFACTURERS FULL SYSTEM OF MATERIALS. IF YOU DO NOT DO THIS, YOU CAN GET AN UNSATISFACTORY RESULT.

(3) Do the penetrant inspection.

NOTE: For accurate results, the inspection area must be cleaned sufficiently before the penetrant is applied. Contamination in a defect will decrease or prevent the flow of the penetrant into the defect and thus cause incorrect indications. Also, surface contamination can hold the penetrant on the surface and thus cause incorrect indications.

(a) Clean the inspection area (AMM 70-20-01/201).
1) Rub with a cloth moist with approved solvent remover, OMat 616.
2) Let the solvent remover stay on the area for sufficient time to dissolve the surface deposits.
3) Remove all remaining solvent remover.

(b) If necessary, do the last step again until all of the surface deposits have been removed.

(c) Let the inspection area dry for a minimum time of 20 minutes.

NOTE: A heat gun at less than 140 F (60 C) for 10 minutes can be used to dry the area.

NOTE: This is to make sure that all of the solvent has gone before the fluorescent penetrant is applied.

(d) Apply the OMat 650 or 651 (or 652) fluorescent penetrant with a brush, cotton swab or spray to the inspection area.
1) Let the penetrant stay on the area for a minimum time of 10 minutes, but not more than the maximum time of 1 hour.

NOTE: Only use the OMat 652 ultra-high sensitivity penetrant if it is specified in the related inspection task.

CAUTION: THIS OPERATION IS CRITICAL AND PENETRANT REMOVER TIME MUST BE KEPT TO A MIMINUM. IF THE REMOVER STAYS ON THE SURFACE FOR TOO MUCH TIME, YOU CAN POSSIBLY GET AN INCORRECT RESULT. THIS CAN SUBSEQUENTLY CAUSE COMPONENT FAILURE.

(e) Remove the unwanted penetrant from the surface of the part with a clean, dry, lint-free cloth.
(f) Remove the last unwanted penetrant.
    1) Make a clean, lint-free cloth moist with OMat 616 solvent remover (AMM 70-20-01/201).
    2) Carefully clean the penetrant from the inspection area.
        a) Only clean two or three times with the moist cloth.
    3) Examine the inspection area with an ultra-violet lamp in low visible light.
        a) Make sure all the surface penetrant has been removed sufficiently to give a satisfactory background.
        b) If it is necessary, do the last three steps again until you get a satisfactory background.
(g) Apply a light coating of OMat 617 aerosol developer.
    1) Let the developer powder stay on the area for a minimum time of 10 minutes, but not more than the maximum time of 2 hours.
(h) Visually examine the inspection area below the ultra-violet lamp for crack indications.
    1) If crack indications can be seen, also visually examine the area with a bright white light.
        a) Use 10X magnification if necessary.

S 082-030-R00

(4) Remove the equipment and materials from the work area.
    (a) Set the ultra-violet lamp to the OFF position.
    (b) Let the ultra-violet lamp become cold.
        1) Then put the lamp into the applicable container for storage to make sure it does not become damaged.

(c) Remove all the tools and materials from the work area.

TASK 70-20-04-202-031-R00

3. Water-Washable Fluorescent Penetrant Inspection (Maintenance Process 213)

A. General

(1) Defects which are open to the surface can be found by fluorescent penetrant inspection. This procedure is non-destructive and uses materials which are of a medium or high sensitivity. The medium sensitivity materials must be used unless the applicable inspection task tells you to use the high sensitivity materials specially.

B. Equipment

(1) Lint-free cloth
(2) Small brush
(3) Portable ultra-violet lamp which gives off UV light in the 320-400 nanometer range.
(4) Ultra-violet light meter
(5) Magnifying glass (X10 magnification)

C. Consumable Materials

(1) Fluorescent penetrant, medium sensitivity, water-washable, OMat Item No. 653
(2) Fluorescent penetrant, high sensitivity, water-washable, OMat Item No. 632
(3) Solvent penetrant remover, OMat Item No. 616
(4) Aerosol developer, non-aqueous, OMat Item No. 617
(5) Absorbent cloth, lint-free - OMat Item No. 2/101
(6) Cotton swabs

D. Procedure

S 902-038-R00

(1) If the area to be inspected is more than 144 square inches (929.0 square centimeters), reject the part.

S 842-032-R00

(2) Prepare the ultra-violet lamp for the inspection.

WARNING: YOU MUST NOT USE THE ULTRA-VIOLET LAMP IF THE ELEMENT IS OPEN BECAUSE OF DAMAGED OR BROKEN GLASS, OR IF THE FILTER IS CRACKED, BROKEN OR DEFECTIVE. IF YOU USE THE LAMP IN THIS CONDITION, YOUR EYES CAN BE DAMAGED.

(a) Examine the ultra-violet lamp and filter to make sure that it is serviceable.
1) Then set the lamp to the ON position.

(b) Let the lamp become warm for approximately 10 minutes to make sure that it will be in a stable condition.
(c) Do a check of the light intensity with the light meter.

NOTE: The lamp can be checked for light intensity before each use.

1) Hold the lamp at a distance of 15 inches (380 mm) above the light meter sensor.
a) Make sure there is a minimum light intensity of 1000 microwatts per square centimeter.

S 232-034-R00

WARNING: YOU MUST OBEY THE MANUFACTURERS HEALTH AND SAFETY DATA FOR THE SPECIFIED MATERIALS. YOU MUST ALSO REFER TO LOCAL REGULATIONS TO MAKE SURE THAT THE PROCEDURES ARE DONE SAFELY. IF YOU DO NOT DO THIS, AN INJURY CAN OCCUR.

CAUTION: THESE PROCEDURES MUST BE DONE BY PERSONS WHO ARE APPROVED BY THE APPLICABLE AUTHORITY. PERSONS WHO ARE NOT APPROVED CAN POSSIBLY GET AN INCORRECT RESULT WHICH CAN SUBSEQUENTLY CAUSE COMPONENT FAILURE.

CAUTION: YOU MUST USE THE MANUFACTURERS FULL SYSTEM OF MATERIALS. IF YOU DO NOT DO THIS, YOU CAN GET AN UNSATISFACTORY RESULT.

(3) Do the penetrant inspection.

NOTE: For accurate results, the inspection area must be cleaned sufficiently before the penetrant is applied. Contamination in a defect will decrease or prevent the flow of the penetrant into the defect and thus cause incorrect indications. Also, surface contamination can hold the penetrant on the surface and thus cause incorrect indications.

(a) Clean the inspection area (AMM 70-20-01/201).
1) Rub with a cloth moist with approved solvent remover, OMat 616.

2) Let the solvent remover stay on the area for sufficient time to dissolve the surface deposits.
3) Remove all remaining solvent remover.
4) If necessary, do the last step again until all of the surface deposits have been removed.

(b) Let the inspection area dry for a minimum time of 20 minutes.

NOTE: A heat gun at less than 140 F (60 C) for 10 minutes can be used to dry the area.

NOTE: This is to make sure that all of the solvent has gone before the fluorescent penetrant is applied.

(c) Apply the OMat 653 (or 632) fluorescent penetrant with a brush, cotton swab or spray to the inspection area.
1) Let the penetrant stay on the areas for a minimum time of 10 minutes, but not more than the maximum time of 1 hour.

NOTE: Only use the OMat 632 high sensitivity penetrant if it is specified in the related inspection task.

CAUTION: THIS OPERATION IS CRITICAL AND PENETRANT REMOVER TIME MUST BE KEPT TO A MINIMUM. IF THE REMOVER STAYS ON THE SURFACE FOR TOO MUCH TIME, YOU CAN POSSIBLY GET AN INCORRECT RESULT. THIS CAN SUBSEQUENTLY CAUSE COMPONENT FAILURE.

(d) Remove the unwanted penetrant from the surface of the part with a clean, dry, lint-free cloth.
(e) Do procedure A or procedure B as follows to remove all signs of unwanted penetrant.
(f) Procedure A
1) Make a clean, lint-free cloth moist with clean water.
2) Carefully clean the penetrant from the inspection area.
a) Only clean two or three times with the moist cloth.

3) Examine the inspection area with an ultra-violet lamp in low visible light.
   a) Make sure all the surface penetrant has been removed sufficiently to give a satisfactory background.
4) If it is necessary, do the last three steps again until you get a satisfactory background.
5) Dry the inspection area with a fan or filtered, pressurized air at no more than 5 psi (34.5 kPa).

(g) Procedure B
1) Make a clean, lint-free cloth moist with OMat 616 solvent remover (AMM 70-20-01/201).
2) Carefully clean the penetrant from the inspection area.
   a) Only clean two or three times with the moist cloth.
3) Examine the inspection area with an ultra-violet lamp in low light.
   a) Make sure all the surface penetrant has been removed sufficiently to give a satisfactory background.
4) If it is necessary, do the last three steps again until you get a satisfactory background.
5) Apply a light layer of OMat 617 aerosol developer.
6) Let the developer powder stay on the area for a minimum time of 10 minutes, but not more than the maximum time of 3 hours.

(h) Visually examine the inspection area below the ultra-violet lamp for crack indications.
1) If crack indications can be seen also visually examine the area using a bright white light.
   a) Use 10X magnification if necessary.

S 082-036-R00

(4) Remove the equipment and materials from the work area.
(a) Set the ultra-violet lamp to the OFF position.
(b) Let the ultra-violet lamp become cold.
1) Then put the lamp into the applicable container for storage to make sure it does not become damaged.

(c) Remove all the tools and materials from the work area.

BONDING, SEALING AND FILLING AGENTS - MAINTENANCE PRACTICES

1. General
   A. This procedure contains the steps to mix, to apply and to cure the agents materials used as agents to bond, seal and fill repairs.

TASK 70-20-06-302-001-R00

2. Use OMat 805 and OMat 806 Two-Part Curing Sealant/Adhesive
   A. Prepare to use OMat 805 and OMat 806.

S 302-017-R00

WARNING: DO NOT SMOKE OR EAT AT WORK PLACES WHERE YOU USE THESE MATERIALS. WEAR BARRIER CREAM, GLOVES AND OVERALLS TO PREVENT MATERIALS THAT ARE NOT CURED FROM COMING INTO CONTACT WITH THE SKIN. AT THE END OF WORK OR IN THE CASE OF CONTAMINATION, THE SKIN MUST BE WASHED THOROUGHLY WITH RESIN REMOVING CREAM.

MATERIALS MUST BE USED IN WELL VENTILATED AREAS.

IF YOU DO NOT OBEY THIS PROCEDURE, YOU CAN CAUSE INJURIES TO YOURSELF AND OTHERS.

(1) Do these steps to mix and apply the material:
   (a) Mix the two components to a homogeneous cream-colored paste in the proportions that follow:
      1) OMat 805 resin - 70 parts by weight
      2) OMat 806 hardener - 30 parts by weight
   (b) Use a small spatual or trowel to apply a thin film of the mixture to the two surfaces to be bonded.
   (c) Use a syringe to apply the mixture for sealing.
   (d) Apply pressure and cure for 1 hour at 95 to 105°C (203 to 221°F).

TASK 70-20-06-302-006-R00

3. Use OMat 8/52 Adhesive
   A. Prepare to use OMat 8/52 Adhesive.

S 302-007-R00

WARNING: YOU MUST USE CLOTHING AND GLOVES TO PROTECT YOURSELF DURING PREPARATION AND AVOID PREVENT WITH THE SKIN. IF YOU DO NOT OBEY THIS PROCEDURE, YOU CAN CAUSE INJURY TO PEOPLE AND DAMAGE TO EQUIPMENT.

(1) Mix and apply the material.

NOTE: OMat 8/52 is a two-part epoxy resin base, general prupose adhesive for use at operating tempertures up to 120°C (248°F). It can also be used as a liquid shim. It has these parts:

Part A - Grey paste must be stirred in its container before weighing out.

Part B - Amber liquid, used as supplied.

(a) Mix the two components to a homogeneous mixture in these proportions:
1) Part A - 100 parts by weight
2) Part B - parts by weight
(b) The working life is approximately 1 hour at 22°C (72°F).

S 942-008-R00

WARNING: YOU MUST USE CLOTHING AND PLASTIC GLOVES TO PROTECT YOUSELF DURING CAUSE PREPARATION. PREVENT CONTACT WITH THE SKIN.

IF YOU DO NOT OBEY THESE PROCEDURES, YOU CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

CAUTION: BONDING MUST BE DONE IMMEDIATELY AFTER SURFACE PREPARATION.

IF YOU DO NOT OBEY THESE PROCEDURES, YOU CAN CAUSE INJURY TO PERSONS.

(2) Apply the mixture to the two surfaces to be bonded with a spatula or palette knife and spread with a comb.
(a) The adhesive thickness should be 0.005 in. (0,13 to 0,61 mm).

NOTE: The best results are obtained with a thinner layer of adhesive but satisfactory results can be obtained with applications up to 0.040 in. (1,02 mm) thick.

S 302-009-R00

(3) Cure the adhesive for the time and temperature shown in table 1.
(a) The minimum cure time is 1 hour.

NOTE: The adhesive will not cure at less than 12°C (54°F). The temperature at the bond-line must be monitored by thermocouples or other convenient method when cure times are accelerated by the application of heat.

TASK 70-20-06-302-010-R00

4. Use the OMat 874 Filler

NOTE: OMat 874 filler is a two-part low density void filling compound. Part A is a white, heavy consistency paste and part B is a blue consistency paste.

A. Prepare to use OMat 874.

S 842-018-R00

WARNING: YOU MUST USE CLOTHING AND PLASTIC GLOVES TO PROTECT YOUSELF DURING CAUSE PREPARATION. PREVENT CONTACT WITH THE SKIN.

IF YOU DO NOT OBEY THESE PROCEDURES, YOU CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(1) Do the steps that follow to use the OMat 874 Filler:.
(a) Mix and Apply the Filler.
(b) Weigh out 100 parts of Part B and 94 parts of Part A.
(c) Knead the two parts until a uniform blue color, with no streaks is obtained.
1) This gives a working life of approximately 1 hour at 22°C (72°F).

(d) Use a spatula, palette knife, small trowel or pressure gun to apply the material.
(e) If the material adheres to the tool, slightly moisten the blade with cold water when smoothing the air-washed surfaces.
1) Do not use too much water because it reacts with the filler as a plasticiser.
(f) Remove excess material as soon as it is hard to the touch, use the tool blade in a burnishing action.
(g) Cure the filler for the time and temperature shown in table 2.

NOTE: The minimum cure time is 30 minutes. The material will not cure at less than 12°C (54°F).

(h) The maximum temperature which can be applied to filler is 150°C (302°F).
1) Above this temperature, surface scorching and exothermic heat reaction can occur.
(i) Remove scorching by abrasion.

TASK 70-20-06-302-012-R00

5. USE OMat 8/107 and 8/136 Polysulphide Sealants

A. Prepare to use OMat 8/107 and OMat 8/136.

S 842-019-R00

WARNING: DO NOT LET THE POLYSULPHIDE MATERIALS GET ON YOUR SKIN. YOU MUST USE THE CORRECT HAND PROTECTION. AFTER USE, WASH THE SKIN WITH A CREAM THAT REMOVES RESIN.

DO NOT SMOKE OR EAT AT THE WORK LOCATION WHERE THESE MATERIALS ARE PREPARED OR USED.

MATERIALS MUST BE PREPARED AND USED IN AREAS WHICH ARE WELL VENTILATED.

IF YOU DO NOT OBEY THIS PROCEDURE, YOU CAN CAUSE INJURIES TO YOURSELF AND DAMAGE TO EQUIPMENT.

(1) Do the steps that follow to use the OMat 8/107 and 8/136 Polysulphide Sealants.
(a) Use the manufacturers' instructions to mix the sealant.

(b) Use a syringe to apply the mixture to the repair area.
(c) Use a spatula to make the repair area smooth before the material is cured.
(d) Let the material become dry to the touch before you use heat to cure it.
(e) Cure the repair for the time and temperature given in tables 3 and 4.

NOTE: The minimum cure time for OMat 8/107 is 1 hour. The minimum cure time for OMat 8/136 is 2.25 hours.

Time - Hours	168	96	40	24	16	8	4	2	1
Temp °C	12	15	20	22	25	30	35	45	60
°F	54	59	68	72	77	86	96	113	140

Table 1 OMat 8/52 Hysol EA934 NA Cure Data Chart

Time - Hours	96	72	36	24	16	8	4	2	1	1/2
Temp °C	12	15	20	22	25	30	35	45	60	100
°F	54	59	68	72	77	86	95	113	140	212

Table 2 OMat 874 Blue Filler EC3524 Cure Data Chart

Time - Hours	30	15	7.5	4	2	1
Temp °C	25	30	35	40	45	50
°F	77	86	95	104	113	122

Table 3 OMat 8/107 PR1436G 81/2 Sealant Cure Times

Time - Hours	72	36	18	9	4.5	2.25
Temp °C	25	30	35	40	45	50
°F	77	86	95	104	113	122

Table 4 OMat 8/136 PR1422 B2 Compound Cure Times

TASK 70-20-06-302-014-R00

6. Use Filler to Recreate Aerodynamic Smoothness

A. Prepare to use Filler.

S 842-020-R00

WARNING: YOU MUST USE CLOTHING AND PLASTIC GLOVES TO PROTECT YOUSELF DURING CAUSE PREPARATION. AVOID CONTACT WITH THE SKIN.

IF YOU DO NOT OBEY THESE PROCEDURES, YOU CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(1) Do the steps that follow to mix and apply the filler.
(a) Prepare OMat 874 Filler (Ref Par. 4.).
(b) Use a palette knife to apply filler to the repair area.
(c) If filler tends to adhere to the blade, moisten blade with cold water to finally smooth the filler.

NOTE: Do not use too much water as it reacts with the filler as a plasticiser.

(d) Let the Filler partially cure, then dress filler with the palette knife until the filler is level with the surface of the adjacent L.P. Compressor case surface.

NOTE: Cure time and temperature are given in table 2. Minimum cure time is 30 minuites.

Maximum temperature that can be applied to the repair is 150°C (302°F). Excess temperature can cause scorching.

(e) Filler will not cure at temperatures less than 12°C (54°F).
(f) Remove scorching with abrasion.

CONSUMABLE MATERIALS - MAINTENANCE PRACTICES

1. General
   A. This procedure gives all the consumable materials that are necessary for the maintenance of the engine. This list was assembled by Rolls-Royce.
   B. This procedure has two parts:
      (1) A consumable materials list which lists the consumable materials by section. The sections are:

Section	Description
1	Processing and Cleaning Materials
2	Processing Sundries
3	Welding, Brazing and Metal Spraying
4	Jointing Compounds and Greases
5	Polishing and Dressing
6	Inspection Materials
7	Paints, Varnishes and Thinners
8	Bonding, Adhesives, Fillers and Sealers
9	Not assigned
10	Oils, Fluids and Lubricants
11	Not assigned
12	Packing

      (2) A list of Suppliers Names and Addresses which are in Supplier Code in alphanumeric order and by region.

          (a) United Kingdom (UK.)
          (b) North American (NA.)
          (c) South American (SA.)
          (d) Asian (As.)
          (e) African (Af.)
          (f) European (Eu.)
          (g) Australian (Aus.)

   C. Alternative materials are shown with an alphasuffix attached to the consumable material item number and can be used unless the maintenance procedure tells you differently.
   D. Usually, orders to Rolls-Royce plc should be confined to materials for which they are given as the only supplier. But, aid will be given should any problem occur with the supply of consumable materials from other sources given.
   E. If you need more data about consumable materials you must read the Overhaul Materials Manual (OMat).

F. In addition, some of the listed materials has been assigned a Boeing Bulk Code. The Boeing Bulk Code lists additional sources of Supply and Suitable substitutes for materials. This Boeing resource number can assist in matching synonymous materials with the ones listed.

G. Abbreviations and Equivalents

Af.	African
AMS	American Material Specification
As.	Asian
A.S.T.M.	American Society for Testing Materials
Aus.	Australian
B.S.	British Standard
DERD	Directorate of Engineering, Research and Development
dia.	diameter
D.T.D.	Directorate of Technical Development
Eu.	European
in.	inch
mm.	millimetre = 0.038 inches
MSRR	Rolls-Royce Material Specification
NA.	North American
SA.	South American
S.W.G.	Standard Wire Gage (British Imperial)
UK.	United Kingdom

H. Standard Wire Gage (British Imperial)

6 S.W.G. = 0.1920 in.	7 S.W.G. = 0.1760 in.
8 S.W.G. = 0.1600 in.	9 S.W.G. = 0.1440 in.
10 S.W.G. = 0.1280 in.	11 S.W.G. = 0.1160 in.
12 S.W.G. = 0.1040 in.	13 S.W.G. = 0.0920 in.
14 S.W.G. = 0.0800 in.	15 S.W.G. = 0.0720 in.
16 S.W.G. = 0.0640 in.	17 S.W.G. = 0.0560 in.
18 S.W.G. = 0.0480 in.	19 S.W.G. = 0.0400 in.
20 S.W.G. = 0.0360 in.	21 S.W.G. = 0.0320 in.
22 S.W.G. = 0.0280 in.	23 S.W.G. = 0.0240 in.
24 S.W.G. = 0.0220 in.	25 S.W.G. = 0.0200 in.
26 S.W.G. = 0.0180 in.	27 S.W.G. = 0.0164 in.
28 S.W.G. = 0.0148 in.	29 S.W.G. = 0.0136 in.
30 S.W.G. = 0.0124 in.	31 S.W.G. = 0.0116 in.
32 S.W.G. = 0.0108 in.	33 S.W.G. = 0.0100 in.
34 S.W.G. = 0.0092 in.	35 S.W.G. = 0.0084 in.
36 S.W.G. = 0.0076 in.	37 S.W.G. = 0.0068 in.
38 S.W.G. = 0.0060 in.	39 S.W.G. = 0.0052 in.
40 S.W.G. = 0.0048 in.	41 S.W.G. = 0.0044 in.
42 S.W.G. = 0.0040 in.	43 S.W.G. = 0.0036 in.
44 S.W.G. = 0.0032 in.	45 S.W.G. = 0.0028 in.
46 S.W.G. = 0.0024 in.	47 S.W.G. = 0.0020 in.
48 S.W.G. = 0.0016 in.	49 S.W.G. = 0.0012 in.
50 S.W.G. = 0.0010 in.	

TASK 70-30-00-912-001-R00

2. Consumable Materials

A. General

(1) Section 1 - Processing and Cleaning Chemicals

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
B00728	101	Kerosene	Commerical grade (DERD.2494) (MIL-T-5624 type JP5)	Local purchase Aus.1
B00728	101A	Kerosene	Safrasol	AS.21
B00025	102	White spirit	B.S.245	UK.10,47,261, 363 NA.36,138 or local purchase
B00025	102A	Solvent	Stoddard solvent Type 1 to A.S.T.M.D484 P-D-680	UK.10 NA.36,138 or local purchase
B00025	102B	Solvent	Safrasol	AS.21
	107	Ethylene glycol (Ethanediol)	Commercial grade B.S.2537:1955	UK.10,261 NA.2,36 or local purchase
	117	Phosphoric acid H3PO4	S.G.1.65 (O-O-670 Class 1)	UK.10 NA.36 or local purchase
	122A	Xylene (Thinners) C6H4(CH3) 2	GPR, BDH 30575	UK.10,209,261 NA.36,216 or local purchase
	122B	Xylene (Thinners) C6H4(CH3) 2	SAFRAXYL	As.21

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
B00148	135	Methyl Ethyl Ketone (MEK) CH3CO C2 H5	Technical grade BDH 26268	UK.10,209,261 NA.216 or local purchase
	146	Abrasive medium	Aluminum oxide 120/220 CSS.12 FEPA 32.GB ANS1 B74-12 120 grade A-A-1045T1	UK.10,27,128, 129 NA.61,95
B00716	150	Acetone (CH3) 2CO	Commercial grade BDH26287 or BDH27023 O-A-51	UK.10,209,261 NA.36,216 or local purchase
	155	Methylated spirit	Industrial GPR BDH30244	UK.10,209 NA.36,216 or local purchase
B00061	169	Methylene chloride (Dichloromethane) CH2C12	GPR BDH 28096 MIL-D-6998	UK.10,209,261 NA.36,216 or local purchase Aus.7
	173H	Alkali deruster	Alkaline deruster Salts 2411121	UK.10,97 NA.24

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	173K	Alkali deruster	MSC Rust-off	UK.10
	175	Chromate conversion coating for aluminum (Immersion type)	Alocrom 1200 DEF-STAN 03-18 (MIL-C-5541)	UK.10,272,363 NA.16 or local purchase
	175A	Chromate conversion coating for aluminum (Immersion type)	Alodine 1200S DEF-STAN 03-18 (MIL-C-5541)	NA.16 NA.36
	175B	Chromate conversion coating for aluminium (Immersion type)	Turcoat Alumigold B MIL-C-5541	UK.10,126 NA.119 Eu.33,34,35 Aus.7,13 AS.28
	175C	Chromate conversion coating for aluminum (Immersion type)	PMD Alchromate MIL-C-5541	UK.10,302
	175D	Chromate conversion coating for aluminum (Brushing type)	Part A Alocrom 1200 MP004 Part B Alocrom 1200 MP005 (MIL-C-81706 type C1A)	UK.10,272,363 NA.16
	175E	Chromate conversion coating for aluminium (Brushing type)	Turcoat liquid Accelagold (ready to use)	UK.10,126 NA.119 Eu.33,34,35 Aus.7,13 AS.28
	176	Engine cleaning solution	CN50	UK.10,163 NA.129 or local purchase

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	178A	Deleted		
	178E	Cold solvent decarbonizer	Turco Transpo	UK.10,126 NA.119 Eu.33,35 Aus.7,13 AS.28,29
	178H	Cold solvent decarbonizer	Turco Supercarb	UK.10,126 NA.119 Eu.33,35 Aus.7,13 AS.28,29
	178J	Cold solvent decarbonizer	MSC 3850	UK.10
B00090	1/21	Deleted — Use OMat 1/257 Desoclean 45, OMat 150 Acetone, or OMat 1/40 Isopropyl Alcohol		
B00090	1/21A	Deleted — Use OMat 1/257 Desoclean 45, OMat 150 Acetone, or OMat 140 Isopropyl Alcohol		
B00175	1/21B	1.1.2 Trichloroethylene (Inhibited and stabilized)	Triklone N B.A.580:1963 Fed.Spec.1956 O-T-634a Type 2	UK.10,47 NA.36 or any approved local agent

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
B00090	1/21C	Deleted — Use OMat 1/257 Desoclean 45, OMat 150 Acetone, or OMat 1/40 Isopropyl Alcohol		
B00090	1/21D	Deleted — Use OMat 1/257 Desoclean 45, OMat 150 Acetone, or OMat 1/40 Isopropyl Alcohol		
B00090	1/21E	Deleted — Use OMat 1/257 Desoclean 45, OMat 150 Acetone, or OMat 1/40 Isopropyl Alcohol		
	1/39	Abrasive medium	Aluminum oxide 80-120 CSS.12 FEPA32GB or ANS1 B74-12 80 grade	UK.10,27,128 NA.95
	1/40	Isopropyl alcohol	GPR BDH29694	UK.10,128,349 NA.93,94
	1/43	Glass beads	Size No. 13 Nom Dia 0.003-0.0015 inch CSS 8 AH Grade 0/100 MIL-G-9954 Grade 13	UK.10,128 NA.93,94
B00019	1/119	Isopropanol (CH3) 2CHOH (propan-2-ol)	Analar grade BDH10224 TT-I-735	UK.10,209,261 NA.216 or local purchase
B00716	1/176	Acetone (CH3) 2CO	Analar grade BDH10003 O-A-51	UK.10,209,261 NA.216 or local purchase

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	1/239	Glass bead	Glass bead Nom Dia 0-009800-0165 in MIL-G-9954A Grade 5 CSS 8 VG300 AECMA PREN 2750	UK.10,128 or any approved local agent
	1/257	Cleaning solvent	Desoclean 45	UK.163 NA.129
	1/257G	Cleaning solvent	Lotoxane	UK.32 AS.2,3,6 EU.17,18,19,20
	1/257H	Cleaning solvent	Lotoxane Fast	UK.32 AS.2,3,6 EU.17,18,19,20

(2) Section 2 - Processing Sundries

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	212	Brush	Painting 0.5 in. wide	UK.10,97 NA.24 or local purchase
	217	Tufnol	Carp brand	UK.10 or local purchase
	230	Adhesive tape (Masking)	Zinc oxide AT 142	UK.10 or local purchase
	237	General purpose paper masking tape	Scotch 202 premium grade (A-A-883 Ty I)	UK.10,108 NA.70
G02070	238	Lockwire	Staybrite DTD189A (0.028 to 0.031 in. dia.)	UK.10,245
G02070	238A	Lockwire	MS9226-03 (0.025 in. dia.	NA.30
G02070	238B	Lockwire	Pt No.5019006 AMS 5689 ASTM A-580 Type 321 Condition A (0.025 in. dia.)	NA.85

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	239	Lockwire	MS9226-06 (0.051 in. dia.)	NA.30
	249	Modeling clay	Plasticine	UK.10 or local purchase
	250	P.V.C. tape	Clear Sellotape 2221	UK.10,22 or local purchase
	256	Adhesive tape (P.T.F.E.)	Scotch No. 61 Blue	UK.10,108 NA.70 or local agent
	262	Temporary Marker felt/fiber tip	Deleted Use alternatives	
	262A	Temporary Marker	Soft chalk Green, Blue	UK.10,153
		NOTE: Previously Item 982.		
	262B	Temporary Marker felt/fiber tip	Staedtler Lumocolour 318 Blue	UK.171 NA.28
	262C	Temporary Marker felt/fiber tip	Staedtler Panocolour 303 Red, Blue, Green, Black	UK.171 NA.28
	262D	Temporary Marker felt/fiber tip	Berol push start valve marker Black, Red, Green	UK.10,172 NA.105
	262J	Temporary Marker felt/fiber tip	Berol wet wipe board writer Red, Green, Brown, Blue, Black	UK.10,172 NA.105
	262K	Temporary Marker felt/fiber tip	Pentel - felt or fiber pen	UK.10,173 NA.17 As.4

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	262M	Temporary Marker felt/fiber tip	Platignum - Instant marker	UK.10
	262N	Temporary Marker felt/fiber tip	Vari line marker	UK.10
	262Q	Temporary Marker felt/fiber tip	Sharpie marker	UK.10
	262S	Temporary marker felt/fiber tip	Artline 30, 50, 70, 100 or 700 Black, Red	As.5
	262T	Temporary marker felt/fiber tip	Marks-A-Lot Black, Red	NA.28
	271	Deleted	Refer to RR Plc	Deleted
	274	Lacing tape	T085	UK.10,88 any approved local agent
	283	Adhesive tape, transparent	Silicone polyester 1602	UK.10,22,108 NA.70,138
	285	Adhesive tape black waterproof	Isatape 160	UK.10,185
	285A	Adhesive tape waterproof	Arnotape AT171	UK.223
	296	Adhesive tape (Electrical)	Scotch No.69 (white)	UK.10,108 NA.70 or local purchase
	298	Adhesive tape (Aluminum foil)	Scotch 425 Def MIL-T-23397 Ty 2	UK.108 NA.70

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	299	Teflon tape	Tygaflor P.T.F.E. self-adhesive coated glass fabric tape Spec 1080AP/ 037/0025/030	UK.106,10 NA.2
	2/7	Wetting agent	Libranone 140	UK.10,91
	2/7A	Wetting agent	Divoplus V5	UK.236 NA.65
	2/12	Paint Brush	Soft camel hair 1 in. (25 mm.)	UK.10 or local purchase
	2/30	Teflon adhesive tape	Scotch 5490 P.T.F.E. plastic tape	UK.10,108 NA.70,138
	2/40	Adhesive tape, paper, heat resistant masking tape	Sellotape 2595 3M HT214	UK.10,22 NA.70
	2/41	Marking compound	Stuarts marking Blue	UK.10, 186 or local purchase
	2/47	Cleaning pads	Lint-free pads (Protective pad refills)	Local purchase
	2/66	Wetting agent	Nonidet P.40 BDH 56009.2L	UK.10,209 NA.216 or local purchase
G00507	2/67	Disposable cleaning tissues	Kimwipes No.7105	UK.240 or local purchase
	2/72	Lockwire	Staybrite DTD189A 20 S.W.G. (0.036 in. dia.)	UK.10,245 or local purchase

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	2/88	Adhesive Tape Polyester, Clear	Scapa 1602 or 1610 B.S. 3924	UK.10,22
	2/94	Adhesive tape (Masking)	Waterproof AT162, Black	UK.223
	2/101	Absorbent cloth, lint-free	Superstrong Soft 917 (MIL-C-24671 or MIL-85043T2)	UK.242 or Local purchase
	2/106	Teflon adhesive tape	TFE5490 plastic film tape	UK.10,108 NA.70
	2/113	Parting film non-porous	234-TFNP	NA.7
	2/117	Adhesive tape (double sided)	3M F9473PC	UK.108 NA.2,70
	2/134	Ball point pen	DIN 16 554/2 Black	UK.10 NA.28,105 or Local purchase
		NOTE: ONLY for marking on electrical harness sleeves.		
	OMat 1/140	Lacing tape/ Tying cord	502-3/3 Nomex	UK.40,65
	2/148	Tape, adhesive FEP FEP	HM 135 FEP HM 150 FEP HM 150 FEP	UK.10, 290

(3) Section 3 - Welding, Brazing and Metal Spraying

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	306	Welding filler wire, 18/8 chromium nickel stainless steel	MSRR.9500/2 B.S.2901:1970 347 S96 formerly BSS2901 A8Nb	UK.10,11,40 314 NA. 54,85,115
	306A	Welding filler wire, chromium nickel stainless steel	Turbaloy 347 A.I.S.I type 347 AMS 5680C MSRR.9500/2	NA.85 or local purchase
	3/40	Metal spraying wire, aluminum	Metco aluminum NS MSSR.9507/105	UK.10,75 NA.48,206 Eu.10 or local purchase
	3/115	Aluminum metal spraying powder	Metco 54NS-1 MSRR.9507/1	UK.10,75 NA.48,206 Eu.10 or local purchase

(4) Section 4 - Jointing Compounds and Greases

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
D00013	401	Grease	Exxon Beacon 325	UK.3,10 NA.33 SA.6 Eu.36 As.12 Af.9 Aus.3
D00013	401A	Grease	AeroShell Grease 7 MIL-PRF-23827 (Supersedes MIL-G-23827) NATO-G-354 DEF STAN 91-53 (Aviation Grease 7 (Aus))	UK.10,13,261 NA.2,10,44 SA.7 Af.8 Aus.6
D00013	401C	Deleted		
D00013	401E	Grease	Castrolease A.I.	UK.60 NA.99,214 As.14,15 Af.10 Aus.5 SA.2
D00013	401F	Grease	Texaco low temperature grease E.P.	UK.143 NA.98
	402	Petroleum jelly	DEF-STAN-91-38 Grade PX-7 (VV-P-236) NATO code NS743 Silkolene 775 (Yellow soft)	UK.10,243

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	404A	Graphite grease	Rocol Aerospec 210 JSD XG 273 DEF STAN 91-85	UK.10,52,6 NA.2,102 As.8 Aus.12 SA.1
D00421	418	Silicone grease	DEF STAN 59-10/2 (MS.4) AMS3087 MIL-S-8660C Amend.1 (DC.4) NATO S-736	UK.10,53 NA.27,218 Aus.8 As.18,19 Eu.42 SA.8
	NOTE: Previously Items 9/69 and 291.			
	423	Jointing compound	DTD.900/4344 Silkolene 762	UK.10,243,261 NA.2 or any approved local agent
	432	Anti-seize compound (graphite)	ZX-13 DEF STAN 80-80/1 and MIL-T-5544B NATO S-720	UK.10,241,261 NA.10,44 SA.7 Af.8 Aus.6
	432B	Anti-seize compound	Castrol Spheerol LG	UK.60 NA.99,214 As.14,15 Af.10 Aus.5 SA.2
	432C	Anti-seize compound	Castrol OSC	UK.60 NA.99,214 As.14,15 Af.10 Aus.5

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
D00263	433	Grease	Aeroshell Grease #14 MIL-G-25537 NATO G 366 DEF STAN 91-51	UK.10,13,261 NA.10,44,2 SA.7 AF.8 AUS.6
	434	Grease		Replaced by Item 401
	435	Grease		Replaced by Item 417A
	436	Jointing Compound		Replaced by Item 4/47
	437	Grease Strontium Chromate		Deleted, use Item 4/65
	438	Grease		Replaced by Item 433
	439	Grease		Replaced by Item 487
	440	Grease (High Temperature)	Texaco Jet Hi Temp. grease MIL-G-25013D	UK.143 NA.98
D00126	440A	Grease (High Temperature)	Aeroshell grease #15A MIL-G-25013 XG300 NATO G 372 DEFSTAN 91-55/1	UK.10,13,261 NA.2,10,44 SA.7 AF.86 AUS.6
	440B	Grease (High Temperature)	Castrol B & R	UK.60 NA.99,214 AS.14,15 AF.10 AUS.5 SA.2

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
D00069	444	Colloidal Molybdenum Disulphide in Toluene	Molydag 709 MSRR 3004	UK.10,68 NA.2,25,55 SA.3 Af.5 or any approved local agent
	NOTE: Previously Item 499.			
	467	Dry film lubricant	For "wet" application use Item 4/20 For "stoved" application use Items 4/44 or 4/44B or 4/44C	
	479	Jointing compound	Titanine J.C.5A DTD 900/4488	UK.10,163 NA.2,129
D00015	487	Synthetic grease	AeroShell grease 16	UK.10,13,216 NA.10,44 SA.7 Af.8 Aus.6
D00015	487A	Synthetic grease	Castrol WTR	UK.60 NA.99,214 As.14,15 Af.10 Aus.5 SA.2

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
D00378	4/3	Grease	Mobil grease 28 MIL-G-81322 DEF STAN 91-52 NATO G-395	UK.98 NA.100,138 As.13 Af.7 Aus.4
D00378	4/3A	Grease	Aero Shell grease 22 MIL-G-81322D DEF STAN 91-52 NATO G 395	UK.10,13,261 273 NA.2,10,44 Af.8 Aus.6
D00378	4/3B	Grease	Castrol AH	UK.10,60 NA.99 214 As.14,15 Af.10 Aus.5 SA.2
D00322	4/20	Thixotropic dry film lubricant	Replaced by Item 4/62	
D00550	4/23	Anti-seize compound, pure nickel special	Bostik, Never Seez NSN 165 NSN 16A NSN-8 NSBT-8N NSBT-16N MSRR 9409	UK.10,83 NA.2,19

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	4/37	Anti-seize lubricant	Felpro C5A	UK.138 NA.2,80
	4/43E	Dry film lubricant (Mixture of Molybdenum disulphide with graphite)	Deleted	
	4/44A	DELETED		
		NOTE: Previously Item 467. For "wet" application and thread lubrication use Item 4/62. For "stoved" application use alternative, Item 4/44.		
	4/44B	Dry film lubricant colloidal graphite	DGF.123 MIL-G-26548 K5200	NA143
		NOTE: K5200 has no chlorinated solvent.		
G00535	4/46	Jointing compound	DTD.900/4586 Hylomar PL32 (Light)	UK.7,10,261 NA.2
G00535	4/47	Jointing compound	DTD.900/4586 Hylomar PL32 (Medium)	UK.7,10,261 NA.2

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	4/48	Jointing compound	DTD.900/4586 Hylomar PL32 (heavy)	UK.7,10,261 NA.2
	4/49	Solid lubricant paste	Molykote G-n Plus paste	UK.10,53 NA.27,218 SA.8 As.18,19 Eu.42 Aus.8
	4/50	Lubricant paste	Molykote G rapid Plus	UK.10,53 NA.27,218 SA.8 As.18,19 Eu.42 Aus.8
D00038	4/51	Bonded lubricant	Molykote D321R	UK.10,53 NA.27,218 Aus.8 As.18,19 Eu.42 SA.8
	4/52	Dry film anti-scuffing spray	Rocol Dry Moly Spray	UK.6,10,52 NA.2 As.8 Aus.14 SA.1

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	4/53	Anti-scuffing paste	Rocol Dry Moly Paste	UK.6,10,52 NA.2,102 As.8 Aus.14 SA.1
	4/54	Inorganic anti-scuffing spray	Rocol Oxy Lube Spray	UK.6,10,52 NA.2 As.8 Aus.14 SA.1
	4/58	Molydisulphide lubricant	Dri-Slide	NA.21,29
	4/62	High Temperature anti-seize compound	Rocol ASC251 MSRR 4008	UK.6,10,52 NA.2,124 As.8 Aus.12 SA.1

(5) Section 5 - Polishing and Dressing

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
GO2046	582	Scotch Brite	Type S.7448 Ultrafine (grey) (MIL-A-9962A Type III, Grade AAA)	UK.10,108
GO2045	583	Scotch Brite	Type A.7447 Very fine (maroon) (MIL-A-9962A Type I, Grade A)	UK.10,108
GO2045	584	Scotch Brite	Type No. 7496 Fine to medium (light green) (MIL-A-9962 Type II, Grade B or C)	UK.10,108
	5/28	Waterproof silicone carbide	Grit size 800	UK.10,27,29
		NOTE: Previously Items 533 and 5/22.		
	5/29	Waterproof silicone carbide	Grit size 600 (A-A-1047A)	UK.10,29
		NOTE: Previously Items 533 and 5/22.		
	5/30	Waterproof silicone carbide	Grit size 500	UK.10,29
		NOTE: Previously Item 548.		

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	5/31	Waterproof silicone carbide	Grit size 400 (A-A-1047A)	UK.10,29
	5/32	Waterproof silicone carbide	Grit size 360	UK.10,29
	5/33	Waterproof silicone carbide	Grit size 320 (A-A-1047A)	UK.10,29
	5/34	Waterproof silicone carbide	Grit size 280 (A-A-1047A)	UK.10,29
	NOTE: Previously Items 534, 556, 585 and 5/20.			
	5/35	Waterproof silicone carbide	Grit size 240 (A-A-1047A)	UK.10,27,29
	5/36	Waterproof silicone carbide	Grit size 220 (A-A-1047A)	UK.29 NA.95 or local purchase
	5/37	Waterproof silicone carbide	Grit size 180 (A-A-1047A)	UK.29,161 NA.95 or local purchase
	5/38	Waterproof silicone carbide	Grit size 150 (A-A-1047A)	UK.29,161 NA.95 or local purchase
	5/39	Waterproof silicone carbide	Grit size 120 (A-A-1047A)	UK.29,161 NA.95 or local purchase
	5/40	Waterproof silicone carbide	Grit size 100 (A-A-1047A)	UK.29,161 NA.95 or local purchase
	5/41	Waterproof silicone carbide	Grit size 80 (A-A-1047A)	UK.29,161 NA.95 or local purchase

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	5/42	Waterproof silicone carbide	Grit size 60 (A-A-1047A)	UK.29,161 NA.95 or local purchase
	5/43	Emery paper (standard)	OOELN251	UK.10,196
	5/56	Emery polishing paper	Deleted Use Item 5/57	
	5/58	Emery polishing paper	Grade 1M Grit size 280 (A-A-1049A)	UK.10,161 NA.95
	5/62	Aluminum oxide abrasive paper	Grade 180 Grit size	UK.10,161 NA.95 or local purchase
	5/63	Aluminum oxide abrasive paper	Grade 150 Grit size (A-A-1048A)	UK.10,29,161 NA.95 or local purchase
	5/65	Aluminum oxide abrasive paper	Grade 100 Grit size (A-A-1048A)	UK.10,29,161 NA.95 or local purchase
	5/66	Aluminum oxide abrasive paper	Grade 80 Grit size	UK.10,29,161 NA.95 or local purchase
	NOTE: Previously Item 535.			
	5/67	Aluminum oxide abrasive paper	Grade 60 Grit size (A-A-1048A)	UK.10,29,161 NA.95 or local purchase
	NOTE: Previously Items 537 and 5/7.			

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	5/74	Aluminum oxide (tape)	Grade 100 Grit size (A-A-1048A)	UK.10,29
	5/82	Waterproof silicon carbide paper disc	Grit size Grade 150 (MIL-A-A-1048A)	UK.10,161 NA.95
	5/88	Glass paper	Grit size 100 Grade F2	UK.10,29
	5/94	Garnet paper	Grit size 150 Grade 4/10 (MIL-A-A-1201 Class 2)	UK.10,27,29 161 NA.95 or local purchase
	5/97	Garnet paper	Grit size 80 Grade 0 (A-A-1201 Class 2)	UK.10,29,161 NA.95
	5/98	Garnet paper	Grit size 60 Grade 1/2 (A-A-1201 Class 2)	UK.10,29,161 NA.95
	5/99	Garnet paper	Grit size 50 Grade 1 (A-A-1201 Class 2)	UK.10,161 NA.95

(6) Section 6 - Inspection Materials

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	606	Developer powder	Magnaflux ZP-4B MIL-I-25135	UK.10,87 NA.20 or local purchase
	606A	Developer powder	Ardrox 9D4A MIL-I-25135	UK.2 NA.127,179 Eu.28 As.1,9 SA.10 Af.11 Aus.1
	606B	Developer powder	Britemor PD3 or PD4 MIL-I-25135	UK.10 NA.99,214 As.14,15 Af.10 Aus.5
G00747	606C	Developer powder	Met-L-Chek D72A (M) MIL-I-25135	NA.63 Eu.21 or local purchase
	606D	Developer powder	Turco DD2A MIL-I-25135	UK.10,126 NA.119 Eu.33,34,35 As.7,28 Aus.13
	606E	Developer powder	F-5D/1 MIL-I-25135	As.16
	606H	Developer powder	Dubl-Chek D90G MIL-I-25135	NA.171 or local purchase

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	616	Solvent penetrant remover	Ardrox No.9 PR50 DTD.929 (MIL-I-25135 Class 2)	UK.2 NA.127,179 Eu.28 As.1,9 SA.10 Af.11 Aus.1
	616A	Solvent penetrant remover	Turco Dy-Chek Remover DTD.929	UK.10,126 NA.119 Eu.33,34,35 Aus.7,13 As.28
	616B			
	616C	Solvent penetrant remover	Magnaflux SKC-S	UK.10,87 NA.20 or Local purchase
	617	Developer nonaqueous aerosol	Ardrox No. 9D6F DTD.929 MIL-I-25135C	UK.2,10 NA.127,179 Eu.28 As.1 SA.10 Af.11 Aus.1
	621A	Fluorescent penetrant remover (hydrophilic)	Ardrox 9 PR12 DTD.929 MIL-I-25135C	UK.2 NA.127,179 Eu.28 As.1,9 SA.10 Af.11 Aus.1

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
G00747	621B	Fluorescent penetrant remover (hydrophilic)	Met-L-Chek E-58D MIL-I-25135	Eu.21 NA.63
	621E	Fluorescent penetrant remover (hydrophilic)	Turco E41 MIL-I-25135	UK.126 NA.119 Eu.33,34,35 Aus.7,13 As.28,29
	621F	Fluorescent penetrant remover (hydrophilic)	Zyglo ZR10B MIL-I-25135	UK.10,87 NA.20 or local purchase
	621H	Fluorescent penetrant remover (hydrophilic)	H91 or H91A	UK.10,71 NA.99,214 Af.10 As.14,15 Aus.5
	621J	Fluorescent penetrant remover (hydrophilic)	Emulsifier F-6E-W/1 MIL-I-25135	As.16
	621L	Fluorescent penetrant remover (hydrophilic)	Dubl-Chek ER83A	NA.171 or any approved local agent
	641	Surface inspection fluid	NML21 MSRR.9015	UK.10,261 NA.2 or local purchase
	652	Fluorescent penetrant. ultra high sensitivity, post-emulsified	Ardrox 985-P14 MIL-I-25135 (1.D.4.)	UK.2 NA.127,179 Eu.28 As.1,9 SA.10 Af.11 Aus.1

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	652A	Fluorescent penetrant. ultra high sensitivity, post-emulsified	Zyglo ZL37 MIL-I-25135 (1.D.4.)	UK.10,87 NA.10 or local purchase
	652B	Fluorescent penetrant. ultra high sensitivity, post-emulsified	Britemor 668 MIL-I-25135 (1.D.4.)	UK.10,60 NA.99,214 As.14,15 Af.10 Aus.5
	652C	Fluorescent penetrant. ultra high sensitivity, post-emulsified	F-6A-SP/1 MIL-I-25135 (1.D.4.)	As.16
	652D	Fluorescent penetrant. ultra high sensitivity, post-emulsified	Dubl-Chek RC77 MIL-I-25135 (1.D.4.)	NA171 or local purchase
	652E	Fluorescent penetrant. ultra high sensitivity, post-emulsified	Met-L-Chek FP-97A (M) MIL-I-25135 (1.D.4)	NA63 Eu.21 or local purchase
	652F	Fluorescent penetrant. ultra high sensitivity, post-emulsified	Turco P-60H (M) or P-60-H2 MIL-I-25135	UK.10,126 NA.119 Eu.33,34,35 As.7,28 Aus.13

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	652G	Fluorescent penetrant. ultra high sensitivity, post-emulsified	Sherwin RC77 MIL-I-25135	NA.17, or local purchase
	653	Fluorescent penetrant. Medium sensitivity, water washable	Ardrox 970/P23 and 970/P24 MIL-I-25135 (1.A.2)	UK.2 NA.127,179 Eu.28 As.1,9 SA.10 Af.11 Aus.1
	653A	Fluorescent penetrant. Medium sensitivity, water washable	Zyglo ZL60C MIL-I-25135 (1.A.2)	UK.10,87 NA.20 or any approved local agent
	653B	Fluorescent penetrant. Medium sensitivity, water washable	Turco WP100M or WP100H or WP100LSBD MIL-I-25135	UK.10,126 NA.119 Eu.33,34,35 As.7,28 Aus.13
	653C	Fluorescent penetrant. Medium sensitivity, water washable	Britemor 4455 MIL-I-25135 (1.A.2)	UK.10,60 NA.99,214 As.14,15 Af.10 Aus.5
	653D	Fluorescent penetrant. Medium sensitivity, water washable	F-4A-B/1 MIL-I-25135 (1.A.2)	As.16

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	653E	Fluorescent penetrant. Medium sensitivity, water washable	Met-L-Chek FP-92B (M) MIL-I-25135 (1.A.2)	Eu.21 NA.63
	653F	Fluorescent penetrant. Medium sensitivity, water washable	Sherwin HM406 Sherwin HM3A MIL-I-25135 (1.A.2)	NA.171 or local purchase
	655	Ultrasonic couplant	Soundsafe	UK.10,362 NA.38

(7) Section 7 - Paints, Varnishes and Thinners

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	708	Red oxide touch-up primer (Synthetic oil resistant)	CO.5151 1721.P.4011	UK.10,163,261
	766	Two-pack epoxy primer and catalyst (Strontium chromate)	Base component PR.143R catalyst ACT149R MIL-I-233777	UK.10,163 NA.129
	766B	Two-pack epoxy primer and catalyst	Deleted	
	766C	Two-pack epoxy primer and catalyst	Base 10P4-2, Hardener EC117, BMS10-11 Tyoe 1, Class A, Grade A	
	766E	Two-pack epoxy primer and catalyst	PR213 Base ACT 213 Catalyst	UK.163
		NOTE: Use thinner, Item No. 7/188.		
	788	Two-pack epoxy finish Black and catalyst	Base EC.75R/801 Black catalyst ACT65R	UK.10,163 NA.129
	788A	Two-pack epoxy finish Black and catalyst	IP9064/9000 and IP9064/CAT	UK.261 NA.2
	795	Two-pack epoxy finish White and catalyst	Base EC75R/802 White Catalyst ACT65R MIL-P-24441	UK.10,163 NA.129
	795A	Two-pack epoxy finish White and catalyst	IP9064/0000 and IP9064/CAT	UK.261 NA.2

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	799	Two-pack epoxy finish Yellow and catalyst BSC381:No.356	Base EC75R/356 Catalyst ACT65R	UK.10,163 NA.129
	799A	Two-pack epoxy finish Yellow and catalyst BSC381:No.356	IP9064/3560 and IP9064/CAT	UK.261 NA.2
	7/22	Air drying high heat resisting touch-up enamel Aluminum	E.3892 1912.A.8000 PL82.C1	UK.10,163
		NOTE: Previously Item 728.		
	7/22A	Air drying high heat resisting touch-up enamel Aluminum	No.428 Hi-Heat aluminum	NA.34
	7/22B	Air drying high heat resisting touch-up enamel Aluminum	IP 9138	UK.261 NA.2
	7/24	Deleted		
	7/24A	Clear touch-up enamel (Synthetic oil resistant)	IP 9169	UK.261 NA.2
	7/28A	Intumescent paint	Flamarest 1600B MSRR.9312	UK.10 NA.45
	7/35	Air drying touch-up enamel, aircraft grey	Deleted	
	7/46	Air dry touch-up enamel, aircraft grey	IP 9170	UK.261 NA.2

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	7/46	Corrosion resistant coating	Sermatel 'W' MIL-C-81751	UK.10,271 NA.62 EU.39
	7/66	Laminar 'X' 500 paint, Gull grey	Base component 8-B-6	UK.10 NA.71,138
	7/73	Silicon Varnish	DC 997 DTD 900/4554	UK.10,53 NA.27,218 Aus.8 As.18,19 Eu.42 SA.8
	7/84	Yellow marking paint, water based	PL168A	UK.10,261 NA.2
	7/93	Thinners for two-pack epoxy finishes	T17	UK.10, 173 NA.129
	7/110C	Heat resisting marking paint	PL.152/R1 (Black)	UK.10,261,40 NA.2
B00332	7/124	Potassium silicate solution	No.66 grade Wt.Ratio 2:2.1 (Si O2/K2O)	UK.10,134,261 NA.2
B00332	7/124A	Potassium silicate	Kasil 33 Wt.Ratio 2:2.1 (Si O2/K2O)	NA.96 or local purchase
	7/149	Fire retardant paint	Decadex Fire Check Paint AFS 1639 (MSRR.9313)	UK.274
	7/151	Polyurethane primer catalyst	ACT 123 (AFS 1355C)	UK.10,163 NA.129
	7/152	Polyurethane primer base	Base PR123 (AFS 1355C)	UK.10,163 NA.129

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	7/153	Polyurethane thinners	T115 (AFS 1355C)	UK.10,163 NA.129
	7/154	Tyflex Polyurethane finish base BAC707 (Grey)	FE102/C1151 Base (AFS 1355C)	UK.10,163 NA.129
	7/155	Tyflex Polyurethane finish catalyst	ACT 102 (AFS 1355C)	UK.10,163 NA.129
	7/156	Tyflex Polyurethane thinners	T609 (AFS 1355C)	UK.10,163 NA.129
	7/157	Primer base	Transferred to Item 766C.	
	7/158	Curing solution	Transferred to Item 766C.	
	7/159	Thinners	TL52-66	NA.167
	7/172	Polyurethane gloss finish base (white)	FE102 white Catalyst Item No. 7/155 Thinners Item No. 7/156	UK.10,163 NA.129
	7/172A	Polyurethane gloss finish base (white)	BAC702-643-3-25 3-25 Use with Catalyst Item No. 7/176 Thinners Item No. 7/177	NA.167

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	7/179	Temporary lightening strike protective paint	Base 528 x 302 Activator 910-006 BSM 10-21 TY1	NA.129,129A
	7/188	Thinner	T702	UK.163
		NOTE: Replaced by item 793.		

(8) Section 8 - Bonding, Adhesives, Fillers and Sealers

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	801	Resin	Araldite My.753	UK.10,38 NA.89
	802	Hardener	Araldite Hy.951	UK.38,265,273 NA.2
	803	Resin	Araldite My.750	UK.38,261,265 273 NA.2,89 or local purchase
	803B	Resin	Araldite F	Aus.11
	805	Resin	Araldite SV.409 AFS 712 (MSRR9026) NML35	UK.10,38,40 261,273 NA.2,89
	806	Hardener	Crayamid 140 (MSRR9026)	UK.10,40,261 328 NA.2,37,153 or local purchase
	806A	Hardener	LC177	Aus.11
	817	Adhesive	Material discontinued, use Item 818.	
	818	Adhesive	Bostic 1777 MSRR 9133	UK.10,83,261 NA.2,19
	872	Cold curing silicone compound (White)	Silcoset 152	UK.10,175,261 NA.2
A00482	872A	Cold curing silicone compound (Red)	RTV106 MIL-A-46106B AFS 1755	UK.10,190 NA.108,125
	NOTE: Previously Item 8/15.			

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
A00027	872B	Cold curing silicone compound	Deleted	
A00096	872C	Deleted		
A00482	872D	Bonding agent	RTV159 AFS 1756	UK.10,190 NA.108,125
		NOTE: Previously Item 879D.		
A00482	872E	Cold curing silicone rubber (Black)	Ambersil 1008A	UK.10,175
A00760	872F	Cold curing silicone rubber	Silastic 732	UK.10,53 NA.27,218 SA.8 As.18,19 Eu.42 Aus.8
	874	Filler Two-pack	EC3524B/A Part A Part B MSRR1001	UK.10,108 NA.2,70 or any local agent
		NOTE: Injection and Spatula application.		
	874A	Filler Two-pack	Bostik E5358 MSRR.1002	UK.10,83 NA.19
		NOTE: Spatula application only.		

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	874B	Filler Two-pack	EC3524B/A AF MSRR.1002	UK.10,108 NA.70
		NOTE: Spatula application only.		
	874D	Filler Two-pack	EC 3534 B/A	UK.10,108 NA.70 Eu.47
	876A	Primer	Silcoset primer O.P.1	UK.10,175,261 NA.2
	876B	Primer	Silcoset primer O.P.2	UK.10,175,261 NA.2
C00580	876C	Primer	DC 1200	UK.53 NA.27,218 SA.8 AS.18,19 EU.42 AUS.8
C00582	876D	Primer	SS 4004 AFS 1755	UK.10,190 NA.125
	887	Fiberglass cloth	Tyglas Y0314/205-T5 (0.003 inches) (0.076 mm) (MSRR.9049)	UK.10,106
	899	Filler	Aerosil Filler DTO 75	UK.10,261,273 NA.2,89
	8/5	Brushable polysulphide sealing compound Two pack, base and accelerator	PR1422A-2 DTD 900/4590 MSRR 9336 MIL-S-8802F	UK.10,163
		NOTE: Previously PR1422-B2.		

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
A00048	8/8	Resin	EPIKOTE 828	UK.10,41 NA.153
	8/9	Hardener	Shell curing agent 'T'	UK.10 NA.10,45 or any approved local agent
	8/9A	Hardener	Ancamine 'T'	UK.24,316
	8/32	Release agent	DP.200/2	UK.10,175
	8/32A	Release agent	Frekote 33	UK.10,338 NA.154
	8/46	Sealing compound	Silastic 730	UK.10,53 NA.27 SA.8 As.18,19 Eu.42 Aus.8
	8/50	Resin	Resin Adiprene LW520 MSRR9212	UK.10,299 NA.118
	8/51	Hardener	HY.932 (UK) XU HY.205 (U.S.A.) (MSRR9213)	UK.10,38,265, 273 NA.89
	WARNING: CONTAINS DDM. DDM IS A CARCINOGEN. NOTE: Use with Item 8/50.			

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	8/52	Adhesive	Hysol E.A.934 NA (2-pack) Part A Grey paste Part B Amber liquid MSRR9328	UK.10,332 Eu.38 NA.2,164
	NOTE: OMat 8/154 may be used as an alternative.			
	8/66	Locking compound	Loctite Superfast 222 NATO stock code 8030-99-224-8425 AFS 1737A/DTD 900/ 6003C MOD SPEC MIL-S-46163A Type 2	UK.10,124,261 NA.2,88 SA.5 As.10,11 Af.6
	8/67	Locking compound	Loctite Superfast 241 NATO stock code 8030-99-224-8992	UK.10,124,261 NA.2,88 SA.5 As.10,11 Aus.2
	8/68	Locking compound	Loctite 242 NATO stock code 8030-99-224-8707 (MIL-S-46163 8-18 Nm) type 2 grade N	UK.10,124,261 NA.88 SA.5 As.10,11 Af.6 Aus.2
	8/68A	Locking compound	Superfast 242 MOD AFS 1737 DTD 900/6003A NATO	UK.10,124,261 NA.88 SA.5 As.10,11 Af.6 Aus.2

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	8/76A	Retaining compound	Superfast 641 Bearing fit	UK.10,124 NA.88 SA.5 As.10,11 Af.6 Aus.2
	8/81	Locking adhesive	Loctite 932 DTD 5629 Grade 1 NATO 8030-99-224-9389	UK.10,124 SA.5 As.10,11 Aus.2
	8/82	Adhesive activator	Loctite 734 Activator F AFS 1100B	UK.10,124 NA.88 SA.5 As.10,11 Af.6 Aus.2
	8/106A	Sealant two-part polysulphide (Brushable)	PR1436G A2 dichromate cat MIL-S-81733	UK.10,132 NA.87
	8/107	Sealant two-part polysulphide	PR1436G B1/2 dichromate cat MIL-S-81733	UK.10,163 NA.87
	8/107A	Sealant two-part polysulphide	PR1436G B2 dichromate cat MIL-S-81733	UK.10,163 NA.87
	8/107B	Sealant two-part polysulphide	PR1436G B4 dichromate cat MIL-S-81733	UK.10,163 NA.87

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	8/117	Adhesive	Hysol EA956 two-part	UK.10,332 NA.164 Eu.38 or any approved local supplier
	8/118	Sealant	Replaced by Item 8/106	
	8/119	Accelerator	Deleted	
	8/120	Polysulphide sealant	PR1750, or PR870, or PR1428, or PR1440 Polysulphide type sealant	UK.163 NA.87
	8/121	Toughened acrylic adhesive with initiator	Permabond F241 and No. 1 initiator DTD900/6102 AFS1646B	UK.10,277 NA.168,219 AUS.10
	8/121A	Toughened acrylic adhesive with activator	Quickbond 612 Quickbond 610 activator	UK.10,277 NA.168 AUS.10
	8/123	Kevlar yarn	Kevlar 49 Aramid yarn 1578D Tex 1420 (Den) Type 965	UK.10,286

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	8/128	Self adhesive PTFE tape (Red) NO LONGER AVAILABLE OMat 2/148 can be used as an alternative for single part repairs	HM50	UK.290, 10
	8/129	Self adhesive PTFE glass cloth	HMGC	UK.10,290
	8/132	Stainless steel powder 200 mesh	A1S 3041304L	UK.10,292
A00394	8/136	Polysulphide compound	PR1422B-2 Two pack mix Base and accelerator DTD900/4709 MSRR9144 MIL-S-8802F Class B-2 GPL	UK.10,163 NA.87
	NOTE: See Item 8/5 for brushable type.			
	8/138	Sealant 2-part pack base and catalyst	Dow Corning DC 90-006	UK.10 NA.2,27 or any approved local agent
	8/138A	Sealant 2-part pack base and catalyst	RTV 88	UK.10,190 NA.108,125

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	8/143	Sealant 2-part pack base and catalyst	Dow Corning DC93-006-1	UK.10,53 NA.27,218 SA.8 Eu.42 As.18,19 Aus.8
	8/147	Adhesive sealant potting compound	Proseal 824 Boeing BMS.5-28 Type 12 Rohr RMS027 Type V111	UK.10,132 NA.87
	8/149	Acrylic adhesive	Permabond F245 MSRR.9418 AFS1646B	UK.10,277 NA.169,219 Aus.10
	8/150	Adhesive	EA9309-3NA Part A Pink Part B Blue	UK.332 NA.164 Eu.38 or local purchase
	8/154	Low temperature curing paste adhesive	Hysol EA9394 (2 pack) Part A Grey Part B Black	UK.10,332 NA.164 Eu.38 or any approved local supplier

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	8/160	Epoxy adhesive	EA9390 Part A Tan Part B Violet	UK.10,332 Eu.38 NA.164 or local purchase

(9) Section 10 - Oils, Fluids and Lubricants

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	1003	Mineral oil (fuel system inhibitor)	Deleted	
		NOTE: Use Item 1024 or alternatives.		
	1003B	Deleted		
	1003C	Deleted		
	1003D	Mineral oil	Deleted	
		NOTE: Use Item 1024 or alternatives.		
	1005	Temporary rust preventative	Px1 DEF.2331 MIL-C-16173 Grade 2 NATO C-614	UK.10,369 NA.10,44 SA.7 Af.8 Aus.6
	1011	Engine lubricating oil (synthetic)	As quoted in Chapter 12-13-03	
	1020	Liquid Paraffin B.P.	Technical white oil	UK.10 or local purchase
	1024A	Mineral oil	AeroShell turbine oil No. 2 or Royco 481 MIL-L-6081 Grade 1010 NATO O-133	UK.13 NA.10,44 SA.7 Af.8 Aus.6
		NOTE: Item 1003 is no longer recommended as an alternative.		

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	1024B	Mineral oil	Deleted	
	1024C	Mineral oil	Avrex M Turbo 201/1010 MIL-L-6081 grade 1010 NATO O-133	NA.100
	1024D	Mineral oil	Castrol Aero GT1010 MIL-L-6081 grade 1010 NATO O-133	UK.10,60 NA.99,214 As.14,15 Af.10 Aus.5 SA.2
	1029	General lubricating oil	Deleted	
	NOTE: Use Item 1024 or alternatives.			
	1042B	Anticorrosion inhibiting fluid	Steelgard 521B DEF STAN 68-10 ISSUE 3 PX-24 NATO CODE C-634	UK.343
	1042D	Anticorrosion inhibiting fluid	LPS1 greaseless lubricant MIL-C-16173D Type 3	UK.10 NA.204
	1070	Compressor washing fluid	ZOK.27 MSRR.9914	UK.10,305 NA.187 AS.24
	1070A	Compressor washing fluid	Castrol ICD 177 Techniclean GT2 (MSRR.9914)	UK.10,60 NA.99,214 As.14,15 Af.10 Aus.5 SA.2

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	1070B	Compressor washing fluid	Turboclean MSRR.9914 TS10268A	UK.306
	1070D	Compressor washing fluid	Ardrox 6345	UK.2 NA.127,179 Eu.28 As.1,9 SA.10 Af.11 Aus.1
	1070E	Compressor washing fluid	Rivanaes R-MC-G21 or R-MC-G21 C-6 concentrate	UK.10,36 NA.18 Eu.43 NA.18
		NOTE: Material is supplied ready diluted unless marked "C-6 concentrate". Dilute C-6 concentrate 1:6 with water.		
	1070F	Compressor washing fluid	Ardrox 6367 or Ardrox 6368 (Turboclean 2)	UK.2,40 NA.127,179 Eu.28 As.1,9 SA.10 Af.11 Aus.1
	1071	Assembly oil	AeroShell 750 DERD.2487	UK.10,13 NA.10,44,138 SA.7 As.14,15 Af.10 Aus.5

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	1071A	Assembly oil	Castrol 98 DERD.2487	UK.10,60 NA.99,214 Af.10 As.14,15 Aus.5 SA.2
	1071B	Assembly oil	Exxon ETO274 DERD.2487	UK.3,10 NA.33 SA.6 Eu.36 Af.9 As.12 Aus.3

(10) Section 12 - Packing

Boeing Bulk Code	Rolls-Royce OMat Item No.	Material	Manufacturers Reference and/or Specification	Rolls-Royce Supplier Code
	1208	Desiccant and humidity indicator	Silica gel BS.2540 CP.345 Cobalt/chloride type	UK.25 or any approved local agent
	1221	Printed, waxed V.P.I. coated kraft paper	No. 03086 Anti-corrosion paper (CSS117) NA. Spec. UU.-P00270	UK.10,279,345 or any approved local agent
	1222	P.V.C. sheeting	Grade DQ unembossed Green 317 BS.1763	UK.10,197 or any approved local agent
	1225	French chalk	DTD.527	UK.10 or any reputable supplier
	1226	Grease resistant paper	DEF.1316	UK.10 or any reputable supplier
	1238	Polythene bags	12 x 5 in. 10.5 x 8.5 in. 7.5 x 3.25 in. 4 x 12 in. 12 x 12 in. DEF1317	UK.82 or local purchase
		NOTE: Previously Item 223.		
	1249	Polythene sheet	DEF.93-13/1	UK.10,350 or local purchase

TASK 70-30-00-912-002-R00

3. Suppliers Names and Addresses

A. General

(1) United Kingdom suppliers (UK.)

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
K6858	UK.2	Brent Europe Ltd Denbigh Road Bletchley Milton Keynes MK1 1PB Phone: 01908 649333 Telex: Fax: 01908 373939
	UK.3	Esso Petroleum Co. Ltd Ermyn Way Leatherhead, Surrey KT2 2UX Phone: 01372 222000 Telex: Fax: 01372 223588
K3237	UK.7	Marston Bentley Ltd Hylo House Cale Lane New Springs, Wigan WN2 1JR Phone: 01942 824242 Telex: 67230 Fax: 01942 826653
	UK.9	Deleted
K6835	UK.10	Med-Lab. Limited Copeland Street Derby DE1 2PU Phone: 01332 349094 Telex: 377347 Fax: 01332 371237

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
K0680	UK.11	Rolls-Royce Plc Derby DE24 8BJ Phone: 01332 242424 Telex: Fax: 01332 249936
	UK.13	Shell Oils Rowlasndsway House On Rowlasndsway Wythenshawe Manchester M225 5SB Phone: 0161 499 4000 Telex: Fax:
	UK.16	D.A. Stuart Oil Co. Ltd Lincoln Street Wolverhampton WV10 0DZ Phone: 01902 456111 Telex: 338228 Fax: 01902 453764
	UK.22	Sellotape G.B. Ltd. The Woodside Estate Dunstable Bedfordshire LU5 4TP Phone: 01582 478 111 Telex: Fax: 01582 471 085
	UK.23	Deleted
	UK.25	Brand Packaging Limited Bridge Mills Holland Street Salford Pendleton, M6 6EL Phone: 0161 736 8941 Telex: Fax: 0161 745 7141

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	UK.27	Washington Mills Electro Minerals Ltd Mosley Road Trafford Park, Manchester M17 1NR Phone: 0161 848 0276 Telex: 666081 Fax: 0161 872 2974
K3895	UK.29	English Abrasives and Chemicals Ltd Doxey Road Stafford ST16 1EA Phone: 01785 51288 Telex: Fax: 01785 59428
	UK.31	Multisol Limited Welsh House 83 Welsh road Nantwich Cheshire CW5 5ET Phone: 01270 610444 Telex: Fax: 01270 610555
	UK.32	Arrow Chemicals Anteco Ltd Stanhope Road Swadlincote, Derbyshire DE11 9BE Phone: 01283 221044 Telex: Fax: 01283 225731
	UK.36	Ivar Rivanaes Ltd 9 Argent Centre Silverdale Road Hayes, Middlesex UB3 3BL Phone: 0181 561 0540 Telex: 9419375 Fax: 0181 848 8789

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	UK.38	Ciba Polymers Duxford, Cambridge CB2 4QD Phone: 01223 838111 Telex: 81101 Fax: 01223 838556
	UK.40	Sourcerer Ltd Rolls-Royce Site Building 26 Ansty Coventry CV7 9SR Phone: 01203 625054 Fax: 01203 625057
	UK.41	Freeman Chemicals Freeman House Private Road No. 4 Colwick Industrial Estate Nottingham NG4 2JT Phone: 0115 9617017 Telex: Fax: 0115 9611034
	UK.45	K and K Greef Ltd Bramley Road Mount Farm Industrial Estate Bletchley, Milton Keynes MK1 1PT Phone: 01908 271511 Telex: Fax: 01908 375611
	UK.47	ICI Chemicals and Polymers Ltd P.O. Box 14 The Heath Runcorn, Cheshire WA7 4QG Phone: 01928 511706 Telex: Fax: 01928 581072

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
K5066	UK.48	Hexcel Composites Duxford, Cambridge CB2 4QD Phone: 01223 833141 Telex: 81101 Fax: 01223 838808
K0567	UK.52	Rocol Lubricants Wakefield Road Swillington, Leeds LS26 8BS Phone: 0113 2322600 Telex: Fax: 0113 2322740
K7750	UK.53	Dow Corning Ltd Cardiff Road Barry, South Glamorgan CF63 2YL Phone: 01446 732350 Telex: Fax: 01446 747350
	UK.56	Owens Corning Prescot Road St. Helens Merseyside WA10 3TR Phone: 01744 24022 Telex: Fax: 01744 612007
K0132	UK.60	Castrol (UK) Ltd Burmah Castrol House Pipers Way Swindon, Wiltshire SN3 1RE Phone: 01793 512712 Telex: 449221 Fax: 01793 486083
	UK.68	Acheson Colloids Company Customer Service Department Prince Rock Plymouth, Devon PL4 0SP Phone: 01752 266351 Telex: Fax: 01752 222343

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	UK.71	Ely Chemical Co. Ltd. Lisle Lane Ely, Cambs CB7 4AS Phone: 01353 665881 Telex: Fax: 01353 664623
	UK.72	Albemarle S.A London Road Bracknell Berks RG12 2UW Phone: 01344 356524 Telex: Fax: 01344 861158
	UK.82	Venus Packaging Limited Lower Middleton Street Ilkeston, Derbyshire Phone: Telex: Fax:
U2215	UK.83	Bostik Limited Ulverscroft Road Leicester LE4 6BW Phone: 0116 251 0015 Telex: Fax: 0116 253 1943
K5549	UK.87	Magnaflux Limited Faraday Road South Dorcan Industrial Estate Swindon, Wiltshire SN3 SHE Phone: 01793 524566 Telex: 449068 Fax: 01793 619498

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	UK.88	Raydex/CDT Gladden Place West Gillibrands Skelmelsdale Lancashire WN8 9SX Phone: 01695 733061 Telex: Fax: 01695 726017
	UK.89	McGean-Rohco (U.K.) Ltd Cee-bee Division Qualcast Road Lower Horseley Fields Wolverhampton, West Midlands WV1 2QP Phone: 01902 451312 Telex: 339188 CBMRE G Fax: 01902 457443
	UK.91	Libra Chemicals Ltd Matens Road North Bank Industrial Park Irlam Manchester M44 5AX Phone: 0161 755 1888 Telex: Fax: 0161 777 9104
K0136	UK.97	W. Canning Co. Ltd Great Hampton Street P.O. Box 288 Birmingham B18 6AS Phone: 0121 236 8621 Telex: 337441 Fax: 0121 236 0444
K1932	UK.98	Mobil Oil Co. Ltd Mobil House 500/600 Witan Gate Central Milton Keynes MK9 1ESB Phone: 01908 853000 Telex: 8812411 mobil-G Fax: 01908 853999

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
K2096	UK.106	Courtaulds Aerospace Advanced Materials Division P.O. Box 1 Summit Littleborough, Lancashire OL15 9QP Phone: 01706 378837 Telex: 63155 Fax: 01706 370203
K0993	UK.108	3M UK plc 3M House 28 Great Jackson Street Manchester M15 4PA Phone: 0161 236 8500 Telex: 667510 MMMMAN G Fax: 0161 237 6136
U0406	UK.124	Loctite UK Watchmead Welwyn Garden City Hertfordshire AL7 1JB Phone: 01707 821000 Telex: Fax: 01707 821194
K4958	UK.126	Turco Products Ltd Brunel Road Earlstrees Industrial Estate Corby, Northants NN17 4JW Phone: 44 1536 263536 Telex: Fax: 44 1536 263890
K2769	UK.128	Abrasive Development Limited Norman House High Street Henley-in-Arden Solihull, Warwickshire B95 5AH Phone: 01564 792231 Telex: 338375 Fax: 01564 793079

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
U1490	UK.129	Universal Abrasives Ltd. Doxey Road Stafford ST16 IDZ Phone: 01785 223122 Telex: Fax: 01785 212259
	UK.132	Deleted
	UK.134	Crosfield Chemicals Ltd. P.O. Box 26 4 Liverpool Road Warrington, Cheshire WA5 1AB Phone: 01925 416100 Telex: 627067 Fax: 01925 659828
	UK.136	Deleted
	UK.142	Applied Chemicals Ltd. Applied House Wilsons Lane Coventry CV6 6JA Phone: 01203 368800 Telex: 31693 Fax: 01203 366639
	UK.143	Texaco Stoke Ltd Sampson Street Hanley Stoke on Trent ST1 5ES Phone: 01782 280444 Telex: Fax: 01782 205080
	UK.153	General Engineering Supplies Co. Ltd 554 High Road Leytonstone E11 Phone: 0181 556 0201 Telex: Fax: 0181 558 9305

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
K5991	UK.161	Norton Abrasive Bridge Road East Welwyn Garden City Hertfordshire AL7 1HZ Phone: 01707 323484 Telex: 267291 Fax: 01707 325231
K5635	UK.163	Courtaulds Aerospace Darlington Road Shildon, County Durham DL4 2QP Phone: 01388 772541 Telex: 58641 DESOTO G Fax: 01388 774373
	UK.170	Deleted
	UK.171	Staedlter (UK) Ltd. Cowbridge Road Talbot Green Pontyclum Glamorgan CF72 8YJ Phone: 01443 237421 Telex: Fax: 01443 237440
K5720	UK.172	Berol Ltd Oldmedow Road Kings Lynn, Norfolk PE30 4JR Phone: 01553 761221 Telex: 817409 Fax: 01553 766534
	UK.173	Pentel Stationery Ltd Hunts Rise South Marston Park Swindon Wilts SN3 4TW Phone: 01793 823333 Telex: 449750 (PENUK) Fax: 01793 823366

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
K7652	UK.175	Ambersil Ltd Wylds Road Castlefield Industrial Estate Bridgewater, Somerset TA6 4DD Phone: 01278 424200 Telex: 46796 Fax: 01278 425644
	UK.185	Industrial Self Adhesive Ltd Greasley Street Bulwell, Nottingham NG6 8NG Phone: 0115 9278281 Telex: Fax: 0115 9770270
	UK.186	Cromwell Tools Thirsk Place Osmaston Road Derby DE24 8JJ Phone: 01332 360660 Telex: Fax: 01332 204239
	UK.190	G. E. Silicones (Division of GE Plastics LTD) Old Hall Road Sale, Cheshire M33 2HG Phone: 0161 905 5027 Telex: 635253 Fax: 0161 905 5022
	UK.195	Petrofina (U.K.) Ltd Manchester Lubricant Terminal Praed Road Trafford Park, Manchester M17 1PQ Phone: 0161 872 0149 Telex: Fax: 0161 872 3957

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
K1905	UK.196	Carborundum Abrasives (GB) Ltd P.O. Box 55 Trafford Park Road Manchester M17 1HP Phone: 0161 872 2381 Telex: 667344 CARBOM G Fax: 0161 953 2982
	UK.197	Weston Hyde Products Ltd Industrial Division Vallis Road Frome, Somerset BA11 3EQ Phone: 01373 463271 Telex: 449571 Fax: 01373 473624
	UK.198	Johnson Matthey Plc. Metal Joining Gate 14 York Way Royston, Hertfordshire SG8 5HJ Phone: 01763 253200 Telex: 817351 Fax: 01763 253168
	UK.199	Deleted
U1185	UK.209	Merck Ltd BDH Laboratory Chemical Division Poole, Dorset BH15 1TD Phone: 01202 669 700 Telex: Fax: 01202 665 599
	UK.223	Advance Tapes International Ltd P.O. Box 122 Vantage Works Abbey Meadows, Leicester LE4 5RA Phone: 0116 2510191 Telex: 34555 Fax: 0116 2652046

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	UK.225	Vinatex Ltd New Lane Havant, Hampshire PO9 2NQ Phone: Telex: Fax:
	UK.233	Deleted
K3814	UK.236	Novamex Technologies Ltd Broad March Daventry, Northants NN11 4HE Phone: 01327 310230 Telex: Fax: 01327 310232
K4182	UK.240	Kimberley-Clark Ltd Larkfield Maidstone, Kent ME20 7PS Phone: 01622 782421 Telex: 94018168 Fax: 01622 782090
	UK.242	Allchem (Midlands) Company Wingate Close Glaisdale Drive East Nottingham NG8 4LP Phone: 0115 9295258 Telex: Fax: 0115 9292379
K0007	UK.243	Silkolene Lubricants PLC Silkolene Oil Refining Belper, Derbyshire DE56 1WF Phone: 01773 824151 Telex: 37219 Fax: 01773 823659
	UK.257	British Petroleum Ltd Brittanic House Moor Lane London EC2Y 9BU Phone: Telex: Fax:

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
K3504	UK.261	Indestructible Paint Co. Ltd 25 Pentos Drive Birmingham B11 3TA Phone: 0121 702 2485 Telex: 338024 BIRCOM G Fax: 0121 778 4338
	UK.271	Sermatech Technical Services (UK) High Holborn Road Codnor, Derby DE5 3NW Phone: 01773 748 921 Telex: 377128 STS C7I Fax: 01773 512344
K0519	UK.272	Henkel Chemicals Ltd Henkel House 292 - 308 Southbury Road Enfield, Middlesex EN1 1TS Phone: 0181 804 3343 Telex: 922708 Fax: 0181 443 2777
	UK.273	B and K Resins Ltd Unit 2 Ashgrove Road Ashgrove Estate Bromley Kent BR1 4TH Phone: 0181 315 1200 Telex: 918593 Fax: 0181 313 0280
	UK.274	Liquid Plastics Ltd P.O. Box 7 London Road Preston, Lancashire PR1 4AJ Phone: 01772 259781 Telex: 67169 LPL-G Fax: 01772 202627

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
U1087	UK.277	Permabond Adhesives Ltd Woodside Road Eastleigh, Hampshire SO5 4EX Phone: 01703 629628 Telex: Fax: 01703 619284
K6402	UK.279	Carrs Paper Ltd Cranmore Boulevard Estate Shirley, Solihull B90 4LJ Phone: 0121 733 3030 Telex: 337836 Fax: 0121 733 3811
	UK.280	Elf Atochem (UK) Ltd Colthrop Lane Thatcham Newbury, Berkshire RG13 4LW Phone: 01635 87000 Telex: 847689 Fax: 01635 861212
	UK.286	M. Wright and Son Quorn Mills Station Road Quorn Loughborough, Leicestershire LE12 8BT Phone: 01509 412365 Telex: Fax: 01509 415618
	UK.290	Holscot Industrial Linings Ltd Harlaxton, Grantham NG32 1HQ Phone: 01476 61380 Telex: Fax:
	UK.292	BSA Metal Powders Montgomery Street Sparkbrook, Birmingham B11 1DT Phone: 0121 773 7386 Telex: Fax: 0121 772 3587

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	UK.299	Uniroyal Chemical Ltd Kennet House 4 Langley Quay Waterside Drive Slough, Berks SL3 6EH Phone: 01753 580888 Telex: 849934 UCHEM G Fax: 01753 592252
	UK.302	PMD Chemicals Broad Lane Coventry CV5 7AY Phone: 01203 466691 Telex: 31416 PMD COVG Fax: 01203 473034
	UK.305	Airworthy Limited Elsted Midhurst, West Sussex GU29 0JT Phone: 01730 816672 Telex: 86428 Fax: 01730 815607
K2884	UK.306	Kent Chemical Co. Ltd George House Bridewell Lane Tenterden, Kent TN30 6HS Phone: 01580 764244 Telex: 95508 Fax: 01580 765652
	UK.314	VBC Ltd Unit 9 Morley Street Industrial Estate Loughborough LE11 1EW Phone: 01509 218008 Telex: Fax: 01509 211552
	UK.323	Astor Stag Tavistock Road West Drayton, Middlesex Phone: 01895 445511 Telex: Fax: 01895 449199

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
K3713	UK.328	Cray Valley Ltd Machen Newport, Gwent NP1 8YN Phone: 01633 440356 Telex: Fax: 01633 440006
U3167	UK.332	Aero Consultants (UK Ltd) 13-14 Clifton Road Huntingdon Cambs PE18 7EJ Phone: 01480 432111 Telex: Fax: 01480 412910
	UK.338	Dexter Asm. Div. Unit 4C Stag Industrial Estate Atlantic Street Altrincham, Cheshire WA14 5DW Phone: 0161 929 0424 Telex: 6689926 frekot Fax: 0161 929 0425
	UK.343	Vapor-Tek Ltd Fairclough Street Great Lever Bolton BL3 2AF Phone: 01204 521795 Telex: Fax: 01204 364576
	UK.345	Deleted
	UK.349	Potters Ballotini Ltd Pontefract Road Barnsley S71 1HJ Phone: 01226 287591 Telex: 54604 POTERS G Fax: 01226 207615

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	UK.350	Sawley Packaging Company Ltd Nottingham Road Derby DE21 6AS Phone: 01332 243006 Telex: 37494 Fax: 01332 290297
	UK.363	Trimite Ltd Arundel Road Uxbridge, Middlesex UB8 2SD Phone: 0189 525 1234 Telex: 934444 Fax: 0189 525 6789
	UK.369	Westbrook Lanolin Argonaut Works Laisterdyke, Bradford BD4 8AU Phone: 01274 663331 Telex: Fax: 01274 667665

(2) North American suppliers (NA.)

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	NA.2	Indestructible Paint Inc. 66 Erna Avenue Milford, Connecticut 06460 U.S.A. Phone: 203 877 9243 Telex: Fax: 203 876 7680
	NA.10	Royal Lubricants Co. Inc. 6 Campus Drive Parsippany, New Jersey 07054 U.S.A. Phone: 201 887 7410 Telex: Fax: 201 605 1818
	NA.12	Dow Chemical Co. 2040 Willard H Dow Center Midland, Michigan 48674 U.S.A. Phone: 517 832 1000 Telex: Fax: 517 810 2666
	NA.16	Parker and Amchem 32100 Stephenson Highway Madison Heights, Michigan 48071 Phone: 313 583 9300 Telex: Fax: 313 583 2976

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	NA.17	Pentel of America Limited Corporate Headquarters 2805 Columbia Street Torrance, California 90503 U.S.A. Phone: 310 320 3831 Telex: 230674006 Fax: 310 533 0691
	NA.18	E.C.T (Engine Cleaning Tech.) 155 South Limerick Road Limerick, Pennsylvania 19468 U.S.A. Phone: 610 948 5100 Telex: Fax: 610 948 5246
	NA.19	Bostic Industrial Division Boston Street Middleton, Massachusets 01949 U.S.A. Phone: 508 771 0100 Telex: Fax: 508 774 7376
37676	NA.20	Magnaflux Corporation 7300 West Lawrence Avenue Chicago, Illinois 60656 U.S.A. Phone: 708 867 3363 Telex: Fax: 708 867 6833
	NA.21	Dri-Slide Inc. Division of Guardsman Chemical Inc. Fremount, Michigan 49412 U.S.A. Phone: 616 924 3950 Telex: Fax: 616 924 2085

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	NA.24	Frederick Gumm Chemical Co. Inc. 538 Forest Street Kearney, New Jersey 07032 U.S.A. Phone: 201 991 4171 Telex: Fax: 201 991 5855
70079	NA.25	Acheson Colloids Co. P.O. Box 611747 1600 Washington Avenue Port Huron, Michigan 48061-1747 U.S.A. Phone: 313 984 5581 Telex: 819231 5265 Fax: 313 984 1446
71984	NA.27	Dow Corning Corporation Midland, Michigan 48686-09954 U.S.A. Phone: 517 496 4000 Telex: 189806000 Fax: 517 496 6486
	NA.28	Boulevard Produits de Bureau 1616 Rue Eiffel Boucherville, Quebec Canada J4B 7W1 Phone: 514 449 4449 Telex: Fax: 514 449 2068

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	NA.29	Florida Aviation International Corp. 2517 Northwest 74th Avenue Miami, Florida U.S.A. Phone: 305 591 3278 Telex: Fax:
	NA.30	Inco Alloys International Inc. P.O. Box 1958 Huntington, West Virginia 25720 U.S.A. Phone: 304 526 5100 Telex: 886413 Fax: 304 526 5441
29700	NA.33	Henri A Patoir Exxon Company International 222 Park Avenue Florham Park, New Jersey 07932-1002 U.S.A. Phone: 201 765 5509 Telex: 132092 Fax: 201 765 4303
	NA.34	United Coatings 2850 Festival Drive Kankakee, Illinois 60901 U.S.A. Phone: 1 800 621 1000 Telex: Fax: 815 935 1322
	NA.36	I.C.I. Americas Inc. Wilmington, Delaware DE 19897 U.S.A. Phone: Telex: Fax:

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	NA.40	Vulcan Chemicals P.O. Box 530390 1 Metroplex Drive Birmingham, Alabama 35253-0390 U.S.A. Phone: 1 (800) 633 8280 Telex: Fax: 205 877 3448
36131	NA.44	Shell Canada Products Ltd 630 - 3rd Avenue Southwest P.O. Box 100 Station M Calgary, Alberta Canada T2P 2HS Phone: 416 469 7544 Telex: Fax: 416 469 7534
	NA.45	Textron Speciality Materials 2 Industrial Avenue Lowell, Massachusetts 01851 U.S.A. Phone: 508 452 8961 Telex: 710 343 1284 Fax: 508 454 5619
71361	NA.52	McGean - Rohco Inc. Cee-Bee Division 9520E CeeBee Drive Downey, California 90241-0016 U.S.A. Phone: 310 803 4311 Telex: 3735455 Fax: 310 803 6701
	NA.55	Acheson Colloids (Canada) Ltd P.O. Box 665 Shaver Street Brantford, Ontario Canada N3T 5P9 Phone: 519 752 5461 Telex: Fax: 519 752 9892

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	NA.56	Monsanto Headquarters 800 North Lindbergh Boulevard St. Louis, Missouri 63167 U.S.A. Phone: 314 694 1000 Telex: Fax: 314 694 7625
58913	NA.62	Sermatech International Inc. 155 Limerick Road Limerick, Pennsylvania 19468 U.S.A. Phone: 610 948 5100 Telex: 84 6335 Fax: 610 948 0811
	NA.61	Washington Mills Electro Minerals Corp 20 North Main Street North Grafton, Massachusetts 01536 U.S.A. Phone: 508 839 6511 Telex: Fax: 508 839 7676
98733	NA.63	Met-L-Chek Co. 1639 Euclid Street Santa Monica, California 90404 U.S.A. Phone: 310 450 1111 Telex: Fax: 310 452 4046
79745	NA.64	Man Gill Chemical Co. 23000 St. Clair Avenue Cleveland, Ohio 44117 U.S.A. Phone: 216 486 5300 Telex: 810 421 8465 Fax: 216 486 1214

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	NA.65	Novamax Technologies (US), Inc. 1615 Johnson Road Northwest Atlanta, Georgia 30318 U.S.A. Phone: 404 799 1292 Telex: Fax: 404 799 1873
94960	NA.70	3M Company 3M Center Building 220-8E-04 St. Paul, MN 55144 U.S.A. Phone: 612-733-1110 Telex: 0230 297023 Fax: 612 733 9973
	NA.71	Dexter Corporation Midland Division 31500 Hayman Street Haywood, California 94544 U.S.A. Phone: Telex: Fax:
	NA.75	ADM Food Additives Division 4666 Fairies Parkway Decatur, Illinois 62526 U.S.A. Phone: 217 424 5387 Telex: Fax: 217 424 2473

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
73165	NA.80	Fel-pro Inc. 3412 Wes Touhy Ave Lincolnwood IL 60645 U.S.A. Phone: 847 568-2820 Telex: Fax: 847 674 0019
	NA.82	Emerson & Cuming Inc. 869 Washington Street Canton, Massachusetts 02021 U.S.A. Phone: 617 828 3300 Fax: 617 828 3104
58401	NA.85	United States Welding Corp. 3579 Highway 50 East 104 Carson City, Nevada 89701 U.S.A. Phone: 702 883 7878 Telex: Fax: 702 883 7776
83574	NA.87	Products Research & Chemical Corp. 5454 San Fernando Road Glendale, California 91203 U.S.A. Phone: 818 242 6815 Telex: Fax:
05972	NA.88	Loctite World Headquarters 10 Columbus Boulevard Hartford Square North Hartford, Connecticut 06106 U.S.A. Phone: 860 520 5000 Telex: Fax: 860 520 5073

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	NA.89	Ciba Polymers Ciba-Geigy Corp. 7 Skyline Drive Hawthorne, New York U.S.A. Phone: 914 347 4700 Telex: Fax: 914 347 2202
	NA.93	Potters Industries Inc. Southpoint Corporation Headquarters P.O. Box 840 Valley Forge, Pennsylvania 19482-0840 U.S.A. Phone: 610 651 4700 Telex: Fax: 601 408 9723
	NA.94	Cataphote Inc. 1001 Underwood Drive P.O. Box 23690D Jackson, Mississippi 39225-2369 U.S.A. Phone: 601 939 4612 Telex: 58-5467 Fax: 601 932 5339
44197	NA.95	Norton Company P.O. Box 15008 Worcester, Massachusets 01615-0008 U.S.A. Phone: 508 795 5000 Telex: Fax: 508 795 5420
	NA.96	P.Q. Corporation P.O. Box 840 Valley Forge, Pennsylvania 19482 U.S.A. Phone: 215 293 7200 Telex: Fax: 215 688 3835

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
59595	NA.98	Texaco Inc. Aviation Sales Dept. 2000 Westchester Avenue White Plains, New York 10650 U.S.A. Phone: 914 253 7284 Telex: Fax:
	NA.99	Castrol Inc. Speciality Products Division 16715 Von Karman Avenue Suite 230 Irvine, California 92714 U.S.A. Phone: 714 660 9414 Telex: 683386 Fax: 714 660 9374
	NA.99A	Burmah-Castrol Canada Ltd 3660 Lakeshore Boulevard West Toronto, Ontario N8V354 Canada Phone: Telex: Fax:
57635	NA.100	Mobil International Aviation and Marine Sales Inc. 3225 Gallows Road Fairfax, Virginia 22037-0001 U.S.A. Phone: 703 846 3000 Telex: 229925 Fax: 703 846 5923

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	NA.102	Fuchs Lubricants Company 17050 Lathrop Avenue Harvey, Illinois 60426 U.S.A. Phone: 708 333 8900 Telex: Fax: 708 333 3841
9V632	NA.105	Berol Corp. Berol USA Division 105 West Park Drive Suite 300 Brentwood, Tennesee 37027 U.S.A. Phone: 615 371 1199 Telex: Fax:
	NA.108	General Electric Canada Inc. Silicone Products Division 2300 Meadowvale Boulevard Mississauga, Ontario L5N 5P9 Canada Phone: 416 858 5765 Telex: Fax: 416 858 6687
	NA.118	Uniroyal Inc. B-2-5 Benson Road World Headquarters Middlebury, Connecticut 06749 U.S.A. Phone: 203 573 3416 Telex: Fax: 203 573 3591

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
OBYNS	NA.119	Turco Products Inc. Subsidiary of Elf Atochem N.A. Inc. 2700 Temple Avenue Suite B Long Beach, 00 California 90806 U.S.A. Phone: 770 939 8332 Telex: Fax: 770 496 5830
	UK.124	LaLonde LaLonde and Associates 768 Westgate Drive Unit 2 Oakville Ontario L6L 5N2 Canada Phone: 905 847 8707 Telex: Fax: 905 847 5584
01139	NA.125	General Electric Co. Silicone Sales Dept. 260 Hudson River Road Waterford, New York 12188 U.S.A. Phone: 518 237 3330 Telex: Fax:
37127	NA.127	Ardrox Ltd. P.O. Box 814 17-19 Woodburns Avenue St. Catherines, Ontario 62R 6Y3 Canada Phone: 416 688 1085 Telex: Fax: 416 684 4214
	NA.128	Deleted

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	NA.129	Courtaulds Aerospace 1608 - 4th Street Berkeley, California 94711 U.S.A. Phone: 510 526 1525 Telex: Fax: 510 525 5669
	NA.138	Rolls-Royce Inc. 11911 Freedom Drive Reston, Virginia 22090-5602 U.S.A. Phone: 703 834 1700 Telex: 6438391 Fax: 703 709 6088
	NA.140	Deleted
	NA.143	Miracle Power Products Corp Speciality Lubricants 1101 Belt Line Street Cleveland, Ohio 44109 U.S.A. Phone: 216 741 1388 Telex: Fax:
	NA.153	Miller-Stephenson Chemical Co. Inc. George Washington Highway P.O. Box 950 Danbury, Connecticut 06810 U.S.A. Phone: 203 743 4447 Telex: 643711 Fax: 203 791 8702
	NA.154	Dexter ASM Div. 1 Dexter Drive Seabrook, New Hampshire 03784 U.S.A. Phone: 603 474 5541 Telex: 6817306 Fax: 603 474 5545

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
33564	NA.164	Dexter Adhesive & Structural Materials P.O. Box 312 Pittsburg, California 94565-0031 U.S.A. Phone: 415 689 4201 Telex: Fax: 415 687 4205
	NA.167	Akzo Nobel Inc. 300 South Riverside Plaza Chicago, Illinois 606 U.S.A. Phone: 312 906 7500 Telex: Fax: 312 906 7680
	NA.168	National Starch and Chemical Corp. Permabond International 15850 West Bluemound Road Suite 30 Brookfield, Wisconsin 53005 U.S.A. Phone: 414 258 6629 Telex: Fax: 414 796 0814
06677	NA.169	Miller Thermal Inc. Alloys International Division 1901 Ellis School Road Baytown, Texas 77521 U.S.A. Phone: 713 426 5535 Telex: Fax: 713 426 7484

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	NA.171	Sherwin Incorporated 5530 Borwick Avenue South Gate, California 90280-7402 U.S.A. Phone: 310 861 6324 Telex: Fax: 310 923 8370
23373	NA.179	Ardrox - Cwc 921 Sherwood Drive P.O. Box 215 Lake Bluff, Illinois 60044-0215 U.S.A. Phone: 708 295 1660 Telex: Fax: 708 295 8748
	NA.186	D.A. Stuart Ltd 43 Upton Road Scarborough, Ontario M1L 2C1 Canada Phone: 416 757 3226 Telex: Fax: 416 757 3220
	NA.187	Lucas Aerospace Customer Service Centre One Circle West P.O. Box 120039 Stamford, Connecticut 06912 U.S.A. Phone: 203 351 8400 Telex: 4750339 Fax: 203 351 8444

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
74-167794	NA.199	Eldorado Chemical Company Inc. P.O. Box 34837 San Antonio, Texas 78265-4837 U.S.A. Phone: 210 653 2060 Telex: Fax: 210 653 0825
	NA.204	LPS Laboratories Inc. 4647 Hugh Howell Road Tucker, Georgia 30085-5052 U.S.A. Phone: 404 934 7800 Telex: Fax: 404 493 9206
	NA.214	Castrol Industrial North America Inc. 1001 West 31st Street Downers Grove, Illinois 60515 U.S.A. Phone: 708 241 4000 Telex: Fax: 708 241 4140
	NA.216	Gallard Schlesinger Ind. Inc. 584 Mineloa Avenue Carle Place, New York 11514-1731 U.S.A. Phone: 516 333 5600 Telex: 510 222 5059 Fax: 516 333 5628

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	NA.218	Dow Corning Canada Ltd 6747 Campobella Road Mississanga, Ontario L5N 2MI Canada Phone: Telex: Fax:
	NA.219	The Chatterson Company Div. of Chatterson Enterprises P.O. Box 1273, Site Code BDRCHCR Weston, Connecticut 06883-0273 U.S.A. Phone: 203 226 0003 Telex: 6974690 WSET UW Fax: 203 226 8552

(3) South American suppliers (SA.)

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	SA.1	ITW Chemicals Products Ltd. AV Jorge Alfredo Camasmie 350, Parque Industrial Ramos De Freitas, 06816-901 Embu-Sao Paulo Brazil Phone: 00 551179611555 Fax: 00 551179611091
	SA.3	Companhia Industrial Agricola Comercio e Importacoa C.I.A.C.I. Avenida San Luis 258 Conjunto 805 Coaxa, Postal 4610 San Paulo, Brazil Phone: Telex: Fax:
	SA.5	Loctite Quemica Ltd Rua Pais da Silva 643 San Paulo, Brazil Phone: Telex: Fax:
	SA.6	Esso Inter-America Inc. 396 Alhambra Circle Coral Gables, Florida 33134 U.S.A. Phone: Telex: Fax:

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	SA.7	Shell Brazil S.A. Avenida Rio Branco 109 Rio de Janeiro, Brazil Phone: Telex: Fax:
	SA.8	Dow Corning do Brazil Ltd Rua Francisco Tramontano 100-80 under 05686 San Paulo, Brazil Phone: 011 531 5199 Telex: 11 57510 Fax: 011 531 5727
	SA.10	Ardrox - Agena Quimica Ltd Rua Camboriu 112 20. 975-160 Rio De Janeiro - RJ Brazil Phone: 21 201 8995 Telex: 2132495 A8NA BR Fax: 21 241 1045

(4) Asian suppliers (As.)

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	As.1	Chemetall Asia PTE Ltd 12 Loyang Crescent Singapore 1750 Phone: 543 0122/543 0411 Telex: RS25259 Fax: 542 1312/542 1319
	As.2	United Trading & Ind. Corp. 2-32-2 Chuocho Meguro-Ku Tokyo 152, Japan Phone: 81 3 37 15 4470 Telex: Fax: 81 3 37 93 5850
	As.3	Golden Arrow Chemicals (PTE) Ltd. 154 Woodlands Industrial Park East Singapore 2775 Phone: 65 368 6811 Telex: Fax: 65 368 9219
	As.4	Pentel Co. Ltd 7-2 Koami-Cho Nihonbashi, Chuo-Ku Tokyo, Japan Phone: Telex: Fax:

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	As.5	Shachihato 1-5 Kodemma Nihonbashi Chuo-Ku Tokyo Japan Phone: Telex: Fax:
	As.6	Abudawood Trading Co. P.O. Box 6060 Jeddah, Saudi Arabia Phone: 966 2 665 6364 Telex: Fax: 966 2 665 2267
	As.7	Sale Tilney (Japan) Ltd GPO Box No. 578 Tokyo, Japan Phone: Telex: Fax:
	As.8	Rocol Far East Ltd Unit 801-5 Westin Centre 26 Hung To Road Kwun Tong Kowloon Hong Kong Phone: 00 85224135803 Fax: 00 85224137863
	As.9	Pyrene-Rai Metal Treatments Ltd Nirlon House 254B Dr. Annie Besant Road Worli, Bombay 400 025 India Phone: 22 4931878 Telex: 1171217 Fax: 22 4931878

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	As.10	Loctite (Japan) Corporation No. 6409, Motoishikawacho Midori-Ku Yokohama-shi, Japan Phone: Telex: Fax:
	As.11	Loctite (Pacific) Limited Room 310, Caroline Mansion 4 Yun Ping Road Hong Kong Phone: Telex: Fax:
	As.12	Esso Eastern Inc. 2401 South Gessner Houston, Texas 77063 U.S.A. Phone: Telex: Fax:
	As.13	Mobile Sekiyu K.K. Sankei New Building 7-2, 1-Chome, Ohtemachi Chiyoda-Ku Tokyo 100, Japan Phone: 813 244 4425 Telex: 229925 Fax: 813 244 4294
	As.14	Castrol Limited 'White House' 91 Walkeshwar Road Malabar Hill Bombay, India Phone: Telex: Fax:

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	As.15	Castrol KK Overseas Ltd Industrial Toyo An Building, 7th Floor 3-23-22, Toyo, Koto-Ku Tokyo 135, Japan Phone: 035 606 7140 Telex: Fax: 035 606 5565
	As.16	Eishin Kagaku Company Ltd 1-2-13 Higashi-Shinbashi Minato-Ku Tokyo 105, Japan Phone: 033 573 4235 Telex: Fax: 033 573 4230
	As.18	Dow Corning Asia Ltd Room 802-806, Glouster Tower The Landmark 11 Pedder Street Hong Kong Phone: Telex: Fax:
	As.19	Dow Corning Kabushika Kaisha Chemicals Product Group 15-1 Nishishimbashi 1-Chome Minato-Ku Tokyo 105, Japan Phone: 03 503 6054 Telex: Fax: 03 503 3565

(5) African suppliers (Af.)

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	Af.5	Noxal Company (South Africa) Pty, Ltd P.O. Box 85 Isando, Transvaal South Africa Phone: Telex: Fax:
	Af.6	Loctite (South Africa) Pty, Ltd 9 Yaron Avenue Lea Glen Florida TVL 1709 Republic of South Africa Phone: 27 11 674 19301 Telex: Fax: 27 11 672 5803
	Af.7	 Phone: Telex: Fax:
	Af.8	Shell South Africa Pty, Ltd Shell House 9 Riebeck Street Capetown 8001 South Africa Phone: 27 21 408 4911 Telex: 5-27401 SA Fax: 419 2864
	Af.9	Esso Africa Inc. 15-17 Suffold Street London SW17 4HS United Kingdom Phone: Telex: Fax:

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	Af.10	Castrol (South Africa) Ltd Princess of Wales Terrace Parktown, Johannesburg South Africa Phone: Telex: Fax:
F3082	Af.11	Chemserve Systems (Pty) Ltd P.O. Box 12055 Chloorkop 1624, Transvaal South Africa Phone: 11 976 2162 Telex: 746124 Fax: 11 976 1706

(6) European suppliers (Eu.)

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	Eu.2	Deleted
	Eu.17	Isaco H/F Gilsbud 7 210 Gardabaer Iceland Phone: 354 1 65 77 44 Telex: Fax: 354 1 65 69 44
	Eu.18	Anaco Kemi AB Box 13073 25013 Helsingborg Sweden Phone: 42 16 40 40 Telex: Fax: 42 16 40 41
	Eu.19	Arrow Ball 157 Rue de Verdum 5770 Hayange France Phone: 33 82 84 12 40 Telex: Fax: 33 82 84 11 10
	Eu.20	Dr Rusges GMBH Von-Der-Horstrasse 18 D-52249 Eschweiler Germany Phone: 49 2403 78711 Telex: Fax: 49 2403 787020
	Eu.21	Met-L-Chek Europa N.V. Singel 386 Amsterdam, Holland Phone: Telex: Fax:

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
B1082	Eu.28	NV Brent SA Aerospace Systems Group Kaleweg 24 - 26 B-9030 Mariakerke (Gent) Belgium Phone: 091 266386 Telex: Fax: 091 266593
	Eu.29	Rhone - Poulene 22 Avenue Montaigne Paris 8e France Phone: Telex: Fax:
	Eu.30	Star Malling Og. Lakkfabrikk, A/S P.O. Box 593 3412 Lier Norway Phone: 47 384 1500 Telex: 47 19 110 Fax: 47 384 17 70
	Eu.31	Degussa Metal & Abteilur 3 Wissfrauenstrasse Frankfurt on Main West Germany Phone: Telex: Fax:

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	Eu.33	Turco-France S.A. 3 et 5 Impasse du Quai de 1'Industrie 91200 Athis-Mons (Essonne) France Phone: 33 1 6048 1636 Telex: 601722 Fax: 33 1 6048 0289
	Eu.34	Turco-chemie Gmbh Postfach 32 33 Wandsbeker Stieg 23 2000 Hamburg 76 Germany Phone: 40 2516 080 Telex: 213820 Fax: 40 2516 0580
	Eu.35	Turco-Italiana s.p.a. Via Artigianale 29 25010 Montirone (Brescia) Italy Phone: 030 267 443 Telex: 305352 turco 1 Fax: 030 267 7137
	Eu.36	Esso Europe Inc. 50 Stratton Street London W1X 6AU United Kingdom Phone: Telex: Fax:

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	Eu.38	Aero Consultants Ltd P.O. Box 2117 8600 Dubendorf Zurich, Switzerland Phone: Telex: Fax:
	Eu.39	Hearchrome SA. 176 Rue D'estienne - D'orves Colombes 92700 France Phone: Telex: Fax:
	Eu.42	Dow Corning Europe 154 Chausse de la Hulpe 1170 Brussels Belgium Phone: Telex: Fax:
	Eu.43	Ivar Rivanaes A/S Damsqardsvei 35 N-5037 Solheimsviken Bergen Norway Phone: 05 290230 Telex: 42289 Fax: 05 296325

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	Eu.47	Deleted

(7) Australian suppliers (Aus.)

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	Aus.1	Surechem Industries Pty Ltd 43 Forge Street Blacktown, N.S.W. 2148 Australia Phone: 2 621 5933 Telex: Fax: 2 621 7638
	Aus.2	Loctite (Australia) Pty Ltd 3 Endeavour Road P.O. Box 2622 Carinbah, N.S.W. 2229 Taren Point 2229 Australia Phone: 61 2 525 8366 Telex: Fax: 61 2 525 5643
	Aus.3	Esso Australia Ltd Esso House 127 Kent Street Sydney, N.S.W. Australia Phone: Telex: Fax:
	Aus.4	Mobil Oil Australia Ltd 417 Saint Kilda Road Melbourne, Victoria Australia 3004 Phone: 613 617 3111 Telex: AA30546 Fax:

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	Aus.5	Castrol Australia Pty Ltd McCredie Road Guildford, N.S.W. Australia Phone: Telex: Fax:
	Aus.6	Shell Company of Australia Ltd. Shell House 1 Spring Street P.O. Box 872K Melbourne 3001 Australia Phone: 03 666 5008 Telex: 134867 Fax: 03 666 5444
	Aus.7	Ajax Chemicals 9 Short Street Auburn, N.S.W. 2144 Australia Phone: 02 648 5222 Telex: Fax: 02 647 1794
	Aus.8	Dow Corning Australia Pty Ltd 4 Ray Road Epping, N.S.W. 2121 Australia Phone: 61 2 868 9111 Telex: Fax: 61 2 868 1507

FEDERAL CODE	SUPPLIERS CODE	SUPPLIERS ADDRESS
	Aus.10	National Starch and Chemical (Pty) Ltd Permabond Division Locked Bag 17 14 Tullamarine Park Road Victoria 3043 Australia Phone: 61 3 338 7722 Telex: Fax: 61 3 330 2346
	Aus.11	Ciba-Geigy Australia Ltd ANC 802933717 Melbourne 295 Settlement Road Thomas Town, Victoria Australia Phone: Telex: Fax:
	Aus.14	ITW Polymers & Fluids Pty Ltd 100 Hassall Street Private Mail Bag 35 Wetherill Park NSW 2164 Australia Phone: 00612 97578880 Fax: 00612 97573855

EXPLANATION OF GEOMETRIC TOLERANCING - MAINTENANCE PRACTICES

TASK 70-41-02-912-001-R00

1. Explanation of Geometric Tolerancing

A. Procedure

S 912-002-R00

(1) The information given on the Repair illustrations includes recommended geometric tolerances by the International Standards Organization (I.S.O.).

S 912-003-R00

(2) Geometric symbols show the relationship between datum (reference) surfaces and the shape. This prevents language problems.

S 912-004-R00

(3) A component has two basic types of tolerance, SIZE and GEOMETRY.

S 912-005-R00

(4) Geometric tolerances control FORM and POSITION. Each symbol shows a property of a part. These symbols are an alternate to a written instruction.

S 912-006-R00

(5) The geometric tolerances are in a box or frame and give the symbols, tolerances, datum surfaces, and basic dimensions.

S 912-007-R00

(6) The illustrations that follow tell about each symbol. On applicable drawings, only the necessary symbols show.

S 912-008-R00

(7) Some illustrations include instructions written in italics. The instructions refer only to the adjacent symbol and not to other symbols on the illustration.

DEFINITIONS

1. Geometric tolerance

Tolerances which control FORM and POSITION.

2. Datum

A surface, axis, plane, etc., real or imaginary to which the TRUE POSITION of a feature has relation or is measured from.

3. Basic

Dimensions which define the form of a feature, and/or the theoretically true position of a feature or features.

4. Maximum metal condition (M)

When the volume of material contained by the feature is at its maximum, as governed by its size dimensions, it is said to be at the maximum metal condition, i.e., The largest shaft, pin, tab, etc. The smallest hole, slot, groove, etc.

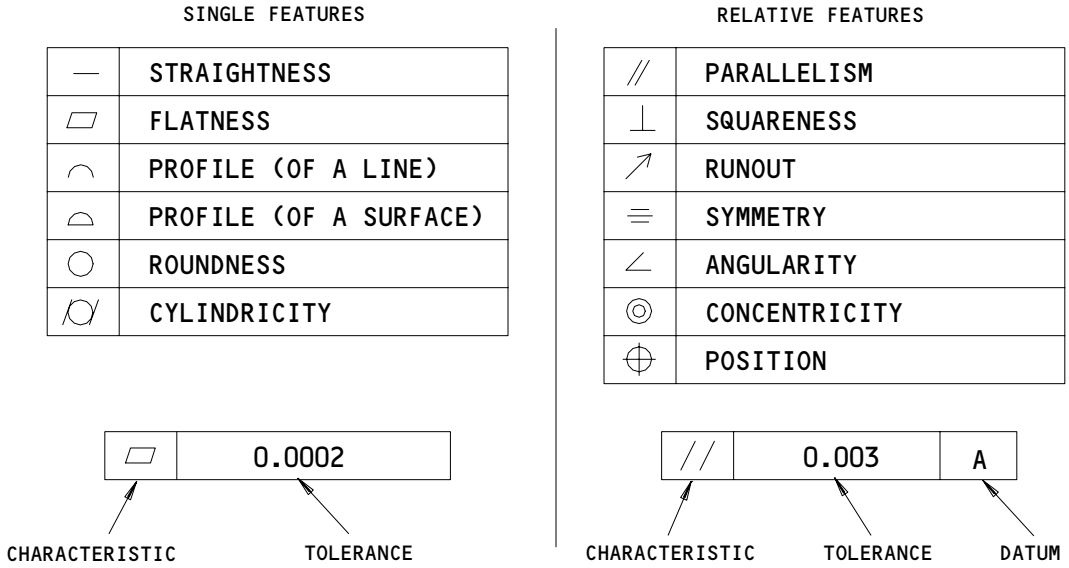
5. Engineering drawing

A document which defines, controls, and identifies a finished manufactured component. (It is not necessarily a working drawing, but MUST be used for FINAL inspection.)

23376

Definitions
Figure 201

SYMBOL CHART (GEOMETRIC CHARACTERISTICS)



GREEK LETTER ϕ (PHI) IS ABBREVIATION FOR DIAMETER.

The SYMBOLS, TOLERANCES and DATUMS are called out in a frame which is connected to the feature requiring geometric control. The dimensions positioning surfaces or features requiring geometrical control have BASIC dimensions and these are identified again by a frame around them.

Of the 13 geometric symbols, six do not require a datum as they only control FORM and can exist alone, as shown on the example.

The remaining seven are relative features and require a datum as they control POSITION - see right-hand example.

In this system ALL tolerance zones are total in magnitude, and are either a circle, cylinder or sphere or the space between two planes, lines or surfaces, or the space between two concentric cylinders etc.

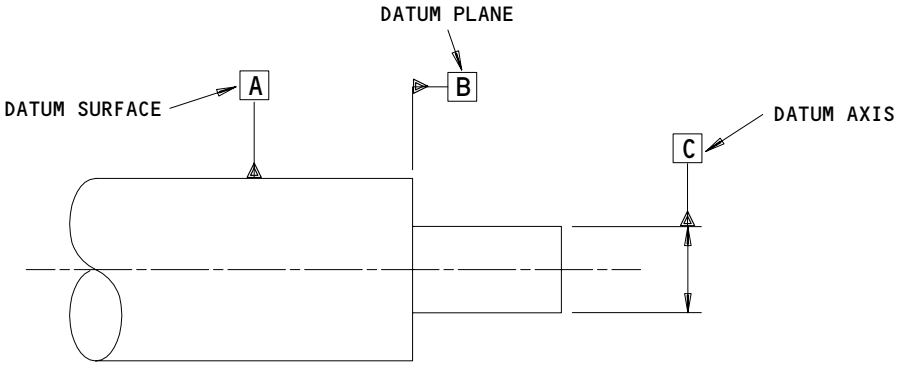
When the tolerance zone is circular in shape the ϕ sign will be added in front of the tolerance.

23377

Symbol Chart
Figure 202

DATUM IDENTIFICATION

DATUM IS IDENTIFIED BY THE LEADER LINE TERMINATING IN A SOLID TRIANGLE



Datum letter A, B etc., used as datums in the tolerance frame, are shown on the body of the drawing in a frame. The feature which is datum is identified by a leader line terminating in a solid triangle.

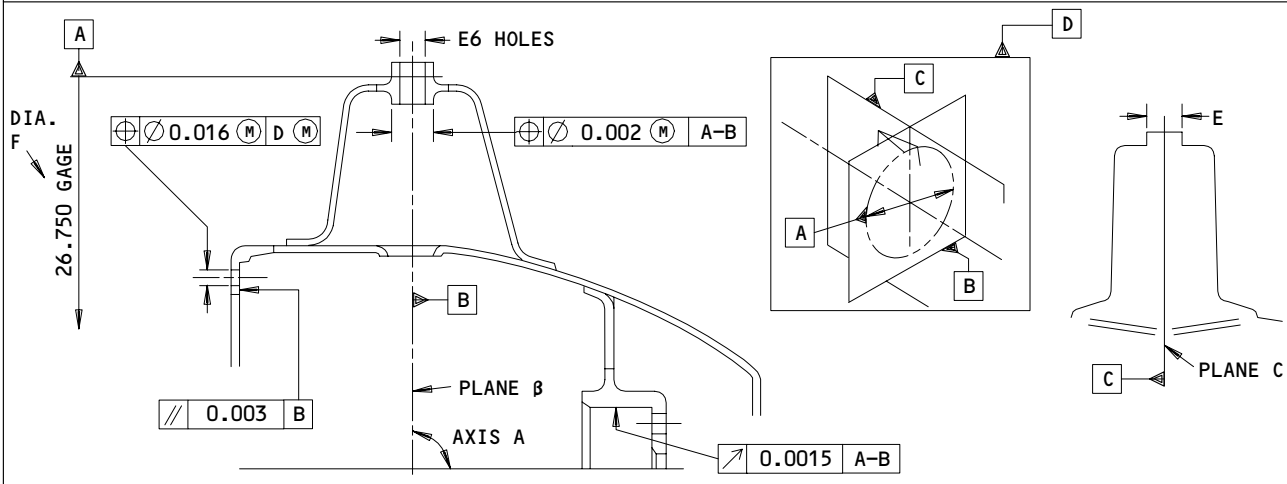
When an axis or plane is required as datum, as opposed to a surface, the leader line and triangle are opposite and in line with a dimension line across the part. The dimension line may or may not carry the size dimension.

It is important to appreciate that datums on drawings are derived from Design features i.e., bearing locations, spigots, dowel holes, joint faces, etc. The drawings specify what the engine will accept, but if the drawing datums are not practical for inspection, then other arrangements must be made BY MANUFACTURING providing the design requirements are not impaired.

23378

Datum Identification
Figure 203

DATUMS (THEORETICAL)



AXIS A ESTABLISHED BY AXIS OF DIAMETERS E AT GAGE DIA. F. PLANE B ESTABLISHED BY AXIS DIAMETERS E, SQUARE TO AXIS A. PLANE C ESTABLISHED BY AXIS A AND AXIS DIA. E. AXIS A, PLANES B & C ARE DATUM FOR ALL FEATURES UNLESS OTHERWISE SPECIFIED.

The DESIGN DATUM is derived from an actual feature of the part, such as the surface of a facing or diameter. These features may then be used to locate the part during the inspection process.

There are a number of occasions when THEORETICAL DATUMS must be specifed, but although theoretical in concept they are derived from actual features, and are made tangible by the inspection fixture.

The diagram shows such an example.

Datum A is an AXIS found by passing a series of pins through an inspection fixture and locating the casing by the 6 holes in the spoke bosses.

Datum B is a PLANE found by the same pin/fixture method.

Datum C is a PLANE found on the fixture by the axis derived at the gage diameter of the pins, and timed by the pin at the top center.

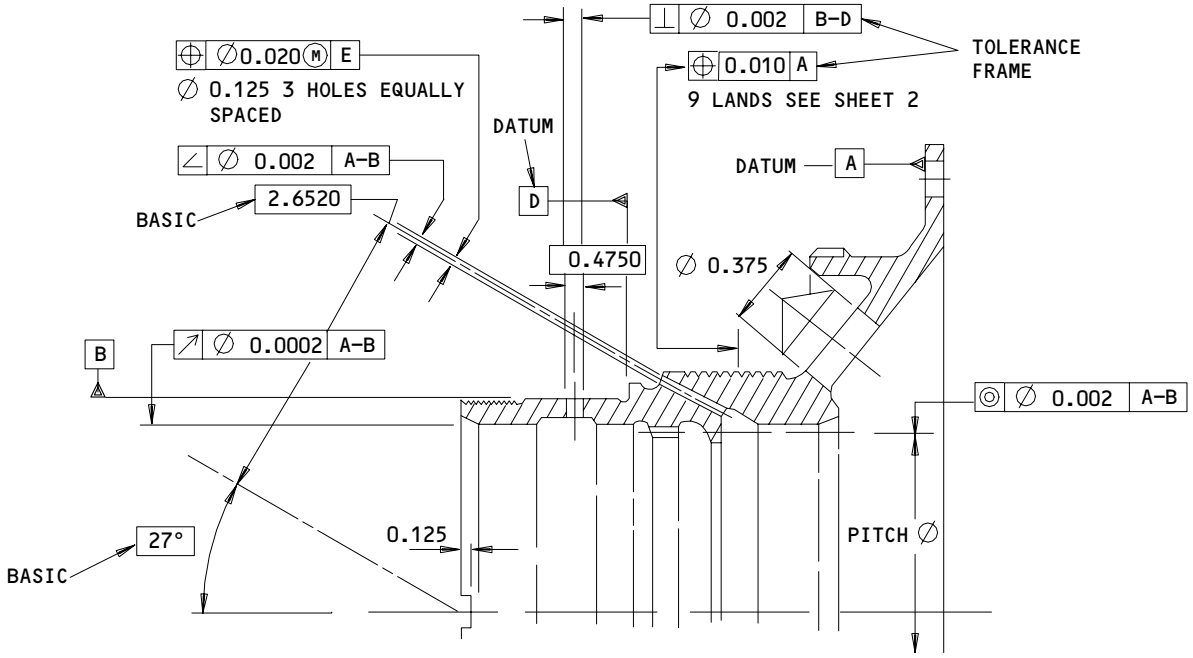
The 3 geometric requirements shown on the diagram may be considered as follows:

1. PARALLELISM of the flange face within 0.003 in., in relation to the fixture (via the pins which have established plane B).
2. RUNOUT of the inner flange surface of 0.0015 in. (clock indicator reading) in relation to an axis of rotation about the gage diameter A, which is square to the plane B, on the fixture (Zero swash on plane B).
3. POSITION of the holes shown in the flange is related to all 3 datums, and the "3 Datum Concept" is used; refer to figure 21.
4. POSITION of the holes in the spoke bosses are relative to the theoretical datums A and B.

23379

Datums (Theoretical)
Figure 204

SAMPLE DRAWING

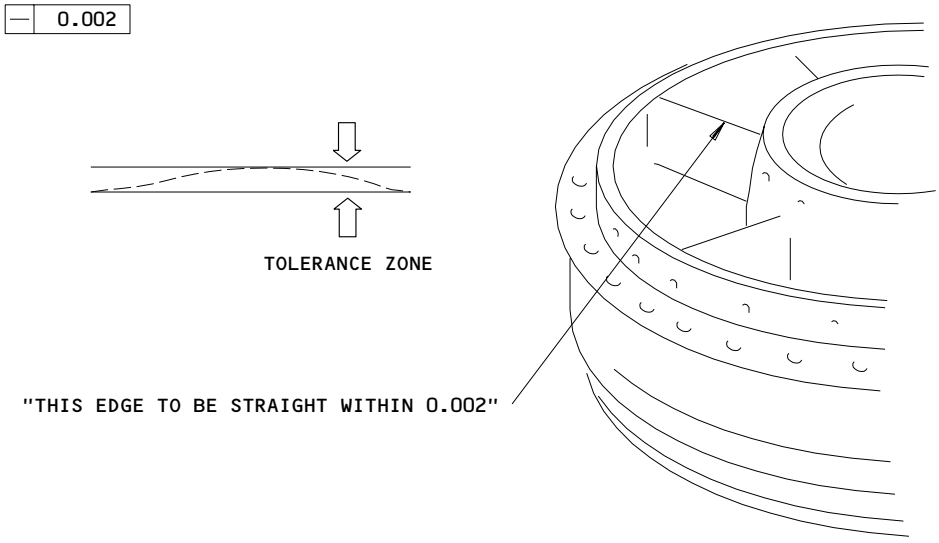


This illustration shows part of a drawing using the geometric tolerancing system, with tolerance frames, datums and basic dimensions contained in frames.

23380

Sample Drawing
Figure 205

STRAIGHTNESS

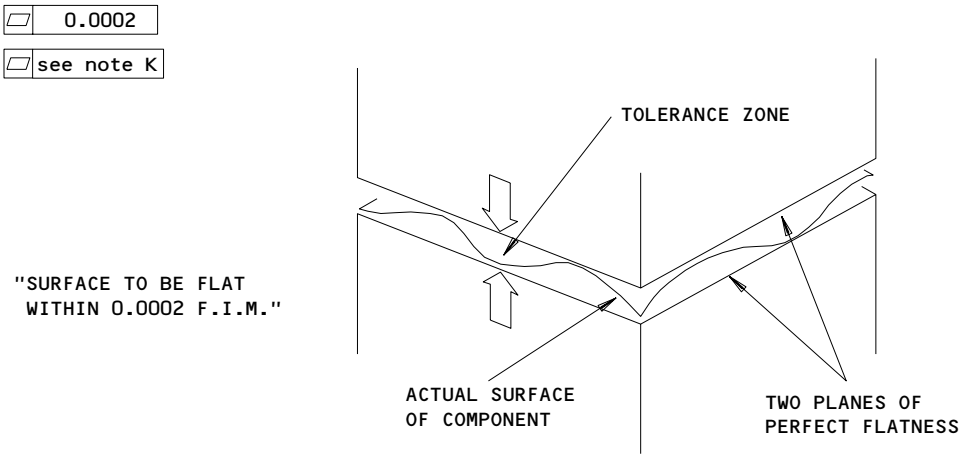


This tolerance frame means that the edge of the feature must lie WITHIN A TOLERANCE ZONE CONTAINED BY TWO STRAIGHT LINES 0.002 IN. APART.

23381

Straightness
Figure 206

FLATNESS



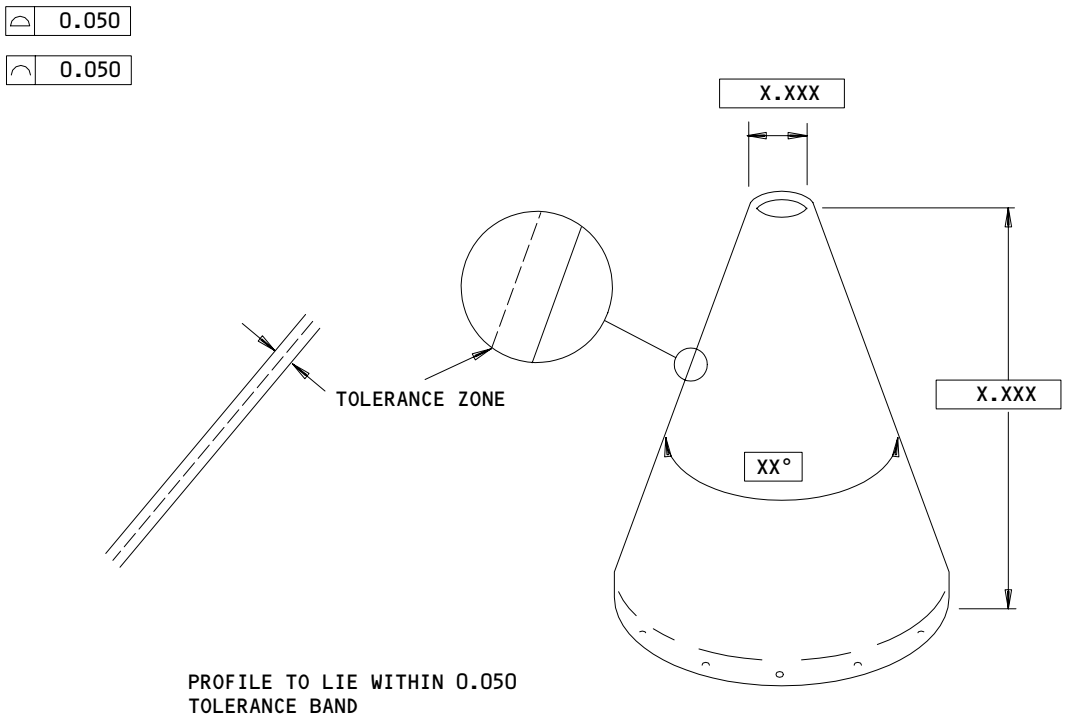
This diagram shows that the actual surface of the feature must lie WITHIN TWO PERFECTLY FLAT AND PARALLEL PLANES THE TOLERANCE ZONE APART. However, when a flatness of high precision is required, the tolerance magnitude portion of the frame will carry a reference to a note, e.g. "See Note 'K'".

Note K would spell out in words "blue bed checking with % contact" or "light band" method of controlling flatness.

23382

Flatness
Figure 207

PROFILE



This diagram shows two symbols. The top one for profiles of features which have surface area, the lower one for lines such as stations through sheet metal parts, etc.

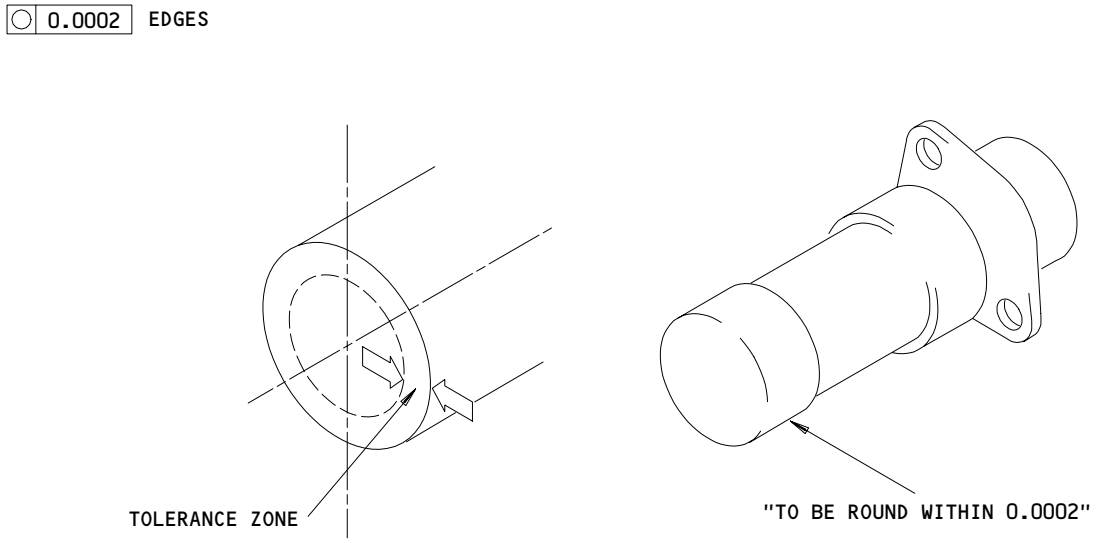
The interpretation is the same for each symbol, and in the example shown the surface of the feature must lie WITHIN A TOLERANCE ZONE 0.050 IN. WIDE WHICH IS CENTERED ON THE BASIC FORM.

If it is a requirement that the tolerance zone shall be in a plus or minus direction, then a separate view will be shown to indicate this, otherwise the total tolerance will be equally spaced about the basic form. Profile tolerances may control size as well as form.

23383

Profile
Figure 208

ROUNDNESS (CIRCULARITY)



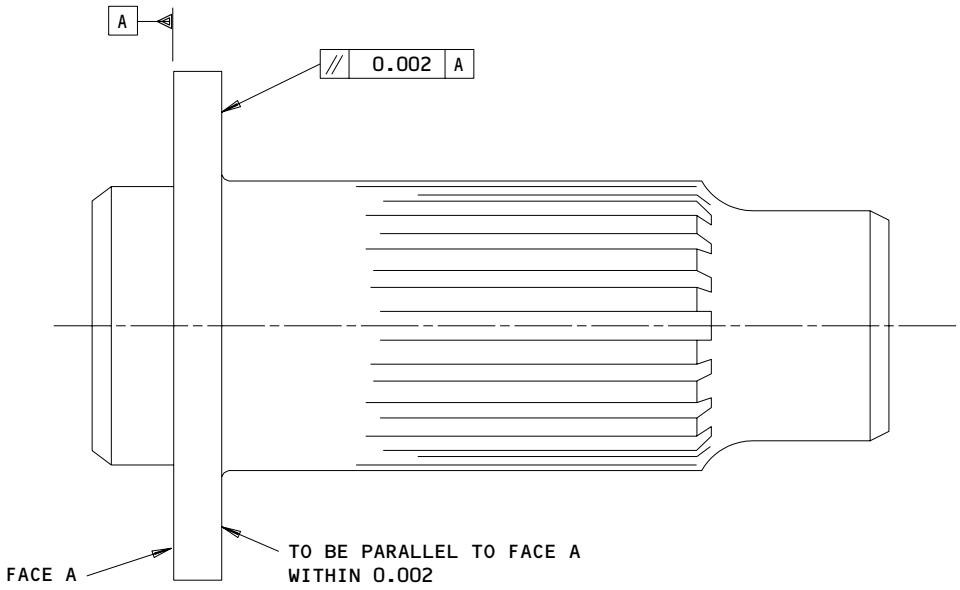
This diagram shows the symbol for roundness (CIRCULARITY) as used to control lines or edges.

The surface or edge of the feature being controlled must lie within a TOLERANCE ZONE WHICH IS AN ANNULUS FORMED BY TWO PERFECTLY ROUND AND CONCENTRIC CIRCLES WHICH HAVE A RADIAL SEPARATION OF THE TOLERANCE SPECIFIED.

23384

Roundness (Circularity)
Figure 209

PARALLELISM



This is the first of the RELATIVE features and the frame now has 3 parts, the 3rd one being for the datum letter.

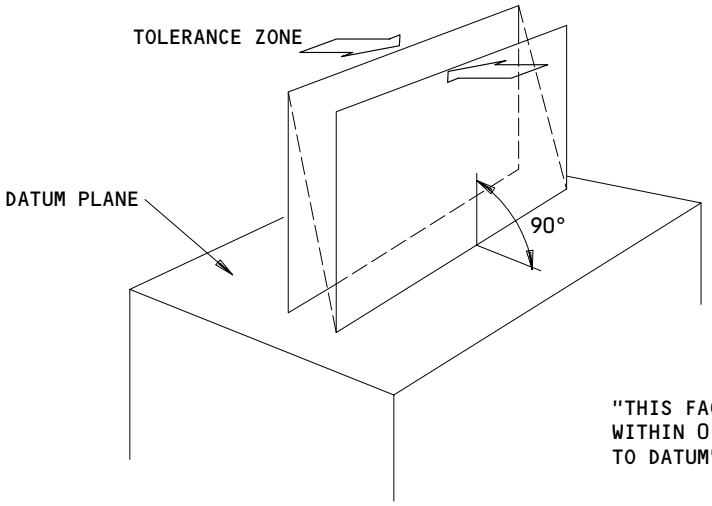
The meaning here is that the feature must lie within a TOLERANCE ZONE OF TWO PLANES PERFECTLY PARALLEL TO THE DATUM A, AND 0.002 IN. APART.

The datum surface is indicated by the letter A in a frame and the leader line terminating in the Solid Black triangle.

23385

Parallelism
Figure 210

SQUARENESS



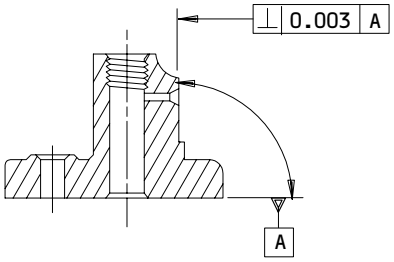
This diagram shows that the actual surface being controlled MUST LIE WITHIN TWO PLANES 0.005 IN. APART, WHICH ARE OF PERFECT SQUARENESS IN RELATION to the datum face.

23386

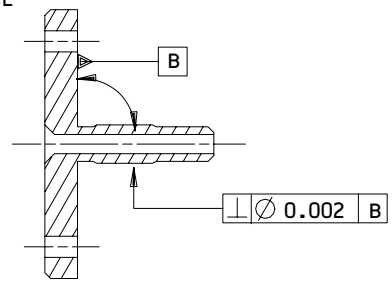
Squareness
Figure 211

SQUARENESS (PERPENDICULARITY)

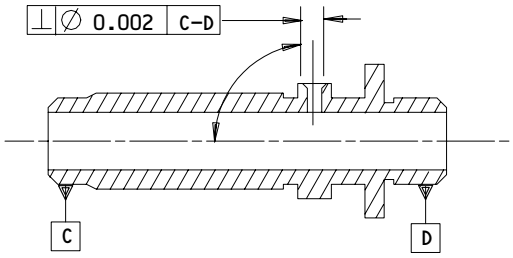
1. SQUARENESS OF A FACE IN RELATION TO A DATUM FACE



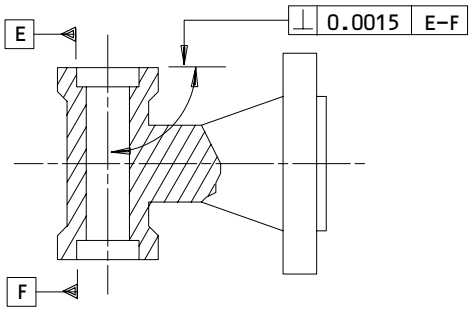
2. SQUARENESS OF AN AXIS IN RELATION TO A DATUM FACE



3. SQUARENESS OF AN AXIS IN RELATION TO A DATUM AXIS



4. SQUARENESS OF A FACE IN RELATION TO A DATUM AXIS



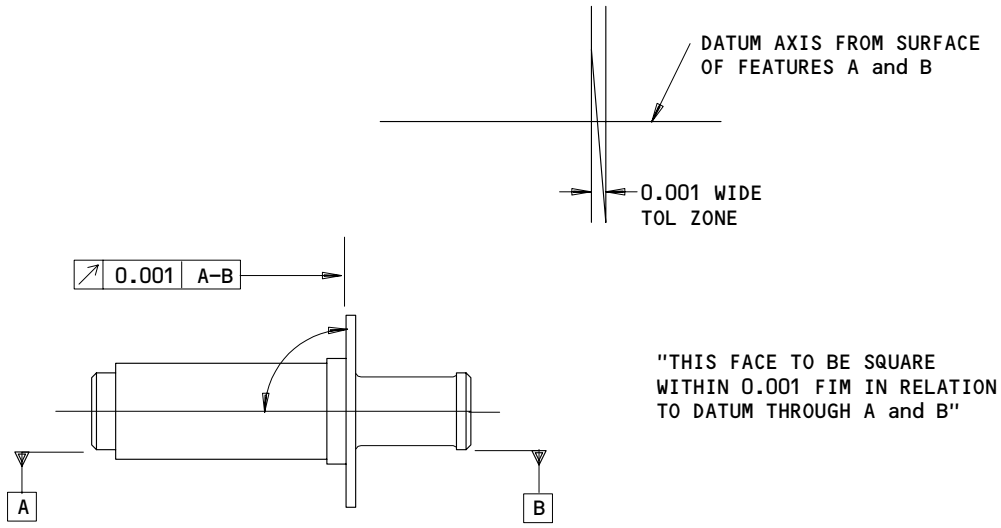
With squareness there are different types of features which require a squareness control:

1. Squareness of a face in relation to a datum face.
2. Squareness of an axis in relation to a datum face.
3. Squareness of an axis in relation to a datum axis.
4. Squareness of a face in relation to a datum axis.

23387

Squareness (Perrpendicularity)
Figure 212

RUNOUT (FACE SQUARENESS CONTROL)



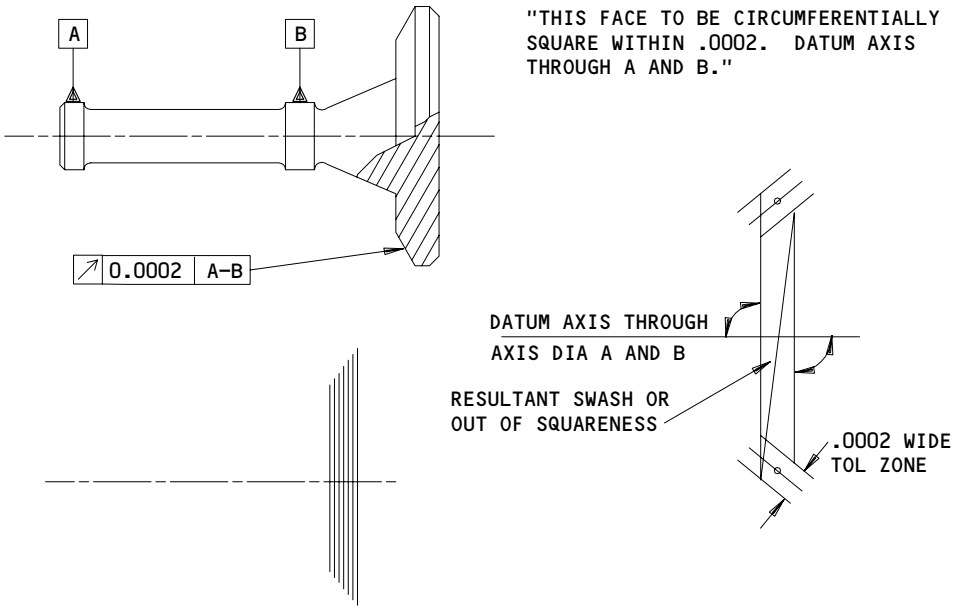
There are many instances where it is a functional requirement to control the squareness of faces on shafts such as the one indicated. The whole surface of the face must be CONTAINED WITHIN A TOLERANCE ZONE, 0.001 IN. WIDE, WHICH IS OF PERFECT SQUARENESS TO THE DATUM.

The symbol - RUNOUT takes into account swash, flatness, or perpendicularity, provided the sum of these does not exceed the specified tolerance. RUN OUT symbol will be used, on parts which can be rotated about the datum feature during inspection, when a combination of these defects can be accepted during one complete revolution without axial movement.

23388

Runout (Face Squareness)
Figure 213

RUNOUT (CIRCUMFERENTIAL SQUARENESS)



For parts with CURVED or CONED faces that require a circumferential squareness control, the runout symbol is used.

This is virtually controlling the squareness of an infinite number of flat circular planes (which make up the coned or curved surface as indicated in the lower left corner).

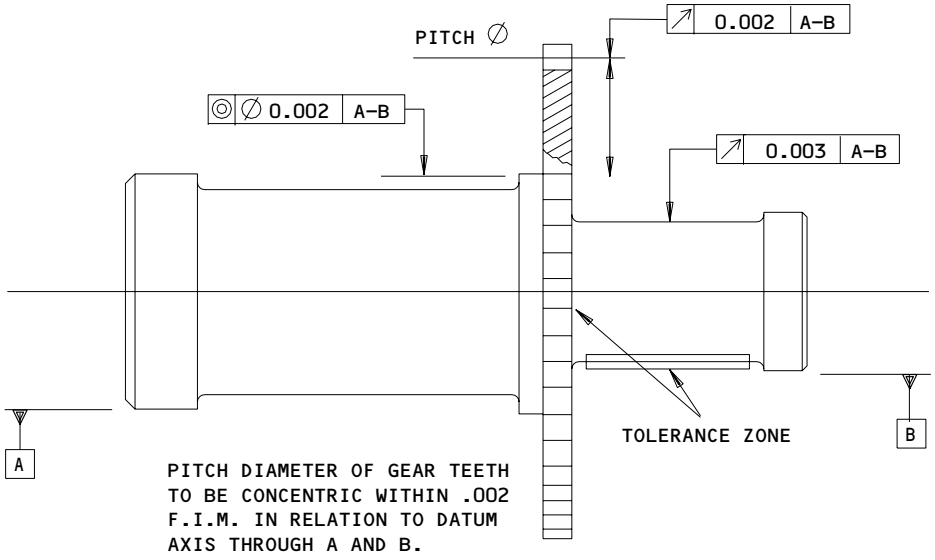
Each individual imaginary plane may have SWASH, be out of SQUARE, or ECCENTRIC, or out of ROUND, or a combination of all or any two of these defects. In practice it is not usually necessary to separate these defects, hence the use of the combined tolerance.

The diagram shows an enlarged view of the deviation of one of the selected points.

23389

Runout (Circumferential Squareness)
Figure 214

CONCENTRICITY



This diagram shows the symbol for concentriciy as two concentric circles, THE TOLERANCE ZONE IS A ∅ 0.002 IN. CYLINDER CENTERED ON THE DATUM AXIS A-B, and the axis of the feature being controlled must lie within this tolerance zone.

NOTE: The datum axis of rotation is derived from the "Surface" of the diameters A AND B. Irregularities in the form of the feature often make it difficult to establish the axis of the feature. For instance, a nominally cylindrical surface may be bowed or out of round in addition to being offset from the datum; in such cases finding the axis of the features would prove difficult and time consuming.

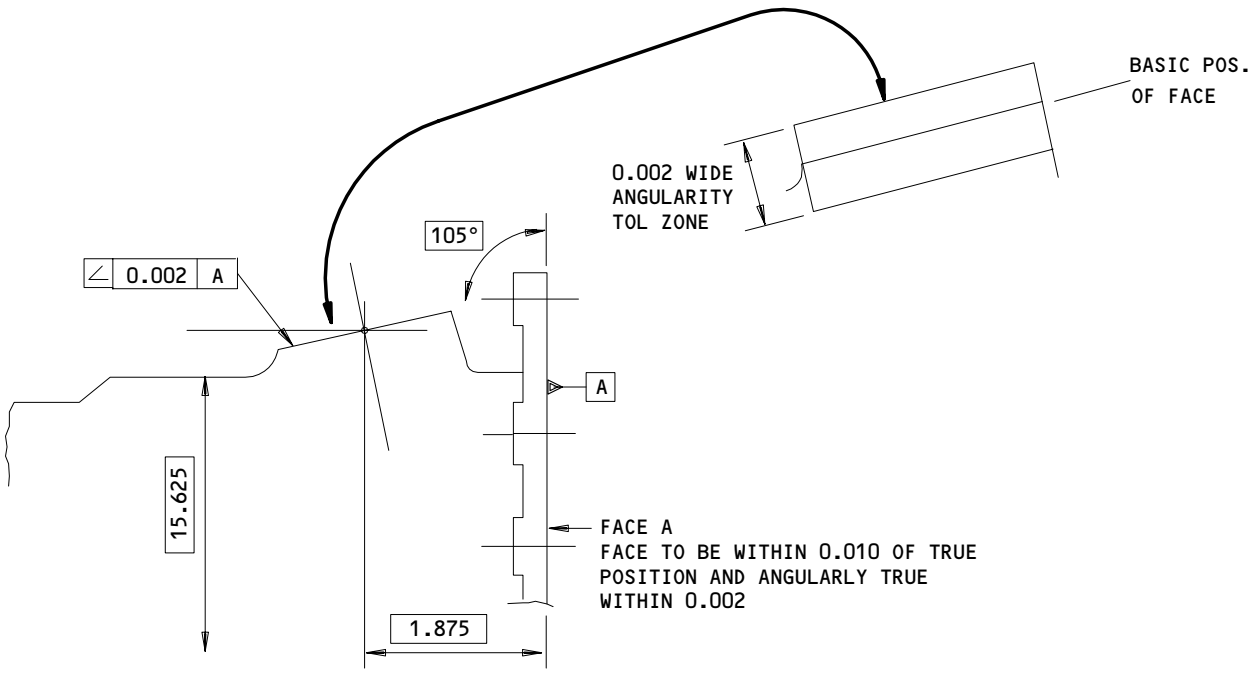
Therefore, unless there is a definite need for the control of axis, it is recommended that the control be specified as runout.

NOTE: This diagram also shows the difference between CONCENTRICITY (control of axis) and RUNOUT (Control of Surface).

23390

Concentricity
Figure 215

ANGULARITY



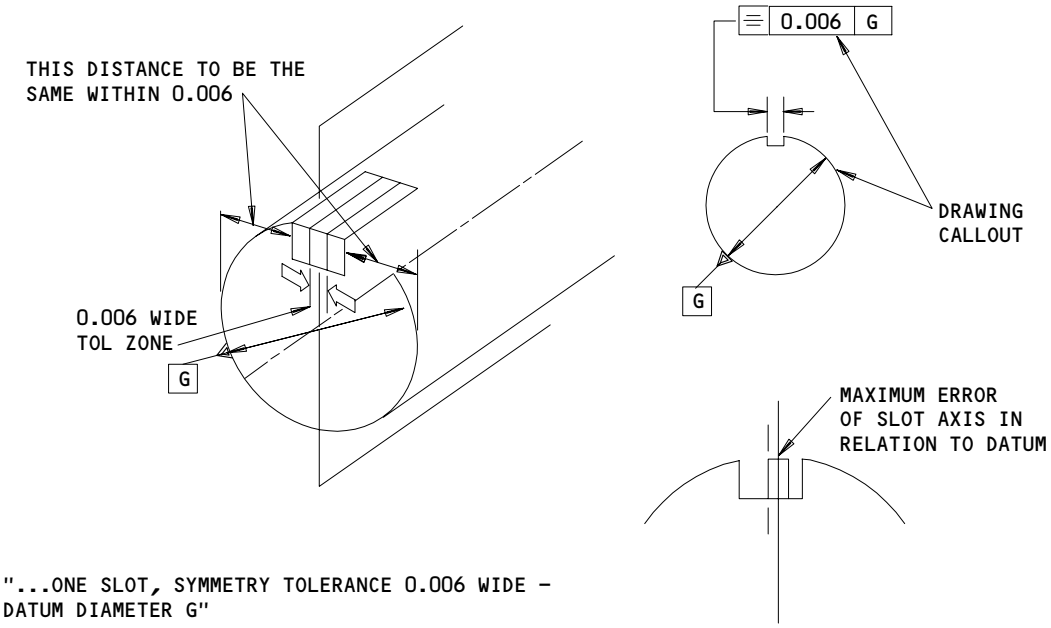
This symbol means that THE ANGULAR TRUTH OF THE FEATURE MUST BE CONTAINED WITHIN TWO PLANES, 0.002 IN. APART, AT THE ABSOLUTE TRUE BASIC ANGLE IN RELATION TO THE DATUM.

If coupled with a coarse position tolerance, the angularity tolerance zone must be contained within the position tolerance zone. This is shown in the right-hand corner of the diagram.

23391

Angularity
Figure 216

SYMMETRY



It may be necessary to control the symmetry of a feature in relation to some datum.

The diagram shows the symmetry symbol, the total tolerance zone and the datum, the example being a slot in a shaft. The meaning of the I.S.O. frame is the same as the note - see bottom left. THE AXIS OF THE SLOT MUST BE CONTAINED WITHIN A 0.006 IN. WIDE TOLERANCE ZONE CENTERED ON THE DATUM PLANE THROUGH THE AXIS OF THE SHAFT.

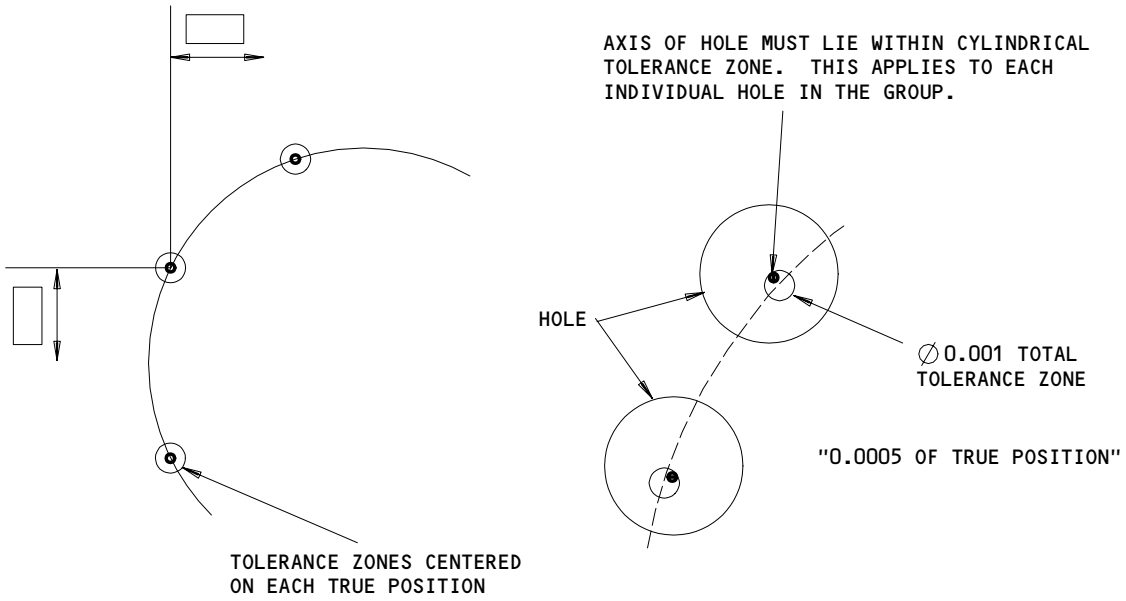
In other words the distance either side of the slot as shown must be the same value within 0.006 in.

NOTE: SYMMETRY although acceptable in certain conditions, has limited application, POSITION being a more practical and economical way of controlling slots by using the maximum material principle.

23392

Symmetry
Figure 217

POSITION – FUNDAMENTALS OF HOLE TOLERANCING

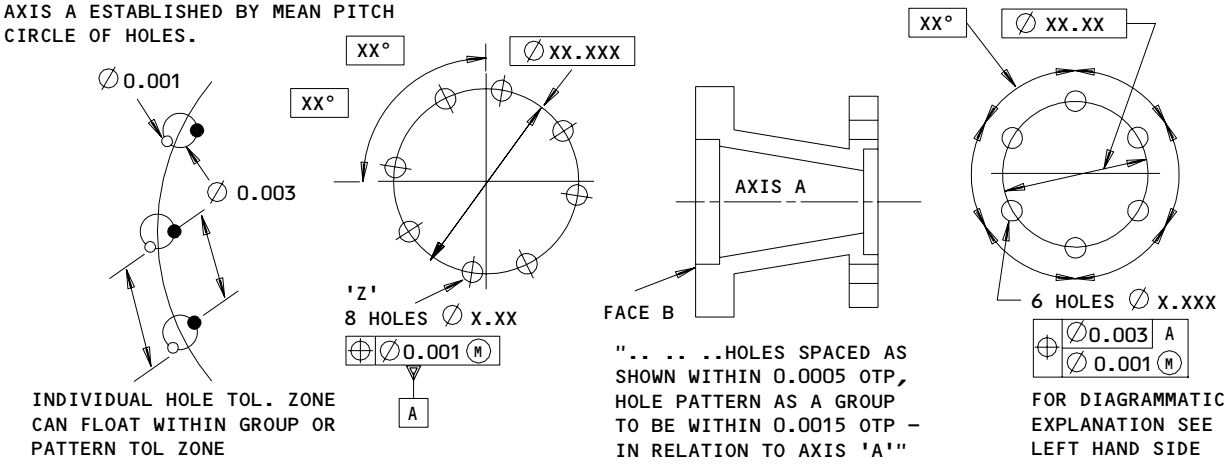


This example shows a number of holes having a common pitch circle. Each hole has its own TRUE POSITION fixed by the BASIC dimensions, with the axis of the hole positioned within 0.0005 in. of true position. The geometric tolerancing system is such that ALL tolerances are total in shape and magnitude. Thus the tolerance is shown as 0.001 in. diameter.

23399

Position – Fundamentals of Hole Tolerancing
Figure 218

POSITION – INDIVIDUAL, PLUS GROUP OR PATTERN TOLERANCE



(a) A requirement, particularly on engines where the casings are used as the engine backbone, is to use the holes in the flanges as centralizing features. This is necessary to ensure that main bearing journals and shafts and seals are correctly aligned, and running concentrically with correct clearances.

The I.S.O. system has been adapted to call out the holes as a datum by the letter A and leader line etc., connected to the tolerance frame for the holes in question. (Bottom left of diagram).

The word meaning is that., THE DATUM A IS THE AXIS OF THE MEAN CIRCLE OF THE HOLES.

(b) It is often a requirement to have TWO tolerances for the same feature, that is the holes in the right-hand flange will require.

1. Tolerances of position for each INDIVIDUAL hole on the pitch circle.
2. Tolerance of position for the PATTERN as a whole, in relation to some datum.

The two requirements are specified by the frame system. At the bottom right, the frame has been split to call up these two requirements.

NOTE: There is no significance in which way round the information is stated in the large frame.

(c) Read the information in the frame and compare it with the word callout, also noting the letter Ⓜ which will be discussed fully, later in the text.

1. The lower part of the frame – POSITION 0.001 IN. DIA. TOLERANCE ZONE FOR EACH OF THE 6 HOLES – there is, in this case, no datum, as the whole group will have relation to a datum.

   This compares with the first portion of the note, "_____holes _____ within 0.0005 in. of true position."

   Note the I.S.O. TOTAL tolerance zone of ∅ 0.001 in., and that the word true position 0.0005 in. is HALF the total tolerance zone.

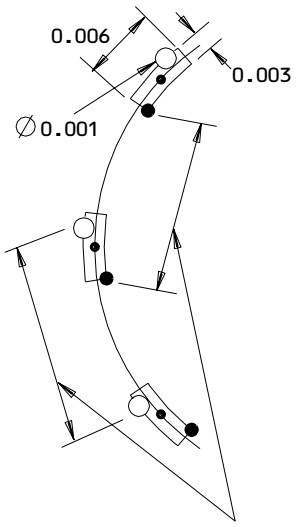
2. The upper part of the frame – POSITION 0.003 IN. DIA. TOLERANCE ZONE DATUM FEATURE A. This must be the group or pattern tolerance of the 6 holes in relation to the datum A. 'A' being the mean pitch circle of the hole on the other flange as previously discussed. This compares with the second portion of the note "hole pattern as a group within 0.0015 in. to axis 'A'."

   NOTE the I.S.O. TOTAL tolerance zone of ∅ 0.003 in. and that the word true position of 0.0015 in. is HALF the total tolerance zone.

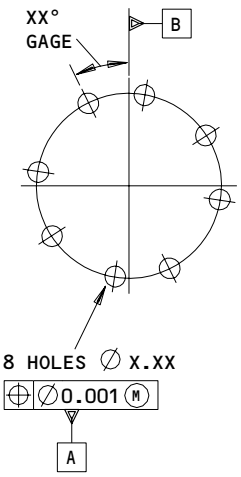
23400

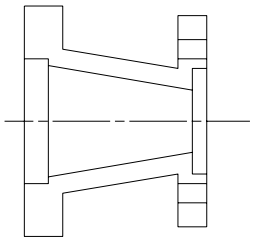
Position – Individual, Plus Group or Pattern Tolerance
Figure 219

POSITION – INDIVIDUAL, PLUS GROUP OR PATTERN, AND CIRCUMFERENTIAL TOLERANCE

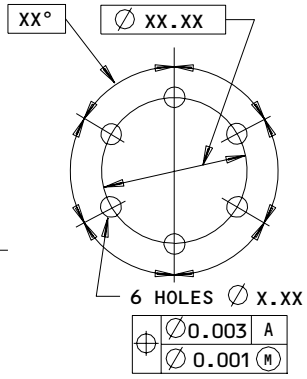


INDIVIDUAL HOLE TOL. ZONE CAN FLOAT WITHIN GROUP OR PATTERN TOL ZONE





6 HOLES ∅ .XXX WITHIN 0.0005 OF TRUE POSITION, HOLE PATTERN AS A GROUP TO BE WITHIN 0.0015 OTP IN RELATION TO AXIS A AND WITHIN 0.003 OTP IN RELATION TO PLANE B.



HOLE PATTERN MAY VARY CIRCUMFERENTIALLY 0.006 TOTAL–DATUM B

(INDIVIDUAL PLUS GROUP OR PATTERN, AND CIRCUMFERENTIAL TOLERANCE)

There are occasions when a third tolerance of position for the same feature will be necessary, as shown on this slide:

1. Position for each individual hole.
2. Position for the group or pattern in relation to an axis datum.
3. Position for the group or pattern in relation to a plane datum.

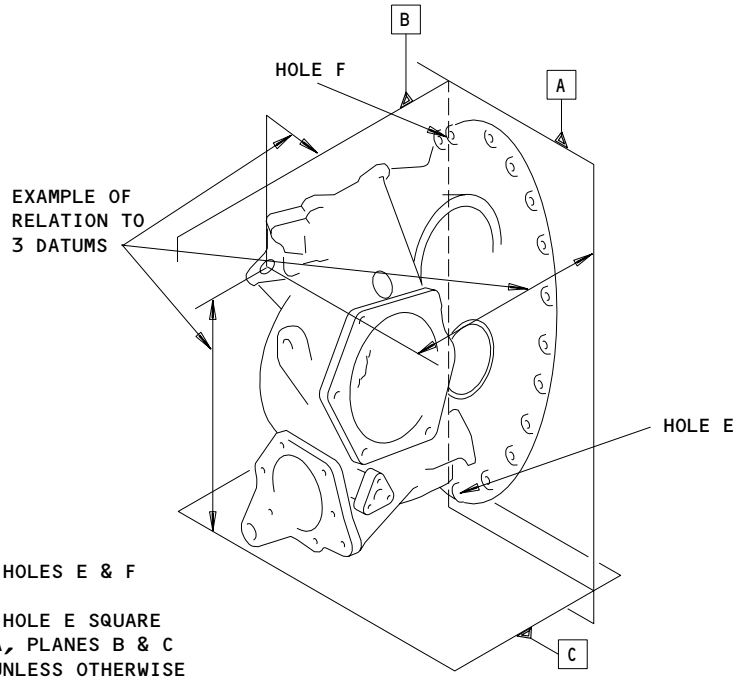
Items (1) and (2) are as the previous diagram, but item (3) will be controlled by a note as shown. This would generate a tolerance zone of 0.003 in. x 0.003 in. total for the group as shown on the left-hand side, but obviously each hole must firstly obey the individual hole tolerance zone.

The diagrammatic view indicates the tolerance magnitude in relation to the axis and a coarser magnitude in relation to the timing plane, with the overriding fine tolerance for individual hole position.

23401

Position – Individual, Plus Group or Pattern
and Circumferential Tolerance
Figure 220

3 DATUM CONCEPT



PLANE B ESTABLISHED BY AXIS HOLES E & F SQUARE TO FACE A.
PLANE C ESTABLISHED BY AXIS HOLE E SQUARE TO FACE A & PLANE B. FACE A, PLANES B & C ARE DATUM FOR ALL FEATURES UNLESS OTHERWISE STATED.

It is a requirement on certain engine components that the true position of the features require to be measured three-dimensionally, that is to say:

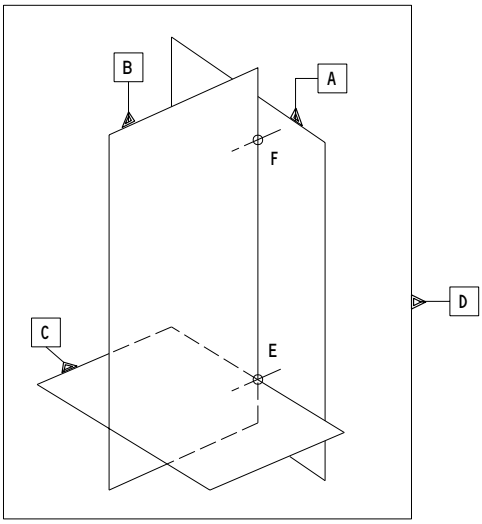
1. axially along the part from the face,
2. in a direction from an axis or plane,
3. angularly in relation to some feature.

It follows that to inspect the part and also to manufacture it, the drawing reader must always consider the part when it is placed in a particular attitude. This position is invariably the "as in engine situ." The previous system of controlling this was by means of quite complex notes as shown on the next diagram. These suffer in translation and a simpler solution is required.

23402

Three Datum Concept
Figure 221

DATUM CONCEPT



COLLECTIVE DATUM OF
3 DATUM CONCEPT

The various salient features are shown pictorially in the attitude required, and enclosed in a frame. This frame is given a letter for use as a datum.

When letter [D] is used elsewhere on the drawing as a datum in one of the tolerance frames, the feature must be considered with the part orientated as shown in this 3-datum concept.

A, B and C can still be used as separate datums as required.

23403

Datum Concept
Figure 222

MAXIMUM METAL CONDITION

1 ⌖ ∅0.004 Ⓜ | A

a) THIS TOLERANCE ONLY APPLIES AT MAXIMUM METAL CONDITION, WHEN Ⓜ IS SHOWN

b) THIS TOLERANCE CAN BE INCREASED BY THE DIAMETRAL INCREASE IN SIZE OF FEATURE WHEN Ⓜ IS SHOWN

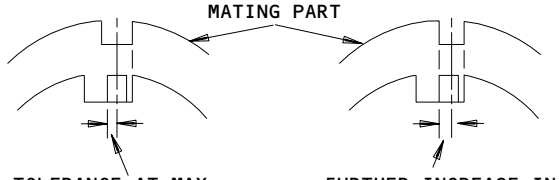
2 ⌖ ∅0.004 Ⓜ | A Ⓜ

WHEN Ⓜ IS NOT SHOWN THIS TOLERANCE APPLIES REGARDLESS OF FEATURE SIZE

3 ⌖ ∅0.004 Ⓜ | A Ⓜ

MAXIMUM METAL CONDITION APPLIED TO FEATURE AND DATUM

Ⓜ EXAMPLE FOR POSITION OF A SLOT



The engineering drawings are dimensioned and toleranced to control the parts at the worst conditions of fit for assembly, that is to say the largest shaft and the smallest hole condition. It follows that a geometrical tolerance, when parts are at their worst conditions of fit, must be adhered to, but when the parts move away from the Maximum Metal Condition (that is in the direction of metal off) a larger geometrical tolerance can be allowed. In order that this requirement can be applied to give manufacturing easement at the inspection stage, the letter Ⓜ is added in the tolerence frame as shown in the frame 1 on the diagram.

To summarize, the 0.004 in. tolerance must be maintained when the part is at its Maximum Metal Condition, but if some metal is removed into the size tolerance, the 0.004 in. can be increased by the amount of metal removed. This easement can only take place if Ⓜ is shown.

This condition is particularly applicable to the posiion of holes, slots and concentricity. As an example of this, consider the casings being checked for position with undersize pins. If it is difficult to push the pins in it may be that they have exceeded their positional tolerance, but can still be accepted providing metal is removed to allow the pin to pass into the hole. It is obvious that the amount of metal removed must not be in excess of the size tolerance.

If a 2.000 – 0.001 in. bore measures 0.0015 in. error during a position check, and the drawing calls for 0.0005 in., this is acceptable if the bore size measures 2.001 in.

There are occasions when any extension of the geometrical tolerance cannot be allowed, in which case the Ⓜ would not be indicated, see frame 2 on diagram. An instance of this is interference fitting holes and tapped holes.

Again there will be instances where inspectional easement can be obtained by applying Ⓜ to the datum feature, in which case the Ⓜ will be added to the datum letter as shown in frame 2. Frame 3 shows the Maximum Metal Condition applied to both feature and datum.

23404

Maximum Metal Condition
Figure 223

SHANK NUTS - MAINTENANCE PRACTICES

TASK 70-42-09-912-001-R00

1. Replacement of Damaged Shank Nuts, FRS.3034

A. General

(1) For the effectivity for all shank nuts, see the Parts Catalogue for the part numbers.

(2) For price and availiability of engine parts and repair of spares, refer to Rolls-Royce Limited.

B. Equipment

(1) Peening tool No. 10 UNF - HU.19641, Item 1

(2) Peening tool 0.250in UNF - HU.19648, Item 2

(3) Peening tool 0.312in UNF - HU.19655, Item 3

(4) Peening tool 0.375in UNF - HU.19657, Item 4

(5) Peening tool 0.500in UNF - HU.19547, Item 5

C. Parts

(1) See the Parts Catalogue for the part numbers.

D. Procedure

S 022-003-R00

(1) Remove the shank nuts.

(a) Drill the flare until it collapses and remove the nut (Fig. 201).

(b) Clean and examine the nut location in the component.

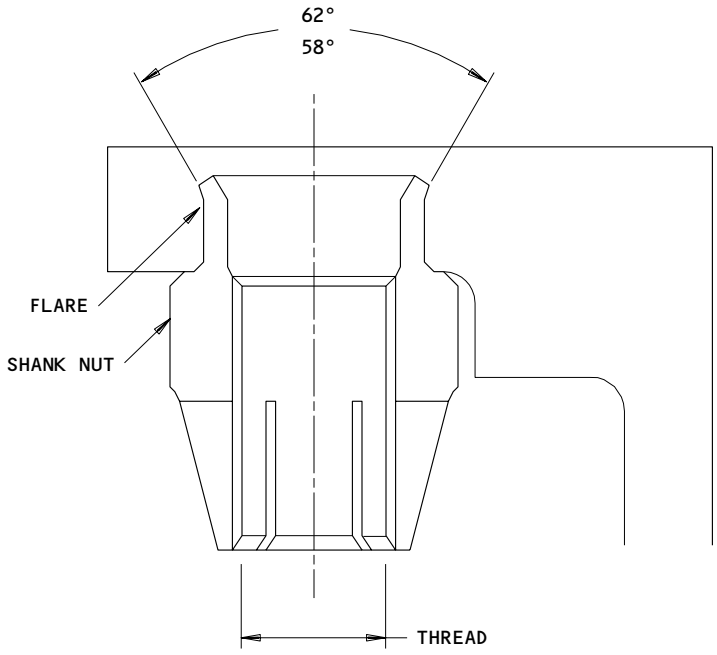
S 422-004-R00

(2) Install the new shank nut.

(a) Install the shank nut

(b) Hold the nut and make the flare (Fig. 201).

NOTE: Select tool from Item 1 to 5.



UNIFIED THREAD SIZE (IN.)	DRILL SIZE IN MILLIMETERS (INCH CONVERSION IN PARENTHESIS)
0.190 (No. 10)	5, 7 (0.224)
0.250	8 (0.315)
0.3125	9, 6 (0.378)
0.375	11, 5 (0.453)
0.500	14 (0.551)

30909

Typical Section Through Shank Nut
Figure 201

STUDS INSTALLED INTO LIGHT ALLOY MATERIAL - MAINTENANCE PRACTICES

1. General
   A. This task gives the procedure to install studs that are larger than the hole. You must make sure the threads in the hole are not damaged.
   B. If you install studs with threads that are larger than the standard thread (it is necessary to use a thread tap), you must use a different procedure.

TASK 70-42-10-912-001-R00

2. Install Oversize Studs into a Light Alloy Material, FRS.3000
   A. Procedure

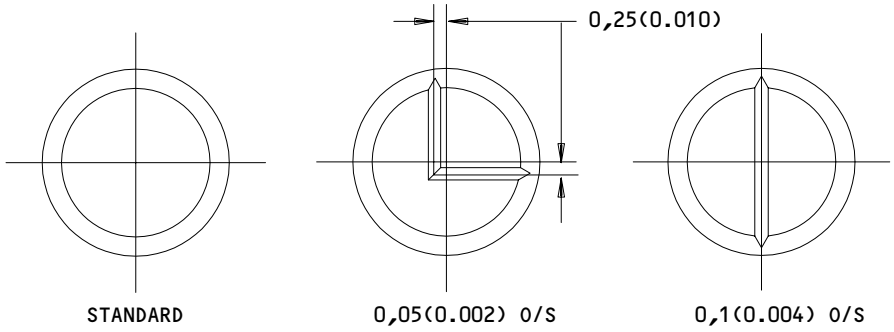
S 912-002-R00

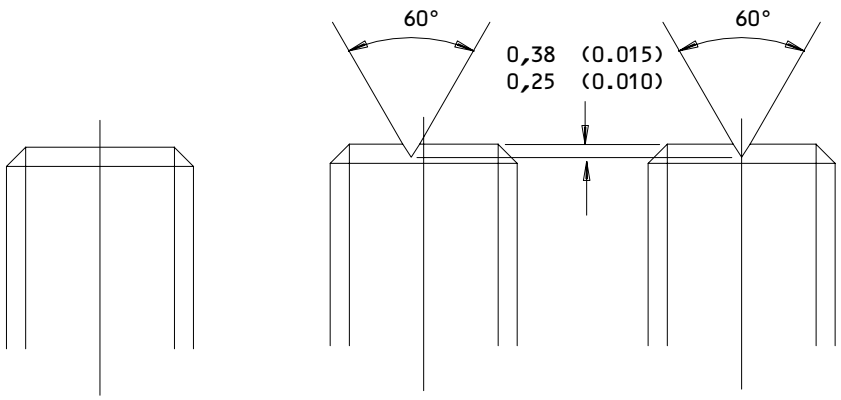
(1) Installation of larger studs (Fig. 201).
   (a) If the threads at the end of the stud are not damaged, you can install the large studs without a thread tap.
   (b) The maximum dimension that the stud can be larger than the hole are shown below:
      1) For studs which are between 0.0250-0.4375 inch (6.35-11.1125 mm) in diameter, the studs are a maximum of 0.002 inch (0.05 mm) larger than the hole.
      2) For studs which have a diameter more than 0.4375 inch (11.1125 mm), the studs are a maximum of 0.0025 inch (0.0635 mm) larger than the hole.
   (c) You can find the maximum dimension for these studs as follows:

NOTE: The part number in the Illustrated Parts Catalog have these suffixes:

1) 0.002 inch (0.05 mm) - suffix P
2) 0.004 inch (0.10 mm) - suffix E

THE OVERSIZE END OF EACH STUD IS IDENTIFIED AS SHOWN BELOW





DIMENSIONS IN MILLIMETERS
CONVERSIONS IN INCHES

30907

Method of Identifying Oversize Studs
Figure 201

REPAIR SURFACES AFFECTED BY MINOR DAMAGE - MAINTENANCE PRACTICES

1. General
   A. This repair must only be used when it is specified by an Inspection and Check procedure.
   B. When you repair the material to these instructions, make sure the shape and surface condition are the same. They must also agree with the limits given in the Inspection and Check procedure.

TASK 70-42-11-912-001-R00

2. Repair Surfaces Which Have Small Damage - FRS.3253
   A. References
      (1) 70-42-12/201, Local Surface Protection
   B. Procedure

S 912-002-R00

(1) Repair the surface damage.

CAUTION: DO NOT USE ALUMINUM OXIDE TYPES OF WHEELS, STONES AND ABRASIVE PAPERS TO REMOVE MATERIAL, OR TO POLISH TITANIUM PARTS. ONLY SILICONE CARBIDE TYPES ARE PERMITTED.

IF MECHANICAL CUTTERS ARE USED, REMOVE ONLY LIGHT CUTS FROM THE MATERIAL OR THE PART WILL BECOME TOO HOT.

(a) If the material has marks, worn areas, or rough edges, repair the area.
   1) Lightly polish the surface or threads to remove the damage.
(b) If the material has dents, rub marks, or is torn, repair the area.
   1) Lightly polish the part until it is smooth.
(c) If the material is twisted, or has dents, repair the area.
   1) Use hand tools to polish the part.
   2) Polish the part until it is smooth.
(d) If the material has cut marks that do not go through it, repair the area.
   1) Use hand tools to make the part smooth.

2) Lightly polish it to get a smooth shape.

(e) If it is burned, repair the material.
   1) Use hand tools to remove the material from the damaged area.
   2) Lightly polish the part until it is smooth.

(f) Repair the material where it has cracks.
   1) Use a rotary file to make the part smooth.
   2) Polish the part until it is smooth.

(g) If the material has areas where it is hit, repair the area.
   1) Use hand tools to make the part smooth.
   2) Use hand tools to scallop the leading and the trailing edges to a 5:1 length/depth minimum ratio.
   3) Polish the part until it is smooth.

(h) Make an inspection of the part.
   1) Do a crack test of the repair area.
   2) Apply a surface protection to the part (Ref 70-42-12/201 and/or use the repair procedure for the part).
   3) Make a record of the repair.
      a) Identify FRS3253 adjacent to the part number.

NOTE: Use the same procedure as for the part number.

LOCAL SURFACE PROTECTION - MAINTENANCE PRACTICES

1. General
   A. This procedure repairs the enamelled surfaces which are damaged. Use waterproof abrasive paper on the damaged area to make it smooth with the adjacent surfaces. Paint the surfaces with enamel.

   B. Use chromate solution for selenius acid.

TASK 70-42-12-912-001-R00

2. Local Surface Protection on Aluminum Cases
   A. Consumable Materials
      (1) Primer, Air Drying
          British Spec - C0.5151
          OMat No. - 708
      (2) Enamel, Air Drying
          British Spec - C0.5153/693
          OMat No. - 7/35
      (3) White Spirit
          British Spec - B.S.245
          OMat No. - 102
      (4) Solvent
          American Spec - A.S.T.M. D484-52
          OMat No. - 1/5
      (5) Paper, Waterproof Abrasive
   B. Local surface protection

          S 912-002-R00
      (1) Do these steps to apply protection to the surface:
          (a) Remove the corrosion from the damaged surfaces.
          (b) Use waterproof abrasive paper to make the damaged surfaces smooth with the adjacent surface.
          (c) Clean the damaged surfaces with solvent.
          (d) Let the surfaces fully dry.
          (e) Apply a layer of primer.
          (f) Let the primer dry for 2 hours.
          (g) Apply a layer of enamel.
          (h) Let the enamel dry for not less than 30 minutes.

TASK 70-42-12-912-003-R00

3. Local Surface Protection on Aluminium IP Compressor Cases
   A. General
      (1) Refer to the Engine Overhaul Processor Manual T.S.D 594-J, O.P. 330 (Brushing procedure) to repair the surface protection on the aluminum IP compressor case.

TASK 70-42-12-912-004-R00

4. Local Surface Protection on Magnesium Cases

A. Consumable Materials

(1) Varnish, Air Drying Clear
British Spec - C0.5187
OMat No. - 7/24

(2) Primer, Air Drying
British Spec - C0.5151
OMat No. - 708

(3) Enamel, Air Drying
British Spec - C0.5153/693
OMat No. - 7/35

(4) Chromate touch-up
British Spec - Dow 19
OMat No. - 1/202

(5) White Spirit
British Spec - B.S.245
OMat No. - 102

(6) Solvent
American Spec - A.S.T.M. D484-52
OMat No. - 1/5

(7) Paper, Waterproof Abrasive

B. Local surface protection

S 912-005-R00

(1) Do these steps to apply protection to the surface:
(a) Remove the corrosion from the damaged surfaces.
(b) Use waterproof abrasive paper to make the damaged surfaces smooth with the adjacent surface.
(c) Clean the damaged surfaces with solvent.
(d) Let the surfaces fully dry.

WARNING: DO NOT BREATH THE GAS GIVEN OUT BY THE CHROMATE TOUCH-UP SOLUTION. THE SOLUTION AND THE GAS GIVEN OUT BY THE SOLUTION IS POISONOUS.

WARNING: DO NOT LET THE ACID SOLUTION TOUCH YOU. MAKE SURE YOU USE APPROVED GLOVES, APRONS, AND EYE PROTECTION.

IF YOU TOUCH THE SOLUTION, FLUSH THE AREA IMMEDIATELY WITH A LARGE QUANTITY OF WATER AND GET MEDICAL AID.

WARNING: IF YOU DO NOT OBEY THESE PRECAUTIONS, INJURY TO YOU AND OTHER PERSONS CAN OCCUR.

(e) Paint the damaged surfaces with chromate touch-up solution to make a brown layer on the surface.

(f) Clean the damaged surfaces with clean water and dry the surfaces immediately.
(g) Apply a layer of varnish.
(h) Let the varnish dry for 30 minutes.
(i) Apply a layer of primer.
(j) Let the primer dry for 2 hours.
(k) Apply a layer of enamel.
(l) Let the enamel dry for not less than 30 minutes.

TASK 70-42-12-912-006-R00

5. Local Surface Protection on Steel Cases

A. Consumable Materials

(1) Primer, Air Drying
British Spec - E.3892 (PL.82)
OMat No. - 7/22

(2) White Spirit
British Spec - B.S.245
OMat No. - 102

(3) Solvent
American Spec - A.S.T.M. D484-52
OMat No. - 1/5

(4) Paper, Waterproof Abrasive

B. Local surface protection

S 912-007-R00

(1) Do these steps to apply protection to the surface:
(a) Remove the corrosion from the damaged surfaces.
(b) Use waterproof abrasive paper to make the damaged surfaces smooth with the adjacent surface.
(c) Clean the damaged surfaces with solvent.
(d) Let the surfaces fully dry.
(e) Apply a layer of enamel.
(f) Let the enamel dry for not less than 30 minutes.

TASK 70-42-12-912-008-R00

6. Local Surface Protection on Light Alloy Skins

A. Consumable Materials

(1) Degreasing fluid (Inhibited and stabilized 1.1.1. trichloroethane)
British Spec - BS.4487: 1969
American Spec - MIL-T-81533
OMat No. - 1/21

(2) Cleaning solution
British Spec - MC.58
OMat No. - 176

(3) Varnish, Air Drying Clear
British Spec - CO.5187
OMat No. - 7/24

B. Local surface protection

S 912-009-R00

(1) Do these steps to apply protection to the surface:

WARNING: DO NOT BREATHE THE GAS FROM THE DEGREASING FLUID. DO NOT LET THE FLUID TOUCH THE SKIN. MAKE SURE YOU HAVE A SUFFICIENT SUPPLY OF AIR WHEN YOU USE THE FLUID. THE GAS FROM THE FLUID IS DANGEROUS.

(a) Clean the damaged surfaces with cleaning solution or degreasing fluid.
(b) Let the surfaces fully dry.
(c) Apply a layer of varnish to the damaged surfaces.
(d) Let the varnish dry for 30 minutes.
(e) Apply a second layer of varnish.
(f) Let the varnish dry for 30 minutes.

TASK 70-42-12-912-010-R00

7. Apply High Heat Resistant Enamel

A. Consumable Materials

(1) Degreasing fluid (Inhibited and stabilized 1.1.1. trichloroethane)
British Spec - BS.4487: 1969
American Spec - MIL-T-81533
OMat No. - 1/21

(2) Cleaning solution
British Spec - MC.58
OMat No. - 176

(3) Enamel, Air Drying
British Spec - E.3892 (PL.82)
OMat No. - 7/22

B. Local surface protection

S 912-011-R00

(1) Do these steps to apply protection to the surface:

WARNING: DO NOT BREATHE THE GAS FROM THE DEGREASING FLUID. DO NOT LET THE FLUID TOUCH THE SKIN. MAKE SURE YOU HAVE A SUFFICIENT SUPPLY OF AIR WHEN YOU USE THE FLUID. THE GAS FROM THE FLUID IS DANGEROUS.

(a) Clean the damaged surfaces with cleaning solution or degreasing fluid.
(b) Let the surface fully dry.
(c) Apply a layer of enamel.
(d) Let the enamel dry for 30 minutes.

SCREW THREADS - MAINTENANCE PRACTICES

1. General
   A. This task gives the procedure to repair parts with damaged threads. This is done by the installation of wirethread inserts.
      (1) Install the new inserts to repair the damaged threads and damaged inserts.
      (2) In light alloy materials, repair the damaged threads by the installation of repair inserts.

      NOTE: Unless permitted by Rolls-Royce, do not install wirethread inserts into major parts that turn, highly stressed areas (engine mounts), or areas that get in the hot flow of gas.

   B. When an insert is damaged during the assembly, it is not necessary to disassemble the unit to replace the insert. Use the tools shown in Fig. 205.
   C. Install screw lock inserts only when shown in the Illustrated Parts Catalogue.
   D. For parts that have holes with threads, see the Illustrated Parts Catalogue for the part numbers.
   E. There are three types of inserts:
      (1) Screw lock insert - one coil is changed to lock the bolt
      (2) Free running insert - this does not lock the bolt
      (3) Repair insert - a solid plug into which an insert is installed

TASK 70-42-13-912-001-R00

2. Repair the Theaded Holes by Fitting Wirethread Inserts - FRS.3002
   A. General
      (1) You must know the 'length of insert' to get the correct Rolls-Royce part number for the wirethread insert or the repair insert (Fig. 210).
      (2) You must know the size of the wirethread inserts and repair inserts to use the correct tools (Fig. 209).
   B. Consumable Materials
      (1) Jointing compound
      British Spec - PL. 32
      OMat No. - 426

C. References
(1) AMM 70-42-12/201, Local Surface Protection
D. Install the wirethread insert or replace the damaged insert

S 022-002-R00
(1) Remove the damaged insert or make a hole for the insert.
(a) Use the tool, Item 1, to remove the insert (Fig. 202).
(b) Use the tools, Items 4, 5, 6, to make a hole (Fig. 201).

S 162-004-R00
(2) Clean the hole.

S 282-006-R00
(3) Make an inspection of the hole.
(a) Use the tool, Item 7, for the inspection.

S 912-007-R00
(4) In all magnesium parts, apply selenious acid to the threads.
(a) Refer to AMM 70-42-12/201.

S 912-008-R00
(5) Find the correct insert.
(a) See the parts paragragh.

S 912-009-R00
(6) In all magnesium parts, apply jointing compound to the threads and the insert.

S 422-010-R00
(7) Install the insert.
(a) Use the tool, Item 2, to install the insert (Fig. 201 and 203).

S 912-011-R00
(8) Remove the tang.
(a) Use the tool, Item 3, to remove the tang (Fig. 204).

S 282-012-R00
(9) Do a crack test of the repair area.

S 282-013-R00
(10) Make an inspection of the insert.
(a) Use the tool, Item 8 or standard plug gauge (Fig. 201).

S 712-014-R00
(11) Do a check of the inbuilt torque of the screw lock inserts.
(a) Use the tools, Items 9, 10, 11, to do a check of the torque of the screw lock inserts (Fig. 206).

S 912-015-R00
(12) If the insert is not a replacement, vibro-engrave 'FRS.3002' adjacent to the part number.

E. Install the repair inserts

S 222-016-R00
(1) Make sure that the boss dimensions are sufficient for the insert (Fig. 207).

S 322-017-R00
(2) Machine a hole for the repair insert.
(a) See the tool paragraph and Fig. 207.

S 162-018-R00
(3) Clean the hole.

S 282-019-R00
(4) Make an inspection of the threads.
(a) Use a standard plug gauge. See Fig. 207.

S 912-020-R00
(5) In all magnesium parts, apply selenious acid to the threads.
(a) Refer to AMM 70-42-12/201.

S 912-021-R00
(6) Find the correct insert.
  (a) See the parts paragraph.

S 912-022-R00
(7) In all magnesium parts, apply jointing compound to the threads and the insert.

S 422-023-R00
(8) Install the repair insert.
  (a) Use the tool, Item 15, to install the insert (Fig. 208).

S 282-024-R00
(9) Make an inspection of the repair insert (Fig. 208).

S 422-025-R00
(10) Install the wirethread insert.

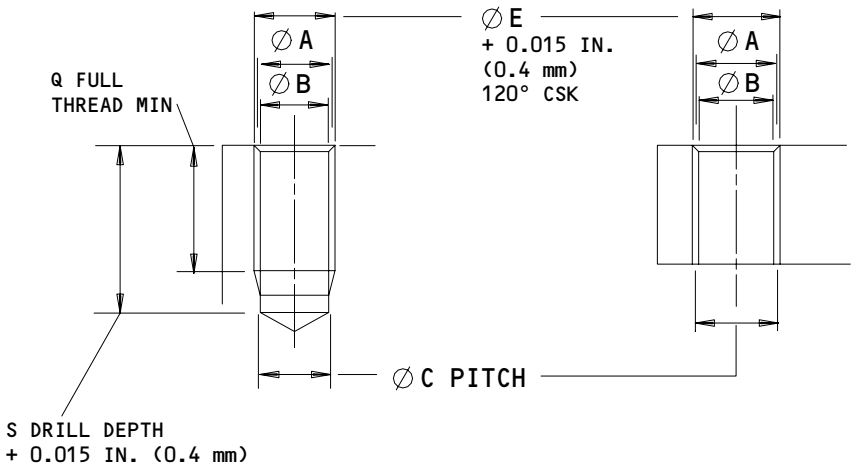
S 912-026-R00
(11) Remove the tang.
  (a) Use the tool, Item 3, to remove the tang (Fig. 204).

S 282-027-R00
(12) Do a crack test of the repair area.

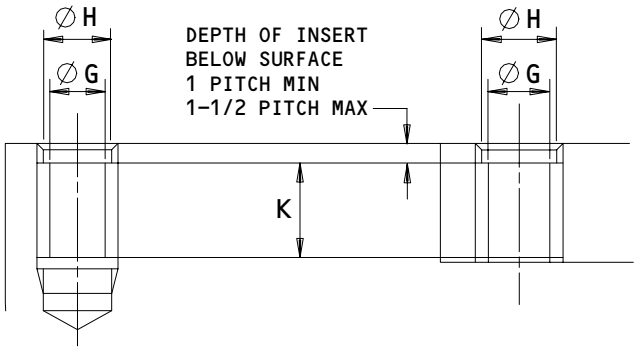
S 282-028-R00
(13) Make an inspection of the insert.
  (a) Use the tool, Item 8 or standard plug gauge, to do the inspection (Fig. 201).

S 712-029-R00
(14) Do a check of the inbuilt torque of the screw lock inserts.
  (a) Use the tools, Items 9, 10, 11, to do a check of the inbuilt torque of the screw lock inserts (Fig. 206).

S 912-030-R00
(15) Vibro-engrave 'FRS.3002' adjacent to the part number.



BEFORE FITTING INSERT



AFTER FITTING INSERT

30917

Wirethread Insert Dimensions - Before and After Fitting Insert
Figure 201 (Sheet 1)

Nominal Unified Thread Size		No. 4	No. 6	No. 8	No. 10
Threads/in.		40	32	36	32
Diameter major "A" (in.)		0.1445	0.1786	0.2001	0.2306
Diameter pitch "C" (in.)		0.1299 0.1283	0.1601 0.1583	0.1840 0.1821	0.2123 0.2103
Diameter minor "B" (in.)		0.1232 0.1142	0.1530 0.1450	0.1759 0.1709	0.2028 0.1978
Countersink diameter "E"		0.155 (3.94)	0.190 (4.83)	0.215 (5.46)	0.240 (6.1)
Nominal length of ID insert	Q	0.135 (3.43)	0.170 (4.32)	0.190 (4.83)	0.220 (5.59)
	S	0.250 (6.35)	0.310 (7.87)	0.320 (8.13)	0.360 (9.14)
Nominal length of 1-1/2D insert	Q	0.190 (4.83)	0.240 (6.1)	0.275 (6.98)	0.320 (8.13)
	S	0.305 (7.75)	0.380 (9.65)	0.100 (10.16)	0.460 (11.68)
Nominal length of 2D insert	Q	0.250 (6.35)	0.310 (7.87)	0.360 (9.14)	0.410 (10.41)
	S	0.365 (9.27)	0.450 (11.43)	0.480 (12.19)	0.550 (13.97)
Nominal length of 2-1/2D insert	Q	0.305 (7.75)	0.375 (9.52)	0.440 (11.18)	0.510 (12.95)
	S	0.420 (10.67)	0.515 (13.08)	0.560 (14.22)	0.650 (16.51)

D = Nominal thread diameter

Dimensions in inches (millimeters)

Threaded Hole Dimensions for Wirethread Inserts

31108

Wirethread Insert Dimensions - Before and After Fitting Insert
Figure 201 (Sheet 2)

Nominal Unified Thread Size (in.)		0.250	0.3125	0.375	0.4375	0.500
Threads (in.)		28	24	24	20	20
Diameter major "A" (in.)		0.2964	0.3666	0.4291	0.5025	0.5650
Diameter pitch "C" (in.)		0.2754 0.2732	0.3421 0.3395	0.4047 0.4020	0.4731 0.4700	0.5357 0.5325
Diameter minor "B" (in.)		0.2639 0.2559	0.3278 0.3228	0.3899 0.3839	0.4561 0.4491	0.5176 0.5116
Countersink diameter "E"		0.312 (7.92)	0.375 (9.52)	0.437 (11.1)	0.510 (12.95)	0.570 (14.48)
Nominal length of ID insert	Q	0.290 (7.37)	0.350 (8.89)	0.420 (10.67)	0.490 (12.45)	0.550 (13.97)
	S	0.450 (11.43)	0.540 (13.72)	0.610 (15.49)	0.710 (18.03)	0.775 (19.68)
Nominal length of 1-1/2D insert	Q	0.410 (10.41)	0.510 (12.95)	0.600 (15.24)	0.710 (18.03)	0.800 (20.32)
	S	0.570 (14.48)	0.700 (17.78)	0.790 (20.07)	0.930 (23.62)	1.025 (26.04)
Nominal length of 2D insert	Q	0.540 (13.72)	0.670 (17.02)	0.790 (20.07)	0.930 (23.62)	1.050 (26.67)
	S	0.700 (17.78)	0.860 (21.84)	0.980 (24.89)	1.150 (29.21)	1.275 (32.28)
Nominal length of 2-1/2D insert	Q	0.660 (16.76)	0.820 (20.83)	0.980 (24.89)	1.145 (29.08)	1.300 (33.02)
	S	0.820 (20.83)	1.010 (25.65)	1.170 (29.72)	1.365 (34.67)	1.525 (38.74)

D = Nominal thread diameter

Dimensions in inches (millimeters)

Threaded Hole Dimensions for Wirethread Inserts

31109

Wirethread Insert Dimensions - Before and After Fitting Insert
Figure 201 (Sheet 3)

Nominal Unified Thread Size		No. 4	No. 6	No. 8	No. 10
Threads/in.		40	32	36	32
Minimum minor diameter "G" (in.)		0.0849	0.1042	0.1339	0.1562
Pitch diameter "H" (in.)		0.0982 0.0958	0.1204 0.1177	0.1487 0.1460	0.1726 0.1697
Minimum length of assembled insert "K"	1D	0.093 (2.36)	0.114 (2.9)	0.143 (3.63)	0.167 (4.24)
	1-1/2D	0.149 (3.78)	0.183 (4.65)	0.225 (5.72)	0.262 (6.65)
	2D	0.205 (5.21)	0.252 (6.4)	0.307 (7.8)	0.357 (9.07)
	2-1/2D	0.261 (6.63)	0.321 (8.15)	0.389 (9.88)	0.452 (11.48)

Nominal Unified Thread Size (in.)		0.250	0.3125	0.375	0.4375	0.500
Threads/in.		28	24	24	20	20
Minimum minor diameter "G" (in.)		0.2113	0.2674	0.3299	0.3834	0.4459
Pitch diameter "H" (in.)		0.2300 0.2268	0.2890 0.2854	0.3516 0.3479	0.4091 0.4050	0.4717 0.4675
Minimum length of assembled inserts "K"	1D	0.223 (5.66)	0.281 (7.14)	0.344 (8.74)	0.400 (10.16)	0.462 (11.73)
	1-1/2D	0.348 (8.84)	0.438 (11.13)	0.531 (13.49)	0.619 (15.72)	0.712 (18.08)
	2D	0.473 (12.01)	0.594 (15.09)	0.719 (18.26)	0.838 (21.29)	0.962 (24.43)
	2-1/2D	0.598 (15.19)	0.750 (19.05)	0.906 (23.01)	1.056 (26.82)	1.212 (30.78)

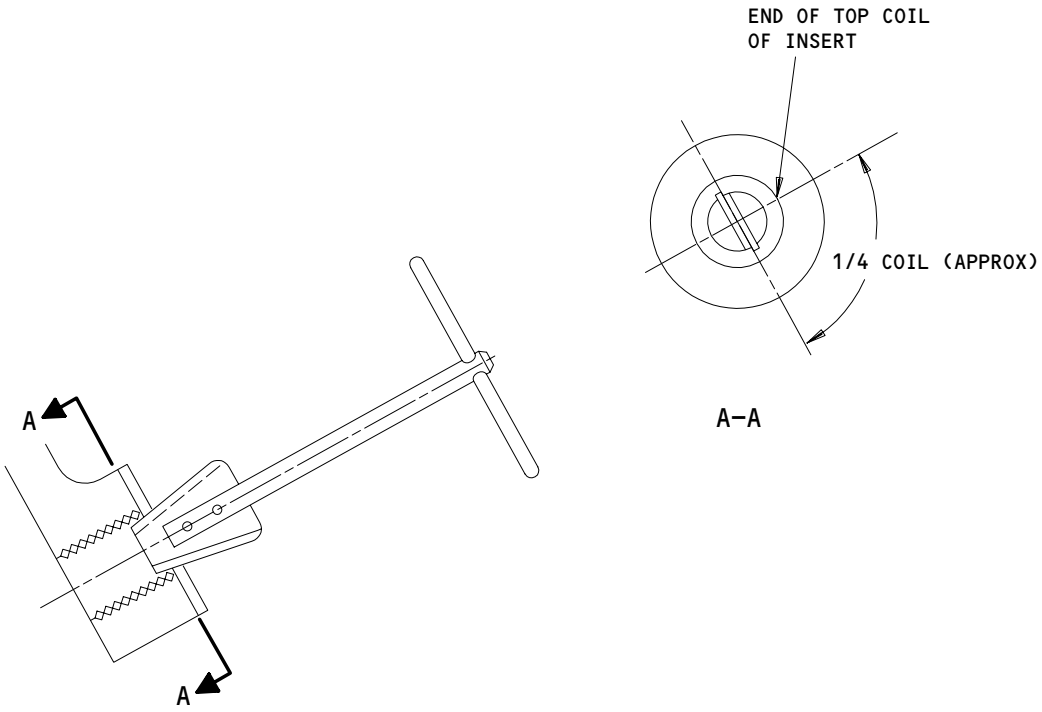
D = Nominal thread diameter

Dimensions in inches (millimeters)

31110

Dimensions of Assembled Inserts

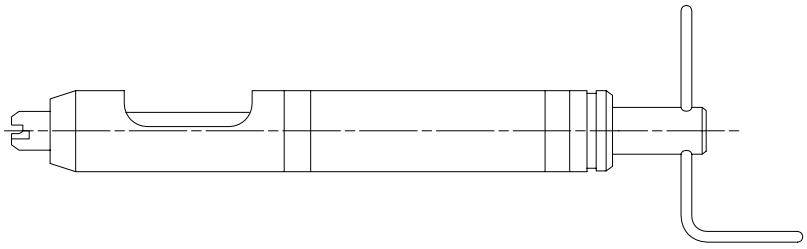
Wirethread Insert Dimensions - Before and After Fitting Insert
Figure 201 (Sheet 4)



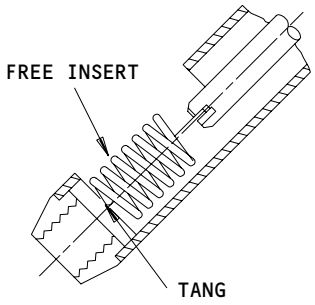
PRESS SPECIAL TOOL INTO INSERT AT APPROX. 1/4 OF A COIL FROM THE END OF THE INSERT WIRE. ROTATE COUNTERCLOCKWISE TO REMOVE INSERT. DISCARD INSERT.

30918

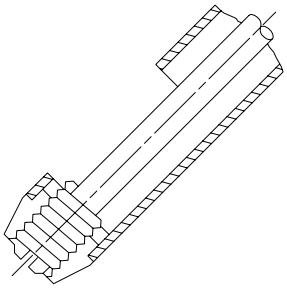
Existing Insert Removal
Figure 202



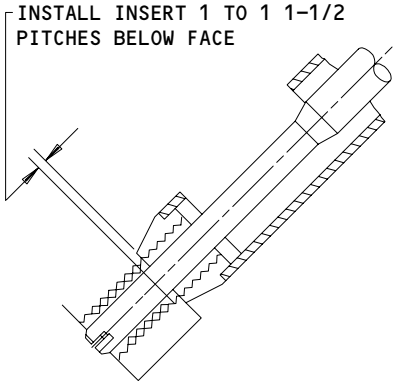
PLAIN TYPE INSERTION TOOL -
FREE RUNNING INSERTS



DRAW BACK MANDREL AND PLACE INSERT IN CHAMBER WITH TANG AT NOZZLE END.



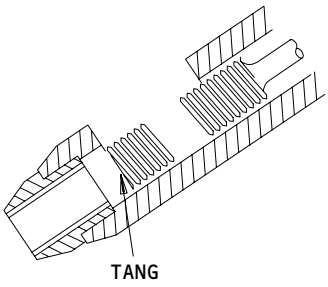
ENGAGE TANG IN SLOT OF MANDREL, ROTATE MANDREL CLOCKWISE AND PUSH FORWARD GENTLY UNTIL INSERT ENGAGES IN NOZZLE, WIND MANDREL UNTIL INSERT JUST EMERGES.



PLACE TOOL SQUARELY OVER TAPPED HOLE. WIND MANDREL UNTIL INSERT IS CORRECTLY IN POSITION. NO FORWARD PRESSURE SHOULD BE USED.

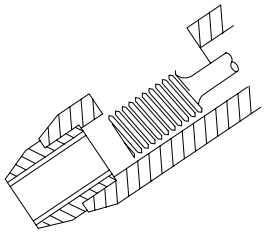
30919

Insert Installation
Figure 203 (Sheet 1)

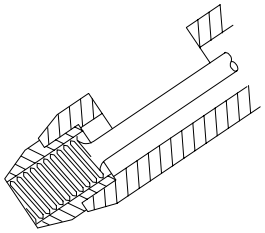


PREWIND TYPE INSERTING TOOL – FREE RUNNING AND SCREW LOCK INSERTS

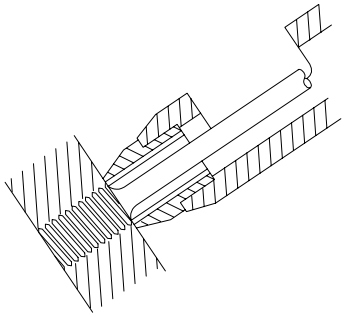
WITHDRAW THE THREADED MANDREL AND PLACE THE INSERT IN THE LOADING CHAMBER.



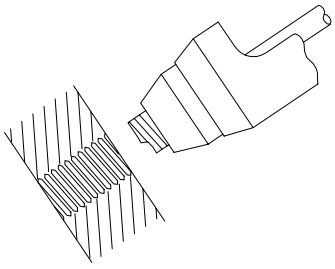
PREVENT THE INSERT FROM MOVING WITH THE THUMB AND ROTATE THE THREADED MANDREL CLOCKWISE UNTIL THE DRIVING FEATURE ENGAGES THE INSERT TANG.



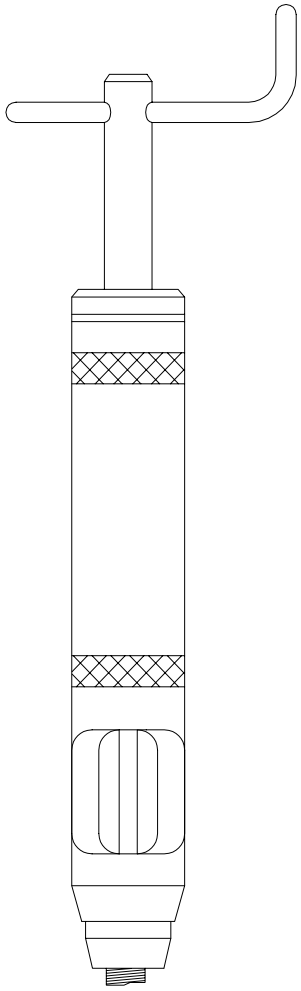
ROTATE THE MANDREL CLOCKWISE AND PUSH FORWARD GENTLY UNTIL THE INSERT LOCATES THE THREAD IN THE TOOL NOZZLE, CONTINUE WINDING THE INSERT INTO THE NOZZLE UNTIL THE INSERT IS ABOUT TO EMERGE FROM THE OPEN END.



PLACE THE LOADED TOOL SQUARELY OVER THE TAPPED HOLE IN THE COMPONENT WHICH IS TO RECEIVE THE INSERT AND ROTATE THE MANDREL CLOCKWISE UNTIL THE INSERT IS AT THE REQUIRED DEPTH.



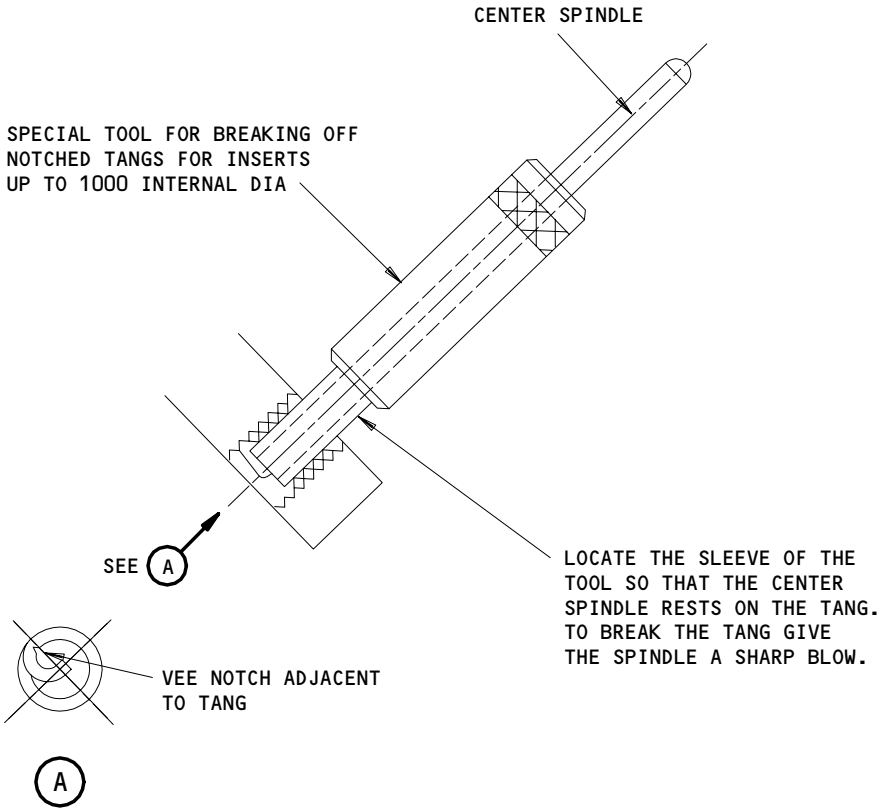
ROTATE THE MANDREL COUNTERCLOCKWISE UNTIL IT IS CLEAR OF THE INSERT.



INSERTING TOOL
PREWINDING TYPE
(THREADED MANDREL)

30920

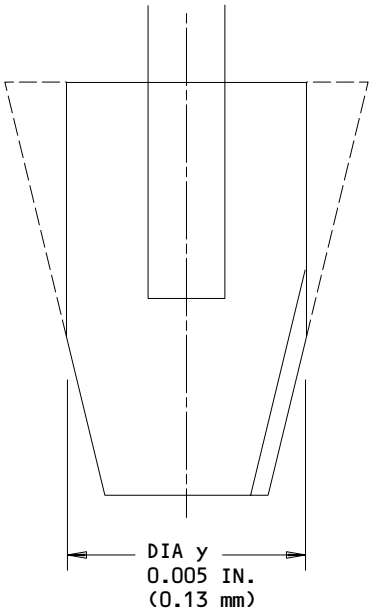
Insert Installation
Figure 203 (Sheet 2)



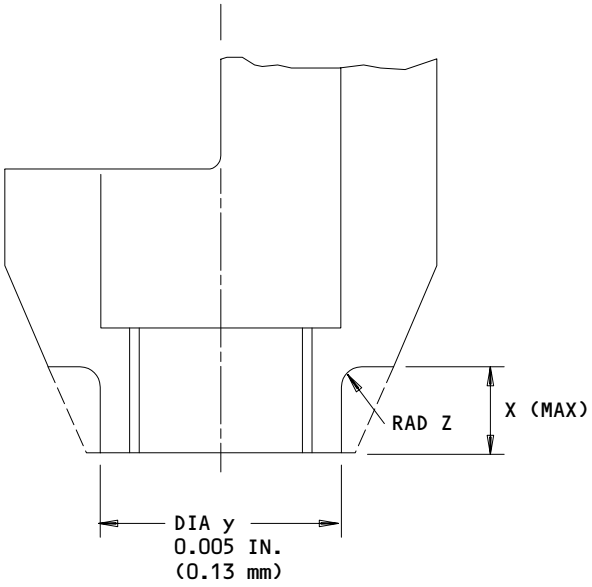
FOR LARGER INSERTS USE SMALL PLIERS AND BEND THE TANG UP AND DOWN, NOT SIDEWAYS.

30921

Remove Insert Tang
Figure 204

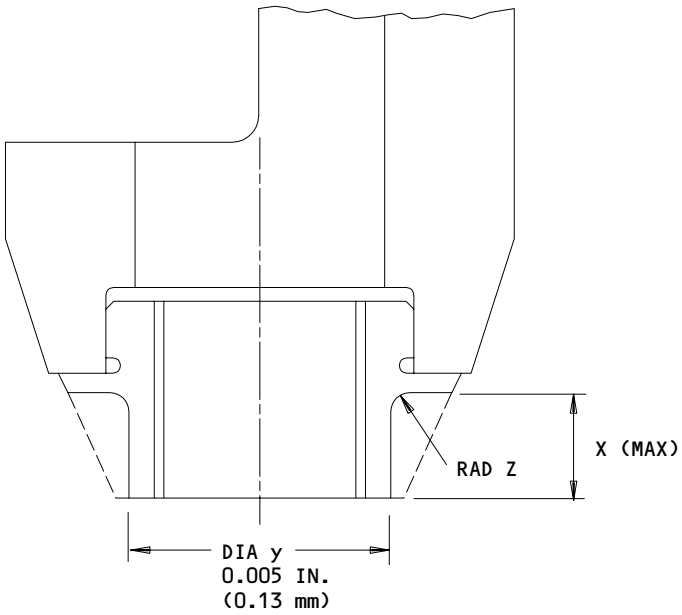


EXTRACTION TOOL



NYLON INSERTION TOOL

30922



ALUM. BODY AND STEEL NOZZLE

30923

Modify Tools to Fit Wirethread Inserts Assembled Parts
Figure 205 (Sheet 1)

Nominal Unified Thread Size	No. 4	No. 6	No. 8	No. 10
Threads/In.	40	32	36	32
Dimension X	0.180 (4.57)	0.180 (4.57)	0.180 (4.57)	0.230 (5.84)
Diameter y	0.175 (4.44)	0.210 (5.33)	0.235 (5.97)	0.260 (6.6)
Radius z	0.050 (1.27)	0.050 (1.27)	0.050 (1.27)	0.050 (1.27)

Nominal Unified Thread Size (In.)	0.250	0.3125	0.375	0.4375	0.500
Threads/In.	28	24	24	20	20
Dimension X	0.230 (5.84)	0.230 (5.84)	0.230 (5.84)	0.230 (5.84)	0.230 (5.84)
Diameter y	0.325 (8.26)	0.395 (10.03)	0.460 (11.68)	0.530 (13.46)	0.595 (15.11)
Radius z	0.050 (1.27)	0.050 (1.27)	0.050 (1.27)	0.050 (1.27)	0.050 (1.27)

y = Minimum diameter for insertion through panels
Dimensions in inches (millimeters)

31111

Tool Dimensions to Fit Wirethread Inserts in Assembled Parts
Figure 205 (Sheet 2)

Nominal Unified Thread Size	Threads/In.	Minimum		Maximum	
		Lb-In.	Nm.	Lb-In.	Nm.
No. 4	40	0.5	0.056	3	0.339
No. 6	32	1.0	0.113	6	0.678
No. 8	36	1.5	0.169	9	1.017
No. 10	32	2.0	0.226	18	2.034
0.250 in.	28	3.5	0.282	30	3.39
0.3125 in.	24	6.5	0.734	60	6.78
0.375 in.	24	9.5	1.017	80	9.04
0.4375 in.	20	14.0	1.582	100	11.3
0.500 in.	20	18.0	2.034	150	16.95

Select minimum torque check plug, torque adapter and Torquemaster.

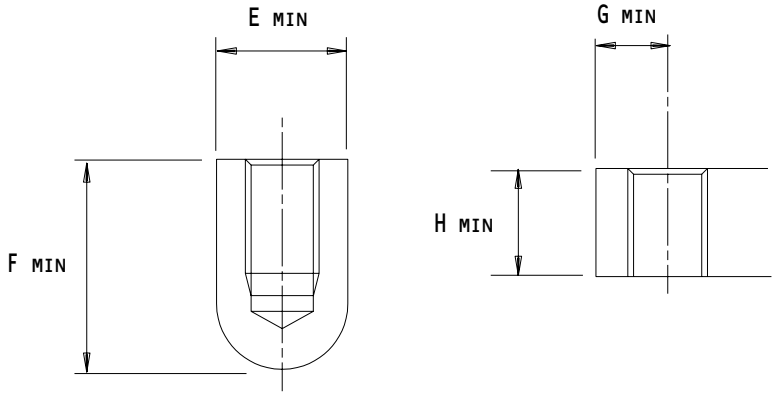
Lubricate minimum torque check plug with engine oil and fit into insert, engage torque adapter and using a standard key spanner, check for insert screw-through by spannering torque check plug through grip coil to full depth of the insert. Reject insert if it has turned more than half a thread in part.

Unscrew torque check plug sufficient to clear locking coil and remove key spanner. Set Torquemaster to correct poundage detailed above and check in-built torque using Torquemaster. Reject insert if torque check plug screws through grip coil.

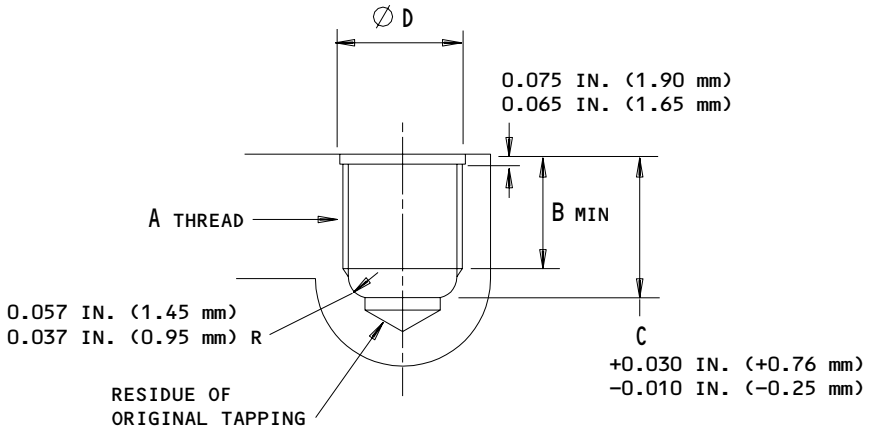
Inserts below minimum torque must be removed and a new insert fitted.

31112

Inbuilt Torque of Screw Lock Inserts
Figure 206



MINIMUM DIMENSIONS FOR REPAIR INSERTS



TAPPED HOLES FOR REPAIR INSERTS

30924

Dimension Standards for Inserts in Light Alloy Materials
Figure 207 (Sheet 1)

BOSS PROPORTIONS – LIGHT ALLOY – PROVISION FOR REPAIR					
Nominal Diameter Insert		No. 10	0.250 In.	0.3125 In.	0.375 In.
Threads/In.		32	28	24	24
Nominal Insert Length 1D	E	0.550 (13.97)	0.650 (16.51)	0.750 (19.05)	0.850 (21.59)
	F	0.540 (13.72)	0.670 (17.02)	0.790 (20.07)	0.900 (22.86)
	G	0.275 (6.98)	0.325 (8.26)	0.375 (9.52)	0.425 (10.8)
	H	0.250 (6.35)	0.300 (7.62)	0.360 (9.14)	0.425 (10.8)
Nominal Insert Length 1-1/2D	E	0.550 (13.97)	0.650 (16.51)	0.750 (19.05)	0.850 (21.59)
	F	0.640 (16.26)	0.790 (20.07)	0.950 (24.13)	1.080 (27.43)
	G	0.275 (6.98)	0.325 (8.26)	0.375 (9.52)	0.425 (10.8)
	H	0.385 (9.78)	0.435 (11.05)	0.520 (13.21)	0.610 (15.49)

Dimensions in inches (millimeters)

31113

Dimension Standards for Inserts in Light Alloy Materials
Figure 207 (Sheet 2)

BOSS PROPORTIONS – LIGHT ALLOY – PROVISION FOR REPAIR					
Nominal Diameter Insert		No. 10	0.250 in.	0.3125 in.	0.375 in.
Threads/in.		32	28	24	24
Nominal Insert Length 2D	E	0.550 (13.97)	0.650 (16.51)	0.750 (19.05)	0.850 (21.59)
	F	0.730 (18.54)	0.920 (23.37)	1.110 (28.19)	1.270 (32.26)
	G	0.275 (6.98)	0.325 (8.26)	0.375 (9.52)	0.425 (10.80)
	H	0.450 (11.43)	0.550 (13.97)	0.680 (17.27)	0.800 (20.32)
Nominal Insert Length 2-1/2D	E	0.550 (13.97)	0.650 (16.51)	0.750 (19.05)	0.850 (21.59)
	F	0.830 (21.08)	1.040 (26.42)	1.260 (32.00)	1.460 (37.08)
	G	0.275 (6.98)	0.325 (8.26)	0.375 (9.52)	0.425 (10.80)
	H	0.530 (13.21)	0.670 (17.02)	0.830 (21.08)	0.990 (25.15)

Dimensions in inches (millimeters)

31114

Dimension Standards for Inserts in Light Alloy Materials
Figure 207 (Sheet 3)

DIMENSIONS OF TAPPED HOLES FOR REPAIR INSERTS (LIGHT ALLOY)					
Special Unified Thread Form "A"	Wirethread Insert		B	C	D (in.)
	Size	Length			
0.3105 in. diameter 24 thread/in. (Light alloy) Minor diameter 0.2812 to 0.2862 in.	No. 10 32 threads/in.	1D	0.320 (8.13)	0.420 (10.67)	0.3348 0.3218
		1-1/2D	0.385 (9.78)	0.485 (12.32)	
		2D	0.450 (11.43)	0.550 (13.97)	
		2-1/2D	0.520 (13.21)	0.620 (15.75)	
0.4355 in. diameter 20 threads/in. (Light alloy) Minor diameter 0.3888 to 0.3970 in.	(0.250 in) 28 threads/in.	1D	0.360 (9.14)	0.460 (11.68)	0.4681 0.4481
		1-1/2D	0.435 (11.05)	0.535 (13.59)	
		2D	0.510 (12.95)	0.610 (15.49)	
		2-1/2D	0.630 (16.00)	0.730 (18.54)	

D = Nominal thread diameter
Dimensions in inches (millimeters)

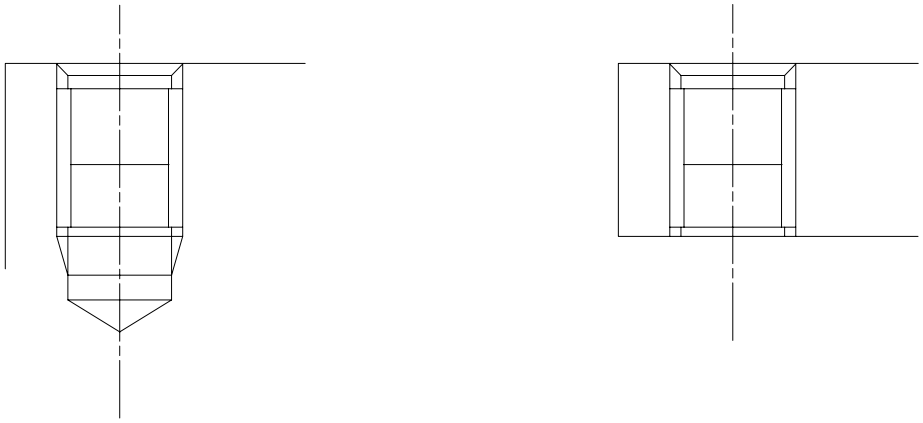
Dimension Standards for Inserts in Light Alloy Materials
Figure 207 (Sheet 4)

DIMENSIONS OF TAPPED HOLES FOR REPAIR INSERTS (LIGHT ALLOY)					
Special Unified Thread Form "A"	Wirethread Insert		B	C	D (in.)
	Size	Length			
0.4975 in. diameter, 20 threads/in. (Light alloy) Minor diameter 0.4513 to 0.4597 in.	0.3125 in. 24 threads/in.	1D	0.405 (10.29)	0.505 (12.83)	0.5306 0.5106
		1-1/2D	0.505 (12.83)	0.605 (15.37)	
		2D	0.640 (16.26)	0.740 (18.8)	
		2-1/2D	0.800 (20.32)	0.900 (22.86)	
0.5600 in. diameter, 18 threads/in. (Light alloy) Minor diameter 0.5084 to 0.5172 in.	0.375 in. 24 threads/in.	1D	0.475 (12.06)	0.575 (14.6)	0.5931 0.5731
		1-1/2D	0.610 (15.49)	0.710 (18.03)	
		2D	0.770 (19.56)	0.870 (22.1)	
		2-1/2D	0.960 (24.38)	1.060 (26.82)	

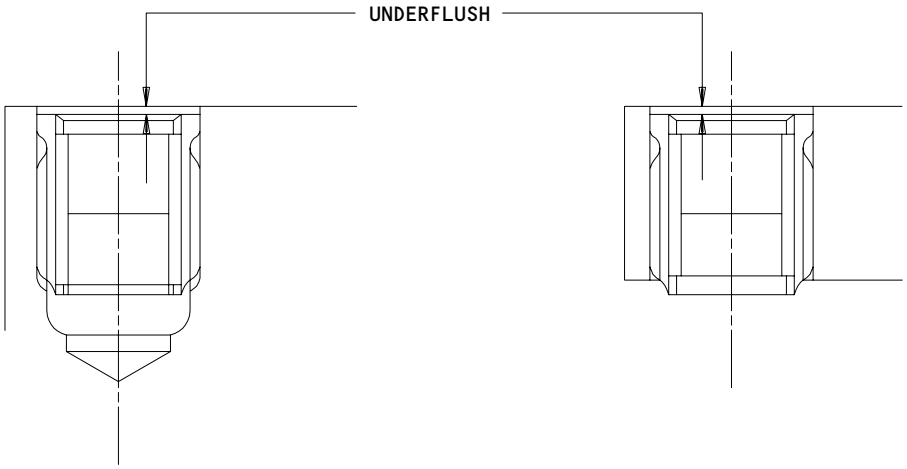
D = Nominal thread diameter
Dimensions in inches (millimeters)

31116

Dimension Standards for Inserts in Light Alloy Materials
Figure 207 (Sheet 5)



BEFORE REPAIR



AFTER REPAIR

30925

Repair Inserts - Before and After Repair
Figure 208

WIRETHREAD INSERTS					
Nominal Unified Thread Size	No. 4	No. 6	No. 8	No. 10	Item No.
Threads/in.	40	32	36	32	-
Extraction tool	HC22912	HC22912	HC22912	HC22913	1
Inserting tool (prewind type)	1709101	1709103	3405506	HC22891	2
Tang removal tool	1709121	1709123	3405526	3405527	3
Roughing tap	1709721	1709723	1709502	1709503	4
Plug tap	1709741	1709743	1709522	1709523	5
Bottoming tap	1709761	1709763	1709542	1709543	6
Special gage for tapped hole	1709581	1709583	1709562	1709563	7
Cross thread gage	-	-	HCU5035	HCU5036	8
Torque check plug	HC7943	HC7941	HC7942	HC21739	9
Torque adapter	HC21743	HC21743	HC21743	HC21743	10
Torquemaster	RR1704302 (all thread sizes)				11
Torque setting rig	1702173	1702173	1702173	1702173	12

31117A

Wirethread and Repair Tools
Figure 209 (Sheet 1)

WIRETHREAD INSERTS					
Nominal Unified Thread Size	0.250 in. (6.35 mm)	0.3125 in. (7.92 mm)	0.375 in. (9.52 mm)	0.4375 in. (11.09 mm)	Item No.
Threads/in.	28	24	24	20	-
Extraction tool	HC22914	HC22914	HC22915	1709063	1
Inserting tool (prewind type)	HC22892	HC22943	HC25569	3405511	2
Tang removal tool	3405528	3405529	3405530	3405531	3
Roughing tap	1709504	1709505	1709506	1709507	4
Plug tap	1709524	1709525	1709526	1709527	5
Bottoming tap	1709544	1709545	1709546	1709547	6
Special gage for tapped hole	1709564	1709565	1709566	1709567	7
Cross thread gage	HCU5037	HCU5038	HCU5039	HCU5040	8
Torque check plug	HC21740	HC21741	HC21742	HC22844	9
Torque adapter	HC21743	HC21743	HC21743	HC21743	10
Torquemaster	RR1704302 (all thread sizes)				11
Torque setting rig	1702173	1702173	1702173	1702173	12

31118

Wirethread and Repair Tools
Figure 209 (Sheet 2)

WIRETHREAD INSERTS					
Nominal Unified Thread Size	0.500 in. (12.7 mm)				Item No.
Threads/in.	20				-
Extraction tool	1709063				1
Inserting tool (prewind type)	3405512				2
Tang removal tool	3405532				3
Roughing tap	1709508				4
Plug tap	1709528				5
Bottoming tap	1709548				6
Special gage for tapped hole	1709568				7
Cross thread gage	-				8
Torque check plug	HC22845				9
Torque adapter	HC21743				10
Torquemaster	RR1704302 (all thread sizes)				11
Torque setting rig	1702173				12

31119

Wirethread and Repair Tools
Figure 209 (Sheet 3)

REPAIR INSERTS					
Insert Unified Size	No. 10	0.250 in.	0.3125 in.	0.375 in.	Item No.
Threads/in.	32	28	24	24	-
Special drill	HU12680	HU12681	HU12682	HU12683	9
Counterbore cutter	HU15980	HU15981	HU15982	HU15983	10
Tap	GU11416	GU11418	GU11419	GU11420	11
Insert driver	HU12675	HU12676	HU12677	HU12678	12
TOOLS FOR HAND CUTTING					
Pilot screw	HU15963	HU14808	HU14829	HU15971	13
Counterbore cutter	HU15964	HU15968	HU14832	HU15972	14
Counterbore stop	HU15965	HU15969	HU15970	HU15973	15
Hollow cutter	HU15966	HU14706	HU14831	HU15974	16
Radius cutter	HU15967	HU14798	HU14830	HU15975	17

31120

Wirethread and Repair Tools
Figure 209 (Sheet 4)

WIRETHREAD INSERTS				
Nominal Unified Thread Size	Threads/in.	Length of Insert	Rolls-Royce Part No.	
			*Screw Lock-Type	*Free Running-Type
No. 4	40	1D	U780200	U140302
		1-1/2D	U780201	U140342
		2D	U780202	U140382
		2-1/2D	U780203	U140422
No. 6	32	1D	U780205	U140303
		1-1/2D	U780206	U140343
		2D	U780207	U140383
		2-1/2D	U780208	U140423
No. 8	36	1D	U780215	U140004
		1-1/2D	U780216	U140044
		2D	U780217	U140084
		2-1/2D	U780218	U140124
No. 10	32	1D	AGS3706	U140005
		1-1/2D	AGS3731	U140045
		2D	AGS3756	U140085
		2-1/2D	AGS3781	U140125

D = Nominal diameter of insert
* = The part numbers in these columns are not alternatives

31121

Wirethread and Repair Parts
Figure 210 (Sheet 1)

WIRETHREAD INSERTS				
Nominal Unified Thread Size	Threads/in.	Length of Insert	Rolls-Royce Part No.	
			*Screw Lock-Type	*Free Running-Type
0.250 in.	28	1D	AGS3707	U140006
		1-1/2D	AGS3732	U140046
		2D	AGS3757	U140086
		2-1/2D	AGS3782	U140126
0.3125 in.	24	1D	AGS3708	U140007
		1-1/2D	AGS3733	U140047
		2D	AGS3758	U140087
		2-1/2D	AGS3783	U140127
0.375 in.	24	1D	AGS3709	U140008
		1-1/2D	AGS3734	U140048
		2D	AGS3759	U140088
		2-1/2D	AGS3784	U140128
0.4375 in.	20	1D	AGS3710	U140009
		1-1/2D	AGS3735	U140049
		2D	AGS3760	U140089
		2-1/2D	AGS3785	U140129
0.500 in.	20	1D	AGS3711	U140010
		1-1/2D	AGS3736	U140050
		2D	AGS3761	U140090
		2-1/2D	AGS3786	U140130

31122

D = Nominal diameter of insert
* = The part numbers in these columns are not alternatives

Wirethread and Repair Parts
Figure 210 (Sheet 2)

REPAIR INSERTS			
Wirethread Insert Unified Size	Threads/in.	Length of Insert	Rolls-Royce Part No.
No. 10	32	1D	KU37016
		1-1/2D	KU37107
		2D	KU37018
		2-1/2D	KU37019
0.250 in.	28	1D	KU37021
		1-1/2D	KU37022
		2D	KU37023
		2-1/2D	KU37024
0.3125 in.	24	1D	KU37026
		1-1/2D	KU37027
		2D	KU37028
		2-1/2D	KU37029
0.375 in.	24	1D	KU37031
		1-1/2D	KU37032
		2D	KU37033
		2-1/2D	KU37034

31123

D = Nominal diameter of insert

Wirethread and Repair Parts
Figure 210 (Sheet 3)

40444

CAPTIVE NUTS - MAINTENANCE PRACTICES

1. General
   A. This task gives the procedure to replace the damaged or loose captive nuts. This nut must be carefully removed from the component before a new nuts is installed.

TASK 70-42-19-912-001-R00

2. Remove and Replace Damaged or Loose Captive Nuts - FRS.3035
   A. General
      (1) For all parts where captive nuts are installed, refer to the Illustrated Parts Catolog.
   B. Equipment
      (1) Hand grinder
      (2) Drill
   C. Procedure

S 912-002-R00

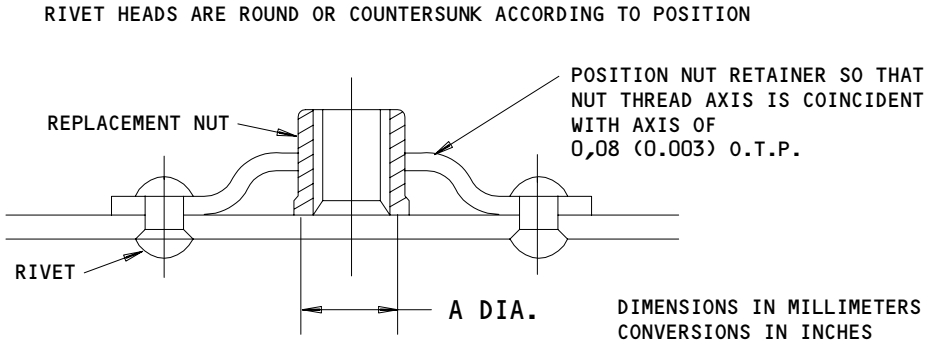
      (1) Do the steps that follow to replace the damaged or loose captive nuts.
         (a) Use a hand grinder to remove the rivets.

NOTE: Do not decrease the thickness of the part when you remove the rivet.

         (b) Put a bolt through the part and attach a new nut in the correct position.
         (c) Put the retainer plate in place.
         (d) Hold the retainer plate.
         (e) If it is necessary, drill the holes in the retainer plate.

NOTE: If you use larger rivets, use a drill to make the holes larger.

         (f) Install the new rivets.



Typical Section Through Captive Nut and Retaining Plate
Figure 201

(g) Remove the bolt.
(h) Make sure the captive nut is in the correct position.
(i) Do a penetrant crack test of the repair.

SEAL EXPOSED FIBERS ON FIBER REINFORCED COMPOSITES - MAINTENANCE PRACTICES

1. General
   A. This procedure gives instructions for a repair which seals all the fibers you can see on resin fiber composites. You must do the blend limits when you do this repair.

TASK 70-42-22-392-001-R00

2. Seal Exposed Fibers on Fiber Reinforced Composites - FRS.3254
   A. Consumable Materials
      (1) Degreasing fluid Inhibited 1.1.1. Trichloroethane
          British Spec./Ref - B.S. 4487: 1969
          OMat Item No. - 174
      (2) Resin, Araldite SV.409
          OMat Item No. - 805
      (3) Hardener, Versamid Polyamide 140
          OMat Item No. - 806
      (4) Lint Free Cloth
   B. Procedure

      S 112-007-R00

      WARNING: USE THE DEGREASING FLUID ONLY IN AREAS WITH A SUFFICIENT AIR SUPPLY.

      WARNING: KEEP THE COMPOUND AWAY FROM YOUR SKIN.

      (1) Clean the surface with a clean, lint free cloth which is moist with degreasing fluid.

      S 392-003-R00
      (2) Mix by weight 100 parts of the resin with 43 parts of the hardener.

      S 392-004-R00
      (3) Make sure you fully mix the compound.

S 392-005-R00
(4) Apply a thin layer of the compound to the prepared areas.

S 392-006-R00
(5) Let the compound dry for 24 hours at approximately 72°F (22°C).

S 372-002-R00
(6) Replace the surface protection.

ACCEPTABLE CRACKS, STOP DRILLING (FRS.3255) - MAINTENANCE PRACTICES

1. General
   A. This procedure gives the instructions for the repair of a crack. Use this procedure only when it is referred to in an inspection.

TASK 70-42-26-912-001-R00

2. Acceptable Cracks, Stop Drilling
   A. Procedure

S 232-002-R00

(1) Do a crack test with a dye penetrant to make sure the crack is not larger than the applicable limits.

S 352-003-R00

(2) Drill a 0.032 inch (0.8128 mm) diameter hole at the end of the crack.

S 352-004-R00

(3) Make the hole smooth.

S 232-005-R00

(4) Do a crack test with a dye penetrant to make sure the crack stops at the hole.

S 932-006-R00

(5) Vibro-engrave "FRS.3255" adjacent to the part number.

CONNECTION OF ELECTRICAL PLUGS - MAINTENANCE PRACTICES

1. General

A. An incorrect connection between the plug and the receptacle can permit them to become wet. This will cause incorrect electrical signals or failure of the circuits. Follow these instructions to prevent problems.

TASK 70-50-02-912-001-R00

2. Connection of the Electrical Plugs

A. Equipment

(1) Connector Pliers - Rolls-Royce 1702424 or Glen Air TG-69 (Glen Air Inc., Glendale, California, U.S.A. and Glen Air International Park Works, Mansfield, Nottinghamshire, U.K.)

(2) Nylon Jaws for Pliers - Rolls-Royce 1702425 or Glen Air G77015

(3) Compressed Air supply - clean, dry (not more than 15 psi)

B. Consumable Materials

(1) Cleaning fluid (Isopropanol alcohol)
British Spec - 'Analar' grade
OMat No. - 1/119

(2) BO1163 Lintfree cloth

(3) Disposable Cleaning tissues
British Spec - Kim wipe (No.3435)
OMat No. - 2/67

(4) Lockwire
British Spec - DTD 189A, 22 S.W.G
American Spec - 21 A.W.G.
OMat No. - 238

C. Prepare for the Connection

S 432-002-R00

(1) Remove the end caps from the plug and the receptacle.

S 552-003-R00

(2) Keep the end caps in a clean dry container.

S 212-021-R00

(3) Examine the plug and the receptacle for liquid or solid contamination.

S 112-022-R00

WARNING: USE THE CLEANING FLUID ONLY IN AREAS WITH A SUFFICIENT FLOW OF AIR.

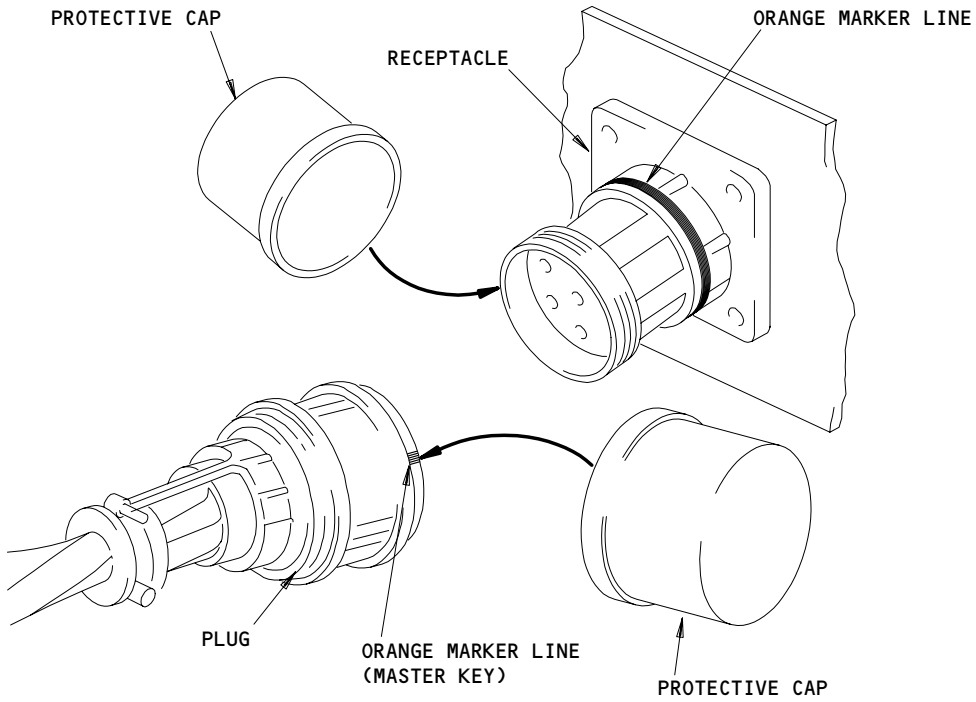
KEEP THE CLEANING FLUID AWAY FROM YOUR SKIN.

TO BREATHE OR TOUCH THE CLEANING FLUID IS DANGEROUS TO YOUR HEALTH.

(4) If you find contamination, clean the plug and the receptacle as follows:
   (a) Apply the cleaning fluid with a brush or a spray gun to remove the contamination.
   (b) Remove the unwanted fluid as follows:
      1) Use a lintfree cloth or tissues to absorb the unwanted fluid.
      2) Or use compressed air to remove the fluid.
   (c) Dry the surfaces with clean dry air.

S 212-006-R00

(5) Examine the harness plugs and receptacles.
   (a) Look for damaged parts or parts which have corrosion.



44833

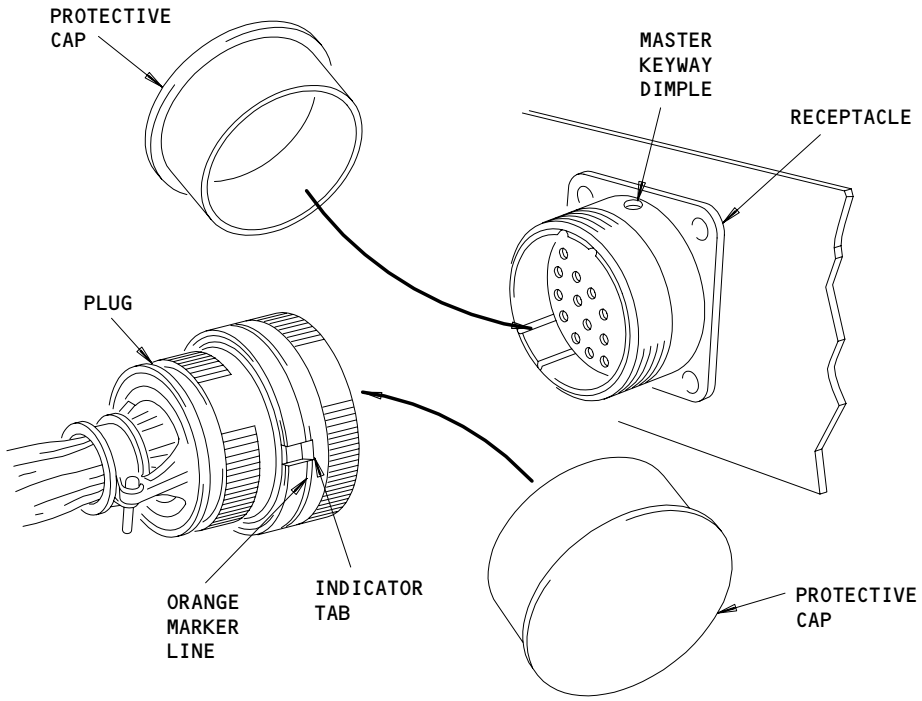
Pyle-National Plug and Receptacle
Figure 201

(b) Examine the inserts.
1) Make sure that the inserts have not become larger in dimension.
2) Make sure that the inserts do not have oil contamination.
3) Make sure that the inserts have no other damage.
(c) Repair or replace the inserts, if it is necessary (Ref WDM 20-21-00 Assembly and maintenance of electrical connectors).

S 212-007-R00
(6) Examine the receptacles which are installed on the unit.
(a) Look for damaged parts or parts which have corrosion.
(b) Examine the inserts.
1) Make sure that the inserts have not become larger in dimension.
2) Make sure that the inserts do not have oil contamination.
3) Make sure that the inserts have no other damage.
(c) Repair or replace the inserts, if it is necessary (Ref relevant Vendor's Overhaul Manual).

D. Connection of the Pyle-National Plug (Fig. 201)

S 822-008-R00
(1) Align the orange line on the master key of the plug with the receptacle master key.



Matrix Plug and Receptacle
Figure 202

S 822-009-R00
(2) Apply a light force to engage the plug in the receptacle.

S 862-029-R00
(3) Make sure that you engage the threads correctly.

S 432-025-R00
(4) Turn the knurled nut of the plug clockwise to engage the threads of the receptacle.

S 822-010-R00

CAUTION: TURN THE KNURLED NUT UNTIL YOU CAN NOT SEE THE ORANGE LINE ON THE RECEPTACLE. THIS WILL MAKE SURE THE NUT IS INSTALLED CORRECTLY.

(5) Continue to turn the nut until the orange line on the receptacle goes out of view and you hear the first click of the nut.

S 432-027-R00
(6) Tighten the nut one-quarter to one-third of a turn more and then stop.

S 432-028-R00
(7) If it is necessary, install lockwire.

E. Connection of the Matrix Plug (Fig. 202).

S 822-015-R00
(1) Align the master key on the plug with the master keyway dimple on the receptacle.

S 822-016-R00
(2) Apply a light force to engage the plug in the receptacle.

NOTE: The blue line on the receptacle is not a stop line.

S 822-017-R00
(3) Make sure that you engage the threads correctly.

S 432-023-R00
(4) Tighten the nut with pliers.

S 432-024-R00
(5) Make sure that the indicator tab in the cut-away part of the knurled ring aligns with the orange line.

WIRE IDENTIFICATION MARKER - MAINTENANCE PRACTICES

1. General
   A. This standard practice gives the procedure to repair or put on new identification markers.
   B. The identification markers are on the harness near each pin.
   C. The harness identification marker is at one location on the harness.
   D. Identification of the wire harness parts:
      (1) Wire - A single electrical conductor with insulation around it.
      (2) Cable - A group of wires in a metal shield and an insulated jacket.
      (3) Harness - One or more cables with connectors or terminal lugs attached to the ends of the cables.
   E. Consumable materials can be replaced with equivalent items.

TASK 70-50-03-352-004-R00

2. Repair of the Wire Identification Markers
   A. Consumable Materials
      (1) G02410 Tape, Adhesive, Electrical - Scotch No. 69 (OMAT 296)
      (2) G02426 Pen, Ballpoint, Black - DIN 16 554/2 (OMAT 2/134)
   B. Procedure

      S 012-005-R00

      WARNING: DO NOT USE HEAT GUNS, SOLDERING GUNS OR SOLDERING IRONS FOR ON-WING REPAIRS. THEY ARE NOT RESISTANT TO EXPLOSIONS AND CAN CAUSE INJURY TO INDIVIDUALS OR DAMAGE TO EQUIPMENT.

      (1) Cut and remove the black identification sleeve.

      S 932-002-R00

      (2) Wind two layers of G02410 tape, Scotch No. 69 (OMAT 296) around the harness at the position the sleeve was removed from.

      S 932-003-R00

      (3) Use the G02426 Pen, DIN 16 554/2 (OMAT 2/134) to write the new identification number on the tape.

MODULAR TERMINAL BLOCK/TERMINAL BLOCK PINS - MAINTENANCE PRACTICES

1. General
   A. This standard practice gives the procedure for the removal and the installation of the Modular Terminal Block/Terminal Block Pins.

TASK 70-50-04-022-017-R00

2. Removal of the Modular Terminal Block/Terminal Block Pins
   A. Equipment
      (1) Tool - Insertion/Extraction, No. 16 Gauge
   B. Procedure

S 212-007-R00

(1) Determine which end of the tool is required for the removal of the block pins.

NOTE: The white portion of the tool is usually used for extraction but the tool is also marked.

S 022-009-R00

(2) Insert the wire in the extraction side of the tool.

S 022-010-R00

(3) Push the tool into the Modular Terminal Block/Terminal Block Pin.

S 022-011-R00

(4) Hold the wire against the serration of the tool and carefully pull the tool and the pin from the matrix block.

TASK 70-50-04-422-018-R00

3. Installation of the Modular Terminal Block/Terminal Block Pins
   A. Procedure

S 212-008-R00

(1) Determine which end of the tool is required for the insertion of the block pins.

NOTE: The tool is marked accordingly.

S 422-012-R00

(2) Place the pin in the applicable hole of the Modular Terminal Block/Terminal Block.

S 422-013-R00
(3) Put the wire in the insertion side of the tool, until the tool is against the shoulder of the pin.

S 422-014-R00
(4) Push down on the insertion tool until the pin clicks in position.

S 082-015-R00
(5) Remove the insertion tool from the Modular Terminal Block/Terminal Block.

S 212-016-R00
(6) Make sure that the pin is installed correctly.

WIRE HARNESS LACING PROCEDURE - MAINTENANCE PRACTICES

1. General
   A. This standard practice gives the procedure to tie the harness with lacing tape.
      (1) Identification of the wire harness parts is as follows:
         (a) Wire - A single electrical conductor with insulation around it.
         (b) Cable - A group of wires in a metal shield and an insulated jacket.
         (c) Harness - One or more cables with connectors or terminal lugs attached to the ends of the cables.
      (2) Make the cables in the wire bundle as straight as possible with a minimum of twists.
      (3) Before you repair a harness, make a note of the position(s) of the lacing tape.

         NOTE: The lacing tape must be installed in the same positions after the repair.

      (4) The distance between the individual laces on the wire bundle is a maximum of 2.00 inches (50.8 mm).
      (5) A bundle of two or more cables must be laced together.
      (6) Consumable materials can be replaced with equivalent items.

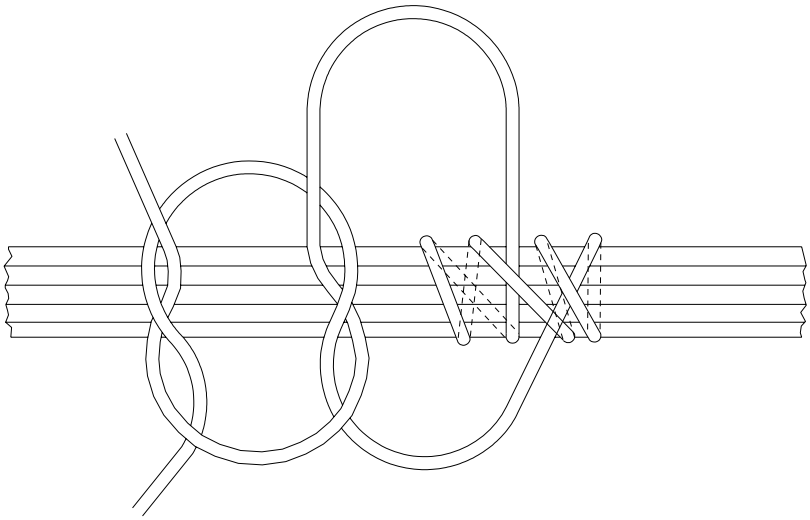
   TASK 70-50-05-912-012-R00

2. Wiring Harness Lacing Procedures
   A. Consumable Materials
      (1) Tape, Lacing and Tying - OMat 2/140
      (2) Tape, Lacing and Tying - OMat 274
   B. Procedure

      S 912-009-R00

      CAUTION: DO NOT TIE THE KNOT TOO TIGHT. IF YOU DO, YOU CAN CUT OR GO THROUGH THE CONDUCTOR JACKET OR INSULATION OF THE CABLE.

      (1) Install the lacing tape on the harness (Fig. 201).
         (a) Make the cables in the harness as straight as possible, with a minimum of twists before the lacing is installed.
         (b) Use the lacing tape to tie the harness at intervals of 2.00 inches (50.8 mm) maximum along its length.
         (c) Cut the two ends of the lacing tape between 0.25 and 0.50 inch (6.35 and 12.7 mm) from the knot.



Lacing Procedure for Electrical Harness
Figure 201

S 912-008-R00

(2) Install the harness breakout support ties (breakouts other than 90 degrees) (Fig. 202).

NOTE: The support ties must be installed on the harness before and after each harness breakout. All wire harness breakouts must be in the same plane as the harness centerline and go along the same direction of the breakout.

(a) Make the cables in the harness as straight as possible, with a minimum of twists before the lacing is installed.
(b) Use the lacing tape and tie a clove hitch around the larger harness.
(c) Make six whips (make in the shape of an eight, see Fig. 202) around the two harnesses.
(d) Thread lacing tape between the two harnesses and make three frapping lashings around the center of the whips.

NOTE: Pull tight after each lashing.

CAUTION: DO NOT TIE THE KNOT TOO TIGHT. IF YOU DO, YOU CAN CUT OR GO THROUGH THE CONDUCTOR JACKET OR INSULATION OF THE CABLE.

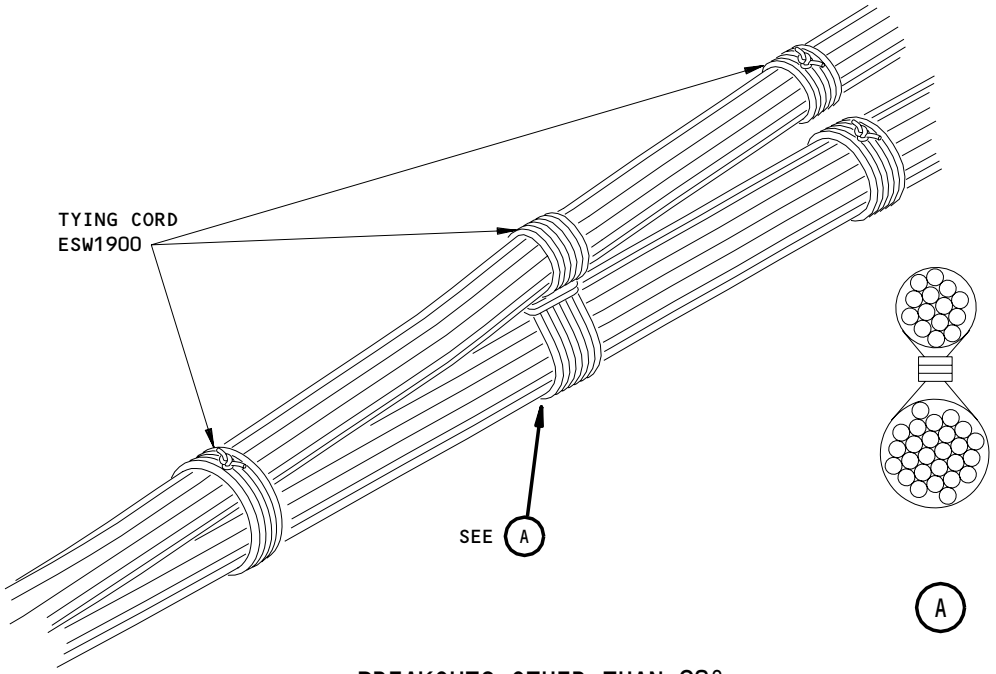
(e) On completion of the lashing, use a reef knot to tie the lacing tape.
(f) Cut the two ends of the lacing tape between 0.25 and 0.50 inch (6.35 and 12.7 mm) from the knot.

S 912-010-R00

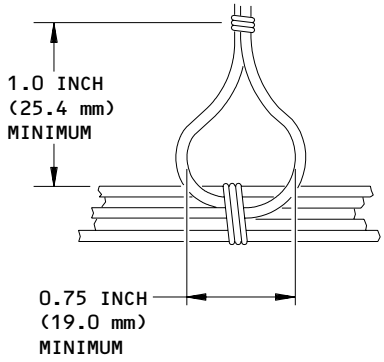
(3) Install harness breakout support ties (90 Degree breakouts) (Fig. 202).
(a) Use the lacing tape to tie the harness.
(b) Install the ties as shown in Fig. 202.
(c) Cut the two ends of the lacing tape between 0.25 and 0.50 inch (6.35 and 12.7 mm) from the knot.

S 912-011-R00

(4) Install harness junction ties (Fig. 203).
(a) At two bunch junctions, or where harnesses cross, put end B of the tie between the largest and the smallest bunches of cables (Detail 1).
(b) Put end B one turn around the smallest bunch, then put it again between the bunches.

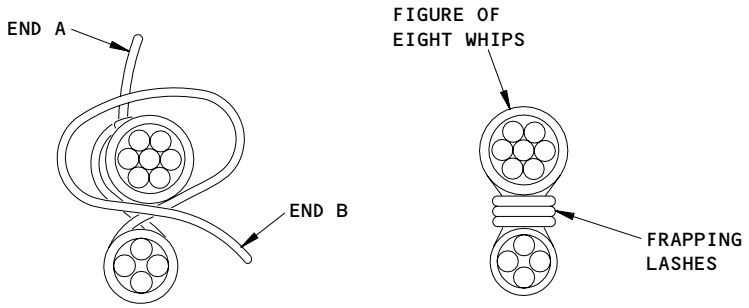


BREAKOUTS OTHER THAN 90°

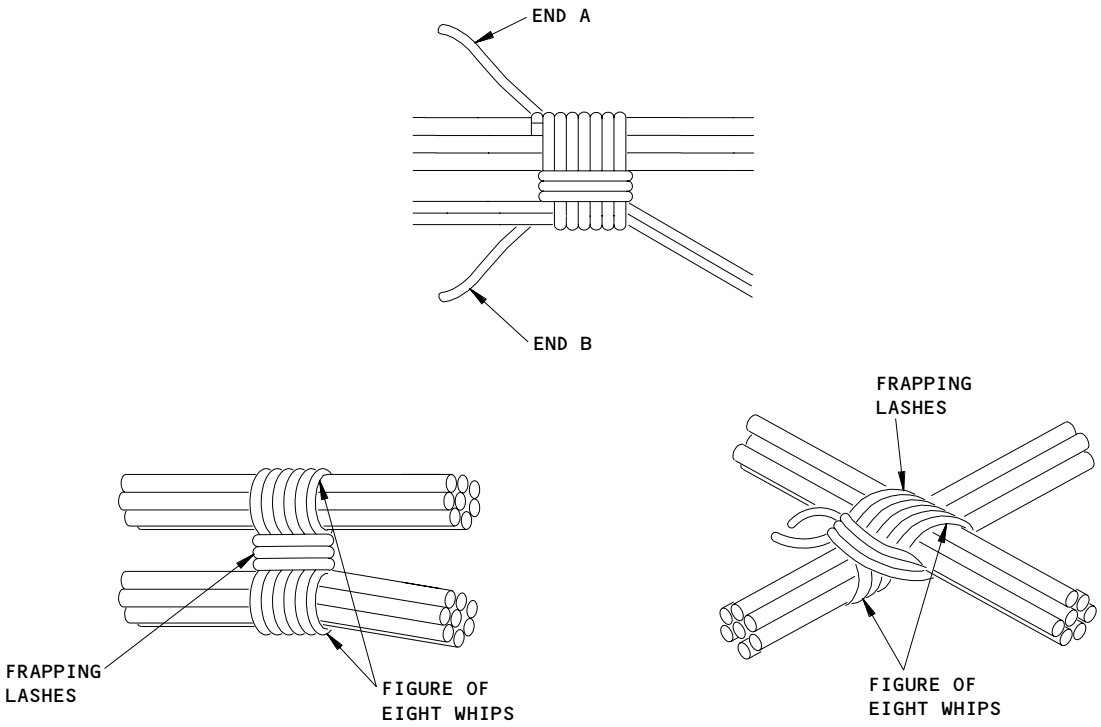


BREAKOUT AT 90°

Lacing Procedure for Electrical Harness/Breakout Support Ties
Figure 202



DETAIL 1



IN-LINE HARNESSES

HARNESS CROSSOVER

DETAIL 2

Lacing Procedure for Electrical Harness/Junction Ties
Figure 203

(c) Put end B one turn around the largest bunch and return the tie to the start position.

NOTE: This makes a "figure of eight" whip.

(d) Pull the tie tight.
(e) Do the four above steps five more times.
(f) Put end B around the back of the "figure of eight" whips, then between the bunches to make a "frapping lash" (Detail 2).
(g) Pull the tie tight.
(h) Do the two above steps two more times.
(i) Put end B back to the start position, then make a square knot in the tie.
(j) Cut the ends of the tie 0.32 inch (8 mm) away from the knot.

TEMPORARY TAPE REPAIR TO CABLE OUTER OUTER PROTECTIVE JACKET

1. General
   A. This procedure has one task.
      (1) This task is the correct procedure to do a Temporary Tape repair of the Cable Outer Protective Jacket.

TASK 70-50-06-702-001-R00

2. Temporary Tape Repair - Outer Protective Jacket
   A. General
      (1) This standard practice gives the instructions to do a temporary tape repair of the cable outer protective jacket.
      (2) You can do this temporary repair only if these limits apply:
         (a) There is no damage to the:
            1) Wire conductor below the outer protective jacket.
            2) Metal braided shield below the outer protective jacket.
         (b) The damage is not more than 50% of the circumference of the outer protective jacket.
         (c) The damage to the outer protective jacket is not more than 2 inches (50 mm) long.
      (3) If the damage to the cable is more than the above limits, you must do a cable splice repair, overtie a replacement cable, or replace the damaged cable.
      (4) You must replace the damaged cable at the next engine overhaul shop visit.
      (5) Identification of the harness parts:
         (a) Wire - A single electrical conductor with an outer protective jacket,
         (b) Cable - A group of wires with a metal braided shield and an outer protective jacket. As well as a group of wires with an outer protective jacket only.
         (c) Harness - One or more cables with connectors or terminal lugs attached to the ends of the cables.
   B. Consumable Materials
      (1) Isopropyl alcohol, 0Mat 1/40
      (2) Disposable Cleaning tissue, 0Mat 2/67

(3) Electrical Tape (Scotch 92), OMat 2/147
(4) Electrical Tape, (Scotch 62), OMat 2/30A
(5) Lacing Tape, OMat 2/140
(6) Black Ball Point Pen, OMat 2/134
(7) Fiberglass Tape (Scotchboy 69), OMat 296

C. References
(1) AMM 24-22-00/201, Electrical Power
(2) AMM 70-50-03/201, Wire Identification Marker
(3) AMM 70-50-05/201, Wire Harness Lacing Procedure

D. Procedure

S 942-006-R00

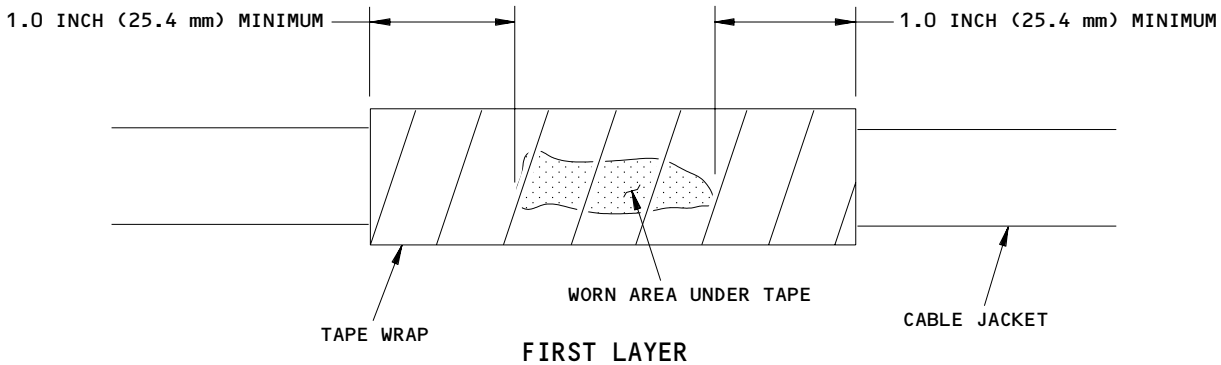
WARNING: DO NOT USE HEAT GUNS, SOLDERING GUNS, OR SOLDERING IRONS FOR THE ON-WING REPAIRS. THEY ARE NOT RESISTANT TO EXPLOSIONS AND CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

WARNING: YOU MUST FIND AND OBEY THE MANUFACTURER'S HEALTH AND SAFETY DATA FOR THE MATERIALS. YOU MUST ALSO REFER TO LOCAL REGULATIONS TO MAKE SURE THAT THE PROCEDURES ARE DONE SAFELY. IF YOU DO NOT DO THIS, AN INJURY OR ENVIRONMENTAL DAMAGE CAN OCCUR.

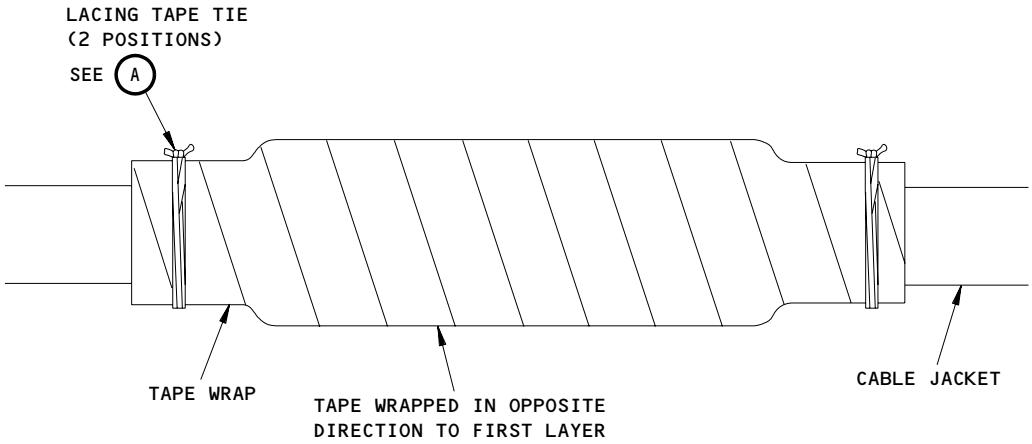
(1) Disconnect electrical power (AMM 24-22-00/201).

S 352-003-R00

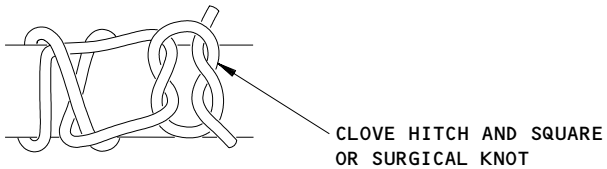
(2) Repair the damaged cables (Fig. 201).
(a) Identify the damaged area of the cable.
1) Release the harness clips (clamps), as necessary, to get access to the damaged cable. Make a record of the position of any clips (clamps) removed.
2) Remove Lacing Tape, as necessary, to get access to the damaged cable. Make a record of the position of any Lacing Tape removed.
(b) Use OMat 2/67 Disposable Cleaning Tissue and OMat 1/40 Isopropyl Alcohol to clean the cable 3.0 inch (75.00 mm) on each side of the damaged area.
(c) Wind one continuous layer of the OMat 2/147 (Scotch 92) Electrical Tape around the cable to be repaired with a 20 percent overlap on each turn (Fig. 201).
1) The OMat 2/147 (Scotch 92) Electrical Tape must continue for 1.0 inch (25.00 mm) more than the damaged area of the outer protective jacket in each direction.



FIRST LAYER



SECOND LAYER



LACING TAPE TIE

A

DEF0000892

Tape Repair to Cable Outer Jacket
Figure 201

(d) In the opposite direction, wind one layer of the OMat 2/30A (Scotch 62) Electrical Tape around the cable to be repaired with a 20 percent overlap on each turn.
1) Make sure the second layer of OMat 2/147 (Scotch 92) Electrical Tape continues for 0.5 inch (12.70 mm) more than the first layer of OMat 2/147 (Scotch 92) Electrical Tape in each direction.
(e) Make a clove hitch with the OMat 2/140 Lacing Tape and a square knot at each end of the OMat 2/30A (Scotch 62) Electical Tape.
(f) Cut the end of the OMat 2/140 Lacing Tape between 0.25 - 0.50 inch (6.25 - 12.70 mm) from the knot.
(g) Tie the harness. Use the record made to replace the OMat 2/140 Lacing Tape on the harness. Use the OMat 2/140 Lacing Tape (AMM 70-50-05/201).
(h) Use the record made to install any harness clips (clamps), removed to get access to the repair area.

S 762-004-R00

(3) Do a wire continuity check and insulation resistance check.
(a) Do a wire continuity check.

CAUTION: EACH CONNECTOR ON THE CIRCUIT THAT MUST HAVE A TEST MUST BE DISCONNECTED. IF THE CONNECTORS ARE NOT DISCONNECTED, UNSATISFACTORY RESISTANCE INDICATIONS OR DAMAGE TO THE CONNECTOR CAN OCCUR.

(b) Disconnect each connector on the damaged harness (AMM 70-50-02/210).

CAUTION: DO NOT BEND OR PUT STRESS ON THE CONTACTS. DAMAGE TO THE CONNECTOR OR CONTACTS MAY OCCUR.

(c) Measure the resistance of all the wires. Make sure that each circuit has continuity from one end of the wire to the other.
(d) Do an insulation resistance check.

WARNING: DO NOT USE A MEGOHMETER FOR THE INSULATION RESISTANCE TEST OF THE ON-WING REPAIR. INJURY TO PERSONNEL OR DAMAGE TO THE AIRPLANE CAN OCCUR.

(e) Make a selection of multimeter.
(f) Set the meter to the 100 megohm scale.

CAUTION: DO NOT BEND OR PUT STRESS ON THE CONTACTS. DAMAGE TO THE CONNECTOR OR CONTACTS MAY OCCUR.

(g) Attach one of the meter test leads to the contact assembly on the connector.

CAUTION: DO NOT BEND OR PUT STRESS ON THE CONTACTS. DAMAGE TO THE CONNECTOR OR CONTACTS MAY OCCUR.

(h) Attach the other meter test lead to a contact assembly on a wire that does not connect to the same circuit.
(i) Read the meter. Make sure that the resistance is a minimum of 100 megohm.
(j) Do the three steps above again for each contact in the connector.
(k) Attach one of the meter test leads to the connector shell.

CAUTION: DO NOT BEND OR PUT STRESS ON THE CONTACTS. DAMAGE TO THE CONNECTOR OR CONTACTS MAY OCCUR.

(l) Attach the other meter test lead to a contact assembly on the wire that must have the test.
(m) Read the meter. Make sure that the resistence is a minimum of 100 megohm.
(n) Do the three steps above again for each wire that must have a test.

CAUTION: YOU MUST NOT USE PLIERS TO CONNECT THE CONNECTOR. THE CONNECTORS MAY BE DAMAGED.

(o) Connect each connector on the repaired harness (AMM 70-50-02/201).

S 932-005-R00

(4) Identify the harness with the temporary repair number.
(a) Wind two layers of OMat 296 (Scotchboy 69) Fiberglass Tape around the harness adjacent to the repair.
(b) Use the OMat 2/134 Black Ball Point Pen to write the temporary repair scheme number FRS7220 om the OMat 296 (Scotchboy 69) Fiberglass tape.

TEMPORARY REPAIR OVERTIE A REPLACEMENT FRS7221

1. General
   A. This procedure has one task.
      (1) This task is the correct procedure to do a Temporary Splice Repair of a Damaged Cable.

TASK 70-50-07-912-001-R00

2. Temporary Splice Repair of a Damaged Cable
   A. General
      (1) You can do this temporary repair only if the limits given below apply:
         (a) Do not put a splice in a cable or a wire less than 6 in. (150 mm) from the backshell.
         (b) Do not put a splice where it changes the position of the harness or the harness clamps.
         (c) A splice is not permitted on the IDG feeder cable.
         (d) A splice is not permitted on any thermocouple cables.
         (e) A splice is not permitted on a low noise cable (Vibration pickup).
         (f) A splice is not permitted on the N1 and N2 compressor speed probe cables.
         (g) A splice is not permitted on the cable to the fuel shutoff valve or microswitch.
         (h) A splice is not permitted on any TRU cables.
         (i) A splice is not permitted on any fire detector wires.
         (j) A splice is not permitted on the cable connecting to the hydraulic pump depressurization solenoid valve.
         (k) A splice is not permitted on the cable that connects the Dedicated Generator to the PCCU.
         (l) A splice is not permitted on the FFG torque motor drive cables.
         (m) A splice is not permitted on the LVDT position feedback cables.
         (n) A splice is not permitted on the cable that controls the anti-ice valve.
         (o) Only one splice repair is permitted between adjacent cable clamps.
         (p) Do not put a splice below a clamp or drip loop.
         (q) A new cable must be overtied to replace the spliced cable at the next "C" check. The damaged cable must be replaced at the next shop visit.
         (r) A record of accomplishment must be kept in the engine log book.
      (2) If the limits above do not apply, you must replace the damaged cable immediately or overtie a replacement cable.
      (3) Identification of the wire harness parts.
         (a) Wire - A single electrical conductor with an insulated cover.

(b) Cable - A group of wires with a metal braided shield and cable insulation jacket or a group of wires with a cable insulation jacket only.
(c) Harness - One or more cables with connectors or terminal lugs attached to the ends of the cables.

(4) Refer to the Component Maintenance Manual (Electrical Harness) and the Engine Illustrated Parts List to find the wire number and cable part number.

NOTE: The replacement cable must be of the same type as the damaged cable. Make sure you keep wire colors the same.

(5) Harness lacing procedures are fully specified (AMM 70-50-05/201).

B. Equipment

(1) PART NUMBER	SUPPLIER	NOMENCLATURE	APPLICATION
Stripmaster 45092	30119	Wire Stripper	Strip the wire.
AMP46447	K1636	Wire Splice Crimp Tool	Used to crimp the Splice to the wires.
MS22520/5-01	11851	Crimp Tool	Used to crimp the ferrules to the wires.
MS22520/5-19	11851	Cable Ferrule Crimp Die	Used with the crimp tool. Orifice B used to crimp BACS13S205BNP ferrule.
MS22520/5-43	11851	Cable Ferrule Crimp Die	Used with the crimp tool. Orifice A used to crimp the BACS13S275CNP ferrule to the wires.
MS22520/5-45	11851	Cable Ferrule Crimp Die	Used with the crimp tool. Orifice A used to crimp the BACS13S250BNP ferrule to the wires.
MS22520/5-41	11851	Cable Ferrule Crimp Die	Used with the crimp tool. Orifice A used to crimp the BACS13S87BNP and the BACS13287CNP ferrule to the wires.
MS22520/5-35	11851	Cable Ferrule Crimp Die	Used with the crimp tool. Orifice A used to crimp the BACS13S348CNP ferrule.

C. Consumable Materials
(1) Tape - 3M Scotch, Copper Foil, Conductive Adhesive, 1181 X 1 in.
(2) Braid, Fire Resistant - Raychem TSX-4
(3) Braid, Fire Resistant - Raychem TSX-6
(4) Tape, Lacing and tying - OMat 2/140
(5) Electrical Tape - OMat 2/30A
(6) Electrical Tape - OMat 2/147
(7) Splice - AMP322326
(8) Isopropyl Alcohol - OMat 1/40
(9) Disposable Cleaning Tissue - OMat 2/67
(10)

PART NO.	DESIGNATION
BACS13S205BNP	Inner ferrule for use with RTS64721 2-core 20AWG cable and RTS52156 2-core 18AWG cable.
BACS13S250BNP	Inner ferrule for use with RTS68381 2-core 18AWG cable and RTS52156 3-core 18AWG cable.
BACS13S287BNP	Inner ferrule for use with RTS65046 3-core 16AWG cable.
BACS13S275CNP	Outer ferrule for use with RTS64721 2-core 20AWG cable.
BACS13S287CNP	Outer ferrule for use with RTS68381 2-core 18AWG cable.
BACS13S348CNP	Outer ferrule for use with RTS65046 3-core 16AWG

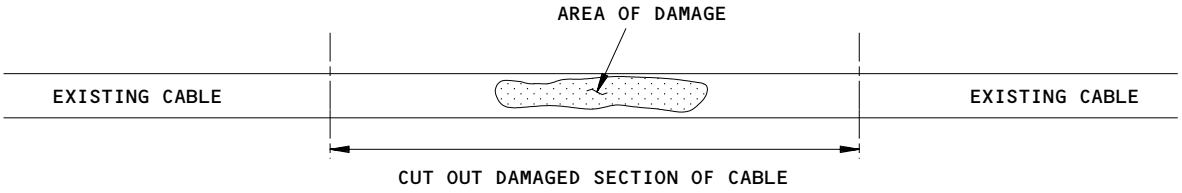
D. Procedure

NOTE: This procedure is for a 2 wire cable. If you put a splice in a 3 wire cable, make sure the insulation edges of all three splices are at least 0.60 in. (15.0 mm) away from each other. For a splice in a 1 wire cable, use this procedure but do not do the instructions for the second wire.

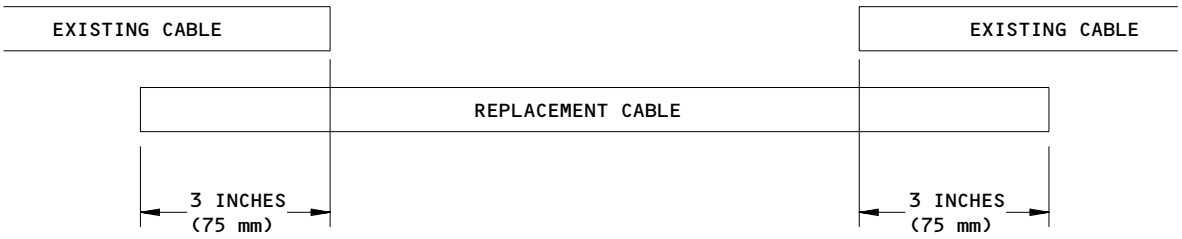
NOTE: This procedure can be used to allow a single splice and replacement of a section of cable whose free end is to be fed directly into a connector. The procedure should be used in conjunction with FRS7222, Overtie a Replacement Cable (AMM 70-50-08/201).

S 912-006-R00
(1) Remove electrical power (AMM 24-22-00/201).

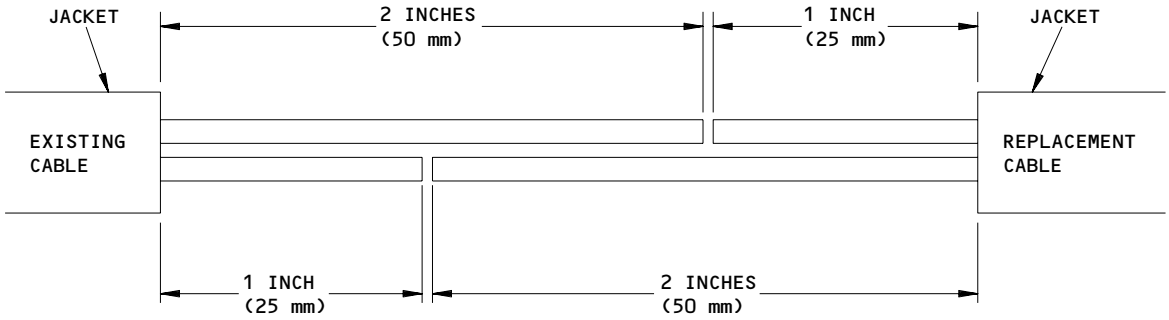
1. IDENTIFY DAMAGED AREA OF CABLE AND CUT OUT.



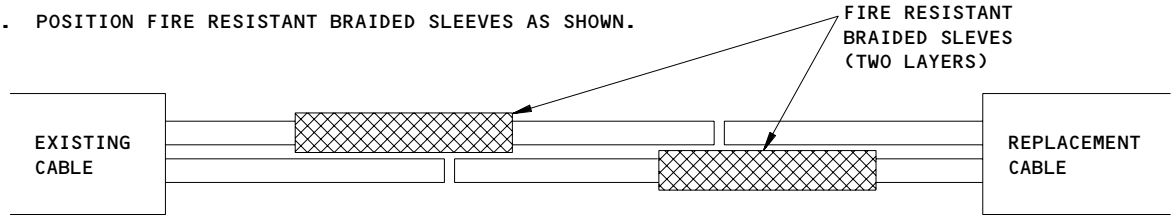
2. CUT REPLACEMENT CABLE TO DIMENSIONS SHOWN.



3. PREPARE BOTH ENDS OF EXISTING CABLE AND BOTH ENDS OF REPLACEMENT CABLE AS SHOWN.



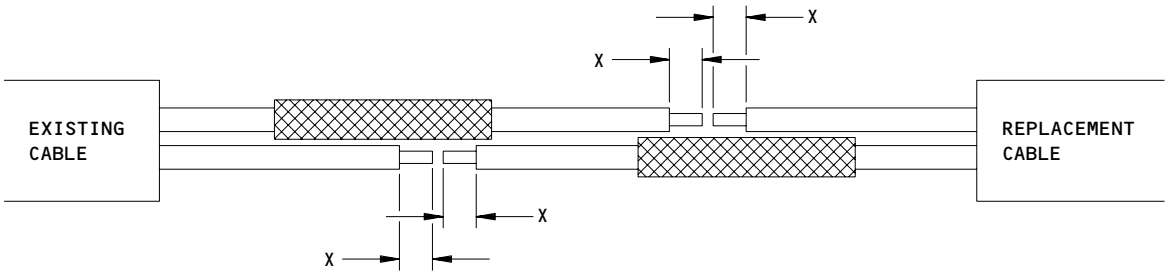
4. POSITION FIRE RESISTANT BRAIDED SLEEVES AS SHOWN.



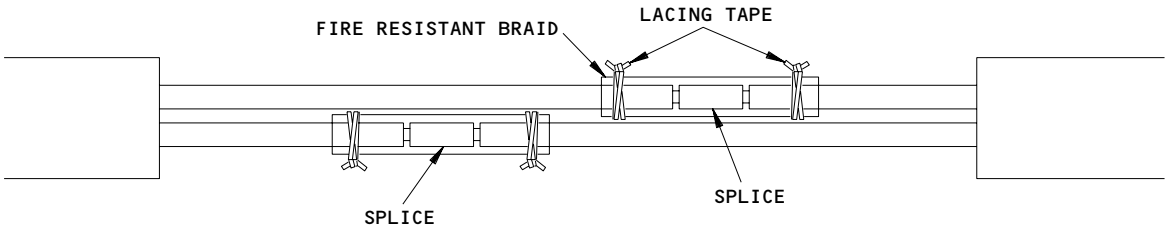
DER0009602

Temporary Splice Repair
Figure 201 (Sheet 1)

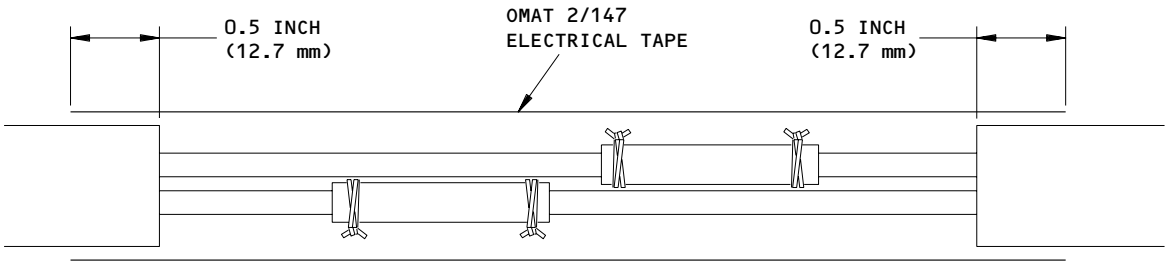
5. PREPARE BOTH ENDS OF EXISTING CABLE AND BOTH ENDS OF REPLACEMENT CABLE AS SHOWN.
STRIP LENGTH X = 0.25 INCH (6.35 mm) MINIMUM, 0.28 INCH (7.14 mm) MAXIMUM.



6. INSERT STRIPPED ENDS IN SPLICE AND CRIMP IN POSITION.
REPOSITION THE FIRE RESISTANT BRAIDS AND SECURE WITH LACING TAPE.



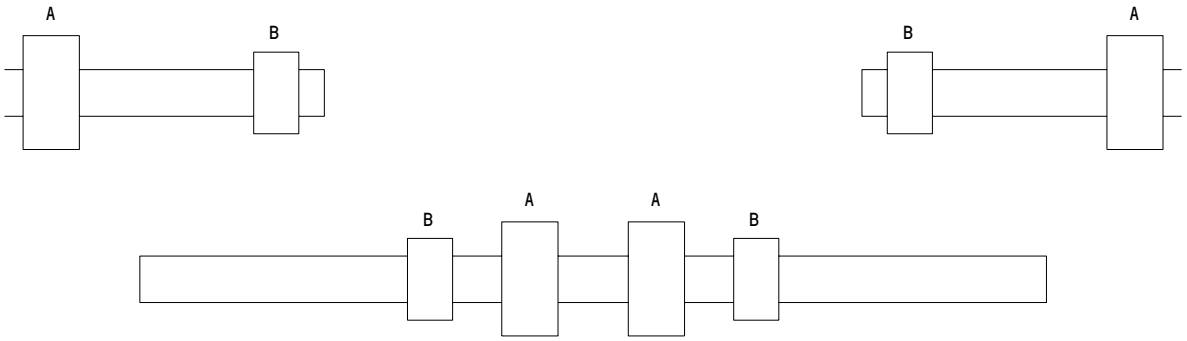
7. PUT THE OMAT 2/147 ELECTRICAL TAPE IN POSITION.



DER0009603

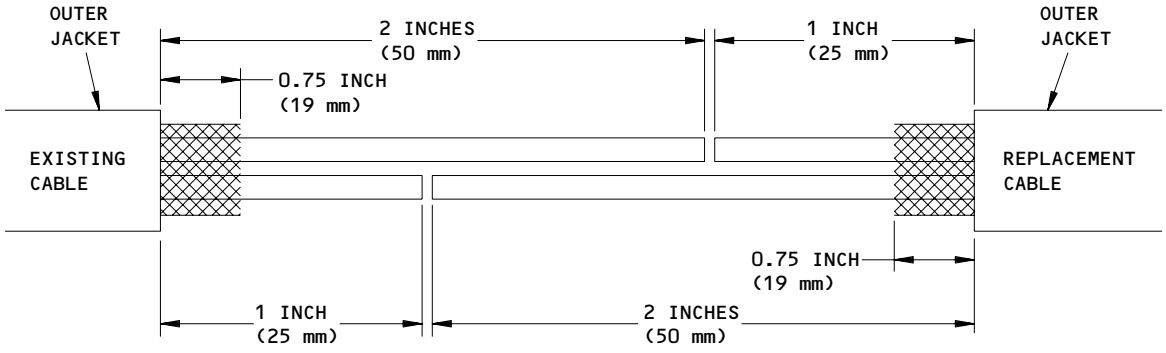
Temporary Splice Repair
Figure 201 (Sheet 2)

8. POSITION SPLICE REPAIR PARTS ON CABLES AS SHOWN.

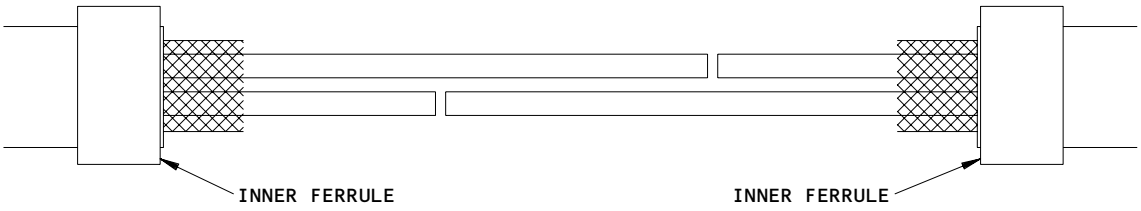


A OUTER FERRULE
B INNER FERRULE

9. PREPARE BOTH ENDS OF EXISTING CABLE AND BOTH ENDS OF REPLACEMENT CABLE AS SHOWN.



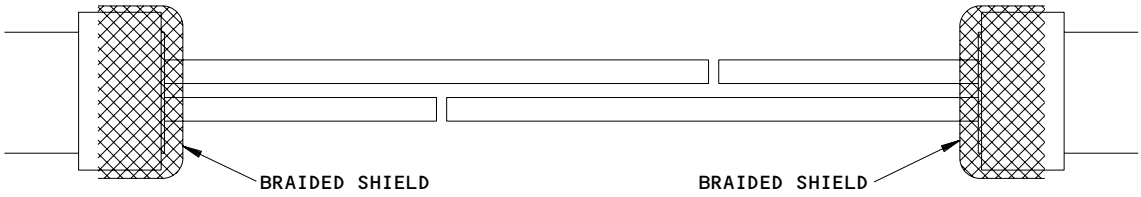
10. CRIMP INNER FERRULES B IN POSITION AS SHOWN.



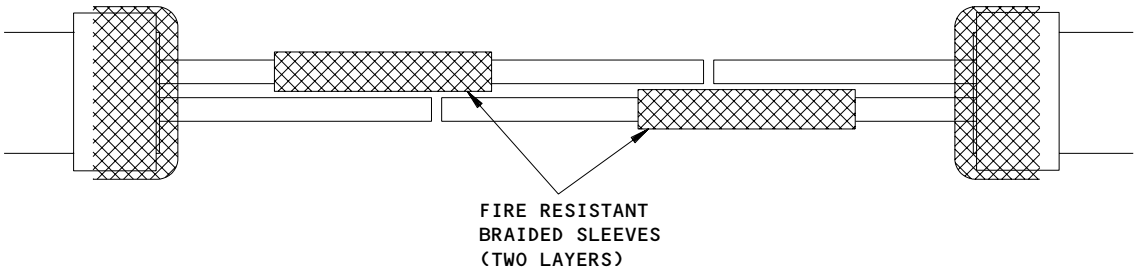
DER0009604

Temporary Splice Repair
Figure 201 (Sheet 3)

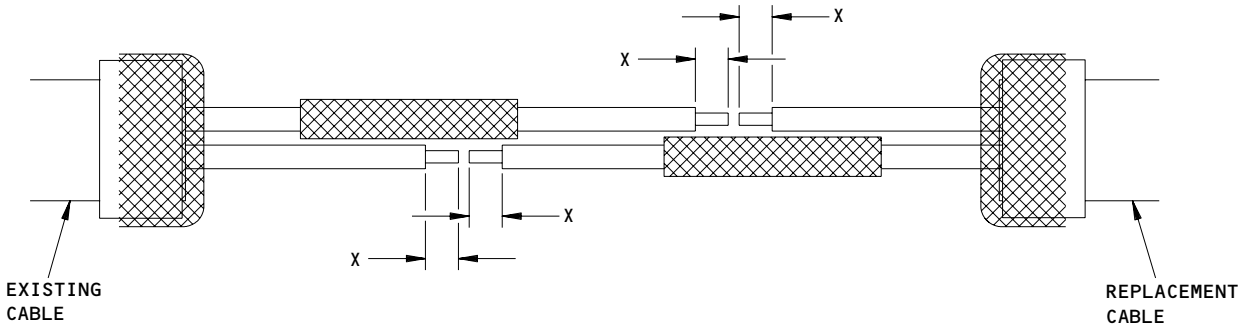
11. FOLD BACK BRAIDED SHIELDS OVER INNER FERRULES AS SHOWN.



12. POSITION FIRE RESISTANT BRAIDED SLEEVES AS SHOWN.



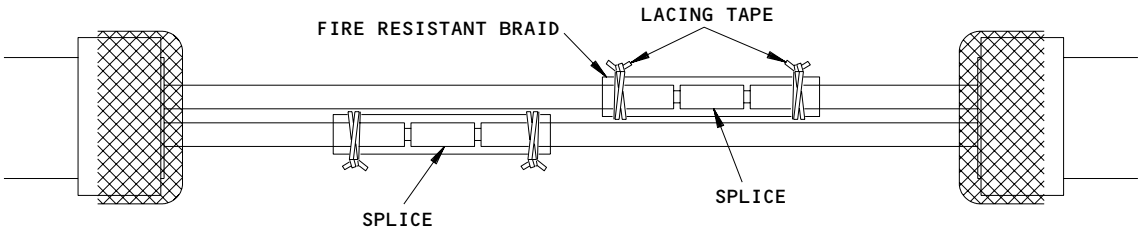
13. PREPARE BOTH ENDS OF EXISTING CABLE AND BOTH ENDS OF REPLACEMENT CABLE AS SHOWN.
STRIP LENGTH X = 0.25 INCH (6.35 mm) MINIMUM, 0.28 INCH (7.14 mm) MAXIMUM.



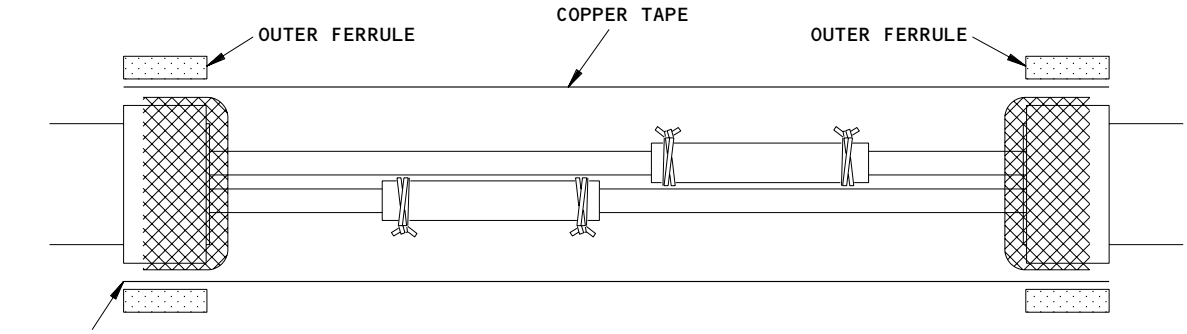
DER0009605

Temporary Splice Repair
Figure 201 (Sheet 4)

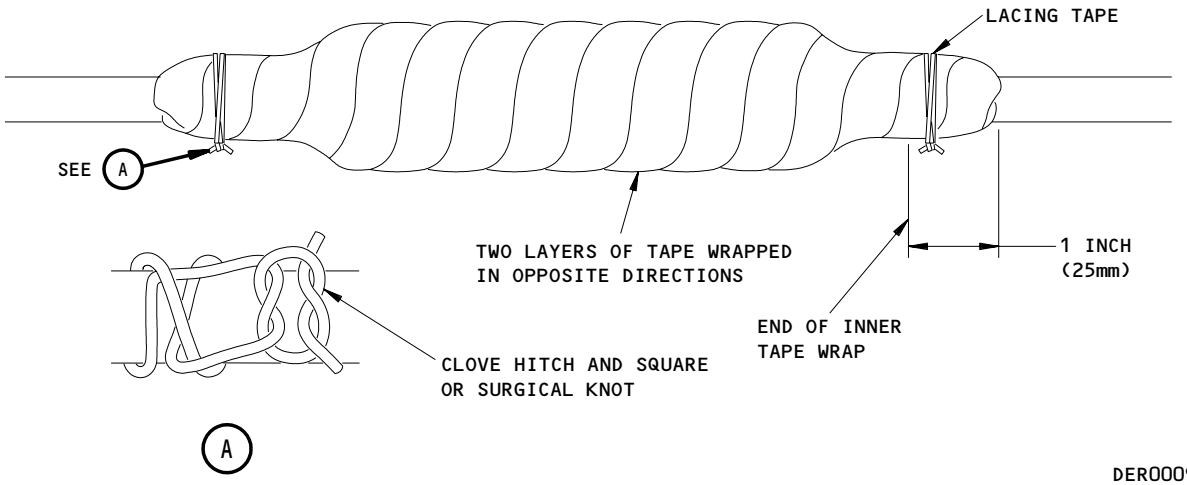
14. INSERT STRIPPED ENDS IN SPLICE AND CRIMP IN POSITION.
REPOSITION THE FIRE RESISTANT BRAIDS AND SECURE WITH LACING TAPE.



15. PUT THE COPPER TAPE IN POSITION AND CRIMP THE OUTER FERRULES A OVER THE INNER FERRULES B AS SHOWN.



16. PUT ELECTRICAL TAPE TO THE INSTRUCTIONS OVER THE SPLICE REPAIR. USE LACING TAPE AS SHOWN.



DER0009606

Temporary Splice Repair
Figure 201 (Sheet 5)

S 932-007-R00
(2) Release the clips (clamps), as necessary, to get access to the damaged cable.
(a) Make a record of the position of the clips (clamps) that you have removed.

S 932-008-R00
(3) Remove the OMat 2/140 Lacing Tape, as necessary, to get access to the damaged cable.
(a) Make a record of the position of the OMat 2/140 Lacing Tape that you have removed.

S 022-009-R00
(4) Cut, remove, and discard the damaged part of the cable from the harness (Fig. 201).

NOTE: You must repair one cable at a time.

S 912-010-R00
(5) CABLES WITH A CABLE INSULATION JACKET ONLY;
Prepare the two ends of the damaged cable (Fig. 201).
(a) You must do these steps at each end of the damaged cable.

WARNING: BE CAREFUL WHEN YOU USE ISOPROPYL ALCOHOL. ISOPROPYL ALCOHOL IS FLAMMABLE AND DANGEROUS TO THE SKIN, EYES, AND RESIPIRATORY TRACT. SKIN AND EYE PROTECTION IS NECESSARY. DO NOT HANDLE FOR LONG PERIODS OF TIME. USE IN AN AREA WITH GOOD VENTILATION. IF YOU DO NOT OBEY THESE INSTRUCTIONS, INJURY TO PERSONS CAN OCCUR.

(b) Clean the end of the damaged cable 12.0 in. (305.0 mm) along the cable.
1) Use Omat 2/67 Disposable Cleaning Tissue made moist with OMat 1/40 Isopropyl Alcohol.
(c) Cut and remove the insulation jacket 3 in. (75 mm) from the end of the damaged cable.
(d) Cut the first wire 2.0 in. (50.0 mm) from the cable from the cable insulation jacket.
(e) Cut the second wire 1.0 in. (25.0 mm) from the cable insulation jacket.

S 912-011-R00
(6) CABLES WITH A CABLE INSULATION JACKET ONLY;
Prepare the replacement cable (Fig. 201).
(a) You must do these steps at each end of the replacement cable.
(b) Cut a length of replacement cable 6.0 in. (150.0 mm) longer than the damaged part of the cable removed from the harness (Fig. 201).

(c) Clean the end of the replacement cable 12.0 in. (30.0 mm) along the cable.
1) Use OMat 2/67 Disposable Cleaning Tissue made moist with OMat 1/40 Isopropyl Alcohol.
(d) Cut and remove the cable insulation jacket 3.0 in. (75.0 mm) from the end of the replacement cable.
(e) Cut the first wire 2.0 in. (50.0 mm) from the cable insulation jacket.
(f) Cut the second wire 1.0 in. (25.0 mm) from the cable insulation jacket.
1) Align the colors of the insulation on the replacement cable wires with the colors of the insulation on the wires of the cable to be repaired.
2) Cut the wires so that the long wire on the cable to be repaired aligns with the short wire on the replacement cable.

S 912-012-R00

(7) CABLES WITH A CABLE INSULATION JACKET ONLY;
Install the replacement cable (Fig. 201).
(a) Cut four lengths of Raychem TSX-4 Fire resistant braid long enough to cover the AMP322326 splice.
1) Expand the Raychem TSX-4 fire resistant braid and put one length on each of the four longer wires (Fig. 201).
(b) Cut four lengths of Raychem TSX-6 fire resistant braid long enough to cover the AMP322326 splice.
1) Expand the Rachem TSX-6 fire resistant braid and put one length on each of the Raychem TSX-4 fire resistant braids installed as above.
(c) Use the wire stripper to remove 0.25 in. (6.30 mm) to 0.28 in. (7.10 mm) of the insulation from each end of the eight wires (Fig. 201).
(d) Make the splice (Fig. 201).
1) Identify the wires of the damaged cable and replacement cable that will be spliced together.
2) Put the damaged cable conductor and the replacement cable conductor into the AMP322326 splice so they lie parallel and next to each other.
a) Align the colors of the insulation on the replacement cable wires with the colors of the insulation on the wires of the cable to be repaired.

b) Do this for each of the damaged cable conductors and the replacement cable conductors.

3) Use the crimp tool to attach the AMP3222326 splice to each of the damaged cable conductors and the replacement cable conductors.

a) Pull the wires to make sure each of the AMP322326 splices are secure and correctly installed.

4) You must not see loose strands of wire from the AMP322326 splice.

(e) Move the Raychem TSX-6 and Raychem TSX-4 fire resistant braid into position over the AMP322326 splices (Fig. 201).

1) Use OMat2/140 Lacing Tape to keep the Raychem TSX-4 fire resistant braid in position.

(f) Wind one continuous layer of OMat 2/147 Electrical Tape around the repair area with a 50 percent overlap. Do this on each turn of the OMat 2/147 Electrical tape (Fig. 201).

1) Make sure the OMat 2/147 Electrical Tape continues for 0.50 in. (13.0 mm) more than the damaged area in both directions along the cable.

2) The OMat 2/147 Electrical Tape must be tight enough to make a moisture resistant seal.

(g) Wind one continuous layer of OMat 2/30A Electrical Tape around the repair area with a 50 percent overlap. Do this on each turn of the OMat 2/30A Electrical Tape.

1) Make sure the OMat 230A Electrical Tape continues for 0.50 in. (13.0 mm) more that the OMat 2/147 Electrical Tape in both directions along the cable.

(h) Use OMat 2/140 Lacing Tape, make a clove hitch and a square knot at each end of the OMat 2/30A Electrical Tape wrap.

1) Cut the ends of the OMat 2/140 Lacing Tape between 0.25 in. and 0.50 in. (6.0 mm and 13.0 mm) from the knot.

S 352-021-R00

WARNING: BE CAREFUL WHEN YOU USE ISOPROPYL ALCOHOL. ISOPROPYL ALCOHOL IS FLAMMABLE AND DANGEROUS TO THE SKIN, EYES, AND RESIPIRATORY TRACT. SKIN AND EYE PROTECTION IS NECESSARY. DO NOT HANDLE FOR LONG PERIODS OF TIME. USE IN AN AREA WITH GOOD VENTILATION. IF YOU DO NOT OBEY THESE INSTRUCTIONS, INJURY TO PERSONS CAN OCCUR.

(8) CABLES WITH A METAL BRAIDED SHIELD AND CABLE INSULATION JACKET; Prepare the two ends of the damaged cable (Fig. 201).

(a) You must do these steps at each end of the damaged cable.

(b) Clean the end of the damaged cable 12.0 in. (305.00 mm) along the harness with OMat 2/67 Disposable Cleaning Tissue made moist with OMat 1/40 Isopropyl Alcohol.

(c) Cut, remove, and discard the cable insulation jacket 3.0 in. (75.0 mm) from the end of the damaged cable.

(d) Cut, remove, and discard the braided shield 0.75 in. (10.0 mm) from the cable insulation jacket.
(e) Cut the first wire 2.0 in. (50.0 mm) from the cable insulation jacket.
(f) Cut the second wire 1.0 in. (25.0 mm) from the cable insulation jacket.

S 352-014-R00

(9) CABLES WITH A METAL BRAIDED SHIELD AND CABLE INSULATION JACKET; Prepare the replacement cable (Fig. 201).
(a) You must do these steps at each end of the replacement cable.
(b) Cut a length of replacement cable 6.0 in. (150.0 mm) longer than the damaged part of the cable removed from the harness.
(c) Clean from the end of the replacement cable 12.0 in. (305.0 mm) along the cable with OMat 2/67 Disposable Cleaning Tissue made moist with OMat 1/40 Isopropyl Alcohol (Fig. 201).
(d) Cut, remove, and discard the cable insulation jacket 3.0 in. (75.0 mm) from the end of the cable.
(e) Cut, remove, and discard the braided shield 0.75 in. (19.0 mm) from the cable insulation jacket.
(f) Cut the first wire 2.0 in. (50.0 mm) from the cable insulation jacket.
(g) Cut the second wire 1.0 in. (25.0 mm) from the cable insulation jacket.
1) Align the colors of the insulation on the replacement cable wires with the colors of the insulation on the wires of the cable to be repaired.
2) Cut the wires so that the long wire on the cable to be repaired aligns with the short wire on the replacement cable.

S 352-015-R00

(10) CABLES WITH A METAL BRAIDED SHIELD AND CABLE INSULATION JACKET; Install the replacement cable (Fig. 201).
(a) Get the correct size inner and outer ferrules (Refer to the Consumable Materials list).
(b) Put an outer ferrule A on each of the two ends of the damaged cable. Move the ferrules along the harness away from the AMP322326 splice area.
(c) Put an outer ferrule B on each of the two ends of the damaged cable. Move the ferrules along the harness away from the AMP322326 splice area.
1) Make sure to get the correct size inner and outer ferrules.
(d) Put the two outer ferrules A and the two inner ferrules B on the replacement cable away from the splice area.

(e) At all of the cable ends on the damaged and replacement cable, make sure that the metal strands of the braided shield are straight and flat to the insulated wire.
(f) Move the four inner ferrules to the ends of the cable insulation jacket on the damaged and replacement cables.
(g) Crimp the four inner ferrules into position flush to the end of the cable insulation jacket. Use crimp tool and applicable die (Fig. 201).
(h) Smoothly fold the braided shield back over the inner ferrule. Put the metal strands equally around the inner ferrule (Fig. 201).
(i) Cut four lengths of Raychem TSX-4 fire resistant braid long enough to cover the AMP322326 splices (Fig. 201).
(j) Expand the Raychem TSX-4 fire resistant braid and put one length on each of the four longer wires.
(k) Cut four lengths of Raychem TSX-6 fire resistant braid the same length as the Raychem TSX-4 fire resistant braid installed above (Fig. 201).
(l) Expand the Raychem TSX-6 fire resistant braid and put one length on each of the Raychem TSX-4 fire resistant braids installed above.
(m) Use the wire stripper to remove 0.25 in. (6.30 mm) to 0.28 in. (7.10 mm) of insulation from the ends of the eight wires (Fig. 201).
(n) Make the splices (Fig. 201).
    1) Identify the wires of the damaged cable replacement cable which will be spliced together.
    2) Put the damaged cable conductor and the replacement cable conductor into the AMP322326 splice.
        a) Do this so that the conductors lie parallel and next to each other.
        b) Do this for each of the damaged cable conductors and the replacement cable conductors.
        c) Align the colors of the insulation on the replacement cable wires with the colors of the insulation on the wires of the cable to be repaired.
    3) Use the crimp tool to attach the AMP322326 splice to each of the damaged cable conductors and the replacement cable conductors.
        a) Pull the wires to make sure each of the AMP322326 splices are secure and correctly installed.

b) You must not see loose strands of wire from the AMP322326 splice.

(o) Put the Raychem TSX-4 fire resistant braid into position over the AMP322326 splices (Fig. 201).

(p) Put the Raychem TSX-6 Fire resistant braid into position over the Raychem TSX-4 fire resistant braid.
1) Use OMat 2/140 Lacing Tape to keep the fire resistant braid in position.

(q) Wind one continuous layer of 1.0 in. (25.0 mm) wide copper tape (Fig. 201).
1) This needs a 50 percent overlap between the inner ferrule B on the existing cable and inner ferrule B on the replacement cable.

(r) Move the outer ferrule A along the cable and into position over the inner ferrule B on the damaged cable. Use the crimp tool and applicable die to install the outer ferrule (Fig./201).

(s) Make sure the copper tape is flush to 0.04 in.(1.0 mm) under flush with the inner and outer ferrules (Fig. 201).
1) If necessary cut, remove, and discard the unwanted copper tape.

(t) Wind the continuous layer of OMat 2/147 Electrical Tape around the repair area with a 50 percent overlap on each turn of the OMat 2/147 Electrical Tape (Fig. 201).
1) Make sure the OMat 2/147 Electrical Tape continues for 0.50 in. (13.0 mm) more than the outer ferrule in both directions along the cables.
2) The OMat 2/147 Electrical Tape must be tight enough to make a moisture resistant seal.

(u) Wind one continuous layer of OMat 2/30A Electrical Tape around the repair area with a 50 percent overlap on each turn of the OMat 2/30A Electrical Tape.
1) Make sure the OMat 2/30A Electrical Tape continues for 0.50 in. (13.0 mm) more than the OMat 2/147 Electrical Tape in both directions along the cables.

(v) Use OMat 2/140 Lacing Tape, make a clove hitch, and a square knot at each end of the OMat 2/30A Electrical Tape wrap (Fig. 201).
1) Cut the ends of the OMat 2/140 Lacing Tape between 0.25 in. and 0.50 in. (6.0 mm and 13.0 mm) from the knot.

S 422-016-R00
(11) Use the record already made of the position of the OMat 2/140 Lacing Tape, to tie the harness with OMat 2/140 Lacing Tape, as necessary (AMM 70-50-05/201).

S 422-017-R00
(12) Install the harness clips (clamps), as necessary. Use the record made when you removed the clips (clamps) from the harness.

S 762-018-R00
(13) Do a wire continuity and insulation resistance check of the cable.
(a) Do a wire continuity check of the cable.

CAUTION: YOU MUST DISCONNECT EACH CONNECTOR ON THE CIRCUIT THAT MUST HAVE A TEST. IF THE CONNECTORS ARE NOT DISCONNECTED, UNSATISFACTORY RESISTANCE INDICATIONS OR DAMAGE TO THE CONNECTOR CAN OCCUR.

(b) Disconnect each connector on the damaged harness (AMM 70-50-02/201).

CAUTION: DO NOT BEND OR PUT STRESS ON THE CONTACTS. DAMAGE TO THE CONNECTOR OR CONTACTS MAY OCCUR.

(c) Measure the resistance of all the wires.
1) Make sure that each circuit has continuity from one end of the wire to the other.

S 762-019-R00
(14) Do an insulation resistance check of the cable.

WARNING: DO NOT USE A MEGOHMETER FOR THE INSULATION RESISTANCE TEST OF THE ON-WING REPAIR. INJURY TO PERSONNEL OR DAMAGE TO THE AIRPLANE CAN OCCUR.

(a) Make a selection of multimeter.

(b) Set the meter to the 100 megohm scale.

CAUTION: DO NOT BEND OR PUT STRESS ON THE CONTACTS. DAMAGE TO THE CONNECTOR OR CONTACTS MAY OCCUR.

(c) Attach one of the meter test leads to the contact assembly on the connector.

CAUTION: DO NOT BEND OR PUT STRESS ON THE CONTACTS. DAMAGE TO THE CONNECTOR OR CONTACTS MAY OCCUR.

(d) Attach the other meter test lead to a contact assembly on a wire that does not connect to the same circuit.
(e) Make sure the resistance is a minimum of 100 megohms.
(f) Do this procedure for all other wires that must have a test.
(g) Attach one of the meter test leads to the backshell.
(h) Attach the other meter test lead to a contact assembly on the wire that must have the test.
(i) Make sure the resistance is a minimum of 100 megohms.
(j) Connect each connector on the damaged harness (AMM 70-50-02/201).

S 932-020-R00

(15) Identify the repair.
(a) Wind two layers of OMat 296 (Scotchboy 69) Fiberglass Tape around the harness adjacent to the repair.
(b) Use the OMat 2/114 Black Ball Point Pen to make a record of the repair scheme number FRS7221 on the OMat 296 (Scotchboy 69) Fiberglass Tape.

TEMPORARY REPAIR-OVERTIE A REPLACEMENT CABLE (FRS7222) - MAINTENANCE PRACTICES

1. General
   A. This procedure has one task.
      (1) This task is the correct procedure to overtie a replacement cable onto a light duty electrical harness.

TASK 70-50-08-702-001-R00

2. Temporary Repair-Overtie a Replacement Cable (FRS7222)
   A. General
      (1) This standard practice gives the instructions to overtie a replacement cable with or without a metal braided shield on to a light duty electrical harness. The replacement cable will go along the length of the harness, outside the clips or clamps.
      (2) The replacement cable must be of the same type as the damaged cable.
      (3) You must replace the damaged cable at the next engine overhaul shop visit.
      (4) Identification of the wire harness parts:
         (a) Wire - A single electrical conductor with an outer protective jacket.
         (b) Cable - A group of wires in a metal braided shield and an outer protective jacket or a group of wires with an outer protective jacket only.
         (c) Harness - One or more cables with connectors or terminal lugs attached to the ends of the cables.
         (d) A receptacle is the attached half of a mating pair of electrical connectors.
         (e) A plug is the free half of a mating pair of electrical connectors.
   B. Equipment
      (1) Screwdriver bit, Philips ACR - PSC-1204-3-R
      (2) Pliers, Soft-jawed - TG-69P
      (3) Nylon tool
      (4) Frame, Crimp Tool - M22520/1-01
      (5) Positioner, Crimp Tool - M22520/1-02
      (6) Head - M27828-1
      (7) Wire Strippers - 45092
      (8) Crimping Tool - AMP46673-8
   C. Consumable Materials
      (1) Tape, Self Amalgamating - OMat 2/141 (100P323)
      (2) Tape, Lacing - OMat 2/140 (ESW 1900)
      (3) Tape, Fiberglass - OMat 296 (Scotchboy 69)
      (4) Pen, Black Ballpoint - OMat 2/134
   D. References
      (1) AMM 24-22-00/201, Electrical Power
      (2) AMM 70-50-03/201, Identification
      (3) AMM 70-50-05/201, Lacing Procedures for Harnesses

(4) SWPM 20-61-00, Assembly of Connectors with Rear Release Contacts
(5) SWPM 20-63-00, Assembly of connectors with front release contacts
(6) WDM 91-21-11

E. Procedure

S 912-002-R00

(1) Do this task: Remove electrical power (AMM 24-22-00/201).

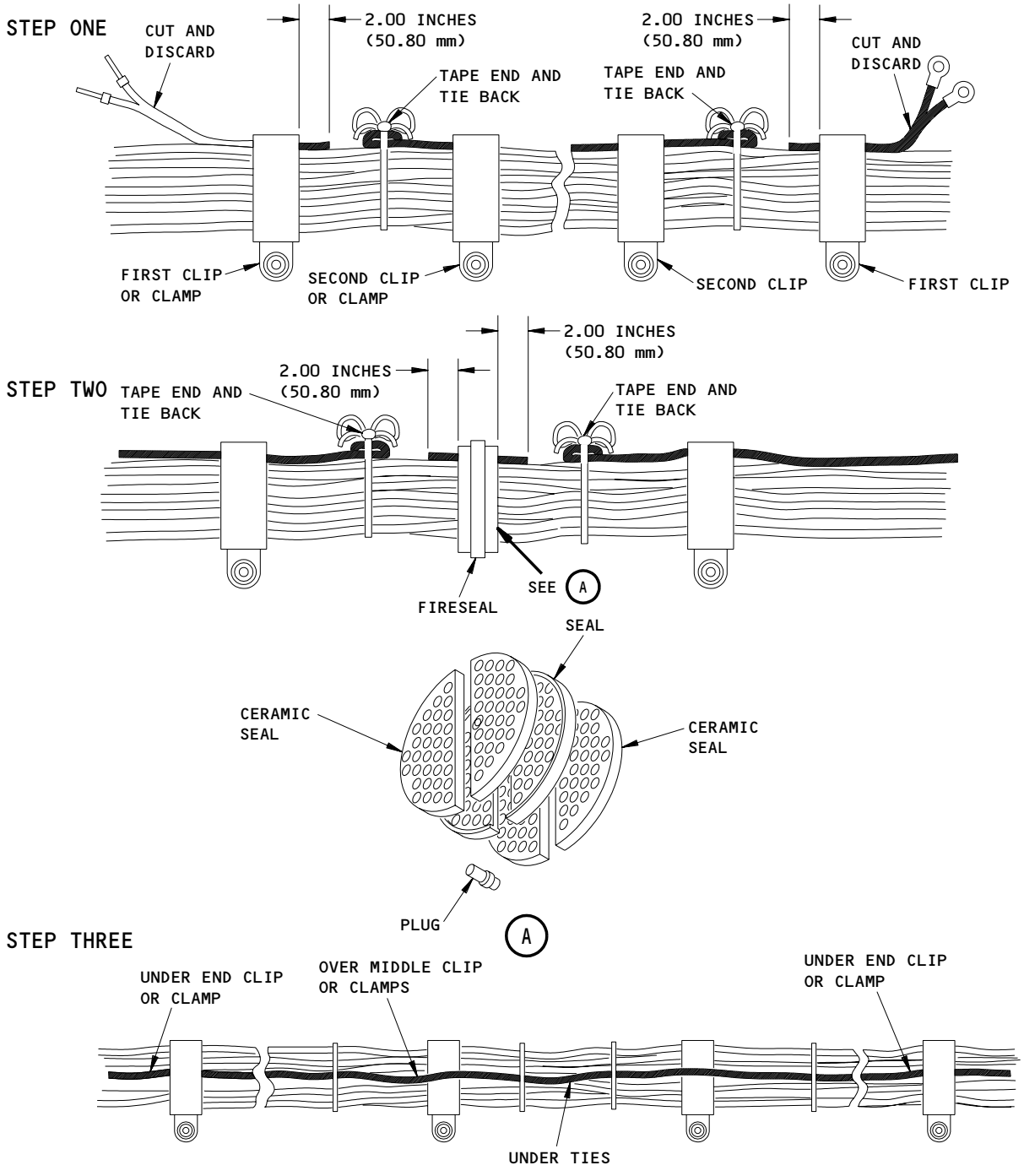
S 912-005-R00

WARNING: DO NOT USE HEAT GUNS, SOLDERING GUNS, OR SOLDERING IRONS FOR THE ON-WING REPAIRS. THEY ARE NOT RESISTANT TO EXPLOSIONS AND CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Repair the damaged cable with the procedure that follows at each connector or termination on the damaged cable (Fig. 201).
  (a) Identify the connectors or teminations on the damaged cable.
  (b) Cut and remove all of the harness ties beween the connector or termination of the damaged cable and the first clip or clamp on the harness.
    1) Make a record of the position of the harness ties that you remove.
  (c) Cut the damaged cable.
    1) Make the cut between the first clip or clamp and the second clip or clamp.
    2) The cut must be 2 inches along the damaged cable away from the first clip or clamp.
  (d) Wind two turns of the OMat 2/141 Self Amalgamating Tape with a 20 percent overlap on each turn of the tape around the end of the damaged cable in the harness bundle.
    1) Make sure the OMat 2/141 Self Amalgamating Tape is 0.80 in. (2 mm) to 0.120 in. (3 mm) over flush with the end of the damaged cable.
    2) Press the over flush end of the OMat 2/141 Self-Amalgamating Tape together to make a moisture resistant seal.
  (e) Make the damaged cable flat to the harness bundle.
  (f) Tie the damaged cable to the harness bundle with OMat 2/140 lacing tape (AMM 70-50-05/201).
  (g) Loosen the first clip or clamp on the harness and release the shorter length of the damaged cable from the clip or clamp.

S 542-003-R00

(3) Get the replacement cable.
  (a) Make sure the replacement cable is the same type of cable and color as the damaged cable.



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Temporary Overtie Repair - Clipping Details
Figure 201

(b) Get the replacement cable.
1) Make the replacement cable the same connector to connector length as the damaged cable.
(c) Refer to WDM 91-21-11 for the correct wire type, gage, length, and connector contact to contact hookups.

S 392-004-R00
(4) If necessary, put the replacement cable through the fire seal (Fig. 201).
(a) If you are sure of the cable identification through (in and out of) the fire seal, do this procedure:
1) Cut and remove all of the harness ties between the fire seal and the first clip or clamp on each side of the fire seal.
a) Make a record of the harness ties that you remove.
2) Cut the damaged cable 2.0 inch (50.8 mm) away from the fire seal on each side of the fire seal.
3) Remove and discard the short piece of damaged cable from the fire seal.
4) Wind two turns of the OMat 2/141 Self-Amalgamating Tape with a 20 percent overlap on each turn of the tape around the end of the damaged cable in the harness bundle.
a) Make sure the OMat 2/141 Self Amalgamating Tape is 0.080 in. (2 mm) to 0.120 in. (13 mm) over flush with the end of the damaged cable.
b) Press the over flush end of the OMat 2/141 Self-Amalgamating Tape together to make a moisture resistant seal.
c) You must do this to the damaged cable on each side of the fire seal.
5) Make the damaged cable flat to the harness bundle.
6) Tie the end of the damaged cable to the harness bundle with OMat 2/140 Lacing Tape (AMM 70-50-05/201).
7) Put the replacement cable through the hole in the fire seal from which you removed the damaged cable.

NOTE: Do this procedure again at every fire seal that the damaged cable goes through.

a) Make the end of the replacement cable adjacent to the applicable connector.

S 392-006-R00

(5) If you are not sure of the cable identification through (in and out of) the fire seal, do this procedure:
   (a) Disassemble the fire seal that the damaged cable goes through.
      1) Remove and keep the screws, nuts and washers that attach the fire seal plates and cable support plates.
      2) Separate the fire seal plates and cable support plates to get access to the ceramic sealing plugs.
   (b) Remove a spare ceramic sealing plug from the fire seal plate.
      1) Make a record of the position of the spare ceramic sealing plug you have removed.
   (c) Assemble the fire seal.
      1) Fit the fire seal plates and cable support plates into the housing engaging ceramic sealing plugs in the appropriate holes.
      2) Install the screws, nuts and washers into the fire seal plates and cable support plates.
   (d) Put the replacement cable through the spare ceramic sealing plug hole in the fire seal.

      NOTE: Do this procedure again at every fire seal that the damaged cable goes through.

      1) Make the end of the replacement cable adjacent to the applicable connector.

S 012-007-R00

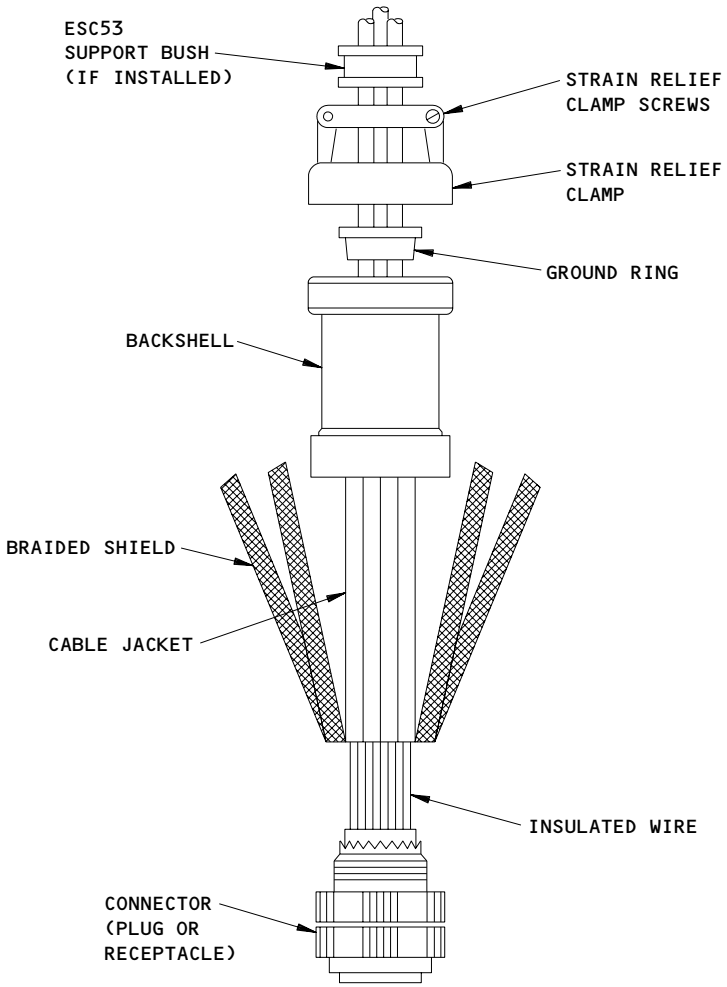
(6) Remove the backshell from the connector (Fig. 202 or Fig. 206).

   NOTE: Do not disconnect the connector from the connectors mating receptacle at the start of this procedure.

   (a) If the damaged cable terminates in a terminal lug, refer to the procedure in this task for the removal of the terminal tags.
   (b) Use the PSC-1204-3-R Philips ACR Screwdriver bit to loosen the strain relief clamp-bar screws.

   CAUTION: YOU MUST NOT USE PLIERS WITH METAL JAWS TO DISCONNECT/CONNECT THE PARTS. THE METAL JAWS WILL CAUSE DAMAGE TO THE PARTS.

   (c) If necessary, use the TG-69P Soft Jaw Connector pliers to loosen the strain relief clamp from the backshell.



DE000D8998

Connector Details
Figure 202

CAUTION: YOU MUST NOT BEND THE ELECTRICAL HARNESSES TOO MUCH WHEN YOU DISCONNECT/CONNECT THE ELECTRICAL CONNECTORS. THE HARNESSES CAN BE DAMAGED AND CAN CAUSE ELECTRICAL CIRCUIT DEFECTS.

(d) Use the TG-69P Soft Jaw Connector pliers to loosen the backshell coupling nut from the connector.
(e) Use the TG-69P Soft Jaw Connector pliers to loosen the connector coupling nut.
    1) Disconnect the connector from the receptable with your hand.
(f) If the backshell is angular, put a temporary mark on the backshell to show the position of the connector master keyway.
    1) Use OMat 296 (Scotchboy 69) Fiberglass Tape and OMat 2/134 Black Ballpoint Pen.
    2) The temporary alignment mark is to make sure the angular backshell is installed in the correct position on assembly.

S 932-008-R00

(7) If the backshell is on a receptacle, do these steps:
(a) Put a temporary mark on the engine bracket to show the position of the receptacle master keyway with the OMat 296 (Scotchboy 69) Fiberglass tape and OMat 2/134 Black Ballpoint pen.
(b) Remove and keep the nuts and screws that attach the receptacle to the engine bracket.
    1) Remove the receptacle from the engine bracket.

S 022-009-R00

(8) Loosen the strain relief clamp bar screws.
(a) Loosen the strain relief clamp bar screws sufficiently to let the support bush move rearward along the harness.
(b) If necessary, you can remove the strain relief clamp bar screws and strain relief clamp bar to allow the support bush to be moved rearward along the harness.
    1) If you remove the strain relief clamp bar, keep the strain relief clamp bar screws and the strain relief clamp bar for re-assembly.

S 022-010-R00

(9) Disassemble the backshell.

(a) If necessary, disconnect the strain relief clamp from the backshell and carefully move the strain relief clamp rearward along the harness.

1) Do not cut, nick or cause damage to the cables, wires or metal braided shield.

(b) If necessary, carefully cut the OMat 2/140 Lacing tape that holds the metal braided shield to the harness bundle.

1) Do not cut, nick or cause damage to the cables, wires or the metal braided shield.

(c) If necessary, move the ground ring rearward along the harness.

(d) If necessary, fold the metal braided shield rearward along the harness bundle.

1) Make the metal braided shield flat on the harness bundle.

2) You can temporarily keep the metal braided shields flat on the harness with OMat 2/141 Self-Amalgamating tape.

(e) Disconnect the backshell from the connector.

1) Move the backshell rearward along the harness.

2) Make sure the backshell is away from the connector.

S 012-011-R00

(10) Disassemble the other termination on the damaged cable.

(a) Do the procedure to disassemble the backshell at each connector on the damaged cable.

S 012-012-R00

(11) Remove the contact, on the damaged cable, from the connector (Fig. 203).

NOTE: If the damaged cable terminates in a receptacle then you must inspect the plug for the blue colored line.

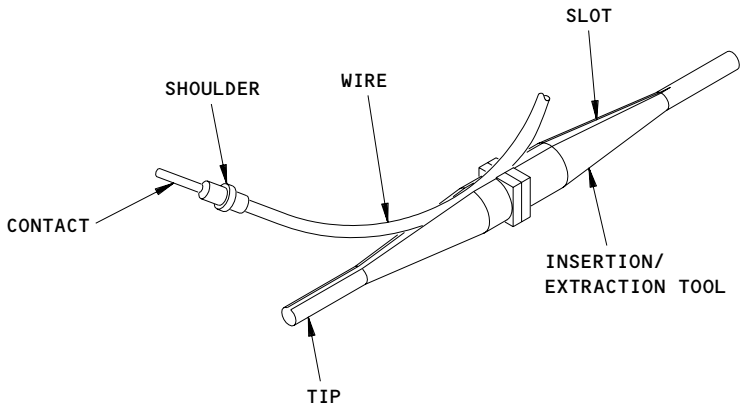
(a) Make a record of the position of the contact that you remove from the connector.

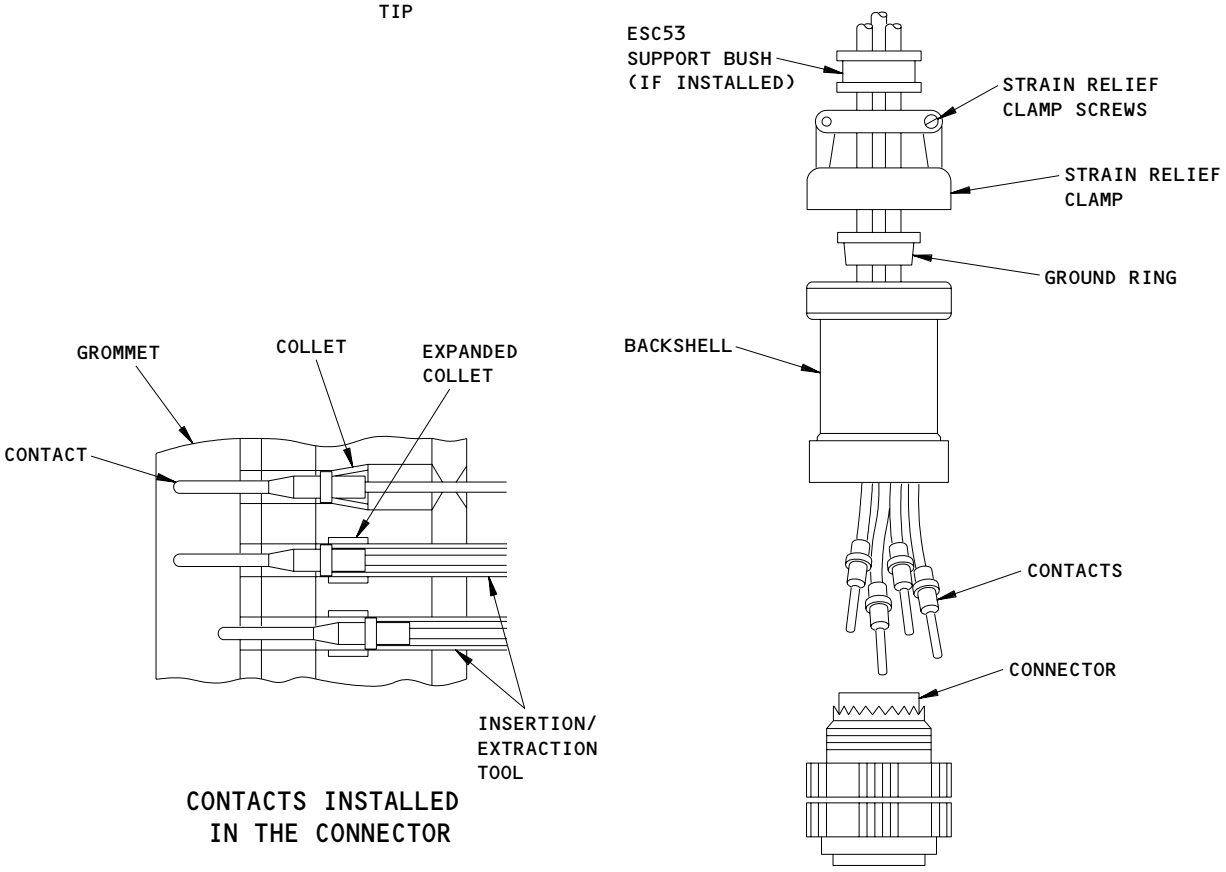
(b) Remove rear release contacts (SWPM 20-63-00).

NOTE: Connectors with rear release contacts have a blue colored line on the plug.

(c) Remove front release contacts (SWPM 20-61-00).

NOTE: Connectors with front release contacts have no colored line on the plug.





DE000D9002

Contacts Installation
Figure 203

S 022-014-R00

(12) Remove the contact.
  (a) Remove and keep the contact and short length of damaged cable.
  (b) If a part of the connector is damaged, you must replace the part.
    1) To replace a part of a connector, you must remove all of the contacts (WDM 91-21-11).

S 912-015-R00

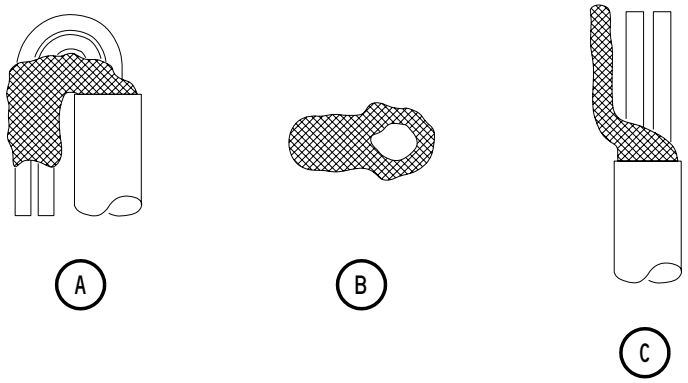
(13) If necessary, prepare the replacement cable with metal braided shield (Fig. 204).
  (a) If necessary, remove the outer protective jacket from the replacement cable.
    1) Cut and remove the outer protective jacket of the replacement cable at the same location as the outer protective jacket of the damaged cable.
  (b) If necessary, push the metal braided shield rearward along the insulated wires to make the metal braid shield become larger.
  (c) If necessary, bend the metal braided shield end in a U-shape (View A, Fig. 204).

CAUTION: YOU MUST MAKE SURE THAT YOU DO NOT CUT, NICK, OR CAUSE DAMAGE TO THE CONDUCTORS OR THE METAL BRAIDED SHIELDS. IF THE CONDUCTORS OR THE BRAIDED SHIELDS ARE DAMAGED, THE ELECTRICAL CIRCUIT CAN BECOME DEFECTIVE.

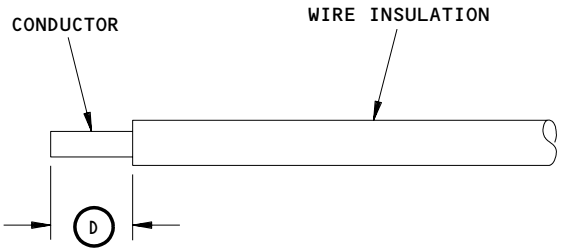
  (d) If necessary, use a Nylon Tool to carefully make a hole in the metal braid shield (View B, Fig. 204).
  (e) If necessary, pull the wires, one at a time, through the hole in the metal braid shield (View C, Fig. 204).
  (f) If necessary, pull the metal braid shield tight to make a flat and equal conductor (View C, Fig. 204).

S 912-016-R00

(14) Install the contact on the replacement cable wire.
  (a) Make sure the replacement cable has the correct overall length
  (b) Put the contact number labels from the damaged cable on the replacement cable.
    1) Make sure that the insulation color of the replacement cable is the same as the damaged cable.
  (c) Remove the insulation (dimension D) from the end of the replacement cable wire with the 45092 Wire Strippers (Fig. 204).



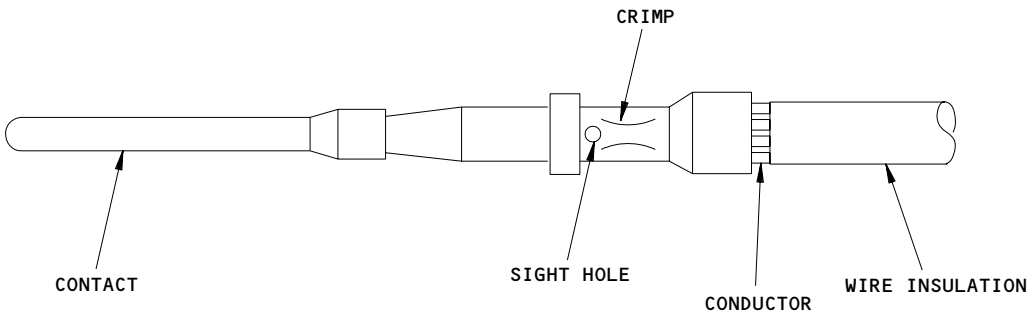
PREPARE BRAIDED
SHIELDS



CONDUCTOR DIMENSION

CONTACT SIZE	MIN INCH (mm)	MAX INCH (mm)
20	0.114 (2.9)	0.154 (3.9)
16	0.208 (5.3)	0.248 (6.3)

D



INSTALLED CONTACT

DE000D9014

Preparation of Wires and Contacts
Figure 204

CAUTION: YOU MUST NOT RELEASE THE LATCH FOR THE CRIMP TOOL POSITIONER IF THE CRIMP TOOL FRAME HANDLE IS IN THE CLOSED POSITION. THE FRAME HANDLE MUST BE IN THE OPEN POSITION WHEN THE POSITIONER IS INSTALLED, REMOVED OR RELEASED. IF YOU DO NOT OBEY THIS INSTRUCTION, THE POSITIONER AND FRAME CAN BE DAMAGED.

(d) Get the crimp tool (Rear release contacts only).
  1) Use MS22520/1-01 Crimp Tool Frame and M22520/1-02 Crimp Tool Positioner for rear release contacts.
  2) Use MS27828 Crimp Tool Frame and MS27828-1 Head for front release contacts.

(e) Do a check of the M22520/1-01 Crimp Tool Frame with M22520/3-01 Crimp Tool Check Gage (Rear release contacts only).

(f) Install the M22520/1-02 Crimp Tool Positioner in the M22520/1-01 Crimp Tool Frame (Rear release contacts only):
  1) Make the selection of the correct positioner for the contact type.
  2) Remove the lock clip from the lock ring on the positioner.
  3) Put the positioner in the tool frame lock plate and align the positioner pins with the lock plate ring slots.
  4) Push the positioner into the tool frame. Then turn the positioner through 90 degrees, in a clockwise direction, until it locks in position.
  5) Install the lock clip on the positioner lock ring.

(g) Install the contact on to the replacement cable (Rear release contacts only).
  1) Remove the lock clip from the lock ring hole on the selector knob.
  2) Lift and turn the tool frame selector knob until the number of the knob agrees with the number on the positioner data plate.
  3) Install the lock clip in the lock ring hole.

  CAUTION: YOU MUST MAKE SURE THAT THE SELECTOR KNOB IS SET CORRECTLY. IF THE SELECTOR KNOB IS IN AN INCORRECT POSITION, THE CONTACT AND WIRE CAN BE DAMAGED. YOU CAN ALSO POSSIBLY GET A CONTACT THAT IS ONLY LOOSLY CRIMPED ON THE CABLE. THIS CAN CAUSE THE ELECTRICAL CIRCUIT TO BECOME DEFECTIVE.

  4) Check the position of the selector knob.
    a) Align the number on the selector knob with the index mark on the tool frame and release the knob.

5) Examine the cable to make sure that the wire strands of the conductor are not separated.
6) Get the correct contact (WDM 91-21-11).
7) Install the end of the conductor into the contact wire hole.
   a) If necessary, carefully twist the wire strands of the conductor in their usual direction of twist.
8) Push the conductor into the contact wire hole until you feel it touch the bottom.

   NOTE: If the insulation on the conductor was not removed correctly, the wire will not touch the bottom of the contact crimp barrel. Alternatively, there will be too much bare wire at the rear shoulder of the contact crimp barrel.

9) Examine the contact to make sure that you can see the conductor through the sight hole in the contact.
   a) Make sure that you cannot see bare wire at the rear shoulder of the contact crimp barrel.
10) Install the contact and conductor through the tool frame hole and into the positioner hole until it touches the bottom.
11) Move the tool frame handles together until the ratchet releases.
12) Remove the crimp contact from the tool.
13) Hold the wire tight and lightly pull on the contact to make sure that the contact is satisfactorily crimped to the conductor.
14) Do the procedure to crimp the contacts again until you have crimped all the contacts on the replacement cable.

S 422-017-R00

(15) Install the contact to the replacement cable (Front release contacts only)(SWPM 20-61-00).

S 422-018-R00

(16) Install the replacement cable.
   (a) Put the replacement cable through the first clip or clamp.
   (b) Make sure you put the replacement cable through the support bush, strain relief clamp, ground ring and backshell before you install the contact into the connector.
      1) Replace any parts of the connector that are damaged (WDM 91-21-11).

S 422-019-R00

(17) Install the contact in the connector (Fig. 203).

(a) Use the record made of the position of the contact that you removed from the connector to replace the contact.

(b) If the overtie cable terminates in a receptacle, you must check the mating plug of the receptacle for the blue colored line (SWPM 20-63-00).

NOTE: Connectors with rear release contacts have a blue colored line on the plug.

(c) If the overtie cable terminates in a receptale, you must check the mating plug of the receptacle to ensure there is no blue line, to install the front release connectors (SWPM 20-61-00).

NOTE: Connectors with front release contacts have no colored line on the plug.

S 422-020-R00

(18) Attach the backshell to the connector (Fig. 205).

(a) If necessary, make the metal braided shields flat and equal.

(b) If necessary, fold the metal braided shield rearward over the cable jacket.

1) Keep the metal braided shield flat and equal.

(c) If necessary, you can temorarily keep the metal braided shield flat and equal on the harness with OMat 2/141 Self Amalgamating Tape.

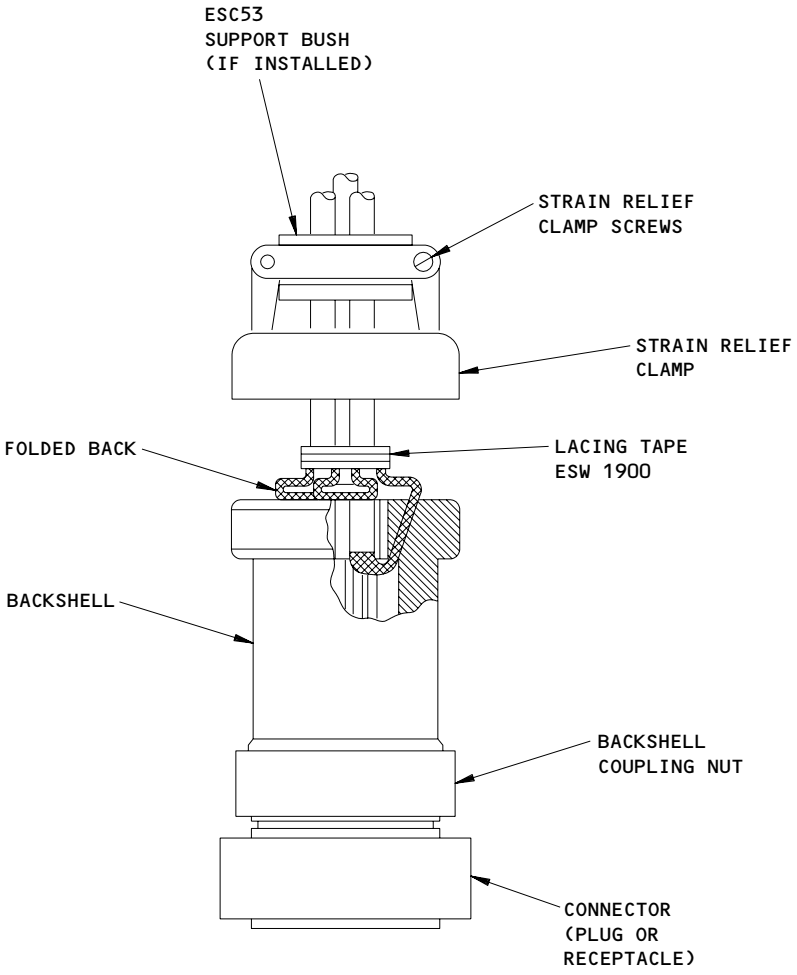
NOTE: This will make it easier to install the backshell.

(d) Hold the connector and move the backshell forward along the harness until the backshell is adjacent to the connector.

CAUTION: YOU MUST MAKE SURE THAT YOU CORRECTLY ENGAGE THE ANTIROTATION TEETH ON THE CONNECTOR AND THE BACKSHELL. IF YOU ENGAGE THE TEETH INCORRECTLY, THEY CAN BE DAMAGED

(e) Start to tighten the backshell coupling nut by hand. Turn the backshell coupling nut clockwise and counterclockwise to make sure the anti rotation teeth engage correctly.

NOTE: When you turn the backshell coupling nut clockwise and counterclockwise the movement makes sure the points of the anti rotation teeth do not come together. If the points of the teeth come together, the connection can feel tight, but later loosen.

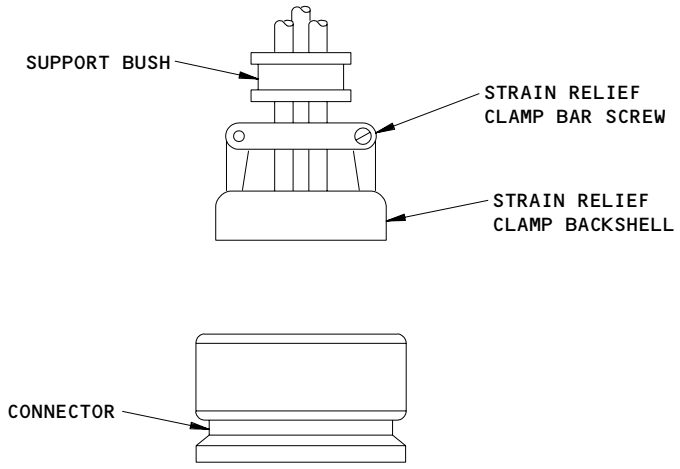


DE000D9001

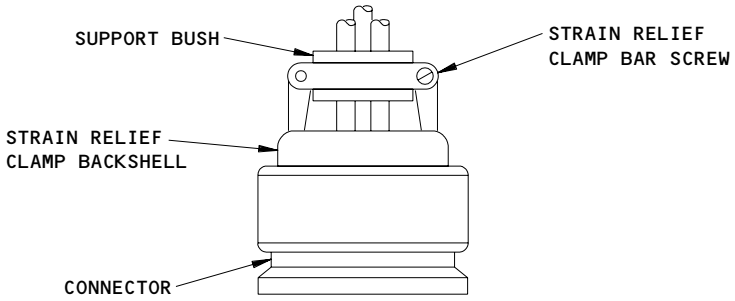
Assembly of Connector
Figure 205

(f) Tighten the backshell coupling nut to the connector by hand.
    1) For angled backshells, make sure that the mark on the backshell is aligned with the master keyway on the connector.
(g) If necessary, open the metal braided shield out into the shape of a cone.
(h) If necessary, move the ground ring forward along the harness.
(i) If necessary, catch the metal braided shield between the ground ring and the backshell.
    1) Make sure the cable outer protective jacket goes through the ground ring before the metal braided shield breaks out of the outer protective jacket.
    2) The metal braided shield must be put equally around the ground ring.
(j) If necessary, fold back the metal shield ends to the harness bundle.
    1) Tie metal braided shield to the harness bundle with OMat 2/140 Lacing tape.
    2) Make sure that the OMat 2/140 Lacing tape is put around the metal braided shield and covers the ends of the metal braided shield.
    3) Make sure there are no loose strands of metal braided shield.
(k) If necessary, move the strain relief clamp forward along the harness and install the strain relief clamp on to the backshell.
    1) Tighten the strain relief clamp to the backshell by hand.
(l) Move the support bush (if installed) forward along the harness into position with the strain relief clamp (Fig. 206).
(m) If the strain relief clamp bars and strain relief clamp bar screws have been removed, loosely assemble the strain relief clamp bars with the strain relief clamp bar screws to the strain relief clamp.

CAUTION: YOU MUST NOT USE PLIERS WITH METAL JAWS TO DISCONNECT/CONNECT THE PARTS. THE METAL JAWS WILL CAUSE DAMAGE TO THE PARTS.



VIEW OF THE DISASSEMBLED CONNECTOR
(TYPICAL)



VIEW OF THE ASSEMBLED CONNECTOR
(TYPICAL)

DER0009646

Connector Details
Figure 206

(n) Use the TG-69P Soft Jaw Connector Pliers to fully tighten the backshell coupling nut. As you tighten the nut, move the backshell clockwise and counterwise. This will help correctly engage the anti-rotation teeth.
(o) If necessary, Use the TG-69P Soft Jaw Connector pliers to fully tighten the srain relief clamp to the backshell.

S 422-021-R00

(19) Install the strain relief clamp.
(a) Use the PSC-1204-2-R Philips ACR Screwdriver Bit to tighten the strain relief clamp bar screws. Continue to tighten the strain relief clamp bar screws until the strain relief clamp bars touch the strain relief clamp.
(b) If there is no support bush installed, make sure that the harness does not move between the strain relief clamp and strain relief clamp bars.
(c) If the harness moves between the strain relief clamp and strain relief clamp bars, put OMat 2/141 Self Amalgamating Tape around the harness bundle to make the harness bundle larger under the strain relief clamp and strain relief clamp bars.

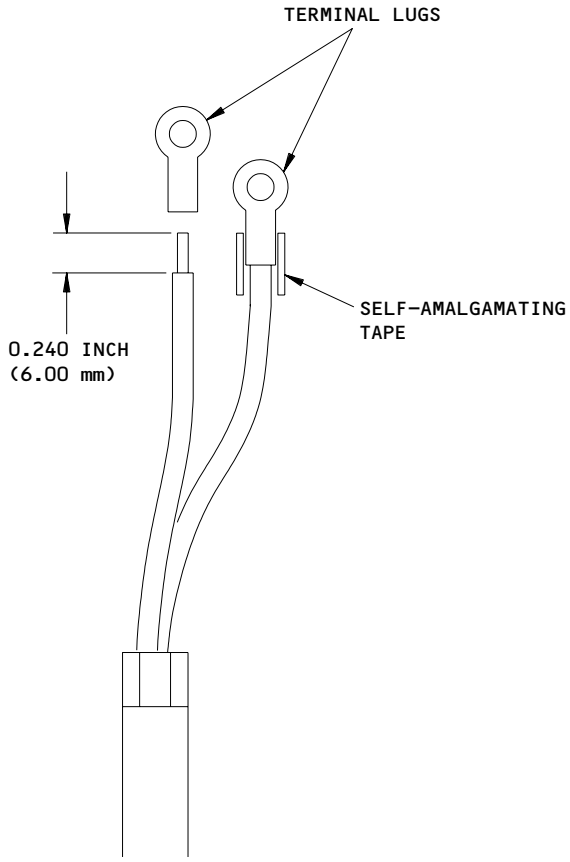
NOTE: Make sure that no OMat 2/141 Self-Amalgamating Tape is between the surfaces of the strain relief clamp and the strain relief clamp bars that touch.

(d) If the strain relief clamp bar does not touch the strain relief clamp, remove some of the OMat 2/141 Self-Amalgamating Tape from the harness bundle to make the haness bundle smaller under the strain relief clamp and strain relief clamp bars.

S 012-023-R00

(20) Remove the terminal lugs (Fig. 207).

NOTE: Remove and keep the nuts, bolts and washers that attach the terminal tag.



VIEW ON THE CABLE END
(TYPICAL)

NOTE: ALL DIMENSIONS ARE IN INCHES (MILLIMETERS)

DER0009645

Wire Preparation Details
Figure 207

(a) Cut remove and discard the heat shrink sleeve from the terminal lug. You must be careful not to nick, cut, or damage the cable insulation.
(b) Cut the terminal lug in the middle of the crimp. Carefully remove the remains of the terminal lug from the cable.
(c) Put the contact number lables from the damaged cable on to the replacement cable. Make sure that the insulation color of the replacemeent cable is the same as the damaged cable.
(d) Remove 0.24 in. (6 mm) of insulation from the end of the replacement cable wire (Fig. 206).
(e) Make sure the replacement cable has the correct overall length.
(f) Put the conductor into the barrel of the terminal lug. Make sure that you can see the end of the conductor at the other end of the terminal lug barrel.
(g) Crimp the terminal lug with the AMP46673-8 Crimping Tool.
    1) Set the jaws of the crimp tool to No. 2.
    2) Put the terminal lug in the center of the jaws of the crimp tool.
    3) Move the crimp tool handles together until the ratchet releases.
    4) Pull the wire to make sure that the wire will not come out of the terminal lug barrel.
(h) Wind to two layers of OMat 2/141 Self Amalgamating tape on to the terminal tag crimp bucket and replacement cable.
(i) Connect the terminal lug to the correct terminal with the nuts, bolts, and washers to attach the terminal lug.

S 352-024-R00

(21) Put the replacement cable along the harness (Fig. 201).
(a) Put the replacement cable along the length of the harness, outside the clips or clamps.
(b) Make sure the replacement cable is clear and cannot touch the adjacent components.
(c) Tie the replacement cable to the harness with the lacing tape. Use the record made at 2(b) to replace the lacing tape up to the first clip point (AMM 70-50-05/201).
(d) Tighten the first clip or clamp on the harness. Make sure the harness cannot move in the clip or clamp.

NOTE: It is not necessary to tie the harness where the replacement cable goes over a clip or clamp.

S 422-025-R00

(22) Assemble each connector or termination on the damaged cable.

(a) Repeat the procedures to assemble each connector or termination for each connector on the damaged cable.

S 762-026-R00

(23) Do a wire continuity and cable insulation resistance check. You must check all of the repaired cables, connectors, and terminal lugs.

CAUTION: EACH CONNECTOR ON THE CIRCUIT THAT MUST HAVE A TEST MUST BE DISCONNECTED. IF THE CONNECTORS ARE NOT DISCONNECTED, UNSATISFACTORY RESISTANCE INDICATIONS OR DAMAGE TO THE CONNECTOR CAN OCCUR.

(a) Do a wire continuity check.

1) If necessary, disconnect each connector on the damaged harness (AMM 70-50-02/201).

CAUTION: DO NOT BEND OR PUT STRESS ON THE CONTACTS. DAMAGE TO THE CONNECTOR OR CONTACTS MAY OCCUR.

2) Measure the resistance of all of the wires. Make sure that each circuit has continuity from one end of the wire to the other end of the wire.

(b) Do an insulation resistance check.

WARNING: DO NOT USE A MEGOHMETER FOR THE INSULATION RESISTANCE TEST OF THE ON-WING REPAIR. INJURY TO PERSONNEL OR DAMAGE TO THE AIRPLANE CAN OCCUR

1) Make a selection of multimeter.
2) Set the meter to the 100 megohm scale.

CAUTION: DO NOT BEND OR PUT STRESS ON THE CONTACTS. DAMAGE TO THE CONNECTOR OR CONTACTS MAY OCCUR.

3) Attach one of the meter test leads to the contact assembly on the connector.

CAUTION: DO NOT BEND OR PUT STRESS ON THE CONTACTS. DAMAGE TO THE CONNECTORS OR CONTACTS MAY OCCUR.

4) Attach the other meter test lead to a contact assembly on a wire that does not connect to the same circuit.

5) Read the meter. Make sure that the resistance is a minimum of 100 megohm.
6) Do the insulation resistance test for each contact in the connector.
7) Attach one of the meter test leads to the backshell.
8) Attach the other meter test lead to a contact assembly on the wire that must have the test.

CAUTION: DO NOT BEND OR PUT STRESS ON THE CONTACTS. DAMAGE TO THE CONNECTOR OR CONTACTS MAY OCCUR.

9) Read the meter. Make sure that the resistance is a minimum of 100 megohm.
10) Do the test procedure for each wire that must have a test.

S 422-027-R00

(24) Connect the electrical harness connectors.

CAUTION: YOU MUST NOT USE PLIERS TO CONNECT THE CONNECTORS. THE CONNECTORS MAY BE DAMAGED.

(a) Connect each connector removed. Use the record made when you removed the connectors to put them in the correct position (AMM 70-50-02/201).

S 912-029-R00

(25) Supply electrical power (AMM 24-22-00/201).

S 932-030-R00

(26) Identify the harness with the repair scheme number.
(a) Wind two layers of OMat 296 Fiberglass Tape around the harness and replacement cable adjacent to the harness identification area.
(b) Use the OMat 2/134 Black ball point pen to record the repair scheme number FRS7222 on the OMat 296 Fiberglass Tape.

S 932-031-R00

(27) Record the temporary repair in the engine log book.
(a) Write the temporary repair number and harness details in the engine log book.
(b) Make a record that states it is necessary to replace the cable at the next engine overhaul.

TORQUE TIGHTENING TECHNIQUE - MAINTENANCE PRACTICES

1. General
   A. A specified torque load is given to the nuts and bolts to prevent overstressing and to give the best security. During assembly of the parts, the nuts and bolts must be tightened to a special load for a particular application or to a standard load for the size of thread used.
   B. The parts to be tightened to special loads are identified, together with their loadings, in each section. Parts for which no special loads are specified must be tightened to standard loads in the tables that follow.
   C. These tables give standard Imperial torque values with Metric and International system (SI) equivalents. In SI system, Newton meter (Nm) is unit of torque and is derived from Newton (N), an 'absolute' unit of force which is not affected by gravitational constant.

      1 Nm = 10.1972 kg.cm.

   D. Use clean engine oil (AMM 12-13-01/301) for lubricating screw threads and abutment faces unless specified differently.

TASK 70-51-00-912-001-R00

2. Torque Tightening Technique
   A. Tools

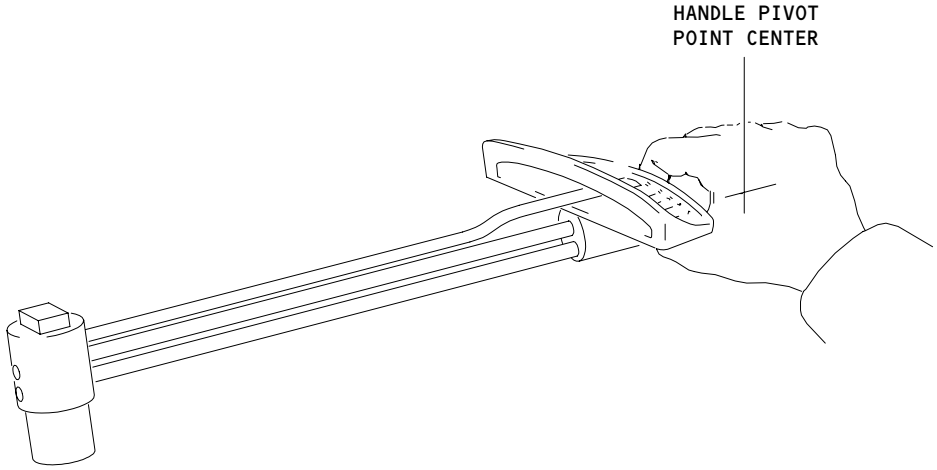
      S 912-002-R00

      (1) Hand Torque Wrenches
         (a) Flexible Beam Type
            1) To get the correct reading, the handle must be gripped lightly with one hand (Fig. 201) and the pull must be applied at the right-angle (90 degrees) to the center line of the wrench.
            2) The handle must float on the pivot point, concentrating the force or load at the correct point.
               a) Once selected, the position of the hand must not be changed, as this will change the concentration of the force.

3) Figure 202 gives the flexible beam torque wrenches and their torque load ranges.
4) To make sure you get the best possible accuracy when you read the scale values, choose a torque wrench which will register within the higher range of scale for the specified load.
5) The first quarter of the scale must not be used for critical loads.
   a) This is because accuracy with which small loads can be read at the beginning of the scale is not considered adequate, and wherever possible, a wrench must be selected to give full benefit from the scale given.
   b) Some flexible beam torque wrenches can have the 'unacceptable' part of scale blank.

(b) Screwdriver Type
1) To get the correct reading, the handle must be gripped in one hand, as you usually hold a screwdriver (Fig. 203), and turned smoothly until you get the specified torque load.
2) Fig. 204 gives the screwdriver torque wrench and torque load range.

(c) Inspection of Wrenches in Service
1) Examine that with conditions of no load, the torque indicating pointer intersects the zero mark on the scale.
   a) If it does not, adjust it as shown in the torque wrench manufacturer's instruction book.



24945

Correct Method of Holding a Flexible Beam Torque Wrench
Figure 201

S 912-003-R00

(2) Adapters

(a) Adapters for torque wrenches are given in Fig. 205.

S 912-004-R00

(3) Extension Spanners

(a) The use of an extension spanner increases the leverage of the torque wrench, thus if the scale reading is not corrected to agree with the length of the extension used, the nut or bolt will be tightened too much with possible damage.

TOOL NO.	LOAD RANGE	SIZE OF DRIVE
	LB/IN.	
1702151	30-140	1/4 IN. SQUARE
1702152	60-280	3/8 IN. SQUARE
1702153	150-550	1/2 IN. SQUARE
	LB/FT	
1702160	50-180	1/2 IN. SQUARE

Flexible Beam Wrenches - Torque Load Range
Figure 202

(b) To get true readings when you use the extension spanner (Fig. 206):

1) Correct the true torque load with these formula to give the necessary torque load.

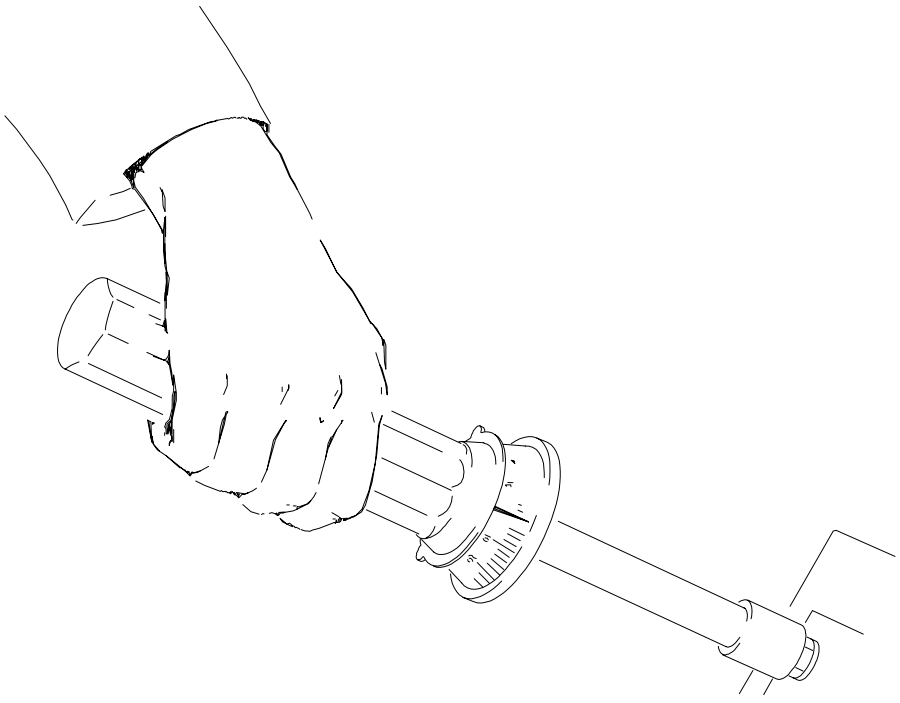
$$\text{Scale reading} = \frac{\text{necessary torque} \times \text{Length of Wrench Lever (A)}}{\text{Length of Wrench Lever (A)} + \text{Length of Spanner (B)}}$$

Example:

A 0.25 inch diameter nut is to be tightened by a 10 inch torque wrench with a 3 inch extension spanner. The true necessary torque load is 75 pound-inches at the nut. Thus the scale reading that is necessary is:

$$\frac{75 \times 10}{10 + 3} = \frac{750}{13} = 58 \text{ lb.in.}$$

2) Hold the wrench handle as shown before and keep the extension spanner aligned with the wrench.



25023

Correct Method of Holding a Screwdriver Torque Wrench
Figure 203

S 912-005-R00

(4) Power Wrenches

(a) A power wrench must only be used to initially tighten the nuts and bolts.

(b) The power wrench must be set to give 50 percent of the final torque load.

(c) The final torque must be applied by use of an approved hand torque wrench.

B. Components

S 912-006-R00

(1) Fitting Studs

(a) Apply the standard torque loads shown in TABLE A unless special torque loads are specified.

S 912-007-R00

(2) Serrated Head Sealing Plugs Installation (Unified or Whitworth threads)

(a) Apply the torque loads shown in TABLE B to each Unified and Whitworth thread sealing plug installed in aluminum or magnesium, unless special torque loads are specified.

TOOL NO.	LOAD RANGE	SIZE OF DRIVE
	LB/IN.	
1703038	8-24	1/4 IN. SQUARE

Screwdriver Type Torque Wrench - Torque Load Range
Figure 204

(b) Do not tighten the sealing plugs more than the recommended torque load value to repair a leak.
1) If it is necessary, install a new sealing plug or repair the plug seating.

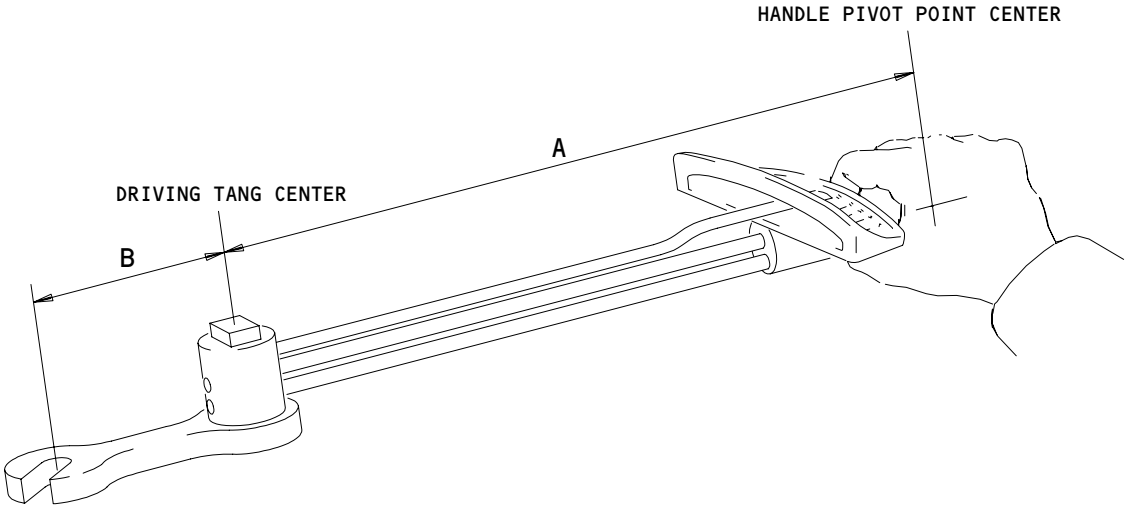
S 912-008-R00

(3) Non Self-Locking Nuts Installation, also Bolt Installation into Non Self-Locking Threads
(a) Apply standard torque loads shown in TABLE C unless special torque loads are specified.

TOOL NO.	ADAPTER SIZE		APPLICATION
1700040	1/4 IN. SQ PLUG	3/8 IN. SQ SOCKET	TO ENABLE SOCKET WRENCHES (1/4 IN. SQ DRIVE) TO BE USED WITH TORQUE WRENCH 1702152
1700041	3/8 IN. SQ PLUG	1/4 IN. SQ SOCKET	TO ENABLE SOCKET WRENCHES (3/8 IN. SQ DRIVE) TO BE USED WITH TORQUE WRENCHES 1703038 AND 1702151
1700042	3/8 IN. SQ PLUG	1/2 IN. SQ SOCKET	TO ENABLE SOCKET WRENCHES (3/8 IN. SQ DRIVE) TO BE USED WITH TORQUE WRENCHES 1702153 AND 1702160
1700043	1/2 IN. SQ PLUG	3/8 IN. SQ SOCKET	TO ENABLE SOCKET WRENCHES (1/2 IN. SQ DRIVE) TO BE USED WITH TORQUE WRENCH 1702152

Torque Wrench Adapters
Figure 205

TABLE A Standard Torque Loads for Driving Studs						
NOMINAL THREAD SIZE (small end if stepped)	MINIMUM			MAXIMUM		
	lb.in.	kg.cm.	Nm	lb.in.	kg.cm.	Nm
0.185 in. (2 BA)	21.0	24.2	2.37	42.0	48.4	4.74
0.190 in. (10 UN)	23.0	26.5	2.60	46.0	53.0	5.20
0.250 in.	45.0	51.9	5.08	90.0	104.0	10.2
0.3125 in.	104.0	120.0	11.7	207.0	238.0	23.4
0.375 in.	178.0	205.0	20.1	356.0	410.0	40.2
0.4375 in.	285.0	328.0	32.2	569.0	655.0	64.3



25022

Correct Method of Using Extension Spanner with Torque Wrench
Figure 206

TABLE B Standard Torque Loads for Fitting Serrated Head Sealing Plugs (Unified or Whitworth Threads)			
NOMINAL DIAMETER	lb.in.	kg.cm.	Nm
0.250in.	20.0	23.04	2.26
0.3125in.	30.0	34.56	3.39
0.375in.	45.0	51.85	5.08
0.4375in.	65.0	74.88	7.34
0.500in.	90.0	103.69	10.2
0.5625in.	90.0	103.69	10.2
0.625in.	140.0	161.30	15.8
0.6875in.	180.0	207.38	20.3
0.750in.	180.0	207.38	20.3

TABLE C *[1]
Standard Torque Loads for Fitting Non Self-Locking Nuts and Bolts

THREAD SIZE	COLUMN A *[2]			COLUMN B *[3]		
	lb.in.	kg.cm.	Nm	lb.in.	kg.cm.	Nm
0.138 in. (6 UN)	8.0	9.22	0.90	10.0	11.52	1.13
0.164 in. (8 UN)	10.0	11.52	1.13	15.0	17.28	1.69
0.190 in. (10 UN)	25.0	28.80	2.82	35.0	40.32	3.95
0.185 in. (2 BA)	25.0	28.80	2.82	35.0	40.32	3.95
0.209 in. (1 BA)	35.0	40.32	3.95	50.0	57.61	5.65
0.250 in.	75.0	86.41	8.47	100.0	115.21	11.3
0.3125 in.	135.0	155.53	15.25	170.0	195.86	19.2
0.375 in.	235.0	270.75	26.55	300.0	345.64	33.9
0.4375 in.	360.0	414.76	40.68	450.0	518.46	50.8
THREAD SIZE	lb.ft.	kg.m.	Nm	lb.ft.	kg.m.	Nm
0.500 in.	47.9	6.62	64.97	63.0	8.71	85.4
0.5625 in.	62.0	8.57	84.1	79.0	10.92	107.0
0.625 in.	90.0	12.44	122.0	113.0	15.62	153.0

*[1] Do not fit silver plated parts together.
*[2] For combinations of cadmium plated nuts with cadmium plated bolts, cadmium plated nuts with unplated bolts and unplated nuts with cadmium plated bolts: use COLUMN A of the above table.
*[3] For combinations of silver plated nuts with unplated bolts, unplated nuts with silver plated bolts and unplated nuts with unplated bolts: use COLUMN B of the above table.

S 912-009-R00

(4) Self-Locking Nut Installation, also Bolt Installation into Self-Locking Captive Nuts or Self-Locking Wire Thread Inserts

(a) Apply the standard torque loads shown in TABLE D unless special torque loads are specified.

(b) Self-locking nuts and inserts have a limited life which depends, mainly, upon ability to retain 'run-down' (in-built) torque.

1) For values of run-down torque, refer to TABLE E.

(c) Run-down torque

1) Run-down torque is the torque necessary to overcome the in-built torque of a locking device in a nut or wire-thread insert when:

a) The nut is engaged on the stud or bolt (or bolt is engaged in insert or captive nut) with the full chamfer of the stud or bolt extended more than the locking device of the nut, insert, or captive nut.

b) There is no axial load on the nut or bolt.

CAUTION: THE RUN-DOWN TORQUE OF A NUT OR INSERT MUST NOT BE CHANGED BY 'CRIMPING' THE LOCKING DEVICE OR BY 'EASING' IT WITH A THREAD TAP.

2) The permitted run-down torque figures are shown in TABLE E.

a) Above the maximum figure, the nut or insert closure section will be overstressed; below the minimum figure the in-built torque is insufficient.

3) Run-down torque figure is an individual value and must not be added to the standard torque load figure.

TABLE D *[1]
Standard Torque Loads for Fitting Self-Locking Nuts and Bolts

THREAD SIZE	COLUMN A *[2]			COLUMN B *[3]		
	lb.in.	kg.cm.	Nm	lb.in.	kg.cm.	Nm
0.138 in. (6 UN)	10.0	11.52	1.13	12.0	13.82	1.36
0.164 in. (8 UN)	15.0	17.28	1.69	20.0	23.04	2.26
0.190 in. (10 UN)	30.0	34.56	3.39	40.0	46.09	4.52
0.250 in.	90.0	103.69	10.17	100.0	115.21	11.3
0.3125 in.	170.0	195.86	19.2	210.0	241.95	23.7
0.375 in.	310.0	357.16	35.0	370.0	426.27	41.8
0.4375 in.	410.0	472.37	46.3	490.0	564.54	55.4
THREAD SIZE	lb.ft.	kg.m.	Nm	lb.ft.	kg.m.	Nm
0.500 in.	53.33	7.373	72.3	65.83	9.100	89.3
0.5625 in.	69.16	9.560	93.8	84.16	11.628	114.0
0.625 in.	100.00	13.826	136.0	120.83	16.705	164.0

*[1] Do not fit silver plated parts together.
*[2] For combinations of cadmium plated nuts or inserts with cadmium plated bolts, cadmium plated nuts or inserts with unplated bolts, and unplated nuts or inserts with cadmium plated bolts; use COLUMN A of above table.
*[3] For combinations of silver plated nuts or inserts with unplated bolts, unplated nuts or inserts with unplated bolts and unplated nuts or inserts with silver plated bolts; use COLUMN B of the above table.

TABLE E
Range of Acceptable Limits of Run-Down Torque For Self-Locking Wire Thread Inserts and Captive Nuts

THREAD SIZE	MINIMUM			MAXIMUM		
	lb.in.	kg.cm.	Nm	lb.in.	kg.cm.	Nm
0.112 in. (4 UN)	0.5	0.57	0.056	3.0	3.46	0.338
0.138 in. (6 UN)	1.0	0.15	0.113	6.0	6.91	0.676
0.164 in. (8 UN)	1.5	1.72	0.169	9.0	10.37	1.017
0.190 in. (10 UN)	2.0	2.30	0.225	18.0	20.74	2.03
0.250 in.	3.5	4.00	0.394	30.0	34.56	3.39
0.3125 in.	6.5	7.48	0.733	60.0	69.12	6.78
0.375 in.	9.5	10.94	1.07	80.0	92.17	9.04
0.4375 in.	14.0	16.13	1.58	100.0	115.21	11.3
0.500 in.	18.0	20.74	2.03	150.0	172.82	17.0
0.5625 in.	24.0	27.65	2.71	200.0	230.43	22.6
0.625 in.	32.0	36.86	3.62	300.0	345.64	33.9
0.750 in.	50.0	57.61	5.65	400.0	460.85	45.2
0.875 in.	70.0	80.65	7.91	600.0	691.27	67.8
THREAD SIZE	lb.in.	kg.cm.	Nm	lb.ft.	kg.m.	Nm
1.000 in.	92.0	105.99	10.4	66.6	9.20	90.3
1.125 in.	117.0	134.79	13.2	75.0	10.37	102.0
1.250 in.	143.0	164.76	16.2	83.3	11.52	113.0

S 912-010-R00

(5) Tube Connectors Installation (Union Nuts, Tube and Hose Connectors)

(a) Apply the standard torque loads shown in TABLES F, G, and H to all standard tube connectors unless special torque loads are specified.

(b) Apply the procedure that follows when you install the nut and nipple connectors.

CAUTION: TO PREVENT DAMAGE TO TUBES AND UNIONS DURING ASSEMBLY OR DISASSEMBLY OF A TUBE CONNECTOR, USE A SPANNER TO PREVENT ROTATION OF THE UNION.

1) Assemble the connector to the union and tighten it to the recommended torque load.
2) Loosen the connector by slackening the nut half a turn.
3) Tighten and loosen the nut two more times.
4) Finally tighten the nut to the recommended torque load.

CAUTION: DO NOT APPLY MORE THAN THE SPECIFIED TORQUE LOAD WHEN YOU TRY TO GET A SATISFACTORY SEAL. IF YOU TIGHTEN THE CONNECTOR TOO MUCH YOU WILL DAMAGE THE NUT.

(c) If the connector leaks, disassemble the nut and nipple connector and examine the parts for the cause of the leak.

(d) Install new parts if it is necessary.

(e) Assemble the connector as shown before.

S 912-011-R00

(6) Torque Tightening Technique for Nuts

CAUTION: IF YOU DO NOT CLEAN AND LUBRICATE THE THREADS IT CAN RESULT IN A CLAMPING LOAD THAT IS NOT SUFFICIENT. IF THE TORQUE LOAD IS MORE THAN THE CORRECT TORQUE VALUE IN AN ATTEMPT TO INCREASE THE CLAMPING LOAD, IT CAN RESULT IN DAMAGE TO THE THREADS WHICH CAN BE HARD TO SEE BUT CAN CAUSE A FAILURE OF THE JOINT DURING SERVICE.

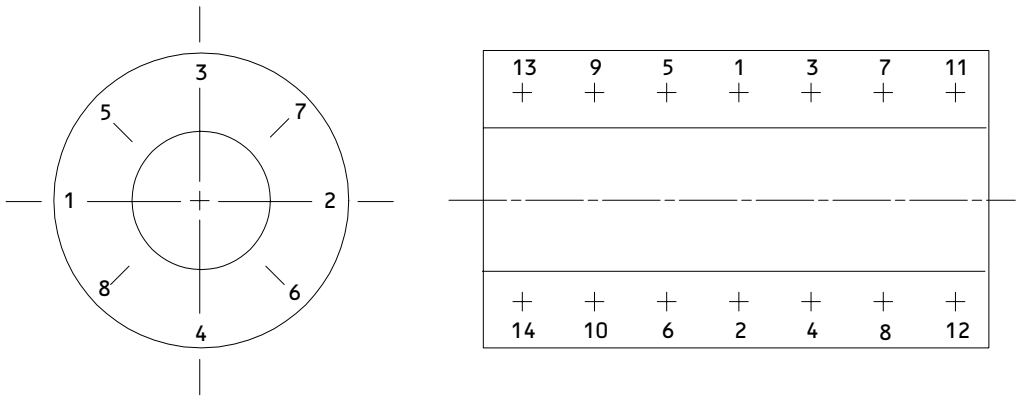
(a) When it is necessary to tighten the nuts again, remove the nuts and clean and lubricate the threads before you install them.

(b) Tighten the nuts to the specified torque load.

TABLE F *[1] Standard Torque Loads For Double-Ended Unions (Parallel Type) Unified Thread				
OUTSIDE DIAMETER OF TUBE (INCHES)	NOMINAL THREAD DIAMETER (INCHES)	TORQUE LOAD		
		lb.in.	kg.cm.	Nm
1/8	0.375	150.0	172.82	17.0
3/16	0.4375	175.0	201.63	19.8
1/4	0.500	205.0	236.19	23.2
5/16	0.625	260.0	299.55	29.4
3/8	0.6875	290.0	334.12	32.8
7/16	0.750	320.0	368.68	36.2
1/2	0.8125	355.0	409.01	40.1
5/8	0.875	390.0	449.33	44.1
3/4	1.0625	505.0	581.82	57.1
7/8	1.1875	600.0	691.27	67.8
OUTSIDE DIA. (IN)	NOM. THRD DIA. (IN)	lb.ft.	kg.m.	Nm
1.00	1.3125	59.0	8.157	80.0
1 1/4	1.625	87.5	12.097	119.0
1 1/2	1.875	119.0	16.453	161.0
1 3/4	2.125	160.0	22.121	217.0
2.00	2.375	208.0	28.757	282.0

*[1] When fitted into a casing or casting, the 'fast' (or casing) ends of parallel unions are subject to a torque load which, to aid security of location, is of a higher value than the torque load specified for the union nuts.

TABLE G Standard Torque Loads For Union Nuts (Thrust Wire Type) Unified Thread				
OUTSIDE DIAMETER OF TUBE (INCHES)	NOMINAL THREAD DIAMETER (INCHES)	TORQUE LOAD		
		lb.in.	kg.cm.	Nm
1/8	0.375	125.0	144.01	14.1
3/16	0.4375	145.0	167.06	16.4
1/4	0.500	170.0	195.86	19.2
5/16	0.625	215.0	257.71	24.3
3/8	0.6875	240.0	276.52	27.1
7/16	0.750	265.0	305.31	29.9
1/2	0.8125	295.0	339.88	33.3
5/8	0.875	325.0	374.44	36.7
3/4	1.0625	420.0	483.89	47.5
7/8	1.1875	500.0	576.06	56.5
1.00	1.3125	590.0	679.75	66.7
OUTSIDE DIA (IN)	NOM. THRD DIA. (IN)	lb.ft.	kg.m.	Nm
1 1/4	1.625	73.0	10.093	99.0
1 1/2	1.875	99.0	13.687	134.0
1 3/4	2.125	133.0	18.389	180.0
2.00	2.375	173.0	23.919	235.0



RING FLANGE

HALF-CASING JOINT

41192

Bolt Tightening Sequence
Figure 207

TABLE H *[1]
Standard Torque Loads For Double-Ended Unions (Stepped Type) Unified Thread

OUTSIDE DIAMETER OF TUBE (INCHES)	NOMINAL THREAD DIAMETER (INCHES)		TORQUE LOAD		
	LARGE END	SMALL END	lb.in.	kg.cm.	Nm
1/8	0.4375	0.385	150.0	172.82	17.0
3/16	0.500	0.4375	175.0	201.63	19.8
1/4	0.5625	0.500	205.0	236.19	23.2
5/16	0.6875	0.625	260.0	299.55	29.4
3/8	0.750	0.6875	290.0	334.12	32.8
7/16	0.8125	0.750	320.0	368.68	36.2
1/2	0.875	0.8125	355.0	409.01	40.1

*[1] When fitted into a casing or casting, the 'fast' (or casing) ends of stepped unions are subject to a torque load which, to aid security of location, is of a higher value than the torque load specified for the union nuts.

S 912-012-R00

(7) Torque Tightening Technique for Locking Devices

(a) Where locking plates, keywashers, or cotterpins are used as locking devices, do the steps that follow:

CAUTION: DO NOT LOOSEN THE NUT TO GET THE LOCKING POSITION. IF YOU LOOWSEN THE NUT YOU WILL GET AN INCORRECT TORQUE LOAD.

1) Where one torque load is specified, it is permitted, and possibly necessary, to tighten the nut more than the specified torque until you get to the subsequent locking position.
2) Where a minimum and a maximum torque load value is specified, the final torque load applied must be in the specified range.

S 912-013-R00

(8) Torque Tightening Technique for Shrouded Keywashers

(a) Shrouded keywashers are prone to 'dishing' during manufacture and, with just one torque tightening procedure, the washers do not always become flat satisfactorily.

(b) If shrouded keywashers are used, do two tightening procedures, as follows:
1) Tighten the nut to the full torque load.
2) Loosen the nut and then tighten it again until you get the full torque load.

S 912-014-R00

(9) Torque Tightening Technique for Jointing Compound
(a) When you use a jointing compound on a joint face that you will torque tighten, tighten to the specified torque load.
(b) Let the jointing compound become dry for 10 minutes then examine the torque value and tighten again if it is necessary.

S 912-015-R00

(10) Tightening Sequence for Close Pitch Bolting (Fig. 207)
(a) Where close pitch bolting is used and where it is necessary to make a seal, adjacent fasteners must not be tightened one after the other.
1) Tighten them in a symmetrical pattern to make sure that strain is not caused to the structure.
(b) Unless otherwise specified, the procedure that follows is recommended:
1) On flanges, tighten the two fasteners approximately opposite to each other to an intermediate torque value.
2) Do the procedure at another pair of fasteners approximately at 90 degrees to the first pair.
3) Bisect the angles that result and continue as before.
4) When the flange faces are in light contact with all fasteners, apply the specified tightening torque in the same sequence.
(c) On half-casing split lines, use the same procedure as shown above, but tighten the mid-section positions first and then move out from the center.

S 912-016-R00

(11) Technique for Fasteners Clamping 'Corrujoint' Seals
(a) When there is no specific procedure to tighten the 'Corrujoint' seals the fasteners must be tightened to the specified torque value.
(b) During the tighten procedure the 'Corrujoint' will compress which will decrease the effective torque initially applied.
(c) To compensate for this decrease in torque do the tighten sequence until the torque value stays constant during one complete pass.

S 912-017-R00

(12) Assembly of (Curvic Coupling) Face Tooth Joints

(a) To standardize the procedures for face tooth joint assembly in order to get the high degree of balance consistent with the design aspects of these types of coupling, apply the procedure that follows in all circumstances where two parts of a face tooth joint are brought together when mating modules.

(b) This procedure is applicable to Curvic couplings, Hirth couplings and any other form of face tooth joint.

(c) The tightening torque values are applicable to both self-locking and non self-locking fasteners.

(d) Assembly procedure

1) Immediately before you move the two parts of the face tooth joint together, the teeth are to be free from all burrs and are to be cleaned to remove all unwanted particles, grease, oil, etc. This is very important as even very small particles can cause interference to the seating of the teeth.

2) When mating the modules, the two parts are to be moved together with sufficient accuracy to make sure the teeth mate correctly and thus avoid a shear load on the teeth.

3) The fastener threads and the bearing surface of the nut or bolt, which is to be turned with the wrench, are to be lubricated with engine oil and the threads engaged, but not run down.

4) Tightening sequence

a) Each bolt hole will be identified by a number which shows the sequence the nut/bolt combination is to be tighten.

NOTE: In the case of small size couplings with 10 or less bolts, the tightening sequence will be specified in the related section of the applicable manual.

b) If the joint is assembled with its axis horizontal, position holes 1 and 2 on the horizontal axis when viewed from the front. If there are an odd number of bolts, hole number 1 is to be on the horizontal axis when viewed from the front.

c) Start with the nut/bolt combination in hole 1 and continue in numerical sequence and tighten the nut/bolt combination to the initial torque value specified in TABLE I.

TABLE I Initial Torque Values		
THREAD DIA.(in.) and T.P.I.	INITIAL TORQUE	
	lb. in.	N.m.
0.190–32 (No.10–32)	20	2,20
0.250–28	40	4,50
0.3125–24	80	9,00
0.375–24	110	12,00
0.4375–20	130	15,00
0.500–20	200	23,00
0.5625–18	260	29,00

d) Follow the same sequence and tighten each nut/bolt combination to the intermediate torque values specified in TABLE J.

TABLE J Intermediate Torque Values		
THREAD DIA.(In.) and T.P.I.	INTERMEDIATE TORQUE	
	lb. in.	N.m.
0.190–32 (No.10–32)	25	2,8
0.250–28	50	5,60
0.3125–24	100	11,00
0.375–24	180	20,00
0.4375–20	250	28,00
0.500–20	400	45,00
0.5625–18	500	56,00

e) Follow the same sequence and tighten each nut/bolt combination to the final torque values specified in TABLE K or the special loading specified in the applicable manual section.

TABLE K Final Tightening Torque Values		
THREAD DIA.(in.) and T.P.I.	FINAL TORQUE	
	lb. in.	N.m.
0.190–32 (No.10–32)	40	4,50
0.250–28	100	11,00
0.3125–24	210	24,00
0.375–24	370	42,00
0.4375–20	490	55,00
0.500–20	790	89,00
0.5625–18	1010	114,00

f) Start with the nut/bolt combination in hole 1 and continue in a clockwise direction, examine each nut/bolt combination for the torque value specified in TABLE K or the special loading specified in the applicable manual section.

STORAGE OF RUBBER RINGS, FLEXIBLE HOSES AND OTHER RUBBER COMPONENTS
MAINTENANCE PRACTICES

1. General
   A. This procedure gives you data on how to keep rubber components.

TASK 70-61-01-912-001-R00

2. Storage of Rubber Rings, Flexible Hoses and Other Rubber Components
   A. Shelf life

S 912-002-R00

(1) The shelf life of rubber and synthetic rubber parts is calculated on the cure date.
   (a) The cure date is shown on the parts or on their containers.
   (b) This applies to rubber parts, bonded rubber to metal parts, cables, harnesses, hoses and hose assemblies that are not installed.
   (c) This does not apply to assembled units and accessories. It also does not apply to fuel units.

S 912-003-R00

(2) The cure date shows the quarter of the year (written as one number), the letter Q, and the year the part started (written as two numbers).

NOTE: The part with the cure date 2Q80 was made in the second quarter of 1980.

S 912-004-R00

(3) The year is divided into quarters as follow:

First quarter	January, February, March
Second quarter	April, May, June
Third quarter	July, August, September
Fourth quarter	October, November, December

NOTE: On some parts, the cure date includes the month.

S 912-005-R00

(4) The age of a part is calculated from the end of the quarter in which it was made.

NOTE: The part with the cure date 2Q80 has an age of one year at the end of the second quarter of 1981 (30th June, 1981).

B. Cure date mark

S 912-006-R00

(1) The rubber parts that you keep in storage bins show their cure data as follows:

S 912-007-R00

(2) Part with a sufficient dimension, will have a mark with a permanent marking fluid of a different color (diaphragms and bulkhead seals but not sealing rings).

S 912-008-R00

(3) Envelopes contain parts which cannot be identified because of their small dimension and all seal rings.

NOTE: These parts or batch of parts have a label attached to them.

S 912-009-R00

(4) All containers for the parts show the cure date, the maker's name or number, the Rolls-Royce part number, and the batch number.

S 912-010-R00

(5) Hoses have 2 groups of numbers and letters for identification along the full length of the hose.

(a) The first group gives data on mixture, while the second group gives length or batch number and cure date as follows:

First 4 numbers - length or batch number

Middle number and letter - quarter symbol and the letter Q

Final 2 numbers - year symbol

NOTE: 01012Q80 identifies the 101st length or batch made in the second quarter of 1980.

S 912-011-R00

(6) Hose assemblies have three identification tabs as follows:

(a) Copy of the hose identification

(b) Hose assembly part number, test date, inspector's stamp and maker's identification

(c) Cure date of the hose assembly

S 912-012-R00

(7) All the containers for the hoses and hose assemblies show the cure date.

C. To keep parts

S 912-013-R00

(1) Keep rubber parts in good condition for maximum life.
  (a) Prevent load, sunlight, ozone, moisture, too much circulation of air, very high or low temperatures.
  (b) Prevent damage and contamination by fuels, oils, greases, or solvents.
  (c) If the parts are in containers, keep them in this condition.
  (d) Do not keep too many parts for the rate the parts are used.
  (e) Use the first cure date parts first.
  (f) Do not permit rubber parts to touch copper or other metal containers.

S 912-014-R00

(2) Keep the parts with no load on them and in their usual shape.
  (a) Prevent too much vertical load on the parts to prevent distortion.
  (b) Keep flexible hoses in straight lengths.
  (c) Coils put a load on the outer surface of each coil and increase the risk of ozone cracks.

S 912-015-R00

(3) Supply sufficient air movement to prevent condensation but do not let the air blow on the parts.

S 912-016-R00

(4) Keep the ozone from mercury gas lamps, electrical machines and outside air away from the parts.

S 912-017-R00

(5) Make sure the parts are not in sunlight.

S 912-018-R00

(6) Keep lip seals in a position that prevents damage and distortion of the seal edge.
  (a) Do not attach tie labels directly to the seals.
  (b) Do not install seal rings on ferrules or bobbins until immediately before installation into an engine because expanded seals can deteriorate.

S 912-019-R00

(7) Keep the temperature between 41 to 100 degrees F (5 to 38 degrees C) and the relative humidity at 65 percent.
  (a) Keep the parts more than 3 feet from all sources of heat.

S 912-020-R00

(8) If the rubber parts are kept in these conditions, their life has no limit, when the parts are given monitored inspection.

S 912-021-R00

(9) The rubber types are divided into 3 groups.

(a) Group A

	Material spec.
Natural rubber	MS 717

These parts are supplied to a customer as much as 5 years from the cure date. The subsequent life has no limit with satisfactory inspection of a sample of the first cure date each 2 years.

(b) Group B

	Material Spec.
1) Butyl	MS 754, 757
Neoprene (Chloroprene)	MS 710, 716 (BS2752 Grade C3 or C4)

These parts are supplied to a customer as much as 7 years from the cure date. The subsequent life has no limit with satisfactory inspection of a sample of the first cure date each 3 years.

2) Nitrile	MS 727, 735, 743, 744, 747, 765 MSRR 9454, 9455 BSEM 602 DTD 5509, 5595, 5607

These parts have a life limitation of 7 years and an extension period of 3 years. Parts will be supplied with 75 percent of the shelf life remaining.

(c) Group X

	Material spec.
Silicone	MS732, 741, 751, 756, 761,
Fluorosilicone	771
Fluorocarbon (Viton)	MSRR 9450 (MS 762), 9451 (MS 782) 9452 (MS 766), 9453, 9490 BSEM 608, 534 DTD 900/4882A, 5543, 5603, 5612, 5613

There is no life limit for supply to a customer or to keep. Cure date identification is kept only to monitor supply.

NOTE: Rubber parts in Groups A and B (does not include Nitrile) to be used on the engines immediately and not to be kept, can have more than the cure date limit. This is permitted because the vendors keep parts in the best conditions.

D. Inspection of the parts

S 212-022-R00

(1) Examine the parts for signs of damage because of time or oxidation.
  (a) Damage is shown by cracks of the surface and deterioration.
  (b) Bend the part carefully and discard it if cracks occur before or after the part is bent.

S 212-023-R00

(2) Do not discard the parts because of a bloom on their surface that is white or has a color.

NOTE: Blooms are usually a protection layer and start from the anti-oxidants that are used in high grade rubber.

S 212-024-R00

(3) Examine all the parts as follows and discard them if they are defective:
  (a) Look for permanent distortion, flat areas, and other visual defects.
  (b) Look for tacky, hard, or soft surfaces.
  (c) Extend or bend the rubber and look for blisters, cracks, and surface peel.
  (d) Look for worn areas on the outer layers of the hose assemblies and cable harnesses.
  (e) Look for corrosion or damage to the end fittings of the hose assemblies and cable harnesses.
  (f) Look for corrosion of the metal parts in bonded rubber-to-metal assemblies.

(g) Look for blockage of the internal diameter of the flexible hoses.

S 782-025-R00

(4) Pressure test the flexible hoses.
  (a) If it is necessary to install a flexible hose because you do not have a pressure test facility, do the step that follows:
    1) Remove the hose for a test as soon as possible.

S 762-026-R00

(5) Do a test on the electrical cables and harnesses.
  (a) Measure the resistance where it applies.
  (b) Measure the insulation resistance and continuity.
  (c) Look for worn areas on the loom.
  (d) Examine the end fittings for satisfactory condition.