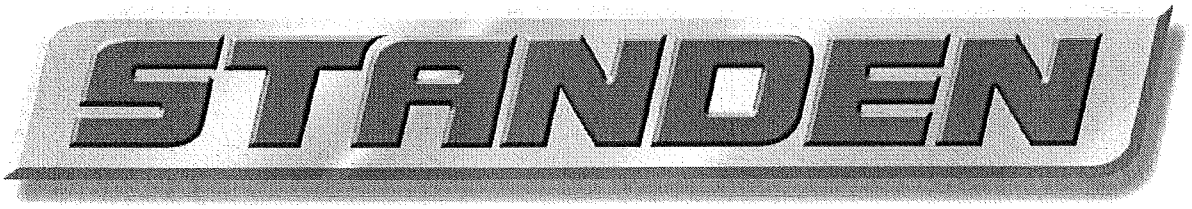


ENTERPRISE

Two Row Potato Harvester

2007-2008

Standen Engineering Limited.
Hereward Works,
Station Road, Ely,
Cambridgeshire.
CB7 4BP
England.

Tel: 01353 661111 www.standen.co.uk Fax: 01353 662370

IMPORTANT

This operators handbook should be regarded as part of the machine. Suppliers of both new and second-hand machines are advised to retain documentary evidence that this handbook was supplied along with the machine.

On installation of the machine (i.e. starting off in the field), the New Machine Installation Record Card should be completed by the dealer/distributor and be countersigned by the customer. The document is proof that the correct procedures have been followed.

The New Machine Installation Record Card should be returned to Standen Engineering Limited within 7 days of installation. Failure to do so may invalidate the machine warranty.

On delivery, check that the machine is as ordered and has not been damaged in transit. Please report any shortfall to your Standen dealer.

The contents of this handbook, although correct at the time of publication, may be subject to alteration by the manufacturers without prior notice.

Standen Engineering Limited operate a policy of continual product development. Therefore, some illustrations and/or text within this publication may differ from your machine.

CONTENTS

1.1 INTRODUCTION

Introduction to the Handbook

This handbook provides the information for the operation, adjustment and maintenance of your Standen Enterprise. To enable you to achieve the best results from the machine, the manufacturer recommends that you read the handbook thoroughly prior to using the machine for the first time.

Record below the details of your machine.

Dealers Name .....

Address .....

.....

Telephone Number .....

Machine Serial Number .....

Date Purchased .....

Date Started Work .....

This symbol indicates important safety messages within this handbook. When you see this symbol, be alert to the possibility of injury to yourself or others and/or damage to the machine and carefully read the message that follows.

Throughout this handbook the terms 'front', 'rear', 'left-hand' (LH) and 'right-hand' (RH) are derived from the tractor driver's position facing forward in the normal direction of travel.

Adjustments to the machine may have to be made singly or in combination according soil conditions. Always allow the machine to settle to a new setting before making further adjustments.

Recommended lubrication and maintenance instructions are included in this handbook and if followed will help to keep the machine in a safe working condition.

Warranty

Should the machine suffer any faults or defects within the warranty period, please contact your dealer. The warranty shall be effective only if the dealer is informed of any such defect as soon as practicable upon discovery.

Replacement Parts

Recommended replacement parts are designed for your machine and have the full backing of the warranty. Only when recommended parts are used can responsibility be considered under the terms of the warranty

Section 3 of this handbook contains a list of spare parts available through your Standen Agents. Each illustration shows a complete unit or assembly in exploded form. Standen's policy of continual product development means that components or even complete assemblies are redesigned from time to time. Where possible the modifications are shown in the remarks column.

The first printing of each page in the spare parts section is identified as issue 1 at the foot of the page. When a complete unit or assembly has been redesigned the appropriate pages are revised and printed as issue 2. The revised pages are filed behind the existing issue so that a complete modification history is gradually built up. When using an illustration and parts list it is essential that both are of the same issue.

Always quote the full serial number of your machine when ordering spare parts.

1.3 SAFETY PRECAUTIONS

Safety

The Standen Enterprise has been designed to comply with current Safety Regulations. However, as with all machinery there will be inherent dangers whilst operating and carrying out maintenance on the machine. The following list of precautions should therefore be brought to the attention of all persons operating and working on the machine. The list is not exhaustive. All machinery is potentially dangerous and the operators must exercise great care at all times. Standen Engineering Limited will not accept liability for damage or injury caused by their products except when such liability is specifically imposed by English statute.

Machine Noise Level

Average continuous noise level at the operator's ear with the machine harvesting crop is 80.75dB (maximum peak level 85.6dB). It should be noted that this level could vary dependant upon tractor/machine combinations.

Operation

The machine must never be operated by untrained personnel or children.

Never allow children or animals in the vicinity where machines are working and never allow anyone to ride on the machine.

Before carrying out any work on the machine, lower the machine to the ground, switch off the tractor engine, apply the handbrake, remove the ignition key and disconnect the PTO shaft.

Never attempt to fit drive chains or drive belts to the machine while the drive sprockets or pulleys are in motion.

Do not work on ground where there is a possibility of overturning or across steep slopes.

Be alert for hidden obstructions. Should the machine hit an obstruction, stop and check for damage before proceeding.

Never set machinery in motion before ensuring that everyone in the vicinity is aware of your intentions.

Never wear loose clothing and always tie back long hair whilst working on the picking area of the machine.

Never operate the machine with the discharge elevator in the folded transport position.

Normal safe working procedures should be adopted at all times. Reduce speed when transporting the machine on sloping ground.

The working area should be kept clear and free of obstructions at all times.

Wear substantial or proper safety footwear. Avoid loose clothing near moving parts. Wear gloves when handling the implement or parts with sharp edges.

The operator must not leave the tractor seat until the machine has been lowered to the ground, the tractor engine switched off, the handbrake applied and the ignition key removed.

Never reverse or turn unless the machine is in the raised position.

All guards and covers must be closed and securely locked before operating he machine.

Inspect the machine on a regular basis and replace damaged or worn parts as necessary.

Inspect the machine for damage after use. Rectify as required.

Never operate the machine in a state of disrepair.

Transport

When in transport, the digger assembly must be locked in the raised position.

When in transport, the discharge elevator must be in the folded transport position.

Only transport the machine at a speed suitable to the prevailing conditions. Be aware of the weight and overall length of the machine at all times.

Maintenance

When left free standing, i.e., not attached to the tractor, the machine must be on level ground.

When working under the machine or if the machine is to be left to stand for any length of time, the digger assembly should be locked in the raised position.

Before working on the machine, all free moving parts should be locked to prevent them moving.

Inspect the hydraulic hoses and fittings for cuts and abrasions. Replace immediately.

The hydraulic system may be under pressure with the machine at rest. Ensure all residual pressure is released before disconnecting any pipework.

Regularly lubricate the machine as per the operator's handbook and check the tightness of all nuts and bolts.

Always use mechanical or additional help when lifting heavy parts.

Safety is the responsibility of the persons working with this machine. Think "safety" at all times. Read and remember the contents of this handbook.

HSE information sheet

HSE
Health & Safety Executive

Safe use of potato harvesters

Agriculture Sheet No 13

Introduction

This information sheet outlines the key dangers common to most potato harvesters. It also lists essential Do's and Don'ts for the safe operation of these machines.

A study of accidents investigated by HSE showed that 11 people were killed and 121 seriously injured when working with potato harvesters between 1988 and 1996.

Five people died and seven were seriously injured when they were run over by potato harvesters.

Ninety-seven people injured arms or legs when caught in haulm or cleaning rollers. These accidents often caused amputations.

All users of potato harvesters need to identify the hazards caused by their harvesters and make sure all those working with these machines know and follow safe working practices to prevent accidents and serious injuries.

Key dangers

Injuries are caused by:

- getting caught in haulm and cleaning rollers;
- harvesters and tractors running over people;
- falling from access ladders and platforms;
- getting caught in conveyors or elevator chains;
- getting caught by the drive mechanisms;
- getting wrapped around the power take-off (PTO) shaft;
- failing to switch off **all** power sources;
- handling bags of potatoes;
- poor working positions causing back strains etc.

SAFETY PRECAUTIONS 1.6

Do's and Don'ts

Do:

- make sure everyone working on the harvester has understood the safety instructions in the handbook;
- provide the operator with clear instructions on the safe way to clean the harvester of haulm, stones, potatoes etc;
- agree a system for communicating between the platform and the tractor driver, eg sound the horn before starting the engine, reversing or engaging drives;
- check that **all** haulm, clod and cleaning rollers are properly guarded. Fit additional guards if anyone can reach the rollers with arms or legs from any position. Manufacturers can help with guard kits;
- fit an alarm or stopping device on the platform;
- make sure you and any of your employees, relief drivers and contractors are properly trained in the safe use of the potato harvester and have read this sheet;
- remember that putting the PTO out of gear will not cut the power to some hydraulically driven components;
- take particular care when reversing; make sure you can see what is behind or seek assistance if the view is obscured;
- stop the tractor engine and pocket the ignition key before you carry out any work on the potato harvester;
- make sure all guards are in position and correctly fitted before starting work;
- **stop the engine before anyone clears a blockage;**
- **stop the tractor before anyone gets on or off the harvester.**

Don't:

- reach into the potato harvester unless all drives are stopped;
- climb over harvesters;
- jump on or off the harvester when it is moving;
- leave the driving position of a moving or running tractor;
- work under box handling attachments without using the supports provided;
- carry out maintenance with the tractor engine running;
- park or carry out maintenance when under or near overhead power lines;
- run the harvester with the guards raised or removed;
- allow children on or near the harvester.

General guidance

Take care when working in difficult conditions or those with weed or haulm problems - don't overload the machine. Remember that avoiding blockages is easier than clearing them. Use drive reversing mechanisms when fitted and encourage the use of conveyor controls to optimise picking conditions.

Make use of relevant training courses such as those run by ATB Landbase, manufacturers and dealers. They will help to ensure the safe and efficient use of your potato harvester.

Further information

HSE priced and free publications are available by mail order from:

HSE Books, PO Box 1999, Sudbury, Suffolk CO10 6FS
Tel: 01787 881165 Fax: 01787 313995.

HSE priced publications are also available from good booksellers.

For other enquiries ring HSE's InfoLine Tel: 0541 545500 or write to HSE's Information Centre, Broad Lane, Sheffield S3 7HQ.

This leaflet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do.

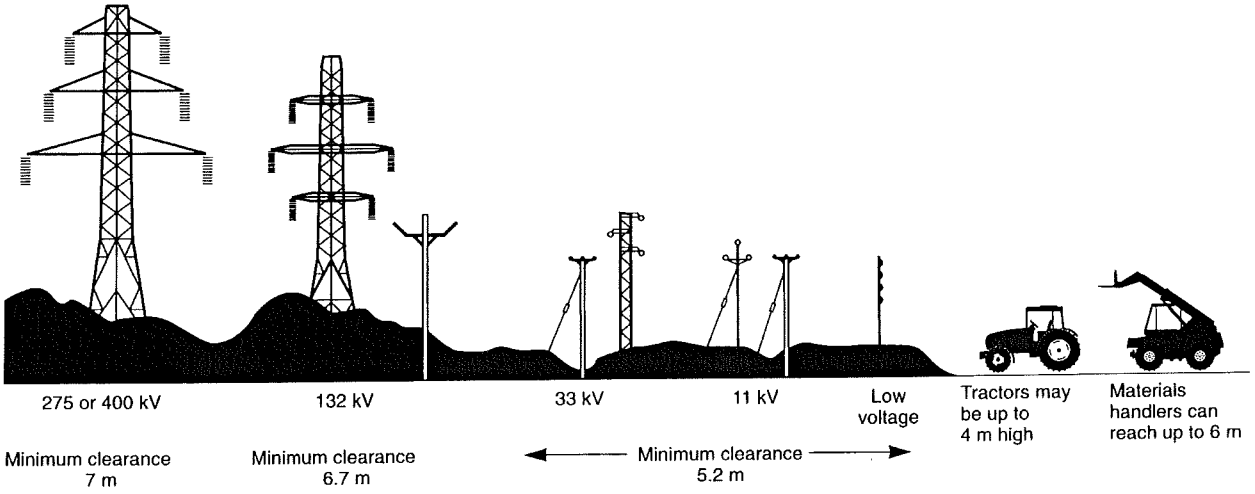
Printed and published by HSE 3/97 AIS13 C50

HSE information sheet

HSE
Health & Safety Executive

Working safely near overhead power lines

Agriculture Information Sheet No 8 (rev)



Be aware of line heights

Introduction

About five people are killed every year in accidents involving overhead power lines during agricultural work. Machinery (eg combines, tipping trailers and loaders); equipment (eg irrigation pipes and ladders); and activities (eg stacking) are often involved. Contact with the lines does not need to be made. Electricity can flash over when machinery or equipment gets close to overhead lines.

Most incidents involve high-voltage lines supported on wooden poles, but the dangers of other power lines cannot be ignored.

This information sheet outlines the steps you can take to reduce the risks when working near overhead power lines. Remember the Electricity at Work Regulations 1989 apply to work activities carried out near power lines.

Planning precautions

Consult your local electricity company. They will provide free information and advice about precautions and safe working procedures which can be followed near power lines.

Find out the maximum height and maximum vertical reach of your machines and those used by contractors.

Find out the routes of **all** overhead lines on your land or near your boundaries. Mark them on the farm map. The electricity company will give you this information.

Make sure you have information about all the lines on your land - if not, contact the owners of those lines.

The farm map can be used as a reference when planning cropping or other work, instructing machine operators and contractors, or buying new equipment.

In cases where there is a significant risk area, it is sensible to discuss the following measures with the electricity company:

- **access**: creating alternative access points and routes - this is often the cheapest option;
- **divert lines**: benefits can arise from burying lines or changing routes - an option particularly suited to farmyards;
- **barriers and goal posts**: by erecting goal posts and barriers, machines which have to pass beneath lines can be limited to a safe height - an option especially suited to gateways and tracks.

Working safely

Key elements of safe systems of work are:

Training

Everybody who works near overhead power lines with a machine or equipment needs to know what the dangers of overhead lines are and the precautions to follow.

Visitors

Contractors are at risk when they work on farms where overhead lines are present. Make sure they know where the lines are and tell them the precautions they need to take. Routes can be marked with safety signs to warn all visitors of the dangers.

Use of machinery

Accidents can be avoided if the following operations are **not** carried out within a horizontal distance of at least 9 m from power lines on wooden poles or at least 15 m of lines on metal towers:

- stacking bales or potato boxes;
- folding sprayer booms;
- tipping trailers or lorries;
- operating materials handlers;
- working on top of combines or other high machinery.

Risks can be reduced by:

- using sprayers with horizontally folding booms;
- taking care not to damage poles and stays;
- making sure machinery can operate safely near any overhead lines;
- fitting shorter radio aerials to high machines so they cannot cause danger;
- carrying irrigation pipes horizontally using two people and not storing pipes near power lines.

EMERGENCY ACTION IN THE EVENT OF AN ACCIDENT

- **Never touch an overhead line - even if it has been brought down by machinery, or has fallen. Never assume lines are dead.**
- **When a machine is in contact with an overhead line, electrocution is possible if anyone touches both the machine and the ground.**
- **If you need to get out to summon help or because of fire, jump out without touching any wires or the machine. Keep away.**
- **Get the electricity company to disconnect the supply. Even if the line appears dead, do not touch it - automatic switching may reconnect the power.**

Further advice

For further advice and information contact your local electricity supply company. You can also get advice from the Farm Energy Centre, National Agricultural Centre, Stoneleigh Park, Warwickshire CV8 2LS (Tel: 01203 696512). To obtain the latest edition of their handbook *Safe use of electricity in farming and horticulture* (FEC 2100: 3rd edition 1992), send them a cheque for £2.50 made payable to Farm Energy Centre.

Further reading

Avoidance of danger from overhead electrical lines GS 6 (rev) HSE Books 1991 ISBN 0 11 885668 5

Farm Electric *The safe use of irrigators and slurry guns near overhead electric power lines* Electricity Association Technology Ltd. Available free from the Farm Energy Centre, National Agricultural Centre, Stoneleigh Park, Warwickshire CV8 2LS

Memorandum of guidance on the Electricity at Work Regulations 1989 HSE Books 1989 ISBN 0 11 883963 2

Management of health and safety at work. Management of Health and Safety at Work Regulations 1992. Approved Code of Practice HSE Books 1992 ISBN 0 7176 0412 8

An HSE video called *Shock horror* is available for purchase or hire from CFL Vision, PO Box 35, Wetherby LS23 7EX (Tel: 01937 541010).

HSE priced and free publications are available by mail order from HSE Books, PO Box 1999, Sudbury, Suffolk CO10 6FS. Tel: 01787 881165 Fax: 01787 313995.

HSE priced publications are also available from good booksellers.

For other enquiries ring HSE's InfoLine Tel: 0541 545500, or write to HSE's Information Centre, Broad Lane, Sheffield S3 7HQ.

HSE home page on the World Wide Web: http://www.open.gov.uk/hse/hsehome.htm

This leaflet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do.

Printed and published by HSE 6/97 AIS 8 (rev) C60

Machine Description

The Enterprise by Standen is a two row tractor drawn potato harvester designed to harvest two rows of potatoes, clean, elevate, and load them into a trailer running alongside. The basic machine is manufactured with a digging width of 1620mm and direct loads the crop with no manning on the machine. Optionally, a manned sorting table allowing up to four pickers can be fitted to the rear of the machine.

Before starting work, check that the machine is in a safe working condition. Check components that could work loose during operation such as wheel nuts, chains, sprockets and share arms etc. These checks are especially important during the first week of work.

Pay attention to the maintenance and lubrication instructions within this handbook and pay particular attention to the safety precautions, they are written as a guide to protect you and others.

Tractor Suitability

The recommended tractor for the Enterprise is four-wheel drive with 100 hp for the basic unmanned machine and 120 hp for the manned machine. These powers may need to be varied to achieve optimum output under different crop conditions, and depending on the specification of the harvester.

The harvester requires a constant hydraulic oil supply from the tractor of a minimum 50 litres/minute with a low back pressure/free return to the tractor. Also required is a 12volt D.C. negative earth power supply rated at 30 amps to feed the electrical control box which is mounted inside the tractor cab. The control box allows the hydraulically and electrically powered functions on the harvester to be operated from the drivers seat while the machine is working.

Should the Enterprise be towed from the tractor clevis hitch then the optional ring hitch spacer must be used to eliminate chop on the clevis pin.

Tractor Wheel Setting

Both the front and rear wheels of the tractor must be set to straddle the bed. This will ensure the wheels run in the centre line of the wheelings. The instructions for adjusting the tractor wheels are given in the tractor manufacturer's handbook.

When carrying out wheel adjustments, always place the jack on firm ground under a solid par of the tractor. Before removing a wheel, place a stout support under the tractor frame in case the jack should become dislodged.

Attaching the Harvester

The operator should have read and understood the tractor operator's manual prior to attaching the machine and putting it to work.

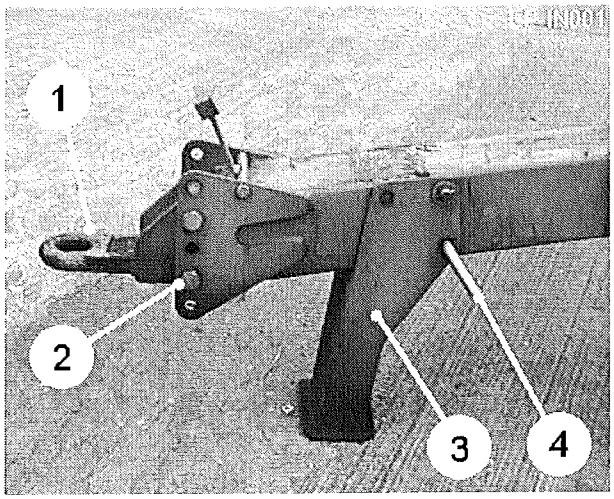


Fig 1

The harvester drawbar is designed to be attached to the pick-up hitch of the tractor. The drawbar eye (item 1, figure 1) is adjustable for height to allow the machine to be set in a level working position. When in work the top of the guard above the Galaxy star unit should be level with the ground. To adjust the eye position, remove the two bolts (item 2, figure 1) and move the eye to the required position. The eye can be turned over to achieve a second range of adjustments. The jack stand (item 3, fig 1) is provided so that the machine is held at a suitable height for safe coupling to the tractor.

Always ensure the stand is positioned on firm, level ground to avoid the machine sinking or sliding whilst stood. Both wheels should be chocked front and rear before removing from tractor.
Do not store the stand separately from the machine. You never know when it will be needed.

When the machine has been securely attached to the tractor, the jack stand can be folded back into the stored position by removing the anchor pin (item 4, fig 1), rotating the stand and then securing it with the anchor pin.

Chassis Height Adjustment

The RH machine levelling ram along with the LH machine support leg allow two operating heights for the chassis. The high position is used with the Proclean separator module fitted, and the low position is used with the Galaxy separator module fitted.

The machine must be connected to the tractor hitch before commencing the chassis height adjustment.

To adjust the chassis height, place chocks at both front and rear of the opposite side wheel to that being adjusted. Using a trolley jack (minimum capacity 2500 kg), jack up one side of the machine using the jacking point under the axle.

When the wheel is clear of the ground, place an axle stand (minimum capacity 2500 kg) under a suitable part of the chassis frame. Adjust the jack until the retaining pin (item 1, figure 3) of the levelling ram/support leg is loose and can be removed. The axle can then be raised or lowered until the hole in the levelling ram/support leg aligns with the required hole and the retaining pin can be replaced. Repeat the operation on the opposite side of the machine ensuring both sides are set to the same position.

PTO Shaft

The machine is designed to operate with the tractors 6 spline, 1 3/8" PTO output shaft.

PTO speeds greater than 540 rpm will cause damage to the system and if exceeded may invalidate the warranty.

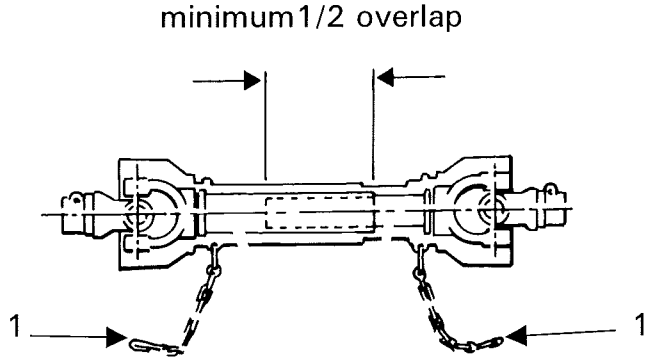


Fig 2

Fit the two halves of the PTO shaft onto their respective drive shafts on the machine and tractor. Check the shaft length by turning the tractor fully in both directions with the machine in its working position while attached to the tractor's pick-up hitch. Ensure the sliding tubes, when fully extended, have an overlap at least half the closed length (see figure 3). Ensure that the ends of the sliding tubes when at the shortest point are not in contact with other parts of the PTO shaft. If necessary, shorten both tubes and guards equally to achieve end clearance at the minimum length position.

Make sure that the drive shaft is fitted correctly and that the lock pins are engaged. All the parts of the PTO shaft, especially the guards, must be kept in good order. Check regularly that the guard is undamaged and fully protects the whole of the shaft, and that both the guard and the shaft will telescope freely.

If it is possible to engage the inner and outer parts of a drive in more than two positions circumferentially then make sure that the universal joint yokes are correctly aligned.

Check that when in the continuous working position, the drive shaft is not at an angle of more than 20° from the PTO centre line. The angle between the drive shaft and the input and output shafts should be equal.
Ensure that the safety chains (item 1, fig 2) used to prevent the guards from turning, are fixed to the tractor and implement in such a way that they will not be stretched when the drive shaft is at maximum articulation. When disconnected from the tractor, position the PTO shaft on the drawbar PTO rest.

Hydraulic Connection

Both feed and return hoses have labels with arrows indicating the direction of oil flow. Connect the return hose to the to the tractor manufacturer's recommended low back-pressure return coupling. Connect the pressure hose to the tractor outlet recommended for constant supply. If in doubt, refer to the tractor handbook. If the flow is adjustable it should be set to supply a minimum 50 litres/minute. The harvester hydraulics will accept up to 80 litres/minute maximum. Consult the tractor manufacturers handbook for details about connecting external equipment to the hydraulic system and hydraulic pump settings.

Electrical Connection

Ensure that all plug and socket connections are clean and coupling pins undamaged before connection, and that they are securely locked together before the power is switched on. Mount the control box securely inside the tractor in a position where it is comfortable to operate when seated. Connect the control box power supply cable directly to the tractor battery or to the tractors highest rated electrical plug if fitted, the blue lead to negative (-) and the brown lead to positive (+).

Do not leave or store the control box outside in the open and always disconnect the control box from the tractor electrical supply when not in use, so avoiding the possibility of draining the battery.

Harvester Wheel Setting

When setting the harvester to particular row widths, the land wheels and digging area of the machine must be adjusted to suit.

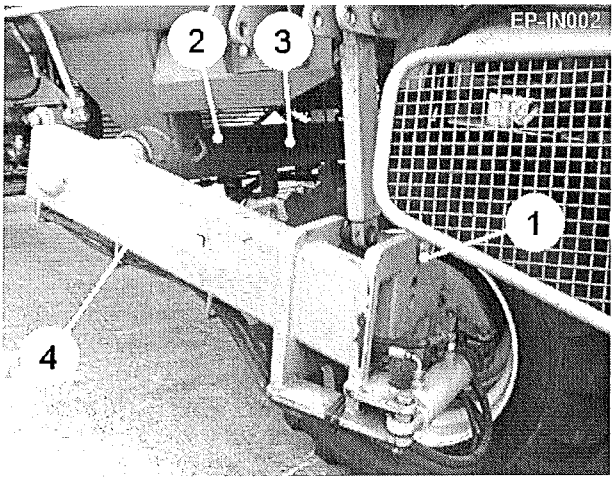


Fig 3

Before commencing axle adjustment, ensure adequate jacks and axle stands of 2500 kg capacity are available, along with suitable wheel chocks.

It is important that the machine is correctly fitted to the tractor and that the tractor handbrake is applied whilst axle adjustments are made.

Place chocks at the front and rear of the opposite side wheel to the one being adjusted. Jack up the machine using the jacking point situated under each axle radius arm. Place an axle stand under the axle beam (item 2, fig 3) and lower the jack to allow the axle stand to take the weight of the machine. Remove the axle beam pin (item 3, fig 3). Slide the axle (item 4, figure 3) to the required position (see figure 4) and replace the pin. Repeat the operation for the opposite side wheel. Both axles must be set correctly even though the RH wheel runs on cleared ground. Ensure linchpins are refitted after adjustments have been completed.

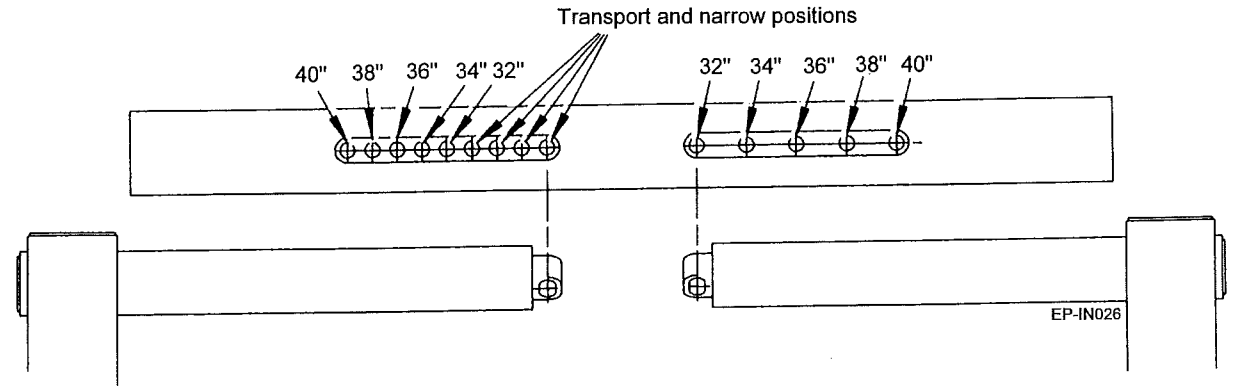


Fig 4

Drawbar

The steerable drawbar is operated by the switch 'Drawbar' right ▲ and left ▼ . The drawbar is used in conjunction with the axle steering to ensure the machine operates parallel to the rows/beds.

Only operate the drawbar when the digger assembly is raised or when the machine is moving otherwise components may be damaged.

Digger Assembly

The digger assembly, which includes the depth wheels, disc coulters, shares and digger web, is controlled by two hydraulic rams which raise and lower the digger assembly in and out of work.

The digger assembly is controlled electronically from the in-cab control box. The 'Digger Share' switch manually raises and lowers the digger web. When set to ▼ the digger is in the float position and will continue to lower until the diablo rollers or shares rest on the ridge. Returning the switch to the neutral position will hold the digger at its present setting. In operation the digging depth is set using the 'Auto Depth' control knob. The set depth can be displayed on the service terminal allowing the operator to adjust the working depth through the field.

The RH digger chassis member is mounted at the rear on a flexible suspension unit (item 1, figure 5). The suspension unit applies some downward pressure and also allows the digger chassis to follow the independent movement of the depth wheels. Pressure adjustment is made by means of the quadrant plate (item 2, figure 5). Rotating the quadrant plate in an anti- clockwise direction will reduce the pressure. Rotating the plate in a clockwise direction will increase the pressure.

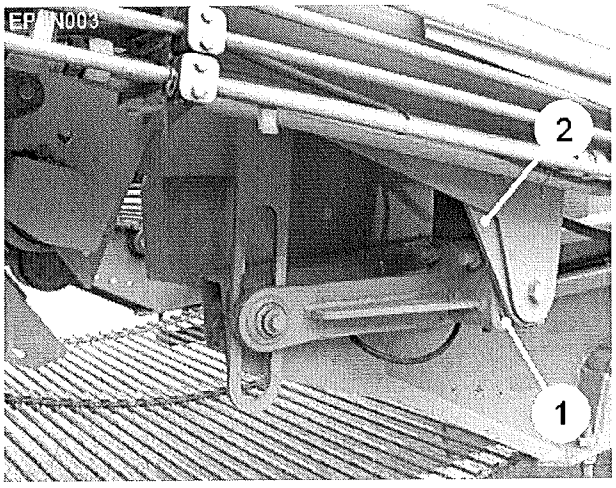


Fig 5

Depth Wheels

A depth wheel (item 1, figure 6) running on each ridge controls the share depth. Rubber torsion springs (item 2, fig 6) in the pivot provide downward pressure. To increase or decrease the amount of pressure exerted by the torsion spring, remove the mounting bolts (item 3, figure 6) in the spring tension bracket and reposition the bracket in either a forward or rearward position. Turning the handle (item 4, fig 6) changes the relationship between the wheel and the trigger plate thus adjusting the working depth.

Row width setting is adjusted by loosening the clamp bolts (item 5, figure 6) and sliding the wheel assembly until positioned centrally over the ridge. Both depth wheels must be equally spaced about the centre line of the machine. The depth wheels are each fitted with a scraper (item 6, fig 6). The scrapers should be set as close to the wheel as possible without fouling them.

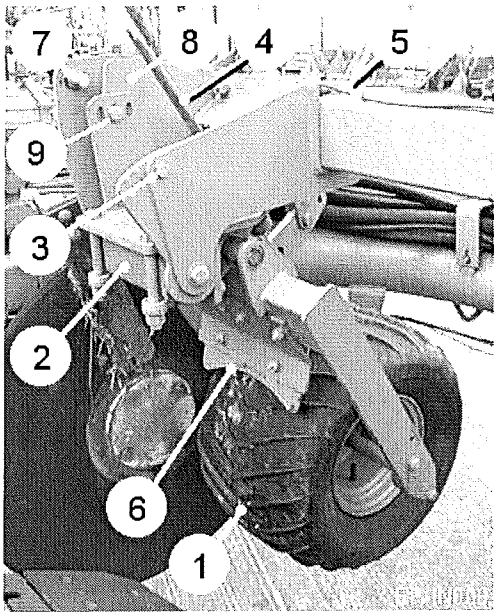


Fig 6

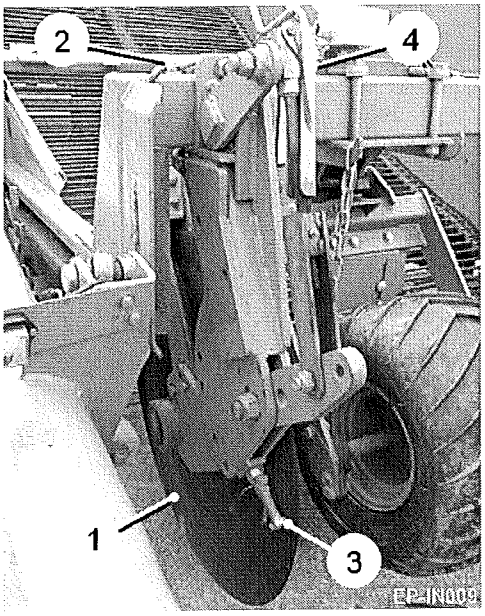


Fig 7

Diablo Rollers (optional)

Diablo rollers can be fitted in place of the depth wheels. The rubber torsion springs allow the weight to be carried off the roller to reduce compaction of the ridge, or for additional pressure to be put on the ridge to consolidate it in light conditions when the flow over the shares is poor. Hydraulically powered diablo rollers are available for use in soil conditions where poor ridge flow over the shares onto the digger web is regularly experienced.

The button starts/stops the diablo roller drive and speed can be varied by turning the control knob clockwise to increase or anticlockwise to decrease speed. Setting the speed of the diablo rollers to run slightly faster than ground speed will induce a positive flow of the ridge onto the shares. Care must be taken not to run the diablo rollers excessively fast as this can cause scuffing to potatoes that are near the top of the ridge.

Automatic Depth Control

Pressing the button brings the automatic depth control into circuit. The 'Digger Share' switch operates the system. Selecting ▲ will manually raise the digger, while selecting ▼ turns on the automatic depth control and the diablo rollers control the depth setting of each digger ram independently. The 'Auto Depth' indicator lights 'L' (left) and 'R' (right) show when the depth control sensors are operating. Time delay for the digger can be set by adjusting the 'Auto Depth' potentiometer.

Share depth is automatically controlled by the proximity sensors (item 7, figure 6). Each roller is adjusted and controlled independently of the other. Fine depth adjustment is made by turning the depth handle (item 4, figure 6).

Turning the handle clockwise will decrease digging depth, whilst turning anti-clockwise will increase digging depth. Larger depth adjustments can be made by repositioning the sensor trigger plate (item 8, figure 6). To adjust the trigger plate, loosen the pivot screw and remove the retaining screw (item 9, figure 6). Rotate the trigger plate to the required position and refit and tighten the screws. Moving the trigger plate forwards increases digging depth, while moving rearwards decreases digging depth. The depth control proximity switches are factory set and in normal circumstances should not require any adjustment.

Disc Coulters

For two row work the harvester is fitted with four disc coulters (item 1, fig 7), and for full width bed work, with two. The disc coulters run on either side of the ridge, cutting and parting the haulm and trash in front of the shares whilst at the same time containing the ridge and feeding it over the shares onto the digger web. The centre discs (if fitted) may need to be set differently to the outer pair which operate where the soil has been compressed by the tractor wheels. The disc coulters are adjustable for depth of work and for different row widths.

To adjust the disc width setting, loosen the clamp bolts (item 2, figure 7) and slide the disc unit to the required position. When correctly set, the discs should be approximately 20mm clear of the edge of the share blades.
Depth adjustment is controlled by the set screw (item 3, figure 7) mounted under each disc arm. Turning the screw clockwise reduces depth and turning anti-clockwise increases depth. Each disc unit is fitted with a torsion block which applies downward pressure to the disc to ensure a clean cut, but allows some movement if the disc should contact an obstacle. Tension adjustment is carried out by turning the handle (item 4, figure 7) clockwise to increase tension and anti-clockwise to decrease tension. The tension should not be set such that the discs act as wheels partially supporting the digger assembly.

Shares

Share pitch adjusters (item 1, figure 8) are fitted to either side of the machine. The points of the share should be kept as high as practical whilst still maintaining adequate digging depth. Lowering the points will assist penetration but may increase risk of crop damage. If the soil has been adequately cultivated this should not be necessary. If the pitch is too steep (points lowered) it can greatly increase the loading or bulldozing effect on the share frame, especially when in hard or tough conditions. Regularly check for soil build-up on the share frame (especially in wet conditions) as a pad of soil at this point will create a considerable braking effect on the digger web. Ensure that the share frame is not in contact with the web bars at this point.

The standard share has two blades per row. Each blade has six mounting holes, of which only three are used at any one time. Row width adjustments are made by using the alternative attachment holes to achieve the required row width (see figure 9).

Several share options are available to suit varying soil and harvesting conditions. The three piece share has stone flaps across the rear of each blade and is used in light fluffy soils which may not flow readily across the share. The two piece share has stone flaps across the rear of each blade and can dig the minimum amount of soil without loss of potatoes. The single piece share option is able to contain flat or wedge shaped stones which may wedge between the blades of other share arrangements. Shares for different crops are also available.

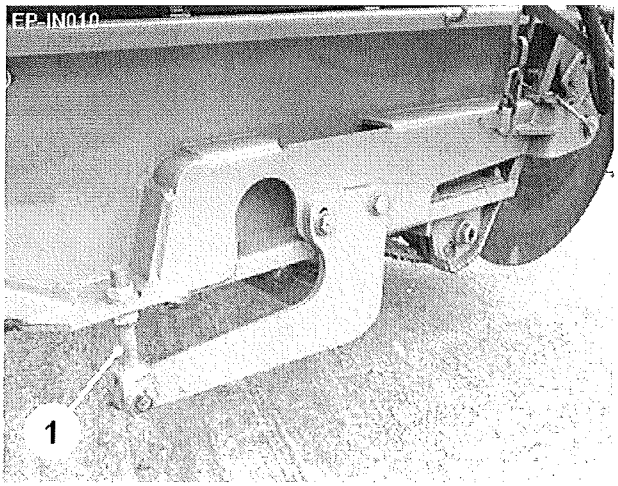


Fig 8

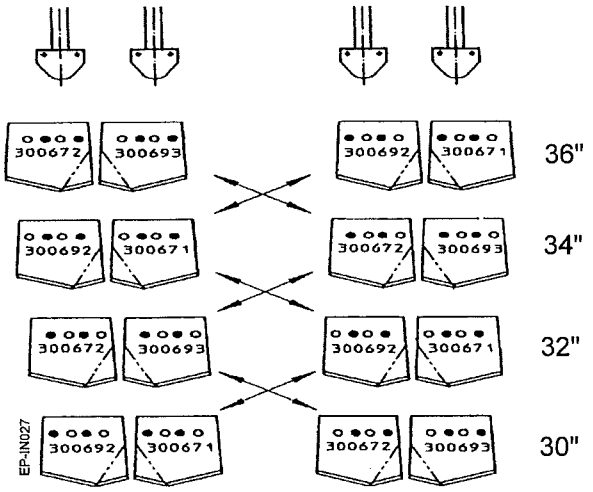


Fig 9

Anti-roll Flaps

The pivoting anti-roll flaps positioned between the discs and web sides and between the two centre discs (if fitted), prevent the crop spilling out of the front of the digging area while at the same time allow material to enter the front of the machine. Different widths are available to suit different row widths.

Haulm Intake Rollers (optional)

Haulm intake rollers are fitted in place of anti-roll flaps in green or difficult haulm conditions. They are fitted for two reasons. The primary reason is to draw in loose haulm and trash from the sides of the ridges and feed it onto the digger web, thus preventing it from building up on the leading edges of the web sides or between the centre disc coulters. The second function is to prevent potatoes from rolling out of the front of the digger web between the discs coulters and the web sides. The tension of the haulm intake rollers can be varied by adjusting the tension spring.

Digger Web

The button starts/stops the digger web and speed can be varied by turning the speed control knob clockwise to increase or anticlockwise to decrease speed. The ideal web speed should take the crop and soil cleanly away from the shares, but be slow enough to avoid excessive crop bounce and roll-back. The speed will be closely related to the degree of agitation used. Web pitches of 28mm, 35mm, 40mm, 45mm and 50mm are available and need to be selected to suit the crop and soil conditions being harvested.

Sweeping Clod Fingers (optional)

The sweeping clod fingers have three functions, firstly to spread the ridge to the full width of the digger web and so maximise the area used for soil separation, secondly to break up the ridge when the soil is solid and start to separate the potatoes from the soil, and thirdly to rub the soil through the web before reaching the agitators.

Hydraulic drive for the sweeping clod fingers is controlled from the in-cab control box.

The button  starts/stops the clod fingers and speed can be varied by accessing the flow parameter on the service terminal. The height of each row of fingers is adjustable. It is not always necessary to set both rows of clod fingers completely down, it is often better to have the second row lower than the first. In heavy green top or rubbish, the clod fingers may cause material to ball up and overload the haulm roller. If this occurs, the fingers should be lifted out of work.

Clod Breaking Fingers (optional)

The clod breaking fingers consist of one or two rows of trailing rubber blocks. These operate by rolling the clods and potatoes which, in some soil conditions, has the effect of splitting the clods and allowing the smaller pieces to fall through the web. To vary their effectiveness the clod fingers can be raised above or lowered down onto the web. Care should be taken not to set the fingers to operate too rigidly onto the web or bruising and skin scuffing may occur.

Agitators

Rotating agitators are fitted inside the digger web. These are designed to separate the soil from the crop as it is elevated up the web.

The button starts/stops the agitators and frequency of agitation can be varied by turning the control knob. The faster the speed the more separation takes place, but also more bruising damage may occur. The amount of agitation necessary will depend on the crop and soil conditions encountered. On light soils care should be taken not to remove too much soil too early as this can lead to crop damage if the entire soil cushion has been removed before reaching the haulm roller.

Control rollers positioned in front of the agitators raise/lower the web relative to the agitator thus controlling the amount of agitation imparted on the crop. To raise/lower the rollers, reposition the roller arm (item 1, figure 10) to align with a different hole. Raising the rollers will reduce agitation. The optional electric actuator (item 2, figure 10) is controlled by the buttons 'Agitation' raise ▲ and lower ▼. The agitator shafts can also be adjusted up and down by repositioning the shaft bearings (item 3, figure 10) into one of three different hole positions.

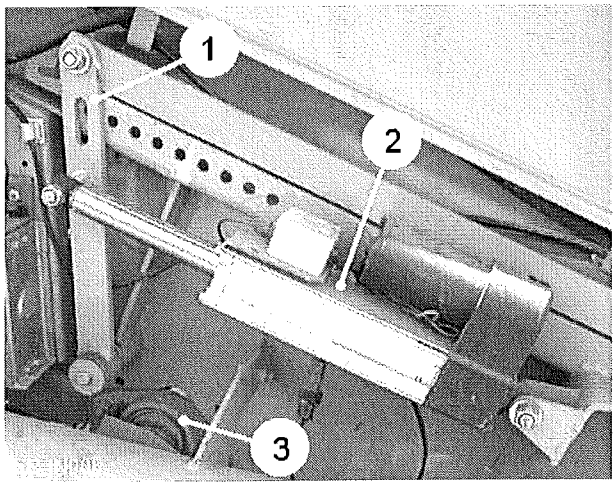


Fig 10

Haulm Roller

Do not attempt to adjust, unblock or open any of the access guards to the haulm roller while the machine is running and never attempt to reach into the haulm roller from below. Always stop the tractor and turn off the engine first.

Due to danger of flying objects, eye protection must be worn when visually monitoring haulm roller performance.

The haulm roller (item 2, figure 13) is designed to pinch the haulm and trash and drop it back onto the ground under the machine. The roller is held in position against the web by spring pressure and the gap between the two is adjustable. A row of haulm guide fingers are mounted above the haulm roller to assist in guiding the haulm into the extraction point.

The over-centre handle (item 1, figure 11) is used to release the spring tension which holds the haulm roller in position against the web. Use the handle to open the rollers if a blockage occurs and also before making adjustments to the roller settings. Always reset the handle before commencing work. To increase the spring tension, adjust the hook bolt (item 1, figure 12).

The over-centre handle (item 1, figure 11) has considerable spring pressure against it. Operate with care.

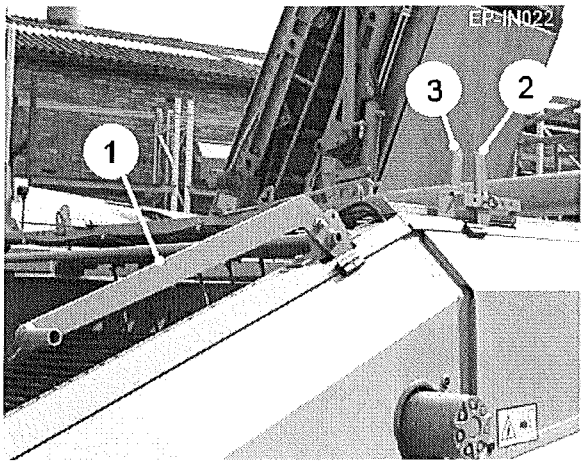


Fig 11

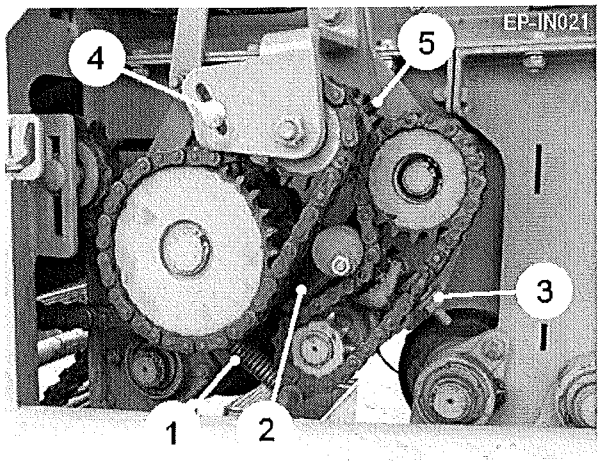


Fig 12

To adjust the gap between the haulm roller and web, release the spring tension using the over-centre handle, and loosen the clamp bolts locking the bump stop (item 2, figure 12). Adjust the setscrew (item 3, figure 12) to achieve the desired new position. A wider setting is likely to remove smaller potatoes. The optimum setting is to have the haulm roller running just clear of the web bars so as to prevent vibration and give maximum grip to extract haulm. Adjust both sides equally ensuring the roller remains parallel to the web and retighten all bolts. Finally, reset the over-centre handle.

Haulm roller height settings are a compromise between haulm extraction and potato loss. In green, immature haulm it is usually best to set the roller low, with the haulm fingers in a high position and allow the bulk of he haulm to pass over the roller and let the trailing end drop onto the roller, which is then dragged back and extracted. At this stage of crop maturity the potatoes are comparatively small and tender, hence the need for the roller to be set low. When the haulm is more mature, and the potatoes somewhat larger, the roller should be raised and the haulm fingers set lower. This means the haulm will be fed directly into the roller and extracted. The potatoes should, at this stage of maturity, be large enough to pass over the roller without damage.

The vertical position of the haulm roller in relation to the web can be adjusted into one of five positions by means of the levers (item 2, figure 11) at either end of the roller. Before adjustment, the nylon chain jockey (item 4, figure 12) mounted on the LH handle must be loosened off. Remove the 'R' clip and pin and reposition the levers. Refit the pins and clips and reset the chain jockey. The haulm roller is fitted with a scraper. Set the scraper as close to the roller as possible without actually fouling it.

For some types of crop it is advantageous to reverse the direction of rotation of the haulm roller. This is achieved by replacing the gear drive (item 5, figure 12) with a chain and sprockets.

Haulm Fingers

The angle of the haulm finger assembly (item 2, figure 13) can be adjusted using the lever (item 3, figure 11). With the lever in the forward position the fingers are lifted out of work. Adjustment should be made so the fingers are lowered sufficiently to guide the haulm into the haulm roller without interfering with crop flow.

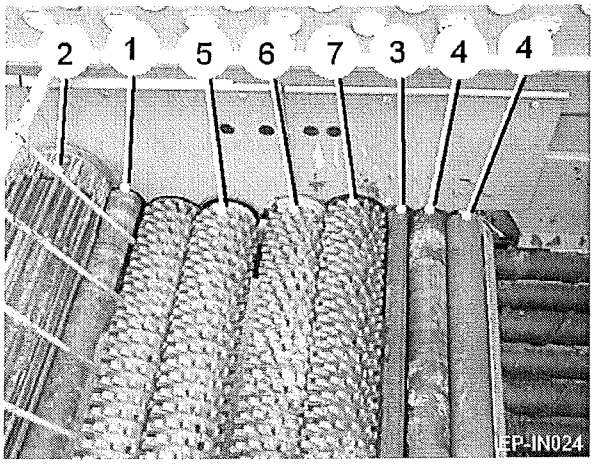


Fig 13

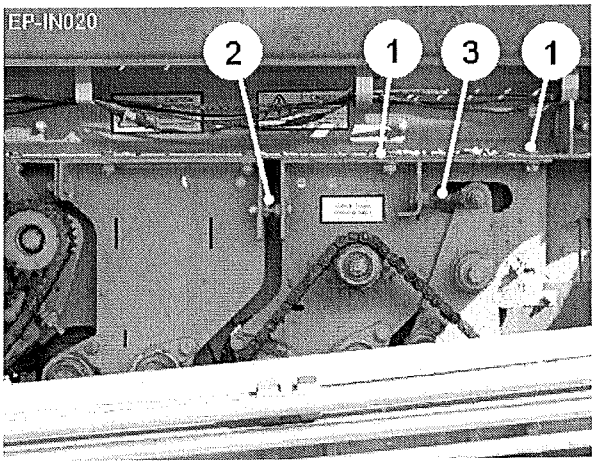


Fig 14

Starflow

The Starflow unit comprises of two pairs of star shafts followed by a clod roller (item 3, figure 13) and two transfer rollers (item 4, figure 13). The button 'Stars' starts/stops the unit.
Operating speed can be adjusted from the control box display terminal. Star shafts are fitted with 14 finger stars as standard. 18 finger stars can be fitted when working with small crops.

The gap between the 2nd star shaft (item 5, figure 13) and 3rd star shaft (item 6, figure 13) can be adjusted so that the amount of separation can be set to suit crop conditions. To adjust, loosen the mounting bolts (item 1, figure 14) and adjust the screws (item 2, figure 14). Ensure the gap is set evenly on both sides of the machine. The gap between the 4th star shaft (item 7, figure 13) and the clod roller (item 3, figure 13) can be adjusted to make the clod roller more aggressive. To adjust, reposition the adjuster (item 3, figure 14). Ensure both sides are adjusted evenly. Three different shaped clod rollers are available, round, hexagonal, and square. The shape of the clod roller affects the level of extraction. The round roller is the least aggressive, while the square roller is the most aggressive. Scrapers fitted to both the clod roller and the transfer rollers should be set as close as possible to the rollers without actually touching them.

For some types of crop it is advantageous to reverse the direction of rotation of the clod roller (item 3, figure 13). This is achieved by replacing the gear drive with a chain and sprockets.

Galaxy Star Separator

The Galaxy stone and clod separator consists of four rows of composite stars and two contra-rotating clod rollers.
The control box button 'Table/Stars' starts/stops the unit and operating speed can varied by turning the control knob. Star shafts are fitted with 14 finger stars as standard. 18 finger stars can be fitted when working with small crops. To accommodate varying soil and crop conditions and alternative clod roller shapes, the gap between the clod rollers and the stars can be adjusted.

Do not attempt to carry out any maintenance, adjustments or remove any blockages from the clod roller unit while the machine is running and never attempt to reach in from below. Always stop the tractor and turn off the engine first.

The steel clod rollers can be adjusted for height in relation to the star shafts. Both rollers are linked together and are adjusted as one unit. Adjustment is made by turning the handles either side on the front of the module. Turning clockwise lowers the rollers, whilst turning anti-clockwise will raise the rollers relative to the stars. Always make adjustments evenly on both sides of the machine. Under normal conditions, the optimum position is when the top of the roller is level with the centre-line of the row of stars in front of it. If raised higher the roller will take out more material, but may also take out small potatoes. Lowering the roller below the optimum position will allow clods to pass over the rollers without being extracted. Adjustment of the rollers is very sensitive. Adjust a little at a time, allow the machine to settle, and then judge the results. Three different shaped clod rollers are available, round, hexagonal, and square. The shape of the clod roller affects the level of extraction. The round roller is the least aggressive, while the square roller is the most aggressive.

Scrapers are fitted beneath each clod roller and should be set as close as possible to the roller periphery without actually touching them.

For some types of crop it is advantageous to reverse the direction of rotation of the clod rollers. This is achieved by re-routing the clod roller drive chain inside the RH drive box (see figure 15).

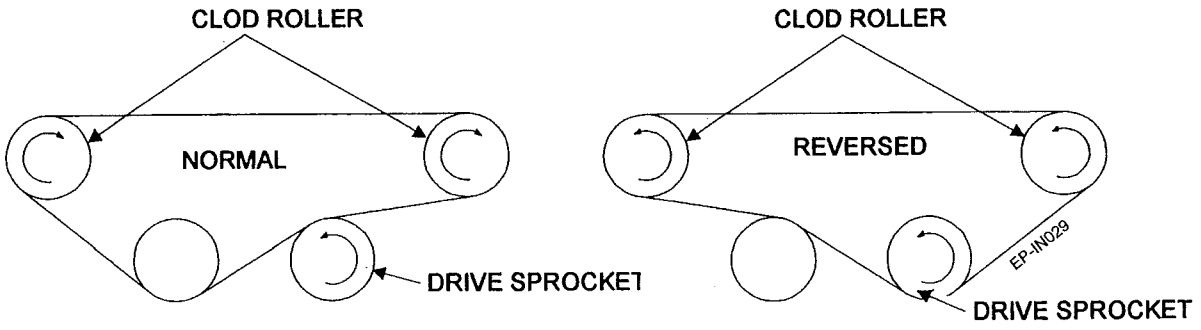


Fig 15

Proclean Separator

The Proclean stone and clod separator module has nine pairs of contra-rotating rollers (item 1, figure 16). Two hydraulic motors running in parallel drive the unit and are able to automatically reverse to clear blockages. Control for the unit is supplied electronically from the in-cab control box.

The controls consist of: 'Cleaner' angle increase, decrease, start/stop, manual 'Reverse', and speed control. The 'Reverse' button starts the roller reverse sequence allowing stones and trash seen by the operator to be ejected before a blockage occurs.

All guards must be in place when the cleaner unit is in operation. Never attempt to clear any blockage from above or below the rollers unless the machine has been stopped and the tractor engine has been switched off.

During the course of the days work, especially in wet conditions, the top of the Proclean gearbox should be checked regularly to keep it clear of soil.

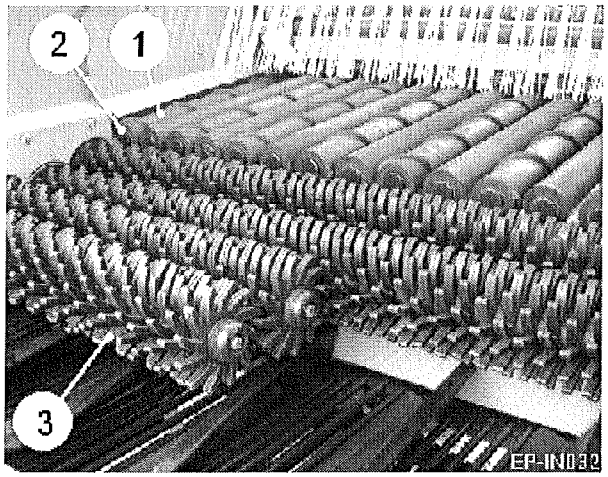


Fig 16

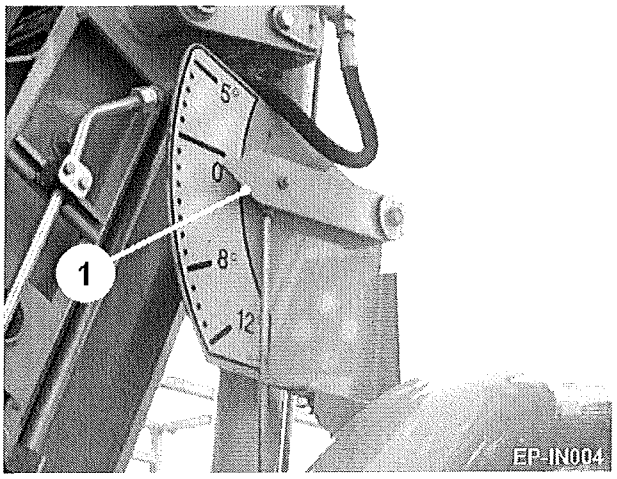


Fig 17

Roller Angle

The steeper the angle of the unit, the quicker the crop flows over it and the less time it has to be cleaned. An optional auto angle unit can be fitted to maintain a pre-set angle on the cleaner when working on undulating ground. The auto angle unit is activated by pressing the button . The angle of the unit is shown by the indicator (item 1, figure 17).

On manned machines, the rear control box roller angle buttons will not operate until the main control box auto angle button is pressed.

Roller Speed

By increasing the roller speed, the crop is accelerated across the table by the scrolled rollers while the heavier soil and stones settle and are pulled through. Slowing the rollers down holds the crop on the table longer allowing more cleaning to take place. It will be necessary to determine the optimum speed and angle of the table to suit the crop being harvested. Variations in crop and soil conditions will change the effectiveness of the table.

Roller Sizes
Various sizes of plain rubber rollers are available. The large diameter plain rollers in conjunction with small diameter spiral rollers will normally be used where tuber size is small and in dry soil conditions. The small diameter plain rollers in conjunction with large diameter spiral rollers are generally used on main crop and where soil conditions are wetter and heavier. However, there is a cross over in the use of the alternative rollers. By varying the angle of the table and the roller speed, the operator will often find an acceptable sample can be achieved without changing rollers. Intermediate gaps can be obtained by selecting alternative combinations of rollers.

Changing Rollers
Remove the four bolts supporting the rear guard. Disconnect the linear actuator from under the unit, raise the module and adequately support it. Prise out the plastic end cap (item 2, figure 16) from the roller to be changed. Remove the roller retaining screw and washers. Slide the roller off the shaft. The rollers are a close fit and may need to be prised off or bumped free. Apply a smear of grease to the drive shaft and slide on the new roller. refit the screw and washers. Finally, refit the rear guard panel.

Roller Scrapers
Scrapers mounted below each plain roller prevent excessive build up of soil and trash damaging or stalling the cleaner unit. To adjust the scrapers, slacken the mounting bolts and slide the scraper blade up until it is 2-3mm clear of the roller.

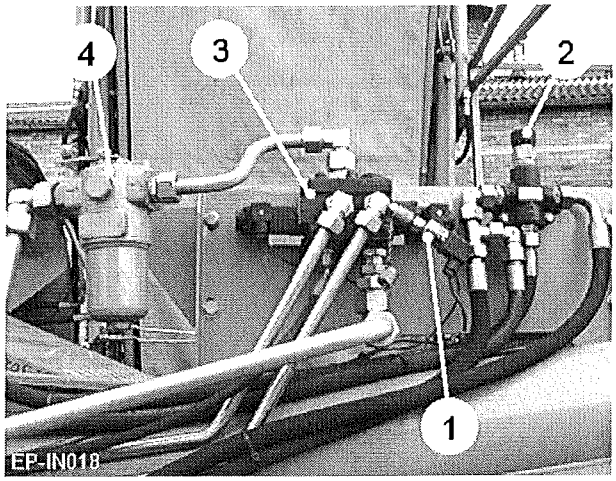


Fig 18

Proclean Separator Reverse Pressure

During varying harvesting conditions it may be found necessary to change the pressure at which the unit reverses. The automatic reverse control is operated by a pressure transducer (item 1, fig 18) that senses the operating pressure, and is monitored by the Can-Bus processor. The reverse pressure is set on the control box display screen. Increase/decrease the reverse pressure in small steps until the required operation is achieved. The operating pressure can be checked in work via the service terminal diagnostic programme.

Spreader Unit

The spreader unit (item 3, figure 16) is made up of full width and part width star shafts. In a direct loading machine, as the crop passes off the Proclean/Galaxy unit onto the elevator web it first passes over the spreader unit. The spreader is designed to distribute the crop evenly over the full width of the elevator.

The button marked 'Spreader/Table' will start/stop the spreader independently of the elevator web. Speed can be varied by adjusting the flow control valve (item 2, figure 18).

Discharge Elevator

The hydraulically driven discharge elevator is designed to fold within the width of the machine for transport and open out of work when loading potatoes into a trailer running alongside. Folding and unfolding is controlled by the control box joystick. Fold in ◄ and fold out ►, operates the bottom section which is primarily used to set the working height and reach. Raise ▲ and lower ▼, operates the top section which adjusts the discharge height of the crop into the trailer and allows for even loading. Normally the inclined bottom section should be fully extended while in work, but it is possible to pull this in a little to suit the position of the trailer while opening out a new plot. Always work with the top section as low as possible in relation to the potatoes in the trailer to minimise drop.

The optional auto height sensor (if fitted) is activated by pressing the button 'Auto Height' .

Note: The auto height sensor is turned off automatically if any of the elevator fold functions are operated.

The speed of the discharge web is controlled electronically by the speed control knob. Adjust the speed of the elevator according to the volume of crop being handled. Excess speed will tend to throw the potatoes too hard into the trailer causing crop damage.

The button 'Discharge' starts/stops all the elements of the rear section of the harvester. With the 'Spreader/Table' button on, the button 'Elevator' starts/stops the elevator web only.

On machines fitted with a picking table, the button 'Spreader/Table' starts/ stops the manned elements of the machine. Because the tractor oil supply is used to power the discharge elevator, the maximum speed of the web will depend on the hydraulic flow from the tractor and may be subject to slight fluctuation when ram services are operated. If ram services are taken to relief (dead headed) the elevator will stop while the tractor relief valve is blowing.

Windrow Attachment

An optional windrow attachment can be fitted to the harvester that allows the crop to be discharged between the two unlifted rows on the left hand side of the machine. This can be used when waiting for, or changing over trailers so that continuous harvesting can take place.

The button 'Windrow' reverses the elevator drive to discharge the crop on the left hand side of the machine.

Easi-pick Table

The Easi-pick Table is a small picking off unit capable of carrying 2 pickers. The unit comprises of a belt from which two pickers sort through the crop, and a chute which returns the crop to the discharge elevator.

The control box button 'Spreader/Table' starts/stops the manned elements of the machine. The speed of the picking belt can be varied to suit crop conditions by adjusting the flow control valve (item 2, figure 18). Tension and tracking of the picking off belt (item 1, figure 19) is provided by roller adjusters (item 2, figure 19). Ensure both sides are adjusted evenly so that the belt tracks correctly. The drive chain is fitted on the LH side of the table and is tensioned by an idler sprocket. Adjust the chain tension by loosening the clamp bolt and sliding the idler in its slot.

Care must be taken at all times when working on moving machinery. Never wear loose clothing and always tie back long hair. People working on the harvester must be made aware of the tractor driver's intentions.

The emergency stop buttons positioned above the picking belt, when activated, shut down all hydraulic drives and electrical controls.

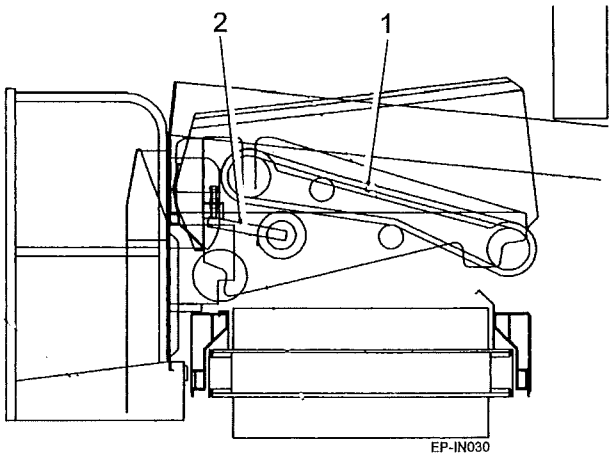


Fig 19

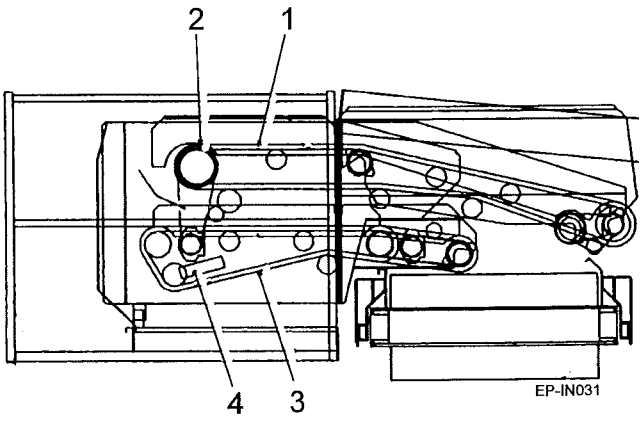


Fig 20

In-line Table

The in-line table is a picking off unit capable of carrying 4 pickers. It comprises of a top belt from which the pickers sort through the crop, and a bottom belt which returns the crop to the discharge elevator.

The control box button 'Spreader/Table' starts/stops the manned elements of the machine. The speed of the picking belt can be varied to suit crop conditions by adjusting the flow control valve (item 2, figure 18).

Adjustment of the top belt (item 1, figure 20) is by adjusting the rear rollers (Item 2, figure 20). Adjustment of the bottom web (item 3, figure 20) is by the web adjusters (item 4, figure 20) on each side of the table. Ensure that the webs are tensioned evenly on both sides of the table. The drive chain is fitted on the LH side of the table and is tensioned by an idler sprocket. Adjust the chain tension by loosening the clamp bolt and sliding the idler in its slot.

Rear Axle

The rear axle is fitted with steerable wheels with the RH wheel linked to the chassis by a hydraulic ram (item 1, figure 21) which allows the harvester to be levelled relative to the ground. Control of the steering and levelling is from the in-cab control box. The joystick 'Axle Level ' raise ▲ and lower ▼ operates the levelling ram.

Ensure the transport lock valve (item 2, figure 21) fitted to the levelling ram is open before operating.

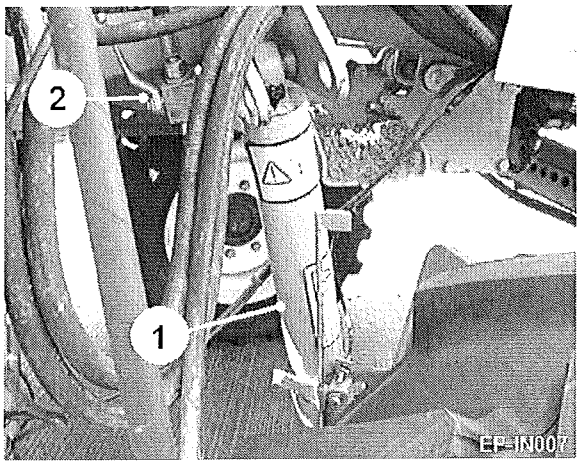


Fig 21

The levelling ram is used to maintain a level attitude when working on slopes thus ensuring an even spread of crop across the full width of the machine. Optional automatic levelling can be fitted to maintain side-to-side 'horizon' level when operating on undulating ground. The automatic levelling is activated by the button 'Axle Level'.

The joystick 'Axle Steer' right ▲ and left ▼ steer the rear of the machine in the indicated direction. During work the steering is used to keep the machine correctly in the rows, especially on slopes where if the wheel is allowed to run on or against the ridge the crop may be damaged.

The auto centre button operates the self-centring circuit to automatically set the wheels to the straight-ahead position.

The rear axle steering is used in conjunction with the steerable drawbar to ensure the machine operates parallel to the rows/beds.

Powered Axle

The optional hydraulic powered axle is designed to provide additional traction during work. The powered axle is capable of transferring up to 45 hp from the tractor PTO to hydraulically drive the harvester wheels giving a maximum speed of 5.5 kmh (3.5 mph). This is achieved by means of an additional load sensing, pressure compensated, variable displacement pump which provides the hydraulic oil flow to drive the wheel motors.

Ensure the wheel motor casings (item 1, fig 24) are filled with hydraulic oil before starting. Failure to do so may cause premature failure of the motor.

The wheels can be set to forward ◄, neutral or reverse ► by operating the 3-way 'Axle Drive' switch on the control box. When forward or reverse is selected the directional control valve (item 1, figure 22) behind the valve mounting plate demands oil flow from the pump to provide the necessary flow required to match the harvester wheel speed to the tractor speed. When the flow matches, the pressure compensator within the pump maintains a constant pressure in the hydraulic system which is set on the external pressure control valve (item 2, fig 22). This valve allows a low operating pressure to be set which is adjustable to give the required drive assistance for normal harvesting. The forward drive can be matched to the tractor by using the speed control knob. Turn the control fully up and then, while in work, turn the knob down until the pressure gauge shows a steady reading. When the high pressure button ⊕ is pressed, the system operating pressure is increased to the setting of the main compensator within the pump.

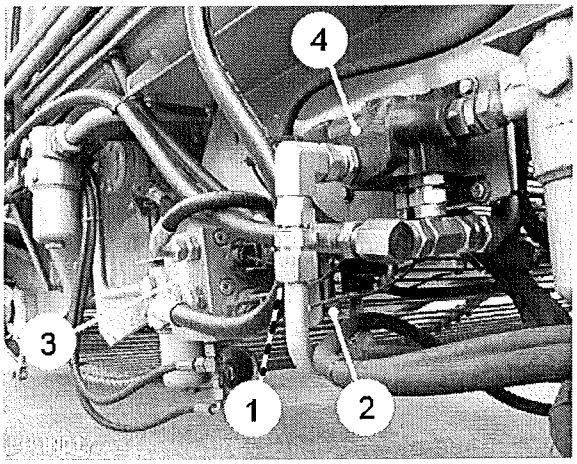


Fig 22

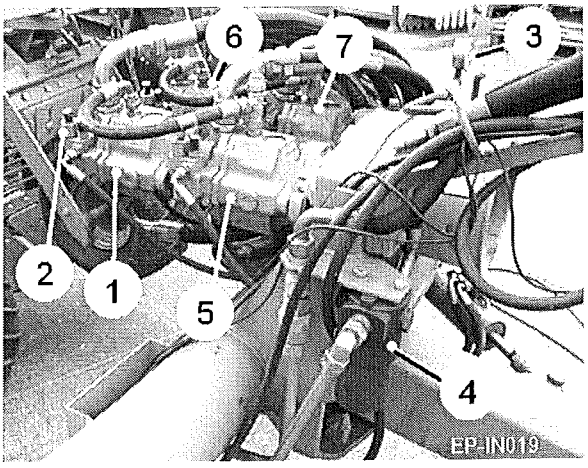


Fig 23

The powered axle pump (item 1, fig 23) is mounted to a double outlet splitter gearbox. Maximum pump output at 540 rpm PTO speed is 75-80 litres/minute with the axle in drive. This can be checked by fitting a flow meter between the pump outlet and the pressure hose and then running the powered axle with both wheels clear of the ground.

Oil feed to the pump is through the RH suction filter mounted in the front of the hydraulic tank.

Always ensure the suction filter knobs (item 3, fig 26) are wound fully in clockwise before operating the harvester.

The system pressure is controlled by the pump relief valve (item 2, fig 23) which is pre-set at 200 bar. It may be necessary to adjust the system pressure if the harvester is trying to push the tractor. One turn anti-clockwise will reduce the relief valve pressure setting by approximately 25 bar. The pressure can be monitored on the pressure gauge (item 3, figure 23) while allowing the harvester to push against a braked tractor.

The pressure relief valve setting should never exceed 200 bar.

Each wheel motor is fitted with a grease ring (item 3, figure 24). To prevent the ingress of dirt and dust pack the ring with grease daily using the two grease nipples.

Bleeding / Filling Wheel Motors

Place the motor (item 1, fig 24) in a position in which one of the bleed screws (item 2, fig 24) is topmost. Remove the bleed screw and pour in hydraulic oil until all trapped air has been eliminated. Refit the bleed screw and repeat for the second motor. Run the motors unloaded. Finally, operate the motors under load and check for leaks and extraneous noise.

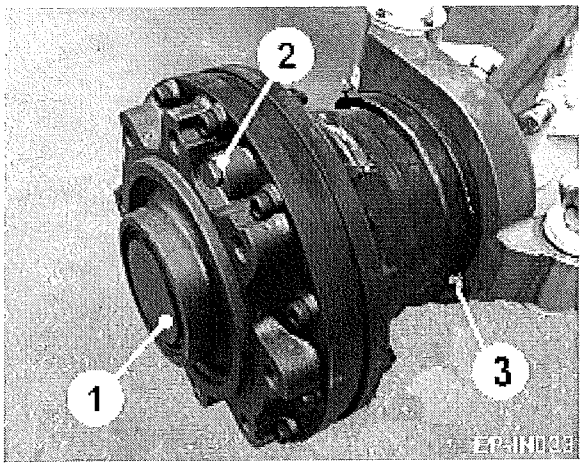


Fig 24

Hydraulic Systems

Two separate hydraulic systems are fitted to the harvester. The hydraulic rams, discharge elevator, spreader or picking table are powered from the tractor external supply. The webs and the other hydraulically driven elements on the machine are supplied from the PTO driven pumps and the onboard oil supply. The only connection between the two hydraulic systems is the electrical control system.

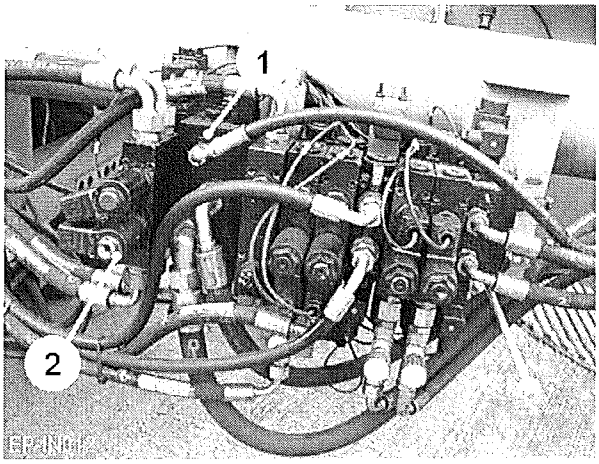


Fig 25

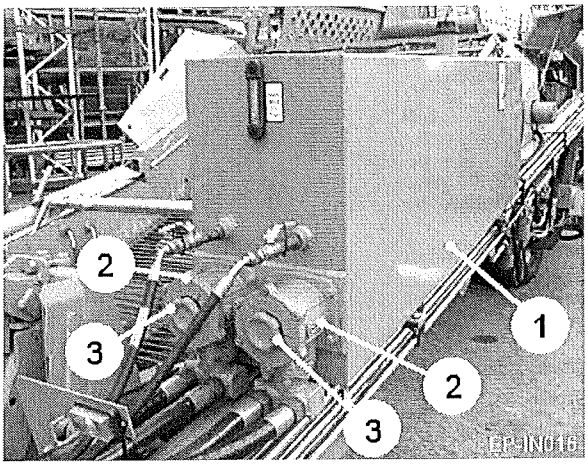


Fig 26

Circuit 1 – Auxiliary Hydraulics

The hydraulic ram services and discharge elevator drives are supplied with hydraulic oil from the tractor. A minimum supply of 40 litres/minute is fed through the pressure filter (item 4, fig 23) into the flow divider section of the auxiliary valve bank (item 1, fig 25). The system will accept up to 70 litres/minute maximum. The valves for the digger lift rams, elevator swan neck and cleaner lift are proportionally controlled from the electrical system. The proportional valve (item 2, fig 25) which controls the discharge web and spreader motors has priority over the ram service valves. The flow rate through each ram service valve is controlled by the spool size and the individual flow settings. The return oil flow from the valves and motors recombines and is returned to the tractor, ideally through a low back pressure or free-flow return coupling. No separate relief valve is fitted to the circuit, the system relies totally on the tractor relief valve. The valve block is capable of operation with open, closed centre or load sensed tractor systems.

PTO Powered Hydraulic Circuits

Depending on the specification of the machine, three or four hydraulic pumps are mounted on the PTO splitter gearbox. Oil for these pumps is supplied from the harvester oil tank (item 1, figure 26). All the pumps are fed through the two oil tank suction filters (item 2, figure 26) and feed to the valves through pressure filters.

When the machine is in use, the suction filter knobs (item 3, figure 26) must be wound fully in clockwise at all times.

Circuit 2

The RH front pump (item 5, fig 23) feeds the secondary circuit. The circuit has either a two, three or four section valve (item 3, figure 22) depending on machine specification mounted on the LH side of the machine. The first section of this valve block feeds the star separator module, and the second section feeds the agitators. Both of these sections are switched on/off from the control box.

Circuit 3
The LH rear pump (item 6, fig 23) feeds either the Proclean or Galaxy separator unit. From the pump the feed is into the valve (item 3, figure 18). The forward speed is proportionally controlled from the control box to give speed adjustment. On/off control is on the control box, and also a manual reverse which allows the operator to reverse the rollers to eject a blockage. Connected into the cleaner forward feed is a pressure transducer which monitors the working pressure of the cleaner, and triggers the valve to reverse the cleaner if a blockage causes too high a pressure. This set pressure can be set on the display screen. From the diagnostic menu, it is possible to read the actual working pressure of the circuit.

Circuit 4
The LH front pump (item 7, fig 23) powers the digger web. From the pump the feed is into the valve (item 4, figure 22). On/off, and proportional speed control are from the control box. Digger web speed should be adjusted to give a consistent crop take-away from the shares.

Circuit 5
When fitted, the RH rear pump (item 1, fig 23) is used to supply the power driven axle. The double acting valve controlling the axle drive is switched to forward and reverse from the control box. For the forward drive a proportional control is also fitted to allow the assist force to be set to match operating conditions. The  button will override the low pressure valve and bring the max system pressure to the pump maximum.

Electrical Control System

Control for the major functions of the Standen Enterprise are provided electronically by the switches mounted on the in-cab control box (item 1, fig 27) switching the valves on the machine via a CAN-Bus control system. The functions can be monitored from the control box display screen (item 2, fig 27). Setting and monitoring can be carried out by following the instructions in the CAN-Bus operating instructions.

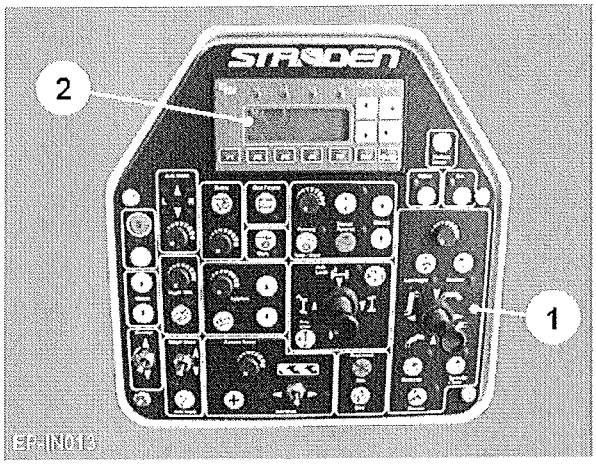


Fig 27

Emergency Stop Button

When activated, the emergency stop button fitted at the rear of the harvester, depending on specification, shuts down all hydraulic drives and electrical controls.

The emergency stop button does not isolate any mechanically driven components.

The electrical control system will only function as a completely connected circuit. The emergency stop button completes the looped circuit and this circuit must be unbroken before the control box can be turned on or reset. If the emergency stop button is tripped, the button must be reset before the in-cab control box will latch on.

Operating Speeds

Each section of the harvester can be adjusted for speed. The following table gives an indication of the normal operating speeds for each section, for average working condition and is intended as a guide only.

Digger web	70 rpm
Starflow	60 rpm
Galaxy	60 rpm
Proclean	350 rpm
Transfer stars	50 rpm
Discharge elevator	50 rpm
Picking off belt	20 rpm
Sweeping clod fingers	As slow as possible

Starting Off Your Harvester

Before commencing work whether starting off a new machine or starting work in a new field, it is advisable to carry out the following checks.

Ensure the harvester is level when hitched to the tractor.

Ensure the hydraulic and electrical connections from the tractor are correctly made and are secure.

Ensure the tractor and harvester wheel settings match the rows to be harvested.

Ensure the shares are set to the correct row widths and are set centrally to the rows.

Release the digger transport chains from their transport position.

Ensure the transport lock valve on the machine level ram is in the open, working position.

Set the shares so that they are evenly spaced and the tip plates are in line with the top of the digger web.

Ensure the depth rollers are mounted centrally over the rows.

Set the disc coulters to the correct width to suit the ridges being lifted, typically 20mm from the outer edge of the share blade.

Ensure the disc coulters are sharp, especially in soft ground or trash.

Ensure the ant-roll flaps/haulm intake rollers are set to the correct width.

Check that the web pitch is suitable for the size of crop to be lifted.

Damage Prevention

A machine that is incorrectly adjusted or operated can cause a significant amount of damage to the crop. The type of damage found in the sample will usually give an indication as to how the damage was caused and where it is occurring. Examine samples at various points. Start in the row in front of the machine and follow the path of the crop through to the trailer. Somewhere between the last undamaged sample and the first signs of damage will be the area causing the problem. The shape and nature of the damage will give clues as to the cause.

When satisfied that the tractor and harvester are set up correctly then commence work. Work the machine for approximately 30 metres and stop. Do not run the machine out, leave the crop and soil on all of the sections of the machine. By a series of visual checks you can assess how the harvester settings are performing, and carry out the following checks.

Damage can take various forms. The following comments will help find and cure some of the more common problems. Remember, the harvester is not always the culprit.

The speed and efficiency of mechanical harvesting can be greatly improved by good planting techniques and adequate cultivation methods. Visually check behind the harvester. If cut or sliced potatoes are evident, the digging depth or disc settings may be incorrect. Potatoes with an uneven cut are normally caused by the shares while a clean straight cut can be caused by the discs.

Check for correct depth of lifting by digging into the lifted rows. Potatoes in the ground indicate depth too shallow. If depth is too deep, then excessive soil will be lifted making the separating areas of the harvester work harder. Avoid lifting the unworked soil below the ridge. A small amount of extra depth will equate to many tonnes of extra soil being lifted.

If undamaged potatoes lie on the surface behind the machine, check their position. If they are to the side of the lifted rows, they may have spilled out of the front of the digger web. Check disc position and anti-roll flaps or haulm intake rollers if fitted. If potatoes lie on top of the lifted rows, check webs are correct pitch for crop being lifted. If Starflow module is fitted, then the gap between 2nd and 3rd star shafts may be too great.

If damaged potatoes lie on top of the lifted rows, these may be being lost through the separating areas of the machine. Check the following.

Crushed potatoes may be caused by the haulm roller, Starflow clod roller setting, or Galaxy clod roller settings. Nipped potatoes may be caused by Proclean roller size, speed, or angle.

Looking on top of the soil under the harvester may give an indication as to where these damaged potatoes are being produced.

Inspect the crop on the digger web. If cut potatoes are evident, check digging depth and disc settings. If clods or stones are present at the sides of the web, then the discs an shares may be set too wide and are picking up material from the wheelings. Excessive soil on the digger web indicates depth too deep.

Check these points with the appropriate section of this handbook. When making adjustments do so one at a time and try harvesting to see the result. More than one adjustment at a time may cause confusion.

In dry conditions:
Keep adequate soil around the crop to prevent risk of damage. Keep soil in the machine as long as possible to cushion the crop. A combination of digging depth and forward speed will help to achieve this. Keep agitation and crop movement down to a minimum. Set depth wheels to exert lightest amount of downward pressure so as not to disturb the ridge or bruise the crop.

In wet conditions:
Set digger web slightly faster than ground speed.

In clod conditions:
Open clod rollers on Starflow and/or Galaxy. Open gap between 2nd and 3rd star shafts in Starflow unit. Fit smaller Proclean rollers.

In stony conditions:
In stony ground a stone can become wedged between the share blades preventing penetration. Make sure discs are kept sharp so that they cut the haulm and prevent rapping and blockages around the roller mountings.

Damage prevention:
Do not hold the crop on the Proclean unit longer than necessary. Run the discharge elevator at a suitable speed to take the crop away smoothly without overloading the web flights or throwing the crop into the trailer.

Getting The Best Results During Harvesting

Tractor/Harvester
Ensure tractor wheel widths are at the correct settings for your row widths and system and that the tyre widths are no too wide as to crush the side of the ridges. Ensure tractor drawbar pin is not too long or the harvester drawbar set too low that it can drag and bunch up haulm which in turn will go into the harvester in large bunches and damage crop at the haulm extraction point. Ensure correct tractor forward speed to match the conditions and harvester capabilities. While standing on level ground and with the harvester connected to the tractor, ensure the drawbar eye is adjusted so that the elevator is parallel to the ground. This will ensure that the machine is at the correct angle for haulm rollers and separators to work at maximum efficiency.

Shares
Ensure the shares are set at the correct width settings for your row widths and system. Make sure the outside corners are cut off the outside share blades, this will help to stop the haulm that the discs have pressed into the ground wrapping around the front corners of the blades. Make sure chamfer on front edge of blades is not too acute as to cause a restriction or bulldozing effect. Ensure the shares are clean and shiny before commencing work. This will reduce drag and help flow into the machine. Ensure stone flaps are parallel with the blades and deliver the crop onto the web and not into it.

In wet, heavy conditions, make sure the share area is kept clean. A build up of soil under the flaps may cause them stand up, causing flow and damage problems to the crop. Also, keep the share frame area clean as this will prolong the life of the web, reduce drive roller wear, and reduce the load on the drive system. If using a centre share blade, ensure the blade is parallel with the other blades. This will maintain an even depth across the bed. Ensure the correct depth settings when moving to different fields and/or varieties. Use the correct share frame and blade configuration for your conditions. As soon as the harvester has finished work, apply a film of grease over the bright working surfaces. This will reduce corrosion and assist flow when the machine starts work next season.

Disc Coulters
Ensure the disc are set to the correct depth. Too much depth will cause soil to slab and encourage the soil to stick to the discs preventing them from turning. Make sure the discs are kept sharp to cut the haulm and that the disc does not have to be set deeper to compensate for not cutting the haulm. In wet conditions set a wider gap between the discs and the share blades (25mm). If crop is rolling back down the web and hitting the discs causing damage, reduce the web speed slightly so there is more soil to carry the crop away. Make sure the discs are being scraped clean. This will help flow into the machine.

Anti-roll Flaps/Haulm Intake Rollers
Ensure the anti-roll flaps fill the gap between the discs and do not stop them from turning. If you experience problems with haulm rapping around the front roller mountings, the haulm intake rollers (if fitted) are adjustable forwards and sideways to position them for optimum performance. If this problem is allowed to continue, it may cause haulm to build up and possibly affect the next row by dragging the crop out or lift the digging depth out, causing damage to the crop. Ensure the rollers are turning at all times. The rollers constantly feed the haulm into the machine and reduce damage at the haulm extraction points. Downward pressure of the rollers is a balance between too little so that he rollers stop turning, and too much so that the rollers are unable to lift when required to.

Depth Wheels
Ensure the depth wheels are set to the correct width settings for your particular system. Double check as sometimes with ridging up during the growing season the ridge positions can vary. Do not apply too much pressure on the depth wheels. As a result of too much pressure, clods could be produced and soil made to stick to the crop. If happens, more agitation will be necessary meaning the possibility of more crop damage. Enough pressure to keep the wheels turning is sufficient in most conditions.

Sweeping Clod Fingers
The first set of sweeping clod fingers (if fitted) should be set higher than the second set. The motion of the fingers should gradually disturb the ridge. If fingers are set too low then a restriction will occur causing loss of output. The speed of the fingers is adjustable from the service terminal. Ensure enough speed to result in an even spread of material across the width of the machine allowing the separator and haulm extraction areas of the machine to work to their maximum capacity.

Clod Breaking Fingers
The clod breaking fingers (If fitted) are adjustable for angle. This gives a restriction to the crop and soil to flow through. Ensure the blocks are not over adjusted such that crop is damaged by rubbing on the web bars, or that the flow of material is restricted too much causing haulm and debris to bunch up which can cause problems at the haulm extraction points. It is important that an even spread of material across the width of the machine is maintained to allow the separator and haulm extraction areas to work to their maximum capacity.

Agitators
Over use of the agitators is one of the main causes of damage and will result in roll back and bounce of the crop causing bruising etc. Always use the minimum amount of agitation. Agitation can be adjusted in two ways. Firstly by speed of rotation and secondly by adjusting the control rollers up or down which lifts or lowers the web onto the agitator. When starting to harvest it is best to begin with minimal agitation. If two agitator shafts are fitted, disconnect the drive chain to the front shaft. Add more agitation as conditions dictate and only use the second agitator shaft when conditions become very heavy. In most conditions set the first agitator shaft at a high speed with the control rollers allowing the web to just touch the agitator rollers. This gives a ripple effect which sieves the soil without bouncing the crop high above the web. When having to use both sets of agitators it is most important that the agitator shafts are synchronised. To achieve this, set one shaft so that one roller is in the 12 o'clock position and on the other shaft the web is supported across two rollers.

Machine Level
It is important to maintain the level attitude of the machine so that an even spread of material across the width of he machine is maintained to allow the separator and haulm extraction areas to work to their maximum capacity.

Digger Web
The digger web speed in conjunction with ground speed is essential for the harvester to work efficiently. Incorrect web speed can result in crop damage and poor harvester performance. If web speed is too fast this will result in roll back and poor take off after the share. Either decrease web speed or increase forward speed. If the web speed is too slow this will result in the machine being overloaded which will cause poor performance of the separating areas, putting undue stress on the mechanical components, reducing the life of the machine, and putting excessive amounts of soil and haulm into the discharge elevator. Either increase web speed or decrease forward speed. There must be enough web speed for the crop to be carried over the haulm roller and not into it.

Haulm Roller
The gap between the haulm roller and the web must be set to a minimum. The best way to achieve this is to turn the web until the web joiner is next to the haulm roller, and then adjust the gap so that the web joiner is only just missing the haulm roller. To reduce the risk of damage to the crop it is best to let the crop land on the stars past the haulm extraction point and let the haulm be guided back into the pinch point of the haulm roller by the haulm guide fingers.

Haulm Guide Fingers
Position the haulm guide fingers out of the way for minimum damage. Only apply tension to the fingers in very wet conditions or when trying to get maximum output from the machine. Ensure enough web speed for the crop to clear the haulm roller. Check condition of rubber finger covers daily before harvesting.

Starflow Separator
Insufficient Starflow speed will cause a nipping effect on the crop. Excessive speed will propel soil/crop over the separating area. Too big a gap between the 4th star shaft and the clod roller can cause nipping, while too small a gap reduces efficiency. Ensure the correct shape of clod roller is being used for your requirements, either round, hexagonal or square. The shape of the clod roller affects the level of extraction. The round roller is the least aggressive, while the square roller is the most aggressive. Ensure the gap between the clod roller and the star shaft is not too big so that it takes haulm out as well as stone and clod, as this may cause a restriction and stop the flow. If there is any restriction whatsoever caused by the clod roller it must be adjusted accordingly or reversed. Forward speed of the harvester is essential to maximise the efficiency of the Starflow separator. Always apply a film of grease to the clod rollers after work to keep them bright, this will assist flow when the machine starts work again. Failing to do so makes the clod roller very greedy until the rust has worn off.

Galaxy Separator
On the Galaxy separator module, ensure the correct shape of clod roller is fitted for your requirements, either round, hexagonal or square. The shape of the clod roller affects the level of extraction. The round roller is the least aggressive, while the square roller is the most aggressive. Excessive speed of the Galaxy unit causes propulsion of the crop/soil/stone over the separator. Insufficient speed will cause a nipping effect on the crop. If brushes are fitted over the Galaxy unit, only use them in very bad conditions. Always apply a film of grease to the clod rollers after work to keep them bright, this will assist flow when the machine starts work again. Failing to do so makes the clod roller very greedy until the rust has worn off.

Proclean Separator
The speed of the Proclean module rollers is essential. Running the rollers too slow will cause nipping. Speed must be enough to keep the crop virtually clear of the rollers for minimum damage. The angle is also very important. The amount of angle will directly relate to the amount of time the crop spends on the rollers. If the angle is sloping downwards, then the crop travels across quickly. This is used in lighter conditions. To hold the crop on the rollers longer, the roller table angle should be set to slope upwards. Angle is adjusted from the control box. If brushes are fitted over the Proclean unit, only use them in very bad conditions. Different roller diameters are available to suit varying conditions. Changing roller diameter effects the gap through which waste material is extracted. A small gap being ideal for dry light conditions and a large gap for heavier conditions.

Spreader Unit
Do not use excessive speed on the Spreader unit as this will propel the crop into the rear elevator panel. Conversely, insufficient speed will cause a restriction in the flow.

Discharge Elevator
Correct discharge elevator speed is essential. The objective is to have the speed as slow as possible, filling every compartment with crop. As far as crop damage is concerned, the more crop in each compartment the better. It should also be fast enough not to cause the crop to spill out over the top of the web flights and roll back causing a restriction at the bottom of the elevator. Too much crop at this position can cause nipping as the web goes around the corner. When in work, apart from opening up, the elevator bottom section should be kept in its fully folded out position. This reduces the chance of the crop rolling back. If necessary, an elevator lowering kit can befitted. This reduces the angle of the elevator bottom section allowing it to reach further into the trailer. A box filling chute is also available.

Harvester Wheels
In normal/dry conditions, the harvester's inside wheel should be set away from the row to reduce compaction of the ridge. In very wet conditions, for ease of pulling the harvester, the inside wheel can be set to run directly behind the tractor wheel. The most outward part of the wheel must not protrude outside the tractor wheel.

Picking Off Belt
If fitted, the Picking Off Belt speed must be fast enough to take crop away from the separator rollers but not be too excessive as to propel crop into the discharge point. The drop off into the discharge elevator or onto the return webs must be well cushioned to reduce crop damage.

Checking Hydraulic Free Flow Return
Hydraulic output from the tractor must be constant. The return must be free flowing at all times or problems with depth etc. will occur. To test this, place digger share into auto (with transport chains removed). When digger assembly is on the ground press the tractor accelerator to maximum. If the shares lift you have a return problem, if not you are ok to work.

Maintenance of the Hydraulic Systems

The components utilised in the design of the hydraulic systems have been chosen for their maintenance free characteristics. Should it be necessary to remove any of the hydraulic components, cleanliness is of the utmost importance. Before breaking any connection in the system, ensure the surrounding area is clean. Pressure wash the machine if possible. Prevent contamination entering the system by plugging any open pipe work and ports with plastic plugs or clean paper wipes. Do not use cloth or rags. Preventing contamination entering the system will prolong the life of the various hydraulic components and will help prevent component failure.

Hydraulic oil under pressure is dangerous. Ensure that any residual pressure is released safely before working on the system. See 'Residual hydraulic pressure dump procedure'. Do not release any hoses without first following this procedure.

Remember that the tractor hydraulic oil supply serves the machine. Ensure the tractor hydraulic system is serviced in accordance with the manufacturers recommendations to prevent cross contamination of the harvester auxiliary system.

To extend the life of the hydraulic system, the hydraulic oil should be carefully monitored. The hot oil level should be kept within the level gauge (item 1, figure 28) Maintain the level by topping up or refilling with Esso Nuto 46 Hydraulic Oil. If the oil becomes cloudy, water may have become mixed with the oil, and the oil should be changed. Tank capacity is approximately 380 litres.

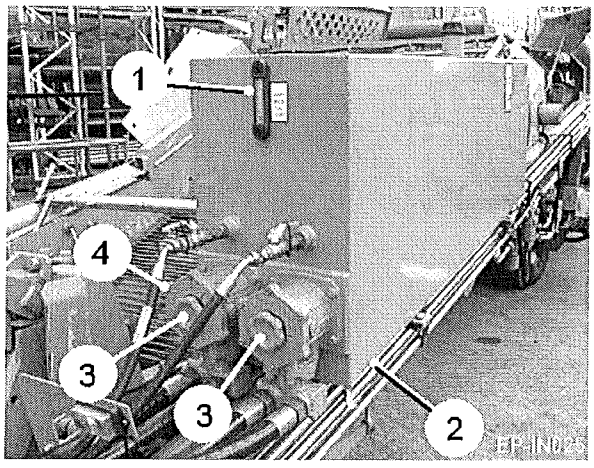


Fig 28

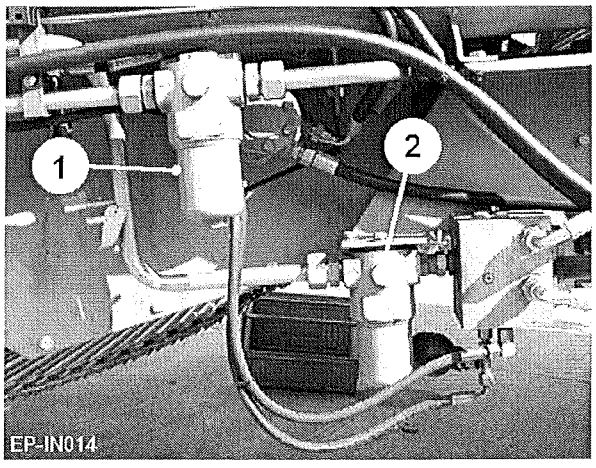


Fig 29

The oil tank magnetic plug (item 2, figure 28) should be removed and cleaned annually. The plug is also used to drain the reservoir, so if the oil is not being changed a temporary 3/4" BSP plug should be used to seal the tank and minimise oil loss.

Regularly check all hoses for chafing or accidental damage and replace immediately.

The pressure filter elements (item 4, fig 18, item 4, figure 23, and items 1 & 2, figure 29) should be replaced after the first 50 hours running time and then every 500 hours or annually thereafter.

To replace a pressure filter element:

1. Switch off the tractor engine and apply the hand brake.

2. In the case of the auxiliary circuit pressure filter (item 4, figure 23), follow the 'Residual hydraulic pressure dump' procedure.

3. Unscrew the bottom casing of the filter housing.

4. Remove the filter element and rinse out the casing.

5. Fit the new element and refit the casing ensuring that it is tight.

6. Run the system and check for leaks.

The two suction filter elements should be replaced after the first 50 hours running time and then every 500 hours or annually thereafter.
The suction filter elements are serviced as follows:

1. Wind the suction filter knob (item 3, figure 28) fully out anti-clockwise to close the cut off valve within the filter housing.

2. Release the screws (item 4, figure 28) holding the filter lid. A small amount of oil will be lost from the filter body.

3. Remove the top of the filter and withdraw the element.

4. Replace the element and reassemble.

5. Wind the suction filter knob (item 3, figure 28) fully in clockwise to open the cut off valve.

6. Run the system and check for leaks.

Residual Hydraulic Pressure Dump Procedure

The following procedure outlines the method of relieving the residual pressure within the hydraulic system. It is essential that this procedure is carried out before any maintenance or repairs are attempted on the hydraulic system.

1. Set the discharge elevator into the fully folded position.

2. Place chocks to the front and rear of both wheels to prevent the machine from moving.

3. Lower the digger assembly to the ground.

4. Lower the harvester onto the drawbar stand and disconnect it from the tractor, leaving the hydraulic and electrical connections in place.

5. With the levelling ram lock valve in the open position, lower the machine to its lowest position. Leave the transport lock in the open position.

6. Switch off the tractor engine.

7. Operate all switches on the driver's control box, in turn, to remove any remaining pressure within the hydraulic system.

8. Disconnect the hydraulic and electrical connections from the tractor.

Steering Ram Link Circuit

The two rear axle steering rams are connected via a link circuit which ensures both rams actuate by equal amounts in opposite directions when turning. The link circuit diverts the oil within the annular section of the extending ram through the bleed valve (item 1, fig 30), into the annular section of the ram opposite thus retracting that ram by the same amount. The circuit must contain the exact volume of oil necessary for the rams, and thus the wheels, to be set correctly. If oil is lost from the link circuit through leakage or during maintenance work etc., the wheels will no longer track correctly and the circuit volume will need to be reset. This can be done by following the procedure outlined below.

1. Operate LH steering to fully extend the LH ram.

2. Open the bleed screw (item 2, fig 30) and operate LH steering again to fully extend the LH ram. The RH ram will now fully retract as additional oil enters the link circuit.

3. With the RH ram fully retracted, close the bleed screw (item 2, fig 30).

4. Operate the steering to full lock in both directions to purge air from the system.

5. Repeat if necessary.

Too much oil in the link circuit will cause the wheels to track inwards toward each other at the front. The excess oil can be released by means of the port (item 3, fig 30). The procedure outlined above should then be used to reset the correct volume.

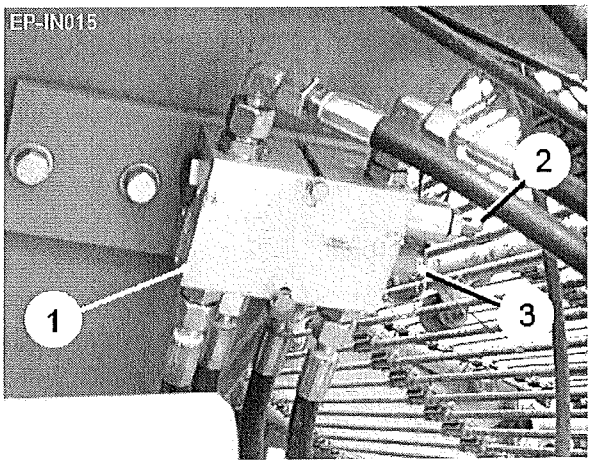


Fig 30

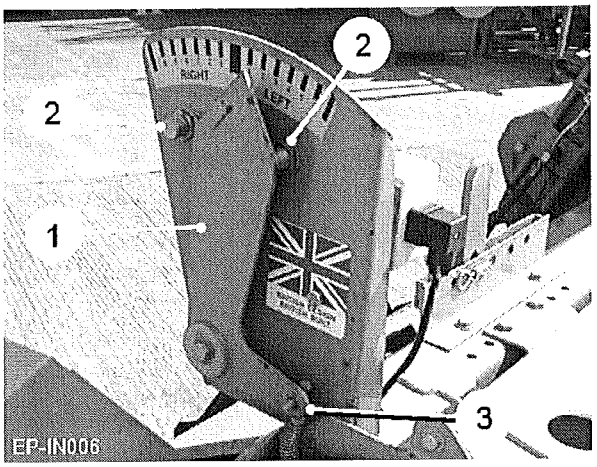


Fig 31

Rear Axle Self-centring

The rear axle self-centring mechanism is combined with the wheel position indicator (item 1, fig 31) and is used to bring the harvester wheels back to the straight ahead position after manoeuvring. The proximity switches (item 2, fig 31) sense the position of the indicator. The centre position is factory-set but may need to be adjusted after a period of service. Should the cable (item 3, figure 31) be in need of adjustment, the wheels will tend to centre to a RH bias. To correct the centre position, the cable can be reset by means of the cable adjuster on the RH axle.

The setting of the proximity switches (item 2, figure 31) in the axle position indicator will only need adjustment if the unit has been dismantled for any reason and should be carried out by a competent service engineer.

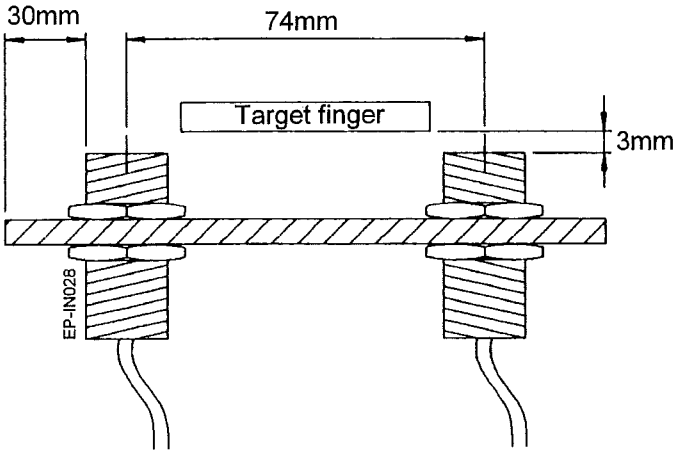


Fig 32

Proximity Switch Adjustment

The proximity switches fitted to both the axle self-centring mechanism and the automatic depth control are factory set and in normal circumstances should not require adjustment. Should it be necessary to readjust the proximity switches then the settings shown (see figure 32) should be obtained.

Maintenance of the Mechanical Drives

Drive chains must be maintained at the correct tension. Maintaining correct tension, alignment and lubrication will ensure the efficient running of the harvester and prolong the life of the drive components. Adjust the chains to give positive drive without undue stretching. Where plastic chain tension or guide blocks are fitted, these will show fairly rapid wear initially but will settle down when the chain rollers rather than the chain side plates come into contact with the plastic.

The input drive shaft from the tractor PTO should be checked for damage regularly and the inner and outer tubes checked to ensure a free sliding movement. Binding between the input drive shaft components will cause severe end loading on the gearbox input shaft leading to premature failure of the gearbox.

Maintenance of the Electrical System

Trouble shooting of the control system must be carried out by a competent engineer familiar with electrical servicing. Items such as the proportional valve control cards, and the control circuit boards may be damaged if incorrectly connected.

New Machines

It is important during the first few weeks with anew machine to keep a regular check for any bolts, screws, connections etc. which may work loose during this initial working period.

Machine Lubrication

Regular lubrication will ensure that the Standen Enterprise provides a long and efficient service life. Depending on soil and weather conditions, the service schedule can vary. It is recommended that the harvester is given a thorough inspection at least weekly during the working season and at this time the machine should be greased and the gearbox oil levels checked. Optional automatic greasing kits can be fitted to the machine and are recommended for machines covering large acreages to reduce maintenance time.

Shafts and bearings fitted with grease nipples should be lubricated using a good quality general purpose grease. Bearings must not be allowed to run dry. When greasing it is better to give a little frequently than a lot a long intervals.

Some of the bearings are sealed and pre-lubricated. Care should be taken not to flood these bearings with grease or the seals may burst allowing grease to escape and dirt to get in. Should this happen, more frequent greasing will be required in order to keep the dirt at bay. When lubricating sealed bearings, only two strokes of the grease gun every twenty acres of work is necessary.

Non-sealed bearings should be greased at least once a day or every ten acres. Wheel motor grease rings should be greased daily to prevent the ingress of dirt and dust.

When checking the chain and gear drives, proprietary chain lubricant or a smear of grease should be applied to prolong their life.
The front input gearbox should be checked regularly for signs of leaks and if necessary topped up with EP 90/140 gear oil.

The Proclean unit gearbox should be checked regularly for signs of leaks and topped up with BP ENERSYN G.S.F.

Universal couplings (such as the PTO shaft) should be dismantled periodically and their shafts smeared with grease.

Apply grease to all pivot points, slideways and exposed threads etc. to ensure they operate easily and remain free of corrosion.

Daily Maintenance

During the working season the following daily maintenance should be carried out. Check all covers and guards are in position, free from damage, and all retaining latches and hinges are in place and operative. Repair or replace any found to be defective before operating the machine.

Carry out the following checklist: -

1. Check tension of all drive chains, adjust if necessary and lubricate with clean oil.
2. Check tyre pressures and adjust if necessary.
3. Check for any damaged or broken rollers, web bars or stars etc. Repair or replace as necessary.
4. Check wheel nuts for tightness.
5. Check all scraper clearances and adjust as necessary. Scrapers should be adjusted as close as possible without actually touching.
6. Check all hydraulic cylinders, valves and pipe work for signs of leaks or damage, repair or replace as necessary.
7. Carry out lubrication
8. Grease axle king pins

Weekly Maintenance

During the working season the following weekly maintenance should be carried out.

1. Carry out all the procedures listed in daily maintenance.
2. Check all shafts, bearings and rollers for undue wear, and replace as necessary.
3. Check all bearings for lubrication, grease as necessary.
4. Check discs and shares blades for excessive wear, replace if necessary.
5. Check hydraulic and gearbox oil levels.

Annual Maintenance

Prior to the start of the working season the following maintenance should be carried out.

1. Carry out all the procedures listed in daily and weekly maintenance.

2. Check all webs for damage or wear and repair or replace as necessary.

3. Check stars and grip rings in Galaxy separator and replace any worn parts.

4. Check metalwork (e.g. side plates) for any damage or wear and repair or replace as necessary.

5. Inspect wheel bearings and check for excessive wear, replace as necessary. Re-pack with fresh grease on re-assembly.

6. Replace the pressure and suction filter elements Use only genuine Standen replacement parts. **THESE ARE NOT WASHABLE ELEMENTS.**

Out of Season Storage

The machine can frequently operate in soils which contain chemical fertilisers etc. When the working season is completed wash and clean the machine thoroughly prior to carrying out the following checks and operations.

1. Apply oil, grease or an anti rust agent on any exposed bright metal surfaces which have been polished by the soil flow.

2. Clean all drive chains and lubricate with oil.

3. After carrying out the hydraulic residual pressure dump procedure, any parts of hydraulic cylinders rods that are still exposed should be greased or oiled to prevent corrosion.

4. Ensure that the tyres are inflated to the correct pressure.

5. Ensure that the hydraulic hose quick release couplings and the electrical connectors on the machine are kept clean and dry.

6. Check the whole machine carefully and note any repairs that may need to be carried out. It is always better to carry out any repairs well before the commencement of the following season.

7. Carry out all the lubrication checks outlined in routine maintenance.

8. Ensure the driver's control box is kept in a safe, dry place and available for use at the commencement of work or for any maintenance to be carried out.

9. Ensure that this handbook is kept in a safe place and available for use at the commencement of work or for any maintenance to be carried out.

Machine Dimensions

Length (basic machine)	8.55 m	
Length with Easi-pic table	9.45 m	
Length with In-line table	10.05 m	
Width working	6.25 m	
Width transport	3.77 m	
Height working	3.77 m	
Height transport	3.54 m	3.67 m (with elevator lowering kit)
Discharge elevator max height	5.28 m	

Machine Weight

Weight (unmanned machine)	5.38 Tonnes
Weight (in-line machine)	7.20 Tonnes

Technical Data

Row widths	76 to 90 cm (30 to 36")	
Tractor power requirement	120 bhp minimum	
Oil flow requirement from tractor	minimum	40 ltr/min
	maximum	70 ltr/min
(For flows greater than 70 ltr/min consult your Standen dealer)		
Electrical requirements from tractor	12V DC negative earth	
Drive requirement from tractor PTO	1 3/8" 6 spline @ 540 rpm maximum	
Tyre size (standard)	405 - 70/20	Trac-grip
Tyre pressure	2.4 Bar	(34 psi)
Wheel nut torque	M18 x 1.5	310 Nm
	M20 x 1.5	330 Nm

Nut/bolt torque

Description	Torque		Description	Torque
M6 nyloc zinc nut	10 lb/ft		M6 bolt/steel nut	7 lb/ft
M8 nyloc zinc nut	23 lb/ft		M8 bolt/steel nut	19 lb/ft
M10 nyloc zinc nut	44 lb/ft		M10 bolt/steel nut	38 lb/ft
M12 nyloc zinc nut	87 lb/ft		M12 bolt/steel nut	70 lb/ft
M16 nyloc zinc nut	208 lb/ft		M16 bolt/steel nut	170 lb/ft
M20 nyloc zinc nut	380 lb/ft		M20 bolt/steel nut	325 lb/ft
M24 nyloc zinc nut	690 lb/ft		M24 bolt/steel nut	565 lb/ft

Standen Engineering's policy of continual product development means that specifications may be altered without prior notice. All dimensions are approximate.

Steering Ram Link Circuit (machines from 2008)

The two rear axle steering rams are connected via a link circuit which ensures both rams actuate by equal amounts in opposite directions when turning. The link circuit diverts the oil within the annular section of the extending ram into the annular section of the ram opposite thus retracting that ram by the same amount. The circuit must contain the exact volume of oil necessary for the rams, and thus the wheels, to be set correctly. If oil is lost from the link circuit through leakage or during maintenance work etc., the wheels will no longer track correctly and the circuit volume will need to be reset. This is done using valves 1 and 2 located above the RH wheel leg (see figure 33).

1. Operate the steering fully to the left.
2. Open valve 1 to divert oil to the left hand steering ram.
3. Open valve 2 to allow oil from the right hand ram through the relief valve.
4. Operate the control box 'Swanneck' and 'Axle Steer Right' switches.
5. Close valves 1 and 2.

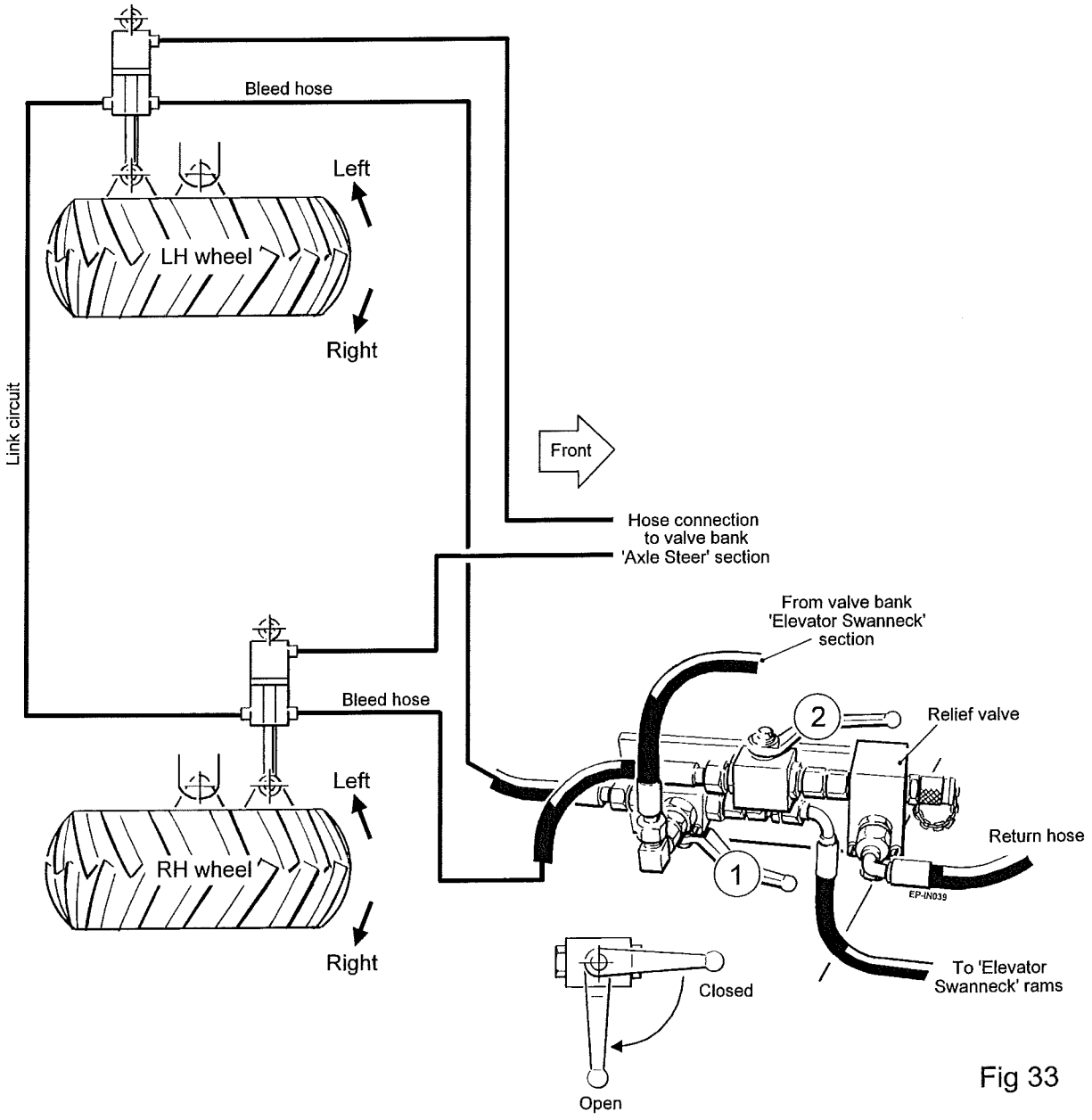
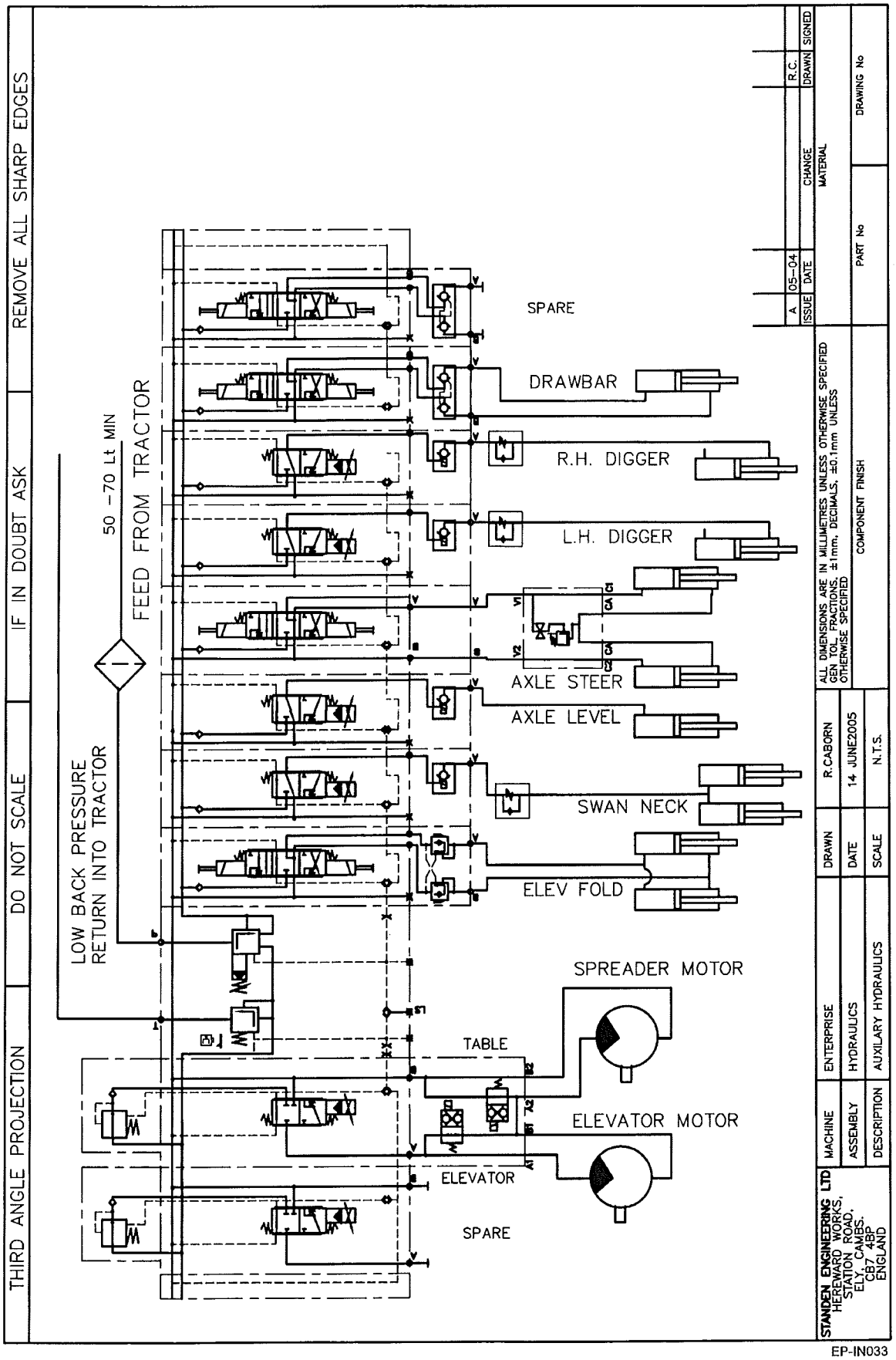


Fig 33

CONTENTS

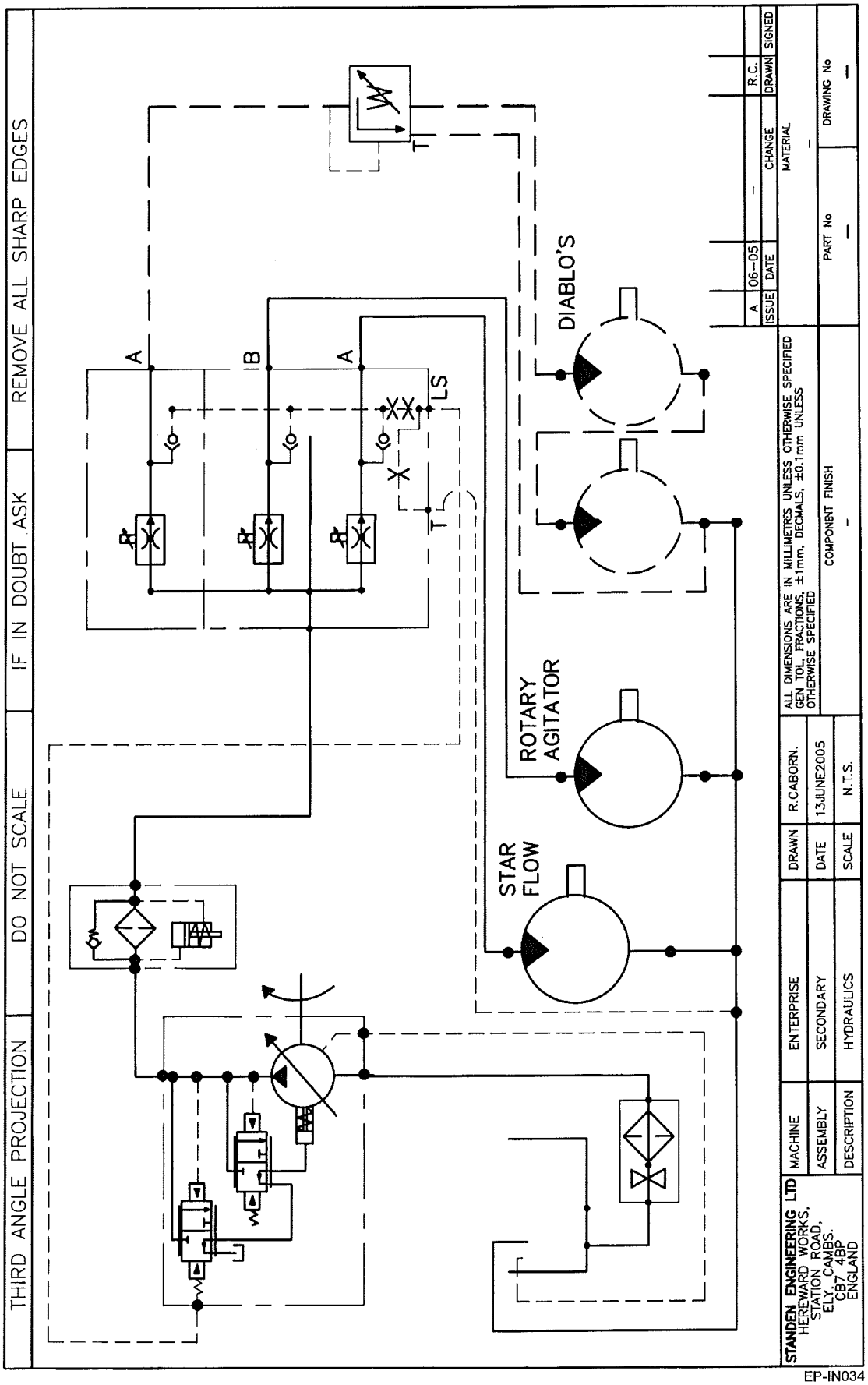
DIAGRAMS

Auxiliary Hydraulics (circuit 1)



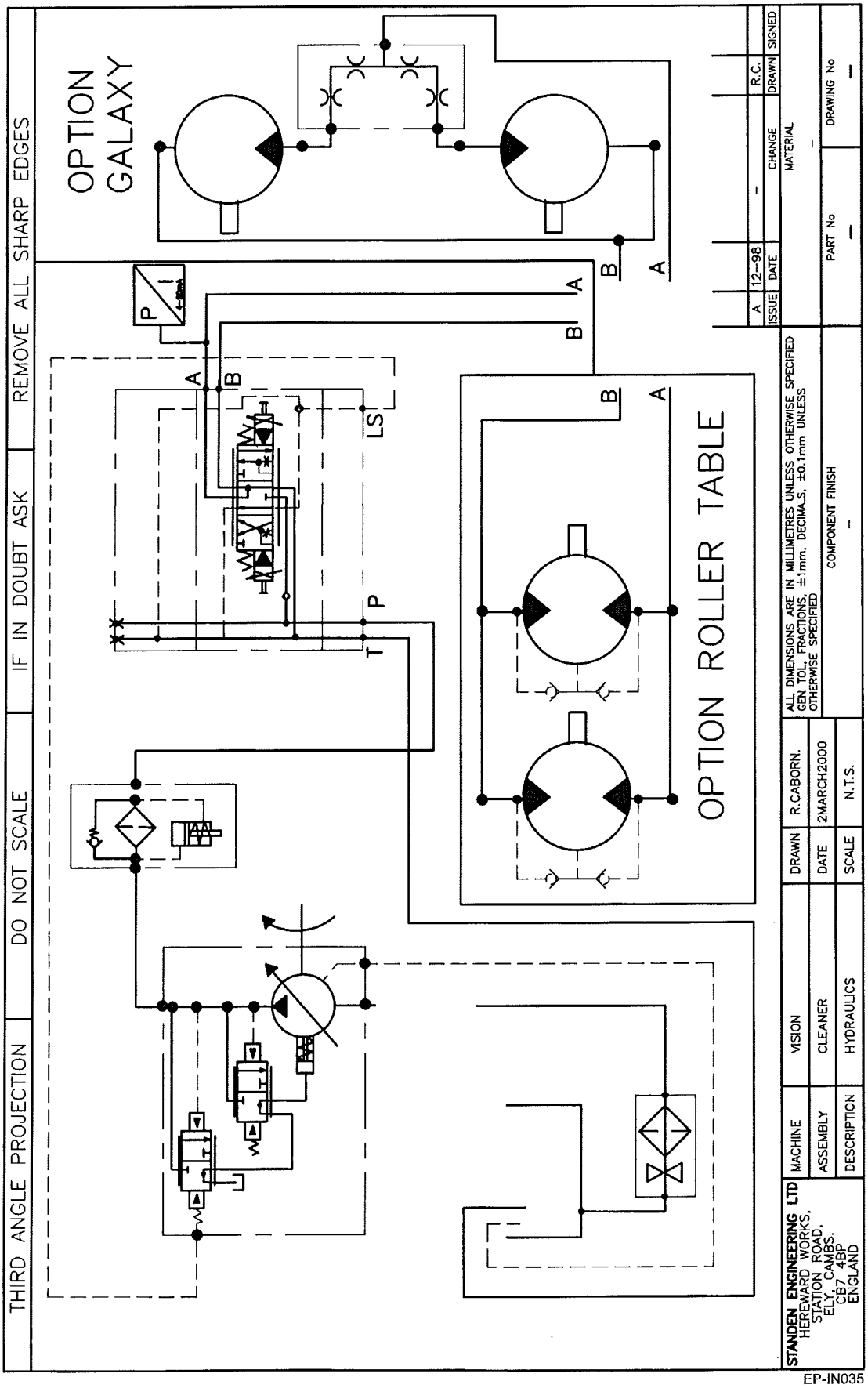
EP-IN033

Secondary Hydraulics (circuit 2)



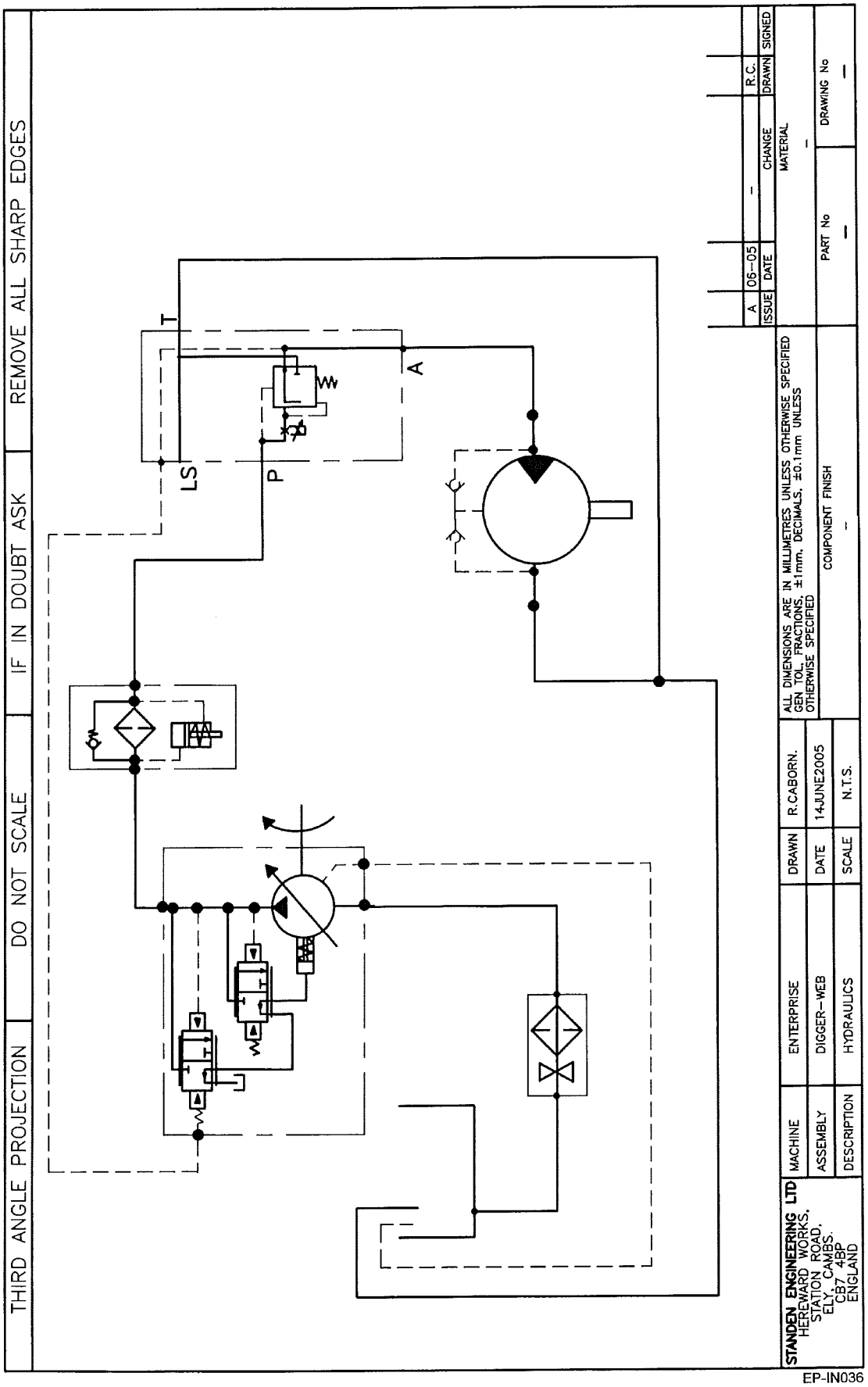
EP-IN034

Proclean/Galaxy Hydraulics (circuit 3)



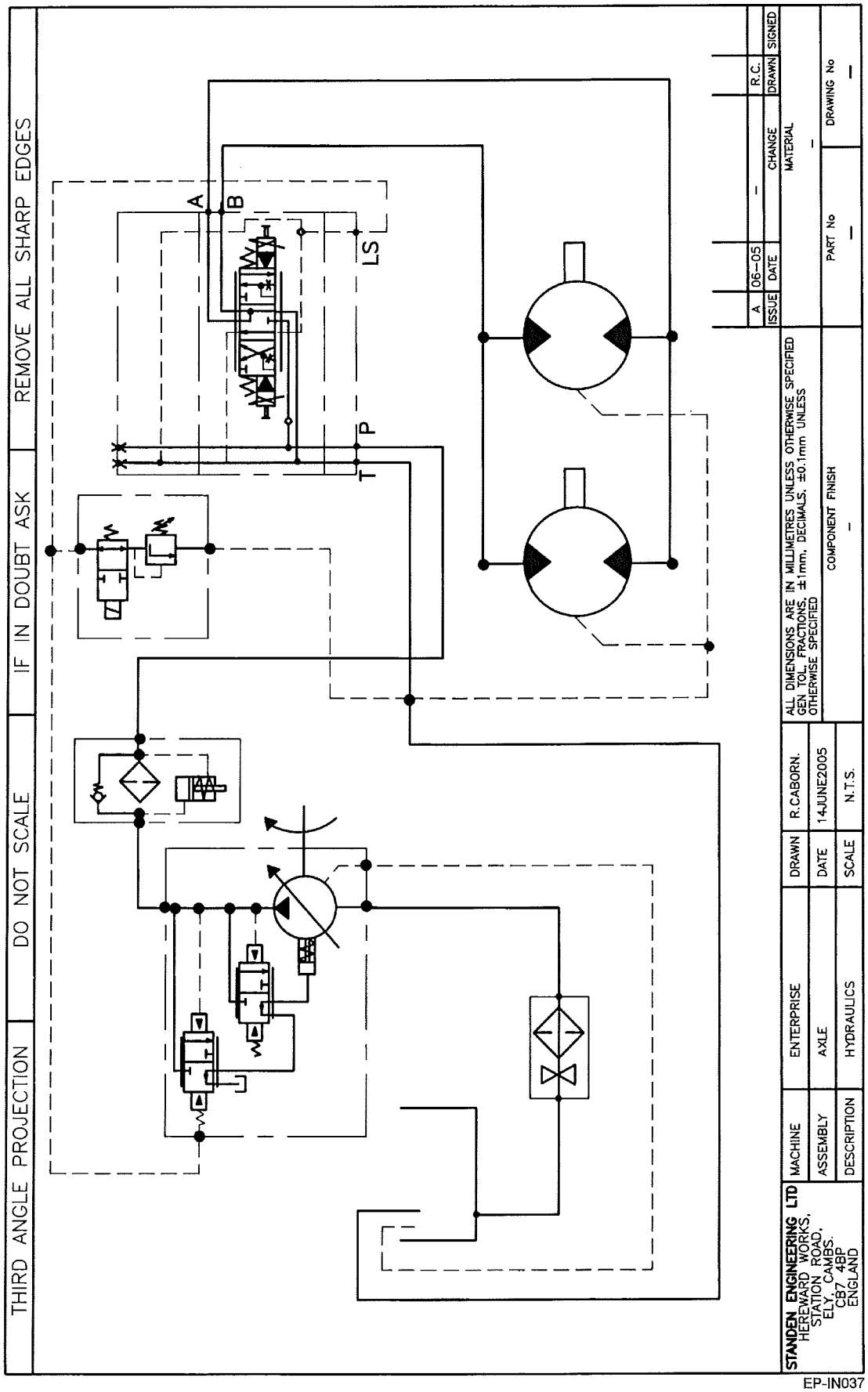
EP-IN035

Digger Web Hydraulics (circuit 4)



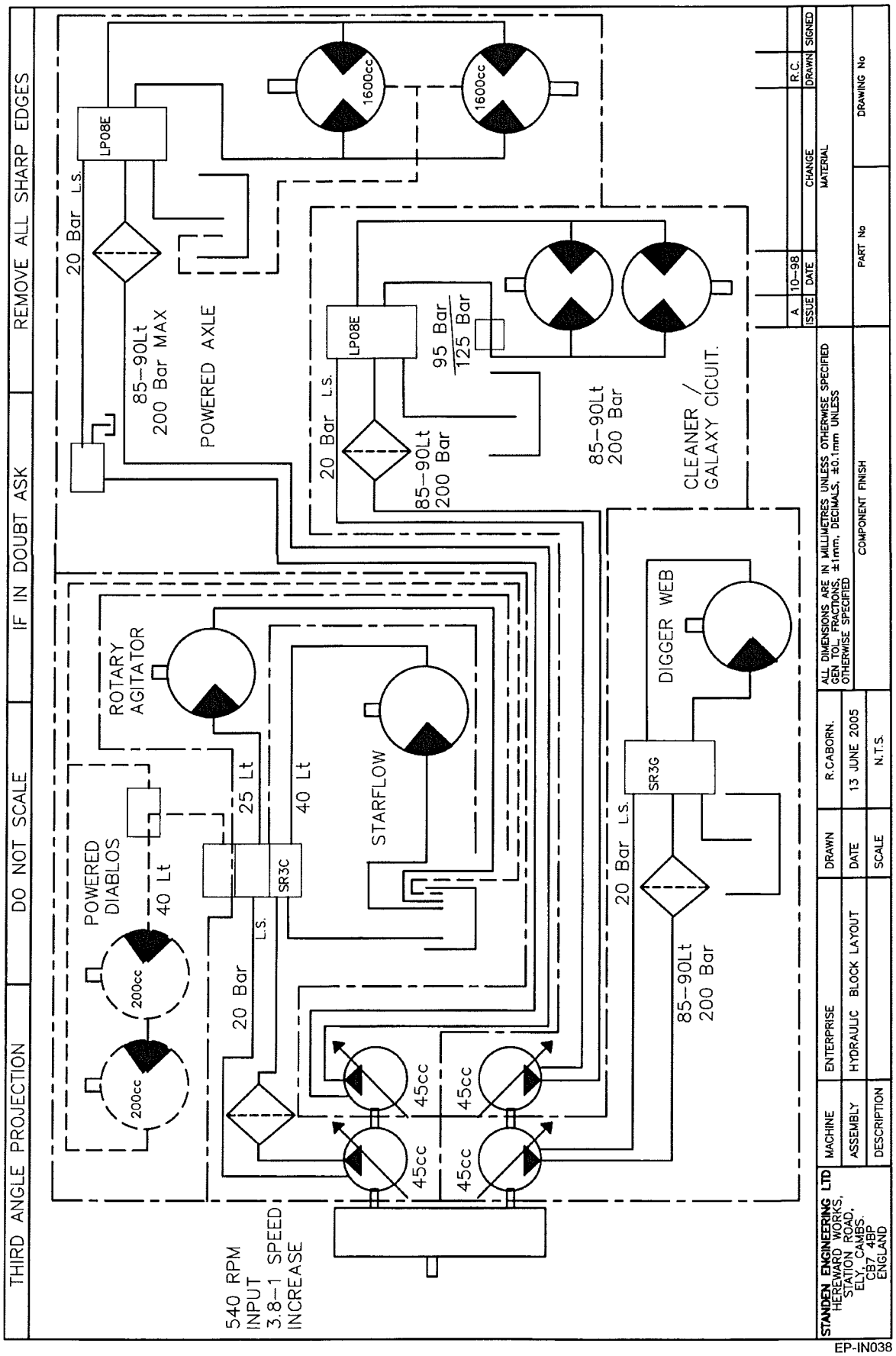
EP-IN036

Powered Axle Hydraulics (circuit 5)



EP-IN037

Harvester Hydraulics Block Diagram



EP-IN038

CONTENTS

CAN-BUS OPERATING INSTRUCTIONS

3.1 CAN-BUS OPERATING INSTRUCTIONS

SYSTEM DESCRIPTION

The electro / hydraulic control system used on the Standen Vision, Vision 'XS', and Enterprise potato harvesters from 2002 is a CAN-Bus system where all the control signals are carried by one pair of wires. The 12 Volt, 30Amp, power supply is taken directly from the tractor battery too the harvester fuses, as the in cab power plugs on some tractors may not be capable of supplying an adequate amperage. Additional wires are used to power the control box, an auxiliary power supply, and to provide a safety stop circuit.

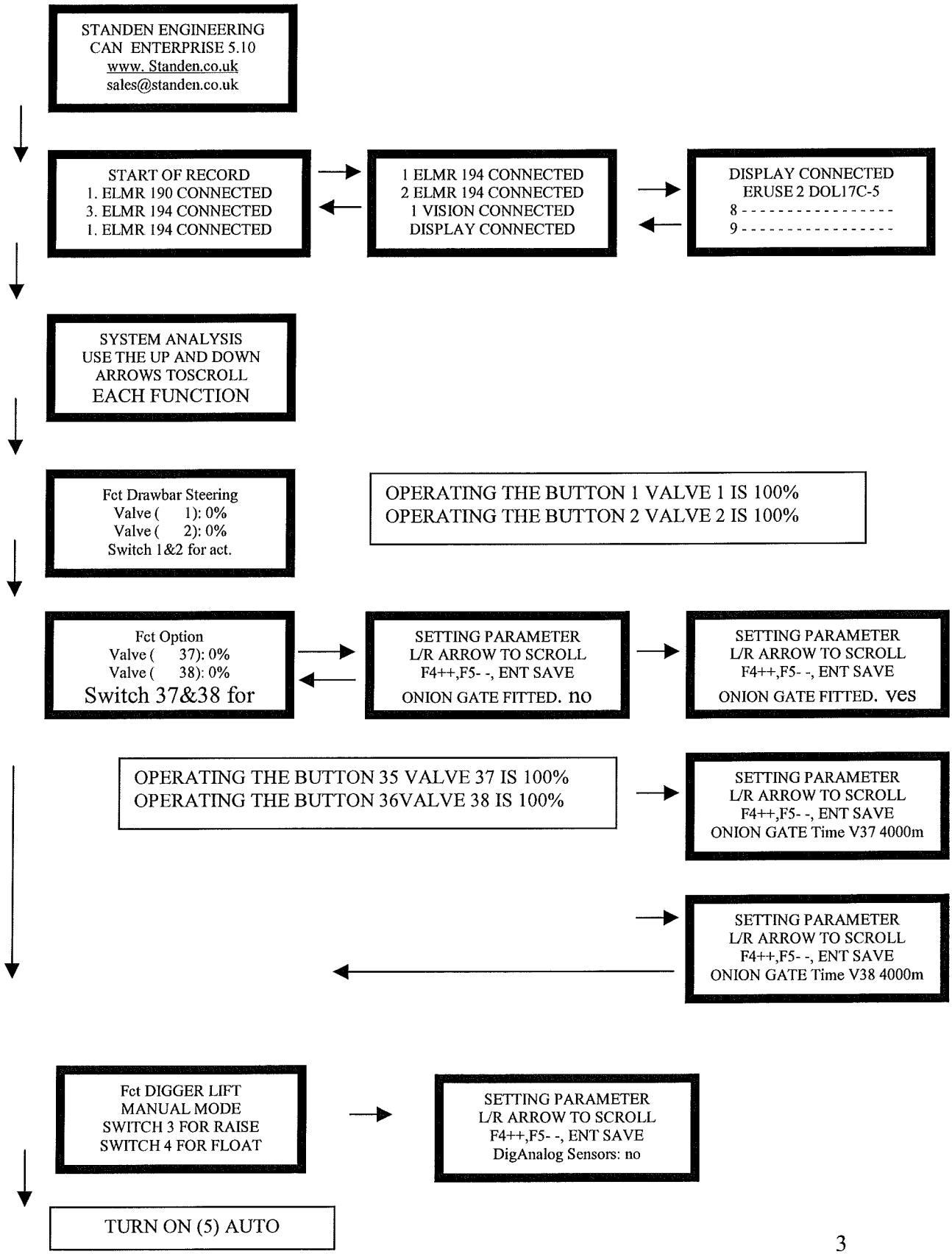
The system comprises of the control fascia, which is connected to the input circuit board. Also in the control box is the service terminal that displays an overall illustration of the system, and allows access to select, and set operating parameters. The terminal display additionally gives access to a system diagnostic menu, which will allow the status of each function to be displayed.

On the harvester the power, and control wires are taken onto a distribution board which allows the connection of the various control sensors, and the fuses which cover all the power outputs. From the distribution board the master processor, and slave modules are connected into the wiring loom which connect all the individual valves.

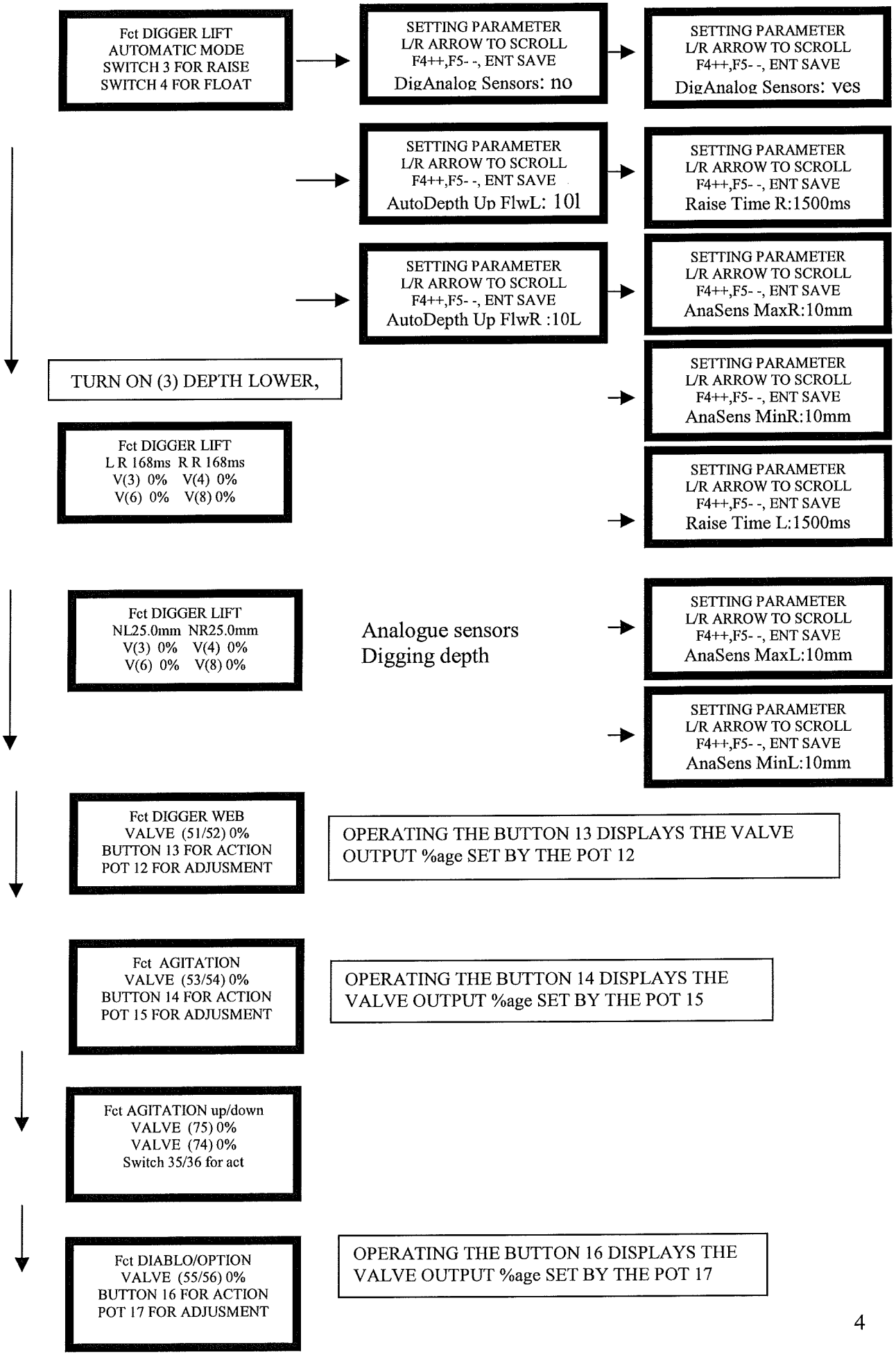
The switching installed on the control panel is designed to cover all build options, and depending on the specification of the machine some functions will not be active.

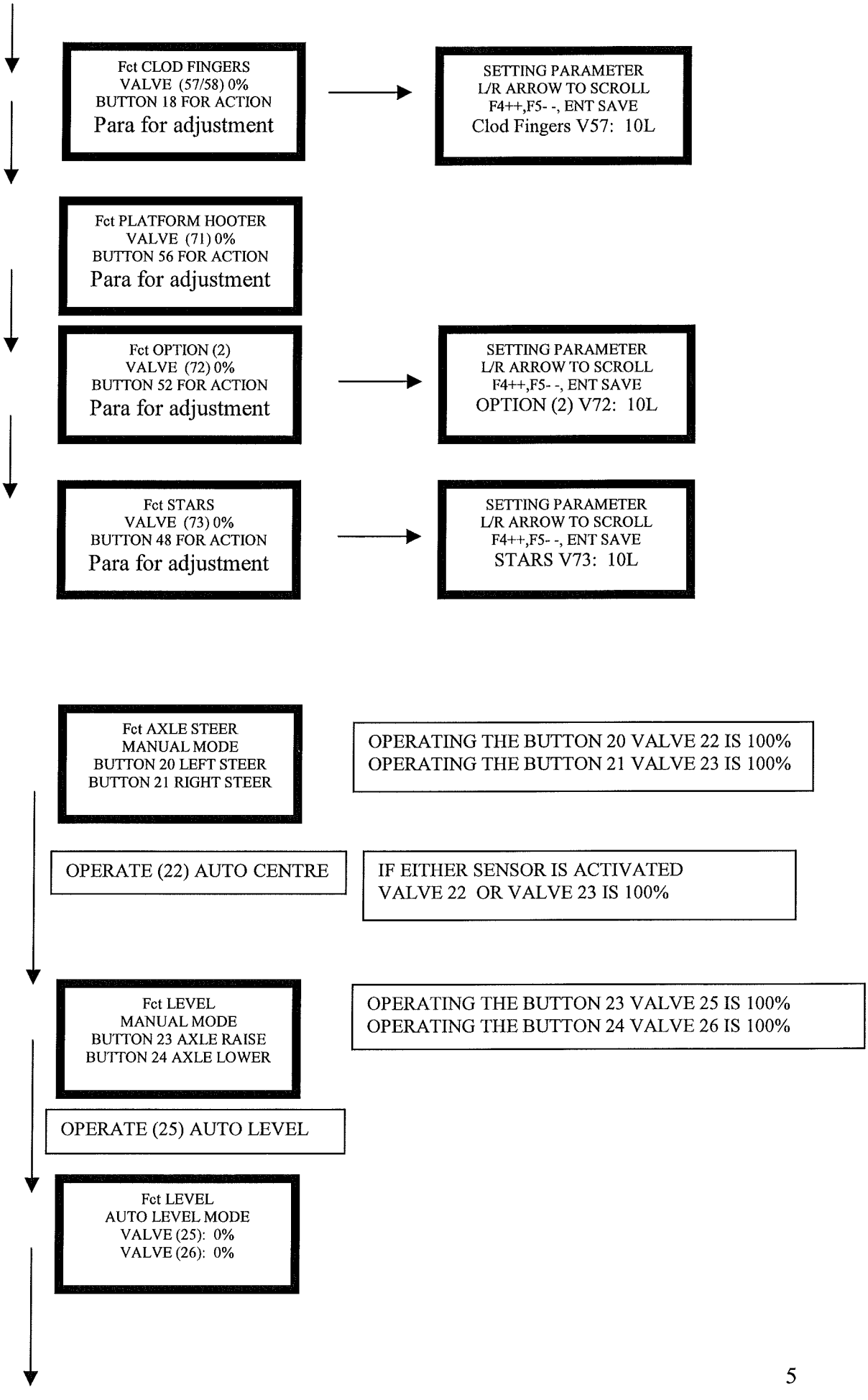
THE MAIN DISPLAY SCREEN

The display screen on the control panel service terminal allows the machine to be set for operating with the possible build options, and to set various parameters to suit the operator.

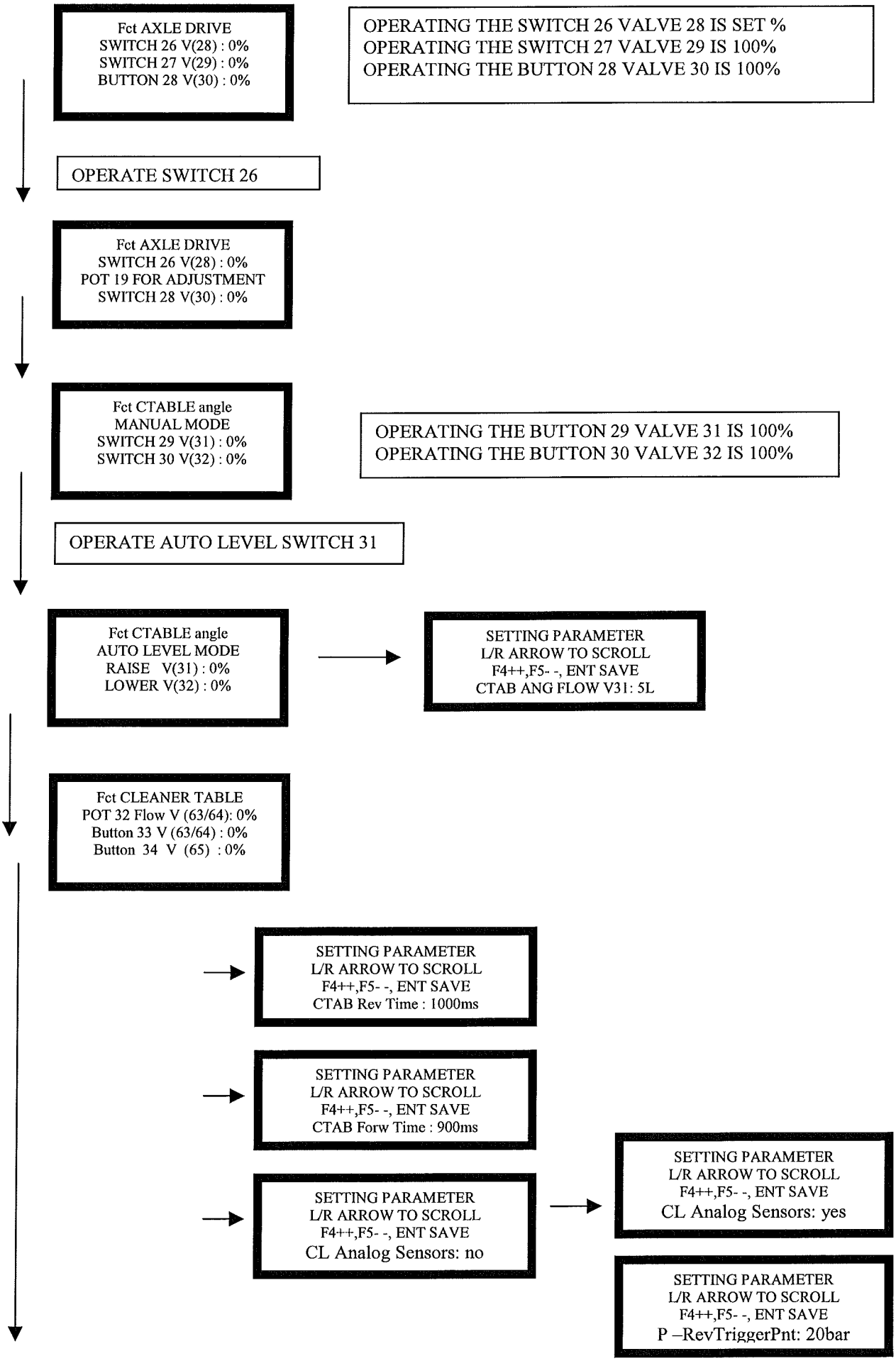


3.3 CAN-BUS OPERATING INSTRUCTIONS




Fct CLOD FINGERS
VALVE (57/58) 0%
BUTTON 18 FOR ACTION
Para for adjustment
SETTING PARAMETER
L/R ARROW TO SCROLL
F4++,F5- -, ENT SAVE
Clod Fingers V57: 10L
Fct PLATFORM HOOTER
VALVE (71) 0%
BUTTON 56 FOR ACTION
Para for adjustment
Fct OPTION (2)
VALVE (72) 0%
BUTTON 52 FOR ACTION
Para for adjustment
SETTING PARAMETER
L/R ARROW TO SCROLL
F4++,F5- -, ENT SAVE
OPTION (2) V72: 10L
Fct STARS
VALVE (73) 0%
BUTTON 48 FOR ACTION
Para for adjustment
SETTING PARAMETER
L/R ARROW TO SCROLL
F4++,F5- -, ENT SAVE
STARS V73: 10L
Fct AXLE STEER
MANUAL MODE
BUTTON 20 LEFT STEER
BUTTON 21 RIGHT STEER
OPERATING THE BUTTON 20 VALVE 22 IS 100%
OPERATING THE BUTTON 21 VALVE 23 IS 100%
OPERATE (22) AUTO CENTRE
IF EITHER SENSOR IS ACTIVATED
VALVE 22 OR VALVE 23 IS 100%
Fct LEVEL
MANUAL MODE
BUTTON 23 AXLE RAISE
BUTTON 24 AXLE LOWER
OPERATING THE BUTTON 23 VALVE 25 IS 100%
OPERATING THE BUTTON 24 VALVE 26 IS 100%
OPERATE (25) AUTO LEVEL
Fct LEVEL
AUTO LEVEL MODE
VALVE (25): 0%
VALVE (26): 0%

3.5 CAN-BUS OPERATING INSTRUCTIONS



CAN-BUS OPERATING INSTRUCTIONS 3.6

Fct DISCHARGE
BUTTON 42 TURNS ON V (66)
POT 43 SETS FLOW V (66)
VALVE (66) : 0%

OPERATING THE BUTTON 42 DISPLAYS THE VALVE OUTPUT % AGE SET BY THE POT 43

Fct ELEVATOR
BUTTON 44 TURNS ON V (44)
First Turn On Spread
VALVE (44) : 0%

OPERATING THE BUTTON 44 VALVE 44 IS 100%

Fct TABLE
BUTTON 45 TURNS ON V (45)
First Turn On Spread
VALVE (44) : 0%

OPERATING THE BUTTON 45 VALVE 45 IS 100%

Fct WINDROW
BUTTON 46 TURNS ON V (46)

VALVE (46) : 0%

OPERATING THE BUTTON 46 VALVE 46 IS 100%

Fct ElevatorSwanNeck
MANUAL MODE
Joystick 37 to RAISE
Joystick 38 to LOWER

JOYSTICK 37 is pressed VALVE(39) : SET FLOW
JOYSTICK 38 is pressed VALVE(40) : 100%

SETTING PARAMETER
L/R ARROW TO SCROLL
F4++,F5- -, ENT SAVE
ElevSwan Neck Flow V39M 25L

OPERATE AUTO HEIGHT SWITCH

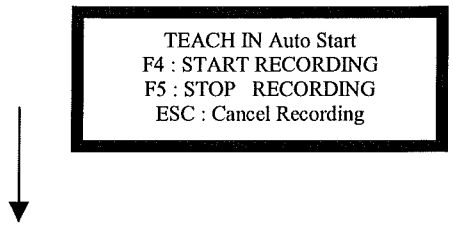
Fct ElevatorSwanNeck
AUTO HEIGHT MODE
VALVE (39) : %
VALVE (40) : %

SETTING PARAMETER
L/R ARROW TO SCROLL
F4++,F5- -, ENT SAVE
ElevSwan Neck Flow V39M 8L

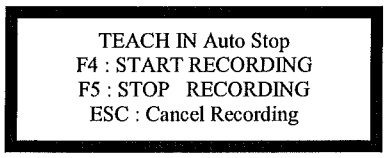
Fct Elevator Fold
Joy 40 in Joy 41 out
Joystick 40 valve (42) 0%
Joystick 41 valve (43) 0%

JOYSTICK 40 is pressed VALVE(42) : 100%
JOYSTICK 41 is pressed VALVE(43) : 100%

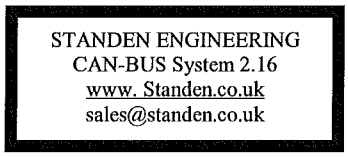
3.7 CAN-BUS OPERATING INSTRUCTIONS



The 'AUTO START' function will remember the sequence of functions carried out between pressing F4, and F5. Pressing 'PROGRAMME START' will repeat this sequence. Pressing 'F4', then directly pressing 'F5' will clear the saved sequence.

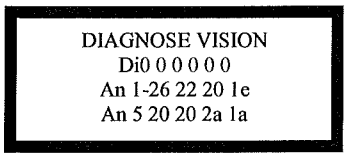


The 'AUTO STOP' function will remember the sequence of functions carried out between pressing F4, and F5. Pressing 'PROGRAMME STOP' will repeat this sequence. Pressing ', and then pressing 'F5' will clear the saved sequence.

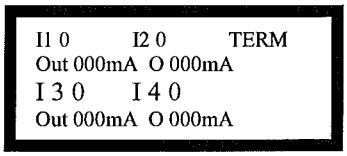


THE SYSTEM DIAGNOSTIC MENU

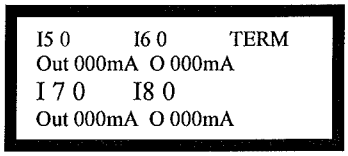
The display screen on the control panel service terminal allows you to view, and investigate each input, and output to check for faults in the control system.
To access the diagnostic channel; on the service terminal press 'F3' + 'F2'
The screens displayed are as follows.



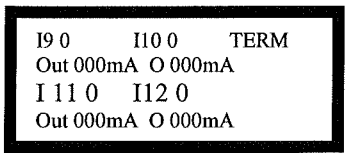
Operating a switch on the panel will cause a change of state on the first row.
Operating a potentiometer will change status on the last two rows.



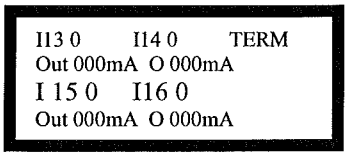
I1 = REAR AGITATION Proportional coil.
I2 = PLATFORM HOOTER.
I3 = OPTION (2) Proportional coil
I4 = STAR CLEANER Proportional coil.



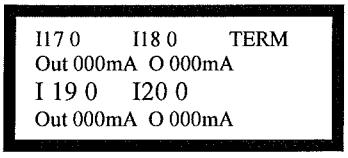
I5 =AXLE LEVEL RAISE.
I6 = AXLE LEVEL LOWER.
I7 =ELEVATOR RUN.
I8 =SPREADER / TABLE RUN.



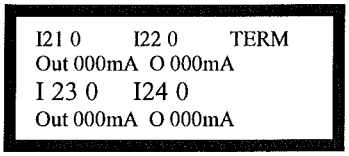
I9 = AGITATION LOWER.
I10 = AGITATION RAISE..
I11 = OPTION (4) RAISE Proportional coil.
I12 = OPTION (4) LOWER Proportional coil.



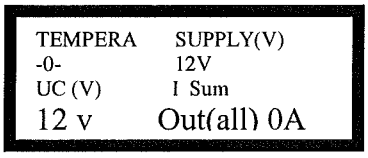
I13 = ELEVATOR WINDROW RUN.
I14 = ELEVATOR FOLD IN.
I15 = ELEVATOR FOLD OUT.
I16 = AUXILIARY.



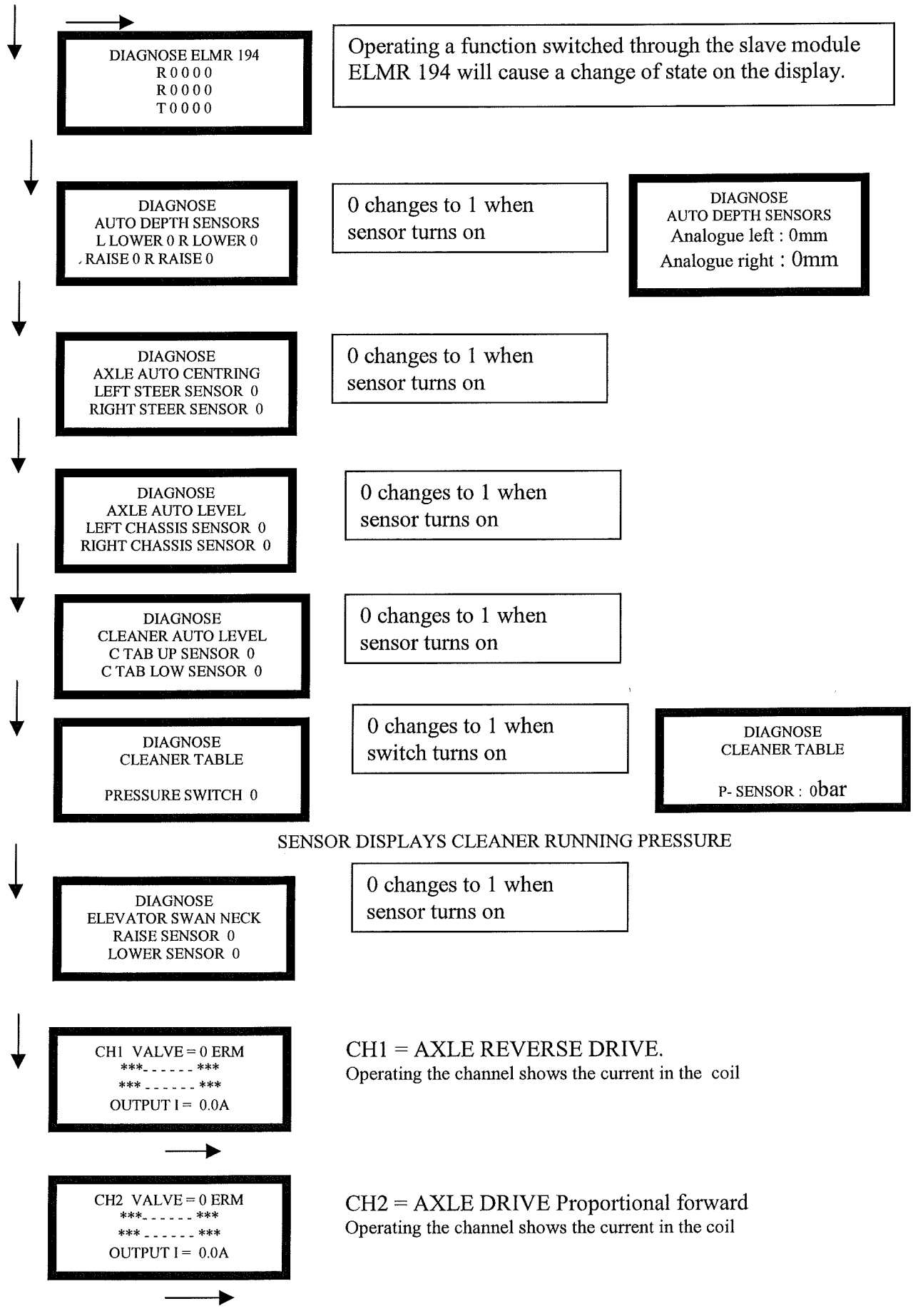
I17 = X
I18 = X
I19 = X
I20 = X

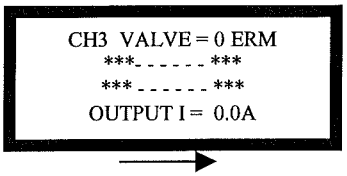


I21 = X
I22 = X
I23 = X
I24 = X

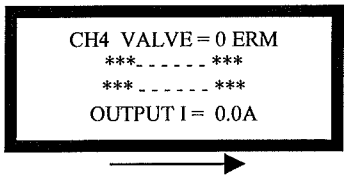


3.9 CAN-BUS OPERATING INSTRUCTIONS

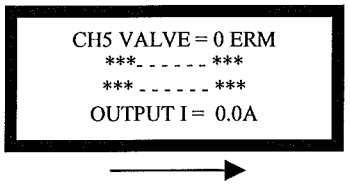




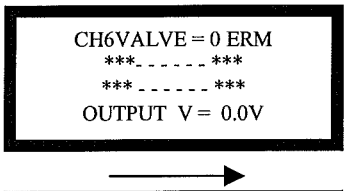
CH3 = CLEANER Proportional forward.
Operating the channel shows the current in the coil



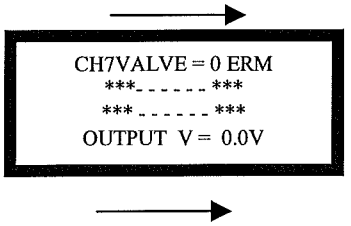
CH4 = CLEANER Proportional raise.
Operating the channel shows the current in the coil



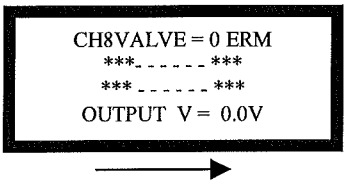
CH5 = SWAN NECK Proportional raise
Operating the channel shows the current in the coil



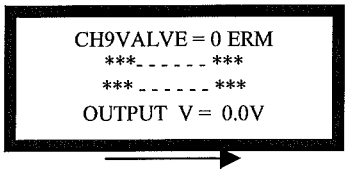
CH6 = CLEANER LOWER.
Operating the channel shows the voltage in the coil



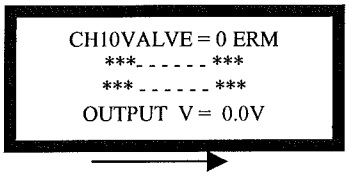
CH7 = CLEANER REVERSE.
Operating the channel shows the voltage in the coil



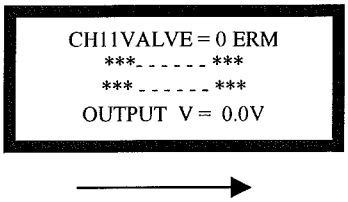
CH8 = SWAN NECK LOWER.
Operating the channel shows the voltage in the coil



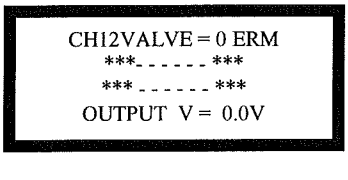
CH9 = RIGHT DIGGER LOWER.
Operating the channel shows the voltage in the coil



CH10 = AXLE STEER LEFT.
Operating the channel shows the voltage in the coil

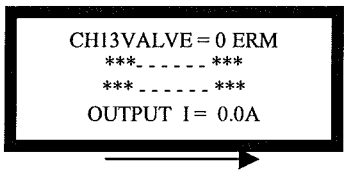


CH11 = AXLE STEER RIGHT.
Operating the channel shows the voltage in the coil

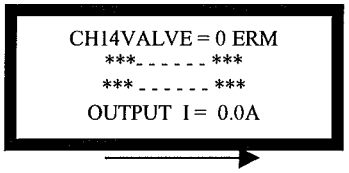


CH12 = AXLE HIGH POWER
Operating the channel shows the voltage in the coil

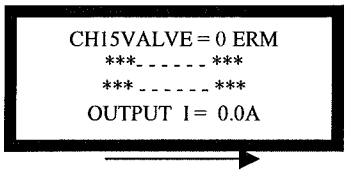
3.11 CAN-BUS OPERATING INSTRUCTIONS



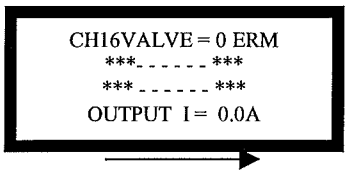
CH13 = LEFT DIGGER Proportional raise.
Operating the channel shows the current in the coil



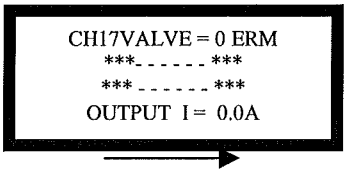
CH14 = RIGHT DIGGER Proportional rasie.
Operating the channel shows the current in the coil



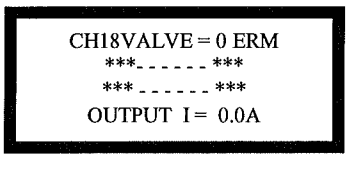
CH15 = DIGGER WEB Proportional coil.
Operating the channel shows the current in the coil



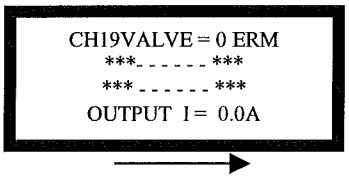
CH16 = AGITATOR Proportional coil.
Operating the channel shows the current in the coil



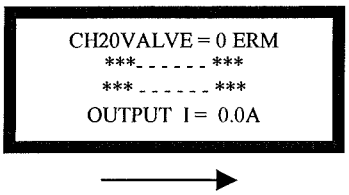
CH17 = DIABLO Proportional coil.
Operating the channel shows the current in the coil



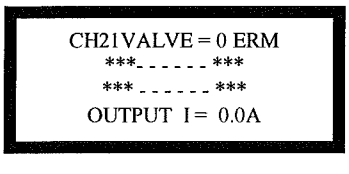
CH18 = CLOD FINGER Proportional coil.
Operating the channel shows the current in the coil



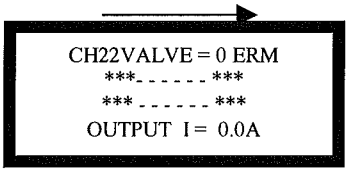
CH19 = DISCHARGE ELEV Proportional coil.
Operating the channel shows the current in the coil



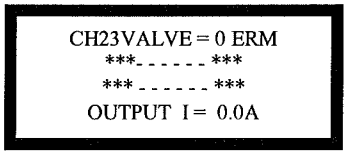
CH20 = DRAWBAR LEFT COIL.
Operating the channel shows the current in the coil



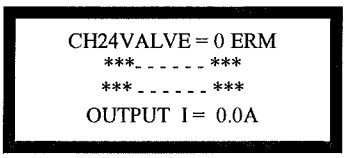
CH21 = DRAWBAR RIGHT COIL.
Operating the channel shows the current in the coil



CH22 = OPTION (1) RAISE.
Operating the channel shows the current in the coil



CH23 = OPTION (1) LOWER.
Operating the channel shows the current in the coil



CH24 = LEFT DIGGER LOWER COIL.
Operating the channel shows the current in the coil

Exit menu display by 'F3' + 'F2'.

SETTING AND OPERATING INSTRUCTIONS

In the event of a fault occurring which requires the main processor module to be replaced, or if the version of the operating software is upgraded, or reloaded then it is necessary to reset the default parameters of the system. After resetting the defaults the parameters can be reset to suit the operating requirements.

TO SET DEFAULT PARAMETERS

Turn on the system.

On the service terminal display enter by pressing F1 + ENTER.

Step down through the levels with the Down arrow to 'STORE DEFAULT GENERAL'

Set the password to'6', then press 'ENTER'

Exiting the level with 'F1'+ 'ENTER' sets the defaults.

Again enter the display with 'F1' + 'ENTER'

Step down through the levels with the Down arrow to 'STORE DEFAULT CHANNEL'

Set the password to'6', then press 'ENTER'

Exiting the level with 'F1'+ 'ENTER' sets the defaults.

Turn off the system.

Turn on the system, check, and reset the system parameters to suit the machine by scrolling through the display screen on the control box using the down arrow, and the left/right arrows to select options, as shown on the parameter list.

3.13 CAN-BUS OPERATING INSTRUCTIONS

Settings for the Parameter STATUS

Description		Enterprise	Vision	Destoner	Value
Web3	not stop	not available	not available		0
	stop	not available	not available		1
Machine Type	Vision			not available	0
	Enterprise			not available	2
Auto reverse	on			not available	0
	off (Galaxy)			not available	4
Hydraulic Drawbar Sensor	low active	not available	not available		0
	high active	not available	not available		8
sum (max. value)					15

e.g.
If you want select Web3 stop and Hydraulic Drawbar Sensor high active the value for STATUS is 8 + 1 = 9

The default parameters set above will configure the system for a standard vision machine, which uses the ELMR194 basic slave module, and fitted with 'analogue depth sensors.

To set the system for Enterprise the default value 2 has to be set

For a Vision 'XS' which uses the larger ELMR196 slave module the system parameters have to be set as follows.

Turn on the system.

On the service terminal display enter by pressing F1 + ENTER.

Step down through the levels with the Down arrow to 'SETUP LEVEL 2 GENERAL'

Set the password to'6', then press 'ENTER'

Step down through the levels with the Down arrow to 'ELMR 194 Number 1'

Change the number '1' for ELMR194 too '3' to identify the ELMR196 on the system press 'ENTER'.

Exiting the level with 'F1'+ 'ENTER' sets the defaults.

Again enter the display with 'F1' + 'ENTER'
Step down through the levels with the Down arrow to 'STORE DEFAULT SLAVE'

Set the password to'6', then press 'ENTER'
Exiting the level with 'F1'+ 'ENTER' pressed together sets the defaults for the ELMR196.
Turn off the system.

SET DEFAULT VALUES

These values are all adjustable from the main display screens. Follow the instructions on the screen using 'F4' to increase values, and 'F5' to decrease values. Revised values must saved with the 'ENTER' key to be effective.

When the 'ENTER' button is pressed, and the 4 green lights above the display screen flash on the revised parameter value shown on the screen is saved as the working value.

PARAMETERS WITH DIRECT ACCESS

1	PAR1	Analg/OnionGat: Digger Analog: Value |= 1 Onion Gate: Value |= 2 Cleaner Analog: Value |= 4
2	PAR2	CTabAngFlowV31: Cleaner Table Angle Flow Valve(31) [ltr]
3	PAR3	CTabRev. Time Cleaner Table Reverse Time [ms]
4	PAR4	CTabForw Time Cleaner Table Forward Time [ms]
5	PAR5	ElevSwanFloV39A Elevator Swan Neck Flow Valve(39) Automatic Mode [ltr]
6	PAR6	OnionGaTimeV37 Onion Gate Time for Valve(37) [ms]
7	PAR7	OnionGaTimeV38 Onion Gate Time for Valve(38) [ms]
8	PAR8	AutoDpthUpFlwL Auto Depth Raise Flow Left Valve(3) [ltr]
9	PAR9	AutoDpthUpFlwR Auto Depth Raise Flow Right Valve(4) [ltr]
10	PAR10	p-RevTrggerPnt Pressure Reverse Trigger Point [bar]
11	PAR11	RaiseTimeR Raise Time Right [ms]
12	PAR12	RaiseTimeL Raise Time Left [ms]
13	PAR13	AnaSensMaxR Analog Sensor Max Band Right [mm] (relative)
14	PAR14	AnaSensMinR Analog Sensor Min Band Right [mm] (relative)
15	PAR15	AnaSensMaxL Analog Sensor Max Band Left [mm] (relative)

16	PAR16	AnaSensMinL Analog Sensor Min Band Left [mm] (relative)
17	PAR17	ClodFingersV57 Clod Fingers Valve 57 [ltr]
18	PAR18	ElevSwanFloV39M Elevator Swan Neck Flow Valve(39) Manual Mode [ltr]
19	PAR19	ScndWebV71 Second Web Valve 71 [ltr]
20	PAR20	Option0V72 Option0 Valve 72 [ltr]
21	PAR21	StarsV73 Stars Valve 73 [ltr]
22	PAR22	Option1RaiseV74 Option1 Raise Valve 74 [ltr]
23	PAR23	Option1LowerV75 Option1 Lower Valve 75 [ltr]
24	PAR24	Option2RaiseV76 Option2 Raise Valve 76 [ltr]
25	PAR25	Option2LowerV77 Option2 Lower Valve 77 [ltr]

The preset values will need to be varied to suit the operation of each machine; before revising programmes, or resetting defaults, note any variations to allow them to be re-entered.

TO FLASH (LOAD) THE PROGRAMME

With the control system connected together, turn of the system at the control box.

Remove the cover from the junction box, and connect the P.C. to the CAN – CPC port on the distribution board.

Turn off the 'Flash switch' on the distribution board.

Turn on the system at the control box.

Select 'Flash with local ID on the P.C. screen.

When prompted on the screen turn on the 'Flash switch'

Wait for the programme to reload.

Turn off the system, disconnect the P.C., and replace the distribution box cover.

After loading the programme it is necessary to set the 'Default Parameters'
The system functions are as follows.

DRAWBAR STEER
The drawbar steer will operate with a double acting valve, fitted with p/o checks. Switching will be with a spring centre toggle switch, switch (1) for left, switch (2) for right.

OPTION
The option switching controls a double acting on/off, or proportional valve. The parameters for an onion gate are also required. When a proportional valve is fitted parameters are required to set the flow rates.
Push button (54) operates raise, Push button (55) operates lower.

DIGGER LIFT
The digger lift will be identical to the latest Vision system, able to operate in manual, or automatic mode. In automatic mode the depth can be controlled either by two pairs of digital sensors with the fascia potentiometer setting raise delay, or by two analogue sensors with the potentiometer setting working depth. Two single acting proportional valves fitted with solenoid lower checks will operate the left and right hand lift rams. Switching will be as follows. A toggle switch (3) momentary will operate manual raise, centre will hold the digger at any position, and (4) latch will operate lower. A momentary push button (5) turns on, and off the auto depth, and lights LED (5) when on.
Potentiometer (10) sets the raise delay, or the working depth depending on which sensors are fitted.
LED (6) lights for left raise signal, and (7) for left lower signal.
LED (8) lights for right raise signal, and (9) for right lower signal.

DIGGER WEB
The digger web will operate a single SR3C 80Lt proportional valve.
Push button switch (13) stops and starts the web, and turns on LED (13) when on.
Potentiometer (12) sets the speed.

AGITATION
The agitation will operate a single SR3C 25Lt proportional valve.
Push button switch (14) stops and starts the web, and turns on LED (14) when on.
Potentiometer (15) sets the speed.
The agitator is moved in and out of operation by an electric actuator. The raise relay for the agitator is turned on by push button (35). The lower relay is turned on by push button (36)

CLOD FINGERS
The clod fingers will operate a single SR3C 16Lt proportional valve.
Push button switch (18) stops and starts the web, and turns on LED (18) when on.
The flow rate is adjusted with a parameter on the service terminal.

STARS
The stars will operate a single SR3C 36Lt proportional valve.
Push button switch (48) stops and starts the web, and turns on LED (48) when on.
The flow rate is adjusted with a parameter on the service terminal.

3.17 CAN-BUS OPERATING INSTRUCTIONS

DIABLO
The diablo will operate a single SR3C 25Lt proportional valve.
Push button switch (17) stops and starts the web, and turns on LED (17) when on.
Potentiometer (16) sets the speed.

AXLE LEVEL
The axle level operates a double acting valve with a p/o check.
Joystick switch (24) raises the machine, switch (23) lower the machine.
When an auto level unit is fitted, push button (25) enables the digital sensor raise /lower signals, and turns on LED (25). If the joystick switches (24 or 23) are operated when the auto level is on, the auto turns off.

AXLE STEER
The axle steer operates a double acting valve with a p/o check.
Joystick switch (21) steers the machine right, switch (20) steers the machine left.
An auto centre unit is fitted, push button (22) enables the digital sensor left / right signals to bring the steering to centre.

AXLE DRIVE
The axle drive operates a double acting '8' series proportional valve with 75Lt spool, to drive forward or reverse, and has a solenoid low pressure relief in the low sense line to give a low / high pressure in the system.
Detented toggle switch (26) engages forward drive, and turns on LED (26).
Detented toggle switch (27) engages reverse drive, and turns on LED (27).
Potentiometer (19) sets the proportional flow rate of the valve.
Push button (28) energises the low pressure relief, and turns on LED (28)

PROCLEAN / GALAXY
The proclean / galaxy option operates a double acting '8' series proportional valve with 75Lt spool., with a pressure switch, or transducer in the pressure line to trigger auto reverse.
A parameter screen is needed to select 'Cleaner table', or 'Galaxy'.
When a roller table is selected, and installed it should work exactly as Vision with all the current parameters.
The push button (33) starts the forward running, and turns on the LED (33) with the sensor and the manual reverse switch (34) triggering the auto reverse function, and turning on LED (34), Potentiometer (32) sets the forward speed, with the reverse being full flow.
When a 'Galaxy' is selected the auto reverse function should be disabled, but the manual reverse should still work.

CLEANER ANGLE
The cleaner angle is operated with an electric actuator.
Push button (29) activates the raise relay, and push button (30) operates the lower relay.
Push button (31) enables the digital signals from the auto level unit, and turns on the LED (31)

OPTION.
The option will operate a single acting proportional valve.
Push button switch (52) stops and starts the function, and turns on LED (52) when on.
The flow rate is adjusted with a parameter on the service terminal.

AUXILARY
The push button (51) turns on the auxiliary power relay in the distribution box, and turns on LED (51) .

ELEVATOR MOTOR
The elevator service is a single acting proportional 63Lt valve, fitted with a top mounted block comprising two solenoid cross line bypass valves.
Push button (42) switches on the proportional valve, and turns on LED (42).
Potentiometer (43) sets the flow.
Push button (44) starts the elevator, and lights LED (44).
Push button (45) starts the spreader, or picking table, and lights LED (445.
Push button (46) switches on the elevator reversing valve, and lights LED (46).

ELEVATOR SWAN NECK
The elevator swan neck operates with a single acting proportional valve, and a solenoid check valve.
Joystick switch (37) raises the swan neck. A service terminal parameter sets the flow.
Joystick switch (38) lowers the swan neck
Push button (39) enables the auto height digital signals, and turns on the LED (39), a service terminal parameter sets the auto height raise flow.
If the joystick switches (37, and 38) are operated the auto height turns of.

ELEVATOR FOLD
The elevator fold operates with a double acting valve fitted with an over centre/ check valve.
Joystick switch (40) folds the elevator in.
Joystick switch (41) folds the elevator out

AUTO STOP / START PROGRAMME
The auto stop programme remembers the stop sequence used by the operator, and can include all functions
Push button 49 starts the sequence.

The auto start programme remembers the start sequence used by the operator, and can include all functions except the discharge elevator swan neck, fold, and run.
Push button 50 starts the sequence.

PLATFORM HOOTER
The push button (56) operates the remote warning buzzer on the machine.
A remote switch on the machine operates the relay in the control box. for the in cab buzzer.

3.19 CAN-BUS OPERATING INSTRUCTIONS

Description	Plug Number	Button / LED Number	Description	Channel	Channel
	ESMR 193	of the terminal		ELMR190	ELMR196
Digital In 1.1	X30.1	55	OPTION LOWER	CH 23	
Digital In 1.2	X30.26	5	AUTO DEPTH ON/OFF		
Digital In 1.3	X30.2	54	OPTION RAISE	CH 22	
Digital In 1.4	X30.27	13	DIGGER WEB ON/OFF	CH 15	
Digital In 1.5	X30.3	18	CLOD FINGERS ON/OF	CH 18	
Digital In 1.6	X30.28	16	DIABLO ON/OFF	CH 17	
Digital In 1.7	X30.4	14	AGITATION ON/OFF	CH 16	
Digital In 1.8	X30.29	48	STARS ON/OFF		SL CH 4
UB Out	X30.5	Common signal for the buttons			
Ground Out	X30.30				
Digital In 2.1	X30.6	36	AGITATION LOWER		SL CH 9
Digital In 2.2	X30.31	28	AXLE HIGH POWER	CH 12	
Digital In 2.3	X30.7	33	TABLE ON/OFF	CH 3	
Digital In 2.4	X30.32	35	AGITATION RAISE		SL CH 10
Digital In 2.5	X30.8	34	TABLE MANUAL REVERSE	CH 7	
Digital In 2.6	X30.33	31	TABLE AUTO LEVEL ON/OFF		
Digital In 2.7	X30.9	22	STEERING AUTO CENTRE		
Digital In 2.8	X30.34	29	TABLE RAISE	CH 4	
UB Out	X30.10	Common signal for the buttons			
Ground Out	X30.35				
Digital In 3.1	X30.11	25	AUTO LEVEL ON/OFF		
Digital In 3.2	X30.36	30	TABLE LOWER	CH 6	
Digital In 3.3	X30.12	26	AXLE DRIVE FORWARD	CH 2	
Digital In 3.4	X30.37	27	AXLE DRIVE REVERSE	CH 1	
Digital In 3.5	X30.13	3	DIGGER SHARE RAISE	CH 13/14	
Digital In 3.6	X30.38	4	DIGGER SHARE LOWER	CH 9/24	
Digital In 3.7	X30.14	1	DARWBAR LEFT	CH 20	
Digital In 3.8	X30.39	2	DRAWBAR RIGHT	CH 21	
UB Out	X30.15	Common signal for the buttons			
Ground Out	X30.40				
Digital Out 1.1	X30.44	26	AXLE DRIVE FORWARD		
Digital Out 1.2	X30.19	28	AXLE DRIVE HIGH POWER		
Digital Out 1.3	X30.43	6	LEFT DIGGER RAISE		
Digital Out 1.4	X30.18	8	RIGHT DIGGER RAISE		
Digital Out 1.5	X30.42	9	RIGHT DIGGER LOWER		
Digital Out 1.6	X30.17	7	LEFT DIGGER LOWER		
Digital Out 1.7	X30.41	5	AUTO DEPTH ON		
Digital Out 1.8	X30.16	13	DIGGER WEB ON		
UB Out	X30.20	Supply Button / LED			
	X30.45				

Digital Out 2.1	X30.24	27	AXLE DRIVE REVERSE		
Digital Out 2.2	X30.49				
Digital Out 2.3	X30.23	25	AUTO LEVEL ON		
Digital Out 2.4	X30.48	33	TABLE ON		
Digital Out 2.5	X30.22	18	CLOD FINGERS ON		
Digital Out 2.6	X30.47	16	DIABLO ON		
Digital Out 2.7	X30.21	48	STARS ON		
Digital Out 2.8	X30.46	14	AGITATION ON		
UB Out	X30.25	Supply Button / LED			
	X30.50				
Digital In 11.1	X40.1	50	PROGRAMME START		
Digital In 11.2	X40.26	49	PROGRAMME STOP		
Digital In 11.3	X40.2	56	PLATFORM HOOTER		SL CH 2
Digital In 11.4	X40.27	52	OPTION ON/OFF		SL CH 3
Digital In 11.5	X40.3	39	ELEV AUTO HEIGHT ON/OFF		
Digital In 11.6	X40.28	51	AUX ON/OFF		SL CH 16
Digital In 11.7	X40.4	45	SPREADER / TABLE ON/OFF		SL CH 8
Digital In 11.8	X40.29	46	WINDROW ON/OFF		SL CH 13
UB Out	X40.5	Common signal for the buttons			
Ground Out	X40.30				
Digital In 12.1	X40.6	42	DISCHARGE ON/OFF	CH 19	
Digital In 12.2	X40.31	44	ELEVATOR ON/OFF		SL CH 7
Digital In 12.3	X40.7	21	AXLE STEER RIGHT	CH 11	
Digital In 12.4	X40.32	20	AXLE STEER LEFT	CH 10	
Digital In 12.5	X40.8	24	AXLE LEVEL LOWER		SL CH 6
Digital In 12.6	X40.33	23	AXLE LEVEL RAISE		SL CH 5
Digital In 12.7	X40.9	40	ELEVATOR IN		SL CH 14
Digital In 12.8	X40.34	41	ELEVATOR OUT		SL CH 15
UB Out	X40.10	Common signal for the buttons			
Ground Out	X40.35				
Digital In 13.1	X40.11	37	SWAN NECK LOWER	CH 8	
Digital In 13.2	X40.36	38	SWAN NECK RAISE	CH 5	
Digital In 13.3	X40.12				
Digital In 13.4	X40.37				
Digital In 13.5	X40.13				
Digital In 13.6	X40.38				
Digital In 13.7	X40.14				
Digital In 13.8	X40.39				
UB Out	X40.15	Common signal for the buttons			
Ground Out	X40.40				
Digital Out 11.1	X40.44	42	DISCHARGE ON		

3.21 CAN-BUS OPERATING INSTRUCTIONS

Digital Out 11.2	X40.19	45	SPREADER ON		
Digital Out 11.3	X40.43	46	WINDROW ON		
Digital Out 11.4	X40.18	39	AUTO HEIGHT ON		
Digital Out 11.5	X40.42	51	AUX ON		
Digital Out 11.6	X40.17	52	OPTION ON		
Digital Out 11.7	X40.41	31	TABLE AUTO LEVEL ON		
Digital Out 11.8	X40.16	34	TABLE MAUAL REVERSE		
UB Out	X40.20	Supply Button / LED			
	X40.45				
Digital Out 12.1	X40.24				
Digital Out 12.2	X40.49	BUZZER RELAY OUT			
Digital Out 12.3	X40.23				
Digital Out 12.4	X40.48				
Digital Out 12.5	X40.22				
Digital Out 12.6	X40.47				
Digital Out 12.7	X40.21				
Digital Out 12.8	X40.46	44	ELEVATOR ON		
UB Out	X40.25	Supply Button / LED			
	X40.50				
Analog In 1	X20.13	10	potentiometer -DEPTH		
Analog In 2	X20.14	17	potentiometer -DIABLO		
Analog In 3	X20.15	19	potentiometer -AXLE SPEED		
Analog In 4	X20.16	43	potentiometer -ELEVATOR		
Analog In 5	X20.5	12	potentiometer -DIGGER WEB		
Analog In 6	X20.6	15	potentiometer -AGITATION		
Analog In 7	X20.7	32	potentiometer -TABLE/STARS		
Analog In 8	X20.8		potentiometer		
Uref Out	X20.4				
GRDref Out	X20.12				

CAN-BUS OPERATING INSTRUCTIONS 3.22

ELMR190	CABLE	CABLE	FUNCTION	OUTPUT	SENSOR	FASCIA	DIST
PIN No	COLOUR	No		CHANNEL	INPUT	SWITCH	BOARD
1	BLUE	EARTH 1	FUSED EARTH				1
2	BLACK	20	AXLE STEER LEFT COIL	CH 10		20	
3	BLACK	28	AXLE HIGH POWER	CH 12		28	
4	RED	RX	SERIAL CON				4RX
5	BLUE	TX	SERIAL CON				5TX
6	PURPLE	106	ANALOGUE DEPTH SENSOR LEFT		AIN 1		109/30
7	PURPLE	108			AIN3		
8	PURPLE	161			AIN5		
9							
10	BLACK	4	LEFT DIGGER LOWER COIL	CH 24		4	
11	BLACK	1	DRAWBAR LEFT COIL	CH 20		1	
12	PURPLE	7	DIGITAL LEFT DIGGER LOWER SENSOR		DIN 2		7
13	PURPLE	9	DIGITAL RIGHT DIGGER LOWER SENSOR		DIN 4		9
14	PURPLE	23	DIGITAL RIGHT STEER SENSOR		DIN 6		23
15	PURPLE	32	AUTO CLEANER LOWER SENSOR		DIN 8		32
16	PURPLE	26	AUTO AXLE LEVEL LOWER SENSOR		DIN 10		26
17	PURPLE	62	PRESSURE SWITCH / / REMOTE MAN REV		DIN 12		62
18	PURPLE	40	AUTO HEIGHT RAISE SENSOR		DIN 14		40
19							
20	RED	3	RIGHT DIGGER PROPORTIONAL RAISE	CH 14		3	
21	RED	14	AGITATOR PROPORTIONAL COIL	CH 16		14	
22	RED	18	CLOD FINGER PROPORTIONAL COIL	CH 18		18	
23	BROWN	84	REFERANCE SUPPLY VOLTAGE 8.5V				23
24	BLACK	4	RIGHT DIGGER LOWER COIL	CH 9		4	
25	BLACK	21	AXLE STEER RIGHT COIL	CH 11		21	
26	BLUE	CAN LOW	CAN BUS SIGNAL				X1.6/2
27	RED	CAN HIGH	CAN BUS SIGNAL				X1.6/1
28	BROWN	POSITIVE	12VOLT FEED				28
29	PURPLE	107	ANALOGUE DIGGER SENSOR RIGHT		AIN 2		107/29
30	PURPLE	109			AIN4		
31	PURPLE	162	PRESSURE TRANSDUCER		AIN 6		62/17
32							
33							
34	PURPLE	6	DIGITAL LEFT DIGGER RAISE SENSOR		DIN 1		6
35	PURPLE	8	DIGITAL RIGHT DIGGER RAISE SENSOR		DIN 3		8
36	PURPLE	22	DIGITAL LEFT STEER SENSOR		DIN 5		22
37	PURPLE	31	AUTO CLEANER RAISE SENSOR		DIN 7		31
38	PURPLE	25	AUTO AXLE LEVEL RAISE SENSOR		DIN 9		25
39	PURPLE	61	DIGITAL PRESSURE SWITCH		DIN 11		61
40	PURPLE	39	AUTO HEIGHT LOWER SENSOR		DIN 13		39
41	PURPLE	56	SOUNDER SWITCH INPUT		DIN 15		
42	RED	3	LEFT DIGGER PROPORTIONAL RAISE	CH 13		3	
43	RED	13	DIGGER WEB PROPORTIONAL COIL	CH 15		13	
44	RED	16	DIABLO PROPORTIONAL COIL	CH 17		16	
45	RED	42	DISCHARGE PROPORTIONAL COIL	CH 19		42	

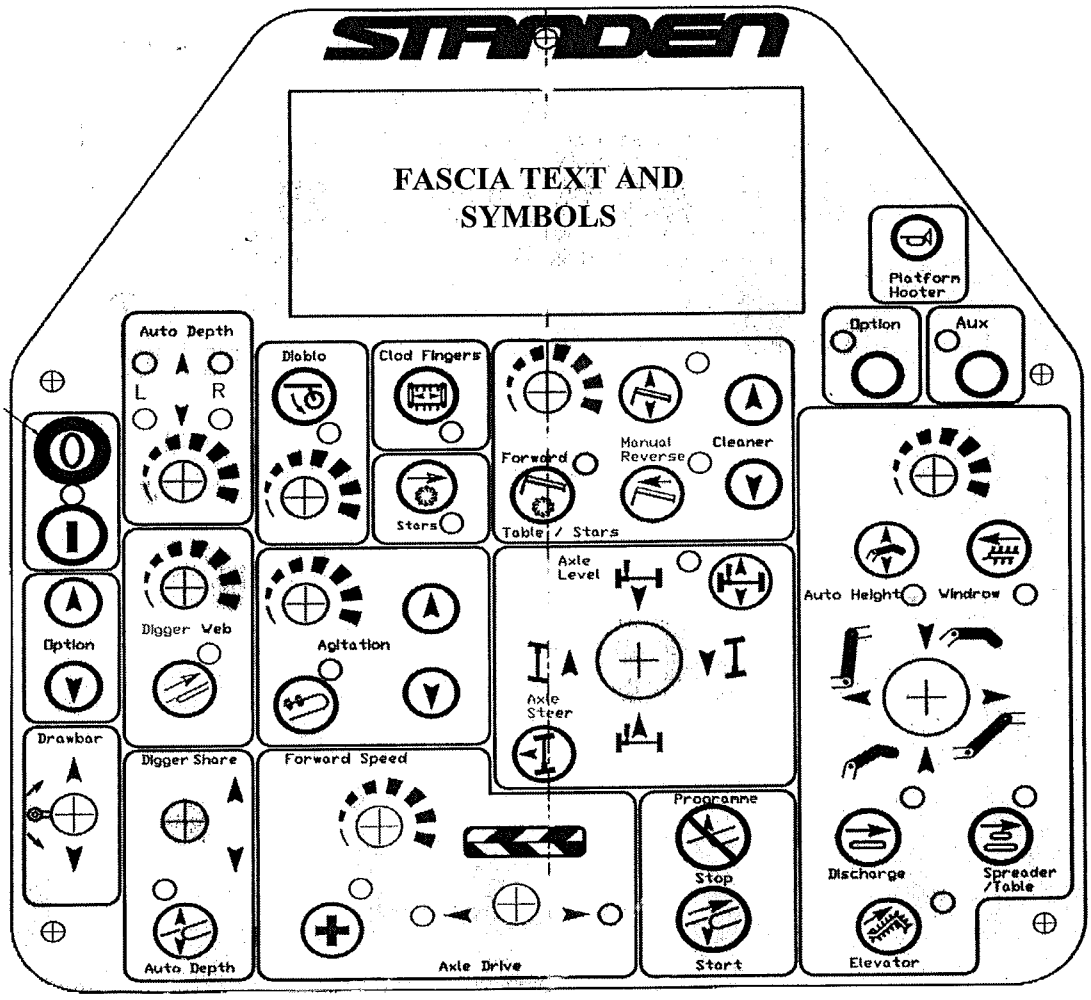
3.23 CAN-BUS OPERATING INSTRUCTIONS

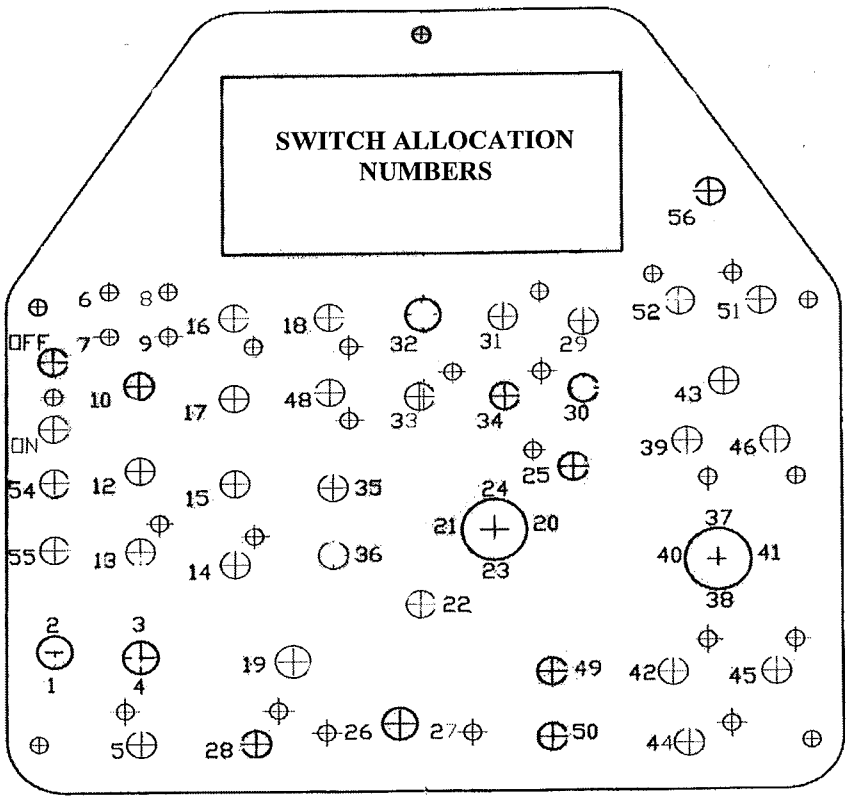
46	BLACK	27	AXLE DRIVE REVERSE COIL	CH 1		27	
47	BLACK	26	AXLE DRIVE FORWARD COIL	CH 2		26	
48	RED	33	CLEANER FORWARD PROPORTIONAL COIL	CH 3		33	
49	RED	29	CLEANER RAISE COIL	CH 4		29	
50	BLACK	2	DRAWBAR RIGHT COIL	CH 21		2	
51	BLACK	54	OPTION VALVE 1 RAISE COIL	CH 22		54	
52	BLACK	55	OPTION VALVE 1 LOWER COIL	CH 23		55	
53							
54	BROWN	POSITIVE	12VOLT FEED				54
55	BLUE	EARTH	0VOLT (FUSED 1 A)				55
56	BROWN	POSITIVE	12VOLT FEED				56
57	BROWN	POSITIVE	12VOLT FEED				57
58	BROWN	POSITIVE	12VOLT FEED				58
59	BROWN	POSITIVE	12VOLT FEED				59
60	BROWN	POSITIVE	12VOLT FEED				60
61	BLACK	30	CLEANER LOWER COIL	CH 6		30	
62	BLACK	34	CLEANER REVERSE COIL	CH 7		34	
63	BLACK	37	SWAN NECK LOWER COIL	CH 8		37	
64	RED	38	SWAN NECK PROPORTIONAL RAISE COIL	CH 5		38	
65	BLUE	EARTH	0VOLT				65
66	BLUE	EARTH	0VOLT				66
67	BLUE	EARTH	0VOLT				67
68	BLUE	EARTH	0VOLT				68

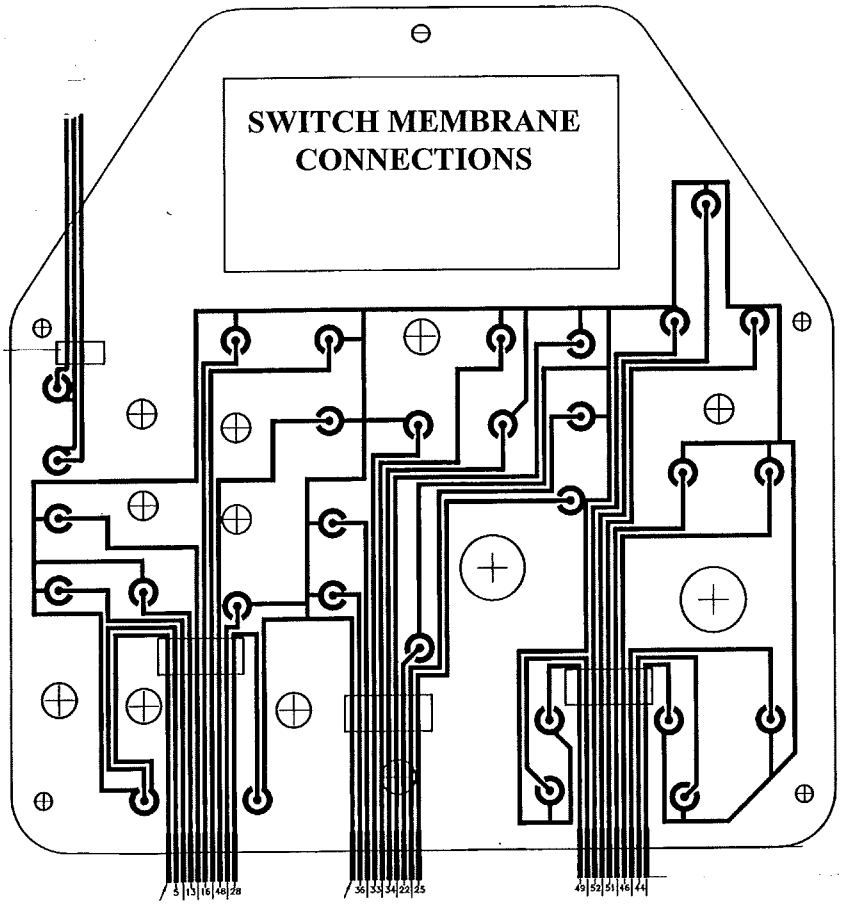
CAN-BUS OPERATING INSTRUCTIONS 3.24

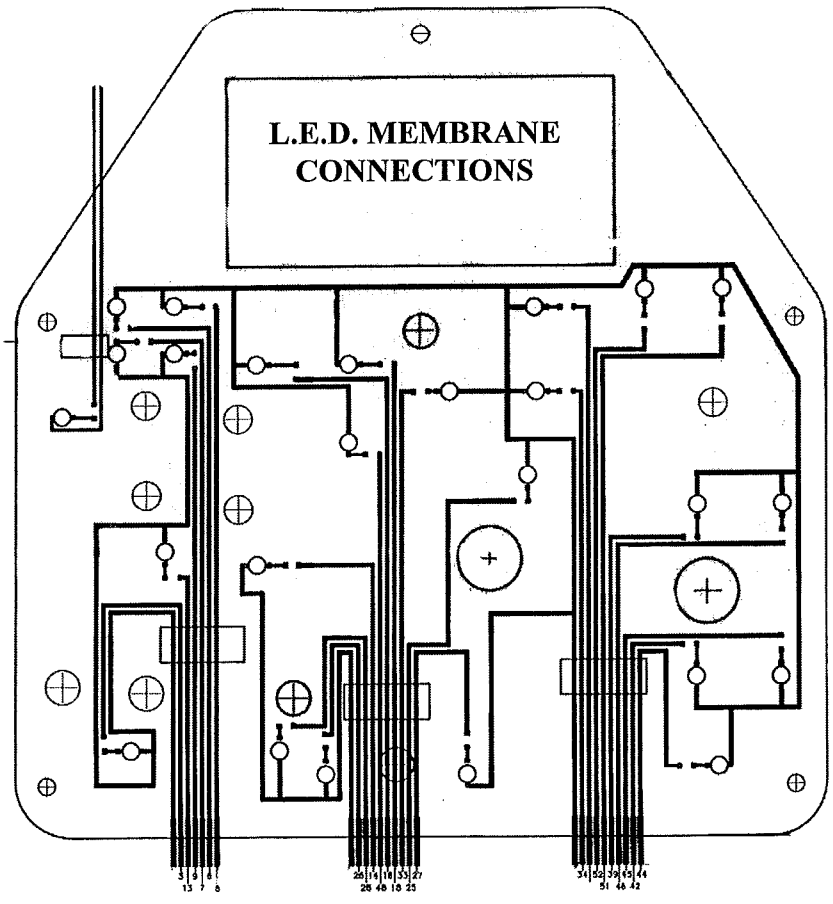
ELMR196	CABLE	CABLE	FUNCTION	OUTPUT	SWITCH
PIN No	COLOUR	No		CHANNEL	NUMBER
1	BROWN	POSITIVE	12 VOLT FEED		
2	BLACK	23	AXLE LEVEL RAISE COIL	SLAVE CH 5	23
3	BLACK	24	AXLE LEVEL LOWER COIL	SLAVE CH 6	24
4	BLACK	44	ELEVATOR RUN COIL	SLAVE CH 7	44
5	BLACK	45	SPREADER/TABLE RUN COIL	SLAVE CH 8	45
6					
7					
8					
9					
10	BLACK	46	ELEVATOR WINDROW COIL	SLAVE CH 13	46
11	BLACK	40	ELEVATOR FOLD IN COIL	SLAVE CH 14	40
12	BLACK	41	ELEVATOR FOLD OUT COIL	SLAVE CH 15	41
13	BLACK	51	SPARE (AUX)	SLAVE CH 16	51
14	BROWN	POSITIVE	12 VOLT FEED		
15	BROWN	POSITIVE	12 VOLT FEED		
16	BLUE	EARTH	0 VOLT		
17	BLUE	EARTH	0 VOLT		
18	BLACK	56	PLATFORM HOOTER	SLAVE CH 2	56
19	RED	48	STAR CLEANER PROPORTIONAL COIL	SLAVE CH 4	48
20					
21					
22	BLACK	36	AGITATION LOWER RELAY	SLAVE CH 9	36
23	BLACK	35	AGITATION RAISE LOWER	SLAVE CH 10	35
24	RED			SLAVE CH 11	
25	RED			SLAVE CH 12	
26	BLUE	CAN LOW -	CAN BUS SIGNAL IN		
27	RED	CAN HIGH +	CAN BUS SIGNAL IN		
28	BROWN	POSITIVE	12 VOLT FEED		
29	BROWN	POSITIVE	12 VOLT FEED		
30	BLUE	EARTH	0 VOLT		
31	BLUE	EARTH	0 VOLT		
32	RED			SLAVE CH 1	
33	RED	52	OPTION VALVE 2 PROPORTIONAL COIL	SLAVE CH 3	52
34					
35					
36	BROWN	POSITIVE	FUSED 12 VOLT FEED		
37					
38					
39					
40	BLUE	CAN LOW -	CAN BUS SIGNAL OUT		
41	RED	CAN HIGH +	CAN BUS SIGNAL OUT		
42	BROWN	POSITIVE	12VOLT FEED		

3.25 CAN-BUS OPERATING INSTRUCTIONS






SWITCH MEMBRANE
CONNECTIONS


L.E.D. MEMBRANE
CONNECTIONS

3.27 CAN-BUS OPERATING INSTRUCTIONS

MODULE CONNECTIONS AND WIRE IDENTIFICATIONS

The wiring connections, and channel allocations for the system are listed in following tables.
The pin numbers refer to the multi-plug connections on the modules.
The cable numbers refer to the continuity numbers on the cables in the loom.
The output channel numbers for the190 module relate to the identification numbers displayed on the Diagnostic screens.

LIMITING AND OVERIDING DEFAULT VALUES

During operation it may be necessary to vary defaulted parameters for example to limit the maximum speed of a motor circuit. To be able to select the relevant channel it is necessary to refer to the list of functions to find the allocated channel number.

On the service terminal display enter by pressing F1 + ENTER.

Step down through the levels with the Down arrow to level '3',

Set the password to'6', then press 'ENTER'

Select the required channel with the left/right arrows;
Scroll to the parameter with the up/down arrows
e.g.(the maximum, and minimum coil current limits are shown as follows;
Imin = 750Ma (minimum coil current)
Imax = 1650Ma (maximum coil current)
If these values are altered press 'ENTER' to save the revised value.
Pressing 'ESC' exits without saving changes.

Exiting the level with 'F1'+ 'ENTER' sets the defaults.

CHANNEL '3' DEFAULT SCREENS