International Aero Engines

SERVICE BULLETIN

ENGINE - FUEL AND CONTROL - TO PROVIDE A NEW ELECTRONIC ENGINE CONTROL (EEC) WITH THE SCN11H SOFTWARE CONFIGURATION - CATEGORY CODE 8 - MOD.ENG-73-0032

1. Planning Information

A. Effectivity

(1) Aircraft: Airbus A320

(2) Engine: V2500-A1 Engines before Serial No.V0200

NOTE: This Service Bulletin must be incorporated concurrently on both the engines on the aircraft.

If Reference (1) is incorporated on the engine(s) when you do this bulletin, it must be removed when this Service Bulletin is incorporated.

To get the benefit of the SCN11H software it is necessary to incorporate Reference (2).

B. Reason

(1) Condition

(a) The Electronic Engine Control (EEC) consolidated bump level selection can cause an increase in the maximum Exhaust Gas Temperature (EGT) during take-off.

(b) A possible failure mode exists which can affect the overspeed protection system in the EEC.

(c) When you switch to the N1 control mode during take-off, it may cause a net thrust deficiency.

(d) The stage 10 bleed override command is active below an altitude of 15000 feet.

(e) There are four EEC selectable bump level ratings.

(f) The Burner Pressure (PB) in range (within PB engine operating range) failure detection logic and the PB synthesis logic are disabled with a total loss of N1 or N2 EEC input.

(2) Background

(a) The EEC simulation studies have shown that when you select the consolidated bump level, it can increase the maximum EGT during take-off.

(b) An analytical review has shown that if there is a short with one channel's autopower discrete, the ability of that channel's software to command the overspeed is lost. The other channel's software command as well as both channels hardware commands are still available to control the overspeed.

(c) A simulation study was done on switching to the N1 control mode during take-off. This study has shown when you accelerate the engine to take-off power it is possible to stabilize at a net thrust which is less than the Engine Pressure Ratio (EPR) mode net thrust.

(d) The stage 10 bleed override command below an altitude of 15000 feet can cause the Environmental Control System (ECS) to have a rapid increase or decrease in the bleed duct pressure.

(e) The changes were made to reduce the number of EEC selectable bump level configurations from four to three.

(f) For the multiple failures of: both sources of a rotor speed and measured PB are failed, PB synthesis is disabled and the EEC commands a failsafe fule flow.

(3) Objective

(a) When the consolidated bump level is used, the EEC will select a higher EGT readline limit (645 degrees Centigrade).

(b) To add software logic that will detect a shorted autopower discrete within the EEC and will send an overspeed failure message to the aircraft system.

(c) To change the EEC N1 control mode trim logic to eliminate the possibility of a thrust deficiency when you go to the N1 control mode during take-off.

(d) To permit the EEC stage 10 bleed override to issue a command, to let the valve stay closed, only above an altitude of 15000 feet.

(e) To provide the EEC with the following selectable bump level ratings: no bump level is -00, three percent bump level is -01 and the seven and one-half percent bump level is -03.

(f) To permit full engine operation on synthesided PB when either the N1 or N2 EEC input is available and the PB has failed.

(4) Substantiation

The close loop bench testing for the software certification was accomplished at Pratt and Whitney and Hamilton Standrad. The flight simulation and flight testing of the SCN11H software logic was accomplished at Airbus in Toulouse, France.

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(5) Effects of Bulletin on Workshop Procedures:

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

(6) Supplemental Information

None.

C. Description

(1) To provide a new Electronic Engine Control (EEC) with SCN11H software logic that incorporates a consolidated bump level.

D. Approval

The Part Number Changes and/or part modifications described in Section 2 and 3 of this Service Bulletin have been shown to comply with the applicable Federal Aviation Regulations and are FAA-APPROVED for the Engine Model listed.

E. Compliance

Category Code 8.

Accomplish based uopn experience with the prior configuration.

F. Manpower

Estimated Manhours to incorporate the full intent of this Bulletin:

Venue	Estimated Manhours
(1) In Service	Not applicable

(2) At overhaul .. .. .. TOTAL 5 minutes

(Note: The parts affected by this Service Bulletin are accessible at Overhaul).

(a) To remove the ACC Front Duct Cover Assembly .. .. 5 minutes

TOTAL 5 minutes

G. Material - Price and Availability

(1) Modification Kit not required.

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

H. Tooling - Price and Availability

None.

I. Weight and Balance

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

(2) Moment arm .. .. .. No effect

(3) Datum .. .. .. Engine front mount Centerline (Powerplant station P.P.S.100)

J. Electrical Load Data

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

K. Reference

(1) Internal Reference No.

91VZ003

(2) Other References

V2500-ENG-75-0025 (Engine - HP/LP Active Clearance Control Ducts - To Provide a Front Duct Cover Assembly for Controlled Service Use).

V2500-ENG-73-0035 (Engine - Fuel And Control - Reprogram The Data Entry Plug For A Bump Rating Change).

Hamilton Standard Service Bulletin EEC150-73-18.

V2500 Engine Illustrated Parts Catalog.

V25000 Engine Manual.

L. Other Publications Affected

(1) The V2500 Engine Illustrated Parts Catalog, Chapter/Section 73-22-34, Figure 1, to add the new parts.

2. Accomplishment Instructions

A. The Source Demonstration requirement of this rework means that any facility not authorised to accomplish this rework either utilize the Authorised Vendors listed below or contact IAE Technical Services to determine if a qualification program can be initiated at their facility.

IAE-INTERNATIONAL AERO ENGINES AG
Corporate Center II
628 Hebron Ave.
Glastonbury, CT 06033-2595 USA
ATTN: Director Technical Services

B. Authorized Rework Vendors for this bulletin are listed below:

Hamilton Support Systems
Customer Service Center
97 Newberry Road
East Windsor, CT 06088 USA

or

Pratt & Whitney Overhaul/Repair Center Europe (PWORCE)
Maastricht Airport
P.O. Box 269
6190 AG BEEK
The Netherlands

C. The designation by IAE of an authorized rework vendor indicates that the vendor has demonstrated the necessary capability to enable it to carry out the rework. However, IAE makes no warranties or representations concerning the qualifications or quality standards of the vendors to carry out the rework, and accepts no responsiblty whatsoever for any work that may be carried out by a rework vendor, other than when IAE is listed as the vendor. Authorized rework vendors do not act as agents or representives of IAE.

D. Rework Instructions

(1) Do a modification of the 2A2166, 2A2189, 2A2284, 2A2285, 2A2356, 2A2390, 2A2391 or 2A2392 Electronic Engine Control (See Reference (4), Chapter/Section 73-22-34, Fig/Item No.01-280) and reidentify by the procedures given in Reference (3).

Procedure	Supplemental Information
(a) Send the Electronic Engine Control to the approved vendor to be modified.	See Figure 1.

(2) Remove the Active Clearance Control (ACC) Front Duct Cover Assembly. Remove to Reference (1) and Figure 2.

(a) Locate the Front ACC Duct.

(b) Remove the two 4W0102 Bolts from the Front Duct Cover Assembly.

(c) Remove the 2A3637 Front Duct Cover Assembly.

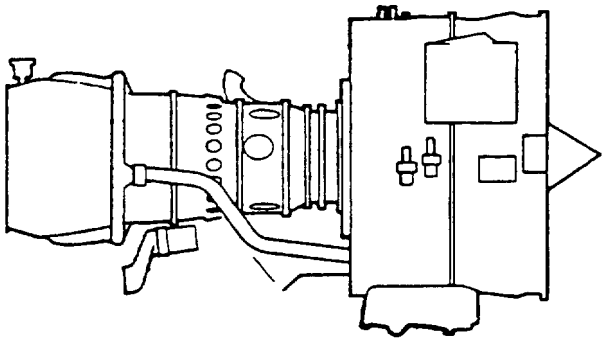
NOTE: When you incorporate this Service Bulletin with the new SCN11H software logic, the Front Duct Cover Assembly given in Reference (1) must be removed.

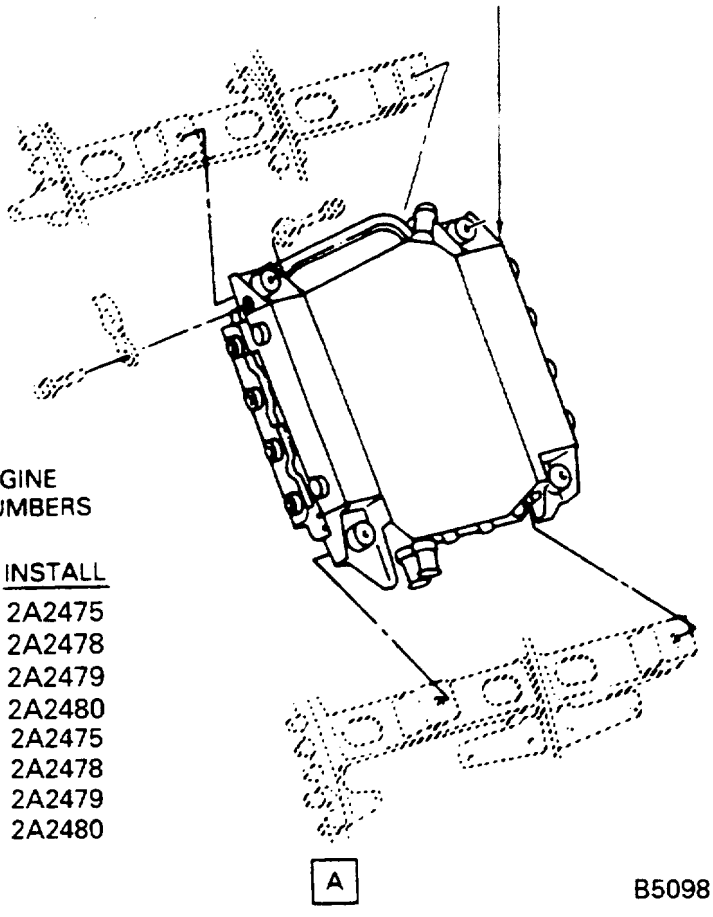
E. Assembly Instructions

(1) Install the 2A2475, 2A2478, 2A2479, or 2A2480 Electronic Engine Control (1 off) by the approved procedure given in Reference (5), Chapter/Section 70-00-32, Installation-02. See Figure 1.

F. Recording Instructions

(1) A record of accomplishment is necessary.

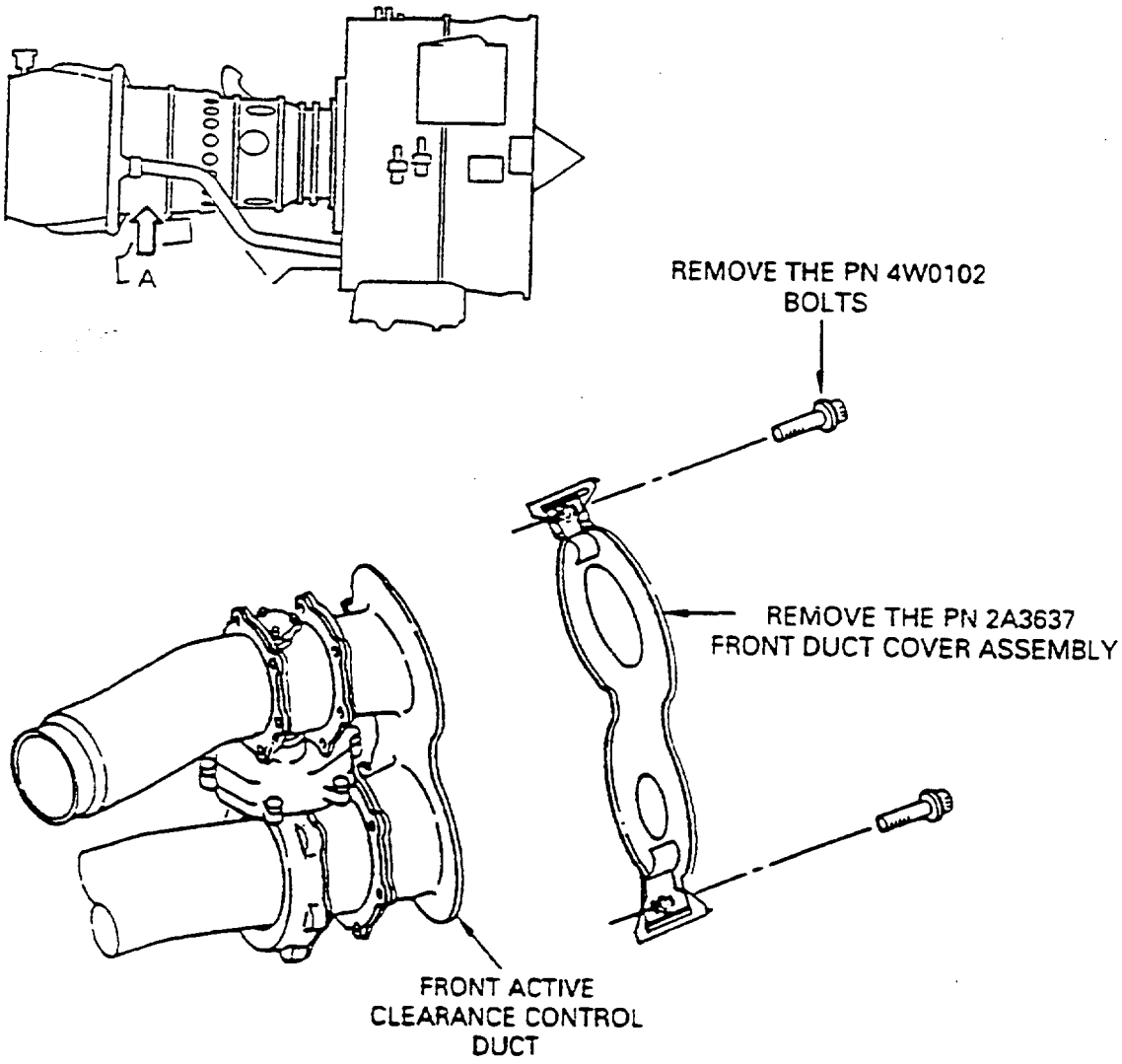




*ELECTRONIC ENGINE CONTROL PART NUMBERS

REMOVE	INSTALL
2A2189	2A2475
2A2166	2A2478
2A2284	2A2479
2A2285	2A2480
2A2356	2A2475
2A2390	2A2478
2A2391	2A2479
2A2392	2A2480

Location of Electronic Engine Control (EEC)
Fig.1



Location of ACC Front Duct Cover Assembly
Fig.2

3. Material Information

Applicability: For each V2500 Engine to incorporate this Bulletin.

A. Kits associated with this Bulletin:

None.

B. Parts affected by this Bulletin:

New Part No. (ATA No.)	Qty	Est'd Unit Price ($)	Keyword	Old Part No. (IPC No.)	Instructions/ Disposition
Applicability: For each V2500 Engine that incorporates V2500-ENG-73-0007, V2500-ENG-73-0015, V2500-ENG-73-0024, V2500-ENG-70-0056 and V2500-ENG-73-0027 to incorporate this Bulletin.					
2A2480 (73-22-34)	1		Control, Electronic Engine	2A2392 (01-280)	(1D) (A) (B) (C)
Applicability: For each V2500 Engine that incorporates V2500-ENG-73-0007, V2500-ENG-73-0015, V2500-ENG-73-0024 and V2500-ENG-70-0027 but not incorporating V2500-ENG-73-0056 to incorporate this Bulletin.					
2A2478 (73-22-34)	1		Control, Electronic Engine	2A2390 (01-280)	(1D) (A) (B) (E)
Applicability: For each V2500 Engine that incorporates V2500-ENG-73-0007, V2500-ENG-73-0015 and V2500-ENG-73-0027 but not incorporating V2500-ENG-73-0024 and V2500-ENG-73-0056 to incorporate this Bulletin.					
2A2475 (73-22-34)	1		Control, Electronic Engine	2A2356 (01-280)	(1D) (A) (B) (F)
Applicability: For each V2500 Engine that incorporates V2500-ENG-73-0007, V2500-ENG-73-0015, V2500-ENG-70-0056 and V2500-ENG-73-0027 but not incorporating V2500-ENG-73-0024 to incorporate this Bulletin.					
2A2479 (73-22-34)	1		Control, Electronic Engine	2A2391 (01-280)	(1D) (A) (B) (G)
Applicability: For each V2500 Engine that incorporates V2500-ENG-73-0007, V2500-ENG-73-0015, V2500-ENG-70-0024, V2500-ENG-70-0056 and incorporates the software changes added by V2500-ENG-73-0027*.					
2A2480 (73-22-34)	1		Control, Electronic Engine	2A2285 (01-280)	(1D) (A) (B) (G)

Applicability: For each V2500 Engine that incorporates V2500-ENG-73-0007, V2500-ENG-73-0015 and V2500-ENG-73-0024, does not incorporate V2500-ENG-70-0056 and incorporates the software changes added by V2500-ENG-73-0027*.

2A2478 (73-22-34	1	Control, Electronic Engine	2A2166 (01-280)	(1D) (A) (B) (E)

Applicability: For each V2500 Engine that incorporates V2500-ENG-73-0007 and V2500-ENG-73-0015, does not incorporate V2500-ENG-73-0024 and V2500-ENG-70-0056 and incorporates the software changes added by V2500-ENG-73-0027*.

2A2475 (73-22-34)	1	Control, Electronic Engine	2A2189 (01-280)	(1D) (A) (B) (F)

Applicability: For each V2500 Engine that incorporates V2500-ENG-73-0007, V2500-ENG-73-0015 and V2500-ENG-70-0056, does not incorporate V2500-ENG-73-0024 and incorporates the software changes added by V2500-ENG-73-0027*.

2A2479 (73-22-34)	1	Control, Electronic Engine	2A2284 (01-280)	(1D) (A) (B) (G)

C. Instruction/Disposition Code Statements:

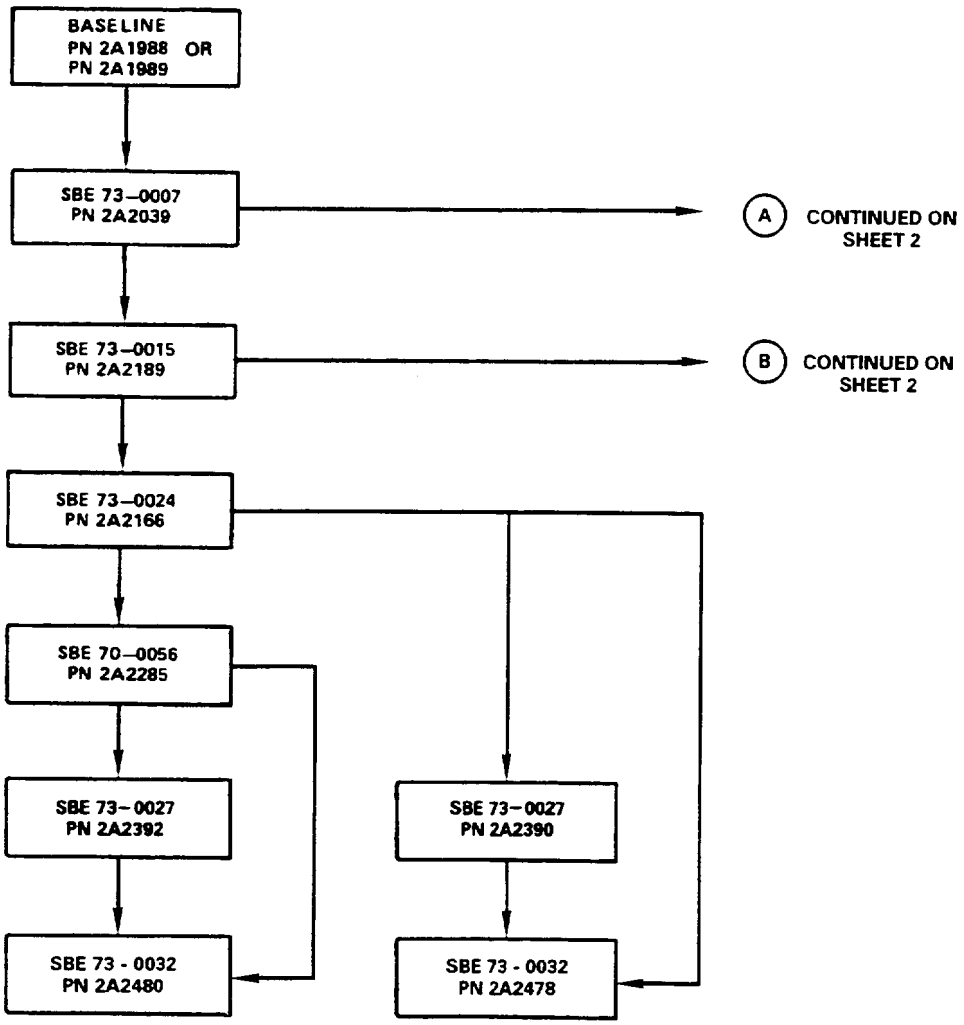
(1D) The New part can be obtained through modification by the approved procedure in Reference (1). Purchase the New parts from or return the Old parts for modification to the approved vendor given in the Accomplishment Instructions.

The new Hamilton Standard part numbers are given in notes (C) (E) (F) and (G).

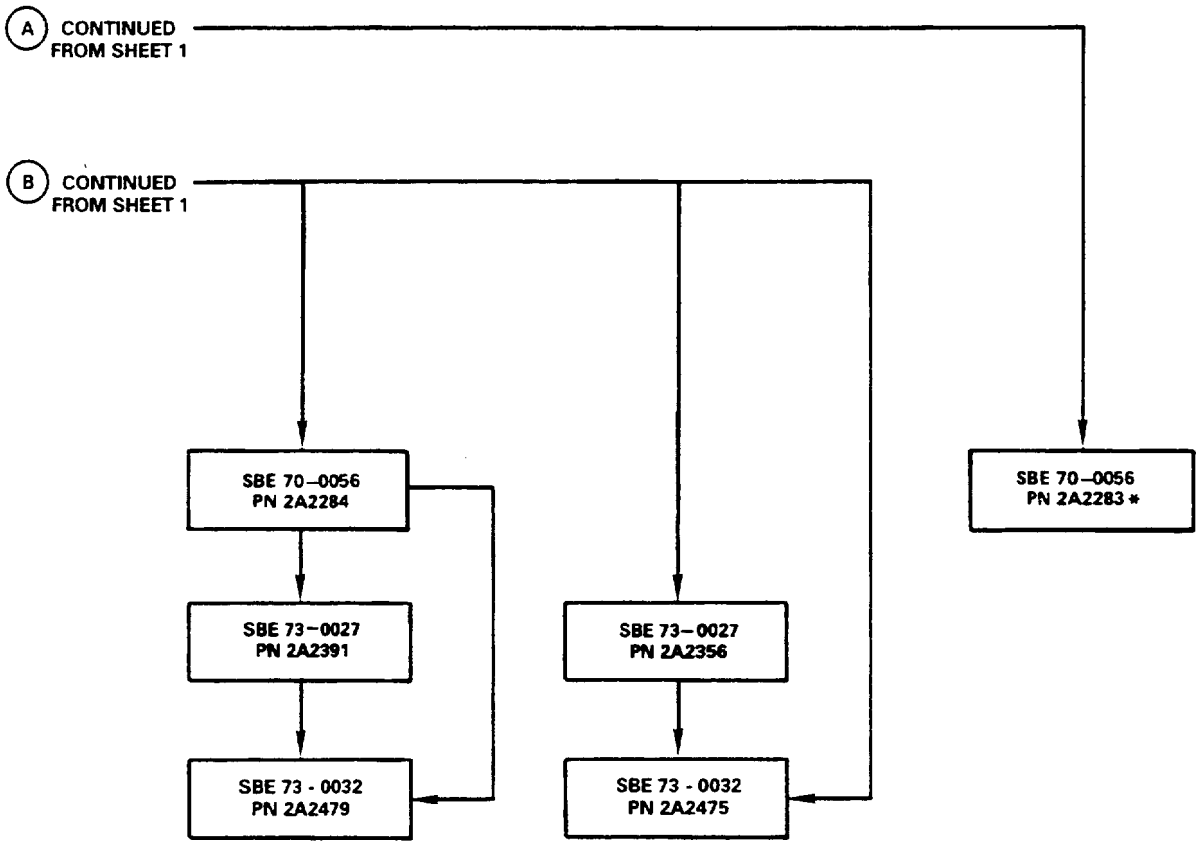
(A) New part is currently available.
(B) The Old part will continue to be available upon request.
(C) HSD P/L 798300-14-038
(E) HSD P/L 798300-10-038
(F) HSD P/L 798300-8-038
(G) HSD P/L 798300-12-038

* Incorporation of the latesst software configuration, given in V2500-ENG-73-0032, will include all the software improvements which were made in V2500-ENG-73-0027. This is why there is more than one old part number progressing up to the same new part number.

NOTE: The estimated 1991 unit prices shown are provided for planning purposes only and do not constitute a firm quotation. Consult the IAE Price Catalog or contact IAE's Spare Parts Sales Department for information concerning firm prices.



Family Tree - Electronic Engine Control (EEC)
Fig.3 (Sheet 2)



* THERE IS NO PROCEDURE TO ADVANCE THIS CONFIGURATION

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Family Tree - Electronic Engine Control (EEC)
Fig.3 (Sheet 2)

Printed in Great Britain

UNITED TECHNOLOGIES
HAMILTON STANDARD

SERVICE BULLETIN

CIRCULATE PROMPTLY

ENGINE FUEL AND CONTROL - EEC150-1 ELECTRONIC ENGINE CONTROL - INCORPORATION OF NEW SOFTWARE CONFIGURATION

1. Planning Information

A. Effectivity

All Hamilton Standard EEC150-1 Electronic Engine Controls Not Incorporating Part Number

798300-8-038
798300-10-038
798300-12-038
798300-14-038

NOTE: The EEC150-1 Electronic Engine Control is used on Airbus A320 aircraft equipped with IAE V2500 engines.

B. Reason

(1) Objective. To incorporate a new software configuration.

(2) Situation. The following situations may occur:

(a) Engines may have increased Exhaust Gas Temperature (EGT) during takeoff.

(b) A shorted discrete in one EEC channel may disable its software commands to the overspeed protection system.

(c) Engines may have reduced thrust during takeoff.

(d) The environmental control system may experience a rapid increase or decrease in bleed duct pressure when the aircraft is below 15000 feet.

(e) The EEC has one unused selectable bump level.

(f) Full engine power is not possible with the burner pressure (PB) measurement lost and either N1 or N2 lost.

(3) Observation. The following have been observed:

(a) The EEC consolidated bump level selection can cause an increased maximum exhaust gas temperature (EGT) during takeoff.

(b) Testing has shown that a short in one channel's autopower discrete may disable that channel's software to command the overspeed protection system. The other channel's overspeed software and both channels' overspeed hardware are unaffected.

(c) Engines may have a small thrust deficiency during takeoff when the EECs operate in the N1 mode.

(d) The 10th stage bleed override command is active below an altitude of 15000 feet. This can cause rapid bleed duct pressure changes in the environmental control system.

(e) There are four EEC-selectable bump level ratings.

(f) Burner pressure (PB) in-range failure detection logic and PB synthesis logic are disabled with a loss of either N1 or N2. This results in the the engine fuel flow being reduced to the failsafe level.

(4) Background. New software accomplishes the following:

(a) The EEC selects a higher EGT maximum limit (645 °C) when the consolidated bump level is used.

(b) Software logic can detect a shorted autopower discrete and send an overspeed failure message to the aircraft system.

(c) Revised N1 control mode trim logic eliminates an engine thrust deficiency when the EEC is in the N1 mode during takeoff.

(d) Revised software logic disables the 10th stage bleed override when the aircraft is below 15000 feet.

(e) The EEC selectable bump levels are reduced to three configurations:

00 - no bump level
01 - three percent bump level
03 - seven and one-half percent bump level

(f) When the PB pressure transducer measurement is not available, new software permits full engine operation by synthesizing the PB pressure and using either N1 or N2.

(5) Substantiation. Successful software certification testing at Hamilton Standard and Pratt & Whitney.

C. Description

The EEC150-1 is disassembled to remove the Channel A and B Processor/Input Modules. New software is incorporated by reprogramming the Processor/Input Modules. After reprogramming, the unit is reassembled and tested.

D. Compliance

Category 8 - Accomplish based on experience with the prior configuration.

E. Approval

The part number changes and/or part modifications described in paragraph 2. of this Service Bulletin have been shown to comply with the applicable Federal Aviation Regulations and are FAA-Approved for the Electronic Engine Controls listed.

F. Manpower

Approximately 8 man-hours are required to accomplish this Service Bulletin. This estimate includes disassembly, assembly and testing.

G. Material - Cost and Availability

(1) The new parts required to accomplish this Service Bulletin are listed in Section 3, Material Information. These parts are available at the prices and lead times indicated and can be obtained from Hamilton Standard by issuing a purchase order for the quantity requested. Purchase orders for this Service Bulletin should be addressed to:

United Technologies Corporation
Hamilton Standard Division
Attention: Commercial After-Market Business
Mail Stop: 1504
One Hamilton Road
Windsor Locks, CT 06096-1010

(2) This program is funded by IAE. The purchase order must refer to this Service Bulletin and IAE Service Bulletin V2500-ENG-73-0032 to ensure accountability.

H. Tooling

None

I. Weight and Balance

None

J. Electrical Load Data

Not affected

K. References

IAE Service Bulletin No. V2500-ENG-73-0032
Component Maintenance Manual 73-22-34 (TR73-3)

L. Other Publications Affected

Component Maintenance Manual 73-22-34 (TR73-3)
Illustrated Parts Catalog 73-22-34

2. Accomplishment Instructions

A. Reprogram the EEC using the following instructions or return the EEC for reprogramming to:

Pratt & Whitney Overhaul/Repair Center Europe (PWORCE)
Maastricht Airport
P.O. Box 269
6190 AG BEEK
The Netherlands

or

United Technologies Corporation
Hamilton Standard Division
Attention: Hamilton Support Systems
Customer Support Center
Electronics Service Center
97 Newberry Road
East Windsor, CT 06088

B. EEC units reprogrammed at the above addresses will be returned with their assemblies re-identified per paragraph 2.D.

CAUTION: UNIT CONTAINS ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICES. REFER TO REPAIR 1 OF COMPONENT MAINTENANCE MANUAL (CMM) 73-22-34 FOR SPECIAL HANDLING CONSIDERATIONS.

C. Reprogram the units according to REPAIR 5 (TR73-3) of CMM 73-22-34. Use the program and version number shown below with the indicated checksums.

	Channel A	Channel B
Application Program:	Y805881	Y805882
Application Version Number:	067	067
Application Checksum:	5435	DB29
.PAR Checksums:		
PN 798300-8-038	DB80	BD4E
PN 798300-10-038	B2F3	B17A
PN 798300-12-038	DB80	BD4E
PN 798300-14-038	B2F3	B17A
Engine Trim Program:	Y806086	Y806086
Engine Trim Version Number:	067	067

D. Incorporation of this modification is indicated by Hamilton Standard part number. Re-identify the assemblies as shown below. Refer to REPAIR 4 (TR73-3) of CMM 73-22-34 for instructions to replace the identification plates.

Assembly	New HS Part Number	New IAE Part Number
EEC150-1	798300-8-038	2A2475
	798300-10-038	2A2478
	798300-12-038	2A2479
	798300-14-038	2A2480
Processor/Input Module-Channel A	793610-X-038	N/A
Processor/Input Module-Channel B	793612-X-038	N/A

NOTE: X - Indicates any hardware configuration.

3. Material Information

The basis for the following data is per EEC150-1. Any prices shown herein are the net prices F.O.B. Hamilton Standard, One Hamilton Road, Windsor Locks, CT 06096-1010 in effect as of date of bulletin and are based on the condition that United Technologies Corporation's Standard Terms and Conditions of Sale pertaining to commercial contracts in effect when the order is accepted will apply. These prices are firm subject to ninety days notice of change, except that corrections, additions, or deletions shall be effective immediately and in the event prices for these parts are included in a related general parts price list, prices shown in such parts price list shall be deemed to have superseded the prices shown herein on the effective date of such price list. Quantities ordered must be in accordance with the specified Minimum Sales Quantity (MSQ) or multiples thereof. Lead times listed herein apply to all orders placed for modification parts, are based on the number of days from acceptance of order, and are subject to change without notice. Lead times for parts ordered as replenishment for inventory will be established in accordance with Hamilton Standard's current product support policy. The maintenance/overhaul factors (M/OH) shown are estimated replacement percentages for the individual parts based on 100 maintenance actions (usage between overhauls) and 100 overhauls, respectively. These estimated factors are furnished for your convenience and they shall not constitute either representations or guarantees.

NOTE: The tabulation below includes code numbers in the "Instructions/Disposition" column identified as "I/D Code". These code numbers designate the following dispositions.

1. Added Part
2. Scrap Part
3. Rework and Reidentify Part
4. Use for Other Applications

A. New Parts Required

New PN	Qty	Unit Price	Lead Time M/OH	MSQ	Nomenclature	Old PN	I/D Code
751333-1	1	1.70	270	020	Plate, Identification	751333-1	2

A. New Parts Required

New PN	Qty	Unit Price	Lead Time M/OH	MSQ	Nomenclature	Old PN	I/D Code
777613-1	6	0.43	210	100	Cover (UV Protective)	777613-1	2

Hamilton Standard Internal Reference Number 221125
Hamilton Standard Internal Identification Number EEC15073.18
Hamilton Standard Reference V2500, A320
IAE Engineering Change Number 90VZ003