PowerBoss®
The Power of Clean

Service Manual
Admiral 40
Rider Sweeper / Scrubber

PowerBoss, Inc.
A Member Of The Hako Group

PB# 4100020SM Rev.* 09/10

1 Introduction

This document is intended for authorized PowerBoss repair personnel and provides specific instructions for the Admiral 40 unit. The user of this manual should have prior knowledge in unit operation and assemblies before attempting repairs. Refer to the User manual and Parts Catalog for this unit.

This document is structured so as to allow and seek continuous extension. You thus receive the documents with the annotation that more or revised pages are to follow in future.

This decision has been taken to allow adding modifications made to the machine equally to the documents as revisions.

Beyond that this document may be improved upon your advice and proposals. We would thus be grateful to receiving your feedback.

2 Safety Information

2.1 Important Safety Instructions

Service persons must read and understand the operation of this unit, refer to the User Manual before operating or maintaining this machine.

Do not operate this machine in flammable or explosive areas.

This machine is designed solely for removing dirt, dust and debris in an outdoor or indoor environment. PowerBoss does not recommend using this machine in any other capacity.

The following information below may cause a potential hazard to the operator and equipment. Read the User manual carefully and be aware when these conditions can exist. Take necessary steps to locate all safety devices on the machine understand there function.

2.2 For Safety when Servicing or Maintaining Machine

Stop on level surface.

Disconnect the power to the machine when servicing.

Avoid moving parts. Do not wear loose jackets, shirts, or sleeves when working on machine.

Avoid contact with battery acid. Battery acid can cause burns. When working on or around batteries, wear protective clothing and safety glasses. Remove metal jewelry. Do not lay tools or metal objects on top of battery.

Authorized personnel must perform repairs and maintenance. Use PowerBoss supplied replacement parts.

2.3 Safety Symbols

Five symbols are used throughout this manual to emphasize various levels of safety information. These symbols and the meaning of each are listed below.

⚠ DANGER
To warn of immediate hazards which will result in severe personal injury or death

⚠ WARNING
To warn of hazards or unsafe practices which could result in severe personal injury or death.

⚠ CAUTION
To warn of hazards or unsafe practices which could result in minor personal injury.

ATTENTION!
To warn of practices which could result in extensive equipment damage.

2.4 Before Servicing the Machine

DANGER

Before working at the machine, disconnect voltage supply (pull battery plug) except for the purpose of voltage and current measurement.

CAUTION

When replacing stripe fuses, only loosen screws. Do not remove them completely - short-circuit hazard. Make sure to fully and evenly insert new blade fuses under the screws.

CAUTION

After each repair proceed to starting and service current measurement to allow detection of eventual defects.

CAUTION

When working at the machine, comply with the general safety and accident prevention regulations as provided by law.

3 General

The Admiral 40 is equipped with a service indication in the hour meter display. Upon switching the key switch ON, a 4 digit code describing the software version (e.g. 3018), is displayed for about 3 seconds, followed by another 4 digit code signalling the last error which again is followed by the hour meter indication. Upon launch of the Admiral 40, software version has updated to 4020.

As soon as a malfunction occurs, the red LED signalling a defect lights up and a warning buzzer sounds. The current error code appears (as 4 digit alpha-numeric code in the service display) with blinking dots between the digits. When all these criteria are met, the error is a current one! There is no error code, containing a “0”. Refer to “11 Error Table With Information On Service Display” to find a listing of the error codes.

This document uses the following abbreviations:

TSG - low discharge signal sender

SWA - dirty water recycling

3.1 Settings

Settings on the control electronics/panel which have to be set and checked on each machine:

In contrast to the Admiral 40, scope of performance of the Admiral 38C is reduced and does not feature all the options available in the Admiral 40. The Admiral 38C (Cylindrical Brush aggregate) has the side broom unit optionally available, while the pre-sweeper, dirty water recycling and cleaning agent dosage options are available and settable for the Admiral 40 only.

- Machine type
- TSG (low discharge signal sender - also called LDS)
- Options
- Delete display of last error after repair
- Program variants depending on the accelerator setting

Settings which may be set via operator panel according to customer requirements:

- Display of last (remedied) error upon switching machine ON

- Selection of water stage upon start of cleaning
- Cleaning agent ON in addition to switching water ON (Admiral 40 only)
- Switching over to SWA upon switching water ON (Admiral 40 only)
- Side brush additionally ON in addition to switching ON scrubbing
- Filter shaking (Admiral 40 only)
- Filter suction ON in addition to sweeping ON (Admiral 40 only)
- Automatic filter shaking after sweeping (Admiral 40 only)

Settings at Module 1:

- Dip-switch for electronic circuit-breakers

Settings at Module 3:

- Dip-switch for electronic circuit-breakers and module coding

Settings at the additional operator panels (Admiral 40 only):

- Dip-switch for operator panel coding

3.2 Brief Description

Machine control is effectuated via the following electronics:

- Control electronics
- Module 1
- Module 3 (for pre-sweeper, side broom and side brush options)
- Operator panel
- Cleaning agent dosage /SWA operator panel (optional, Admiral 40 only)
- Cleaning agent module (optional, Admiral 40 only)
- Auxiliary voltage module (36V/24V transformer)

Voltage to the electronics is supplied by the auxiliary voltage module which transforms 36 Volts to 24 Volts. As the electronics are the same as other integrated machines, the 24V electronics have to be transformed for use in the Admiral 40 and Admiral 38C machines. Components such as the motors and pumps, however, are still 36V components.

The 24V voltage supply must not, even under load, fall below 23V since otherwise, supply of the modules 1 and 3 would be insufficient and cause a CAN error (4000 error code).

The control electronics covers all control and monitoring functions in the machine except for drive control.

Operation of drive controller is independent from the other electronics and only the release signal

and the signal for speed reduction are transmitted via control electronics to drive controller. Beyond that, a signal is transmitted from drive controller to control electronics for forward and reverse ride.

Upon occurrence of a defect on the drive controller, an error code is not output since this controller has its own diagnostic indicator (see “10 Drive Controller”).

The buttons for scrubbing, suction, scrubbing and suction and the green Hako button for combined cleaning may be switched arbitrarily such that the selected function is activated. Pre-sweeper/side broom and /or side brush function can be activated or de-activated disregarding of the selected cleaning mode, if present in the machine.

The remaining functional buttons (water, brush ground pressure) allow activating or de-activating the related functions in addition to the cleaning procedure without effect on the running function.

The machine is equipped with a seat switch. Activation of this switch is required before switching key switch on since otherwise sweeping and scrubbing functions (even in combination) are locked. If the seat switch is not activated, suction can only be activated for the „Hand suction hose“ option.

Constant activation of the seat switch is also required. Leaving the seat while key switch is ON causes locking of the functions.

It is equally required to release parking brake to enable cleaning functions and drive control is released.

3.2.1 Switch Off Suction / Recovery Tank Filled Up

The suction function is either stopped by the operator via button actuation or automatically upon the „recovery tank filled up“ signal.

Switching off by operator:

- Squeegee is lifted up
- Suction motors switch off delayed (15 seconds)

Switching off after tank filled up:

- The switch signalling „recovery tank filled up“ opens as soon as the tank is filled
- If switch is open for 3 seconds or longer (spill protection) squeegee will be lifted and the suction motors switch off with a delay of 15 seconds.

3.2.2 Initial Position/Release, Lock Functions

When turned ON and the seat switch closed, all units of the machine are set to „initial position“.

This means that the control electronic triggers all units (lifting elements and motors). Lifting elements will be lifting up as long as they are not switched off by the micro-switch controlling the

upper limit position and integrated in the lifting element. This means that the outputs for the lifting elements are powered for approx. 6 sec every time the machine is switched on. Motors are off and the cleaning unit LED indication in the operator panel extinguishes. The drive controller is transmitted the release signal.

Should the seat switch not be activated, the motors will also be turned off - for safety reasons - but the lifting elements will not be lifting and the travel drive controller will not be released either.

The only exception: water suction by hand hose.

Before operation of the pre-sweeper (Admiral 40 only), the hood is to be closed and the dirt hopper correctly inserted. The hood and the dirt hopper are monitored each by a switch (NC switch) being serially connected. As soon as the switch opens, the LED in the standard operator panel lights to signal „open hood“ and the pre-sweeper function is disabled. Since both switches are serially connected, this LED equally lights if the switch signalling „no dirt hopper inserted“ opens. In case of faulty function, check the switch and all cable connections and connectors.

Another safety request is effected by the thermal switch of the broom motor. If this switch opens, the pre-sweeper function will be disabled and an error code appears.

After engaging the parking brake, all cleaning functions will be disabled and the red LED „brake engaged“ lights. This switch is an NC switch as well and it is thus required, in case of faulty function, to check the switch, all cable connections and connectors.

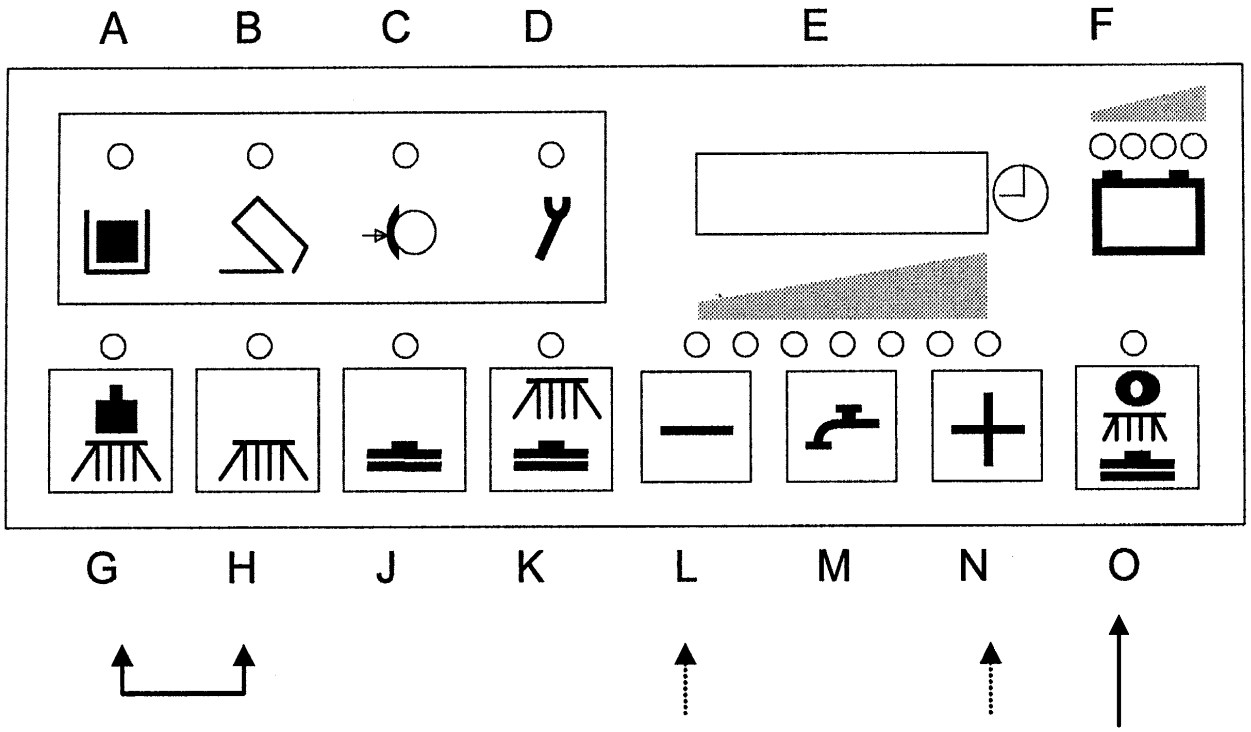
Activation of the „Brushes“ function causes lowering of the brush head to the so-called central position. The lifting element does not attain the lower limit position before cleaning with increased ground pressure. The brush head lifting element thus has 3 micro-switches integrated, one each for the upper, the central and the lower limit position.

Extracting the side brush unit is possible only after the brush head had lowered or in other words: if the central position micro-switch does not switch, the „brush lowering completed“ signal is missing and the side brush does not swing out. This signal depends on the central position micro-switch only such that swinging out of side brush is possible as well for cleaning with increased brush ground pressure. Since on its way down to the lower limit position the central position micro-switch had been triggered even if no fault occurred during cleaning with increased ground pressure.

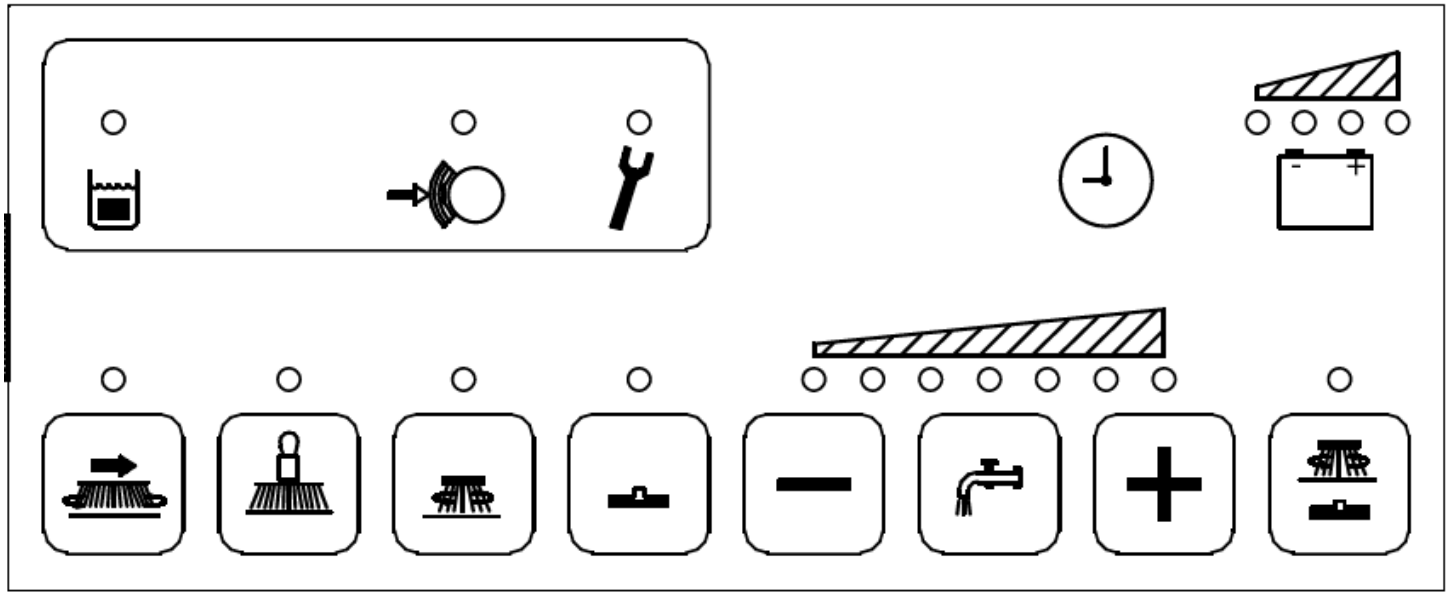
4 Machine Type Settings

Check settings for machine type, TSG and options; display and delete last error

The settings described in this step are to be checked and modified if required. Proceed to check and adjustment in particular after electronics replacement.



The picture shows the Admiral 38C operator panel. Position of the programming buttons is identical to those of the Admiral 40. Only the icons differ due to the different functional scope of this machine.



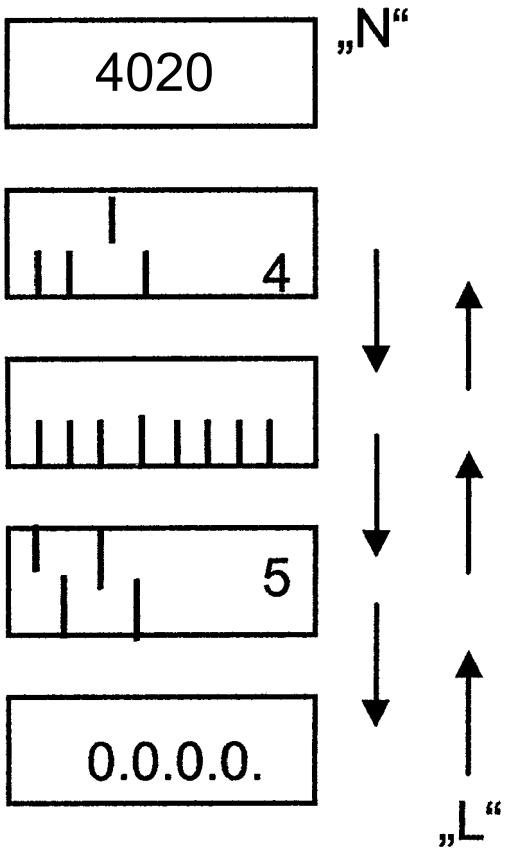
B1050 TB & WZB

Entry into programming

1. Switch off machine by key switch
2. Simultaneously press “G” and “H” and hold depressed, then switch on key switch
3. Hold depressed both buttons as long as the software version is displayed then release buttons

Display of set machine type then appears automatically. Use the “N” button to proceed to display of set options and display of TSG setting or then to display of last (remedied) error. Use the “L” button to return to previous display.

Quit program any time by switching OFF the key switch.



Software version, automatic change to next display

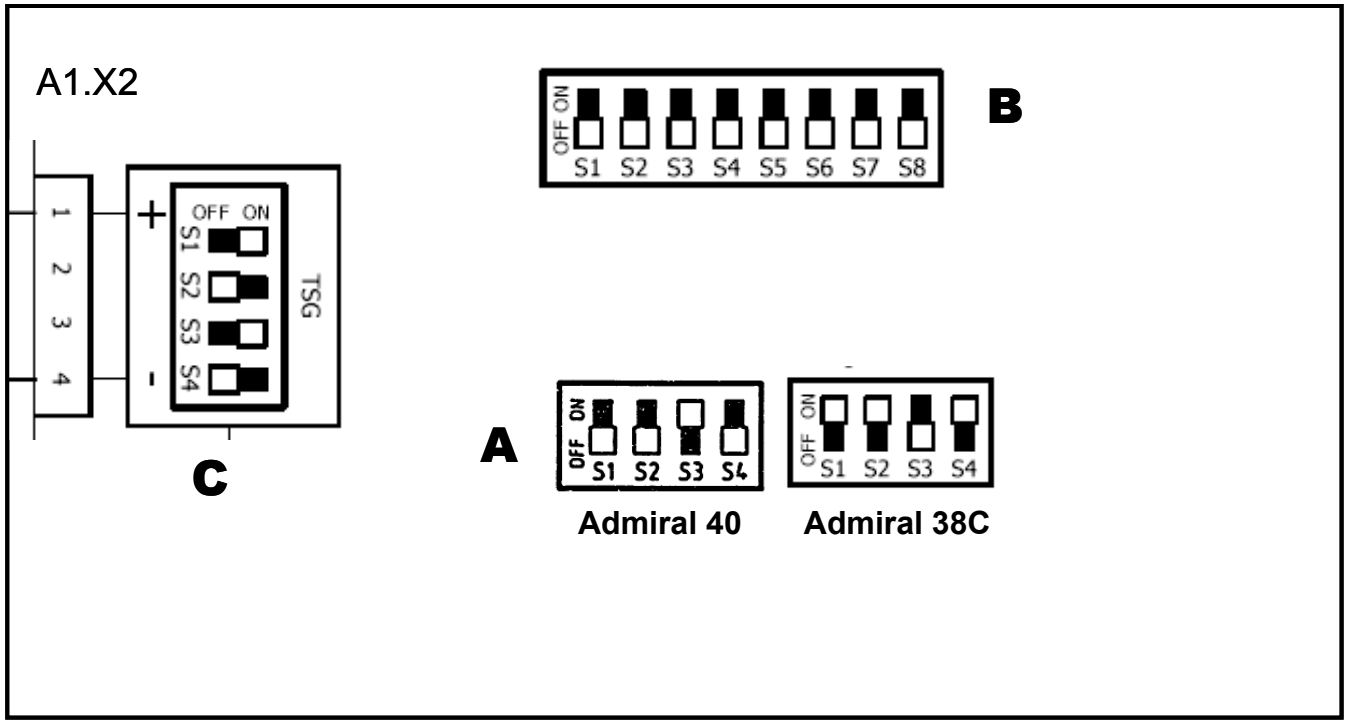
Set machine: 4 means Admiral 40; 11 means Admiral 38C

Set options

TSG setting

Display last error and reset

Control electronics



4.1 Check And Set Machine Type

1. Make sure to have the correct machine type set. Use the Dip switch A on the control electronics for setting (see “4.2 Check And Set Options”)
2. For the Admiral 40 machine, the bars no. 1, 2, 4 are to set in bottom and the bar no. 3 in top position. This setting is a prerequisite for display of the cipher 4. For the Admiral 38C machine, the bar no. 3 is to set in bottom and the bars 1, 2 and 4 in top position. This setting is a prerequisite for display of the “11 Error Table With Information On Service Display”.
3. If other ciphers appear, modify combination at the Dip switch.

Admiral 40	1: OFF	Admiral 38C	1: ON
	2: OFF		2: ON
	3: ON		3: OFF
	4: OFF		4: ON

4.2 Check And Set Options

1. Setting each option in the machine is required at the Dip switch B (see “Control electronics” on page 20) on the control electronics.

2. The Dip switches are assigned as follows:

1:	Cleaning agent dosage (Admiral 40 only)	(set = “ON”)
2:	SWA (Admiral 40 only)	(set = “ON”)
3:	Side brush (Admiral 40)	(set = “ON”)
4:	Tool (Admiral 40 suction only) Tool (Admiral 38C Spraying and suction)	(set to “OFF”) (set = “ON”)
5:	Pre-sweeper (Admiral 40 & Admiral 38C*)	(set = “ON”)
6:	Cylindrical brush deck	(set = “ON”)
7- 8:	not assigned, i.e.	“OFF”

* - for the Admiral 38C the side broom is activated.

3. An option is set if the Dip switch is set to ON.

4.3 Check And Set TSG

1. The TSG has to be set in any case to the correct battery type.
2. When fitting other battery types, modify TSG setting as described below by using Dip switch C on the control electronics (see “Control electronics” on page 20)
3. Dip switch 4 is to set to 36 V (OFF).

Set the TSG according to the following table. (No. 5 - PzS - is the default setting)

	6	7	5	4	3	2	1	0
→	Gel (Sonnenschein)	Gel (Deta)	PzS	PzS fremd	GIS	GIS fremd	GIS USA	GIS USA
1	0	1	1	0	1	0	1	0
2	1	1	0	0	1	1	0	0
3	1	1	1	1	0	0	0	0
4	ON = 24V / OFF = 36V							

Battery definitions

GiS Battery - Is a flooded wet acid battery with grid plates

PzS Battery - Is a tubular plate wet battery

“1” means ON; “0” means OFF

The addition “foreign” indicates batteries which are not delivered by Hako.

Reset voltage for the TSG: approx. 38.5V.

This voltage is required to reset the TSG capacity to 100%.

CAUTION

As far as maintenance-free gel batteries are concerned, the difference between Sonnenschein and Deta is no longer made and setting depends on the battery type. Setting 6 for GIV batteries and setting 7 for PzV batteries, irrespective of the manufacturer. (For historical reasons, the designations Sonnenschein and Deta remain in the documents).

4.4 TSG Error 3211

TSG - Remarks on the error 3211

The controller receives data from the TSG module in serial form and transmission of a telegram takes one second. The 3211 error occurs when two telegrams with the same contents are not received within 5 seconds and this equally is the case if there is no transmission at all.

Apart from an actual defect of the TSG the following causes are possible for this error message:

- No voltage supplied to the TSG (MK controller: A1:X2.1 + 4)
- TSG is in auto test mode: battery DIP switch set to off-off-off or on-off-off (1-2-3) - from Software revision 4.020 on, this adjustments are used for US-american batteries

After occurrence of the 3211 error it is also possible to use the LED of the TSG to detect functioning of data transmission since the TSG bar lights as soon as two telegrams with the same contents have been successfully transmitted within 5 seconds. In all other cases, the bar does not light.

4.5 View And Delete Last Error

View

1. Press “N” button three times; then a 4-digit error code with blinking dots appears (last error occurred and remedied)
2. Quit program by switching OFF key switch (do not switch OFF key switch when proceeding to point “Delete”)

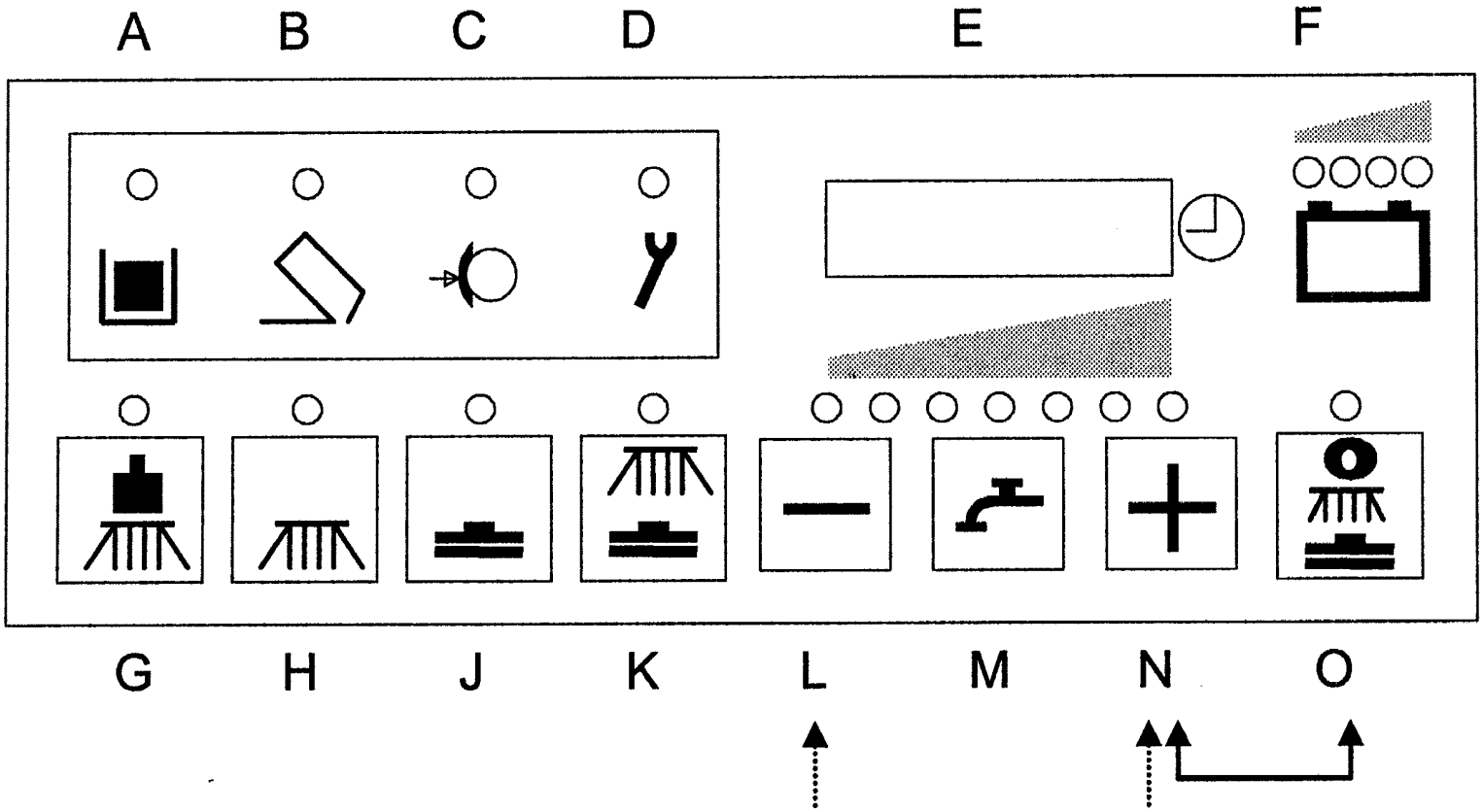
Delete

1. Press “O” button and hold depressed as long as the display changes to 0.0.0.0.
2. Release button, switch key switch OFF and on again
3. The software version appears then and changes to normal hourmeter display
4. It is possible at any time and as described under “View” to read out the last occurred error from the memory and view it since the error code is saved there
5. Quit program by switching OFF key switch

5 Programming Different Procedures

Programming of different procedures of cleaning functions depending on the direction switch (check and set)

(For setting of the Admiral 38C, it is the position of buttons which is decisive and not the icon on the operator panel)



Check

1. Switch off machine by key switch
2. Simultaneously press “N” and “O” buttons and hold depressed, then switch on key switch
3. Hold both buttons depressed as long as the software version appears in the display then release both buttons
4. Viewing the different programs is possible by pressing the button “L” (down) or the button “N” (up).
5. The active program is marked by a dash in front of the cipher
6. Quit program by switching OFF key switch (do not switch OFF key switch when proceeding to point “Set”)

Set

1. Use the “L” or “N” button to select the desired program
2. Press the “O” button and hold depressed until the dash appears in front of the cipher. The program then is saved and active
3. Quit program by switching OFF key switch

5.1 Program Functions

Precondition for functioning of the following programs is that “Brushes” and/or “Suction” and/or “Sweep” are ON. All programs allow normal cleaning and suction in ‘forward’ accelerator position; for the ‘Neutral’ and ‘Reverse‘ accelerator positions, however, differences apply and are listed in the following table.

Program code	Accelerator position/ Direction switch	Function according to accelerator position/direction switch		
		Brush head + Water	Squeegee	Broom (Admiral 40 only)
1	Neutral	Brushes and water ON	Suction remains ON	Broom remains ON
	Reverse	Brushes and water ON	Lift squeegee	Broom remains ON
2	Neutral	Brushes and water ON	Lift squeegee	Broom remains ON
	Reverse	Brushes and water ON	Lift squeegee	Broom remains ON
3	Neutral	Brushes and water OFF	Suction remains ON	Broom remains ON
	Reverse	Brushes and water ON	Lift squeegee	Broom remains ON
4	Neutral	Brushes and water OFF, lift brush head	Lift squeegee	Broom off and lifted up
	Reverse	Brushes and water OFF, lift brush head	Lift squeegee	Broom off and lifted up

Program code	Accelerator position/ Direction switch	Function according to accelerator position/direction switch		
		Brush head + Water	**Squeegee**	**Broom (Admiral 40 only)**
5	Neutral	Brushes and water OFF	Lift squeegee	Broom remains ON
	Reverse	Brushes and water ON	Lift squeegee	Broom remains ON
6 (Admiral 40 only)	Neutral	Brushes and water OFF, (delay of 1 second for brushes to avoid the brushes from being switched OFF when changing from forward to reverse ride)	Lift squeegee	Broom OFF and lifted up
	Reverse	Brushes and water ON	Lift squeegee	Broom OFF and lifted up

When the selected function of water supply, brush or suction function or the green Hakomatic button is switched off by changed accelerator position, the function-related LED blinks.

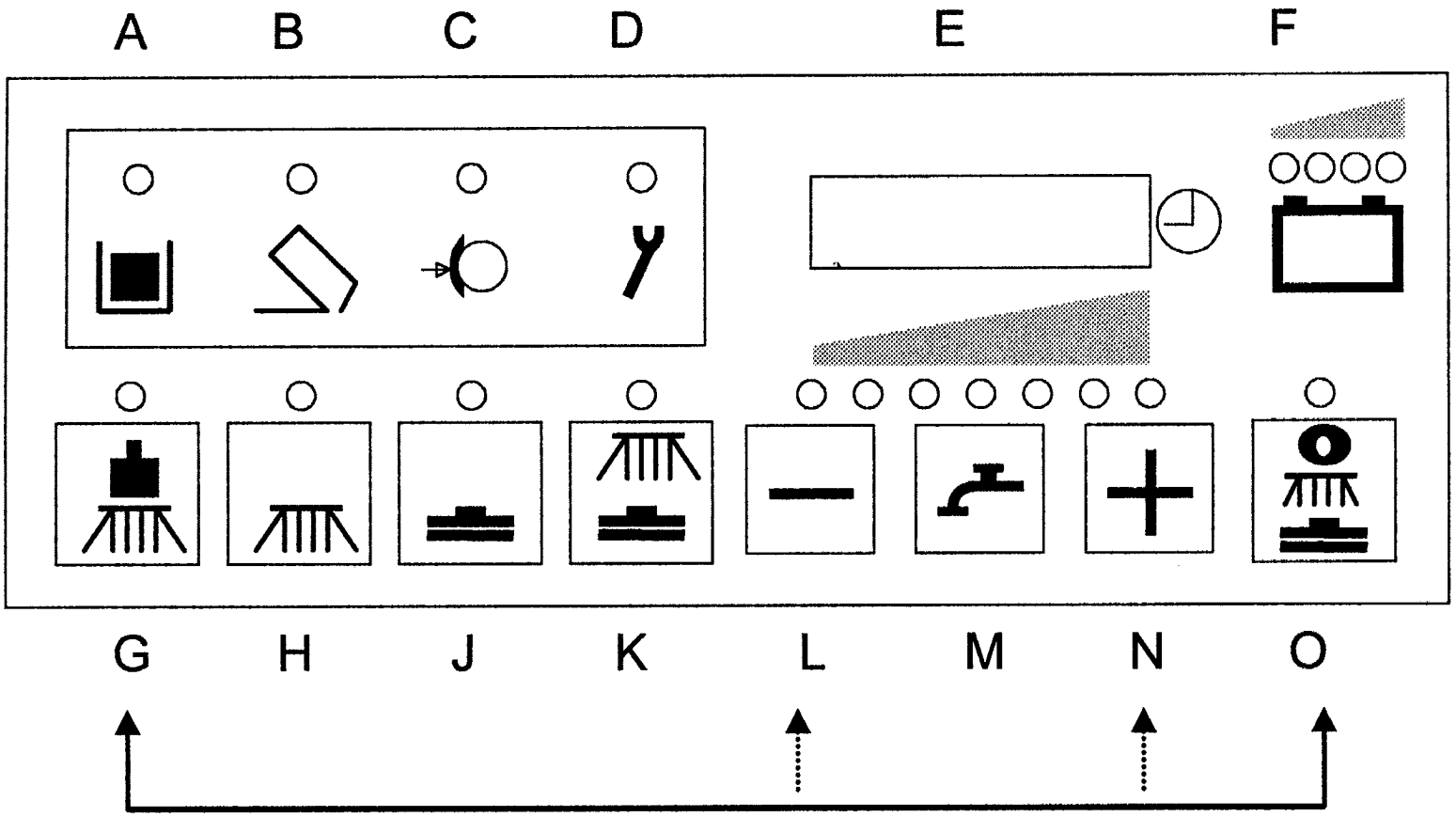
“ON” always means ‘switched ON’ and ‘lowered‘.

“OFF” only means ‘switched OFF’, ‘lifted’ is additionally indicated

6 Specific Customer Settings

(Display of last error and selection of water stage, cleaning agent, SWA, side brush, filter)

The settings described in this step can be modified according to customer requirements. Factory settings need not be adopted. For setting of the Admiral 38C, it is the position of buttons which is decisive and not the icon on the operator panel.

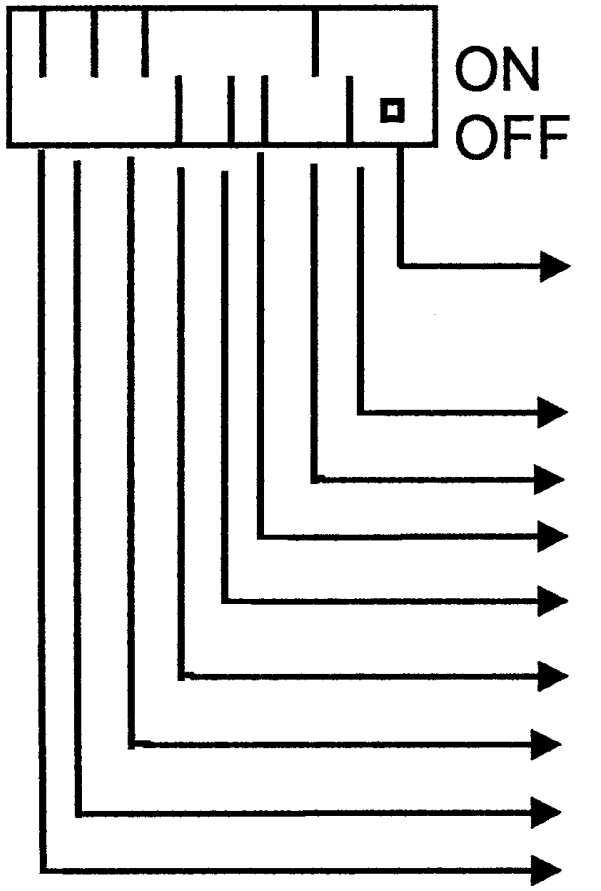


Entry into programming

1. Switch off machine by key switch
2. Simultaneously press ”G” and “O” buttons and hold depressed, then switch on key switch
3. Hold both buttons depressed as long as the software version appears in the display then release both buttons

Then the programed settings for the following points are displayed automatically:

- Display of last (remedied) error upon switching ON: yes / no
- Water stage at start of cleaning: last selected stage/ always medium stage
- Switch on cleaning agent together with switching ON water: yes / no (Admiral 40 only)Water stage for Scrubbing and suction: last selected stage/ always medium stage (Admiral 38C)
- Switch over to SWA upon water ON: clear water / SWA (Admiral 40 only)
  Switch on side brush/side broom together with switching ON scrubbing: yes / no (Admiral 38C)
- Switch on side brush together with switching ON scrubbing: yes / no (Admiral 40 only)
- Filter shaking: in interval / as long as button is depressed (Admiral 40 only)
- Switch on filter suction together with switching ON sweeping: yes / no (Admiral 40 only)
- Automatic filter shaking after sweeping: yes / no (Admiral 40 only)



(Factory setting represented)

Currently programed setting

Filter (Admiral 40 only)

Side brush

SWA (Admiral 40 only)/Side broom/-brush with scrubbing

Cleaning agent (Admiral 40 only)/water stage at scrub/suct

Water stage

Error display

6.1 PPV1 (Display Of Last Error)

1. Select desired setting by “L” and “N” buttons
2. The corresponding bar starts blinking
3. Use “M” button to move the bar up and down Up = ON = Error code (of the remedied error) will be displayed for 3 seconds after switching on Down = OFF = Error code (of the remedied error) will not be displayed
4. Save setting by pressing the green button (“O” button) as long as the dot appears at the bottom right of the display

6.2 PPV2 (Water stage Upon Start of cleaning)

1. Select desired setting by “L” and “N” buttons
2. The corresponding bar starts blinking
3. Use “M” button to move the bar up and down
   Up = ON = last selected stage is set
   Down = OFF = always the medium stage is set
4. Save setting by pressing the green button (“O” button) as long as the dot appears at the bottom right of the display

6.3 PPV3 (Cleaning Agent / Waterstage)

1. Select desired setting by “L” and “N” buttons
2. The corresponding bar starts blinking
3. Use “M” button to move the bar up and down

Admiral 40	Up	= ON = Cleaning agent is equally switched on
	Down	= OFF = Cleaning agent is not switched on
Admiral 38C	Up	= ON = Water stage for Scrubbing and suction: last selected stage
	Down	= OFF = always the medium stage is set

4. Save setting by pressing the green button (“O” button) as long as the dot appears at the bottom right of the display

6.4 PPV4 (Switch Over to SWA / Side broom - side brush)

1. Select desired setting by “L” and “N” buttons
2. The corresponding bar starts blinking
3. Use “M” button to move the bar up and down

   Admiral 40 Up = ON = Switching to dirty water recycling (SWA)
   Down = OFF = Switching to clear water

   Admiral 38C Up = ON = Switching on side broom / brush together with scrubbing
   Down = OFF = don´t switch on side broom / brush

4. Save setting by pressing the green button (“O” button) as long as the dot appears at the bottom right of the display

6.5 PPV5 (Side Brush Upon Switching On Scrubbing) (Admiral 40 only)

1. Select desired setting by “L” and “N” buttons
2. The corresponding bar starts blinking
3. Use “M” button to move the bar up and down
   Up = ON = side brush is equally switched on
   Down = OFF = side brush is not switched on
4. Save setting by pressing the green button (“O” button) as long as the dot appears at the bottom right of the display

6.6 PPV6 (Filter Shaking) (Admiral 40 only)

1. Select desired setting by “L” and “N” buttons
2. The corresponding bar starts blinking
3. Use “M” button to move the bar up and down
   Up = ON = Filter shaking as long as button is depressed
   Down = OFF = Filter shaking after switching on by button 3 times in intervals
4. Save setting by pressing the green button (“O” button) as long as the dot appears at the bottom right of the display

6.7 PPV7 (Filter Suction Upon Switching On Sweeping Mode) (Admiral 40 only)

1. Select desired setting by “L” and “N” buttons
2. The corresponding bar starts blinking
3. Use “M” button to move the bar up and down
   Up = ON = Filter suction is equally switched on
   Down = OFF = Filter suction is not switched on
4. Save setting by pressing the green button (“O” button) as long as the dot appears at the bottom right of the display

6.8 PPV8 (Automatic Filter Shaking After Sweeping (Admiral 40 only)

1. Select desired setting by “L” and “N” buttons
2. The corresponding bar starts blinking
3. Use “M” button to move the bar up and down
   Up = ON = after a minimum of 2 minutes of sweeping, shaking is automatically switched on upon end of sweeping
   Down = OFF = shaking is not automatically switched on upon end of sweeping
4. Save setting by pressing the green button (“O” button) as long as the dot appears at the bottom right of the display

7 Settings On Module

The settings on the modules have an influence on load values of the electronic circuit-breakers and the module coding.

7.1 Module 1

As they have an influence on the load value of the electronic circuit breakers for the brush head and squeegee lifting elements, the Dip switch settings have to be correct on Module 1.

Dip switch setting:

1: OFF
2: OFF

Circuit-breaker values:

Brush head:	5.7 A
Squeegee:	5.7 A

7.2 Module 3

As they have an influence on the module coding and the load value of the electronic circuit breakers for the pre-sweeper / side broom / side brush lifting elements, the Dip switch settings have to be correct on Module 3.

Module 3 Code A (pre-sweeper)(Admiral 40 only): (side broom) (Admiral 38C only)

1: OFF
2: OFF
3: OFF
4: OFF
electr. c.-b.: 5.7 A

Module 3 Code D (side brush): (Admiral 40)

1: ON
2: ON
3: OFF
4: ON
electr. c.-b.: 1.9 A

8 Operator Panel Settings (Admiral 40 only)

The Code A and B operator panels (pre-sweeper / side brush and Cleaning agent / SWA) have to be correctly set - i.e. coded - on the Dip switch.
These operator panel are available only in the Admiral 40.
They are located under the right-hand operator panel of the machine.

Code A (Pre-sweeper/Side brush; A2):

1: OFF

2: OFF

Code B (Cleaning agent / SWA; A10):

1: ON

2: OFF

9 Water Pump

9.1 Water Amounts

For checking function of the water pump, voltage for each of the stages can be measured at Module 1 (A5:X2:6+7).

When using a True RMS device, having water in the tank and ensuring that suction turbine is OFF, the values from the following table shall be obtained:

When using other than the indicated measuring devices, values may vary since measured voltage is pulsed. Beyond that the value depends on battery voltage. Here, measurement was done with charged battery presenting three green LED lighting in the battery indication.

The voltage values in the table are given for the Admiral 40 only.

Beyond that, evaluation of the actually delivered water amount is to be preferred since voltage values only indicate whether water pump control is operable or not.

	Admiral 40			Hakomatic Admiral 38C	Option Tool Admiral 38C
		without Sidebrush	with Sidebrush		
Stage 1:	xx V	ca. 1,3 l/min	ca. 2,7 l/min	ca. 1,3 l/min	ca. 1,0 l/min
Stage 2:	ca. 5,7 V	ca. 2,2 l/min	ca. 3,3 l/min	ca. 2,2 l/min	ca. 1,0 l/min
Stage 3:	ca. 7,4 V	ca. 2,9 l/min	ca. 3,9 l/min	ca. 2,9 l/min	ca. 1,0 l/min
Stage 4:	ca. 8,9 V	ca. 3,6 l/min	ca. 4,4 l/min	ca. 3,6 l/min	ca. 1,0 l/min
Stage 5:	ca. 12,0 V	ca. 4,7 l/min	ca. 5,5 l/min	ca. 3,9 l/min	ca. 1,0 l/min
Stage 6:	ca. 14,7 V	ca. 5,7 l/min	ca. 6,4 l/min	ca. 4,1 l/min	ca. 1,0 l/min
Stage 7:	ca. 20,0 V	ca. 7,5 l/min	ca. 8,2 l/min	ca. 4,4 l/min	ca. 1,0 l/min

9.2 Standstill Detection For Water Pump

Automatic standstill detection for water pump:

The electronics offer a possibility for water pump protection if delivery of pump is blocked.

When the pump takes in water from the tank but cannot deliver it to the brushes, a pressure builds up downstream the pump. Without protection by the electronics, the pump would continue delivery against this pressure and could be damaged.

The electronics detects interruption of free delivery of the pump and automatically switches off the pump for 2 seconds.

After these 2 seconds, pump is briefly switched on with simultaneous measurement whether delivery then is free or whether water supply to brushes is still blocked. When delivery of the pump is free, the selected stage remains ON; if counter-pressure is still present, the pump again is switched OFF for 2 seconds. This procedure is repeated until fault will be remedied.

10 Drive Controller

10.1 SEVCON Controller (Diagnostic LED)

The light-emitting diodes (LED) are directly located on the electronics

LED indication	Malfunction	Remark
OFF	Drive controller without function	Voltage supply interrupted Check fuses and wiring
ON	Drive controller is operable	Drive controller function okay
2 signals	Wrong start sequence	Check accelerator and direction switch as well as cabling
3 signals	Output transistors do not connect or no connection to drive motor	Check wiring to drive motor; check carbon brushes; if okay but error still present replace drive controller
4 signals	Output transistors do not connect or no connection to drive motor	Check wiring to drive motor and drive motor. Check direction switch and direction contactors on drive controller; if okay but signals still present, replace drive controller

LED indication	Malfunction	Remark
5 signals	Output transistors defective	160 A fuse blown, check release signal from control electronic; Check direction switch and direction contactors on drive controller; if okay but signals still present, replace drive controller
6 signals	Accelerator or cable connection interrupted	Check accelerator and wiring, plugged connection eventually loose; check direction switch and drive potentiometer switch
7 signals	Battery voltage insufficient, less than 13 Volts	Measure voltage, check connections
8 signals	Temperature of drive electronics exceeded (70 °C and higher)	Is travel drive smooth? Is parking brake setting okay? Longer uphill rides? Max. operating current approx. 45 A

10.1.1 Signal Measurement at the Drive Controller (SEVCON)

During test of the drive controller, the following points should be checked since faultless operation of the drive controller is not possible without the described signals applying accordingly.

The drive controller is designated by A6 in the circuit diagram and is supplied with 36 V even though some of the signals are 24-Volts signals. The drive controller is a pulse controller activating the motor by the pulsed voltage. In case of full throttle forward ride, battery voltage always applies at the motor.

1. Is F51-160A fuse okay?
2. Is battery voltage applying at drive controller?
3. Is battery minus connected at drive controller?
4. Is battery voltage applying at A6-X51:2 after switching key switch ON?
5. Cabling between accelerator potentiometer and drive controller okay?

Voltage measurement:

Green at A6-X51:8 (approx. 8.6V)
Red at A6-X51:9 (0-5V depending on potentiometer position)
Yellow at A6-X51:3 (approx. 0V)
Measured to battery minus

Resistance measurement (with machine switched off and potentiometer disconnected):

Between green and red: approx. 5.7 kΩ Reducing to approx. 1.8 kΩ upon actuation
Between yellow and red: approx. 1.8 kΩ Increasing to approx. 5.7 kΩ upon actuation
Between yellow and green: approx. 4 kΩ Unchanged upon actuation

⚠ CAUTION

The potentiometer has a nominal value of 4 kΩ ± 20%. This means:
Due to the 20% tolerance, values may vary between 3.2 kΩ and 4.8 kΩ. Depending on these tolerances, the measured values may increase or reduce by up to 0.8 kΩ.

6. Is connection between A6:X51:3 and A1:X4:3&4 okay? Is battery minus equally connected to A1:X4:3&4?

7. Is battery minus applying at A1:X3:1 after closing of key switch and seat contact switch? Battery minus equally at S54:1? Is connection between A1:X3:1 and S54:1 okay? Only when battery minus is applying to S54 potentiometer switch, the closed direction contactors can control the potentiometer switch and the S53 direction switch.

8. Connection between direction switch and drive controller okay?
   S53:B2 to A6-X51:4 (forward)
   S53:B4 to A6-X51:5 (reverse)

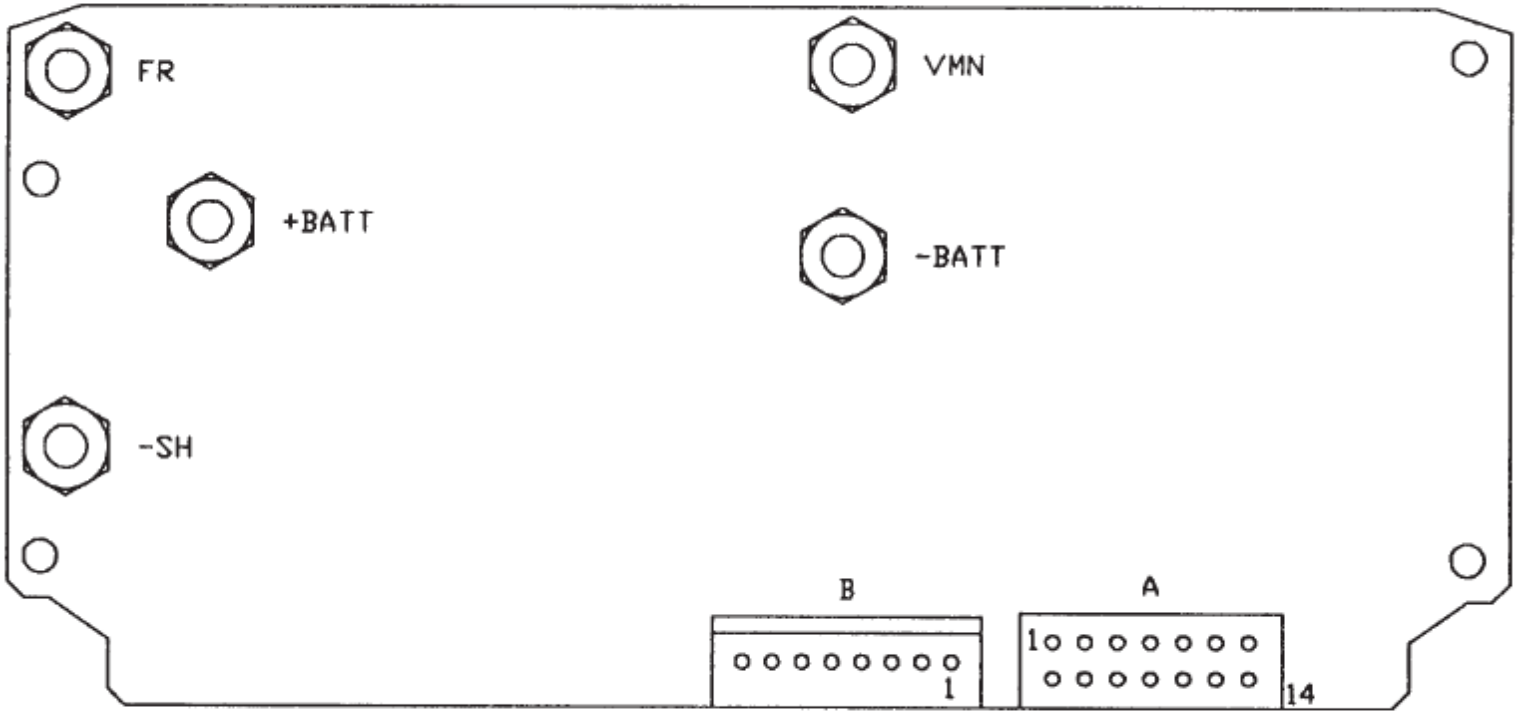
9. Connection between direction switch and A1 control unit okay?
   S53:A2 to A1:X8:4
   S53:A4 to A1:X8:2

10. Are 24V applying at A1:X8:4 with “reverse” ride being selected?
11. Are 24V applying at A1:X8:2 after “forward” ride selected?
12. Is jumper in A1:X8 between Pin 1 and 3 and 5 okay?
13. Do switches S53 (direction) and S54 (potentiometer) operate faultlessly?
14. Is battery minus applying at A6-X51:4 with “forward” ride being selected (potentiometer switch has to close)?
15. Is battery minus applying at A6-X51:5 with “reverse” ride being selected (potentiometer switch has to close)?
16. Is battery minus no longer applying at A6-X51:11 with “reverse” ride being selected (signal for speed reduction)?
17. Is cabling between drive controller and drive motor okay? Please check each cable and their contacts. Do two wires contact via crimping > short-circuit?
18. Do direction contactors switch? Eventually proceed to activate each of them directly.
19. Test with diagnostic device (general diagnostic devise and not that specific one for drive controller as in the old version)

10.2 ZAPI Controller

The ZAPI controller has a diagnostic input. Unless not expressly indicated in the service documents, modification of the default values and parameters is not admitted.

Anordnung der Stecker



A = Stecker für Schützansteuerung und Steuereingänge
B = Stecker für Console oder Alarm-LED

Description of control connections of the ZAPI controller

A1	RV1	Speed reduction 1; active if no positive voltage is applying
A2	IRE	Emergency inversion acc. to Europ. standard; active if a pos. voltage is applying
A3	MT	Tiller micro switch; active if a pos. voltage is applying
A4	NT2	Activation of neg. direction contactor forward ride (auto-stop), Bypass contactor, general contactor or electric brake (standard)
A5	CH	connected + (from key switch)
A6	IRZ	Emergency inversion (“ZAPI standard”); active if no positive voltage is applying
A7	RV2	Speed reduction 2; active if no positive voltage is applying
A8	PT	Activation positive for all contactors and micro-switches
A9	MA	Micro-switch forward ride; active if a pos. voltage is applying
A10	MI	Micro-switch reverse ride; active if a pos. voltage is applying
A11	NT1	Activation negative direction contactor reverse ride (auto-stop) or both direction contactors (standard)
A12	NPOT	Potentiometer negative
A13	CPOT	Potentiometer arm
A14	PPOT	Potentiometer positive (13V; output impedance 82Ohm)

10.2.1 Automatic Monitoring of the Components

The micro-processor effectuates evaluation of basic controller functions.

This evaluation concerns:

- **Check upon switching key switch ON:**

Watch Dog, current sensor, power MOS FET, contactor activation (contactor driver), direction switch, potentiometer connections, EEPROM)

- **Check in standstill:**

Watch Dog, current, power MOS FET, contactor activation (contactor driver), potentiometer connections)

- **Check during ride:**

Watch Dog, current, power MOS FET, contactor activation (contactor driver), potentiometer connections), closing and opening of contactors

- **Permanent Monitoring:**

Temperature, battery voltage

Eventual error messages are indicated by a blinking LED on connector B (section 2). The number of blinks indicates the error type.

10.2.2 Error Codes Displayed Via The LED

No.	Blinks	Message	State*	Remark
1)	1	WATCH-DOG	A	Error on electronics
2/3/4/5)	1	EEPROM	A	Error on electronics (EEprom)
6)	2	INCORRECT START	B	Direction actuated upon switching ON (or incorrect connection of IR)
7)	3	VMN LOW	B	MOSFET short-circuited
8)	3	VMN HIGH	B	Diodes short-circuited or direction contactor stuck
9)	4	VACC NOT OK	B	Potentiometer defective
10)	5	I=0 EVER	A	No current flow detectable during ride
11)	5	HIGH CURRENT	A	Current flow in rest mode
12)	6	PEDAL WIRE KO	B	Potentiometer wiring defective
13)	7	TEMPERATURE	C	Temperature > 76°C
15)	8	DRIVER 1 KO	A	NT1 driver short-circuited
16)	8	DRIVER 1 SIC KO	A	Contactor coil on NT1 short-circuited
17)	8	DRIVER 2 KO	A	NT2 driver short-circuited
18)	8	DRIVER 2 SIC KO	A	Contactor coil on NT2 short-circuited
19)	8	DRIVER SHORTED	B	Driver short-circuited (NT1)
20)	8	CONTACTOR OPEN	B	Contactor does not close
21)	9	POSITION HANDLE	B	Tiller micro-switch not actuated
22)	9	INVERSION	B	Deadman bounce key (IR) actuated or incorrectly wired
23)	9	FORW.+BACKW.	B	Both directions simultaneously actuated
24)	Perman. light	BATTERY	C	Battery discharge too important

*** A = switch off system, remedy fault and switch on again**
B = remedy fault and actuate direction again
C = display of state and eventual software-controlled measures

10.2.3 Explanations On Displayed Error Messages

(1)WATCH-DOG

Test during rest state as well as during ride; internal self-test of hard- and software; replace controller in case of fault alarm!

(2)EEPROM PAR. KO

Error in the memory area containing values of the setting parameters. System switches off. If error still persists after having switched key switch OFF and ON again, replace logic! If error disappears, mind that the saved parameter values are deleted.
(—> initial setting)

(3)EEPROM CONF. KO

Error in the memory area containing the controller configuration data. If error still persists after having switched key switch OFF and ON again, replace logic! If error disappears, mind that the saved configuration is deleted. (—> initial setting)

(4)EEPROM DATA KO

Data of the memory area controlling the hourmeter counter are corrupted. If alarm disappears after having switched key switch OFF and ON again, mind that the hourmeter counter is reset to zero then.

(5)EEPROM OFF LINE

Error in the non-volatile memory containing those values of the hourmeter counter concerning the programmable parameters and the saved alarms. If error still persists after having switched key switch OFF and ON again, replace controller!

(6)INCORRECT START

Corrupted order of sequence of start conditions. The system only starts if, depending on SAFETY SWITCH programming, the following order is observed :

- Key switch - tiller micro-switch - direction switch (HANDLE)
- Key switch - direction switch (FREE)
- Key switch + seat switch - direction switch (SEAT)

Possible causes:

a) Direction or tiller micro-switch stuck.
b) Operator did not observe sequence.
c) Incorrect wiring.

If no external fault can be detected, replace controller!

(7)VMN LOW

Test in rest state and during ride up to VMN synchronised for 80%;

Voltage at VMN terminal normally equals 50% Vbatt if contactors are open. If this voltage is insufficient (< 30% VBatt), an alarm will be output. Possible causes:

a) Main contactor (if available) does not close or is not connected at all
b) Short-circuit between VMN and -Batt terminals (metal particle or other) (disconnect cable at VMN terminal, switch on, fault disappears)
c) Power MOSFET short-circuited or permanently activated by the logic; disconnect cable at VMN terminal, switch on, fault persists, replace controller
d) Bypass contactor (if available) stuck or opens too slowly

(8)VMN HIGH

Test in rest state;

Voltage at VMN terminal normally equals 50% Vbatt if contactors are open. If this voltage is excessive (> 70% VBatt), an alarm will be output. Possible causes :

a) One of the direction contactors is permanently closed due to mechanical blocking or permanent activation (incorrect wiring of contactor coil)
b) Short-circuit between field and anchor coil of the motor (disconnect cable at VMN terminal, switch on, Fault disappears, repair motor)
c) Incorrectly connected motor cable (check field and anchor wiring)
d) Power element of controller defective (suppressor or brake diodes short-circuited) disconnect cable from VMN terminal, switch on, fault persists, replace controller

(9)VACC NOT OK

Test in rest state;
An alarm is displayed if the potentiometer voltage is higher than 1V, related to the saved minimum value.

Possible causes:

a) One of the wires at the potentiometer or inductive sensor is broken.
b) Potentiometer or inductive sensor is defective.

(10) I=0 EVER

Test during ride;
If, during ride, the current does not exceed a determined minimum value, the error message appears and the system switches off.

Possible causes :

a) Resistance of the motor is excessive due to motor defect or faulty carbon brush contact
b) Current sensor is defective (replace controller)

(11) HIGH CURRENT

Test in rest state - contactor open;
If measured current is >50A, an alarm will be output and the system switches off. Current sensor is defective (replace controller!)

(12) PEDAL WIRE KO

If no voltage can be measured at the Pin NPOT (A12), to which the negative potentiometer terminal is connected, an alarm is output. Possible causes:

a) Wire at PPOT (A14) terminal broken
b) Wire at NPOT (A12) terminal broken
c) Potentiometer defective (infinite resistance)
d) Potentiometer resistance >47 kOhm

(13) TEMPERATURE

This message indicates that temperatures has exceeded 76°C.

Maximum current is reduced by steps down to zero with a temperature of 86°C. Possible causes:

a) If the alarm is output directly after switching the system ON with a cold controller, temperature monitoring is not working correctly (replace controller!)

b) If the alarm is output shortly after start of operation, heat is insufficiently dissipated (check installation and fastening screws)

(14) NO FULL COND.

Test at full speed;

If, at full speed, voltage at the VMN terminal is > 1/3 VBatt, this is an indication for a faulty diagnostic circuit and the system switches off.

If the error persists, replace controller (logic unit).

(15) DRIVER 1 KO

If voltage at the NT1 terminal (A11) does not correspond to the desired value, an alarm is output and the system switches off.

Possible causes:

a) Wire at the NT1 terminal (A11) broken or coil of the direction contactor for reverse ride is defective.

b) Internal driver MOSFET short-circuited (replace controller!)

(16) DRIVER 1 SIC KO

If current load at the contactor driver which activates the NT1 output (A11) is excessive, an alarm is output and the system switches off.

Possible causes :

a) Short-circuit of the wire at NT1 terminal (A11) to +Batt
b) Coil of the connected contactor short-circuited or current consumption > 5A

(17) DRIVER 2 KO

If voltage at the NT2 terminal (A4) does not correspond to the desired value, an alarm is output and the system switches off.

Possible causes:

a) Wire at the NT2 terminal (A4) broken or coil of the direction contactor for forward ride is defective.
b) Internal driver MOSFET short-circuited (replace controller!)

(18) DRIVER 2 SIC KO

If current load at the contactor driver which activates the NT2 output (A4) is excessive, an alarm is output and the system switches off.

Possible causes :

a) Short-circuit of the wire at NT2 terminal (A4) to +Batt
b) Coil of the connected contactor short-circuited or current consumption > 5A

(19) DRIVER SHORTED (only with H0 STANDARD TRACT.)

If voltage at the NT1 terminal (A11) does not correspond to the desired value, an alarm is output and the system switches off.

Possible causes:

a) Wire at the NT1 terminal (A11) broken or coil of the direction contactor for forward or reverse ride is defective.

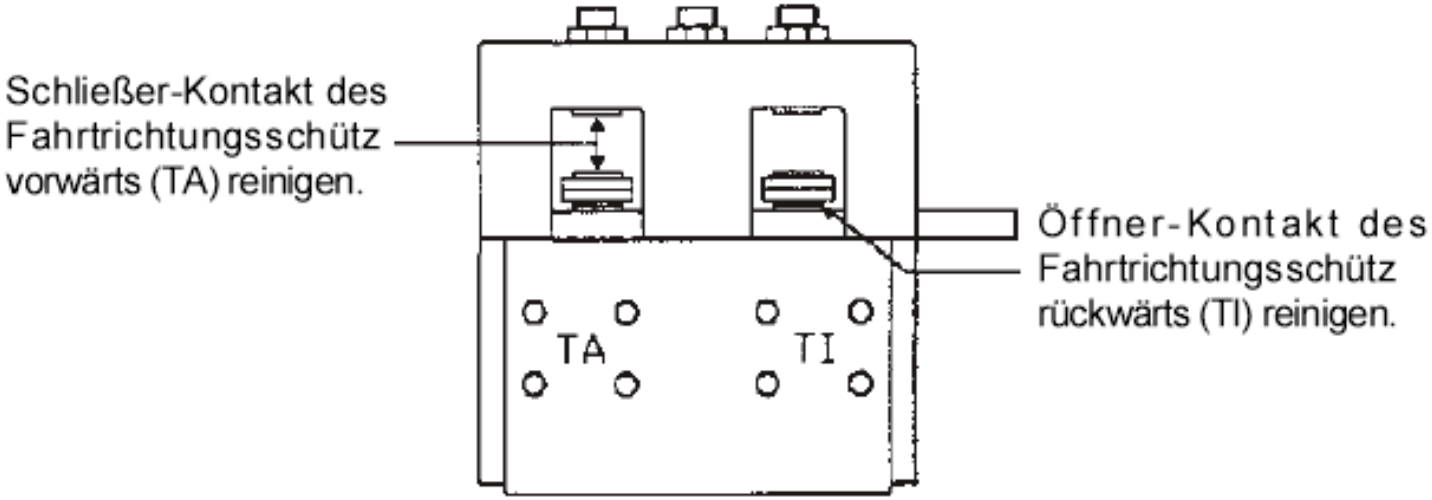
b) Internal driver MOSFET short-circuited (replace controller!)

(20) CONTACTOR OPEN

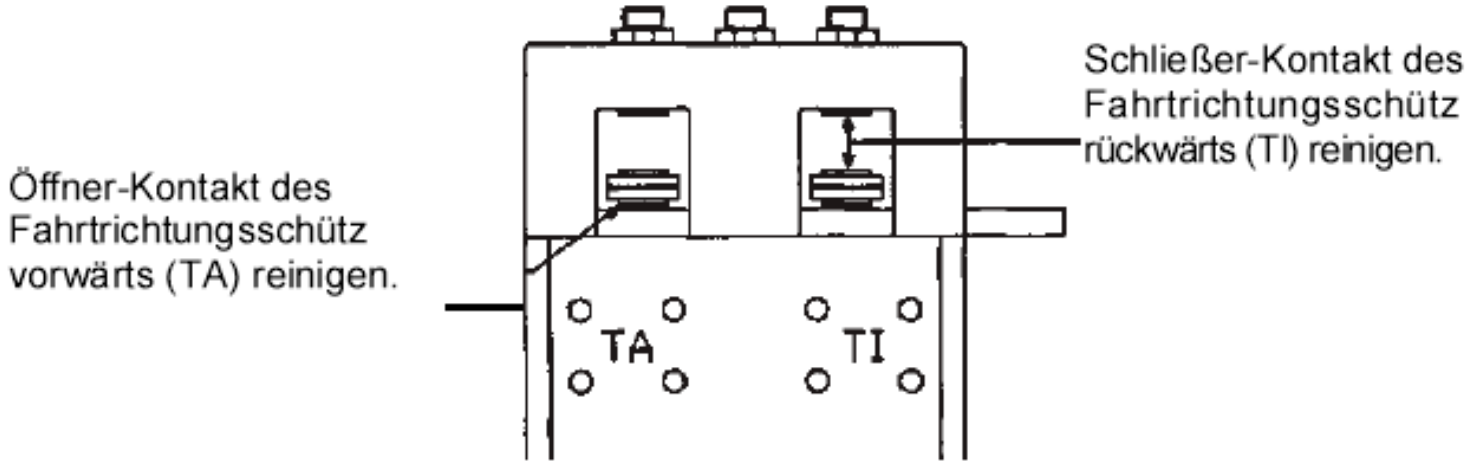
Test upon actuation of a direction;
It is checked whether the selected direction contactor closes by measuring the value of the VMN.
If this value is not correct, an alarm is output.
Proceed to the following instructions for remedy:

When does error occur?	1st test	result	2nd test	Result	Error
In forward direction only	Forward direction contactor closes for 0.3 seconds and then opens	Yes	-->	-->	A1
		No	For 0.3 seconds, a voltage applies to the coil of the forward direction contactor	Yes	B1
				No	C1
In reverse direction only	Reverse direction contactor closes for 0.3 seconds and then opens	Yes	-->	-->	A2
		No	For 0.3 seconds, a voltage applies to the coil of the reverse direction contactor	Yes	B2
				No	C2
In both directions	Forward or reverse direction contactor (as actuated) closes for 0.3 seconds and then opens	Yes	-->	-->	A3
		No	For 0.3 seconds, a voltage applies to the coil of the forward or reverse direction contactor (as actuated)	Yes	B3
				No	C3

A1 The NO contact of the forward direction contactor (TA) or the NC contact of the reverse direction contactor (TI) is soiled or stuck.
Clean contacts or replace contactor group if required.



A2 The NC contact of the forward direction contactor (TA) or the NO contact of the reverse direction contactor (TI) is soiled or stuck.
Clean contacts or replace contactor group if required.



A3 Connection to motor interrupted:

- Carbon brushes without contact to collector (Fig. 1)
- Connecting cable of carbon brush broken (Fig. 2)
- Motor winding defective or motor cable broken
- Inverted motor connection

Fig. 1

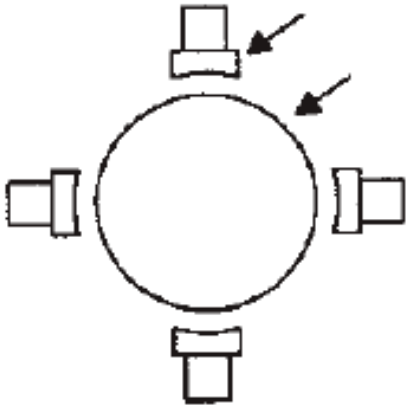
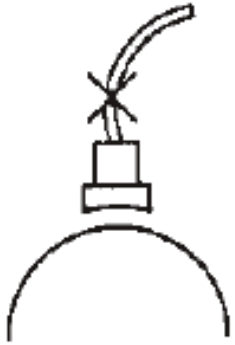


Fig. 2



B1 The forward direction contactor is correctly activated but does not close.

- contactor coil defective, measure resistance by ohmmeter
- contact is mechanically blocked
- nominal voltage of contactor coil is higher than the battery voltage

B2 The reverse direction contactor is correctly activated but does not close.

- contactor coil defective, measure resistance by ohmmeter
- contact is mechanically blocked
- nominal voltage of contactor coil is higher than the battery voltage

B3 The forward or reverse direction contactor is correctly activated but does not close.

- coils of contactors are defective, measure resistance by ohmmeter
- contacts are mechanically blocked
- nominal voltage of contactor coils is higher than the battery voltage

C1 No voltage at the coil of the forward direction contactor. Check connector and cable of the contactor coil to plus supply and to Pin A4 (NT2).

C2 No voltage at the coil of the reverse direction contactor. Check connector and cable of the contactor coil to plus supply and to Pin A11 (NT1).

C3 No voltage at the coils of the forward and reverse direction contactors. Check connectors and cables of the contactor coils to plus supply and to Pin A4 (NT2) and A11 (NT1).

Are the items C1, C2, C3 without fault, replace logic.

(21) POSITION HANDLE

If, upon switching ON, the tiller micro-switch has already been actuated, an error is output (only if SAFETY SWITCH is programed to HANDLE). Possible causes:

c) Tiller micro-switch stuck
d) Incorrect operation

(22) INVERSION

If, upon switching ON, the emergency inversion switch (deadman) has been pressed, an alarm is output. Possible causes:

a) Micro-switch for emergency inversion stuck
b) Incorrect operation
c) Incorrect wiring or programming

(23) FORW - BACK

Fault is displayed if two directions are simultaneously active. Possible causes:

a) Wiring defective.
b) Direction micro-switch stuck. If none of the causes applies, replace logic!

(24) BATTERY

Battery discharged, i.e. voltage has fallen below 60% of nominal voltage. An alarm is output. The system switches off but may be restarted. In that case, maximum current will be reduced to 50% of the programed maximum current value.

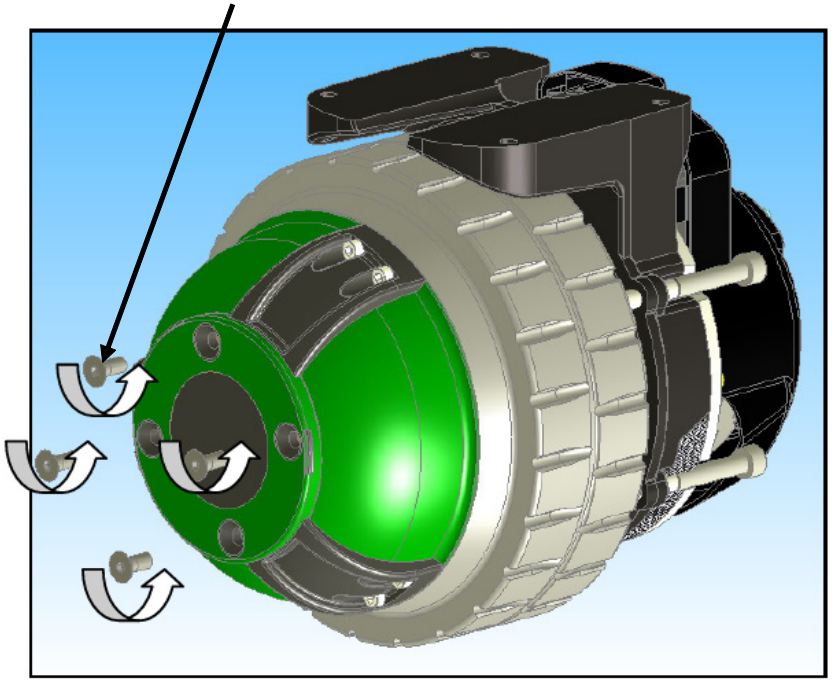
10.3 Drive Motor Admiral 38C (Amer)

10.3.1 Tire replacement

WARNING

Lift up the machine so that the tire is not touching the ground.

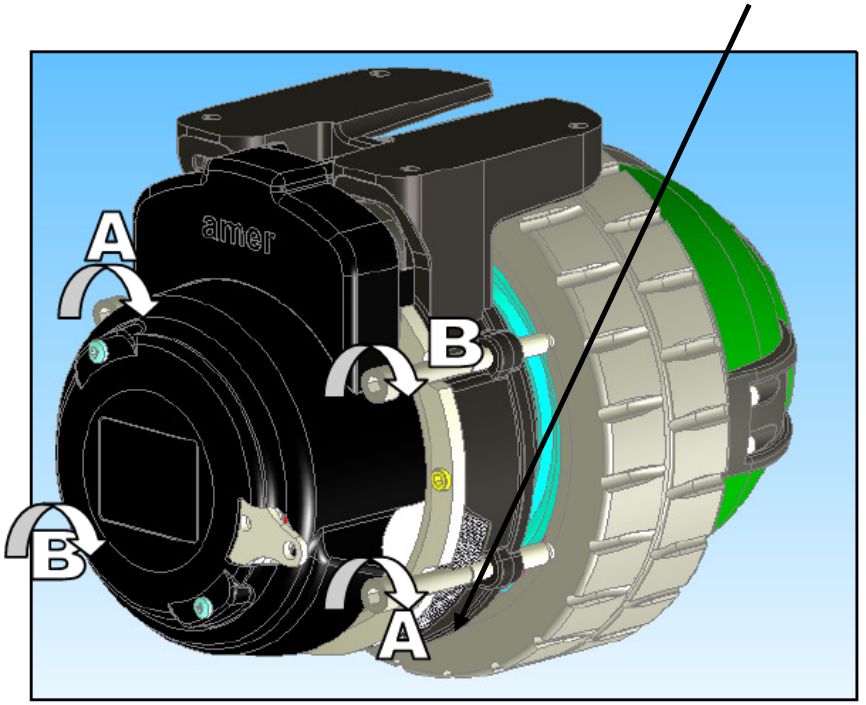
Unscrew the 4 screws of the hub



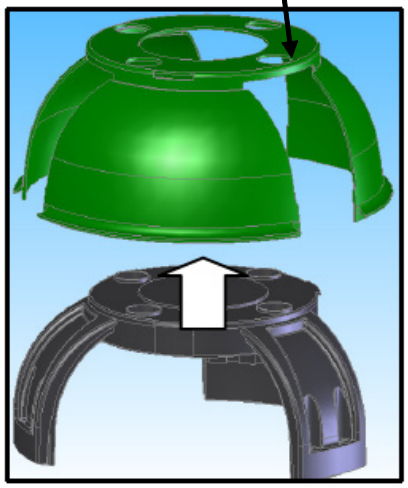
WARNING

Remove the 4 pullers after this operation.

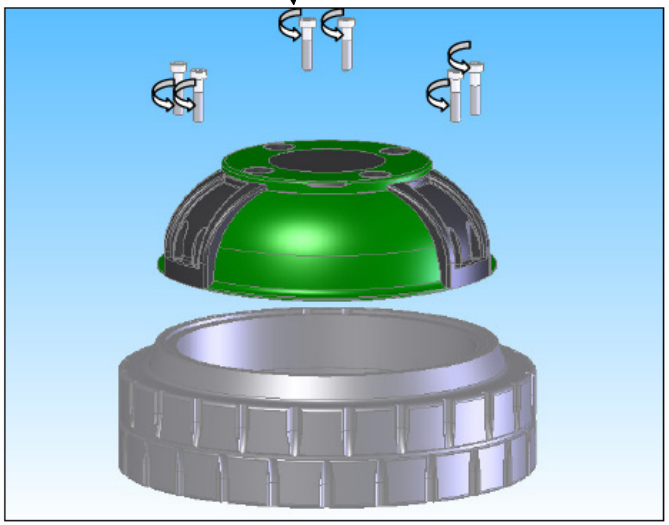
Screw the 4 pullers two by two (at 180°) in the bracket until the hub is removed (Tool PN 03502210)



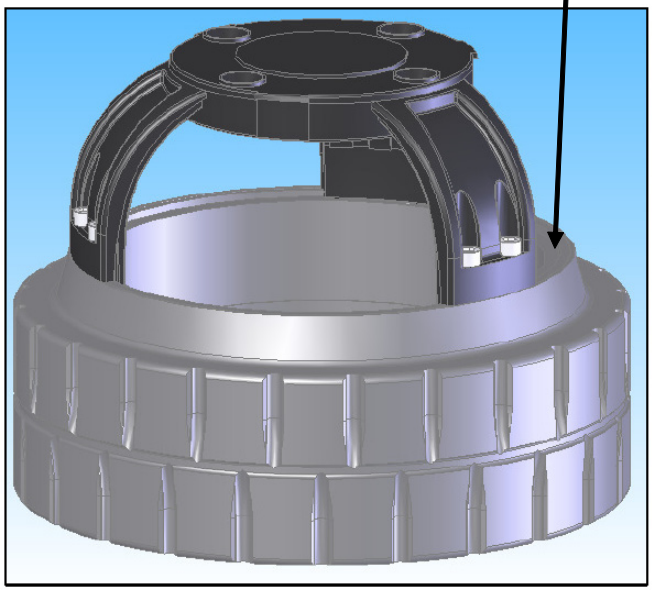
Remove the plastic hub cover



Unscrew the 6 screws M6x30 tightening torque 16Nm ±10%



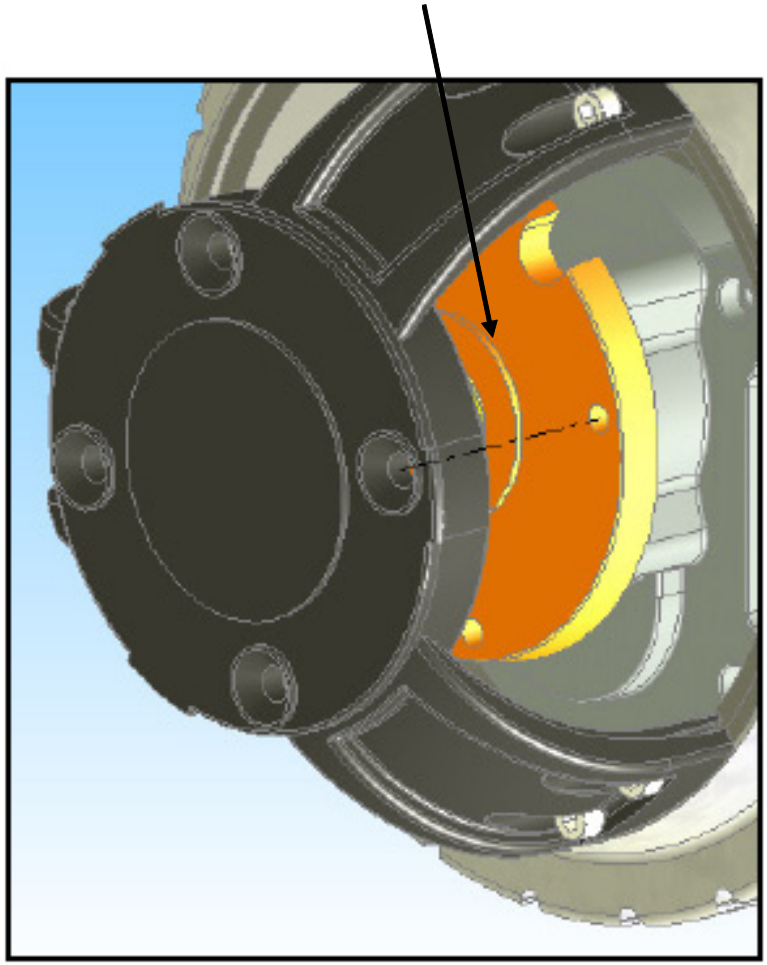
Replace the old tire and re-assemble the new tire with the hub without the plastic hub cover Torque screw 16 Nm ± 10%



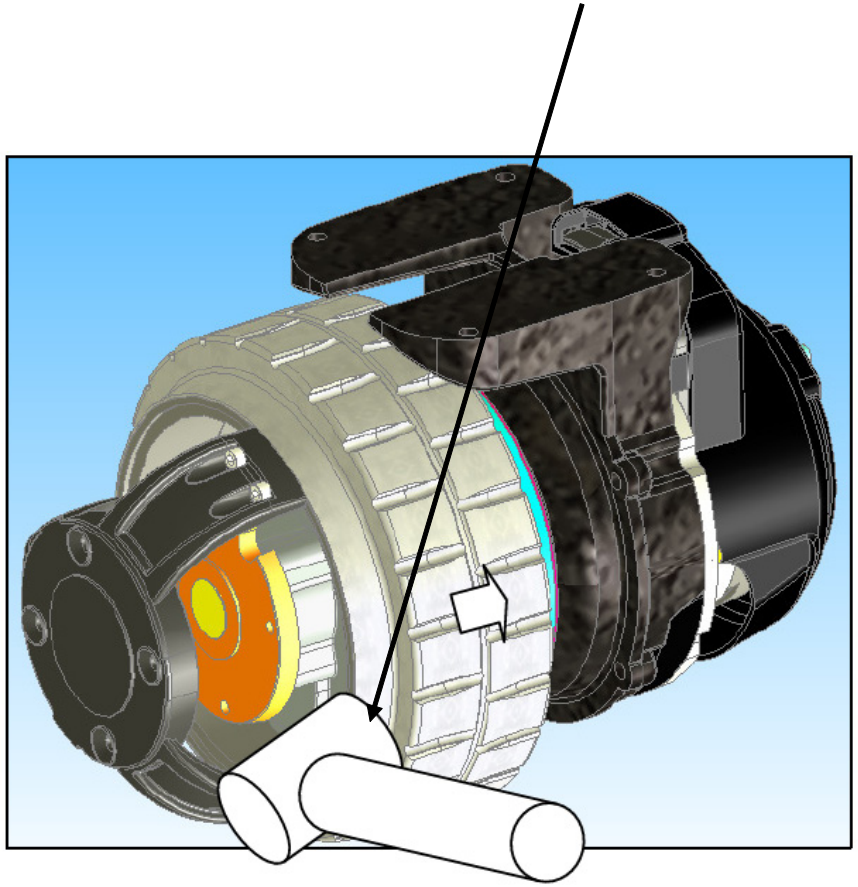
WARNING

Check the radial position of the hub with the inner disc during the mounting

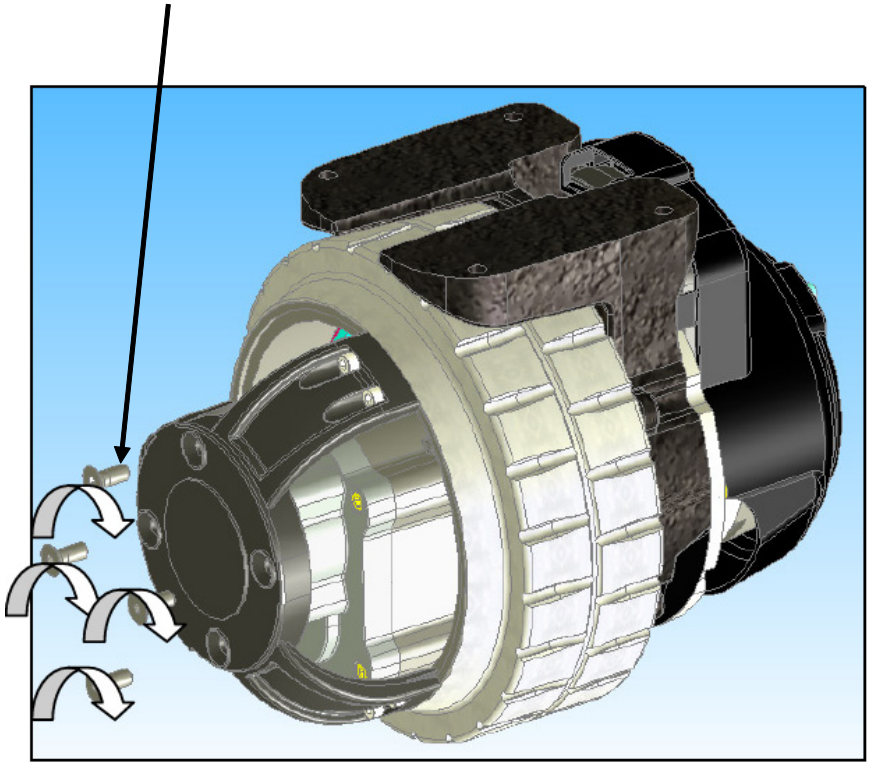
Tire puller kit (Tool PN 03502210)



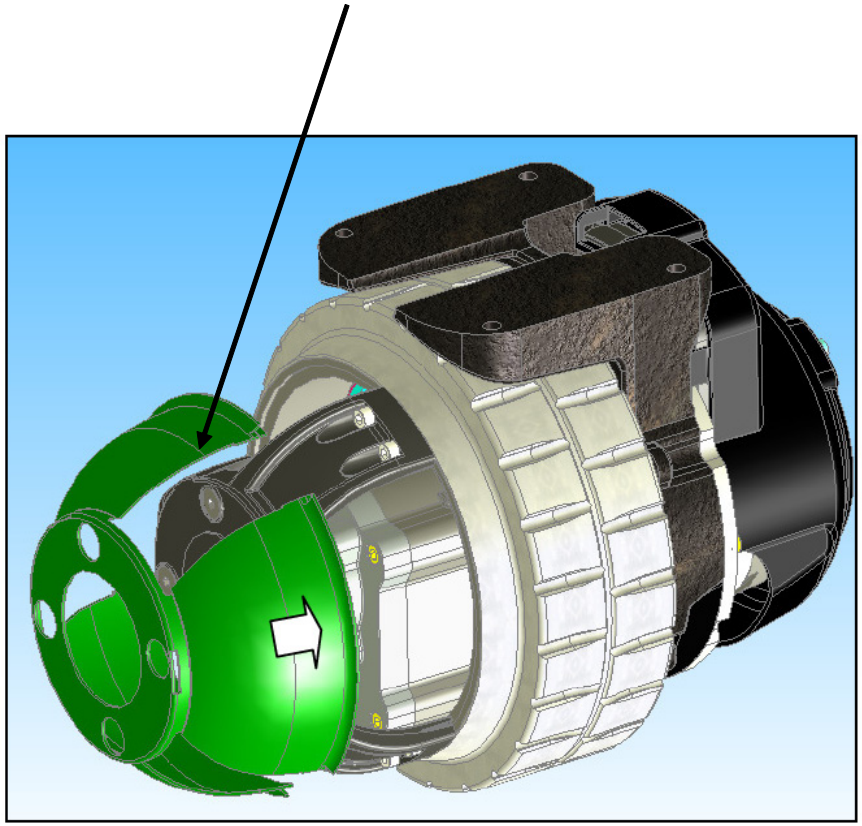
Install the wheel on the MTR11 by using a plastic mallet



Screw the 4 screws M8x20 tightening torque screw 22 Nm ±10%



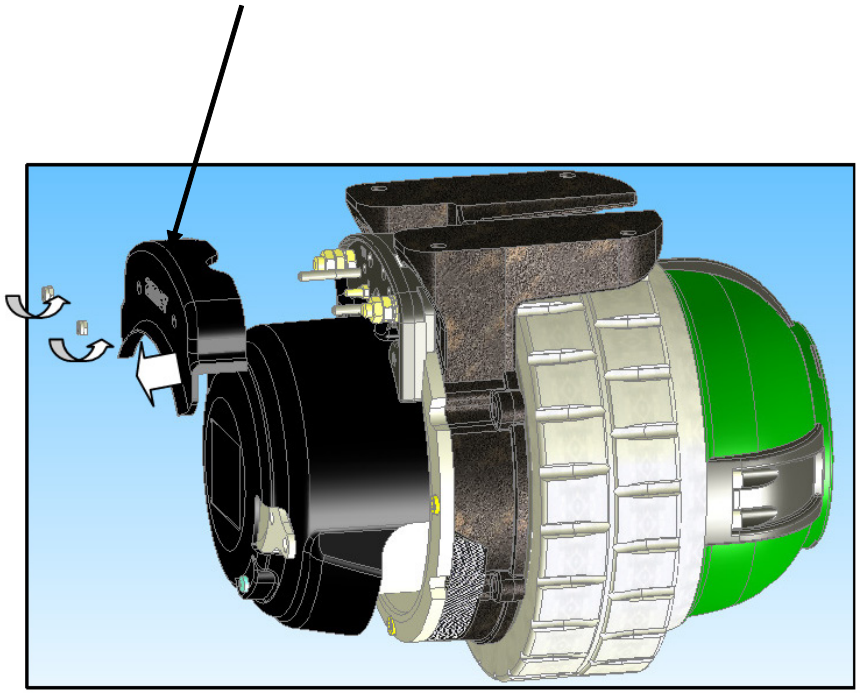
Mount the plastic cover hub manually



Check (every 1000 hours) and replacement (max. 1500 hours) of the carbon brushes

- The wear out limit of the carbon brushes is 12 mm

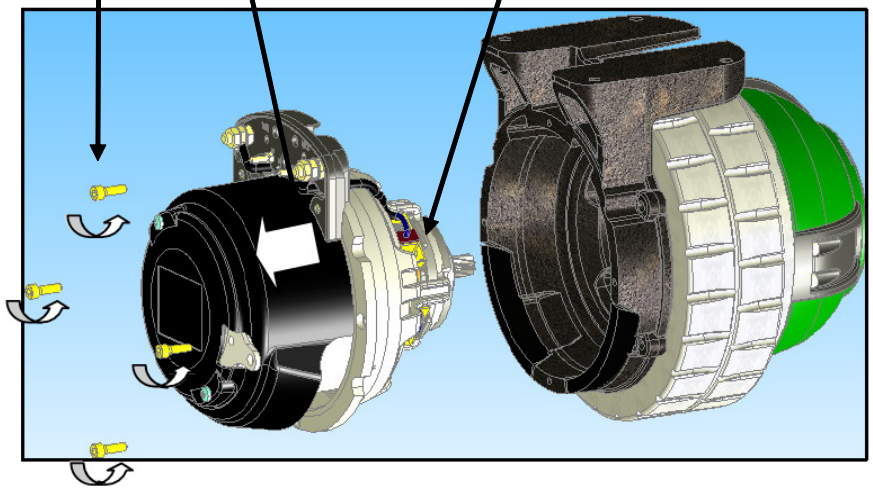
Unscrew the 2 nuts. After remove the terminal board cover.



Remove the 4 screws M6x20.

Tightening torque 9.5Nm -10% +20%
Then remove the motor.

Replace the carbon brushes



11 Error Table With Information On Service Display

The error table may provide a reference code to a electrical schematic to assist in isolating the fault. Refer to “12 Electrical Schematics” for more information.

Error code in the display	Malfunction	Remark
1.2.5.2.	Thermal switch Brush motor	Wire broken since NC activation? Measure operating current (approx. 12 A for a motor when operated without increased pressure and on Fama Famin) Motor overload due to unfavorable floor-brush-combination and/or permanent ride with increased ground pressure?
1.2.6.1.	Blocking protection Brush motor	Check 35 A fuse Measure operating current (approx. 12 A for a motor when operated without increased pressure and on Fama Famin) Motor overload due to unfavorable floor-brush-combination and/or permanent ride with increased ground pressure?
1.2.6.3.	Electronic circuit-breaker Brush lifting element	Jammed? Lifting element stopped by limit stop before being switched off by micro-switch? Check coding of Module 1 Measure operating current (approx. 3.5A max. during lifting)
1.3.5.1.	Thermal switch Side brush (Admiral 40)	Jammed? Permanent contact to border during ride? Wire broken since NC activation? Check 35 A fuse; Measure operating current (approx. 8 A max.)

Error code in the display	Malfunction	Remark
1.3.6.1.	Blocking protection Side brush (Admiral 40)	Jammed? Permanent contact to border during ride? Wire broken since NC activation? Check 35 A fuse; Measure operating current (approx. 8 A max.)
1.3.6.2.	Blocking protection Lifting element Side brush (Admiral 40)	Jammed? Lifting element stopped by limit stop before being switched off by micro-switch? Check coding of Module 3 Code D (A9) Measure operating current (approx. 1.2A max. during lifting)
1.4.6.1.	Electronic circuit-breaker Lifting element Squeegee	Jammed? Lifting element stopped by limit stop before being switched off by micro-switch? Check coding of Module 1 Measure operating current (approx. 3.2A max. during lifting)
2.2.5.1.	Thermal switch Broom (and thermal switch Side brush Motor if new version is fitted) (Admiral 40 only)	Thermal switch of Broom or Side brush motor opened or cabling faulty? Jammed? Measure operating current (approx. 9.5 A max. on Fama Famin for broom motor) Wrong sweeping track width? Unfavorable floor-brush-combination? At machines equipped with the new side brush version (Kit 105-736, side brush motor PN 105-733): Is side brush setting okay? Jammed? Measure operating voltage (max. 2.5 A after approx. 10 minutes run) and approx. 100-110 rpm
2.2.6.1.	Blocking protection broom (Only Admiral 40)	Jammed? Check 35 A fuse on A4.F2 Measure operating current (approx. 9.5 A on Fama Famin floor), Sweeping track adjustment (30 mm - 50 mm) Unfavorable floor-broom combination?

Error code in the display	Malfunction	Remark
2.2.6.2.	Blocking protection lifting element broom (Only Admiral 40)	Jammed? Does lifting element moves up to dead stop before being switched off by micro switch? Check module coding module 3 Code A (A4) switch S4 to OFF Measure operating current (approx. 3.3 A when lifting)
2.3.5.1.	Thermal switch side broom left / right (Admiral 40 & Admiral 38C)	Side broom setting okay? Jammed? Measure operating current (max. 2.5 A after approx. 10 minutes run)
2.3.6.1.	Blocking protection L-h side broom (Admiral 40 & Admiral 38C)	Side broom setting okay? Jammed? Measure operating current (max. 2.5 A after approx. 10 minutes run) and approx. 100-110 rpm
2.3.6.2.	Blocking protection R-h side broom (Admiral 40 & Admiral 38C)	Side broom setting okay? Jammed? Measure operating current (max. 2.5 A after approx. 10 minutes run) and approx. 100-110 rpm
2.3.6.4.	Blocking protection lifting element side broom (Admiral 38C)	Jammed? Does lifting element moves up to dead stop before being switched off by micro switch?
3.1.6.1.	Fuse Module 1 (A5)	Check 10 A / 80 V fuse. If code for blocking protection of lifting element for brush or squeegee is indicated, check these, check water pump; with SWA equally check K2 and water pump (SWA) check 35A fuse; measure operating current of suction turbines (approx. 19.5 A max. for one Motor)

Error code in the display	Malfunction	Remark
3.1.6.2.	Fuse Module 3 Code A (A4; for pre-sweeper) (Admiral 40 & Admiral 38C)	Check all fuses F1(10 A / 80 V) and F4-F7, check motors for filter suction (F6 = 20A/80V), shaking (F7 = 20A/80V), r-h (F4) and l-h side broom (F5) Caution: If old version of side broom motor (PN 51-237) is still installed, the F4 and F5 fuses are 20A/80V. If new version of side brush motor (PN 105-733) is already installed, the F4 and F5 fuses are 10A/80V
3.1.6.6.	Fuse Module 3 Code D (A9; for side brush) (Admiral 40)	Check all fuses (F4 - F7 (5 A / 80 V)) and F1 (10 A / 80 V), check water valve Side brush
3.1.6.7.	Fuse Control electronic	Check fuse 7.5 A / 32 V Check connection to cleaning agent unit (A7:X2:2), to Module 1 (A5:X1) and to the Modules 3 (A4:X1 and A9:X1) and to the operator panel cleaning agent/SWA (A10:X1:1) for abrasion, short-circuit, etc.
3.2.1.1.	TSG defective	Measure approximate battery voltage on control electronics A1.X2 PIN 1 and 4 even with the machine being switched off; if not okay, check cable connection up to battery plug; check battery selection setting of Dip switch on control electronics; if okay but error 3.2.1.1 still present, then replace control electronics (also see “4.4 TSG Error 3211”)
3.4.1.1.	Accelerator fault	Check accelerator and direction switch as well as cabling

Error code in the display	Malfunction	Remark
3.4.5.1.	Thermal switch of drive motor	Is travel drive smooth? Parking brake setting okay? Longer uphill rides effectuated? Interrupted wire since NC activation? Measure operating current (approx. 40 A during cleaning)
4.1.2.1.	Module 1 not recognized	Check fuse F1 (2 A / 32 V), check water valve of brushes and SWA; check contacts and contactors; check current supply of Module 1 (voltage transformer) check CAN connectivity
4.1.3.1.	Module 1 no response (timeout)	Check fuse F1 (2 A / 32 V); check CAN bus; check contacts and connectors; check resistance (2 x 120 W) check current supply of Module 1N (voltage transformer)
4.3.2.1.	Module 3 Code A not recognized (A4; for pre-sweeper) (Admiral 40 & Admiral 38C)	CAN bus connected? Check fuse F3 (2 A / 32 V); check contacts and connectors; module coding okay? (see “7.2 Module 3”) check current supply of Module 3 (voltage transformer)
4.3.2.4.	Module 3 Code D not recognized (A9; for side brush) (Admiral 40)	CAN bus connected? Check fuse F3 (2 A / 32 V); check contacts and connectors; module coding okay? (see “7.2 Module 3”) check current supply of Module 3 (voltage transformer)
4.3.3.1.	Module 3 Code A no response; timeout (A4; for pre-sweeper) (Admiral 40 & Admiral 38C)	CAN bus connected? Check fuse F3 (2 A / 32 V); check contacts and connectors; module coding okay? (see “7.2 Module 3”) check current supply of Module 3 (voltage transformer)
4.3.3.4.	Module 3 Code D no response; timeout (A9; for side brush) (Admiral 40)	CAN bus connected? Check fuse F3 (2 A / 32 V); check contacts and connectors; module coding okay? (see “7.2 Module 3”) check current supply of Module 3 (voltage transformer)

Error code in the display	Malfunction	Remark
4.5.2.1.	CAN operator panel Code A not recognized (for pre-sweeper/side brush) (Admiral 40 only)	Check CAN bus to operator panel pre-sweeper/side brush; check contacts and connectors; check resistance (120 W); check module coding (see “8 Operator Panel Settings (Admiral 40 only)”) (60 W due to parallel connection)
4.5.2.2.	CAN operator panel Code B not recognized (for Cleaning agent/SWA) (Admiral 40 only)	Check CAN bus to Cleaning agent/SWA operator panel; check contacts and connectors; check resistance (120 W); check module coding (see “8 Operator Panel Settings (Admiral 40 only)”) (60 W due to parallel connection)
4.5.3.1.	CAN operator panel Code A no response; timeout (for pre-sweeper / side brush) (Admiral 40 only)	Check CAN bus to pre-sweeper/side brush operator panel; check contacts and connectors; check resistance (120 W); check voltage supply of operator panel (voltage transformer) (60 W due to parallel connection)
4.5.3.2.	CAN operator panel Code B no response; timeout (for Cleaning agent / SWA) (Admiral 40 only)	Check CAN bus to Cleaning agent/SWA operator panel; check contacts and connectors; check resistance (120 W); (60 W due to parallel connection) Check voltage supply of operator panel (voltage transformer)
4.6.1.1.	Internal control unit error	Check contacts of all connectors on control electronics (for corrosion); check voltage supply (current transformer) replace control electronics
4.6.2.1.	CAN bus error (no response - timeout)	Check CAN bus cabling between control electronics and modules; check contacts and connectors; check resistance (120 W) (60 W due to parallel connection)

Error code in the display	Malfunction	Remark
4.6.3.1.	CAN bus error (Buserror)	Check CAN bus cabling between control electronics and modules; check contacts and connectors; check resistance (120 W) (60 W due to parallel connection)
4.6.3.2.	CAN bus error (overrun)	Check CAN bus cabling between control electronics and modules; check contacts and connectors; check resistance (120 W) (60 W due to parallel connection)
4.6.5.1.	Wrong machine type set	Check machine setting of Dip switch A on control electronics A1
4.6.5.2.	Set option not available	Too many options set on Dip switch B (see “4 Machine Type Settings”)? All modules connected via CAN bus?
4.6.5.3.	Module overhang (too many modules in the machine)	All options set on Dip switch B (see “4 Machine Type Settings”)?

12 Electrical Schematics

The following section provides wiring diagrams, connection scheme, circuit diagrams to assist in isolating a fault. The following tables provide a reference code, component description, page and horizontal zone.

The reference code are categorized by letters:

A = Controllers
B = Sensors and Alarms
C = Capacitors
E = Lights
F = Fuses
G = Machine Battery
H = Horn
K = Relays
M = Motors
R = Resistors
S = Switches
V = Diodes
X = Junctions and Connectors
Y = Electric Valves

The location of the component is indicated by the schematic page number and horizontal zone. Example: A1 - control unit - 1.23 is located on page one of the schematic and in section 23 of the horizontal zone. The horizontal zone is indicated by the numbers across the top of the schematic, once you have located the number scan vertically down the page to find the A1 component.

12.1 Connection Scheme Admiral 40 (91025007)

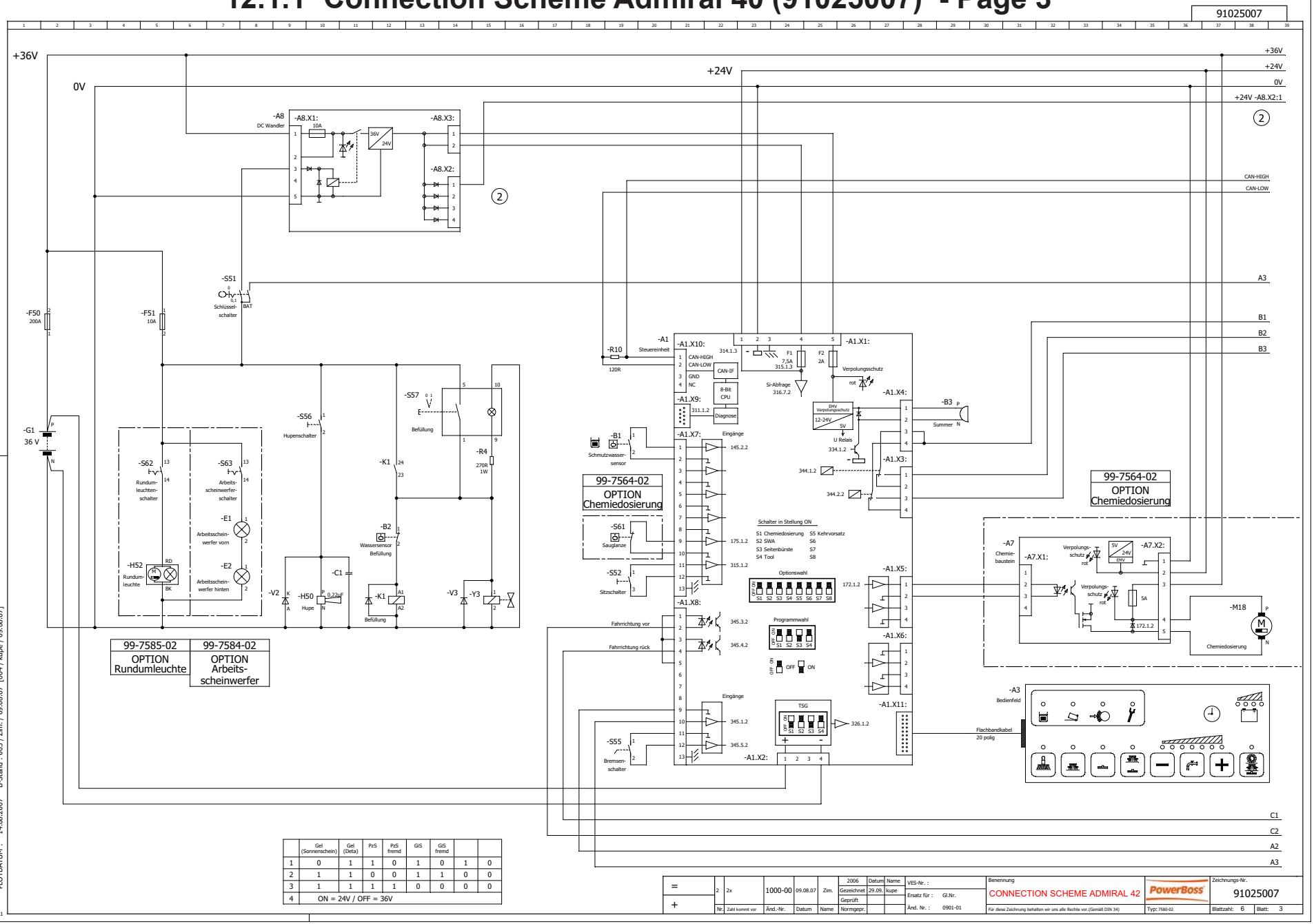
Reference Code	Compnent Description	Part No.	Location (Page & Zone)
A1	Control unit, Function control	01175790	3.23
A2	Control panel (electr. module) pre-sweeper/side brush	00512490	5.32
A3	Standard control panel (electronic module B-type machine)	00712220	3.31
A4	Module 3E “Code A” (pre-sweeper OPTION)	00512460	5.13
A5	Module 1, Power motors	00752920	4.25
NOTE: *NON-Stock Item			

Reference Code	Compnent Description	Part No.	Location (Page & Zone)
A6	Drive controller	01171320	4.11
A7	Module, Chemical agent (chemical agent dosage OPTION)	00512450*	3.31
A8	DC/DC converter	00512440	3.9
A9	Module 3E “Code D” (side brush OPTION)	00512460	6.13
A10	Control panel (electric module) chemical agent / soiled water recycling	90493453*	6.32
B1	Float switch, Recovery tank (soiled water)	00959650	3.19
B2	Float switch, Filling (filling OPTION)	00959650	3.12
B3	Alarm (Piezo buzzer) (signal transmitter)	00745850	3.29
C1	Capacitor, 0.22µF Horn	00980040*	3.11
E1	Front working floodlight (working floodlight OPTION)	00980040*	3.8
E2	Rear working floodlight (working floodlight OPTION)	00451320*	3.8
F50	Fuse, 200A- Main	00101520	3.2
F51	Fuse, 10A- Working floodlight and rotating beacon OPTION	00874970	3.5
G1	Battery 36V, Wet 6V 395Ah (6 required)	956715	3.2
H50	Horn	00050810	3.10
H52	Rotating beacon (rotating beacon OPTION)	90196387*	3.5
K1	Relay, Filling (filling OPTION)	00059550	3.12
K2	Relay, Soiled water recycling (soiled water recycling OPTION)	00120840*	4.20
K3	Relay, Forward / reverse direction	01079810	4.6
M1	Water pump	97047310*	4.22
M2	Soiled water recycling pump (soiled water recycling OPTION)	97047310*	4.20
M3	Actuator, Squeegee (lifting element)	00650200	4.33
M4	Actuator, Side brush (lifting element) (side brush OPTION)	00142140*	6.9
M5	Drive motor	00910150	4.16
NOTE: *NON-Stock Item			

Reference Code	Compnent Description	Part No.	Location (Page & Zone)
M6	Actuator, Pre-sweeper (lifting element) (pre-sweeper OPTION)	00650110	5.9
M7	Cylindrical broom (pre-sweeper OPTION)	00911390	5.4
M7.S1	Thermal switch, Cylindrical broom (pre-sweeper OPTION)	part of M7	5.6
M8	Side broom 1, Right (pre-sweeper OPTION)	01057330	5.22
M8.S1	Thermal switch, Side broom 1 (pre-sweeper OPTION)	part of M8	5.23
M9	Side broom 2, Left (pre-sweeper OPTION)	1057330	5.22
M9.S1	Thermal switch, Side Broom 2 (pre-sweeper OPTION)	part of M9	5.23
M10	Actuator, Brush deck (lifting element)	00650110	4.37
M11	Filter shaker motor (pre-sweeper OPTION)	00512370	5.25
M12	Filter vacuum motor (pre-sweeper OPTION)	00512370	5.25
M13	Brush motor 1, Right	00650230	4.37
M13.S1	Thermal switch, brush motor 1	part of M13	4.38
M14	Brush motor 2, Left	00650230	4.37
M14.S1	Thermal switch, brush motor 2	part of M14	4.38
M15	Side brush motor (side brush OPTION)	00142130*	6.6
M15.S1	Side brush thermal switch (side brush OPTION)	part of M15	6.7
M16	Vacuum motor 1, Left (suction turbine)	00911380	4.35
M17	Vacuum motor 2, Right (suction turbine)	00911380	4.38
M18	Chemical agent dosage (chemical agent dosage OPTION)	00112300*	3.38
R1	Drive potentiometer	00975500	4.4
R4	Resistor, 270Ω (filling OPTION)	19245109*	3.15
R8	Resistor, 0.56Ω (pre-sweeper OPTION)	00903500	5.25
R9	Resistor, 0.56Ω (pre-sweeper OPTION)	00903500	5.25
R10	Terminating resistor CAN bus 120Ω	90266925*	3.19
NOTE: *NON-Stock Item			

Reference Code	Compnent Description	Part No.	Location (Page & Zone)
R11	Terminating resistor CAN bus 120Ω	90266925*	4.22
S51	Key switch	90323437	3.8
S52	Seat switch (contact switch)	00041420	3.19
S53	Drive direction switch (toggle switch)	00697630	4.4
S54	Drive potentiometer switch (micro switch)	00975510	4.4
S55	Parking brake switch (stop light switch)	00028680	3.19
S56	Horn switch (push button switch)	00133770	3.10
S57	Filling switch (filling OPTION) (rocker switch)	00009050*	3.14
S59	Dirt hopper switch (pre-sweeper OPTION) (push switch)	00927610	5.8
S60	Hood switch (pre-sweeper OPTION) (push switch)	00927610	3.19
S61	Suction lance switch (chemical agent dosage OPTION)	90045058*	3.5
S62	Rotating beacon switch (rotating beacon OPTION) (rotary switch)	00521380	3.8
S63	Working floodlight switch (working floodlight OPTION) (rotary switch)	00521380	3.9
V2	Recovery diode for horn –H50	90194879*	3.9
V3	Recovery diode for water valve for filling –Y3	90194879*	3.14
Y1	Water valve, Brushes	00563220*	4.22
Y2	Water valve, Soiled water recycling system (soiled water recycling OPTION)	00563220*	4.20
Y3	Water valve, Filling (part of filling OPTION)	00651240	3.15
Y4	Water valve, Side brush (side brush OPTION)	00563220*	6.23
NOTE: *NON-Stock Item			

12.1.1 Connection Scheme Admiral 40 (91025007) - Page 3



	Gel (Sonnenschein)	Gel (Deta)	PzS	PzS fremd	GiS	GiS fremd		
1	0	1	1	0	1	0	1	0
2	1	1	0	0	1	1	0	0
3	1	1	1	1	0	0	0	0
4	ON = 24V / OFF = 36V							

=	2	2x	1000-00	09.08.07	Zim.	2006	Datum	Name
+	Nr.	Zahl kommt vor	Änd.-Nr.	Datum	Name	Gezeichnet	29.09.	kupe
						Geprüft		
						Normgepr.		

VES-Nr. :
Ersatz für : Gl.Nr.
Änd. Nr. : 0901-01

Benennung: CONNECTION SCHEME ADMIRAL 42

Für diese Zeichnung behalten wir uns alle Rechte vor.(Gemäß DIN 34)

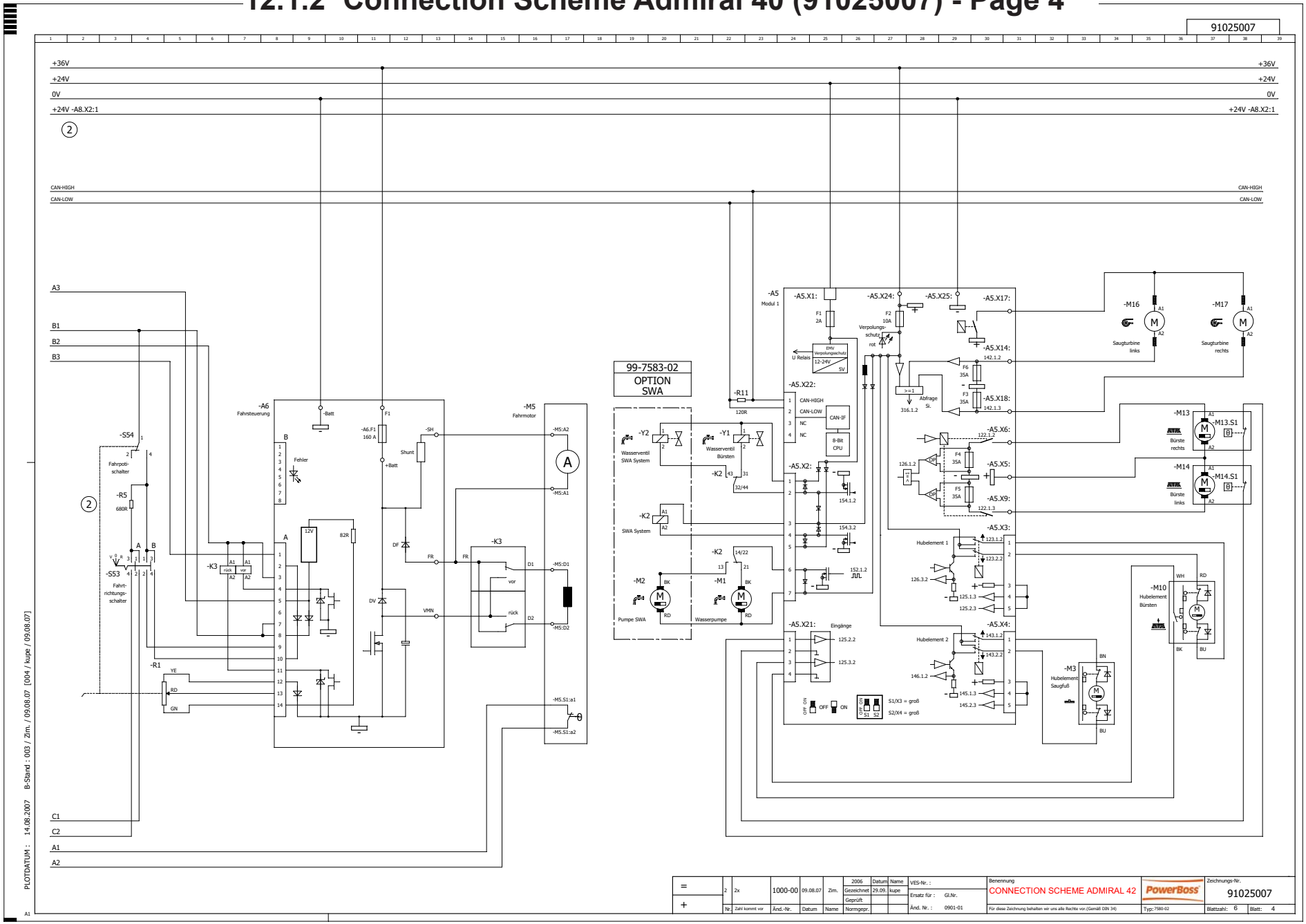
PowerBoss

Typ: 7580-02

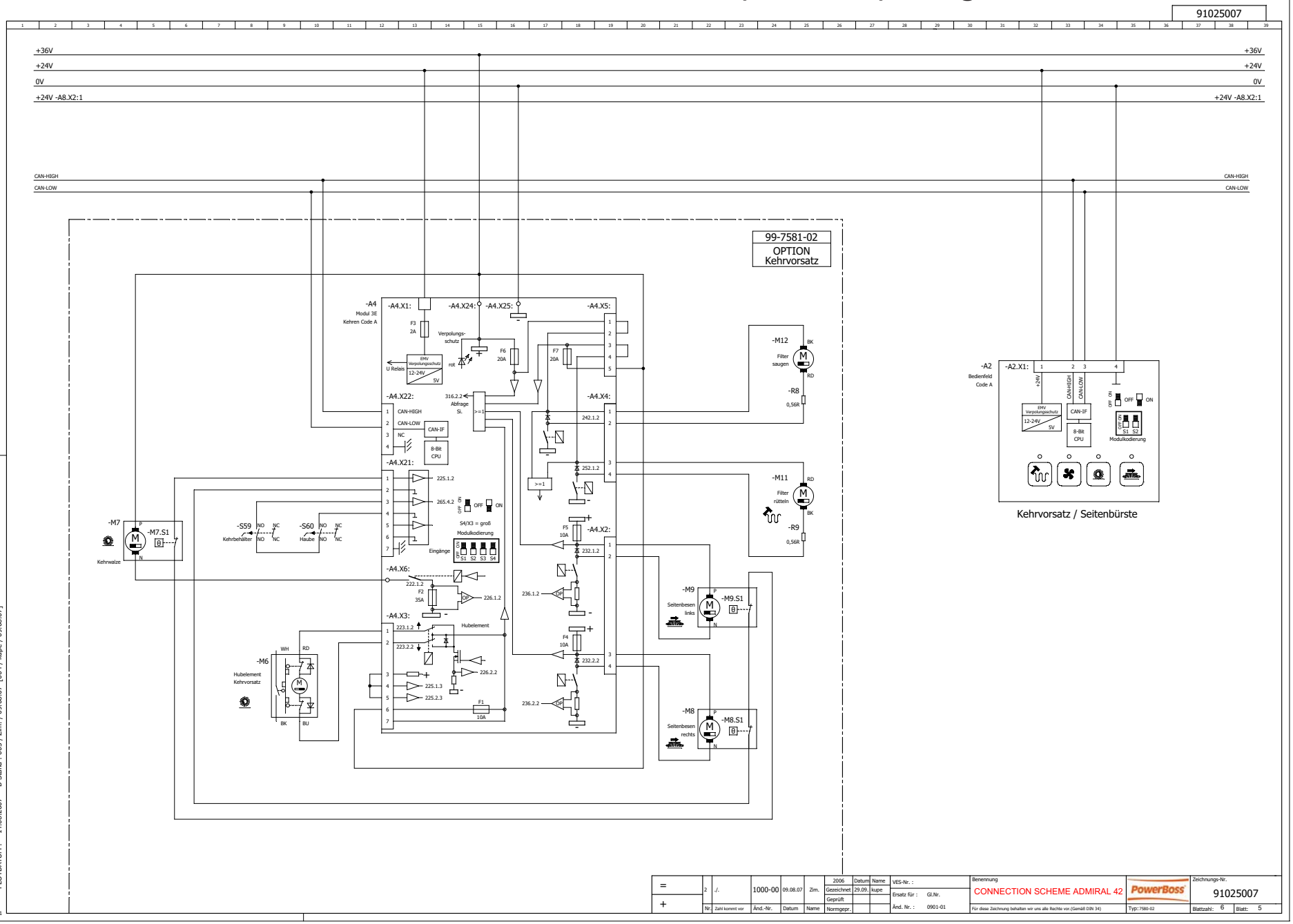
Zeichnungs-Nr.: 91025007

Blattzahl: 6 Blatt: 3

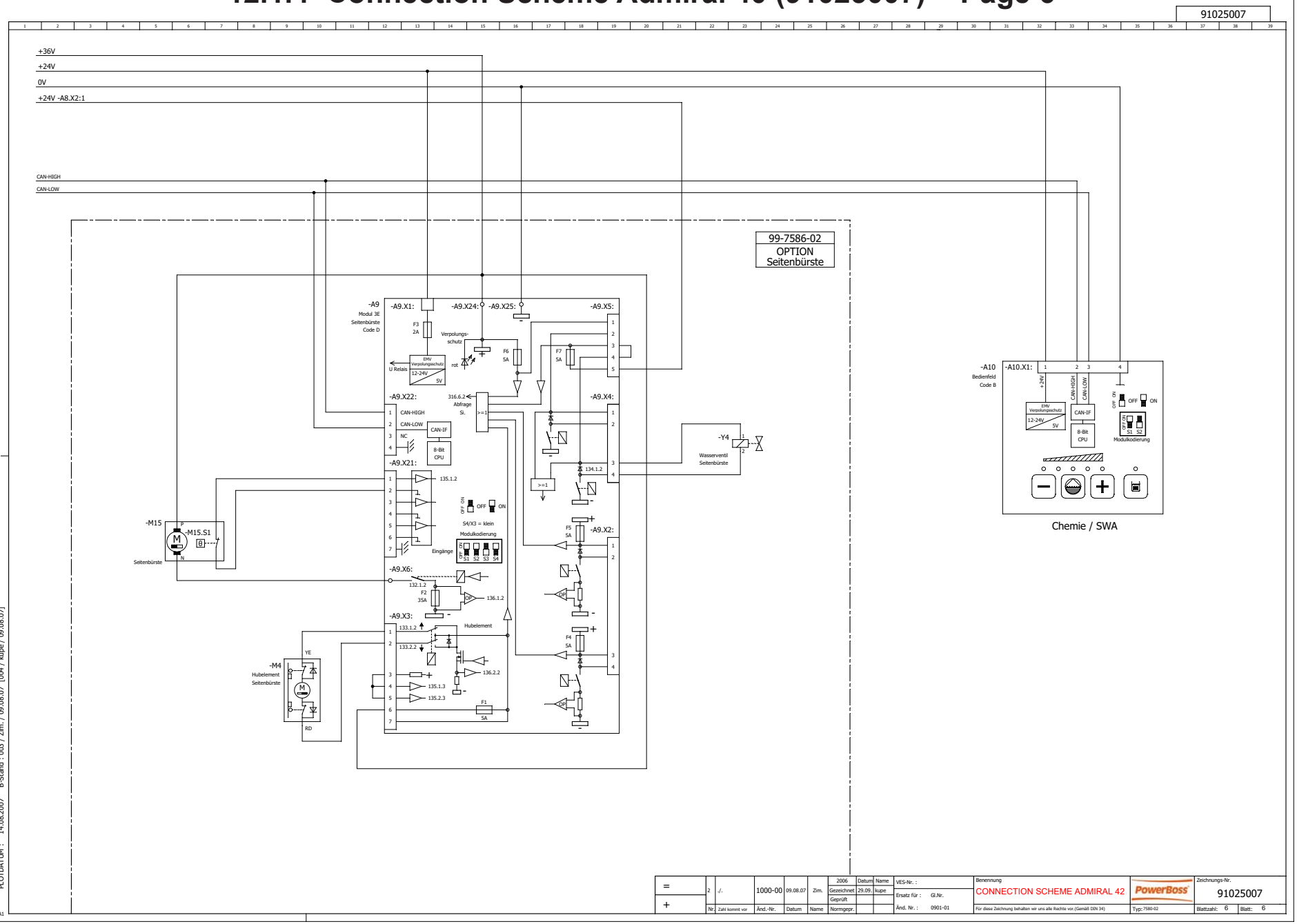
12.1.2 Connection Scheme Admiral 40 (91025007) - Page 4



12.1.3 Connection Scheme Admiral 40 (91025007) - Page 5



12.1.4 Connection Scheme Admiral 40 (91025007) - Page 6



12.2 Circuit Diagram Admiral 40 (91025015)

Reference Code	Compnent Description	Part No.	Location (Page & Zone)
A1	Control unit, Function control	01175790	4.24
A2	CAN control panel (electr. module) pre-sweeper/side brush	00512490	5.22
	CAN control panel, complete, for –A2 and –A10 (foil, plate, module)	00512500	
	CAN control panel for –A2 and –A10 (foil, plate)	90335514*	
A3	Standard control panel (electronic module B-type machine)	00712220	5.6
	Standard control panel, complete, for –A3 (foil, plate, module)	00512480	
	Standard control panel for –A3 (foil, plate)	90335522*	
A4	Module 3E “Code A” (pre-sweeper OPTION)	00512460	6.16
A5	Module 1, Power motors	00752920	5.26
A6	Drive controller	01171320	5.5
A7	Module, Chemical agent (chemical agent dosage OPTION)	00512450*	7.32
A8	DC/DC converter	00512440	6.11
A9	Module 3E “Code D” (side brush OPTION)	00512460	7.10
A10	CAN control panel (electric module) chemical agent / soiled water recycling	90493453*	5.32
B1	Float switch, Recovery tank (soiled water)	00959650	4.35
B2	Float switch, Filling (filling OPTION)	00959650	4.16
B3	Alarm (Piezo buzzer) (signal transmitter)	00745850	4.35
C1	Capacitor, 0.22µF Horn	00980040*	4.4
E1	Front working floodlight (working floodlight OPTION)	00980040*	7.26
E2	Rear working floodlight (working floodlight OPTION	00451320*	7.28
F50	Fuse, 200A- Main	00101520	4.5
F51	Fuse, 10A- Working floodlight and rotating beacon OPTION	00874970	4.6
NOTE: *NON-Stock Item			

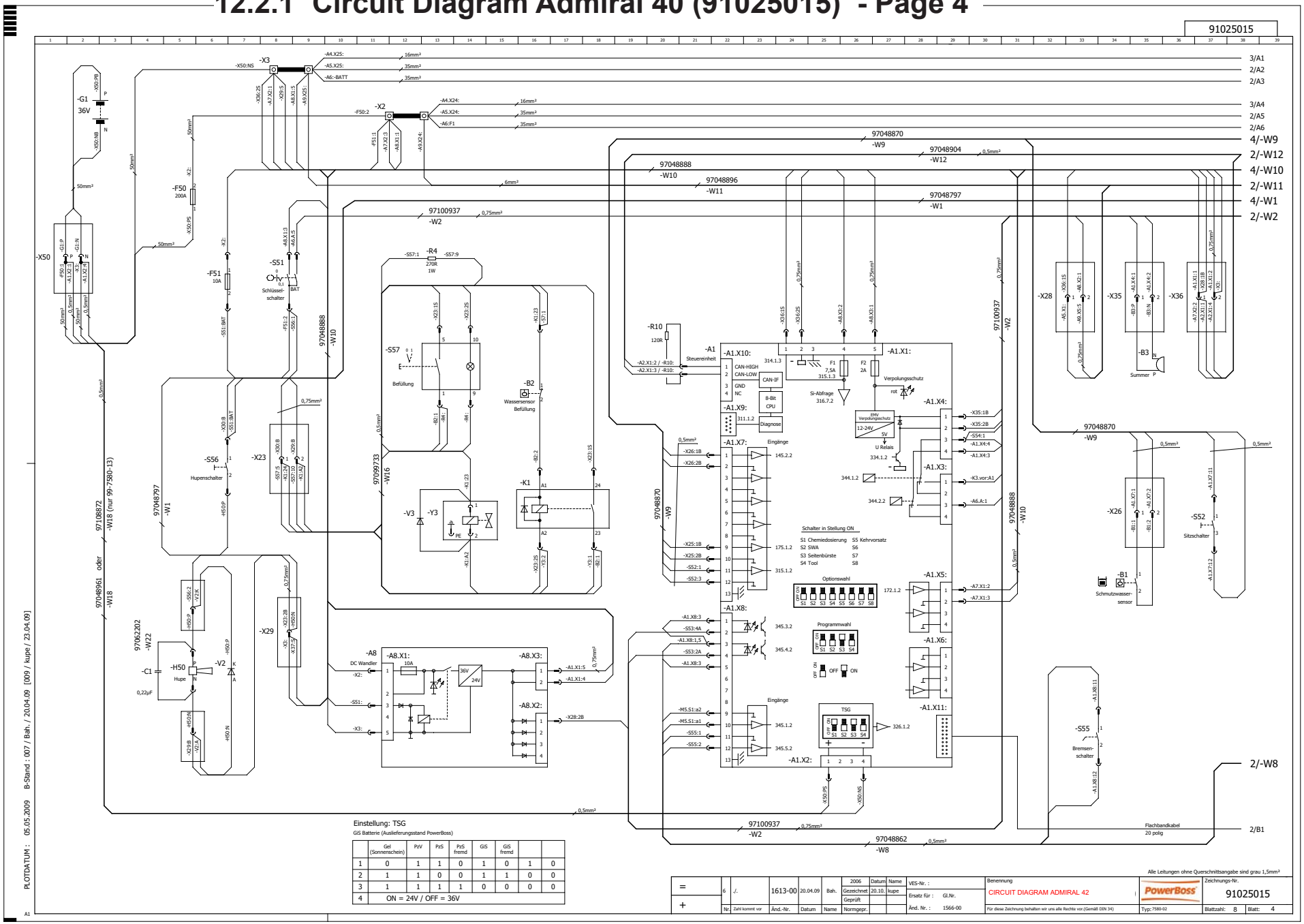
Reference Code	Compnent Description	Part No.	Location (Page & Zone)
G1	Battery 36V, Wet 6V 395Ah (6 required)	956715	4.3
H50	Horn	0050810	4.5
H52	Rotating beacon (rotating beacon OPTION)	90196387*	7.22
K1	Relay, Filling (filling OPTION)	00059550	4.16
K2	Relay, Soiled water recycling (soiled water recycling OPTION)	00120840*	5.16
K3	Relay, Forward / reverse direction	01079810	5.9
M1	Water pump	97047310	5.15
M2	Soiled water recycling pump (soiled water recycling OPTION)	97047310*	5.15
M3	Actuator, Squeegee (lifting element)	00650200	5.38
M4	Actuator, Side brush (lifting element) (side brush OPTION)	00142140*	6.33
M5	Drive motor	00910150	5.12
M6	Actuator, Pre-sweeper (lifting element) (pre-sweeper OPTION)	00650110	6.6
M7	Cylindrical broom (pre-sweeper OPTION)	00911390	6.2
M7.S1	Thermal switch, Cylindrical broom (pre-sweeper OPTION)	part of M7	6.4
M8	Side broom 1, Right (pre-sweeper OPTION)	01057330	6.2
M8.S1	Thermal switch, Side broom 1 (pre-sweeper OPTION)	part of M8	6.3
M9	Side broom 2, Left (pre-sweeper OPTION)	01057330	6.2
M9.S1	Thermal switch, Side Broom 2 (pre-sweeper OPTION)	part of M9	6.3
M10	Actuator, Brush deck (lifting element)	00650110	5.37
M11	Filter shaker motor (pre-sweeper OPTION)	00512370	6.3
M12	Filter vacuum motor (pre-sweeper OPTION)	00512370	6.5
M13	Brush motor 1, Right	00650230	5.36
M13.S1	Thermal switch, brush motor 1	part of M13	5.38
M14	Brush motor 2, Left	00650230	5.36
NOTE: *NON-Stock Item			

Reference Code	Compnent Description	Part No.	Location (Page & Zone)
M14.S1	Thermal switch, brush motor 2	part of M14	5.38
M15	Side brush motor (side brush OPTION)	00142130*	6.29
M15.S1	Side brush thermal switch (side brush OPTION)	part of M15	6.30
M16	Vacuum motor 1, Left (suction turbine)	0911380	5.30
M17	Vacuum motor 2, Right (suction turbine)	00911380	5.33
M18	Chemical agent dosage (chemical agent dosage OPTION)	00112300*	7.35
R1	Drive potentiometer	00975500	5.11
R4	Resistor, 270Ω (filling OPTION)	19245109*	4.13
R8	Resistor, 0.56Ω (pre-sweeper OPTION)	00903500	6.7
R9	Resistor, 0.56Ω (pre-sweeper OPTION)	00903500	6.3
R10	Terminating resistor CAN bus 120Ω	90266925*	4.20
R11	Terminating resistor CAN bus 120Ω	90266925*	5.24
S51	Key switch	90323437	4.8
S52	Seat switch (contact switch)	00041420	4.37
S53	Drive direction switch (toggle switch)	00697630	5.4
S54	Drive potentiometer switch (micro switch)	00975510	5.9
S55	Parking brake switch (stop light switch)	00028680	4.34
S56	Horn switch (push button switch)	00133770	4.6
S57	Filling switch (filling OPTION) (rocker switch)	00009050*	4.13
S59	Dirt hopper switch (pre-sweeper OPTION) (push switch)	00927610	6.11
S60	Hood switch (pre-sweeper OPTION) (push switch)	00927610	6.11
S61	Suction lance switch (chemical agent dosage OPTION)	90045058*	7.38
S62	Rotating beacon switch (rotating beacon OPTION) (rotary switch)	00521380	7.23
S63	Working floodlight switch (working floodlight OPTION) (rotary switch)	00521380	7.26
NOTE: *NON-Stock Item			

Reference Code	Compnent Description	Part No.	Location (Page & Zone)
V2	Recovery diode for horn –H50	90194879*	4.7
V3	Recovery diode for water valve for filling –Y3	90194879*	4.12
X2	Distributor + potential (36V)	00121440	4.12
X3	Distributor – potential (0V)	00121440	4.8
X5	Connector, 8 pin		6.11
X6	Connector, 8 pin		6.11
X18	Connector, 8 pin		7.5
X22	Connector, 1 pin		5.2
X23	Connector, 2 pin		4.8
X24	Connector, 1 pin (pre-sweeper OPTION)		5.7
X25	Connector, Suction lance switch (chemical agent dosage OPTION)	19791128	7.37
X26	Connector, 2 pin- Float switch, Recovery tank (soiled water sensor)	19791128	4.34
X27	Connector, 2 pin- Actuator, Squeegee (lifting element)	19791128	5.38
X28	Connector, 2 pin		4.32
X29	Connector, 1 pin		4.8
X30	Connector, 1 pin		7.23
X31	Connector, 1 pin- Water pump (female)	19791037	5.15
X32	Connector, 1 pin- Water pump, (male)	19791029	5.16
X33	Connector, 1 pin- Soiled water pump (Recycling pump OPTION), (female)	19791037	5.15
X34	Connector, 1 pin- Soiled water pump (Recycling pump OPTION), (male)	19791029	5.16
X35	Connector, 2 pin- Alarm (Piezo buzzer) (signal transmitter), (female)	19791128	4.34
X36	Connector, 2 pin		4.36
NOTE: *NON-Stock Item			

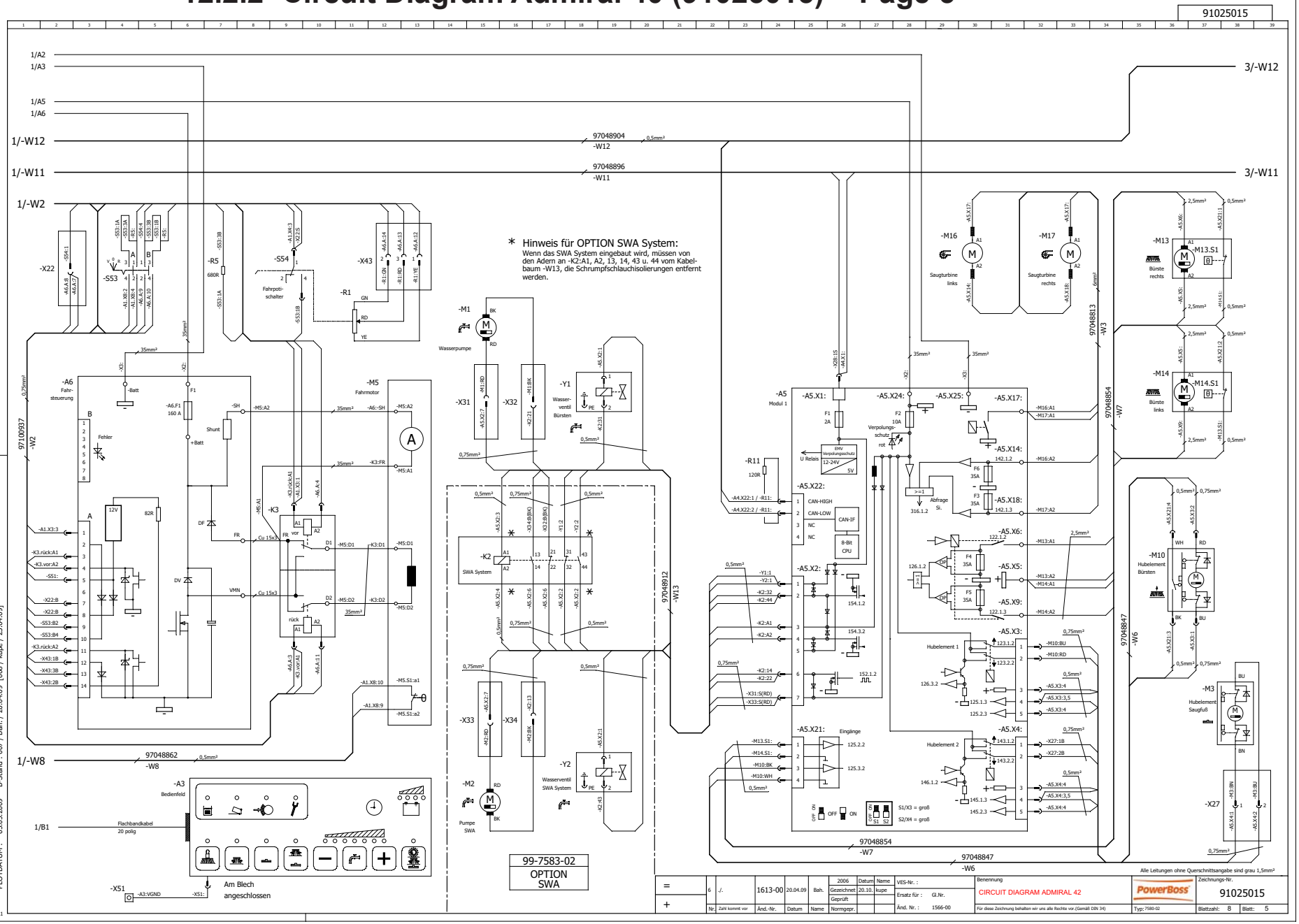
Reference Code	Compnent Description	Part No.	Location (Page & Zone)
X37	Connector, 1 pin		7.28
X38	Connector, 2 pin- Filter shaker- M11 (pre-sweeper OPTION)	19791128	6.2
X39	Connector, 2 pin- Filter vacuum- M12 (pre-sweeper OPTION)	19791128	6.5
X40	Connector, 2 pin- Rotating beacon, (rotating beacon OPTION)	19791128	7.22
X42	Connector, 2 pin- Actuator, side brush (side brush OPTION)	19791128	6.32
X43	Connector, 3 pin- Drive potentiometer	00972399*	5.12
X50	Battery connector, 175A (2 per machine) SB175	740159	4.1
X51	Connection stud for virtual earth of control panel –A3		5.4
X52	Connection stud for virtual earth of control panel –A10		6.30
X53	Connector, 1 pin- Side brush thermal switch- Right (pre-sweeper OPTION)	19791037	6.5
X54	Connector, 1 pin- Side brush thermal switch- Right (pre-sweeper OPTION)	19791029	6.5
X55	Connector, 1 pin- Side brush thermal switch- Left (pre-sweeper OPTION)	19791037	6.5
X56	Connector, 1 pin- Side brush thermal switch- Left (pre-sweeper OPTION)	19791029	6.5
Y1	Water valve, Brushes	00563220*	5.19
Y2	Water valve, Soiled water recycling system (soiled water recycling OPTION)	00563220*	5.19
Y3	Water valve, Filling (part of filling OPTION)	00651240	4.14
Y4	Water valve, Side brush (side brush OPTION)	00563220*	6.37
NOTE: *NON-Stock Item			

12.2.1 Circuit Diagram Admiral 40 (91025015) - Page 4

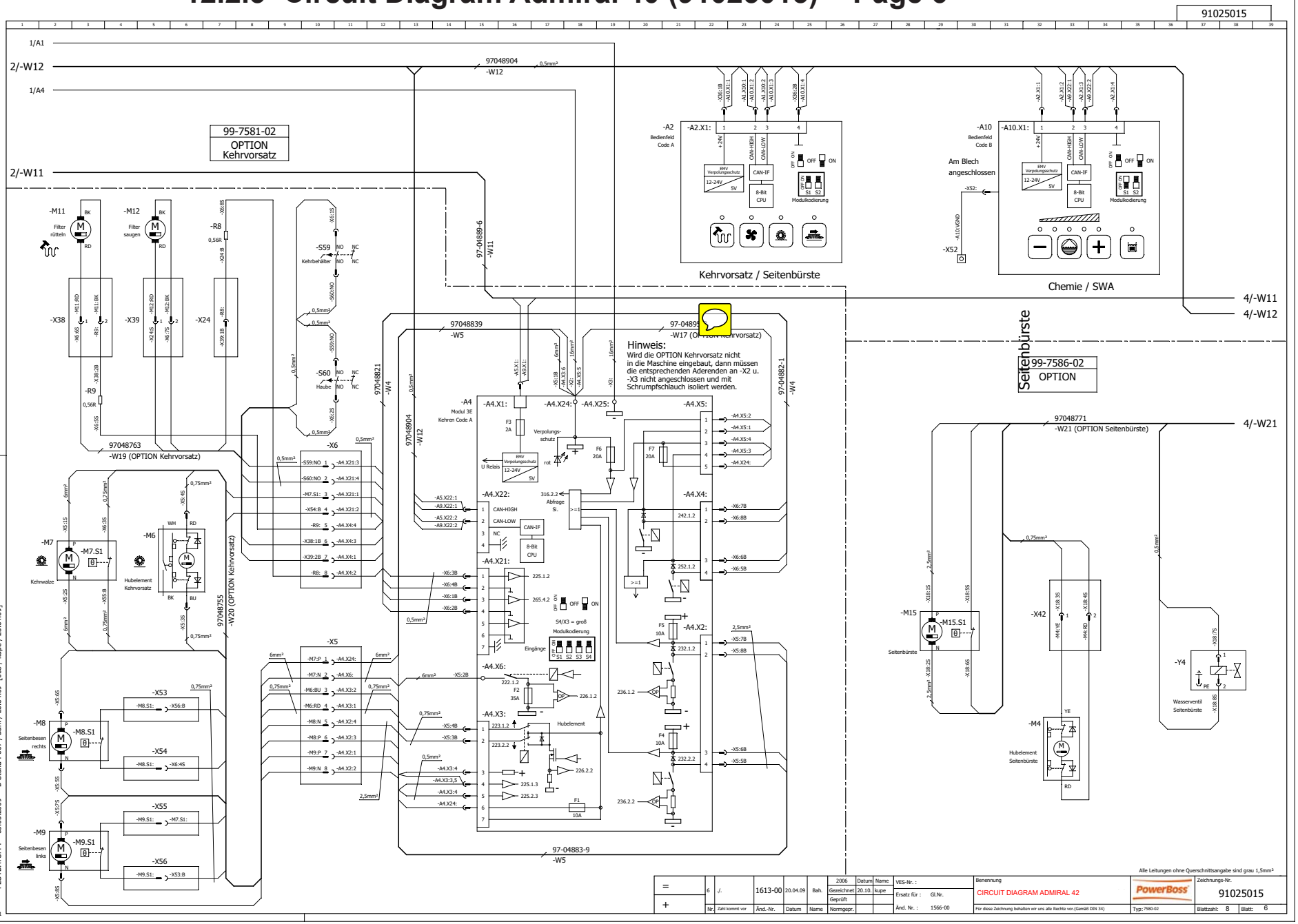


	Gel (Sonnenschein)	PzV	PzS	PzS fremd	GiS	GiS fremd		
1	0	1	1	0	1	0	1	0
2	1	1	0	0	1	1	0	0
3	1	1	1	1	0	0	0	0
4	ON = 24V / OFF = 36V							

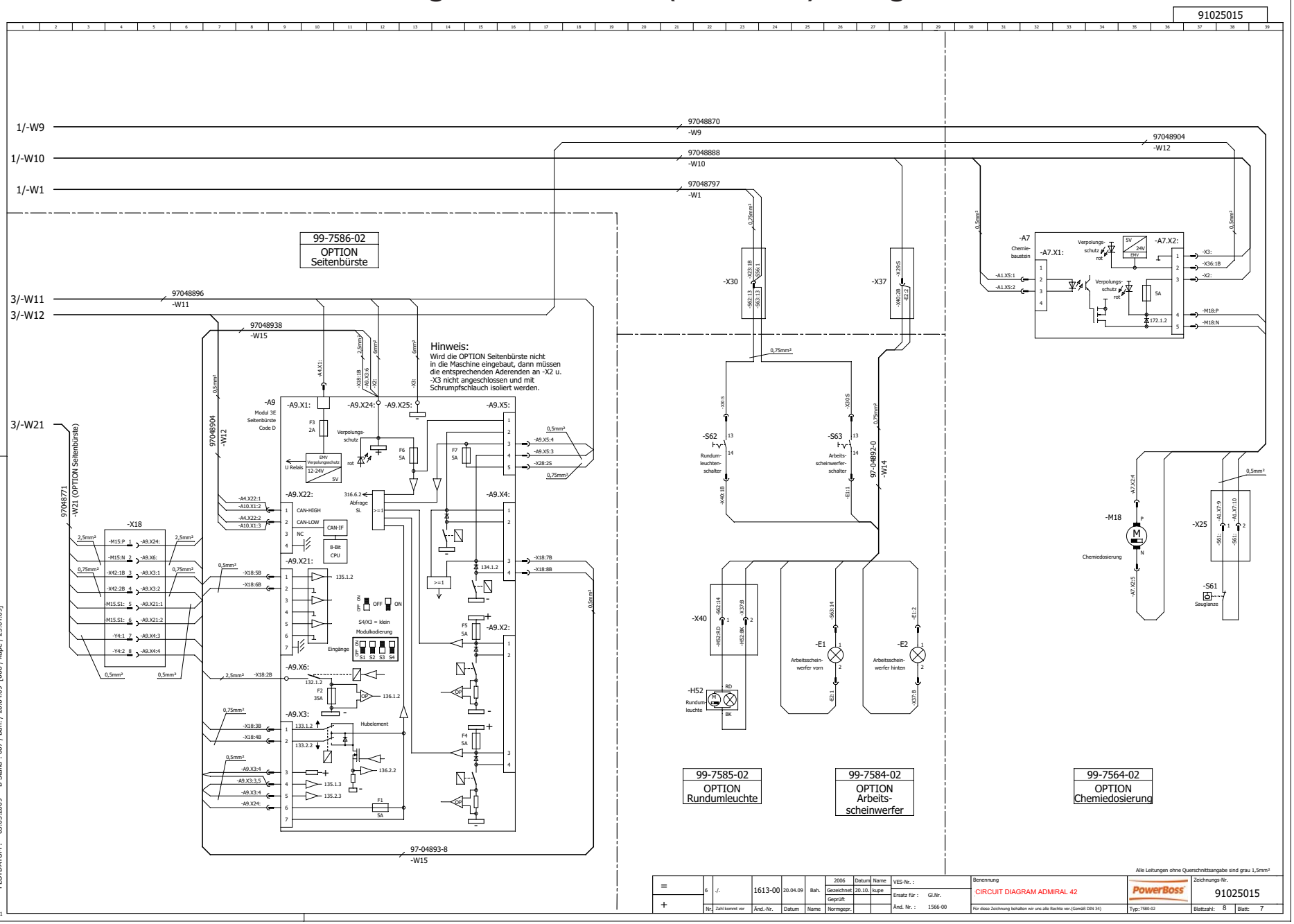
12.2.2 Circuit Diagram Admiral 40 (91025015) - Page 5



12.2.3 Circuit Diagram Admiral 40 (91025015) - Page 6



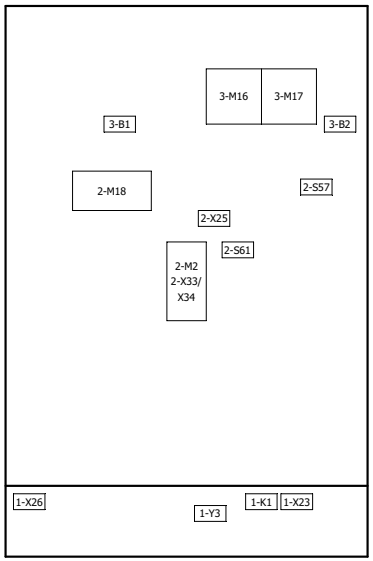
12.2.4 Circuit Diagram Admiral 40 (91025015) - Page 7



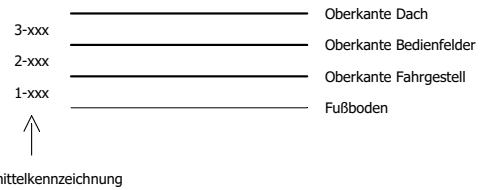
12.2.5 Circuit Diagram Admiral 40 (91025015) - Page 8

91025015

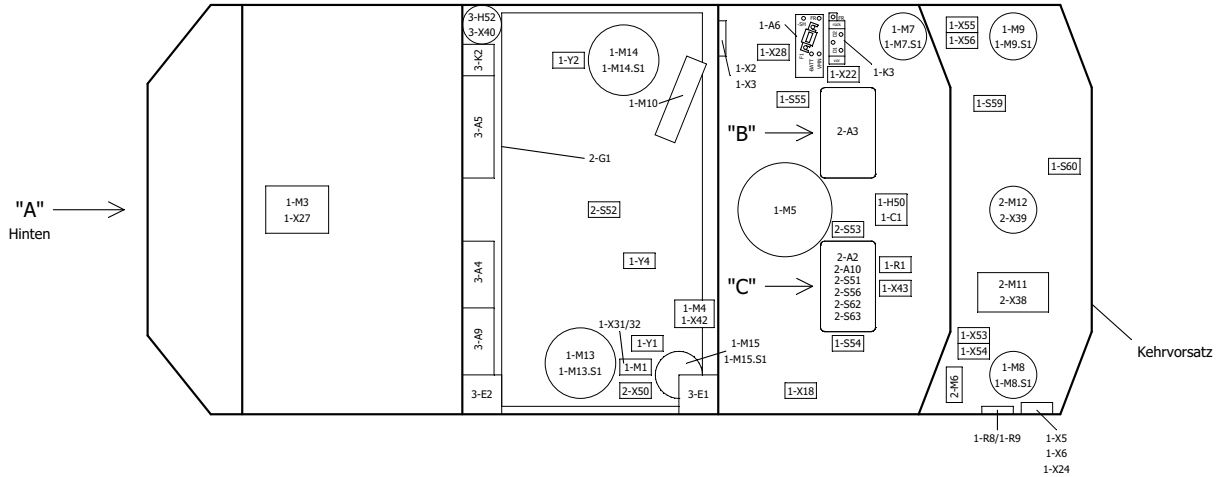
Ansicht "A"



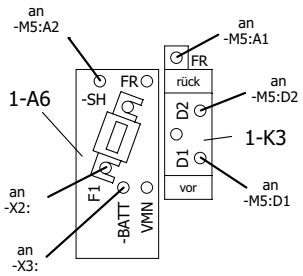
Zuordnung der Betriebsmittel



Draufsicht

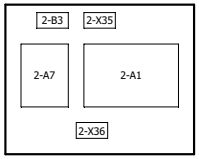


Ansicht vergrössert Fahrsteuerung



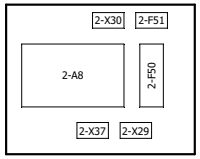
Ansicht "B"

"Handschuhfach" links



Ansicht "C"

"Handschuhfach" rechts



=	6	./.	1613-00	20.04.09	Bah.	2006	Datum	Name	VES-Nr. :	Benennung	PowerBoss	Zeichnungs-Nr.
+						Gezeichnet	20.10.	kupe	Ersatz für: Gl.Nr.	CIRCUIT DIAGRAM ADMIRAL 42		91025015
						Geprüft			Änd. Nr. : 1566-00			
	Nr.	Zahl kommt vor	Änd.-Nr.	Datum	Name	Normgepr.				Für diese Zeichnung behalten wir uns alle Rechte vor.(Gemäß DIN 34)	Typ: 7580-02	Blattzahl: 8 Blatt: 8

PLOTDATUM : 05.05.2009 B-Stand 007 / Bah. / 20.04.09 008 / kupe / 23.04.09

A2

Notes

13 WARRANTY

Revision F
Effective November 1, 2008
PowerBoss Made Simple Industrial Limited Warranty

Minuteman International owner of PowerBoss warrants to the original purchaser/user that the product is free from defects in workmanship and materials under normal use. PowerBoss will, at its option, repair or replace without charge, parts that fail under normal use and service when operated and maintained in accordance with the applicable operation and instruction manuals. All warranty claims must be submitted through and approved by factory authorized repair stations.

This warranty does not apply to normal wear, or to items whose life is dependent on their use and care. Parts not manufactured by PowerBoss are covered by and subject to the warranties and/or guarantees of their manufacturers. Please contact Minuteman International for procedures in warranty claims against these manufacturers.

Special warning to purchaser -- Use of replacement parts not manufactured by PowerBoss or its designated licensees, will void all warranties expressed or implied. A potential health hazard exits without original equipment replacement.

All warranted items become the sole property of Minuteman International or PowerBoss or its original manufacturer, whichever the case may be.

PowerBoss disclaims any implied warranty, including the warranty of merchantability and the warranty of fitness for a particular purpose. PowerBoss assumes no responsibility for any special, incidental or consequential damages.

This limited warranty is applicable only in the U.S.A. and Canada, and is extended only to the original user/purchaser of this product. Customers outside the U.S.A. and Canada should contact their local distributor for export warranty policies. PowerBoss is not responsible for costs or repairs performed by persons other than those specifically authorized by PowerBoss. This warranty does not apply to damage from transportation, alterations by unauthorized persons, misuse or abuse of the equipment, use of non-compatible chemicals, or damage to property, or loss of income due to malfunctions of the product. If a difficulty develops with this machine, you should contact the dealer from whom it was purchased.

This warranty gives you specific legal rights, and you may have other rights, which vary from state to state. Some states do not allow the exclusion or limitation of special, incidental or consequential damages, or limitations on how long an implied warranty lasts, so the above exclusions and limitations may not apply to you.

	Travel*	Labor	Parts	Engine	Extended Warranty	Costs
Walk behinds						
Battery sweepers	Ninety days	One year	One year	N/A	2 years Parts + Labor (or 2000 Hours)	2%
IC sweepers	Ninety days	One year	One year	Through manufacturer	2 years Parts + Labor (or 2000 Hours)	2%
Battery scrubbers	Ninety days	Two years	Three years	N/A	3 Years Parts + Labor (or 3000 Hours)	2%
Riders						
Battery scrubbers	Ninety days	Two years	Three years/2000 hrs	N/A	3 Years Parts + Labor (or 3000 Hours)	2%
IC sweeper/scrubbers	Ninety days	Six months	Two years/2000 hrs	Two years/3000 hrs**	2 years Parts + Labor (or 2000 Hours)	3%
IC sweepers	Ninety days	Six months	Four years/3000 hrs	Five years/3000 hrs**	4 Years Parts + 2 Years Labor (or 4000 Hours)	3%
Exceptions						
Apex series sweeper	Ninety days	One year	One year/1000 hrs	One year/1000 hrs**	2 years Parts + Labor (or 2000 Hours)	3%
6X sweeper	Ninety days	Six months	Two years/2000 hrs	Two years/2000 hours**	2 years Parts + Labor (or 2000 Hours)	3%

Tank Bladders Eight years/ no additional labor
Polypropylene plastic tanks Ten years/ no additional labor
Batteries 0-3 months full replacement, 4-12 prorated credit
Chargers One-year replacement
Replacement parts Ninety days
***Two-hour cap**
****Through engine manufacturer. See section 3 of warranty manual for engine warranty exceptions**
***** Based upon dealer's certification status**
Extended Warranty MUST be signed up within 30 days of delivery to End User (Dealer has 1Year from Receiving Machine to Sign up extended Warranty)
Extended Warranty Cost is based on Invoice Price multiplied by the Percentage listed in the Extended Warranty Column

All above labor and travel reimbursed at 65 or 75% of the published shop rate.

PowerBoss®
The Power of Clean

“The Power of Clean”

PowerBoss Is A Full Line Manufacturer Of Sweepers and Scrubbers For Industrial Facilities.

PowerBoss,Inc 175 Anderson Street P.O. Box 1227- Aberdeen North Carolina 28315

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