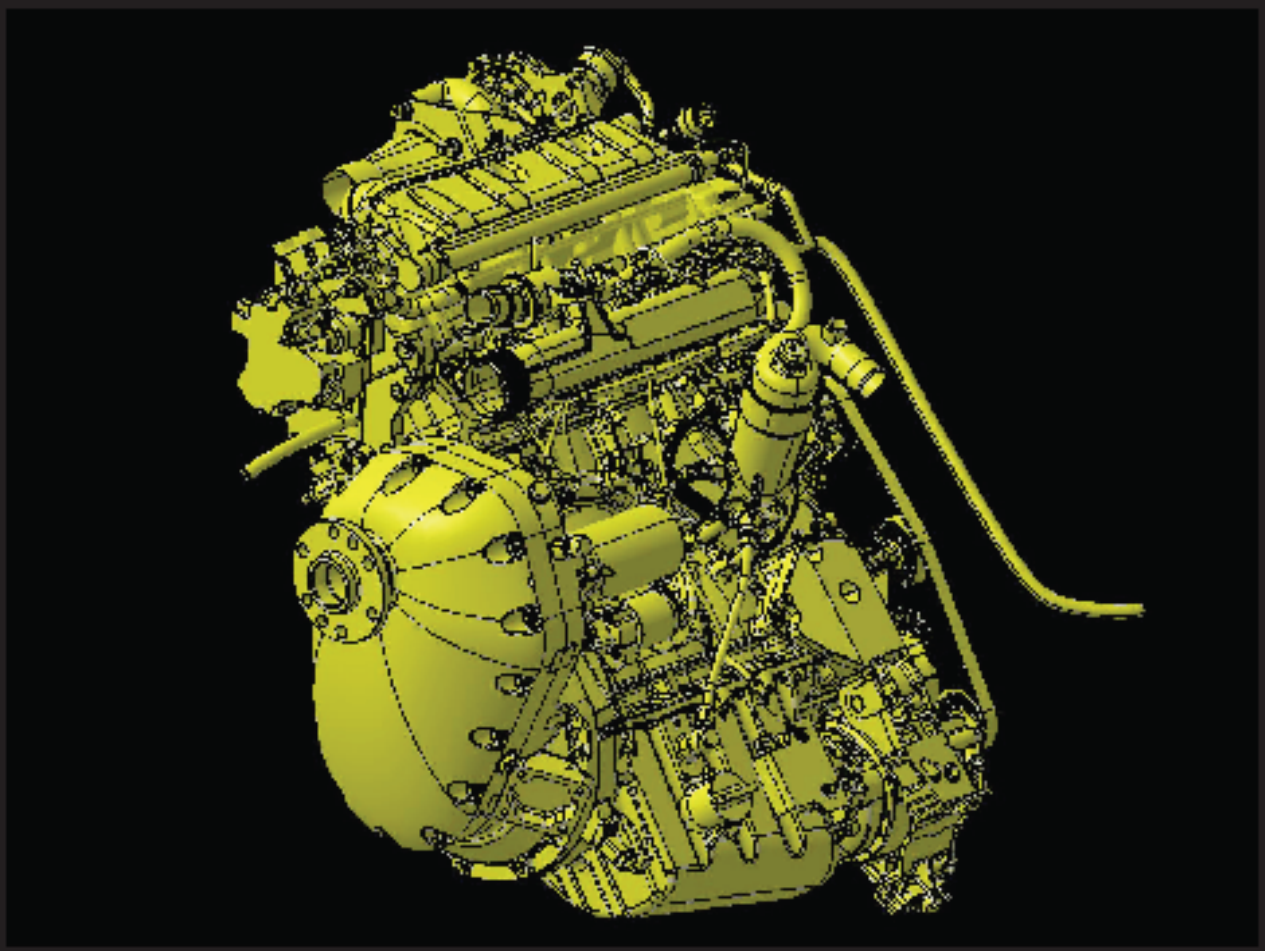
Austro Engine

Maintenance Manual
AE 300

Doc. No.: E4.08.04



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Maintenance Manual AE 300

Date: Wiener Neustadt, 2012-04-10

Author: Austro Engine GmbH
Rudolf – Diesel – Straße - 11
A-2700 Wiener Neustadt

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Introduction

All revisions of this manual, with exception of Temporary Revisions must be recorded in the following table.

The new or amended text is indicated by a vertical black line at the left hand side of the revised page, with the revision number and date appearing at the bottom of the page.

Temporary revisions, if applicable, are inserted behind the cover page of this manual. Temporary revisions are used to provide information on systems or equipment until the next 'permanent' revision of the Engine Manual. If a 'permanent' revision covers a Mandatory or Optional Design Change Advisory (MDC or ODC), the corresponding temporary revision is superseded.

It is the responsibility of the installer to ensure that this manual is maintained to a current status.

If the address or the ownership of the engine/aircraft changes, an address card has to be sent to **Austro Engine GmbH.**

List of Revision

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1	Authority remarks updated	All	All	07.05.2009				
3	Authority remarks included	Intro 01 02 03 04 05 12 24 51 71 73 76 77 78 79 80 81 85 92	2,4,5,6,7, 10,11,12, 13,14 1,2 1,2,3,4 1,2 1 1,2,3,4,5, 6,7 1,2 1,2 1,2,3,4,5, 6,8 1,2,4,5 1,2,3,4,5, 6,7,8,9 1,2,3,4 1 1,2 1,2,3,4,5, 6,7,8,9, 10,11,12, 13,14,15, 16,17,18 1,2,3 1,2,3 1,2,3,4,5, 6,7,8,9,1 0,11,12, 13,14,15, 16,17,18, 19,20,21, 22 1,2,3,4,5	09.09.2009				
4	MDC-E4-117	Intro 02 05 12 24 51 71 73 76 78 79	2,4-16 3 4,5 1 2,3,4 1-6,8 2-25 1,2,4, 6-9 1-4 1,2 1-3, 5, 7-17	2010-05-04				

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List of Abbreviation

AE	Austro Engine
BATT	Battery
BPA	Boost Pressure Actuator
BPS1	Boost Pressure Sensor 1
BPS2	Boost Pressure Sensor 2
CAD	Computer Aided Design
CAN	Controller Area Network
CAS 1	Camshaft Sensor 1
CAS 2	Camshaft Sensor 2
CCW	Counter-Clockwise
CPC	Connector Type
CRS 1	Crankshaft Sensor 1
CRS 2	Crankshaft Sensor 2
CS	Certification Specification
CTS	Coolant Temperature Sensor
CTS_GPC	GPC Coolant Temperature
DOHC	Double Overhead Camshaft
EASA	European Aviation Safety Agency
EECS	Electric Engine Control System
EECU	Electric Engine Control Unit
ECU	Electric Control Unit
EMI	Electromagnetic Interference
EPC	Electric Pneumatic Converter
ESD	Electrostatic Sensitive Device
FAR	Federal Aviation Regulations
FMU	Fuel Metering Unit
FPS	Fuel Pressure Sensor
FTS	Fuel Temperature Sensor
GBTS	Gearbox Temperature Sensor
GEN	Alternator Plug
GND	Ground
GOV	Governor Actuator
GPC	Glow Plug Control Unit
GP 1	Glow Plug 1
GP 2	Glow Plug 2
GP 3	Glow Plug 3
GP 4	Glow Plug 4
HIRF	High Intensity Radiated Field
HPP	High Pressure Pump
IAT 1	Intake Air Temperature 1
IAT 2	Intake Air Temperature 2
INJ 1	Fuel Injector 1
INJ 2	Fuel Injector 2
INJ 3	Fuel Injector 3
INJ 4	Fuel Injector 4
MA	Manual Amendments
MBN	Mercedes Benz Norm
MDC	Mandatory Design Change Advisory

MOK	Oil Combinant Sensor Temperature
ODC	Optional Design Change Advisory
OPS	Oil Pressure Sensor
PCV	Pressure Control Valve
RPM	Revolutions Per Minute
RPS	Rail Pressure Sensor
SB	Service Bulletin
SL	Service Letter
SW	Soft Ware
TDD	Type Design Definition
TC	Turbo Charger
TVD	Torsional Vibration Damper
Ubatt	Battery Voltage

Conversion Table of Given Torque Values

Newton Meter (Nm)	Pound-force inch (lbf in)
1	9
2	18
3	27
4	35
5	44
6	53
7	62
8	71
9	80
10	89
11	97
12	106
13	115
14	124
15	133
16	142
17	150
18	159
19	168
20	177
21	186
22	195
23	204
24	212
25	221
26	230
27	239
28	248
29	257
30	266
35	310
40	354
50	443

Conversion Table of Given Pressure Values

Pressure [bar]	Pressure [psi]	Pressure [lbf/ft²]
0,0	0	0
0,3	4	627
0,5	7	1044
1,0	15	2089
1,5	22	3133
2,0	29	4177
2,5	36	5221
3,0	44	6266
3,5	51	7310
4,0	58	8354
4,5	65	9398
5,0	73	10443
5,5	80	11487
6,0	87	12531
6,5	94	13576
7,0	102	14620
7,5	109	15664
8,0	116	16708
8,5	123	17753
9,0	131	18797
9,5	138	19841
10,0	145	20885

Consumable List

Various types of consumables are necessary for the engine maintenance defined in this manual. These consumables are listed in the table below including the applicability reference.

Consumables	Material definition	Parts applicability
Sealant	A003 989 982 010 - Mercedes Benz	Oil Sump Crankcase End Cover (Rear & Front)
	DOW_CORNING_736 (Heat Resistant/Sealant)	Fire Sleeve
Grease / Lubricant (acid free lubrication)	Released AE300 engine oils which are defined in the AE300 Operation Manual.	O-ring and Rubber Gaskets
	A001 989 42 51 10 - Mercedes Benz special grease	Injectors (see chapter 73-00-22 Installation of the Injektor Seal)
Loctite	No. 243 No. 542 No. 2710	For the respective Loctite applicability refer to the relevant chapters of this manual.
Safety Wire	Suitable for flight purposes stainless safety wire. Wire thickness 0.81 mm	For applicability refer to the relevant chapters of this manual.

Please contact the **Austro Engine GmbH** customer support under service@austroengine.at or +43 (0) 2622 23000 2525 in case of material availability.

Contents

Chapter 01-00-00 General

This Maintenance Manual contains all instructions necessary for continued airworthiness.

The engine installation instructions for the engine are given in the engine Installation Manual E4.02.01.

The engine operating information and the description of the engine are given in the engine Operation Manual E4.01.01.

For special removal and installation procedures from the aircraft manufacturer refer to the applicable Aircraft Maintenance Manual.

Unless otherwise stated only new or overhauled parts, if applicable, shall be used in case of exchange acc. to this manual.

01-10-00 General Engine Description

Designation:

Brand Name: **AE 300**
TC-Designation: E4 for the engine followed by a letter, which indicates installation specific configuration changes. .
E4-A..... Basic Design
For detailed information refer to MSB E4-002

Brief Description:

The **AE 300** is a liquid-cooled, in-line four-stroke four cylinder engine with a double overhead camshaft (DOHC). Every cylinder has four valves which are actuated by the cam follower.
The direct fuel injection is realized with a common rail technique and the engine is turbo charged.
The whole engine operation is controlled by an Electronic Engine Control System.
The engine is equipped with an electrical starter, an alternator, a water pump, an oil pump, a coolant system and an oil cooler. The propeller is driven by a directly integrated gearbox with an integral torsional vibration damper

Power: 123,5 KW (165,6 hp) with a torque of 513 Nm (4540.43 Lbin) at 2300 PropRPM
Displacement: 1991 cm³ (121,5 cu in³)
Bore: 83 mm (3,26 in)
Stroke: 92 mm (3,62 in)
Weight (dry): 185 kg (408 lbs)
Gear Ratio: 1,69

The EECU is the Electrical Engine Control Unit which is used to control the engine actuators (e.g. fuel injectors) according to the engine sensor information.

The EECU consists of two similar ECUs (Engine control Units).
A voter is integrated in the EECU and proposes an ECU to control the engine regarding the ECU operating hours or in case of a failure the ECU with better engine control capability.

- This engine is not capable for aerobatics use.
- This engine is not approved for rotor craft.
- The engine should not be operated without propeller.
- This engine is only designed for pull propeller installations.

Scope of Supply:

The following components and assemblies are included as part in the Type Design of the **AE 300**:

- Core engine
- Turbocharger
- Thermostat
- Water Pump
- Fuel injection system
- Starter
- Alternator with Alternator regulator
- EECU
- All actuators and sensors required for engine operation
- Wiring harness
- Gearbox
- Power Lever Sensor
- Glow Plug Control

Additional:

The following components are not part of the Type Design of the AE 300. These parts are provided by the airframe manufacturer.

- Governor
- Fuel pumps
- Fuel Filter Housing
- Fuel Filter
- Engine shock mounts

For detailed specifications see corresponding chapters.

Engine Front View:

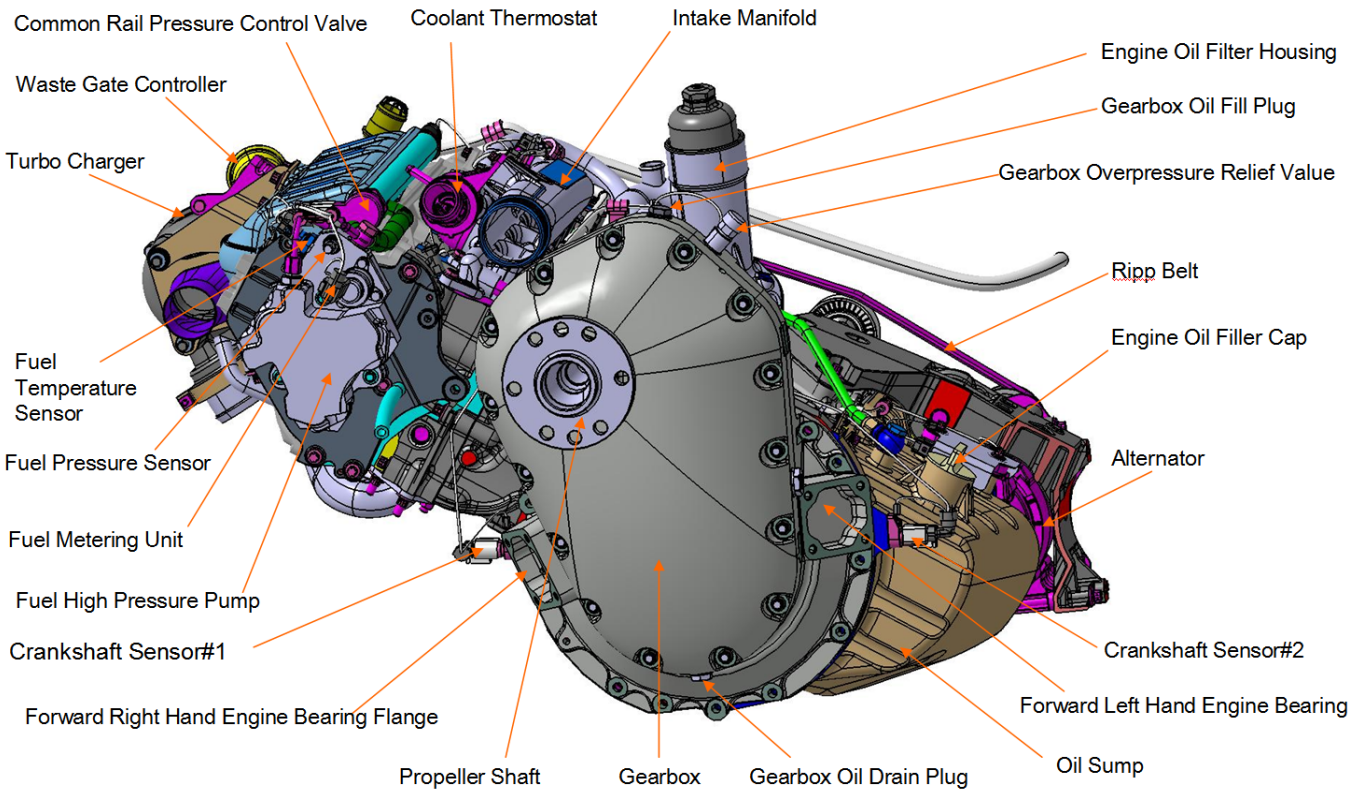


Fig. 01 - 1 Engine Front View

Engine Top View:

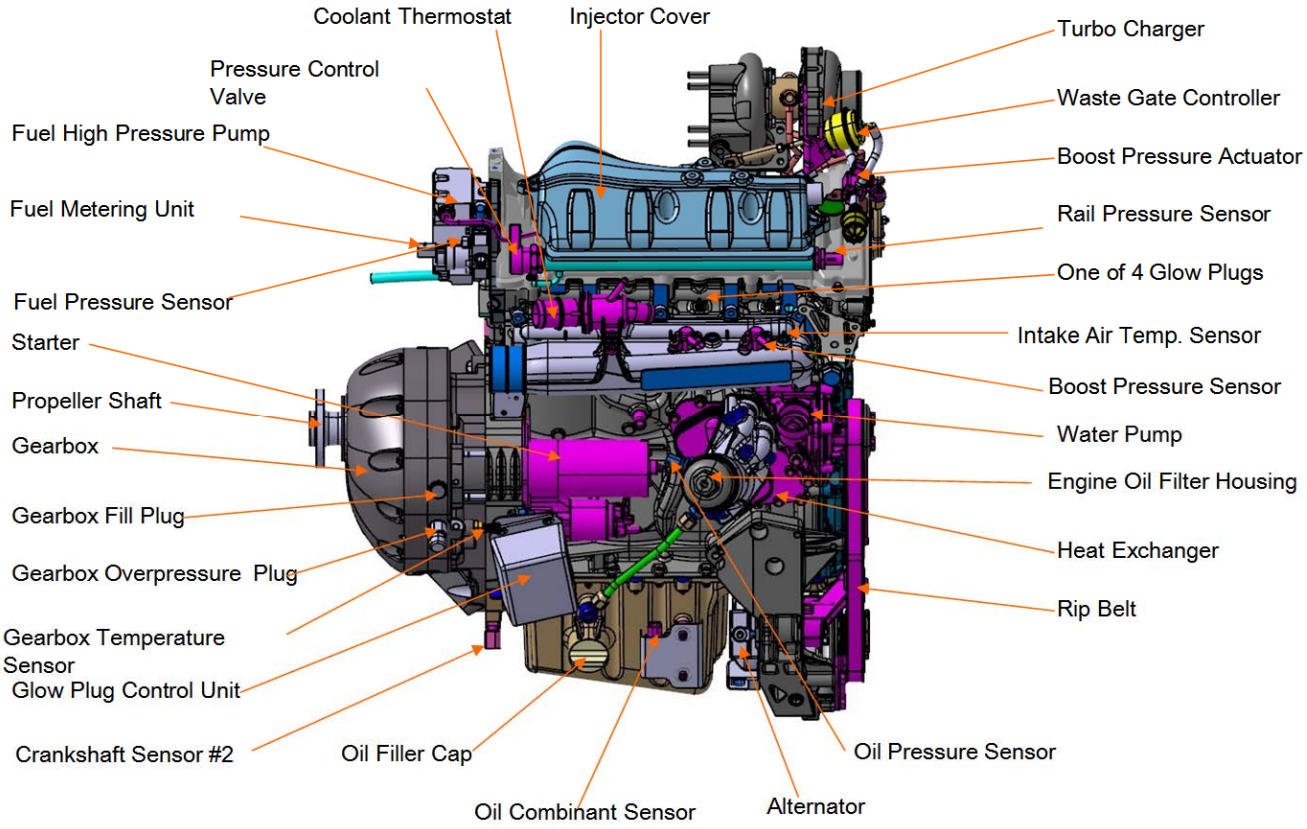


Fig. 01 - 2 Engine Top View

Engine Left Side View:

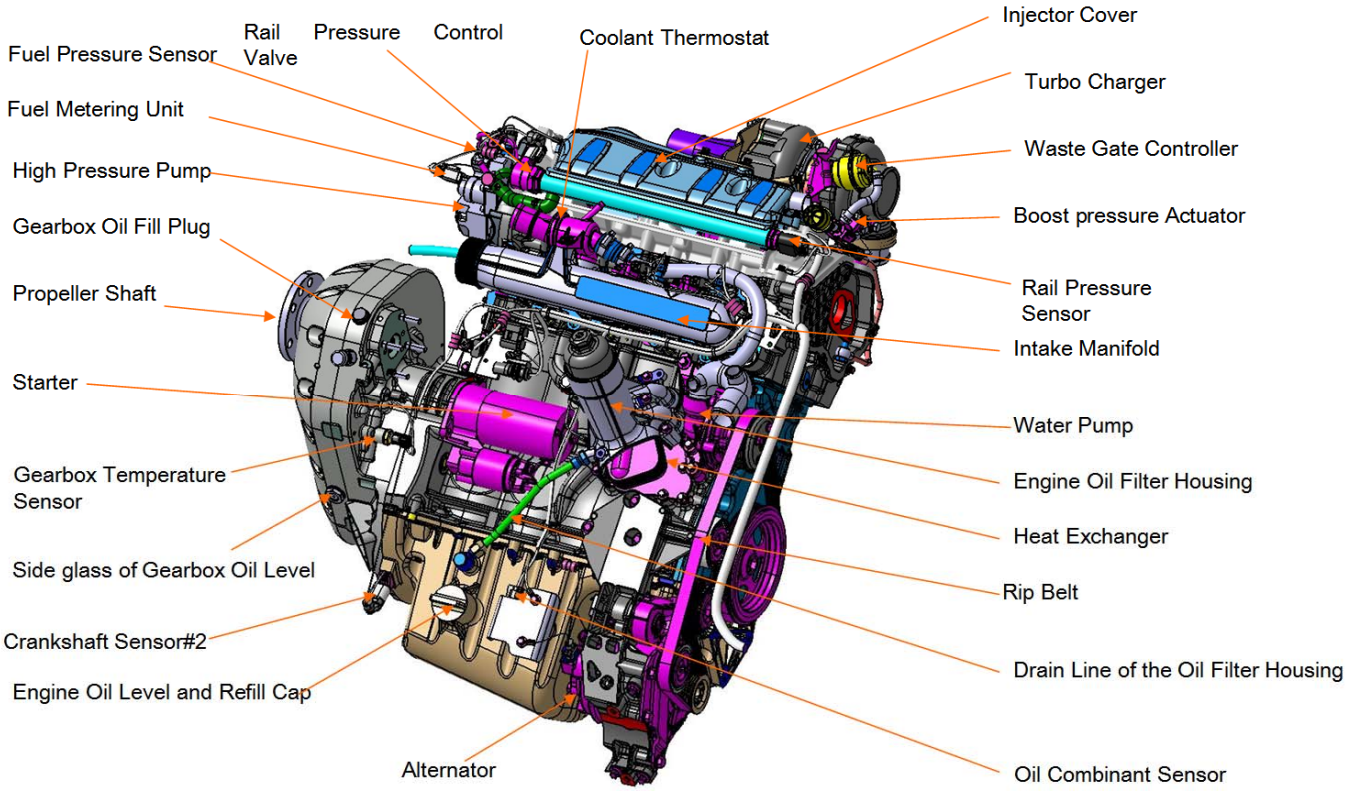


Fig. 01 - 3 Engine Left Side View

Engine Right Side View:

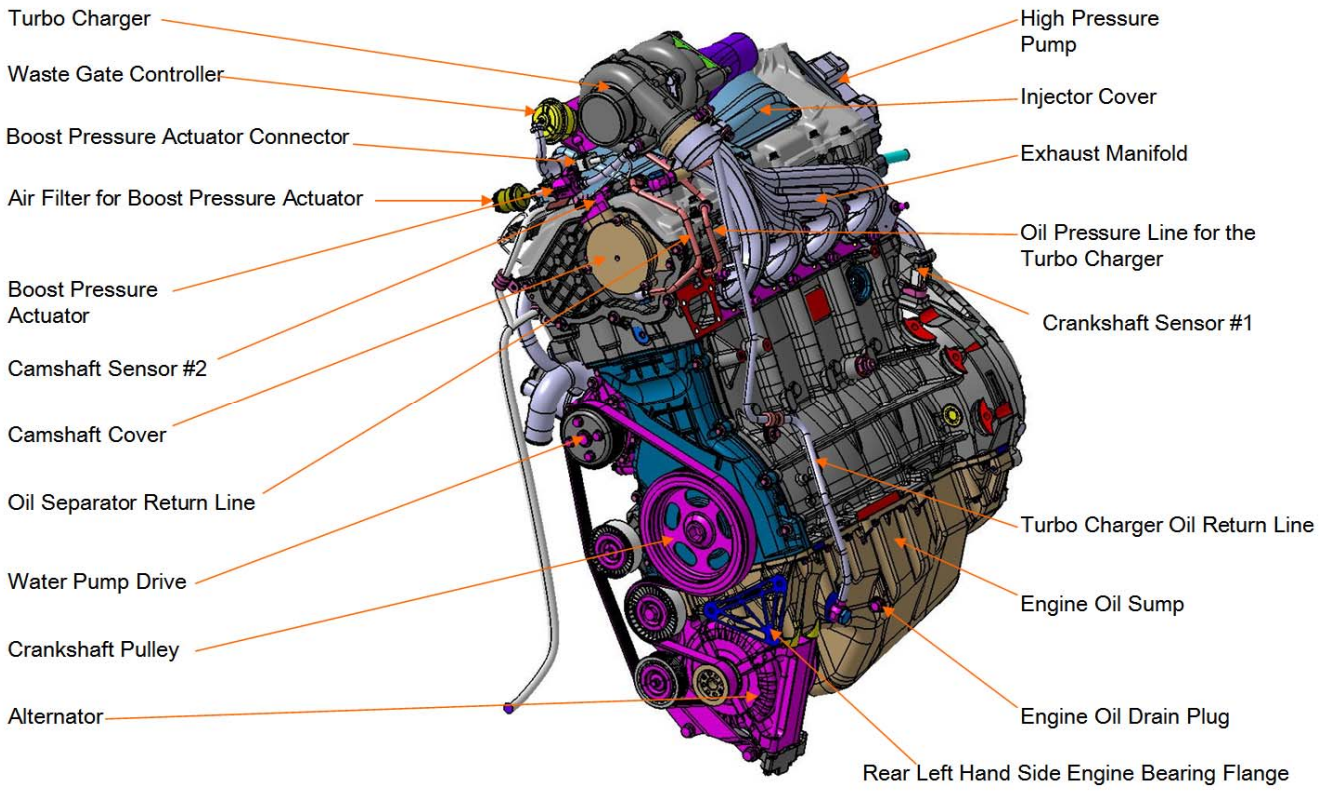


Fig. 01 - 4 Engine Right Side View

Engine Top View with removed Injector Cover:

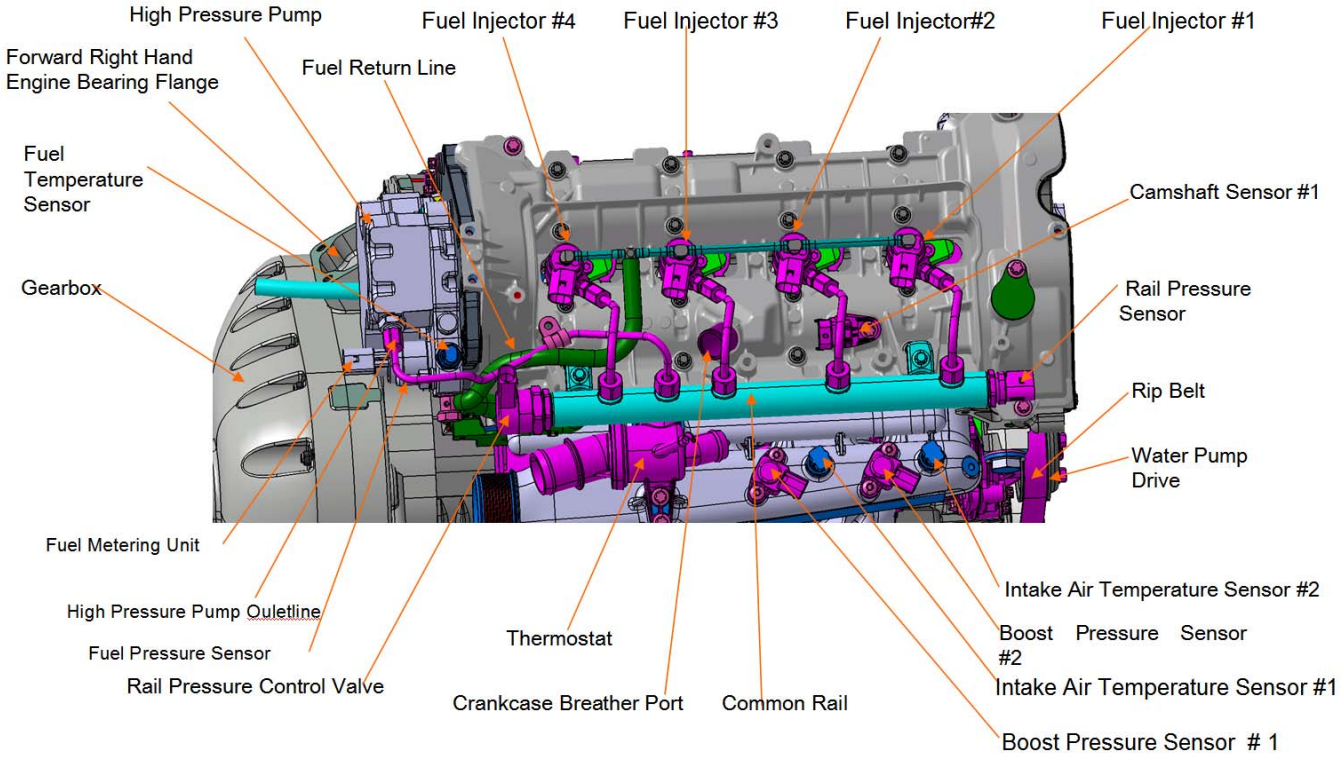


Fig. 01 - 5 Detailed Top View with removed Injector Cover

Dimensions:

Bore:	83 mm (3.268 in)
Stroke:	92 mm (3.622 in)
Cylinder spacing (center to center):	90 mm (3.543 in)
Displacement total:	1991 cm³ (121,5 in³)
Displacement (per cylinder):	498 cm³ (30,4 in³)
Compression ratio:	17.5:1
Gearbox ratio:	1,69
Weight (dry):	185 kg

Characteristics:

Manifold pressure	max.	2660 mbar
Fuel pressure:	max.	1650 bar
Firing order:		1:3:4:2

Gearbox:

The AE300 is equipped with a gearbox to reduce RPM from the 3880 RPM maximum of the engine to 2300 RPM at the propeller. The reduction ratio of the gearbox is 1.69:1. The figure shows the gearbox case and the gearbox case cape of the disassembled gearbox.

The gearbox contains three gears. The gearbox housing itself is casted, while the gears are forged steel.

The governor is attached to the top of the gearbox and controls the pitch of the propeller.

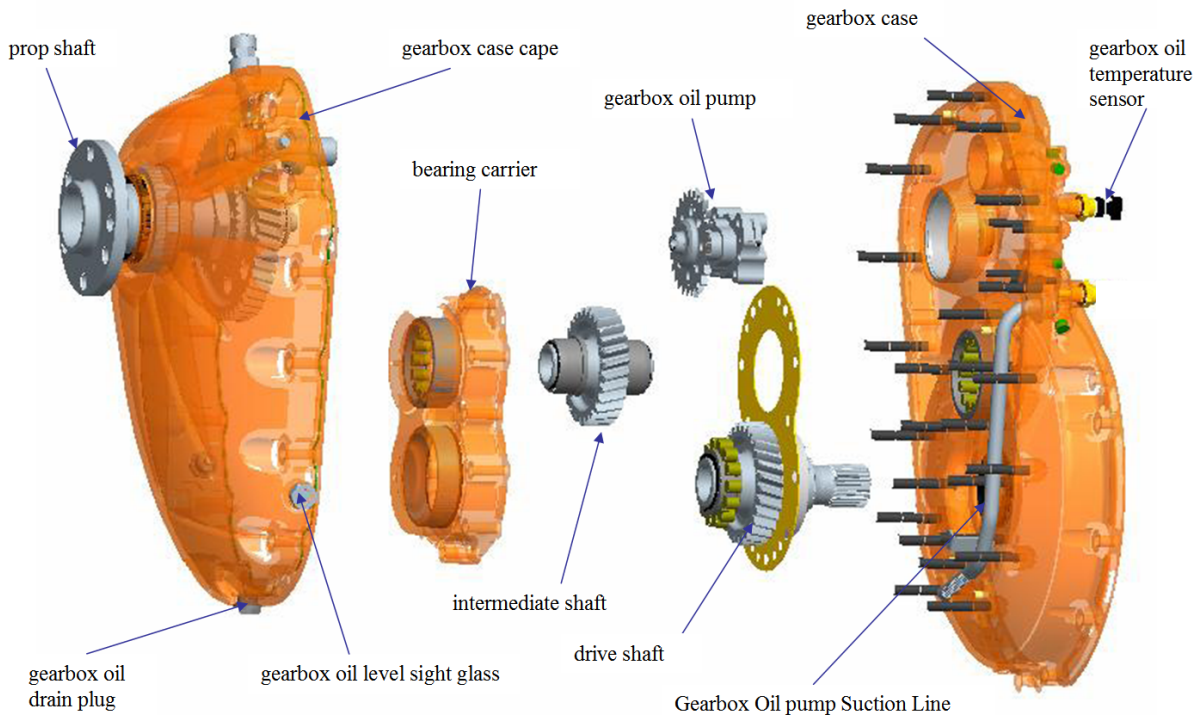


Fig. 01 - 6 Gearbox

Torsion Vibration Damper (TVD)
Between gearbox and crankshaft a torsion vibration damper is implemented to reduce torsion vibration. On one hand the crankshaft is protected from vibrations coming from the propeller, on the other hand the gearbox is protect from vibrations coming from the crankshaft and the combustion process. The damper is composed of two elements, a mass and an energy dissipating element. The mass resists the acceleration of the vibration and the energy dissipating element absorbs the vibrations.

Crankshaft
The crankshaft of the AE 300 is made of vacuum remolded, forged steel. The crankshaft has 5 main bearings.

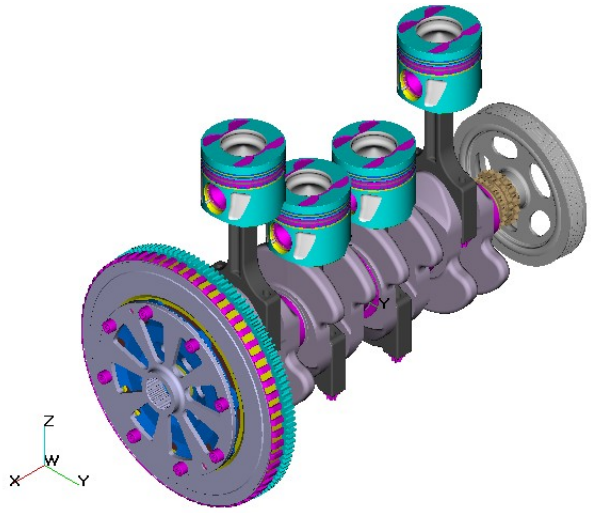


Fig. 01 - 7 Crankshaft with Two Mass Flywheel attached

Crank Case
The AE300 Crankcase is a single piece, squeeze casted part. Based on this design (cast iron) separate cylinder liners are not necessary. The cast iron design of the crank case has good failsafe running functions and also a reduced noise emission. The design of the AE300 is an inline, liquid cooled engine, the crankcase incorporates the cylinders as well as the coolant passages.

The bore of the cylinder is 83 mm (3,268in). The displacement per cylinder is 498cm³ (30,4 cu in) which results in a total displacement of 1991 cm³ (121,5 cu in) of the engine. The stroke per piston is 92 mm (3,622 in)

The crankcase also includes provisions for an internal oil pump and a water pump that is mounted on the engine crank case and driven by the rip belt. The crankcase includes a wet oil sump and contains the oil supply of the engine.

Cylinder Head
The cylinder head is made of high strength aluminum alloy. The cylinder head is equipped with two camshafts. Each camshaft drives one intake and one exhaust valve per cylinder. One camshaft is driven by chain directly from the crankshaft. The other camshaft is driven off the first by direct gear. The chain drive consists of a double steel chain. Chain tensioning is automatic, and the system is maintenance free for the life of the engine. The camshafts operate 16 valves ,8 intake and 8 exhaust valves actuated by roller levers with hydraulic valve- clearance compensation.

The combustion chamber shape of the AE300 is defined mainly by the shape of the piston The valves are arranged such that the intake air enters the combustion chamber in a swirling pattern to improve combustion efficiency.

The location of the fuel injector is central to the four valves. The hole immediately next to the injector hole is the hole for the glow plugs, which are used during pre-heating. The remaining openings in the cylinder head are coolant passageways. The compression ratio of the engine is 17,5:1.

V-Ripped Belt
The engine is equipped with a V-ribbed belt at the rear end, which drives the coolant pump and the alternator driven by the crankshaft pulley. The belt is self-tensioning by a spring-loaded pulley.

01-10-10 Intake/Exhaust System Description

General:

For operation the engine has to be supplied by the intake system with compressed air at manifold pressures up to 2660 mbar (38,57 psi), which varies with altitude and power setting. The increased manifold pressure is accomplished with an exhaust driven turbo charger. After the turbocharger, the air passes through the intercooler, through the engine to the turbine side of the turbocharger before exhausting to the atmosphere.

The intake air is cleaned by an air filter and then compressed by the turbo charger. During compression the intake air gets hot. An intercooler between turbo charger and engine is provided to cool the intake air down thus the desired engine performance can be obtained.

At the intake manifold the intake air temperature and intake air pressure are measured. For the temperature and pressure readings there are two sensors for each value installed. To provide the intake air pressure corresponding to the desired engine power and ambient EECU pressure a waste gate valve is directly mounted at the turbo charger.

Turbo Charger
The EECU controls the turbocharger by using RPM, measured manifold pressure and barometric pressure to determine a target value for manifold pressure. The EECU then sends an output signal corresponding to this target value to a boost pressure actuator, which actuates the waste gate.

The boost pressure actuator uses air pressure from the compressor side of the turbocharger to control a diaphragm box. This diaphragm box is mechanically linked to the turbo charger waste gate and regulates the amount of exhaust gas that bypasses the turbocharger turbine and therefore manifold pressure.

The figure shows the turbocharger with the boost pressure actuator, air filter for the boost pressure actuator and the waste gate controller which is attached to the turbo charger.

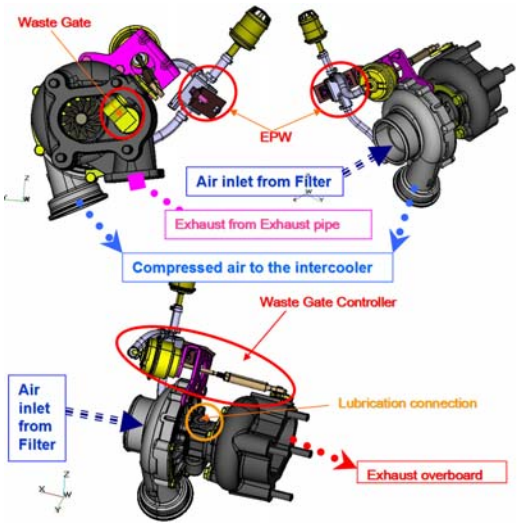


Fig. 01 - 8 Turbo Charger Operation

Components of the A/C System:
(For installation and maintenance details refer to the applicable Aircraft Maintenance Manual)

- Air filter
- Intercooler
- Hoses
- Alternate Air intake if required

Part of the engine TDD:

- Turbocharger
- Intake manifold
- Exhaust manifold

Example for acceptable Air Intake system:
(For particular installation refer to the applicable Aircraft Maintenance Manual)

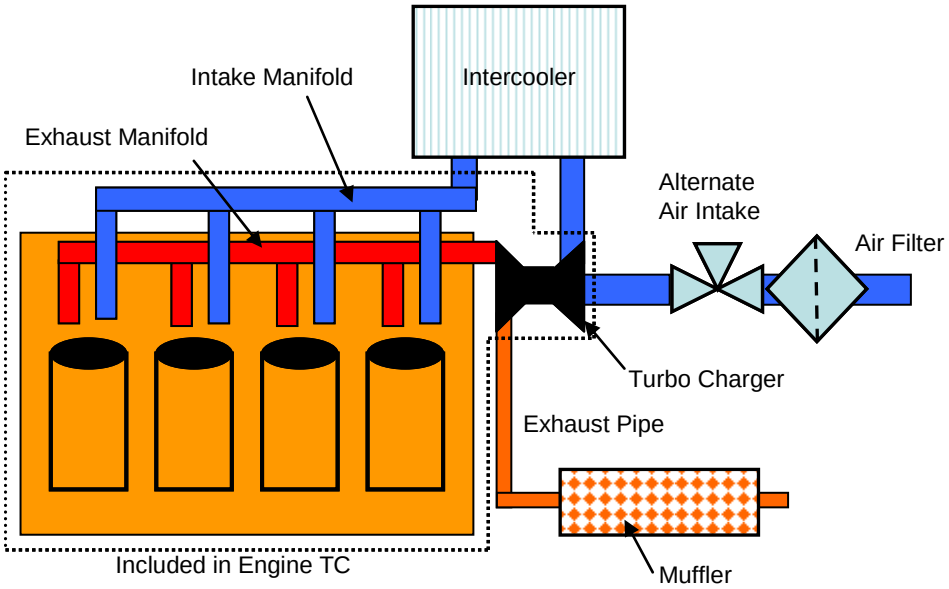


Fig. 01 - 9

01-10-20 Fuel System Description

General:

The AE 300 is equipped with a common rail fuel injection system. In such a system the common rail is a high-pressure fuel reservoir that supplies fuel to solenoid type injectors. Fuel enters the common rail directly from the high-pressure pump which compresses the fuel up to 1680 bar. The amount of required fuel is regulated by a fuel metering unit which is attached direct to the high pressure pump.

The actual fuel pressure in the rail (and therefore to the injectors) is measured by the rail pressure sensor. The EECU interprets the rail pressure, compares it to a target value, and adjust the rail pressure control valve to reach the correct pressure. Return fuel flows back to the fuel tank. Fuel is supplied to the injectors through the injector supply ports. Excess fuel (not depicted) is also returned. The fuel pressure supplied to the injectors is varied continuously. A higher fuel pressure ensures better vaporization and therefore better combustion, as well as shorter injection duration, allowing delivering the desired fuel volume at the optimal time. By varying the fuel pressure, the injection duration can be varied for a given desired fuel injection volume per cycle, allowing for better combustion at lower RPM.

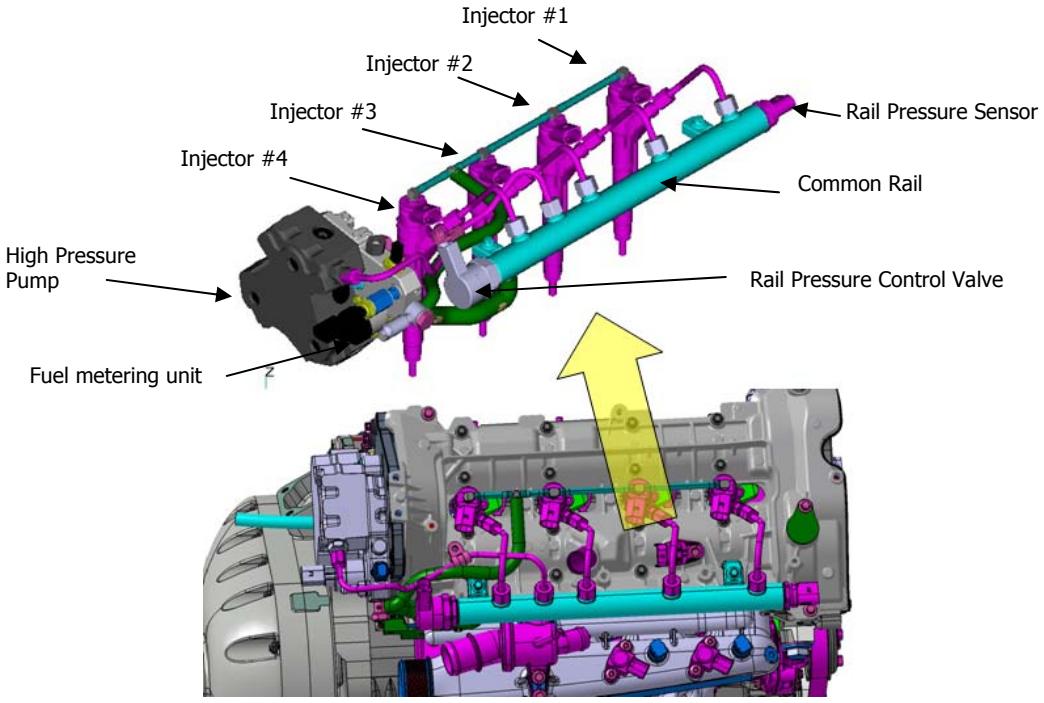


Fig. 01 - 10 Common Rail fuel System

Components of the A/C System:
(For installation and maintenance details refer to the applicable Aircraft Maintenance Manual)

- Feed pump
- Fuel feed line
- Fuel filter
- Fuel return line
- Fuel shut off valve

Part of the engine TDD:

- High pressure pump (HPP)
- High pressure fuel rail
- Low fuel pressure sensor
- High fuel pressure sensor
- Fuel temperature sensor
- Fuel control pressure valve

Fuel Distribution System:

There must be a shut-off valve on the feed line. In case of an emergency it must be possible for the pilot to shut of the fuel flow.

CAUTION

In the return line a provision must be provided to cut off fuel flowing back to engine in case of an engine fire (e.g. check valve).

CAUTION

Protection of the intake line to the fuel pump against vibration and other additional forces is necessary.

Example for acceptable Fuel distribution system:
(For particular installation refer to the applicable Aircraft Maintenance Manual)

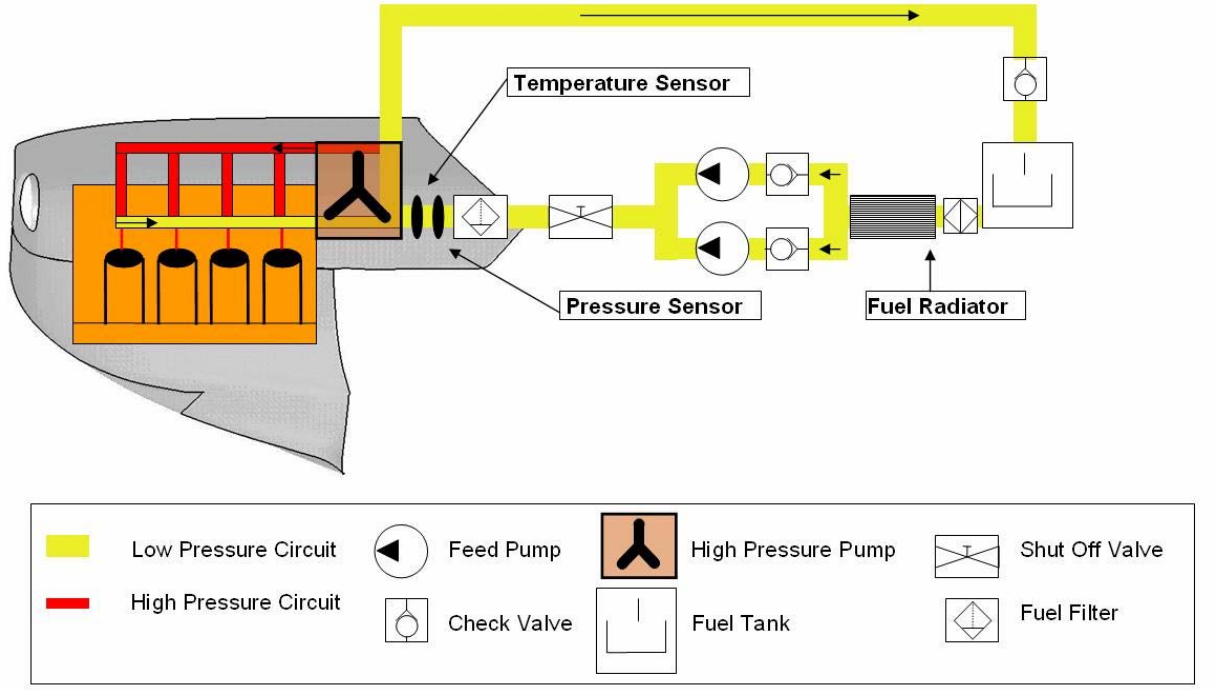


Fig. 01 - 11 Fuel circuit

01-10-30 Exhaust System Description

General:

The exhaust system is necessary to release the exhaust fumes in a safe and proper way into the environment. Wrong installation and maintenance can lead to vibrations, which can cause serious damage in the exhaust system.

Excessive tension at exhaust system mounting points could cause cracks and be a potential fire hazard.

Components of the A/C System:
(For installation and maintenance details refer to the applicable Aircraft Maintenance Manual)

- Exhaust pipe (including optionally exhaust muffler)

Example for acceptable Exhaust System is given under 01-10-10
(For particular installation refer to the applicable Aircraft Maintenance Manual)

01-10-40 Coolant System Description

General:

The internal engine cooling circuit consists of coolant pump, which is driven by the belt, the integrated coolant/oil heat exchanger, coolant ducts within crank case, cylinder head and intake manifold, where the coolant temperature sensors are located, and the coolant thermostat.

Coolant enters the engine, driven by the coolant pump. Depending on coolant temperature the coolant passes at the coolant thermostat through the short circuit direct back to the engine, or through the radiator, where it is cooled before returning to the engine by passing the oil/coolant heat exchanger.

At the thermostat there are two circuits connected, the small circuit, which is flown through as long as the engine is cold and the radiator circuit, which starts to be opened as soon as a coolant temperature measured direct at the thermostat is above 80 °C (176 °F).

Above 95 °C (203 °F) coolant temperature the radiator circuit is fully open and the small circuit totally closed. The Heating circuit is always open and aids in cooling.

An expansion tank is provided which contains a silica reservoir to provide the necessary corrosion protection. The expansion tank has an overpressure valve installed which limits the relative pressure in the coolant system to max. 2,3 bar (33,36 psi). In addition a low pressure valve is installed to protect the coolant system from negative pressure

The coolant reservoir allows the coolant to expand when cold, or allows the cooling system to draw additional coolant as needed. The coolant reservoir also contains a low coolant level indicator

Components of the A/C System:
(For installation and maintenance details refer to the applicable Aircraft Maintenance Manual)

- Coolant radiator
- Cabin Air Heat Exchanger
- Coolant expansion Tank
- Overpressure Valve
- Low pressure Valve
- Silica Reservoir
- Coolant hoses

Cooling Circuit:

Example for acceptable cooling circuit:
(For particular installation refer to the applicable Aircraft Maintenance Manual)

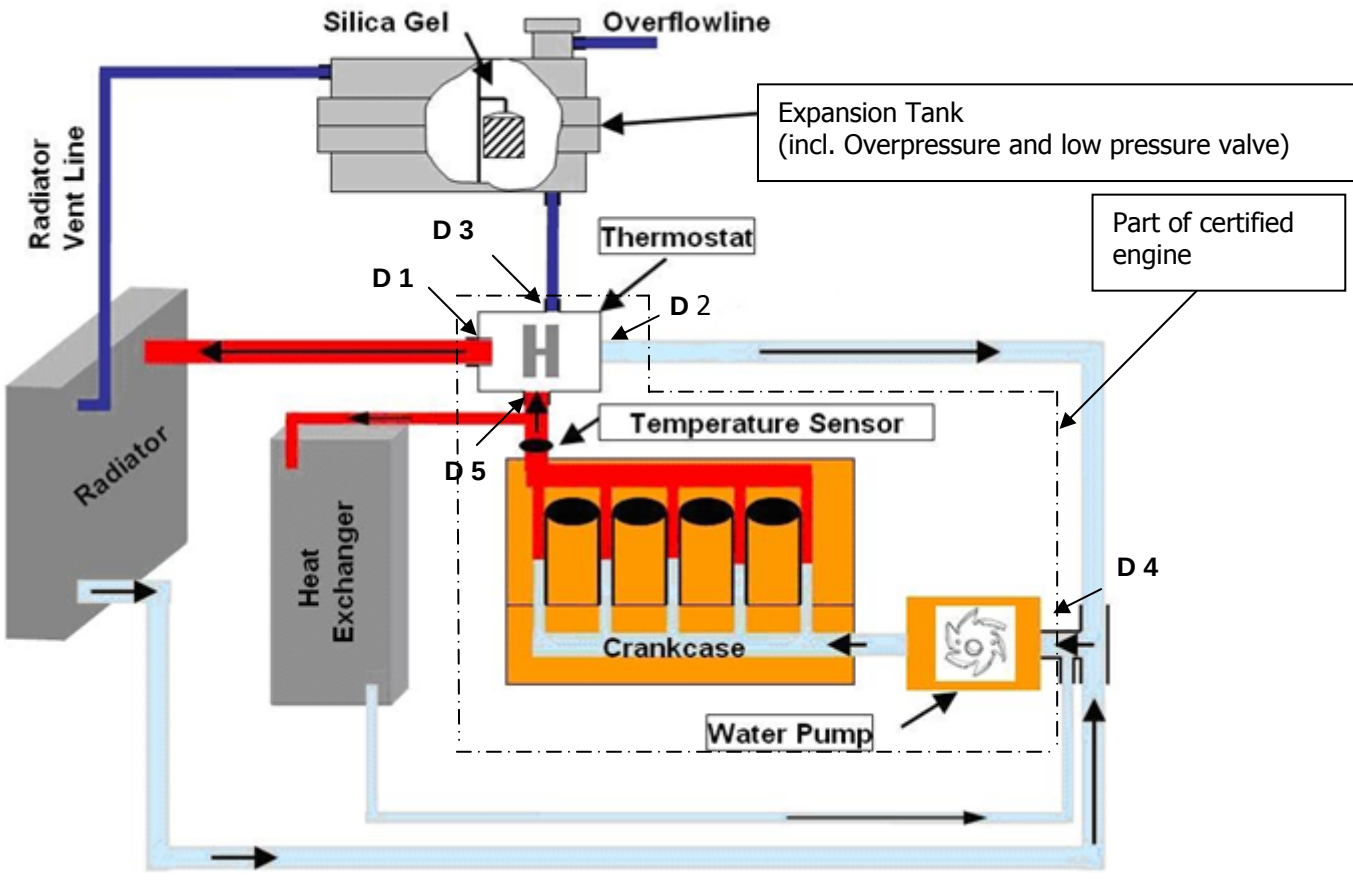


Fig. 01 - 12 Cooling Circuit

Thermostat Opening Temperature:

Small Cooling Circuit without Radiator:	<80 °C (<176 °F)
Mixed Operation:	80 °C – 95 °C (176 °F – 203°F)
Radiator Through-Flow	>95 °C (>203°F)

To prevent the system from to much coolant flowing through the vent line an orifice is installed with an inner diameter of 2 mm (0.079 in) within the line between expansion tank and radiator. If the line is small enough no orifices are necessary.

01-10-50 Lubricating System Description

General:

The lubricating system of the AE300 consists of an internal chain driven oil pump, which pumps the engine oil through the oil filter, the coolant/oil heat exchanger and the lubrication ports of the engine.

The lubricating system is part of the engine. A coolant/oil heat exchanger as part of the engine provides the oil cooling. Dependant on the coolant temperature the oil temperature is obtained. If necessary the cooling capacity can be increased by an airstream over the oil sump.

Below the injector cover an oil separator is installed. The breather air out of the crankcase is guided through an oil separator. Downstream the oil separator the crankcase air is released through the breather line into the environment. The outlet of the oil separator at the injector cover has to be connected to a breather line provided by the OEM. The oil separator is protected with an overpressure relief valve.

In front of the oil filter the oil pressure is measured. The oil temperature is measured in the oil sump next to the oil filler neck.

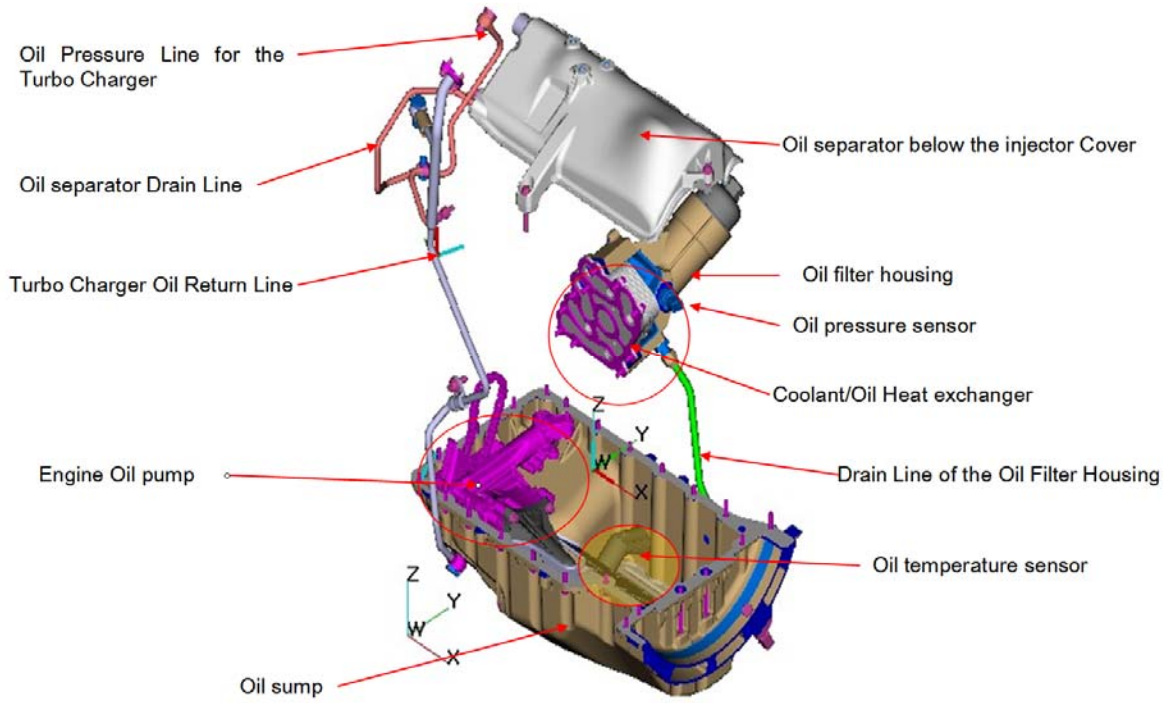


Fig. 01 - 13 Lubrication System

01-10-60 Electrical System Description

The Electrical System consists of the following major Components:

- Starter
- Generator
- GPC – Glow Plug Control Unit
- EECU – Electronic Engine Control Unit
- Sensors & Actuators

The EECS Block Diagram shows the connection between the EECS components which are used in the AE 300 Engine and displays also the Interface from the Airframe to the EECS of the AE 300.

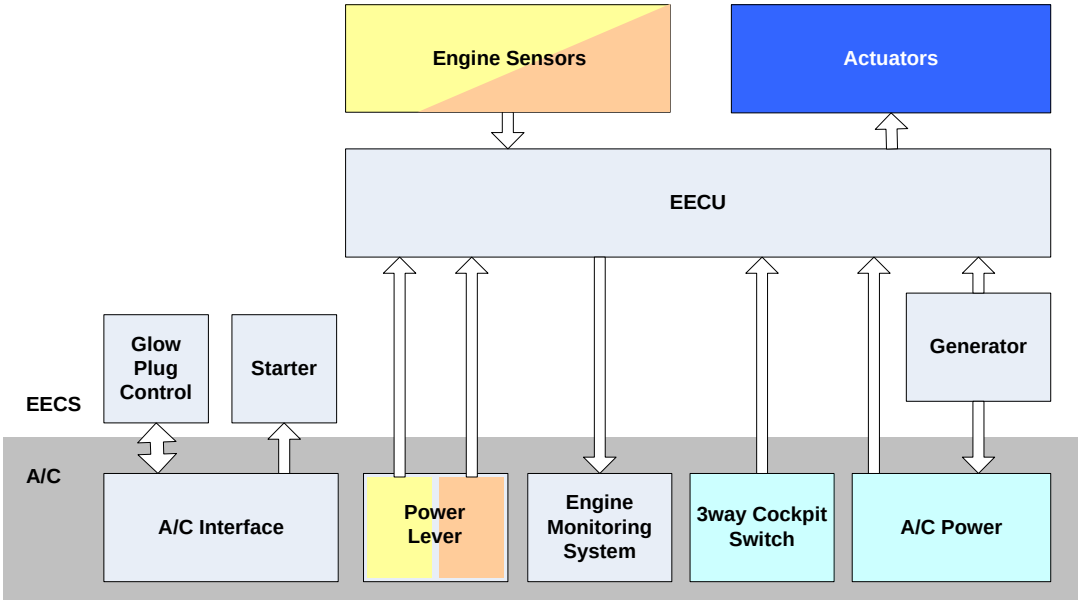


Fig. 01 - 14 EECS Block Diagram

The starter is manually controlled by the pilot. The EECU will detect a running engine at 600rpm (Propeller) and further activation is not necessary.

The Generator is a 28V/70A power supply which consists of an alternator mounted to the engine and an external regulator. This power supply is used to supply the EECS and the airframe.

The Glow Plug Control Unit is only used to enhance the cold starting behavior of the engine on ground. It controls the power which is dissipated by glow plugs. These quick start glow plugs help to ignite the compressed fuel/air mixture because of their hot surface temperature.

The EECU is a 28V supplied device which consists of two similar parts, called ECU A and ECU B. Each ECU is able to control the engine itself. At each self test both ECU channels will be tested.
Depending on the operating hours count the active ECU will be selected. The other ECU channel is in hot standby that means active, evaluating sensor values but not operating actuators.
In case of a detected failure on one ECU an internal voter can switch over to the alternate channel.
If different kinds of failures are active at the same time, the switch over decision is based on failure priorities.
This switch over decision can be overruled by the pilot by manually forcing one channel.

The interface to the engine indications in the A/C is realized via a serial Bus (CAN-Bus).

The pilot interface is realized over Power Lever Sensors. Each ECU has it´s own sensor. Each sensor has two outputs which are used to perform plausibility checks of the sensor.

EECU Functions

Sensors and Actuators

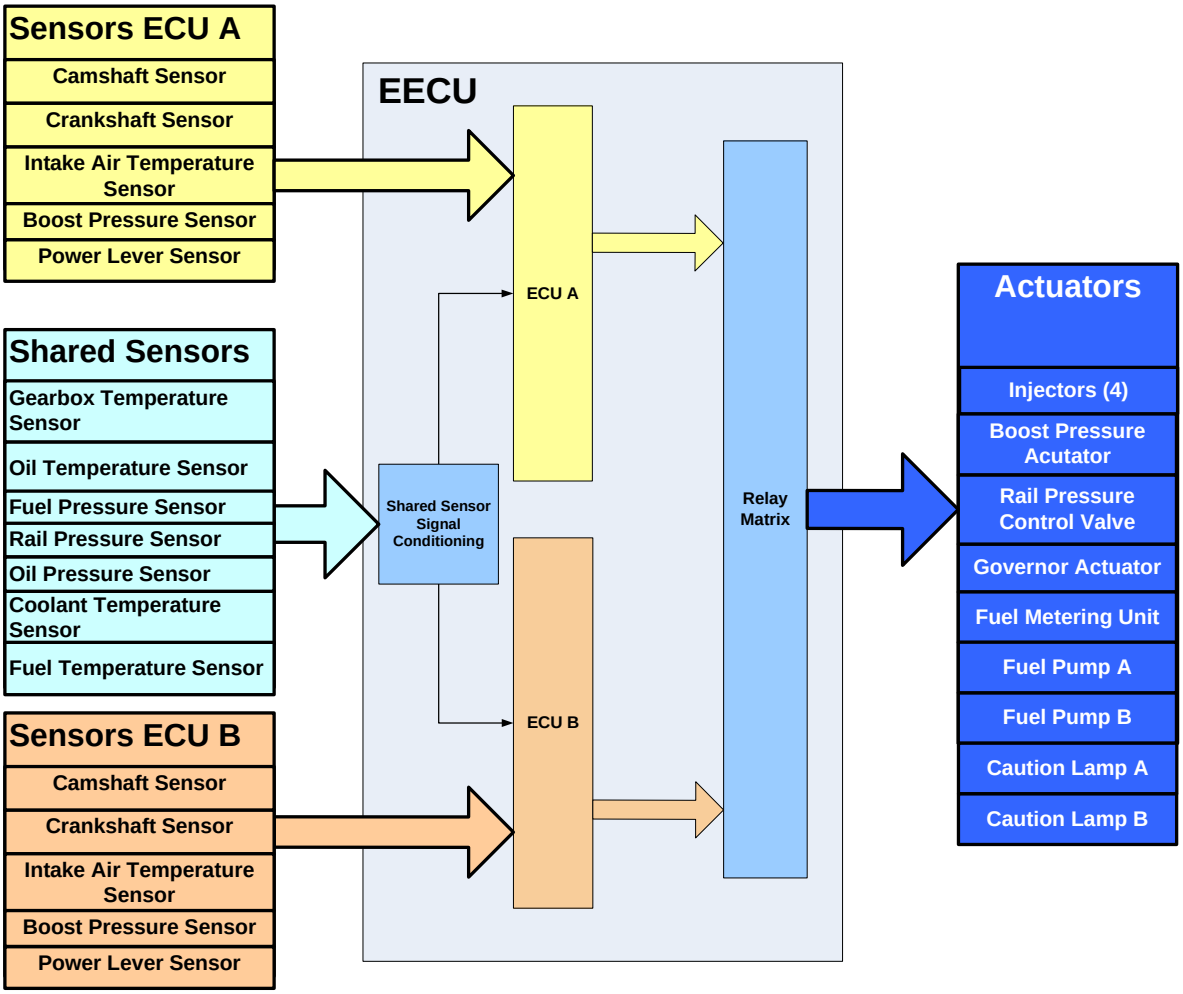


Fig. 01 - 15 Sensors and Actuators

Sensors

- Power Lever Sensor
  - Power Lever Sensor position evaluation
  - Hall Effect Sensor with dual output
- Crank Shaft Sensor
  - Engine speed evaluation
- Cam Shaft Sensor
  - Engine position evaluation
- Fuel Pressure Sensor
  - Used for evaluation of the fuel pressure after the pre-supply pump
- Oil Pressure Sensor
  - Used for evaluation of the engine oil pressure
- Rail Pressure Sensor
  - Used to evaluate the rail pressure
- Boost Pressure Sensor
  - Boost (Intake Air) Pressure evaluation
- Coolant Temperature Sensor
  - Used for coolant temperature evaluation
- Fuel Temperature Sensor
  - Used for fuel temperature evaluation
- Gearbox Oil Temperature Sensor
  - Used for gearbox temperature evaluation
- Engine Oil Temperature Sensor
  - Combinant Sensor used for engine oil temperature evaluation
- Intake Air Temperature Sensor
  - Intake Air Temperature evaluation

Actuators

- Injectors
- Boost Pressure Actuator
- Rail Pressure Control Valve
- Fuel Metering Unit
- Pre-Supply (electrical) Fuel Pump
- Governor Set Point Actuator
- Caution Lamps

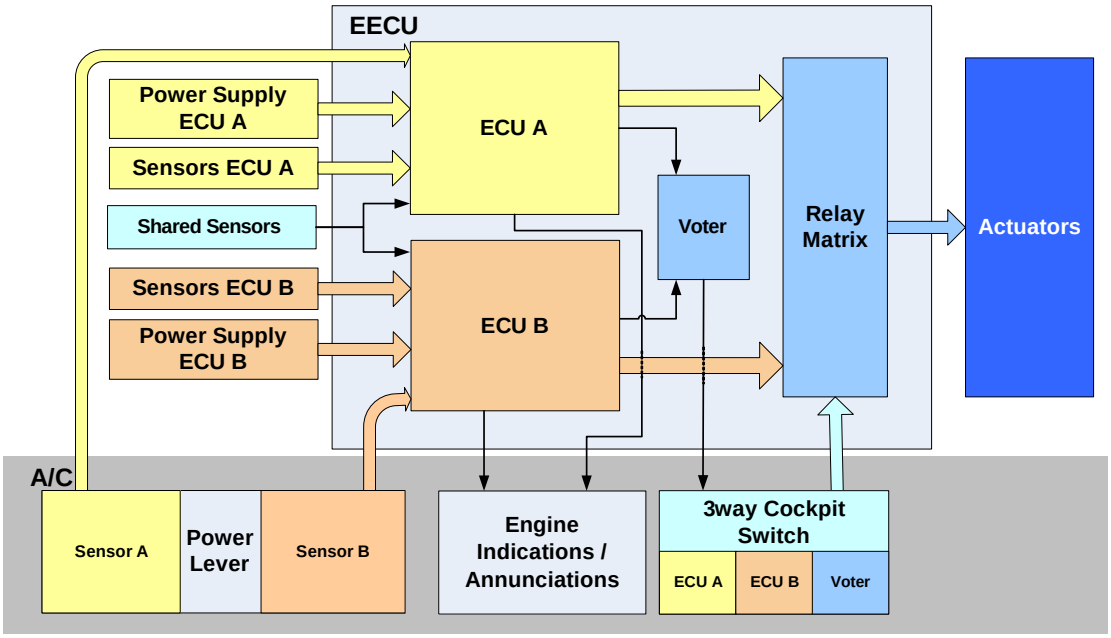


Fig. 01 - 16 EECU

- Electrical Interfaces
  - Outputs protected against
    - Short Circuit Ubatt
    - Short Circuit GND
  - Diagnosis on Outputs and Sensor Inputs
    - Short Circuit Ubatt
    - Short Circuit GND
    - Open Load
  - Sensor Inputs
    - Linearization of the input voltage
      - According to the sensor characteristics

- Monitoring of external interfaces
  - External interfaces are monitored (sensors, actuators)
  - A recognised failure (e.g. electrical) is internally reported
  - Reported failures may inhibit other functions/monitoring
- SW Function Montoring
  - Separately calculated Values are used for monitoring the main Engine Control Functions (e.g. Engine Speed Calculation, Injection Quantity Calculation)
- EECU Hardware Monitoring provided
  - Internal Supplies
  - Internal Memories
  - Internal communication

- Failure monitoring / Fault Code Memory
    - Reported Failures
        - are stored in the Fault Code Memory
            - Up to 20 entries
        - Can lead in an ECU switch over
        - Can activate the ECU caution
        - Can cause a substitute function (e.g. substitute value)

- ECU Switch Over
    - Reported Failures can lead to an automatic switch over
        - An internal logic (Voter) selects the ECU to be active
        - The Pilot can overrule the decision of the EECU
        - The magnitude of power change can be up to 10%
        - The typical switch over time is 10 ms.
- Diagnosis via defined CAN- Protocol possible
    - AE diagnostic tool (AE 300 wizard)

- Eventrecorder and Datarecorder provided
    - Eventrecorder stores defined „Events" (e.g. reported failures, crossed limits)
    - Datarecorder stores cyclically predefined values
        - Time stamp based on a Real Time Clock
- Statistics
    - Records statistics of 8 physical parameters
    - Engine and ECU uptimes are recorded

Engine Speed and Power Regulation

The desired propeller speed set point is calculated depending on the power lever sensor position. The current engine speed is used to compute the deviation of the actual propeller speed from the set point.
The deviation is converted into an output ratio for the set point actuator. The propeller speed set point is set by an electric motor (actuator) in the governor system. This electric motor substitutes the conventionally used Bowden Cable.
The governor itself controls the propeller speed via the propeller blade pitch angle adjustment. The actuator control ensures together with the monitoring a safe and correct actuation.
If the set point is reached the actuator is deactivated (hysteresis provided).

The requested engine torque is calculated depending on the power lever position and the engine-speed.
- Depending on the requested torque the resulting injection quantity (fuel mass) is calculated.
- Depending on the calculated injection quantity the required boost pressure (air mass) is calculated.

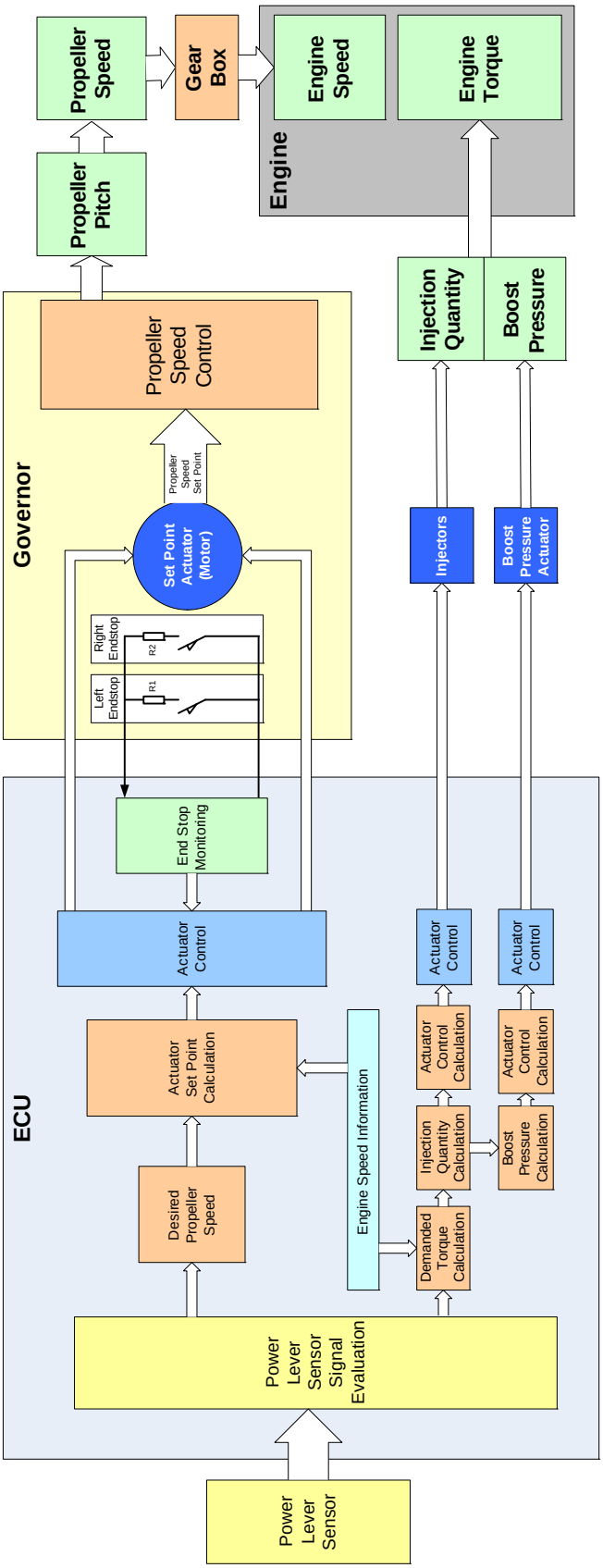


Fig. 01 - 17 EECU and Covernor

Propeller Self Test (Automatic Run-Up Test)

Description:

The propeller governor self test has been designed to emulate the manual run-up test performed by the pilot of an aircraft equipped with a conventional (mechanical) propeller control lever. With the single power lever installation of the AE300 engine, the self test button must be pressed during the automatic run up. The self test button in the cockpit has to be released once before a new (subsequent) self test can be initiated by pressing the button again.

Release Criteria:

The propeller governor self test will only be released if the following release conditions have been met:

- Aircraft on the ground.
- Prop speed = idle (below 1000rpm).
- Prop speed = idle (below 1000rpm).
- Power lever = idle (below 5% power lever position).
- No errors pending
- Self test button active (and pressed during the whole test run).

The EECU will increase the prop speed to about 1900 rpm producing thrust. Therefore the brakes have to be applied during the whole test run to prevent the A/C from moving.

The engine oil temperature and gearbox oil temperature shall be within the green range of the respective engine indicators before initiating the self test.

Test Abortion:

The propeller governor self test will abort immediately and the prop speed will be reduced to idle for the following reasons:

- "Self test"-button has been released by the pilot.
- "Weight on wheels"-switch has been released for more than 1 sec.
- Power lever has been moved above the 5% position
- An error has been detected by the EECU (see "Diagnosing Self Test Failures" for failure analysis).

Cockpit Indications:

For the proper sequence of cockpit indications and possible caution alerts during the self test, refer to the applicable Aircraft Flight Manual.

Error Handling

In the following table the engine control system errors and their error handling is listed. Three different types errors are known:

- Errors which lead to a latched caution indication
- Errors which lead to a non-latched caution indication
- Not indicated errors

In case of a latched caution an unscheduled maintenance is necessary and Austro Engine GmbH has to be informed.

Latched Caution Indication

Failure description	Failure Code	Caution Indication	Caution Latched	ECU Switch Over
Analogue-digital converter failure	2319	YES	YES	YES
Power lever sensor 1 failure	1222	YES	YES	YES
Power lever sensor 2 failure	1234	YES	YES	YES
Atmospheric pressure sensor failure	1105	YES	YES	YES
Actuator supply voltage failure	1A04	YES	YES	YES
Battery voltage failure	1615	YES	YES	YES
Boost pressure actuator power stage failure	2526	YES	YES	YES
Boost pressure sensor failure	105	YES	YES	YES
Coolant temperature sensor failure	115	YES	YES	YES
ECU identity failure	1D11	YES	YES	YES
ECU temperature sensor failure	2361	YES	YES	YES
Cam shaft sensor failure	2043	YES	YES	YES
Crank shaft sensor failure	2045	YES	YES	YES
Event: Boost pressure operating range	1E12	YES	YES	YES
Event: Fuel pressure operating range	1E13	YES	YES	YES
Fuel pressure sensor failure	2006	YES	YES	YES
Fuel temperature sensor failure	180	YES	YES	YES
Gearbox oil temperature sensor failure	1B11	YES	YES	YES
CJ940 power monitoring chip failure	2329	YES	YES	YES
ECU EEPROM failure	1617	YES	YES	YES
ECU hardware encapsulation failure	2386	YES	YES	YES
ECU recovery has occured	2356	YES	YES	YES
ECU recovery has occured	2357	YES	YES	YES
ECU recovery has occured	2358	YES	YES	YES
CJ940 power monitoring over voltage failure	2350	YES	YES	YES
Intake air temperature sensor failure	110	YES	YES	YES
Injection limitation occured	2352	YES	YES	YES
Injection valve Bank 1A failure	2123	YES	YES	YES
Injection valve Bank 1B failure	2139	YES	YES	YES
Injection valve Bank 2A failure	2124	YES	YES	YES
Injection valve Bank 2B failure	2140	YES	YES	YES
Injector driver chip failure A	2324	YES	YES	YES
Injector driver chip failure B	2325	YES	YES	YES
Cylinder 1 - Injection valve failure	201	YES	YES	YES
Injection valve Cylinder 1B failure	2141	YES	YES	YES

Failure description	Failure Code	Caution Indication	Caution Latched	ECU Switch Over
Cylinder 2 - Injection valve failure	202	YES	YES	YES
Injection valve Cylinder 2B failure	2142	YES	YES	YES
Cylinder 3 - Injection valve failure	203	YES	YES	YES
Injection valve Cylinder 3B failure	2143	YES	YES	YES
Cylinder 4 - Injection valve failure	204	YES	YES	YES
Injection valve Cylinder 4B failure	2144	YES	YES	YES
MOK-sensor hardware failure	2061	YES	YES	YES
MOK-sensor PWM-signal failure	2062	YES	YES	YES
Metering unit, electric current monitoring	2149	YES	YES	YES
Metering unit, power stage open circuit	2197	YES	YES	YES
Metering unit, power stage short to BATT	2198	YES	YES	YES
Metering unit, power stage short to GND	2199	YES	YES	YES
Watchdog communication failure	2321	YES	YES	YES
Main relay path 1 failure	1A01	YES	YES	YES
Main relay path 2 failure	1A02	YES	YES	YES
Main relay path 3 failure	1A03	YES	YES	YES
Engine oil pressure sensor failure	1B13	YES	YES	YES
Oil temperature sensor	2014	YES	YES	YES
Injection monitoring failure	2322	YES	YES	YES
Redundant engine speed monitoring failure	2343	YES	YES	YES
Boost pressure governor failure	2359	YES	YES	YES
Rail pressure control valve, electric current monitoring	2151	YES	YES	YES
Pressure control valve power stage failure	2500	YES	YES	YES
Pressure control valve power stage failure	2501	YES	YES	YES
Pressure control valve power stage failure	2502	YES	YES	YES
Propeller governor-actuator power stage failure	1C02	YES	YES	YES
Propeller governor-actuator failure	1C03	YES	YES	YES
Propeller governor-actuator end stop switch failure	1C04	YES	YES	YES
Electric fuel pump actuator failure	2100	YES	YES	YES
Common rail pressure sensor failure	190	YES	YES	YES
Test of redundant shut off paths	2122	YES	YES	YES
Sensor supply voltage 1 failure	1611	YES	YES	YES
Sensor supply voltage 2 failure	2306	YES	YES	YES
Sensor supply voltage 3 failure	2332	YES	YES	YES
Engine master switch signal failure	1612	YES	YES	YES
TPU monitoring failure	2342	YES	YES	YES
Voter relay failure	1D14	YES	YES	YES
Watchdog connection failure	2323	YES	YES	YES

Non-Latched Caution Indication

Failure description	Failure Code	Caution Indication	Caution Latched	ECU Switch Over
ECU XA connector failure	1D01	YES	NO	NO
ECU actuator connector failure	1D02	YES	NO	NO
ECU XB connector failure	1D03	YES	NO	NO
Cam shaft and crank shaft synchronisation failure	2606	YES	NO	NO
Power lever position sensor 1 of ECU A and B not consistent	1B01	YES	NO	NO
Power lever position sensor 2 of ECU A and B not consistent	1B02	YES	NO	NO
Barometric air pressure sensing of ECU A and B not consistent	1B03	YES	NO	NO
Boost pressure sensing of ECU A and B not consistent	1B04	YES	NO	NO
Cam shaft speed sensing of ECU A and B not consistent	1B05	YES	NO	NO
Crank shaft speed sensing of ECU A and B not consistent	1B06	YES	NO	NO
Coolant temperature sensing of ECU A and B not consistent	1B07	YES	NO	NO
Fuel pressure sensing of ECU A and B not consistent	1B08	YES	NO	NO
Fuel temperature sensing of ECU A and B not consistent	1B09	YES	NO	NO
Gearbox oil temperature sensing of ECU A and B not consistent	1B0A	YES	NO	NO
Intake air temperature sensing of ECU A and B not consistent	1B0B	YES	NO	NO
Engine oil pressure sensing of ECU A and B not consistent	1B0C	YES	NO	NO
Engine oil temperature sensing of ECU A and B not consistent	1B0D	YES	NO	NO
Common rail pressure sensing of ECU A and B not consistent	1B0E	YES	NO	NO
Main relay (ECU) failure	1610	YES	NO	NO
External CAN bus failure	600	YES	NO	NO
Internal CAN receive message failure	1D04	YES	NO	NO
Internal CAN transmit message failure	1D05	YES	NO	NO
External CAN transmit failure	2214	YES	NO	NO
Engine oil pressure failure	1B14	YES	NO	NO
ECU initialization failure	1D12	YES	NO	NO
ECU switchover due to internal CAN message timeout	1D13	YES	NO	NO
Common rail, metering unit failure 0	2047	YES	NO	YES
Common rail, metering unit failure 1	2015	YES	NO	YES
Common rail, metering unit failure 2	2016	YES	NO	YES
Common rail, metering unit failure 3	2017	YES	NO	YES
Common rail, metering unit failure 4	2018	YES	NO	YES
Common rail, pressure control valve failure 0	2051	YES	NO	YES

Failure description	Failure Code	Caution Indication	Caution Latched	ECU Switch Over
Common rail, pressure control valve failure 1	2019	YES	NO	YES
Common rail, pressure control valve failure 2	2020	YES	NO	YES
Common rail, pressure control valve failure 3	2021	YES	NO	YES
Common rail, pressure control valve failure 4	2023	YES	NO	YES
Common rail, pressure control valve failure 5	2052	YES	NO	YES
ECU self test timeout failure	1D07	YES	NO	NO
Propeller self test failure	1C01	YES	NO	NO

Description of ECU Switch Over

In case of an ECU switch over, the other ECU channel takes over the control of the engine.
This control mode change can lead to slightly different power settings (0-100% power available, but initial power setting may deviate up to 5 %), due to the tolerances of the sensor mounting to the power lever.
This switch over can lead to a temporarily (less than 1 sec) and slight deviation in the desired speed till the ECU internal control functions are aligned to the engine operation state.

If a failure occurs which results in reduced engine control capability (e.g. injector failure) the power performance is also reduced with the now active ECU channel.

If a failure occurs and the now active ECU can rely on plausible values (e.g. Boost Pressure Sensor defect) the performance of the engine will remain unchanged.

Because both ECU´s are similar, also two warnings are provided to display that one or both channels detect a failure.

Not indicated faults

Failure description	Failure Code	Caution Indication	Caution Latched	ECU Switch Over
Data logger failure	1E02	NO	NO	NO
Caution lamp power stage failure	1C11	NO	NO	NO
Record manager failure	1E01	NO	NO	NO
Real time clock failure	1D06	NO	NO	NO
Indicator: ECU self test is active	1D08	NO	NO	NO

Default Values in case of a failure

Failure description	Failure Code	Default Value	Effect on Engine Performance	Engine power display
Power lever sensor 1 failure	1222	Sensor 2 or if both fail 80%	No effect, or if both fail about 80% available ,	Correct
Power lever sensor 2 failure	1234	Sensor 1 or if both fail 80%	No effect, or if both fail about 80%,	Correct
Atmospheric pressure sensor failure	1105	800mbar	Limitation of the engine	Correct
Battery voltage failure	1615	24V	No effect	Correct
Boost pressure sensor failure	105	2600mbar	About 80%of the engine power shall be available.	Deviates
Coolant temperature sensor failure	115	-20°C or 60°C depending on oil temperature	No effect	Correct
ECU temperature sensor failure	2361	100°C	No effect	Correct
Fuel pressure sensor failure	2006	2,5bar	No effect	Correct
Fuel temperature sensor failure	180	21°C	No effect	Correct
Gearbox oil temperature sensor failure	1B11	0°C	No effect	Correct
Intake air temperature sensor failure	110	60°C	As stated in the Performance Diagrams at 60°C Intake Air Temperature	Deviates
Engine oil pressure sensor failure	1B13	0,03bar	No effect	Correct
Oil temperature sensor	2014	70°C	No effect	Correct
Common Rail pressure Sensor faiilure	190	Control Set Point	About 80%of the engine power shall be available	Deviates

Electrical System Installation Requirements:

The following requirements have to be observed to ensure a proper performance of the AE 300 in the installation environment.

Pay attention that the entire electrical system and wiring harness is protected against chafing at hot parts or sharp edges.

The source of electric power of the aircraft is the main battery as defined in 14.5.5.14. The engine is equipped with an alternator, which is the electrical power system dedicated to the engine. An excitation battery as defined in 14.5.2.3 has to be provided for alternator start up. Thereafter the alternator is self-exciting.

The following basic rules apply for a proper electrical system.

The EECU, alternator and batteries must be wired that in a case of battery failure a voltage supply for the EECU and fuel feed pumps is still granted.

It must always be possible to separate the engine electrical system (EECU, associated systems and alternator) from the battery and the rest of the aircraft electrical system.

It must be ensured, that the electric power supply to the EECS is always in compliance with the requirements defined in RTCA DO160D, Section 16, Cat B.
The required minimum reliability of the EECS electric power supply is depended on the class airplane. Consult AC 23.1309-1C for determination. If this requires the installation of an EECS backup electric power system, it must be ensured, that this system is independent and isolated from the airplane bus system or systems so that electric power from the backup system is supplied to the EECS solely.

An example below gives an overview about a possible installation with isolated supply-Buses showing the possibility of separating the Alternator from the Main Bus.

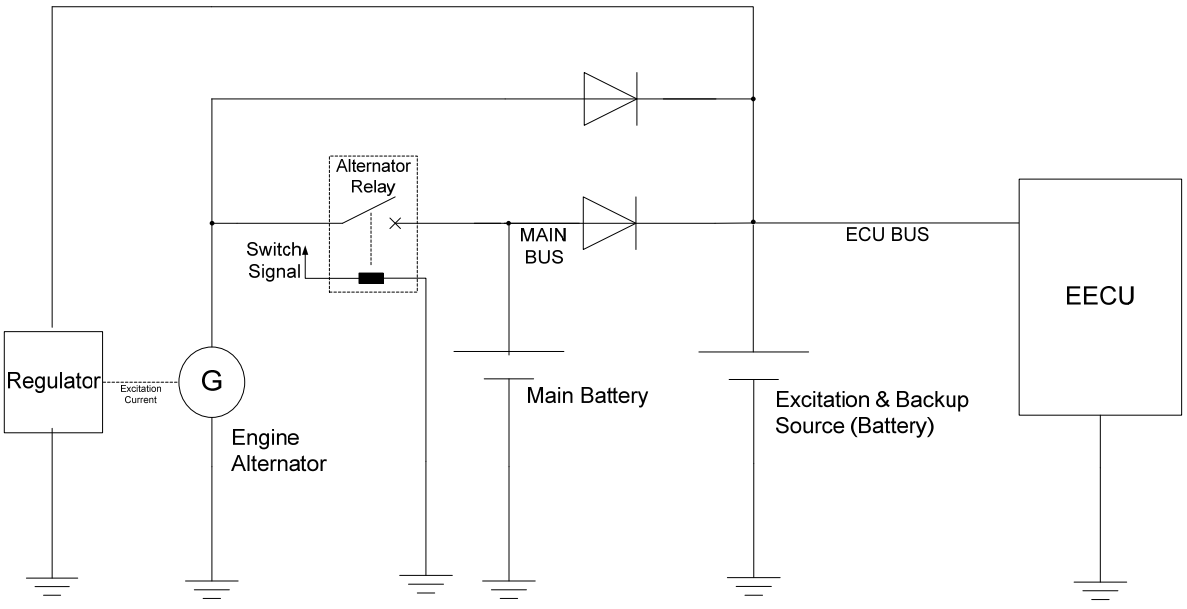


Fig. 01 - 18 Power Supply Installation

Technical Data of the Electrical System Components:

EECU:

The EECU is the Electrical Engine Control Unit which is used to control the engine actuators (e.g. fuel injectors) according to the engine sensor information.

The EECU consists of two similar ECUs (Engine control Units).
A voter is integrated in the EECU and proposes an ECU to control the engine regarding the ECU operating hours or in case of a failure the ECU with better engine control capability.

In Installations using the caution indication via CAN, the caution lamp shall be substituted by a resistor. If the substitute load is not installed, a Caution Lamp Circuit failure will be detected.

If applicable for the installation, lightning protection bonding of the EECU housing to airframe GND shall be with AWG 4 wire with a maximum length of 0.5m.

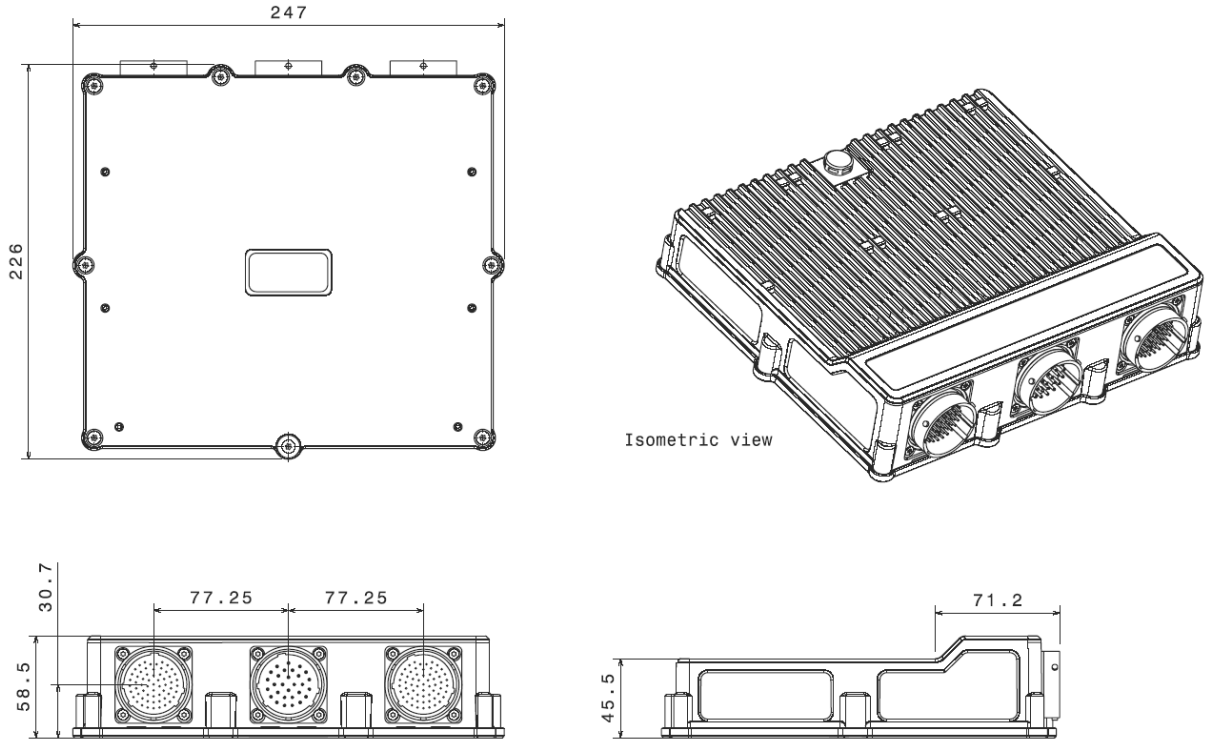


Fig. 01 - 19 EECU Dimensions (in mm)

Display and Diagnostic Interface:

The Display and diagnostic interface is a High Speed CAN Bus (with 500k Baud) which is used to transmit all information to a display/indication panel.

A BUS termination is required at the physical end of the BUS.
CAN-termination resistors 60R (2x 120R in parallel, 120R in EECU included)
(CAN Bus according ISO 11898)

For Example:

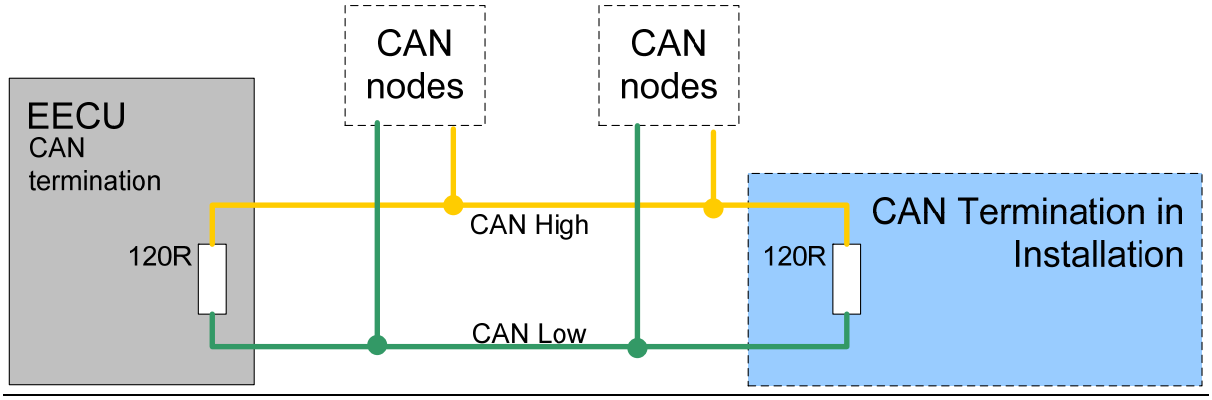


Fig. 01 - 20 CAN Bus Termination

Make sure that the terminating connector is installed in a save position that in any event a disconnection is impossible.

According to the CAN BUS Protocol each ECU of the EECU sends its own engine information.
Any device connected to the EECU CAN BUS must not transmit any data on the EECU CAN BUS!

It is part of the installer's responsibility to verify that the information displayed in the engine instruments conform to the information provided by the CAN BUS.

Alternator:

The alternator system consists of an alternator and an alternator-regulator device.

The alternator provides the following main properties:

- Air-cooled synchronous three-phase alternator with a claw-pole rotor
- Built-in semiconductor rectifier
- Stator winding circuit: delta connection
- External alternator regulator (mounted on the aircraft)
- Belt-driven by the engine

There are three external terminal points on the alternator:

- Power output (connected with battery)
- Excitation current input
- Ground (housing)

The output voltage of the alternator has to be constant, independent from engine speed and actual load current. This requires a regulation of the output voltage by a variation of the excitation current (implemented in the alternator-regulator device).

To avoid damage of the alternator the regulator must be deactivated when the engine is not running.

Electrical starter:

The main power supply to the starter cannot be protected with a fuse. Thus the routing must ensure that there is no increased risk of fire in the event of a short circuit.

The electrical connection of the starter is shown in Chapter 92-00-00 Wiring diagrams.

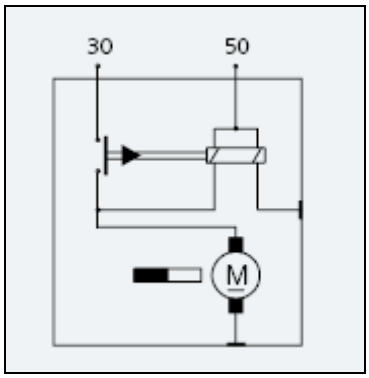


Fig. 01 - 21 Starter Wiring Diagram

Function	Description
Terminal T30	Power supply starter <200A*
Terminal T50	Power supply on T50 ACTIVATES the starter
	Pull-in current <30A
	Hold-in current <7,5A
Ground GND	Connect starter housing on GND (engine block)

Starter Connector

*Depends on different terms (temperature, mounted propeller, etc.) the current through the supply line can reach a value up to 200A.

Glow Plug Control Unit:

The glow system is designed to be only active, if the aircraft is on ground.
This is provided by an "A/C on ground indication", which must be implemented into the aircraft design. This needs to be low if active (switch to GND if active).
These lamps are not essential for flight operation. Therefore they can be seen as optional for installation. Replace Annunciation Lamp GPC and Caution Lamp GPC with a pull-down resistor (5kOhm), if the lamps are not used.

But it is recommended to install the indication lamps to ease failure analysis for maintenance actions e.g. if problems with cold start performance occur.

Governor Interface:

This EECU is able to actuate the electric motor which changes the governor-set point.
According to power lever position the related propeller speed is controlled by the EECU see Fig. 01-11.
A more detailed description can be found in section Governor Functional description.

As long as the actual propeller speed is different to the predefined propeller set point curve, the EECU provides a signal to drive the electric motor which is part of the governor.

The desired engine speed for low power is only reachable in flight.

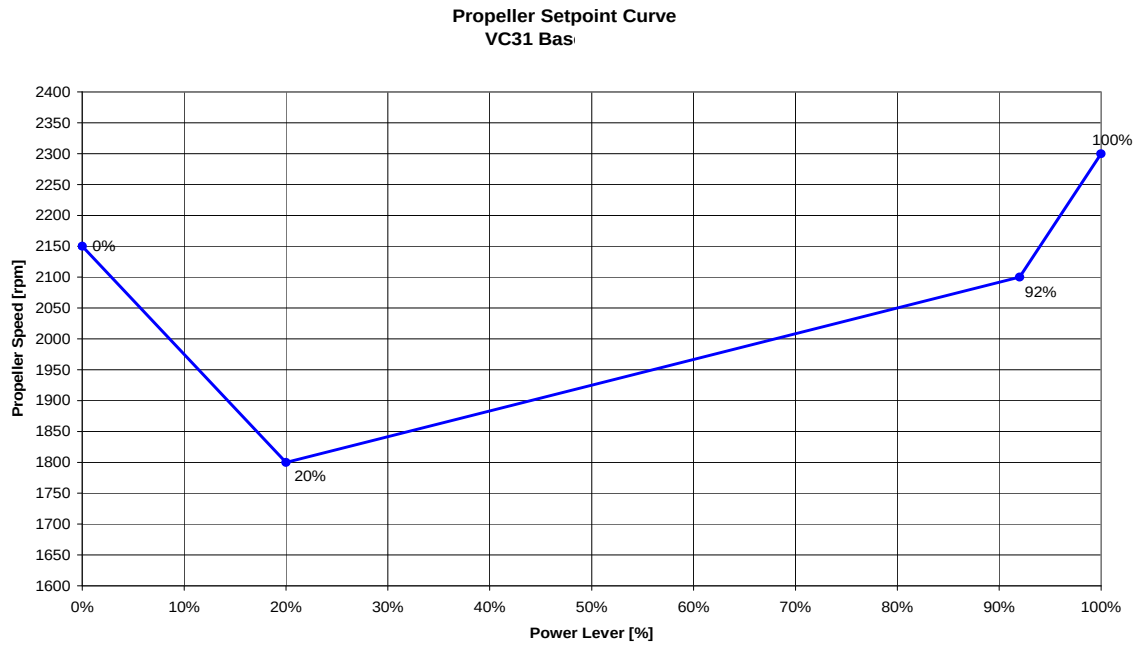


Fig. 01 - 22 Propeller Setpoint Curve

Max Take Off Power:	100 %
Max Continuous Power:	92 %

The governor must have two mechanical stops which can be detected by the EECU through sensing pins. If one of these stops is reached the electric motor will not be actuated into the direction of the detected stop, only movement into direction of the opposite stop is possible. The EECU also detects mechanical jamming of the electrical motor. In case of a e.g. a defect motor or mechanical stop sensing the motor will not be overheat because of excessive current consumption.

The connector equipped on the harness is a Deutsch AS 008 35 PN. Each compatible connector can be used on a governor.

Pin	Description
1	Feather Valve
2	Feather Valve
3	Motor +
4	Motor -
5	Governor Stop Sensing
6	GND

Governor Pin Assignment

Electrical Drawing Example

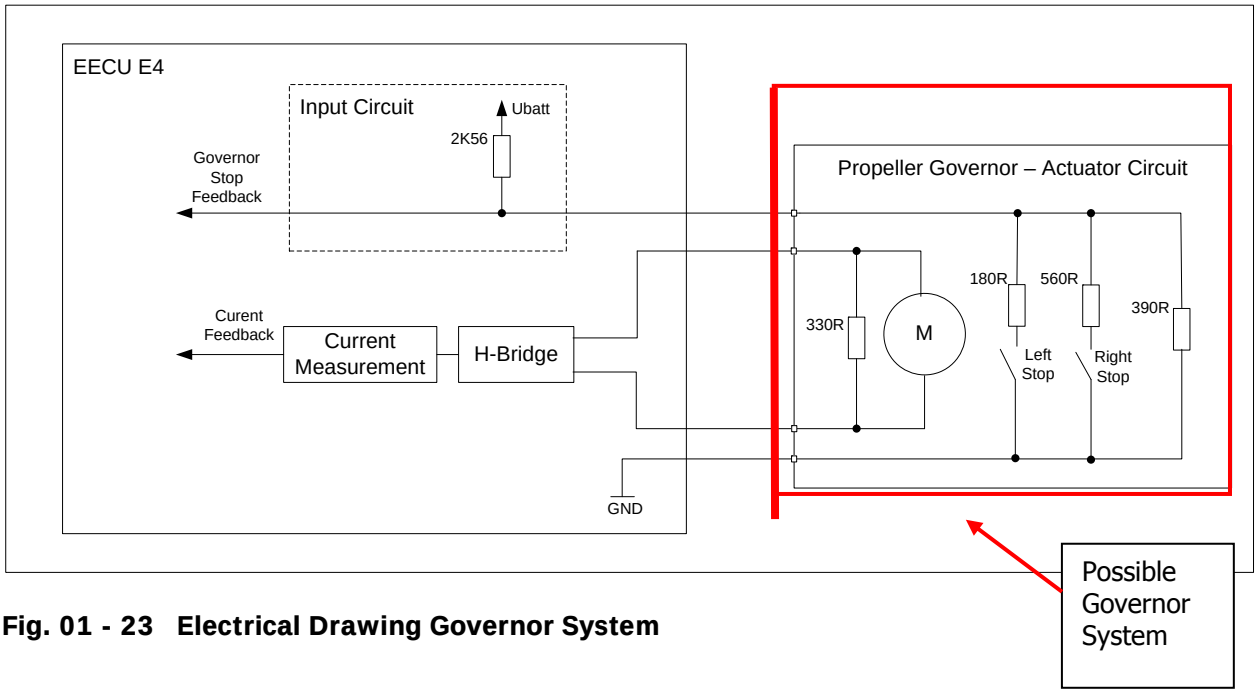


Fig. 01 - 23 Electrical Drawing Governor System

EECU Caution Lamp:

Each ECU has its own caution lamp output. The lamp will be supplied with bus voltage via the ECU. These display lamps are used to inform the flight crew of a detected EECU or Engine failure. (For particular installation refer to the applicable Aircraft Maintenance Manual)

Power Lever Sensor:

The Power Lever Sensor is a sensor using the Hall-Effect.
It has two independent outputs with different output characteristics which are verified inside the ECU.
Each ECU requires its own sensor. E.g. in a twin engine installation, 4 sensors are necessary.
The installation of the two power lever sensors for the EECU shall ensure that the output signals are within 5% to each other (e.g. Signal A 85%, Signal B 87%).

Engine Selftest Pushbutton:

The engine is able to perform a Selftest. For this a normally open closer pushbutton is installed.

Activation of the Selftest via the Selftest Pushbutton is only be possible if the VOTER Switch is in AUTO Position (logical AND relation).
During the whole Selftest the Pushbutton must remain pressed.
(For particular installation refer to the applicable Aircraft Maintenance Manual)

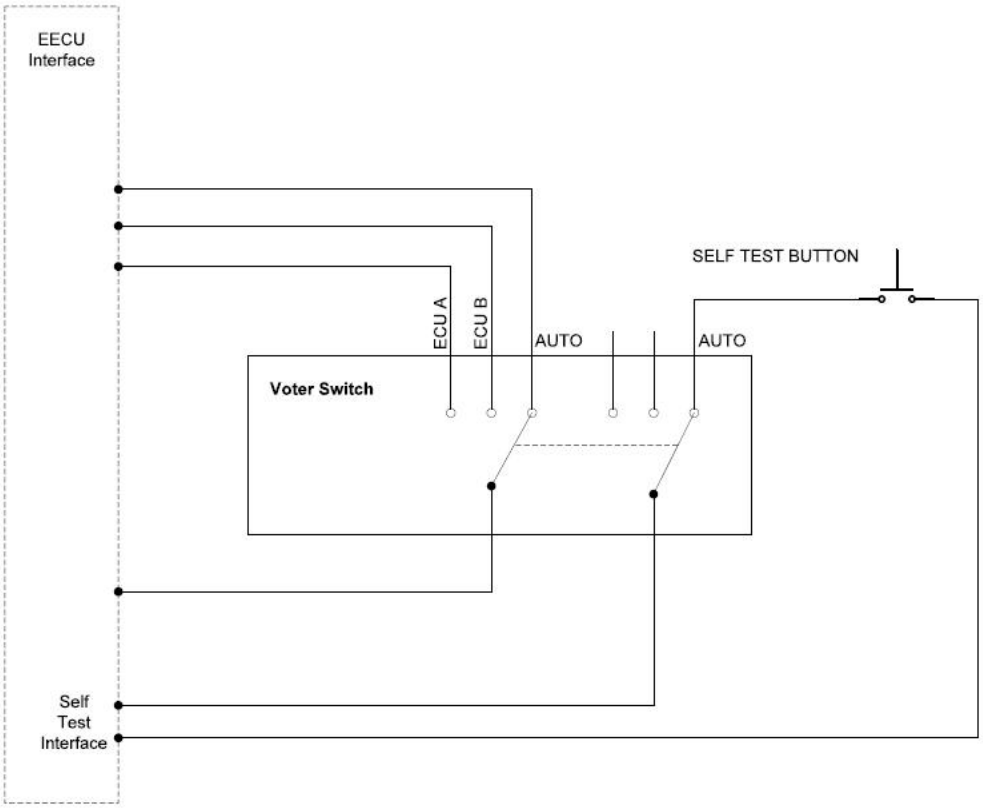


Fig. 01 - 24 Self Test Wiring

Engine Display if installed:

Description:

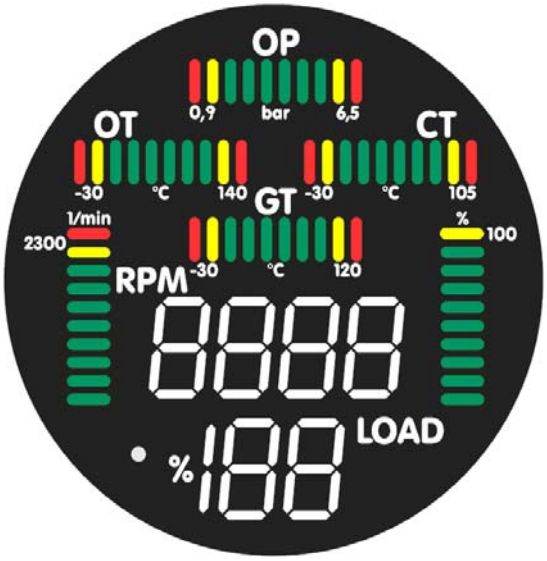
One applicable engine display system consists of a Main Engine Display (MED) and a Secondary engine Display (SED) device, which is offered by Austro Engine (part no. MED: A1A-10-100-000; part no. SED: A1A-10-200-000). This system is proven to display the relevant engine parameters in consistence with the engine operation limitations as described in the Operation Manual.
The display is approved as part of the engine installation by the airframe manufacture.

Installation, Operation and Maintenance Information:

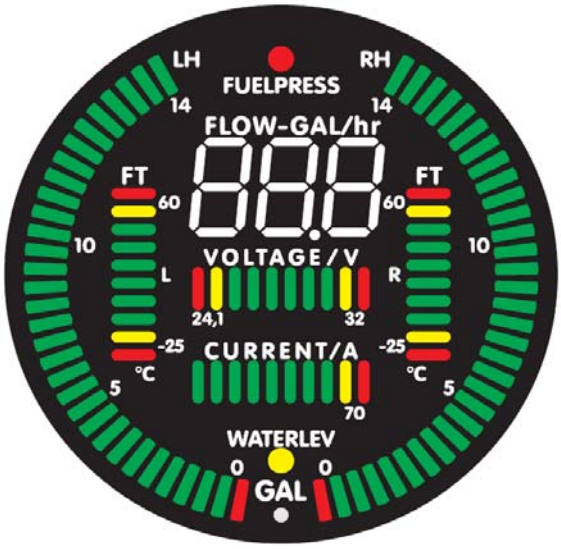
The instructions for installing, operating and maintaining the engine displays are given in the document A1.04.01 Revision 3 "Design Specification". In this document the definition of the physical and functional interfaces to the aircraft and aircraft equipment is given.

Display Layout, Limits and Indication:

MED Layout



SED Layout



01-10-70 Governor Description

An electrically controlled hydro mechanical governor is installed. The governor is not part of the engine.

Approved governors for installation:	MT-propeller P-877-16 MT-Propeller P-853-16

The EECU provides a signal for the governor to adjust the required rpm set point (refer to Fig.01-11)

Governor drive:

Flange of the backside of the gearbox:	AND 20010
Prop/Governor drive ratio:	1:1,22
Direction of rotation :	CCW (facing gearbox pad)
Overhang moment	max. 3 Nm
Break away torque:	max. 40 Nm

An adequate filter, mesh or other appropriate measure to prevent governor damage due to contaminants in the gearbox oil has to be installed.

Governor Functional Description:

The propeller speed is conventionally controlled and kept by a mechanical propeller governor but the set point of the governor is adjusted by an electric motor controlled by the EECU.

This electric motor substitutes the conventionally used Bowden cable and if e.g. the connection to the set point actuator fails, the set point remains unchanged and the governor controls the propeller speed to the last set-point.

The desired propeller speed set point is calculated depending on the power lever sensor position. (refer to Governor Interface)
The current engine speed divided by the gear box ratio is used to compute the propeller speed deviation which is then converted into an output ratio for the actuator
The propeller speed set point is set by an electric motor (actuator) in the governor system.

The governor controls the propeller speed via the propeller blade pitch angle
The actuator control ensures together with the monitoring a safe and correct actuation
If the set point is reached the actuator is deactivated and the governor controls the engine speed to the set point.

Overview of propeller speed control:

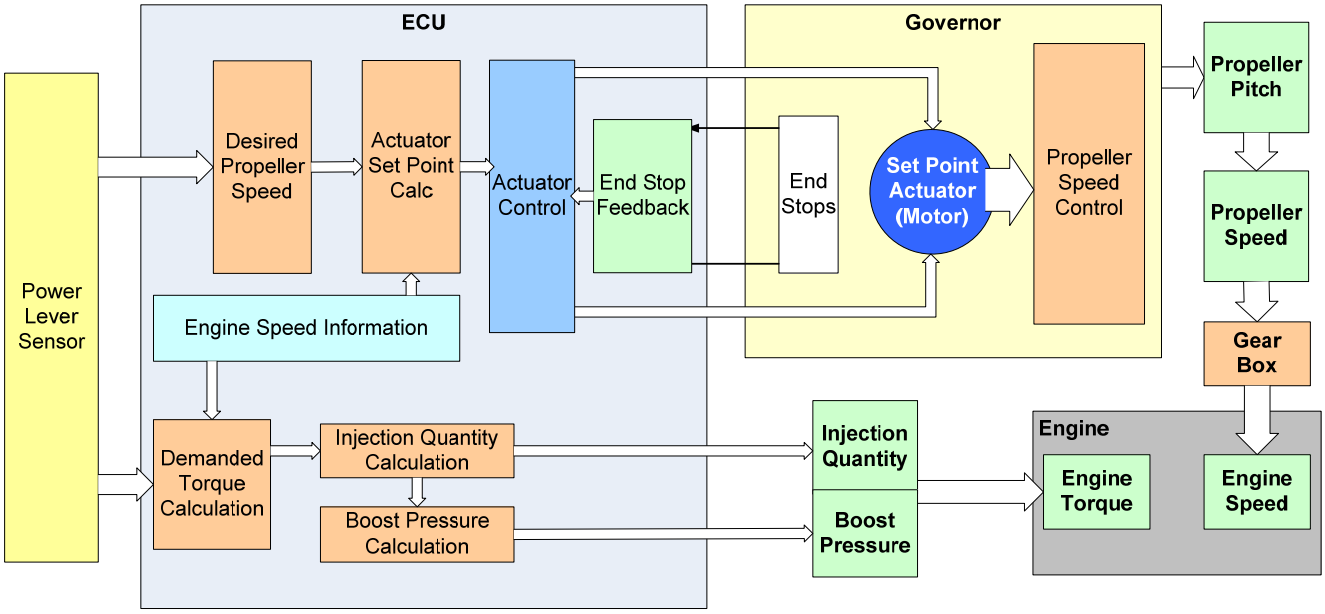


Fig. 01 - 25 Propeller Speed Control

Chapter 02-00-00 Transport and Packaging

02-00-10 Packaging

The engine is packed in a wooden crate and will be shipped attached to the corresponding mountings. If not declared otherwise the engine is shipped without any liquids.

Fig.02 - 1

The box containing the supplied parts is filled with filler material and closed with adhesive tape.

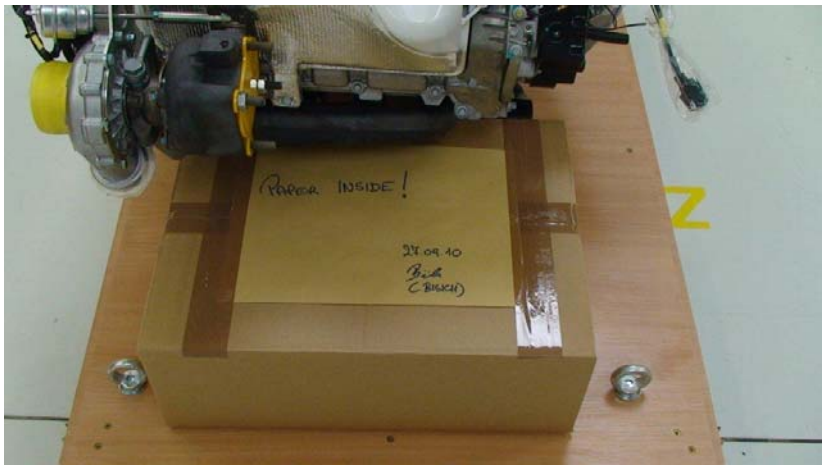


Fig.02 - 2

On the box an envelope with the papers belonging to the motor is attached.

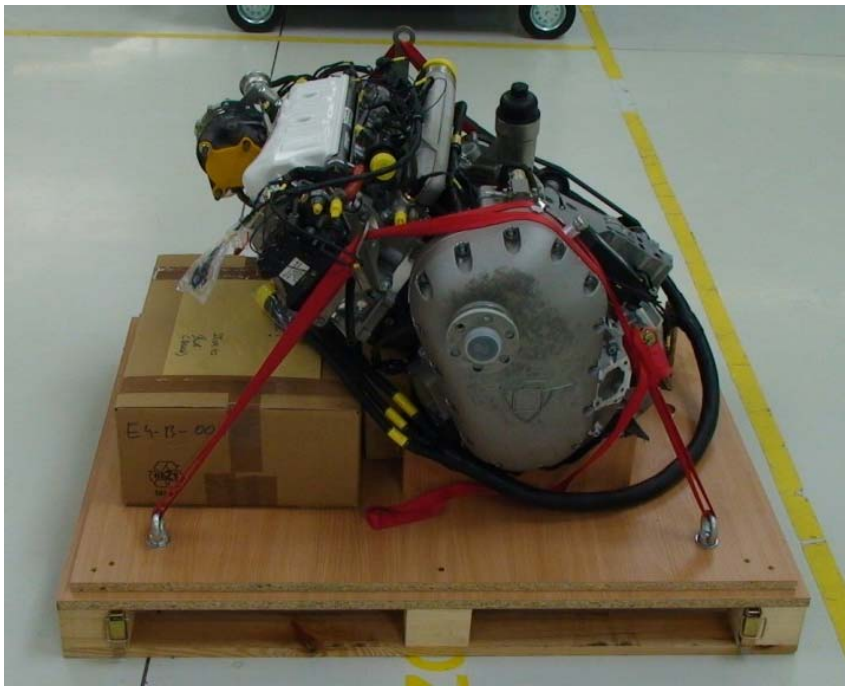


Fig.02 - 3

This box is positioned in the slope below the injector cover.

Fig.02 - 4

Then the engine is covered by a special VCI foil.

Fig.02 - 5

Fig.02 - 6

The whole engine is enclosed by a wooden box.

02-00-20 Transport

CAUTION

The engine has to be lifted with the transport eyelets.

The used hoisting device must be suitable for the weight of the engine.

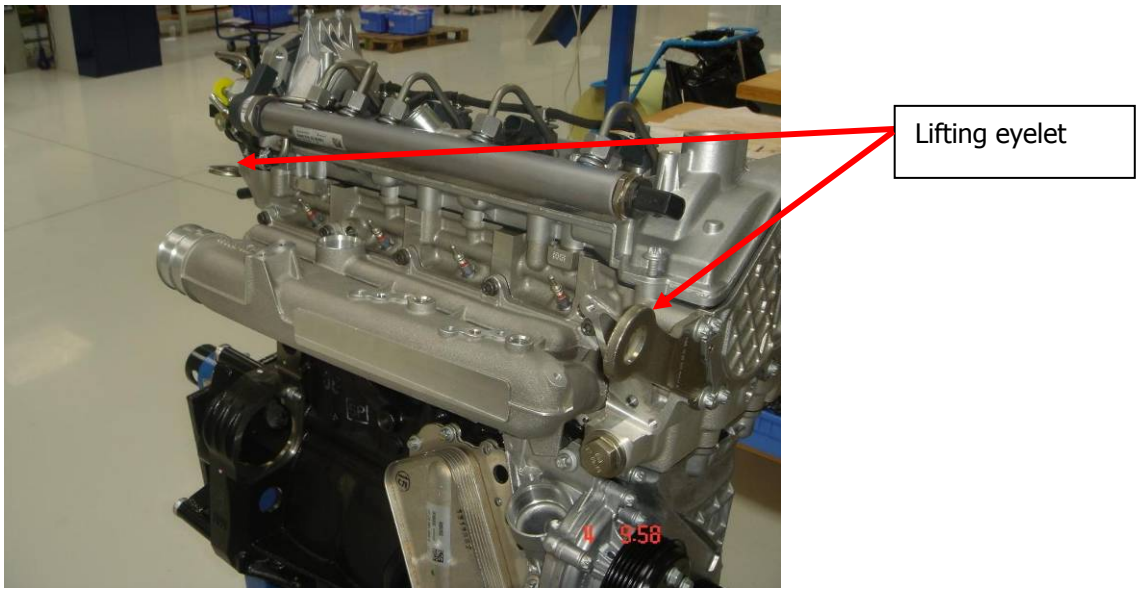


Fig.02 - 7 Lifting eyelet 1

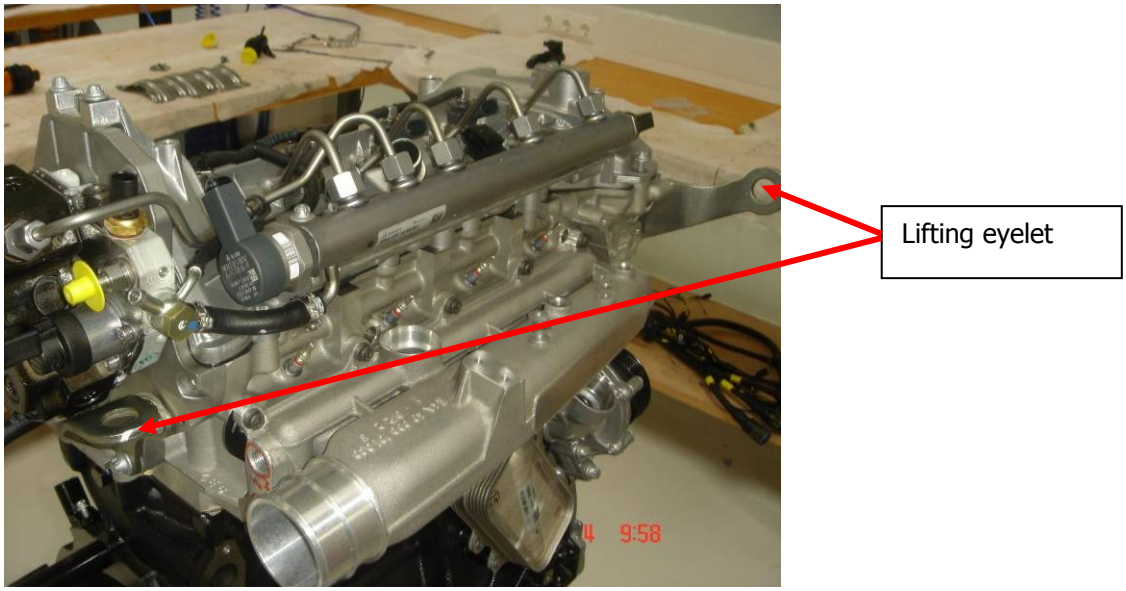


Fig.02 - 8 Lifting eyelet 2

The lifting eyelet at the cylinder head must be dismounted after installing the engine.

02-00-30 Protective Covers

To protect the engine of corrosion it should be stored and transported in a package appropriate for corrosion protection. Suitable corrosion protection is available at Austro Engine GmbH.

All engine openings have to be protected against ingress of dirt and moisture.

All protective covers and mountings have to be removed before taking the engine into operation.

To avoid contamination during the installation process, the covers should be removed step by step with installing the lines and hoses.

02-00-40 Storage

During transport and afterwards storage, following terms must be observed:

Storage temperature	-25°C to 70°C (-13°F to 158°F)
Humidity	max. 60%
Storage time	8 weeks

The engine has to be stored in suitable workplaces in a horizontal position, the cylinder axis must have an angle of 34°, always covered against environmental influences and never outside. For further information refer to the Installation Manual E4.02.01 Chapter 6 "Installation Position".

For storage requirements refer to the Operation Manual E4.01.01. of the AE 300 engine.

02-00-50 Return Parts Shipping Instruction

If you have to return parts to Austro Engine, please follow these instructions:

- Clean the part, especially oil contaminated arts like Governors
- Tag the part with an unserviceable tag and fill all required information
- Put the part in an appropriate box together with shock absorbing material e.g. bubble foil, foam etc.
- Make the box ready for shipment

- If the whole engine has to be supplied back ensure that the appropriate box as described in Chapter 02-00-10 is used

03-00-00 Engine Installation

For detailed engine installation refer to the applicable Aircraft Maintenance Manual.

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Chapter 04-00-00 Airworthiness Limitation

No Limitation.

EASA Approval Statement:

This Airworthiness Limitation Section is approved by European Aviation Safety Agency (EASA) in accordance with the applicable certification procedures and the type certification basis.
Any changes must be documented and approved by the local airworthiness agency.

FAA Approval Statement:

The Airworthiness Limitation Section is FAA approved and specifies maintenance required under Sec. 43.16 and Sec. 91.403 of Title 14 of the Code of Federal Regulations unless an alternative program has been FAA approved.

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Chapter 05-00-00 Time Limits and Maintenance Check

05-00-01 General

Work on the engine must be conducted by a certificated mechanic or otherwise authorized persons under consideration of the applicable national requirements. For warranty reason all of the tasks described in this manual must be performed by trained personnel only.

All applicable national and international regulation must be observed.

In the present Maintenance Manual the correct maintenance of the aircraft engine **AE 300** is documented.
With the publication of the Maintenance Manual, **Austro Engine GmbH** ensures the correctness of the instruction. In case of changes **Austro Engine GmbH** will inform with Service Bulletins, Service Letters or manual amendments, if it is necessary.
If there are any problems with the maintenance and repair or any further questions about the engine, **Austro Engine GmbH** can be contacted.

The aircraft engine has to be maintained and repaired in accordance with the instructions given in this manual unless otherwise approved under consideration of the applicable national requirements.
It is necessary to read this instructions attentive and carefully. To grant a proper engine work and to obtain the maximum service life all work steps have to be done as shown.

For any further information **Austro Engine GmbH** can be contacted.

The following symbols and warning signs are used in this manual to point out important instruction. They must be observed strictly to prevent personal injury and material damage, to insure operational safety of the aircraft and to avoid any damage to the aircraft as a result of incorrect handling.

Disregarding these safety rules can cause personal injury or even death.

Disregarding these special instruction and safety measures can damage the engine or other components.

The maintenance intervals must be strictly observed. When the service is not executed in accordance to this manual **Austro Engine GmbH** will reject any warranty claims.

Additional note or instruction for better understanding of an instruction.

05-10-00 Time Limits

The time limits below must be followed to obtain the max. service life of the engine.

Every 600 operating hours:

- Replace the High Pressure pump – refer to Chapter 73-00-40

Every 1200 operating hours:

- Replace the V-Ribbed Belt all 5 years or after 1200 hours – refer to Chapter 85-40-10
- Replace the Gearbox – refer to Chapter 85-10-10
- Overhaul Engine - remove and reinstall engine in accordance with the applicable Aircraft Maintenance Manual
- Replace the EECU all 5 years or after 1200 hours

Fuel filter recommended replace latest every 100 hours – refer to applicable Aircraft Maintenance Manual.

05-10-01 Claimable Exceed of Maintenance Actions

Maintenance Actions based on operating hours

Operating Hours Intervals	Claimable Exceed of the Basic Interval
up to and including 100 operating hours	± 10 %
between 101 and 1000 operating hours	± 5 %
more than 1000 operating hours	± 50 operating hours

Maintenance Actions based on time

Time Intervals	Claimable Exceed of the Basic Interval
up to and including 2 months	± 5 days
between 2 months and 1 year	± 15 days
more than 1 year	± 30 days

05-10-02 Engine Time between Overhaul

The maximum time between overhaul of the engine is 1200 hours.
After this time the engine has to be overhauled by a certificated mechanic or otherwise authorized person under consideration of the applicable national requirements. For warranty reasons the overhaul has to be conducted by trained personnel only in accordance with the instructions given in the overhaul manual of **Austro Engine GmbH.**
No overhaul permitted before publication of the Overhaul Manual.

05-20-00 Schedule Maintenance Inspections and Checks

The following service intervals are mandatory to obtain the maximum service life of the engine.
If the engine has not been in operation for a certain time a service interval based on time become effective. The time intervals are beneath the operating service interval.

Activities/Services Interval	100 h 12 Months		300 h		600 h		1200 h		Chapter
	Check	Change	Check	Change	Check	Change	Check	Change	refer to
TORSIONAL-VIB.DAMPER									
Two Mass flywheel			•						05-20-01
ELECTRIC									
Alternator			•						05-20-02
Engine Harness and Sensors	•								05-20-03
EECU								•	05-20-04
EECU read out	•								05-20-05
GEARBOX									
Oil	•			•					05-20-06
Gearbox								•	05-20-07
BELT DRIVE SYSTEM									
V-Ribbed Belt	•							•	05-20-08
ENGINE OIL									
Oil		•							05-20-09
Oil Filter		•							05-20-10
FUEL SYSTEM									
HPP(High pressure pump)						•			05-20-11
Cylinder Head Drain	•								05-20-12
Fuel System	•								05-20-13
Fuel Filter		•							05-20-14
EXHAUST SYSTEM									
Waste Gate Controller	•								05-20-15
Exhaust System	•								05-20-16
COOLING SYSTEM									
Coolant						•			05-20-17
Cooling System	•								05-20-18
OIL SEPERATOR									
Breather line	•								05-20-19
ENGINE									
Zonal Inspection	•								05-20-20
Injector Cover			•						05-20-21

05-20-01 Two Mass Flywheel

Check the Two Mass Flywheel according procedure E40804-M238 in the latest effective issue.
For Removal and Installation of the Two Mass Flywheel refer to Chapter 85-10-50.

05-20-02 Alternator

Check the Alternator according procedure E40804-M258 in the latest effective issue.
For Removal and Installation of the Alternator refer to Chapter 24-00-10.

05-20-03 Engine Harness and Sensors

Carry out a visual inspection of the wiring harness for signs of wear or damage.
Inspect the sensor connections for tight fit.

The parts of the harness which are located below the injector cover have to be inspected every 300 hours.

To prevent any damage on cables and sensor, don't apply forces on the cables!

In case of any significant wear or damage, contact **Austro Engine GmbH**.

05-20-04 EECU

Replace the EECU in accordance with the applicable Aircraft Maintenance Manual.

05-20-05 EECU Read Out

Read out EECU using the AE 300 Wizard and send data to **Austro Engine GmbH.**
For usage instructions of the AE 300 Wizard refer to the AE 300 Wizard User Guide E4.08.09.

Data to be sent:

- Engine log
- Event recorder

(Exception: If not otherwise communicated/defined with AE)

05-20-06 Gearbox – Oil

For gearbox oil check conduct following steps:

- Gearbox oil level check according to Chapter 12-20-11
- Gearbox oil inspection according to Chapter 85-10-20

For gearbox oil change conduct following steps:

- Collect a sample of used Gearbox Oil using the oil container provided with the 300 h Service Kit and send the oil sample to **Austro Engine GmbH**
- For gearbox oil discard and refill refer to Chapter 85-10-40.

05-20-07 Gearbox

Replace the gearbox according to Chapter 85-10-10.

05-20-08 V-Ribbed Belt

Conduct a detailed visual inspection of the V-ribbed belt.
Inspect V-Ribbed Belt for abrasion and signs of damage.
Inspect the belt pulley profiles and the tensioner for damage and dirt.

In case of dirt clean the v-ribbed belt using water only.
If one of the following damages occurs replace the v-ribbed belt:

- textile reinforcement visible between the ribs
- tapered ribs
- transverse cracks on the running surface
- dirt between the ribs
- transverse cracks in the ribs
- frayed textile reinforcement

For replace of the v-ribbed belt refer to Chapter 85-40-10.

Do not lubricate the v-ribbed belt.

05-20-09 Engine – Oil

Exchange Engine Oil according to Chapter 79-00-20 and Chapter 79-00-30.

Collect a sample of the used Engine Oil using the oil container provided with the 100 h Service Kit and send the oil sample to **Austro Engine GmbH**.

After Engine Oil exchange perform an engine ground run according to Chapter 71-00-03.

After the ground run inspect the oil system for leakage.
If leaks are found please contact **Austro Engine GmbH** for further instructions.

If necessary insert engine oil according to chapter 12-20-01

05-20-10 Engine Oil Filter

Replace Oil filter according Chapter 79-00-70.
Use only original Austro Engine oil filter insert: E4A-52-100-802

Conduct a visual inspection of the used oil filter for contamination and metal abrasion. If unusual contamination (metal shavings exceeding 1,5 mm; concentration of particles; clogged filter) is found, or in case of doubt contact **Austro Engine GmbH**.

05-20-11 High Pressure Pump

Replace High Pressure Pump according to Chapter 73-00-40.

05-20-12 Cylinder Head Drain

Disconnect Cylinder Head Drain Line from cylinder head.
Blow through the drain hole using compressed air.
Blow through the Cylinder Head Drain line using compressed air to ensure an unobstructed line.
Connect Drain line.

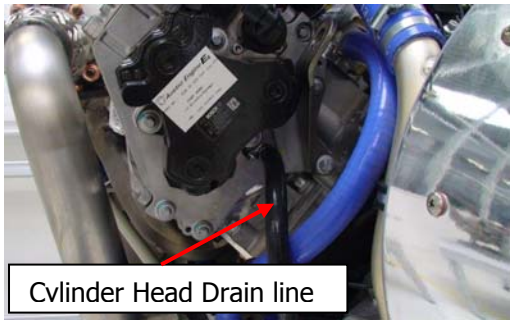

Fig. 05 - 1

Fig. 05 - 2

05-20-13 Fuel System

Conduct a visual inspection of the Fuel System.
Inspect especially for signs of wear and leakage.
Check if the fittings are tightened.

05-20-14 Fuel Filter

Replace fuel filter in accordance with the applicable Aircraft Maintenance Manual.

05-20-15 Waste Gate Controller

Check and adjust the waste gate controller according to Chapter 81-00-30

05-20-16 Exhaust System

Inspect the exhaust manifold for cracks using a flashlight and a mirror.
Inspect the exhaust manifold gaskets for signs of leakage.
In case of leakages replace the exhaust manifold gaskets according to Chapter 78-00-00.
If cracks have been found contact **Austro Engine GmbH**.

05-20-17 Coolant

For exchange of coolant refer to applicable Aircraft Maintenance Manual.

At each exchange of coolant the freezing point has to be checked. The freezing point with a coolant mixture of 50/50 is -38 ºC (-36.4 ºF).

Recommended radiator protection type: Glysantin Protect plus / G 48 mixed at a ratio of 50:50 with distilled water.

05-20-18 Cooling System

Conduct a visual inspection of the Cooling System.
Inspect especially for signs of wear and leakage.
If leakage is detected the affected connections have to be inspected for tight fit or damaged hoses must be replaced.

05-20-19 Breather Line

Inspect the outlet of the Breather Line for abnormal quantity of oil (oil dust has to be expected).
In case of oil detection clean the Breather Outlet and conduct an engine ground run according to Chapter 71-00-03.
After the ground run inspect the breather outlet again. If oil accumulation is obvious, contact **Austro Engine GmbH.**

For inspection and replace of the breather line refer to the applicable Aircraft Maintenance Manual.

05-20-20 Zonal Inspection

Conduct a visual inspection of the whole engine surface using a flashlight and mirror.
Look especially for signs of wear and leakage at the oil sump gasket and the cylinder head gasket.
Inspect for loose parts or foreign objects.
If sign of wear, leaks, loosen parts or foreign objects could be found, contact **Austro Engine GmbH** for further instructions.

05-20-21 Injector Cover

Remove Injector Cover according to 85-00-11.

- Conduct a visual inspection of the high pressure fuel lines. Inspect especially for signs of wear and leakage.
- Carry out a visual inspection of the wiring harness for signs of wear or damage. Inspect the cam shaft sensor connection and the injector connections for tight fit.
- Inspect the Oil Separator hoses for damage.
- Inspect the Oil Separator for signs of leakage.
- Clean the area below the injector cover using cleaning agent. To assure an unobstructed cylinder head drain the cleaning agent should drain off through the cylinder head drain line.

Do not apply cleaning agent on opened sensor connections.

Install Injector Cover according to Chapter 85-00-12.

05-50-00 Unscheduled Maintenance Checks

05-50-01 Performance Deterioration

Read out the EECU data using the AE 300 Wizard and send data to **Austro Engine GmbH** for analysis and further instructions.

Data to be sent:

- Engine log
- Data log (min. 3 hrs.).

(Exception: If not otherwise communicated/defined with AE)

05-50-02 Over Temperature

- Inspect the fluid level for leakage.
- Read out the EECU data using the AE 300 Wizard and send data to **Austro Engine GmbH** for analysis and further instructions.

05-50-03 Sudden Stoppage Inspection

- Remove the engine in accordance with the applicable Aircraft Maintenance Manual and send it to **Austro Engine GmbH**.

05-50-04 Propeller Strike Inspection

- Remove the engine in accordance with the applicable Aircraft Maintenance Manual and send it to **Austro Engine GmbH**.

05-50-05 Lightning Strike Inspection

Direct: Remove the engine in accordance with the applicable Aircraft Maintenance Manual and send it to **Austro Engine GmbH**.

Indirect: Visually inspect the sensor for signs of damage.
Visually inspect all electric engine components for signs of damage. (Sensors, Actuators, EECU, Harness, GPC, Starter, Alternator)

Perform a ground run according to Chapter 71-00-03, read out the data using the AE 300 Wizard and send data to **Austro Engine GmbH** and further instructions.

05-50-06 High Oil Consumption Inspection

- Inspect engine for oil leakage.
- Inspect the compression.
- Send Data to **Austro Engine GmbH** for analysis and further instructions.

05-50-07 Oil System Contaminated

- Send an oil sample to **Austro Engine GmbH** for further investigation.

05-50-08 Oil Pressure Loss Inspection

- Check Oil quantity.
- Inspect if "neg. g" flights have been conducted. (Visual inspection of the breather outlet for oil contamination).
- Read out the EECU data using the AE 300 Wizard and send data to **Austro Engine GmbH** for analysis and further instructions.

05-50-09 Inability to Start the Engine

- Check voltage.
- Check battery condition.
- Check fuel supply.
- Check for EECU cautions.
- Read out EECU data using the AE 300 Wizard and send data to **Austro Engine GmbH** and further instructions.

Chapter 12-00-00 Servicing

12-20-00 Engine Oil Servicing

12-20-01 Check the Oil Level

1. For checking the oil level the oil dipstick has to be taken out.
2. For optimum run, the oil level should be in the middle of the min / max mark.
3. Otherwise the right quantity of engine oil has to be refilled according to the requirements specified under Chapter 79-00-00 Engine Oil.
4. Afterwards the oil dipstick has to be inserted and closed.

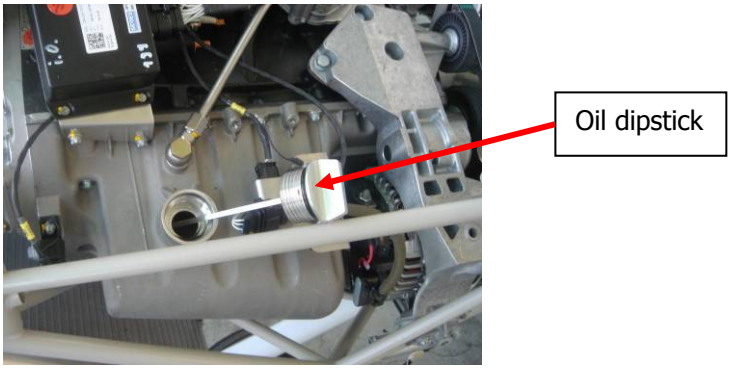

Fig. 12 - 1

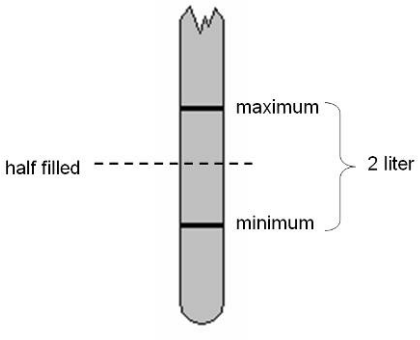

Fig. 12 - 2

12-20-10 Gearbox Oil

12-20-11 Check the Gearbox Oil Level

The quantity of the gearbox oil has to be checked.

If the oil level is seen in the inspection window from the gearbox, 0,5 l of gearbox oil has to be refilled (refer to Chapter 85-10-43).

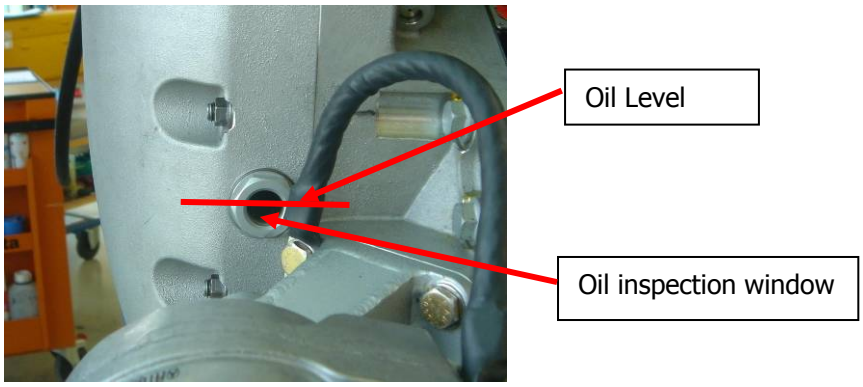

Fig. 12 - 3

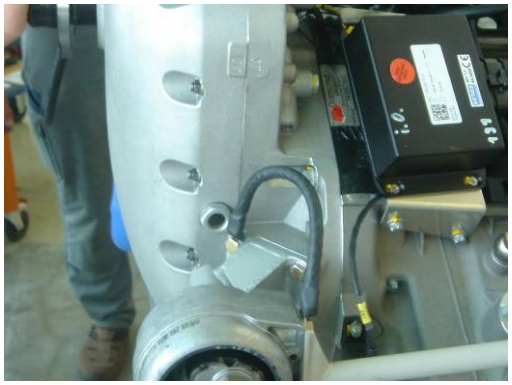

Fig. 12 - 4

For details acc. to the Prop Regulation System refer to the applicable Aircraft Maintenance Manual.

12-40-00 Engine Coolant Servicing

For the Servicing of the Engine Coolant Fluid refer to the applicable Aircraft Manufacture Manual.

Chapter 24-00-00 Electrical Power

24-00-01 General

For general description of the Electrical Power refer to the AE 300 Operation Manual E4.01.01 - Chapter 7.

24-00-10 Alternator

24-00-11 Removal of the Alternator

1. Disconnect the battery according to the applicable Aircraft Maintenance Manual.

First disconnect the negative pole and second the positive pole.

2. Remove the v-belt - refer to Chapter 85-40-11.
3. Remove the electrical line [1] marked with "GEN/G2".
4. Loose the screws [2] from the belt tensioner [3].
5. Remove the alternator mounting screws [4] and carefully remove the alternator [5].

24-00-12 Installation of the Alternator

1. Carefully install the Alternator [5] and install the mounting screws [4]
2. Torque the screws [2] and [4] with 20 Nm.
3. Connect the electrical cable [1] with the Alternator. (GEN/G2).

If the connection is wrong a serious damage to engine is possible.

4. Install the v-ribbed belt according to Chapter 85-40-12.

Inspect the V-ribbed Belt for correct installation.

5. Connect the main battery according to the applicable Aircraft Maintenance Manual.
6. Perform an engine ground run according to the Chapter 71-00-03.

Figures for Chapter 24-00-11 and 24-00-12

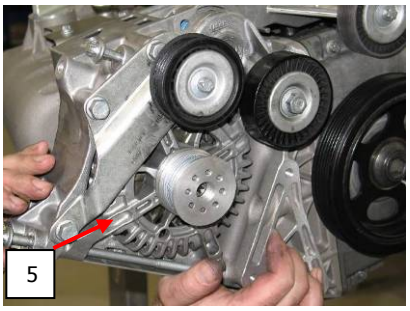

Fig. 24 - 1

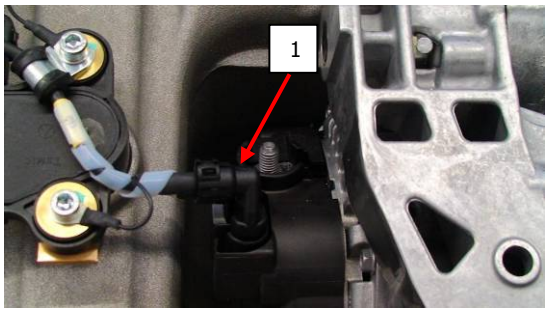

Fig. 24 - 2

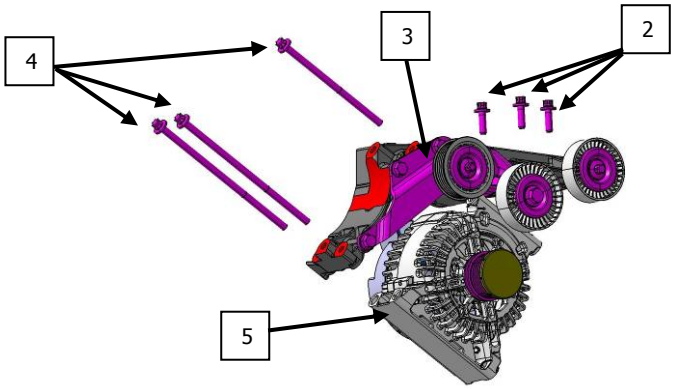

Fig. 24 - 3

24-00-13 Alternator/Regulator Adjustment E4A-91-100-000

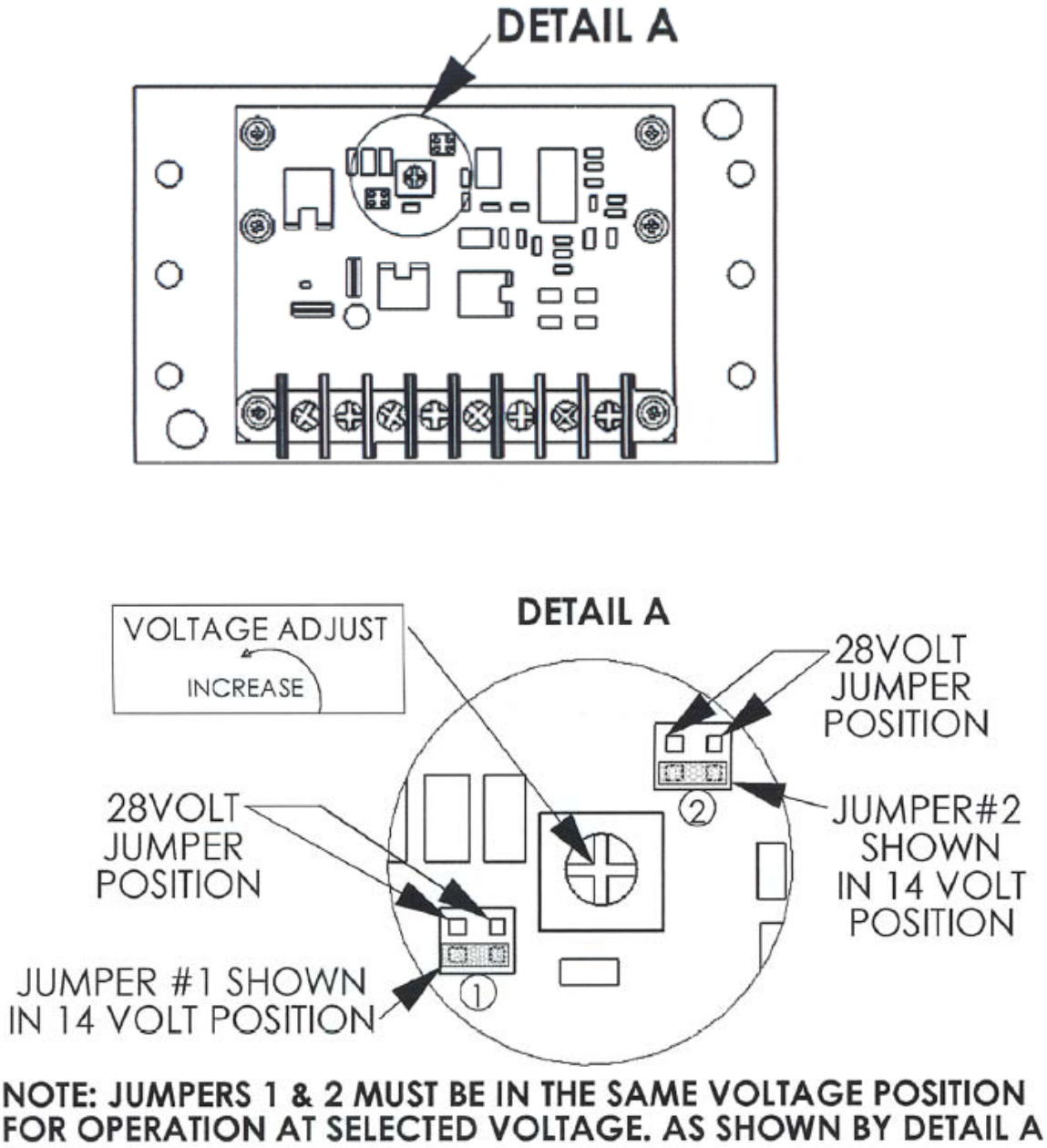

Fig. 24 - 4

24-00-14 Adjustment procedure of voltage regulation E4A-91-100-000

The engines should be brought up to full operation coolant temperatures prior to adjustment.

With one engine at cruising speed, the voltage on the operating system is adjusted to 28 volts at a typical electrical load by a replace of the set screw (see Fig. 24 – 4).The first engine is switched off and the next engine is switched on. The second system has to be adjusted to the same voltage at the same load and engine speed (only for twin-engine applications).

24-00-15 Adjustment of alternator balancing E4A-91-100-000 (only for twin-engine applications)

Both systems are switches on and the loads have to be compared for the operation point of the voltage regulation adjustment.

If it is desired to pull the load division closer together, the regulator of the heavier loaded alternator has to be adjusted lower respectively the regulator of the lower loaded alternator has to be adjusted higher.

A test of the adjustment results shall be conducted by turning on the heaviest loads available and varying of the engine speeds.

For not having significant brush wear difference on both alternators the alternator load current should be as equal as possible. A difference of less than 25A is strongly recommended.

After completion of the regulator adjustment, the regulator set screws have to be fixed with torque seal.

24-00-16 Alternator / Regulator Adjustment E4A-91-200-000

There is no regulator adjustment (e.g.: by potentiometer) required to establish a stable voltage regulation.

24-00-17 Paralleling for twin engine system E4A-91-200-000

A current-regulator is implemented, which enables the adjustment of the load balancing in twin-engine applications with high accuracy and fault-tolerance against single faults at the load-balancing adjustment structure. The set point of this current regulator is generated dynamically as averaged load current of both alternators.
The set point of one voltage regulator in the system is modified continuously to compensate static and dynamic asymmetries of the system.

Graphic below show the basic installation in a twin engine system.

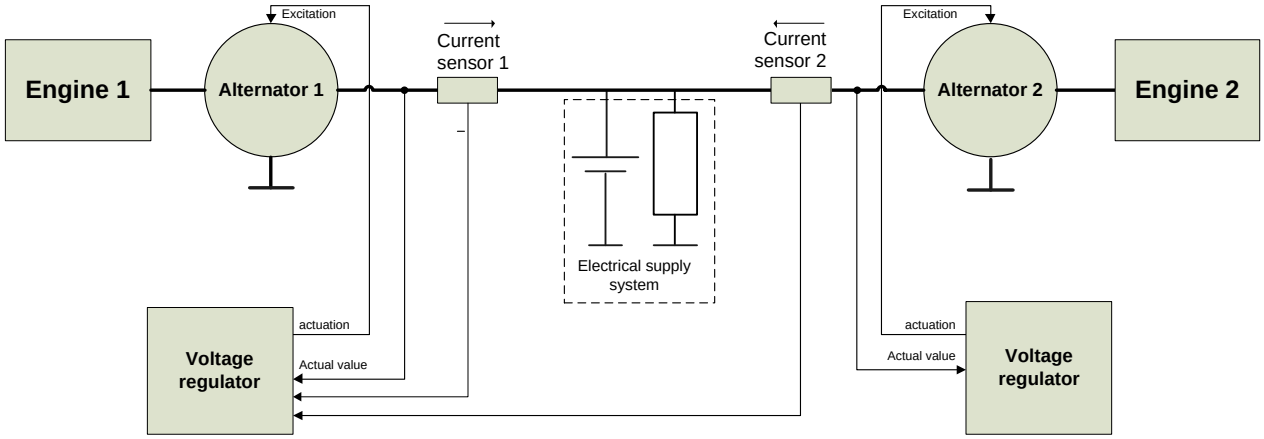

Fig. 24 - 5

24-00-18 Replacing Alternator Regulator E4A-91-100-000

If it is necessary to replace the alternator regulator type E4A-91-100-000 with the alternator regulator type E4A-91-200-000, it has to be mentioned that case the wiring harness needs to be replaced.

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Chapter 51-00-00 Standard Practices

51-00-10 Safety Wiring

Safety wire is used to secure fasteners to prevent them from coming lose. It's used a lot in aviation and racing. To safety wire fasteners you will need safety wire, safety wire pliers, wire cutters (dykes), and needle nose pliers. In a pinch, you can make do with the wire and needle-nose pliers with a cutting edge. The hardest part of safety wiring is drilling the holes in the hardened fasteners. There are jigs available to hold nuts and bolts so they can be drilled more easily. You may also be able to purchase pre-drilled fasteners and save yourself some time. Safety wire comes in many types and sizes. You must first select the correct type and size of wire for the job. Annealed corrosion-resistant steel or stainless steel wire is used in race preparation.

51-00-11 The following Alternator rules apply to safety wiring

1. All safety wires must be tight after installation, but not under so much tension that normal handling or vibration will break the wire.
2. The wire must be applied so that all pull exerted by the wire tends to tighten the nut.
3. Twists should be tight and even, and the wire between nuts as taut as possible without over-twisting. Safety wire pliers can easily twist the wire too far, breaking or weakening it.
4. Twist ends should routed so that no injured ours

For this reason, wire between nuts should be twisted with the hands. The use of pliers may damage the wire. Pliers should be used only for final end twist before cutting excess wire

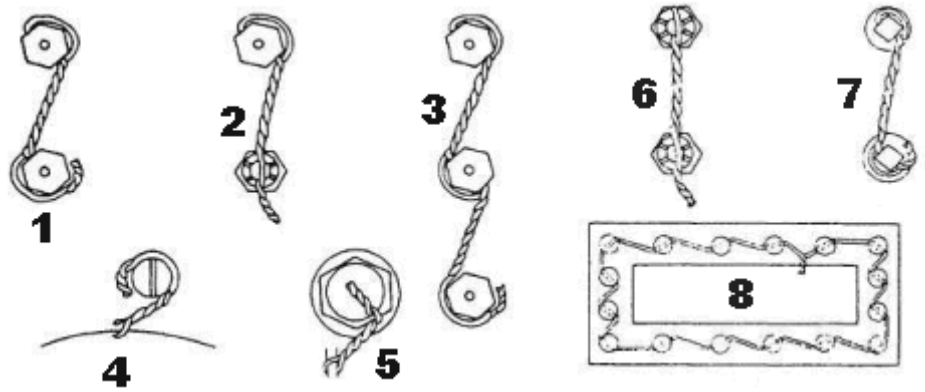


Fig. 51 - 1

Patterns

All critical nuts except the self-locking types must be safe tied; the method used depends upon the particular installation. The illustration at left shows various methods commonly used in safety wiring nuts, bolts, and screws. Examples 1, 2, and 7 show the proper method of safety wiring bolts, screws, square head plugs, and similar parts when wired in pairs. Examples 4 and 5 show a single threaded component wired to a housing or lug. Example 3 shows several components wired in series. Example 6 shows the proper method of wiring castellated nuts and studs. Note that there is no loop around the nut. Example 8 shows several components in a closely spaced, closed geometrical pattern, using the single-wire method.

51-00-12 Single Wire Safe Tying

Insert the wire through each part consecutively in the direction that will prevent the part from loosening. Draw the wire tightly around each bend and twist the ends into a tight pigtail close to one of the safe tied parts. Cut the pigtail square, leaving a minimum of three twists. Bend the pigtail over against the part being safe tied to prevent snagging. You should not use safety wire longer than 24 inches for single wiring three or more parts as a group.

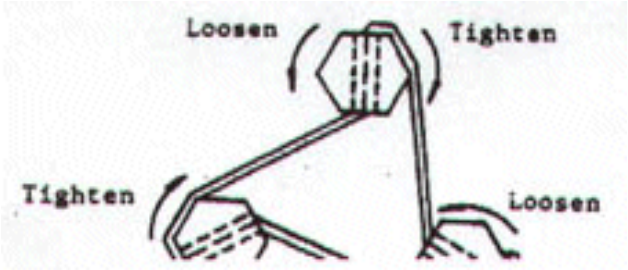


Fig. 51 - 2

51-00-13 Double Wire Safety Wiring By Hand

Pull the wire through the first bolt. Bend one end of the wire around the head of bolt #1 toward bolt #2, in a direction such that a pull on the twisted wire toward bolt #2 would cause bolt #1 to tighten. Twist the outer wire under the other wire close to bolt #1. Continue twisting the wire clockwise, keeping the strands wide apart to ensure a tight even twist. When the twisted pair reaches bolt #2 without slack, insert the wire in the bolt hole in a direction so that bolt #2 cannot loosen without pulling bolt #1 tight. Bend the free wire around the head of bolt #2, and twist the wires counter clockwise. Continue twisting counter clockwise beyond the bolt to form a pigtail. Cut the pigtail square, leaving a minimum of three twists. Bend the pigtail over against the part being safe tied, to prevent snagging.

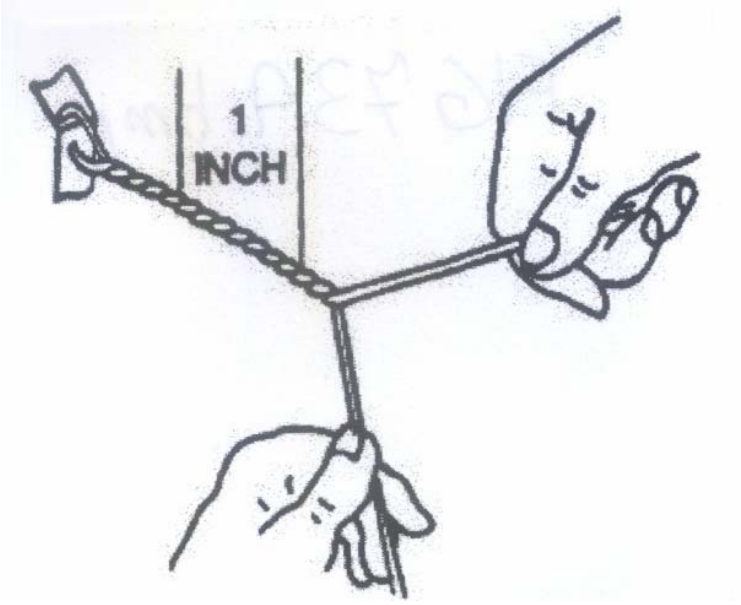


Fig. 51 - 3

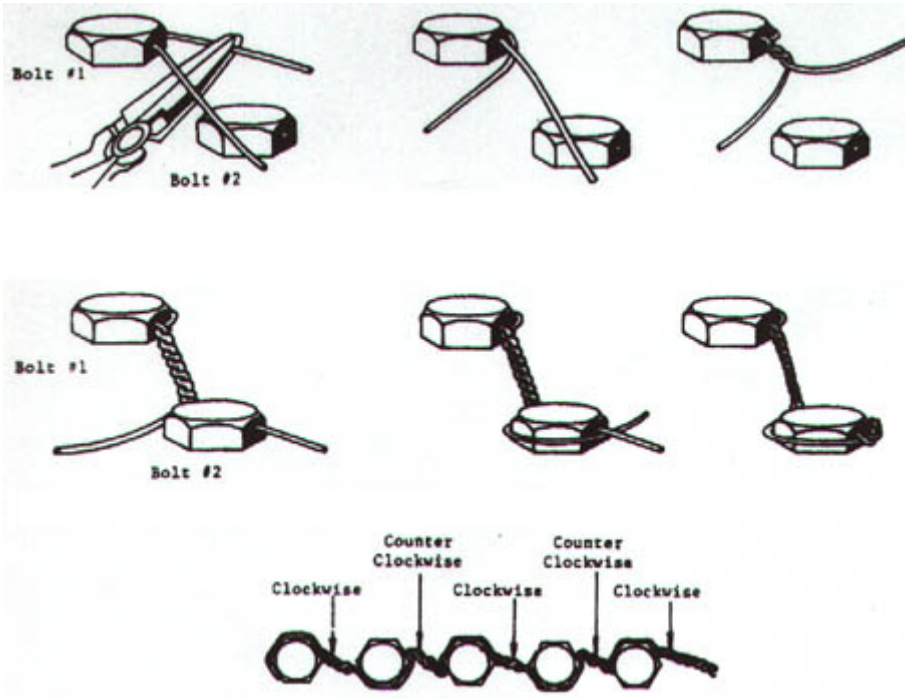


Fig. 51 - 4

51-00-14 Double Wire Safety Wiring Using Pliers

Start by looping the wire through the fastener, using a little extra wire, because you don't want to be short at the end. Loop the wire coming out of the bottom hole around the bolt head clockwise and pull the wire tight with needle nose pliers in the direction of the second bolt. Start the twist by hand (two to three turns) then bring the two wires together and clip the safety wire pliers on the wires next to the hole it will go in on the second bolt, keep the two wires next to each other in the pliers jaws (no gap between them). Pull the safety wire pliers twist-knob to twist the wire, hold the pliers to keep it from twisting backwards and let the knob retract then repeat until the desired twist is reached. Do not over-twist the wire, you can easily weaken or break it. Unclip the safety wire pliers, put one wire through the second bolt (using needle nose pliers helps), loop the other wire around the bolt head, start the twist by hand, clip on the safety wire pliers and twist. Now you're ready to cut the wire. Leave about 1/4 inch of a tail (about 3 twists) Tuck it around the last fastener so it doesn't snag.

Fig. 51 - 5

Fig. 51 - 6

Assorted Odd Bolt Heads and Nuts

When various types of bolt heads and or nuts are safe tied to stationary parts, you can use either right or left hand twists. Attach the safety wire in such a manner that if the bolt or nut should start to loosen then the wire would be in the direction of tightening the fastener.

51-00-15 Samples of Safety Wiring

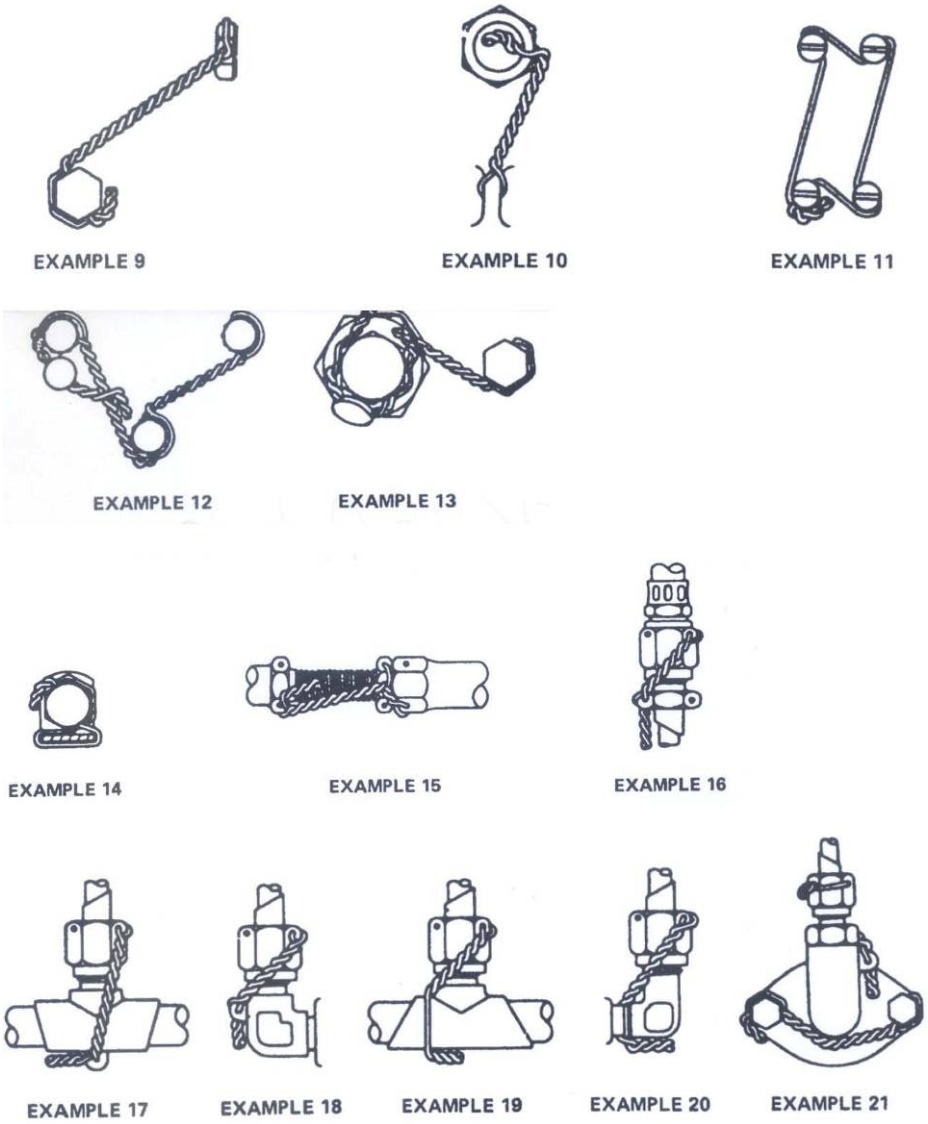


Fig. 51 - 7

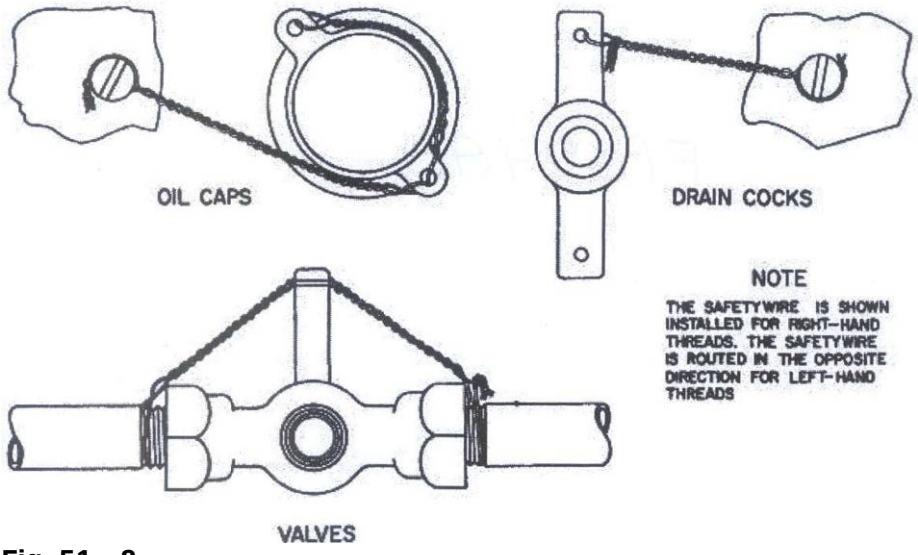

OIL CAPS
DRAIN COCKS
NOTE
THE SAFETYWIRE IS SHOWN INSTALLED FOR RIGHT-HAND THREADS. THE SAFETYWIRE IS ROUTED IN THE OPPOSITE DIRECTION FOR LEFT-HAND THREADS
VALVES

Fig. 51 - 8

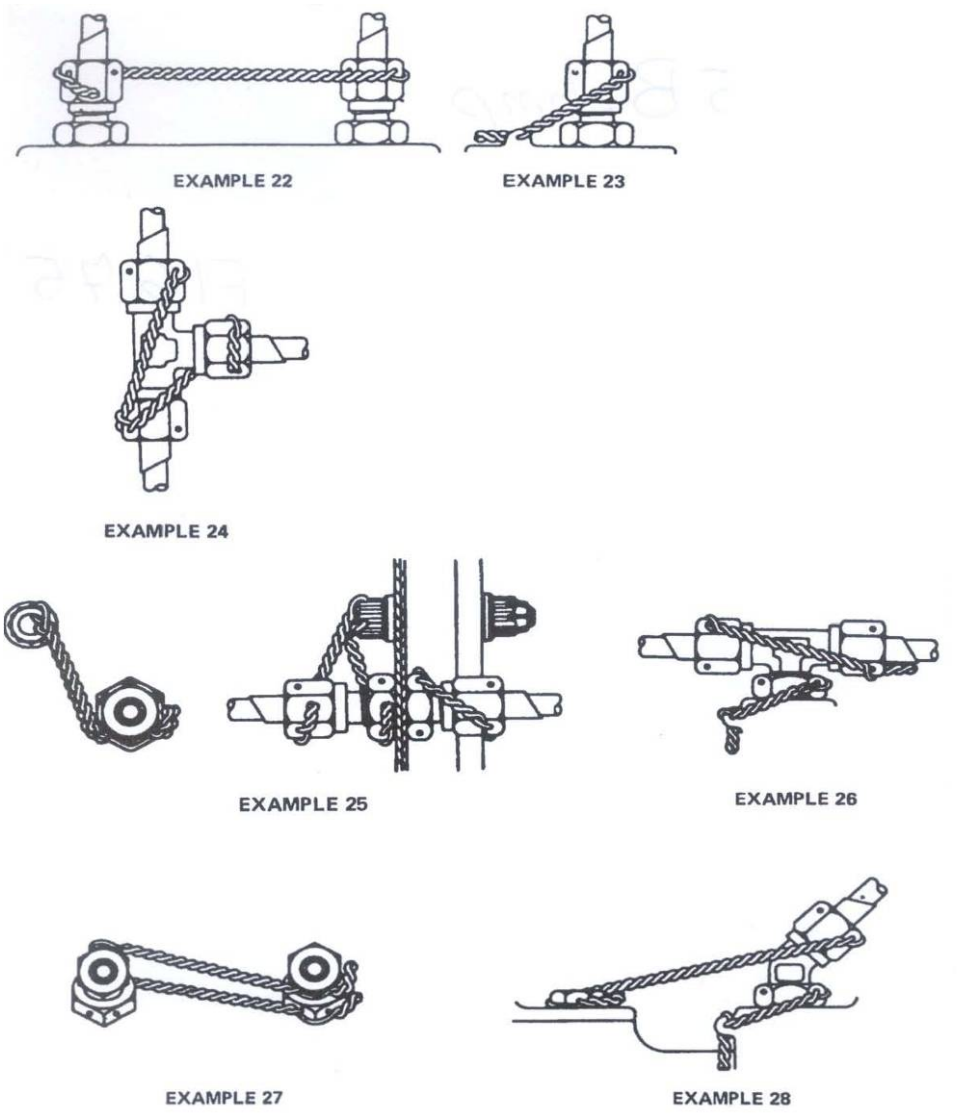

EXAMPLE 22
EXAMPLE 23
EXAMPLE 24
EXAMPLE 25
EXAMPLE 26
EXAMPLE 27
EXAMPLE 28

Fig. 51 - 9

51-00-20 Torque Standards

The importance of correct torque application cannot be overemphasized. Under torque can result in unnecessary wear of nuts and bolts, as well as the parts they secure. Over torque can cause failure of a bolt or nut from overstressing the threaded areas. Uneven or additional loads that are applied to the assembly may result in wear or premature failure. The following are a few simple, but important procedures, which should be followed to ensure that correct torque is applied.

Be sure that the torque applied is for the size of the bolt shank not the wrench size.

a. Calibrate the torque wrench at least once a year, or immediately after it has been abused or dropped, to ensure continued accuracy.
b. Be sure the bolt and nut threads are clean and dry, unless otherwise specified by the manufacturer.
c. Run the nut down to near contact with the washer or bearing surface and check the friction drag torque required to turn the nut. Whenever possible, apply the torque to the nut and not the bolt. This will reduce rotation of the bolt in the hole and reduce wear.
d. Add the friction drag torque to the desired torque. This is referred to as "final torque," which should register on the indicator or setting for a snap-over type torque wrench.
e. Apply a smooth even pull when applying torque pressure. If chattering or a jerking motion occurs during final torque, back off the nut and retorque.

Many applications of bolts in aircraft/engines require stretch checks prior to reuse. This requirement is due primarily to bolt stretching caused by over torque.

f. When installing a castle nut, start alignment with the cotter pin hole at the minimum recommended torque plus friction drag torque.

Do not exceed the maximum torque plus the friction drag. If the hole and nut castellation do not align, change washer or nut and try again.
Exceeding the maximum recommended torque is not recommended.

g. When torque is applied to bolt heads or cap screws, apply the recommended torque plus friction drag torque.
h. If special adapters are used which will change the effective length of the torque wrench, the final torque indication or wrench setting must be adjusted accordingly. Determine the torque wrench indication or setting with adapter installed as shown in figure

Torque wrench with various adapters.

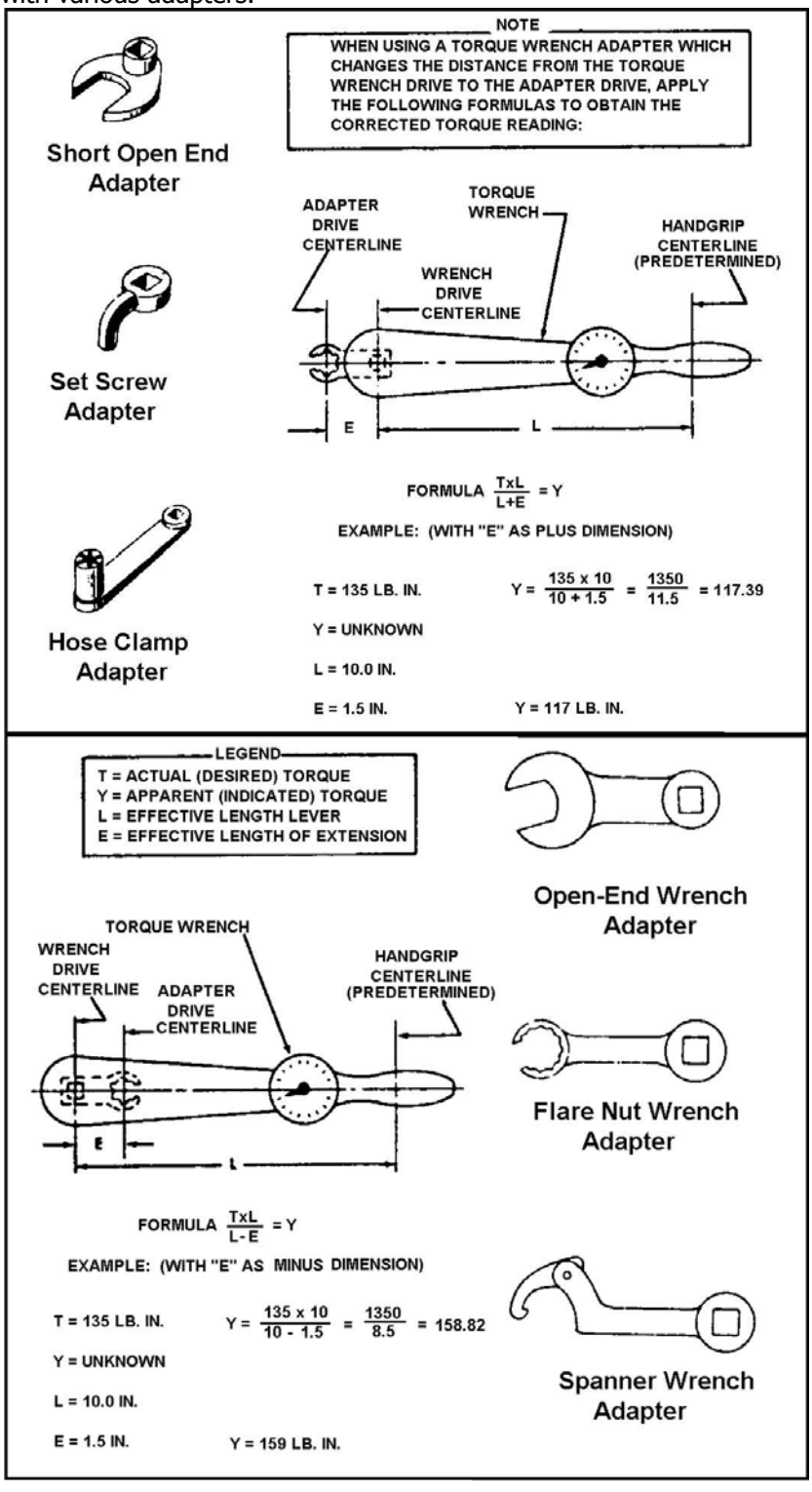


Fig. 51 - 10

Elimination of friction in interference fit applications may sometimes be attained by placing the bolt in a freezer prior to installation. When this procedure is used, the bolt should be allowed to warm up to ambient temperature before torque.

Chapter 71-00-00 Power Plant

71-00-01 General

For description see Chapter 01-10-00 General Engine Description

71-00-02 Instruction

An engine ground test run should be conducted after any work on the engine. After running the test, the engine has to be inspected visually, especially the replaced and repaired engine parts.

Some work steps have to be performed when the engine is warm.
These work steps must be taken with utmost care.

Wrong maintenance of the engine can cause heavy engine damage even to engine stop during aviation.

To award the warranty approved parts from the **Austro Engine GmbH** must be used. For further information of maintenance **Austro Engine GmbH** can be contacted.

71-00-03 Engine Ground Run

After work on the engine it is recommended to perform a ground run following this procedure:

For starting, warm up and shut down refer to the applicable Aircraft Flight Manual (AFM).

Aircraft engine ground run must be performed in a secure and save area protected against movements of unauthorised persons.
Accidents can cause severe injury or even death.

Aircraft engine ground run must be performed by authorised persons only.

The area of the propeller must be kept clear. If objects get into the propeller, propeller and engine can be seriously damaged.

To execute the Engine Ground Test Run, following steps have to be performed consecutive:

For engine start and warm up refer to the applicable Aircraft Flight Manual (AFM)

Conduct EECU self test (Refer to the applicable Aircraft Flight Manual)

Start engine test

1. Ensure that the Voter switch is on the ECU A position.
2 Move power lever quickly to the full-load position. The propeller must accelerate smoothly and steadily up to the propeller speed of 2300 rpm. The load indicator must show more than 95%. Maintain this status for 30 seconds, and then return the load selector to the idle position.
3. Move the Voter switch to the ECU B position. Move the power lever to the full-load position. The propeller must accelerate smoothly and steadily up to the propeller speed of 2300 rpm. The load indicator must show more than 95%. Maintain this status for more than 30 seconds, and then return the load selector to the idle position.
4. Return the Voter switch to the Auto position.
5.

Shut off engine in accordance to the applicable Aircraft Flight Manual (AFM).

In case of failure indications read out data using the AE 300-Wizard.

After the Engine Ground Run perform a visual inspection of the engine. Look especially for leakage and chafing.

Chapter 71-50-00 Electrical Harness

71-50-01 General

The harness provides electrical interconnection between all system components. Also it is an important part for HIRF & lightning protection.

71-50-02 General Information -> Wiring harness

The wiring harness has to be fixed at several points to avoid harness damage caused by normal engine operation (e.g.: due to vibration). Fixing points are marked in „ Fig. 71 - 39, Fig. 71 - 40 and Fig. 71 - 41".

Bend radius :	min.	100 mm
Unsupported distance :	max.	150 mm

All connectors must be plugged in a way to avoid forces applied to the connector.

No tension on the harness is allowed at all.

Pay attention for correct interlocking of the plug and socket connections. Inspect the correct locking of ALL connectors.

All shielding wires must be attached via electrically conducting connections to the engine block at the actuator and sensor ends of the wiring harness. It is not allowed to shorten or to extend the shielding wires.

No changes are allowed of the delivered wiring harness.
Only the delivered configuration is tested (EMI, lightning protection) and approved.
Exception: To avoid abrasion, mounting of protective tube is allowed.

71-50-10 Engine Harness E4A-90-000-000

Inspect the engine harness for chafing, damage or missing clamps.
In case of signs of wear or damage contact **Austro Engine GmbH** for further instructions.

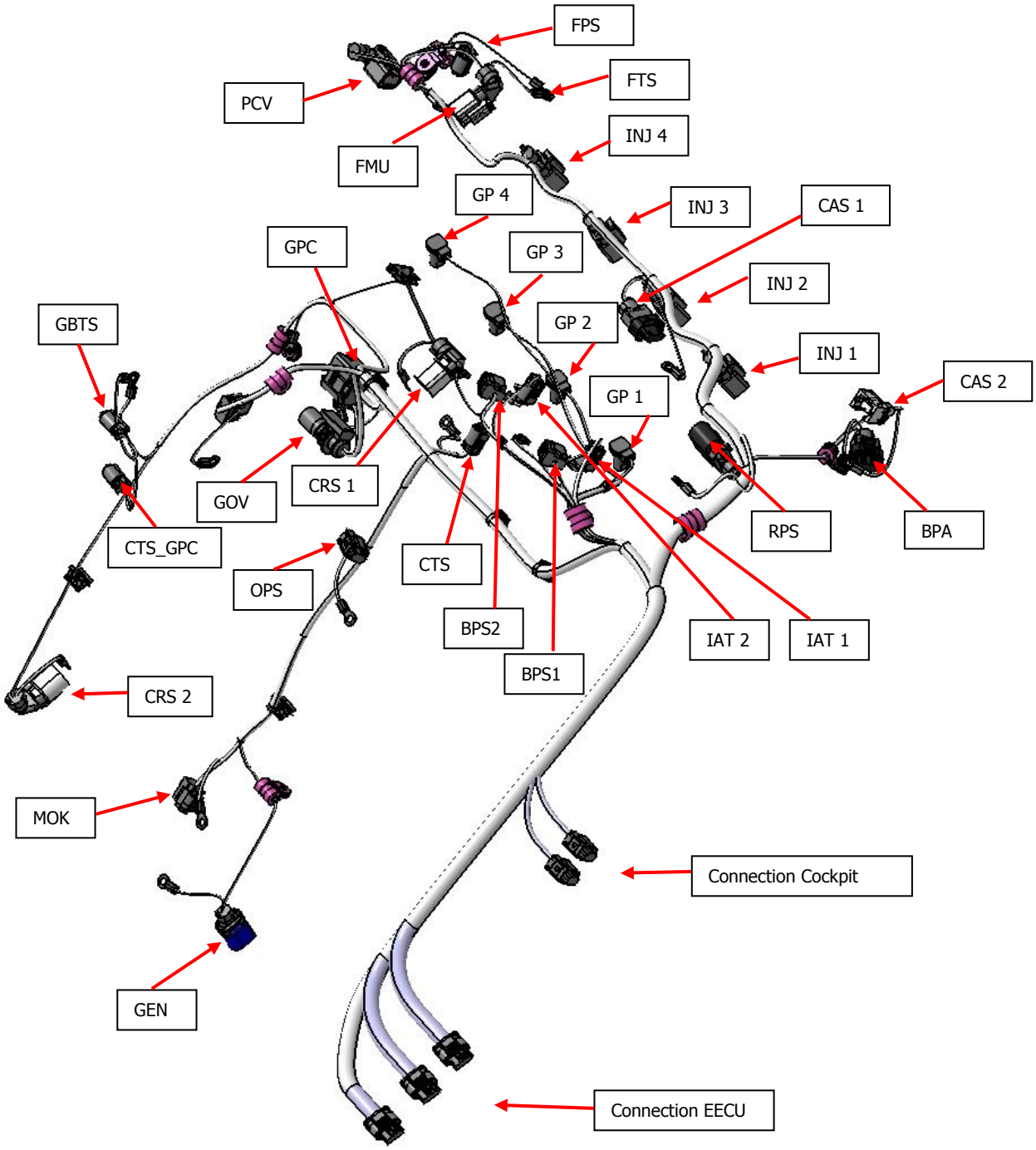


Fig. 71 - 1

Pay attention for correct interlocking and snapping of the plug and socket connections (e.g. ECU connector or Injector connector)

71-50-20 Sensor – Check

The sensors have to be inspected for loosened, chafed or damaged connectors according to the attached list and schematic. Be aware of, that some connectors have interlocks which need to be checked.
In case of signs of damage contact **Austro Engine GmbH** for further instructions.

71-50-30 Description Plug Connector Wiring Harness

Wiring diagram	Description long version	German description	Abbr.	
B1/1	Fuel Pressure Sensor	Kraftstoffdrucksensor	FPS	
B4/6	Rail Pressure Sensor	Raildrucksensor	RPS	
B40	Oil Combinant Sensor Temperature	Kombinierter Ölsensor Temperatur	MOK	
B5/1	Boost Pressure Sensor 1	Ladedrucksensor	BPS1	
B5/2	Boost Pressure Sensor 2	Ladedrucksensor	BPS2	
B5/3	Oil Pressure Sensor	Öldrucksensor	OPS	
B50/1	Intake Air Temperature 1	Ladelufttemperatursensor	IAT 1	
B50/2	Intake Air Temperature 2	Ladelufttemperatursensor	IAT 2	
B50/3	Coolant Temperature Sensor	Kühlwassertemperatur	CTS	
B50/5	Gearbox Temperatur Sensor	Getriebetemperatursensor	GBTS	
B50/6	GPC Coolant Temperature	Kühlwassertemperatursensor GPC	CTS_GPC	
B50/7	Fuel Temperature Sensor	Kraftstofftemperatursensor	FTS	
B6/1	Camshaft Sensor 1	Nockenwellensensor	CAS 1	X)
B6/2	Camshaft Sensor 2	Nockenwellensensor	CAS 2	
G115	ECU A			
G121	ECU Power			
G116	ECU B			
G2	Alternator Plug	Alternator Stecker	GEN	
GPC	A/C Interface 6			
L5/1	Crankshaft Sensor 1	Kurbelwellensensor 1	CRS 1	
L5/2	Crankshaft Sensor 2	Kurbelwellensensor 2	CRS 2	
M55	Governor Actuator	Governor	GOV	
N14/2	Glow Plug Control	GPC Glow Plug Control	GPC	
R9/1	Glow Plug 1	Glühkerze 1	GP 1	
R9/2	Glow Plug 2	Glühkerze 2	GP 2	
R9/3	Glow Plug 3	Glühkerze 3	GP 3	
R9/4	Glow Plug 4	Glühkerze 4	GP 4	
W11				
X1/1	A/C Interface 1			
X1/2	A/C Interface 2			
X2/1	A/C Interface 3			
X3/1	A/C Interface 4			
X3/2	A/C Interface 5			
Y31/5	Boost Pressure Actuator	EPW	BPA	
Y74	Pressure Control Valve	Druckregelventil Rail	PCV	
Y76/1	Fuel Injector 1	Injektor	INJ 1	X)
Y76/2	Fuel Injector 2	Injektor	INJ 2	X)
Y76/3	Fuel Injector 3	Injektor	INJ 3	X)
Y76/4	Fuel Injector 4	Injektor	INJ 4	X)
Y94	Fuel Metering Unit	Zumesseinheit	FMU	

X) This Sensor can only be checked all 300 h if the Injector cover is removed.

71-50-40 Material and saving material for the Engine wiring harness

Pos	Part number	Description	St	Torque specification	Tool
01	E4A-90-000-000	Engine wiring harness	1		
02	E4A-90-000-801	Hex-head screw with tooth lock M6x10	1	6 Nm	
03	DIN3016-W1-DM 12x15	Clamp	1	12 Nm	
04	DIN3016-W1-DM 6x15	Clamp	2	5 Nm	
05	DIN3016-W1-DM8x15	Clamp	2	6 Nm	
06	E4A-90-000-802	Hex-head screw with tooth lock M6x16	2	10 Nm	
07	E4A-90-000-803	Hex-head screw with tooth lock M8x16	1	12 Nm	
08	E4A-90-100-801	Cable strap 100 x 2,5 mm	60		
09	DIN3016-W1-DM15x15	Clamp	1		
10	E4A-90-100-808	Cable strap with EdgeCLip	1		
11	DIN3016-W1-DM10x20	Clamp	2		
12	DIN3016-W1-DM13x20	Clamp	1	12 Nm	
13	E4A-90-100-805	Cable strap 340x4,5	2		
14	E4A-90-100-810	Mesh tube ø 8 mm x195 cm			
15	E4A-90-100-811	Mesh tube ø 13 mm x 100 cm			

Mounting of mesh tube pos.14 and pos.15 is shown on several Figures.

71-50-60 Mounting Backbones

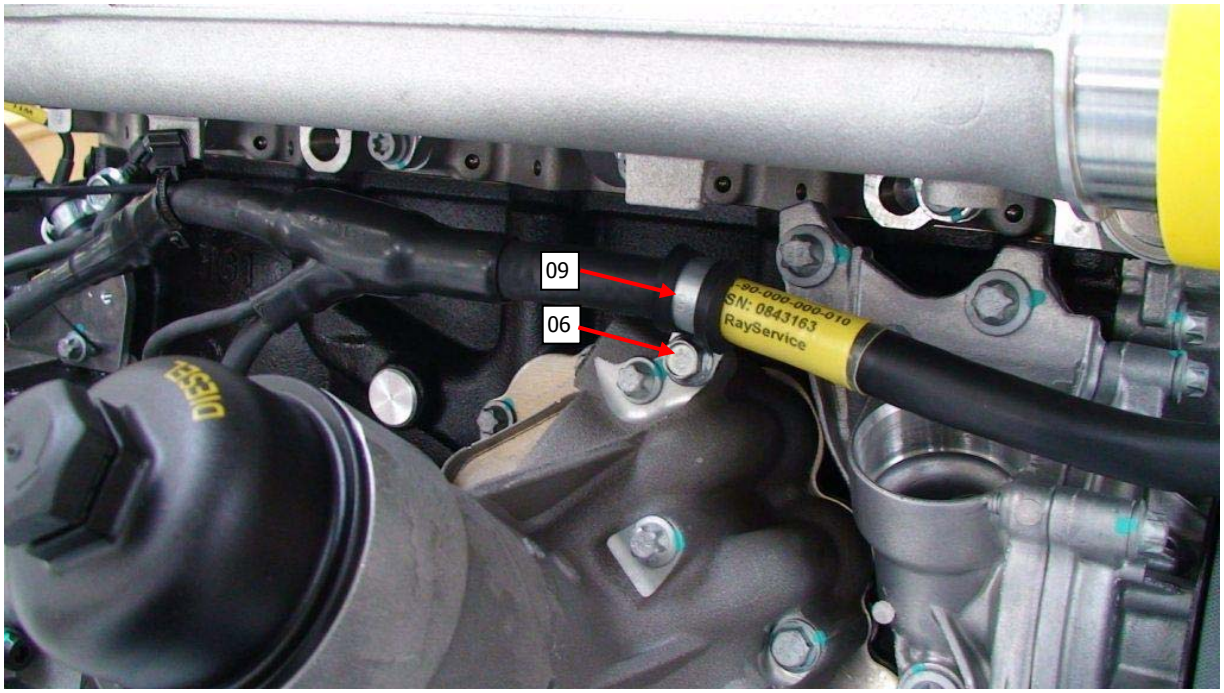


Fig. 71 - 2
Use the screw [06] to fix the clamp [09] and torque it with 10 Nm (see Fig. 71-2)

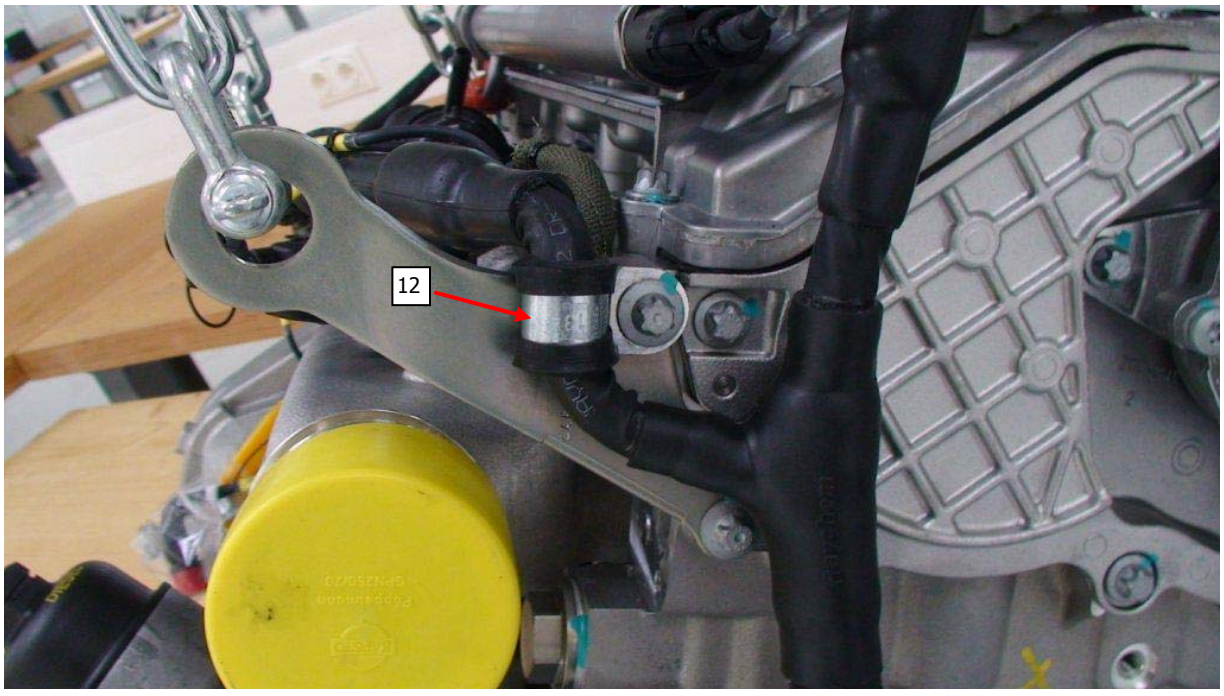


Fig. 71 - 3
Use the screw of the engine fastener to fix the clamp [12] and torque it with 12 Nm (see Fig.71-3).

71-50-70 Intake Air Manifold

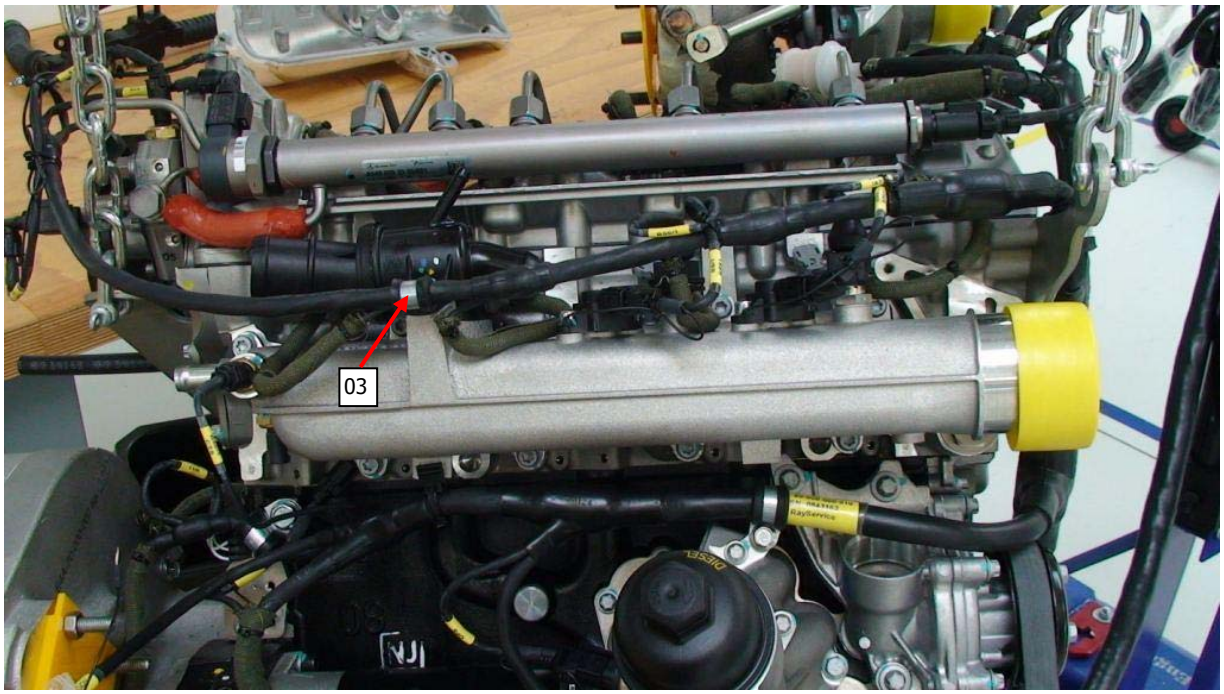


Fig. 71 - 4

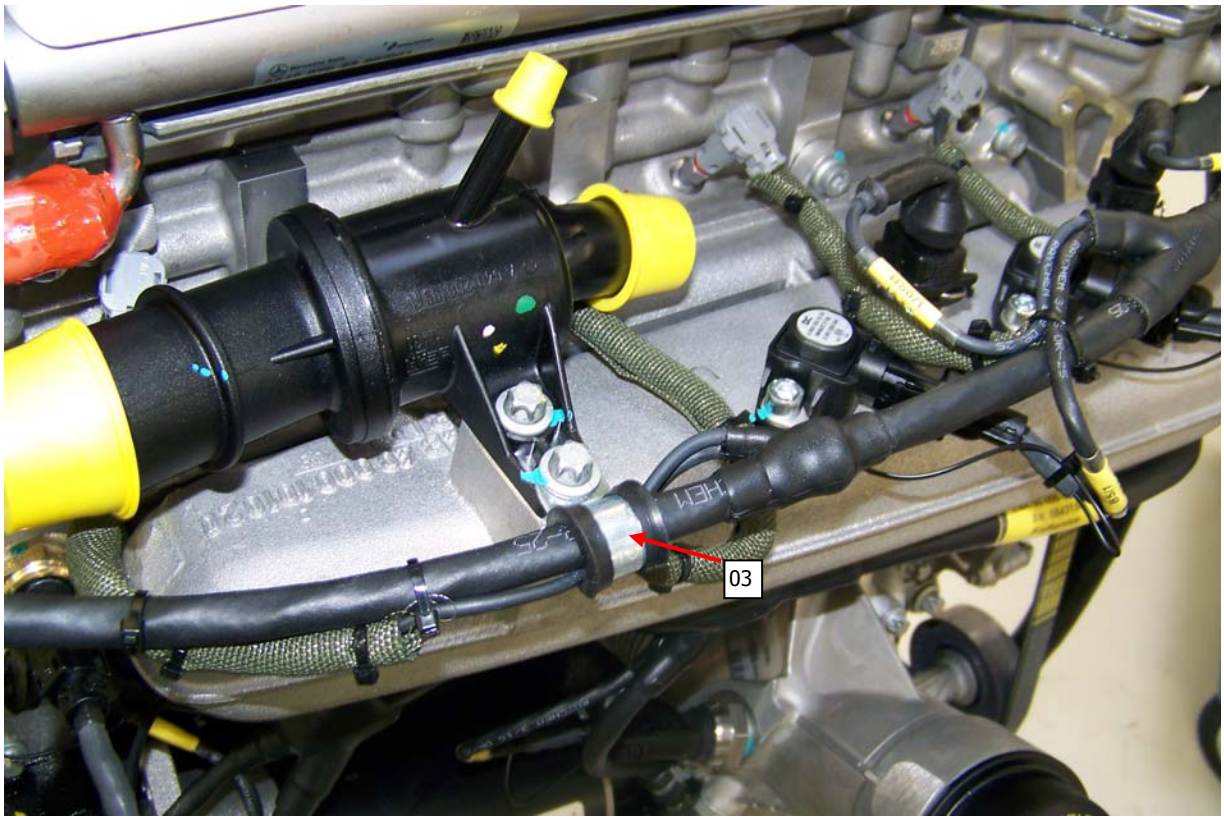


Fig. 71 - 5

Use Clamp 03 to fix the sub-backbone (intake air manifold) and the wire for glow-plug 4 and torque it with 12 Nm.

Fig. 71 - 6

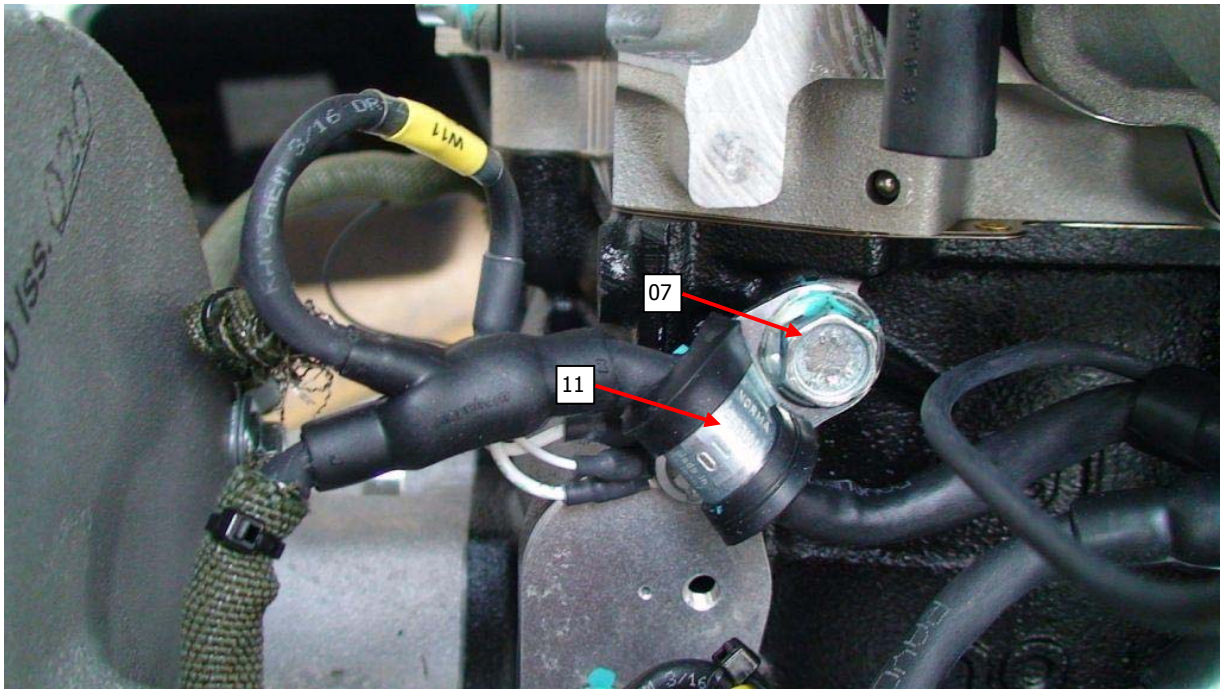


Fig. 71 - 7

Use the screw [07] and torque it with 12 Nm to fix the clamp [11] .
(see Fig. 71-7).

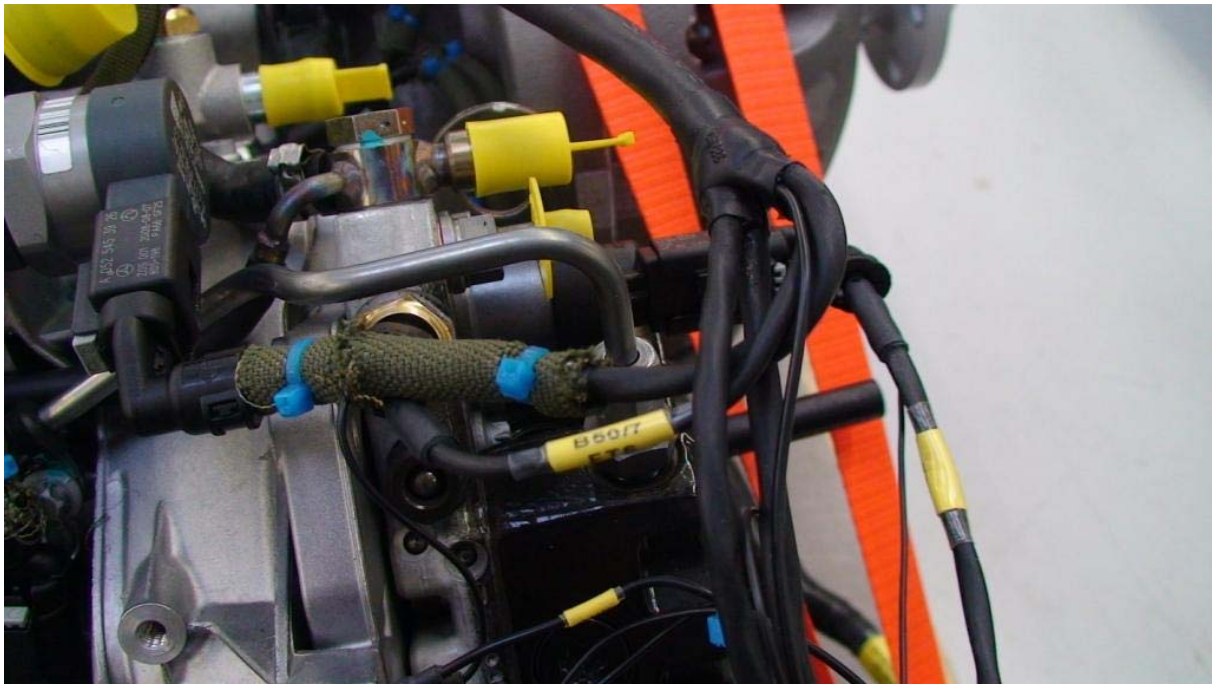


Fig. 71 - 8

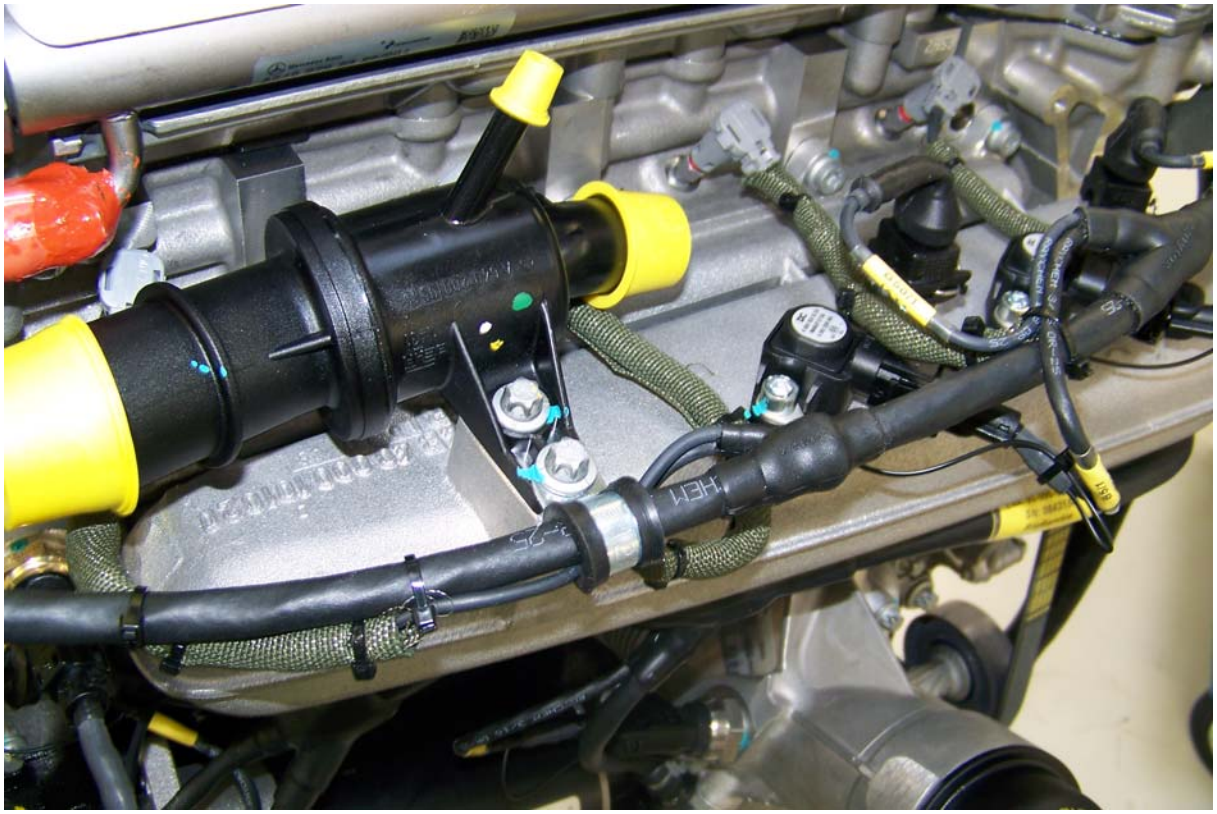


Fig. 71 - 9

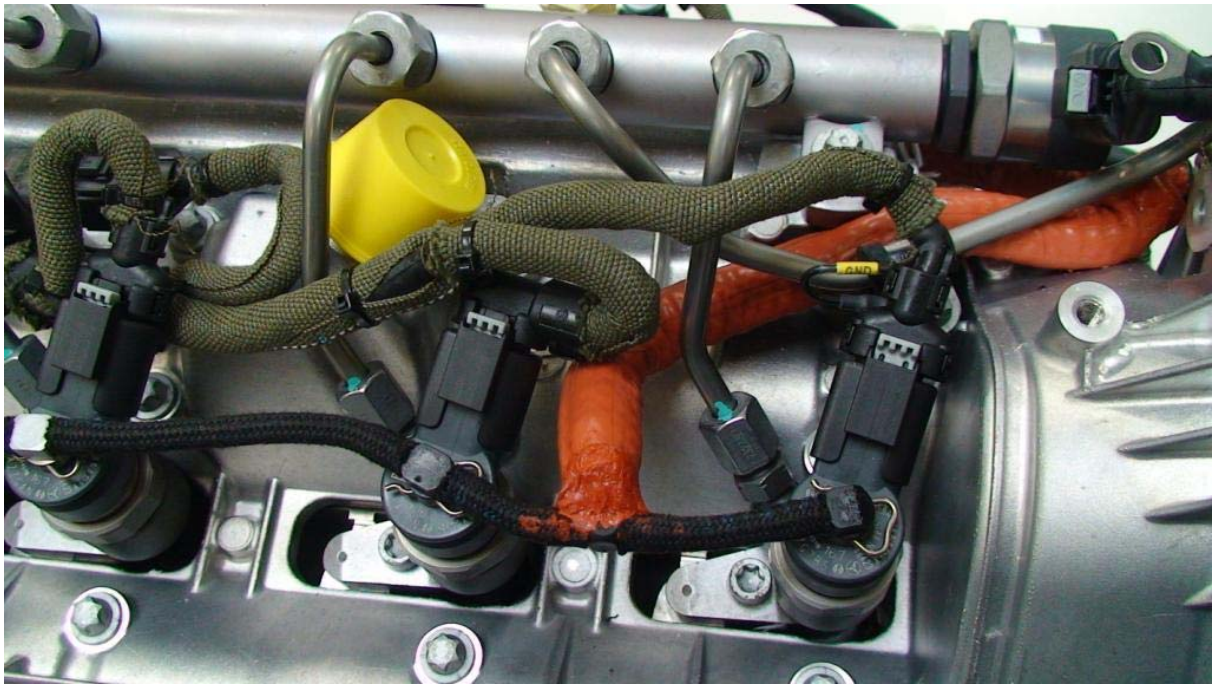


Fig. 71 - 10

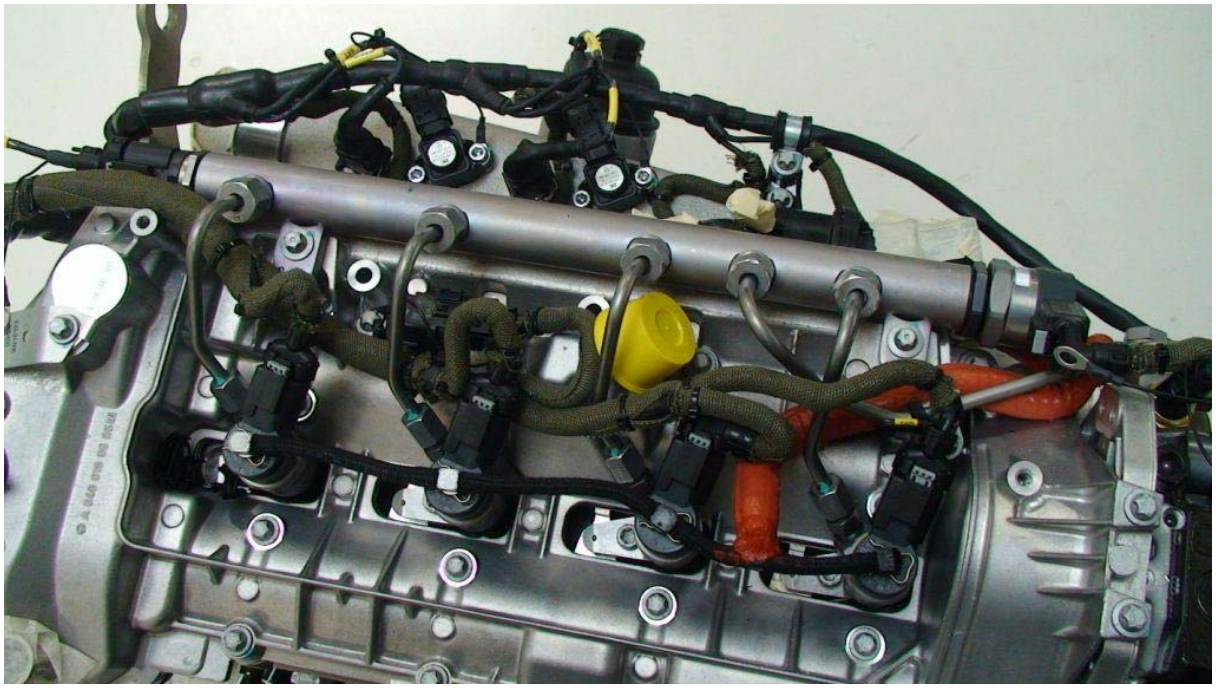


Fig. 71 - 11

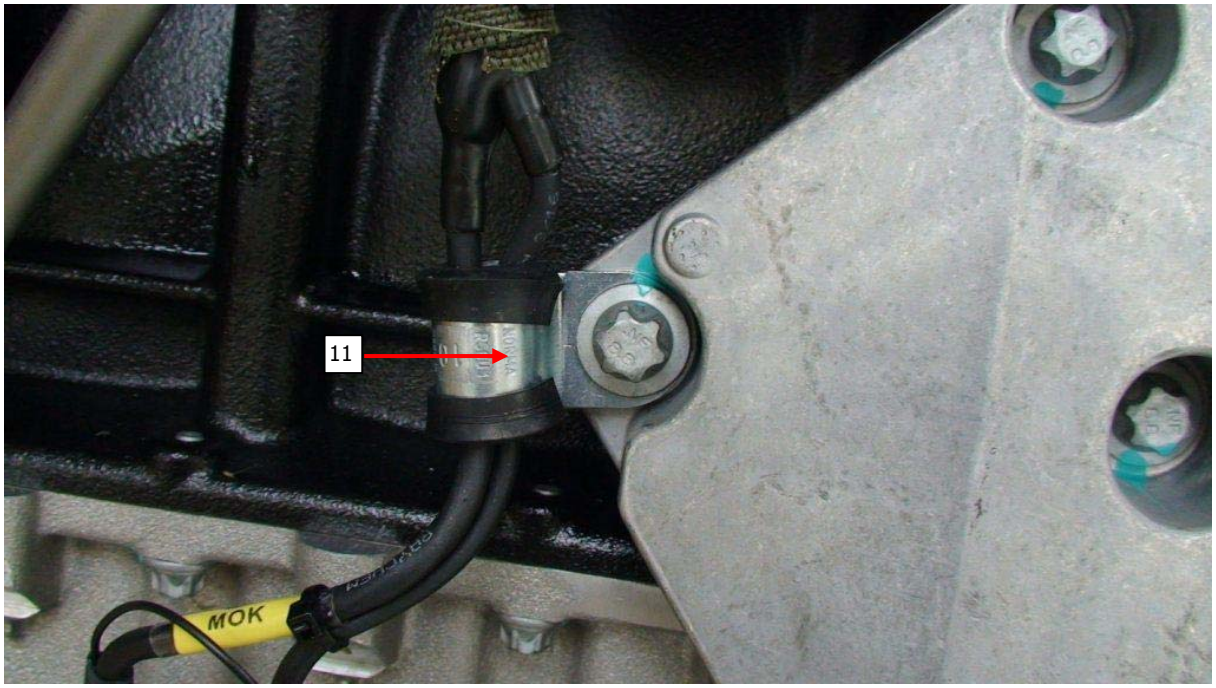


Fig. 71 - 12

Fig. 71 - 13

Clamp [11] is screwed on the fastener of the alternator (see Fig. 71 – 13).

Fig. 71 - 14

Use the screw (Pos. 02) to fix the clamp [05] and torque it with 6 Nm (see Fig. 71 - 14).

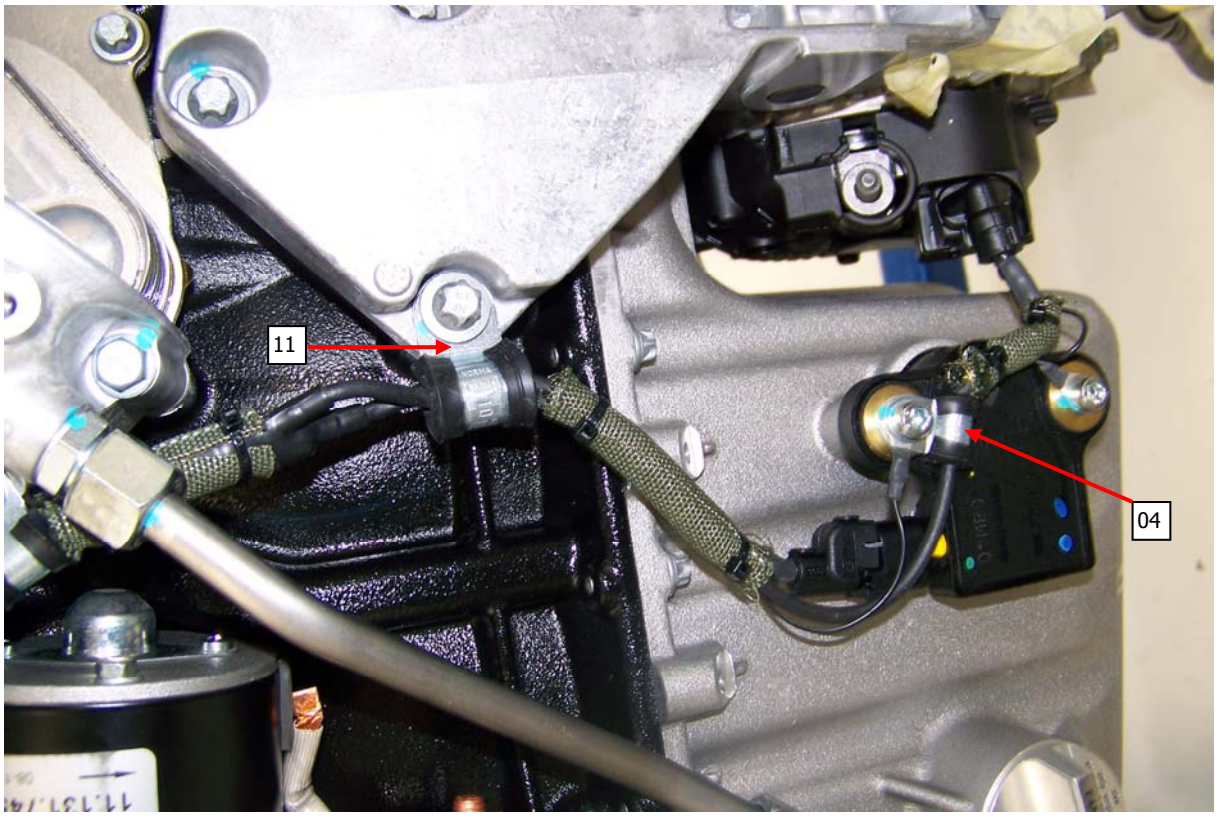


Fig. 71 - 15

Clamp [04] is screwed on the Oil level sensor.

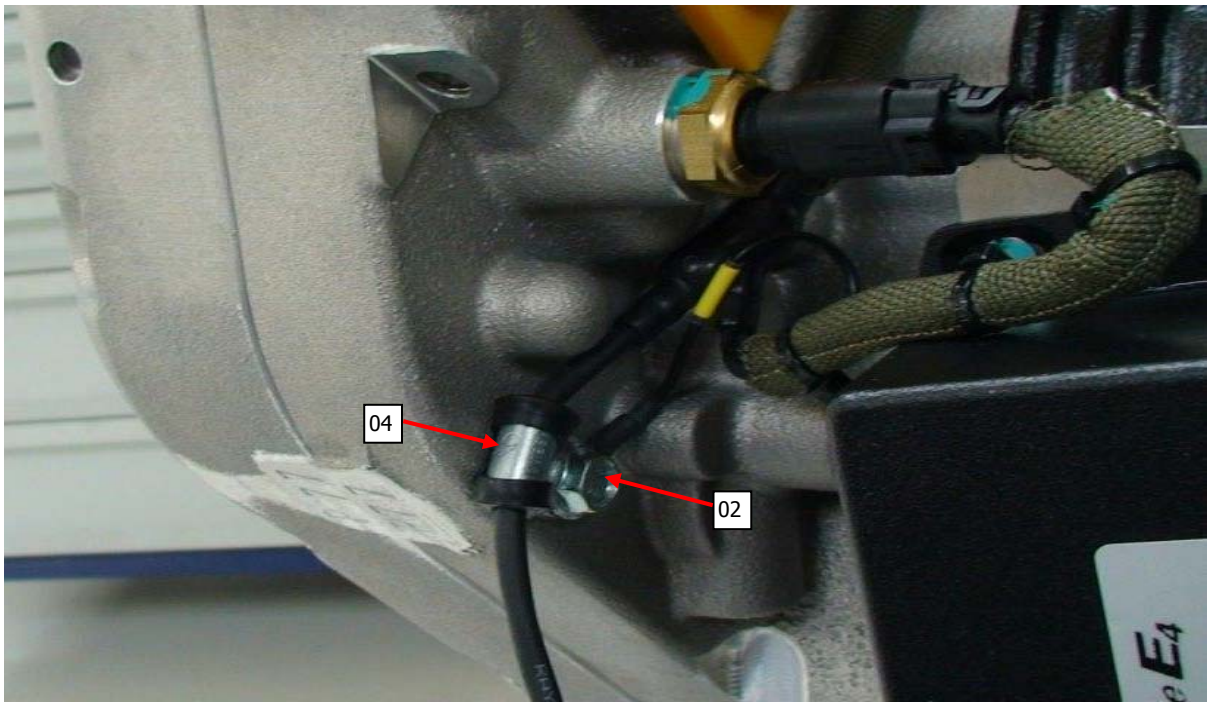


Fig. 71 - 16

Use the screw 02 to fix the Clamp 04 and torque it with 6 Nm (see Fig. 71 - 16).

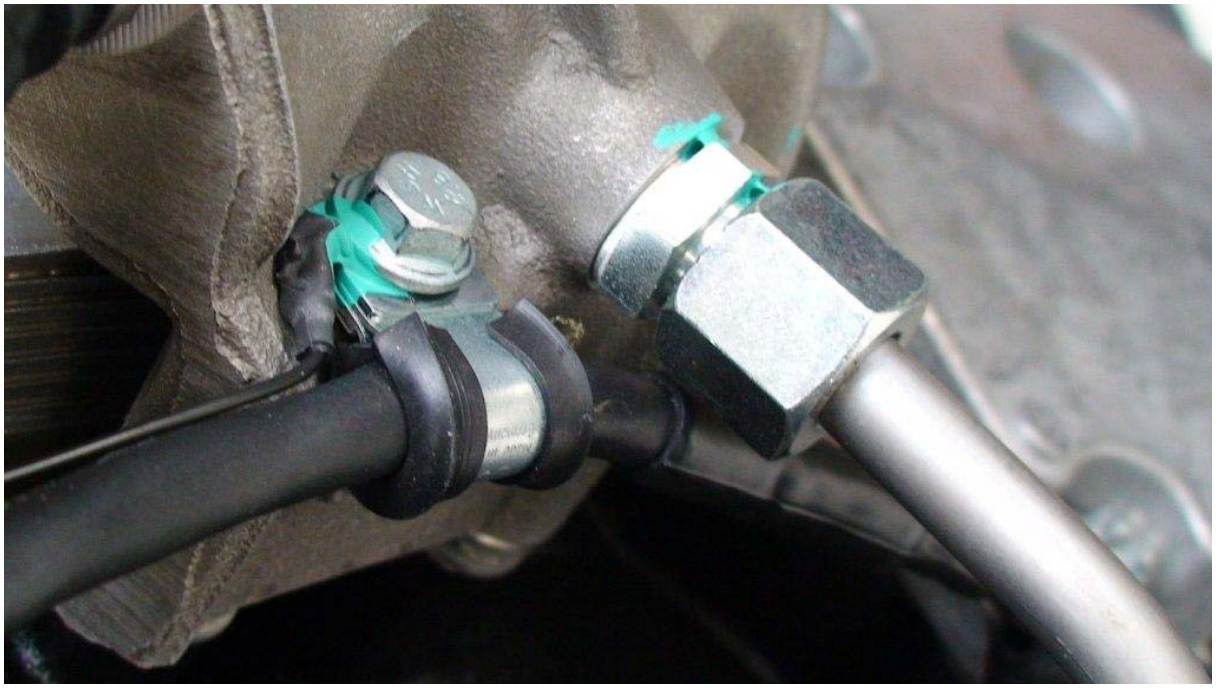


Fig. 71 - 17

Fix the clamp on the oil filter housing. The clamp-bow is orientated to the engine block (see Fig. 71 – 17).

71-50-80 Alternator

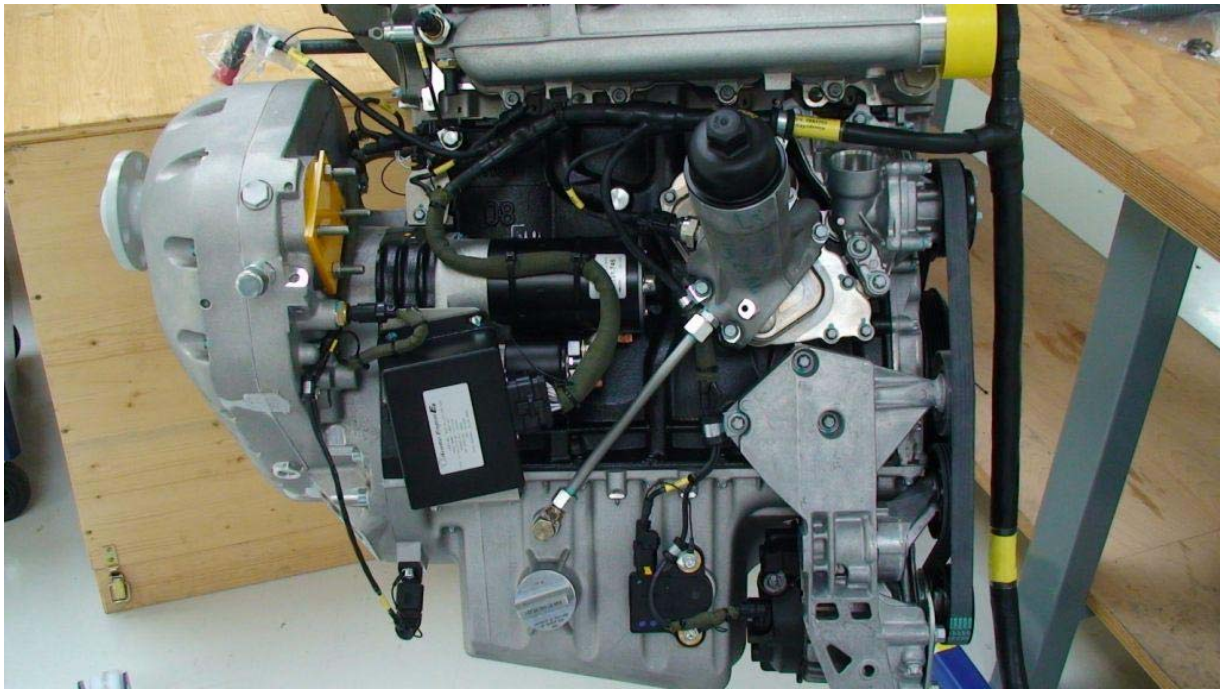


Fig. 71 - 18

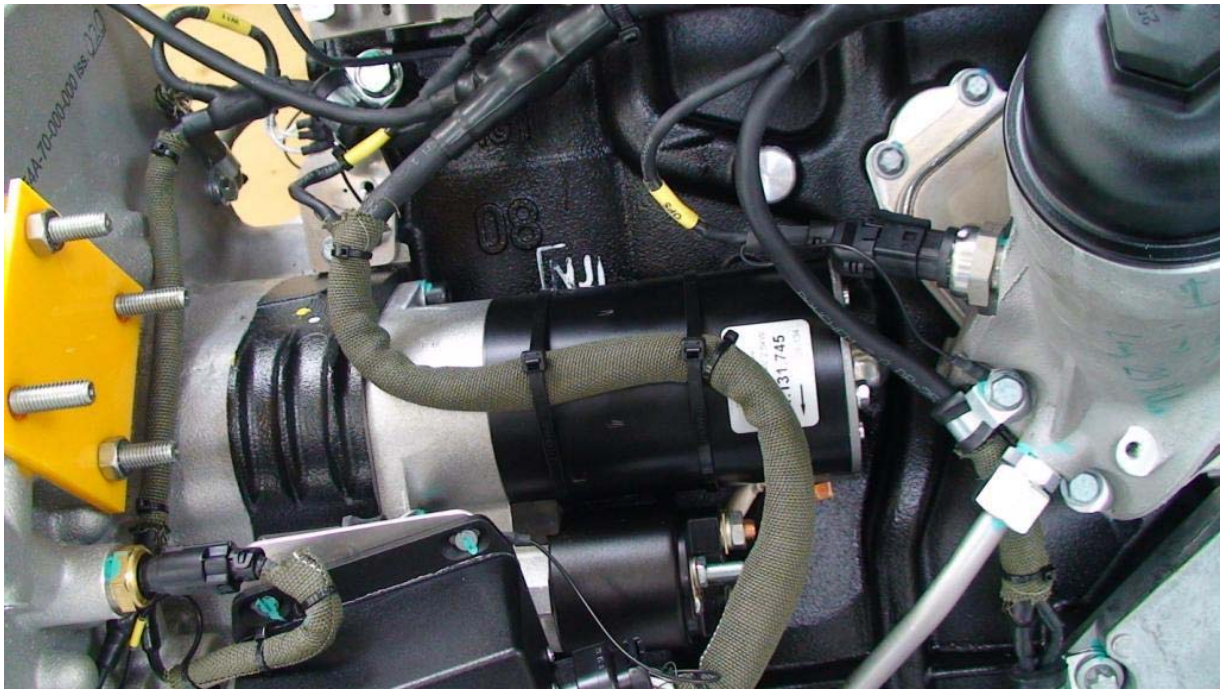


Fig. 71 - 19

71-50-90 GPC

Fig. 71 - 20

71-50-100 CRS 1 & 2

Fig. 71 - 21

Fig. 71 - 22

71-50-110 Mechanical protection (Mesh tube)

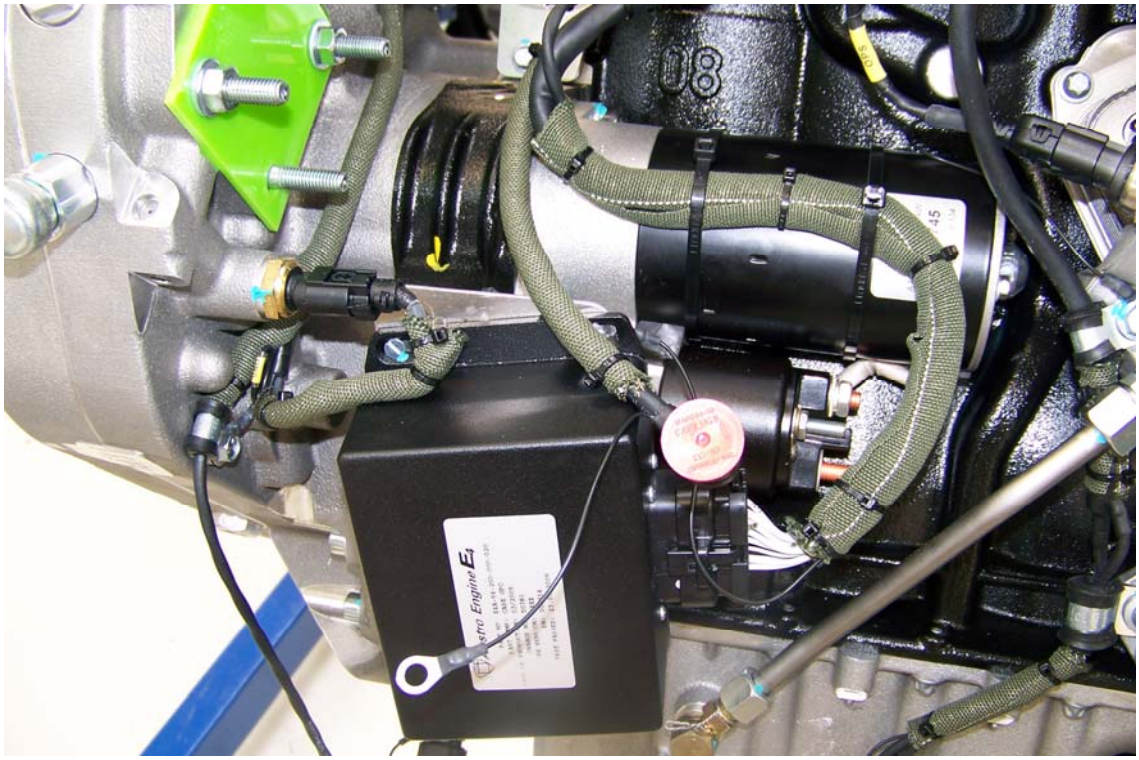


Fig. 71 - 23

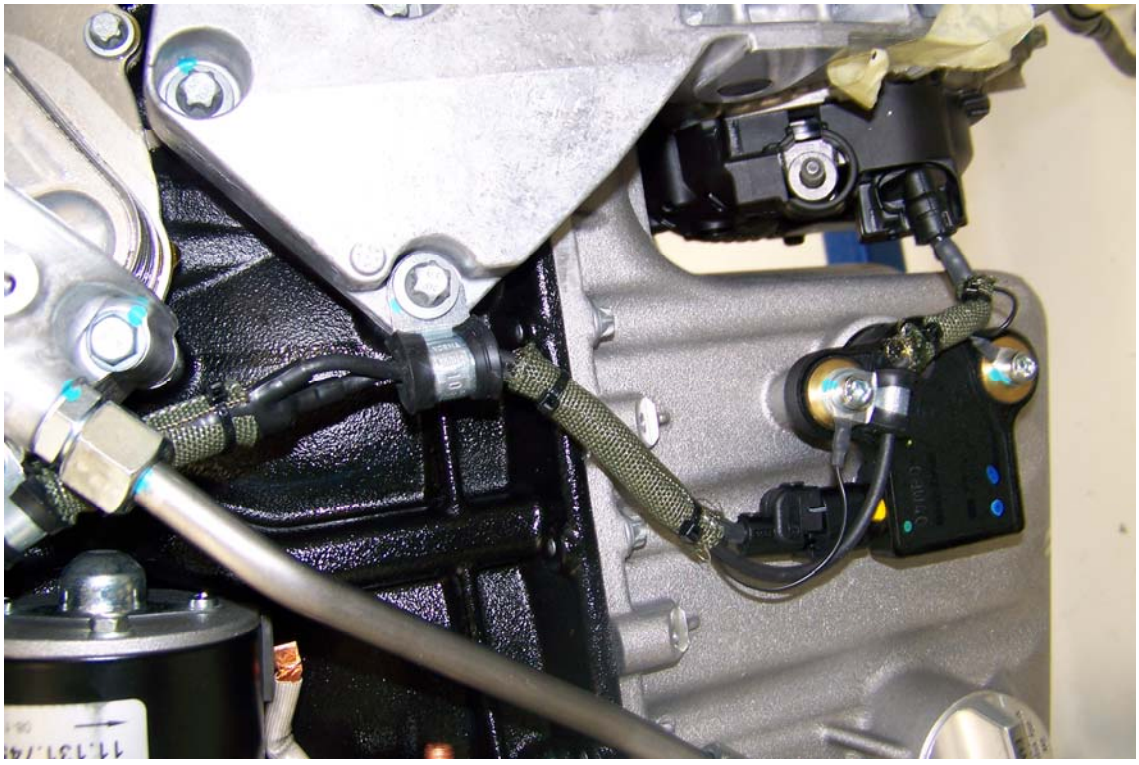


Fig. 71 - 24

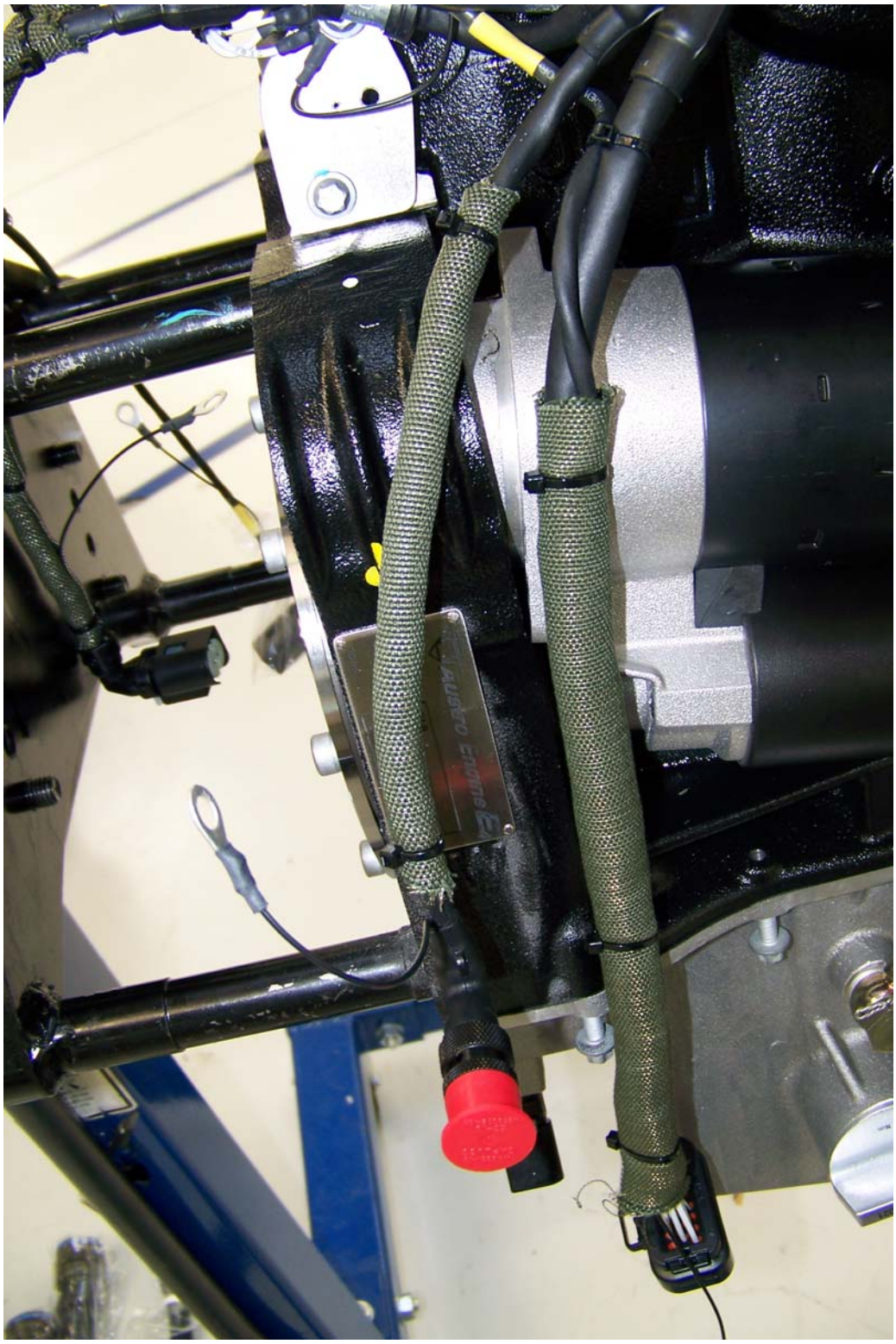


Fig. 71 - 25

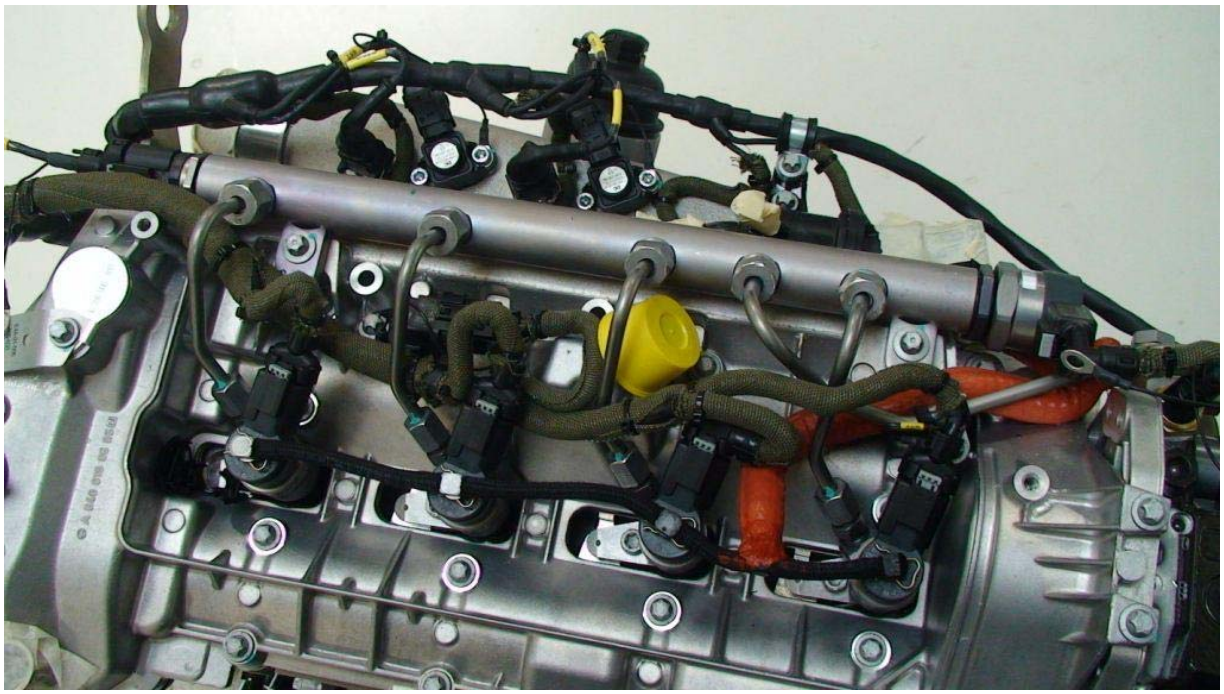


Fig. 71 - 26

Fig. 71 - 27

Fig. 71-27 shows the CORRECT mounting of the EPW wire.
Fix the cable by the usage of cable strap and mind a sufficient distance between cable and turbo charger case.

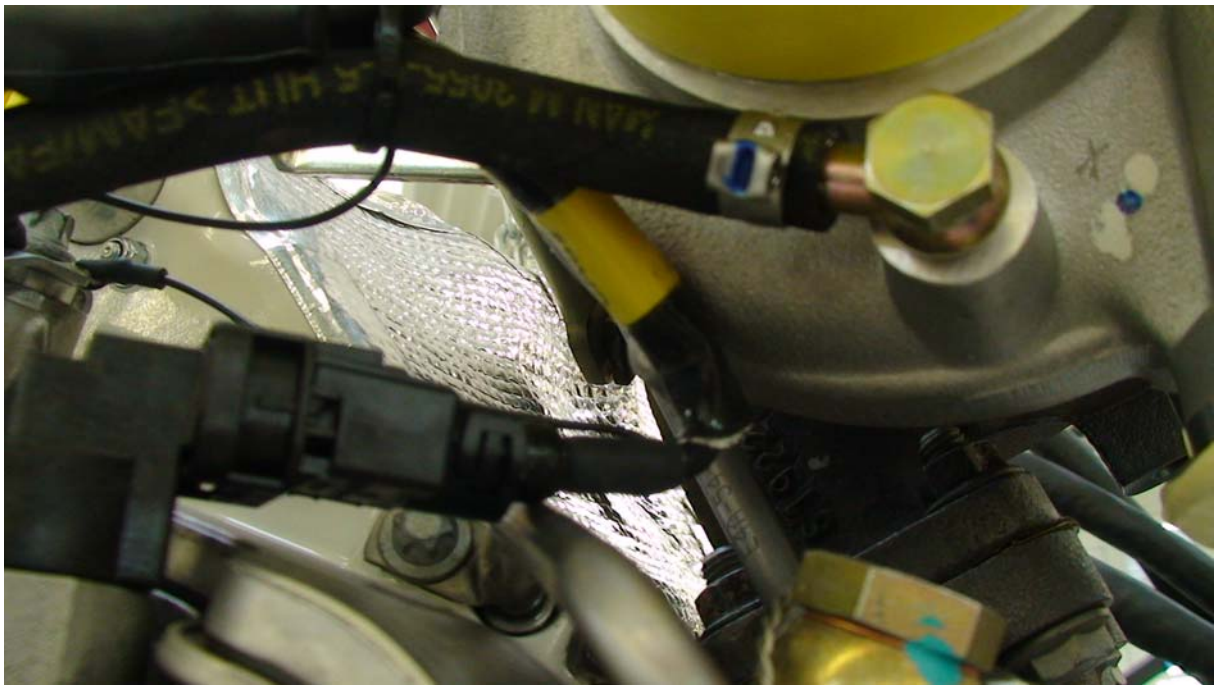


Fig. 71 - 28

Fig. 71 – 28 shows the WRONG mounting of the EPW wire.
Caution: The wire must not touch the turbo charger housing!

Fig. 71 - 29

Fig. 71 – 29 shows the laying and the fixing point of the shielding cable.

71-50-120 Engine Harness E4A-95-000-000 and E4B-95-000-000

Inspect the engine harness for chafing, damage or missing clamps.
In case of signs of wear or damage contact **Austro Engine GmbH** for further instructions.

Block diagram E4A

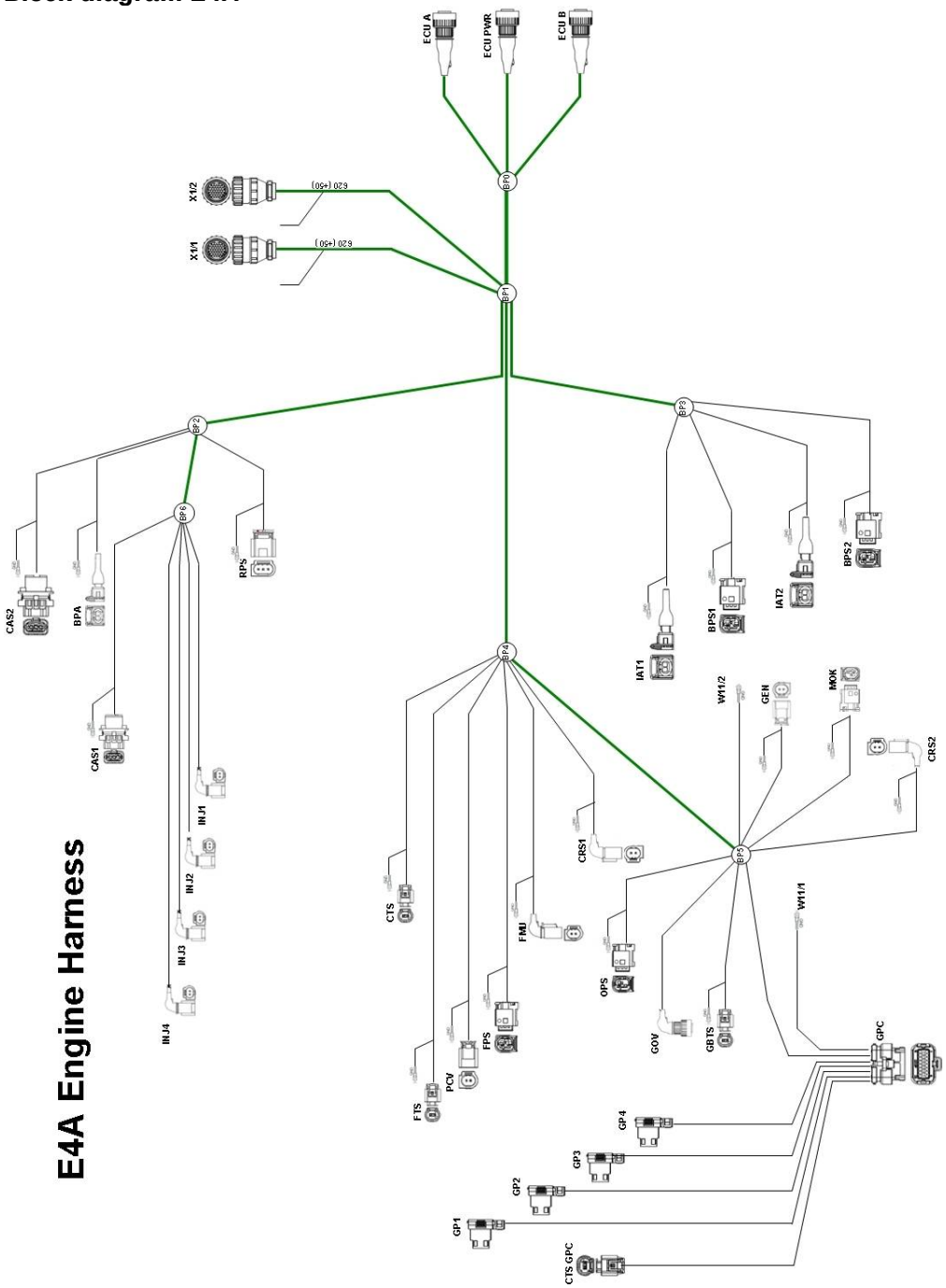


Fig. 71 - 30

Pay attention for correct interlocking and snapping of the plug and socket connections (e.g. ECU connector or Injector connector).

Block diagram E4B

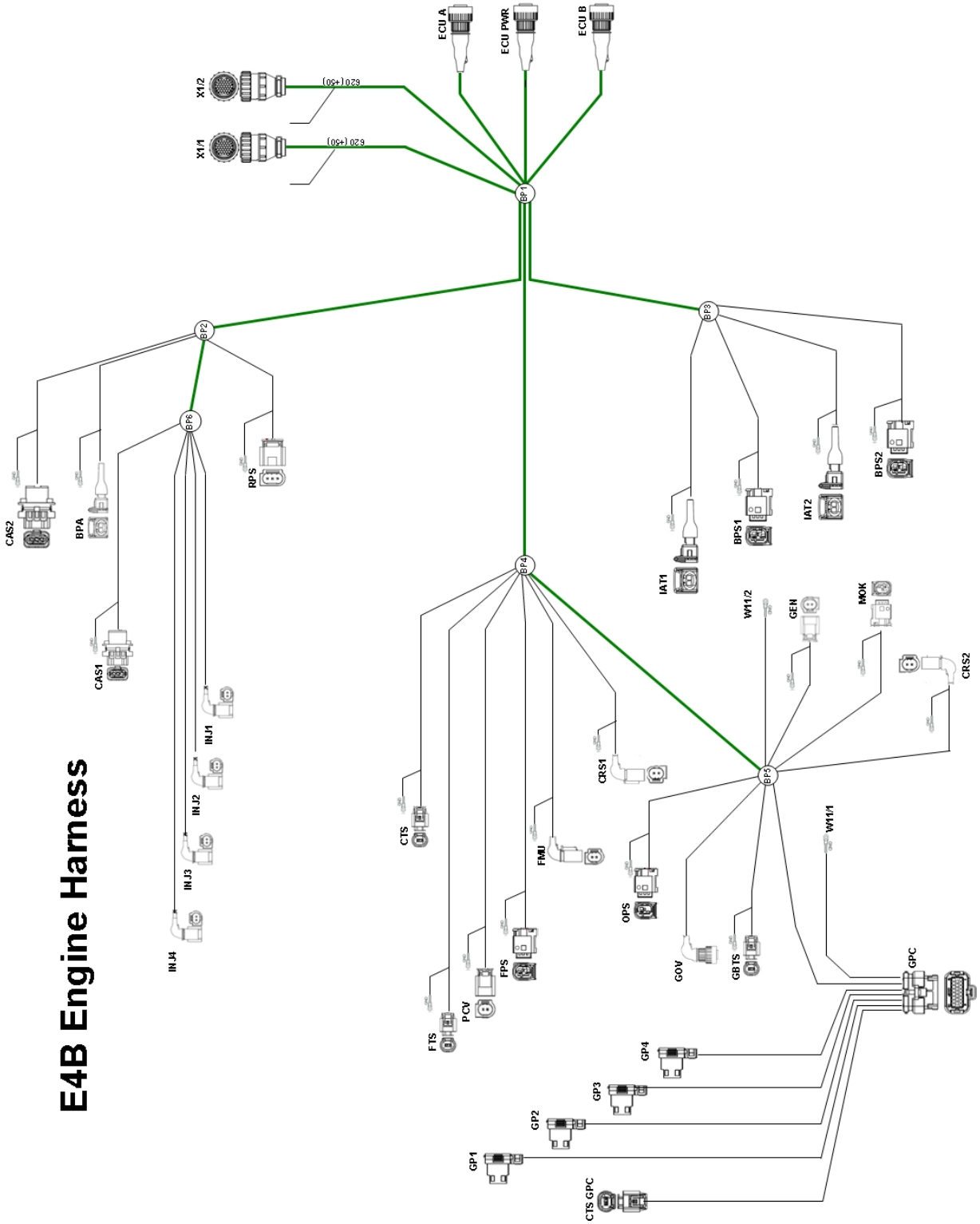


Fig. 71 - 31

71-50-130 Sensor – Check

The sensors have to be inspected for loosened, chafed or damaged connectors according to the attached list and schematic.
In case of signs of damage contact **Austro Engine GmbH** for further instructions.

71-50-140 Description Plug Connector Wiring Harness

Wiring diagram	Description long version	German description	
FPS	Fuel Pressure Sensor	Kraftstoffdrucksensor	
RPS	Rail Pressure Sensor	Raildrucksensor	
MOK	Oil Combinant Sensor Temperature	Kombinierter Ölsensor Temperatur	
BPS1	Boost Pressure Sensor 1	Ladedrucksensor	
BPS2	Boost Pressure Sensor 2	Ladedrucksensor	
OPS	Oil Pressure Sensor	Öldrucksensor	
IAT 1	Intake Air Temperature 1	Ladelufttemperatursensor	
IAT 2	Intake Air Temperature 2	Ladelufttemperatursensor	
CTS	Coolant Temperature Sensor	Kühlwassertemperatur	
GBTS	Gearbox Temperatur Sensor	Getriebetemperatursensor	
CTS_GPC	GPC Coolant Temperature	Kühlwassertemperatursensor GPC	
FTS	Fuel Temperature Sensor	Kraftstofftemperatursensor	
CAS 1	Camshaft Sensor 1	Nockenwellensensor	X)
CAS 2	Camshaft Sensor 2	Nockenwellensensor	
ECU A	ECU A	ECU A Stecker	
ECU PWR	ECU Power	ECU Power Stecker	
ECU B	ECU B	ECU B Stecker	
GEN	Alternator Plug	Alternator Stecker	
GPC	GPC Connector	GPC Stecker	
CRS 1	Crankshaft Sensor 1	Kurbelwellensensor 1	
CRS 2	Crankshaft Sensor 2	Kurbelwellensensor 2	
GOV	Governor Actuator	Governor	
GPC	Glow Plug Control	GPC Glow Plug Control	
GP 1	Glow Plug 1	Glühkerze 1	
GP 2	Glow Plug 2	Glühkerze 2	
GP 3	Glow Plug 3	Glühkerze 3	
GP 4	Glow Plug 4	Glühkerze 4	
W11 / 1	Ground Connection GPC	Masse Verbindung für GPC	
W11 / 2	Ground Connection Governor	Masse Verbindung für Governor	
X1/1	CPC 1 A/C Interface 1	CPC 1	
X1/2	CPC 2 A/C Interface 2	CPC 2	
BPA	Boost Pressure Actuator	EPW	
PCV	Pressure Control Valve	Druckregelventil Rail	
INJ 1	Fuel Injector 1	Injektor	X)
INJ 2	Fuel Injector 2	Injektor	X)
INJ 3	Fuel Injector 3	Injektor	X)
INJ 4	Fuel Injector 4	Injektor	X)
FMU	Fuel Metering Unit	Zumesseinheit	

X) This Sensors can only be checked all 300h if the Injector cover is removed.

71-50-150 Material and saving material for the E4A Engine wiring harness

Pos	Teilenummer	Bezeichnung	St	Drehmoment in Nm	Werkzeug	Sicherung
01	E4A-95-000-000	LU Kabelbaum	1			
02	DIN3016-W1-DM28-20	Schelle 28	1			
03	DIN3016-W1-DM 22x15	Schelle 22	2			
04	DIN3016-W3-DM 8x15	Schelle 8	1			
05	PLT4S-M30	Kabelbinder	25			
06	E4A-90-100-808	Edge Clip	3			
07	E4A-90-000-809	Edge Clip	5			
08	50266513	Edge Clip	3			
09	E4A-90-100-801	Schraube	2	5		
10	E4A-95-100-000	Assy Shielding Fuel Pressure	1			

71-50-160 Material and saving material for the E4B Engine wiring harness

Pos	Teilenummer	Bezeichnung	St	Drehmoment in Nm	Werkzeug	Sicherung
01	E4B-95-000-000	LU Kabelbaum	1			
02	DIN3016-W1-DM28-20	Schelle 28	1			
03	DIN3016-W1-DM 22x15	Schelle 22	2			
04	DIN3016-W3-DM 8x15	Schelle 8	1			
05	PLT4S-M30	Kabelbinder	25			
06	E4A-90-100-808	Edge Clip	3			
07	E4A-90-000-809	Edge Clip	5			
08	50266513	Edge Clip	3			
09	E4A-90-100-801	Schraube	2	5		
10	E4A-95-100-000	Assy Shielding Fuel Pressure	1			

71-50-170 E4 Engine Harness mounting instruction

On the following pages the mounting of the engine harness is described in detail. The mounting instruction is identical for both versions of E4 engine harness (E4A-95-000-000 and E4B-95-000-000).

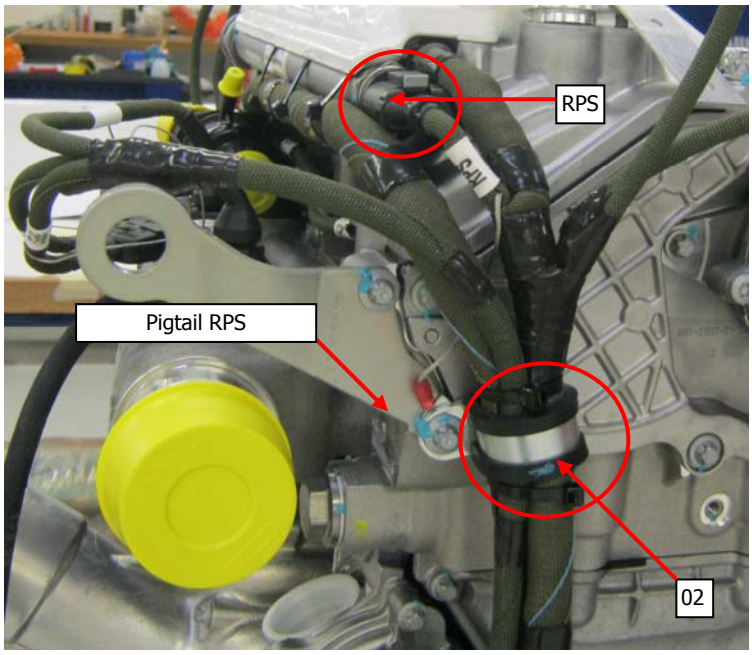


Fig. 71 - 32

A clamp which is mounted to the lifting eyelet (12 Nm) is used for fixation wiring harness and RPS pigtail as shown at Fig. 71 -32.

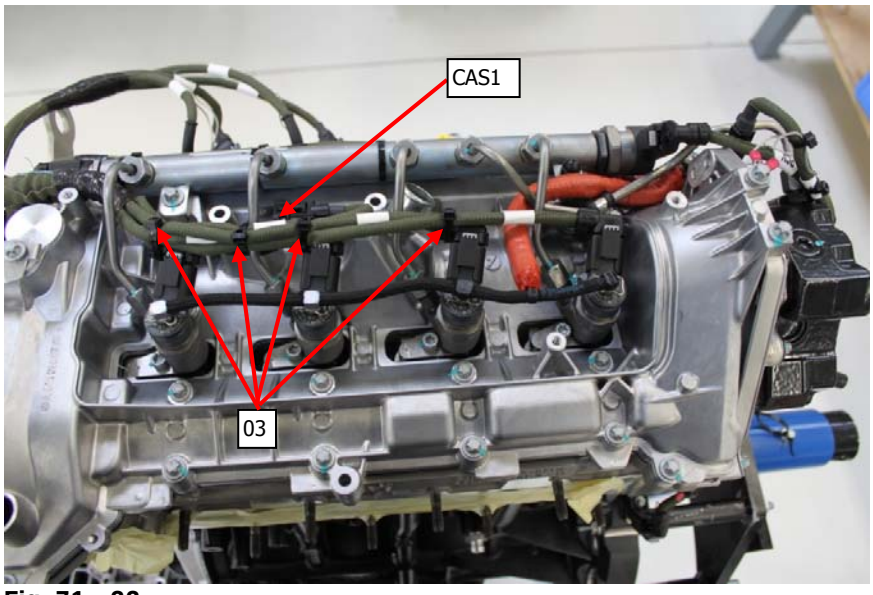


Fig. 71 - 33

The wiring harness has to be placed above the pipes for each injector. CAS1 pigtail has to be connected to the fastening screw (14 Nm) of CAS1.
The wiring harness has to be fixed with cable ties 05 in the near of injector plug.

Fig. 71 - 34

Fig. 71 - 35

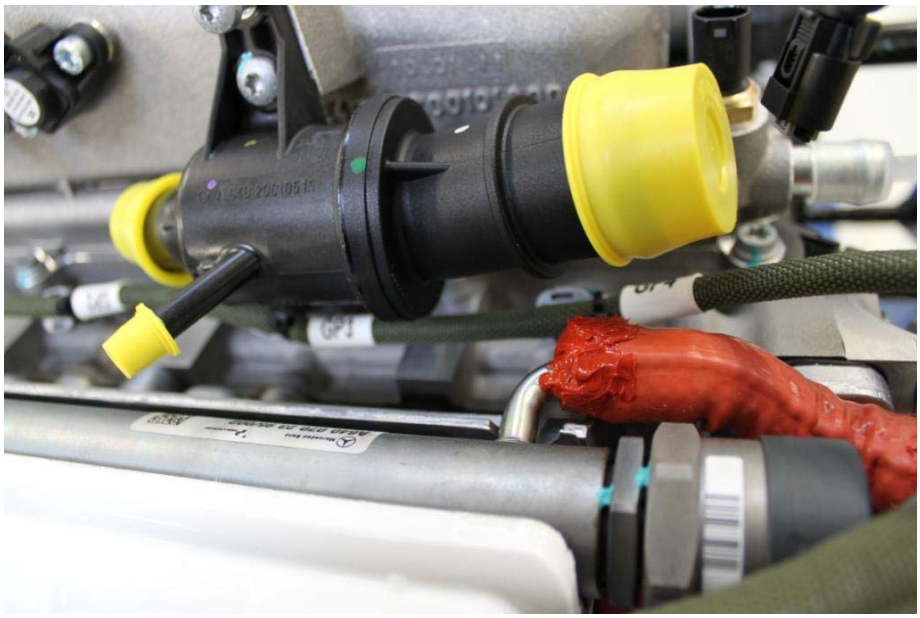


Fig. 71 - 36

The branch for the glow plugs shall be placed behind the thermostat as shown at Fig. 71 - 34, Fig. 71 – 34 and Fig. 71 – 36.

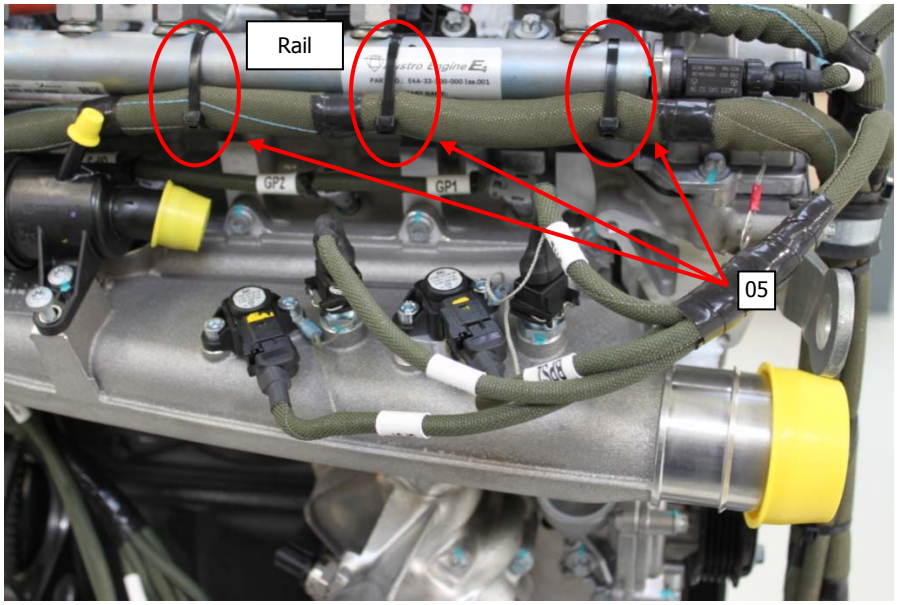


Fig. 71 - 37

The wiring harness has to be placed on the rail and fixed with 3 cable ties 05 .
It has to be ensured that the branches and cable ties do not constrain the mounting of the injector cover.

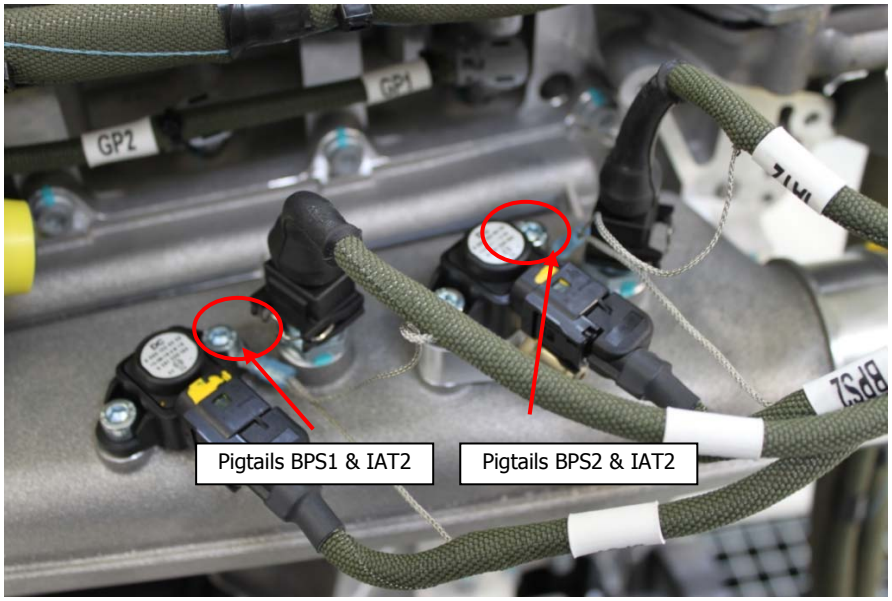


Fig. 71 - 38

The mounting screws (5 Nm) of sensors, BPS 1 and BPS 2 shall be used to connect the pigtails of IAT 1, IAT 2, BPS 1 and BPS 2 with the intake air manifold.

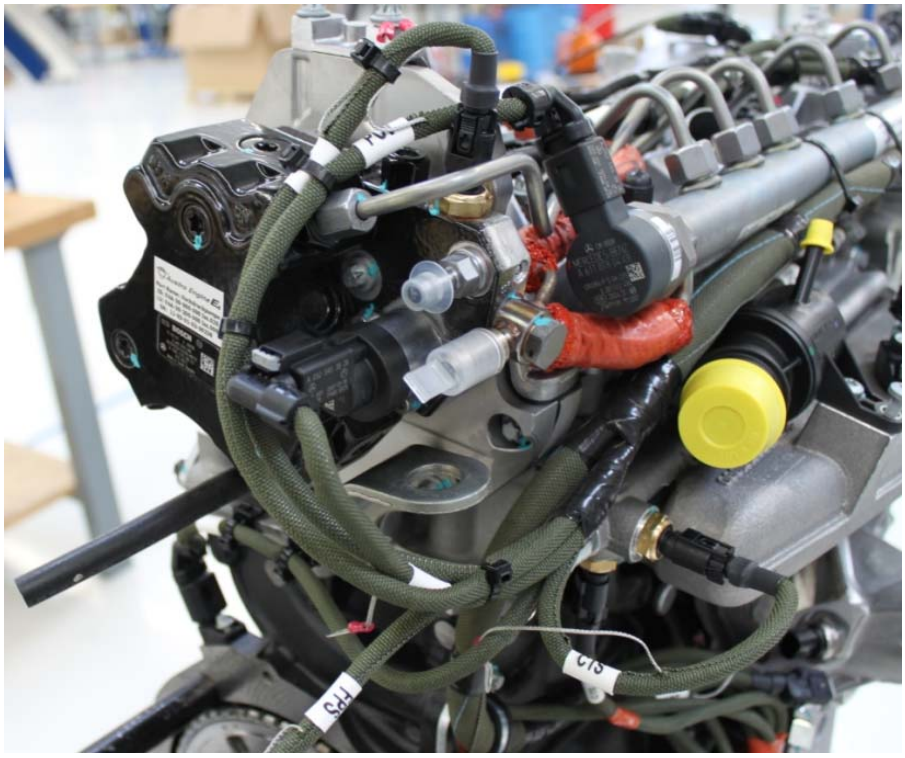


Fig. 71 - 39

It has to be insured that the engine wiring branch hat to be placed as shown at Fig. 71 – 39.

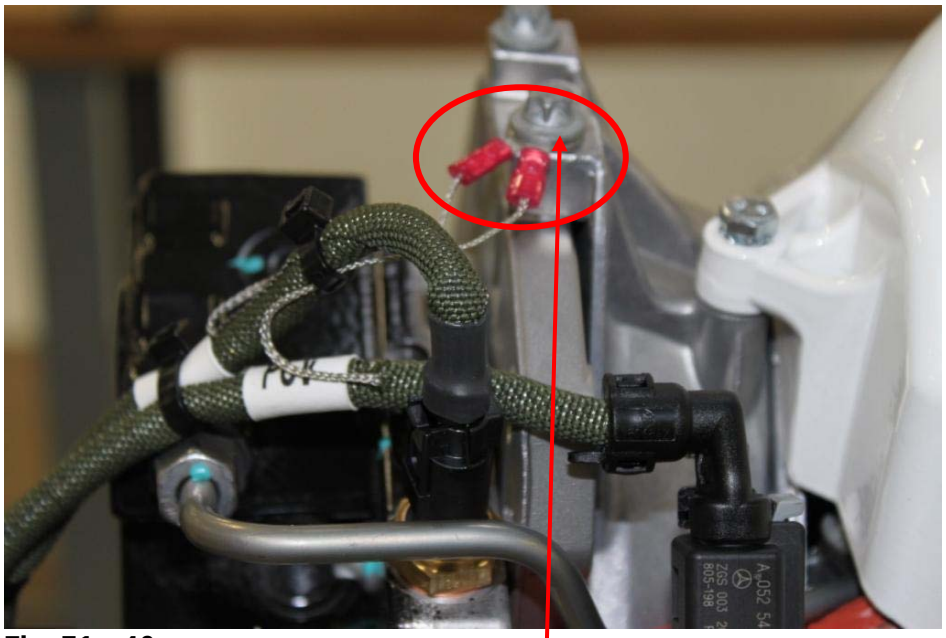


Fig. 71 - 40

The pigtails of FTS and PCV have to be screwed (12 Nm) as shown at Fig. 71 – 40.

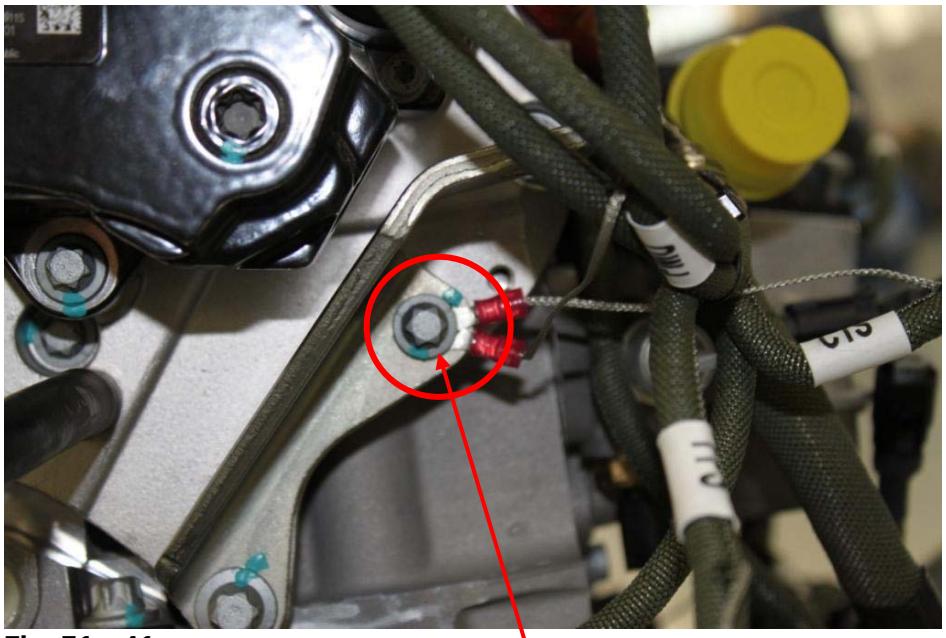


Fig. 71 - 41

The pigtails of FMU and CTS have to be screwed (12 Nm) to the lifting eyelet shown at Fig. 71 – 41.

CAUTION

For the engine harness E4A-95-000-000 and E4B-95-000-000 the fuel pressure sensor (FPS) and fuel pressure sensor cable have to be covered by an additional shielding (E4A-95-100-000), which is provided with the engine if applicable.

If the engine harness E4A-90-000-000 is installed this procedure is not applicable.

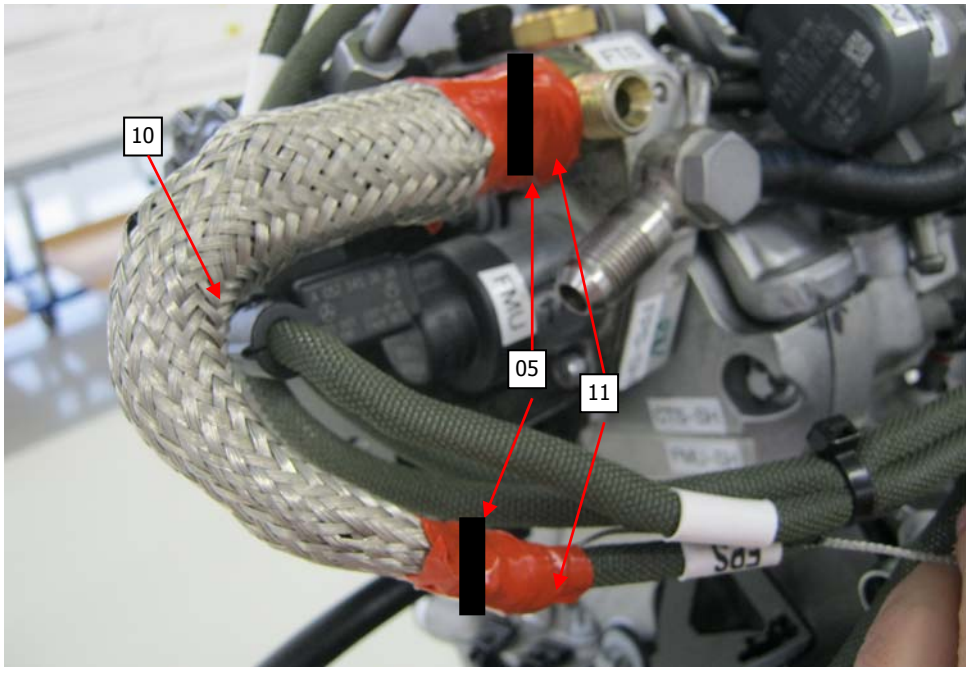


Fig. 71 - 42

Fuel pressure sensor and the fuel pressure sensor cable have to be equipped with an additional shielding as shown in picture Fig. 14. 2. Therefore cover the fuel pressure sensor and fuel pressure sensor cable with a netting [10], RAY-90-25.0 with the length of 180mm. At each end of the netting a cable tie [05] is used to fix the netting. At each end of the netting a tape [11] can be used to avoid splicing.

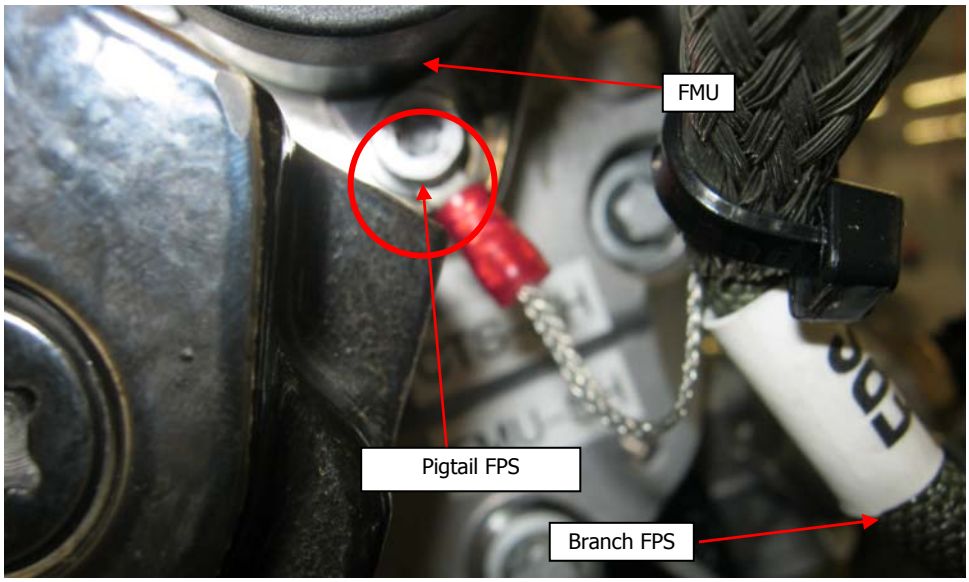


Fig. 71 - 43

The pigtail connector of FPS has to be connected to the mounting screw of the FMU as shown at Fig. 71 – 43

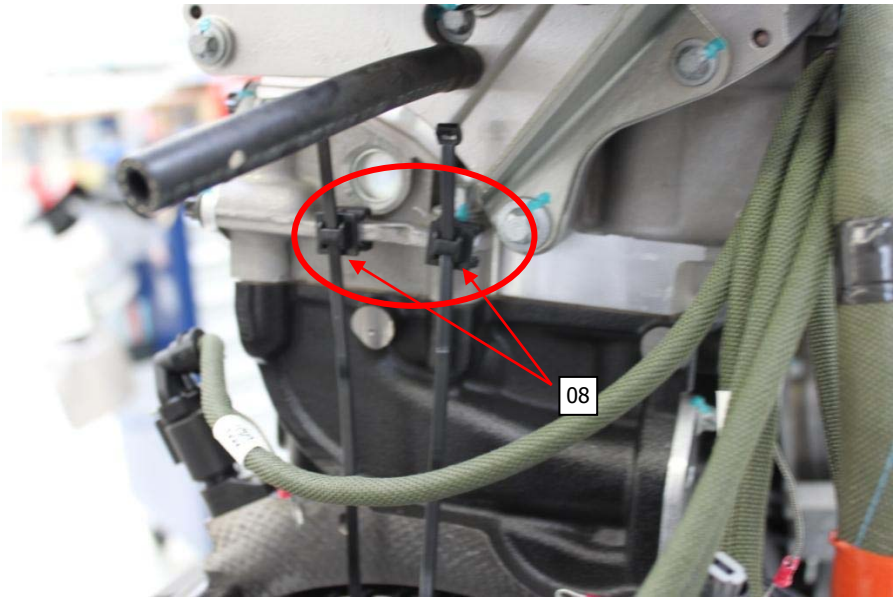


Fig. 71 - 44

For fixation the branch of CRS1 sensor the edge clips 08 has to be placed as shown at Fig. 71 – 44.

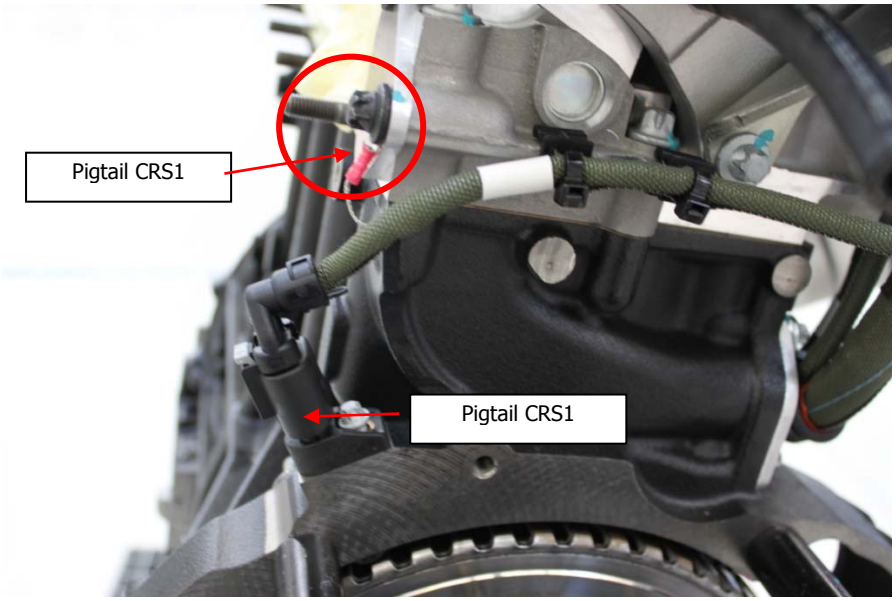


Fig. 71 - 45

The pigtail of CRS1 (crankshaft sensor) has to be connected to the screw of EGR cover (21 Nm).
The edge clips shall be used to fix the branch of CRS1.

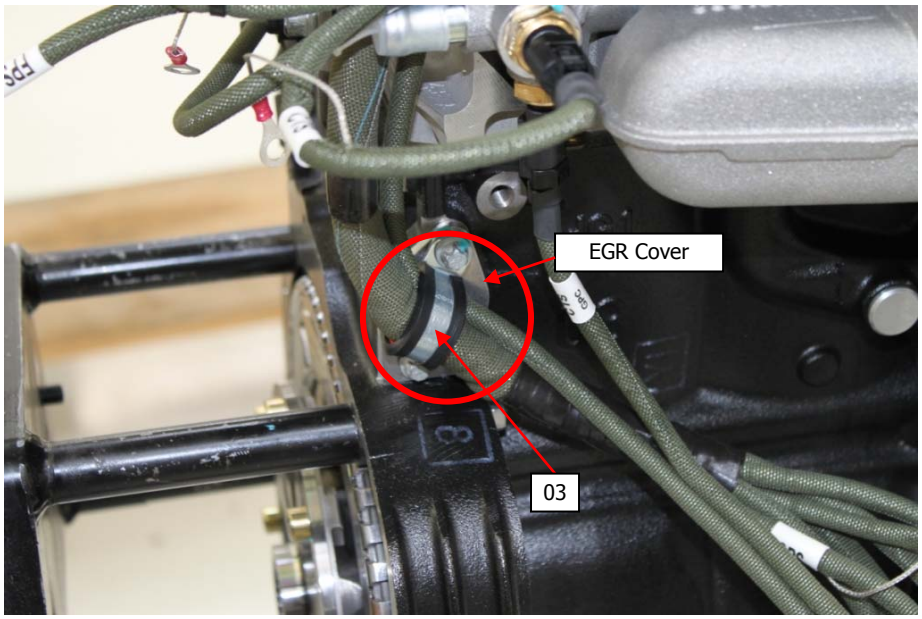


Fig. 71 - 46

The engine harness has to be fixed (9 Nm) with a clamp 03 to the EGR cover. The rest of the branch located in that area are fixed after starter, gearbox and GPC are mounted.

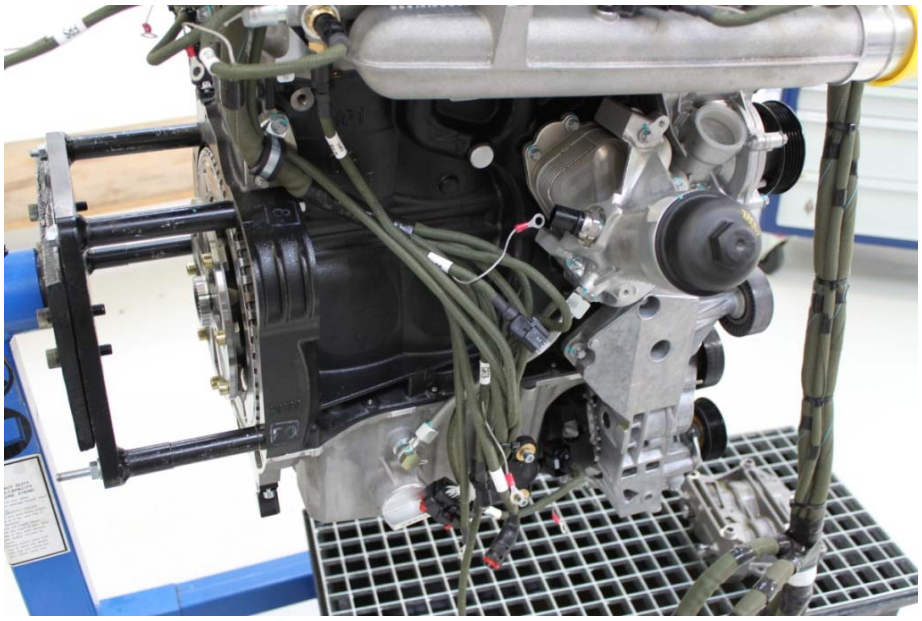


Fig. 71 - 47

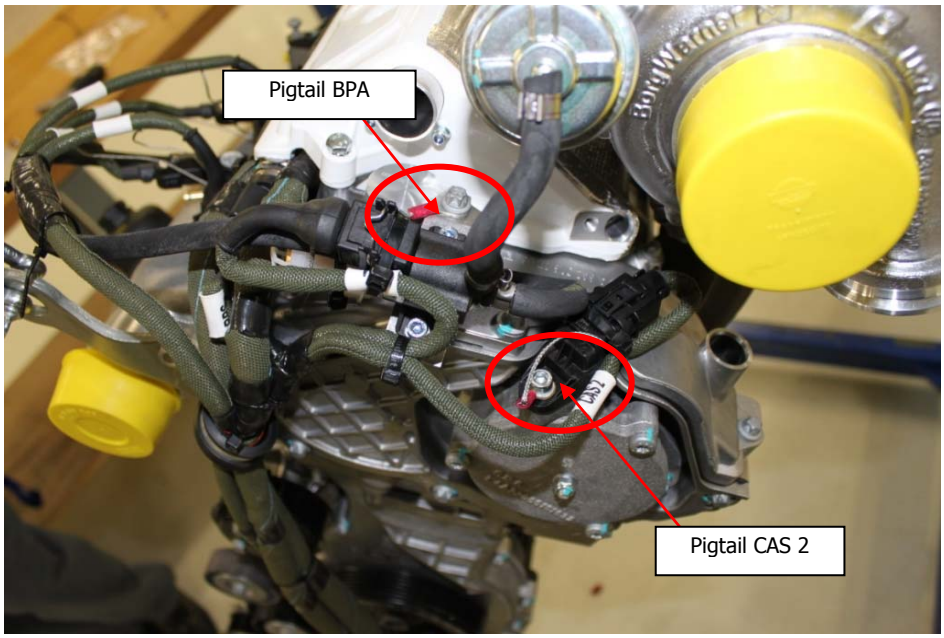


Fig. 71 - 48

Pigtail of CAS2 has to be connected sensor mounting screw (12 Nm), pigtail of BPA has to be connected to injector cover plate (9Nm), as shown at Fig. 71 -48.
Branch of CRS2 has to be placed as shown on picture above. Ensure that the branch is not in contact with the turbo charger.

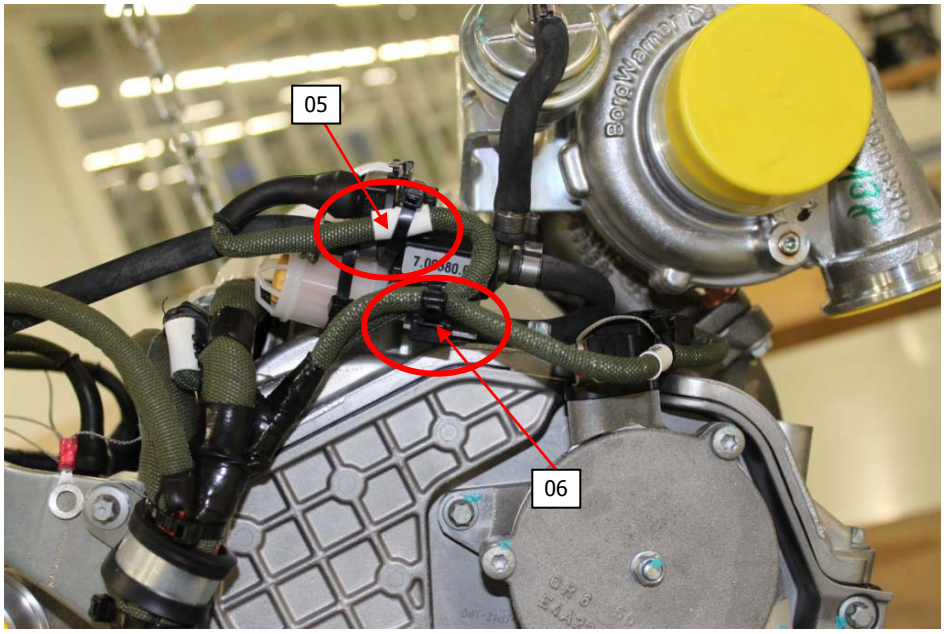


Fig. 71 - 49

The branch of EPW and CAS2 has to be fixed with edge clip [06] and cable tie [05] as shown at Fig. 71 – 49.

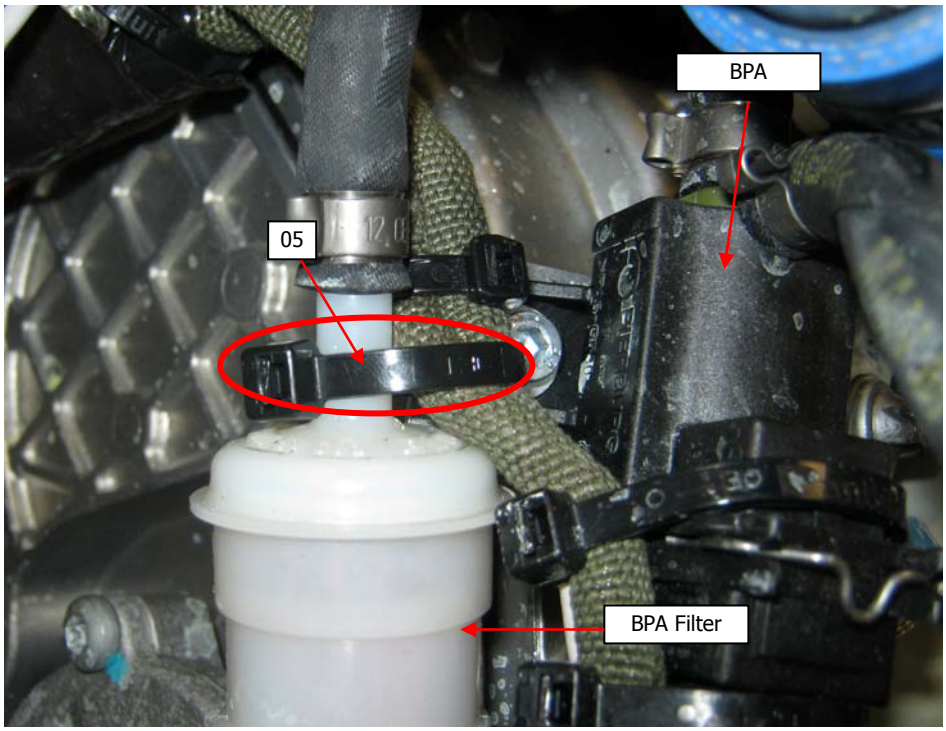


Fig. 71 - 50

BPA filter has to be fixed with a cable tie [05] as shown at Fig. 71 – 50.
Only the connector adapter (of PBA filter) is allowed to be used for fixation with the cable tie.

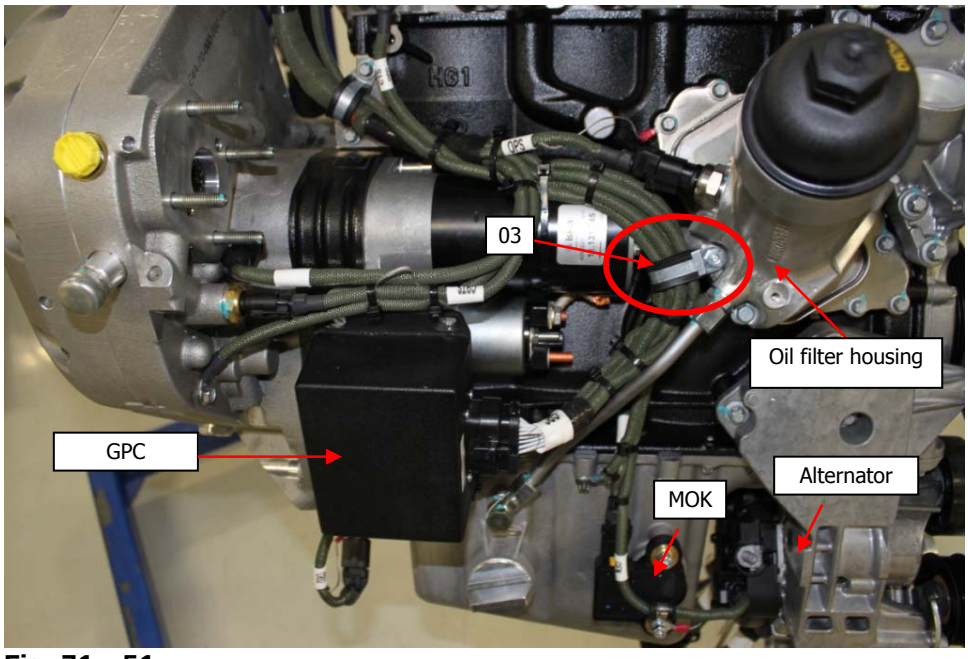


Fig. 71 - 51

The branch of GPC, MOK and GEN, CRS2 has to be fixed with a clamp [03] to the oil filter housing screws (8 Nm).

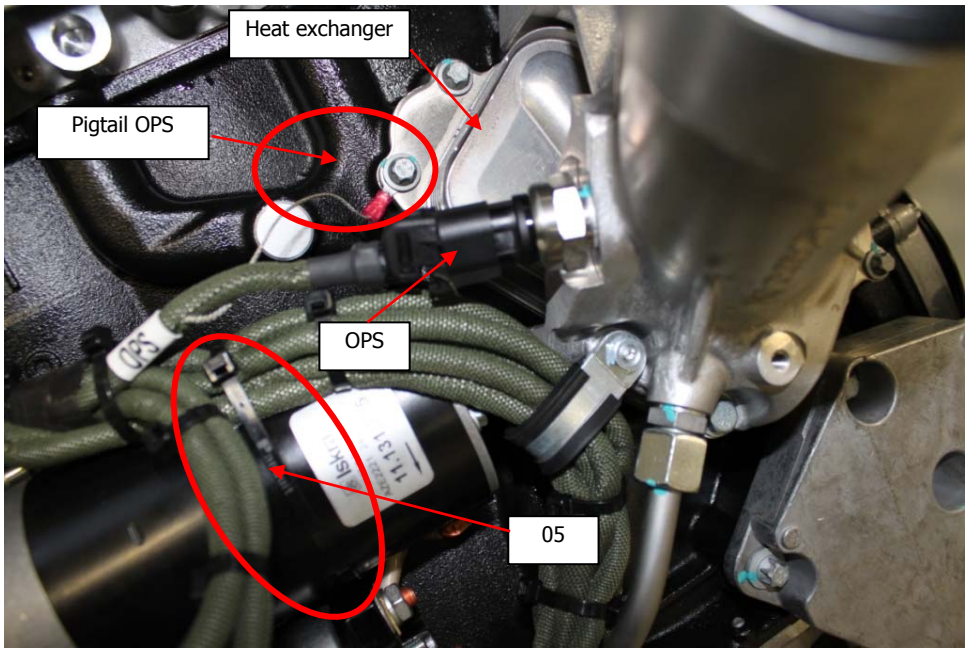


Fig. 71 - 52

The pigtail of OPS has to be connected to the heat exchanger (9 Nm). The engine harness has to be fixed with cable tie [05] to the starter.

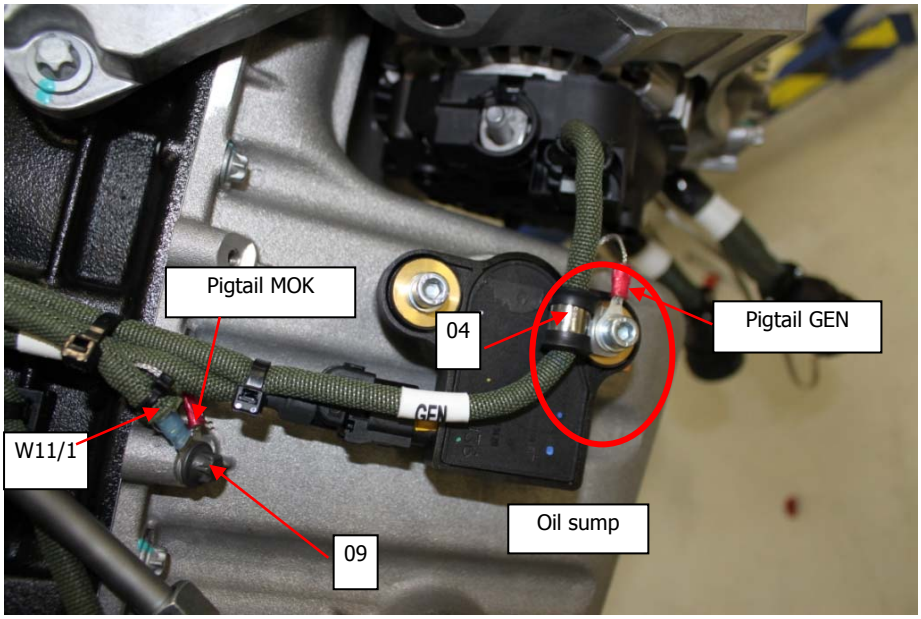


Fig. 71 - 53

Clamp [04] is used for fixation the branch of GEN. The screw of MOK which is used for mounting the clamp shall also be used to connect the pigtail of GEN (5 Nm). W11/1 loop and pigtail of MOK have to be connected to the screw of the oil sump (5 Nm).

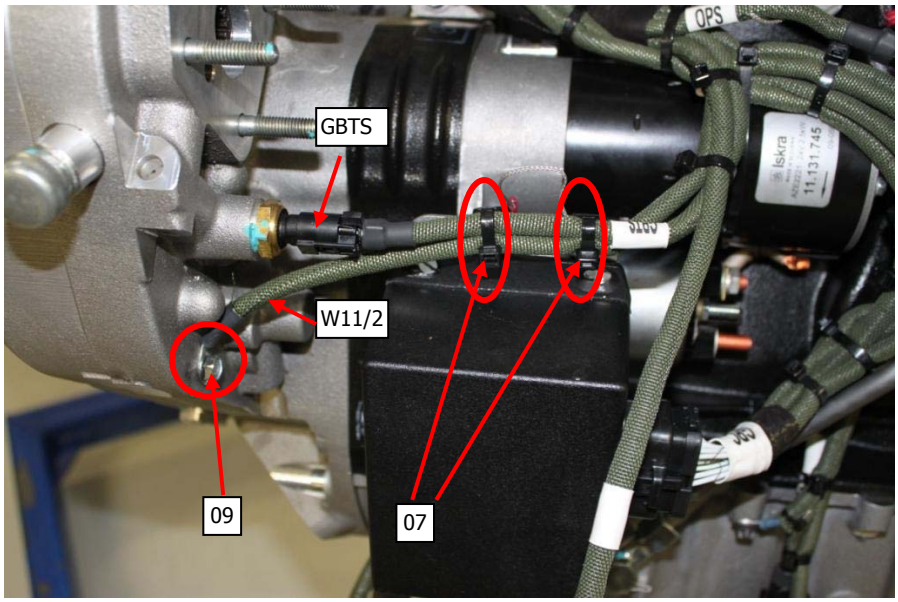


Fig. 71 - 54

2 edge clips have to be mounted to the GPC holder. The edge clips shall be used for fixation the branch of GBTS and W11/2 as shown at Fig. 71 – 54.

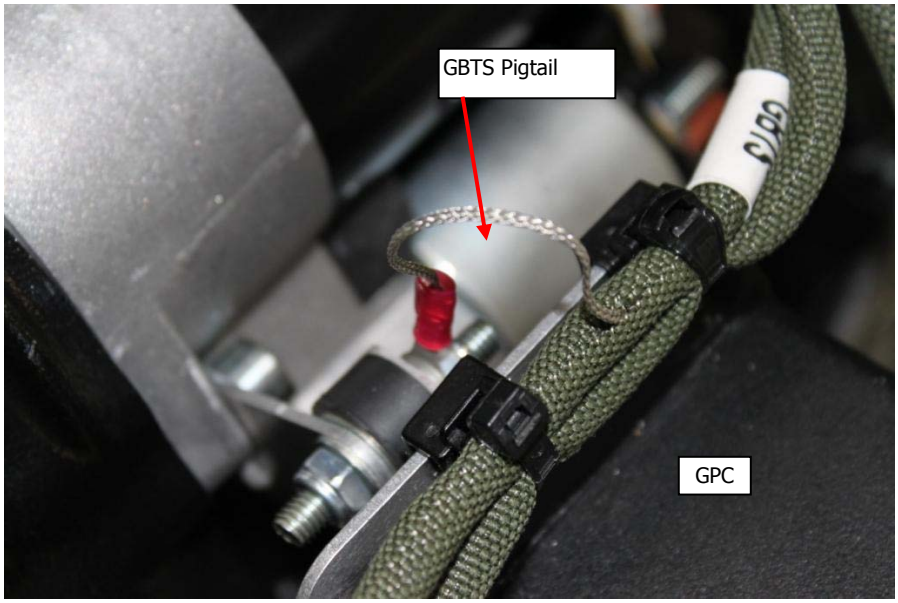


Fig. 71 - 55

The pigtail of GBTS has to be connected to the GPC holder screw (10 Nm) as shown at Fig. 71 – 55.

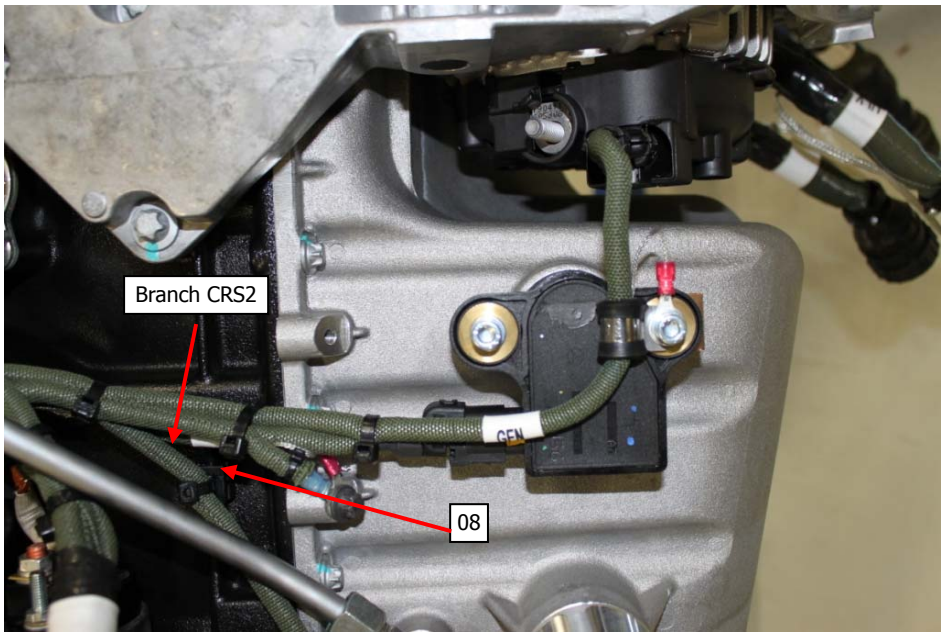


Fig. 71 - 56

One edge clip [08] has to be mounted as shown at Fig. 71 – 56.
It shall be used to fix the branch of CRS2.

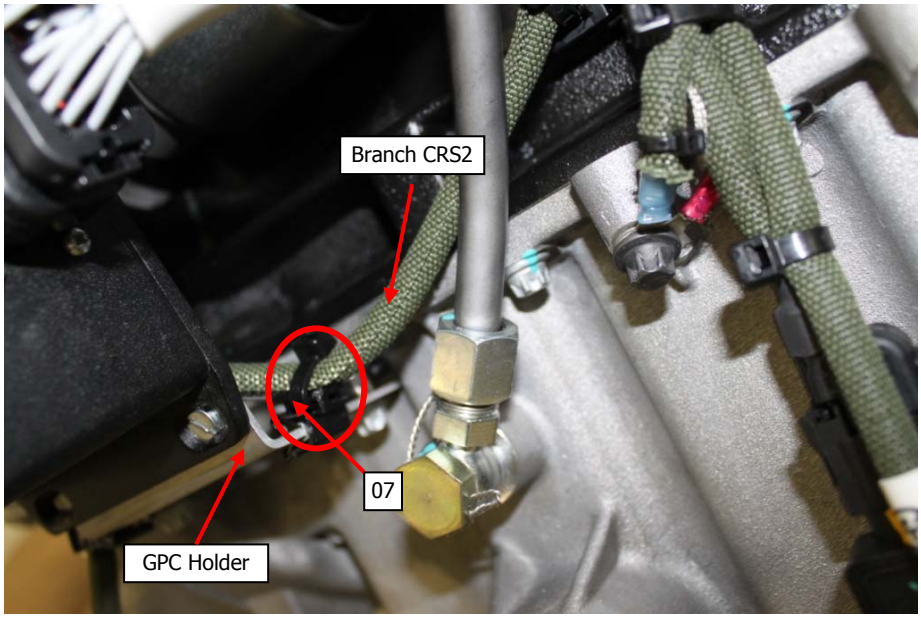


Fig. 71 - 57

One edge clip [07] has to be mounted as shown at Fig. 71 – 57.
It shall be used to fix the branch of CRS2.

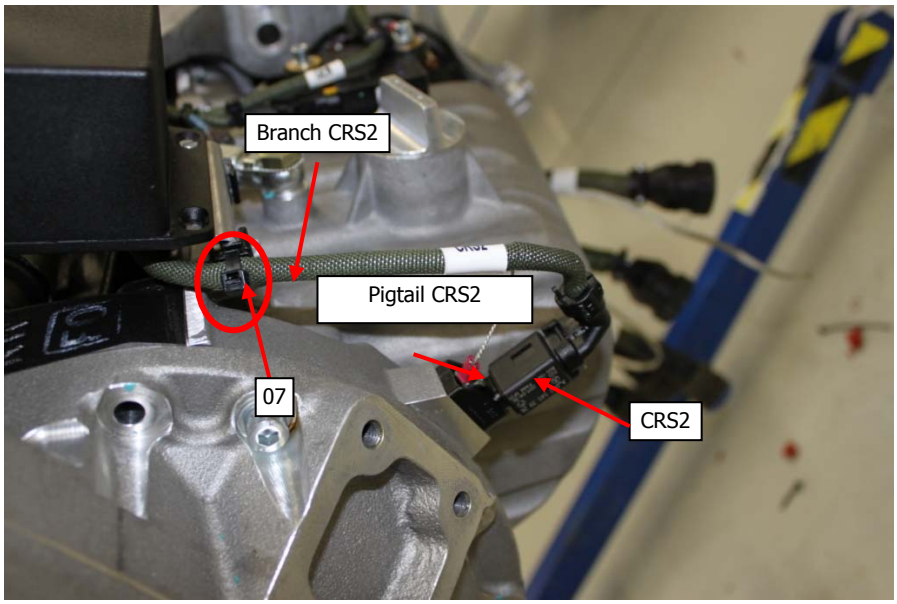


Fig. 71 - 58

One edge clip [07] has to be mounted as shown at Fig. 71 – 58. It shall be used to fix the branch of CRS2. The pigtail of CRS2 has to be connected to the screw (11 Nm) of CRS2.

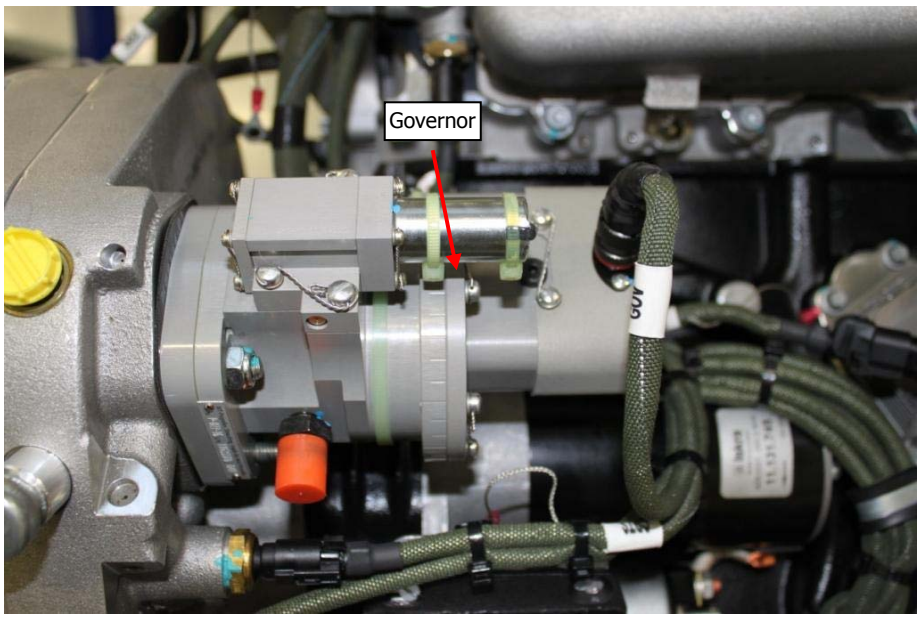


Fig. 71 - 59

The governor pigtail is included to the bayonet connector GOV. No additional screwing of pigtail is therefore needed.

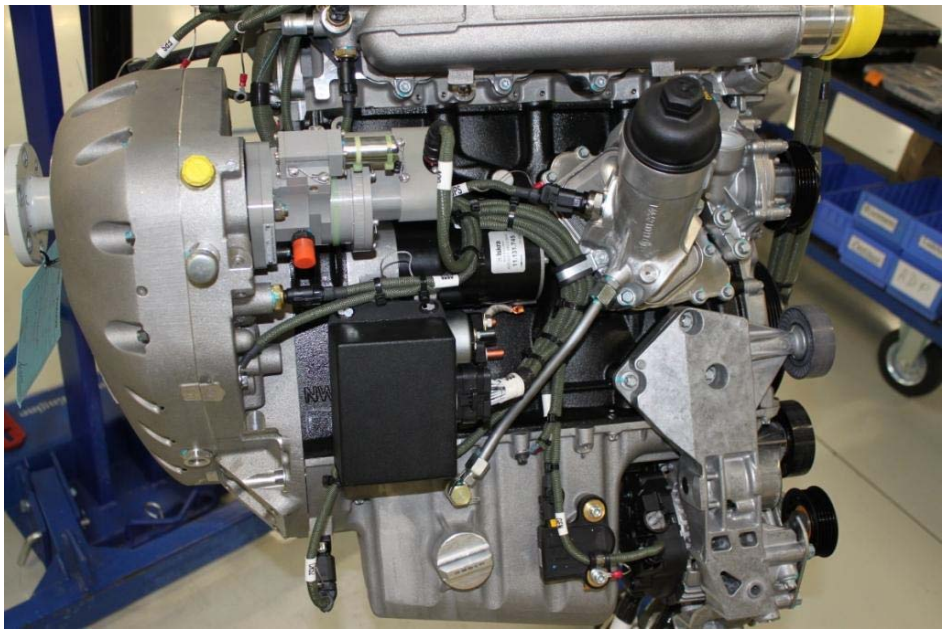


Fig. 71 - 60

The installer of the engine harness is allowed to use the same cable tie type for additional fixation, if the described fixation points are not sufficient. It has to be ensured by installer that the additional cable ties are not directly mounted to driven or hot parts of the engine.

If it is required the installer is allowed to use cable ties 05 and Edge Clips (06; 07; 08) to fix the engine harness additional. In such a case of an additional fixation with the described materials it has to be ensured that the branches with the used materials are not attached to hot areas.

71-50-180 Fastening point in the aircraft (E4A-90-000-000)

The wiring harness has to be fixed at several points to avoid harness damage.
Fixing points are marked in Fig 71.-.61, Fig. 71.-.62 and Fig. 7 - 63.

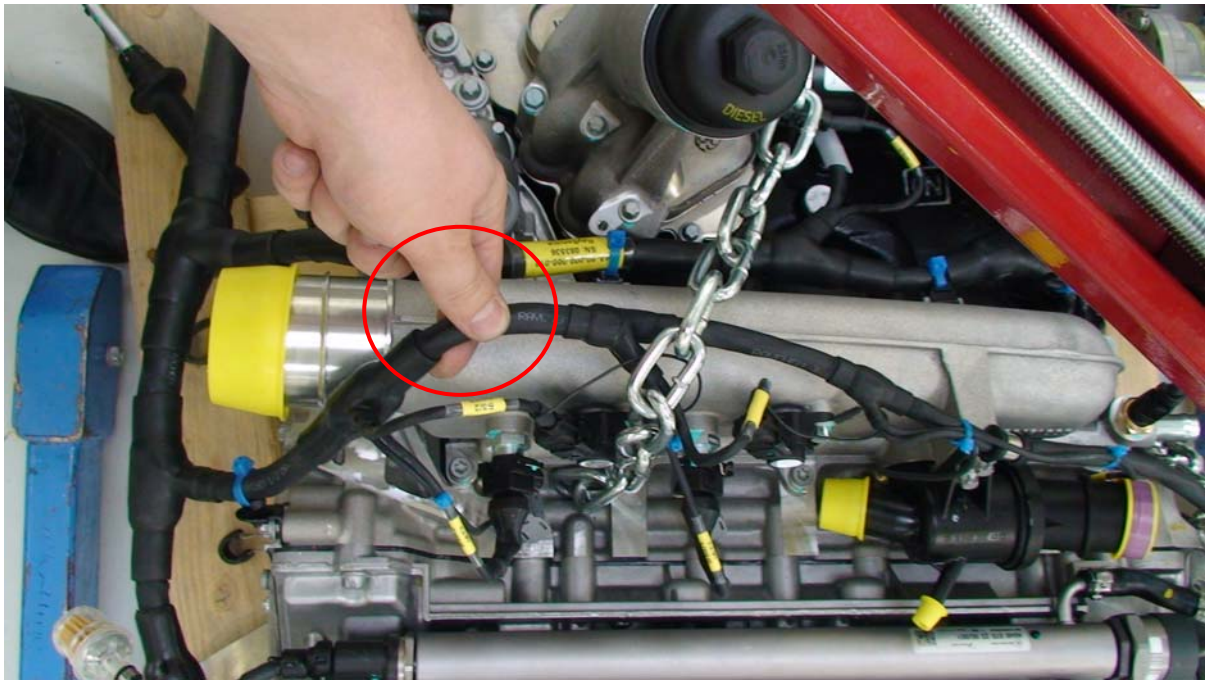


Fig. 71 - 61

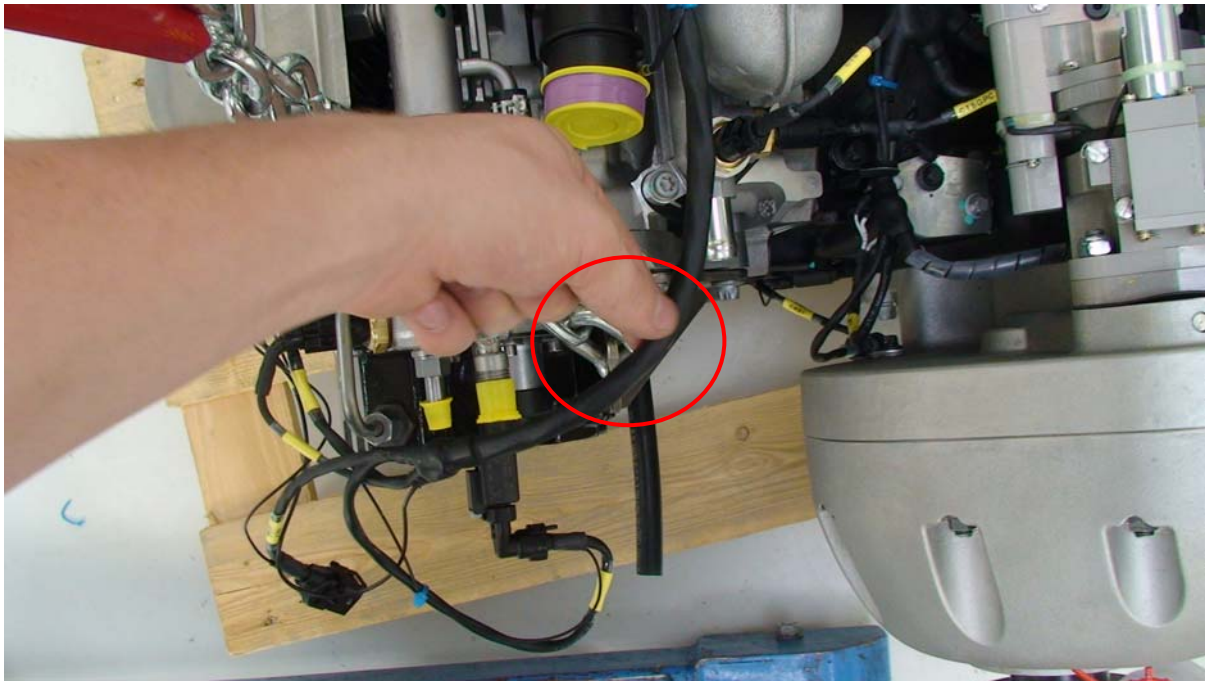


Fig. 71 - 62

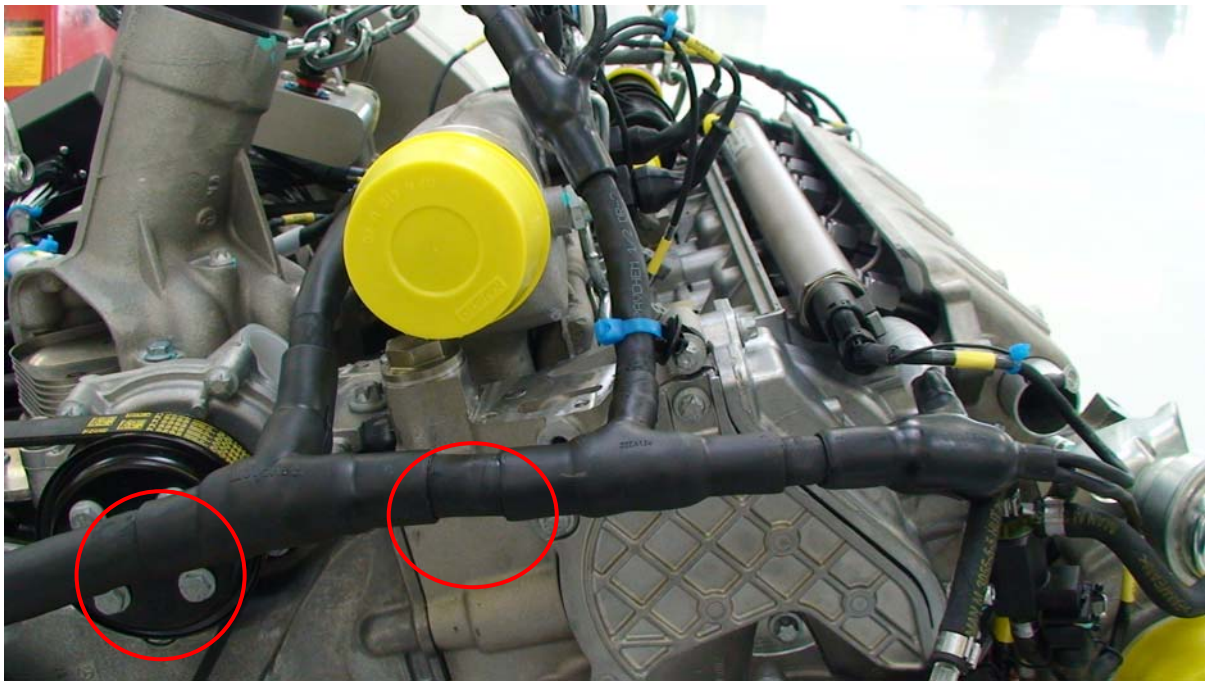


Fig. 71 - 63

71-50-190 Remove the wiring harness

CAUTION

DISCONNECT the power source prior to the remove of the wiring harness.

- Remove the Injector Cover – refer to Chapter 85-00-11 Removal of the Injector Cover.
- Remove all clamps. (Pos. 03, 04, 05, 09, 11, 12).
- Remove the cable strap from the Edge Clip (Pos.10) and the starter motor.
- Disconnect the shielding cable.
- Disconnect the wiring harness from all electrical equipment which is connected to the harness. Start on the right gearbox side.
- The harness can be removed.

Each connector is locked. Release the lock before disconnect the plugs.

For example some locking-systems are shown.

Connectors locked | Connectors unlocked

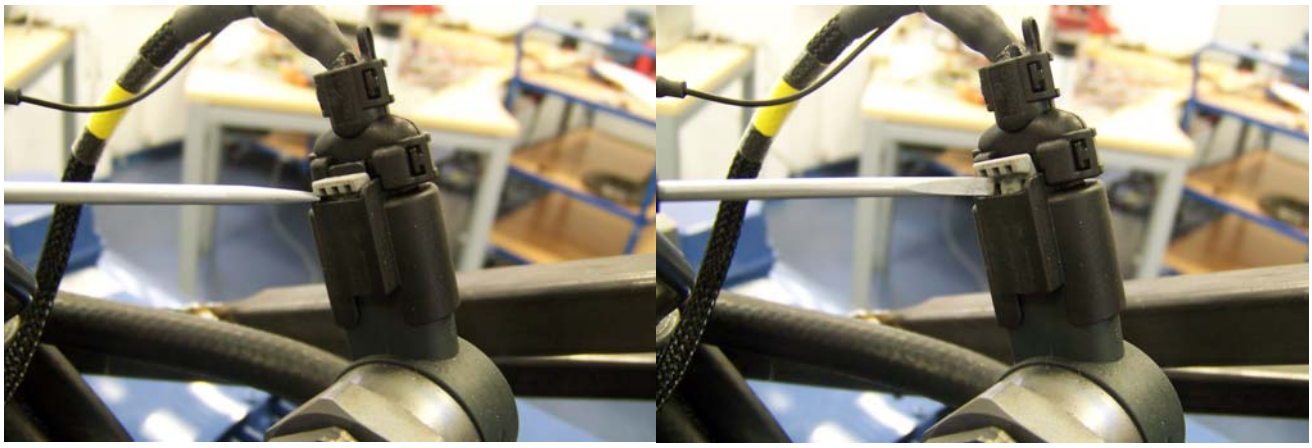


Fig. 71 - 64

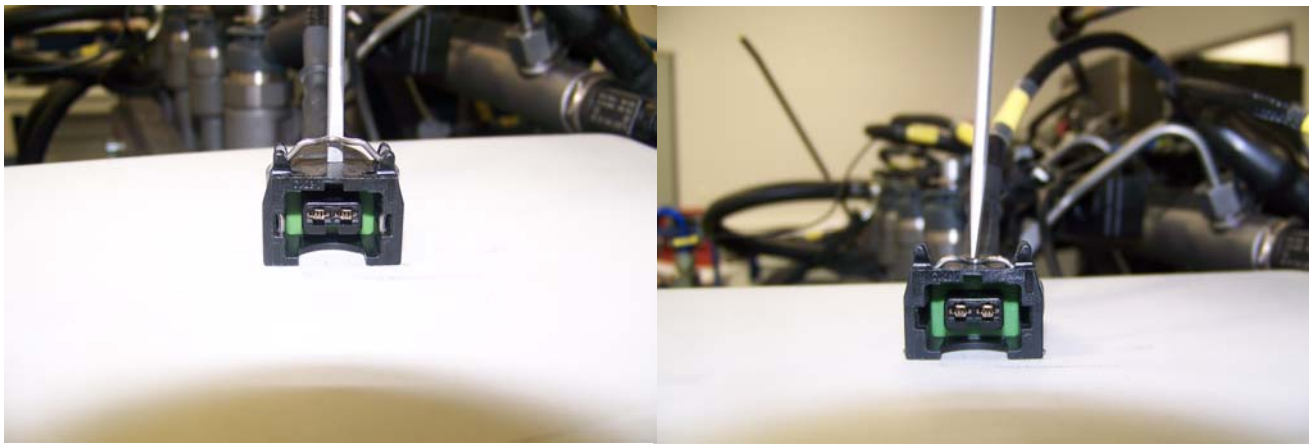


Fig. 71 - 65

Connectors locked

Connectors unlocked

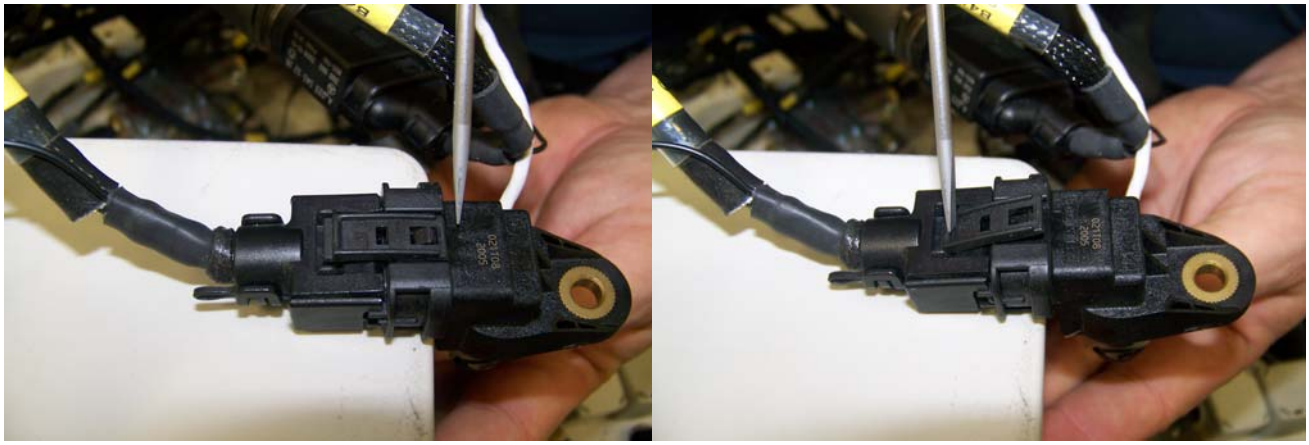


Fig. 71 - 66

Chapter 73-00-00 Engine Fuel and Control

73-00-01 General

For detailed description refer to the AE 300 Operation Manual E4.01.01 – Chapter System Description.

For approved fuels refer to the AE 300 Operation Manual E4.01.01 Chapter Fuel Grade.

73-00-10 Injector

73-00-11 Removal of the Injector

1. Remove the injector cover - refer to Chapter 85-00-11.
2. Disconnect the injector 1-4 connectors [6] from the injector head.
3. Remove the circlip [7] from the injector fuel return line [8].
4. Open the flare nuts [9] of the high pressure fuel line on the injector side.
5. Loose the flare nuts [10] on the common rail to give more space during removal of the injector.
6. Remove the screw [4] off and the clamping shoe [5] of the injector (for picture see next page).
7. Carefully remove the injectors (if necessary use the "Dismount Tool for Injectors", see List of Tools).

Mark each injector for correct position. Do not swap injector IQA-Codes!

73-00-12 Installation of the Injector

If a new injector is installed, record IQA-code given at the top of the injector.
The IQA-code has to be programmed into the EECU with the AE 300-Wizard.

1. Put on the new gasket rings [1] of the injectors - refer to Chapter 73-00-22.
2. Lubricate the cleaned injectors [2] with special grease [3] refer to Chapter 73-00-22.
3. Insert the injectors according to the marking sequence during the removal Chapter.
4. Use only new (!) screws [4] for clamping shoe [5].
5. Starting torque for clamping shoe:

Level 1:	7 Nm
Level 2:	90º
Level 3:	90º

6. Install the fuel line [9] to the injector with 22 Nm.
7. Screw on the nut on the common rail with 27 Nm
8. Install the fuel return line to each injector.
9. Install on each injector the circlip on the fuel return line.
10. Install on the injector the electrical cable (injector 1 – 4).
11. Install the injector cover - refer to Chapter 85-00-12.
12. Program the IQA-code into the EECU with the AE 300-Wizard (if new injectors installed).

13. Perform an engine ground run according to Chapter 71-00-03.
14. After the ground run inspect fuel system for leakage.

For picture see Chapter 73-00-20 - Injector seal.

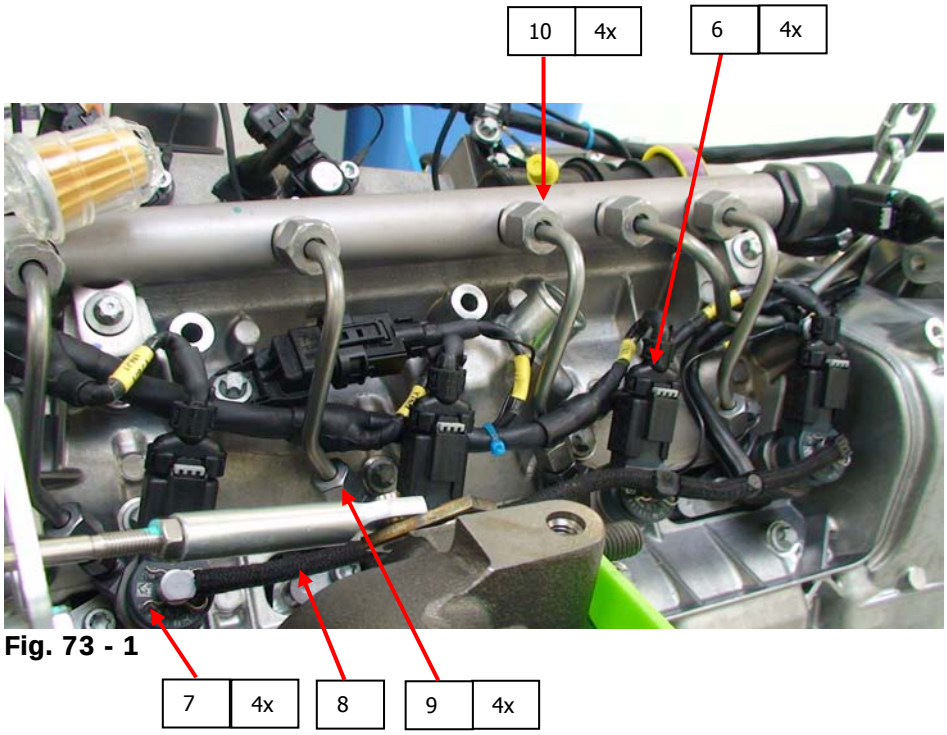


Fig. 73 - 1

73-00-20 Injector Seals

73-00-21 Removal of the Injectors Seals

1. Remove of the injector cover - refer to Chapter 85-00-11.
2. Remove the injector - refer to Chapter 73-00-11.
3. Remove gasket rings [1] and clean injector shaft.

73-00-22 Installation of the Injectors Seals

1. Install new gasket rings [1].
2. Install the injectors - refer to Chapter 73-00-12.
3. Install the injector cover - refer to Chapter 85-00-12.
4. Perform an engine ground run according to Chapter 71-00-03.
5. After the ground run inspect fuel system for leakage.

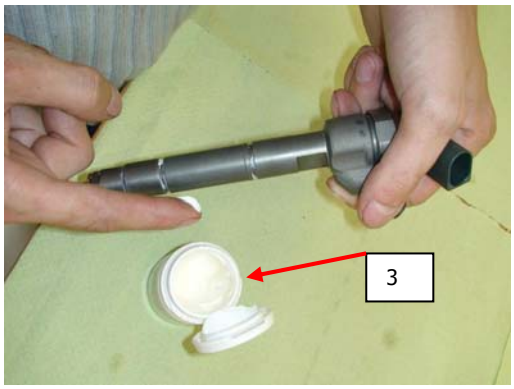


Fig. 73 - 2

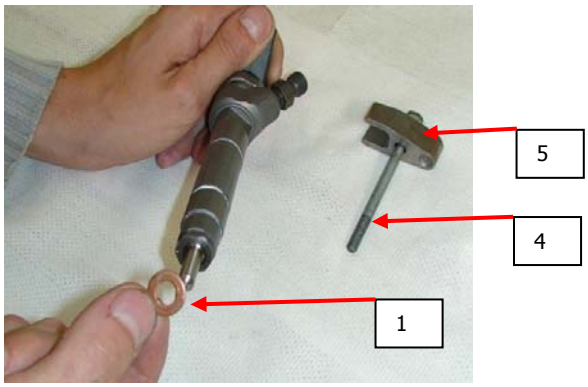


Fig. 73 - 3

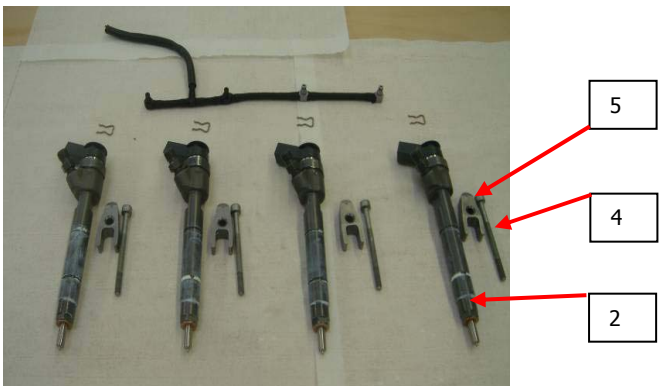


Fig. 73 - 4

Injector grease [3] is available at Austro Engine GmbH.

73-00-30 Fuel Return Line

73-00-31 Removal of the Fuel Return Line

1. Remove the injector cover - refer to Chapter 85-00-11.
2. Remove the clips [1] from the 4 injectors.
3. Pull down the return line assy.
4. Remove the safety wire [2] and the banjo bolt [3].
5. Remove the clamps [4] from the rail return line [5].
6. Pull down the two return lines [5], [8] from the fitting [6].

73-00-32 Installation of the Fuel Return Line

1. Push the new return line assy into the 4 injectors.
2. Safe it with the clip [1].

CAUTION Do not scratch the IQA-Code (see picture)

3. Pull the fire sleeve over the return line [8].
4. Push the return line [8] on the fitting [6].
5. Pull the fire sleeve over the rail return line [5].
6. Install new rail return line [5] between common rail and fitting [6] and safe it with a new clamp.
7. Use heat resistant sealant (see Consumable List) to cover all fire sleeve ends.
8. Install the banjo bolt [3], torque it with 27 Nm and safe it with a safety wire (use only new sealing rings [7]).
9. Install the injector cover - refer to Chapter 85-00-12.
10. Perform an engine ground run according to Chapter 71-00-03.
11. After the ground run inspect the fuel system for leakage.

Figures for Chapter 73-00-31 and 73-00-32

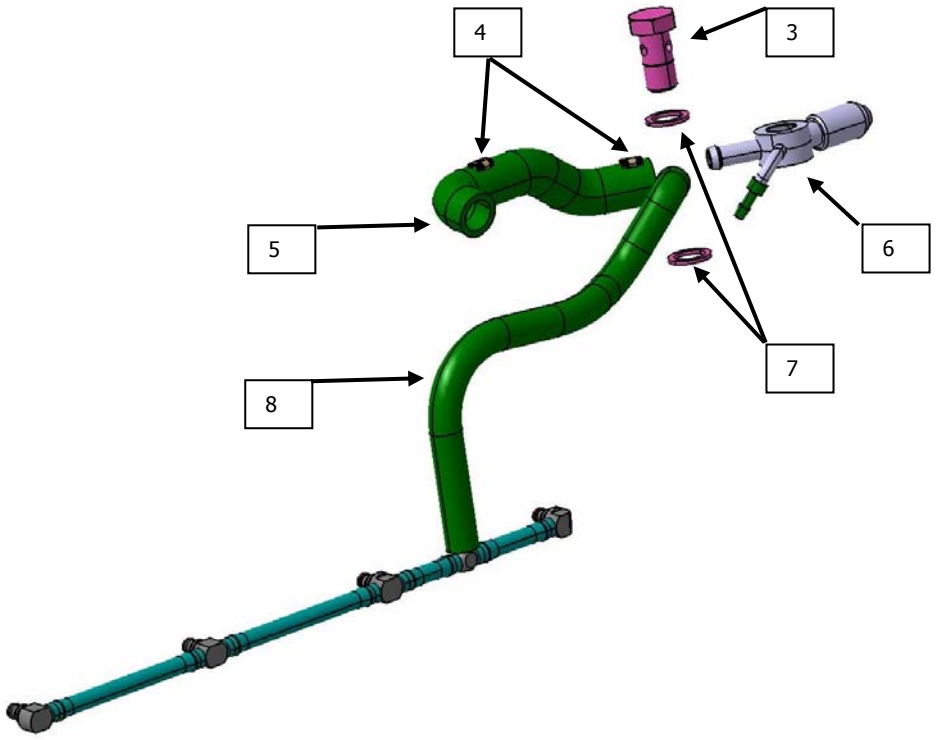


Fig. 73 - 5

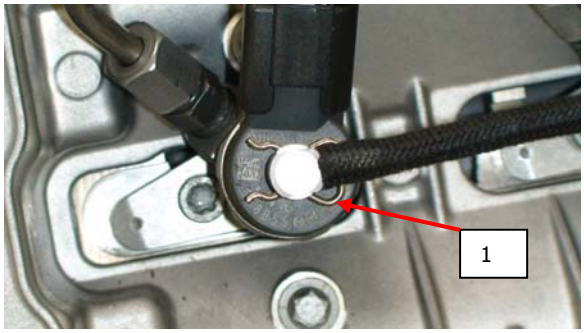


Fig. 73 - 6

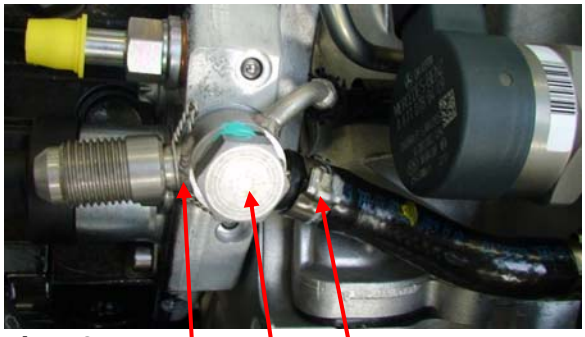


Fig. 73 - 7

73-00-40 High Pressure Pump

73-00-41 Removal of the High Pressure Pump

1. Disconnect the cable plug connection [8] (FPS).
2. Disconnect the cable plug connection [7] (FTS).
3. Disconnect the cable plug connection [1] (FMU).
4. Unscrew the fuel connection [2] - refer to the applicable Aircraft Maintenance Manual.
5. Remove the safety wire [3].
6. Remove the banjo bolt [4].
7. Screw on the coupling nut [5].
8. Remove the banjo bolt [9] with the fuel pressure sensor.
9. Disconnect the screws [6].
10. Remove the high pressure pump assy.
11. Clean the sealing face.
12. Look out for correct position of the rubber gasket.

Fig. 73 - 8

Whenever loosening or tightening hose connections fitted with a twin nipple, always hold the twin nipple steady.

73-00-42 Installation of the High Pressure Pump

1. Slightly lubricate the rubber gasket with engine oil.
2. Fit on the high pressure pump assy.
3. Screw down the screws [6] with 12 Nm.
4. Screw on the coupling nut [5] with 22 Nm.
5. Install the banjo bolt [4] with new sealing rings and torque that with 27 Nm.
6. Install the banjo bolt [9] with the FPS, use Loctite 243 and new sealing rings and torque that with 22 Nm.

CAUTION

When using Loctite, make sure, that the thread is free of grease and apply only a thin film of Loctite.

7. Mount the fuel line - refer to the applicable Aircraft Maintenance Manual.
8. Fit on the connector [1] (FMU).
9. Fit on the connector [7] (FTS).
10. Fit on the connector [8] (FPS).
11. Clean working area.
12. Perform an engine ground run according to Chapter 71-00-03.
13. After the ground run the engine must be cooled down for a further tighten of the banjo bolt [4] with 27 Nm.
14. Install a safety wire [3].
15. After the ground run inspect fuel system for leakage.

For picture see Chapter 73-00-50 – Low Fuel pressure sensor.

73-00-50 Low Fuel pressure sensor

73-00-51 Removal of the Fuel pressure sensor

1. Disconnect the cable plug connection [8] (FPS).
2. Screw out the FPS.

Whenever loosening or tightening hose connections fitted with a twin nipple, always hold the twin nipple steady.

73-00-52 Installation of the Fuel pressure sensor

1. Use only a new sealing ring.
2. Screw on the FPS with 20 Nm.
3. Fit on the connector (FPS).
4. Perform an engine ground run according to Chapter 71-00-03
5. After the ground run inspect fuel system for leakage.

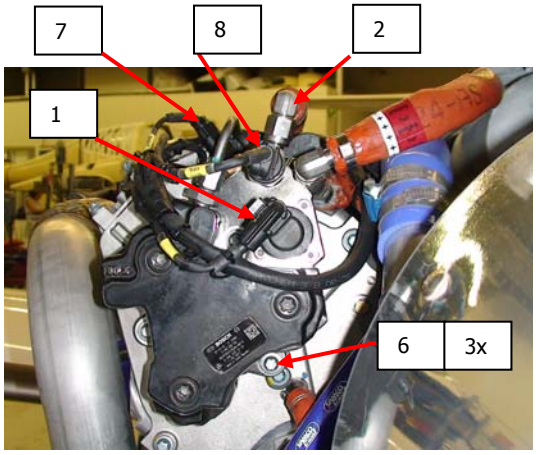


Fig. 73 - 9

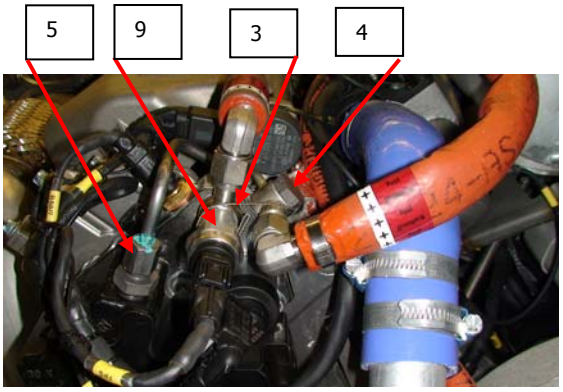


Fig. 73 - 10

73-00-60 Rail Pressure Sensor

73-00-61 Removal of the Rail Pressure Sensor

1. Remove the connectors (RPS), (PCV).
2. Remove the injector cover - refer to Chapter 85-00-11.
3. Open the coupling nuts [1].
4. Loose the coupling nuts [2] at the injectors to have more space during removal the common rail.
5. Remove the screws [3].
6. Remove the common rail assy [4].

73-00-62 Installation of the Rail Pressure Sensor

1. Install the new common rail assy [4] and screw it down with 16 Nm.
2. Screw on the fuel lines on the common rail.
3. Torque the coupling nuts at the common rail with 27 Nm.
4. Torque the coupling nuts at the injectors with 22 Nm.
5. Install the injector cover - refer to Chapter 85-00-12.
6. Attach the connectors (RPS), (PCV).
7. Clean the working area.
8. Perform an engine ground run according to Chapter 71-00-03.
9. After the ground run inspect fuel system for leakage.

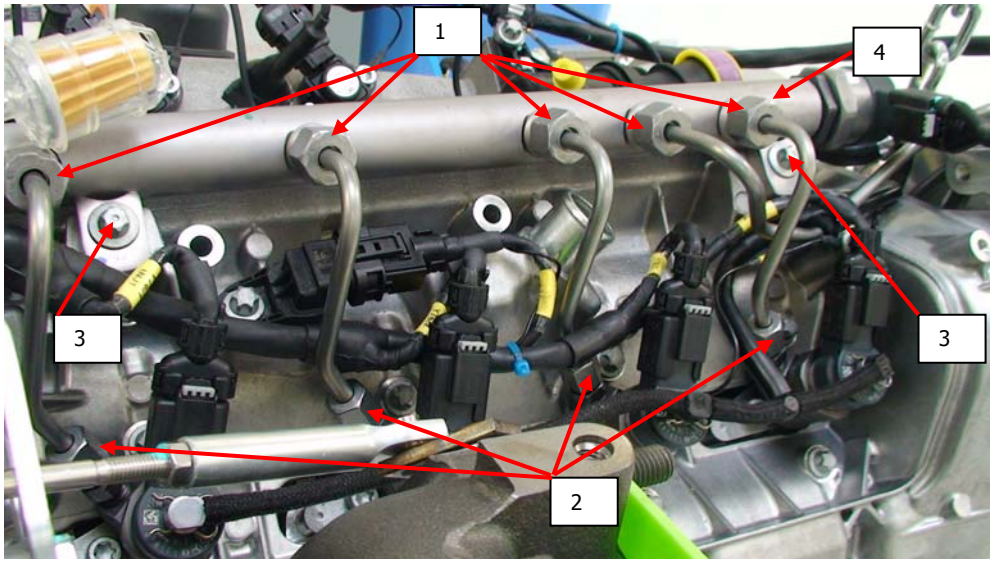


Fig. 73 - 11

73-00-70 Rail Pressure Control valve

Use the same procedure from Chapter 73-00-60.

Chapter 76-00-00 Engine Control

76-00-01 General

For detailed description refer to the Chapter 01-10-60 Electrical System Description.

76-00-10 Engine Electronic Control Unit (EECU)

For removal and installation of the EECU refer to the applicable Aircraft Maintenance Manual.

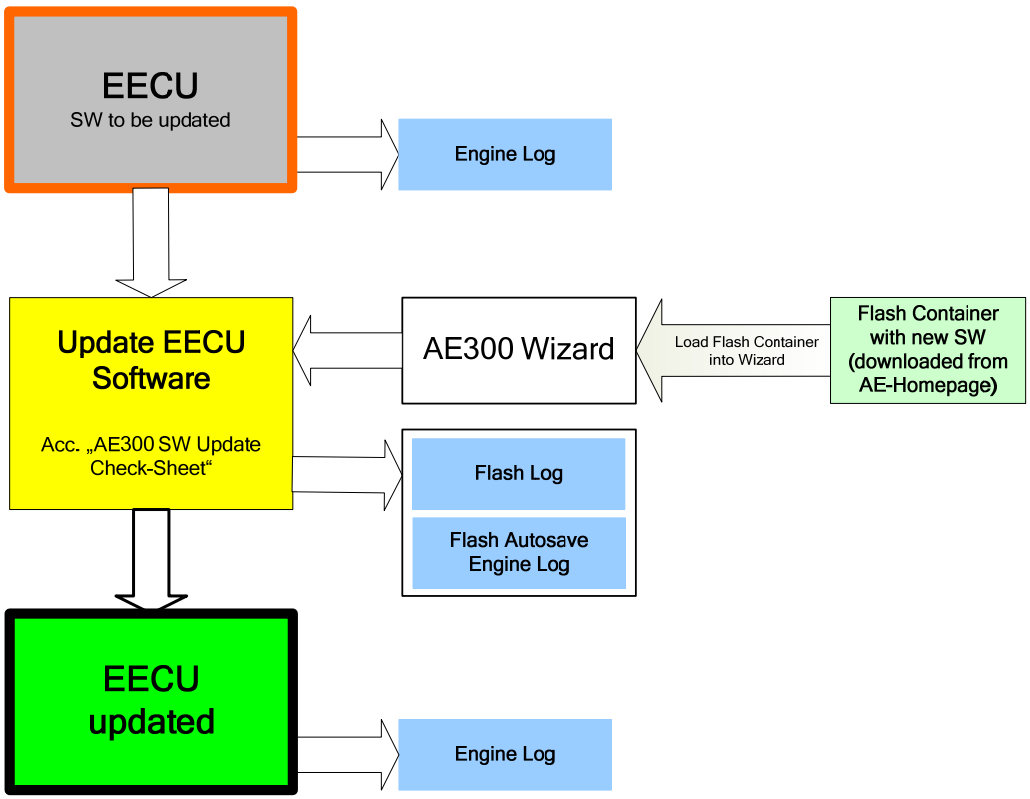
76-00-11 Software Updates

To perform an EECU Software Update you have to follow the instructions given below.

> The intention of this procedure is to document the current status of the EECU, update the EECU Software (SW) acc. to the MSB-E4-003 using the AE Wizard and document the updated status of the EECU.

For detailed instructions on the Software Updates Process itself refer to the AE 300 Wizard User GuideE4.08.09 at least revision 7.
The Software-file for updating the EECU will be part of a Flash Container (FCT) which is used by the AE300-Wizard.This FCT is available at the Austro Engine Homepage / Client Area.

Use the appendix of MSB E4-003 "Execution Report" to document the performed update.
The EECU Software Update Procedure below will also guide you through a Software Update procedure by use of references to AE300 Wizard.



Refer to MSB E4-003 for current software versions. Software updates may only be performed by an **Austro Engine GmbH** service partner.

EECU Software Update Procedure

1. Connect AE 300 Wizard to EECU
    a. AE300 Wizard at least version 1.2.0.0 required.
    b. For reference use AE300 Wizard User guide"
2. Check Software-Version on ECU A and ECU B
3. Compare Software-Version on ECU A and ECU B to latest valid Software-Version (according to MSB E4-003)
4. If SW version is obsolete and/or not the latest valid version available perform further steps as described below

5. Load latest valid "Flash Container" into AE300 Wizard
    a. "Latest valid Version" according to MSB-E4-003
6. EECU SW Update according AE-300 Wizard User Guide section "EECU Software update"
7. Perform "EECU SW Update" according AE-300 Wizard User Guide
    a. Wizard User Guide section "EECU Software update"
8. Check if "GREEN MESSAGE BOX appeared
    a. Update Process successful;
9. Check Software Version on ECU A and ECU B
10. Compare Software Version in ECU A and ECU B
11. ECU A and ECU B have same SW
    a. According to AE300 Wizard User Guide
12. Read out "Engine Log" and compare to latest valid SW Version.
    a. In case of doubt contact Austro Engine and provide "Engine Log"
13. Check function and connection to Engine Display
    a. Start Engine
    b. Switch manually to ECU A
    c. Check if Engine Data is displayed correctly
    d. Check that no Engine Caution Indication is generated or active
    e. Switch manually to ECU B
    f. Check if Engine Data is displayed correctly
    g. Check that no Engine Caution Indication is generated or active
    h. Stop Engine
14. Disconnect AE 300 Wizard

76-00-20 Glow Plug Control

76-00-21 Removal of the Glow Plug Control

1. Remove the plug connection [1] (GPC).
2. Remove the screws [2].
3. Remove the glow control box [3].

76-00-22 Installation of the Glow Plug Control

1. Use only new stop nuts.
2. Fit on the glow control box [3].
3. Torque the nuts with 4 Nm.
4. Fit the connector (GPC) [1]
5. Perform an engine ground run according to Chapter 71-00-03.

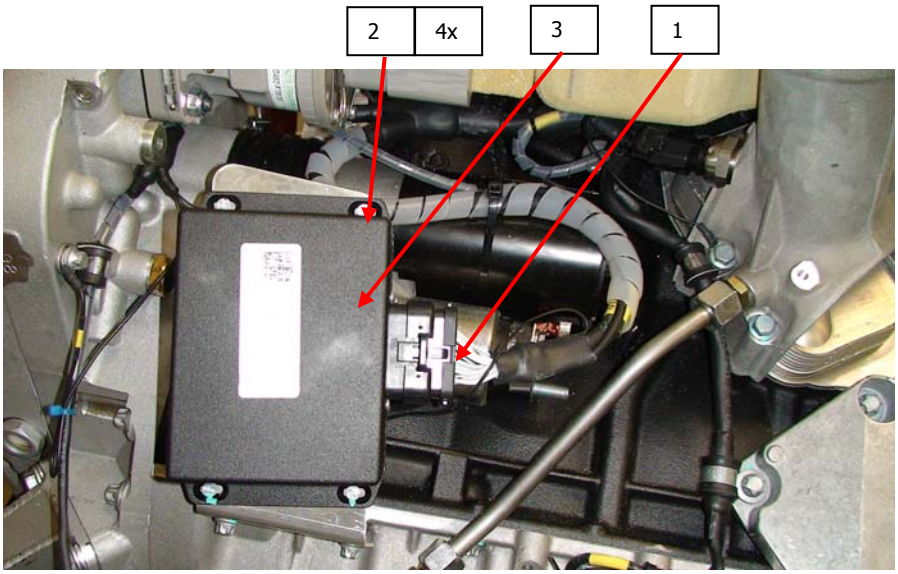


Fig. 76 - 1

76-00-30 Crankshaft Sensor

76-00-31 Removal of the Crankshaft Sensor

1. Remove the electrical lines [1].”CRS1 or CRS2”.
2. Remove the screw [2].
3. Remove the crankshaft-sensors [3].

76-00-32 Installation of the Crankshaft Sensor

1. Install the crankshaft-sensors.
2. The distance between the sensor and the two mass flywheel must be 0,8 mm +/- 0,5 mm.
3. Screw down the fixing screws with 11 Nm.
4. Inspect the correctly seat from the sensors.
5. To clip the electrical line [1] “CRS1 or CRS2”.
6. Perform an engine ground run according to Chapter 71-00-03.

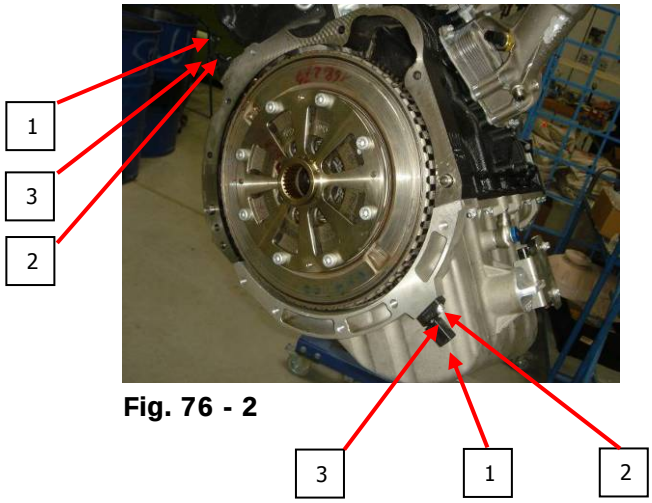


Fig. 76 - 2

76-00-40 Camshaft Sensor CAS 1

76-00-41 Removal of the Camshaft Sensor CAS 1

1. Remove the injector cover - refer to Chapter 85-00-11.
2. Pull down the electrical connector CAS 1.
3. Remove the locking screw from the sensor [1].
4. Pull the camshaft sensor out.

76-00-42 Installation of the Camshaft Sensor CAS 1

1. Lubricate the new o-ring with acid free lubrication.
2. Push the sensor into the cylinder head cover and inspect the correctly seat of the o-ring.
3. Tighten up the camshaft sensor screw with 14 Nm.
4. Inspect the correctly seat of the sensor.
5. Attach the electrical connector CAS 1.
6. Install the injector cover - refer to Chapter 85-00-12.
7. Perform an engine ground run according to Chapter 71-00-03.

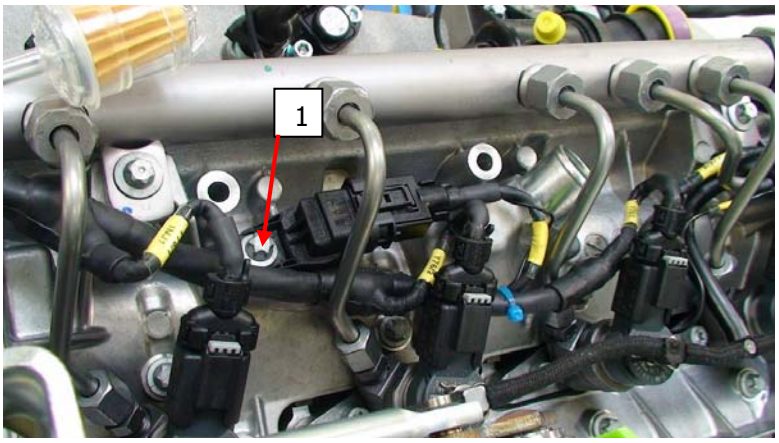


Fig. 76 - 3

76-00-50 Camshaft Sensor CAS 2

76-00-51 Removal of the Camshaft Sensor CAS 2

1. Pull down the electrical connector CAS 2.
2. Remove the locking screw from the sensor [1].
3. Pull the camshaft sensor out.

76-00-52 Installation of the Camshaft Sensor CAS 2

1. Lubricate the new o-ring with acid free lubrication.
2. Push the sensor into the sensor housing and inspect the correctly seat of the o-ring.
3. Tighten up the camshaft sensor screw with 12 Nm.
4. Inspect the correctly seat of the sensor.
5. Attach the electrical connector CAS 2.
6. Perform an engine ground run according to Chapter 71-00-03.

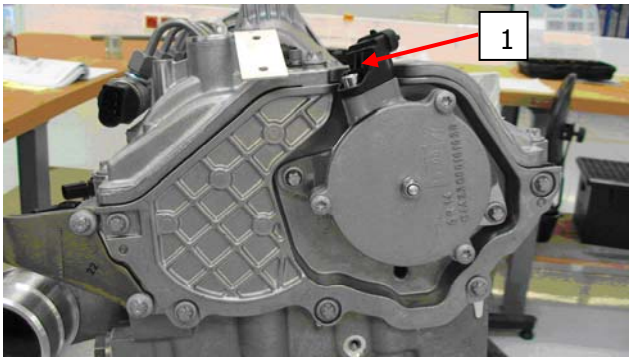


Fig. 76 - 4

Chapter 77-00-00 Engine Indicating

77-00-01 General

The engine indicating is realized by the EECU. The EECU gathers the required information from engine sensors and passes it through the CAN-Bus to an engine display.
If a failure in indication is suspected maintain the relevant sensor (Rely on EECU sensor failure detection to identify electrically defect sensors.)

77-00-10 Gearbox Temperature Sensor

Refer to Chapter 85-10-30.

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Chapter 78-00-00 Engine Exhaust

78-00-01 General

For detailed description refer to Chapter 01-10-10 Intake/Exhaust System Description.

78-00-10 Exhaust Manifold

78-00-11 Removal of the Exhaust Manifold

1. Remove the exhaust pipe from the turbo charger - refer to the applicable Aircraft Maintenance Manual.
2. Remove the intake air hose from the turbo charger - refer to the applicable Aircraft Maintenance Manual.
3. Remove the oil return line from the turbo charger - refer to Chapter 79-00-111.
4. Remove the lubricate line from the turbo charger - refer to Chapter 79-00-101.
5. Remove the clip [1] from the waste gate controller [2] and pull down the hose.
6. Remove the banjo bolt [3].
7. Open the nuts [4] from the exhaust manifold [8].
8. Remove the exhaust manifold with the turbo charger.
9. Remove the screws [5].
10. Remove the turbo charger [6].

78-00-12 Installation of the Exhaust Manifold

1. Attach the turbo charger with new gasket [7] to the exhaust manifold [8].
2. Insert the screws [5] with new nuts.
3. Tighten the screws equally with 35 Nm.
4. Install the exhaust manifold [8] with the turbo charger [6].
5. Use only new gaskets [9].
6. Screw the exhaust manifold with new nuts [4] with 30 Nm.
7. Put on the hose on the waste gate controller and fix it with the clip [1].
8. Install the banjo bolt [3] with new sealing rings and torque it with 7 Nm.
9. Before install the oil line fill in approximately 1 cm³ engine oil (see Fig. 78 - 1).
10. Install the oil lubricate line - refer to Chapter 79-00-102.
11. Install the return line - refer to Chapter 79-00-112.
12. Install the intake air hose - refer to the applicable Aircraft Maintenance Manual.
13. Install the exhaust pipe - refer to the applicable Aircraft Maintenance Manual.
14. Clean the working area.
15. Perform an engine ground run according to Chapter 71-00-03.
16. After the ground run inspect exhaust system for leakage.

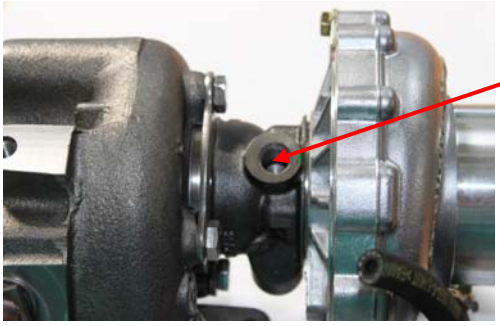

Fig. 78 - 1

Figures for Chapter 78-00-11 and 78-00-12

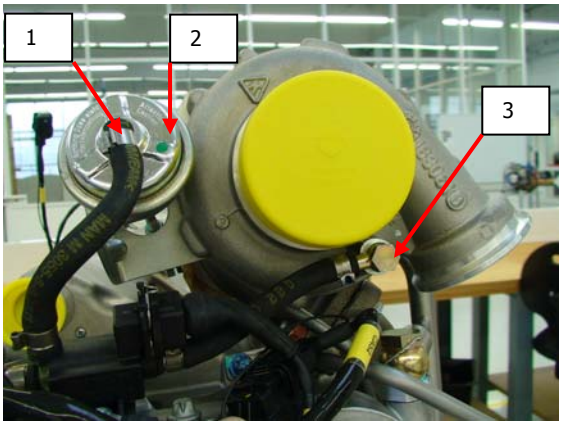

Fig. 78 - 2

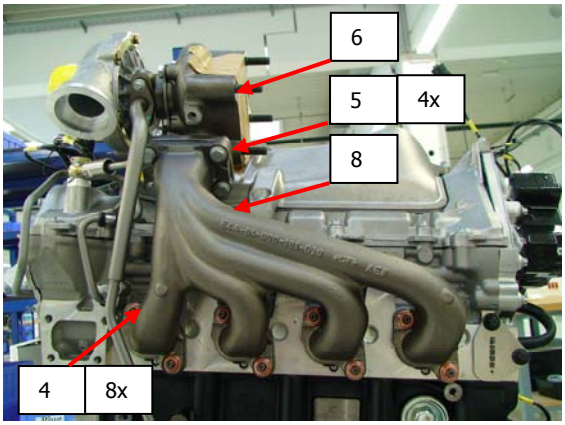

Fig. 78 - 3

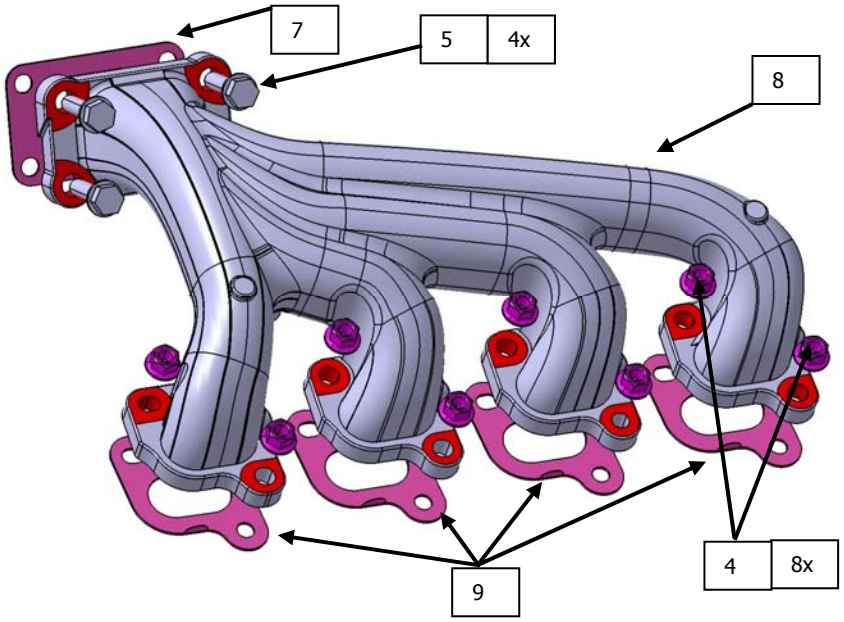

Fig. 78 - 4

78-00-20 Exhaust Manifold Gasket Exchange

For Removal and Installation refer to Chapter 78-00-00.

Chapter 79-00-00 Engine Oil

79-00-01 General

Engine Oil Information:

For approved engine oils see Operation Manual E4.01.01 – Chapter 3.5.6.1.

Oil volume (initial filling)		7.5 l
Oil volume (continuously)	min.	5 l
	max.	7 l

CAUTION

Only engine oils conforming to MB 229.5 specification are approved by **Austro Engine GmbH** to be used for operation. **Austro Engine GmbH** will not assume any liabilities if other types of oil are used.

79-00-10 Oil-Filter Housing Draining Line

79-00-11 Removal of the Oil-Filter Housing drain line

1. Open the sleeve nut [1] of the drain line [2] on the upper end (Oil filter housing) first.
2. Remove the safety wire from the banjo bolt [3].
3. Open the sleeve nut [4] on the lower end of the drain line [2].
4. Open the banjo bolt [5] at the oil sump [6].
5. Carefully remove the drain line.
6. Remove the gasket rings from the banjo bolt [5].

Whenever loosening or tightening hose connections fitted with a twin nipple, always hold the twin nipple steady.

79-00-12 Installation of the Oil-Filter Housing drain line

1. Put on new gasket rings on the banjo bolt [5].
2. Connect the lower end of the drain line [2] to the banjo bolt [5].
3. Connect the banjo bolt [5] to the oil sump [6].
4. Connect to upper end of the oil drain line [2] to the fitting of the oil filter housing [7].
5. Torque the banjo bolt [5] with 20 Nm.

Do not over torque the banjo bolt – serious damage of the oil sump is possible.

6. Torque the lower sleeve nut of the oil drain line [2] with 16 Nm.
7. Torque the upper sleeve nut of the oil drain line [2] with 16 Nm.
8. Apply safety wire on banjo bolt [5] according to the standard practices on Chapter 51-00-00.
9. Clean the working area.
10. Perform an engine ground run according to Chapter 71-00-03.
11. After the ground run inspect oil system for leakage.

Figure for Chapter 79-00-11 and 79-00-12

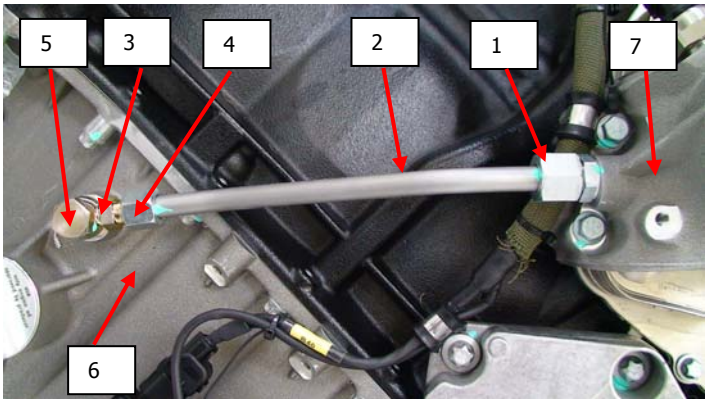

Fig. 79 - 1

79-00-20 Drain of Engine Oil

1. Remove the safety wire [1].
2. Put a container (min. 8,5 l) below the drain plug.
3. Open the oil drain plug [2].
4. Open the Oil Dip Stick
5. Let the oil drain off.

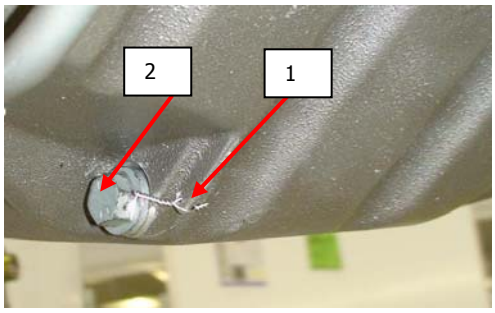

Fig. 79 - 2

79-00-30 Refill of Engine Oil

6. Turn in the oil drain plug [2] with a new sealing ring and torque it with 30 Nm.
7. Save it with a safety wire Ø 0,81 mm.
8. Refill Engine Oil at the Oil Dip Stick Opening
9. Install Oil Dip Stick and check oil level (refer to Chapter 12-20-01)

Only use recommended engine oil according to 79-00-01 General

79-00-40 Oil Sump

79-00-41 Removal of the Oil Sump

1. Remove the engine - refer to the applicable Aircraft Maintenance Manual.
2. Remove the gearbox - refer to Chapter 85-10-11.
3. Remove the belt tensioner - refer to Chapter 85-40-21.
4. Drain the engine oil from the oil sump - refer to Chapter 79-00-20.
5. Remove the oil return line - refer to Chapter 79-00-11.
6. Remove the oil filter housing drain line - refer to Chapter 79-00-111.
7. Remove the screws from the oil sump [11], [12], [13] and [14].
8. Remove carefully the oil sump [1].
9. Remove the crankshaft sensor - refer to Chapter 76-00-31.
10. Remove the oil dipstick.
11. Remove the oil level sensor – refer to Chapter 79-00-121.
12. Replace the oil drain plug to the new oil sump according to chapter 79-00-20 and refill the engine oil according to Chapter 79-00-30.
13. Remove the engine bracket – refer to the applicable Aircraft Maintenance Manual.
14. Remove the screws [3].
15. Remove the oil slashing plate [2].

79-00-42 Installation of the Oil Sump

1. Install the oil slashing plate [2]
2. Screw the oil slashing plate down with 5 Nm ± 0,5 (use Loctite 243).

When using Loctite, make sure, that the thread is free of grease and apply only a thin film of Loctite.

3. Install the engine bracket – refer to the applicable Aircraft Maintenance Manual.
4. Install the oil drain plug – refer to Chapter 79-00-30.
5. Install the oil level sensor – refer to Chapter 79-00-120.
6. Install the oil dipstick.
7. Install the crankshaft sensor - refer to Chapter 76-00-32.
8. Put on carefully a new gasket [15] on the oil sump [1] and then put the oil sump on the engine.

Use a small amount of sealant near the joint of the crankshaft cover.

9. Screw down the oil sump according to the tightening diagram: (Figure 74) 1st step: 6 Nm , 2nd step 13 Nm.
10. Install the oil filter housing drain line – refer to Chapter 79-00-12.
11. Install the return line – refer to Chapter 79-00-112 Installation of the Oil Return Line.
12. Install the belt tensioner – refer to Chapter 85-40-22.
13. Install the gearbox – refer to Chapter 85-10-12.
14. Install the engine to the aircraft – refer to the applicable Aircraft Maintenance Manual.
15. Fill in engine oil – refer to the Chapter 79-00-30.
16. Clean the working areas.
17. Perform an engine ground run according to Chapter 71-00-03.
18. After the ground run inspect fluid systems for leakage.

79-00-50 Oil Sump Gasket Exchange

For Removal and Installation refer to Chapter 79-00-40.

Figures for Chapter 79-00-41 and 79-00-42

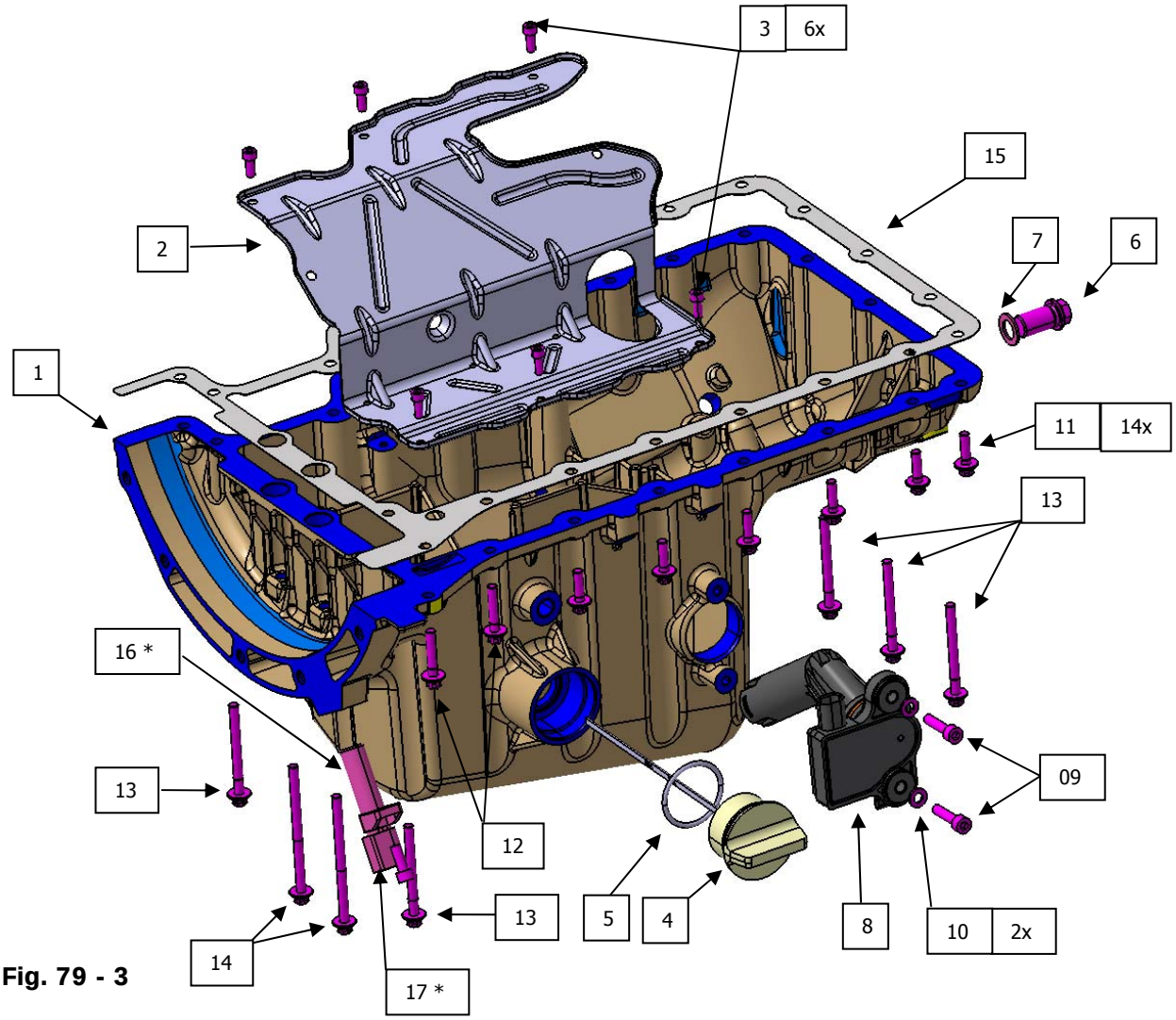

Fig. 79 - 3

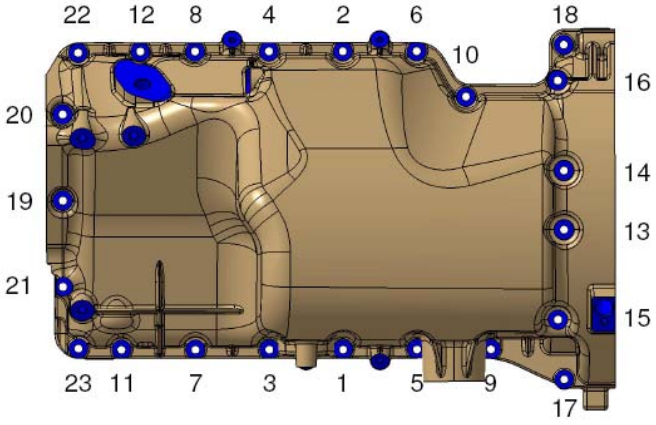

Fig. 79 - 4 Tighting Diagram

79-00-60 Oil-Filter Housing

79-00-61 Removal of the Oil-Filter Housing

1. Remove the oil filter housing drain line – refer to Chapter 79-00-11.
2. Remove the fitting [9] from the oil filter housing drain line.
3. Remove the oil filter – refer to Chapter 79-00-71.
4. Remove the (OPS) Oil pressure sensor [3] – refer to Chapter 79-00-131
5. Remove the screws [5], [6] and the screw [7] with the clamp [8] of the wiring harness.
6. Remove the oil filter housing.

79-00-62 Installation of the Oil-Filter Housing

1. Use new o-rings [4], lubricate it with acid free lubrication.
2. Install the oil filter housing carefully.
3. Screw it down with the screws [5], [6] and [7] and torque them with 9 Nm. (do not forget the claps from the wiring harness)
4. Install the (OPS) Oil pressure sensor [3] – refer to Chapter 79-00 132
5. Install the oil filter – refer to Chapter 79-00-72.
6. Install the fitting [9] from the draining line with a new sealing ring and torque with 18 Nm.
7. Install the oil filter housing drain line – refer to Chapter 79-00-12.
8. Clean the working area.
9. Perform an engine ground run according to Chapter 71-00-03.
10. After the ground run inspect oil system for leakage.

For picture see Chapter 79-00-72.

79-00-70 Oil-Filter

79-00-71 Remove and discard of the Oil-Filter

1. Remove oil filter by unscrewing of the oil filter cover [1].
2. Detach the oil filter from the oil filter cover by pulling them off.
3. Discard the oil filter [2].

79-00-72 Installation of the Oil-Filter

1. Use only new o-rings at the oil-filter.
2. Put on the new filter on the cover.
3. Screw down the oil filter cover with 25 Nm.
4. Clean the working area.
5. Perform an engine ground run according to Chapter 71-00-03.
6. After the ground run inspect oil system for leakage.

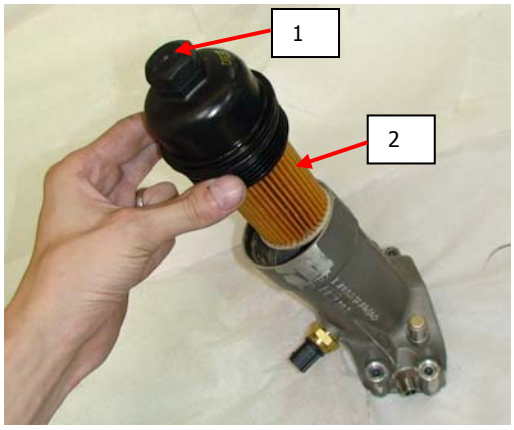

Fig. 79 - 5

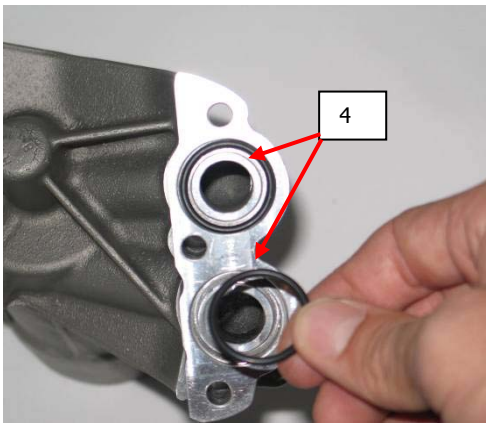

Fig. 79 - 6

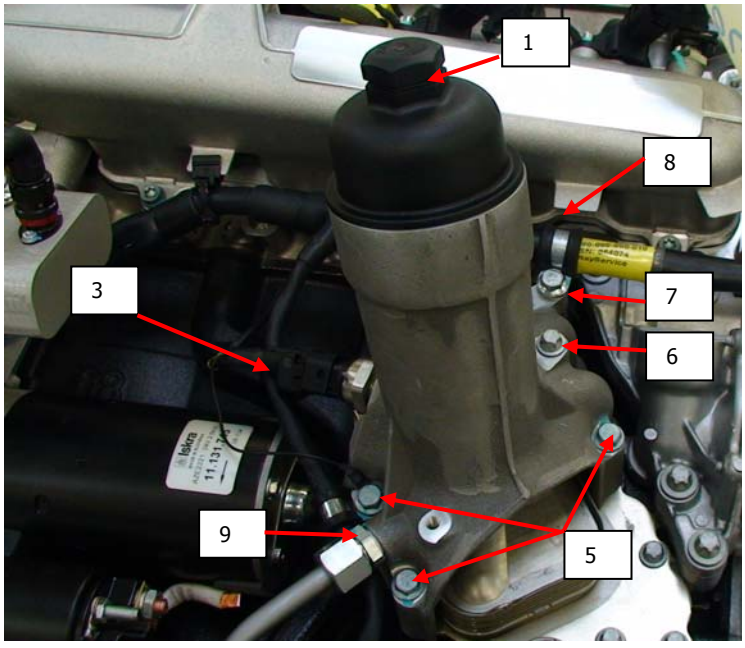

Fig. 79 - 7

79-00-80 Oil Separator

79-00-81 Removal of the Oil Separator

1. Remove the injector cover - refer to Chapter 85-00-11.
2. Remove the screws [8].
3. Remove the oil separator [1].
4. Open the steel tape clamp and pull down the hose [6].
5. Pull down the hose [5].
6. Pull down the oil pipe [3].
7. Remove the By-Pass Valve [2] - refer to Chapter 79-00-83.

79-00-82 Installation of the Oil Separator

1. Install the by-pass valve [2] – refer to Chapter 79-00-84.
2. Install the hose [6] using the steel tape clamps (lubricate the connecting tube with acid free lubrication)

The hose need to be installed stressless - see Fig. 79 -8.

3. Push on the hose [5] (lubricate the connecting tube with acid free lubrication).
4. Push on the oil pipe [3].
5. Use only new sealing rings [4] (lubricate the rings with acid free lubrication).
6. Install the oil separator on the injector cover.
7. Push on the tube to the injector cover [9].
8. Push on the oil pipe into the injector cover [10].
9. Inspect the correct position of the o-rings [4].
10. Screw on the oil separator with 5 Nm using Loctite 243.

When using Loctite, make sure, that the thread is free of grease and apply only a thin film of Loctite.

11. Install the injector cover – refer to Chapter 85-00-12.
12. Clean the working area.
13. Perform an engine ground run according to Chapter 71-00-03.
14. After the ground run inspect oil system for leakage.

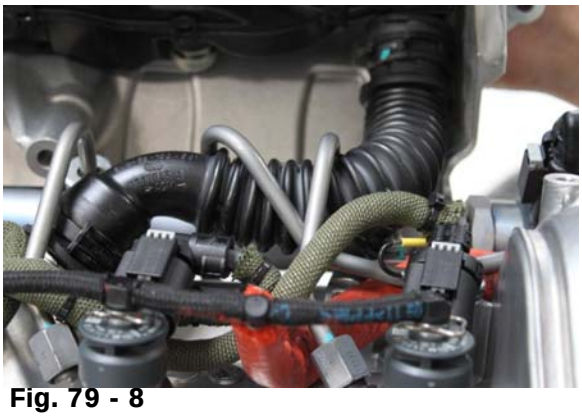

Fig. 79 - 8

79-00-83 Removal of the Oil Separator By-Pass Valve

1. Remove the injector cover – refer to Chapter 85-00-11.
2. Remove the oil separator - refer to Chapter 79-00-81.
3. Remove the by-pass valve [2].
4. Clean and inspect the thread.

79-00-84 Installation of the Oil Separator By-Pass Valve

1. Install the new by-pass valve.
2. Screw it down carefully by hand torque.
3. Use Loctite 243.

When using Loctite, make sure, that the thread is free of grease and apply only a thin film of Loctite.

4. Install the oil separator – refer to Chapter 79-00-82.
5. Install the injector cover – refer to Chapter 85-00-12.
6. Clean the working area.
7. Perform an engine ground run according to Chapter 71-00-03.
8. After the ground run inspect oil system for leakage.

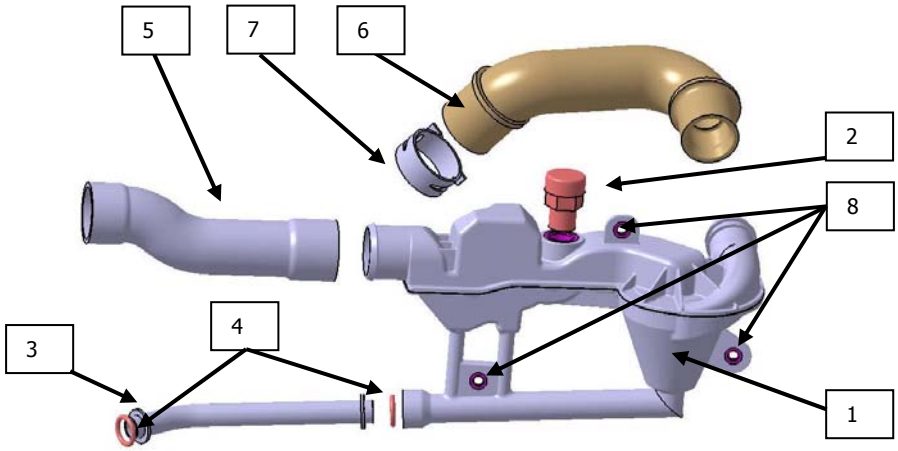

Fig. 79 - 9

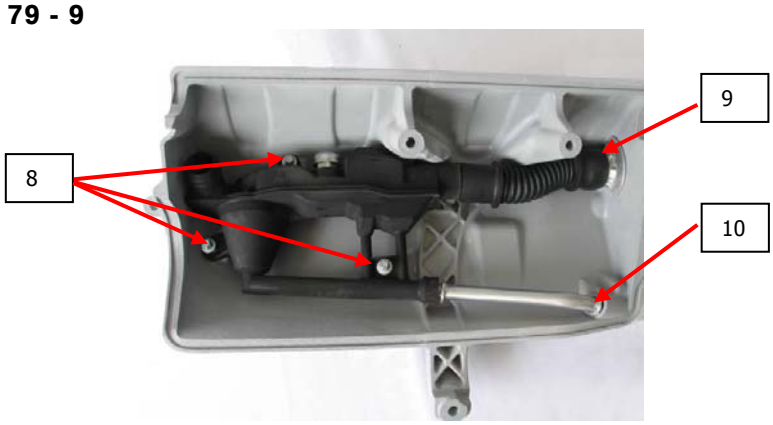

Fig. 79 - 10

79-00-90 Oil Separator Return Line

79-00-91 Removal of the Oil Separator Return Line

1. Remove the safety wire [2].
2. Remove the banjo bolt [1] at the camshaft sensor housing.
3. Remove the screw from the injector cover.
4. Remove the oil line [4].

79-00-92 Installation of the Oil Separator Return Line

1. Use new o-ring [5] and lubricate it with acid free lubrication.
2. Push the oil-line in the injector cover and fixed it with the screw.
3. Install the banjo bolt in the camshaft sensor housing with new sealing rings and torque it with 15 Nm.
4. Secure the banjo bolt with a safety wire.
5. Clean the working area.
6. Perform an engine ground run according to Chapter 71-00-03.
7. After the ground run inspect oil system for leakage.

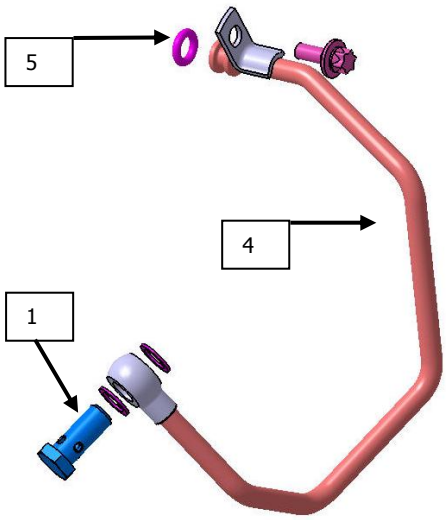

Fig. 79 - 11

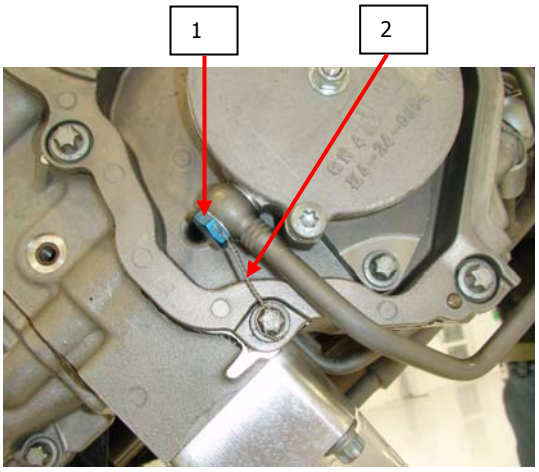

Fig. 79 - 12

79-00-100 Lubricant Line

79-00-101 Removal of the Lubricant Line

1. Remove the safety wire [1].
2. Remove the banjo bolt [2].
3. Remove the screw [3] with the clip [4].
4. Remove the screw [5].
5. Dismount the oil lubricant line [6].

79-00-102 Installation of the Lubricant Line

1. Use new sealing rings – refer to Chapter 79-00-104.
2. Fit on the new pipe [6].
3. Screw down the screw [5] and torque it with 12 Nm.
4. Screw down the banjo bolt [2] and torque it with 45 Nm.
5. Screw down the screw [3] with the clip [4] with 12 Nm.
6. Clean the working area.
7. Perform an engine ground run according to Chapter 71-00-03.
8. After the ground run inspect oil system for leakage.
9. The lubricant line banjo bolt has to be torqued again with 45 Nm after cooling down the engine.
10. Secure the banjo bolt with safety wire.

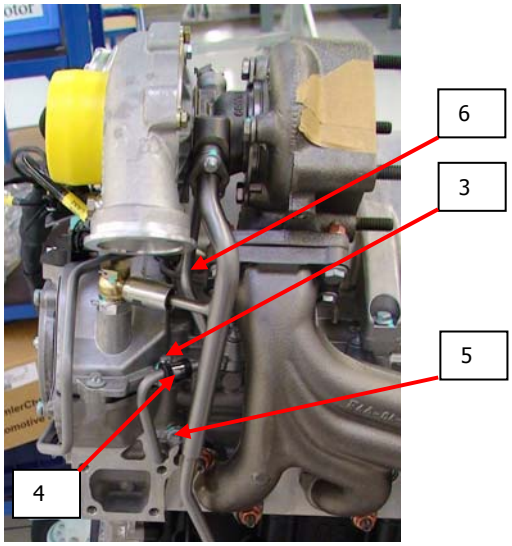

Fig. 79 - 13

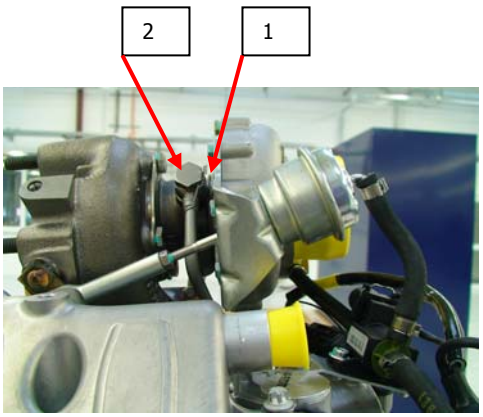

Fig. 79 - 14

79-00-103 Removal of the Lubricant Line Sealing Ring

1. Remove the lubricant line [1] – refer to Chapter 79-00-101.
2. Remove the sealing ring [3] at the banjo bolt [4].
3. Remove the o-ring. [2].

79-00-104 Installation Lubricant Line Sealing Ring

1. Install the new o-ring and lubricate it with acid free lubrication.
2. Install the new sealing rings [3].
3. Install the lubricant line [1] – refer to Chapter 79-00-102.
4. Perform an engine ground run according to Chapter 71-00-03.
5. After the ground run inspect oil system for leakage.
6. The lubricant line banjo bolt has to be torqued again after cooling down the engine.

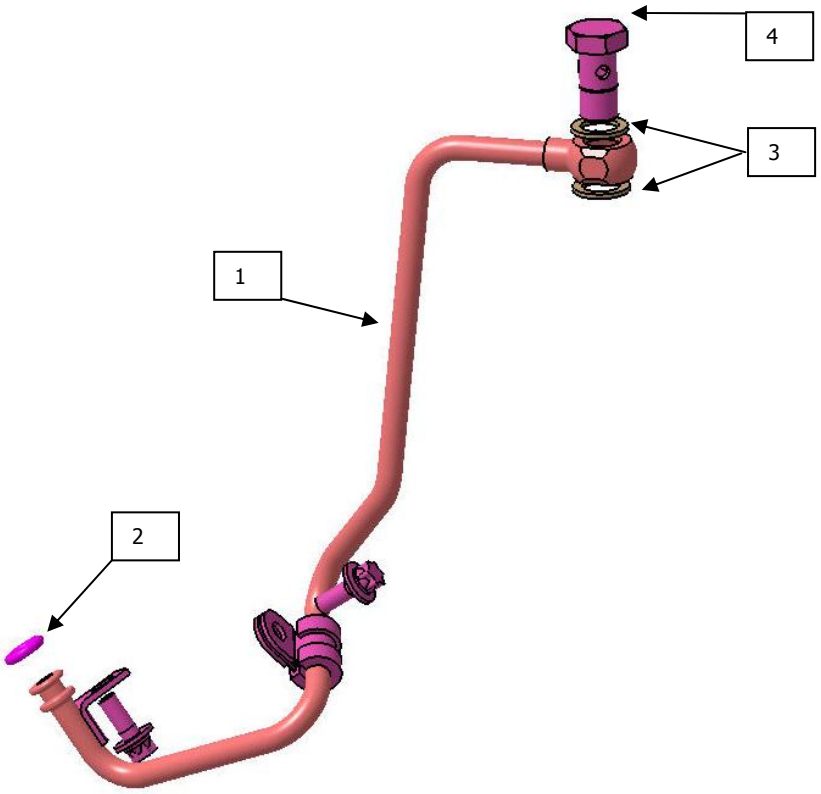

Fig. 79 - 15

79-00-110 Oil Return Line

79-00-111 Removal of the Oil Return Line

1. Drain engine oil – refer to Chapter 79-00-20
2. Remove the wire protection [1].
3. Remove the banjo bolt [2] at the oil sump.
4. Remove the screw [2] at the turbo charger.
5. Remove the screw [4] with the clamp [5].
6. Remove the oil return line [6] (pull the line carefully from the adapter [7]).

79-00-112 Installation of the Oil Return Line

1. Fit on the new gaskets – refer to Chapter 79-00-114.
2. Push the line back to the adapter [7].
3. Screw down the banjo bolt [2] (don't tighten the banjo bolt)
4. Put on the screw [4] with the clip [5] (don't tighten the screw).
5. Screw down the screw [3] with 9 Nm.
6. Tighten the banjo bolt [2] with 50 Nm and save it with safety wire.
7. Screw down the screw [4] with 21 Nm.
8. Clean the working area.
9. Refill engine oil – refer to Chapter 79-00-30.
10. Perform an engine ground run according to Chapter 71-00-03.
11. After the ground run the engine must be cooled down, then inspect for leakage of oil and tightened the banjo bolt [2] again with 50 Nm and saved with safety wire.

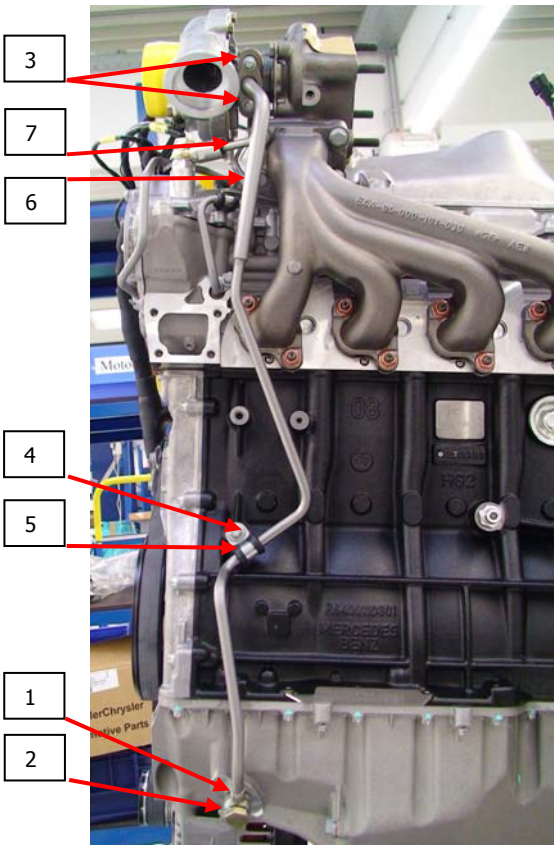

Fig. 79 - 16

79-00-113 Removal of the Oil Return Line Gasket

1. Remove the oil return line – refer to Chapter 79-00-111.
2. Remove the o-ring [1]
3. Remove the gasket [2]
4. Remove the sealing rings [3].

79-00-114 Installation of the Oil Return Line Gasket

1. Install the new o-ring [1] and lubricate with acid free lubrication.
2. Install the new sealing rings [3].
3. Install the new gasket [2].
4. Install the oil return line – refer to Chapter 79-00-112.

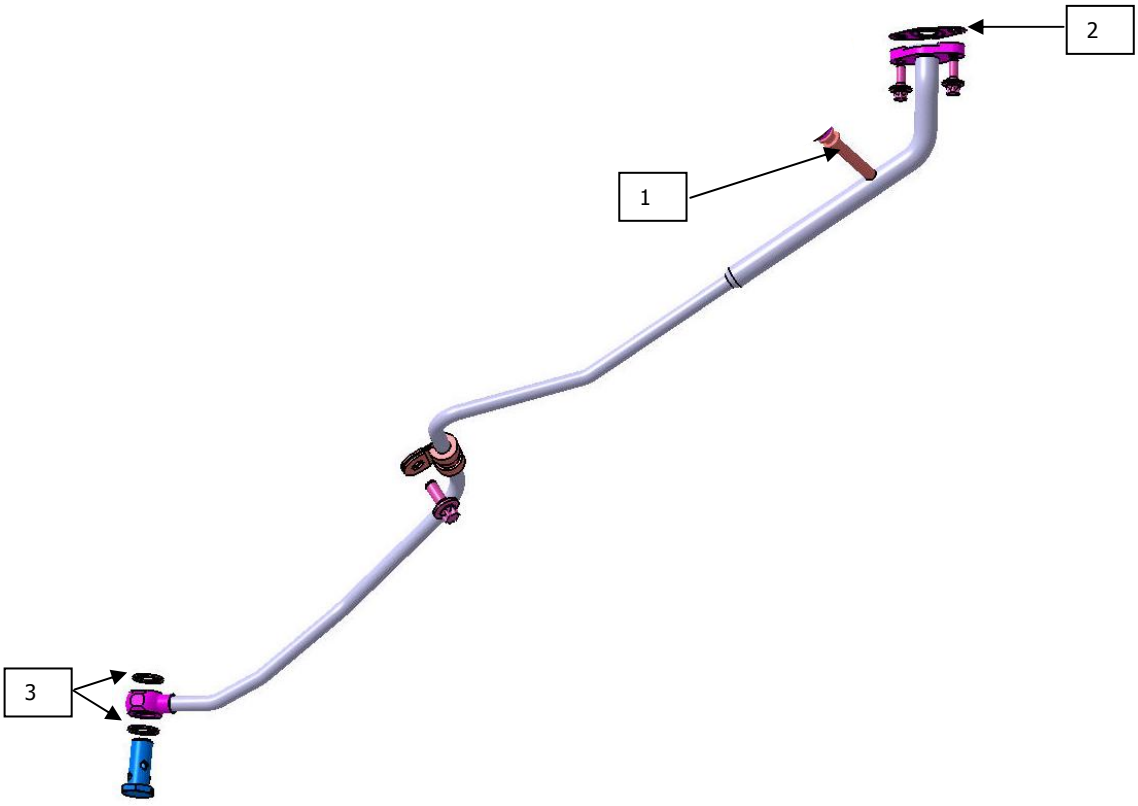

Fig. 79 - 17

79-00-120 Oil Level Sensor

79-00-121 Removal of the Oil Level Sensor

1. Disconnect the electrical connector (MOK).
2. Disconnect the screws.
3. Remove the cover and the oil-level sensor.
4. Remove and fit the oil-level-sensor.

79-00-122 Installation of the Oil Level Sensor

1. Use a new o-ring.
2. Lubricate the o-ring with oil.
3. Insert the oil-level-sensor.
4. Push down the sensor with light pressure in the oil sump [1].
5. Put the cover in place above the oil level sensor.
6. Screw the oil level sensor together with the cover down with 5 Nm using Loctite 243.

When using Loctite, make sure, that the thread is free of grease and apply only a thin film of Loctite.

7. Connect the cable (MOK).
8. Perform an engine ground run according to Chapter 71-00-03.
9. After the ground run inspect oil system for leakage.

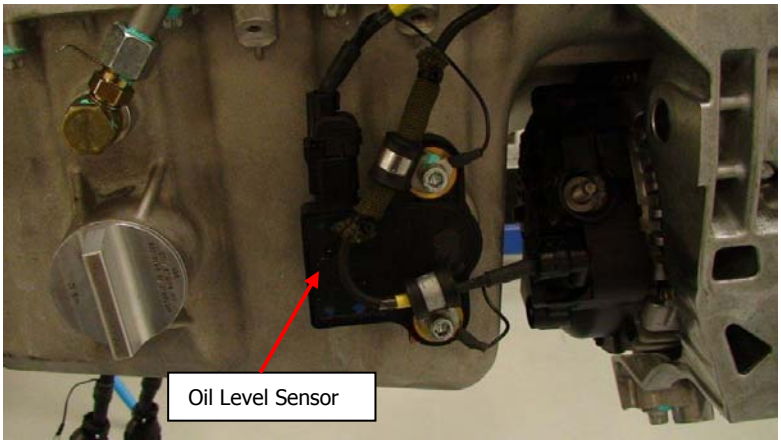

Fig. 79 - 18

79-00-130 Oil Pressure Sensor

79-00-131 Removal of the Oil Pressure Sensor

1. Disconnect the electrical connector (OPS) [1].
2. Remove the sensor [2].

79-00-132 Installation of the Oil Pressure Sensor

1. Put on a new sealing ring.
2. Screw down the new oil pressure sensor [2] with 20 Nm using Loctite 542.

When using Loctite, make sure, that the thread is free of grease and apply only a thin film of Loctite.

3. Connect the electrical connector (OPS) [1].
4. Clean the working area.
5. Perform an engine ground run according to Chapter 71-00-03.
6. After the ground run inspect oil system for leakage.

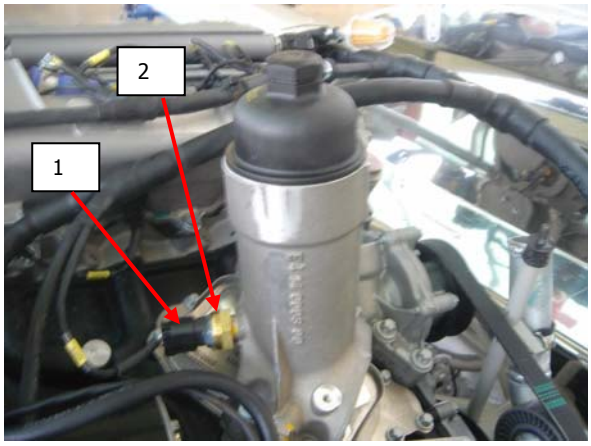

Fig. 79 - 19

79-00-140 Governor

The Governor is not part of the engine. For detailed information refer to the applicable Aircraft Maintenance Manual.

79-00-141 Removal of the Governor

1. Remove the electrical connector (GOV) [1].
2. Remove the oil hose [2] (if installed) – refer to the applicable Aircraft Maintenance Manual.
3. Remove the four nuts [3].
4. Pull down carefully the governor.
5. Remove the gasket and clean the sealing face.

79-00-142 Installation of the Governor

1. Use a new gasket.

CAUTION

Inspect the correct seat of the gasket.
Take care, that the curved side of the gasket metal sieve must be assembled in direction to the governor (see Fig. 79 – 22).

2. Push on carefully the governor.
3. Fixed the governor with new stop nuts and torque them crosswise with 20 Nm.
4. Connect the electrical connector (GOV) [1].
5. Connect the oil hose [2] (if installed) – refer to the applicable Aircraft Maintenance Manual.
6. Clean the working area.
7. Perform an engine ground run according to Chapter 71-00-03.
8. After the ground run inspect gearbox oil system for leakage.
9. Inspect gearbox oil level, if necessary adjust the oil level – refer to Chapter 85-10-40

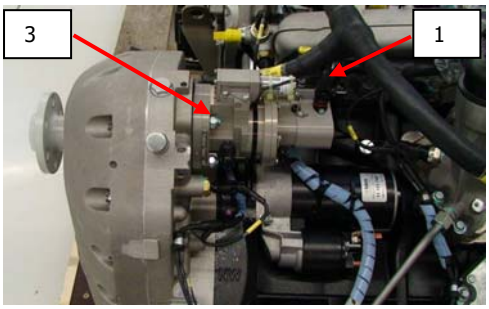

Fig. 79 - 20

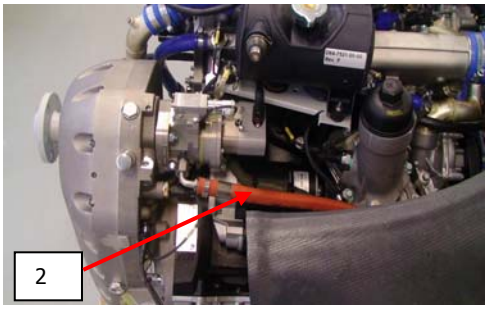

Fig. 79 - 21

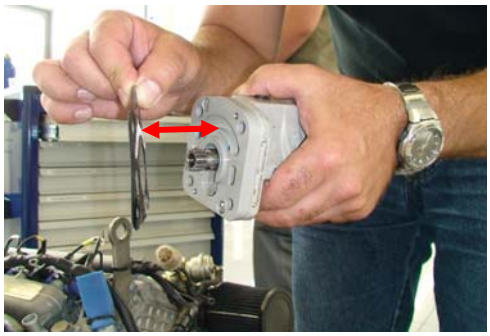

Fig. 79 - 22

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Chapter 80-00-00 Starting

80-00-01 General

For detailed description refer to the AE 300 Operation Manual E4.01.01 - Chapter Operating Instructions.

80-00-10 Starter

80-00-11 Removal of the Starter

1. Disconnect the battery – refer to the applicable Aircraft Maintenance Manual.

First disconnect the negative pole and second the positive pole.

2. Disconnect the electrical cables from the starter – refer to the applicable Aircraft Maintenance Manual.
3. Remove the tie rap [1].
4. Remove the screws [2] from the GPC-bracket.
5. Remove the screw [3].
6. Place the GPC side wards.
7. Do not lose the spacer [4].
8. Remove the second screw at the starter.
9. Remove carefully the starter.

80-00-12 Installation of the Starter

1. Install carefully the starter.
2. Put the GPC-bracket in the correct position.
3. Screw on the screws [2] with the spacer [4].
4. Screw on the screws on the starter.
5. Torque the screws on the starter with 22 Nm.
6. Torque the screws [2] with 13 Nm.
7. Install a new tie rap [1].
8. Connect the electrical cables – refer to the applicable Aircraft Maintenance Manual.
9. Connect the battery – refer to the applicable Aircraft Maintenance Manual.
10. Perform an engine ground run according to Chapter 71-00-03.

Figure for Chapter 80-00-11 and 80-00-12.

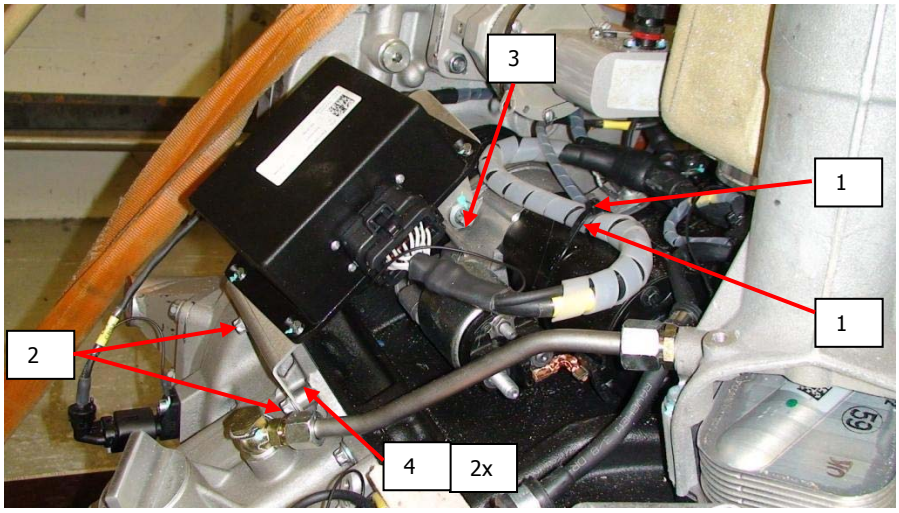

Fig. 80 - 1

80-00-20 Glow Plugs

80-00-21 Removal of the Glow Plugs

1. Remove the cable connector [1] carefully with a gripper (GP1/GP2/GP3/GP4).
2. Remove the glow plugs.

80-00-22 Installation of the Glow Plugs

1. Screw in the glow plugs and torque them with 11 Nm.
2. Clip on the cable connector [1] again.
3. Perform an engine ground run according to Chapter 71-00-03.

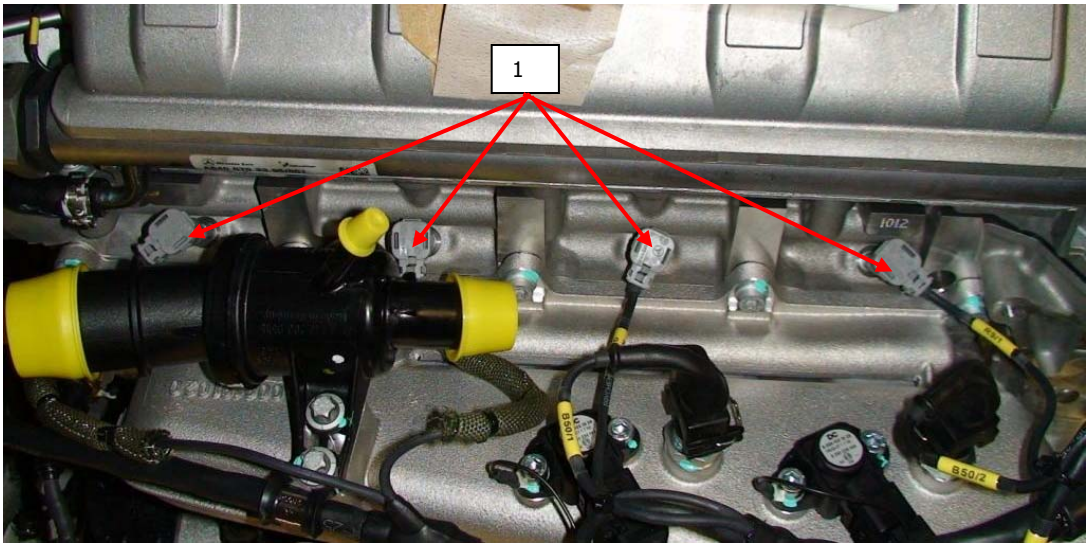

Fig. 80 - 2

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Chapter 81-00-00 Turbocharging

81-00-01 General

For description refer to Chapter 01-10-10 Intake/Exhaust System Description.

81-00-10 Turbo Charger Complete

81-00-11 Removal of the Turbo Charger

1. Remove the exhaust manifold including turbo charger – refer to Chapter 78-00-11.
2. Remove turbo charger from exhaust manifold – refer to Chapter 78-00-11.

81-00-12 Installation of the Turbo Charger

1. Install turbo charger on exhaust manifold – refer to Chapter 78-00-12
2. Install exhaust manifold including turbo charger – refer to Chapter 78-00-12

For explosion picture see also Chapter 78-00-12.

81-00-13 Removal of the Waste Gate Controller

1. Disconnect hose at the top of the waste gate controller.
2. Remove three M6 bolts [2].
3. Remove circlip [1].
4. Disconnect rod from waste gate lever and remove waste gate controller [3].

81-00-14 Install new Waste Gate Controller

The following figure defines the Installation versions of the waste gate controller bracket.

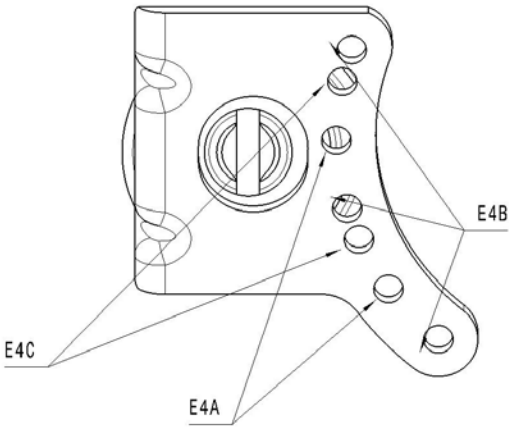

Fig. 81 - 1 Waste Gate Controller – Installation Versions

Take care to install the waste gate controller according to your engine configuration (E4A, E4B or E4C).

1. Install the bracket with the M6 bolts [2] and torque them with 7 Nm.
2. Chose a suitable air pressure device (see Fig. 81 – 4) as described in Chapter 81-00-32.
3. Attach the chosen device to the top of the waste gate controller and apply pressure till the rod starts to move. Do not excess a pressure level of 3,5 bar.
4. Connect rod to waste gate lever.
5. Adjust waste gate controller – refer to Chapter 81-00-32.

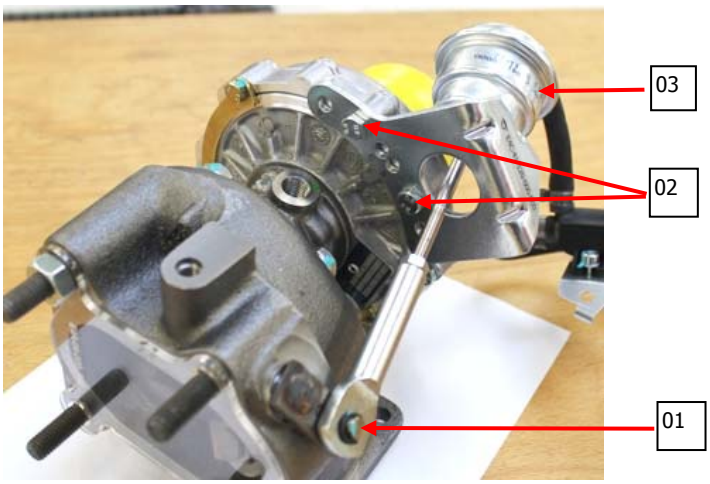

Fig. 81 - 2 E4A Turbo Charger

CAUTION

Note: For fixing of the rod on the waste gate lever use new circlip.

81-00-20 Boost Pressure Actuator

81-00-21 Removal of the Boost Pressure Actuator (BPA)

There are actually two different BPA installation versions on the E4 engine.
At the previous version the BPA inlet is connected to the turbocharger (see Fig. 81 – 3).
The BPA inlet of the latest version is connected to the Manifold and therefore the BPA is installed twisted.

1. Remove the electrical connector [1] "BPA".
2. Remove the clamps [2] as required.
3. Remove the hoses.
4. Loose the screws [3].
5. Remove the boost pressure actuator [4].

81-00-22 Installation of the Boost Pressure Actuator

In case of installation of the previous BPA versions (for explanations refer to chapter 81-00-21) please follow the steps 1, 3 (routing according Fig. 81 – 4) 4, 5 and 7 of the following installation instruction.

In case of installation of the latest BPA version (for explanation refer to chapter 81-00-21) the following steps need to be followed.

If parts need to be replaced (e.g. bracket or hose) it is always required to install the latest BPA version.

1. Install the boost pressure actuator [4] using existing screws [3], washers and new counter nuts and torque them with 3 Nm.
2. Make sure that the spacer [5] is installed on the Manifold according to chapter 85-30-22.
3. Route the hoses according Fig. 81 - 4.
4. Install hoses and secure them with the clamps [2].
5. Connect electric connector "BPA" [1].
6. If the previous disassembled EPW (according chapter 81-00-21) was connected to the Turbo Charger instead to the Manifold make sure that the Turbo Charger outlet is plugged with a scrub screw [6]. Secure the scrub screw with Loctite 542 and torque them with 5 Nm.
7. Perform an engine ground run according to Chapter 71-00-03.

Fig. 81 - 3 Previous BPA installation version

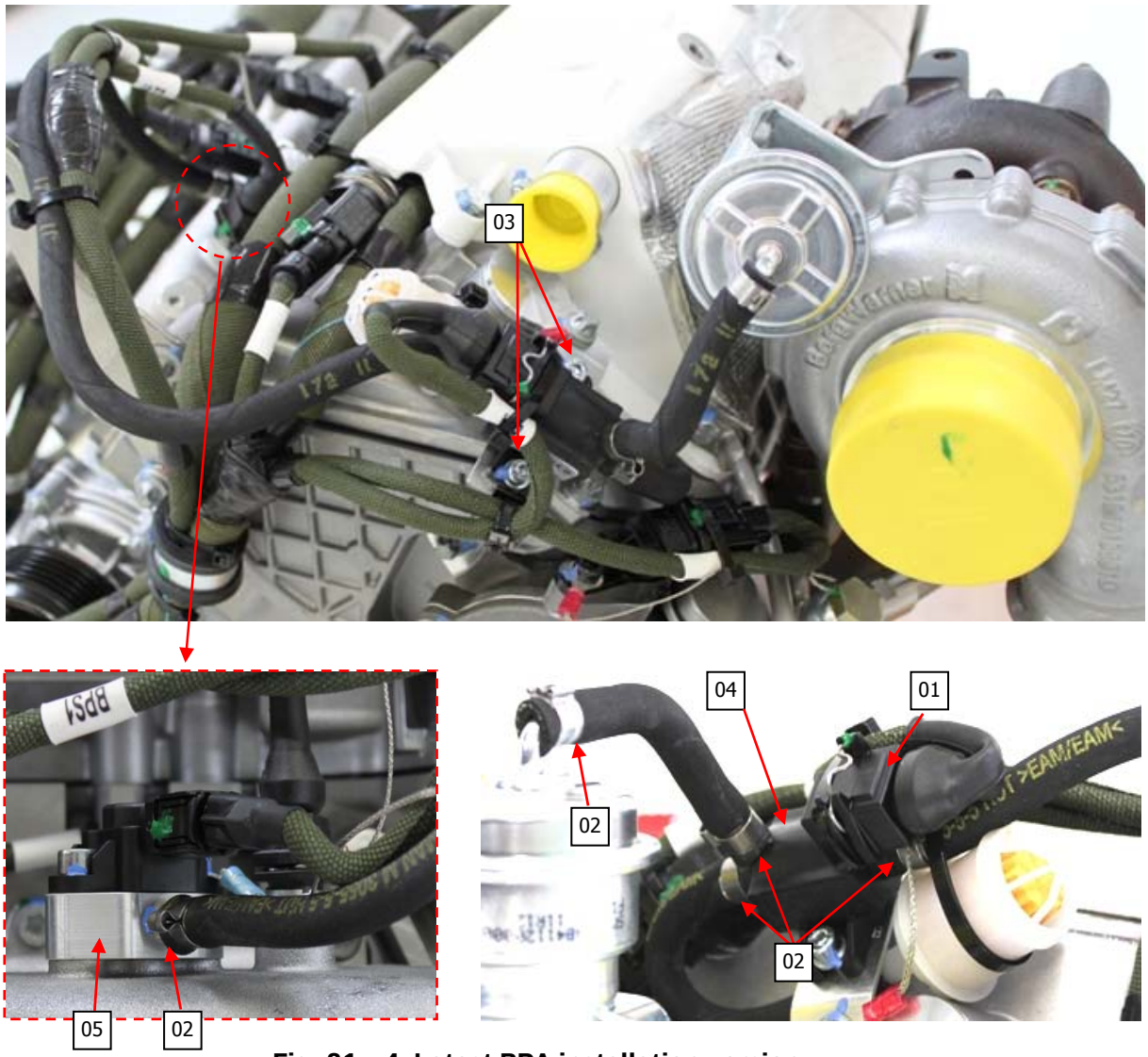

Fig. 81 - 4 Latest BPA installation version

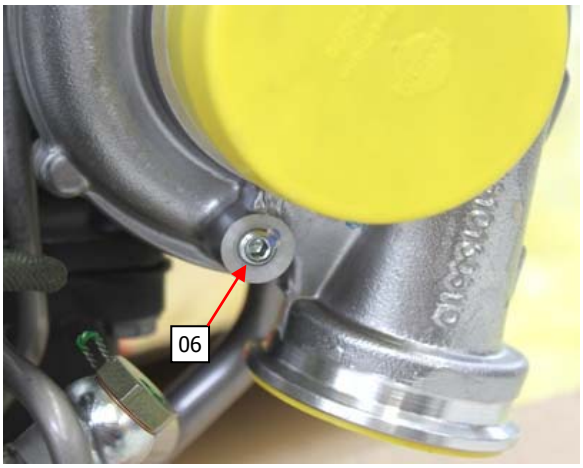

Fig. 81 - 5 Scrub screw installation

81-00-30 Waste Gate Controller

81-00-31 Inspection

If you have problems with the waste gate controller, remove the complete turbo charger, refer to Chapter 81-00-11 and send it to an **Austro Engine GmbH** – Service Center.

81-00-32 Check / Adjust of the Waste Gate Controller

1. For checking the waste gate controller, remove the clip[1] and pull down the hose[2].
2. For the checking procedure use an air pressure device with the ability to increase the pressure at the waste gate slowly.
3. Push the hose [3] from the chosen air pressure device [4] on the controller and fix it with a clamp.
4. With the air pressure device pump air in the controller slowly to prevent damage.
5. At 1,5 bar the push rod must begin to move.
6. If it is necessary to correct the adjustment, loosen the nut [5] and remove the circlip [6].

Let a pressure from 1,4 – 1,5 bar in the controller to discharge the waste gate.
It's not allowed to excess the max pressure level of 3,5 bar.

7. If you will reduce the opening pressure, turn the fitting [7] out of the pushrod [8].
8. If you will heighten the opening pressure, turn the fitting [7] into the pushrod [8].
9. Recapitulate this procedure until the pressure have 1,5 bar.
10. When the pressure is correct, mount the fitting [7] back and safe it with the circlip [6].
11. A new circlip has to be used for installation.
12. Torque the nut [5] with 6 Nm using Loctite 243.

When using Loctite, make sure, that the thread is free of grease and apply only a thin film of Loctite.

Hold the pushrod [8] with a gripper.

13. Remove the hose [3] from the special tool [4] and push on the hose [2] on the controller.
14. Secure the hose with new clamp.
15. Perform an engine ground run according to Chapter 71-00-03.

Figures for Chapter 81-00-31 and 81-00-32

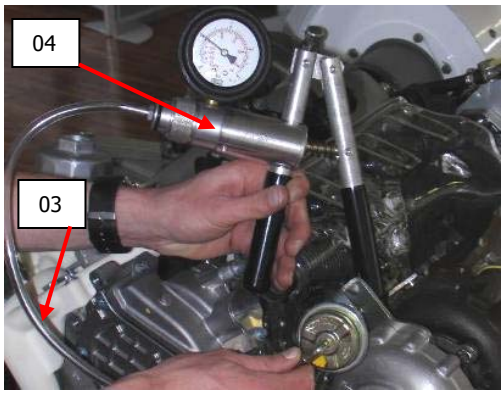

Fig. 81 - 6

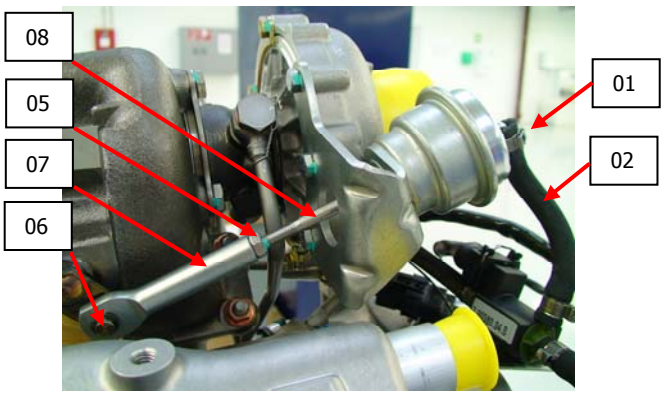

Fig. 81 - 7

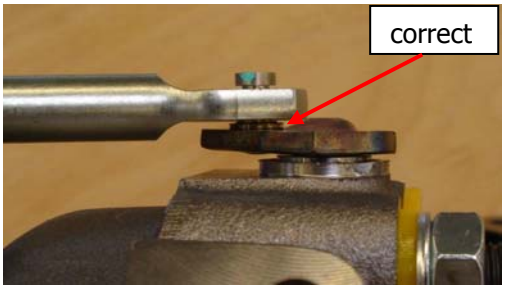

Fig. 81 - 8

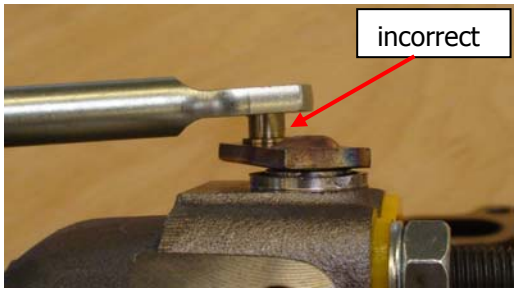

Fig. 81 - 9

Chapter 85-00-00 Reciprocating Engine

85-00-10 Injector Cover

85-00-11 Removal of the Injector Cover

1. Disconnect the breather line [5] from the injector cover – refer to the applicable Aircraft Maintenance Manual.
2. Remove the oil-separator return line - refer to Chapter 79-00-91.
3. Remove the screws [1].
4. Carefully lift up the injector cover [4].
5. Open the hose clamp [2].
6. Pull off the hose [3] from the cylinder head.
7. Remove the cover.

85-00-12 Installation of the Injector Cover

1. Route the oil separator hose [3] below the high pressure lines – refer to Fig. 85 - 2 and Fig. 85 - 3.
2. Push the oil separator hose on the socket and fix it with the hose clamp [2].

Make sure that the hose is installed and routed without tension. If necessary push the hose below the high pressure lines in direction connector socket to assure the stress less routing.

3. Put the injector cover [4] in position above the cylinder head

Install the oil separator hose stressless.

4. Screw down the injector cover with 9 Nm.
5. Attach the breather line to the injector cover - refer to the applicable Aircraft Maintenance Manual.
6. Install the oil-separator return line - refer to Chapter 79-00-92.
7. Perform an engine ground run according to Chapter 71-00-03.

Figures for Chapter 85-00-11 and 85-00-12

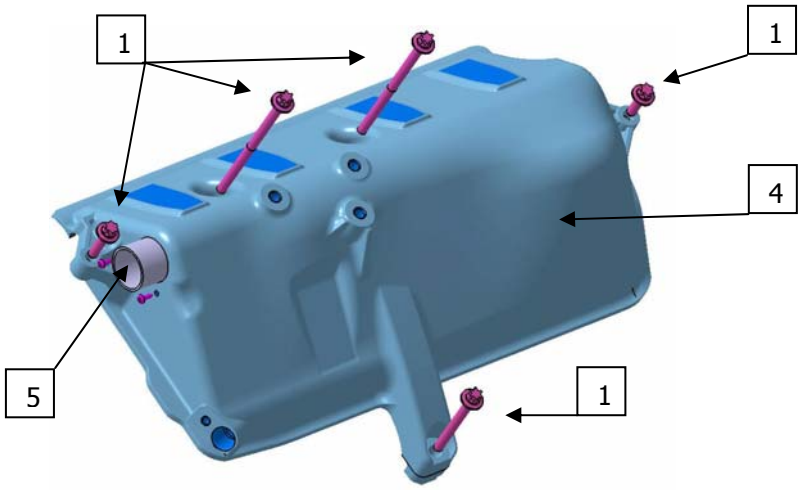

Fig. 85 - 1

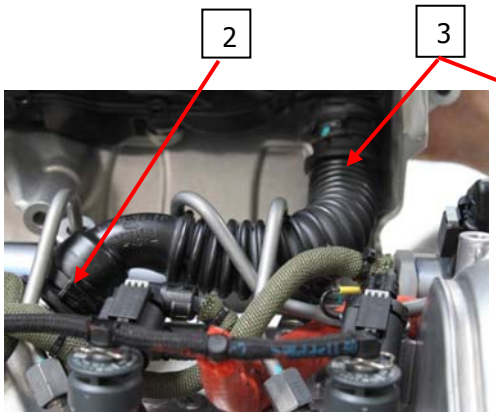

Fig. 85 - 2

Fig. 85 - 3

85-10-00 Reciprocating Engine Front System

85-10-10 Gearbox

85-10-11 Removal of the Gearbox

1. Apply a container with minimum 3 litres below the gearbox drain plug.
2. Open the gearbox filler plug [1].
3. Open the gearbox drain plug [2]
4. Remove the propeller – refer to the applicable Aircraft Maintenance Manual.
5. Remove the electrical connector [3] of the governor solenoid marked with "GOC/M55" and secure the connector and the socket with a cap.
6. Remove the pressure line [13] from the governor (If the pressure line is installed) - refer to the applicable Aircraft Maintenance Manual.
7. Remove the electrical connector of the gearbox temperature sensor [5] market with "GBTS/B50/5" and secure the connector and socket with a cap.
8. Remove all clamps [14] of the cable fixation for the crankshaft sensor.
9. Remove the engine starter –refer to Chapter 80-00-11.
10. Install forward engine hinge [6] for slinging the engine (if not installed).
11. Sling the engine on the forward hinge and apply slow force.
12. Open and remove the right [7] and left [8] forward engine mounts - refer to the applicable Aircraft Maintenance Manual.
13. Support the gearbox or sling the gearbox on the prop shaft.
14. Remove the gearbox screws [9] (11x).

Four different types of screws are used. Mark screws for correct position before removing.

15. Remove the gearbox [10].
16. Remove the governor [4]– refer to Chapter 79-00-141

85-10-12 Installation of the Gearbox

CAUTION

If the gearbox is replaced due to high debris contamination make sure that the parts mounted to the gearbox and operated with gearbox oil (i.e. propeller, governor and feathering accumulator if applicable) are properly purged before reinstallation.

1. Install the governor – refer to Chapter 79-00-142
2. Put the gearbox [10] in place in front of the engine.
3. Insert the 11 screws [9] on the gearbox and equally torque the screws with 22 Nm.

Four different types of screws are used. Make sure that the correct screws according to the marking during removal are used.

4. Install the two forward engine mounts [7] and [8] to the gearbox - refer to the applicable Aircraft Maintenance Manual.
5. Install the starter on the engine - refer to Chapter 80-00-12.
6. Connect the pressure line to the governor - refer to the applicable Aircraft Maintenance Manual
7. Connect the electrical connector [3] "GOV/M55" to the governor solenoid.
8. Connect the electrical connector [5] of the gearbox temperature sensor marked with "GBTS/B50)".
9. Install all clamps [14] of the cable fixation for the crankshaft sensor.

10. Install the gearbox magnetic drain plug – refer to Chapter 85-10-22.
11. Fill the gearbox with 2,1 l gearbox oil according to 85-10-41 General
12. Install the filling plug [1] with 12 Nm and apply safety wire according to the standard practices.
13. Install the adequate propeller - refer to the applicable Aircraft Maintenance Manual.
14. Perform an engine ground run according to Chapter 71-00-03.
15. After the ground run check gearbox oil system for leakage.

Figures for Chapter 85-10-11 and 12.

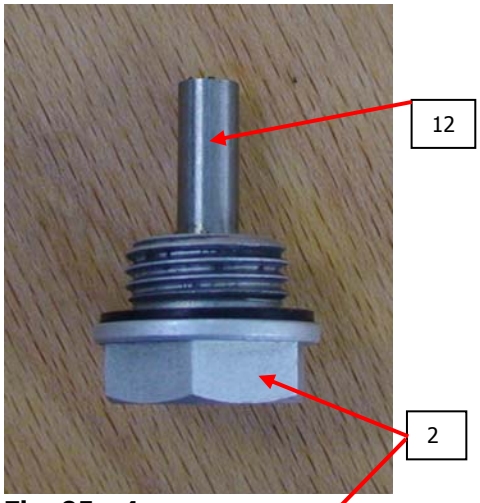

Fig. 85 - 4

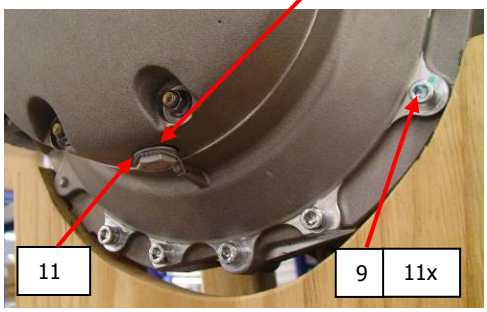

Fig. 85 - 7

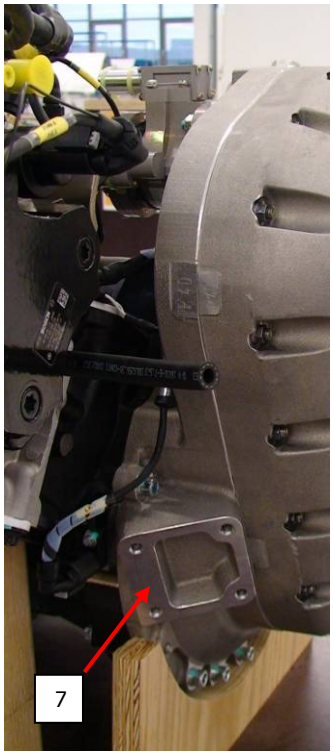

Fig. 85 - 5

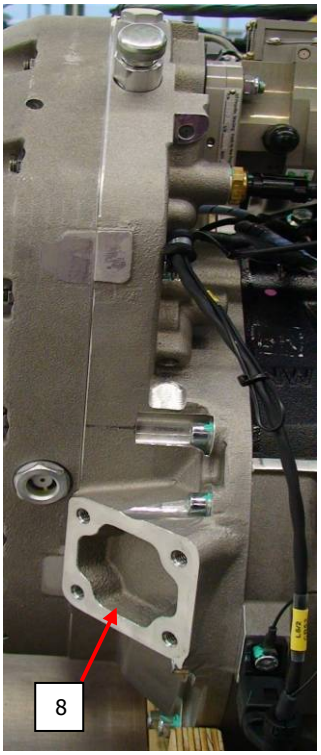

Fig. 85 - 6

Additional Figures for Chapter 85-10-11 and 12.

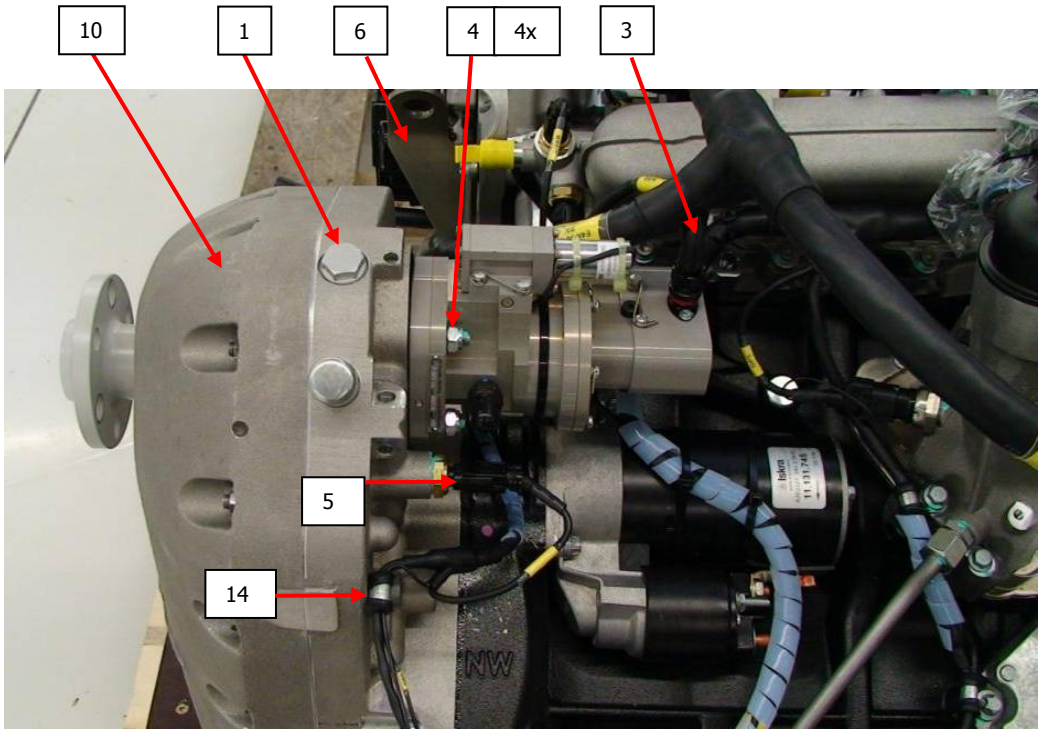

Fig. 85 - 8

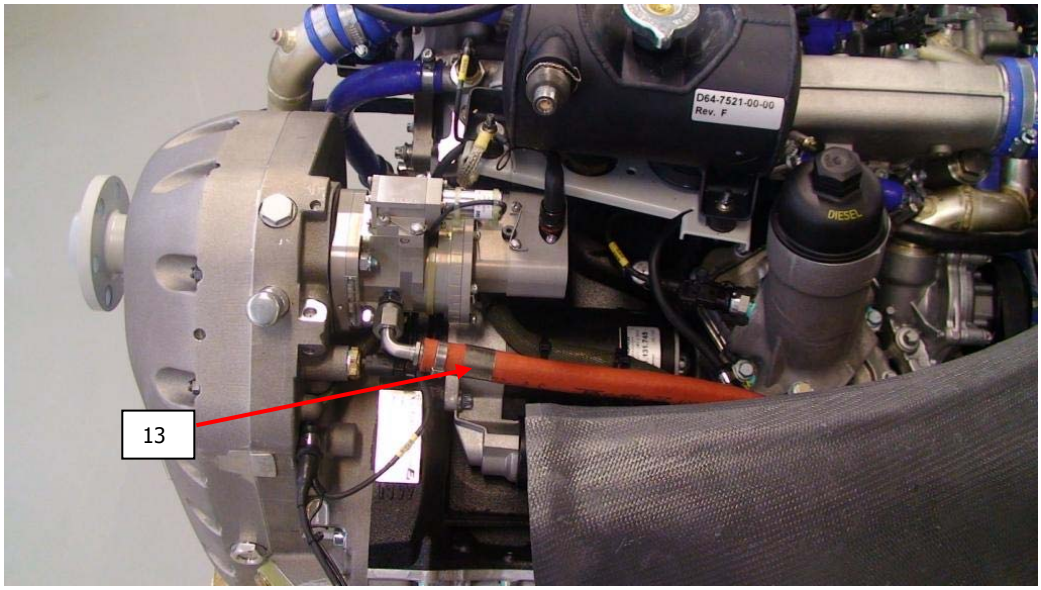

Fig. 85 - 9

85-10-20 Gearbox Magnet-Drain Plug

85-10-21 Removal of the Gearbox Magnet-Drain Plug

1. Remove the wire protection from the filler screw.
2. Dismount the filler plug [1].
3. Put a container (min. 2,5 l) below it.
4. Remove the wire protection [11] of the magnet drain plug.
5. Remove the magnet drain plug. [2].
6. Drain the gearbox oil through the included filter which is included in the scheduled maintenance kit of Austro Engine for bigger pieces of material and non magnetic material.
7. Dip the magnetic drain plug in a solvent of remove oil contamination for better debris inspection.
8. Investigate the drain plug for accumulation of debris. (see Note below).

If this is the first gearbox oil inspection to be conducted on this engine (gearbox TSN: 100 h) a quantity like the one shown in Fig. 85 – 10 is acceptable, as slightly more debris is not uncommon for the first flight hours.

Fig. 85 - 10 Acceptable quantity for first 100 h inspection

If the gearbox operation time is more than 100 h TSN, less debris is allowable. Thus compare the magnetic drain plug with the one shown in Fig. 85 – 11. Should the particles present on the magnetic drain plug be over the allowable size or quantity contact **Austro Engine GmbH** for further information and send a picture of the contaminated magnetic drain plug via E-mail to service@austroengine.at.

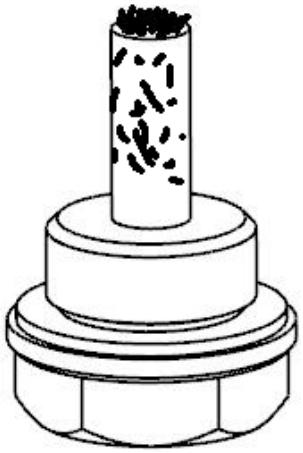

Fig. 85 - 11 Accumulation of allowable debris

Following types of particles are allowable:

- Small quantities that are like thin pieces of hair (see Fig. 85 – 10).
- Small quantities that are like powder (see Fig. 85 – 10).

Following types of particle are not allowable:

- Large quantities that are like thin pieces of hair.
- Large quantities that are like powder.
- Particles that are like flakes.
- Particles greater than the above mentioned.

9. Clean the magnet drain plug [2].

85-10-22 Installation of the Gearbox Magnet-Drain Plug

1. Inspect the gaskets, if worn, use a new gasket.
2. Lubricate the gasket.
3. Install the magnet drain plug and torque the plug with 12 Nm.
4. Secure the magnet drain plug with safety wire.
5. Refill the gearbox oil – refer to Chapter 85-10-43.
6. Screw on the gearbox filler plug with 12 Nm [1] and secure it with safety wire.

85-10-30 Gearbox Temperature Sensor

85-10-31 Removal of the Gearbox Temperature Sensor

1. Disconnect the electrical connector [1] (GBTS).
2. Remove the temperature sensor [2].

85-10-32 Installation of the Gearbox Temperature Sensor

1. Use new gasket [3].
2. Install the gearbox temperature sensor using Loctite 2701.

CAUTION When using Loctite, make sure, that the thread is free of grease and apply only a thin film of Loctite.

3. Torque the gearbox temperature sensor with 15 Nm.
4. Connect the electrical connector (GBTS).
5. Perform an engine ground run according to Chapter 71-00-03.
6. After the ground run inspect gearbox oil system for leakage.

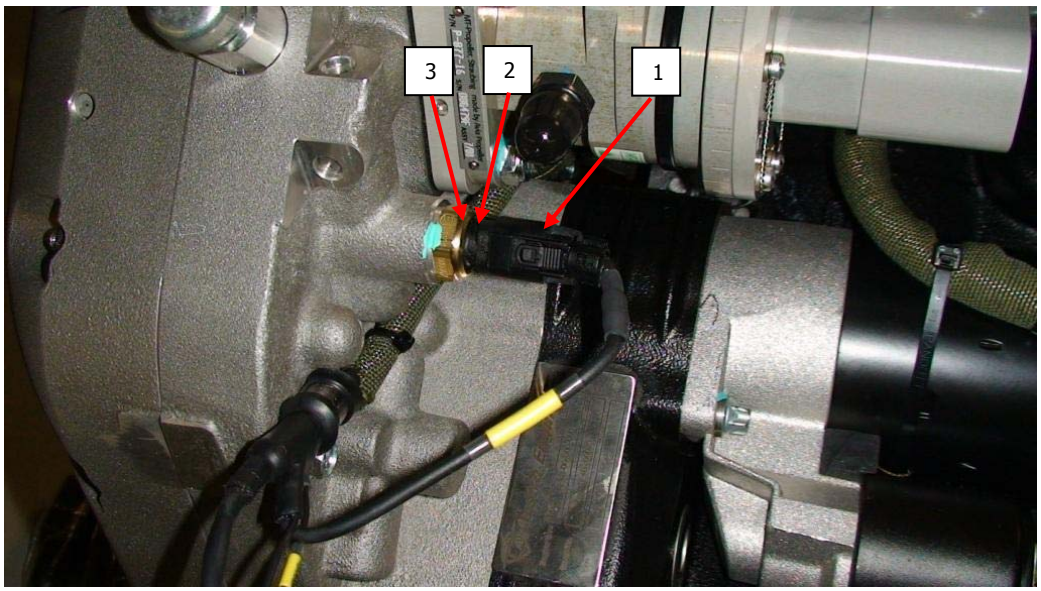

Fig. 85 - 12

85-10-40 Gearbox Oil

85-10-41 General

Gearbox Oil Information:

Gearbox oil type: Shell Spirax GSX 75W-80

Oil volume: 2,1 l

For checking the gearbox oil level- refer to Chapter 12-20-11.

85-10-42 Exchange of the Gearbox Oil

For exchange of the gearbox oil refer to Chapter 85-10-21.

85-10-43 Refill of the Gearbox Oil

1. Install the magnet drain plug - refer to Chapter 85-10-22.
2. Fill in gearbox oil up to the inspection window (approx 1,6 l).
3. Conduct a ground run with more than 1800 rpm to fill A/C gearbox oil system.
4. Fill in gearbox oil up to the inspection window.
5. Fill in additional 0,5 l of gearbox oil.

With 0,5 l gearbox oil quantity above inspection window level the gearbox is filled with the required quantity of 2,1 l.

6. Secure gearbox filler plug with safety wire.

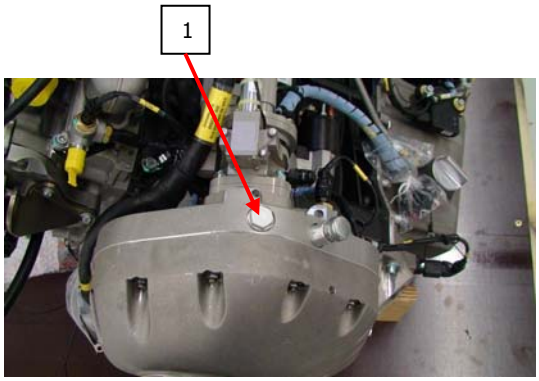

Fig. 85 - 13

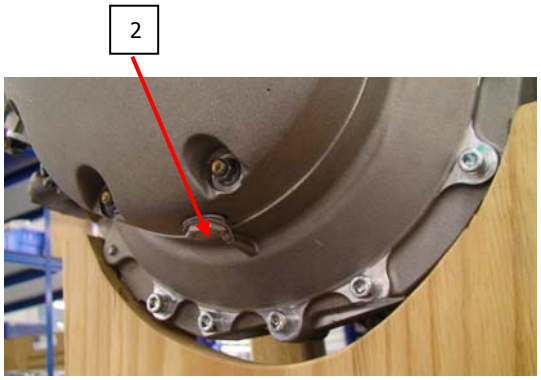

Fig. 85 - 14

85-10-50 Two-Mass-Flywheel

85-10-51 Removal of the Two-Mass-Flywheel

1. Remove the starter - refer to Chapter 80-00-11.
2. Remove the gearbox – refer to Chapter 85-10-11.
3. Disconnect the ground strip of the crankshaft senor plugs
4. Disconnect the crankshaft sensor plugs.
5. Remove the crankshaft sensors - refer to Chapter 76-00-31.
6. Attach the flywheel locking tool [1] (see List of Tools).
7. Remove the 8 screws [2] and afterwards remove the hub [3].
8. Remove the 8 screws [4] from the two-mass-flywheel.
9. Remove the two-mass-flywheel.
10. Remove the locking tool.
11. Clean and inspect the hole threads.

85-10-52 Installation of the Two-Mass-Flywheel

1. Install the new two-mass-flywheel. Pay attention to the aligning pin.
2. Re-attach the hub [3] to the pins and tighten up the 8 screws [2] with 25 Nm.
3. Re-attach the flywheel locking tool.
4. Use new 8 bolts and screw them in finger-tight in a crosswise sequence.
5. Tighten up all 8 screws in a crosswise sequence with the first step 45 Nm and the second step with 90°.
6. Remove the flywheel locking tool.
7. Install the crankshaft sensors - refer to Chapter 76-00-32
8. Connect the crankshaft sensor plugs.
9. Attach the ground strips of the crankshaft sensor plugs
10. Install the gearbox - refer to Chapter 85-10-12.
11. Install the starter – refer to Chapter 80-00-12.
12. Perform an engine ground run according to Chapter 71-00-03.
13. After the ground run inspect gearbox oil system for leakage.

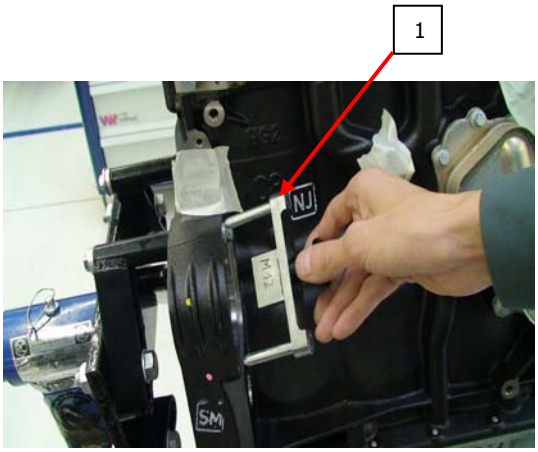

Fig. 85 - 15

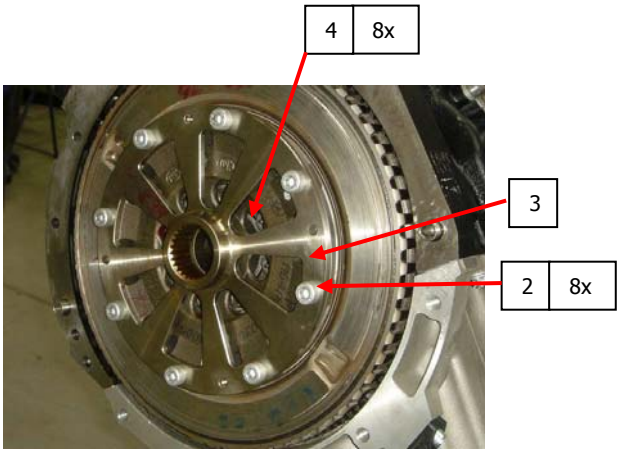

Fig. 85 - 16

85-20-00 Reciprocating Engine Power Section

85-20-10 Crankshaft Cover

For removal and installation of the crankshaft cover the engine has to be removed from the aircraft.

85-20-11 Removal of the Crankshaft Cover

1. Drain coolant – refer to the applicable Aircraft Maintenance Manual.
2. Drain engine oil – refer to Chapter 79-00-20.
3. Remove the engine from the aircraft – refer to the applicable Aircraft Maintenance Manual.
4. Remove the gearbox - refer to Chapter 85-10-11.
5. Remove the two-mass-flywheel – refer to Chapter 85-10-51.
6. Remove the oil sump – refer to Chapter 79-00-41.
7. Remove the screws [1] of the crankshaft cover.
8. Remove the crankshaft cover [2].

85-20-12 Installation of the Crankshaft Cover

1. Clean the sealing ring contact surface on the crankcase with a fibre-free cloth.
2. Mount the crankshaft cover [2] with the mounting sleeve [3] and tight the 6 screws [1] with 9 Nm.

The cover has to be installed without any kind of fluid or lubricant.

3. Look out for correct horizontal alignment of the crankshaft cover with the crankcase at position 4 in the picture below.
4. Remove the mounting sleeve [3]
5. Clean the sealing surface for oil sump.
6. Apply engine sealing material at the joint [4].

The recommended engine sealing material is available at **Austro Engine GmbH**.

7. Use new oil sump gasket.
8. Install the oil sump – refer to Chapter 79-00-42.

Don't damage the crankshaft sensor.

9. Install two-mass-flywheel - refer to Chapter 85-10-52.
10. Install the gearbox – refer to Chapter 85-10-12.
11. Install the engine - refer to the applicable Aircraft Maintenance Manual.
12. Refill engine oil – refer to Chapter 79-00-30.
13. Refill coolant – refer to the applicable Aircraft Maintenance Manual.

For coolant information please refer to Chapter 05-20-17 Coolant

14. Clean the working area.
15. Perform an engine ground run according to Chapter 71-00-03.
16. After the ground run inspect engine fluid systems for leakage.

Figures for Chapter 85-20-11 and 85-20-12.

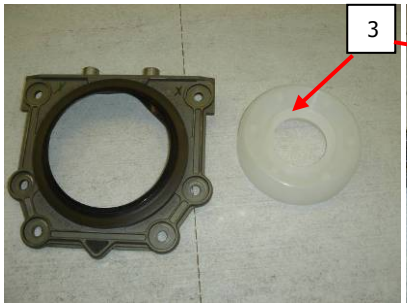

Fig. 85 - 17

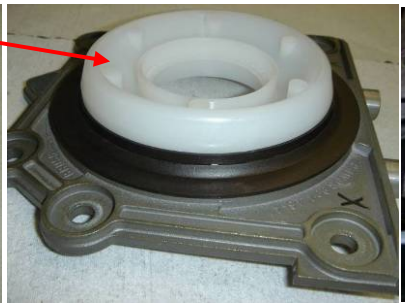

Fig. 85 - 18

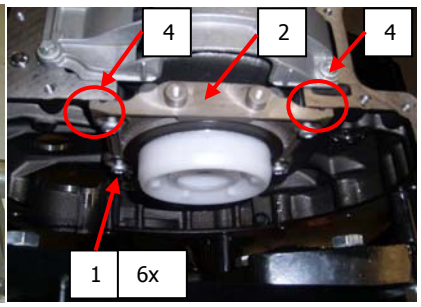

Fig. 85 - 19

85-30-00 Reciprocating Engine Cylinder Section

85-30-10 Intake Air

85-30-11 Removal of the Intake Air Manifold

1. Remove the intake hoses - refer to the applicable Aircraft Maintenance Manual.
2. Put a container below the engine coolant drain.
3. Drain the engine coolant - refer to the applicable Aircraft Maintenance Manual.
4. Remove the coolant hoses - refer to the applicable Aircraft Maintenance Manual.
5. Remove the coolant thermostat - refer to Chapter 85-70-41.
6. Remove the intake-air temperature sensor#1-IAT1 (B50/1) and intake air temperature sensor #2 – IAT2 (B50/2) refer to Chapter 85-30-31.
7. Remove the boost pressure sensor #1 – BPS1 (B5/1) and boost pressure sensor #2 – BPS2 (B5/2) refer to Chapter 85-30-21.
8. Remove the coolant temperature sensor #1 – CTS1 (B50/3) and coolant temperature senor #2 – CTS1 (B50/4) refer to Chapter 85-70-11.
9. Remove the screw [10] 9x.
10. Remove the intake air manifold [13].
11. Take off the gasket [9].
12. Clean the sealing surface.

85-30-12 Installation of the Intake Air Manifold

1. Fit on the new gasket
2. Put the intake air manifold in position above the cylinder head sealing area.
3. Screw the intake air manifold down with 14 Nm
4. Install the coolant thermostat [11] – refer to Chapter 85-70-42.

Inspect for the correct position of the o-ring.

5. Install the coolant hoses -refer to the applicable Aircraft Maintenance Manual.
6. Install the intake air temperature sensor #1 & #2 – refer to Chapter 85-30-32.
7. Remove the security plug of the sensor and connector.
8. Install the electrical connectors to the intake-air temperature sensor +#1-IAT1 (B50/1) and intake air temperature sensor #2 – IAT2 (B50/2).
9. Install the boost pressure sensor #1 & #2 - refer to Chapter 85-30-22.
10. Install the electrical connectors to the boost pressure sensor #1 – BPS1 (B51) and boost pressure sensor #2 – BPS2 (B5/2).
11. Install the coolant temperature sensor #1 & #2 - refer to Chapter 85-70-12.
12. Install the electrical connectors to the coolant temperature sensor #1 – CTS1 (B50/3) and coolant temperature sensor #2 – CTS1 (B50/4).
13. Install the air intake hoses - refer to the applicable Aircraft Maintenance Manual.
14. Fill engine with coolant and bleed the cooling system – refer to the applicable Aircraft Maintenance Manual.
15. Perform an engine ground run according to Chapter 71-00-03.
16. After the ground run inspect coolant system for leakage.

Intake Air Version E4-A

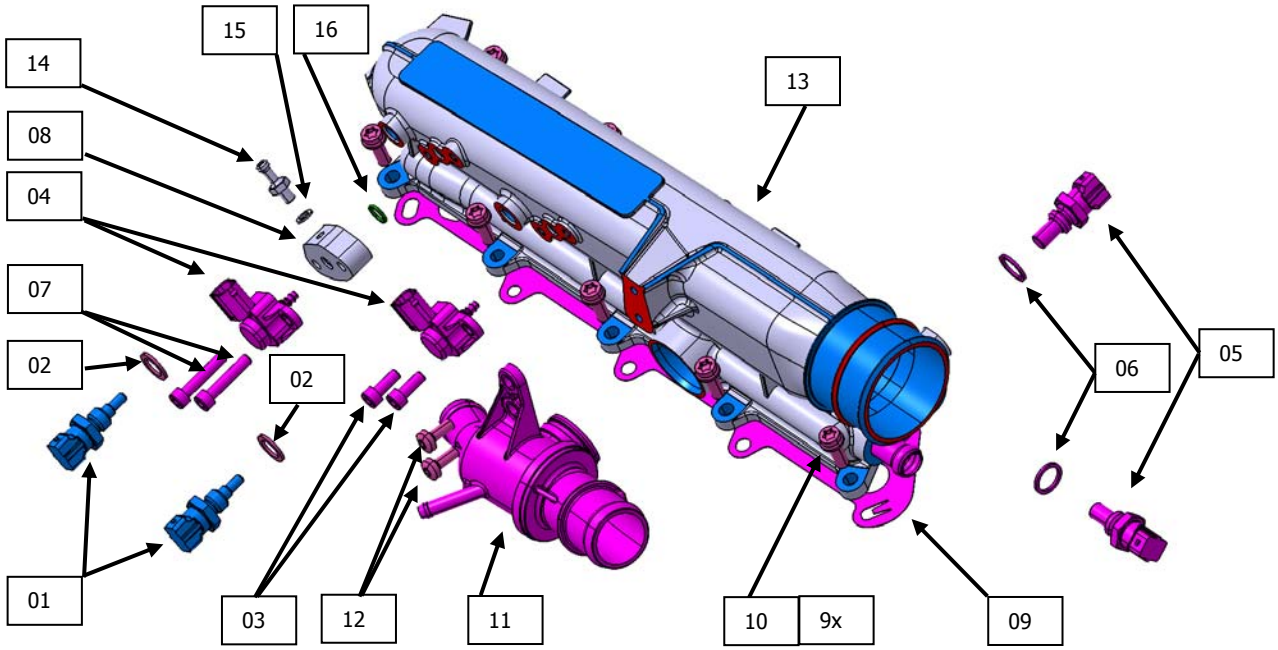

Fig. 85 - 20

Intake Air Inlet E4-A

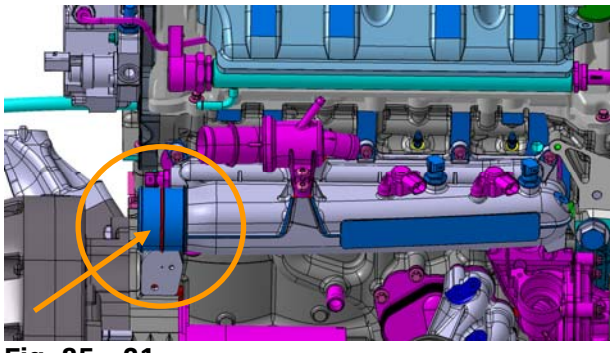

Fig. 85 - 21

Intake Air Version E4-B

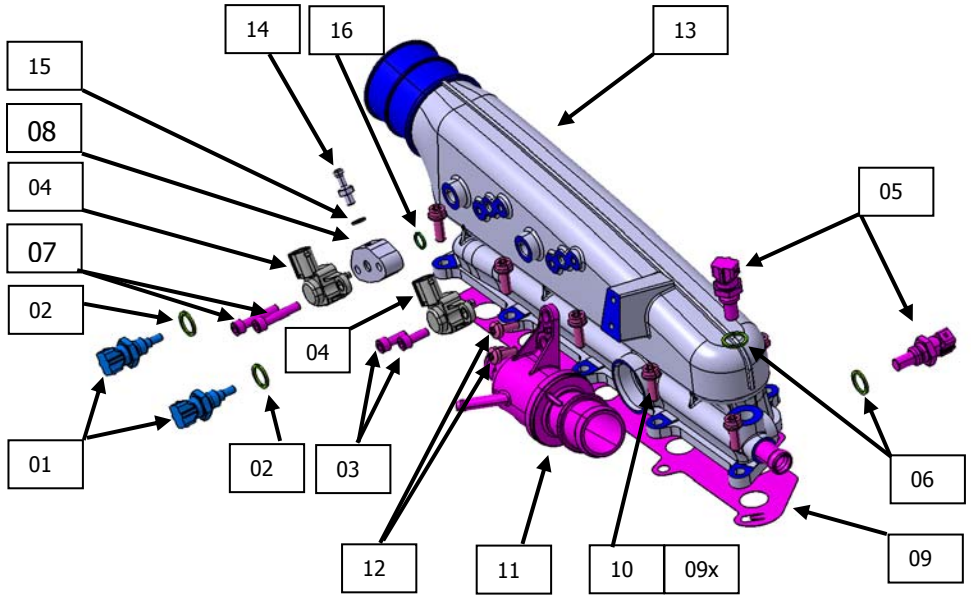

Fig. 85 - 22

Intake Air Inlet E4-B

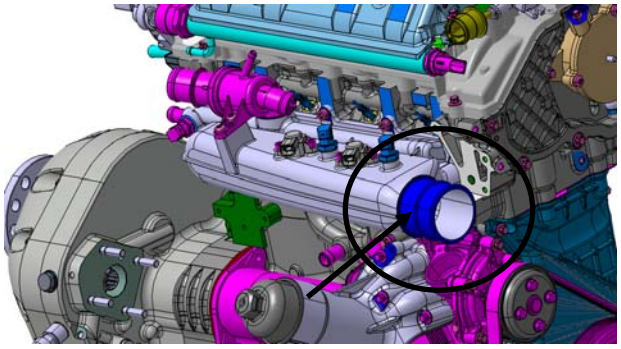

Fig. 85 - 23

85-30-20 Boost Pressure Sensor

85-30-21 Removal of the Boost Pressure Sensor

1. Disconnect the electrical connector "BPS1 + BPS2"
2. Remove the screws [3] and [7].
3. Remove the boost pressure sensor [4] and the spacer [8].

85-30-22 Installation of the Boost Pressure Sensor

1. Insert boost pressure sensor and the spacer with new o-ring.
2. Look out for the correct position of the o-ring.
3. Lubricate or ring with acid free lubrication.
4. Spacer [8] assembly steps in case of latest Boost Pressure Actuator installation: Assemble the hose nipple [14] together with the sealing [15] onto the spacer [8] using Loctite 542 and torque them with 5 Nm.
5. Screw boost pressure sensor screws down with 5 Nm using Loctite 243.

When using Loctite, make sure, that the thread is free of grease and apply only a thin film of Loctite.

6. Connect the electrical connectors "BPS1 or BPS2".
7. Perform an engine ground run according to Chapter 71-00-03.

85-30-30 Intake Air Temperature Sensor

85-30-31 Removal of the Intake Air Temperature Sensor

1. Disconnect the electrical connectors "IAT1 or IAT2".
2. Remove the intake air temperature sensor [1].

85-30-32 Installation of the Intake Air Temperature Sensor

1. Use new sealing rings [2].
2. Install the intake air temperature sensor with new sealing rings
3. Torque intake air temperature sensor with 15 Nm.
4. Connect the electrical connectors "IAT1 or IAT2".
5. Perform an engine ground run according to Chapter 71-00-03.

85-40-00 Reciprocating Engine Rear Section

85-40-10 V-Ribbed Belt

85-40-11 Removal of the V-Ribbed Belt

1. Move the v-belt tensioner [1] clockwise by turning the screw [2] to release the belt tension
2. Secure the v-belt tensioner with a locking pin [3].
3. Remove the v-ribbed belt [4].

85-40-12 Installation of the V-Ribbed Belt

1. Fit the v-ribbed belt [4] as illustrated in the diagram.

Make absolutely sure that the belt is routed as shown in the diagram.
No other routing is allowed.
Make sure that the ribbed side of the v-ribbed belt is facing inward.
In addition make sure that the ribs of the belt match the rills on the wheel.
The belt must lie within the boundaries of the wheel

2. Move the v-belt tensioner [1] clockwise by turning the screw [2]
3. Remove the locking pin [3].

The correct v-belt tension will be set automatically

4. Perform an engine ground run according to Chapter 71-00-03.

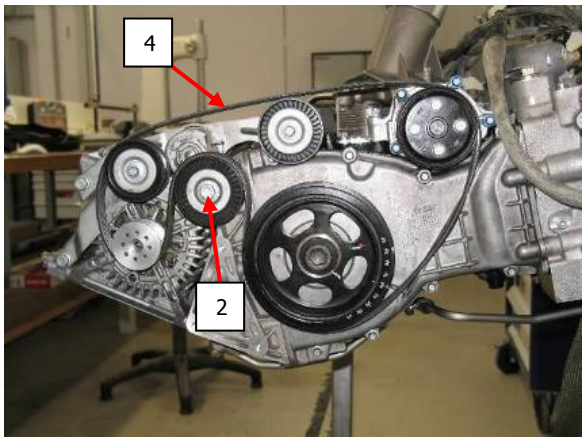

Fig. 85 - 24

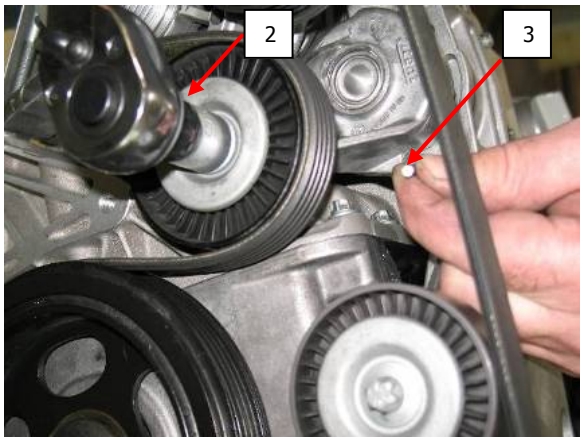

Fig. 85 - 25

85-40-20 Belt Tensioner

85-40-21 Removal of the Belt Tensioner

1. Remove the v-ribbed belt - refer to Chapter 85-40-11.
2. Remove the Alternator - refer to Chapter 24-00-11.
3. Remove the screw from the tensioner [5].
4. Remove the tensioner.

85-40-22 Installation of the Belt Tensioner

1. Put the belt tensioner in position.
2. Install the screws – do not torque the screws.
3. Install the Alternator - refer to Chapter 24-00-12.
4. Install the V-ribbed belt - refer to Chapter 85-40-12.
5. Perform an engine ground run according to Chapter 71-00-03.

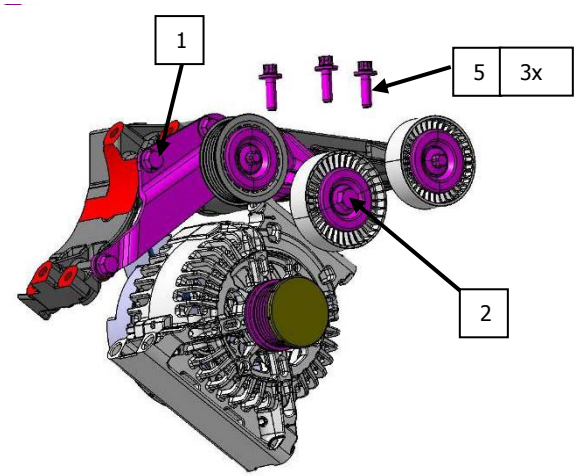

Fig. 85 - 26

85-40-30 Belt Tensioner – Roller

85-40-31 Removal of the Belt Tensioner – Roller

1. Remove the v-ribbed belt - refer to Chapter 85-40-11.
2. Remove the screw [1] from the roller.
3. Remove the roller.

85-40-32 Installation of the Belt Tensioner – Roller

1. Install the new roller
2. Torque the screw [1] with corresponding torque (see picture below) using Loctite 243.

When using Loctite, make sure, that the thread is free of grease and apply only a thin film of Loctite.

3. Install the v-ribbed belt - refer to Chapter 85-40-12.
4. Perform an engine ground run according to Chapter 71-00-03.

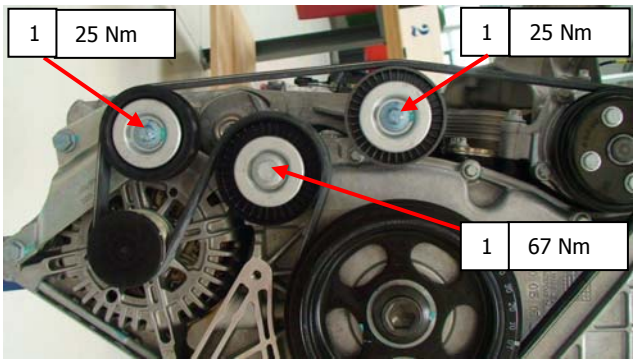

Fig. 85 - 27

85-70-00 Reciprocating Engine Liquid Cooling

85-70-10 Coolant Temperature Sensor

85-70-11 Removal of the Coolant Temperature Sensor

1. Drain the coolant - refer to applicable Aircraft Maintenance Manual.
2. Disconnect the electrical connector "CTS, CTS _ GPC".
3. Remove the coolant water temperature sensor [5] from the intake air manifold.

85-70-12 Installation of the Coolant Temperature Sensor

1. Use sealing rings [6].
2. Screw down the coolant temperature sensor with 15 Nm.
3. Connect the electrical connector "CTS, CTS_CGPCP".
4. Fill and bleed the coolant system – refer to the applicable Aircraft Maintenance Manual.
5. Clean the working area.
6. Perform an engine ground run according to Chapter 71-00-03.
7. After the ground run inspect coolant system for leakage.

For explosion drawing see Chapter 85-30-12 – Intake Air.

For coolant information please refer to Chapter 05-20-17 Coolant

85-70-20 Water Pump

85-70-21 Removal of the Water Pump

1. Drain the coolant - refer to the applicable Aircraft Maintenance Manual.
2. Remove the coolant pipe - refer to the applicable Aircraft Maintenance Manual.
3. Remove the v-ribbed belt - refer to Chapter 85-40-11.
4. Disconnect the screws [1] [2].
5. Remove the water pump [3].
6. Clean the sealing face.

85-70-22 Installation of the Water Pump

1. Install the new o-ring [4]
2. Install sealing ring [5]
3. Lubricate both rings with acid free lubrication.
4. Put on water pump [3] in position.

Inspect o-ring and sealing ring for correct installation.

5. Screw down the water pump and torque the screws with 20 Nm.
6. Install the coolant pipe - refer to the applicable Aircraft Maintenance Manual.
7. Install the v-ribbed belt - refer to Chapter 85-40-12.
8. Fill and bleed the cooling system - refer to the applicable Aircraft Maintenance Manual.
9. Clean the working area.
10. Perform an engine ground run according to Chapter 71-00-03.
11. After the ground run inspect coolant system for leakage.

For coolant information please refer to Chapter 05-20-17 Coolant

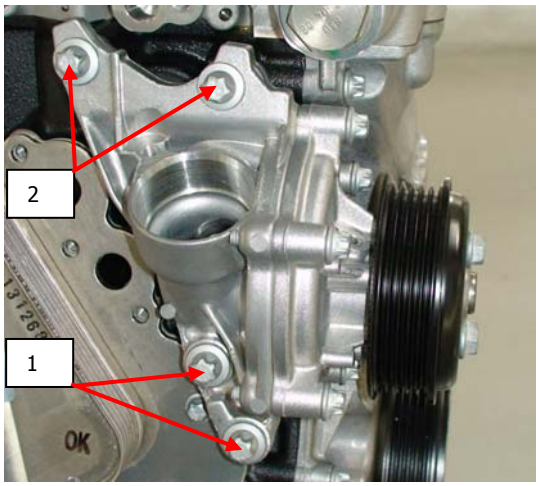

Fig. 85 - 28

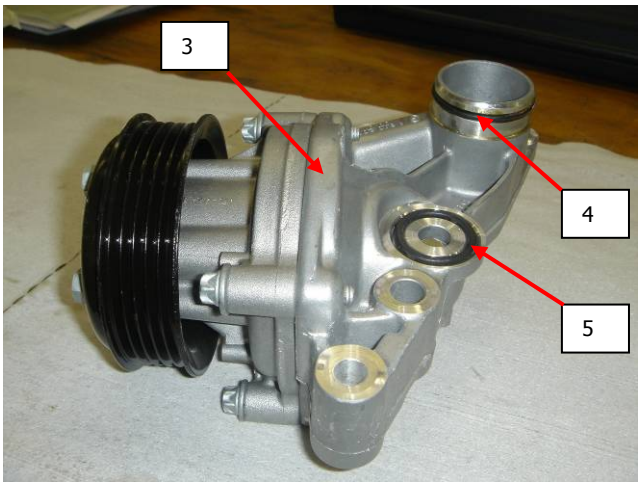

Fig. 85 - 29

85-70-30 Heat Exchanger

85-70-31 Removal of the Heat Exchanger

1. Remove the oil filter housing drain line - refer to Chapter 79-00-11.
2. Remove the oil filter housing - refer to Chapter 79-00-61.
3. Remove the screws [1] from the heat exchanger [2].
4. Remove the heat exchanger.
5. Clean the sealing face.

85-70-32 Installation of the Heat Exchanger

1. Install new gasket.
2. Put heat exchanger in place
3. Screw heat exchanger down and torque screws [1] with 9 Nm.
4. Install the oil filter housing - refer to Chapter 79-00-62.
5. Install the oil filter housing drain line - refer to Chapter 79-00-12.
6. Clean the working area.
7. Check the oil level – refer to Chapter 12-20-01.
8. Perform an engine ground run according to Chapter 71-00-03.
9. After the ground run inspect oil and coolant system for leakage.

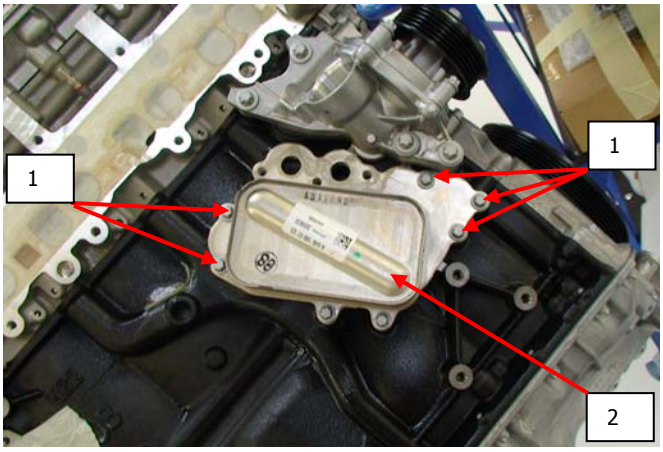

Fig. 85 - 30

85-70-40 Coolant Thermostat

85-70-41 Removal of the Coolant Thermostat

1. Drain the coolant - refer to the applicable Aircraft Maintenance Manual.
2. Remove the coolant hoses attached to the coolant thermostat - refer to the applicable Aircraft Maintenance Manual.
3. Remove the screws [1].
4. Remove the thermostat [2].

85-70-42 Installation of the Coolant Thermostat

1. Install new o-ring.
2. Take care for the proper fit of the o-ring.
3. Attach the coolant hoses to the coolant thermostat - refer to the applicable Aircraft Maintenance Manual.
4. Clean the connecting surface of the manifold if necessary.
5. Lubricate o-ring with acid free lubrication.
6. Install the thermostat (inspect correct position of the o-ring).
7. Ensure that the thermostat is fitted properly (see Fig. 85 -.32) and without any preload to the manifold.
8. Install the screws [1] with the clamp of the wiring harness and torque with 12 Nm.
   If engine harness E4A-95-000-000, or E4B-95-000-000 is used the clamp of the wiring harness is not needed!
9. Fill in coolant and bleed system – refer to the applicable Aircraft Maintenance Manual.
10. Clear the working area.
11. Perform an engine ground run according to Chapter 71-00-03.
12. After the ground run inspect coolant system for leakage.

For coolant information please refer to Chapter 05-20-17 Coolant

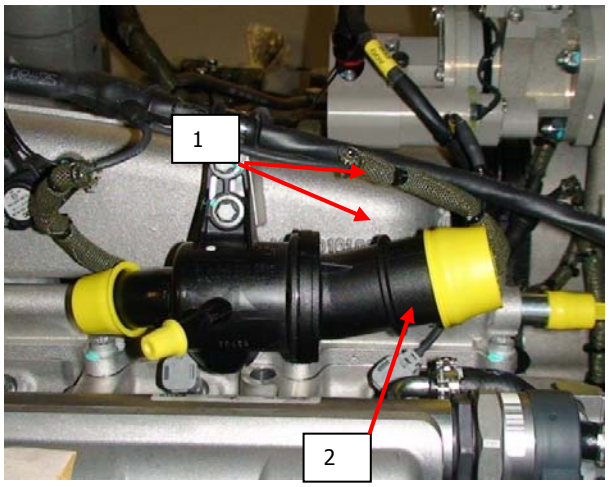

Fig. 85 - 31

Fig. 85 - 32

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Chapter 92-00-00 Additional Informations

Engine Wiring Diagrams for E4A-90-000-000

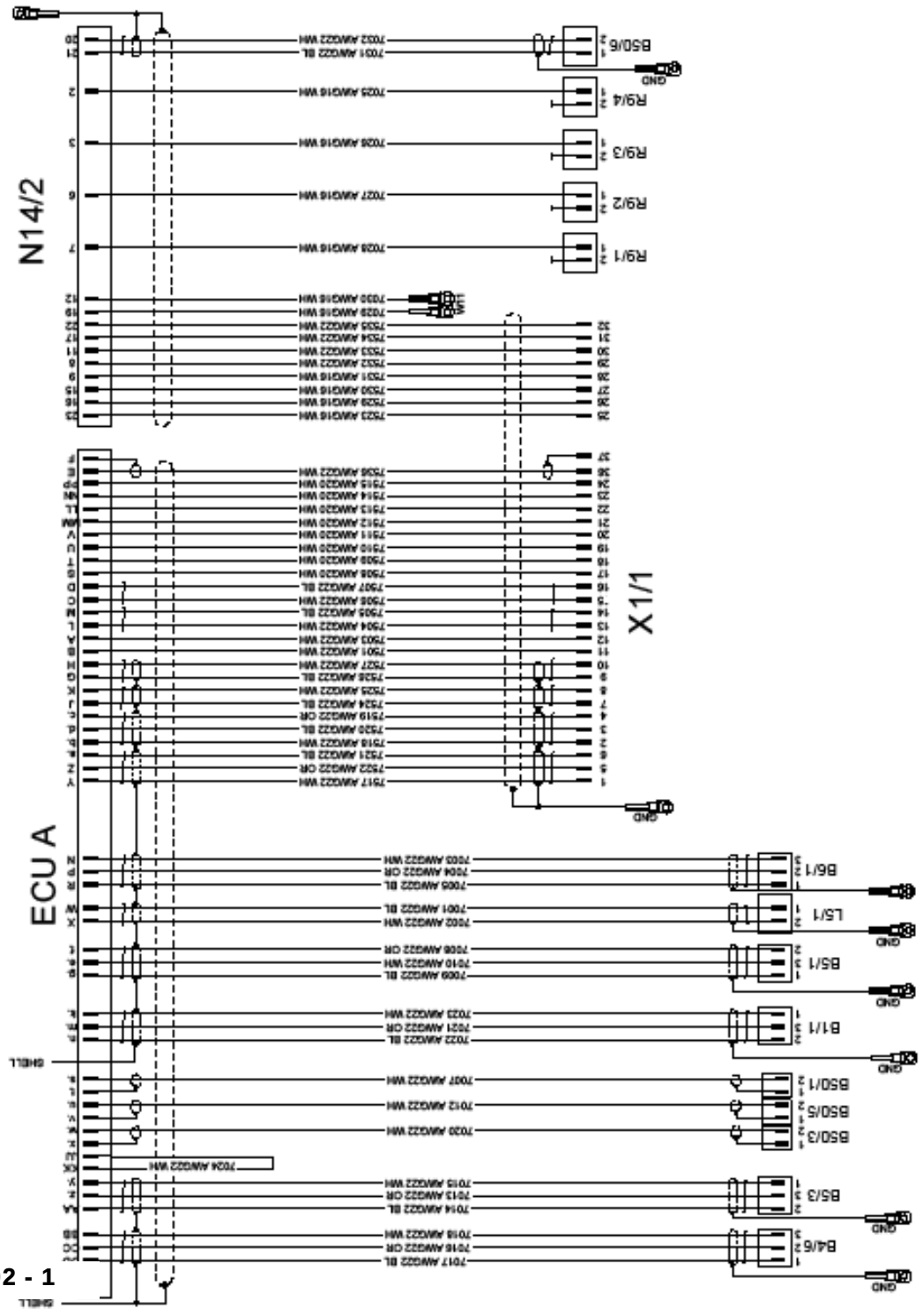


Fig. 92 - 1

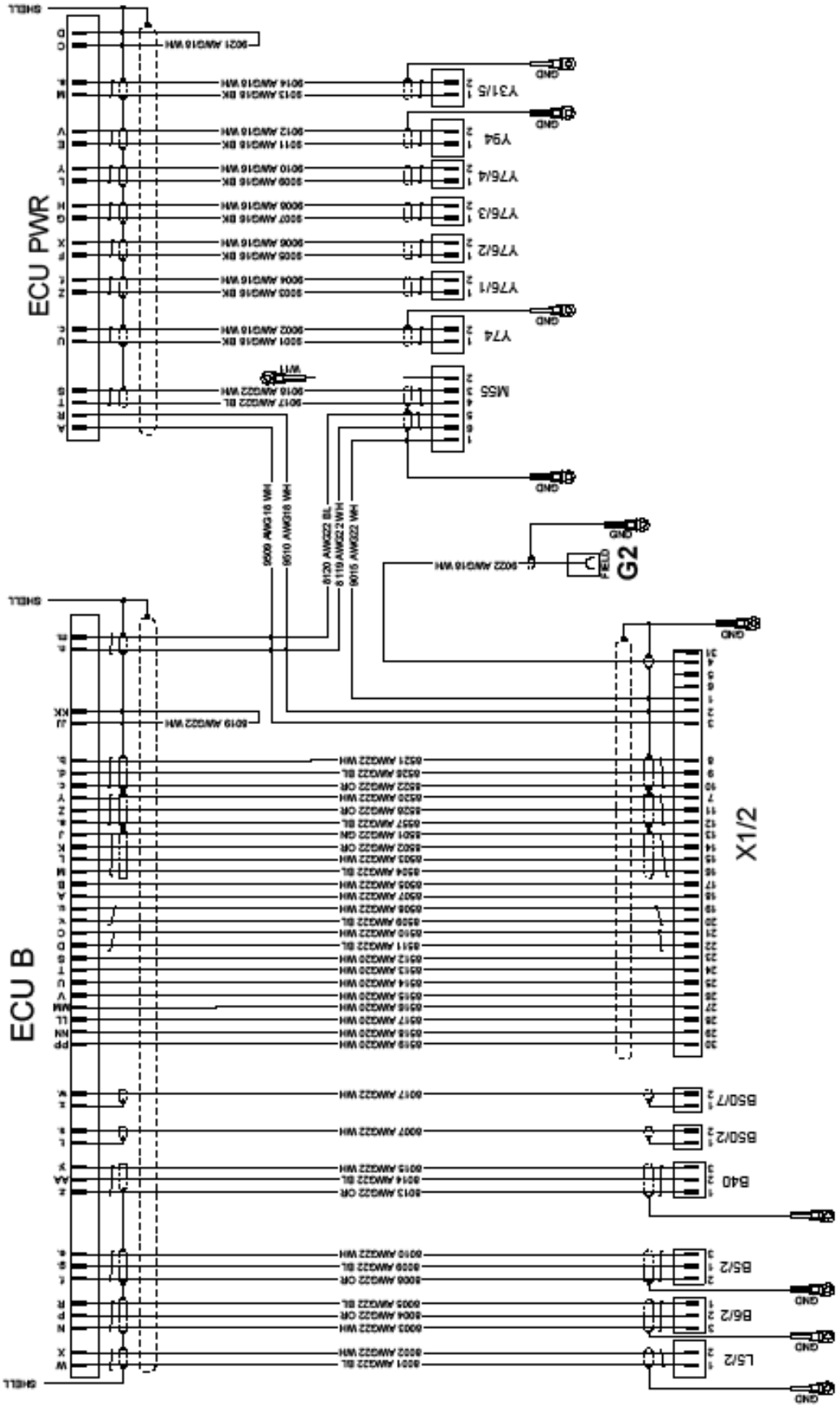

ECU PWR
ECU B
X1/2
G2
Y31/S
Y94
Y76/4
Y76/3
Y76/2
Y76/1
Y74
M55
B50/7
B50/2
B40
B5/2
B6/2
L5/2
GND
SHELL

Fig. 92 - 2

Engine Wiring Diagrams for E4A-95-000-000 und E4B-95-000-000

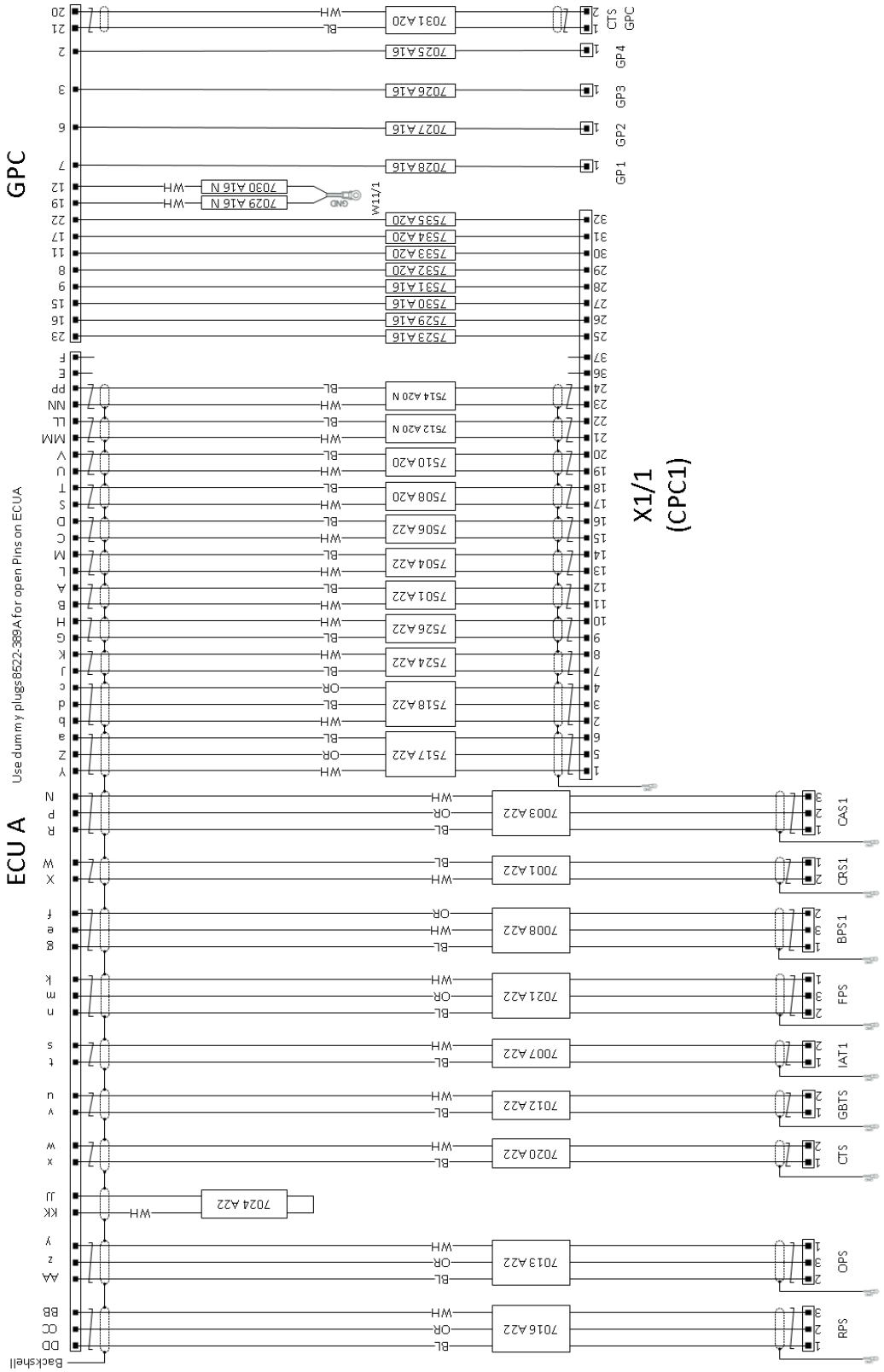


Fig. 92 - 3

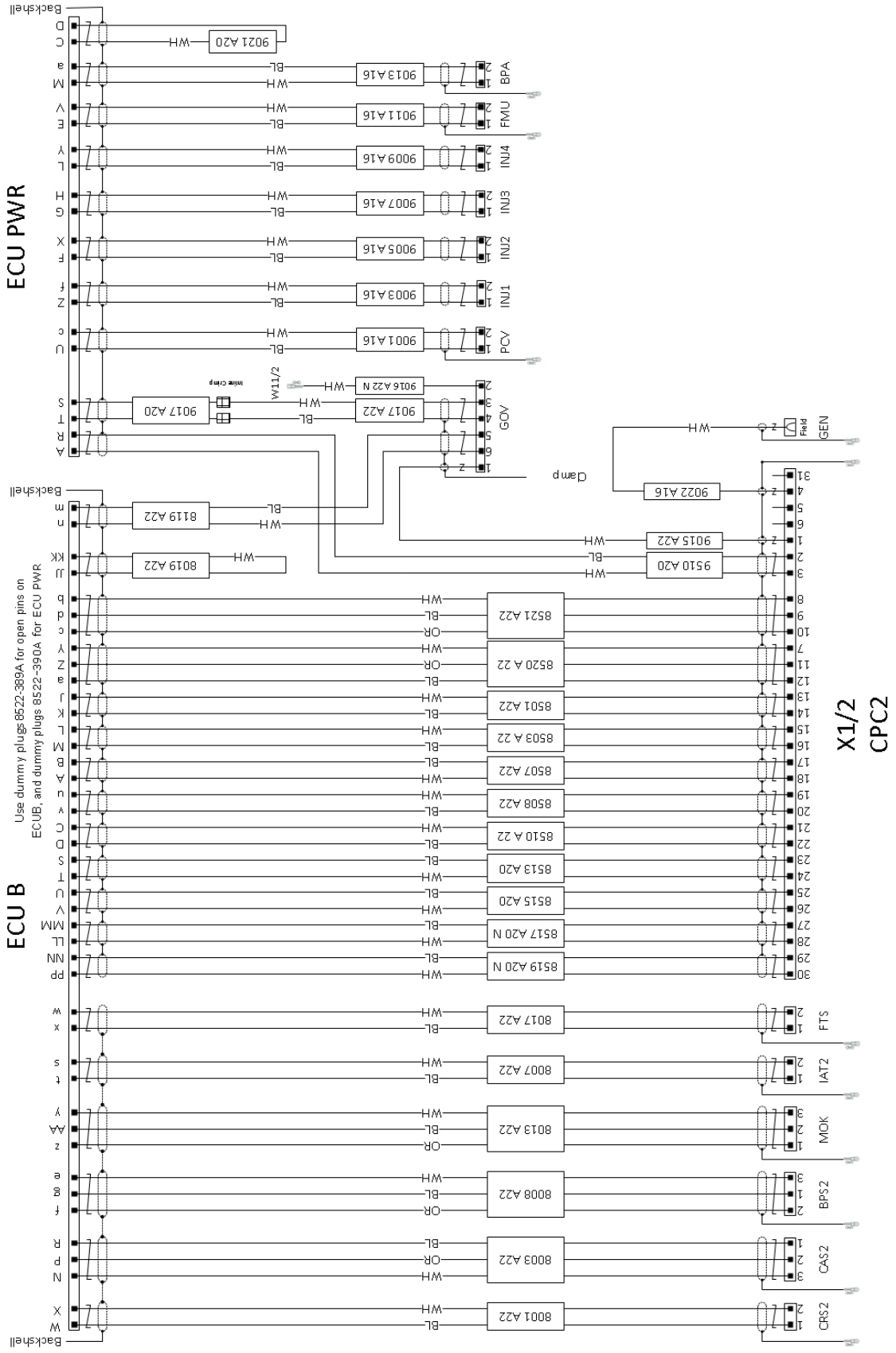

ECU PWR
ECU B
X1/2
CPC2
Backshell
Use dummy plugs 8522-389A for open pins on ECUB, and dummy plugs 8522-390A for ECU PWR
9021 A20
9013 A16
9011 A16
9009 A16
9007 A16
9005 A16
9003 A16
9001 A16
9016 A22 N
9017 A20
9017 A22
8119 A22
8019 A22
9022 A16
9015 A22
9510 A20
8521 A22
8520 A 22
8501 A22
8503 A 22
8507 A22
8508 A22
8510 A 22
8513 A20
8515 A20
8517 A20 N
8519 A20 N
8017 A22
8007 A22
8013 A22
8008 A22
8003 A22
8001 A22
BPA
FMU
INJ4
INJ3
INJ2
INJ1
PCV
GOV
GEN
FTS
IAT2
MOK
BPS2
CAS2
CRS2
Damp
Inline Clamp
W11/2

Fig. 92 - 4

Aircraft Interface Wiring

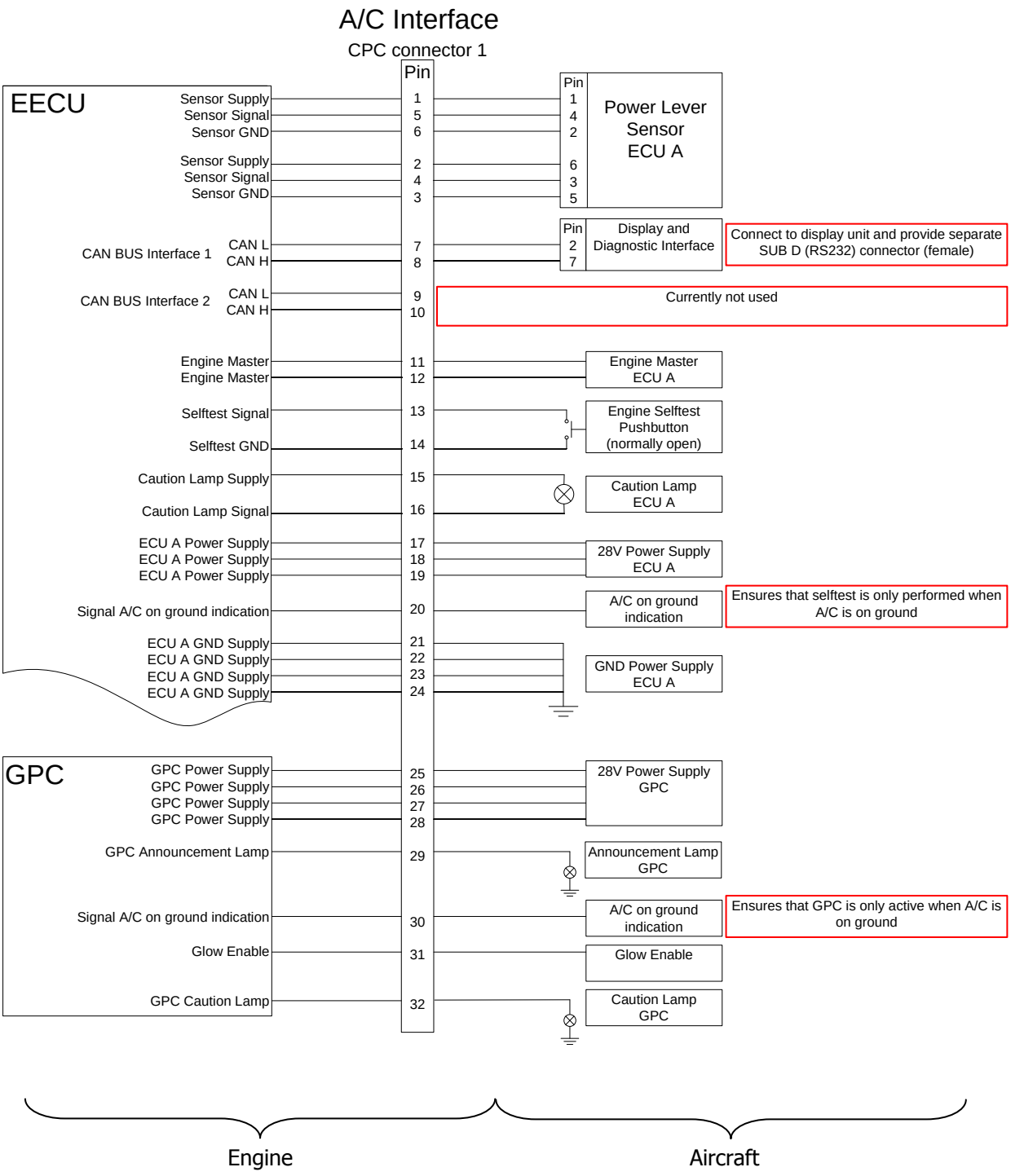


Fig. 92 - 5

Aircraft Interface Wiring

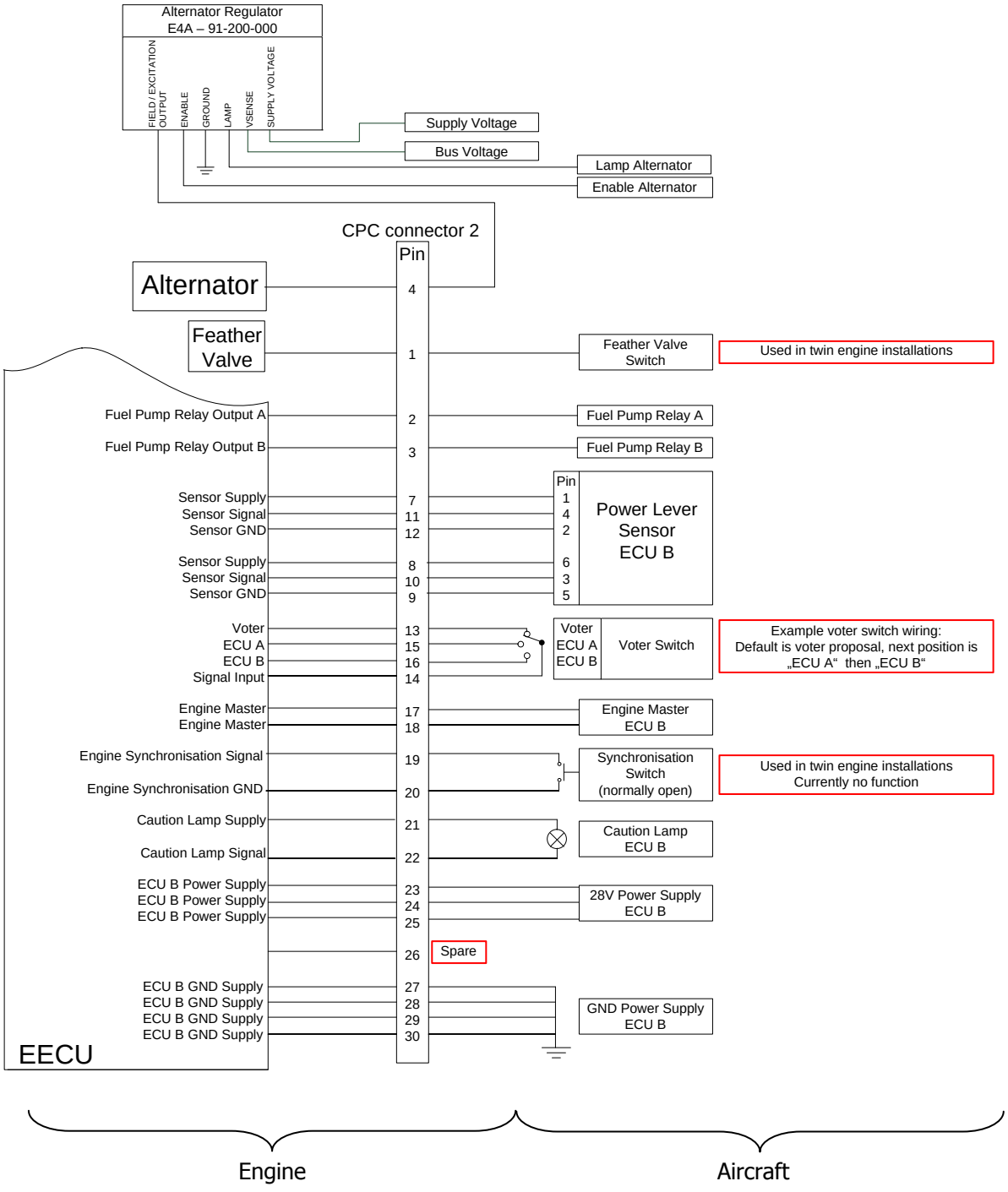


Fig. 92 - 6

Aircraft Interface Wiring

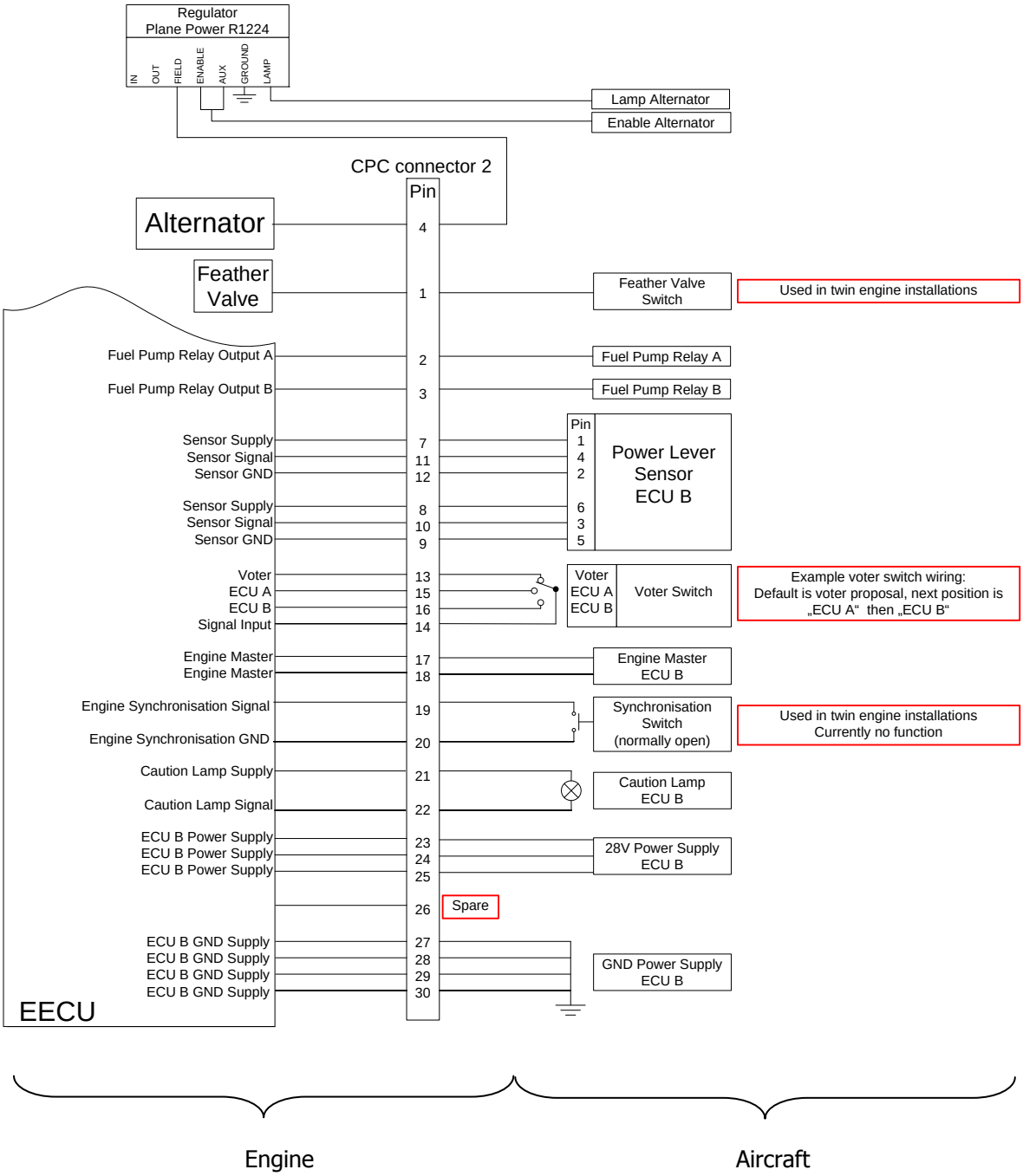
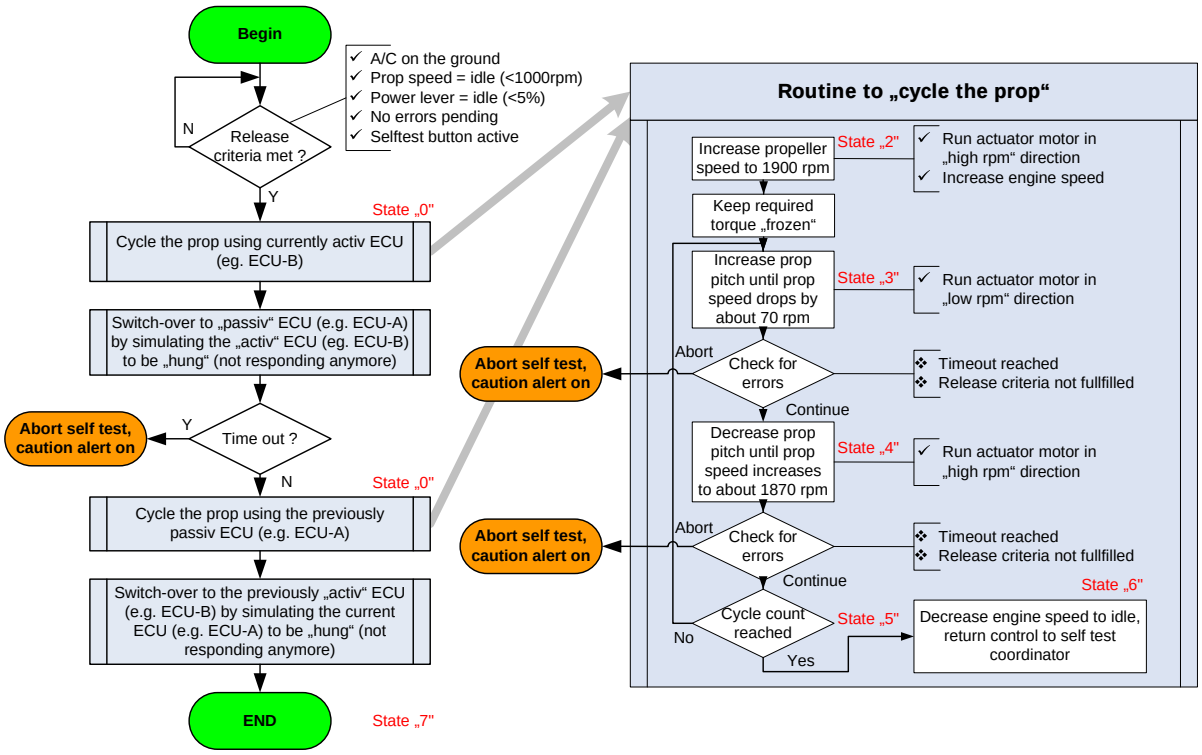


Fig. 92 - 7

Propeller Self Test (Automatic Run-Up Test)

Self Test Overview:

The following diagram shows the sequence of events, checks and results expected by the EECU software while running the propeller self test procedure.



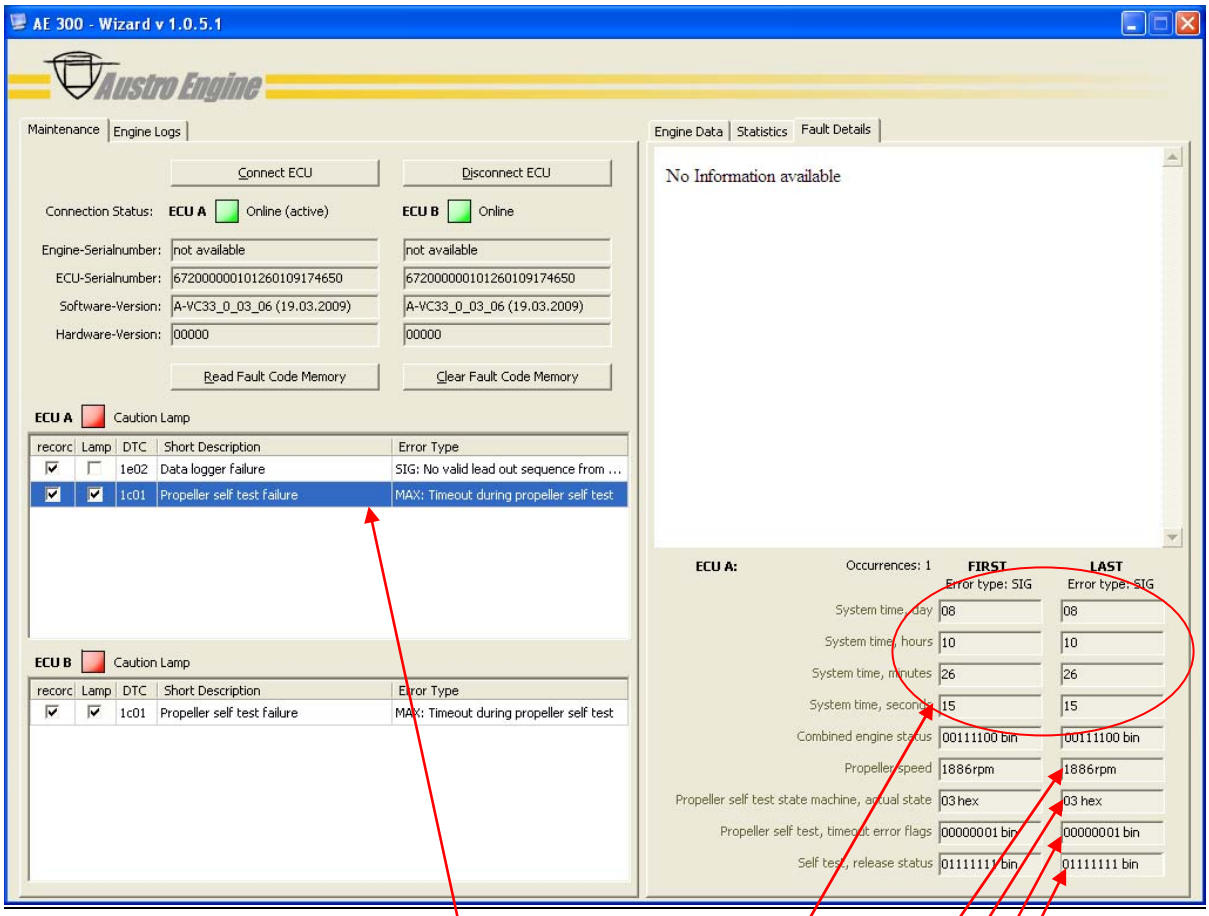
In case of an abort due to a failure, the current state ("0–7") of the test is stored as one of the environmental conditions within the Fault Code Memory (FCM) entry to help diagnosing the abort.

Diagnosing Self Test Failures using the Fault Code Memory:

If the Propeller Self Test does not complete successfully, an entry will be written into the Fault Code Memory (FCM).

The FCM entries can be displayed by the "AE 300 Wizard" (see "List of Tools").
For setup and usage of the AE 300 Wizard please refer to the latest revision of the "AE 300 Wizard User Guide", document number E4.08.09. The chapter "Using the Fault Code Memory (FCM)" in the "Trouble Shooting"-Section explains, how to work with the FCM.

The AE 300 Wizard will display an FCM entry caused by a failure during the propeller self test which contains information sampled at the time of the occurrence similar to the following example:



Diagnostic Trouble Code (DTC) = 1C01

Propeller self test failure
(MAX: Timeout during propeller self test)

Time of first and last occurrence

Day, hour, minutes and second

Propeller speed = 1886 rpm

Propeller self test internal state = 03

(refer to picture "Self Test Overview")

Timeout error flags = 00000001

Self test release status = 01111111

Trouble Shooting Steps:

1. Display the FCM entry (fault details)
2. The "propeller self test internal state" provides the number of the phase which has been aborted. Refer to the "Self Test Overview" to understand what the expected result of the phase was.
3. Depending on the information provided by step 2, check:

4a. The "Propeller speed" to see if a speed goal had not been reached.
4b. The "Timeout error flags" to see the reason for a timeout
4c. The "Self test release status" to see if a release condition is not fulfilled anymore.

Layout of Timeout Error Flags:

Bit position	7	6	5	4	3	2	1	0
Timeout error flags shown in FCM:	**0**	**0**	**0**	**0**	**0**	**x**	**x**	**x**

Bits 0, 1 or 2 will be set to "1" to indicate the reason for the self test timeout:

Bit	Description of reason
0	"1" = Timeout during pitch-up test "state 3" (expect rpm drop > 70rpm within 8s)
1	"1" = Timeout during pitch-down test "state 4" (expect rpm > 1870 rpm within 3s)
2	"1" = Overall propeller self test timeout (expect overall test completion within 25s)
3-7	Not used

Layout of Self Test Release Status:

Bit position	7	6	5	4	3	2	1	0
Release status as shown in FCM:	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**

The Propeller Self Test will start if bit 0 (release self test) has been set to "1". Bits 2-7 will indicate the individual release criteria as described in the "Self Test Overview".

Bit	Description of release condition
0	"1" = Overall release to start self test is given
1	"1" = No active error pending
2	"1" = Bits 5 and 6 are set to "1"
3	"1" = The self test switch in the cockpit is actually pressed
4	"1" = Self test switch rising edge detected; "0" = self test switch falling edge detected
5	"1" = Power lever is in low idle position (< 5%)
6	"1" = If propeller speed was idle (< 1000rpm) AND squat switch (WoW) is depressed
7	"1" = Current propeller speed is idle (<1000rpm)

Each ECU senses the power lever position separately. So if the power lever sensors are not properly aligned one ECU might release the self test with power lever position <5% while the other ECU might not release the self test because it senses a position >5% !

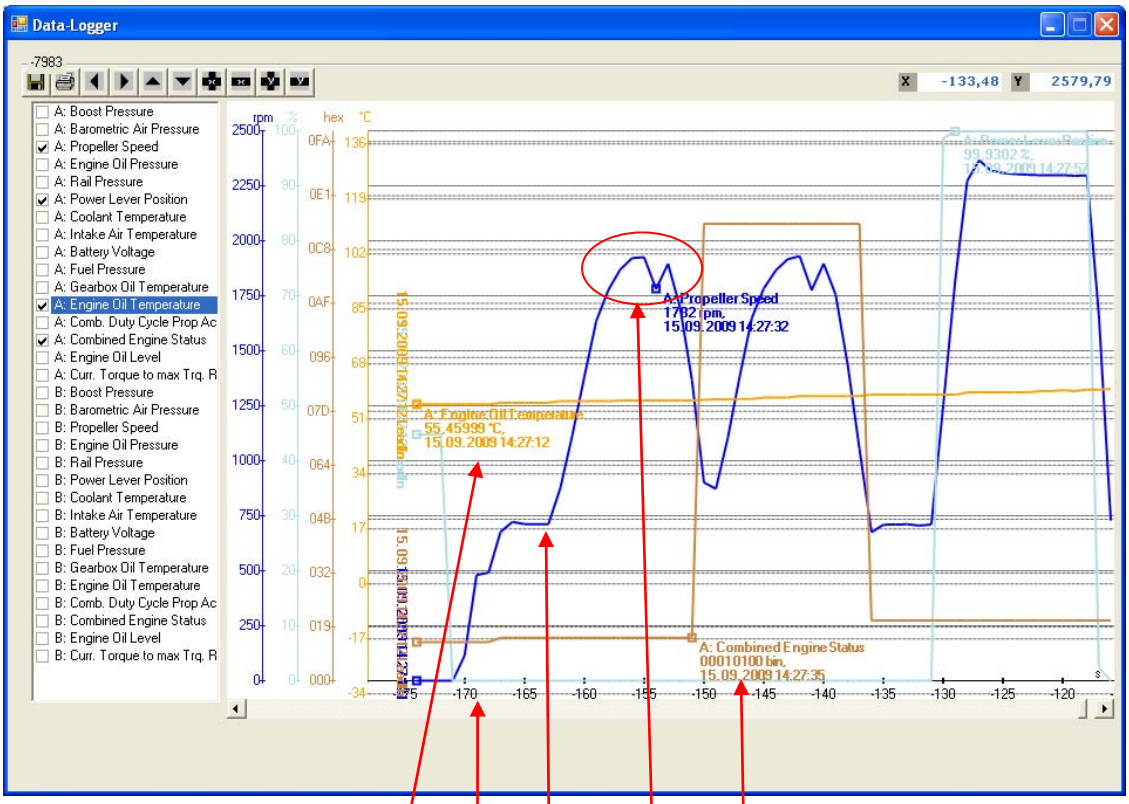
There is a hysteresis in the detection of propeller idle speed. If the propeller speed increases beyond 1000rpm, it has to be decreased below 800rpm again before the release criteria of bits 6 and 7 can be fulfilled again.

Diagnosing Self Test Failures using the Data Logger:

If the FCM entry of a self test failure is not available or if trouble shooting multiple events from past flight cycles, using the Data Logger function of the EECU is recommended.

The Data Logger information can be downloaded and displayed by the "AE 300 Wizard" (see "List of Tools").
For setup and usage of the AE 300 Wizard please refer to the latest revision of the "AE 300 Wizard User Guide", document number E4.08.09. The chapter "Offline Analysis using the Data Logger" in the "Trouble Shooting"-Section explains, how to work with the Data Logger.

The AE 300 Wizard will display the Data Logger record of a successfully performed propeller self test similar to the following example (e.g. after replacement of a faulty governor shown below).



Engine oil temperature above 50°C

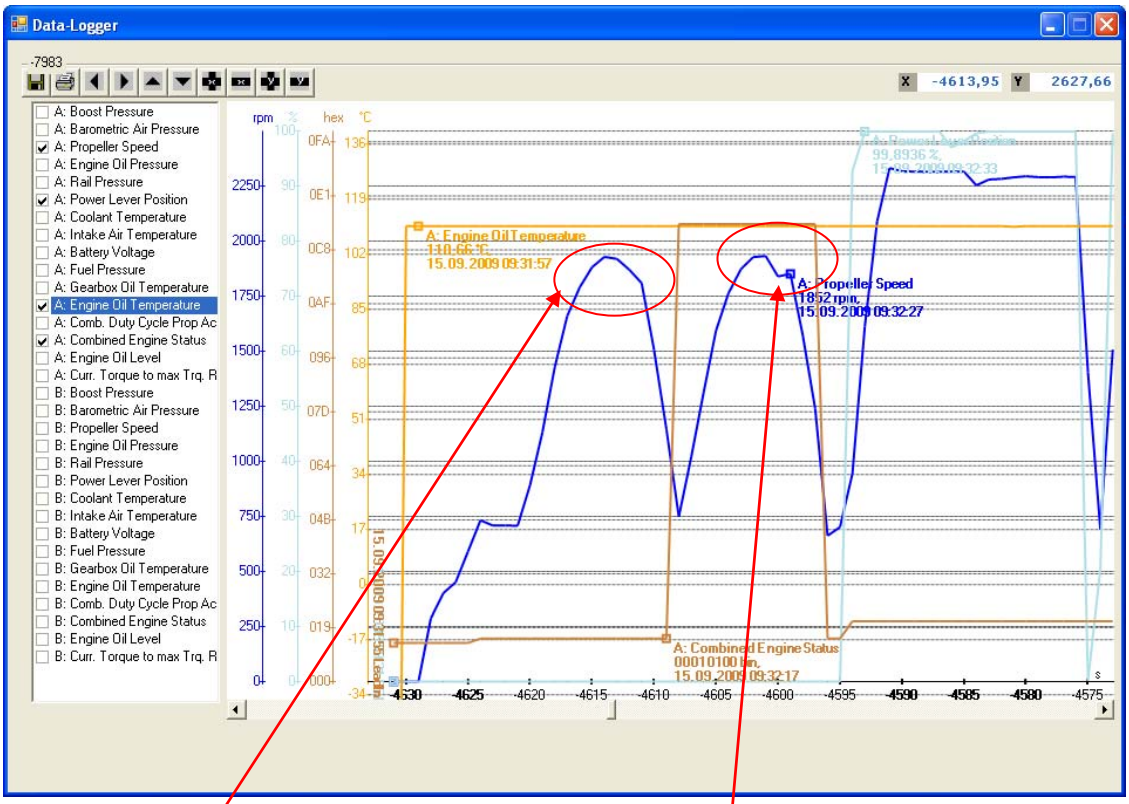
Power lever to idle, propeller speed to idle

Self test starts

State 2: Propeller speed increases beyond 1900rpm
State 3: Propeller speed decreases by at least 70rpm
State 4: Propeller speed increases again beyond 1870rpm.

Switching from ECU-A to ECU-B, perform test on ECU-B

The AE 300 Wizard will display the Data Logger record of a failure during the propeller self test similar to the following example (a faulty propeller governor):



The self test occurrence can be found by looking for the characteristic two "humps" in the propeller speed-line when at the same time the power lever is at "0%". Also the "Combined Engine Status" shows an ECU-switchover event between the two "humps".

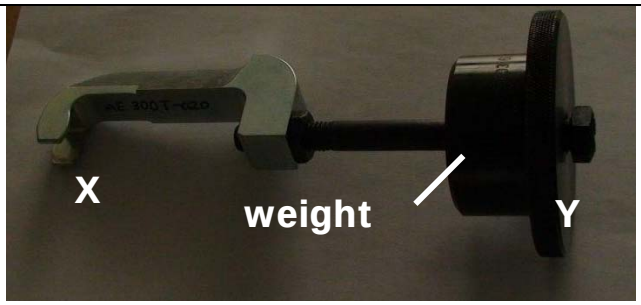
Problem 1:

The pitch-up test phases (state 3) and pitch-down (state 4) are not clearly defined on ECU-A

Problem 2:

During the pitch-down test phase (state 4) the goal of 1870 rpm had not been fulfilled on ECU-B (actual speed reached was just over 1850 rpm) which eventually had caused a caution lamp indication.

List of Tools

Title:	Tool:	Remark:
AE 300 Wizard	EECU Software Read Out Program The user guide E4.08.09 of the AE 300 Wizard will be delivered with the program	For installation and usage of the Software refer to the user guide E4.08.09
Flywheel Locking Tool		For use see Chapter 85-10-51 Removal of the Two-Mass-Flywheel
Dismount Tool for Injector		After removal of the clamping shoe (see chapter 73-00-11 Removal of the Injector point 6) the tool has to be positioned with the end "X" of the tool below the injector nut. Then the injector can be loosened with a hint of the "weight" to the upper end "Y" of the tool in upward direction.

List of Attachment

E40804-M238-r2	Two Mass Flywheel – Additional Maintenance Procedure
E40804-M258-r0	Alternator – Additional Maintenance Procedure