Quick Dent Repair System

Operation Instruction

FY-9015

Operation Instruction

Application
The repair of the minor dents, oval pits and paintless dents

Material
High-strength stainless steel
White plastic steel

Point Types & Functions
a. Bullet type: repair oval pits
b. Knife type: repair minor dents
c. Blade type: repair minor dents and oval pits
d. Plastic steel: repair paintless dents

Sizes & Functions
a. small size: repair mild dents and oval pits
b. Medium size: repair moderate dents and oval pits
c. Large size: repair severe dents and oval pits

Angles & Functions
This system can quickly repair different dents with different degrees of damage from different angles under different situations.

Instructions
a. It is difficult to repair minor dents and oval pits left over from major repairs and this quick dent repair system is designed to solve this problem.
b. Observe the minor dents and oval pits, locate the position, choose appropriate tools, push by the point of the tool from the back of the panel, push harder by thigh if convenient and repeat if can’t achieve at a time.
c. Use plastic steel tools to gently tap and flatten dents and oval pits which have been pushed too much.

Attentions
a. Do not push too hard when repairing the panel.
b. Ensure the tool surface is smooth and without any distortion.
c. Clean up oil-water and dirt on the surface after repairing.

Chapter One: Common Tools & Equipment for Dent Repair

The common dent repair tools fall into two catagories: special tools and assistive tools.

Section One: Dent Repair Special Tools

1. Single-bend long tool
Repairing area: front and rear fenders, door, roof, hood, trunk lid
Applicable situation: when the dent is far to reach, the interior space is large and the panel has only one layer.

2. Double-bend long tool
Repairing area: front and rear fenders, door, van roof, hood, trunk lid
Applicable situation: when the dent is too far to be reached by the single-bend long tool, the interior space is large and the panel has only one layer.

3. Hook tool
Repairing area: special for front fender
Applicable situation: at the brow of the front fender

4. Big Right-angle flat-end tool
Repairing area: front and rear fenders, door
Applicable situation: when the fulcrum is far, the dent area is big and often need to rotate the tool.

5. Big bend flat sharp-end tool
Repairing area: the double-layer part over the door

6. Single-bend sharp-end tool
Repairing area: the single-layer parts all over the car
Applicable situation: the most used and most widespread tool when repairing small dents.

7. Double-bend sharp-end tool
Repairing area: front and rear fenders, door
Applicable situation: when repairing small dents where the single-bend sharp-end tool can’t reach.

8. Flat sharp-end tool
Repairing area: the double-layer parts all over the car
Applicable situation: when the gap between the two layers is large and the dent is far.

9. Flat sharp-end hand tool (single-bend)
Repairing area: the double-layer parts all over the car
Applicable situation: when the gap between the two layers is small and the dent is close.

Section Two: Dent Repair Assistive Tools

1. Dent repair lamp

Repairing area: dents on the car body

Functions:

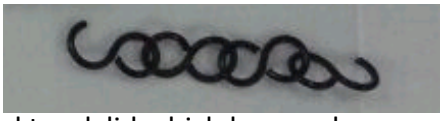
a. Locate the position of the dent
b. Check the size and shape of the dent
c. Locate the bumps of the dent
d. Locate the position to use dent repair tools
e. Locate the position to use dent repair tools in the next step

2. Dent repair pen

Usage: Use the pen to flatten small bumps caused by uneven forces during the repair process, the internal force when the dent is forming or the tension of the metal.

Attentions:
Make sure the pen is perpendicular to the paint surface in case of scratching the paint if tilted. The strength should be equal. Do not hit too hard to cause unrepaired points.
Light scratches caused by the pen can be rubbed by a 2000 grit sandpaper and polished by FMC830.

3. Hook



Usage: Use the hook when repairing the hood, roof, door, rear fender and trunk lid which have only one layer. Choose the hole or gap on the body frame as the point of force to fix the hook when there is no fulcrum around the dent.

Attentions:
Start repairing only after the hook is firmly fixed, otherwise it may damage the body frame and the hook. If there is no hole on the body frame, use the gap to fix the hook, or drill a hole.
Check the hole or gap after repairing. Do some simple treatments if there is distortion, or make up the paint if there are cracks or peeling. The car body will get rusted after long period exposed to the air if without any treatments.

4. Glass protection plate & triangle plate

Use the glass protection plate when repairing the front and rear doors while the window is open. It protects the glass from being scratched or crushed by tools during repair without taking down the glass. Place the protection plate from the top of the glass to 10cm below the dent. Roll down the window to the lowest and insert the protection plate along the lateral of the window glass.

Insert the triangle plate into the gap between the protection plate and the lateral of the window glass. Make sure the triangle plate is deep enough to allow the repair tool to pass smoothly. Insert the triangle plate gradually. Pushing too hard may damage the glass window, door seal or the window frame. Place the triangle plate directly above the dent to ensure the tool can reach the dent.

5. Glue pulling kit
Repairing area: A & B pillars, double-layer, where tools can't reach. It is designed to repair cars damaged by hailstorm, easy operation, time and energy saving and effective.

6. Wrenches
6# - 7# open-end wrench & offset ring spanner
8# - 10# open-end wrench & offset ring spanner
12# - 14# open-end wrench & offset ring spanner
13# - 15# open-end wrench & offset ring spanner

7. Flat-blade & Phillips screwdrivers
Repairing area: screws on roof, interiors and door

8. Utility knife
Repairing area: Cut the glue between the frame structures to make way for repair tools.

Repairing method: Use the knife to scrape the sealing glue between the two layers of the car body. Scrape gradually.

9. Portable electric drill & hole saw
Repairing area: Portable electric drill and 14# hole saw for dents at double-layer car body where repair tools can't reach.

Repairing method: The steel plate is thin therefore only need lower-power portable electric drills. Use 4mm or 6mm drill bit and 14mm hole saw. The hole saw for aluminium alloy is enough. Pay attention to use electricity safely. Stably hold the hole saw when using it. Try to avoid use of the hole saw in case it damages the original structure of the car body.

Drill at a location as close to the dent as possible, without any obstacles and as less visible as possible in case of influencing the car body appearance. Use a hard steel punch to punch a hole first in case the drill slips when drilling at inclined surface. Don't drill at the front of the car or anywhere may influence the appearance. Control the strength when drilling. Drill lightly at first then gradually drill harder. Do not drill too hard especially at double-layer location with limited internal space, otherwise it may drill to the outside. Repaint the hole position and add buckle to protect it after the repair.

10. Jack
Repairing area: dents on the car frame

11. Tire wrench
Repairing area: Remove tires

12. Buckle screwdriver
Repairing area: Remove interiors
Repairing method: Use strength equally, do not force too hard and do not damage the interiors and the buckles.

Chapter Two: Dent Repair Practices

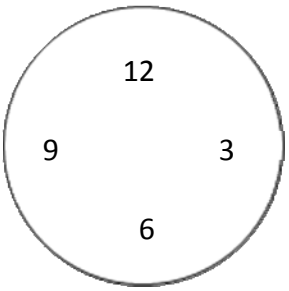
1. Locate the point

a. Locate the point by dent repair tools.
b. Flatten small bumps during practices.
c. Repeat ”a” and “b” to locate the point and know where the tools can reach.

Attentions:
a. Observe the change of the boundary of the lamp light.
b. Do not hit too hard in case the paint cracks.
c. The fulcrum should be at the middle or two-thirds of the tool.
d. Control the strength. Start lightly and increase the force gradually. Try to make the dent a semicircle.

Right repair process:

a. Extrude the center of the dent for the first time. Extrude the center again for the second time. Extrude harder this time and observe the change of the dent.
b. Extrude Point 9.
c. Extrude Point 3
d. Extrude Point 12
e. Extrude Point 6
f. Repeat the above steps to make the dent a point.



Attentions:
a. It takes about 10-20 times of extrusion to repair a dent.
b. The dent gets smaller after each extrusion.
c. Once a bump appears, flatten it by the dent repair pen.
d. Observe the change of the boundary of the lamp light and make the dent a point on the paint surface in the end. Dent repair technique means the technique of using special tools to shrink dents on the sheet plate into points on the paint surface.

2. Locate the position for the tool by the boundary of the lamp light

a. Push to detect where the tool can reach.
b. Push harder and observe the boundary of the lamp light.
c. Use the same strength to push forward and backward. Meanwhile the boundary of the lamp light will move. Try not to make bumps when moving. Move the tool and repeat Step A to Step C.
d. Put the tool back and check if there are any obstacles.
e. Check the tool again then start repairing.

3. Repair method of dents with complicated shapes

a. Use the pen to make the dent a semicircle as much as possible.
b. Repair step by step.
c. Try not to make bumps when moving.
d. Observe the change of the dent.

Extrude → Observe → Move → Locate

Chapter Three: Dent Repair Basic Technology

The examination of the car body is important to decide what to repair. The content and method of examination differs for different cars and different damage conditions.

Below are the instructions based on Santana, for example:

Section One: Repair Process of the Door

1. Check the position of the dent:

2. Place the lamp bracket:

3. Observe the dent in the light:

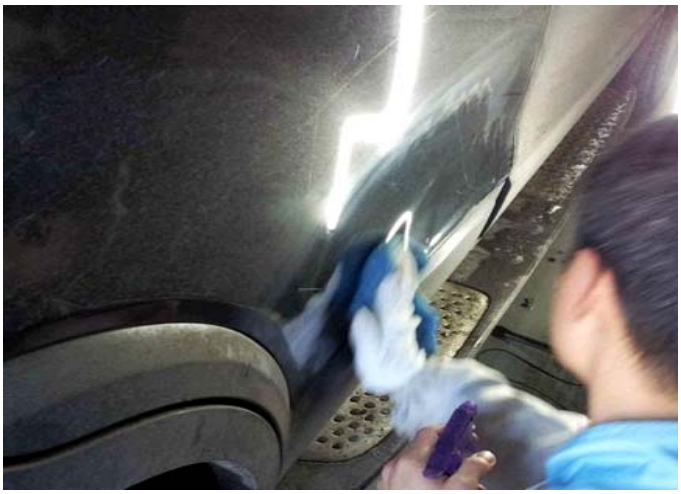
4. Insert the glass protection plate:

5. Inset the triangle plate:

6. Use the tool to repair:

7. Use the flattening pen and hammer:

8. Treatment of the paint:



9. Treatment agent:

10. Repair finished:

Chapter Four: Concept & Classification of SRS System

Section One: Introduction

The dent repair process need disassembling, sometimes in small area and sometimes need in large area. When in large area, we may need take down the SRS system, so the operator need know about the SRS system and know how to take it down.

1. Concept of SRS system

SRS is the abbreviation of Supplement Restraint System, which is a safety protection device widely used in modern cars. It is installed in front of the driver seat and the front passenger seat to reduce the harm of the enormous inertia force caused in the collision. With the seatbelt fastened, the airbag helps reduce injuries on the chest, the head and the face.

When the car stops in a collision, passengers in the car will keep moving forward at the same speed if not wearing the seatbelt, and may hit the steering wheel or the front windshield and get severely injured; if fastened with the seatbelt, passengers will gradually stop moving forward with the car. If the collision is too violent, passengers will slow down but may still hit things in the car before they stop with the car. If the airbags in the steering wheel and the dashboard pop up, they will protect passengers from hitting things in the car and evenly spread the impact on the head and the chest. Accident statistics show airbags only pop up in 10% of accidents; when they pop up, they can reduce 25% injuries on the head and 80% injuries on the face.

2. Classification of SRS system

a. Classified by numbers of airbags: single-SRS system, dual-SRS system and multi-SRS system.

Single-SRS system has only one airbag installed in the steering wheel; dual-SRS system has one airbag installed in the steering wheel and another airbag in the dashboard in front of the passenger seat; multi-SRS system has airbags on the door or the side of seats except for the airbags in the steering wheel and the dashboard.

b. Classified by ignition control modes: mechanical control and electronic control.

The mechanical control mode detects and ignites the airbags in a mechanical way, which is rarely used now. The electronic control mode detects and ignites the airbags by impact sensors and electronic control unit, which is widely used now.

c. Classified by the protected objects:

For the driver: SRS system for the driver is the most widely used SRS system, which protects the driver in head-on collisions. It is installed in the middle of the steering wheel and has American type and European type. The American type is designed on the assumption that the collision happens when the driver doesn't wear the seatbelt and has a larger volume, about 60L; the European type is designed on the assumption that the collision happens when the driver wears the seatbelt and has a smaller volume, about 40L.

For the front-seat passenger: the front-seat passenger could be an adult or a child and he or she may sit in different postures, who will definitely hit the dashboard, the front windshield, the window frame or the door frame, therefore the airbag is designed bigger, about 160L, to protect the passenger from injuries.

In case of side collisions: the airbag can be installed in the upper beam of the door, the inner plate of the door or the side of the seats. The airbag in the upper beam of the door protects the passenger's vital organs like the chest, the heart and the lung. BMW adopts the double side collision SRS system to expand the protection area. Its airbag is in a tube shape. The side collision SRS system is usually small due to space limitation, 35-40L if in the inner plate of the door, 12L if on the side of the seats.

For the rear-seat passengers: usually there isn't airbag at the rear seats, but recently SRS system for the rear-seat passengers (including side collision SRS system for rear-seat passengers) has emerged. It could be as large as 100L and its structure is basically the same as other SRS systems. It is mostly installed in the seat back of front seats and can ignite the airbag between the front seats and the rear-seat passengers.

For legs: Moton Intern develops a SRS system to protect driver's legs. It consists of a 13L airbag and a gas generator. It prevents the driver's legs, calves and knees from hitting with pedals and the joystick. It is installed in the plate under the dashboard. Its structure is similar with other SRS systems.

Section Two: Disassembly

A. Turn the ignition switch to "OFF" and cut the earth cable of the car battery. Wait for at least 20s then start repairing.
B. Do not connect the car to any external power source.
C. Lay the airbag assembly faceup.
D. All airbag components have warning signs on them. Do follow the instructions in operation.
E. Remove the sensor if necessary in case of electric shock.
F. All cables and connectors of the SRS system are in yellow.
G. Install the airbag according to the following steps:
* Turn the ignition switch to "LOCK".
* Connect the earth cable of the car battery.
* Wait for at least 10s then turn the ignition switch from "LOCK" to other positions.

A540E & A540L
A. Turn the ignition switch to "LOCK".
B. Cut the earth cable of the car battery.
C. Wait for at least 30s then start repairing.
D. SRS system has a back-up power. Repairing within 30s may accidently ignite the airbags.
E. Removing the electrical connectors of the airbag when the ignition switch is at "ON" or "ACC" may leave trouble code of the SRS system on the record.

Section Three: Ignition

Note: Read and record all trouble codes before disassembling the SRS system.
A. Turn the ignition switch to "LOCK".
B. Take apart and wrap the connector of the battery earth cable by insulating tape.
C. Wait for at least 2min after insulating the car battery because the SRS system keeps enough voltage to ignite the airbags in a short time.
D. Connect the earth cable of the car battery after the repair.
E. Turn the ignition switch to "ON" from the front-passenger side.
F. If the SRS warning light is on for 6s-8s and off for at least 45s, the SRS system works properly.

Section Four: Disassembly & Installation of Volkswagen Passat B5

1. Disassembly & installation of the SRS system in front of the driver

(Steering wheel with four spokes)

Disassembly:
Cut the earth cable of the car battery;
Loosen the steering gear adjusting lock, turn the steering wheel till the spokes are vertical, pull out the whole steering wheel and lay it down;
Tighten the steering gear adjusting lock;
Insert a 175mm screwdriver 45mm into the hole from the back of the steering wheel;
Compress the screwdriver and the clip and remove the chain of the SRS positioning piece;
Turn the steering wheel 180° counterclockwise and loose the opposite second positioning piece;
Turn the steering wheel to the middle (the car wheels are parallel);
Remove the chain plug of the SRS system.

Installation:
Turn on the ignition switch;
Connect the car battery.
Note: Nobody should be in the car.

Disassembly of the steering wheel:
Take apart the SRS system in front of the driver
Turn the steering wheel to the middle (the car wheels are parallel);
Remove the hexagon bolt and dismantle steering wheel from the steering gear shaft.

2. Disassembly & installation of the SRS system in car with reduction slip ring

Remove two Phillips head screws;
Take down the bushing of the change-over switch;
Remove the Phillips bolts;
Loosen the height adjusting lock of the steering wheel;
Take down the lower bushing of the change-over switch;
Take down the connecting plug;
Remove the chain of the positioning hook and take down the reduction slip ring from the change-over switch.
Note: only dismantle and install the slip ring when the steering wheel is in the middle (the car wheels are parallel). Use wire harness to fix the reduction ring in the middle.

3. Disassembly & installation of the SRS system in front of the front-passenger

Disassembly:
Cut the earth cable of the car battery;
Take down the cover (clamped by clips) of the SRS system from the dashboard;
Turn the cover upward and remove the hexagon nut;
Remove the hexagon bolt, take down the airbag from the support arm and remove the connecting plug.

Installation:
Turn on the ignition switch;

Connect the earth cable of the car battery.
Note: Nobody should be in the car.

4. Disassembly & installation of the airbag controller

Note: disconnect the earth cable of the car battery before disassembling the airbag controller.
Take down the cover and middle bracket of the middle console;
Remove the chain of the hook and take down the connecting plug from the controller;
Remove the nut and take down the controller from the nut.

5. Disassembly & installation of the SRS system in front of the rear-passenger

Disassembly:
Cut the earth cable of the car battery;
Dismantle the bracket of the seatback and loosen the shield of the seatback;
Remove the bolts;
Take down the plug of the airbag and take the airbag down from the seatback bracket.

Installation:
Turn on the ignition switch;
Close the door;
Connect the earth cable of the car battery.
Note: Nobody should be in the car.

Chapter Five: Basic Concepts of Dent Repair Technique

Section One: Dent Repair Technique

▲ What is car dent?
Dents are bumps or pits caused on the car body by internal and external force in extrusion and collision.

▲ What is car dent repair technique?
Car dent repair technique is the technique of extruding the car body under moving light to repair the dent, without polishing the putty and repainting the car body in traditional repair.

▲ Advantage
Innovative – no need of painting, keep original paint
Timesaving – need shorter time than traditional repair
Valuable – no discoloration or fading of original paint
Environmental friendly – no pollution in the whole process

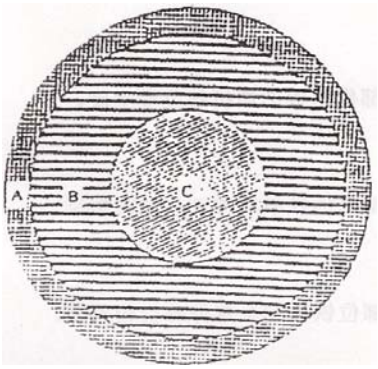
▲ Disadvantage
A. Deep dents and severe distortion of the car body can't be repaired.
B. Scratches on the paint can't be repaired.
C. Overlapped panels and where tools can't reach can't be repaired.

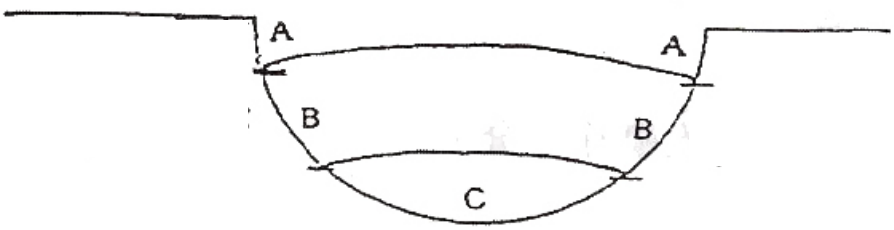
▲ Irreparable parts
Parts made of PU, plastic or fiberglass; angles made by machine tools; hard bends of the car door; double-layer panels.
Note: Small dents on A & B pillars or multi-layers can't be repaired by gluing.

Car body repair and paint process in dent repair:
A. Mechanical pulls and pushes to repair dents
B. Remove old paint film, degrease and clean
C. Blow the putty and sand
D. Dry the putty
E. Sand the putty at bumps and blow the putty at pits
F. Degrease and clean
G. Cover (use tape or paper to cover parts which don't need painting)
H. Brush primer and dry
I. Sand and dry
J. Handle defects
K. Degrease and clean
L. Cover (use tape or paper to cover parts which don't need painting)
M. Mix paint with close colors
N. Spray and dry
O. Polish
P. Wash the car

Section Two: Dent Structure

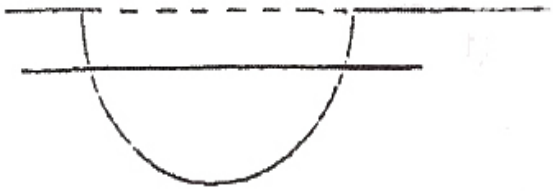
The sheet metal extends because of external force:



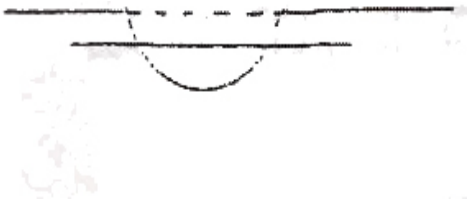


A.  very hard B.  hard C.  soft

There are 10%-20% very hard (A) in a dent. The dent repair is to make the proportion 50%.



10%-20%



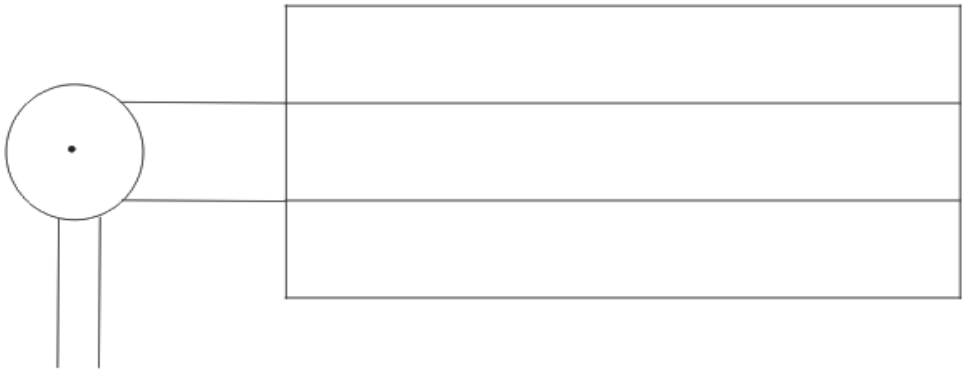
50%

Section Three: Dent Repair Tools

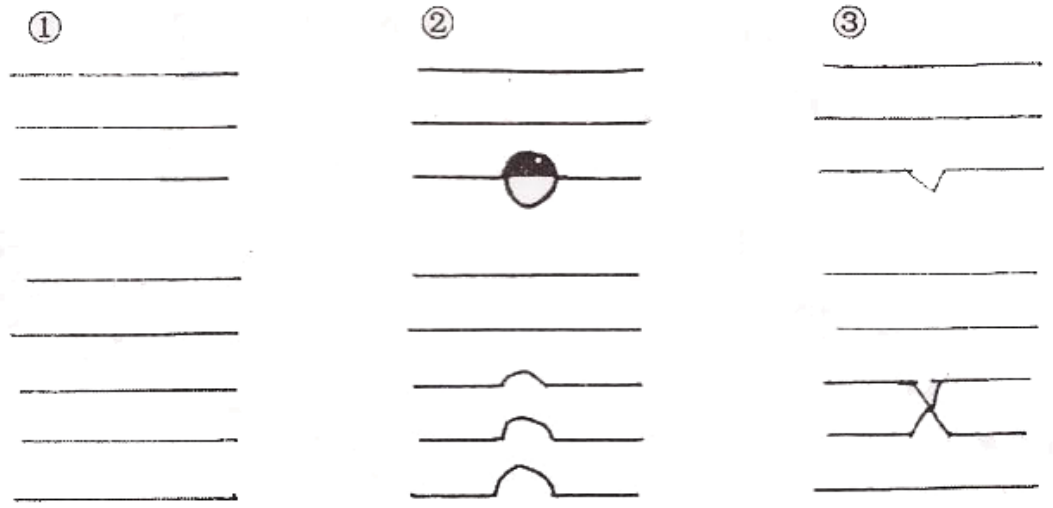
Usage of Lamp

1. Function of the lamp
   A. Locate the dent
   B. Observe the shape and size of the dent
   C. Where the tool to reach
   D. Where the tool to reach in the next step

The lamp:



The boundary of the lamp light on the car body:



2. Usage of the lamp
   A. Position of the light: how to place the lamp plays a decisive role in the repair.
   B. Angle of the light: adjust the lamp arm to decide the movement position.
   C. Adjustment of the light: look at the lampshade to adjust the thickness.

3. The lamp light plays a 70%-8% role in the repair.

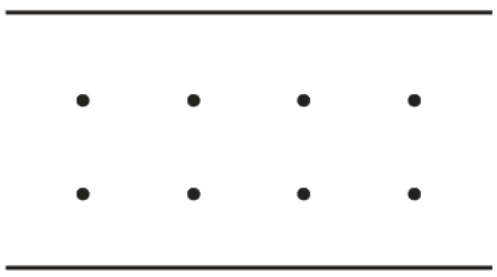
4. The most important thing is to make sure the light is parallel to the car body surface, that is the light, the lampshade, the dent and the eyes are on a straight line.

Categories & Usage of Dent Repair Tools

(1) Pushing tools – Push the dent up from the side of the bottom, can repair the door
(2) Hand tools – When other tools can't reach
(3) Rotating tools – Rotate the side of the tool, can repair the door
(4) Extruding tools – Lay the tool against the inside of the car as a fulcrum and insert it into small gaps
(5) Spiral tools – Can repair the upper part or slopes of the door
(6) US lamp
(7) Sheet metal hammers
(8) Flattening pen – Start gently; make the deep dent shallower; keep the dent round; pay attention when the car body is hot.
(9) Hole saw
(10) S hook
(11) Ring hook

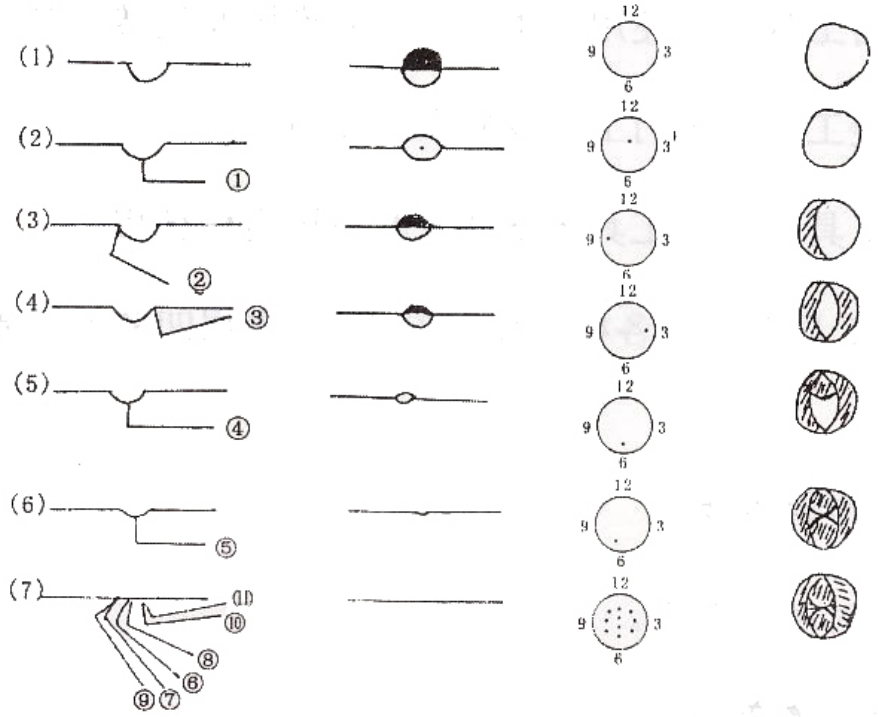
Section Four: Dent Repair Method

1. Locate the dent:

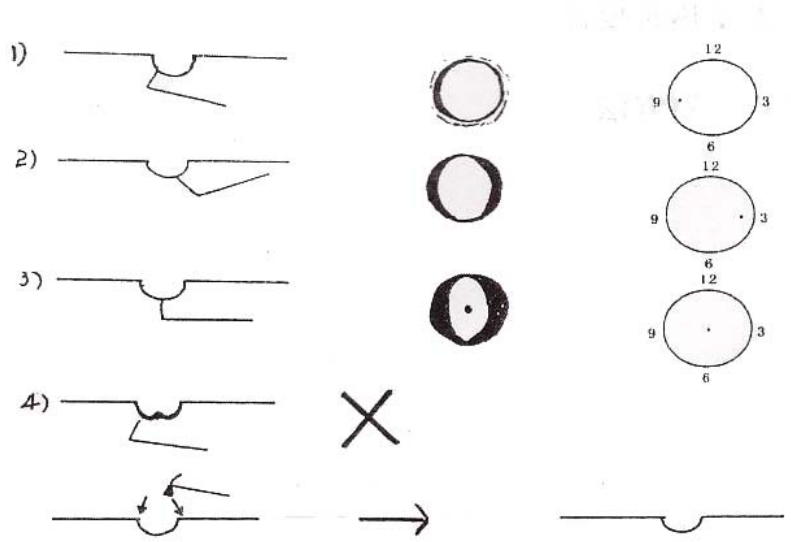


A. Use pen to draw dots for practice.
B. Use the flattening pen to hit the point position for practice.
C. Practice repeatedly until you know where to place the tool.
Note: The car body is made of different materials. Don't hit too hard.

2. Regular dents:



3. Irregular dents:



Use flattening pen to make the irregulars dents regular first.

4. Wrong technique may lead to the following situation:
(1) Increase the repair time
(2) Lower the repair quality
(3) Damage the paint
(4) Crinkle the straight edges
(5) Cause irreparable damages

5. How to reach the point by tools:

a. Push to locate the point, if can't,
b. Push harder and move eyes to observe the point, if still can't,
c. Use the same strength to move the tool forward and backward and observe the change of the surface (do not make bumps during moving), if still can't,
d. Move the tool and repeat Step a to Step c until locate the point.

6. Basic techniques of dent repair:
(1) Dents on the hood and the trunk:
Tools: pushing, rotating, extruding, hand, etc.
Order: A. Take down the liner; B. Use hand tools and extruding tools at double-layer panel.

(2) Dents on the roof:
Tools: pushing, rotating, extruding, hand, etc.
Order: A. Take down the liner; B. Use hand tools and extruding tools at double-layer panel.

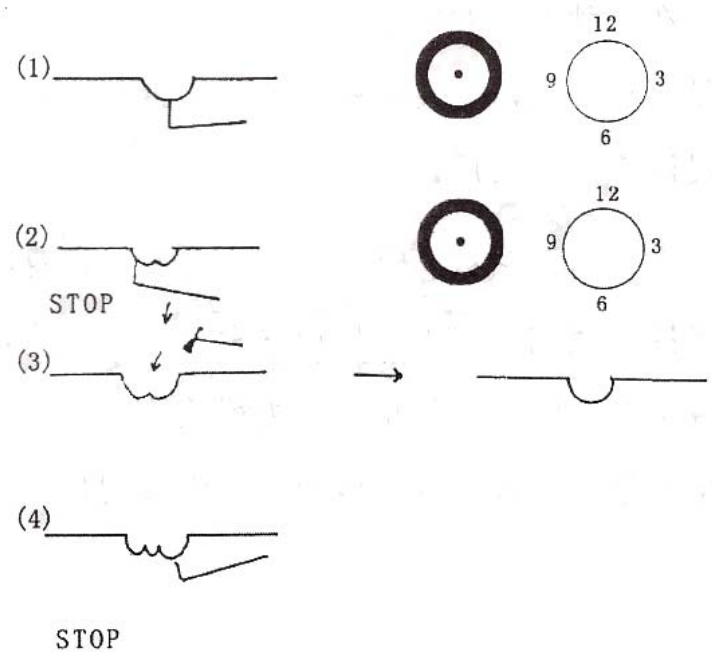
(3) Dents on the left and right front wings, wheel hub
Tools: pushing, rotating, extruding, spiral, etc.
Order: A. Take down the headlight and make a mark; B. Insert the tool under the fender.

(4) Dents on the rear rings and rear end
Tools: pushing, rotating, extruding, etc.
Order: A. Take down the taillight; B. Take down the liner on the side of the trunk.

(5) Dents on the front and rear doors
Please use the glass protection plate to prevent the glass from scratching.
Tools: pushing, rotating, extruding, spiral, hand, etc.
Order: A. Open the window; B. Take down the liner of the door; C. Use the drain channel gap.

(6) Dents on other places
Tools: all tools
There is a need of drilling holes when using hooks to repair dents.

7. Complicated dents:



Make the dent round before using tools. Don't hit too hard.