ESR 5000 SERIES
MAINTENANCE MANUAL

Order Number: 812577-006
Revision: B • Printed in Germany

Maintenance work

- Always carry out maintenance work in accordance with the test and maintenance schedule contained in this manual and any applicable service bulletins.
- Before carrying out maintenance work prepare the truck as follows:
  - Park the truck on a level surface
  - Lower the forks to the ground
  - Switch off the truck and prevent it from being switched on again
  - Disconnect the battery and prevent the connector from being attached by unauthorised personnel.
- When carrying out work that requires battery supply, jack up the truck until the drive wheel is clear of the ground.
- Do not use a naked flame near the truck or to check fluid levels or for leaks.
- Always have suitable fire protection equipment to hand when carrying out work.
- Keep the truck clean; this makes it easier to find loose or missing components.
- Welding work must only be carried out after prior consultation with Crown.
- Keep the work area clean and well lit. An untidy or poorly lit work area can lead to accidents.
- Only use original Crown spare parts and accessories.
- Never install or commission damaged components.

Restoring the truck to service after maintenance work

- After carrying out maintenance refit any safety mechanisms that have been removed and make sure they are working correctly.
- The truck may only be restored to service after maintenance work once all the truck functions have been successfully tested, in particular on the following components:
  - Brakes
  - Speed control
  - Direction switches
  - Steering
  - Lifting mechanism
  - Warning devices (horn, warning indicator)
- To avoid endangering other people, always test the truck in an open area where there are no other people or obstacles.

Cleaning work

Particular care is required when cleaning the truck and components that have been removed. See page 13.

Handling batteries

- Batteries may only be charged, serviced or replaced by trained personnel. Observe the instructions contained in the operator manual, as well as the instructions of the battery and charger manufacturers.
- The charger must be appropriate to the battery voltage and capacity. First connect the battery, then switch the charger on.
- When handling batteries wear acid protective clothing such as safety gloves, goggles and an apron.
- Do not use a naked flame and do not smoke when handling batteries.
- Do not touch battery terminals with metal objects. Cover the battery terminals with a suitable insulation (such as a plywood board) if you have to work in this area.
- Always charge batteries in designated charging areas and make sure the area is well ventilated.
- Remove battery acid stained clothing immediately.
- If acid comes into contact with the skin, rinse immediately with plenty of clean water. If it comes into contact with the eyes, rinse immediately with clean water for several minutes and then seek medical attention.
- Immediately neutralize and thoroughly rinse any spilled battery fluid.

Warning and instruction decals on the truck

- In accordance with the test and service intervals check that the warning and instruction decals on the truck are complete and legible.
- Clean any dirty decals and replace any damaged or missing ones.

Note: The spare parts manual gives details of the labelling and position of the warning and instruction decals on the truck.

Lifting gear and slings

- Always use suitable hoist devices and lifting gear with sufficient capacity.
- Attach lifting gear to the designated strap points and prevent it from slipping. Make sure the lifting gear cannot touch other components during lifting.

Truck Assembly and Commissioning

Truck assembly

WARNING

Falling loads are hazardous

Fatal injuries can result if the truck or crane crash or if a load falls.

➢ *Make sure the crane, lifting truck and the load handling equipment used have the required capacity. Information on the required capacity can be found on the truck data plate under "Truck Weight Less Battery" and "Battery Weight".*

The trucks are normally dispatched with the mast and chassis separate, lying flat on pallets.

The maximum component weight on a pallet is 1800 kg.

Required tools

- Sufficient number of clevis, hooks and lifting accessories with a 2 tonne capacity.
- A crane with a minimum capacity of 2 tonnes.
- A forklift truck with a minimum capacity of 2 tonnes at the required lift height.

Erecting the chassis

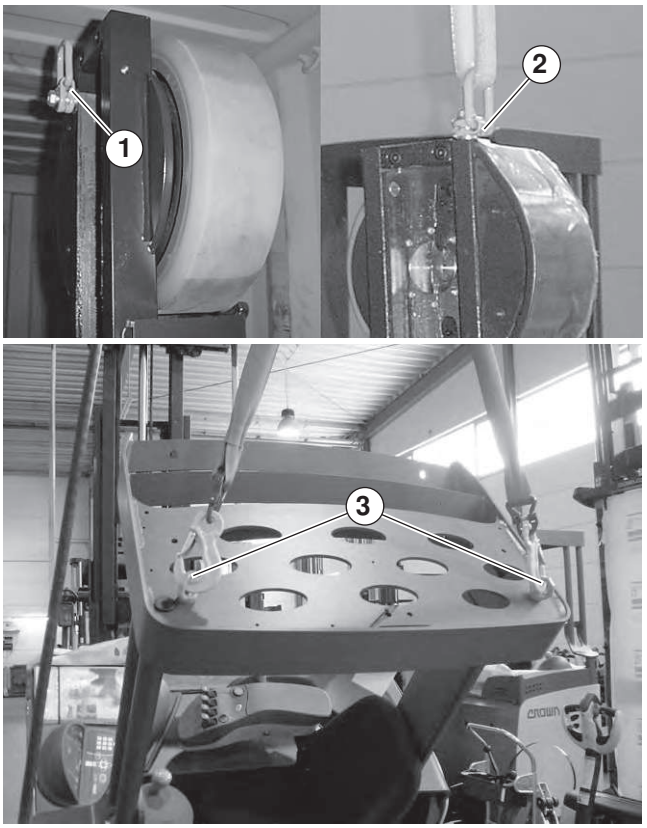


Fig. 8 Attaching the shackles and clevis

1	Shackle mounted on the outside of the outrigger
2	Shackle mounted on the front of the outrigger
3	Shackles mounted on the overhead guard

Erecting the chassis

1. Attach the shackles and clevis as shown in Figure 8 to the outriggers and overhead guard.
2. Position the crane next to the overhead guard.
3. Position the forklift truck next to the outriggers. Attach the load slings to the forks and prevent them from slipping.

Components below the floorboard

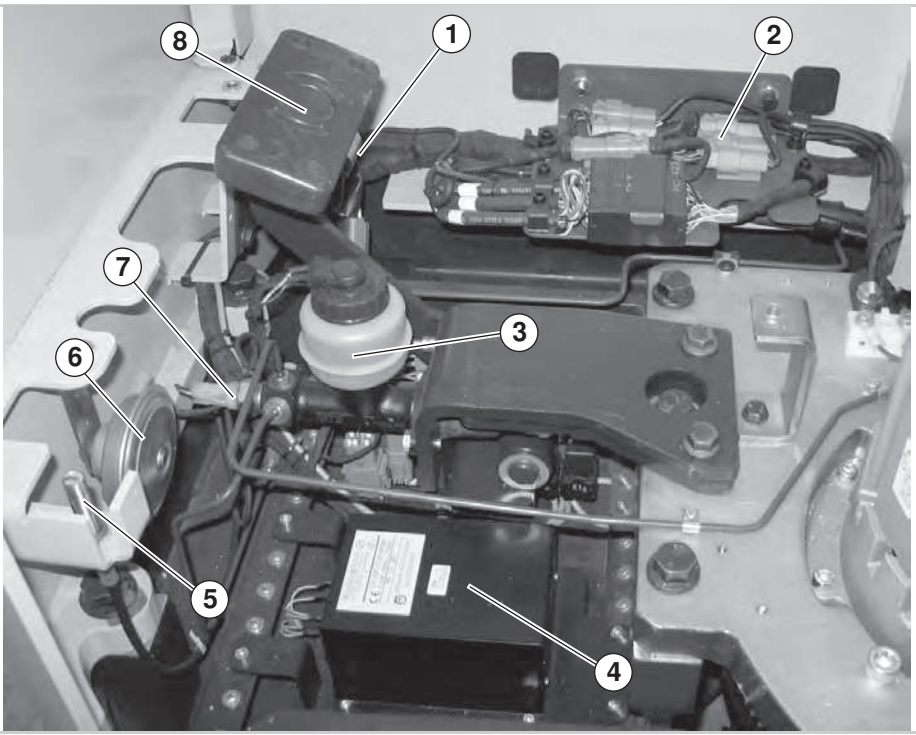


Fig. 25 Components below the floorboard

1	Accelerator pedal potentiometer and travel switch	5	Safety pedal sensor
2	Main plug assembly	6	Horn
3	Brake fluid reservoir with main brake cylinder and BFS	7	Brake pressure switch
4	DC / DC converter (option)	8	Brake pedal

Reach carriage

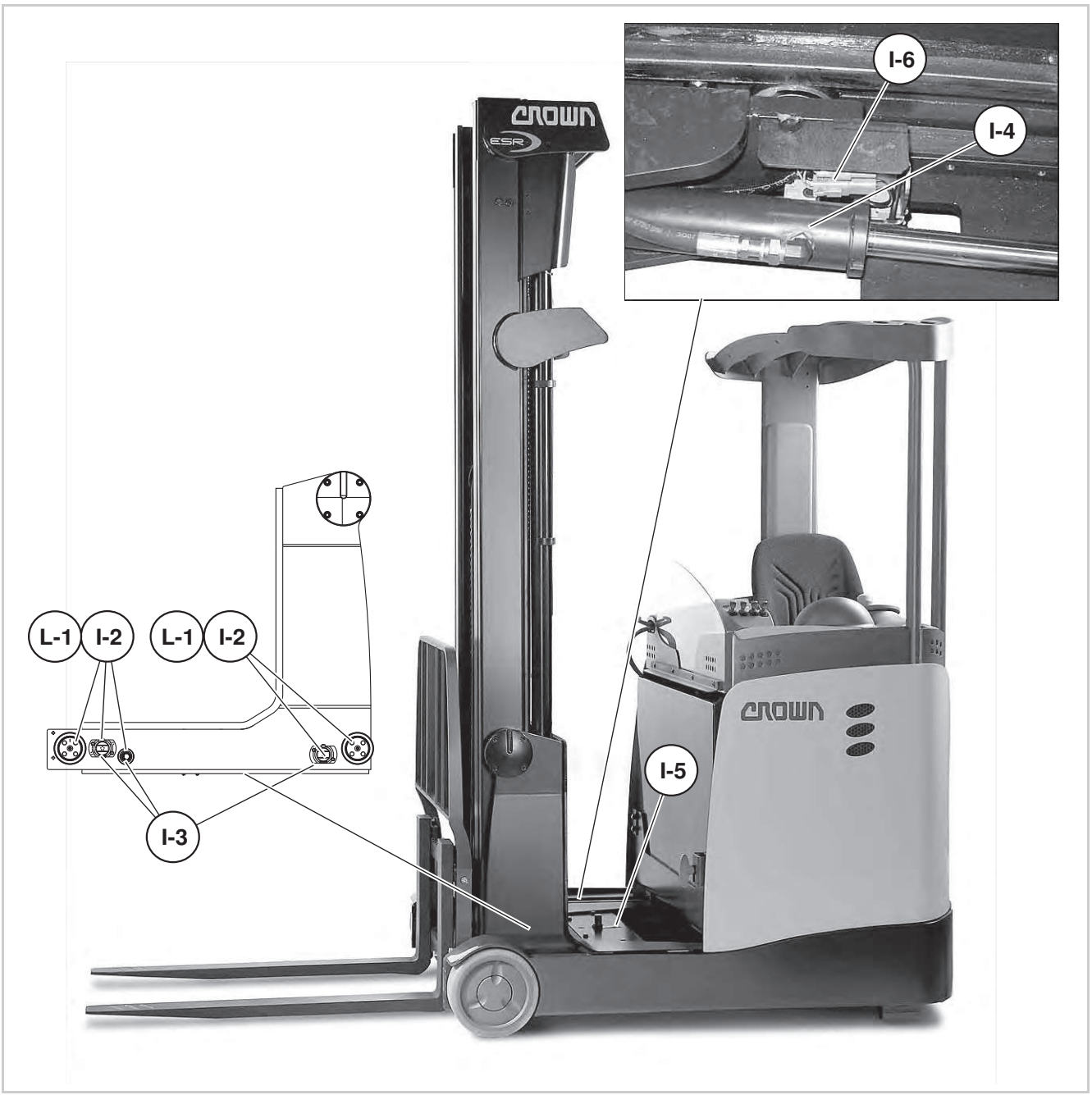


Fig. 29 Reach carriage

Mast

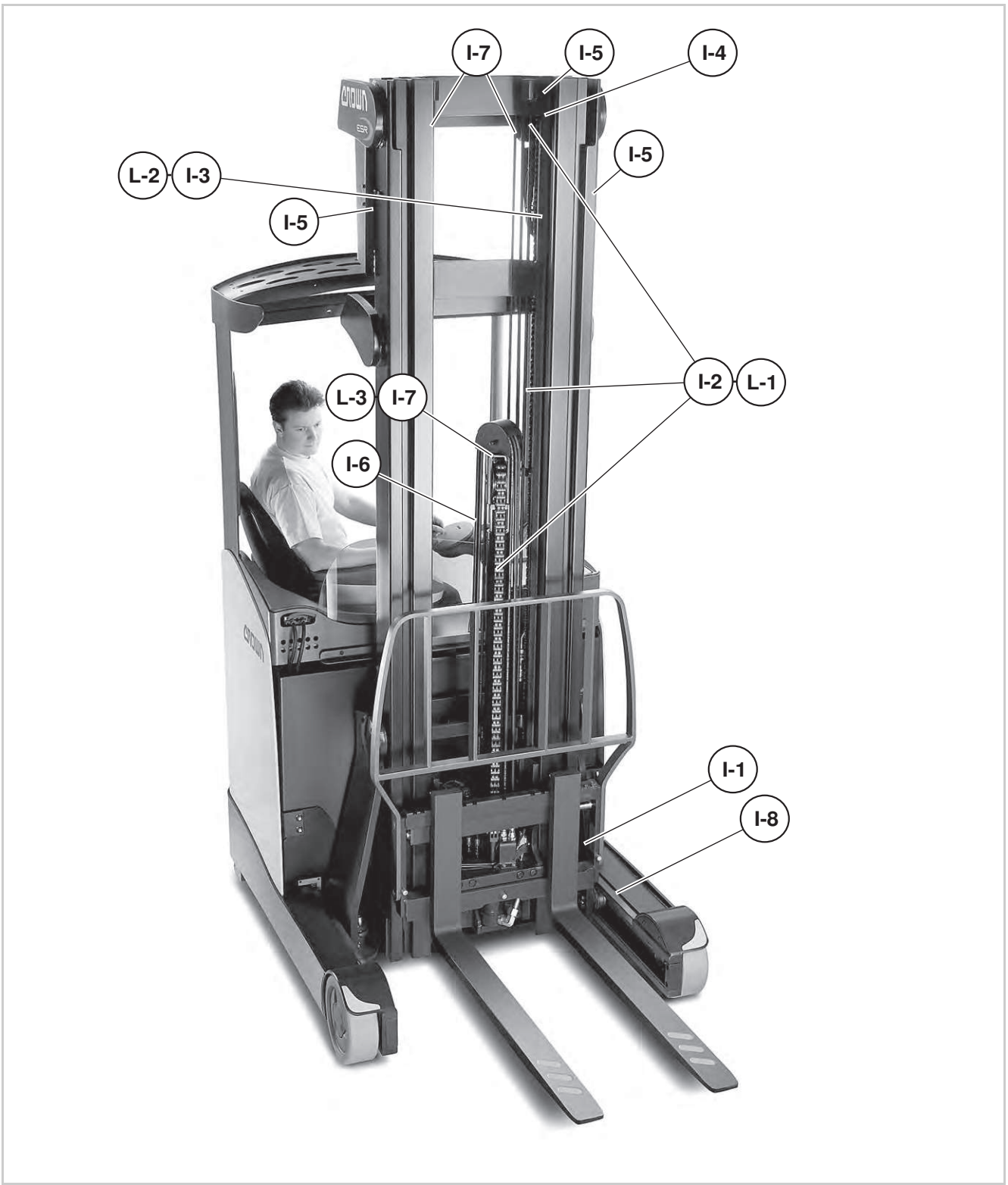


Fig. 34 Mast

Replacing the Heater Filter Element

The heater in the door frame is equipped with an intake air filter. The filter element can be accessed from the bottom of the door when it is opened.

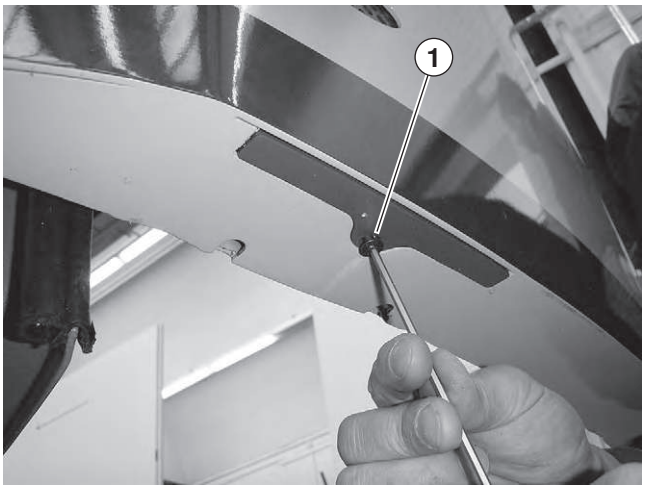


Fig. 44 Removing the screw

Removing the filter element

1. Remove the screw (1).

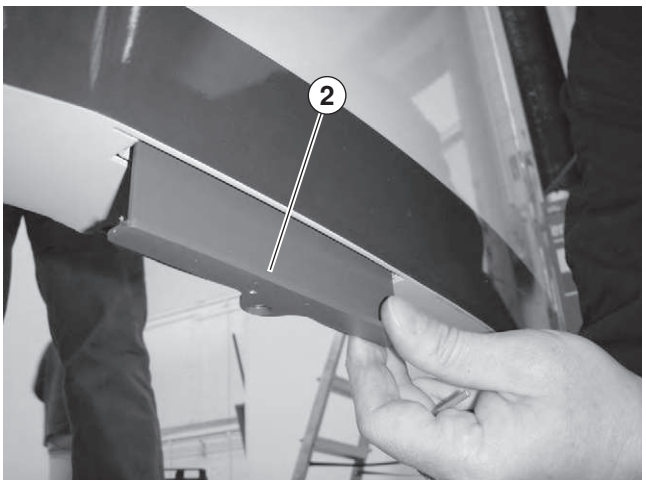


Fig. 45 Removing the bracket

2. Pull the bracket (2) down with the filter element.

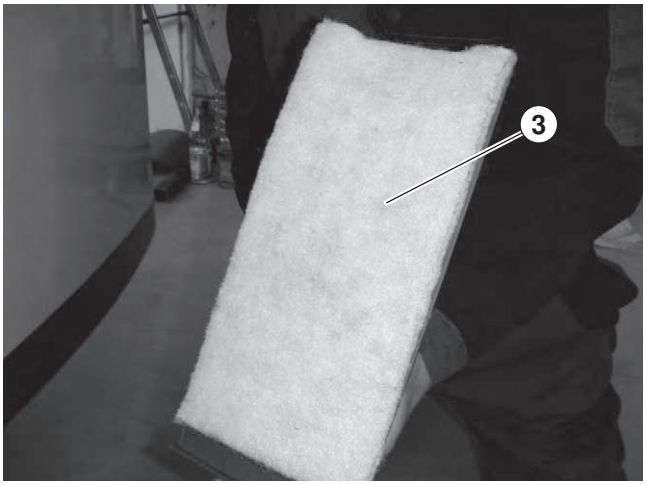


Fig. 46 Filter element

3. Remove the filter element (3) from the bracket and dispose of it.
4. Apply weak, dry compressed air to the bracket and heater element to remove any remaining dust.

Filter element assembly

1. Attach the new filter element to the bracket and refit the bracket in the reverse order of disassembly.

Extending the mast reach carriage

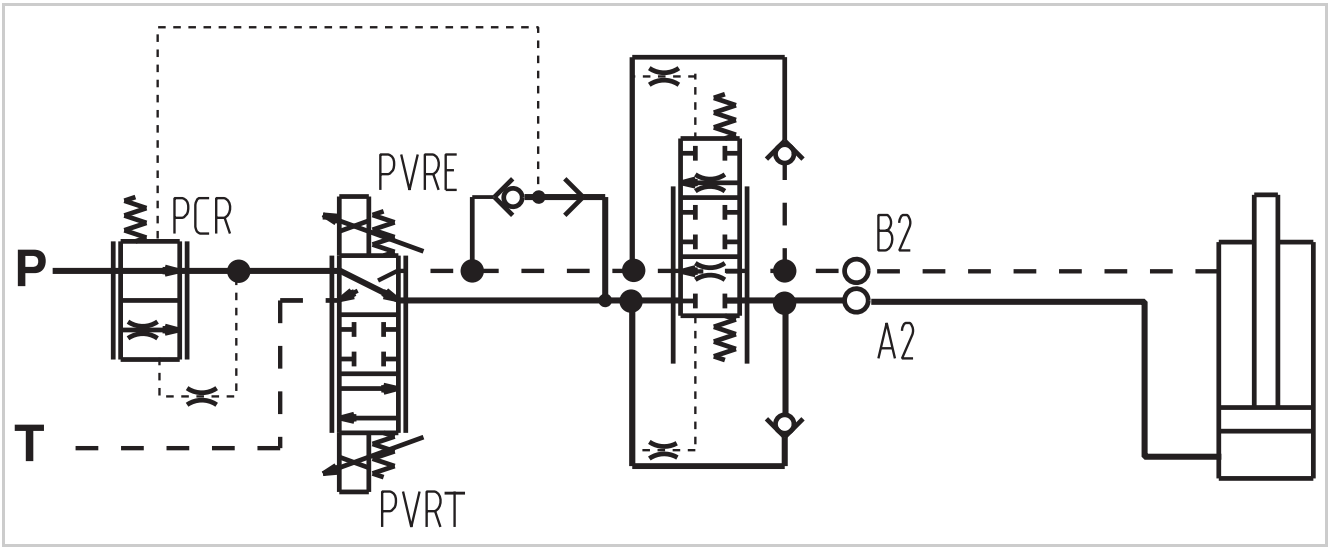


Fig. 49 "Extend mast reach carriage" hydraulic circuit

The following symbols are used in the diagrams:

- Pilot line
- Pressure line
- Suction line
- Return line

The “extend mast reach carriage" function is requested by pulling the corresponding control lever. The voltage on the slider of reach potentiometer POT3 changes. The pump and the magnetic coil of the PVRE proportional pilot valve are activated.

The speed of the reach carriage is determined by the movement of the control lever. It is governed by the pump motor speed and the position of the PVRE proportional valve.

PVRE opens in proportion to the movement of the control lever. Oil flows from input P of the manifold through the flow control valve PCR and the PVRE valve via the bypass check valve to output A2. From A2 on to the piston dome side of the reach cylinder. The reach carriage extends.

The two pilot lines on the flow control valve PCR regulate this so that the flow of oil and hence the speed of the reach carriage are kept constant depending on the oil pressure and the potentiometer setting.

The flow of oil to A2 moves the brake piston and the return line from B2 to PVRE opens.

The extending reach cylinder pushes the oil out of the cylinder. The oil can flow back to the reservoir via the return line of the PVRE valve.

If the control lever is released, the pump and the PVRE valve are switched off.

PVRE is closed through bias spring force and the flow of oil to the reach cylinder is interrupted. The pressure on the pilot line of the brake valve reduces, the brake piston is moved to the neutral position through bias spring force. The pressure on the reach cylinder is restrained through the closed position of the brake valve. The cylinder remains in its current position.

Bleeding and Flushing the System

Safety notices

WARNING

High pressure hydraulic system
High-pressure hydraulic oil can cause injury!

- ➢ *Wear safety gloves and goggles or a face mask when depressurising the system.*

WARNING

Lowering forks can cause injury
The forks automatically lower when the hydraulic system is being bled.

- ➢ *Never stand underneath a raised fork.*
- ➢ *Seal off the hazardous area to prevent other people from entering and standing under a raised fork.*

CAUTION

Health risk
Cleaning agents, lubricants and consumables can damage your health.

- ➢ *Observe the manufacturer's safety instructions when handling cleaning agents, lubricants and consumables.*

Bleeding the free lift cylinder

1. Prepare the work area to collect spilled oil.
2. Fully extend the free lift cylinder.
3. Open the bleed screw on the free lift cylinder.
4. Tighten the bleed screw as soon as bubble-free oil emerges.
5. Clean up any oily components on the truck.

Bleeding the lift cylinders

1. Prepare the work area to collect spilled oil.
2. Extend the lift cylinder as far as possible.
3. Open the bleed screw on the lift cylinder.
4. Tighten the bleed screw as soon as bubble-free oil emerges.
5. Carry out steps 2 to 4 on the other lift cylinder.
6. Clean up any oily components on the truck.

Bleeding the reach cylinder

1. Extend the forks and hold the control lever in the limit position for approx. 5 seconds.
2. Retract the forks and hold the control lever in the limit position for approx. 5 seconds.
3. Repeat steps 1 to 2 until the reach mechanism moves without any delay or jerky movement.

Bleeding the sideshift cylinder

Note: This bleeds all the hydraulic lines to the fork carriage.

1. Extend the sideshifter and hold the control lever in the limit position for approx. 5 seconds.
2. Retract the sideshifter and hold the control lever in the limit position for approx. 5 seconds.
3. Repeat steps 1 to 2 until the sideshifter moves without any delay or jerky movement.

Bleeding the tilt cylinder

Note: The sideshift cylinders must be bled beforehand!

1. Tilt the fork carriage back and hold the control lever in the limit position for approx. 5 seconds.
2. Tilt the fork carriage forward and hold the control lever in the limit position for approx. 5 seconds.
3. Repeat steps 1 to 2 at least 10 times.

Bleeding the 5th function cylinder

See “Bleeding the tilt cylinders”

Flushing the lift cylinders

Note: The lift cylinders must be bled.

Preparing for flushing

1. Fully extend the mast.
2. Check the lift cylinders for leaks.
   ⇨ If a cylinder is leaky, repair it (see page 465).
   ⇨ If the cylinders are sealed, proceed to step 3.

Flushing the lift cylinders

3. Extend and retract the mast at maximum speed to the maximum lift height at least 10 times.

⇨ This flushes the lift cylinders.

Hydraulic Port Torques

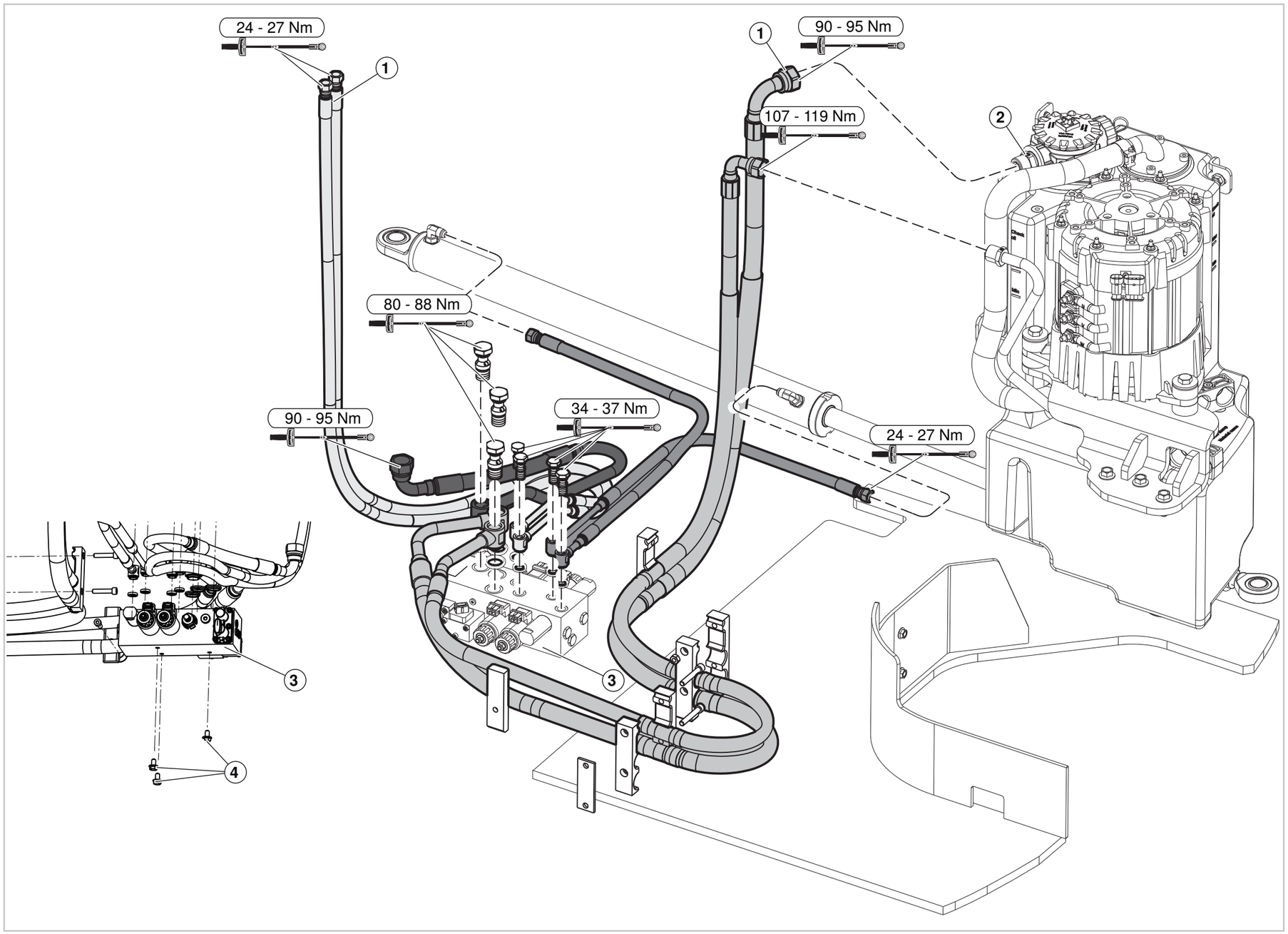


Fig. 67 Overview of Hydraulic Lines and Ports

1	Accessories hose system
2	Lift function hose system
3	Manifold in mast reach carriage
4	Manifold mounting screws[a)]

a). Insert with Loctite® 242, part no. 053050-006.

Note: Torque the hose clamp mounting screws to 20 - 25 Nm.

CAUTION

The filter can be damaged if the return line hose union is torqued incorrectly

➢ *Counter the torque on the union (1) by holding tight the filter connection (2).*

ELECTRICAL SYSTEM

F8 Travel Alarm

F8.1 Alarm Off
F8.2 Alarm Reverse
F8.3 Alarm Forward

F9 Beacon

F9.1 Beacon Off
F9.2 Key Switch
F9.3 Beacon Reverse
F9.4 Beacon Forward
F9.5 Beacon Forward and Reverse

F10 User Performance

F10.1 No
F10.2 Yes

F11 User Code

F11.1 No
F11.2 Yes
F11.3 View
F11.4 Add
F11.5 Delete

F12 Set Language

F12.1 English
F12.2 German
F12.3 French
F12.4 Italian
F12.5 Dutch
F12.6 Spanish
F12.7 Danish
F12.8 Finish
F12.9 Swedish
F12.10 Norwegian
F12.11 Portuguese
F12.12 Turkish
F12.13 Polish
F12.14 Czech
F12.15 Hungarian
F12.16 Slovenian
F12.17 Greek

F13 Change Unit

F13.1 Euro
F13.2 USA

F14 Set Rack Select

F14.1 No
F14.2 Yes

F15 Height/Weight

F15.1 No
F15.2 Yes

F16 Timer

F16.1 No
F16.2 Yes

F17 Error Log

F17.1 No
F17.2 Yes

F18 Operator Alarm

F18.1 No
F18.2 Yes

F19 Battery Alarm

F19.1 No
F19.2 Yes

F20 Fork Positioning

F20.1 No
F20.2 Yes

Steering control module (SCM) temperature

Steer motor (M3) temperature

A2 Inputs

Direction switch status display when in forward position (ON = activated, OFF = deactivated).

Direction switch status display when in reverse position (ON = activated, OFF = deactivated).

Voltage reading on slider of "Travel" potentiometer (POT1) and corresponding digital reading in the 2nd row.

Item	Voltage	Digital reading
Neutral position	0.7 - 1.5 V	0
Maximum setting	8.5 - 9.5 V	1023

Note: If the digital readings 0 and 1023 are not reached, the potentiometer is not correctly calibrated.

Voltage reading on slider of "Lift" potentiometer (POT2) and corresponding digital reading in the 2nd row.

Item	Voltage	Digital reading
Neutral position	4.3 - 4.7 V	460 - 570
Max. lower	0.7 - 1.5 V	0
Max. lift	7.8 - 8.2 V	1023

Note: If the digital readings 0 and 1023 are not reached, the potentiometer is not correctly calibrated.

C5 Side Shift

Calibrating the "Sideshift" control lever

1. Press the ▶ key.
   ⇨ Menu item C5.1 opens up.

1. Move the "Sideshift" control lever as far as the stop in the "Right" direction and hold it in position.
2. Press the ↵ key.
   ⇨ Menu item C5.2 opens up.

3. Move the "Sideshift" control lever as far as the stop in the "Left" direction and hold it in position.
4. Press the ↵ key.
   ⇨ Menu item C5.3 opens up.

5. Release the control handles.
6. Press the ↵ key.

⇨ If the calibration was successful, menu item C6 opens up.

C6 5th Function

Calibrating the 5th function

Note: The 5th function is calibrated automatically.

1. Press the ▶ key.

⇨ Menu item C7 is displayed.

F2 Free Lift Switch

1. Press the ▶ key.
   ⇨ Menu item F2.1 opens up.

Loading basic settings for trucks with 1.4 or 1.6 t capacities

2. Press the ↵ key to activate NO (no FLS) or press ▶ to open menu item F2.2.

3. Press ↵ to activate YES (FLS present).

⇨ Menu item F2 opens up and the status is displayed.

F3 Height Encoder

1. Press the ▶ key.
   ⇨ Menu item F3.1 opens up.

2. Press the ↵ key to activate NO (no ECR5) or press ▶ to open menu item F3.2.

3. Press ↵ to activate YES (ECR5 present).

⇨ Menu item F3 opens up and the status is displayed.

F18 Operator Alarm

Switching the audible signal for malfunctions on or off

1. Press the ▶ key.
   ⇨ Menu item F18.1 opens up.

2. Press ▼ to select YES (alarm on) or NO (alarm off).
3. Press the ↵ key.
   ⇨ Menu item F18 opens up again and displays the required status.

Performance Menu (Software V1.0)

1. Activate the Service menu (see page 106) and scroll through to menu item PERFORMANCE using the ▼ or ▲ keys.

2. Press the ▶ key.
   ⇨ Menu item P1 opens up.

P1 Setup P1

Entering the performance setting

1. Press ▼ to select performance setting P2 or P3.
2. Press ▶ to select P1.
   ⇨ Menu item P1.1 opens up.

Entering the maximum forward speed

3. Press the ▶ key.
4. Menu item P1.1.1 opens up.

1. Enter the new value.

Note: The default and maximum settings are shown in the 2nd row.

2. Press the ↵ key.

Entering the maximum reverse speed

1. Press the ▶ key.
2. Menu item P1.2.1 opens up.

3. Enter the new value.

Note: The default and maximum settings are shown in the 2nd row.

4. Press the ↵ key.

⇨ Menu item P1.3 opens up.

Utilities Menu (Software V1.0)

1. Activate the Service menu (see page 106) and scroll through to menu item UTILITIES using the ▼ or ▲ keys.

```
U T I L I T I E S
                 ▶
```

2. Press the ▶ key.
   ⇨ Menu item U1 opens up.

U1 Software Version

Displaying the software version

```
U 1   S O F T W A R E
      V E R S I O N  ▶
```

1. Press the ▶ key.
   ⇨ Menu item U1.1 opens up.

```
U 1 . 1     V C M
8 X X X X X - X X X - X X X
```

Displaying the main control module (VCM) service hours

⇨ The software version of the main control module is displayed.

Displaying the traction control module's (TCM) software version

2. Press the ▼ key.

⇨ Menu item U1.2 opens up.

```
U 1 . 2     T C M
8 X X X X X - X X X
```

Displaying the hydraulic control module (HCM) software version

3. Press the ▼ key.

⇨ Menu item U1.3 opens up.

```
U 1 . 3     H C M
8 X X X X X - X X X
```

Displaying the steering control module (SCM) software version

4. Press the ▼ key.

⇨ Menu item U1.4 opens up.

```
U 1 . 4     S C M
8 X X X X X - X X X - X X X
```

Performance level defaults

P1 Setup P1			
	P1.1	Travel Speed FWD	14
	P1.2	Travel Speed REV	14
	P1.3	Acceleration	8
	P1.4	Plugging	8
	P1.5	Coasting	8
	P1.6	Reduction Brake	7
	P1.7	Pedal Brake	9
	P1.8	Raise Speed	5
	P1.9	Raise ACC	3
	P1.10	Lower Speed	9
	P1.11	Lower Stop	Soft
	P1.12	Reach Speed	5
	P1.13	Tilt Speed	5
	P1.14	SS Speed	5

P2 Setup P2			
	P2.1	Travel Speed FWD	11
	P2.2	Travel Speed REV	11
	P2.3	Acceleration	7
	P2.4	Plugging	8
	P2.5	Coasting	8
	P2.6	Reduction Brake	7
	P2.7	Pedal Brake	9
	P2.8	Raise Speed	5
	P2.9	Raise ACC	3
	P2.10	Lower Speed	9
	P2.11	Lower Stop	Soft
	P2.12	Reach Speed	5
	P2.13	Tilt Speed	5
	P2.14	SS Speed	5

P3 Setup P3			
	P3.1	Travel Speed FWD	10
	P3.2	Travel Speed REV	10
	P3.3	Acceleration	5
	P3.4	Plugging	6
	P3.5	Coasting	6
	P3.6	Reduction Brake	7
	P3.7	Pedal Brake	9
	P3.8	Raise Speed	5
	P3.9	Raise ACC	3
	P3.10	Lower Speed	9
	P3.11	Lower Stop	Soft
	P3.12	Reach Speed	5
	P3.13	Tilt Speed	5
	P3.14	SS Speed	5

PP4 BDI Setting

P4.1	Acid Battery	6
	Maintenance Free Battery	8

P5 Travel > LCS

P5.1 9

P6 Travel > FLS

P6.1 9

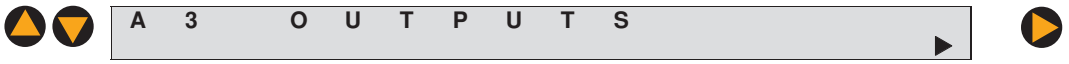
P7 Travel > Custom

P7.1 9

P8 Lower > Custom

P8.1 9

A3 Outputs



VCM speed specification for the traction motor.

VCM speed specification for the pump motor.

Brake modulation (ON = activated; OFF = deactivated).

Main contactor modulation (ON = activated; OFF = deactivated).

Lift valve modulation (ON = activated; OFF = deactivated).

Lower valve modulation (ON = activated; OFF = deactivated).

"Mast retract" valve modulation (ON = activated; OFF = deactivated).

"Mast reach" valve modulation (ON = activated; OFF = deactivated).

"Right" mast function modulation
(ON = activated; OFF = deactivated):

- Tilt
- Sideshift
- 5th function

C7 Weight

Calibrating the load sensor

Note: A minimum test weight of 1400 kg is required and the FKS switch must be closed (fork tilt in neutral position). If one of the above conditions is not met, “WRONG CALIBRATION” is displayed when the ↵ key is pressed.

1. Press the ▶ key.
   ⇨ Menu item C7.1 opens up.

2. Raise the forks slightly **without** load.
3. Enter 0 kg if required.
4. Press the ↵ key.
   ⇨ The load sensor is now calibrated to 0 kg and menu item C7.2 opens up.

WARNING

Exceeding the maximum capacity can result in accidents!
You yourself or bystanders can be fatally injured if the lift mechanism is overloaded and the load falls down.

➢ *Do not exceed the maximum capacity as indicated on the capacity plate.*

5. Raise a known test load ≥ 1400 kg.
6. Raise the forks slightly.
7. Enter the weight of the known test load.
8. Press the ↵ key.

⇨ The load sensor is now calibrated over the entire measurement range.

F	9	.	2			B	E	A	C		=		K	E	Y
A	C	T	I	V	E		K	E	Y						↵

4. If the beacon is to be activated as soon as the truck is switched on, press ↵. Otherwise press ▼ to scroll to menu item F9.3.

F	9	.	3			B	E	A	C		=		R	E	V
A	C	T	I	V	E		R	E	V	E	R	S	E		↵

5. If the beacon is only to be activated for reverse travel (REV), press ↵. Otherwise press ▼ to scroll to menu item F9.4.

F	9	.	4			B	E	A	C		=		F	W	d
A	C	T	I	V	E		F	O	R	W	A	R	D		↵

6. If the beacon is only to be activated for forward travel (FWD), press ↵. Otherwise press ▼ to scroll to menu item F9.5.

F	9	.	5			B	E	A	C		=	B	O	T	H
A	C	T	I	V	E		F	W	D	&	R	E	V		↵

7. If the beacon is to be activated for both forward and reverse travel (BOTH), press ↵. Otherwise press ▼ to scroll to menu item F9.6.

F	9	.	6			B	E	A	C		=	S	W	I	T
A	C	T	I	V	E		S	W	I	T	C	H			↵

8. If the beacon is only to be activated manually with the switch, press ↵.

F10 User Performance

Allocating user PINs and performance settings.

▲▼

F	1	0				U	S	E	R		=			N	0
U	S	E	R		P	E	R	F	O	R	M	A	N	C	E

1. Press the ▶ key.
   ⇨ Menu item F9.1 opens up.

F	1	0	.	1		U	S	E	R		=			N	O
A	C	E	E	S	S		O	N	L	Y		P	2		↵

2. Press ↵ to select NO.

Note: If NO is selected each user is assigned performance setting P2. Performance settings P1 and P3 are no longer available.

3. If performance settings P1 - P3 are to be made available to the user, press ▼.
   ⇨ Menu item F10.2 opens up.

F	1	0	.	2		U	S	E	R		=		Y	E	S
A	C	E	E	S	S		P	1		P	2		P	3	↵

4. Press ↵ to select YES.

Note: If YES is selected a user can be assigned performance settings P1, P2 or P3.

F26 Keyless Entry

Setting keyless truck power-up

1. Press the ▶ key.
   ⇨ Menu item F26.1 opens up.

2. Press ▼ to select YES (power up without a key switch) or NO (power up with a key switch).
3. Press the ↵ key.
   ⇨ Menu item F26.1 opens up again and displays the setting.

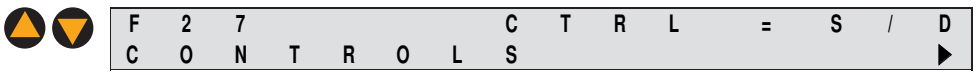
Entering the interval for standby mode

1. Otherwise press ▼ to scroll to menu item F26.2.
   ⇨ Menu item F26.2 opens up.

2. Press the ▶ key.
   ⇨ Menu item F26.2.1 opens up.

3. Enter the interval (in minutes).

F27 Operation Control



Selecting the control lever

1. Press the ▶ key.
   ⇨ Menu item F26.1 opens up.

2. Press ▼ ▲ to select the control lever versions for the hydraulic functions:
   – S/D = Fingertip control lever or dual-axis hydraulic control lever
   – MTC = Multitask control handle
3. Press the ↵ key.
   ⇨ Menu item F26 opens up again and displays the setting.

P	1	.	6				R	B	R		=					X
R	E	D	U	C	T	I	O	N		B	R	A	K	E		▶

Setting the braking pattern

This setting affects the deceleration rate for speed changes.

1. Press the ▶ key.
2. Menu item P1.6.1 opens up.

P	1	.	6	.	1			R	B	R		=				
S	T	D	=	7						M	A	X	=		9	↵

3. Enter the new value.

Note: The default and maximum settings are shown in the 2nd row.

4. Press the ↵ key.

⇨ Menu item P1.7 opens up.

P	1	.	7				P	B	R		=					X
P	E	D	A	L		B	R	A	K	E						▶

Setting the service brake (brake pedal)

This setting determines the amount of additional brake force produced by the electro-mechanical brake.

1. Press the ▶ key.
2. Menu item P1.7.1 opens up.

P	1	.	7	.	1			P	B	R		=				
S	T	D	=	9						M	A	X	=		9	↵

3. Enter the new value.

Note: The default and maximum settings are shown in the 2nd row.

4. Press the ↵ key.

⇨ Menu item P1.8 opens up.

P	1	.	8				R	A	I		=					X
R	A	I	S	E		S	P	E	E	D						▶

Setting the lift speed

1. Press the ▶ key.
2. Menu item P1.7.1 opens up.

P	1	.	8	.	1			R	A	I		=				
S	T	D	=	5						M	A	X	=		5	↵

3. Enter the new value.

Note: The default and maximum settings are shown in the 2nd row.

4. Press the ↵ key.

⇨ Menu item P1.9 opens up.

1. Press the ▶ key.
   ⇨ Menu item U3.1 opens up.

U	3	.	1		B	R	A	K	E		=			N	O
C	O	N	F	I	R	M									↵

2. Press ▼ to select YES (override parking brake) or NO (do not override parking brake).
3. Press the ↵ key.

⇨ Menu item U3 opens up and the status is displayed.

U4 Check Fan 1 - 4

1. Testing the fans

U	4				F	A	N			=			O	N	
C	H	E	C	K	F	A	N		1	-	4				▶

1. Press the ▶ key.
   ⇨ Menu item U4.1 opens up.

U	4	.	1		F	A	N				=		O	F	F
C	O	N	F	I	R	M									↵

2. Press ▼ to select ON (FANs 1 - 4 on).
3. Press ↵ and test FANs 1-4

⇨ Menu item U4 opens up and the status is displayed.

U5 Truck Lockout

U	5				T	L	O	C	K	=		Y	E	S	
T	R	U	C	K	L	O	C	K	O	U	T				▶

Disabling the truck

1. Press the ▶ key.
   ⇨ Menu item U5.1 opens up.

U	5	.	1			T	L	O	C	K	=			N	O
C	O	N	F	I	R	M									↵

2. Press ▼ to select YES (truck disabled) or NO (truck not disabled).
3. Press the ↵ key.

⇨ The next time the truck starts “Truck locked by Service” is displayed.

Event Code 180

Display: **ECR3 HALL SENSOR**

Explanation: Error in encoder ECR3 of steer motor.

ECR3 is a 2-channel Hall sensor fitted in the steer motor. This event code is generated if a channel is not correctly identified or if 2 channels are shorted.

Effect:
- Parking brake applied
- Traction module deactivated
- Main contactor ED1 de-energised

Possible Causes:
- Wiring or connectors damaged
- +5 V supply

Remedy:

Check wires and connections

1. Check wires and connections for discontinuity and short circuits.
   ⇨ If there is no damage, proceed to step 3.

+5 V supply

2. Disconnect PC414.
3. Using a voltmeter measure the voltage between PC414-5 and -6 and between PC414-7 and -8.
   ⇨ If there is a +5 V supply, proceed to step 4.
   ⇨ If there is no +5 V supply, proceed to step 6.
4. Reconnect PC414.
5. Using a voltmeter measure the voltage between PC436-1 and -2.
   ⇨ If there is a +5 V supply, proceed to step 7.
   ⇨ If there is no +5 V supply, this indicates that a wire has been disconnected. Proceed to step 8.

Replace steer module

6. Replace the steer module (see page 326).

Replace steer motor

7. Replace the steer module (see page 402).

Repair wiring

8. Repair the wiring.

Event Code 212

Display:	**15 VOLT SUPPLY HM**
Explanation:	Internal 15 V hydraulic module supply faulty.
Effect:	• Parking brake applied • Traction and hydraulic modules deactivated • Main contactor ED1 de-energised
Possible causes:	• Hydraulic module error
Remedy:	**Replace the hydraulic module** 1. Replace the hydraulic module (see page 326)

Event Code 213

Display:	**5 VOLT SUPPLY HM**
Explanation:	Internal 5 V hydraulic module supply faulty.
Effect:	• Hydraulic module is deactivated • Travel at creep speed enabled
Possible causes:	• Hydraulic module error
Remedy:	**Replace the hydraulic module** 1. Replace the hydraulic module (see page 326)

Event Code 243

Display: **POT3 ABOVE LIMIT**

Explanation: The voltage on the slider of potentiometer POT3 is permanently monitored during power-up and operation. The upper limit of 10.8 volts has been exceeded.

Effect:
- Hydraulic functions are deactivated

Possible causes:
- Wiring short circuit
- Potentiometer faulty

Remedy:

Check the voltage readings

1. In the Analyzer menu select item A2.5 (see page 118).
2. Apply “Lift/Lower".
   ⇨ If approx. 12 V is displayed, either there is a short circuit or an input on the VCM is faulty. Proceed to step 3.

Check the potentiometer wiring

3. Check the potentiometer wiring for a short circuit.
   ⇨ If the wiring is ok, proceed to step 4.

Measure the voltage levels on the potentiometer with a multimeter

4. Using a multimeter measure the voltage between CA408-2 and CA408-1.
   ⇨ If approx. 12 V are displayed, this indicates the potentiometer is faulty. Proceed to step 8.
5. Leave the control handle in neutral and using a multimeter measure the voltage between CA408-2 and CA408-1.
   ⇨ It should be 4,3 – 5,3 V.
6. Move the control handle as far as the stop in the "Lift" position and using a multimeter measure the voltage between CA408-2 and CA408-1.
   ⇨ It should be 7,8 – 9,5 V.
7. Move the control lever as far as the stop in the "Lower" position and using a multimeter measure the voltage between CA408-2 and CA408-1.
   ⇨ It should be 0,7 – 1,9 V.

⇨ If normal readings are taken in steps 5 to 7, this indicates the potentiometer is ok.

Compare the readings taken with the multimeter with those in the Analyzer menu display.

⇨ If normal readings are taken in steps 5 to 7 but approx. 12 V are displayed in the Analyzer menu, this indicates that the VCM input is faulty. Proceed to step 9.

Note: If no cause can be found and the truck works correctly after restarting, monitor the frequency of the fault (see Log Events Menu (Software V1.0), page 157). If the event occurs frequently, contact the Crown service department.

Replace the potentiometer

8. Replace the potentiometer POT3 (see page 335).

Replace the main module (VCM)

9. Replace the VCM (see page 325).

Replace the main module (VCM)

16. Replace the VCM (see page 325).

Event Code 264

Display: **PVAL ACCESSORY L**

Explanation: Overcurrent detected on PVAL valve coil as “5th function left” is performed. Output to PVAL cut out by VCM.

Effect:
- All outputs to the hydraulic valve coils are cut out.

Possible causes:
- Faulty coil
- Wiring short circuit
- Main module VCM faulty

Remedy:

Measuring the coil resistance

1. Disconnect PC809 from valve.
2. Measure resistance between pin 1 and pin 2 on the coil.
   ⇨ If the resistance is 25 Ω, proceed to step 4.
   ⇨ If the resistance is not 25 Ω, proceed to step 3.

Replace the coil

3. Replace the coil.

Check the wiring for short circuits

4. Connect PC809.
5. Start up the truck.
6. Leave the "5th function" control lever in neutral and measure the voltage between PC422-12 and B–.
   ⇨ If B+ is present, proceed to step 7. If not, proceed to step 10.
7. Disconnect PC809 from the valve and measure the voltage again between PC422-12 and B–.
   ⇨ If B+ is still present, this indicates a short circuit to B+ between PC809-2 and PC205-13. Proceed to step 12.
   ⇨ If B+ is not present, proceed to step 8.
8. Power down the truck.
9. Re-connect PC809. Proceed to step 13.

Locate and repair disconnected wires

10. Check for disconnected wires.
    ⇨ Is a wire is disconnected, proceed to step 11.
    ⇨ If not, proceed to step 7.
11. Repair the wire.

Locate and clear short circuits

12. Clear the short circuit to B+ in the wire from PC809-2 to PC205-13.

Event Codes 300 - 385

Event Code 300

Display: **HIGH CURRENT TM**

Explanation: Current in power part of traction module is too high (> 525 A).

Effect:
- Parking brake applied
- Traction and hydraulic modules deactivated
- Main contactor ED1 de-energised

Possible Causes:
- Short circuit in following components:
  - Power cable to traction motor
  - Traction motor coil
  - Traction module output stage
- Blocked drive

Remedy:

Check wires and connections

1. Check wires for short circuits.
   ⇨ If there is no damage, proceed to step 2.

Measure the traction motor insulation resistance

2. Power down the truck.
3. Check the motor coil insulation resistance.
   ⇨ If a coil fails, proceed to step 4.
   ⇨ If the coils are ok, proceed to step 5.

Replace the traction motor

4. Replace the traction motor (see page 352).

Check the drive for blockage

5. Check the drive for freedom of movement.
   ⇨ If the drive moves freely, proceed to step 6.

Replace the traction module

6. Replace the traction module (see page 325).

Event Code 301

Display: **SHORT CIRCUIT TM**

Explanation: Short circuit in power circuit of traction module.

Effect:
- Traction and hydraulic modules deactivated
- Main contactor ED1 de-energised
- Parking brake applied

Possible Causes:
- Short circuit in following components:
  - Power cable to traction motor
  - Traction motor coil
  - Traction module output stage

Event Code 340

Display: **POT1 ABOVE LIMIT**

Explanation: The voltage on the slider of potentiometer POT1 is permanently monitored during power-up and operation. The upper limit of 10.8 volts has been exceeded.

Effect:
- Travel functions are deactivated

Possible Causes:
- Wiring short circuit
- Potentiometer faulty

Remedy:

Check the voltage readings

1. In the Analyzer menu select item A2.3 (see page 118).
2. Depress accelerator.
   ⇨ If 0 V is displayed, there is either an open circuit between CA407-2, CA407-1 and the main module (VCM) or a short circuit between CA407-2 and CA407-3. Proceed with step 3.

Check the potentiometer wiring

3. Check the wiring to connectors PC407 and PC205 for discontinuity and short circuits.
   ⇨ If the wiring is ok, proceed to step 4.

Measure the voltage levels on the potentiometer with a multimeter

4. Leave the accelerator pedal in neutral and using a multimeter measure the voltage between CA407-2 and CA407-1.
   ⇨ It should be 0,7 – 1,5 V.
5. Depress the accelerator pedal as far as the stop and using a multimeter measure the voltage between CA407-2 and CA407-1.
   ⇨ It should be 9,5 – 10,5 V.

⇨ If normal readings are taken in steps 4 to 5, this indicates the potentiometer is ok. If not, proceed to step 300.

Compare the readings taken with the multimeter with those in the Analyzer menu display.

⇨ If normal readings are taken in steps 4 to 5 but approx. 0 V are displayed in the Analyzer menu, this indicates a transient event.

Note: If no cause can be found and the truck works correctly after restarting, monitor the frequency of the fault (see Log Events Menu (Software V1.0), page 157). If the event occurs frequently, contact the Crown service department.

Replace the potentiometer

6. Replace potentiometer POT1 (see page 334).

Event Code 462

Display: **FAN OUTPUT**

Explanation: Overcurrent detected on HCM output to fans during power-up. Output to fans switched off by the HCM.

Effect:
- Travel at inching speed enabled
- Mast reach and lowering only

Possible Causes:
- Faulty fan
- Short circuit

Remedy:

Test the fans

1. Test the fans (see *U4 Check Fan 1 - 4*, page 169).
   ⇨ If a faulty fan is discovered, proceed to step 2.
   ⇨ If the fans are working, proceed to step 3.

Replace the fans

2. Replace any faulty fans.

Trace short circuit

3. Trace for a short circuit between PC415 or PC435 to CA201-2 on HCM.
   ⇨ Repair faulty wiring.

Check wiring and operation of channel B on height encoder ECR5

10. Connect the voltmeter between PC205-38 and B–.
11. Raise the fork carriage above free lift height and then continue raising it very slowly.
    ⇨ If the voltage jumps between 0 V and 5 V, channel B is ok. Proceed to step 17.
    ⇨ If 0 V is constantly displayed, proceed to step 14.

Check 12 V supply wiring

12. Check for disconnected wiring from CA203-14 (on display) to CA803-3 and from CA203-20 to CA803-1.
    ⇨ If there is a disconnection, proceed to step 15.
    ⇨ If there is no disconnection, proceed to step 18.

Check channel A wiring on ECR5

13. Check for disconnected wiring from CA205-9 via CA422-31, CA600-2 to CA803-2.
    ⇨ If there is a disconnection, proceed to step 15.
    ⇨ If there is no disconnection, proceed to step 16.

Check channel A wiring on ECR5

14. Check for disconnected wiring from CA205-38 via CA422-32, CA600-4 to CA803-4.
    ⇨ If there is a disconnection, proceed to step 15.
    ⇨ If there is no disconnection, proceed to step 16.

Repair wiring

15. Repair wiring.

Replace encoder ECR5

16. Replace ECR5 (see page 332).

Replace the main module (VCM)

17. Replace the VCM (see page 325).

Replace the display

18. Replace the display (see page 326).

Preparing the control module safety test

Jacking up the truck

1. Disconnect the battery.
2. Jack up the truck (see page 17).
3. Remove the panels to gain access to the control modules.

Traction control module safety test

Testing the short circuit detection for phase U to V on the traction control module

1. Fit a 355 A fuse on the test wiring.
2. Connect the test wiring with additional nuts to terminals U and V of the traction control module.
3. Place the fuse holder on the floor.
4. Carefully check the entire unit again for possible short circuits.
   ⇨ Is everything is ok, proceed to step 5.
5. Switch on the truck.
6. Apply the safety pedal, direction switch and accelerator pedal.
   ⇨ The test has been successful if the main contactor ED1 is de-energised and event code 301 is displayed.
   ⇨ If the fuse blows in the test cable, the traction control module is faulty. Replace the traction control module immediately (see page 325).
7. Power down the truck.
8. Disconnect the battery.

Testing the short circuit detection for phase U to W on the traction control module

1. Remove the test wiring (355 A fuse) from terminal V and connect it to terminal W.
2. Place the fuse holder on the floor.
3. Carefully check the entire unit again for possible short circuits.
   ⇨ Is everything is ok, proceed to step 4.
4. Switch on the truck.
5. Apply the safety pedal, direction switch and accelerator pedal.
   ⇨ The test has been successful if the main contactor ED1 is de-energised and event code 301 is displayed.
   ⇨ If the fuse blows in the test cable, the traction control module is faulty. Replace the traction control module immediately (see page 325).
6. Power down the truck.
7. Disconnect the battery.

Testing the short circuit detection for phase W to V on the traction control module

1. Remove the test wiring (355 A fuse) from terminal U and connect it to terminal W.
2. Place the fuse holder on the floor.
3. Carefully check the entire unit again for possible short circuits.
   ⇨ Is everything is ok, proceed to step 4.
4. Switch on the truck.
5. Apply the safety pedal, direction switch and accelerator pedal.
   ⇨ The test has been successful if the main contactor ED1 is de-energised and event code 301 is displayed.
   ⇨ If the fuse blows in the test cable, the traction control module is faulty. Replace the traction control module immediately (see page 325).
6. Power down the truck.
7. Disconnect the battery.

Removing the test wiring

8. Remove the test wiring.

Checking travel functions after the test

9. Check the travel functions after the test.

Hydraulic control module safety test

Testing the short circuit detection for phase U to V on the hydraulic control module

1. Fit a 355 A fuse on the test wiring.
2. Connect the test wiring with additional nuts to terminals U and V of the hydraulic control module.
3. Place the fuse holder on the floor.
4. Carefully check the entire unit again for possible short circuits.
   ⇨ Is everything is ok, proceed to step 5.
5. Connect the battery.
6. Power up the truck.
7. Apply the safety pedal and activate lifting.
   ⇨ The test has been successful if the main contactor ED1 is de-energised immediately and event code 201 is displayed.
   ⇨ If the fuse blows in the test cable, the hydraulic control module is faulty. Replace the hydraulic module immediately (see page 326).
8. Power down the truck.
9. Disconnect the battery.

Wiring the Dual Axis Hydraulic Control Levers

WARNING

Incorrect wiring can result in serious injury
Swapping potentiometers will result in malfunctions during operation.

- *Make sure the potentiometers are connected to the correct interface slot.*
- *When you have finished, carry out a functional test.*

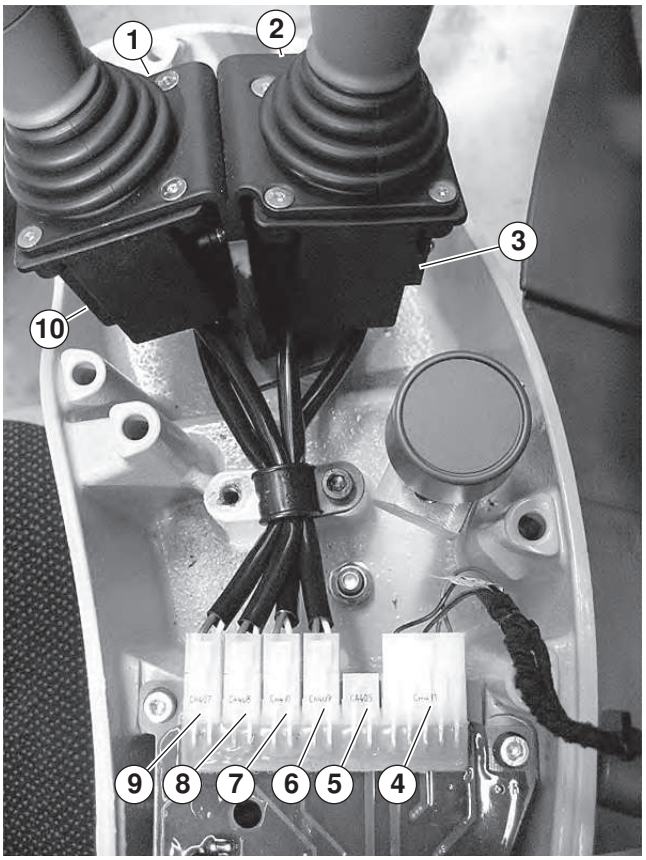


Fig. 89 Interface and connector layout

1	POT3 to CA408 (mast extend / retract)
2	POT4 to CA410 (fork tilt)
3	POT5 to CA409 (sideshift left and right)
4	CA411 (horn and direction switch)
5	CA405 (5th function)
6	CA409 (sideshift left and right)
7	CA410 (fork tilt)
8	CA408 (mast extend / retract)
9	CA407 (lift and lower)
10	POT2 to CA407 (lift and lower)

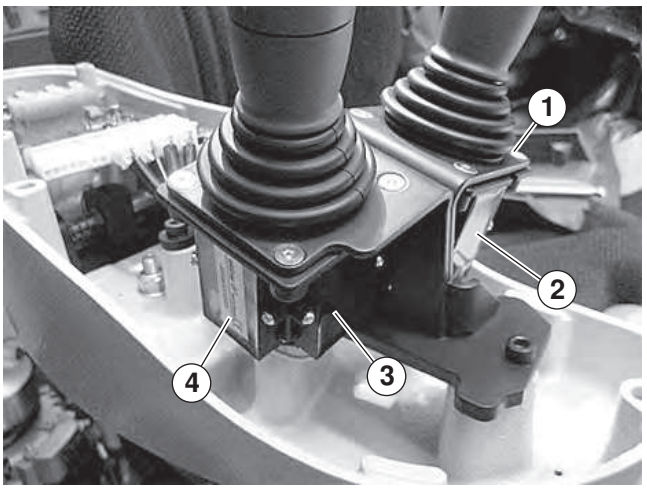


Fig. 90 View from display

1	POT2 to CA407 (lift and lower)
2	POT3 to CA408 (mast extend / retract)
3	POT4 to CA410 (fork tilt)
4	POT5 to CA409 (sideshift left and right)

12. Pre-tension the spring by 11 mm, tension the camera cable and fit the cable clamps as described in "*Fitting the camera cable clamps*".

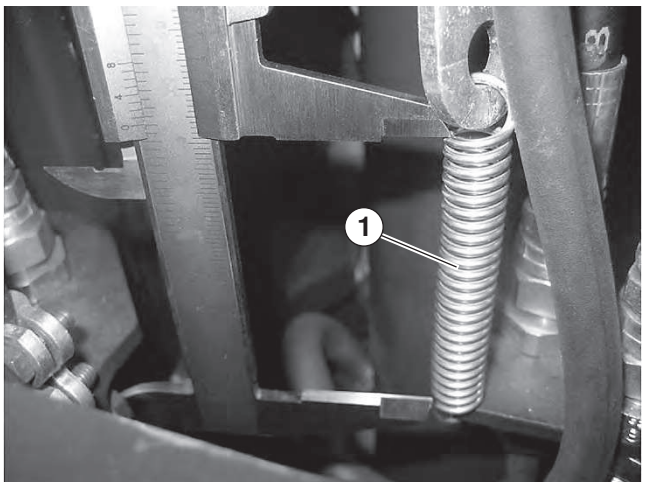


Fig. 106 Pre-tensioning the springs

13. Pre-tension the spring by 11 mm, tension the camera cable and attach the cable clamps as described in "*Fitting the camera cable clamps*".

Fitting the camera cable clamps

CAUTION

Incorrect assembly can prematurely damage the camera cable

The camera cable will be damaged if the required gap A (see Fig. 101) is not maintained, or not maintained evenly.

- *Maintain the specified gap A on both sides of the clamp.*

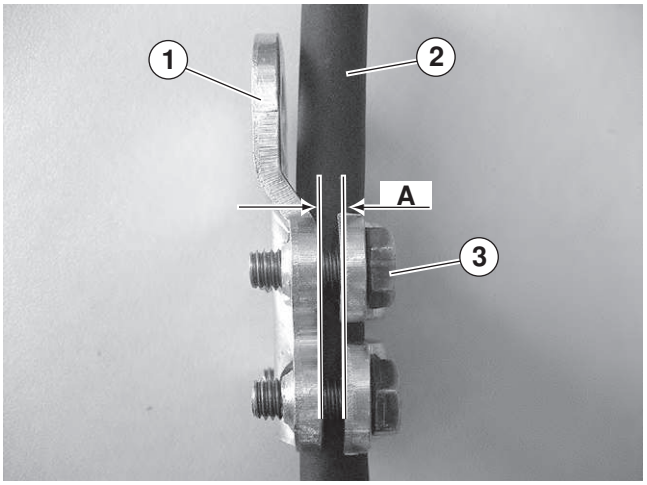


Fig. 107 Camera cable clamp

A	Gap (1.5 mm)
1	Cable clamp (052067-001)
2	Camera cable (826962)
3	Locking screw (4 off)

Connecting the power cables

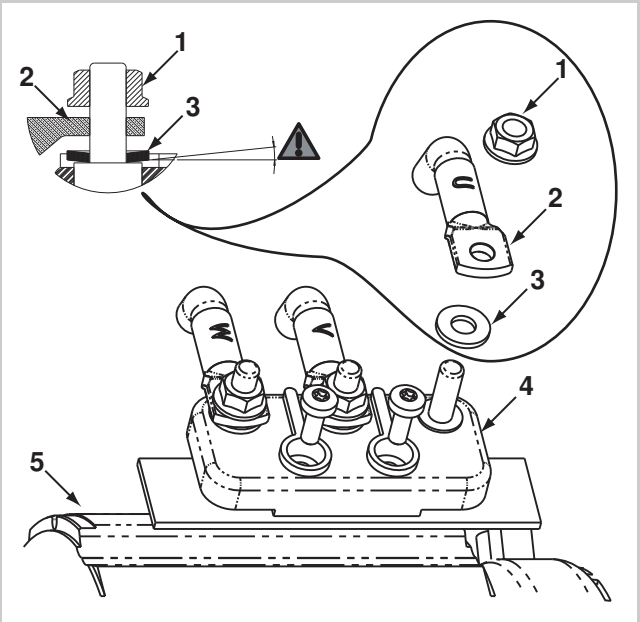


Fig. 116 Power cable

1	Nut
2	Power cable
3	Curved washer
4	Terminal board
5	Pump motor

1. Insert the power cables (2) with references U, V, W in the adaptors of the terminal board (4).
2. Insert the curved washers (3) with the curve facing down (see Figure 116) into the adaptors of the terminal board (4).
3. Insert the nuts (1) and torque them to 8.1 - 9.9 Nm.

Battery with 840 Ah

Fig. 133 840 Ah: battery retracted

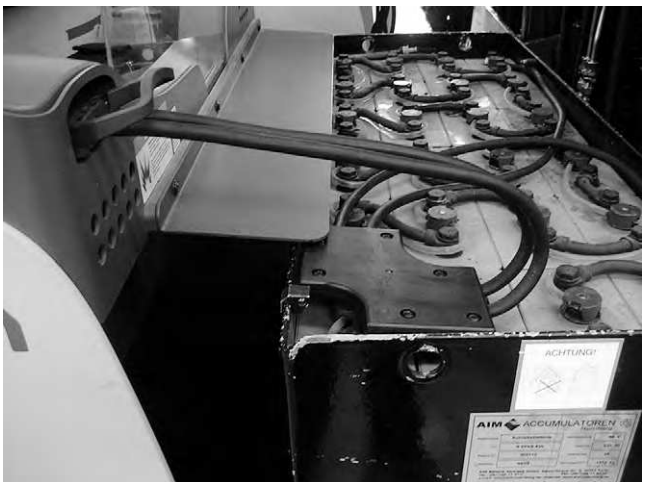


Fig. 134 840 Ah: battery extended

BRAKE SYSTEM

Adding Brake Fluid

WARNING

Incorrect brake fluid will result in brake failure
The use of hydraulic or lubrication oil as a brake fluid will cause the brake to fail. Fatal accidents could result.

➢ *Use only DOT 4 brake fluid. See Recommended Lubricants and Consumables chart on page 30.*

Note: Brake fluid does not easily disappear. Determine the cause (leak, brake lining wear etc.). Rectify the cause before filling the container.

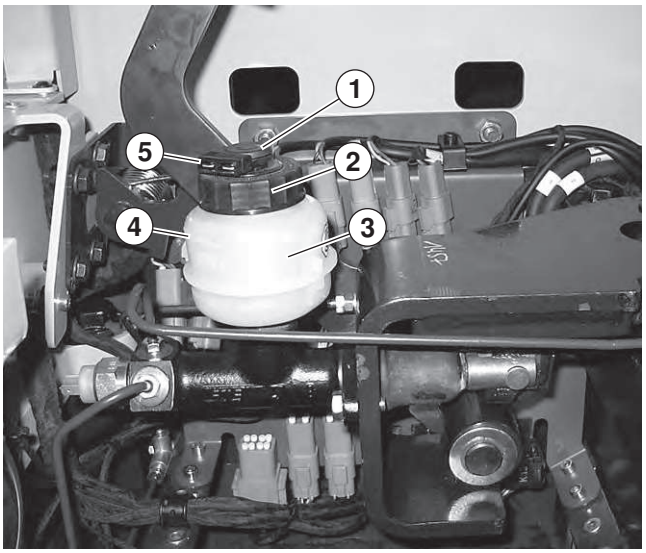


Fig. 155 Storage tank on main brake cylinder

1	Test key for float switch BFS
2	Cover
3	Reservoir
4	“Max.” mark
5	BFS ports

Preparation

1. Switch off the truck, disconnect the battery and prevent it from being switched on again.
2. Remove the floorboard from the floor area.
3. Remove the electrical connections from the BFS switch (5, Fig. 155).

Adding brake fluid

4. Remove the cover (2).
5. Add DOT4 brake fluid up to the mark (4).
6. Screw the cover back on.
7. Restore the electrical connections to the BFS switch (5, Fig. 155).
8. Connect the battery and switch on the truck.
9. Press the test button (1) to check the BFS switch.
   ⇨ The "brake fluid level" indicator light on the display lights up, event code 841 is displayed. It is working correctly.
   ⇨ The "brake fluid level" warning indicator does not light up on the display. Wiring or switch error. For troubleshooting see page 316.

Manual wheel change, drive wheel turned 70° to the right

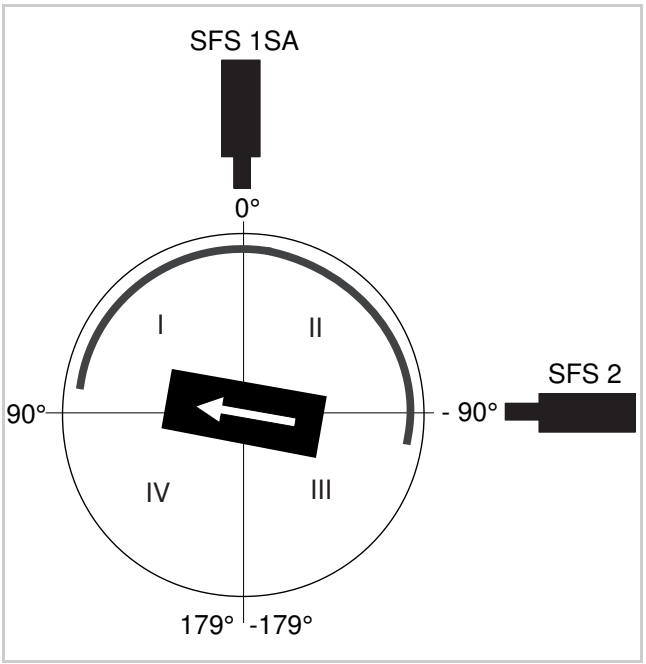


Fig. 161 Steered wheel in 80° position

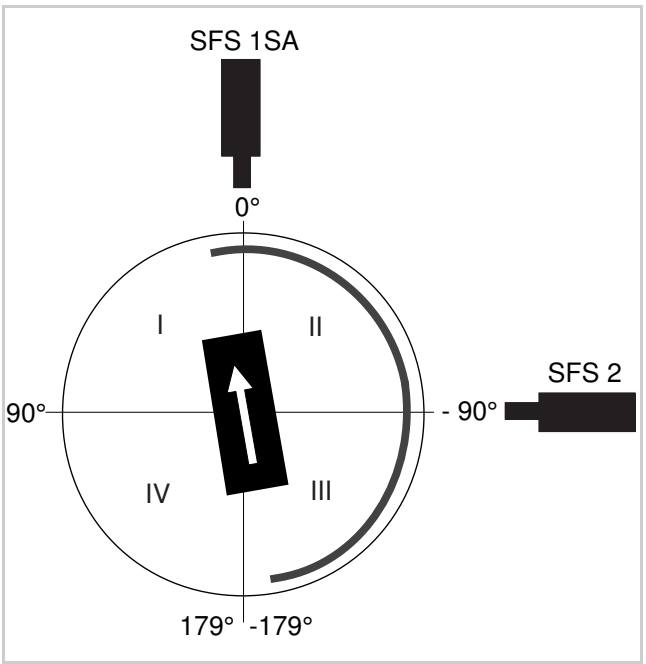


Fig. 162 Steered wheel turned 70° to the right

When the truck was parked, the steering control module stored the position of the drive wheel at 80°. The drive wheel is therefore in the 1st quadrant (see Fig. 161).

The drive wheel is now replaced. The steered wheel is turned manually 70° to the right (see Fig. 162).

The next time the truck starts up the steering control module compares the stored position (80°) with the current position (10° (80°-70°=10°)). As the drive wheel is still in the 1st quadrant, the error routine does **not** start. Steering remains in normal mode.

When the truck is started, provided the last stored value and the current calculated value for the drive wheel position are in the same quadrant, the error routine will not start.

You will only recognise this error by the fact that the steering wheel display does not match the actual steer angle on the drive wheel and the full 360° steering range is not reached.

Left steering

If the steering wheel is turned to the left, starting from a stored value of 80° the 90° level is reached 10° later. The steer angle display shows 90°.

However, the steer angle on the drive wheel is actually only 20° with respect to 0° for normal forward travel. The error routine does not start, as the drive wheel is still within the 1st quadrant.

70° later the mechanical 90° position is reached (SFS 1SA switches, SFS 2 has not switched). The steer angle display shows 160° and the error routine starts.

To reset the steering to 180° or 0°, simply turn another 90° to the left or right. This resets the steering to 180° or 0°.

Right steering

Starting from 80° as the stored value, after a further 10° you reach the switch area of the proximity switch SFS 1SA. The proximity switch applies. This switch signal resets the stored and calculated values in the traction control module to 0°. The steering angle display now matches the actual position of the drive wheel. The full steering range of 360° is now available again.

There is no message displayed when the calculated and stored angles are reset, as the steering control module is not going through the error routine. This happens in the normal mode of the steering control module each time the cam on the gear unit cover enters the switch area of the proximity switch SFS 1SA.

To rectify this error, you just need to steer accordingly so that the cam on the gear unit cover enters the switch area of proximity switch SFS 1SA.

LIFTING MECHANISM

Dismantling and Assembling the Mast

Safety notices

WARNING

Risk of trapping and severing limbs
Unsecured components can sever limbs and cause fatal injuries.
When carrying out work on the mast and the attachments:

- ➢ *Always block the mast stages and attachments to prevent them from accidentally moving.*
- ➢ *Make sure the equipment used has sufficient strength.*

CAUTION

Health risk
Cleaning agents, lubricants and consumables can damage your health.

- ➢ *Observe the manufacturer's safety instructions when handling solvents and lubricants.*

Tips & tricks

Switches and lines (electrical, hydraulic):

- Undo the mast attachments (base plates, clamps). This facilitates positioning for later re-assembly and normally saves having to adjust the switches.

Lift chains:

- Remove the chain bolt, not the chain anchor. This also normally saves subsequent adjustment.

Dismantling the mast

Fork carriage removal

1. Remove the mast (see page 415).
2. Remove the free lift switch (FLS), otherwise it will be damaged when the fork carriage is extended.
3. Remove the free lift cylinder chain.
4. Disconnect all hydraulic lines and if applicable electrical lines to the fork carriage.
5. Using a load sling raise and maintain the fork carriage.
6. Using the crane, move the fork carriage "down" from the 2nd mast stage.

Removing the 2nd mast stage

7. Remove all mast cables, hydraulic hoses and if applicable the height encoder and the camera system with the wiring and ropes - up to the outer mast. The wires and hoses should not run into the inner area of the mast stages. This would damage them when the mast is dismantled further.
8. Remove the lift chain and chain pulley from the free lift cylinder.
   Store the chain so that it is protected from contamination.
9. Remove the lift chains.
   Store the lift chains so that they are protected from contamination, marking the position of the chains (left / right). They will subsequently have to be re-assembled in their original positions.
10. Using a crowbar push the 2nd mast stage down until the bottom mast rollers can be accessed.
11. Remove the bottom mast rollers and shims out of the 2nd mast stage.
    Store the rollers and shims so that they can later be fitted in the same position.
12. Attach two load slings (one in the bottom, one in the top area of the 2nd mast stage) and using the crane pull the 2nd mast stage (without rollers!) out of the 1st mast stage.
13. Place the 2nd mast stage onto a suitable surface.

Removing the 1st mast stage

14. Remove the guide pulleys for the hoses and chains at the top left and right of the 1st mast stage.
15. Remove the anti-bend pins (10, Fig. 176) and the locking screws (13).
16. Using a crowbar, push the 1st mast stage up until the mast stage can be attached to the crane with 2 load slings.

Note: The ends of the lift cylinder piston rods should now lie freely, no longer in the mast stage seats.

17. Using the crane, pull the 1st mast stage out until the mast stops become visible through the circular hole at the bottom.
18. Remove the bolts (19, Fig. 176) and take out the mast stops (18) with the brackets (16 17) and the shims (16).

Note: Store all the parts so that they can be re-assembled later in the same position.

Lift Cylinder Removal and Assembly

The removal and assembly procedure differs depending on the lift height. Beyond an 8 m lift height the mast must be removed before the lift cylinders can be removed from a horizontal mast (see page 432).

Safety notices

WARNING

Risk of trapping and severing limbs
Unsecured masts stages and attachments can sever limbs or even cause fatal injuries.

- *Before starting assembly always block and secure the relevant components with equipment with sufficient strength and stability.*

WARNING

High-pressure hydraulic oil can cause severe injury
Whenever a high pressure hydraulic oil enters the skin it must be treated as a medical emergency.
Seek medical assistance even if the skin appears normal at first.
To avoid accidents:

- *Depressurise the hydraulic system before opening any sections of it.*
- *Tighten all connections before pressurising the system.*
- *Keep hands and body away from pressurized fluid.*
- *Only trace leaks with a piece of paper or cardboard.*

CAUTION

Health risk
Cleaning agents, lubricants and consumables can damage your health.

- *Observe the manufacturer's safety instructions when handling solvents and lubricants.*

Lift cylinder removal on masts up to 8 m

See Fig. 181

Removal preparation

1. Fully lower the fork carriage.
2. Place a flat tray underneath the work area to collect any spilled hydraulic oil.
3. Remove the panels (22 & 30).
4. Extend the mast until the 2nd mast stage has been raised approx. 500 mm.
5. Place approx. 200 mm long hard wooden blocks in the channels of the outer mast and secure them with clamps.
6. 350Place 350 - 400 mm long hard wooden blocks in the channels of the 1st mast stage and secure them with clamps.
7. Slowly lower the fork carriage in full.
   The lift chains are now relieved.

Lift cylinder removal

8. Switch off the truck, disconnect the battery and prevent it from being switched on again.
9. Remove the anti-bend pin (10) and screw (13).
10. Remove the chain bolts from the top of the cylinder tube connection and use wire to prevent the lift chains on the mast stage from falling down.
11. Depressurise the hydraulic system (see page 78).

CAUTION

Do not use any tools in step 12!. *Tools will damage the piston rod.*

12. Manually pull the piston rod down and out of the top seat and push it as far as the stop in the lift cylinder.
13. Place a load sling below the tappets of the cylinder tube and gently tension the cylinder using the crane.
14. Undo the hydraulic port from the lift cylinder.
15. Raise the lift cylinder out of the mast.

Inspecting Chain Supports and Lift Chains

WARNING

Crashing loads can cause injury!
*Lift chains, chain supports, chain bolts and their attachments are **safety components**. Their failure can cause the load to crash, resulting in fatal injuries.*

➢ *Replace damaged lift chains and their chain supports, chain bolts and connecting items with original spare parts before restoring the truck to service. If 2 chains are used paired, replace in pair.*

The inspection covers the following points:

- Checking the service hours for the chain supports and lift chains.
- Checking the lift chain for elongation.
- Checking for wear on the edges of the chain connection plates.
- Checking for pitting due to corrosion, in particular on the outer surfaces of the connection plates.
- Checking for twisted and protruding pins.
- Checking for loss of freedom in the chain links.
- Checking for damage to the anchor bolts and their attachments.
- Checking for wear and corrosion of the chain supports and anchor bolts.

Checking the service hours for the lift chains and anchor bolts

1. Check the chain support date of manufacture (see engraving on chain support):
   If the chain supports are 3 years or older, replace the chain supports, anchor bolts and lift chains together with all their attachments.
2. Check the number of service hours since the chain support and lift chains were last replaced:
   If the chain supports or lift chains have been in service for 6000 hours or more, replace the chain supports, anchor bolts and lift chains together with all their attachments.

Checking the lift chain for elongation

General

The chain bends as it passes over the chain rollers. This gradually causes the chain links and the chain plate eyelets to wear. The chain therefore elongates over time.

Preparatory measures

1. Remove the lift chain if it cannot be fully inspected when installed.
2. Clean the lift chain (see page 13).

Tools required:

- Wear gauge (see Fig. 187) or steel ruler

Fig. 187 Crown wear gauge

Chain wear can be measured with a wear gauge (part no. 106440) or a steel tape measure.

The Crown wear gauge (see Fig. 187) has two scales:

- Scale “A” is used for 19.05 mm (0.75 inch) and 25.4 mm (1 inch) pitch chains.
- Scale “B” is used for 15.88 mm (0.625 inch) pitch chains.

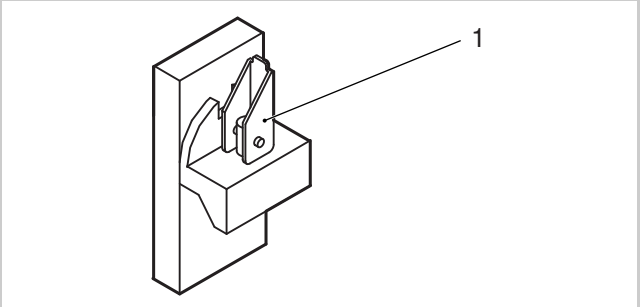


Fig. 204 Fork stop

Measuring the fork blade wear

The heel is particularly sensitive to wear. If the width is 90 % or less than the original value, the fork must be replaced.

Use calliper part no. 107330 to measure.

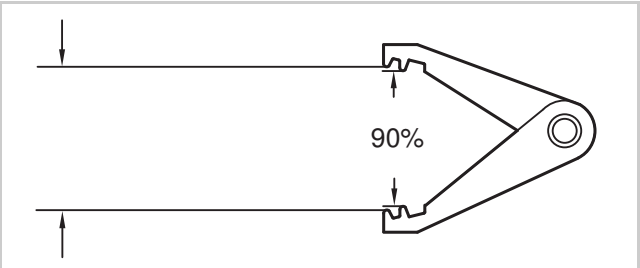


Fig. 205 Calliper (part no. 107330)

This calliper has 2 opposite tappets (see Fig. 205).

1. Using the outer tappets calculate the original fork blade width on the fork shank:
2. Using the outer tappets scan the fork shank width (item a = 100 % in Fig. 206) and fix the calliper. This determines the 100 % value. The inner tappets correspond to 90 % of the value previously obtained.
3. Now use the inner tappets (90 %) to scan the fork blade between the shank and the start of the curved area (1, Fig 206).
   If the calliper fits at any point over the fork blade, then the fork is worn. Remove the worn fork from service.

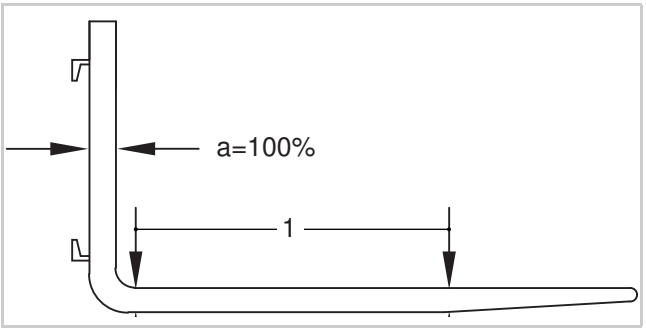


Fig. 206 Fork blade wear

General

Safety notices

CAUTION

Health risk
Cleaning agents, lubricants and consumables can damage your health.

➢ *Observe the manufacturer's safety instructions when handling solvents and lubricants.*

Hydraulic System Repair Instructions

- Hydraulic systems are sensitive to dirt.
- Thoroughly clean disassembled hydraulic components before dismantling them.
- Always repair hydraulic components at a clean workstation.
- Immediately protect cleaned and de-greased components with a thin coating of hydraulic oil.
- Protect components against re-contamination before assembling them.
- Immediately seal open hydraulic ports on repaired assemblies with dummy plugs. This also applies to open ports and lines on the truck.
- Do not refinish any cylinder surfaces. Replace any damaged parts.
- Always replace all the seals on the assembly. Used seals can cause leaks.

– Backring (6)
– O-ring (7)

2. Carefully de-grease the threads of the cylinder cap and the cylinder tube with a solvent.

⇨ The cylinder cap is now ready for assembly.

3. Push the cylinder cap carefully over the lubricated piston rod, taking care not to oil the thread.
4. Apply two drops of Loctite 242 to the start of the thread.
5. Screw the cylinder cap a few turns onto the cylinder tube and then grease the rest of the thread and screw the cylinder cap on in full.
6. Torque the cylinder cap to 130 ±10 Nm.
7. If the bleed screw has been removed, insert it again and torque to 5 - 6 Nm.

Final tasks

1. Re-assemble the free lift cylinder (see page 435).
2. Bleed the hydraulic system (see page 79).
3. Perform the drift test (see page 81).

Replacing the Cold Store Cab Windows

Important notes

Engineer qualifications

In order to ensure the adhesive quality and a visually appealing result you must be experienced in replacing adhesive windows. If in doubt arrange for a car body-builder to carry out the repair work.

Cure times

CAUTION

Premature load can cause the adhesive to loosen

- ➢ *Wait for at least 1 h after gluing. The truck can then be moved carefully on level surfaces at room temperature, but no load can be placed on it yet.*
- ➢ *Allow the adhesive to cure for 24 h at room temperature and at least 50% relative air humidity. You can then start up the truck again with load or in the cold store.*

Approved adhesives and primers

The windows should only be glued with the following materials:

- Bostik Simson ISR70-08 adhesive
- Simson Primer M

Cleaning the glued surfaces and windows

Always use isopropyl alcohol as a general cleaning agent and for non-cured adhesive residue. Residue from other cleaning agents can considerably reduce the window adhesion.

Do not use compressed air. Compressed air can contain oil mist. Oil severely reduces adhesion.

Ambient conditions for repair work

The adhesive used must be applied in ambient temperatures of +5 °C to +35 °C.

Bostik Simson ISR70-08 is SMP based and cures through air humidity.

The application temperature can be +5 °C to +35 °C. We recommend approx. 20 °C. Anything above that reduces the cure time significantly.

Note: Remove the truck from the cold store with plenty of time before the repair work to allow it to adapt to the ambient temperature.

Safety Notices

WARNING

Health risk

- ➢ *Observe the manufacturer's safety instructions when handling solvents and lubricants.*

Tools required

In addition to the usual tools the following tools are essential:

- Special tool to cut out glued car windows (draw knife, draw wire or electrical device).
- Two or more rubber extractors of sufficient size to handle the window securely.

Removing damaged windows

Securing the truck

1. Switch off the truck, disconnect the battery and prevent the truck from being switched on again.

Masking off the surrounding surfaces

2. Mask off the chassis areas next to the adhesive to avoid damaging the surface when the window is cut out.
3. Disconnect the window heater connecting cable and fix it to the window.

Cutting out the window

WARNING

Unsuitable tools can cause severe cuts and stab wounds

Standard knives can break or slip when the window is being cut out, causing sever cuts or stab wounds.

- ➢ *Use the designated special tool to remove the window.*

4. Cut out the window with the special tool. Obtain the help of an assistant to secure the window with the rubber extractors to prevent it from falling out.

Note: It is important to leave a layer of the old adhesive on the frame (approx. 50 % of the original thickness). The new adhesive sticks perfectly to the old adhesive.

5. Lift out the defective window with the rubber extractors and dispose of it.

Abbreviation	Description	Abbreviation	Description (Sheet 2 of 2)
PLS	Platform switch	TCM	Traction motor
PS	Pressure switch	HR	Heating
HCM	Hydraulic control module	ALM	Travel Alarm
RECEIVER	Receiver	TRANSMITTER	Transmitter
BDI	Combination instrument	CHARGER	On-board charger
BRK	Electromagnetic brake	DR	Driver
SLS	Sideshift left switch	SRS	Sideshift right switch
ECS	Lift control switch	---	---

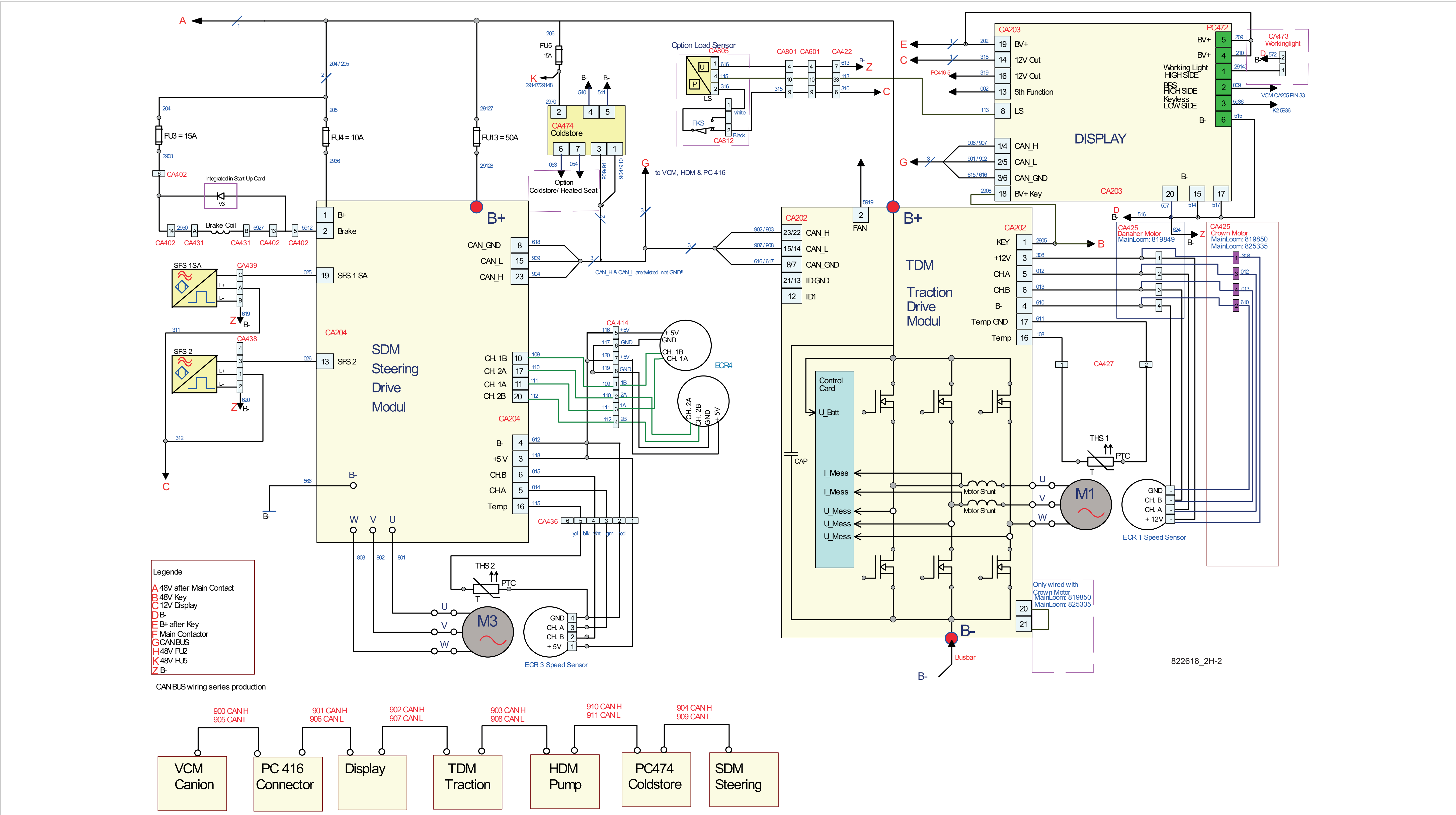
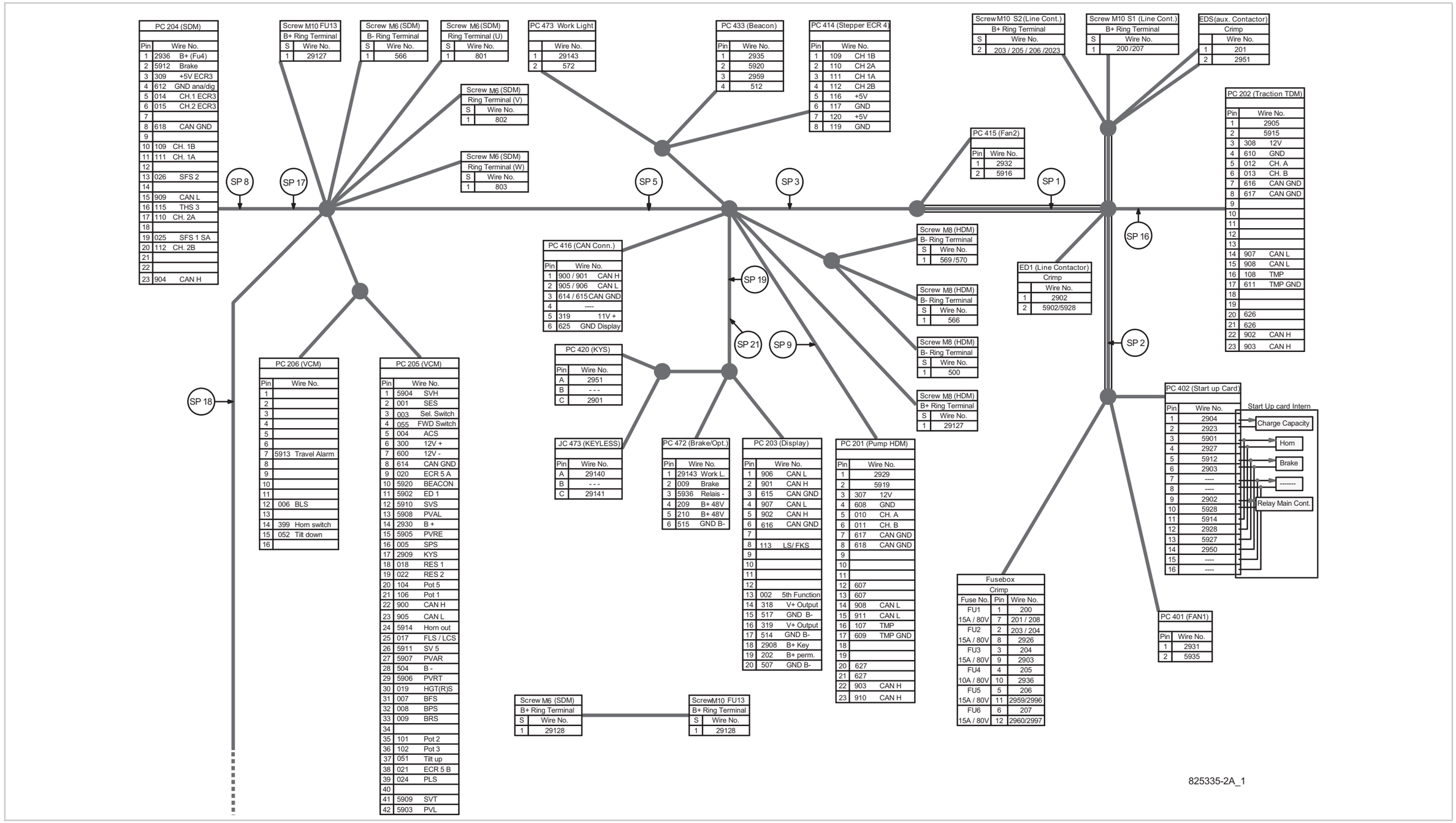

SDM
Steering
Drive
Modul
TDM
Traction
Drive
Modul
DISPLAY
B+
B-
CA204
CA202
CA203
PC472
CA474
Coldstore
Option Load Sensor
Option
Coldstore/ Heated Seat
to VCM, HDM & PC 416
CAN_H & CAN_L are twisted, not GND!
FU3 = 15A
FU4 = 10A
FU13 = 50A
FU5
15A
Integrated in Start Up Card
Brake Coil
SFS 1SA
SFS 2
ECR4
THS 2
PTC
THS 1
M3
M1
ECR 3 Speed Sensor
ECR 1 Speed Sensor
Control
Card
U_Batt
CAP
I_Mess
U_Mess
Motor Shunt
Busbar
CA473
Workinglight
Working Light
HIGH SIDE
Keyless
LOW SIDE
CA425
Danaher Motor
MainLoom: 819849
CA425
Crown Motor
MainLoom: 819850
MainLoom: 825335
Only wired with
Crown Motor
MainLoom: 819850
MainLoom: 825335
822618_2H-2
Legende
A 48V after Main Contact
B 48V Key
C 12V Display
D B-
E B+ after Key
F Main Contactor
G CAN BUS
H 48V FU2
K 48V FU5
Z B-
CAN BUS wiring series production
900 CAN H
905 CAN L
901 CAN H
906 CAN L
902 CAN H
907 CAN L
903 CAN H
908 CAN L
910 CAN H
911 CAN L
904 CAN H
909 CAN L
VCM
Canion
PC 416
Connector
Display
TDM
Traction
HDM
Pump
PC474
Coldstore
SDM
Steering

Fig. 238


PC 204 (SDM)
Pin Wire No.
1 2936 B+ (Fu4)
2 5912 Brake
3 309 +5V ECR3
4 612 GND ana/dig
5 014 CH.1 ECR3
6 015 CH.2 ECR3
7
8 618 CAN GND
9
10 109 CH. 1B
11 111 CH. 1A
12
13 026 SFS 2
14
15 909 CAN L
16 115 THS 3
17 110 CH. 2A
18
19 025 SFS 1 SA
20 112 CH. 2B
21
22
23 904 CAN H
Screw M10 FU13
B+ Ring Terminal
S Wire No.
1 29127
Screw M6 (SDM)
B- Ring Terminal
S Wire No.
1 566
Screw M6 (SDM)
Ring Terminal (U)
S Wire No.
1 801
Screw M6 (SDM)
Ring Terminal (V)
S Wire No.
1 802
Screw M6 (SDM)
Ring Terminal (W)
S Wire No.
1 803
PC 473 Work Light
Wire No.
1 29143
2 572
PC 433 (Beacon)
Pin Wire No.
1 2935
2 5920
3 2959
4 512
PC 414 (Stepper ECR 4)
Pin Wire No.
1 109 CH 1B
2 110 CH 2A
3 111 CH 1A
4 112 CH 2B
5 116 +5V
6 117 GND
7 120 +5V
8 119 GND
Screw M10 S2 (Line Cont.)
B+ Ring Terminal
S Wire No.
2 203 / 205 / 206 /2023
Screw M10 S1 (Line Cont.)
B+ Ring Terminal
S Wire No.
1 200/207
EDS(aux. Contactor)
Crimp
Wire No.
1 201
2 2951
PC 415 (Fan2)
Pin Wire No.
1 2932
2 5916
PC 202 (Traction TDM)
Pin Wire No.
1 2905
2 5915
3 308 12V
4 610 GND
5 012 CH. A
6 013 CH. B
7 616 CAN GND
8 617 CAN GND
9
10
11
12
13
14 907 CAN L
15 908 CAN L
16 108 TMP
17 611 TMP GND
18
19
20 626
21 626
22 902 CAN H
23 903 CAN H
SP 8
SP 17
SP 5
SP 3
SP 1
SP 16
SP 19
SP 21
SP 9
SP 2
SP 18
PC 416 (CAN Conn.)
Pin Wire No.
1 900 / 901 CAN H
2 905 / 906 CAN L
3 614 / 615 CAN GND
4 ----
5 319 11V +
6 625 GND Display
Screw M8 (HDM)
B- Ring Terminal
S Wire No.
1 569 /570
Screw M8 (HDM)
B- Ring Terminal
S Wire No.
1 566
Screw M8 (HDM)
B- Ring Terminal
S Wire No.
1 500
Screw M8 (HDM)
B+ Ring Terminal
S Wire No.
1 29127
ED1 (Line Contactor)
Crimp
Wire No.
1 2902
2 5902/5928
PC 206 (VCM)
Pin Wire No.
1
2
3
4
5
6
7 5913 Travel Alarm
8
9
10
11
12 006 BLS
13
14 399 Horn switch
15 052 Tilt down
16
PC 205 (VCM)
Pin Wire No.
1 5904 SVH
2 001 SES
3 003 Sel. Switch
4 055 FWD Switch
5 004 ACS
6 300 12V +
7 600 12V -
8 614 CAN GND
9 020 ECR 5 A
10 5920 BEACON
11 5902 ED 1
12 5910 SVS
13 5908 PVAL
14 2930 B +
15 5905 PVRE
16 005 SPS
17 2909 KYS
18 018 RES 1
19 022 RES 2
20 104 Pot 5
21 106 Pot 1
22 900 CAN H
23 905 CAN L
24 5914 Horn out
25 017 FLS / LCS
26 5911 SV 5
27 5907 PVAR
28 504 B -
29 5906 PVRT
30 019 HGT(R)S
31 007 BFS
32 008 BPS
33 009 BRS
34
35 101 Pot 2
36 102 Pot 3
37 051 Tilt up
38 021 ECR 5 B
39 024 PLS
40
41 5909 SVT
42 5903 PVL
PC 420 (KYS)
Pin Wire No.
A 2951
B - - -
C 2901
JC 473 (KEYLESS)
Pin Wire No.
A 29140
B - - -
C 29141
PC 472 (Brake/Opt.)
Pin Wire No.
1 29143 Work L.
2 009 Brake
3 5936 Relais -
4 209 B+ 48V
5 210 B+ 48V
6 515 GND B-
PC 203 (Display)
Pin Wire No.
1 906 CAN L
2 901 CAN H
3 615 CAN GND
4 907 CAN L
5 902 CAN H
6 616 CAN GND
7
8 113 LS/ FKS
9
10
11
12
13 002 5th Function
14 318 V+ Output
15 517 GND B-
16 319 V+ Output
17 514 GND B-
18 2908 B+ Key
19 202 B+ perm.
20 507 GND B-
PC 201 (Pump HDM)
Pin Wire No.
1 2929
2 5919
3 307 12V
4 608 GND
5 010 CH. A
6 011 CH. B
7 617 CAN GND
8 618 CAN GND
9
10
11
12 607
13 607
14 908 CAN L
15 911 CAN L
16 107 TMP
17 609 TMP GND
18
19
20 627
21 627
22 903 CAN H
23 910 CAN H
Screw M6 (SDM)
B+ Ring Terminal
S Wire No.
1 29128
Screw M10 FU13
B+ Ring Terminal
S Wire No.
1 29128
Fusebox
Crimp
Fuse No. Pin Wire No.
FU1 1 200
15A / 80V 7 201 / 208
FU2 2 203 / 204
15A / 80V 8 2926
FU3 3 204
15A / 80V 9 2903
FU4 4 205
10A / 80V 10 2936
FU5 5 206
15A / 80V 11 2959/2996
FU6 6 207
15A / 80V 12 2960/2997
PC 402 (Start up Card)
Pin Wire No.
1 2904
2 2923
3 5901
4 2927
5 5912
6 2903
7 ----
8 ----
9 2902
10 5928
11 5914
12 2928
13 5927
14 2950
15 ----
16 ----
Start Up card Intern
Charge Capacity
Horn
Brake

Relay Main Cont.
PC 401 (FAN1)
Pin Wire No.
1 2931
2 5935
825335-2A_1

Fig. 247

From connector	Pin number	Wire number	To connector / neutral point	Pin number
PC 422 Mast	1	5909 SVT	PC 205	41
	2	019 HGT(R)S	PC 205	30
	3	017 FLS/LCS	PC 205	25
	4	022 RES 2	PC 205	19
	5	5910 SVS	PC 205	12
	6	310 12V+	SP 10	---
	7	613 GND	SP 11	---
	8	5903 PVL	PC 205	42
	9	5904 SVH	PC 205	1
	10	5905 PVRE	PC 205	15
	11	5907 PVAR	PC 205	27
	12	5908 PVAL	PC 205	13
	13	018 RES 1	PC 205	18
	14	2921 BV +	SP 4	---
	15	503 BV -	SP 5	---
	16	5906 PVRT	PC 205	29
	17	024 PLS	PC 205	39
	18	5911 SV5	PC 205	26
	31	020 ECR 5 A	PC 205	9
	32	021 ECR 5 B	PC 205	38
	33	113 LS	PC 203	8
PC 425 ECR1 Travel	1	308	PC 202	3
	2	012	PC 202	5
	3	013	PC 202	6
	4	610	PC 202	4
PC 426 BLS	A	006	PC 206	12
	B	---	---	---
	C	3101	SP 10	---
PC 427 THS1	1	108	PC 202	16
	2	611	PC 202	17
PC 429 ECR2 Pump	1	307	PC 201	3
	2	010	PC 201	5
	3	011	PC 201	6
	4	608	PC 201	4

Connector	Part No. Housing	Part No. Anti-Backout	Part No. Contact pins
PC 438	792881-003	793091-003	792883
PC 439	792881-002	793091-002	792883
PC 440	792881-005	793091-005	792883
PC 470	792881-006	793091-006	792883
PC 471	792881-006	793091-006	792883
PC 472	116851		116858
PC 473	792881-001	793091-001	792883
JC 473	792880-002	793090-002	792882
PC 474	792881-005	793091-005	792883

From connector	Pin number	Wire number	to connector / neutral point	Pin number
JC 473 Keyless	A	29140	Relay K1	30
	C	29141	Relay K1	87
PC 474 CAN OUT card	1	904 / 910	PC 204 / 201	23 / 23
	2	2970	SP 18	---
	3	909 / 911	PC 204 / 201	15 / 15
	4	540	SP 15	---
	5	541	SP 15	---
	6	053 Heat, seat	PC 471	6
	7	054 Freezer	PC 470	11
	8			
Fuse box	1	200	Screw M10 S1	Ring-T
	7	201 / 208	EDS / SP 19	Ring-T / ---
	2	203 / 204	Screw M10 S2/ fuse box	Ring-T / 3
	8	2926	SP 2	---
	3	204	Fuse box	2
	9	2903	PC 402	6
	4	205	Screw M10 B+	Ring-T
	10	2936	PC 204	1
	5	206	Screw M10 S1	Ring-T
	11	2959 / 2996	PC 433 / SP 18	3
	6	207	Screw M10 S1	Ring-T
	12	2960 / 2997	PC 421 / SP 20	3 / ---
EDS	Crimp	201	Fuse box	7
	Crimp	2951	PC 420	A
ED1	Crimp	2902	PC 402	9
	Crimp	5902 / 5928	PC 205 / PC 402	24 / 10
Relay options K 12	30			
	86	2924	SP 1	---
	85	927	K 13	86
	87			

Connector	Part No. Housing	Part No. Anti-Backout	Part No. Contact pins
PC 436	818925-004	818926-004	818927
PC 438	792881-003	793091-003	792883
PC 439	792881-002	793091-002	792883
PC 440	792881-005	793091-005	792883
PC 470	792881-006	793091-006	792883
PC 471	792881-006	793091-006	792883
PC 472	116851		116858
PC 473	792881-001	793091-001	792883
JC 473	792880-002	793090-002	792882
PC 474	792881-005	793091-005	792883

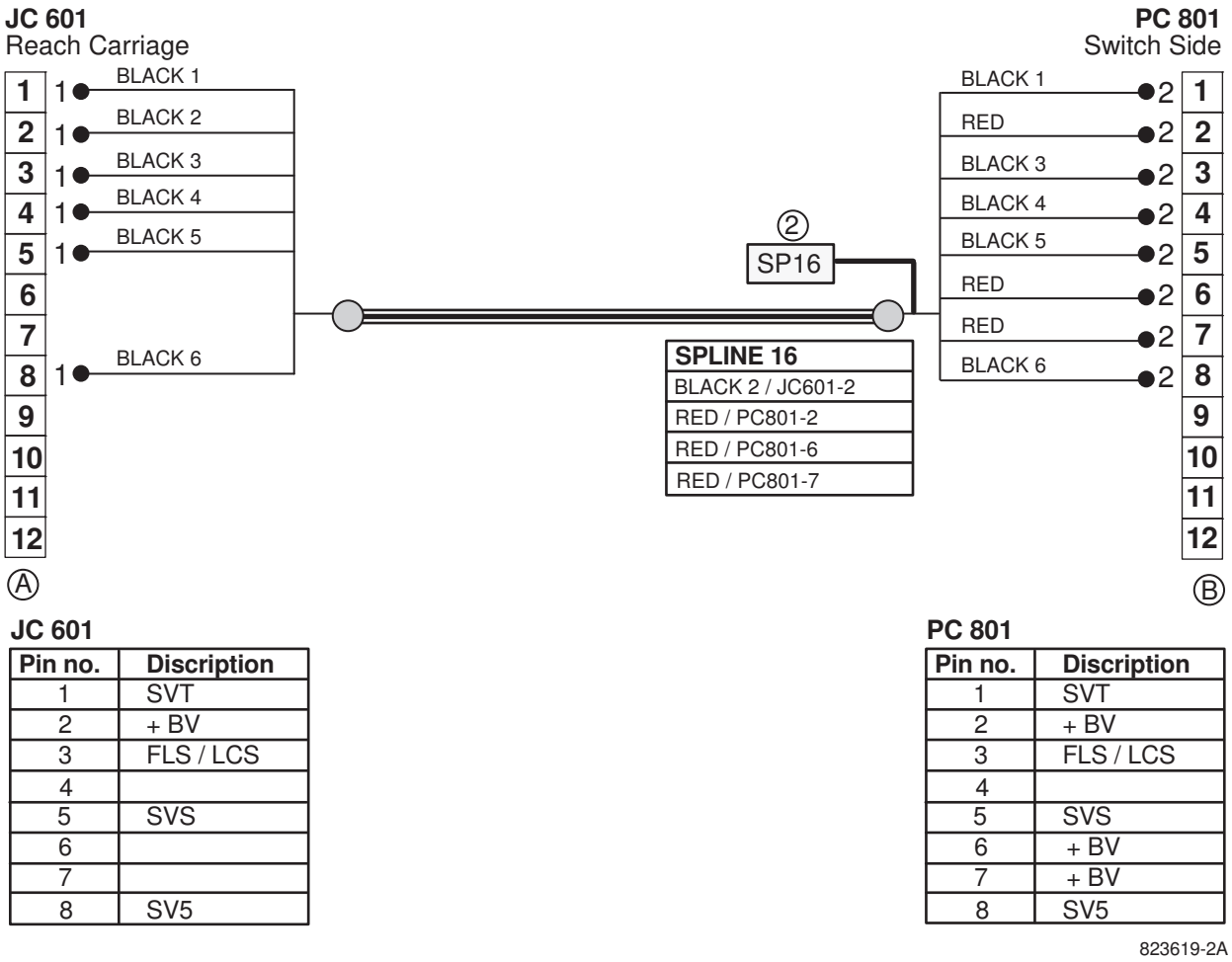
From connector	Pin number	Wire number	To connector / neutral point	Pin number
JC 473 Keyless	GS	29140	Relay K1	30
	H	29141	Relay K1	87
PC 474 CAN OUT card	1	904 / 910	PC 204 / 201	23 / 23
	2	2970	SP 18	---
	3	909 / 911	PC 204 / 201	15 / 15
	4	540	SP 15	---
	5	541	SP 15	---
	6	053 Heat, seat	PC 471	6
	7	054 Freezer	PC 470	11
	8			
Fuse box	1	200	Screw M10 S1	Ring-T
	7	201 / 208	EDS / SP 19	Ring-T / ---
	2	203 / 204	Screw M10 S2/ fuse box	Ring-T / 3
	8	2926	SP 2	---
	3	204	Fuse box	2
	9	2903	PC 402	6
	4	205	Screw M10 B+	Ring-T
	10	2936	PC 204	1
	5	206	Screw M10 S1	Ring-T
	11	2959 / 2996	PC 433 / SP18	3
	6	207	Screw M10 S1	Ring-T
	12	2960 / 2997	PC 421 / SP 20	3 / ---
EDS	Crimp	201	Fuse box	7
	Crimp	2951	PC 420	GS
ED1	Crimp	2902	PC 402	9
	Crimp	5902 / 5928	PC 205 / PC 402	24 / 10
Relay options K 12	30			
	86	2924	SP 1	---
	85	927	K 13	86
	87			

Manifold, mast wire harness

Replacement Parts

Item no.	Part no.	Description
1	792880-006	Pin housing
2	792881-002	Connector housing
3	793091-002	Anti-Backout
4	792881-003	Connector housing
5	793091-003	Anti-Backout
6	792883	Connector housing crimp
7	792882	Pin crimp
8	793222	Empty pin
12	814156-001	Housing
13	814156-002	Housing
14	814164	Housing
15	793217-022	Crimp Faston, female
16	793217-027	Insulating sleeve
18	793090-006	Anti-Backout
	812327	Harness, complete

Mast Cable, 6 Core, ESR 5000, Mast



JC 601

Pin no.	Discription
1	SVT
2	+ BV
3	FLS / LCS
4	
5	SVS
6	
7	
8	SV5

PC 801

Pin no.	Discription
1	SVT
2	+ BV
3	FLS / LCS
4	
5	SVS
6	+ BV
7	+ BV
8	SV5

Fig. 263 Mast cable, 6 core, ESR 5000, mast

Plug connector housing

Type	Housing	Part no.	Description
A	**JC 601**	792880-006	Housing
		793090-006	Anti-Backout
B	PC 801	792881-006	Housing
		793091-006	Anti-Backout

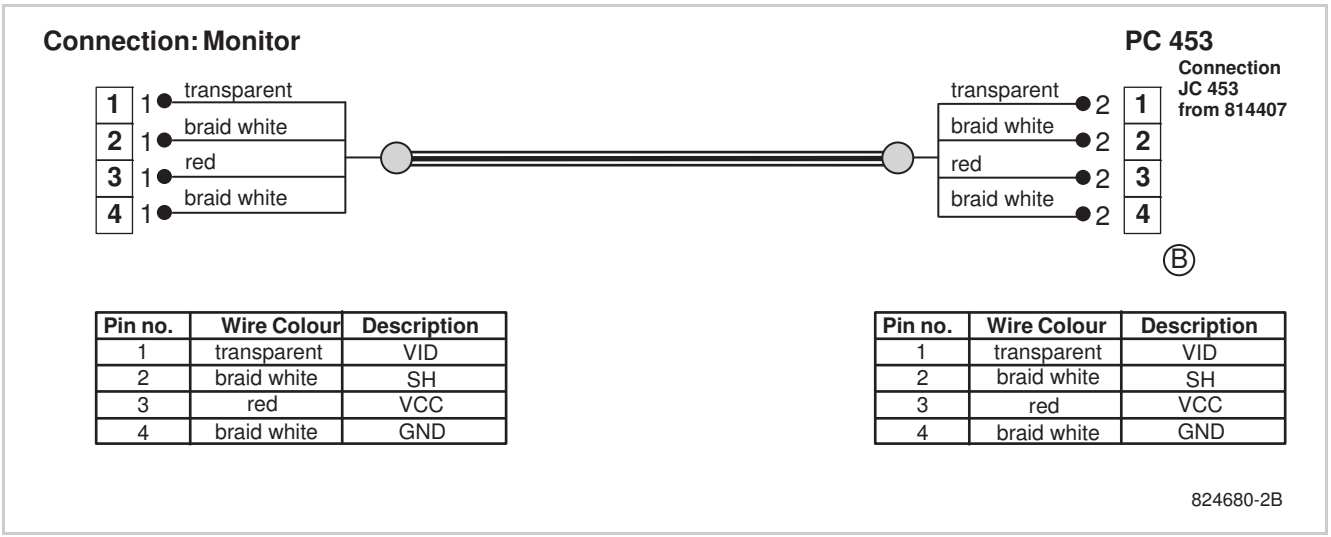
Contact pins

Item No.	Part no.
1	792882
2	792883

Spare parts

Part no.	Description
823619	Harness, complete

Motec Camera, Reach Mechanism on Display Housing, Option



Pin no.	Wire Colour	Description
1	transparent	VID
2	braid white	SH
3	red	VCC
4	braid white	GND

Pin no.	Wire Colour	Description
1	transparent	VID
2	braid white	SH
3	red	VCC
4	braid white	GND

Fig. 273 Motec camera, reach mechanism on display housing, option

Plug connector housing

Type	Housing	Part no.	Description
B	PC 453	792881-003	Housing
		793091-003	Anti-Backout
		814406-001	Cable and connector

Contact pins

Item No.	Part no.
2	792883

Spare parts

Part no.	Description
824680	Harness, complete

Beacon Wire Harness, Option

Plug connector housing

Type	Housing	Part no.	Description
A	**JC 433**	792880-003	Housing
B	PC 434		Housing
	PC 435	792881-001	Housing

Contact pins

Type	Part no.
1	792882
2	792883

Replacement Parts

Part no.	Description
824318	Harness, complete

Reading lamp wire harness, option

Plug connector housing

Type	Housing	Part no.	Description
A	**JC 441**	792880-005	Housing
B	**RL**	792881-003	Housing
C	PC 450	792881-005	Housing

Contact pins

Item No.	Part no.
1	792882
3	792883

Replacement Parts

Part no.	Description
824371	Harness, complete

DC / DC Converter NA Wire Harness, Option

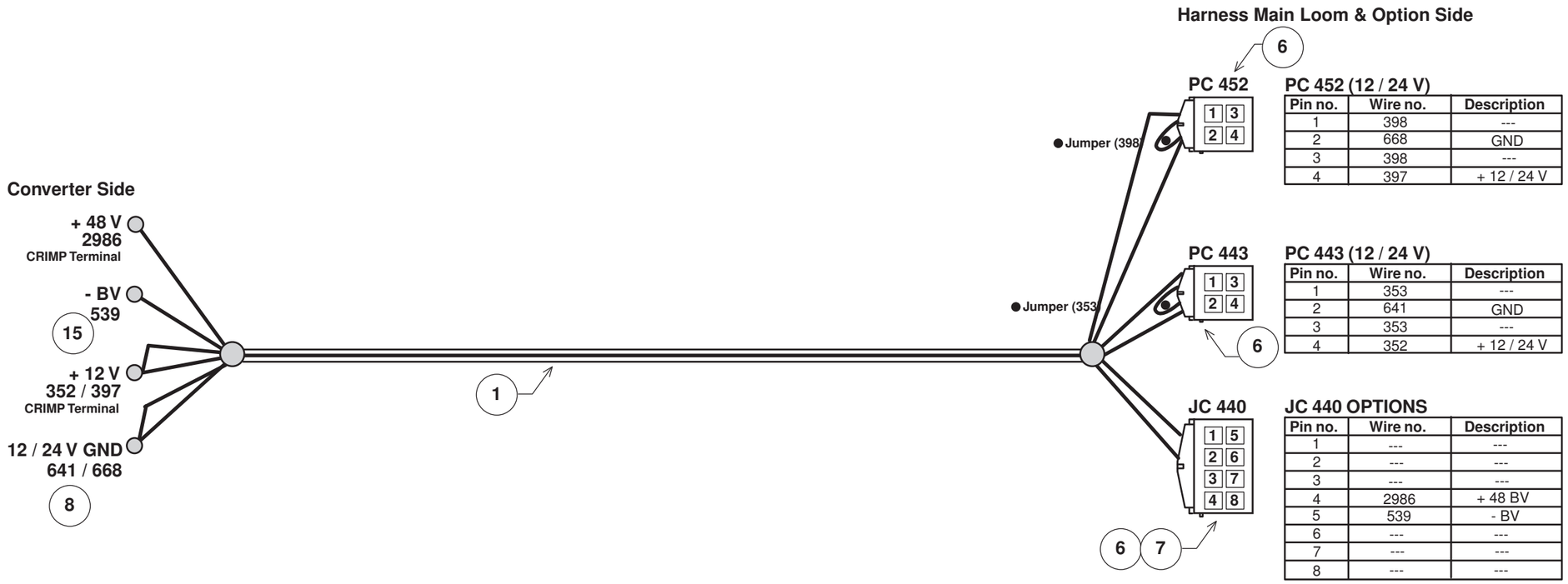


Fig. 286 DC / DC converter NA wire harness, option

Cold Store Cab Main Harness

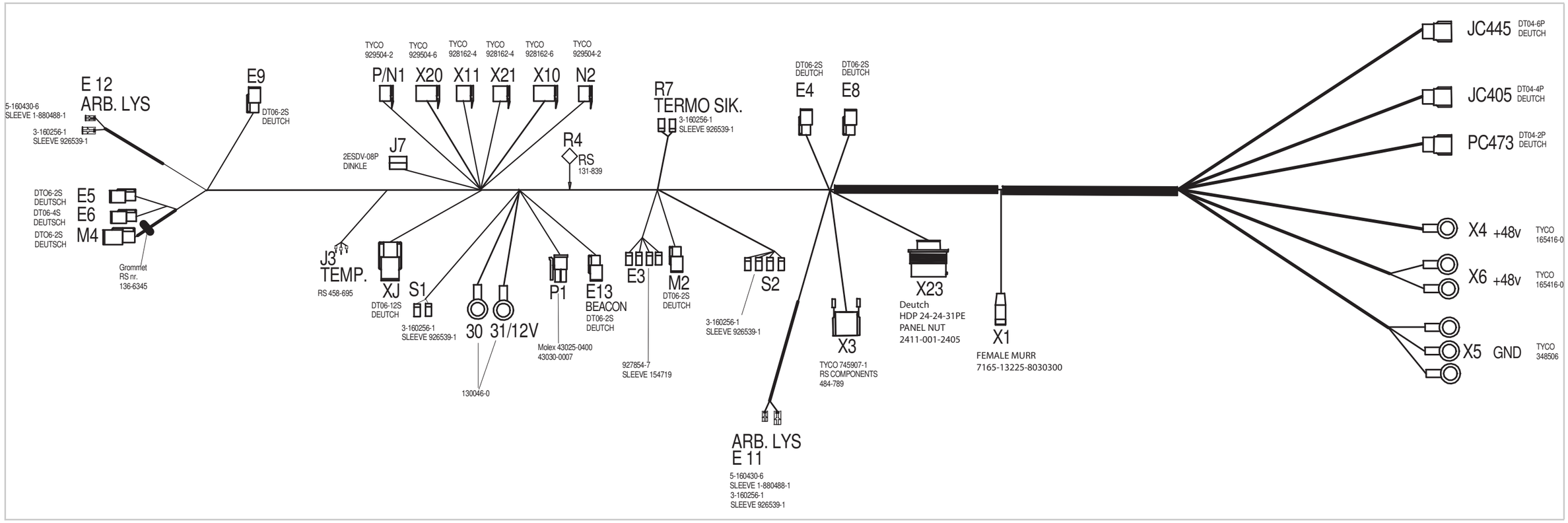


Fig. 292 Main harness