



## Diagramas - Sistema Eléctrico

### GENERAL LIST OF CONTENTS



### en Inglés



# INVERTIR EN CONOCIMIENTOS PRODUCE SIEMPRE LOS MEJORES BENEFICIOS

# Las herramientas que nunca deben faltar a la hora de efectuar el mantenimiento o reparación de su vehículo...



### Los manuales de Taller, Reparación o Servicio y los Diagramas de Cableado del Sistema Eléctrico... SOLICITELOS AHORA MISMO !





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## TECTOR

6 TO 26 t REPAIR MANUAL ELECTRIC/ELECTRONIC SYSTEM





## **EuroCargo**

This publication describes the characteristics, the data, the correct methodology of the repairs that can be made on each individual component of the vehicle.

By complying with the instructions supplied and using the specific tools it is possible to perform any repair intervention correctly, within the specified time frames, while protecting the technicians against incidents.

Before starting any repair work, make sure that all accident prevention devices are ready at hand.

Check and wear the protective personal equipment provided for by the safety standards: goggles, helmet, gloves, shoes.

Check the efficiency of all processing, lifting and transport tools before using them.

The data contained in this publication might fail to reflect the latest changes which the Manufacturer may introduce at any time, for technical or sales purposes, or to meet the requirements of local legislation.

Copy, even partial, of text and drawings is forbidden.

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#### PREFACE



This manual is part of the aids that the Technical Publications sector makes available to workshop technicians to allow the most correct performance of maintenance and/or repair operations and it is also a good way to familiarise with the IVECO product.

The experience acquired over many years in servicing and in editing technical publications has led us to devote a special volume to the electric system fitted on the models in question, considering the speciality and complexity of the subject.

This manual is intended for people with professional preparation in the "Vehicle Electrician" sector and who at the same time avail of adequate and indispensable testing and/or measurement equipment for the main electrical ratings.

In drafting the texts and representing the graphics we have taken account of the particular necessities of the operator technician in some cases stating references or repeating certain diagrams in different places that may be obvious to a design engineer.

The completeness of the information given in the wiring diagrams, the size chosen and the ease with which they can be taken allow the repair operator to avail of all the information exactly where it is needed most, i.e. on the vehicle.

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### Introduction

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### General warnings for electrical/electronic components

### DO NOT EVER DISCONNECT THE BATTERIES FROM THE SYSTEM WITH THE ENGINE RUNNING. DO NOT START THE ENGINE WITHOUT FIRST HAVING CONNECTED THE BATTERIES IN A PERMANENT MANNER.

- Before working on the vehicle, immobilise the wheels with chocks.
- Do not use fast chargers to start the engine. Engine starting can be performed either by means of separate batteries or by means of a special truck.
- Incorrect polarisation of the power supply voltage for the electronic control units (e.g. erroneous battery polarisation) may damage the components irreversibly.
- If you have to disconnect the batteries from the system, always disconnect the frame ground cable from the negative terminal of the batteries first.
- Before connecting the batteries to the system, make sure that the system is suitably insulated.
- Disconnect the batteries from the system before recharging them by means of an external unit.
- Disconnect the external recharging unit from the power mains before removing the unit's pliers from the battery terminals.
- Do not fit / remove the ECU connector without cutting out the power first.
- At temperatures of over 80 °C (drier ovens), take down the ECU's.
- During electrical welding operations disconnect the connectors from the ECU's.
- At the connection stage, tighten the flanged nuts of the connectors (temperature and pressure sensors, etc.) to he required torque. Check the exact polarity of the battery terminals when starting the engine by means of the auxiliary truck.
- Before working on the vehicle's electrical/electronic system disconnect the positive pole of the battery
- Connectors are viewed from the cable side.



- Key storage procedures are affected by electromagnetic disturbances such as cell phones and the like, so: I. Ensure there are no sources of disturbance in the cab or close to the keys.
- 2. Keys not inserted in the panel must be at a distance of at least 1 meter.

When working on electronic control units, plug connections and electrical connections to the components, measurements can be made only on suitable testing lines, by means of special plugs and plug-type bushes. Do not under any circumstances make use of improper devices such as metal wires, screwdrivers, clips and the like. In addition to the risk of causing a short circuit, this might damage plug-type connections and this would then give rise to contact problems.

### General warnings for electrical/electronic components

- Before disconnecting the jointing connector from an ECU, insulate the system (Figure to the side, ref. A)
- Do not produce sparks to check for the presence of voltage in a circuit.
- Do not touch the plugs of ECU connectors with your fingers.
- Do not use a test lamp to assess the continuity of a circuit; use only suitable checking equipment (ref. B).
- Do not power directly the components controlled by ECU's with the rated voltage of the vehicle.
- Do not introduce the tips of a measuring device into ECU connector plugs. To make measurements, use the UNITESTER (ref. C).
- Make sure that the wiring of electronic devices conforms to the IVECO system specifications (in terms of length, type of lead, arrangement, straps, connection to the shielding braid, grounding, etc.), and restore the connecting wires with care after repair and maintenance interventions. To prevent the possible malfunctioning of on-board electronic systems, the wiring of additional equipment must not follow the same path as these wires.
- To replace a component, use only the corresponding original IVECO part.
- Do not install additional electrical and / or electronic devices not specified by IVECO or not envisaged by local legislation.
- Do not connect the negative terminals of additional devices to the negative terminals of the electronic systems.
- Before performing electrical welding operations on the vehicles, disconnect all the ECU's and / or disconnect the power cable from the positive terminal of the battery and connect it to the frame ground (ref. D).



### Concept of ground and electromagnetic compatibility

The electrical system is traditionally uni-polar. The body, the frame, the metal cases of the electromechanical components serve as equipotential return conductors to the generators, since any point in their metal structure or any non-insulated negative terminal is at the same reference potential, or GROUND. This is why the ground has been chosen as the reference term for the entire system and has been assigned, conventionally, the value of zero.

For obvious construction needs, the negative network of the system includes a number of grounding points situated on the vehicle as a function of the location of the components on the frame, the engine and the bodywork.

Ideally, all the units should be connected to a single grounding points so as to ensure that each of them, and in particular each of the electronic devices, has a clearly defined ground reference.

For the foregoing reasons, we should distinguish between the power ground, or system ground, characterised by high direct current intensity (> I A for the electromechanical components), and the analogue ground, characterised by wave shapes at given frequencies and very modest current intensity (mA,  $\mu$ A of the electronic systems).

The definition of the analogue ground (or signal ground) depends on the sensitivity of the electronic systems to EMC (electromagnetic compatibility), since eddy signals, which may be generated either by on-board or by extraneous systems, cause the malfunctioning and/or deterioration of the systems themselves.

In order to minimise noise or interference, whether continuous or transient, generated by eddy radiation, it is essential to keep in mind that the efficiency of the system's reference plane or ground depends, at each connecting point, on excellent conductivity characteristics (contact resistance approaching zero).

To sum up, we can say that the ground, understood as equipotential electrical conductor, or as potential reference term for all on-board electrical/electronic components, is subdivided into system ground and analogue ground.

The system's grounding points are established by the Manufacturer and must obviously be free of paint, oxidation, grease, dust, etc.



6616



The system's grounding points are established by the Manufacturer and must obviously be free of paint, oxidation,

- the terminal side.
- 2° Apply the paint with a brush from a can, or by spraying it.
- 3° Connect the grounding cables within 5 minutes of the application of the paint.
- 4° If you are fitting a new grounding contact, sand the terminal fastening hole to remove all the anaphoretic paint from the frame and create a supporting plane without indentations or steps.

### Practical tips

The negative leads connected to a system grounding point must be as short as possible and connected to one another in "star" configuration; make sure that they are tightened in an orderly and adequate manner (Figure 4, ref. M).

Furthermore, for electronic components, the instructions to be followed very carefully are:

- ECU's must be connected to the system ground if they are provided with a case.
- ECU negative cables must be connected both to a system grounding point, such as for instance the dash compartment ground (with no "serial" or "chain" connections) and to the negative terminal(s) of the battery/batteries.
- Even though they are not connected to the system ground/battery negative terminals, analogue ground elements (sensors) must have excellent insulation. As a result, special care must be devoted to the eddy resistances of the cable terminals: oxidation, seam-folding defects, etc.
- The metal braid of shielded circuits must be in electrical contact at either end with system components.
- Only one end of the shielding braid must be connected to the system ground.
- In the presence of jointing connectors, the non-shielded portion, **d**, must be as short as possible in the proximity of the connectors (Figure 5).
- The cables must be arranged so as to run parallel to the reference plane, i.e., as close as possible to the frame/body structure.
- Additional electromechanical systems must be connected with the greatest care to the system ground and must not be placed alongside the cables of electronic components.



### CAN Line

CAN stands for "Controller Area Network" and indicates a dedicated wiring harness that connects the various control units (ECU) of a vehicle to one another, thus creating a structure very similar to that of the nervous system.

This system makes it possible instant exchange of huge amounts of data among the various electronic systems available on the vehicle.

The system provides a bidirectional operation mode which is increasingly establishing itself in the automotive field, thanks to the smaller number of conductors and interferences.

Information is delivered in accordance with a protocol that sets out the data exchange modes:

- Synchronization of information.
- Modes for call and response among the various systems.
- Identification and solution of transmission errors (if any).



### CAN line make-up

The cable used for the CAN line available on the vehicle is of the twisted type.

This ensures that no electrical noise affects signals.

Grey is the colour of the sheath.

Figure 7



A. Sheath (gray) - B. Twisted wires (white/green)

### Efficiency tests on the CAN line

In order to check the perfect working order of the CAN line available on the vehicle, a few measurements must be made.

To make these measurements, it is necessary to connect to 30-pole diagnosis connector pins 22 and 23, and measure the following:



0 Ω	~ <b>60</b> Ω	~ I20 Ω	0.L.
CAN line short-circuited	CAN line OK	One resistor shut off	CAN line shut off

"CAN LINE" com Figure 9	ponents on vehicle	
Ref. I 2 3 4 5 6 7 8 9	Description Rev counter Cluster Immobilizer 30-pole diagnosis connector Body Controller ABS ECAS Intarder EDC 7	

### General

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### Description of basic system

Electrical characteristics

- I. Unipolar system with negative pole connected to frame ground
- 2. Rated power supply voltage of 24  $V_{dc}$ , with two 12 V / 110 Ah batteries connected in series
- 3. Power supply of electrical system and battery recharging with alternator 28V / 70A (BOSCH) (90A OPT).
- 4. Starting by means of starter motor: 24V / 4.0 kW (BOSCH)









### ENGINE LEFT HAND SIDE

Rei.	Description	Comp. code
А	Coolant temperature sensor	85153
В	Electronic injection solenoid valve	78247
С	Engine pre-heating resistance	61121
D	Fuel pressure sensor	85157
Е	Boosting air pressure/ temperature sensor	85156
F	Pulse sensor on timing system	44037
G	Pulse sensor on timing system	48042
Н	Solenoid valve for fuel pressure regulator	78013
I	Fuel temperature sensor	47042
L	EDC 7 electronic control unit	85150
М	Engine rpm sensor	48035

#### ENGINE RIGHT HAND SIDE

Ref.	Description	Comp. code
А	Alternator	03000
В	Oil pressure / temperature sensor	-
С	Oil level transmitter	44043
D	Starter motor	08000

### **POWER NETWORK**

### Positive network

Never disconnect the system batteries when the internal-combustion engine is running. Prior to connecting the batteries to the system, make sure that the latter is properly insulated. The batteries must be disconnected from the system when they are to be recharged.

The aim of the electric system is to generate, control, store and distribute the power necessary for vehicle component operation.

To this purpose, the electronic base system power supply is delivered by a generator (alternator 28V - 70A) and two batteries (12V, 110Ah each) connected in series.

A "positive pin" is located inside the cab, behind the dashboard (just next to the bulkhead). A 16 mm<sup>2</sup> cable from the battery is connected to this pin. Here, the following inputs are available:

- Control unit interconnecting connector G and terminal  $A-10\ \text{mm}^2$
- Starting switch (+30 / 4 mm<sup>2</sup>)
- Fuse holder 70000/1, fuse 1-4 mm<sup>2</sup>
- Fuse holder 70000/2, fuse 1-4 mm<sup>2</sup>

#### **Power cable sections**

-	cable direct from the battery	=	16 mm <sup>2</sup>
-	cable to the UCI	=	10 mm <sup>2</sup>
-	cables to the fuses	=  /	2, 5/4 mm <sup>2</sup>
-	alternator cable	=	16 mm <sup>2</sup>
-	starting motor cable	=	70 mm <sup>2</sup>

**NB** In case work has to be carried out on the vehicle's electric/electronic network, it is recommended that the battery positive pole be disconnected.



#### **Negative network**

The batteries are connected to the chassis ground by means of a brown, 70 mm<sup>2</sup> cable, at earth point (M6) on the left side member.

The starting motor is connected to chassis ground (M8) by means of a 70 mm<sup>2</sup> cable fastened onto the right side member just next to the motor itself. The same cable is used to bond the complete internal-combustion engine assembly to the chassis ground.

The same electric, negative equipotentiality of the chassis is provided to the vehicle cab, by means of a stranded wire connected onto the cab front and onto the front right side member.

Inside the cab (behind the Body Controller) is an earth point marked "S" and called "SIGNAL EARTH". Here, the earths for the electronic control units located inside the cab and the 30-pole diagnosis connector earth are available.





MI/M3. Cab interior earth (left side) - M2. Cab interior earth (right side) - M4. Roof panel earth - M5. Rear chassis earth - M6. Battery earth - M7. Front part, left side member earth - M8. Starting motor earth - M9. Front part, left side member earth - S. Cab interior earth (signal earth) - TI/T2. Electric, negative equipotentiality stranded wire


Earth point Description   MI Internal ceiling light. "MENU UP" button. "MENU DOWN" button. "MENU G" button.		II / /
MI Internal ceiling light. "MENU UP" button. "MENU DOWN" button. "MENU G" button.		
Internal light switch. Emergency light switch. Cluster (A19).	Earth point	Description
M3 Switch on the left-side pillar. Floor cable earth. Steering column stalk (B)/(A)/(C). Cruise Control (control). Clutch ON signalling switch.	Earth point MI	Description   Internal ceiling light. "MENU UP" button. "MENU DOWN" button. "MENU G" button.   "MENU OK" button. Rear fog light switch. Headlamp trim control. Fog light switch.   Internal light switch. Emergency light switch. Cluster (A19).







- 52502 Key operated selector
- 85150 EDC 7 control unit
- 08000 Starter motor
- 25224 Switch to prevent starting with a gear engaged
- **53006** Button for engine starting from inside the cab
- **53512** Switch to prevent engine starting with the handbrake released
- 53511 Cab unhooked indicator switch

#### **ENGINE STARTING**

General

Before working on the vehicle, place the chocks under the wheels to prevent the vehicle from moving accidentally.

Before tilting the cab make sure that the space in front of the vehicle is sufficient.

Engine starting from the engine compartment can be performed solely when the cab is firmly anchored in its maximum opening position, the parking handbrake is applied and the gear lever is in neutral.

# Starting from inside the cab (Cab hooked)

Engine starting from inside the cab (solid line in synoptic figure) is performed by setting the key-operated selector 52502 onto position 50.

In this manner, a positive voltage is supplied to pin B20 of electronic control unit EDC7 85150.

The same control unit, via pin B27, operates the remote control switch that powers the starter motor.

The EDC7 control unit programmed with the new software checks, during start-up, whether the gear-lever is put in neutral; therefore, it will not enable engine start-up if the gear is engaged.

This control is cut out if the clutch pedal is pressed.

Starting from inside the cab (Cab tilted)

To tilt the cab it is always necessary to apply the parking brake, make sure that the gear lever is in neutral and tilt the cowling fully open.

To tilt the cab proceed as follows:

- rotate the knob clockwise all the way (by means of the lever supplied as standard)
- introduce the cab tilting lever into the hand pump;
- work on the pump starting lever

The engine can be started from inside the cab only in the following conditions:

- the switch to prevent engine starting with the handbrake released 53512 is closed, i.e., the handbrake is applied;
- the switch to prevent engine starting with the gears engaged and turn on the reversing light 53508 is closed, i.e., the gear lever is in neutral;
- The cab unhooked with cab tilted indicator switch 53511 is closed on the ground side;
- the key-operated selector is in travelling position (+15).







### Main components

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The vehicle's electric system has been modified by introducing a new instrument board called Instrument Cluster, similar to the model available on higher range "STRALIS" vehicles.

This system has the following characteristics and is made up of:

- one instrument indicating the vehicle speed (both in km/h and mph);
- one instrument indicating engine speed (peculiar scale for 270 CV model);
- one fuel level gauge;
- one coolant temperature gauge;
- one display showing faults and user messages;
- three optical indicator clusters;
- four buttons to scroll the various menus (model Highline only);
- one background lighting control button;
- one trip meter reset button (page shift on Baseline).

In addition to being connected to the vehicle's CAN line, the Instrument Cluster receives a set of signals directly from a few sensors or switches available in the vehicle's electric system.

The Instrument Cluster also receives the signals from the four buttons for display menu control. The button operating logic is of the standard type: the arrows allow you to shift the pages; if a page with various lines to be displayed is chosen, the display allows you to view only 3 lines at a time or a page with a submenu. Pressing OK allows you to access the page and the "arrows" can be used. Button C allows you to return to the previous page. A black-and-white display is available. The lack of a colour display has been made up for by a logic associating a yellow or red warning light to the icon indicating the information to be signalled to the driver. Direct signals are sent out to the Instrument Cluster (no CAN line is provided) from:

- Engine oil level
- Fuel level
- Presence of water in the diesel fuel filter
- Air filter clogged signalling
- Rear converter limit switch signalling (vehicles 60/100)
- Rear brake oil level (vehicles 60/100)
- Immobilizer optical indicator
- Battery recharge indicator
- Trailer ABS failure indicator.

All the other signals are received, through the CAN line, in order to allow the relevant message to be displayed.

The Cluster does not store failures; it only displays them.

At present, the vehicle systems on which diagnosis can be made are EDC, ECAS, IMMOBILIZER, ELECTRIC MIR-RORS, and BODY CONTROLLER.

With these systems, if the "HIGHLINE" model Cluster is available, a diagnosis screen can be shown on the display, which allows you to refer to the failure codes of the concerned system.

These codes can be referred to by means of the "MENU" buttons provided on the dashboard.

The ABS, INTARDER and AUXILIARY HEATER systems cannot be diagnosed at present.

#### Models available

Two models of the IC system are available: BASELINE and HIGHLINE. They differ from each other in that they have (or have not) control buttons, and the screens on the IC display.

#### **Baseline**

No menu control button is provided. Trip meter reset button (this is also used to change IC screen).

#### Highline

Four menu/IC screen control buttons are available. Trip meter reset button (this is also used for trip 1 function).

#### Screens available with vehicle running

#### Baseline

time/km/partial km time/km/partial time time/miles/partial miles (UK customer market) brake air pressure / engine oil pressure

#### Highline

time/km/partial km/°C/gear engaged (automatic transmission) time/km/partial time/°C/gear engaged (automatic transmission) engine oil pressure / brake air pressure trip 1 trip 2

#### Screens available with stationary vehicle

#### **Baseline**

time/km/partial km time/km/partial time time/miles/partial miles (UK customer market) engine oil level brake air pressure / engine oil pressure

#### Highline

time/km/partial km/°C/gear engaged (automatic transmission) time/km/partial time/°C/gear engaged (automatic transmission) engine oil level / brake pad wear percentage (%) engine oil pressure / brake air pressure trip 1 trip 2 fuel litre meter index / fuel consumption indicator engine oil level / brake pad wear percentage (%) light check diagnostics vehicle maintenance language setting / measurement unit



Description	Colour	Ideograph	Description	Colour	Ideograph
External lights	Green	EDDE	Side power takeoff 1 ON	Yellow	} <mark>,</mark>
High-beam headlamps	Blue	≣D	Rear power takeoff 2 and torque distributor both ON	Yellow	۱ <mark>۳</mark>
Emergency lights	Red		Tractor left indicator	Green	ф
Instrument board failure	Red		Decelerator ON	Yellow	(B)
Fog lights	Green	却	Exhaust brake ON	Yellow	<b>O</b>
Rear fog lights	Yellow	()≢	Braking system failure	Red	0
Slow gears engaged	Yellow	٩	Emergency brake ON	Red	P
Engine preheating	Yellow	æ	Tractor ABS failure	Yellow	(ABS)
Programmable speed limiter	Yellow	km	Trailer ABS failure	Yellow	18) 18)
Heated mirrors	Yellow	ц.	Special emergency brake (FF vehicles) ON	Red	(H)
Front transverse differential lock	Yellow	ĩ	Pneumatic suspension low pressure	Red	68 8 80 80
Longitudinal differential lock - Torque distributor (in neutral)	Yellow	Pet	Trailer right indicator	Green	¢
Rear transverse differential lock	Yellow	₽			

#### (FAILURE) INDICATORS ON THE DISPLAY

When the functions below are actuated, or when the following anomalies occur, the corresponding symbol will appear in the display section.

The yellow symbols (minor anomalies and failures) will appear on the left side of the display; the red symbols (serious failures) will appear on the right side.



Description	Colour	Ideograph
Minor anomaly and failure warning light	Yellow	
Serious failure warning light (stop)	Red	

Description	Colour	Ideograph	Description	Colour	Ideograph
Rear axle brake air low pressure	Red	6-0	Radiator water low level	Red	****
Front axle brake pad wear	Red	©1	EDC	Red	(EDC)
Rear axle brake pad wear	Red	IO	Gearbox failure	Red	$\odot$
Brake fluid low level	Red		Gearbox oil high temperature	Yellow	Ū.
Rear AoH converter limit switch	Red	(AoH)	Retarder high temperature	Yellow	(B))
Tractor EBS failure	Red	(EBS)		Yellow	®
Tractor EBS failure	Red	(EBS) 1	Pneumatic suspension failure	Red	( <u>⊕ !</u>
Engine oil low pressure	Red		IBC failure	Red	IBC
Engine coolant high temperature	Red	<b></b>	Generator charge	Red	<b>- +</b>
Engine oil low level	Red		Auxiliary generator charge	Red	- <u>π</u> +

79489

Description	Colour	Ideograph	Description	Colour	Ideograph
Power steering fluid low level	Red			Yellow	-Ö:-
Cab uncoupled	Red	$\Diamond$	Box tipped	Yellow	₽°,
Loading gate	Red	<b>~</b>	Air filter clogged	Yellow	۳
Airbag failure	Red	<b>R</b>	Presence of water in the diesel fuel prefilter	Yellow	
Doors open	Red		Windscreen washer fluid low level	Yellow	£}
Vehicle braked by EBS	Yellow			Yellow	F_ €
ASR ON (brake control)	Yellow	ASR			ă,
Tractor EBS failure	Yellow	(EBS)			(km) 2
Tractor EBS failure	Yellow	(BS)1	Vehicle braked by EBS		*
	Yellow	۲. ۲	EDC in power takeoff mode		PTO
Immobilizer actuation/failure		+•• Code	Safety belts not fastened		Å
Immobilizer actuation/failure	Yellow	÷			$\odot$
Start-up cut out	Yellow				$\odot$
Gearbox failure	Yellow	$\bigcirc$	Low external temperature		Ж
Automatic transmission gear engagement restraint	Yellow	₹			A
Pneumatic suspension failure	Yellow	( <u>∎</u> !÷	CAN network failure	Yellow	CAN
Pneumatic suspensions not in running conditions	Yellow		CAN network failure	Red	CAN
IBC anomaly	Yellow	IBC			

#### "POP-UP" EVENTS

Both current models allow you to display a few vehicle conditions (called "POP-UP events") in the base page structure, for a pre-established time. After this screen is shown, the display will automatically go back to the latest screen available.

Below is a list of the conditions that can be displayed:

Headlamp setting Mirror adjustment Speed limiter Cruise control PTO (revs) Engine idling speed





85589







## FUSE ASSEMBLY



Position Ra		Rating	Function	Power supply
		30A	Heated windscreen	+30
	2	30A	Heated windscreen	+30
70000/3	3	-	-	-
70000/3	4	-	-	-
	5	-	-	-
	6	-	-	-
	I	10A	Auxiliary heater	+30
70000/1	2	10A	Cigar lighter / Headlamp washer / Ceiling light	+30
	3	10A	Fog light / Rotating lamps	+30
	4	10A	Conditioner / Adjustable heated mirrors	+30
	5	10A	Heated seat	+15/1
	6	10A	Reversing lights	+15/1
	I	20A	Diesel fuel heating / Loading gate / Diesel fuel prefilter	+30
			heating / Window regulator	
70000/2	2	20A	Sunroof	+30
	3	20A	Trailer ABS	+30
	4	20A	ABS	+30
	5	5A	ABS - ECAS	+15/1
	6	5A	ABS	+30



Fuse	Rating	Description
I	5A	Body Control (15) / MICO tachograph / Instruments Cluster
2	5A	Cab uncoupled / Immobilizer / Sensor for presence of water in the diesel fuel filter / Head-
		lamp trim corrector / Bed lights
3	5A	MICO tachograph / Body Control (Left low-beam lamp - Right high-beam lamp)
4	5A	Body builders
5	5A	EDĆ7
6	5A	Trailer takeoff (+15) / Chassis body builder takeoff (+15)
7	10A	Central locking / Auxiliary heater / Fridge / Radio
8	10A	Body Control (Right low-beam lamp - Left high-beam lamp)
9	10A	Cab body builders (+15)
10	10A	Body Control (left sidelights and stop lights)
11	10A	Body Control (indicators - emergency lights)
12	10A	Horn
13	10A	Window regulators / Heated windscreen
14	20A	Windscreen defrosting electric heater / Conditioner
15	20A	Body Control (windscreen wiper – windscreen washer)
16	20A	Brake air drier / Adjustable heated rearview mirrors / Control unit
17	10A	External light body builders (+58)
18	5A	Instruments Cluster
19	10A	EDC7
20	10A	Body Control (right sidelights and rear fog light)















#### **STEERING COLUMN STALK** Figure 22 RES + SET $\hat{\nabla}$ OFF В E Ð R C TECHNICAL VIEW Cable Ref. Function colour code 1103 **Right** indicator 2 0000 Earth 3 Left indicator 1109 Α 4 1116 Horn control 5 Horn positive (+30) 1116 I High-beam lamp actuation control 2 2201 3 0000 В Earth 4 2204 Headlight flashing device control 5 0000 Earth T 8881 Windscreen wiper 2 3 8882 Windscreen wiper (reset) 4 С -5 0000 Earth 6 8822 Windscreen wiper (intermittent wipe) 7 Windscreen wiper (electric pump control) 8886 0000 I Earth 2 To Body Controller terminal A38 (SET+) 8157 3 8155 To Body Controller terminal A37 (RESUME) D 4 0000 Earth 5 8156 To Body Controller terminal A27 (SET) 6 7 8154 To Body Controller terminal A28 (RESUME)



BODY CON Linking con	NTROLLER nectors
Figure 24	A
C-	
	D E [84592]
Ref.	Description
A	External lights / Rear fog lights / Start-prevent switch with hand brake OFF / High-beam headlamps / Low-beam headlamps / Flashing the lights / Headlamp trim / Emergency lights / Indicators / Brak- ing gasket wear / Speed limiter / Exhaust brake selector / Door lights / Slow gear switch / Front and rear brake air pressure sensors / Stop signal (from brake pedal switch on the duplex) / Wind- screen wiper
В	Power takeoff / Levels: radiator water, power steering oil, windscreen washer, TGC
С	Power supply +30 (after TGC) / +30 / CAN line / Windscreen wiper motor / Windscreen washer electric pump / Ceiling light / Step lights / Earth / Indicators / Left low-beam lamp / Right high- beam lamp / Trailer junction (right-left indicators) / CAN line
D	Left high-beam lamp / Right high-beam lamp / rear fog lights, stop lights, sidelights, clearance lights, number-plate lights
E	(High-low) gear engagement solenoid valve control

## Component control connector "A" (black)

Ref.	Cable colour code	Function
I	3302	Positive for fog light remote-control switch
2	5560	Positive for brake air sensors
3	0000	Earth
4	6662	Signal from start-prevent switch with hand brake ON
5	9024	Signal from exhaust brake selector (PIN1)
6	9976	Geared-down speed ON warning light (signal)
7	2237	External light switch (PIN 4)
8	2282	Rear fog light switch (PIN 2)
9	8886	Control steering column stalk (PIN 7C)
10	-	IVECO rear axle differential lock signal
11	9934	Signal from headlamp trim corrector (PIN 3)
12	9936	Headlamp adjustment unit control (PIN 2)
13	5561	Brake air pressure sensor signal
14	-	-
15	9025	Signal from exhaust brake selector (PIN 7)
16	2205	Signal from slow gear selection switch selector
17	9968	Signal from speed limiter switch
18	2228	Signal from fog light switch
19-20	6620/6621	Signal from Rockwell rear axle transverse differential lock signalling switch
21	5562	Front brake air pressure sensor signal
22	7728	Signal from emergency light actuation switch
23	0003	Signal from left door button
24	8882	Steering column stalk (windscreen wiper control PIN 3C)
25	1103	Steering column stalk (right indicator switch)
26	2204	Steering column stalk (headlamp flashing device button)
27	8151	Cruise Control steering column stalk ( SET-)
28	8154	Cruise Control steering column stalk (RESUME)
29	8822	Steering column stalk (windscreen wiper control PIN6)
30	8881	Steering column stalk (windscreen wiper control PIN-10)
31	0010	Joint connector 4
32	3333	External light switch (PIN 5)
33	0003	Switch on right door for external lighting
34	1117	Stop light button (stop signal)
35	1109	Left direction steering column stalk (A3)
36	2201	High-beam lamp actuation steering column stalk (B2)
3/	0155 0157	Steering column stalk (Cruise Control resume)
20	6157	Front wheel chee weer signalling
37	2012	Pear wheel shoe wear signalling
<del>4</del> 0	6013	near wheel shoe wear signalling
## Connector "C" (black)

Ref.	Cable colour	Function	
-	-	Free	
2	7768	Positive +30 (prima TGC)	
3	4441	Positive for internal ceiling light	
4	2221	Right high-beam headlamp	
5	2231	Left low-beam headlamp	
6	886 I	Windscreen wiper motor (53B)	
7	8882	Windscreen wiper motor (53)	
8	8886	Positive for windscreen washer electric pump	
9	8873	Windscreen wiper motor (31B)	
10	0000	Earth	
11	-	CAN "H" line	
12	-	CAN "L" line	
13	-	Free	
14	2197	Positive after TGC	
15	4408	Positive for step light	
16	1117	Positive after TGC	
17	1180	Positive for trailer left indicators	
18	1120	Positive for left indicators	
19	1185	Positive for trailer right indicators	
20	1125	Positive for right indicators	

## Connector "D" (blue)

Ref	Cable colour	Function			
	code	rancaon			
I	4442	Positive for ideograph illumination			
2	-	Free			
3	2282	Positive for trailer reverse fog light			
4	2286	Positive for reverse fog light			
5	3334	Positive for rear left sidelights			
6	3380	Positive for front left sidelight / Positive for front right clearance light			
7	3339	Positive for rear clearance lights			
8	3332	Positive for trailer left sidelight			
9	8807	Positive after TGC			
10	2223	ight low-beam headlamp / Headlamp trim consent			
11	2219	eft low-beam headlamp			
12	8879	ositive after TGC			
13	8887	ositive after TGC			
14	3334	Number-plate lights			
15	3335	Positive for rear right sidelights			
16	3390	Positive for front right sidelights / Positive for front left clearance light			
17	3331	Positive for trailer front sidelights / Positive for body builders connector external light			
		remote-control switch			
18	77	Positive for left stop light			
19	1172	Positive for right stop light			
20	1179	Positive for trailer stop light			

# Connector "E" (white) "B"

Pof	Cable colour	Function			
Rel.	code	Tunction			
I	-	Free			
2	-	Free			
3	9973	Positive for high gear engagement solenoid valve control (9-speed gearbox)			
4	8879	Positive +15			
5	-	Free			
6	-	Free			
7	9110	Positive for geared-down speed engagement solenoid valve control (9-speed gearbox)			
I	-	Rear power takeoff ON signal			
2	-	Side power takeoff ON signal			
3	-	Free			
4	-	Free			
5	-	Free			
6	-	Free			
7	-	Radiator water level signal (red)			
8	-	ower steering oil level signal (red)			
9	-	Windscreen washer fluid level signal (red)			
10	-	Free			
11	-	Free			
12	-	Free			
13	-	Free			
14	-	Free			
15	-	Control from TGC closing button			
16	-	Free			
17	-	Free			
18	-	Positive for TGC closing remote-control switch excitation			
19	-	Free			
20	-	Free			







2	-	-	22	Pin 32 EDC7	0169
3	''+50'' signal	8037	23	Pin 87 EDC7	5120
4	Engine stop signal	9906	24	Conditioner control	9066
5	Cab unhooked signal	6666	25	Conditioner compressor remote-con-	9067
				trol switch	
6	Clutch ON signal	0160	26	Conditioner compressor actuation	9068
				signal	
7	EDC diagnosis line K	2298	27	Conditioner	9065
8	EDC diagnosis line L	1198	28	Battery "+" for tachograph and radio	7777
9	30-pole diagnosis pin 23 (engine	5198	29	EDC blink-code power supply and	7151
	phase)			clutch ON signal interruption	
10	Start-up from engine compartment	8050	30	-	-
	30-pole diagnosis pin 28 (rate gyroscope)	5584	31	Stop light button	8153/1117
12	Hand brake ON signal	9907	32	Accelerator pedal pin 5	0159
13	-	-	33	-	-
14	-	-	34	Accelerator pedal Pin 3	0157
15	-	-	35	Accelerator pedal Pin 2	5158
16	Power supply ''+15''	805 I	36	Accelerator pedal Pin I	5157
17	Diesel fuel heating remote-control	0087	37	-	-
	switch				
18	Diesel fuel heating remote-control	8837	38	-	-
	switch				
19	Exhaust brake cut-out with ABS	0027	39	EDC tuse	8150
20	Warning light alternator ''L''	7780	40	-	-

## Connector "C" (white)

## Figure 28





50341/A

Ref.	Description	Cable	Ref.	Description	Cable
Ι	Trailer reverse fog light	2282	21	-	-
2	Reversing light	2268	22	-	-
3	Right rear direction indicator	1125	23	Signal for the presence of water in the diesel fuel filter	5530
4	Left rear direction indicator	1120	24	Signal for the presence of water in the diesel fuel filter	8879
5	Right trailer direction indicator	1185	25	Air filter clogged signalling	6663
6	Left trailer direction indicator	<b>1180 26</b> Geared-down speed ON signalling warning light		9976	
7	Trailer front and left stop lights	-	27	Horn	1116
8	Trailer right sidelights	3331	28	"+15" for body builders	8869/8869
9	Trailer left sidelights	3332	29	Windscreen washer water pump	8886
10	-	-	30	Windshield wiper motor 53/B	8881
11	Tractor right and left reverse fog lights	2286	31	Windshield wiper motor 53	8882
12	Tractor right stop light	1172	32	Windshield wiper motor 31/B	8873
13	Tractor left stop light	1177	33	-	-
14	Tractor right and left number-plate lights	3330	34	Engine oil level	5506
15	Rear right sidelights	3334	35	Engine oil level	5505
16	Rear left sidelights	3335	36	-	-
17	Rear right/left clearance lights	3339	37	-	-
18	Front wheel brake wear	6012	38	-	-
19	Rear wheel rake wear	6013	39	-	-
20	-	-	40	-	-

50355



## Figure 29





50341/A

Ref.	Description	Cable	Ref.	Description	Cable
I	Automatic transmission	-	21	Automatic transmission	-
2	Automatic transmission	-	22	Automatic transmission	-
3	Automatic transmission	-	23	Automatic transmission	-
4	Automatic transmission	-	24	Automatic transmission	-
5	Automatic transmission	-	25	Automatic transmission	-
6	Automatic transmission	-	26	Automatic transmission	-
7	Automatic transmission	-	27	Automatic transmission	-
8	Automatic transmission	-	28	Automatic transmission	-
9	Automatic transmission	-	29	Automatic transmission	-
10	Automatic transmission	-	30	Automatic transmission	-
11	Automatic transmission	-	31	Automatic transmission	-
12	Automatic transmission	-	32	Automatic transmission	-
13	Automatic transmission	-	33	Automatic transmission	-
14	Automatic transmission	-	34	Automatic transmission	-
15	Automatic transmission	-	35	Automatic transmission	-
16	Automatic transmission	-	36	Automatic transmission	-
17	Automatic transmission	-	37	-	-
18	Automatic transmission	-	38	-	-
19	Automatic transmission	-	39	-	-
20	Automatic transmission	-	40	-	-

50355







50341/A

Ref.	Description	Cable	Ref.	Description	Cable
I	Side right indicator	1124	21	-	-
2	Side left indicator	1126	22	Rear brake converter limit switch	6684
3	-	-	23	Rear brake converter limit switch	6613
4	-	-	24	Tachograph (BI)	5514
5	Right low-beam headlamp	2223	25	Tachograph (B2)	0058
6	Right high-beam headlamp	2221	26	Tachograph (B3)	5517
7	Front right indicator	1123	27	Tachograph (B4)	5516
8	Left low-beam headlamp	2231	28	Brake fluid level sensors	6680
9	Left high-beam headlamp	2219	29	-	-
10	Front left indicator	1129	30	Front brake air pressure	5562
11	Right/left fog lights	2228	31	Brake air pressure sensor power supply	5560
12	-	-	32	Rear brake air pressure	5561
13	-	-	33	Brake air sensor earth	0000
14	Headlamp trim adjustment	9936	34	-	-
15	Headlamp trim adjustment	9935	35	Rear transverse differential lock ON	0055
				signal (IVECO)	
16	-	-	36	Rear transverse differential lock ON	6621
				signal (Rockwell)	
17	Right clearance light and front side-	3390	37	Rear transverse differential lock ON	6620
	lights			signal (Rockwell)	
18	Left clearance light and front side-	3380	38	Negative for fuel filter heating	0087
	lights				
19	Fuel level gauge earth	0616	39	Positive for clutch sensor, Blink code	7777
				button, exhaust brake switch. Cruise	
				Control buttons and speed limiter	
				button	
20	Fuel low level gauge	5555	40	Fuel heating resistor	7733

## Connector "F" (black)







50341/A

Ref.	Description	Cable	Ref.	Description	Cable
I	-	-	21	Front right ABS solenoid valve power	9920
				supply	
2	Suspension failure (low pressure)	6401	22	Rear ABS solenoid valve power supply	9930
				(right × 260)	
3	Rear right level sensor	5421	23	Rear left ABS solenoid valve power	9928
				supply	
4	Rear right level sensor	0400	24	-	-
5	Rear left level sensor	5422	25		-
6	Rear left level sensor	0400	26	Front left ABS sensor	5570
	Front level sensor	5410	27	Front left ABS sensor	5570
8	Front level sensor	0400	28	Front right ABS sensor	5571
9	Front ECAS solenoid valve	9413	29	Front right ABS sensor	55/1
	Rear ECAS solenoid valve	9423	30	Rear left ABS sensor	55/2
	Rear ECAS solenoid valve	9424	31	Rear IEIT ABS sensor	55/2
	Rear ECAS solenoid valve	9425	32	Rear right ABS sensor	55/3
	Rear IERT ABS solenoid valve earth	0000	33	Rear right ABS sensor	55/3
	Front left ADS solenoid valve earth	0000	24	- Resitive for ECAS man/front distribut	- 0400
15	Front right ABS solehold valve earth	0000	22	Fositive for ECAS rear/front distribu-	7400
14	Roar ARS colonaid valva parth	0000	24		
17	Rear solenoid valve power supply (left	9931	30	-	-
11	(1000  value power supply (left $2.240)$	7751	57	-	-
18	Front left ABS sciencid value power sup-	9921	38		_
	nly	//21	50		-
19	Front left ABS solenoid value power sup-	9919	39		_
	nly	////	57		-
20	Front right ABS solenoid valve power	9918	40		_
		//10	10		_
	Supply				1

50355

## **DIAGNOSIS CONNECTOR**

Bulkhead pin 30-pole diagnosis connector				
System		Funct.	Cable colour code	
EDC	 2	L	1198 2298	
ABS	3 4	L K	1199 2299	
-	5 6	-		
Cluster / Tachograph	8		9	
-	9	-	-	
AIR TOP 2000	10	K	2295	
Service actuation key turned to "MARCIA"	11	+15	8876	
Immobilizer	12	K	2292	
-	13	L	1196	
-	14	К	2296	
ECAS suspensions	15	-	-	
	16	К	2294	
-	17	-	-	
	18	-	-	
-	19	-	-	
-	20	-	-	
CAN H	21	Н	6108	
CAN L	22	L	6109	
Engine phase signal	23	Phase	5198	
Screen	24	Braided wire		
Engine start-up signal	25	-	8050	
Engine start-up signal	26	-	8892	
Engine revs	27	n	5584	
Vehicle speed pulse	28	n	5542	
Earth	29	31	0050	
Power supply	30	+30	7772	



73666

A 30-pin diagnosis connector is provided on the lower part of the cab under the central instrument panel, for diagnosis of vehicle electronic systems. An optional "VDI" electronic center is available for reading center data without interference.

\* Connections only with the optional VDI.

## Adapter for bulkhead readings

In addition to tests through MODUS, IT2000 and IWT upstream or downstream the bulkhead this adapter enables to operate on each bulkhead pin to perform readings with multimeter (as shown in detail A in the figure below).



TACHOGR	АРН		
Figure 34			
		I. Tachograph	79369
Ref. 2 3 A 4 5 6	Cable colour code 7768 4444 8879 6108 0066 0066	Function   Positive +30 direct to the battery   Ideograph illumination   Positive +15   CAN "H" line   Earth   Earth	
7 8 1 2 3 4 5 6 7	6108 5514 0058 5517 5516 - 5515	- CAN "L" line Sensor (A) signal Sensor (B) signal Sensor (C) signal Sensor (D) signal - - To diagnosis connector pin 29	
C 4 5 6 7 8	- - - - - - - - - - - - - - - - - - -		
L 2 3 0 4 5 6 7 8	- - - - - - ! !!9!	- - - - - - Signal: Cluster B1 / Diagnosis pin 8 -	

## **Electronic systems**

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### **Description of EDC 7 injection system**

#### IVECO Code recognition

The EDC7 control unit communicates with the Immobilizer ECU to obtain the engine starting enable signal.

#### Engine pre-heating resistance control

The pre-post heating function is activated when even a single water, air or fuel temperature sensor indicates a temperature lower than 5 °C.

#### Timing phase recognition

The cylinder in which to inject the fuel is recognized through the signal from sensor on the camshafts and the sensor on the flywheel.

#### Injection control

Based on the information coming from the sensors, the control unit manages the pressure regulator, changes the pre-injection and the main injection operating modes. On Tector motors pre-injection is active at any rotation speed rate of the motor.

#### Closed cycle control of injection pressure

Based on engine loading, as determined by processing the signals from the various sensors, the control unit manages the regulator to have the optimal pressure at all times.

#### Main pilot injection advance control

Based on the signals from the different sensors, the control unit determines the optimal point according to the internal mapping.

#### Idling speed control

The control unit processes the signals from the different sensors and adjusts the quantity of fuel injected. It checks the pressure regulator, varies the electro-injector injection time. Within certain thresholds, it also takes into account battery voltage.

#### Maximum speed limitation

At 2700 rpm, the control unit limits fuel flow by reducing the electro-injector opening time. At a speed of over 3000 rpm, it de-activates the electro-injectors.

### Cut Off

Fuel cut off at release stage is managed by the control unit which implements the following logics:

- cuts off the power to the electro-injectors
- re-activates the electro-injectors immediately before idling speed is reached
- controls the fuel pressure regulator.

#### Exhaust fume control at acceleration stage

At considerable load levels, based on the signals from the air flowmeter and the engine speed sensor, the control unit manages the pressure regulator and varies the electro-injectors actuation time, so as to prevent the emission of exhaust fume.

#### Fuel temperature control

When the temperature of the fuel exceeds 75 °C (as measured by the sensor placed on the fuel filter) the control unit reduces the injection pressure.

If the temperature exceeds 90 °C, the power is reduced to 60%.

### After Run

The control unit microprocessor makes it possible to memorize some data in the EEPROM, including the failure memory and the Immobilizer information, so as to make them available for the subsequent starting.

#### Protection from overheating

If water temperature reaches 110 °C, the central control unit reduces the motor performance. When the temperature falls below 100 °C, the motor starts to function normally again.



Print 603.93.181

Ref.	Description
I	Position sensor on accelerator pedal
2	Primary and secondary brake switch
3	Sensor on clutch pedal
4	Exhaust brake switch
5	Immobilizer ECU
6	Ignition key
7	Lever mounted switches
8	Cab unhooked switch
9	Handbrake engaged
10	Neutral switch
11	(20 A) protective fuse
12	Tester connector
13	Blink-Code button
14	Exhaust brake selector
15	Starter motor
16	Crankshaft sensor
17	Engine stop/start buttons
18	Preheating remote control switch
19	Fuel temperature sensor
20	Fuel heating resistor
21	Timing system sensor
22	Pressure regulator
23	Coolant temperature sensor
24	Preheating resistor
25	Electro-injectors
26	Air temperature/pressure sensor
27	Fuel temperature/pressure sensor
28	Exhaust brake solenoid valve
29	Oil temperature/pressure sensor



Ref.	Component code	Description			
I	85153	Coolant temperature sensor			
2	78247	Electro-injector			
3	85157	RAIL pressure sensor			
4	85156	Air temperature/pressure sensor			
5	44037	Power steering level sensor			
6	48042	Timing sensor			
7	47042	Fuel temperature sensor			
8	85150	EDC7 control unit			
9	48035	Crankshaft sensor			
10	44043	Engine oil level transmitter			
11	42030	Engine oil pressure/temperature sensor			
12	61121	Pre-post hearing resistance			

### EDC 7 electronic control unit



A. Injector connector - B. Frame connector - C. Sensor connector

The control unit is fitted onto the engine via a heat exchanger by means of elastic blocks which reduce the vibrations transmitted to the unit by the engine.

It is powered by a fuse (20 A) placed in the UCI (fuse no. 19).

The main relay which is normally used to power the system is located inside the control unit itself.



ECU	Cable	Function		
Pin	Colour			
l÷4	-	-		
5	NW	Ground for pressure regulator		
6	-			
7	NP	Control for pressure regulator		
8	-	-		
9	PY	Power supply for engine oil temperature pressure sensor		
10	NY	Power supply for air pressure temperature sensor		
	-			
12	GY	Power supply for rail pressure sensor		
3÷ 6	-			
17	YR	Ground for fuel temperature sensor		
18	YN	Ground for coolant temperature sensor		
19	PN	Ground for engine oil temperature pressure sensor		
20	GN	Power supply for rail pressure sensor		
21	N	Power supply for air pressure / temperature sensor		
22	-	-		
23	U	Timing sensor		
24	U	Crankshaft sensor		
25	R	Crankshaft sensor		
26	-	-		
27	GO	Signal from rail pressure sensor		
28	NG	Signal from air pressure sensor		
29	UO	Signal from air temperature		
30	R	Ground for timing sensor		
31÷32	-	-		
33	PO	Signal from engine oil temperature sensor		
34	YU	Signal from diesel oil temperature sensor		
35	PG	Signal from engine oil pressure sensor		
36	YO	Signal from coolant temperature sensor		



## "B" frame connector

ECU Pin	Cable	Function	
39	8051	Positive from key-operated switch, +15	
40	-	-	
41	9907	Signal from handbrake engaged switch	
42	6666	Signal from cab unbooked switch	
43	8892	Positive from gearbox on peutral switch	
44	9905	Positive from start button from engine compartment	
45	9906	Positive from start button from engine compartment	
44	//00	I ostuve i offistop buttor i officienci officienci officienci	
47 47	-		
40	-	- Engine altres signal foundiers aris source atom (nin 22)	
48 40	5198	Engine phase signal for diagnosis connector (pin 23)	
49	5584	Signal for electronic rev counter	
50	0158	INegative from accelerator pressed switch	
51	-	-	
52	6107		
53	6108	CAN line (green wire) H	
54	5159	- Positive for accelerator podal position consor	
55	5150	I Ositive for accelerator peda position sensor	
57-58	-		
59	-		
60	_		
61	-		
42	- 5440	- Clutch conson	
62	5002		
63	-		
64	0535	Inegative for BLINK CODE LED	
65	-	-	
66 (7.7)	-	-	
72	-	- Signal from accolorator proceed quitch	
72	0159	Pedundant signal from assolution proceed switch	
73		Redundant signal from accelerator pressed switch	
74	5155		
75	-	- Positive from secondary brake pedal switch	
70	5502	Signal from second speed limiter switch	
78	9071	Air-conditioning system	
70 79	-		
80	-	_	
81	0157	Ground for accelerator pedal position sensor	
82	-		
83	5157	Signal from accelerator pedal position sensor	
87	5120	PTO	

#### Electroinjectors connector "A" Figure 6 12 16 11 6 5 50350 ECU Cable Function Pin Colour I -\_ 2 -3 RU Cylinder 2 injector WP 4 Cylinder 3 injector 5 WV Cylinder 4 injector 6 RW Cylinder 2 injector 7 Ground -8 Ground -9 RG Cylinder I injector 10 UN Cylinder 6 injector 11 UG Cylinder 5 injector WR Cylinder 3 injector 12 13 RY Cylinder I injector W 14 Cylinder 4 injector 15 UO Cylinder 6 injector 16 UY Cylinder 5 injector

#### Colour legend

- **B** black
- **R** red
- U blue
- W white
- P purple
- G green
- N brown
- Y yellow
- **O** orange



#### Air temperature/pressure sensor (85156)

This component combines a temperature and a pressure sensor.

It is fitted to the intake manifold so that, by measuring the maximum quantity of air taken in, it makes it possible to determine the exact amount of fuel to be injected at each cycle.

This sensor is connected to the control unit via pins 21/C - 29/C - 10/C - 28/C.

It is powered at 5 V.

The output voltage is proportional to the pressure (or temperature) measured by the sensor.

Pins 21/C - 29/C Temperature Pins 10/C - 28/C Pressure

#### Oil pressure/temperature sensor

This component is identical to the air temperature/ pressure sensor

It is mounted horizontally on the engine oil filter.

It measures the engine oil temperature and pressure.

It is connected to the control unit via pins 19C - 33C - 9C - 35C.

The values sent are transmitted to the EDC control unit which, in its turn, controls the indicator on the dash (indicator / low pressure warning light).

Pins 19/C - 35/C Temperature Pins 9/C - 33/C Pressure

The engine oil temperature is used by the EDC unit only.

Pof	Description	Control unit Pin	
Rei.	Description	Oil	Air
I	Ground	19C	2IC
2	Temp. signal	35C	29C
3	+5	9C	10C
4	Press. signal	33C	28C

## Crankshaft sensor (48035)

This inductive type sensor is located in the left front part of the engine. It generates signals obtained from magnetic flux lines which close through the openings of a toothed wheel force fitted to the crankshaft. The same signal is used to manage the electronic rev counter.

It is connected to the control unit via pins 25C - 24C.

The sensor's resistance value is ca 900  $\Omega$ .

Supplier BOSCH

Tightening torque  $8 \pm 2$  Nm

### Timing system sensor (48042)

This inductive sensor is located in the left front part of the engine. It generates signals obtained from magnetic flux lines which close through the holes situated in gears force fitted to the camshaft. The signal generated by this sensor is used by the ECU as the injection timing signal.

Though it is similar to the crankshaft sensor, it is not interchangeable with the latter since its outer shape is different.

It is connected to the control unit via pins 23C - 30C.

The sensor's resistance value is ca 900  $\Omega$ .

Supplier BOSCH

Tightening torque  $8 \pm 2$  Nm



### Fuel pressure sensor (85157)

Fitted to one end of the rail, it measures the pressure of the existing fuel in order to determine the injection pressure. The value of injection pressure is used to keep the pressure level under control and to determine the time duration of the injection electronic command.

It is connected to the control unit on pins 20C - 27C - 12C.

It is powered at 5 V.



#### High pressure pump (pressure regulator)

Pump with 3 radial pistons controlled by the timing gears, requiring no phase adjustment, with rotor type feed pump fitted to the back.

- A. Connection between fuel discharge outlet and filter support
- **B.** Connection for fuel inlet from control unit heat exchanger
- C. Connection for fuel inlet from fuel filter
- D. Connection between fuel outlet from feed pump and filter
- E. Connection between fuel outlet and rail
- I. High pressure pump
- 2. Feed pump
- **3.** Pressure regulator (N.O. solenoid valve modulated by the control unit by means of PWM signal).

#### Pressure regulator

Situated at the inlet of the high pressure pump, on the low pressure system, it adjusts the quantity of fuel reaching the high pressure pump as a function of the commands received from the electronic control unit.

It basically consists of the following parts:

- trapezoidal section shutter;
- valve control pin;
- pre-charging spring;
- coils.

In the absence of the control signal, the pressure regulator is normally open, and hence the high pressure pump is in its maximum delivery conditions.

The control unit modulates a PWM control signal which reduces, to a greater or lesser extent, the section carrying the fuel to the high pressure pump.

This component cannot be replaced individually and hence it cannot be taken down.

The amount of fuel feeding the high pressure pump is metered by a proportional valve situated on the low pressure system - managed by the EDC 7 control unit.

The delivery pressure to the rail is modulated between 250 and 1400 bar by the control unit working on the pressure regulator solenoid valve.

lt is a N.O. solenoid valve

Its resistance is ca 3.2  $\Omega$ .

It is connected to the control unit via pins C5 - C7.



### Electroinjector

The injector features a traditional construction, save for the fact that it has no needle return springs.

The electroinjector essentially consists of two parts:

- actuator atomiser consisting of a pressure rod I, a needle **2** and nozzle **3**;
- control solenoid valve, consisting of a coil **4** and pilot valve **5**.

The solenoid valve controls the rise of the atomiser needle.

## Injection starts

Upon being energised, coil **4** moves up the shutter **6**. The fuel contained in the control volume **9** flows back towards line **12** resulting in a pressure drop in the control volume **9**.

At the same time, the fuel pressure in the pressure chamber **8** moves up the needle **2** resulting into the fuel being injected into the cylinder.

#### Injection ends

When coil **4** is de-energised, the shutter **6** closes again so as to re-create a balance of forces which moves the needle back into its closed position and stops the injection process.

This is a N.O. solenoid valve.

Individually connected to EDC control unit on connector  $\ensuremath{\mathsf{A}}\xspace.$ 

The resistance of the coil of each individual injector is 0.56  $\div$  0.57  $\Omega$ .



connection - 14. Spring - 15. High pressure fuel inlet.



CONNECTOR 2

CONNECTOR 3

I

2

3

4

I

2

3

4

Cylinder 4 injector

Cylinder 4 injector

Cylinder 3 injector

Cylinder 3 injector

Cylinder 6 injector

Cylinder 6 injector

Cylinder 5 injector

Cylinder 5 injector

5 A

14 A

12 A

4 A

10 A

15 A

16 A

IΙΑ

## Adapters for diagnostic with MODUS, IT2000 and IWT

## Adapter for readings on engine injector

In addition to tests through MODUS, IT2000 and IWT this adapter enables to perform readings with multimeter on individual injectors (as shown in detail A).

#### Figure 19



001662t



#### Fuel pre-filter

The water separation type fuel filter is mounted on the right hand side of the vehicle frame and has, on the cartridge base **3**, a sensor **4** detecting the presence of water in the fuel.

The filter support houses a manual priming pup  ${\bf 5}$  and a screw  ${\bf 2}$  to bleed the air from the system.

The presence of condensate in the filter and the filter clogged condition are revealed by sensor **4** by turning on a single warning light in the dash.

If the warning light lights up, take action immediately to remove the cause, as common rail system components deteriorate quickly if there is water or impurities in the fuel.




## Pre-post heating resistance

This resistance is located on the intake manifold.

It is used to warm up the air in pre-post heating operations. It is powered by a remote control switch situated on the left hand side of the frame.

Its resistance is  $\sim$  0,5  $\Omega$ .

## Resistance control remote control switch

The remote control switch is connected to the EDC control unit via pins 4B - 16B.

It is activated when the temperature of the water or the diesel oil exceeds 5  $^{\circ}\mathrm{C}.$ 

It is located in the front part of the vehicle, on the left longitudinal.

The remote control switch coil resistance is about 15  $\Omega$ .





## Load sensor on accelerator for EDC (85152)

The accelerator pedal position sensor is of potentiometric type, with built in N.O. minimum switch.

It supplies to the ECU a value proportional to the activation angle of the pedal itself, so as to determine fuel feed.

It is connected to the control unit via pins 73B - 81B - 83B - 55B - 58B.

The resistance of the potentiometer is ca 1 K  $\Omega$  . The power supply voltage is 5 V.

## Exhaust brake solenoid valve

This is a N.C. on-off solenoid valve.

It is positioned on the left hand side of the frame. By controlling this solenoid valve, the ECU opens the passage for the air coming from the aux. unit tank to control the exhaust brake cylinder which, in its turn, closes the throttle valve in the exhaust manifold.

It is connected to the control unit via pins 4B - IIB.

## Testing methods

Two warning lights (yellow or red) will be displayed according to the gravity of the failure. HIGHLINE model clusters will show a "DIAGNOSTIC" screen, in the middle part of the display, which will indicate failure codes.

## MODUS - IWT - IT 2000

These diagnostic instruments allow you to make a full diagnosis of the various systems available on IVECO range vehicles.





# ABS (6 - 10 ton)

Component location on a vehicle (Electric system)



# ABS (6 - 10 ton)

Component location on a vehicle (Pneumatic system)



I. Phonic wheel - 2. Check valve - 3. Hydropneumatic converter - 4. Pressure control takeoff - 5. Hydropneumatic converter - 6. Exhaust brake solenoid valve - 7. A.P.U. - 8. Phonic wheel - 9. Wheel revs sensor - 10. Spring-operated cylinder - 11. Power valve - 12. Triple-control servodistributor - 13. Coupling head - 14. Emergency braking tank + trailer - 15. Hydraulic pressure control takeoff - 16. Wheel revs sensor - 17. Phonic wheel - 18. Rear disc brake assembly - 19. Quick-release valve - 20. Pressure reducer - 21. Electropneumatic valve - 22. Air tank - 23. Pressure control takeoff - 24. Pressure reducer - 25. Front disc brake assembly - 26. Wheel revs sensor - 31. ABS electronic control unit - 32. Single-cylinder compressor - 33. Emergency brake distributor - 34. Trailer deceleration control distributor (option) - 35. Wheel revs sensor.

# ABS (12 - 18 ton)

Component location on a vehicle (Electric system)



# ABS (12 - 18 ton)

Component location on a vehicle (Pneumatic system)



78952

Phonic wheel - 2. Check valve - 3. Exhaust brake solenoid valve - 4. A.P.U. - 5. Relay valve - 6. Phonic wheel Engine revs sensor - 8. Combined brake cylinder - 9. Triple-control servodistributor - 10. Coupling heads - 11. Emergency braking tank + trailer - 12. Hydraulic pressure control takeoff - 13. Wheel revs sensor - 14. Phonic wheel - 15. Rear disc brake assembly - 16. Quick-release valve - 17. Pressure reducer - 18. Electropneumatic valve - 19. Air tank - 20. Pressure control takeoff - 21. Pressure relief valve - 22. Front disc brake assembly - 23. Membrane brake cylinder - 24. Wheel revs sensor - 25. Phonic wheel - 26. Exhaust brake cylinder - 27. Exhaust brake control button - 28. Duplex distributor - 29. ABS electronic control unit - 30. Single-cylinder compressor - 31. Emergency brake distributor - 32. Trailer deceleration control distributor (option) - 33. Wheel revs sensor.

ectronic con	trol unit (E	<b>Bosch)</b>  6   4	7    3
Figure 39			
ſ			
11	╔╩━╸	╸╸╸╸╜┋┋╩	₩⋛⋛ ৺─ ৺ ⋛⋛ ৺─── ৺ ⋛⋛ ╹ ╹፟፟ []
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	3 1	18 3 11	<b>6 3 HT 9 3 HV 15</b>
	<b>J I</b>		
Connector	PIN	Cable colour	Description
	1	-	CAN "L" line
	2	-	- CANI "H" line
	4	-	
	5	6684	Signal from front br. converter cylinder limit switches(only vehicles 60-10
	6	-	-
	7	8847	Positive (+15)
	8	7710	
Ι	9	-	-
	10	0050	Ground
	11	-	-
	12	2299	Ground To tester connector (pin 4) line K
	13	1199	To tester connector (pin 3) Line L
	15	-	-
	16	-	-
	17	-	-
	18	6670	ABS failure warning light control
	I	9921	Positive for left axle ABS solenoid valves
	2	9919	Positive for left axle ABS solenoid valves
11	3	0000	Positive for left axle ABS solenoid valves
	4 5	5570	Positive for ABS left sensor
	6	-	
	1	-	-
	2	-	-
	3	-	-
	4	5571	Negative for ABS right sensor
III	5	5571	Positive for ABS right sensor
	6	-	
	/	8166	Positive for right axle ABS solenoid valves
	9	0000	Negative for right axle ABS solenoid valves
		9930	Positive for right rear axle (Model 260) solenoid valve
	2	9931	(Positive for right rear axle Model 260 solenoid valve)
	3	0000	Negative for rear axle ABS (left Mod. 260) solenoid valve
	4	-	-
	5	5572	Positive for ABS left sensor
	6	5572	Negative for ABS left sensor
13.7	/	-	- Desitive for ADS wight our
IV	ð Q	55/3	Positive for ABS right sensor
	7	9971	(Positive for rear axle ABS right Mod 260 solenoid value)
		9924	Positive for rear axle ABS (right Mod. 260) solehold valve
	12	0000	(Negative for rear axle ABS right Mod. 260 solenoid valve)
	13	-	-
	14	-	-
	15	-	-



#### Brake switch

This is a microswitch mounted directly on the duplex distributor (SWITCH).

The N.C. contact provides the control unit (pin B76) with a positive signal (with the pedal released) and is used to detect service brake actuation so as to deactivate the Cruise Control function and cut off fuel delivery.

The N.A. contact provides the BODY CONTROLLER control unit (pin A34) with a positive signal, so that the control unit itself can control stop light actuation.

## **Electric connections**

Ref.	Cable colour	Description
I	-	Power supply positive signal
2	1176	Positive signal to turn on the stop lights (Body Controller, pin EI I)
3	7151	Power supply positive signal
4	8158	Positive signal with brake released for EDC control unit (pin B76)

## Sound wheel and speed sensor 88001

Sensors continuously supply the electronic center with all the data it requires to properly pilot the electro valves.

Signals are obtained from magnetic flow lines that close through the teeth of a teethed wheel facing the sensor and rotating together with the wheel.

Passage from full to empty due to the presence or absence of the tooth causes sufficient magnetic flow variation to create induced electromagnetic force at sensor terminals and thus an alternating electrical signal that is sent to the electronic center.

The clearance between the sensor and wheel, called air gap, must obviously be at a pre-set value of  $0.8 \div 1.6$  mm for proper signals to be sent. Resistance of each sensor at connection terminals is between 1 and 2 kW.

The toothed wheel is called sound wheel because the signal it generates has the same frequency as a sound wave.

The frequency of this signal serves to define wheel rotation speed.

Frequency variations, or the speed at which signals follow one another, define acceleration and deceleration rates.





000841t





Diagnostics Warning lights operation

## Figure 42



79486

## ABS system anomalies signalling

By inserting the key-switch, the electronic unit will carry out a system test by lighting the signalling lights placed on the dashboard for ~2 seconds. If no failures are detected, the lights will be turned off. Otherwise, depending on the anomaly severity, the following warning lights will remain on:

## Red ABS light (1)

This warning light signals the presence of anomalies in the trailer ABS system (for towed vehicles).

This warning light signals the presence of a serious anomaly in the system, which impairs the braking system operation. In this case, contact your IVECO Dealership immediately, since braking will, under such conditions, occur in the normal mode.

# Trailer ABS red warning light (2)

It signals the presence of anomalies in the ABS system on the trailer (for vehicles suitable for towing).

# Braking gasket wear signalling (HIGHLINE models)

Braking gasket wear is signalled by means of the display available on the CLUSTER, and the degree of wear is shown as a percentage value (%).

Failure codes are not currently shown in the display.





# ECAS (not present on 4x4 version)

## General

The air suspension features great flexibility, vibration damping capacity and above all, thanks to the system's self-adjusting functions, it maintains the "frame-road surface" distance constant, regardless of vehicle load. By means of a special button, the air suspension makes it possible, among other things, to vary the "frame-road surface" distance and hence the height of the vehicle's loading floor.

In addition to the well known advantages of air suspension, the ECAS suspension offers:

an appreciable reduction in air consumption;

prompt action of the different adjustment processes;

simple system construction;

full safety;

the possibility of total system diagnosis.

The ECAS (Electronically Controlled Air Suspension) system automatically controls the nominal level of the vehicle's air suspension, with the possibility, for the vehicles that adopt it, of lifting the rear added axle, when required by the vehicle's operating conditions, and transferring the load onto the drive axle at take-off, if adherence conditions are poor (aid at take-off).

However, all the foregoing operations can take place only in specific operating conditions under the surveillance of the safety devices equipping the systems connected to the units involved.

The ECAS automatically controls the height of the frame (the distance between the frame and the road surface) based on the actual values sent in by the sensors, by comparing these actual values with the nominal ones stores in its memory.

If the actual level changes or departs from the nominal value or the value set previously by the driver, the control unit corrects it by means of the electropneumatic devices.

The system is equipped with a remote control for frame lifting/lowering and levelling operations, which can be operated with the vehicle standing or moving.

In addition to the lifting, lowering and self-levelling operations, the remote control makes it possible to save other frame levels, which can be recalled as necessary.



The correction is applied with a time lag, as follows:

- $\sim$ I sec. if the vehicle is standing
- $\sim$  60 sec. if the vehicle is moving

If the level is not reset within a max. time interval of 30 sec. of the start of the correction, the control unit will memorise a plausibility error.

At the braking stage, upon receiving a signal from the stop light switch, the electronic control unit stops all automatic level adjustment operations. Though it has a Blink Code, displayed through the red warning light, for a preliminary diagnosis, the control unit has a highly advance self-testing system that can recognise and memorise, as a function of environmental conditions, any failure, including those of intermittent types, which may occur during system operation, so as to ensure effective and reliable repair interventions. All tests and failure memory programming/deletion interventions, etc. can be performed by means of the computerised testing station "MODUS". All system components, save for the steering system, are connected to the electronic control unit via a comb type connector. The number of the pins, and hence the type of ECU, vary depending on the version.

Location of the components on the vehicle  $(6 \div 10 t)$ 



I. Controlled-pressure valve - 2. Front axle level sensor - 3. Front air-operated spring - 4. Front axle electropneumatic distributor - 5. Rear air-operated spring - 6. Check valve - 7. Rear axle electropneumatic distributor - 8. Tank
- 9. Pressure control takeoff - 10. Rear axle level sensor.



Controlled-pressure valve - 2. Front axle level sensor - 3. Front air-operated spring - 4. Front axle electropneumatic distributor - 5. Rear air-operated spring - 6. Check valve - 7. Rear axle electropneumatic distributor - 8. Tank - 9. Pressure control takeoff - 10. Rear axle level sensor.

# ECAS center for 4x2 P tractore rear compressed air suspension system





001717t

# Connector XI

Pin	Cable	Function
I	GN/VE	CAN ''L'' line
2		
3	WS/BI	CAN "H" line
4		
5	8445	Positive from manual leveling push button (Optional)
6		
7	7440	Positive for power supply direct from the battery
8	6402	Communication line with remote control (pin 3)
9	2294	Line K for diagnosis connector (pin 4)
10	8810	Positive for key-controlled power supply
11	6403	Communication line with remote control (pin 4)
12	0000	Earth
13	8810	Positive for remote control power supply (pin 1)
14		
15	0402	Negative for remote control (pin 2)
16		
17		
18		

## Connector X2

Pin	Cable	Function	
I			
2			
3			
4	9400	Negative for front axle (pin 2) and rear axle (pin 4) solenoid valve (front / rear distributor)	
5	5422	Positive for left rear axle level sensor (pin 1)	
6			
7	0400	Negative for rear axle level sensors (pin 2)	
8	5421	Positive for right rear axle level sensor (pin 1)	
9	5410	Positive for front axle level sensor (pin 1)	
10	9425	Negative for rear left chassis control solenoid valve (pin 3) (rear distributor)	
11	9423	Negative for power supply solenoid valve (pin 1) (rear distributor)	
12			
13	9424	Negative for rear right chassis control solenoid valve (pin 2) (rear distributor)	
14			
15		Negative for front chassis control solenoid valve (pin 1) (front distributor)	

# Level sensor

Pulse 5 to 15V
Inductive
Max 100mA
Max 100°

The level sensor is made up of a coil fastened to the frame and a small piston.

By means of a cam and a lever connected to the axle, with each variation in height the piston is moved inside the coil and changes the inductance.

The electronic control unit uses these variations to intervene during the different working stages of the system. The connecting lever of the sensor **has a fixed, non adjustable measure.** 



## Axle electropneumatic distributor (78242)

This unit consists of a control solenoid valve and two pneumatic distributors for the management of both sides of the axle.

To prevent pressure transfers between the air springs and hence to stabilise the axle on, the internal connection between the outlets is fitted with a calibrated hole.

The electropneumatic distributor is connected to the system via a 3-pin connector.

- Positive for solenoid valve power supply "A" Pin I
- Pin 2 Negative \_
- Pin 3

Figure 52



## Rear axle electropneumatic distributor (78243)

This unit consists of three solenoid valves, "A", "B" and "C", and as many pneumatic distributors.

Solenoid valve "A" is responsible for the management of the supply/discharge distributor.

Solenoid valve "B" manages the right hand side frame levelling distributor.

Solenoid valve "C" manages the left hand side frame levelling distributor.

The electropneumatic distributor is connected to the system via a 4-pin connector.

- Pin I Solenoid valve "A" power supply positive
- Pin 2 Solenoid valve "B" power supply positive
- Pin 3 Solenoid valve "C" power supply positive
- Pin 4 Common negative

#### Figure 53





The traditional controls in the cab have been replaced by a remote control unit which is located on the left.

This device is used to manage the different frame levelling functions.

Its pull-out construction makes it possible to make all the selections both from inside the cab and from the ground.

It consists of a series of selection buttons and two tell-tales:

A) Green light for the selection of the front axle \*

B) Green light for the selection of the rear axle

- I) Front axle selection\*
- 2) Rear axle selection
- 3) Level "I" memory
- 4) Level "2" memory
- 5) Frame levelling
- 6) Frame lifting
- 7) Frame lowering
- 8) STOP

The remote control is connected t the system via a 4-pin connector

- Pin I Power supply positive
- Pin 2 Negative
- Pin 3 Control unit communication line
- Pin 4 Control unit communication line

For the use of the remote control see the "Operation" section.

\* For full air vehicles only.







# Diagnosis

If an anomaly is found, the CLUSTER display will show an error message which can be yellow (minor anomaly) or red (serious anomaly).

If yellow symbol 2 (minor anomaly) appears, it will be shown on the left side of the display. If red symbol 3 (serious anomaly) appears, it will be shown on the right side of the display.

The engine must not be stopped if warning light I comes on.

If warning light 3 comes on when the vehicle is running, stop the vehicle and turn the ignition key to "STOP". Turn the key to "MAR" again after approximately 7 seconds: if warning light 3 does not go out after approximately 2 seconds, contact your Dealership immediately.





# Engine Brake

## Simplified system operation

The "engine brake" system is controlled by the EDC control unit.

There are three engine brake control modes which can be selected using the special switch on the centre dashboard, to be used in the different types of situations/routes.

With the selector in the rest position, the button on the cab floor is always operational, (for intermittent use on hills and on snow or ice).

With the selector in position 1 the engine brake is combined with the accelerator pedal, coming into action when the pedal is released (to be used on long downhill roads with steady gradient).

With the selector in position 2 the engine brake is combined with the service brake, functioning starting from the first section of pedal stroke and maintaining the position (essentially to be used to reduce service brake wear for routes where much use of it is needed).

Every time the engine brake is engaged a warning lamp on the cluster turns on.

Engagement of the engine brake in combination with the accelerator pedal disables all the adjustment operations connected with the Cruise Control.



The lighting of the respective warning light (located on the CLUSTER) occurs through the "CAN" line.



switch - 8. Accelerator pedal with position sensor - 9. Engine brake selector

## Immobilizer

## Description and operation

For better protection against theft, the vehicles have been equipped with an engine blocking system called "Immobilizer" which is automatically activated when the ignition key is removed. The key, in fact, contains an electronic device, known as "Transponder", which transmits a coded signal to a special control unit "ICU" that enables the engine to be started only if it recognises the code.

## General characteristics

## System composition

The main components of the system can be summarised as follows:

Immobilizer control unit (ICU)

Anti-theft device + No. 2 keys with electronic Transponder (non separable)

Aerial (on ignition switch)

EDC type fuel flow actuator (ACT)

Code\_card (specific card with PIN electronic code and mechanical code)

## Installation

For its correct operation, the system requires an installation process consisting of the following stages:

Key training

Actuator training

At the end of the process, the Immobiliser control unit is able to detect tampering attempts by recognising the components connected to it in a univocal manner (non separable)

# Operating principle

With the key set on "ON", the Transponder contained in the key generates a code which is received by the Immobiliser control unit through the aerial.

The control unit transmits to the actuator a request for a validation process by communicating the code received. The actuator deciphers the code and compares it with the data saved during the installation process.

If the comparison is successful the actuator transmits to the control unit a request to enable fuel flow.

The control unit processes the request and, if everything is correct, sends out the fuel release command to the actuator. The vehicle can be started.







#### Electronic keys (No. 2)

Figure 64



The handle of the key contains an electronic device called a **"Transponder"** that is **NOT** powered by any battery, this device contains and transmits the secret code.

By inserting the key, the "**Transponder**" is activated and therefore energized by the radio waves emitted by the antenna (assembled on the lock of the key switch) and automatically replies by emitting the secret code. If the two codes match, the control unit enables the vehicle to be started, if they don't match it blocks the flow of fuel and therefore the vehicle cannot be started.

- Two keys are supplied.
- Each key contains a "Transponder" with the relative secret code.
- IT IS VERY IMPORTANT to follow the correct procedure for key learning.

The "Transponders" in the keys cannot be removed. There is no master key.

# <text>

The antenna is assembled coaxially to the key switch. Its function is to:

- Provide energy to the "Transponder" of the key to send the secret code

- Receive the signal from the ''Transponder'' and send it to the control unit The antenna is connected to the control unit at PINS A1 - A2
| Code Card |                 |
|-----------|-----------------|
| Figure 66 |                 |
|           | IVECO           |
|           | CODE            |
|           | ELECTRONIC CODE |
|           |                 |
|           |                 |

A card that shows two types of code:

- Electronic code
- Mechanical code

#### Electronic code

This code is essential to start the engine in an emergency situation (key is not recognized, or control unit is not functioning).

The code can be inserted by depressing the accelerator pedal.

### Mechanical code

This code is necessary in the event of a request for a duplicate key (mechanical part).

Keep the Code Card in a safe place within reach.

## Emergency procedure (starting)

If the vehicle will not start because the key is not recognised, the Immobiliser control unit is defective, etc., it is necessary to perform a **specific** starting procedure.

It is indispensable to enter the "Electronic code", given in the "Card Code", ONLY by working on the accelerator pedal as described below:

- I. Turn the key to ON
- 2. After about 2 seconds, the EDC telltale starts blinking fast.
- 3. Press the accelerator pedal and keep it pressed for about 5 to 12 seconds.
- 4. The EDC telltale begins blinking slowly, as soon as the accelerator pedal is released
- 5. When the number of blinks corresponds to the first digit of the "**Electronic code**", press the accelerator pedal all the way and then release it.
- (While the pedal is pressed, the EDC telltale stays off).
- 6. Continue the reading process and the relative pressure on the accelerator pedal for the other four digits of the **"Electronic code"**.
- 7. At the end of the sequence, if the code introduced is correct and there are no system faults, the EDC telltale stops blinking. The operation has been concluded correctly.
- 8. Start the vehicle.

To perform the emergency procedure in case the CAN line is affected by a SERIOUS FAULT, it will be necessary to refer to the lighting messages of LED (1) available in the U.C.I. in front of the passenger's seat. Under normal conditions, displaying will occur by means of the EDC warning light available on the Cluster display.

#### Figure 67



79370A

Figure 68

#### Key memorisation process





In the event that the key is lost or for its replacement, a specific procedure must be followed using **only the specific diagnostic devices**.

This procedure can only be carried out with the assistance of the Modus, IWT

The key memorization procedure can be carried out even if the EDC control unit is not connected.

- The keys have already undergone a learning procedure, and therefore belong to that ICU.
- It is possible to "teach" new and old keys.
- In each case the keys used (enabled on ignition) can never be more than three in number and can only be those used during the last learning process.
- A key that has been previously memorized but not inserted in the last learning process will not be able to start the vehicle.

The memorization procedure can only be carried out after having correctly inserted the **Electronic Code** shown on the Code Card supplied.

There are two different procedures, depending on the following situations:

- Replacement or addition of one or more keys.
- Installation of a new Immobilizer control unit.

For further clarifications on this matter see manual no. 603.43.613.

#### Problems during memorization of keys

In the event that the procedure fails, the indicator does not go out.

- 1) The same key has been inserted twice non-consecutively.
- 2) The key has not been turned to the stop position quickly enough.
- 3) More than three keys have been attempted to be memorized.
- 4) Learning process carried out with keys that are not part of the same KIT (only in installation procedure).
- 5) Learning procedure carried out with keys that have already been used in other ICU.
- 6) Problems with learning procedure not being carried out correctly.

# Diagnosis

A yellowDiagnosis warning light will appear in the left side of the display. If the "HIGHLINE" model Cluster is available, a "DIAGNOSIS" screen can be shown in the middle part of the display, which will indicate the failure codes

# IT 2000

New-generation diagnostic tools that is able to diagnose all IVECO electronic systems.

# MODUS

Higher level diagnosis performed by a computerised station which makes it possible to perform system testing by following the prompts that appear on the monitor.

Open system that lets you apply a veritable intervention strategy.

It supports data processing functions. Each operation performed leaves a trace in the station and makes it possible to program the electronic control units.

# IWT

Portable, new generation tool supplementing the MODUS station.

It is a powerful tool that can be used to perform a complete fault-finding procedure and take a wide range of measurements.

#### Figure 69



T 2000 IVECO

10000

**IT 2000** 





IVECO tools can perform the following testing functions:

Diagnostic procedure		Instruments		
	IWT	MODUS	IT	
Emergency starting	YES	YES	YES	
Key teaching		YES	NO	
Identification of control unit		YES	YES	
Recognition of failures	YES	YES	YES	
Description of repair procedures		YES	NO	
Pre-set commands for replacement of EDC/Immobilizer control units		YES	NO	

- IWT = IVECO wiring tester
- **MODUS** = Maintenance and diagnostic system
- IT = IVECO electronic tester
- **NO** = Function not available
- **YES** = Function available
- **YES** = Function available with superior characteristics (makes it possible to obtain information and make measurements, gives easy access to EDC/Immobiliser selection communications).

### System self-testing

After the initial test, the behaviour of the "code" light informs the operator about system faults, such as:

Light "always blinking" at a frequency of "0.3 sec. ON" and "3 sec OFF" reveals that an error is present or that the starting procedure in an emergency has not been performed correctly.

Light "always blinking" at a frequency of "0.3 sec. ON" and "3 sec OFF" reveals that no key training process has been performed.

Light "permanently lit" means that the key training procedure has not been performed correctly.

o As a preliminary step you can display the faults, if any, on the telltale module of the on-board panel by activating the Blink code.

For a more exhaustive diagnosis, however, it is indispensable to use the tools, such as MODUS, available to the service network.

<u>}</u>

If after accurate diagnosis it is necessary to replace one or more components, proceed as described below

ALL ENGINES			
PART TO BE REPLACED	PARTS TO BE ORDERED	OPERATIONS AND NOTES	
One or two keys	Parts Keys	$\Rightarrow$ Cut the keys according to the mechanical code.	
(with one still available)		$\Rightarrow$ Perform "Key memorising" in Immobilizer diagnostics (*).	
Addition of a key		otherwise the will NO LONGER be enabled for starting.	
Steering lock	KEYS KIT with:	$\Rightarrow$ Change the steering lock and ratchets.	
and/or ratchets	2 cut Parts keysSteering	$\Rightarrow$ Perform ''Key memorising'' in Immobilizer diagnostics (*).	
ALL the keys	lock + Ratchets	$\Rightarrow$ State the <b>new</b> mechanical code on the Code Card.	
Ratchets	• KIT with:	$\Rightarrow$ Change the ratchets.	
(excluding steering lock)	2 traditional keys + ratchets	NB. Traditional keys means keys without Transponder.	
Code card (due to loss)	Code Card	⇒ Complete the "Code Card Duplicate Request Form" printing it from MODUS and send it as mentioned in the ORDER MANAGEMENT form of the IVECO SPARES warehouse concerned.	
Aerial	Aerial	$\Rightarrow$ Replace.	
ECU Immobilizer	KIT ECU Including: Immobilizer ECU - 2 keys to be gut	⇒ Complete the "New Immobilizer Installation Form" printing it from MODUS and send it as mentioned in the ORDER MANAGEMENT form of the IVECO SPARES warehouse concerned.	
	New Code Card	$\Rightarrow$ Cut the keys according to the mechanical code.	
		$\Rightarrow$ Perform ''Key memorising'' in Immobilizer diagnostics (*).	
		<b>NB.</b> At the end of this operation, check that the electronic code shown on the screen corresponds to the one printed on the Code Card, if it is different, put the one on the screen on the Code Card.	
		$\Rightarrow$ In EDC diagnostics perform ''new key recognition''.	
		$\Rightarrow$ Put the old mechanical code on the new Code Card.	
		$\Rightarrow$ Scrap the old keys as it will be NO LONGER possible to use them.	
EDC control unit	EDC control unit	⇒ The system recognises the new actuator automatically the first time the ignition key is moved to Drive.	
		<b>NB.</b> To order the EDC Control Unit complete the specific form printing it from Modus and sending it to the Market Technical help Desk.	

(\*) With MODUS 2.0 (Windows), 1.6C (DOS) or IWT 1.4 release before performing "New key memorising", it is absolutely necessary to disconnect the EDC. Once the operation has been completed, clear the fault memory to prevent the error from staying memorised on the actuator.

#### AIR TOP 2000 auxiliary heater

#### Introduction

Driving a vehicle implies a remarkable physical and mental effort especially in the case of long journeys.

A comfortable environment is essential to safe driving and a prerequisite against possible and unexpected accidents.

For this purpose the vehicle can be equipped with special air-conditioning systems. This section deals with the AIR TOP 2000 auxiliary heater



Turn off the heater to avoid risks of explosions in proximity of fuel depots, filling stations, store-rooms where dusts or fumes could be set on fire (coal depots, wood dust or cereals store-rooms etc.).

- To avoid the risk of intoxication do not start the heater in a closed or poorly aerated environment even by means of a time preselector.



### **G**eneral description

The air-operated AIR TOP 2000 auxiliary heater, whose working principle is based on the evaporator, is thoroughly separated from that of vehicle's engine.

The heater consists essentially of the following components:

- comburent air fan
- heated air fan
- heat exchanger
- burner union and combustion pipe

The heater is controlled and monitored by means of the following units:

- electronic control unit
- flame test
- bulb
- heat Imiting device
- heat sensor

The vehicle's fuel tank supplies the heater with fuel through a metering pump.

The AIR TOP 2000 heater is started and set in operation by a control unit and a timer device. The latter can be of different types depending on the vehicle model on which it is assembled.

#### Specifications and data

Control voltage

Heat power output

Fuel consumption

Electric power output

Output temperature

Air delivery Weight

Figure 71

max regulation max regulation max regulation max regulation max 24V 2Kw 0.9 to 1.8Kw 0,240L/h 0.12 to 0.22L/h 22W 10 to 18W +40°C +10°C to +35°C 70m<sup>3</sup>/h 2,6Kg



AIR-OPERATED AIR TOP 2000 HEATER



15. Engine fuel system connecting unit - 16. Fuel pump - 17. Safety switch - 18. Motor - 19. Seal -20. Photoresistance

### Circuit connection system

- a. Heater air input port
- **b.** Hot air output port
- c. Comburent air input line
- d. Exhaust gas output line
- e. Fuel feed line

# Adjusting the CO<sub>2</sub> content

The auxiliary heater system meets all safety installation standards.

The comburent air is taken from the vehicle exterior.

The exhaust lines are designed to ensure complete discharge of all gases to the vehicle exterior.

All pipes distributing the hot air inside the cab are made of materials guaranteed to resist to very high temperatures (over 130°C).

The  $CO_2$  content in the exhaust gases is adjusted by means of a potentiometer installed in the electronic control unit or control board. The heater is precalibrated by the Manufacturer depending on the type of hot air and comburent air fan included in the system (refer to Figure 73).

Regulation of the heater unit is by means of the potentiometer (use a suitable screwdriver).

Turn the pointer to the right to increase the fan rpm and decrease the  $CO_2$  content. Turn the pointer to the left to reduce fan rpm and increase the  $CO_2$  content.

If the regulation field is found to be inadequate, for example if the heating and comburent air fan was replaced, proceed to a new preliminary regulation of the heater unit.

### Preliminary heater regulation

NOTE. The following procedure deletes all presetting regulation data set by the Manufacturer.

- I. Remove the top case.
- 2. Switch the heater on.
- 3. Within 5 seconds from switching the unit on, quickly turn the potentiometer twice around the regulation field.
- 4. Adjust to the desired amount of CO<sub>2</sub> content.
- 5. Switch the heater off.

Figure 73

6. Fit the top case and fasten it securely.



Adjusting the  $CO_2$  content from the control board.

# Operation

#### Beginning of the combustion phase

Once the desired temperature (ranging between 10° and 45°C) is preset, the heater can be switched on by means of the hand/automatic device. The pilot lamp illuminates and the bulb is activated via a pulse regulation system.

The heating and comburent air motor starts to turn at high speed for about 1 sec and then gradually reduces its speed to 30% of its potential.

If the temperature of the air entering the system is higher than the desired temperature only the heating and comburent air motor is activated.

On the contrary, if the temperature of the air entering the system is lower than the desired temperature the combustion process is set in operation.

After 20 seconds approximately the fuel metering pump is started by the electronic control unit or control board.

25 seconds later the fan speed is increased and kept steady for about 20 seconds, i.e. until the beginning of the combustion phase.

From the moment the flame is turned on (indicated by the flame sensor) the combustion process remains steady for the next 20 seconds, that is to say the fan speed is subjected to continuous increasing adjustments until it reaches its maximum figure (this phase lasts 20 seconds approximately).

Should the flame go out during this phase, the starting procedure is automatically repeated.

If combustion is irregular, after two minutes the fan increases its speed for about 30 seconds with the bulb activated and the fuel metering pump closed; the starting procedure is then repeated.

If a second attempt at starting the combustion process also proves unsuccessful, the heater is probably defective. It will go off on its own after 80 seconds approximately.

The heating and comburent air fan is brought to peak speed for about two minutes.

The overall combustion phase lasts for about three minutes.

The control device is fitted with a green led which illuminates and remains on (fixed light) throughout normal operation of the system. A flashing light by the same led indicates overheating.

# Cab heating

While the heater is in operation exhaust gases flow to the heat exchanger. The heat developed by the combustion process is passed on to the heat exchanger faces, absorbed by the air fed by the fan and then spread into the cab.

The temperature of the air entering the system is measured by a sensor fitted to the heater inlet side.

If the temperature of the outgoing air is lower than the preset value, the heater increases its heating power until it reaches the specified figure.

When the system is required to work for a long time without stopping, the delivery of the metering pump is reduced every 15 minutes for 20 seconds in order to increase its heating output to 1.1 Kw.

The pump delivery is instead reduced every 30 minutes for 4 seconds if the desired heating output is less than 1.1 Kw.

Once the preset temperature is attained, the system will reduce the speed of the heating and comburent air fan and the delivery of the fuel metering pump.

- If the temperature of the air entering the heater is higher than the figure selected beforehand, the system will function at idling speed for about 5 seconds and then switch off the metering pump and terminate the combustion process. The fan speed will remain steady for about 35 seconds after which it will increase (for at least 120 seconds) to 60% of its maximum power thus allowing the heater to cool down.
- If the temperature of the air entering the heater is lower than the figure selected beforehand, the fan will function at 30% of its maximum power.

The heater will remain on even in case a signal from the temperature sensor informs the control unit that the running temperature is lower than the preselected figure.

### Switching the system off

The led goes off as soon as the cutoff device is actuated.

If the combustion phase has not yet started (heater just switched on) or the system is running at idling speed (owing to a higher temperature of the intake air compared to the preselected value), the heater is immediately turned off.

On the other hand, if combustion is already under way switching off of the heater involves immediate cutoff of the combustion process. In this case the fan speed will remain steady for five seconds and then be reduced to 60% of its maximum power within 30 seconds. As soon as the control unit receives information from the temperature sensor that the flame has gone off, the fan will rev up for about one minute and then return to 60% of its power for two more minutes. The system will then be deactivated.



# Main system components

### Electronic control unit or control board

The electronic control unit is integrated into the heater. It is designed to ensure correct functioning of the system and keep the combustion process constantly under control.

The purpose of the heat sensor (inside the control unit) is to regulate the temperature while a potentiometer (also in the control unit) is meant to adjust the speed of the heating and comburent air fan.

The system thus ensures that the desired temperature is quickly reached inside the cab and then kept steady according to the preselected figure.

### Burner union and combustion pipe

The fuel flowing inside the burner union is distributed into the combustion pipe through the burner section.

Heating of the heat exchanger results from the combustion of the fuel and air mix inside the pipe.

### Heat exchanger

The heat developed by the combustion process inside the heat exchanger is sent to the heating and comburent air fan.

### Comburent and heating air fan

The comburent and heating air fan conveys the desired amount of air to be combusted into the burner union through the comburent air input port.

The heating air is delivered to the heater output port by means of a fan.



#### Flame test

The flame test is performed by a PTC type low value resistor which adjusts its resistance depending on flame and heating degree.

During the heating phase the condition of the flame is therefore kept constantly under control.

# **TEST VALUES**

Cold \_ 25°C resistance

2.6 to 3.4 ohm 5 mA min

Warm 800°C resistance test current

12 to 15 ohm 5 mA min

### Bulb

The bulb enables ignition of the air and fuel mix during the heater starting phase.

The bulb functions as an electric resistor. It is assembled into the burner union on the flame's opposite side.

### **TEST VALUES**

25°C resistance 1.3 to 1.44 ohm \_ 5 mA min test current



#### Heat limiting device

The purpose of this device is to protect the heater from excessive operating temperatures.

Overheating protection occurs at a temperature of  $150^{\circ}$ C.

Intervention of the heat limiting device stops the supply of electric power to the fuel metering electric pump and cuts off the heater which cools down and then closes electrically.

Should operation of the burner be required after a failure due to overheating, wait for the heat limiting device to cool down first; then delete the failure from the control unit's memory by turning the heater off and on again.

The limiting device is also activated in case of compressed air leaks (over I mBar) between the air intake side and the heating air line.

### Fuel metering pump

This pump is made up of fuel feed, metering and cutoff components.

Fuel supply to the heater is from the vehicle's fuel reservoir.

Assembly of the pump should be carried out according to specified installation standards.

The metering pump should be secured by means of a shock absorber suspension system.

When assembling the pump, follow strictly the fitting position shown in the figure to ensure that all air bubbles are thoroughly expelled.

The fuel pump is fixed on chassis longitudinal member.



Figu	re 83	
Ref.	Description	Cable colour
Ref.	Description           Air temperature adjustment thermostat supply           Supplementary heater supply	Cable colour 7736 7708
Ref. 1 2 3	Description           Air temperature adjustment thermostat supply           Supplementary heater supply           Timer supply	Cable colour 7736 7708 7725
Ref. 1 2 3 4	Description           Air temperature adjustment thermostat supply           Supplementary heater supply           Timer supply           Supplementary pump supply           Supplementary pump supply	Cable colour 7736 7708 7725 7783
Ref. 1 2 3 4 5	Description Air temperature adjustment thermostat supply Supplementary heater supply Timer supply Supplementary pump supply Supplementary pump supply Supplementary heater blower engine supply	Cable colour 7736 7708 7725 7783 7722 7783
Ref. 1 2 3 4 5 6 7	Description           Air temperature adjustment thermostat supply           Supplementary heater supply           Supplementary pump supply	Cable colour 7736 7708 7725 7783 7722 7783 7722
Ref. 1 2 3 4 5 6 7	Description Air temperature adjustment thermostat supply Supplementary heater supply Timer supply Supplementary pump supply Supplementary pump supply Supplementary heater blower engine supply Supplementary heater tuming-on spark plug supply Supplementary heater tuming-on spark plug supply	Cable colour 7736 7708 7725 7783 7722 7783 7705 0022
Ref. 1 2 3 4 5 6 7 8 8	Description Air temperature adjustment thermostat supply Supplementary heater supply Timer supply Supplementary pump supply Supplementary pump supply Supplementary pump supply Supplementary pump supply Supplementary heater tuming-on spark plug supply Supplementary heater ground	Cable colour 7736 7708 7725 7783 7722 7783 7705 0022
Ref. 1 2 3 4 5 6 7 8 9	Description Air temperature adjustment thermostat supply Supplementary heater supply Timer supply Supplementary pump supply Supplementary pump supply Supplementary pump supply Supplementary pump supply Supplementary heater turning-on spark plug supply Supplementary heater ground -	Cable colour 7736 7708 7725 7783 7722 7783 7705 0022
Ref. I 2 3 4 5 6 7 8 9 10	Description           Air temperature adjustment thermostat supply           Supplementary heater supply           Supplementary heater supply           Supplementary pump supply           Supplementary heater turning-on spark plug supply           Supplementary heater ground           -           Diagnostic K Line	Cable colour 7736 7708 7725 7783 7722 7783 7705 0022 - - - 2295

# Fault diagnosis

Fault symptoms	-	general
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Fault	Possible cause	Remedy
The heater goes off	No combustion after starting or	Turn the heater off briefly and then
	after starting procedure is repeated	turn it on again
	The flame goes off during heater	Turn the heater off briefly and then
	operation	turn it on again
	Heater overheating and pilot lamp blinking	Ensure the heating air is free to flow inside the pipe
		Turn the heater off briefly and then turn it on again
	Feed voltage low	Charge batteries.
		Turn the heater off briefly and then
		turn it on again
The heater emits black smoke	Comburent and/or exhaust air	Ensure comburent/exhaust air is
	pipes restricted	free to flow inside the pipe

# Fault symptoms - heater running

Fault	Fault occurs after	Remedy	
The heater does not start, all leds off on control board	immediately	Faulty wiring, fuse cut off	
The heater does not start, led on	immediately	Faulty fan/control unit, fan locked	
Speed extremely low, no starting	immediately	Faulty command or defective installation of control instrument	
The fan motor starts briefly but the fan does not turn	l second	Bulb short circuit or cut off, flame test cut off or control unit faulty	
Motor off, no washing	5 seconds	Fan motor locked	
Washing occurs after	l second	Faulty flame	
Washing occurs after	20 seconds	Electronic control unit voltage low	
Washing occurs after 2 mins; no pulses from metering pump	120 seconds	Pump wiring faulty or pump failure	
Washing occurs after	40 to 120 sec.	Metering pump or overheating protection device cut off	
Washing occurs after	230 seconds	Incorrect fuel quantity, fan slow/faulty, burner scaled, comburent and exhaust air lines restricted, heat exchanger scaled, fuel metering pump locked	
Washing performed	while heater is running	Faulty component: flame test, bulb, sensor, overheating, metering pump.	
Motor off, no washing	while heater is running	Fan motor either faulty or locked	
Metering pump cycle discontinued; 30 seconds max speed after starting procedure is repeated	while heater is running	Flame goes off owing either to gas bubbles in combustion lines or upwind at the exhaust gas output port	

#### **Repair operations**

Repair and maintenance operations should be carried out only by skilled personnel.



Isolate system batteries before carrying out any repair operation on the auxiliary heater.

Especially before the cold season operate the heater at regular intervals for at least ten minutes approximately every four weeks to prevent mechanical parts from locking with time. Overhaul the entire system before the winter season.

Carry out the following operations to obtain maximum performance from your heater:

- Ensure the heating air input and output ports are not restricted by dirt or foreign bodies; this could result in heater overheating and consequent release of the heat limiting device.
- Clean the auxiliary heater from the outside.
- Check efficiency of electrical connections.
- Check the condition of exhaust gas and comburent air lines. Ensure they are not damaged or restricted.
- Check fuel line for tightness and filter efficiency. Replace the latter, if necessary.

#### Error code display

The following error codes are shown on the digital timer display in the event of a system failure.

Error code	Description
F 01	No starting (after performing the starting procedure twice)
F 02	Flame cutoff
F 03	Low voltage or overvoltage
F 04	Immediate flame recognition failure
F 05	Flame test cutoff or short-circuit
F 06	Temperature sensor cutoff or short-circuit
F 07	Fuel metering pump cutoff or short-circuit
F 08	Fan motor cutoff or short-circuit or defective fan motor running speed
F 09	Bulb cutoff or short-circuit
F 10	Overheating

#### Testing connector (72021)

The U.C.I. compartment contains a 30 pin testing connector for the electronic system tester.

# **Circuit cards**

		Page
Card I:	Positive direct to the batteries	3
Card 2:	Positive after main current switch	4
Card 3:	Positive after main current switch	5
Card 4:	Service power supply (15/1)	6
Card 5:	Service power supply (+15/1)	7
Card 6:	Service power supply (+15/2)	8
Card 7:	Body Controller	9
Card 8:	Body Controller	10
Card 9:	Body Controller	
Card 10:	EDC (Connector B)	12
Card 11:	EDC (Connector B)	13
Card 12:	EDC (Connector A)	14
Card 13:	Instrument Cluster / Tachograph	15
Card 14:	Immobilizer	16
Card 15:	ABS (4X2)	17
Card 16:	ABS (6X2)	18
Card 17:	ECAS 4X2 Pneumatic	19
Card 18:	ECAS 4X2 Full Pneumatic	20
Card 19:	Auxiliary heater AIRTOP2000	21
Card 20:	Manual-control air-conditioning	22
Card 21:	CAN lines	23
Card 22:	Cigar lighter/Horns/Electric heater	24
Card 23:	Rotating lamps/Bed lights/ Emergency light/Headlamp washer	25
Card 24:	Electric window regulator/Sunroof (with and without the Bed Module)	26
Card 25:	Heated windscreen/Heated prefilter/ Brake air drier/Pneumatic, heated seats .	27

		Page
Card 26:	Central locking/Adjustable, heated rearview mirrors	28
Card 27:	Main current remote-control switch (TGC)/Compliance to rules ADR (TMP)	29
Card 28:	Main current remote-control switch (TGC)/Compliance to rules ADR (TMP)	30
Card 29:	Cab tipping/Overall power takeoff	31
Card 30:	Fridge/Voltage reducer/Car radio	32



























# Card 13: Instrument Cluster / Tachograph



Base - February 2003




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## Card 25: Heated windscreen/Heated prefilter/Brake air drier/Pneumatic, heated seats



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