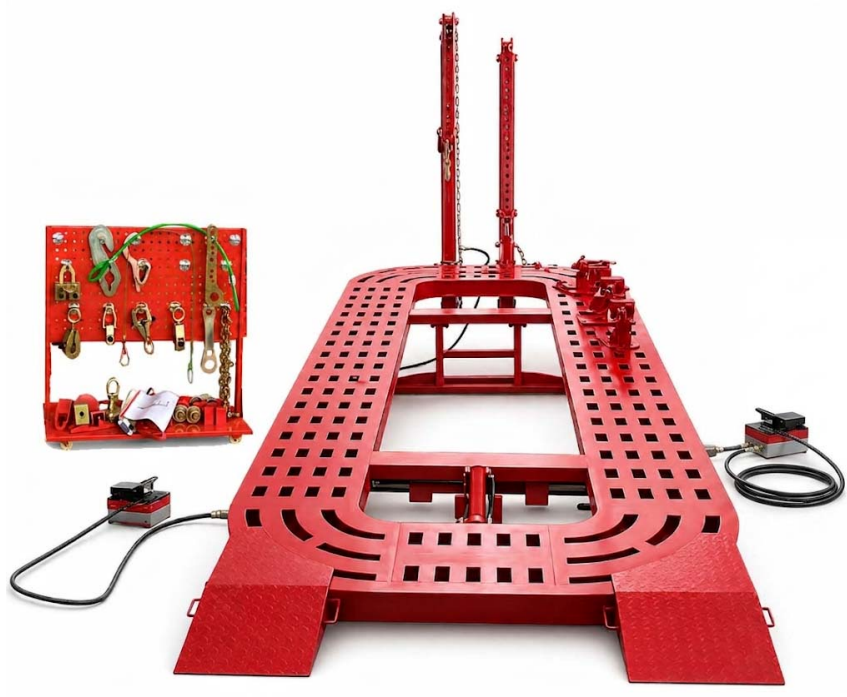


THE MANUAL OF AUTO COLLISION REPAIR SYSTEM



INTRODUCTION

With the development of automobile design and manufacturing technology and the use of more and more new materials, the technology of automobile maintenance must adopt to the technology of automobile manufacturing which develops and changes continuously. The traditional body is mainly made of low or medium carbon steel while now most of the whole body vehicles are made of high-strength steel. And there are great differences in the method of maintenance between the high-strength steel and low-carbon steel.

When the vehicle is damaged, the repair workers should use all-directions pulling system to adjust it but not use fire if not necessary, because fire can change the structure of the metal and reduce the body strength. When the vehicle is crashed again, the body cannot protect the passengers effectively.

This Body Repair System uses the hydraulic pulling system and many kinds of accessories to pull the damaged parts into original. For the sake of the accuracy of stretch, precision measuring system is designed to ensure exact measurement of damaged vehicle and the original function of repaired vehicle.

This manual is to talk about the equipment and accessories of this Body Repair System. It will tell the repair workers how to use this product and the accessories. By giving many pictures, this manual will tell the workers how to clamp the damaged vehicle and how to use the measuring system to plan and analyse the repair process.

During the installation and operation, the workers must do exactly as this manual says, or it will cause accident and human's injury. When workers are operating this equipment, the biggest load and the biggest beared pressure of system cannot surpass the required. Otherwise it may cause danger and result in the damage of human bodies and properties.

This vehicle collision repair equipment is specially designed for workers to do more quick and exact adjustment and to better working experience.

Remark: This intrusion is applied to vehicle collision repair equipment, which is the original edition of the instruction!

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CHAPTER I SAFETY CAUTIONS

Safety is the most important requirement. The works should use the products very carefully.

1. Before repairing the damaged vehicle, the workers must refer to the service manual and the recommended operation method of the manufacturer.
2. The pictures that this user manual list are only for the sake of explaining how to maintain the damaged car through equipments of System. Because of the difference in vehicle type and the degree of collision, the repair workers should make different plan in the light of concrete conditions.
3. Before repairing the damaged vehicle, get empty to block and use the brake to avoid the movement of the vehicle.
4. When the platform is lifted or descended, pay attention to the tools, hydraulic tubes and air tubes, etc. Hydraulic tubes must be kept complete and have no harm of any form. It is forbidden to bake the hydraulic pump by fire.
5. Check the seal of hydraulic system often. If the seal is not strict, the workers should maintain or replace it immediately.
6. The workers who are not trained are forbidden to operate the product. Workers must clean up the place around the machine in time to reduce dust and oil stain; The tools must be put into the tool-box and are not allowed to drop them radomly to avoid slipping fall and tripping.
7. The operating staff must put on safety cap, working clothes and working shoes before entering the operation area.
8. Before pulling, the damaged vehicle must be clamped tightly. During the pulling, the vehicle is forbidden to move.
9. The pulling tools must be clamped tightly on the damaged parts, which makes sure that the pulling tools will not fall off during pulling.
10. During pulling, it is forbidden to use jack to anchor the damaged vehicle and the works are forbidden to stand under the vehicle.
11. During pulling, the pressure gauge of the hydraulic pump should not surpass 10000PSI.
12. The works are forbidden to stand beside the vehicle when the vehicle is lifting. Some workers should help the driver to control the direction beside the platform when the vehicle is loading. During pulling, the workers are forbidden to stand behind the stressed chain or pulling tools.
13. Before using the chain, ensure that there are not any bend, twist, knot. The works should check periodically the fray of notch, distort of slot, bend and supporting and if there are damage or distortion of the chain. If there is any of the above defects, change the chain at once.
14. The chain is forbidden to use bend or bolt to make it longer or shorter. If necessary, use the special tool to shorten or lengthen the chain. The cushion should be used on the pointedness of the chain and it is forbidden to bake the chain by fire.
15. The Chain and Nylon Sling are only used for pulling and straightening, but not used for lifting or others.
16. Before operating, please must check the locking device of machine and ensure it is

flexible and safe.

CHAPTER II EQUIPMENT TYPE

The platform is made of a piece of armor plate that is planed, sandblast. Many locating slots ensures an operation of 360° for pulling towers. In every holes, four armor plates are soldered around. Platform is boxes constitute, more firm and more steady. The tower pillar and platform are designed integratively and the tower pillar can move round on the track of the platform. The imported hydraulic systems have a longer service life and lower rate of breakdown. The plate tools and accessories forged by alloy steel have high strength and a long service life. The tool cart is designed to be humanization and convenient. The platform is suitable for the adjustment of mini and medium-sized car.

CHAPTER III SHIPMENT

1. Shipment

During the shipment, be careful that:

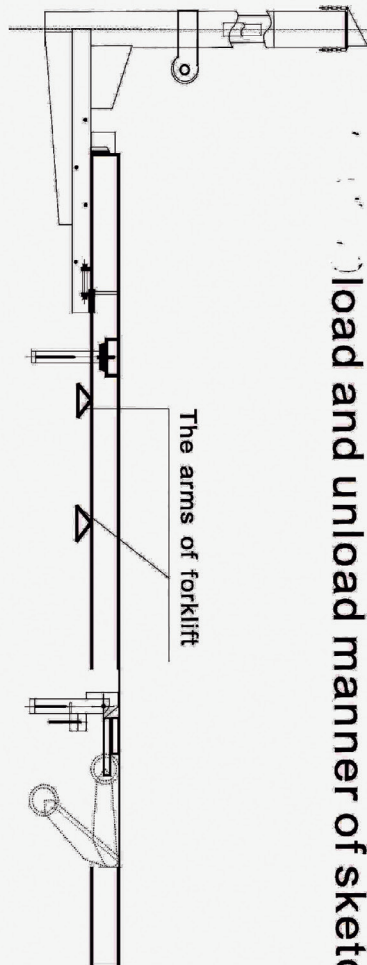
1. The workers should use larger truck which is longer and wider than the equipment.
2. Pay attention to the connection between the platform and the base system.
3. During the shipment, it is forbidden that equipment has a direct contact with the floor of the carriage. The wood block is necessary.
4. During the shipment, the equipment must be fixed.
5. During the shipment, the movable parts of the equipment (such as the tower pillar) must be fixed firmly.
6. During the shipment, the keen-edged heavy things are forbidden to load on the above surface of the equipment.
7. It is forbidden that the equipment is put together with tinder and caustic materials.
8. During the shipment, be careful that every part can not be damaged, especially drenched.

2. Lifting

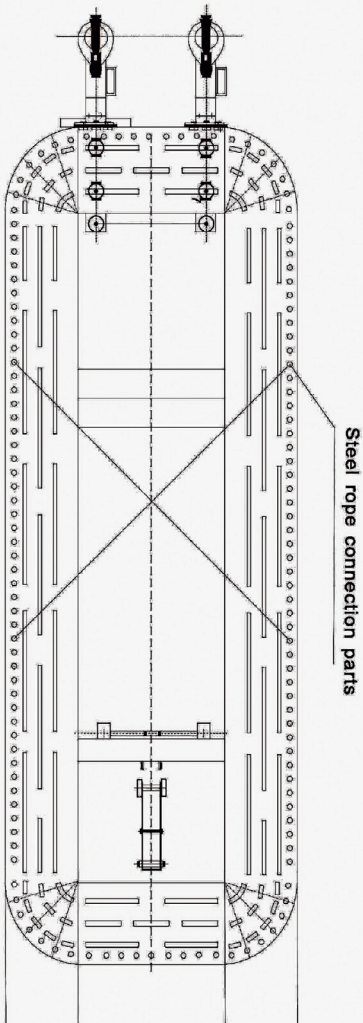
When lifted with crane, the load should not be less than 2 tons. Four ropes should be put around the platform. The demonstration picture is following:

When lifted with forklift, the arm length should be about 2 meters and the lifting weight should be over 3 tons. The two arms of the forklift should work from the longer side to the platform.

Load and unload manner of sketch map



Picture3-2



Picture3-1

CHAPTER IV INSTALLATION

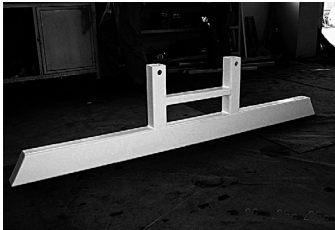
Requirements for workplace

1.Space Requirement:the flat cement ground that has 4 meters in width and 8 meters in length at the least.

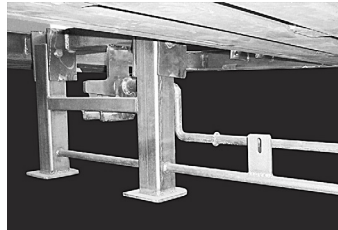
2.Lighting Requirements: There should be enough natural light or artifical light in workshop. The coefficient of lighting shoud not be lower than IV grade in the workshop; should not be lower than 220Lx in the operation area; should not be lower than 110Lx in other places.

1 . Legs Installation

Support systems can be grouped into fixed legs, moveable legs and roller legs (As picture 1 and 2) .



picture 1

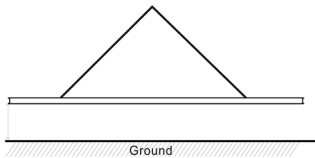


picture 2

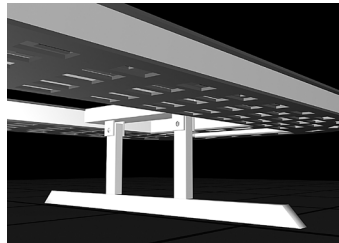
2 . Fixed legs installation

The worker should lift the platform to the right height and keep it (As picture-3).

(Put the fixed legs under the platform (as Picture-4) and ensure the holes are in the same position.



picture 3



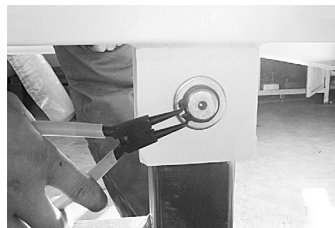
picture4

Then put the bolt into the hole and fix it (As picture-5).

Set the snap rings (As Picture-6).

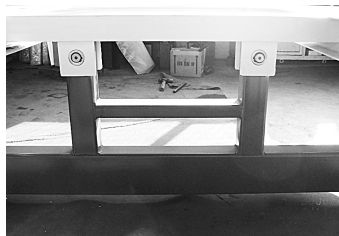


picture 5



picture6

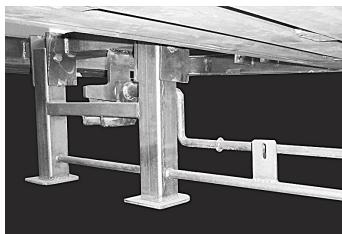
The installation of fixed legs has been finished(As Picture-7).



Picture-7

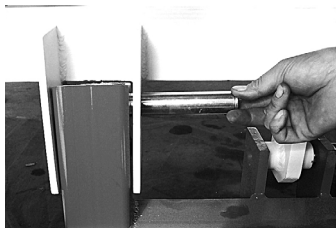
Moveable legs installation

The worker should lift the platform to the right height and put the fixed legs under the platform and ensure the holes are in the same position (As Picture-8).



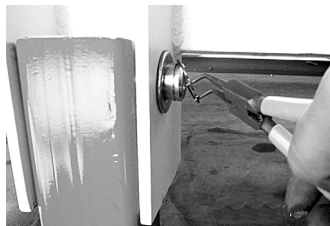
Picture-8

Set up the bolt (As Picture-9).



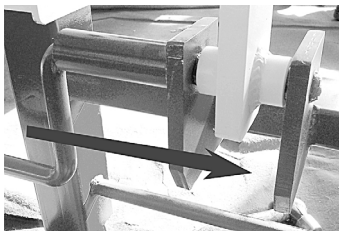
Picture-9

Put the cushion and set up the snap rings (As Picture-10).



Picture-10

As the picture-11 shows, lock it.



Picture-11

The picture-12 shows the installed moveable legs.

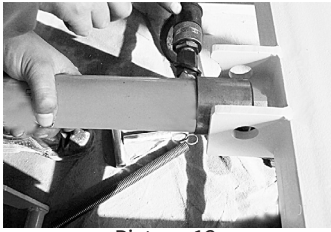


Picture-12

Roller legs installation

Put the lift cylinder on the beam of platform (As Picture-13).

Set the bolts (As Picture-14).



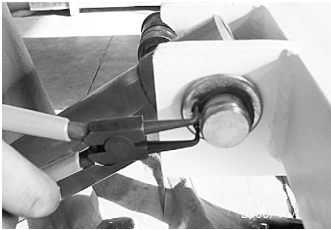
Picture-13

Put the cushion and set up the snap rings. (As Picture-15)



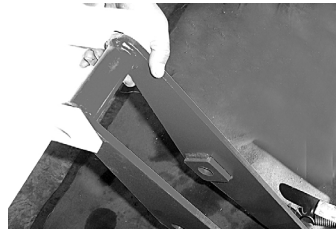
Picture-14

Put the legs on the relative position of the platform. (As Picture-16)



Picture-15

Set up the bolts. (As Picture-17)



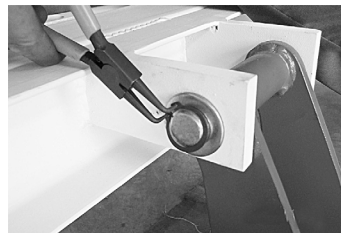
Picture-16

Put the cushion and set up the snap rings. (As Picture-18)



Picture-17

Then put the lift cylinder on the middle of the legs, then set up the bolt. (As Picture-19)

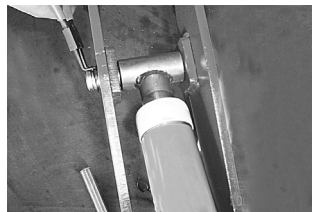


Picture-18

Set up the snap rings on the two ends. (As Picture-20)



Picture-19



Picture-20

Set up the spring. (As Picture-21)



Picture-21

The Picture-22 shows the installed lift legs.



Picture-22

II .Tower Installation

The tower pillar weighs about 100kg.

The workers can decide the lift method

according to the weight (such as the mini

crane or other equipments). Lift the tower

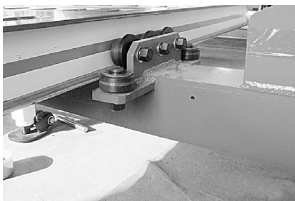
pillar to the right height and put it under

the platform. (As Picture-23)



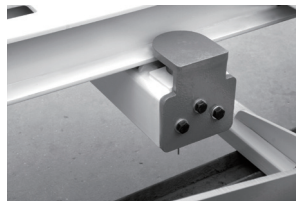
Picture-23

Put the oriented collars by the platform. (As Picture-24)



Picture-24

Then fix bolts to tighten. (As Picture-25)



Picture-25

At this moment, the workers can push the tower pillar around the platform. If the tower pillar moves stably, the tower installation is correct.

Attention: During the tower installation, the workers should be caution and careful.

Chains installation

Put the chain through the collar (as picture-26) and the top of the tower pillar (as picture-27).



Picture-26



Picture-27

The tower pillar installation has been finished. (as picture-28)

Note: One tower pillar is fitted with one piece of chain.

Picture-28



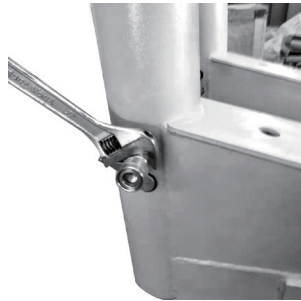
III . HYDRAULIC SYSTEMS INSTALLATION

Air hydraulic pump (as Picture-29)

Connect the connector to the oil cylinder (as Picture-30,31,32) and tighten it (as Picture-33,34,).



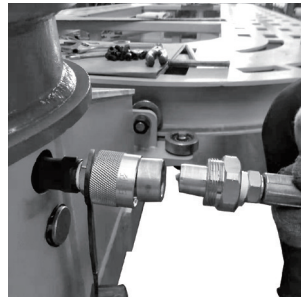
Picture-29



Picture-30



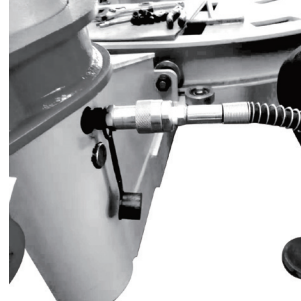
Picture-31



Picture-32



Picture-33



Picture-34

Connect the air supply with the pump.(As Picture-35,36,)



Picture-35



Picture-36

Start up the oil pump. (As Picture-37,38)



Picture-37



Picture-38

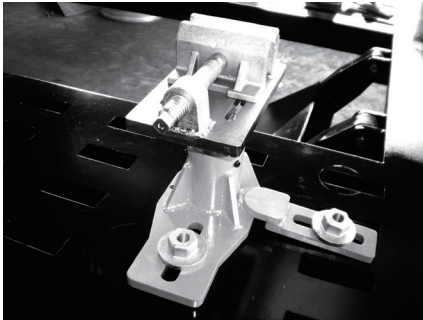
Attention: The installation of electrical hydraulic pump is the same as the air hydraulic pump.

IV . Clamp installation

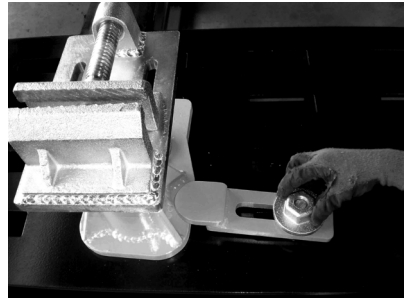
Put the clamp on the right position for the platform according to the damaged parts of the damaged vehicle. (As Picture-38)

Then setup the bolts from underside of the platform.

sAnd give the screw from upside of the platform. (As Picture-39)



Picture-38



Picture-39

V Installation of Hanging plate

Use the bolts to fasten the tool-board, the base, the tri-circle connecting-board together. As the picture 40.

vPut hook at each side of the hanging plate and put the accessories and measuring systems away.



Picture-40

CHAPTER V LIFTING STYLE

1. Lift the accessories

- (1) Trailing board
 - a. Lift the damaged vehicle with the jack.
 - b. Put the loading ramp under the wheels in order that rolling wheel has the same direction with other wheels.
 - c. Put down the jack and make the wheels drop into the groove of loading ramp.
 - d. Clip the fixed parts of vehicle with clamps if the wheels have been taken down.
 - e. Put down the jack and make the clamps drop into the groove of loading ramp.

(2) Wheel Supporting Frame

- a. Adjust the width between the bolts of bracket of wheel.
- b. The height of the fixed hole should be suitable.
- c. Make the two bolts get through the fixed hole.
- d. Give the bolt a good screw and fix the bracket.

2. Note:

- (1) Clean up tings on the platform up and down.
- (2) Fasten the movable parts of the platform (such as the tower pillar, the secondary-lift).
- (3) Connect the oil pump and oil cylinder with the connectors.

3. Lifting the platform:

- (1) Put the loading ramp near the platform.

(2) Drive the accident vehicle onto the platform or use the winch to push the vehicle on the platform. If the front wheels are broken, put the loading ramp under the wheels and push the vehicle on the platform. After taking apart the wheel bracket, clip the fixed points of the vehicle, put it onto the loading ramp and push the vehicle on the platform.

4. Descending the platform

- (1) Put the loading ramp near the platform.
- (2) Drive the vehicle away from the platform or draw it.

5. Secondary-lifting (purchase on selection)

- a. Put the secondary-lifting on the platform and let four wheels be close to the platform. As picture 5-4.



5-4

b. Join the oil tube of air hydraulic pump and hydraulic oil cylinder with the connector. As picture 5-5.

c. Put the secondary-lifting in front of or behind the vehicle. Unfold the extended board and put the rubber block away. As picture 5-6.

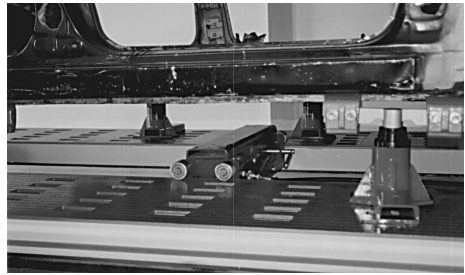
d. Start the hydraulic pump and lift the secondary-lifting and set up the self lock system. As picture 5-7.

6. Descending operation

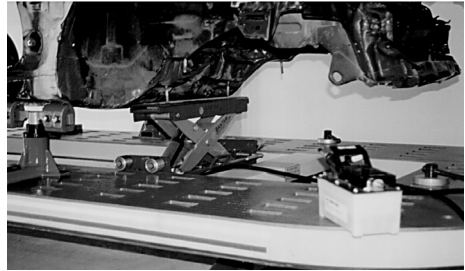
Check the oil tube and air tube to make sure the connection is under good condition. Start the hydraulic pump, lift the secondary-lifting and shake off the self lock system. Control the outlet valve of the hydraulic pump softly and let it descend softly.

Note:

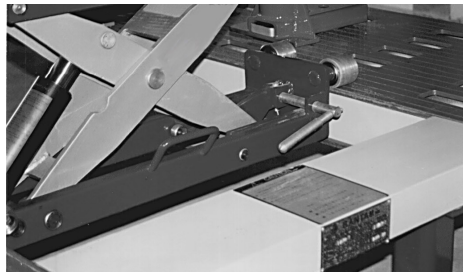
When the workers use the secondary-lifting, the workers should control the hydraulic pump softly and let it ascend slowly. If it is time to descend the secondary-lifting, control the outlet valve of the hydraulic pump softly and let it descend softly. DO NOT USE THE HUDRAULIC PUMP QUICKLY!



5-5



5-6

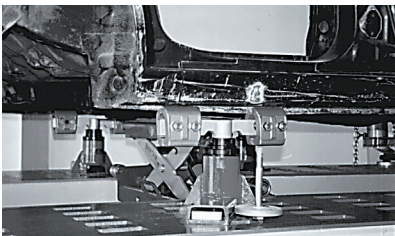


5-7

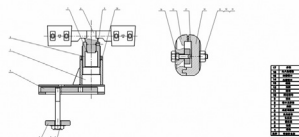
CHAPTER VI CLAMP SYSTEM

General clamp systems including four clamps. The clamps can be anchored on the four sides of the central area. The unique clamp systems can orient automatically.

Clamp systems can orient, clamp, support and stretch. The clamp systems of our platform can adapt to various kinds of vehicles. As picture 6-1 and 6-2.



6-1



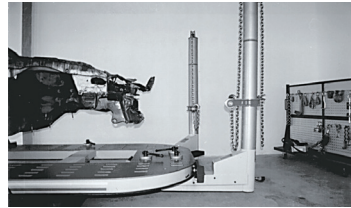
6-2

Structure of auto body

A vehicle includes three parts according to the theory of repairing: driving area, passenger area and luggage area. The parts where clamps are fixed are called controlling area. The clamp systems are designed to support the auto body of loading type and suitable for the platform of our platform I. When the specially designed vehicles need to repair like BENZ and HONDA, the accessory clamps are necessary.

1. Installation

(1) Inspect the damaged vehicle and make decision where is the right position for the platform according to the damaged parts. Usually the distance between the tower pillar and body is 50-70cm. As picture 6-3.

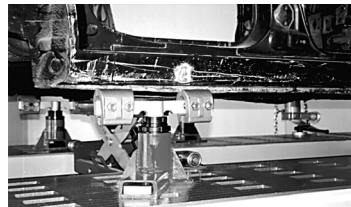


6-3

(2) Drive the damaged vehicle on the platform.

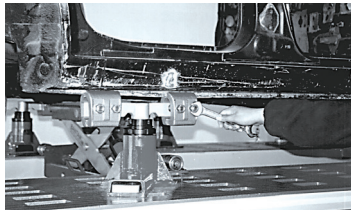
NOTE: The workers are forbidden to stand behind the vehicle during the pulling.

(3) Use the brake and use the wood to fix the wheels.



6-4

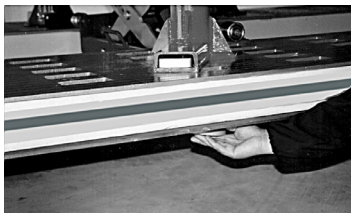
(4) Inspect the location' shape and decide to use what kind of clamp system. If the location' shape is special, please use the optional clamp.



6-5

(5) Turn the clamps to the height needed, and loose the bolts of the teeth. The height depends on the damaged parts and the hobby of the repair workers. As picture 6-4.

(6) Tighten the bolts (M16) of the teeth, as picture 6-5.



6-6

(7) Setup the bolts from underside the platform and tighten them. As picture 6-6.

(8) Before every pulling, the workers must check the bolts whether there are tight or not. Between the two pullings, the workers must check all the fixed bolts and make sure the clamps are tightened. If the front wheels are taken apart, please use the wheel support frame.

CHAPTER VII HYDRAULIC SYSTEM

1. Checking

- (1) Pay attention to the required pressure, bearing capacity. The working pressure cannot surpass the required pressure given on the gauge.
- (2) Checking the connectors. The connectors should be tightened by hands.
- (3) Checking the connectors of the oil tube. If it is bent or broken too seriously, change it at once. When using the hydraulic oil gauge, check the pressure and make sure the pressure cannot surpass the required pressure.
- (4) The pneumatic pump should use the water/oil separator. The workers should empty the water and change the broken parts.
- (5) The pneumatic pump should release heat in time when working constantly to avoid the fire accident caused by hydraulic oil overheating.

2. Operation

- (1) Before working, checking the oil tubes and connectors.
- (2) Connect the air hydraulic pump to the pneumatic supply. The required pneumatic supply is 0.8 MPa.
- (3) Control the pneumatic pump and the gauge will work.
- (4) Put the control switch on the position of the output pressure and make the platform and tower pillar descend slowly.

3. Maintenance

- (1) Check the joints and the connectors regularly. The loose connectors and oil leakage will make the hydraulic system work unsteady.
- (2) Check the hydraulic oil regularly.
- (3) The hydraulic oil must be changed after working of 200-300 hours. If the working environment is dirty, the hydraulic oil must be changed more frequently. And the hydraulic must be changed completely once.
- (4) Keep the hydraulic parts from the pollution of the dust and grease.
- (5) Keep the working environment clean.
- (6) Checking hydraulic system and the connectors regularly. Change the broken parts at once.
- (7) Check the hydraulic oil after working of 40 hours every time.

4. Specifications of the hydraulic system

- (1) Air hydraulic pump
Power: 10000PSI
Air supply required: 0.5-0.8Mpa
- (2) Hydraulic cylinder
The longest travel: 254mm
Bearing capacity: 10tons

5. The troubles of operation

- (1) The unstable trouble of cylinder. If there is air in the hydraulic system, it will work unsteadily. When the workers meet the problem, he can put the pump higher than the tube and the cylinder, which will make the air go back to the oil reservoir. Turn off the

valve and make the cylinder as long as possible. Turn on the valve and repeat this process three to five times.

(2) The cylinder cannot last for the whole process. Usually this problem is caused by not enough oil in the reservoir. So the worker should check the reservoir. If needed, fulfill it with oil.

(3) The hydraulic cylinder cannot return. This problem is caused by too much oil or air, discharge air from the system. Check the reservoir to keep reasonable oil inside. And check if the piston is bent or not and the quick connectors are broken or not.

(4) The worker should check if the oil valve is turned off or not. If the oil valve is turned off, the cylinder still descends. Check the ball valve of the oil valve and use alcohol or kerosene to wash it. If there is still trouble, repair the pump at once.

(5) The system only work for one time. Maybe the valve is dirty, wash it and add some oil.

NOTE:

Pay attention to the length of the sealed gummed tape and avoid it to block the hydraulic system. If the pneumatic pump, hydraulic cylinder, hydraulic pipe, hydraulic gauge do not work well, these parts must be repaired by technician or the customers can post the bad tools to our company. If the customers take apart these parts without the admission of our company and there are damages in the tools, there is no responsibility of our company. The customers must pay it by themselves.

CHAPTER VIII ACCESSORIES

The platform gives a long list of accessories. According to the need of the workers, he can use the accessories alone or together. The technician should decide the operation method according to the type of the damaged vehicle and extent of the damage.

Caution

(1) During the pulling, the workers should check the clamp position to avoid the dropping of tools.

(2) Be careful when using tools to pull welding parts. There is a broken sound when the weld joint is set apart.

(3) Before the pulling, the worker should check the teeth and make sure the teeth are clean.

(4) During the pulling, the worker should take care of the electrical parts of the vehicle and hydraulic tubes.

(5) Any person cannot stand behind the chains or repairing tools during the pull.

(6) All tools are not allowed to be overloaded.

(7) When using the gauge, note that the pressure should accord with the requirement.

Note:

Please use these tools as the given pounds. If the workers pass the required pounds to use the tools, it maybe destroy the tools. Our company has no responsibility for this problem. And our company has the power of changing the tool kinds or number. And the tool's number will be exactly as packing list says.

CHAPTER IX TOWER SYSTEM

The power pillar of the platform can be move on the platform.

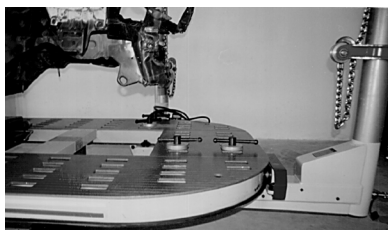
1. Move the power pillar to the damaged parts. If the damaged parts are too strong, the workers should use two tower pillars to pull.
2. Fix the tower pillar with bolts of M28x6. As picture 9-1.
3. Fix the rear tower pillar and tighten it.
4. Check the 2, 3 steps to see if they are tight in order to avoid sliding.
5. Connect the pneumatic pump with hydraulic oil tube. Tighten the connectors by hands.
6. Install the clamp on the damaged part, and connect the chain hook with the clamp. As picture 9-2.
7. **Check the chain to find whether there is knot or twist.**
8. Adjust the position of the collar and loosen the bolt. As picture 9-3.
9. Lock the chain. As picture 9-4.

10. Check the chain, clamp, and collar again and control the pneumatic pump

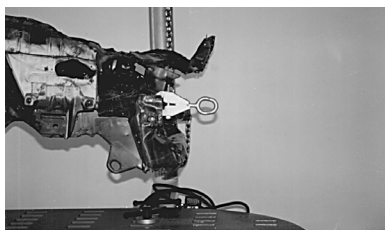
11. to supply pressure. During the process, take care of the clamp and connectors.
12. During the pulling, any person is forbidden to stand behind the tower pillar and the pulling tools.

13. During the pulling, the worker should use the hammer to tap the damaged part to destroy the stress. Please notice the tension of the chain at any time.

14. When the collar is more far from the platform, the pull strength should be less. The collar should not be higher than the red line. As picture 9-5.



9-1



9-2



9-3



9-4



9-5

15. After the pulling, the worker should open the oil-turn valve of the air pump and release the pressure. The ram will come down. Then adjust the chains, collars, etc. If it needs, pull other parts by doing the same process.

16. After the pulling, the worker should release the pressure and put back the chains and accessories. Loosen the connectors of the hydraulic oil tube from the tower pillar.

17. Loosen the bolt (M28X6) fixing the tower pillar. Push it to a proper position for the convenience of the next time.

Attention: During the pulling, the bolts of the tower pillar must be tightened for fixing the platform. The operators are forbidden to stand behind the pulling tower, the chain or tools can hurt the workers and the chain can not be knot and twisted.

CHAPTER X COLLISION REPAIR

1. Collision Repair Theory

If the damaged parties are small, the worker can use pulling system to pull it out. But if there is a big damaged part and knots, the worker can not repair it by pulling to the opposite direction due to the difference in strength and return-rate of every tool. So collision repair needs the following tools:

- (1) Fix system with various functions
- (2) Pulling tools with various shapes
- (3) Pulling system with various functions
- (4) Measuring system

2. Collision Repair Technology

One direction pulling is suitable for frame body. It is easy for workers to repair and adjust the body. But it is not suit for unibody. The unibody is more complex and the collision energy is easy to expand to the whole body. During the repairing process, it needs more pulling points and directions. Our platform can fulfill the above requirements and give you a long list of repair accessories to avoid the construction damage for the vehicle. The process of auto collision repair is following:

- (1) Get to know the safeguard of the damaged automobile.
- (2) Analyse the auto body of the damaged body
- (3) Adjust the fixed point
- (4) Repair the fixed point and check the repair result

3. Collision Repair Process

- (1) The analysis of damaged body

Before repair, the worker should take off the damaged parts. Because the collision energy is easy to manage far away.

- (2) Pull

After analysis, the workers should plan the repair process and do as it.

- (3) The repair order

The metal of unibody is easy to move, bend. So the workers should repair the vehicle by different parts and directions. Or it will damage other normal parts.

4. Pulling Process

- (1) Length. Pull the damaged parts by the direction parallel to the center marks.
- (2) Width. Pull the damaged parts by horizontal direction.
- (3) Height adjustment.

Usually not to try to pull the damaged parts once because the high-strength steel is sensitive to heat. If some damaged parts are folded too tightly, the workers should heat the damaged parts during the pulling. The heated place can only be the edges or two tightened metal plates. Heating is a kind way to destroy the stress but not a way to soften any section. Pull the selected section to restore the original dimension slowly and destroy the stress of the bent steel. The damaged vehicle will be repaired correctly. The repair order is: Length, Width and Height.

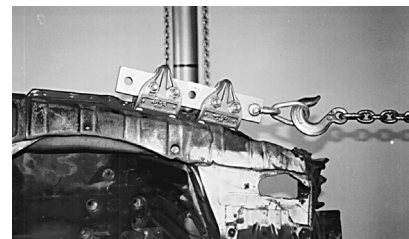
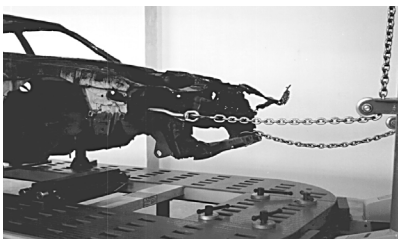
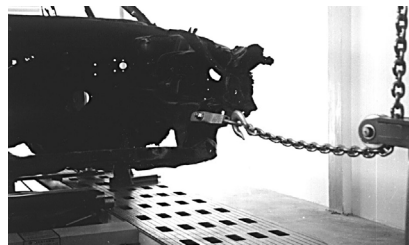
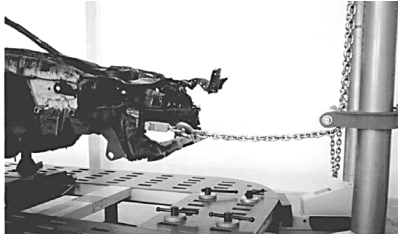
5. Damage repair of the special places

- (1) Damage of the front section

The damage of the front section is decided by the crashing speed and damage section, etc. If the beam, bender and other accessories are damaged, the workers should pull the front beam on the side where the damaged parts should be changed.

Sometimes the collision energy will expand to the A pillar. The worker should take apart the front beam and bender and pull it, at the same time, the workers should push the damaged part from inside.

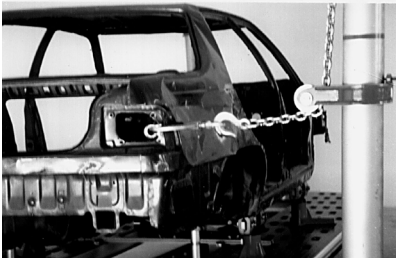
The examples of using the accessories:



(2)Damage of rear section

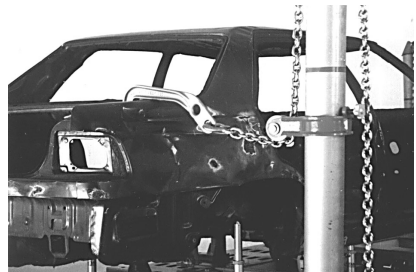
The structure of rear section is more complex than the front section. The collision energy will expand easier. Usually the rear bumper will be damaged and the collision energy will expand to the rear bender. The fender will be damaged and cause the quarter panel to move to the front side, this will also change the gap of other parts. If it is possible, the damage will also influence the ceiling, doors and body center pillar. When the workers use the pulling system to pull the damaged rear beam, at the same time, they should measure the dimension under the body, the workers decide the repairing process according to the gap between the metals. When the rear beam is crashed into the rear hood, not try to repair the rear coping that mildly distorts.

Sometimes, the damaged of front section will cause the twist of the rear section. The worker should clamp the lower part of rear section. The basic adjustment can only adjust some lower parts. Then, install the clamp system again to keep the adjustment and go on adjusting other damaged parts. Once the upper part can install the clamp system, the workers should install the clamp system at once and take off the serious damaged parts and install a new one. As the picture



(3)The beside damage

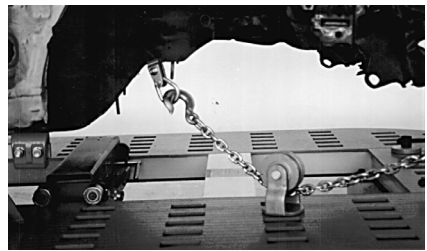
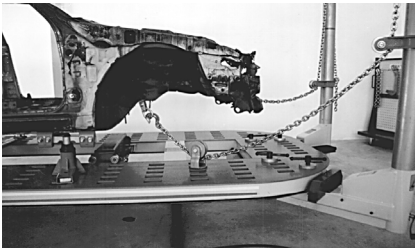
If the beside part of the vehicle is damaged, the floor will be also changed. To repair this kind of damage, the workers should pull the front and rear section firstly if they pull the damaged part from the center section. If the workers want to adjust the damaged part from the upper section, they should fix the bottom on the platform to the opposite direction. If they want to pull the damaged part from the center section, they also connect the locomotive tower pillar with the hydraulic ram.



(4)The damage of ceiling

The damaged ceiling metal will cause the damage of beside pillar, bender and windshield. When the vehicle is turned over, the body pillar and the ceiling will be bent. The extent of damage should be decided according to the distortion of the vehicle window and door. When the workers want to repair the damaged part, they can use hydraulic ram to push from inside and use tower pillar to other parts.

(5)The operation of downing pulling



6. Attention process of the collision repair

The basic rule of the collision repair is that: If the damaged part is impossible for adjustment, the workers should repair the part to the original shape. During the adjustment, the workers can weld the damaged part when the bent edge becomes smooth or the cut welding part is moved to the back on the same line. When the bent part become straight, the worker should use the hammer to destroy the stress. If it is an unibody, usually the parts depend on each other, so the damaged parts maybe give more stress to the neighbor part. For this reason, the worker should pull it slowly and periodically, at the same time, check the movement of the parts, make sure the pull of the damaged part is effective. If the damaged part is not moved, the worker should change the pull direction or pull part.

The pull strength is opposite to the damaged strength. So the damaged part is as strong as undamaged. The damaged parts all resist the strength and there is a strong stress that destroys the pull. In fact, the adjustment and part changing can not be done for the same time during the repair. So the worker has to measure the adjustment by eyes during the adjustment. If the adjustment is good, before going on the next adjustment, the worker has to finish the every kind of repair.

When it is time to repair the close bent part, the worker can use the clamp pincers to clamp the bent part, then the adjustment direction is on the image line and this line is the prolong line of the original position.

For the unibody, do not try to cut every part of the damaged part, and lately repair the part by welding another strengthened part. Because the modern design body construction is designed for the controlled damage, this can avoid or delay the damage of the important part. So if the part is broken, torn or not well repaired, the workers should change the whole part. Usually the damaged part will meet more strong stress than the neighbor part, so during the repair, all the important control pointer must be measured and controlled to avoid the excessive adjustment.

CHAPTER XI : MAINTENANCE

1. Hydraulic system maintenance

- (1) Keep the working environment clean.
- (2) The air supply of oil pump is required to be far from water and dust. The oil-water separator must be added to the air route. The pressure should be 0.5-0.8Mpa.
- (3) Keep the hydraulic parts from water, dust and grease. Oil pump is forbidden to move on the floor and oil gauge should be protected.
- (4) Before operation, the workers should check if there is leakage in the hydraulic system and if there is loose of the connectors or not. Change it at once if it is.
- (5) Check the oil capacity of oil pump regularly. If it is not enough, please supply the oil of 46-Great Wall, Gulf-46, Mobil-30, BP-32, Shell-32, Esso-32, Caltex-32, etc. at once.

Change hydraulic oil every three months. When changing the oil, please open the oil box and clear up smudgy things on the bottom and the inlet of the oil box.

(6) Draw on the dustproof cap while the connectors of hydraulic system are out of work.

(7) The workers are forbidden to repair the hydraulic pump and cylinder to avoid the lost or loss of accessories when they are not used. Please post it to our company or it should be repaired under the guidance of professional technician.

2. Accessories maintenance

(1) Keep the teeth of clamps clean.

(2) Do not tap the tools or chains during the pulling.

(3) During the pulling note the oil gauge.

(4) The tools are forbidden to contact with causticity liquid.

(5) The tools should be put away on the tool-car when they are not used.

3. Measuring systems maintenance

(1) Take and put the measuring system lightly.

(2) The measuring systems are forbidden to be contacted with causticity things.

(3) When tightening or fixing the loose bolts, not too much strength is necessary.

(4) After measuring, the tools should be put back on the tool car.

4. Platform and accessories maintenance

(1) Keep the platform clean without grease or causticity things.

(2) Do not tap the platform.

(3) Supply lubricating oil regularly to the movable parts pf the tower pillar, collar, legs, etc.

(4) Check the bolts of the tower pillar, fixing legs, etc.

CHAPTER XII : MEASURING SYSTEM

(purchase on selection)

Base:

Datum plane is an imaginary plane parallel to the underbody of the vehicle. The datum plane is the reference plane, it is the datum height. The measurement is vertical to the datum line.

The length on the side view should be parallel with the datum line. So the length should be measured by measuring systems from the datum line.

The distance from each side to the center marks has the same dimension. The vertical plane including all the center marks is the datum. The width dimension should be measured from the measured point to the datum.

The height measurement should be vertical with the datum line and the measurement should be from the datum line. The measurement of the height is the distance from the hole to the datum line.

Measuring process

1. Put the damaged vehicle on the platform and make the body center marks on the same

line with the center marks of the platform, and put the measuring system on the platform

2. Find reference points. Find at least three reference points. If the front section is damaged, find the points at the rear or middle section. If the rear section is damaged, find the points at the front section. If one side is damaged, find the points at the other side.

3. Adjust the measuring system. Make plane of the measuring system parallel to the reference plane.

4. Adjust the height of clamp according to the height from the dimension book. For example, the distance is 180mm from one point to the height reference line, maybe this distance is not enough for the tyre to leave from platform. So the worker should add another 200 mm, the data should be 380mm. Then find the reference points and control points of the measuring system, and compare them each other. If they are the same data, it means the reference points are correct. Or the workers should find the reference points again.

5. Install the measuring bracket on the platform. Fix the two vertical ruler on the long sliding base, then fix the side measuring pointer on where it needs. If one side is damaged, take the other side as the reference part, then put the pointers on this side and write down the data, adjust the pointer to the same height. The worker will know the changed dimension.

6. Pull. During the pulling, the worker should use hammer to tap damaged section. If the damaged parts need more strength, the worker can use two tower pillars to pull. And the worker should watch the pulling carefully.

7. The worker should measure the body again, if the data is not the same as the dimension book, measure it again.

IT uses the dimension book of MITCHELL from USA.

Measuring method

(1) Tape measure

Tape measure can be used for measuring the distance from two points. In three-dimensional spaces, the error is unavoidable. So the tape measure is rarely used.

(2) Machinery measurement

Machinery measurement need to adjust the height of auto body and it leads to the low efficiency. measuring system of our company imported from America is advanced at home. The measuring system can be applied to the universal measurement. The measuring system can make sure itself parallel with the datum and the measure accuracy is high. The total weight of measuring system is only 1.5kg and the close length is only 1.02 meter. measuring system can flex in 0.04-1.90 meter.

(3) Electronic measuring system

The head of electronic measuring system is similar to the manipulator. In every joint



there is an optic coding machine and the angle of circling joints can be measured by the coding machine. Through these angles, the worker can work out the three-dimensional coordinates. The defect of electronic measuring system is to measure one point once. The electronic measuring system of CAR-O-LINER company in Sweden and SPANESI company in Italy is advanced and multifunctional.

(4) Laser measuring system

Laser measuring system has the characteristics of high-accuracy, fast-speed, etc. During the operation of repairing system, the workers can monitor and control the repair process by the laser measuring system. The technician can measure the well-repaired vehicle through the laser measuring system and hand in the information to the user to avoid the dissension.

Laser measuring system is the most advanced measuring tools in the world. After CHIEF company in America, our company has developed automatic laser measuring system.

The workers must pull the damaged parts to the original position for repairing a damaged vehicle well. The followings are required:

- i. Measure exactly;
- ii. During the repairing, repeated measurement is necessary.
- iii. Check whether the dimension is correct or not after repairing.

END

The main process of the collision repair include: the bent adjustment, reverse or change of the damaged welding steel panel. So the worker must have a wholly repair plan when it is the time to repair the collision. And the main process is following:

- i . Analyse the damage collision and make a plan.
- ii . Dismount the decoration part and mechanical part.
- iii . Point the damaged car on the repair system platform, and decide to change or repair the damaged part or not according to the actual condition.
- iv . Pull the damaged vehicle.
- v . Rusty dealing.
- vi . Paint.
- vii . Restore all the discounted parts.
- viii . Exercise the vehicle.

The crash will influence the car very much. If the car is crashed, the body design will let the front and rear part to be easy damaged, because this step will create an energy absorbing structure, and insure the safety of passenger seat. At that time, the worker should find out the data, construction, direction, speed and the collision angle and direction, etc. before the right estimate, try best to learn about the fact and make a decision of the repair plan.

This manual talked about the installation and the use of the equipment, notice process, etc. and introduce clearly the collision analyzing. But for each damaged car, the worker should analyse the car and make a clear plan.

APPENDIX I :

Knowable Of Hydraulic System' s Breakdown And Dispose

1、Pneumatic pump is out of working and no sound.

- a) Confirm the air pipe is opened.
- b) Confirm the air pressure is higher than 0.5Mpa.
- c) Confirm the air inlet valve is working

2、Pneumatic pump is out of working and air escape.

Oil and water separator is not installed at the air inlet of pneumatic hydraulic pump or the pump is dirty because of discharged the water filter unregularly.

3、The pneumatic hydraulic pump is tricking oil.

- a) Ensure the oil is accounts for 2/3 of the fuel tank.
- b) The seal gasket between the top head and oil pump should be changed.
- c) The hydraulic pump's pedals is tricking oil.the seal gasket between the cover of pump and front cap should be changed.
- d) The seal gasket between the cover of the pump and piston.

4、The hydraulic pump can not maintaining the pressure.

- a) Oil seeking at the junction of the oil pipe.Reround the seal tape.
- b) Ensure the check value is regular,seal gasket is unspoiled,two step steel ball、 spring retainer and spring is ordinary and changed on time.

5、Hydraulic pump is working without pressure.

Open the unloading value,press the air supply value botton keep the pump working 15 seconds,then presse the air supply value with pedal,repeat this operation until support the pressure successfully.

6、Hydraulic pump is working with less pressure and cylinder working slowly.

The trap value should be washed.

7、Pump warking without any manul operation when connect with compression air.

Air support value is dirty and lack of lubricate. Wash it and add some lubricating oil.

8、Hydraulic pump can not be restoration.

- a) The check value is not open enough so that the oil is unflowing as the reason of fasten joint thread is loose
- b) The oil pipe is crimped,prop up the platform with jack and fix it,then open the screw connector and pull the piston back to the pump completely so that the air is empty and tighten the connector.
- c) throttling valves is crimped.unload and separate the value with special tools and clean the trap part.
- d) Adjust and change fasten MD,unload the MD from oil pipe, and screw the check value ensure the check value of MD and FD can be opened mutually so that the oil pipe is unblocked,if it is still cannot work,FD must be changed.

9、Leak oil.

- a) Ensure the connection is screwed.
- b) Change the sealing washer.

