GEnx-1B SERVICE BULLETIN - 73-0097 R01

Revised: 01/29/2021
Issued: 12/17/2020

SB 73-0097 R01 ENGINE FUEL AND CONTROL - ELECTRONIC ENGINE CONTROL (73-21-20) - REPLACEMENT OF INTEGRATED CIRCUIT MN4 ON MAIN CHANNEL BOARDS

GE Designated: -CONFIDENTIAL-

TRANSMITTAL INFORMATION
REVISION 1 TO SERVICE BULLETIN 73-0097
Revision 1 is issued to update paragraphs 1., PLANNING INFORMATION and 4., APPENDIX - A.
The original was issued December 17, 2020. Revision bars in the left margin identify changes.

1. PLANNING INFORMATION

A. Effectivity

* * * GEnx-1B64, -1B64/P1, -1B64/P2, -1B67, -1B67/P1, -1B67/P2, -1B70, -1B70/75/P1, -1B70/75/P2, -1B70/P1, -1B70/P2, -1B70C/P1, -1B70C/P2, -1B74/75/P1, -1B74/75/P2, -1B76/P2, -1B76A/P2

This Service Bulletin is applicable to all GEnx-1B engines.

The electronic engine controls (EECs) VIN 114E9586G10 (P/N 2447M85P01), VIN 114E9586G11 (P/N 2121M82P07), VIN 114E9586G12 (P/N 2447M85P02), VIN 114E9586G8 (P/N 2121M82P06), VIN 115E9084G1 (P/N 2447M85P03), and VIN 115E9084G2 (P/N 2447M85P04) are affected by this Service Bulletin.

B. Description

This Service Bulletin provides instructions to replace the EEC MN4 bridge ball grid array (BGA) microprocessor.

C. Compliance

Category 2

GE recommends that you do this Service Bulletin as soon as possible without effect on revenue service but under the following conditions based on the cycles since new (CSN) or cycles since repair (CSR) of the EEC MN4 microprocessors as follows:

* Replace the EEC MN4 microprocessor before 11,000 CSN.

* For the EEC MN4 microprocessors that have accumulated more than 11,000 CSN, replace within 1 year from the original issue date of this Service Bulletin.

* Thereafter, replace the EEC MN4 microprocessors before 11,000 CSR.

NOTE: For the purposes of this Service Bulletin, EEC shop visit is the induction of the EEC into any FADEC International authorized repair shop.

NOTE: EEC MN4 microprocessor replacement is limited to a maximum of three replacements for each main channel board (MCB). After three replacements, the MCB will need to be replaced.

Impact A

This recommendation is to address a condition that may affect Flight Safety.

NOTE: A loss of thrust control (LOTC) may occur.

NOTE: This Service Bulletin can be done in shop.

This Service Bulletin is offered to improve the reliability or performance of your GE product, or to help prevent the occurrence of the event or condition described in this Service Bulletin. If the operator elects not to participate in the bulletin, that decision will be taken into consideration by GE in evaluating future product performance issues that may arise in the operator's fleet.

D. Concurrent Requirements

None.

E. Reason

(1) Objective:

To rework a part, improve reliability, and reduce significant events.

(2) Condition:

An LOTC event has occurred due to an EEC MN4 microprocessor solder ball failure.

(3) Cause:

Accumulated thermal cycles of the EEC with age causes the solder ball to fail.

(4) Improvement:

The MN4 integrated circuit on the MCB will be removed along with the solder and will be replaced with a new solder and a new BGA.

(5) Substantiation:

Substantiation by analysis.

F. Approval

The data contained in this Service Bulletin has been reviewed by the FAA or authorized entity representing the FAA and the repair(s) and modification(s) herein comply with the applicable Aviation Regulations and are APPROVED for installation in the model(s) listed in this Service Bulletin.

G. Manpower

Refer to the attached FADEC International Service Bulletin FADEC3/73-092 (latest version).

H. Weight and Balance

Weight and balance are not changed.

I. References (Use the latest version of these documents)

GEnx-1B, Boeing 787 Aircraft Maintenance Manual (AMM)

GEK 112851, GEnx-1B Engine Manual (EM)

GEK 112864, GEnx-1B Engine Illustrated Parts Catalog (EIPC)

GEK 114001, GEnx-1B Component Maintenance Manual (CMM), 73-21-50

FADEC International Service Bulletin FADEC3/73-092, ENGINE FUEL AND CONTROL - Electronic Control Unit (73-00-00) - ECU Modification - Replacement of MN4 Microprocessor BGA on Main Channel Boards (MCB)

J. Publications Affected

None.

K. Interchangeability

Not applicable.

L. Software Accomplishment Summary

Not applicable.

2. MATERIAL INFORMATION

A. Material - Price and Availability

(1) Parts necessary to do this Service Bulletin:

Refer to the attached FADEC International Service Bulletin FADEC3/73-092 (latest version).

(2) Other Spare Parts:

None.

(3) Consumables:

None.

B. Industry Support Information

Refer to the attached FADEC International Service Bulletin FADEC3/73-092 (latest version).

C. Configuration Chart

None.

D. Parts Disposition

None.

E. Tooling - Price and Availability

None.

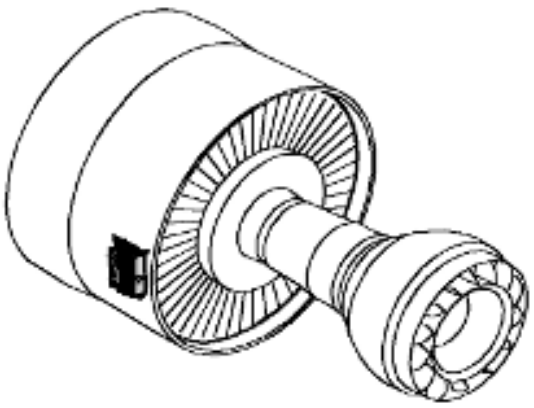
3. ACCOMPLISHMENT INSTRUCTIONS

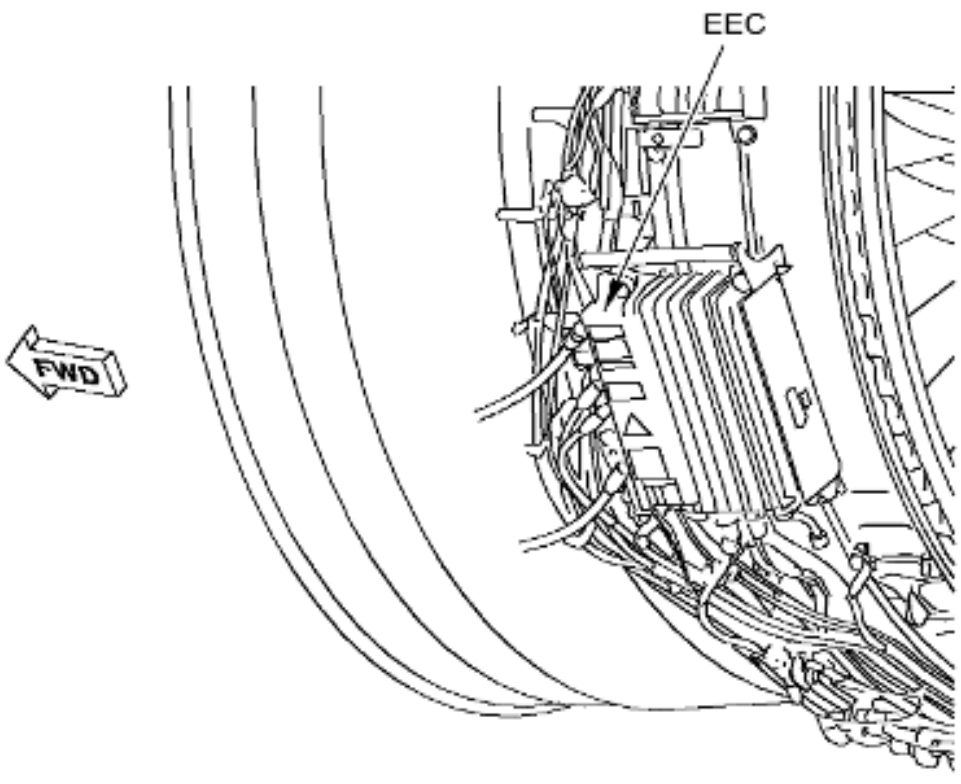
A. General

(1) Remove the EEC (Figure 1). Removal instructions have not changed. Refer to the GEnx-1B EM, 72-00-00, DISASSEMBLY 001 or GEnx-1B Boeing 787 AMM, G73-21-05, ELECTRONIC ENGINE CONTROL - REMOVAL, B787-A-G73-21-05-00A-520A-A.

(2) Send the removed EEC (Figure 1) to FADEC International. Refer to the attached FADEC International Service Bulletin FADEC3/73-092 (latest version).

(3) Install the EEC (Figure 1). Installation instructions have not changed. Refer to the GEnx-1B EM, 72-00-00, ASSEMBLY 001 or GEnx-1B Boeing 787 AMM, G73-21-05, ELECTRONIC ENGINE CONTROL - INSTALLATION, B787-A-G73-21-05-00A-720A-A.





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EEC Location
Figure 1

4. APPENDIX - A

VENDOR SERVICE BULLETIN SUMMARY TABLE

Vendor Service Bulletin Title:	ENGINE FUEL AND CONTROL - Electronic Control Unit (73-00-00) - ECU Modification - Replacement of MN4 Microprocessor BGA on Main Channel Boards (MCB)
GE Service Bulletin Number:	GEnx-1B S/B 73-0097, Revision 1

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Supplier Service Bulletin Number:	FADEC3/73-092	Vendor:	FADEC International
Category:	2	Vendor CAGE Code:	3E6E4
Component Maintenance Manual (CMM):	73-21-50	CMM CAGE Code:	3E6E4

PARTS AFFECTED

New GE Part Number	Old GE Part Number	New Vendor Part Number	Old Vendor Part Number	Part Name
2121M82P06	2121M82P06	114E9586G8	114E9586G8	Control, Electronic Engine
2121M82P07	2121M82P07	114E9586G11	114E9586G11	Control, Electronic Engine
2447M85P01	2447M85P01	114E9586G10	114E9586G10	Control, Electronic Engine
2447M85P02	2447M85P02	114E9586G12	114E9586G12	Control, Electronic Engine
2447M85P03	2447M85P03	115E9084G1	115E9084G1	Control, Electronic Engine
2447M85P04	2447M85P04	115E9084G2	115E9084G2	Control, Electronic Engine

NOTE: For interchangeability and/or material support, refer to the attached FADEC International Service Bulletin FADEC3/73-092 (latest version).

TO: Holders of ENGINE FUEL AND CONTROL-FADEC3 GEnx-1B Electronic Control Unit (ECU).

FROM: FADEC International
CAGE: 3E6E4
11-13 Rue Ampere
91344 MASSY - FRANCE
Web: http://fadecinternational.net

SUBJECT: FADEC3-73-092, ENGINE FUEL AND CONTROL - ECU Modification - Replacement of MN4 BGA microprocessor on Main Channel Boards (MCB), Revision 0, dated Dec 17/2020.

The subject Service Bulletin is attached to this letter of transmittal.

SUMMARY: This Service Bulletin gives procedure to replace Integrated circuit MN4.

REVISION HISTORY	
Basic Issue	Dec 17/2020

Please direct any questions or comments to the address above.

FADEC International

SERVICE BULLETIN

ENGINE FUEL AND CONTROL - Electronic Control Unit (73-00-00) - ECU Modification – Replacement of MN4 BGA microprocessor on Main Channel Boards (MCB).

1. PLANNING INFORMATION

A. Effectivity

(1) This Service Bulletin applies to the following Electronic Control Units (ECUs): VIN 114E9586Gx (P/N 2121M82P0x and P/N 2447M85P0x), VIN 115E9084Gx (P/N 2447M85P0x) containing MCB P/N 392-207-904-0, 392-207-905-0, 392-207-906-0, 262197983-0905, 262197983-0906, 262197983-1905, 262197983-1906.

Note #1: Here under are Main-Channel-Boards (MCB) that have had MN4 previously replaced. This is the best-known list at last revision of this Service Bulletin:

ECU S/N	MCB S/N	Shop Received date (DD/MM/YYYY)	ECU S/N	MCB S/N	Shop Received date (DD/MM/YYYY)
FFFG6056	07L1007	21/01/2020	FFFG6073	08G1168	29/08/2017
FFFG6732	15M6534	09/10/2018	N/A (FI Rotable)	07D0183	05/11/2018
N/A (FI Rotable)	17B6262	08/05/2019	/	/	/

Note #2: The EEC/ECU level effectivity is based on the best available data. It is also allowable to perform this Service Bulletin on an affected subassembly that has been removed from a top-level unit. This Service Bulletin may also be performed on subassemblies sent individually that meet above criteria.

Note#3: MN4 replacement is limited to a maximum of 3 replacements for each MCB. After 3 replacements, concerned MCB will need to be replaced.

FADEC International

SERVICE BULLETIN

ENGINE FUEL AND CONTROL - Electronic Control Unit (73-00-00) - ECU Modification – Replacement of MN4 BGA microprocessor on Main Channel Boards (MCB).

B. Reason

(1) Objective

This Service Bulletin authorizes the replacement of Integrated circuit MN4 on Main-Channel-Boards to prevent operational events related to solder ball fractures.

(2) Condition

A solder ball failure on the Integrated Circuit (MN4) on the MCB could initiate a system effect that may result in a LOTC.

(3) Cause

Aging of BGA (Ball Grid Array) solder balls degraded the integrity of the solder connection.

(4) Improvement

The Integrated Circuit (MN4) on the MCB will be removed along with the solder and will be replaced with new solder and a new BGA.

(5) Substantiation

Substantiation is by fleet experience.

C. Description

This Service Bulletin provides replacement instruction for the ECU MN4 Ball Grid Array (BGA) microprocessors.

D. Compliance

(1) Technical Compliance.

Category 2.

See GE SB 73-0097 for compliance.

Note: MN4 replacement is limited to a maximum of 3 replacements for each MCB. After 3 replacements, the main channel board will need to be replaced.

E. Approval

This Service Bulletin with the part numbers listed in the paragraph 1.A., Effectivity is accepted by GE. GE has traceability to FAA engineering for acceptance of this service bulletin.

F. Manpower

(1) Approximately 4 man-hours is needed to complete this Service Bulletin. These hours do not include any Service Bulletins that need to be done to upgrade parts to the current configuration.

FADEC International

SERVICE BULLETIN

ENGINE FUEL AND CONTROL - Electronic Control Unit (73-00-00) - ECU Modification – Replacement of MN4 BGA microprocessor on Main Channel Boards (MCB).

(2) If you do not have the capability or if you want the Service Bulletin accomplished by authorized personnel, return the affected ECU and a Purchase Order to a substantiated repair facility. Send the affected ECU to this address:

FADEC International c/o BAE Systems 4250 Airport Expressway Fort Wayne, IN 46809 USA Attn: Service Center	OR	FADEC International c/o Safran Electronics & Defense 13 rue Ampere 91334 Massy France Attn: Service Center

G. Industry Support

Please contact your FADEC International Customer Service Manager for details.

H. Material

Refer to Paragraph 3.A., Parts and Consumables. Material can be ordered from:

FADEC International: c/o BAE System 4250 Airport Expressway Fort Wayne, IN 46809 USA Attn: Customer Account Representative-Spares SITA/ARINC code: FWALMXD Phone: +1-260-434-5600 E-mail: spares.enginecontrols@ baesystems.com	OR	Spare Orders FADEC International 11-13 rue Ampere 91334 Massy France Attn: Customer Account Representative-Spares SITA/ARINC code: PARHSCR Phone: + 33 1 64 14 83 31 E-mail: fadec.csc@safrangroup.com

FADEC International

SERVICE BULLETIN

ENGINE FUEL AND CONTROL - Electronic Control Unit (73-00-00) - ECU Modification – Replacement of MN4 BGA microprocessor on Main Channel Boards (MCB).

I. Tooling

TOOL NAME	SUGGESTED SOURCE
Oven, Thermal For Hot-cold thermal cycling during test. Must be capable of -54 ± 2.5 °C (-65 ± 4.5 °F) to 105 ± 2.5 °C (221 ± .5 °F)	Commercial

J. Weight and Balance

Weight and Balance are not affected.

K. References

GEnx-1B SB 73-0097,
ECU CMM 73-21-50,
MCB PRM 73-23-56,
PROPRIETARY PRACTICES MANUAL 73-20-23 or 73-20-23A

L. Publications Affected

None.

SERVICE BULLETIN

ENGINE FUEL AND CONTROL - Electronic Control Unit (73-00-00) - ECU Modification – Replacement of MN4 BGA microprocessor on Main Channel Boards (MCB).

2. ACCOMPLISHMENT INSTRUCTIONS.

ACCOMPLISHMENT INSTRUCTIONS SHOULD ONLY BE PERFORMED BY FADEC INTERNATIONAL AUTHORIZED PERSONNEL.

Direct correspondence to: FADEC International:

CS-Customer.Service@baesystems.com
BAE Systems
1098 Clark Street
Endicott, NY 13760
USA
Attn: Commercial Product Support
Website: www.baesystems-ps.com/customersupport

OR

fadec.csc@safrangroup.com
Safran Electronics & Defense
11-13 rue Ampere
91334 Massy
France
Attn: Customer Product Support
Phone: +33 1 64 14 83 31

A. Equipment Protection.

CAUTION: SUBASSEMBLIES OF THE EQUIPMENT CAN CONTAIN ESDS DEVICES (MICROCIRCUITS, SEMICONDUCTORS, AND FILM RESISTORS) THAT ARE SENSITIVE TO VOLTAGES MADE BY ELECTROSTATIC DISCHARGE. OBEY ESDS PRECAUTIONS WHEN YOU HANDLE SUBASSEMBLIES THAT HAVE THE ESD SYMBOL. THESE PRECAUTIONS ARE APPLICABLE TO THE FULL SUBASSEMBLY WHICH CONTAINS ESDS DEVICES.

WHEN ESDS SUBASSEMBLIES ARE NOT INSTALLED IN THE UNIT, THEY MUST BE KEPT OR MOVED IN MATERIALS THAT ARE ELECTRICALLY CONDUCTIVE, AND MUST NOT BE PUT IN NON-CONDUCTIVE PLASTIC BAGS. STATIC SHIELD BAGS, OR THEIR EQUIVALENT, ARE THE CORRECT PROTECTIVE MATERIALS TO KEEP OR MOVE SUBASSEMBLIES. REFER TO THE GENERAL PRACTICES MANUAL, CHAPTER 73-60-00, FOR SPECIAL PROCEDURES FOR ESDS SUBASSEMBLIES.

CAUTION: SUBASSEMBLIES OF THE EQUIPMENT CAN CONTAIN MOISTURE SENSITIVE DEVICES THAT CAN BE DAMAGED DURING SOLDERING OPERATIONS. OBEY MSD PRECAUTIONS IN THE GENERAL PRACTICES MANUAL, CHAPTER 73-61-00, PRIOR TO SOLDERING ANY MSD.

FADEC International

SERVICE BULLETIN

ENGINE FUEL AND CONTROL - Electronic Control Unit (73-00-00) - ECU Modification – Replacement of MN4 BGA microprocessor on Main Channel Boards (MCB).

B. Incoming Inspection

Use the steps that follow to examine ECU.

(1) If the Part Number is not inside scope of the Effectivity paragraph or SB 73-0097 is on the Service Bulletin label and the cycle limitation has not been violated as per the compliance section, this Service Bulletin is not necessary. If the PN is listed, continue to paragraph (2).

(2) If the ECU and/or MCB Serial Number is listed in Note #1 of the Effectivity paragraph and cycle limitation in Compliance section has not been violated, the Service Bulletin is not necessary. Otherwise, continue to Step 2.C.

C. Disassembly

Use the steps that follow to disassemble the ECU.

CAUTION: DISCARD ALL SCREWS AFTER USE. ALWAYS USE NEW SCREWS. LOCKING FEATURES CAUSE DAMAGE TO SCREW-THREADS.

(1) Remove the Rear Cover. Refer to CMM 73-21-50 for DISASSEMBLY Procedures.

(2) Examine the MCBs for their Serial Numbers and presence of SB 73-0097 accomplishment label. Refer to Figure 2 for location of the Serial Number and accomplishment label.

-If the Serial Number is listed in Note #1 of effectivity paragraph and cycle limitation in compliance section has not been violated this Service Bulletin is not necessary for these MCB.

-If SB 73-0097 accomplishment label is present on one or both MCB and cycle limitation in compliance section has not been violated, this Service Bulletin is not necessary for these MCB.

-Remove the MCB or MCBs for which SB 73-0097 has to be applied. Refer to CMM 73-21-50 for DISASSEMBLY procedures.

-If none MCB need application of SB 73-0097, then continue to step 2.E. and reassemble the ECU.

D. Repair

NOTE: All soldering must be complete within 24 hours of removing the MCB from the oven. If necessary, bake the MCB again.

(1) Remove Cover, Card rails and stiffeners. Refer to PRM 73-23-56 DISASSEMBLY.

SERVICE BULLETIN

ENGINE FUEL AND CONTROL - Electronic Control Unit (73-00-00) - ECU Modification – Replacement of MN4 BGA microprocessor on Main Channel Boards (MCB).

(2) Remove and replace Integrated circuit MN4 (P/N 620-076-017-0). (Refer to Figure 1). This repair will be performed using the following internal FADEC International procedures:

Proprietary Practices Manual 73-20-23.

OR

Proprietary Practices Manual 73-20-23A.

(3) Recoat the repaired areas with Type SR Conformal coating. Refer to PRM 73-23-56 REPAIR.

(4) Install Cover, Card rails and stiffeners. Refer to PRM 73-23-56 ASSEMBLY.

(5) Mark MCB with polyimide SB accomplishment label (approx. 0.1875 in. X 1 in. (approx. 4.762 mm X 25.4 mm) with 73-0097 and date of application. Refer to Figure 2 for approximate label location. Trim label to fit as necessary. Refer to the GENERAL PRACTICES MANUAL 73-30-16. If some 73-0097 label are already present, do not remove them, but put additional label side by side.

(6) Test and program the MCB.

(a) Run 20 unpowered temperature cycles of two hours duration each Temperature:

- Cold -54 ±2.5 °C (-65 ±4.5 °F)
- Hot 105 ±2.5 °C (221 ±4.5 °F)
- Timing (1 cycle in 2 hours):
  - 44 ±3 minutes at stabilized cold temperature
  - 16 ±3 minutes transition cold to hot (at 10 ±2 °C (18 ±3.6 °F) per minute)
  - 44 ±3 minutes at stabilized hot temperature
  - 16 ±3 minutes transition hot to cold (at 10 ±2 °C (18 ±3.6 °F) per minute)

(b) Program MN4 per PRM 73-23-56 Appendix A procedure or equivalent process and equipment.

(c) Test per PRM 73-23-56 TESTING AND FAULT ISOLATION Section.

E. Assembly

Use the steps that follow to assemble the ECU.

(1) Reinstall the MCBs. Refer to CMM 73-21-50 for ASSEMBLY procedures.

(2) Install the Rear Cover on the ECU. Refer to CMM 73-21-50 for ASSEMBLY procedures.

FADEC International

SERVICE BULLETIN

ENGINE FUEL AND CONTROL - Electronic Control Unit (73-00-00) - ECU Modification – Replacement of MN4 BGA microprocessor on Main Channel Boards (MCB).

F. ECU Testing.

For return to service, do a complete ATP at ROOM, COLD, and HOT temperatures. Refer to the TESTING AND FAULT ISOLATION section of CMM 73-21-50.

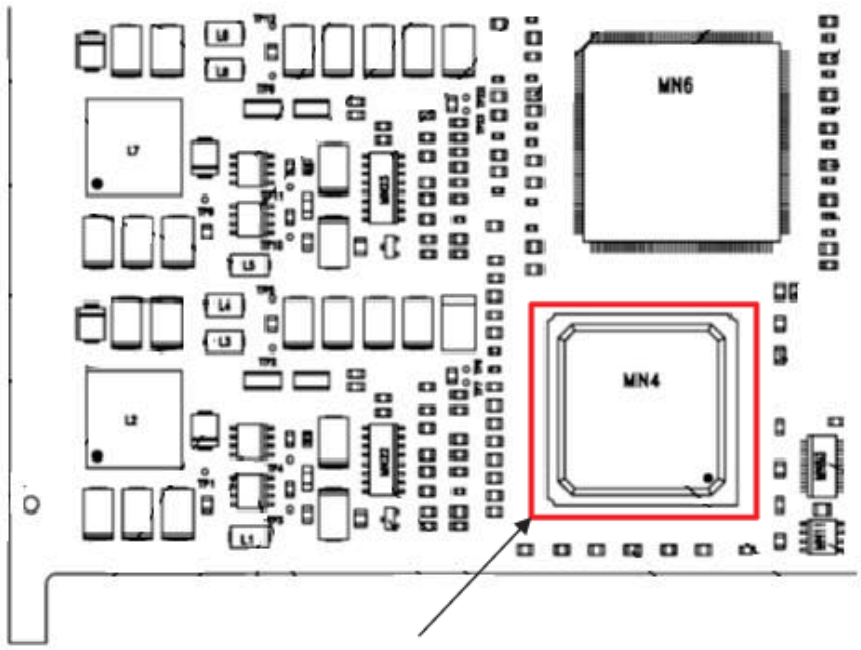
G. Service Bulletin Identification Plate Marking.

Use a ballpoint pen to mark the Service Bulletin Identification Plate as follows: 73-0097.

FADEC International

SERVICE BULLETIN

ENGINE FUEL AND CONTROL - Electronic Control Unit (73-00-00) - ECU Modification – Replacement of MN4 BGA microprocessor on Main Channel Boards (MCB).

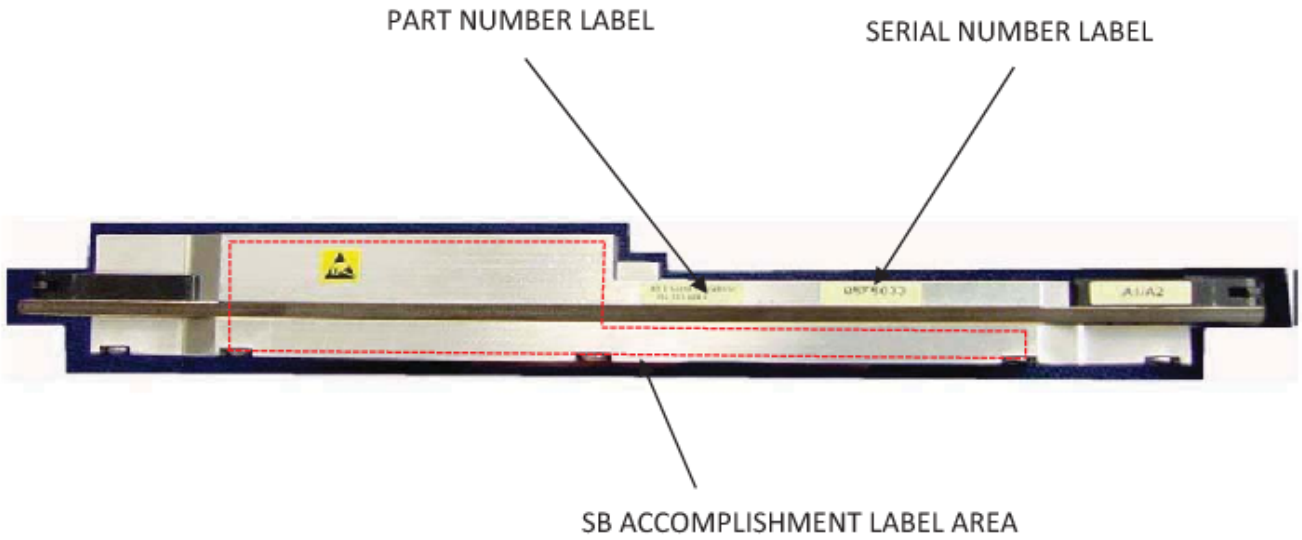


Location of MN4
Figure 1

FADEC International

SERVICE BULLETIN

ENGINE FUEL AND CONTROL - Electronic Control Unit (73-00-00) - ECU Modification – Replacement of MN4 BGA microprocessor on Main Channel Boards (MCB).



Part Number and Serial Number Locations
Figure 2

SERVICE BULLETIN

ENGINE FUEL AND CONTROL - Electronic Control Unit (73-00-00) - ECU Modification – Replacement of MN4 BGA microprocessor on Main Channel Boards (MCB).

3. MATERIAL INFORMATION.

A. Parts and Consumables.

(1) Parts necessary to do this Service Bulletin:

PART NUMBER	QTY/ ECU	PART NAME	UNIT $ PRICE	PKG QTY	LEAD TIME DAYS
620-076-017-0	2	Integrated circuit (MN4)	(*)	(-)	--

NOTE: * FADEC International will quote the price of these parts. Pricing is available.

(2) Future spare parts.

None.

(3) Consumables.

None.

B. Configuration Chart

Configuration Chart is not provided because there is no change to the defined ECU hardware configuration.

C. Interchangeability.

Modified ECUs are interchangeable with non-modified ECUs. Modified MCBs are interchangeable with unmodified MCBs.

D. Parts Disposition.

None.