Sidelifter SB362 & SB450

Operation, Service & Maintenance Manual

DC-41326-02EN V1310

STEELBRO

Container Handling Solutions

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Change History

This page records changes to this publication.

DATE	VERSION	DESCRIPTION
October 2013	V1310	Care of chains

Warranty Summary

This warranty statement is a summary of the full product warranty and does not constitute a full statement of the warranty terms and conditions.

The following warranty is given in lieu of and to the exclusion of any other guarantee, condition or warranty, either expressed or implied by statute or otherwise and whether regarding goods manufactured by ourselves or others. Provided the terms of payment are promptly complied with by you, we undertake to remedy with reasonable despatch, any original defects arising from faulty workmanship, in any goods manufactured by us, which under proper and normal conditions of use, are revealed within twelve (12) calendar months or one thousand (1000) hours of operation, whichever occurs soonest from the date of delivery, provided the defective item is returned to our Works, freight paid both ways, or in the case of the item not being returnable, then provided the expenses of travelling, transport, plant hire and accommodation are to your account.

Any goods supplied or work done in remedying such defects shall not extend our liability under this clause beyond the time stipulated above. At the expiration of such time, all further liability on our part shall cease. In the case of goods or material not of our manufacture, we shall endeavour to secure for you, the benefit of any guarantee given to us in respect thereof. In no case, shall we be liable for the cost of replacing and fitting of defective goods, and goods replaced shall become our property. No responsibility will be accepted for any defect, unless we first receive a written complaint, and we have been given first priority and ample opportunity to rectify the defect.

Liability for consequential damage or loss arising from defects, faulty materials, omissions, or negligence of workmanship, in any goods supplied by us is excluded.

Labour charges for work carried out under the terms of this warranty are to the purchaser's account.

Variations to the above are subject to STEELBRO New Zealand Limited Management approval.

Claims under warranty will only be accepted if all conditions of warranty are satisfied.

Foreword

This Operators Manual deals with your new **STEELBRO** Sidelifter. Take the time to read it through - it will be time well spent. The manual contains a short description of the Sidelifter together with instructions on its operation and maintenance. Usually this manual is provided along with other documentation, including manuals provided by third party manufacturers, compliance certification, parts lists, technical drawings and schematics. This information is provided in bound print format, in a folder or on a data CD.

To ensure a long life for your Sidelifter, you should ensure it is maintained regularly. All servicing, apart from lubrication and minor repairs should, wherever possible, be carried out by a **STEELBRO** approved service facility.

We reserve the right to introduce without notice, changes in data, equipment and service and maintenance instructions.

Symbols

This symbol means that the instruction in the shaded area is essential to the safe operation of your Sidelifter and failure to follow the instruction is likely to lead to injury or damage to property

This symbol means that the instruction in the shaded area relates to safe or recommended practice and failure to follow the instruction could lead to damage or accident.

This symbol means that the information in the shaded area is useful and/or is something we wish to emphasise.

Owner and Operator Responsibilities

Regulation Compliance

It is the responsibility of the **OWNER** to ensure that use of the Sidelifter fully complies with all Local Authority, State and Government regulations covering lifting equipment, road use, health and safety in the country where the Sidelifter is being used.

Health and Safety Compliance

The **OWNER** must provide and maintain work environments, systems of work, and equipment that is, as far as practicable, safe and without risks to health.

The **OWNER** must ensure that only properly trained and approved operators use the Sidelifter. In some locations, the law requires an operator's Certificate of Competency. The **OWNER** must ensure that they comply in full with such requirements.

Operators must consistently demonstrate:

1. Healthy and safe work practices.
2. Medical and mental fitness for the task.
3. A sound knowledge of emergency procedures.
4. A sound knowledge of the contents and requirements of the **STEELBRO** Manuals.

If there is a hazard to health or safety that cannot be eliminated, the **OWNER** must immediately cease using the Sidelifter and contact **STEELBRO** for advice.

Maintenance and Servicing

The **OWNER** should be aware that the reliability, safety, and longevity of the Sidelifter depends on the standard of maintenance and servicing that it receives during its working life. The maintenance and servicing schedules set out in the **STEELBRO** Manuals must be met, and **ONLY** suitably qualified technicians should carry out this work using best practice safe working methods.

Service personnel should always wear appropriate personal protective equipment when maintaining and servicing Sidelifters.

Maintenance Hazards

Service personnel should be aware of these materials and substances which can be hazardous when working with Sidelifter components:

- *Exhaust Gas* - Exhaust gases from power pack engines contain many toxic air contaminants including carbon monoxide which is a colourless, odorless gas. Power packs should only be operated in well ventilated areas.
- *Diesel Fuel* - The vapour and the liquid are irritants to the lungs and skin. Use nitrile or viton gloves to avoid skin contact with diesel fuel. Handle diesel fuel with care and avoid exposure to naked flame.
- *Hydraulic Oil* - Hazards associated with hydraulic oils include burns from hot fluid and accidental injection of fluid beneath the skin due to pinhole leaks in hoses. Gloves will not prevent this type of accident. Always ensure hydraulic system pressure has been relieved before working on hydraulic systems. When detecting hydraulic leaks use a piece of wood or cardboard and not your fingers to find a leak. Pinhole leaks can also atomise hydraulic fluid which can then be ignited by spark or flame. Use nitrile gloves to avoid skin contact with hydraulic oils.
- *Battery Acids and Gases* - Lead acid batteries use highly corrosive sulphuric acid and produce hydrogen and oxygen which are flammable. Avoid naked flames around batteries and protect your skin using butyl gloves.
- *Antifreeze* - The power pack uses an ethylene glycol long life coolant as a corrosion inhibitor and protection against freezing damage. These coolants are toxic by ingestion and absorption through the skin. Use butyl or viton gloves for protection.

Design and Modifications

When **STEELBRO** notifies you that a modification is required, it is the responsibility of the **OWNER** to ensure that the modification is carried out in accordance with the instructions from **STEELBRO** and if requested, to withdraw the Sidelifter/trailer from service until the modification has been carried out.

The **OWNER** should withdraw the Sidelifter/trailer from use when any deficiencies are identified during inspection of the Sidelifter/trailer which may affect its safe operation, until the design or operational deficiency is rectified.

The **OWNER** should ensure that neither the Sidelifter/trailer nor any of its components are used beyond their design capacity. For crane design capacity refer to the Working Load Limit decal and for the chassis design capacity (when applicable) refer to the Chassis Plate decal. Copies of both of these are included in the manual.

Particular care should be taken to ensure that the emergency stop controls are always operational.

Safety Instructions

It is the responsibility of the Owner to ensure that a Steelbro Sidelifter is only operated by an operator who:

- **is well trained, mentally alert and physically prepared**
- **is working under safe conditions in a comfortable environment**
- **is using a properly maintained and inspected machine in a safe manner**
- **has knowledge of operational and safety measures before operating the Sidelifter**

Operator Safety

Do not use a mobile phone or wear radio or music headphones while operating the Sidelifter.

Avoid any distractions or interruptions while operating the Sidelifter. Stop your lift operation in a safe position if you are being distracted or interrupted.

Always use personal protective equipment when operating the Sidelifter.

If you are unable to continue crane operation due to injury or illness, the Sidelifter must be stopped immediately and the fact must be reported to a responsible person. All operations must be disabled until it has been established whether the Sidelifter caused the injury or illness and the Sidelifter has been assessed as suitable for service.

Take care of your back when bending or manually lifting heavy items (e.g. when changing tyres or attaching chains to Sidelifter crane arms).

All Sidelifter operations can be carried out with the operator at ground level. **DO NOT** climb onto the crane structure. For maintenance or other operations that require 'working at height' refer to the appropriate regulations.

Shift Safety Practices

For the first lift of a working shift and the first lift of each shift where the load is greater than 50% of the maximum lifting capacity, the load must be raised a short distance to test the system before continuing the operation.

At the end of a working shift the Sidelifter should be left in a safe condition in a designated parking area and reasonable precautions taken against unauthorized operation. **SAFE CONDITION** is defined as power supply turned off and with cranes fully stowed. If laden, the container/s should be properly loaded onto the twistlocks, not suspended in any way.

Tractor Unit Safety

A trailer mounted Sidelifter should not be operated unless a tractor unit is coupled to it for stability purposes.

Always apply the vehicle park brake before operating the Sidelifter.

Never overload axles.

Regularly check tyre pressures. Incorrect tyre pressure reduces driving performance and increases tyre wear.

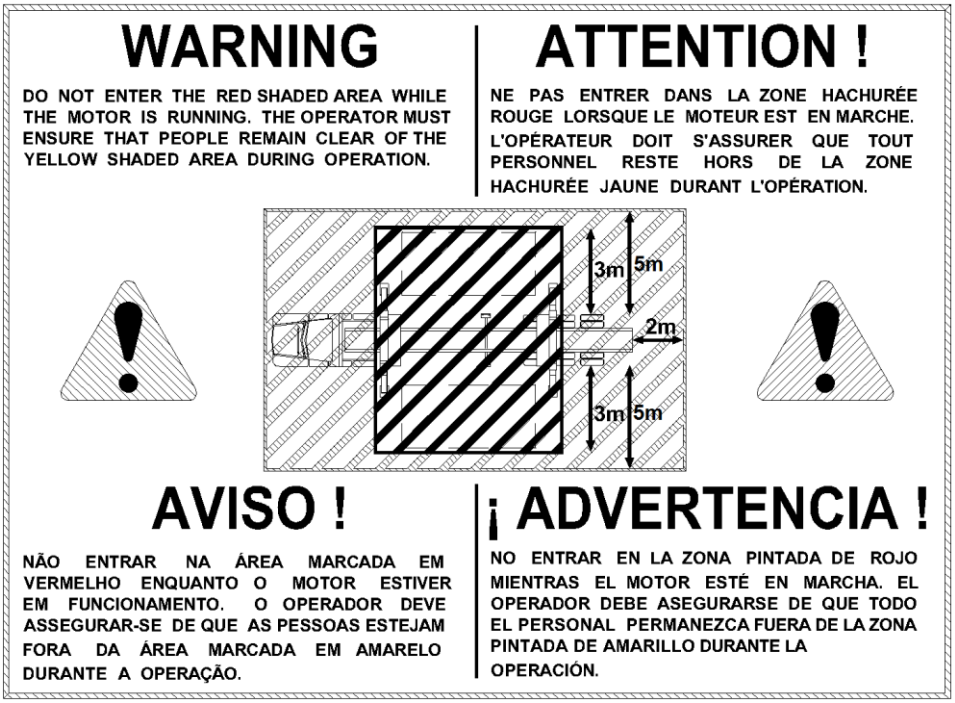
When some tractor unit park brakes are applied they stop providing air to the Sidelifter. Sidelifters with a powerpack need an air supply to operate the pneumatic throttle control on the powerpack. If this is the case then apply the Sidelifter park brake rather than the tractor unit park brake.

Stabiliser Legs

Always deploy the stabiliser legs before operating the cranes. Check that the feet have a firm surface sufficient to withstand the combined weight of the Sidelifter and load, which could be as much as 29 tonne per foot, before commencing any lifting or unloading.

The stabiliser legs must never be operated when the Sidelifter cranes are under load.

Work Area Safety



During operations unauthorised personnel **MUST** keep out of the working area of the Sidelifter as shown in the Dangerous Zone Warning decal.

Always keep the Sidelifter clean and keep loose parts stowed away securely. (Use toolbox provided for this specific purpose)

Never walk or stand below a suspended load.

Never leave the Sidelifter unattended with the load on the hooks and/or the operation controls enabled.

When transferring containers to or from other vehicles do not stand between those vehicles. The Sidelifter must be operated from the end of the companion vehicle. Refer to Lifting Safety (on page 13) for more information on the recommended operating areas.

Lifting Safety

This STEELBRO Sidelifter is designed to lift from one side only. Do not lift any load beyond the centre-line of the Sidelifter onto the ‘non-lifting’ side, referred to in this document as the 'offside'. Do not attempt to lift a container from the offside.

Never exceed the maximum capacity stated on the Working Load Limit Chart for your unit.

Always ensure the twistlocks are unlocked prior to commencing lifting operations.

With Sidelifters that traverse to handle different container sizes, lifting is only permitted when the crane modules are placed into the correct lift positions as defined by the crane stops.

Lifting lugs are left hand and right hand and must be used in their correct positions.

Ensure that lugs are fitted according to the instructions in the manual Lifting Lug Instructions (on page 47).

Do not lift containers from the top lifting points without the use of a STEELBRO top-lifting frame.

ISO Tanktainer Lifting

When flammable liquids are being charged to or discharged from ISO Tanktainer containers:

- the engine must be **SHUT DOWN**
- the battery isolating switch turned **OFF**.

When ISO Tanktainers are being loaded or unloaded from the Sidelifter ensure that **ALL TANKTAINER VALVES ARE SHUT**.

Recommended Operating Area

The Sidelifter Operator must have a full view of the load during the lift and if required sufficient competent persons must be available to assist. The recommended operating area is shown below:

This is a view from above. Operator stands on the lifting side at least 2 metres back from the rear of the Sidelifter where he has a clear field of vision of both the lifting side and rear of Sidelifter. This position is also recommended for transfer to or from a companion vehicle

For transfer to or from a railway carriage, the recommended Operating Area is at least 2 metres back from the rear of the Sidelifter, close enough to the gap between the Sidelifter and carriage to be able to see both.

Other Hazards

Be aware of these other hazards which may affect the safety of your lifting operation:

- Wind Effects - Strong or gusty winds can make it difficult to safely load or unload a container.
- Soft Ground - The ground under the stabiliser legs must be capable of supporting the load. Assess the ground conditions before loading or unloading. Use packing material to spread the load when the ground is assessed as not being capable of supporting the load with the stabiliser foot alone.
- Do not climb on the Sidelifter. Use a ladder if you need to reach the chain lugs when double stacking containers.
- Load shifting - To prevent unsecured container contents moving during a transfer, keep the container as level as possible when lifting and transferring the container.
- Ground Angle - Ensure that you are operating within the acceptable ground angle limits of the Sidelifter.

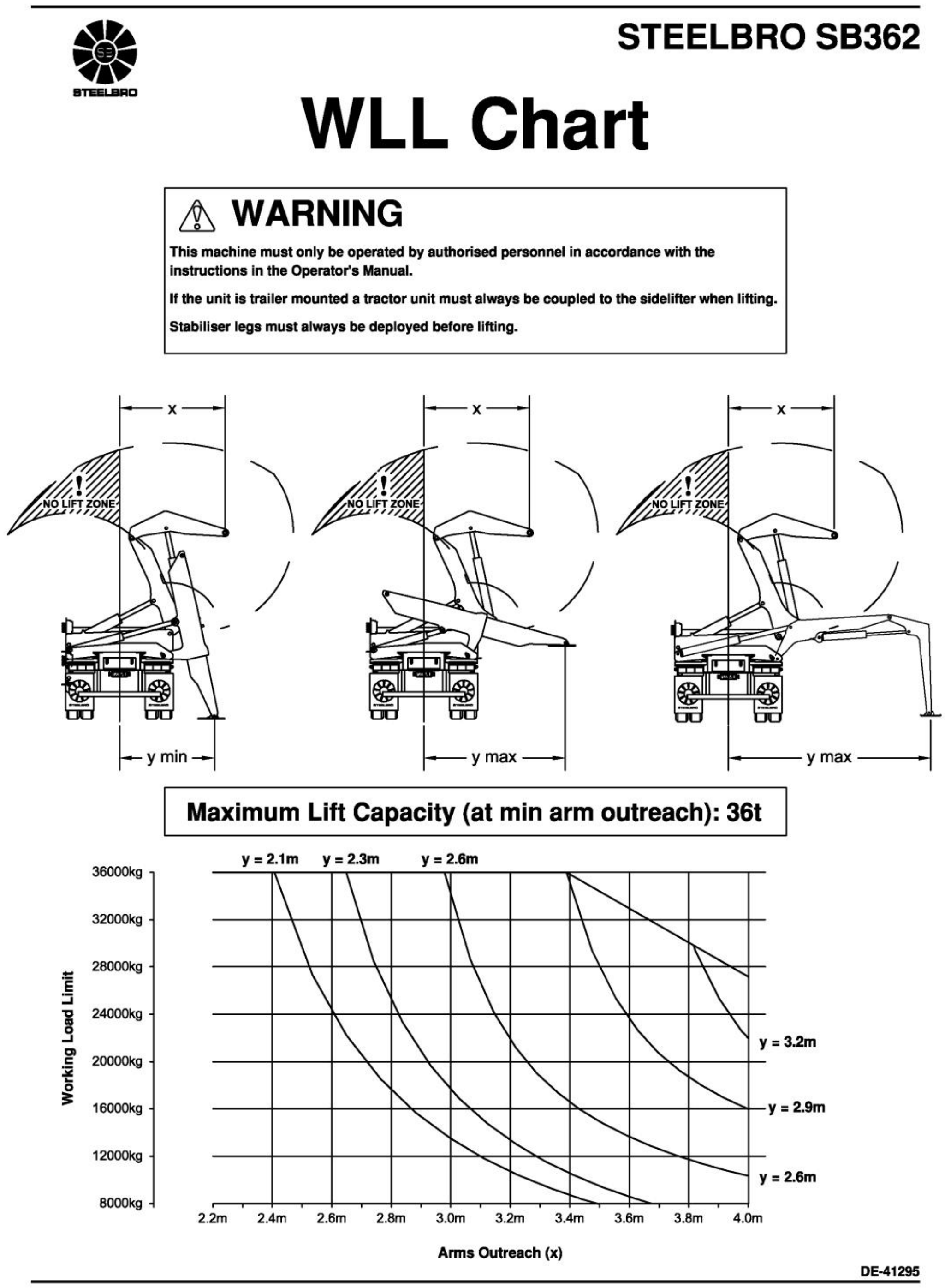
The maximum camber and elevation limits for Sidelifters are:

	40' CONTAINER	20' CONTAINER
Camber	+/- 6 degrees	+/- 6 degrees
Elevation	+/- 4 degrees	+/- 6 degrees

WLL Chart SB362

Never exceed the maximum capacity stated on the Working Load Limit Chart for your unit.

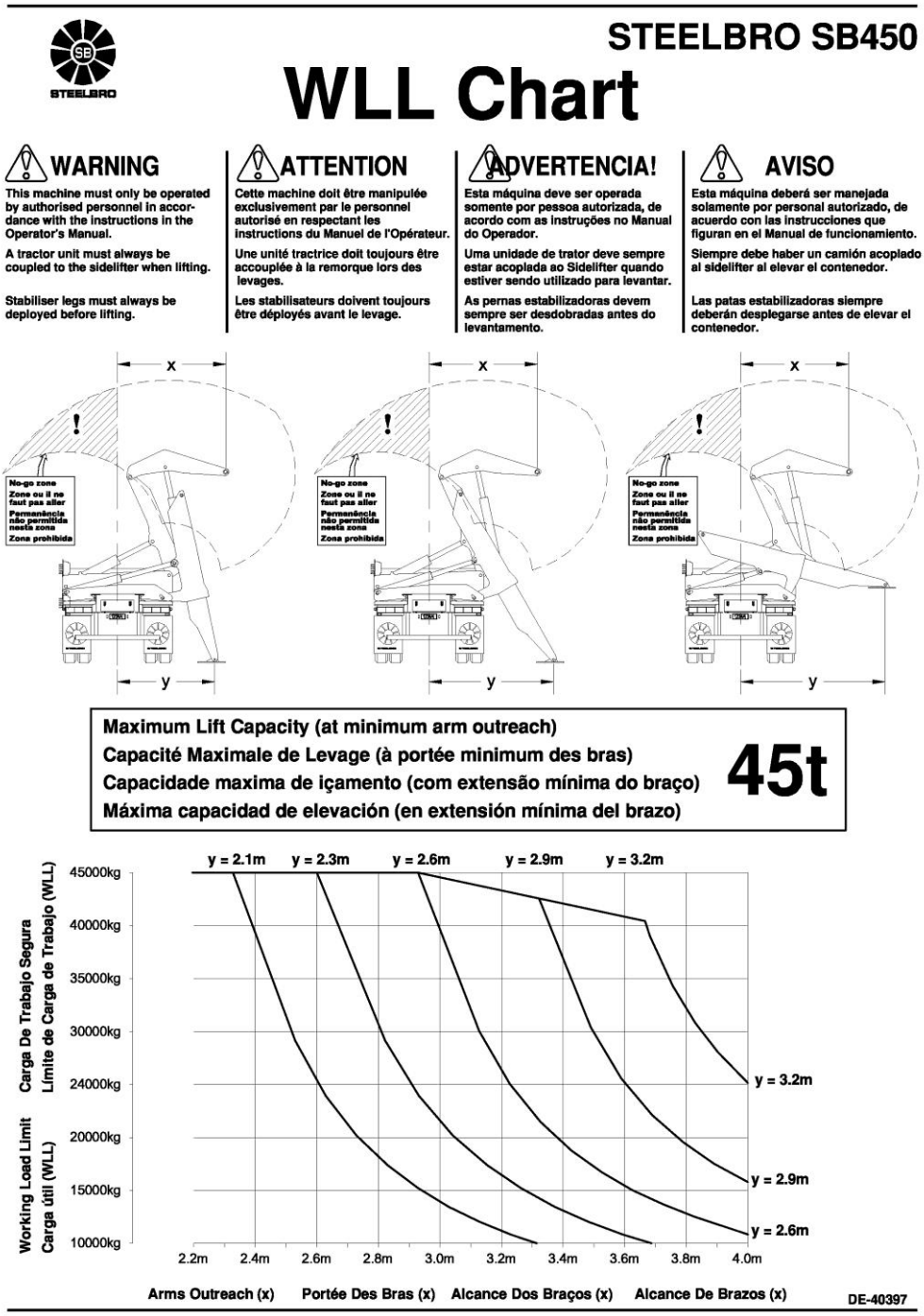
The Working Load Limit Chart is located on the chassis of your Sidelifter.



WLL Chart SB450

Never exceed the maximum capacity stated on the Working Load Limit chart for your Sidelifter.

The Working Load Limit Chart is located on the chassis of your Sidelifter.



Overhead Power Lines and Lightning Strikes

Overhead Power Lines

Do not operate the Sidelifter close to power lines or cables. See Operating Near Power Lines for further information on safe distances.

Lightning Strikes

Do not operate the Sidelifter during a lightning storm. If the Sidelifter should be struck during a lightning storm then a full functional test should be completed before using the Sidelifter to lift containers.

Driving Safety

Before Driving Away

Check that:

- Stabiliser legs are fully retracted
- Cranes are stowed in the low folding position
- Chains stowed safely
- Twistlocks are locked
- Nothing is protruding beyond the width of the vehicle

Driving Style

- Always pay attention to the road conditions and adapt driving style to suit.
- Take extreme care when approaching and taking turns. The huge inertia mass of a laden Sidelifter and its tendency to go straight could cause a sideways skid of the whole unit, particularly on a slippery road surface. Road train drivers should take special care.
- Take particular care when reversing the Sidelifter.

Other Important Points

- Never drive with a suspended load.
- Never use the cranes to drag a container along on the ground.
- Unladen Trombone machines should only be driven with the chassis in the retracted position.
- Never operate the Sidelifter cranes while the vehicle is moving.
- Know the physical dimensions and weight of your vehicle to ensure you do not exceed roadway limits such as bridge weight or height limits.

Crane Traverse Safety

Sidelifters that can handle different sized containers by moving the crane modules must have all arms and stabilisers in the stowed position when the crane modules are moved.

Never move the crane modules with modules loaded or the arms and stabilisers extended.

Emergency Stop Button

In an emergency, depress the emergency stop button on the remote control, until the engine has stopped.

As an extra precaution, and if it is safe to do so, turn off the engine key switch on the main control panel.

Modifications

No modification may be carried out on the Sidelifter without written authority from Steelbro.

Hydraulic System

Always ensure that when disconnecting hydraulic tubing and hoses there is no hydraulic pressure in the line before switching off the power supply to the system.

Getting Started

General Description

STEELBRO Sidelifters are able to load ISO containers to and from:

- The ground
- Truck decks
- Other trailers
- Rail wagons
- Stacked two high (units with chain shorteners)

Because the STEELBRO Sidelifter lifts the container using chains and lifting lugs attached to the bottom container corner castings, it is ideal for handling tanktainers and containers that do not have forklift pockets.

Sidelifters are available with different lifting capacities and also in different mounting configurations.

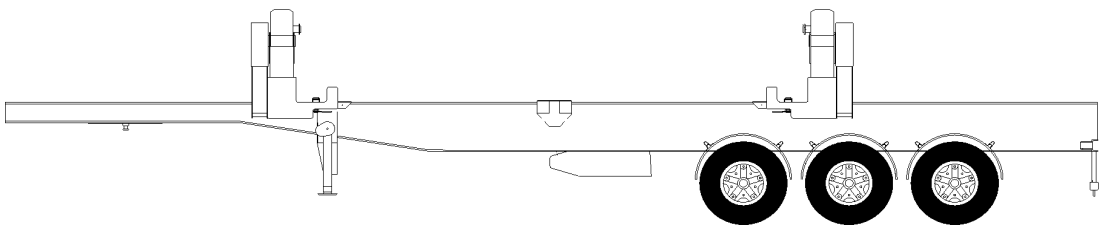
Sidelifter Configurations

All that is necessary for operating the Sidelifter is a tractor unit or truck of sufficient size, with compatible braking, electrical and kingpin couplings.

Sidelifters can run on a Power Take Off (PTO) system, if specified, and require a tractor unit with a PTO unit, pump and hydraulic coupling.

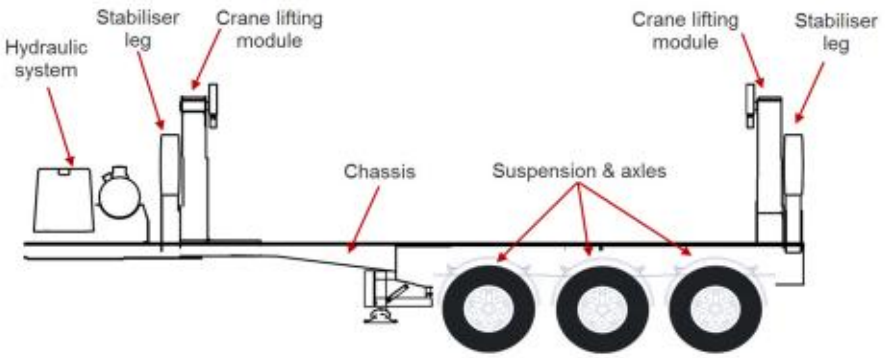
Truck mounted Sidelifters run on a Power Take Off (PTO) system, and require the truck to have a compatible PTO unit, pump and hydraulic coupling.

Traversing Module Model



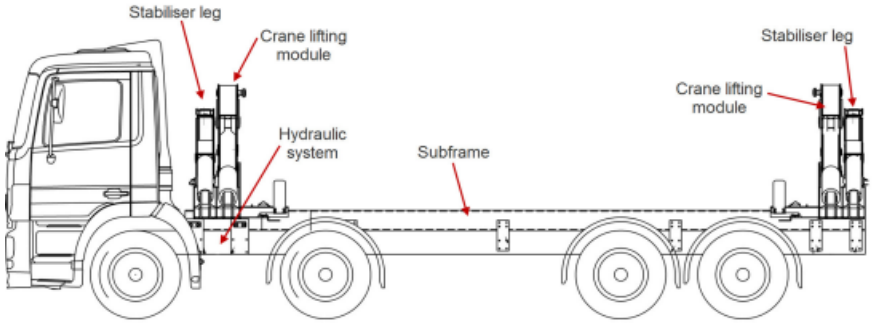
This Sidelifter configuration has at least one traversing (sliding) module. The chassis can be of the fixed or trombone type.

Fixed Module Model



This type of Sidelifter has fixed modules and carries 20 foot ISO containers.

Truck Mounted Model



Truck mounted Sidelifters are usually fixed to a subframe and can carry one short ISO container.

Operator Controls

STEELBRO Sidelifters have three types of control systems - Analogue, Digital and SMARTlift.

As an option the Sidelifter can be specified with radio remote control. Both the cable and radio controls are identical in function.

Sidelifter control valves have detachable manual levers. In the event of an electrical breakdown the operating cycle can be completed manually by using these levers. The levers are stored in tool box.All operator controls are on the remote control transmitter.

The control functions include:

- Two joystick controls which operate all lift arm and stabiliser leg operations
- A two position switch for high or low speed
- A positional rotary switch which selects Off, module traverse, stabiliser legs or lifting arms.
- A red "mushroom" Emergency Stop button.
- Remote Start
- Horn
- Worklamp On/Off

- Trombone function

Joystick Controls

The joysticks, together with the function selector switch, control all movements of the lifting arms and stabiliser legs.

Arms Mode:

Function	Movement
Top arm up	Joysticks up
Top arm down	Joysticks down
Bottom arm out	Joysticks out
Bottom arm in	Joysticks in

Stabiliser Mode:

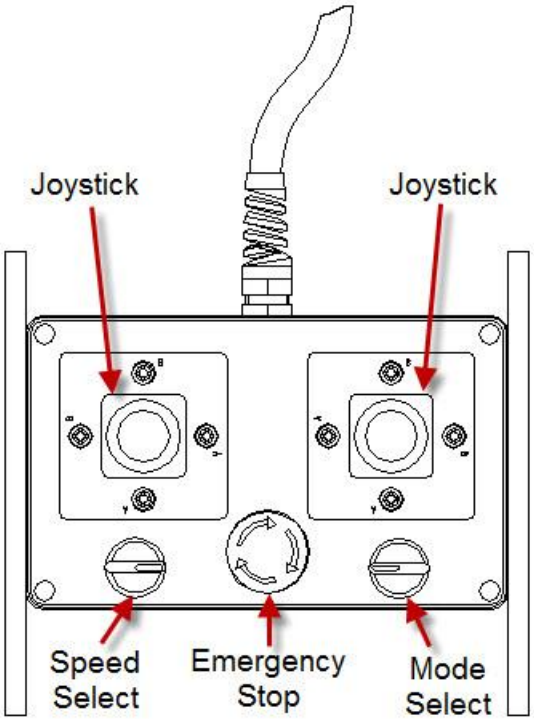
Function	Movement
Stabiliser out	Joysticks out
Stabiliser in	Joysticks in
Tilt ram up	Joysticks up
Tilt ram down	Joysticks down

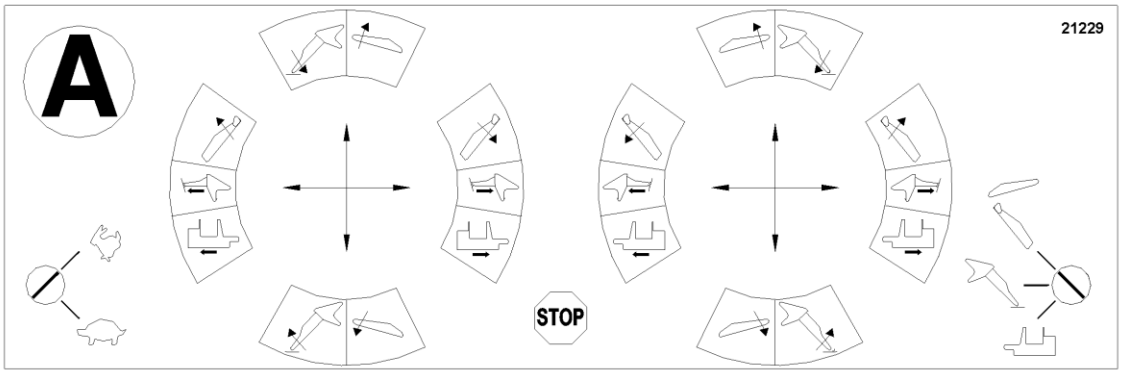
Traverse Mode:

Function	Movement
Module traverse to 40 foot position	Joystick out
Module traverse to 20 foot position	Joystick in

Operator Controls - Analogue

The operator controls for a standard analogue cable remote control are shown below.



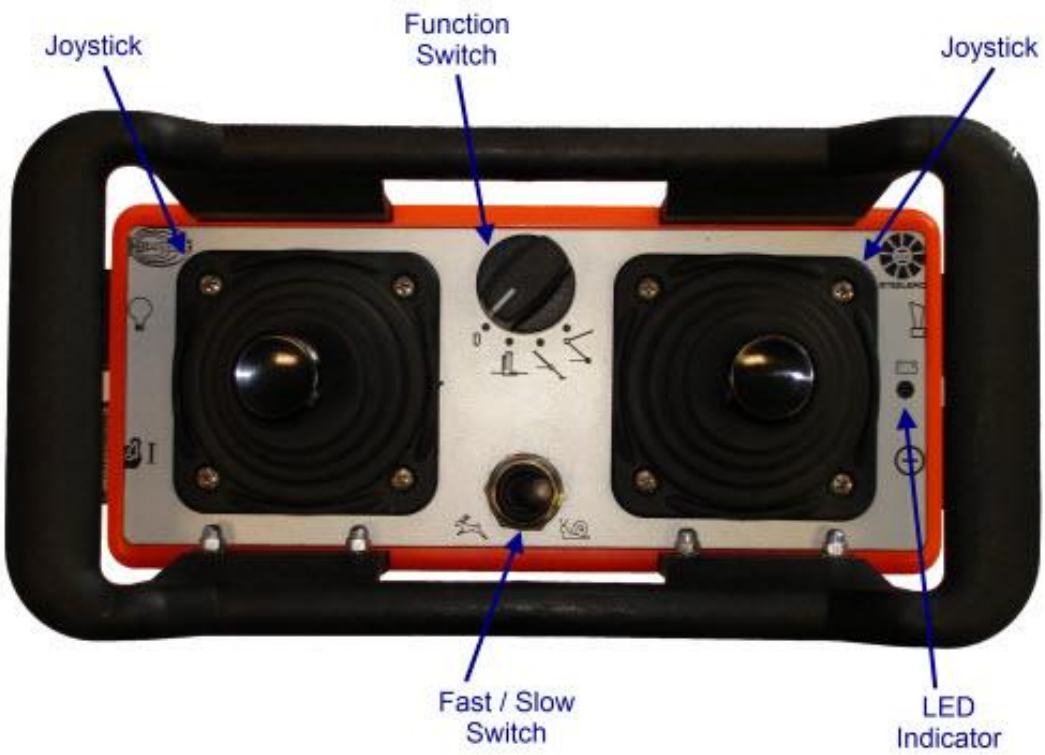


Top View Controls

Mode Select	Three position switch (std) for Traverse Mode / Stabiliser Mode / Arms Mode
Speed Select	Two position toggle switch to select hi or low speed hydraulic operation
Emergency Stop	Press to stop all operations. To restart operations the Emergency Stop button must be rotated clockwise to release it.

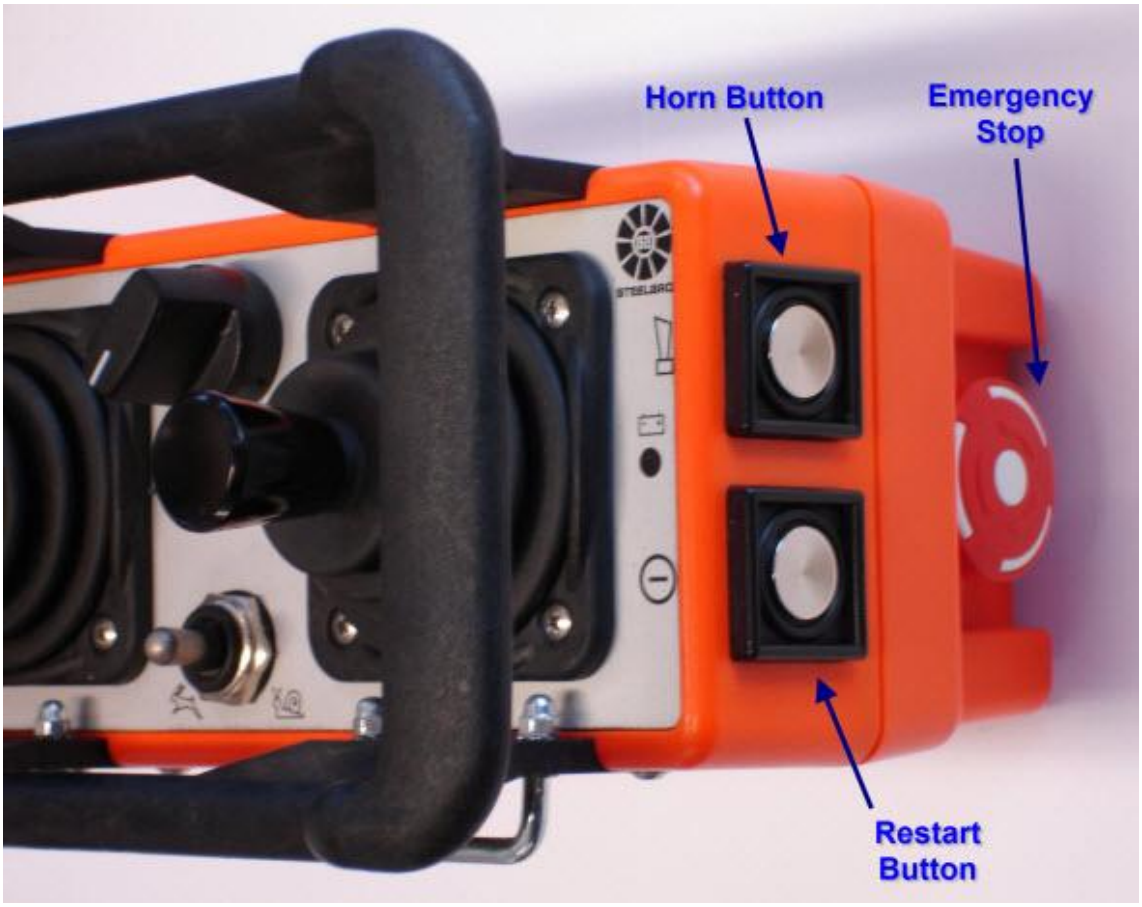
Operator Controls - HBC

The operator controls for the HBC remote control transmitter are shown below.



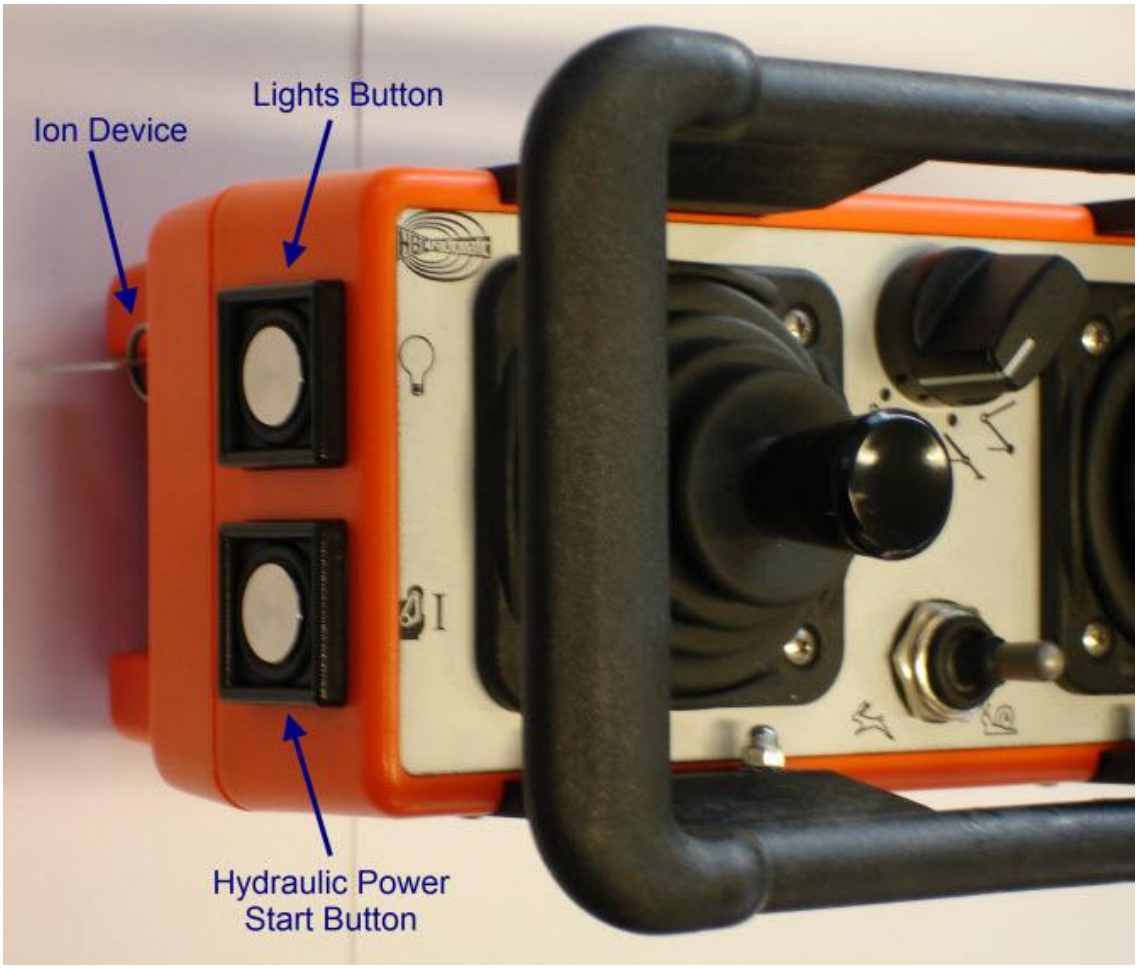
Top View Controls

Function Switch	4 position switch for Off / Traverse Mode / Stabiliser Mode / Arms Mode
Fast / Slow Switch	2 position toggle switch to select Hi or Low speed hydraulic operation
LED Indicator	Flashes red when battery requires charging. Flashes rapidly green when making contact with the receiver. Flashes slowly green when communicating with the receiver.



Right Side Controls

Horn Button	Press to sound the warning horn
Transmitter Restart	Start the remote control transmitter if it has powered down
Emergency Stop	Press to stop all operations. To restart operations the Emergency Stop button must be rotated clockwise to release it.



Left Side Controls

Light Switch	Turns on / off the lights on the lifter arms
Powerpack Start	Starts / stops the hydraulic power pack.
Ion Device	This screw-in plug identifies the remote control with the receiver and disables controller if removed.

Commissioning Checks

Prior to operation of your new Sidelifter, make the following checks:

- Examine the Sidelifter, checking that the specification is as ordered
- Check for any damage to exposed equipment that may have occurred during the delivery journey (lights, mudguards, bodywork etc.)
- If the battery and night work lamps have been stowed in the toolbox for security purposes during shipping, then these need to be fitted. Ensure that the battery has sufficient electrolyte and is fitted with negative terminal to earth
- Check tractor unit turntable compatibility to ensure safe coupling of the kingpin to the tractor unit and fitting of any kingpin blocks in the case of fifth wheel couplings mounted on oscillating 5th wheels
- Lubricate the tractor coupling,(i.e. trailer upper fifth wheel plate and kingpin with a good grease. Hub grease is ideal. Couple and uncouple the Sidelifter to ensure the coupling lock operates freely
- Connect up brake hoses and see that couplings are seating correctly. Listen for air leaks. Check brake operation. Ensure spring brakes have had the release bolts removed
- Check tractor unit electrical coupling and layout compatibility, ensuring proper operation of clearance marker lights, brake lights and indicator lights
- Ensure tyres are inflated to correct pressure
- Examine axle alignment for any damage during delivery journey
- Check axle oil level in hub sight glasses if oil filled hubs fitted
- Ensure landing legs wind up and down while trailer is coupled to tractor
- Check dry thread torque settings for wheels and suspension. Refer to manufacturers data for settings.
- Check that hydraulic oil level is between "Min" and "Max" levels as indicated on the hydraulic reservoir sight glass with all crane lifting modules and stabiliser legs fully stowed at the 20' position
- Ensure sufficient engine oil and engine coolant is in the Power Pack engine when fitted
- Check that fuel level on Power Pack diesel tank is above minimum sight glass level

Preparation and Startup

1. For cable remotes, connect the remote control lead from the Sidelifter control cabinet to the remote control box.
2. Clean down the area where the module slides over the chassis top flanges with a clean dry cloth.
3. Start the engine in the following sequence:

- Check the tractor unit is correctly coupled with the park brake applied
- Ensure all the Emergency stops are released and remote control (cable or radio) is working
- Insert the key into the Sidelifter start switch and if the engine is cold turn the key to the preheat position and hold the key in this position until the amber preheat lamp beside the key switch goes out.
- Turn the key to the start position. When the engine starts release the key.

In tractor/trailer combinations where the trailer parks on spring brakes:

Applying park brakes will stop air being supplied from the tractor unit to the trailer. The Sidelifter requires an air supply to retract the crane module locking pins and operate the engine stop and speed control. Normally there is enough pressure remaining the the trailer air system to operate these controls provided there are no leaks in the air system.

This caution does not apply to units where parking brakes are operated by applying air pressure to the service lines.

Chain Preparation and Shutdown

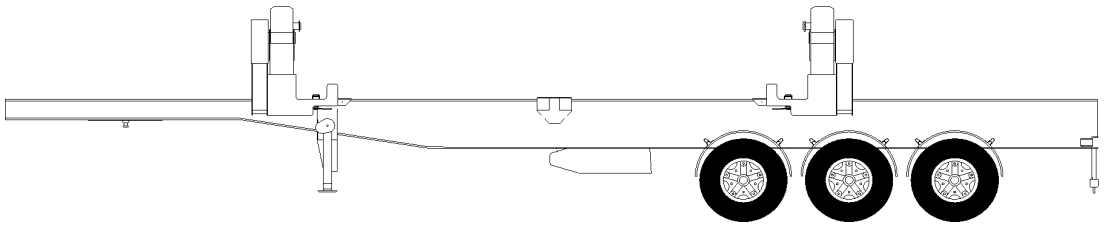
1. If the lifting chains are stowed in the toolbox then fit these as follows:

- On the remote control, select Legs  , and place the feet on the ground
- Select Arms  and High speed () and raise the bottom arms to their maximum
- For chains that use Clevis pins, attach the hammerlocks of the chains to the Clevis. For chains using an oblong link, fit the oblong link over the G pin on the end of the crane arm
- Raise the top arms until the chains hang freely in the air
- Check that the lifting lugs, which are left and right handed, are correctly positioned as per Lifting Lug Instructions (on page 47). Ensure that the left and right lifting lugs are in their correct positions. If not, lower the top arm, and reposition. Raise the top arm and check lug position is now correct
- Return the lifting arms to their stowed position ensuring the lifting chains are in the chain trays beside the twistlocks

2. Move each lifting module independently from the delivery position to the opposite end of its traverse. Clean down chassis surfaces along where the lifting module moves.

- Allow the powerpack engine to idle for a minute after working at full power to allow a gradual rate of cooling
- Shut down the engine by turning off the remote control or pressing any of the red emergency stop buttons on remote control box.
- Turn off the key ignition. Remove the key if the unit is to be left unattended for any time.
- Always turn off the radio control when not in use

Main Components



The main components of the Sidelifter are:

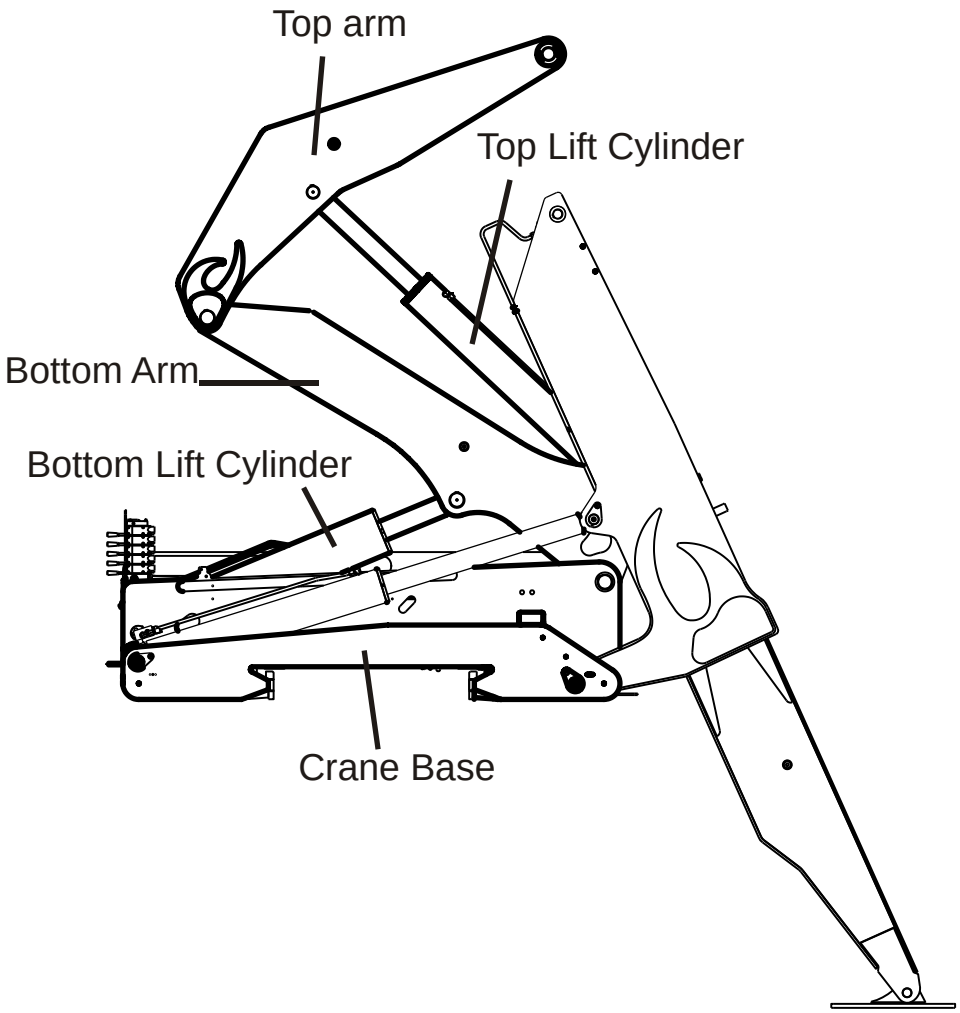
- Crane lifting modules
- Stabiliser legs
- Lifting accessories
- Electrical system
- Hydraulic system
- Pneumatic system
- Power pack or PTO
- Chassis, suspension and axles

The Sidelifter has two traversing crane modules and can carry one 20 foot or one 40 foot container. Optional centre twistlocks allow the Sidelifter to carry 2 x 20 foot containers.

All that is necessary for operating a Sidelifter is a tractor unit of sufficient size with compatible braking, electrical and kingpin couplings.

Crane Lifting Module and Stabiliser Legs

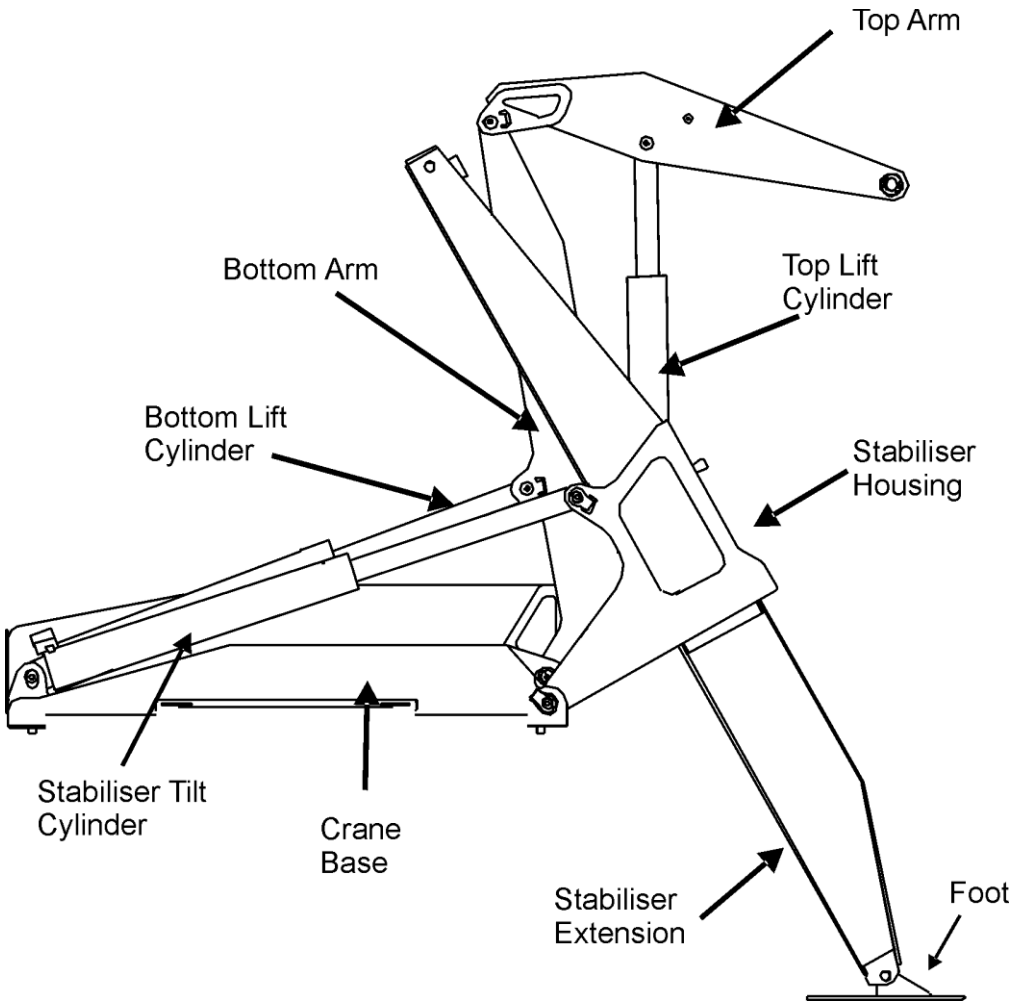
Crane Lifting Modules



The crane modules and lifting arms are continuously welded box sections constructed from high tensile steel.

The pins are mounted in replaceable lubricated glacier bearings.

Crane Base and Lifting Arms



The crane modules and lifting arms are continuously welded box sections constructed from high tensile steel.

The pivot pins are mounted in replaceable lubricated glacier bearings.

Ground Pressure

Working ground pressure figures are based on the Maximum Lifting Capacity of the Sidelifter. Designers should take into account the fact that Sidelifters can lift heavier loads than their Maximum Lifting Capacity because of their built-in safety margins. The strength of surfaces on which a Sidelifter will operate should allow for this. Based on the Maximum Lifting Capacity of the Sidelifter, ground pressures and loading per square foot are:

Model	Weight of box at MLC*:	Max. Load per Foot	Max. Ground Pressure
SB362	36 tonnes	24 tonnes	1.7 MPa
SB450	45 tonnes	28.5 tonnes	1.8 MPa

*MLC= Maximum Lifting Capacity.

Max. Ground Pressure = Max. Load per foot / area of stabiliser foot.

Where the pre-operational risk assessment reveals the presence of cellars, underground services, ducts or the like, a competent person must assess whether the ground is stable enough to support the load of the stabiliser foot.

Stabiliser Interlock System

The Stabiliser Interlock system prevents lifts from being attempted without the stabilisers being deployed. A plunger switch fitted to the stabiliser housing is activated when the foot has positive downward pressure. Until that time the lifting arms are disabled.

Operation

On units fitted with analogue controls, on startup a warning beeper sounds and a warning light on the crane illuminates until both stabilisers are deployed.

The 'top arm up' and 'bottom arm down' functions are disabled until there is a positive downward pressure on the stabiliser foot.

Never move the stabilisers with any load on the arms. This is highly dangerous. If the stabilisers lift off the resting place during a loading operation, the correct action is to move the load back over the stabilisers before manoeuvring the load back over the trailer, keeping the distance between the bottom of the load and the twistlocks as small as practicably possible. If the stabilisers continue to lift then first return the load to the ground before deploying the stabilisers further in order to increase foot pressure.

System Logic	Warning Buzzer and Light	Relay (no)	Top Arm Up	Top Arm Down	Bottom Arm Up	Bottom Arm Down
Both Stabilisers touching the ground	NO	CLOSED	YES	YES	YES	YES
Either or both Stabilisers off the ground	YES	OPEN	NO	YES	YES	NO

Stabiliser Legs

Stabiliser legs are continuously welded box sections constructed from high tensile steel. The pivot pins are mounted in glacier bearings.

The versatility of Steelbro Sidelifter stabiliser legs provides stable safe transfer of containers to or from the ground, other containers, railway carriages and other vehicles.

Sidelifters can be supplied with three different stabiliser types to meet differing demands:

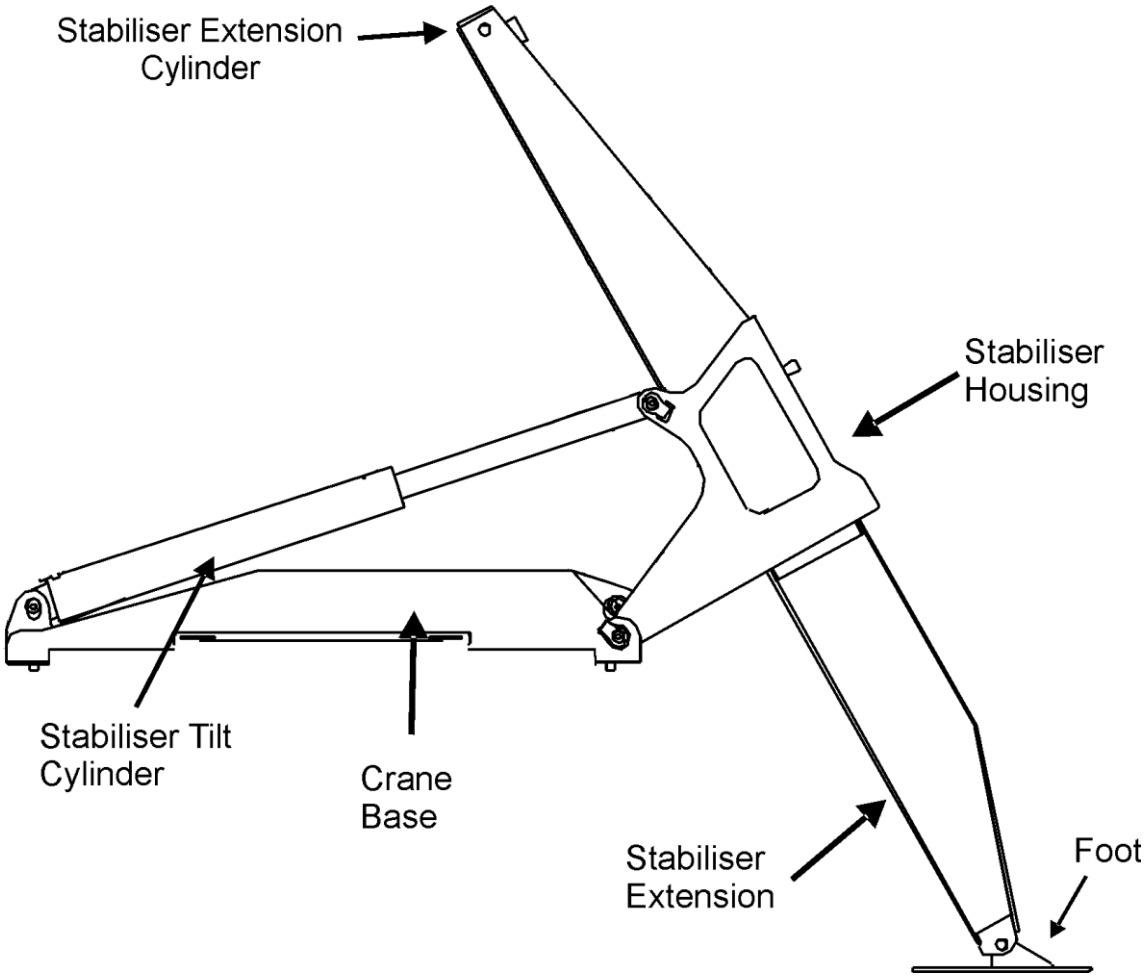
- Tilt and Extend Stabiliser - for most situations
- Bending Leg Stabiliser - for working extra close in to companion vehicles
- Bridge Leg Stabiliser - Extra stability and faster companion trailer load / unload times

Each of these three stabiliser types is described separately.

Never operate the Sidelifter without first deploying the stabiliser legs.

Always attempt to put the stabiliser leg out to the maximum reach for maximum stability during the lift.

Stabiliser Legs - Tilt and Extend Type



This is the most common type of stabiliser leg fitted to Sidelifters being versatile enough for most situations. It can be used in conjunction the Bridge Leg stabiliser for the extra versatility that the Bridge Leg provides (1 Bridge Leg, 1 Tilt and Extend Leg).

This type of stabiliser can be moved in extension and tilt independently or at the same time. The stabiliser can be placed in these positions:

- At maximum outreach on the ground
- In a close-in position on the groud
- Underneath the deck of a companion vehicle.
- On the deck of a companion vehicle.

Never operate the Sidelifter without first deploying the stabiliser legs.

Always attempt to put the stabiliser leg out to the maximum reach for maximum stability during the lift.

How to Operate the Tilt and Extend Leg

The Tilt and Extend Leg stablisers are extended or retracted via the remote control joysticks. The table below shows how the joysticks control the two stabiliser legs.

Function	Joystick Action
Tilt stabiliser Up	Joystick Up
Tilt stabiliser Down	Joystick Down
Extend stabiliser Out	Joystick Out
Retract stabiliser In	Joystick In

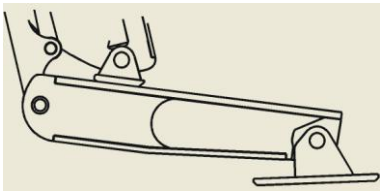
Deploying the Tilt and Extend Leg Stabilisers

1. Tilt the stabiliser legs outwards as far as possible dependent on the space available.
2. If timber dunnage is required then place it on the ground where the foot will make contact with it.
3. Extend the stabiliser down until the stabiliser foot just makes contact with the dunnage or the ground. Do not load the stabiliser so that the Sidelifter chassis lifts up, only contact is required.

Retracting the Tilt and Extend Leg Stabilisers

1. Ensure that you have completed your container lift and the container is secure on the ground, Sidelifter or companion vehicle.
2. Ensure chains and crane arms are stowed securely.
3. Retract the stabiliser leg.
4. Tilt the stabiliser legs inwards to their stowed position.
5. Remove any timber dunnage if it was used.

Bending Leg Stabiliser



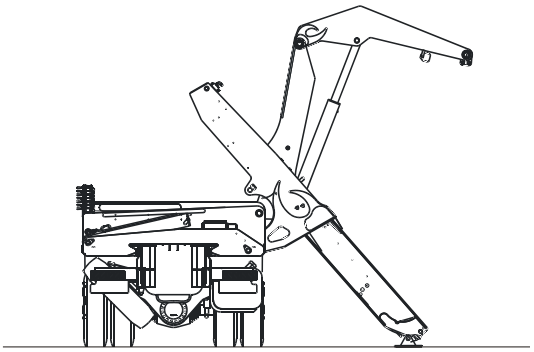
Bending Leg Stabiliser

The Steelbro Bending Leg Stabiliser capabilities are the same as the Tilt and Extend type but provides better stability where the Sidelifter is close to a rail wagon or companion trailer. The Bending Leg stabiliser allows the foot to be extended underneath the rail wagon or companion trailer giving better stability due to further outreach.

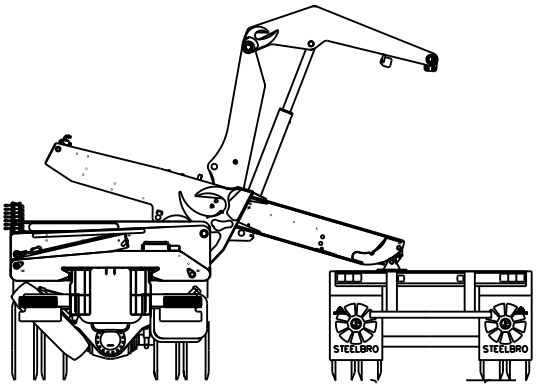
The Bending Leg stabiliser can be deployed:

1. With the ankle fully retracted and the foot resting on the ground giving the same stabiliser outreach as a standard Tilt and Extend stabiliser.

2. On the deck of a rail wagon or trailer, with the ankle fully retracted, the same way as with a standard Tilt and Extend stabiliser.
3. With the ankle fully extended / rotated and the stabiliser housing fully tilted giving the same reach and stability as a standard Tilt and Extend stabiliser when up close to a rail wagon or companion trailer. Only use this position for situations where the Sidelifter has to get closer than normal to railway wagons or trailers.



1



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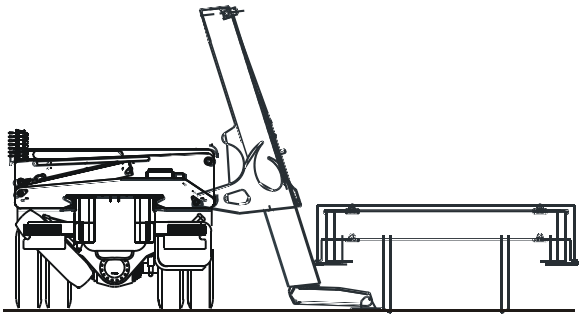


3

How to Operate the Bending Leg (SB362 / SB450)

The extension and retraction of the bending leg "ankle" is operated from the remote control. It is essential that the operator follow the instructions below.

Ankle Mode:	
Extend Bending leg ankle	Joysticks Up
Retract Bending leg ankle	Joysticks Down
Extend Stabilisers	Joysticks Out
Retract Stabilisers	Joysticks In

Lifting can only take place when the bending leg ankle is either fully extended or fully retracted. NEVER attempt to lift on the bending leg ankle when it is not fully extended or fully retracted.

Follow these steps to deploy the front and back Bending Leg Stabilisers.

1. Tilt the legs over as far as possible.
2. Switch the remote to Ankle Mode shown by the  symbol.

3. Start extending the Ankles by pushing both joysticks directly upward.
4. As the Ankles start to curve round into position, extend the stabiliser extensions by pushing the joysticks at an angle between the extend positions (North West on the left joystick and North East on the right, relative only to the remote itself of course) until the ankles are fully extended and the feet placed on the ground.
5. If necessary, adjust the position further, ensuring that both feet are on a firm, flat surface. Do not load the stabiliser so that the Sidelifter chassis lifts up, only contact is required. If a foot is not at the correct angle, a warning will go off as discussed in the following section.

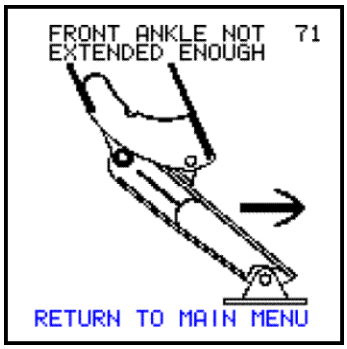
Retracting the Bending Leg Ankles

1. Set the remote to Ankle mode/  .
2. Push the joysticks in to retract the stabiliser housings.
3. When the feet are off the ground, retract the ankles by pushing joystick down, watching for edges that an ankle or foot may get caught on.
4. Once the stabiliser extensions and ankles are fully retracted, switch to Stabiliser mode/  and return the legs to their retracted position.

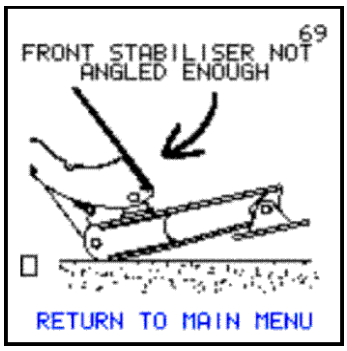
Bending Leg Safety Warning

Never apply any load to the foot before the Ankle is either fully extended, or fully retracted! This is to prevent serious damage to the construction that will consequently result in an unstable/unsafe operation.

If the ankle is not fully extended and you try to switch out of Ankle mode, an alarm will sound and the warning below will appear on the display screen until you complete the deployment of the ankle.

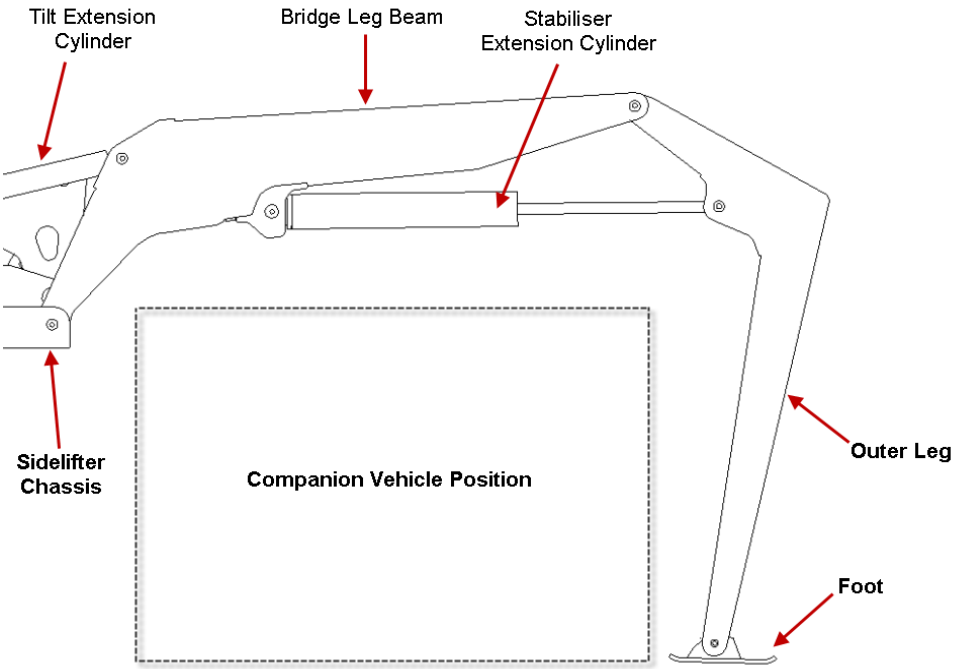


If the stabiliser leg is tilted at too shallow an angle, the result is the back joint of the ankle touching the ground as shown in the screen display below. Therefore, if the stabiliser housing is not angled steeply enough, the controls for the Ankle Mode are locked out and attempting to use them will result in the alarm sounding and the warning screen displaying as below.



Never apply any load to the rear joint of the Ankle. This will damage the construction and consequently result in an unstable/unsafe operation.

Stabiliser Legs - Bridge Leg Type



The Bridge Leg stabiliser provides these major advantages over the Tilt and Extend stabiliser:

- Extra stability due to further outreach than Tilt and Extend stabiliser
- Faster load and unload of container between ground and companion trailer as stabiliser can be left extended with container suspended while companion vehicle is moved beneath it.

The stabilisers can be placed in these positions:

- Over Companion Mode - On the ground straddling the companion trailer (or rail wagon) which can be moved into position underneath the stabilser.
- On Companion Mode - On the deck of a companion vehicle (trailer or rail wagon).

Never operate the Sidelifter without first deploying the stabiliser legs.

Always attempt to put the stabiliser leg out to the maximum reach for maximum stability during the lift.

How to Operate the Bridge Leg Stabiliser

The Bridge Leg Beam and the Outer Leg are extended or retracted via the remote control joysticks. The table below shows how the joysticks control the two stabiliser legs.

Function	
Extend Bridge Leg Beam	Joysticks Up
Retract Bridge Leg Beam	Joysticks Down
Extend Outer Leg	Joysticks Out
Retract Outer Leg	Joysticks In

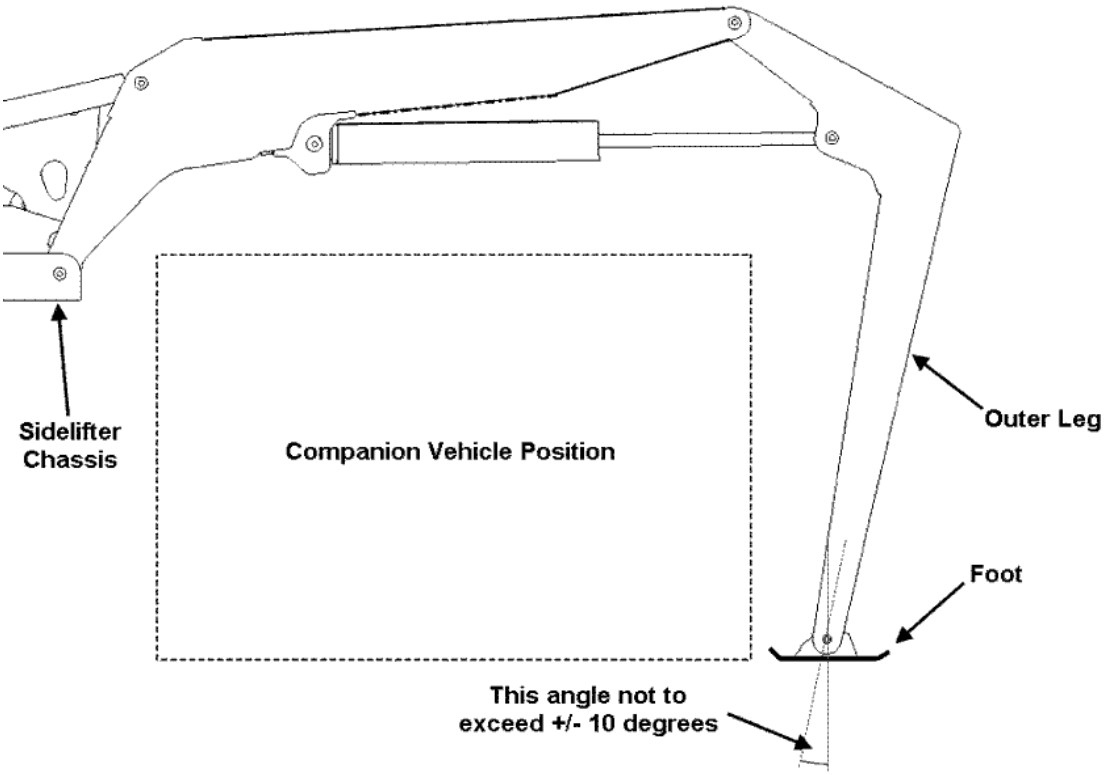
Over Companion Mode

This mode of operation is where the Bridge Leg Beam and Outer Leg are deployed over the top of the companion trailer or rail wagon. This provides maximum stability and allows for rapid loading and unloading of companion trailers.

Positioning The Foot

It is important that the foot is positioned so that:

- The Bridge Leg Beam is as horizontal as possible
- The foot is in full horizontal contact with the ground
- The angle between the vertical axis of the foot and the vertical axis of the Outer Leg is no more than + or - 10 degrees



Deploying the Bridge Leg in Over Companion Mode

1. Extend the Outer Leg first until it is about 90 degrees to the Bridge Beam.

2. Extend the Bridge Leg Beam until the Outer Leg foot makes contact with the ground. The Bridge Leg Beam and Outer Leg may be deployed together as long as you ensure that the Outer Leg foot does not make contact with the ground (or anything else) before reaching its final deployment position.
3. Ensure the Outer Leg foot is in full contact with the ground and that the angle between the vertical axis of the foot and the vertical axis of the Outer Leg does not exceed 10 degrees. Do not load the stabiliser so that the Sidelifter chassis lifts up, only contact is required.

Do not place the foot of the Outer Leg on a companion vehicle deck as it is likely to slip off.

Retracting the Bridge Leg in Over Companion Mode

1. Ensure that you have completed your container lift and the container is secure on the Sidelifter or companion vehicle.
2. Ensure chains and crane arms are stowed securely.
3. Start retracting the Bridge Leg Beam first until the Outer Leg foot is above the ground.
4. Both leg and beam may be retracted together so long as you ensure that the Outer Leg and foot do not make any contact with the ground or the companion vehicle.
5. Ensure that the Outer Leg is securely stowed against the Bridge Leg Beam with the Outer Leg foot in contact with the Bridge Leg Beam base.

On Companion Mode

This mode of operation is used for trailer to trailer container transfers where the Outer Leg is stowed against the Bridge Leg Beam and the Outer Leg rests on the deck of the companion vehicle. The part of the Outer leg that rests on the companion vehicle deck is a load transfer area where a pressure plate protrudes through the Outer Leg. This mode is used in situations where the Bridge Leg Beam cannot be deployed in Over Companion mode due to space restrictions.

Positioning the Outer Leg

It is important that:

- The Outer Leg is fully stowed into the Bridge Leg Beam with the Outer Leg foot in contact with the Bridge Leg Beam base. If this is not done then the Outer Leg structure could fail when deployed to the companion vehicle deck.
- Timber dunnage is placed at the point where the Outer Leg pressure plate will contact the deck of the companion vehicle. If this is not done then the deck of the companion vehicle may be damaged.

Deploying the Bridge Leg in On Companion Mode

1. Ensure that the Outer Leg is securely stowed against the Bridge Leg Beam with the Outer Leg foot in contact with the Bridge Leg Beam base.
2. Place appropriately sized dunnage on the deck of the companion vehicle at the point where the Outer Leg pressure plate is expected to make contact with the companion vehicle deck.
3. Extend the Bridge Leg Beam until it the point where the Outer Leg pressure plate is about to make contact with the dunnage timber.
4. Adjust the dunnage timber position if necessary.

5. Extend the Bridge Leg Beam until it makes firm contact with the dunnage timber. The Outer Leg pressure plate should just rest on the dunnage but should not be loaded so as to raise the chassis of the Sidelifter.

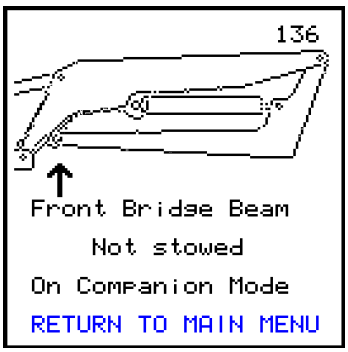
Retracting the Bridge Leg in On Companion Mode

1. Ensure that you have completed your container lift and the container is secure on the ground on on the Sidelifter or companion vehicle.
2. Ensure chains and crane arms are stowed securely.
3. Retract the Bridge Leg Beam to the fully stowed position.
4. Remove the timber dunnage from the companion vehicle.

Bridge Leg Safety Warning

Not fully stowed Outer Leg in ON Companion mode

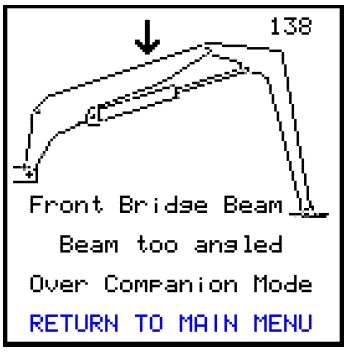
If you try to deploy the Outer Leg in On Companion mode and you have not fully stowed the Outer Leg to the Bridge Leg Beam base then SmartLIFT will display message 136 (Front stabiliser) or 137 (Rear stabiliser):



Deploying the Outer Leg in this situation can damage the Outer Leg of the Bridge Leg.

Bridge Leg Beam Angle Too High in Over Companion Mode

If you deploy the Outer Leg in Over Companion mode and the Outer Leg foot is significantly higher than the ground at the base of the Bridge Leg Beam then the Bridge Leg Beam will be at too high an angle for operation. SmartLIFT will display message 138 (Front stabiliser) or 139 (Rear Stabiliser) :



Lifting Components

This section describes the chains and lifting lugs for use on the crane arms.

Care of Chains

Chain slings play a very important part in performing lifting operations **SAFELY**. A chain sling is made up of chains, clevis or oblong ring, shorteners and lugs. A certified chain sling has had each component individually tested and then the whole sling is tested and certified. Note these important points about chain slings:

- Only use chain slings that have been tested and certified.
- Never weld any part of a chain sling.
- If a chain sling shows any signs of distortion, excessive wear or damage send it to an approved testing facility, for replacement of all damaged parts and to be re-certified. Alternatively replace the chain sling with a new certified chain sling.

Chains should be proof tested annually. **STEELBRO** recommends that all inspection certificates be retained.

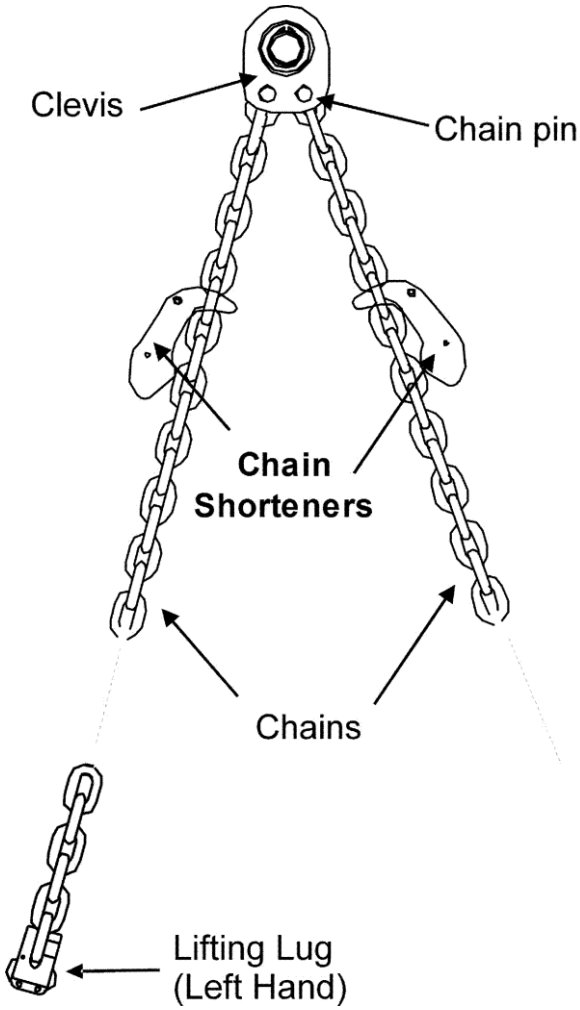
Hammerlocks

Hammerlocks have a stress pin linkage. If a hammerlock will not fully fold then it is likely that chain sling has been over-stressed. Send over-stressed chain slings to an approved testing facility for replacement of all damaged parts and to be re-certified.

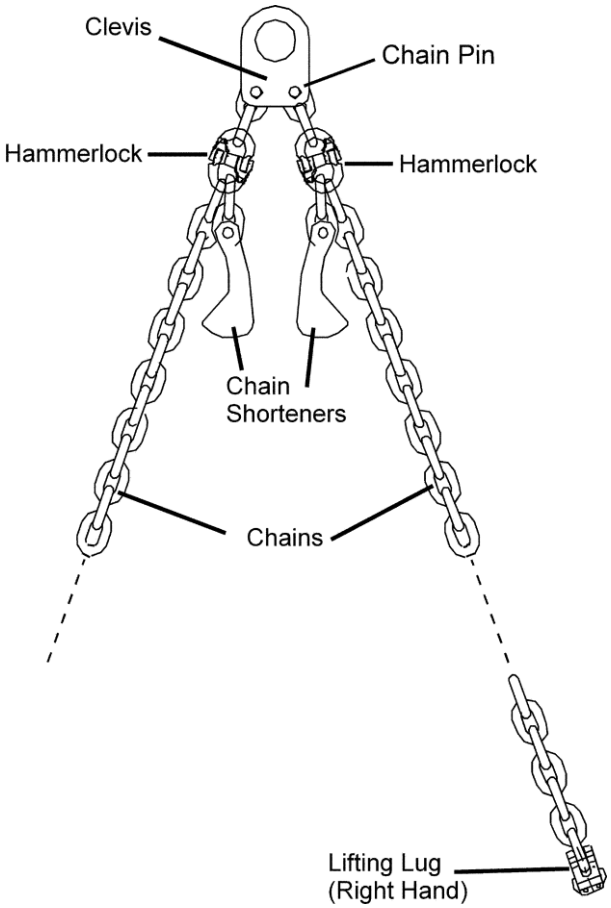
Lifting Chains - Clevis (SB362 / SB450)

The clevis lifting chain assemblies for 16mm and 20mm chain slings are illustrated below. Shorteners are included in chain slings where the unit is capable of stacking containers two high. Instructions for their use are in the section **CHAIN SHORTENING INSTRUCTIONS** (Refer to "Chain Shortening" on page 81).

Never switch chains from one machine to another as they may vary between one Sidelifter and another in length and size.



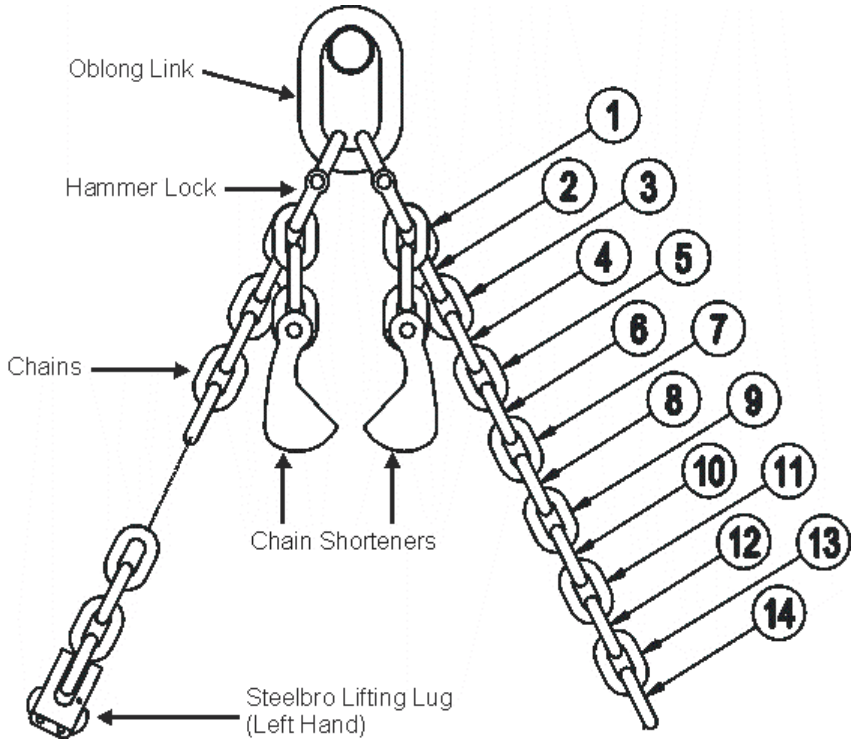
16mm Chain Sling Assembly



20mm Chain Sling Assembly

Lifting Chains - Oblong Link

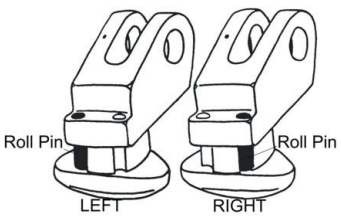
The oblong link lifting chain assembly is illustrated below. When handling the top link, take care to place it on the lifting pin with the left and right chain legs in their correct position, and facing towards the container. Shorteners are included in chain slings where the unit is capable of stacking containers two high. Instructions for their use are in the section **CHAIN SHORTENING INSTRUCTIONS** (Refer to "Chain Shortening" on page 81).



Oblong Link Chain Assembly

Never switch chains from one machine to another as they may vary between one Sidelifter and another in length and size.

Lifting Lug Instructions

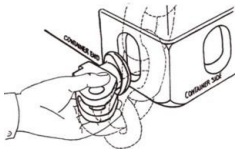


The only real difference between a left-hand Lug and a right-hand Lug is the position of the roll-pin which is marked in black in the above diagram. The roll-pin prevents the lug from accidentally falling out of the container corner casting. When facing the end of a container, the container corner casting at your left hand side is the Left Hand Container Corner Casting. The other one on the right is the Right Hand Container Corner Casting.

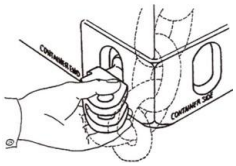
Always use the left lug in the left corner casting and the right lug to the right corner casting. Using a lug in the wrong corner casting can result in the container coming loose during a lift with potentially fatal results.

Using the Container Lifting Lugs

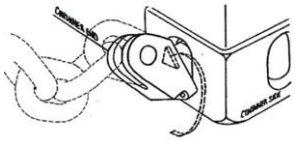
1. With the clevis facing away from the container, insert the lug into the container casting hole.



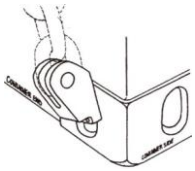
2. Rotate the lug so the clevis moves towards the centre line of the container and until the roll-pin prevents it from rotating any further.



3. The clevis now points inwards at an angle of approximately 60 degrees to the horizontal. The roll-pin prevents the lug from accidentally falling out of the container corner casting.



4. When the container is lifted, the lug will slide to the top of the container corner casting hole and rotates backwards slightly to the angle of the supporting chain. This removes any load from the roll-pin.



The angle of support chains ensures that the lifting lugs stay locked inside the container castings while the container is suspended.

Using the Sidelifter lifting chains instead of appropriate lifting accessories for handling non-ISO container items, or for top lifting of ISO containers, will cause severe damage to the machine, and place personnel at risk. Any such action will void our warranty.

Electrical System

Electrical System Power Pack Version

The electrical system consists of the following:

- A 12-volt supply from the engine alternator system
- A main control box
- Two crane module mounted junction boxes
- A chassis mounted junction box for the SMARTlift Control system where fitted
- Remote control - cable, radio or both according to customer specification

System Layout - Powerpack

Electrical power is supplied from the Kubota alternator system to the main junction box. The cable remote is plugged into this junction box and for radio control, the receiver unit is plugged into this junction box. The main junction box is connected to the chassis mounted junction box and the two crane mounted junction boxes. If SMARTlift control is fitted, it is located on the chassis between the main junction box and the crane mounted junction boxes.

System Operation - Powerpack

The main control box is equipped with a key/starter switch, oil and alternator warning lamps, water temperature gauge, glow plug indicator lamp and an hour meter.

When the key is turned, the 12 volt system is energised and the run stop control (solenoid operated) moves to the run position. Provided the trailer air system is fully charged, the engine can now be started. Movement of the joysticks signals the engine speed control (solenoid pneumatic actuated air cylinder) to maximum speed. When the joysticks are returned to their neutral position the engine speed returns to idle after approximately three seconds. (In the analogue control system a timer system in the main junction box provides this 3 second delay).

Remote Control Functions

The remote control is equipped with two joysticks to operate all hydraulic functions. A function selector switch allows selection of stabiliser legs, crane arms, and for units with crane traverse function, crane traverse. This allows joystick signals to be transmitted via relays in the main junction box directed to the Danfoss control valves via the crane mounted junction boxes. The joysticks also incorporate micro switches that independently signal the dump solenoid relay and the "PVEM power relay" (powers up the Danfoss control valve coils). There are more details on how to use the remote control to operate the cranes in the section Crane Operations (on page 66).

Also mounted in the remote control is a two-position switch for "High Speed" and "Low Speed" selection. When "High Speed" is selected, two relays in the main junction box are activated, one to direct joystick signals to the Danfoss control valve coils, the other to activate the "High speed load sensed unloader valve" solenoid coils. When "Low Speed" is selected these unloader valve relays are de-energised. An emergency stop button is fitted to the remote control to shut down all systems in an emergency.

Dangerous Goods Specifications

Sidelifters with dangerous goods specification are fitted with a dual pole battery isolation switch.

Never turn the battery isolation switch off while the Kubota powerpack is running!

This will cause a Load Dump solenoid to turn off which may damage the electrical system.

Electrical System PTO Version

The electrical system consists of the following:

- A 12 or 24 Volt power supply from the front chassis services panel
- A main control box
- Two crane module mounted junction boxes
- A chassis mounted junction box for the SMARTlift Control system where fitted
- Remote control - cable, radio or both according to customer specification
- Electro hydraulic coils for a crane control valve

System Layout - PTO

Electrical power is supplied from the front services panel to the main junction box. The cable remote is plugged into this junction box (for radio control the receiver unit is plugged into this junction box).

The main junction box is connected to the two crane mounted junction boxes. If the Smartlift Control system is fitted, it is located on the chassis between the main junction box and the crane mounted junction box.

System Operation - PTO

Remote Control Functions

The remote control is equipped with two joysticks to operate all hydraulic functions. A function selector switch allows selection of stabiliser legs, crane arms, and for units with crane traverse function, crane traverse. This allows joystick signals to be transmitted via relays in the main junction box directed to the Danfoss control valves via the crane mounted junction boxes. The joysticks also incorporate micro switches that independently signal the dump solenoid relay and the "PVEM power relay" (powers up the Danfoss control valve coils). There are more details on how to use the remote control to operate the cranes in the section Crane Operations (on page 66).

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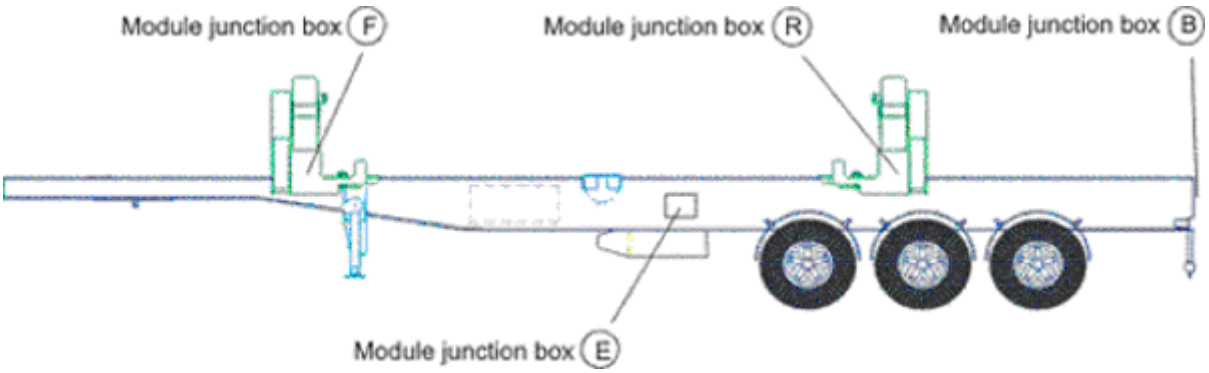
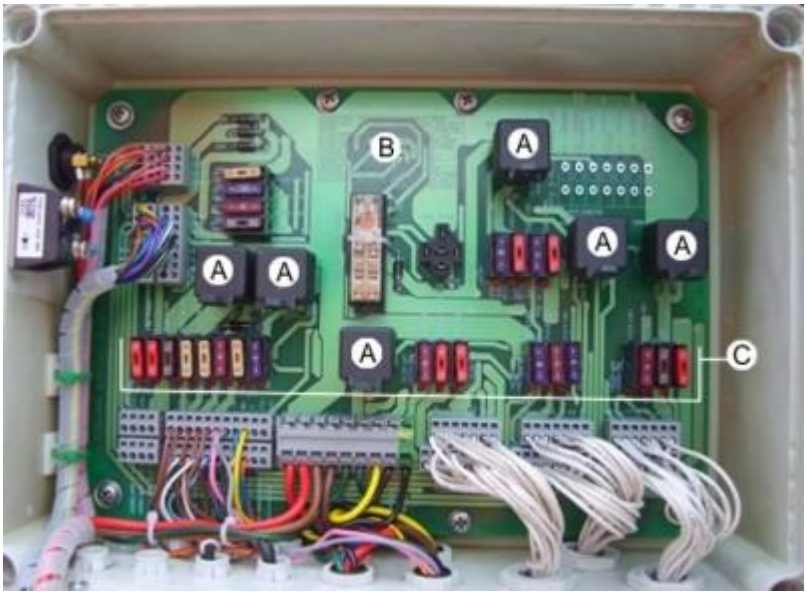
Electrical Junction Boxes - Digital

The figure below shows the location of the electrical junction boxes on the Sidelifter. The state of the LEDs in the E box, and the F and R boxes can be used for initial fault finding.



Junction Box E

Junction box E is located about midway down the side of the Sidelifter chassis.



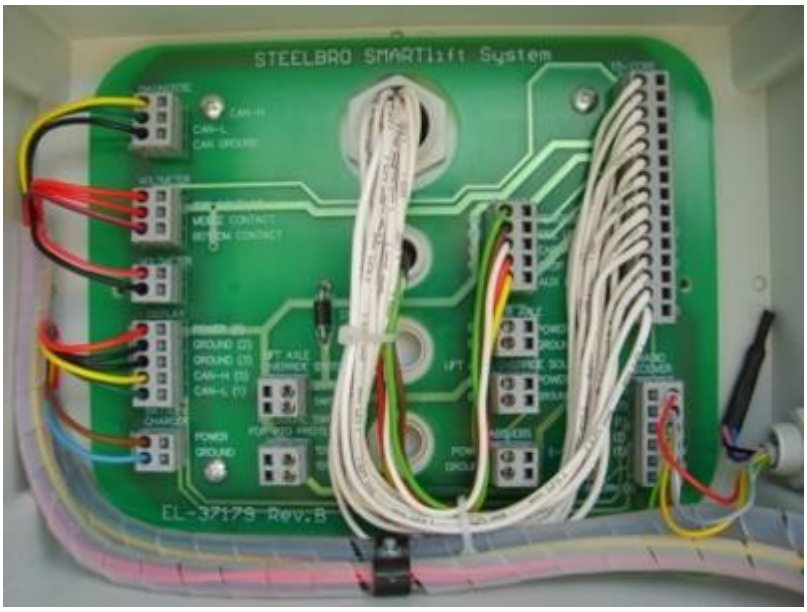
This is the main junction box and controls engine functions. It contains most of the fuses and relays.

Key:

A	Relay switches. A lit green LED signifies that the relay is energised.
B	Table showing fuse layout.
C	Fuses. A lit red LED indicates that the fuse is blown.

Junction Box B

Junction Box B is located at the rear of the Sidelifter.



Junction Box B runs the display screen and radio receiver.

Steer axle lock and lift axle override (where used) are also wired from this junction box.

There are no LEDs or fuses located in Junction box B

Junction Boxes F & R

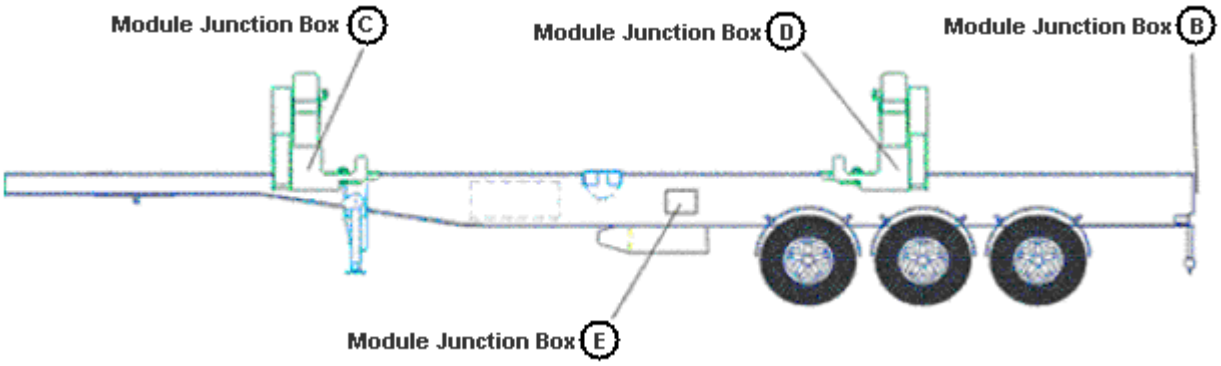
These junction boxes are located on crane modules. They connect sensor inputs and hydraulic valve controls on the crane modules. The circuitry layout of the F and R boxes is identical.

NOTES

- Fuse 15 (Front) and Fuse 17 (Rear) is the UE (permanent power) fuse and is continuously on.
- Fuse 16 (Front) and Fuse 18 (Rear) is the angle sensor ground.
- The front and rear ECU (Controller) is also located within this enclosure.

Electrical Junction Boxes - Analogue

The figure below shows the location of the electrical junction boxes on the Sidelifter. The state of the LEDs in the E box, and the C and D boxes can be used for initial fault finding.



Junction Box B

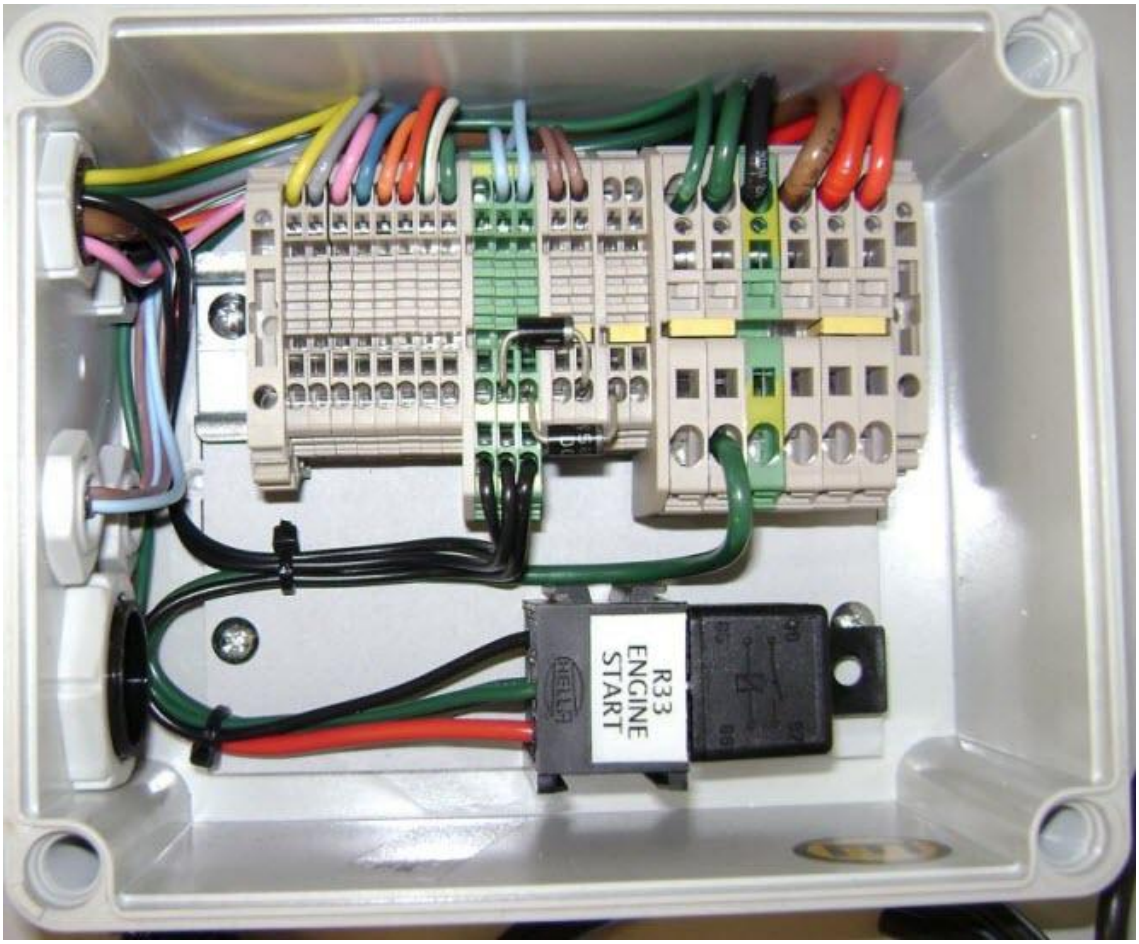
This is the main junction box containing most of the fuses and relays.

- Relays are lit with a GREEN LED when energised.
- Fuses are lit with a RED LED when they are blown.

Junction Box E

- Junction Box E is a simple junction box located between the B box and the powerpack.

- It also houses R33 which is the engine start relay.



Junction Boxes C & D

- These simple junction boxes are located on crane modules. They connect sensor inputs and hydraulic valve controls on the crane modules to the multicore cable running back to the main control box (B).
- They contain no fuses or relays.

Hydraulic System

Hydraulic System - Power Pack Version

The hydraulic system consists of the following:

- Hydraulic oil reservoir with return oil filter and a breather assembly
- Direct coupled hydraulic pump(s)
- High speed load sensed unloader valve assembly (except 121 and manual control models)
- High-pressure oil filter
- Danfoss proportional control valve(s)
- Two hydraulic cylinders fitted with double check valves operating each stabiliser leg
- One hydraulic cylinder fitted with single over-centre valves operating each top arm
- One hydraulic cylinder fitted with double over-centre valves operating each bottom arm
- Two hydraulic cylinders or four hydraulic motors to traverse the cranes (except on truck mounted and fixed crane units)
- A solenoid operated dump valve connected to the load sense system (optional)
- A hydraulic pressure gauge (or 2 for manual control version)

System Control

The system is controlled by a cable remote or the optional radio remote carried by the operator. These have identical ergonomics, consisting of a pair of two axis joysticks, a function selector switch, a high/low speed selector switch and an emergency stop button.

System Operation

The tandem pump delivers oil to the high speed load sensed unloader valve, where the two flows can be combined to give high speed operation, or split to give low speed with the second pump flow returning to the oil reservoir.

Also fitted to this valve is a solenoid operated dump valve that is activated by the joystick controllers and the emergency stop buttons.

The pump flow from the high speed load sensor (LS) unloader valve passes through the high pressure filter and is divided and supplied to the front and rear control valves. These valves are connected to each other with a load sense line. This helps to maintain synchronisation of the crane lifting arms when unequal loads are handled.

Fitted into the load sense line is an optional solenoid operated dump valve. When the valve is in the de-energised condition, load sensed (LS) oil is dumped to tank. When the valve is energised, the LS line is blocked to tank and allows the hydraulic system to operate.

A hydraulic gauge is fitted into the LS line and indicates the pressure in the system.

The crane control valves are Danfoss PVG 32 proportional type and are signalled from the joysticks for directional control. High or low speed can be selected at the remote control. The low speed function only applies to the lifting arms. The stabiliser legs are always in high speed irrespective of the position of the high/ low speed selector switch as they do not require the fine control required for the lifting arms.

Low Speed Mode

On analogue units when "Low Speed" is selected only one pump is supplying oil to the system. The joystick signals pass via an electronic hydraulic flow (EHF) control and the function speed is reduced by 50% to allow fine control under heavy and difficult loading conditions.

Digital units use a different method to provide a 50% low speed operation.

High Speed Load Sense (LS) Unloader Valve Logic

Following is a summary of the logic and function of the "High speed load sense unloader valve".

Item Characteristic	High speed mode	Low speed mode
Operating oil flow	120l/min	60l/min
Operating Pressure	140bar (2000psi) @ HS-LS-U valve	280bar (4000psi) @ Danfoss PVG32
No of pumps operating	2 x Pumps	1 x Pump (second pump to tank)
High speed Solenoid	Energised	De-energised
High Speed relief	140bar (2000psi)	Not Active
Load Sense Solenoid	Energised	De-energised
Load Sense Relief	140bar (2000psi)	Not Active

Hydraulic System - PTO Version

The hydraulic system consists of the following:

- High pressure supply coupling and low pressure return coupling on the front chassis services panel
- High Pressure Filter
- 2 Danfoss proportional control valve banks
- 4 hydraulic cylinders fitted with two check valves operating the stabiliser legs
- 2 hydraulic cylinders fitted with one over-centre valve operating the top lifting arms
- 2 hydraulic cylinders fitted with two over-centre valves operating the bottom arms
- 2 hydraulic cylinders or four hydraulic motors to traverse the cranes (except on Fixed and Truck-mounted units)
- A solenoid operated dump valve connected to the load sense line
- A hydraulic pressure gauge

System Control

The system is controlled by a cable remote or the optional radio remote carried by the operator. These have identical ergonomics, consisting of a pair of two axis joysticks, a function selector switch, a high/low speed selector switch and an emergency stop button.

System Operation

High pressure oil is supplied via the supply coupling on the front services panel to the high pressure filter, beyond this filter it is divided and supplied to the front and rear control valves. These valves are connected to each other with a load sensing line. This helps to maintain synchronisation of the crane lifting arms when unequal loads are handled. Fitted into the load sense line is a solenoid operated dump valve. When the valve is in the de-energised condition load sensed (LS) oil is dumped to tank. When the valve is energised the LS line is blocked to tank enabling the hydraulic system to operate. A hydraulic gauge is fitted into the LS line indicating hydraulic system pressure.

The crane control valves are Danfoss PVG 32 proportional type and are signalled from the joysticks for directional control. High or low speed can be selected at the remote control. The low speed function only applies to the lifting arms. The stabiliser legs are always in high speed irrespective of the position of the high/ low speed selector switch as they do not require the fine control required for the lifting arms.

On analogue units when "Low Speed" is selected only one pump is supplying the system and the joystick signals pass via an electronic hydraulic flow (EHF) control and the function speed is reduced by 50% to allow fine control under heavy and difficult loading conditions.

Digital units use a different method to provide a 50% low speed operation.

Hydraulic Safety

Over Centre Valves

The hydraulic system is fitted with pilot operated over-centre valves on the crane arm cylinders which are factory preset to cope with all foreseen shock loads or attempts to lift more than the crane's Maximum Lifting Capacity.

The over-centre valves:

- Prevent the arms from moving unless there is a pressure signal from the main hydraulic valve.
- Help keep the movement of the load controlled and constant when being lowered, regardless of the pressure that may be in the cylinder.
- Ensure that the cylinders are held in position, should the hydraulic system lose pressure. This stops the arms from dropping and thus preventing any run away of the load in the event of a hose failure.

Hydraulic Lock

An hydraulic lock is incorporated which prevents the operator from extending the bottom lift cylinder to a hazardous configuration whereby the load could runaway.

This lock can also be activated if the bottom lift cylinder is fully retracted and system pressure is allowed to build up to 4000 psi. If the lock is unintentionally activated in this manner, the operator will be required to wait for a short period of time to allow the pressure to dissipate and the lock release.

Pneumatic System

This system comprises the following elements:

- A hold back protection valve
- Crane module locks
- An engine speed control cylinder (Power Pack only)
- Self steer axle (if fitted)

Hold Back Protection Valve

This valve protects the trailer brake system and isolates the auxiliary pneumatic system if the trailer air system drops below a predetermined level as shown in the auxiliary circuit drawing provided.

Crane module locks

Only Sidelifters with rack and pinion style or centre drive traverse have crane module locks.

Two single acting air cylinders are mounted on the underside of the crane lift module between the chassis rails. The cylinders are connected to a plunger style-locking pin that locks the lifting modules in their correct lifting positions. They are spring loaded to lock and air actuated to unlock.

Engine Speed Control

An ON/OFF air solenoid valve when activated by either remote joystick supplies system air pressure to the base end of the speed control cylinder to obtain maximum engine speed (2800rpm). Retracting the cylinder returns the engine to the idle speed (approximately 1400rpm).

Engine Run/Stop Control

An engine RUN/STOP control solenoid activated by the key switch and deactivated by the emergency stop buttons. This solenoid requires power to be on to run the engine. If power is removed, the engine will stop.

Self Steer Axle (if fitted)

On Sidelifters with a self-steer axle there is an air supply fitted to the rear axle to control the steering of the self-steer axle. For further information refer to the manufacturer's documents supplied.

Power Pack

The power pack is a Kubota diesel engine. This engine develops approximately 40 horsepower at 2800 rpm and the motor speed is governed to the required pump speed of 2800 rpm.

The power pack control panel is within a weatherproof cabinet, located either on the side or the rear of the machine.

The electric start key and switch are situated on the control panel, as are any or all of the following, depending on the model and control system:

- Hour meter, water temperature and oil pressure gauges
- Generator and pre-heat warning lamps
- E-stop circuit lamp and a glow lamp

.

Chassis, Suspension and Axles

Parts of this chassis are fabricated from high tensile steel and must not be welded without authority from Steelbro or its authorised service representative.

The standard Kingpin is a 2" S.A.E. removable (bolt in) type.

Two-speed wind up landing legs are fitted behind the gooseneck.

The make and model of this Sidelifters axles and suspension are detailed in a separate section of this manual together with the maintenance and service information of those components.

Notes on Tractor/Semi Trailer Operation

Coupling and Uncoupling

Periodically check that coupling jaws or hook locks are free, working easily and are well lubricated. If the main plate is covered with road dirt and grit, clean off with solvent and re-lubricate with a good quality grease (hub grease is ideal).

Regularly inspect tractors and trailers for damage to couplers, kingpins and pick-up plates, caused by violent impact.

We recommend this, as it is the practice of some drivers to back up to trailers too fast, when coupling.

Undetected damage resulting from the careless and dangerous habit of backing up to the trailer too fast can endanger life and goods.

Experience Counts

Everyone connected with articulation is familiar with the sound of a tractor being coupled to a trailer - but it is difficult to draw a line between the firm, positive "clunk" and an impact between tractor and trailer severe enough to cause damage.

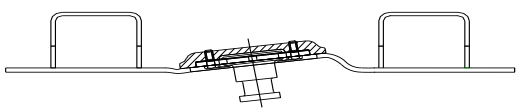
Chief Cause of Trouble

Coupling heights of loaded trailers when parked will vary due to many operating factors, such as difficult road or yard surfaces. Fleet surveys have shown that most damage is caused by attempting to couple up units that are unsuited in terms of coupling heights.

Many of the older tractors have rear springs with a high deflection rate, and when uncoupling a loaded trailer, the landing gear is wound down at the loaded height. As the tractor moves away from the trailer, the tractor springs rise to the unladen position. Thus, when re-coupling, the tractor springs have to be forced down to permit the fifth wheel to pass under the trailer plate. This action requires considerable effort, but if the driver uses too much power, an excessively violent coupling takes place. Damage is often caused to the trailer plate in this way and periodic checks should be made to ensure that the plate is not distorted and that the kingpin is square to the face of the trailer pick - up plate.

Damage can also be caused to the coupler throat, and spreading of the hook jaws, if the trailer is too high for the tractor unit. The surfaces of the trailer pick up plate and fifth wheel coupler should be in contact to obtain correct connection.

Drawing showing a typical damage and misalignment of kingpin caused by an excessively violent coupling of tractor and trailer:



Simple Checking Devices for Semi Trailers

The plate and kingpin can be checked very quickly by using a straight edge. This can be any straight flat piece of metal or timber with an appropriate rectangular section cut out to clear the kingpin.

Place the straight edge across the trailer plate, first across the trailer and then longitudinally, and you will soon see any bow or distortion in the plate. Also by having a cut-away rectangular shape square to the flat edge, any damage or misalignment of the kingpin can be seen. The cut-away portion should be made to the correct depth - the same as the kingpin depth - thus serving to show that the kingpin has not been forced upwards, which would probably impair the coupling mechanism.

To check the tractor coupling, it's a good idea to use part of an old plate of convenient size with a kingpin mounted in position. This way the coupling action can be simulated. When coupled, the pin should be held firmly and snugly without slack.

Crane Operations

This section covers how to operate the cranes when performing different kinds of lifts.

Operating Near Power Lines

Do not operate a Sidelifter close to power lines.

Electricity supply bodies in each State/Country may have issued regulations or guidelines for the use of cranes in the vicinity of overhead conductors (power lines). The Sidelifter operator must be familiar with these regulations and carry out a site-specific risk assessment prior to the start of any operation where working within close proximity to power lines is required.

All power lines must be treated as live unless the electricity distributor or transmission line operator has stated otherwise. Such a statement must be in writing and include date and time frame of the isolation of the power lines.

The Sidelifter, the lifting arms and the load must be kept at least the listed distances from any power lines during operation:

Voltage	Minimum Distance Required
Up to 500	2.0 metres
500 to 40 000	4.0 metres
40 000 to 133 000	6.4 metres
Over 133 000	10 metres

Where the above stated minimum distances cannot be achieved, the electricity distributor must be notified in writing and the Sidelifter must not be operated within the minimum distance until the following requirements are satisfied:

For Power lines up to and including 133 000 V

- Written permission from the electricity distributor has been obtained
- All conditions specified by the electricity distributor are complied with.
- The electricity distributor is notified before work commences.
- A ‘Spotter’ performs spotting duties.
- A pre-start site/job meeting has been convened and a risk assessment completed.

For power lines greater than 133 000 V

- The electricity distributor has provided an easement entry permit.
- Written permission from the electricity distributor has been obtained
- All conditions specified by the electricity distributor are complied with.
- The electricity distributor is notified before work commences.
- A 'Spotter' performs spotting duties.
- A pre-start site/job meeting has been convened and a risk assessment completed.

Contact with Power Lines

If the Sidelifter or load contacts power lines, the relevant electricity distributor must be notified immediately. The Sidelifter operator must warn other personnel not to touch any part of the Sidelifter or load and if possible without anyone approaching operate the Sidelifter to break contact.

When unable to move or untangle the Sidelifter from the power line, no further action must be taken until the power is isolated and conditions are confirmed safe.

When a Sidelifter has been in contact with a power line, it must be checked by a suitably competent person and must not be returned into service until all recommended repairs have been completed.

Trombone Chassis

Warnings:

When travelling unladen, the chassis MUST be fully retracted.

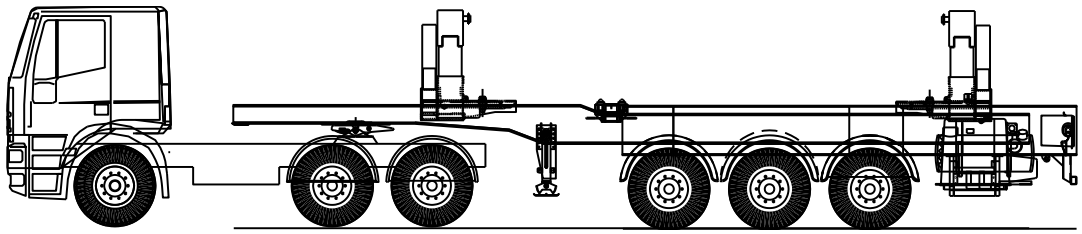
ONLY use the rear 20' position in yard operations and not for travelling on roads.

NEVER attempt to extend or retract the chassis when the Sidelifter is laden.

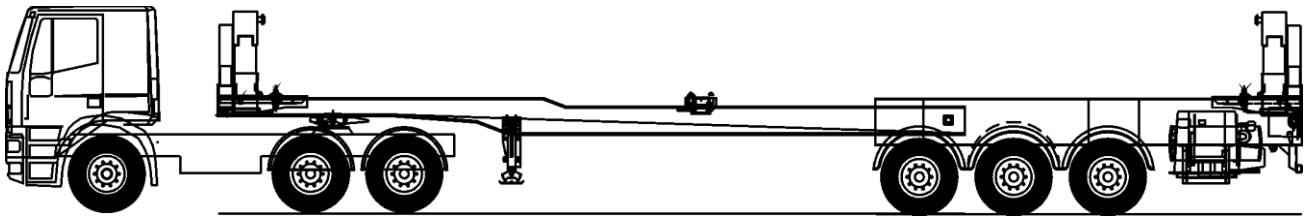
The trombone Sidelifter comprises a two part chassis that slides in and out (hence the name "trombone"). When fully extended the trombone Sidelifter can carry one 40 foot container or two 20 foot containers. If specified it can also carry a 45 foot container. When fully retracted, it can carry one 20 foot container.

The trombone Sidelifter has either a rack and pinion traverse front crane module and cylinder traverse rear crane module, or rack and pinion for both modules. The engine is mounted on the side of the trailer.

There are two kinds of trombone mechanisms available - hydraulic and manual. The hydraulic trombone mechanism uses a hydraulic cylinder to extend and retract. The manual trombone mechanism uses the tractor unit to extend and retract. Instructions for extending and retracting each type follows:



Trombone Sidelifter in retracted, 20 foot position



Trombone Sidelifter in extended, 40 - 45 foot position.

Extending and Retracting the Trombone Sidelifter - Manual Version

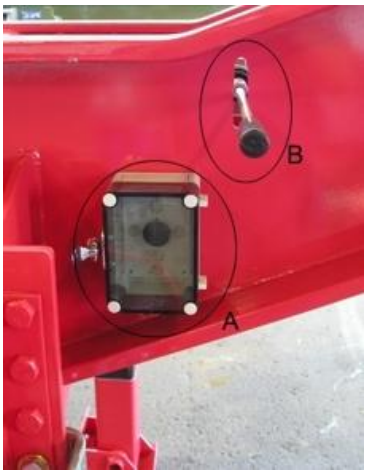
Either type of trombone Sidelifter must be coupled to a tractor unit during extending or retracting.

NEVER attempt to extend or retract the chassis when the Sidelifter is laden.

HYDRAULIC EXTEND/RETRACT INSTRUCTIONS

Before extending or retracting the trombone chassis, ensure the modules are in the retracted 20 foot position. If the unit has a front lift axle then this should be raised. A rear lift axle should remain lowered at all times. Apply park brake on the tractor unit and release the trailer brakes.

1. On the remote control, select Low Speed and Arms Mode.
2. On the chassis, push in and hold the trombone lock release button located in the clear box at the landing legs (see A).
3. Move the lever (B) down to extend OR up to retract the chassis.



Once the mechanism starts to move, release the trombone lock release button (A), but keep holding the lever (B) as you walk beside the unit. Once released the lock will self reset so the locks will automatically lock when they get to the next lock position.

MANUAL EXTEND/RETRACT INSTRUCTIONS

Before extending or retracting the trombone chassis, ensure the modules are in the retracted 20 foot position. If the unit has a front lift axle then this should be raised. A rear lift axle should remain lowered at all times.

1. Unlock the trombone locks with the Trombone lock key located on the control panel at the front of the rear half of the trailer (C). The key has two positions UNLOCK and RESET.
2. Apply the trailer brake in the tractor unit and **SLOWLY** drive forward for extension, or reverse for retraction. The trombone locks will automatically reset as the chassis moves and will self lock when in correct position.

If the tractor unit is not equipped with a "trailer brake only" option, disconnect the air lines between the tractor unit and the trailer so that the spring brakes will apply automatically and hold the rear half of the chassis in place and allow the chassis to extend or retract.

Driving too fast when extending or retracting the unit can damage the locks. Always drive very slowly until the locks engage before increasing driving speed.

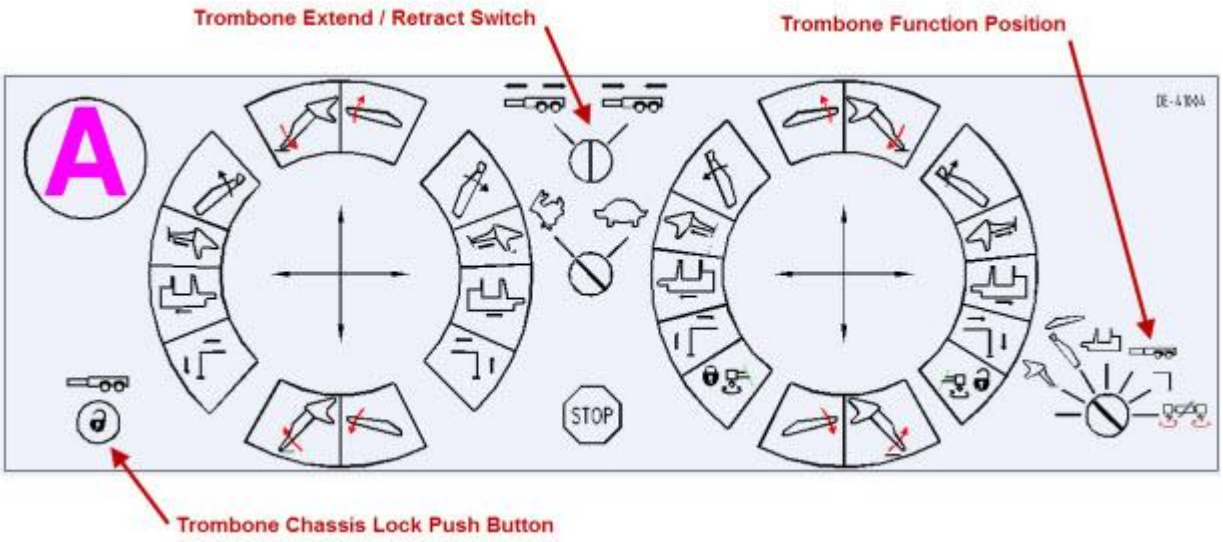
Extending and Retracting the Trombone Sidelifter - Remote

Trombone Sidelifters must be coupled to a tractor unit during extending or retracting.

NEVER attempt to extend or retract the chassis when the Sidelifter is laden.

REMOTE HYDRAULIC EXTEND/RETRACT INSTRUCTIONS

Before extending or retracting the trombone chassis, ensure the modules are in the retracted 20 foot position. If the unit has a front lift axle then this should be raised. A rear lift axle should remain lowered at all times. Apply park brake on the tractor unit and release the trailer brakes. Ensure you have sufficient space behind the trailer to extend the chassis.



1. On the remote control, select the Trombone function.
2. Press and hold the Trombone Chassis Lock push button on the remote.
3. Turn the trombone extend / retract switch to the desired function. The trombone chassis will start to move.
4. Release the lock button when the chassis has started to move.
5. Release the trombone switch when the chassis is in the correct position and you hear the chassis locks click into place.

Manually check that the trombone is fully extended or retracted AND locked before you drive the Sidelifter.

Positioning the Lifting Cranes

Follow these steps to position the crane modules and trailer ready to lift a container:

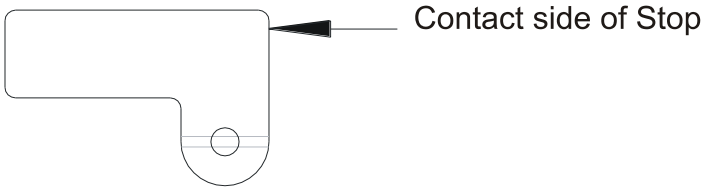
1. Position the lifting cranes in the appropriate positions for the size of container. This makes it easier to line up the cranes beside a container.

   a) Select Traverse (or).

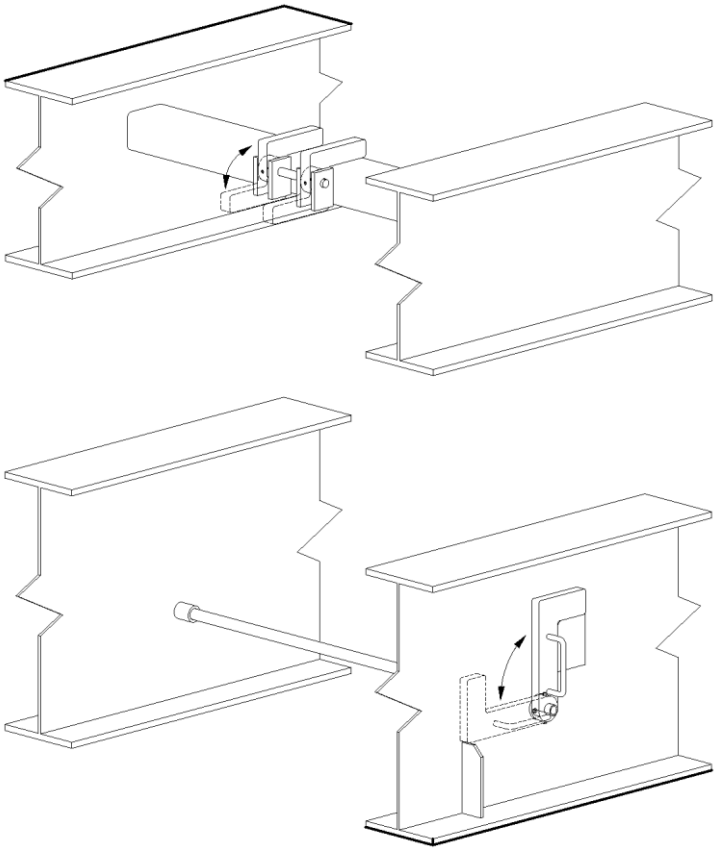
   b) To move modules out to 40' position, push joysticks out. To move to 20' position, push joysticks in.

2. Park the Sidelifter trailer for lifting the container and ensure the parking brake is ON.

If the Sidelifter has additional positions for one or both of the cranes, it will be fitted with intermediate stops. In this case the crane module will need to be positioned on the contact side of the stop yet far enough so the stop can be flipped over. Once the stop has been flipped over the crane module can be moved until it contacts the stop giving the desired position. See the diagram below.



The position and operation of the crane stops are shown below.



Lifting a Container from the Ground

On a Sidelifter with bending leg stabilisers, refer to the section on how to deploy them before reading the instructions below:

Before performing a lift, ensure the following conditions are met:

Sidelifter must be attached to the tractor unit.

Sidelifter park brake is applied.

Check that the lifting area complies with safety zones recommended on the decal and is clear of any obstructions.

Ensure that the strength of the ground surface is sufficient to withstand a 29 tonne maximum point loading. If in any doubt, place hardwood timber packing of at least 50mm thick and 200mm x 500mm under each stabiliser foot.

If the stabiliser feet have been placed into a hollow or downward slope then sufficient timber packing will need to be placed under the feet to lift them back up to a level position, if you wish to handle a loaded container.

Park the Sidelifter alongside the container with approximately 300mm clearance between the container and the Sidelifter

Perform the following checks:

a) Sidelifter twistlocks are directly opposite the container corner castings.

b) Sidelifter parking brake is applied.

c) No hazards and obstructions such as overhanging building awnings, electric power lines or telephone cables.

d) Nothing is in the way of the Stabiliser Legs and/or Feet and surface is solid enough to bear them.

e) Twistlocks on the Sidelifter are in the raised position and unlocked.

- Start the hydraulic system supply (Powerpack or PTO). If the powerpack engine is cold then allow it to warm up for 2-3 minutes.
- Move to the safe operating zone as shown on the decal.
- Select **HIGH SPEED** () operation on the remote control if this option is available.
- On multicrane units, select the Front 20', 40', or rear 20' option on the 3-way switch.
- Select **STABILISERS** ( or ). Extend the stabiliser leg extensions to their maximum then tilt the legs until the feet touch the ground. Do not load feet - additional pressure will not give additional stability
- Set the mode selection switch on the remote control to Arms (). Manoeuvre the top and bottom arms until the chains are positioned centrally to the ends of the container, and fit the lifting lugs into the corner castings of the container, ensuring that there are no twists or tangles in the chains and that the left and right hand lifting lugs are in their correct positions

Do not try to force the cranes alongside a container. If the lifting arms will not clear the container, the lifting equipment and stabiliser legs should be returned to the stowed position and the Sidelifter positioned so it will clear the container.

- Take an initial strain on the chains by raising the top arms upwards. Ensure that the lift pins of the crane are in the centre of the container. Use the movement of the top and bottom arms to centralise the lift pins. Take the weight of the container and check that the Sidelifter is stable with the weight being lifted
- Select **LOW SPEED** ( or ) on the remote control if this option is available.
- Lift the container approximately 150mm (6in) off the ground by raising the top arms. In the event that the container is lifting unevenly it may be necessary to operate one end only to bring the lower end of the container up to a level position. Move the container, just above the ground, towards the Sidelifter, until it is about 300 mm from the side of the Sidelifter
- Raise the top arms until the bottom of the container is level with the top of the Sidelifter chassis
- Lower the bottom arms until the container corner fittings are above their respective twistlocks

Rapid starting and stopping movements are stressful on the equipment, and may cause the container to swing, which may damage the cranes and twistlocks. To ensure smooth movement, operate the controls gently avoiding any sharp movements.

- Lower the container down onto the twistlocks by locating either front corner onto a Twistlock cone, and then the rear visible corner onto its Twistlock cone. With practice operators will be able to land the containers onto the twistlocks in one smooth operation
- Select **HIGH SPEED** () if this option is available
- Lower the lifting arms to their stowed position
- Select Stabiliser Mode and return the stabiliser legs to their stowed position. It is also good practice to fully stow cranes when transporting containers between facilities
- Let the hydraulic system supply (powerpack or PTO) engine to idle for at least 1 minute to allow it to cool down gradually.
- Stop the engine, turn the key off and stow the controls With cable remotes avoid twisting and knotting the cable.
- Lock the twistlocks

The Sidelifter can now be driven to the unloading site.

Placing a Container on the Ground

Before performing a lift, ensure the following conditions are met:

Sidelifter must be attached to the tractor unit.

Sidelifter park brake is applied.

Check that the lifting area complies with safety zones recommended on the decal and is clear of any obstructions.

Ensure that the strength of the ground surface is sufficient to withstand a 29 tonne maximum point loading. If in any doubt, place hardwood timber packing of at least 50mm thick and 200mm x 500mm under each stabiliser foot.

If the stabiliser feet have been placed into a hollow or downward slope then sufficient timber packing will need to be placed under the feet to lift them back up to a level position, if you wish to handle a loaded container.

Park the Sidelifter alongside the area where the container is to be placed, ensuring that conditions above are all met

Attach the lifting chains to the container. Ensure there are no twists or tangles.

Unlock the twistlocks

Ensure the twistlocks are unlocked prior to lifting

- Start the engine. Select High Speed () on the High/Low Speed Switch
- Allow the powerpack engine to warm up for 2-3 minutes if starting from cold.
- Fully extend the stabiliser legs and place the feet on the ground. Do not load the feet as additional pressure will not give additional stability.
- Raise the top and bottom arms until the chains are evenly tensioned
- Select low speed ( or ) on the remote control
- Raise the top arms to lift the container clear of twistlocks on the liftside.
- Move the container across the chassis by raising the bottom arms until the container is 300mm clear of the side of the Sidelifter
- Lower the top arms to place the container on the ground. If it is necessary to move the container further out from the Sidelifter, do this with the container no more than 150mm, (6in) above the ground
- Once the container is placed firmly on the ground, set the remote control to mode "0" for safety.
- Remove the lifting lugs from the container
- Return to the safe operating area and switch the remote control to Arms mode

- Switch to high-speed operation () and return the lifting arms to the stowed position, ensuring the lifting chains are in the chain trays beside the twistlocks
- Return the stabiliser legs to the stowed position. It is also good practice to fully stow cranes when transporting containers between facilities
- Let the powerpack engine idle for at least 1 minute to allow it to cool down gradually.
- Stop the engine, turn the key off and stow the controls With cable remotes avoid twisting and knotting the cable.

Transferring Containers to and from a Truck or Trailer

Ensure that the spacing between the vehicles is such that the stabiliser foot is able to reach the centre line of deck on companion truck or trailer. Always refer to stability chart before commencing lift.

Follow the procedure as described previously for loading to and from the ground:

Stabiliser leg placed on deck or chassis

Where the deck length permits, legs should be placed on top of the companion truck or trailer. If the deck of the companion truck or trailer has been designed for operating with a Steelbro Sidelifter, position the stabiliser foot in the designated area. Alternatively place the stabiliser feet with care, ensuring that the point of contact is strong and stable enough to bear the weight of the lift. Timber dunnage may help to distribute the load.

Stabiliser leg placed on ground

If there is insufficient room to place the stabiliser on the deck they can be placed on the ground.

Park the two vehicles approximately 1 metre apart. Place one leg on the ground as far as possible under the rear of the companion truck. Place the other leg as far as possible under the front of the companion truck on the ground. Longer truck decks can be treated as per transferring 20' containers onto 40' trailers.

Transferring 20' Containers to and from 20' Trailers or 40' Containers to and from 40' Trailers

Follow the loading to and from the ground procedure except:

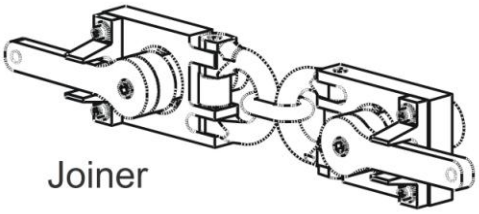
- Park the two vehicles approx 1 metre apart, with twistlocks aligned
- Place one stabiliser leg on the ground as far as possible under the rear of the companion truck.
- Place the other stabiliser leg on the ground under the tractor unit chassis, if it can be placed there fully extended without obstruction. If not, jack-knife the companion tractor unit to 45 degrees enabling the stabiliser leg to be placed on the ground fully extended in front of the companion trailer

Always ensure the twistlocks on both vehicles are unlocked before commencing transfers.

Lifting 2 x 20' Containers using Container Joiners

ENSURE that container joiners are attached to both sides of the containers BEFORE lifting the containers.

Do not use container joiners with flat racks.



Container joiners can join two 20-foot containers so that they may be lifted together as if they were one 40-foot container.

Fit the joiners into the bottom corner castings on both sides of the containers and lock them.

When not being used, store the container joiners on their chassis mounting brackets or in the toolbox.

Rating

Steelbro container joiners (Part Number LF-20020) are rated to be used to lift 2 containers each with a maximum gross mass of 15,000 kg.

Transferring 2 x 20' Containers to a 40' Trailer

If not using container joiners to transfer 2 x 20 foot containers onto a 40 foot trailer, two separate transfers are required, from the 20-foot position on the Sidelifter onto two different positions on the companion trailer. With some models of Sidelifters the companion trailer needs to be designed for wide spaced 20 foot carrying. This is not necessary when using container joiners.

This does not work in reverse i.e. it is not possible to unload two x 20 foot containers from a Sidelifter using its own cranes, as two separate lifts. To achieve this, use the container joiners.

Follow loading from the ground procedure except:

1. Load the first container onto the front of the 40 foot trailer in the most forward position achievable and lock all the twistlocks.

2. Load the 2nd container onto the rear set of twistlocks of the 40 foot trailer

Transferring Containers to and from Rail Wagons

If there is sufficient room at either end to place the stabiliser leg onto the rail wagon and there is access to the bottom corner castings, then these transfers can be done in the same manner as trailer transfers.

If there is insufficient access to the corner castings of the containers to allow the lifting lugs to be attached then a top lift frame must be used.

If the stabiliser legs cannot be placed onto the rail wagon, it is necessary to park the Sidelifter to allow the stabiliser feet to be as far as possible underneath the wagon, with the legs extended to their maximum.

Do not place stabiliser feet on rail tracks. Feet must be placed on level surface.

Double Stacking Containers

Double stacking is where one container is placed on top of another, to save floor or ground space. We recommend that operators receive training in this technique before attempting it themselves.

This topic explains how to double stack and unstack.

If attempting to double stack containers after sunset or before sunrise, use extra lighting to ensure you can clearly see the containers you are moving.

Do not place a 20' box on top of a 40' box or a 40' box on top of a 20' box.

No anti slip protection is provided on the legs. If you use them as an access platform you do so at your own risk.

Do not use Sidelifter lifting chains in the top castings of the ISO container as this may cause severe damage to the machine, and place personnel at risk. Any such action will void our warranty. Top lifting should only be attempted with a top-lifting frame.

Before performing a lift, ensure the following conditions are met:

Sidelifter must be attached to the tractor unit.

Sidelifter park brake is applied.

Check that the lifting area complies with safety zones recommended on the decal and is clear of any obstructions.

Ensure that the strength of the ground surface is sufficient to withstand a 29 tonne maximum point loading. If in any doubt, place hardwood timber packing of at least 50mm thick and 200mm x 500mm under each stabiliser foot.

If the stabiliser feet have been placed into a hollow or downward slope then sufficient timber packing will need to be placed under the feet to lift them back up to a level position, if you wish to handle a loaded container.

Double Stacking - lifting container from Sidelifter to place on top of another container

The table below shows the trailer to container positioning limits for different heights of the container on the ground.

Height of container on ground	Maximum distance between Trailer and Container on ground
Standard 8'6" (2591 cm)	500 mm (~20 inches)
High Cube 9'6" (2896 cm)	250 mm (~ 10 inches)

Double stacking and unstacking a High Cube 9'6" container (see table above) requires a trailer twistlock height (measuring from twistlock base to ground) of at least 1350mm.

1. Shorten the chain assemblies in accordance with the relevant "Chain Shortening Instructions (Refer to "Chain Shortening" on page 81)"
2. Park the Sidelifter away from (see table above) and parallel to the side of the container on the ground with the container ends level with each other.
3. Fully extend the stabiliser legs and place the feet on the ground. Packing needs to be placed under the feet in soft or doubtful ground.
4. Connect the lifting chains.
5. Raise the container off the Sidelifter to clear the top of the container on the ground. To do this, follow these steps:
   a) Move the bottom arms OUT until the lifted container almost touches the container on the ground.
   b) Raise the container vertically until the lifted container clears the top of the container on the ground. Be very careful not to allow the container to move over the offside/non lift side.
6. Keeping the lifted container as low as possible above the top of the container on the ground, move it out across the top of the container on the ground.
7. Align the corner castings of the bottom and the top containers, then lower the container onto the container on the ground.
8. Remove and unshorten the lifting chains. Use a ladder to reach up to remove the lugs from top container; do not walk on the crane arms or legs!
9. Return the stabiliser legs to the stowed position. It is also good practice to fully stow cranes when transporting containers between facilities

10. Let the powerpack engine idle for at least 1 minute to allow it to cool down gradually.
11. Stop the engine, turn the key off and stow the controls. With cable remotes avoid twisting and knotting the cable.

Unstacking - lifting top container back onto Sidelifter

1. Shorten the chain assemblies in accordance with the relevant “Chain Shortening Instructions (Refer to "Chain Shortening" on page 81)”
2. Park the Sidelifter away from (see table above) and parallel to the side of the container on the ground with the container ends level with each other.
3. Fully extend the stabiliser legs and place the feet on the ground. Packing needs to be placed under the feet in soft or doubtful ground.
4. Connect the lifting chains using a ladder to reach up to attach the lugs to the container. Do not walk on the crane arms or legs!
5. Lift the container no more than 150mm (6 inches) above the container on the ground. Lift it gently as it may swing a little when first lifted. Once the container is lifted and is stable, move it towards the Sidelifter across the top of the container on the ground.
6. Bring the lifted container in towards the Sidelifter until it is just clear of the container under it. Manoeuvre the container over the twistlocks on the Sidelifter. **BE VERY CAREFUL NOT TO ALLOW THE CONTAINER TO MOVE OVER THE OFFSIDE/NON LIFT SIDE.**
7. Once the container is above the twist locks, completely lower the top arms and then the bottom arms, to sit the container on the twist locks.
8. Remove and unshorten the lifting chains.
9. Return the stabiliser legs to the stowed position. It is also good practice to fully stow cranes when transporting containers between facilities
10. Let the powerpack engine idle for at least 1 minute to allow it to cool down gradually.
11. Stop the engine, turn the key off and stow the controls. With cable remotes avoid twisting and knotting the cable.

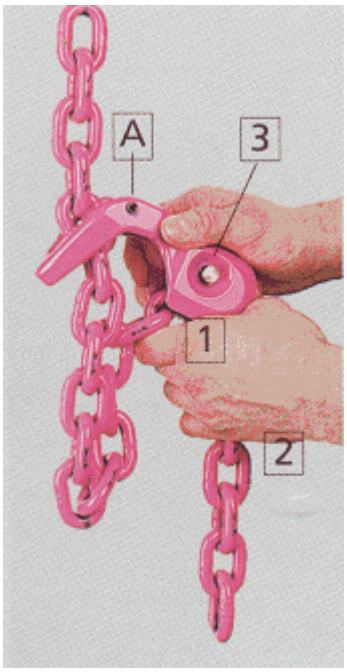
The Sidelifter is ready to be transported or the container can be removed as per procedure for unloading a container from the Sidelifter to the ground.

Chain Shortening

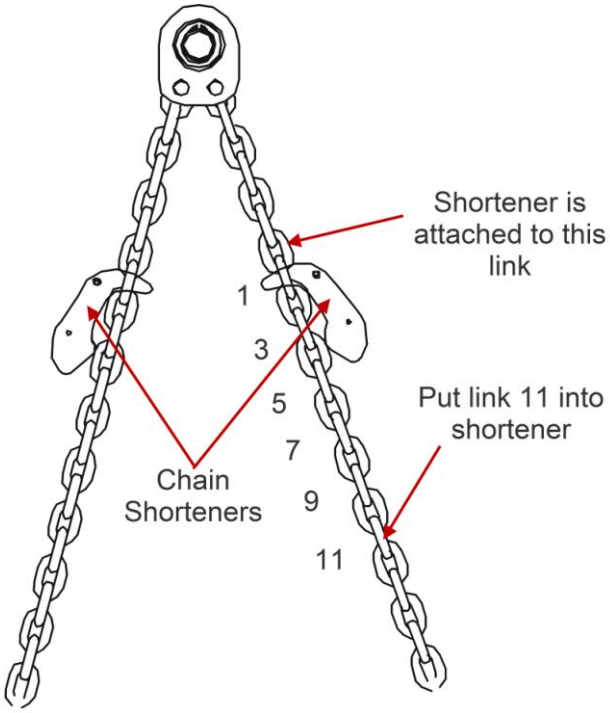
Chains need to be shortened in some situations such as double stacking of containers. Refer to the instructions following according to the model of your Sidelifter.

Chain Shortening Instructions 16mm Chain - SB362

To shorten the chains, follow these instructions:



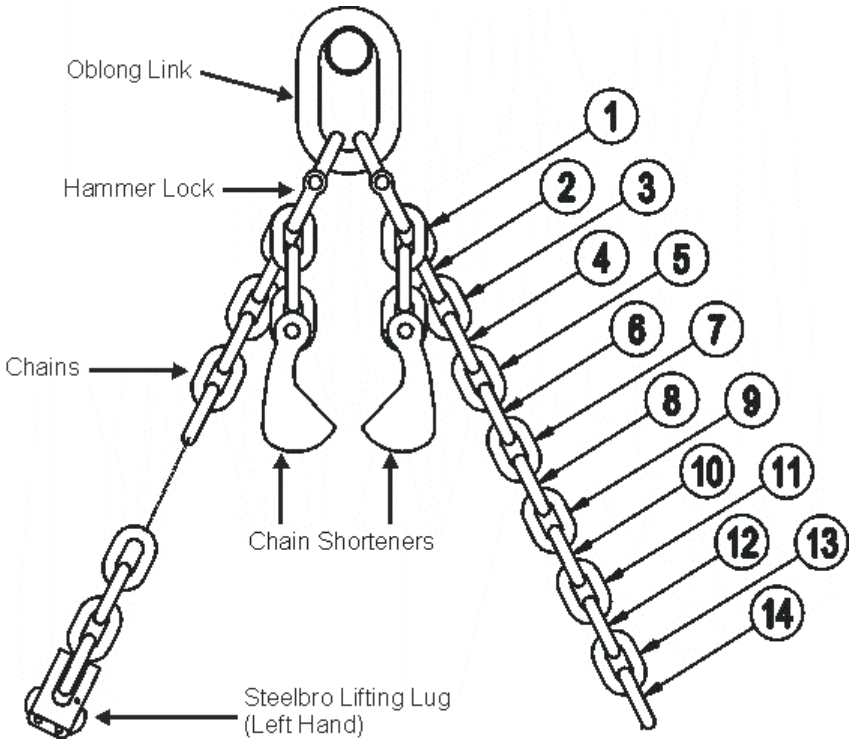
- From, and including, the first free link below where the chain shortener is joined into the chain (**A**), count down 11 links. See the diagram below for numbering.
- Holding the chain so it is slack, slot link 11 into the pocket of the chain shortener
- Pull it down to ensure it is seated properly. If required, depress the spring loaded securing bolt (**3**). The securing bolt locks automatically. Check it is locked securely.
- Check all four chains are equally shortened before lifting container.
- To release the chain again, reverse the procedure, depressing securing bolt at the same time



Check all four chains are equally shortened before lifting the container.

Chain Shortening Instructions 20mm Chain - SB450

Counting the link that is attached to the hammerlock, place link 14 in the slot provided in the chain shortener.



20mm oblong loop style chain shorteners

Check all four chains are equally shortened before lifting the container.

Radio Remote

The radio remote offers an exceptional level of performance and reliability.

The transmitter features proportional joysticks for precise control of crane speed, and a rugged IP65 rated housing. All crane functions including the starting of the onboard powerpack and crane mounted worklamps can be controlled remotely.

The radio remote is protected against electromagnetic fields and radio interference. Radio remote controls use the latest frequency synthesizer technology to eliminate the problems typically associated with radio remote control systems.

The radio remote control system includes a transmitter and a receiver. These systems operate over the 400-470 MHz radio band range (70 cm band) and are FCC approved.

The transmitter generates the electronic signal that communicates with the receiver. The transmitter and receiver are set with identical address codes and frequency channels. This allows operation of multiple Sidelifters within the same area without signal interference.

As an additional safety feature, the Danfoss valves are only energised when the joysticks are moved off-centre. Also the load sense dump solenoid is only energised when the joysticks are moved off-centre, or when the manual override PIN number has been entered on Digital Control units.

Overriding the E-Stop Circuit

This applies only to units fitted with digital or SMARTlift control units.

Sidelifter control valves have manual levers located in the cylindrical container in the side tool box. In the event of an electrical breakdown, the operating cycle can be completed manually by using these levers, but the load sense dump solenoid must be energised first.

You can override the E-stop circuit and energise the load sense pump solenoid by pressing the rubber covered button in the left hand end of the start-key 'E' junction box.

Emergency Stop

For all emergency situations, push the E-stop pushbutton in.

Correct any dangerous conditions and follow the Sidelifter Starting Procedure.

To restart the system:

Step	Hetronic	HBC
1	Disengage E-Stop button	Press Restart button
2	Press Start/Horn button	-

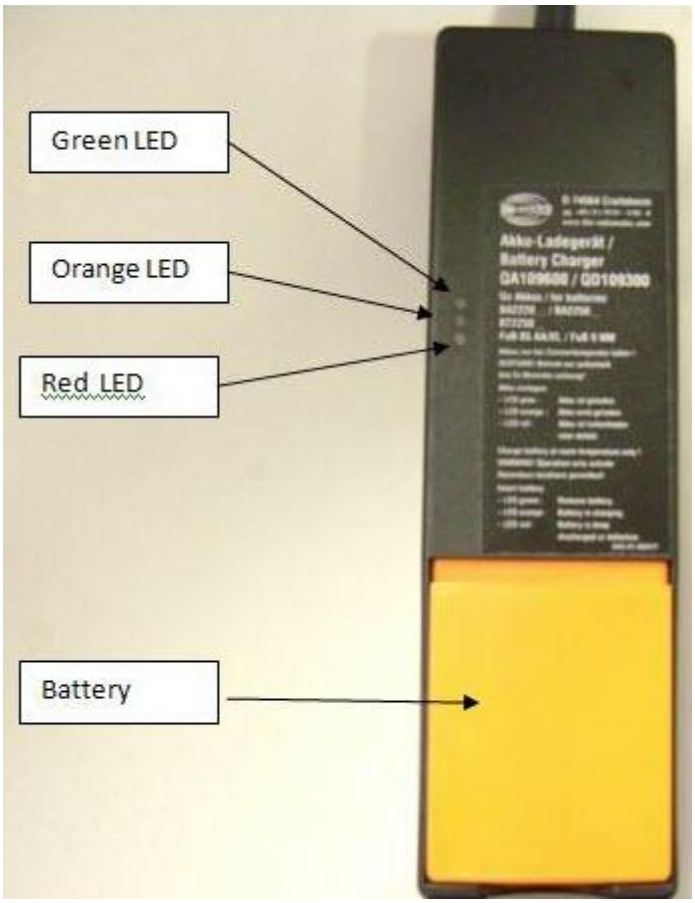
Safe Mode

When the transmitter voltage drops below approximately 3.4 volts, the system automatically goes into Safe Mode. A buzzer will sound to indicate a low battery charge. After a further 30 seconds the transmitter sends the E-stop signal and all Sidelifter motion commands are disabled.

To restart the system

Step	Action
1	Remove the discharged battery from the transmitter.
2	Place the discharged battery into the charger.
3	Insert a fully charged battery into the transmitter
4	Use the Sidelifter Starting Procedure

Radio Remote Battery Charging System - HBC



LED Indicator	Meaning
Orange	The battery is inserted in the charger and is being charged.
Green	The battery is inserted in the charger and is fully charged.
Red	The battery is inserted in the charger is deeply discharged or defective

The battery cannot be damaged by leaving it in the charger.

If the battery is bad and has an open cell, no LEDs will light up. If the battery has a shorted cell, the charge LED will blink continuously. In either case, do not use the battery. Properly dispose of a bad battery.

Digital Control Operating System

Digital Control is included as standard on many models of Sidelifter.

The SMARTlift Load Monitoring System is part of the Steelbro commitment to stay at the cutting edge of Sidelifter design and technology. The system uses advanced electronic technology to enable intelligent control and improved Sidelifter safety.

SMARTlift Load Monitoring is available as an additional factory option, or can be added later as an upgrade to a Sidelifter model equipped with Digital Control.

The SMARTlift Load Monitoring system controls all crane and power pack electrical systems via two electronic controllers, one situated on each crane.

READ THIS SECTION BEFORE USING SMARTLIFT

The SMARTlift Load Monitoring System is NOT a fail-safe safety system. Its purpose is to monitor the load and to make the operator aware of potentially unsafe practices but it will not prevent these from happening should the operator continue with an action.

SMARTlift is not a substitute for responsible operation and operator training. It is essential that operators follow safety procedures, making themselves aware of the operator manual and taking heed of the warnings and cautions contained in it. If in doubt, they should seek further training.

It is essential that the system is properly maintained. In the unlikely event of a fault the owner must report this immediately to the service agent. Until the fault is repaired, the system cannot be considered fully operational.

Components

The Digital Control system consists of the following components:

- Electronic Control Unit (ECU) x 2, one located on each crane base
- Danfoss electro-hydraulic proportional control actuators
- An LCD display located at the rear of the chassis
- A radio remote control.
- Stabiliser deployed microswitch sensors
- Kubota engine run/stop and rpm control
- Hydraulic high/low speed valve solenoids

Sidelifter Starting Procedure

If the Kubota Engine is cold, use the **COLD STARTING PROCEDURE**.

If the Kubota Engine is warm, use the **WARM STARTING PROCEDURE**.

Digital System / Kubota Power Pack Cold Starting Procedure

Step	Description
1	Complete all the pre-operation checks as detailed in the Kubota Operators Manual
2	Ensure that the tractor unit is connected to the trailer and that the pneumatic circuit is fully charged. The throttle actuator and run/stop actuator require air to operate. The engine will not start without a fully charged auxiliary pneumatic circuit.
3	Ensure that all E-stop buttons are released.
4	Turn the Start key clockwise one click to the **ON** position
5	Select the instruction according to the type of remote control below:

Radio Remote	Release the E-stop button on the right side of the remote by twisting it clockwise. Press the start button in the right side of the remote. The green LED on the top right side of the remote will flash fast showing it is trying to communicate with the receiver. Once a signal is found the green LED will flash slowly.
Cable Remote	Release the E-stop button on the side of the remote. Press the start button in the side of the remote

Step	Description
6	The green E-stop circuit light should illuminate. Turn the start key clockwise to the **GLOW** position and hold for five seconds.
7	Turn the start key clockwise to the **START** position and hold until the engine has started. You will know that the start is successful when on the LCD display screen, the wheel pattern rotates to spell out S-M-A-R-T-L-I-F-T on each segment. If the engine fails to start refer to the Troubleshooting Section of this manual and the Kubota Operators Manual.
8	Allow the engine to warm up for 2-3 minutes before putting under load.

Caution: The Start Key can be left in the ON position during the day, but must be switched to the OFF position at the end of each day to prevent the Control system battery from discharging completely.

Digital Control / Kubota Power Pack Warm Starting Procedure

A warm start is when the start key is left in the **ON** position during the working day.

Use the Cold Start Procedure on the previous page from Step 5

Sidelifter Shutdown Procedure

Allow the powerpack to idle for at least 1 minute to allow the engine temperature to drop gradually. It is recommended that chains are stowed, twistlocks locked and any cables stowed before switching off.

Then shutdown the Sidelifter according to the type of control you are using:

Control Type	Shutdown Method
Radio Remote	Turn the Function Switch anti-clockwise to the **OFF** position. Press the E-stop button **IN**.
Cable Remote	Turn the Function Switch anti-clockwise to the **OFF** position. Press the E-stop button **IN**.

If you are not going to use the Sidelifter for more than 3 hours then turn the Sidelifter Start key anti-clockwise to the OFF position. This will prevent the control system battery from being discharged.

Operational Modes

The remote has a Mode switch with these settings:

- Off
- Traverse
- Stabiliser
- Arm

The joysticks control the components that have been selected by the mode switch. This section explains the purpose of each mode and its characteristics.

Other modes may be available relating to specific additional custom features. These are explained in the section of the manual relating to their function.

Off Mode

Selecting Off mode on the remote turns off power to the Danfoss valves. If the Sidelifter is moved while the SMARTlift system is operating, the mode switch **MUST** be set to **OFF.** Otherwise, any accidental movement of the joysticks while the vehicle is moving may activate the hydraulics and cause damage.

When driving on public highways you MUST switch off the SMARTlift system completely by depressing any of the E-stop buttons. On Hetronic radio remote models you can switch off the main black keyswitch.

Traverse Mode

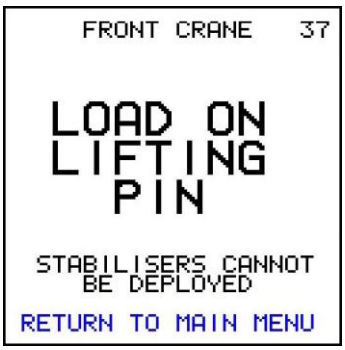
Selecting Traverse mode on the remote allows the crane to be moved along the chassis rails. This mode is not required for fixed truck mounted units.

- While the stabiliser is in contact with the ground, Traverse mode is automatically disabled and the error message shown below will be displayed.

- **HIGH SPEED** is automatically selected for when Traverse mode is selected.

Stabiliser Mode

Selecting Stabiliser mode allows the stabiliser legs to be extended or retracted. If the system is fitted with load monitoring stabilisers cannot be moved if there is a load on the G-Pin.

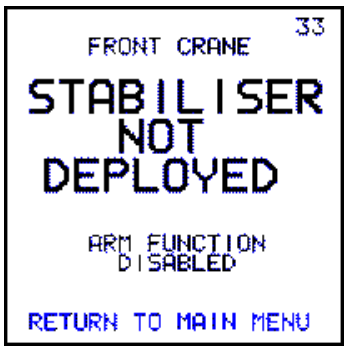


- **HIGH SPEED** is automatically selected for Stabiliser mode

Arm Mode

Selecting the Arm mode allows the crane arms to be extended or retracted.

- If you select Arm mode, the sensors automatically check that the stabilisers are firmly in contact with the ground or a companion trailer. If there is no contact, Arm mode is automatically disabled, the warning horn is sounded and a screen message is displayed.



- Note that if a stabiliser lifts off the ground during the loading operation, the lift IS allowed to continue.

Optional Modes

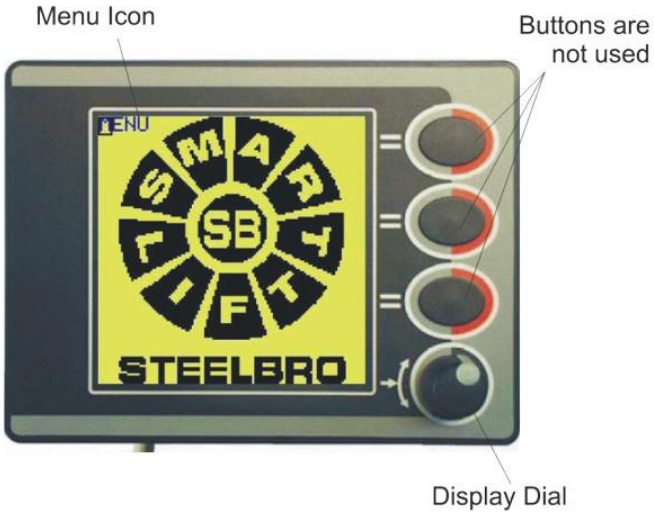
If your unit has bending leg stabilisers, offside stabilisers and/or you use a top-lifting frame, there are corresponding modes marked on the remote control.

Display Screen

The SMARTlift system is equipped with an interactive LCD display screen.

The LCD display screen is used for:

- Displaying system information, warnings, alarms and crane settings.
- Carrying out crane synchronisation and manual override tasks.



Navigating the Screen

You can navigate the screen using the display dial, positioned as shown in the diagram above. Please note that the three buttons are not used.

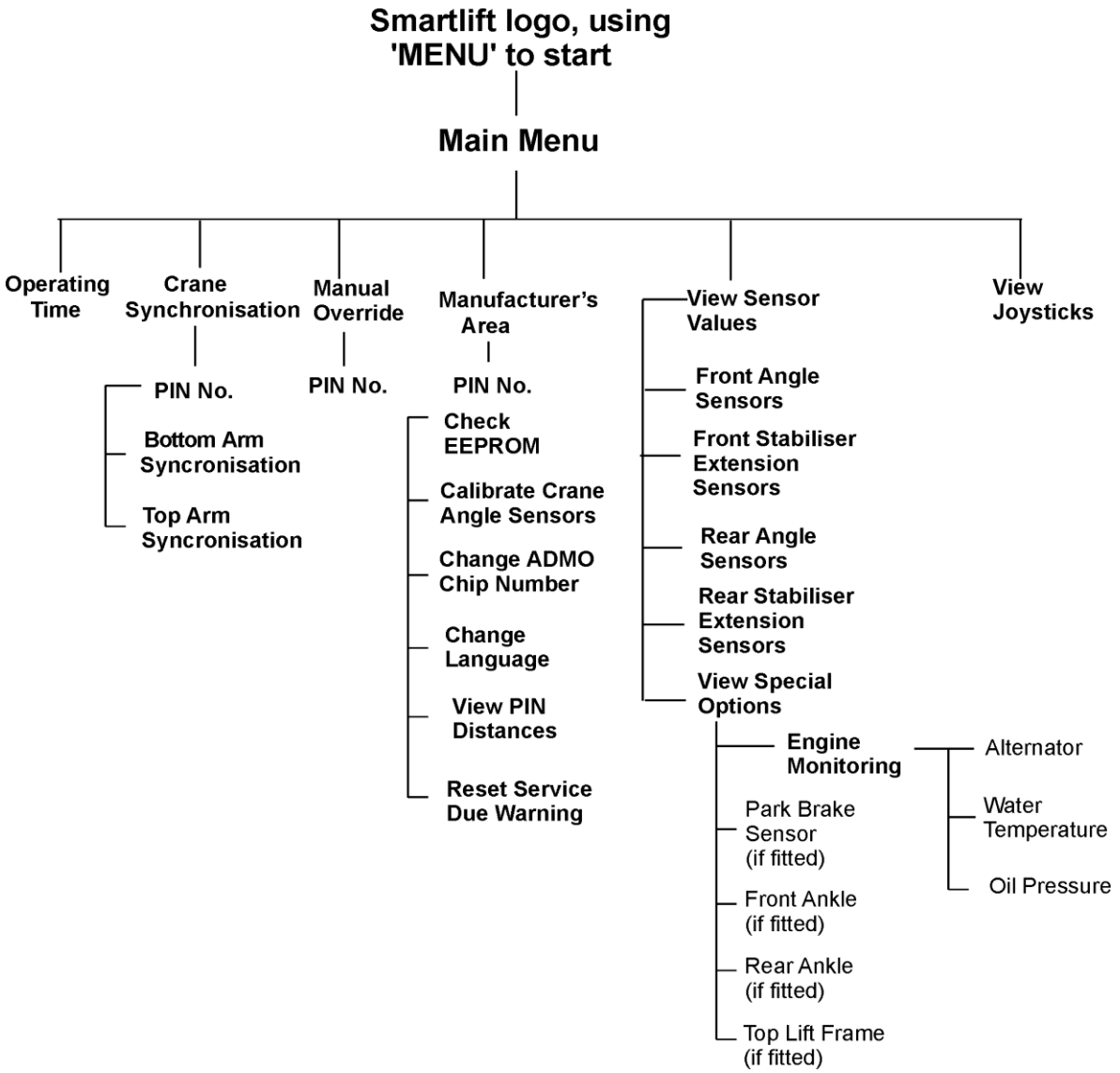
To move through the screens and menu items, turn the display dial clockwise or anticlockwise..

To make a selection from a menu or change a variable, press the display dial.

Accessing the Menu Structure

To access the Menu Structure, from the default screen, turn the display dial until the menu icon is highlighted, then press the dial. Each of the main menu items gives access to the next layer of the menu structure. The lower menus and screens have a Return to the Main Menu or previous menu item which allows you to back out of the menus.

The figure below shows all of the menus and functions available and the paths to follow to access them.

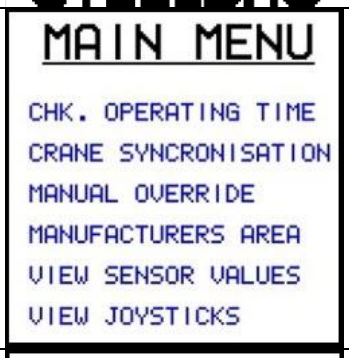


Note that some menu options may not be available on some models.

Operating Time - Menu Item

The operating time of the Sidelifter is available from the LCD display screen by navigating to the Operating Time menu item. Refer to Accessing the menu structure (91).

Use the steps below to navigate to the Operating Time display.

STEP	SCREEN	ACTION
1		Select the **MENU** item by pressing the display dial.
2		Select the **CHK OPERATING TIME** menu item and press the display dial.
3		The Sidelifter operating hours is displayed.

Crane Synchronisation - Menu Item

The Crane Synchronisation menu is protected by a PIN number to prevent unauthorised or untrained access. It is highly recommended that only trained personnel perform crane synchronisation.

Crane synchronisation is the process of matching the speed of the front and rear cranes in **LOW SPEED** only. If they are "out of sync", one function will appear to move faster than the other.

The cranes are synchronised before the trailer leaves the factory. However, if you notice that the cranes are operating at different speeds, it is possible to synchronise the cranes again by following the procedure below. This is not uncommon after about 50 hours of use, by which time the hydraulics have bedded in a little.

How to Synchronise the Cranes

Crane synchronisation is available through the LCD display screen menu structure.

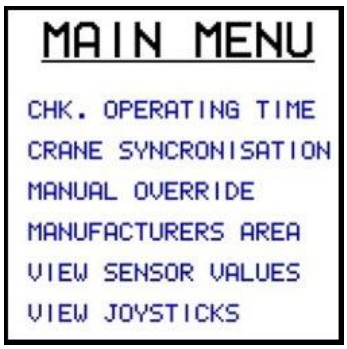
Synchronisation is only effective when **LOW SPEED** is selected on the radio remote.

1. Set the correct engine speed or oil flow rate.

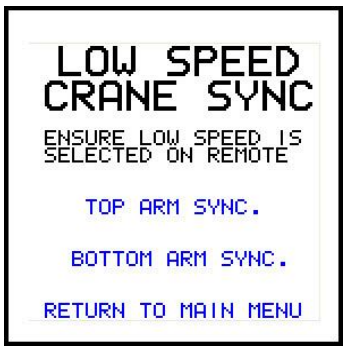
   If using Power Pack version: Check the engine maximum speed is 2800 rpm.

   If using PTO version: Set the truck engine rpm to obtain 100-120 l/min oil flow to the Sidelifter.

2. On the remote control, select **LOW SPEED** and Arm mode.
3. On the LCD display screen, go to the Main Menu and select **CRANE SYNCHRONISATION**.



4. Enter the PIN number provided with this manual by turning the display dial and pressing it when the correct digit appears, then turning the dial to go to the next field and pressing, and turning to select the number etc.
5. When the correct PIN is entered the Crane Synchronisation menu appears as shown below



6. Select **TOP ARM SYNC**, and the Top Arm screen is displayed as shown below.

7. On the remote control, select both top arms up with the joysticks at full deflection and time the arms in seconds, over their full stroke.

	SB330	SB361	SB401	SB362	SB450
Top Arm Up	48 sec	52 sec	54 sec	48 sec	54 sec
Top Arm Down	30 sec	32 sec	35 sec	30 sec	35 sec
Bottom Arm Up	65 sec	90 sec	90 sec	65 sec	90 sec
Bottom Arm Down	50 sec	70 sec	70 sec	50 sec	70 sec

If the time of either or both does not match the time in the table above, you will need to adjust the percentage values on the screen until it does. To do this, select the appropriate function by turning the dial then pressing it. You can then adjust the value up or down by turning the dial back or forward, and then save the new value by pressing the dial again.

8. Repeat for the bottom arms.

Testing the Synchronisation Settings

Test the settings when lifting a 15-20 tonne container to check that the arms are synchronised under normal loading and unloading conditions. Small adjustments of the percentage values may be required to achieve this.

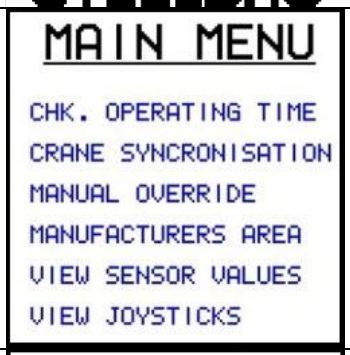
Try slowing down the fast arm instead of speeding up the slow arm as you run the risk of running out of available oil flow to gain speed / synchronisation. Remember to actuate both front and rear cranes simultaneously when doing the timing.

Manual Override - Menu Item

To access Manual Override mode, via the LCD display screen enter the Single Lift manual override PIN 1970. This will allow you to override the SMARTlift system for one operation only. The system should only be overridden in the event of a system failure.

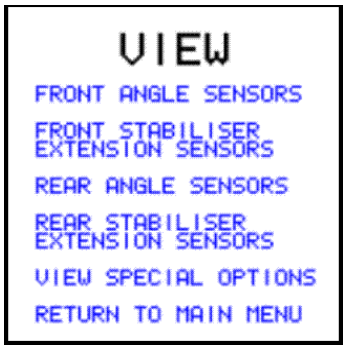
In manual override mode safety features of the load monitoring system are disabled and the operation of the arms is extra slow. The override will remain in place until the system is turned off or the reset pin 9999 is entered.

Use the steps below to navigate to the Manual Override function.

STEP	SCREEN	ACTION
1		Select the **MENU** item by pressing the display dial.
2		Select the **MANUAL OVERRIDE** menu item and press the display dial.
3		The **ENTER CODE** screen is displayed. Enter the override code.
4		The **MANUAL MODE** warning screen is displayed.

View Sensor Values - Menu Item

The View Sensor Values menu enables access to information useful for diagnostic purposes.



Front Angle Sensors

The Front Angle Sensors option displays information about the extension of the front stabiliser in millimetres, the angle of the stabiliser top and the bottom arms in degrees, and the pressure in the top arm lifting cylinder.

Front Stabiliser Extension Sensors

The Front Stabiliser Extension Sensors option displays information about the magnetic counter, the magnetic reset sensors, and the stabiliser deployed microswitch.

Rear Angle Sensors

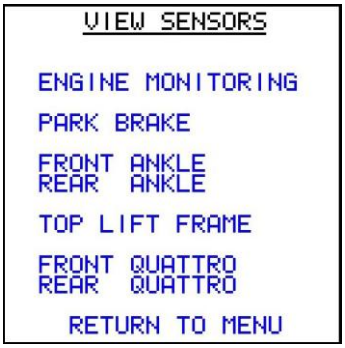
The Rear Angle Sensors option displays information about the extension of the front stabiliser in millimetres, the angle of the stabiliser top and the bottom arms in degrees, and the pressure in the top arm lifting cylinder.

Rear Stabiliser Extension Sensors

The Rear Stabiliser Extension Sensors option displays information about the magnetic counter, the magnetic reset sensors and the stabiliser deployed microswitch.

View Special Options

To view engine management information, and information about optional features (if fitted) installed on the Sidelifter, select View Special Options.



The View Special Options menu displays information on:

Engine Monitoring

An Engine Monitoring system continuously monitors the Kubota engine oil pressure, water temperature and the alternator. If there is low oil pressure, high water temperature or the alternator is not charging, then an audible alarm is triggered and a message is displayed on the LCD display screen. If low oil pressure or high water temperature is detected the Kubota engine will shutdown automatically after twenty seconds to prevent permanent damage from occurring.

Park Brake Sensor (if fitted)

The Park Brake Sensor prevents operation of the Sidelifter without first activating the park brake. Either the status ON or OFF is displayed.

Front Ankle (if fitted)/Rear Ankle (if fitted)

The retract, extension and error status of the ankles of the bending leg stabilisers are monitored and displayed.

Top Lift Frame (if fitted)

The Top Lift Frame sensor detects and displays when all four twistlocks on top lift frame have made contact with all four corner casting pocket on the container and the twistlocks have engaged.

Front Quattro

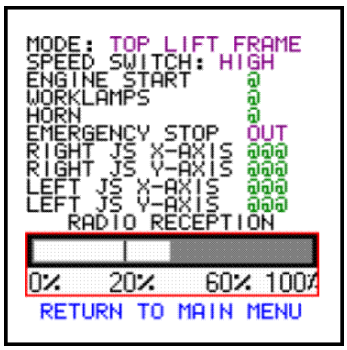
Refer to supplementary information for this item.

Rear Quattro

Refer to supplementary information for this item.

View Joysticks - Menu Item

Selecting the View Joysticks option displays information useful for diagnostic purposes. Values displayed are useful for determining if there are communication errors between the radio remote and the electronic control units located on each crane base.



The possible values displayed for each menu item are described below:

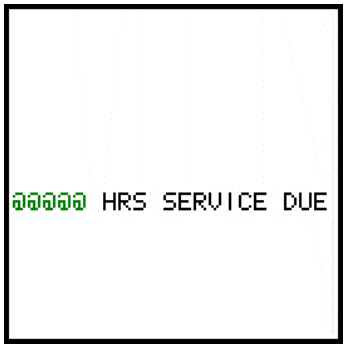
- MODE: one of OFF MODE, TRAVERSE, STABILISER, ARMS, OFFSIDE LEG, BANDY LEG or TOP LIFT FRAME
- SPEED SWITCH: either HIGH or LOW

- ENGINE START, WORKLAMPS and HORN: either 0 (off) or 1 (on)
- EMERGENCY STOP: either OUT or IN
- RIGHT JS X-AXIS and LEFT JS X-AXIS: the function of the joysticks in the up/down position is represented numerically, from 85 to 171, with a neutral position of 127
- RIGHT JS Y-AXIS and LEFT JS Y-AXIS: the function of the joysticks in the in/out position is represented numerically, from 85 to 171, with a neutral position of 127
- RADIO RECEPTION: the level of radio reception between the radio remote and the electronic control units is displayed via a bar graph. Note that this value is not available for display when the HBC radio remote is being used.

Service Due Warnings

Service due warnings operate at 50hrs, 100hrs and at every 100hrs after that.

Cancelling the current service due warning setting and resetting with the next service interval must be done by an authorised service agent.



SMARTlift Load Monitoring System (Optional)

SMARTlift is available as an addition to Digital Control on many Sidelifters.

SMARTlift uses its intelligent software and sensors to monitor and control the lifting operation with precision and reliability. SMARTlift warns the operator when the load has moved to the limit of the safe working envelope and prevents the operator from moving the load further into an area where stability might be compromised.

Use of the SMARTlift LM System is not a replacement for proper operator training. The system is installed as an AID to safe operation of the Sidelifter. The system cannot react to the high momentum generated by a heavy, violently swinging container which WILL result in the Sidelifter becoming unstable. ALWAYS ensure that the load is properly under control.

Components

The SMARTlift system consists of the following components:

- All of the components listed under SMARTlift Control
- **Top arm angle sensor** x 2, located on each top arm.
- **Bottom arm angle sensor** x 2, located on each bottom arm.
- **Stabiliser angle sensor** x 2, located on each stabiliser housing.
- **Magnetic proximity sensor** x 4, located on each stabiliser housing.
- **Encoder strip** x 2, located on the stabiliser extension.
- **Reset magnet** x 4, located on each end of the stabiliser extensions.
- **Trailer angle sensor** x 1, located on the trailer chassis.

Electrical Control Units

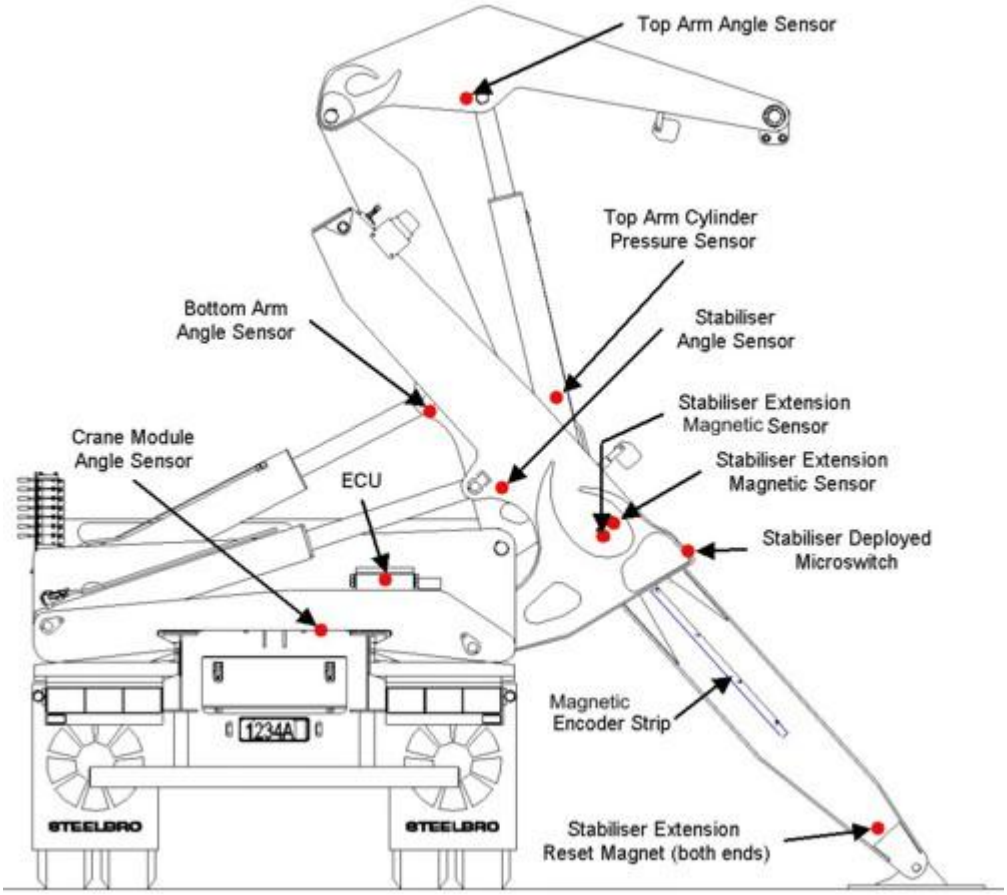
Each crane is equipped with an Electronic Control Unit (ECU) which monitors the following Sidelifter parameters:

- Stabiliser angle
- Stabiliser extension
- Stabiliser foot in contact with ground
- Bottom lifting arm angle
- Top lifting arm angle
- Top lifting arm hydraulic cylinder pressure

- Trailer camber and elevation

Location of Sensors

The sensors are marked by dots and labelled in the diagram below.



Angle and Pressure Sensor Failures

Angle and pressure sensor failures stop the operation of the Sidelifter. To continue operating the Sidelifter it is necessary to enter manual override mode. To do this, via the LCD display screen enter the Single Lift manual override PIN provided with this manual. This will allow you to override the SMARTlift system for this one operation only.

In manual override mode safety features of the load monitoring system are disabled and the operation of the arms is extra slow.

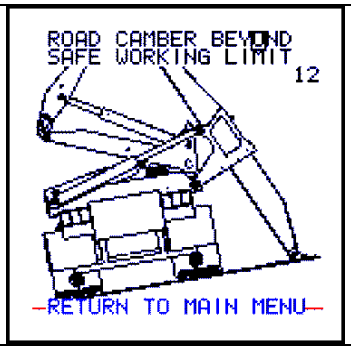
Operational Modes

This section lists the characteristics that are in addition to those described in the section Operational Modes (on page 88)

Arm Mode

A number of the special functions of SMARTlift are available while in Arm mode.

- When Arm mode is selected during an operation, the sensors automatically check that the stabilisers are firmly in contact with the ground or a companion trailer. If there is no contact, Arm mode is disabled and a warning sound (the horn) and screen message is displayed
- However, if a stabiliser lifts off the ground during the loading operation, the lift is allowed to continue
- When you select Arm mode for the first time during an operation, the sensors automatically check the trailer camber and elevation. If these are outside safe working parameters, Arm mode is disabled and the screen messages below are displayed appropriately.. It may be possible to correct the trailer camber using the stabilisers

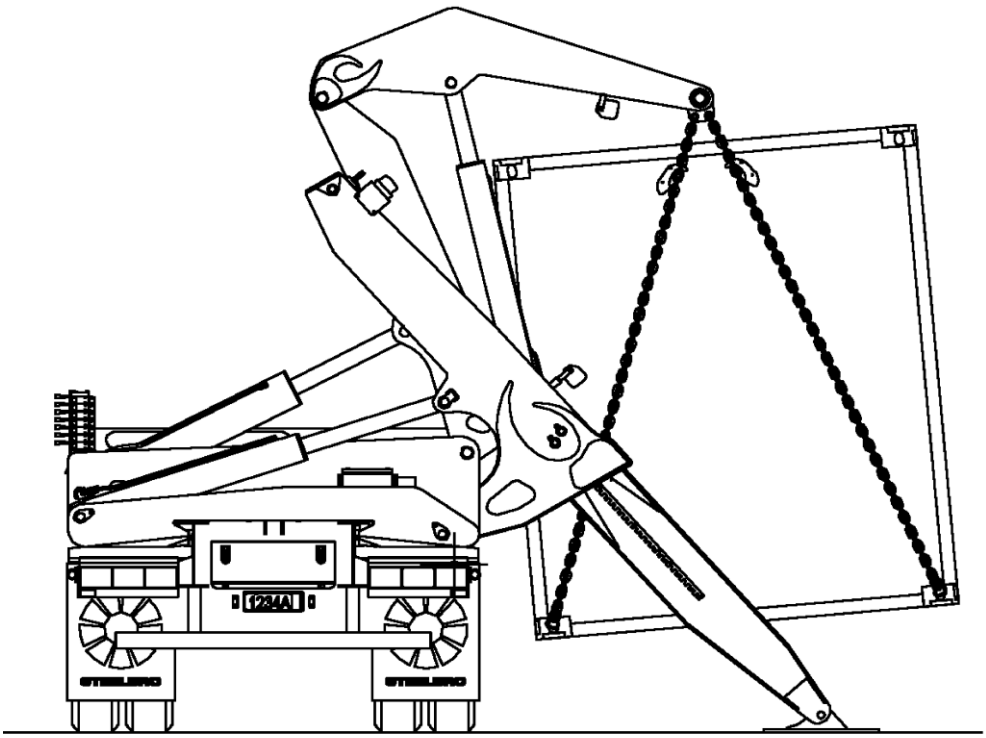


- Offside Stability Alarm: If the lifting G-Pin is within 250mm of the trailer centre line on the stabiliser side and the base of the container is higher than the top of the offside bash plates, the offside alarm is engaged. Bottom Arm Down and Top Arm Up functions are disabled. Below this height, the offside bash plates will prevent the container from going too far offside. The SMARTlift system also engages the offside alarm if the G-Pin crosses the centre line of the trailer while loaded.

- The pressure in the top arm cylinder is also measured, which enables the system to estimate the mass on the lifting pin. This value is displayed to the nearest tonne whenever the Sidelifter is in Arm mode
- If the road elevation is such that one end of the Sidelifter trailer is higher than the other then the system will allow the high end of the container to be lifted higher than offside bash plate height, so that the container can be placed on the twist-locks
- When lifting two 20-foot containers together it is sometimes necessary to gain extra height above the offside bash plates to position the containers over the centre twist-locks. To gain extra height, press the horn button on the remote, once to override the SMARTlift height limitation. The SMARTlift system will then beep once in reply. A message on the LCD display screen confirms that Double Twenty mode is operational. The SMARTlift system will stay in Double Twenty mode until either the engine is switched off or the horn button is pressed once. This procedure only works when the Sidelifter is in Arm mode.
- Each crane Electrical Control Unit (ECU) calculates the position of the stabiliser foot and the position of the lifting G-Pin. When the G-Pin is extended beyond the stabiliser foot **(**K-Pin**)**, the system calculates the stability of the Sidelifter on the loading side. As the G-Pin is extended the system first warns that an unstable situation is imminent. See screen message below.

- If the operator carries on, the system disables the functions that increase the distance of the G-Pin from the trailer and displays the screen message shown below.

- If the stabiliser is very steeply angled and the container is very heavy, then the SMART*lift* system may prevent the G-Pin from even being extended beyond the K-Pin.
- The diagram below shows a situation where a container has been unevenly loaded on the side nearest the Sidelifter.



- During loading it is necessary for the operator to:

  a) lift the container higher than normal above the twist-locks and

  b) move the G-Pin further over the offside than normal.

- These situations can cause the SMARTlift offside protection to activate earlier than desired. There are three ways to work around the issue:

  a) Move the Sidelifter and pick the container up from the other side.

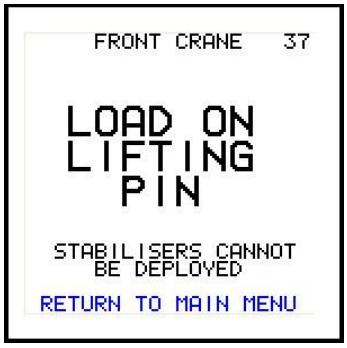
  b) Shorten the chains so the container can be lifted higher.

c) If in the experience of the operator it is safe to attempt the lift, then via the LCD display screen enter the Single Lift manual override PIN provided with this manual. This will allow you to override the SMARTlift system for this one operation only.

In manual override mode safety features of the load monitoring system are disabled and the operation of the arms is extra slow.

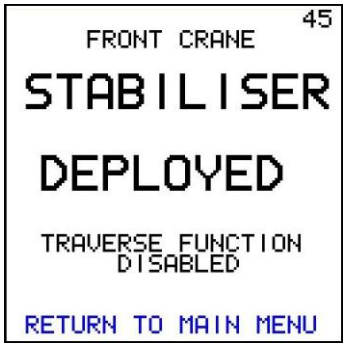
Stabiliser Mode

- Stabiliser mode is disabled if there is any load on the lifting pin and a warning sound (the horn) and screen message is displayed



Traverse Mode

- If the stabiliser is extended for any distance, Traverse mode is disabled and a warning sound (the horn) and screen message is displayed.



Lifting Containers on Steep Elevations

When lifting containers on steep elevations it is necessary to lift one end of the container higher than the other so that it can be located on the twist-locks.

The procedure is always to lift the up-hill end of the container higher than the downhill end.

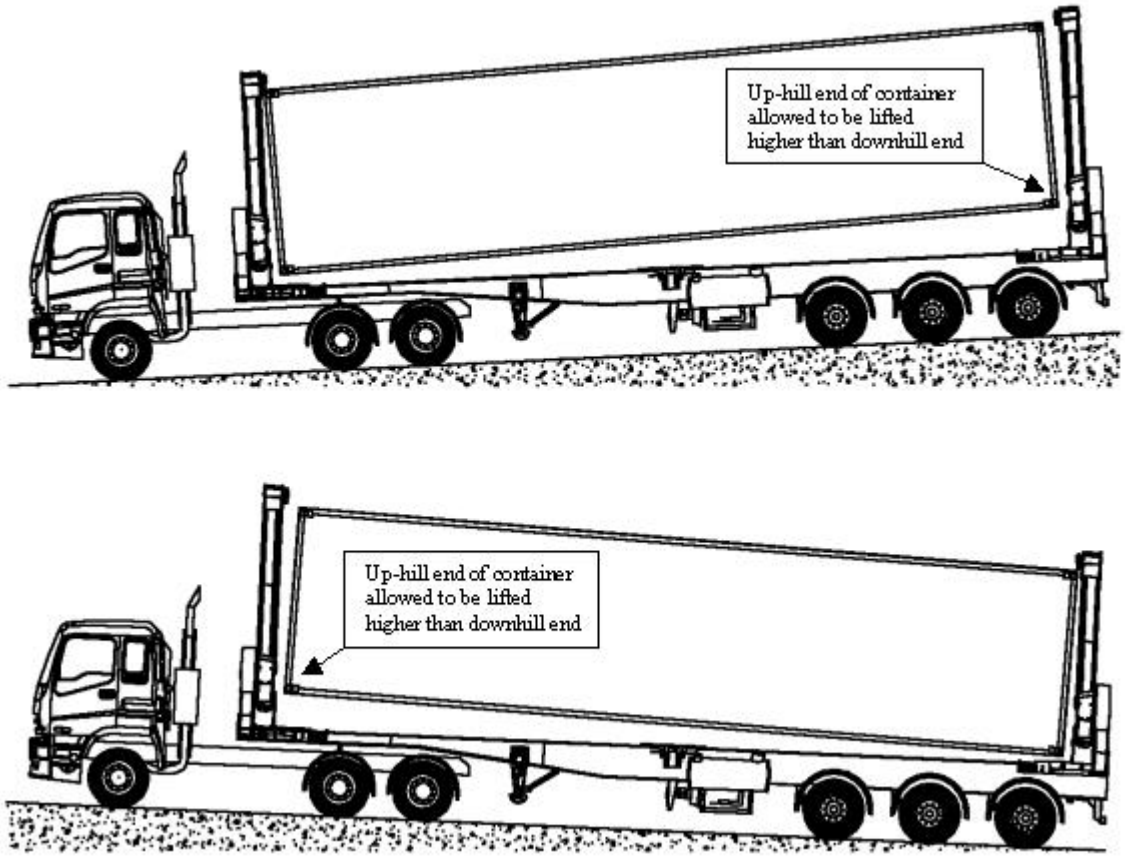


Figure 16

The SMARTlift system measures the trailer angle (elevation) and allows the uphill end of the container to be lifted higher than normal, so as to allow the downhill end to be located on the twist-locks.

The maximum camber and elevation limits for Sidelifters are:

	40' CONTAINER	20' CONTAINER
Camber	+/- 6 degrees	+/- 6 degrees
Elevation	+/- 4 degrees	+/- 6 degrees

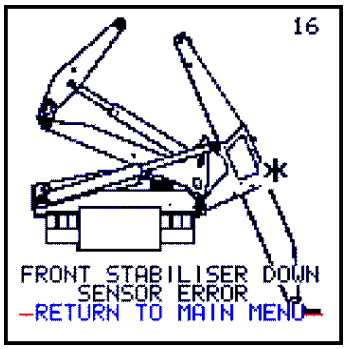
Automatic Fault Detection

The system will detect common electrical faults such as wire breakages and short-circuits in the angle sensors, pressure sensors and the stabiliser deployed microswitch.

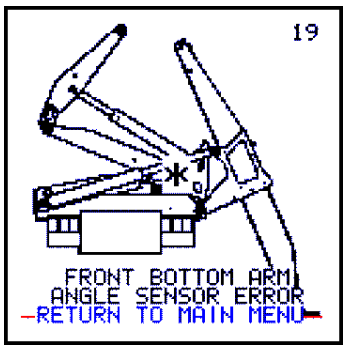
If the system detect a fault then a warning horn sounds and a screen message is displayed. The screen message will show where the suspect sensor is located. The location is indicated with a "*" symbol.

The system may also prevent certain functions used when a sensor fault is detected. To allow a lift with a faulty sensor refer to the manual override procedure.

The screen message below shows that the sensor on the front stabiliser down sensor has a fault.



The screen message below shows that the sensor on the front bottom arm angle sensor has a fault.



Flat ECU Battery

If the ECU battery voltage drops too low it will not be possible to start the Sidelifter the usual way. This can be due to the Sidelifter being unused for a period of time or during operation at sub-zero ºC temperatures.

In this situation use the Jump Start procedure to start the unit.

If the ECU battery continually fails to hold a charge then it must be replaced as soon as possible.

Jump Start Procedure:

Note - This procedure only works with radio remotes.

Follow instructions below using the E-stop Override Button:

1. Make sure all three E-stops are OUT (located on radio remote, E Box and front of trailer respectively)
2. Bring the radio remote over to the Start Key Enclosure (E Box) so both are within reach. Ensure there is a charged battery in the radio remote. Turn the radio remote on.

3. Press and hold in the E-stop Override button located on the left side of the Start Key Enclosure. See photo below:

4. With the other hand start the engine by turning the start key. Wait 5-10 seconds for the alternator to charge the ECU battery slightly.
5. While still pressing the E-stop Override button, push the green start button on the radio remote.
6. Release the E-stop Override button.
7. If all three E-stops in the out position, the engine should continue to run and the Sidelifter should work normally. Give the ECU battery a chance to charge (5-10 minutes) before turning the engine off again.

Only use this as a temporary fix. If the ECU battery continually cannot hold a charge then it must be replaced.

Manufacturer's Area

The Manufacturer's Area menu is protected by a PIN number to prevent unauthorised access. Only appropriately authorised personnel can access this area.

Troubleshooting

With the SMARTlift system, there is a comprehensive range of error messages including screens and sounds.

This chapter covers:

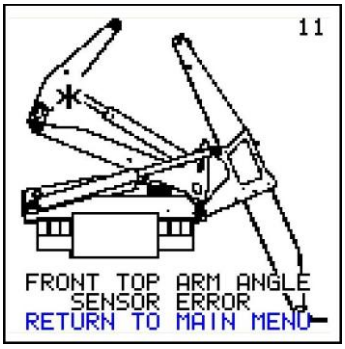
- Message screens - why they appear and what to do if this happens
- Miscellaneous other troubleshooting or fix information

LCD Error or Warning Screens

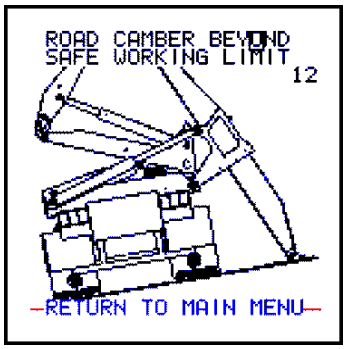
This section references each of the error or warning screens and possible causes and fixes.

When contacting Product Support about a system issue, please have the number which identifies the SMARTlift screen being displayed.

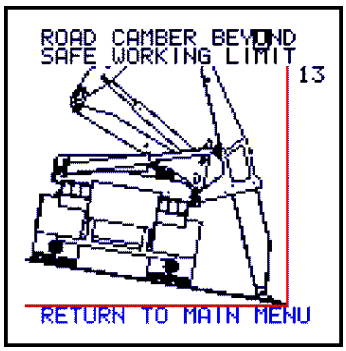
Top Arm Angle Sensor Error F11 R18

Screen Image 11= FRONT CRANE 18 = REAR CRANE	
Explanation	Fault detected between Crane ECU and Top Arm Angle Sensor The Top Arm Angle Sensor measures the angle of the Top Arm.
Causes	▪ Damaged sensor cable or connector plug ▪ Moisture in sensor connecting plug ▪ Faulty sensor
Operator Actions	▪ Check connector plug firmly seated and not damaged ▪ Use override code to continue operation ▪ Request service
Service Tasks	▪ Check sensor cable and connector plug. ▪ Replace the sensor. The orientation of the sensor is important and the cable should point upwards. Recalibrate using procedure SL0005. ▪ Check the calibration by hanging a plumb bob from the G-Pin and position the bottom arm in the vertical position so that the G-Pin is vertical to the D-Pin ▪ With the diesel engine not running but SMARTlift switched on, go to **MANUFACTURERS AREA – VIEW PIN DISTANCES-VIEW FRONT OR REAR PIN DISTANCES-VIEW HORIZONTAL DISTANCE DG**. The distance should be zero +/- 10mm ▪ Remember, all angle sensors are the same component so it is possible to swap sensors in order to help diagnose faulty wiring or a faulty sensor. Just remember to recalibrate any sensor that is moved!

Road Camber Beyond Safe Working Limit 12

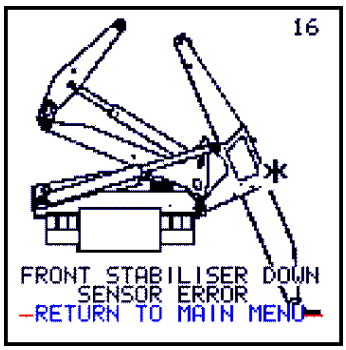
Screen Image	
Explanation	▪ Either the front, rear or both crane bases are angled beyond acceptable limits
Causes	▪ Damaged sensor cable or connector plug ▪ Moisture in sensor connecting plug ▪ Faulty sensor
Operator Actions	▪ Check trailer is parked on level ground. ▪ Check connector plug firmly seated and not damaged ▪ Check sensor has not come loose ▪ Use override code to continue operation ▪ Request service
Service Tasks	▪ Park the trailer on level ground and go to **VIEW SENSOR VALUES** then **VIEW FRONT** (or **REAR**) **ANGLE SENSORS** ▪ The trailer camber and elevation angle sensor readings should = 0 degrees ▪ If not, then first check that the angle sensor has not come loose before recalibrating using procedure SL0005 ▪ If the recalibration fails then check the wiring before replacing the sensor. ▪ Remember, all angle sensors are the same component so it is possible to swap sensors in order to help diagnose faulty wiring or a faulty sensor. Remember to recalibrate any sensor that is moved!

Road Camber Beyond Safe Working Limit 13

Screen Image	

Explanation	▪ Either the front, rear or both crane bases are angled beyond acceptable limits
Causes	▪ Damaged sensor cable or connector plug ▪ Moisture in sensor connecting plug ▪ Faulty sensor
Operator Actions	▪ Check trailer is parked on level ground. ▪ Check connector plug firmly seated and not damaged ▪ Check sensor has not come loose ▪ Use override code to continue operation ▪ Request service
Service Tasks	▪ Park the trailer on level ground and go to **VIEW SENSOR VALUES** then **VIEW FRONT** (or **REAR**) **ANGLE SENSORS** ▪ The trailer camber and elevation angle sensor readings should = 0 degrees ▪ If not, then first check that the angle sensor has not come loose before recalibrating using procedure SL0005 ▪ If the recalibration fails then check the wiring before replacing the sensor. ▪ Remember, all angle sensors are the same component so it is possible to swap sensors in order to help diagnose faulty wiring or a faulty sensor. Remember to recalibrate any sensor that is moved!

Stabiliser Down Sensor Error F16 R15

Screen Image 16= FRONT CRANE 15 = REAR CRANE	
Explanation	Stabiliser Down Microswitch is not operating correctly. The Stabiliser Down Microswitch signals when the Stabiliser is fully down.
Causes	▪ Damaged sensor cable or connector plug ▪ Moisture in sensor connecting plug ▪ Faulty sensor
Operator Actions	▪ Check connector plug firmly seated and not damaged ▪ Use override code to continue operation ▪ Request service

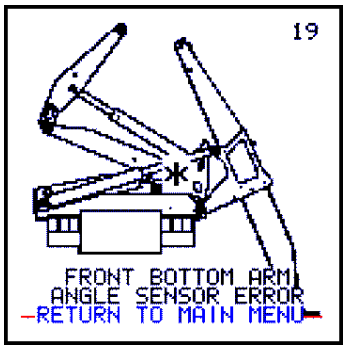
Service Tasks

- Check sensor cable and connector plug.
- Check the microswitch. The microswitch has a Normally Open (NO) and a Normally Closed (NC) contact.
- On the LCD screen go to **VIEW SENSOR VALUES** then **FRONT** or **REAR STABILISER EXTENSION SENSORS.** At the bottom of the screen the switch state is displayed.
- Check the microswitch states against the values in the table below

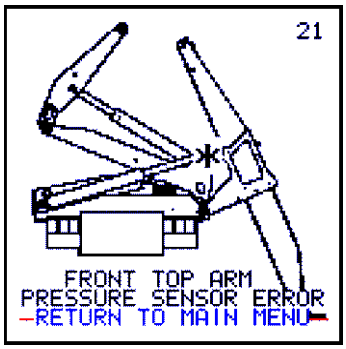
Condition	NO Contact State	NC Contact State
Stabiliser on ground	1	0
Stabiliser not on ground	0	1
Defective microswitch	0	0
Defective microswitch	1	1

Replace the microswitch if either of the defective states in the above table is shown.

Bottom Arm Angle Sensor Error F19 R20

Screen Image 19 = FRONT CRANE 20 = REAR CRANE	
Explanation	Fault detected between Crane Junction Box and Bottom Arm Angle Sensor The Bottom Arm Angle Sensor measures the angle of the bottom arm.
Causes	▪ Damaged sensor cable or connector plug ▪ Moisture in sensor connecting plug ▪ Faulty sensor
Operator Actions	▪ Check connector plug firmly seated and not damaged ▪ Use override code to continue operation ▪ Request service
Service Tasks	▪ Check sensor cable and connector plug. ▪ Replace the sensor. The orientation of the sensor is important and the cable should point upwards. Recalibrate using procedure SL0005. ▪ Check the calibration by hanging a plumb bob from the D-Pin and position the bottom arm in the vertical position so that the D-Pin is vertical to the A-Pin. ▪ With the diesel engine not running but SMARTlift switched on, go to **MANUFACTURERS AREA – VIEW PIN DISTANCES-VIEW FRONT OR REAR PIN DISTANCES-VIEW HORIZONTAL DISTANCE AD**. The distance should be zero +/- 10mm. ▪ Remember, all angle sensors are the same component so it is possible to swap sensors in order to help diagnose faulty wiring or a faulty sensor. Just remember to recalibrate any sensor that is moved!

Top Arm Pressure Sensor Error F21 R23

Screen Image 21= FRONT CRANE 23 = REAR CRANE	
Explanation	Front or rear ECU is receiving a pressure sensor signal outside 4-20mA range The pressure sensor (shown below) measures the hydraulic pressure in the piston side of the top arm cylinder and is located on the top arm lifting cylinder. 
Causes	▪ Damaged sensor cable or connector plug ▪ Moisture in sensor connecting plug ▪ Use override code to continue operation ▪ Faulty sensor
Operator Actions	▪ Check connector plug firmly seated and not damaged ▪ Request service
Service Tasks	▪ Check sensor cable and connector plug. ▪ Go to **VIEW SENSOR VALUES, VIEW FRONT** or **REAR ANGLE SENSORS** and check that when the top arm is fully extended that the pressure reading increases as expected ▪ Replace sensor if pressure does not change or is incorrect when cross checked with the analogue pressure gauge mounted on the rear crane

Road Elevation Beyond Safe Working Limit 22

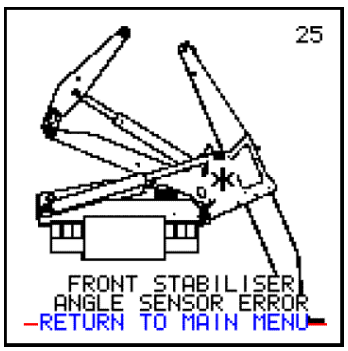
Screen Image	
Explanation	▪ Either the front, rear or both crane bases are angled beyond acceptable limits
Causes	▪ Damaged sensor cable or connector plug ▪ Moisture in sensor connecting plug ▪ Faulty sensor
Operator Actions	▪ Check trailer is parked on level ground. ▪ Check connector plug firmly seated and not damaged ▪ Check sensor has not come loose ▪ Use override code to continue operation ▪ Request service
Service Tasks	▪ Park the trailer on level ground and go to **VIEW SENSOR VALUES** then **VIEW FRONT** (or **REAR**) **ANGLE SENSORS** ▪ The trailer camber and elevation angle sensor readings should = 0 degrees ▪ If not, then first check that the angle sensor has not come loose before recalibrating using procedure SL0005 ▪ If the recalibration fails then check the wiring before replacing the sensor. ▪ Remember, all angle sensors are the same component so it is possible to swap sensors in order to help diagnose faulty wiring or a faulty sensor. Remember to recalibrate any sensor that is moved!

Road Elevation Beyond Safe Working Limit 24

Screen Image	

Explanation	▪ Either the front, rear or both crane bases are angled beyond acceptable limits
Causes	▪ Damaged sensor cable or connector plug ▪ Moisture in sensor connecting plug ▪ Faulty sensor
Operator Actions	▪ Check trailer is parked on level ground. ▪ Check connector plug firmly seated and not damaged ▪ Check sensor has not come loose ▪ Use override code to continue operation ▪ Request service
Service Tasks	▪ Park the trailer on level ground and go to **VIEW SENSOR VALUES** then **VIEW FRONT** (or **REAR**) **ANGLE SENSORS** ▪ The trailer camber and elevation angle sensor readings should = 0 degrees ▪ If not, then first check that the angle sensor has not come loose before recalibrating using procedure SL0005 ▪ If the recalibration fails then check the wiring before replacing the sensor. ▪ Remember, all angle sensors are the same component so it is possible to swap sensors in order to help diagnose faulty wiring or a faulty sensor. Remember to recalibrate any sensor that is moved!

Stabiliser Angle Sensor Error F25 R26

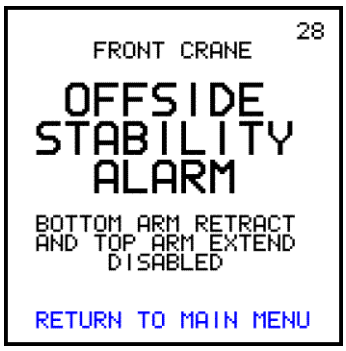
Screen Image 25 = FRONT CRANE 26 = REAR CRANE	
Explanation	Fault detected between Crane Junction Box and Stabiliser Angle Sensor The Stabiliser Angle Sensor measures the angle of the stabiliser.
Causes	▪ Damaged sensor cable or connector plug ▪ Moisture in sensor connecting plug ▪ Faulty sensor
Operator Actions	▪ Check connector plug firmly seated and not damaged ▪ Use override code to continue operation

	▪ Request service
Service Tasks	▪ Check sensor cable and connector plug. ▪ Replace the sensor. The orientation of the sensor is important and the cable should point upwards. Recalibrate using procedure SL0005. ▪ Check the calibration by hanging a plumb bob from the L-Pin and move the Stabiliser so that L-Pin is vertical to the H-Pin ▪ With the diesel engine not running but SMARTlift switched on, go to **MANUFACTURERS AREA – VIEW PIN DISTANCES-VIEW FRONT OR REAR PIN DISTANCES-VIEW HORIZONTAL DISTANCE HL**. The distance should be zero +/- 10mm. ▪ Remember, all angle sensors are the same component so it is possible to swap sensors in order to help diagnose faulty wiring or a faulty sensor. Just remember to recalibrate any sensor that is moved!

Stability Alarm F27 F30

Screen Image 27 = FRONT CRANE 30 = REAR CRANE	
Explanation	The arms have been extended to the edge of the safe working envelope on the stabiliser side of the Sidelifter ▪ All arm functions that could move the load further away from the trailer are disabled ▪ If the top arm is above horizontal, then only top arm up function will be allowed ▪ If the top arm is below horizontal then only top arm down function will be allowed ▪ Bottom arm up function is disabled ▪ Bottom arm down function is enabled
Causes	▪ If within safe working envelope then angle sensors or their calibration may be faulty ▪ Stabiliser magnetic counter error ▪ Top arm pressure sensor error
Operator Actions	▪ Move arms back within the safe working envelope ▪ If the load IS within the safe working envelope then use override code to continue operations ▪ Request service
Service Tasks	▪ Check the operation of the stabiliser extension magnetic counter by going to **VIEW SENSOR VALUES** then **FRONT** or **REAR STABILISER EXTENSION SENSORS.** As the stabiliser extension is deployed the LCD display screen should display a changing count as the magnetic counter reads the magnetic strip. With the stabiliser extension fully extended, the magnetic counter should display as 1 and the top reset magnet should display as 0. With the stabiliser extension arm fully retracted the magnetic counter should display as 0 and the top reset magnet should display as 1 ▪ Check the calibration of the stabiliser, bottom and top arm angle sensors. Do this by hanging a plumb bob one at a time between pins A&D, D&G and H&L as described in the calibration procedure SL0005 and then go to the **MANUFACTURERS AREA** then **VIEW PIN DISTANCES** and check that the HORIZONTAL DISTANCES, AD, DG and HL are zero mm (±10mm) when the plumb bob is lined up

Offside Stability Alarm F28 R31

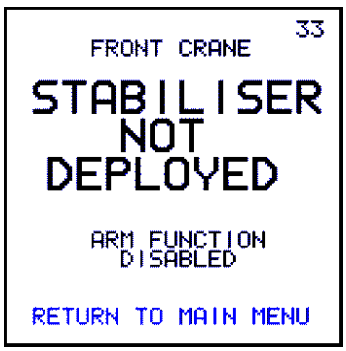
Screen Image 28 = FRONT CRANE 31 = REAR CRANE	
Explanation	The load has been moved outside the safe working envelope onto the non-stabiliser side of the trailer
Causes	▪ The lifting pin (G-Pin) has crossed the centreline of the trailer with a load ▪ The operator has lifted the container too high and has come within 200mm of the centreline of the trailer.
Operator Actions	▪ If the G-Pin is on the non-stabiliser side of the trailer centreline, move it back to the stabiliser side ▪ If the container has been lifted too high then lower the container to a more suitable height for landing on the trailer twistlocks
Service Tasks	▪ Check the calibration of the bottom and top arm angle sensors. Do this by hanging a plumb bob between pins A&D and D&G as described in the calibration procedure SL0005 and then go to the **MANUFACTURERS AREA** then **VIEW PIN DISTANCES. C**heck that the HORIZONTAL DISTANCES, AD and DG are zero mm (±10mm) when the plumb bob is lined up.

Stability Warning F29 R32

Screen Image 29 = FRONT CRANE 32 = REAR CRANE	
Explanation	The arms have been extended within 250mm of the edge of the safe working envelope on the Stabiliser side of the Sidelifter. ▪ If high speed mode is selected then low speed is automatically activated ▪ High speed can be re-entered only if the arm extension is reduced and both

	joysticks are in the neutral position
Causes	▪ Arm extension to great for safe working ▪ Stabiliser magnetic counter error ▪ Top arm pressure sensor error
Operator Actions	▪ Use low speed mode if safe to do so. ▪ Reduce arm extension ▪ Check sensor has not come loose ▪ Use override code to continue operation ▪ Request service
Service Tasks	▪ Check that the Stabiliser Extension measurement is operating correctly ▪ Check the calibration of the Stabiliser, Bottom and Top Arm Angle Sensors. Do this by hanging a plumb bob between pins A&D, D&G and H&L as described in the calibration procedure SL0005 and then go to the **MANUFACTURERS AREA** then **VIEW PIN DISTANCES** and check that the HORIZONTAL DISTANCES, AD, DG and HL should be zero mm (±10mm) when the plumb bob is lined up

Stabiliser Not Deployed – Arm Function Disabled F33 R34

Screen Image 33 = FRONT CRANE 34 = REAR CRANE	
Explanation	Arms mode has been entered without the stabiliser being properly deployed. Enough pressure must be put on the stabiliser foot so that the gap between the stabiliser extension and stabiliser housing closes and activates the stabiliser down microswitch.
Causes	▪ There is not enough pressure on the stabiliser foot ▪ The stabiliser down microswitch or the wiring to it is faulty.
Operator Actions	▪ Put more pressure on the stabiliser foot ▪ Check the microswitch connection on the stabiliser ▪ Use override code to continue operation ▪ Request service

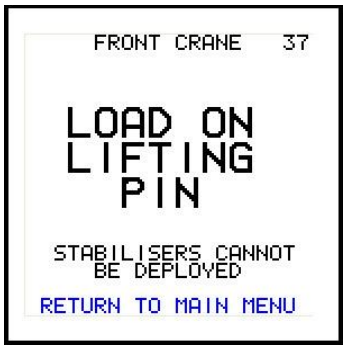
<table>
<tr><td>Service Tasks</td><td>

Check that the stabiliser down microswitch is functioning correctly
On the LCD screen go to VIEW SENSOR VALUES then FRONT or REAR STABILISER EXTENSION SENSORS. At the bottom of the screen the microswitch state is displayed
Check the microswitch states against the table below

<table>
<tr><th>Condition</th><th>NO Contact State</th><th>NC Contact State</th></tr>
<tr><td>Stabiliser on ground</td><td>1</td><td>0</td></tr>
<tr><td>Stabiliser not on ground</td><td>0</td><td>1</td></tr>
</table>
Replace the microswitch if the microswitch states are not those shown in the table.
</td></tr>
</table>

Load On Lifting Pin – Stabilisers Cannot Be Deployed F37 R38

<table>
<tr><td>Screen Image

37 = FRONT CRANE
38 = REAR CRANE</td><td> 
</td></tr>
<tr><td>Explanation</td><td>Stabiliser mode has been entered while there is still load on the lifting pin (G-Pin).</td></tr>
<tr><td>Causes</td><td>

The load has not been fully released from the arms
The top arm pressure sensor is faulty

</td></tr>
<tr><td>Operator Actions</td><td>

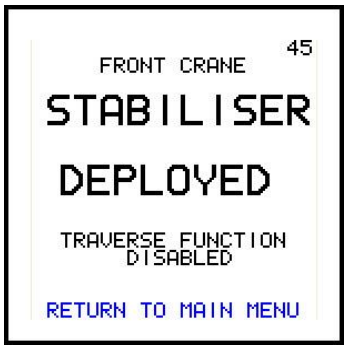
Check that the load has been released from the arms and retry stabiliser mode.
Use override code to continue operation
Request service

</td></tr>
<tr><td>Service Tasks</td><td>

Check the top arm pressure sensor value by going to VIEW SENSOR VALUES then FRONT or REAR ANGLE SENSORS. At the bottom of the page the pressure in the top arm cylinder will be displayed. With no load on the G-Pin the pressure should be less than 20bar
If the reading is more than 20bar regardless of any loading on the G-Pin then replace the pressure sensor
When replacing the sensor make sure that the top arm is fully folded down and that all hydraulic pressure in the cylinder is released by using the manual lever on the Danfoss PVG valve. Wear eye protection.

</td></tr>
</table>

Stabiliser Deployed – Traverse Function Disabled F45 R44

Screen Image 45 = FRONT CRANE 44 = REAR CRANE	
Explanation	Operator has entered traverse mode without the stabiliser first being fully retracted
Causes	▪ Stabiliser not fully retracted ▪ Faulty foot down microswitch sensor or connection
Operator Actions	▪ Fully retract the stabiliser then retry entering traverse mode ▪ Use override code to continue operation ▪ Request service

<table>
<tr><td>Service Tasks</td><td>

- On the LCD screen go to **VIEW SENSOR VALUES**, then **FRONT** (or **REAR**) **STABILISER EXTENSION SENSORS**. Check that the foot down micro switch values change when the foot is placed on the ground and lifted off the ground as shown in the table below.

Condition	NO Contact State	NC Contact State
Foot on ground	1	0
Foot off ground	0	1

- If the stabiliser is fully folded and retracted, but the microswitch indicates that the foot is on the ground, check and if necessary adjust the microswitch on the stabiliser housing.
- If the microswitch is correctly adjusted but still gives incorrect readings then replace the microswitch.
- Check that the magnet located on the side of the stabiliser extension near the foot end is in place
- Check that the stabiliser counts in and out correctly by looking at the LCD screen during operation of the stabiliser. During retraction the counter should reach zero mm by the end of the magnetic strip. During extension the counter will only start when the first magnet of the magnetic strip is reached
- Go to **VIEW SENSOR VALUES** then **FRONT** or **REAR STABILISER EXTENSION SENSORS**. With the stabiliser extension fully retracted the values displayed should show the values below

Condition	Magnetic Counter	Reset Magnet
Stabiliser extension fully retracted	1	0
Stabiliser extension fully extended	1	1

</td></tr>
</table>

Warning Angle Sensors Not Calibrated F53 R113

<table>
<tr><td>Screen Image

53 = FRONT CRANE
113 = REAR CRANE</td><td> 
</td></tr>
<tr><td>Explanation</td><td>

- The ECU has detected that the angle sensor calibration data has been lost. This may cause stability alarms to be activated unexpectedly

</td></tr>
<tr><td>Causes</td><td>

- Faulty ECU

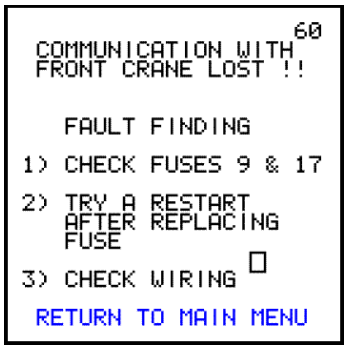
</td></tr>
</table>

	▪ Power loss to ECU
Operator Actions	▪ Use override code to continue operation ▪ Request service
Service Tasks	▪ Park the trailer on level ground ▪ Sidelifter should be recalibrated using the plumb bob calibration method ▪ Ensure that the latest software version is being used, confirm with STEELBRO ▪ Report the problem to STEELBRO

Max Rated Load Exceeded 58

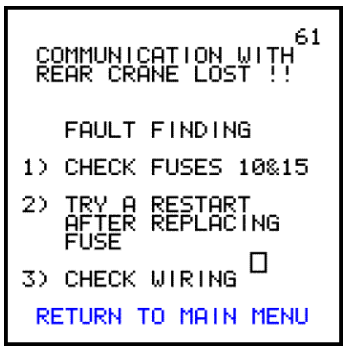
Screen Image	
Explanation	This controls the maximum lifting capacity allowed.The message is displayed if the operator attempts to lift a load that is greater than the maximum allowed load.
Causes	▪ The operator has attempted to lift a load heavier than the allowed load ▪ The maximum rated load has been set too low ▪ The load pressure sensor is faulty
Operator Actions	▪ Lift a lighter load ▪ Use override code to continue operation ▪ Request service
Service Tasks	▪ Pressure sensor may be faulty. ▪ Angle sensors not calibrated.

Communication With Front Crane Lost! 60

Screen Image	
Explanation	The rear crane ECU has lost communication with the front crane ECU
Causes	▪ Blown fuse caused by a pinched sensor wire ▪ Power loss to ECU
Operator Actions	▪ Check and replace fuse(s) ▪ It is not possible to the override code to continue operation. Only the manual override button can be used to manually complete any crane movements. ▪ Request service

Service Tasks	▪ Check fuses. A blown fuse could be caused by a pinched sensor wire
	▪ Power has been lost to the ECU, check:
	  ▪ ECU D+, Pin 28
	  ▪ ECU UE, Pin 54
	  ▪ ECU Ground, Pin 55
	▪ Turn key switch off.
	▪ Check CANbus continuity by measuring resistance between CAN-H and CAN-L at the diagnostic plug. 60Ω = good, 120 Ω = break in CANbus..

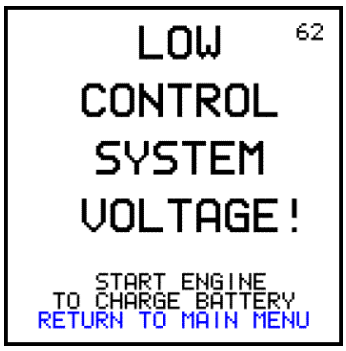
Communication With Rear Crane Lost ! 61

Screen Image	
Explanation	The front crane ECU has lost communication with the rear crane ECU
Causes	▪ Blown fuse caused by a pinched sensor wire ▪ Power loss to ECU

Operator Actions	▪ Check and replace fuse(s) ▪ It is not possible to the override code to continue operation. Only the manual override button can be used to manually complete any crane movements. ▪ Request service

Service Tasks	▪ Check fuses. A blown fuse could be caused by a pinched sensor wire
	▪ Power has been lost to the ECU, check:
	  ▪ ECU D+, Pin 28
	  ▪ ECU UE, Pin 54
	  ▪ ECU Ground, Pin 55
	▪ Turn key switch off.
	▪ Check CANbus continuity by measuring resistance between CAN-H and CAN-L at the diagnostic plug. 60Ω = good, 120 Ω = break in CANbus..

Low Control System Voltage 62

Screen Image	
Explanation	The voltage in the ECU battery located on the Kubota powerpack frame has fallen to below 11V. The ECU battery is only used to provide a stable voltage to the electronic components of the SMARTlift system while the Kubota powerpack is being started
Causes	▪ The system being left ON while the Kubota powerpack is not running ▪ Faulty ECU battery diode ▪ Faulty alternator ▪ Faulty charging connection to ECU battery
Operator Actions	▪ Start the Kubota powerpack to charge the ECU battery ▪ Check the connections to the ECU battery ▪ Request service
Service Tasks	▪ Check that the ECU battery is charging when the alternator is turning. The system voltage should rise to 14.2V and current will flow across the diode allowing the ECU battery to charge from the main battery ▪ Check the alternator voltage output if no charge current flowing.

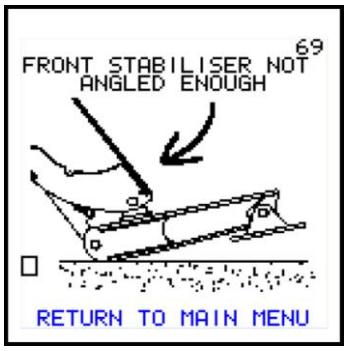
No Joystick Data Received 64

Screen Image	
Explanation	The radio remote has detected minor radio interference, or there has been an interruption of data being sent from the radio remote.
Causes	▪ Radio interference
Operator Actions	▪ The error has not triggered the E-Stop circuit so the problem can be resolved by pressing the green Start button on the side of the remote.
Service Tasks	None

Joystick Error Reported L65 R66

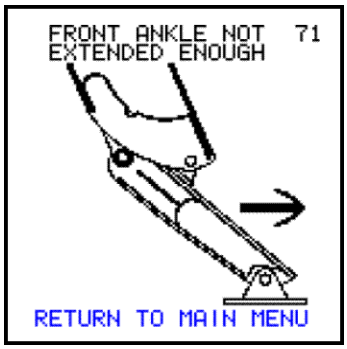
Screen Image 65 = LEFT JOYSTICK 66 = RIGHT JOYSTICK	
Explanation	The joystick has or is developing a fault. This may be an intermittent problem.
Causes	▪ Faulty joystick
Operator Actions	▪ Complete operations using override code if necessary. ▪ Request service - return part to STEELBRO
Service Tasks	It is not possible to service a joystick so the part should be replaced.

Stabiliser not angled enough F69 R70

Screen Image 69 = FRONT CRANE 70 = REAR CRANE	
Explanation	The operator has selected bending leg mode but the sensor indicates that the stabiliser arm is not at the correct angle to deploy the bending leg. The stabiliser must be sufficiently angled so that when the bending leg is deployed the foot, not the ankle, comes into contact with the ground.
Causes	▪ Stabiliser is not at the correct angle to deploy the bending leg ▪ Trailer chassis is on a camber over to the non-stabiliser side ▪ Incorrect calibration of the stabiliser angle sensor ▪ Faulty stabiliser angle sensor
Operator Actions	▪ Adjust the stabiliser angle to a more upright position ▪ Ensure the trailer has as little camber to the non-stabiliser side as possible ▪ Use override code to continue operation ▪ Request service
Service Tasks	▪ If the Stabiliser is already at maximum angle and the message is still displayed then check that the trailer camber is not over +3° (i.e. chassis leaning towards the non-stabiliser side). If this is the case it may not be possible to safely deploy the bending leg. ▪ Check the calibration of the stabiliser angle sensor by hanging a plumb bob from the L-Pin and move the stabiliser so that L-Pin is vertical to the H-Pin. ▪ With the power pack engine not running but SMARTlift switched on, go to MANUFACTURERS AREA, VIEW PIN DISTANCES, VIEW FRONT OR REAR PIN DISTANCES, VIEW HORIZONTAL DISTANCE HL. The distance should be zero +/- 10mm.

Ankle not extended enough F71 R72

<table>
<tr><td>Screen Image

71 = FRONT CRANE
72 = REAR CRANE</td><td> 
</td></tr>
<tr><td>Explanation</td><td>The bending leg must be fully deployed or fully retracted before any lifting can take place.

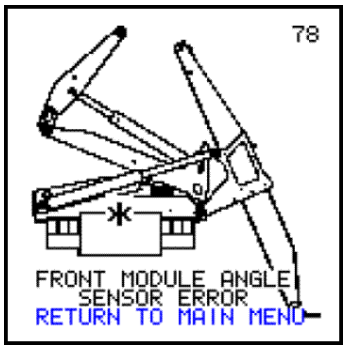
If arms mode is selected and the bending leg sensors indicate that the bending leg is not fully deployed or not fully retracted then this message is displayed.</td></tr>
<tr><td>Causes</td><td>▪ Bending leg not fully extended or not fully retracted
▪ Bending leg fully extended sensor faulty or needs adjustment
▪ Bending leg fully retracted sensor faulty or needs adjustment</td></tr>
<tr><td>Operator Actions</td><td>▪ Fully extend or fully retract bending leg and retry arms mode
▪ Use override code to continue operation
▪ Request service</td></tr>
<tr><td>Service Tasks</td><td>▪ Go to VIEW SENSOR VALUES, VIEW SPECIAL OPTIONS, FRONT or REAR ANKLE.
▪ Actuate the bending leg between the fully retracted and fully extended positions. Observe that the ANKLE POSITION should change from fully retracted to partially extended to fully extended. The individual switch values are displayed and should be as follows.

<table>
<tr><th>Ankle Position</th><th>Leg Retracted Sensor NO switch</th><th>Leg Retracted Sensor NC switch</th><th>Leg Extended Sensor NO Switch</th></tr>
<tr><td>Fully retracted</td><td>Closed</td><td>Open</td><td>Open</td></tr>
<tr><td>Partially extended</td><td>Open</td><td>Closed</td><td>Open</td></tr>
<tr><td>Fully extended</td><td>Open</td><td>Closed</td><td>Closed</td></tr>
</table>
If any sensor switch displays incorrect values then replace it.</td></tr>
</table>

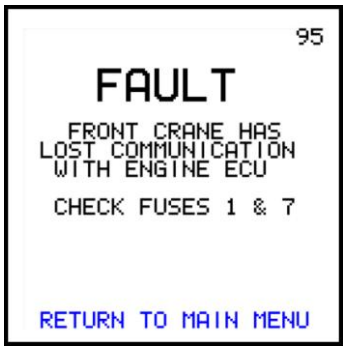
Mode Select Switch Error 75

Screen Image	
Explanation	The Mode Select switch is not in any valid mode Valid modes are, in clockwise order from OFF position: ▪ Off ▪ Traverse ▪ Stabiliser ▪ Arm ▪ Off-Side Stabiliser ▪ Bending / Quattro Leg ▪ Top Lift Frame
Causes	▪ Faulty switch
Operator Actions	▪ It is not possible to the override code to continue operation. Only the manual override button can be used to manually complete any crane movements. ▪ Request service
Service Tasks	▪ Go to **VIEW JOYSTICKS** on the Main Menu and check the mode changes as the mode switch on the remote is rotated. The switch has a stop pin that prevents unused modes being selected ▪ If the modes displayed are not in the order listed above then the switch is faulty and should be replaced

Module Angle Sensor Error F78 R79

Screen Image 78 = FRONT CRANE 79 = REAR CRANE	
Explanation	Fault detected between Crane Junction Box and a module angle sensor The module angle sensor measures the elevation and camber of the trailer.
Causes	▪ Damaged sensor cable or connector plug ▪ Moisture in sensor connecting plug ▪ Faulty sensor
Operator Actions	▪ Check connector plug firmly seated and not damaged ▪ Use override code to continue operation ▪ Request service
Service Tasks	▪ Check sensor cable and connector plug. ▪ Replace the sensor. The orientation of the sensor is important and the cable should point upwards. Recalibrate using procedure SL0005. ▪ With the trailer parked on level ground the elevation should be 0° and the camber should be 0°. These values can be seen at View Sensor Values ▪ Remember, all angle sensors are the same component so it is possible to swap sensors in order to help diagnose faulty wiring or a faulty sensor. Just remember to recalibrate any sensor that is moved!

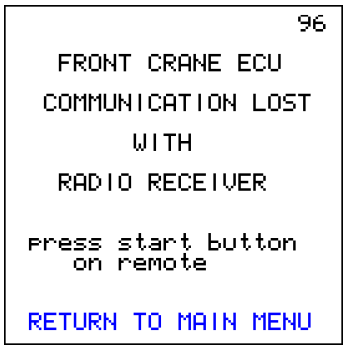
Front Crane Has Lost Communication with Engine ECU 95

Screen Image	
Explanation	The front crane ECU has lost communication with the engine ECU

Causes	▪ Fuse blown ▪ CANbus fault ▪ Power to ECU lost
Operator Actions	▪ Check fuses 1 & 7 in junction box E ▪ It is not possible to the override code to continue operation. Only the manual override button can be used to manually complete any crane movements. ▪ Request service

Service Tasks	▪ Check fuses 1 and 7 in junction box E
	▪ Turn key switch off
	▪ Check CANbus continuity by measuring resistance between CAN-H and CAN-L at the diagnostic plug. 60Ω = good, 120 Ω = break in CANbus
	▪ Check power is present at the engine ECU:
	  ▪ ECU EU (+ve), Pin 3
	  ▪ ECU Ground, Pin 11

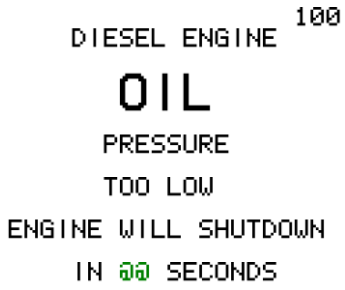
ECU communication lost with Radio Receiver F96 R97

Screen Image 96 = FRONT ECU 97 = REAR ECU	
Explanation	The front or rear crane ECU is not receiving any joystick data from the radio receiver via the CANbus
Causes	▪ Faulty radio remote transmitter ▪ Faulty CANbus ▪ Faulty radio receiver
Operator Actions	▪ Press the **START** button on the remote to try to restart data transmission. ▪ If data transmission is not restarted, it is not possible to the override code to continue operation. Only the manual override button can be used to manually complete any crane movements. ▪ Request service
Service Tasks	▪ Go to **VIEW JOYSTICKS** to confirm that there is no communication ▪ Check the integrity of the CANbus ▪ Check the state of the LED indicators inside the radio receiver

Diesel Engine Water Temperature too High 99

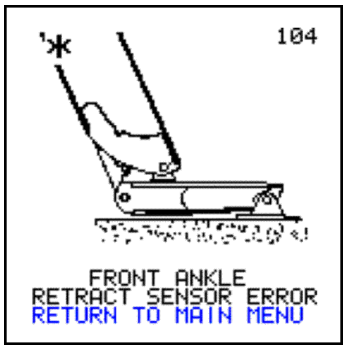
Screen Image	
Explanation	The oil pressure is too low while the engine is running and the Sidelifter will shutdown after 20 seconds to protect the engine from damage.
Causes	▪ Low coolant level ▪ Faulty coolant temperature switch ▪ Short on wire between water temperature switch and Pin 16 on front ECU.
Operator Actions	▪ Allow the engine to cool down ▪ Check the water coolant level. ▪ Use override code to continue operation ▪ Request service
Service Tasks	When the water temperature is too high, the water temperature switch closes and grounds Pin 16 on the ECU to earth causing this message to be displayed. ▪ Allow the engine to cool down ▪ Check the radiator water level is adequate. ▪ Disconnect the yellow wire from the water temperature switch. If the water temperature switch contact has continuity to earth when the engine has cooled then the switch is faulty and should be replaced. ▪ Start the engine. ▪ If the message is displayed when the yellow wire to the water temperature switch is still disconnected then there must be a short to earth on the wire between the water temperature switch and Pin 16 on the Front ECU

Diesel Engine Oil Pressure too low 100

Screen Image	
Explanation	The oil pressure is too low while the engine is running and the Sidelifter will shutdown after 20 seconds to protect the engine from further damage.
Causes	▪ Low oil level ▪ Faulty oil pressure switch
Operator Actions	▪ Check the oil level. ▪ Use override code to continue operation ▪ Request service
Service Tasks	▪ Check the oil level is OK. When there is insufficient oil pressure then the oil pressure switch closes and grounds Pin 17 on the ECU to earth causing this message to be displayed. ▪ If the orange wire to the oil pressure switch is connected to earth when the engine is running (i.e. when the supply voltage is over 13volts) then this message will be displayed. ▪ Disconnect the orange wire from the oil pressure switch. If the oil pressure switch contact has continuity to earth then the switch is faulty and should be replaced. ▪ Start the engine ▪ If the message is displayed when the orange wire to the oil pressure switch is still disconnected then there must be a short to earth on the wire between the oil pressure switch and Pin 17on the Front ECU

Ankle Retract Sensor Error F104 R105

<table>
<tr><td>Screen Image

104 = FRONT CRANE
105 = REAR CRANE</td><td> 
</td></tr>
<tr><td>Explanation</td><td>The bending leg retract sensor is faulty.</td></tr>
<tr><td>Causes</td><td>▪ Sensor wiring fault or short circuit
▪ Loss of power to sensor
▪ Faulty sensor</td></tr>
<tr><td>Operator Actions</td><td>▪ Use override code to continue operation
▪ Request service</td></tr>
<tr><td>Service Tasks</td><td>▪ Check the operation of the sensor is by going to VIEW SENSOR VALUES, VIEW SPECIAL OPTIONS, FRONT or REAR ANKLE.
▪ The error message is displayed when the both the Leg Retracted Switches are in the CLOSED state or when both switches are in the OPEN state.
▪ If both switches are in the CLOSED state then it is most likely there is a wiring fault, a short circuit or a sensor failure.
▪ If both switches are in the OPEN state then it is most likely there is a damaged wire, a wiring fault, loss of power to the sensor, or a sensor failure.
<table>
<tr><th>Ankle Position</th><th>Leg Retracted Sensor NO switch</th><th>Leg Retracted Sensor NC switch</th><th>Leg Extended Sensor NO Switch</th></tr>
<tr><td>Fully retracted</td><td>Closed</td><td>Open</td><td>Open</td></tr>
<tr><td>Partially extended</td><td>Open</td><td>Closed</td><td>Open</td></tr>
<tr><td>Fully extended</td><td>Open</td><td>Closed</td><td>Closed</td></tr>
</table></td></tr>
</table>

Ankle Extend Sensor Error F106 R107

Screen Image 106 = FRONT CRANE 107 = REAR CRANE	
Explanation	The bending leg extend sensor may be faulty or requires adjustment.
Causes	▪ Bending leg extend sensor is faulty or requires adjustment ▪ Wiring fault
Operator Actions	▪ Use override code to continue operation ▪ Request service
Service Tasks	▪ This message is displayed when the both the fully retract sensor and the fully extend sensor are sensing the bending leg. It is not possible for the leg to be fully retracted and fully extended at the same time. ▪ If message is displayed only when the bending leg is fully retracted then it is most likely that the extend sensor just needs adjusting slightly away from pivot. ▪ If adjustment does not clear the fault then replace the sensor switch.

Ankle Position	Leg Retracted Sensor NO switch	Leg Retracted Sensor NC switch	Leg Extended Sensor NO Switch
Fully retracted	Closed	Open	Open
Partially extended	Open	Closed	Open
Fully extended	Open	Closed	Closed

Alternator Not Charging 109

Screen Image	
Explanation	The alternator on the Kubota powerpack is not charging the ECU battery.
Causes	▪ Faulty alternator

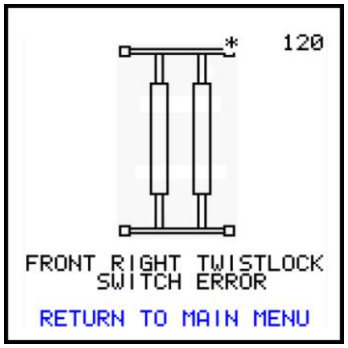
	▪ Faulty wire from alternator to pin 38 on rear ECU. ▪ Short on wire between water temperature switch and Pin 16 on front ECU.
Operator Actions	▪ Use override code to continue operation ▪ Request service
Service Tasks	▪ If the BLUE wire to the alternator has continuity with earth while the engine is running (i.e. while oil pressure is sensed by the ECU) then the message above will be displayed ▪ Check the voltage at the alternator and ensure that it reaches at least 14.1V when the engine is running ▪ Disconnect the spade connector from the alternator and see if the message disappears ▪ If the message does not disappear check the continuity of the wire between the alternator and Pin 38 on the Rear ECU. There must be no shorts to earth ▪ Otherwise check directly on the alternator to ensure that the contact floats when the alternator is spinning

Trailer Park Brake Not Applied 110

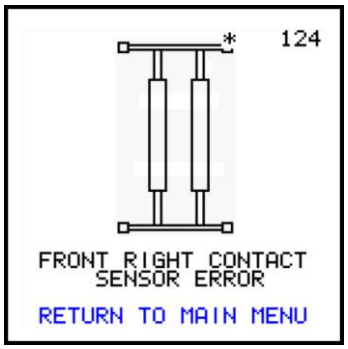
Screen Image	
Explanation	This is an optional feature for customers who wish to prevent the operation of the Sidelifter until the park brake has been engaged. An additional sensor is added to the brake circuit. This message is displayed if the operator attempts to operate the Sidelifter without the Park Brake ON.
Causes	▪ Park brake not applied ▪ Park brake sensor faulty
Operator Actions	▪ Apply park brake and retry operation with remote control. ▪ Use override code to continue operation ▪ Request service
Service Tasks	▪ If the sensor becomes disconnected or the connecting wire is damaged then this message will be displayed. ▪ With the park brake ON the park brake sensor closes between contacts 1 & 4. With the park brake OFF the park brake sensor closes between contacts 1 & 2. Contact 1 is connected to the Rear ECU via wire 8. Contact 2 is not connected.

	Contact 4 is connected to earth in junction box E. ▪ Check the continuity of the wire from contact 1 on the sensor to pin 39 on the rear ECU ▪ If the switch does not close between contacts 1&4 when the park brake is ON then adjust the switching point by removing the electrical plug and turning the adjusting screw

Top Lift Frame - Twistlock Switch Error FR120 FL121 RR 122 RR 123

Screen Image 120 = FRONT RIGHT 121 = FRONT LEFT 122 = REAR RIGHT 123 = REAR LEFT	
Explanation	The twistlock switches sense the position of the top lift frame twistlocks. There is a switch at each corner of the top lift frame. One of the switches is reporting incorrect information.
Causes	▪ Faulty twistlock switch ▪ Faulty switch wiring
Operator Actions	▪ Use override code to continue operation ▪ Request service
Service Tasks	▪ Each twistlock switch has complementary outputs (i.e. Normally Open and Normally Closed switches). If the Front ECU detects that both twistlock switch outputs are the same state then the error message will be displayed. ▪ The twistlock switch cable is either shorting or broken, or that the twistlock switch has failed. ▪ Swap the twistlock switch with one from another corner and see if the error moves with the switch.

Top Lift Frame - Contact Sensor Error FR124 FL125 RR126 RL127

Screen Image 124 = FRONT RIGHT 125 = FRONT LEFT 126 = REAR RIGHT 127 = REAR LEFT	
Explanation	The frame contact sensors sense when the top lift frame is resting on top of the container. There is a sensor for each corner of the top lift frame. One of the switches is reporting incorrect information.
Causes	▪ Faulty contact sensor switch ▪ Faulty contact sensor switch wiring
Operator Actions	▪ Use override code to continue operation ▪ Request service
Service Tasks	▪ Each contact sensor switch has complementary outputs (i.e. Normally Open and Normally Closed switches). If the Front ECU detects that both contact sensor switch outputs are the same state then the error message will be displayed. ▪ The contact sensor switch cable is either shorting or broken, or the contact sensor switch has failed. ▪ Swap the contact sensor switch with one from another corner of the frame and see if the error moves with the switch.

Top Lift Frame – Twistlocks Are In-between Open and Closed 128

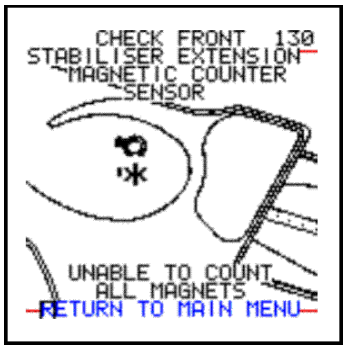
Screen Image	
Explanation	If any of the twistlocks are sensed to be between the fully open or fully closed positions then the Sidelifter arms will be disabled.
Causes	▪ Twistlocks not moved to fully open or fully closed ▪ Faulty twistlock sensor switch

	▪ Faulty twistlock sensor switch wiring
Operator Actions	▪ Enter Top Lift Frame mode and open or close the twistlocks fully ▪ Use override code to continue operation ▪ Request service
Service Tasks	▪ Go to **VIEW SENSOR VALUES, VIEW SPECIAL OPTIONS, TOP LIFT FRAME**, **TWISTLOCKS.** Each twistlock states is displayed. Activate the twistlocks and check that the twistlock states change accordingly ▪ Check the twistlock switches are operating correctly by removing the inspection covers on top of frame corner giving the problem

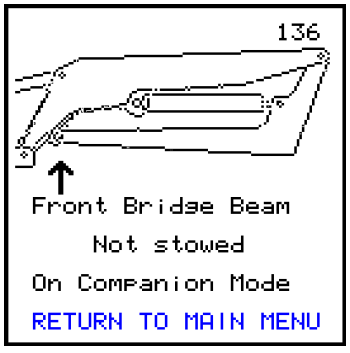
Top Lift Frame Is Not Fitted 129

Screen Image	
Explanation	If the Mode Select switch on the remote is set to Top Lift Frame mode but the Top Lift Frame is not fitted then this message will be displayed
Causes	▪ Top lift frame is not fitted
Operator Actions	▪ Use override code to continue operation ▪ Request service
Service Tasks	▪ If the Top Lift Frame is plugged in and this message is displayed then there is no communication between the Front ECU and the top lift frame controllers ▪ Check the continuity of the CANbus and also check that power is reaching both top lift frame control cards.

Stabiliser Extension Magnetic Counter Sensor F130 R131

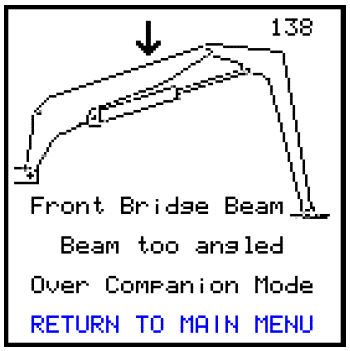
Screen Image 130 = FRONT ECU 131 = REAR ECU	
Explanation	The ECU has counted the number of steps on the plastic strip between the stabiliser fully retracted and the stabiliser fully extended positions and has either over-counted or under-counted compared to the correct number of steps. This could mean that the magnetic sensor is too close or too far away from the magnets embedded in the plastic strip.
Causes	▪ Magnetic sensor incorrect distance from magnets on stabiliser extension strip ▪ Faulty magnetic sensor
Operator Actions	▪ Use override code to continue operation ▪ Request service
Service Tasks	▪ Check the SENSOR VALUES screen under the STABILISERS menu item and observe the count as the leg travels in and out. It is often possible to see where exactly on the strip the magnetic sensor cannot read the magnets properly. The counter should increment evenly as the leg moves. If the counting stops in some sections then the problem may be in that area of the stabiliser extension strip. ▪ Ensure the plastic strip is lined up along the length of the leg by taking the magnetic sensor off the stabiliser housing. Look through the hole as the leg moves in and out. The plastic strip should remain centred in the hole through the entire length. If it does not it may need to be re-aligned. ▪ If the magnetic sensor is not sensing any magnets at all then check the wiring and the power to the sensor. If there are no problems with the wiring the sensor may be faulty and should be replaced.

Outer Leg not stowed against Bridge Beam Base F136 R137

Screen Image 136 = FRONT CRANE 137 = REAR CRANE	

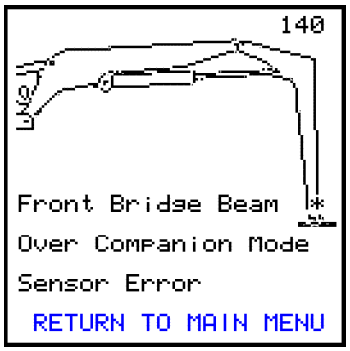
Explanation	The Outer Leg of the Bridge Leg Stabiliser is not stowed properly while the Bridge Leg is being used in On Companion mode.
Causes	▪ Outer Leg not fully stowed when On Companion sensor indicates Outer Leg pressure plate is in contact with companion vehicle ▪ Bridge Beam base sensor is faulty or requires adjustment if Outer Leg appears fully stowed against Bridge Beam base ▪ Outer Leg pressure plate sensor is faulty if Outer Leg is NOT resting on deck of companion vehicle ▪ Wiring fault
Operator Actions	▪ Ensure leg is fully stowed and use override code if the Outer Leg **IS** stowed properly ▪ Request service
Service Tasks	▪ If alarm is present when On Companion sensor is NOT in contact with the deck of the companion vehicle, ensure On Companion sensor plate is not stuck down and that the On Companion sensor is working properly ▪ The Bridge Beam base sensor may need adjustment or the Outer Leg foot may be damaged and preventing contact with the sensor ▪ If adjustment does not clear the fault then replace the sensor switch.

Bridge Beam Too Angled F138R139

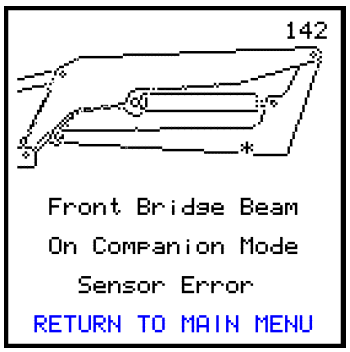
Screen Image 138 = FRONT CRANE 139 = REAR CRANE	
Explanation	The sensor is detecting that the Bridge Beam has not been lowered enough for operating in Over Companion mode.
Causes	▪ Bridge Beam angle sensor is faulty or requires adjustment ▪ Wiring fault ▪ Outer Leg foot is too far above ground (e.g. dunnage support may be too large)
Operator Actions	▪ Use override code to continue operation if Bridge Beam appears to be horizontal and Outer leg foot is placed correctly on ground. ▪ Request service
Service Tasks	▪ Bridge Beam angle sensor may need adjustment. ▪ If adjustment does not clear the fault then replace the sensor switch.

	▪ If alarm is present when the Outer Leg foot is NOT on the ground then check if Over Companion sensor is working correctly.

Bridge Outer Leg Foot Sensor Failure F140 R141

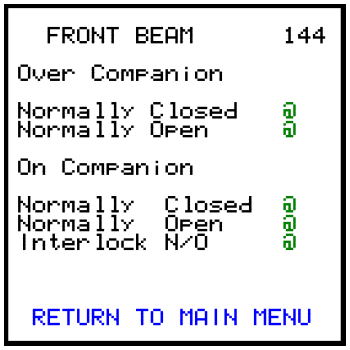
Screen Image 140 = FRONT CRANE 141 = REAR CRANE	
Explanation	The Outer Leg sensor at the foot may be faulty or requires adjustment or replacement.
Causes	▪ Outer Leg sensor at the foot is faulty or requires adjustment ▪ Wiring fault
Operator Actions	▪ Use override code to continue operation if Outer Leg foot is in contact with ground and the Outer Leg angle to the vertical is within plus or minus 10 degrees ▪ Request service
Service Tasks	▪ Inspect and if necessary, adjust Outer Leg foot sensor. ▪ If the sensor is damaged or adjustment does not clear the fault then replace the sensor switch.

Bridge Outer Leg Knee Sensor Failure F142 R143

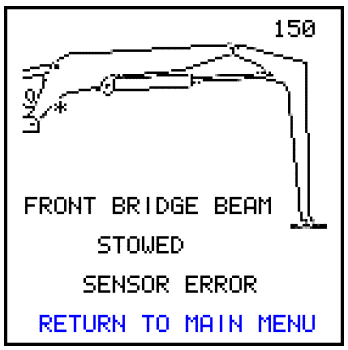
Screen Image 142 = FRONT CRANE 143 = REAR CRANE	
Explanation	In On Companion mode the Outer Leg sensor in the pressure plate area may be damaged, faulty or requires adjustment.
Causes	▪ Outer Leg sensor in the pressure plate area is faulty or requires adjustment ▪ Wiring fault

Operator Actions	▪ Use override code to continue operation if Outer Leg is fully stowed to Bridge Beam base ▪ Request service
Service Tasks	▪ Inspect and if necessary, adjust the Outer Leg sensor in the pressure plate area. ▪ If the sensor is damaged or adjustment does not clear the fault then replace the sensor switch.

Bridge Leg Diagnostics F144 R145

Screen Image 144 = FRONT CRANE 145 = REAR CRANE	
Explanation	Diagnostic display of Bridge Leg sensors.
Causes	Operator has selected this screen
Operator Actions	Use the information displayed to diagnose problems
Service Tasks	None

Outer Leg Stowed Sensor Error F150 R151

Screen Image 150 = FRONT CRANE 151 = REAR CRANE	
Explanation	The Outer Leg Stowed sensor at the base of the Bridge Beam may be faulty or require adjustment or replacement.
Causes	▪ Sensor is faulty ▪ Sensor needs adjustment

	▪ Wiring faulty
Operator Actions	▪ Use override code to continue operation if Outer Leg foot is in firm contact with Bridge Leg base ▪ Request service
Service Tasks	▪ Inspect and if necessary, adjust sensor ▪ If the sensor is damaged or adjustment does not clear the fault then replace the sensor

Angle Sensor Calibration Failure

Screen Image	
Explanation	This message can refer to any of the eight angle sensors on the Sidelifter. The message only occurs during angle sensor calibration.
Causes	▪ Angle sensor is installed incorrectly ▪ Wrong arm or stabiliser selected set up with plumb bob ▪ Bottom arm may need to be recalibrated before top arm can be calibrated.
Operator Actions	▪ Use override code to continue operation
Service Tasks	Check: ▪ The angle sensor is bolted to the correct side of the arm or stabiliser and that the orientation is correct (i.e. wire pointing upwards) ▪ The angle sensor selected on the display menu corresponds with the arm or stabiliser that has been set-up with the plumb bob ▪ If difficulty is encountered with calibrating the top arm angle sensor, then try swapping it with the bottom arm angle sensor and recalibrate both.

Memory Sector One Corrupt

Screen Image	

Explanation	This message can appear for either the Front or Rear ECU
	▪ Memory Sector One of the Rear ECU saves the:
	  ▪ Last Stabiliser Extension
	  ▪ Last Load

	▪ Operating Hours ▪ Estimated Number of Lifts (only from 2007) ▪ Next Service Due ▪ The Rear ECU Memory Sector One variables are accessible via the LCD screen ▪ The variables are saved back to memory every time the SMARTlift system is switched off ▪ Data corruption can occur if the ECU battery is disconnected while SMARTlift is 'ON' ▪ In the event of the rear memory sector being corrupted it is likely that the Operating Hours will need to be reset. Also the Next Service Due Hours should also be reset ▪ The Front ECU contains a duplicate of the above information but it is **NOT** accessible via the LCD screen
Causes	▪ ECU battery is disconnected while SMARTlift is ON
Operator Actions	▪ Continue to operate ▪ Return for service as soon as possible to check memory and reinstate data
Service Tasks	**Procedure for resetting the Operating Hours** ▪ Enter the MANUFACTURERS AREA using the required PIN  ▪ Use the Dial to select the point in the top right hand corner of the screen ▪ The Change Operating Hours Screen is displayed. Enter the PIN number (STEELBRO must be contacted for authorisation) using the dial ▪ A moving "OK" will be displayed next to the PIN number ▪ The Estimated Operating Hours can now be set ▪ The Service Due Hours can be set in the normal way by following procedure SL0025_1GB

Memory Sector Two Corrupt

Screen Image	
Explanation	This message can appear for either the Front or Rear ECU. Memory Sector Two of each ECU saves the angle sensor calibration data
Causes	▪ ECU battery is disconnected while SMARTlift is ON
Operator Actions	▪ Continue to operate ▪ Return for service as soon as possible to check memory and reinstate data
Service Tasks	If this message is displayed then the Front or Rear Crane will have to be recalibrated according to procedure SL0005

Memory Sector Three Corrupt

Screen Image	
Explanation	This message can appear for either the Front or Rear ECU. Memory sector three of each ECU saves the crane synchronisation Data
Causes	▪ ECU battery is disconnected while SMARTlift is ON
Operator Actions	▪ Continue to operate ▪ Return for service as soon as possible to check memory and resynchronise cranes
Service Tasks	If this message is displayed then the cranes will have to be resynchronised according to the procedure described in the Sidelifter Operators Manual

Maintenance

Safety First

When carrying out any maintenance or service task, ensure that you adhere strictly to the safety practices detailed in this manual.

These include the safety instructions referred to in Safety Instructions (on page 11) but also the specific warnings and cautions highlighted throughout the manual.

Why Genuine Parts?

When you or your service workshop carry out service or repair work on your STEELBRO Sidelifter, it is important that you only fit genuine STEELBRO Sidelifter spare parts.

The STEELBRO Sidelifter is manufactured to a high technical specification. To guarantee a long and trouble free product life ensure that your Sidelifter is regularly serviced.

Preventative Maintenance

The following section describes the service and maintenance requirements of the Sidelifter. All components must be checked regularly for proper functioning and adjustments made only if necessary. Before the Sidelifter left the factory, every valve in the hydraulic system was thoroughly tested and properly adjusted and the complete unit was test operated at full lifting capacity. A duly competent person must carry out all servicing and any subsequent adjustment.

When using a steam cleaner on the Sidelifter, avoid cleaning near hydraulic cylinder shafts, electrical control boxes or junction boxes and switches. While the latter are fully water proofed, they may not tolerate hot steam cleaning jets.

Grease and Oil Specifications

The hydraulic system and the hydraulic fluid are matched in respect of lubricating performance, effect on seals, and non-compatibility with other materials. For this reason do not mix different types of hydraulic fluid, such as mineral oils, synthetic fluids and water based fluids, and never mix or contaminate your hydraulic fluid with diesel oils or alcohol based products.

We recommend the use of non-molybdenum based greases as these do not deteriorate the crane bushings.

Use	Recommended Product
Hydraulic Oil	Castrol Hyspin AWS46 or equivalent*
Bearing Grease	Shell Alvania EP or equivalent
Hub Grease	Shell Alvania EP2 or equivalent
Hub Oil	Castrol Multitrax 80w/140 or equivalent
Wheel Stud Grease	Shell Alvania EP2 or equivalent

* May vary for different markets depending on temperature range:

Temperature Range	Recommended Product
From -20°C to +30°C	Castrol Hyspin AWS 32
From -10°C to +40°C	Castrol Hyspin AWS 46
From 0 to 50°C	Castrol Hyspin AWS 68

For units fitted with a Kubota Powerpack refer to the Kubota manual for details of recommended engine fluids.

Servicing Trailer Running Gear

For servicing detail refer to the **SUSPENSION** and **AXLE MANUALS**.

Records

All checks, adjustments, replacement of parts, repairs and inspections performed, and all irregularities or damage potentially effecting the Sidelifter's safety should be recorded in an orderly manner. In some countries this is mandatory.

A comprehensive STEELBRO service programme is available through your distributor. As this is designed specifically to support the safety, operation and maintenance requirements of your Sidelifter, we recommend that you contact your distributor for more information if you do not already this programme in place.

For your convenience, a service programme summary logbook is provided.

Daily Inspection Requirements

Hydraulics System

- Check the engine oil and water levels

- Check the oil level in the hydraulic reservoir. The oil level needs to be between the "Max" and "Min" levels on the sight glass when the Sidelifter is in the stowed position. Check pump suction line shut off valves are open.
- Check that the lifting arms and stabiliser legs can be operated with ease and that the controls automatically return to the neutral position
- Inspect the hydraulic lines, connections and other components to detect any oil leakage or damage. Tighten any loose or leaking connections

Ensure that when connecting Quick Release Couplings, the low-pressure line is always correctly fitted before fitting the high-pressure line.

When disconnecting hydraulic tubing and hoses, always ensure that no hydraulic pressure has been retained in the line after the power supply to the system has been switched off. Operate the manual levers on the valve bank to relieve any residual hydraulic pressure.

Refer to Precautions with Over-Centre Valves and Check Valves (on page 158).

Lifting Gear and Chassis

- Check the lifting chains, lifting lugs, hammerlocks and other components of the chain assemblies to ensure that they are not damaged. The hammerlocks should be able to fold otherwise they have been overstressed and are in need of replacement
- Check the Sidelifter, chassis and twistlocks for damage. For example, check that the container guides on the "non-lifting" side of the crane bases are present and not unduly bent or deformed.
- Inspect the lifting module sliding areas on top of the main chassis for cleanliness.

Brakes - Air Pressure Systems

- Run the truck engine to achieve maximum air system pressure. Stop the truck engine and check the truck air gauge does not show a rapid loss of pressure that would indicate an air leak
- Apply and release the brake pedal twice. Air pressure should not drop abnormally when brakes are applied. Check that the brakes release immediately. Check that the slack adjusters on the trailer axle camshafts do not have excess movement that indicates brake adjustment is required
- Check that all hoses are firmly connected and are not damaged
- Vent air reservoirs to expel condensate by using the drain valves

Lights

- Inspect switches and lights for broken brackets, fused bulbs and cracked lenses. Check for loose wiring connections - usually indicated by flickering, dull or intermittent lights
- Clean light lenses and reflectors

Wheels and Tyres

- Check tyre pressures are correct, check that the valves are not damaged and trailer axle dust covers are in place
- Remove all objects trapped in the tyre tread and ensure tread depth complies with road regulations
- Ensure tyres have no cuts or bulges
- Examine all wheels for damage caused by "kerbing" or severe road shock
- Check that the wheel nuts are properly seated and show no signs of running loose
- Check oil level in the axle hubs is between the minimum and maximum levels if the axles are of the oil filled type

After any removal and refitting of any wheel with ISO wheel nuts, ensure nuts are re-tightened within 50 to 100km of travel. Neglecting to do so could result in loss of a wheel.

Suspension

- Check springs for shifting or missing leaves, loose or missing clips and any damage
- Check suspension U- bolt, bearings and bushes for security and condition
- Check air bags for damage, chaffing etc

Weekly Inspection and Service Requirements

Perform all activities required for daily and weekly inspections and in addition carry out the following service procedures.

Chassis

- Grease all grease nipples on the chassis, brake slack adjusters and landing legs with the recommended grease
- Grease semi trailer rub plate and kingpin with a good quality hub grease
- Clean any lifting module sliding areas on top of main chassis and then wipe over with clean cloth

Grease points are detailed on the lubrication chart in this manual.

Lifting Modules

- Grease all lifting arms and cylinder pivot bearings at front and rear
- Check all pivot pin keeper plates and circlips for security

Landing Legs

- Check landing legs for damage and serviceability

Monthly Inspection and Service Requirements

Perform all activities required for daily and weekly inspections and in addition carry out the following service procedures.

Lifting Chains & Accessories (Monthly)

Visually inspect the lifting chains, lifting lugs, hammerlocks and crane lifting pins for any signs of damage or excessive wear.

Hydraulic System and Chassis

- Check all bolts on the Sidelifter. If a power pack is fitted then check the pin keeper plates and the combined hydraulic reservoir/fuel tank mounting. Tighten any loose bolts.
- Check that the Sidelifter operator notices are in place
- Check the lifting arms and stabiliser legs to detect any visual signs of damage, deformation or wear in the bearings
- Service engine air filter and change as required
- Check the Emergency Stop button and the electrical safety devices

Brakes - Air Pressure Systems

- Check that the linkages on the trailer axle camshafts do not have excessive movement. If so adjust brakes in accordance with brake servicing instructions
- Listen to the air system for evidence of any air leaks and tighten any loose connections. Use soapy water to locate a suspected air leak.

Lights

- Check all cables are firmly connected and not damaged by scuffing or pinching

Wheels and Tyres

- Check wheel bolt/nut torque settings as detailed in the **AXLE MANUAL**

WARNING: After any removal and refitting of any wheel with ISO wheel nuts, ensure nuts are re-tightened within 50 to 100km of travel. Neglecting to do so could result in loss of a wheel.

Six Monthly Inspection and Service Requirements

Perform all activities required for daily, weekly and monthly inspections and in addition carry out the following service procedures.

Hydraulic System

- Check all hydraulic hoses and pipe work for wear, scuffing and fretting
- Check the mountings of the hydraulic reservoir for condition and security
- Change the following filters where applicable:
  - Engine oil
  - Engine fuel
  - Hydraulic oil tank
  - Hydraulic oil pressure
- Change the oil in the power pack engine
- Clean the hydraulic tank breather element
- Change the hydraulic oil if required. If water contamination is present oil should be changed. See hydraulic oil change guide at the end of the maintenance section of this manual
- Check fan belt tension
- Check condition of radiator hoses.
- Check engine coolant for condition as detailed in Kubota Operators Manual. If you need to refill the coolant then ensure the air is bled from the coolant system after filling:
  - After filling run the engine at a low idle with the radiator cap removed until the engine reaches normal operating temperature.
  - Replace the cap and let the engine cool
  - Check coolant level in the radiator after the engine has cooled and top up if necessary.
- Check battery fluid levels

For detailed instructions on power pack routine required maintenance, refer to The Kubota Engine Operators Manual.

Chassis

- Disconnect the tractor unit from the trailer and check the king pin for wear and security of attachment
- Thoroughly clean the Sidelifter
- Check chassis components for signs of stress, damage, cracking, corrosion etc

Avoid spraying the chrome shafts of the hydraulic cylinders with a water blaster or system cleaner.

Suspension and Axles (As detailed in the suspension and axle manuals)

- Carry out brake servicing
- Check out suspension servicing
- Check axle alignment
- Check nut torque settings

Annual Inspection and Testing

Perform all activities required for daily, weekly and six monthly inspections and in addition carry out the following service procedures.

King Pin

The king pin connecting the Sidelifter to the tractor unit should be crack tested or renewed. The latter is often the cheaper alternative. This check is required by automotive testing stations in New Zealand, and is recommended to all Sidelifter owners because of the stresses applied when lifting loads.

Lifting Chains & Accessories

Remove lifting chain slings and inspect all components for any damage or excessive wear. You must comply with all local regulations regarding inspection and testing of lifting chain slings. Chains should be proof tested annually. **STEELBRO** recommends that all inspection certificates be retained.

Lifting Equipment

Carry out a full monthly and six monthly inspection, and pay particular attention to the lifting arms, stabiliser legs, and their mountings for any signs of cracking, or other damage. Check top arm lifting pins for wear by ensuring the pins can be rotated in their bearings. Check the emergency stop and the electrical safety devices.

Maximum Load Test

After all other checks have been completed, carry out a Maximum Load Test:

- The load should be the maximum load shown on the Working Load Limit chart.
- When lifting off the Sidelifter, keep the test load close to the Sidelifter
- Carry out test at 300mm clearance between the Sidelifter side rail and the container.

Testing After Repairs to the Cranes

No modification may be carried out on the Sidelifter without written authorisation from Steelbro. Unauthorised modifications automatically void all warranties and service agreements.

After repairs on the crane and before putting it back into use, a **MAXIMUM LOAD TEST** must be carried out as described in the previous section.

Maintenance Notes

Pressure Line Filter

This filter is of the full flow type with a bypass valve fitted. It has a replaceable element and this should be changed after the first 50 hrs of operation and thereafter at every 200 hours or six months.

Return Line Filter

This filter is of the full flow type with bypass and should be changed at the same intervals as the pressure filter.

Filler Breather

One filler breather is on the hydraulic oil reservoir.

The filler cap breather gauze of this unit needs washing out with cleaning solvent and blown dry with compressed air every 500 hrs or 6 months or as required particularly if operating in dusty conditions.

The strainer gauze in the tank aperture should be checked for condition and cleaned as required. Ensure the gauze is intact and no splits or damage is evident.

Emergency Instructions in Case of Electrical Faults

The PVG control valves are fitted with manual operating handles for emergency or servicing use. In the event of an electrical fault in the control system, they can be used independently to complete the loading or unloading of a container.

The plug on the affected solenoid will have to be disconnected before manual control can be operated as the valves are held in neutral with the electrical system connected.

Precautions with Over-Centre Valves and Check Valves

Cylinders, fitted with Check Valves and or Over-centre Valves, can remain pressurised. The pipes connecting the ‘B’ port to the Check/Over-centre Valve Block Assembly, mounted to the ‘A’ port, can remain pressurised.

To relieve the pressure in these systems, carry out the following steps:

(For units fitted with Over-Centre Cartridges)

- Slacken the adjustment lock nut and relieve the cylinder pressure by turning the adjustment screw anticlockwise until no resistance is noticeable (about 5 full turns)
- The Over-Centre Cartridge can now be screwed outward to a point where the sealing surfaces are separated, thus guaranteeing no pressure remains trapped in the cylinder or pipe work

Recommended Companion Vehicles

The following points should be considered if purchasing future companion vehicles;

1. When buying 12.5 metre or longer semi-trailers we recommend an extra set of twistlocks to allow wide spacing of two 20' containers i.e. An extra set of twistlocks at the front or rear outside the existing 40' set to give Sidelifter arm access when two 20' containers are carried.
2. When specifying truck flat-decks we recommend a space of 215mm between the twistlock centres and the headboard. This allows sufficient room to fit the lifting lugs to the container. A further consideration is that if you buy a mini-Sidelifter for handling empty containers then a space of 800mm will be required.
3. When buying drop deck container trailers, we recommend a space of 215mm between the drop in deck, and the twistlock centres, to allow sufficient room to fit the lifting lugs to the container.
4. When setting up tractor units for use with a semi-trailer to be loaded or unloaded by the Sidelifter, appropriate reinforcing across the chassis rails of the tractor unit enables the Sidelifter to put a leg on this reinforcing rather than uncoupling or jack-knifing the tractor unit.

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