CURSOR AUTOMOTIVE
Thank you for preferring Iveco Motors and may we compliment you on the choice you have made.
Before carrying out any work on the engine, read through the procedures set out in this manual carefully.
If you follow these instructions your engine will be guaranteed trouble-free operation and a long life.
Remember that, wherever you are, the Iveco Motors Service Network will be at your side to offer you highest levels of skill and professionalism.

Guarantee
In order to get the best performance from your engine and benefit from the guarantee you must comply with the instructions contained in this publication.
Failure to carry out these operations correctly or not at all may invalidate the guarantee.

Spare parts
It is essential to use only Original Iveco Motors Spare Parts if the engine is to be kept in its original sound condition.
The use of non-original spare parts will invalidate the guarantee and release Iveco Aifo from any long-term liability.

Liability
The manufacturer’s liability is dependent on the execution of the “Checks and Maintenance” operations mentioned in this manual.
For this purpose, a record must be kept of the maintenance operations carried out, which, as far as extraordinary maintenance is concerned, must be performed by authorised workshops.
SAFETY REQUIREMENTS

Basic safety
The following basic safety instructions are intended to reduce danger to persons or objects when an engine is running or idle.
- Engines must not be used for any purpose other than that specified by the manufacturer. Before an engine may safely be used for any other purpose, a specific agreement shall be drawn up with the manufacturer.
- Tampering with the engine, making alterations or using parts other than Original Iveco Spare Parts may compromise safe operation.
- These instructions shall be applied in accordance with the provisions of other Regulations in effect in the specific Country of use.

During maintenance operations
- Never wear loose clothing, rings or chain jewellery when working with engines or moving parts.
- Wear protective gloves and safety goggles:
  - when filling batteries with acid
  - when topping up inhibitors or antifreeze
  - when changing or topping up lubricant oil (hot engine oil may scald when drained; let oil cool to below 60°)
  - when working with compressed air (compressed air used for cleaning must be under 2 Atm (30 psi / 2 kg/cm²).
- Wear a safety helmet when working in the presence of suspended loads or equipment located at head level.
- Always wear safety shoes and overalls.
- Protect your hands with cream.
- If your overalls get wet, change them immediately.
- When working on parts that may be under voltage, make sure your hands and feet are dry. If necessary, use an insulated footboard. If you are not experienced in this type of maintenance work, always have it done by specialised personnel.
- Do not attempt to carry out repairs with which you have no experience. Always follow the instructions, and, if in doubt, contact the manufacturer or specialised personnel.
- Keep the engine clean at all times, removing any oil, diesel oil, or coolants that may be spilled.
- Store greasy cloths in flameproof containers.
- Do not leave cloths on the engine.
- Obtain suitable safe containers for used motor oil.
- When starting up an engine after repair work, make sure that you will be able to stop air intake in the event of a runaway upon startup.
Engine cooling circuit
- Never add coolant to an overheated engine until it has cooled down.
- Check the coolant level regularly and top it up whenever necessary, using the appropriate fluid only. Water used in the engine's cooling circuit must always be clean and as free as possible of minerals which could form deposits and of corrosive chemical products. Artificially softened water should never be used; rust and corrosion may be prevented by treating water with anticorrosive agents approved by the manufacturer.
- In winter measure the specific density of antifreeze regularly to make sure that the engine is adequately protected from cold. Remove the radiator cap gradually; cooling circuits are normally under pressure and hot liquid could be sprayed out if the pressure is reduced too quickly.
- Check belt tension and wear regularly.

Lubrication circuit
Check the oil level in the oil pan regularly and top it up if necessary.
- Change lubricant oil regularly with the recommended frequency, making sure that the oil you use has the characteristics and viscosity specified in these Instructions.

Fuel circuit
- Try to keep the fuel tank full most of the time in order to prevent condensation.
- Remove water and sediments from the tank regularly.
- Replace the fuel filter regularly, whenever the pressure drops or the performance of the engine decreases.
- Do not smoke or light any flame while filling the fuel tank.
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ENGINE IDENTIFICATION
The engine code is stamped on the rear left side of the crankcase.

Engine technical data F2BE0681 (C78 ENT C)
Number of cylinders 6, in line
Bore 115 mm
Stroke 125 mm
Displacement 7.8 l
Type: Diesel 4 stroke direct injection

Maximum rating
259 kW 352 CV @ 2400 rpm

Engine technical data F2BE0682 (C78 ENT C - Bus)
Number of cylinders 6, in line
Bore 115 mm
Stroke 125 mm
Displacement 7.8 l
Type: Diesel 4 stroke direct injection

Maximum rating
259 kW 352 CV @ 2400 rpm

Engine technical data F3AE0681 (C10 ENT C)
Number of cylinders 6, in line
Bore 125 mm
Stroke 140 mm
Displacement 10.3 l
Type: Diesel 4 stroke direct injection

Maximum rating
316 kW 430 CV @ 2100 rpm

Engine technical data F3BE0681 (C13 ENT C)
Number of cylinders 6, in line
Bore 135 mm
Stroke 150 mm
Displacement 12.9 l
Type: Diesel 4 stroke direct injection

Maximum rating
397 kW 540 CV @ 1900 rpm
ELECTRICAL SYSTEM
Tension: 24V
Batteries: 2 x 12 V - 143 Ah (on request 24V - 90A)
Starter motor: 24V - 4.5 kW

ELECTRICAL SYSTEM (F2BE0682)
Tension: 24V
Batteries: 2 x 12 V - 180 Ah
Starter motor: 24V - 4.5 kW
STARTING AND RUNNING

Engine starting with an external temperature over 10°C

Key switch position
0.  = Key in and out, engine stopping, steering lock.
1.  = Engine pre-starting, various auxiliary functions, pre-heating.
2.  = Engine starting.

- Turn on battery isolator switch on chassis (where fitted).
- Insert the key in the ignition switch and turn clockwise to position 1 (MAR).
- All standard warning lamps plus the EDC warning lamp light up.
- Turn the key to position 2 (AVV) and release it as soon as the engine starts
  **Do not depress the accelerator pedal while the engine is started.**
- The control unit performs a general check of about 1 or 2 seconds on all sensors before starting fuel injection.
- In position MAR, the EDC warning lamp remains on until the driver depresses the brake pedal.

If the lamp does not light up carry out the following tests:
- Press blink code button 3 in order to test EDC telltale 1 and warning lamp 2.
- If these lamps do not light up check fuse.

You don’t need to wait for the lamp to go out in order to turn the engine on.
If the lamp remains on or blinks, a defect has been detected; in this case, refer to the fault diagnosis paragraph.

- Wait for air pressure to reach the specified value in reservoirs.
- If the engine does not start immediately, do not run the starter motor for more than 30 seconds. After starting the engine proceed slowly and keep engine at an average speed until normal operating temperature is reached.

By this method it is possible to obtain the following results:
- Constant and regular oil flow throughout the lubrication circuit.
- Exhaust emissions within the specified limits.
- Reduced fuel consumption.

Warning! Do not run the engine at idling speed, either cold or warm, for a long time to reduce the quantity of noxious emissions.
Engine starting with an external temperature below 10°C

- The vehicle is equipped with an electric device that pre-heats the intake air for starting the engine in low temperatures.
- Insert the key in the ignition switch and turn clockwise to position 1 (MAR).
- Warning lamp 3 lights up for 2 seconds in Auto-test mode.
  It stays on if cold-starting is required (and throughout the duration of the latter, otherwise it goes out).
- All standard warning lamps plus the EDC warning lamp light up.
- Wait for the pre-heating lamp 3 to start blinking.
- Turn the key to position 2 (AVV) and release it as soon as the engine starts.

Note: If engine starting does not occur within a few seconds from the moment the lamp starts to blink, the lamp is turned off and the pre-heating system is also switched off to avoid discharging the batteries.

The pre-heating operation must therefore be repeated.
Before driving away
Ensure the brake low air pressure (brake failure) warning lamp is extinguished, and that the braking system air pressure gauge shows a minimum pressure of 6.5 bar for both front and rear axles. If the warning light illuminates, or the gauge indicates less than 6.5 bar; there is a fault in the braking system. Refer to an Authorised Dealer immediately. If the vehicle must be moved, extreme care should be taken as full braking efficiency will not be available.

Engine stopping
To stop the engine turn the key to position 0 (STOP).
As the EDC control unit remains connected to the batteries immediately after the engine has been turned off, it is of the utmost importance that you wait at least three seconds before disconnecting the batteries through the isolator switch.

Warning!
Serious damage to electronics on-board the vehicle can result from either of the following incorrect operations:
• Use of the isolator switch while attempting to stop the vehicle (use in the event of an emergency only).
• Connection/disconnection of the EDC control unit connectors with the engine running and the control unit energized.
Checking faults using the EDC warning light (Fault diagnosis)
The EDC warning light informs the driver on possible injection system faults. If the warning lamp comes on during normal operation of the vehicle, a fault has been detected.

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<th>Standard operation</th>
<th>Continuous light</th>
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<td></td>
<td><strong>Serious defect</strong></td>
<td>1. Continue your trip carefully. Turn to an Authorised Dealer as soon as you can.</td>
</tr>
<tr>
<td></td>
<td>The system operates irregularly.</td>
<td></td>
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<tr>
<td>Blinking</td>
<td><strong>Very serious defect</strong></td>
<td>1. Park the vehicle on the road side. 2. Contact the Dealer. 3. Turn the vehicle to the nearest Authorised dealer.</td>
</tr>
<tr>
<td>light</td>
<td>The system operates irregularly. Failure of one or more of the safety functions. Possible engine STOP.</td>
<td></td>
</tr>
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</table>
The EDC warning lamp provides information on the faults it has detected by means of a code consisting of long or short blinks (blink code).

The fault check process is enabled by means of the diagnosis key located under the fuse door.

This key also controls another EDC warning lamp connected in parallel to the one on the dashboard.

Fault check and identification process

- Stop the vehicle and switch the engine off.
- Turn the ignition key to MAR (control panel on engine off).
- Press the fault diagnosis key and ensure the EDC lamp blinks once.

**No faults stored.**

- If after being off for some time, the lamp starts blinking (long flashes first and short ones afterwards), a fault is present.
ON THE SPOT MAINTENANCE

Precautionary measures for electronic units installed on the vehicle
In order to avoid improper operations which can result in permanent damage to the control units installed on the vehicle, it is advisable to observe the following instructions:

• Proceed as follows to carry out electric arc welding on the chassis; disconnect battery positive terminal and connect it to chassis earth; disconnect connector from control units.
• When welding close to an electric control unit, remove the latter from the chassis; use d.c. to carry out the welding operation; ensure the welding machine is earthed as close to the welding point as possible; ensure battery cables are not parallel to the vehicle’s electrical cables.
• Never disconnect and/or connect connectors from control units with engine running or with control unit energized.
• After any servicing operation requiring battery disconnection make sure that, on reconnection, terminals are well secured to the poles.
• Do not disconnect the battery with engine running.
• Do not use a battery charger to start the engine.
• Disconnect the battery from on-board mains when charging it.
• Remove the electronic control units if special operations require temperatures higher than 80°C.

Precautions to be strictly observed
• Before carrying out any servicing operation on the electrical system control unit and in particular before replacing the engine starting relay, it is absolutely necessary to take the following precautions to avoid the risks of short circuits.
• Before removing the relay from the control unit, it is of the utmost importance that you switch off the main switch or disconnect the battery terminals.
• A new relay is to be installed where the plastic casing has come off during relay removal or if the relay has been opened for any reason.
• Do not generate temperatures over 100°C (sparks, welding operations, etc...) in proximity of pretightening or airbag devices.
Batteries
The used type of batteries require few maintenance operations, therefore, under normal operating conditions, it is not necessary to top up the electrolyte. However, periodical checks are required to verify that the electrolyte level is comprised between the MIN and MAX references shown on the battery.

Safety precautions to be adhered to when handling batteries
1. Smoking fires or free flames are strictly forbidden. Avoid generating sparks while connecting components or measurement instruments to batteries. Before disconnecting the batteries always disconnect permanently energized components (tachograph, interior lighting device, etc.) by removing the relevant fuse from the control unit.

   Avoid reversing connecting wires and mishandling fixed wrenches; shortcircuit risk.

   Avoid removing terminals caps if no absolutely necessary. When performing wire connections install the earth wire last.

2. Wear protection goggles or mask!
3. Keep batteries and acids at a safe distance from children!

4. The battery contains acids. Wear gloves and protective clothes.

   Do not tilt or overturn the battery as acid may issue from its holes.

5. Strictly adhere to directions provided by the manufacturer.

6. Risk of explosions! Take particular care after the battery has been recharged or at the end of long journey. During the charging phase explosive gas (hydrogen and oxygen mixture) is developed inside the battery! Air carefully.
Battery recharge

Warning: The battery recharging procedure is described for information only. When this operation must be carried out you should call the Iveco Service Organization.

It is recommended that the battery is recharged slowly and at low amperage for approximately 24 hours. A longer or more violent recharge may damage the battery.

Recharge the battery following the procedure below:

• If the vehicle is fitted with an alarm system, switch it off.
• Disconnect the electrical system terminals from the battery poles.
• Connect the recharging unit cables to the battery poles.
• Switch on the recharging unit.
• Once the recharging operation is completed, switch the unit off before disconnecting it from the battery.

Reconnect the terminals to the battery poles observing their polarity.

Practical hints

To prevent the battery from running down and to preserve its operation, you should follow these recommendations:

• The battery terminals must be well tightened.
• The users (car radio, lights, etc.) should not be kept On for a long time when the engine is not running.
• When the engine is stopped and the vehicle has been correctly parked, before leaving it make sure that no interior or exterior lights are still ON.
• Before carrying out any operation on the electrical system, disconnect the battery negative terminal.
PROTECTING THE ENGINE FROM COLD

Cooling circuit
Check the percentage of PARAFLU 11 in the coolant every year. It should be at least 50% at all times throughout the year; if necessary, top up with water and PARAFLU 11 to provide adequate protection from rust.

Fuel supply
Use the winter fuels provided by oil companies. Keep the fuel tank as full as possible at all times.

Electrical system
Cold creates additional stress on batteries; their capacity decreases as the temperature drops. Check the batteries frequently; a flat battery will be damaged by frost.
CHECKING THE ENGINE

Before each journey
Place the vehicle on level ground, stop the engine and leave it so for at least 30 minutes. Then use the gauge on the upper panel to check the engine level.

Topping up engine oil level
Topping up is required when the gauge in the cab is positioned within the MIN. Refill with new oil through filler 2. Then check the oil level by means of dipstick 1.

Risk of fire: Always remember to close filler 2 when topping up is completed to avoid dangerous oil losses while the vehicle is travelling.
With engine cold:
check engine coolant level. It should be between MAX and MIN reference marks.
Top up through filler 1, if necessary.

Note:
Plug 2 is sealed off and should not be tampered with.

Warning: turn off the engine and wait until it cools down before removing the plug
or you could be hit by the hot fluid ejected from the tank.

Weekly
Slacken tap 1 to drain water which may have accumulated in the fuel prefilter.

Check the battery electrolyte level;
if necessary, top up using distiller water with batteries at rest and cold through filler
caps 1.

(Not applicable to maintenance free batteries).

Note: when the vehicle is not used for more than one week, disconnect the main
switch (where fitted) and remove the steady ground connection from the minus-
pole of the battery.
SCHEDULED MAINTENANCE

To make sure that your engine continues to run at its best, you should check, inspect and adjust it according to the instructions provided on the following pages, at the intervals specified.

Regular maintenance is your best guarantee of safe operation and low operating costs.

Please contact your nearest Iveco Service Centre to arrange to have the maintenance work done after the specified number of kilometres.

Note to the user

The engine should be lubricated after the specified number of kilometres where diesel contains less than 0.5% sulphur.

NOTE: Where diesel fuel contains more than 0.5% sulphur, the engine should be lubricated after half the specified number of kilometres.

Maintenance schedule

- Change engine oil 800 hours (or 1 year)
- Change oil filter 800 hours (or 1 year)
- Check auxiliary belts condition 800 hours
- Change fuel filter 800 hours
- Change fuel prefilter 800 hours
- Check and adjust the load sensing valve, as required 1600 hours
- Replace auxiliary belts 3200 hours
UNSCHEDULED MAINTENANCE

Maintenance

• Clean radiator inlet Every year

• Check coolant liquid density Every year (before the winter season)

• Replace engine coolant liquid Every 2 years
MAINTENANCE-A FEW PRACTICAL HINTS

Engine oil change
• Unscrew drain plug 1 and drain the oil into a suitable container.
• Withdraw dipstick 3.
• Refill with new oil through filler 4.

Oil filter replacement
• Remove oil filter 2.
• Before fitting the new cartridges smear the seal with engine oil.
• Screw in cartridges by hand until in contact with the filter head and then tighten them a further 3/4 of a turn by hand.

Warning! Stop the engine and let it cool down for a while before replacing defective parts or you could seriously burn yourself.
Changing fuel filter
• Unscrew the fuel filter and replace it.
• Before fitting the new filter the gasket should be wetted with diesel fuel or engine oil.
• Screw the filter on by hand until there is contact with the support and then tighten by a further 3/4 of a turn.

Important!
When renewing fuel filter this should not be pre-filled and prevent foreign matters from entering the system and damaging engine components pump injectors.

Water in fuel prefilter
If warning lamp lights up, unscrew tap 4 to drain the water.

Changing pre-filter
• Unscrew fuel pre-filter and replace it.
• Before fitting the new filter the gasket should be wetted with diesel fuel or engine oil.
• Screw the filter on by hand until there is contact with the support and then tighten by a further 3/4 of a turn.

Air-bleed fuel system. Risk of fire!
• Undo the bleed screws. Air-bleed residues should be drained into suitable containers via special pipes connected to the bleed screws:
  1 = assembled on prefilter mounting (chassis).
  2 = assembled on filter mounting (engine).
  5 = assembled on the cylinder head front side.
• Operate the hand pump 3 (on prefilter) until you see that the fuel issuing from bleed screw 1 is thoroughly free from air (screw in the screw when this operation is over). Continue pumping until the fuel is noticed to issue thoroughly free from air from bleed screw 2 and 5 also (the latter is assembled on the cylinder head from side).
• Close both screws.

Now the circuit is thoroughly air-bled.
Start the engine and let it idle for a few minutes in order to eliminate any air residue.
Antifreeze concentration

- The vehicle cooling system is protected by a 50% mixture of antifreeze and water. In order to ensure protection from corrosion, the specified mixture of antifreeze and water should be maintained all year round, even in temperature climates. When topping-up, ensure that the mixture used is in the correct proportion (50% mixture of Paraflu\textsuperscript{11} and water). Antifreeze concentration can be checked using a hydrometer (refer to an Authorised Dealer).

Variable geometry turbocharger check valve - Air filter

- Use a suitable wrench to undo the air filter.
- Before installing the new cartridge wet the seal slightly with diesel or engine oil.
- Screw in the cartridge by hand until it touches its mounting and then tighten it a further 3/4 turn.

Blow-By filter

- Use restriction indicator 1 to check the condition of filter 3.
- Proceed as follows to replace the filter: undo screws 2, remove the cover, pull out filter 3 and replace it with a new one.
  As the filter operates in one direction only, both stiffening bars should be visible from the outside as shown in the figure.
Refueling

Use standard type diesel oil only (EN 590 standard).
Fuel additives are not recommended. The use of fuel additives could restrict the warranty conditions provided for by the vehicle’s manufacturer.
Refueling from barrels or cans can lead to fuel pollution resulting in irregular operation of the fuel feed system. If so, either filter the fuel by means of the suitable equipment or let possible impurities settle, as required.

Low temperature fuel:
To low temperatures the fuel’s fluidity rate can be lower than specified owing to the separation of the paraffin wax. This process may result in filter restriction.
The EN 590 standard provides for several fuel classes to be adhered to at low ambient temperatures.
Complying with the regulations in force depending on climate conditions (yearly seasons and different countries’ geographical position) is the oil companies’ full responsibility.

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<tr>
<td>F3A</td>
</tr>
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<td>F3B</td>
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<tr>
<td>Urania Turbo - Urania Turbo LD (1)</td>
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<tr>
<td>Engine sump and filter</td>
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<td>F2B</td>
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<td>F3A</td>
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<td>F3B</td>
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<td>Fuel tank</td>
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* Oil must be changed at least once a year even if the number of kilometres specified in the maintenance schedule has not been reached
1) According to standard E2-96
2) Use a mixture of 50% water and 50% Parafiu I I (SAEJ1034) protective antifreeze. This mixture has a freezing point of - 35 °C.
3) When filling the fuel tank, use a funnel with a very fine metal screen to prevent impurities in the fuel from blocking up the filters.