SERVICE MANUAL

Machine: U AC Power Plus

Manual No: 005954

Edition 2010A

Electrical system

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10 Electrical system

10.1 Introduction

10.1.1 Component description

The electrical system consists of:

- a 48 Volt battery
- an ATC
- a drive regulator
- a pump regulator
- a number of sensors, both microswitch types (mechanical/magnetic) and analogue-digital types.
- inductive sensors for steering
- contactors for connection of the power circuits
- electric motors for driving the gearbox and hydraulic pump
- electromagnetic brake
- electric steering
- electric fans
- electrically operated hydraulic valve

Trucks equipped for use in cold storage facilities have enclosed cabs including electric heating and lighting as optional equipment.

Some trucks are equipped with radio equipment.

Other electrical installations may be encountered due to specific customer requirements. These are not taken up in this Service Manual.

10.1.2 Safety

- Electric powered vehicles can be dangerous. All testing, trouble shooting and calibration must be carried out by authorised personnel. The drive wheel should run free of the floor and be able to rotate freely during work.
- Take off watches, necklaces, bracelets and rings before starting repair and troubleshooting work.
- The electrical system has a multi-stage safety system to provide the highest possible level of safety. Abnormal conditions are detected and depending on the type of fault different measures are implemented. The least critical condition only generates a warning via the display. Faults that may result in dangerous situations result in a stop and trouble shooting assistance via the error log.
- The battery must always be disconnected with all replacement and repair work on the electrical system.
- It is essential that all cables (especially the battery cables) are connected correctly as the electronics used in the truck are sensitive to incorrectly polarised supply voltage.

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- All dust and magnetic or metallic particles must be regularly cleaned from solenoid switches and solenoids to guarantee operation.
- Extreme importance must be placed on precautionary measures to avoid accidents during all work on the vehicle. A general rule is always to implement preventive measures that are adapted to the type of vehicle to be worked on. The general rules below must always be observed:
- Smoking or naked flames are strictly forbidden as there is a risk of explosion in the vicinity of batteries and while working on gas equipped vehicles. The battery should always be protected during grinding work. The fire regulations for the building should also be observed.
- Always lift the truck so that the drive wheel is free of the ground to prevent the vehicle from running away. The vehicle must not rest solely on the jack, but must be secured by some form of blocking.
- Always remove the battery plug to prevent the risk of injuries caused by crushing. The mast, carriage and hydraulic unit can be actuated due to an electrical fault or mistake while working. The battery plug may only be connected while trouble shooting and when the greatest of care is exercised, (with the truck raised).
- During work on and around the mast and hydraulic unit, these must be locked using a mast lock, wooden blocks or other appropriate material. No other persons may be in the vicinity of the truck when this is test run in combination with repair work, as there is a risk of incidents and accidents occurring due to the truck making an unexpected manoeuvre.

⚠ *Warning!*

Standing on the reach carriage between the mast and battery partition with the current connected to the truck can result in fatal injury!

- The system should not be pressurised, e.g. the pump motor shut off and the forks down in forward tilt position when dismantling parts of the hydraulic system.

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10.2 Battery

10.2.1 Replace

Use the reach lever when replacing or extracting the battery.

1. Move in the reach carriage until it stops.
2. Continue to activate the lever at the same time as the arrow up key on the keyboard is pressed. The reach carriage will then move in a little further.
3. Loosen the battery stop by pressing down the pedal with your right foot on U*S. Keep holding down and move out the reach carriage. The battery will now follow out
4. Replace the battery and then move in the reach carriage until it stops, Continue to activate the lever at the same time as the arrow up key on the keyboard is pressed. The reach carriage will then move in a little further. The battery is locked automatically when it reaches its innermost position.
5. Now move out the reach carriage and check that the battery lock has locked correctly.

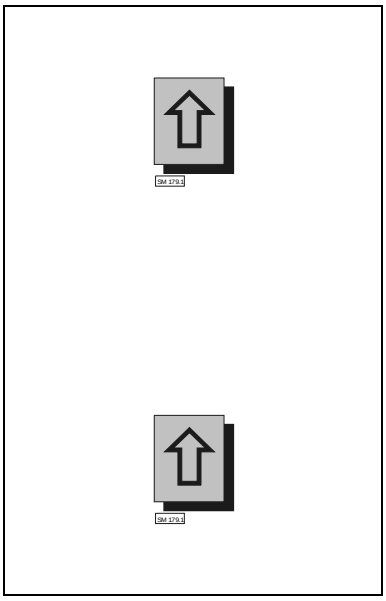

Figure 10.1

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10.2.2 Capacity measurement

The battery capacity is shown as a percentage of a fully charged battery to the left of the lower row on the display. Measurements are fully controlled by software, and no further electronics are required. The battery capacity is checked by measuring the battery voltage when the truck has been at rest for 3 minutes. If the period between measurements becomes too long, the ATC uses the running time counter to calculate the capacity.

When the battery capacity becomes too low a warning message is given on the top row of the display, and the battery capacity value starts to flash.

Lift stop with a low battery is linked to the battery capacity measurement.

Both the warning level and the stop level are set in the service function.

Battery capacity %	Voltage 48 V sys.	Acid density g/cm3
0	45.84	1.070
2	45.95	1.075
4	46.06	1.079
6	46.17	1.084
8	46.28	1.088
10	46.39	1.093
12	46.50	1.098
14	46.61	1.102
16	46.72	1.107
18	46.83	1.111
20	46.94	1.116
22	47.05	1.121
24	47.16	1.125
26	47.28	1.130
28	47.39	1.134
30	47.50	1.139
32	47.61	1.144
34	47.72	1.148
36	47.83	1.153
38	47.94	1.157
40	48.05	1.162

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Battery capacity %	Voltage 48 V sys.	Acid density g/cm3
42	48.16	1.167
44	48.27	1.171
46	48.38	1.176
48	48.49	1.180
50	48.60	1.185
52	48.71	1.190
54	48.82	1.194
56	48.93	1.199
58	48.04	1.203
60	49.15	1.208
62	49.26	1.213
64	49.37	1.217
66	49.48	1 222
68	49.59	1.226
70	49.70	1.231
72	49.81	1.236
74	49.92	1.240
76	50.04	1.245
78	50.15	1.249
80	50.26	1.254
82	50.37	1.259
84	50.48	1.263
86	50.59	1.268
88	50.70	1.272
90	50.81	1.277
92	50.92	1.282
94	51.03	1.286
96	51.14	1.291
98	51.25	1.295
100	51.36	1.300

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10.2.3 Battery parameters from version 3.00

Select 48V batt.	Nominal battery voltage, state 1 for 48 Volt, 0 for 24 Volt. 48 Volt is Default.
Measured B+ (mV)	Actual battery voltage to ATC. You can make corrections for voltage losses in cables and contactors up to the ATC by changing these values. To make the correction, measure the battery voltage at the poles using a voltmeter that can show 4 digits at 50 Volts, then state the voltage in mV. (If the voltmeter shows 48.12 Volt, press 48120 Ent).
Battery size (Ah)	Stated in Ah. This is normally stated on the battery. Default is 550.
Pump size (kW)	State in whole kW. Default is 14.
Utilisation (%)	Usage, stated from 50 to 200 per cent, and used to correct for light/hard driving. Default is 100. Higher values are used with harder driving, lower values for lighter driving.
Chassis const. 1	Calculation constant to receive a warning of whether the chassis has an unpermitted HIGH voltage depending on too low resistance between the chassis and the battery's positive pole. See table. Default is 917.
Chassis const.2	Calculation constant to receive a warning of whether the chassis has an unpermitted LOW voltage depending on too low resistance between the chassis and the battery's negative pole. See table. Default is 110.
Low batt. level:	Determines at what percentage of the battery capacity that the ATC shall warn that it is time to charge the battery. Default is 25%.
Lift stop level	Determines at what percentage of the battery capacity that the ATC should shutdown the lift function and limit the driving speed to crawling speed. Default is 20%.

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10.3 Chassis

10.3.1 Checking the ATC - chassis connection

(This is performed in combination with service and replacing of the ATC).

1. This should be checked using a calibrated DMM in order to determine whether the ATC makes good contact with the rest of the chassis. Set the digital multimeter to resistance measurement, measurement range 200 Ohm.Ω . Touch the measurement probes together and read off the display. The value ought to be 0.0 to approx. 0.6 Ohm.Ω .
2. Connect one of the measurement probes to one of the bright screw heads on the ATC box and the other probe to the screw for the chassis connection, (located on the battery wall under the ATC connection green/yellow cable). The value read off should not be more than max. 0.5 Ohm higher than the read off value under point 1.
3. If the value is higher make a check on some of the other screws on the ATC box. If this does not help the screw for the chassis connection must be checked. First check by measuring this across another clean metal surface, if the value is also too high the thread for the chassis connection should be cleaned using a plug tap and a new check should be performed.

☞ ***Important!***

Chassis faults should always be rectified during the servicing.

10.3.2 Potential measurement

The potential measurement on the chassis is performed with a voltage divider connected between B+ and B-, with the centre outlet connected to the chassis. The voltage divider has sufficiently large resistances to comply with EU's insulation requirements at the same time as potential changes can be measured via an analogue input on the ATC.

If voltage is discovered on the chassis an error code is displayed. The error code is stored together with the time and date in the error log.

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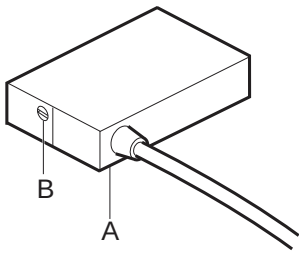
10.3.3 Optical aisle sensor, rail guidance

There are two versions of the optical aisle sensor. The new version has increased, adjustable, sensing distance.

The part number remains the same as before and the new sensor is totally compatible with the old one. The new sensor can replace an old one without modification.



Pos	Designation
A	Sensor
B	Sensitivity adjustment screw

Figure 10.2

To identify the difference between old and new sensors see table below.

Production Date	Marking on sensor	Maximum operating distance
< October 14, 2002	BSC4	200 mm
> October 14, 2002	BSC6	400 mm

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10.3.4 Caster wheel rotation lock, UFS

The new caster weel rotation lock is valid from version 5, 2002w33–

Functionality

The castor wheel will be locked from rotation when the left foot switch is used for emergency braking, when panic braking with the brake pedal or if the emergency stop switch is used. The caster wheel rotation lock will also be applied for different kinds of errors that normally activate the electric brake on top of the traction motor.

Service and fault finding

Current transducers

To increase the safety, two current transducers are used for monitoring the current to the motor brake and the caster wheel rotation lock.

If there is a loss of current when it would be normal with a current flow, or if there is a short circuit in any of the brake circuits, an error will be detected and stored in the error log.

If an error is detected and the truck is commanded to drive in normal (fork/reversed fork) direction, the truck will not stop but the caster wheel lock will be applied. If an error is detected and the truck is commanded to drive in a sideway direction the truck stops.

If the truck was stopped because of a momentary fault, reset is done with OFF/ON from the keypad. If the truck was stopped because a permanent fault, that it can only be moved again if the load wheel is turned to normal (fork/reversed fork) direction and the caster wheel rotation lock is emergency hand released.

The ATC2 reading of the current transducers can be seen in the menu "Hydraulic inputs". When in Service menu, no current is flowing through the brake coils and a fixed value between 2,5V and 2,8V should be read for both transducers if everything is OK. The text string in the display shows "B2.5W2.5", where B = Traction motor brake and W = Wheel rotation lock.

If there is no connection to the ATC2 and the input is open, then approximately 4,8V will be read. A broken ground line will also give approximately 4,8V and a broken +5V line around 1,5V. Values lower than 2V and higher than 4V are under no circumstances allowed and an error logging will occur.

Emergency hand release of caster wheel lock

In the top of the wheel cover for the caster wheel are there two holes with 30 mm diameter. Under the wheel cover is the brake for the castor wheel lock situated. There are two M5 holes in the brake. If two M5x45 screws are screwed all the way down in those holes will the caster wheel lock will be emergency hand released.

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New error code

If the truck stops and E54 shows up in the display, this is because of an open circuit or short circuit in one of the brake circuits or one of the brake coils or due to a broken transducer, loss of transducer signal or transducer supply. E54 is always logged together with a four level sub information string giving a numerical value.

E54			
Subinfo	**Value**	**Description**	**Note**
Line 1	10 or 11	**10**=Drive motor brake or transducer **11**=Wheel lock or transducer	
Line 2	0, 1 or 5	**0**= Brake current expected but no brake current read. **1**= No brake current expected but brake current read. **5**= Transducer signal out of range < 2 volt or >5volt.	If **5**, check transducer, supply (5.0 V) and signal wires. Truck will still work normaly and drive is permitted but fault should be repaired for correct current monitoring
Line 3	*	Brake current value when the error was logged	
Line 4	*	Value for no brake current	A normal value is around 512 - 580

***** *Any value can be calculated to a voltage value from the following formula: value/ 1023 x 5.*

Example: Value = 914, read voltage is 914/1023 x 5 = 4,48V. This means that values out of range are approximately below 409 or above 818.

If the brake pedal is stamped hard, so the "Total brake switch" S4 is engaged, there is a possibility that error code E54 occurs in the display. The reason for this is that the ATC cannot sample fast enough. This kind of E54 error is always logged together with the sub information 10, 0 and two low voltage values around 570. This error will disappear from the display and be reset with OFF/ON from the keypad. The error will remain in the logbook but be overwritten if this error occurs again.

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10.4 Connectors in cold storage rooms

10.4.1 Greasing

Grease Kryotox, ATLET article number 110781, should be applied to all electrical connectors in the machine housing, below the shelf where the computer and the AC regulator are mounted. The exception is the two contactors located in the regulators. Moreover, grease all contactors and the connector blocks in the mast and mast base are greased on cold store designed models. The hand spray, part number 110782, should be used in order to do this.

The grease should be applied to contactor surfaces when the contactors are drawn apart. The connectors are then reconnected and the grease is pressed from behind into the connector housing so that this is filled. A connector block is regarded as all blocks that have more than one cable. Flat pins that are protected by some form of casing are not to be greased. This applies to the connector blocks connected to the valve.

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10.5 Drive and pump regulator (2005w04–)

10.5.1 Dismantling, assembling

- Dismantling the panels, see section 4.
- Loosen the cables connected to the regulators.
- Check that the cables are labelled, if not, label the cables before removing.
- Disconnect the bolts holding the regulators. Most bolts are accessible without the need of dismantling the bracket.
- Assemble in the reverse order.

☞ ***Important!***

When fitting a new regulator, check that the air tunnel where the regulator is mounted is free of dust and the like.

10.5.2 Designation

Henceforth, the drive regulator will be named TMC (Traction Motor Controller). The drive regulator will be named PMC (Pump Motor Controller).

TMC and PMC are identical with the same article number. You decide the function the regulator is to have with the cable by connecting B+ to different pins in the control connector.

- TMC: Connect B+ to pin 2.
- PMC: Connect B+ to pin 1.

In order for the regulators to operate with the intended capacity, the fan cooling must be working. The speed of the fan is controlled according to the temperature of the regulators.

10.5.3 General on control of the AC motors

For an AC based control system, it is important that the rotation of the motor is synchronised with the drive motor regulator. A sensor, incremental encoder, is used for this that is located in the motor, with two phases for displaced 90°. If these signals are disturbed or fail, the synchronisation between the motor and drive regulator will not work. This will result in the motor turning very slowly and drawing maximum current. Avoid running the motor in this position.

10.5.4 Connections

The tightening torque for the power connections must be 20 Nm. Screws and washers for the power connections must be brass and must not be replaced with steel. The length of the screws must not exceed 28 mm. When disconnecting the power connections, the negative connection must be disconnected last.

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10.5.5 Cable connections

All operating signals are connected to the regulators with a 35-pin contact.

Table 10.1 Functions in the control connector

Pin	Function	Comment
1	Selection of function as pump regulator.	B+ in for active selection
2	Selection of function as drive regulator.	B+ in for active selection
7	Feed to PC connection.	+15V
10	From temperature sensor	
11	Input from encoder bearing in motor	B channel
12	PC communication	RS 485 B
21	From temperature sensor in motor	
22	Input from encoder bearing in motor	A channel
23	PC communication	RS 485 A
24	Positive feed to the regulator	+48V
30	Negative to PC connection	Gnd
31	Negative to encoder bearing	Gnd
32	Feed to encoder bearing	+15V
34	CAN communication	Low channel
35	CAN communication	High channel

10.5.6 Power cables

Make battery and motor connections using M10 bolts on the top of the regulator. Make sure you fit these correctly to avoid polarity faults that can damage the regulator. Always be careful to avoid the risk of the motor cables short circuiting to the chassis.

☞ ***Important!***

Only qualified personnel may carry out work on the electrical system and system settings.

☞ ***Important!***

The battery must be disconnected when working on the electrical system. If this is not possible when troubleshooting, you must raise the truck's drive wheel from the ground.

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10.6 Insulation resistance

10.6.1 Routine test

You must first disconnect the connections (plugs) before the truck is insulation tested in order to protect the regulators and other electrical components on the truck. This is because damage may occur that will shorten the life of component parts. In the event of large insulation errors it is appropriate to use a universal instrument until the error has been found and then make a final insulation test.

This applies to all electronic units in the truck.

The instrument has a dangerous voltage across the measurement terminals. Do not touch the terminals during testing.

Routines for insulation testing of all truck models.

1. Set the test voltage to 100 volts for the insulation measurement instrument.
2. Pull out the battery plug. Disconnect connections/terminals to electrical components and electronic systems before the test is performed as these can be damaged by the test voltage.
3. Connect the instrument's earth lead to the truck chassis at a point with good electrical contact. The other lead is connected to the electrical panel plug's positive terminal.
4. Press the start button and wait until the display has stabilised, now release the button and read off the value on the display. An approved value of 48 volts on trucks should be at least 48000Ω , (48 kΩ).
5. Let the earth lead remain attached to the chassis and connect the other lead to the electrical panel plug's negative terminal. After this repeat point 4.

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10.7 Temperature measurement

Temperature measurements are made up to software version 3.41 using NTC resistance (Negative Temperature Coefficient). The temperature can be shown from 0 to approx. 150 C. ATC has 6 channels to measure the temperature.

When the temperature is too high the driver receives an error message on the display. This takes place in two stages. The temperature limits can be set from the service menu function. The first stage involves an error message and the second stage involves a new error message and e.g. the pump/drive motor being shutdown.

The following statistics are saved for the temperature:

The number of times the temperature range has been reached in intervals:

The temperatures that apply up to software version 3.41 are shown below.

Oil	Motors and regulators
Temp. above 75° C	above 120° C
Temp 71 - 75° C	111 - 120° C
Temp 66 - 70° C	101 - 110° C
Temp 61 - 65° C	91 - 100° C
Temp 56 - 60° C	81 - 90° C

The temperatures that apply from software version 3.42 are shown below.

Oil	Motors and regulators
Temp above 70° C	above 120° C
Temp 61 - 70° C	101 - 120° C
Temp 51 - 60° C	81 - 100° C
Temp 41 - 50° C	61 - 80° C
Temp up to 40° C	up to 60° C

Only the oil temperature is measured with NTC resistance in AC Power Plus.

In the drive and pump motor systems the temperature is measured in the regulators and motors using PTC resistors. The temperature is reported to the ATC via the CAN network.

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10.7.1 Trouble shooting - hydraulic functions channels 3, 4 and 5

Trouble shooting for the hydraulic functions channels 3, 4 and 5 display symbols and contact definitions as shown below. Moreover, trouble shooting is identical to the reach out, see “The reach out function does not work - other functions OK.” on page 77.

Function	Symbol	Connector
Tilt out	to TO	P82,1 P82,2
Tilt in	ti TI	P81,1 P81,2
Side shift display side	S<SLL	P53,1 P53,2
Side shift seat side	S>SR	P50,1 P50,2
Fork spread in	>< SO	P54,1 P54,2
Fork spread out	< > SC	P51,1 P51,2

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10.8 Magnetic switch for the reach stop

10.8.1 Reach stop

The magnetic switch is adjusted so that the reach movement towards the machine housing stops at A=1-15 mm. The reach speed is set via the valve parameters “set valves”.

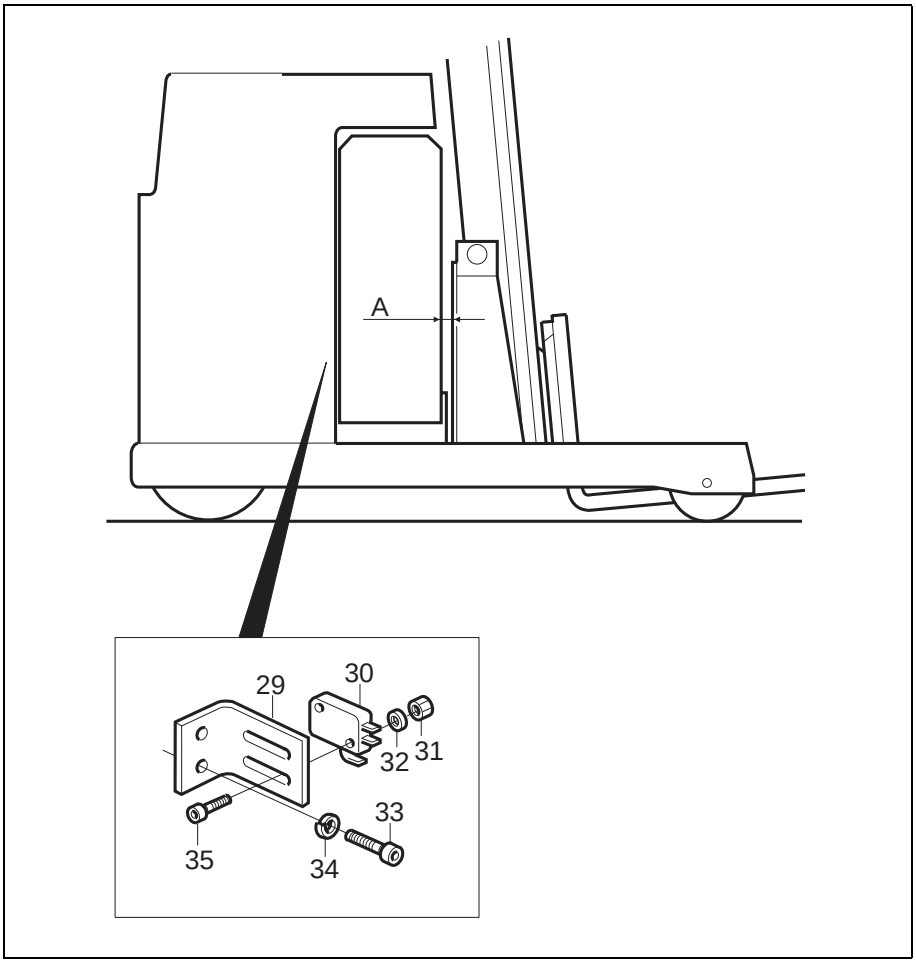

Figure 10.3

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10.8.2 Reach stop damping (2005w04÷) (trucks with S3)

The purpose of the reach stop damping is make mast movement more gentle.

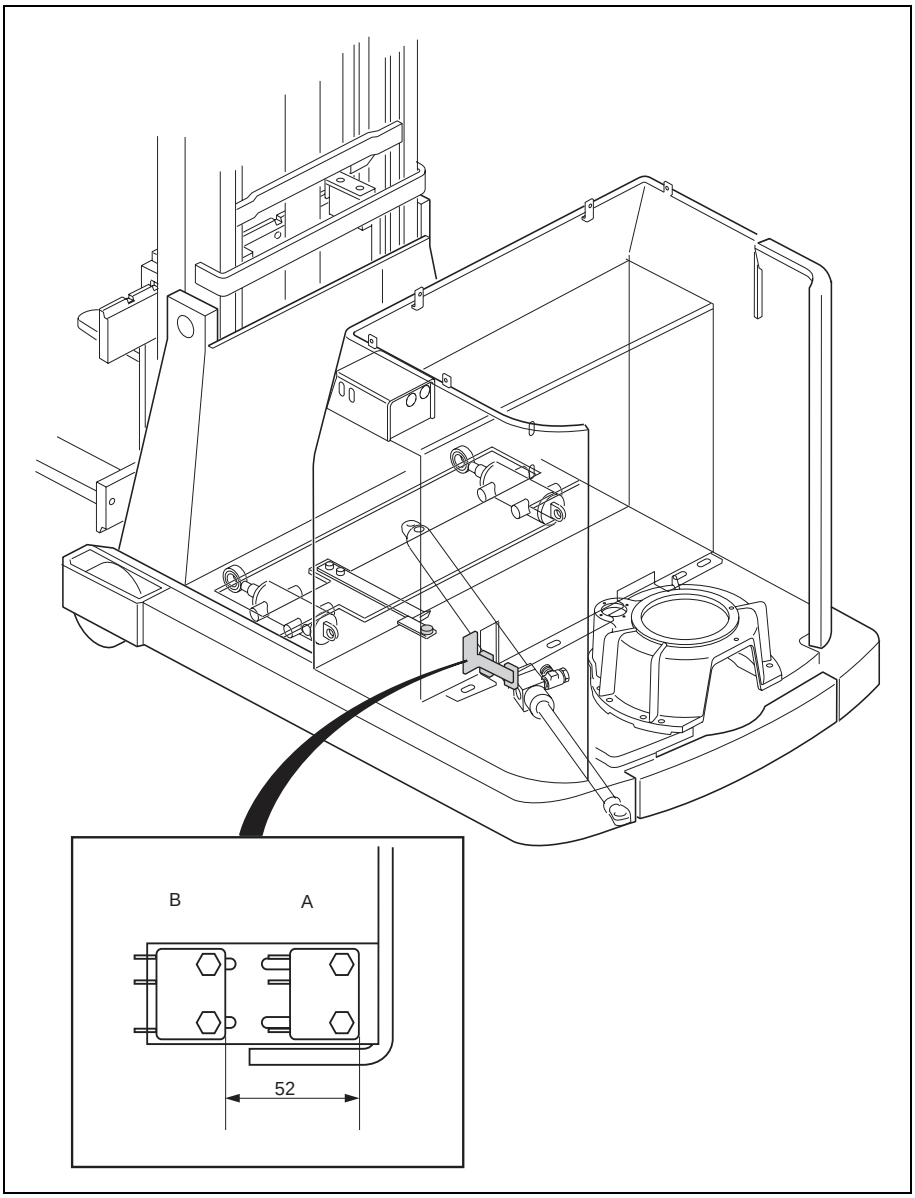

Figure 10.4

Damping of reach-in movement

Damping of the reach-in movement is performed in two steps using two magnetic sensors.

1. Sensor (A) gives a signal for reducing reach speed.
2. Sensor (B) gives a signal for stopping the reach movement.
3. Make other settings via the truck computer.

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Damping of reach-out movement

Damping of the reach-out movement is made with an inductive sensor. Sensor that indicates that the reach cylinder has reached its lowest position. The movement is slowed but not stopped.

1. The sensor is located high or low in its bracket depending on how high the cylinder is positioned, and around 4 mm from the cylinder pipe at fully out-reached carriage position.

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10.9 Fuses

10.9.1 Standard

Standard fuses		
F1	10A	ATC internal fuses
F4	5A	
F5	5A	
F2 heavy	300A	Drive motor
F3 heavy	300A	Pump motor
F4	20A	Servo motor Only applies to trucks with fly by wire steering.
F6	10A	Pump regulator (measurement point B+3) Valve block Steering wheel indicator Manoeuvre cold storage cab
F7	5A	Electric servo and end position switch (measurement point B+4) Drive regulator Extra equipment not supplied by Atlet
F8	5A	Fan door
F9	10A	ATC
F10	5A	B+ ref (see trouble shooting, warning low battery)
F12	5A	Charging circuit regulator
F14	5A	Emergency stop circuits
F18	20 A	Servo fuse Only applies to trucks with EPS 2001 steering.
F19	20 A	Servo fuse Only applies to trucks with EPS 2001 steering.

10.9.2 Extra accessories

Fuses, extra accessories		
F11 heavy	80 A	Main supply cold storage cab
F13	-	Interior cold storage cab

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Fuses, extra accessories		
F15	5 A	Radio
F17	5 A	Headlamp
F21	63 A	Motor circuit, motorised battery rollers
F22	5 A	Manoeuvre, motorised battery rollers

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10.10 Horn

10.10.1 Connection

When connecting the horn the terminals on the terminal block should be turned towards you. Connected according to the standard wiring diagram.

Setting the sound. Applies to trucks manufactured up until week 30 in 2001:

A number of dipswitches labelled 1-5 can be found at the rear of the horn. The switches are set so that 1-3 are closed and 4-5 are open. The tones obtained will then be 970 Hz for the horn and 2850 Hz for the buzzer. There is also a potentiometer screw that can be turned clockwise to the stop to give the maximum sound level.

From week 31 2001 there is a new, electronic signal horn. This has a detachable buzzer above the horn and a higher level of sound.

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10.11 Atlet's truck computer ATC

10.11.1 Component and interface description

The ATC system consists of a keyboard and display in three parts and an ATC unit

.

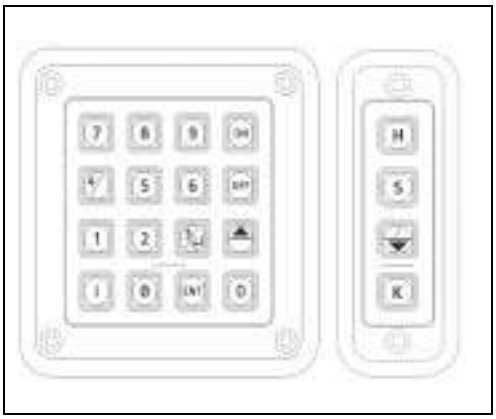

Figure 10.5 The keyboard

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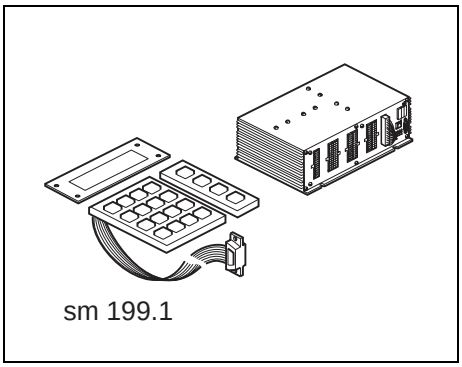

Figure 10.6

Display:

The top row is used for information. The bottom row is the status row.

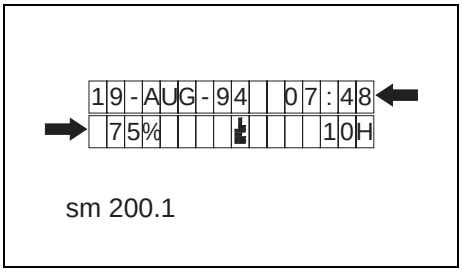

Figure 10.7

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The bottom row (75%), indicates here the remaining battery capacity. (10h), indicates here the total running time.

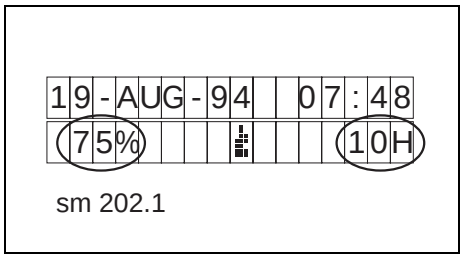

Figure 10.8

Here a hare indicates normal speed while a tortoise indicates low speed. The arrow down key toggles between high and low speed.

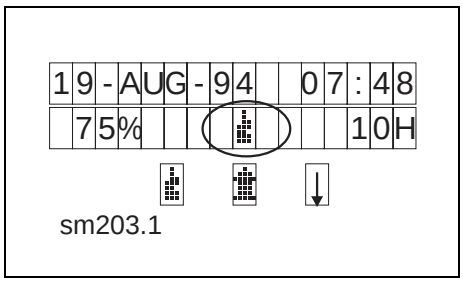

Figure 10.9

Error messages are shown in the form of a code (E15).

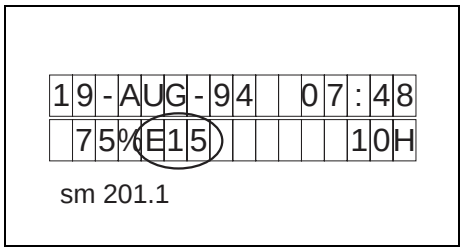

Figure 10.10

10.11.2 Handling

The service functions are activated via the S (service) key on the keyboard. These functions are divided into levels, Driver, Local Service, Atlet Service and Customer Service.

The Driver level allows the language to be changed as well as tuning of the truck's drive and hydraulic characteristics.

On the Local level its possible to change the ID and password for the driver and local service, calibrate the speed and lift controls, check inputs and outputs, read statistics and make a hardcopy. A password must be entered to select any of the Local Service functions.

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On the ATLET level it is possible to change all IDs and passwords, set parameters for the height preselection, set options, read the error log, make hardcopies and download settings from another ATC or PC. A password must be entered to select any of the ATLET Service functions.

The Customer Service level allows reading and printing of statistical information, communication with PSION palm-sized computers, unlocking of a collision-locked truck and resetting of customer logs and counters.

The menu that appears once the correct password has been entered will be abbreviated. This is because only the menu title and one menu option (0: Exit) is displayed. You can browse through the menus using the number and arrow keys, while the Enter key selects the menu.

When you enter a parameter list, i.e. where it is possible to change parameter values, you should use the arrow keys when you do NOT wish to change the values. If you want to change a value, enter a new numerical value and confirm using Enter. If you make a mistake you must complete the procedure and try again. For some functions it is possible to go back using the arrow key.

10.11.3 Service functions

The service functions are primarily used to facilitate the ATLET Service. In addition, the service functions make it possible to read off all the measurements made using the Measurement/Statistics functions.

Functions included are:

- Changing the ID and password for Driver, Local and ATLET service levels.
- Checking that sensors and cables on inputs function.
- Checking that digital outputs and cables function.
- Calibrate and check the operation of the accelerator pedal.
- Calibrate and check the operation of the brake pedal.
- Calibrate and check the operation of the hydraulic levers.
- Reports of Measurement/Statistic functions.
- Read and reset running times.
- Read and reset the error log.
- Hard copies.
- Download settings from another ATC or PC.

10.11.4 Change passwords

It is possible to change the service organisation's own password as well as the drivers' ID and password.

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10.11.5 Calibration and control of the hydraulic levers

Hydraulic levers are calibrated by measuring the maximum stroke and neutral position for this function. See chapter 8.

10.11.6 Running time functions

The running times of the following functions can be read:

- Total usage.
- Pump motor on 5 levels.
- Forwards.
- Backwards.

The running time of each function presented in hours. The maximum number of hours is 99999. When printing the running hours are also calculated and shown as a percentage of the total usage. The running hours can either be reset for all units or individually.

10.11.7 Printing of statistics

A function is available under CUSTOMER Service to print all statistical functions either individually or all at once. Any serial printer or a PC can be used for this purpose.

10.11.8 Collision sensor

This function requires a special sensor mounted on the chassis.

The program has 5 adjustable limits and when one of these is exceeded one or more of the following functions are activated:

1. A warning message is shown on the display.
2. The truck's normal horn is activated and produces an intermittent signal.
3. The warning lamp on the truck lights/flashes.
4. The truck logs off.
5. A special password is required to stop the above.

When one of the 5 levels is exceeded a warning text is shown on the display at the same time as the impact force of the collision is stored with the time, date and driver ID in the customer log.

10.11.9 ATC connector

ATC, contactor and pin numbering. Fuses, see section 10.9 Fuses.

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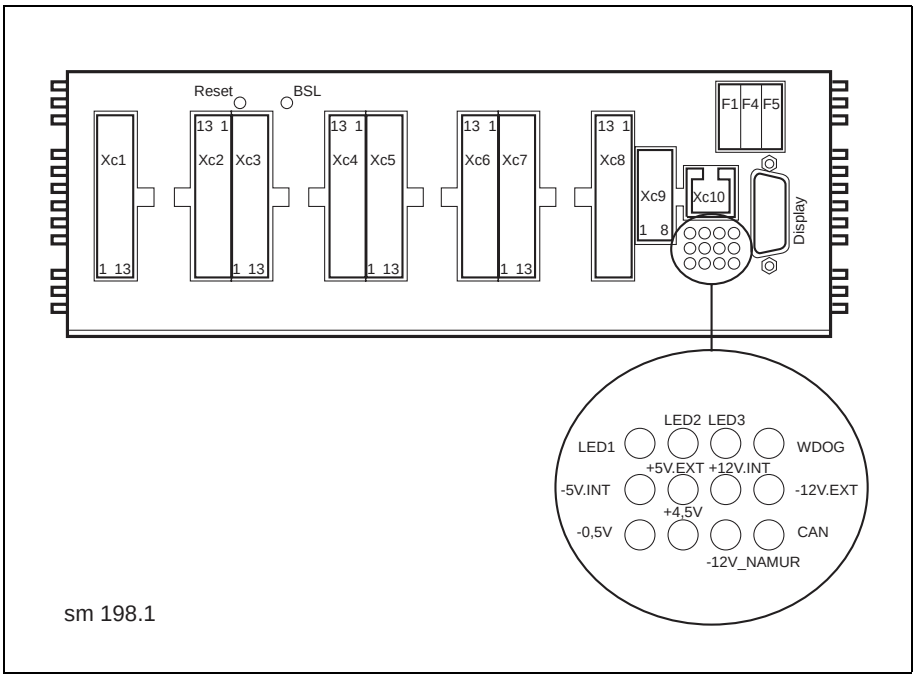

Figure 10.11

10.11.10 Checking the inputs and outputs

Virtually all inputs and outputs can be checked directly from the service menu. The checks are divided into the functions: driving, hydraulics, options and others.

Inputs are always given as option 1. Letter combinations will be shown on the display for each active input. Cyclic checks are made at intervals of 0.1 seconds. The test is cancelled by pressing ENTER.

A number of options are shown on the display when test running the outputs. The output in question is selected by a number 1 to 9. The name of the output is shown and you can toggle between on off by using the “1” key. “0” is used to leave the current output.

10.11.11 Digital inputs

There are 44 inputs on the ATC. All, except 8, have the same characteristics.

Two of these inputs are intended fir 48 V feed, 2 for servo errors and one for the straight steering sensor and three for fuse monitoring.

The digital inputs are used to determine a closed or open switch. If you measure the voltage, with B- as a reference, on an open input you should get about 0.5 Volt while 4.5 Volt will be returned for a closed input.

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Switches should be connected as illustrated. (input)

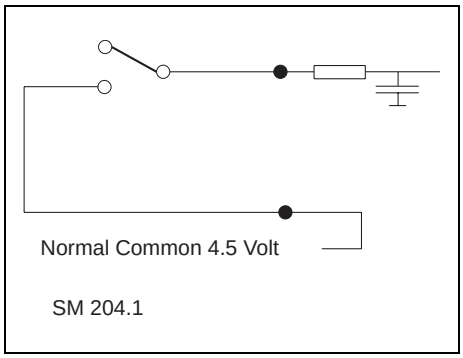

Figure 10.12

The appearance of the input.

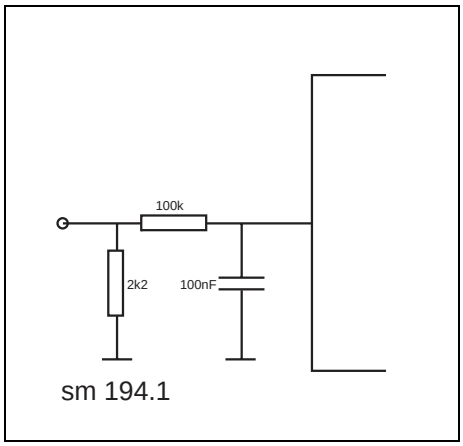

Figure 10.13

The appearance of the servo input. Note that both servo inputs are only used for trucks with fly by wire steering. For steering of the EPS 2001 type, the inputs are not connected to the server.

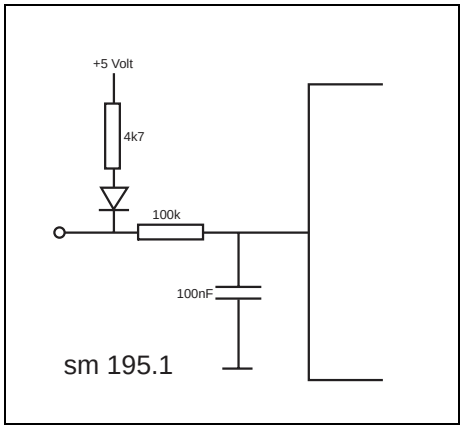

Figure 10.14

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10.11.12 Digital outputs “XC1-XC11”

There are 35 outputs on the ATC distributed across a number of contactors.

The outputs are specified for 0.1A, 1A and 3A. All outputs feature overload protection.

Supply outputs

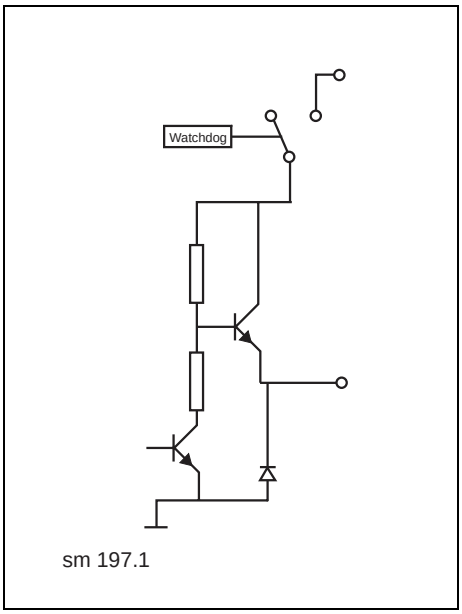

Figure 10.15

12 of the outputs use an optional voltage, for example, 12 volt or B+ The choice of voltage is made by connecting the required voltage to XC5:23.

Lowering outputs.

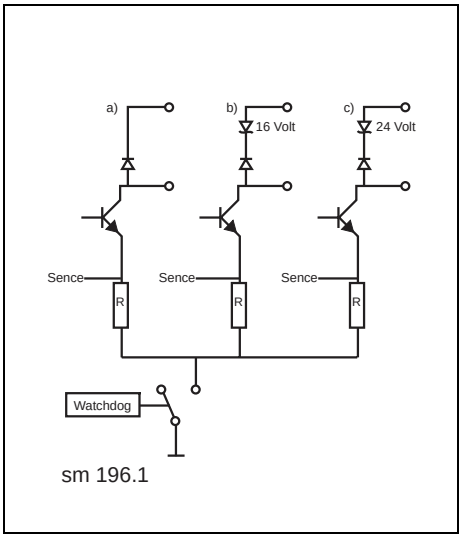

Figure 10.16

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10.11.13 Digital outputs B+ supply

Connector	Function	Type	Remarks
XC3:10	Reverse steering wheel indicator	1.0 A High	+ / Supply
XC3:11	Forward steering wheel indicator	1.0 A High	+ / Supply
XC3:21	Buzzer	1.0 A Low	- / Supply
XC3:22	Main contactor	1.0 A Low	- / Supply
XC1:22	Brake	3.0 A Low	- / Supply
XC1:23	Flashing lights	1.0 A Low	- / Supply
XC1:24	Horn	3.0 A Low	- / Supply
XC4:23	Key relay	0.1 A Low	- / Supply
XC1:21	Standby	1.0 A Low	- / Supply
XC8:22	Constant current valve level selector	1.0 A Low	- / Supply
XC8:23	Standby	1.0 A Low	- / Supply
XC6:23	Lamp load wheel 0 degrees	1.0 A Low	- / Supply
XC6:24	Lamp load wheel 90 degrees	1.0 A Low	- / Supply
XC2:22	Position light	0.1 A Lamp	- / Supply
XC3:01	Standby	0.1 A High	+ / Supply
XC3:08	Standby	0.1 A High	+ / Supply

10.11.14 Digital outputs 12 V supply

Connector	Function	Type	Remarks
XC2:11	Not connected	0.1 A Lamp	- / Supply
XC2:21	Not connected	0.1 A Lamp	- / Supply
XC3:05	Automatic drive wheel rotation anticlockwise UFS Only applies to trucks with fly by wire steering	0.1 A Lamp	- / Supply
XC3:06	Automatic drive wheel rotation clockwise UFS Only applies to trucks with fly by wire steering.	0.1 A Lamp	- / Supply
XC3:02	Truck-on lamp	0.1 A Lamp	- / Supply
XC3:03	Straight steering lamp	0.1 A Lamp	- / Supply
XC3:04	Brake lamp	0.1 A Lamp	- / Supply

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10.11.15 Digital outputs B+ supply

Connector	Function	Type	Remarks
XC5:01	B+ lift valve block	1.0 A Low	- / Supply
XC5:02	B+ PWM lower valve block	1.0 A Low	- / Supply
XC5:03	B+ Reach IN	1.0 A Low	- / Supply
XC5:04	B+ Reach OUT	1.0 A Low	- / Supply
XC5:05	B+ tilt IN	1.0 A Low	- / Supply
XC5:06	B+ tilt OUT	1.0 A Low	- / Supply
XC5:07	B+ side shift pedal side	1.0 A Low	- / Supply
XC5:08	B+ side shift seat side	1.0 A Low	- / Supply
XC5:09	B+ fork spread OUT	1.0 A Low	- / Supply
XC5:10	B+ fork spread IN	1.0 A Low	- / Supply
XC5:11	5V PWM supply steering wheel indicator	1.0 A Low	- / Supply
XC5:12	B+ PWP regulator fan	1.0 A Low	- / Supply

10.11.16 Valve parameters

Parameter description

A description of the valve section, lift/lowering is given here, however, the same applies to reach, tilt, side shift, rotate/side shift. The following functions are all POSITIVE movements. Lift, reach in, tilt up, rotate clockwise, forks together and side shift towards the driver.

POS MAX DUTY	Pump output for maximum positive movement (max. lift).
POS MIN DUTY	Pump output for minimum positive movement (min. lift).
NEG MAX DUTY	Pump output for maximum negative movement (max. lower).
NEG MIN DUTY	Pump output for minimum negative movement (min. lower).
JOYST.DEADZONE	The distance from the neutral position that the joystick must be moved before any actuation is made on the pump. This applies to both the positive and negative movements.
POSITIVE ACC	Ramp of acceleration for pump output for positive movement.
POSITIVE RET	Ramp of decreasing pump output for positive movement.

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NEGATIVE ACC	Ramp of acceleration for pump output for negative movement.
NEGATIVE RET	Ramp of decreasing pump output for negative movement.
FETCH B./SCALEF	Must not be changed

Checking and adjusting values

POS MAX DUTY and NEG MAX DUTY define the speed of the movement at max. joystick actuation, these are not normally changed, but if you want calmer/ slower movement, for example, while tilting these parameters can be reduced.

POS MIN DUTY for lifting is to be adjusted to ensure the joystick starts the pump, without the forks moving, before more throttle is applied.

NEG MIN DUTY for lowering should be set so that it is possible to gradually run the pump or lowering movement with a minimum of joystick actuation (lower values give lower speeds).

FETCH B./SCALEF. used for reach for battery recovery and remains as a limiter for the overall pump output with simultaneous valve movements. The value is set to “1” with the battery on rollers to disable the function.

10.11.17 Performance parameters

The language should be set to English in order to follow the instructions below, see the appendix at the end of the chapter

Setting of machine parameters

Each machine model has its own basic settings. For example, a UNS can have a different top speed compared to a UHS. The parameters are preset at the factory and can only be changed using special PC software. Under normal conditions the factory settings should never be changed after delivery. Further parameter adjustments described below represent percentages of these basic settings and are therefore limited.

The basic settings are written into the software for ATC II.

Setting of driver categories

Up to four sets of parameters may be defined. The system should be used to define, for example, the two categories “experienced drivers” and “learners”. All parameters are preset at the factory and are only intended to be modified by

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qualified personnel. Consequently, the setting options are protected under the "ATLET service":

3: ATLET service

4: Settings

1: Performance

1. AC Driver 1 (Preset to normal "experienced drivers" and represents performance according to the data sheet.
2. AC Driver 2 (Preset to a little lower performance than "AC Driver 1")
3. AC Driver 3 (Preset to "learner performance")
4. AC Driver 4 (Preset throughout to max. performance. Intended to show the truck's maximum capacity at demonstrations and must not be set for a driver to perform daily operations.)

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Description of parameters in each set (possible setting range in percentage of max.):

Drive speed	Top speed	20 - 100%
Creep speed	Speed limitation activated by [arrow down] key or by the ATC logic (Tortoise on the display).	10 - 90%
Acceleration drive	Time based ramp	20 - 100%
Current limit Drive	Max. permitted current limit	20 - 100%
Reduction braking, drive	Braking torque when the accelerator is released.	0 - 100%
Reversing brake, drive	Braking torque when the driving direction is reversed.	50 - 100%
Pedal braking	Max braking torque when the brake pedal is used.	50 - 100%
Maximum backward speed	Top speed in the direction of the forks as a percentage of the “Top speed” above.	20 - 100%
Maximum pump speed	Top speed of the pump.	50 - 100%
Maximum lowering speed	Top speed for fork lowering.	70 - 100%
Acceleration pump	Current limit. Limits the torque and acceleration.	20 - 100%
Soft hydraulics	Gentler hydraulic control	0 = off 1 = on
Steering high speed	Progressive steering	20-100%
Steering low speed	Progressive steering	20-100% The value must not fall below that for Steering high speed.

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Factory set values

Function	Performance category			
	1	2	3	4
Drive speed	100	80	50	100
Creep speed	40	40	40	50
Current limit Driving	100	90	80	100
Acceleration drive	80	70	60	100
Reduction brake, drive	90	75	70	100
Reverse brake	75	70	70	100
Pedal braking	100	100	90	100
Maximum backward speed	100	80	80	100
Maximum pump speed	100	100	90	100
Maximum lowering speed	100	100	100	100
Acceleration pump	100	100	90	100
Soft hydraulics	0	0	1*	0

* For URF the value is 0.

The parameters that the driver can adjust make up a percentage of the value in the category he/she has been placed in. For example, the top speed is set by:

Top speed = Machine parameter (see 2.1) × Driver category % (see 2.2) × Driver's own settings %

Example: Top speed = 12 km/h × 90% × 100% = 10.8 km/h.

Note!

If the parameter "Max. speed reverse" is set lower than 100% it will also be added to the above calculation example when reversing.

Note!

When the parameter for soft hydraulics is 1, the soft hydraulics are forced in. The driver cannot set the Soft Hydraulics parameter to 0 and get hard hydraulics.

Individual driver settings

Each driver ID code can have its own performance profile, but this must be linked to one of the four driver categories. When a new driver is defined a new question is asked “Driver category”? - at the end of the sequence. On delivery the factory code 1/2222 is linked to “AC Driver 1” category.

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Important!

When delivered category 4 is set for the demonstration of the truck's maximum capacity and must be readjusted if it is to be used for practical operations.

Each driver can set his/her own performance profile; under the condition that individual driver IDs are used. The personal profile is activated each time the driver starts the truck. Follow the instructions to store your own performance profile.

1. Press the [S] key with the battery plug connected, but in the “logged off” mode.

Select “6”. Driver parameters by pressing the [6] key, or scroll using the arrow keys. Press[ENT].

2. Enter your unique ID start code.
3. A parameter menu is displayed:

0. Quit

1. Maximum drive speed 20 - 100% Default 100%

2. Acceleration drive 20 - 100% Default 100%

3. Reduction braking (motor brake) 10 - 100% Default 70%

4. Reverse brake 50 - 100% Default 70%

5. Soft hydraulics 1:Yes 0:No

6. Steering high speed Default 25

7. Steering low speed Default 75

4. Move to the parameter you wish to change. Use the number keys to enter a new value. Save the value by pressing [ENT].
5. When you have finished, select “0. Exit” followed by [ENT] to exit the menu.
6. Exit the service menu by pressing “0. Exit” and [ENT].
7. Log on to the truck and test drive.

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10.12 Error codes

10.12.1 General

Check the error log and write down or print out the contents of the log before starting any trouble shooting.

Certain error codes and sub-information are only logged once per 24 hour time frame (00:00 - 23:59), which is why the log must be purged in order for the fault to be logged again.

This applies to error codes:E64, E65, E66, E97, E100 and E107 with identical first sub-information, and E95, E96 and E99 with identical first and second sub-information.

Note!

That there is more information available for codes marked by an asterisk by pressing the I key when reading the error log. The extra information is always included in the printout.

10.12.2 Error code description

Error code	Error messages	Subinfo	Description	Inspection/ Corrective action
E01	High temperature		Not used	No action required.
E02	Chassis + voltage		B+ is detected in the chassis. (Voltage over xx Volt is detected)	
E03	Chassis - voltage		B- is detected in the chassis. (Voltage under xx Volt detected)	
E04	Cable error		Not used	No action required.
E05	Servo tachometer fail.		Fault reported from steering controller.	See faultfinding flowchart.
E06	Servo motor fail.		Fault reported from steering controller.	See faultfinding flowchart.
E07	Servo regul. fail.		Fault reported from steering controller.	See faultfinding flowchart.
E08	Fk7 abnormal		Not used.	No action required.

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Error code	Error messages	Subinfo	Description	Inspection/ Corrective action
E09	Multi chassis error		Not used.	No action required.
E10	Joystick abnormal	Channel lift	Lift joystick signal is out of allowed range.	Check the lift joystick and it´s connections. Calibrate the joystick.
		Channel 2	Second joystick signal is out of allowed range.	Check the second joystick and it´s connections. Calibrate the joystick.
		Channel 3	Third joystick signal is out of allowed range.	Check the third joystick and it´s connections. Calibrate the joystick.
		Channel 4	Fourth joystick signal is out of allowed range.	Check the fourth joystick and it´s connections. Calibrate the joystick.
		Channel 5	Fifth joystick signal is out of allowed range.	Check the fifth joystick and it´s connections. Calibrate the joystick.
E11	NVR partly reset		NVR fault.	The most probable cause for this is electrostatic discharges.
E12	NVR total reset		NVR fault	See E11.
E13	NVR forced reset		Tells last time the NVR was manually reset.	No action required.
E14	Battery parameters reset		Tells last time the battery parameters was manually reset.	No action required.
E15	Service parameters reset		Not used.	No action required.
E16	Valve. parameters reset		Tells last time the valve parameters was manually reset.	No action required.

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Error code	Error messages	Subinfo	Description	Inspection/ Corrective action
E17	Drive parameters reset		Tells last time the drive parameters was manually reset.	No action required.
E18	Options reset		Tells last time the options was manually reset.	No action required.
E19	Error log reset.		Tells last time the error log was manually reset. Applies from software version 3.42.	No action required.
E20	Not used		Not used.	
E21	Drive carbon brush worn		Not used on AC macheines.	
E22	P1 carbon brush worn		Not used on AC macheines.	
E23	P2 carbon brush worn		Not used on AC macheines.	
E24	Servo carbon brush worn		Not used on AC macheines.	
E25	Brakelining worn		Not used on AC macheines.	
E26	NV2 partly reset		NVR fault.	See E11.
E27	NV2 total reset		NVR fault.	See E11.
E28	NV2 forced reset		NVR fault.	See E11.
E29	NVR -> MIRROR		NVR fault.	See E11.
E30	MIRROR -> NVR		NVR fault.	See E11.
E31	Drive motor overheated		Not used on AC machines.	
E32	P1 overheated		Not used on AC machines.	
E33	P2 overheated		Not used on AC machines.	
E34	Servo overheated		Not used.	
E35	Hyd oil overheated		Hydraulic oil overheated.	

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Error code	Error messages	Subinfo	Description	Inspection/ Corrective action
E36	Temp1 overheated.		Normally not used	On a standard machine set the option “Extra 1 Temp” to No.
E37	Temp2 overheated.		Normally not used	On a standard machine set the option “Extra 2 Temp” to No.
E38	ATC overheated.		ATC overheated	Check the fan and ventilation in the area around the ATC.
E39	Not used		Not used.	
E40	NV3 forced reset		NVR fault.	See E11.
E41	Chassis to Input		Not used on AC machines.	
E42	Output to Input		Not used on AC machines.	
E43	Unknown chassis fault		Not used on AC machines.	
E44	Chassis to Output		Not used on AC machines.	
E45	Chassis to B-		Not used on AC machines.	
E46	Chassis to B+		Not used on AC machines.	
E47	Not used		Not used.	
E48 (– software 3.57)	Brake sensor low		Brake sensor value is out of allowed range.	Calibrate and check the brake. See chapter 11 for instructions.
E48 (software 3.60–)	Brake sensor err	Sensor to low	Brake sensor value is lower than allowed.	Calibrate and check the brake. See chapter 11 for instructions.
E48 (software 3.60–)	Brake sensor err	Sensor to high	Brake sensor value is higher than allowed.	Calibrate and check the brake. See chapter 11 for instructions.
E49 (software 3.60–)	Accelerator err	Sensor to low	Accelerator sensor value is lower than allowed.	Calibrate and check the accelerator. See chapter 11 for instructions.

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Error code	Error messages	Subinfo	Description	Inspection/ Corrective action
E49 (software 3.60–)	Accelerator err	Sensor to high	Accelerator sensor value is higher than allowed.	Calibrate and check the accelerator. See chapter 11 for instructions.
E50	Not used		Not used.	
E51	F6 Fuse broken		Fuse F6 broken.	Check fuse F6 and connections.
E52	F7 Fuse broken		Fuse f7 broken.	Check fuse F7 and connections.
E53	F8 Fuse broken		Fuse F8 broken.	Check fuse F8 and connections.
E54*	Caster wheel rotation lock		Reported current to main brake or caster wheel rotation lock is higher or lower than expected.	See separate description. See chapter 10.3.4.
E55*	S3 system 1 err.	No checkswitch during lift	No checkswitch (S16) when ifting passed 4.5 m.	Check that the checkswitch (S16) is adjusted to 4500 +/- 10mm. Check that the checkswitch closes when affected bu magnet. Check the height measuring system (A24 & A26). Check that the “Height offset” is correctly set.
		No checkswitch during lowering	No checkswitch (S16) when lowering passed 4.5 m.	Check that the checkswitch (S16) is adjusted to 4500 +/- 10mm. Check that the checkswitch closes when affected by magnet. Check the height measuring system (A24 & A26). Check that the “Height offset” is correctly set.

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Error code	Error messages	Subinfo	Description	Inspection/ Corrective action
		Bad forkheight at checkswitch	Wrong height value when checkswitch (S16) is passed.	Check that the checkswitch (S16) is adjusted to 4500 +/- 10mm. Check that the checkswitch closes when affected by magnet. Check the height measuring system (A24 & A26). Check that the “Height offset” is correctly set.
		Reach stop switch timeout	Reach stop switch (S5) is not closed in tilme at reach out.	Check the reach stop switch (S5) function.
		Contradict. load wheel sensors	Both UFS rotating whell stops (S45 and S44) are closed at the same time.	Check the rotating wheel and stop switches function.
		Contradict. zero and low fork sw.	Conflict between the LZ and LF switches.	
		Contradict zero and check switch	Conflict between the LZ and CS switches.	
		Contradict LF and check switch	Conflict between the LF and CS switches.	
E56	Not used		Not used.	
E57	Not used		Not used.	
E58	Not used		Not used.	
E59	Test common error		The not fully developed cable supervision option is set to on. A true or false fault is indicated.	Set option “System supervis.” to No.
E60	Wheel angle sensor		FBW	
E61	Rotation sensor.		FBW	
E62*	Faulty input from S8		WGU only. Indicatesan illegal combination of the inputs from the S8 switch (WGU auto/manual button).	Check the S8 switch and it´s connections.

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Error code	Error messages	Subinfo	Description	Inspection/ Corrective action
E63	Not used		Not used.	
E64*	High output short circuit	XC?.??	The current in the reported output is higher than it is rated for Normally short circuit).	Find and correct the fault causing the increased current (short circuit).
E65*	Low output short circuit	XC?.??	The current in the reported output is higher than it is rated for (Normally short circuit).	Find and correct the fault causing the increased current (short circuit).
E66*	Lamp output short circuit	XC?.??	The current in the reported output is higher than it is rated for, (Normally short circuit).	Find and correct the fault causing the increased current (short circuit).
E67	High output intermittent		The current in any of the high outputs is higher than it is rated for (Normally short circuit).	Find and correct the fault causing the increased current (short circuit).
E68	Low output intermittent		The current in any of the low outputs is higher than it is rated for (Normally short circuit).	Find and correct the fault causing the increased current (short circuit).
E69	Lamp output intermittent		The current in any of the lamp outputs is higher than it israted for (Normally short circuit).	Find and correct the fault causing the increased current (short circuit).
E70	High output unknown		The current in any of the high outputs is higher than it is rated for (Normally short circuit).	Find and correct the fault causing the increased current (short circuit).
E71	Low output unknown		The current in any of the low outputs is higher than it is rated for (Normally short circuit).	Find and correct the fault causing the increased current (short circuit).
E72	Lamp output unknown		The current in any of the lamp outputs is higher than it is rated for (Normally short circuit).	Find and correct the fault causing the increased current (short circuit).
E73	Erase error NV1		NVR fault	Change ATC

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Error code	Error messages	Subinfo	Description	Inspection/ Corrective action
E74	Program. error NV1		NVR fault	Change ATC
E75	Erase error NV2		NVR fault	If repeated change ATC
E76	Program. error NV2		NVR fault	If repeated change ATC
E77	Erase error NV3		NVR fault	If repeated change ATC
E78	Program. error NV3		NVR fault	If repeated change ATC
E79	Not used		Not used.	
E80*	TRAP error bus		Internal computer fault	See E11
E81*	TRAP error instruction		Internal computer fault	See E11
E82*	TRAP error word		Internal computer fault	See E11
E83*	TRAP error prot		Internal computer fault	See E11
E84*	TRAP error oper		Internal computer fault	See E11
E85*	TRAP error stun		Internal computer fault	See E11
E86*	TRAP error stof		Internal computer fault	See E11
E87	Not used		Not used	
E88	Not used		Not used	
E89*	Stack error		Internal computer fault	See E11
E90*	Division by zero		Internal computer fault	See E11
E91*	Miscalculation		Internal computer fault	See E11
E92*	INTERNAL error, system monitoring		The not fully developed vable supervision option is set to on. A true or false fault is indicated.	Set option “System supervis.” to No.
E93	Not used		Not used.	
E94	Not used		Not used.	

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Error code	Error messages	Subinfo	Description	Inspection/ Corrective action
E95*	CAN hardware	Various.	CAN comunication failure.	Check the CAN-bus cables. Check the voltage supply to all units connected to the CAN-bus.
E96*	CAN software	Various.	CAN comunication failure.	Check the CAN-bus cables. Check the voltage supply to all units connected to the CAN-bus.
E97*	Drive sys stopped	Motor temp to high e2	Drive motor overheated.	See faultfinding chart.
		Controller´s temp too high e4	Drive controller overheated.	See faultfinding chart.
		Controller not responding	Controller not responding at startup.	See faultfinding chart.
		Overcurrent e8	Motor impedance to low.	See faultfinding chart.
		DC bus to low e64	To low voltage over the B+ and B- posts on the controller.	See faultfinding chart.
		No charge DC bus e128	No B+ on the B+ post on the controller.	See faultfinding chart.
		DC bus to high. HW e16	To high voltage over the B+ and B- posts on the controller.	See faultfinding chart.
		ATC contradictory e2048	Faulty comand from the ATC.	See faultfinding chart.
E98*	Hydraulic stopped	Motor temp to high e2	Drive motor overheated.	See faultfinding chart.
		Controller´s temp too high e4	Drive controller overheated.	See faultfinding chart.
		Controller not responding	Controller not responing at startup.	See faultfinding chart.
		Overcurrent e8	Motor impedance to low.	See faultfinding chart.

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Error code	Error messages	Subinfo	Description	Inspection/ Corrective action
		DC bus to low e64	To low voltage over the B+ and B- posts on the controller.	See faultfinding chart.
		No charge DC bus e128	No B+ on the B+ post on the controller.	See faultfinding chart.
		DC bus to high. HW e16	To high voltage over the B+ and B- posts on the controller.	See faultfinding chart.
		ATC contradictor y e2048	Faulty comand from the ATC.	See faultfinding chart.
E99*	CAN fatal error		Not used.	
E100*	Drive sys abnormal	Controller temp sensor. W2	Fault detected on the internal temperature sensor in the controller.	See faultfinding chart.
		Controller temp sensor. W4	Fault detected on the internal temperature sensor in the controller.	See faultfinding chart.
		Motor temp sens lost. W32	Motor temperature sensor lost.	See faultfinding chart.
		Motor temp sens shorted. W64	Motor temperature sensor shorted.	See faultfinding chart.
		Speed signal out of range w128	Speed comand from the ATC has exceded the controllers maximum value.	See faultfinding chart.
		Controller calib error. W256	Internal calibration fault in the controller.	See faultfinding chart.
		Controller rev to default w512	Controller has reverted to default settings.	See faultfinding chart.
E101*	Hydraulic abnormal	Controller temp sensor. W2	Fault detected on the internal temperature sensor in the controller.	See faultfinding chart.
		Controller temp sensor. W4	Fault detected on the internal temperature sensor in the controller.	See faultfinding chart.

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Error code	Error messages	Subinfo	Description	Inspection/ Corrective action
		Motor temp sens lost. W32	Motor temperature sensor lost.	See faultfinding chart.
		Motor temp sens shorted. W64	Motor temperature sensor shorted.	See faultfinding chart.
		Speed signal out of range w128	Speed comand from the ATC has exceded the controllers maximum value.	See faultfinding chart.
		Controller calib error. W256	Internal calibration fault in the controller.	See faultfinding chart.
		Controller rev to default w512	Controller has reverted to default settings.	See faultfinding chart.
E102*	Steering stopped	Internal overcurrent	Motor impedance to low.	See faultfinding chart.
		Controller internal watchdog	Internal software failure.	See faultfinding chart.
		High voltage or Motor shorted	Motor impedance to low or internal overvoltage in the controller.	See faultfinding chart.
		Controller safety output	Current in the safety output is out of allowed range.	See faultfinding chart.
		Steering wheel sensor fault	Imballance between the two signals from the steering sensor.	See faultfinding chart.
		Internal motor controller fault	Motor impedance to high.	See faultfinding chart.
		Motor internal sensor fault		See faultfinding chart.
		CAN watchdog time out	CAN communication error.	See faultfinding chart.
		Controller not responding	CAN communication error.	See faultfinding chart.

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Error code	Error messages	Subinfo	Description	Inspection/ Corrective action
E103*	Steering abnormal	Controller rev to default	Incorrect user parameters detected in controller, and reverted to default.	See faultfinding chart.
		Overheated steer	Steering controller overheated	See faultfinding chart.
		Hi current steer		
		Hi/low voltage	Voltage supply to the steering controller is out of allowed range.	See faultfinding chart.
		High temp steering	High temperature in steering controller	See faultfinding chart.
		Steering sensors sync fault	Steering sensor calibration failed.	Check and adjust the steering sensors. See chapter 7.
E104*	Wire guide unit	Steer anten. Ang too high in lock	Steer antenna angle to high in locked/locked slowdown mode.	Check/adjust the antennas positions. Calibrate the WGU.
		Fork anten. angl too high in lock	Fork antenna angle to high in locked/locked slowdown mode.	Check/adjust the antennas positions. Calibrate the WGU.
		WGU not calibr.	Pickup mode requested without having calibrated or set a valid frequency.	Calibrate/set the frequency.
		Timeout, ATC not sent msg in time	PDO timeout (PDO=Process Data Objects)	See E11.
E105*	Drive system	Motor phase error	One or several motorphases not connected. Or damaged power stage in controller.	1. Check cables to motor. 2. Replace motor 3. Replace controller.
		Main supply voltage too low	Main power to the controller is below 60% of nominal value for more than 3 sec.	See faultfinding chart.
		Main supply voltage too high	Main power to the controller is over 130% of nominal value for more than 3 sec.	See faultfinding chart.

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Error code	Error messages	Subinfo	Description	Inspection/ Corrective action
		Motor overcurrent	Overcurrent in controller power stage.	1. Check cables and connectors between motor encoder and controller. 2. Change motor. 3. Change controller.
		Speed encoder	Controller get no information from speed encoder in motor. One or several cables may be damaged.	See faultfinding chart.
		CAN bus communicat ion	Fundamental problems with CAN bus communication.	See E11.
		Mode select	None exiting mode selected by mode inputs.	Check cable to pin 1 or pin 2 on connector to controller. Measure voltage to pin 1 or pin 2 on connector.
		Controller temp sensor faulty	Internal fault of temperature sensor in controller.	See faultfinding chart.
		Controller internal fault	One of several internal fault have occured in the controller.	See faultfinding chart.
		Device software New version	New software loaded in controller.	No action required.
		Lost ATC command	ATC doesn´t send CAN messages in time to controller.	See E11.
		Controller stop. communicat ing	Controller stops sending CAN messages to ATC.	Check CAN cables. Check that the controller have power. Replace unit.
		Controller not responding !!	Controller don´t respond to the ATC during start up.	Check CAN cables. Check that the controller have power. Replace unit.
		Controller high temperature	To high temperature inside controller.	Check that fans are running.

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Error code	Error messages	Subinfo	Description	Inspection/ Corrective action
		Motor high temperature	To high temperature inside motor.	Check that fans are running. Check cables to temp sensor.
E106	Pump system (SD hydraulic motor system)	See E105.	See E105.	See E105.
E107	Steering system (EPS steering)	Steering sensors sync fault.	Steering sensor calibration failed.	See faultfinding chart.
		Internal overcurrent.	Motor impedance to low.	See faultfinding chart.
		Controller internal watchdog.	Internal software failure.	See faultfinding chart.
		High voltage or motor shorted.	Motor impedance to low or internal overvoltage in the controller.	See faultfinding chart.
		Controller safety output.	Current in the safety output is out of allowed range.	See faultfinding chart.
		Steering wheel sensor fault.	Imballance between the two signals from the steering sensor.	See faultfinding chart.
		Internal motor controller fault.	Motor impedance to high.	
		Motor internal sensor fault.		See faultfinding chart.
		CAN watchdog timeout.	CAN communication error.	See faultfinding chart.
		Controller not responding.	CAN communication error.	See faultfinding chart.
		Controller rev to default.	Incorrect user parameters detected in controller, and reverted to default.	See faultfinding chart.

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Error code	Error messages	Subinfo	Description	Inspection/ Corrective action
E108	Smart card	Reader circuit	Smart card reader detected that the reader circuit has an error (0x5430).	If this fault occurs frequently, replace the Smart card reader.
		EEPROM read	Smart card reader detected that a EEPROM read caused an error (0x5531).	If this fault occurs frequently, replace the Smart card reader.
		EEPROM write	Smart card reader detected that a EEPROM write caused an error (0x5532).	If this fault occurs frequently, replace the Smart card reader.

10.13 Warnings

10.13.1 Description

The ATC display shows warning messages beside previously described error conditions. Typical warning conditions are when the temperature of a regulator or motor approaches a critical level. This results in reduced power to the overheated unit. However, the trucks remain operational. System temperatures under -20°C result in a power reduction and a warning condition. The warning message on the display disappears once conditions return to normal.

Function	Warning temperature	Stop temperature
Drive motor	145	165
Lift motor	145	165
Drive regulator	85	125
Lift regulator	85	125
Hydraulic oil temperature	60	65
Steering regulator	75	85

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10.14 Menu tree ATC

The ATC menu tree is an appendix in the last chapter.

10.14.1 Error log

ATC has a log containing the last 30 faults that have occurred. This can be servo faults, lift sensor faults, speed controller faults, etc. Each fault is traced with the time and date.

All faults found by the ATC are given a code. Significant error codes are shown on the displays lower row until they are acknowledged by reading the error log. Minor error codes are saved in the error log without being displayed. When reading the fault log, the error code is translated into text.

10.14.2 Subinfo

Error codes with underlying subinfo. Read the fault log in the log and bring up subinfo by “pressing” the I on the keyboard.

10.14.3 General instructions with all types of faults on trucks in combination with power outage

ATC is not working normally

- Check the ATC internal fuses F1, F4 and F5.
- Check the nine measurement points which are isolated terminal posts.
  - B+ should be 48V when the battery plug is fitted.
  - B- should be 0V when the battery plug is fitted.
  - B+2 should be 48V when the emergency stop is “pulled up”.
  - AGND (analogue earth) should be 0V.
  - B 12V should be 12V.
  - B 5V should be 5V.
  - B+3 should be B+ 48V when the truck is logged on.
  - B+4 should be B+ 48V when the truck is logged on.
  - B+5 should be B+ 48V when the truck is logged on and the servo is active.

B+ or B- deviates

If B+ or B- deviate, check the battery plug, electrical panel plug and associated cable connections.

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B+2 deviates

If B+2 deviates, check the fuse F14 and the emergency stops SE1 and SE2. Check the voltage for contactors K11 and K12 to ensure that the coils are not short circuited and that the freewheel diodes across the coils are intact. Check also that the contactors' cable connections are tight.

B+3 deviates

If B+3 deviates, check the fuse F6 and connections from the key relay connections K3.30 to K3.87, if the relay does not close, check the coil resistance Ω should be around 300), the freewheel diode across both relays and cable connection to ATC XC1.17 and XC1.27. If the relay circuit is OK, check that B+ 48V puts out on ATC XC1.17 and that the output XC4.23 draws to 0V when logging on, if not, replace the ATC.

B+4 deviates

If B+4 deviates, make a check as set out above but on F7 and K6.30, K6.87.

B+5 deviates

If B+5 deviates, go to trouble shooting electric servo steering.

AGND deviates

If AGND deviates, check the connections between AGND measurement point and ATC XC1.10. If AGND is broken it gives a calibration error. If AGND is not put out by ATC, change the ATC.

B5V deviates

If B5V deviates, check that the cable connections between B5V and ATC XC1.11 are intact. Ensure that nothing loads 5V by pulling out all ATC connectors except XC9, also disconnect the CAN bus, now measure whether there is 5V on the measurement points or XC1.11, if not change the ATC.

B12V deviates

If B12V deviates, check the connections between B12V and ATC XC3.17. If B12V is broken the indicating lamps will not light. Ensure that nothing loads 12V by pulling out all ATC connectors except XC9, also disconnect the CAN bus, now check whether the ATC puts 12V out on pin XC3.17, if not change the ATC.

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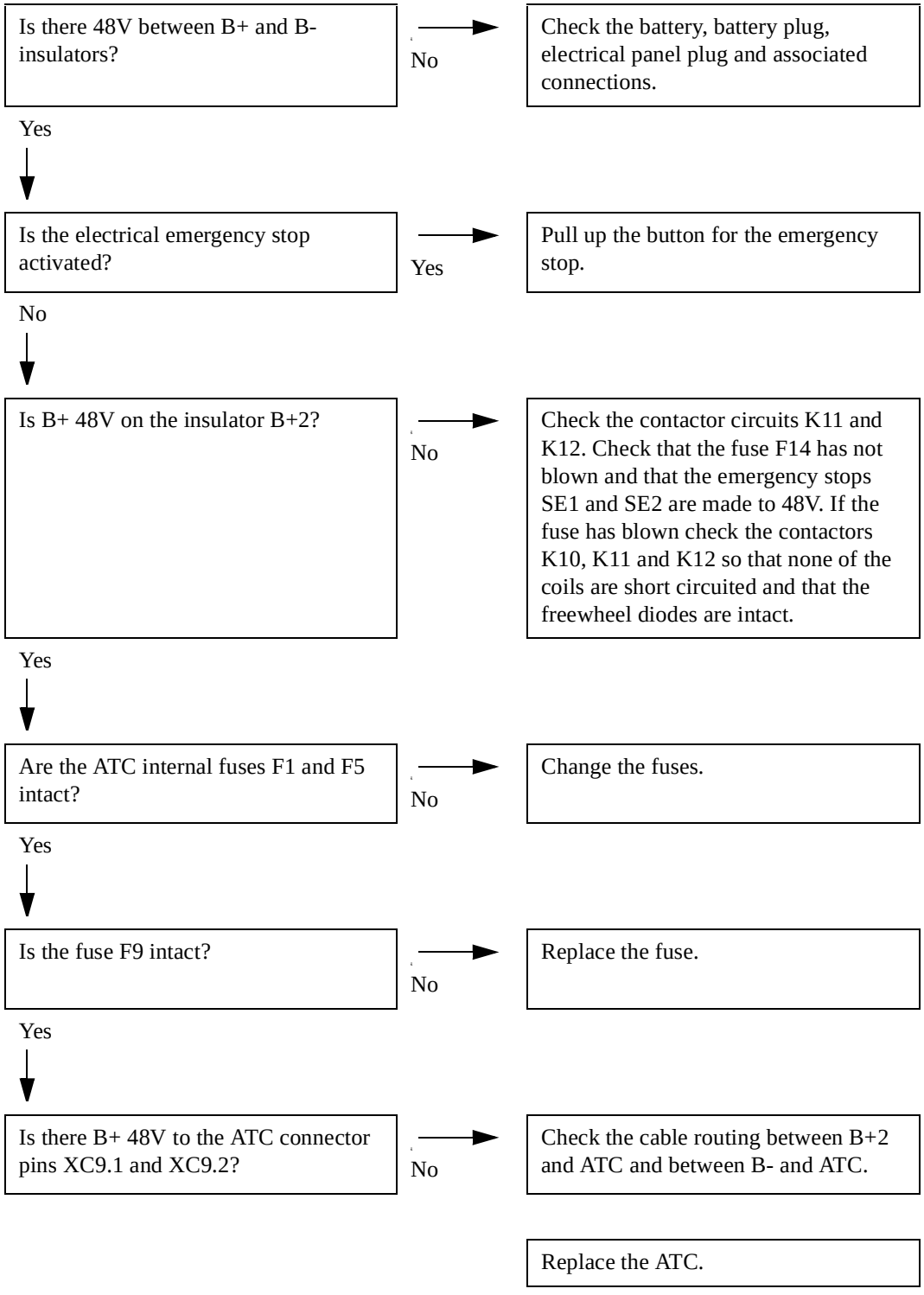
10.15 Trouble shooting - operational disturbance

10.15.1 Truck and ATC

The truck and ATC have complete function stop.



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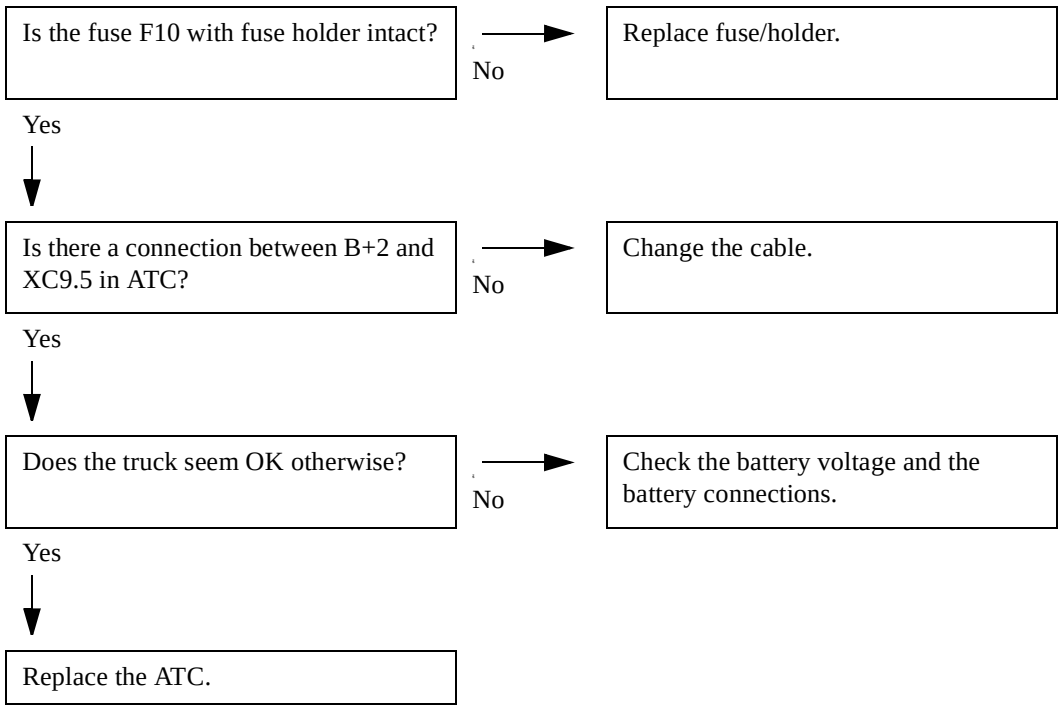
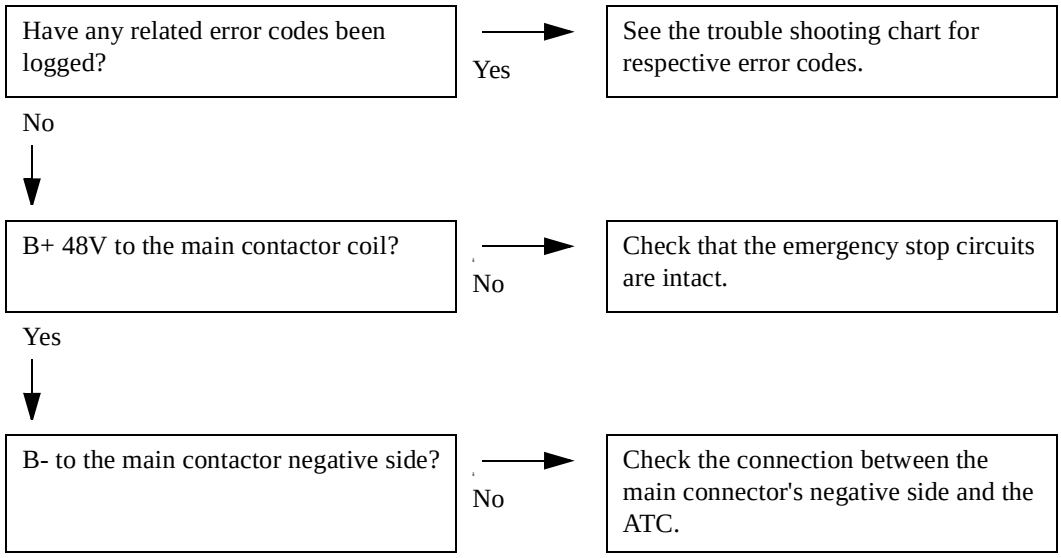
10.15.2 Battery

Warning low battery in combination with E02 B+ on the chassis. The battery supply shows 00% depending on a fault occurring before or after logging on. It is not possible to lift after lowering.



10.15.3 Main contactor

Main connectors do not make once the truck is logged on. ATC is voltage fed.



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Yes

If these are OK, replace the ATC. Perhaps the ATC does not put out B- to the connector's coil.

Are the connector's coil and freewheel diode intact?

No → Change the connector/diode.

Yes

Change the regulator.

10.15.4 Fuse

Fuse has tripped.

Replace the fuse (with correct fuse value) and restart.

The probable cause for a blown fuse is a short circuit in the regulator's power stage or that the average current exceeds the fuse's rated current.

Does the fuse blow just after the main contactor has made?

Yes → Change the drive regulator/pump regulator.

Tip: If the drive or pump motor fuse has blown when starting the error code E97 or E98 is given with the subinfo: “No charge DC-bus” E128.

No

Start the truck again.

Does the fuse blow again after the truck has been running for some time?

Yes → Check that the mechanical torque in the gearbox is not too great due to worn parts or, e.g. that the pump jams.

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If the truck has been run with a heavy load and at a high speed and with many stops and starts or in any other way exceeded its limitations, try to reduce the speed, load, acceleration and retardation (braking).

Increased friction, increased load, high speed and rapid starting/stopping increase the average current from the regulator. The truck may have been driven over its maximum performance.

Warning!

Always make sure that the regulators are correctly discharged by removing the battery plug and waiting for 2 minutes before fuses are changed, risk for arcing.

Important!

The regulators are discharged more quickly if the battery plug is removed when the emergency stop control is in its upper mechanical position.

10.15.5 The drive regulator status indicator

The drive regulator status indicator is flashing.

1. The truck must be logged on. Does the status lamp flash?
   - Yes → Look for an error code and go to the related trouble shooting chart.
   - No (the status lamp is dimmed)
2. Is there a supply voltage B+ 48V to the regulator's connector E1.24
   - No → Go to point 5 below.
   - Yes ↓
3. Battery voltage low?
   - Yes → Charge and check the battery.
   - No ↓
4. Change the drive regulator.

Point 5 and downwards only apply to trucks with fly by wire steering.

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5. Does the servo work?

Yes → Check the connections between B+4 and the regulator's connector E1.24

No ↓

The servo probably has no supply voltage or the safety system has tripped. Go to the trouble shooting chart for the electric servo.

A flashing status lamp means the drive regulator has indicated a fault.

When the status lamp dims this means that the drive regulator is not receiving any supply voltage or that the internal program has not been run.

10.15.6 Traction motor

The drive motor only runs at a low speed with a ticking noise, or the motor attempts to start, but cannot or run unevenly with a low torque.

1. Are the motor cables correctly connected and make good contact between the drive motor and the drive regulator?

No → Tighten the connections or replace the motor cables.

Yes ↓

2. Is the voltage on the motor cable between M1.1 and M1.2 approx. 12V DC?

No → Go to point 5 below.

Yes ↓

3. Is the voltage at M1.3 and M1.4 approx. 4 V DC with M1.2 as a reference when the motor rotates? Alternatively 0V or 8V DC when the motor is at a standstill.

No → After checking the motor's connector connections, change the drive motor.

Yes ↓

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4. Look for the break/short circuit in the cables between the drive regulator and the drive motor M1.2 - E2.22 and M1.3 - E1.11 and between M1.3 and M1.4. Both connectors are pulled out of their connections on the motor and drive regulator.

5. Is the voltage between the drive regulator contact points E1 K1.3 and E1 K1.4 approx. 12V?

Yes → Check that there is not a short circuit in the cables between the motor contact M1 and the drive regulator contact, both connectors are pulled out of their connections. Measure between M1.2 - E1 M1.3 and between M1.1 and M1.2.

No

6. Switch the regulators. Note that in most cases the drive and pump regulators can be switched with each other for test purposes. First check that the article numbers correspond with each other.

7. Is there still a fault with the drive motor system.

No → If the fault moves to the pump motor system, change the drive regulator that is now fitted in the pump regulator's place.

Yes

8. Change the drive regulator.

The drive motor's speed gradually drops.

(High drive regulator temperature)

Was the warning text “High tmp drive C” visible on the display when the symptom occurred?

No → Go to, symptom: high temp in the drive motor.

Yes

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Check that the regulator fan works as it should by first removing the battery plug and then restarting the truck again.

↓

Does the fan start within about 20 seconds?

→ Yes

Check that nothing obstructs the air flow through the regulator's heatsinks. If the heatsinks are covered in dust or other objects, clean under these.

No

↓

Connect a voltmeter between X26.1 and X26.2 and repeat the procedure to check the regulator fan.

Is the voltage at around B+ 48V for a few seconds after you have logged in to the truck?

→ Yes

Change the fan.

No

↓

Check the cables between the fan contact X26.1 and the ATC contact XC5.19, X26.2 and XC5.12. carefully. If the cables are OK and the truck has no other faults, change the ATC.

High drive motor temperature.

1. Was the warning text "High temp drive M" visible on the display when the symptom occurred?

→ No

Start using the truck again and ask the truck driver to report any new warning messages.

Yes

↓

2. Does the machine housing fan work?

→ No

Go to point 4 below.

Yes

↓

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3. * Check that nothing obstructs the air flow to the motor.
* If the motor is dirty, clean it.
* Let the truck rest until the temperature has dropped.
* If the truck works above its specified capacity the acceleration and speed must be lowered or the current limit lowered.

4. Connect a voltmeter to the fan.
Is the voltage B+ 48V?

→ No

Check that the fuse F8 has not blown and that the cables are intact.
Also check the thermostat if the truck is in the cold store design.

Yes

↓

Change the fan.

☞ ***Important!***

If the truck is allowed to continue working despite the temperature warnings it can result in an automatic stop of the drive motor system, the error codes will be E97 with “Drive stopped” subinfo will be “motor temp too high e2” or “controller's temp too high e4” registered in the log. If the temperature is allowed to drop to the normal level, the truck will run at full capacity again.

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10.15.7 Pump motor

The pump motor's speed gradually drops.

(High temperature on the pump regulator)

Was the warning text “High tmp hydrau C” visible on the display when the symptom occurred?

No → Go to the next page, high pump motor temperature.

Yes ↓

Check that the regulator fan works as it should by first removing the battery plug and then restarting the truck again. ↓

Does the fan start within about 20 seconds?

Yes → Check that nothing obstructs the air flow through the regulator's heatsinks. If the heatsinks are covered in dust or other objects, clean under these.

No ↓

Connect a voltmeter and repeat the procedure to check the regulator fan. Is the voltage at least B+ 48V for a few seconds after the fan has started?

Yes → Change the fan.

No ↓

Is there B+ 48V on the fan?

No → Check the cables between the fan contact X26.1 and the ATC contact XC5.19 carefully. If the cables are OK and the truck has no other faults, change the ATC.

Yes ↓

Check the cables between the fan contact X26.2 and the ATC contact XC5.12 carefully. If the cables are OK and the truck has no other faults, change the ATC.

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High pump motor temperature.

1. Was the warning text "High tmp hydrau M" visible on the display when the symptom occurred?
   - No → Start using the truck again and ask the truck driver to report any new warning messages.
   - Yes ↓
2. Does the machine housing fan work?
   - No → Go to point 4 below.
   - Yes ↓
3. * Check that nothing obstructs the air flow to the motor.
   * If the motor is dirty, clean it.
   * Let the truck rest until the temperature has dropped.
   * If the truck works above its specified capacity the acceleration and speed must be lowered or the current limit lowered.
4. Connect a voltmeter to the fan.
   Is the voltage B+ 48V?
   - No → Check that the fuse F8 has not blown and that the cables are intact.
     Also check the thermostat if the truck is in the cold store design.
   - Yes ↓
5. Change the fan.

Important!

If the truck is allowed to continue working despite the temperature warnings it can result in an automatic stop of the drive motor system, the error codes will be E98 with “Hydraulics stopped” subinfo will be “motor temp too high e2” or “controller's temp too high e4” registered in the log. If the temperature is allowed to drop to the normal level again, the truck will run at full capacity again.

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The pump motor only runs at a low speed with a ticking noise.

1. Are the motor cables correctly connected and make good contact between the pump motor and the pump regulator?
   - No → Tighten the connections or replace the motor cables.
   - Yes ↓

2. Switch the regulators. Note that in most cases the drive and pump regulators can be switched with each other for test purposes. First check that the article numbers correspond with each other.
   - → NOTE! If you cannot switch the regulators go to point 4.

3. Is there still a fault with the pump motor system.
   - No → Change the pump regulator that is now fitted in the drive regulator's place.
   - Yes ↓

4. Is the voltage on the motor cable between M2.1 and M2.2 approx. 12V DC?
   - No → Go to point 8 below.
   - Yes ↓

5. Is the voltage at E2 K1.5 and E2 K1.6 approx. 4V DC with E2 K1.4 as a reference when the motor rotates? Alternatively 0V or 8V DC when the motor is at a standstill?
   - No → After checking the pump regulator's connections, change the pump regulator.
   - Yes ↓

6. Is the voltage at M2.3 and M2.4 approx. 4 V DC with M2.2 as a reference when the motor rotates? Alternatively 0V or 8V DC when the motor is at a standstill?
   - No → After checking the motor's connector connections, change the pump motor.
   - Yes ↓

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7. Look for the break/short circuit in the cables between the pump regulator and the pump motor M2.4 E2 K1.5 and M2.3 E2 K1.6 and between M2.3 and M2.4. Both connectors are pulled out of their connections on the motor and pump regulator.

8. Is the voltage between the pump regulator and the contact points E2 K1.3 and E2 K1.4 approx. 12V?

Yes → Check that there is not a break or short circuit in the cables between the motor contact and the pump regulator contact, both connectors are pulled out of their connections. Measure between E2 K1.3 - E2 K1.4 and between M2.1- E2K1.3 and M2.2 - E2 K1.4.

No ↓

9. Change the pump regulator.

10.15.8 Pump regulator status indicator

The pump regulator status lamp flashes on and off.

1. The truck must be logged on. Does the status lamp flash?

Yes → Look for an error code and go to the related trouble shooting chart.

No ↓

2. Is there a supply voltage B+ 48V to the regulator's connector E2 K1.1

No → Go to point 5 below.

Yes ↓

3. Battery voltage low?

Yes → Charge and check the battery.

No ↓

4. Change the pump regulator.

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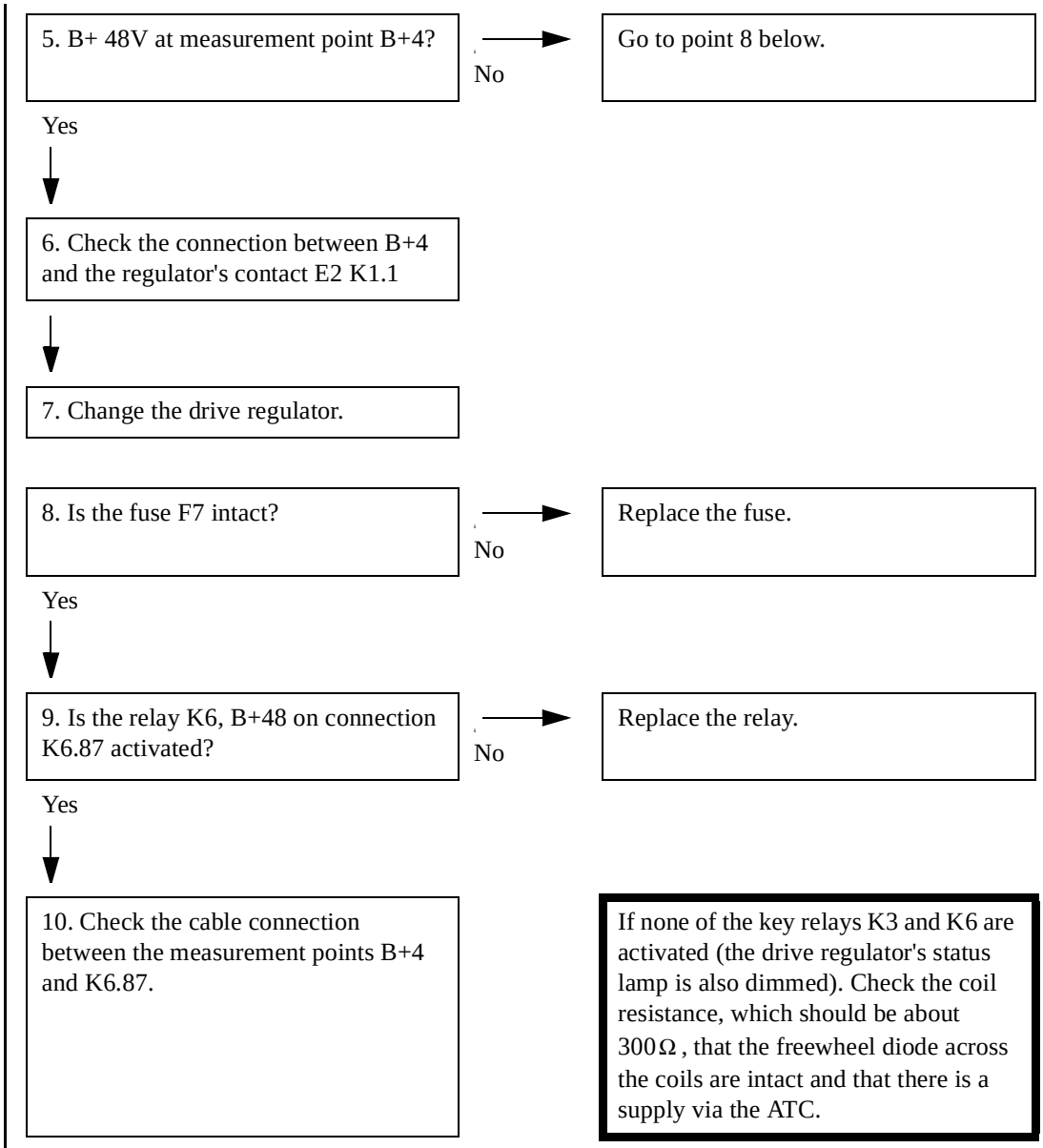
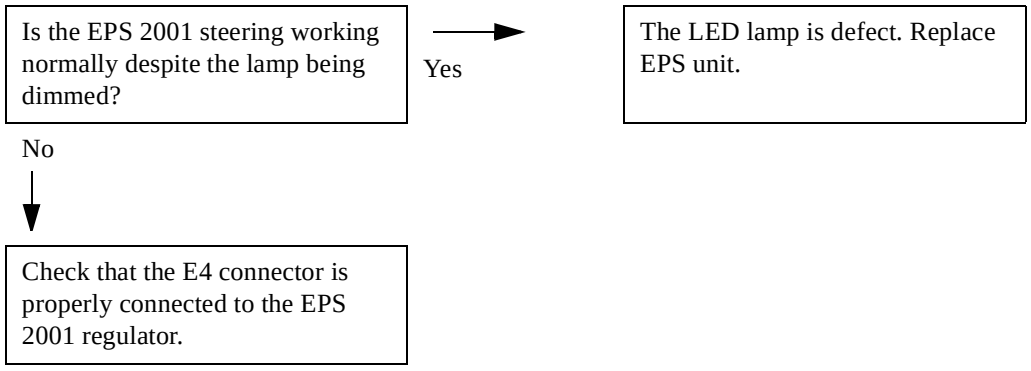


10.15.9 Steering system - EPS 2001

The LED for status lamp for the steering system is off.



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Is the battery voltage too low for normal operation? (Should be 33.6 - 62.4V DC.)

Yes → Charge the battery.

No

Measure the voltage between B- and the E 4.7 and E 4.8 connections on the servo. Is the nominal battery voltage +48V DC?

No → Check the fuses F18 and F19, and connection F2. B+ on the drive regulator.

Yes

If faults arise, repair or replace the cabling.

Measure the voltage between B+ and the E 4.1 and E 4.2 connections on the servo. Is the nominal battery voltage +48V DC?

No → If faults arise, repair or replace the cabling.

Yes

Connect a new EPS 2001 to the E4 connector without dismantling the EPS 2001 unit.

If the LED lamp is lit, this indicates that the new EPS 2001 unit has made an approved start-up.

Restart the truck. If the LED lamp is lit in the new EPS 2001 unit, replace the unit.

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10.15.10 The drive function

The drive function does not work, one or two directions.

NOTE!
If the brakes are applied these will hold the truck despite full power. Check that the regulator works, a weak humming noise should be audible.

With error code E8, check analogue sensor for accelerator and recalibrate.

1. Is the drive function lost in both directions?

No → Check in the menu drive inputs whether either Fd or Bd lights when forward or reverse directions are activated.

Yes ↓

2. Does the motor's electric brake release when the left-foot switch is activated and any drive direction is selected?

Yes → Check the accelerator's analogue sensor so that it goes from approx. 2V - 4.95V. If not check mechanism and possibly replace the sensor.

No ↓

3. Does the symbol “SA” light in the menu drive inputs when the left-foot switch is activated.

Yes → Go to point 5

No ↓

4. Check the sensor for the left-foot switch and related cables. The signal is made when the left-foot switch is activated.

5. Check that the brakes are not applied and that the cables are intact.

6. Breakage/short circuit in the brake coil?

Yes → Change the brakes.

No ↓

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7. B+ 48V voltage to the brakes when the left-foot switch and drive direction are selected?

No → Go to point 9.

Yes ↓

8. Adjust or replace the brakes.

9. Brake switch OK?

Yes → Replace the ATC.

No ↓

Rectify.

10.15.11 Forks

Lowering the forks does not work or the speed is too low.

Other hydraulic functions are OK.

If error code E10 “joyst. fault”, check the sensor and recalibrate.

1. Does dD light = lower when lowering is activated in the menu hydraulic inputs?

No → Check the control cable for the joystick and the joystick. If the joystick is not working it should be replaced and a new calibration done.

Yes ↓

2. Check that the level for lowering has not been accidentally set to 0.

3. Is the voltage between P61.1 and P61.3 less than 27V when lowering is activated?

Yes → Go to point 5.

No ↓

4. Replace the valve block.

Yes ↓

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5. Breakage/short circuit in the coil between P61.1 and P61.3? → Yes → Change the coil.

No ↓

6. Is the cable connection between the valve block and ATC OK? → Yes → Replace the ATC.

No ↓

7. Change the cable.

Lift function does not work - other functions OK.

If error code E10 “joyst. abnormal”, check the joystick function and recalibrate.

1. Does the pump rotate? → Yes → Go to point 7.

No ↓

2. Does “L” show on the display for hydraulic inputs on the service menu, when the joystick is activated? → No → Check the control cable for the lift joystick and the joystick. If the joystick is not working it should be replaced and calibrated.

Yes ↓

3. Is the lift stop activated? The symbol ^ is visible on the display when logging on and LLi is not showing on the menu for hydraulic inputs. → Yes → If the truck is normally fitted with a lift stop, check the sensor and its cables, the signal is cut with a lift stop.

No ↓

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If the truck is not fitted with a lift stop, check to see whether the function has been accidentally selected in the menu “set options”

↓

Rectify or replace.

4. Is the remaining battery capacity lower than 20%?

Yes → Is the truck equipped with lifting cut-out? In the event of a low battery lifting is stopped when the capacity is under 20%. Charge the battery.

No

↓

5. Check that the lift stop with a low battery has not been accidentally set to a too high value. (The pump can be broken).

6. Follow the trouble shooting chart for AC regulators.

↓

7. B+ 48V valve block connector P61.2?

No → Replace the valve block cables.

Yes

↓

8. Is the voltage between P61.1 and P61.2 < 27V with full lever movement? (Only needed to be checked if you can safely say that the lowering function does not work.)

Yes → Go to point 10.

No

↓

9. Replace the valve block.

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10. Has breakage or short circuit occurred in the coil between P61.1 and P61.2? → Yes: Change the coil.

No ↓

11. Is the cable connection between the valve block and ATC OK? → Yes: Replace the ATC.

No ↓

Change the cable.

The reach in function does not work other functions OK.

NOTE!
When measuring voltage across the valve coil the connector must be connected to the valve block. In the event of breakage/short circuit the connector should not be connected.

If error code E10 “joyst. abnormal”, check the joystick function and recalibrate.

1. Does the pump rotate? → Yes: Go to point 5.

No ↓

2. Does “R” = reach in, show when the joystick is activated in the menu hydraulic inputs? → No: Check the control cable for the lift joystick and the joystick. If the joystick is not working it should be replaced and calibrated.

Yes ↓

3. Is the symbol “RS” showing in the menu hydraulic inputs? → No: Check that the level has not been accidentally set to 0.

Yes ↓

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4. “RS” = Reach in stop, must only be showing when the reach is in the fully retracted position. Check the reach stop switch and related cables. The signal is cut when the reach stop is activated.

5. B+ 48V valve block connector P72.1?

No → Change the valve block cable.

Yes ↓

6. Is the voltage between P72.1 and P72.2 < 27V when the reach in lever is activated?

Yes → Go to point 8.

No ↓

7. Replace the valve block.

8. Breakage or short circuit in the coil between P72.1 and P72.2?

Yes → Change the coil.

No ↓

9. Is the cable connection between the valve block and ATC OK?

Yes → Replace the ATC.

No ↓

Change the cable.

The reach out function does not work - other functions OK.

If error code E10 “joyst. abnormal”, check the joystick function and recalibrate.

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1. Does the pump rotate? → Yes → Go to point 4.

No ↓

2. Does “E” = reach out, show when the joystick is activated in the menu hydraulic inputs? → No → Check the control cable for the reach joystick and the joystick. If the joystick is not working it should be replaced and calibrated.

Yes ↓

3. Check that the level for the reach out has not been accidentally set to 0.

4. B+ 48V valve block connector P71.1? → No → Change the valve block cable.

Yes ↓

5. Is the voltage between P71.1 and P71.2 < 27V when the reach out lever is activated? → Yes → Go to point 7.

No ↓

6. Replace the valve block.

☞ ***Important!***

For UFS trucks this error may be due to the malfunction of the “S46” switch. The switch must be closed in order for the reach out movement to work. This can be checked under the hydraulic inputs in the service menu, where “RO” is displayed if the switch is closed. A UFS truck drops down to creep speed and a tortoise is displayed if the switch is faulty.

7. Breakage or short circuit in the coil between P72.1 and P72.2? → Yes → Change the coil.

No ↓

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8. Is the cable connection between the valve block and ATC OK?

Yes → Replace the ATC.

No ↓

9. Change the cable.

NOTE!
When measuring voltage across the valve coil the connector must be connected to the lever. In the event of breakage/short circuit measuring on the lever the connector should not be connected.

10.15.12 Automatic driving of the drive unit - UFS

Automatic driving of the drive unit UFS does not work.

Is the servo steering working when using the mini wheel?

No → Look for error codes and follow each trouble shooting chart.

Yes ↓

Check that the S7 switch located on the joystick for automatic steering of the drive unit is working.
This switch should close when it is affected. This can be checked under the hydraulic inputs in the service menu.“S7” is showing in the display when it is affected.

10.15.13 Rotating wheel indication - UFS

The pump does not stop in one or both end positions when the UFS rotating wheel is operated. The green indication lamps for rotating wheel indication are not working in the direction rotation has been ordered.

Check that the S44 and S45 switches are working. Switch S44 should close when the rotation wheel is in straight position to the fork tips. Switch S45 should close when the rotation wheel is in 90° position to the forks.

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Important!

If the S44 switch is closed, PC is shown in the display for hydraulic inputs. If S45 is closed, PCC is displayed instead.

10.15.14 Low temp drive/Low temp hydraul

Drive the truck at a reduced speed and reduced load until the regulator has warmed up to approx. 20 degrees for full operating capacity.

Or

Drive the truck in a heated building until the regulator has reached the temperature for full operating capacity.

10.15.15 High/Low voltage - EPS 2001

Check that the voltage is within the range 33.6 - 62.4 V DC under operation.

Do errors occur when the main contactor K10 is open?

Yes → Check that the components in the EPS charging circuit are intact. Fuse F12 and resistor R300. See relevant trouble shooting chart for more information on error codes.

No ↓

Look for voltage drop in the path of the current from the battery to the EPS unit, and from the EPS back to B-. Check the fuse holder and fuses F18 and F19, as well as B- and F2.B+. Check B+ extra carefully.

Replace EPS.

Check that high resistance or a bad connection are not present in the battery cable to the B+ and B- regulators.

A regenerative drive regulator could raise the voltage in the supply cables and the resistance is too great.

Replace EPS unit.

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10.15.16 High temp Steering/Overheated steer - EPS 2001

Check that nothing obstructs the air flow to the EPS 2001. Remove any dust from the unit.

The error arises when the temperature on the EPS unit's cooling flange exceeds the maximum value for safe operation.
The two most common causes are high ambient temperature by the control module or that the EPS unit has been supplying too much output to the motor for too long.

Check if friction has increased in the steering, or if something may have caused the need for greater turning force to rotate the wheel.

Important!
When “Overheated Steer” occurs, stop the truck and maintain standstill condition until the temperature falls within the safety range.

The temperature measurement components may be defective.

Replace EPS unit.

The steering unit may have developed increased internal friction.

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10.16 Trouble shooting - error messages

10.16.1 E05, E06, E07, Electric servo - fly by wire

E05 is tachometer error, E06 is servo motor error, E07 is servo regulator error.

Do the faults occur together resulting in the drive no longer working?

→ Check that the servo's safety relay K4 is made, if not, the probable fault lies with one of the limit switches for the servo.
Check the red LEDs 2 and 3 in the servo box, both the bistable switches must be open when the drive unit is in the end positions, otherwise closed.

Change the servo box.
Change the motor.

Yes ↓

Is the green lamp on the servo box on?

→ No: Check the fuse F7 and measurement point B+4, see the general instructions for a power failure.

Yes ↓

E05 or tacho fault logged?

Tip: Red LED “ERROR 4” lights on the control box if the fault occurs during operations and the truck has not been logged off. If the tacho fault arises when the truck is logged off the fault is not logged, error code E97 is shown.

→ Yes: Check the tachometer and its cables. The tachometer should give increasing voltage with speed/ wheel turning. If the cables are okay, replace the tachometer,
or replace the servo box.

No ↓

E05 or servo motor fault logged?
Red LED Error 5 lit on the control box.

→ No: See important comments below.

Yes ↓

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Check that the motor fuse F4 is intact.
Check that there is a low resistance between the motor's poles, the carbon brushes may be finished.
Check the motor cables.
Make a visual inspection of the servo connector strips to ensure they are OK.
Check that the coil resistance is approx. 70Ω and that the cables are OK.
Check that the freewheel diode across the connector coil is intact.

Continue

Change the servo box.
Change the servo motor.

☞ ***Important!***

Error codes E05 tacho fault, E06 servo motor fault and E07 servo regulator fault are generally overwritten by error code E97.

☞ ***Important!***

If both the LEDs ERROR 4 and ERROR 5 are on, the servo box should be replaced (E07).

10.16.2 CAN

Subinfo: CAN -too many errors. e256

Check that the CAN bus is not short circuited or that the connector is broken.
Also check the termination resistors at the ends are intact and maintain a value of 120Ω .

The fault can arise when the CAN interface on the regulator has discovered too many communication errors in a message across the CAN bus.

Is the CAN BUS supply between E1 K1.12 and E1 K1.13 (applies to the drive regulator) or E2 K1.12 and E2 K1.13 (applies to the pump regulator) less than 8V DC?

Yes → Check the CAN bus external supply and change the cables if necessary. The CAN bus is fed via ATC 12V, connectors XC9.12 and XC9.7.

No

Change the regulator.

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Subinfo: CAN watchdog time-out. e512

The fault arises when the regulator has not received any control message from the ATC under a period exceeding 70 milliseconds.

Does the same fault occur on more than one regulator across the CAN-bus?

Yes → Check that the CAN bus is intact on all nodes.

No → Change the regulator.

Check the function of the ATC.

Change the regulator.

10.16.3 E97, E98. Drive system stopped/ Hydraulics stopped

Subinfo: Controller not responding

Drive motor system. This first step only applies for trucks with fly by wire steering.
Check that it is not the alarm to the electric servo system that has activated and caused a break to the regulator.
See “E05, E06, E07, Electric servo - fly by wire” on page 82.

Check the CAN bus cables and terminations between the ATC and motor regulator extremely carefully. The most probable cause is a break on one of the four CAN bus wires.

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Try changing the motor regulator or switching the regulators.

↓

Change the ATC.

Subinfo: Overcurrent e8

Switch off the voltage, wait a few seconds and switch on the voltage again.

Overcurrent arises when the regulator's load impedance drops under a minimum value. This is often caused by a short circuit in the regulator's output stage, in the heavy cable connection between the motor and regulator or in the motor.

↓

Subinfo: Overcurrent e8? → No → Finished.

Yes

↓

Check the motor cables for a short circuit between U-V, U-W and V-W, also check that the phases are not short circuited or have inferior insulation to the chassis.

In order to measure a short circuit in the motor cables they must be unscrewed from the isolated terminal posts on both the regulator and motor sides.

↓

Change the regulator.

↓

Subinfo: Overcurrent e8? → No → Finished.

Yes

↓

Change the motor.

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Subinfo: DC bus too low e64, or subinfo: No charge DC bus e128

Error code E 97:
If the motor fuse for the drive motor has blown when starting you receive the message:
“Drive stopped subinfo: No charge DC bus e128”

Error code E 98:
If the motor fuse for the hydraulic motor has blown when starting you receive the message:
“Hydraul stopped subinfo: No charge DC bus e128”

The fault appears when the regulator's software detects that the voltage between the + and B- terminals is too low for the regulator to be reliable.

Is the battery voltage low?

Yes → Charge the battery.

No ↓

Does the fault appear when the regulator is delivering high current to the motor?

Yes → Check the supply voltage between the regulator's + and B- terminal while running. If the voltage is under 70% of the nominal battery voltage, find the voltage drop in the circuits that feed the drive regulator.
(Minimum supply voltage is 22V).

No ↓

Check the charging circuit F12 R300 and that the components are intact. ↓

Change the regulator.

Check the connections to the regulator's B+, + and B- terminals. Tighten the nuts to 15 Nm. ↓

Check the truck's battery.

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Subinfo: DC bus too high. HW e16.

Check the heavy cables between the motor and the regulator and between the regulator and the battery.

The error occurs when the regulator detects that the battery voltage is too high for reliable regulator operation. This condition normally arises when too much energy has been regenerated (recovered) to the battery or the resistance between the regulator and battery is too high. The battery voltage between the + and B- terminals on the regulator must not exceed 60V DC.

Check the line contactor K10, (connections and contactor tips)

The regulator's measurement of the supply voltage can be defective.

Is the above OK?

Yes →

The requested brake torque can be too high.

No ↓

Rectify the cables and connector.

Reduce the amplitude for the brake torque via ATC.
See the sections on the pedal brake, reversing brake or reduction brake.

Change the regulator.

Change the battery.

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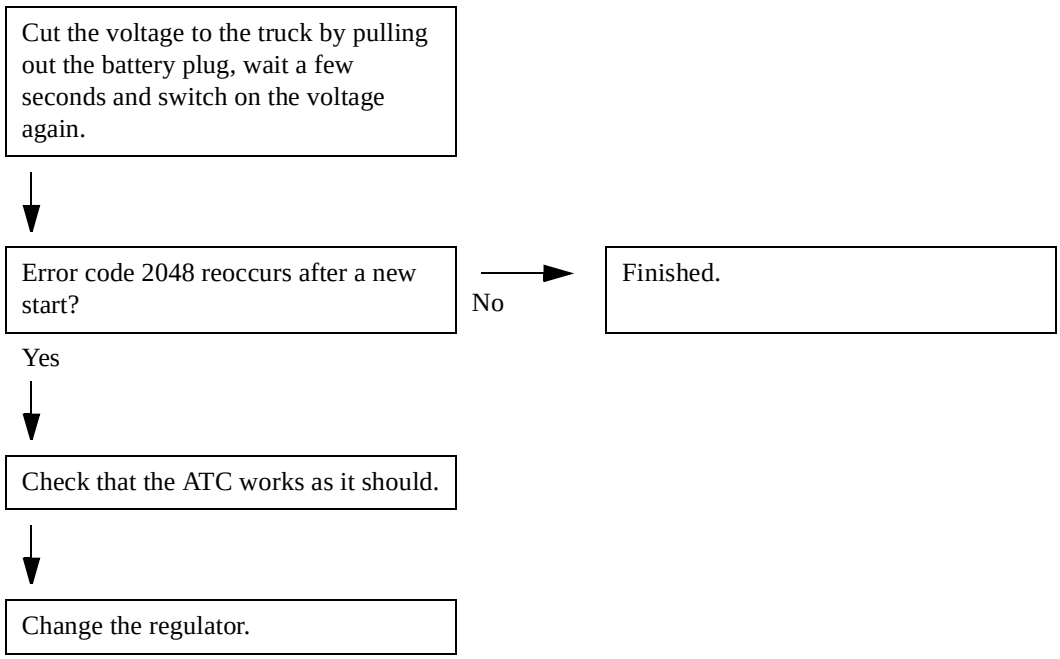
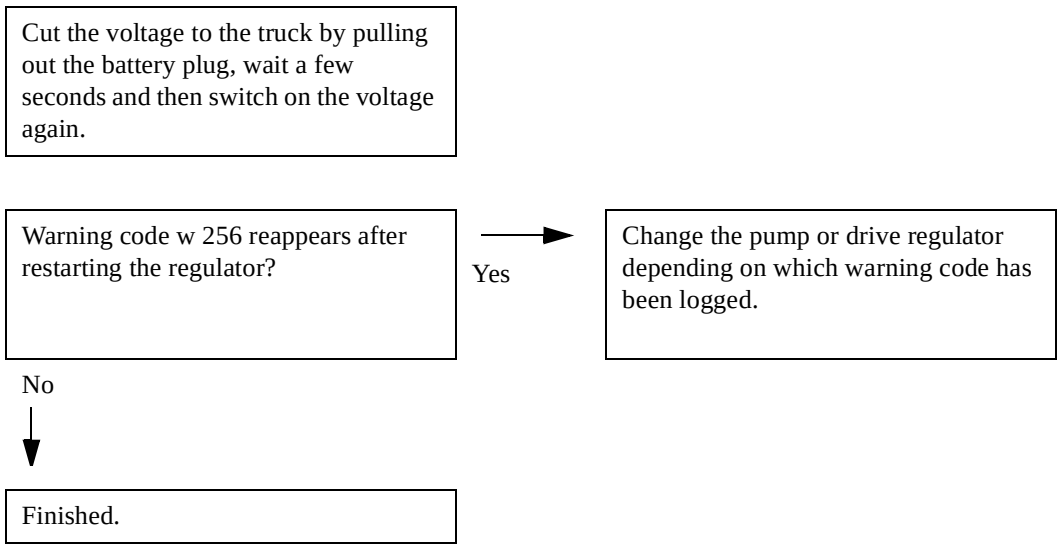
Subinfo: ATC contradictory. e2048



10.16.4 E100, E101. Drive system abnormal/ Hydraulics abnormal

Subinfo: Controller calib error. w256



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Subinfo: Controller rev to default w512.

Change the regulator if the fault arises repeatedly during start up.

Subinfo: Controller temp sensorW2, sensor w4.

Cut the voltage to the truck by pulling out the battery plug, wait a few seconds and switch on the voltage again.

The regulator's temperature sensor can be defective.

Warning code W2 drive regulator or W4 pump regulator logged after the truck starts?

No → Finished.

Yes ↓

Change the pump or drive regulator depending on which warning code has been logged.

Subinfo: Speed signal out of range. w 128.

Switch off the voltage to the ATC and regulator by pulling out the battery plug.
Start the truck again.

The ATC has sent a speed command to the regulator, which exceeds the user's maximum speed parameter. <Motor_HighSpeed>
The regulator limits the true speed to <Motor_HighSpeed>.

Does the warning message reoccur after a restart?

No → Finished.

Yes ↓

Change the pump or drive regulator depending on which warning code has been logged.

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Replace the ATC.	

Subinfo: Motor temp sens lost. w32, Motor temp sens shorted. w64.

Check that the sensor is OK and not short circuited. Check the cable connection between the motor temperature sensor and the regulator.	The sensor is measured in the 8 way connector on the motor after the truck side cables have been disconnected. If the sensor is OK you should receive a value of about 500Ω at room temperature, which is measured across pins 7 and 8 on the connector. If the temperature is higher the resistance will increase.
If the sensor is defective, change the motor.	
If there is a cable fault (see the explanation to the right), rectify or change the cable.	In order to check the cable connections, loosen the 8 way contactor on the motor and the 13 way contactor on the related regulator. Measure across pins 7 and 8 on the 8 way contactor, the resistance should be infinite. Measure that the cables are intact between pin 7 on the motor contactor and regulator contactor, and pin 8 on the motor contactor and pin 4 on the regulator contactor, the resistance should be well under 0.5Ω .
Change the regulator.	The regulator's temperature measurement can be malfunctioning.

10.16.5 E102, E103, E107 Servo stopped/Servo abnormal -EPS 2001

E102, E107 Subinfo: Internal Overcurrent

Replace EPS unit	This error arises when the load impedance which the EPS unit's power stage measures, is too low for the EPS 2001 to be able to correctly regulate the motor current.

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E102, E107 Subinfo: Controller saftety Output.

Has some other error code been logged when the error arose?
Yes → See the trouble shooting chart for relevant error codes.
No ↓

Is +48V DC present in the circuit B+ 4, X99.3 up to K7.85?
No → Change the cable.
Yes ↓

Is the circuit K9.86, X99.5 up to E4.9 intact with low-resistance?
No → Change the cable.
Yes ↓

Is the circuit K7.86 - K9.85 intact?
No → Change the cable.
Yes ↓

Is the freewheel diode across the relay coils intact?
No → Change the cable.
Yes ↓

Are the relay coils K7 and K9 intact, and do they have a resistance of around 300Ω ?
No → Replace the relay.
Yes ↓

Replace EPS unit.

The error occurs when the current intensity in the safety input's current circuit falls outside of the allowed range.

E102, E107 Subinfo: Controller not responding.

Press OFF/On on the keyboard. Does this solve the problem?
Yes → Finished.

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No

Disconnect the current to the EPS 2001 with help of the battery cable. Wait 15 seconds and reconnect the battery to the EPS.

This error occurs when the time runs out for the EPS's internal Watchdog Timer.

Has the problem occurred again, after the EPS 2001 has been restarted?

No → Finished.

Yes

Is the CAN cable between the ATC and EPS 2001 OK?

No → Change the cable.

Yes

Replace EPS unit.

E102, E107 Subinfo: Steering Wheel Sensor Fault.

Check +5V DC supply to the connections 2 and 5 on the steering wheel sensor. Disconnect the steering wheel sensor and check that the linear resistance is around 57Ω between connections 1 and 3, and 4 and 6. Test the cable connections. OK?

No → Replace the steering wheel sensor or cabling.

Yes

Replace EPS.

This error occurs when an imbalance between phase A and B inputs from the stepping motor has been detected.

E102, E107 Subinfo: High Voltage or Motor Shorted.

Replace EPS unit

This error occurs when the motor impedance is too low for the EPS 2001 to be able to correctly regulate it, or if the alternating current force is too high for the power stage.

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E102, E107 Subinfo: Internal Motor / Controller Fault.

Replace EPS unit

This error arises when the load impedance which the EPS unit's power stage measures, is too high for the EPS 2001 to be able to correctly regulate the motor current.

E103, E107 Subinfo: Controller rev to default.

Disconnect the current to the EPS 2001 with help of the battery cable. Wait 15 seconds and reconnect the battery to the EPS.

This error occurs when the EPS 2001 has registered incorrect user parameters and returned to preset parameters.

Has the problem occurred again, after the EPS 2001 has been restarted?

→ No

Finished.

Yes

↓

Replace EPS unit.

E102, E107 Subinfo: CAN watchdog time out.

Is the CAN bus cabling between the ATC and EPS 2001 intact? Is 12V DC present between the E4.12 and E4.3 connections

→ No

If the cabling is faulty, repair or replace If 12V DC is not present, check that the ATC gives +12V DC on the XC9.12 connection and 0V on XC9.7. (If there is an error on the +12V DC, the lamps in the truck will not work.)

Yes

↓

↓

Replace EPS unit.

Check for errors in the +12V DC supply. It is appropriate to disconnect all computer connectors except XC9 and check that 12V DC is present between XC9.12 and XC9.7.

This error occurs if the EPS 2001 does not receive a sync or PDO message within a specified time.

Replace computer.

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E103, E107 Subinfo: Steering sensors sync fault.

Turn the mini-wheel so that the wheel rotates between the end positions or a complete revolution.

This error occurs if calibration in the steering sensors was not successful within one minute following the display of the “Spin steer wheel” message. See section 7.

Was the “Steering checked” message received?

→ No

Check and adjust the steering position sensors. See section 7.

Yes

↓

Finished

E102, E107 Subinfo: Controller internal watchdog.

Replace EPS unit.

This error arises when a program run error in the EPS unit occurs.

10.16.6 E105, Drive system

E105 Sub info: Input voltage too low in the main circuit

Battery OK?

→ No

Charge/replace the battery.

Yes

↓

Is the fuse for the drive regulator intact?

→ No

Replace the fuse. If the fuse blows again, replace the regulator

Yes

↓

Is K10 line contactor closed?

→ No

Check that there is +24V between X98.5 and X98.6.
The contactor must have +48V from the emergency stop button via X23, ATC provides the contactor with negative via XC3.22.

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Yes

Is there voltage at K10.3+ → No: Check that K11 is closed

Yes

Check the cabling between K11.4- and the regulator. Fault found? → No: Replace the regulator

Yes

Repair the cabling

Note!

When measuring the voltage at the regulator B+ or K11.4-, there is a major risk that you measure a voltage from logic+ at the regulator.

E105 Sub info: Overcurrent to motor

Is the control cable between the regulator and motor OK? → No: Repair the cabling The fault may also be due to a gap in the contact in the case of intermittent faults.

Yes

Replace motor

E105 Sub info: Input voltage too high in the main circuit

Measure the voltage between B- and B+ on the regulator. → Voltage > 60 V: Check why the voltage is high.

Voltage < 60 V.

Is the fault condition permanent? → Yes: Replace the regulator

No

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In the case of intermittent faults this may be due to the truck being shut down by the emergency stop during operation.

E105 Sub info: Rotation sensor in motor

Is the control cable between the regulator and motor OK?

Yes

Replace motor

E105 Other fault

Internal fault in the regulator.

If the fault is permanent, replace the regulator

10.16.7 E106, Pump system

E106 Sub info: Input voltage too low in the main circuit

Battery OK?

No → Charge/replace the battery.

Yes

Is the fuse for the drive regulator intact?

No → Replace the fuse. If the fuse blows again, replace the regulator

Yes

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Is K10 line contactor closed?

No → Check that there is +24V between X98.5 and X98.6. The contactor must have +48V from the emergency stop button via X23, ATC provides the contactor with negative via XC3.22.

Yes ↓

Is there voltage at K10.3+

No → Check that K11 is closed

Yes ↓

Check the cabling between K11.4- and the regulator. Fault found?

No → Replace the regulator

Yes ↓

Repair the cabling

Note!

When measuring the voltage at the regulator B+ or K11.4-, there is a major risk that you measure a voltage from logic+ at the regulator.

E106 Sub info: Overcurrent to motor

Is the control cable between the regulator and motor OK?

No → Repair the cabling The fault may also be due to a gap in the contact in the case of intermittent faults.

Yes ↓

Replace motor

E106 Sub info: Input voltage too high in the main circuit

Measure the voltage between B- and B+ on the regulator.

Voltage > 60 V → Check why the voltage is high.

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Voltage < 60 V.

Is the fault condition permanent? → Yes → Replace the regulator

No

In the case of intermittent faults this may be due to the truck being shut down by the emergency stop during operation.

E106 Sub info: Rotation sensor in motor

Is the control cable between the regulator and motor OK?

Yes

Replace motor

E106 Other fault.

Internal fault in the regulator.

If the fault is permanent, replace the regulator

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10.17 Trouble shooting table - battery

10.17.1 Battery stop

Indication	Cause	Action
Worn rubber stops	The speed for mast shift is set too high.	Reduce the reach in speed.
Mast shift does not work, mast runs against the battery.	The magnetic switch for the reach stop is defective.	Check the function of the switch. Replace the switch.
The mast runs against the battery.	The magnetic switch for the reach stop is incorrectly adjusted.	Adjust according to the instructions.

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10.18 Wiring diagram

For wiring diagrams, see “Service Manual Electrical Diagrams U** AC”, Atlet P/N 005973 and Atlet P/N 119013.

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10.19 Appendix 1, Menu tree

The following section is Appendix 1 that contains menu trees (Version 3.71). The menu trees in Appendix 1 are specified in the list below.

Service menu

Set language

Local service

ATLET service

Custom service

Start up

Remote service

Logged on service

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Remote service

Level 1		Level 2	Remarks:
Remote service 0: Exit			
↑↓			
Remote service 1: Init. Phone			
↑↓			
Remote service 2: Answer a call			
↑↓			
Remote service 3: Call number	ENT ->	Give phone nr	

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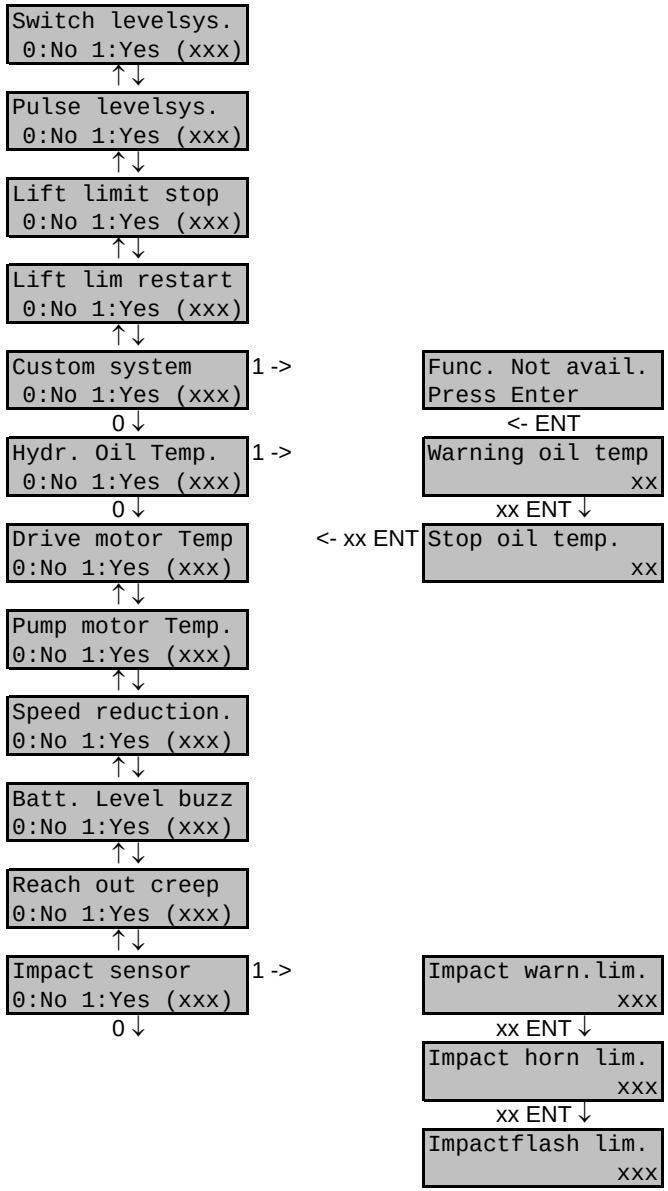
Startup

Level 1	Level 2	Level 3	Level 4	Level 5	Remarks:



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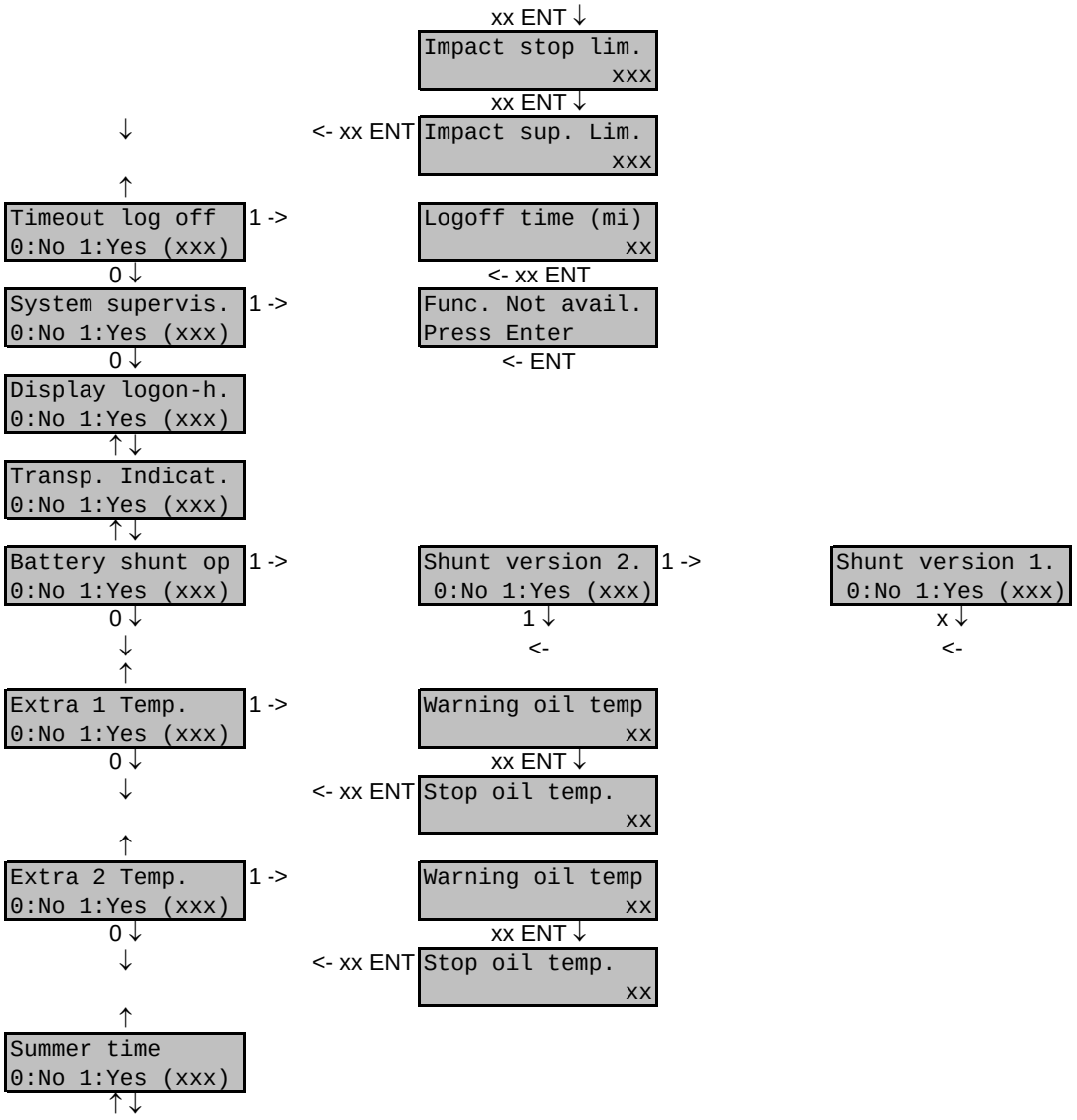
Startup

Level 1	Level 2	Level 3	Level 4	Level 5	Remarks:



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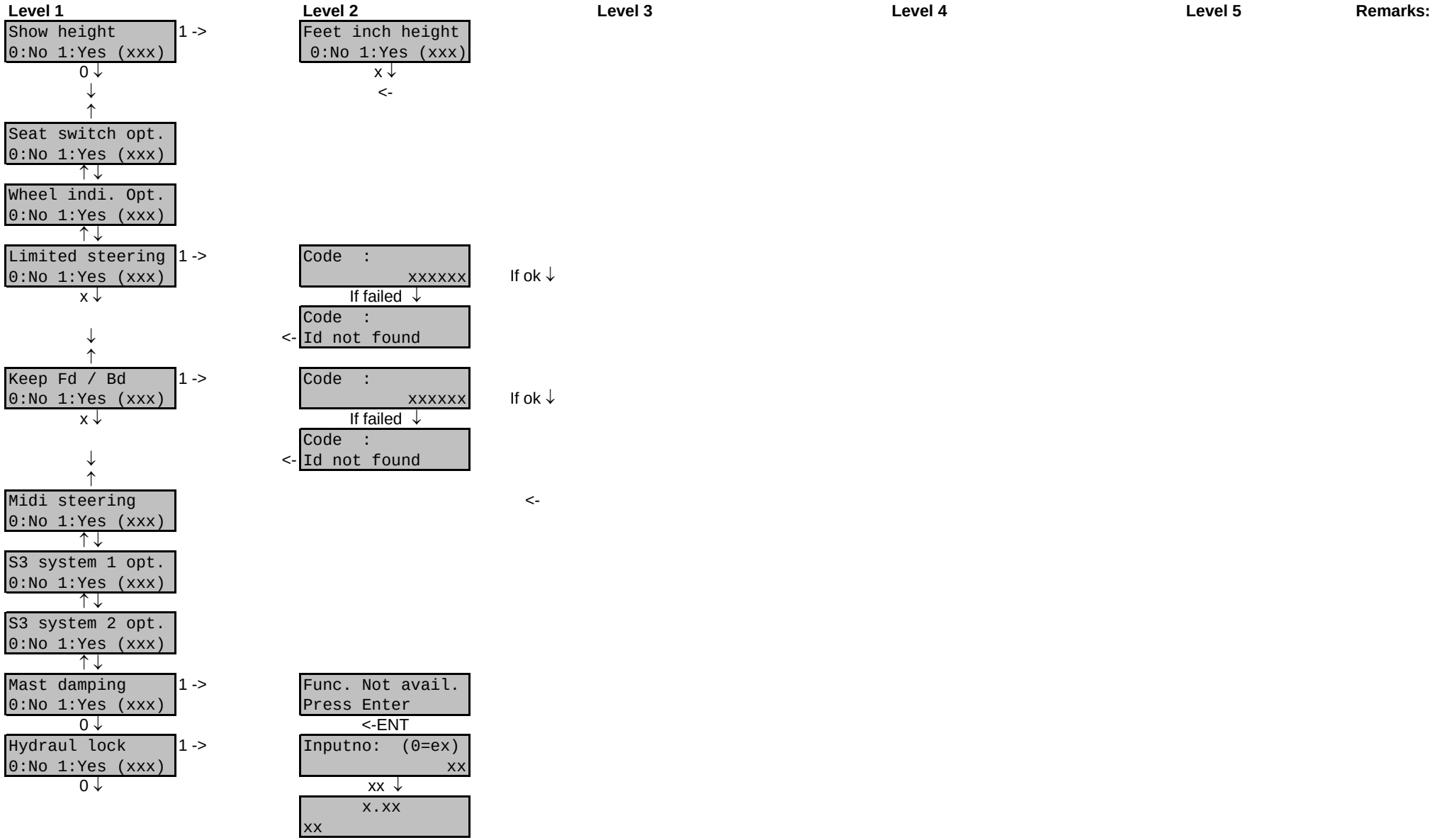
Startup



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Startup

Level 1		Level 2	Level 3	Level 4	Level 5	Remarks:
↑		ENT ↓				
Driver settings 0:No 1:Yes (xxx)		<- Dig. Inputxxxxxx xx				
↑↓						
Tilt centering 0:No 1:Yes (xxx)						
↑↓						
Sideshift center 0:No 1:Yes (xxx)						
↑↓						
SmartCard option 0:No 1:Yes (xxx)	1 ->	Damage option 0:No 1:Yes (xxx)				
0 ↓		<-x				
Topp damping(H4) 0:No 1:Yes (xxx)	1 ->	Topp damping(H4) xxxx				
0 ↓		<-xxxx ENT				
Alcolock option 0:No 1:Yes (xxx)						
↑↓						
Keylock option 0:No 1:Yes (xxx)						
↑↓						
Resease acceler. and hit digitkey						
Push acceler max and hit digitkey	If ok ->	↓				
If failed ↓						
Calibration fail Press enter		↓				
ENT ↓						
Resease brakeped and hit digitkey		<-				
Push brake max and hit digitkey	If ok ->	↓				
If failed ↓						
Calibration fail Press enter		↓				
ENT ↓		<-				

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Startup

Level 1	Level 2	Level 3	Level 4	Level 5	Remarks:
Select joystick x->	Channel x Max and min				
ENT ↓	Channel x And hit digitkey				
	Any digit key ↓				
	Calibration OK Press enter ENT ->	Select joystick			
	If failed ↓				
	Calibration fail Press enter ENT ->	Select joystick			

Select 48V batt.
0:No 1:Yes (xxx)
↑↓
Measured B+ (mV)
xxxxx
xxxxx ENT↓
Battey size(Ah)
xxx
↑ xxx ENT↓
Pump size(kW)
xx
↑ xxx ENT↓
Utilisation (%)
xxx
↑ xxx ENT↓
Chassis const. 1
xxx
↑ xxx ENT↓
Chassis const. 2
xxx
↑ xxx ENT↓
Low batt. Level
xx
↑ xxx ENT↓
Lift stop level
xx
↑ xxx ENT↓
Spare 1
xxxxx

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Startup

Level 1	Level 2	Level 3	Level 4	Level 5	Remarks:
If option Wheel indi. choosen -> otherwise ↓	Indicate pedal xxx				
	ENT ↓				
↓	<- ENT Indicate seat xxx				
If option S3 1 or Show height choosen -> otherwise ↓	Wire scalefactor xxx				
	↑ xxx ENT ↓				
↓	<- ENT Forkzero Offset xxx				
If option Switch level system choosen -> otherwise ↓	Number of levels xx				
	↑ xxx ENT ↓				
	Up pwm : (500) xxx				
	↑ xxx ENT ↓				
	Up time : (.1s) x				
	↑ xxx ENT ↓				
↓	<- ENT Waittime : (.1s) x				
If oprtion Pulse level system choosen -> otherwise ↓	Number of levels xx				
	↑ xxx ENT ↓				
	Wire scalefactor xxx				
	↑ xxx ENT ↓				
	Forkzero Offset xxx				
	↑ xxx ENT ↓				
	In/Out Offset: xx				
	↑ xxx ENT ↓				
	Level no: (0=ex) x	x ENT -> <- xxxx ENT	Level: xxxx		

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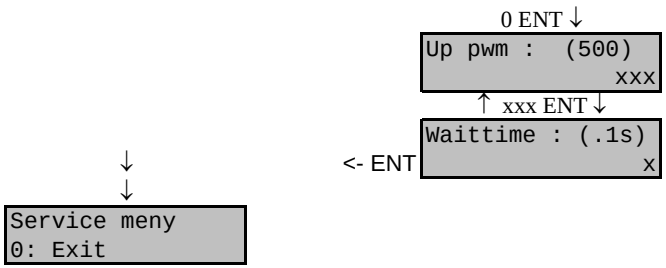
Startup

Level 1	Level 2	Level 3	Level 4	Level 5	Remarks:



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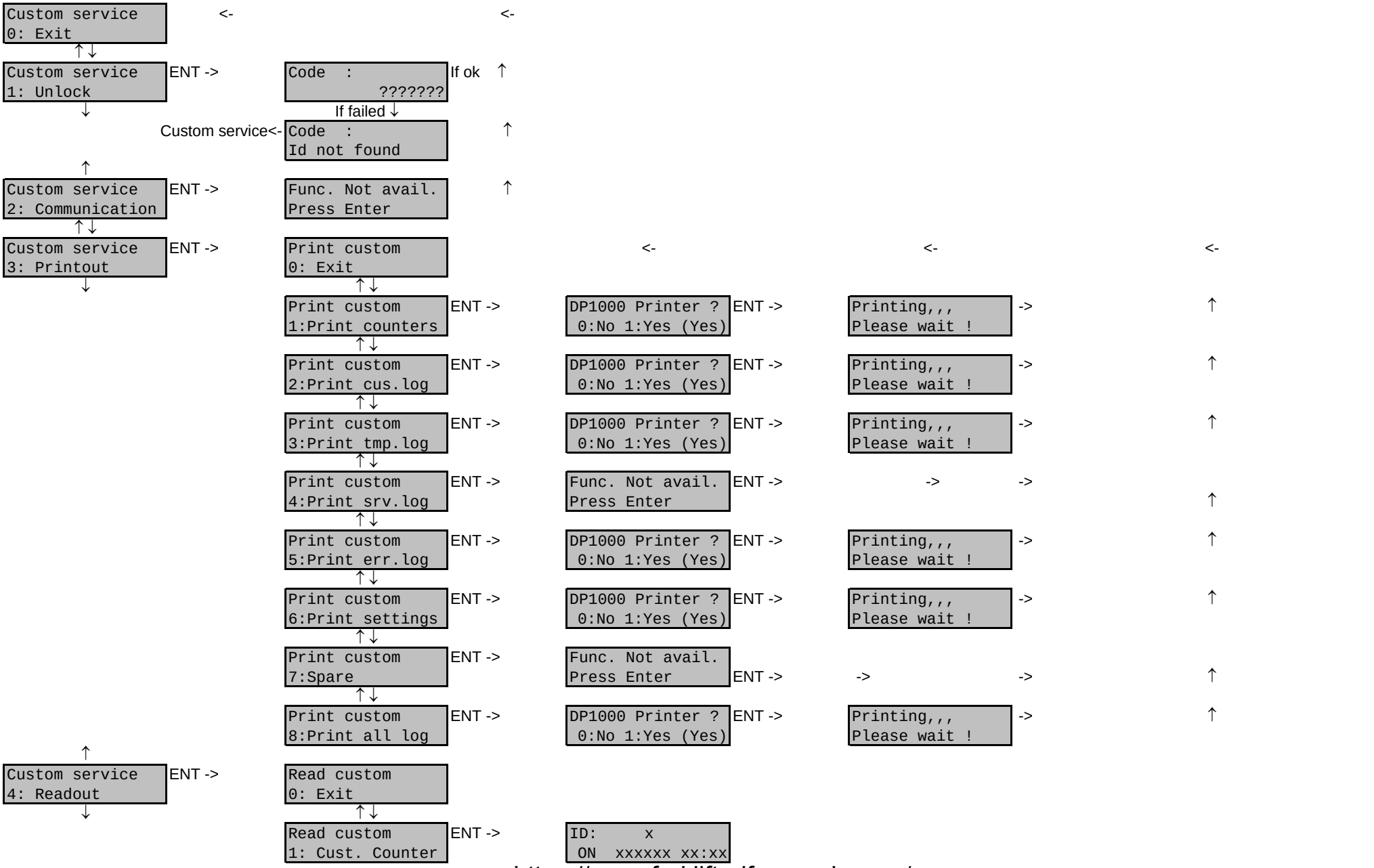
Custom service



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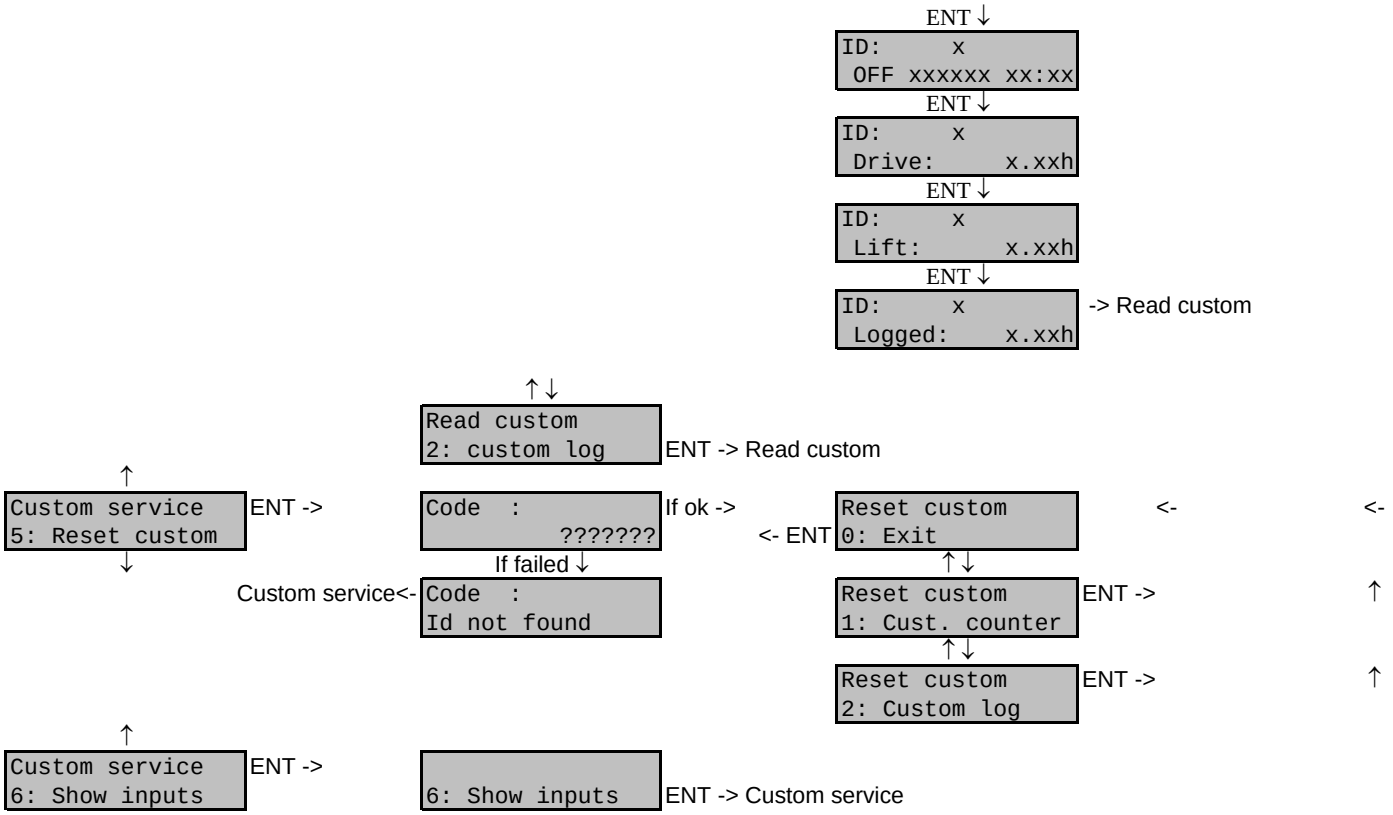
Custom service



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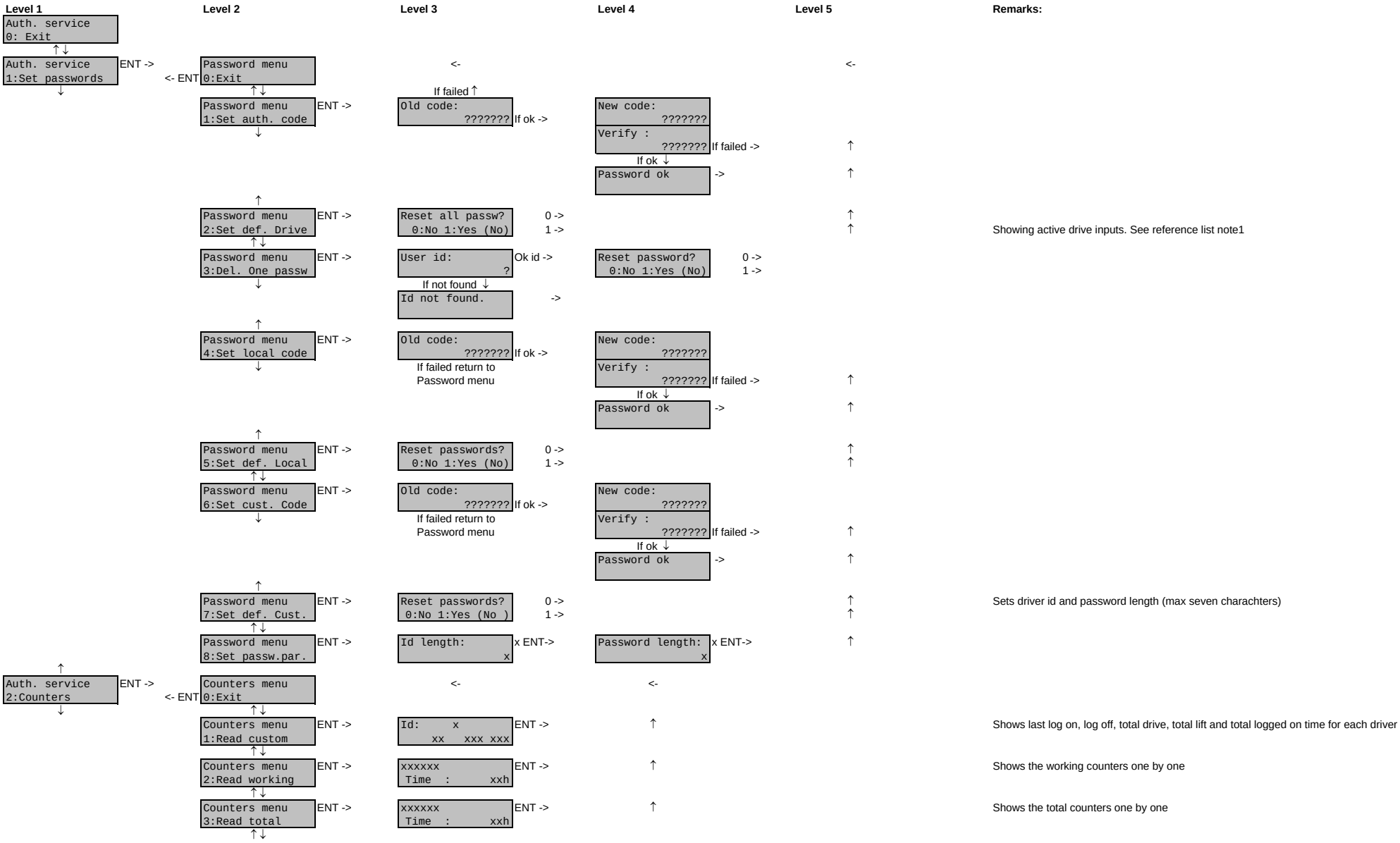
ATLET service



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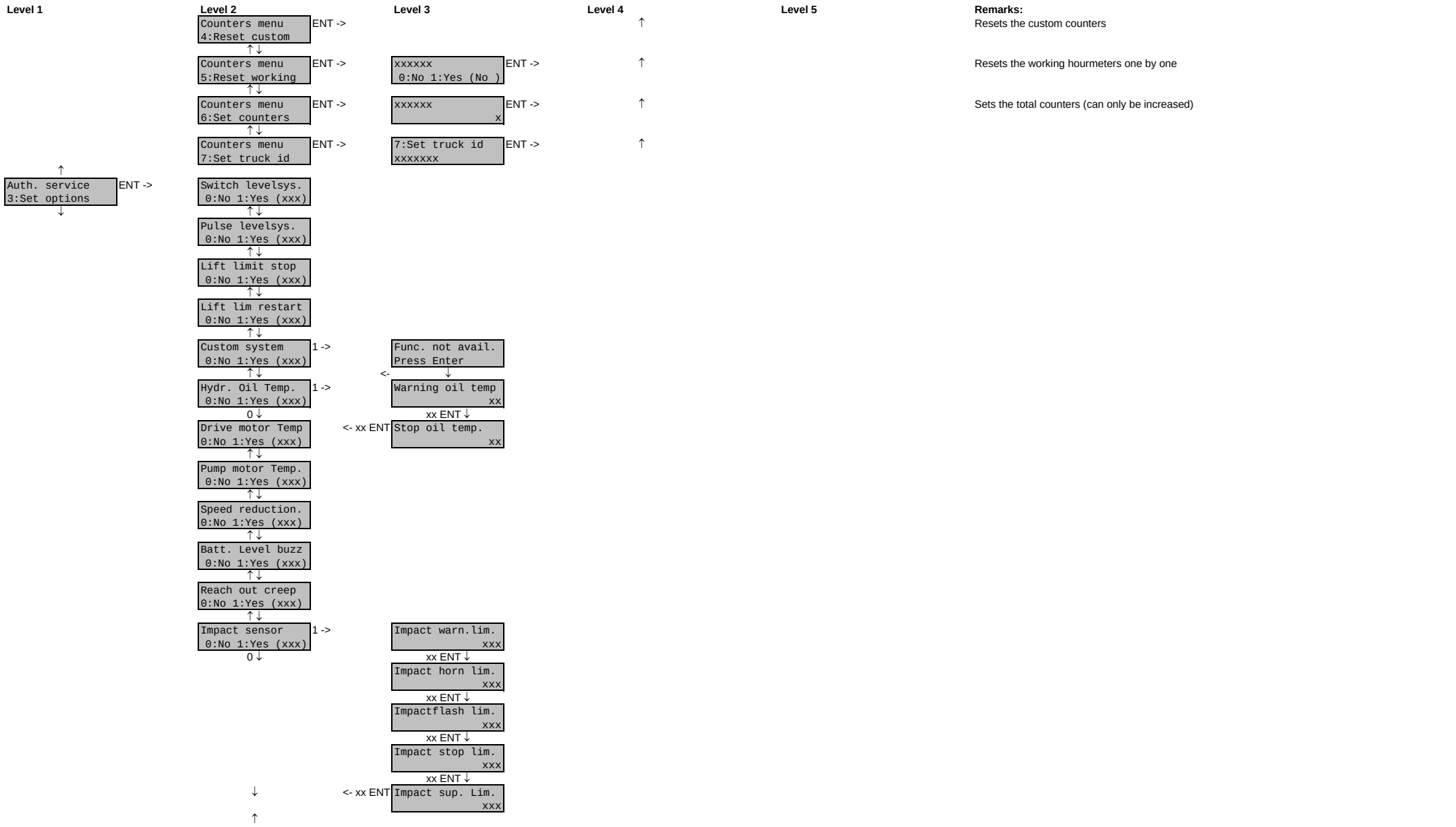
ATLET service



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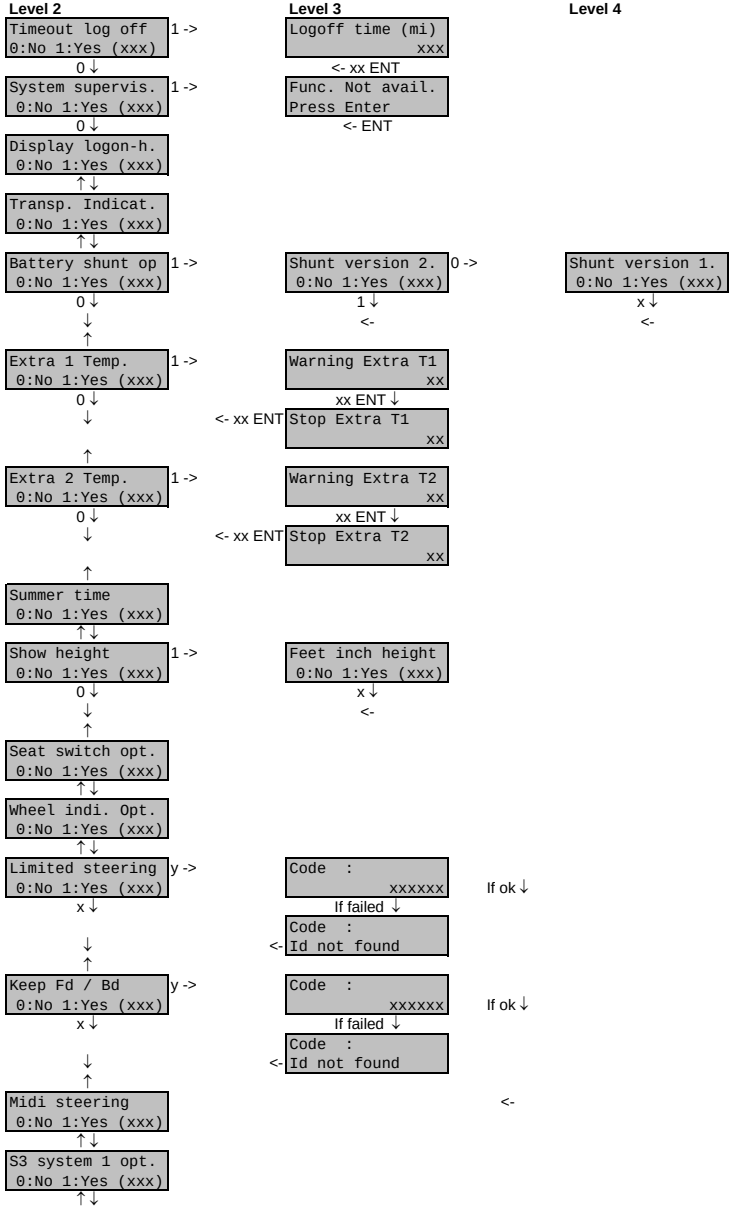
ATLET service

Level 1	Level 2	Level 3	Level 4	Level 5	Remarks:



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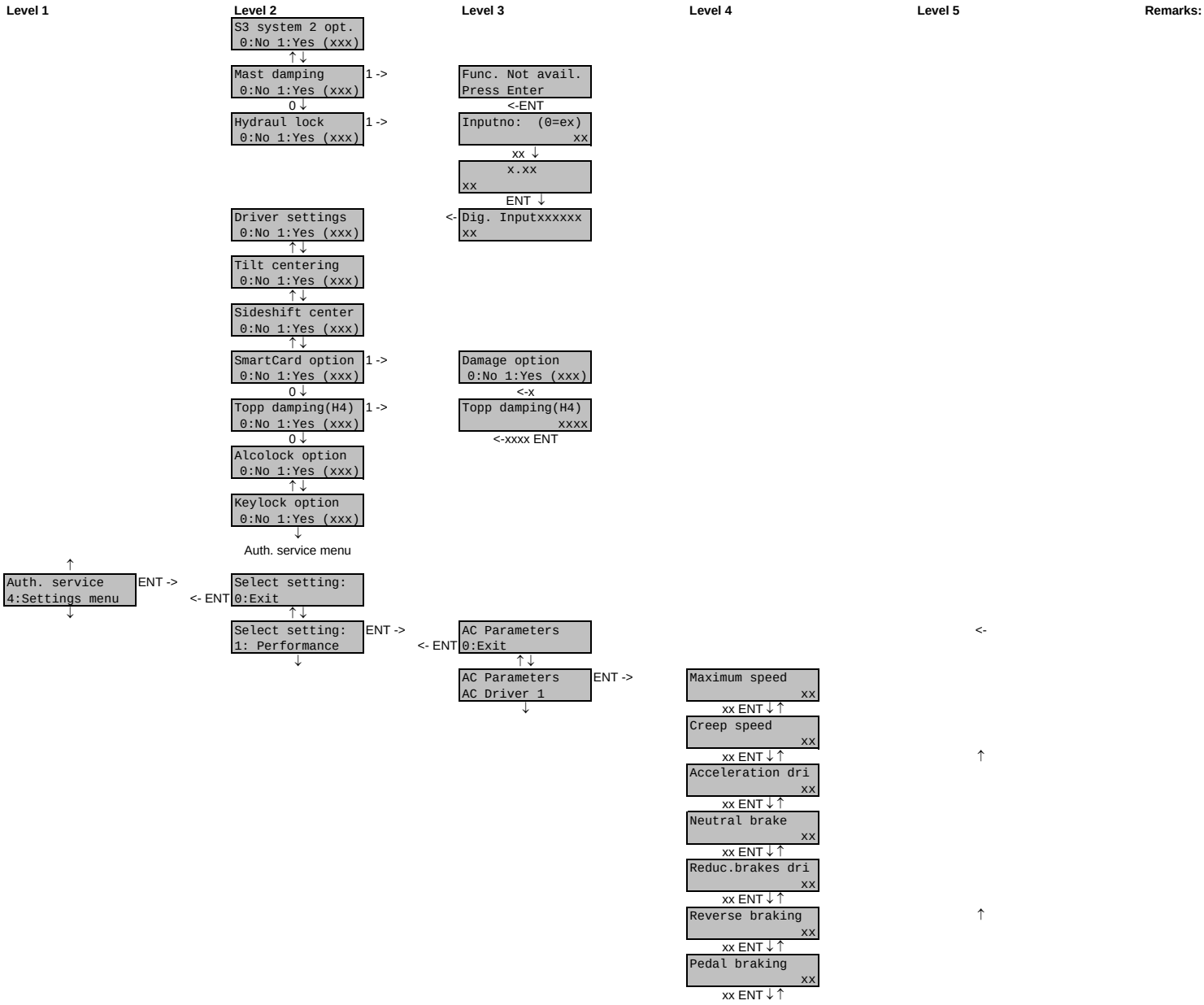
ATLET service



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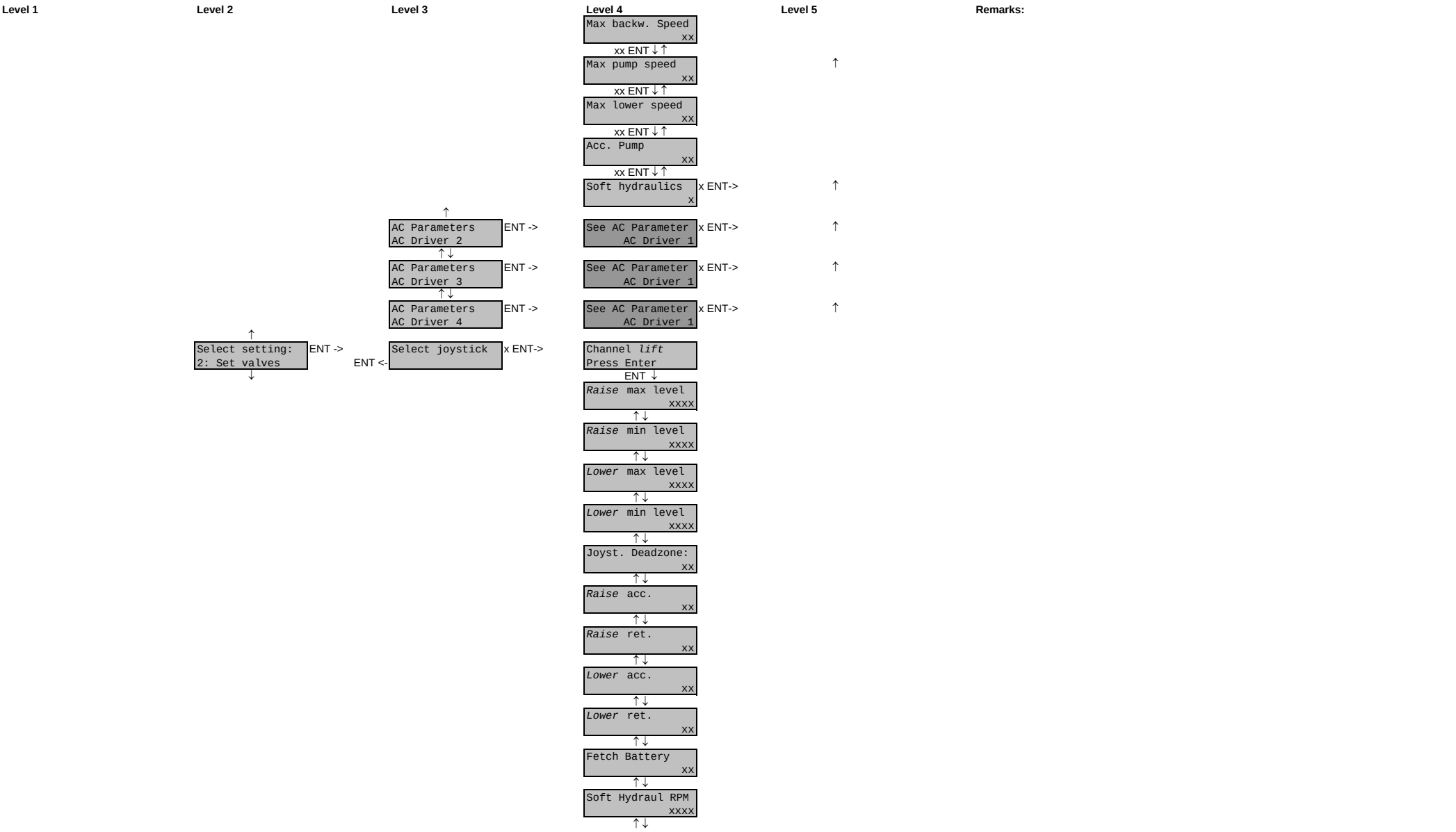
ATLET service



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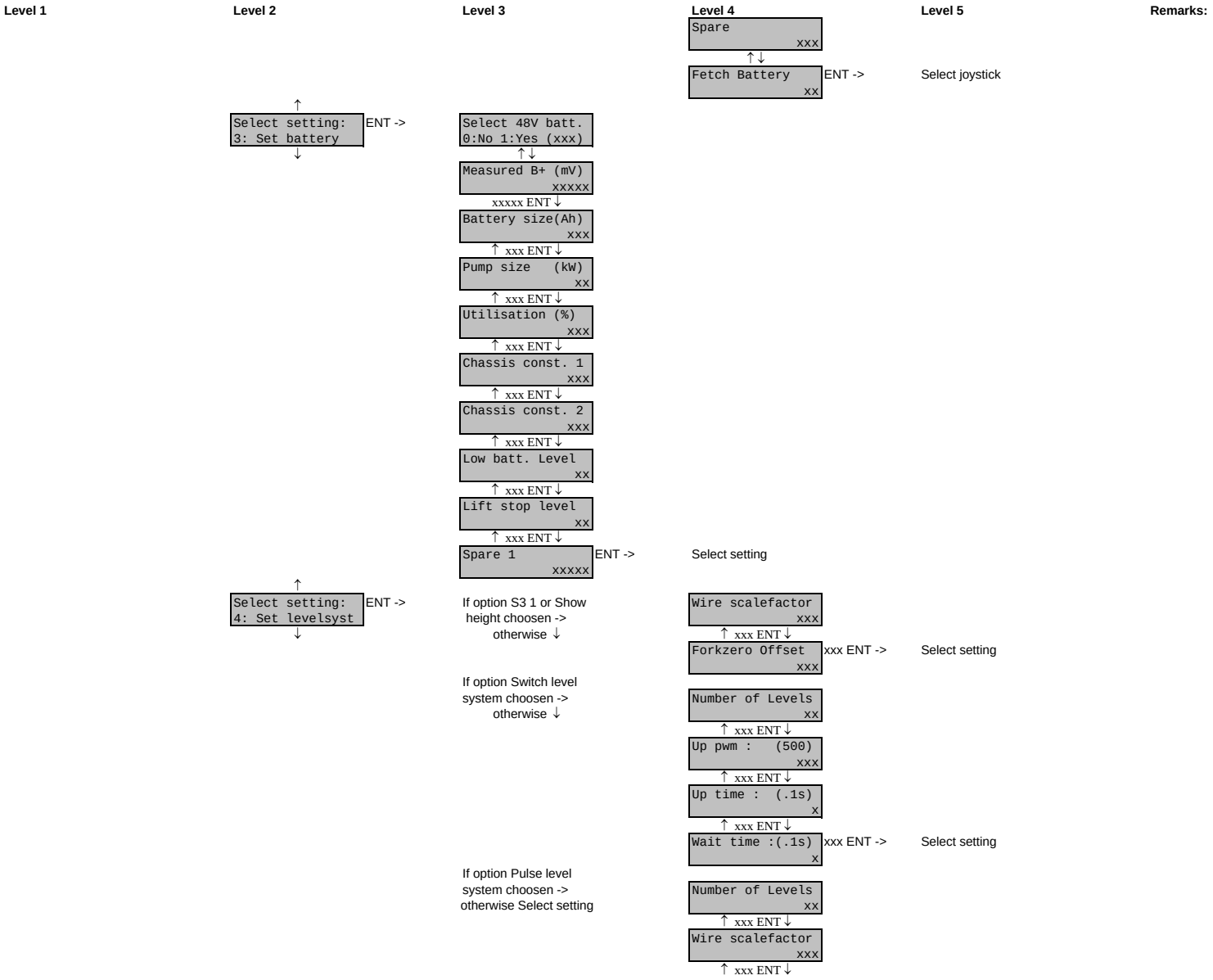
ATLET service



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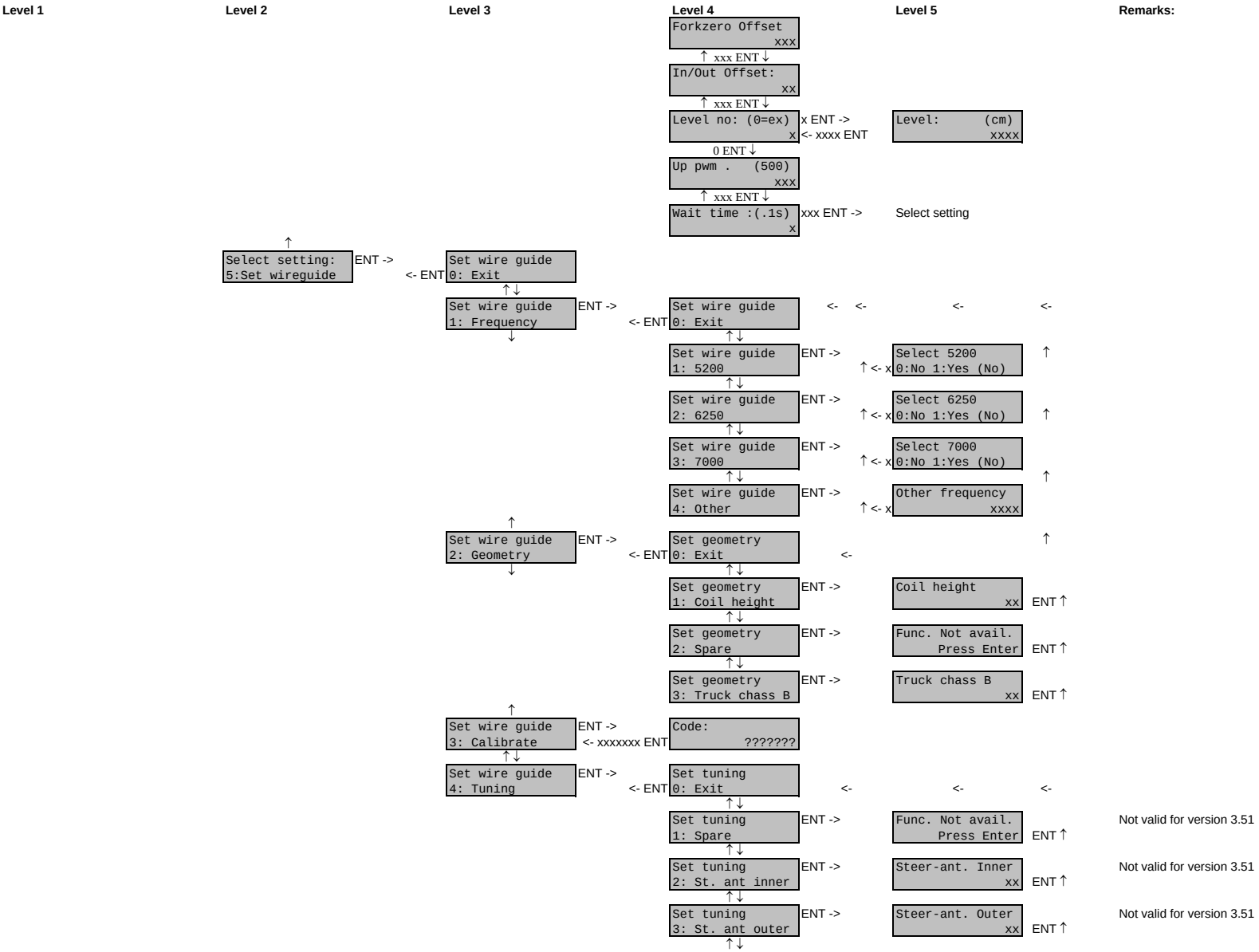
ATLET service



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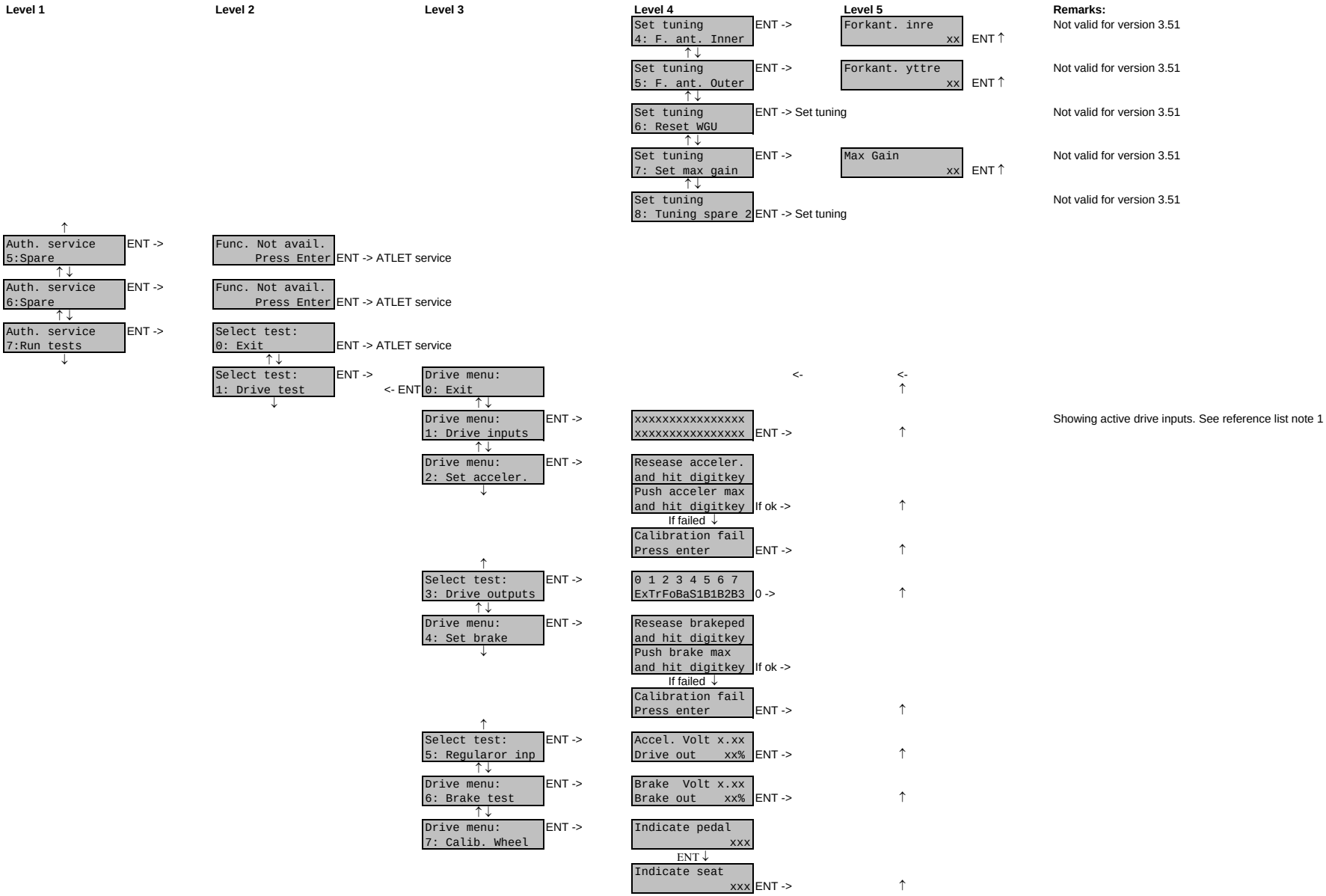
ATLET service



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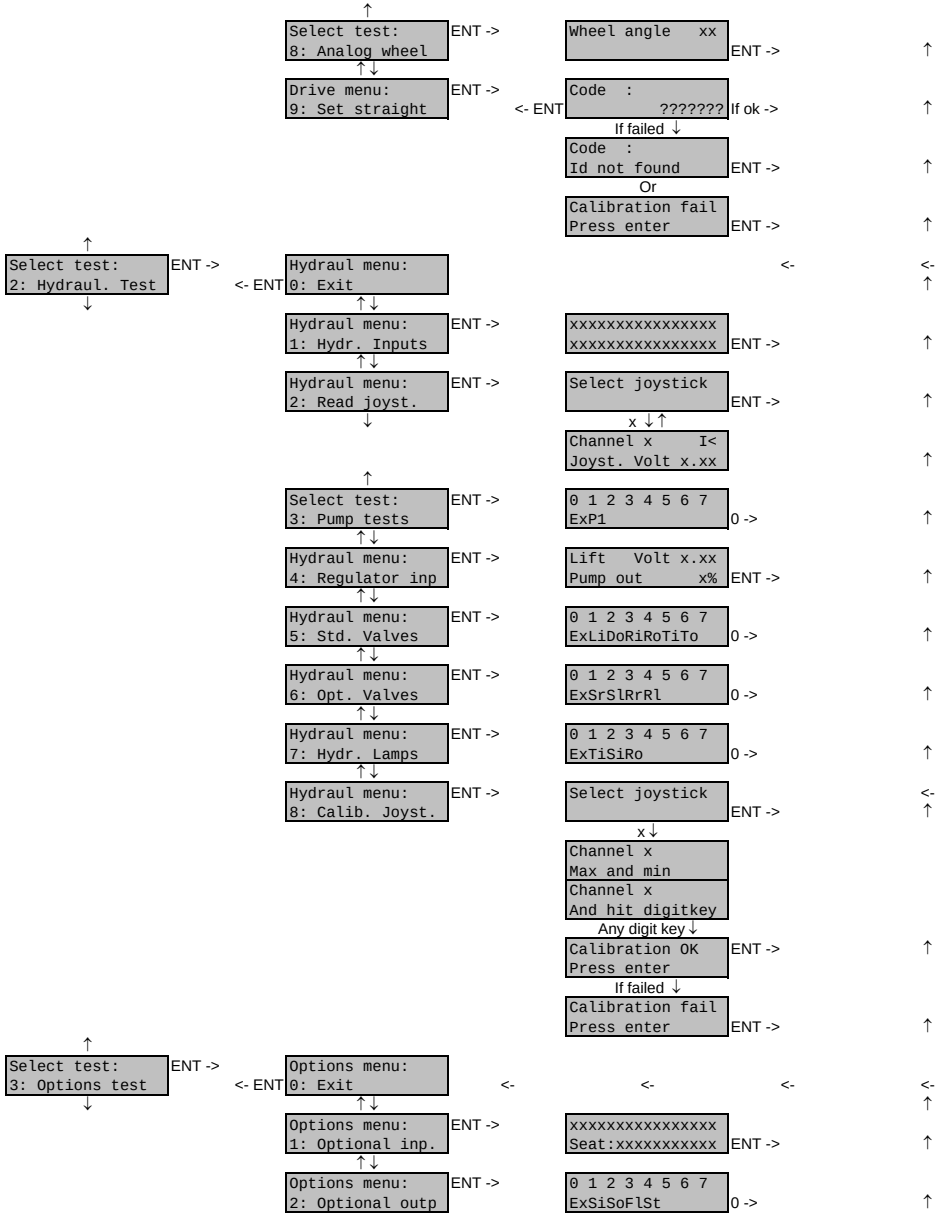
ATLET service

Level 1	Level 2	Level 3	Level 4	Level 5	Remarks:



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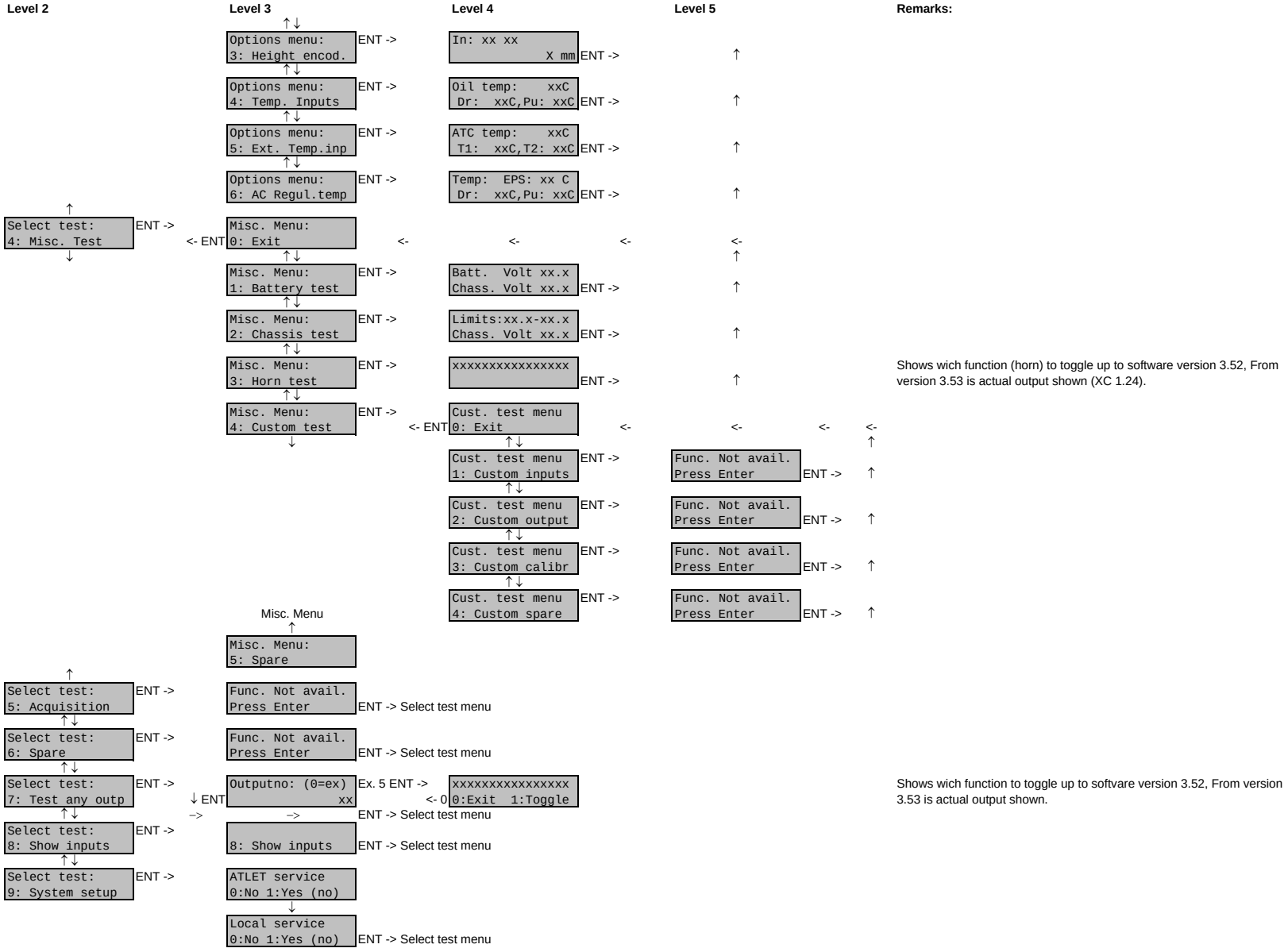
ATLET service



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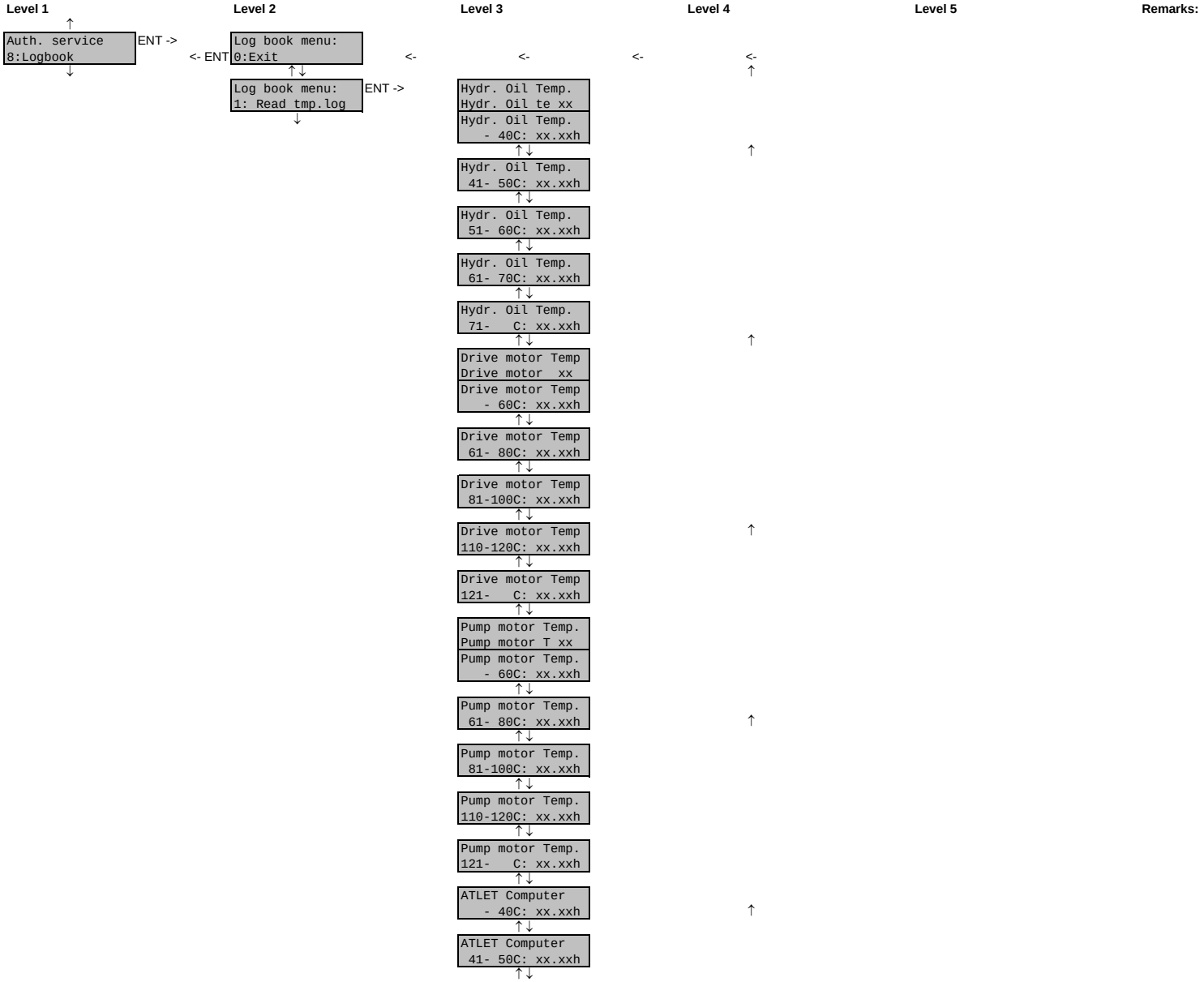
ATLET service



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ATLET service

Level 1	Level 2	Level 3	Level 4	Level 5	Remarks:
		ATLET Computer 51- 60C: xx.xxh			
		ATLET Computer 61- 70C: xx.xxh			
		ATLET Computer 71- C: xx.xxh	↑		
		Extra 1 Temp. Extra 1 Temp xxx			
		Extra 1 Temp. - 40C: xx.xxh			
		Extra 1 Temp. 41- 50C: xx.xxh			
		Extra 1 Temp. 51- 60C: xx.xxh	↑		
		Extra 1 Temp. 61- 70C: xx.xxh			
		Extra 1 Temp. 71- C: xx.xxh			
		Extra 2 Temp. Extra 2 Temp xxx			
		Extra 2 Temp. - 60C: xx.xxh			
		Extra 2 Temp. 61- 80C: xx.xxh	↑		
		Extra 2 Temp. 81-100C: xx.xxh			
		Extra 2 Temp. 110-120C: xx.xxh			
		Extra 2 Temp. 121- C: xx.xxh			
		Dr regul. Temp. - 40C: xx.xxh	↑		
		Dr regul. Temp. 41- 50C: xx.xxh			
		Dr regul. Temp. 51- 60C: xx.xxh			
		Dr regul. Temp. 61- 70C: xx.xxh			
		Dr regul. Temp. 71- C: xx.xxh	↑		
		Pu regul. Temp. - 40C: xx.xxh			

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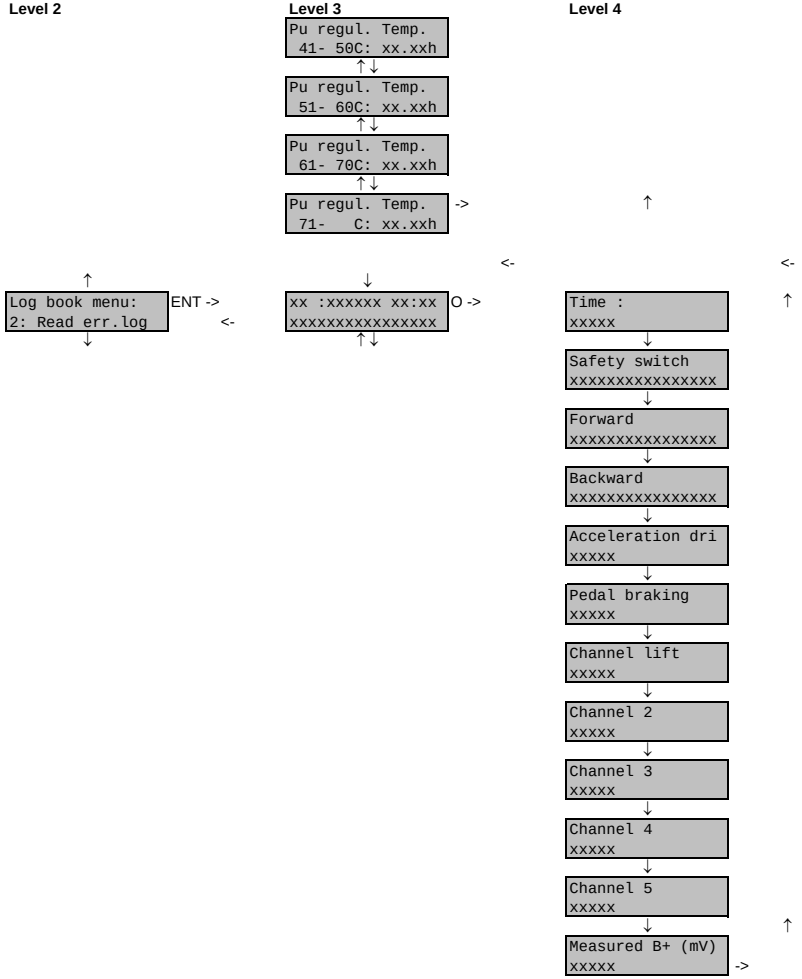
ATLET service

Level 1	Level 2	Level 3	Level 4	Level 5	Remarks:


Pu regul. Temp.
41- 50C: xx.xxh
Pu regul. Temp.
51- 60C: xx.xxh
Pu regul. Temp.
61- 70C: xx.xxh
Pu regul. Temp.
71- C: xx.xxh
->
<-
<-
Log book menu:
2: Read err.log
ENT ->
<-
xx :xxxxxx xx:xx
xxxxxxxxxxxxxxxx
O ->
Time :
xxxxx
Safety switch
xxxxxxxxxxxxxxx
Forward
xxxxxxxxxxxxxxx
Backward
xxxxxxxxxxxxxxx
Acceleration dri
xxxxx
Pedal braking
xxxxx
Channel lift
xxxxx
Channel 2
xxxxx
Channel 3
xxxxx
Channel 4
xxxxx
Channel 5
xxxxx
Measured B+ (mV)
xxxxx
->
->
->

ATLET service

Level 1	Level 2	Level 3	Level 4	Level 5	Remarks:
		xx :xxxxxx xx:xx xxxxxxxxxxxxxxx			
		↑↓			
		xx :xxxxxx xx:xx xxxxxxxxxxxxxxx			
	↑				
	Log book menu: 3: Read service	ENT ->	Func. Not avail. Press Enter	ENT -> Log book menu	
	↑↓				
	Log book menu: 4: Sign service	ENT ->	Func. Not avail. Press Enter	ENT -> Log book menu	
	↑↓				
	Log book menu: 5: Reset service	ENT -> Log book menu			
	↑↓				
	Log book menu: 6: Reset tmp.log	ENT -> Log book menu			
	↑↓				
	Log book menu: 7: Reset err.log	ENT -> Log book menu			
	↑↓				
	Log book menu: 8: NVR upload	ENT ->	Func. Not avail. Press Enter	ENT -> Log book menu	
↑					
Auth. service 9:Set all def.	ENT ->	Are you sure ? 0:No 1:Yes (xxx)	ENT -> ATLET service		

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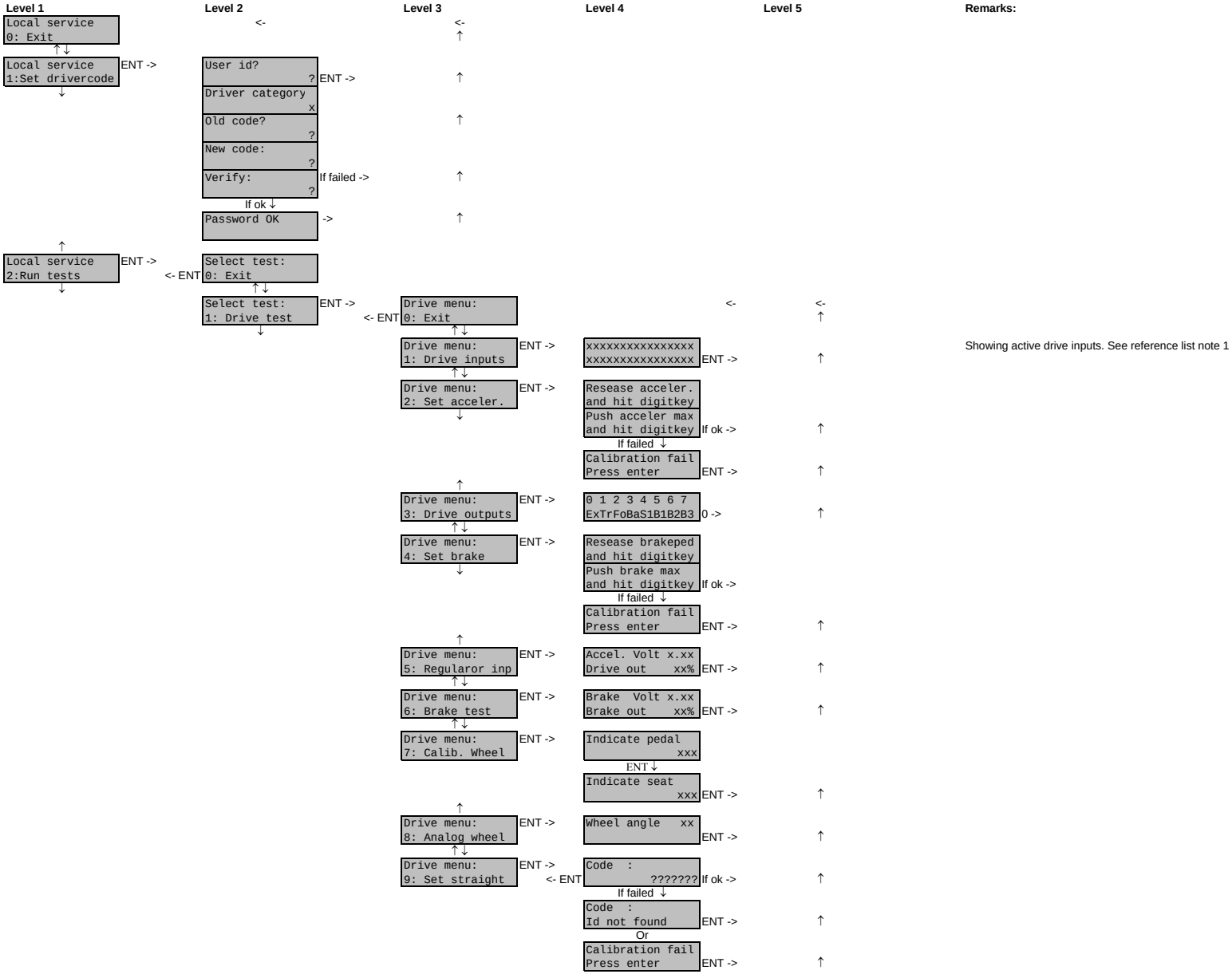
Local service



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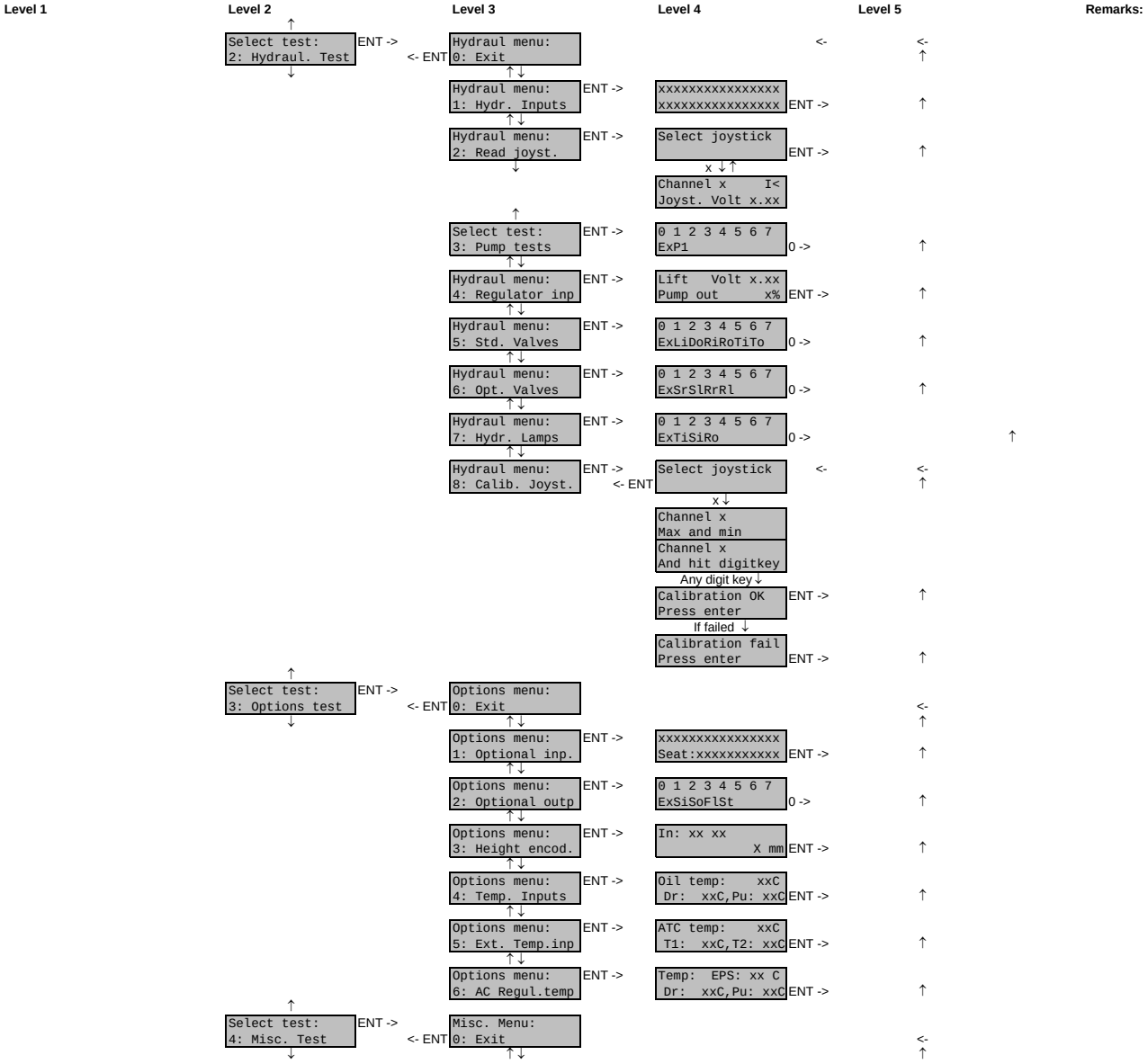
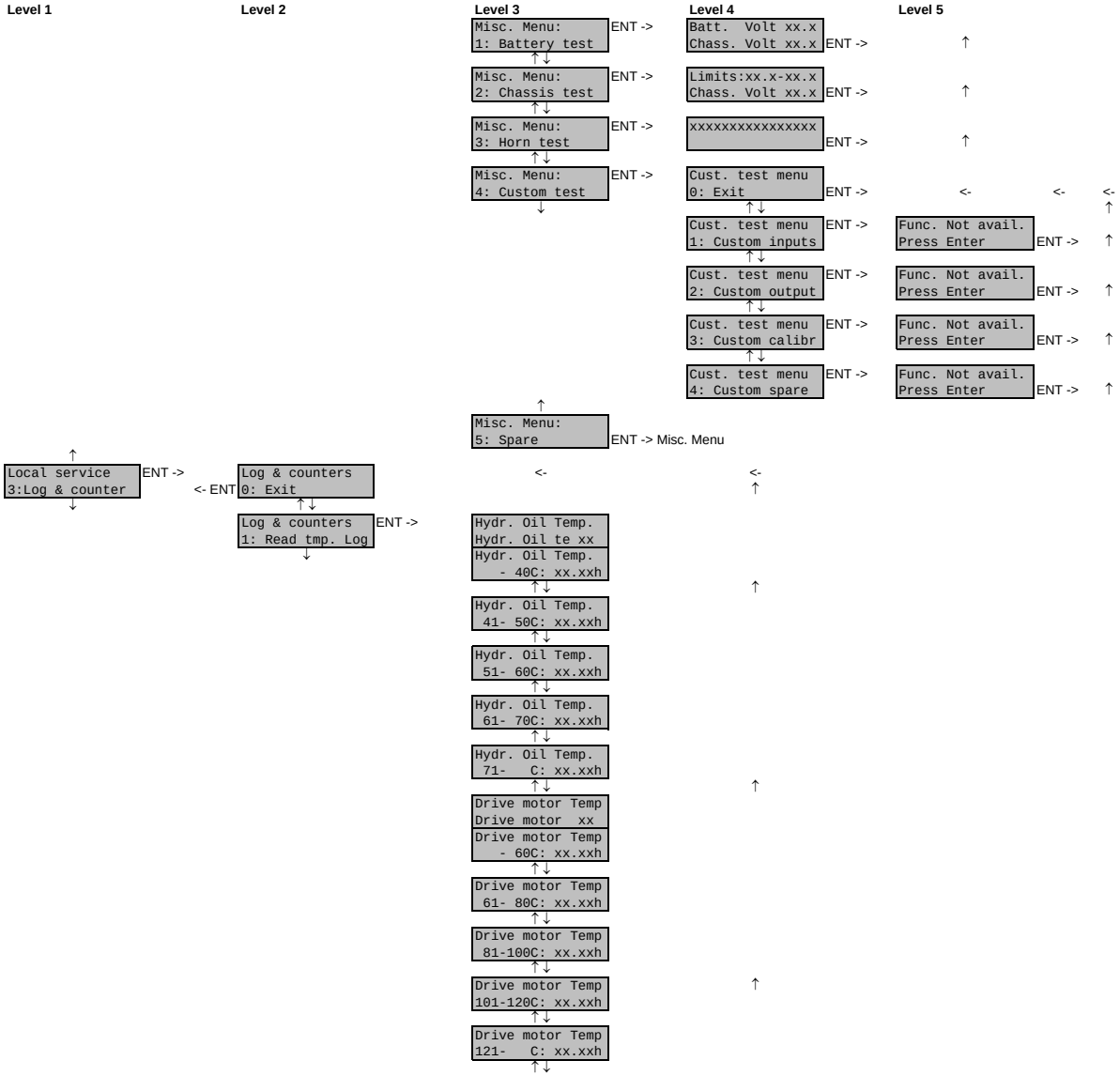
Local service



https://www.forkliftpdfmanuals.com/

Local service



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Local service

Level 1	Level 2	Level 3	Level 4	Level 5	Remarks:
		Pump motor Temp. Pump motor T xx			
		Pump motor Temp. - 60C: xx.xxh			
		Pump motor Temp. 61- 80C: xx.xxh	↑		
		Pump motor Temp. 81-100C: xx.xxh			
		Pump motor Temp. 110-120C: xx.xxh			
		Pump motor Temp. 121- C: xx.xxh			
		Truck Computer - 40C: xx.xxh	↑		
		Truck Computer 41- 50C: xx.xxh			
		Truck Computer 51- 60C: xx.xxh			
		Truck Computer 61- 70C: xx.xxh			
		Truck Computer 71- C: xx.xxh	↑		
		Extra 1 Temp. Extra 1 Temp xxx			
		Extra 1 Temp. - 40C: xx.xxh			
		Extra 1 Temp. 41- 50C: xx.xxh			
		Extra 1 Temp. 51- 60C: xx.xxh	↑		
		Extra 1 Temp. 61- 70C: xx.xxh			
		Extra 1 Temp. 71- C: xx.xxh			
		Extra 2 Temp. Extra 2 Temp xxx			
		Extra 2 Temp. - 60C: xx.xxh			
		Extra 2 Temp. 61- 80C: xx.xxh	↑		
		Extra 2 Temp. 81-100C: xx.xxh			
		Extra 2 Temp. 101-120C: xx.xxh			
		Extra 2 Temp. 121- C: xx.xxh			

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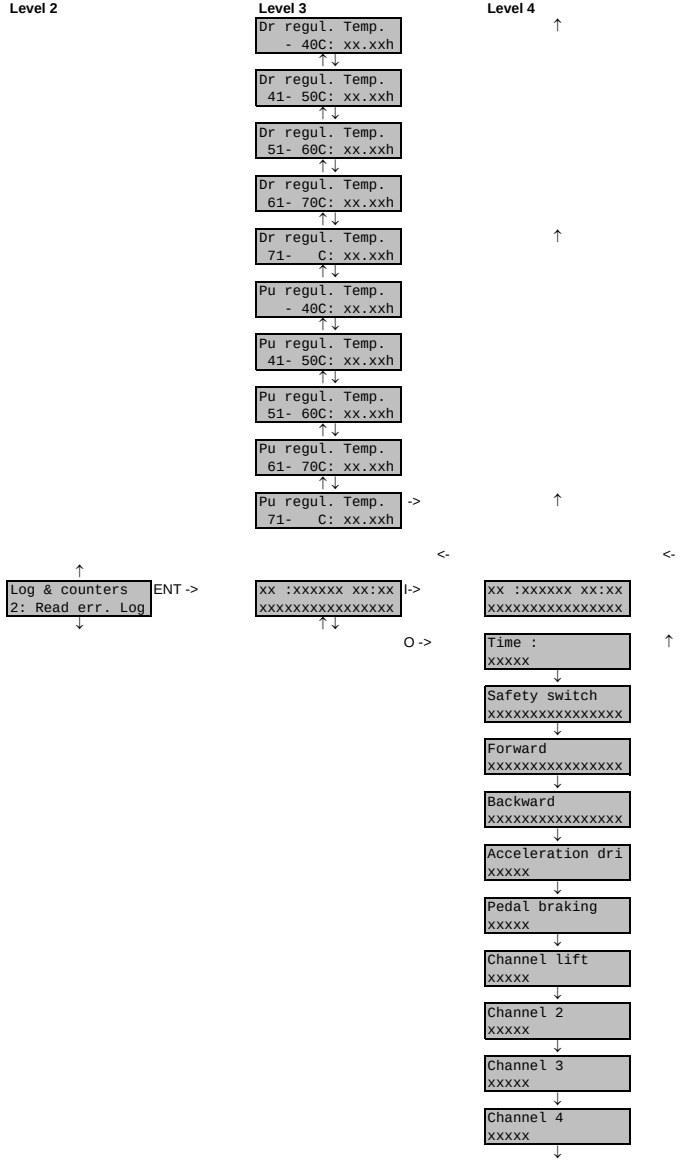
Local service

Level 1	Level 2	Level 3	Level 4	Level 5	Remarks:



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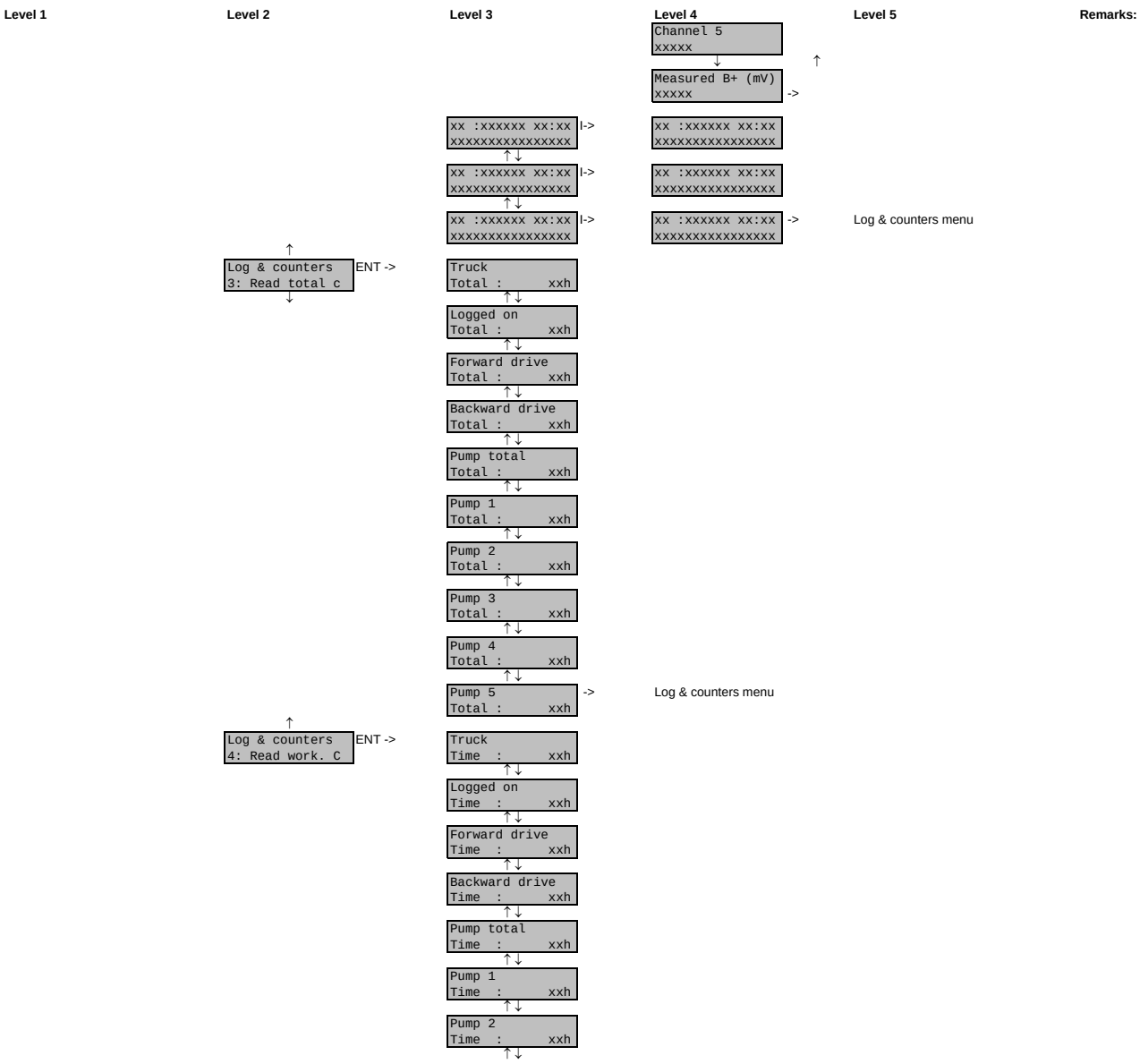
Local service



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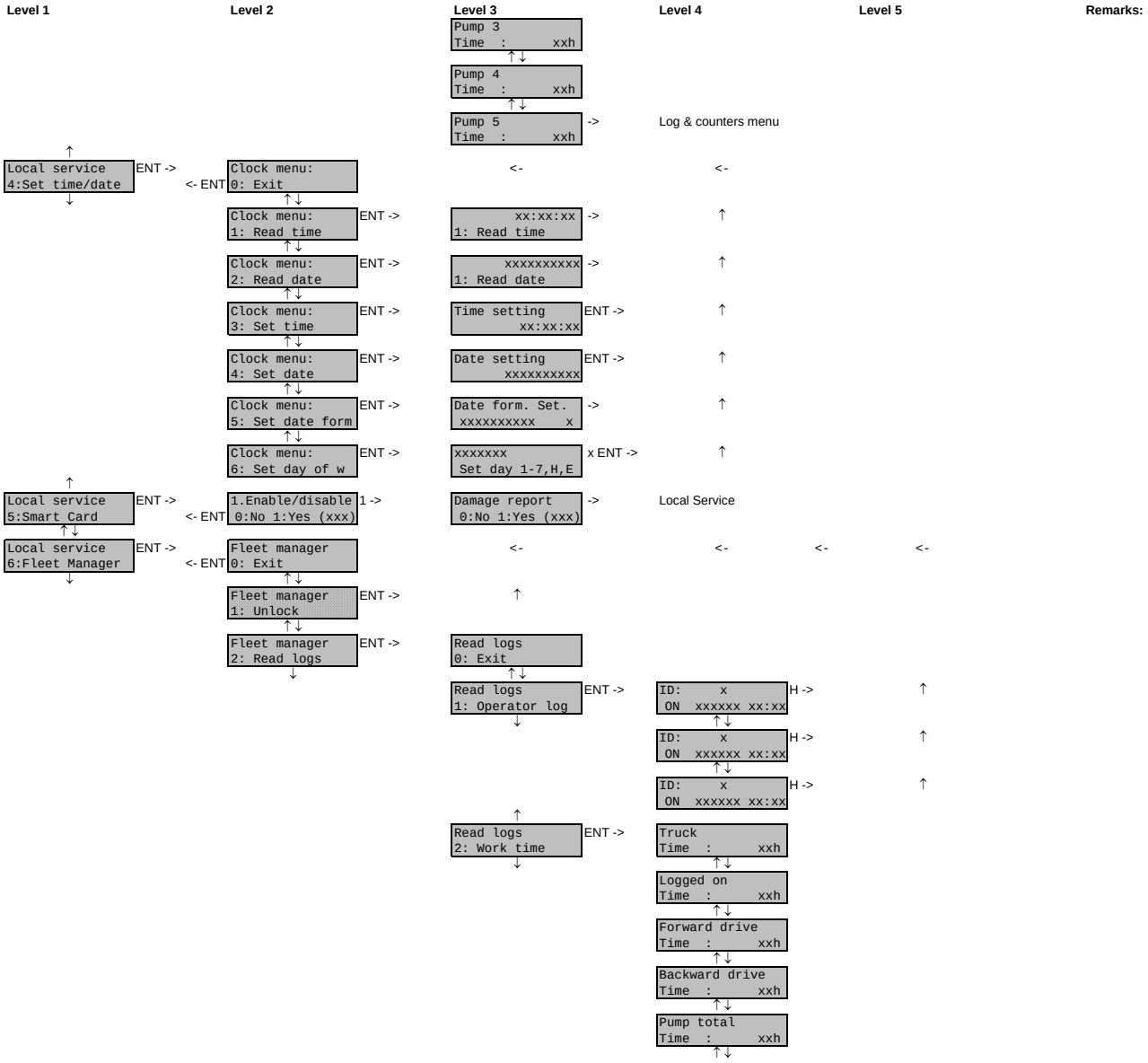
Local service



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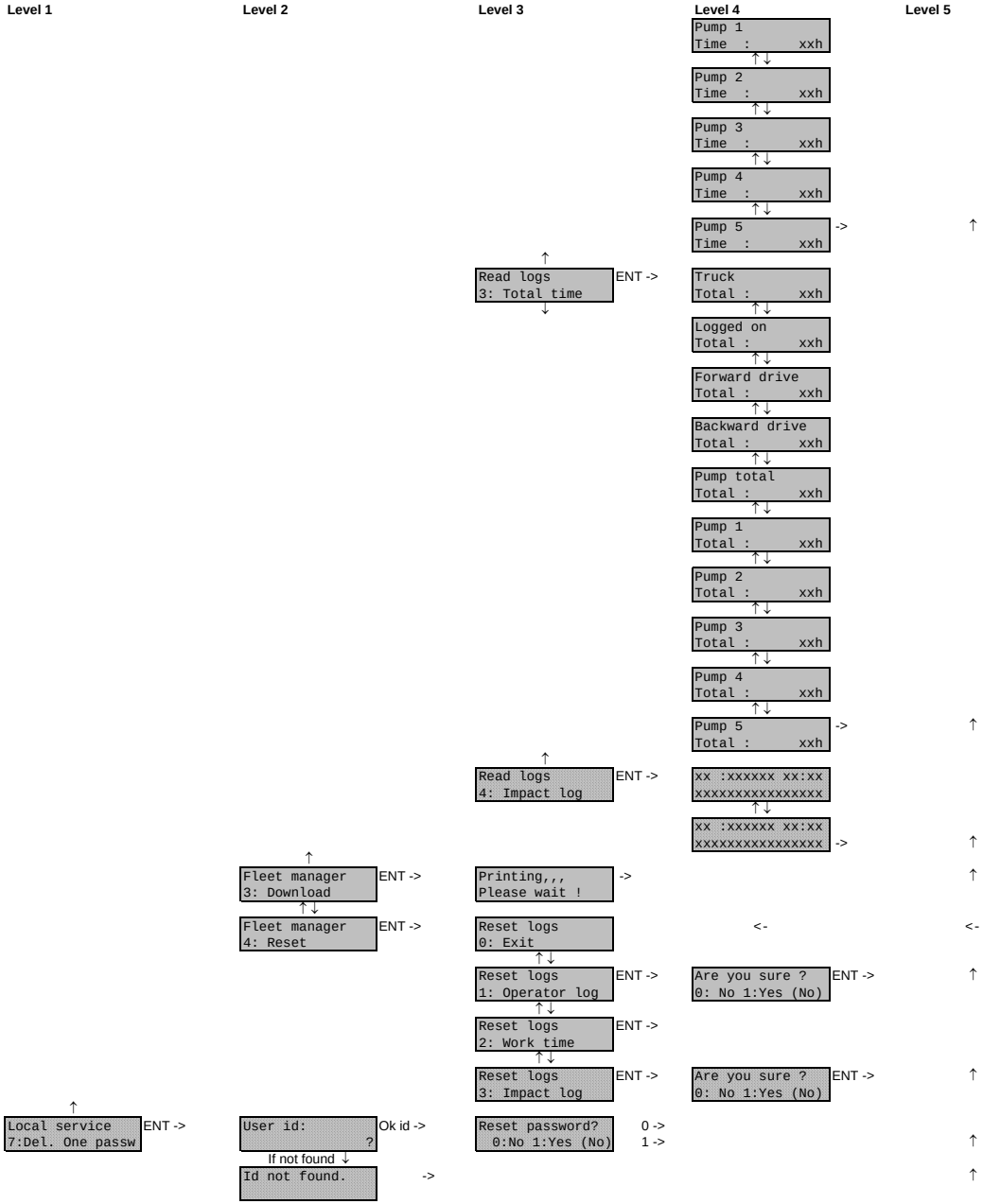
Local service



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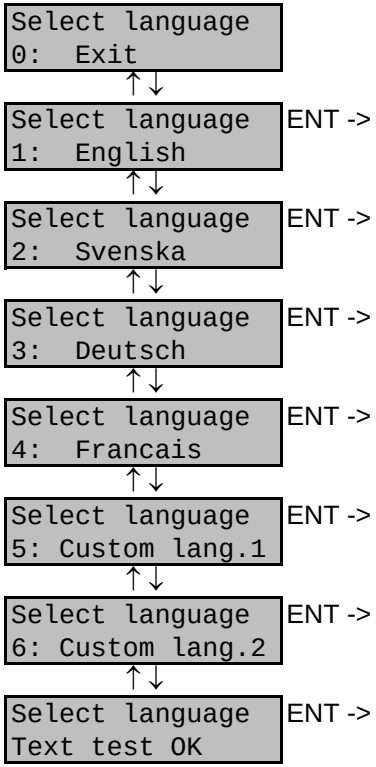
Set language

Level 1



Remarks:

See the instruction handbook for nore info

Spanish language implemented as a custom language since version 3.70/3.65

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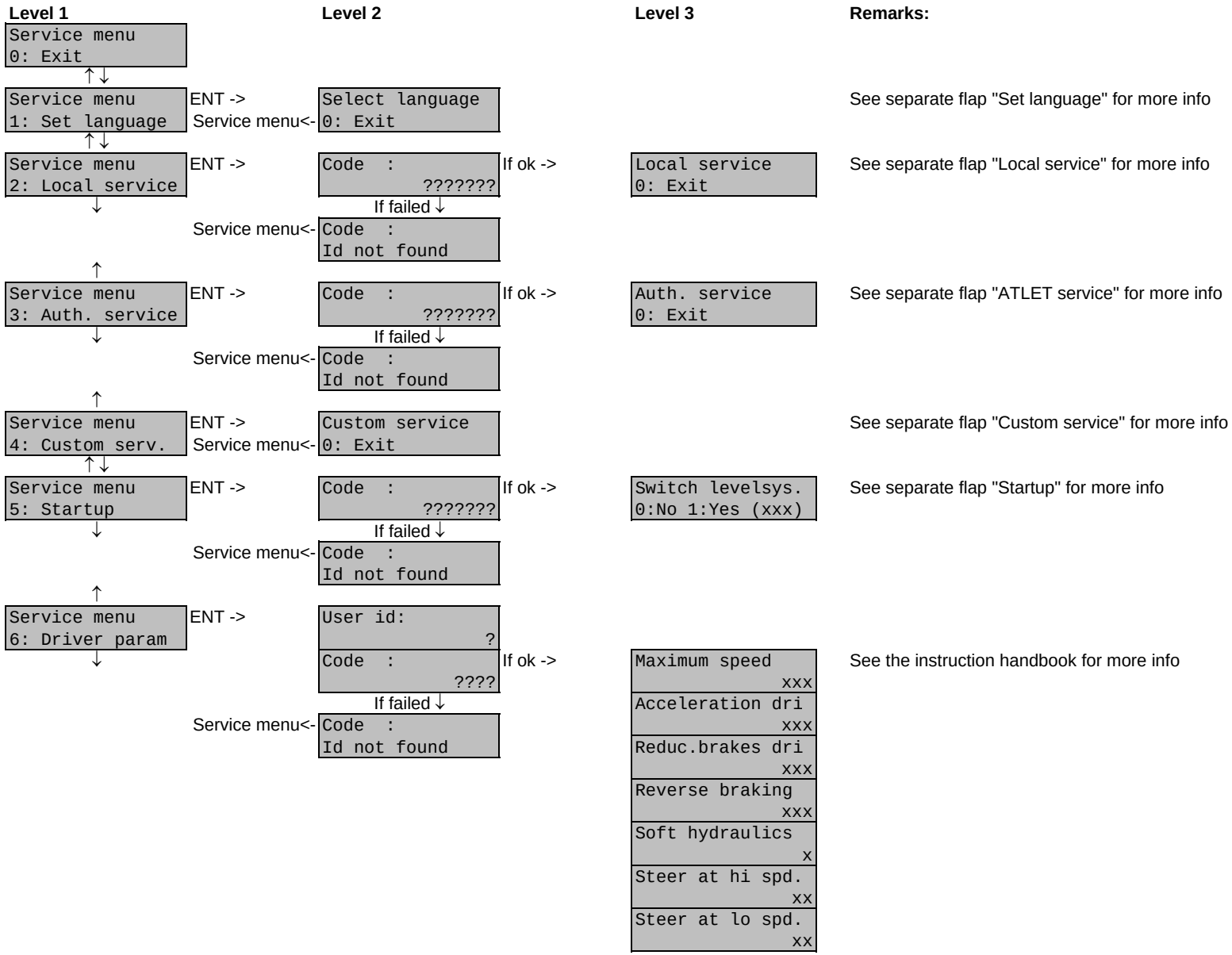
Service menu



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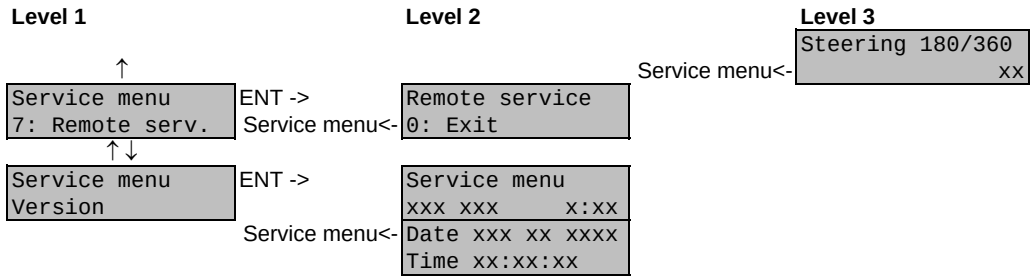
Service menu



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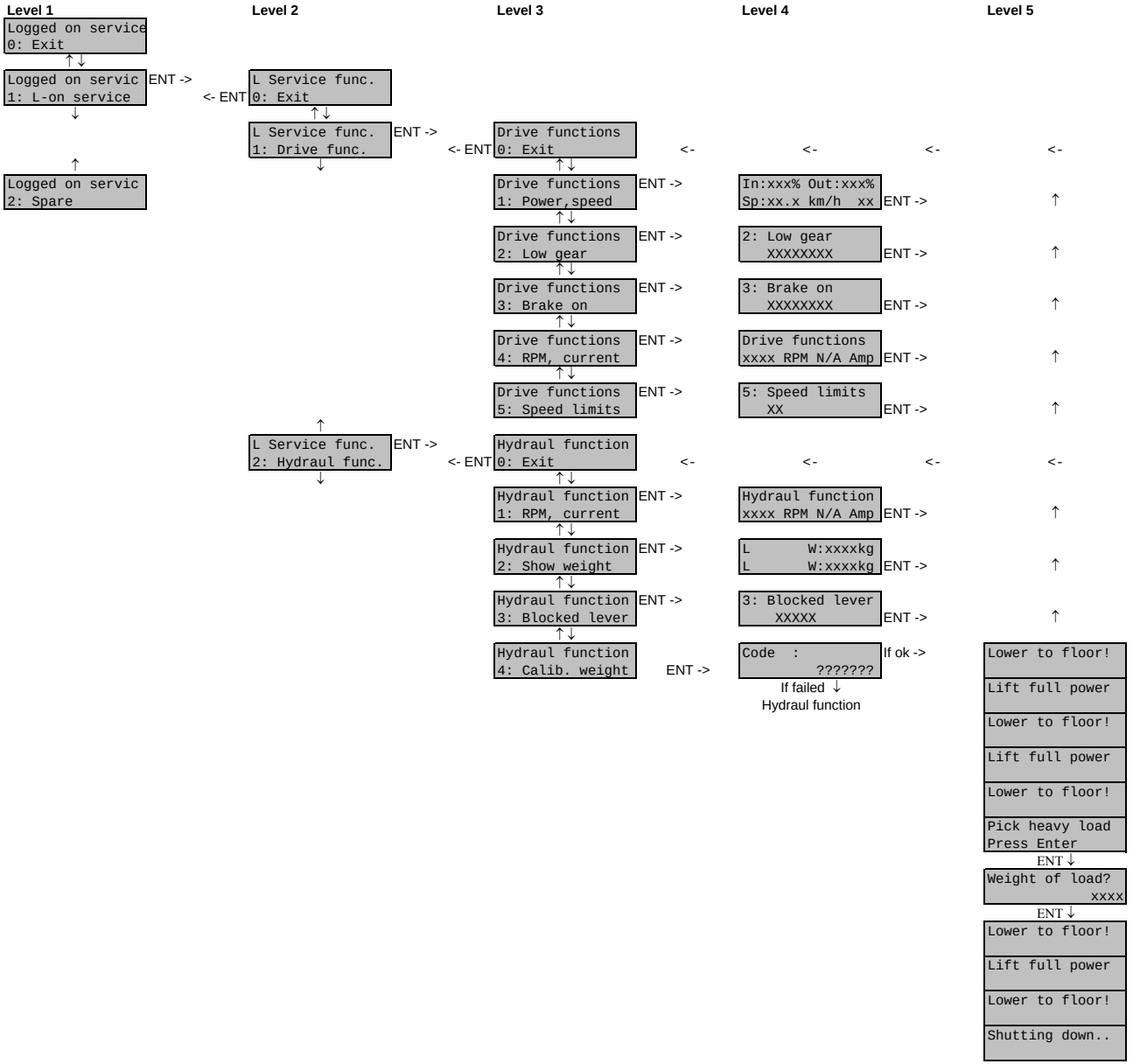
Logged on serice



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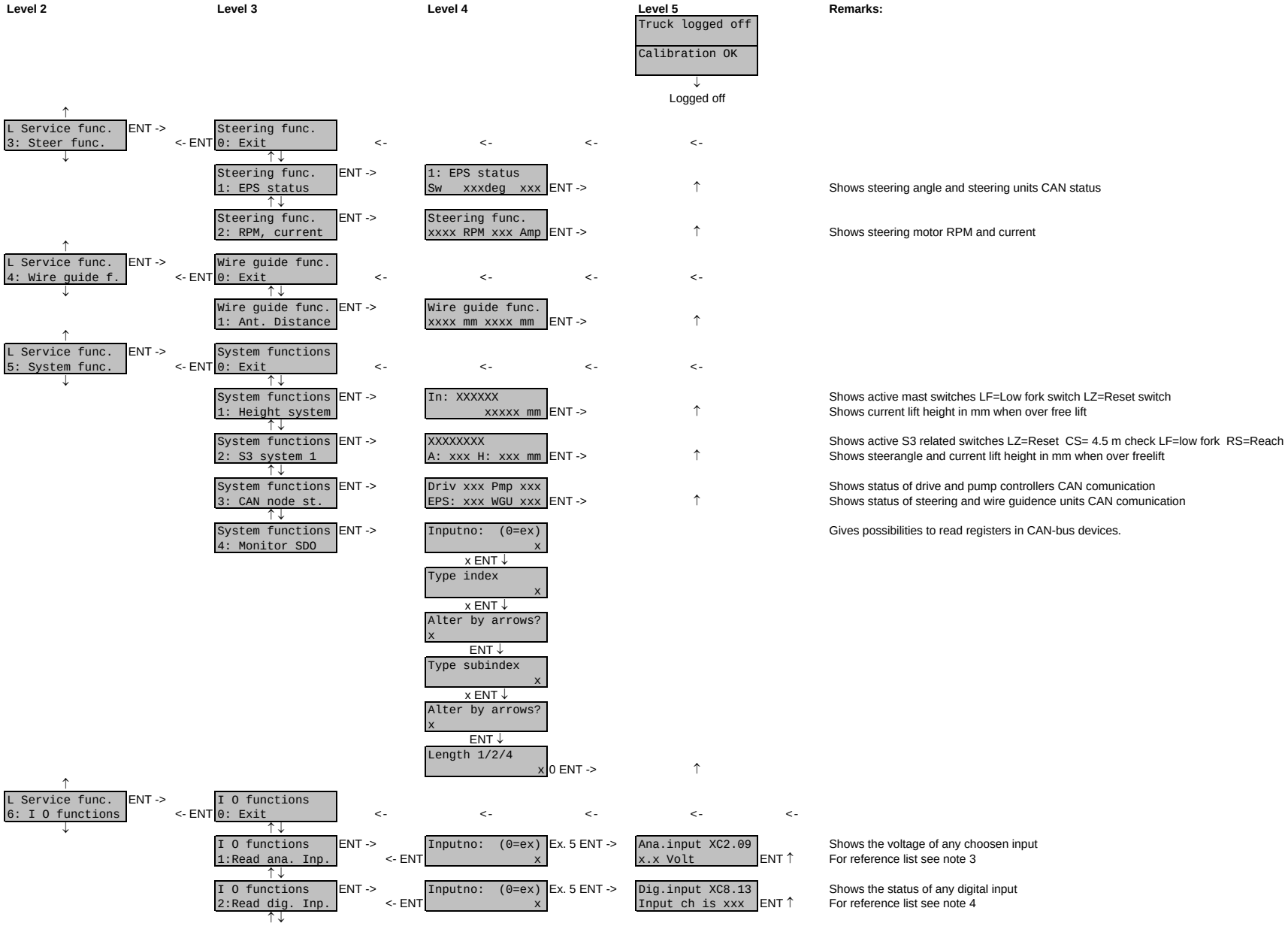
Logged on serice



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Logged on serice

Level 1	Level 2	Level 3		Level 4		Level 5		Remarks:
		I O functions	ENT ->	Inputno: (0=ex)	Ex. 5 ENT ->	XC 3.22		Shows the status of any digital output
		3:Read dig. Outp	<- ENT	x		Output is xxx	ENT ↑	For reference list see note 5
	↑							
	L Service func.	Misc functions						
	7: Misc func.	0: Exit	<-	<-	<-	<-		
		↑↓						
		Misc functions	ENT ->	Batt. Volt xx.x				Shows battery voltage.
		1: Battery test		Chass. Volt xx.x	ENT ->	↑		Shows the chassis voltage
		↑↓						
		Misc functions	ENT ->	Limits:xx.x-xx.x				Shows the chassis voltage limits in volts
		2: Chassis test		Chass. Volt xx.x	ENT ->	↑		Shows the chassisvoltage
		↑↓						
		Misc functions						
		Spare	ENT ->			↑		
		↑↓						
		Misc functions	ENT ->	Oil temp: xxxC				Shows the oil temperature
		4: Temp. Inputs		Dr: xxxC,Pu:xxxC	ENT ->	↑		Shows the drive and pump motor temperature
		↑↓						
		Misc functions	ENT ->	ATC temp: xxxC				Shows the ATC temerature
		5: Ext. Temp.inp		T!: xxxC,T2:xxxC	ENT ->	↑		Shows extra temp 1 and 2
		↑↓						
		Misc functions	ENT ->	Temp: EPS:xxxC				Shows steering unit temperature
		6: AC Regul.temp		Dr: xxxC,Pu:xxxC	ENT ->	↑		Shows the drive and pump motor controllers temperature

Notes

1

The lower row of the display shows first the speed input in % after that there is a number if there is any contitions which limits that.
1 Low gear selected from keypad.
2 Internal stop from drive? Logic.
3 In aisle, forks not at home or low fork switch
4 Emergency low speed ordered by ?
5 Reach out creep speed option activated.
5 Steering wheel outside straight window in aisle, only URF.
6 Speed reduction option activated.
7 Low speed ordered by WGU..
8 Low speed ordered by WGU in calibration mode.
9 Forks not in home position, only URF.

2

The lower row of the display shows first the brake output in % after that there is a number if there is any other conditions which comands brake
1 Safety switch is not activated.
2 Stop ordered from CAN communication or drive controller.
3 No direction selected.
4 Parking brake ordered by drive program. Pedal pressed deeply.
5 Brake sensor err
6 Brake command from EPS.
7 Brake command from WGU.
8 E95 (CAN hardware) demends parkingbrake.
9 EPS is powered down because of Off/Log off.

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Logged on serice

Level 1	Level 2	Level 3	Level 4	Level 5	Remarks:

3 Reference table for channel numbers used to test analog inputs

Channel number	XC-contact
1	9:5
2	9:6
3	1:08, 4:08
4	1:19, 4:20
5	2:09
6	2:16
7	2:19
8	7:18
9	Int. temp
10	9:08
11	7:01
12	7:02
13	7:03
14	7:04
15	7:05
16	7:06
17	7:07

4 Reference table for channel numbers used to test digital inputs

Channel number	XC-contact	Channel number	XC-contact
1	1:01, 4:03	22	8:05
2	1:02, 4:04	23	8:06
3	1:03, 6:02	24	8:07
4	1:04, 6:01	25	8:08
5	8:13	26	6:09
6	8:14	27	6:10
7	2:01	28	8:11, 6:11
8	2:02	29	8:12, 6:12
9	2:03	30	9:11
10	2:04	31	2:23
11	4:12	32	6:04
12	2:06	33	6:05
13	4:01	34	6:13
14	4:02	35	6:14
15	4:05	36	9:09
16	4:06	37	1:05
17	9:10	38	1:06
18	8:01	39	8:09
19	8:02	40	8:10
20	8:03	41	4:15
21	8:04	42	4:16

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Logged on serice

Level 1	Level 2	Level 3	Level 4	Level 5	Remarks:

5 Reference table used for channel numbers used to test digital outputs

Channel number	XC-contact	Channel number	XC-contact
1	2:11	25	3:04
2	3:21	26	5:08
3	1:21	27	5:09
4	6:24	28	5:10
5	3:22	29	5:11
6	1:22	30	5:12
7	3:08	31	3:10
8	No output	32	3:11
9	8:23	33	1:23
10	6:23	34	1:24
11	4:23	35	3:01
12	5:03	36	3:06
13	5:04	37	Led 0
14	2:22	38	Led 1
15	3:05	39	Led 2
16	8:22	40	No output
17	3:03	41	3:06
18	3:02	42	3:05
19	2:21	43	6:23
20	5:01	44	6:24
21	5:02	45	6:23
22	5:05	46	6:24
23	5:06	47	2:22
24	5:07		

6 The lower row of the display shows first the speed input in % after that there is a number if there is any contitions which limits that.
1 Drive speed factor.
2 Back speed factor.
3 WGU machine speed limit.
4 Low forks low weight or no S3:2
5 Low forks high weight S3
6 Reach out high weight S3
7 Reach out low weight S3
8 Reach in high weight S3
9 Height speed S3

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