AP 103D-0208-2

ENGINE STARTING SYSTEMS, PLESSEY, TYPE I.P.N.

GENERAL ORDERS AND MODIFICATIONS

BY COMMAND OF THE DEFENCE COUNCIL

Ministry of Defence

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ROYAL AIR FORCE by D Air Eng (RAF)

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Service users should send their comments through the channel prescribed for the purpose in:
Naval Aircraft Maintenance Manual (RN)
Emer Aircraft A 040 (Army)
AP 100B-0101 Order 0504 (RAF)

PREFACE

1 Material issued for inclusion in this Topic 2 should be filed in the following order:

1.1 Preface (this page)

1.2 General orders. These leaflets are identified by the letters 'GO' and should be filed in numerical order.

1.3 Equipment modification list. This list shows all MOD-approved modifications affecting the subject of this Topic 2, including those for which leaflets will not be issued. The list will be reissued periodically. As modification leaflets are inserted, suitable entries should be recorded in the applicable columns of this list.

1.4 Modification leaflets. Leaflets bear numbers allotted in sequence as the leaflets are sent to press and should be filed in numerical order.

2 When a complete leaflet or individual leaf is reissued in amended form the alterations are indicated by triangles thus ▶——◀ to show where text has been changed.

MOD Mod. No.	Contractor Mod. No.	Mod. plate strike No.	Modification title	Class	Leaflet No.
2510 2487 2565 2635			Group modification CONTROL UNIT - INTRO OF MODIFIED PWB GROUP MODS. INTRO CONTROL UNIT ASSY. PT. No. 700/1/12170	RPO B/3 ON REPL. RECORD. B/2	1 2 3 4

IPN Starter, Engine Group 23/E, Canberra PR Mk 9 Aircraft. To introduce a Group Modification to include the following previously approved modifications under cover of a single modification number:
Mods: S196, S203, S206, S207, S210, S212, S225, S226, S227, S238, S243, S244 Pt 1, S250, S254, S260 Pt 1, S261, S275, S279, S281, S291, S302, S305, S306, S311, S314, S464, S670, S816, S882.

(Mod No Plessey 2510)

(Class: Record Purposes Only)

(D/ADSM25/10/22/34)

ADP No XPP 25100)

Amendment Instructions: Insert this leaflet (1 leaf) in correct sequence. Update the Section/Sub-section/Equipment Modification List. Sign the Amendment Record Sheet.

NOTE: This leaflet is issued for informatory purposes only.

1. INTRODUCTION

There is insufficient space on the starter modification plate to add any future modifications. When modification 2510 appears on the modification plate it will indicate that all the modifications listed above are embodied.

(1) This modification does not supersede, partially supersede or satisfy the work called for by any other Modification, Service Engineered Modification, SRIM or Special Instruction (Technical).

(2) This modification is applicable only if all the modifications listed are embodied.

E2

IPN Starter, Airframe Groups 8/A, 23/A, 5/A9 and 5/A10, Embodiment of a Control Unit Assy Pt No 700/8/12170 (37F/6082313) to the standard of Plessey ESD Mod 1112 which introduces Printed Wiring Board 'A' Assy Pt No 419/1/41777/000 with additional capacitor, diode and change of transistor type in place of and by conversion of Printed Wiring Board 'A' Assy Pt No 419/1/09599 Aircraft applicability Hunter F Mk 6, FGA Mk 9 and PR Mk 10, Canberra PR Mk 9, Lightning F Mk 3, F Mk 6 and T Mk 5.

(Mod No Plessey 2487)

(Class B/3 on replacement of Control Unit Assy)

(File Ref: D/ADSM 25/10/22/31)
(ADP No XPP 24870)

Amendment Instructions: Insert this leaflet (1 leaf) in correct sequence. Update the Section/Sub-section/Equipment Modification List. Sign the Amendment Record Sheet.

NOTE: This leaflet is issued for informatory purposes only.

1. INTRODUCTION

Instances have occurred of relay chatter induced by self generated spike voltages, causing continuous running of the Control Unit, welding of the relay contacts and blowing of the 10 Amp. circuit fuse on shutdown. If the fuse is replaced under these conditions the starter will operate on selection of the Master Switch without initiation of the starter button.

A modified Control Unit, embodying an additional diode and capacitor to prevent relay chatter and a change of transistor type to improve control in the switching circuit, has satisfactorily completed an Approval Test.

(1) This modification does not supersede, partially supersede or satisfy the work called for by any other modification, Service Engineered Modification, SRIM or Special Instruction (Technical).

(2) This modification is the cover modification to component Mod No 1112 (Liquid Fuel Starter Control Unit Assy. 37F/6082313 (Plessey Ref: 700-1-12170) To introduce Printed Wiring Board 'A' Assembly No 419-1-41777-000 with additional capacitor, diode and change of transistor type in place of and by conversion of Printed Wiring Board Assembly No 419-1-09599).

2. EFFECT ON MASS AND MOMENT

This modification has no effect on mass and moment.

3. EFFECT ON SERVICING AND ON GROUND SUPPORT EQUIPMENT

(1) This is a design improvement to reduce 'in service' defects.

(2) There is no effect on ground support equipment.

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E2

Starting System
Group Modification

AP 103D-0208-2
Leaflet No 3

To introduce a group modification to include previously approved modifications under cover of a single modification number for IPN Starter, Engine group 5/E2. Lightning F Mk 3, F Mk 6 and T Mk 5 aircraft.

(Mod No Plessey 2565)

(Class: Record purposes only)

(D/ADSM25/10/22/67)

(ADP No XPP25650)

Amendment Instructions: Insert this leaflet (1 leaf) in correct sequence. Update the Section/Sub-Section/Equipment Modification List. Sign the Amendment Record Sheet.

NOTE: This leaflet is issued for informatory purposes only.

1. INTRODUCTION

There is insufficient space on the starter modification plate to record any future modifications. When Mod 2565 appears on the modification plate it will indicate that all the following modifications have been embodied.

S368, S371, S405, S464, S660, S670, S816, S849, S879, S881, S882, S888, S899, 2019, 2127, 2179, 2213, 2264, 2279, 2347.

(1) This modification does not supersede, partially supersede or satisfy the work called for by any other Modification Service Engineered Modification, SRIM or Special Instruction (Technical).

(2) This modification is applicable only if all the modifications listed are embodied.

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IPN STARTER, AIRFRAME GROUPS 5/A9, 5A/10, 8A, 23/A
(Applicable to Hunter F Mk 6, FGA Mk 9 and PR Mk 10;
Canberra PR Mk 9; Lightning F Mk 3, F Mk 6 and T Mk 5)

Mod No Plessey 2635/ESD 1196 (Class B/2)

D/SM 25/10/22/96
ADP Nos XPP 26350
XPP 11960

Embodiment of a Control Unit Assembly Part No 700/1/12170 (37F/6082313) to the standard of Plessey ESD Mod 1196 which introduces Boards A, B and C Assembly in place or by conversion of existing Boards A and B Assembly

Amendment Instructions: Insert this leaflet (4 leaves) in correct sequence. Update the Section/Sub-section/Equipment Modification List. Sign the Amendment Record Sheet.

1. INTRODUCTION

Instances have occurred where relay "chatter", induced by self generated spike voltages, has caused welding of the relay contacts, continuous running of the Control Unit and blowing of the 10 Amp circuit fuse. If the fuse is replaced under these conditions the Starter will operate on selection of the Master Switch without initiation of the Start button. A modified Control Unit, incorporating an additional printed wiring board 'C', together with changes to the existing printed wiring board A and B assembly, is introduced. The additional circuitry ensures correct operation at all times.

(1) This Modification does not supersede, partially supersede or satisfy the work called for by any other Modification, Service Modification, or Special Instruction (Technical).

2. EMBODIMENT

This modification will be embodied as directed by Command Headquarters.

3. APPROXIMATE TIME REQUIRED FOR EMBODIMENT

The work will take approximately 2 Manhours. Not including testing.

4. DRAWINGS REQUIRED

Drawing No Plessey / 2635, is incorporated in this leaflet.

5. PARTS AND SPECIAL TOOLS REQUIRED

(1) Parts and/or Materials.

(a) The modification kit which consists of the following items will be assembled by the contractor under Reference No 37F/8227 and is to be demanded on SM 24b Mods quoting the modification number.

(i) Items supplied by the contractor:

Ref No	Part No	Nomenclature	Qty	Class of Equipment
	419-1-41971-000	Board, PW Assy 'C'	1	
	700-1-22590-000	Spacer & Insert Assy	1	
	999-4-01135-004	Terminal Stud	3	
	403-4-06779-299	Resistor 120K	1	
	403-4-06779-300	Resistor 130K	1	
	403-4-06779-301	Resistor 150K	1	
	403-4-06779-302	Resistor 160K	1	
	991-4-00221	Washer-Plain	1	
	991-4-00442-005	Washer-Crinkle	1	
	991-4-13521-000	Screw-Ch Hd 6 BA - 1¾	2	
	991-4-00060-081	Screw-Ch Hd 6 BA x ¾	1	
	915-4-98151-004	Sleeve, Marker 1 mm x ⅛ (Red 2)	2	
	915-4-98151-005	Sleeve, Marker 1 mm x ⅛ (Orange 3)	12	
	915-4-98151-006	Sleeve, Marker 1 mm x ⅛ (Yellow 4)	2	
	915-4-98151-007	Sleeve, Marker 1 mm x ⅛ (Green 5)	2	
	915-4-98151-008	Sleeve, Marker 1 mm x ⅛ (Blue 6)	2	

(ii) Service Supply items:

Ref No	Part No	Nomenclature	Qty	Class of Equipment
6145-99-0149436	-	Wire, equipment, 19/0.15 mm, PTFE to EL 1930, type 'B', pink	4 ft	C

(b) The following materials are to be provided under unit arrangements.

Ref No	Part No	Nomenclature	Qty	Class of Equipment
33C/2202840		Ink, Marking, White	A/R	C
30D/2015271		Solder, Multi-core	A/R	C
5E/5253721		Tinned Copper Wire	A/R	C

(2) Special Tools and/or Test Equipment

No special tools or test equipment are required for the embodiment of this modification.

6. MODIFICATION OF SPARES

The following list shows the spares affected by this modification and the parts required to modify them.

Ref No	Part No	Nomenclature	Qty	Class of Equipment
	700-1-12711	Board Assy, printed wiring 'B'		
	419-1-09599	Board Assy, printed wiring 'A'		
	999-4-01135-004	Terminal Stud		

Spares will be modified under arrangements by SM 24c3(RAF).

7. CHANGE OF REFERENCE, PART AND ASSEMBLY NUMBERS

The embodiment of this modification changes reference, part and assembly numbers as follows:

OLD			NEW		
Ref No	Part/Assy No	Nomenclature	Ref No	Part/Assy No	Nomenclature
	419-1-09600	Boards Assy Printed Wiring 'A' and 'B'.		419-1-41973-000	Boards Assy Printed Wiring A, B and C
	419-1-09599	Board Assy Printed Wiring 'A'		419-1-41974-000 alt 419-6-41947-000	
	700-1-12711	Board Assy Printed Wiring 'B'		419-1-41975-000	

8. SEQUENCE OF OPERATIONS

The following is the sequence of operations:

WARNING:

BEFORE ANY ELECTRICAL CIRCUIT IS DISTURBED OR DISCONNECTED, ALL ELECTRICAL POWER SUPPLIES IN, TO OR FROM THE EQUIPMENT ARE TO BE DISCONNECTED. POWER SUPPLIES ARE TO BE RECONNECTED ONLY WHEN THE PERSON RESPONSIBLE FOR EMBODYING OR INSPECTING THE MODIFICATION IS SATISFIED THAT ALL ACTION HAS BEEN TAKEN TO MAKE THE EQUIPMENT SAFE FOR RECONNECTION.

NOTE: This modification has been incorporated in AP 113D-1007-6 at the Second Edition dated March 1983. Therefore, for simplicity, the following instructions only detail the changes and rework necessary to bring the Wiring Boards and Cable form to that standard. Reference should be made to AP 113D-1007-6 for all other instructions on assembly to the post-modification standard.

(1) Refer to AP 113D-1007-6. Remove Boards A and B assembly together with 30 Amp relay from Control Box.

(2) Separate Relay from Board assembly by unsoldering leads from coil tags and releasing leads from terminal screws.

CAUTION

The application of heat during unsoldering/soldering operations must be kept to a minimum and, where possible, a suitable heatsink employed to prevent damage to components.

(3) Carefully unsolder and disconnect one end of each lead connecting Board A and B.

Note: It is not necessary to completely remove the leads unless the Boards are being replaced by new or previously modified Boards or because of repair requirements.

(4) Refer to Drawing Plessey / 2635 Fig 1. From Board A Part No 419/1/09599 unsolder and remove the following:

R15 Resistor

TR7 Transistor

C1 Capacitor

D18 Diode

Remove the identifying coding, R15, TR7, C1 and + sign, D18 and + sign.

(5) Drill out three existing holes, Ref Y, to 1.95 mm diameter and fit Terminal Studs (Qty 3), Part No 999/4/01135/004. Studs to be swaged and wired to track using Tinned Copper Wire 0.5 mm diameter and Solder, Multicore 22 SWG (See sketch).

(6) Remove Board Part No 419/1/09599. Using white ink re part number to 419/6/41947/000. Code reference identity of new Terminal Studs 41, 42, 43, alongside each as shown. Using varnish, reprotect exposed areas.

(7) Refer to Drawing Plessey / 2635 Fig 2. Rework Board 'B' Part No 700/1/12711 by drilling hole 3,20 mm diameter at position shown. Recode Board as 419/1/41975/000.

(8) Using Equipment Wire 19/0.15 mm PTFE covered Pink produce new Leads as follows:

Lead No 32	8.5 in long
Lead No 33	6.0 in long
Lead No 34	6.5 in long
Lead No 35	11.0 in long
Lead No 36	9.0 in long

Identify as appropriate using Helsyn marker sleeves at each end.

Bare each end for soldering.

(9) Refer to AP 113D-1007-6, Repair Instructions. Assemble Boards A, B and C together using Spacer and Insert Assembly Part No 700/1/22590-000, 6BA Screws Part No 991/4/13521/000 (Qty 2) and Part No 991/4/00060/081, with Plain Washer Part No 991/4/00221 and Crinkle Washer Part No 991/4/00442/005 incorporating new leads where appropriate and resoldering existing leads disconnected in Operation (3).

Termination of new leads.

Lead 30	Terminal 35	Board C to Ra 1	Common with 08
Lead 31	Terminal 34	Board C to Ra 1	Common with 16 and 17
Lead 32	Terminal 39	Board C to 41	Board A
Lead 33	Terminal 38	Board C to 42	Board A
Lead 34	Terminal 40	Board C to 43	Board A
Lead 35	Terminal 37	Board C to D3 Tag	Board A
Lead 36	Terminal 36	Board C to D7 Tag	Board A

Note: Leads 30 and 31 are supplied connected to Board 'C'.

(10) Refer to AP 113D-1007-6 Assembly Instructions. Complete assembly of unit.

(11) Mark the number 1196 on the unit Modification Plate.

9. SPECIAL TESTS AFTER EMBODIMENT

When the modification has been embodied and inspected do the following special tests:

Refer to AP 113D-1007-1 Chapter 2. Carry out Standard Serviceability Test. During "Normal Light Up - overspeed inoperative test - (Para 5)", if the time indicated is outside the specified limits and correct timing cannot be achieved by adjustment of RV 4, then change Resistor R14 on Board 'A' for one of those included in the Modification Kit.

10. RECORDING ACTION

When this modification has been embodied and inspected, in accordance with current authorised procedure the relevant entries are to be made in the appropriate aircraft records.

Note: Modification 2635 is the cover modification for Electrical Services Division (ESD) Mod 1196 and should be quoted in aircraft records.

11. DISPOSAL OF REDUNDANT PARTS

The undermentioned parts rendered redundant by the embodiment of this modification are to be disposed of as scrap.

Ref No	Part No	Nomenclature	Qty	Class of Equipment
	403-4-78261-297	Resistor	1	
	402-8-50829-024	Capacitor	1	
	415-4-98046-027	Diode	1	
	915-4-98819-000	Transistor	1	

12. EFFECT ON MASS AND MOMENT

This modification has no effect on mass.

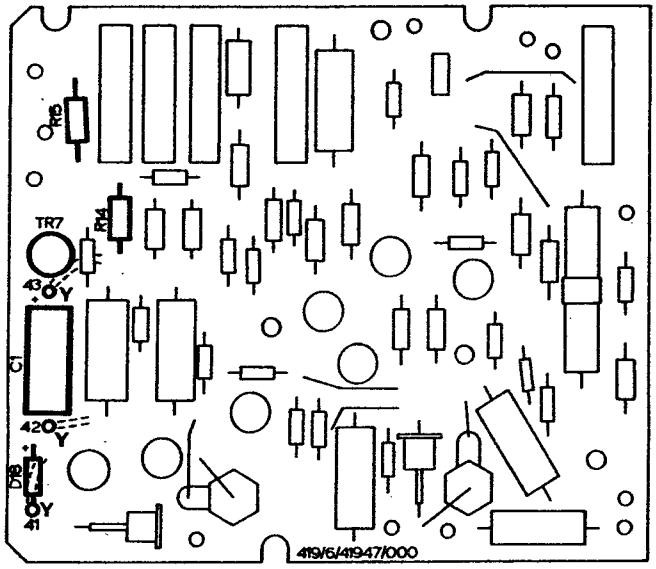
13. EFFECT ON AIRCRAFT OR EQUIPMENT OPERATION AND HANDLING

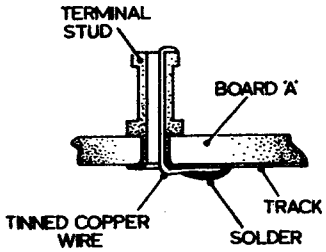
This modification does not affect the operation or handling of the aircraft or equipment.

14. EFFECT ON SERVICING AND ON GROUND SUPPORT EQUIPMENT

(1) Incorporation of this modification will diminish the possibility of unwanted start initiation when selecting the Master Switch and reduce the incidence of circuit fuse failure.

(2) All relevant APs will require amendment to take account of changes introduced by this modification.





TYPICAL TERMINAL STUD AT REF 'Y'

FIG 1

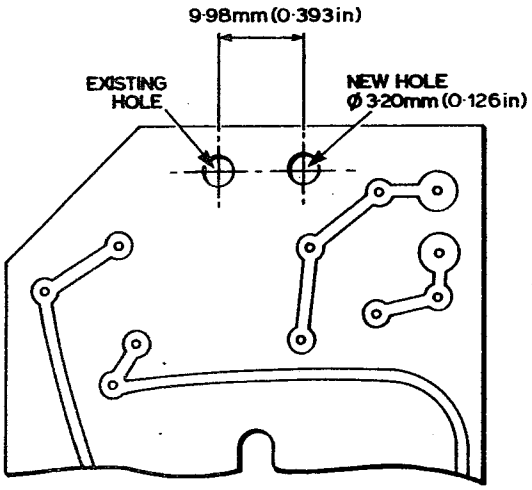


FIG 2