

# MAGNETI MARELLI

3D wheel alignment system

User's manual

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## INTRODUCTION

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*The purpose of this manual is to furnish the owner and operator of this machine with a set of practical and safe instructions for the use and maintenance of the wheel aligner.*

*Follow all the instructions carefully and your aligner will assist you in your work and give lasting and efficient service in keeping with our traditions.*

*The following paragraphs define the levels of danger regarding the machine, associated with the warning captions found in this manual.*

### **DANGER**

**Refers to immediate dangers with the risk of serious injury or death.**

### **WARNING**

**Dangers or unsafe procedures that can cause serious injury or death.**

### **ATTENTION**

**Dangers or unsafe procedures that can cause minor injuries or damage to property.**

*This manual is subject to changes and updates.*

*Always read the personalisation and update instructions appended to the manual.*

*The manual is organised into logical chapter headings to facilitate its consultation, and is intended – particularly as far as maintenance operations are concerned – for specialised technicians with the necessary knowledge of mechanical, electromechanical and computerised systems. The system has in any case been designed to simplify as much as possible all the operations relative to its normal functioning, as well those pertaining to the more delicate troubleshooting phases: to this end, a wide array of on-screen messages (which are described in this manual) provide specific information for solving the various problems which may arise.*

*Read these instructions carefully before powering up the machine.*

*Keep this manual and all illustrative material supplied with the machine in a folder near the aligner where it is readily accessible for consultation by the machine operator.*

*The technical documentation supplied is an integral part of the machine, and must always accompany the equipment if it is sold or transferred to a new owner.*

*The manual is applicable exclusively to the machine model and serial number indicated on the data plate affixed to it.*



### **WARNING**

**Adhere to the contents of this manual. Manufacturer declines all liability in the case of actions not specifically described and authorized in this manual.**

**The wheel aligner is a measuring tool, so the suggestions for the adjustments to be made on the vehicle (animations or fixed help-on-line contained in the aligner) are merely indicative. In any case, before making any intervention on the vehicle, the operator must examine and be aware of the regulations (in other words the instructions or**

recommendations of the manufacturer), and always make the adjustments in compliance with such priority indications.

The company declines all responsibility deriving from the execution of such regulations and any damage that could eventually result.

*the Manufacturer.*

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## TRANSPORT, STORAGE AND HANDLING

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### Machine transport conditions

*The aligner must be shipped in its original packing and stowed in the position indicated on the outside.*

- *Packaging data (2 pcs.):*

#### NOTE

*Some of the illustrations in this manual have been taken from photographs of prototypes; the standard production models may differ slightly in certain respects.*

*These instructions are for the attention of persons with basic mechanical skills. We have therefore condensed the descriptions of each operation by omitting detailed instructions regarding, for example, how to loosen or tighten the fixing devices on the machine, etc.*

*Do not attempt to perform operations unless properly qualified and with suitable experience. In case of need, please contact our nearest authorized Service Centre for assistance.*

#### NOTE

*All the installation operations must be carried out by Technical Service personnel authorized by*

- *the central unit in a carton box on a pallet.*
- *the accessories (including the measuring heads) in a wooden crate on a separate pallet.*

	Central unit (Box on pallet)	Supply kit (Wooden crate)
Dimensions (cm)	116x76x140	154x92x113
Weight (Kg)	90	90

### Ambient conditions in the place of storage

- *Relative humidity: 20% ÷ 90%*
- *Temperature range: -10° ÷ +60°C.*



#### WARNING

**Do not stack other items on top of the packing or damage may result.**

### Handling

*To move the packing, insert the tines of a fork-lift truck into the slots on the base of the packing itself (pallet) (fig. 1).*

*To move the machine, use the wheels of the aligner; to lift the machine, insert the tines of a fork-lift truck under the lower base of the wheeled cabinet, keeping them close to the wheels of the aligner (fig. 2).*



#### **WARNING**

**This operation must be carried out very carefully to prevent the unit from tipping over or being damaged.**



#### **ATTENTION**

**Handle with care: violent vibrations may damage the equipment.**



#### **ATTENTION**

**Keep the original packaging materials so that the machine can be safely shipped at a later date if necessary.**

#### **WARNING**

**Choose the place of installation in strict observance of local regulations regarding safety in the workplace.**



#### **ATTENTION**

If the machine is to be installed outdoors, it must be properly protected by a canopy roof or any other protection device to avoid contact with water.

Place the aligner in the designated work position and make sure that the rear panel of the



Before moving the equipment, first pull out the power cable from the outlet.

## INSTALLING THE MACHINE

### Installation clearances



#### WARNING

machine is at least 25 cm away from the nearest wall.

The radio system between the measuring heads and the central unit works within a radius of about 15 m.; to prevent loss of signal, radio equipment should be kept away from large metal items.

Following the instructions in the technical service manual, it is possible to select the disturbance-free communication channel to optimise communications.

#### Note

Excessive ambient light levels or direct exposure to sunlight may impair the operation of the measuring heads, preventing a clear view of the images on the screen.



#### ATTENTION

Make sure that there are no permanent magnets, electromagnets or sources of heat in the vicinity of the machine as these could cause irreparable damage (they might irreparably damage the program disk and the Personal Computer).



#### WARNING

Take the utmost care when unpacking, assembling, lifting and setting up the machine as described in this heading.

Failure to observe these instructions can lead to damage to the machine and injury to the operator or other persons.

### Installation

- Unpack the equipment, placing the packing in the position indicated above.
- Remove all the accessories from the pallet and from inside the machine, and set them down nearby.
- Place the aligner in the desired position (see paragraph "Installation Clearances").
- Proceed to unpack the accessories.
- Remove the upper rear panel (A, fig. 14) of the aligner in order to access its interior.

### ***Installing the electrical connector panel***

- *Install the electrical connector panel at the top of the cabinet (B, fig. 14). Connect electrical connector panel to one of the HDD power cables leading out of the back of the PC and to the Hard Lock device with a USB cable (G, F, fig. 11).*

### ***Installing the Hard Lock device:***

- *Insert the tip of a pen into the hole at the side to open the SIM holder (fig. 47).*
- *Remove the wheel aligner SIM card (fig. 46) from its punched backing card (keep the backing card with the serial number for future queries) and insert in the SIM holder (fig. 47), with the gold contacts facing upward.*
- *Push the SIM holder in.*
- *Fix the Hard Lock device (B, fig. 16) and the 2 charging cable retainer brackets (A, Fig. 16) onto the back of the cabinet with the relative fastener screws.*
- *Connect the 2 USB cables to the Hard Lock device: connect one to an unused USB port on the PC; connect the other to the USB port on the electrical connector panel (E, F, fig. 11).*
- *Connect the 4 sensor charging cables (with RJ45 connectors) to the electrical connector panel (B, fig. 14) and fasten them into the 2 charging cable retainer brackets (A, Fig. 16) at the back of the cabinet.*
- *Unpack the keyboard, place it on the shelf provided in the moulded casing (fig. 4) and insert the data cable through the hole provided in the shelf.*
- *Remove the computer from its packing (keep the packing materials for future transport) and place it in the compartment provided inside the cabinet (A, fig. 5).*
- *Remove the monitor from its packing (keep the packing materials for future transport) and place it on the top of the console (fig. 4).*



### **WARNING**

**It is highly recommended to always fix LCD monitor in order to avoid possible damagings which had to accidental hits against the equipment. It is recommended therefore to always use the monitor fixing kit accessory PN. 8-61200143 (A, Fig. 6). The Manufacturer declines all liability for claims deriving from the non-used of the LCD monitor fixing device.**

- *Pass the monitor cables through the cable slot on the rear side of the cabinet (fig. 7 and fig. 8) to access the computer compartment.*
- *Connect the monitor to one of the Shuko sockets available (fig. 3).*
- *Connect the monitor signal cable to the PC, as shown in fig. 11.*
- *Tie the power supply leads and monitor signal cables together outside using two straps.*
- *Connect the power supply, keyboard and printer (optional).*
- *Fit the 4 measuring head supports (A, fig. 15) to the sides of the cabinet using the corresponding holes and the 4 Allen screws provided.*
- *When the connections are complete, fit the rear panel (A, fig. 14).*

### **NOTE**

Arrange the various connection cables tidily, laying them along logical routes and avoiding unnecessary extra length or tangles (see fig. 13); tie them together with clamps in various points if necessary.



## ATTENTION

For additional information about the technical characteristics, warnings, maintenance and any other data about the monitor or the printer, read the relative operator's manuals supplied with machine documentation.

## Installing the Printer

The Windows<sup>®</sup> operating system supports the installation of the majority of printers available on the market.

### Warning !

Some latest-generation printers may conflict (when two or more printers are installed on the same personal computer).

The manufacturer pre-installs one model of printer; if the printer supplied is of this model once the connection has been made it will be ready for use.

If the printer is of a different model it must be installed, following the instructions provided in the installation and setup manual provided with the printer itself.

To avoid problems when using printers not supplied by the manufacturer, it is best to uninstall all models of printer previously installed before installing a new model. The aligner is preset to use an 80 column, size A4, colour printer.



## ATTENTION

During installation the aligner must be turned off.

- Open the drawer of the cabinet (A, fig. 17) and place the printer in the compartment (Fig. 17).
- Connect the other end of the data cable (USB) to the printer (end with square-section connector).
- Pass the power supply lead through one of the two slots on the upper shelf (PC compartment shelf) and connect it to one of the Shuko sockets available (fig. 3).
- Pass the printer data cable (USB cable) through one of the two slots on the upper shelf (PC compartment shelf).
- Connect the printer data cable (USB cable) to a connector located behind the PC (USB port) as shown in figure 11.
- Make the power supply leads and printer data cables pass on the same side so as to fix the cables to the adjacent sides of the cabinet with the clamps and supports provided.

## Instructions for correct assembly of the radio units

Secure the Hard Lock device to the central unit, at the rear of the machine (B, fig. 16), using the provided holes.

To assure the most efficient radio communications between the heads and the central unit, proceed as follows.

### **Installation:**

- Fix the Hard Lock device to the cabinet (B, fig. 16), referring to the diagrams for positioning of the radio on the central unit (fig. 19 - 20 - 21).



### **ATTENTION**

If you are not faced with one of the standard conditions illustrated, place the Hard Lock device so that it is as "visible" as possible (i.e. with the smallest number of metal obstacles between the two) to the heads and well away from metal objects which may screen the electromagnetic waves.

### **NOTE**

If further communication problems are encountered after the Hard Lock device has been positioned correctly, fix the radio to a wall of the workshop, taking care to position it:

- high up,
- well way from metal objects, • "visible" to the heads.

### **Ambient conditions in the place of operation**

Relative humidity: 20% ÷ 90% (without condensation)

Temperature range: 5°C ÷ 35°C



### **WARNING**

The machine must not be operated in potentially explosive atmosphere.

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## **ELECTRICAL HOOK-UP**

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The manufacturer presets the aligner to operate with a power supply of 230 VAC.

It can be preset to operate on 115 VAC by setting the PC voltage change switch as appropriate.

### **NOTES**

- However, it is important to check that the monitor and printer are preset to operate with voltages other than 230 VAC.
- The power supply cable supplied with the machine complies with the relevant regulations.



### **WARNING**

All electrical hook-up operations to the main power supply must be exclusively carried out by qualified electricians.

- The electrical supply line must be suitably sized in relation to:



1. *the machine's power draw, as specified on the machine data plate.*
  2. *the distance between the machine and the electric hook-up point, in order that the voltage drop at full charge does not exceed 4% (10% during the starting phase) in relation to the nominal value of the voltage on the machine data plate.*
- *The user must:*
    1. *provide a power cord in appliance with local electrical regulations*
    2. *connect the machine to a dedicated power line with its own 30 mA circuit breaker*
    3. *install fuses on the power supply line, suitably dimensioned according to the indications in the general electric diagram in this manual*
    4. *make sure that the workshop is provided with an efficient ground circuit.*
  - *In order to prevent the machine being used by unauthorized personnel, it is advised to disconnect the power supply plug when the machine remains idle (switched off) for long periods of time*
  - *If the machine is hooked up directly to the main control board, without a separate plug to socket connection, a key switch or a switch that can be locked out must be installed to prevent the machine from being used by persons other than those authorized.*



### WARNING

**For correct and safe operation of the machine it must be connected to an efficient ground circuit.**

**NEVER connect the ground wire to a gas pipe, water pipe, telephone line or other makeshift system.**



### WARNING

**Before connecting the power plug to the power panel make sure that the line voltage is the same as the power supply indicated on the machine's data plate.**

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## SAFETY REGULATIONS

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### WARNING

**Failure to observe these instructions and the relative danger warnings can cause serious injury to the operator and others.**

**Do not power up the machine before you have read and understood all the danger/warning notices in this manual.**

*This machine must be used only by qualified and authorized personnel. A qualified operator is considered to be a person who has read and understood the manufacturer's instructions, is suitably trained, and is conversant with safety and adjustment procedures to be adhered to during operations.*

Operators are expressly forbidden from using the machine under the influence of alcohol or drugs capable of affecting physical and mental capacity.

*The operator must:*

- *Read and understand all instructions on how to use the machine.*
- *Make sure to have a thorough knowledge of the capabilities and characteristics of this machine.*
- *Keep unauthorized persons well clear of the area of operation.*
- *Make sure that the machine has been installed in compliance with established legislation and standards.*
- *Make sure that all machine operators are suitably trained, that they are capable of using the machine correctly and that they are adequately supervised during their work.*
- *Do not touch power lines or the inside of electric motors or other electrical equipment until the power has been disconnected and locked out.*
- *Read this manual carefully and learn how to use the machine correctly and safely.*
- *Always keep this user manual in a place where it can be readily consulted when working with the machine and consult it whenever you are in need of confirmation or explanations.*



## **WARNING**

**Do not remove or deface the safety Danger, Warning or Instruction decals. Replace any missing or illegible Danger, Warning or Instruction decal. Missing or damaged decals can be obtained from your nearest dealer.**

- *When using and carrying out maintenance on the machine observe the unified industrial accident prevention regulations for high voltage industrial equipment.*
- *Any unauthorized alterations made to the machine automatically release the manufacturer from any liability in the case of damage or accidents in relation with such alterations. Specifically, tampering with or removing the machine's safety devices is a breach of the regulations for industrial accident prevention.*

## **Key to warning and instructions labels**



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## **GENERAL CHARACTERISTICS**

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- *Complete system for measuring the characteristic angles of a vehicle, consisting of four measuring heads and one central unit.*
- *Latest-generation electronics using multiprocessor technology.*
- *Data communication between the measuring heads and the central unit:*
  - *by means of radio-frequency devices;*

- Possibility of a cable connection between the central unit and the measuring heads also for radio-frequency models.
- Alignment angles measured using CCD goniometers.
- Steering angles measured directly by the measuring heads, without the use of electronic turntables.
- Central unit equipped with:
  - Personal Computer,
  - PC keyboard,
  - 80 column ink-jet printer (Optional), - LCD Monitor (Optional).
- New, simple and intuitive graphic interface for selecting the available functions and displaying the measurement data.
- Sequence of operations configurable according to the user's needs.
- Program developed on the Windows® platform.
- Intelligent unit for simultaneous charging of the four measuring head batteries.
- Measuring heads powered by rechargeable commercial Ni-MH batteries.
- Measuring heads equipped with keypad for selecting the functions directly from the work position.
- Electronic level on each measuring head.
- Help facility available from any point of the program by pressing the dedicated key.
- Option settings (e.g.: mm / inches, °60, °100, ...) easily configured within each program context using menus invoked by pressing a dedicated key.
- Primary vehicle databank containing over 20,000 vehicles with the associated reference data for the angles.
- Personalized vehicle databank, containing the vehicles and data entered by the user using the "insert", "modify", "delete" functions.
- Vehicles from the primary and personalized databanks displayed in a single list for easier consultation.
- Handling of reference data for adjustments based on vehicle chassis height (for vehicles which support this mode).
- Possibility of saving the job sheets of the operations performed on the vehicles ("Customer databank").
- Two run-out compensation (ROC) programs:
  - ④ **"3-point ROC":**
    - ⌚ Two run-out compensation (ROC) programs;
    - ⌚ possibility of simultaneous execution on several wheels (except for the two wheels on the same side);
    - ⌚ possibility of fully automatic execution without the need to press any keys.
  - ④ **"Push Mode ROC"**
    - ⌚ simultaneous compensation on the four wheels by pushing the vehicle for a distance corresponding to a wheel rotation of approximately 90°;
    - ⌚ automatic and guided execution using the encoder incorporated into each measuring head;
    - ⌚ applicable to 4WD vehicles.
- The adjustment windows, with different layouts of the graphic and numeric parts.
- Help function with animated graphic display of adjustment operations.
- Simplified calculation and adjustment of the toe curve.

- Other programs:
  - ④ adjustment of the vehicle with wheels raised (jack & hold); ④ calculation and complete adjustment of the toe curve (optional);
  - ④ calculation of databank tolerances and storage of latest generation Mercedes camber and caster values according to the manufacturer's provided procedure (optional);
  - ④ electronic acquisition of chassis height values, very useful when adjusting French cars (optional);
  - ④ calculation and adjustment of the steering rack box height;
  - ④ adjustment of the steering wheel position
- Calibration program.
- Utility and diagnostics programs.
- Various types of self-centering clamps are available for the requirements of different wheels.

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## TECHNICAL DATA

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- Measurement fields (in centesimal degrees):
 

Toe angle.....	± 10.00°
Camber.....	± 10.00°
Caster.....	± 30.00°
King pin.....	± 30.00°
Set back.....	± 10.00°
Thrust angle.....	± 10.00°
Steering angle.....	± 10.00°
Full steering angle (manual input of the reading performed on the graduated mechanical turntables) ..... ± 99.99°	
- Maximum resolution:..... ± 0.01° (0.1 mm)
- Power supply (standard):..... 110/230 Vac. - 50/60 Hz
- Absorbed power: ..... 500 W
- Power supply socket protection (mains fuses):..... 3.15 AT - 250 V
- Radio measuring head batteries:..... 1.2V, AA, 2000-3000 mA/h NiMH rechargeable batteries  
(n. 4 each measuring head)
- Max. dimensions:
 

- Control unit	
600x600x1550	
- Measuring heads.....	895x170x310 mm
- Net weight (control unit with 4 measuring heads):
 

- Control unit. ....	65 Kg
- Measuring heads.....	18.0 Kg
- Electrical and electronical components weight ..... 20 Kg
- Noise level in work conditions:..... < 70 db(A)

**NB:**

**USE ONLY 1.2 V AA NiMH RECHARGEABLE BATTERIES with a capacity between 2000 and 3000 mAh.**

- When fully charged, new batteries with a capacity of 2600 mAh will ensure 8 hours of continuous operation.

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## MACHINE OUTFIT

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1 DVD ROM with programme 1  
Instruction manual.  
1 Steering wheel holder.  
1 Pedal depressor

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## OPTIONAL ACCESSORIES

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*For information, please consult our illustrated catalogue.*

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## WHAT IS AN ALIGNER

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*An aligner or wheel aligner is defined as a measurement instrument detecting the characteristic alignment angles of a vehicle.*

*An aligner consists of a central unit and two or four measuring heads to apply to the wheels of the vehicle.*

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## CHARACTERISTIC ANGLES

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### 1) TOE (Fig. 35 and fig. 36)

*Toe is the angle between the equatorial plane of the wheel and the axis of symmetry or the thrust axis of the vehicle.*

*The axis of symmetry is an imaginary line that divides the car into two halves longitudinally; the thrust axis is the direction of travel of the rear axle.*

*The unit of measurement for toe values is degrees or millimetres.*

### 2) CAMBER (fig. 37)

*Camber is the angle between the equatorial plane of the wheel and the vertical plane; camber is positive when the upper part of the wheel is angled away from the vehicle. The unit of measurement for camber values is degrees.*

### 3) CASTER (fig. 38)

*Caster is the angle formed between the vertical and an imaginary extension from the steering axis on the longitudinal plane of the vehicle (longitudinal upright angle).*

*Caster is measured with the wheels turned. The unit of measurement is degrees.*

### 4) KING PIN ANGLE (fig. 39)

*This is the angle formed between the vertical and the extension of the steering axis on the transverse plane of the vehicle (transverse upright angle).*

*The king-pin angle is measured with the wheels turned. The unit of measurement is degrees.*

#### **5) TOE-OUT ON TURN (fig. 40)**

*Steering angle toe difference on the front wheels. The unit of measurement is degrees.*

#### **6) SET BACK (or misalignment of wheels on the same axle) (fig. 41)**

*This measurement shows the difference in position of one wheel with respect to the other on the perpendicular of the longitudinal axis of the vehicle.*

*Set back is measured on the front and rear axles of the vehicle; although rear set-back must not be confused with the thrust angle. The unit of measurement is degrees.*

#### **7) THRUST ANGLE (fig. 42)**

*This is the angle formed between the axis of symmetry of the vehicle and the direction of travel of the rear axle.*

*The unit of measurement is degrees.*

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## **MAIN OPERATIONAL COMPONENTS OF THE MACHINE**

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### **WARNING**

**Get to know your machine.** The best way to prevent accidents and obtain top performance from the machine is to ensure that all operators know how the machine works.

**Learn the function and location of all commands.**

**Carefully check that all the commands on the machine are working properly.**

**To avoid accidents and injury, the machine must be installed properly, operated correctly and serviced regularly.**

### **Central Unit**

*Fig. 22*

1. Monitor
2. Printer
3. Personal Computer
4. Keyboard
5. Measuring heads
6. Measuring head compartment
7. Monitor mount

## Radio communication measuring heads

The measuring heads (fig. 24) of this aligner do not require any cables or cords because they have been designed using the latest CCD technology.

The angles are measured by means of 8 CCD goniometers and the data are transmitted from the measuring heads to the central unit by means of radio-frequency devices.

Each measuring head is equipped with a rechargeable battery pack which, when fully charged, is able to operate for approximately 8 hours.

Batteries can be charged by simply cable-connecting the measuring heads to the central unit.

In order to avoid running down the battery, the measuring heads automatically switch off after approximately five or ten minutes of inactivity (the automatic switch-off time depends on the conditions in which the measuring heads are not used, as explained in the "Measuring heads" section below), keeping in memory the data calculated up until that time.




At the time of automatic switch-off an audible warning is sounded to alert the operator.

Each measuring head must be positioned exclusively on the vehicle wheel indicated on the adhesive data plate affixed to the measuring head.

Fig. 24

1. Keyboard
2. Connector for recharging/emergency cable connection
3. Battery housing
4. Longitudinal CCD goniometer
5. Transverse CCD goniometer
6. Hole for inserting the clamp pin
7. Measuring head release button
8. Locking knob

• Description of keys and measuring head keypad functions (fig. 25)

Symbol	Description
	<b>"Power"</b> key Switches the measuring head on and off (the LED above the key indicates the working status).
	<b>"ROC"</b> key Starts the compensation procedure (the LED above the key indicates the ROC procedure execution status).
	<b>"Level"</b> indicator LEDs.

	<p>Battery charge status is indicated by the two LEDs on the recharge/emergency cable connector (2, fig. 24).</p> <p>Green LED on, charge in progress; orange LED on, charge problems; both LEDs on and head working, battery charged; both LEDs off and head not working, battery failure or not present)</p>
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## PREPARING VEHICLES FOR WHEEL ALIGNMENT

*In order to perform wheel alignment correctly, all parts of the vehicle must be in compliance with the manufacturer's specifications; it is especially important to check the tyre pressure and eliminate play in bearings and ball joints.*

*Position the vehicle over an inspection pit or on a lift that is correctly equipped for alignment operations. Make sure that the turntables and oscillating footboards are locked.*

*Mount the self-centering clamps on the wheels and lock them on the rim using the handles.*

*For steel or projecting edge rims, the clamps should be secured from the inside (1, fig. 23), in the case of alloy rims secure the clamps from the outside (2, fig. 23), for rims with plastic covers secure the clamps from the inside with the pins reversed (3, fig. 23).*

*If necessary, you can tap the wheel clamps gently with the hand to fit the clamp nose between the rim and the tyre bead.*

*For other types of support clamps with a jaw or dedicated closing device, follow the instructions attached and inserted in the specific package.*

*Insert the measuring heads on the pin of the self-centering clamps until they snap into position.*

## SWITCH-ON AND SWITCH-OFF

### Central unit

*Switch the PC on then wait for the starting screen to appear (fig. 26). To correctly switch off the aligner:*

- return to the starting screen (fig. 26)
- press the "F10" key;
- confirm by choosing "√"
- wait for the computer to switch off (screen goes blank)



### ATTENTION

**Never switch off the machine when there is a page other than the logo page because such an action might damage the PC.**

**If this should occur, when the PC is switched back on, the software will request the user to press any key to perform the "SCANDISK" operation.**

**This operation is used to check that the PC has not been damaged and, if necessary, to update some files that might have been damaged.**

**At the end of the process, if the program reboots normally, then no problems have occurred. Instead, if any message appears that blocks the program start-up procedure, contact the nearest technical assistance centre.**



## Measuring heads

Switch on the measuring heads by pressing the "Power" key on the keypad (fig. 25).

The green LED indicates that the measuring head has powered up.

To switch off the measuring heads, press the "Power" key again.

The measuring heads can also be powered down automatically ("auto switch-off") by a special software procedure in the following cases:

- if the equipment has been inactive for about five minutes, with no communications between measuring heads and central unit and no measuring head key pressed.
- if the equipment has been inactive for about ten minutes, with no angles recorded and/or no measuring head or central unit key pressed.
- when the battery power level falls below the minimum value required for operation.

### Note

Each sensor head is powered by a NiMH battery that is recharged by connecting the sensor head recharge cable to the electrical connector panel (H, fig. 11). The yellow LED on the sensor head connector lights to indicate when charging is in progress.

The manufacturer cannot be held responsible for any damage caused by the use of non-original batteries or battery chargers.

### Battery recharging procedure

Battery charging is managed directly from the head board. The charging cables carry 12 V DC voltage directly from the PC power unit.

The batteries may also be charged by connecting the sensors to the central unit with the emergency cables.

The possible signals displayed by the sensor head during charging are described as follows. •

Yellow LED on: charging in progress;

- Red LED on: charging error;
- both LEDs off and sensor head working: battery charged;
- both LEDs off and sensor head not working: battery faulty or absent

### Run-down process

For maximum durability and optimum operation, the NiMH type batteries used in the wheel balancer sensor heads must be periodically run-down.

The run-down process consists in draining all four batteries completely with a constant absorption current, and then recharging them.

We recommend running down the batteries every 15 - 30 days, depending on the number of recharge cycles performed (the more frequently the batteries are charged, the more frequently the run-down procedure is necessary). To run down the batteries, leave the sensor heads on (from the sensor head test screen) until the batteries are fully drained.

### NB:

Rechargeable NiMh AA penlight batteries are used. When fully charged, new batteries will ensure 8 hours of continuous operation.

## GENERAL CONSIDERATIONS

*The equipment's simple interface makes operation quick and easy to learn. The operating procedures are generally standardised throughout the program, as summarised below.*

### Selecting functions

*The functions available in each program context are shown as special icons on a bar at the bottom of the screen.*

*To select a specific function, press the key (from F1 to F10) indicated on the icon in question. To facilitate and simplify the use of the machine, each key is generally associated with the same type of command in the various program contexts.*

*In particular:*

- F1 invokes the on-line "Help".
- F2 equivalent to "Esc", returns to the previous window (except in the starting screen where a password must be entered to shut down the program and switch control to Windows®).
- F3 equivalent to "Enter", advances to the next window.
- F4 calls up a screen of status option settings, subdivided into logical groups. For example: units of measurement, measurement data resolution, ...  
     *The options shown are context-sensitive in relation to the point of the program in which F4 was pressed.*
- F10 returns to the starting screen. When pressed from the starting screen, this key exits both the program and Windows®, in order to correctly switch off the PC.
- F5 ÷ F9 have functions which may vary in the context of each specific program.

### Scrolling items in a list

*To scroll and select items from a list (menu), such as the databank, use the ↑, ↓ arrow keys and the Pag↑, Pag↓ page up/down keys.*

*Sometime the values in a table can be selected by scrolling up or down through the fields provided using the F5 or F6 keys.*

*In some cases an item can be selected directly by typing its first letter.*

### Setting an option







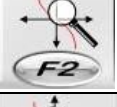







*To change the options in the screens called up by pressing the F4 and F5 keys, use the "Tab", "Shift" + "Tab" keys to move from one group of options to the next, and the ↑, ↓ arrow keys to scroll through the individual options within the selected group.*




*Press the F3 key to exit the Setup window and save the settings.*


















*When the system then prompts confirmation of the choice made, you may:*

- select F2 to not save the changes made
- select F3 to confirm the settings made
- select F4 to abort the saving procedure and remain in the setup window.

The table below lists the various icons and their corresponding functions. Each icon also indicates the associated function key.



















SYMBOL	FUNCTION DESCRIPTION
	<i>Invokes the on-line Help</i>
	<i>Exits the on-line Help</i>
	<i>Exits the aligner program and go to the Windows desktop (available only from the starting screen)</i>
	<i>Returns to previous screen</i>
	<i>Exits the confirmation window without saving the settings that have been changed (only available in the confirmation windows)</i>
	<i>Exits the confirmation window and confirms the choice made</i>
	<i>Selects the toe curve checking procedure.</i>
	<i>Selects the toe curve adjustment procedure.</i>
	<i>Advances to next screen</i>
	<i>Exits the confirmation prompt window and saves the settings that have been changed (only available in the confirmation windows)</i>
	<i>Exits the confirmation window and confirms the choice made</i>
	<i>Aborts the confirmation prompt window and returns to the work or setting selection window (only available in the confirmation windows)</i>
	<i>Resets job count to zero.</i>
	<i>Resets the jobs counter</i>

	<i>Displays the aligner setup window (in the main window); displays the contextual setup window (in the working windows)</i>
	<i>Exits the confirmation window without confirming the choice made</i>
	<i>Exits the confirmation window and confirms the choice made</i>

	<i>Aborts the confirmation prompt window and returns to the work or setting selection window (only available in the confirmation windows)</i>
	<i>Performs automatic identification of the type of radio module to the central unit</i>
	<i>Selects control of the central unit radio module</i>
	<i>Selects control of the measuring head radio module</i>
	<i>Decreases the rim diameter measurement</i>
	<i>Scrolls down to the next item in a list (only available in windows with a list of options)</i>
	<i>Chooses adjustment of the vehicle's axle with the wheels raised</i>
	<i>Concludes adjustment of the vehicle's axle with the wheels raised</i>
	<i>Displays the next page, the windows which contain a large amount of information are divided into pages. (E.g. On-line help, job record management, etc.)</i>
	<i>Displays the Smart Card "Data Form" window (only available in the Diagnostics window)</i>
	<i>Displays the job record management window</i>
	<i>Resets any steering wheel alignment correction values already in the memory</i>
	<i>On/off function for maximum steering angle check (only available if electronic turntables have been enabled in the setup). Enabled option When the option is enabled an icon displaying a turntable appears in the top right-hand corner of the heading bar.</i>
	<i>Prints the current window.</i>
	<i>Carries out a data backup (makes a reserve copy of the data present in the file).</i>
	<i>Carries out a data restore (carries out a data reset, replacing the data available in the file with those saved previously).</i>
	<i>Stores the set configuration.</i>









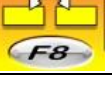










*Perform standard programming (with default settings) of the radio modules operating at 2.4 GHz*

	Switches between display of the caster, total toe and setback adjustment boxes. (only available in the front axle adjustment window).
	Switches between display of the camber, track difference and setback adjustment boxes. (only available in the rear axle adjustment window).
	Accesses and performs the procedure for update of the enabled programs, using the smart card (in the service procedure)
	Runs the front spoiler procedure (the key only appears when the front transverse goniometers do not give a reading)
	Accesses the measuring head zero-calibration procedure
	Deletes the selected datum (a Make, Vehicle, Customer or Job)
	Loads the data of the last job saved into the memory
	No job available for loading into the memory
	Increases the rim diameter measurement
	Scrolls up to the next item in a list (only available in windows with a list of options)
	Displays the Make - Vehicle - Customer modification window
	Transmits data between the PC and the (optional) chassis height and angle measurement instrument
	Displays the vehicle record window.
	Runs the rear spoiler procedure (the key only appears when the rear transverse goniometers do not give a reading)
	Displays the vehicle adjustment window, showing the adjustments of the various angles for the selected vehicle.
	Starts the measuring head zero and full scale calibration procedure.
	Deletes the selected item (Make - Vehicle - Customer - Job) (Make - Vehicle entered by the user).
	Opens the customer record management window.

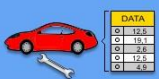

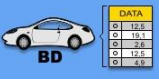




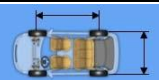













*Prints out the final record of the job done.*







	Sets chassis clearance data input with unit of measurement in millimetres.
	Sets chassis clearance data input with unit of measurement in degrees.
	Displays the calibration check window.
	Displays the window for input of a new Customer - Vehicle - Make - Operator.
	Displays the radio module setup window.
	Displays the operator management window.
	Displays a window with a list of working windows. Used for skipping between windows.
	Displays the service programme selection window. [Demo – Crooked steering wheels – Measuring head calibration – Measuring head test – After-sales service – Job count (if set) – Radar adjustment (Optional, if enabling has been purchased) – Backup/Restore].
	Recalls the window for selection of the vehicle from the databank.
	Displays the window for checking of the calibration of the mechanical values.
	Skips vehicle selection from the databank by selecting "typical vehicle" mode.
	Locks out the data to allow levelling of the measuring heads.
	Releases the data locked out earlier to allow levelling of the measuring heads.
	Opens the job record for input of the customer and vehicle data
	Aborts the job in progress and returns to the "starting screen".
	Exits the aligner program and Windows, initiating the correct power-down procedure (available only from the starting screen)
	Returns to the window which opened a list of options (only available in windows with a list of options)

The tables below provide a list of the icons available in the windows, with a list of options (menus for skipping between windows) and the description of the relative functions.

MENU AVAILABLE IN JOB STATUS	
SYMBOL	FUNCTION DESCRIPTION
	<b>Data summary:</b> (Displays the window which summarises the adjustment data for the current vehicle).
	<b>Databank:</b> (Displays the window for selection of a vehicle from the databank).
	<b>Databank Summary:</b> (Displays the window with the adjustment data for the current vehicle, taken from the databank).
	<b>Steering angle:</b> (Displays the window for performance of the steering lock for measurement of the caster, king pin, included angle and maximum steering angle).
	<b>Rear Axle:</b> (Displays the rear axle adjustment window).
	<b>Front Axle:</b> (Displays the front axle adjustment window).
	<b>Ballast and fuel:</b> (Displays the window for ballast location and the amount of fuel. only available for vehicles which require ballast and/or known amounts of fuel)
	<b>Wheelbase and track:</b> (Displays the window containing the wheelbase and track measurement for the vehicle being tested).
	<b>Previous jobs</b> (Displays the window containing the list of jobs saved previously, to allow comparison with the current measurement).
	<b>Toe curve:</b> (puts into execution the toe curve adjustment procedure).
MENU AVAILABLE IN SERVICE STATUS	



SYMBOL	FUNCTION DESCRIPTION
	<b>Demo:</b> (sets the aligner program to work in demo mode, without using the measuring heads).
	<b>Crooked Steering Wheels:</b> (Starts the crooked steering wheel adjustment procedure).
	<b>Measuring head calibration:</b> (Displays the window for selection of the various measuring head control and calibration procedures).
	<b>Measuring head test:</b> (Displays the measuring head test window).
	<b>Technical Assistance:</b> (Displays the window for diagnostics, measuring head setup, reading of the enabled smart card settings and radio module setup).
	<b>Job Count:</b> (puts into execution the visualisation of the jobs performed by the wheel aligner; the visualisation is protected with a password). This function is visible only if enabled in the wheel aligner general setup.
	<b>Radar adjustment:</b> (displays a selection window where the type of rader you wish to align can be selected). This function is optional. It can be enabled by purchasing an additional <b>AVP</b> or <b>MBP</b> enabling kit.
	<b>Data saving (Backup):</b> (visualises the window for the manual execution and/or automatic execution setting of the data Backup procedure).
	<b>Data reset (Restore):</b> [visualises the execution window for resetting the data (Restore)].

#### MENU AVAILABLE IN THE ROC STATUS

SYMBOL	FUNCTION DESCRIPTION
	<b>3-point ROC:</b> (Selects three-point ROC. This procedure saves three positions for each wheel, for ROC calculation). The procedure can also be carried out on each individual measuring head, when it is fitted to the wheel, even if the other measuring heads have not yet been fitted on the other wheels.
	<b>Push-mode ROC:</b> (selected to perform the ROC without removing the vehicle's wheels from the lift or from the floor). It is performed by pushing the vehicle backward for 90°, confirming the position by pressing the ROC button on a head, then, moving the vehicle forward, until it reaches the initial position, confirming again the position by pressing the ROC button on a head.).
	<b>ROC skip:</b> (The working procedure moves on straight to the working windows, without performing the ROC calculation).
	<b>ROC Recall:</b> (Recalls the data from the last ROC procedure performed. Normally used when the data have to be recovered, without having to repeat the ROC procedure, after a power failure while a job is in progress).

## MENU AVAILABLE IN RADIO CONTROL STATUS

SYMBOL	FUNCTION DESCRIPTION
--------	----------------------

	<b>Automatic master module search:</b> <i>(Opens the window for automatic identification of the type of radio module connected to the central unit)</i>
	<b>2.4 GHz module service:</b> <i>(Opens the window for control of central unit and measuring head radio modules operating at the frequency of 2.4 GHz)</i>

## ERROR WINDOW

When a communications error occurs (a measuring head is switched off) or a measurement error occurs (there is an obstacle between two measuring heads) the window in fig. 33 appears. The illustration show the vehicle's two axles, with a line and an arrow identifying the measuring head where the error has occurred.

In these cases, the cause of the error must be corrected in order to resume normal operation. If this is not possible, press F10 to return to the starting screen and correctly exit the program. Then call in the technical support service.

When being used in demo mode without the measuring heads, the system must ignore measurement and data transmission errors due to the absence of the measuring heads themselves.

To do this, select the "Demo" option in the Service" window.

To access the service window, press the F8 key from the programme's starting screen.

In this situation ("Demo" mode), a special icon is displayed in the top right-hand corner of the heading bar. The values displayed are completely random.

At the end of the demo, remember to repeat the same procedure to return the machine to working status.

## STARTING WINDOW

The following keys are active in the starting window (fig. 26):

- F1 invokes on-line "Help".
- F2 exits the alignment program (with password prompt) and return to the Windows desktop.
- F3 (or "Enter") goes to the next screen in the established operation sequence (job record, vehicle / customer databank, compensation, measurement).

- F4 sets up all the status option settings (setup).
- F6 to recover the last job done (with icon active).
- F8 opens the utility procedures window.
- F9 skips vehicle selection from the databank ("generic vehicle" mode).
- F10 exits the alignment program and Windows **with the correct power-down procedure**.

Press the F4 key to display/set up all the aligner options.

The general setup function (F4 from the starting window) has been provided because some users prefer to change all the available options before starting the measurement procedures. In all the working windows, press the F4 key to display/set up all the options relating to the current working window.

---

## JOB RECORD WINDOW

---

If vehicle selection by means of job record has been set in the machine setup as alignment operating procedure, the job record input window appears automatically.

This window allows input of the vehicle data, the customer and the vehicle make/model selection following the procedures described in the "General Considerations" section.

The following keys are active in this window:

- F1 displays the on-line "Help" function
- F2 returns to the previous screen
- F3 (or "Enter"): advances to the next window - F4 sets :

- ☞ Units of measurement:

- ⑨ Pressure

- Bar
      - Psi.

- ⑨ Mileage/Kilometres on the clock

- Kilometres
      - Miles

- ☞ Job record

- ⑨ Type

- Minimal
      - Complete

- F5 to access job record management
- F6 to access vehicle record management
- F7 to access customer record management
- F8 to access operator record management
- F9 to access the databank and select the vehicle make/model (the databank can also be accessed by pressing the down arrow on the "Make" line)
- F10 aborts the job in progress and returns to the starting window.

### **Notes**

- By entering the customer and vehicle data, the program checks if the same data are already stored in the file. If the data are already stored, the page is automatically filled in with the

previously stored data. If all of or some data are not present, they will be stored upon job completion only.

**Note:** Data storage is performed only if set in the wheel aligner general setup.

---

## JOB RECORD MANAGEMENT WINDOW

---

To access this window, press the F5 key from the job record input window.

It displays the list of jobs saved on file. To select a job, proceed as described in the paragraph "General considerations".

The following keys are active in this window:

- F1 displays the on-line "Help" function
- F2 returns to the previous window
- F3 (or "Enter"): confirms selection of a job and advances to the window which displays the job record on file.
- F4 orders the job record list according to:
  - Date;
  - Customer;
  - Vehicle registration number;
  - Operator;
  - Order number
- F5 complete list of the jobs in the file. - F7 deletes the job record selected from file - F10 returns to the job record input window.

---

## VEHICLE RECORD WINDOW

---

To access this window, press the F6 key from the job record input window.

It displays the list of vehicles saved on file.

To select a job, proceed as described in the paragraph "General considerations".

The following keys are active in this window:

- F1 displays the on-line "Help" function
- F2 returns to the previous window
- F3 (or "Enter"): confirms selection of a vehicle and advances to the window which displays the vehicle's data.
- F5 to print the complete list of the vehicles stored in the file.
- F6 modifies the data of the vehicle selected from file
- F7 deletes the selected vehicle from file
- F8 enters a new vehicle on file
- F10 returns to the job record input window.

### **Notes**

- Press F8 to enter a new vehicle; the program checks if it is stored in the file when the car number is entered. If the data are present, the program signals it and asks if they have to be displayed. If you answer yes, the window is automatically filled in. If you answer no, an empty window appears so that the car number can be entered.

- If the customer data are changed or new data are entered for the first time, the program asks if you wish to access the customer data sheet management window for entering and storing the data.

---

## CUSTOMER RECORD WINDOW

---

To access this window, press the F7 key from the job record input window.

It displays the list of customers saved on file.

To select a job, proceed as described in the paragraph "General considerations". The following keys are active in this window:

- F1 displays the on-line "Help" function
- F2 returns to the previous window
- F3 (or "Enter"): confirms selection of a customer and advances to the window which displays the customer's data.
- F5 to print the complete list of the customers stored in the file.
- F6 modifies the data of the customer selected from file
- F7 deletes the selected customer from file
- F8 enters a new customer on file
- F10 returns to the job record input window.

### Notes

- Press F8 to enter a new customer; the program checks if the customer is stored in the file when the relevant data are entered. If the data are present, the program signals it and asks if they have to be displayed. If you answer yes, the window is automatically filled in. If you answer no, the window appears completely empty.

---

## OPERATOR RECORD WINDOW

---

To access this window, press the F8 key from the job record input window. It displays the list of operators saved on file.

To select a job, proceed as described in the paragraph "General considerations". The following keys are active in this window:

- F1 displays the on-line "Help" function
- F2 returns to the previous window
- F3 (or "Enter"): confirms selection of an operator and advances to the window which displays the operator's data.
- F5 to print the complete list of the operators stored in the file.
- F6 modifies the data of the operator selected from file
- F7 deletes the selected operator from file
- F8 enters a new operator on file
- F10 returns to the job record input window.

**Notes**

- Press F8 to enter a new vehicle; the program checks if the operator is stored in the file when the relevant data are entered. If the data are present, the program signals it and asks if they have to be displayed. If you answer yes, the window is automatically filled in. If you answer no, the window appears completely empty.

If you do not wish to confirm saving, press F2.

---

## FILE DATA INPUT WINDOW

---

The data input windows refer to:

- Marks of vehicle in databank;
- Models of vehicle in databank;
- Customers on file;
- Vehicles on file;
- Operators on file.

---

## FILE DATA MODIFICATION WINDOW

---

The modification screens refer to:

- Vehicle makes in databank (makes entered by the operator)
- Vehicle models in databank (models entered by the operator)
- Customers on file
- Vehicles on file
- Operators on file

To make a modification, proceed as follows:

- select the field to be modified using the "Tab" or "Shift" + "Tab" keys (if the window contains more than one field)
- enter a new character/value over the letters or numbers of the selected item - re-enter the correct value.

To confirm the changes made and exit this window, proceed as follows:

- press the F3 key; you will be prompted to confirm saving of the modified data. - press F3 to confirm.

To enter the data, proceed as follows:

- select the field to be entered using the "Tab" or "Shift" + "Tab" keys (if the window contains more than one field)
- type a character/value

To confirm the data entered and exit this window, proceed as follows:

- press the F3 key; you will be prompted to confirm saving of the data. - press F3 to confirm,

If you do not wish to confirm saving, press F2.

When entering a new item, the system prompts the user with data for a similar vehicle to simplify the entry of the tolerance data.

**Notes**

The data for a new customer and/or a new vehicle can also be entered at the end of the measurement and adjustment procedure of a model chosen from the vehicle databank. In the



printing window, a message prompting the input of data will appear when saving of data on request or in automatic mode has been set in the setup.

In the printing window, the data input window is accessed by pressing the F9 key.

---

## VEHICLE MAKE AND MODEL SELECTION WINDOW

---

If display of the vehicle make and model selection window has been set as part of the operating sequence in the machine setup, this window appears automatically. It allows the user to select the make of the vehicle using the procedures described in the paragraph "General Considerations".

The following keys are active in this window:

- F1 displays the on-line "Help" function
- F2 returns to the previous screen
- F3 (or "Enter"): confirms selection of a make and advances to model selection window - F4 chooses whether to display:
  - ⑨ Makes/models file
    - all the available makes;
    - only makes from the primary databank;
    - only user-defined makes in the secondary (personalised) databank.
  - ⑨ Markets
    - Argentina
    - Brazil
    - China
    - Europe
    - Japan
    - Korea
    - Asia
    - North Africa
    - North America
    - Oceania
    - South Africa
    - South America
  - ⑨ Listing order
    - Alphabetical
    - By date
  - ⑨ Vehicle description
    - Commercial
    - Manufacturer
- F6 modifies a previously entered make (only for user-entered makes)
- F7 deletes a previously entered make (only for user-entered makes if there are no associated models)
- F8 enters a new make (see paragraph "Enter/Modify window") - F10 returns to the starting window.

### Notes

- The aligner cannot be operated unless a hardware protection key (SIM) has been inserted.

- The main protection circuit board configured for the basic version is supplied with the machine.



## ATTENTION

For the wheel aligner to operate, the main card must always be present and fitted into the slot inside the unit; in case of malfunction, make sure that the reader is wired correctly as described in the operator's manual.

- At start up, the program checks for the sim card and operating levels enabled. If the sim card is not detected, an error message will appear (fig. 44). It will only be possible to use the program in demo mode.
- Check that the Hard Lock device is correctly connected to the computer (fig. 11) and/or that the sim card is present and correctly inserted in the reader.

## Notes

- To give an idea of the size of the sim card and thus of the seat provided for it on the circuit board, fig. 46 shows how this is obtained: press with your thumb on the centre of the card to release the two connecting tabs and obtain the sim card to be used.
- The sim card must be fitted with the gilded insert (fig. 47) facing upward and the bevelled edge facing outward, as shown (fig. 47). Push it right into place.
- At start up, as well as checking for the sim card the program also checks the operating levels enabled on it.

## Enabling extra wheel aligner functions

Additional wheel aligner functions are enabled by updating its main protection card. Upgrading is performed with the "Upgrade SIM CARD" obtained by ordering the relative accessory kit. Upgrade cards are marked with specific symbols for identification. More detailed information on identifying upgrade cards is given in the leaflet accompanying the upgrade card itself.

## Data bank abbreviations

/	Separates different models
4WD	Four Wheel Drive
4WS	Four Wheel Steering
4x4	Four wheel drive
8565050+	From this chassis number
8565050-	Up to this chassis number
ALU	Lightweight alloy wheels
AS	Pneumatic suspension system
HS	Hydraulic suspension system
CAB	With cab
CABR.	Cabriolet
CYL	Cylinders
DR	Door

<i>ESTATE</i>	<i>Estate version (station wagon)</i>
<i>FWD</i>	<i>Front wheel drive</i>
<i>HD</i>	<i>Heavy-duty or offroad</i>
<i>LHD</i>	<i>Left hand drive</i>
<i>PAS</i>	<i>Power assisted steering</i>
<i>R</i>	<i>Radial</i>
<i>RHD</i>	<i>Right hand drive</i>
<i>BT</i>	<i>"BIAS" tyre</i>
<i>RT</i>	<i>Radial tyre</i>
<i>RWD</i>	<i>Rear wheel drive</i>
<i>S</i>	<i>Special or sport</i>
<i>SPORT</i>	<i>Sport</i>
<i>SLS</i>	<i>Self levelling suspensions</i>
<i>SW</i>	<i>Station wagon</i>
<i>T</i>	<i>Turbo</i>
<i>TD</i>	<i>Turbo diesel</i>
<i>TDI</i>	<i>Turbo diesel injection</i>
<i>XP</i>	<i>Normal tyres</i>
<i>IRS</i>	<i>Independent rear suspensions</i>
<i>IFS</i>	<i>Independent front suspensions</i>
<i>SPS</i>	<i>Sports suspensions</i>
<i>SWB</i>	<i>Short wheel base</i>
<i>MWB</i>	<i>Medium wheel base</i>
<i>LWB</i>	<i>Long wheel base</i>
<i>MM/AA+</i>	<i>After the indicated date (month/year)</i>
<i>MM/AA-</i>	<i>Before the indicated date (month/year)</i>
<i>RS</i>	<i>Rigid suspensions</i>
<i>AT</i>	<i>Automatic transmission</i>
<i>TA</i>	<i>Double axis</i>
<i>TS</i>	<i>Single axis</i>
<i>LOA</i>	<i>Load</i>
<i>PLO</i>	<i>Partial load</i>
<i>UNL</i>	<i>Unloading</i>
<i>AB</i>	<i>Antiroll bar</i>

---

## **"COMPENSATION" (ROC) WINDOW**

---

*Allows the user to perform rim run-out and plane error compensation, using the chosen type of procedure (fig. 28, 29 and 30).*

*The following ROC options are available:*

- **3-point ROC**
- **Push-mode ROC**

- **ROC skip**
- **ROC Recall**

*The following keys are active in this screen:*

- *F1 displays the on-line "Help" function*
- *F2 returns to the previous window*
- *F3 starts the selected ROC procedure (to move on to the next screen if the ROC Skip or ROC Recall procedure has been selected)*
- *F4 sets up the desired type of default compensation procedure and selects the vehicle weight unit of measurement:*
  - ⌘ Roc
    - Ⓢ Roc
      - "three-point ROC"
      - "Push-mode ROC" (90-degree displacement)
      - "ROC skip"
      - "ROC Recall" ⌘ unit of measurement:
    - Ⓢ Weight
      - Kilograms
      - Pounds
- *F5 used to scroll downward through the list of ROC options available - F6 used to scroll upward through the list of ROC options available - F10 returns to the starting window.*

### **Performing "3-point ROC"**

1. *Lift the vehicle.*
2. *Check that the wheels (or one wheel) are able to turn freely and that the measuring heads are switched on and not locked.*
3. *Press the "ROC" key (fig. 25) of the measuring head on which you wish to perform the ROC procedure. An hourglass appears on the screen to indicate the start of the measurement; when the hourglass disappears and the "OK" message appears on wheel concerned, the initial position (0°) of that wheel has been saved in memory.*  
Important: *Do not touch the measuring heads during the measurement data acquisition phase.*
4. *Manually turn the wheel by 90° following the instructions (fig. 28)*  
Important: *Turn the wheel always, and only, in the clockwise direction.*
5. *Press the measuring head "ROC" button again (fig. 25) to have the measuring head store the position.*
6. *Wait for the audible signal and for the "OK" message to appear, indicating that the "90°" position has been saved in memory.*
7. *Manually turn the wheel by another 90° in the same direction.*  
Important: *Turn the wheel always, and only, in the clockwise direction.*
8. *Press the measuring head "ROC" button again (fig. 25) to have the measuring head store the position.*
9. *Wait for the audible signal and for the "OK" message to appear, indicating that the "180°" position has been saved in memory.*
10. *Repeat steps 3, 4, 5, 6, 7 for the other wheels.*

## Notes

- Turn the wheel exclusively in the clockwise direction.
- The compensation of a wheel can be repeated by pressing the “ROC” key of the corresponding measuring head.
- The ROC procedure can be performed on more than one wheel simultaneously; the important thing is not to perform the procedure simultaneously on two wheels on the same side (e.g. front right wheel and rear right wheel).

### Executing “ROC 90” (push mode)

- Check that the wheels are able to turn freely and that the measuring heads are switched on and not locked.
- Press the “ROC” key (fig. 25) on any one of the measuring heads to start the procedure. Four hourglasses appear on the screen to indicate the start of the measurement; when the hourglasses disappear and the “OK” message appears on the four wheels, the measurement of the initial position (0°) has been completed on all the wheels.
- Push the vehicle following the instructions (fig. 29) so as to turn the wheels by approximately 90°.
- Press the “ROC” button of any of the measuring heads again (fig. 25) to have the measuring head store the position.
- Wait for the audible signal and for the “OK” message to appear, indicating that the “90°” position has been saved in memory for all the wheels.
- Move the car to the initial position, thus making the wheels rotate for about 90° in the reverse direction until they reach their initial position (0°).
- Press the “ROC” button of any of the measuring heads again (fig. 25) to have the measuring heads store the position.
- Wait for the audible signal and for the reappearance of the “OK” messages, indicating that the “0°” positions of all the wheels have been saved in memory.

At the end of the compensation procedure, a screen appears containing icons, which represent the operations to be carried out:



Lower the vehicle (only for “3-point ROC”)



Settle the suspensions by bouncing the vehicle up and down



Lock the wheels using the special brake pedal depressor



Lock the measuring heads

- Carry out the operations indicated by the icons

- Press F3 (Enter) to confirm and advance to the next screen. This also concludes the compensation procedure.

## CHASSIS CLEARANCE WINDOW

---

*After ROC has been performed, if the selected vehicle requires certain databank values to be varied as a function of the height of the chassis at specific points, the chassis clearance window appears.*

*The operator must select the height values on the displayed tables, which most closely match those of the vehicle in question. To make the selection, proceed as described in the paragraph "General considerations".*

*In certain cases it is not possible to make a selection; the displayed height values are "prescribed" values, i.e. the only correct references for databank values, to be achieved if necessary by applying weights to the vehicle.*

*The following keys are active in this window:*

- F1 invokes on-line Help.
- F3 (or "Enter"): passes to the next window in the established operating sequence. - F10 returns to the starting window.

---

## DATABANK SUMMARY WINDOW

---

*Shows the databank values for the selected vehicle and allows the rim diameter to be changed using the F5 and F6 keys (fig. 27).*

*The following keys are active in this screen:*

- F1 displays the on-line "Help" function
- F2 returns to the previous screen
- F3 proceeds to the next screen in the established operation sequence - F4 sets the unit of measurement and the alignment procedure:

    ↻ unit of measurement

    ⑨ Toe angle

- Degrees;
- Length;

    ⑨ Diameter

- Diameter selected by user
- Diameter 28.65;
- Diameter 27.28;
- Diameter 400mm

    ⑨ Setback and Track Difference

- Degrees;
- Length;

    ⑨ Length

- Millimetres;
- Inches;

    ⑨ Angles

- Grades;
- Degrees;

    ⑨ Pressure

- Bar;
- Psi;

    ⑨ Weight

- Kilograms;

- Pounds; ⌘ Alignment procedure
- ⑨ Databank value display
  - Yes;
  - No;

- F5 decreases the rim diameter measurement
- F6 increases the rim diameter measurement
- F7 displays the vehicle adjustment window
- F8 displays a window with a list of working windows. Used for skipping quickly between windows. - F10 returns to the starting window.

---

## ANIMATION WINDOW

---

*This window is recalled by pressing key F7 from the following windows:*

- Databank data summary; - Rear axle adjustment - Front axle adjustment.

*This window is used for playing video clips, which illustrate the procedure for adjusting the following angles: - rear toe*

- rear camber
- front toe
- toe curve (for Audi/Volkswagen)
- front camber
- caster
- king pin inclination (King pin)

*Certain angles may be adjusted, in which case the corresponding animations will or will not exist, as indicated by the graphics. To select a video clip, press key F5 or F6 and then press to switch to F3 step-by-step display.*

*When the video clip of the adjustment has finished, key F5 or F6 can be used to scroll through the various steps of the procedure.*

*To switch from step-by-step viewing mode to selection of an angle video clip for display, use the "Tab" or "Shift" + "Tab" keys.*

*The following keys are active in this screen:*

- F1 displays the on-line "Help" function
- F2 (or "Esc"): halts playback of the clip or returns to the previous screen
- F3 (or "Enter"): starts or replays the clip
- F5 Scrolls down through the adjustment selection list /moves on one step in display of the clip for an adjustment.
- F6 Scrolls up through the adjustment selection list /moves back one step in display of the clip for an adjustment.
- F10 returns to the starting window.

---

## STEERING WINDOW

---

For executing the steering for calculating: caster, king pin inclination, included angle, toe-out on turn (fig. 31).

If turntables with graduated scales are fitted, maximum steering can also be measured visually and the reading performed can be entered in a suitable window using the keyboard. Admitted values range from 21.00° to 99.99°; if a value out of that range is entered, the program changes the entered value to the lowest admitted value (21.00°).

The following keys are active in this window:

- F1 invokes on-line "Help"

- F2 returns to the previous screen - F3 advances to the next screen - F4 sets up:

    ☞ Unit of measurement

        ⑨ Angles

            ♦ Grades

            ♦ Degrees ☞

Wheel aligner

    ⑨ turntables enabled;

        ♦ Always;

        ♦ On request;

        ♦ Never;

        ♦ Yes, steering box check;

- F5 sets the maximum steering procedure enabling/disabling (this key is not visible if the "Turntable enabling" field in the setup is set to "Never").

- F8 displays a window with a list of working windows. Used for skipping quickly between windows. - F10 returns to the starting window.

To perform the standard steering procedure, follow the on-screen instructions and proceed as described below:

- release the turntables;

- align the wheels by following the on-screen indicator until "STOP" is displayed;

**Note:** if the vehicle on which the measurements are being made has very low front and rear spoilers, preventing the measuring heads' transverse goniometers from making a reading, the software will display a warning message prompting use of the spoiler procedure, and the program will continue from the spoiler procedure selection window.

- lock all measuring heads perfectly level;

- turn the wheels to the left until the "STOP" message appears;

- wait for the data acquisition and for the turn-right arrows to appear;

- turn the wheels to the right (relative to the centre position) until the "STOP" message appears;

- wait for the data acquisition and for turn-left arrows to appear; • turn the wheels once again to the left to straighten the steering.

The standard procedure detects the steering angle using the measuring head goniometers.

If the full steering procedure has been selected, proceed as follows:

- release the turntables;



- align the wheels by following the on-screen indicator until "STOP" is displayed;

**Note:** if the vehicle on which the measurements are being made has very low front and rear spoilers, preventing the measuring heads' transverse goniometers from making a reading, the software will display a warning message prompting use of the spoiler procedure, and the program will continue from the spoiler procedure selection window.

- Reset the graduated scale in order to measure maximum steering on both turntables.
- lock all measuring heads perfectly level;
- turn the wheels to the left until the "STOP" message appears;
- wait for the data acquisition;
- turn the wheels further to the left until the steering wheel locks;
- read the graduated scale on the turntables, the internal (left wheel) and external (right wheel) maximum steering angle and enter the read values in the corresponding fields on the relevant data input window.
- turn the wheels to the right (relative to the centre position) until the "STOP" message appears;
  - wait for the data acquisition;
- turn the wheels further to the right until the steering wheel locks;
- read the graduated scale on the turntables, the internal (right wheel) and external (left wheel) maximum steering angle and enter the read values in the corresponding fields on the relevant data input window.
- turn the wheels back to the left to straighten the steering.

The maximum steering procedure requires the use of turntables with suitably sized graduated scale.

At the end of the steering procedure, a screen appears with icons indicating the operations to be performed next:



Position the steering wheel with the spokes straight



Lock the steering wheel

If the steering box recording function is enabled, the program will display the icons shown below, indicating the operations to be carried out:



Measure the angle of difference between the current steering box position and the steering wheel straight position.



Remove the steering wheel.

Put the steering wheel back in place with the spokes straight.



Lock the steering wheel.



---

## REAR AXLE MEASUREMENT AND ADJUSTMENT WINDOW

---

*Displays the measured angles for the rear vehicle axis and the reference adjustment tolerances (fig. 32).*

*The values are continually updated to guide the operator performing the adjustment.*

*The following keys are active in this window:*

- F1 invokes on-line "Help"
- F2 returns to the previous window
- F3 (or Enter) advances to the next window
- F4 sets:

- ↻ Unit of measurement

- ⌚ Toe angle
      - Degrees;
      - Length;
    - ⌚ Length
      - Millimetres
      - Inches
    - ⌚ Angles
      - Grades

*Take care over the AIRBAG safety system and steering wheel position measuring heads, if installed.*

*In all cases, the measuring head levelling device readings are displayed.*

*Carry out all the operations indicated by the icons*

*Press key F3 (Enter) to confirm and advance to the next screen.*

*At this point the system acquires and saves the "diagnostic" data for the vehicle, i.e. the values describing the state of the vehicle prior to adjustment.*

*These values are then shown on the screen of the measurement data summary table.*

- Degrees

- ↻ Alignment procedure

- ⌚ Adjustment with car raised
      - On;
      - Off;

- F5 enables/disables execution of the "Jack & Hold" procedure
- F6 switches between display of the camber, Track Difference and Setback adjustment boxes (set back).
- F7 displays the animation window
- F8 displays a window with a list of working windows. Used for skipping quickly between windows.
- F10 returns to the starting window.

### **Notes**

- The numeric values are colour-coded as follows:
  - Red background: value outside the permitted tolerance range;
  - Green Background: value within the permitted tolerance range;
  - Blue background: value with no associated reference tolerance range;
- Animated icons that respond to the progress in the adjustment procedure appear beside the adjustment value display fields.

- The icons assume the following forms:
  - Large icon with pointer.  
Provides an approximate indication of the status of the angle and the wheel position (shown on an arc with different coloured zones: red zones mean value outside tolerance range, central green zone mean acceptable value);  
The large icon with pointer ceases to be animated and the coloured arc disappears when there are no tolerance values for the vehicle selected.
  - Small icon with coloured scale.  
Provides a high-precision reading, appropriate to the tolerance value, of the variations in the adjustment value in relation to the tolerance value. Displayed instead of the large icon with pointer when this icon gives a reading in the green zone. The reading is provided on a graduated bar. When the wheel value is near the limits of the tolerance range, the bar background is white. It switches to green when the wheel adjustment value is at +/- 4 grades from the nominal setting value.
- The status of the measuring head levelling devices mounted on the axle considered appears in the bottom of the screen, above the F5 and F6 keys.

## FRONT AXLE MEASUREMENT AND ADJUSTMENT WINDOW

~~Displays the measured values for the front vehicle axle and the reference adjustment tolerances.~~

The values are continually updated to guide the operator performing the adjustment. The following keys are active in this screen:

- F1 invokes on-line "Help"
- F2 returns to the previous window
- F3 (or Enter): advances to the next window - F4 sets:
  - ↻ Unit of measurement Ⓢ Toe angle
    - Degrees;
    - Length
    - Ⓢ Length
      - Millimetres
      - Inches
    - Ⓢ Angles
      - Grades
      - Degrees
  - ↻ Alignment procedure
    - Ⓢ Adjustment with car raised
      - On;
      - Off;
- F5 enables/disables execution of the "Jack & Hold" procedure
- F6 switches between display of the caster, Total Toe and Setback adjustment boxes (set back) - F7 displays the animation window
- F8 displays a window with a list of working windows. Used for skipping quickly between windows.
- F10 returns to the starting window.

## **Notes**

- *If the steering angle procedure has not been performed, the caster adjustment boxes are displayed completely empty.*
- *If the steering angle procedure has been performed and the front adjustment window is accessed with the front measuring heads not levelled, the caster adjustment boxes are displayed completely empty, with the measuring head not levelled warning sign beside them. Level the measuring heads to display the contents of the adjustment box (in this case it is not necessary to press the caster measurement value freeze key F9, because the software automatically performs this operation invisibly).*
- *During the caster adjustment, in cases where the variation is very great, the inclination of the front measuring head may induce a non-negligible error in the calculated toe and set back values. If this condition occurs at the end of the adjustment, it is recommended to proceed as follows:*
  - *press F9 to lock (freeze) the displayed caster value (shown on yellow background);*
  - *position the measuring head in a visually horizontal position (level); - press F6 again to unlock the caster value; - adjust the toe.*
- *If a clamp or a wheel had to be demounted in order to adjust caster or camber, a new compensation must be performed on that wheel. The only type of compensation (ROC) that can be performed out of the ROC environment - consult the "Compensation" (ROC) window paragraph - is the three-point ROC.*

---

## **MEASUREMENT SUMMARY WINDOW**

---

*The measurement summary window (fig. 48) can be called up from different parts of the program by pressing the F8 key, selecting the "Data Summary" option from the list and pressing the F3 key.*

*This window shows the tolerance value and current adjustment measurements of all the vehicle's axles.*

*The following keys are active in this window:*

- *F1 displays the on-line "Help" function*
- *F2 returns to the previous window*
- *F3 (or "Enter"): advances to the next window - F4 sets the units of measurement* ☉ *Toe angle*
  - *Degrees;*
  - *Length;*
- ☉ *Setback and Track Difference*
  - *Degrees*
  - *Length*
- ☉ *Length*
  - *Millimetres*
  - *Inches*
- ☉ *Angles*
  - *Grades • Degrees* ☉ *Pressure*
  - *Bar*
  - *Psi* ☉ *Weight*
  - *Kilograms*

- Pounds - F10 returns to the starting window.

---

## PREVIOUS JOBS WINDOW

---

The window can be called up from different parts of the program by pressing the F8 key, selecting the "Previous Jobs" option from the list and pressing the F3 key.

If the job record (at least the registration number) has been filled in for the vehicle being measured, when this function is accessed the program displays the list of jobs already saved for the vehicle; otherwise, it displays the full list of all the jobs on record, to allow selection of the job required.

After selecting the memorised job for display, press F3 and the screen will display all the values saved and the values currently measured, to allow easy comparison, so any shifts in the vehicle's geometry can be identified at a glance.

The following keys are active in the job record selection screen:

- F1 displays the on-line "Help" function
- F2 returns to the previous screen
- F3 (or "Enter"): advances to the next screen - F4 to print the list of jobs on record - F10 returns to the starting screen.

The following keys are active in the screen which compares with saved and current values:

- F1 displays the on-line "Help" function
- F2 returns to the previous screen
- F7 prints the comparison between the saved and current values.
- F10 returns to the starting screen.

---

## TOE CURVE WINDOW

---

The window can be called up from the front axle adjustment window only, by pressing the F8 key, selecting the item "Toe Curve" from the list and pressing the F3 key.

It allows the manual toe curve measurement and adjustment procedure to be performed. The "preparing vehicles for wheel alignment" window is displayed. Follow the instructions indicated and press F3.

The toe curve adjustment window is displayed; adjust, then press F3.

The "preparing vehicles for wheel alignment" window is displayed again. Follow the instructions indicated and press F3 to go back to the front axle adjustment procedure.

The following keys are active in the "preparing vehicles for wheel alignment" window and in the "Toe curve" window:

- F1 displays the on-line Help
- F2 goes back to the previous window
- F3 (or "Enter") goes to the next window
- F7 displays the vehicle adjustment window - F10 goes back to the previous window.

---

## PERSONALISE PRINTOUT WINDOW

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*Appears at the end of a measurement cycle (fig. 45).*

*Allows setting of the advertising message that will appear on the printout, together with the number of copies.*

---

## SPOILER PROGRAM

---

*This program allows measurement of angles even on vehicles equipped with especially low spoilers which block measurement by the front and/or rear transverse goniometer.*

*If this condition occurs, before display of the “Rear axle measurement and adjustment window”, the screen shows the usual error page (fig. 33) indicating the measurements which are not possible.*

*The following conditions may occur.*

### 1. Rear spoiler

*The user may:*

- *press key F3 to continue. It will not be possible to calculate the rear axle set back;*
- *press key F7 to select the “Rear Spoiler program”.*

### 2. Front spoiler

*The user may:*

- *press key F3 to continue. It will not be possible to calculate the front axle set-back;*
- *press key F6 to select the “Front Spoiler program”.*

### 3. Front and rear spoilers

*The user must press F6 or F7 to select the spoiler program.*

*The user may choose to perform the spoiler program on the rear axle (by pressing key F7) or on the front axle (by pressing key F6).*

*The spoiler program must be carried out, following the prompts which appear on the screen, as described below:*



- *Tilt the front or rear left-hand measuring head (depending on the chosen procedure) until the infrared measuring beam is able to pass below the spoiler;*



- *Press key F3 to memorise the measuring head angle of inclination.*



- Tilt the front or rear right-hand measuring head (depending on the selected procedure) as described above; obtaining this condition is assisted by the movement of the cursor on the graduated scale shown on the screen, and signalled by appearance of the "STOP" icon.



- Return the two measuring heads to the level condition



- Press key F3 to display the "Rear axle measurement and adjustment window".

If the infrared measuring beam is still obstructed after the second measuring head has been tilted to the level indicated, the user must repeat the procedure, lowering the first measuring head further and readjusting the position of the second measuring head. The program guides the operator through the procedure with the same icons described above.

#### **Note:**

If the front and rear spoilers are fitted, independently from the spoiler procedure selected, at the end of the procedure on the axle selected, the program will indicate that the spoilers are fitted and will ask you if you wish to perform the procedure on the other axle.

It is possible to choose whether or not to perform the second spoiler procedure, which, in this way, will allow set back measurement on both axles.

During execution of the Spoiler program, the following keys are active:

- F1 to display the on-line "Help" function
- F2 to return to the previous window
- F3 to store the first measuring head camber value after it has been lowered - F10 returns to the starting window.

#### **Notes**

If the vehicle on which the measurement is being performed is fitted with very low front and rear spoilers that impede the measurement of the measuring head transverse goniometers, the double spoiler procedure is requested in the caster measurement window so as to allow the wheel to be aligned before starting steering.

---

## **JACK & HOLD PROGRAM**

---

This program is started by selecting the corresponding F4 menu option from the wheel aligner program starting window.

It allows the vehicle's characteristic angles to be adjusted with the axle concerned lifted, by first locking ("freezing") the value displayed for the lowered vehicle, so that the variations caused by the lifting operation are ignored.

Follow the graphic prompts on the screen, described below:

- press F5 with the vehicle lowered to lock (freeze) the values;
- level all measuring heads;
- lift the vehicle;

- level all measuring heads again;
- press the F3 key to confirm that the vehicle has been lifted;
- perform the adjustment;
- press the F5 key again to lock (freeze) the values again;
- level all measuring heads;
- lower the vehicle;
- level all measuring heads again;
- press the F3 key again to confirm that the vehicle has been lowered.

---

## UTILITY PROCEDURES WINDOW

---

*The service window is accessed by pressing key F8 from the wheel aligner program starting window.*

*A list of the options available is displayed:*

- Demo;
- Crooked steering wheels;
- Measuring head calibration;
- Measuring head Test;
- Technical Assistance;
- Job Count (if enabled in the wheel aligner general setup – F4 from the Logo page).

*Select an option and press F3 to access the chosen procedure.*

### Demo

*Select the “Demo” option and press key F3 to enable/disable operation of the program in demo mode. In demo mode it is no longer possible to use the measuring heads and all the values displayed are random. Enabling/disabling of this function is indicated by an icon (red **X** over a white car) in the top right-hand corner of the working window.*

### Crooked Steering Wheels Procedure

*This program adjusts the toe values to obtain a perfectly "straight" steering wheel during road testing of the vehicle.*

*Select the “Crooked Steering Wheels” option and confirm by pressing key F3.*

*Perform the various steps of the program as follows:*

- press key F3 to advance one stage;
- position the vehicle as for execution of the complete measurement procedure;
- position the steering wheel as for road testing;
- position the steering wheel with the spokes straight;
- adjust the half-toes until the values shown on screen read zero; - exit the program.

*At the end of the program, the system prompts for permanent saving of the calculated compensation values.*

### Warning !



If the operator, having noted a systematic error, chooses to permanently save the compensation values, the system will automatically apply the corrections to all subsequent toe value calculations.

**This is equivalent to modifying the calibration of the system, and should only be used as a stopgap measure while waiting to perform a proper calibration** with the correct procedures and equipment.

A special icon appears on the screen to signal that there are active compensation values (fig. 49).

Pressing the F7 key deletes previously calculated compensation values.

The following keys are active in this window:

- F1 displays the on-line "Help" function
- F2 returns to the previous window
- F3 (or "Enter"): advances to the next window - F4 sets the units of measurement
  - ⑨ Toe angle
    - ◆ Degrees;
    - ◆ Length;
  - ⑨ Length
    - ◆ Millimetres
    - ◆ Inches
  - ⑨ Angles
    - ◆ Grades
    - ◆ Degrees
- F10 returns to the starting window.

## Calibration Program

This window allows the user to check and/or perform measuring head calibration.

Access the program, and position the measuring heads level as requested.

The procedure required can be selected using keys F6, F7, F8 and F9.

In these screens, data are only communicated between the central unit and measuring heads by means of the wire connection; radio communications cannot be used.

The following keys are active in this screen:

- F1 displays the on-line "Help" function
- F2 returns to the previous window
- F5 displays the head test window
- F6 performs the zero calibration procedure.
- F7 performs the zero and inclinometer full scale calibration procedure.
- F8 performs the measuring head electronic calibration check.
- F9 performs the measuring head mechanical calibration check.
- F10 returns to the starting window.

Only the zero and inclinometer full scale calibration procedure (F7) is described below, because it incorporates the zero calibration procedure.

## **Preliminary operations**

- Place the stand in front of the central unit so that it is perfectly level and stable.
- Adjust the stand when perfectly levelled using the adjustable feet.
- Place the measuring heads on the stand, each in its correct position (fig. 43).
- Level the measuring heads using the special spirit level and then lock them into position.
- Switch on the measuring heads and the central unit.
- Connect the measuring heads together and to the central unit using the connection cables - Select the calibration program.

You will be asked to confirm the selection made.

- Confirm by pressing key F3 (or abort with key F2).

## **Calibrations**

The instructions below refer to the information provided in figure 43.

- Wait for the automatic zero setting of all transducers.
- Place the "high" shim under foot "3"
- Wait for the data acquisition
- Place two "high" shims under feet "1" and "2"
- Wait for the data acquisition
- Place the "low" shim under foot "3" and then the "medium" shim under foot "2" - Wait for the data acquisition
- Position the "low" shim under foot "3" and the "medium" shim under foot "1"
- Wait for the data acquisition
- Place the "low" shim under foot "3" - Place the "medium" shim under foot "1" - Wait for the procedure to finish.

## **Warning !**

All the data acquisition operations take place automatically if the transducer values fall within the established tolerance range; if this is not the case, the procedure halts and signals the out-of-range condition.

## **Electronic Calibration Check**

This window is used to check the measuring heads calibration (or the value read from several transducers including possible electronic corrections calculated and saved during the zero and inclinometer full scale calibration).

In this window, as in all the windows in the calibration environment, data are only communicated between the central unit and heads by means of the emergency cables.

The window shows the calibrator with the measuring heads fitted, each in its own position.

The data for the current check are displayed alongside each measuring head.

The values outside the tolerance thresholds are displayed in red, whereas the positive values are displayed in green.

The following keys are active in this window:

- F1 displays the on-line "Help" function
- F2 returns to the previous window
- F5 moves on to the next step in the calibration check (for step-by-step performance of the zero and inclinometer full scale calibration).
- F6 (only displayed after F5 is pressed), moves back one step in the calibration check.

- F7 provide the printout containing the data of the check performed - F10 returns to the starting window.

### **Warning !**

*If some values are outside the permitted tolerance ranges the zero and inclinometer full scale calibration procedure should be performed. Before performing the zero and inclinometer full scale calibration procedure, it is always important to check that the mechanical calibration is correct.*

### **Mechanical Calibration Check**

*This window is used to check the mechanical calibration of the measuring measuring heads (or the value read from several transducers without the influence of possible electronic corrections). In this window, as in all the windows in the calibration environment, data are only communicated between the central unit and heads by means of the emergency cables.*

*The window shows the calibrator with the measuring heads fitted, each in its own position.*

*The data for the current check are displayed alongside each measuring head.*

*The values outside the tolerance thresholds are displayed in red, whereas the positive values are displayed in green.*

*The following keys are active in this window:*

- F1 displays the on-line "Help" function
- F2 returns to the previous window
- F5 moves on to the next step in the mechanical calibration check (for step-by-step checking of the zero and inclinometer full scale calibration).
- F6 (only displayed after F5 is pressed), moves back one step in the mechanical calibration check.
- F7 provide the printout containing the data of the check performed - F10 returns to the starting window.

### **Warning !**

*If some values are outside the permitted tolerance ranges, mechanical adjustments must be made on the measuring heads. In this case, call the Technical Assistance.*

### **Measuring head test**

*This window allows the user to check that the measuring heads are working correctly when they are fitted to the wheels of a vehicle.*

*The system allows checking of the angle read by the inclinometers, the angle and reception level of the CCDs.*

*Press the F5 key to display the release of the software installed on the measuring heads.*

*The release appears in the top box of each window dedicated to each measuring head. The following keys are active in this window:*

- F1 displays the on-line "Help" function
- F2 returns to the previous window
- F5 switches from the current window to the window with the software information and vice-versa.
- F10 returns to the starting menu window.

## Technical Assistance

*Window for use by the technical support service only.*

*Users are urged not to access this window. Improper use of the procedures in this program section may cause aligner malfunctions.*

### Job Count

*This option is visible only if previously enabled in the wheel aligner general setup.*

*To access the "Job Count" window, enter the password (the password is not indicated in this manual for security reasons). If interested in this option, please request the password from the support service.*

*The window (fig. 50) is divided into two sections: the left section displays the overall count of the job performed, the right section shows the job count per day. A calendar is also displayed, where the desired visualisation date can be selected.*

*Three boxes are located above the calendar, where the desired day, month and/or year can be selected for rapid selection of the date searched. After setting the date, confirm the selection by pressing the "Enter" key*

*This window behaves like message windows, where the active function keys are in the window, whereas the function bar keys are disabled.*

*The following keys are active in this window:*

*- F2 goes back to the previous window - F4 resets the overall job count to zero.*

### Notes

*When resetting the overall job count to zero, only the overall count is reset to zero, while the number of jobs saved every day is not altered.*

---

## SAVE DATA (BACKUP) AND RESET DATA (RESTORE) PROCEDURE

---

*For the versions that support it, the "Save data" (Backup) and "Reset data" (Restore) function is available.*

*The program can "Save data" in any valid disc (Hard Disk, USB support, etc.)*

*The Program manages data saving and keeps available the last five saves on the local disc drive (Disc C, Disc D, etc. corresponding to the permanent disc drives - Hard Disk- installed on the PC). Regarding the removable discs, (USB support, etc.), no check is carried out.*

*During the different situations described in the following sections, some messages reported below may be displayed to simplify the description of the each operation:*

Message	Description
"Operation successful"	Operation carried out successfully (Settings saving, "Save data" execution, "Reset data" execution).

<i>"Operation failed"</i>	<i>Operation carried out unsuccessfully (Settings saving, "Save data" execution, "Reset data" execution). Try carrying out the operation again.</i>
<i>"Not enough disc space"</i>	<i>During the "Save data" procedure, the space available, in the destination path selected, is less than what is requested. The procedure is not performed. Select another path with enough space and repeat the procedure.</i>
<i>"Data filing path not found"</i>	<i>During the "Save data" procedure, if you try to perform the "Save data" procedure in a path not found (wrong) or removed (E.g. USB support). Check by performing the procedure described in the - "Save Data" procedure setting up section - the path set for the "Save data" procedure and, if required, select a valid path.</i>
<b>Message</b>	<b>Description</b>
<i>"Undefined error."</i>	<i>In presence of an unpredicted status. Indicate the exact procedure performed, which has caused the error, to the technical support service.</i>

### **"Save Data" procedure (Backup)**

The "Save Data" procedure can be performed in manual or automatic mode.

The "Save Data" procedure can be carried out in compressed mode (zip format) or by simply making an exact copy of the files, without zipping them.

For the automatic mode, the following functions can also be set up:

1. how often the program should perform the "Save Data" procedure
2. confirmation request to the user before filing.

#### **A) "Save Data" procedure setting up**

To set up the "Save Data" procedure, proceed as follows:

1. From the starting screen (Logo screen), press "F8"
2. Select the "Save Data" option with the ↑ or ↓ arrows
3. Press "Enter" ↵ to confirm.

*The screen on figure 51 will be displayed.*

**N.B.: To move through the different objects (boxes) present on the screen, use the tab key.**

4. With the ↑ or ↓ arrows, select, in the box "B", the disc where you wish to save "Data Saving".
5. With the ↑ or ↓ arrows, select, in the box "C", the folder where you wish to save "Data Saving".
6. Press "Enter" ↵ to confirm.

*The data filing path is displayed in full in the box "A"*

7. In the box “D”, it is possible to select automatic filing (Data Saving) using the space bar.
8. In the box “E”, indicate how often you wish to perform “Data Saving” using the numeric keypad.
9. In the box “F”, it is possible to select whether or not to ask if you wish to perform automatic filing (Data Saving) pressing the space bar.
10. In the box “G”, it is possible to select whether the information (Data Saving) is filed in compressed format (zip) or as a simple copy of the files, pressing the space bar.
11. After setting your own choices, press “F6”
12. Press F3 to confirm.
13. Press “F2”, to exit the “Save Data” settings screen and go back to the “Service” screen.
14. Press “F2” to go back to the starting screen (logo screen)

**Note:** in this stage, it is also possible to perform “Data Saving” manually, carrying out before step 13, the following operations:

- a) Press “F5”
- b) Press “F3” or “Enter” ↵ to confirm.

**Note:** Find an example of a screen with all the settings on fig. 52.

#### **B) “Save Data” manual execution**

To perform “Save Data” manually, proceed as follows:

1. From the starting screen (Logo screen), press “F8”
2. Select the “Save Data” option with the ↑ or ↓ arrows
3. Press “Enter” ↵ to confirm.

The screen on figure 51 will be displayed.

**N.B.:** To move through the different objects (boxes) present on the screen, use the tab key.

4. With the ↑ or ↓ arrows, select, in the box “B”, the disc where you wish to save “Data Saving”.
5. With the ↑ or ↓ arrows, select, in the box “C”, the folder where you wish to save “Data Saving”.
6. Press “Enter” ↵ to confirm.  
The data filing path is displayed in full in the box “A”

**N.B.:** the instructions contained from point 7 to 9 inclusive refer to the settings related to the automatic Backup (see the next note )

7. In the box “D”, it is possible to select automatic filing (Data Saving) using the space bar.
8. In the box “E”, indicate how often you wish to perform “Data Saving” using the numeric keypad.
9. In the box “F”, it is possible to select whether or not to ask if you wish to perform automatic filing (Data Saving) pressing the space bar.

10. In the box “G”, it is possible to select whether the information (Data Saving) is filed in compressed format (zip) or as a simple copy of the files, pressing the space bar.
11. After setting your own choices, press “F5”
12. Press F3 to confirm.
13. Press “F2”, to exit the “Save Data” settings screen and go back to the “Service” screen.
14. Press “F2” to go back to the starting screen (logo screen)

**Note:** The path selected to perform the manual filing is valid exclusively for this filing, the last path saved remains in the memory, performing the procedure described in the “Save Data” procedure setting up” section. If you wish to save these settings permanently, before step 13, follow the instructions contained from point 7 to 9 inclusive and the carry out the following operations:

- a) Pressing “F6”
- b) Press “F3” or “Enter” ↵ to confirm.

### C) “Save Data” automatic execution

At the end of the period that was set up, the program automatically performs the “Save Data” procedure.

The program exclusively prompts for confirmation to perform the procedure if, in the setup settings, the “Confirmation request before filing” option is selected, in the box “F” figure 51; otherwise, the procedure is performed without the user noticing anything.

In this case, the confirmation request is setup in the “Save Data” setup; the following message will be displayed before performing filing, at the end of the period that was set up, upon aligner start-up: “Data filing...Want to perform it ?”.

- Press “F3” if you want to perform the “Save Data” procedure
- Press “F2” if you do not want to perform the “Save Data” procedure

### **“Reset Data” procedure (Restore)**

The “Reset Data” procedure can be exclusively performed in manual mode.

Before resetting data, the machine performs a backup of the data to be replaced. To restore the backup, contact the technical assistance service.

To perform the “Reset Data” (Restore) procedure, follow the instructions below thoroughly:

1. From the starting screen (Logo screen), press “F8”
2. Select the “Reset Data” option with the ↑ or ↓ arrows
3. Press “F3” or “Enter” ↵ to confirm.

The screen on figure 53 will be displayed

**N.B.: To move through the different objects (boxes) present on the screen, use the tab key.**

The program always suggests restoring the last “Save Data” procedure performed (obviously, if the path is available, it may not be available if the “Save Data” is performed on a removable device; for example, an USB support).

**If you wish to select the disc and the folder where to restore the “Save Data” procedure, proceed as follows; otherwise, proceed from step 4.**

**N.B.:** *The destination path of the files to be restored, not set, regarding the restore program, automatically positions the file in the correct work position.*

- a) With the ↑ or ↓ arrows, select, in the “B” box Figure 53, the disc where the “Save Data” procedure to be restored is located.
  - b) With the ↑ or ↓ arrows, select, in the “C” box Figure 53, the folder where the “Save Data” procedure to be restored is located.  
The name of the folder to be searched is generated following the rules below:  
for example: BU\_31102006\_170653 where  
BU\_ indicates BackUp  
31102006\_ indicates ddmmyyyy  
170653 indicates hhmmss
  - c) Press “F3” to confirm.
  - d) The path where to restore the data filed is displayed in full in the box “A” Figure 53.
4. In the “Reference Reset” “D” Figure 53, the identification data (Day, month, year, time) about when the “Save Data” procedure selected to be restored is performed are indicated.
  5. Press “F5” to confirm.  
The “Want to continue?” message will be displayed.
    - I. Press “F3” if you want to reset data filed
    - II. Press “F2” if you do not want to reset data filed.
- Once the reset data filed procedure is complete, the program will indicate that it is not necessary to restart to allow the software to reorganise the data just reset.
6. Press “F3”
  7. Press “F2” to exit the “Reset Data” screen and go back to the “service” screen.
  8. Press “F2” to exit the “service” screen and go back to the starting screen (Logo screen)
  9. Press “F10” to switching off the computer.
  10. Press “F2” to confirm computer switching off.
  11. Switch on the computer

Wait until the aligner program finishes data reorganization before operating.

---

## USING THE RECHARGE/EMERGENCY CABLES

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The emergency cable set consists of four cables, which are each 2 m.

To initiate the battery charging process, connect the charge connector for each sensor head (2, fig. 24) to one of the available sockets on the electrical connector panel (B, fig. 14).

The emergency cables allow the operator to continue working even when the measuring head batteries are flat, in the event of a radio system malfunction or when the calibration procedure is in progress.

Four RJ45 standard cables of appropriate length are required (not included).



## UNAUTHORISED USE

*It is forbidden to use the aligner for any purpose other than measuring the characteristic alignment angles of a vehicle (see description in the chapter "Characteristic Angles").*



### WARNING

**Use of the aligner for any purpose other than its original function releases the manufacturer from all responsibility for any damage or injury that may result.**

*It is recommended to use the Personal Computer installed in the central unit only with the programs supplied by the Manufacturer.*



### ATTENTION

**The software in the HARD DISK and in the update CD ROMs are the property of Manufacturer and can be used only with the personal computer supplied with the machine.**



### ATTENTION

**It is highly recommended not to use the Personal Computer for games or with other software based on unauthorised copies, to avoid reducing the safety of plants and persons. This is mandatory to avoid any possible contamination from computer viruses.**

*In any case, it is recommended to check the compatibility of all original software not supplied by the Manufacturer with an authorised Technical Service Centre.*



### ATTENTION

**Do not remove the Personal Computer from its installation position to avoid any damage to the connections.**

---

## **MOST COMMONLY ENCOUNTERED VEHICLE ALIGNMENT FAULTS**

**Vehicle tends to wander to the left or the right.**

**Cause:** tyre side slip.

*Invert the position of the wheels on the same axle:*

- if the vehicle now tends to wander to the other side, take one of the wheels whose position you have already inverted and turn the tyre on the rim.
- if the wander direction does not change perform the same operation on the wheels of the other axle.
- if this double inversion procedure fails to solve the problem, check that camber values on the same axle are identical, make the same comparison for caster values.

### **Steering wheel not aligned with vehicle trajectory.**

#### **Possible causes:**

- mechanical backlash.
- ROC has been skipped or performed incorrectly.
- wheel alignment performed with the steering wheel off centre.
- front wheels adjusted with respect to the axis of symmetry instead of the thrust axis.

### **Disparity between steering locks.**

- Manual procedure:
  - The steering box range must be centred by counting the number of steering wheel revolutions from full lock to full lock.
  - Position the steering wheel in the centre of its range and perform the normal procedure for adjustment of the front half-toe values.
  - Position the steering wheels correctly, disassembling it from the steering column if needs be.
- Electronic procedure:
  - The steering box range must be centred by using the intended aligner procedure (See STEERING ANGLE WINDOW paragraph).

### **Steering wheel is excessively stiff with vehicle stopped.**

#### **Possible causes:**

- excessive caster.
- incorrect king-pin angle.
- excessive camber.
- low tyre pressure.

### **Steering wheel return is too low or too forceful when driving.**

- Incorrect caster value - adjust.

### **Tyre wear.**

- tyres with irregular wear on both walls: incorrect pressure - under-inflated.
- tyre with irregular wear in the centre of the tread: incorrect pressure - over-inflated.
- tyre wear with stepped profile: shock absorber not working properly.
- tyres on the same axle with irregular wear on a single wall: toe values are out of tolerance.
- only one tyre on the same axle with an irregularly worn wall: camber out of tolerance.

### **Vehicles with just one register.**

- *Adjust total toe to the manufacturer's specifications.*
- *Set the left and right front toe values so that they are identical.*

- Remove the steering wheel from the steering column and move it to the correct position; if the steering wheel has adjustment slots, use them.

### **Adjusting vehicle with power steering.**

- Before making any adjustments start the engine, turn the steering wheel to full lock in both directions, position it in the centre of its turning range and immobilize it.
- With the exception of vehicles for which manufacturer's specifications indicate adjustment with the engine running only, the engine can be switched off or left running during adjustments, as preferred. **Vehicles with hydro-pneumatic or intelligent suspension systems.**
- Adjust the vehicle with the engine running and the suspensions for normal driving road clearance.

### **Vehicles with fixed rear axle.**

- Even if the rear axle is fixed, measure the relative values to pick up on possible misalignment; now adjust the front left and right half-toes with respect to the thrust axis in order to eliminate the problem of a misaligned steering wheel.

---

## **TROUBLE SHOOTING**

---

### **The machine shows no signs of life**

#### **Mains voltage incorrect or not present.**

- Check the electrical plant and hook up the machine correctly. **Plug inserted in the wrong socket.**
- Connect the plug properly. **One of the power fuse has blown.**
- Renew the fuse.

#### **Incorrect power supply voltage.**

- Set the power supply voltage jumper to the correct position, check also the power supply of the transformer.

#### **Power switch at back of monitor is set to off.**

- Set the monitor power switch to ON.

## **Keyboard**

### **Keyboard not accepting commands.**

#### **Keyboard connection cable is not inserted.**

- Make sure the cable is inserted in the computer inside the aligner. **Faulty keyboard.**
- Call the service centre.

#### **Function key jammed (Alt, Alt Gr and Ctrl keys)**

- 
- Check all the keys and release as necessary.

## Measuring heads

### Measuring head remains off.

#### The LED/s do not turn on.

*Burned LED/s or key that does not make the necessary contact.*

- Keep pressing the defective key and if the defect is not eliminated, contact the technical service department.

### After pressing the ON-OFF key on a measuring head, that measuring head turns off after a few seconds.

#### Battery low.

- Charge the measuring head or replace the battery.

### The measuring head fails to execute ROC.

#### Transducer values are fluctuating too violently.

- Make sure that the vehicle is stably positioned and wait.

### The monitor displays one or more measuring heads with a yellow triangle containing an exclamation point.

- Check that the measuring head is not turned off.
- Check communications using the emergency cables, to ensure that the radio system is not malfunctioning

### The measuring heads fail to transmit but no error message appears on the monitor.

- Check that "Demo" operating mode has not been set.

### Steering wheels not straight.

#### Compensation routine performed incorrectly.

- Repeat compensation taking care that the corresponding wheel on the opposite side of the vehicle does not rotate or steer (in the case of steer wheels).

### Measuring heads out of calibration.

- Calibrate the measuring heads

---

## MAINTENANCE

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### WARNING

•  
The Manufacturer declines all liability for claims deriving from the use of non-original spares or accessories.



## WARNING

Before making any adjustments or performing maintenance, disconnect the electrical supply from the machine and make sure that all moving parts are suitably immobilised. Do not remove or modify any parts of this machine except in the case of service interventions.



## ATTENTION

Keep the working area clean.

Do not clean the machine with compressed air or jets of water.

When cleaning the area take steps to avoid raising dust as far as possible.

*Store the measuring heads carefully in a dry place when not in use, to avoid loss of calibration with consequent measurement inaccuracy.*

- *Calibrate the measuring heads at least once every 6 months.*
- *Keep the measuring head glass covers clean (use a soft cloth, do not remove or scratch).*
- *Keep the turntables and the oscillating footboards on which the vehicle alignment is performed perfectly clean and do not oil or grease them.*

---

## SCRAPPING

*If the machine is to be scrapped, remove all electrical, electronic, plastic and metal components and dispose of them separately, as provided for by local legislation (see figs. 54 - 54a).*

---

## ENVIRONMENTAL INFORMATION

*Following disposal procedure shall be exclusively applied to the machines having the crossed-out bin symbol on their data plate*

*This product may contain substances that can be hazardous to the environment or to human health if it is not disposed of properly.*

*We therefore provide you with the following information to prevent releases of these substances and to improve the use of natural resources.*



*Electrical and electronic equipments should never be disposed of in the usual municipal waste but must be separately collected for their proper treatment.*

*The crossed-out bin symbol, placed on the product and in this page, remind you of the need to dispose of properly the product at the end of its life.*

*In this way it is possible to prevent that a not specific treatment of the substances contained in these products, or their improper use, or improper use of their parts may be hazardous to the environment or to human health. Furthermore this helps to recover, recycle and reuse many of the materials used in these products.*

•

*For this purpose the electrical and electronic equipment producers and distributors set up proper collection and treatment systems for these products.*

*At the end of life your product contact your distributor to have information on the collection arrangements.*

*When buying this new product your distributor will also inform you of the possibility to return free of charge another end of life equipment as long as it is of equivalent type and has fulfilled the same functions as the supplied equipment.*

*A disposal of the product different from what described above will be liable to the penalties prescribed by the national provisions in the country where the product is disposed of.*

*We also recommend you to adopt more measures for environment protection: recycling of the internal and external packaging of the product and disposing properly used batteries (if contained in the product).*

*With your help it is possible to reduce the amount of natural resources used to produce electrical and electronic equipments, to minimize the use of landfills for the disposal of the products and to improve the quality of life by preventing that potentially hazardous substances are released in the environment.*





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## RECOMMENDED FIRE-EXTINGUISHING EQUIPMENT

---

*When choosing the most suitable fire extinguisher consult the following table:*

	<b>Dry combustibles</b>	<b>Inflammable liquids</b>	<b>Electrical fires</b>
Water	<b>YES</b>	<b>NO</b>	<b>NO</b>
Foam	<b>YES</b>	<b>YES</b>	<b>NO</b>
Dry chemical	<b>YES*</b>	<b>YES</b>	<b>YES</b>
CO <sup>2</sup>	<b>YES*</b>	<b>YES*</b>	<b>YES*</b>

**YES\*** = Use only if more appropriate extinguishers are not on hand and when the fire is small.



### WARNING

The indications in this table are of a general nature.

They are designed as a guideline for the user.

The applications of each type of extinguisher will be illustrated fully by the respective manufacturers on request.

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## GLOSSARY

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*Following there is a brief description of some of the technical terms used in this manual.*

### Characteristic Angles

*This term refers to all the angles that can be normally measured on a wheel aligner (total front/rear toe, left/right and front/rear half toe values, left/right and front/rear camber, left/right caster, left/right king-pin angle, and steering angle difference at 20°).*

### CCD

*Special type of infrared measuring head. It has excellent linearity.*

### Longitudinal goniometer

*CCD measuring head that measures the angles using an infrared beam that is parallel to the vehicle's axis of symmetry. Goniometers that measure the angles between the front and rear of the vehicle.*

### Transverse goniometer

*CCD measuring head that measures the angles using an infrared beam that cuts across the vehicle. Goniometers that measure the angles between the right and left side of the vehicle.*

### Clamp

*Adapter from wheel and measurement measuring head.*

### Inclinometers

*Inclinometers are electronic devices that measure their angle of inclination with respect to the vertical; they are used to measure camber, caster and king pin inclination values.*

### **Equatorial plane**

*Hypothetical vertical plane that divides the wheels into two equal parts.*

### **Turntable**

*This is a base mounting a disk on which the steer wheels of the vehicle are positioned.*

*Turntables reduce friction between the tyre and the ground to facilitate settling in of the suspensions and to cancel measurement errors during steering turns. The area between the disk and its base must be kept scrupulously clean.*

### **Infrared beams (IR)**

*Electromagnetic waves that are invisible to the naked eye.*

### **Measuring heads**

*Measurement instruments that are applied to the vehicle wheels to measure characteristic angles.*

### **Head**

*Synonym of measuring head.*

### **Transducer**

*Electronic component that converts a physical parameter into another type of parameter, e.g. angle transducers convert angles into proportional electronic signals.*

---

## **GENERAL WIRING DIAGRAM**

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PN. 4-110926

<b>AP1</b>	<i>Personal computer.</i>
<b>AP3</b>	<i>Keyboard.</i>
<b>AP4</b>	<i>Printer.</i>
<b>AP5</b>	<i>Monitor</i>
<b>AP9</b>	<i>Radio RX/TX board.</i>
<b>AP10</b>	<i>Motherboard (CPU)</i>
<b>AP20</b>	<i>Hard Lock</i>
<b>AP21</b>	<i>Electrical connector panel</i>
<b>AP14</b>	<i>Control panel</i>
<b>BP1</b>	<i>Angle transducer</i>
<b>BP2</b>	<i>Inclinometer</i>
<b>FU</b>	<i>Fuse 10 A T</i>
<b>GB1</b>	<i>Battery</i>
<b>HL1</b>	<i>LED light.</i>
<b>QS1</b>	<i>Master switch</i>
<b>XB1</b>	<i>Measuring head connectors</i>
<b>XB2</b>	<i>Connector.</i>
<b>XB3</b>	<i>USB Connector</i>
<b>XB4</b>	<i>IR Remote control Connector</i>

<b>XB5</b>	<i>HDD Connector</i>
<b>XS2</b>	<i>Multiple socket</i>

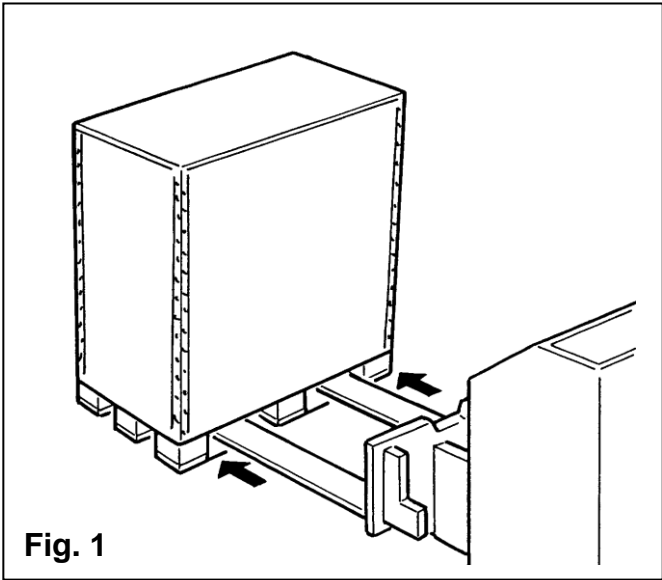


Fig. 1

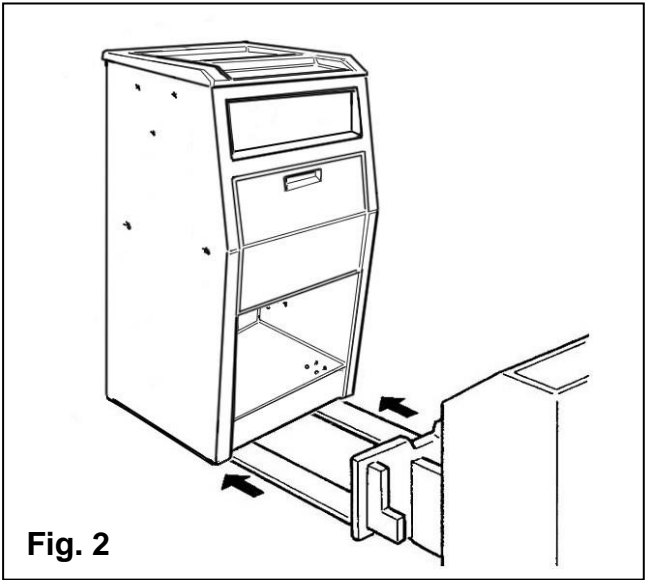


Fig. 2

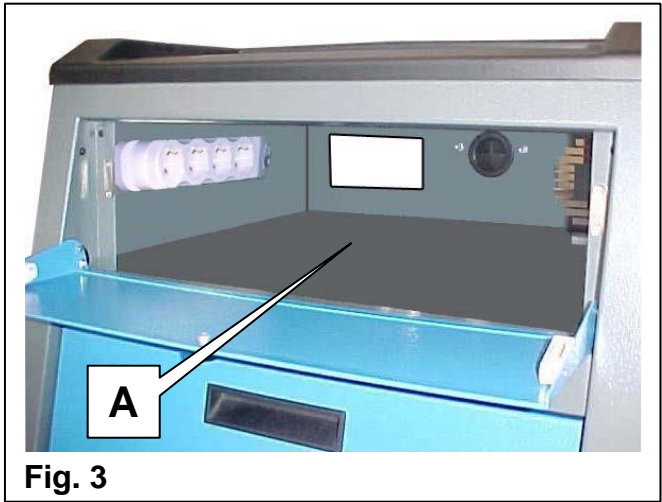


Fig. 3



Fig. 4



Fig. 5

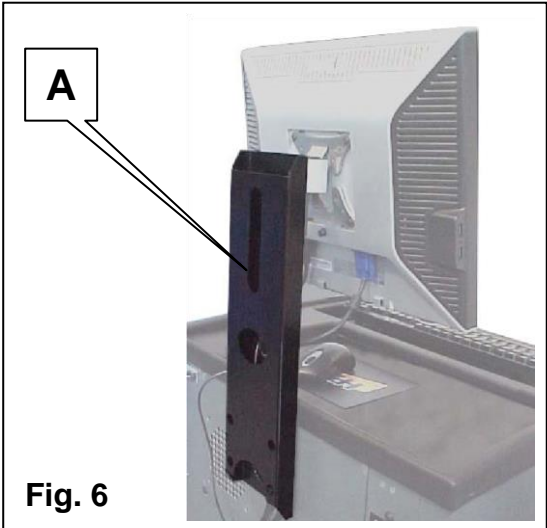
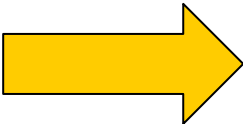


Fig. 6



Fig. 7



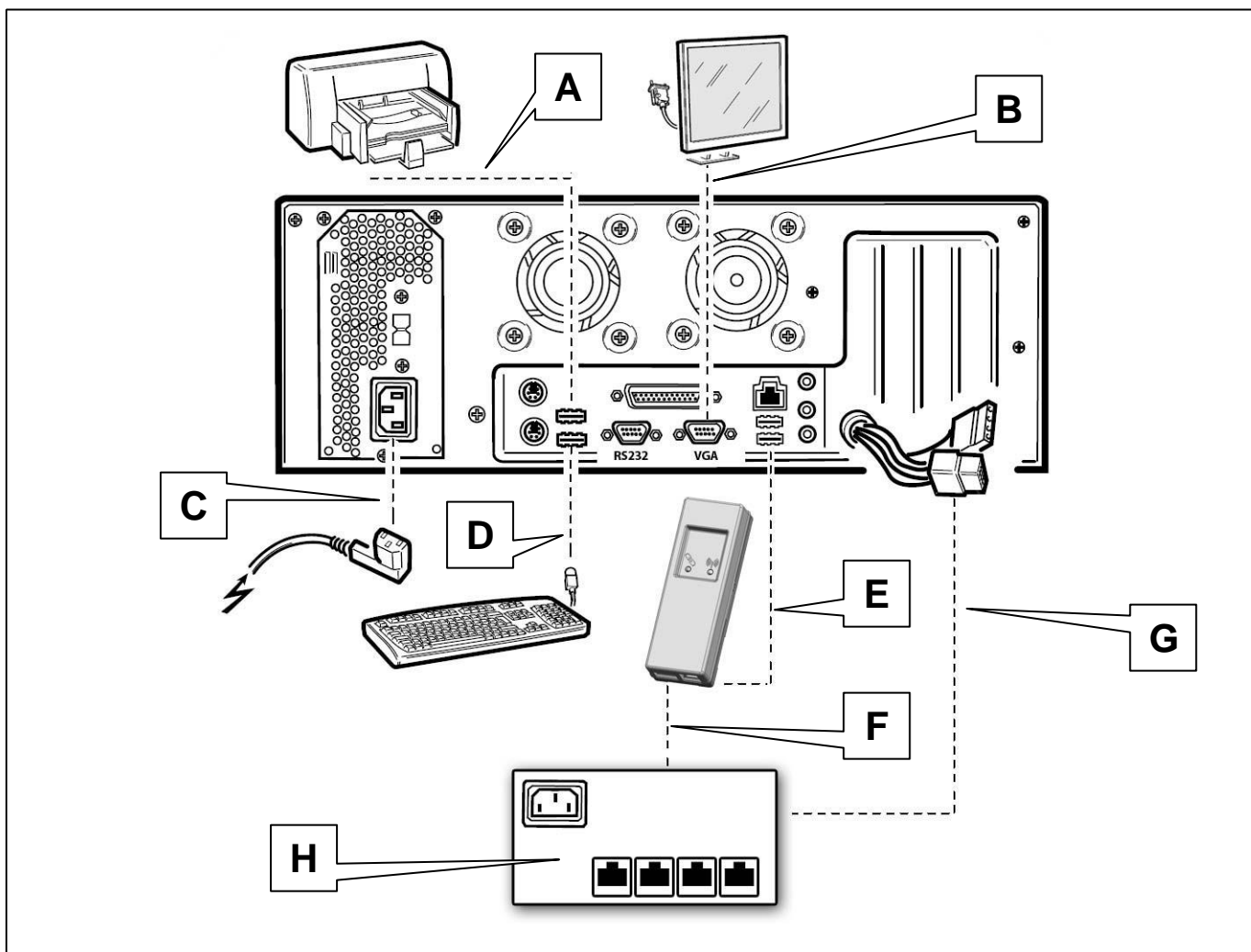
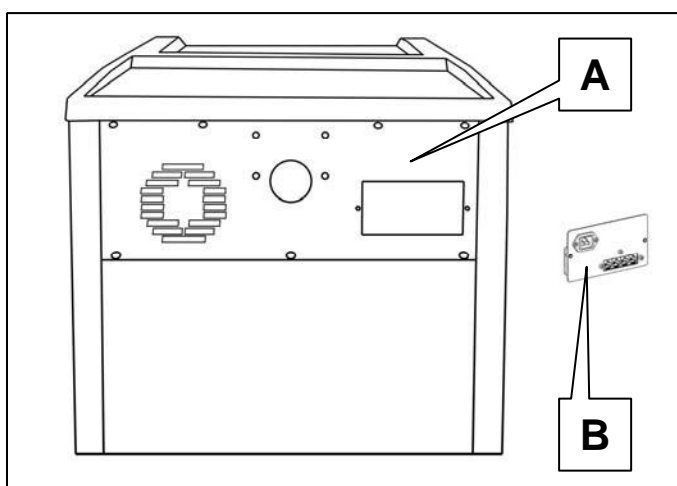


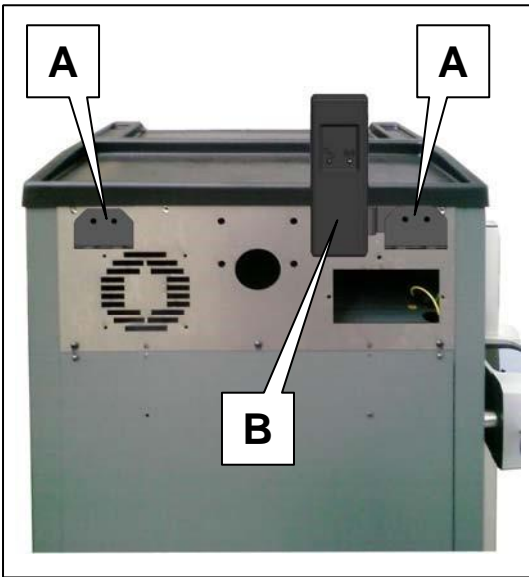
Fig. 11



Fig. 13



**Fig. 14**

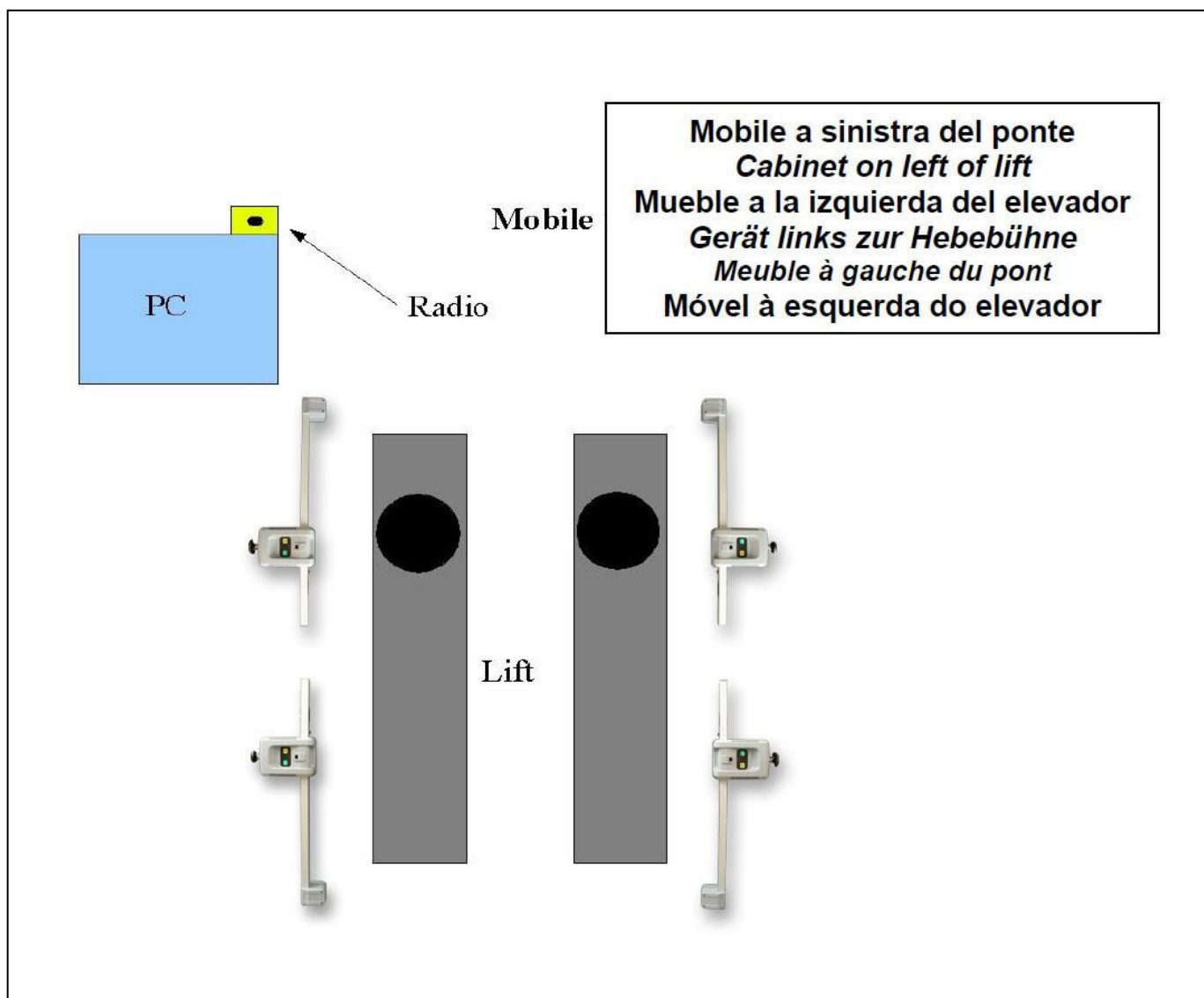


**Fig. 16**

**Fig. 15**



**Fig. 17**



**Fig. 19**

**Mobile a destra del ponte**  
**Cabinet on right of lift**  
**Mueble a la derecha del elevador**  
**Gerät rechts zur Hebebühne**  
**Meuble à droite du pont**  
**Móvel à direita do elevador**

Radio

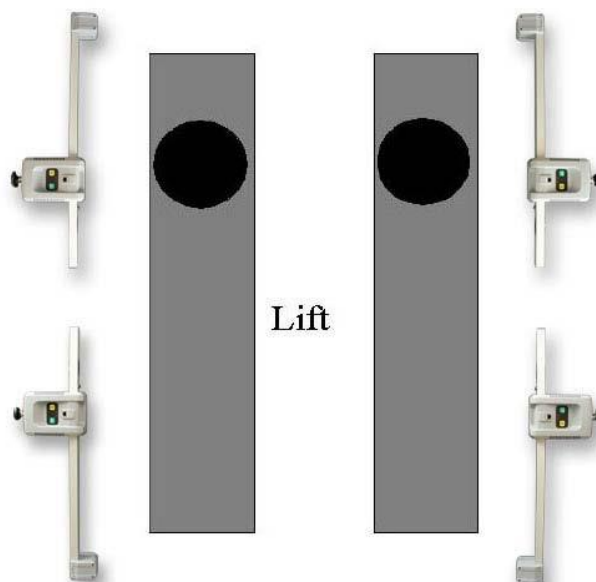
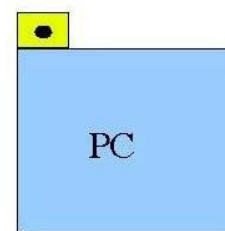
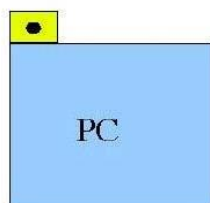


Fig. 20

Radio



**Mobile in posizione centrale**  
**Cabinet in central position**  
**Mueble en posición central**  
**Gerät in zentraler Position**  
**Meuble en position centrale**  
**Móvel em posição central**

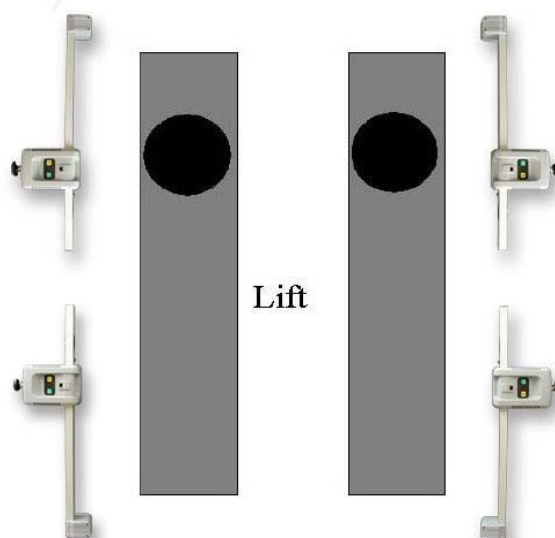
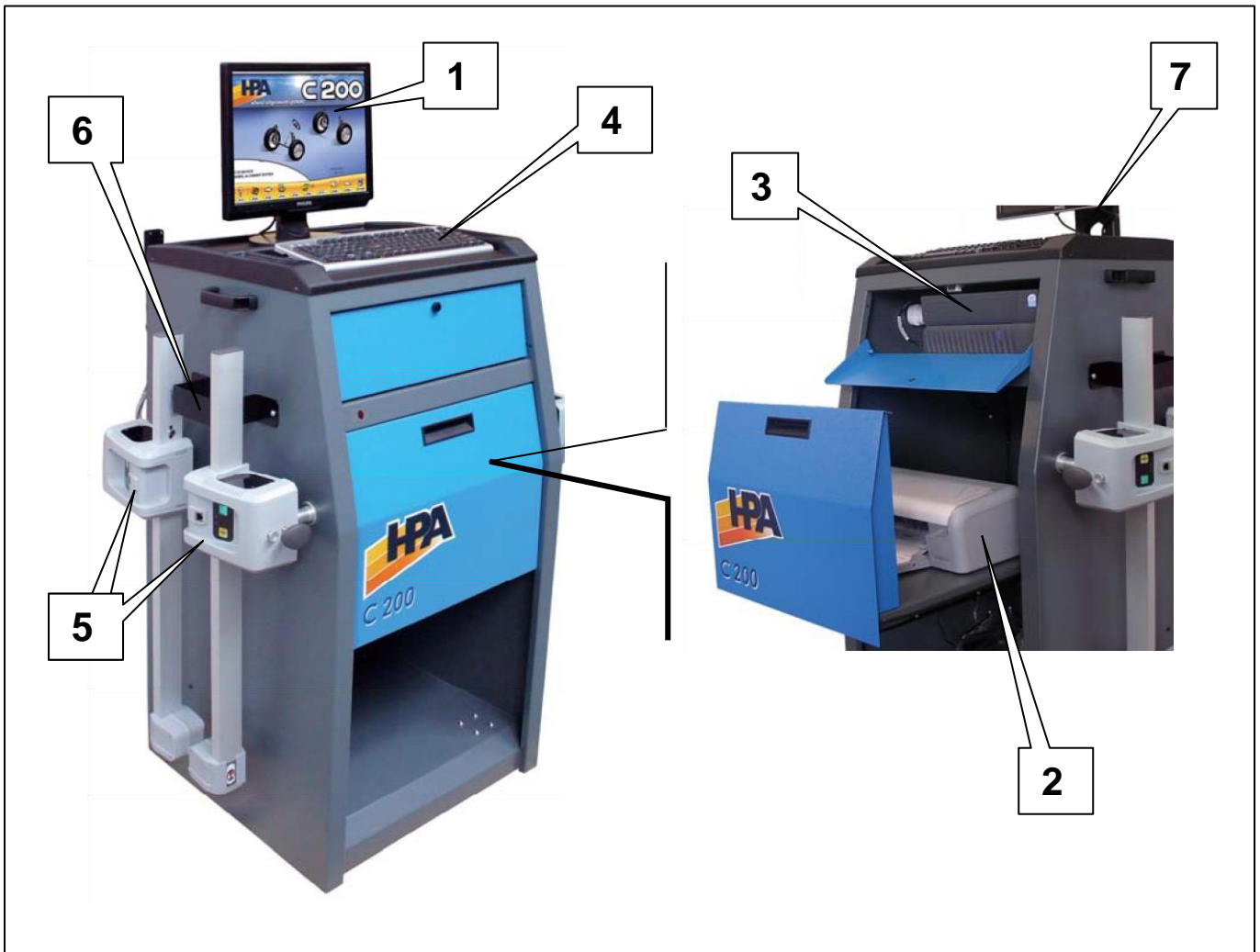


Fig. 21





**Fig. 22**

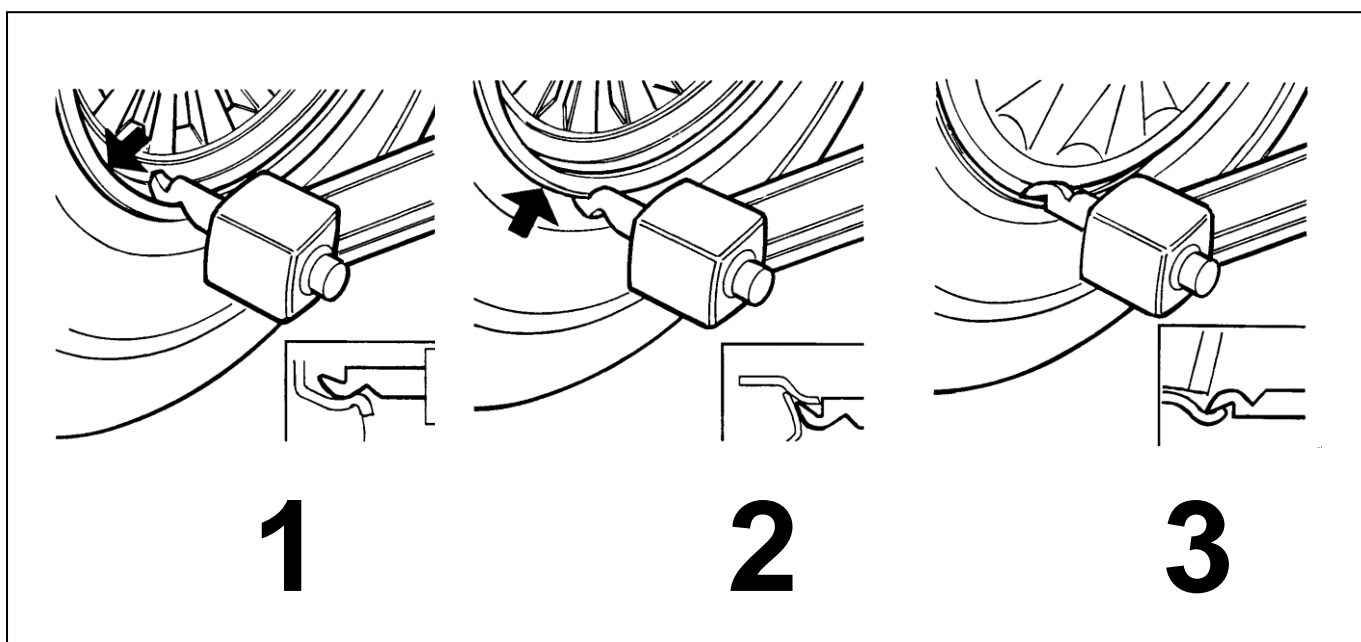


Fig. 23

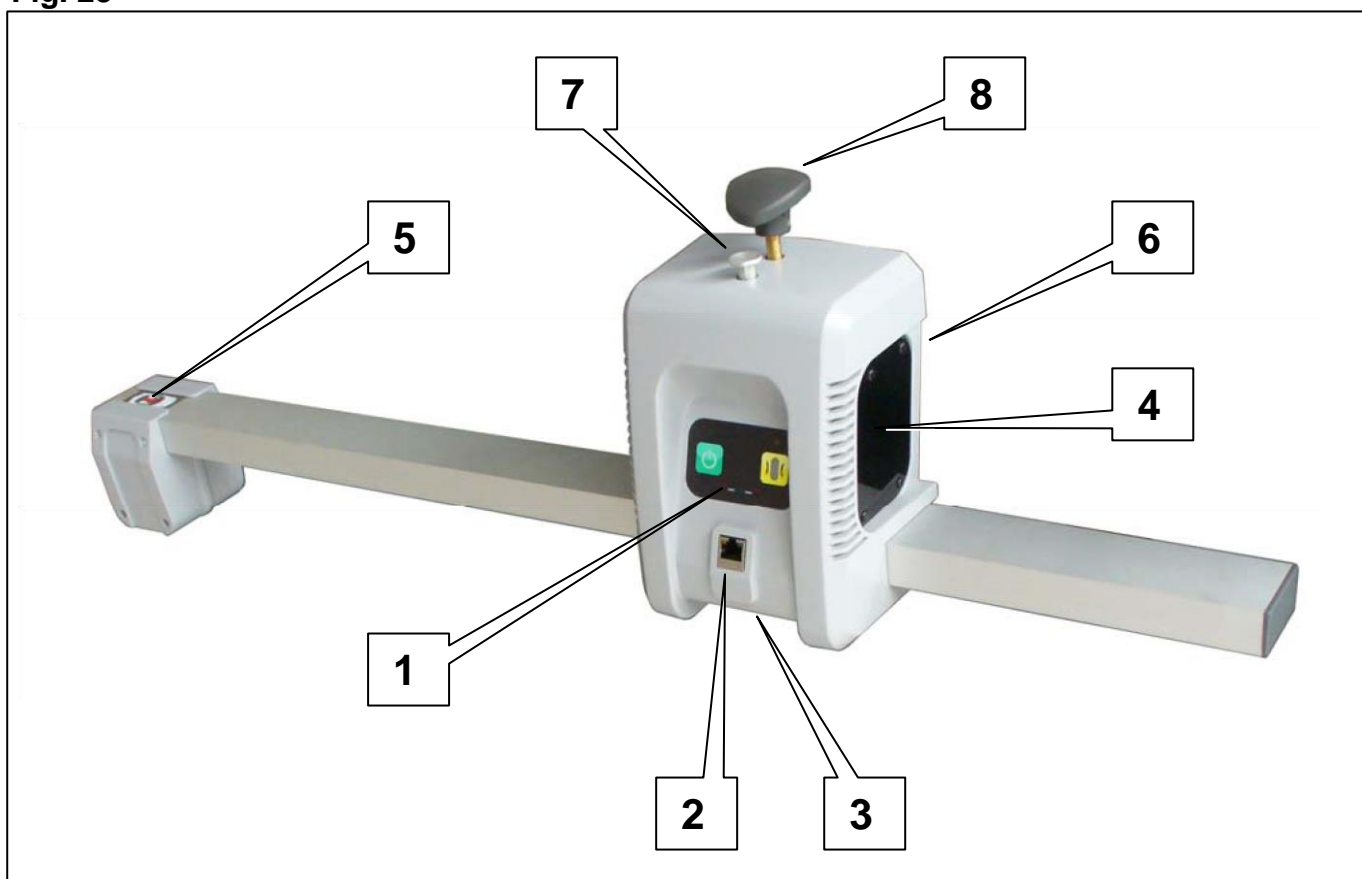


Fig. 24

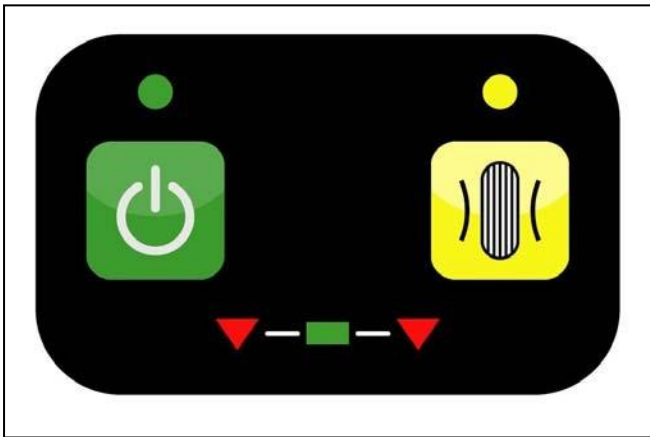


Fig. 25

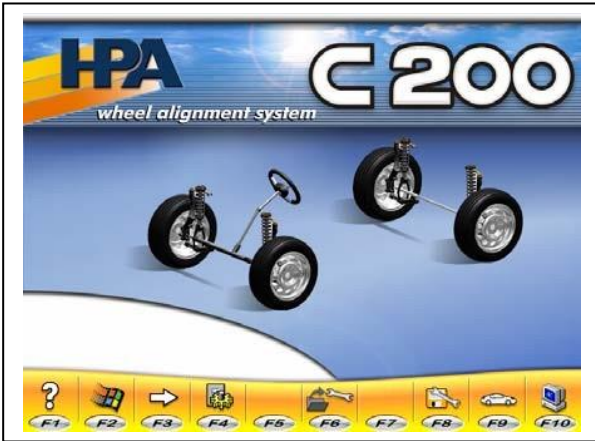


Fig. 26



Fig. 28



Fig. 30



Fig. 32













FERRARI 612 TRIM										Databank Data Summary									
Code:		1625																	
Description:		FERRARI 612 TRIM																	
Starting Year:		1992		Ending Year:		1995													
Reference Diameter:				18"		Driving Force				2714.0mm				Trunk Ballast				10 Kg	
Wheel base LH				2714.0mm		Wheel base RH				2714.0mm				Trunk Filling Level				50%	
FRONT AXLE																			
Datum				- Tolerance				+ Tolerance				Track				1515.0mm			
LH				RH				0.0mm				Track				Rim			
Total toe				+0.8mm				+0.8mm				+0.8mm				Type			
Half toe				+0.4mm				+0.4mm				+0.4mm				Pressure			
Camber				00.25°				00.25°				00.75°				Weight Difference			
Caster				+0.92°				+0.92°				00.75°				Ballast			
King pin angle				+0.67°				+0.67°				00.75°				20 Kg			
Included angle																			
Steering angle diff. at 20°																			
Max Int. Steering Angle				+35.25°				-32.00°				+02.00°							
Max Ext. Steering Angle																			
Symmetry error																			
REAR AXLE																			
Datum				- Tolerance				+ Tolerance				Track				1502.0mm			
LH				RH				0.0mm				Track				Rim			
Total toe				+3.2mm				+0.8mm				+0.8mm				Type			
Half toe				+1.6mm				+0.4mm				+0.4mm				Pressure			
Camber				01.00°				01.00°				00.75°				Weight Difference			
Symmetry error																			
Thrust angle												Ballast				30 Kg			
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>																			

Fig. 27



Fig. 29



Fig. 31

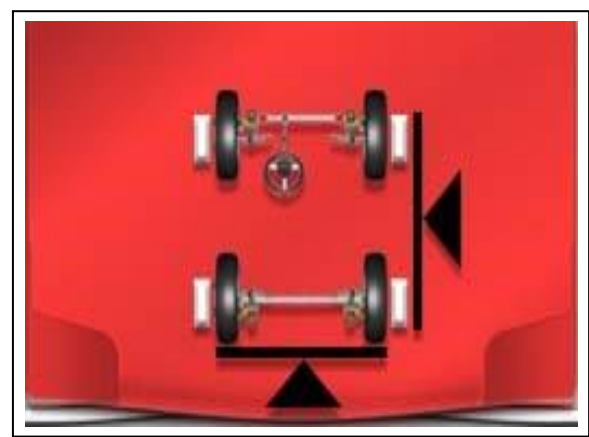


Fig. 33



Fig. 34

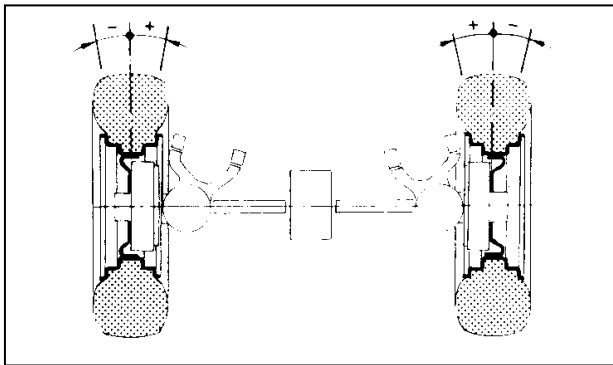


Fig. 36

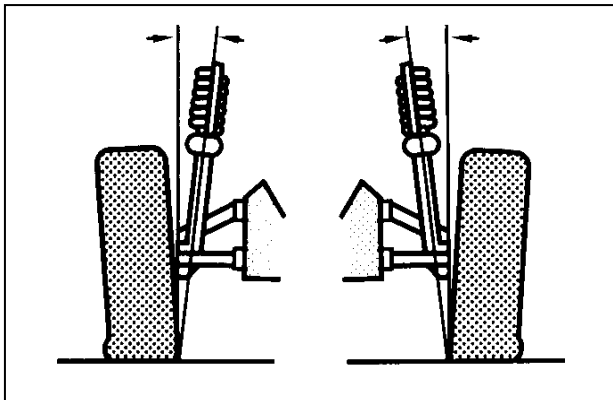


Fig. 39

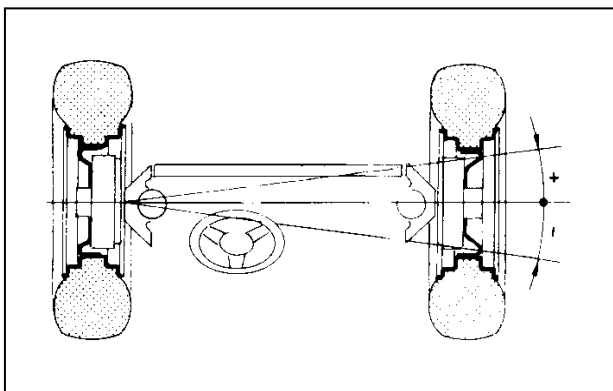


Fig. 41

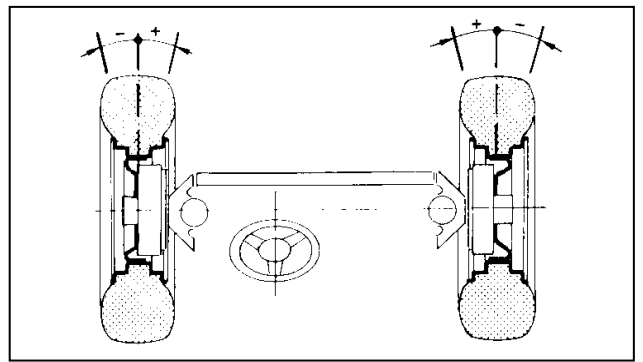


Fig. 35

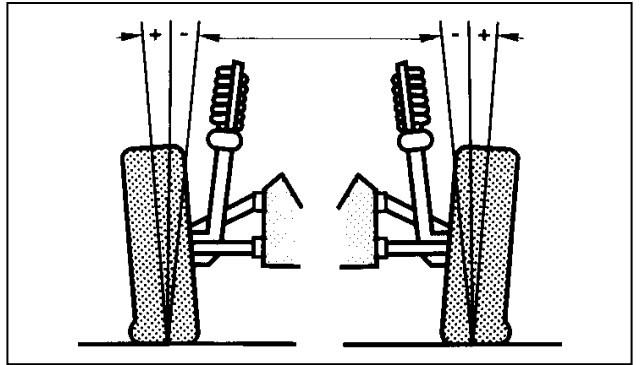


Fig. 37

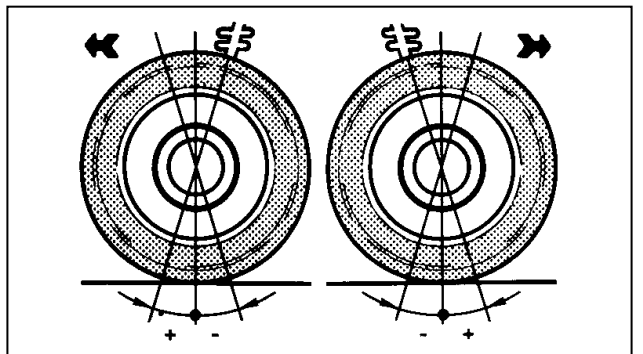


Fig. 38

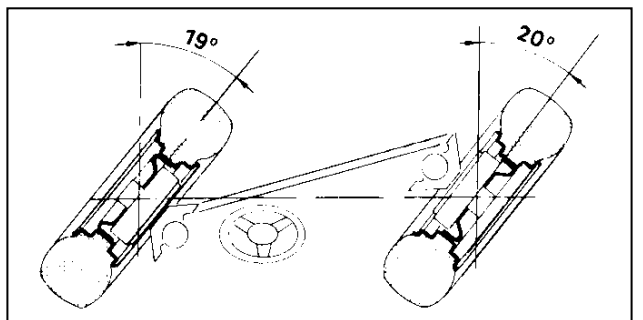


Fig. 40

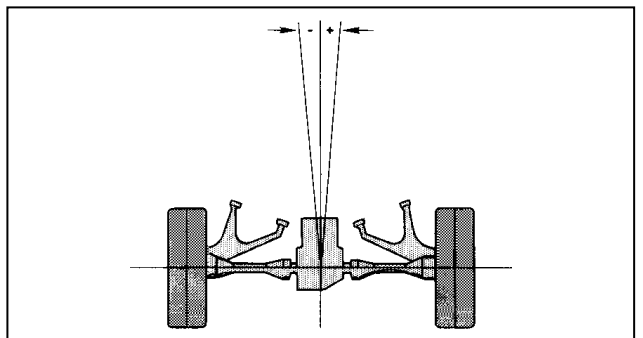
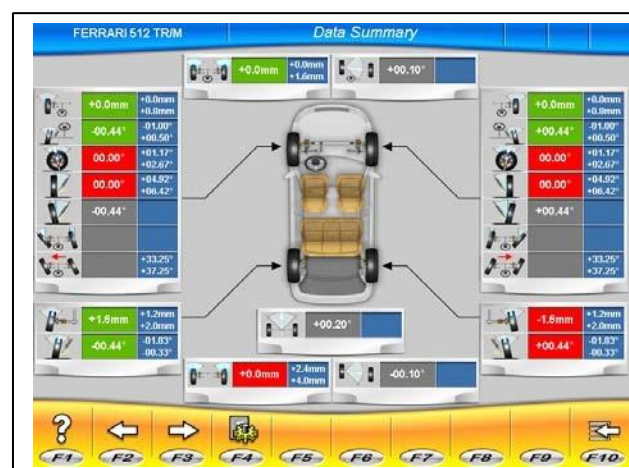
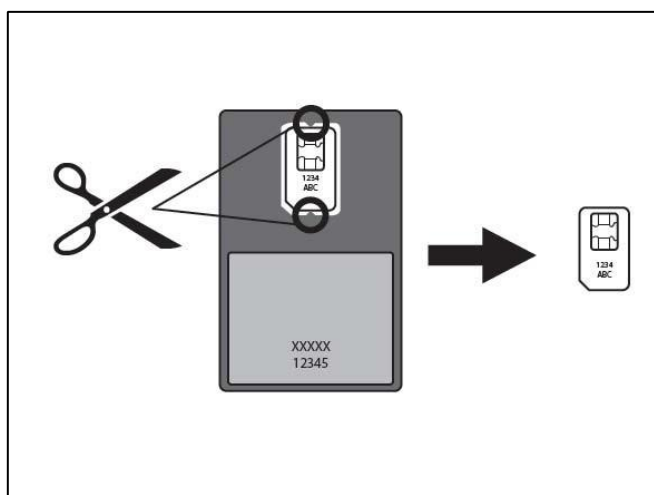
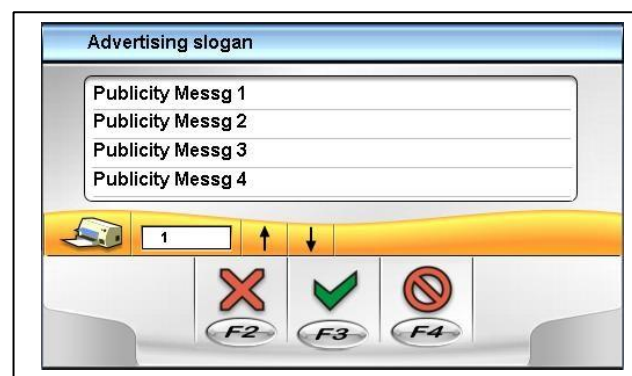
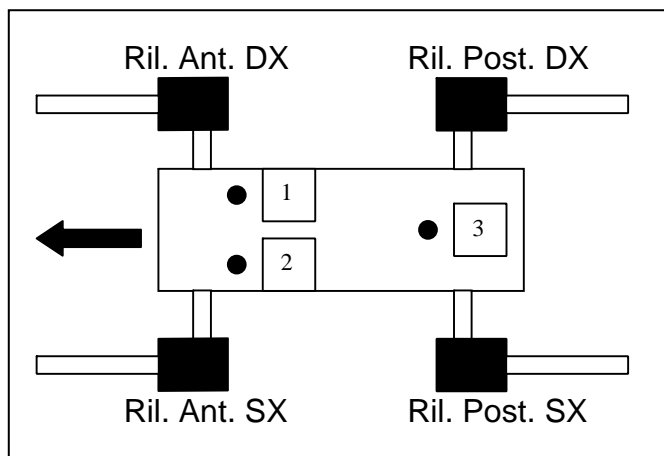


Fig. 42





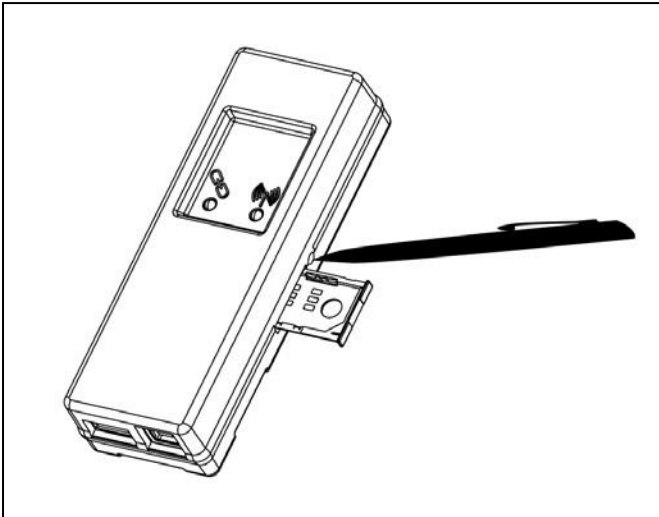


Fig. 48



Fig. 49

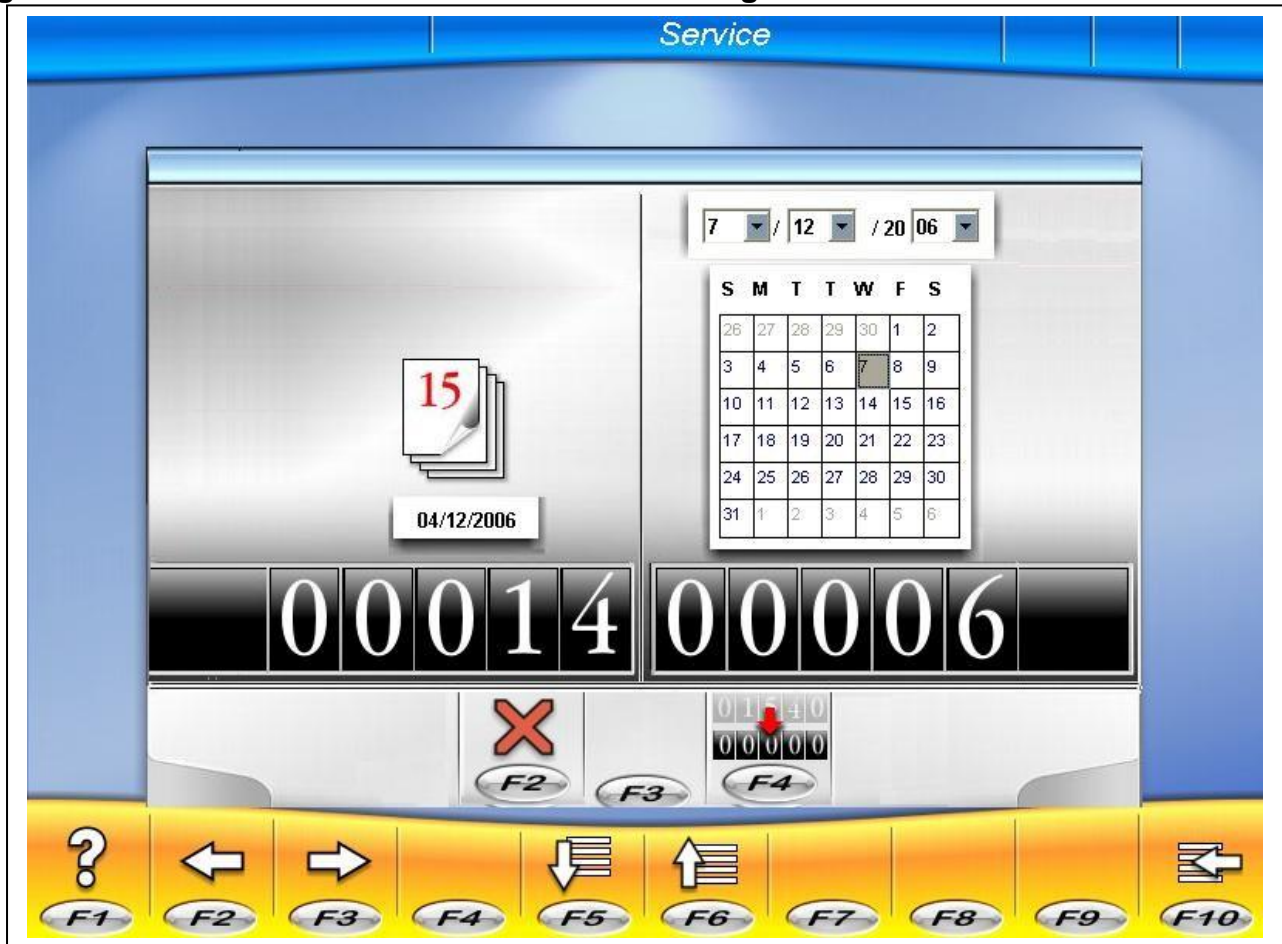


Fig. 50

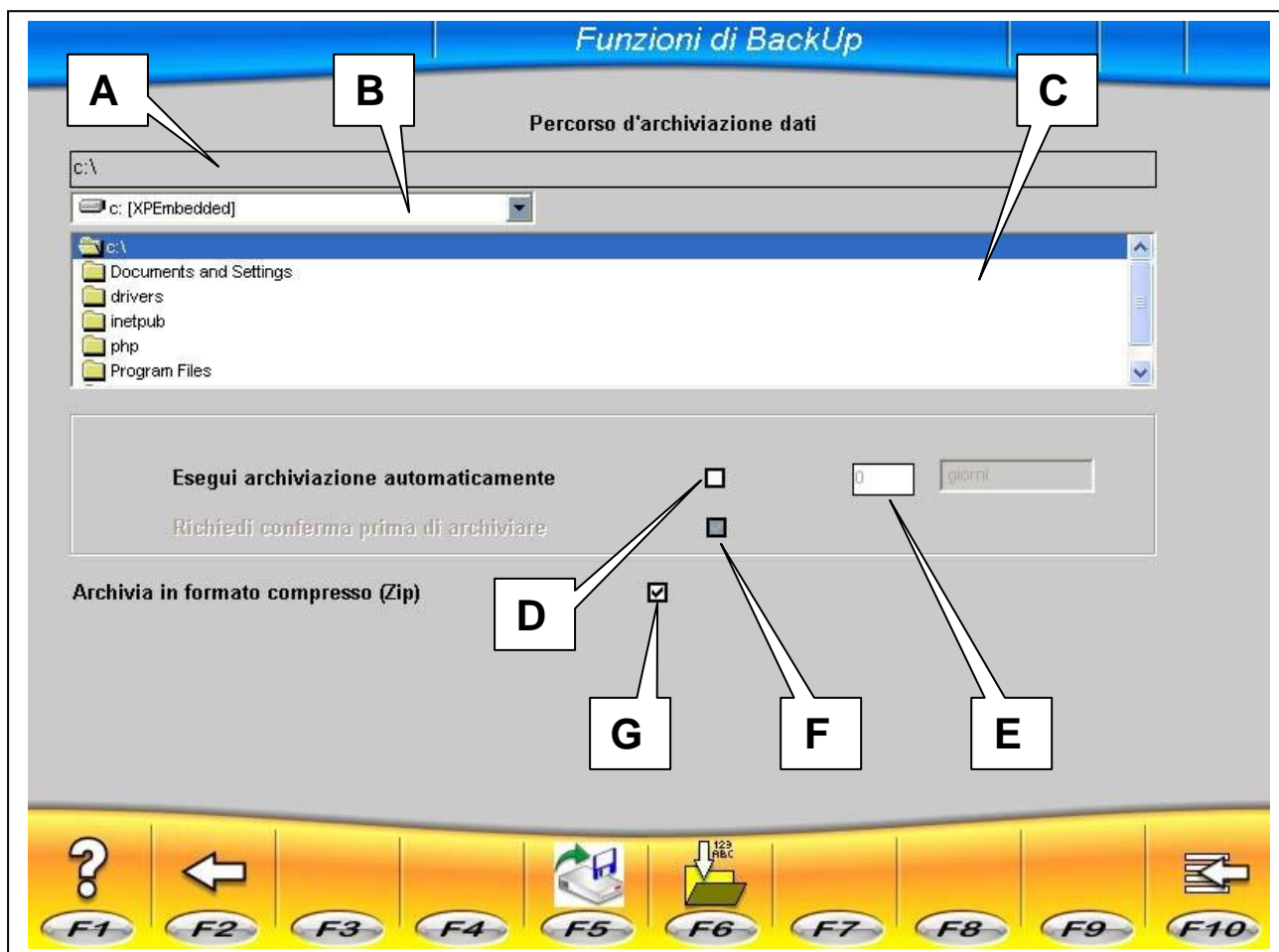


Fig. 51



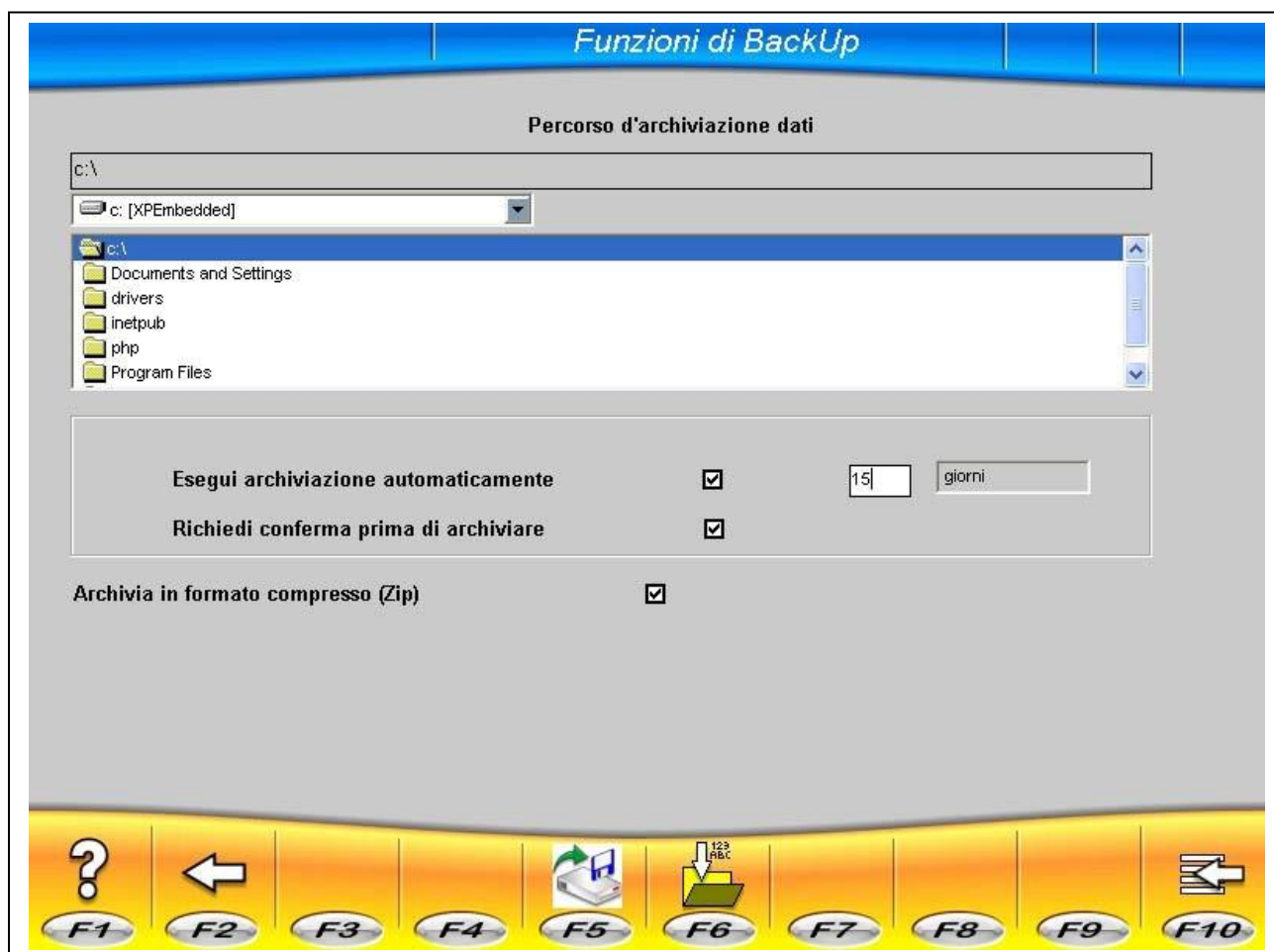


Fig. 52

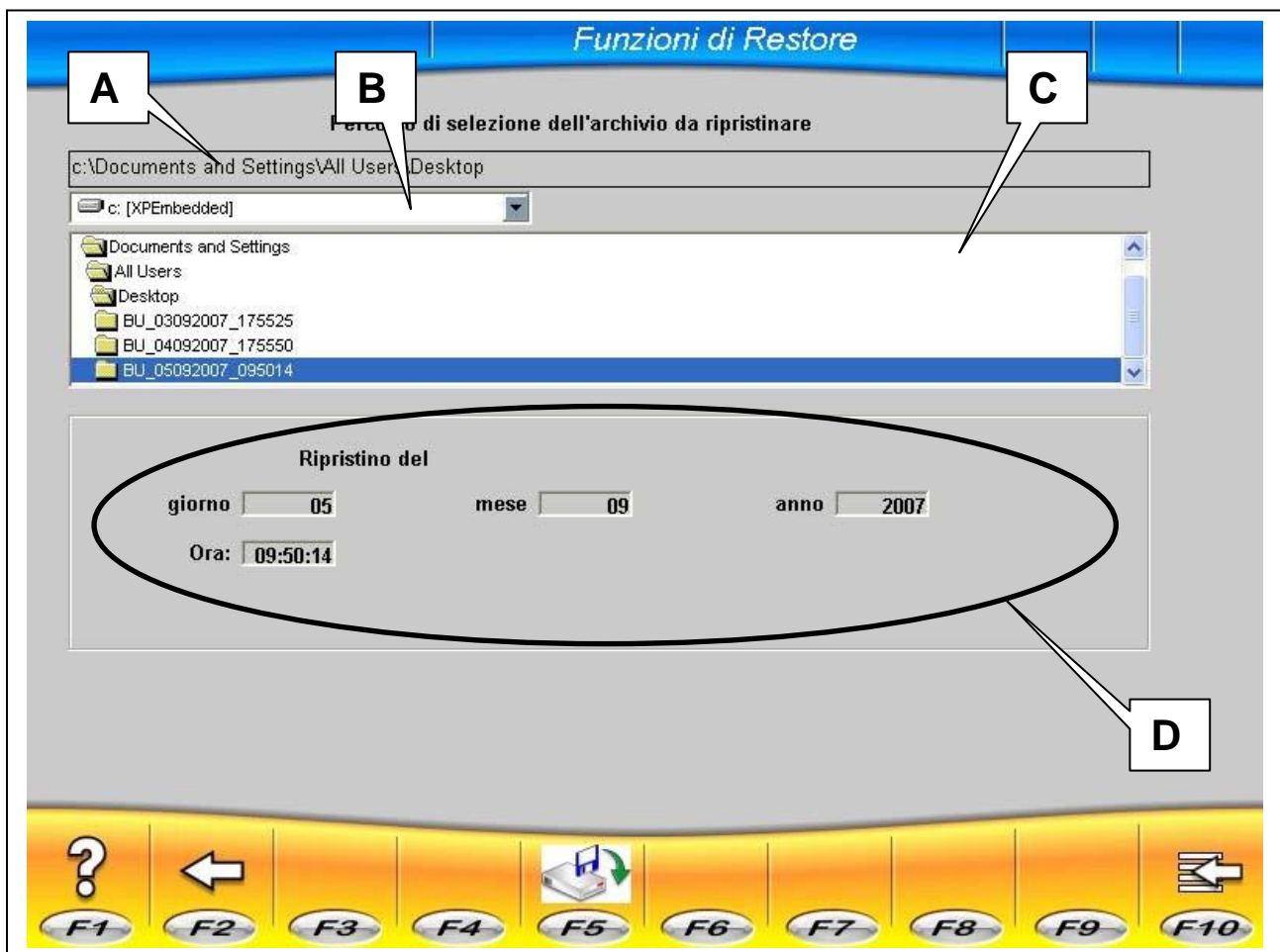


Fig. 53

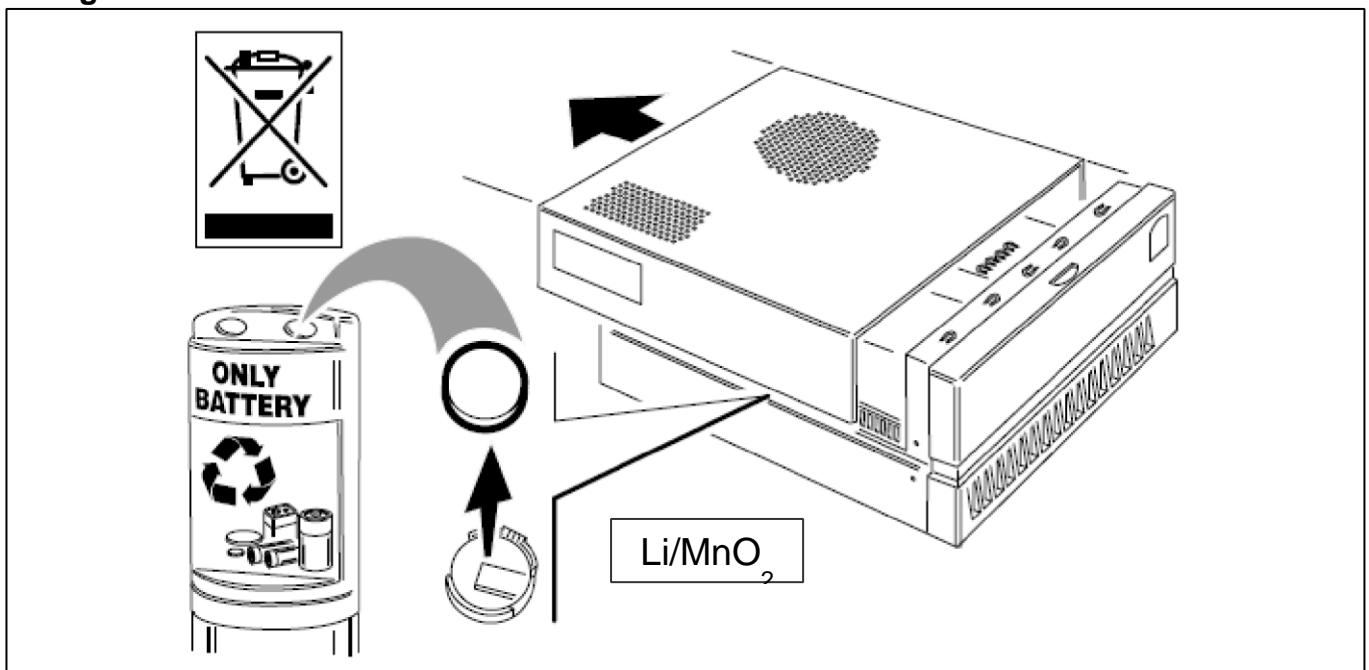
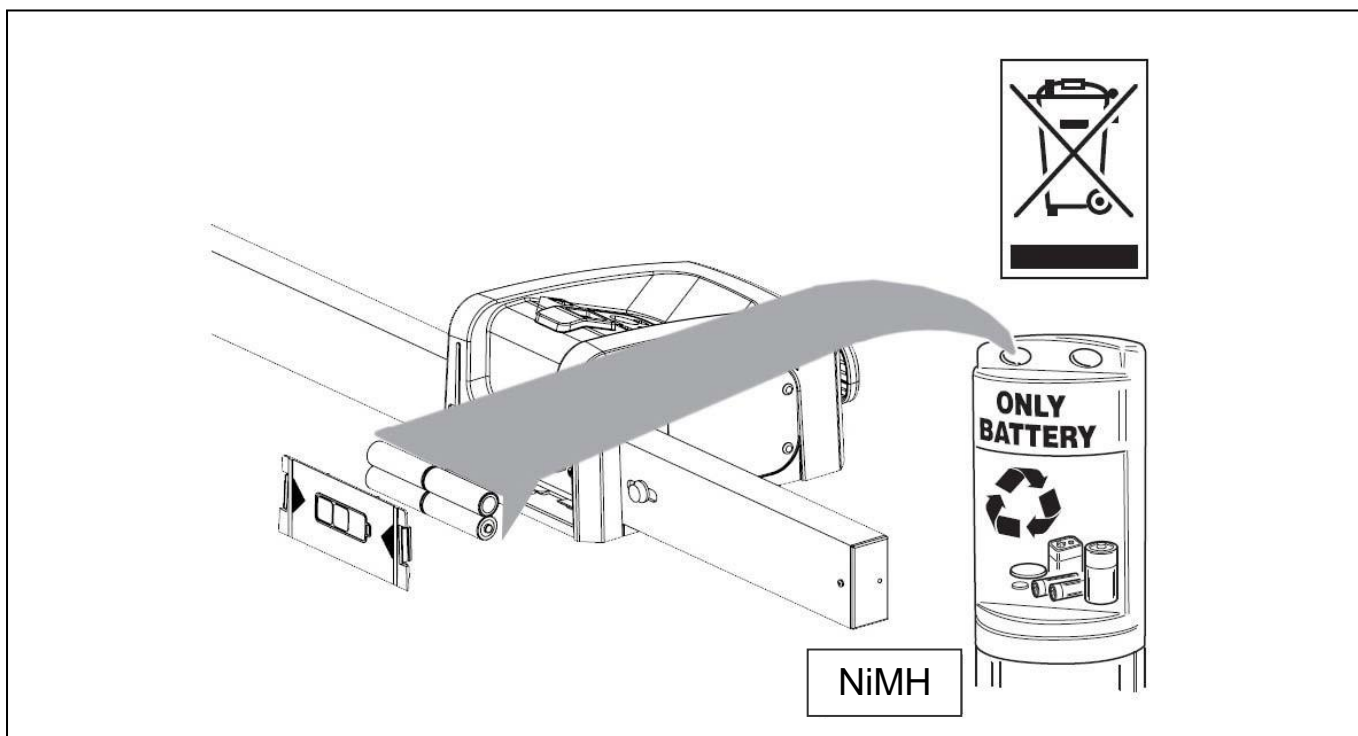


Fig. 54



**Fig. 54a**

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