THE AGRIBUGGY 5D

LOW GROUND PRESSURE VEHICLE

OPERATOR INSTRUCTION MANUAL

MANUFACTURED BY:

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THIS MANUAL SHOULD BE KEPT WITH THE MACHINE AT ALL TIMES AND SHOULD BE READ BY ALL OPERATORS BEFORE USING, MAINTAINING OR REPAIRING THE MACHINE

After reading this manual and becoming acquainted with the Agribuggy it is recommended that you fill the sprayer with water only and have a trial run in a grass or stubble field. It is important that you get used to all aspects of operating the machine before applying chemicals.

The machine has been designed specifically for crop spraying and fertiliser spreading and therefore does not come within the scope of the Agriculture (Tractor Cabs) regulations. It should, therefore, not be used for any other purpose and should not be used for towing or be fitted with any other equipment unless approved by the manufacturer.

Revised 7/11/95 - Applicable to machines manufactured from Nov 95 - Build No. 5D528 onwards.

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CE

EC Declaration of conformity

T.J. Frazier Ltd.
The Airfield,
Seaton Ross,
York. YO4 4NF

Type: **FRAZIER LOW GROUND PRESSURE VEHICLE**

Model: **AGRIBUGGY 5D 96**

Build no.: **.....**

Serial no.: **.....**

Month/year of manufacture**: .....**

This is to certify that the above machine complies with the Supply of Machinery (Safety) Regulations 1992 (S.I. 1992/3 073) as amended by (S.I. 1994/2063) and has been self-certified by the above named company.

Signed ..... Date .....

Safety Precautions.

For your own and, more importantly, other peoples safety please read this section carefully and remember the points made.

1. The machine should only be used, maintained and repaired by people familiar with it and in doing so they should comply with the the operating, maintenance and safety instructions in this manual.
2. The machine should not be driven at speeds in excess of 30 m.p.h. (45kph)
3. Maximum laden weight should not exceed 4.5 tonnes.
4. Keep all nuts & bolts tight.
5. Do not permit any person to ride on the machine other than the driver.
6. Stop engine and apply parking brake before leaving seat.
7. Great care should be exercised when operating on steep gradients to maintain proper stability.
8. Always keep machine in gear when going downhill.
9. Brakes should always be kept in proper operating condition.
10. Ensure that your speed is low enough for an emergency stop to be effective and safe under all load conditions
11. Ensure all guards are fitted at all times.
12. Ensure engine is stopped and handbrake applied before carrying out any adjustments or lubrication.
13. Engine must be stopped before connecting, disconnecting or making any adjustment to the hydraulic power take off.
14. Never start the engine other than from the driving position.
15. Select neutral and depress clutch before starting engine.
16. The machine should be regularly maintained as per the maintenance schedule in this manual.
17. Before carrying out any repairs or welding on the Agribuggy, the sprayer or the spreader, remove all chemical and fertiliser residues with a pressure washer or steam cleaner together with a suitable detergent and brushing if necessary - Burning chemical fumes are extremely toxic - Ammonium Nitrate (e.g. Nitram) can be explosive. Chemical residues are extremely hazardous to anyone working on the machine.
18. Hose machine down regularly - do not allow dirt / fertilisers to build up on the engine , particularly Nitram - this can create a fire hazard!

NB If any factory or field repairs have to be carried out on a contaminated machine we reserve the right to either refuse to carry out the work or to charge for any necessary cleaning.

Agricultural chemicals can be very dangerous. Improper selection or use can seriously injure people, animals, plants, the soil or other property. Be safe: select the right chemical for the job. Handle it with care. Follow the instructions on the container label and instructions for the spraying equipment.

Operation

Running in.

There are no strict running in rules for the Ford XLD 418T diesel engine. However, do not treat it harshly during the first fifty hours running. Avoid consistently high speeds above 3500 rpm but do not let the engine labour. There should always be a positive response from the throttle. Select the right gear for the job. Be prepared to reduce your working speed if necessary. Check the instruments frequently and keep the coolant and oil filled to their recommended levels on a daily basis.

After the running in period speeds should be progressively increased up to maximum performance. **The engine should not be run continually above 4000 rpm and should never exceed 4500 rpm** (3600 rpm if fitted with high power PTO system - see appendices) or damage to the hydraulic system may result.

After completing the first 50 hours running, carry out the maintenance instructions summarised in the maintenance section of this manual.

Handbrake

Situated at left hand side of cab floor. **This should not be applied,** other than in an emergency, **whilst the vehicle is in motion** or transmission damage may result. A visual warning illuminates on the ICM monitor (see following pages) when the handbrake is applied and an audible alarm will sound if the machine is moved whilst it is still applied.

Starting engine

Ensure PTO is disengaged before starting. Depress the clutch and accelerator pedal, turn the ignition switch to the centre position and wait until the 'glow plug' warning light on the ICM goes out (approx. 2-20 seconds depending on ambient temperature). Crank the engine by turning the key fully clockwise. Release key when engine starts. If it does not start within 20 seconds or starts and then stops, return the key to the off position, wait a few seconds and then repeat the above procedure.

After starting the engine allow it to idle for a few seconds to allow oil to reach the turbo-charger. Avoid high engine revs until the engine and hydraulic system have warmed up.

The first position on the ignition switch powers accessories only such as the Radio.

Stopping engine

To stop engine turn key anticlockwise. **Allow engine to slow idle for a minute or so before stopping** particularly if you have been running at high engine revs. If the engine stalls at any point, try to restart immediately.

Power steering

When turning do not hold the steering tight on full lock as this will cause the relief valve to blow off and the system to overheat. Do not turn the steering whilst the Agribuggy is stationary particularly when on hard surfaces. This causes unnecessary, excessive pressures in the steering system especially when wide tyres are fitted.

For information on the optional four wheel steering system please see appendix 1 towards the rear of this manual

Throttle.

The Agribuggy is not normally fitted with a hand throttle in the cab. It is not possible to use a hand throttle in the field due to type of fuel pump governing system fitted to this engine. The foot throttle should be used for normal applications and you will find a constant speed can quite easily be maintained with a little practice.

A remote hand throttle is fitted onto the rear cab panel near the step. It is fitted to enable the PTO speed to be held at 540 rpm when stationary for self-filling the sprayer.

Ensure that the hand throttle is returned to the tick-over position immediately after use.

Do not leave the machine unattended when the hand throttle is being used

Gearchange

The gear lever, situated at right-hand side of seat, operates the gearbox by a cable system. The shift pattern is of a conventional layout. It is light to operate and should not be forced. If difficulty is experienced when selecting a gear, return to neutral, remove foot from clutch then depress clutch again and re-select gear required. **When selecting reverse gear,whilst moving the lever back allow it to move slightly to the left to ensure the gear is fully engaged.** Please note there is a gate fitted in the gearbox which makes it impossible to go directly from fifth gear to reverse.

FRAZIER ICM

Introduction

The Agribuggy is fitted with a multi-function monitor which displays and monitors all the various functions relating to the engine, ground and PTO speeds, area covered etc. It has various audible and visual warnings built in and links to the sprayer controls, the four wheel steer system (if fitted) and to the air conditioning. It is relatively easy to operate and the majority of the calibration figures are factory preset.

In addition to the ICM you may have either an RDS Delta 3 or 4 sprayer controller fitted. The instructions later in this chapter for working out and setting the calibration factors for wheel circumference, can also be used for these units. The additional features of these units are explained in more detail in an accompanying booklet.

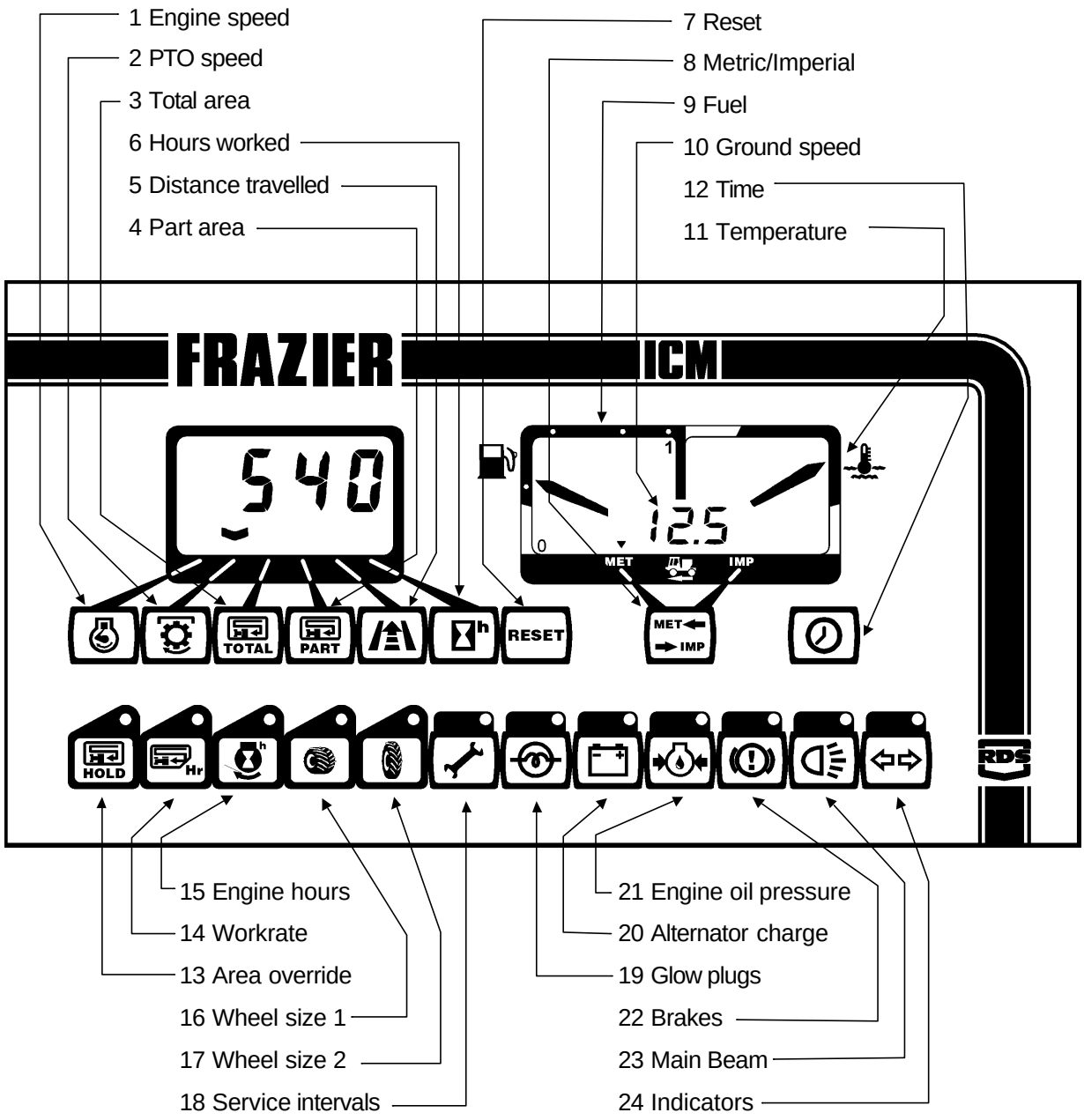
The calibration factors for all Deltas are normally factory preset, however, it is recommended that the wheel circumference be re-calibrated in field conditions, before using the machine, to ensure accuracy of applications.

Operating - ICM

ICM Functions

The ICM will display any of the following information in one or other of the two display windows. Some functions are displayed permanently and some require a button press. The various warning systems are either simple warning lights or may be audible together with a flashing display. All the functions are described in more detail over the following pages. The numbered functions below are indicated on the facing page.

Function /Display	Notes
1 Engine speed	Press to display engine speed in LH window
Engine speed warning	Visual and audible alarms for excessive engine speed
Air conditioning cut-out	Automatic cut out for air conditioning compressor at low engine speeds
2 PTO speed	Press to display PTO speed in LH window
PTO speed warning	Visual and audible alarms for excessive PTO speed
3 Total area	Press to display total area covered in LH window
4 Part area	Press to display part area covered in LH window
Area cut out	Links to sprayer controls to stop acre meter when sprayer switched off
5 Distance travelled	Press to display distance travelled in LH window
6 Hours worked	Press to display hours worked in LH window
7 Reset	Press to reset either total area, part area, distance or hours worked
8 Metric / Imperial	Press to convert speed and information stored from metric to imperial
9 Fuel	Permanent display of fuel tank level
Low fuel	Audible and visual warning when fuel level drops to approx. 10 litres
10 Ground speed	Permanently displayed in either km/hr or mph
Ground speed alarm	Audible and visual alarm if 50 km/hr (30mph) exceeded
4WS alarm	Audible and visual warning to lock system for roadwork (over 19 km/hr)
11 Temperature gauge	Permanent display of engine temperature
Temperature warning	Audible and visual warning for engine overheating
12 Clock	Press to display time of day in LH window
13 Area override	Press to stop acremeter recording when in auto mode
14 Workrate	Press to display spot rate of work in LH window
15 Engine hours	Press to display total engine running hours in LH window
16 Wheel calibration 1	Press to select preprogrammed calibration for wheel size 1
17 Wheel calibration 2	Press to select preprogrammed calibration for wheel size 2
18 Service intervals	Press to display hours to and type of next service
Service reminder	Audible & visual warning to remind when service is due
19 Glow plugs	Glow plug warning light for engine starting
20 Alternator	Alternator charge warning light
21 Engine oil pressure	Engine oil pressure warning light
Oil pressure alarm	Visual and audible alarm if pressure low for 10secs with engine running
22 Handbrake	Visual warning light, audible alarm only when moving
Brake fluid	Warning light for low level, audible alarm if moving
23 Main beam	Warning light
24 Indicators	Warning light and audible beep with each flash


1 Engine speed
2 PTO speed
3 Total area
6 Hours worked
5 Distance travelled
4 Part area
7 Reset
8 Metric/Imperial
9 Fuel
10 Ground speed
12 Time
11 Temperature
FRAZIER
ICM
540
12.5
MET
IMP
TOTAL
PART
RESET
HOLD
RDS
15 Engine hours
14 Workrate
13 Area override
16 Wheel size 1
17 Wheel size 2
18 Service intervals
21 Engine oil pressure
20 Alternator charge
19 Glow plugs
22 Brakes
23 Main Beam
24 Indicators

Operating - ICM

ICM Operation

When the vehicle ignition is first switched on all segments of both displays will come on momentarily as it goes through its own test procedure. It will then display the same function that was selected last time it was switched off.

All internal accumulated data and programmed data is stored in the instrument memory whether it is connected to a power supply or not.

Please refer to the diagram on the previous page when reading the following instructions.

1/ Engine speed

Press this button for the engine speed to be displayed in the left hand window. The small chevron in the bottom of the display window will indicate that this function has been selected.

Engine overspeed warning

Should the maximum recommended engine speed be exceeded, (normally 4,000 rpm) the LH display will flash with the engine speed and an audible buzzer will sound.

Air conditioning cut-out

The ICM provides an output which is connected to the air conditioning system. This cuts the system out at engine speeds below 1200 rpm.

2/ PTO speed

Press this button for the PTO speed to be displayed in the left hand window. The small chevron in the bottom of the display window will indicate that this function has been selected.

PTO overspeed warning

Should the maximum recommended PTO speed be exceeded, (normally 575 rpm) the LH display will flash with the PTO speed and an audible buzzer will sound.

3/ Total area covered

Press this button for accumulated area to be displayed in the LH window. The small chevron in the bottom of the display window will indicate that this function has been selected. The instrument is normally connected to the sprayer or spreader master on/off control so that the area will only accumulate when the sprayer/spreader is in work. When the sprayer/spreader is off the small chevron indicator in the bottom of the display will flash. When switched on it is steady to show the instrument is recording. The automatic cut-out can also be over-ridden manually (see below).

4/ Part area

This operates exactly the same as total area. The two area meters allow one to be used to check the area covered for each tank load or field whilst the other can be used to check the area covered over a day or any other longer period of time. Either area meter can be reset to zero at any time. (see below)

5/ Distance travelled

This operates exactly the same as total & part area and will measure distance covered in miles or kilometres.

6/ Hours worked

Press this button to display the accumulated time (in hours) worked in the LH display window. It can be reset to zero whenever required (see below).

7/ Reset

Area, distance and hours worked can be individually reset to zero at any time. To do so, firstly select the function that you wish to reset and then press and hold down the reset button. The display will flash for a few seconds and will then revert to zero.

8/ Metric / Imperial

The ICM can convert any displayed or stored information between Metric and Imperial units at any time. A small chevron indicator at the bottom of the RH display indicates which units are currently selected. To convert from one to the other, simply press the Metric/Imperial button to move the chevron between the MET & IMP indices below the display window.

9/ Fuel level

The LH side of the RH display operates like a conventional fuel gauge. Should the fuel level drop to around 10 litres the indicator bar will flash and an audible alarm will sound every 10 seconds.

10/ Ground speed

The forward speed is permanently displayed in the RH display in either mph or kmph

Ground speed alarm

Should the maximum recommended forward speed (normally 30 mph) be exceeded the forward speed display will flash and the audible alarm will sound.

Four wheel steer alarm (if fitted)

The ICM provides an output for the electronic 4WS control. This activates at speeds above 12 mph. If the 4WS is not switched into "Road mode" when this speed is reached an audible alarm sounds in the 4WS control box and a visual warning illuminates.

11/ Temperature gauge

The temperature display in the RH window works like a conventional gauge. There is also a two stage warning system built into the system to indicate engine overheating. At the first stage, when the indicator goes into the red sector, the indicator bar will flash and the audible alarm will sound. If the engine continues to get hotter the audible alarm volume will increase and "STOP" will flash in the LH display. The engine must be stopped when either of the alarms sound to avoid damage and the cause of overheating be investigated immediately.

12/ Clock

Press this button to display the time of day in the LH window

13/ Area override

Press this button to override the automatic cutout on the area meter. When you do so the area/distance meters will stop recording, the chevron in the LH display will flash and the L.E.D will illuminate on the override button. This can also be used if an automatic cut-out is not fitted to the sprayer/spreader controls.

14/ Workrate

Press this button to show your spot rate of work in the LH display window. This will show your workrate in acres or hectares / hour as you are driving along.

15/ Engine hours

Press this button to show the total accumulated engine hours worked by the machine. This function only records whilst the engine is running and can only be factory reset.

16/17 Wheel calibration

The ICM relies on an accurate wheel calibration factor being programmed in to enable it to display accurate information on ground speed and area covered etc. (Programming is covered later in this chapter). The instrument can be preprogrammed with two different calibration factors for different size wheels - e.g. Low pressure and row crop or, for extreme accuracy, different factors can be used for when working in soft/wet conditions and hard/dry conditions.

One of the L.E.D indicators on one of the wheel calibration buttons will be illuminated at all times to indicate which one is in current use. To change to the other, press and hold the button down for approximately 5 seconds.

18/ Service intervals

When you press this button two pieces of information are shown in the LH display window. Firstly the number of hours remaining to the next service and secondly the type of service due next (f,a,b,c etc).

Service reminder

When a service first becomes due the L.E.D indicator on the service interval button will illuminate and the the alarm will sound once only. The LH display will also indicate that a service is due. After that a reminder will show on the LH display each time the engine is started and the L.E.D on the button will show continually.

When the appropriate service has been carried out it is then necessary to go into the instrument programming mode to reset the service interval reminder (see programming - later in this chapter). The L.E.D will then go out, the service hour counter reset and it will start counting down to the next service.

The different service types (f,a,b etc) are indicated in the service schedule later in this manual.

19/ Glow plug warning light

The L.E.D will illuminate when the ignition is first switched on and will go out when the engine is ready for starting. For more information on starting see the starting section earlier in this manual.

20/ Alternator Warning light

If this warning light illuminates whilst the engine is running it indicates a fault with the alternator / charging system which should be investigated immediately.

21 Oil pressure warning light

This warning light should go out within a few seconds of start-up. If it is still on after 10 seconds the alarm will sound and the LH display will flash "STOP" . The alarm will also be activated if the oil pressure becomes low at any other time when the engine is running. The engine should, of course, be stopped immediately should the alarm be activated and the cause investigated.

22/ Handbrake / Low brake fluid warning light

This warning light will be illuminated at all times if the handbrake is on or if the brake fluid is low. An audible alarm will also sound if the machine is moving.

23/ Main beam warning light

This warning light will be illuminated when the headlights are set to main beam.

24/ Indicator warning light

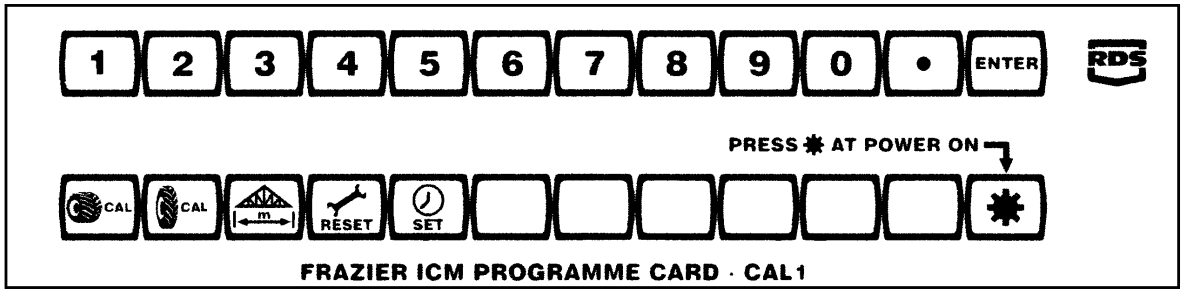
This warning light will flash and an audible beep will sound in conjunction with the direction indicators and hazard warning flashers.

Programming

There are various inputs which must be programmed into the ICM relating to the machine and the sensors installed. The majority of these inputs are factory preset and cannot be altered by the operator.

The input data that can be altered by the operator can only be viewed or changed when the ICM is changed from its normal "Operating mode" to its "Programme mode"

A front panel overlay card is provided which indicates the new "programme mode" functions of each of the buttons along the bottom of the instrument.



The ICM Overlay Card

Entry into programme mode

a/ Select either Metric or Imperial on the instrument according to which units you wish to use for programming and then switch the ignition off.

b/ Position the overlay card on the front panel of the instrument over the function buttons.

c/ Press and hold down the * button whilst switching the ignition back on.

d/ The LH display will show "CAL" to confirm that the ICM is in programme mode. The * button should be released immediately that "CAL" is displayed.

e/ The functions of all the lower buttons have all now changed to those indicated by the overlay card. The LH display will show the value of any of these factors currently set in the instrument simply by pressing the appropriate function button.

f/ The upper row of buttons (immediately below the displays) have also changed to become data entry keys having values of 1 to 9, 0, decimal point and ENTER.

Operating - ICM

Data entry procedure

All numerical data is entered by the same procedure as detailed below:

a/ Select the programme function to be checked or altered by pressing the appropriate button on the overlay card. The LH display will show the numerical value currently stored for that function.

b/ If the value is correctly set then no further action is required. Simply select the next function to check or switch the ignition off to return to operating mode.

c/ To set a new value use the top row of buttons as numerical entry keys . Key in the number, as the first key is pressed the number will flash in the LH display and the RH display will flash "Ent". As the full number is keyed in, it will all appear in the LH display. Each key press is acknowledged with an audible beep.

d/When the number is correctly set, press "Enter" to confirm the entry. The display will then stop flashing and the new data value is displayed in the LH window.

If you enter your value incorrectly, simply press "Enter" at any time and then enter the value again.

Data values

Wheel calibration 1 & 2

The data value to be set on these functions is the distance the vehicle travels forwards over 2 intervals between speed sensor pulses.

This data must be determined under practical operating conditions to allow for any wheel slip, sinkage or tyre deformation.

The Agribuggy is fitted with a propshaft speed sensor and the data programmed is the distance the machine travels forwards for two revolutions of the prop shaft. Determine this distance by driving the machine forwards for exactly 20 revolutions of the prop shaft, measure the distance travelled and divide this distance by 10 to determine the true "speed sensor factor" or distance travelled between 2 sensor pulses.

The following settings are the factory settings and are only approximate. The machine should be re-calibrated before use and the new settings recorded for future reference.

Tyre size	Metric factor (metres)	Imperial factor (inches)
38x20x16 low pressure	0.891	35.10
12.4 x 16 intermediate	0.905	35.63
9.5 x 24 intermediate	1.06	41.76
7.2 x 36 row crop	1.207	47.53
8.3 x 36 row crop	1.28	50.43
7.2 x 40 row crop	1.347	53.04

An alternative method of calculating the wheel factor, although not as accurate, is as follows:

Measure the distance from the ground to centre of the axle whilst in working conditions and approximately half loaded. Multiply this figure by 2.04 to get the wheel sensor factor.

Implement width

The data value to be set on this function is the full working width of the sprayer or spreader in either metres or inches.

Time set

The data value to be set on this function is the time of day. Enter the hour followed by minutes e.g. 0915.

Service interval reset

To reset the service interval counter press and hold down the function button for a minimum of 5 seconds. The LH display will then show the hours remaining to the next service and the next service type.

Hydraulic PTO system.

For information on the optional high power PTO system (Airtec) please see appendices

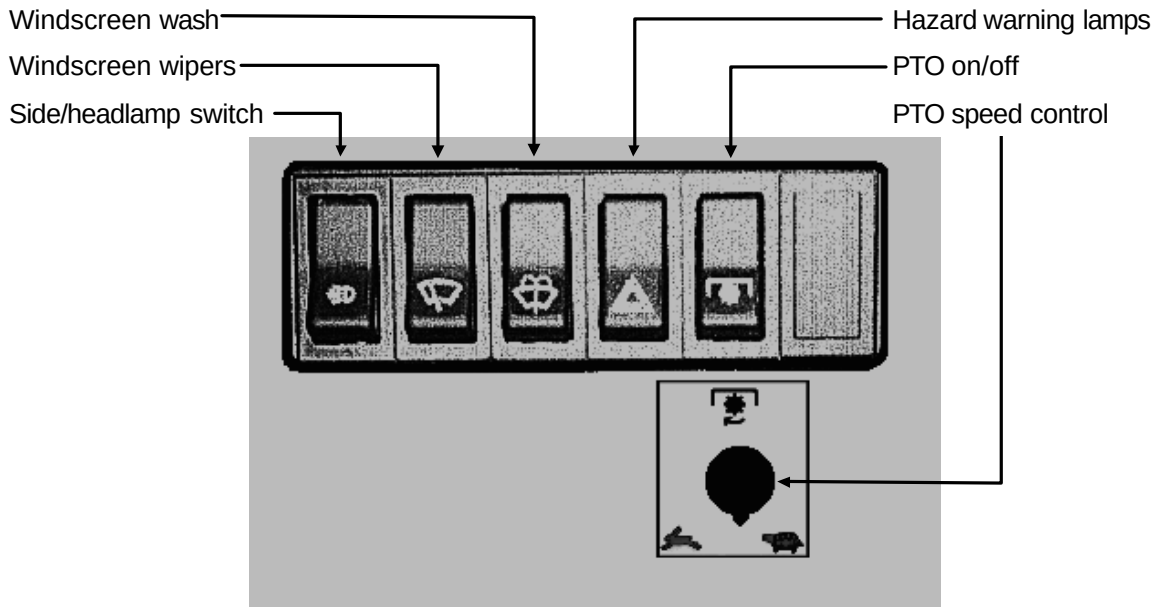
Safety

1/ Ensure PTO is disengaged before starting engine.

2/ The engine **MUST** be switched off before connecting the PTO or making any adjustments.

Operation

The PTO is hydraulically driven, is fully independent and may therefore be engaged at any time providing the engine revs are not too high. To engage the PTO press the PTO switch down on the dashboard. (see below) A lamp built into the switch will illuminate continually whilst it is switched on.



Dashboard switch bank

Operation - Ventilation

Setting PTO speed

The hydraulic pump is geared so that 540 r.p.m. on the PTO is reached at a minimum engine speed of 2400 rpm To set the PTO for 540, or indeed any other required speed, increase the engine speed to approx. 2800 rpm and adjust the speed with the knob immediately below the PTO switch. **NB. the knob must be pulled out before turning to unlock it and pushed back in afterwards.** The actual PTO speed can be read off the LH display of the ICM (see previous pages). Turning the knob clockwise will increase the speed and anticlockwise will decrease the speed.

Once the speed is set, if the engine rpm is increased there will not be a significant increase in PTO speed. The PTO speed should never exceed 600 rpm For most spraying operations **you will find it is not necessary to always run the PTO at 540 rpm.** Lower PTO speeds result in reduced wear and tear in the spray pump and hydraulic system, a lower engine power requirement and can help to prevent foaming in the spray tank.

If the sprayer is fitted with a high capacity spray pump e.g. 4, 5 or 6 cyl. the PTO speed should be set as low as possible whilst spraying. Speeds in the order of 350 rpm for a 6 cyl. pump and 450 rpm for a 4 cyl. pump are normally more than adequate to achieve working pressure with excess flow left for agitation. Higher speeds may result in overheating of the hydraulic system. The PTO speed can then be increased to 540 after each load for quick-filling if required.

It is important to ensure that sprayer filters are kept clean and that self-cleaning filters are working correctly at all times. Failure to do so will result in loss of PTO speed and overheating of the hydraulic system.

Spool valves

The levers to operate the spool valves are situated to the left of the drivers seat. Labels on the inside of the door and on the back of the battery box (next to hydraulic connectors) show which lever operates which connector. There may be up to 4 valves fitted which can be any combination of single and double acting spools. A double acting spool can be safely used to operate a single acting service if required.

The hydraulic system/spool valve(s) fitted are only designed for intermittent operation of hydraulic cylinders and should not be used to power motors or other hydraulic circuits. Maximum pressure at the spools is approx. 1800 psi (124bar) Please consult the manufacturer if you require higher pressures or if wish to use them for any other purpose.

Please ensure that all couplings are clean before connecting hoses and that any couplings that are not in use are protected with plugs / caps. Ingress of dirt into the hydraulic system can lead to premature wear and possible failure of major components.

Air Conditioning / ventilation

The air conditioning unit (if fitted) is integrated into the ventilation system within the cab roof. The unit will cool or heat the air which is partly drawn in to the cab through the carbon filter system and partly re-circulated. This ensures the cab is kept positively pressurised to keep dust and vapours out of the cab. Machines without air conditioning draw the whole air supply through the carbon filter.

Operation

To operate the fan, turn the centre switch in the roof panel clockwise until you find the most preferred of the three speeds. The adjustable vents in the roof console can be directed to wherever you require the air.

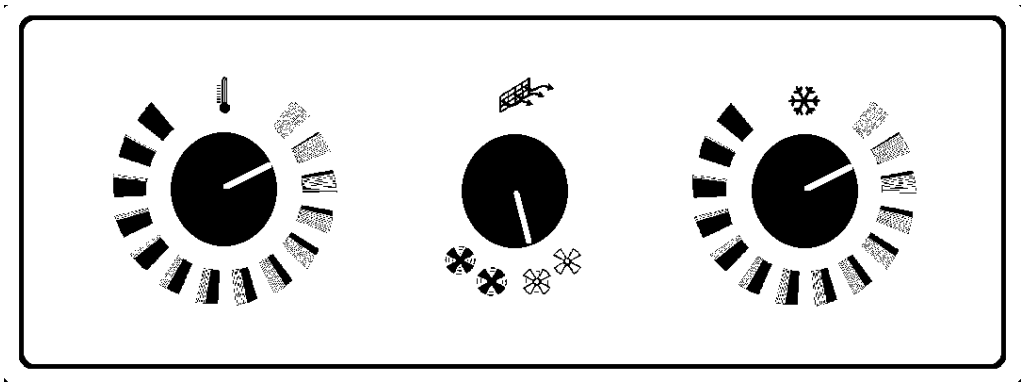
To reduce the temperature of the air, turn the RH switch clockwise until the cab temperature is reduced as required. For maximum efficiency the LH control for the heater should be turned fully anti-clockwise. Remember the chiller will only work when the engine is running at over 1200 rpm.

Always keep the cab door closed to keep the cab cool.

To increase the temperature of the air turn the LH heater control clockwise and the chiller control anti-clockwise.

Demisting

In damp conditions the heater control can be used in conjunction with the chiller to dehumidify the air entering the cab - to demist quickly turn both controls fully clockwise.



Heater control Fan speed Chiller control

Ventilation controls

Row crop work.

Only row crop wheels recommended by the manufacturer should be fitted to the Agribuggy. Fitting any other wheels will invalidate the warranty. Wheel track should not exceed 72'' without consulting the manufacturer. The top road speed is increased significantly when row-crops are fitted, however, a top speed of 30 m.p.h. (50 kph) should still **NOT** be exceeded. **Speeds over 20 mph (32 kph) should only be used if the tyres fitted are suitable.**

Please read notes on steering stop adjustment if you are fitting row crops on an Agribuggy with a wheel track of less than 68''. The stops may have to be altered to maintain adequate wheel/cab clearances. It as also advisable to service the brakes as a matter of course before fitting row crop wheels in the Spring.

It is recommended that the front crop deflector and underbelly crop sheet be fitted when working in tall crops particularly as harvest approaches. This not only reduces crop damage but also protects the underside of the machine and stops the crop being pulled into the drive belts, shafts and alternator etc.

The front mounted crop deflector also helps to prevent the radiator from blocking. It may have to be extended for use in oil seed rape and some other tall crops. If so please ensure that the extension does not restrict the air flow into the radiator, especially when being used on the road.

See appendix 6 for row crop wheel track settings.

Field Operation

The optimum working speed of the Agribuggy in reasonable conditions is 6-9 mph. (10-14 kph) This speed is normally achieved in second gear for 7.5 mph (12 kph). If conditions are good, you may be able to travel in third gear as long as the engine is not labouring.

Try to keep between 2200 and 3400 rpm. Slow down and select a lower gear if necessary.

High engine revs will result in higher engine temperatures and fuel consumption.

The suspension of the Agribuggy gives it a relatively smooth ride compared with a tractor, however, it should still be driven with care and respect especially over rough ground.

Should you get badly "bogged down" when working in wet conditions, ensure that mud has not been forced up into the crankshaft pulley / drive belt area. If it has, then thoroughly clean the area and check that the camshaft drive belt cover has not been damaged and that mud has not got inside the cover. Please seek advice immediately, from T.J. Frazier Ltd., if it has.

Field planning.

Try to plan your field before you start work. You will soon find out what the Agribuggy is capable of. If a field has any particularly wet areas or steep banks, plan the field so that your load is reduced before you reach them. If it has a very steep hill in it, it is advisable to reduce your working speed to 6 mph to do the whole field. 1st and 2nd gear can then be used. When spraying at relatively high speeds, it is very important that your working speed is maintained to avoid over or under dosing. For this reason it is important that two 12 metre bouts are sprayed around the headland before spraying the rest of the field. When spraying the rest of the field maintain your speed as you travel onto the headland and do not start to turn until the sprayer is switched off. After turning, straighten up, and try to get up to your target speed before switching back on.

Potatoes.

When spraying potatoes with row crop wheels fitted it is most important that care is taken when turning. If a dummy headland is left between the field rows and the headland rows you may find it necessary to shunt when turning to avoid crossing over the headland rows. Go as slow as possible (bottom gear) if turning over the rows is unavoidable to ensure unnecessary strain on the machine is kept to a minimum.

Sugar Beet.

When spraying sugar beet you will find it best to look forwards and drive by the centre of the machine rather than trying to look down at the wheels. Fit a centre marker on the bonnet if necessary. For low-dose/high pressure spraying forward speed should not exceed 6 mph (10 kph). We recommend the use of a jet which will apply 7+-10 gals (75-110 l/ha) at 5 mph (8 kph) at 45-50 psi (3.25-3.5 bar). E.G. Lurmark 015-F110 (light brown).

Choice of jets.

We recommend the use of 110 degree fan nozzles for general high speed spraying. These will give better coverage than 80 degree jets with a more appropriate droplet size. Twin outlet or twin jet caps will give even better coverage. However, you should always check on your chemical container for recommendations regarding forward speed, pressure, spray quality and water rates before choosing which nozzles to use.

Forward speed

Most spraying operations can be carried out at 7.5 mph (12 kph), however the following points should be taken into consideration: The spray boom should ride evenly and should not bounce and yaw about. An unstable boom is one of the main causes of uneven application and is probably the main reason why chemical manufacturers and suppliers often recommend a slower working speed. If the crop is particularly dense or tall and good penetration is essential reduce your speed to 6 mph (10 kph). Also remember that, contrary to popular belief, increasing pressure does not increase penetration. It simply increases the number of smaller droplets which will settle on the upper leaves or blow away. e.g. for pre-harvest Round-Up a max speed of 6 mph (10 kph) and a pressure of 30 psi (2 bar) is recommended. If conditions are particularly rough, even if the boom is stable, it may pay to reduce speed for the sake of the machine.

Fertiliser spreading.

Vicon spreaders.

When using Vicon spreaders the following points should be noted: When first fitted, the height of the spout on the spreader is higher than that specified by the manufacturer. However, once loaded and in the field you will find it will be a lot nearer the correct height above the crop. It is far better to be too high than too low and this should have no significant effect on the spread pattern. As a guide, the last bit of fertiliser should be hitting the previous wheeling. When spreading Nitram, or similar prilled material, the rear mudguards should be removed to avoid any effect on the spread pattern.

The spreader has a built-in shock absorber in it's spreading mechanism to avoid shock loads being passed down the PTO shaft. It is very prone to seizing up. It should therefore be checked each time it is used to avoid possible damage to the shaft and hydraulic motor. Check as follows: Wedge the flywheel so it can't move in either direction. Push a screwdriver or bar through the PTO shaft yoke and try to turn the shaft. It should move approx. 20 degrees against the force of the shock absorber and then spring back to the central position. If it does not it should not be used till it has been repaired. If in doubt please consult T.J. Frazier.

Lely Centreliner spreaders.

Ensure there is a sheet fitted across the front of the spreader to avoid fertiliser being thrown forwards onto the machine. This is most important and a better sheet than the one supplied with the spreader should be fitted if necessary. Please remember the warranty does not cover faults caused by corrosion!

Due to the relatively low pressure that the Agribuggy hydraulics work at, the hydraulic control on the spreader may be too slow. If it is, remove the restrictors in the end of the actuating rams. However take care if it is also used on a tractor - it may then work too fast and damage may result.

A purpose made mounting frame is now available from T.J. Frazier which carries the later Centreliners on a 3 point linkage. This allows the tilt angle to be altered with a special top link and allows use of the headland tilt facility on the spreader.

Amazone spreaders.

Mounting frames are available for both Amazone ZAU and Amazone ZAM spreaders. A guide is available from T.J. Frazier for setting the spreaders up, however, as with all spreaders, it is advisable to have them tray tested before use.

Seed Drilling

Safety

Only seed drill conversions supplied or recommended by T.J. Frazier Ltd. should be fitted to the Agribuggy 5D. Incorrectly fitted drill units will invalidate the manufacturer's warranty, may be hazardous to the operator and may seriously reduce the life of the machine or some of its major components.

The only drills currently suitable for fitting to the Agribuggy are those of the pneumatic type with lightweight, Suffolk coulter toolbars up to a maximum width of 4 metres.

Make sure you follow the safety, operating and maintenance instructions given by the respective drill manufacturer.

Operation

When drilling with the Agribuggy, a PTO speed of 520 rpm is normally more than adequate to operate this type of airseeder.

Whilst drilling the engine speed should not exceed 3200 rpm and ideally should be kept below 3000 rpm.

Wheel track eradicators should be set as shallow as possible to keep the draft load on the Agribuggy to a minimum and following harrows should only be fitted to 3m units.

Maintenance

An oil-to-air hydraulic cooler unit must be fitted in front of the engine radiator when driving a pneumatic airseeder. This should be kept perfectly clean together with the radiator immediately behind it. Failure to do so will result in overheating of both the hydraulic and engine cooling systems.

Service & Warranty.

The Agribuggy carries a 12 month / 500 hour warranty on defective parts and workmanship. It does not cover faults caused by incorrect use and servicing or faults caused by fertiliser or chemical corrosion.

All servicing should be carried out as per this instruction manual during the warranty period. The first service is normally carried out by the customer after the first fifty hours running. If any faults are apparent on delivery, at this first service or during the warranty period we would be grateful if you would notify us as soon as possible even if the fault is rectified by yourselves. We have found many people repair straight-forward faults themselves without telling us, however our policy is one of continual improvement and with your co-operation together with any suggestions and ideas we shall continue to improve the machine to our mutual advantage.

If any problems occur with the machine please contact your supplier, without delay, with whom you can discuss the best way to deal with the problem to avoid unnecessary delays. If a repair is carried out by yourselves or by an outside engineer to save time, and you wish to claim costs under warranty, **we must be notified first or the claim will not be accepted under any circumstances.** Unauthorised repairs may affect or even invalidate any remaining warranty. Any parts replaced must be returned to us for assessment.

If our service engineers are called out at any time , to work on the machine or if the machine has to be returned to our works for repair, it must be thoroughly cleaned to remove all chemical and fertiliser residues to enable the work to be carried out safely and effectively. If the machine is not clean , we reserve the right to either refuse to carry out the work or to charge for cleaning.

Maintenance and technical information.

The life of the Agribuggy will depend on the care it receives throughout its life. It is the operator's responsibility to ensure that the machine is correctly operated and that the maintenance operations outlined in this manual are carried out regularly after the specified hours of operation are reached. If you are unsure of how to carry out any of the maintenance operations please do not hesitate to enlist the help of either your dealer or T.J. Frazier Ltd.

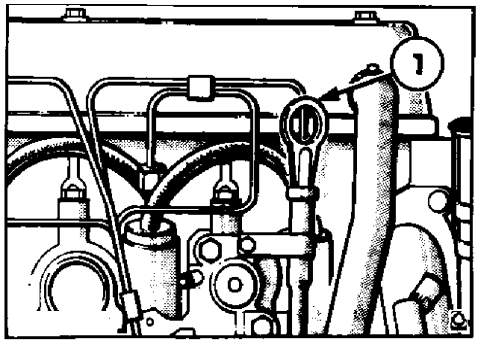
All nuts and bolts should be checked for tightness after the first days operation, especially axle u-bolts, wheel nuts and propeller shaft bolts. Check engine and hoses for fluid leaks regularly during the first few days of operation.

Please refer to the condensed maintenance guide for service intervals.

Engine Oil

Checking oil

Check oil level daily ensuring that the Agribuggy is stood on level ground. Use only Ford/Motorcraft Super engine oil SAE 10W/30 or a high quality 15W/40 oil meeting specification API-SG/CD. The use of a universal tractor oil is generally not recommended. Do not fill above 'Max' mark on dipstick.



1. Oil dipstick location

Changing oil and filter.

1. Warm engine to normal operating temperature.

2. Make sure machine is stood on level ground and stop engine.

3. Remove oil filler cap from rocker cover, place suitable draining tray under engine and remove drain plug from oil pan.

4. Using a suitable strap wrench, unscrew the oil filter canister one complete turn.

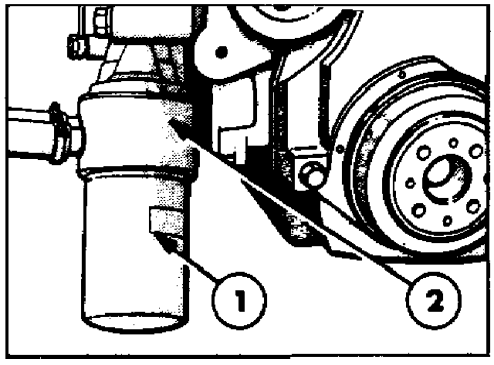
5. Position a suitable draining tray underneath the filter and remove the filter from the engine casting by hand. Discard the old filter canister.

6. Thoroughly clean the oil filter housing face.

7. Partly pre-fill the new filter with clean oil of the correct type. Apply a thin film of clean oil to the filter sealing ring.

8. Screw on new filter until sealing ring abuts the filter head and tighten a further 1/2 to 3/4 turn. **DO NOT** overtighten.

9. Replace sump drain plug and fill engine via filler neck in rocker cover. Total oil capacity (inc. filter) is 4.8 litres.



1. Oil filter canister.

2. Oil cooler.

NB either a cranked or flexible ended funnel will be required for filling oil through the rocker cover filler neck.

10. Replace oil filler cap, run engine and check for any leaks from the oil filter.

11. Stop engine, allow oil to settle and top up as necessary.

Adjusting drive belts.

Alternator belt.

1. Disconnect the battery earth lead.

2. Slacken the bolt fixing the alternator adjusting arm to the engine after firstly loosening the lock-nut. (This bolt also supports the hydraulic pump mounting plate)

3. Loosen the main alternator mounting bolts. (Fig. a1)

4. Loosen the adjuster centre locking bolt. (1) in Fig a2.

5. Tension the drive belt by applying and maintaining a torque of 10Nm (7.5 lb ft) to the pinion nut while at the same time tightening the centre locking bolt (Fig. a3).

If a new belt has been fitted the pinion nut torque should be 15 Nm (11 lb ft).

It is important that these torque figures be strictly adhered to - great care should be taken not to overtighten the belt or damage to the alternator will result.

6. Tighten the alternator mounting bolts.

7. Tighten the adjusting arm retaining bolt, not forgetting the lock-nut.

8. Re-connect the battery earth lead.

It is advisable (and easier) to replace the alternator belt along with the water pump and air conditioning compressor drive belts (if fitted) when the camshaft drive belt is replaced every 600 hrs.

Using an underbody crop sheet for late-season row crop work will help to prolong the life of the belts and the alternator.

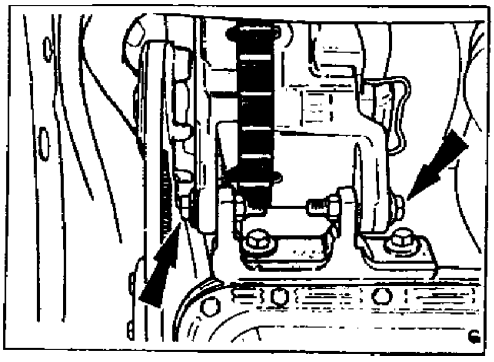


Fig. a1 - Alternator mounting bolts.

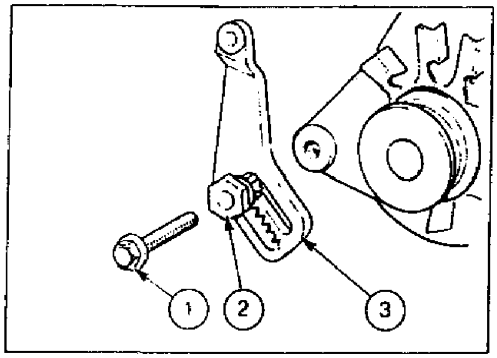


Fig. a2 - Rack & pinion adjuster.
1. Centre locking bolt.
2. Pinion nut.
3. Adjusting arm.

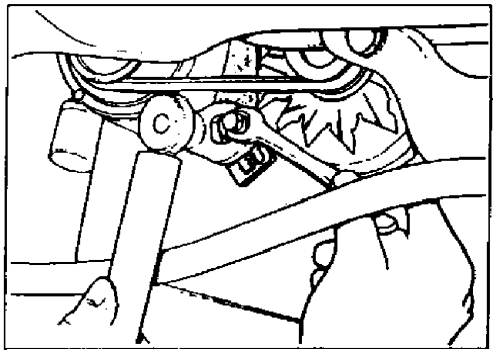


Fig. a3 - Tensioning method for alternator drive belt.

Water pump drive belt.

1. Slacken the idler pulley mounting and adjusting bolts (Fig. b1).

2. Move idler pulley to obtain the specified belt tension, then tighten the adjusting and mounting bolts.

3. Re-check tension.

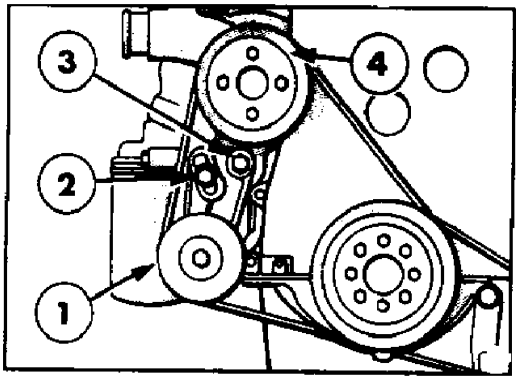


Fig. b1 - Water pump drive belt.
1. Idler pulley.
2. Idler pulley adjusting bolt.
3. Idler pulley mounting bolt.
4. Water pump pulley.

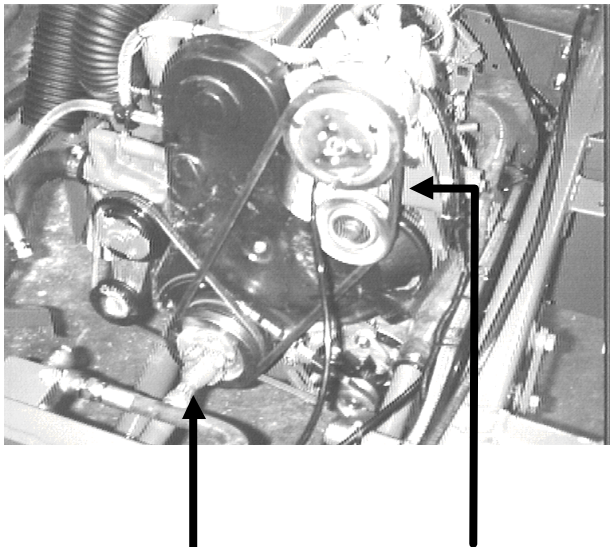
Air conditioning compressor drive belt (if fitted).

1. slacken the centre retaining bolt on the jockey pulley eccentric.

2. Rotate the eccentric to tension the belt.

3. Retighten the centre bolt.

NB - Do not overtighten the belt.



Hydraulic pump drive shaft

Air conditioning compressor jockey pulley eccentric

Hydraulic pump drive.

The hydraulic pump is driven by a propeller shaft connected to the front engine crankshaft pulley.

This shaft should be greased weekly or every 50 operating hours. There are 3 grease nipples on the shaft - one on each universal joint and one on the centre sliding section.

One end of this shaft will have to be removed to replace any of the drive belts. It is recommended, and is in fact easier, to disconnect this from the hydraulic pump end.

Take care not to pull the two shaft halves apart - If you do so it must be put back together in exactly the same position to ensure it stays in balance.

Cooling system

The coolant level is visible through the transparent walls of the degas tank. The coolant should be level with the 'Max' mark when the engine is cold. DO NOT OVERFILL. Allow engine to cool down until the back of the hand can be held against the cylinder head without discomfort before removing cap. Only turn the cap to the first stop so that pressure in the system is released then wait a few seconds before removing the cap completely.

Never use cold water to top-up the cooling system of a hot engine, particularly if the coolant level is very low. This could cause serious damage to the engine.

The system should only be topped up with a water / anti-freeze mix as specified below.

Ensure that the pressure cap is re-tightened correctly before running engine.

After two years the cooling system must be flushed out and coolant replaced. When the coolant is replaced or if a high quantity of coolant has to be used for topping up then care must be taken to ensure the system is free from air. To do this remove the top end of the top hose and add coolant through the degas tank until it can be seen that the top hose and radiator is completely full. Re-fit the hose and top up to the correct level. The engine should then be run (with the cab heater turned on) until it reaches normal working temperature and then switched off and allowed to cool and the water level re-checked.

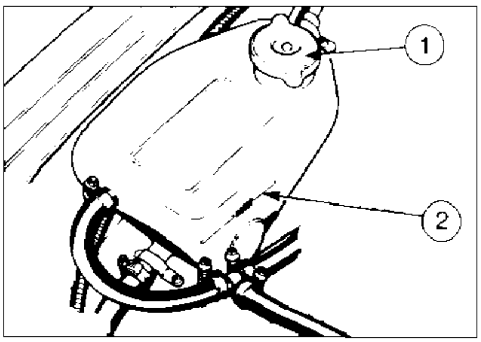
The engine block drain bung is situated just above the starter motor. (see diagram on right)

Coolant capacity is approximately 2 gal (9.5l). Either use Ford motor car antifreeze (this is coloured pink and a 40% solution should be used for topping up) or a proprietary antifreeze meeting European specification ESD-M79B49-A Please check with your supplier that the antifreeze you use meets this specification to ensure full warranty cover.

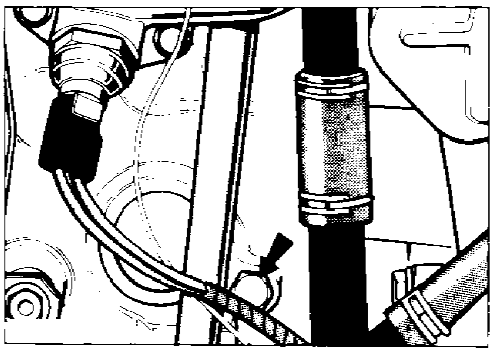
A fine mesh screen is fitted in front of the radiator and should be kept clean at all times. It can be cleaned by brushing lightly or blowing out with an airline.

Ensure that the radiator core is also kept clean - inspect it regularly but take care if using a pressure washer to clean it - it is very easy to flatten the fins which will reduce air flow through it.

For late season spraying it is recommended that the optional crop deflector be fitted to the front of the Agribuggy to not only reduce crop damage but also to avoid blocking of the radiator grill/screen with pollen etc.



1. Filler cap
2. Maximum level indicator



Cylinder block drain bung.

Fuel system

It is particularly important to keep the fuel system well maintained - If even only slight traces of contamination or water are allowed to get past the filtration system and into the injection pump, the engine performance will be seriously affected and serious damage will be caused to the pump leading to very costly repairs.

Fuel tank

The fuel tank holds approx. 15 gals (65 litres). Use clean diesel fuel only. Always fill the tank at the end of the days work to avoid condensation. Drain the diesel tank periodically.

Water/sediment trap

A water trap/sediment bowl is fitted in the suction line between the tank and fuel filter. The glass bowl should be checked weekly for any signs of water or sediments. The glass bowl should be removed, emptied and cleaned before it gets half full of water. When the bowl is removed you will also find a gauze mesh filter under the head unit which should also be removed and thoroughly cleaned. When replacing the bowl take care not to overtighten the thumbscrew.

Draining fuel filter

The fuel filter unit should also be drained regularly. To do so slacken the knurled knob or hexagon headed screw underneath the filter assembly to allow any accumulated water to drain from the filter.

Replacing fuel filter element

1. Drain fuel from fuel filter.

2. Support the bowl at base of filter while unscrewing the centre retaining bolt (1).

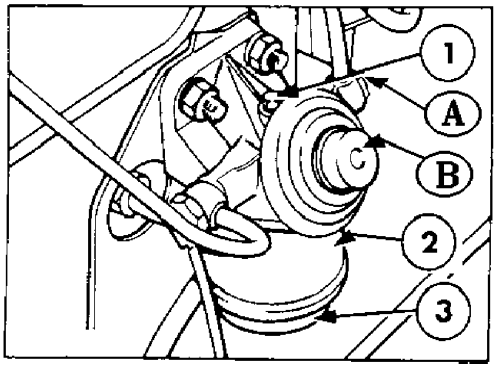
3. Detach bowl and filter element from the filter head and discard the element and both sealing rings.

4. Wash out the bowl with clean fuel oil.

5. Assemble new filter element between head and bowl, using new sealing rings at top and bottom.

6. Tighten centre retaining bolt.

7. Tighten drain plug in bowl.



Fuel filter assembly.
1. Retaining bolt.
2. Filter element.
3. Bowl.
A. Bleed nipple.
B. Hand primer.

Bleeding the fuel system

The injection pump on the XLD 418T diesel engine is self priming, however, should you change the filter or run out of fuel, the system will need bleeding as far as the fuel filter. A hand pump and bleed screw is fitted to the top of the fuel filter housing for this purpose (see below).

1. Connect a flexible tube between the bleed nipple on the filter outlet pipe connection, and a suitable container.

2. Slacken the bleed nipple and depress the filter hand primer repeatedly until air-free fuel flows from the tube.

3. Tighten the bleed nipple and remove the tube.

Maintenance

Valve clearances.

Due to the design of the camshaft and followers there is very little wear on the tappits and only infrequent adjustment is required. The tolerances should be checked as per the maintenance schedule. If adjustment is needed it is recommended that it be done either by a Ford motor dealer, T.J. Frazier or your dealer. (Special tools are required). Tolerances: (cold) Inlet - 0.235 to 0.365 mm Exhaust - 0.435 to 0.565 mm.

Camshaft / injection pump drive belts.

The camshaft drive belt should be replaced as a matter of course every 600 hours and the injection pump belt every 1200 hrs. This routine work can be carried out by either ourselves, by some of our main dealers or by your nearest Ford car/commercial dealer.

Special tools are required and the job should not be attempted without these tools and the appropriate service manual.

Failure to replace the cam belt at the recommended intervals or failure to follow the correct fitting procedure can lead to belt failure which will result in serious and costly engine damage.

Hydraulic system.

The hydraulic system develops a maximum of 6hp Please consult the manufacturer if you wish to drive anything other than a conventional diaphragm sprayer pump or Vicon, Lely Centreliner or Amazone twin disc fertiliser spreaders.

Do not alter the relief valve settings on either the spool valve or flow divider without consulting the manufacturer. They are preset at: Flow divider (main relief) 1800 PSI, Spool valve relief valve 1800 PSI, Power Steering 1050 PSI. Ensure the hydraulic system is kept clean. Be careful when refilling tank. Do not direct high pressure hose at filler/breather cap. Oil level should be kept to top of level/temperature gauge. Use good quality, clean hydraulic oil for topping up only (I.S.O VG 68). Do not use universal oils. Change return line filter when indicator on filter unit turns red or at least every 12 months. If excessive oil contamination is evident the oil should also be changed and the suction filter (inside tank) should be removed and washed out. If this filter is removed ensure that no contamination gets inside the suction pipe or into the inside of the filter.

If an oil-to-air cooler is fitted in front of the engine radiator, ensure that it is kept perfectly clean along with the radiator behind it at all times. Failure to do so will lead to overheating of the hydraulic and/or engine cooling systems.

See appendices for information on the uprated pto systems.

Tyres.

The low pressure tyres are normally preset at 10 psi (0.7 bar). The pressure may be reduced in adverse conditions to as low as 6 psi (0.6 bar) depending on the load being carried. However the main thing to watch is that the tyre side walls do not crease when loaded. If the machine is being used for long periods on the road the pressure should be increased to 14 psi (1 bar). Row crop tyres should be inflated to 35 psi (2.4 bar).

Air Cleaning System

The Agribuggy is fitted with a Filter Minder air restriction indicator. This has a scale on it which shows when the air cleaner is getting dirty. It is fitted on the side of the air filter assembly. It is reset by pressing the rubber button on the end of the indicator. Avoid opening the air filter assembly until the gauge indicates 18" air restriction. Service BEFORE the yellow indicator reaches the red line. When air filter element does need servicing, replace it with a new one. Do not attempt to clean it. Protect gauge from engine degreasers and solvents - they may cause deterioration of the polycarbonate housing. The condition of the air intake hoses should be checked regularly for signs of any damage and should be replaced if necessary.

Cab Filtration Unit

Ensure the air intake grill under the front of the cab roof is kept clear of any build up of dust. To remove the filter, undo the four nuts securing the panel on top of the roof, lift the panel up, disconnect the wire for the beacon and unplug the radio aerial. The panel can then be removed. Remove the rubber strap from over the top of the carbon filter and remove it from its frame. The filter should be replaced, as a matter of course, every 300 hrs. or 6 months (whichever comes first). The carbon in the filter degenerates after this period of time and becomes ineffective. New filters are available from your supplier or T.J. Frazier.

Air conditioning

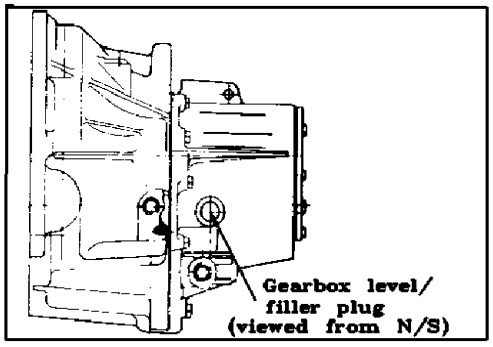
There are no user serviceable parts in the air conditioning system, the only regular maintenance being the servicing of the compressor drive belt - as described earlier in this manual.

It is recommended that unit is serviced once a year (in the spring) by a qualified refrigeration engineer.

The refrigerant gas currently being used is a hydrocarbon gas - HR30. **NB this gas is highly flammable** and for this reason the system must not be interfered with. However It is perfectly safe under normal operating conditions with the system charge being relatively small at only 14 ozs.

Gearbox Oil

The rearmost plug on near side of gearbox is a combined level/filler plug. Use E.P. Gear Oil SAE EP 80.



Clutch

The clutch is cable operated and is fitted with a self adjusting mechanism on the top of the clutch pedal. It should not require any adjustment.

Maintenance

Battery

The battery fitted is 'maintenance free' and topping up is not normally required throughout the normal life of the battery. However, the level should still be checked when periodic services are carried out. Ensure terminals are kept clean and protected with petroleum jelly.

An isolator switch is fitted to the outside of the battery box near the step for use in emergencies or when any welding is being carried out to the machine.

Electrical fuses

Fusebox 1 (Top) left > right

1	Roof fan, radio, wiper park	15A
2	Wash/wipe	10A
3	PTO, Brake warning lamp	3A
4	4WS, RDS	5A
5	Indicators	7.5A
6	Fuel solenoid, stop lamps	10A
7	Spray controls (motorised valves)	7.5A
8	Ignition	25A

Fusebox 2 (bottom)

1	Spare	8A
2	Spray controls (solenoids)/auxiliary	15A
3	Power socket (cig lighter)	15A
4	Rear work lamps / beacon	15A
5	Front work lamps	15A
6	Headlights, flash, horn	15A
7	Air con compressor, Hazard flashers	15A
8	Four wheel steer	2A

Wiring system.

A main feed is taken from the battery to a terminal block in the dashboard. This is then split to feed fuses 1 to 8 in the lower fuse box and fuses 1, 2 and 8 in the top fuse box. A feed returns from the ignition switch to fuses 3 to 7 in the top fuse box. The ICM, 4WS, wipers and fuel pump solenoid are all fed from the ignition switch. All other switches are fed directly from the fuse box so **make sure everything is switched off when leaving the machine stood** or you may return to find a flat battery.

The relay on the battery panel controls the glow plug timing. This is protected by a fuse link where the feed connects onto the battery. This link will melt in the event of a direct short.

NB. It is most important that all wiring connections in the engine compartment and under the bonnet are protected from the corrosive effects of fertilisers and chemicals. All connections should be frequently checked, cleaned if necessary and coated with oil, grease, or any other suitable anti-corrosive lubricant.

Handbrake

The transmission brake is normally adjusted with the cable adjuster at the cab end of the cable. To adjust, firstly chock the wheels and ensure the brake lever is off. Then adjust the nuts on the cable end fitting whilst someone rocks the brake disc for you, until the pad starts to drag on the disc. Then back off a small amount until it clears.

If you run out of adjustment, back off the cable adjustment, unbend the tab on the anti-rotation clip (A) and loosen the screw enough to disengage the lever spline, Rotate the lever one tooth anticlockwise and retighten the screw making sure the spline teeth are properly engaged. Bend up a tab that aligns with one of the screw head flats. Then readjust at the cab end of the cable as above.

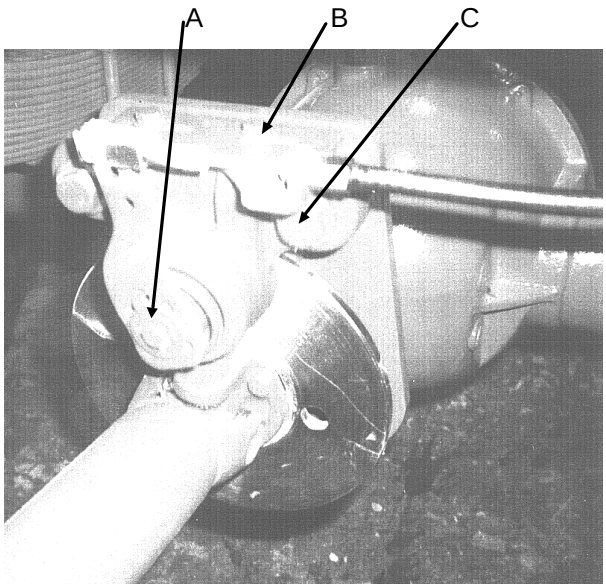
Further adjustment is provided on the slotted cable mounting bracket (B) if required.

It is most important that the calliper assembly is kept clean and well lubricated. **Oil all moving parts regularly particularly when the Agribuggy is being used to spread fertiliser.**

A grease nipple is also fitted into the operating cable approx 300mm up from the brake calliper.

Check the friction pads for wear regularly and replace if necessary. To check for wear, measure the distance from the carrier side casting to the rear of the disc face. This should not be less than 1.5mm.

To replace the pads remove the locknuts from the two main calliper mounting bolts (C), remove the bolts and the calliper assembly. The old pads can then be prised out and replaced with new ones. Reassemble and readjust as above.



Steering.

The steering on the Agribuggy 5D is hydrostatic with the oil supply for the steering unit being taken from the main system. There are therefore no specific oil levels to check.

There are grease nipples on the steering ram ball joints which require greasing periodically.

See appendix 1 for further information on the four wheel steering system.

Steering stop Adjustment

When fitting row crop wheels, for late season work, you may find it necessary to have to adjust the steering stops to stop the wheels fouling the cab. This will almost certainly be the case if you are working on track widths of less than 68".

To adjust the stops, firstly turn the steering until the wheels are just clearing the cab on LH lock and then simply slacken off the lock-nut and screw out the stop till it touches the swivel housing. Repeat for LH lock.

When screwing the stops in, it is important that they are not screwed in further than the original factory settings. This will cause the swivels to over-rotate causing damage to the seals and may also result in damage to the axle drive shafts.

Maintenance

Brakes.

The master cylinder is situated under the cab floor. Top up with ‘Universal’ brake fluid to between maximum and minimum marks on the reservoir.

The linkage from the brake pedal to the master cylinder should be lubricated regularly. There is also a grease nipple on the lower brake linkage pivot shaft.

The brakes on the latest 5Ds are all self adjusting discs and only need to be checked for wear periodically. Have the pads replaced before they get right down to "bare metal".

If you use your Agribuggy to spread a lot of fertiliser, inspect the metal brake pipes regularly for signs of corrosion and replace as and when necessary.

Wheel Bearings

If wheel bearing play is evident adjust as follows:

1. Jack up off floor and fit axle stands.

2. Remove 10 studs securing drive flange and centre cap screw.

3. Fit two M8 setscrews into tapped extractor holes & tighten equally to break seal between flange and hub.

4. Pull off drive flange.

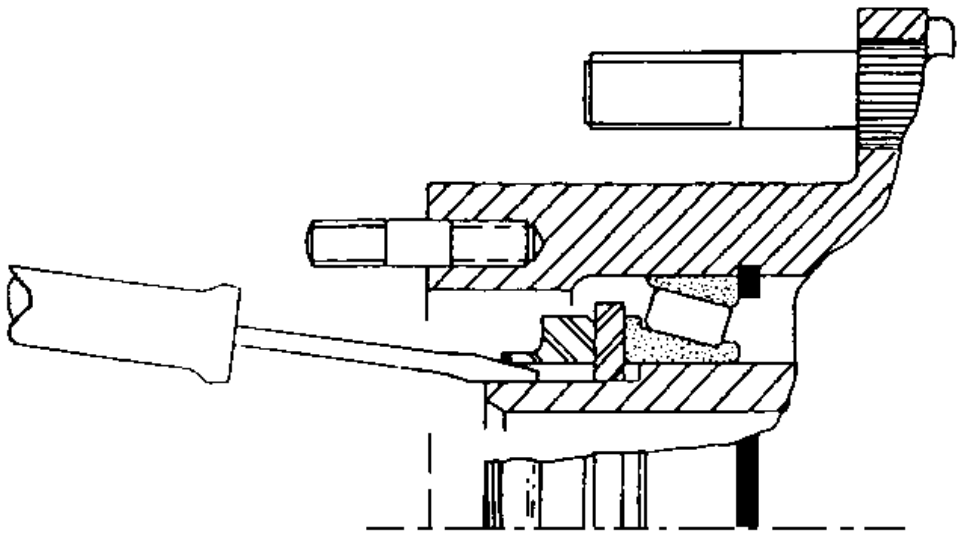
5. Gently tap up locking tab on the bearing locknut (see diagram below) until the tab is level with the top of the thread. **Great care must be taken not to damage the thread or difficulty will be experienced in adjusting the nut.**

6. Tighten the nut to 35 lb ft to preload the bearings and check that wheel spins freely.

8. Rebend the locking tab on the locknut.

9. Repack hub with high-temperature grease (if necessary).

10. Replace drive flange, etc using new gasket or silicone sealant. Tighten securing bolts to 42 lb ft.



Cross section of wheel hub showing lock tab position

Axle Oil levels.

Use SAE 90/140 gear oil for topping up the following oil levels:

Rear axle.

The filler/level plug is situated on the front, nearside of the differential housing just behind the transmission brake. There are two plugs on the housing, the top one of which is the correct level. This plug and can also be used for filling.

Front axle.

The filler/level plugs are situated on the rear, nearside of the differential housing. The top one of the two being the level plug.

Wheel hubs.

All the wheel hubs are packed with a high temperature grease on the 5D axles. The hubs should be repacked when the wheel bearings are adjusted. Some oil from the centre differential housing may also find its way into the rear hubs - please do not be concerned about this (Two wheel steer only).

Greasing.

Grease nipples are located as follows and all nipples should be greased every 50 hrs.

Prop shafts - 2 on each universal joint and 1 on the centre sliding section

Hydraulic pump drive shaft - 1 on each joint and 1 on the centre sliding section

Track rod ends - normally sealed for life but may sometimes be fitted with nipples

Steering ram ball joints - on axle end of ram(s)

Handbrake cable - 1

Footbrake linkage - Underneath RH front corner of chassis

Axle king pins - 4 on front axle (4 also on four wheel steer rear axle)

Axle steering swivels - there are two nipples on each double joint. The easiest way to access them is to jack the front end of the machine (or rear in the case of 4WS units) off the floor and turn the steering into full lock (The steering stops may also need to be screwed right in). The wheel can then be rotated to expose each nipple. A grease gun with a narrow end will be required.

Cleaning.

Great care should be taken in cleaning the machine, particularly after spreading fertiliser. Some types of fertiliser are very corrosive and if not cleaned daily, problems will soon be encountered.

The wiring system is most vulnerable and connections should be checked regularly. The radiator is also susceptible to corrosion and every effort should be made to keep fertiliser out of the radiator core.

After washing off, leave engine running for a while so that the engine compartment dries out.

Some types of fertiliser spreaders are prone to throwing fertiliser forwards or making a lot of dust. If this is the case with your spreader it is advisable to fit a sheet or screen in front of the spreader to stop it getting into the engine compartment.

Coating the chassis with a mixture of oil and diesel, or a proprietary anti-corrosive coating agent, after cleaning, pays dividends if you spread large amounts of fertiliser.

Please remember the warranty does not cover problems caused by corrosion!

Maintenance Schedule.

	Service type (referred to by ICM)	f			a	b	c	d
	Service operation	Daily or every 10 hrs	After first 50 hrs	Every 50 hrs / weekly	Every 150 hrs	Every 300 hrs / 6 mths	Every 600 hrs / yearly	Every 1200 hrs / 2 yrs
1	Check engine oil level and top up if necessary	*	*	*	*	*	*	*
2	Check coolant level and top up if necessary	*	*	*	*	*	*	*
3	Check air filter restriction indicator	*	*	*	*	*	*	*
4	Grease hydraulic pump drive shaft	*	*	*	*	*	*	*
5	Grease prop shafts & axle shafts and check for wear		*	*	*	*	*	*
6	Grease steering joints & check for wear		*	*	*	*	*	*
7	Grease brake pedal linkage		*	*	*	*	*	*
8	Grease transmission brake / cable		*	*	*	*	*	*
9	Lubricate electrical connections		*	*	*	*	*	*
10	Check wheel nuts for tightness	*	*	*	*	*	*	*
11	Check brake fluid level		*	*	*	*	*	*
12	Check hydraulic filter pressure			*	*	*	*	*
13	Check fuel water trap and clean if necessary		*	*	*	*	*	*
14	Drain water from fuel filter				*	*	*	*
15	Check alternator and water pump belt tension & adjust			*	*	*	*	*
16	Change engine oil and filter			*	*	*	*	*
17	Check for oil, fuel & coolant leaks			*	*	*	*	*
18	Check battery water level			*	*	*	*	*
19	Check brake operation and adjust if necessary		*	*	*	*	*	*
20	Clean & lubricate battery terminals				*	*	*	*
21	Clean oil filler cap				*	*	*	*
22	Clean & lubricate transmission brake, check for wear & adjust		*	*	*	*	*	*
23	Check gearbox oil level				*	*	*	*
24	Check all engine, steering box, prop-shaft bolts etc for tightness.			*	*	*	*	*
25	Check condition & security of wiring looms					*	*	*
26	Renew fuel filter element					*	*	*
27	Check engine idling speed & adjust if necessary					*	*	*
28	Visually check for exhaust smoke & system leaks					*	*	*
29	Check all air, oil and water hoses for leakage, damage or deterioration					*	*	*
30	Remove wheels, check brakes for wear and replace pads if necessary					*	*	*
31	Check & adjust wheel bearings					*	*	*
32	Check axle oil levels					*	*	*
33	Drain fuel tank						*	*
34	Check valve clearances & adjust if necessary						*	*
35	Replace cab carbon filter					*	*	*
36	Replace cam shaft drive belt						*	*
37	Drain & replace gearbox oil							*
38	Flush out cooling system & renew coolant							*
39	Change hydraulic oil, replace filter and clean suction element							*
40	Drain brake fluid, replace & re-bleed							*
41	Replace fuel pump drive belt							*

Parts.

All replacement parts are available from T.J. Frazier or your dealer. Some parts may also be available from other local sources. Only genuine replacement parts should be used during the warranty period and we strongly recommend that you do the same after the warranty has expired. If you require any parts information please do not hesitate to contact us.

When ordering parts please quote the Agribuggy model/build no. which can be found on a plate on the front right hand corner of the Agribuggy chassis. E.G. **5D355**

If you are in any doubt about operating or maintaining the machine or fitting any of your own equipment please do not hesitate to contact us.

This instruction book covers all the most important points on operation and servicing of the Agribuggy but, by no means, does it cover everything in full detail. It is updated periodically and we would therefore welcome any suggestions of further information that you would like to see included. We hope to produce a more detailed workshop manual and parts book in the not too distant future.

The manufacturer cannot be held responsible for any accident, injury, or any other occurrence resulting from the incorrect use of the machine or equipment fitted to it.

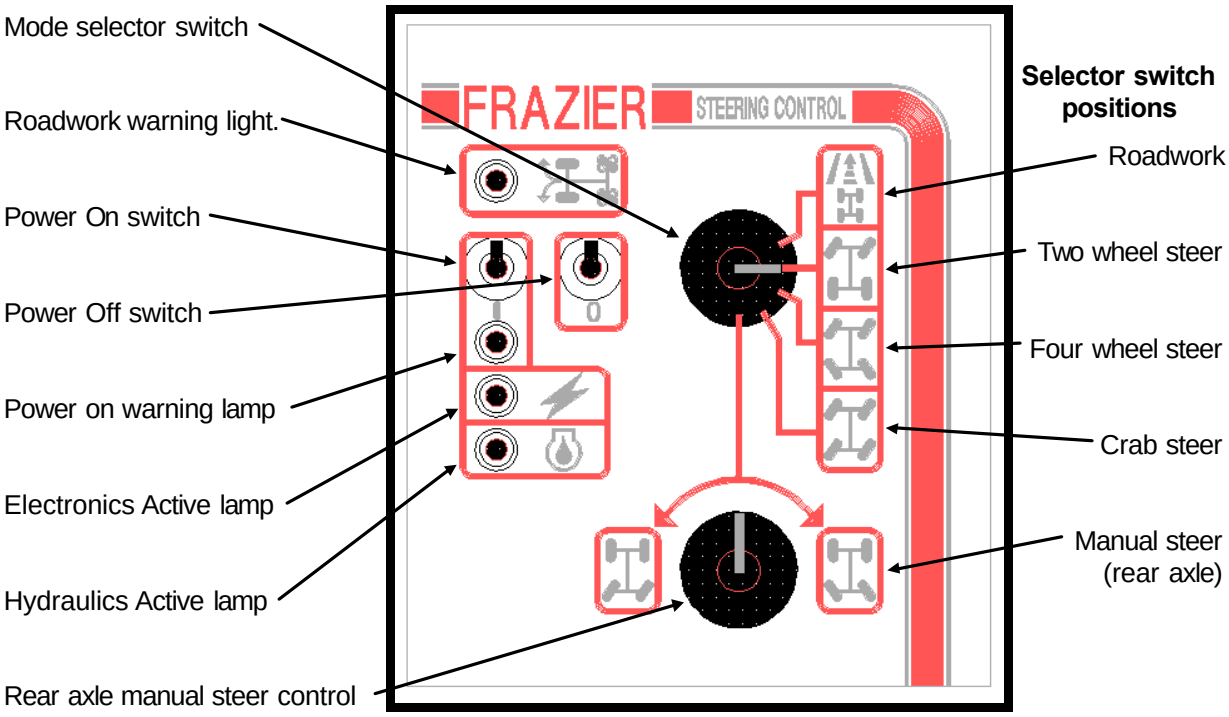
FOUR WHEEL STEERING SYSTEM

The four wheel steer system on the Agribuggy is controlled electronically. Signals from sensors mounted on both axles are continually monitored by the electronic control box and a varying signal is sent from the control to an electro-hydraulic proportional valve which, in turn, directs oil to the steering ram on the rear axle to ensure the rear wheels are always kept in the correct position. The rear wheel position is also continually monitored when in two wheel, crab and manual modes, again, to ensure that the wheels do not "creep" and to keep them in the correct position.

Safety precautions

1. Always ensure the rear wheel area is clear before activating the four wheel steer system.
2. Always switch to the roadwork position for speeds above 12 m.p.h. (20 kph)
3. Do not switch modes when travelling at speed.
4. After using the manual steering mode always return the control to the centre position.

Control panel



Operating

The FWS system should be activated immediately after starting the engine. Ensure the rear wheel area is clear and then press the "Power On" switch on the control box. The Green lamp immediately below the power switch should then light up to show there is power to the box.

The "Electronics Active" and "Hydraulics Active" lamps will also light up as long as the mode selector switch is not in the "Roadwork" position.

All three green lamps must be lit before the electronic control system will function correctly.

Operating modes

Two wheel steer

In *Two Wheel Steer* mode the rear axle position is monitored continually and fine adjustments will be made by the system to ensure the wheels keep straight. All three green lamps must be lit up for this to work correctly. You may switch to this position at any time in the field and the rear wheels will straighten up automatically.

Four wheel steer

In *Four Wheel Steer* mode the rear wheels will always follow the front ones and will give you the tightest turning circle. However, you may find the machine easier to steer down the field if you switch back to *Two Wheel Steer* after turning. You may switch to and from this position at any time in the field and the rear wheels will re-align automatically.

Crab steer

Crab steer may sometimes be useful when manoeuvring in buildings and in tight corners in fields. The rear wheels turn in the same direction as the front ones allowing the machine to move sideways.

Manual steer (rear wheels)

In *Manual Steer* mode the rear wheels can be steered manually and independently of the front ones. When you have switched to *Manual Steer* lift the manual steer knob to unlock it and then rotate in the required direction to steer the rear wheels. This is also useful for manoeuvring in tight corners and may also be useful to offset the rear wheels slightly when working on steep side banks to stop the rear of the machine from slipping downhill. When you have set the rear wheel position the knob should be pushed back down to lock it in position. Before switching back to any other steering mode the rear wheels should be centralised with the manual control and the knob locked in position.

Road work

In the *Roadwork* position the electronics are deactivated for safety and the rear axle will lock. Before switching to this position, allow the rear wheels to straighten up in *Two Wheel Steer.* After a few miles on the road the wheels may tend to "creep". If this happens slow down, switch back to *Two wheel Steer* (which will quickly straighten the rear wheels) and then switch back to *Roadwork* again. An audible alarm and red warning lamp are fitted in the control box which will both activate at speeds above 12 m.p.h. when in any of the other steering modes.

Safety systems

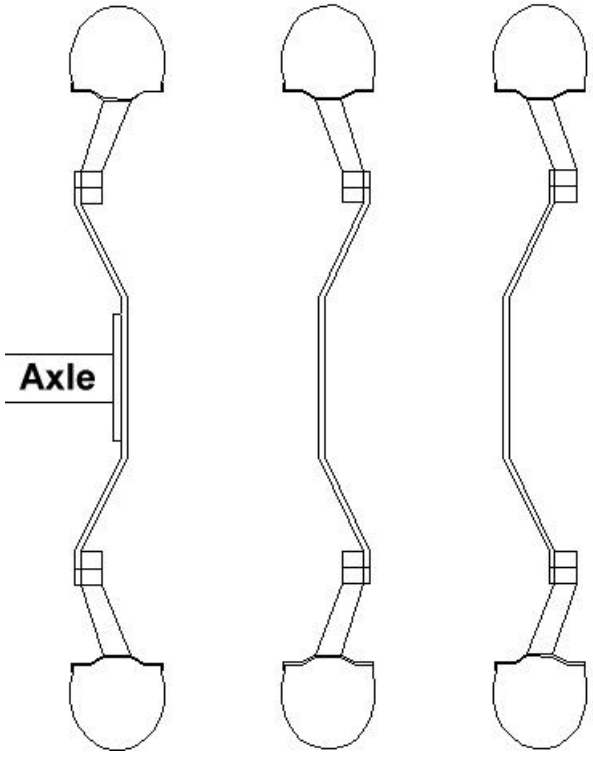
There are two safety systems built into the unit - one in the hydraulic control valve and one in the electronic control box. Should either of the systems detect a fault then one of the green lamps will go out on the control panel and the system will cease operating or ''lock-out''. To reset the system, deactivate it by pushing the "Power Off" switch and then switch back on with "Power On".

The valve safety system will often lock out if the unit is switched on when the engine is not running. This is normal and will reset itself when the engine is started. The control box safety system will lock out if it receives wildly varying signals from each axle - this can happen, for example, if the front steering is operated after engine start-up and before activating the FWS system. If this happens, re-align the front wheels with the rear wheels and then reset the system as above. It will also lock out if sensor wires or sensors are damaged.

Should the system fail completely it can be operated manually to ‘‘get you home’’ as follows: Leave the electronic system switched off after starting the engine and attach the manual lever supplied to the hydraulic control valve. The valve is situated under the rearmost edge of the engine cowling. Operate the lever to centralise the rear wheels. The Agribuggy can then be driven and operated as normal.

You will find, however, that the rear steering will tend to creep out of position after a while and will need further periodic manual realignment until the fault can be rectified.

Row crop wheel settings



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