



**DAVID BROWN**

**4600 SELECTAMATIC**

**Instruction  
book**

## SAFETY POINTS

- ⚠ **Don't** operate the independent foot brake when travelling at high speed.
- ⚠ **Don't** run on the highway without locking the two foot brake pedals together.
- ⚠ **Don't** run the PTO or Belt Pulley without a guard.
- ⚠ **Don't** wear loose clothing near moving parts of the tractor, engine or implements.
- ⚠ **Don't** leave the ignition/starter key in the tractor when unattended, especially where children have access.
- ⚠ **Don't** swerve or turn sharply at speed.
- ⚠ **Don't** let the clutch in suddenly on a slope, or brake fiercely if running backwards down hill, or the tractor may rear up.
- ⚠ **Don't** use the differential lock on the public highway.
- ⚠ **Don't** try to make a sharp turn unless the differential lock is out of engagement.
- ⚠ **Don't** operate the tractor on dangerously steep ground. Move cautiously on steep slopes, the sudden swing of a heavy implement, or the pull of a trailer, may cause trouble. Use the clutch, brakes, throttle and steering *slowly*. Beware especially of slippery surfaces.
- ⚠ **Don't** carry passengers on the tractor or linkages.
- ⚠ **Don't** turn with a projecting implement without making sure there is room for it.
- ⚠ **Don't** hitch trailed implements above the centre line of the rear axle.

# DAVID BROWN

## 4600 Selectamatic Livedrive

### INSTRUCTION BOOK



4600/1 — Livedrive

*With 3-cylinder Gasoline Engine*

**DAVID BROWN TRACTORS LIMITED**

**MELTHAM**

**· YORKSHIRE**

**· ENGLAND**

**HD7 3AR**

Publication No. TP655

# INTRODUCTION

The 4600 Selectamatic tractor with 3-cylinder gasoline engine incorporates the latest refinements of technical design and is the culmination of many years of development and rigorous field testing. In fact, it is a tractor which does a wide range of farming jobs well, reliably and efficiently.

Good design is backed up by skilled manufacture on some of the most modern machines currently available in Europe. The potential life and efficiency which is built into the tractor by careful choice of materials, close manufacturing limits and expert assembly, requires the co-operation of the user whose responsibility it is to carry out the *regular* lubrication and maintenance outlined in this book.

Almost any but the complete novice will be able to carry out the various work which a tractor driver is required to do. But to do this in the easiest, quickest and most efficient way, not to mention the *safest* way because a tractor can be a dangerous machine if handled carelessly and without thought, requires knowledge and skills which have to be acquired. This book gives the necessary information, armed with which the user will quickly gain skill after a little practice.

It is suggested that time spent in reading the Operation and Regular Maintenance sections of this book *before* the new tractor is put into use, will be amply repaid. It is appreciated that the tractor will only be used occasionally for some tasks and the book should be kept readily available at all times so that one's memory may be refreshed. For ease of use the book is divided into 4 sections as indicated in the contents list opposite.

In case of difficulty of any kind, the person most fitted to assist you is your David Brown dealer. Besides having specialist knowledge of the product, he has a great experience of local conditions which will be especially useful to you. In any query always quote the full *prefix* and *serial number* of the tractor and also the *engine type* and *number*.

Note: A list of abbreviations used in this book is given on page 86

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## PRECAUTIONS WITH A NEW TRACTOR

Although every engine is tested and part run-in at the factory care should be taken during the first 25 to 50 hours' use. Avoid excessive speeds or heavy loading. Do not allow the engine to labour, change to a lower gear instead. Use the middle range of engine speeds from 1200 to 1800 rev/min. If possible use light loads to begin with and gradually increase the loading until the engine is fully run-in. If higher speed or heavy loading must be used, keep this down to very short periods interspersed with periods of light load.

## FIFTY-HOUR SERVICE

After 50 hours, change the engine oil and filter element, drain and flush the transmission gearbox and final drive reduction housings and change the full-flow filter element. Refill with new oil. Check the valve clearances and tightness of cylinder head and main external nuts and bolts.

**Note** — The transmission gearbox is filled at the factory with special oil having inhibitors to prevent corrosion and assist initial bedding in. This oil **must** be discarded after 50 hours and the gearbox refilled with new oil of the type recommended on pages 48 to 50.

## SECTION 1. OPERATION



### IMPORTANT

To start the engine it is essential that the hand-throttle lever is fully closed and that the foot throttle is lifted upwards with the shoe toe to return the governor and carburettor butterfly to the fully closed position.

### STARTING THE GASOLINE ENGINE (FROM COLD)

1. With fuel in the tank.
2. Pull out the choke control.
3. Put the gear shift in neutral (the right-hand lever).
4. Depress the clutch pedal fully. The starter cannot be energised until this is done because of the safety switch.
5. Switch on the ignition and operate the starter by turning the ignition key to the right against the spring.



Release the ignition key as soon as the engine fires and immediately it runs push the choke control part way in to prevent over rich mixture with erratic running and smoky exhaust.

Leaving the choke part way out will ensure a fast idling speed to give a quick warm-up. The choke may be pushed home as soon as the engine is warm enough to idle slowly.

### RESTARTING WHEN WARM

When the engine is still warm, or the weather very hot the engine will start without use of the choke. Do not use the choke unnecessarily as this causes wear due to dilution of the lubricating oil by fuel.

If the choke has been used excessively and flooding occurs, a start may be made by opening the throttle wide with the choke pushed in. Close the throttle immediately on starting.

### STOPPING THE ENGINE

Close the throttle. If the engine has been working hard, allow it to idle for 2 minutes. Switch off the ignition and pull out stop knob. Do not attempt to re-start engine before ensuring that knob is pushed in. Remove the key when leaving the tractor unattended.

### STOPPING THE TRACTOR

Reduce travel speed by closing the throttle and apply the foot brakes. Just before the tractor comes to a halt, disengage the clutch and stop the engine. Apply the handbrake securely and park the tractor in a low gear ratio. To prevent accidental starting, ensure that the ignition key is removed.

## CONTROLS

The engine and tractor controls are shown in Fig. 1/1 and 1/2.

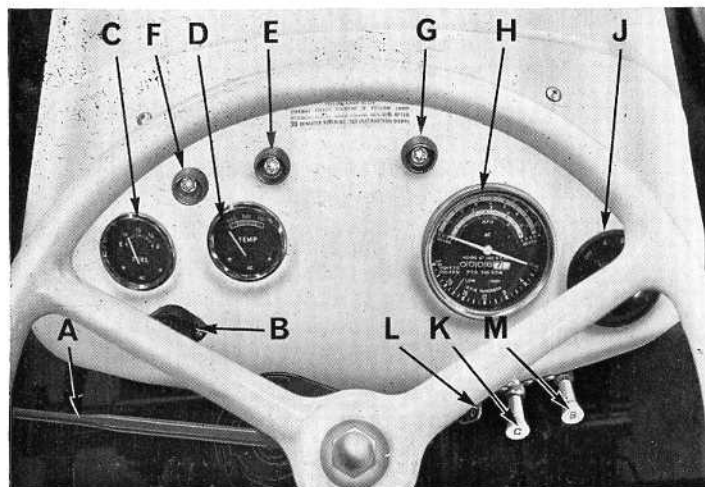


FIGURE 1/1. INSTRUMENT PANEL

- |                                       |                                  |
|---------------------------------------|----------------------------------|
| A. Throttle lever                     | F. Filter warning light (Yellow) |
| B. Horn button                        | G. Charge warning light (Red)    |
| C. Fuel gauge                         | H. Tractormeter                  |
| D. Temperature gauge                  | J. Light switch                  |
| E. Oil pressure warning light (Green) | K. Choke                         |
|                                       | L. Ignition/starter key          |
|                                       | M. Engine stop knob              |

### OIL WARNING LIGHT

The green light is illuminated when oil pressure is too low. Ensure that it lights when the isolating switch is turned on and goes out when the engine runs.

### NO CHARGE WARNING LIGHT

The red light is illuminated when the isolating switch is turned on but should extinguish as soon as the dynamo commences to charge.

### TRANSMISSION FILTER WARNING LAMP

When the fall in pressure across the full flow filter element in the hydraulic system is high enough to open the valve and allow oil to by-pass the filter element, the yellow warning lamp illuminates. This may occur (a) when the filter element is blocked with dirt and requires changing for a new one or (b) when the oil is cold and engine speed is high.

It is also arranged to light when the isolating switch is turned on and the driver should check that the bulb lights each time before starting the engine. A faulty bulb should be replaced as soon as it fails.

If the bulb glows or flickers at idling speeds, this should be ignored.

The warning lamp may illuminate at less than full engine speeds when the oil is cold. The engine speed should be adjusted so that the light is not kept on for more than a few minutes otherwise proper filtering of the oil will not take place.

When the filter element becomes blocked with dirt it will be found impossible to run the engine at high speeds, even when the oil is warm, without the warning lamp illuminating. When the bulb lights at 1800 rev/min after a warming up period of 30 minutes the full flow filter element **must** be changed for a new one at the first opportunity.

### THROTTLE CONTROL LEVER

When fully rearwards the engine is governed to its maximum speed. The rated speed of the engine is 1800 rev/min and may be set by observing the tractormeter. This speed should be used for most purposes to conserve fuel and engine life. It also gives a PTO speed of 532 rev/min.

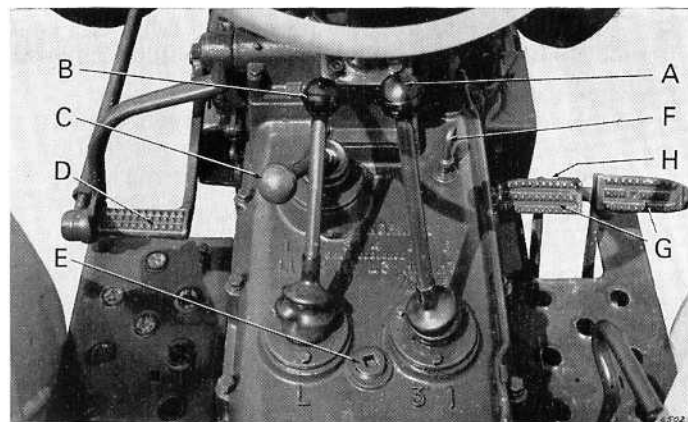


FIGURE 1/2. CONTROLS

- |                       |                             |
|-----------------------|-----------------------------|
| A. Gear (shift) lever | E. Transmission filler plug |
| B. H/L range lever    | F. Transmission dip stick   |
| C. S/N (creep) lever  | G. Brake pedals             |
| D. Clutch pedal       | H. Locking bar              |

## LIGHT SWITCH

This has 4 positions, and depending on whether single or double filament headlamps are fitted, gives the following positions.

<i>Single filament</i>	<i>Double filament</i>
1. Off	1. Off
2. Side and Tail*	2. Side and Tail*
3. Side and Tail*	3. Side, tail and head (low beam)*
4. Side, tail and head*	4. Side, tail and head (high beam)*

\* The rear plough lamp may be switched on by its own switch in these position.

## BRAKES

Twin foot pedals at the right-hand side give independent control of the brakes to assist steering in confined spaces. To ensure full braking power on the road, the locking bar H, Fig. 1/2 should be used on the highway. However, the balance of the braking system should be checked each week or whenever the tractor is taken on the road after working extensively where one brake is used much more than the other for turning at headlands, etc. If this precaution is not taken, an unexpected and dangerous swerve may occur.

## LIVEDRIVE CLUTCH

There are two main stages of pedal movement. Stage 1 — Complete disengagement of the transmission clutch is denoted by an increase in pedal pressure at point A, Fig. 1/3. In practice the pedal should always be pressed to this point.

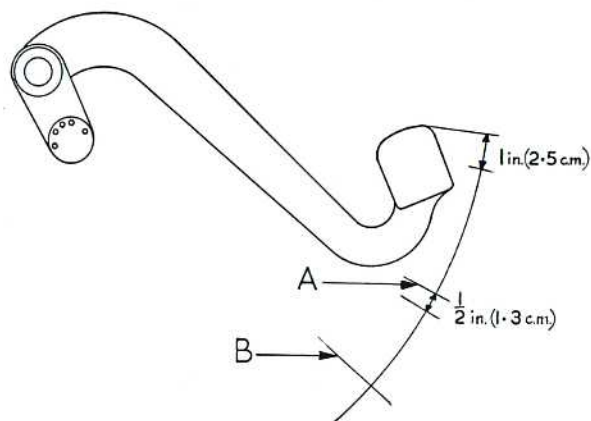


FIGURE 1/3. LIVEDRIVE CLUTCH

- A. *Transmission disengaged*
- B. *Transmission and PTO disengaged*

“Easing” of the clutch to reduce forward speed, when baling etc., to allow the implement to clear a heavy patch, is detrimental to the life of the clutch plates. When moving off with a loaded trailer on road haulage, engine speed should be kept as low as possible. Full engagement of the clutch should be obtained as quickly as possible, **then**, the throttle opened. **The clutch should not be operated at full engine speed or excessive wear will result.**

Stage 2 — Fully depressing the clutch pedal also disengages the PTO (B, Fig. 1/3). Between stages 1 and 2 there is a short buffer stage of constant pressure to prevent accidental slipping of the PTO clutch when using the transmission clutch. If the PTO clutch is not used frequently, the pedal should be fully operated once a week and the PTO “freed” to prevent binding of the plates.

## ENGINE SPEED INDICATOR

The engine speed indicator fitted to the instrument panel should be used in conjunction with the chart attached to the bonnet (hood).

The travel speed in any gear can be obtained by reading the engine speed on the indicator and transferring this to the bottom line of the chart. The speed can be read off where a vertical line projected upwards crosses the required horizontal gear line.

Alternatively any travel speed in an appropriate gear can be projected downwards and the necessary engine speed determined. The throttle can then be set to give the required engine speed as observed on the engine speed indicator.

The vertical red lines indicate the engine speed to be set to obtain standard PTO speeds of 540 or 1000 rev/min in high PTO ratio. The blue line shows the setting for 540 rev/min in low PTO ratio. Any desired travel speed may be obtained by noting which gear line bears the nearest desired speed where it crosses the vertical line. This gear should then be selected. Note that belt pulley work should be carried out at 1000 rev/min PTO in high ratio. The 1000 rev/min setting in high ratio should also be used for transmitting high horsepowers on PTO work.

## 6-SPEED TRANSMISSION GEARBOX

The main transmission gearbox controlled by the right-hand (shift) lever has 3 forward and 1 reverse speed. The secondary transmission gearbox, controlled by the left-hand (shift) lever has two ratios — high and low (H and L). The combination of these two ratios gives a choice of 6 forward and 2 reverse speeds. The order of the speeds 1 to 6 and the necessary combination of the gear (shift) lever settings is shown on top of the transmission cover.

The H/L gear (shift) lever also has a neutral position mid-way and should be used when the tractor is stationary for belt pulley or PTO work.

Experience is the best guide to the choice of speeds for any particular requirement, but if the engine is labouring, denoted by loss of speed when the load is applied, select a lower gear ratio.

The transmission is of the sliding gear type, and gear changing (shifting) while the tractor is in motion must only be undertaken by an experienced driver.

## 12-SPEED TRANSMISSION GEARBOX

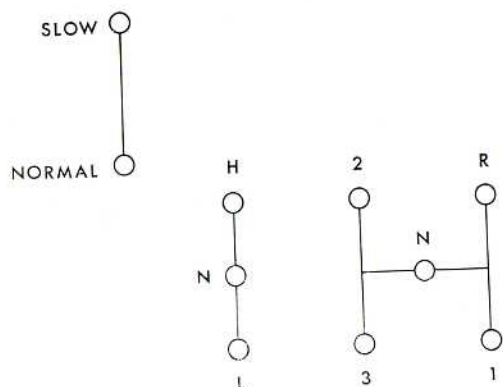


FIGURE 1/4. POSITIONS OF GEAR (SHIFT) LEVERS

Twelve-speed tractors have three shift levers. The H/L range and main levers are as shown in Fig. 1/2 with a third lever on the left. The extra lever has two positions: normal (marked "N") and slow (marked "S"). In the normal rearward position "N", the speeds obtainable are the same as the 6-speed gearbox. In the forward position "S", an additional slower range of speeds is available.

The 12 forward speeds and the positions of the gear (shift) levers are shown on the chart on the instrument panel. Direct drive (Normal) with the gear (shift) lever rearward, is shown in the yellow or white sections of the chart. The slow speeds, with the gear (shift) lever forward, are shown in the red sections of the chart.

The first 3 speeds in the red section give slow speeds for planting, transplanting, hedging and ditching and similar operations. The higher ratios in the red part of the chart (speeds 5, 6 and 9) provide speeds fairly close to the direct drive speeds and are suitable for light traction and PTO work.

It is recommended that the direct drive gears (gear (shift) lever rearwards in the Normal position) be used for continuous heavy traction such as 3-and 4-furrow (bottom) ploughing.

# THE SELECTAMATIC HYDRAULIC SYSTEM

## INTRODUCTION

The David Brown Selectamatic System embodies a most advanced system of implement control devised for tractor mounted equipment. This is achieved with the utmost simplicity of operation. The following points have been catered for in its design.

1. **Simple control** — Whatever mode of operation is required, the implement is fully controlled by a single hand lever. Lift, hold, drop, height position, depth position, and TCU (weight transfer) are all available at the hand lever.
2. **Simple change from one service to another** — Selection is by means of a 3-position pointer.
3. **Ease of control of the implement** — The sensitivity of the hand lever is automatically adjusted to suit the mode of operation. A large movement of the hand lever is used for adjustments requiring precise setting. Finger guides are provided for repetition of settings. The depth and height settings of the hand lever are not affected by variations in engine speed.
4. **Reliability** — In order to ensure satisfactory reliability a full-flow oil filter has been included in the hydraulic oil system. This will remove particles of dirt which could interfere with the working of high pressure hydraulic valves.
5. **Ease of service** — The control valve has been designed as a single separate unit which can be fully bench tested before fitting to the tractor. There are a minimum number of connections and three simple adjustments to be made after fitting to the tractor, only one of which need be made with the engine running.
6. **Variable rate of drop** — The rate of drop can be adjusted by the user to suit the type of work. When set by a small handwheel, the rate is fixed at the chosen speed and is constant regardless of load.

# DESCRIPTION OF THE SELECTAMATIC CONTROLS

Before turning to the operation of the four services available with the Selectamatic hydraulic system it is useful to have a knowledge of the action of each of the units of the mechanism.

## HAND LEVER

This operates in a quadrant and controls the hydraulic system according to the mode determined by the selector dial pointer.



## SELECTOR DIAL POINTER

A small pointer on a dial mounted on the rear axle casing is turned to one of three positions, "DEPTH", "HEIGHT" or "EXTERNAL/TCU", to select the mode of operation required. To ensure the dial pointer is free to turn, the hand lever should be held rearwards in the "select" position. When set, the control valve receives information from the appropriate source, *i.e.* the sensing unit for depth control, from the ramshaft (rockshaft) for height control, or from the hand lever for TCU and external equipment. The "EXTERNAL/TCU" position is equally applicable to depth wheel (gauge wheel) controlled implements on the linkages and external hydraulic equipment.

## SENSING UNIT

The top (upper) link is attached to a spring loaded sensing unit which is connected to the control valve by a cable which transmits information regarding the implement draught. When the selector pointer is in the "DEPTH" position, the cable causes the control valve to adjust the depth of the implement to maintain a constant draught. The hand lever overrides the sensing unit to determine the draught around which the control valve operates and thus the depth can be determined by the operator.

## FINGER GUIDES

Two finger guides are provided which can be clamped to the quadrant by thumb screws in any suitable position so that the hand lever may be returned quickly to the same place when required.

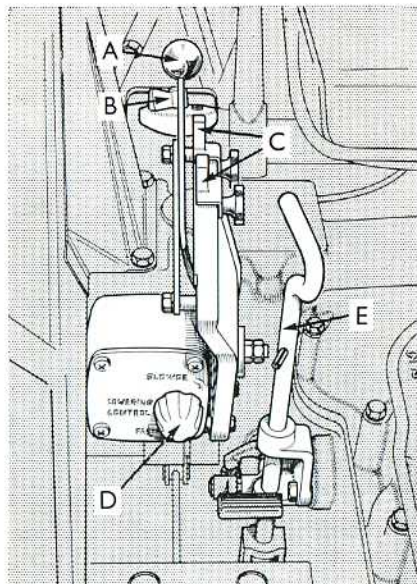


FIGURE 1/5. CONTROLS  
 A. Hand lever  
 B. Dial pointer  
 C. Finger guides  
 D. Lowering adjustment  
 E. Parking brake

### 3-WAY VALVE

This optional unit provides two oil supply points for operation of external equipment controlled by the Selectamatic control lever. It is mounted on the rear axle case at the left-hand side of the seat. Selection of internal or either of the external supply points with an additional position where supply is to the internal and one external point, is by means of a 4-position lever.

Lubrication of the gearbox and PTO is supplied by overflow oil from the hydraulic pump. When using external equipment which uses a large and continuous flow of oil (*i.e.* mower), lubrication to the gearbox and PTO may be reduced to a critical level unless the return oil is fed back into the lubrication system. This is done by returning the oil to the point provided on top of the rear axle case at the right-hand side of the seat. Provision is also made at this point for mounting an external hydraulic valve (see page 67).

### CATCH UNIT

When external equipment is being used which includes its own hydraulic control valve, a continuous pressure of oil is required from the internal system. In order to hold the hand lever in the lift position against the spring, a Catch Unit-

U730 is available for fitting to the rear setscrew of the quadrant as shown in Fig. 1/6.

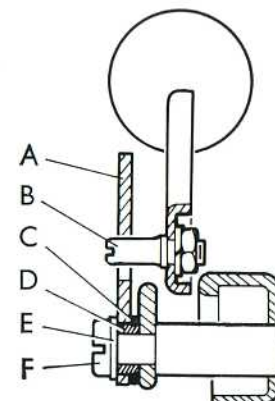


FIGURE 1/6.  
 CATCH UNIT  
 A. Catch  
 B. Peg  
 C. Rubber ring  
 D. Bush  
 E. Washer  
 F. Existing screw

### LOWERING ADJUSTMENT

The rate of lowering may be adjusted by turning a knob on the front of the axle casing. Lowering is governed by a flow control valve and the speed is independent of the load on the system.

### LIFT LATCH

A latch is provided on the left-hand ramshaft (rockshaft) bracket for stowing the links in the top position when not in use. **Never pass the hand under the lift rod and ramshaft (rockshaft) arm to release the lift catch. Serious injury will occur if the links should fall.** When the latch lever is pushed downwards the links will be automatically held at the top when fully raised. To raise the links fully when a load is attached, it will be necessary to pull the hand lever fully rearwards past the spring loaded stop to override the automatic hold which occurs just before the lift latch is reached.

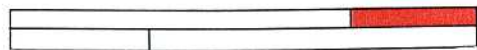
Before attempting to release the latch the linkages must be fully raised, either by pulling the hand lever fully rearwards or, if there is no weight on the links, by hand if preferred. The latch lever is then pulled upwards to release the latch.

The lift latch should be used whilst transporting implements. **Care should be taken to avoid impact loads by driving carefully and slowly over rough ground.**

## OPERATION OF SERVICE 1

Implements with depth wheel (gauge wheel) and use of TCU

### SETTINGS

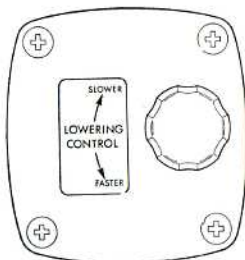
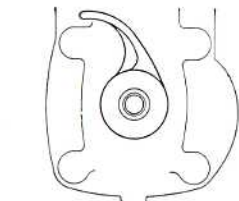


Red band — Select

1. Pull the hand lever fully rearwards in the red band to "select" and while holding there against the spring, turn the selector dial pointer to "TCU".
2. With the engine running, pull the hand lever fully rearwards against the spring and pull the lift latch upwards to disengage it.



3. Set the lowering adjustment temporarily to mid-position and adjust later by trial to give the required rate of lowering for the work in hand.

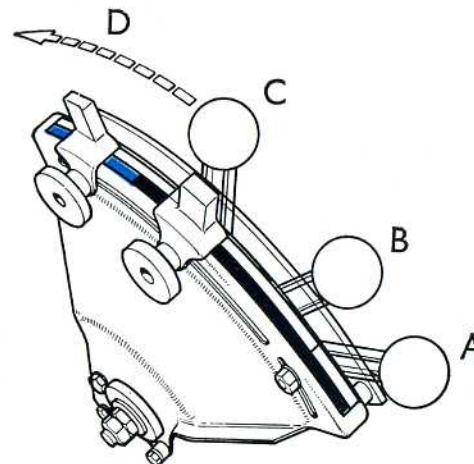


4. Set the first finger guide to the lower position. \*
5. Set the second finger guide approximately 1 inch in front of the first guide.

\* Lowering will occur over a range of movement of the hand lever but only one position will give maximum rate of drop with completely free evacuation to the sump. This is most easily found without anything attached to the linkages and is correct when they will fall under their own weight after having been raised hydraulically. Once found in this way, the position should be noted for future reference.

## OPERATION

At the beginning of the furrow, push the hand lever forward to the lower position. When the plough has reached its full working depth any required amount of TCU (weight transfer) may be applied by pushing the hand lever further forward. Maximum TCU is obtained when the hand lever is fully forward. When the correct amount of TCU has been determined, the second finger guide should be re-positioned into line with the hand lever for future reference.



Black band — Lift, hold, lower

Blue band — TCU

FIGURE 1/7.

HAND LEVER POSITIONS WITH DIAL POINTER AT TCU

- |                   |                  |
|-------------------|------------------|
| A. Lift position  | B. Hold position |
| C. Lower position | D. Range of TCU  |

At the headland, pull the hand lever fully rearward past the spring loaded stop. Release it when the implement has fully lifted. The hand lever will spring back to the hold position.

To avoid variation in depth, TCU should be maintained to the end of the furrow. In order to get proper penetration the hand lever should not be pushed forward to the TCU position until the proper working depth has been reached. On the other hand, application of TCU should not be delayed too long or

wheel slip will occur before TCU becomes effective. Once wheel spin has occurred it is difficult to stop. The correct timing and anticipation of the required quantity of TCU is a matter of skill which comes very quickly with a little practice.

### LINKAGE ADJUSTMENT WHEN USING TCU

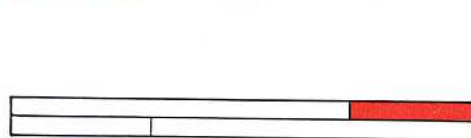
Because of the different forces acting on the plough when using TCU a slight re-adjustment to the settings may be required.

1. The top (upper) link should be shortened slightly to counteract the tendency of the plough to ride out of the ground. It should however, be used as long as possible consistent with obtaining the required depth.
2. To correct a tendency of the front furrow to become shallow, lengthen the right-hand levelling lever slightly.
3. On soft ground raise the depth wheel slightly to maintain the correct depth. Some of the weight is taken off the depth wheel and so it will not sink so deeply into soft earth as it would without TCU.

## OPERATION OF SERVICE 2 "DEPTH CONTROL"

Implements without depth wheel (gauge wheel)

### SETTINGS

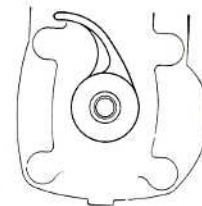


Red band — Select

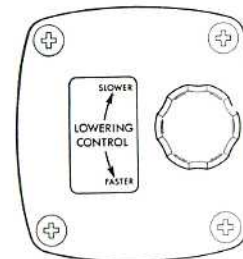


1. Pull the hand lever fully rearwards in the red band to "select" and while holding it there against the spring, turn the selector dial pointer to "DEPTH".

2. With the engine running, pull the hand lever fully rearwards against the spring and pull the lift latch upwards to disengage it.



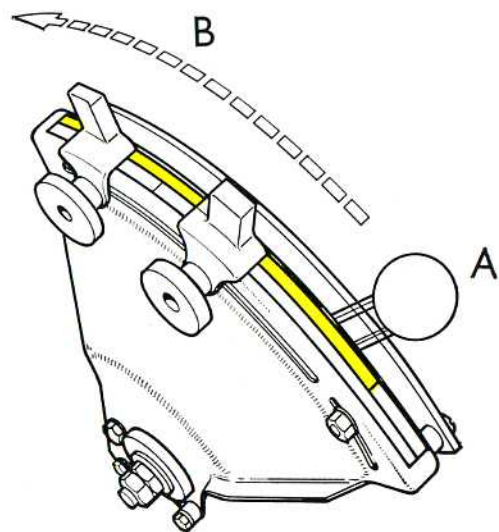
3. Set the lowering adjustment temporarily to mid-position and adjust later by trial to give the required rate of lowering for the work in hand.



4. Set the first finger guide temporarily to a mid-position.
5. Push the second finger guide to the front of the quadrant.

## OPERATION

At the beginning of the furrow, push the hand lever forward to the finger guide. Adjust the hand lever forward to increase depth and rearward to decrease depth until the required depth has been found by trial. Set the finger guide in line with the hand lever so that the same depth can be found easily on subsequent furrows. At the headland, pull the lever rearwards up to the spring loaded stop to lift the implement. If wheel slip occurs, differential lock should be used as described on page 28.



Yellow band — Range of depth

FIGURE 1/8.

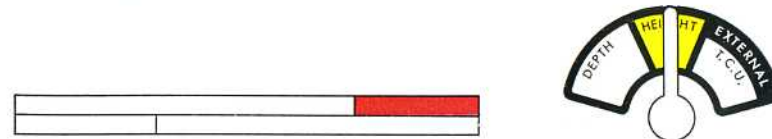
HAND LEVER POSITIONS WITH DIAL POINTER AT DEPTH

A. Lift position    B. Range of depth

## OPERATION OF SERVICE 3 "HEIGHT CONTROL"

Light draught, or implements working above ground level

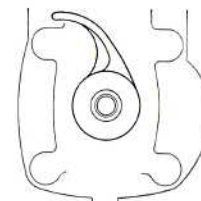
### SETTINGS



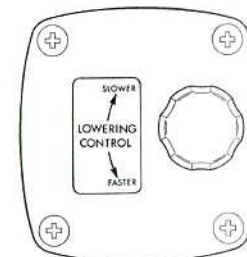
Red band — Select

1. Pull the hand lever fully rearwards in the red band to "select" and while holding it against the spring, turn the selector dial pointer to "HEIGHT".

2. With the engine running, pull the hand lever fully rearwards against the spring and pull the lift latch upwards to disengage it.



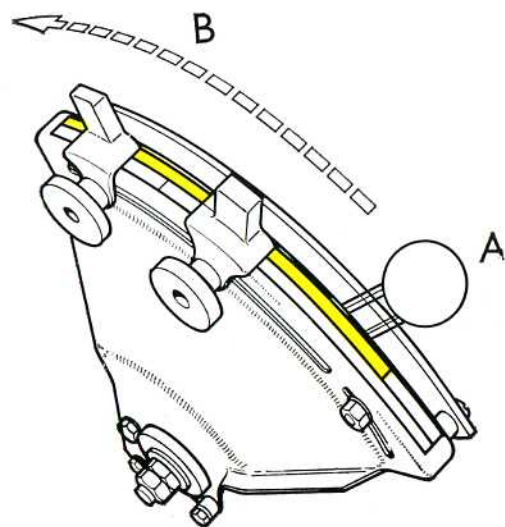
3. Set the lowering adjustment temporarily to mid-position and adjust later by trial to give the required rate of lowering for the work in hand.



4. Set the first finger guide temporarily to mid-position.
5. Set the second finger guide fully forward to the front of the quadrant.

## OPERATION

Raise the implement by pulling the hand lever rearwards up to the spring loaded stop. Push the lever forward until the implement is lowered to the required height. Set the finger guide into line with the hand lever so that the same height may be found again easily.



Yellow band — Range of height

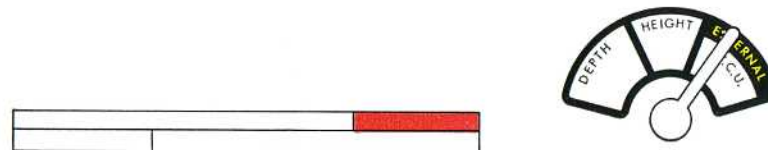
FIGURE 1/9.  
HAND LEVER POSITIONS WITH DIAL POINTER AT HEIGHT

A. Lift position      B. Range of height

## OPERATION OF SERVICE 4

External Equipment operated by the tractor hydraulic supply

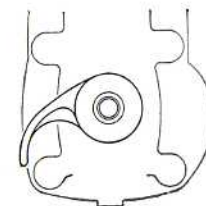
### SETTINGS



Red band — Select

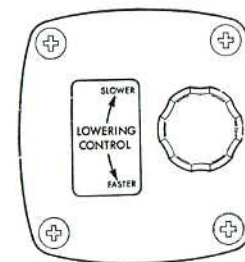
1. Pull the hand lever fully rearwards in the red band to "select" and while holding it against the spring, turn the selector dial pointer to "EXTERNAL".

2. Stow the links on the lift latch (push the lift latch downwards and pull the hand lever fully rearward against the spring until the linkages rise above the latch).



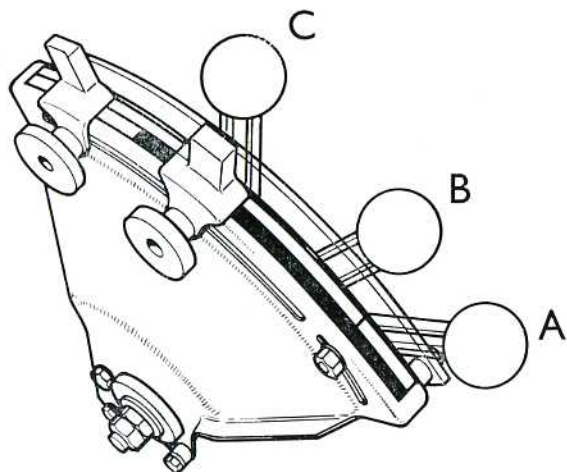
3. Set the 3-way valve lever to the external system required See page 25.

4. The lowering adjustment should be set by trial to give the required rate of lowering for the work in hand.



5. Set the first finger guide to the lower position.\*
6. Push the second finger guide fully forward to the front of the quadrant.

\*See footnote on page 16.



Black band — Lift, hold, lower

FIGURE 1/10.

HAND LEVER POSITIONS WITH DIAL POINTER AT EXTERNAL

A. Lift position B. Hold position C. Lower position

## OPERATION

It is advisable to ensure that there is sufficient oil in the sump to feed the external system, approximately half a gallon extra will be needed for a trailer or loader. Up to one gallon extra may be added when necessary. To pump oil to the external equipment, pull the hand lever fully rearward past the spring loaded stop. To stop the flow of oil, release the hand lever which will spring back to the hold position (in this position the pump is unloaded and the oil locked in the external equipment). To return oil to the sump, push the hand lever forward to the finger guide. **Do not go forward beyond the lower position** or TCU pressure will be applied and this is sufficient to drive a mower or raise an empty loader.

For external equipment with its own hydraulic controls and requiring continuous pressure, hold the hand lever in the rear position by using the Catch Unit-U730 (see page 15).

## 3-WAY VALVE

### Connections

The two external connections are available on the front of the unit and are supplied sealed with  $\frac{3}{4}$  UNC plugs. The upper connection is designated No. 1 and the lower one No. 2.

Any equipment which requires a continuous supply of oil, such as a hydraulic mower, should have its return oil taken to a point which enters the gearbox lubrication system, otherwise the gearbox and PTO will not be properly lubricated. See page 67.

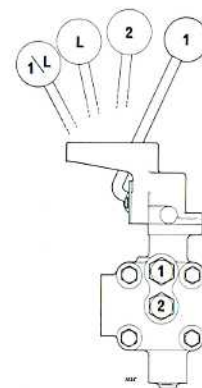


FIGURE 1/11.  
3-WAY VALVE

1. Output connection 1  
2. Output connection 2

### Operation

The selector lever moves sideways and it is only necessary to place it in line with the symbol on the transfer referring to the equipment required as follows:

1. Connects to outlet 1.
2. Connects to outlet 2.
- L. Connects to internal ram to operate linkages.
- 1/L. Connects to outlet 1 and linkages at the same time.

Control is then carried out by the Selectamatic hand lever as described on the previous page. For use of dump valve (where fitted) see page 27.

## OPERATION OF LIVE EXTERNAL EQUIPMENT

(Optional Unit)

Either a single (U844) or twin (U845) live double-acting take-off valve may be fitted in place of the external hydraulic connection housing at the right-hand side of the seat on top of the rear axle case.

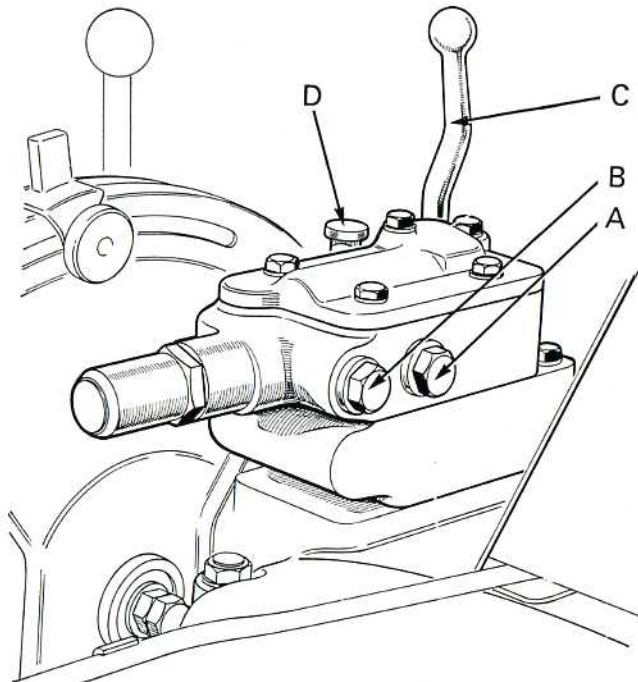


FIGURE 1/12. LIVE, DOUBLE-ACTING, TAKE-OFF VALVE MOUNTED ON THE DISTRIBUTOR BLOCK

- A. Output to this connection when lever C is forward
- B. Output to this connection when lever C is rearward
- C. Operating lever
- D. Dump valve

Connections to the double-acting take-off valve are shown at A and B in Fig. 1/12. When the control lever is pushed forward, oil is fed to connection A and returned to the sump via connection B. When the control lever is pulled rearward the oil flow is reversed. Both positions have an indent so that the

lever is retained when pushed to the extreme of its movements. An automatic reject valve is incorporated so that the lever is returned to the centre position and cuts off the oil flow when the external ram reaches the end of its travel and the pressure increases.

When connecting external equipment it is advisable to arrange the connections so that when the lever is pulled rearwards the implement raises, and lowers when the lever is pushed forward.

When a second live-valve is fitted, this is identical to the first; connections and operation are similar. It works quite independently.

### DUMP VALVE (Optional fitment)

This valve allows a much quicker rate of lowering of external ram operated equipment such as trailers. It must *not* be used for linkage mounted implements although it may be used to lower the pick-up hitch to facilitate quick coupling.

The valve control knob is situated on top of the rear axle case to the right of the seat, adjacent to the "select" portion of the hydraulic control lever, D Fig. 1/12.

### OPERATION

1. Push the hydraulic control into the 'lower' position.
2. Press down the dump valve knob and turn through 90° (either direction) and pull upward.
3. When the implement is fully lowered, push the knob down and twist about 90° until it locates in the retention indent.

## DIFFERENTIAL LOCK

This locks the drive so that both rear wheels turn at the same speed, thus one wheel cannot slip unless the other one does.

### ENGAGING

To engage differential lock, press the pedal firmly with the right heel **before** slip occurs. **If slip has occurred, close the throttle or de-clutch before pressing the differential lock pedal.** Re-engage the clutch gradually. Maintain a steady pressure on the pedal until the differential lock engages. Ensure that the pedal is pressed down the full amount. Retain the lock in engagement by resting the heel on the pedal.

### DISENGAGING

The differential lock is spring loaded so as to push it out of engagement but any tendency to slip will create a binding action which will prevent it from disengaging. To disengage it is only necessary to momentarily relieve the load or reverse the load. This is done by pressing quickly first on one brake pedal, then on the other. When ploughing it is usually only necessary to press on the landwheel brake.

If differential lock is used for trailer work with the brakes locked together, disengagement can be obtained by steering first to one side then to the other.

**Note.** If the tractor is stopped and the differential lock remains in engagement, it may be released by momentarily reversing the tractor.

**Warning.** The differential lock must not be used in the higher gears, at high speeds, or on the public highway.

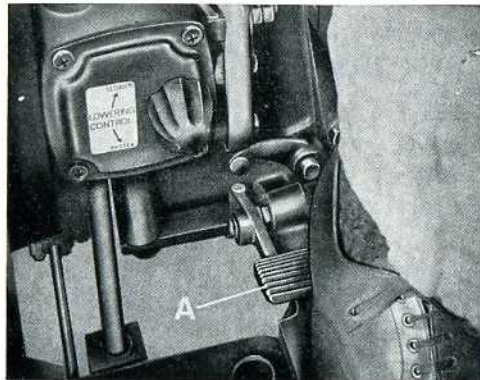


FIGURE 1/13.  
DIFFERENTIAL LOCK  
A. Pedal

## BALLAST

Wheel slip is expensive, not only because of wear but also because it wastes fuel. It should be reduced by use of TCU where possible. If extra traction is required, resort to ballasting by means of wheel and chassis weights. Alternatively, or in addition, water ballast in the tyres may be used. A special anti-freeze solution should be used where temperatures below freezing are encountered. The tyre should never be completely filled. For full details and for the correct apparatus for filling, consult your Dealer or the tyre manufacturer's literature.

## WHEEL WIDTH ADJUSTMENT

### TRACK SETTINGS FOR PLOUGHING

For 12 in. to 16 in. ploughs (30.5 to 40.6 cm) the rear track should be set to 56 in. (142 cm) and the front track to 52 in. (132 cm). This brings the insides of the front and rear tyres into line.

For ploughs of 8 in. to 12 in. widths (20 cm to 30.5 cm), the rear wheels should be set to 52 in. (132 cm) and the front axle to 52 in. (132 cm) width but off-set to the left-hand side to bring the inside of the right-hand front tyre into line with the inside wall of the rear tyre.

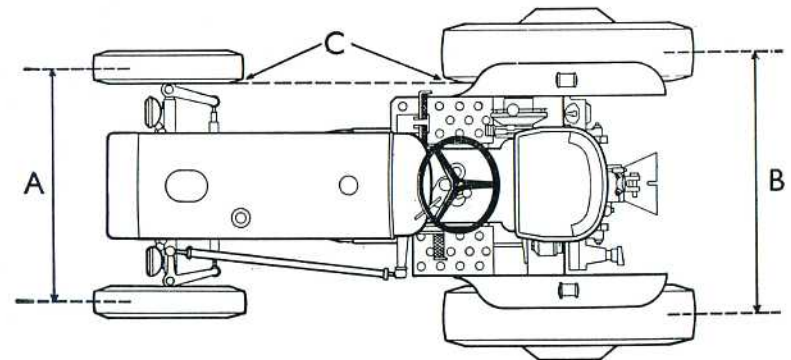


FIGURE 1/14. WHEEL SETTINGS FOR PLOUGHING  
Front setting A, 4 in. (10 cm) less than rear setting B  
C — Tyre wall in-line

## REAR TRACK ADJUSTMENT

The rear track width can be varied by 4 in. (10 cm) steps. The wheel centres are dished so that they can be fitted to the hub either way round. The lugs on the wheel rim are off-centre so that by fitting the wheel either way round, a variation is obtained. A further variation is obtained by fitting the wheel rim lugs either side of the dished centre. The full range of settings are shown in Fig. 1/15.

**Note.** When fitting rear wheels observe the correct direction of rotation of pneumatic tyres. The tread pattern must be such that when looking down on top of the tyre, the Vee of the tread points forward.

**Important.** Take care to place the jack on firm ground under a solid part of the tractor. Before removing a wheel, place some pieces of stout wood under the tractor frame to support it should the jack become dislodged.

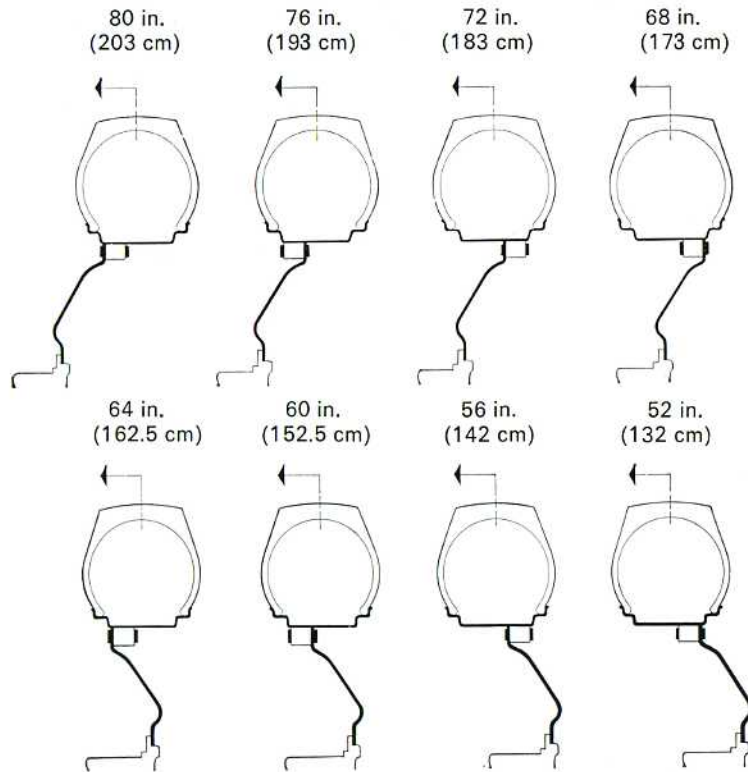


FIGURE 1/15. REAR WHEEL-POSITIONS OF RIMS AND CENTRES

## FRONT TRACK ADJUSTMENT

The axle extension is secured by two bolts A Fig. 1/16. These are screwed into threaded holes in the axle and do not require the use of nuts. To adjust the track width, jack up the axle, remove the adjustment nut and bolt from the track rod, remove completely the two bolts A and slide the axle extension to the required position and re-fit the bolts. (When adjusting the left-hand half of the axle, the wheels should be turned to the right so that the steering arm B does not obstruct removal of the bolts.) Ensure that the spring washers are used and the bolts fully tightened. When both halves of the axle have been adjusted, re-fit the nut and bolt through the track rod to position the wheels parallel when straight ahead. All exposed holes should be plugged with the plastic plugs provided in the tool box.

**Note.** On no account should the front wheel be fitted with the wheel centre dish outwards to give increased track width. Doing this upsets the steering geometry causing poor steering and heavy tyre and pivot wear.

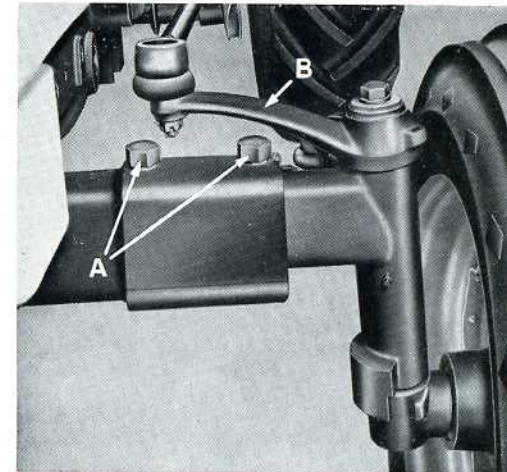


FIGURE 1/16.

FRONT AXLE TRACK ADJUSTMENT

A. Axle securing bolts B. Steering arm

## TYRE PRESSURES

Tyres are expensive and it pays to check the pressure frequently. Incorrect pressure, either too high or too low, is the chief cause of tyre wear and damage. Check pressures once a week. If water ballasted the pressures should be checked very frequently.

Front tyres—all conditions ..	25 lb/in <sup>2</sup> (1.76 kg/cm <sup>2</sup> )
Rear tyres { field work ..	12 lb/in <sup>2</sup> (0.84 kg/cm <sup>2</sup> )
road work ..	14 lb/in <sup>2</sup> (0.98 kg/cm <sup>2</sup> )

## LINKAGE SETTINGS

### LINKAGE SETTINGS FOR CATEGORY I IMPLEMENTS

The uncranked end of the lower link with the larger ball is fitted on the **inside** of the hitch bracket using the sleeve supplied in the tool box to bring the pin to the diameter of the hole in the ball. Ensure that the links are correctly handed so that the crank at the rear end is turned inwards.

The lift rods should be connected using the pin on the check chain which gives the shorter length of chain. The end of the chain and the other pin is allowed to hang loose.

**Note.** If the check chain is excessively tight when marking out a field, temporarily fit the right-hand lower link on the outside of the hitch bracket.

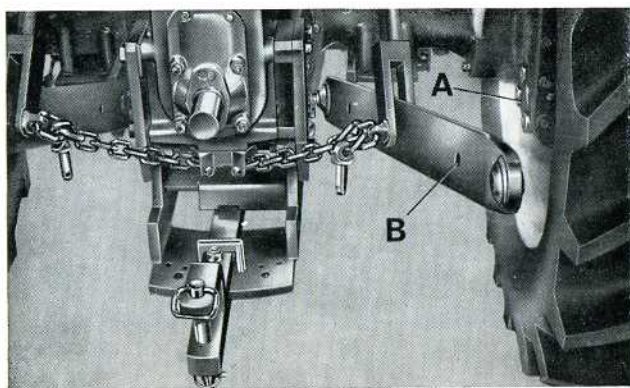


FIGURE 1/17. POSITIONS OF LINKAGE, CHECK CHAINS AND STABILISER BAR

- A. Mounting pad for linkage stabiliser
- B. Hole for linkage stabiliser

### LINKAGE SETTING FOR CATEGORY II IMPLEMENTS

The cranked end of the lower link is fitted on the **outside** of the hitch bracket with the crank turning outwards using the pins provided through the small ball.

The lift rod is attached using the end pin on the check chain.

When side movement must be avoided, a stabiliser bar may be fitted as shown in Fig. 1/17 using the rearmost hole in the lower link. The links are still free to lift up and down.

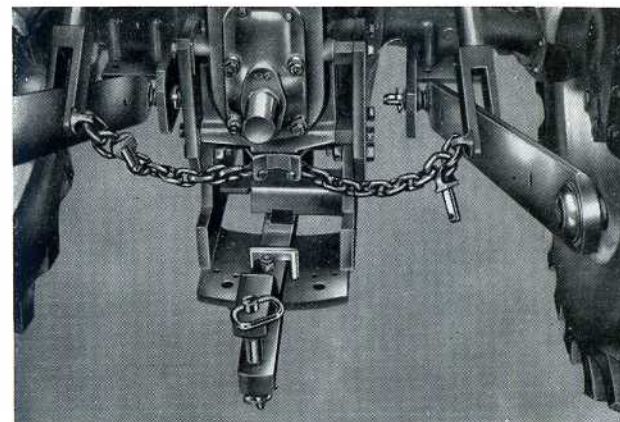


FIGURE 1/18. POSITION OF LINKAGE AND CHECK CHAINS

## LIFT RODS

For ploughing the lift rod and levelling lever should be set initially to 19 in. (48.3 cm) measured between the pivot centres.

**N.B.** The lift rod must not be extended to more than 21 in. (53.4 cm) between pivot centres, otherwise there will be excessive strain on the remaining thread. Similarly the levelling lever must not be extended beyond 21 ¼ in. (54 cm).

When not attached to the lower links *i.e.* when the drawbar is used and the lower links removed, the check chain pins should be inserted to prevent the lift rods unscrewing and falling off.

## PERMANENT DRAWBAR

A simple drawbar with two positions, a normal towing position with a weight limit of 2200 lb (1000 kg), and an extended position 14 in. (35.6 cm) behind the PTO with a weight limit of 1200 lb (545 kg).

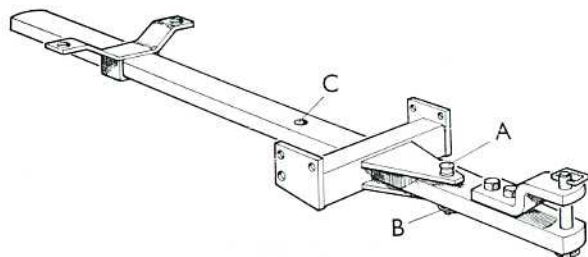


FIGURE 1/19. PERMANENT DRAWBAR

- A. Securing pin
- B. Linch pin
- C. Pin A secures here in extended position

## SWINGING DRAWBAR

### STOWED POSITION

The front end of the bar is pushed through the "U" support bracket on the left-hand side and secured with the towing pin.

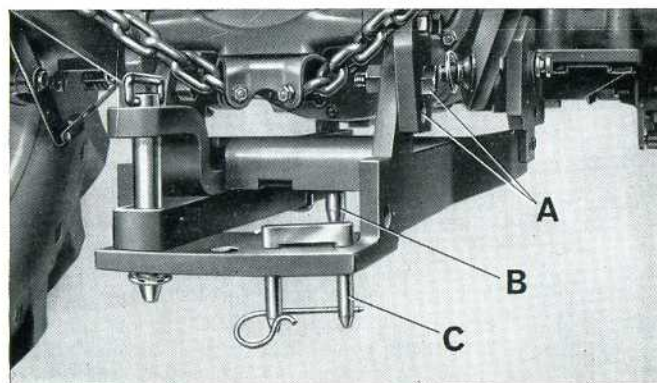


FIGURE 1/20. DRAWBAR — STOWED POSITION

- A. Alternative height positions
- B. Front securing pin-towing position
- C. Rear securing bracket-towing position

## TRAILER TOWING POSITION

For trailers exerting a downward load at the clevis up to a maximum of 3000 lb (1360 kg) the forward towing position should be used. The drawbar is secured at the 2nd hole from the front by the downward projecting pin under the drawbar frame. The linch pin must be used to fasten the bar.

The rear of the drawbar is held by an inverted "U" shaped clamp and secured by the pin as shown in Fig. 1/21. This clamp can be fitted in several positions either centrally or to each side.

## FULLY EXTENDED POSITION

Attachment is similar to the trailer position described above except that the front hole in the drawbar is used. This gives a towing position in relation to the PTO shaft which conforms to the British Standard for PTO driven implements. The maximum downward load at the clevis in this position is 2500 lb (1133 kg).

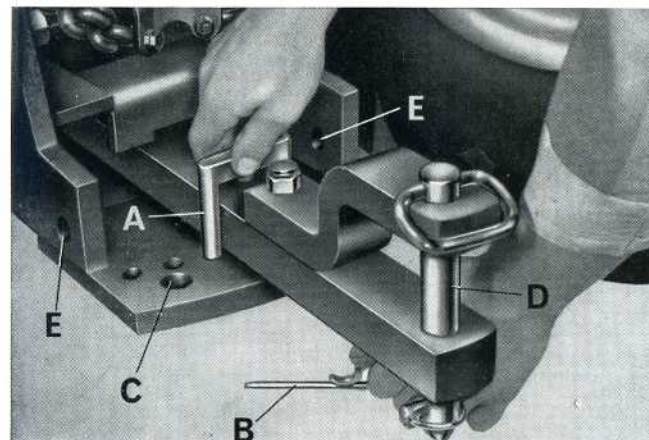


FIGURE 1/21. DRAWBAR

- A. Securing bracket
- B. Pin
- C. Drawpin secures drawbar through this hole in stowed position
- D. Drawpin
- E. Holes for pick-up hitch lift rods

## HEIGHT ADJUSTMENT

When in the fully extended position the clevis can be adjusted to 4 heights. The rear of the drawbar frame can be bolted at two different positions and in either position the drawbar may be fitted either way up giving heights of 9 in. (22.9 cm), 11 in. (27.9 cm), 13 in. (33 cm) and 15 in. (38.1 cm) on 14.9/13-28 tyres.

## PICK-UP HITCH

A pick-up hitch may be fitted to the drawbar frame when the drawbar is in the stowed position.

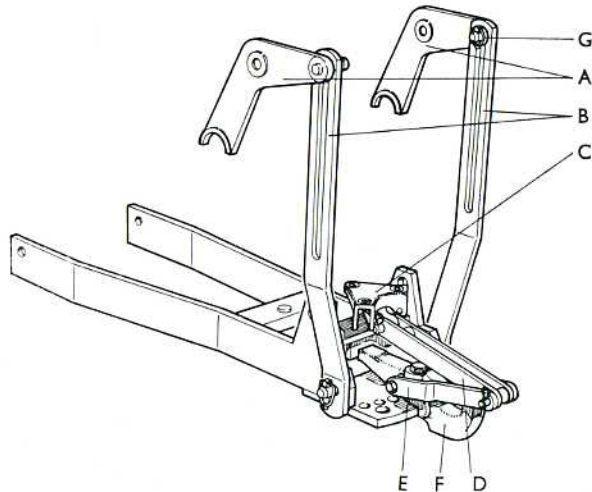


FIGURE 1/22. PICK-UP HITCH

- |                   |              |
|-------------------|--------------|
| A. Extension arms | E. Jaw plate |
| B. Lift rods      | F. Jaw       |
| C. Anchor bracket | G. Washer    |
| D. Draw link      |              |

## FITTING INSTRUCTIONS

Bolt the towing hook firmly to the centre of the drawbar frame. Remove the check chain anchor bracket from under the PTO housing and bolt the new anchor bracket and jaw plate in its place. Transfer the check chains to the new bracket. Fit the jaw and jaw link using the pins and spring clips provided.

Bolt the left- and right-hand lift arms to the inside of the ram arms (rockshaft arms) using the  $4\frac{1}{2}$  in. (10.8 cm) long bolts in place of those through the lift rods. The pins welded to the ends of the lift arms should be on the inside of the arms.

Fit the cranked lift rods with the slotted ends uppermost, fitting a  $\frac{3}{8}$  in. (2.2 cm) washer between the drawbar frame and the lift rod at the bottom end and between the lift rod and securing linch pin at the top end.

The linkages may be used without interference in this position. To use the pick-up hitch, remove the 2 bolts securing the drawbar frame to its rear support brackets.

## OVERLOAD RELEASE

When an implement attached to the linkages strikes an obstacle, the impulse from the top link is transmitted through a cable to release the clutch. This stops the tractor and prevents excessive damage to the tractor or implement.

The load at which the clutch is released is set by compressing the spring in the top link by an adjustable collar. It should be tightened sufficiently to prevent an excessive number of releases but not so tight that the implement would be damaged before the release operates. Adjust by trial and error, erring on the slack side to begin with and tighten a little at a time until unnecessary releases are just eliminated. The clutch is re-engaged by re-engaging the hand lever B with the latch C after putting the gear into neutral. Negotiate the obstacle before putting the implement to work again.

**Note.** Never operate the overload release except from the driving position. To avoid wear on the clutch put the gear lever into neutral and re-engage the overload release as soon as possible if it is desired to keep the engine running.

The overload release only disengages the transmission clutch, but it should never be used to stop the tractor for PTO or belt pulley work. The gear range lever should always be put in neutral when the belt pulley or PTO is being used for stationary work.

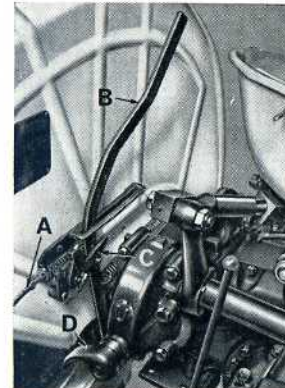


FIGURE 1/23

- |                           |
|---------------------------|
| A. Cable to top link unit |
| B. Hand lever             |
| C. Latch                  |
| D. Lift latch             |

## SECTION 2. REGULAR MAINTENANCE

**Regular** routine maintenance is essential. The importance of carrying this out regularly cannot be over emphasised. A properly maintained tractor retains its efficiency longer and remains reliable and ready for use at any time. Failure to carry out the maintenance properly can lead to unnecessary repairs, usually at unexpected and awkward times and in the long run is much more expensive than the cost of the regular attention. Because of its importance, the David Brown maintenance procedure has been made very simple. To this end the requirements have been divided into a daily inspection and greasing, plus 5 tasks A, B, C, D, and E to be carried out at set periods. The frequency of these tasks is shown in the table opposite and it is only necessary to keep an eye on the hour meter. The recommended times are for normal temperate conditions and in areas of dry dust or wet mud, the daily greasing and inspection of the air cleaner, should be carried out twice a day or more often if dictated by experience. The other tasks should also be carried out at correspondingly shorter intervals.

It is strongly recommended that the tasks be carried out at the end of the day on which the hour meter reaches the stipulated time. The oils will then be warm and will drain away easily.

**NOTE.** Attention to cleanliness is very important. All grease points must be cleaned before applying the grease gun. Sump plugs and filler caps must be wiped clean before removing and any containers used for filling the engine, gear-boxes or fuel tank must be kept perfectly clean. The smallest grain of dust in the fuel system can cause faults with loss of power and early replacement. It is recommended that servicing be carried out under cover wherever possible.

## TABLE OF SERVICE TASKS

In addition to the Daily Inspection and greasing, carry out the tasks marked X at the times shown.

**Note.** Recommended times are for normal conditions. In very wet and muddy conditions — grease more often. In dry dusty conditions (*i.e.* stationary work or hot climates) — clean the air filter, oil and fuel filters and carry out oil changes more frequently.

Hour Meter Reading	Task A	Task B	Task C	Task D	Task E
60	X	†			† (1 to 4)
125	X	X			
185	X				
250	X	X	X		
315	X				
375	X	X			
440	X				
500	X	X	X	X	
560	X				
625	X	X			
685	X				
750	X	X	X		
815	X				
875	X	X			
940	X				
1000	X	X	X	X	X

† New and Reconditioned Tractor only.

## DAILY INSPECTION

1. **Inspection** — Check for oil, water and fuel leaks.
2. **Engine Oil** — Top up the engine sump if below the safe limit.
3. **Fuel** — Top up the fuel tank to within  $1\frac{1}{2}$  in. (4 cm) of the top. This ensures a good supply and reduces condensation in the tank. Visually check the fuel water trap for excessive dirt or water. Clean if necessary.
4. **Pre-Cleaner** — In dry and dusty conditions the paper element in the pre-filter should be cleaned every 8 hours by tapping gently on its side. In damp and less dusty conditions the pre-filter element will not require such frequent attention but experience will guide you to the correct periods of cleaning. A blocked filter will give rise to rich mixture, low power and sooty exhaust. This should not be allowed to occur.



- 4a. **Air Cleaner** — Where a paper element pre-cleaner is not fitted, check the oil in the air cleaner oil cup as item 1 in Task A, page 42.
5. **Greasing** — In dusty or wet and muddy conditions apply lubricant to the following points (see Fig. 2/2). Clean the grease points (fittings) before applying the gun.

**SAE 140 OIL** { King Pins.  
Front Axle Trunnions (2 points).

**GREASE** { Front Hubs.\*  
Steering Box Cross-shaft (3 points).  
Rear Hubs.\*

6. **Wheel Nuts** — Early in the tractor life it is essential that the wheel nuts are checked for tightness each day. Once the conical seats have bedded in this will no longer be necessary.

\* Continue until **grease** exudes from inside of hub. This is not a sign that the hub seal is faulty.

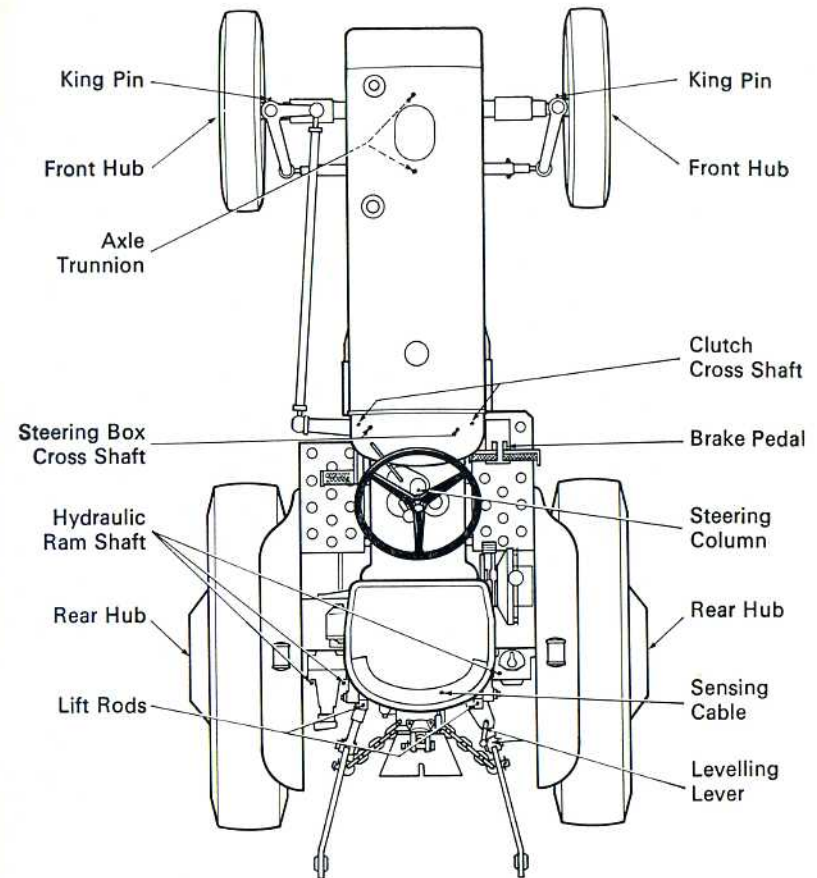


FIGURE 2/2. GREASING CHART

In addition to the above points, the water pump and distributor should be greased with **High melting point grease** every **500 hours only**

## SERVICE TASK A

Every 60 hours under normal conditions — **more often if necessary.**

1. **Air Cleaner** — Check the condition of the oil in the air cleaner oil cup after releasing the 3 toggle clips. The oil should be clean and up to the level of the bead. If the pre-filter becomes damaged, the oil will dirty quickly and should be discarded and refilled with new engine oil. Occasionally detach the wire mesh element with its sealing rings and clean in gasoline, drain and replace. It is essential that all joints are air tight to prevent dust being drawn in. If the rubber sealing ring on the oil bath becomes damaged, a new one must be fitted.
2. **Gearbox Oil** — Top-up the gearbox oil to within the safe marks on the dip stick if necessary.

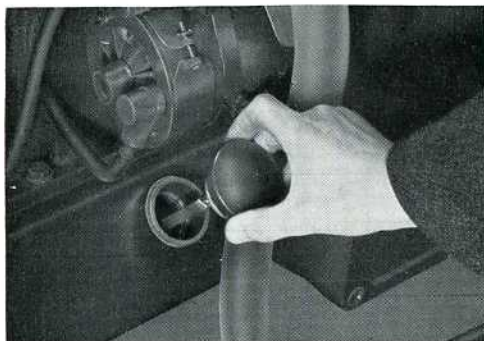


FIGURE 2/3. ENGINE OIL FILLER

3. **Greasing** — Apply lubricant after cleaning the grease points (fittings).

**SAE 140 OIL** { King Pins.  
Front Axle Trunnions (2 points).

**GREASE** { Front Hubs.  
Steering Box Cross-shaft (3 points).  
Steering Column top bearing.  
Clutch Cross-shaft (2 points)\*.  
Rear Hubs.  
Brake Pedal (1 point).  
Sensing Unit Cable.  
Hydraulic Lift Ramshaft (2 points).  
Lift Rod and levelling lever (5 points).

\* Take care not to overgrease. Apply only 2 shots of the grease gun.

4. **Controls** — Lubricate the controls and pivots with new engine oil. In dry, dusty conditions these points are best left unlubricated.
5. **Brakes** — Check that the brakes pull evenly when the two pedals are locked together. Also readjust as given on page 68 if there is more than 2in. (5 cm) of travel before commencement of operation.
6. **Clutch** — Check free-play and reset to 1 to 1½ in. (2.5 to 3.8 cm) if necessary.
7. **Water** — Top up the radiator, if necessary, to within 1 in. (2.5 cm) of the neck to allow for expansion. Release the cap slowly as the system is pressurised.
8. **Battery** — Fill up the battery with distilled water as instructed on the lid. Dry off any spilled water. The battery will require more frequent attention in hot, dry conditions.
9. **Tyres** — Inflate tyres to correct pressures.

Front tyres—all conditions 25 lb/in<sup>2</sup> (1.76 kg/cm<sup>2</sup>).

Rear tyres { field work 12 lb/in<sup>2</sup> (0.84 kg/cm<sup>2</sup>).  
road work 14 lb/in<sup>2</sup> (0.98 kg/cm<sup>2</sup>).

## SERVICE TASK B

Every 125 hours under normal conditions — **more often if necessary.**

1. **Engine Oil Change** — Drain the engine sump whilst hot. Refill to within the safe marks on the dipstick with new oil.

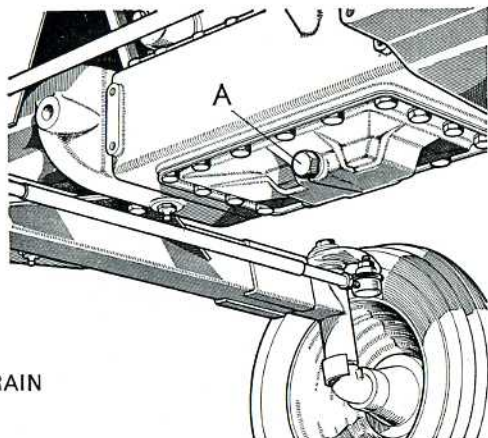


FIGURE 2/4.  
ENGINE SUMP DRAIN

A. Oil drain plug

2. **Final Drive Oil Check** — Top up the final drive reduction units to the plug with new oil if necessary. Check that the hole in the vent plug is clear.
3. **Distributor** — Clean the surfaces of the contact points and re-set the gap to 0.020 in. (0.50 mm). Smear a small amount of high melting point grease to the cam and one or two drops of oil through the oil hole.
4. **Fuel Water Trap** — Clean out the fuel water trap and sediment bowl.

## SERVICE TASK C

Every 250 hours under normal conditions — **more often if necessary.**

1. **Oil Filter Renewal** — While the engine oil is being drained, remove the oil filter and fit a new element.
2. **Sparking Plugs** — Remove, clean and re-set the sparking plug gaps to 0.025 in. (0.63 mm). Take care not to bend the centre electrode.

## SERVICE TASK D

Every 500 hours under normal conditions — **more often if necessary.**

1. **Gearbox Filter** — Drain the gearbox and transmission housing into a **clean** container. Cover the container and allow the oil to stand while completing the servicing operations. Remove the full flow filter housing, clean out with fuel oil and a stiff brush, making sure that the wire screen is also clean and free of bits. Fit a new paper element filter and re-assemble. Refill with the original oil except for the last gallon which should be discarded with any sediment. Top up with new oil. Cleanliness is most essential as the transmission oil is used in the Selectamatic hydraulic system.

**NOTE:** It may be necessary to fit a new element assembly before 500 hours. The filter warning lamp will indicate this, see page 6.

Clean the nylon filter in the by-pass valve plunger situated in the hydraulic control valve assembly.

2. **Sparking Plugs** — Remove the sparking plugs and fit new ones. Set the gap to 0.025 in. (0.63 mm) before fitting.
3. **Valve Clearance** — Check and reset the valve clearances.
4. **Fan Belt** — Check the tension by deflecting midway between the pulleys. Adjust this, if necessary, to be  $\frac{1}{2}$  in. (12.7 mm) deflection.
5. **Distributor** — Fit a **new set of distributor points** if necessary and set the gap to 0.020 in (0.50 mm).
6. **Inspection** — Check over the tightness of external nuts, etc.

7. **Water Pump** — Apply high melting point grease sparingly to the water pump grease point (fitting).
8. **Dynamo** — Apply one or two drops of thin oil to the lubricating pad at the end of the dynamo. Replace the rubber plug.
9. **Air Filter** — Where a paper element pre-filter is fitted, fit a new paper element.

## SERVICE TASK E

Every 1000 hours under normal conditions — **more often if necessary.**

1. **Engine Oil Pump** — Clean the oil pump wire mesh.
2. **Gearbox** — When hot, drain the oil from the two plugs, (main frame and rear axle). Replenish through the gearbox cover with new oil.
3. **Final Drives** — When hot, drain the oil from the final drive reduction housing and refill to the plug with new oil.
4. **Belt Pulley** — Where fitted, drain off the oil and refill to the level of the plug with the same grade of oil as used for the Gearbox and Hydraulic System.
5. **Inspection** — Check the front hub, front axle and steering for wear and adjustment.
6. **Brakes and Clutch** — Check the adjustment of the brakes and clutch.

## FUEL, GREASE AND ANTI-FREEZE

### FUEL

Regular grade gasoline having an Octane rating of not less than 90 (Research Method) should be used. It should be clean and free from water.

**Warning** — Remember that gasoline is a highly inflammable liquid and should be stored and handled with care. Whilst re-fuelling switch off the engine and do not smoke or use naked lights.

### GREASING POINTS

A good quality multi-purpose grease should be applied to all grease fittings (except the water pump and the distributor ram which requires a high melting point grease applied sparingly every 500 hours). To avoid keeping various types of grease, a high melting point grease may be used for all fittings except those that require oil.

### ANTI-FREEZE

Good quality anti-freeze should be used diluted with clean pure water to the manufacturer's recommendation for the temperature encountered.

The anti-corrosion products in the anti-freeze, have a limited life and the mixture should not be kept in the system for longer than two years. The system should be flushed before filling with new solution.

