CALM

HEAVY DUTY FIRE TRUCK DRIVER TRAINING MANUAL

This manual has been prepared to acquaint CALM personnel with operation and maintenance of heavy duty fire trucks. Also included are some important safety notes, driving techniques and general information to enable the safe and effective use of this equipment. It is hoped that full use will be made of this booklet as a reference both during the training session and in the future.

DRIVER TRAINING

Driver education can only be effective if :-

The Attitude

The Technique and

The Traffic Laws are learned and applied. They are interrelated and cannot be separated, one is useless without the other.

Attributes of a good driver :-

1. A good driver is one who knows his own limitations and capabilities and drives within them.
2. Who knows the probable limitations and capabilities of other road users and respects them.
3. Whose mental approach to driving is to maintain an accident free record.
4. Who possesses a sound knowledge of traffic laws - road craft and nature's laws, and puts that knowledge to good use.
5. Who exercises courtesy and consideration for others.

Driving Plans

Driving plans and decisions are made on a combination of :-

A. What you can see.

B. What you cannot see.

C. The possible circumstances which may reasonably be expected to develop.

Training eyes for better driving observations

One of the chief causes of accidents is failure of drivers to see and recognise hazards while they still have time to avoid them and this usually means faulty seeing habits. Few people realize that we see clearly only through a small cone of central eyesight. (When you look 30m ahead all you see is 1.5m in width).

The following five "rules for seeing" provide a system of training the eyes and mind to consistently select the important details.

1. Aim high in steering
2. Get the big picture.
3. Keep the eyes moving. Shift eyes every two seconds, the eyes normally send forty complete new pictures per second to the brain.
4. Leave yourself an "out".
5. Make sure other road users see you.

These seeing habits are only part of the safe driving technique. They must be supplemented by a thorough understanding of the individual physical capacities and limitations, the traffic laws, and vehicle control and its capabilities.

The system of car control may be defined as, the system or drill, each feature of which is to be considered (in sequence) by the driver, at the approach to any hazard.

1. A hazard may be any physical feature, such as a cross road roundabout system road junction, bend or hill-crest or any potentially dangerous traffic situation developing ahead.
2. Other road users.
3. Road and weather conditions.

By the correct application of this system, the car will at all times be :-

1. In the right place on the road.
2. Travelling at the right speed, and
3. With the right gear engaged.

Acceleration sense may be defined as the ability of the driver to vary the speed of the vehicle to negotiate a hazard when braking is not required.

Causes of skidding - excessive speed, excessive braking, course steering, rough acceleration.

Thinking or reaction time distance

This distance will vary in three ways :-

A. With the speed of the vehicle
B. With the physical and mental condition of the driver
C. With the degree of concentration he gives to his driving.

Driving Plans

A really good driver will formulate his driving plans on the correct assessment of the ever-changing scene ahead and to the rear of his vehicle. He should have a deliberate and calculating temperament, able to make driving decisions without hesitation in a methodical manner at any moment. All decisions must be based on the principle of safety for others as well as himself.

He must realise that these driving plans and decisions are made on a combination of :-

(a) What he can see
(b) What he cannot see
(c) The possible circumstances which may reasonably be expected to develop.

Motoring conditions in Australia are such that a driver can rarely base his decisions solely on (a) above, because there are many stretches of road where the layout and traffic conditions do not permit an unobstructed view. The greatest difficulties arise from conditions in areas into which the driver cannot see, such as around bends and corners, behind trees and buildings, at places where roads converge, or where other traffic obstructs the view of the road beyond.

Training Eyes For Better Driving Observations

Driving skills can be judged by the ability a driver shows in avoiding conflicts, whether set up by himself or others.

Having already dealt, under Driving Plans, with some basic fundamental skills in relation to "how to do It", the next step is to consider "when to do it". This refers to the timing of manoeuvres. Proper timing of vehicle movements is an essential part of expert driving.

In order to achieve proper timing a driver must understand and then practise correct "seeing methods" since they alone can help him avoid the conflicts inherent in the normal traffic environment.

Seeing does not necessarily occur just because the eyes are open. The eyes look at countless things that are not really seen at all. The mind selects only a few details on which it concentrates with sufficient intensity to result in meaningful visual images.

Until a driver knows what to look for and how to read the road and traffic pattern he can't know when to make his moves.

One of the chief causes of accidents is "failure of drivers to recognize hazards while they still have time to take defensive action to avoid them" and this usually means faulty seeing habits.

Few people realise that we see clearly only through a small cone of central eyesight. When you look 30m ahead all you see with this central eyesight is a bare 1.5m in width. At 100m the cone is 5m wide, and at 300m, 16m wide.

Most objects are first detected by the driver's fringe vision (upper, lower or side sight), which acts as a magnet for central vision. New drivers and many experienced ones mistakenly use central vision for steering, gluing their eyes to the road so fixedly that significant changes in the wider traffic pattern may be missed.

A driver should depend chiefly on his lower fringe vision for steering, so that his central vision can move freely, checking ahead and to the sides. On curves, he should look well ahead to the centre of his turning path and by doing so his car will track smoothly in the correct path.

The following five "rules for seeing" provide a system of training the eyes and the mind to consistently select the important details :-

Aim High in Steering

This means look well ahead. The faster the speed the further it will be necessary to aim the vision. Correct steering requires use of the "high aim steering" formula and this calls for repeated glances well ahead at the centre of the path of travel. The vehicle will then readily follow in the middle of this path.

With oncoming cars a driver should check lane position and stability while they are still a long distance away. At night, the driver should keep glancing well in front of his headlight spray, looking for dark shapes on the road. He should only travel at a speed which will enable him, in an emergency, to stop within the distance illuminated by his headlights.

Perspective is a factor which causes some drivers (particularly beginners) undue concern and leads them to make certain errors.

Seated behind the wheel, the driver is some 2m behind the front bumper bar of his vehicle, 3m ahead of the rear bumper, and perhaps .5m to the right of centre. As a result there is a blind spot for him around the vehicle, which is greatest on the left or near side.

The high aim method offsets this for the driver steers where his eyes are aimed, well out ahead in the middle of the desired path.

He does not look at any specific position of the vehicle any more than a person walking or running looks at his feet. The runner should look into space - the space which he expects his feet to occupy. Similarly, in throwing a cricket ball to the wicket keeper the fieldsman does not look at the ball or his arm, or the ground in between, he looks to where he intends the ball to go, the wicket-keeper.

Get the Big Picture

This involves learning to see all the roadway and traffic scene ahead and to consider the objects immediately ahead as only a small part of the whole.

If a vehicle is to move, it must have space into which it can go. The driver must be able to continually select the best steering path and learn to recognize and make allowances for objects, conditions or situations ahead which might affect progress along this path. "The Big Picture" viewing formula, together with the other viewing habits, will give the driver a system for moving his vehicle safely and surely.

The sharp central vision must not be permitted to fix on anything for more than an instant. The eyes should sweep over the scene for a full city block, or for a kilometre on rural highways. This allows instant appreciation of any change in speed or direction by other drivers, and also indicates the problems facing other drivers so that it is possible to anticipate their next moves. Advance warning is also given of other environmental influences which will require the driver to change position or prepare for evasive action.

Take the driver who follows closely behind the driver in front. He is confined to low aim steering and small picture viewing. On the other hand, the driver who stays an appropriate distance behind can get the "big picture". He can watch the vehicle with his fringe vision and apply his other seeing habits to seeing around, ahead and to the sides of the vehicle ahead.

Keep the Eyes Moving

A driver should develop the habit of shifting his eyes at least every two seconds (the eyes normally send 40 complete new pictures per second to the brain).

Without this eye-moving habit, a driver's vision may freeze on one traffic conflict while he is heading blindly for another (thus one driver, intent on steering clear of a line of parked cars, failed to see a child run into the street ahead. His foot was still on the accelerator when his car hit and killed the child).

If an eye-holding situation occurs a careful driver will counter it immediatley by reducing speed, taking appropriate evasive action and stopping if necessary.

It is important to check the rear-view mirror at frequent intervals and to beware of the blind spots both left and right.

When halted for a traffic light a driver should check on cross-traffic before starting forward on the green (the first three seconds after the light changes are the most dangerous). Most drivers think they move their eyes much more than they actually do. Probably the most common after-accident statement is "I didn't see him".

Leave Youself An "Out"

Keep an "out" is an operational habit of expert drivers who, like professional pilots or ship's officers, always follow procedures which will prevent doubtful situations from becoming emergency situations. They adjust their pace and time their movements to take advantage of the moments when the traffic situation is in their favour. In the rare unavoidable case, when only split second action will avoid an accident they have an escape course already in mind and do not waste critical moments in deciding on the best possible response.

There are three major driving practices which will achieve this

(a) **Space Cushion:** A good driver will manoeuvre for better spacing by moving forward or dropping back. This will keep a suitable distance behind the vehicle ahead as in the "Big Picture" habit. If the driver behind is too close he will move forward.

A space cushion is essential all round - at the sides as well as front and rear.

A driver, when overtaking on an unlaned road, should not pass between opposing moving vehicles, that is "not make the filling in the sandwich".

It is senseless to give up a space cushion simply to move ahead one slot in a traffic line-up. If a parked vehicle looms ahead, a driver whose eyes are trained for better driving will, by exercising the "Aim High Steering" and "Big Picture Habit", see it in time to move out to pass well before he reaches the stage of being boxed in behind it.

(b) **Visibility/Speed:** A good driver adjusts his speed according to visibility. He will reduce speed when rounding curves, topping hills and when darkness or other hazards lessen visibility.

(c) **Way Out:** He will always leave himself an out in doubtful situations by reducing speed and being ready to brake. Children, cyclists, animals and absent-minded pedestrians are common sources of doubtful situations to the alert driver.

Safe driving under all road and environmental conditions calls for defensive driving, based on sound seeing habits.

Make Sure Other Road Users See You

A driver must be certain that a pedestrian or other driver who might cause conflict has actually seen his vehicle. Proper communication with them is essential to safe driving. It is not sufficient to give a signal or message, but also to be certain the message has been received and undertood. The expert signals or transmits the message to others of his intentions while he still has sufficient time and space in which to avoid them if they do not respond.

A driver is required to turn his lights on at sunset but should turn his lights on as soon as it's dusk to make recognition of his vehicle far more certain. He should also use lights when weather conditions appreciably lower visibility.

These seeing habits are only part of the safe driving technique. They must be supplemented by a thorough understanding of individual physical capacities and limitations, the motor traffic laws, and motor vehicle control and its capabilities.

THE SYSTEM OF VEHICLE CONTROL

The system of vehicle control is the basis upon which the whole technique of good driving will be built. It must have a solid foundation, and any weakness in its structure, either theoretical or practical, will be evident in a driver's performance. The system as presented in this Chapter is equally applicable to the control and safe riding of a motor cycle so that the word "Driver" can also be taken to mean "Rider".
The driver must acquire the best possible appreciation of the System. He must understand and remember its principles and this is a matter for mental application.

The proper application of the system requires skill which can only be acquired by practice.

System Defined

The System of Vehicle Control may be defined as :-

A SYSTEM OR DRILL, EACH FEATURE OF WHICH IS TO BE CONSIDERED (IN SEQUENCE) BY THE DRIVER, AT THE APPROACH TO ANY HAZARD.
A **HAZARD** may be any physical feature, such as a crossroad, roundabout system, road junction, bend or hill-crest or any potentially dangerous traffic situation developing ahead.

The definition required a driver to **CONSIDER EACH FEATURE IN SEQUENCE** at the **APPROACH** to a hazard. These features, which are shown in correct order in the table below must be supported by sound assessment of the road conditions and correct manipulation of the controls if safe passage of the vehicle is to be achieved.

FEATURES OF THE SYSTEM

	NAME	OBJECT
(I)	COURSE SELECTED	To determine the course to be taken to negotiate the hazard.
(ii)	MIRRORS AND SIGNALS	To check for following or overtaking traffic and to signal intention to other road users
(iii)	BRAKES	To reduce speed to a safe rate of approach and arrival at the hazard.
(iv)	GEARS AND MIRRORS	To select appropriate gear for flexible control and to check again for following and overtaking traffic.
(v)	NORMAL ACCELERATION (A1 or A2 if safe)	To leave the hazard safety having regard to the road surface and traffic conditions.

Application of the System

It will be seen from the following paragraphs that in applying the System of Vehicle Control the driver's whole plan of driving is mapped out. It is deliberate and thoughtful and is the fundamental basis for safe driving on the road.

By the correct application of this System the vehicle will at all times be :-

IN THE RIGHT PLACE ON THE ROAD;
TRAVELLING AT THE RIGHT SPEED and
WITH THE RIGHT GEAR ENGAGED.

GEAR CHANGING

One of the most admirable qualities to be found in the good driver is the ability to make the best use of the gear ratios of the vehicle he is driving. Gear changing in itself is not a difficult operation but it can be performed in two ways: with finesse and maximum vehicle sympathy and control or carelessly with undue wear on the vehicle and minimal control.

It is through the gearbox that the power of the engine is transmitted to the differential and through to the wheels. The power available is limited and is proportional to the r.p.m. of the engine. Therefore different gears are used to make it possible for the engine to maintain r.p.m. and perform the work necessary to move the car from stationary, to accelerate, decelerate and travel along the road up and down hill, at any safe speed up to the vehicle's maximum.

Correct Use of Gears

No matter how well a driver may handle a vehicle, his ability to use the gearbox properly will do much to make or mar his driving. The first-class driver should aim always :-

1. To be in the correct gear for every road speed and traffic condition.
2. To make all gear changes quietly.
3. After selecting the gear, to connect the engine power to the transmission without jerk to the vehicle by means of gentle use of the clutch.
4. To be capable of engaging a particular gear without first using an intermediate gear.
5. To know the approximate maximum road speed of the vehicle he is driving in the intermediate gears.
6. To avoid changing gear when alongside a vehicle he is overtaking (both hands should remain on the steering wheel).

To satisfy these requirements the driver should endeavour to improve his ability to judge road speed without reference to the speedometer, and to judge engine r.p.m. by sound in each gear at various speeds. He should pay great attention to the details of the precise manipulation of the accelerator, clutch and gear lever. If at first he is not as successful as he expects to be, he should take frequent spells of practice, concentrating on gear changing alone.

Vehicle sympathy is a quality to be admired in any driver. It is shown in many ways, not the least of which is the manipulation of the gear changing controls and the r.p.m. used in any gear.

The operation of the vehicle engine can be heard and felt and the knowledge gained by the combined use of these senses should enable the driver to drive his vehicle with that delicacy and smoothness, sometimes called "polish" which is so much a fetish among keen motorists.

Some common faults when changing gear, and in its kindred operations, are set out below :-

(i) Inability to recognise the sound of engine speed, and the correct relationship between it and the road speed of the vehicle.

(ii) Failure to assess road speed correctly before selecting a particular gear. The most common error is that of trying to engage a lower gear at too high a speed.

(iii) Failing to take a proper grip on the gear lever when moving it from one position to another. This is the root of many gear changing difficulties.

(iv) Lack of precise co-ordination between foot and hand movements to effect a clean, smooth, gear change.

(v) Late gear changing, or entire failure to change down at the approach to a hazard when the road speed and conditions demand a lower gear.

(vi) Failing to recognise the sound of the engine when "over revving" in a low gear.

(vii) Timidity and reluctance to attempt necessary changes down to lower gears, after previous unsuccessful attempts.

Following Distances

Under the heading "Stopping Distances" it was indicated that the distance it takes to stop a vehicle is a combination of reaction distance and braking distance; and the relative of these at different speeds is illustrated in Figure 7.

Generally speaking braking distances as between vehicles are fairly equal but reaction distance varies from one person to another in terms of physiological characteristics (eg. state of health, reaction reflexes, age, powers of concentration).

Following distance is the space you should allow between your vehicle and the vehicle immediately ahead of it to enable you to avoid (by braking or swerving) colliding with the vehicle if for some reason the driver of that vehicle stops or reduces speed suddenly.

If that situation develops you will need not only time in which to react - which may be affected by a number of variables but additional space to take into account any of a number of variables which might cause the vehicle ahead to decelerate in shorter distance than your own. The results of reaction test conducted "off the road" and with the driver duly alerted, (but at different levels of distraction) also show wide individual variations in reaction times varying between .75 seconds and 1.5 seconds. Under real life driving conditions these times could be extended to 2 or 3 seconds or more.

In deciding what is a safe distance to follow it is not possible to lay down hard and fast rules as any given distance may not be adequate from moment to moment. (See pages 56 to 58).

In the past rules based on judgement of distance (one vehicle length for each 16.6km/h of speed) have been used but accurate judgement of distance is not a common ability and the rule is unreliable. A better method is based on judgement of time and is called the timed interval method in which two seconds of time are allowed between vehicles.

This interval can be judged with reasonable accuracy by counting - "one thousand one, one thousand two". Watch the vehicle ahead pass some definite point, you should be able to complete your count before reaching the same point. Practise your count against a clock at first, then practise in areas of low traffic density until you learn to recognise appropriate following distances for different speeds.

While this rule is self adjusting for differences in vehicle speed the driver must use his own judgement in allowing for other variables. Where conditions of visibility and/or road adhesion are less than good allow about twice the distance.

It is important to appreciate the continuing need for concentration and alertness. In many cases the first indication of a change in traffic speed comes from the illumination of the brake lamps of the vehicle ahead, or, on other words, when the driver ahead has already seen the need reduce speed and has reacted.

Under unfavourable conditions (health, environment), allow even greater following distance. Following too closely is dangerous. If a driver runs into a vehicle in front he is guilty of following too closely for his reaction ability or he is guilty of inattention.

STOPPING DISTANCES

The distance required to make a stop is determined by three time intervals.

The first is **perception time:** the time that passes between the time the emergency appears and the time the driver recognises it as serious. Normally this period is only a fraction of a second, but for a driver who is sleepy or under the influence of alcohol, it may be seconds long.

The second period is the **reaction time:** the time required to get the foot from the accelerator to the brake.

The third period is **braking time:** the length of time the tyres react on the road before the vehicle stops.

In determining the distance required for a particular driver to stop, perception time is usually not included as it is difficult to measure and is extremely variable.

The total distance required to stop comprises the distance travelled while the driver is moving his foot from the accelerator and the distance the brakes need to stop the car. Stopping Distance = Reaction Distance + Braking Distance (Figure 7).

The alerted driver takes about three quarters of a second between seeing danger and moving his foot from the accelerator to the brake pedal. A vehicle travelling at 100km/h will travel a distance of some 20m in this time. Similarly, at 30km the distance will be approximately 6m.

Tests have shown that a car with efficient brakes moving at 30km/h will travel a distance of approximately 6m on a dry concrete or bitumen surface before the brakes will stop it.

Therefore, if a driver has a thinking or reaction time of three quarters of a second, the total stopping distance at 30km/h will be 6m + 6m or a total of 12m. At 60km/h the reaction distance will be 12m and the braking distance approximately 22m, making a total stopping distance of 34m.

It is important to note that, when the speed is doubled, the braking distance is not doubled but is four times as great.

If the road is wet, snowy, or icy, stopping distances may be as much as twice the distance on a dry road. Also, in descending a hill, the pull of gravity will tend to keep the vehicle going and thus increase the stopping distance. In going up a hill, gravity is already trying to stop the vehicle, so that the stopping distance will be shortened.

The stopping distances set out in Figure 7 have been based on the reaction time of three-quarters of a second together with the approximate distance a motor car will travel before stopping.

Watch should be constantly maintained for situations developing ahead, at each side and behind. These will be anticipated by the safe driver - he never keeps his eyes **glued to the car in front.**

Always watch for the stop light (or hand signal) seven or eight cars ahead.

A driver in the right lane should watch for the vehicle ahead preparing to turn right or the vehicle entering his lane from the right, or the obstruction at the kerb that will divert vehicles from the left-lane into his path.

Look for pedestrians and especially anticipate when to stop when approaching intersections and marked pedestrian crossings.

FIGURE 7

MINIMUM STOPPING DISTANCE AT DIFFERENT SPEEDS WITH A BRAKING EFFICIENCY OF 60%

Km/h	Reaction Distance	Braking Distance	Total Stopping Distance
10	2m	2m	4m
20	4m	3m	7m
30	6m	6m	12m
40	8m	10m	18m
50	10m	15m	25m
60	12m	22m	34m
70	14m	29m	43m
80	16m	38m	54m
90	18m	48m	66m
100	20m	60m	80m

VEHICLE SAFETY AT PRESCRIBED BURNS AND WILDFIRES

Certain measures are needed to safeguard vehicles during prescribed burning or fire suppression operations.

Parked vehicles. More often than not, vehicles will be parked for a greater part of the time, and so should be :-

* Parked so that they can move directly out of the area on a known, safe route.
* Left with the ignition key in the lock.
* Parked on a cleared or previously burnt area.
* Parked so that other vehicles may pass easily and safely.
* Left with cab windows closed and all inflammable material towed away.

If a man is left with the vehicle he should know the outline of the whole operation, what other members of the gang are doing, any rendezvous with others, and communication schedules.

Driving through fire and smoke. Should it become necessary to drive through a burning area or one heavily covered with smoke, the following procedure should be observed :-

* Drive at a slow safe speed.
* Keep cab windows closed.
* Switch on headlights.
* Remove exposed inflammable material from vehicle.
* Personell travelling on truck tray should have water available, through a powered pumper, tank or knapsack sprays, and must wear all available items of protective equipment.

The procedure to be followed **by Drivers** in the event of a vehicle accident is as follows :-

(1) Advise the District Officer in Charge/Mechanical Supervisor who will attend to the following investigation and reporting as required.
(2) Complete SGIC Form 263 or 264 or 451 and forward the original direct to the Regional Mechanical Supervisor.
(3) Complete the Accident Investigation Form and forward the original to Engineering Services, duplicate to the Safety Officer, SOHQ and the triplicate to Regional Leader.

In the event of a vehicle accident involving a third party, the following additional procedure is to be followed **by the Driver.**

(1) Obtain the name and address of the driver and/or owner of the other vehicle or any other property involved.
(2) Obtain the licence number, make and type of the other vehicle(s) involved.
(3) Obtain the name of the insurer of the other vehicles involved.
(4) Obtain the name and address of any witness(es) involved.
(5) Note the damage to other vehicles and/or property involved.
(6) In no circumstances is liability to be admitted by anyone.
(7) Notify the District Manager who will advise Engineering Services and the Regional Leader (Safety) by telephone.

CAUTION

TILT ROO BAR BEFORE TILTING CAB...

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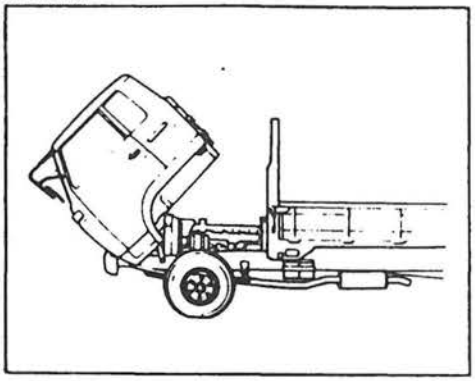
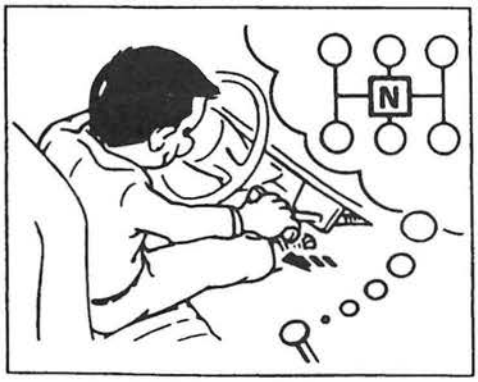
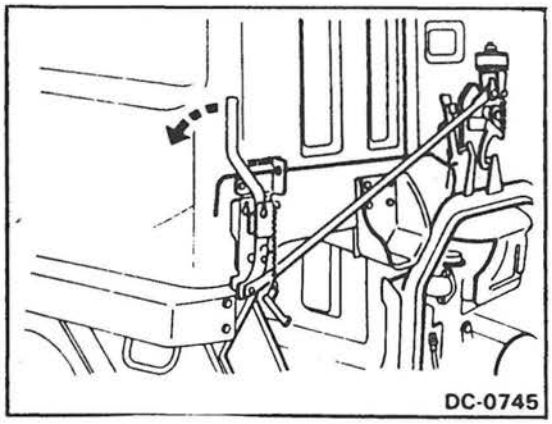


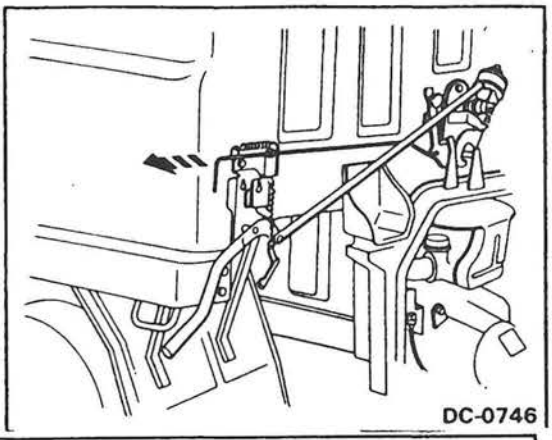
Cab Tilting (Except Crew Cab Models)
Tilt the cab in the following manner when checking or servicing the components or parts in the engine compartment.



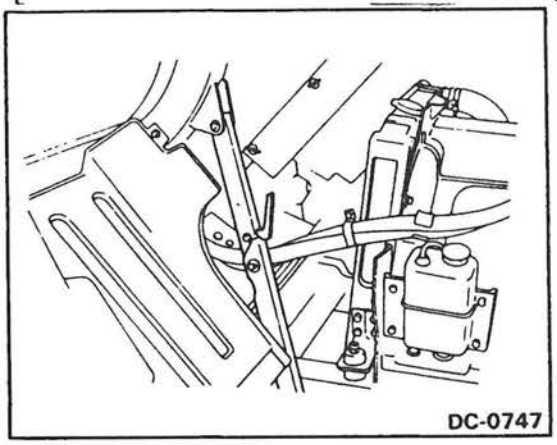
1. **Preparation for cab tilting**
* Park the vehicle on level ground and check that there is a sufficient space in front of the cab and above the cab.
* Set the parking brake firmly and brace the wheels as necessary
* Place the gearshift lever in neutral position
* Keep interior of cab free from items that are liable to fall down.
* Close the doors securely



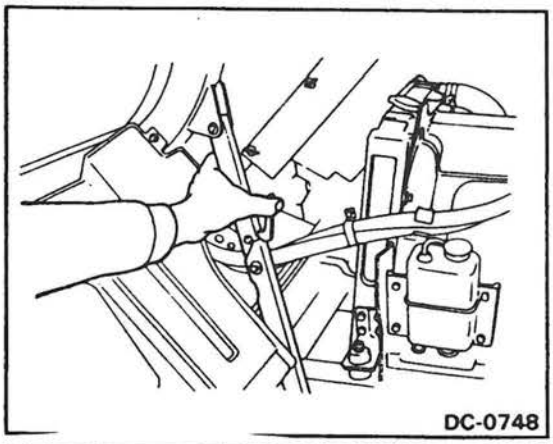
2. Unlock the cab tilt lever at the left rear part of the cab by pulling the lock pin and pulling the lever toward the reader



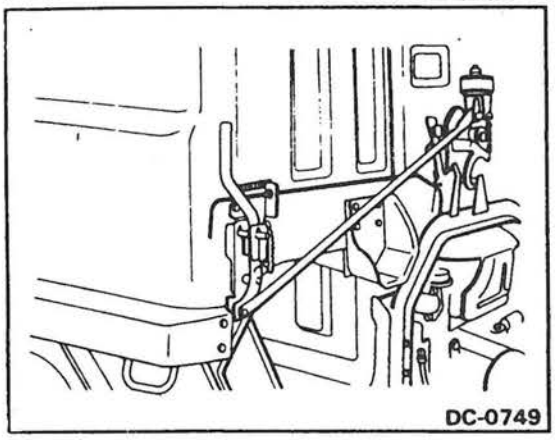
3. Pull the safety lever forward while holding the assistant handle to prevent abrupt raising of the cab. **The safety lever automatically returns home position when released**



4. Raise the cab to stop and check that the cab stay is locked

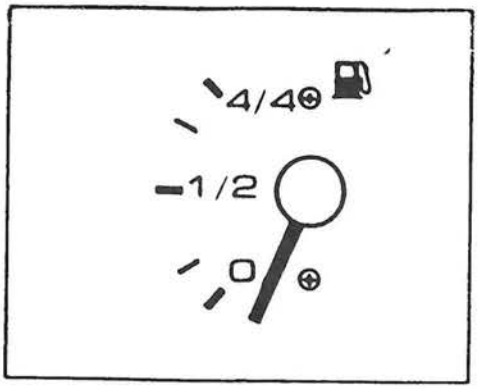


5. To lower the cab, unlock the cab stay while holding the lock lever with hand, then pull the stay rearward so that the cab begins to lower. Release the lock lever and lower the cab by holding the assistant handle. The cab becomes locked automatically.

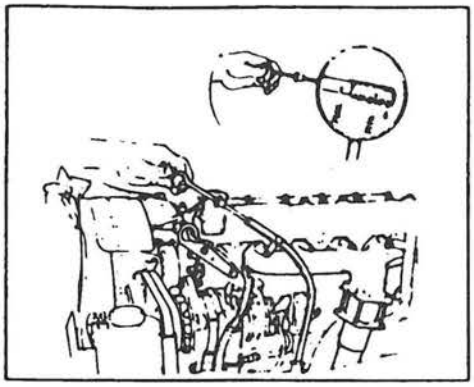


6. To lock the cab, push the tilt lever upward. When the cab is locked, insert a lock pin in to the tilt lever and make sure that the lock pin is held in position securely.

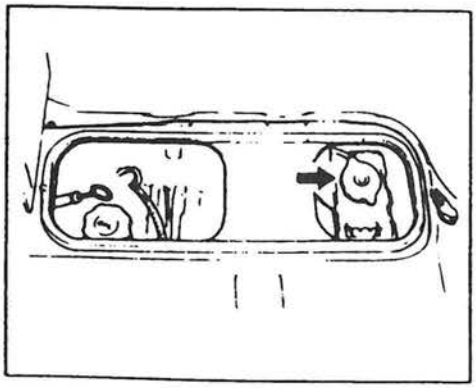
EVERY DAY



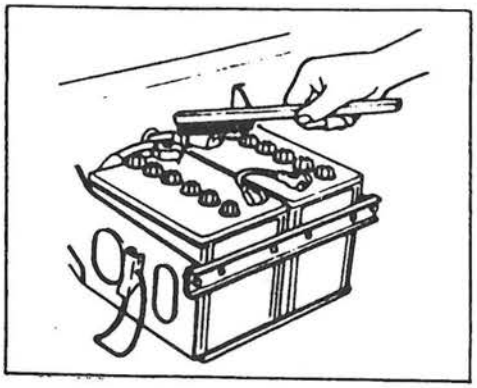
Fuel Guage
The guage indicates level of fuel in the fuel tank when the starter switch in "ON" The letters "4/4" amd "O" represent "Full" and "Empty" respectively.



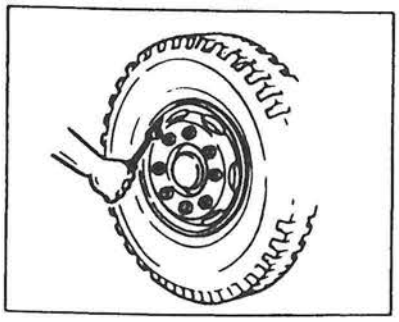
Within Engine Compartment
Check engine oil level



Check engine coolant level and radiator cap for looseness (Except **TRB** and 6BGI engine models).



Cleaning of Battery
If the external part of the battery is fouled, clean with tepid water. Apply a thin coat of vaseline or grease to the battery terminals to prevent corrosion.



Tyre Inflation pressure, damage and tread wear

Standard inflation pressure:

Tyre Size	Inflation pressure at cold (PSI kPa)
9.00.20	96 = 662

ISIZU TRUCK MAINTENANCE

Every day when in use :-

P	Fuel	=	Check fuel in truck, and in pumper
O	Oil	=	Oil in the truck and pumper
W	Water	=	Check radiator in truck and pumper
E	Electrical	=	Check all lights. Check batteries, truck and pumper.
R	Rubber	=	Check tyre pressures, and for damage.

Also check brake fluid in both systems and clutch

Also drain air tanks

Every week when in use or 500km :-

(1) Power check

(2) Grease springs tail shaft etc.

(3) Check air cleaner gauge.

NOTE: Air cleaner **should not be cleaned until gauge shows red**

At the end of each fire season or 5,000km

(1) Power check

(2) Weekly check and grease

(3) Oil change and full service
NOTE - NOT **filter change.**

(4) Have mechanic check air cleaner element.

At the start of each fire season or 10,000km

Power check

Weekly check and grease

Oil change and full service

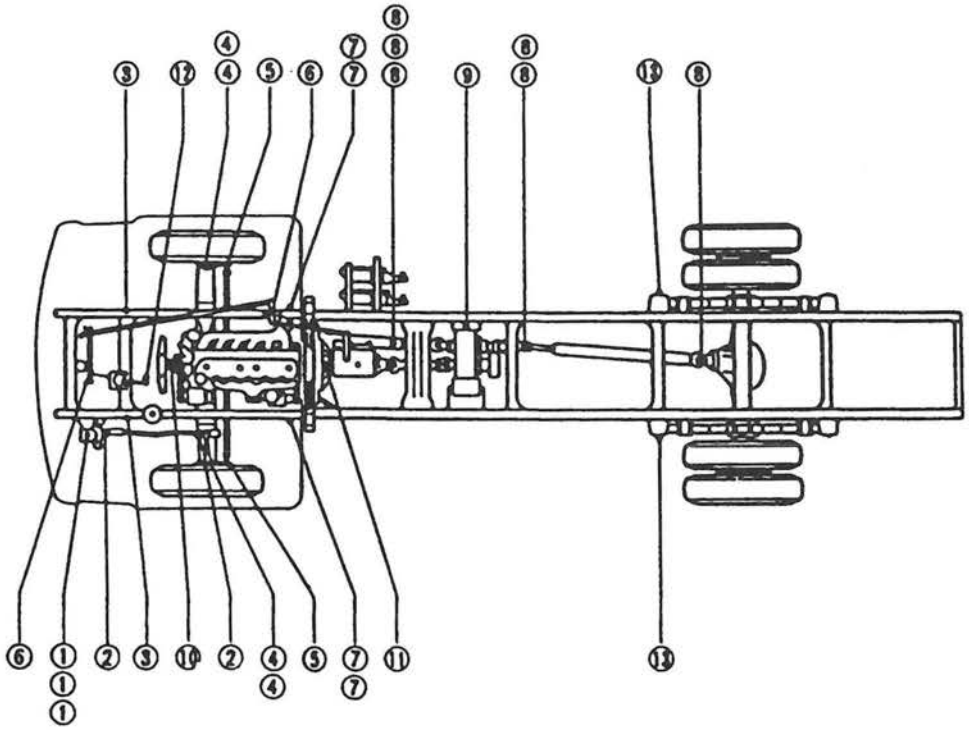
Change oil filters

Change fuel filters

Have mechanic check air filter element.

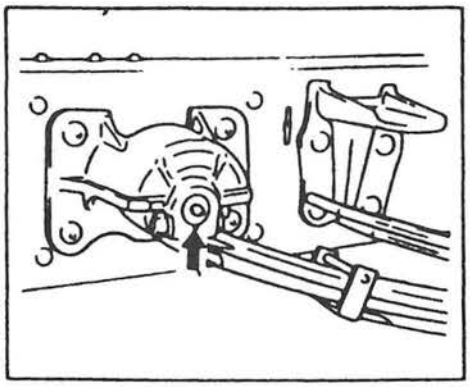
GREASING POINTS 4 X 4

GREASE EVERY 5000 KM OR 3 MONTHS

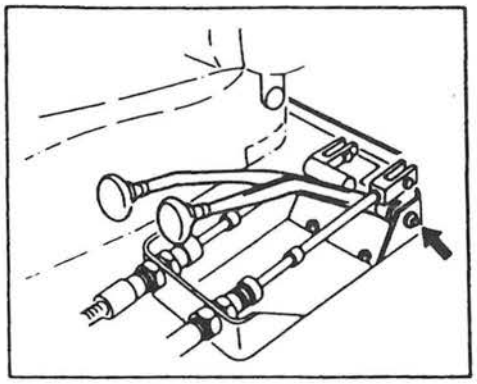


1. Steering shaft univ. joints and sliding sleeve.
2. Drag link
3. Front spring, spring pin
4. King pin
5. Tie rod end
6. Gearshift control rod
7. Front spring shackle pin.
8. Propellor shaft universal joints and sliding sleeve.
9. Packing brake relay lever.
10. Engine water pump.
11. Clutch shift block.
12. Transfer case gear control lever.
13. Rear spring spring pin

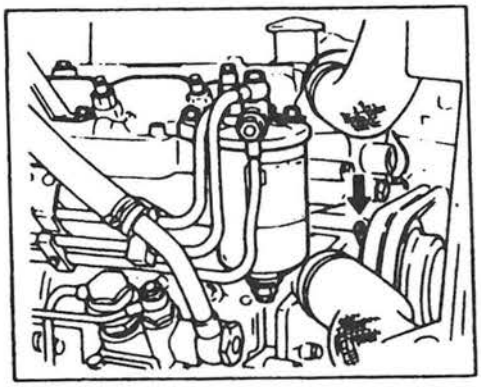
GREASING



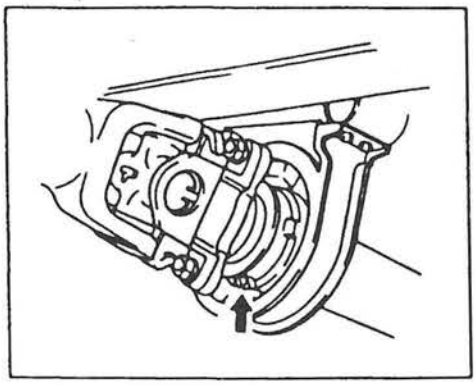
Rear spring, spring pin (2 points)



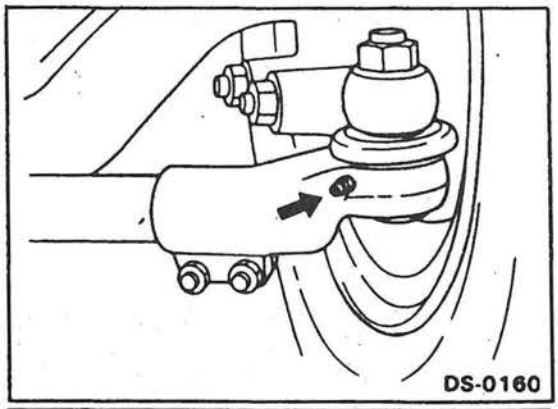
FTS Tansfer case gear control lever (1 point)



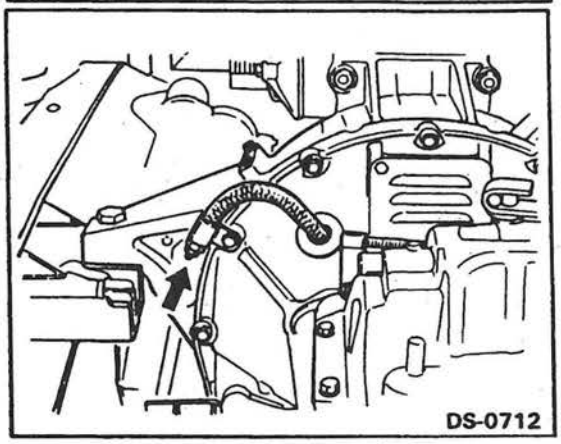
Engine water pump bearing (1 point)



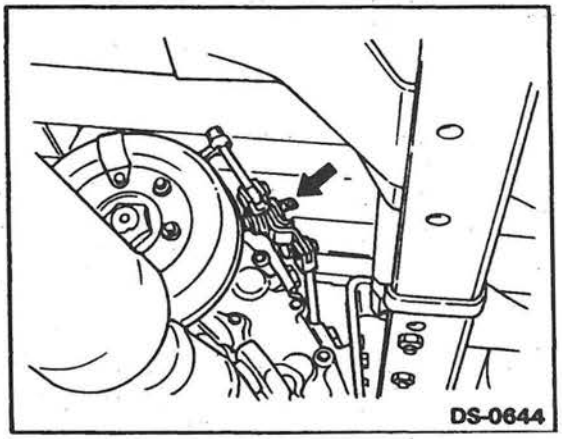
Repacking of propellor shaft centre bearing grease
Disassemble and wash clean the centre bearing, then repack with 120g (4.2 oz) of new multi-purpose type grease.
When the vehicle is subjected to severe operating conditions, the centre bearing must be greased frequently by a grease nipple installed in the plug hole.



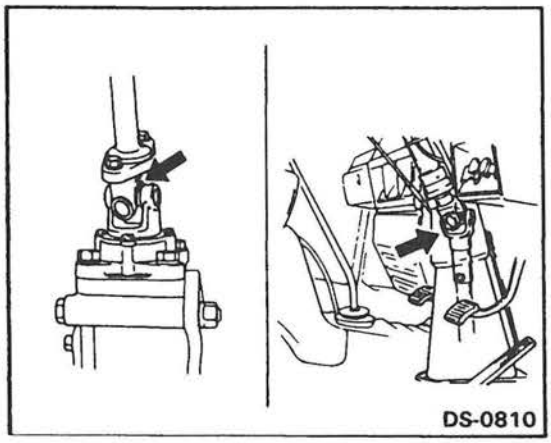
FTS Tie rod ends (2 points)



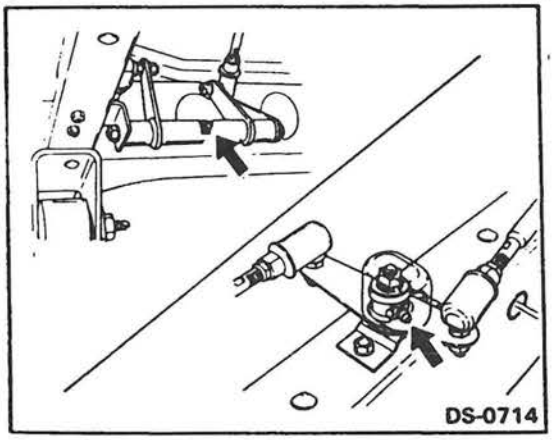
M/T Clutch shift block (1 point)



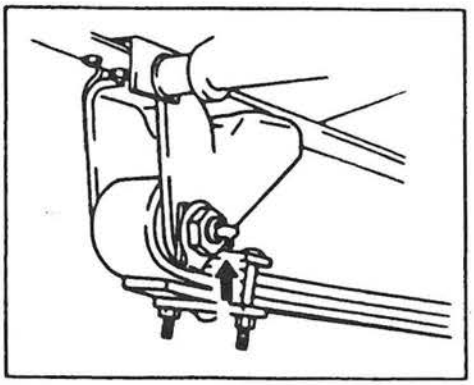
FTS Parking brake relay lever (1 point)



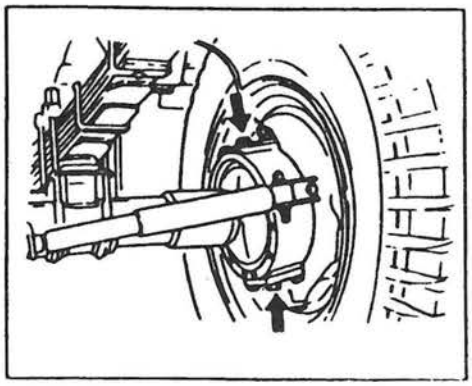
Steering shaft universal joints and sliding sleeve (3 points)



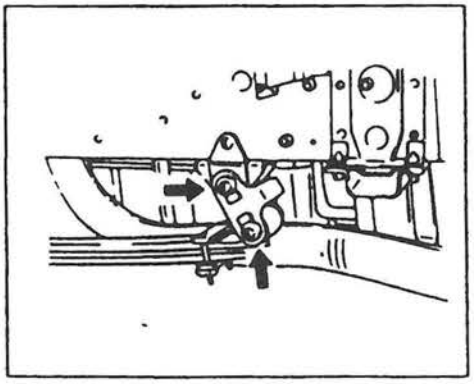
M/T Gear shift control rod (2 points)



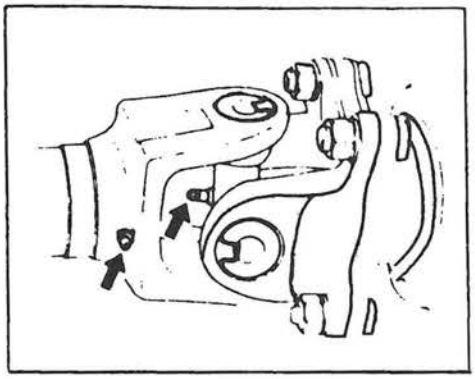
Front spring, spring pin (2 points)



FTS

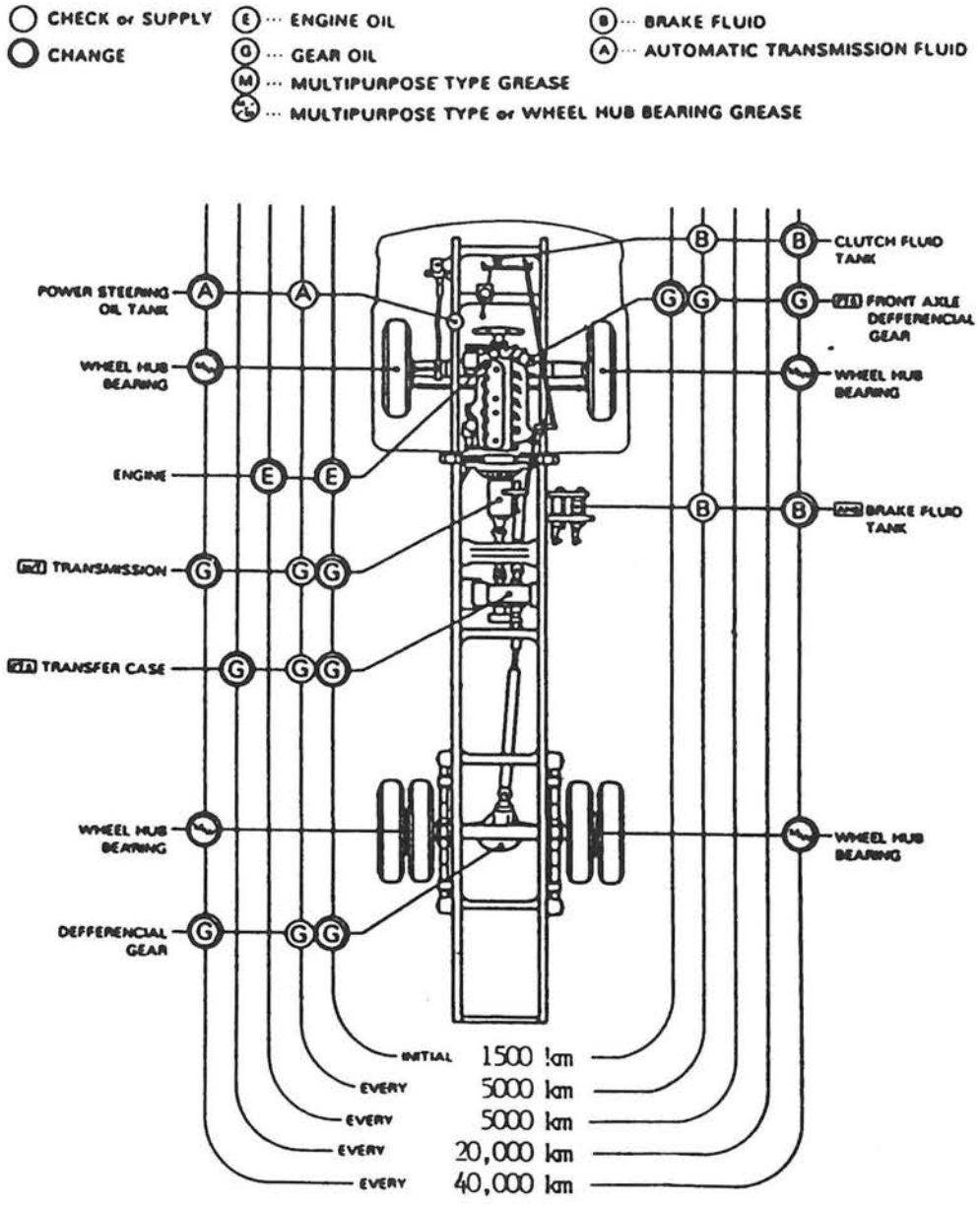


Front spring shackle pin (4 points)

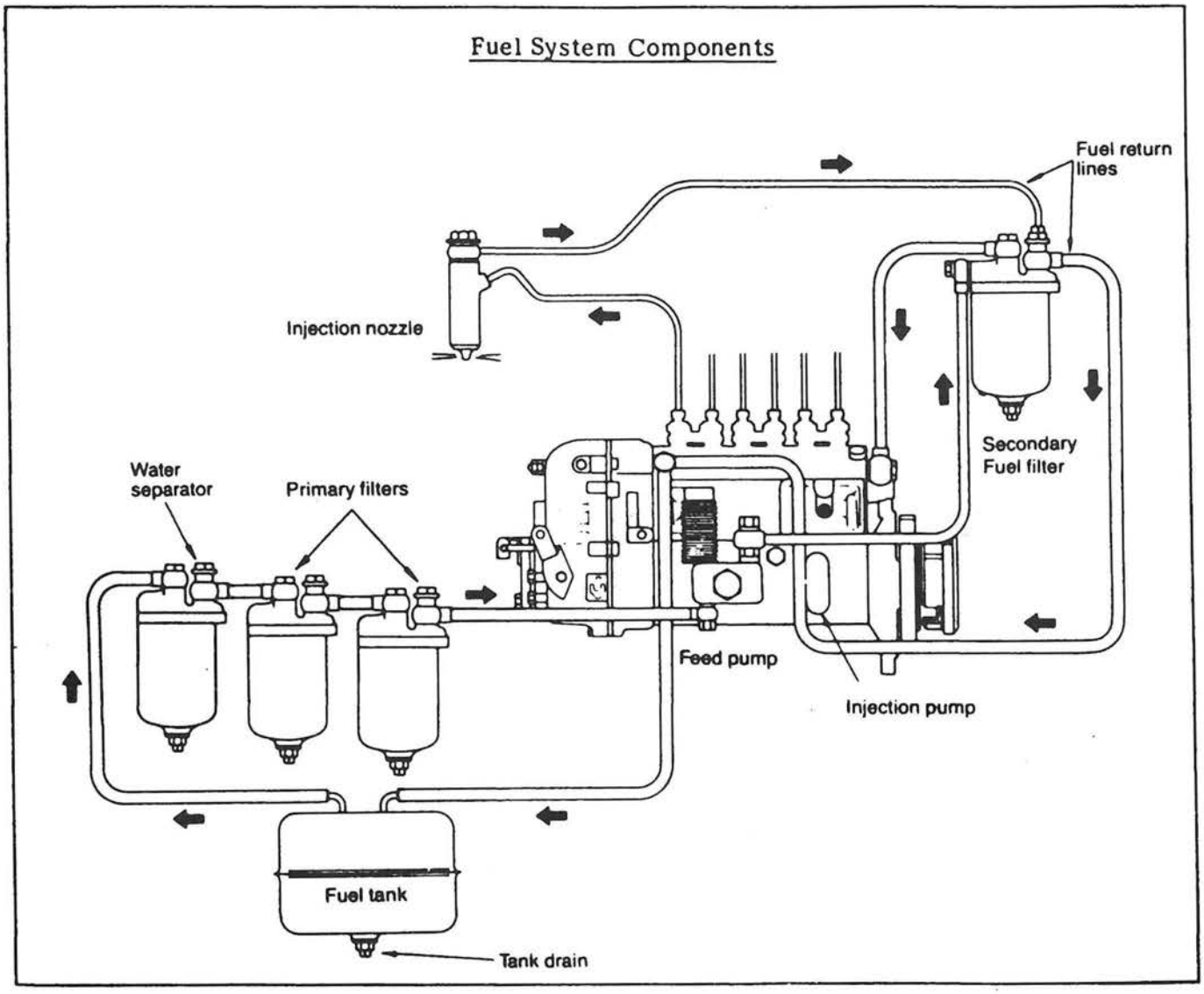


Propellor shaft universal joints and sliding sleeves

LUBRICATION CHART 4 X 4

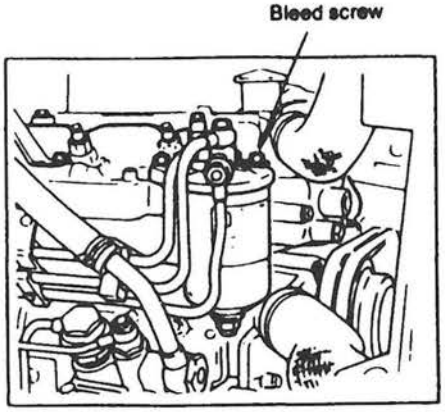


FUEL SYSTEM



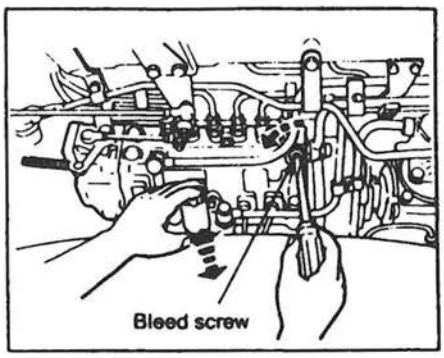
The fuel system on a diesel engine needs regular servicing, because the injectors and injector pump are made up of close tolerance components. If any dirt or water get in to either the injectors or the pump, serious damage will occur.

BLEEDING THE FUEL SYSTEM



There are three bleed screws in this system:

1. On top of the water separator
2. Located on top of the fuel filter housing.
3. On the injector pump body as indicated.



To bleed the system :

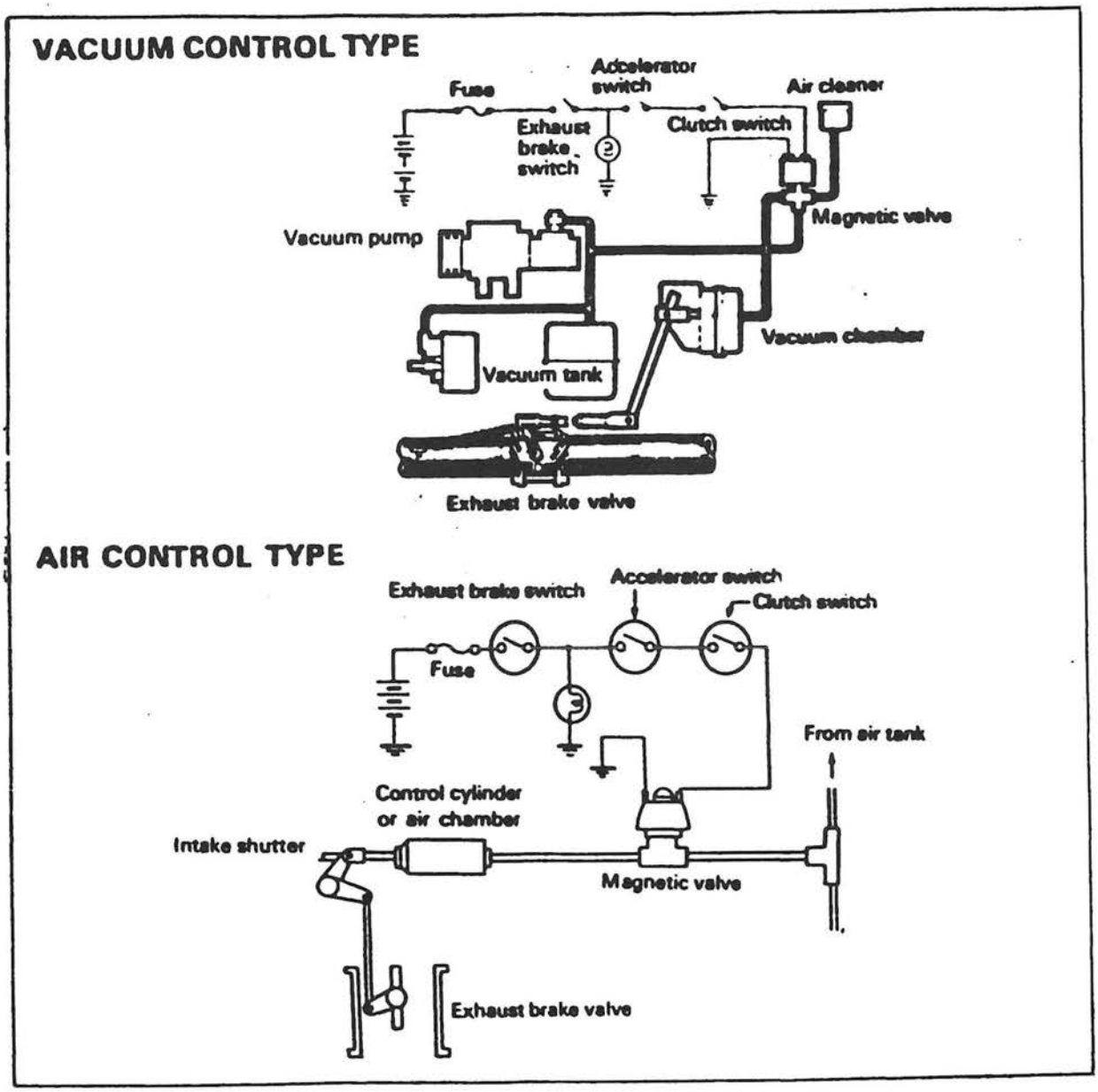
1. Operate the plunger on the feed pump
2. Open both bleed screws in the engine compartment.
3 Continue pumping till all air is removed.
4. Close each bleed screw in turn
5. Ensure all traces of air are removed.

If you have a problem removing the air, check the sealing surfaces around all filters and joints.

NOTE: The fuel stored in the fuel tank should not be left any longer than three months. If you do not use a full tank of fuel in a three month period, drain all the fuel from the system and replace with a new batch of fuel.

In colder areas you will need to watch the fuel usage between summer and winter.

At the end of summer change to winter fuel



EXHAUST BRAKE SWITCH

Exhaust brake system is designed to shut off exhaust pipe when the engine brake is applied, thereby to assist in brake action.

When the switch lever is pulled the indicator light comes on indicating that the exhaust brake is in operative condition.

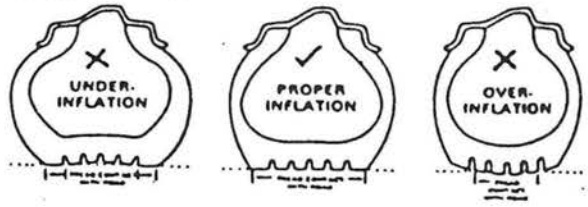
It is advisable to operate the exhaust brake when descending a slope or when stop and go driving is involved. Exhaust brake system is released when either acceleration pedal or clutch pedal is depressed but the indicator light remains on.

Keep the exhaust brake switch in the "off" position when running the engine at idle for warming up etc.

THE NATIONAL SAFETY COUNCIL OF WESTERN AUSTRALIA

Tyre care

Pressure

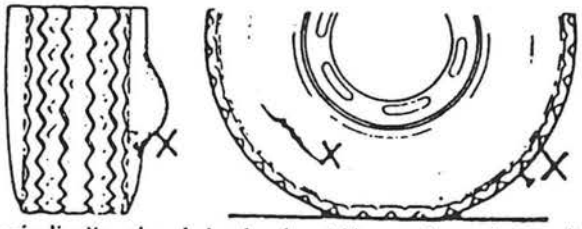


The single most important aspect of tyre care is pressure maintenance. Most people have their tyres pumped only when they notice they are slightly flat. But remember that all tyres naturally lose air, because rubber is a semi-porous material. Remember also that it is the pressurised air contained in the tyre, and not the tyre itself, that carries the load. Therefore for even wear and good grip (which imply both economy and safety) it is essential to check tyre pressure regularly — once a week at least. And don't forget the spare!

Valve Caps

The valve cap not only helps seal air in the tyre — it also prevents fine dirt particles from becoming trapped between valve core and valve stem which permits a slow loss of air. It is important, therefore, that valve caps are always replaced.

Visual Checks

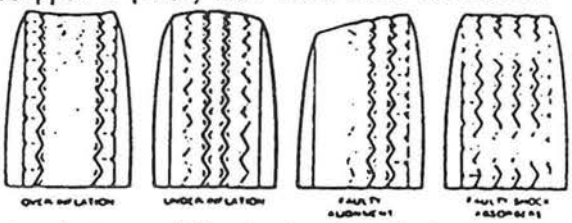


Periodically, visual checks should be made on the outside and inside of tyres (bending down while having someone move the car slowly will do) for damage such as cuts and bruises, trapped stones, and oil leaks (oil decomposes rubber). Cuts usually get bigger and deeper with tyre use, and can result in eventual tyre failure. Small bruises or scuffs resulting from a kerb impact can indicate serious damage on the inside. Stones trapped in the tread grooves finally damage the tread rubber if not removed.

Uneven Wear

If your tyres wear unevenly, it is an indication that something is wrong. Wear on both the shoulders could mean that your tyre is under-inflated, while wear in the centre only could mean that the tyre has been overinflated.

Wear on the outer shoulder only could mean that your camber, caster or king-pin settings need adjusting; scupped or patchy wear could mean worn shock



absorbers or grabbing brakes. The list is a long one, but gènerally speaking uneven tyre wear can tell you a lot about the mechanical condition of your vehicle and should consequently be checked and repaired.

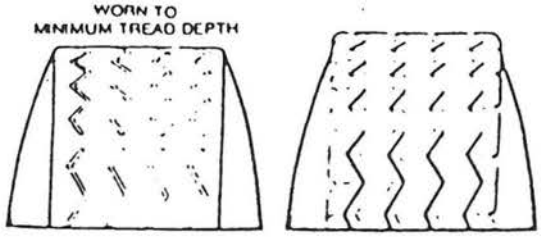
Balance

With today's sophisticated highways and vehicle suspensions it is essential, for a smooth and comfortable ride, to have at least the front wheels balanced both statically and dynamically. This will prevent vehicle shake and possible damage and will give you a greater degree of control. Less energy is wasted, and consequently fuel is saved.

Tread Depth

The purpose of the tread is to provide the tyre with adequate grip, steering control and stopping power. Tread grooves are also essential for water dispersion and it should be borne in mind that tread grip diminishes rapidly as the tyre wears down.

So remember: for your own safety and that of others — check your tyres regularly and carefully for wear and replace them at the very latest when they have a minimum of 1.5mm tread left. Leaving it any later would not only endanger your own and others' lives but could prove false economy as a tyre casing too far worn would be valueless as it would not be suitable for re-treading.



CONSERVATION AND LAND MANAGEMENT
Issued August, 1987.

This job specification aim is to provide guidelines for maintenance and safe operations of a standard Heavy Duty unit.

The Power Unit

The standard Holden engine operated completely independent of the transport vehicle. Engine cooling is by radiator circulated water and is in no way dependent on any water supply from the tank.

Super grade or unleaded petrol may be used. It is supplied from a 45 litre tank. An instrument panel mounted on the protective cowling incorporates a choke, oil pressure and temp gauges, ammeter, ignition switch and warning light. A hand throttle is located on the rear cowling, frame. A pump water pressure and vacuum gauge is also located on the instrument panel. The panel can be illuminated for night work.

THE PUMP

A direct coupled centrifugal 50mm High Lift Stalker pump is mounted directly behind the motor. The pump will deliver approx. 2500kpa at 400rpm. An inline filter is located on the suction side of the pump to prevent debris from entering the pump and damaging the brass impaller or blocking discharge nozzles.

Delivering Water from the Tank

Water may be delivered directly from the 2700 litre tank through the 19mm live reel hose or through three 38mm canvas hose outlets by following the steps below :-

Steps :

1.1 Open the inlet valve from the tank to the pump

1.2 Start the engine (choke necessary if starting from cold)

1.3 Open approximately delivery valve or valves. Note all other valves should be fully closed. (Important) Crucial that the priming pump valve is fully closed.

At this stage it is of utmost importance to stress the need for caution when increasing pressure at the delivery point.

When operating the pump over "mop-up" engine setting the pump operator must, at all times, be in a position to reduce engine revolutions should the hose operator be unable to control the delivery hose.

NOTE: The valve on the inlet pipe from the tank to the pump should be left in the "on" position at all times while the unit is engaged in fire suppression work in the field.

The exception to the rule is when draughting of water.

Draughting and Priming

In order to draught water from a static water supply it is necessary to have the suction hose and the complete body of the pump full of water. This means that all air must be withdrawn from these sections of the unit. To achieve priming, an Ajax hand operated priming pump is located behind and below the valve manifold panel. The priming pump operates on a simple rubber diaphragm. The diaphragm is however, easily rendered useless if correct procedure is not followed when priming.

Steps:

1.1 Position the vehicle carrying the pump as close to the source of water as is safe. Ensure that the strainer is in a depth of about 0.5m which is desirable to prevent air being drawn in.

If the water source has a sandy or soft bottom a shovel or other material must be placed under the strainer to prevent sand being drawn into the system.

1.2 Close the valve between the tank and pump. Open the inlet valve between the suction hose line and the pump. Open the small valve between the priming pump and pump. Close all other valves.

1.3 With slow, firm strokes, activate priming pump ensuring that full travel of each stroke is utilized. The handle of the priming pump will become harder to depress as water is drawn up. It will discharge from the priming pump outlet when the system is primed.

1.4 Close off the priming pump valve. Start the engine to run at about 1/4 throttle.

Slowly open the discharge valve to the tank or to any selected outlet. Observe the pressure gauge while opening the discharge valve. Pressure will be indicated if the priming has been successful. Increase throttle to desired setting. Failure to prime at the first attempt may be due to air being trapped in the system and the operator should repeat the process.

Failure at the second attempt generally indicates a fault has developed and that air is being drawn into the system. A visual inspection of the suction hose together with a physical testing for firm joints must then be carried out.

VERY IMPORTANT

Failure to turn off the valve between the priming pump and main pump after priming and before starting the engine can cause water pressure from the pump to enter the priming pump and render the rubber diaphragm useless.

MAINTENANCE OF FIRE PUMPER UNITS

To provide adequate maintenance of Departmental fire pumper units the following procedures should be implemented.

It is the responsibility of the District Manager to ensure that the pumper maintenance and storage is carried out in accordance with these instructions.

1.0 **DAILY - by pump operator (when unit is infrequent use):**

1.1 Check cooling water level where applicable.

1.2 Check engine oil level.

1.3. Fill fuel tank (should be kept full).

1.4 Check suction hose and filters.

1.5 Where chemicals, wetting agents or retardants have been used, flush pump, plumbing and hoses with clean water.

NOTE: When unused fire retardant mixture is to be stored in pumper tank ensure main valve from tank is closed before flushing.

1.6 Keep engine surrounds free from debris such as leaves, twigs etc.

2.0 **WEEKLY - by pump operator:**

2.1 Items 1.1 to 1.5 of daily maintenance.

2.2 Check battery for cleanliness and tightness of terminals, water level where applicable.

2.3 Check for correct operation of gauges, controls and valves.

2.4 Thoroughly clean down engine and unit.

2.5 Report all defects and malfunctions to OIC or Ranger in Charge.

2.6 All units to be test run until engines have reached normal operating temperatures. Make sure the pump is re-circulating water through the plumbing system.

Gland Adjustment

Pumps are despatched from the workshop with glands correctly packed. After the pump has been in operation for a time it will be necessary to tighten up the gland as the packing beds down.

Adjustment is as follows:

The inlet valve from the tank must be open and all discharge valves closed. The pump pressure should increase to approximately 410kpa at which point a slow drip of water should be visible from the gland. When pumps are to be packed it will first be necessary to remove all the older packings. The five packing rings must cut from 7mm square suction packing approximately 112mm long. This will have a gap of approximately 3mm when the packing is wrapped around the shaft.

The packing must be inserted into the packing box one ring at a time, making sure the gaps of successive rings are not together but are staggered around the shaft.

When five (5) new packing rings are fitted the gland should not enter the packing box more than approximately 12mm.

The gland nuts must be screwed up evenly and should be little more than finger tight. A tight gland causes the packing to burn and score the pump shaft.

Use only the best quality woven type grapheted packing in the gland.

Sets of packing can be obtained from Collie Fire Store pre-cut to length.

Maintenance following Use of Retardants

Fibreglass tanks are not affected by the chemicals used in the retardants and little maintenance is required to the interior of the tank. To protect and maintain the exterior and appearance of fibreglass tanks, thoroughly clean down, then treat with Amorall protectant at least twice a year.

All pumpers which have been using retardants must be thoroughly flushed due to the corrosive action on metal surfaces. Flushing should be carried out as follows :-

1.1 Uncoil the suction hose and place in a clean water source.

1.2 Prime the system

1.3 Deliver water through all discharge points including live reel, but excluding the tank filler unit until all visible signs of retardant have ceased. Open and close discharge valves as above while flushing to clean all working parts.

3.0 **GENERAL MAINTENANCE ITEMS**

3.1 Engine oil to be changed at least twice during year. Once at the commencement of the fire season and once midway through fire season.

3.2 Packing glands on pump and gate valves to be repacked or adjusted as necessary.

3.3 Check inline filter baskets for damage and corrosion.

3.4 Welding of brackets and attachments or changing the design of units is not permitted without the authority of Engineering Services or Protection Branch.

3.5 To protect and maintain the exterior appearance of fibreglass tanks, clean down and then treat with Amorall protectant at least twice yearly (beginning and end of summer).

4.0 WINTER STORAGE

4.1 All units to be stored under cover in a dry, well ventilated area.

4.2 Units to be off the grounds, well supported in a safe, level position.

4.3 Locate units in a position so that motors can be run and are accessible for maintenance purposes.

4.4 Tank to be **full** of **clean** water.

4.5 Where chemicals have been used ensure that pump, tank and plumbing have been thoroughly flushed with clean water before storage.

5.0 WINTER MAINTENANCE

To be done weekly as per items 2.1 to 2.6 of Weekly Maintenance.

6.0 ANNUAL INSPECTION

At least once per year a thorough inspection and test running will be carried out by the Mechanical Supervisor accompanied by the Senior Fire Control Officer and District Fire Officer.

7.0 PUMP MAINTENANCE COSTS

All maintenance to fire pumper units is to be charged to the appropriate district maintenance item number.

8.0 **SPECIAL NOTES**

* DO NOT RUN ENGINES IN AN ENCLOSED AREA.
* ENSURE PROPER VENTILATION OF STORAGE AREA.
* EXHAUST GASES CONTAIN CARBON MONOXIDE WHICH IS ODOURLESS, COLOURLESS AND DEADLY POISON.

PUMPER TROUBLE-SHOOTING GUIDE

PUMPING FROM TANK FAULT	POSSIBLE CLAUSE	REMEDY
Low or Nil Water Pressure	(A) Tank empty (B) Tank valve part closed or closed. (C) Blocked in line filter (D) Air lock in plumbing or pump.	(A) Check Tank (B) Check valve function (C) Clean and retighten filter (D) Stop engine Open a 38mm (1, 1/4) Discharge valve after removing hose, and allow water to gravitate through pumping. NOTE: Only successful if tank water level is higher than plumbing. ALTERNATIVE: Hand prime pump from tank as for tank as for draughting.
Failure to main steady pressure while pumping.	(A) In line filter partially (B) Excess of wetting detergent (C) Tank air vents blocked (Unusual)	(A) Clean filter. (B) Dilute by over-filling tank with water. Do not add more detergent until a satisfactory dilution is achieved. (C) Check vents.

PUMPER TROUBLE-SHOOTING GUIDE

PUMPING FROM TANK FAULT	POSSIBLE CAUSE	REMEDY
Pump won't prime	(A) Air leak in suction hose joints. (B) Punctured suction hose (C) Gland packing leaking (D) Strainer and hose not fully submerged. (E) Incorrect valves open (F) Priming pump diaphragm US (no pressure felt at handle)	(A) Check joints and tighten if necessary. (B) Visual inspection, if faulty replace. (C) Adjust as per guide. (D) Excavate sump if necessary to gain depth. (E) Recheck valve settings. (F) Workshop replacement.
Pumper engine labouring and losing revolutions	(A) Impellor loose on shaft & binding on pump housing, usually indicated by grinding from pump.	(A) Stop immediately for mechanical inspection.
Pump engines - sudden build-up of revolutions.	(A) Tank level dropping below pump inlet pipe.	(A) Stop engine and refill with water.