STARTING - PNEUMATIC STARTER - INTRODUCTION OF STARTER WITH REVISED CARBON SEAL RETENTION - SUMITOMO SB 80-2514 - CATEGORY CODE 7 - MOD.ENG-80-0013

See Vendor Bulletin 80-2514

1. Planning Information

A. Effectivity

(1) Aircraft
- (a) Airbus A319
- (b) Airbus A320
- (c) Airbus A321
- (d) Boeing-Douglas MD-90

(2) Engines
- (a) V2500-A1 Engines prior to Serial No.V0362
- (b) V2522-A5 Engines prior to Serial No.V10272
- (c) V2524-A5 Engines prior to Serial No.V10272
- (d) V2527-A5 Engines prior to Serial No.V10272
- (e) V2530-A5 Engines prior to Serial No.V10272
- (f) V2533-A5 Engines prior to Serial No.V10272
- (g) V2525-D5 Engines prior to Serial No.V20158
- (h) V2528-D5 Engines prior to Serial No.V20158

B. Concurrent Requirements

None.

C. Reason

(1) Condition

If the cranking times are too long, damage can be caused to the starter turbine carbon-seal of the pneumatic starter. This can result in an oil leak.

The problem is caused by differential expansion between the carbon seal and the bearing sleeve during temperature conditions which are higher than usual. This results in the loss of interference fit and lets the carbon seal move forward and touch the seal rotor.

(2) Background

The problem has been found in service.

(3) Objective

The purpose of this Service Bulletin is to maintain unit reliability.

(4) Substantiation

A satisfactory engineering analysys and vendor rig tests have been done on the changes contained in this Service Bulletin.

(5) Effect of Bulletin on Workshop Procedures

Removal/Installation	Not affected
Disassembly/Assembly	Not affected
Cleaning	Not affected
Inspection/Check	Not affected
Repair	Not affected
Testing	Not affected

(6) Supplemental Information

None.

D. Description

(1) This Service Bulletin includes the installation of a Pneumatic Starter which has Sumitomo Modfication L12.

(2) The changes are as follows:

(a) The Pneumatic Starter has changed. The material of the carbon seal sleeve-cup has changed from 300-series stainless steel to the same as that for the bearing sleeve (AISI 410).

(3) L12 will be put on the modification plate of units which have this modification.

E. Approval

The part number changes and/or part modification are given in Section 2 and 3 of this Service Bulletin. They obey the applicable Federal Aviation Regulations and are FAA-APPROVED for the engine model listed.

F. Compliance

Category Code 7

This Service Bulletin can be done when there are no initial parts remaining.

G. Manpower

Estimate of man-hours necessary to embody this Service Bulletin in full:

Venue	Estimated Man-hours
(1) In service	Not applicable

(2) At overhaul .. .. .. No additional time is necessary to embody this Service Bulletin.

NOTE: It is possible to get access to the parts affected by this Service Bulletin during overhaul.

H. Material - Price and Availability

(1) A modification kit is not necessary.

(2) See "Material Information" section for prices and availability of spares.

I. Tooling - Price and Availability

Special tools are not necessary.

J. Weight and Balance

(1) Weight change .. .. .. None

(2) Moment arm .. .. No effect

(3) Datum .. .. Engine front mount centreline (Power Plant Station - PPS 100)

K. Electrical Load Data

This Service Bulletin has no effect on the aircraft elelctrical load.

L. References

(1) Internal Reference No.

EC96VI013

(2) Other References

IAE V2500 reference modifications

ENG-70-0391 Starting - Pneumatic Starter - Introduction of an oil sight glass facility as an option.

ENG-80-0009 Starting - Pneumatic Starter - Introduction of an oil pressure fill facility.

Refer to Sumitomo Vendor Service Bulletin 80-2514

Airbus Aircraft Modification 21820

M. Other Publications Affected

(1) Illustrated Parts Catalog (IPC), Chapter/Section, 80-13-41.

2. Accomplishment Instructions

A. Rework Instructions

None.

B. Assembly Instructions

For the correct Removal/Installation procedures refer to the A319, A320 or A321 Aircraft Maintenance Manual (AMM), Chapter/Section 80-13-41.

or

The MD-90 Aircraft Maintenance Manual (AMM), Chapter/Section 80-11-01.

C. Recording Instructions

(1) A record of accomplishment is necessary. Refer to Sumitomo Vendor Service Bulletin 80-2514.

3. Material Information

Applicability: For each V2500 Engine for which this Service Bulletin is applicable.

A. Kits necessary for this Service Bulletin:

None

B. Vendor Units affected by this Service Bulletin:

New Part No. (ATA No.)	Qty	Est'd Unit Price ($)	Keyword	Old Part No. (IPC No.)	Instructions Disposition
A1 and A5 Models					
790425A4 (80-13-41)	1		Starter, pneumatic	790425A4 (01-200)	(A)(B)(S1)
For Units incorporating EC94VR028					
790425A3 (80-13-41)	1		Starter, pneumatic	790425A3 (01-200)	(A)(B)(S1)
D5 Models					
790425A3 (80-13-41)	1		Starter, pneumatic	790425A3 (01-200)	(A)(B)(S1)
For Units incorporating EC93VR070B					
790425A4 (80-13-41)	1		Starter, pneumatic	790425A4 (01-200)	(A)(B)(S1)

NOTE: The unit prices, if shown, are an estimate and they are given for the purpose of planning only. For information about actual prices, refer to the IAE Price Catalog or contact IAE's Spare Parts Sales Department.

C. Instructions disposition codes

(A) New part is currently available
(B) Old part will be discontinued
(S1) Old and new parts are freely and fully interchangeable

SUMITOMO PRECISION PRODUCTS CO., LTD.

SERVICE BULLETIN

PNEUMATIC STARTER - REPLACEMENT OF THE ROTOR SEAL ASSEMBLY

1. Planning Information

A. Effectivity

(1) Refer to Table 1.

Table 1. Effectivity

All Pneumatic Starters Part Number (PN) 790425 that do not incorporate the stock list number	Serial Number of First Production Incorporation
L12	A10349

NOTE: This Service Bulletin is applicable to MD90, A320 and A321 aircraft that have IAE V2500 Engines.

B. Concurrent Requirements

(1) None

C. Reason

(1) Problem

(a) Some starters have exhibited oil leakage from the turbine end carbon seal.

(2) Cause

(a) The seal cup is made of 300 series stainless steel and the bearing sleeve is made of 400 series stainless steel. These materials have different coefficients of thermal expansion. During temperature variations the seal cup has yielded causing a change in the interference fit in the bearing sleeve. The seal cup and assembly moved towards the rotor and the seal cup contacted the rotor. Metal particles were generated and the carbon seal was damaged which resulted in oil leakage.

(3) Solution

(a) The seal cup material is being changed to 400 series stainless steel so that it will have the same coefficient of expansion as the bearing sleeve. This will maintain the correct interference fit during thermal variations of the parts.

(4) Substantiation

(a) Thermal testing was conducted and the seal assembly maintained the correct fit in the bearing sleeve.

D. Description

(1) Replace the seal assembly PN 797646-1 with the new seal assembly PN 797646-2 during repair or overhaul of the starter. Reidentify the rotor balance assembly PN 797652-3 as 797652-4 and add L12 to the stock list numbers on the starter nameplate.

E. Compliance

(1) Recommended - Accomplish during the next shop visit when the starter is disassembled for other reasons.

F. Approval

(1) This Service Bulletin No. 80-2514 (IAE SB V2500-ENG-80-0013) was technically agreed to by IAE on 6 July 97. The part number changes shown in paragragh 3 of this service bulletin have been sanctioned under a product development / control system that has been approved by the D.G.A.C. (Direction Generale de L'Aviation Civile) - Paris.

G. Manpower

(1) No additional man hours are necessary when you do this service bulletin procedure at component maintenance or overhaul.

H. Weight and Balance

(1) None

I. Electrical Load Data

(1) No Change

J. Software Accomplishment Summary

(1) Not Applicable

K. References

(1) Component Maintenance Manual (CMM) 80-13-41

L. Other Publications Affected

(1) CMM 80-13-41

M. Interchangeability or Intermixability of Parts

(1) This SB must be accomplished in it's entirety without substitution of the new parts listed in the material section.

2. Material Information

A. Material - Price and Availability

(1) Refer to Table 2.

B. Industry Support Information

(1) None

C. Material Necessary for Each Component

(1) Material to be Purchased

(a) The parts that are necessary to do this Service Bulletin are shown in Table 2.

(b) Any parts that usually are discarded when you disassemble the Pneumatic Starter are not in Table 2.

(c) In Table 2, "MSQ" is the Minimum Sales Quantity. The parts that have an entry in this area of Table 2 are supplied only in this quantity, or a multiple of this quantity.

(d) In Table 2, "Keyword" is the name of the part.

(e) In Table 2, the "instruction codes" tell you what to do with the parts. A short list under Table 2 tells you about the instruction codes that are used in Table 2.

(f) The prices that are shown are estimates for one part in US dollars. When you buy the parts, the prices may be different. Send requests for parts to:

Mail: Hamilton Standard
A United Technologies Company
Attention: Manager Commercial Spares
Mail Stop: 2MGGHH10
One Hamilton Road
Windsor Locks, CT 06096-1010
USA

Facsimile: (860) 654-6905

(g) If more data is necessary, ask your Hamilton Standard account representative.

Table 2. Parts To Be Purchased

New PN	Keyword	Old PN	Qty	MSQ	Estimated Unit Price	Instruction Codes
797646-2	Seal Assembly, Rotor	797646-1	1	001	$252.00	A, B, C

- Instruction Code A. The Service Bulletin change adds the "New PN" to the Pneumatic Starter.
- Instruction Code B. The Service Bulletin change removes the "Old PN" from the Pneumatic Starter. Discard the part.
- Instruction Code C. The "Old PN" has the same fit and function as the "New PN."

(2) Material Supplied by the Operator

(a) None

D. Material Necessary for Spare

(1) Material to be Purchased

(a) Refer to Table 2

(2) Material Supplied by the Operator

(a) None

E. Reidentified Parts

(1) None

F. Tooling - Price and Availability

(1) None

3. Accomplishment Instructions

A. Use the instructions that follow to replace the carbon seal assembly PN 797646-1 with PN 797646-2 during repair or overhaul of the starter for other reasons.

(1) Disassemble, clean, and inspect the starter in accordance with the CMM instructions.

(2) Assemble the starter in accordance with the assembly section of the CMM except replace seal assembly PN 797646-1 with PN 797646-2. The new seal assembly is installed using the same procedures and has the same fit and function as the old seal assembly.

B. To show that this service bulletin was done, add Sumitomo Precision Products Co., LTD (SPP) modification number "L12" on the starter identification plate. The SPP part number is not changed by this Service Bulletin.

C. Hamilton Standard Internal Reference Numbers 250820, 250742-2

SUMITOMO PRECISION PRODUCTS CO.,LTD.

SERVICE INFORMATION RELEASE

NO. SIR:V2500SXV:002
DATE

MODEL: PS400-1 AND PS400-1D MODEL
PRODUCT: STARTER CONTROL VALVE

Subject: Starter Control Valve Screening

ATA Chapter: 80-13-51

Manual Revision: N/A

Service Bulletin: N/A

Modification Data Plate Information: N/A

This document is raised to recommend the Check on the wing and Cleaning in the maintenance area for Starter Control Valve to eliminate a potential defect on the electrical solenoid by screening at an A Check or other earliest convenience, and it is considered the most effective prevention of operational delays which may be caused due to the valve in-operation.

Taking this prevention indicated hereafter, degradation of operational performance due to the valve removal will be eliminated or dramatically reduced.

1. Effectivity

   Valve S/No: Up To A0676

2. Failure Mode

   Some events that the starter control valve has failed to open fully by sticking of the electrical solenoid during engine starting have been reported.

   As the result of the field check and the receiving inspection on the defective valve by Sumitomo Precision Products, the solenoid operational voltage was found to have increased to above acceptance limits.

   The primary cause of this failure mode is deterioration of the solenoid performance.

3. Failure Cause

   The cause of the solenoid operational voltage out of limit condition has been attributed to increased friction occurring between the solenoid plunger and bore. Investigation of returned units has shown that this was related to a locally rough surface finish that existed on some solenoid plungers.

   During operation on installed engines the nickel plating on these components was reduced to powder. The effect of the locally rough surface finish and the trapped nickel powder caused an increase in friction between the plunger and bore of the solenoid.

The rough surface finish is considered to have originated from the machining and handling process that have subsequently been improved.

4. Problem Extent

It is possible that there still exist such solenoids that were manufactured with unacceptably or locally rough surfaces on their plungers currently operating on some valves in field.

However, despite statistical study of the field experience and review of production records, the batch or the batches affected by the forementioned manufacturing problem are not specified so far.

5. Screening

A. Purpose

The screening procedure described in this Paragraph is recommended to find the valves with effected solenoids conveniently before failures occur at engine starting and, besides, to improve operational performance of the valve in service.

(1) All effected valves should be checked for satisfactory solenoid operation. This can be accomplished by performing a pull in check using the minimum operating voltage of the solenoid. The valves passing this test are proved to be free from deterioration of the solenoids.

(2) The solenoids are to be separated from those valves failing in the test and to be disassembled, then the nickel ground powder both on the plunger and plunger bore is to be wiped and cleaned. After cleaning, the valves are to be re–tested in the same manner as described above (1).

(3) After these reworks, the valves whose electrical solenoids have been cleaned are considered to become free from deterioration and from our experience, they are usable because the rough surfaces of the plungers are normally ground and blended to become practically smooth without being damaged to the base metal of the plungers through engine operation.

B. Planning Information

(1) Manpower

Approximately one (1) hour

(2) Material

Material required to perform this cleaning is as listed below.

Part Name	SPEC or Part Number
Boot	M85049-68-4S8D
Lock Wire	MS20995C20
Methyl Alcohol	AMS3004
Methyl Ethyl Ketone	TT-M-261
Lacing Tape	748929-1 (for Mod. No. L8 only)

(3) Tooling

Tool required to perform this cleaning is as listed below.

Part Name	Part Number
Contact Insertion and Removal Tool	M81969/14-03

(4) Reference

Component Maintenance Manual (CMM): 80-13-51
" Starter Control Valve "

C. Procedure

For A1 and A5 Engines
For access to the start valve on the aircraft refer to AMM 80-13-51-000-010 Paragraph 1, 2.

For D5 Engines
For access to the start valve on the aircraft refer to AMM 80-11-02 Paragraph 1, 2, and 3.
Ref also General Maintenance Practices 80-00-00.

Regarding the Figure number and the item numbers, refer to the Illustrated Pasts List of CMM 80-13-51 unless otherwise specified herein.

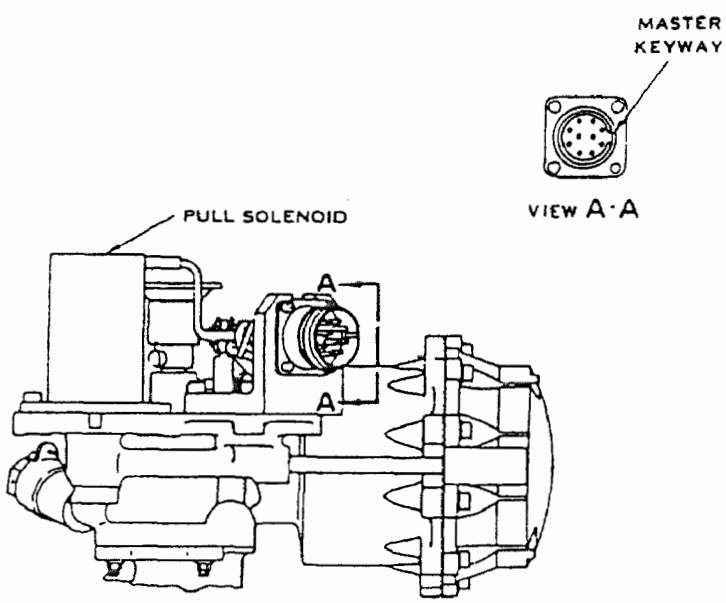
(1) Check On Wing

The check is recommended at an "A" check on the aircraft or other earliest convenience.

(a) Check – Electrical Solenoid

Remove the electrical connector from the start valve. Using those equipment specified below apply 9.25 – 9.5 Vdc across contacts 1 and 2 of the connector (160) and check the solenoid actuation. The figure of the contacts is also shown below for reference. The contact size number is #16, .0625 inch diameter (1.5875 mm).

Equipment	Specification
Regulated DC Power Supply	0 – 35 Vdc 10A or Equivalent
Stethoscope	Industrial or Medical type



Electrical Solenoid and Connector

Listen to the click sound carefully when energized.

NOTE: Click sound is so small that it is recommended to use a stethoscope.

Repeat above procedure for contacts 3 and 4.

If the valve solenoid actuation is satisfactory, no further work is necessary. Return the engine to normal condition.
Replace the connector to the start valve

For A1 and A5 engines
Refer to AMM 80–13–51–400–010 paragraph's 4A and B

For D5 engines
Refer to AMM 80–11–02 Paragraph 4 item E, F, G and H

If the check on the valve does not indicate satisfactory operation of the solenoid, remove valve from the engine for the next step if time permits, or schedule valve removal for the next step at the next convenient opportunity.

(2) Check Off The Wing

For A1 and A5 Engines
For removal of start valve from the engine refer to AMM 80–13–51–000–010

For D5 Engines
For removal of start valve from the engine refer to AMM 80–11–02
Ref also General Maintenance Practices 80–00–00

This procedure shall be performed if the solenoid failed to pass the check on the wing.

(a) Disassembly – Valve Assembly (See Figure 1)

Remove screws (210) and separate the solenoid (220) from actuator housing (360) in accordance with DISASSEMBLY SECTION of CMM 80–13–51.

(b) Visual Check – Electrical Solenoid (See Figure 1)

Set the Solenoid so as to the small pin position upward, then watch the pin whether it actuate or not when applying 9.25 – 9.5 Vdc across contacts 1 and 2 of electrical connector (160). The pin shall be pulled in when energized.

NOTE: The pin stroke is very short, approximately 0.8 mm (.031 in). Carefully gaze on the pin movement.

Repeat above procedure for contacts 3 and 4.

If the solenoid actuation is confirmed, the solenoid can be used as is. Then reassemble the electronic solenoid on the valve as described in the following section of (c)

The solenoid which dose not operate at this check shall be cleaned in accordance with the next cleaning section (3).

(c) Reassembly – Valve Assembly (See Figure 1)

Install the solenoid on valve with two screws (210) in accordance with ASSEMBLY SECTION of CMM 80–13–51.

(3) Cleaning

This procedure shall be performed if the solenoid fails to operate at the above check (2).

(a) Disassembly – Electrical Solenoid (See Figure A)

NOTE: Regarding the item numbers prefixed with "S", refer to the Figure A of Appendix A.

NOTE: The components of the solenoid are so small that they are to be kept carefully in clean containers separately.

NOTE: The components of the solenoid are matched set parts, therefore identify these parts so as not to be mixed with components of other solenoid.

NOTE: The shims removed from solenoid are needed to be reassembled as before.

Remove the pin (S6) from the bracket (S4) bore of the solenoid. After loosening the four screws (S5), remove the bracket (S4). Remove the plunger (S3), the spring (S2) and the shims (S1) from inside of the core of solenoid.

NOTE: Regarding the item numbers not prefixed with "S", refer to the IPL of CMM 80–13–51.

As for the valve assembly of Modification No. L6 and L7, remove screw (70). (See Figure 1)

Cut and remove boot (320). Remove ground wire (190) and contacts (170) so as to separate the solenoid from connector (160) in accordance with DISASSEMBLY SECTION of CMM 80–13–51.

(b) Cleaning – Solenoid (See Figure A)

WARNING: DO NOT GET METHYL ETHYL KETONE, TT–M–261, AND METHYL ALCOHOL IN YOUR EYES OR SKIN. DO NOT BREATH THEIR GAS. THEY ARE FLAMMABLE AND POISONOUS. WEAR PROTECTIVE CLOTHING AND BE SURE AREA HAS A GOOD FLOW OF AIR.

NOTE: Regarding the item numbers prefixed with "S", refer to the Figure A of Appendix A.

Wipe external surface of the pin (S6) and the plunger (S3) and internal surface of the solenoid with a soft cloth wet with methyl ethyl ketone, TT–M–261, or methyl alcohol AMS3004. Dry clean surfaces with a clean lintless wiper.

(c) Reassembly – Electrical Solenoid (See Figure A)

NOTE: Regarding the item numbers prefixed with "S", refer to the Figure A of Appendix A.

Reassemble the components on the solenoid as follows:

Install the shim (S1), the spring (S2) and the plunger (S3) into the solenoid bore. Attach the bracket (S4) to the solenoid with the four screws (S5). Tighten all the screws (S5) to a torque of 3.2 to 4.7 pound–inches (.36 to .54 Newton–Meters).
Insert the pin (S6) into the bore of the bracket (S4).

(d) Visual Check – Electrical Solenoid (See Figure 1)

Perform the visual check in accordance with section (2)(b) except the disposition of failed solenoids. The solenoids which do not pass the visual check are to be returned to Sumitomo or its authorized repair stations.

(e) Reassembly – Valve assembly (See Figure 1)

Install the solenoid on the valve with the two screws (210), then install the boot (320), the ground wire (190) and the contacts (170) into the connector (160) in accordance with ASSEMBLY SECTION of CMM 80–13–51.

D. Identification

Record the screening result in the engine maintenance log sheet as follows.

(1) Valve Serial No.

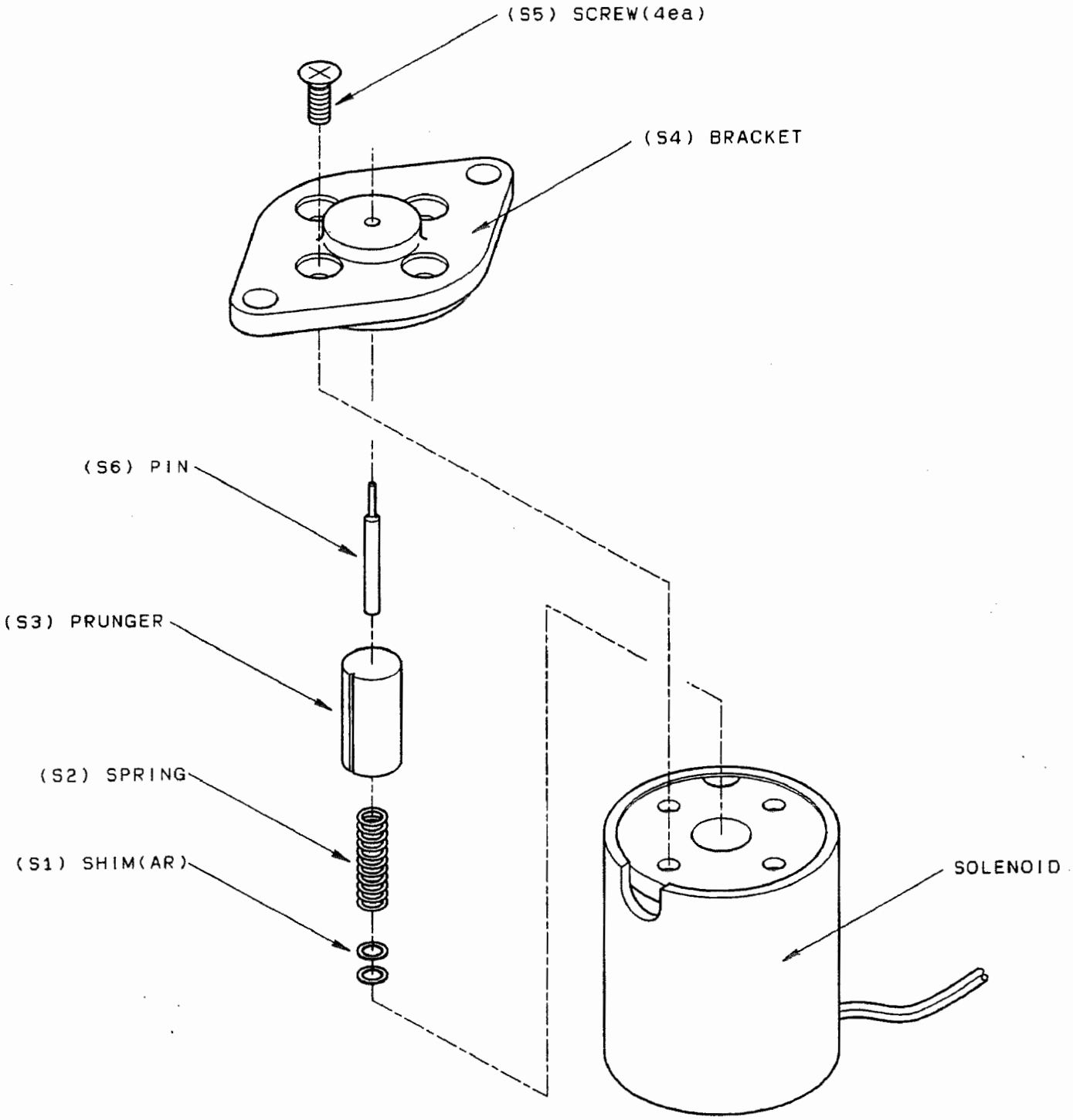
(2) Disposition of electrical solenoid
(Use as is, Cleaned , Returned or Replaced)

(3) Date of Disposition

6. Remedial Action

Several corrective actions against all possible causes on manufacturing processes have been taken to eliminate recurrence of the same failure mode on the electrical solenoid to be installed onto the valve in the future.

Furthermore, for a positive future improvement of the current plating combination between the plunger and the plunger bore, which is sensitive to the surface finish grade, design change to more preferable plating combination is being to proposed to IAE.



Solenoid Assembly
Figure A