

COMBiLiFT

LIFTING INNOVATION

Dear Customer,

Thank you for choosing us and showing your faith in the Combilift range of products. With this Combilift Product you now own a machine designed by our team of experienced engineers using the most up to date design techniques and technology with the sole aim of producing a machine that is efficient, reliable, safe and the right tool for your businesses material handling needs. The Combilift product possesses a vast range of multi-functional application possibilities that makes it one of the leading products in the material handling industry.

Combilift Ltd

The Purpose of this operators Manual

This Manual contains all of the information you will require to operate your Combilift product safely and efficiently. It is essential that this manual remain with the machine at all times. It is essential that the operator read this manual before attempting to operate the Combilift.

- Always follow all safety instructions laid out in this manual
- All instructions, prohibitive or otherwise, found in this manual should be adhered to at all times. They are there to protect your life and the lives of others.
- Always perform the Daily Inspection as indicated in this manual and follow the guidelines on service intervals.

www.combilift.com

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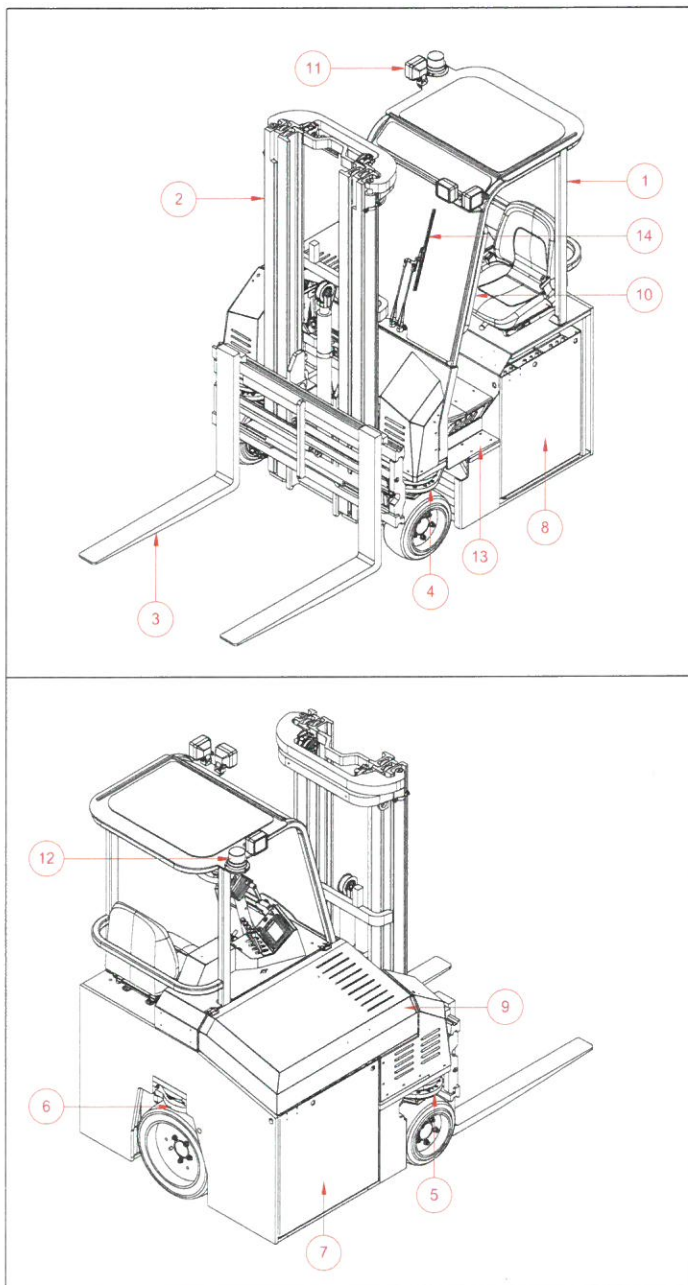
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Section 1: Machine Layout and Operator Controls

1.1: Machine Overview and Components Layout

It is essential before you start operating the Combilift to be familiar with the main components and controls of the machine, their function and where they are located. Figure 1.1 below indicates all of the major components of the truck. Figure 1.2 on the following page indicates all of the operator controls.

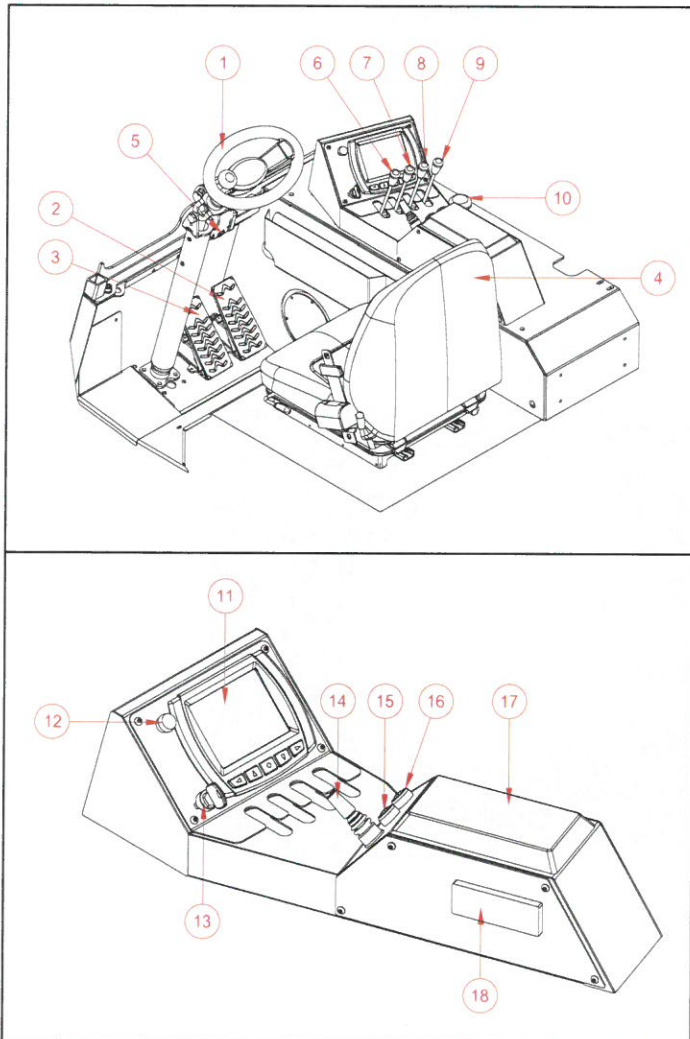


Component List

1. Overhead Guard
2. Mast
3. Forks
4. Front Left Swivel
5. Front Right Swivel
6. Rear Swivel
7. Right Hand Battery
8. Left Hand Battery
9. Bonnet
10. Grab Handle
11. Work Lights
12. Strobe Beacon
13. Cabin Access Step
14. Windscreen Wiper

Figure 1.1: Machine Components Layout

1.2: Operator Controls Layout



Controls List

1. Steering Wheel
2. Accelerator Pedal
3. Brake Pedal
4. Adjustable Seat
5. Wiper Switch (Optional)
6. Lift Control Lever
7. Tilt Control Lever
8. Side Shift Control Lever
9. Fork Position Control Lever
10. Battery Isolator Switch
11. Graphical User Interface (GUI)
12. Work Lights Switch
13. Ignition Key Switch
14. Direction Selector
15. Horn Button
16. Cut-Out Override (Optional)
17. Arm Rest
18. Fuse Box

Figure 1.2: Machine Controls Layout

Note

The component layout detailed above is that of a standard truck. This layout may vary due to individual customer requirements.

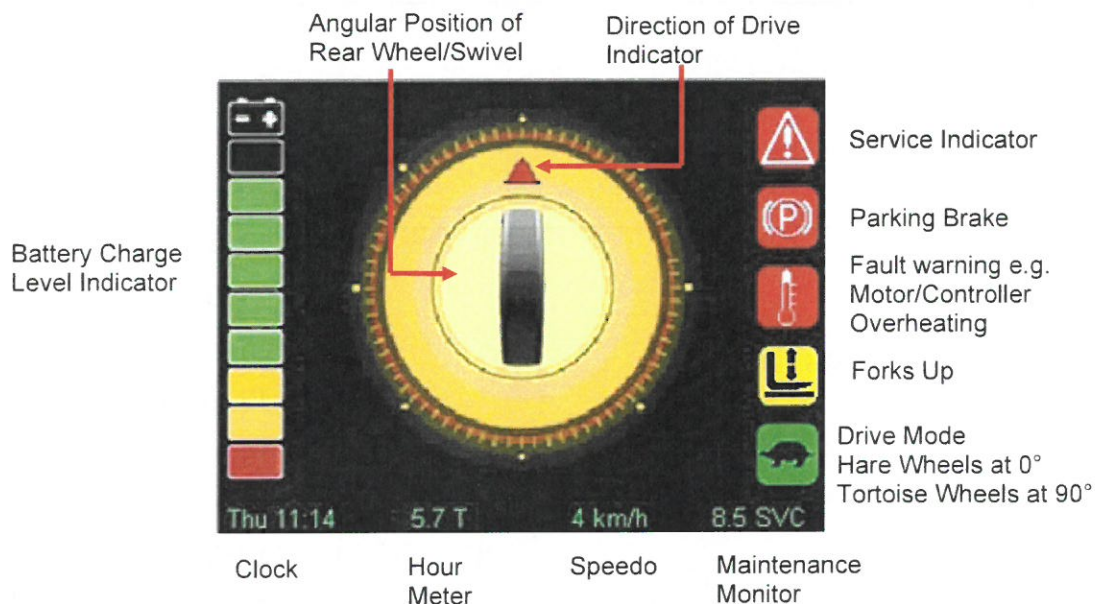
Refer to the decals in the cabin of the individual truck as they take precedence over the layout shown here.

1.3: Operator Controls & Display Descriptions

Now that the layout of the operator controls has been identified, the next step is to detail how the controls function.

Graphical User Interface (GUI)

The illustration below shows the GUI with all of the indicators illuminated. Descriptions are also given for each of the indicators.




Clock

- The clock displays the day and time in digital format. Thu 11:14
- To set the clock press the centre button on the GUI console, choose “User Functions” then “Time/Date”. The following list will appear:
 - Set Hour
 - Set Minutes
 - Set Year
 - Set Month
 - Set Day
 - Set Weekday
 - Save & Exit
 - Cancel
- Use the up, down, right and left arrow buttons to change the desired item.
- To set “Hour”, use the up or down arrow buttons to highlight “Set Hour”, then press right arrow button to highlight number. Then press up or down arrows to reach desired value. To move on to setting additional items, press left arrow button once and follow similar procedure to change other items.
- When finished setting all desired values, choose “Save & Exit”.

Hour Meter

- The hour meter records the total number hours the truck has been operating for in hours and tenths of an hour.

5.7 T**Maintenance Monitor**

- The maintenance monitor is used to determine the time remaining until the next service is required. The time remaining is displayed in hours and tenths of an hour.

8.5 SVC**Note**

The maintenance monitor can only be reset by connecting a handheld programmer or a computer with the relevant software installed.

Service Indicator

- The service indicator is displayed on the screen 1 hour before the truck is due to be serviced. Initially it will be displayed after 99 hours to indicate that the initial 100 hour service is due.
- After the initial service the technician should set the service indicator to be displayed after every 249 hours in accordance with the maintenance schedule.

**Note**

The service indicator can only be reset by connecting a handheld programmer or a computer with the relevant software installed.

Speedometer

- The speedometer is used to determine the velocity of the truck in kilometres per hour.

4 km/h**Battery Charge Indicator**

- The battery charge indicator displays the level of charge remaining in the batteries.
- The image opposite shows that the battery has 80% charge remaining.



Fault Warning Indicator

- The fault warning indicator is displayed when a fault has been detected in the electrical control system. A fault message will also flash on the screen.
- The truck must not be operated while this icon is displayed as damage to the electrical components may occur.
- Certain faults will cause the machine to shut down automatically. Other less serious faults will allow the machine to be driven to a safe place.
- Refer to Appendix 1 – Motor Controllers Diagnostics & Troubleshooting on page 51



Note

The fault warning indicator will reset automatically when faults have been resolved.

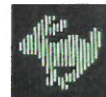
Forks up & Tortoise together

- The Forks up icon will only ever be displayed in conjunction with the tortoise icon.
- These two icons are displayed together when the forks are above a given height.
- Their purpose is to inform the operator that the mast is up and therefore the truck will operate at reduced speed.



Hare

- When forward or reverse travel is selected the 'hare' icon is displayed on the GUI.



Tortoise

- When left or right travel is selected the 'tortoise' icon is displayed on the GUI to inform the operator that the truck will operate at reduced speed.



Ignition Key Switch

- This is a two-position key switch located on the dash, which isolates the electrical system when in the 'OFF' position.



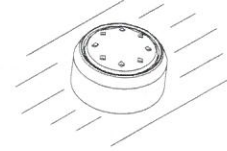
Work Lights Switch

- This is a three position rotary switch located on the dash
- Position 0 – Lights Off
- Position 1 – Front Work Lights On
- Position 2 – Front & Side Work Lights On



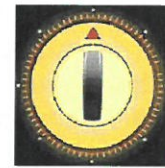
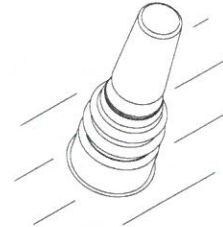
Horn Button

- The horn Button is the push button located on the dash next to the directional control lever.
- To operate the horn, depress the button.



Direction Selector

- The directional selector is the 5-position joystick located on the dash. It can be set to neutral, forward, reverse, left or right.
- In order to select a direction of travel, push the joystick in the desired direction.
- Always return the joystick to the neutral position when the truck is not moving.
- The drive direction selected is indicated by the red arrow on the GUI. In the screen shot shown here it can be seen that forward has been selected.

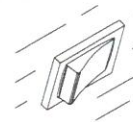


Note

The truck will NOT start unless the direction control lever is in the neutral position.

Wiper Switch

- The wiper switch shown opposite is located at the front of the cabin to the right of the steering column. See Item 5 in *Figure 1.2* on page 5.
- To activate the wiper flip the switch to the ON position.



Parking Brake

- The parking brake is automatically applied as soon as the truck comes to a halt.
- This prevents the truck from rolling back if it is stopped while travelling up an incline.
- It is automatically released when the accelerator pedal is pressed.



Optional Mast Lift Cut-Out with Override Button

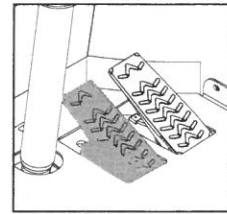
- This optional safety feature prevents the mast from being elevated above a given height.
- When the mast is raised to a predetermined cut-out height it will stop rising.
- A push button switch is provided on top of the lift lever to override the mast lift cut-out feature.
- To raise the mast above the cut-out height the operator must press the mast lift override button.
- The mast can then be raised to its full height.

Push Button
On Top Of Lift
Lever



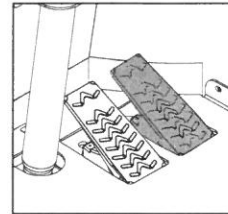
Brake Pedal

- The Brake Pedal is the pedal on the floor nearest the steering Column as shown shaded on grey in the diagram opposite.
- When the Brake Pedal is pressed deceleration is achieved by means of counter current in the drive motors.
- Sufficient deceleration can usually be achieved by means of releasing the accelerator pedal. Frequent use of the brake pedal is not recommended.
- This forklift has an ANTI-ROLL-BACK-function. It will not roll back, if the accelerator pedal is released on an incline.



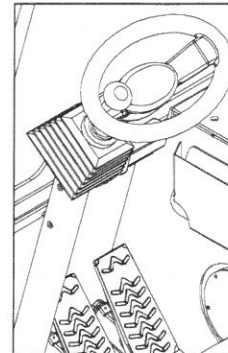
Accelerator Pedal

- The accelerator pedal is located on the floor on the right hand side of the cabin as shown shaded in grey in the diagram opposite.
- The accelerator pedal allows the operator to control the truck speed.
- To INCREASE speed, DEPRESS the pedal.



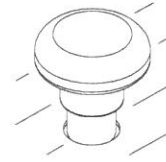
Steering Wheel / Column

- All models have both front and rear-end steering.
- When in forward mode the front wheels are fixed and the rear wheel steers the truck.
- Rear-end steering allows sharper turns in confined areas but demands greater driver care when turning.
- When in sideward mode, the rear wheel is fixed and the front wheels steer the truck.
- When driving forwards, turn steering wheel clockwise to turn truck clockwise, turn steering wheel anticlockwise to turn truck anti clockwise.
- When driving in reverse, turn steering wheel clockwise to turn truck anticlockwise, turn steering anti clockwise to turn truck clockwise.
- When driving in sideward mode, turning the steering wheel clockwise will turn truck clockwise. Turning the steering wheel anticlockwise will turn truck anticlockwise.
- The same is true for travel in either direction when in sideward mode.
- The steering wheel is also equipped with a spinner knob for easier steering.
- The angle of the steering column is adjustable to increase driver comfort.
- To adjust the angle of the steering column, loosen the locking lever on the side of the column by turning it clockwise.
- Adjust the steering column to the desired angle.
- To lock the steering column, turn the locking lever anticlockwise until tight.



Battery Isolator Switch

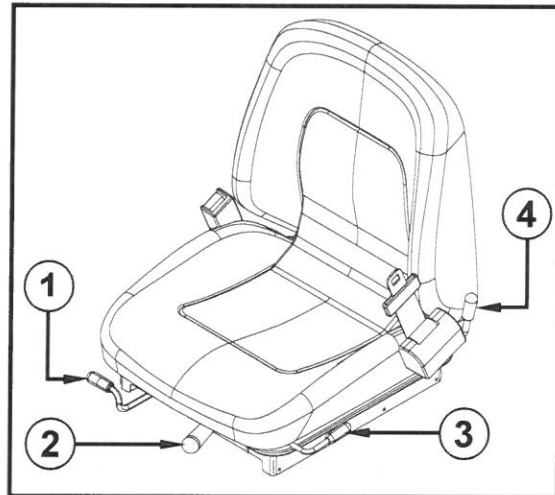
- This switch is used to disconnect power from the battery in the event of an emergency.
- The switch is located on the dash beside the arm rest. See Item 10 in *Figure 1.2* on page 5.
- When the Combilift is not in use turn the switch to 'OFF' by pressing it down until it clicks into the closed position.
- The Combilift will not power-up unless the switch is returned to the 'ON' position by pulling the switch up.



Seat Adjustment

- It is the responsibility of the Operator to ensure that the seat is adjusted according to operator weight, height etc before operating the truck.
- ALWAYS report any malfunctioning of the seat adjustments immediately.
- ALWAYS wear the seat belt provided.
- DO NOT adjust the seat when vehicle is in operation.
- Keep clear of moving parts.
- Authorised & competent personnel should carry out Installation & Maintenance only.

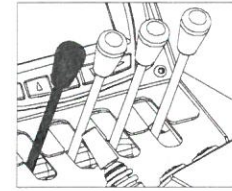
- 1) The standard seat can be positioned as the operator requires by releasing the seat slide lever (item 1) and moving the seat forward or back.
- 2) The weight adjustment is controlled by moving the weight adjustment lever (item 2) to increase or decrease the firmness of the seat base suspension. There are 5 weight settings from 50-120 kg (110-265lbs).
- 3) The seat angle can be adjusted by releasing the seat tilt lever (item 3) and tilting the seat forward or back. There are 2 seat tilt positions.
- 4) The backrest can also tilt to suit the operator by releasing the backrest tilt lever (item 4), and tilting the backrest forward or back. There are three backrest tilt settings.



1.4: Hydraulic Control Lever Functions

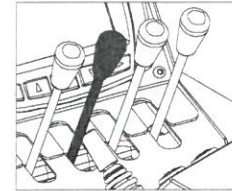
Lift Control Lever (Closest to Operator)

- The lift control lever controls the lift function of the Mast.
- To RAISE the forks, PULL the lever BACK.
- To LOWER the forks, PUSH the lever FORWARD.



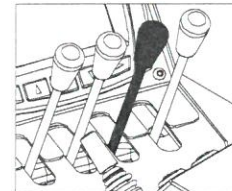
Tilt Control Lever (2nd from Operator)

- The tilt control lever controls the tilt function of the Mast.
- To TILT the mast FORWARD, PUSH the lever FORWARD.
- To TILT the mast BACK, PULL the lever BACK.



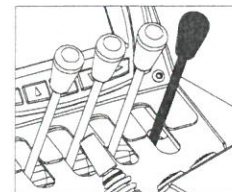
Side Shift Control Lever (3rd from Operator)

- The side shift control lever controls the lateral movement function of the fork carriage.
- To Shift the forks LEFT, PUSH the lever FORWARD.
- To SHIFT the forks RIGHT, PULL the lever BACK.



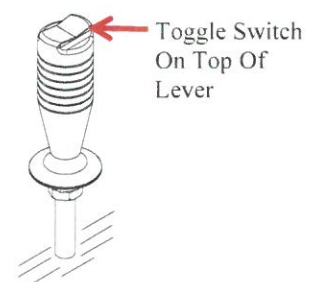
Standard Fork Position Control Lever (4th from Operator)

- The standard fork position control lever controls the position of the forks on the fork carriage.
- The forks can be moved simultaneously closer together or further apart.
- To MOVE the forks OUT/APART, PUSH the lever FORWARD.
- To MOVE the forks IN/TOGETHER, PULL the lever BACK.

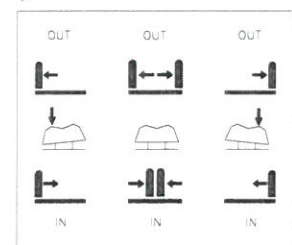


Optional Independent Fork Position Control Lever (4th from Operator)

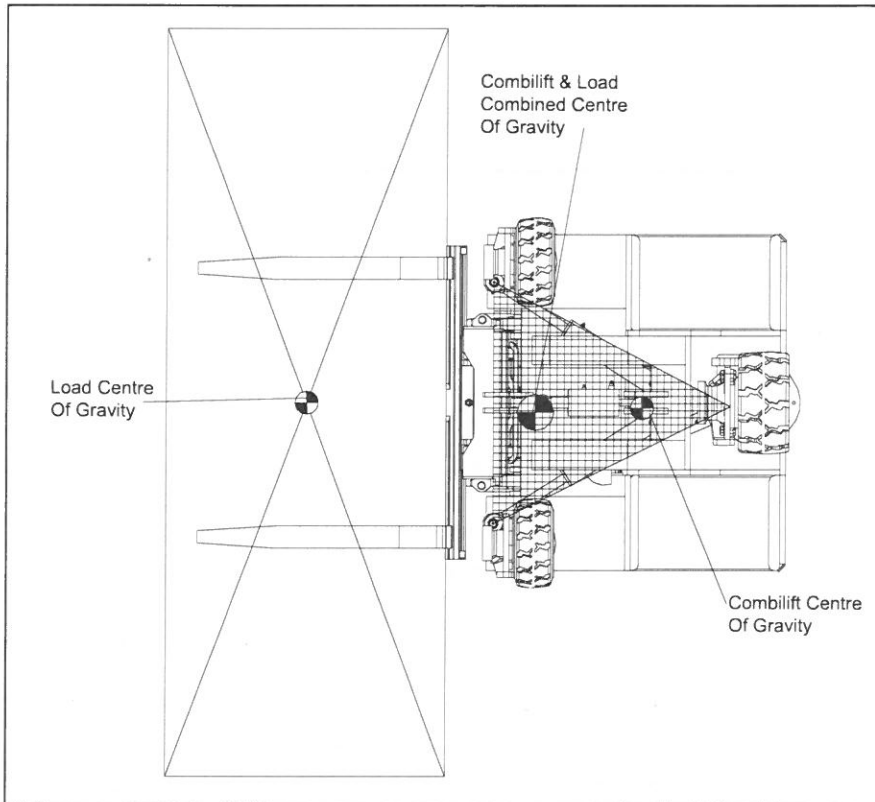
- The independent fork position control lever controls the position of the forks on the fork carriage.
- The lever operates the fork position function in the same way as the standard lever (see standard fork position control lever description on the previous page) unless the switch on top of the lever is pressed.
- When the switch is used the forks can be moved independently of each other along the fork carriage.
- To MOVE the LEFT fork OUT, PUSH the lever FORWARD while pressing the left side of the button.
- To MOVE the LEFT fork IN, PULL the lever BACK while pressing the left side of the button.
- To MOVE the RIGHT fork OUT, PUSH the lever FORWARD while pressing the right side of the button.
- To MOVE the RIGHT fork IN, PULL the lever BACK while pressing the left side of the button.



Toggle Switch
On Top Of
Lever

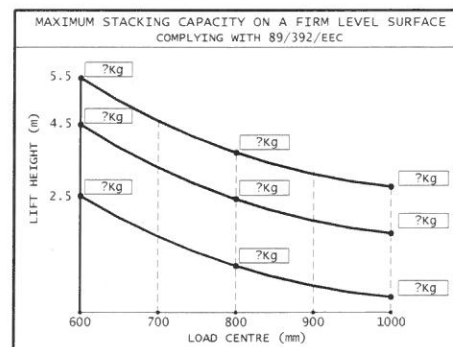


To keep the lift truck stable, the centre of gravity must stay within the area of the lift truck represented by a triangle drawn between the three wheels. If the centre of gravity moves forward of the triangle front, the lift truck will tip forwards. If it moves outside the right or left of the triangle the truck will tip to the side.



2.3: Load Chart

The rated capacity of the truck is illustrated on a load chart located inside the cabin. The load centre is determined by its centre of gravity and is measured from the front face of the forks to the centre of gravity of the load. It is assumed that the centre of gravity in the vertical direction is no greater than the specified horizontal load centre.



It is the responsibility of the operator to determine that the weight of the load to be handled is not greater than the capacity shown on the load chart. The operator **must not** handle any load that is greater than the capacity shown.

2.4: Serial Plate

The Serial Plate is the Metal Disc that is fixed to the Combilift in the cabin of every machine. It is engraved with a number of details, which are required by law. These are:

- The Truck's serial Number
- Truck's rated Capacity
- Truck's unladen weight
- Truck's date of manufacture
- Manufacturer's name and address.

This plate should not be removed by anyone. If lost order a replacement from Combilift immediately.

2.5: Operators Qualification

The Combilift must NOT be operated by any other individual other than those who have been trained to do so. Training should be carried out either by Combilift Driver training personnel or a Combilift authorised training organisation. Details of these organisations can be acquired from Combilift Ltd.

2.6: Operators Responsibilities

Always ensure that the truck is in good working order before commencing work. This is achieved by performing the **Daily inspection of the Combilift**. The daily inspection is to be carried out at the beginning of the working day or at the start of each shift.

It is the operators' responsibility to perform the daily inspection before each shift. The Inspection and how it should be conducted is covered later in this publication.

Unless authorised and trained to do so, the operator must not attempt any repairs, but report defects immediately. When authorised to perform maintenance work and/or repairs, ALWAYS ensure that the appropriate Health and Safety regulations are strictly adhered to.

Report any operational problems that may develop, (damaged pallets, ground surface breaking up etc.) which could not only reduce safety but also cause damage to the truck.

Never attempt to exceed your truck's handling capacity and take all precautions to ensure safety of others as well as yourself. Stop working and switch off if for any reason, in your opinion, the truck becomes unsafe or defective.

2.7: Entering and Exiting the Operator Cabin

- When entering or exiting the Operator cabin of the Combilift, always use a three point contact method to avoid slips and falls. The three point contact method is applied by keeping 3 of the bodies 4 limbs (hands & feet) in contact with the machine.
- Always use the handles and footsteps on the machine.
- NEVER use the steering wheel as a handle.

2.8: Starting Procedure

In order to start the Combilift insert the key into the key switch and turn the key to the on position.

NOTE

The Combilift will not power up if any of the following conditions exist:

- The driver is not sitting on the seat
- The directional control lever is not in the neutral position
- The battery isolator switch is in the closed or Off position
- The operator depresses the accelerator pedal whilst switching on the key switch

2.9: Moving Off

- Ensure that the forks are as low as possible.
- Select forward or reverse, or, right or left with Direction Control switch.
- Look around and when all is clear and apply light pressure to the accelerator pedal until the truck begins to move.
- Increase pressure on accelerator pedal to increase truck speed.

NOTE

The Combilift has a maximum ground speed of 10km/hr. Always adhere to all speed limits in the area which the truck is operating

2.10: Changing Direction without Changing Mode

- Remove foot from the accelerator pedal.
- Truck will gradually come to a complete stop.
- Select change of direction, when wheels have locked in desired position gradually increase pressure on accelerator until truck is travelling at desired speed.

2.11: Changing Into Sideward Mode

- Remove foot from the accelerator pedal and allow truck to come to complete stop.
- Ensure that all observers stand clear of the truck.
- Move the direction control switch from forward/reverse into the required sideward direction. The wheels will automatically align themselves at right angles to the forks.
- Wait until wheels are locked and dash symbol is illuminated (Turtle) before moving.

2.12: Change Back To Forward Mode

NOTE

When in sideward mode the front wheels steer the truck while the back wheel remains fixed

NOTE

Before changing back to Forward Mode, select sideward mode "RIGHT" and turn the steering completely anti-clockwise.

This ensures correct alignment of the front wheels in forward mode.

- Remove foot from the accelerator pedal and allow truck to come to complete stop.
- Ensure all observers stand clear of truck.
- Move the direction control switch from left/right into the required forwards direction.
- Wheels will automatically align themselves parallel with the forks.
- Wait until wheels are locked and dash symbol (turtle) is no longer illuminated before moving.

NOTE

When in forward mode the back wheel steers the truck, while the front wheels remain fixed.

2.13: Stopping

- Deceleration by means of releasing the accelerator pedal until a complete stop has been achieved should be sufficient during normal and safe operation.
- The forks must be lowered when the truck has stopped.
- The parking brake will be activated after time laps.
- After truck has stopped, return the direction control switch to neutral.

2.14: Loading

- Do not exceed rated capacity of truck. Overloading can cause truck instability. If in doubt, check with the load chart, located inside the cabin.
- Before picking up a load adjust the forks to ensure that they are equally spaced about the centre line of the fork carriage and as widely spaced as possible to take the weight of the load evenly.
- Check that the forks are of sufficient length. The length should be at least two thirds of the depth (front to back) of the load.
- When manoeuvring to pick up a load, avoid erratic movements that could result in damage to the load and/or truck.

2.15: When Loading In Sideward Mode

- Drive in Sideward Mode and stop, when the forks are at the centre of the load.
- Change to Forward Mode
- Lower/raise the forks to the required height.
- Slowly drive forks into the pallet
- Lift load.
- Double fork load if necessary until load is tight against face of forks. (See section on "double forking")
- Tilt slowly rearward to secure the load.
- Drive slowly rearwards until the load and forks are clear from the racking
- Lower forks until load is 150mm (6") above the ground.
- Change to Sideward Mode and drive in the desired direction

2.16: When Loading In Forward Mode

- Manoeuvre the machine forward so it is at the centre of the load.
- Lower/raise forks to the required height.
- Slowly drive forks into the pallet
- Lift load.
- Tilt slowly rearward to secure load.
- Double fork load if necessary until load is tight against face of forks.
- Drive slowly rearwards until the load and forks are clear from the racking
- Lower forks until load is 150mm (6") above the ground.
- Drive on in Forward Mode

2.17: Placing a Load When in Sideward Mode

- Drive in Sideward Mode and stop, when the load is in the centre of the placing area.
- Change to Forward Mode.
- Lower/raise the forks to the required height.
- Drive slowly forward, until the load is over the placing area.
- Lower load.
- Tilt forward.
- Drive slowly rearward until the forks are clear of load.
- Lower forks until load is 150mm (6") above the ground.
- Change to Sideward Mode and drive in the desired direction

NOTE

With a long length load, drive whenever possible in the sideward mode.
Tilt elevated loads forwards, only when directly over load destination

2.18: Placing a Load When In Forward Mode

- Drive machine forward as close to the placing area as possible.
- Lower/raise the forks to the required height.
- Drive slowly forward, until the load is over the placing area.
- Lower load.
- Tilt forward.
- Tilt slowly forward.
- Drive slowly rearward until the forks are clear of load.
- Lower forks until load is 150mm (6") above the ground.
- Drive on in Forward Mode

2.19: Double Forking

If it is not possible to engage forks fully when lifting a load it will be necessary to move the load closer to the front of the machine before lifting. This can be achieved by double forking the load.

NOTE

The lift capacity of the Combilift is reduced if the forks are not fully engaged.

To Double Fork a Load:

- Raise the load slightly and drive rearward sufficiently to bring the load closer to the machine.
- Lower the load and drive forward until the load is against the fork face.
- The load is now ready to be lifted.

2.20: Stacking

- Slowly approach stack with load tilted backwards.
- Stop at face of stack, select neutral.
- Elevate load until clear of stack top.
- Move forward until load is above the stack.
- Tilt mast to vertical position and lower load onto stack.
- Drive rearward and lower forks to 150mm (6") above ground before moving off.

2.21: De Stacking

- Stop at face of stack, select neutral and apply brake.
- Elevate forks to permit entry into pallet.
- Move forward and enter the pallet with the forks.
- Elevate load until clear of stack and tilt mast backwards to stabilise load.
- Drive rearward and lower load to 150mm (6") above ground.

2.22: Adjusting Load Forks

- Forks should be spaced as far apart as the load being moved will allow. Both forks should always be the same distance from the centre of the fork carriage.
- To adjust, raise forks approximately 25mm (1") off the floor.
- Switch off key switch
- Lift up the keeper pin and slide the forks along the carriage.
- When the forks are set to the desired position ensure that the keeper pin is engaged in a slot on the top of the fork carriage bar.

2.23: Operating Conditions

The Combilift can operate on various surfaces but the following should be noted

- **Ground Surface:** Floor and road surfaces should be of adequate load capacity, firm, smooth and level. Approaches to kerbs, railway crossings etc. should also be firm, smooth and adequately ramped to prevent possible displacement.
- **Aisle Dimensions:** Aisles should be arranged to eliminate corners, angles, inclines, steep ramps, narrow passages and low ceilings.
- **Headroom:** Structures over aisles, which may be potential obstacles should be defined and marked with a conspicuous colour. Low doorways should be marked with their clearance limits.

- **Operating in Hazardous Areas:** Standard trucks are not equipped to operate in cold stores, flammable or explosive areas, corrosive atmospheres or areas containing a high degree of dust contamination.
- **Gradients:** When differences in levels exist, low gradient ramps should be provided, having smooth, gradual level changes at top and bottom to prevent shocks to the load or fouling of the forks. Except in emergencies, do not turn the truck on gradients. Correct gradient procedure should be followed at all times (see Safety Precautions) Do not park on a gradient. In an emergency chock wheels, but do not leave the truck unattended.

Section 3: Safe Operation

Combilift forklift trucks are equipped with certain safety devices as standard equipment and strongly urge that these vehicles be operated with the safety devices supplied.

3.1: Safe Operation

- Combilift will not assume any liability for injuries or damage arising from or caused by the removal of any safety devices from their vehicles by the user.
- Fully trained, qualified and authorised drivers must only operate Combilift forklift trucks.
- Ensure that the truck is suitable for the area in which it is to be operated.
- Before raising or lowering forks, give clear indication of your intentions to other people and ask them to stand clear.
- Do not allow anyone to walk or stand beneath elevated forks.
- Do not exceed rated load capacity of the truck. In no circumstances should counterweights be added to increase capacity.
- If the hoist mechanism malfunctions or becomes stuck in a raised position, operate the hoist control lever to eliminate any slack in the chains. DO NOT go under the elevated parts of the truck to attempt to carry out repairs.

WARNING

Never lower the hoist mechanism with the load forks mechanically supported. Failure to observe this rule will result in carriage plus load forks falling as they are pulled clear of the support causing excess shock loading and possible damage to the hoist components as the hoist chain slack is taken up.

3.2: Operating in Hazardous Areas

- No spark proofing is fitted to the truck as standard; consequently it MUST NOT be used in flammable or explosive areas.
- The truck MUST NOT be used in corrosive atmospheres or in areas containing a high degree of dust contamination.

3.3: Safe Driving on Gradients

- When differences in levels exist, gradient ramps should be provided, having smooth, gradual level changes at the top and bottom to prevent shocks to the load or fouling of the forks.
- Do not drive across, turn or stack on gradients.
- Correct gradient procedure should be followed at all times.
- Do not park on a gradient. In an emergency apply the brake and chock the wheels - but do not leave the truck unattended.
- Always approach an incline straight on, and keep forks and /or load facing uphill at all times.

3.4: Driving Position

- Only operate controls from the correct driving position and do not operate any control until you are certain of its function.

3.5: Seat Switch

- The seat switch prevents the truck from operating if the driver is not sitting on the seat.

Never place items under the seat; they could prevent the seat switch from operating properly.

3.6: Parking

- Ensure that the direction control switch is set to neutral.
- Lower the forks fully.
- Park clear of aisles, doorways, stairways and fire points and ensure that the truck will not obstruct other traffic.

3.7: Bridge Plates and Dock Boards

- Bridge plates and dock boards must have an adequate safety factor to support a loaded truck and be secured when in use to prevent accidental movement.
- Do not exceed the maximum permissible load, which must be clearly marked on all bridge plates and dock boards.
- The sides of bridge plates, and where possible dock boards, must be raised to minimise the possibility of the truck being driven over the edge.
- The surface of the above equipment must be of a slip resistant substance.
- Drive slowly when crossing bridge plates and dock boards.

3.8: Lifting the Machine

- Lift the machine only when necessary.
- Check machine weight before lifting.
- Batteries should be removed before lifting.
- Use only the two lifting points on the mast and ensure that the mast is tilted fully back before lifting.

Section 4: Maintenance & Service Information

The service intervals are given in both operating hours (recorded on the lift truck meter) and in calendar time. Service the machine at the interval that occurs first. These intervals are based on normal operation of 8 hours per day. The time intervals must be decreased from the recommendations in the maintenance schedule for the following reasons: -

- If the lift truck is used more than 8 hours per day.
- If the lift truck must work in dusty operating conditions.

Combilift trucks are built with quality components. The use of inferior spare parts can result in inadequate safety and poor reliability. Only use genuine approved parts.

4.1: Initial Service at 100 hours

The initial service at 100 hours is conducted to ensure that the Combilift is in optimum working condition and to increase the working life of components. To complete the Initial service, the following steps must be carried out by a Combilift certified maintenance technician.

- Check battery electrolyte levels
- Replace hydraulic return filter (located in front)
- Check all electrical connections/terminals
- Check that all bolts and fittings are tight
- Check all Wheel nuts for tightness
- Grease all points indicated on Grease Point Chart
- Check mast chains. Lubricate and adjust as necessary.
- Check machine for hydraulic leaks
- Check hydraulic oil level.
- Change oil in transmission.

Note: Lubricate all grease points on a WEEKLY basis using an EP2 grease. (See Grease Point Chart)

Note: Check all wheel nuts are present and secure on a daily basis. Torque all wheel nuts every 250 hours to: 140Nm or 103ft-lbs)

4.2: Hydraulic Oil

The hydraulic oil in the Combilift should conform to the international standard I.S.O G344: HV Grade Oils with Improved Viscosity/Temperature Characteristics. It should also have the correct temperature range for the ambient temperature in which the machine is being operated. If the operating temperature is outside of the standard range, the standard oil **MUST** be replaced with oil of the correct grade. The table below lists several examples of commercially available oils. Ensure that the correct type is used for the relevant ambient temperature.

- **Mast** – Check for twisting and distortion in the channels. Look for signs of cracking and check that there are no missing or loose bolts. Check the mast chains for wear, missing links and pins. Make sure that the chains are of equal tension and are adequately lubricated. **DO NOT place your hands inside the mast at any stage to check the chains tension.** Press on the chains with a long stick or screwdriver. Check around the lift and tilt cylinders for signs of leakage. Also check all the hoses attached to the mast for signs of leaking oil.
- **Operator Cabin / Overhead Guard** – look for signs of damage and cracking to the overhead guard. Report any signs of damage immediately to your supervisor.

The Electric Drive System Checks

These checks are performed in order to ensure that the electric drive system is in good working order and fit to perform in a safe manner. The checks are performed as follows:

- **Check all electrical connections** – Check for loose or missing nuts or bolts on all electrical terminals. Ensure that all plugs are securely connected and free from damage.
- **Check the pump motor** – Listen for any strange or excessive noises; be observant of any strange smells such as a burning smell. Remove any dust or debris such as leaves from the motor casing.
- **Check the drive motors** – Listen for any strange or excessive noises, be observant of any strange smells such as a burning smell. Remove any dust or debris such as leaves from the motor casing.
- **Check the batteries** – Ensure all connections are sound and that no damage has been done to the cells i.e. the cells are not cracked or leaking. Check for loose or bare wires on all battery connections.
- **Check battery electrolyte level** – Ensure that the electrolyte in the battery cells has not fallen below an acceptable level

The Operational Checks

These checks are performed in order to ensure that every part of the Combilift functions correctly and in a safe manner. The checks are performed as follows:

- **Check the seat belt** – Enter the cabin using the three point contact method. Make sure that the seat belt functions correctly. Check for any cuts or fraying along the belt and that it secures correctly into the retainer. **Always wear the seat belt provided when you are driving the Combilift.**

- **Check the seat** – All Combilift machines come with adjustable air suspension seats. The operator must ensure that the seat is correctly adjusted for their individual height and weight. Instructions on how to set the seat can be found on page 12 of this manual.
- **Turn on the Machine** – Insert the key into the ignition and turn the key to the “On” position. This will allow power to flow through the electrical system. The dash display should power up.
- **Test the horn** – Depress the horn button to test the horn.
- **Listen** – Listen to the motor for a few seconds before driving off. Be alert to any strange sounds, noises or odours from the motor that may indicate a problem such as a smell of burning. If you detect anything, which is not normal, stop the machine immediately and investigate the problem.
- **Check the Dash** – look at the dash display and make sure that the warning symbols are all off. The only warning symbol that should be visible after the motor is started is the parking brake. Should any other warning symbols be visible, report the fault to your supervisor. A full list of all the gauges, indicators and controls along with each function can be found in section 2 of this manual.
- **Check the mast functions** – After checking that there is adequate space and headroom, perform the checks on the mast functions. Raise and lower the mast making sure that the operation is smooth and controlled. Extend the mast forward and then retract it. Again watch for any signs of sticking. Tilt the mast fully forwards and backwards. Then test any auxiliary functions that may be fitted to **your** Combilift.
- **Check the Brakes** – The parking brake is applied and released automatically. Move the direction control joystick in the desired direction of travel and apply light pressure to the accelerator pedal. The machine should start to move slowly in the selected direction. Increase pressure on the pedal to increase speed.
Release the accelerator pedal and apply pressure to the brake pedal. The machine should slow down and stop. As soon as the motors stop turning the parking brake will be engaged.
If either brake is not working do not operate the machine and report the fault to your supervisor. Make sure that you have adequate space to perform this test and that it is performed on a level surface.
- **Check the Directional Control Lever** – With the machine switched on, select forward mode. Press the accelerator pedal to drive the machine forward. Release the accelerator pedal to stop the machine. Select reverse on the directional control stick and press the accelerator pedal. The machine should now travel backwards. Release the accelerator pedal to stop the machine. Select left on the directional control lever. The wheels will start to realign for sideward mode. When the wheels are fully in position, press the accelerator pedal. The machine should now travel to the left. Release the accelerator pedal to stop the machine, select right

travel on the directional control lever and press the accelerator pedal. The machine should now travel to the right.

- **Check the steering** –With the machine switched on, turn the steering wheel fully clockwise and counter-clockwise. The steering should move easily in both directions, and not seem excessively stiff or loose.
- **Check the front wheel alignment** – With the machine switched on, select Forward/Reverse mode. The front wheels should align parallel to the sides of the truck. If the front wheels are out of alignment select Right/Left mode with the direction selection switch. Wait for the wheels to finish aligning then turn the steering wheel to fully extend both front steering cylinders. Hold this position for a few seconds. Now turn the steering wheel to fully retract both cylinders and hold this position for a few seconds. Select Forward/Reverse mode on the direction selection switch and wait for the wheels to finish aligning. Check the front wheel alignment. Both front wheels should be aligned parallel to the platforms.

Note

Do not attempt to correct the wheel alignment by adjusting the front master steering cylinder rod end before trying the procedure outlined above.

On completion of the inspection the operator should:

- Report any defect immediately to the supervisor / appropriate person.
- Never operate a lift truck that is in need of repair.
- Repairs should only be performed by authorised personnel.

In order to keep a record of these daily inspections it is advised that a daily inspection checklist like the one provided on the next page should be used when performing the checks. A copy of this checklist should be kept on file at all times in order to keep track of the machines service history as well as any faults that occur.

Note

Remember, in some countries, it is against the law NOT to perform these checks or keep a record of the inspections.



Customised Handling Solutions

Operators Daily Inspection Sheet

Model: _____	Serial No: _____
Date: _____	Shift No: _____

Inspect the Combilift before each shift. Should the Combilift be found to require servicing or if during the operation the Combilift malfunctions or becomes unsafe, stop the truck and report the situation immediately to the designated authority. DO NOT operate the Combilift or attempt to service it. Servicing is only to be conducted by a qualified technician.

Mark the Appropriate Box with **X** **OK** **Machine OK** **Service Required**

		Mon	Tues	Wed	Thurs	Fn	Sat	Sun
Visual Checks	Damage <i>Bent, Dented or Broken Parts</i>	OK	OK	OK	OK	OK	OK	OK
	Leaks <i>Tank, Valves, Fittings, Hoses, Transmission</i>	OK	OK	OK	OK	OK	OK	OK
	Tires <i>Chunks missing, Loose wheel nuts</i>	OK	OK	OK	OK	OK	OK	OK
	Forks <i>Bent, Damaged or Worn</i>	OK	OK	OK	OK	OK	OK	OK
	Mast (inc. Chains) <i>Damage, Signs of bending, loose chains</i>	OK	OK	OK	OK	OK	OK	OK
	Overhead Guard <i>Damage, Cracking</i>	OK	OK	OK	OK	OK	OK	OK
	Electric Motors (Wheels & Pump) <i>Smell</i>	OK	OK	OK	OK	OK	OK	OK
	Battery <i>Signs of damage or leaking, Electrolyte Level</i>	OK	OK	OK	OK	OK	OK	OK
	Electrical Connections/Terminals <i>Nuts & Bolts Present & Secure, Plugs Secure</i>	OK	OK	OK	OK	OK	OK	OK
	Hydraulic Oil Level <i>Acceptable Range</i>	OK	OK	OK	OK	OK	OK	OK
	Controller & Motor <i>Build up of leaves, dust or debris</i>	OK	OK	OK	OK	OK	OK	OK
	Hoses <i>Good Condition, No signs of wear</i>	OK	OK	OK	OK	OK	OK	OK
	Operational Checks	Safety Equipment <i>Horn, Operator Restraint, Reversing Bleeper</i>	OK	OK	OK	OK	OK	OK
Electric Motors (Wheels & Pump) <i>Runs smoothly, No unusual or excessive noise</i>		OK	OK	OK	OK	OK	OK	OK
Mode change <i>Wheels realign smoothly, no sticking</i>		OK	OK	OK	OK	OK	OK	OK
Travel <i>No unusual Noise, Smooth changes</i>		OK	OK	OK	OK	OK	OK	OK
Steering <i>No excessive play or restriction in either mode</i>		OK	OK	OK	OK	OK	OK	OK
Hydraulic Controls <i>Forks-Lift/lower, tilt, Aux functions</i>		OK	OK	OK	OK	OK	OK	OK
Rear Steering Chains <i>Checked daily and Lubricated every 250 Hours</i>		OK	OK	OK	OK	OK	OK	OK
Parking Brake <i>Functions and releases</i>		OK	OK	OK	OK	OK	OK	OK
Hour Meter Reading								
Operator Initials								
Supervisors Initials								

Notes (regarding repair, etc): _____

4.6: Front Drive Transmission

The lubricant used in the wheel drive transmissions must be non-corrosive, hypoid differential gear lubricant suitable for API GL-5 applications.

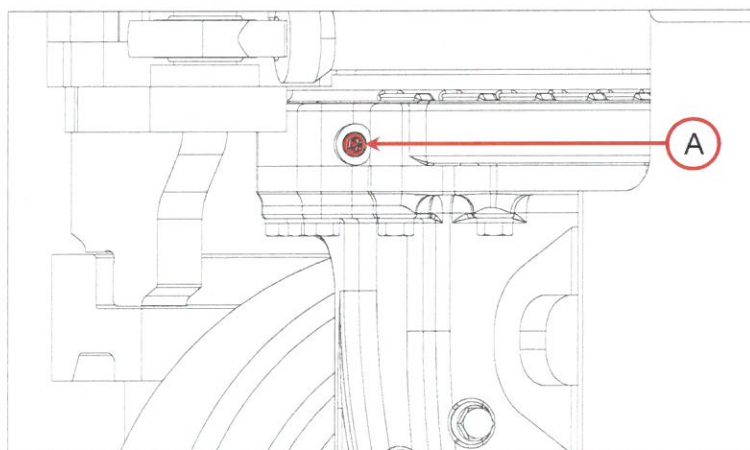
An initial oil change should be made after the first 100 hours of operation and subsequent changes should be made at intervals of every 2000 hours of operation.

In addition to the oil changes the oil level must be checked after every 500 hours of operation. If necessary the oil must be topped up to the required level with oil of the same type as that already contained in the transmission.

Combilift use: Maxol Gear Oil 80W/90

Checking the Front Drive Transmission Oil Level:

1. Select sideward mode (wheels at 90° to the sides of the truck) for left or right travel and turn the steering wheel in the appropriate direction to fully extend the front steering cylinders. This is the optimum position for gaining access to the oil plugs.
2. Switch off the trucks power using the key switch on the dash.
3. Ensure the transmission is cool enough to touch before proceeding.
4. Unscrew and remove the oil filler plug (A) from the top of the transmission using a 7mm Allen key. Check the oil level with a flashlight.
5. The oil should be up to the bottom of the filling hole. If necessary top up until oil starts to trickle from the hole. An oil funnel with a tube can be used to add oil.
6. Clean the filler plug and apply high-temperature red RTV silicone gasket maker to the threads. Refit the plug into the hole at the top of the transmission, then clean up any oil spills immediately.
 - **Oil Plug Tightening Torque: 22Nm (16 ft.lbs)**
7. Repeat steps 3-5 on the transmission on the opposite side.



Note

It is essential that the truck is level to ensure accurate oil level when checking and changing the oil.

Changing the Front Drive Transmission Oil:**Caution**

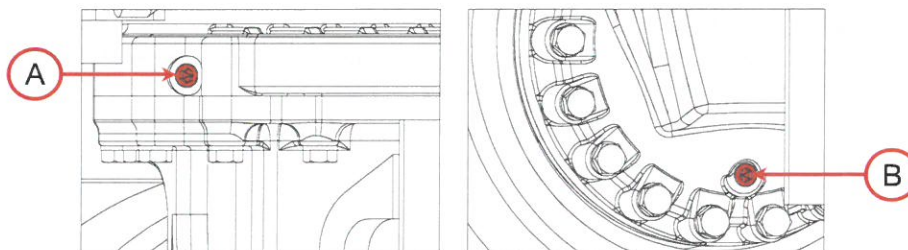
Surfaces and oil can be hot after continuous operation of the truck. Allow the front drive transmissions to cool sufficiently before changing the oil.

Note

Do not pour fluids into the ground, down a drain or into a stream, pond or lake. Observe relevant environmental protection regulations when disposing of oil, coolant, fuel, electrolyte and other harmful waste.

Procedure:

1. Drive the truck for a short period to warm up the oil.
2. Select sideward mode (wheels at 90° to the sides of the truck) for left or right travel and turn the steering wheel in the appropriate direction to fully extend the front steering cylinders. This is the optimum position for gaining access to the oil plugs.
3. Switch off the truck at the key switch on the dash.
4. Unscrew and remove the oil filling plug (A) from the top of the transmission using a 7mm Allen (male hexagonal) key.
5. Place a container under the oil drain plug (B) to collect the used oil then unscrew and remove the oil drain plug.



6. Allow approximately 5 minutes for the oil to drain completely.
7. Clean the drain plug (B) and apply high-temperature red RTV silicone gasket maker to the threads. Screw the plug into the hole at the bottom of the transmission.
 - *Oil Plug Tightening Torque: 22Nm (16 ft.lbs)*
8. Add fresh new oil of the recommended type to the transmission through the oil filler hole at the top. Stop when oil begins to trickle from the hole. An oil funnel with a tube can be used to add oil.
 - *Approximate Wheel Hub Transmission Oil Volume: 3.6L (3.8 quarts)*
9. Use a flashlight to check that the oil is level with the bottom of the filler hole.
10. Clean the filler plug (A) and apply high-temperature red RTV silicone gasket maker to the threads. Screw the plug into the hole at the top of the transmission, then clean up any oil spills immediately.
11. Check the oil level after a short period of operation and top up if required with oil of the same type as that in the transmission.
12. Repeat steps 4 to 11 on the transmission on the opposite side.

4.7: Rear Wheel Hub

The lubricant used in the rear wheel hub must be non-corrosive, hypoid differential gear lubricant suitable for API GL-5 applications.

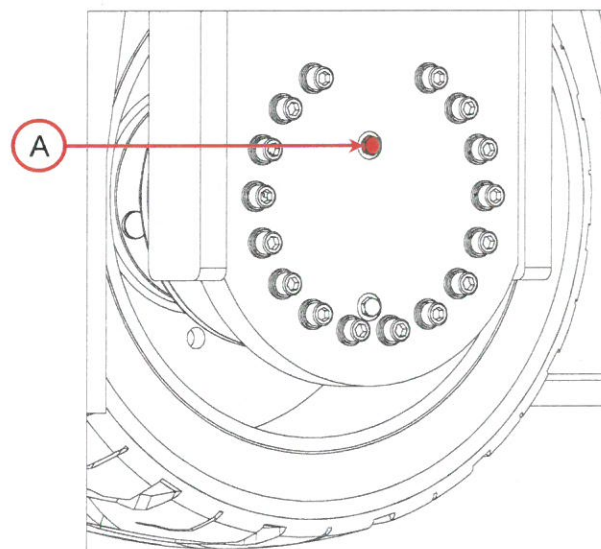
An initial oil change should be made after the first 100 hours of operation and subsequent changes should be made at intervals of every 2000 hours of operation.

In addition to the oil changes the oil level must be checked after every 500 hours of operation. If necessary the oil must be topped up to the required level with oil of the same type as that already contained in the transmission.

Combilift use: *Maxol Gear Oil 80W/90*

Checking the Rear Wheel Hub Oil Level:

1. Select forward or reverse mode (wheels parallel to the sides of the truck) then turn the steering wheel clockwise until the rear steering reaches full lock. This is the optimum position for gaining access to the oil plugs.
2. Switch off the trucks power using the key switch on the dash.
3. Ensure the wheel hub is cool enough to touch before proceeding.
4. Unscrew and remove the oil filler plug (A) from the rear swivel using an M14 spanner or socket. Check the oil level with a flashlight.
5. The oil should be up to the bottom of the filling hole. If necessary top up until oil starts to trickle from the hole. An oil funnel with a tube can be used to add oil.
6. Clean the filler plug and apply high-temperature red RTV silicone gasket maker to the threads. Refit the plug into the oil filler hole, then clean up any oil spills immediately.
 - **Oil Plug Tightening Torque: 17Nm (12 ft.lbs)**



Note

It is essential that the truck is level to ensure accurate oil level when checking and changing the oil.

Changing the Rear Wheel Hub Oil:**Caution**

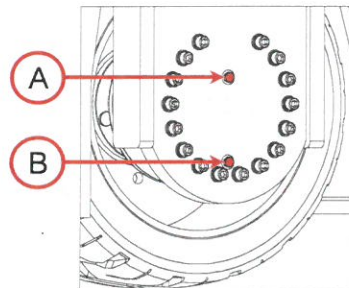
Surfaces and oil can be hot after continuous operation of the truck. Allow the rear wheel hub to cool sufficiently before changing the oil.

Note

Do not pour fluids into the ground, down a drain or into a stream, pond or lake. Observe relevant environmental protection regulations when disposing of oil, coolant, fuel, electrolyte and other harmful waste.

Procedure:

1. Drive the truck for a short period to warm up the oil.
2. Select forward or reverse mode (wheels parallel to the sides of the truck) then turn the steering wheel clockwise until the rear steering reaches full lock. This is the optimum position for gaining access to the oil plugs.
3. Switch off the trucks power using the key switch on the dash.
4. Unscrew and remove the oil filler plug (**A**) from the rear swivel using an M14 spanner or socket.
5. Place a container under the oil drain plug (**B**) to collect the used oil then unscrew and remove the oil drain plug.



6. Allow approximately 5 minutes for the oil to drain completely.
7. Clean the drain plug (**B**) and apply high-temperature red RTV silicone gasket maker to the threads. Screw the plug into the hole at the bottom of the transmission.
 - *Oil Plug Tightening Torque: 17Nm (12 ft.lbs)*
8. Add fresh new oil of the recommended type to the transmission through the oil filler hole at the top. Stop when oil begins to trickle from the hole. An oil funnel with a tube can be used to add oil.
 - *Approximate Wheel Hub Transmission Oil Volume: 2.5L (2.64 quarts)*
9. Use a flashlight to check that the oil is level with the bottom of the filler hole.
10. Clean the filler plug (**A**) and apply high-temperature red RTV silicone gasket maker to the threads. Screw the plug into the hole at the top of the transmission, then clean up any oil spills immediately.
11. Check the oil level after a short period of operation and top up if required with oil of the same type as that in the hub.

4.8: Maintenance Schedule

In order to keep the Combilift in optimum working condition it is necessary to service the truck at regular intervals. The Chart below details the intervals (in hours of machine operation) at which maintenance tasks should be performed.

Action	Service Interval (Hrs)				
	Daily	250	500	2000	5000
Check Electric Pump Motor	•				
Check Electric Wheel Motors & Transmission	•				
Check All Electrical Connections/Terminals	•				
Check All Nuts And Bolts Are Present & Secure	•				
Check Front Drive Transmission Oil Level			•		
Check Rear Wheel Hub Oil Level			•		
Change Front Drive Transmission Oil				•	
Change Rear Wheel Hub Oil				•	
Check Motor Mounts & Mounting Bolts			•		
Check Pump Mounting Bolts			•		
Check Cooling Fan	•				
Check Hydraulic Oil Level	•				
Change Hydraulic Oil					•
Change Hydraulic Return Filter Cartridge			•		
Change Hydraulic In-Tank Strainer Filter					•
Check Battery Electrolyte levels	•				
Check Swivel Bearings (Slew Rings)			•		
Check Mast Bearings	•				
Check Mast Chains	•				
Lubricate & Adjust Mast Chains		•			
Grease Mast Channels		•			
Check Wheel Nuts	•				
Torque Wheel Nuts		•			
Check Hydraulic Hoses for Leaks	•				
Check Hydraulic Hoses for Signs of Wear	•				
250 hours = 4months, 500 hours = 8 months 2000 hours = 24 months, 5000 hours = 80 months					

Grease All Points Indicated on the Grease Point Chart Weekly. (See 4.14: on page 40)

4.9: Battery Safety Guidelines

It is important to note that there are a number of safety guidelines that **MUST** be adhered to when working with the batteries of the Combilift electric lift truck in order to ensure operator safety.



Warning



Lead Acid Batteries contain Sulphuric acid, which can damage skin or eyes on contact. Always wear the correct protective clothing when topping up batteries, including a face shield to protect the eyes and rubber gloves to protect the skin. Should acid contact the eyes or skin flush out / wash immediately with water and seek medical attention



Warning



Lead Acid Batteries produce flammable and explosive gases. Keep all arcs, sparks, flames and lighted tobacco away from the batteries never smoke in or near to the battery charging area



Caution

Always read the instruction manual before using charger and only use either the charger that is supplied with the machine or one that is certified by Combilift for use with the machine.



Caution

Ensure that the charger is in the pause mode before disconnecting the charger cable from the battery plug.



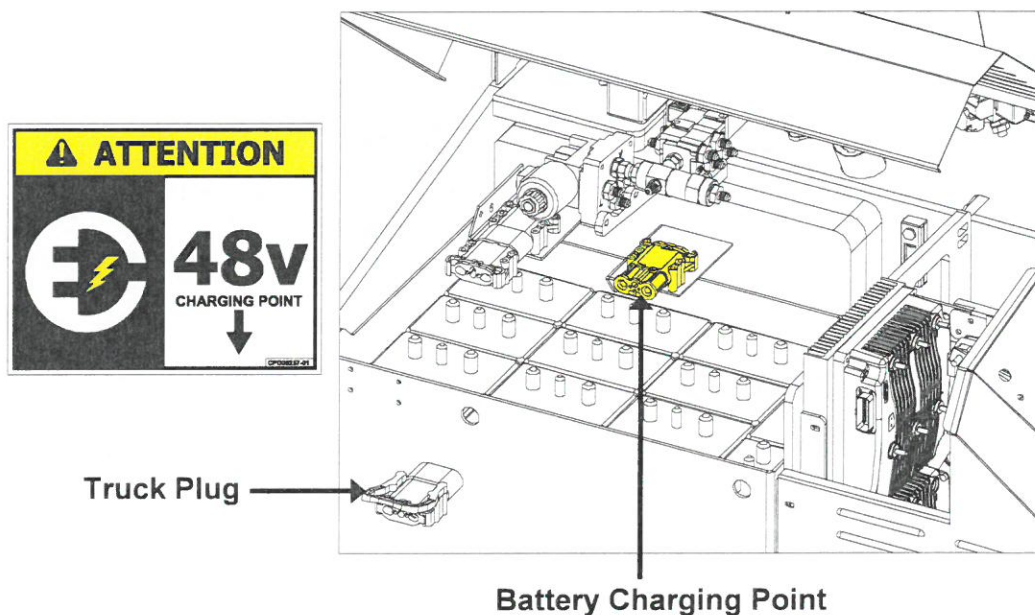
Caution

Always connect the charger to the battery. Never connect the charger directly to the machine via the plug terminals

4.10: Battery Charging

When charging the batteries on your Combilift, always adhere to the recommended charging procedure below and details as stated in the manual supplied with charger.

- Park the Combilift in a designated battery charging area.
- Open the bonnet on the right hand side of the Combilift.
- Disconnect the truck plug from the battery plug.
- Check that the battery voltage corresponds to the voltage indicated on the charger-rating label.
- Check the charger cable for damage such as frayed leads or broken connectors.
- Check that the charger is switched on and the ammeter is working.
- If the cable is free from damage attach the charger plug to the battery plug highlighted in yellow in the diagram below. Charging will then start automatically
- The charger will now reset itself and perform a self-test routine. During this period the LED is illuminated amber. Then after a delay of approximately four seconds the charging current will flow, indicated by the appropriate LED indication as shown in the charger manual.
- If it is necessary to disconnect the charger before battery has fully charged the pause button **MUST** be pressed in order to stop current flow. The Operator then has 10 minutes to disconnect the charger from the battery before charging will automatically recommence.
- When charging has finished the Charger displays that the battery plug can now be removed from the charger (LED illuminates solid green). Disconnect the charger lead from the battery plug and store the lead in a safe place.
- Reconnect the truck plug to the battery plug and close the bonnet securely.



4.11: Battery Maintenance

It is essential that the Batteries on the Combilift be well maintained in order to ensure truck efficiency and improve the working life of the batteries. In order to ensure the batteries are in their best working condition, take the following steps.

- Ensure the Battery cover is always closed when the truck is not being charged. This helps to keep unwanted dirt and moisture off the tops of the batteries.
- Ensure that the batteries electrolyte levels are within the acceptable range.



Caution



Ensure that the hoist that is being used to lift the batteries has sufficient capacity to lift the batteries.

Should the batteries require changing, it is advised that the following procedure should be used.



Caution



Always replace old batteries with new batteries that are of the same size and weight as the originals. Lighter batteries will affect the capacity of the truck. Heavier batteries will cause damage to other components.

4.12: Battery Removal

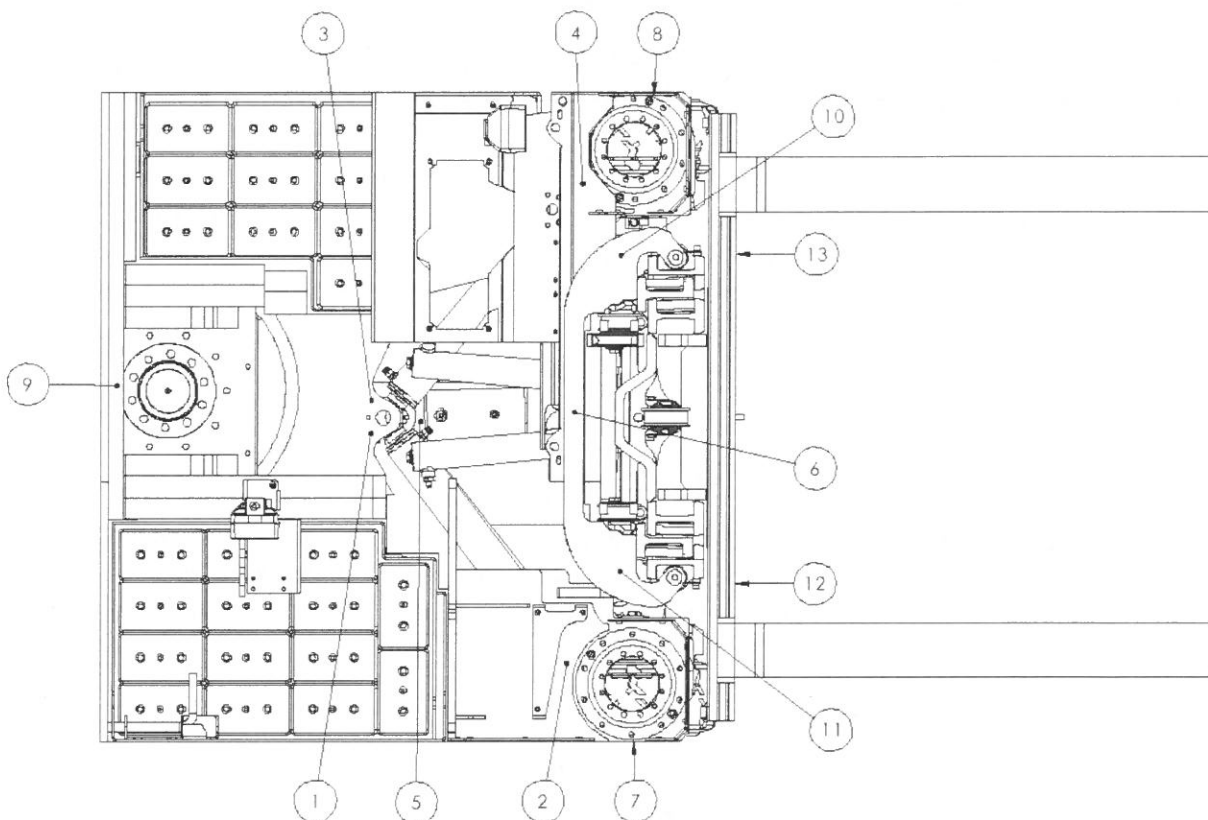
- Park the Combilift in the designated battery bay.
- Open the bonnet/ battery cover of the Combilift.
- Disconnect the battery plug from the machine
- By means of a pallet truck or other such take the battery out of the Combilift, ensuring that all personnel remain at a safe distance from the raised battery.
- Insure that conductive material does not come in contact and link the battery posts as this may cause a short circuit that could result in an explosion.
- As soon as the battery has been manoeuvred away from the machine lower it onto a pallet and have it stored ready for disposal.

4.13: Battery Installation

- Park the Combilift in the designated battery bay.
- By means of a pallet truck or other such devise lift the battery so that the connector is facing in the correct direction.
- Fit the battery into place.

4.14: Grease Point Chart

Lubricate all of the points indicated on the chart below on a weekly basis using the appropriate EP2 Grease. Also lubricate all grease points on the mast and any attachments that may be fitted to the Combilift.



- | | |
|------------------------------|-------------------------------|
| 1. Front Right Steering Back | 2. Front Right Steering Front |
| 3. Front Left Steering Back | 4. Front Left Steering Front |
| 5. Mast Tilt Back | 6. Mast Tilt Front |
| 7. Front Right Swivel | 8. Front Left Swivel |
| 9. Rear Swivel | 10. Mast Mounting Pin Left |
| 11. Mast Mounting Pin Right | 12. Fork Side shift Right |
| 13. Fork Side shift Left | |

4.15: Putting a Truck in Storage

- To prevent problems, the lift truck must be correctly serviced and maintained during storage.
- Components that need extra care during storage are electric motors, hydraulic cylinders and batteries.
- The best form of protection is to operate the truck for a short period at regular intervals.
- The truck must be stored in an area that is clean, cool and dry and has minimal dust and vibration. There must be adequate free space around the truck to perform all checks and operations.
- The temperature in the storage area should be between +5 °C and +40 °C without any sudden changes. The relative humidity should be below 50%.
- The electric pump motor and traction motors must be operated to keep them free of rust. The frequency of operation depends on the on relative humidity of the storage environment. If the relative humidity is greater than 60% the motors must be operated weekly. Operate the truck for at least five minutes.
- Before operating, perform the daily/pre-operation inspection. Take care of any problems immediately. Also, check the fluid level in the hydraulic tank.
- Disconnect the battery plug from the truck plug during storage and charge the battery. A fully charged battery must be available at all times to operate the truck.
- Charge the batteries every month and check the electrolyte levels when the batteries are fully charged. Top up with distilled water if necessary.
- Before putting the truck back into service charge the battery and check the electrolyte levels.



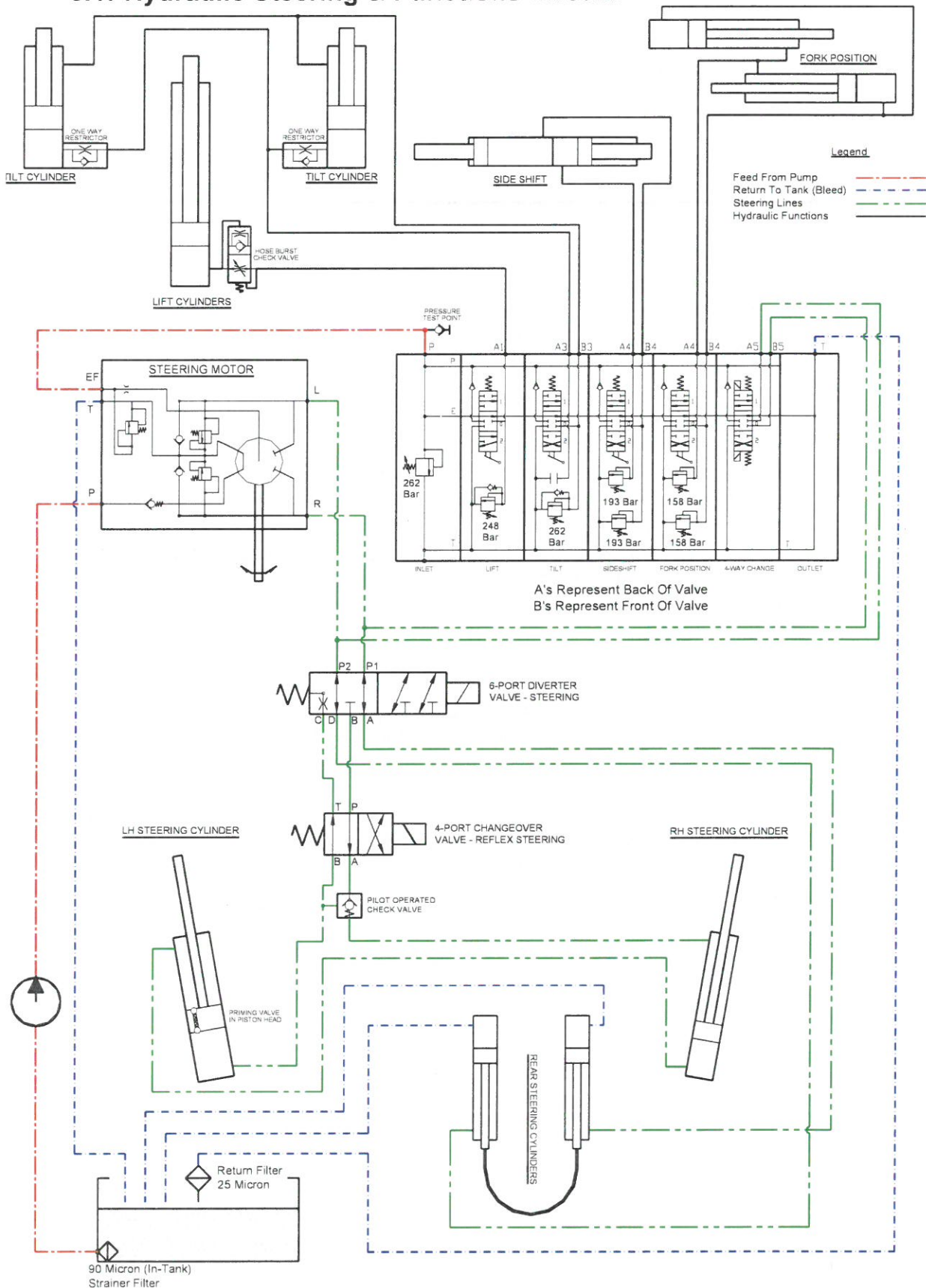
Caution

Never connect the charger directly to the machine via the plug terminals

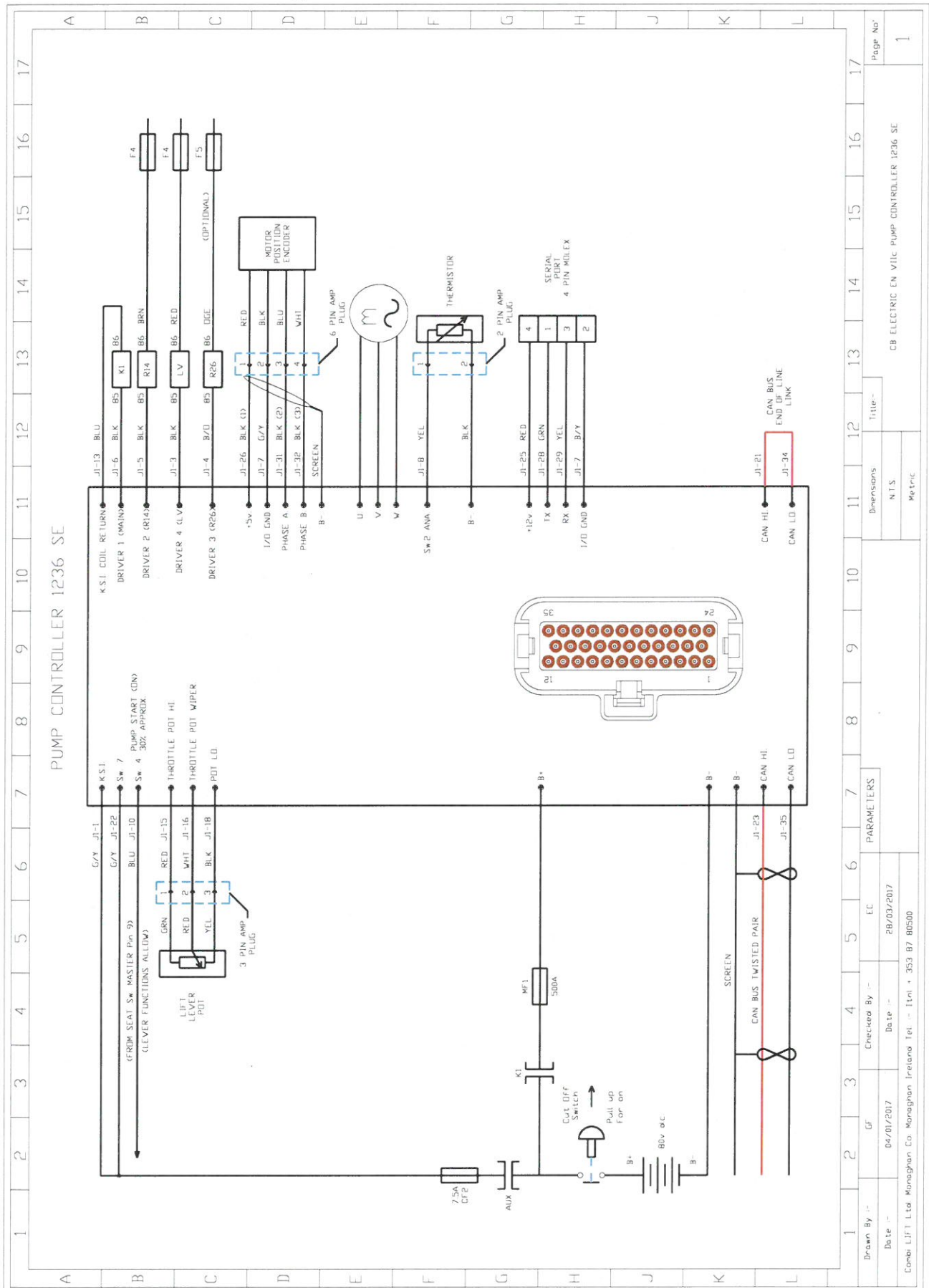
- All hydraulic cylinders should be put through a complete operation cycle several times each month where possible. This will help keep the seals active. Fully extend and retract each cylinder where possible.
- To protect the cylinder rods, park the truck with all cylinders fully retracted where possible. Lower the mast fully and tilt fully forward.
- Cover any exposed area of the hydraulic cylinder rods with a protective cover or coating such as 'denso tape' to inhibit corrosion.

Section 5: Circuit Diagrams

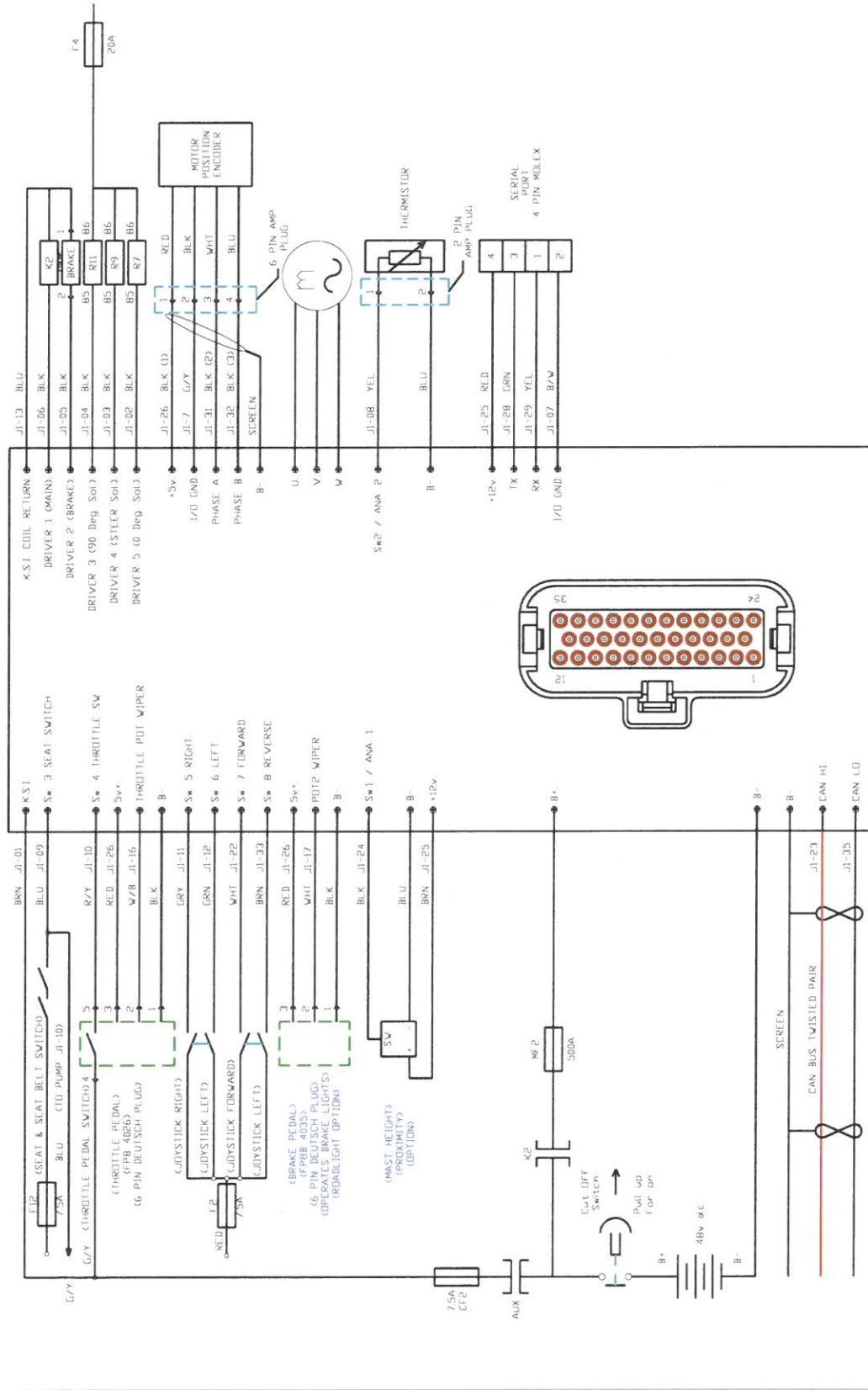
5.1: Hydraulic Steering & Functions Circuit:



5.2: Electric Wiring Circuit:

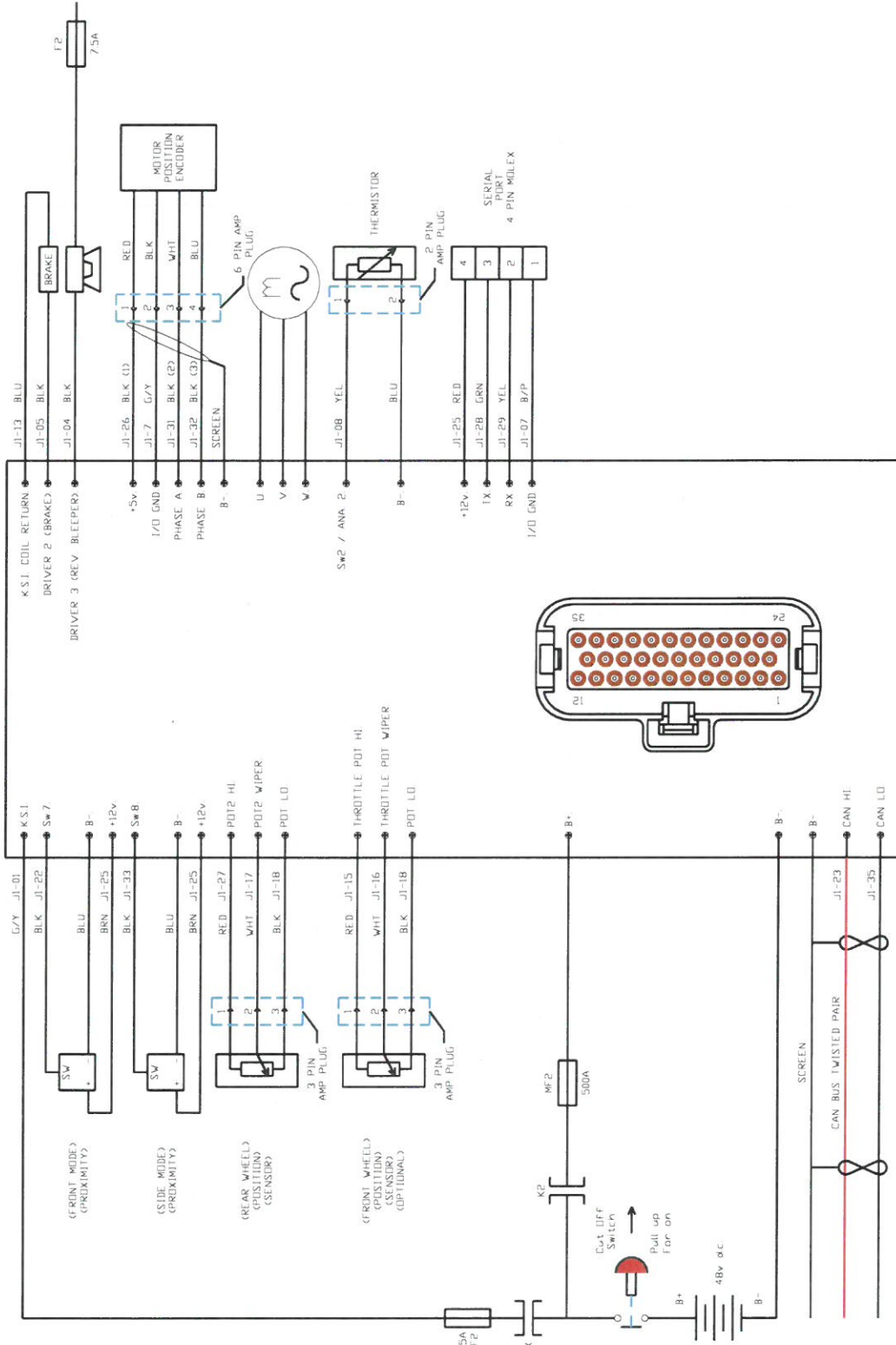


TRACTION MASTER CONTROLLER 1232 SE

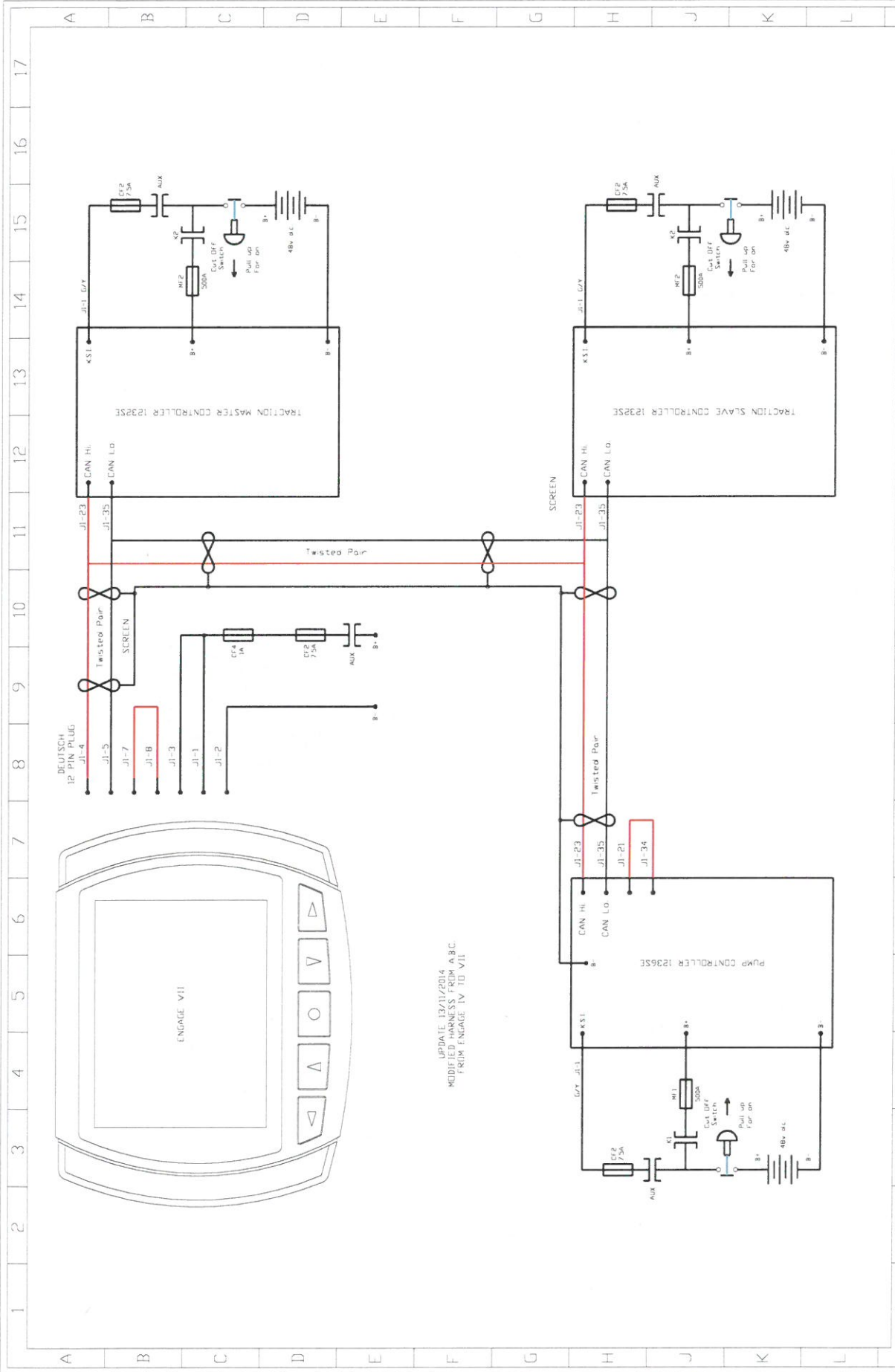


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Combi LIFT Ltd. Monaghan Co. Monaghan Ireland Tel: +353 87 805300																	

TRACTION SLAVE CONTROLLER 1232 SE

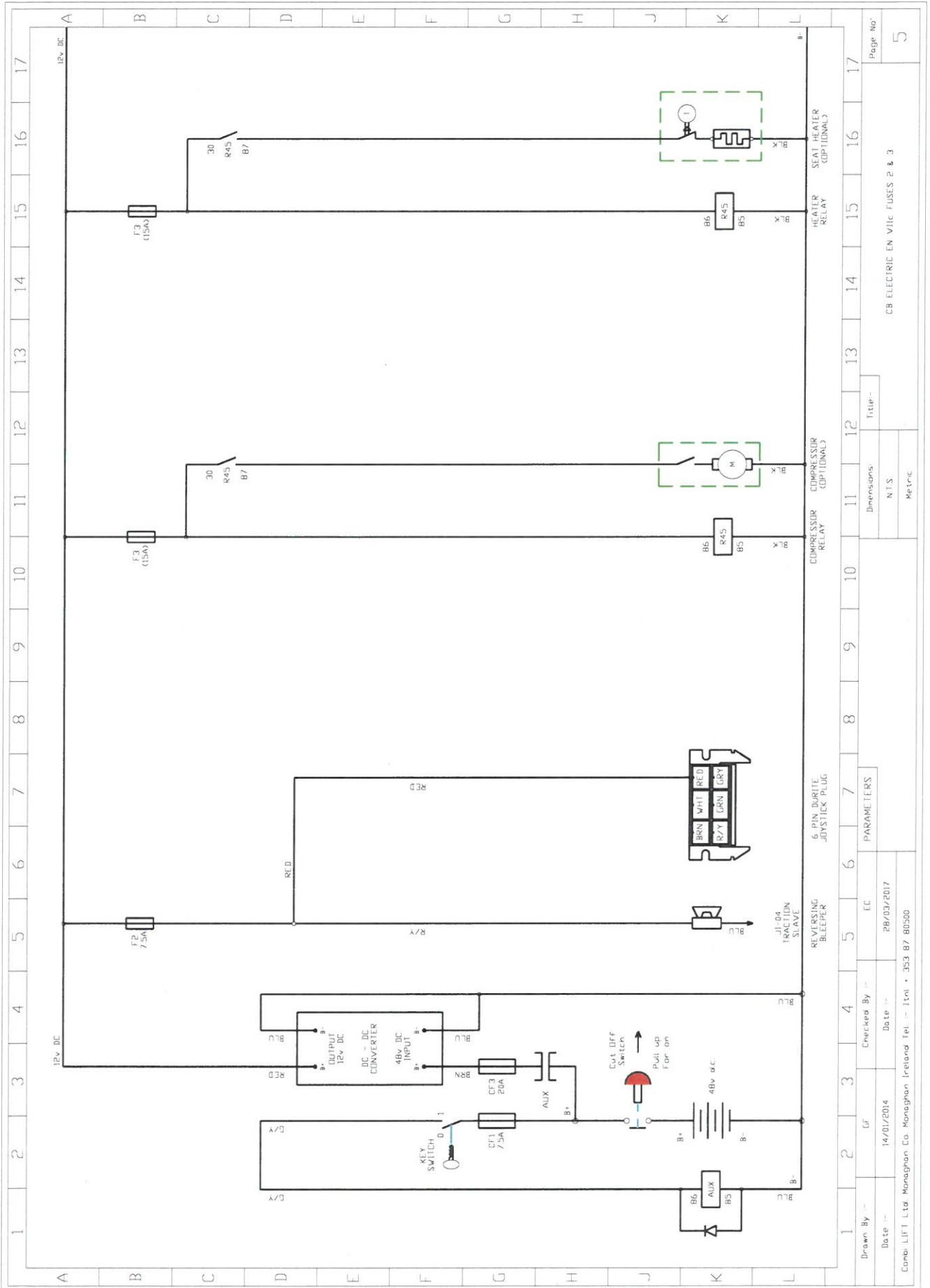


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Combi LIFT Ltd Monaghan Co. Monaghan Ireland Tel :- Intl + 353 87 80500																



UPDATE 13/11/2014
 MODIFIED HARNESS FROM A.B.C.
 FROM ENGAGE IV TO VII

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CB ELECTRIC EN VILIC FUSES 2 & 3

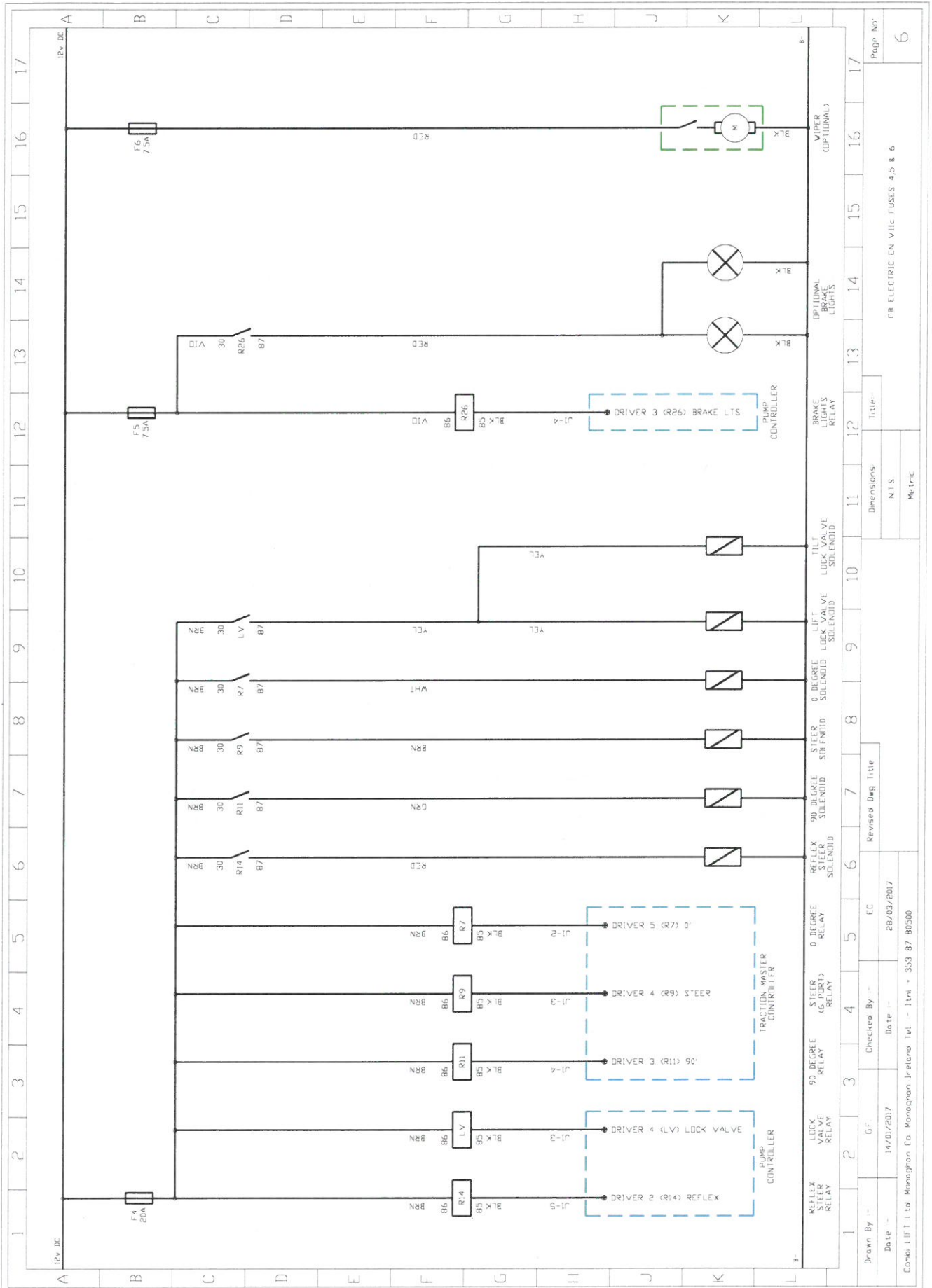
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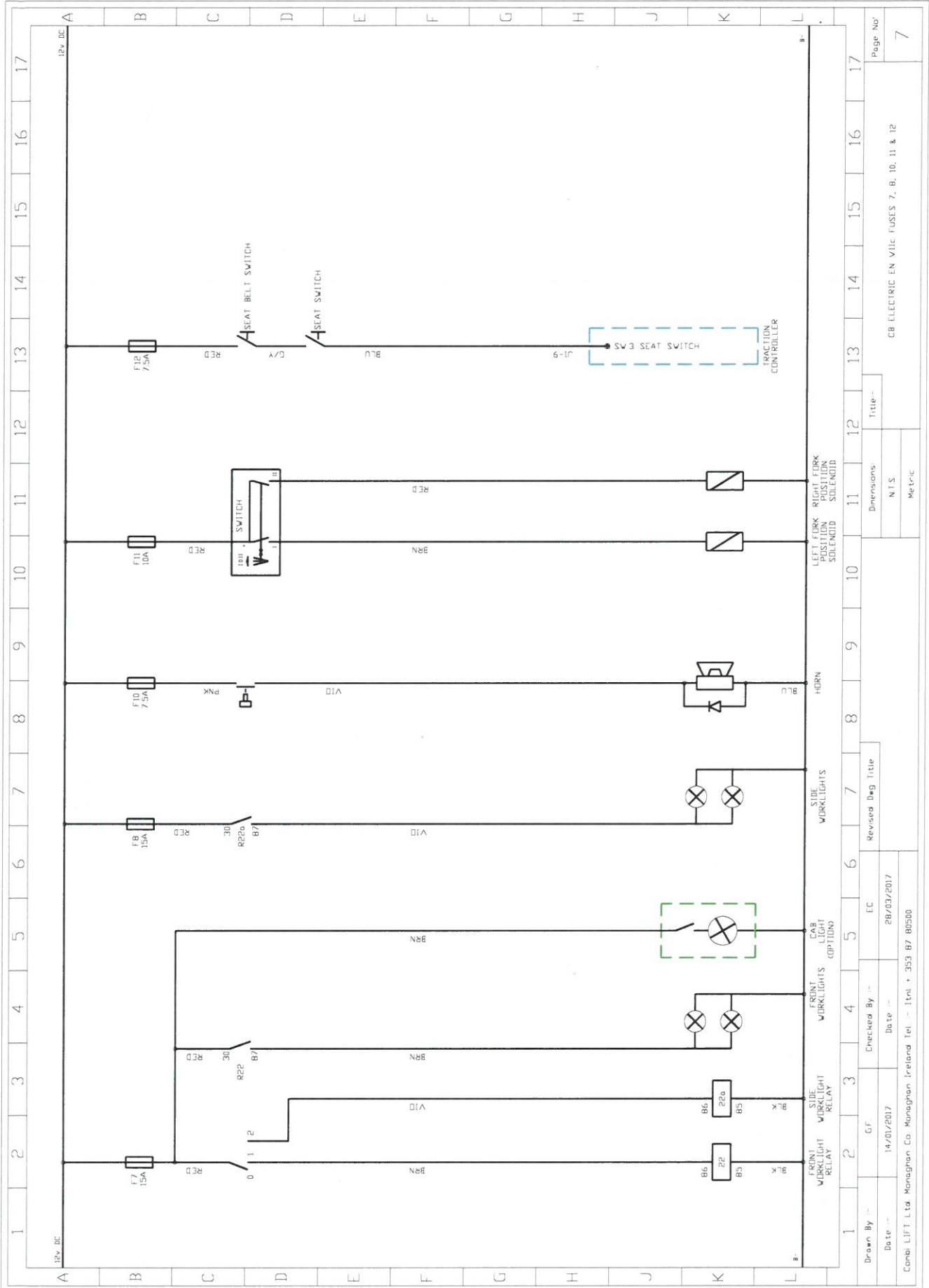
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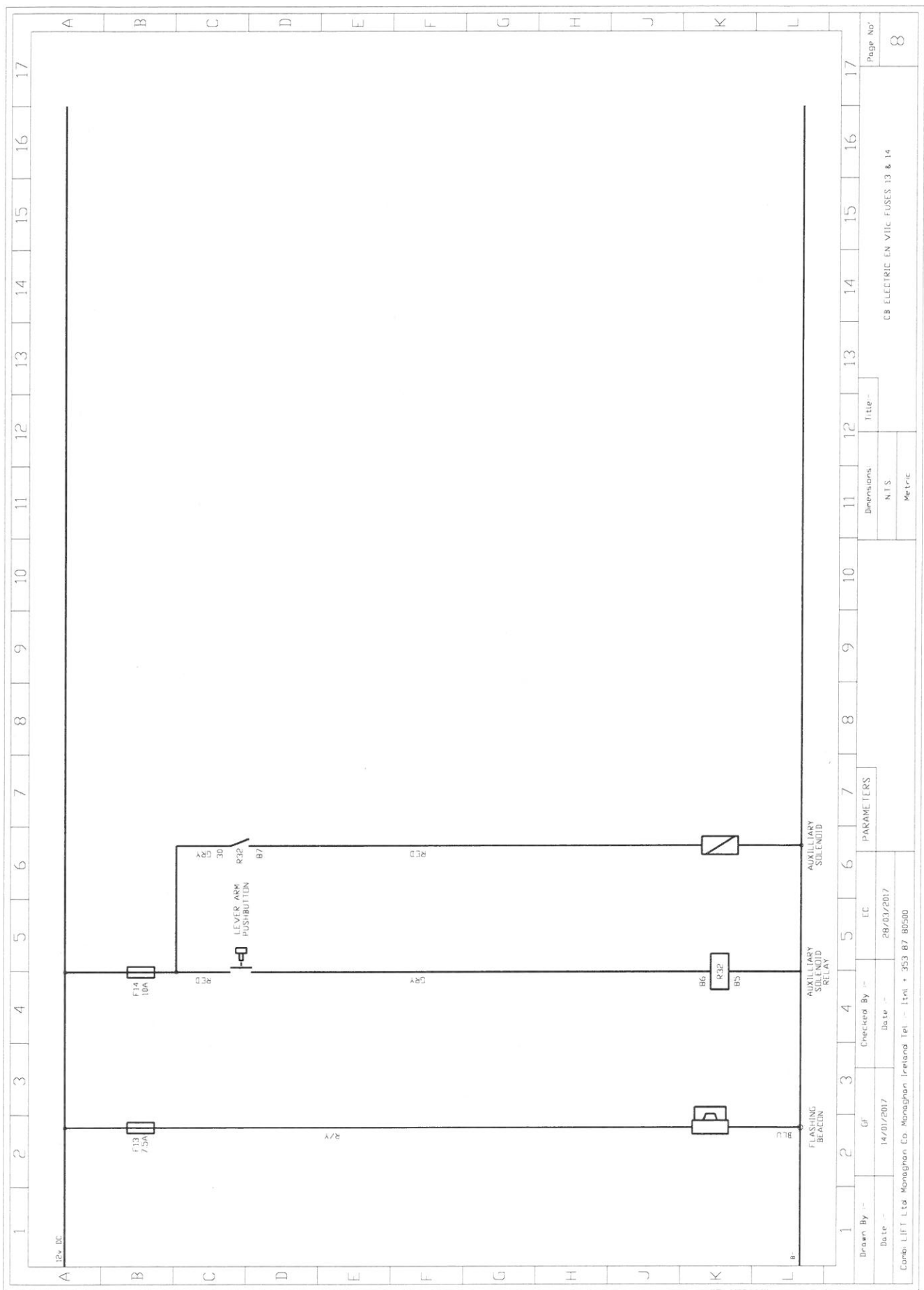
Drawn By: GF
Date: 14/01/2014

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CB ELECTRIC EN V11C FUSES 13 & 14

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Metric	

PARAMETERS

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Date :-	14/01/2017	Date :-	28/03/2017

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Section 6: Controller Diagnostics & Troubleshooting

The motor controllers detect a wide variety of faults or error conditions. Faults can be detected by the operating system or by the VCL (Vehicle Control Language) code. This section describes the faults detected by the operating system.

6.1: Diagnostics

There are two methods of obtaining diagnostics information:

1. By reading the display on a 1313 handheld or 1314 PC programmer.
2. By observing the fault codes issued by the status LEDs.

See Table 6.1 for a summary of LED display formats.

The 1313/1314 programmer will display all faults that are currently set as well as a history of the faults that have been set since the history log was last cleared. The programmer displays the faults by name.

The pair of LEDs built into the controller (one red, one yellow) produce flash codes displaying all the currently set faults in a repeating cycle. Each code consists of two digits. The red LED flashes once to indicate that the first digit of the code will follow; the yellow LED then flashes the appropriate number of times for the first digit. The red LED flashes twice to indicate that the second digit of the code will follow; the yellow LED flashes the appropriate number of times for the second digit.

Example: Battery Under voltage (code 23).

In the Fault menu of the 1313/1314 programmer, the words **Under voltage Cutback** will be displayed; the real-time battery voltage is displayed in the Monitor menu (“Key switch Voltage”).

The controller’s two LEDs will display this repeating pattern:

red	yellow	red	yellow
*	* *	* *	* * *
(first digit)	(2)	(second digit)	(3)

The numerical codes used by the yellow LED are listed in the troubleshooting chart (Table 6.2), which also lists possible fault causes and describes the conditions that set and clear each fault.

Summary of LED display formats

The two LEDs have four different display modes, indicating the type of information they are providing.

DISPLAY	STATUS
Neither LED illuminated	Controller is not powered on; or vehicle has dead battery; or severe damage.
Yellow LED flashing	Controller is operating normally.
Yellow and red LEDs both on solid	Controller is in Flash program mode.
Red LED on solid	No software loaded, or an internal hardware fault detected by the Supervisor or Primary microprocessor. Cycle KSI to clear. Reload software or replace controller if necessary.
Red LED and yellow LED flashing alternately	Controller has detected a fault. 2-digit code flashed by yellow LED identifies the specific fault; one or two flashes by red LED indicate whether first or second code digit will follow.

6.2: Troubleshooting

The troubleshooting chart, Table 6.2, provides the following information on all the controller faults:

- fault code
- fault name as displayed on the programmer's LCD
- the effect of the fault
- possible causes of the fault
- fault set conditions
- fault clear conditions.

Whenever a fault is encountered and no wiring or vehicle fault can be found, turn the Key switch (KSI) to the 'OFF' position then back to the 'ON' position to see if the fault clears. If it does not, turn off the KSI and remove the 35-pin connector from the motor. Check the connector for corrosion or damage, clean it if necessary, and re-insert it.

Table 6.2 Troubleshooting Chart

CODE	PROGRAMMER LCD DISPLAY EFFECT OF FAULT	POSSIBLE CAUSE	SET/CLEAR CONDITIONS
12	Controller Overcurrent <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>FullBrake.</i>	<ol style="list-style-type: none"> External short of phase U,V, or W motor connections. Motor parameters are mis-tuned. Controller defective. Speed encoder noise problems. 	<i>Set:</i> Phase current exceeded the current measurement limit. <i>Clear:</i> Cycle KSI.
13	Current Sensor Fault <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>FullBrake.</i>	<ol style="list-style-type: none"> Leakage to vehicle frame from phase U, V, or W (short in motor stator). Controller defective. 	<i>Set:</i> Controller current sensors have invalid offset reading. <i>Clear:</i> Cycle KSI.
14	Precharge Failed <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>FullBrake.</i>	<ol style="list-style-type: none"> See Monitor menu» Battery: Capacitor Voltage. External load on capacitor bank (B+ connection terminal) that prevents the capacitor bank from charging. 	<i>Set:</i> Precharge failed to charge the capacitor bank to the KSI voltage. <i>Clear:</i> Cycle Interlock input or use VCL function <i>Enable_Precharge()</i> .
15	Controller Severe Undertemp <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>FullBrake.</i>	<ol style="list-style-type: none"> See Monitor menu» Controller: Temperature. Controller is operating in an extreme environment. 	<i>Set:</i> Heatsink temperature below -40°C. <i>Clear:</i> Bring heatsink temperature above -40°C, and cycle interlock or KSI.
16	Controller Severe Overtemp <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>FullBrake.</i>	<ol style="list-style-type: none"> See Monitor menu» Controller: Temperature. Controller is operating in an extreme environment. Excessive load on vehicle. 	<i>Set:</i> Heatsink temperature above +95°C. <i>Clear:</i> Bring heatsink temperature below +95°C, and cycle interlock or KSI.
17	Severe B+ Undervoltage <i>Reduced drive torque.</i>	<ol style="list-style-type: none"> Battery Menu parameters are misadjusted. Non-controller system drain on battery. Battery resistance too high. Battery disconnected while driving. See Monitor menu» Battery: Capacitor Voltage. Blown B+ fuse or main contactor did not close. 	<i>Set:</i> Capacitor bank voltage dropped below the Severe Undervoltage limit (see page 58) with FET bridge enabled. <i>Clear:</i> Bring capacitor voltage above Severe Undervoltage limit.
18	Severe B+ Overvoltage <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>FullBrake.</i>	<ol style="list-style-type: none"> See Monitor menu» Battery: Capacitor Voltage. Battery menu parameters are misadjusted. Battery resistance too high for given Battery disconnected while regen braking. 	<i>Set:</i> Capacitor bank voltage exceeded the Severe Overvoltage limit with FET bridge enabled. <i>Clear:</i> Bring capacitor voltage below Severe Overvoltage limit, and then

Table 6.2 Troubleshooting Chart continued

CODE	PROGRAMMER LCD DISPLAY EFFECT OF FAULT	POSSIBLE CAUSE	SET/CLEAR CONDITIONS
22	Controller Overtemp Cutback <i>Reduced drive and brake torque.</i>	<ol style="list-style-type: none"> 1. See Monitor menu» Controller: Temperature. 2. Controller is performance-limited at this temperature. 3. Controller is operating in an extreme environment. 4. Excessive load on vehicle. 5. Improper mounting of controller. 	<p><i>Set:</i> Heatsink temperature exceeded 85°C. <i>Clear:</i> Bring heatsink temperature below 85°C.</p>
23	Undervoltage Cutback <i>Reduced drive torque.</i>	<ol style="list-style-type: none"> 1. Normal operation. Fault shows that the batteries need recharging. Controller is performance limited at this voltage. 2. Battery parameters are misadjusted. 3. Non-controller system drain on battery. 4. Battery resistance too high. 5. Battery disconnected while driving. 6. See Monitor menu» Battery: Capacitor Voltage. 7. Blown B+ fuse or main contactor did not close. 	<p><i>Set:</i> Capacitor bank voltage dropped below the Undervoltage limit (see page 58) with the FET bridge enabled. <i>Clear:</i> Bring capacitor voltage above the Undervoltage limit.</p>
24	Overvoltage Cutback <i>Reduced brake torque.</i> <i>Note: This fault is declared only when the controller is running in regen.</i>	<ol style="list-style-type: none"> 1. Normal operation. Fault shows that regen braking currents elevated the battery voltage during regen braking. Controller is performance limited at this voltage. 2. Battery parameters are misadjusted. 3. Battery resistance too high for given regen current. 4. Battery disconnected while regen braking. 5. See Monitor menu» Battery: Capacitor Voltage. 	<p><i>Set:</i> Capacitor bank voltage exceeded the Overvoltage limit (see page 58) with the FET bridge enabled. <i>Clear:</i> Bring capacitor voltage below the Overvoltage limit.</p>
25	+5V Supply Failure <i>None, unless a fault action is programmed in VCL.</i>	<ol style="list-style-type: none"> 1. External load impedance on the +5V supply (pin 26) is too low. 2. See Monitor menu» outputs: 5 Volts and Ext Supply Current. 	<p><i>Set:</i> +5V supply (pin 26) outside the +5V±10% range. <i>Clear:</i> Bring voltage within range.</p>
26	Digital Out 6 Open/Short <i>Digital Output 6 driver will not turn on.</i>	<ol style="list-style-type: none"> 1. External load impedance on Digital Output 6 driver (pin 19) is too low. 	<p><i>Set:</i> Digital Output 6 (pin 19) current exceeded 15 mA. <i>Clear:</i> Remedy the overcurrent cause and use the VCL function <i>Set_DigOut()</i> to turn the driver on again.</p>
27	Digital Out 7 Open/Short <i>Digital Output 7 driver will not turn on.</i>	<ol style="list-style-type: none"> 1. External load impedance on Digital Output 7 driver (pin 20) is too low. 	<p><i>Set:</i> Digital Output 7 (pin 20) current exceeded 15 mA. <i>Clear:</i> Remedy the overcurrent cause and use the VCL function <i>Set_DigOut()</i> to turn the driver on again.</p>

Table 6.2 Troubleshooting Chart continued

CODE	PROGRAMMER LCD DISPLAY EFFECT OF FAULT	POSSIBLE CAUSE	SET/CLEAR CONDITIONS
28	Motor Temp Hot Cutback <i>Reduced drive torque.</i>	<ol style="list-style-type: none"> 1. Motor temperature is at or above the programmed Temperature Hot setting, and the current is being cut back. 2. Motor Temperature Control Menu parameters are mis-tuned. 3. See Monitor menu » Motor: Temperature and »Inputs: Analog2. 4. If the application doesn't use a motor thermistor, Temp Compensation and Temp Cutback should be programmed Off. 	<p><i>Set:</i> Motor temperature is at or above the Temperature Hot parameter setting.</p> <p><i>Clear:</i> Bring the motor temperature within range.</p>
29	Motor Temp Sensor Fault <i>MaxSpeed reduced (LOS, Limited Operating Strategy), and motor temperature cutback disabled.</i>	<ol style="list-style-type: none"> 1. Motor thermistor is not connected properly. 2. If the application doesn't use a motor thermistor, Motor Temp Sensor Enable should be programmed Off. 3. See Monitor menu » Motor: Temperature and »Inputs: Analog2. 	<p><i>Set:</i> Motor thermistor input (pin 8) is at the voltage rail (0 or 10V).</p> <p><i>Clear:</i> Bring the motor thermistor input voltage within range.</p>
31	Coil1 Driver Open/Short <i>ShutdownDriver1.</i>	<ol style="list-style-type: none"> 1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or faulty wiring. 	<p><i>Set:</i> Driver 1 (pin 6) is either open or shorted. This fault can be set only when Main Enable = Off.</p> <p><i>Clear:</i> Correct open or short, and cycle driver.</p>
31	Main Open/Short <i>ShutdownMotor; ShutdownMainContactor; ShutdownEMBrake; ShutdownThrottle; FullBrake.</i>	<ol style="list-style-type: none"> 1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or faulty wiring. 	<p><i>Set:</i> Main contactor driver (pin 6) is either open or shorted. This fault can be set only when Main Enable = On.</p> <p><i>Clear:</i> Correct open or short, and cycle driver</p>
32	Coil2 Driver Open/Short <i>ShutdownDriver2.</i>	<ol style="list-style-type: none"> 1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or faulty wiring. 	<p><i>Set:</i> Driver 2 (pin 5) is either open or shorted. This fault can be set only when EM Brake Type = 0.</p> <p><i>Clear:</i> Correct open or short, and cycle driver.</p>
32	EMBrake Open/Short <i>ShutdownEMBrake; ShutdownThrottle; FullBrake.</i>	<ol style="list-style-type: none"> 1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or faulty wiring. 	<p><i>Set:</i> Electromagnetic brake driver (pin 5) is either open or shorted. This fault can be set only when EM Brake Type > 0.</p> <p><i>Clear:</i> Correct open or short, and cycle driver.</p>
33	Coil3 Driver Open/Short <i>ShutdownDriver3.</i>	<ol style="list-style-type: none"> 1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or faulty wiring. 	<p><i>Set:</i> Driver 3 (pin 4) is either open or shorted.</p> <p><i>Clear:</i> Correct open or short, and cycle driver.</p>
34	Coil4 Driver Open/Short <i>ShutdownDriver4.</i>	<ol style="list-style-type: none"> 1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or faulty wiring. 	<p><i>Set:</i> Driver 4 (pin 3) is either open or shorted.</p> <p><i>Clear:</i> Correct open or short, and cycle driver.</p>
35	PD Open/Short <i>ShutdownPD.</i>	<ol style="list-style-type: none"> 1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or faulty wiring. 	<p><i>Set:</i> Proportional driver (pin 2) is either open or shorted.</p> <p><i>Clear:</i> Correct open or short, and cycle driver.</p>

Table 6.2 Troubleshooting Chart continued

CODE	PROGRAMMER LCD DISPLAY EFFECT OF FAULT	POSSIBLE CAUSE	SET/CLEAR CONDITION
36	Encoder Fault <i>ShutdownEMBrake;</i> <i>ShutdownThrottle.</i>	1. Motorencoder failure. 2. Bad crimps or faulty wiring. 3. See Monitor menu» Motor: Motor RPM.	<i>Set:</i> Motor encoder phase failure detected. <i>Clear:</i> Cycle KSI.
37	Motor Open <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>FullBrake.</i>	1. Motor phase is open. 2. Bad crimps or faulty wiring.	<i>Set:</i> Motor phase U, V, or W detected open. <i>Clear:</i> Cycle KSI.
38	Main Contactor Welded <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>FullBrake.</i>	1. Main contactor tips are welded closed. 2. Motor phase U or V is disconnected or open. 3. An alternate voltage path (such as an external precharge resistor) is providing a current to the capacitor bank (B+ connection terminal).	<i>Set:</i> Just prior to the main contactor closing, the capacitor bank voltage (B+ connection terminal) was loaded for a short time and the voltage did not discharge. <i>Clear:</i> Cycle KSI
39	Main Contactor Did Not Close <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>FullBrake.</i>	1. Main contactor did not close. 2. Main contactor tips are oxidized, burned, or not making good contact. 3. External load on capacitor bank (B+ connection terminal) that prevents capacitor bank from charging. 4. Blown B+ fuse.	<i>Set:</i> With the main contactor commanded closed, the capacitor bank voltage (B+ connection terminal) did not charge to B+. <i>Clear:</i> Cycle KSI.
41	Throttle Wiper High <i>ShutdownThrottle.</i>	1. See Monitor menu» Inputs: Throttle Pot. 2. Throttle pot wiper voltage too high.	<i>Set:</i> Throttle pot wiper (pin 16) voltage is higher than the high fault threshold (can be changed with the VCL function <i>Setup_Pot_Faults()</i>). <i>Clear:</i> Bring throttle pot wiper voltage below the fault threshold.
42	Throttle Wiper Low <i>ShutdownThrottle.</i>	1. See Monitor menu» Inputs: Throttle Pot. 2. Throttle pot wiper voltage too low.	<i>Set:</i> Throttle pot wiper (pin 16) voltage is lower than the low fault threshold (can be changed with the VCL function <i>Setup_Pot_Faults()</i>). <i>Clear:</i> Bring throttle pot wiper voltage above the fault threshold.
43	Pot2 Wiper High <i>FullBrake.</i>	1. See Monitor menu» Inputs: Pot2 Raw. 2. Pot2 wiper voltage too high.	<i>Set:</i> Pot2 wiper (pin 17) voltage is higher than the high fault threshold (can be changed with the VCL function <i>Setup_Pot_Faults()</i>). <i>Clear:</i> Bring Pot2 wiper voltage below the faultthreshold.
44	Pot2 Wiper Low <i>FullBrake.</i>	1. See Monitor menu»Inputs: Pot2 Raw. 2. Pot2 wiper voltage too low.	<i>Set:</i> Pot2 wiper (pin 17) voltage is lower than the low fault threshold (can be changed with the VCL function <i>Setup_Pot_Faults()</i>). <i>Clear:</i> Bring Pot2 wiper voltage above the fault threshold.

Table 6.2 Troubleshooting Chart continued

CODE	PROGRAMMER LCD DISPLAY EFFECT OF FAULT	POSSIBLE CAUSE	SET/CLEAR CONDITIONS
45	Pot Low Overcurrent <i>ShutdownThrottle;</i> <i>FullBrake.</i>	<ol style="list-style-type: none"> 1. See Monitor menu» Outputs: Pot Low. 2. Combined pot resistance connected to pot low is too low. 	<i>Set:</i> Potlow (pin 18) current exceeds 10mA. <i>Clear:</i> Clear pot low overcurrent condition and cycle KSI.
46	EEPROM Failure <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>ShutdownInterlock;</i> <i>ShutdownDriver1;</i> <i>ShutdownDriver2;</i> <i>ShutdownDriver3;</i> <i>ShutdownDriver4;</i> <i>ShutdownPD;</i> <i>FullBrake.</i>	<ol style="list-style-type: none"> 1. Failure to write to EEPROM memory. This can be caused by EEPROM memory writes initiated by VCL, by the CAN bus, by adjusting parameters with the programmer, or by loading new software into the controller. 	<i>Set:</i> Controller operating system tried to write to EEPROM memory and failed. <i>Clear:</i> Download the correct software (OS) and matching parameter default settings into the controller and cycle KSI.
47	HPD/Sequencing Fault <i>ShutdownThrottle.</i>	<ol style="list-style-type: none"> 1. KSI, interlock, direction, and throttle inputs applied in incorrect sequence. 2. Faulty wiring, crimps, or switches at KSI, interlock, direction, or throttle inputs. 	<i>Set:</i> HPD (High Pedal Disable) or sequencing fault caused by incorrect sequence of KSI, interlock, direction, and throttle inputs. <i>Clear:</i> Reapply inputs in correct sequence.
47	Emer Rev HPD <i>ShutdownThrottle;</i> <i>ShutdownEMBrake.</i>	<ol style="list-style-type: none"> 1. Emergency Reverse operation has concluded, but the throttle, forward and reverse inputs, and interlock have not been returned to neutral. 	<i>Set:</i> At the conclusion of Emergency Reverse, the fault was set because various inputs were not returned to neutral. <i>Clear:</i> If EMR_Interlock = On, clear the interlock, throttle, and direction inputs. If EMR_Interlock = Off, clear the throttle and direction inputs.
49	Parameter Change Fault <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>FullBrake.</i>	<ol style="list-style-type: none"> 1. This is a safety fault caused by a change in certain parameter settings so that the vehicle will not operate until KSI is cycled. For example, if a user changes the Throttle Type this fault will appear and require cycling KSI before the vehicle can operate. 	<i>Set:</i> Adjustment of a parameter setting that requires cycling of KSI. <i>Clear:</i> Cycle KSI.
51–67	OEM Faults (See OEM documentation.)	<ol style="list-style-type: none"> 1. These faults can be defined by the OEM and are implemented in the application-specific VCL code. See OEM documentation. 	<i>Set:</i> See OEM documentation. <i>Clear:</i> See OEM documentation.

Table 6.2 Troubleshooting Chart continued

CODE	PROGRAMMER LCD DISPLAY EFFECT OF FAULT	POSSIBLE CAUSE	SET/CLEAR CONDITIONS
68	VCL Run Time Error <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>ShutdownInterlock;</i> <i>ShutdownDriver1;</i> <i>ShutdownDriver2;</i> <i>ShutdownDriver3;</i> <i>ShutdownDriver4;</i> <i>ShutdownPD;</i> <i>FullBrake.</i>	<ol style="list-style-type: none"> VCL code encountered a runtime VCL error Controller is performance-limited See Monitor menu » Controller: VCL Error Module and VCL Error. This error can then be compared to the runtime VCL module ID and error code definitions found in the specific OS system information file. 	<p><i>Set:</i> Runtime VCL code error condition</p> <p><i>Clear:</i> Edit VCL application software to fix this error condition; flash the new compiled software and matching parameter defaults; cycle KSI.</p>
69	External Supply Out of Range <i>None, unless a fault action is programmed in VCL</i>	<ol style="list-style-type: none"> External load on the 5V and 12V supplies draws either too much or too little current. Fault Checking Menu parameters Ext Supply Max and Ext Supply Min are mistuned. See Monitor menu » Outputs: Ext Supply Current. 	<p><i>Set:</i> The external supply current (combined current used by the 5V supply [pin 26] and 12V supply [pin 25]) is either greater than the upper current threshold or lower than the lower current threshold. The two thresholds are defined by the External Supply Max and External Supply Min parameter settings (page 53).</p> <p><i>Clear:</i> Bring the external supply current within range.</p>
71	OS General <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>ShutdownInterlock;</i> <i>ShutdownDriver1;</i> <i>ShutdownDriver2;</i> <i>ShutdownDriver3;</i> <i>ShutdownDriver4;</i> <i>ShutdownPD;</i> <i>FullBrake.</i>	<ol style="list-style-type: none"> Internal controller fault. 	<p><i>Set:</i> Internal controller fault detected.</p> <p><i>Clear:</i> Cycle KSI.</p>
72	PDO Timeout <i>ShutdownThrottle;</i> <i>CAN NMT State set to Pre-operational.</i>	<ol style="list-style-type: none"> Time between CAN PDO messages received exceeded the PDO Timeout Period. 	<p><i>Set:</i> Time between CAN PDO messages received exceeded the PDO Timeout Period.</p> <p><i>Clear:</i> Cycle KSI or receive CAN NMT message.</p>
73	Stall Detected <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>Control Mode changed to LOS (Limited Operating Strategy).</i>	<ol style="list-style-type: none"> Stalled motor. Motor encoder failure. Bad crimps or faulty wiring. Problems with power supply for the motor encoder. See Monitor menu » Motor: Motor RPM. 	<p><i>Set:</i> No motor encoder movement detected.</p> <p><i>Clear:</i> Either cycle KSI, or detect valid motor encoder signals while operating in LOS mode and return Throttle Command = 0 and Motor RPM = 0.</p>

Table 6.2 Troubleshooting Chart continued

CODE	PROGRAMMER LCD DISPLAY EFFECT OF FAULT	POSSIBLE CAUSE	SET/CLEAR CONDITIONS
74	Fault On Other Traction Controller	Dual Drive fault: see Dual Drive manual.	
75	Dual Severe Fault	Dual Drive fault: see Dual Drive manual.	
77	Supervisor Fault <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>ShutdownInterlock;</i> <i>ShutdownDriver1;</i> <i>ShutdownDriver2;</i> <i>ShutdownDriver3;</i> <i>ShutdownDriver4;</i> <i>ShutdownPD;</i> <i>FullBrake.</i>	<ol style="list-style-type: none"> 1. The Supervisor has detected a mismatch in redundant readings. 2. Internal damage to Supervisor microprocessor. 3. Switch inputs allowed to be within upper and lower thresholds for over over 100 milliseconds. 	<i>Set:</i> Mismatched redundant readings; damaged Supervisor; illegal switch inputs. <i>Clear:</i> Check for noise or voltage drift in all switch inputs; check connections; cycle KSI.
78	Supervisor Incompatible <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>ShutdownInterlock;</i> <i>ShutdownDriver1;</i> <i>ShutdownDriver2;</i> <i>ShutdownDriver3;</i> <i>ShutdownDriver4;</i> <i>ShutdownPD;</i> <i>FullBrake.</i>	1. The main OS is not compatible with the Supervisor OS.	<i>Set:</i> Incompatible software. <i>Clear:</i> Load properly matched OS code or update the Supervisor code; cycle KSI.
82	Bad Calibrations <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>FullBrake.</i>	1. Internal controller fault.	<i>Set:</i> Internal controller fault detection. <i>Clear:</i> Cycle KSI.
83	Driver Supply Fault <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>FullBrake.</i>	1. Internal controller fault in the voltage supply for the driver circuits.	<i>Set:</i> Internal controller fault detection. <i>Clear:</i> Cycle KSI.

Table 6.2 Troubleshooting Chart continued

CODE	PROGRAMMER LCD DISPLAY EFFECT OF FAULT	POSSIBLE CAUSE	SET/CLEAR CONDITIONS
87	Motor Characterization Fault <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>FullBrake.</i>	1. Motor characterization failed during characterization process. See Monitor menu » Controller: Motor Characterization Error for cause: 0 = none 1 = encoder signal seen, but step size not determined; set Encoder Step Size manually. 2 = motor temp sensor fault. 3 = motor temp hot cutback fault. 4 = controller overtemp cutback fault. 5 = controller undertemp cutback fault. 6 = undervoltage cutback fault. 7 = severe overvoltage fault. 8 = encoder signal not seen, or one or both channels missing. 9 = motor parameters out of characterization range.	<i>Set:</i> Motor characterization failed during the motor characterization process. <i>Clear:</i> Correct fault; cycle KSI.
88	Encoder Pulse Error <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>ShutdownInterlock;</i> <i>ShutdownDriver1;</i> <i>ShutdownDriver2;</i> <i>ShutdownDriver3;</i> <i>ShutdownDriver4;</i> <i>ShutdownPD;</i> <i>FullBrake.</i>	1. Encoder Steps parameter does not match the actual motor encoder.	<i>Set:</i> Motor lost IFO control and accelerated without throttle command. <i>Clear:</i> Ensure the Encoder Steps parameter matches the actual encoder; cycle KSI.
89	Motor Type Fault <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>FullBrake.</i>	1. The Motor_Type parameter value is out of range.	<i>Set:</i> Motor_Type parameter is set to an illegal value. <i>Clear:</i> Set Motor_Type to correct value and cycle KSI.
91	VCL/OS Mismatch <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>ShutdownInterlock;</i> <i>ShutdownDriver1;</i> <i>ShutdownDriver2;</i> <i>ShutdownDriver3;</i> <i>ShutdownDriver4;</i> <i>ShutdownPD;</i> <i>FullBrake.</i>	1. The VCL software in the controller does not match the OS software in the controller.	<i>Set:</i> VCL and OS software do not match; when KSI cycles, a check is made to verify that they match and a fault is issued when they do not. <i>Clear:</i> Download the correct VCL and OS software into the controller.

Table 6.2 Troubleshooting Chart continued

CODE	PROGRAMMER LCD DISPLAY EFFECT OF FAULT	POSSIBLE CAUSE	SET/CLEAR CONDITIONS
92	EM Brake Failed to Set <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>Position Hold is engaged when Interlock=On.</i>	<ol style="list-style-type: none"> 1. Vehicle movement sensed after the EM Brake has been commanded to set. 2. EM Brake will not hold the motor from rotating. 	<p><i>Set:</i> After the EM Brake was commanded to set and time has elapsed to allow the brake to fully engage, vehicle movement has been sensed.</p> <p><i>Clear:</i> Activate the throttle.</p>
93	Encoder LOS (Limited Operating Strategy) <i>Enter LOS control mode</i>	<ol style="list-style-type: none"> 1. Limited Operating Strategy (LOS) control mode has been activated, as a result of either an Encoder Fault (Code 36) or a Stall Detect Fault (Code 73). 2. Motor encoder failure. 3. Bad crimps of faulty wiring. 4. Vehicle is stalled. 	<p><i>Set:</i> Encoder Fault (Code 36) or Stall Detect Fault (Code 73) was activated and Brake or Interlock has been applied to activate LOS control mode, allowing limited motor control.</p> <p><i>Clear:</i> Cycle KSI or, if LOS mode was activated by the Stall Fault, clear by ensuring encoder senses proper operation, Motor RPM = 0 and Throttle Command = 0</p>
94	EMR Rev Timeout <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i>	<ol style="list-style-type: none"> 1. Emergency Reverse was activated and concluded because the EMR Timeout timer has expired. 2. The emergency reverse input is stuck On. 	<p><i>Set:</i> Emergency Reverse was activated and ran until the EMR Timeout timer expired.</p> <p><i>Clear:</i> Turn the emergency reverse input Off.</p>
98	Illegal Model Number <i>ShutdownMotor;</i> <i>ShutdownMainContactor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>FullBrake.</i>	<ol style="list-style-type: none"> 1. Model_Number variable contains illegal value. 2. Software and hardware do not match. 3. Controller defective. 	<p><i>Set:</i> Illegal Model_Number variable; when KSI cycles, a check is made to confirm a legal Model_Number and a fault is issued if one is not found.</p> <p><i>Clear:</i> Download appropriate software for your controller model.</p>
99	Dualmotor Parameter Mismatch	Dual Drive fault: see Dual Drive manual.	

Section 7: Warranty Registration

The warranty registration form can be filled in and submitted online at:

www.combilift.com/warranty

Please complete the warranty registration online within 30 days of receipt of the truck.

Alternatively the warranty registration form on the following page can be used.

WARRANTY REGISTRATION FORM



Please complete the form below and return this to us within 30 days of delivery to Customer.
Form can be submitted online @ www.combilift.com/warranty

DEALER DETAILS: (Supplier)

Dealer Name: _____ Tel: _____
First Name: _____ Last Name: _____
E-mail: _____ Position/Role: _____
Street: _____ Address Line 2: _____
City: _____ Zip/Postal Code: _____
County/State: _____ Country: _____

MACHINE DETAILS

MODEL: _____ SERIAL NO.
Delivery / installation date: __ / __ / ____

CUSTOMER DETAILS (please state address where truck is located)

Customer Business Name: _____ Tel: _____
First Name: _____ Last Name: _____
E-mail: _____ Position/Role: _____
Street: _____ Address Line 2: _____
City: _____ Zip/Postal Code: _____
County/State: _____ Country: _____

I have received my Aisle-Master/Combilift forklift and read the Operators Manual and am satisfied with both.

*Customer's Signature: _____ Date: _____

WHEN COMPLETED PLEASE RETURN TO:

BY POST TO: Combilift, Gallinagh, Monaghan, County Monaghan, Ireland.

BY EMAIL TO: warranty@combilift.com

Failure to complete Warranty Registration Form may impact the Warranty Claim Process.

