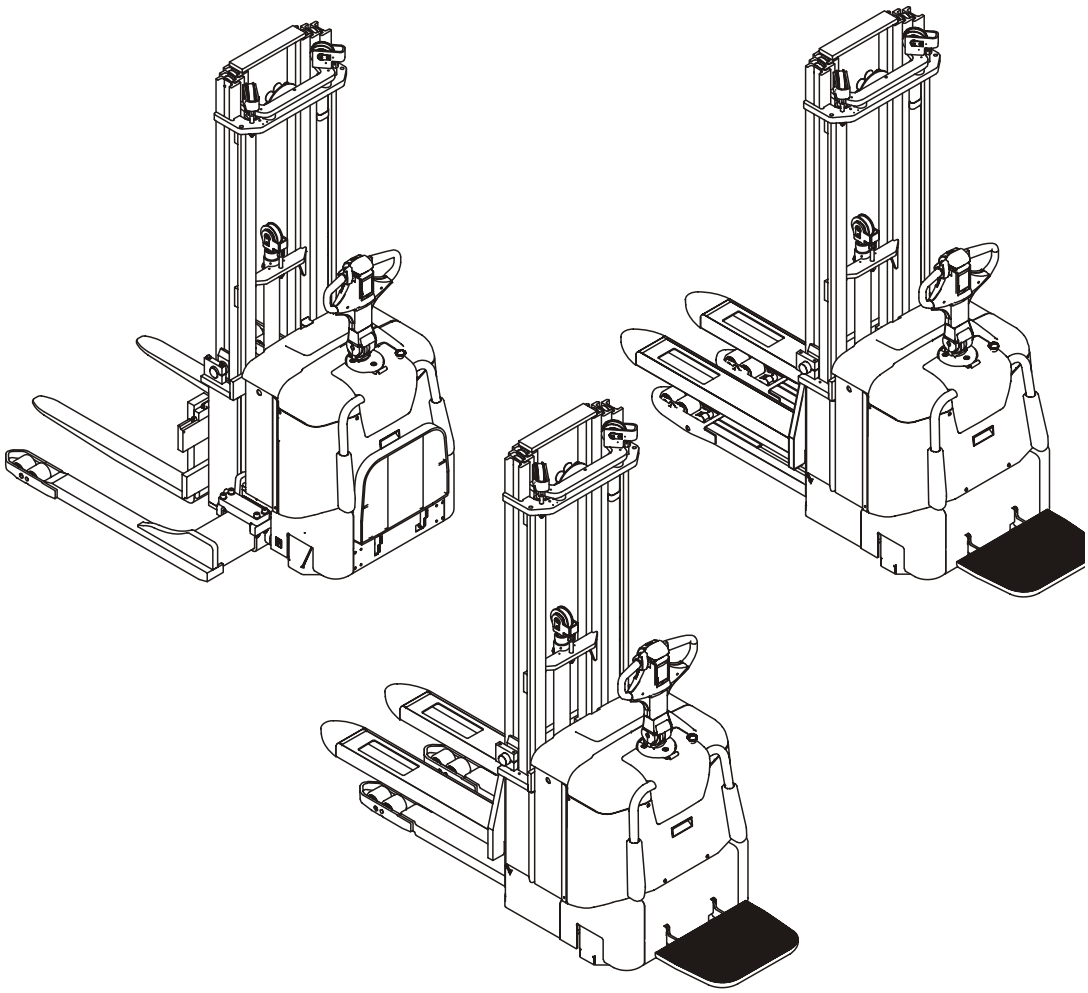
Service Manual

en



7SLL12.5, 7SLL16, 7SLL20, 7SLL13.5S, 7SLL12.5F, 7SLL16F, 7SLL20F

Valid from serial number: 985777-

Order number: 249896-040
Issued: 2007-05-11 ITS

TOYOTA
INDUSTRIAL EQUIPMENT

Order number	Date	Valid from serial number	T-code
249896-040	2007-05-11	985777-	789, 790, 791, 817, 818

2-Technical data

Table 1: Technical data

Drive motor	
Type	TSL140B-DS41
Output	1,7 kW
Duty cycle	S2, 60 min
Minimum carbon brush length	13 mm
Nominal commutator diameter	Ø63 mm
Minimum commutator diameter	Ø60 mm
Resistance, shunt field winding, at 25 C°	0,498 Ω (26C°)
Resistance armature winding, at 24 °C	0,0161 Ω (26C°)
Insulation resistance between the windings and motor casing	>= 1 Mohm
Weight	17 kg
Brake	
Type	BFK458-12
Braking force	32 Nm
Output	40 W
Resistance coil	14,4 Ω
Nominal play in actuated position	0,3-0,5 mm
Minimum thickness brake disc	8,8 mm
Thickness of a new brake disc	10,0 mm
Transmission/drive gear	
Type	2-stage angle transmission
Gear ratio	16,29:1
Oil volume	1,0 litre
Oil type	Hypoid oil
Oil type at normal temperature	SAE 80W/90
Oil type at temperature < -15^{o}C	SAE 75W

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3.2 Cleaning and washing

Cleaning and washing of the truck is important to assure a high level of reliability.

- Clean and wash the truck once a week.

NOTE!
Risk of short-circuiting.
The electrical system can become damaged.
Prior to washing, be sure to disconnect the battery by disconnecting the battery connector.

3.2.1 External cleaning

- Remove dirt, chips, etc. from the wheels daily.
- Use a well-known degreasing agent, diluted to a suitable concentration.
- Wash off loose dirt using lukewarm water.

NOTE!
Seizure, corrosion.
Mechanical parts could become damaged.
Following washing of the truck, lubricate it according to the lubrication schedule in the Maintenance section.

3.2.2 Cleaning the motor compartment

- Prior to washing, cover all electric motors, connectors and valves.

NOTE!
Risk of short-circuiting.
The electrical system can become damaged.
Electric components must not be washed with a high-pressure jet.

- Wash the motor compartment with a well-known degreasing agent diluted to a suitable concentration.
- Wash off loose dirt using lukewarm water.

3.2.3 Electric components

- Use compressed air to blow clean the electric motors.
- Clean electric panels, logic cards, connectors, valves, etc. with a rag moistened with water and a suitable detergent.

NOTE!
Risk of short-circuiting.
Electric components can become damaged.
Avoid breaking the warranty seals on the logic cards.

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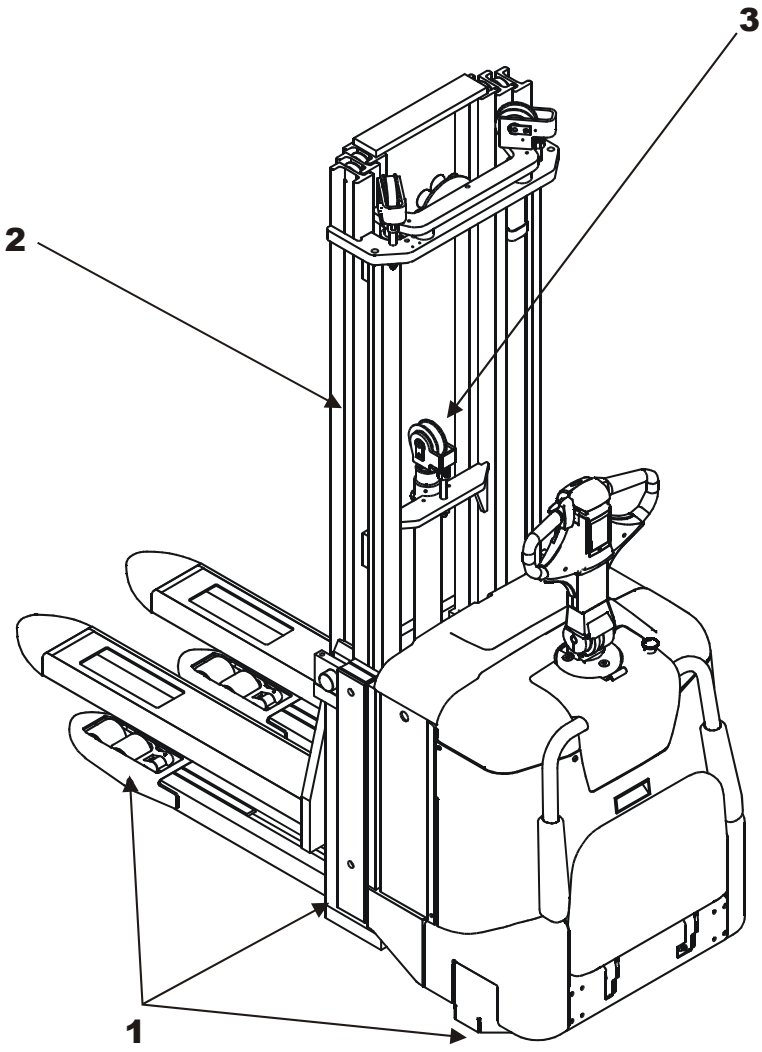

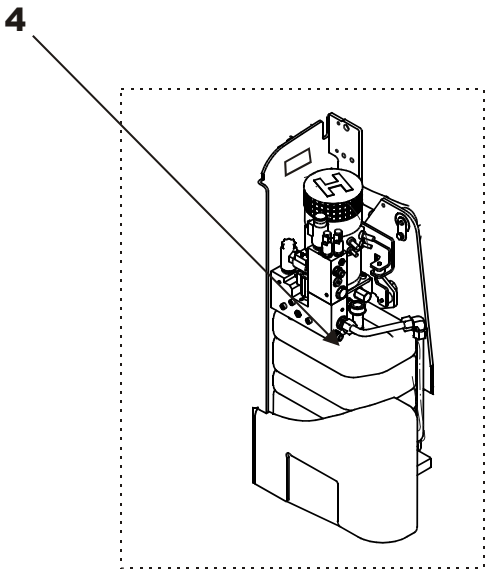

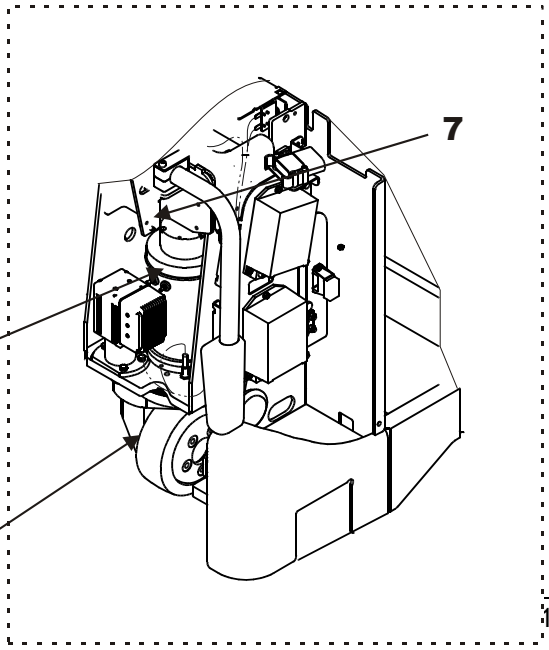

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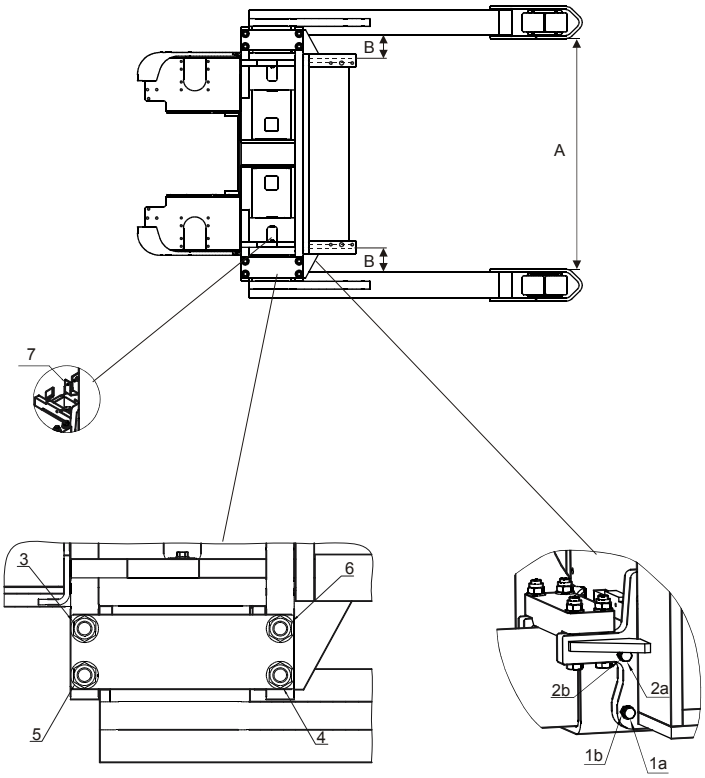
5.1.4 Adjusting the support arm width



Proceed as follows when adjusting the A measure between the support arms:

- Lift one side of the truck.

WARNING!

The truck can topple over.
Do not lift both support arms at the same time.
Lift one side at a time and arrange sufficient support under the truck during this work procedure.

- Loosen the locking nuts and locking screws on the front of the cross member (1a,1b, 2a and 2b).
- Loosen the cap screws and nuts (3, 4, 5, 6).
- Pull out (or retract) the support arm. To obtain the A measure, the B measure must equal A/2 - 374 mm. Make sure the B measure is identical on both sides.
  If the support arm is pulled too far out, the safety catch (7) will lock the support arm to prevent it from falling out of the cross member.
- Following adjustment of the support arm width, tighten the screws and nuts (1a,1b, 2a, 2b) by hand.
  Tightening order: 1a, 1b, 2a, 2b
- Finger tighten the nuts (3, 4, 5, 6) and then tighten them to a torque of 55 Nm.
  Tightening order: 3, 4, 5, 6

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6.3.3 Cleaning

Keep the motor as clean as possible since this is a decisive factor for correct operation. Regularly inspect the motor and motor compartment for build-up of dust, oil and other contaminants.

If the motor windings and internal compartments are dry, use a vacuum cleaner with a suitable nozzle to clean the motor. Compressed air can be used together with a vacuum cleaner for cleaning. If this is the case, make sure the compressed air is clean and dry.

If deposits have formed on the windings, use a lint-free cloth to remove them. If required, moisten the cloth with an organic, volatile grease solvent that will not damage the windings. However, do not use too much cleaning agent as it could penetrate into the motor parts.

If grease deposits are left on the surface, use a suitable solvent to remove cleaning agent remains.

If the motor components are heavily contaminated, it may be necessary to use a solvent that is sprayed onto the parts. It is especially important for the rotor that the cleaning agent is applied in a manner that avoids contaminants from penetrating into the motor section.

One method to clean the rotor is to submerge it in solvent. If this method is used, be sure to later dry the motor using a heat source. During the drying process, arrange good ventilation and allow the components to dry until repeated insulation resistance measurements show similar and approved values.

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8.2.2 Brake disc replacement

Replace the brake disc when its entire thickness has become 8,8 mm.

- Disconnect the electric cables from the brake.
- Loosen and remove the three mounting bolts and the brake coil.
- Replace the brake disc on the hub and inspect the friction plate for wear. If the surface is uneven, then replace the friction plate.
- Unscrew the locking nuts on the coil at least 6 mm to assure there is a large play between the coil and the pressure plate when the coil is later reinstalled.
- Attach the coil to the motor end and adjust the play as described in the section ”Basic adjustment of the play”.
- Reconnect the electric cables.

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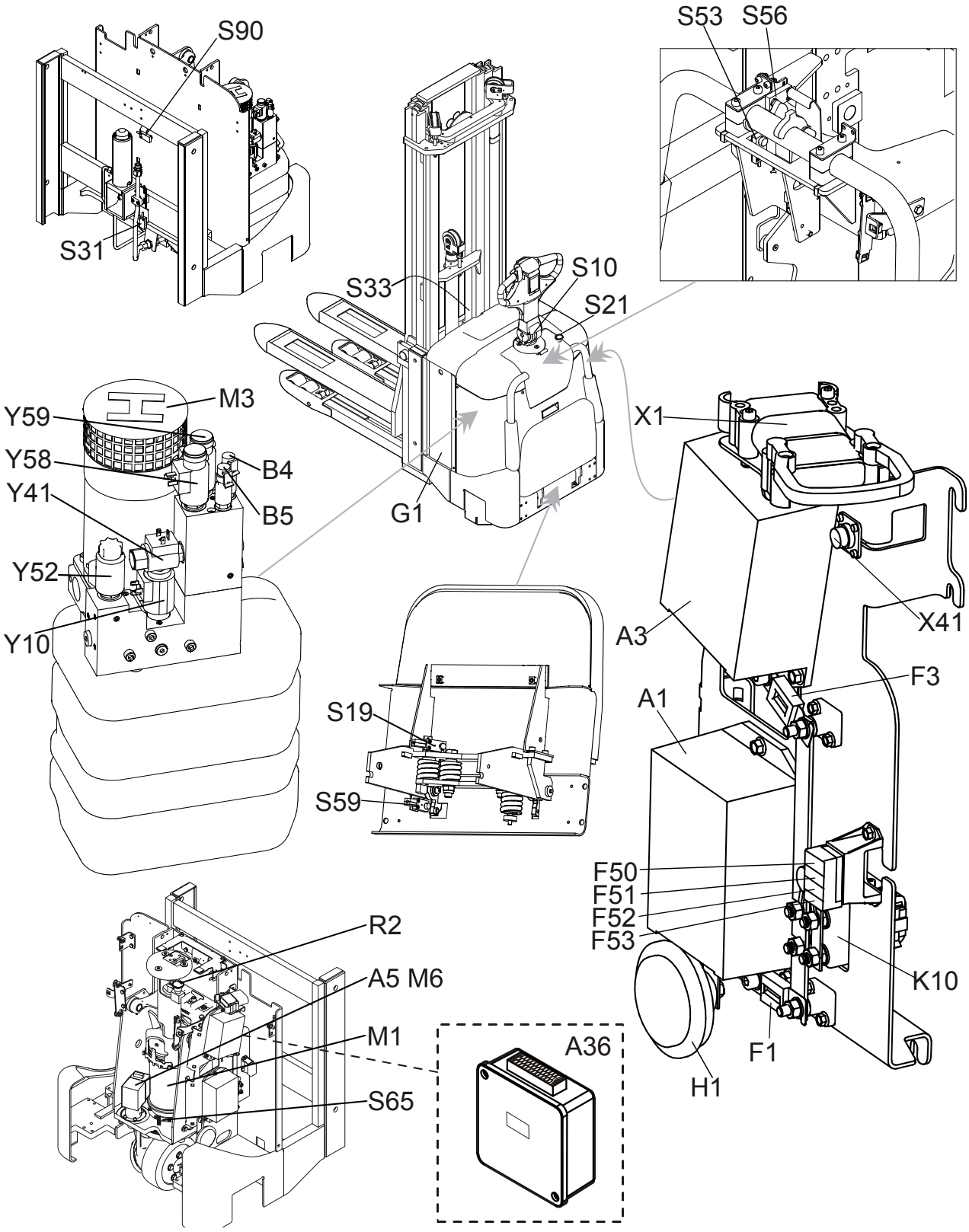
11.2 Electrical equipment overview

11.2.1 Component placement



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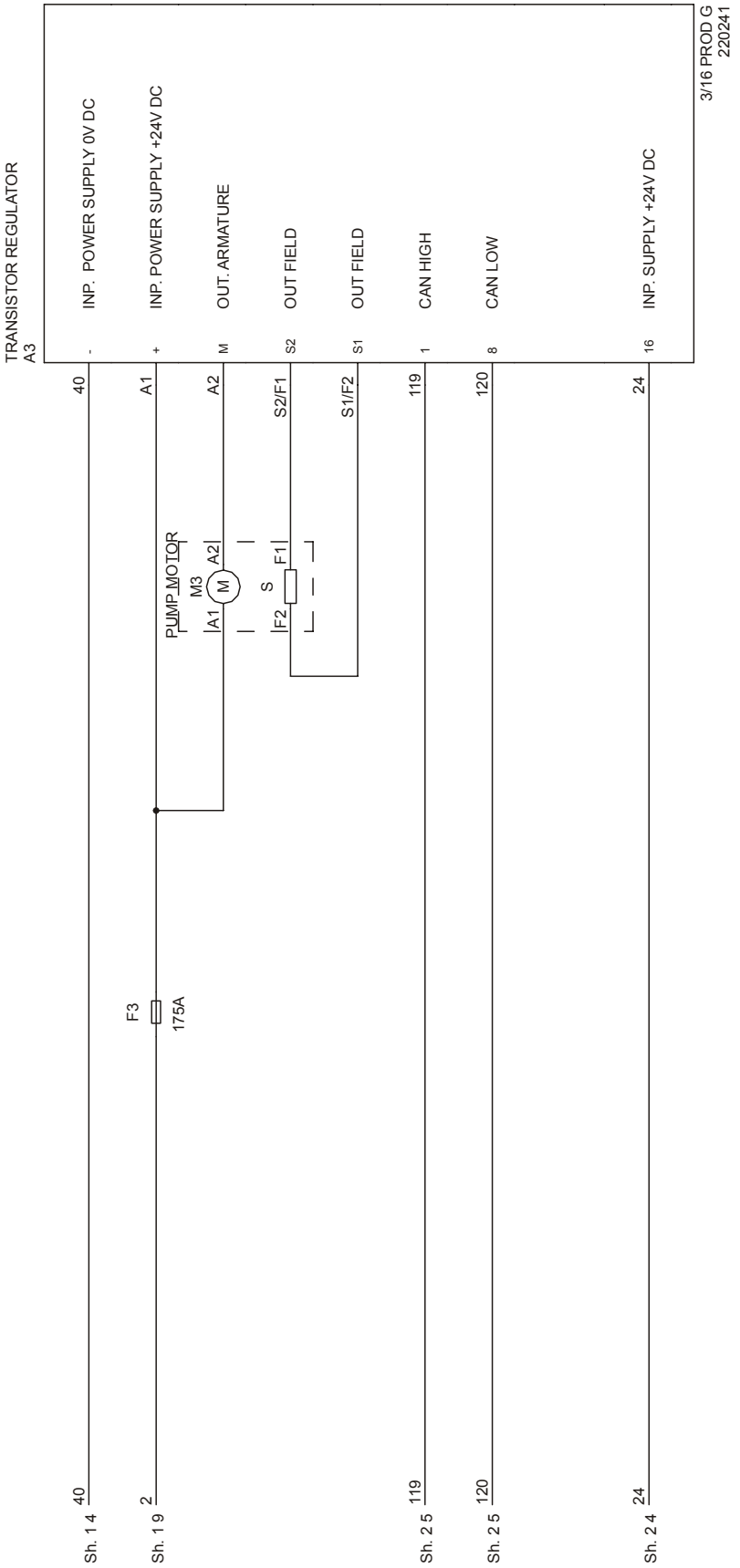

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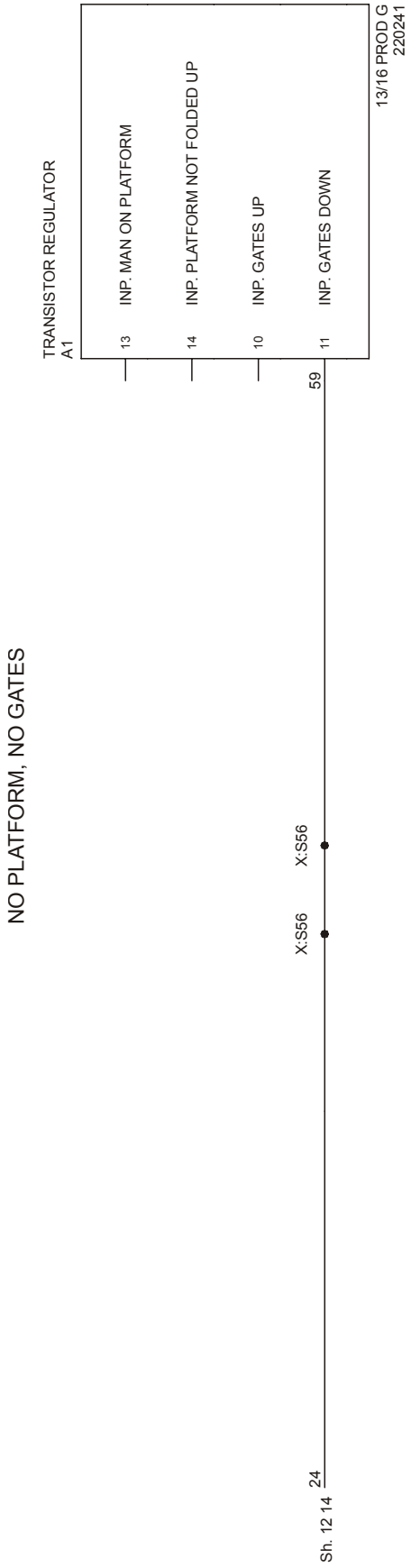

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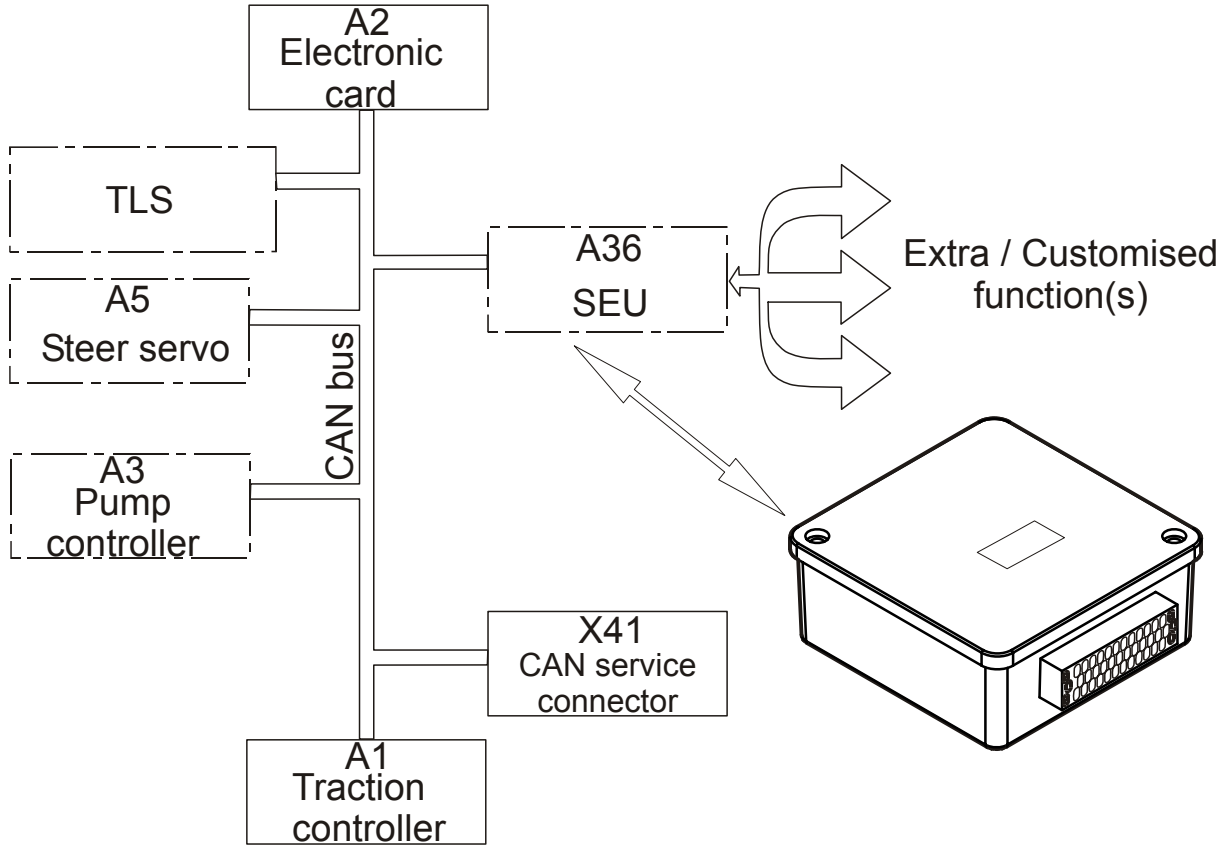

Fig. 2 Connection architecture for SEU

tipin connector which handles all inputs, outputs, CAN and supply signals.

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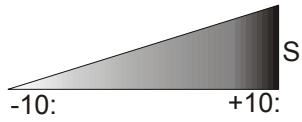
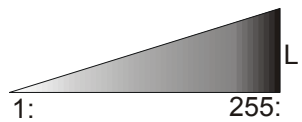
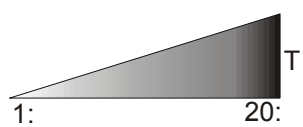
11.5.8 Summary of service parameters

NOTE!

Before changing any parameters, ensure you have read and understood the procedures for viewing and setting parameters in sections "11.5.3 Viewing parameters - CAN key connected" on page 39 and "11.5.8 Summary of service parameters" on page 43

*Service Manua*l The CAN service key must be connected to the external CAN connector [X41] before adjusting any Service parameters

Table 15: Summary of service parameters

Parameter	Name	Unit	Min.	Max.	Step	Std.	Note
10	PIN-code	-	0	9999	1	1	PIN code assignment. NOTE: Not applicable if Parameter #39 has been set to the value 5, 6, 7 or 8.
14	Creep speed	%	-10	10	1	0	 S= Speed at first sensor
15	Non-configurable options 0 to 9	Standard value = "0" See Service Manual"11.5.10 Configurable "Option" Parameters" on page 57					
16	Configurable option #1	These parameters provide correct operation of trucks which have been modified with an approved special request modification. If no such modifications are present on the truck, these parameters shall all be set to "0" See"11.5.10 Configurable "Option" Parameters" on page 57					
17	Configurable option #2						
18	Configurable option #3						
19	Configurable option #4						
20	Hour meter selection	-	1	5	1	2	Select which hour meter is normally displayed
21	Battery size	-	1	20	1	5	Battery size selection
22	Maximum fork lowering speed	-	64	255	5	180	 L= max. lowering speed
23	Fork lower stop ramp	-	1	20	1	7	 T= Stop ramp time

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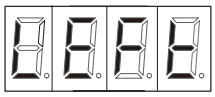
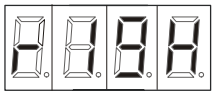
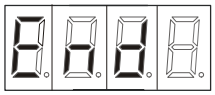
Before performing this calibration, ensure the drive wheel in centre sensor [S65] is functioning and correctly adjusted.

To calibrate the steer servo perform following procedure:

- Select parameter #36 and set its value to 1.
- Switch off the truck by pressing  on the keypad.
- Press  on the keypad. The display shows 
- Turn the tiller arm fully to the left until end stop is reached.
- Press horn button [S18]. Display now shows 
- Turn the tiller arm fully to the right until end stop is reached.
- Press horn button [S18]. Display now shows  .
- Switch off the truck by pressing  on the keypad.
- Press  on the keypad. Steering calibration is now complete

37 - Steering offset

This parameter can be used to “trim” the actual steering position of the drive wheel in relation to the position of the steering tiller. It should only be adjusted after having performed a steering calibration (parameter #36)

A situation which may require that this parameter be adjusted is if the truck tends to drift away from a straight ahead course when driving over longer distances Many factors can contribute to this. It is therefore advisable to make adjustments to this parameter on a trial and error basis.

Whenever this parameter is adjusted, it is necessary to restart the truck. (Disconnect and reconnect battery)

38 - Steer servo activated

If the truck is equipped with steer servo it must be activated by setting this parameter.

Value 0 - Steer servo not activated (default)

Value 1 - Steer servo activated

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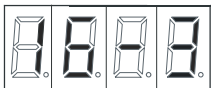
Table 25: Base option 3 - Truck movement activates SEU O/P

...continued from previous page

Argument #3	Selection of activating movement					
Initial display  (value shown after 2s)	Values	Drive for-ward	Drive back-ward	Lift forks	Lower forks	Any other move-ment
	1	X				
	2		X			
	3	X	X			
	4			X		
	5	X		X		
	6		X	X		
	7	X	X	X		
	8				X	
	9	X			X	
	10		X		X	
	11	X	X		X	
	12			X	X	
	13	X		X	X	
	14		X	X	X	
	15	X	X	X	X	
	16					X
	17	X				X
	18		X			X
	19	X	X			X
	20			X		X
	21	X		X		X
	22		X	X		X
	23	X	X	X		X
	24				X	X
	25	X			X	X
	26		X		X	X
	27	X	X		X	X
	28			X	X	X
	29	X		X	X	X
	30		X	X	X	X
	31	X	X	X	X	X

...table continued on next page

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11.6.3 List of fault codes

NOTE!

The text “Restart the truck!” in the following tables always means switching the truck off completely by removing the battery connector [X1], reconnecting and then switching the truck on again.

Table 31: List of fault codes

Code	Description	Possible cause / *Hint or Solution*
C3	TLS: Shock sensor values above limit	A shock sensor has reported values above limit. Driving may be too tough Make sure that the shock sensor limits are correct. Make sure that the shock sensor is correct located./*Brake activates and stops the truck. A TLS reset command* activates the truck.
C4	TLS: Truck set out of use	Possibility to set the truck “out of use” with a TLS command. / *Truck can´t be used before a TLS command sets the truck “in use”*
C19	Default parameter value warning	"Certain parameter value(s) may be outside their normal max-min range. These parameter values will be reset to their default values. / " It may be necessary to check the settings of all parameters if this code is displayed
C20	Butterfly warning	Problem with butterfly sensor [L1]. Butterfly may have been activated during start up or faulty sensor(s).[A2] / *Check action of butterfly*
C21	Lift/Lower control warning	Lift / Lower control for the forks may have been activated during start up or faulty sensor / *Check action of Lift / Lower control*
C28	Emergency switch warning	Emergency switch activated [S21] No voltage supply to Traction transistor regulator [A1]. Harness problem. / *Check emergency switch is not depressed. Check wiring.*
C29	Service time warning	Next service is due / *Check service counter. It may not be reset after latest service See “ # 25 - Service interval” on page 49 for setting of parameter #25.*
C30	Max.fork load exceeded	The load on the forks has exceeded the truck’s classified lift capacity. / *Ensure the load to be lifted does not exceed the classified lift capacity* Check that lifting is not performed against the mechanical stop. This applies to both fork lifting and support arm lifting. Ensure the mast sections and lifting chains move freely Check pressure sensor o/p [B1:INP.PRESSURE LIFT] voltage ≈ 0,5V with no load & lowered forks / support arms Perform a Max. load calibration See “ # 36 - Calibrate” on page 50

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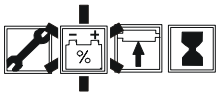
11.6.5 Built-in Test Function

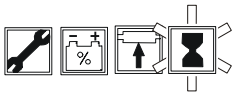
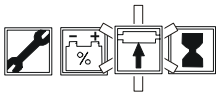
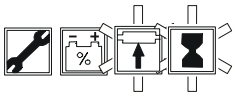
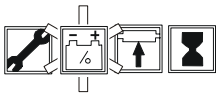
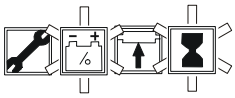
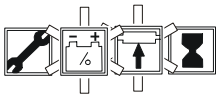
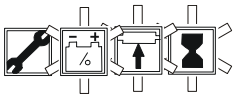
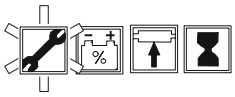
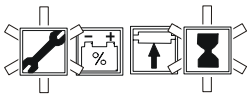
The truck's control system provides a number of useful built-in test functions

- Connect CAN-key in [X41] and press  [A17].
- Battery status is shown. 
- Press Horn [S18] repeatedly to choose Built-in Test mode.

NOTE!

All truck functions operate as normal in this mode. Care should be taken when operating the truck and reading the display at the same time!

Table 33: Built-in test modes

Flashing symbol	Displayed data	Unit
	Speed reference value sent to traction transistor controller.	-
	Lift / lower command value sent to pump transistor controller.	
	Main control card signals [A2] See Table 36:	-
	Inputs / outputs traction transistor regulator & pump transistor regulator. See Table 34: & Table 35:	-
	Battery voltage	V
	Armature current to traction motor [M1]	A
	Field current to traction motor [M1]	A
	Armature PWM to traction motor [M1]	%
	Armature current to pump motor [M3]	A

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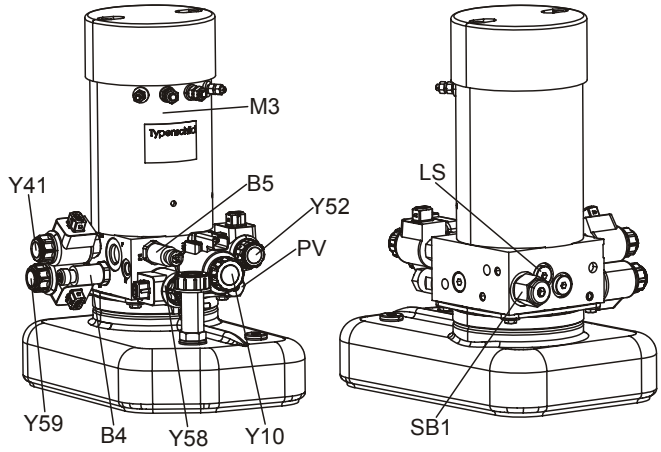
12.2 Main Components

Pos.	Designation
B4	Pressure sensor, fork lift/support arm lift
B5	Pressure sensor, PowerTrak
LS	Load selector valve (only trucks with support arm lift)
M3	Pump motor
PV	Overflow valve, max. 210 bar
SB1	Pressure-compensation valve
SB2	Lowering brake valve (only trucks with support arm lift)
Y10	Proportional valve, lowering forks
Y41	Lowering valve, lowering support arms (only trucks with support arm lift)
Y52	Selector valve, fork/support arms (only trucks with support arm lift)
Y58	PowerTrak valve, draining PowerTrak cylinder
Y59	PowerTrak valve, filling PowerTrak cylinder

With support arm lift



Without support arm lift

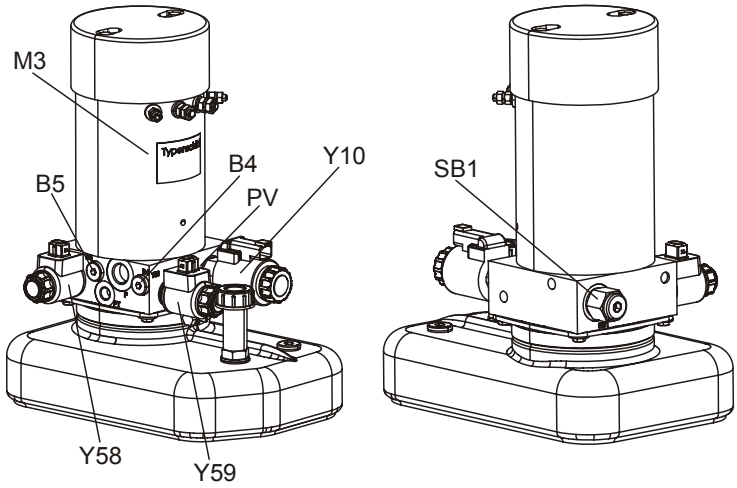


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Table 39: Recommended Product

Ambient temperature	Viscosity class	Recommended Products*
> - 40°C < - 30°C	VG 15	Klüberoil 4UH 1-15, Klüber Lubrication
> - 30°C < + 5°C	VG 68	Klüberoil 4UH 1-68N, Klüber Lubrication Anticorit LBO 160 TT, Fuchs DEA
> + 5°C < + 45°C	VG 150	Klüberoil 4UH 1-150N, Klüber Lubrication Anticorit LBO 160, Fuchs DEA Rexoil, Rexnord Kette
>+ 45°C <+ 80°C	VG 220	Klüberoil 4UH 1-220N, Klüber Lubrication

* Equivalent products from another manufacturer may be used.

NOTE!

Do not use a special rust protective agent to prevent rust on the lift chains.
These agents impair the lubrication of the chains. Regular lubrication is the best method to prevent rust attack.

Order number	Date	Valid from serial number	T-code
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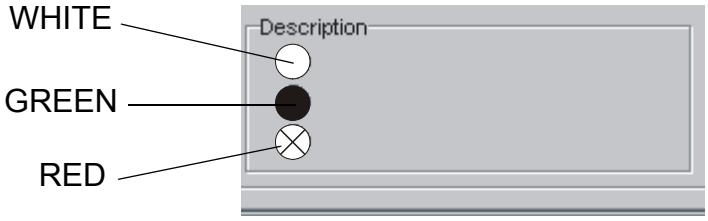
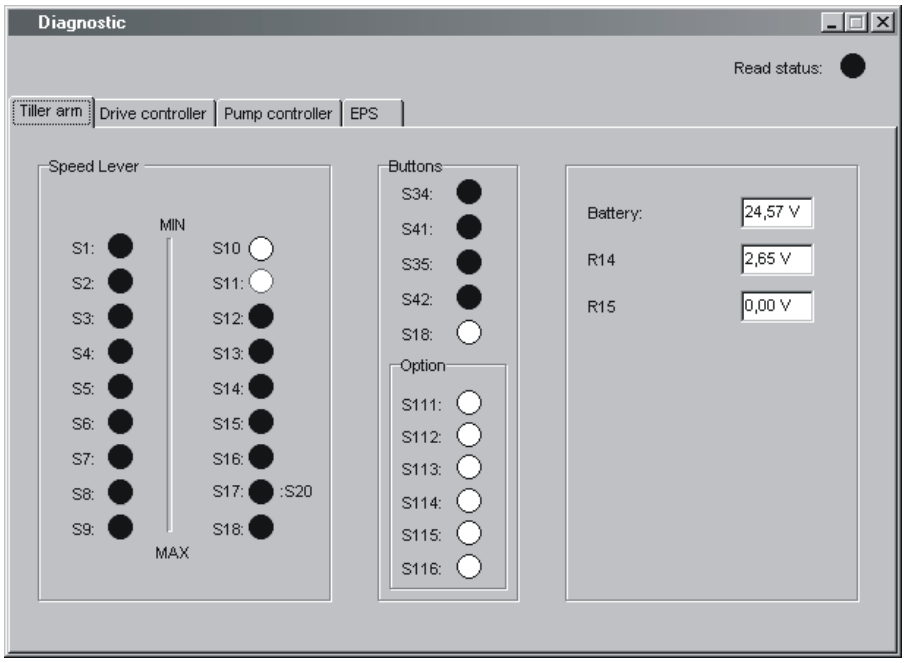
14.9.1 Representation of signal colours

The screen dumps shown in the following section have been modified to improve legibility in black & white print.



14.9.2 “Tiller arm” tab



Clicking on the *tiller arm* tab will display a dialogue showing the following:

- *Speed lever* -The status of the speed control and travel direction selector. The status of each individual hall element is displayed.
- *Buttons* -The status of the control buttons is displayed. “Sxx” refers to the switch designations as given in the circuit diagram.
- *Option* - Status of option buttons
- *Battery* - The measured battery voltage
- R14 - Shows the measured signal voltage from the lift/lower control
- *R15* - Not used at present

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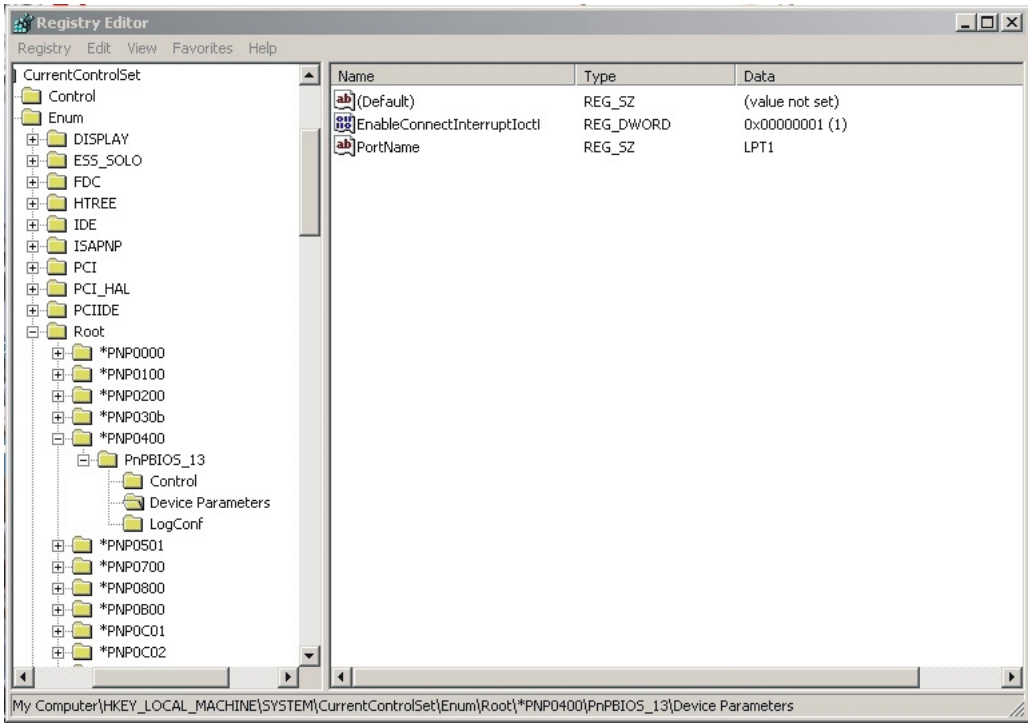

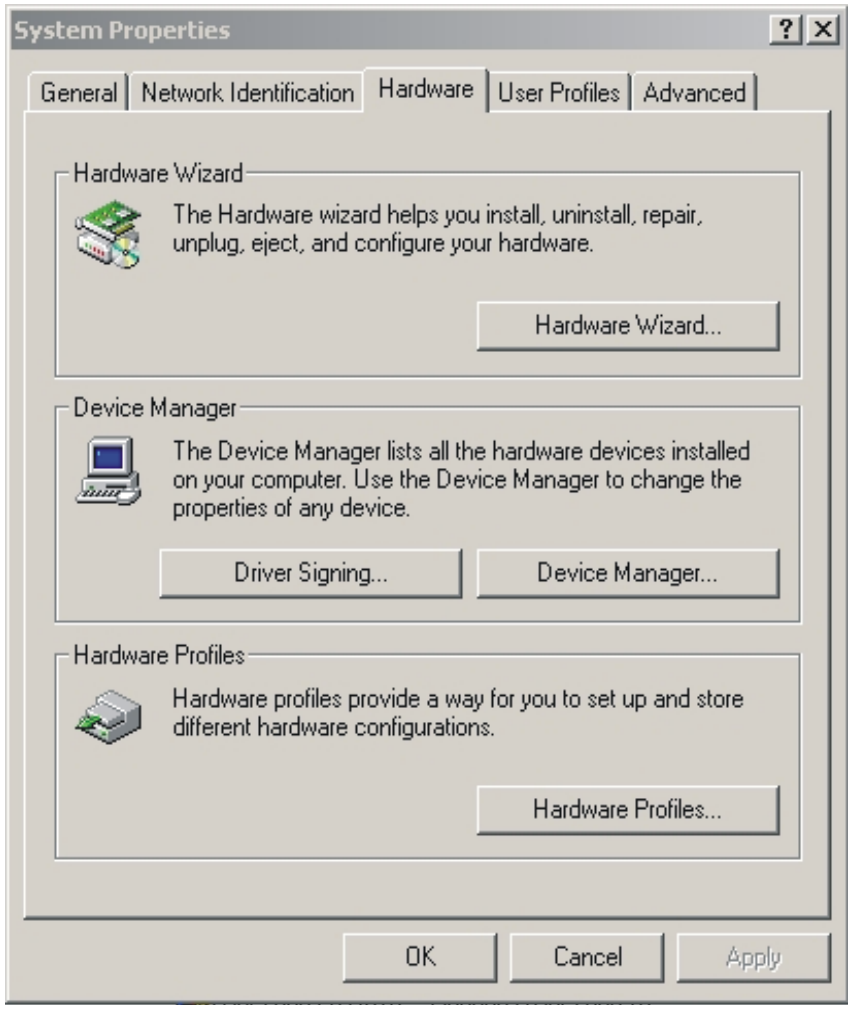

Order number	Date	Valid from serial number	T-code
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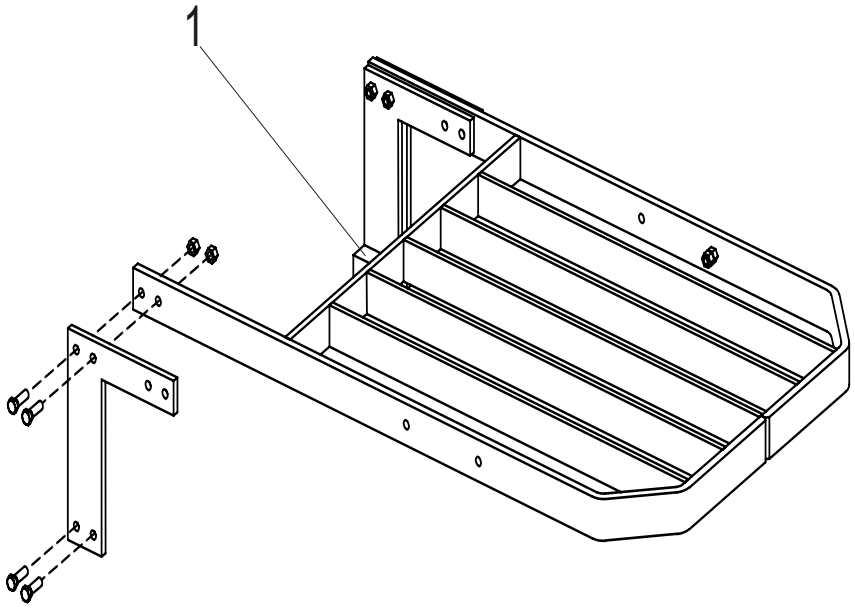
15.9 Overhead guard (option) (0810)



15.9.1 Dismantling

- Remove the overhead guard (1).

15.9.2 Material handling

Place the overhead guard in a container intended for iron and steel scrap.