166 Introduction - BODYSHELL PANELS - REPLACING AND REPAIRING

INTRODUCTION

Introduction

Alfa Romeo has produced this collection of technical information to support the training programme for the new 166 model.
The subjects have been developed, documenting, above all, the technical innovations, useful for overcoming the various tests set by the new legislation, assisting the description and teaching aspects, limited to providing minimal ideas, rules and precautions.
For information on repair techniques and vehicle technical data, refer to the descriptions in the specific sections in the Repair Manual.

Aerodynamics

The style of the new car, featuring smooth lines which are modern yet, at the same time, recall styles of the past, contains all of the sporting tradition of Alfa Romeo plus the quality of a large saloon.The aims of adaptability, comfort, functionality and strength already achieved on previous models have all been consolidated.
The front, the side panels with new and traditional perimeter trims, the side windows, the joined surfaces, the rear section and the underbody have been designed with special attention paid to the aerodynamic profile which, together with the typcial marque attitude, have made it possible to achieve an excellent drag coefficient and also reduce aerodynamic noise.

SAFETY

Introduction

The main aim of car manufacturers is undoubtedly the complete safety of the driver and passengers.
To adapt the vehicle to market regulations, both European and world wide, which have become very exacting, the new Alfa Romeo has been designed with care taken over every detail in order to respond in the best possible way to all situations.

Preventative safety

This involves all those factors which determine the comfort of driving conditions and allow situations which could distract the attention of the driver to be prevented:

- extremely rigid bodyshell;
- optimum engine mountings;
- climate control system, equipped with devices such as, solar ray sensor, automatic switching off of recirculation for the exchange of air inside the passenger compartment, passenger compartment air filter, pollen filter, which allows a better exchange of air and better transpiration and thermal comfort and a balanced distribution throughout the passenger compartment thanks to the numerous vents, producing a significant development compared with conventional systems;
- optimum visibility conditions thanks to the extensive glazed area and, on request, a windscreen with a rain sensor;
- new adjustable headlamps which are automatically realigned, by means of a sophisticated system of signals coming from position sensors in the suspension and a longitudinal accelerometer (for pitching movements due to the vehicle accelerating or braking).The headlamps are available, on request, with exhaust gas (xenon) bulbs which have twice the intensity of normal halogen bulbs and allow better visibility;
- the layout of the steering wheel, the pedals, the main controls and the warning lights has been carefully thought out to obtain a good balance between the driving position and the ease of reaching these controls allowing a sports driving style whilst maintaining a level of comfort which ensures the best possible control of the vehicle;
- the generous dimensions of the interior spaces which make it possible to diversify the areas of activity inside the vehicle combined with the wraparound seats and, available on request for the front seats, electrical adjustments which allow the necessary comfort of the driver and the occupants of the vehicle;
- abundant use of sound insulation materials and the adoption of special solutions for anti-vibration fixings to lower the mechanical noise and ensure quiet driving;
- interior fittings which respond to the most stringent regulations governing flammability.

Active safety

This involves all those measures which actively contribute to driving safety such as take-off and acceleration, solutions which guarantee stable and powerful braking and the dynamic behaviour of the vehicle

In this field, the Alfa 166, in addition to confirming the tradition of the marque, finds itself at the top end of the market, adopting solutions which include:

- a dual crossover independent circuit braking system with ABS, fitted as standard on all models, with 4 channels and 4 active sensors which reduce the implementation times, equipped with electronic brake force distribution (E.B.D.);
- an integrated drive control system (A.S.R. / T.C.S.), available on request;
- a "high quadrilateral" front suspension, similar to those used in competitions, guarantees a high degree of control with both sports and normal driving.The advantages of this suspension are felt in: the driving precision and controlability of the vehicle, even in the wet and in poor grip conditions, an immediate and precise response and a capacity to absorb obstacles and uneven road conditions;
- rear multilink type suspension with new geometry which combines the sophisticated performance of the multilink system with the relative design simplicity of the quadrilateral system and makes it possible to stabilize the vehicle during steering, guaranteeing excellent road holding properties and reactions to roll and pitching facilitating control ,even during extreme manoeuvres;
- steering and power assisted steering designed with precision and immediate responsiveness in all situations in mind, with the conditions which sometimes give rise to noise during operation having been minimized.

Passive safety

Passive safety concerns the collection of solutions and features of devices which contribute to avoiding or lessening the consequences of an accident.

Statistically about 60% of accidents involve frontal impacts, 30% side impacts and the remaining 10% include bumps, fires and overturning. The structure of the Alfa 166 has been designed and developed with the main objective being to safeguard the occupants from these impacts, to crumple in a controlled manner in the case of frontal, side and rear impacts and to absorb the energy from the impact without compromising the passenger survival chamber. The structure of the Alfa 166 has been designed and developed with the main objective being to safeguard the occupants from these impacts, to crumple in a controlled manner in the case of front, side and rear impacts and to absorb the energy from the impact without compromising the passenger survival chamber.

Passive safety system main features

Both the basic version of the vehicle with twin air bags (driver and passenger), fitted as standard on all versions, and the version with a driver's air bag and a passenger side bag, have been successfully tested in accordance with the regulations governing the following situations:

- offset frontal impacts at high speed - the front crumple zone and the strengthened passenger survival
- dynamic side impacts - the structure of the side panel, the centre pillar and the reinforced door panels ensure conformity to the regulations;
- overturning - the structure of the roof panel and the high resistance pillars ensure the survival cell;
- prevention of the intrusion of the load transported in the luggage compartment - ensured by the partition behind the backrest and the links to the bodyshell;
- resistance to rear impacts - ensured by the reinforced structure and the new rear side members;
- impacts at low speed (4 - 15 kph) - special design features have made it possible to minimize damage, with considerable savings in repair costs;
- front and rear bumpers which exceed the standards in the regulation (ECE 42) and pass the test without serious damage thanks to the optimum deformability and the presence of high density expanded material.

Fire safety

This is achieved through the FPS (Fire Prevention System) which consists of:

- internal fire extinguishers which restrict the propagation speed of the flames;
- an inertia switch to cut off the fuel pump;
- a reflux valve and antimisfiring shields (overheating of the catalyzer on petrol versions);
- a system protecting the cables through which high intensity currents flow;
- no fuel leaks and retaining of the battery in the case of an impact or overturning;
- fuel tank made from a plastic material which has high mechanical and fire resistant properties, located in front of the rear axle and firmly secured to the bodyshell;
- steel pipes in the area of the spark out.

Bending and torsional strength

The high bending and torsional strength of the Alfa 166 bodyshell, in addition to endowing the vehicle with impressive passive resistance qualities, also translates into multiple advantages:

- less noise thanks to fewer vibrations;
- improved driveability, keeping the suspension angles correct;
- extremely precise driving with a sensation of a firm ride and great comfort;
- increased resistance to breaking caused by the use of the vehicle over particularly uneven roads;
- the sensation of a compact car;
- also ensuring that the overall qualities of the vehicle are maintained for a longer period of time.

Resistance to frontal impacts

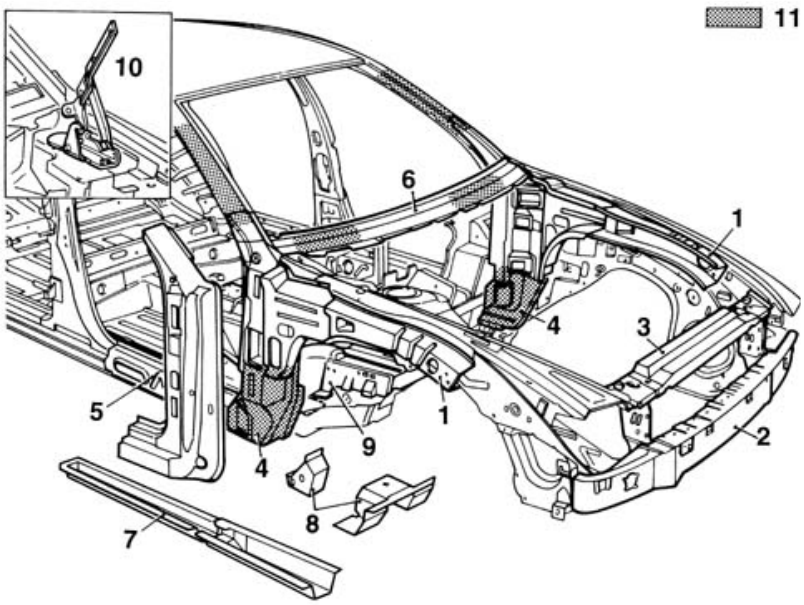
 In the case of operations to the bodyshell, if the structural reinforcements are distorted they must always be replaced.

The differentiated strength bodyshell has strengthening reinforcements for the survival chamber to resist the stringent frontal impact tests to ensure the rigidity and indestructibility of the passenger compartment offering maximum protection to the occupants and keeping the effect of the impact to a minimum.

The following are the main operations which have been carried out to the bodyshell to achieve the proposed objectives:

- the reinforcements in the struts, designed to crumple in a pre-set fashion absorbing and distributing the force of the impact thanks to the connecting front crossmember which also allows non central impacts to be absorbed.There is also a further element which absorbs the impact of the rigid foam;
- reinforcements in the side members and the side pillars connected by a box section crossmember under the windscreen which ensures the transverse rigidity of the passenger compartment joining the side panels at waist height;
- reinforcements under the floor panel and on the gear lever support which increase the solidity and strength of the floor, limiting the deformation of the pedals, as far as possible;
- adoption of bonnet lid retaining hooks and a new system for fixing the dashboard.

A further function of absorbing and distributing the force of the impact is carried out by the engine frame which discharges the forces to the box sections under the floor and avoids excessive loads on the passenger compartment.
These devices in the box sections, in conjunction with the presence of rigid foam, retaining systems and internal energy absorbing parts allow the Alfa 166 to pass the tests with flying colours.



1.REINFORCEMENTS IN THE STRUTS
2.LOWER FRONT CROSSMEMBER
3.UPPER FRONT CROSSMEMBER
4.REINFORCEMENTS IN SIDE PILLARS
5.REINFORCEMENTS IN SIDE MEMBERS
6.BOX SECTION CROSSMEMBER UNDER THE WINDSCREEN
7.LONGITIDUNAL REINFORCEMENTS UNDER THE FLOOR
8.REINFORCEMENTS UNDER THE FLOOR
9.GEAR LEVER SUPPORT REINFORCEMENT
10.BONNET LID RETAINING HOOK
11.STRUCTURAL FOAM

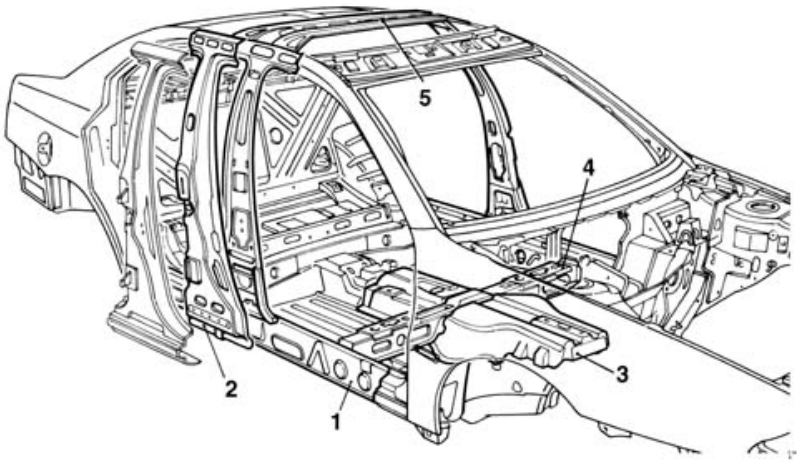
Resistance to side impacts

As far as resistance to side impacts is concerned, the bodyshell has been designed to conform to the mos recent European regulations and is capable of guaranteeing a high level of safety with special crumple zones in the case of an impact which ensure the passenger survival cell protecting the occupants.

The above has been achieved by:

- reinforcing the side members under the door inserting beams with a high degree of transverse rigidity to maintain the resistance to deformation properties between the front pillars and the centre pillars forming an ideal door seal;
- reinforcing the centre pillars along their entire length, inserting a high resistance diaphragm reinforced where the seat belts are mounted and in the area of the lock strikers;
- adopting a central reinforcement for the floor, which includes the reinforcement for the tunnel for the gear lever support and the crossmember joining the side members under the door with controlled deformation to optimize the distribution of the forces;
- inserting a multi-thickness box section connecting beam between the centre pillars in the side panels under the high resistance roof panel.

A further essential element in the resistance to side impacts consists of the doors which are discussed in the paragraph which follows.



1.UNDERDOOR SIDE MEMBER REINFORCEMENT
2.COMPLETE CENTRE PILLAR REINFORCEMENT DIAPHRAGM
3.GEAR LEVER SUPPORT TUNNEL REINFORCEMENT

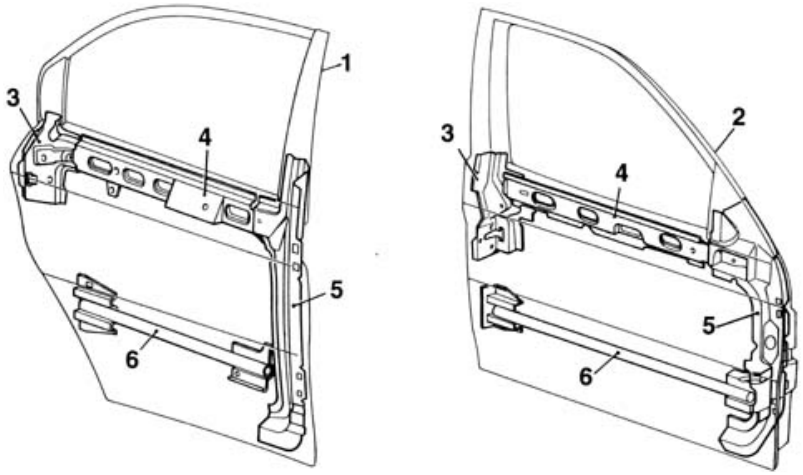
4.REINFORCEMENT CROSSMEMBER BETWEEN THE UNDERDOOR SIDE MEMBERS
5.CENTRE PILLAR CONNECTING BOX SECTION BEAM

Structure of the doors

The structure of the doors is of fundamental importance for the safety of the passengers in the case of side impacts and has therefore been designed with optimum geometry and rigidity of the door panels to complete the capacity to maintain the survival cell and keep possible injury of the occupants to a minimum.The structure of the doors allows them to be opened after the most severe frontal and rear impacts.

This has been achieved by:

- adopting tubular impact beams and waist reinforcements which follow the line of the pillars, completing the seal of the high resistance door;
- adopting high resistance locks and strikers;
- using energy absorption internal door liners with no sharp corners, designed to ensure the minimum impact with the body in the case of an accident;
- adopting opening devices with bowden cables which ensure operation even in the case of a side impact.



1.REAR DOOR
2.FRONT DOOR
3.REAR WAIST REINFORCEMENT
4.WAIST REINFORCEMENT
5.PILLAR REINFORCEMENT
6.TUBULAR IMPACT BEAM

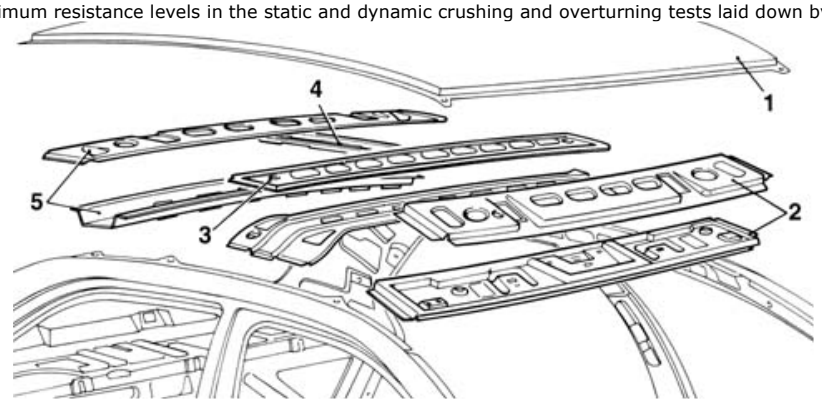
Structure of the roof

The particular structure of the roof, in addition to defining the profile of the vehicle, confers greater strength on the passenger compartment, contributing to the safety of the passengers both in the case of a side impact or if the vehicle overturns which, although only making a very small percentage of accidents, is the most dangerous possible type of impact.

The following increase the solidity of the structure of the passenger compartment:

- connecting box sections between the side panels which further strengthen the roof panel;
- a longitudinal connecting crossmember between the centre rib and the crossmember above the rearscreen;
- structural adhesive applied along the edges of the ribs in contact with the roof which, in addition sticking the parts with good mechanical resistance, also performs a damping function for the roof panel vibrations.

These solutions allow optimum resistance levels in the static and dynamic crushing and overturning tests laid down by European regulations.



1.ROOF PANEL
2.BOX SECTION CROSSMEMBER ABOVE THE WINDSCREEN
3.CENTRE RIB CONNECTING THE PILLARS

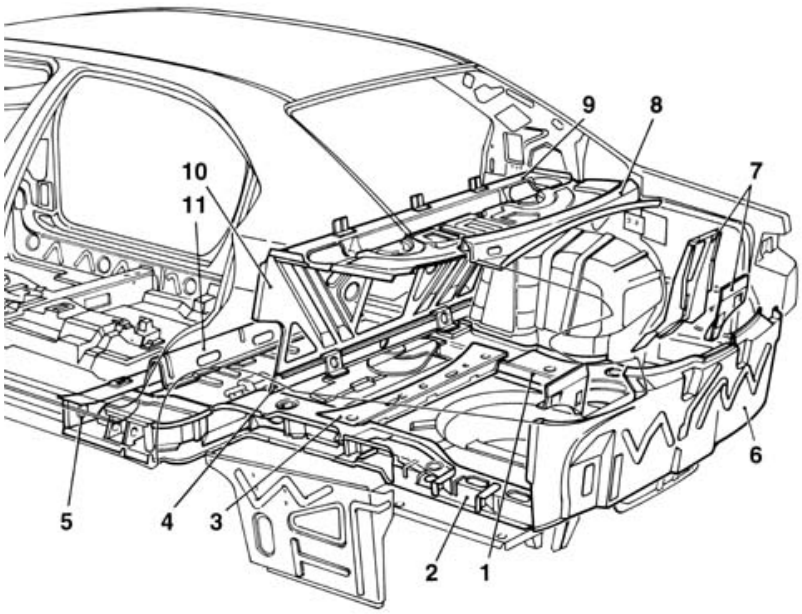
4.LONGITUDINAL CROSSMEMBER
5.BOX SECTION CROSSMEMBER ABOVE THE REARSCREEN

Resistance to rear impacts

The resistance to rear impacts is very high and exceeds the tests established by the most stringent European regulations.

This is ensured by:

- reinforced rear side members connected to one another by crossmembers which distribute the force of the impact to the entire structure, optimizing absorption;
- reinforced rear box section crossmember;
- crossmember under the rearscreen and shelf under the rear parcel shelf;
- partition behind the backrest which also has a protective function against the movement of the load transported in the luggage compartment during an impact;
- rear floor which has a special crossmember which contributes in retaining the occupants of the rear seat.



1.LEFT SIDE MEMBER
2.RIGHT SIDE MEMBER
3.REAR CONNECTING CROSSMEMBER
4.CENTRE CONNECTING CROSSMEMBER
5.FRONT CONNECTING CROSSMEMBER
6.REAR BOX SECTION CROSSMEMBER
7.REAR CROSSMEMBER REINFORCEMENTS
8.CROSSMEMBER UNDER THE REARSCREEN
9.SHELF UNDER THE REAR PARCEL SHELF
10.PARTITION BEHIND THE BACKREST
11.ANTI-SINKING CROSSMEMBER

Passenger compartment and seats

The passenger compartment has been designed to ensure the best possible driving conditions:

- with the instruments and controls ergonomically positioned;
- the dashboard designed with rounded profiles and made from a controlled defomation foam material, with special care taken over the area under the steering column to minimize possible injury to the driver's legs;
- adopting, as standard, twin air bags (driver and passenger) which can be combined, on request, with a side bag protection system for the front seats;
- the furnishings are completed by covers in a high energy absorption material featuring rounded profiles and surfaces with seats which have been made extremely comfortable through the use of differentiated carrying capacity upholstery to ensure optimum support for the various parts of the body;
- there are adjustments which allow an optimum driving position for all drivers, combining the possibility of adjusting the driver's seat and a height and axially (depth) adjustable steering wheel fitted as standard on all versions.

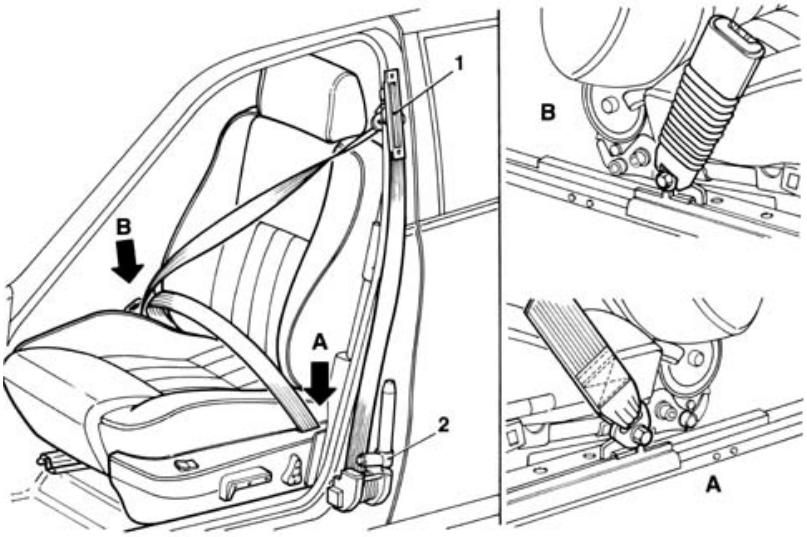
Front seats

The following measures have been adopted to contribute to the safety of the driver and the passenger in the front seats:

- seat belts: height adjustable with a double mounting on the seat, with an electronically controlled pretensioner and high efficiency reel which keep the belt in the correct position irrespective of how the seat has been adjusted, where the outside seat belt mounting has been moved from the centre pillar to the seat (detailA) and the belt mounting on the seat, tunnel side (detailB) has been shortened to reduce the possibility of lengthening.This solution, in addition to the added benefit for the seat belt wearer, also improves the retaining of the occupant compared with traditional systems, with the belt mounting on the floor, allowing a considerable reduction in acceleration and allowing the body to be kept in the correct position contributing to the anti-submarining effect;

- reinforced backrest structures and cushions with anti-submarining effect profiles, with high energy absorbing properties;
- adjustment of the backrest which allows it to assume better positions and eliminate the possibility of "falling backwards" in the case of adjustment whilst driving;
- height adjustment in relation to the standard position which can be set by means of a ratchet lever with extremely small loads which is easy to use on longitudinal sliding guides inclined so that they correspond to the forward movement as well as the raising of the seat;
- These adjustments are also available, on request, in motorized form.

The backrests are also prepared for a controlled structural yield which, in the case of a rear impact, allows the structure to tilt backwards absorbing part of the energy without causing injury to the passengers.



1.SEAT BELT HEIGHT ADJUSTER
2.ELECTRONICALLY CONTROLLED PRETENSIONER

Rear seats

The rear seats are fitted with:

- a partition behind the backrest which protects the passengers from the movement of loads in the luggage compartment;
- specially designed mountings on the bodyshell for the seat belts which guarantee the improved retention of the occupants in the case of an impact.

The anti-submarining function for the occupants is guaranteed by a crossmember above the floor.

Windows

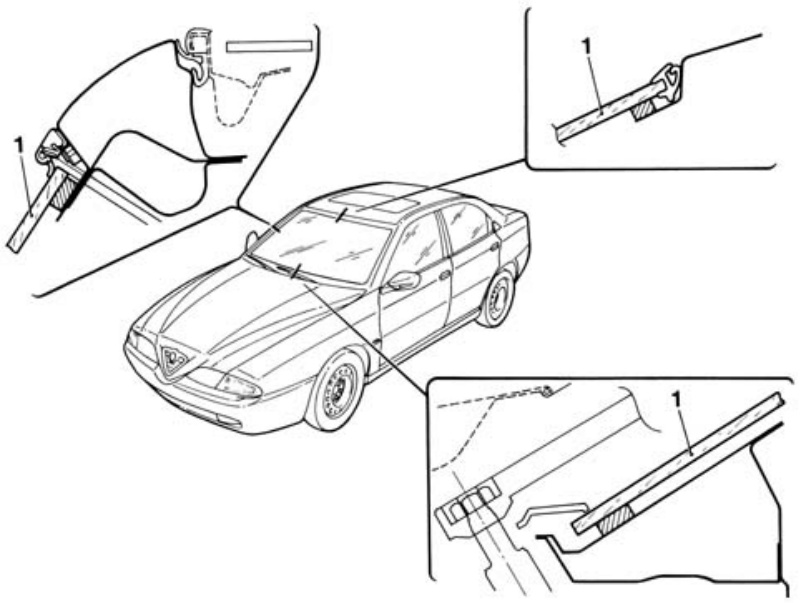
A further safety feature is provided by the fixed windows, the windscreen and the rearscreen which are bonded to the bodyshell, hereby contributing to increasing the structural rigidity of the vehicle.

Windscreen

A stratified windscreen has been adopted to increase the safety of the vehicle.
This solution means that if the windscreen is affected by stonechipping or is hit by an object and shatters, visibility is maintained and a high degree of protection is offered in the case of impact with the head.

The windscreen, boneded with the seal to the bodywork, also contributes in greatly reducing noise due to wind rustling and is available, on request, with:

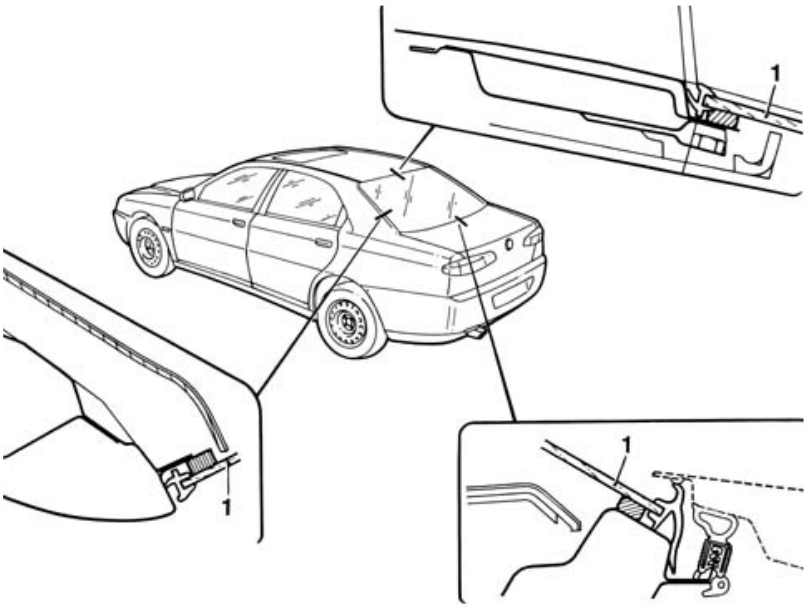
- a defrosting resistance in the area supporting the windscreen wiper blades to avoid damage in the case of ice;
- a rain sensor which automatically operates the windscreen wipers if it rains, altering the speed and frequency according to the amount of water on the windscreen.



1.STRATIFIED WINDSCREEN

Rearscreen

The rearscreen, in non stratified glass, is bonded to the bodywork, making a particularly smooth line which offers less wind resistance and less aerodynamic noise.



1.REARSCREEN

BODYSHELL PROTECTION

Introduction

In accordance with domestic laws, the bodyshell of the Alfa 166 has been designed to be resistant for many years to any kind of environmental attacks as far as both the internal parts, which are not visible but potentially subject to corrosion, and the external parts, subject above all to damage which could adversely affect the appearance of the vehicle, are concerned.
These results have been achieved by studying the structure of the internal panels to minimize exposure to corrosive penetration, making widespread use of galvanized panels and using multiple protective treatments on all the inner and outer panel surfaces.

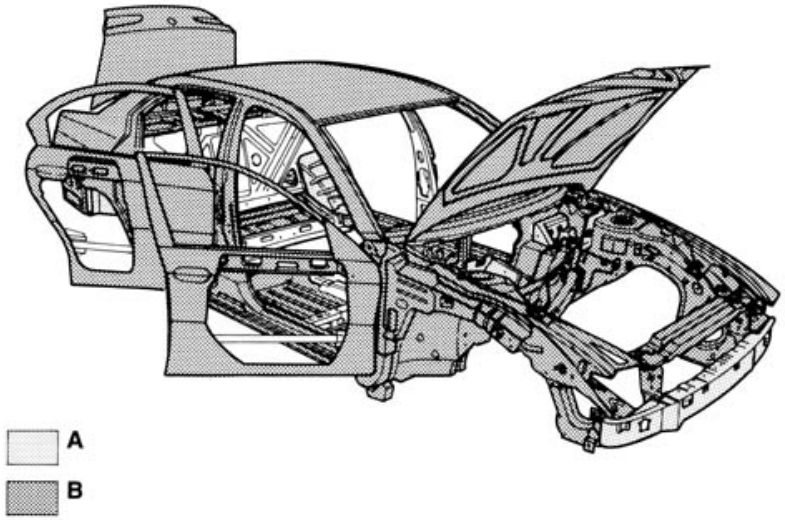
Galvanized panels

Galvanized panels can be produced through two different technological processes:

- galvanizing process deposition; the panel is immersed in or comes into contact with (according to whether both sides or only one side is involved in the process) a solution of zinc salts with a layer of pure zinc with a high degree of surface finish being deposited through the electrolytic effect;
- fire deposition; the melted zinc is deposited on the panel through a thermal effect; this process, which is mainly used for the structural

elements of the bodyshell, can produce zinc thicknessesof up to 20 micron to be used for the parts most exposed to corrosion, compared with the 8 micron usually used for the rest of the galvanized panels.

The layer of zinc provides a chemically active protection for the steel known as "sacrificial" which, combined with the subsequent protection systems, guarantees excellent anti-corrosion properties over a period of time.
70% of the weight of the bodyshell is made from galvanized steel on the Alfa 166.Of this 70%, 75% is galvanized on both sides.
All the structurally important parts such as, for example, the mountings for the suspension and the reinforcements for the seat belts, are made from these materials.
As far as the external parts, subject to cosmetic corrosion, are concerned, the visible surfaces of the open moveable parts are 100% galvanized.

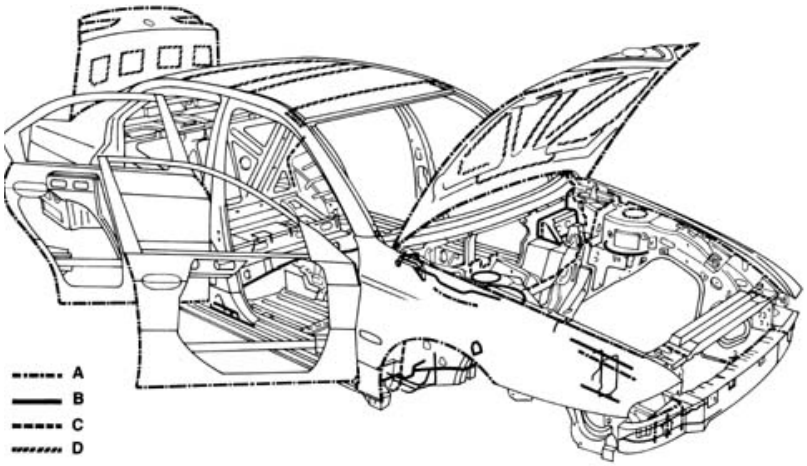


A. DOUBLE GALVANIZED PANELS
B. SINGLE GALVANIZED PANELS

Following the galvanizing treatment, the bodyshell is subjected to bonderization, a treatment which washes any grease or surface oxidation from the panels and to painting by cataphoresis, a treatment which is fundamental for the protection of the structural elements because the paint is deposited in areas of the bodyshell which would not otherwise be accessible.All the joins between the bodyshell panels are then sealed to prevent the penetration of corrosive agents.

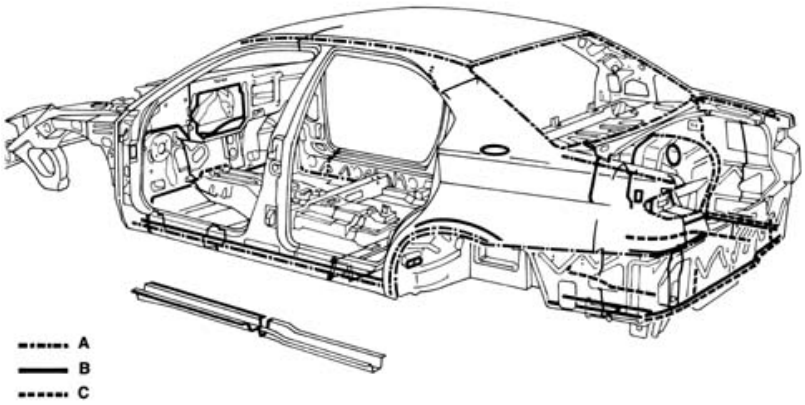
Sealant application

The diagrams below illustrate the most important points on the bodyshell where sealants are applied.
The different types of lines indicate the different types of sealant applied.
FRONT VIEW



A. HOT HARDENING SEALANT TYPE A
B. HOT HARDENING SEALANT TYPE B
C. HIGH CONSISTENCY FILLER
D. HOT HARDENING SEALANT TYPE A2

REAR VIEW



A. HOT HARDENING SEALANT TYPE A
B. HOT HARDENING SEALANT TYPE B
C. HIGH CONSISTENCY FILLER

Application of bodyshell anti-abrasion protective

The anti-abrasion protection is applied, immediately following the sealants; it is applied to all surfaces exposed to stonechipping.This protection, with strong elasticity and adhesive properties for the application surface, also makes a considerable contribution to noise damping. Both materials, sealants and anti-abrasives, are then dried in the oven.

Protection with wax based oil

After the application of the anti-abrasives and the painting cycle, the anti-corrosion treatments are completed by the application of wax based oil in the box sections.

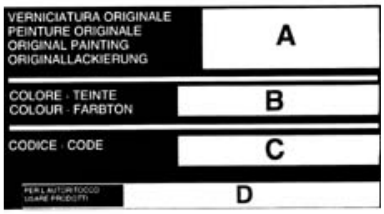
During servicing operations which involve replacing box sections, the wax based oil treatment must be renewed.

Painting

The type of colour for the vehicle and its characteristics are indicated on the identification plate which contains the following information:P

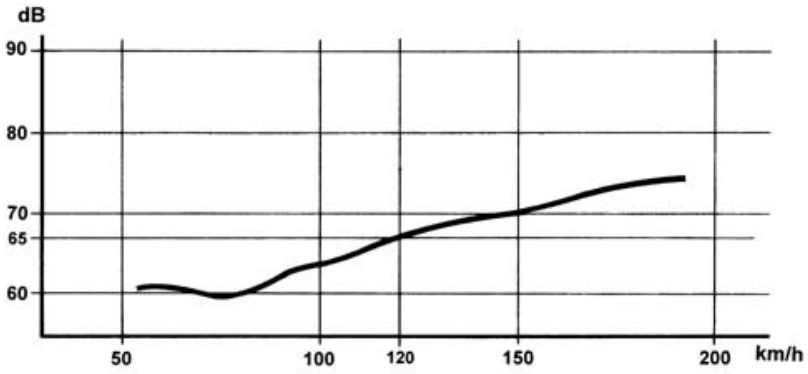
- A. paint product supplier;
- B. enamel colour and type;
- C. code;
- D. type of produce to be used for retouches and painting in the case of service operations.

COLOUR IDENTIFICATION PLATE



SOUND INSULATION

In order to meet the CEE regulations the design of the Alfa 166 has produced exterior noise levels of below 64 decibels, whilst inside the passenger compartment, at an average speed of 120 kph in fifth speed, a noise level equal to 68 decibels has been reached.



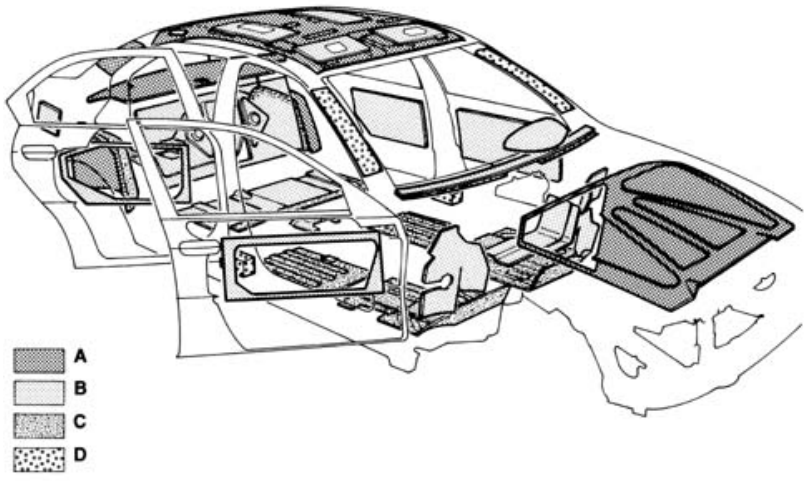
The improvement of the comfort whilst driving, in terms of quietness and quality of life inside the passenger compartment, has been achieved mainly through work on insulating the noise transmitted from the road surface, on the mechanics, on the assembly of the parts and on the aerodynamics.
All the types of engine fitted on the Alfa 166 belong to a new generation which technological contents designed to also improve the acoustic/vibrational aspects.
This same concept is also valid for the power transmission components, the suspension and the mountings on the bodyshell.
The low aerodynamic noise level is also safeguarded by the shape of the vehicle and the care taken over the components which, with their inevitable profiles, often adversely affect acoustic comfort, such as door handles, external rear view mirrors, bumpers, various profiles.

The following are the most effective measures taken to achieve an optimum level of sound insulation:

- special plugs have been inserted in the struts, the windscreen pillars and the rearscreen pillars; being made from a thermo-expandable material, they increase in volume during the bodyshell cataphoresis processes by around ten times thereby completely filling the box section;
- optimization of the bodyshell with the careful design of all components subject to noise, where the rigidity has been increased and he fixings have been reinforced and special care has also been taken over the choice of contact materials;
- sound insulation linings for the panels with thermo-bonding materials applied before painting;
- sound-deadening linings for the front of the dashboard, the front and rear running boards, the wheel housings in the luggage compartment and the side panels in the luggage compartment with pre-formed, composite panels;
- an extremely thick sound-deadening lining for the roof panel which is stuck to improve the sound insulation properties;
- the use in the openings for passing the cables between the engine and passenger compartments on both the panels and the sound insulation material of double rubber seals with a thickness of [sup3] = 5 mm, to reduce the transmision of noise from the engine compartment to the passenger compartment;
- a thorough check of the sealants.

To maintain the high level of acoustic comfort reached, in the case of repairs the solutions adopted during the construction must be exactly renewed.

DIAGRAM SHOWING APPLICATION OF SOUND INSULATION MATERIALS ON THE VEHICLE

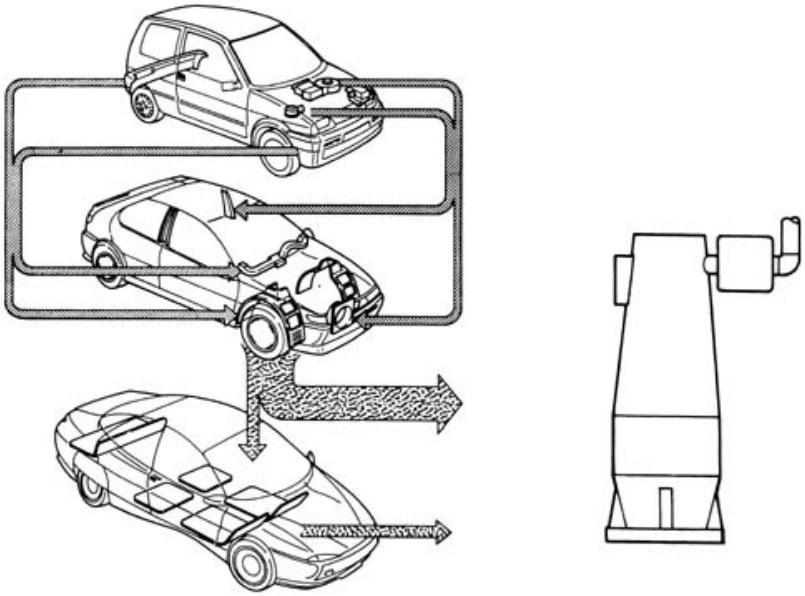


A. SOUND INSULATION MATERIALS
B. SOUND-PROOFING MATERIALS
C. DAMPING MATERIALS
D. THERMO-EXPANDABLE MATERIALS

RECYCLABILITY OF MATERIALS

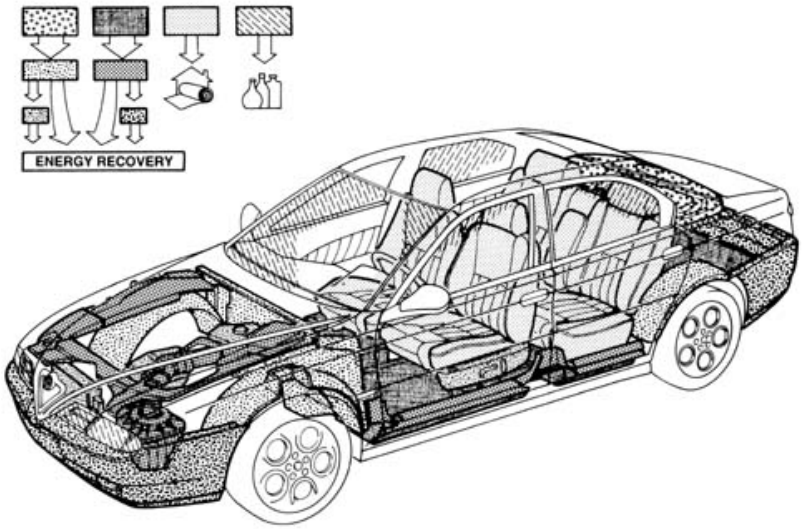
Currently, when the vehicle reaches the "end of its life" only themetal parts are recovered and reused to produce new steel and new aluminium castings.

All of the remaining part of the vehicle, which corresponds to about 25% in weight, is abandoned or eliminated.
An enormous amount of material and energy is therefore wasted in addition to contributing to increasing the size of the problem of disposing of solid waste.
The problem of recycling plastic materials can be solved from the design.
During this stage it is necessary to evaluate the possibility of reusing the material in future components.
DIAGRAM SHOWING REUSE OF RECYCLED MATERIALS



Recycling does not allow the same component to be produced as the starting one because the necessary properties of reliability cannot be guaranteed or it may not be suitable.
Insulating materials for buildings are obtained from seat upholstery.
For other plastic materials, the recylcling is carried out as follows: for example, the material for wheel arch liners which comes from the bumpers is then used in the next stage for producing sound insulation linings and finally ends up as fuel for the production of energy.
This model has been designed so that all the plastic and rubber components weighing more than 50 grams are marked with coded symbols which identify the material for recycling and therefore all the components can be recycled.
MARKING A PART IN RECYCLABLE MATERIAL

Recycling therefore involves three successive generations of vehicles, contributing to savings in raw materials.
PARTS OF THE VEHICLE WHERE THE RECYCLING FLOW IS ACTIVE.



The tables, in the chapter on product Descriptions and Specifications, show the symbols and the names of the recyclable materials on the vehicle.This is because in service situations the suitable products are selected and used for internal washing, painting plastic materials, repairs, bonding, etc.
The aim is to avoid possible damage with product which are not compatible with one another.
In addition, marking makes it possible to select organic materials on the basis of their chemical composition.
It is also advisable, in a service situation, to separate materials on the basis of their composition in order to be able to send them off more easily for recycling.

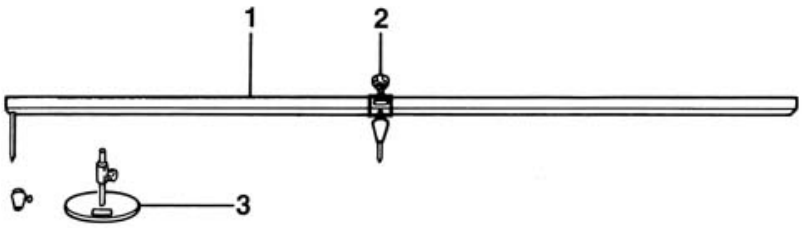
IMPACT DIAGNOSIS

Introduction

This chapter is designed to point out the most practical and correct ways to allow body repairers to obtain the best results.
Before starting to repair a vehicle, even one which is only slightly damaged, it is necessary to carry out a series of checks.
The first stage is to analyze the type of impact which has caused the damage and then the operations required to repair the vehicle.
The examination of the parts of the bodyshell structure which have been damaged, the possibility of repairing them or the need to replace them means that it is necessary to produce both an estimate of the repair costs and to decide the order of the repair operations in order to optimize the repair time.
A preliminary check involves a series of dimensional checks being carried out, not designed to measure specific distances, but to assess the deformation suffered by the bodyshell.
Jigs should be used for these checks on the diagonals for the engine and luggage compartments, passenger compartment, windscreen and rearscreen housings and door housings.

Jigs

The jigs consist of a graduated bar along which a cursor slides with a measuring push rod.
It is possible to fit a push rod to one end of the bar to support it correctly
EXAMPLE OF JIG

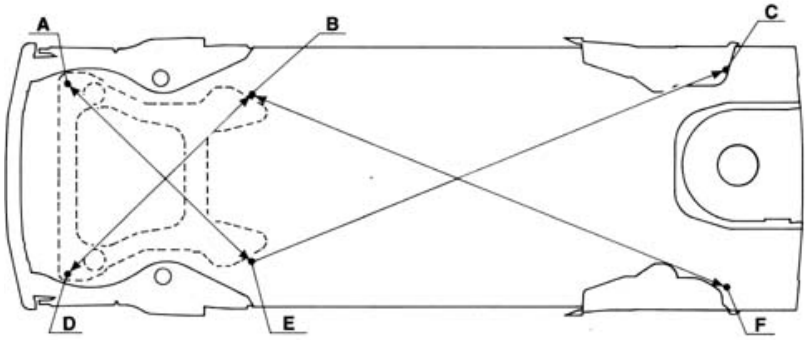


1.JIG
2.CURSOR
3.SUPPORT DISC

Check and restore the typical bodyshell distances

Checking the bodyshell measurements is the first operation which should be carried out in the sequence of repair operations.
The deformations suffered by the bodyshell as the result of a reasonably severe impact almost always cause alterations to the shape and the structure of the different parts of the bodyshell.
These alterations, if not corrected, are capable of seriously adversely affecting the safety of the vehicle, unpredictably altering the road holding and handling properties of the vehicle.
Measuring the distances may or may not require the dismantling of the vehicle mechanical asemblies, depending on the type of gauge used and the features of the jig.

Carrying out the check directly on the mechanical assembly mounting points (which requires their dismantling) guarantees greater precision.
It is, however, possible to carry out a preliminary check, using a gauge (control rod) at the points illustrated in the diagram which follows, with the assemblies fitted, but if there is non alignment, a more detailed check must be carried out, dismantling the mechanical units, an operation which is inevitable given that the bodyshell will have to be adjusted.
Start the check in a part of the vehicle which is not affected by the impact.For example, in the case of a vehicle where the impact has been at the front, to check whether the structure has suffered deformation, proceed with checking oints C-E- = B-F; if there are no differences in length, move on to checking points B-D = A-E.
It is possible, in this way, to establish a more exact fault diagnosis for the repair.
The operation is completed by the subsequent operation of restoring the distances using the hydraulic equipment which must ALWAYS precede the actual operations of repairing and/or replacing the damaged panels.
PRELIMINARY CHECK POINTS



Checking the mechanical elements which could have suffered deformation must not be neglected.

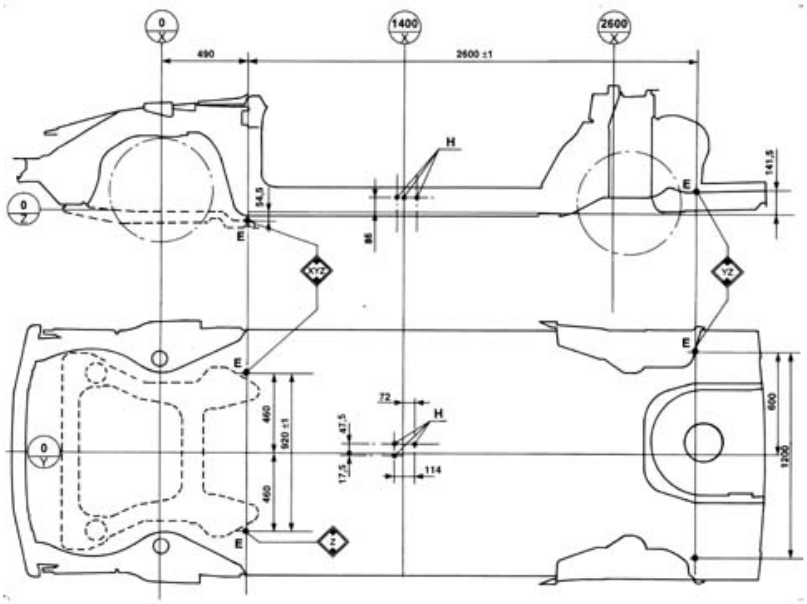
Typical bodyshell measurements

Each bodyshell has a series of typical measurements which exactly determine the position in space, in relation to a conventional reference system, using coordinates x,y,z, of particular points on the actual bodyshell, usually mounting points for the mechanical components and the suspension (see diagrams below).
The operation of checking the typical bodyshell measurements is carried out using special equipment, known as jigs, to which the bodyshell is secured, using suitable fixing elements, and checked using the gauges
The jig consists of a solid, rectangular frame with a steel profile.This frame can, in turn, be fitted on various different equipment: four column or central piston lifts, various test benches or on wheels.
The distances to be measured on the gauges are not usually the same distances supplied by the Manufacturer of the vehicle, but they are translated by the Manufacturer for the gauges and jigs to be used.
Each Manufacturer of jigs publishes a series of figures with the equipment which should be used for specific checking operations on each type of vehicle.

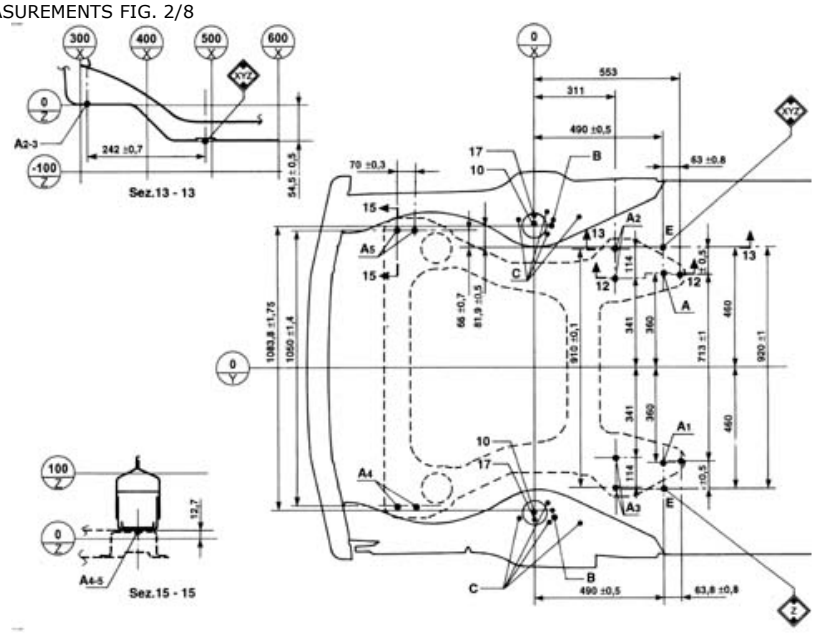
KEY FOR REFERENCE POINTS FOR CHECKING UNDERBODY:

- A Engine support frame mounting openings
- B Openings for suspension positioning pins;
- C Openings for fixing front suspension;
- D Side strut mounting: D1-D2 Centering openings for fixing strut;
- E Main opening;
- F Centering openings for rear suspension crossmember mounting;
- G Centering openings for fuel tank;
- H Handbrake lever support mounting;
- L Silencer and exhaust pipes fixing;
- M Front suspension fixing openings;
- N Openings for front suspension loading and positioning pins;
- R Engine rod mounting centre;
- 10 Front and rear suspension shock absorber theoretical point
- 11 Rear suspension shock absorber theoretical point;
- 17 Front suspension shock absorber theoretical point;

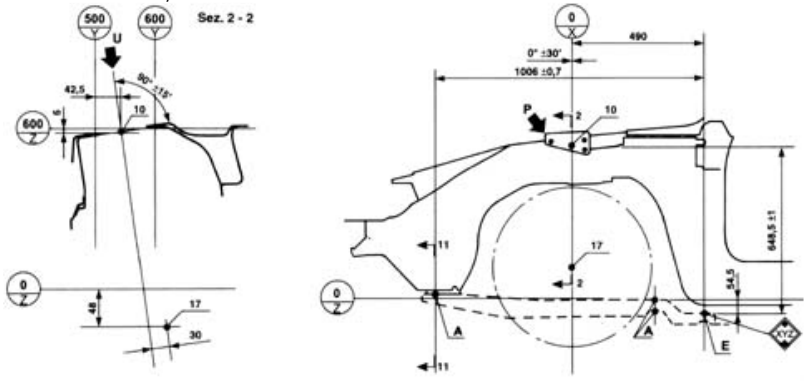
TYPICAL BODYSHELL MEASUREMENTS FIG. 1/8



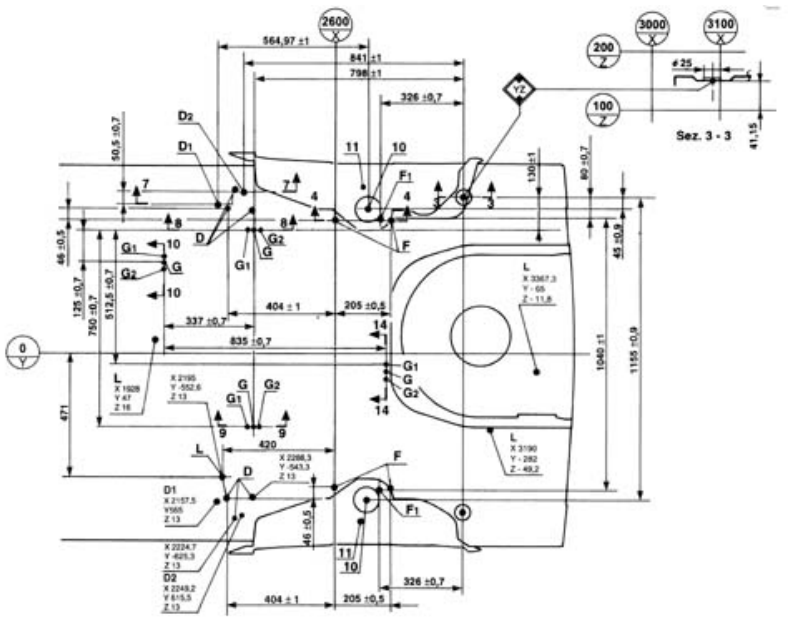
TYPICAL BODYSHELL MEASUREMENTS FIG. 2/8



TYPICAL BODYSHELL MEASUREMENTS FIG. 3/8



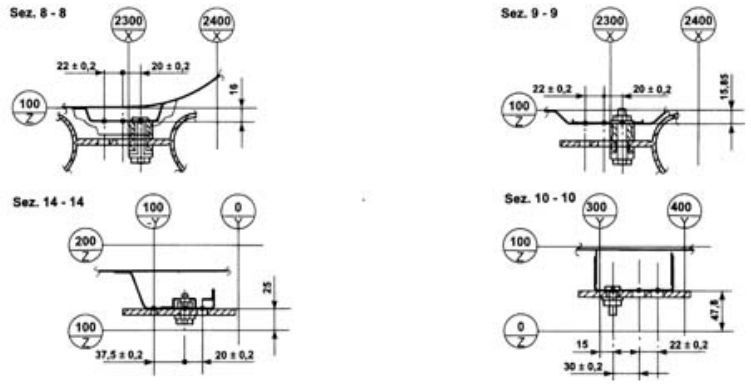
TYPICAL BODYSHELL MEASUREMENTS FIG. 4/8



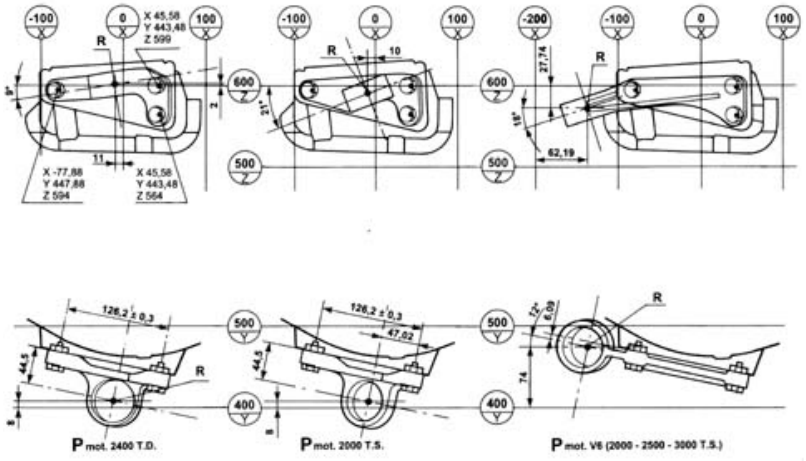
TYPICAL BODYSHELL MEASUREMENTS FIG. 5/8

TYPICAL BODYSHELL MEASUREMENTS FIG. 6/8

TYPICAL BODYSHELL MEASUREMENTS FIG. 7/8



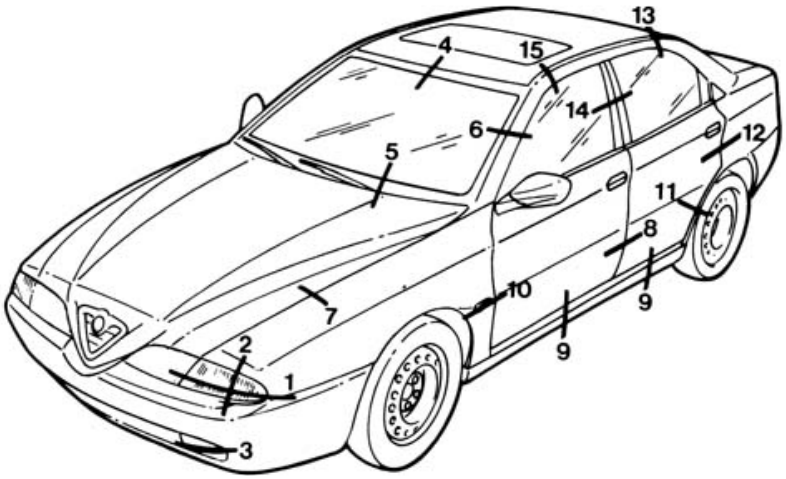
TYPICAL BODYSHELL MEASUREMENTS FIG. 8/8



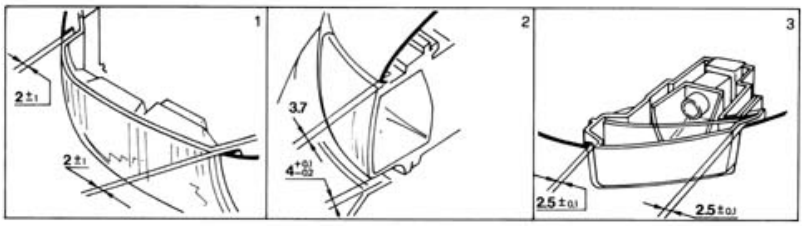
ADJUSTMENT OF MOVEABLE PARTS

Measurements for adjusting moveable parts

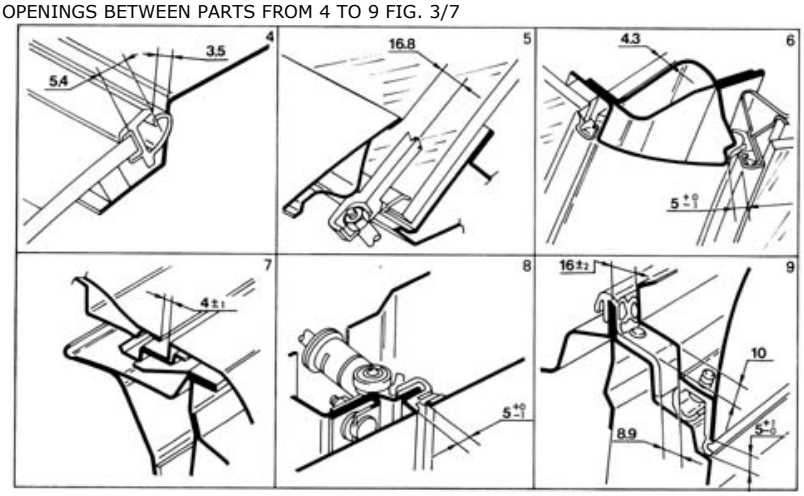
In order to facilitate and check the operations of dismantling the moveable parts, here is a list of the existing openings (measurements expressed in millimetres) for appropriate adjustments.
The adjustment methods are illustrated in the sections containing the procedures for removing and refitting the moveable parts.
3/4 FRONT VIEW OF THE VEHICLE WITH THE POSITION OF THE MEASURING POINTS FOR THE OPENINGS BETWEEN THE MOVEABLE PARTS FIG. 1/7



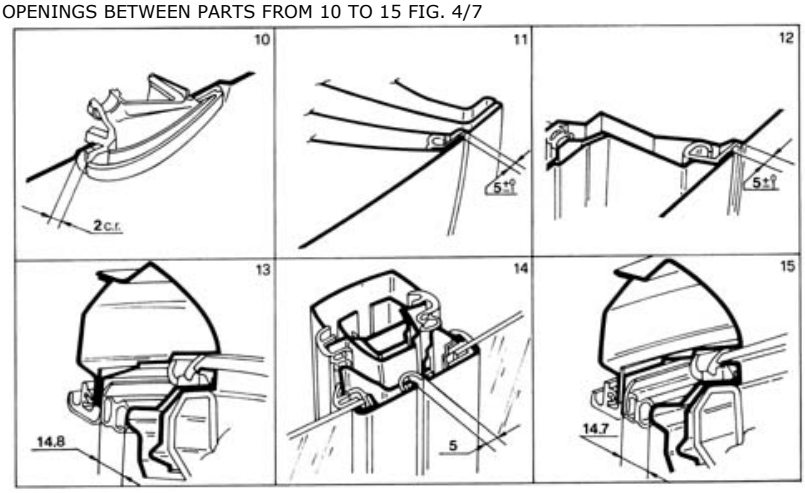
MEASURING POINTS FOR OPENINGS BETWEEN PARTS FROM 1 TO 3 FIG. 2/7



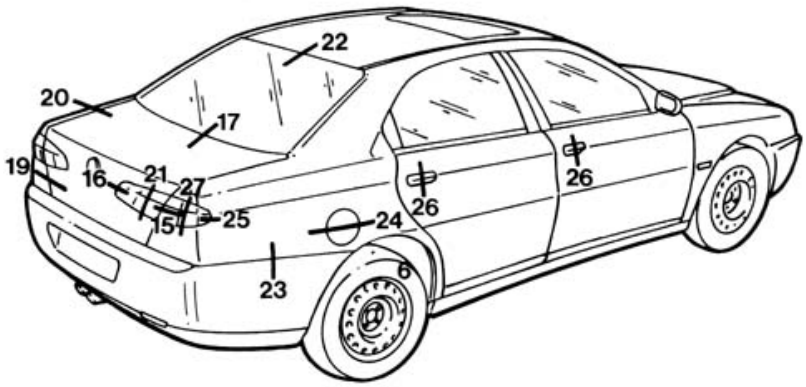
MEASURING POINTS FOR OPENINGS BETWEEN PARTS FROM 4 TO 9 FIG. 3/7



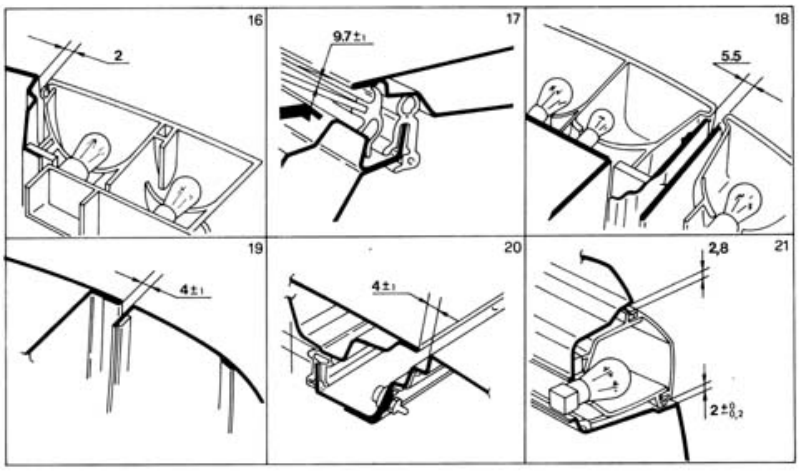
MEASURING POINTS FOR OPENINGS BETWEEN PARTS FROM 10 TO 15 FIG. 4/7



3/4 REAR VIEW OF THE VEHICLE, SHOWING MEASURING POINTS FOR THE OPENINGS BETWEEN THE MOVEABLE PARTS FIG. 5/7



MEASURING POINTS FOR THE OPENINGS BETWEEN THE PARTS FROM 16 TO 21 FIG. 6/7



MEASURING POINTS FOR THE OPENINGS BETWEEN THE PARTS FROM 22 TO 27 FIG. 7/7