



GLOBAL CRANE TRAINING



AC200-1 OPERATION

Machine Engines

Machine Engines Content



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Carrier Engine

Damage prevention measures

The following safety measures must be observed to prevent injury to persons and damage to the engine, components or cables.

- Only start the engine when the batteries are properly connected. Do not disconnect the batteries when the engine is running.
- Only start the engine when the speed sensor is connected.
- Never use a boost charger to start the engine. Jump starting only with separate batteries.
- For rapid charging of the batteries, the battery terminals must be disconnected. Follow the operating instructions for the boost charger.
- The batteries must be disconnected when electric welding work is carried out, and the "+" and "-" cables are connected to one another.
- The lines of the control units may only be disconnected and connected when the electrical system is switched off.
- Switching the poles of the supply voltage for the control units (e.g. by connecting the poles of the batteries incorrectly) can lead to the destruction of the control units.
- Tighten the plug connections on the injection system to the prescribed torque.
- For temperatures of higher than + 80° C (176° F) (foundry furnace) the control units must be removed.

- Use only suitable test cables for taking measurements on plug connections (Mercedes Benz connector set).
- Telephones and radio equipment which are not connected to an external antenna can cause malfunctions to the vehicle electronics and endanger the operating safety of the engine.

Before commissioning, make sure that you have read the operating instructions of the engine manufacturer. These are enclosed in part 5 of this documentation.

The following points are primarily limited to information which specifically affects the crane.



Before Starting the Engine

1. Follow the instructions in the operating manual of the engine manufacturer.

2. Checking Before Starting Up:

- Fuel supply
- Hydraulic oil level

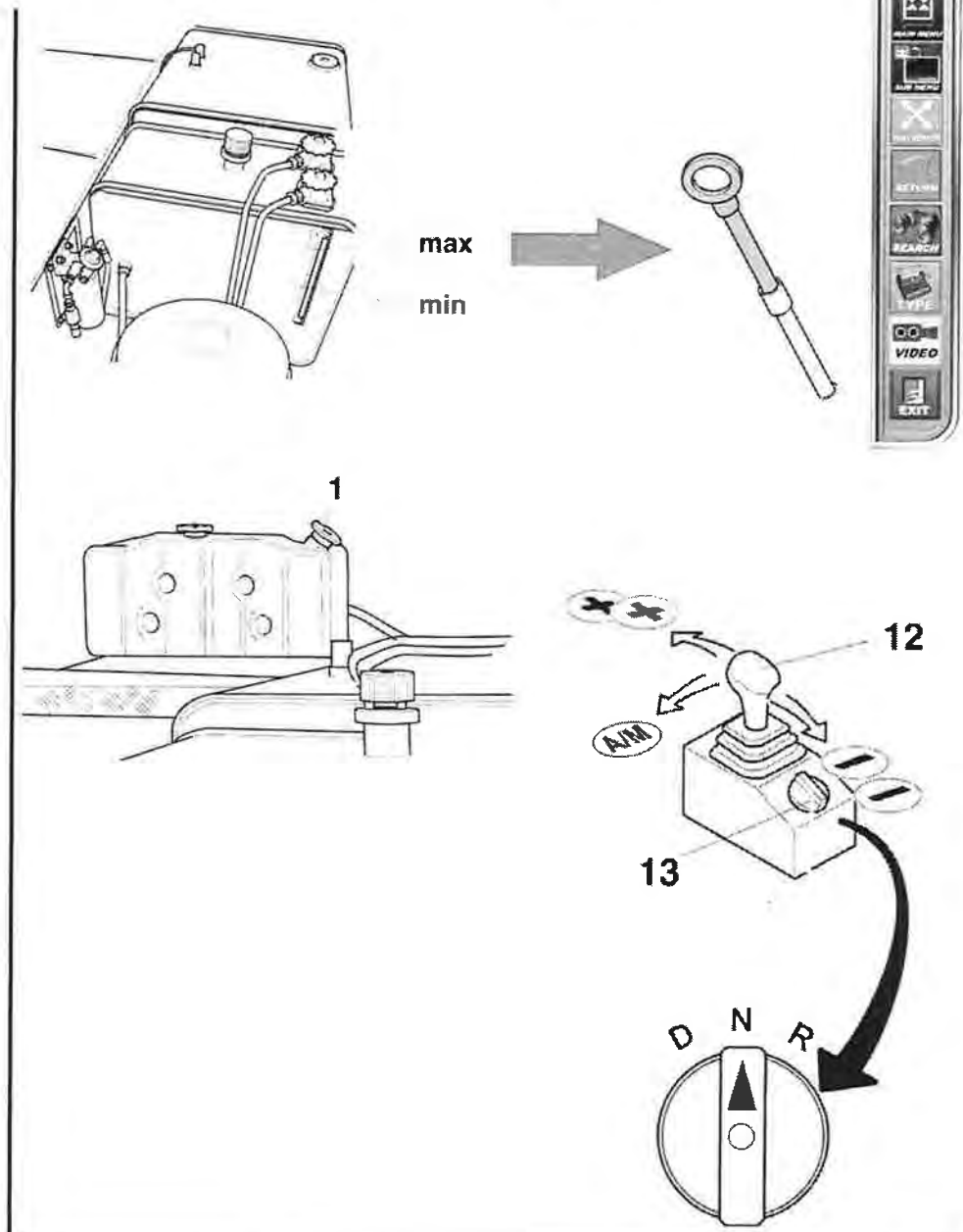
To avoid damage to the travelling hydraulic pumps, the engine may no longer be started – with normal hydraulic oil filling (ATF

- Type A Suffix A) – at temperatures under -25C (-13F).

- Engine oil level
- Coolant level :

The cooling system is filled correctly if the coolant level reaches the marked line in the filler neck.

- Parking brake (14) closed
- Rotary switch (13) to “N”
- Quick stop device (optional); must not be actuated.



Starting aid with external batteries

If the batteries are “weak”, the chassis engine can be started with the aid of batteries from the superstructure engine and vice versa.

In contrast to the specifications given in the separate engine operating instructions (part 5), no foreign starting aid cables are used to jump the batteries.

Depending on the crane version, two cable couplings (with one plug and one socket each) are optionally located on the right-hand side of the chassis.

On the 5-axle basic unit, the cable couplings are located in the right-hand storage box underneath the outrigger controls.

On the 6-axle basic unit (not shown here), the cable couplings are located behind a panel above the outrigger controls.

On the superstructure, similar connections are optionally located on the front of the engine cowling. At the same time, “Minus” (ground) is always installed on the plugs (1A / 1B) and “Plus” is always installed on the sockets (2A / 2B).

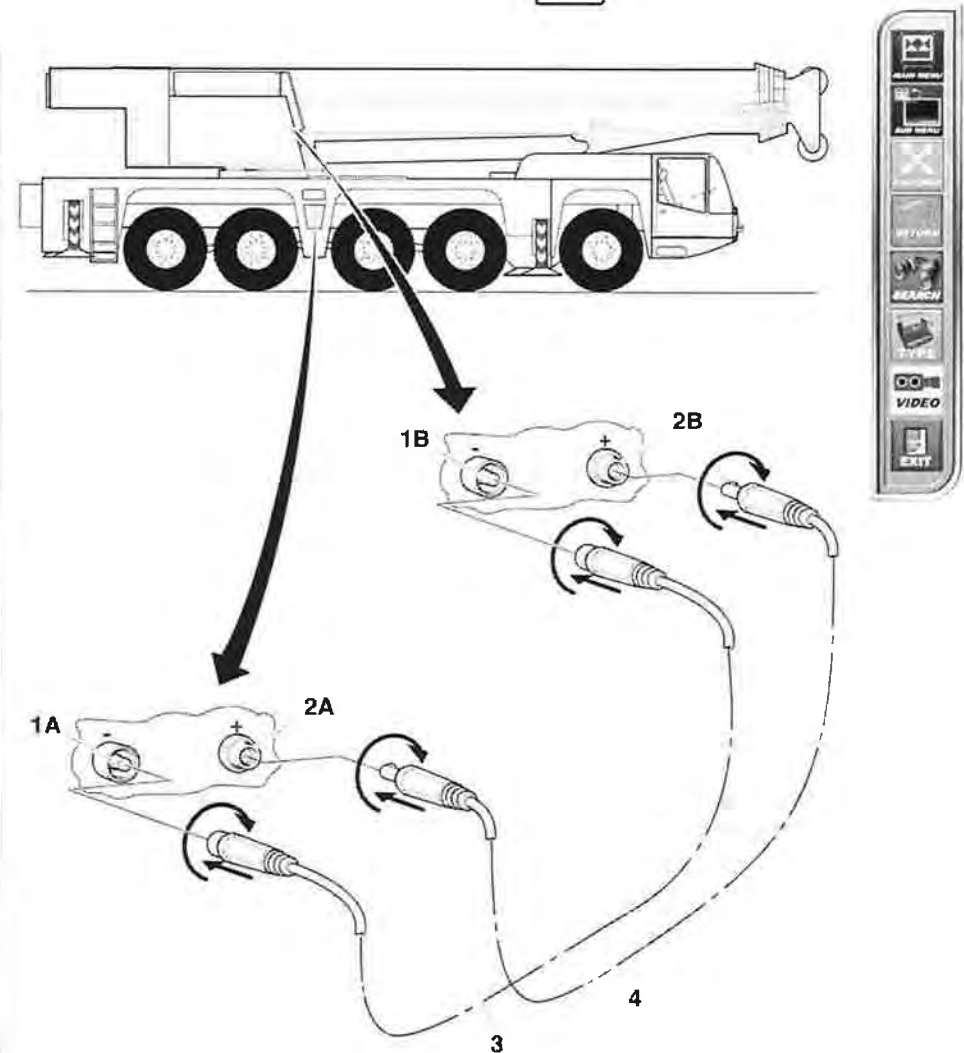
Here, both supplied starting aid special cables (3, 4) (cable cross section 95 mm²/ 0.15 in²) can be connected; the different shapes of the connecting pieces ensures that the poles cannot be confused.

Other crane vehicles that are equipped with these connections from our product program can also be used as a starting aid.

We do not recommend other forms of starting aid.

Risk of injury / explosion!

- **When using the starting aid, do not bend over the batteries.**
 - **Do not smoke in the vicinity of the batteries;**
 - Avoid sparks or unshielded flames.**
 - **A discharged battery can freeze at -10C (14F).**
- It must be thawed before using the starting aid.**



- To not use a starting aid with defective batteries.
- Be sure that the voltage (24 V) is the same for the flat and the booster battery.
- Only use a starting aid with original starting aid cable.
- In no case should you use a boost charger. (Damage to electronic parts)
- Before using the starting aid, separate mobile communication systems from the electrical system.
- Be sure that plugs / sockets do not come into contact with the metal parts of the device (risk of short circuit).

Action steps for the starting aid with cable couplings / special cable:

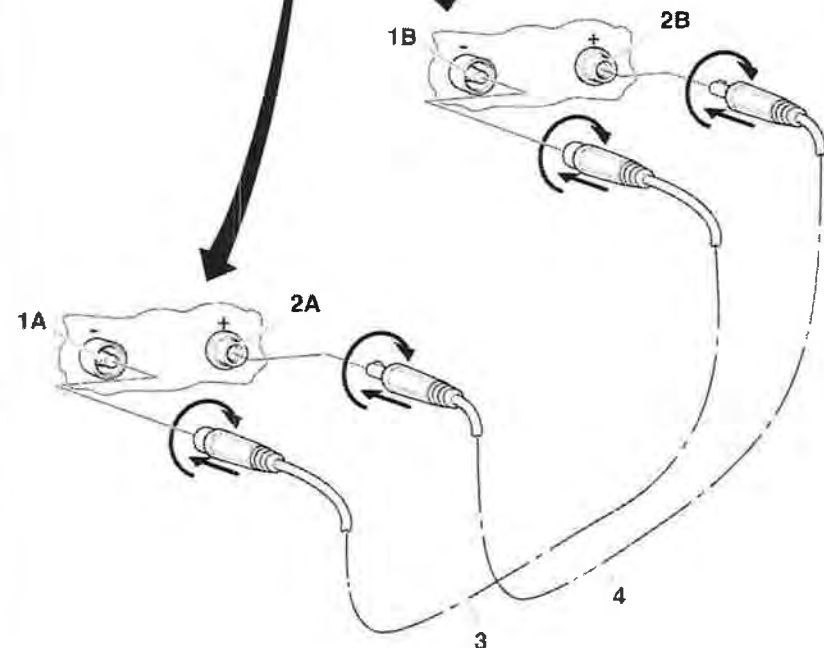
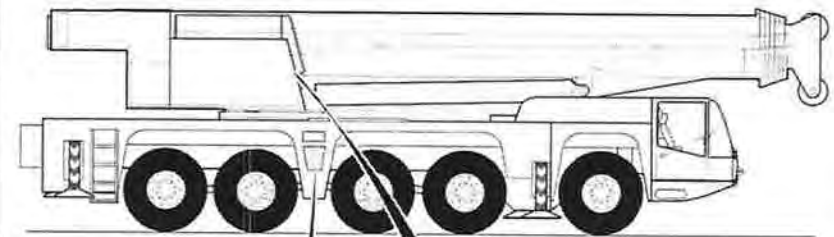
1. Switch off ignition in the superstructure and chassis.
2. Connect the starting aid special cable to the cable couplings.

(connect and tighten with a short turn to the right.)

First connect the minus pole (cable 3) and then the plus pole (cable 4).

Electrical components could be damaged if the connecting sequence is reversed.

3. Start the current supply engine; let the engine run at high speed.
4. Current consumption engine:
Turn the key in the ignition starter switch to starting position.
Start the engine and let it run at idle speed.
5. Remove the cable, first from the "plus" (cable 4) and then from the "minus" (cable 3).



Ignition-starter switch

Starting procedure (engine start)

Never start the engine without the batteries connected properly.

The engine can either be started in the driver's cab or on the outrigger controls (external start).

Start the engine in the driver's cab

1. Insert the key in the latch contact (15) and turn (to the right) into the driving position (position "3").

When the ignition has started, the electrical system carries out a self-test; the most important signal connections to the instrument panel are checked. At the same time, a control signal sounds twice and all indicator lights (31-40 and 50.1) flash.

The function control is ended after the control signals go out.

Some indicator lights that have been activated may light up; e.g. item 39 "Parking brake".

The "CH" display appears on the (transmission information) display (75).

The basic display "Indicator lights" appears on the driver information display (43). The selected functions or existing malfunctions are shown.

For more information, see Sect. 4 in "Driver information system".

2. Engine start

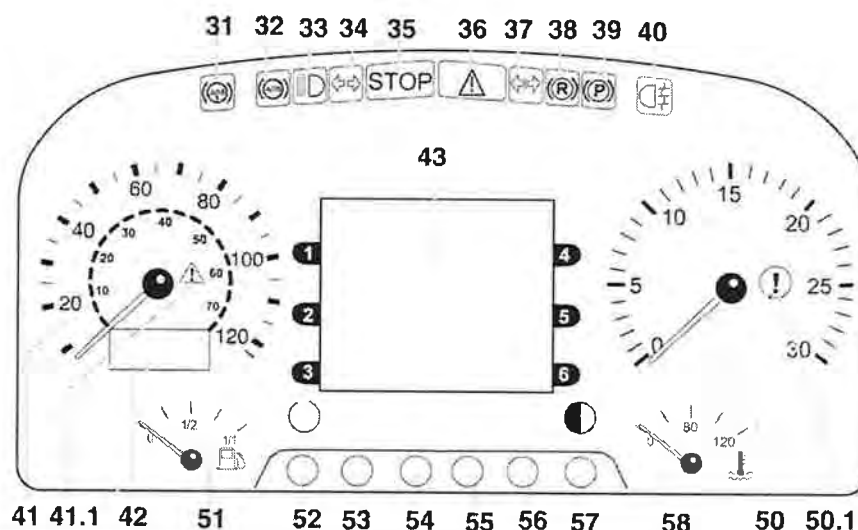
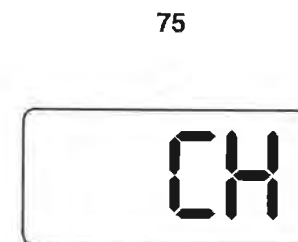
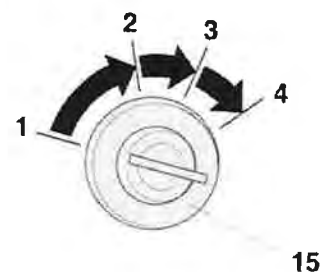
When the control signal has stopped: Turn the key on as far as possible (position "4") and start the engine, without operating the accelerator pedal.

If required, interrupt the starting procedure after no more than 20 seconds and repeat after approx. 1 minute.

Before attempting to start the engine again, turn the key back to the first stop.

Release the key after the engine has started.

3. If the engine does not start up after the third attempt: Look for the cause of the fault with the help of the operating instructions.

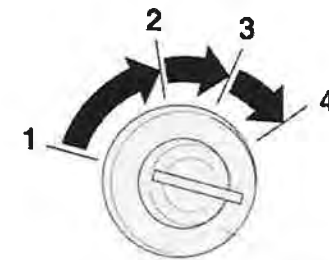


**Start the engine on the outrigger controls
(external engine start)**

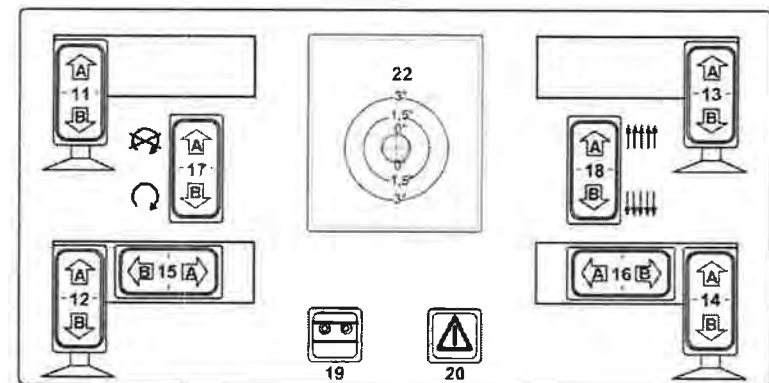
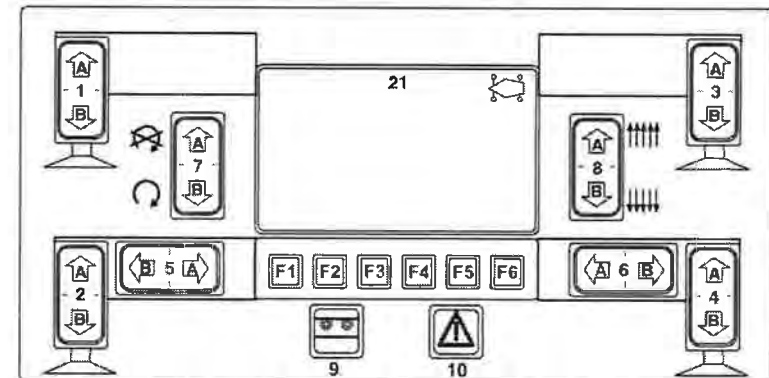
1. Insert the key in the latch contact (15) (position "2").
2. Press the "caution" key (10 / 20) for approx. 5 secs. (ignition on, "ramp up" data bus).
3. Press and hold the "caution" key (10 / 20) and also press key "engine start" (7B / 17B).
4. After the engine has started release both buttons.

When the outriggers are operated, an engine speed of 1200 U/min (rpm) is automatically set.

When the engine is started on the outrigger controls the warning displays are not in the operator's line of view. It is therefore important to listen for acoustic warning signals (buzzer).



15



After Starting the Engine

Never disconnect the battery terminals when the engine is running.

Keep your eye on the engine oil pressure!

If the oil pressure is too low, the B12 indicator light will appear on the driver information display. At the same time,

the “STOP” indicator light (35) will light up on the instrument panel, and an acoustic warning signal (buzzer) will be emitted.

When the “Oil pressure” warning (B12) is shown, the operating safety of the engine is in danger.

Stop the vehicle immediately and switch off the engine.

Determine the cause of the fault!

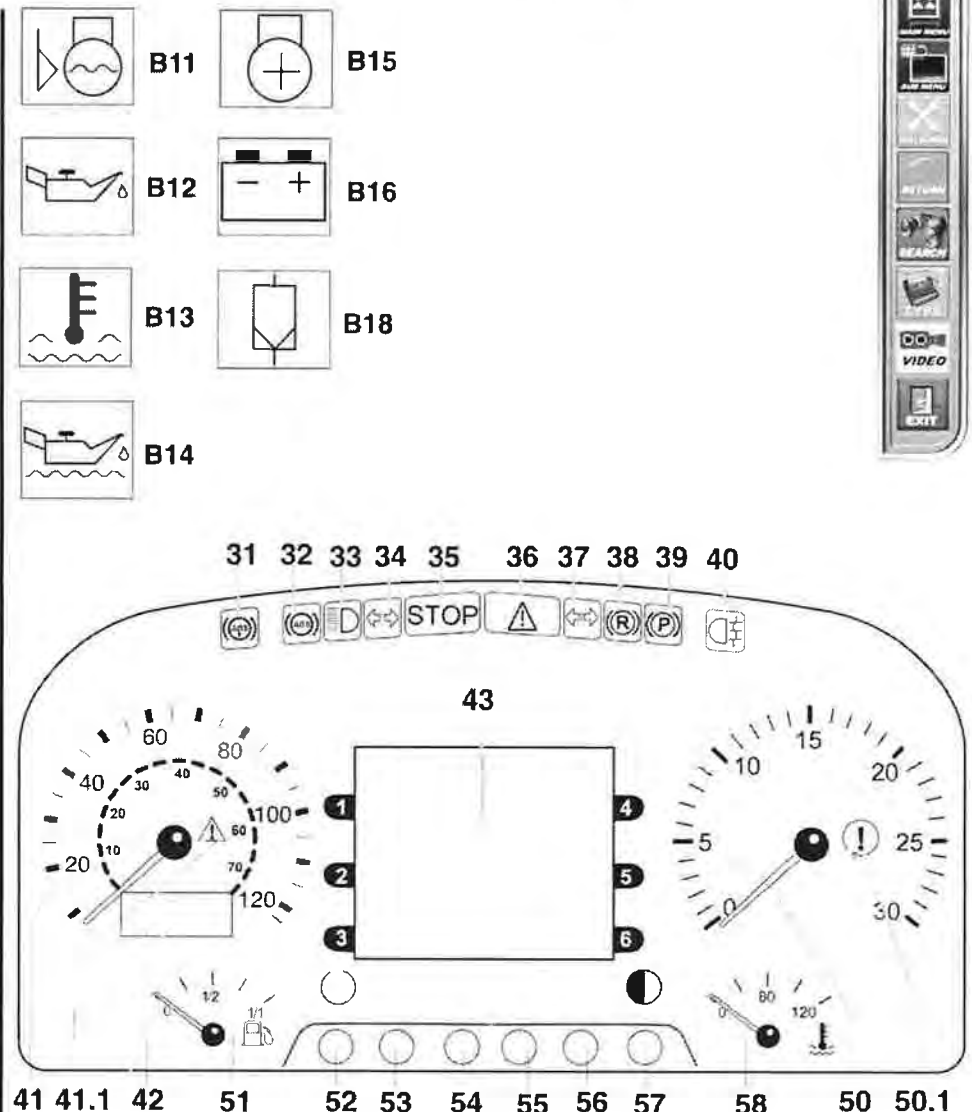
Do not leave the engine running at a standstill to warm it up.

Only operate the engine at full speed / full load once the prescribed operating temperature has been reached.

If indicator light (B18) lights up, service the air filter.

Switch the engine off immediately in the case of:

- falling or heavily fluctuating oil pressure
- falling output / revs in spite of constant operating conditions
- heavily smoking exhaust
- excessively high coolant and oil temperature
- sudden abnormal engine noises.



Before Switching Off the Engine

Leave the engine running at idle speed for approx. 1–2 minutes before switching off:

- when the coolant temperature is high (above 95° C / 203° F);
- after driving at full engine power (e.g. after driving on a slope), to allow the exhaust turbocharger to cool down.

Switching Off (Engine Stop) in Normal Circumstances

The engine can be switched off both in the driver's cab and on the outrigger controls.

When the ignition is "off" the transmission automatically switches to neutral.

When leaving the crane, remove the ignition key and close off the cab.

Switching off the Engine in the Driver's Cab

In the driver's cab the engine is switched off with the ignition switch (15).

The following condition ensures when the engine is started:

– If the engine is started in the driver's cab:

Turn the ignition starter switch (15) from driving position (position "3") to position "2".

– If the engine is started at the outrigger controls:

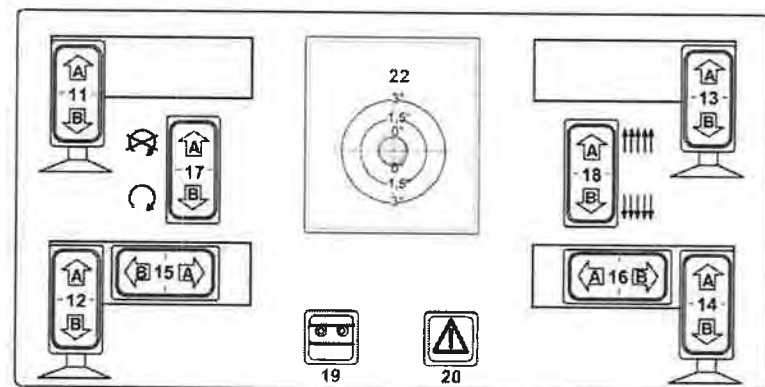
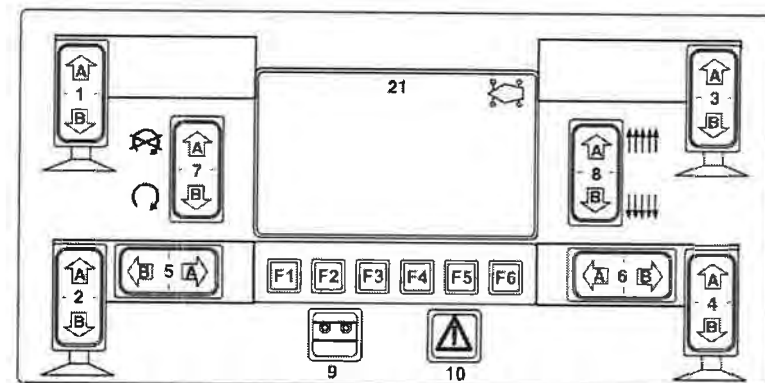
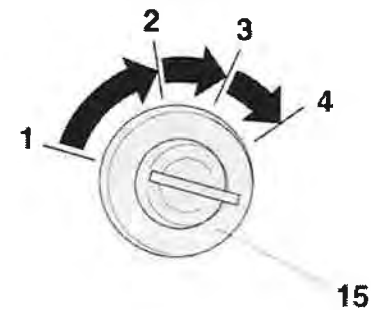
Turn the ignition starter switch (15) from position "2" to position "1".

Switching Off the Engine on the Outrigger Control

The engine is switched off on the outrigger control by pressing button (7A / 17A).

At the same time, this results in the following interaction with the ignition starter switch (15) in the driver's cab:

- * The ignition remains switched on when the ignition switch (15) is in position "3".
- * The ignition is switched off when ignition switch (15) is in position "1".



Switching Off the Engine in an Emergency Switching Off Procedure “Quick Stop” (Optional Equipment”)

On the chassis, the engines of the superstructure and chassis can be switched off together at two central points. A mushroom pushbutton is located on the left- and right-hand side of the crane near the outrigger controls for this purpose. Press the knob to activate the quick stop device. Once it has been activated, the mushroom pushbutton must be released again before an attempt is made to restart the crane (turn and unlock).

The rapid cutout device only functions when the handbrake is applied and the gear is in neutral.

After the quick stop device has been activated the indicating light (A20) lights up until the “Locked” position is released again.

“Quick Stop” with Air Shutoff Valve

Using a trap between the air filter and engine the air flow is cut off when the device is actuated.

Independently of manual activation, when a certain speed is exceeded (approx. 2700 U/min / rpm) the quick stop device is automatically activated. At the same time the fuel supply is interrupted. The engine is switched off.

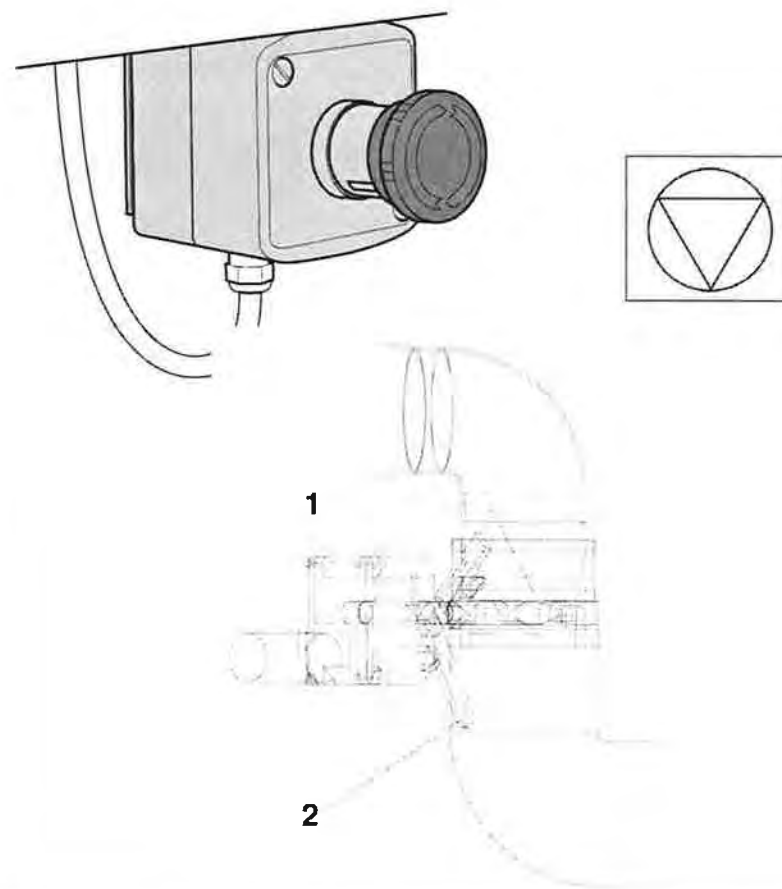
Before the engine is restarted the trap (1) must be manually released. Return lever (2) to the starting position.

Risk of damage!

When the trap is closed the engine cannot be started.

Repeated starting attempts lead to engine damage.

Before the restart, all air carrying hoses – incl. the charge air hoses between the engine and after cooler – must be checked to ensure that they are fitted correctly and are completely free of blockages.


A20

Electronic Engine Management

The chassis engine is equipped with an electronic control system. This monitors both the engine and itself (self-diagnosis).

The control and monitoring equipment is in the cab on the chassis.

Engine Control

- 1 Increase idle speed, accelerate vehicle, store speed.
- 2 Reduce idle speed, slow down vehicle, store speed.
- 3 (Sustained action brake)
- 4 Switch off idle speed increase, switch off cruise control, switch off limiter
- 5 Switch on limiter

Idle speed / intermediate speed / max. working speed

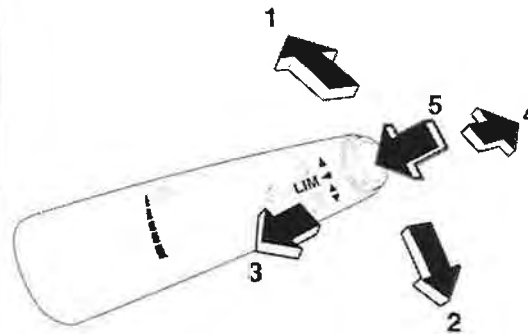
If required, the idle speed when the vehicle is stationary can be increased from approx. 550 U/min (rpm) to max. 750 U/min (rpm).

The engine speed (with parking brake on) can also be adjusted to any value – from neutral gear to a fixed parameter maximum working speed of 1200 U/min (rpm); e.g. for emergency operation of the superstructure functions.

When the outriggers are operated, an engine speed of 1200 U/min (rpm) is automatically set.

When the intermediate revs are selected the engine speed can only be changed to the max. working speed (120 U/min) (rpm) – by pressing the accelerator pedal (18).

If the ignition switch (15) is placed in the "Off" position, the set intermediate speed is deleted. It must be reset.



Idle Speed

1 Hold = increase idle speed.

Tap = increase idle speed by approx. 20 U/min (rpm).

2 Hold = reduce idle speed.

Tap = reduce idle speed by approx. U/min (rpm).

After releasing the lever the engine runs at the increased speed.

4 Tap = idle speed increase switched off.

The idle speed increase is automatically switched off after starting off.

Cruise Control

Using the cruise control, the vehicle drives at a stored speed (without actuating the accelerator pedal).

Any speed above 40 km/h (25 mph) can be stored.

Risk of accidents!

Do not switch on the cruise control on a slippery surface.

Risk of skidding!

Only use the cruise control when the traffic conditions enable a constant speed. It may not be possible to hold the speed on inclines.

Do not exceed the highest speed in the individual gears (observe the revolution counter).

When the cruise control is switched on take your foot off the accelerator pedal.

Switch on the cruise control:

The cruise control is switched on using the actuating lever on the right of the steering column.

– Accelerate the vehicle with accelerator pedal (above 40 km/h (25 mph))

– Lever in position

1 Hold = accelerate. Release lever, the speed that has been reached is stored.

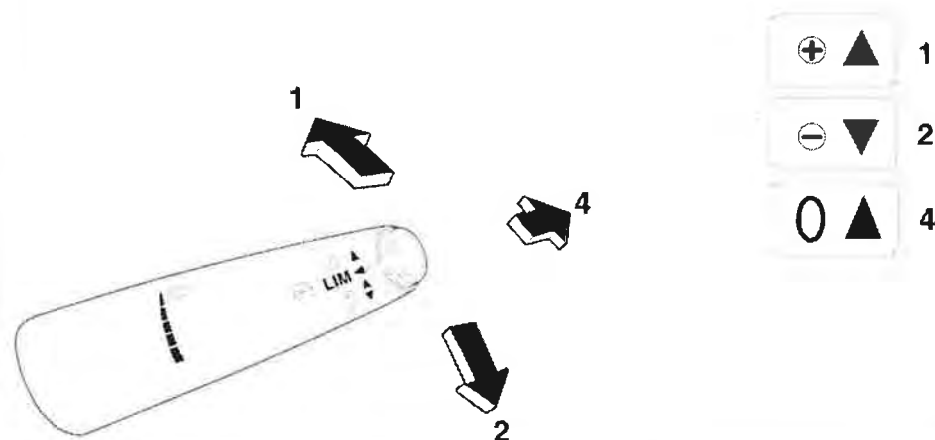
Tap = store current speed or increase stored speed by increments of 0,5 km/h (0.3 mph)

2 Hold = slow down. Release lever, the speed that has been reached is stored.

Tap = store current speed or reduce stored speed by increments of 0,5 km/h (0.3 mph).

Resume stored desired speed.

After releasing the lever the engine runs at the speed that has been reached.



Switch off the cruise control:

Tap the lever in position 4.

The cruise control is automatically switched off:

- when the brake is activated.

(The set speed remains stored.)

- for speeds under 40 km/h (25 mph).

(The set speed remains stored.)

- when the cruise control is switched on.

(The set speed remains stored.)

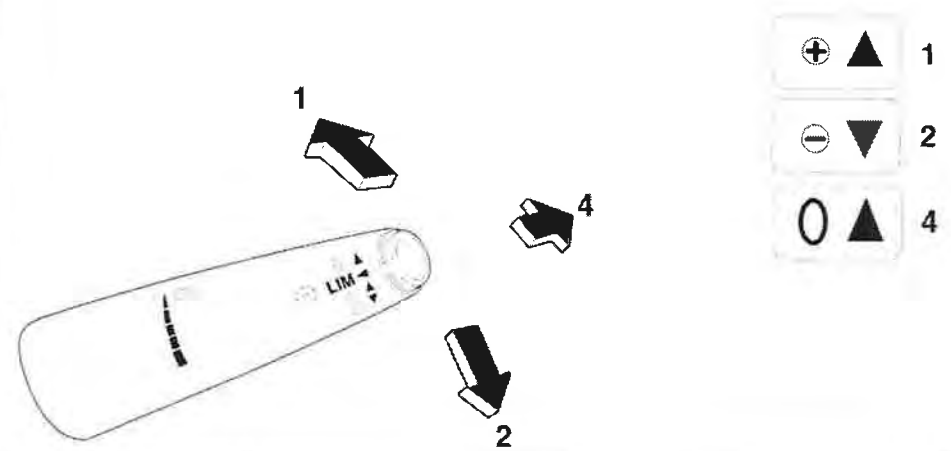
By briefly tapping on the lever (position 2) the vehicle drives again

at the stored speed.

If the vehicle is accelerated with the accelerator pedal when the

cruise control is switched on, the stored speed is resumed

once the accelerator pedal is released.



Limiters (for Limiting the Maximum Speed)

Using the limiter the driving speed can be limited at any level above 40 km/h (25 mph).

Switch on limiter:

- accelerate the vehicle to the desired speed.
- Press button (5). The speed limiter is activated.

Switch off limiter:

Tap the lever in position 4.

The highest speed that can be set is automatically deleted, when the ignition–starter switch (15) is turned back to position “2” or when the cruise control is switched on.

To exceed the set maximum speed:

If the set maximum speed is to be exceeded (e.g. when overtaking):

Press the accelerator pedal briefly as far as possible, past the full throttle position (kick-down). After the vehicle has accelerated release the accelerator pedal and press again. The set speed limit is reactivated.

Increase the set maximum speed:

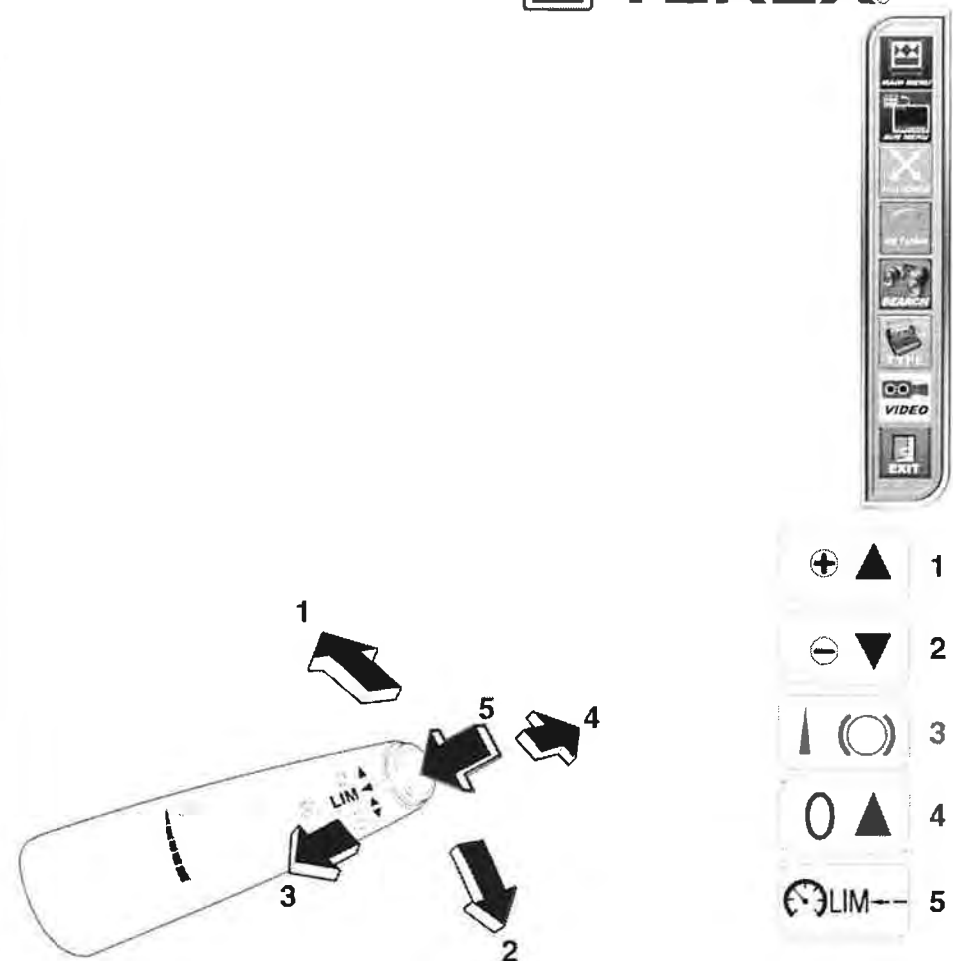
If the set maximum speed is to be increased:

Press button (5), hold and accelerate the vehicle. Once the desired speed has been reached, release the button.

To reduce the set maximum speed:

If the set maximum speed is to be reduced:

Release the accelerator pedal (if necessary, brake the vehicle). Once the desired speed has been reached, press button (5).



Monitoring the Engine Fault Display

All faults in the engine system and the engine electronic system are collected. If a fault occurs, this is shown by the indicator light (B15).

Regardless of this general detection / display, certain faults are directly shown by their own indicator lights (with the corresponding symbol).

At the same time, the indicator light (35) "STOP" or "Caution" (36) will light up on the instrument panel; in some cases an acoustic warning signal (buzzer) can also be heard.

When there is a malfunction / warning display and at the same time the red warning light "STOP" (35) lights up, the operational safety of the engine is in danger. Stop the vehicle immediately and remedy the fault.

- Speed monitor

(50.1) Light emitting diode, red

If it lights up: The engine speed is exceeding 2350 U/min (rpm) (excessive engine speed).

Be sure that the engine does not exceed the permissible speed range.

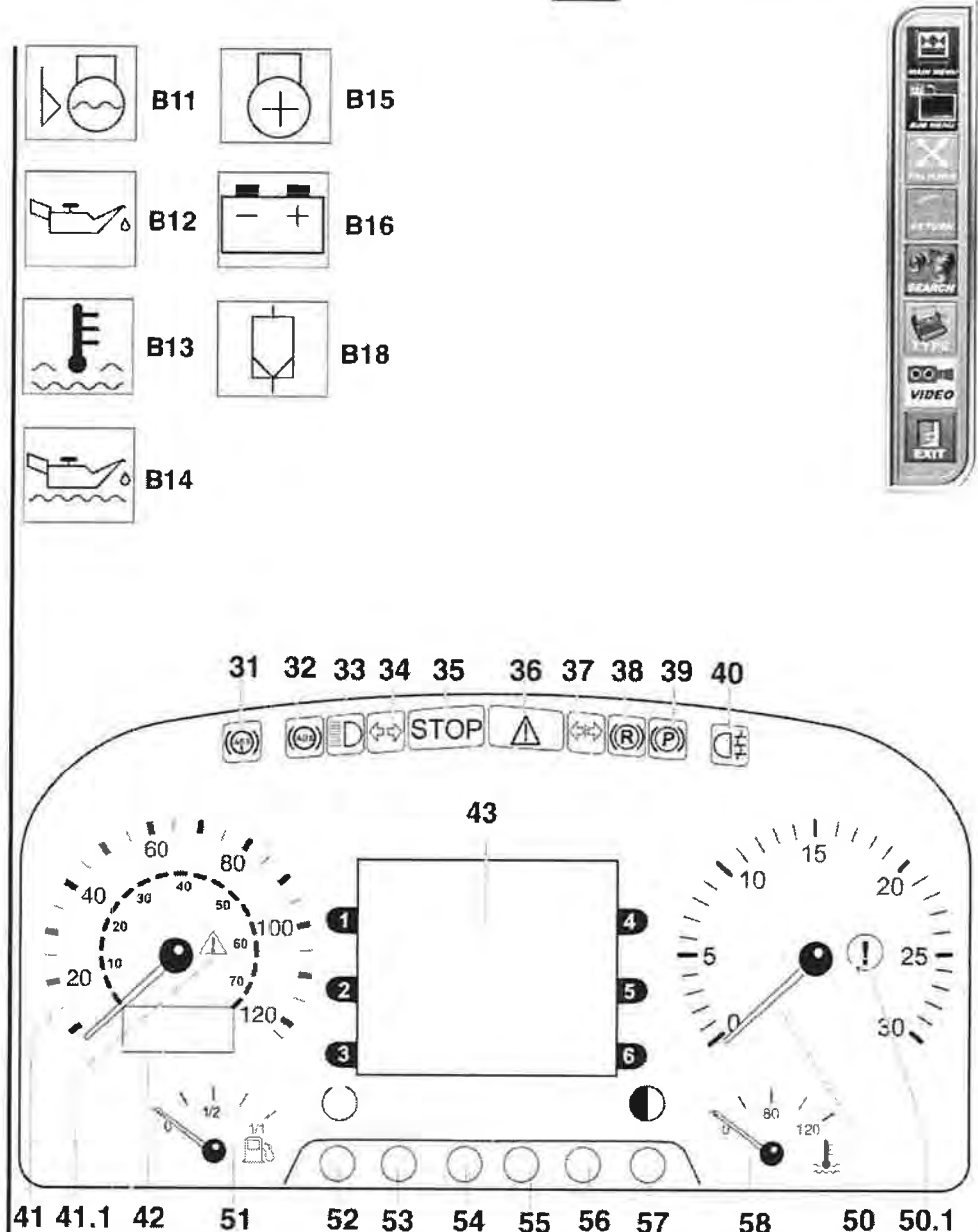
At an engine speed of 2300 U/min (rpm), the exhaust brake is deactivated to protect the engine mechanics against damage.

- Engine faults (engine system / electronic system)

(B15) Indicating light, red

When the fault indicator lights up read off the fault code.

All faults are stored in the system and can be read off as fault codes. Faults which are only displayed temporarily are also stored.





- Coolant level

(B11) Indicating light, red

The “Coolant level” (B11) warning is displayed when the coolant level in the expansion tank has sunk to about 2 l (0.5 gal) under the normal level. At the same time, the alarm buzzer will also sound.

Switch off the engine immediately and determine the cause of the fault.

- Oil pressure

(B12) Indicating light, red

The “Oil pressure” warning is displayed when – while the engine is running – the oil pressure is too low in the engine (= depending on the speed).

At the same time – if the level continues to fall – the alarm buzzer sounds.

Switch off the engine immediately and determine the cause of the fault.

- Coolant temperature

(B13) Indicating light, red

The “Coolant temperature” warning (B13) is displayed when a coolant temperature of 104 ° C (219° F) is reached in driving mode. At the same time the alarm buzzer sounds at 110 ° C (230° F) and the engine output is automatically reduced.

The engine can still be operated; however determine the cause.

- Oil level

(B14) Indicating light, red

The “Oil level” warning (B14) is displayed when the oil level in the engine has sunk considerably under the minimum amount. At the same time, the alarm buzzer will also sound.

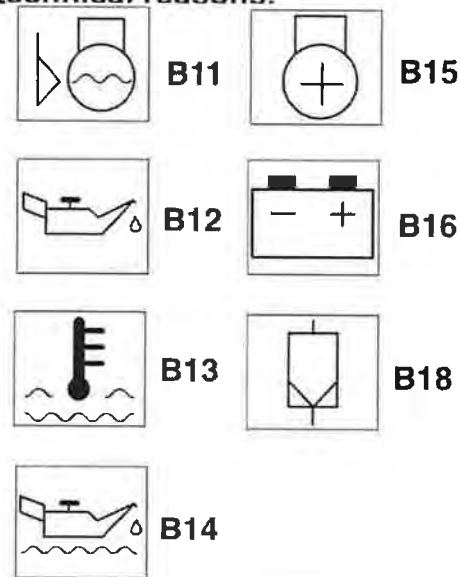
Switch off the engine immediately and determine the cause of the fault.

This display serves only as additional information. The oil

level may only be monitored using the oil measuring stick.

Depending on the design, this display function is not

possible for technical reasons.



- Charging current

(B16) Indicating light, red

If the "charging current" warning is displayed when the engine is running, switch off the engine and check the belt drive.

Do not let the engine run without the belt drive; the coolant pump is not working.

Reading Off the Fault Memory

When warning light (B15) lights up, the system has recognized a fault.

The fault codes can be read off with the "Minidiag 2" (Mercedes-Benz) diagnosis device. This is usually done by our customer service or in a DaimlerCrysler AG workshop.

Action steps for error diagnosis:

- Switch off the engine.
- Connect the diagnosis device to the diagnosis socket (14-pin; in the control box "X 300" in the driver's cab).
- Switch on the ignition.

Do not start the engine.

When the engine is running fault codes cannot be deleted. If no fault codes are displayed, check the fuse and grounding of the diagnosis socket.

- Call up the menu for reading the fault codes from the control unit.
- Call up the fault codes.

A description of all fault codes can be found in the separate operating instructions of the engine manufacturer (see part 5 in this service literature).

Evaluation of the Displayed Faults

The error code has five digits; the first digit indicates the fault group (0, 1 or 2). Depending on which fault group is displayed, you should proceed as follows:

- Fault group 0

The fault code is stored, but only displayed when the diagnosis instrument is connected.

The fault can, if required, be rectified during the next service.

The engine can still be used.

- Fault group 1

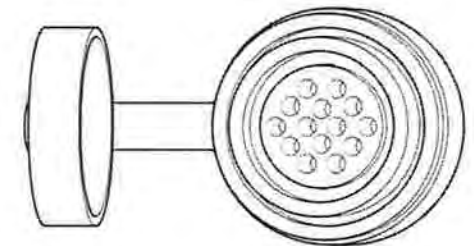
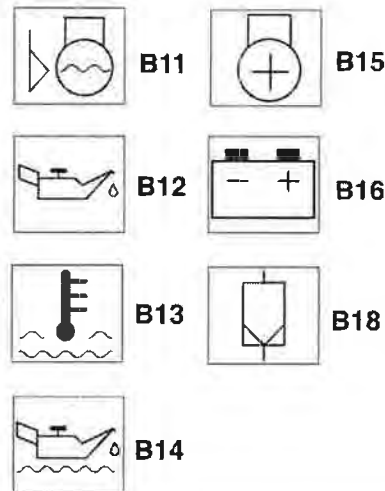
The fault must be rectified as soon as possible.

Risk of accidents! You must reckon with altered running characteristics of the engine.

- Fault group 2

The fault must be rectified immediately.

Risk of accidents! The running characteristics of the engine are different (emergency running program).



Superstructure Engine

Starting Procedure

Start the engine as follows:

- Insert ignition key into ignition lock (16, S 300) and turn to the right. Indicator light (50 "Charge current too low") must come on.

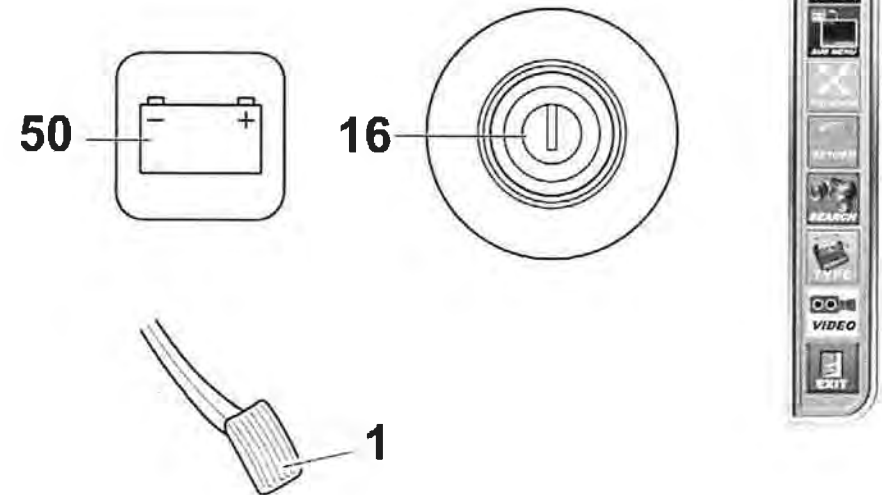
Do not press pedal when starting a warm engine.

- Turn ignition key further to the right up to the stop and hold in this position until the engine fires.

Release the ignition key as soon as the engine starts. On no account should the starter be operated with the engine running.

Observe the following points if the engine fails to start up after 5 seconds:

- *Slowly press down the speed adjuster (1)*
- *Repeat the starting procedure. Do not exceed 20 seconds.*
- *Wait 60 seconds before attempting another start.*
- *If the engine fails to start on the third attempt, determine the cause of the fault with the aid of the engine manufacturer's operating instructions.*



After Starting the Engine

- If the engine is running and no oil pressure is displayed at the pressure gauge (66, P1367) and / or the control lamp „Engine oil pressure too low“ is flashing (51, „Engine oil pressure too low“), turn off the engine immediately and determine the cause.

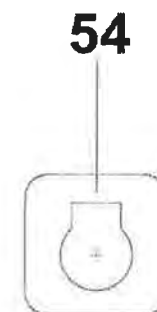
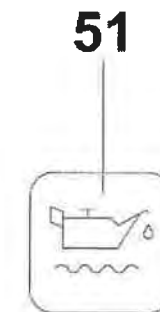
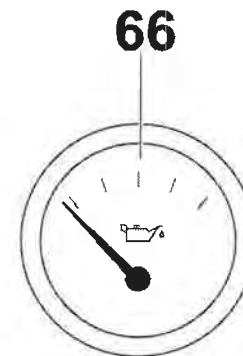
Avoid high revs when the engine is cold.

- Only run the engine when the battery is properly connected as otherwise the alternator will be damaged.
- If the engine cuts out, turn the ignition key immediately to the right.
- If the indicator light (54 "Fault ADM / engine") lights up when

the engine is running, switch off the engine immediately and determine the cause of the fault.

Switch off the engine immediately if:

- falling or heavily fluctuating oil pressure
- a loss in power or revs without a change in the speed adjustment or operating conditions
- heavily smoking exhaust
- coolant or oil temperature too high
- abnormal engine noises



Switching off the Engine

Switch off the engine as follows:

1. Bring the speed control pedal (1) into the "idle" position.
2. Leave the engine running for approx. 2 minutes at idle speed.
3. Turn the ignition key (16) to the left and remove.

When leaving the cab:

- Switch off the ignition in the superstructure
- Do not blip the throttle just before switching off the engine.
- Do not switch off the engine immediately, but leaving running without load at idle speed for a few minutes in order to balance out the temperature..

Engine Cutout Switch (Optional)

Damage can occur to the engine, especially to the after-cooler tubes, when the engine rapid stop switch is activated.

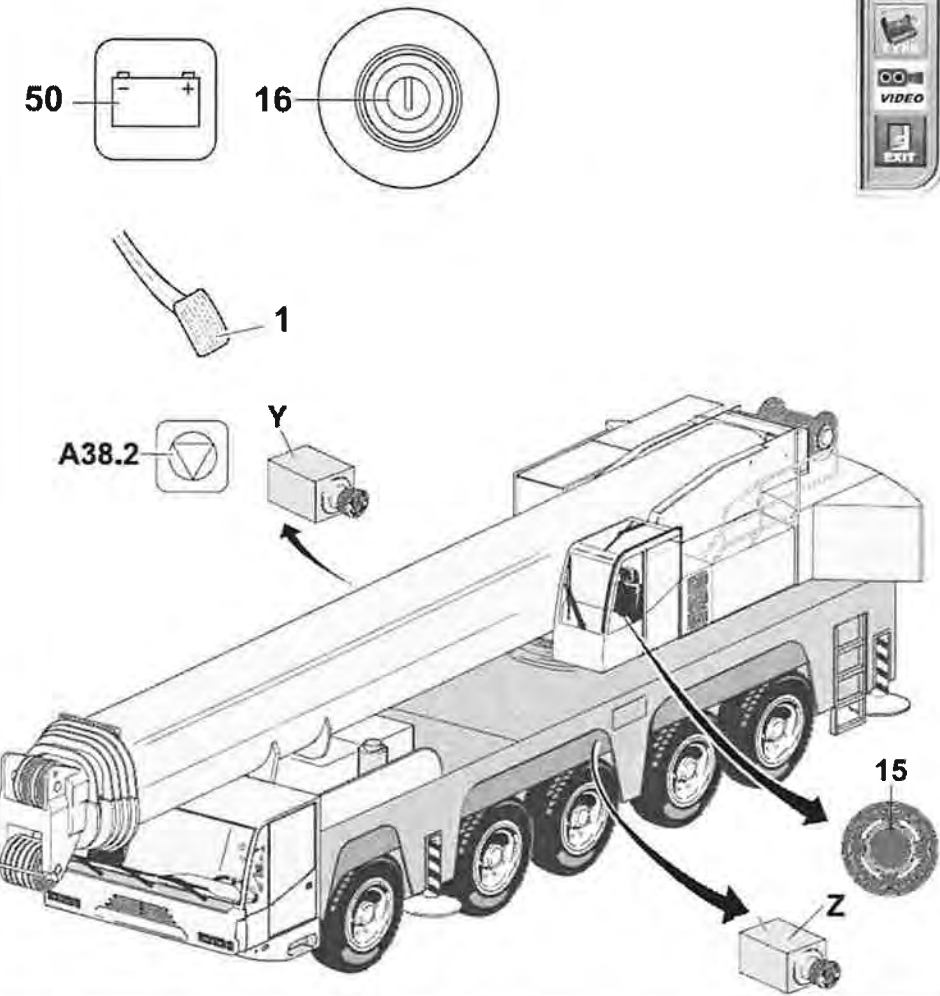
Your crane is equipped with engine cutout equipment. This includes three engine cutout switches. One switch is located in the superstructure cab on the dashboard (item 15). **Two additional**

engine cutout switches are located on the chassis frame on the right- and left-hand side (Y and Z).

The engine cutout switch is only guaranteed to work when the parking brake is applied in the chassis cab and the transmission is placed in "neutral".

All engines/motors are switched off! In the chassis cab the indicator light (53; engine cutout switch actuated) lights up.

The engine can only be restarted once all engine cutout switches have been unlocked again. The flaps in the engines' air suction channels must be reopened manually before the engine is started again (lever on air suction channel).



NOTES;

