

Service Manual

Minuteman[®]
Excellence Meets Clean

**For the
HM40B and HM47B Rider
Sweeper**

**For:
Training
Troubleshooting
Adjustments**



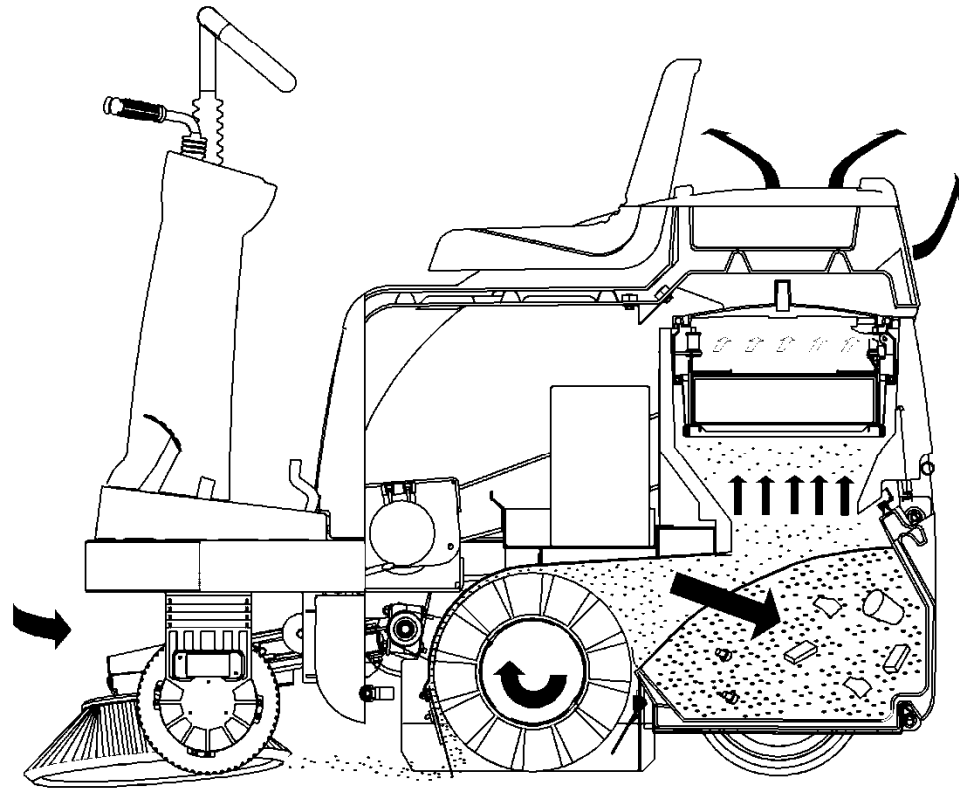
Rev 08/2016

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1. WORKING PRINCIPLE

The side brush wipes the dirt at borders and edges into the collecting track of the wide cylindrical broom. This broom transports the debris overhead and into the dirt hopper. The fine dust raised during this operation is evacuated to the suspended filter by the suction fan where the dust is separated. The air returned into the environment is clean.

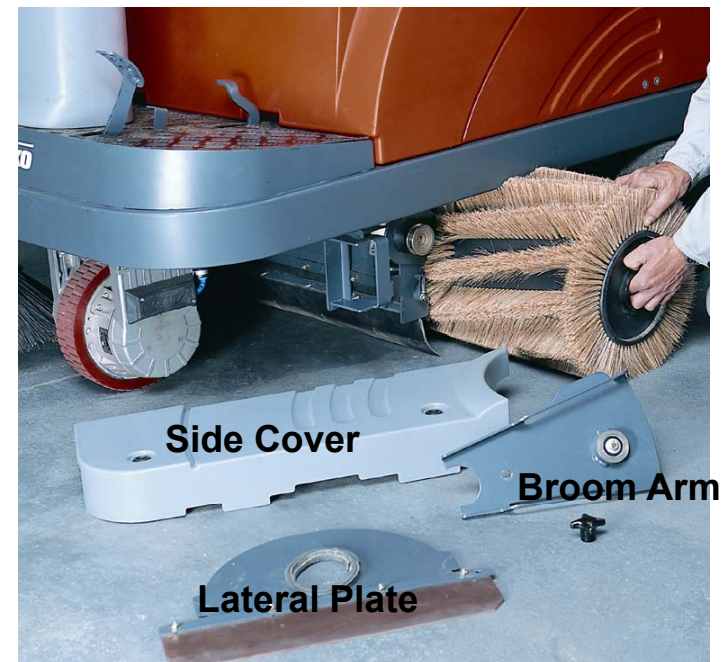
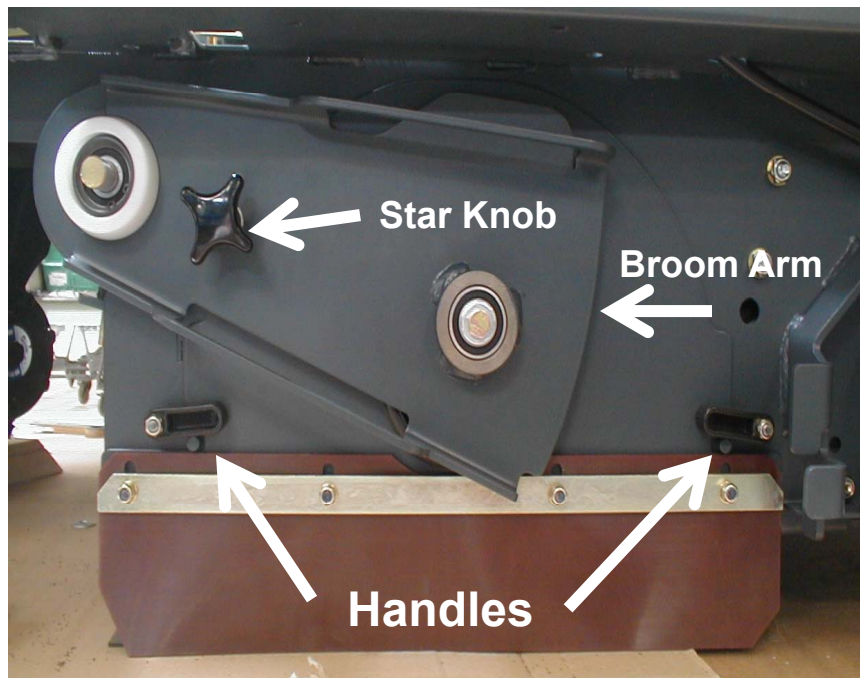


2. Technical Data

Vehicle dimensions and weights	HM40B/HM47B	
Length with side brush	Mm	1520
Width with 1 side brush	Mm	1120
Height above steering wheel	Mm	1340
Empty weight – without batteries	Kg	
Empty weight – serviceable	Kg	
Driving and sweeping performance		
Forward/reverse speed	km/h	6.0 / 4.0
Sweeping speed	km/h	up to 6.0
Sweeping track with/w/o 1 / with 2 side brushes	Mm	700 / 970 / 1240
Theoretical surface performance with 2 side brushes	m ² /h	up to 7450
Theoretical surface performance without side brush	m ² /h	up to 4200
Gradability (for 1 min. max.)	%	up to 12
Tires		
Tire size (serial) front / rear		4.00 – 4/6 Pr Pneumatic tires
Inflation pressure	Bar/PSI	6/87
Cylindrical broom		
Diameter/ length	mm	345 / 700
Diameter (min. due to wearing)	mm	approx. 290
Speed	rpm	530 ± 20
Sweeping track adjustment	mm	50 + 10
Bristling		PA
Side brushes		
Diameter	mm	460
Speed	rpm	approx. 90
Bristling		PA

3.1 Cylindrical Broom

- **Replacing the Cylindrical Broom**
- **Mount:**
- Lower broom
- Remove plastic side cover
- Loosen star-shaped knob (2) and remove left broom arm
- Open both handles and remove lateral plate
- Remove broom by pulling
- **Dismount:**
- Proceed in inverse order
- Note: Twist broom while inserting until it distinctly catches on the notch.

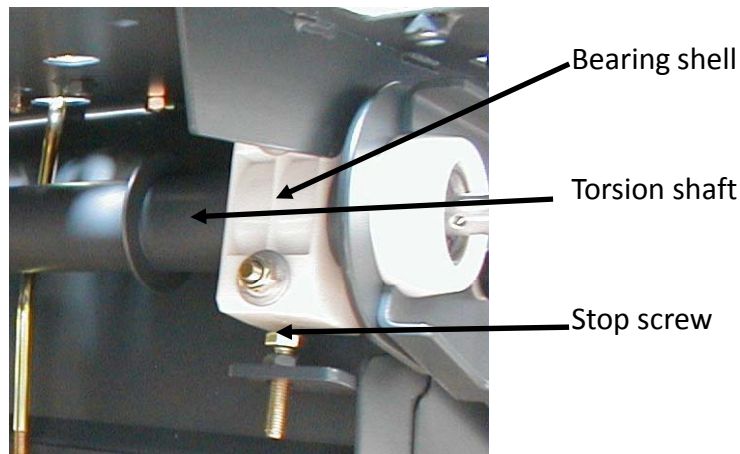


3.2 Main Broom Adjustment

- **Check Sweeping Track**
- Park machine on level concrete or asphalt surface.
- (check inflation pressure of pneumatic tyres and adjust pressure if required)
- Turn on cylinder broom and let it run dry for a short time.
- Lift broom and turn off, forward the machine a bit and measure sweeping track width.
- With the correct broom adjustment the parallel sweeping marks have to appear on the floor (sweeping track)
- The sweeping track width should be for the HM40R and HM47R (KS40R- KS47R) 2 Inches \pm .2 inches (50 \pm 5mm).
- **Note:** Exceeding the specified sweeping track parameter has a negative effect on the service life of the cylindrical broom.
- The sweeping track reduced as the broom diameter reduces due to wearing of the bristles.
- **Adjust parallelism**
- Loosen left bearing shell of the torsion shaft
- Adjust parallelism at the stop screw
- Bearing shell
- Torsion shaft
- Stop screw
- **Sweeping Track Adjustment**
- The sweeping track is adjusted after loosening of the handle and turning the star-shaped knob in the engine compartment.

Adjust parallelism

- Loosen left bearing shell of the torsion shaft
- Adjust parallelism at the stop screw



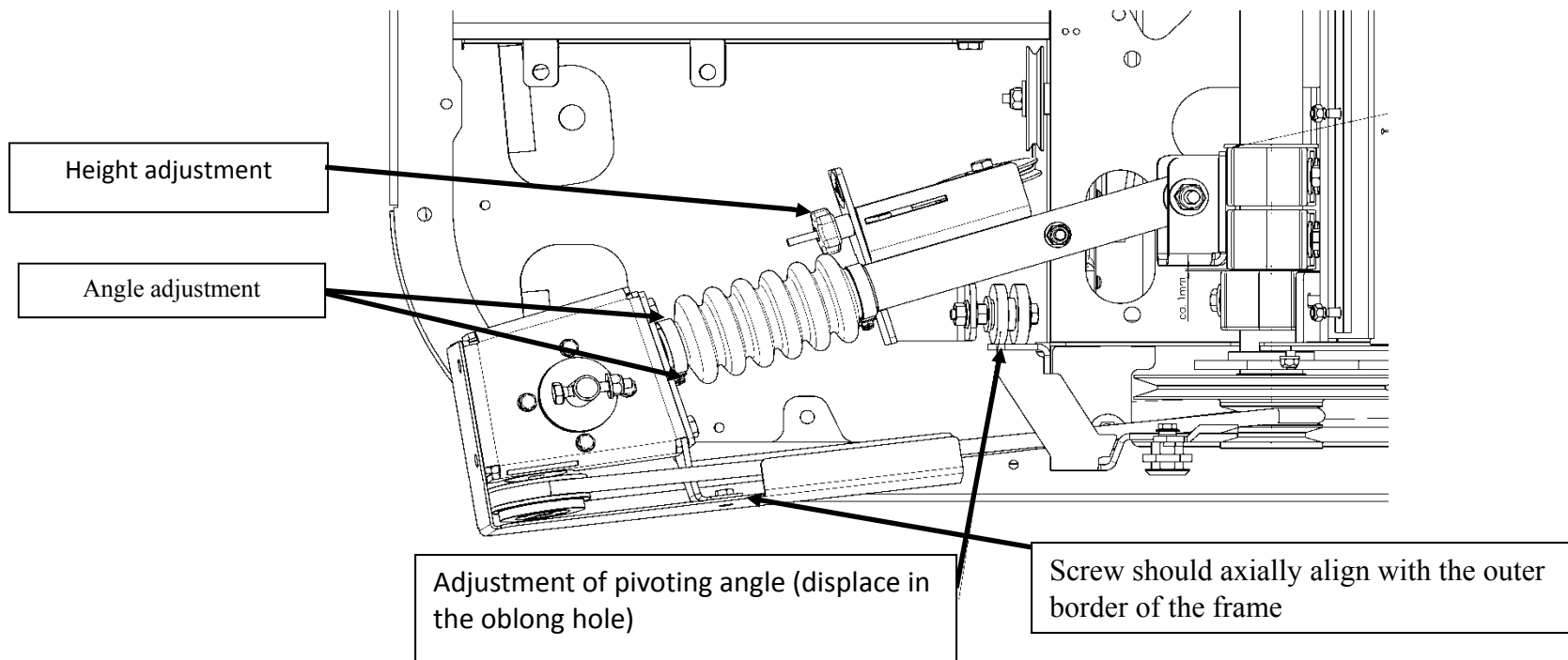
3.3 Sealing Strips

- **Check and Adjust Sealing Strips at the Broom Compartment**
- In order to assure good function of the sweeper, a perfect condition and correct adjustment of the sealing strips of the broom compartment are required, especially in order to attain the prescribed low pressure ($\geq 9\text{mm water column}$) in the broom compartment, a clean sweeping result and the less possible wear of the sealing strips.
-
- Proceed to adjustment of the sealing strips at the bottom of the broom compartment on level ground only.
- The lateral and rear sealing strips are adjustable in oblong holes, the front sealing strip by controlling mechanism.
-
- Check the inflation pressure of pneumatic tyres and modify pressure if required.
-
- The sealing strip at the front folding apron has to be lightly inclined backwards and stand on the floor.
-
- Ground clearance of the left- and right-hand sealing strips is 5/64" (2mm)
-
- Ground clearance of the rear sealing strip is approx. = .20" (5mm)
- **Note:** Replace defective sealing strips immediately

3.4 Side Brush Adjustment

Adjust inclination of the side brush such that approx. $\frac{2}{3}$ of the brush perimeter has contact with the floor.
For right-hand side brush this ground contact is recommended between **11 and 3 o'clock** seen in direction of travel.
For left-hand side brush this ground contact is recommended between **9 and 1 o'clock** seen in direction of travel.

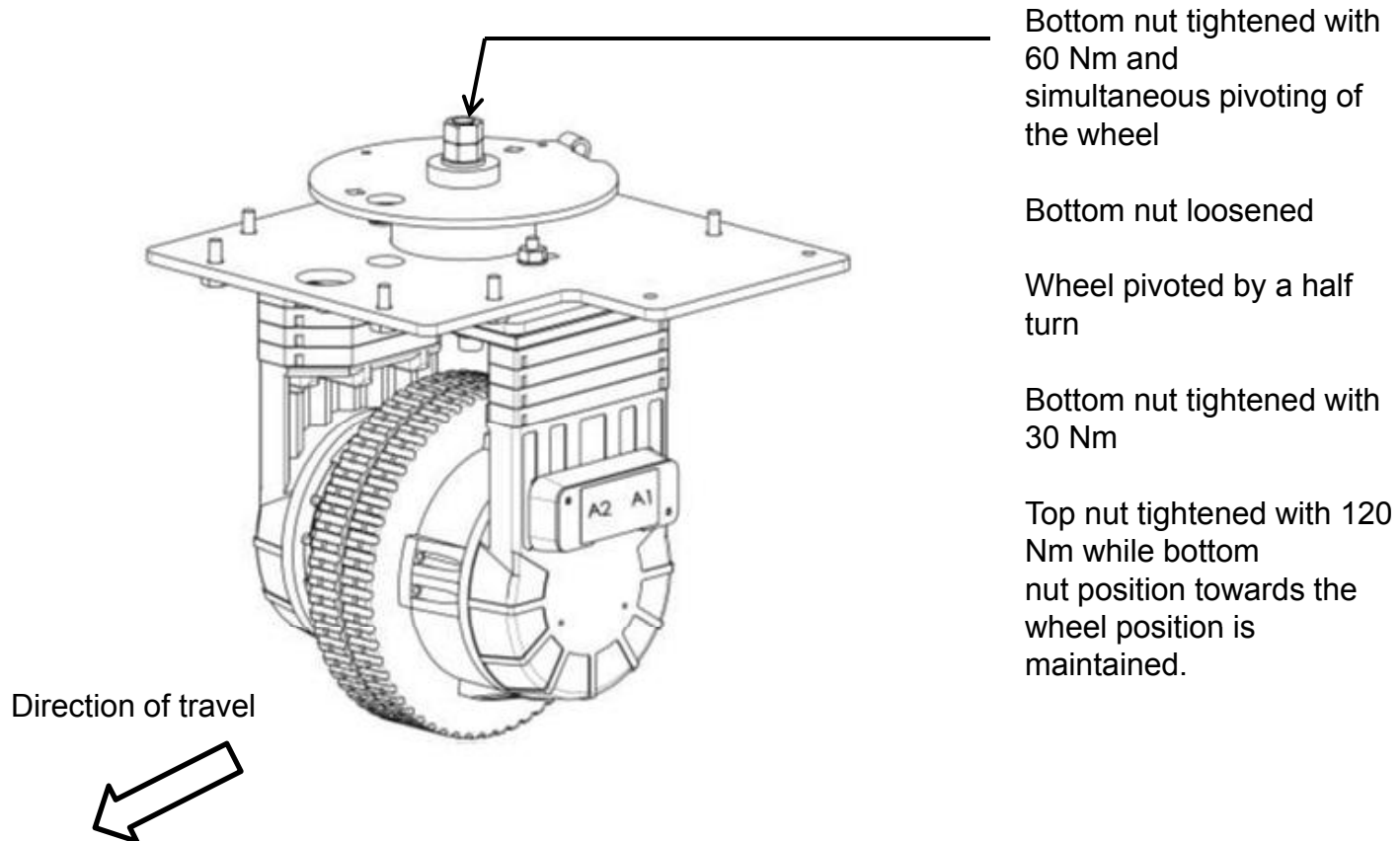
- Adjust inclination after loosening the gear holder and by displacing in the oblong holes.
- Adjust height of the lifted side brush at the Bowden cable such that the alignment of the top edges of the belt pulleys is approx. 10° less than vertical axis. Then the distance between the top side of the V-belt and the fairing holder is about 15mm.
- Tension of the V-belt is not adjustable but given by elastic force.



4. Front Wheel Drive

Bearing Plate Adjustment

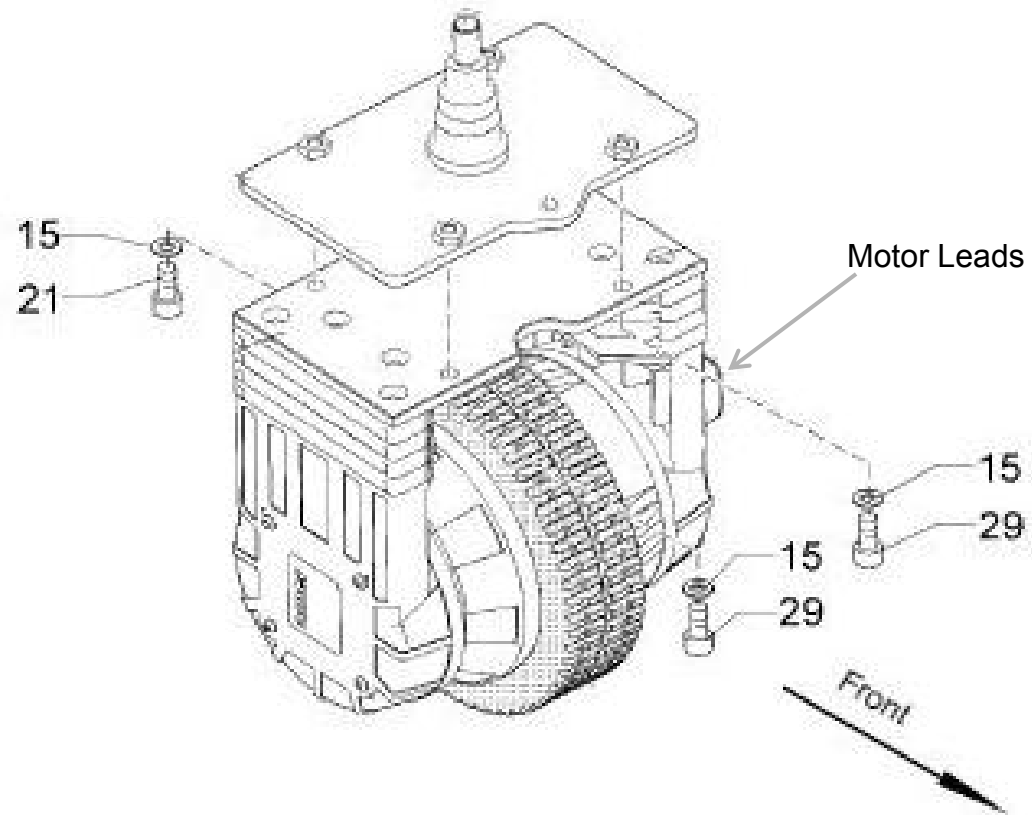
Manufactured before 11-2011



4.1 Removing The Drive Motor

The drive motor can be removed from the machine by doing the following:

1. Disconnect the batteries
2. Jack up the front of the machine.
3. Disconnect the motor leads.
4. Remove the four bolts # 21 & 29.



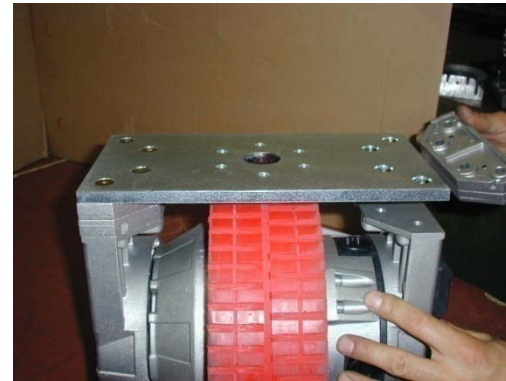
4.2 Replacing Drive Tire

Steps to be executed for wheel changing



1.

Dismount drive unit at the separation point between the wheel support plates



3.

Remove holder between the plate and the brush flange



2.

Loosen fixing screws of plate and holder



4.

Remove the lateral sealing plug

4.2 Replacing Drive Tire



5.

Pull brush flange off
the motor axle



7.

Loosen the
8 wheel bolts



6.

Remove brush flange



8.

Pull off the tire

4.2 Replacing Drive Tire



9.
Check condition and cleanliness of slip rings



11.
Tighten wheel bolts crosswise with 16Nm



10.
Insert new tyre and tighten wheel bolts crosswise and hand-tight



12.
Check carbon brushes for wearing and smooth running in the brush holder

4.2 Replacing Drive Tire



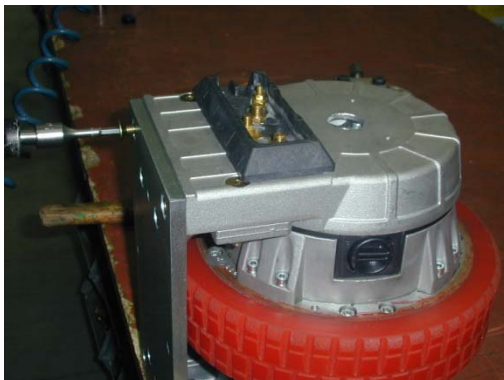
13.

Place brush flange and drive in straight onto the motor shaft



15.

Insert sealing plug into borehole



14.

Screw fastening plate



16.

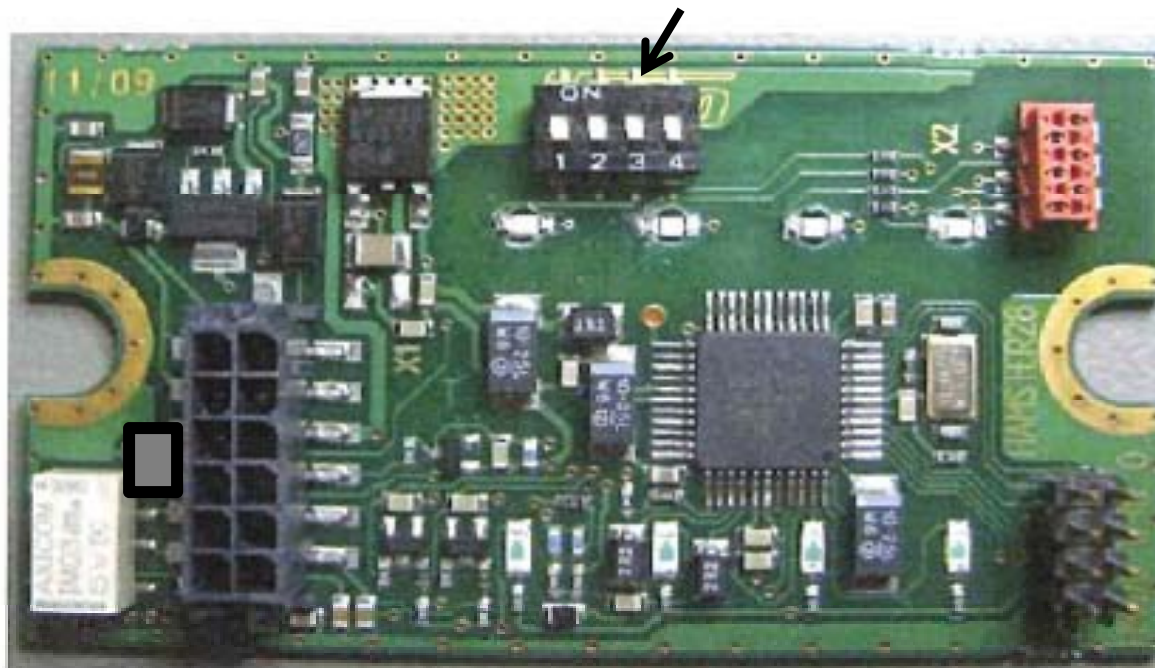
Then maintenance is completed.

Drive unit may be mounted to the machine.

5. LDS (New Style used after 11-2011)

The LDS controller board has dip switches for setting the machine to the correct battery type such as Wet, Gel and AGM battery types. This is required for maximum run time and battery life.

Dip Switches



Pins on Connector

7	1
8	2
9	3
10	4
11	5
12	6

5.1 Programming the LDS (Signal Transmitter)

Signal Transmitter Settings

Dip-Switch 1	Dip-Switch 2	Dip-Switch 3	Dip-Switch 4	Battery Type
OFF	OFF	OFF	OFF	Crown without Offset
ON	OFF	OFF	OFF	Crown with Offset
OFF	ON	OFF	OFF	GiS, USA Plate Type Wet Lead Acid
ON	ON	OFF	OFF	GiS Euro Wet Lead Acid
OFF	OFF	ON	OFF	PzS USA Tube Type
ON	OFF	ON	OFF	PzS Euro Wet Tube Type
OFF	ON	ON	OFF	GiV AGM & Gel Plate Type
ON	ON	ON	OFF	PzV AGM & Gel Tube Type
OFF	OFF	OFF	ON	Hoppeke AGM
ON	OFF	OFF	ON	empty
OFF	ON	OFF	ON	empty
ON	ON	OFF	ON	empty
OFF	OFF	ON	ON	empty
ON	OFF	ON	ON	empty
OFF	ON	ON	ON	empty

If all Dip-switches are ON, then the wired detection is used.

The LDS could show via the LED's (LDS; bottom row) the following error messages:

- 1) All LED's flashing (Red and 3 x Green)
- 2) Only the Green LED's flashing

Error message 1 means that PIN 4 of LDS has no return signal

=> Check output PIN8; Check relay K2;
Check fuse F3; Check wiring and
plugs at the relevant components

Error message 2 means

=> at the moment not activ

Note: Use the "Crown With Offset" for Crown wet
batteries for maximum run time.

6. Drive System Overview

The drive motor is operated by the electronic drive control unit.

The operator selects travel direction in the first section of the lever arm of the drive pedal by the corresponding micro-switch. Then, travel speed is transferred to the drive control unit with the potentiometer operating continuously and for both forward and reverse mode.

Speed of reverse ride will be reduced by the electronic board to 60% even if the potentiometer is fully deviated.

The drive motor temperature is monitored and together with the LDS, this control reduces travel speed by 50% in case of overheating or insufficient charging status of the battery. Further discharging or overheating of the main motor cause cut-off of this function

Do not exceed duration of 1 minute of max. 12% uphill ride. Steeper slopes or longer rides on less steep paths lead to overload and thus to shutdown of the travel drive unit.

If an error occurs during first operation of the controller or during operation, the controller recognizes some of the errors and displays them.

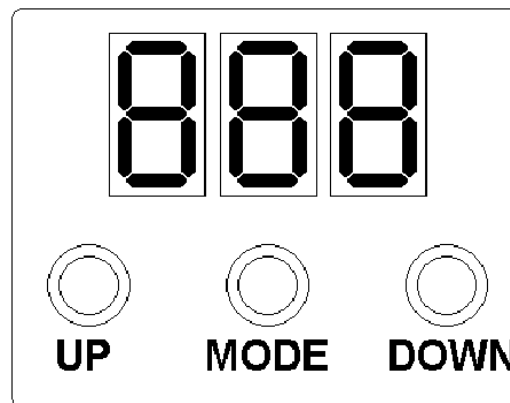
Bypass the seat switch for diagnosis since otherwise the non-actuated switch displays the error code „A12“.

6.1 Drive Controller Error Codes

Display	Cause	Remedy
A1	Incorrect start sequence Selection of "forward" mode	Check pedal position, Check micro-switch "forward", Check micro-switch wiring
A2	Incorrect start sequence Selection of "forward" mode	Check pedal position, Check micro-switch "forward", Check micro-switch wiring
A3	Potentiometer defective	Check potentiometer Check potentiometer wiring
A4	Potentiometer out of neutral position during first operation	Check mechanical operation of the drive pedal Check calibration of controller or re-calibrate if required
A5	Inadmissible controller temperature	High motor current, exceeding ambient temperature Insufficient heat dissipation by controller
A6	Seat contact or contact breaker active	Seat contact activated (driver not seated) or wire broken
A7	Motor current 1 exceeded	Motor current exceeded (e.g. extensive uphill ride) Error at motor or wiring
A8	Motor current 2 exceeded	Motor current exceeded (e.g. extensive uphill ride) Error at motor or wiring
A9	Under voltage (< 18 V)	Low discharge of battery, Check battery feed line
A10	Overvoltage (< 45 V)	Wrong battery type installed, faulty connection Voltage peaks at electric on-board system
A11	Overload controller / engine	Motor current; check controller setting (overload protection)
A12	Controller deactivated	Seat switch not activated; Turn key switch off and on while on the seat; or open circuit on the seat switch circuit, check the 6 pin connector near controller, seat switch, seat switch harness, 10 amp fuse. Check for B- on pin 6 of controller, if present check the K3 relay.
A13	Control voltage supply interrupted	Control fuse defective, check control line from ignition lock and earth line (PIN 15/16)
A14	Internal software error	Switch controller off and on again
A15	Short-circuit or exceeding current at	Switch controller off and on again

6.2 Programming The Drive Controller

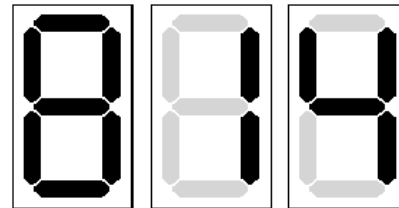
- **Note:** When replacing the controller: May require re-calibrating the potentiometer.
- **Note:** Only trained and authorized Minuteman service technicians are admitted to adjust the programming the controller.
- Incorrect setting may cause defects of the controller and important malfunctions leading to uncontrollable riding behaviour of the machine.
- **General Description of Keys**
- Three keys are located below the 7-segment LED display. Start programming by pressing the “MODE” key and the first parameter “F0” appears. Use the “UP” key to step forward to the next parameter (F1, F2 ...) and the “Down” key to step back. After having attained the desired parameter, select it by pressing the “Mode” key. The parameter appears in the display.
- If the programming mode has not yet been invoked before pressing the “UP” or “Down” key, display directly changes to the password level and shows “F00” or “100” while the left cipher flashes.



6.2 Programming The Drive Controller

- **Enter Password**

(Password for potentiometer setting only)



- Use the “UP” and “Down” keys to select the first and flashing number of the three-digit password and acknowledge by pressing the “Mode” key. Then, enter and acknowledge the next flashing central cipher alike.
 - Upon entering and acknowledging the last, right-hand cipher and in total, the correct password, display changes to the last parameter or to “F0”
 - If entering of one of the three ciphers is incorrect, complete the procedure until after entering if the last cipher and acknowledgement by “MODE” the display shows “Err” briefly. Then repeat the complete entering procedure.
- **Modify Parameter**

In some cases, the 5-pin plug of the K3 relay in the machine has to be disconnected before programming the controller.

After correct entering of password, the parameter “F.” selected before appears in the display. Invoke the numeric value of the parameter by pressing the “MODE” key. Modify this numeric value of the selected parameter by the “UP/“DOWN” keys. Acknowledge modification by pressing the “MODE” key. Then the selected parameter “F.” is displayed.

6.2 Programming The Drive Controller

- **Modify Parameter**

In some cases, the 5-pin plug of the K3 relay in the machine has to be disconnected before programming the controller.

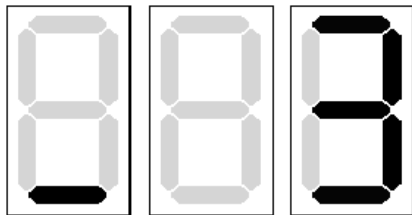
After correct entering of password, the parameter “F..” selected before appears in the display. Invoke the numeric value of the parameter by pressing the “MODE” key. Modify this numeric value of the selected parameter by the “UP/“DOWN” keys. Acknowledge modification by pressing the “MODE” key. Then the selected parameter “F..” is displayed.

- It is possible to quit the parameter mode immediately by simultaneous pressing the “MODE” and “UP” keys.
- The mode is automatically quit after 20 seconds without actuation of key. The controller then attains its operating mode.
- Viewing parameters is possible without entering the password while modification of parameters always requires entering of password.

6.3 Calibrate Drive Potentiometer

When replacing the controller or the drive potentiometer, the controller has to be adapted to the potentiometer.

1. Press “MODE” key and select parameter “F20” using the “UP” key, acknowledge with “MODE” key.
2. Set numeric value of “F20” to “1” using the “UP” key. (Caution: if the programming level has not yet been invoked, password level is displayed)
3. Enter password and acknowledge with “Mode” key.
4. Re-select parameter “F20” with “UP”/“DOWN” keys and acknowledge with “MODE” key.
Set numeric value of “F20” to “1” using the “UP” key and acknowledge.
5. Select parameter “F10” with “DOWN” key and acknowledge with “MODE” key
6. The display then shows the “0” value. If not, use the “UP”/“DOWN” keys to set it to “0” and acknowledge with “MODE”.
7. The display then shows “F10” again.
8. While the displays shows “F10“, press the “UP” and “DOWN” keys simultaneously for some seconds until the display changes.

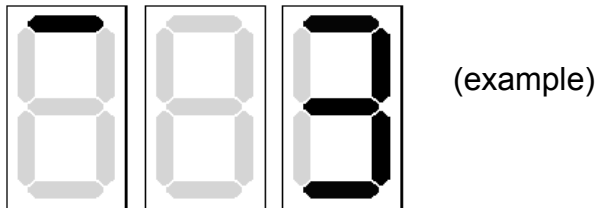


The left **bottom** LED segment then shows a “-“ (minus sign) while the right-hand LED segment displays a potentiometer voltage parameter between “0” and “5”.

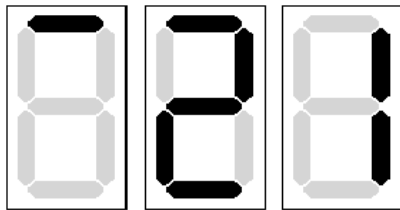
Acknowledge this value with “MODE” key while the drive pedal is in neutral position.

6.3 Calibrate Drive Potentiometer

9. Display changes. The **top** left LED segment shows a “-“ (minus sign) while the right-hand LED segment displays a potentiometer voltage parameter between “0” and “5”.

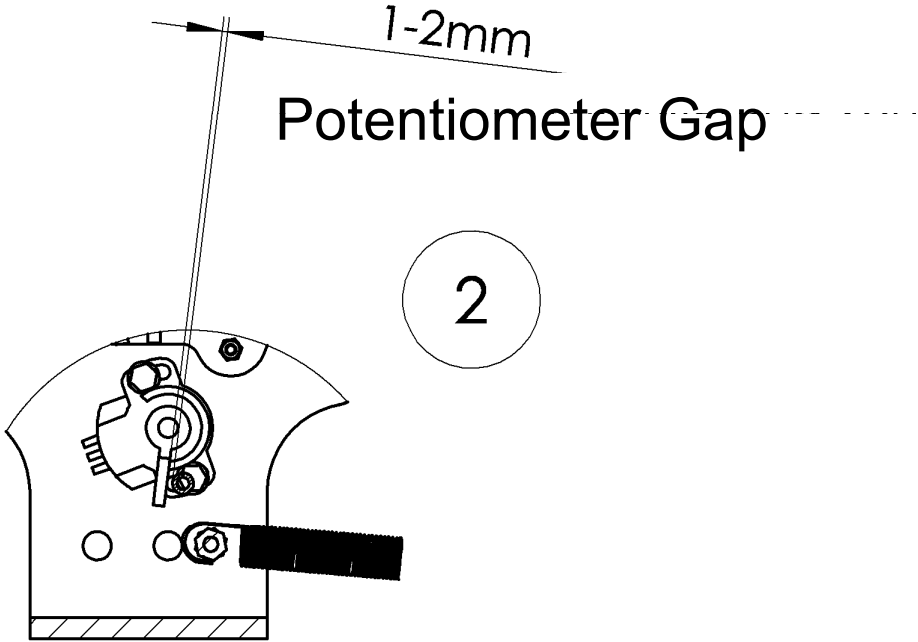
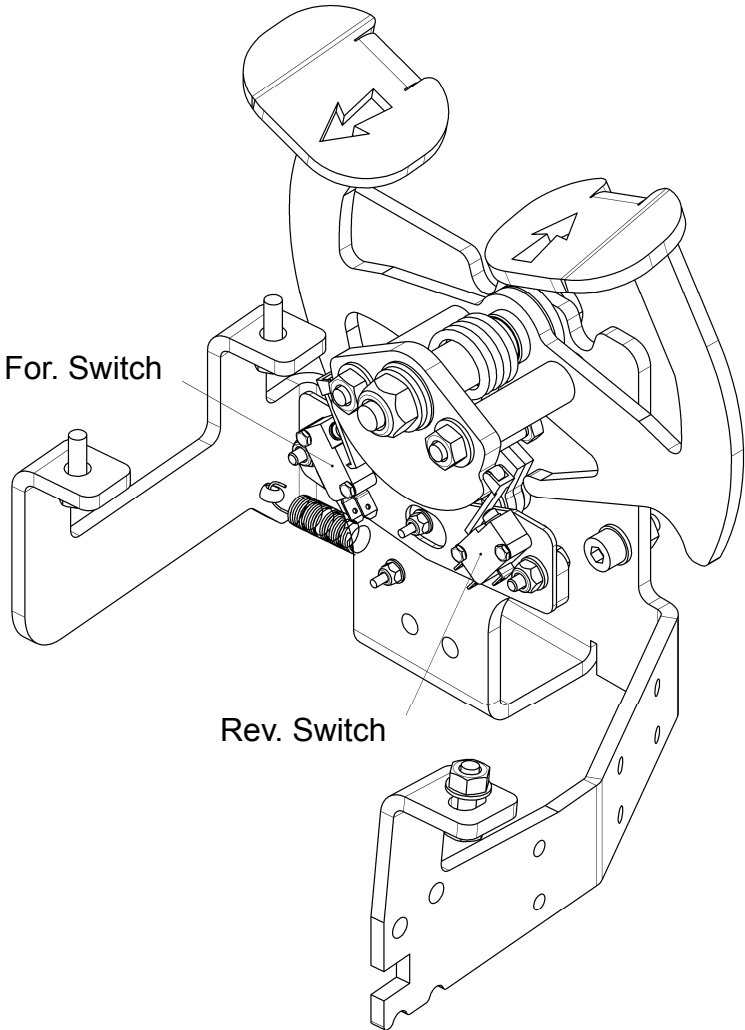


10. Actuate drive pedal in forward direction until stop. Then, a value between “10...30” shall appear on the display. If drive pedal is actuated to maximum, acknowledge with “MODE” key.



11. Display automatically changes to “F0” parameter. The potentiometer is read in.
12. Programming mode is automatically quit after 20 seconds or can be left immediately by simultaneous pressing the “UP” and “MODE” keys.
13. Re-plug 5-pin plug to K3 relay.
14. Switch machine off and on again, check function of travel drive direction and speed.

6.4 Drive Pedal Adjustment



The potentiometer should be adjusted so that there is 1-2mm gap before it is activated.

6.5 Drive Motor Specifications



Drive Motor

Blocking Current = Desired 90 ± 5 amps

Normal Current

Forward Current = Desired 17 ± 3 amps

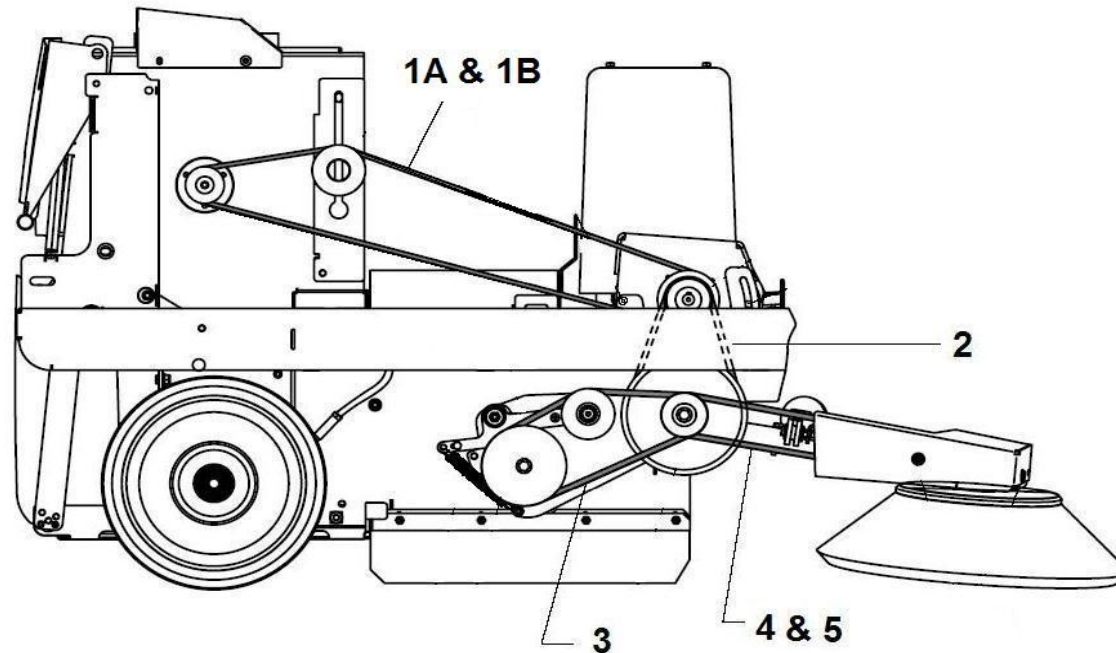
Reverse Current = Desired 12 ± 2 amps

Main Brush Motor

Normal Current = Desired 37 Amps

(Main and side broom motors turned on)

7. Belt Locations and Part Numbers



- 1A. Part # 01131280 Before 3-2005 (V Belt)
- 1B. Part # 16422313 After 3-2005 (Multi-V Belt)
- 2. Part # 01131300 Belt
- 3. Part # 01130980 Belt
- 4. Part # 01130710 Right Side Broom Belt
- 5. Part # 01134320 Left Side Broom Belt



V Belt

Ref. 1A



Multi-V Belt

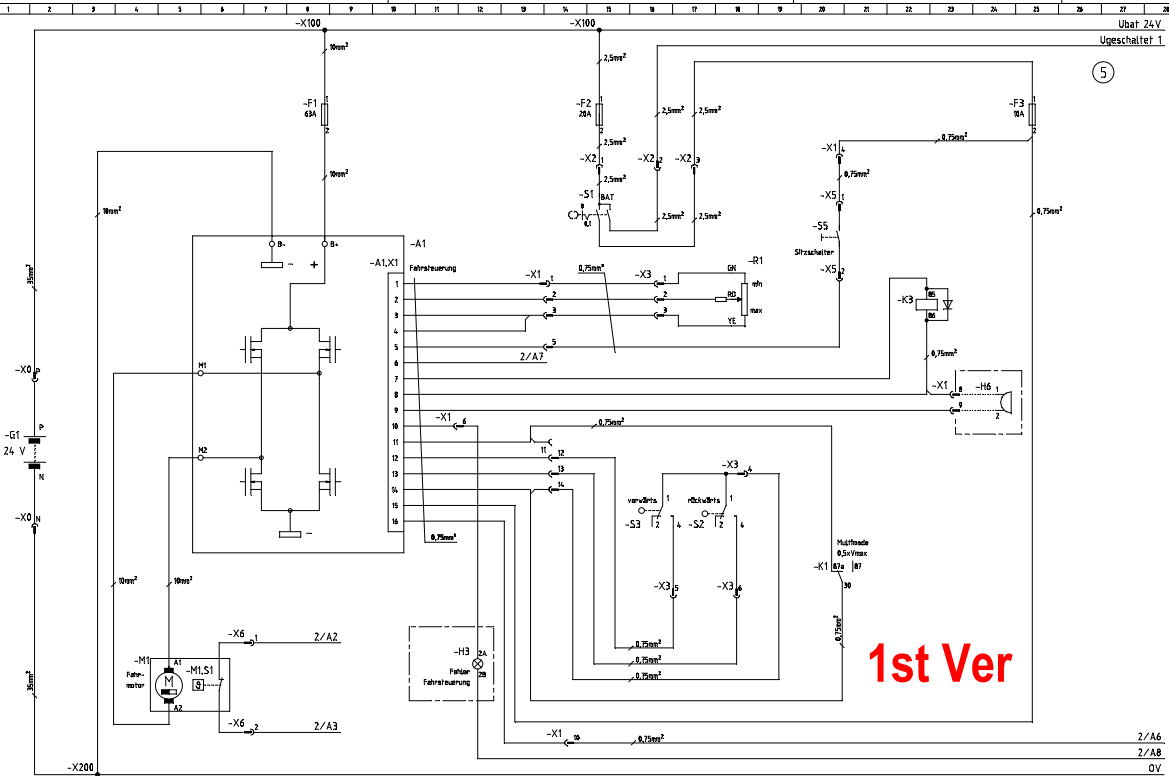
Ref. 1B

8. Wiring Diagrams Old Style



- Wiring diagram for models manufactured before 11-2011 are following.

5



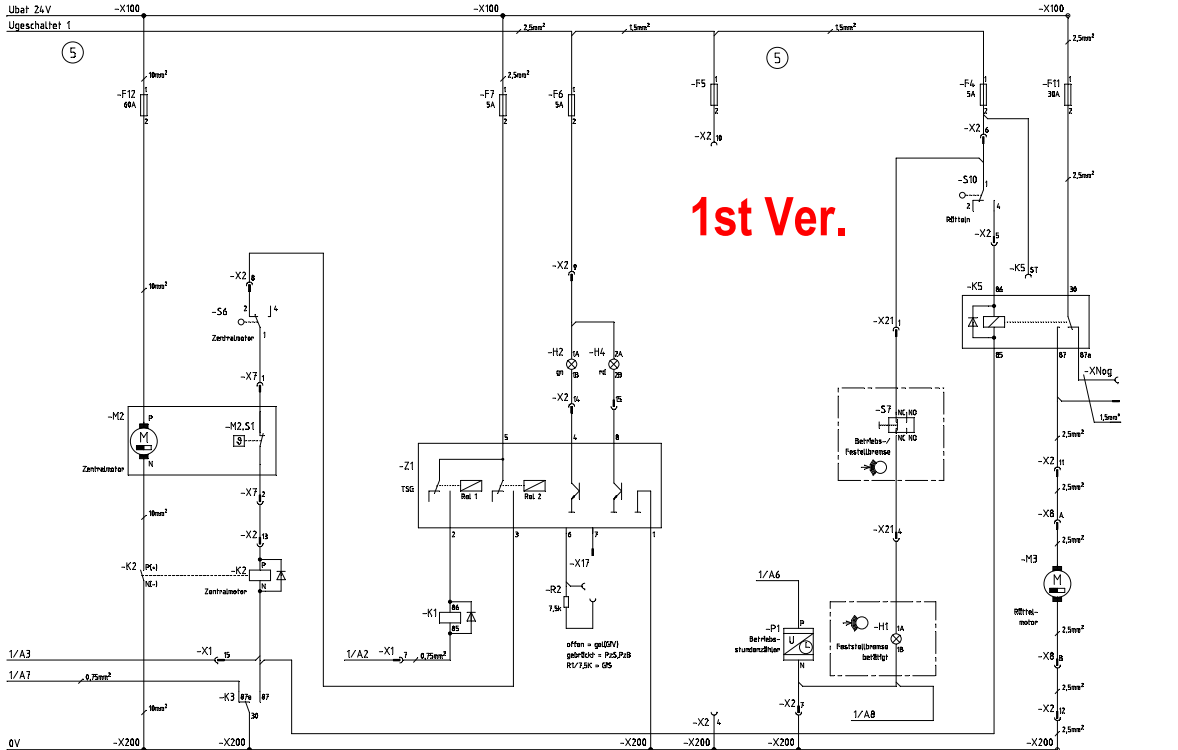
1st Ver

2/A6
2/A8
0V

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										Änd. Nr.:	7814-82	Für diese Zeichnung bestehen wir uns als Rechte vorbehalten © 2003 JAL		Typ: 6002-20
												Alle Leitungen ohne Querschnittsangaben sind grau besetzt		
												Hilti-Werkzeu GmbH & Co D-73890 Bad Oelze		
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1st Ver.

PLOTDATUM : 28.05.2004 B-Stand 006 / HP / 26.05.04 015 / lupse / 26.05.04

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Benennung
KLEMMPLAN
 Ersatz IDN: 04.Nr.
 7814-82

Ref.	Benennung	Pfade	Ref.	Benennung	Pfade
-A1	Fahrsteuerung	/1.8			
-F1	St. 63A Leistungsteil Fahrsteuerung	/1.8			
-F2	St. 20A Vorsicherung Ugeschalter 1 und 2	/1.15			
-F3	St. 10A Steuerung Fahrsteuerung	/1.25			
-F4	St. 5A Anzeigen Bedienfeld, RÜtteln	/2.24			
-F5	Sicherung Reserve	/2.17			
-F6	St. 5A Anzeige TSG	/2.14			
-F7	St. 5A TSG	/2.12			
-F11	St. 30A Rüttelmotor	/2.26			
-F12	St. 60A Zentralmotor	/2.4			
-G1	Batterie 24V	/1.2			
-H1	Kontrollleuchte Feststellbremse (vorgesehen nicht eingegebaut)	/2.22			
-H2	Kontrollleuchte TSG Batterie ok	/2.14			
-H3	Kontrollleuchte Fehler Fahrsteuerung (vorgesehen nicht eingegebaut)	/1.12			
-H4	Kontrollleuchte TSG Batterie entladen	/2.15			
-H6	Summer (vorgesehen nicht eingegebaut)	/1.24			
-K1	Relais Multimode	/2.11			
-K2	Relais Zentralmotor	/2.7			
-K3	Relais	/1.22			
-K5	Relais	/2.24			
-M1	Fahrmotor	/1.5			
-M1.S1	Thermokontakt Fahrmotor	/1.6			
-M2	Zentralmotor	/2.4			
-M2.S1	Thermokontakt Zentralmotor	/2.7			
-M3	Rüttelmotor	/2.25			
-P1	Betriebsstundenzähler	/2.19			
-R1	Fahrtpotentiometer	/1.18			
-R2	Widerstand 7k5	/2.14			
-S1	Schlossschalter	/1.15			
-S2	Mikroschalter Fahrtrichtung rückwärts	/1.18			
-S3	Mikroschalter Fahrtrichtung vorwärts	/1.16			
-S5	Sitzschalter	/1.20			
-S6	Mikroschalter Zentralmotor	/2.7			
-S7	Schalter Betriebs-/Feststellbremse (optionaler Einbau möglich)	/2.22			
-S10	Mikroschalter Rütteln	/2.24			
-Z1	TSG	/2.12			

1st Version

A3	S	0041-22	/.	26.05.04	MP	2003	Datum	Name	VES-Nr. 1	 Hako-Werke GmbH & Co D-53044 Bad Honnef	Benennung 1	Jonas 900 E	91-02114-7	Blatt 3 9 Bl.
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KLEMMPLAN

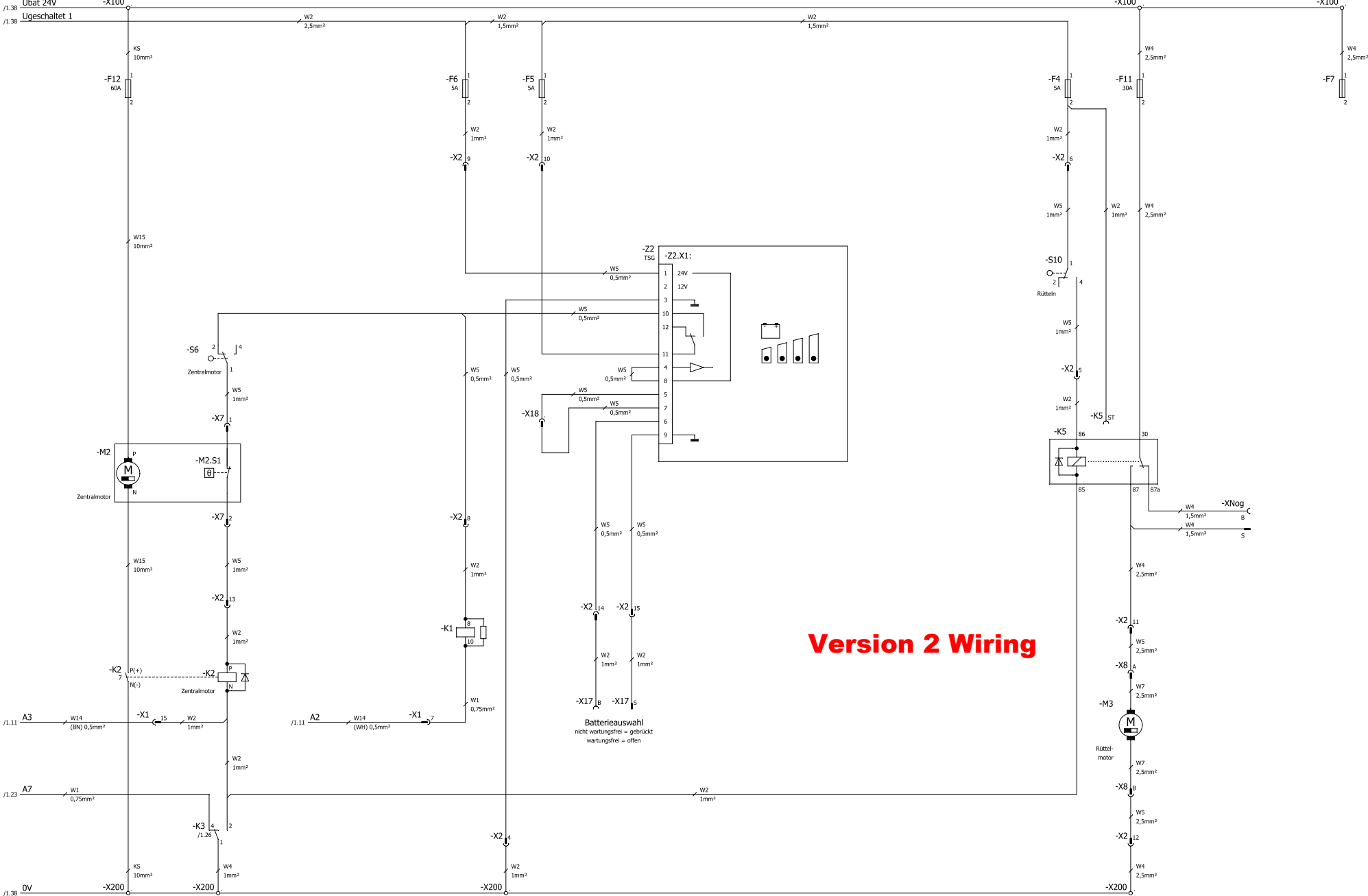
Jonas 900 E

91-02114-7

9. Wiring Diagrams New Style



- Wiring diagram for models manufactured after 11-2011 are following.



/1.38

Ugeschaltet 1

/1.11

/1.23

/1.38

-X100

-X100

-X2

-X8

-M3

-X8

-X2

-X2

-X200

-X200

-X100

-X100

-F7

-X2

-X2

-X2

-X2

-X2

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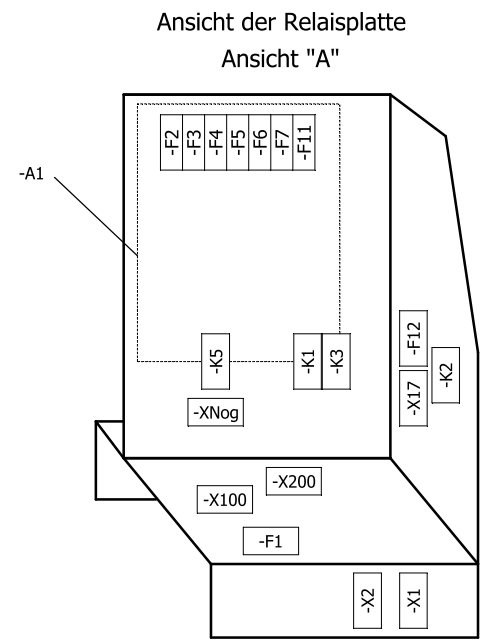
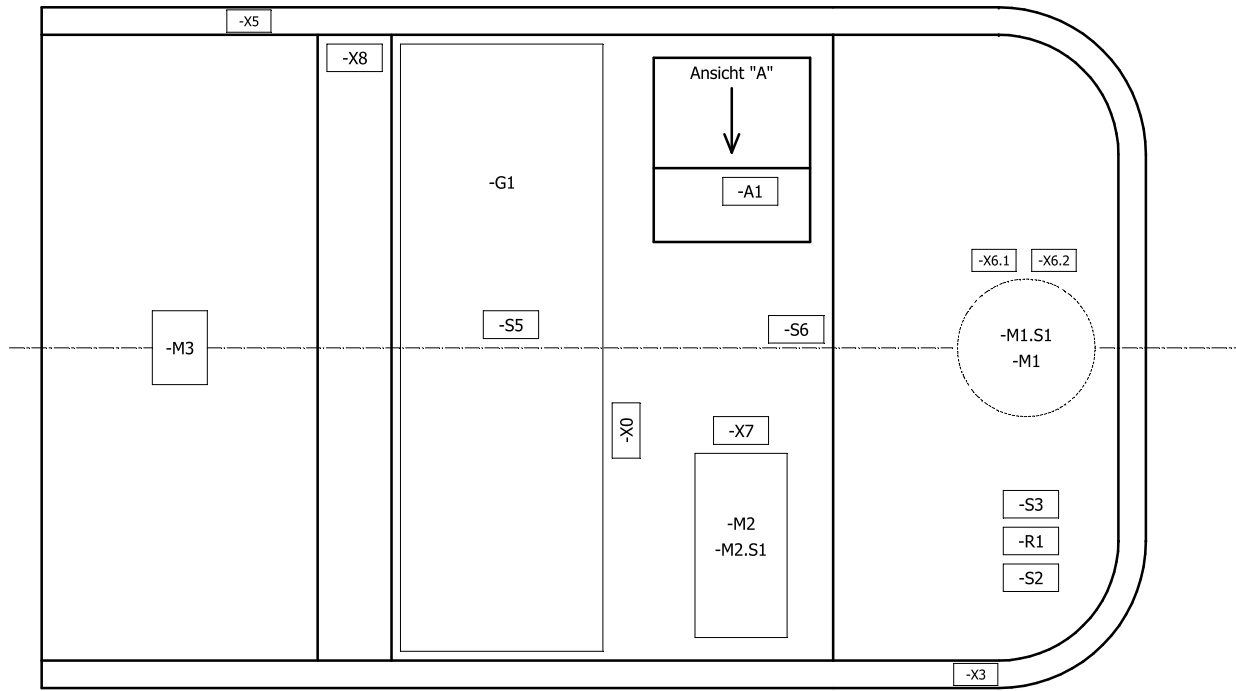
-X2

-X2

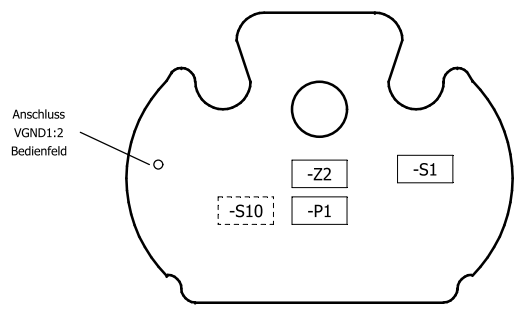
Version 2 Wiring

Ref.	Benennung	OPT	Sach-Nr.	Pfade	Ref.	Benennung	OPT	Sach-Nr.	Pfade
-A1	Fahrsteuerung		90422395	/1.10		Liste der Steckverbinder			
-F1	Si. 63A Leistungsteil Fahrsteuerung		19731314	/1.10	-X0	Batteriestecker 160A		2 polig	/1.3
-F2	Si. 20A Vorsicherung Ugeschaltet 1 und 2		19731058	/1.17	-X1	Steckverbinder		15 polig	/1, 2
-F3	Si. 10A Steuerung Fahrsteuerung		19731082	/1.30	-X2	Steckverbinder		15 polig	/1, 2
-F4	Si. 5A Rütteln		19731181	/2.30	-X3	Steckverbinder		6 polig	/1
-F5	Si. 5A TSG		19731181	/2.16	-X5	Steckverbinder		2 polig	/1.25
-F6	Si. 5A Anzeige TSG		19731181	/2.14	-X6.1	Anschlusstecker Thermok. Fahrmotor		1 polig	/1.9
-F7	Sicherung Reserve			/2.37	-X6.2	Anschlusstecker Thermok. Fahrmotor		1 polig	/1.9
-F11	Si. 30A Rüttelmotor		19731157	/2.31	-X7	Anschlusstecker Thermok. Zentralmotor		3 polig	/2.7
-F12	Si. 60A Zentralmotor		19731414	/2.5	-X8	Steckverbinder		2 polig	/2.31
-G1	Batterie 24V			/1.3	-X17	Steckverbinder		1 polig	/2.17
-H6	Summer (vorgesehen nicht eingebaut)			/1.29	-X18	Steckverbinder		1 polig	/2.15
-K1	Relais Multimode		90567777	/2.14	-X100	Anschlussbolzen + Potential Relaisplatte		Blzen M8	/1, 2
-K2	Relais Zentralmotor		90422650	/2.7	-X200	Anschlussbolzen Masse Potential Relaisplatte		Bolzen M8	/1, 2
-K3	Relais		90567777	/1.26	-XNog	Steckverbinder		1 polig	/2.34
-K5	Relais Rütteln		90267485	/2.30					
-M1	Fahrmotor		90418146	/1.7					
-M1.S1	Thermokontakt Fahrmotor		zu -M1	/1.8					
-M2	Zentralmotor		90419581	/2.5					
-M2.S1	Thermokontakt Zentralmotor		zu -M2	/2.7		Liste der Kabelbäume			
-M3	Rüttelmotor		90434374	/2.31	W1	Kabelbaum -W1		97115893	
-P1	Betriebsstundenzähler		90463324	/1.15	W2	Kabelbaum -W2		97115836	
-R1	Fahrpotentiometer		97-07710-1	/1.14	W4	Kabelbaum -W4		97115901	
-S1	Schlüsselschalter		90323437	/1.17	W5	Kabelbaum -W5		97115877	
-S2	Mikroschalter Fahrtrichtung rückwärts		90306002	/1.23	W6	Kabelbaum -W6		97081202	
-S3	Mikroschalter Fahrtrichtung vorwärts		90306002	/1.22	W7	Kabelbaum -W7		97081210	
-S5	Sitzschalter		90421868	/1.25	W14	Kabelbaum -W14		97086334	
-S6	Mikroschalter Zentralmotor		90306002	/2.7	W15	Kabelbaum -W15		97081582	
-S10	Mikroschalter Rütteln		90306002	/2.30	KS	Kabelsatz		97116107	
-Z2	TSG		90562570	/2.19					

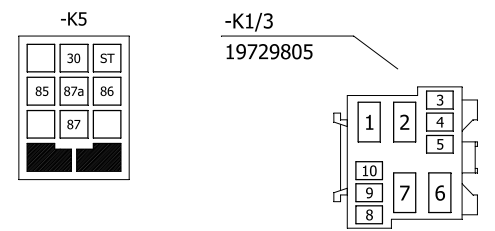
Version 2 Wiring



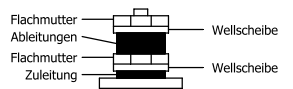
Draufsicht Bedienfeld




Ansicht der Relaissockel (Steckrichtung kabeitig)

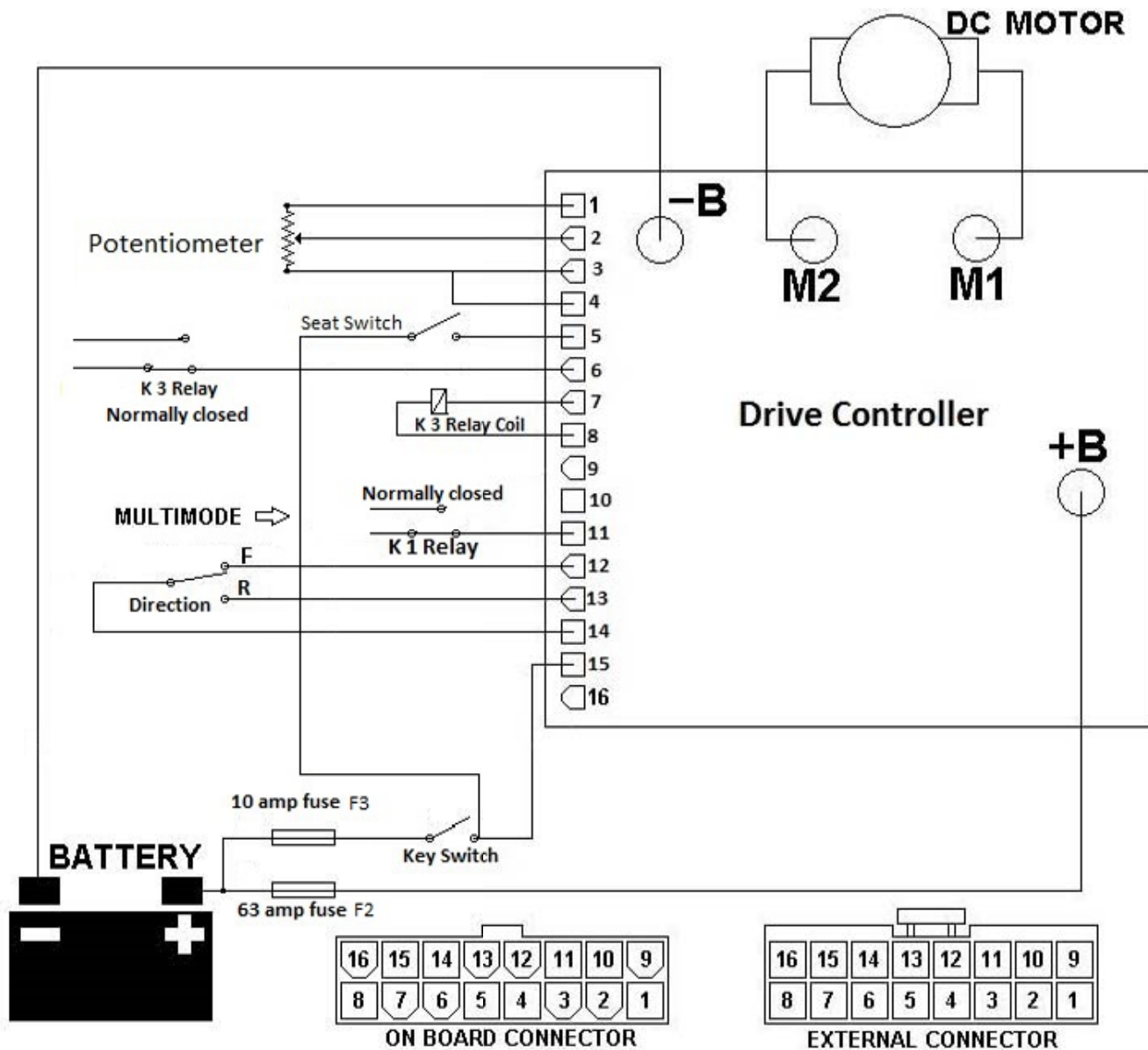


Montagehinweis zu den Strombolzen:
-X100 u. -X200



Version 2 Wiring

=	0	Eingeführt lt.	2086-00	20.09.10	MP	2010	Datum	Name	VES-Nr. :	Benennung	 Hako-Werke GmbH & Co D-23840 Bad Oldesloe	Zeichnungs-Nr. 91031153
						Gezeichnet	20.09.	kupe	Ersatz für: 91021147	SCHALTPLAN Jonas 900 E		
+		Nr.	Zahl kommt vor	Änd.-Nr.	Datum	Name	Normgepr.		Änd. Nr. :	Für diese Zeichnung behalten wir uns alle Rechte vor.(Gemäß DIN 34)	Typ: 6502-20	Blattzahl: 4 Blatt: 4

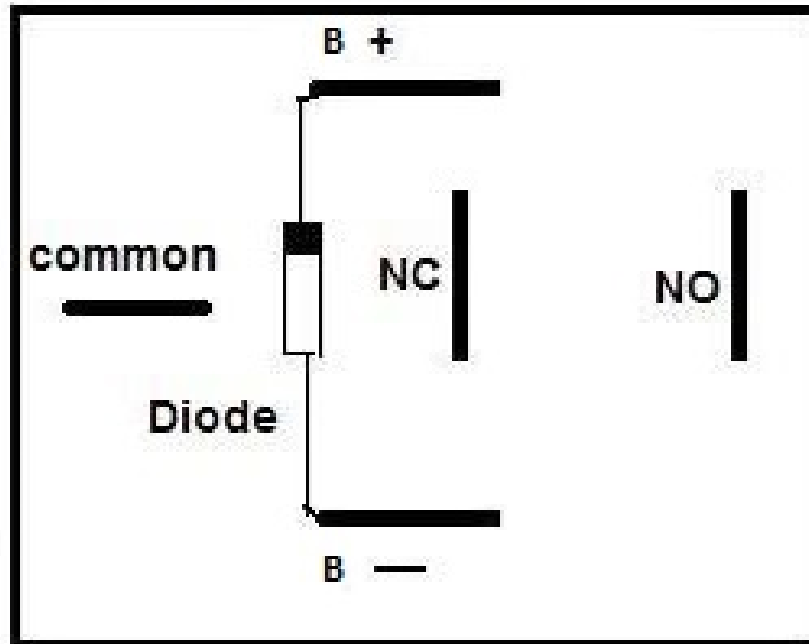


00965030 Relay

K 1 and K2 Relay

Bottom View

Looking at terminals



Top View

Looking at the top of black cover and receptical

Note: Diode is inside relay

