Johnston

Johnston
Sweepers Limited

Maintenance Manual

CN101
Suction Sweeper

Part No. 7032299

Revision Level A

Foreword F

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CHAPTER 1

Engine

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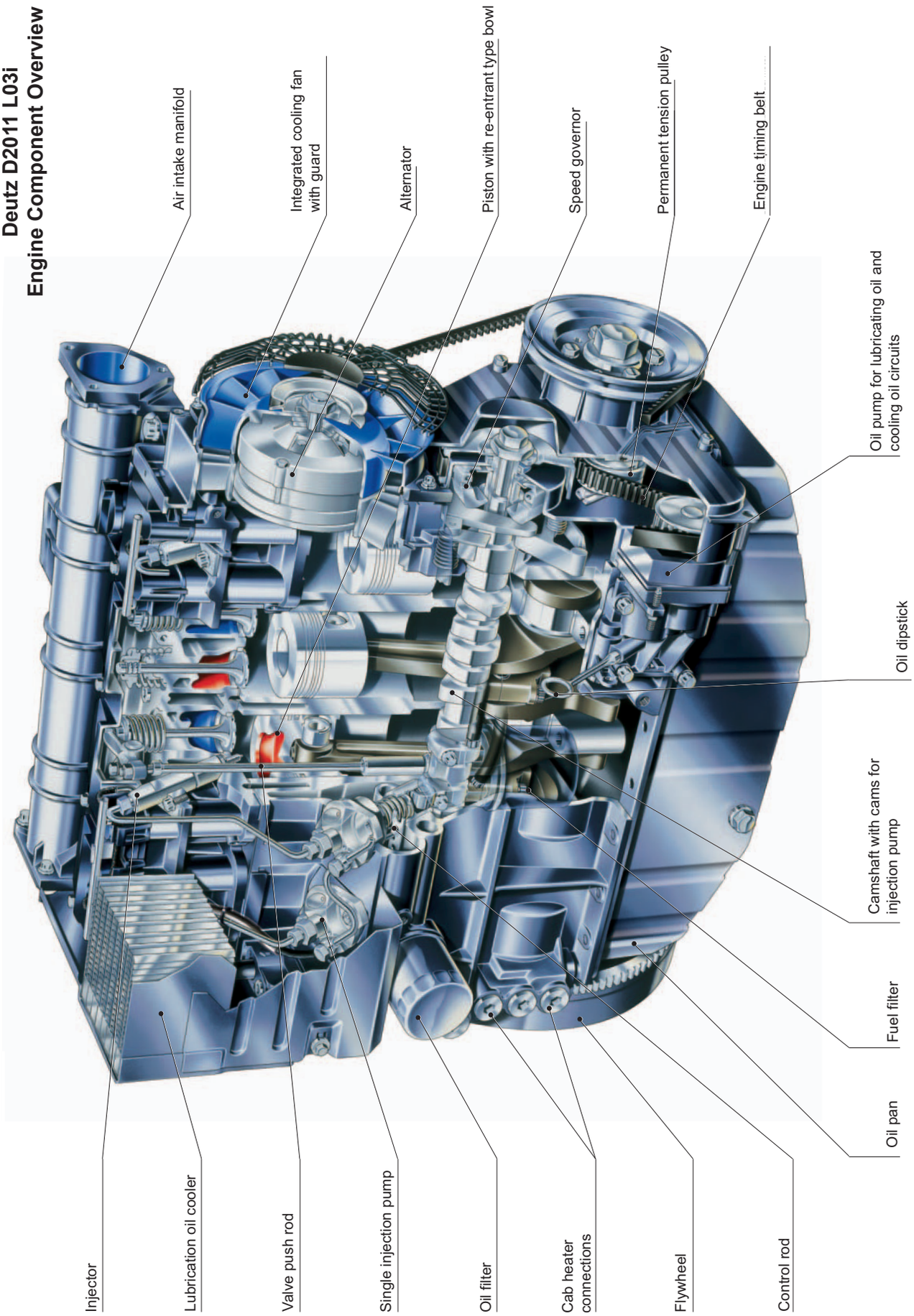
Deutz D2011 L03i
Engine Component Overview



For engine operator's manual please refer to the following document;

Deutz Operator's Manual_English.pdf

For engine timing belt replacement information please refer to the following document;

Deutz Timing Belt Replacement.pdf

CHAPTER 2

Hydraulic System

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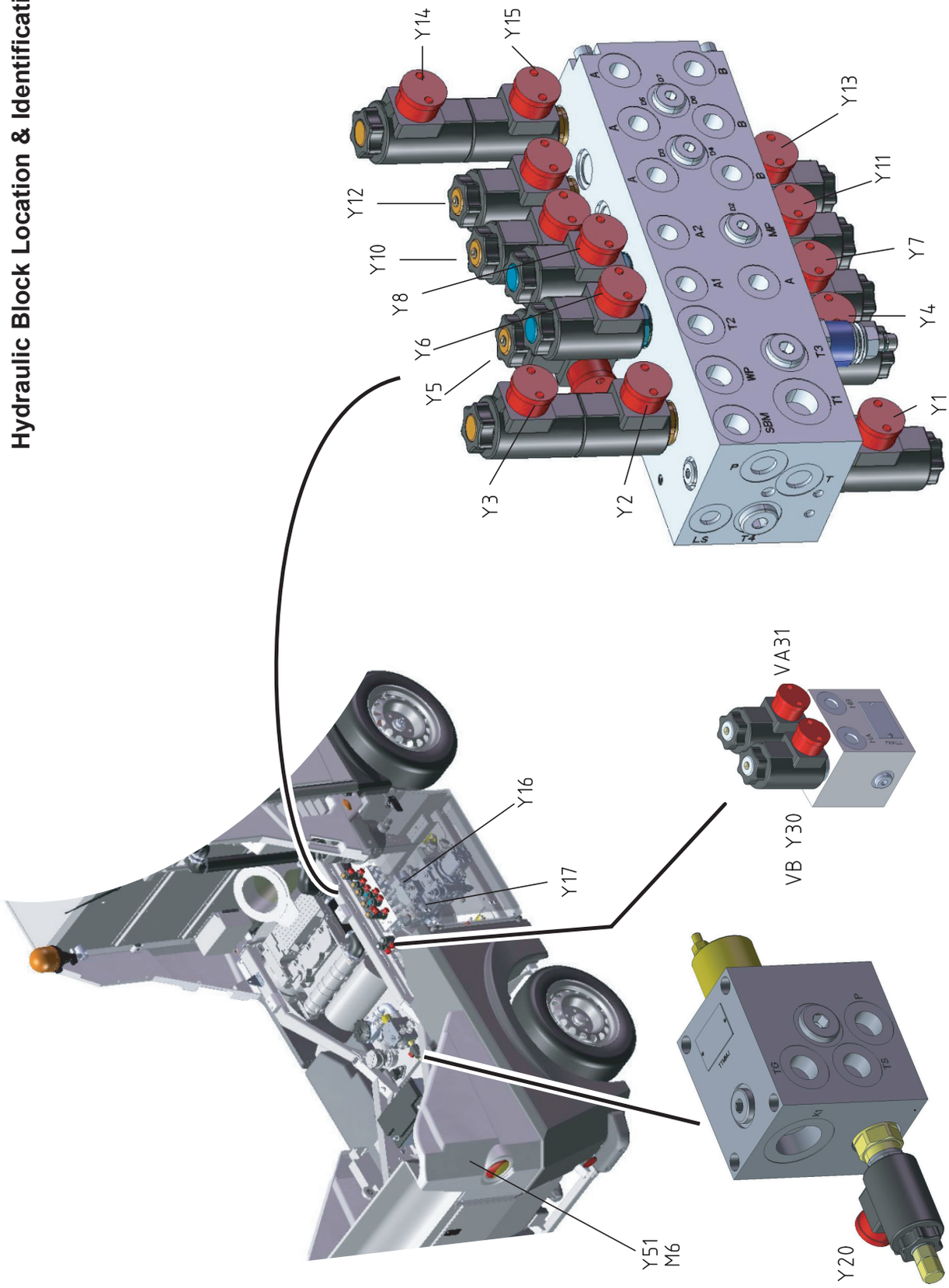
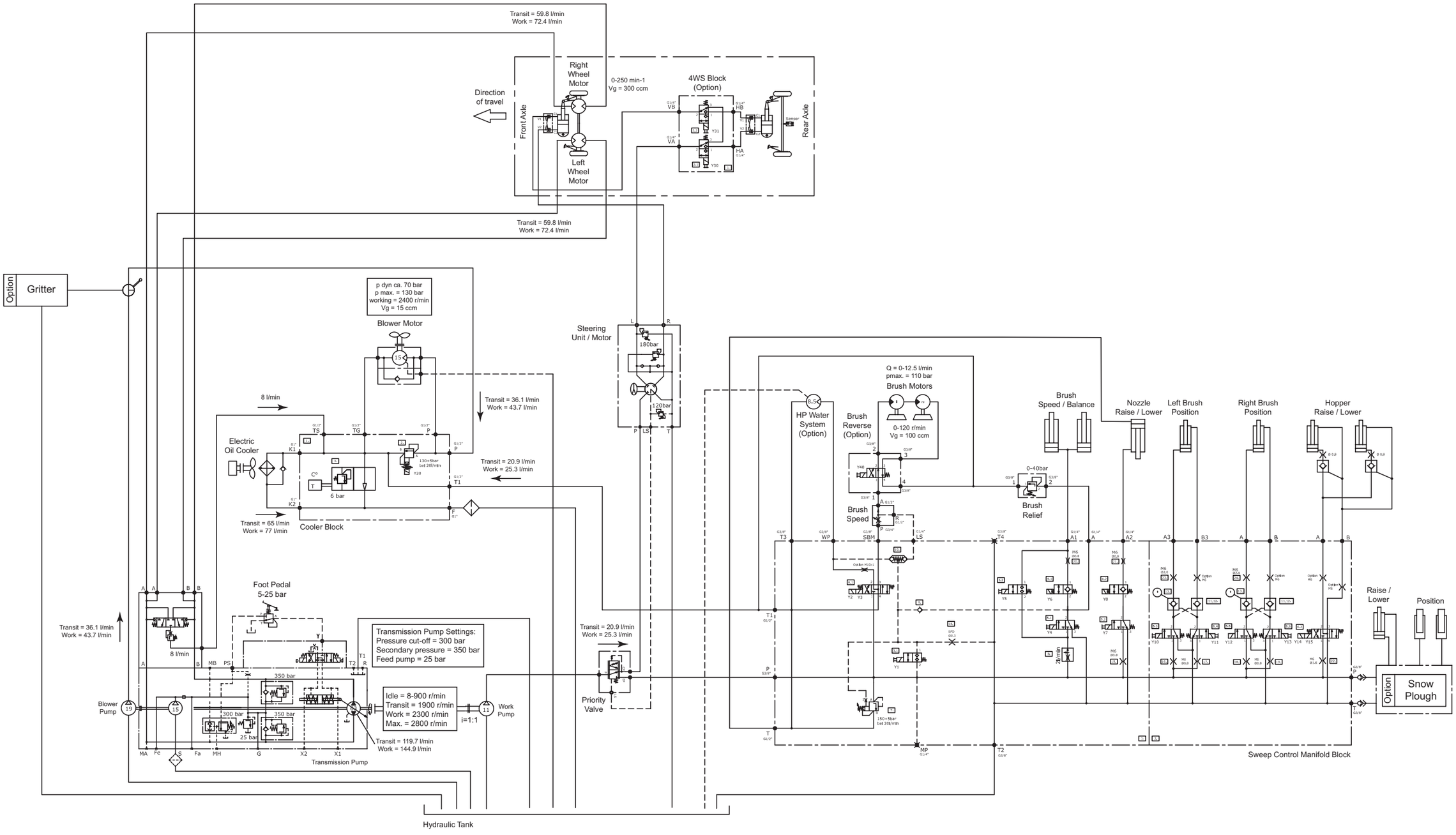
Hydraulic Block Location & Identification



Hydraulic Circuit

(drawing reference: 400-3-019483 - Issue A)



Vehicle Function Truth Table

			Position number on pattern P400-3-019483	Pos. 3															Pos.1.2	Pos.4		Pos.7
			el. Capacity solenoid coils (Watt)	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
Operating Mode	**Function**	**Action**	**Remark**	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Y6**	**Y7**	**Y8**	**Y9**	**Y10**	**Y11**	**Y12**	**Y13**	**Y14**	**Y15**	**Y20**	**Y30**	**Y31**	**Y40**
Transit	Pressure-free circulation	Transit mode	All solenoids inactive																			
Work Mode - Start	Suction nozzle	Raise / lower									X											
	Side brushes	Raise / lower	Hydraulic discharge side brush with pos 1,9 adjustable				X		X													
	Side brush hydraulic motor	Rotate	Speed of side brushes with pos 1,1 adjustable			X																
	Side brush adjustment - left	Out		X									X									
	Side brush adjustment - left	In		X										X								
	Side brush adjustment - right	Out		X											X							
	Side brush adjustment - right	In		X												X						
	Side brushes	Off		X				X														
	Suction fan	On																	X			
	Guidance preselection	4WS on	Switch on only when vehicle is stationary																	X	X	
	Reverse direction of brush rotation	Reverse	Double-delockable check valves insert li/re on self-service			X																X
Work Mode - Finish	Suction nozzle	Raise		X						X												
	Side brushes	Raise		X				X														
	Side brush hydraulic motor	Stop																				
	Suction fan	Off																				
High Pressure Wash	Water pump	On			X																	
Hopper Raise / Lower	Hopper	Lift		X													X					
	Hopper	Lower		X														X				

Key:	
X	Solenoid coil after function has been turned off.
X	Solenoid coil active until function is not required.
	Solenoid coil inactive.

CHAPTER 3

Electrical System

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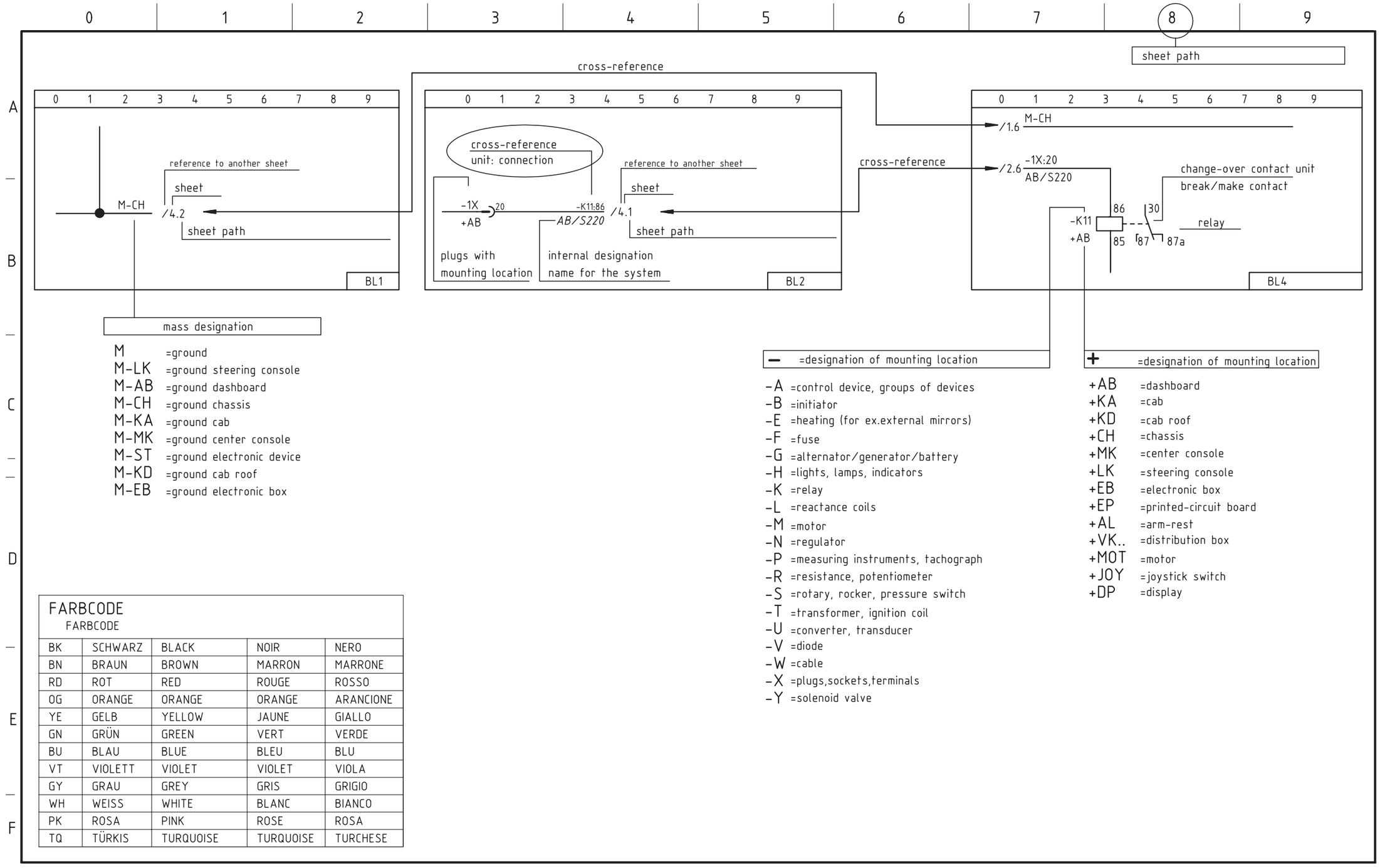
Electrical Circuit Key

(drawing reference: 7013052 - Issue D)



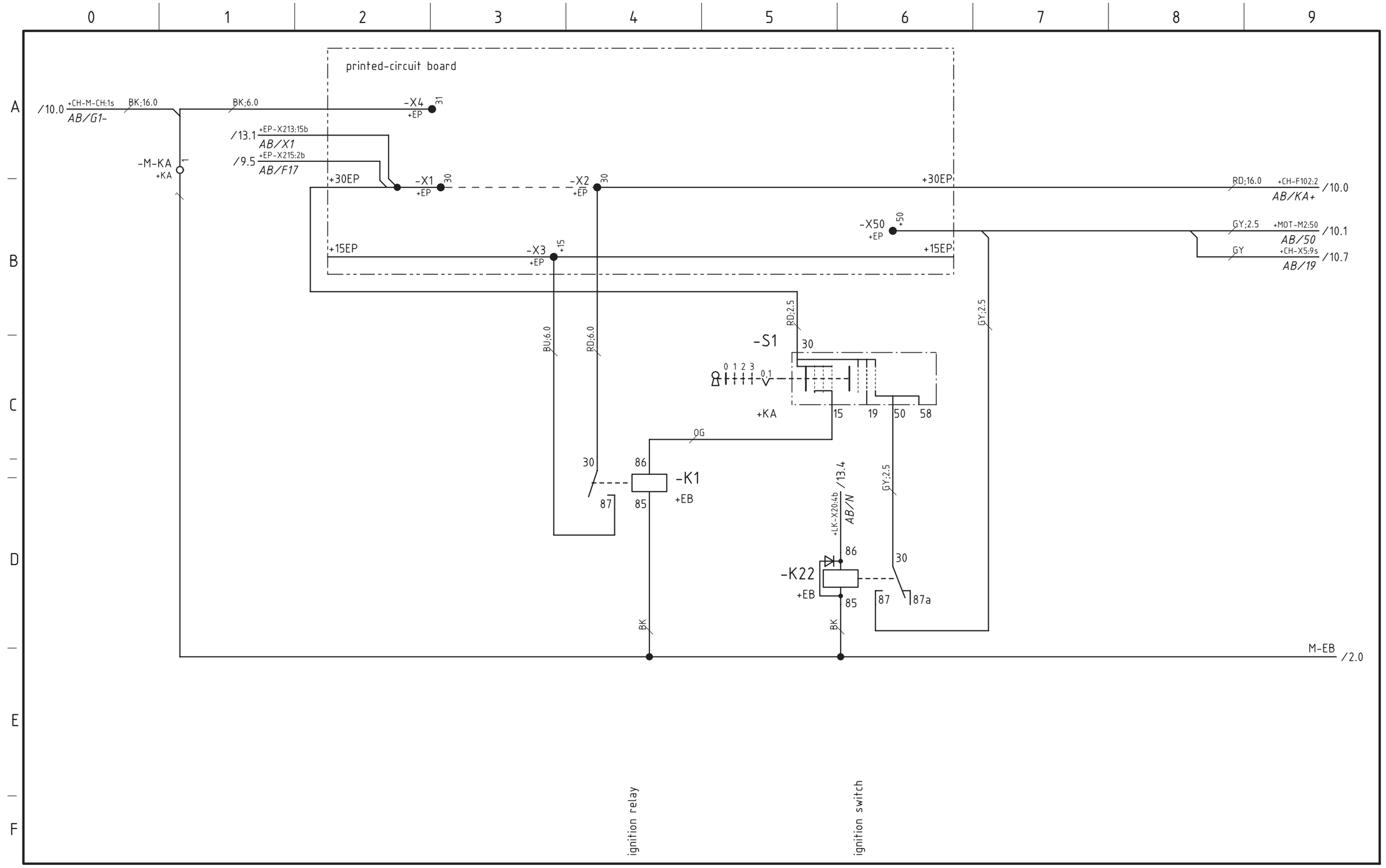
FARBCODE

FARBCODE

BK	SCHWARZ	BLACK	NOIR	NERO
BN	BRAUN	BROWN	MARRON	MARRONE
RD	ROT	RED	ROUGE	ROSSO
OG	ORANGE	ORANGE	ORANGE	ARANCIONE
YE	GELB	YELLOW	JAUNE	GIALLO
GN	GRÜN	GREEN	VERT	VERDE
BU	BLAU	BLUE	BLEU	BLU
VT	VIOLETT	VIOLET	VIOLET	VIOLA
GY	GRAU	GREY	GRIS	GRIGIO
WH	WEISS	WHITE	BLANC	BIANCO
PK	ROSA	PINK	ROSE	ROSA
TQ	TÜRKIS	TURQUOISE	TURQUOISE	TURCHESE

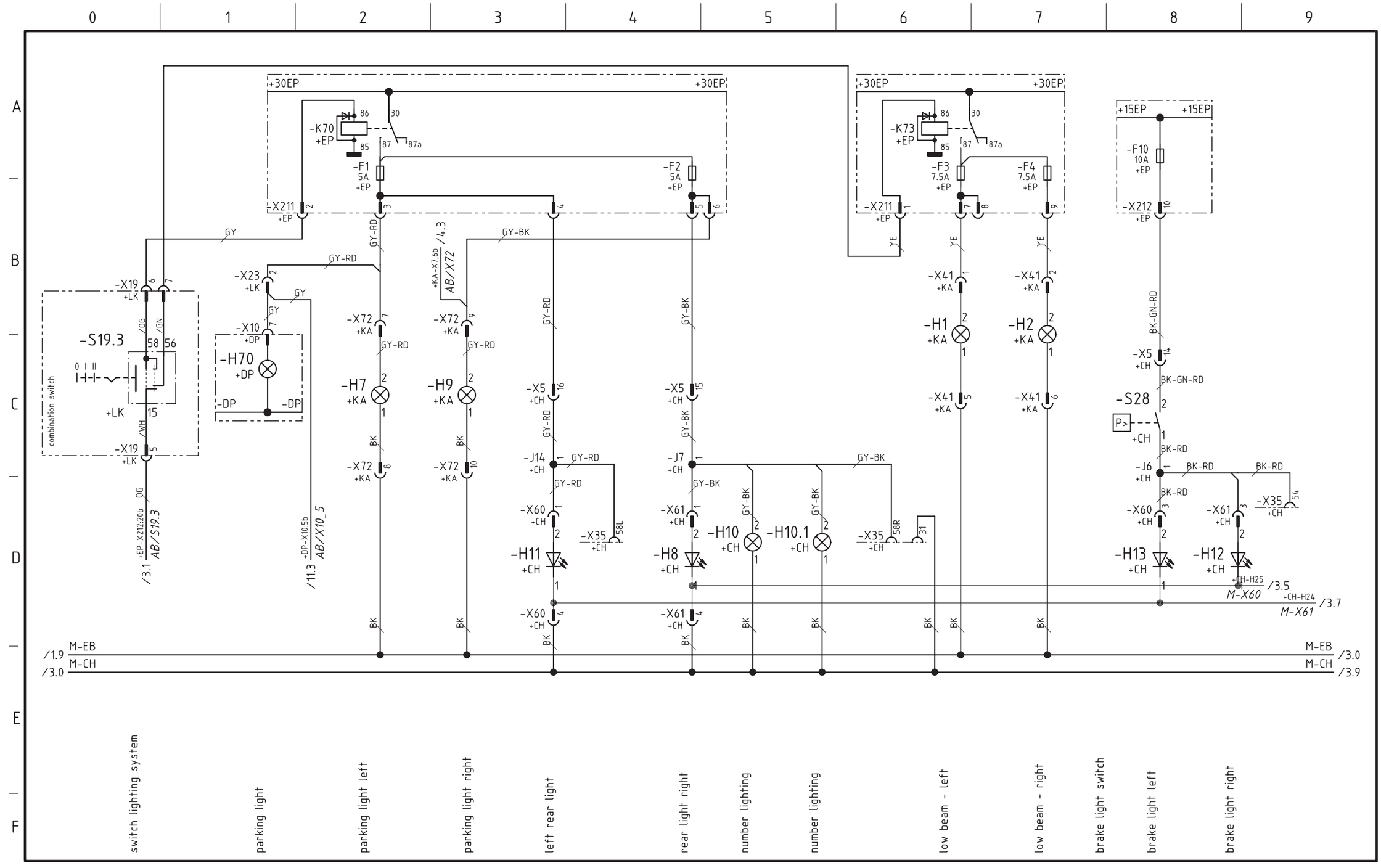
Ignition Switch Circuit

(drawing reference: 7013052, Sheet 1 - Issue D)



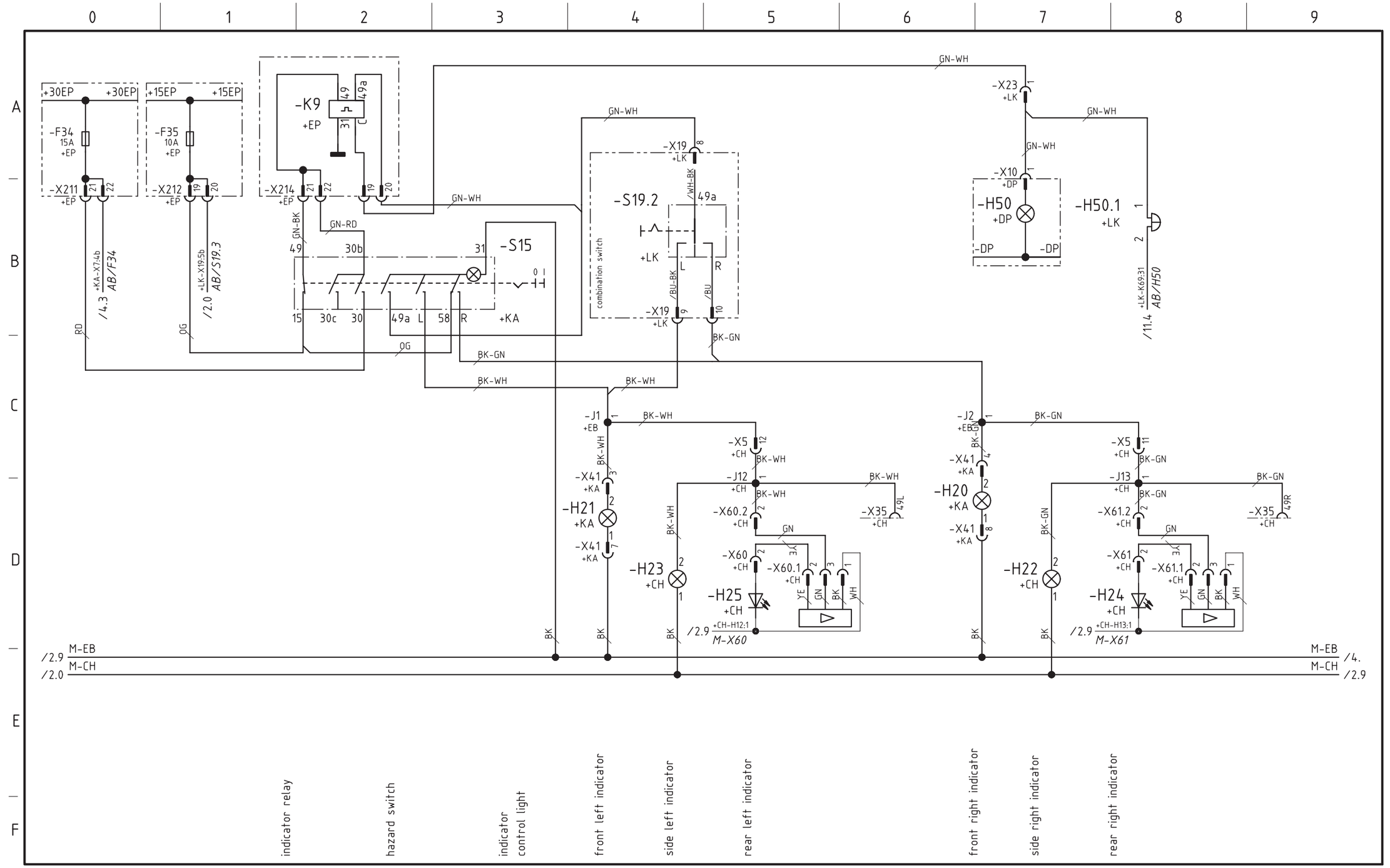
Rear Lighting System Circuit

(drawing reference: 7013052, Sheet 2 - Issue D)



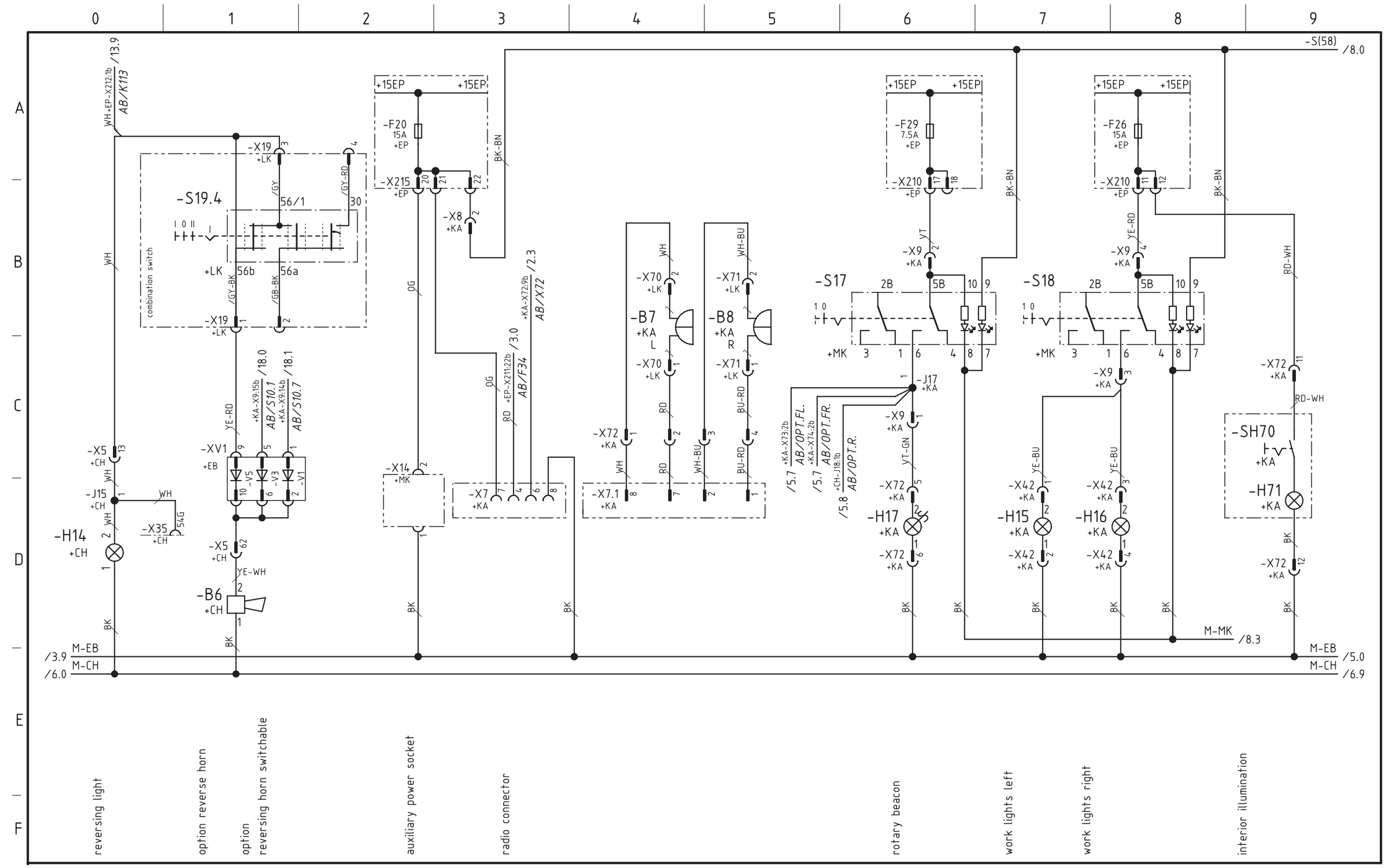
Indicators Circuit

(drawing reference: 7013052, Sheet 3 - Issue D)



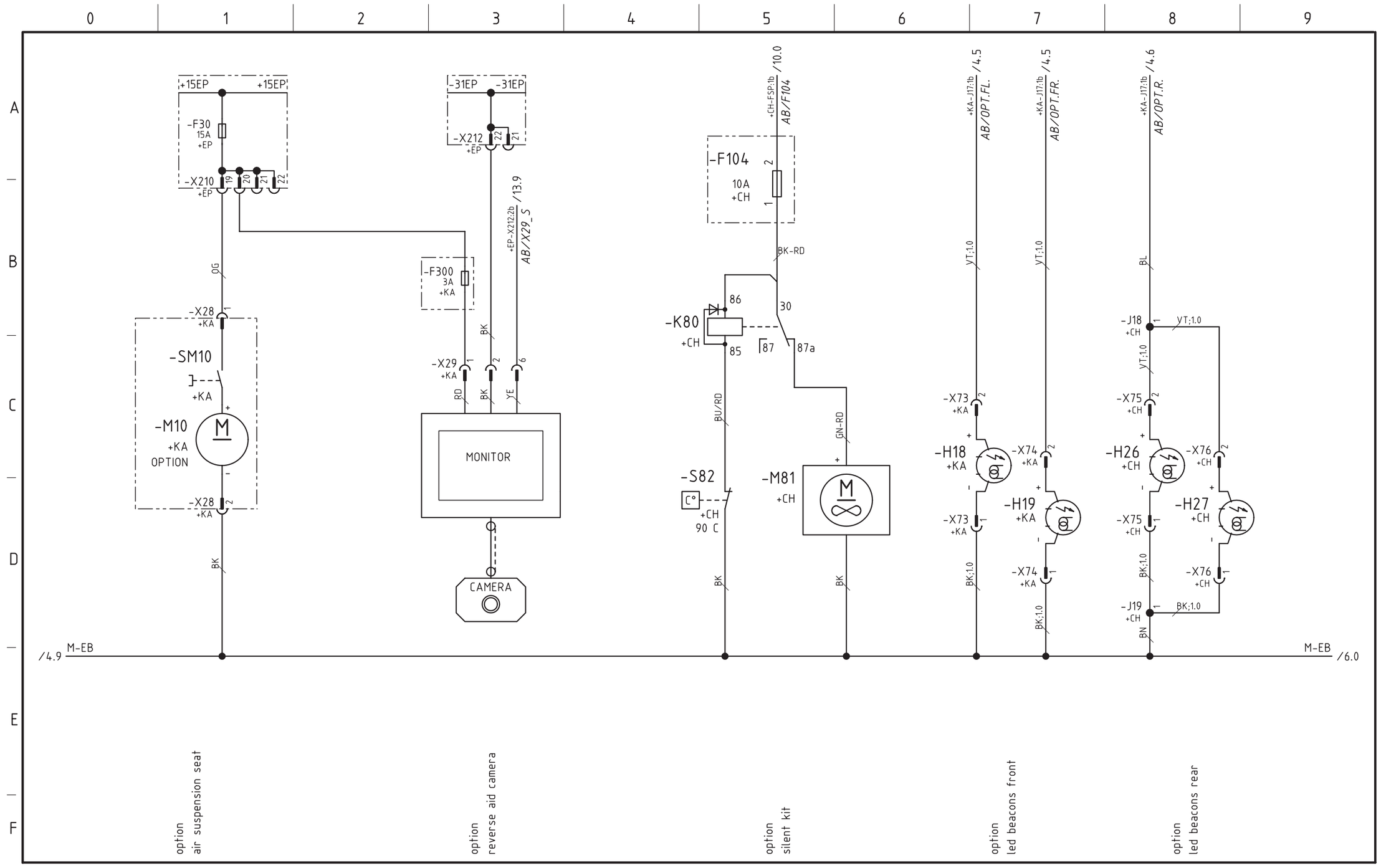
Front Lighting Circuit

(drawing reference: 7013052, Sheet 4 - Issue D)



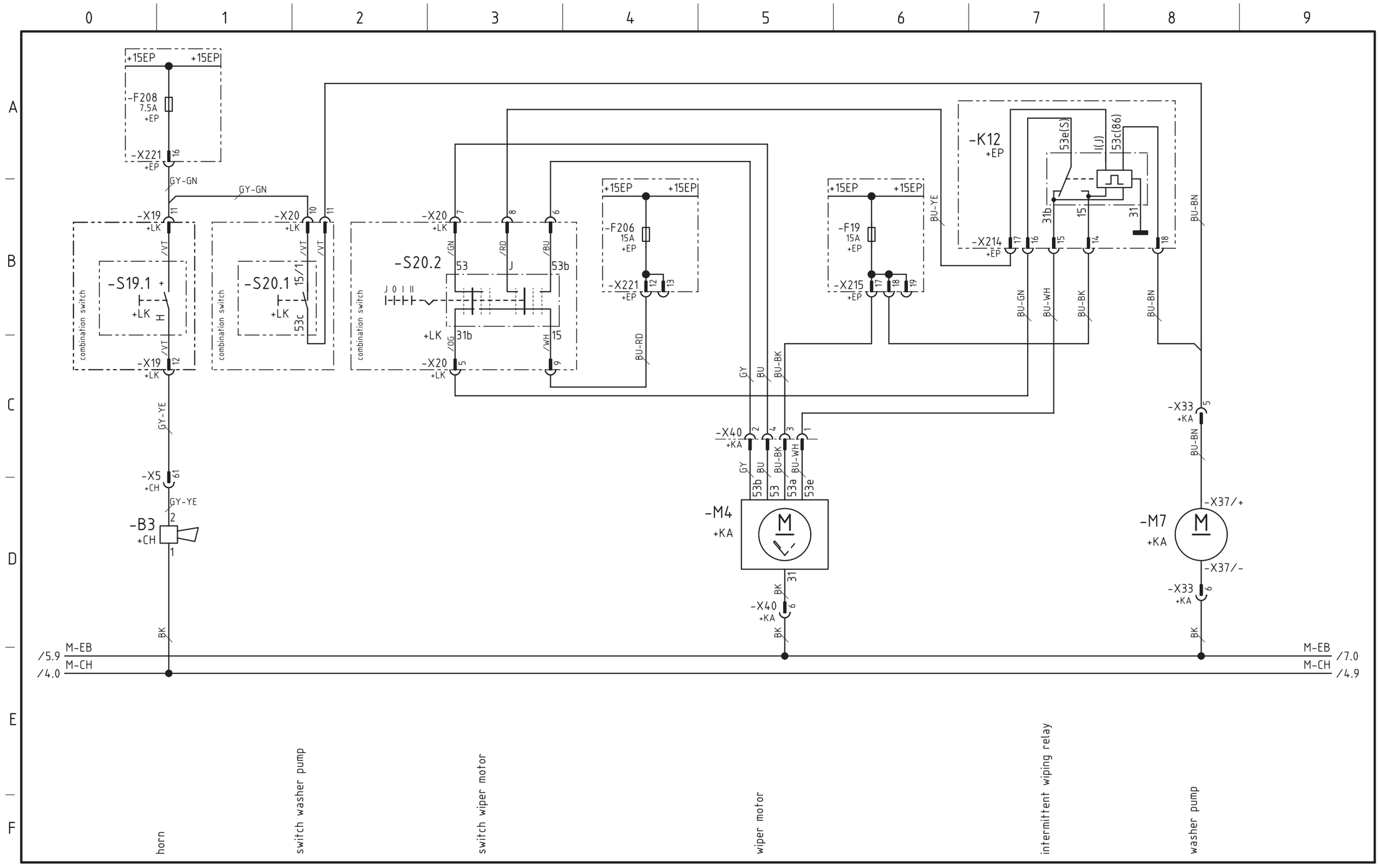
Reversing Camera Circuit

(drawing reference: 7013052, Sheet 5 - Issue D)



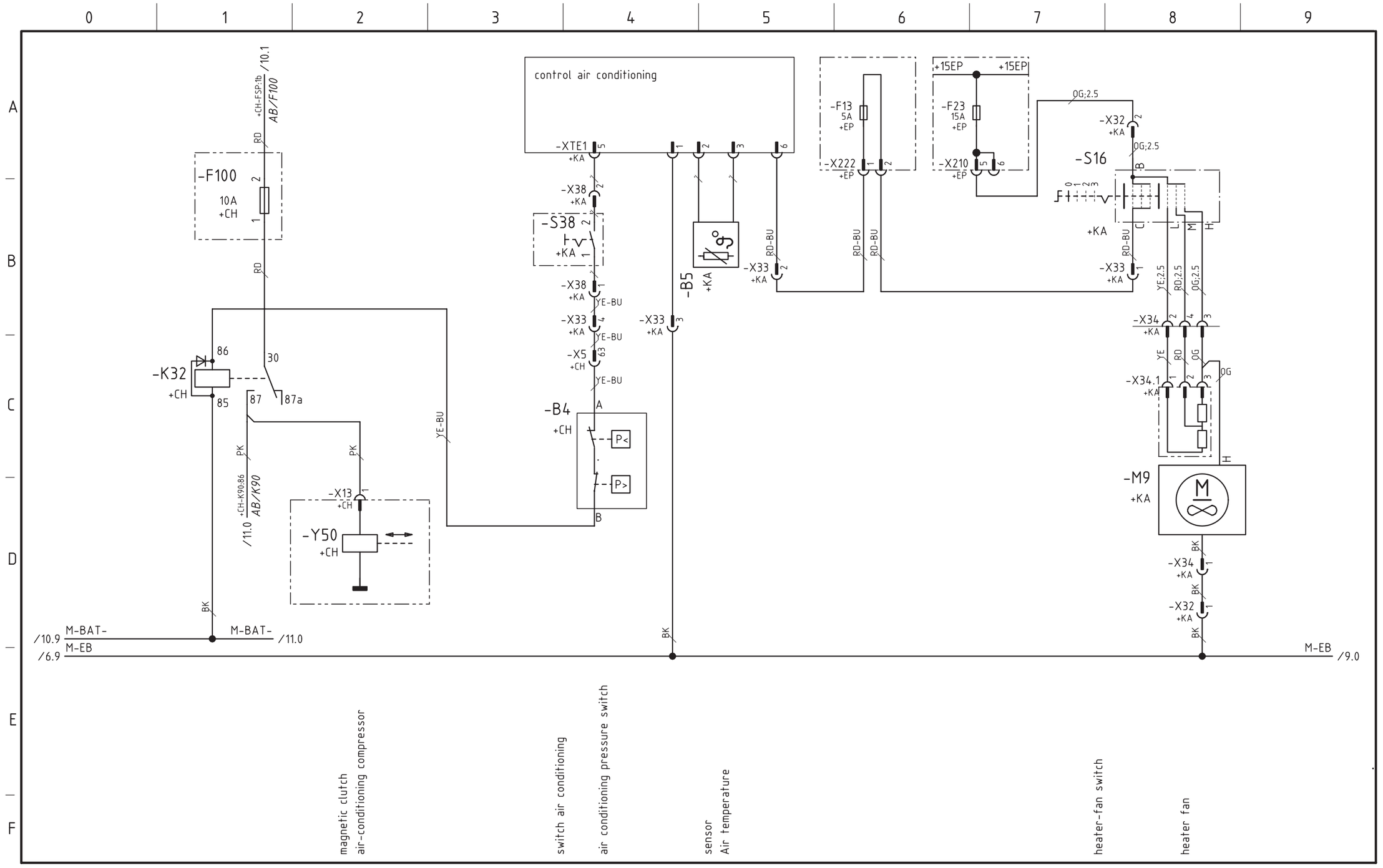
Wipers Circuit

(drawing reference: 7013052, Sheet 6 - Issue D)



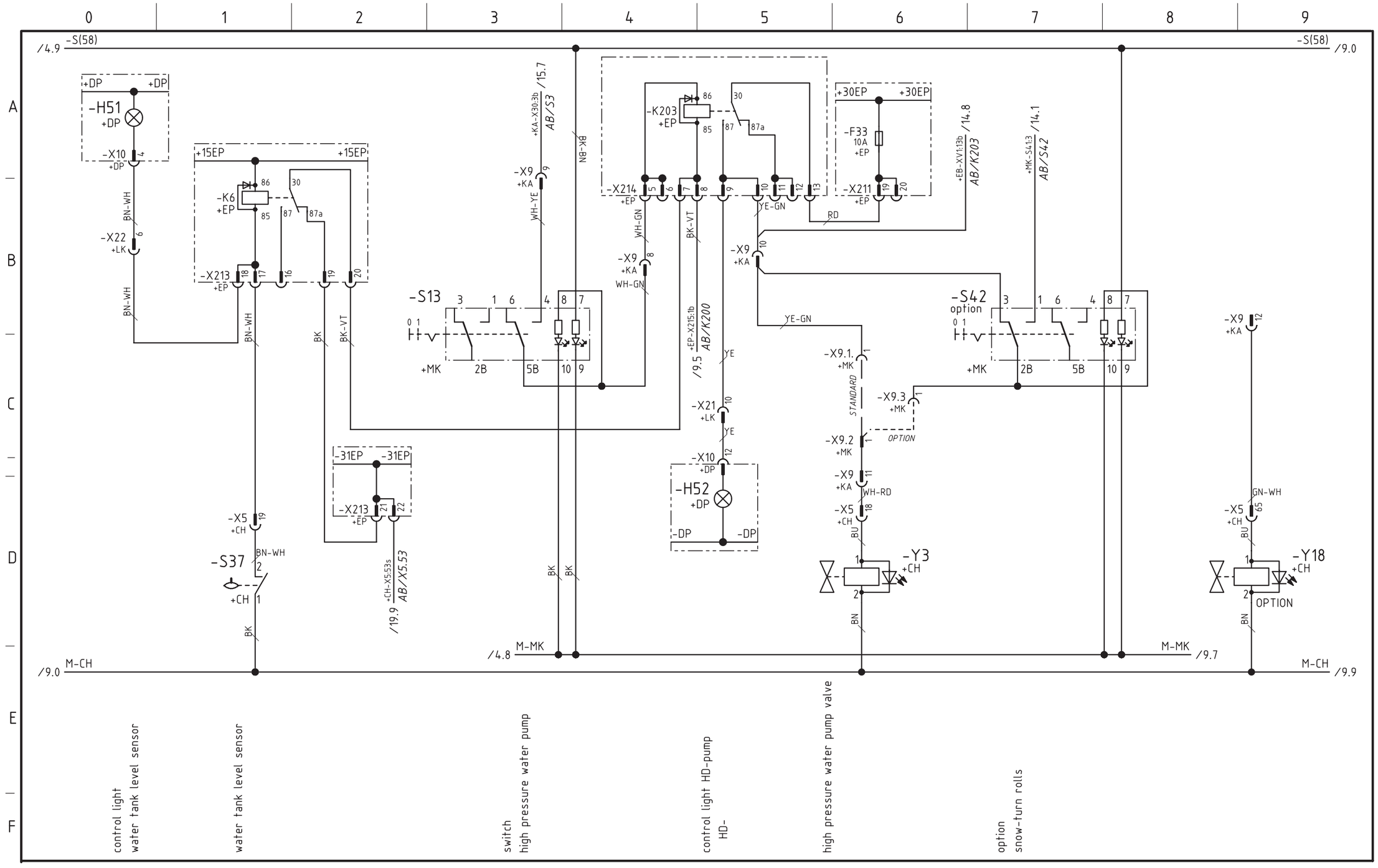
Heater / Air Conditioning Circuit

(drawing reference: 7013052, Sheet 7 - Issue D)



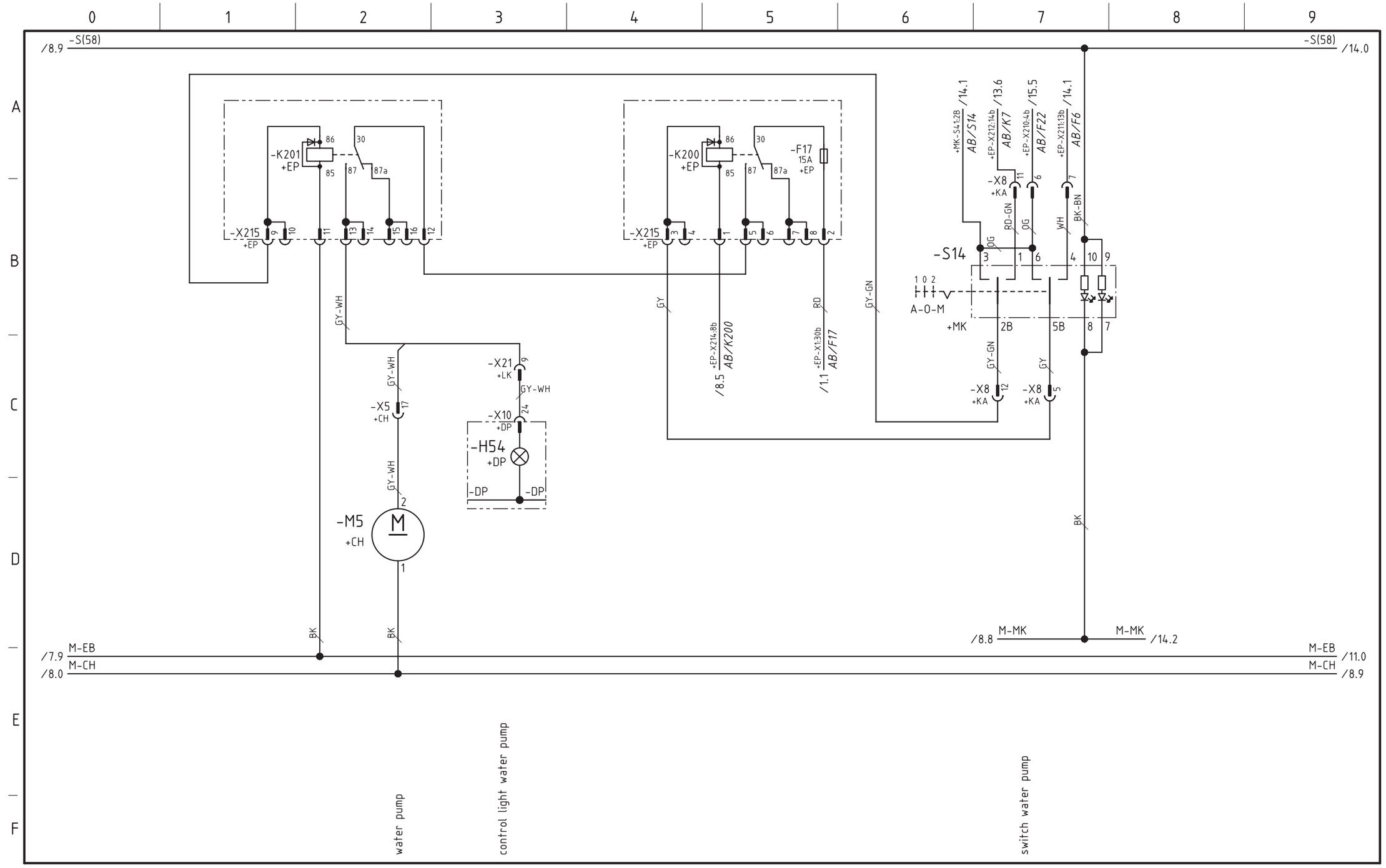
Water System 1 Circuit

(drawing reference: 7013052, Sheet 8 - Issue D)



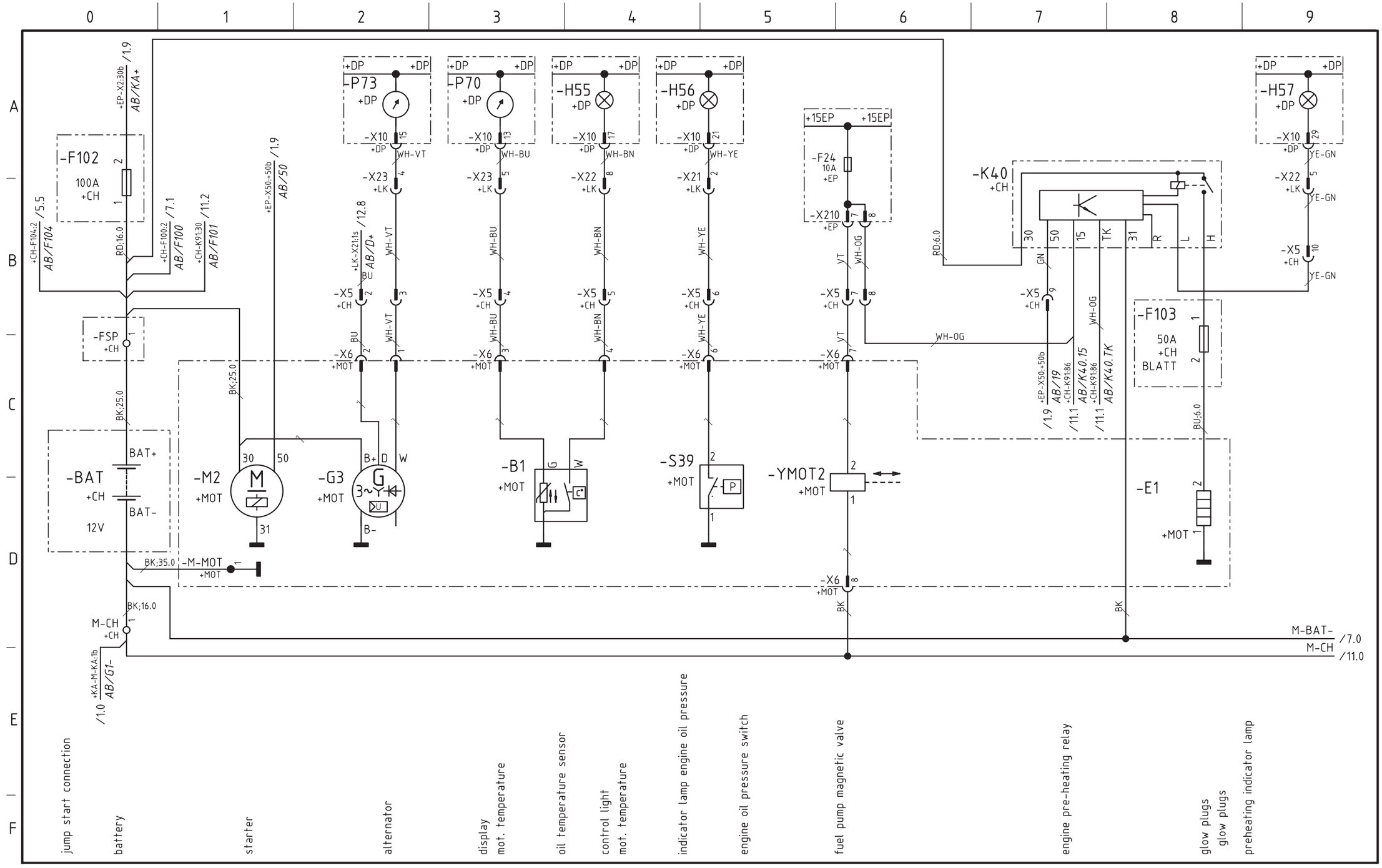
Water System 2 Circuit

(drawing reference: 7013052, Sheet 9 - Issue D)



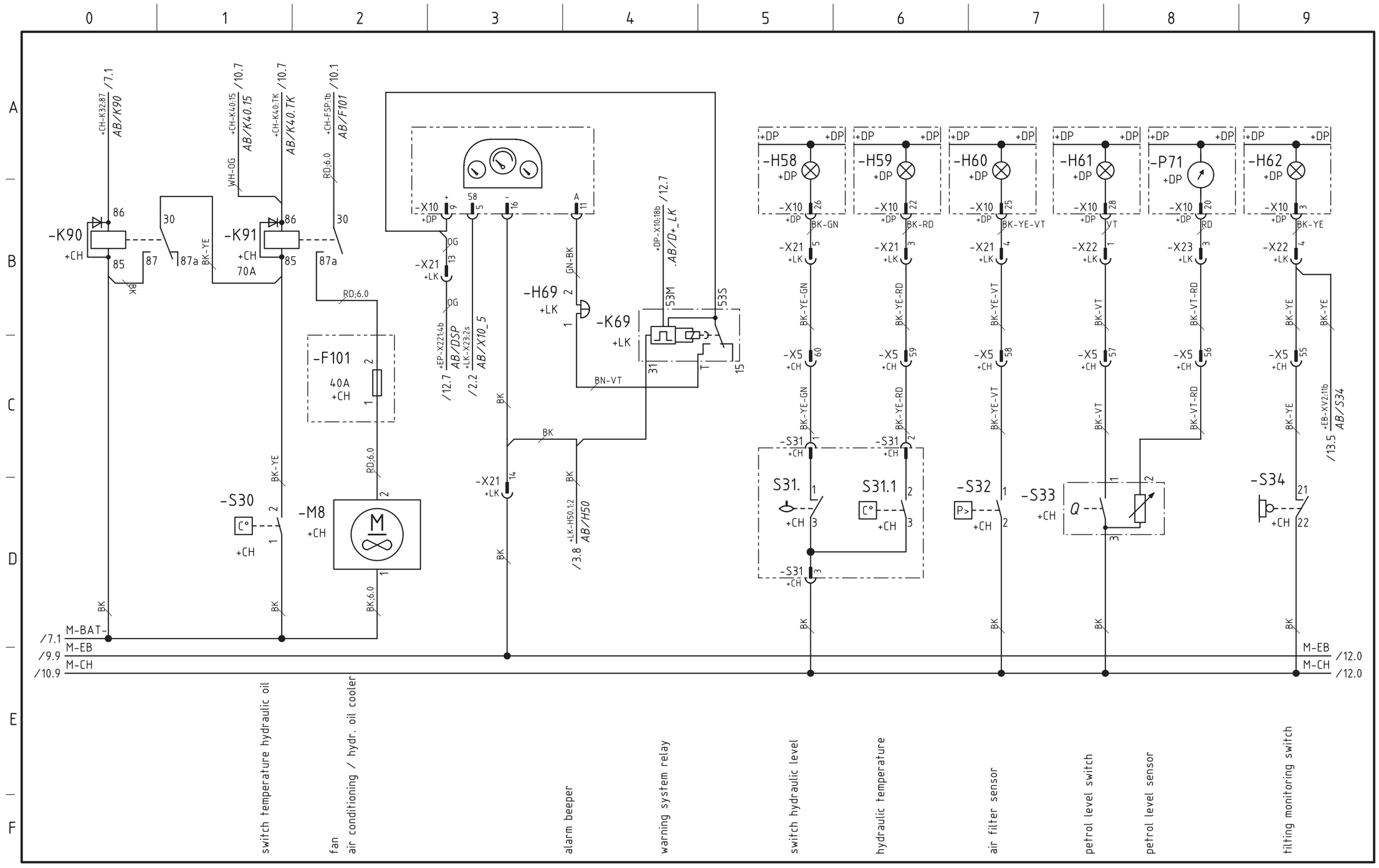
Engine Starter Circuit

(drawing reference: 7013052, Sheet 10 - Issue D)



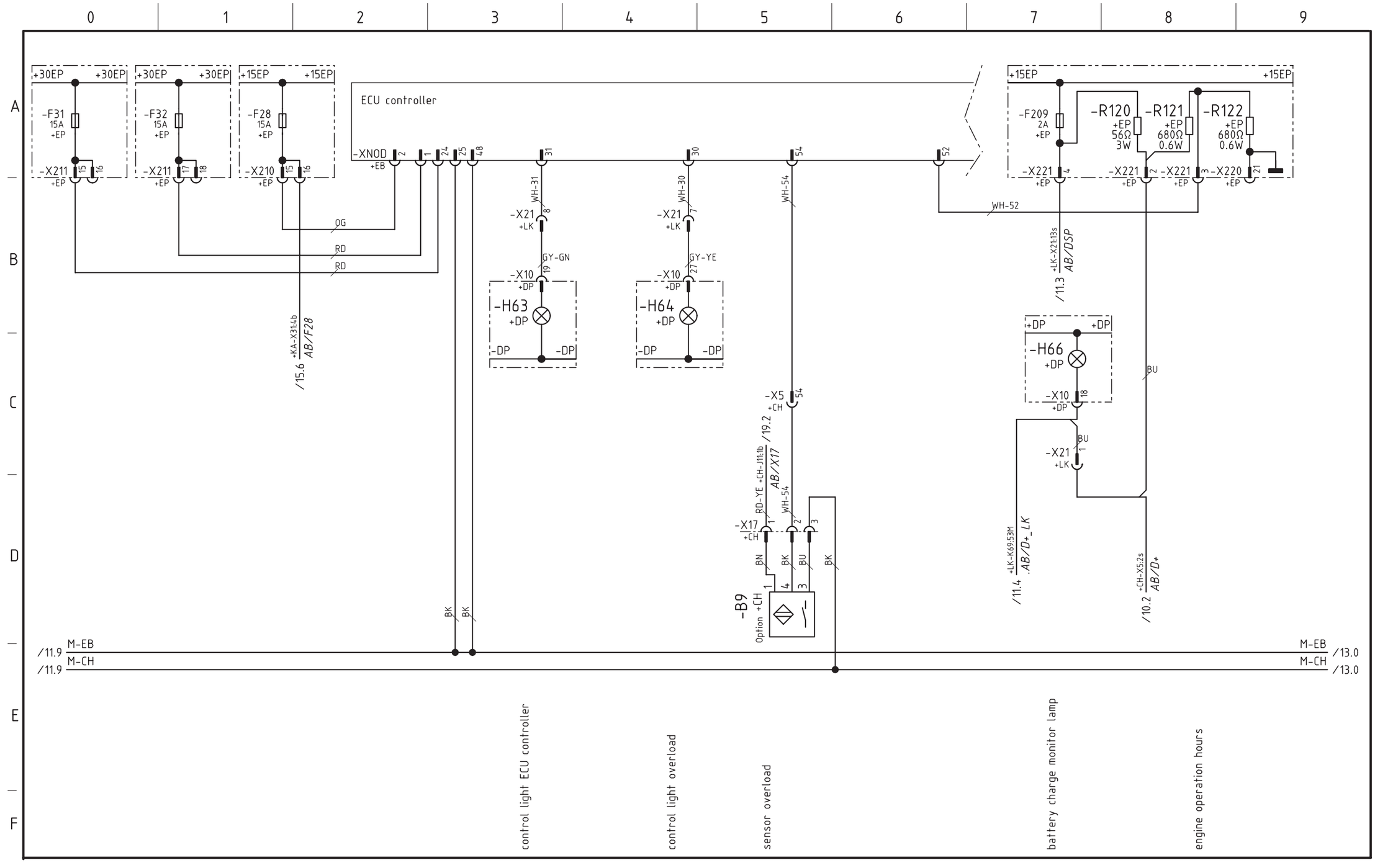
Sensors Circuit

(drawing reference: 7013052, Sheet 11 - Issue D)



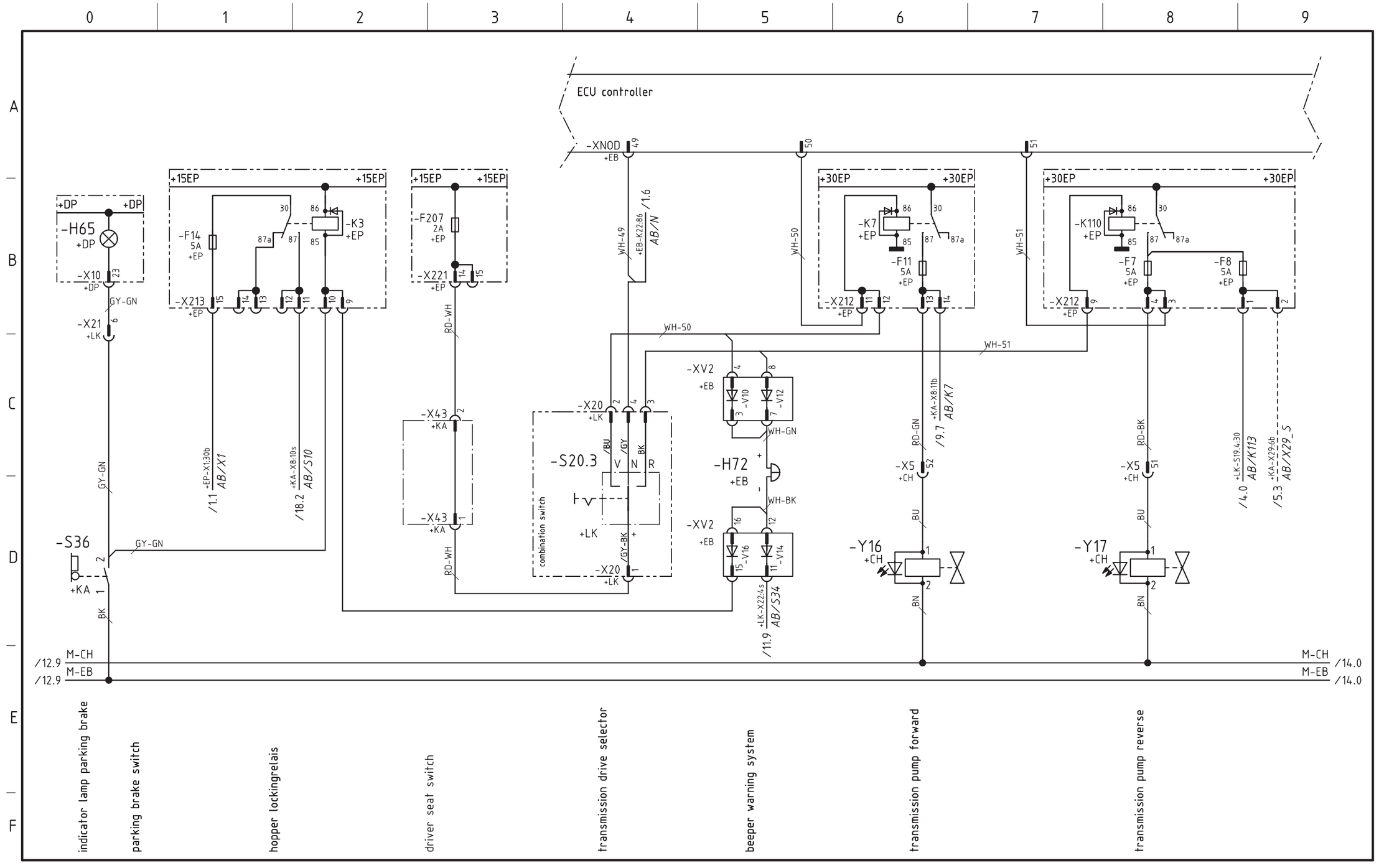
ECU Controller Circuit

(drawing reference: 7013052, Sheet 12 - Issue D)



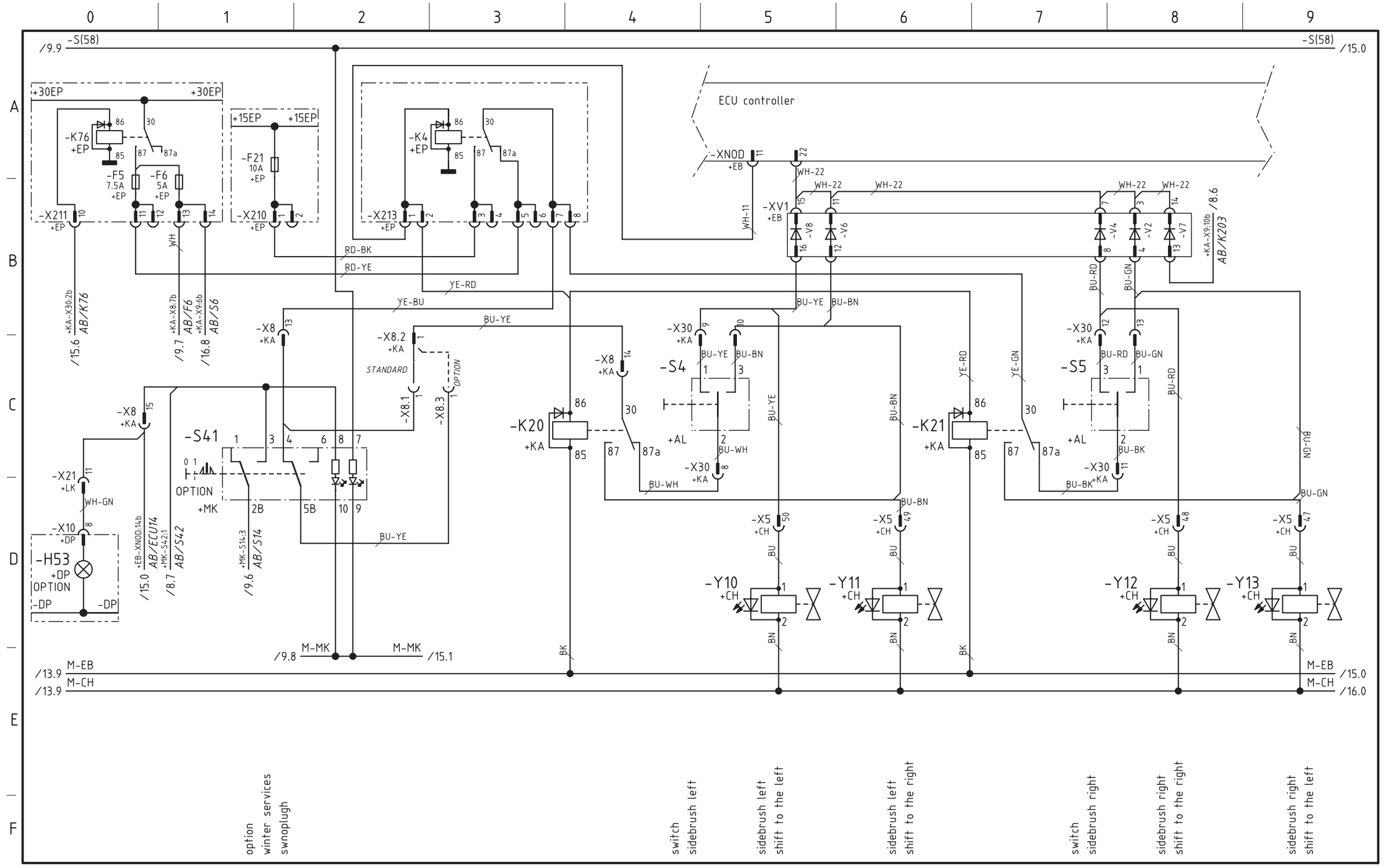
Transmission Circuit

(drawing reference: 7013052, Sheet 13 - Issue D)



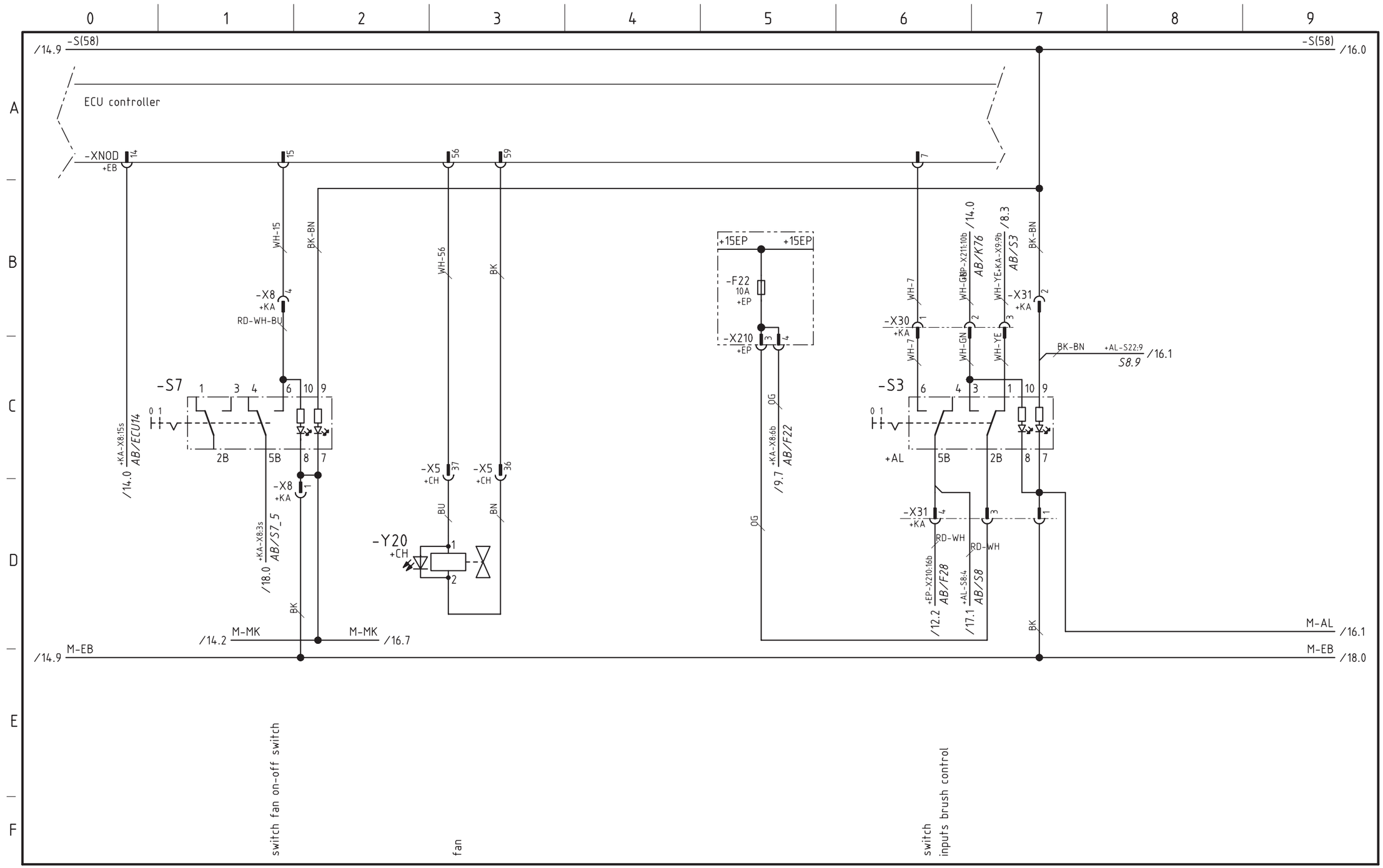
Side Brush Positioning Circuit

(drawing reference: 7013052, Sheet 14 - Issue D)



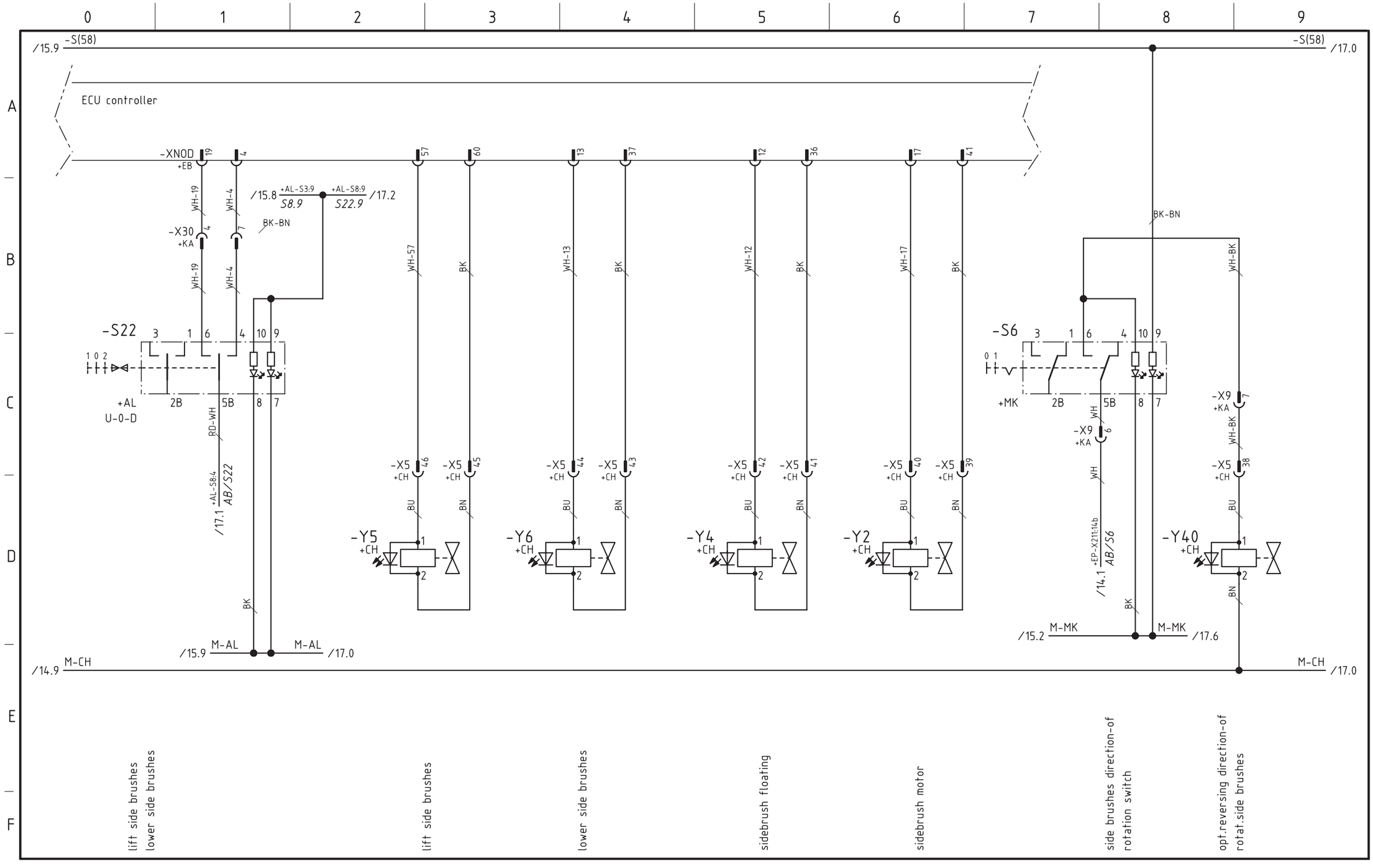
Suction Circuit

(drawing reference: 7013052, Sheet 15 - Issue D)



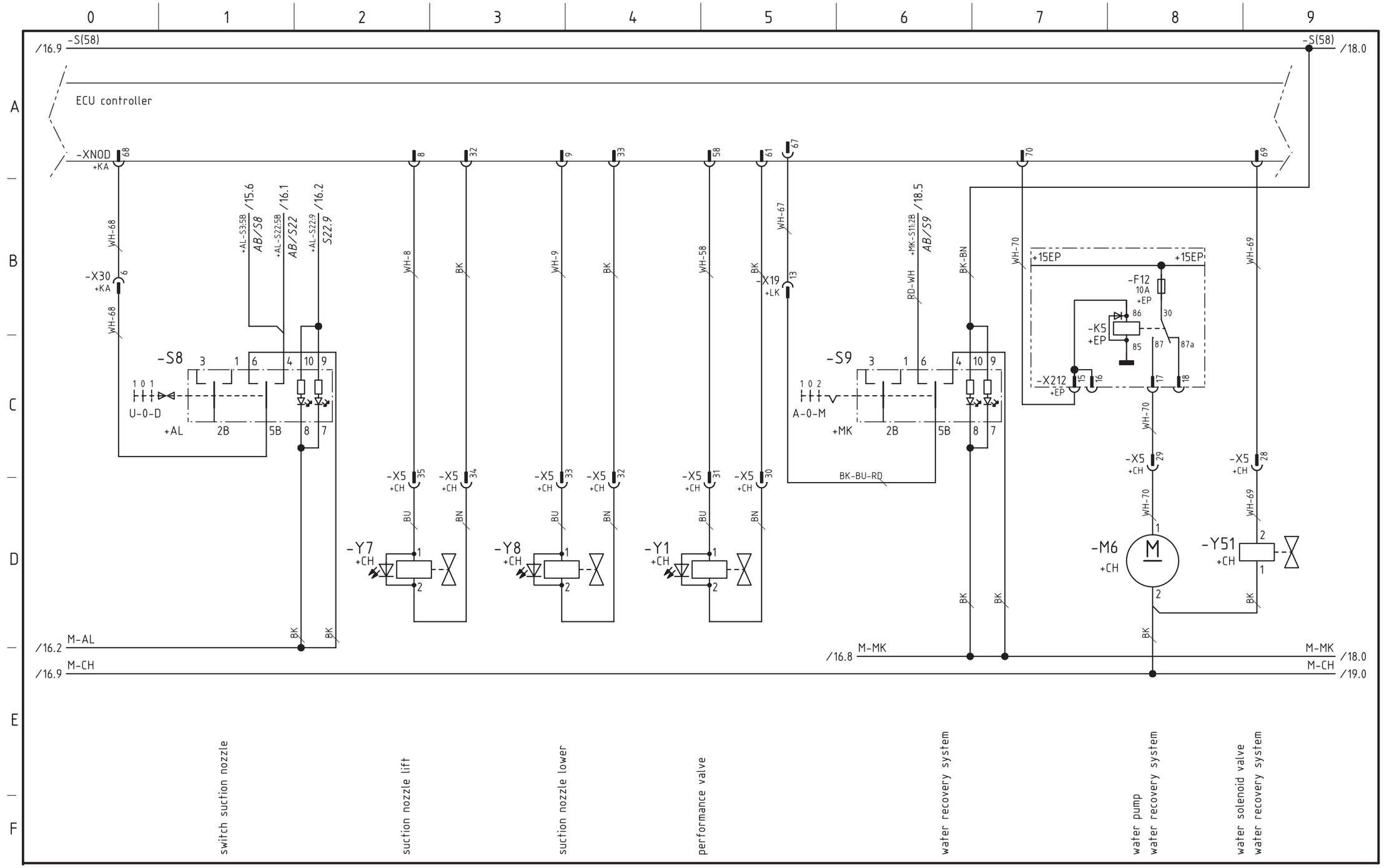
Side Brush Sweeping Control Circuit

(drawing reference: 7013052, Sheet 16 - Issue D)



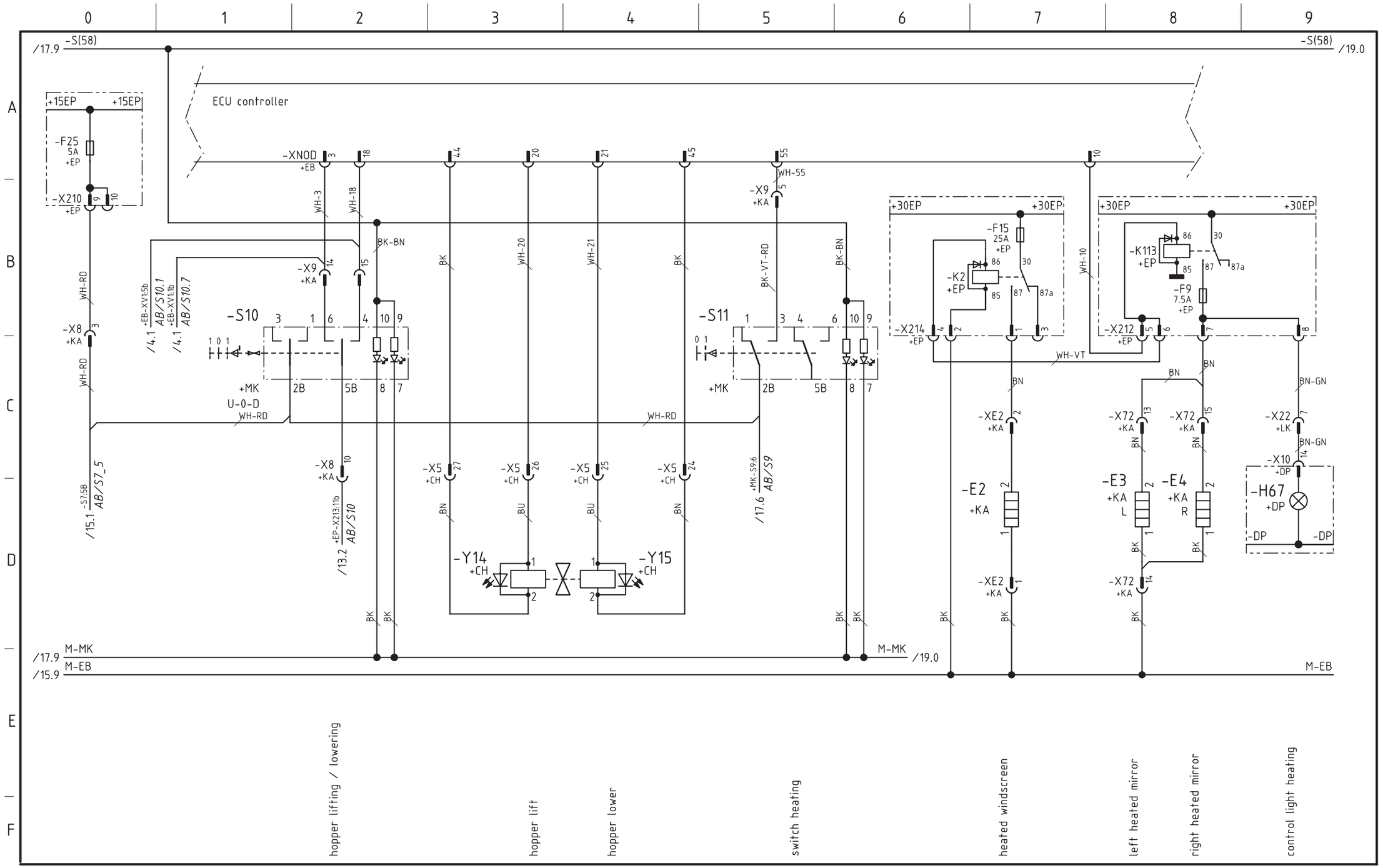
Hydraulics & Water Recirculation Circuit

(drawing reference: 7013052, Sheet 17 - Issue D)



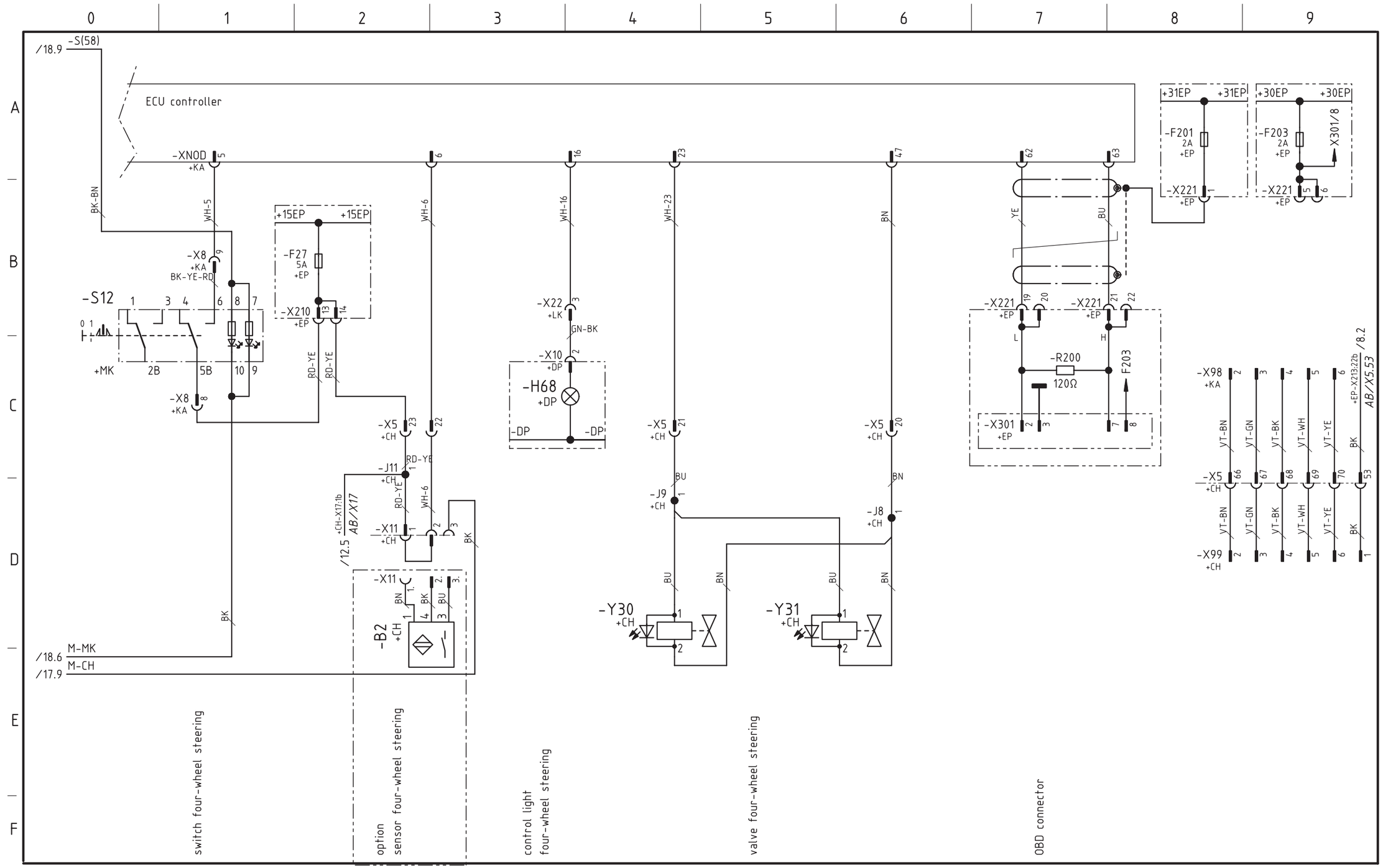
Hopper & Heating Circuit

(drawing reference: 7013052, Sheet 18 - Issue D)



4WS Circuit

(drawing reference: 7013052, Sheet 19 - Issue D)



CHAPTER 4

Optional Equipment

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4WS Bleeding

The following outlines the correct procedure for the removal of air from the Johnston CN101 rear hydraulic 4 wheel steering (4WS) cylinder.

Should for any reason air be introduced into the 4WS hydraulic system (hose replacement, etc.) the following procedure must be undertaken to ensure that the 4WS system functions safely and as intended.

Air in the rear steering cylinder may result in inconsistent control and poor centralisation of the rear wheels.

Procedure

Safe working practices should be adhered to throughout.

1. Start the engine, raise the hopper and support on the prop. Activate the 4WS and turn the steering wheel fully to the left hand lock (rear wheels will point to the right hand side). Stop the engine; the rear steering cylinder is now at its maximum stroke, see figure one.

2. Remove the cover panel above the hydraulic control located on the right hand side of the machine (held by five 13mm headed fixings). Fit the tee piece and test point between the hose and adaptor at the HB port on the 4WS hydraulic valve block and tighten securely with the test point facing vertically, see figure two.

3. From the hydraulic test kit use one of the test hoses to connect between the test point at HB on the 4WS hydraulic valve block, see figure three. and the test point at port PS on the charge pressure connector of the driving pump, see figure four.

4. Start the engine.

Warning

Starting the engine will charge the 4WS hydraulic valve block output HB to a pressure of 25 bar. Any air trapped within the system will also be compressed to this pressure.

Suitable precautions must be applied when venting the circuit in the following steps.

5. Whilst taking all necessary precautions to protect the any personnel and the surrounding area from any air and oil that is released. Slowly undo the banjo connector bolt on the rear steering cylinder until any trapped air and oil is seen to be released from the connection. Repeat several times or until no air is seen to be expelled and then retighten the connection bolt ensuring correct orientation of the hose.
6. Stop the engine; disconnect the test hose from the 4WS hydraulic valve block and the charge pressure connector of the driving pump. Refit the protective covers to both test points.

7. Start the engine, activate and operate the 4WS - check the circuit for leaks – Stop the engine.

8. Refit the cover panel over the hydraulic controls and top up the hydraulic oil as required – see operator's gu for further details.
9. Lower the hopper and test drive the vehicle to ensure correct operation.

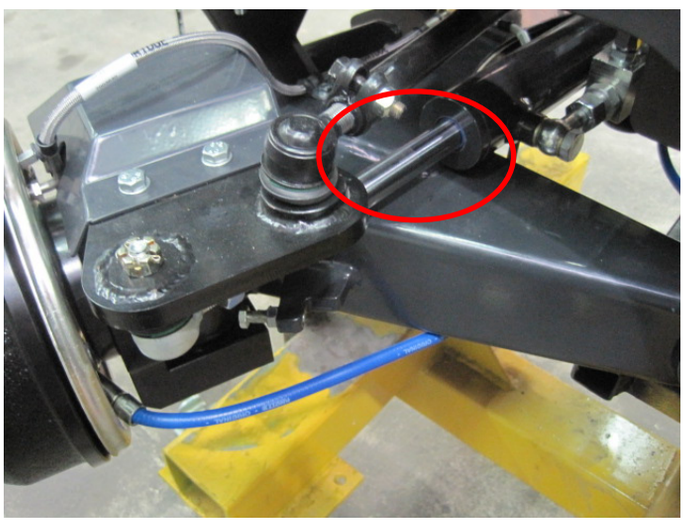

Figure One

Rear steering cylinder extended to its maximum stroke.

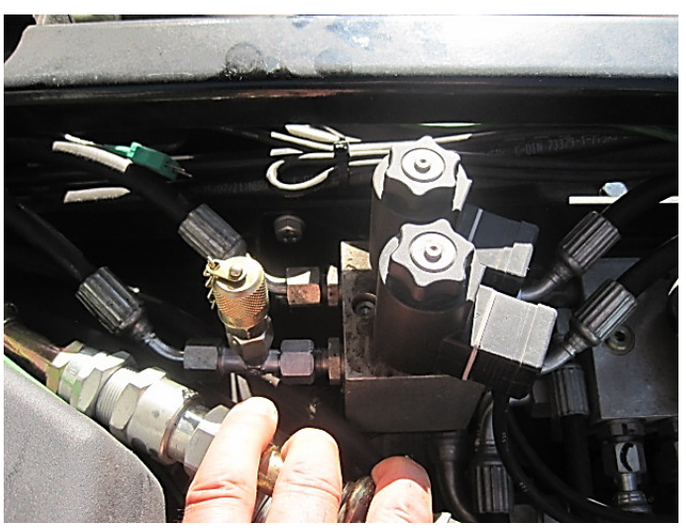

Figure Two

Installation of tee piece and test point to port HB of the 4WS hydraulic valve block.

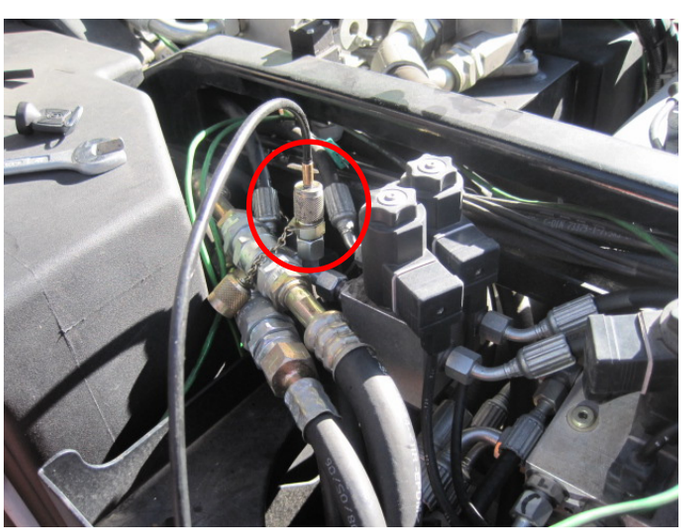

Figure Three

Test hose connected to test point at port HB on the 4WS hydraulic valve block.

Figure Four

Connection for test hose to test point at port PS on the charge pressure connector of the driving pump.

Figure Five

Banjo connector on the rear steering cylinder.

Figure Six

Whilst taking all necessary precautions, slowly release the banjo connector bolt on the rear steering cylinder until any trapped air is seen to be released from the connection and then retighten.

CHAPTER 5

Servicing Procedures

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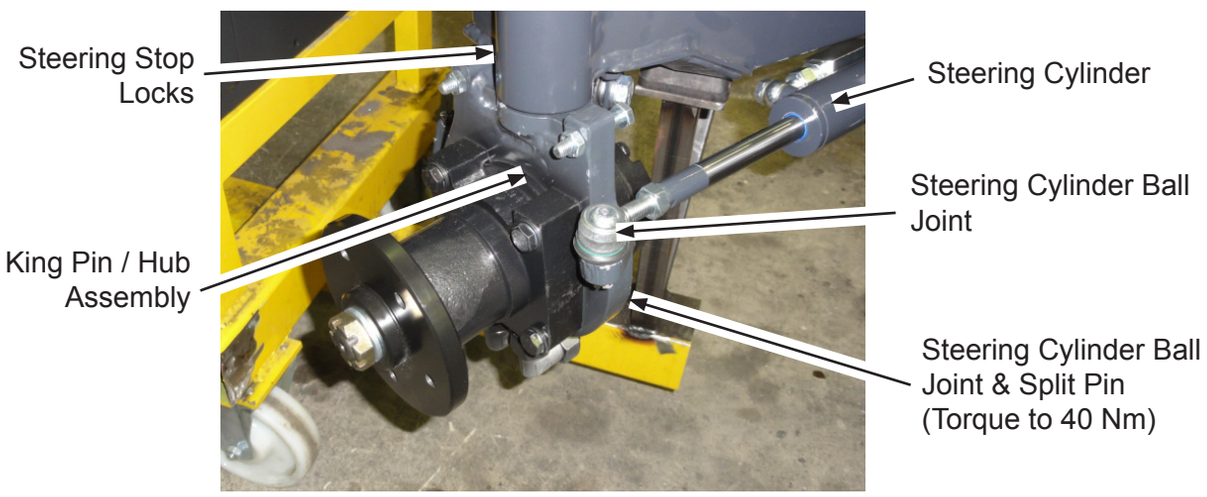
Adjustment of Steering Components (TB 1519)

Prior to a planned retrofit campaign an adjustment procedure for the front axle steering components as well as on-going periodic inspections are being introduced.

Please refer to the following sections defined by the steering configuration of the vehicle of either two wheel steer **(2WS)** or four wheel steer **(4WS).**

Once adjustment is affected, the periodic inspections must be carried out on a weekly basis – Until the retrofit applied.

Details for Identification



Adjustment procedure for 4WS models

The front steering locks are adjusted in comparison to the factory adjusted rear stops and the following procedures should be followed to ensure correct adjustment.

1. Check security of ball joint.

b) With the vehicle on a level surface, raise the front of the vehicle and support securely on axle stands.

c) Remove both front wheels.

d) Remove the split pin from the steering cylinder ball joint nut (on the front of the right hub assembly) and check the security of the ball joint by tightening the nut to 40Nm also check for any movement between the ball joint and hub assembly.

e) Renew split pin and secure.

Note: Should any play exist between the ball joint and hub assembly following tightening of the nut, further action will be required – Please contact the appropriate Johnston Sweepers Ltd. service provider.

2. Adjust steering lock stops

a) Check the steering cylinder ball joint locknut as this is paint marked at the factory – if the paint mark is intact it would suggest no prior adjustment has been undertaken, so the lock stops will not require adjustment – If this is the case, please proceed directly to item 3. If the marks are disturbed continue as follows.

b) Slacken the lock nuts and adjust the steering lock stops (4 in total) to a minimum setting (the head of the lock stop setscrew should contact the king pin/hub assembly in the minimum setting).

c) Start the vehicle engine and engage 4WS, ensuring the vehicle remains stable and fully supported on the axle stands (It may be necessary to raise the rear of the vehicle as well as the front due to ground conditions) steer the vehicle to the left until the rear steering just contacts the appropriate rear steering lock stops – at this point no further steering wheel movement should be undertaken and the vehicles engine switched off.

d) In this position the appropriate front axle steering locks can be adjusted until they contact the axle beam and the lock nuts secured. (Rear adjuster on the left hand side and front adjuster on the right hand side).

e) Start the vehicle engine, ensuring 4WS is engaged and the vehicle remains stable and fully supported on the axle stands steer the vehicle to the right until the rear steering just contacts the appropriate lock stops – at this point no further steering wheel movement should be undertaken and the vehicles engine switched off.

f) In this position the appropriate front axle steering locks can be adjusted until they contact the axle beam and the lock nuts secured. (Front adjuster on the left hand side and rear adjuster on the right hand side).

g) Start the vehicle engine, ensure the vehicle remains stable and fully supported on the axle stands, disengage 4WS and centralise the rear steering and turn off the engine.

3. Adjust cylinder ball joint

a) Steer the vehicle to the full right hand lock.

b) Release the steering cylinder ball joint lock nut.

c) Adjust the ball joint/cylinder length by rotating the cylinder rod until the cylinder is at its maximum extension whilst the steering remains against the right hand steering lock stops.

d) Re-secure the steering cylinder ball joint lock nut and mark with paint pen to indicate the unit has been adjusted.

e) Start the vehicle engine and engage 4WS, ensuring the vehicle remains stable and fully supported on the axle stands (It may be necessary to raise the rear of the vehicle as well as the front due to ground conditions) steer the vehicle to the left until the rear steering just contacts the appropriate rear steering lock stops – at this point no further steering wheel movement should be undertaken and the vehicles engine switched off.

f) With the steering in this position, check the front axle steering locks are in contact with the axle beam (Rear adjuster on the left hand side and front adjuster on the right hand side). If clearance exists the steering locks should be adjusted until they contact the axle beam ensuring the lock nuts are secured.

g) Start the vehicle engine, ensure the vehicle remains stable and fully supported on the axle stands, disengage 4WS and centralise the rear steering and turn off the engine.

h) Refit the road wheels torqueing the bolts to 100Nm.

i) Return the vehicle to the ground and road test to ensure full operation of steering.

Adjustment procedure for 2WS models only

The front axle lock stops are adjusted to allow a specified turning circle to be achieved; the following procedure should be followed to ensure correct adjustment.

1. Check security of ball joint

a) With the vehicle on a level surface, raise the front of the vehicle and support securely on axle stands.

b) Remove both front wheels.

c) Slacken the lock nuts and adjust the steering lock stops to a minimum setting (the head of the lock stop setscrew should contact the king pin/hub assembly in the minimum setting).

d) Remove the split pin from the steering cylinder ball joint nut (on the front of the right hub assembly) and check the security of the ball joint by tightening the nut to 40Nm also check for any movement between the ball joint and hub assembly.

e) Renew split pin and secure.

Note: Should any play exist between the ball joint and hub assembly following tightening of the nut, further action will be required – Please contact the appropriate Johnston Sweepers Ltd. service provider.

2. Adjust cylinder ball joint

a) Release the steering cylinder ball joint lock nut.

b) Adjust the ball joint/cylinder length by rotating the cylinder rod until the dimension between the ball joint centre and cylinder rod end is 40mm (figure one).

c) Re-secure the steering cylinder ball joint lock nut and mark with paint pen to indicate the unit has been adjusted.

3. Adjust steering lock stops

a) Steer the vehicle to the full right hand lock and adjust the appropriate front axle steering locks until they contact the axle beam and secure the lock nuts (Front adjuster on the left hand side and rear adjuster on the right hand side).

b) Now steer the vehicle to the left whilst measuring between the ball joint centre and the cylinder end face until a measurement of 97mm is achieved (Fig 2.).

c) At this point adjust the appropriate front axle steering locks until they contact the axle beam and secure the lock nuts (Rear adjuster on the left hand side and front adjuster on the right hand side).

d) Centralise the steering and refit the road wheels torqueing the bolts to 100Nm.

e) Return the vehicle to the ground and road test to ensure full operation of steering.

Periodic inspection – All Models (2WS and 4WS)

As prescribed, periodic inspection of the steering cylinder ball joint should be undertaken to ensure that security of its fixing is maintained.

1. Check security of ball joint

a) With the vehicle on level ground with the handbrake applied rotate the steering to give full right hand lock.

b) Remove the split pin from the steering cylinder ball joint nut (on the front of the right hub assembly) and check the security of the ball joint by tightening the nut to 40Nm and checking for any movement between the ball joint and hub assembly.

c) Renew split pin and secure.

Note: Should any play exist between the ball joint and hub assembly following tightening of the nut further action will be required – Please contact the appropriate Johnston Sweepers Ltd. service provider.

Adjustment of Steering Components - Tools required

1 x Trolley jack (capable of safely lifting the vehicle to the required height).
2 x Axle stands (sufficient to support the vehicle safely at the required height)
1 x 22mm open ended spanner.
2 x 17mm spanner.
1 x 19mm socket.

1 x 17mm socket
1 x torque wrench (Suitable for above sockets and able to give 40Nm and 100Nm measurements).
1 x Paint pen.

Parts required

Split pin 2mm x 30mm - as required.

Standard Repair Time

Adjustment of lock stops, steering and initial periodic inspection - 60 Minutes.

Periodic inspection - 15 Minutes.

Front Axle Steering Components (TB 1522)

Further to TB1519 a retrofit campaign has been introduced to enhance the reliability of the front axle steering components utilising a larger ball joint and associated components..

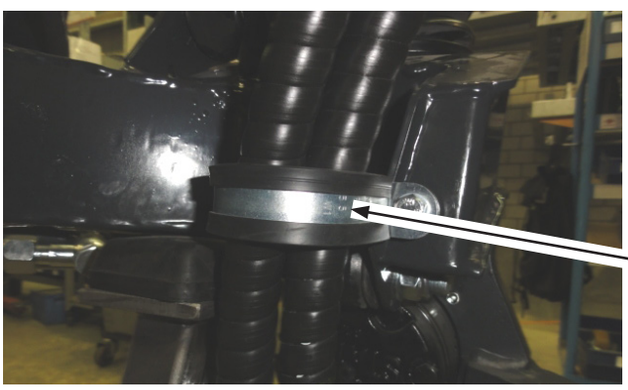
The components must be replaced by following the procedures outlined below:-

Replacement of Components

1. With the vehicle on a level surface, raise the front of the vehicle and support securely on axle stands.

2. Remove right hand front wheel.

3. Working on the right hand side front hub assembly, remove the clamp from the drive hoses (item 1) – shown below.

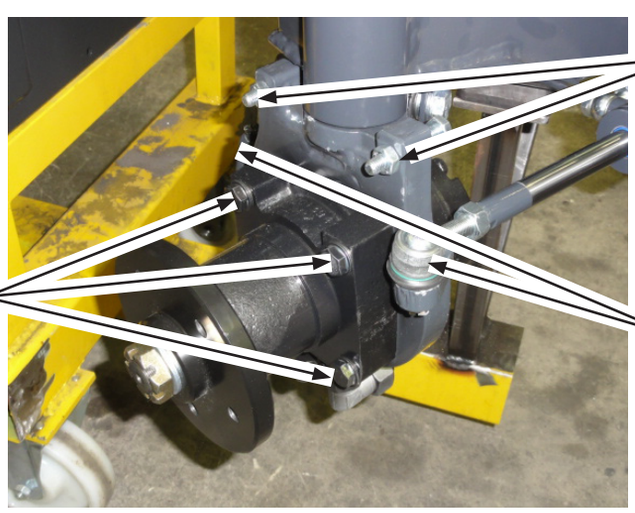


4. Remove the four screws (Item 2) and the drive motor with the hoses still connected – support until refitted to ensure hoses are not damaged.

5. Remove the split pins and nuts from the two steering ball joints (Item 3) and disconnect them from the swivel housing using a ball joint separator.

   Remove and discard the ball joint fitted to the steering cylinder.

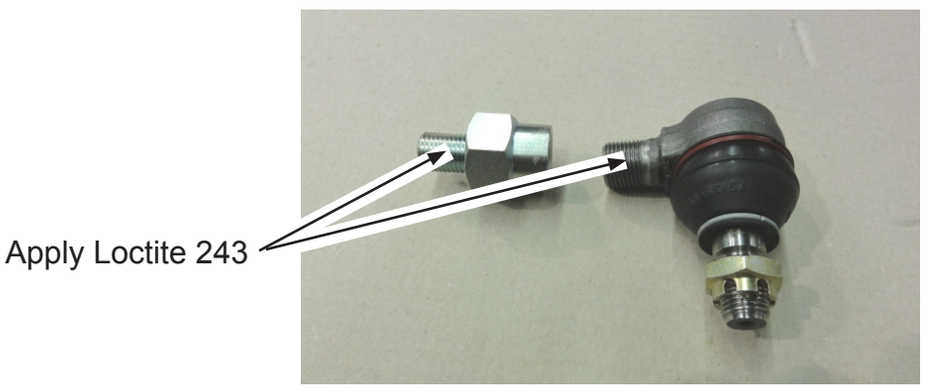
6. Remove the swivel housing retaining screw (Item 4) (this can be achieved by working through the spring) and withdraw the swivel housing.



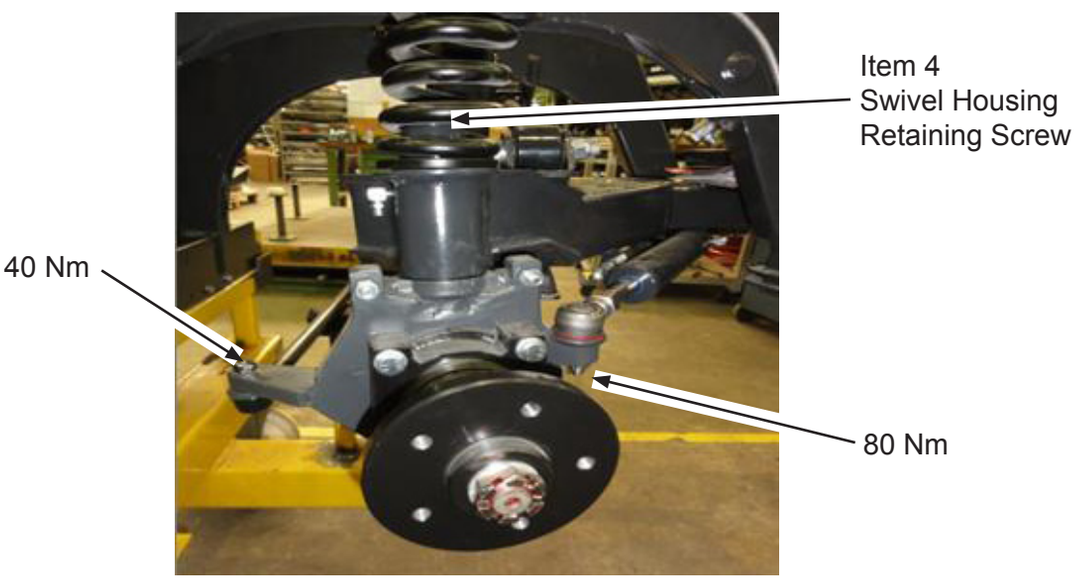
7. Remove the steering lock stops (Item 5) from the swivel housing and discard the original swivel housing.

8. Using the revised swivel housing (Part number 7001770) re-assemble the components in reverse order of removal with the exception of the steering cylinder ball joint. The swivel housing retaining screw (Item 4) should be fitted using Loctite 243.

9. The revised steering cylinder ball joint (Part number 7022475) and adaptor (Part number 7021822) can now be fitted to the cylinder and tightened using Loctite 243 on both thread faces – shown below.



10. The ball joint should now be fitted to the swivel housing and tightened to 80Nm – shown below.



11. Refit the road wheel and torque to 100Nm and return the vehicle to the ground.

12. Carry out adjustment to the front wheel alignment using propriety “tracking” equipment to give a figure of 0°40’ Toe in, by adjusting the length of the track rod located behind the axle.

13. Carry out adjustment to the steering lock stops as detailed below depending on steering configuration – Four wheel steer or two wheel steer.

Adjustment of Steering Lock Stops – 4WS Models Only

1. With the vehicle on a level surface, raise the front of the vehicle and support securely on axle stands.

2. Remove both front wheels.

3. Start the vehicle engine and engage 4WS, ensuring the vehicle remains stable and fully supported on the axle stands (It may be necessary to raise the rear of the vehicle as well as the front due to ground conditions) steer the vehicle to the left until the rear steering just contacts the appropriate rear steering lock stops – at this point no further steering wheel movement should be undertaken and the vehicles engine switched off.

4. In this position the appropriate front axle steering locks can be adjusted until they contact the axle beam and the lock nuts secured. (Rear adjuster on the left hand side and front adjuster on the right hand side).

5. Start the vehicle engine, ensuring 4WS is engaged and the vehicle remains stable and fully supported on the axle stands steer the vehicle to the right until the rear steering just contacts the appropriate lock stops – at this point no further steering wheel movement should be undertaken and the vehicles engine switched off.

6. In this position the appropriate front axle steering locks can be adjusted until they contact the axle beam and the lock nuts secured. (Front adjuster on the left hand side and rear adjuster on the right hand side).

7. Start the vehicle engine, ensure the vehicle remains stable and fully supported on the axle stands, disengage 4WS and centralise the rear steering and turn off the engine.

8. Refit the road wheels torqueing the bolts to 100Nm.

9. Return the vehicle to the ground and road test to ensure full operation of steering.

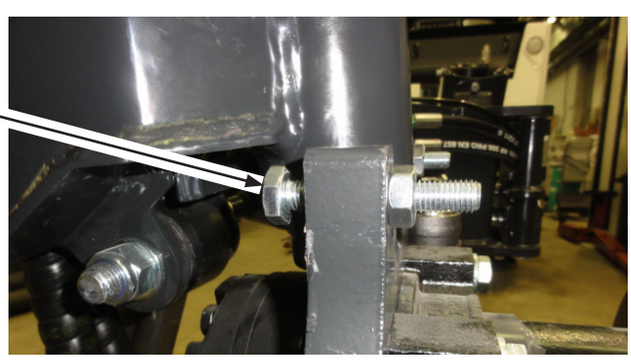
Adjustment of Steering Lock Stops – 2WS Models Only

1. With the vehicle on a level surface, raise the front of the vehicle and support securely on axle stands.

2. Remove both front wheels.

3. Adjust the right and left hand rear most lock stops to 25mm protruding from the swivel housing.

Adjust rear most steering lock stops to 25mm.



4. Rotate the steering until full right hand lock is achieved and the right hand rear most steering lock is in contact with the axle assembly. With the steering in this position adjust the left hand front steering lock until it also contacts the axle assembly.

5. Rotate the steering until full left hand lock is achieved and the left hand rear most steering lock is in contact with the axle assembly. With the steering in this position adjust the right hand front steering lock until it also contacts the axle assembly.

6. Centralise steering.

7. Refit the road wheels torqueing the bolts to 100Nm.

8. Return the vehicle to the ground and road test to ensure full operation of steering.

Tools Required

1 x Trolley jack (capable of safely lifting the vehicle to the required height).
2 x Axle stands (sufficient to support the vehicle safely at the required height)
1 x 27mm spanner.
1 x 22mm spanner.
2 x 17mm spanner.

1 x 13mm spanner.
1 x 13, 19, 17 and 22mm sockets with a ratchet.
1 x Torque wrench (Suitable for above sockets and able to give between 40Nm and 100Nm measurements.
1 x Ball joint separator.
1 x Tracking gauges.

Parts Required

Kit part number - TB1522

Description	Part Number	Quantity
Ball Joint	7022475	1 Off
Adaptor	7021822	1 Off
Swivel Housing - RH	7001770	1 Off
Loctite 243	Reference	

Standard Repair Time

120 minutes.

Note: This design improvement has been introduced in production from Manufacturing Sequence Number 0175.

Engine Oil Consumption (TB 1549)

The following instructions should be implemented for the Deutz engines fitted to the Johnston CN101.

The instructions apply during the first 500 to 700 operating hours and are intended to prevent high oil consumption:

- Higher than usual oil consumption during the first 500 to 700 operating hours of the running-in period is quite normal.

- In general and especially during the running-in period the engine should not be left to idle for long periods.

- Only use the oil grade recommended in the operator manual.
  Do not use a lower grade oil.
  Using a lower grade oil will increase oil consumption.

- The oil level may be checked with the engine hot or cold with the engine switched off. If the engine has been running it should be switched off for minimum of 5 minutes prior to checking the level to allow the oil to settle.

  If you want to compare oil levels ensure that the oil levels to be compared are checked under similar conditions.

- When filling, only fill up to the halfway mark on the dipstick. If you fill to the upper mark, the engine will use the excess oil until the level drops to the halfway mark. Often this is declared as the normal oil consumption of the engine but this is not in effect the case.

- If engine oil consumption is exceptionally high despite implementation of the running-in instructions, you should inform your local Johnston representative. You will also be asked to record the consumption data over a period of 100 hours running time. You should record the oil consumption and the fuel consumption for comparison.

  The limit value for the maximum specific lubricant consumption is 0.75 % (max.) of fuel consumption.

Recommended Oil Grade from Operators Manual.

Minimum Specification	-	ACEA E3-96/E5-02, API CH-4/CG-4, DHD-1
Viscosity	-	10W-40

CHAPTER 6

Service Tools

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The following tools are available through our Spares Network

Tool No.	Description	Function
437/3	Pressure Gauge Set	Used to measure hydraulic and water pressures.
437/4	Optical Tachometer	Used to measure fan rpm.
437/7	0.55 Litres/min Flow Gauge	Used to measure hydraulic flows.
437/8	Impulse Adaptor	Connects to 437/4 to measure engine speeds from fuel injection pipes.

CHAPTER 7

Health and Safety

Introduction

The information presented in this chapter does not infer that there are hazards associated with the Johnston sweepers. It is given as a guide to general precautions that should be exercised in the course of their maintenance work.

Whilst every effort has been made to ensure completeness of this document, owners and operators of Johnston sweepers are reminded of their responsibilities to comply with all relevant legislation including Risk/ COSHH Assessments and Approved Codes of Practice.

Health and Safety Precautions

The information presented in this section does not infer there are any particular hazards associated with these machines. It is given as a guide to the general precautions that should be taken in any workshop environment when working on machines of this nature in the course of their maintenance.

Safety symbol:
The universal symbol is used throughout this manual to indicate information which is essential for health and safety of all operating personnel.

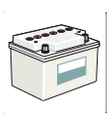
Refer to all state, district/company, or council Health and Safety Regulations and follow the procedures laid down.

The repair and maintenance of machinery such as this can involve physical hazards or other risks to health. This section lists some of these hazards and the precautions necessary to avoid them.

The list is only general but all other operations, procedures and the handling of materials should be carried out in accordance with the requirement of health and safety laws, which is the responsibility of the Owner/Operator/Maintainer.

Anti Freeze:
Anti-freeze may be absorbed though the skin in toxic or harmful quantities.
If swallowed, seek medical attention immediately.
Some types, i.e., isopropanol, ethylene glycol and methanol are flammable.

Batteries:
Gases released during charging are explosive. Never use naked flames or allow sparks near charging or recently charged batteries.



Disconnection:
Disconnect the negative battery lead from battery first. The positive cable must always be disconnected last.

Reconnection:
Always reconnect the positive battery cable first.

Jump-starting and use of auxiliary (booster) batteries:
Do not jump-start maintenance free batteries if in a deeply discharged state as internal short circuits may occur.

If a maintenance free battery is found to be in a deeply discharged state, it is essential to remove the battery and recharge off the vehicle. Jump-starting will not enable the vehicles own charging system to initiate the charging process.

Jump starting procedure:
Always follow this procedure when connecting a booster battery.

Take care not to cause sparking which could ignite hydrogen gas being given off by the batteries.

1. Apply the park brake, turn off ignition, lights and other electrical loads.
2. If the slave battery is mounted on another vehicle, ensure that the vehicles are not touching.
3. Ensure that the donor battery voltage is compatible with the vehicle battery.
4. Ensure that adequate ventilation is available to the vehicle and slave batteries.
5. Connect positive terminal of the donor battery group to positive terminal of the discharged battery group.
6. Connect negative terminal or slave battery group to chassis earth of the discharged battery group.
7. Attempt to start the casualty vehicle.
8. Once the vehicle has started, remove the negative lead from the chassis and then the slave battery.
9. Remove positive lead from discharged chassis and then the donor chassis.

If the vehicle will not start with a booster battery, contact your local Johnston Service Network.

Chemical materials:
Chemical materials such as solvents, sealers, adhesive, paints, resin foams, battery acids, anti-freezes, brake fluids, oils and grease should always be used with caution and stored and handled with care.

Chemical materials may be toxic, harmful, corrosive, irritant or highly flammable and give rise to hazardous fumes and dust.

Always consult the appropriate safety standards for handling such materials.

Typical biohazard symbol

Typical radioactive material symbol

Typical poison symbol

Always use appropriate protective clothing

Reminders
Chemical materials

DO	remove chemical materials from the skin and clothing as soon as practical after soiling. Change heavily soiled clothing and have it cleaned.
DO	carefully read and observe hazard and precaution warnings given on hazardous material containers and in any accompanying leaflets, posters or other instructions. Hazardous material health and safety data can be obtained from manufacturers.
DO	organise work practices and use protective clothing to avoid soiling of the skin and eyes; breathing vapours, aerosols, dust, and fumes; inadequate container labelling; fire and explosive hazards.
DO	wash before job breaks, before eating, smoking, drinking or using toilet facilities when handling chemical materials.
DO	keep work areas clean, uncluttered and free of spills.
DO NOT	mix chemical materials except in accordance with the manufacturer's instructions. Some chemicals can form other toxic or harmful substances; give off toxic or harmful fumes; be explosive when mixed together.
DO NOT	spray chemical materials, particularly those based on solvents, in confined spaces; for example, when people are inside a vehicle.
DO NOT	apply heat or flame to chemical materials, except under the manufacturer's instructions. Some are highly flammable and some may release toxic or harmful fumes.
DO NOT	leave containers open. Fumes given off can build up to toxic, harmful or explosive concentrations. Some fumes are heavier than air and will accumulate in confined areas, pits, etc.
DO NOT	transfer chemical materials to unlabelled containers.
DO NOT	clean hands or clothing with chemical materials. Chemicals, particularly solvents and fuels will dry the skin and may cause irritation with dermatitis. Some can be absorbed through the skin in toxic or harmful quantities.

Dusts:
Powder, dusts or clouds may be irritant, harmful or toxic. Avoid breathing dusts from powdery chemical materials or those arising from dry abrasion operations.
Wear respiratory protection in accordance with the requirement of the Health and Safety Acts.

Electric shocks:
When working on electrical systems, remove watches, bracelets and rings as these can conduct electricity and cause shorts and/or burns.

Electric shocks can result from the use of faulty electrical equipment or from the misuse of equipment even in good condition.

Ensure that electrical equipment is maintained in good condition and frequently inspected and tested.

Ensure that flexes, cables, plugs and sockets are not frayed, kinked, cut, cracked or otherwise damaged.

Ensure that electrical equipment is protected by the correct rated fuse and if used outside an earth-leakage circuit breaker is used.

Never misuse electrical equipment and never use equipment that is in any way faulty. The results could be fatal.

Use reduced voltage equipment (110 or 24 volt) for inspection and working lights where possible.

Ensure that the cables of mobile electrical equipment cannot be trapped and damaged such as in a vehicle hoist, trolley jacks, etc.

Use air operated mobile equipment where possible in preference to electrical equipment.

Exhaust fumes:
These contain asphyxiating, harmful and toxic chemicals and particles such as carbon oxides, nitrogen oxides, aldehydes, leads and aromatic hydrocarbons.
Engines should only be run under conditions of adequate extraction or general ventilation and not in confined spaces.
NB : Catalyst exhausts/silencers can run at extremely high temperatures.

Fire and welding:
Observe strict fire safety when storing and handling flammable materials or solvents, particularly near electrical equipment or welding processes.
Disconnect battery, microprocessors, etc. before commencing welding. Failure to observe this could cause failure of components.
Ensure before using electrical or welding equipment that there is no fire hazard present.
Have a suitable fire extinguisher available when using welding or heating equipment.
Special precautions must be taken before any welding or cutting takes place on vessels which have contained combustible materials, e.g. fuel tanks.
The sound insulation foam used on the equipment must be removed if any welding is to be carried out in that area of the machine.

First aid:
It is desirable for someone in the workshop to be trained in the first aid procedures.
Splashes or particles in the eye should be flushed with clean water for at least ten minutes and medical attention sought.
Soiled skin should be washed with soap and water.
Inhalation affected individuals should be removed to fresh air immediately.
If hazardous material has been swallowed or if the effects of exposure to hazardous materials persist, consult a doctor with information (label) on material used.
Do not induce vomiting (unless indicated by the manufacturer).

High-pressure air and lubrication equipment:
Always keep high-pressure equipment in good condition and regularly maintained, particularly at joints and unions.

Never direct a high (or low) pressure nozzle at the skin as the fluid may penetrate to the underlying tissue, etc, and cause serious and potentially fatal injury.

Oils and greases:
Prolonged and repeated contact with mineral oil may result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis.
Gross and prolonged contact, especially with used engine oil, which contains potentially harmful contaminants, may cause skin cancer.

Where there is a risk of eye contact, e.g., by splashing, eye protection should be worn, for example, chemical goggles or face shields; in addition, an eyewash facility should be provided.

Adequate means of skin protection and washing facilities should be provided.

Repeated or prolonged skin contact should be avoided by wearing protective clothing, including impervious gloves where practical. Particular care should be taken with used oils and greases containing lead.

First Aid treatment should be obtained immediately for open cuts and wounds.

Apply barrier cream before each work period to help when removing oil from the skin.

Use proprietary hand cleaners only if they can be removed from the skin using water.

Overalls must be cleaned regularly. Discard clothing that cannot be cleaned and footwear that has become impregnated.

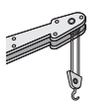
In the event of a skin condition occurring consult a doctor and tell him/her that your work involves using oil.

Solvents:
Solvents such as acetone, white spirit, toluene, xylene and trichloroethane are flammable.

Avoid splashes to the skin, eyes and clothing. Wear protective gloves, goggles and clothing.

When using solvents ensure good ventilation; avoid breathing fumes, vapours, spray-mists and keep containers tightly sealed. Do not use in confined spaces. When spraying materials containing solvents, for example paints, adhesives or coatings, use extraction ventilation or personal respiratory protection in the absence of adequate general ventilation.

Do not apply heat or flame except under specific and detailed manufacturer's instructions.



Suspended loads:
Never work under an unsupported, suspended or raised load. For example, jacked up vehicle, raised tipper body, suspended engine, etc.

Always ensure that lifting equipment e.g., jacks, hoists, axle stands, slings, etc are adequate and suitable for the job, in good condition and regularly maintained.

NEVER improvise lifting tackle. **ALWAYS** ensure body props and/or axle stands are used when working under bodies or chassis.

Workshop tools and equipment:
Only use tools and equipment for their intended purposes.

Never overload equipment such as hoists, jacks, axles stands or lifting slings. Damage caused by overloading is not always immediately apparent and may result in a fatal failure the next time the equipment is used.

Never use damaged or defective tools or equipment.

Always wear suitable eye protection when using grinding, chiselling or air guns.

Always wear a suitable breathing mask when using sand blasting equipment, working with asbestos based materials (such as brake linings) or using spraying equipment.