SW5500, FLOORTEC R 985



Service Manual

Advance Model Numbers:

9084416010 SW5500 B
9084417010 SW5500 LP

Nilfisk Model Numbers:

9084410010 SW5500 B
9084413010 FLOORTEC R 985 B
9084412010 SW5500 D
9084411010 SW5500 LPG
9084414010 FLOORTEC R 985 LPG

Nilfisk® | Advance by Nilfisk

English

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03 - General Information

Machine General Description

The SW5500 / FLOORTEC R 985 is a “ride-on” industrial machine designed to clean/sweep floors, in commercial or industrial environments, in one pass. The machine can be supplied in one of the following version:

- with a rechargeable battery, installed on the machine (Battery version)
- with a battery charged by a diesel engine, both installed on the machine (Diesel version)
- with a battery charged by an LPG gas engine (LPG version)

The machine is equipped with one main cylindrical broom, and one or two side disc brooms.

The rear hopper and a vacuum system allow for dust and dirt collection.

The hopper is equipped with a lifting system to discharge the collected debris.

Service Manual Purpose and Field of Application

The Service Manual is a technical resource intended to help service technicians when carrying out maintenance and repairs on the SW5500, to guarantee the best cleaning performance and a long working life for the machine.

Please read this manual carefully before performing any maintenance and repair procedure on the machine.

Other Reference Manuals

<table>
<tr><th>Brand</th><th>Model</th><th>Product Code</th><th>Instructions for Use</th><th>Spare Parts List</th></tr>
<tr><td rowspan="2">ADVANCE</td><td>SW5500 B</td><td>9084416010</td><td>1467287000</td><td rowspan="2">1464285000</td></tr>
<tr><td>SW5500 LP</td><td>9084417010</td><td>1467284000</td></tr>
<tr><td rowspan="5">NILFISK</td><td>SW5500 B</td><td>9084410010</td><td rowspan="2">1466465000</td><td rowspan="5">1466473000</td></tr>
<tr><td>FLOORTEC R 985 B</td><td>9084413010</td></tr>
<tr><td>SW5500 D</td><td>9084411010</td><td rowspan="3">1466472000</td></tr>
<tr><td>SW5500 LPG</td><td>9084412010</td></tr>
<tr><td>FLOORTEC R 985 LPG</td><td>9084414010</td></tr>
<tr><td></td><td colspan="2">DIESEL ENGINE</td><td colspan="2">YANMAR OPERATION MANUAL L70N</td></tr>
<tr><td></td><td colspan="2">LPG ENGINE</td><td colspan="2">HONDA OWNER’S MANUAL GX270</td></tr>
</table>

Assembly Instructions	Instruction Code	Machines concerned
Protection roof kit	1466894000	ALL
Cover kit for protective roof	1466895000	
USB port kit	1466896000	
Seat kit with suspension	1466897000	
Left side broom kit	1466898000	
Working light kit	1466899000	
Dust guard kit	1466900000	
Side broom guard kit	1466901000	
Battery charger kit	1466904000	SW5500 B, FLOORTEC R 985 B
Hybrid kit	1466903000	SW5500 D, SW5500 LPG, FLOORTEC R 985 LPG

These manuals and spare parts list are available at:

- Local Advance or Nilfisk Retailer
- Advance website: www.advance-us.com
- Nilfisk website: www.nilfisk.com
- EZ-Data application

Conventions

Forward, backward, front, rear, left or right are intended with reference to the operator's position when driving.

Serial Number Label

Reference to Figure 1

The machine serial number and model name are marked on the plate (see the example to the side).

Product code and year of production are marked on the same plate (Date code: A18, means January 2018).

This information is useful when requiring machine spare parts.

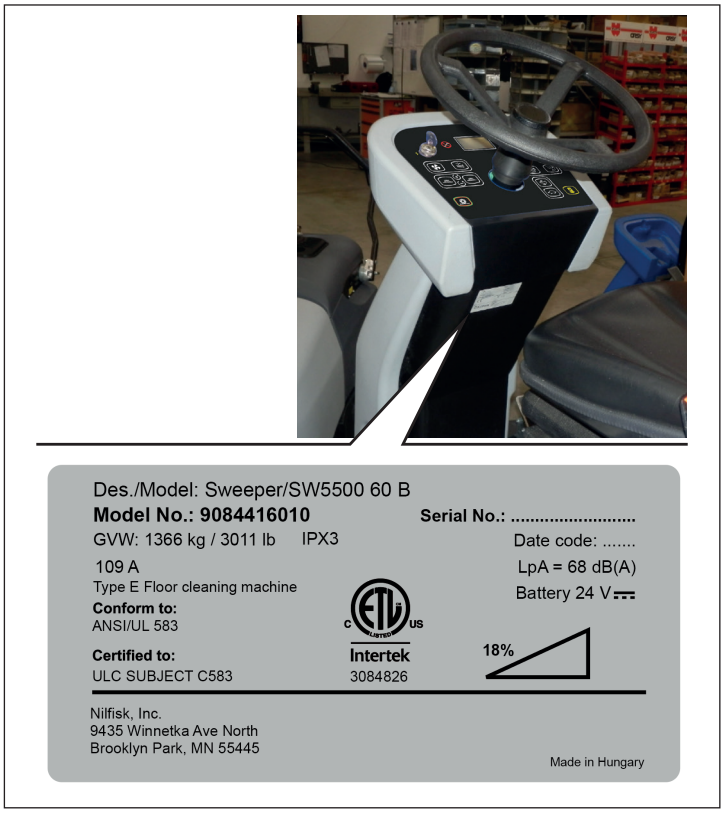
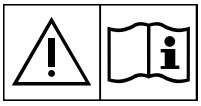
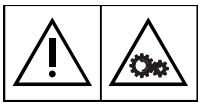
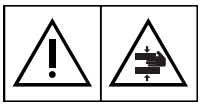
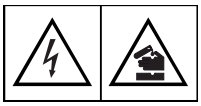


Figure 1: Figure 1

Safety

The following symbols indicate potentially dangerous situations. Always read this information carefully and take all necessary precautions to safeguard people and property.

Visible Symbols On The Machine

	**WARNING!** Carefully read all the instructions before performing any operation on the machine.		**WARNING!** Hot parts, danger of burns.
	**DANGER!** Internal combustion engine. Do not inhale exhaust gas fumes. Carbon monoxide (CO) can cause brain damage or death.		**WARNING!** Moving parts.
	**WARNING!** Do not wash the machine with direct or pressurized water jets.		**WARNING!** Moving parts. Danger of crushing.
 X %	**WARNING!** Do not use the machine on slopes with a gradient exceeding the specifications.		**WARNING!** Parts under voltage. Presence of corrosive fluids.

It is important for you to read and understand this manual. The information it contains relates to protecting your safety and preventing problems. The symbols below are used to help you recognize this information.



DANGER: Indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury.



WARNING: Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION: Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.



Note: *Indicates an important informational message.*

General Instructions

Specific warnings and cautions to inform about potential damages to people and machine are shown below.

DANGER: (for SW5500, FLOORTEC R 985 Battery/Diesel/LPG)

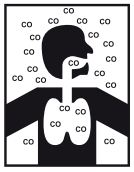
- ***Before performing any maintenance, repair, cleaning or replacement procedure disconnect the battery connector, remove the ignition key and engage the parking brake.***
- ***This machine must be used by properly trained operators only.***
- ***Sharp turns must be made in safe conditions. Avoid abrupt turns, particularly on slopes, and turns with the hopper lifted.***
- ***Do not lift the hopper when the machine is on a slope.***
- ***Do not work under the lifted machine without supporting it with safety stands.***
- ***When working under the open hood, ensure that it cannot be closed by accident.***
- ***Do not operate the machine near toxic, dangerous, flammable and/or explosive powders, liquids or vapors: This machine is not suitable for collecting dangerous powders.***
- ***Do not wear jewels when working near electrical components.***

DANGER: (for SW5500, FLOORTEC R 985 Battery)

- ***Keep the batteries away from sparks, flames and incandescent material. Explosive gases are released when charging the batteries.***
- ***Do not wear jewels when working near electrical components.***
- ***If the machine is equipped with lead (WET) batteries, battery charging produces highly explosive hydrogen gas. Keep the hood open when charging the batteries and perform this procedure in well-ventilated areas and away from naked flames.***
- ***When lead batteries (WET) are installed, do not tilt the machine for more than 30° from the horizontal plane to prevent the highly corrosive acid from leaking out of the batteries. When the machine is to be tilted to perform maintenance procedures, remove the batteries.***

DANGER: (for SW5500, FLOORTEC R 985 Diesel/LPG)





- ***Carbon monoxide (CO) can cause brain damage or death.***
- ***The internal combustion engine of this machine can emit carbon monoxide.***
- ***Do not inhale exhaust gas fumes.***
- ***Only use indoors when adequate ventilation is provided, and with the help of an assistant who can monitor the operator's health.***
- ***Keep the batteries away from sparks, flames and incandescent material.***
- ***Be careful: fuel is highly flammable.***
- ***Do not smoke or bring naked flames in the area where the machine is refueled or where the diesel fuel is stored.***

- *Refuel outdoors or in a well-ventilated area, with the engine off.*
- *Leave at least a space of 4 cm in the filler to allow the fuel to expand.*
- *After refueling, check that the fuel tank cap is firmly closed.*
- *If any fuel is spilled while refueling, clean the tank area and allow the vapors to evaporate before starting the engine.*
- *Do not let fuel come into contact with the skin; do not breathe fuel vapors. Keep out of reach of children.*
- *Do not tilt the engine or the machine too much to avoid fuel spillage.*
- *When moving the machine, the fuel tank must not be full and the fuel valve must be closed.*
- *Do not lay any object on the engine.*
- *Stop the engine before performing any procedure on it. To avoid any incidental start, disconnect the spark plug cap or disconnect the battery negative terminal.*
- *See also the SAFETY RULES in the Engine Manual, which is to be considered an integral part of this Manual.*



WARNING: (for SW5500, FLOORTEC R 985 Battery/Diesel/LPG)

- *Carefully read all the instructions before carrying out any maintenance/repair procedure.*
- *When working near the hydraulic system, always wear protective clothes and safety glasses.*
- *This machine is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the machine by a person responsible for they safety.*
- *Children should be supervised to ensure that they do not play with the machine.*
- *Close attention is necessary when used near children.*
- *Use only as shown in this Manual. Use only Nilfisk recommended accessories.*
- *Check the machine carefully before each use, always check that all the components have been assembled before use. If the machine is not perfectly assembled it can cause damages to people and properties.*
- *Take all necessary precautions to prevent hair, jewels and loose clothes from being caught by the machine moving parts.*
- *To avoid any unauthorized use of the machine, remove the ignition key.*
- *Do not leave the machine unattended without being sure that it cannot move independently.*
- *Do not use the machine on slopes with a gradient exceeding the specifications.*
- *Do not tilt the machine more than the angle indicated on the machine itself, in order to prevent instability.*
- *Use only brooms supplied with the machine or those specified in the Instructions for*

use manual. Using other brooms could reduce safety.

- ***This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.***
- ***Before using the machine, close all doors and/or covers as shown in the Instructions for use manual.***
- ***Do not wash the machine with direct or pressurized water jets, or with corrosive substances.***
- ***Use the machine only where a proper lighting is provided.***
- ***Working light (optional) has to be used only to enhance visibility on the floor to be cleaned, but it does not authorize anyone to use the sweeper in dark environments.***
- ***While using this machine, take care not to cause damage to people or objects.***
- ***Do not bump into shelves or scaffoldings, especially where there is a risk of falling objects.***
- ***Do not lean liquid containers on the machine, use the relevant can holder.***
- ***The storage temperature must be between 0 °C and +40 °C.***
- ***The machine working temperature must be between 0 °C and +40 °C.***
- ***The humidity must be between 30 % and 95 %.***
- ***Always protect the machine against the sun, rain and bad weather, both under operation and inactivity condition. Store the machine indoors, in a dry place. (If applicable) This machine must be used in dry conditions, it must not be used or kept outdoors in wet conditions.***
- ***Do not use the machine as a means of transport, or for pushing/towing.***
- ***The machine's maximum capacity, operator's weight not included, is 240 kg (the weight of waste).***
- ***In case of fire, use a powder fire extinguisher, not a water one.***
- ***Adjust the operation speed to suit the floor conditions.***
- ***Avoid sudden stops when the machine is going downhill. Avoid sharp turns. Drive at slow speed when going downhill.***
- ***This machine cannot be used on roads or public streets.***
- ***Do not tamper with the machine safety guards.***
- ***Follow the routine maintenance procedures scrupulously.***
- ***Do not allow any object to enter into the openings. Do not use the machine if the openings are clogged. Always keep the openings free from dust, hairs and any other foreign material which could reduce the air flow.***
- ***(Only for versions equipped with DustGuard™ system). Pay attention during machine transportation when temperature is below freezing point. The water in the tank or in the hoses could freeze and seriously damage the machine.***
- ***Do not remove or modify the plates affixed to the machine.***
- ***When the machine is to be pushed for service reasons (missing or discharged***

batteries, etc.), the speed must not exceed 4 km/h.

- ***In case of machine malfunctions, ensure that these are not due to lack of maintenance. If necessary, request assistance from the authorized personnel or from an authorized Service Center.***
- ***If parts must be replaced, require ORIGINAL spare parts from an Authorized Dealer or Retailer.***
- ***To ensure machine proper and safe operation, the scheduled maintenance shown in the relevant chapter of this Manual, must be performed by the authorized personnel or by an authorized Service Center.***
- ***The machine must be disposed of properly, because of the presence of toxic-harmful materials (batteries, oils, etc.), which are subject to standards that require disposal in special centers.***

WARNING: (for SW5500, FLOORTEC R 985 Battery)

- ***Do not close a door on the battery charger cable, or pull the battery charger cable around sharp edges or corners. Do not run the machine on the battery charger cable.***
- ***Before using the on board battery charger (optional), ensure that frequency and voltage values, indicated on the battery charger plate, match the electrical mains voltage.***
- ***Keep the battery charger cable away from heated surfaces.***
- ***Do not use the machine if the battery charger cable or plug is damaged.***
- ***Before performing any maintenance procedure, disconnect the battery charger cable from the electrical mains to avoid any risk of fire, electric shock or injuries.***
- ***Do not smoke while charging the batteries.***

WARNING: (for SW5500, FLOORTEC R 985 Diesel/LPG)

- ***While the engine is running, the silencer warms up; do not touch the silencer when it is hot to avoid burns or fires.***
- ***Running the engine with an insufficient quantity of oil can seriously damage the engine. Check the oil level with the engine off and the machine on a level surface.***
- ***Never run the engine if the air filter is not installed, because the engine could be damaged.***
- ***Technical service procedures on the engine must be performed by an authorized Dealer.***
- ***Only use original spare parts or parts of matching quality for the engine. Using spare parts of lower quality can seriously damage the engine.***
- ***See also the SAFETY RULES in the Engine Manual, which is to be considered an integral part of this Manual.***

Guide lines to bacteria control and other dangers coming from the presence of microbes in the DustGuard™ system.

To prevent the operators and other people from developing infections caused by microbes and Legionella that may flourish in the dust guard system, take the following precautions:

- If possible, fill the tank with cold water (< 20°C).
- DO NOT use stagnant water to fill the tank.
- DO NOT use recycled water, undrinkable water or water that has been in contact with the soil.
- Adjust and turn the nozzles towards the floor only, from preventing possible inhaling.
- Do not store the machine outdoors or near sources of heat.
- Do not over-fill the tank. Fill the tank sufficiently so that it can be emptied by using the system.
- Empty the tank every 10 hours or once a week, according to the use.
- If the machine is not used for more than one week, empty the tank completely, and let it dry.
- If the tank cannot be cleaned regularly, consider using a biocide that can kill or exert a controlling effect on Legionella bacteria. Biocide must be chosen according to the local regulations and must be used according to the relevant instructions and cautions, to avoid that the personnel gets affected by dangerous chemical substances.
- If chemical products have to be used in the water tank, it is mandatory to apply the relevant information and caution labels of the product.

Machine Lifting



WARNING: Do not work under the lifted machine, if it is not securely fixed.

Machine Transportation



WARNING: Before transporting the machine, make sure that:

- ***All covers are closed.***
- ***The tanks are empty.***
- ***The battery connector is disconnected.***
- ***The machine is securely fastened to the means of transport.***

Machine Nomenclature (know your machine)

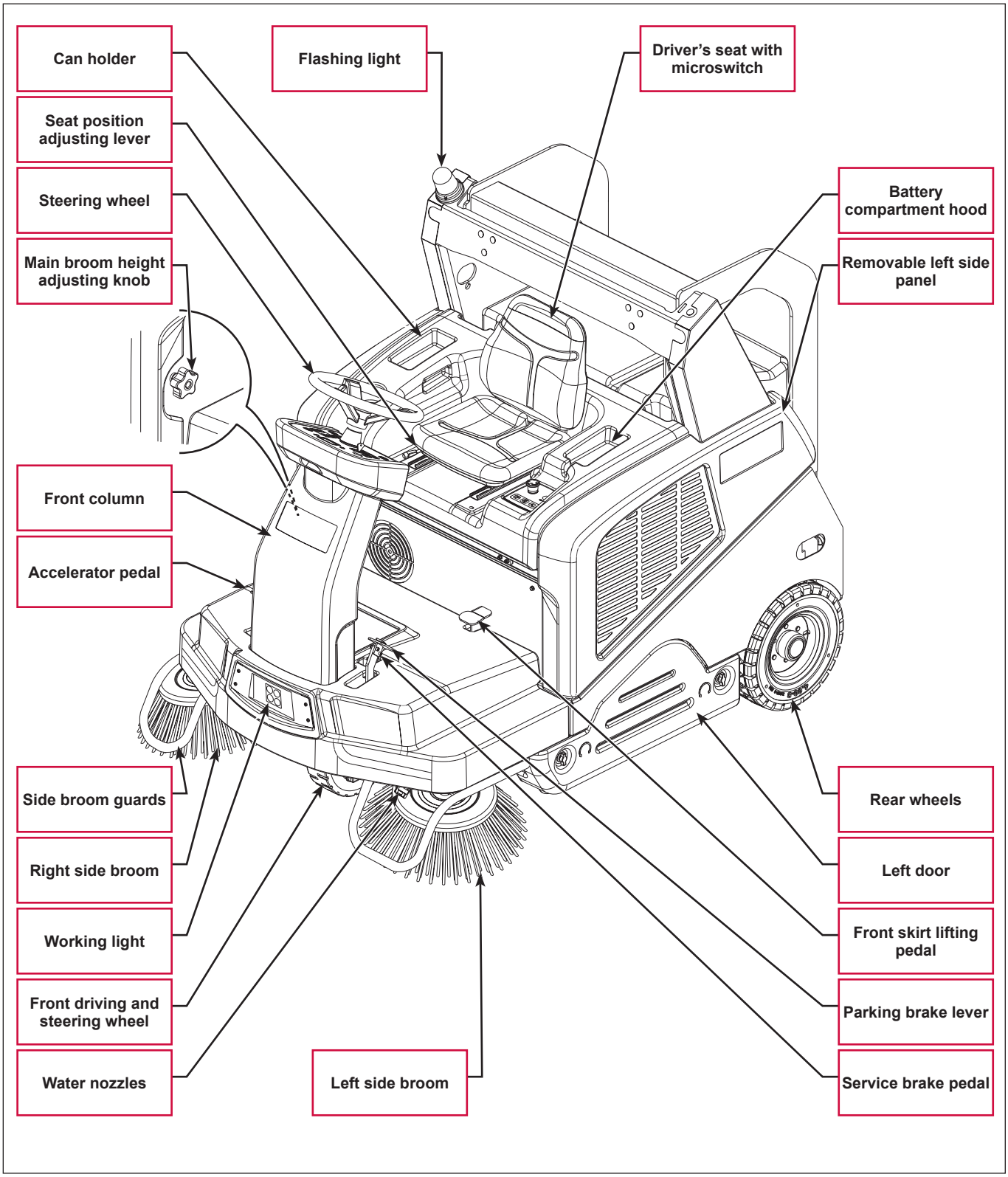


Figure 2:

Machine Nomenclature (Continues)

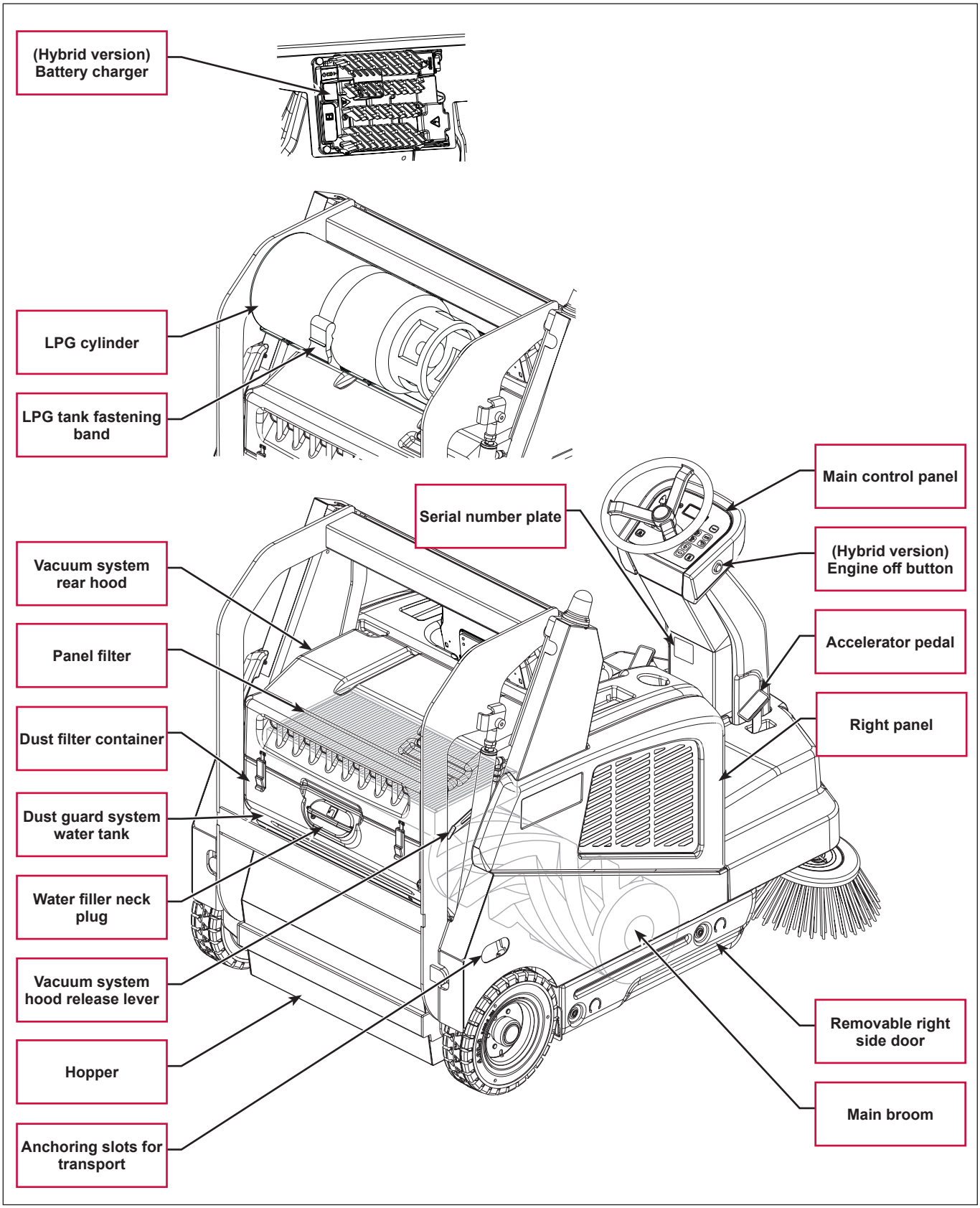


Figure 3:

Machine Nomenclature (Battery version) (Continues)

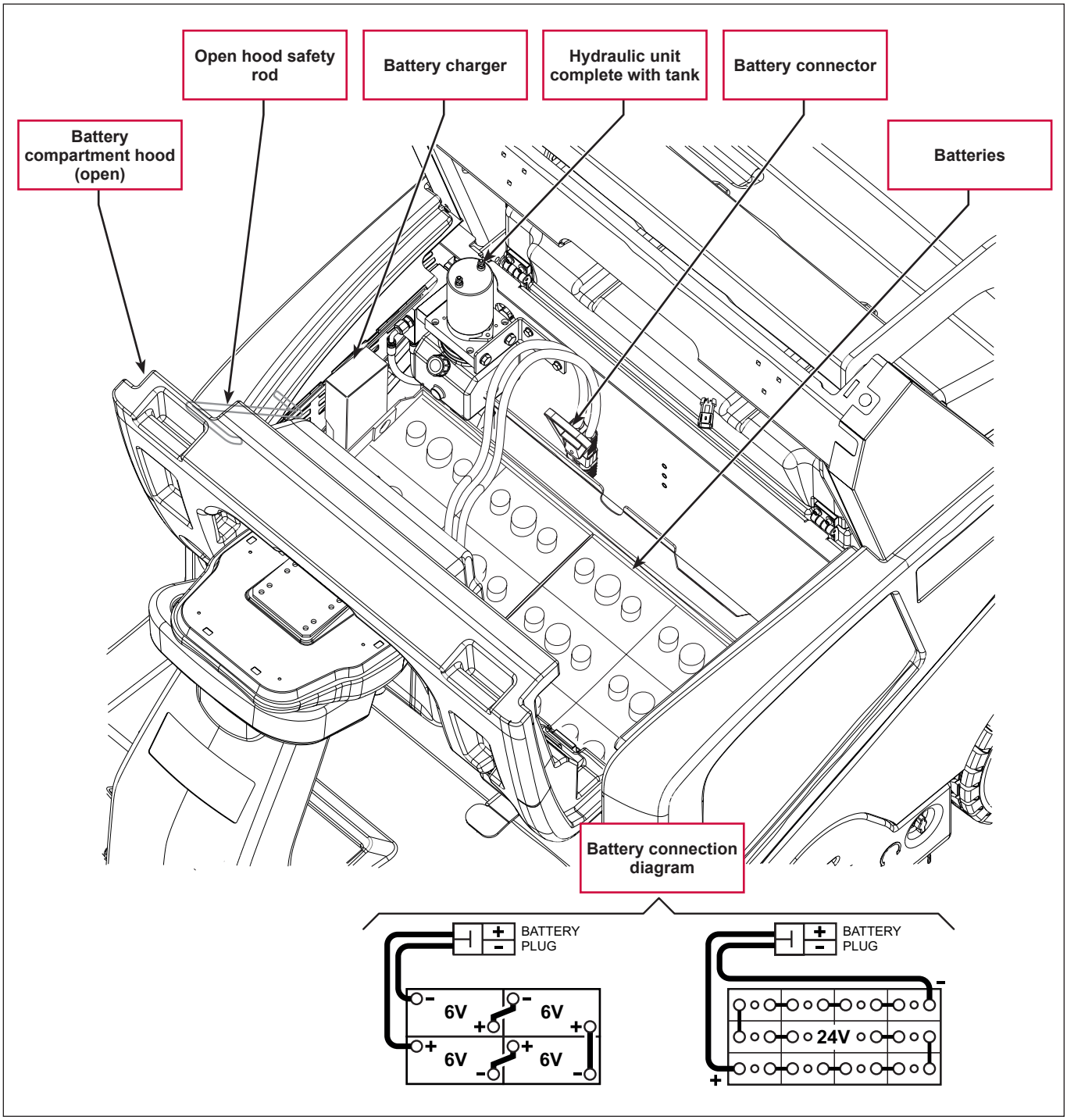


Figure 4:

Machine Nomenclature (Diesel version) (Continues)

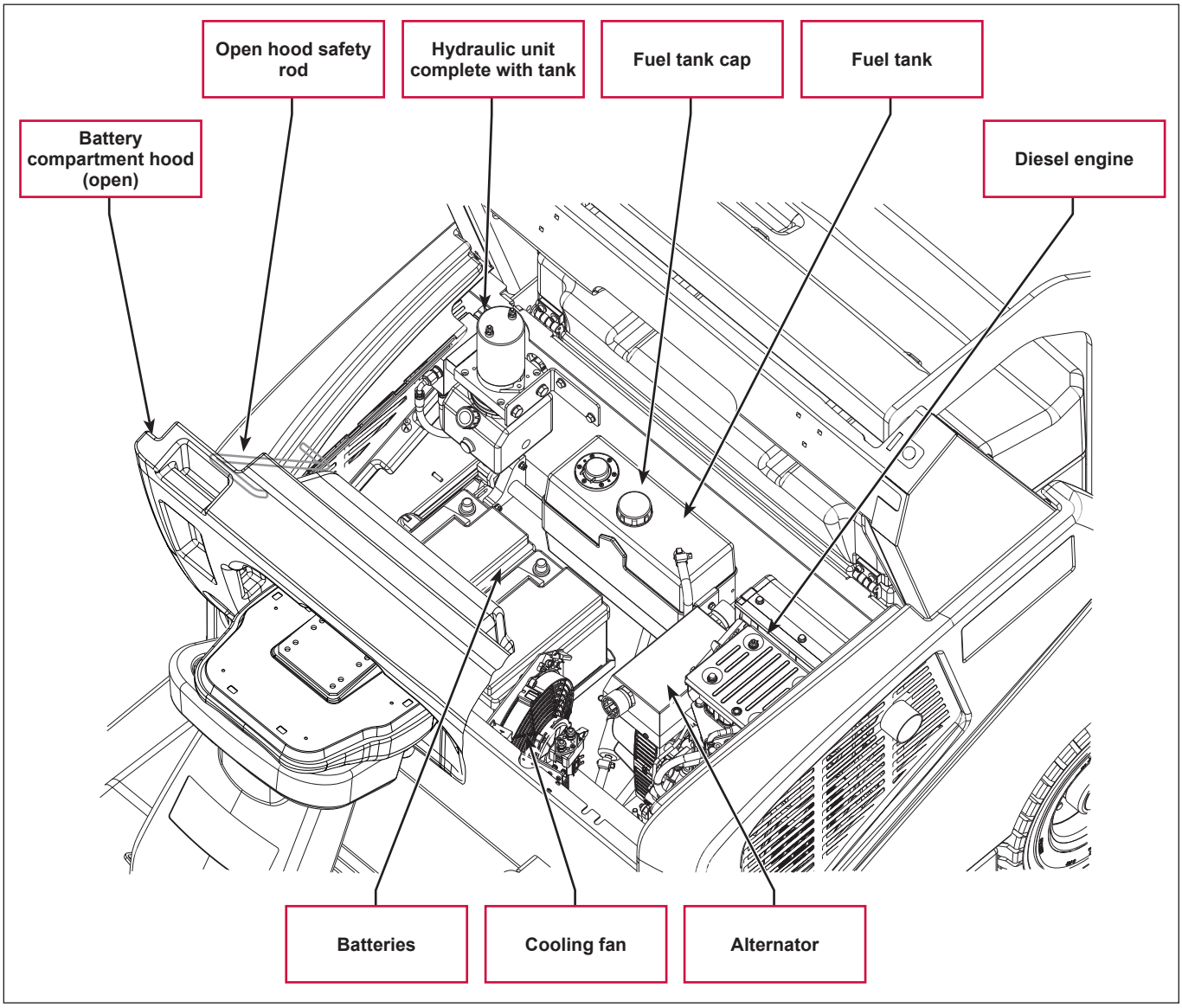


Figure 5:

Machine Nomenclature (LPG version) (Continues)

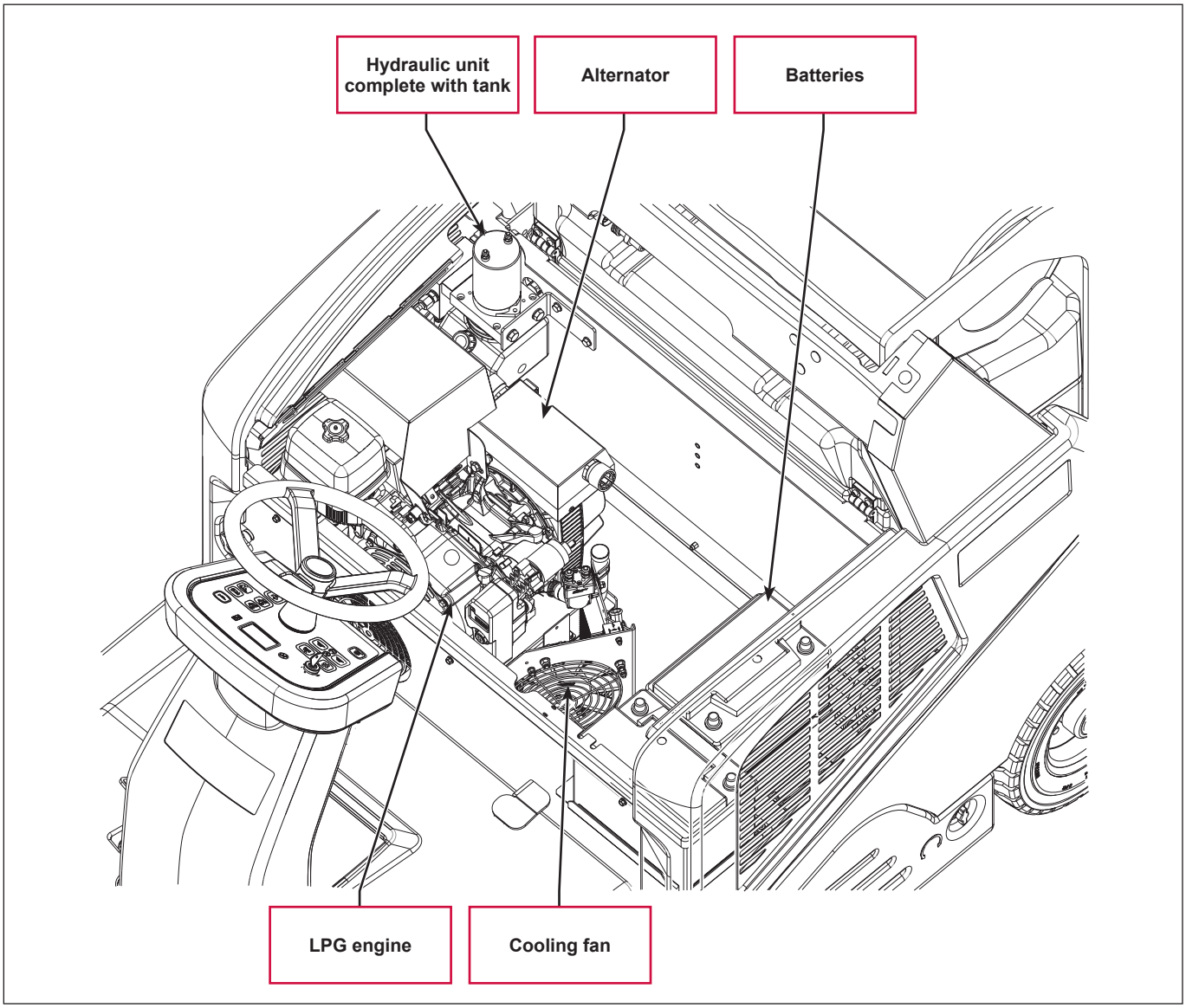


Figure 6:

Control panel

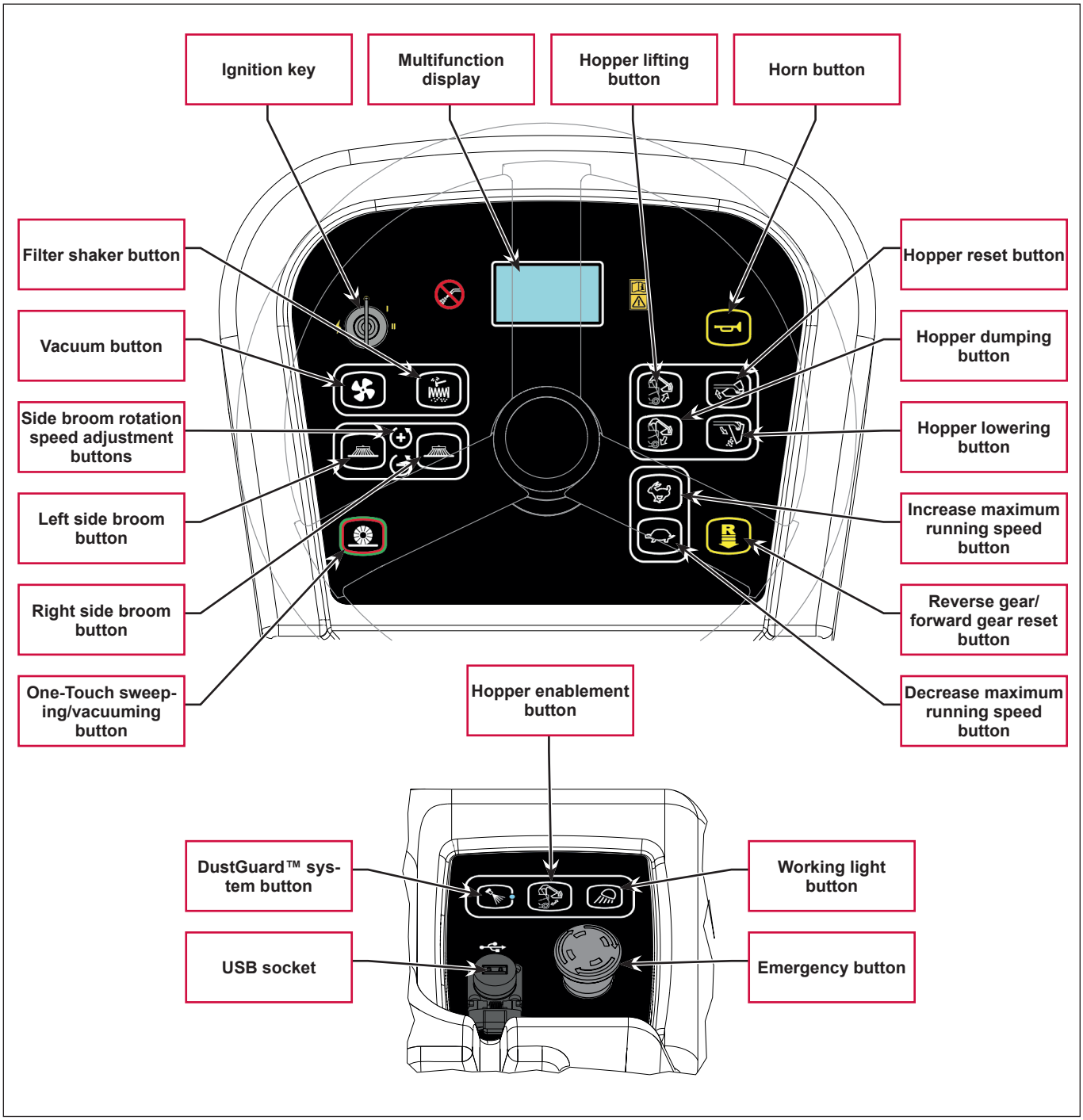


Figure 7:

Multifunction display - Items displayed

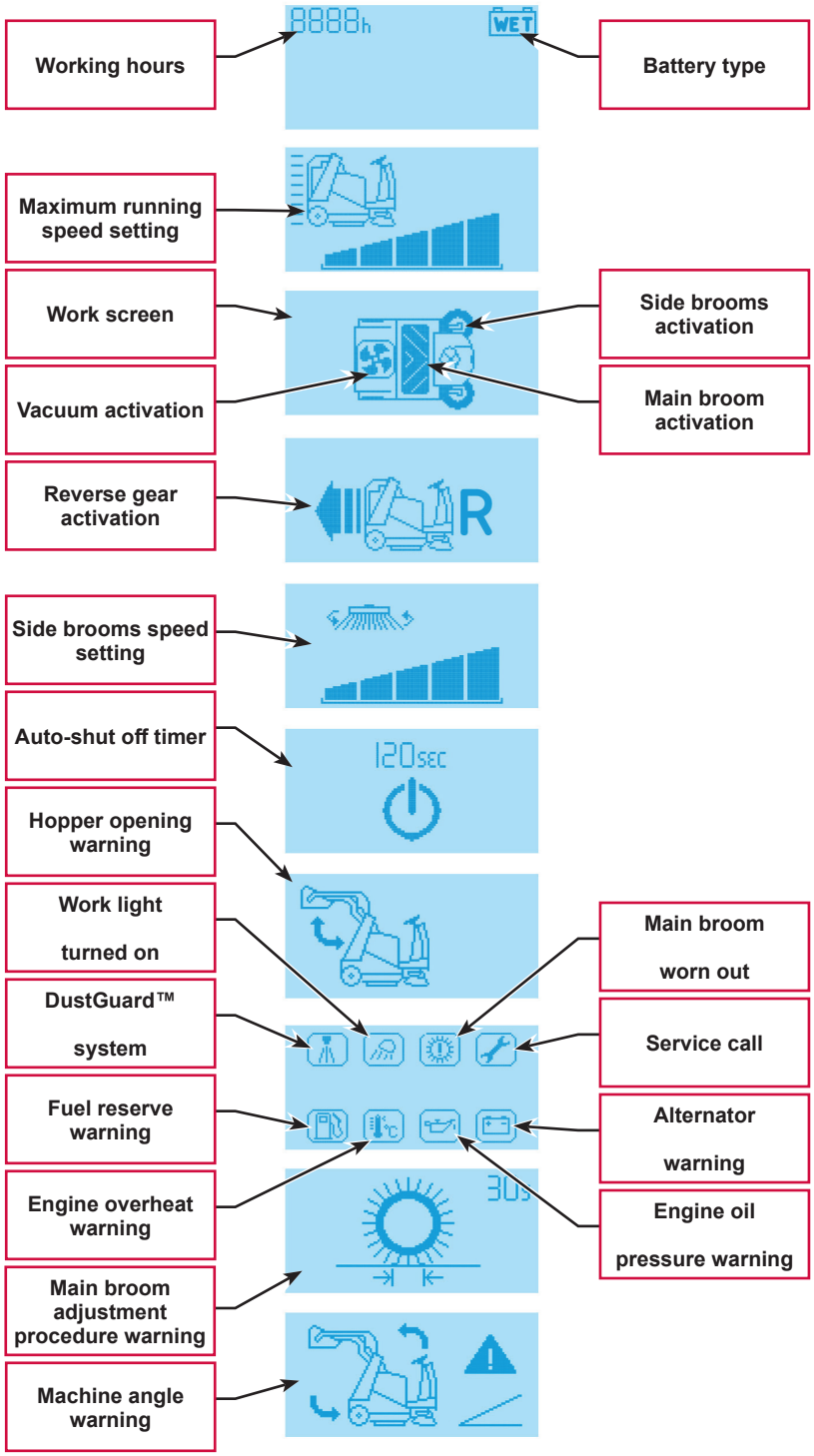


Figure 8:

Service and Diagnostic Equipment

Besides a complete set of standard meters, the following instruments are necessary to perform fast checks and repairs on Nilfisk machines:

Laptop computer charged with the current version of EzParts, Adobe Reader and (if possible) Internet connection.

- Digital Volt Meter (DVM)
- Amp clamp with possibility of making DC measurements
- Hydrometer
- Battery charge tester to check 12V batteries
- Antistatic wrist strap
- Dynamometric wrench set
- A copy of the Instructions for use and Spare parts list of the machine to be serviced (provided with the machine or available at www.nilfisk.com or other Nilfisk websites).

Technical Data

Model		SW5500 B FLOORTEC R 985 B	SW5500 D	SW5500 LPG FLOORTEC R 985 LPG
Cleaning width	With one side broom	46.3 in (1,175 mm)		
	With two side brooms	59 in (1,500 mm)		
Main broom size (length x diameter)		33.5 x 14.2 in (850 x 360 mm)		
Side broom diameter		20 in (500 mm)		
Theoretical working capacity	Main broom	6,338 yd^2/h (5,300 m^2/h)	6,697 yd^2/h (5,600 m^2/h)	
	With one side broom	8,694 yd^2/h (7,270 m^2/h)	9,484 yd^2/h (7,930 m^2/h)	
	With two side brooms	11,050 yd^2/h (9,240 m^2/h)	12,055 yd^2/h (10,080 m^2/h)	
Hopper	Capacity	5.3 ft^3 (150 liters)		
	Maximum liftable weight	529 lb (240 Kg)		
	Maximum lifting height	65 in (1,650 mm)		
Filter	Cleaning system	Electrical filter shaker		
	Area	75.3 ft^2 (7 m^2)		
	Filter efficiency	77% @ 0,8 µm		
Power		WET or GEL/AGM batteries for cyclical/drive use 24V (180 - 480 Ah C5)	-	
System voltage		24 V		
Power		-	5.5 hp (4.1 kW) @ 3,000 rpm	7,6 hp (5,7 kW) @ 3,000 rpm
Engine model		-	Yanmar L70N	Honda iGX 270
Fuel type		-	Diesel	LPG
Fuel tank capacity		-	1.8 US gal (7 liters)	-
LPG tank capacity		-	-	33 lb (15 Kg)
Type of	Engine oil	-	SAE 15W40	SAE 10W30
	Hydraulic system	Arnica 46		
Main broom	Motor power	1.3 hp (1,000 W)	1.7 hp (1,250 W)	
	Speed	3,800 rpm	4,800 rpm	
Side broom	Motor power	0.16 hp (120 W)		
	Speed	40/155 rpm		
Vacuum	Motor power	0.35 hp (260 W)		
Drive	Type	Electrical on the front wheel		
	Gearmotor power	1.6 hp (1,200 W)		
	Forward speed	5.6 mi/h (9 km/h)	6.2 mi/h (10 km/h)	
	Reverse speed	2.5 mi/h (4 km/h)	2.8 mi/h (4.5 km/h)	
Maximum gradient when working		20 %		
Hopper hydraulic control unit		1.1 hp (800 W)		
Filter shaker motor		2 x 12 W		
Total absorbed power		3.48 hp (2.6 kW)		
Working autonomy		8 h	7.5 h	12 h
Dimensions (length x width x height)	Machine body	73.8 x 47.2 x 61.6 in (1,875 x 1,200 x 1,564 mm)		
	Machine with side brooms	73.8 x 51.2 x 61.6 in (1,875 x 1,300 x 1,564 mm)		
	Machine with FOPS (optional)	73.8 x 47.2 x 78.5 / 81.7 in (1,875 x 1,200 x 1,995 / 2,075 mm)		
	Battery compartment	18.5 x 32.3 x 28.5 in (470 x 820 x 725 mm)	-	
LPG tank maximum size (length x diameter)		-	-	34.9 x 12 in (886 x 306 mm)

Technical Data (Continues)

Model		SW5500 B FLOORTEC R 985 B	SW5500 D	SW5500 LPG FLOORTEC R 985 LPG
Weight	Curb weight (without batteries)	1,402 lb (636 Kg)	1,669 lb (757 Kg)	1,684 lb (764 Kg)
	Total curb weight (*)	2,427 lb (1,101 Kg)	1,847 lb (838 Kg)	1,920 lb (871 Kg)
	Front axle curb weight (*)	1,106 lb (502 Kg)	780 lb (354 Kg)	804 lb (365 Kg)
	Rear axle curb weight (*)	1,320 lb (599 Kg)	1,067 lb (484 Kg)	1,115 lb (506 Kg)
	Gross vehicle weight (GVW)	3,011 lb (1,366 Kg)	2,641 lb (1,198 Kg)	2,518 lb (1,142 Kg)
Wheel specific pressure on the floor (front - rear wheels, in running conditions)		232 - 116 psi (1.6 - 0.8 N/mm^2)	101 - 58 psi (0.7 - 0.4 N/mm^2)	101 - 72 psi (0.7 - 0.5 N/mm^2)
Sound pressure level at workstation (ISO 11201, ISO 4871, EN 60335-2-72) (LpA)		68 dB(A) ± 3 dB(A)	84 dB(A) ± 3 dB(A)	79 dB(A) ± 3 dB(A)
Machine sound pressure level (ISO 3744, ISO 4871, EN 60335-2-72) (LwA)		88 dB(A)	104 dB(A)	98 dB(A)
IP protection class		X3		
Dust guard system water tank (optional) capacity		8.4 US gal (32 liters)		
U-turn space (right - left)		91 - 93.5 in (2,310 - 2,375 mm)		
Vibration level at the operator's arms (ISO 5349-1) (**)		< 98.4 in/s^2 (< 2.5 m/s^2)		
Vibration level at the operator's body (ISO 2631-1)		31.5 in/s^2 (0.8 m/s^2)		

(*) With operator on board, fuel tank and hopper empty.

(**) Under normal working conditions, on a level asphalt surface.

CAUTION: If the machine is to be used at ambient temperatures below +10°C, the oil should be changed with equivalent oil having a viscosity of 32 cSt. For temperatures below 0°C, use an oil with lower viscosity

Hydraulic Oil Technical Data

AGIP ARNICA		46	32
Viscosity at 40 °C	in^2/s (mm^2/s)	0.07 (45)	0.05 (32)
Viscosity at 100 °C	in^2/s (mm^2/s)	0.012 (7.97)	0.009 (6.40)
Viscosity index	/	150	157
Flash point COC	°F (°C)	419 (215)	396 (202)
Pour point	°F (°C)	-32.8 (-36)	-32.8 (-36)
Density at 15 °C	lb/gal (Kg/l)	1.9 (0.87)	1.9 (0.865)

Technical Data (Continues)

Machine Material Composition and Recyclability

Type	Recyclable percentage	SW5500 B FLOORTEC R 985 B weight percentage	SW5500 D weight percentage	SW4000 LPG FLOORTEC R 985 LPG Weight percentage
Aluminum	100 %	0.2 %	0.2 %	0.1 %
Electric motors - various	29 %	15.3 %	15.1 %	20.4 %
Ferrous materials	100 %	64.9 %	65.6 %	61.1 %
Wiring harnesses	80 %	0.0 %	0.0 %	0.0 %
Liquids	100 %	0.5 %	0.6 %	0.6 %
Plastic - non-recyclable material	0 %	0.0 %	0.0 %	0.0 %
Plastic - recyclable material	100 %	0.9 %	1.1 %	0.8 %
Polyethylene	92 %	8.7 %	8.3 %	8.1 %
Rubber	20 %	9.3 %	9.0 %	8.7 %
Cardboard - paper - wood	100 %	0.2 %	0.2 %	0.1 %

Dimensions

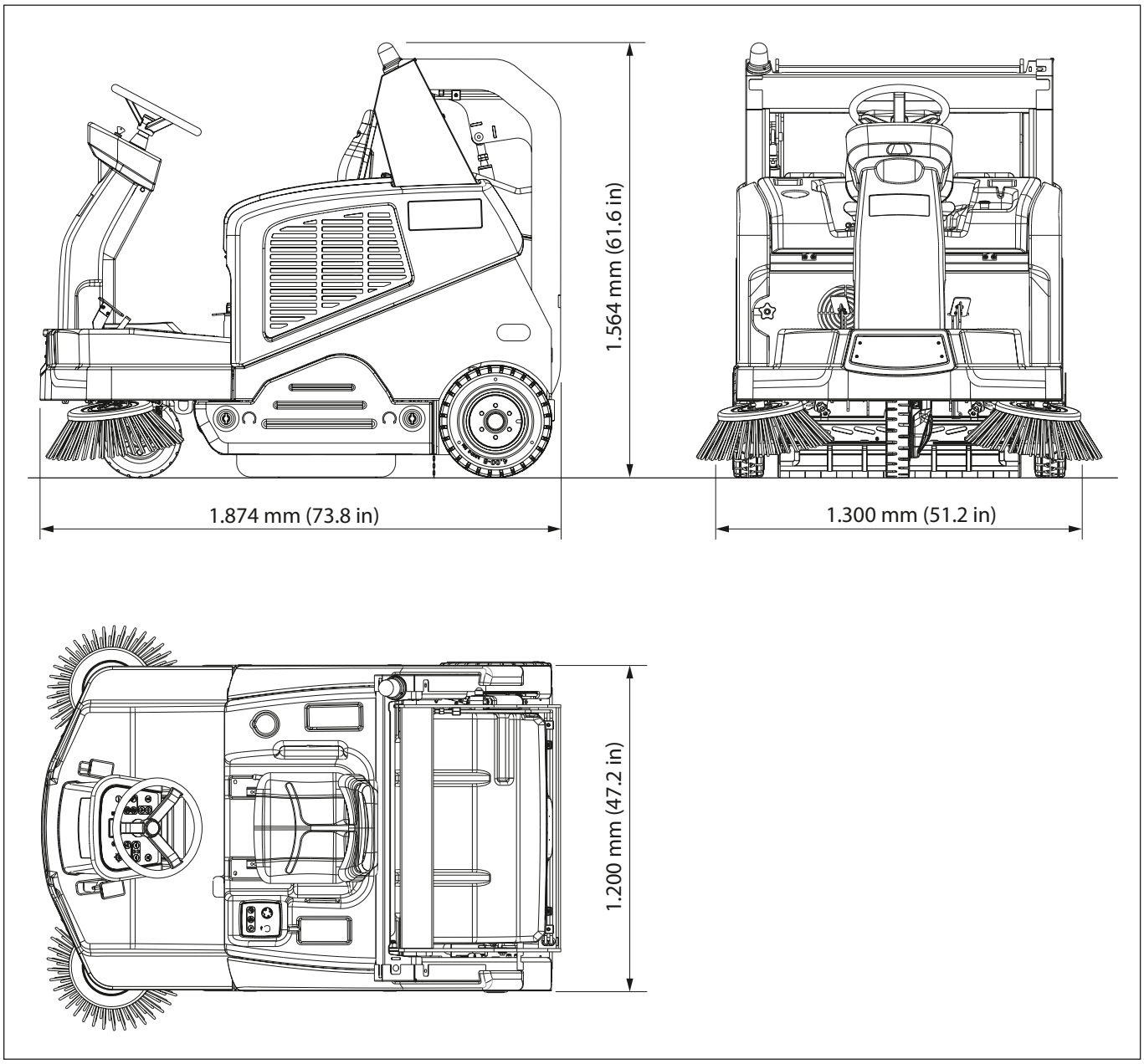


Figure 9:

Maintenance

The lifespan of the machine and its maximum operating safety are ensured by correct and regular maintenance.



WARNING: Read carefully the instructions in the Safety chapter before performing any maintenance procedure.

The following tables provides the scheduled maintenance. The intervals shown may vary according to particular working conditions, which are to be defined by the person in charge of the maintenance.

For instructions on maintenance procedures, see the following paragraphs.

Scheduled Maintenance Table (Battery version)

Procedure	Upon delivery	Every 10 hours	Every 50 hours	Every 100 hours	Every 200 hours	Every year
Battery charging	(1)					
Battery (WET) fluid level check		(2)				
Side and main broom height check						
Service brake cable adjustment		(3)				
Hopper dust filter check and cleaning (“A” method)			(4)			
Hopper hydraulic lifting system oil level check			(2)			
Skirt height and operation check						
Dust guard system water filter check and cleaning						
Hopper dust filter check and cleaning (“B” method)				(4)		
Filter shaker operation check						
Brake adjustment						
Nut and screw tightening check				(5)		
Steering chain cleaning						
Safety system operation check				(2)		
Brake pad check/adjustment/replacement				(3)		
Hopper dust filter check and cleaning (“C” method)					(4)	
Hopper gasket integrity check						
Lifted hopper sensor operation check/adjustment						
Motor carbon brush check and replacement						
Hydraulic system oil change						(6)

(1) Daily or after using the machine.
(2) Or before start-up.
(3) Or more frequently if the machine is used on slopes.
(4) Or more often in dusty areas.
(5) And after the first 8 running-in hours.
(6) Change the hydraulic system oil for the first time after 500 hours, then every 2,000 hours or every year.

Scheduled Maintenance Table (Diesel/LPG version)

Procedure	Upon delivery	Every 10 hours	Every 50 hours	Every 100 hours	Every 200 hours	Every year
Engine oil level check	(1)					
Battery fluid level check		(2)				
Side and main broom height check						
Engine air filter check		(1)				
Service brake cable adjustment		(3)				
Hopper dust filter check and cleaning (“A” method)			(4)			
Hopper hydraulic lifting system oil level check			(2)			
Skirt height and operation check						
Dust guard system water filter check and cleaning						
Engine air filter cleaning			(4)	(4)		
Hopper dust filter check and cleaning (“B” method)				(4)		
Filter shaker operation check						
Brake replacement						
Engine oil change				(5) (6)		
Spark plug check/cleaning						
Nut and screw tightening check				(6)		
Steering chain cleaning				(*)		
Safety system operation check				(2)		
Engine filter trap cleaning						
Engine baffle plate cleaning						
Fuel filter cleaning				(7)		
Brake pad check/adjustment/replacement				(3)		
Hopper dust filter check and cleaning (“C” method)					(4)	
Hopper gasket integrity check						
Lifted hopper sensor operation check/adjustment						
Fuel filter cleaning (diesel)						
Engine paper air filter replacement						
Spark plug replacement						
Engine idle speed check/adjustment						
Valve clearance check/adjustment						
Hydraulic system oil change						(7)
Supply hose replacement (LPG)						
Engine combustion chamber cleaning	Every 500 hours					
Fuel hose check/replacement (Diesel)	Every 2 years					

(1) Daily or after using the machine.
(2) Or before start-up.
(3) Or more frequently if the machine is used on slopes.
(4) Or more often in dusty areas.
(5) Or every 6 months.
(6) And after the first 20 running-in hours.
(7) Change the hydraulic system oil for the first time after 500 hours, then every 2,000 hours or every year.

05 - Control System

Functional Description

The machine is started by the ignition key (KEY), located on the main control panel. When the key is turned to I, the Display Controller (EB3) is powered which in turn powers the control section of the Main Machine Controller (EB1) via the output on J1.5.

The Main Machine Controller (EB1) in turn powers the control section of the Drive Wheel Controller (EB2) via the output on J1.11.

Ahead of the ignition key (KEY) there is the emergency button (SW0). Upline of SW0 the key circuit is protected by the relevant fuse (F2). Between the fuse (F2) and the emergency button (SW0) is the normally closed contact of the shut-off relay inside the battery charger. This contact prevents machine operation when the battery charger is connected to the mains. If there is no battery charger, the contact is short circuited by a jumper on connector (C2).

Following the starting procedure described above using the (KEY), both boards (EB1) and (EB2), after checking the status of the outputs to check whether there are any internal or external short circuits, power the corresponding contactors (ES1) and (ES2), which supply battery voltage to the corresponding power sections of the boards themselves.

Checking of the various machine functions occurs via momentary buttons on the Main Control Board (EB4) (on the steering column) and side control panel ì board (EB5) (beside the seat).

All machine functions, with the exception of the drive, are managed and controlled directly by the Main Machine Controller (EB1).

The drive function is managed by the Drive Wheel Controller (EB2).

All controls relating to the drive function (operator presence (SW1) and accelerator pedal (R1)) are wired directly to the Drive Wheel Controller (EB2), with the exception of the following 2 control signals:

- Digital forwards/backwards signal
- Analogue maximum speed signal

The digital forwards/backwards signal is managed by the Main Machine Controller (EB1) which receives the control from the reverse button  and is sent to the Drive Wheel Controller (EB2) via output A4.1.

The horn and the reverse warning buzzer are an integral part of the Main Machine Controller (EB1).

The analogue maximum speed signal is managed by the Main Machine Controller (EB1) on the basis of the status of various inputs and parameters (see Wheels System, Traction chapter) and is sent via output A4.3 to the Drive Wheel Controller (EB2).

The Drive Wheel Controller (EB2) communicate with the Main Machine Controller (EB1) also with CAN-BUS (see Wheels System, Traction chapter).

On the Main Machine Controller is installed a 3-axis accelerometer that is used to reduce the speed of the machine during the turns (see AMAX and KG hidden parameters) and to alert the operator when he rises the hopper on a dangerouse slope (see ASTAB hidden parameter).

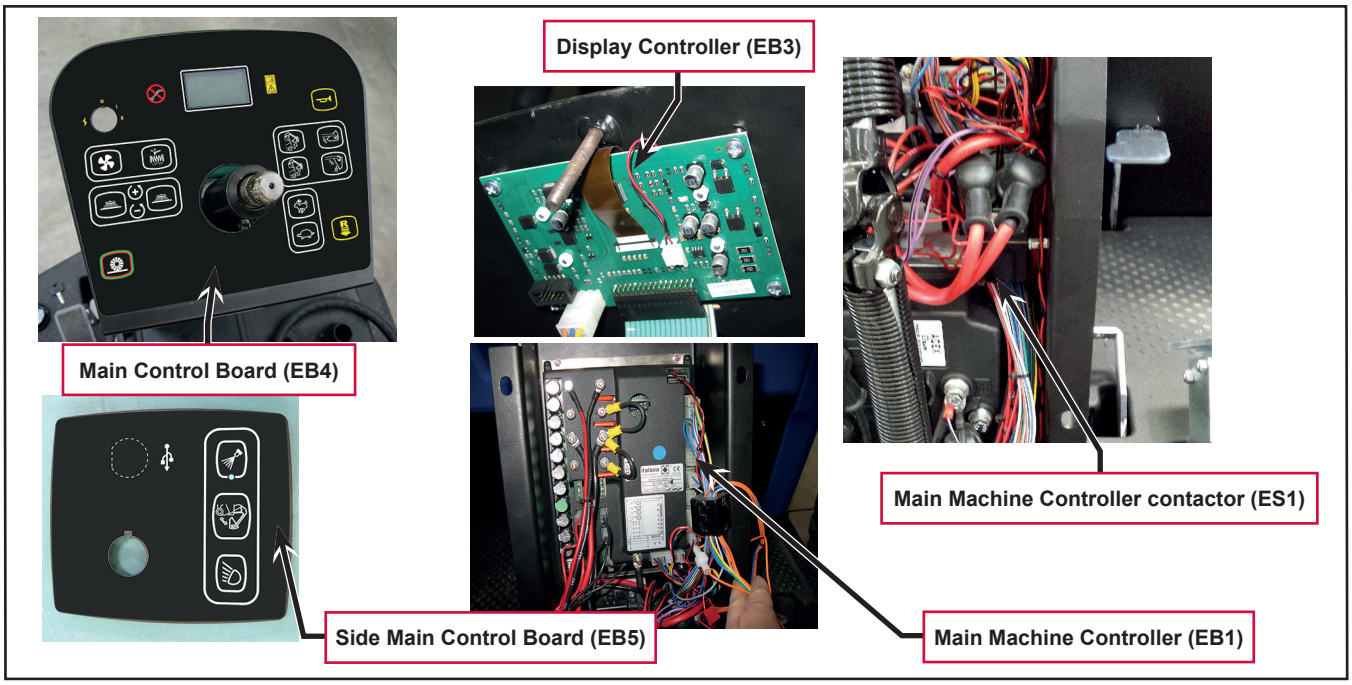

Display Controller (EB3)
Main Control Board (EB4)
Main Machine Controller contactor (ES1)
Side Main Control Board (EB5)
Main Machine Controller (EB1)

Figure 1:

Functional Block Diagram

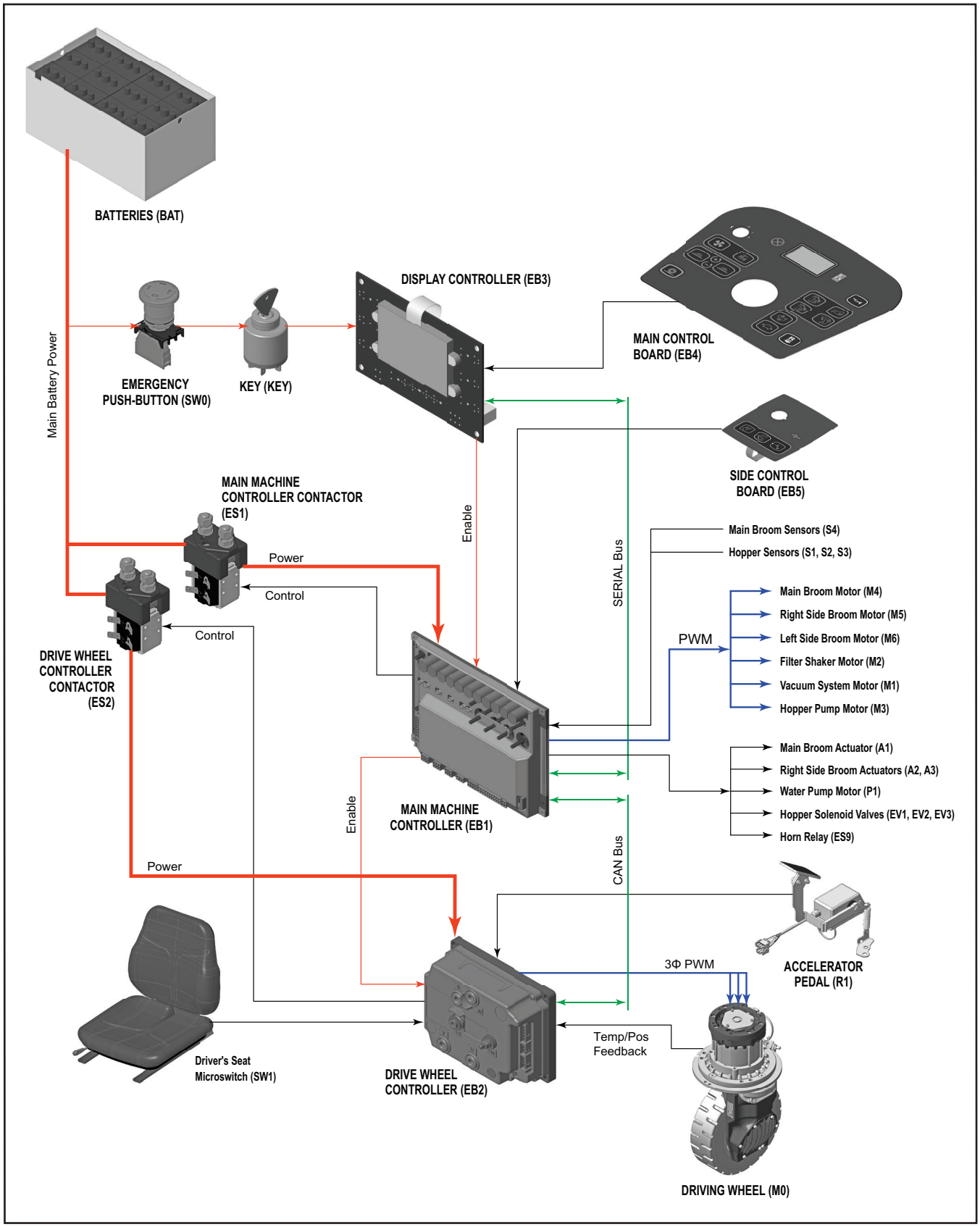


Figure 2:

Wiring Diagram

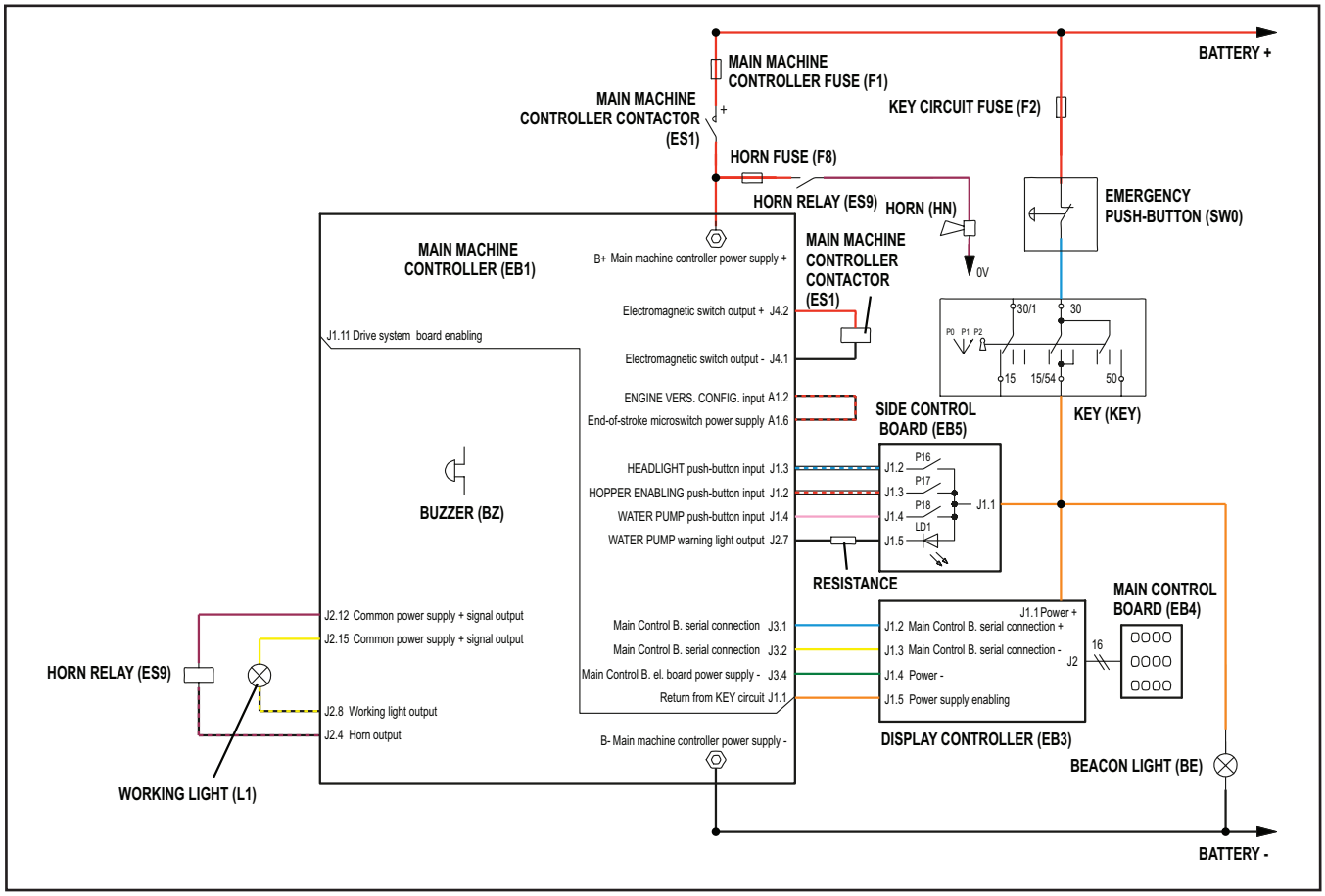


Figure 3:

Component Locations

- Main Machine Controller (EB1)
- Display Controller (EB3)
- Main Control Board (EB4)
- Side Main Control Board (EB5)
- Flat cables from (EB3) to (EB4)
- Ignition key (KEY)

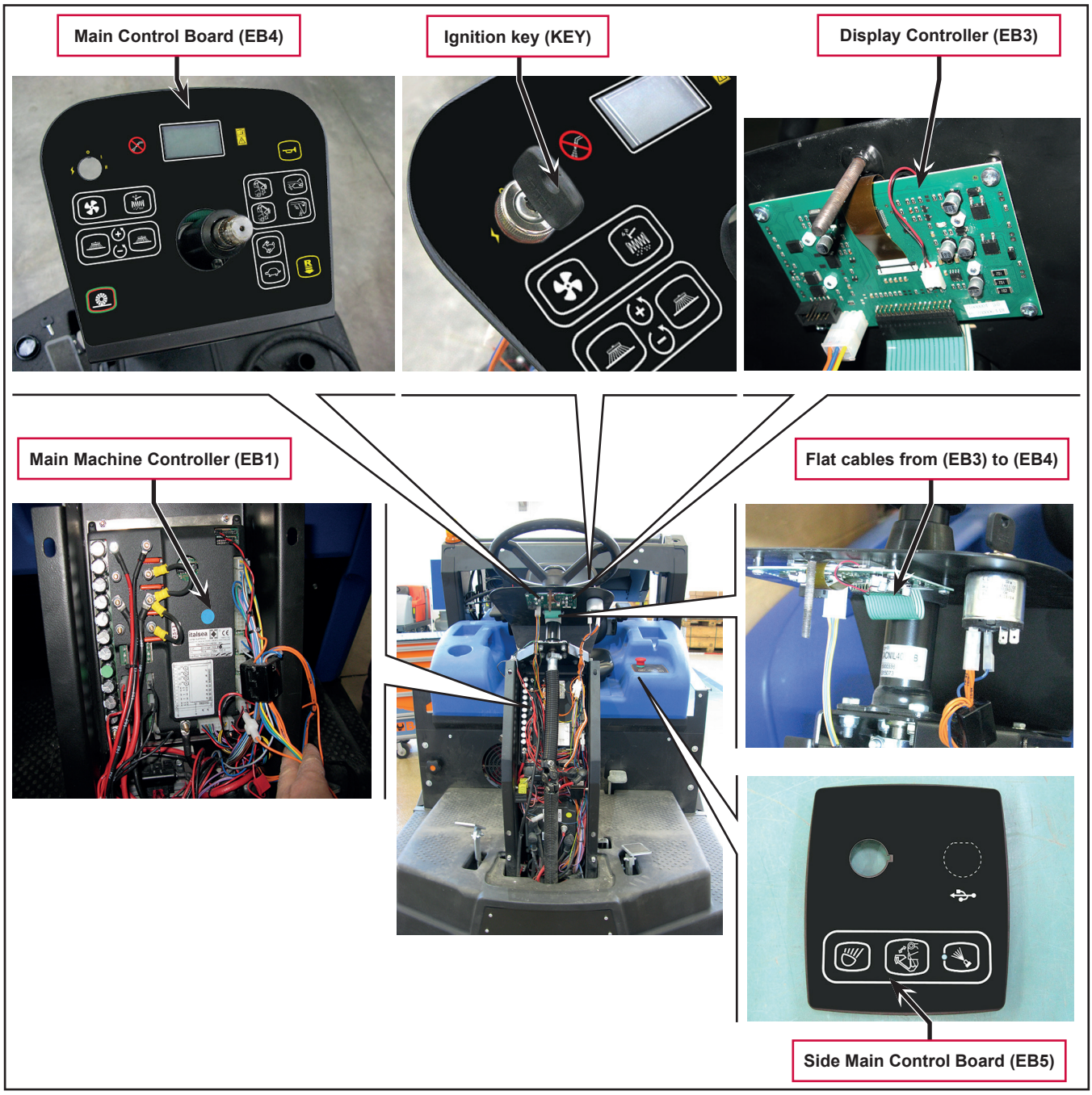


Figure 4:

Troubleshooting

Main Machine Controller Alarm Codes

The Main Machine Controller indicates a series of alarms in case of malfunction of one or more systems, and in case of abnormal conditions detected in the input signals.

The alarms are grouped into 3 categories:

- GENERAL ALARMS (G...) relating to generic function of the Main Machine Controller (EB1)
- FUNCTIONS ALARMS (F..) relating to managed functionality of the Main Machine Controller (EB1)
- DRIVE SYSTEM ALARMS (TR..) relating to Drive Wheel Controller (EB2)

The alarms are shown on the display as in the example.



Figure 5:

The drive system alarm are shown on the display ai in the example.

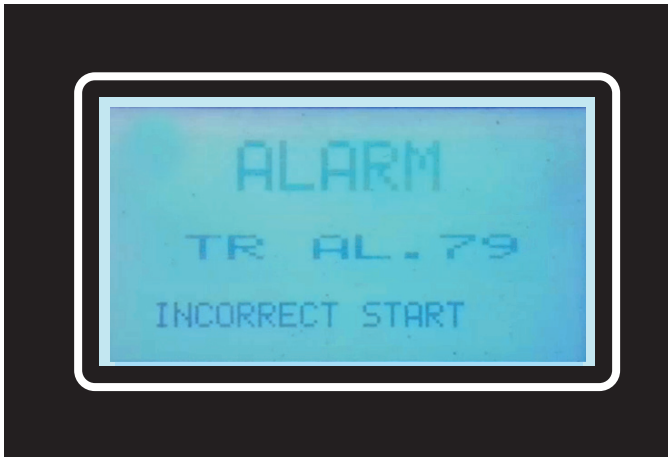


Figure 6:

Main Machine Controller Alarm Codes (Continues)

General alarms				
Alarm code *----------* *Description*	*Meaning*	*Condition*	*Effect*	*Service Suggestions*
G2	EEPROM error	EEPROM error	All functions blocked + reset to default settings	Shut down and restart the machine, if the alarm continues, change the Main Machine Controller (EB1)
G3	Blown main fuse or broken line contactor (contacts always open)	Power circuit open (upline fuse) = (contactor active and V downline < 18V for 1 sec.)	All functions blocked	Check the Main Machine Controller fuse (F1) (change if blown). Check the Main Machine Controller contactor (ES1): it should close its contact a few seconds after the machine is turned on (replace if blown)
G4	Battery voltage low (Battery version)	B+ < 20,4 V (for WET setting) for at least 10 sec. B+ > di 21,6 V (for GEL/ AGM setting) for at least 10 sec.	All functions blocked	Charge the batteries; if the alarm persists replace the batteries.
G4	Battery voltage low (Diesel and LPG versions)	B+ < 24.0V for at least 300 sec. with engine running (ALT input high) or B+ < 19.4V (for at least 3 sec.)	All functions blocked	Check the alternator fuse (F4) (change if blown). Check the charging system contactor (ES10): it should close its contacts when the drive pedal is pressed and the drive wheel is operational. Check the ALT output current draw while working; it should be sufficient to keep the battery voltage over 25-26V. Check the batteries. Perform a charging cycle on the batteries; if the alarm persists replace the batteries.
G5	High voltage (Battery version)	B+ - B- > 32V (instantaneous)	All functions blocked	Check the battery connections. Could be also caused descending from heavy slopes if the batteries are not enough capable. If repeated change the batteries or use bigger battery pack size.
G5	Battery voltage high (Diesel and LPG versions)	B+ > 33V for at least 300 sec. or B+ > 40.0V (instantaneous)	All functions blocked	Check the battery connections. Check the (ES10) contactor from welded (stuck closed) contacts. Could be also caused descending from heavy slopes if the batteries are not enough capable. If repeated change the batteries or use bigger battery pack size.
G6	Serial communication error with Display Controller	No communication or communication error for at least 1 sec.	All functions blocked	Check the yellow and blue wires between Display Controller (EB3) and Main Machine Controller (EB1) J3 connector. Check for about 5V on the blue, if not probably the Display Controller EB3 has to be replaced. Check for about 2.5V on the yellow, if not probably the Main Machine Controller (EB1) has to be replaced.
G7	CANBUS communication error with Drive Wheel Controller	No communication or communication error for at least 30 sec.	All functions blocked	Check the black&red twisted wires between Main Machine Controller (EB1) J7 connector and Drive Wheel Controller (EB2) JC connector.
G8	Line contactor fault (contacts always open)	B+ > 15V on ignition or B+ < 15V after activation of output J3.5	All functions blocked	Check the (ES1) Main Machine Controller contactor functionality. Also check the vacuum system motor: if it is damaged or not connected, alarm G8 can appear as well (because the board uses the vacuum system motor output to draw the internal residual energy when the machine is turned off).

Main Machine Controller Alarm Codes (Continues)

Main Machine Controller alarms				
Alarm code *----------* *Description*	*Meaning*	*Condition*	*Effect*	*Service Suggestions*
F2	MAIN BROOM motor amperometric protection	I > ISC (parameter) for a time inversely proportional to the difference between I and ISC	Main broom operation blocked	Check for debris blocking the main broom correct rotation. Check the main broom adjustment and the current draw in normal use. Compare with parameter ISC (max allowable current into the main broom motor).
F3	RIGHT SIDE BROOM motor amperometric protection	I > 10A FOR T>30s or I > 20A for T>5s	Right side broom operation blocked	Check for debris blocking the right broom correct rotation. Check the right broom adjustment and the current draw in normal use.
F4	LEFT SIDE BROOM motor amperometric protection	I > 10A FOR T>30s or I > 20A for T>5s	Left side broom operation blocked	Check for debris blocking the left broom correct rotation. Check the left broom adjustment and the current draw in normal use.
F5	VACUUM SYSTEM amperometric protection	I > 20A for T>10s	Vacuum system operation blocked	Check for debris blocking correct rotation of the vacuum system motor. Replace the vacuum system motor.
F6	HOPPER LIFTING PUMP amperometric protection	I > 80A for T>10s	Hopper lifting pump operation blocked	Check the hopper hydraulic system, change the pump motor.
F10	MAIN / SIDE BROOM / VACUUM SYSTEM / HOPPER RAISING PUMP power section damaged	Short circuit of MOSFET or main broom current reading circuit damaged	Broom / vacuum system / water pump operation blocked	Check for a short circuit in one of the Main Machine Controller main outputs: main broom, side brooms, vacuum system, hydraulic pump harnesses. Substitute the Main Machine Controller.
F11	Functions stage high temperature	Heat Sink Temperature. Functions stage > 90°C	All power outputs blocked	Check for dust in the electrical compartment or inside the Main Machine Controller cover. Check for proper tightening of the board fixing screws.
F12	MAIN BROOM output short circuit	I > 150A for 20µsec.	Broom function block	Check for any short circuit in the main broom motor harness.
F13	RIGHT SIDE BROOM output short circuit	I > 100A for 10µsec.	Broom function block	Check for any short circuit in the right broom motor harness.
F14	LEFT SIDE BROOM output short circuit	I > 100A for 10µsec.	Broom function block	Check for any short circuit in the left broom motor harness.
F15	VACUUM SYSTEM output short circuit	I > 150A for 20µsec.	Vacuum system operation blocked	Check for short circuits in the vacuum system motor harness.
F16	HOPPER LIFTING PUMP output short circuit	I > 150A for 20µsec.	Hopper lifting pump operation blocked	Check for any short circuit in the hydraulic pump motor harness.

Main Machine Controller Alarm Codes (Continues)

Drive system alarms				
CODE - Description (shown on multifunction display)		*Condition*	*Effect*	*Service Suggestions*
TR AL.8	**WATCHDOG**	Issue internal to the drive board.	Drive operation blocked	Switch off and on the machine by key switch (KEY). If persists, replace the Main Machine Controller.
TR AL.13	**EEPROM KO**	Issue internal to the drive board.	Drive operation blocked	Switch off and on the machine by key switch (KEY). If persists, replace the Main Machine Controller.
TR AL.17	**LOGIC FAILURE #3**	Motor circuit fault (internal to Drive Wheel Controller (EB2))	Drive operation blocked	**TR AL.62** Replace the Main Machine Controller.
TR AL.18	**LOGIC FAILURE #2**	Motor phase voltages alarm on starting	Drive operation blocked	Check the wires from the Drive Wheel Controller (EB2) and the drive system motor (M0). Check for any short of the cables to + BATT. It's could be generated switching on the machine douring movement.
TR AL.19	**LOGIC FAILURE #1**	Battery voltage below 9.0V or above 35.0V	Drive operation blocked	Check the battery voltage and the battery connections.
TR AL.30	**VMN LOW**	Low voltage on motor phases	Drive operation blocked	Check the battery voltage or substitute the Drive Wheel Controller **TR AL.65**
TR AL.31	**VMN HIGH**	High voltage on motor phases – Possible short circuit on battery + or no battery –	Drive operation blocked	Check the continuity from Battery negative to EB2.B-.
TR AL.37	**CONTACTOR CLOSED**	(Internal to Drive board (EB2))	Drive operation blocked	Replace the Main Machine Controller.
TR AL.38	**CONTACTOR OPEN**	Contactor not closing	Drive operation blocked	Check for the drive system contactor (ES2) wires, replace the contactor.
TR AL.53	**STBY I HIGH**	Issue internal to the drive board.	Drive operation blocked	Switch off and on the machine by key switch (KEY). If persists, replace the Main Machine Controller.
TR AL.60	**CAPACITOR CHARGE**	The power-supply capacitors are not charging – problem internal to Drive Wheel Controller (EB2) or battery problem	Drive operation blocked	Check the battery voltage or substitute the Drive Wheel Controller.
TR AL.62	**TH. PROTECTION**	High internal temperature	Drive operation blocked	Check the working current in the drive system motor (M0).
TR AL.65	**MOTOR TEMPERAT.**	Motor thermal sensor over 150°C	Maximum drive speed reduced to 23%	Check the working current in the drive system motor (M0). Check for exceeding dust in the drive system motor compartment.
TR AL.66	**BATTERY LOW**	Battery below 10%	Drive operation blocked	Check the battery voltage and the battery connections.
TR AL.74	**DRIVER SHORTED**	Contactor diode short circuit (internal to Drive Wheel Controller (EB2)) or no contactor positive (internal to Drive Wheel Controller (EB2))	Drive operation blocked	Replace the Main Machine Controller.

CODE - Description (shown on multifunction display)		*Condition*	*Effect*	*Service Suggestions*
TR AL.75	**CONTACTOR DRIVER**	Issue internal to the drive board.	Drive operation blocked	Switch off and on the machine by key switch (KEY). If persists, replace the Main Machine Controller.
TR AL.78	**VACC NOT OK**	Pedal analogue output not minimum at rest	Drive operation blocked	Check the drive pedal (R1) mechanical position, substitute the drive pedal. Pedal output voltage (white wire) should be less than 0.1Vdc (Pedal is supplied at 12-14Vdc, analogue output is 0-5Vdc).
TR AL.79	**INCORRECT START**	Pedal pressed on start (pedal microswitch closed)	Drive operation blocked	Check the drive pedal (R1) mechanical position, substitute the drive pedal.
TR AL.82	**ENCODER ERROR**	Encoder signal not received or not plausible	Drive operation blocked	Check the encoder (ENC) wires, replace the encoder, replace the drive board. Check for encoder supply from the drive board: 12-14V between wire red (+) and wire black (-). Check the encoder output: 2 square waves 5V amplitude 90° shifted (frequency is proportional to the motor rpm) from wire blue (Phase A) and wire white (Phase B).
TR AL.86	**PEDAL WIRE KO**	No pedal negative	Drive operation blocked	Check the accelerator pedal wiring or replace the accelerator pedal (R1)
TR AL.208	**EEPROM KO**	Issue internal to the drive board.	Drive operation blocked	Switch off and on the machine by key switch (KEY). If persists, replace the Main Machine Controller.
TR AL.209	**PARAM RESTORE**	Issue internal to the drive board.	Drive operation blocked	Switch off and on the machine by key switch (KEY). If persists, replace the Main Machine Controller.
TR AL.210	**WRONG RAM MEM.**	Issue internal to the drive board.	Drive operation blocked	Switch off and on the machine by key switch (KEY). If persists, replace the Main Machine Controller.
TR AL.211	**STALL ROTOR**	Motor stall	Drive operation blocked	Check the drive system motor (M0)
			Check the wiring from the motor wheel Encoder (ENC) and the Drive Wheel Controller (EB2)	Repare the Encoder wiring or substitute the sensor
TR AL.212	**WRONG RAM**	Issue internal to the drive board.	Drive operation blocked	Switch off and on the machine by key switch (KEY). If persists, replace the Main Machine Controller.
TR AL.218	**SENS MOT TEMP KO**	Motor thermal sensor out of scale	Drive operation blocked	Check the drive system motor temperature sensor (S5) wires, replace the temperature sensor.

CODE - Description (shown on multifunction display)		*Condition*	*Effect*	*Service Suggestions*
TR AL.220	**KEY OFF SHORTED**	Short circuit on key circuit	Drive operation blocked	Check the key switch circuit wires from B+ to EB2.JC.1 (SW0, KEY, ES8 (only for LPG/D versions)).
TR AL.221	**FLASH CHECKSUM**	Software problem (internal to Drive board (EB2))	Drive operation blocked	Replace the Main Machine Controller.
TR AL.223	**COIL SHOR. MC-EB**	Contactor coil short circuit	Drive operation blocked	Check for the drive system contactor (ES2) coil wires, replace the contactor.
TR AL.226	**VACC OUT RANGE**	Pedal analogue output beyond max	Drive operation blocked	Check the drive pedal (R1) harness: Check for any short circuit of one of the cables to the + BATT on the external or internal drice pedal. Pedal output voltage (white wire) should be less than 5Vdc (Pedal is supplied at 12-14Vdc, analogue output is 0-5Vdc).
TR AL.228	**SEAT SWITCH OPEN**	Seat microswitch open	Drive operation blocked	Check the driver's seat switch (SW1) wires, replace the driver's seat switch.
TR AL.231	**WATCHDOG#2**	Issue internal to the drive board.	Drive operation blocked	Switch off and on the machine by key switch (KEY). If persists, replace the Main Machine Controller.
TR AL.233	**POWER MOS SHORT**	(Internal to Drive board (EB2))	Drive operation blocked	Replace the Main Machine Controller.
TR AL.236	**CURRENT GAIN**	Max current problem (internal to Drive board (EB2))	Drive operation blocked	Replace the Main Machine Controller.
TR AL.248	**NO CAN MSG.**	CAN communications problem	Broom and vacuum system operation blocked during machine movement	Check the 2 canbus wires between EB1.J7 and EB2.JC.
TR AL.250	**THERMIC SENS. KO**	Thermal sensor out of scale (internal to Drive Wheel Controller (EB2))	Drive operation blocked	Replace the Main Machine Controller.
TR AL.251	**WRONG BATTERY**	Battery voltage <18V or > 30V on starting	Drive operation blocked	Check the battery voltage and the battery connections. Check the key switch circuit wires from B+ to EB2.JC.1 (SW0, KEY, ES8 (only for LPG/D versions)).

All drive system alarms cut power to the driving wheel motor until the KEY input is reset (with the exception of alarm INCORRECT START which is reset as soon as the pedal is released).

Service Screens

The alarms activated during normal machine operation are stored and can be read in the corresponding log (Alarm Log Screen).

Main Screen

1. Turn the ignition key to the starting position “I” while holding down the One-Touch  and right side broom  buttons simultaneously to access the main screen.



Figure 7:

2. Press the hopper lifting button  to change the machine settings (see Machine Settings Screen).
3. Press the hopper lowering  button to check any alarms stored by the machine (see Alarm Log Screen).
4. Press the increase running speed  button to check the machine working hours (see Operating Time Counter Screen).
5. Press the decrease running speed  button to exit service mode and return to operator mode.
6. Press both the horn  and reverse  buttons for entering in the Main Machine Controller outputs verification screen (see Main Machine Controller Outputs Verification Screen).

Machine Settings Screen

The machine settings screen functions allow you to customize some parameters described in the following table of modifiable parameters.

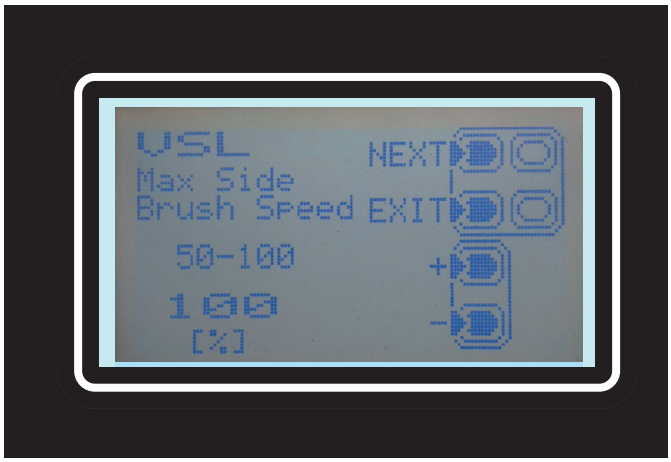


Figure 8:

1. To increase the value of the current parameter, press the increase running speed button  .
2. To decrease the value of the current parameter, press the decrease running speed button  .
3. To move to the next parameter, press the hopper lifting button  .
4. To return to the main screen, press and hold the hopper lowering button  .

MODIFIABLE PARAMETERS					
Code	Description		Min. value	**Factory Setting**	Max. value
VSL	Side broom speed		50%	**100%**	100%
SCF	Filter shaker activation time		5 sec	**20 sec**	60 sec.
FVMIN	Minimum forward speed		0%	**25%**	100%
FVMAX	Maximum forward speed	Battery	10%	**85%**	100%
		Diesel / LPG	10%	**100%**	100%
RVMAX	Maximum reverse speed		10%	**30%**	50%
BAT (*)	Installed battery type		WET	**WET**	GEL / AGM
TOFF	Automatic shut-off time		0 sec	**300 sec**	600 sec
BRGH	Display contrast		5	**25**	50
RESET (**)	Resets all parameters to the factory default values		NO	**NO**	YES

(*) Significant for version and battery and with hybrid kit installed.

(**) The RESET function is active only for “MODIFIABLE PARAMETERS” and not for “HIDDEN PARAMETERS”.

Machine Settings Screen (Continues)

The following parameters are displayed only when, on reaching the last RESET parameter, the hopper lifting button  is pressed together with the One-Touch button  and the right side broom button  .

Otherwise, pressing only the hopper lifting button  returns to the first VSL parameter.

WARNING: Do not change these parameters unless specifically to a factory representative.

HIDDEN PARAMETERS						
Code	Description		Min. value	**Factory Setting**	Max. value	Meaning
HYB	Hybrid system		NO	**NO**	YES	Set to YES if the machine is equipped with hybrid system kit.
FAN	Altern./rpm/fan motor management mode		NO	**NO**	YES	Technical parameter, do not modify.
TSERV	Service advisory timer		0	**0**	1,000	If > 0: number of hours before the “service” icon appears on the multifunction display. If = 0: function disabled.
ISC	Main broom maximum current	Battery	50	**70**	1,000	Maximum continuous current permitted for the main broom motor.
		Diesel / LPG	50	**60**	100	
HRC	Maximum number of hours without recharge		0	**5**	50	(Significant only for machines equipped with hybrid system KIT). Cumulative number of hours running on battery without performing a complete charge with on-board battery charger.
AMAX	Maximum lateral acceleration (g/100)		1	**15**	100	Maximum lateral acceleration value permitted without reducing the machine speed.
KG	Lateral acceleration control constant		1.0	**1.6**	2.0	Extent of speed reduction in the event the maximum lateral acceleration threshold AMAX is exceeded. (High value = greater speed reduction)
ASTAB	Maximum hopper safety angle		1	**10**	50	Maximum machine slope angle beyond which the hopper dumping system is disabled for safety (hydraulic pump supply voltage reduced to 50%).

Alarm Log Screen

This function allows you to check any alarms stored by the machine.

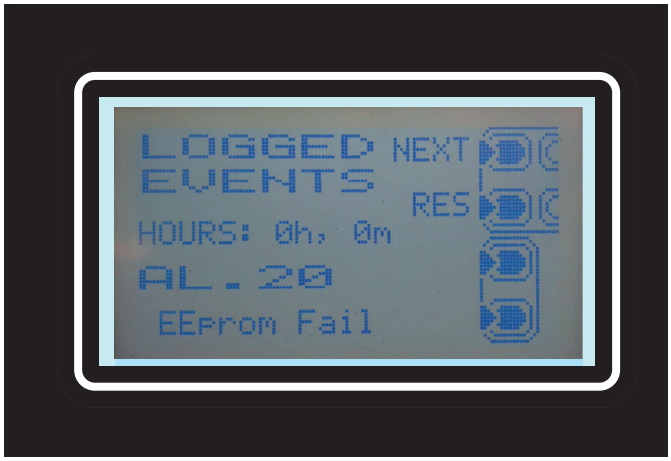


Figure 9:

Use this function only with the support of the Nilfisk Service Centre to solve problems with machine operation.

To return to the main screen, press the hopper lifting button  repeatedly.

Each alarm (see table in the Main Machine Controller Alarm Codes) is stored along with the working hour (machine operating time counter) at which it occurred and all alarms are recorded in the order in which they occurred, from the most recent to the oldest.

The memory holds up to 20 alarm records, after which the oldest are overwritten when new alarms occur.

Press the hopper lifting button  to display the next alarm.

Press and hold the hopper lowering button for 3 seconds  to delete all alarms in memory.

Operating Time Counter Screen

The operating time counter screen function allows you to check the total accumulated hours of work for each machine subsystem:

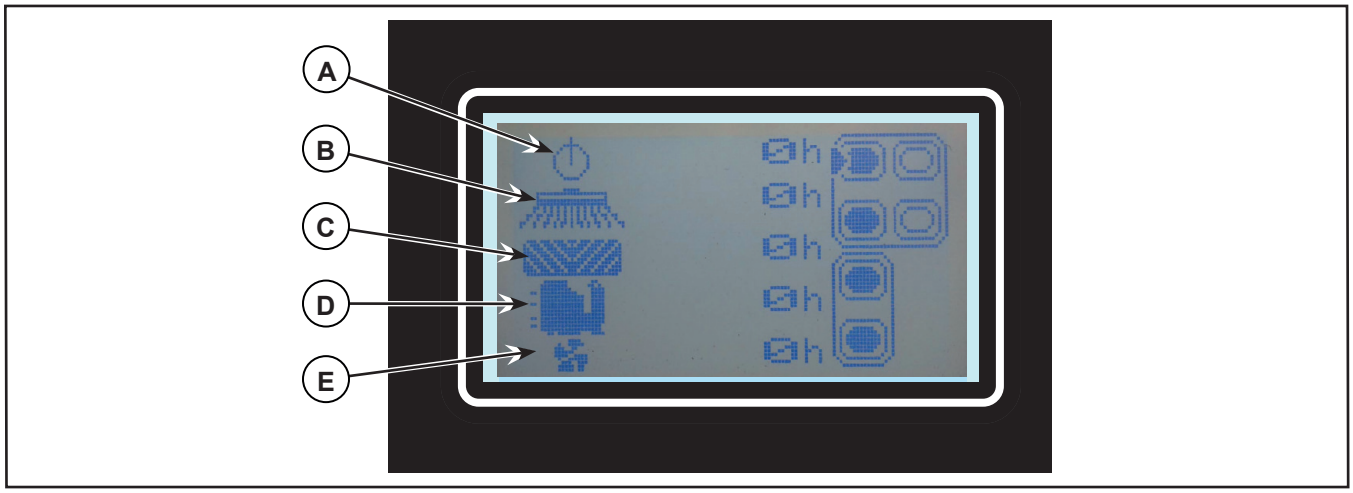


Figure 10:

- (A) TOTAL hour counter (machine on time)
- (B) SIDE BROOMS hour counter (side brooms usage time)
- (C) MAIN BROOM hour counter (main broom usage time)
- (D) DRIVE hour counter (drive system usage time)
- (E) VACUUM hour counter (vacuum system usage time)

To return to the main screen, press the hopper lifting button  .

Main Machine Controller Outputs Verification Screen

This function allows you to individually activate one of the Main Machine Controller outputs, press the relevant button as following table.



Figure 11:

In this way, the output will be independently activated from any condition present on the inputs and only for the time while the button is pressed.

Where indicated in the table, the display shows in real time the current consumption detected by the card on the active output.

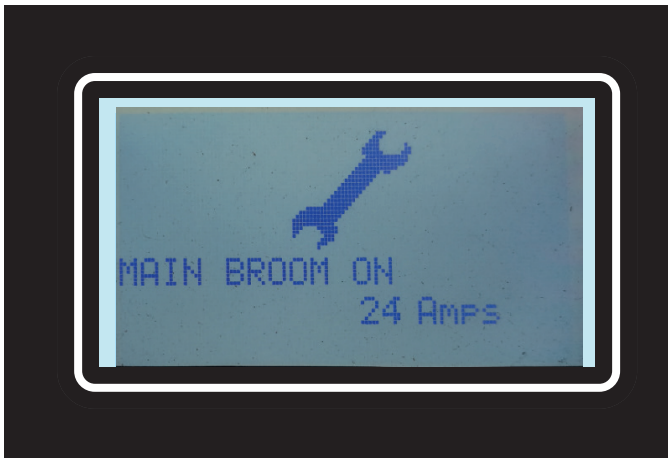


Figure 12:

For some buttons, not directly related to any the output activation, the display shows the effective button pressing.

WARNING: Pay maximum attention when using this feature as all safety systems will be bypassed.

Main Machine Controller Outputs Verification Screen (continues)

Button	Action	**Text shown on the display**	Current value diplayed
	MAIN BROOM motor output activation	**MAIN BROOM ON**	Yes
 RH	RIGHT SIDE BROOM motor output activation (100% PWM)	**RIGHT BROOM ON**	Yes
 LH	LEFT SIDE BROOM motor output activation (100% PWM)	**LEFT BROOM ON**	Yes
	Button pressed confirmation	**SIDE BROOM SPEED UP PRESSED**	No
	Button pressed confirmation	**SIDE BROOM SPEED DOWN PRESSED**	No
	VACUUM output activation	**VACUUM MOTOR ON**	Yes
	MAIN BROOM ACTUATOR lowering activation	**MAIN BROOM ACTUATOR DOWN**	Yes
	MAIN BROOM ACTUATOR lifting activation	**MAIN BROOM ACTUATOR UP**	Yes
 RH +	RIGHT SIDE BROOM ACTUATOR lowering activation	**RIGHT BROOM ACTUATOR DOWN**	Yes
 RH +	RIGHT SIDE BROOM ACTUATOR lifting activation	**RIGHT BROOM ACTUATOR UP**	Yes
 LH +	LEFT SIDE BROOM ACTUATOR lowering activation	**LEFT BROOM ACTUATOR DOWN**	Yes
 LH +	LEFT SIDE BROOM ACTUATOR lifting activation	**LEFT BROOM ACTUATOR UP**	Yes
	FILTER SHAKER output activation	**FILTER SHEAKER ON**	Yes
	Button pressed confirmation	**MACHINE SPEED UP PRESSED**	No
	Button pressed confirmation	**MACHINE SPEED DOWN PRESSED**	No
	HOPPER LIFTING VALVE output activation	**HOPPER LIFT UP VALVE ON**	No
	HOPPER LOWERING VALVE output activation	**HOPPER LIFT DOWN VALVE ON**	No
	HOPPER OVERTURN VALVE output activation	**HOPPER OPEN VALVE ON**	No
	HOPPER VALVE output activation	**HOPPER PUMP ON**	Yes
	PUMP output activation / deactivation	**CLACSON ON**	No
	Button pressed confirmation	**REV GEAR PRESSED**	No

Removal and Installation

Main Machine Controller (EB1)

Removal

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Open the battery/engine compartment hood with the handle and fasten it with the support rod.
4. Disconnect the battery connector (Battery Version) - Disconnect the batteries (Diesel and LPG Version).
5. Unscrew the four screws (A) fastening the fairing (B).
6. Unscrew the nut (C) on the front.
7. Slide the sleeve (D) until it is flush on the steering wheel.
8. Press the stud (E), sliding it upwards (causing the Main Control Board (F) to lift slightly, then remove the fairing (B) by disengaging it from its seat and the stud (E).
9. Disconnect the electrical connection (G) from the Display Controller (H).
10. Disconnect the electrical connections (I) from the ignition key assembly (J).
11. Unscrew the four screws (K) on the Main Control Board support.

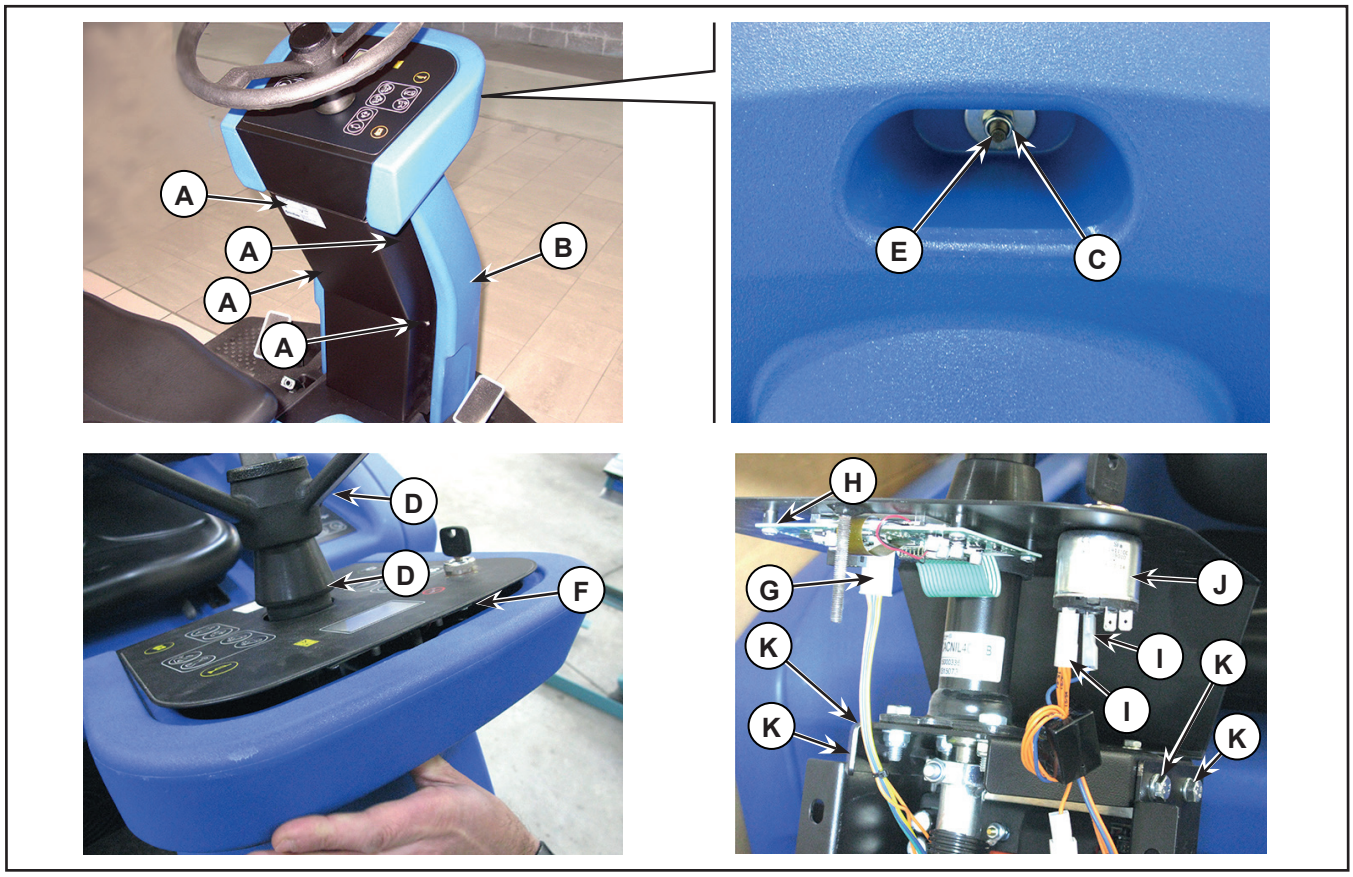


Figure 13:

Main Machine Controller (EB1) (Continues)

12. Remove the steering wheel with steering shafts assembly (L), gripping it as shown in the figure, and disengaging it from the shaft with key (M).
13. Disconnect all the electrical connections from the Main Machine Controller (N) after marking their various positions.
14. Unscrew the four nuts (P) and remove the Main Machine Controller (N).

Installation

15. Assemble the components in the reverse order of removal, and note the following:

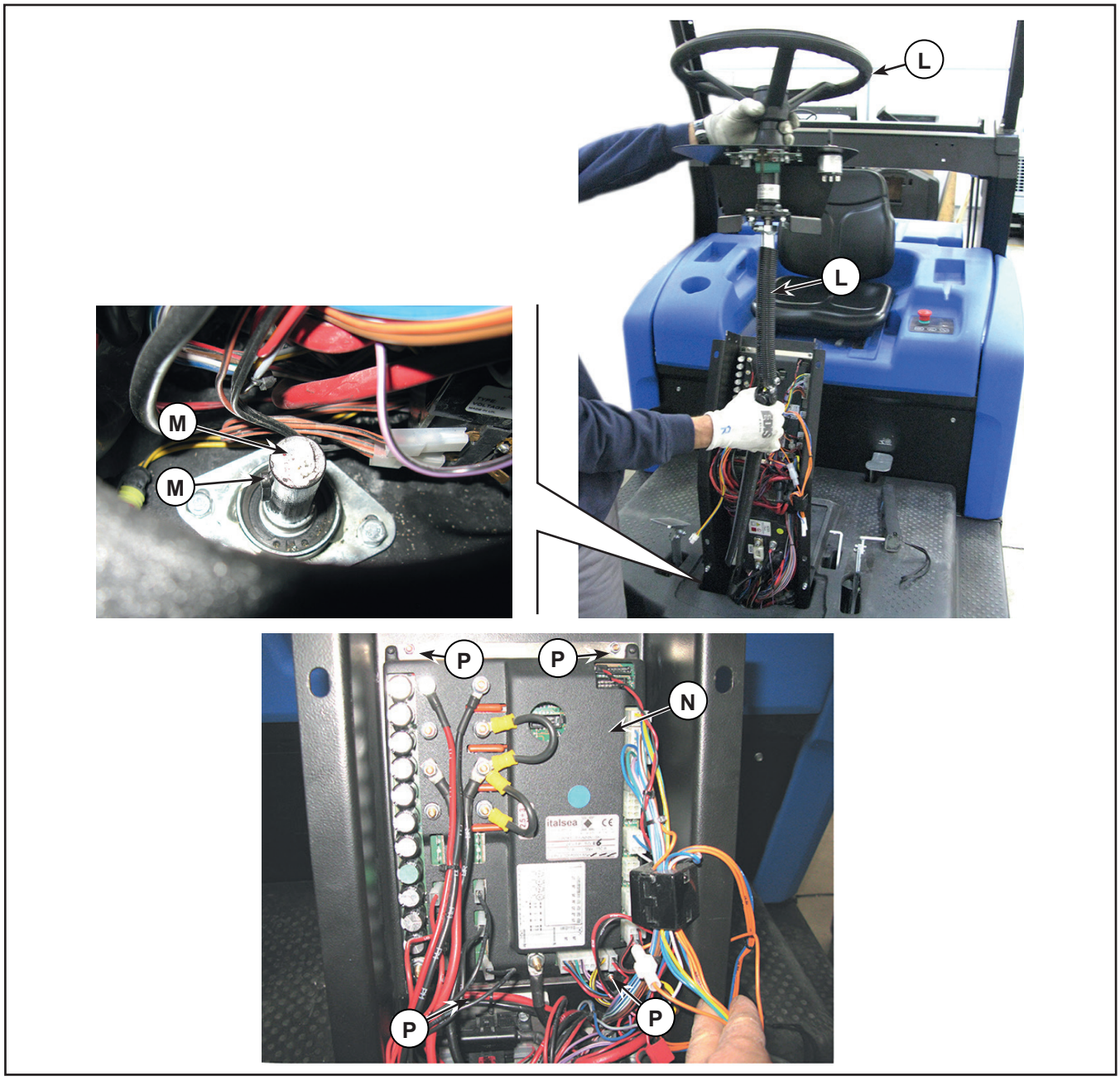


Figure 14:

Drive Wheel Controller (EB2)

Removal

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Open the battery/engine compartment hood with the handle and fasten it with the support rod.
4. Disconnect the battery connector (Battery Version) - Disconnect the batteries (Diesel and LPG Version).
5. Unscrew the four screws (A) fastening the fairing (B).
6. Unscrew the nut (C) on the front.
7. Slide the sleeve (D) until it is flush on the steering wheel.
8. Press the stud (E), sliding it upwards (causing the Main Control Board (F) to lift slightly, then remove the fairing (B) by disengaging it from its seat and the stud (E).
9. Disconnect the electrical connection (G) from the Display Controller (H).
10. Disconnect the electrical connections (I) from the ignition key assembly (J).
11. Unscrew the four screws (K) on the Main Control Board support.

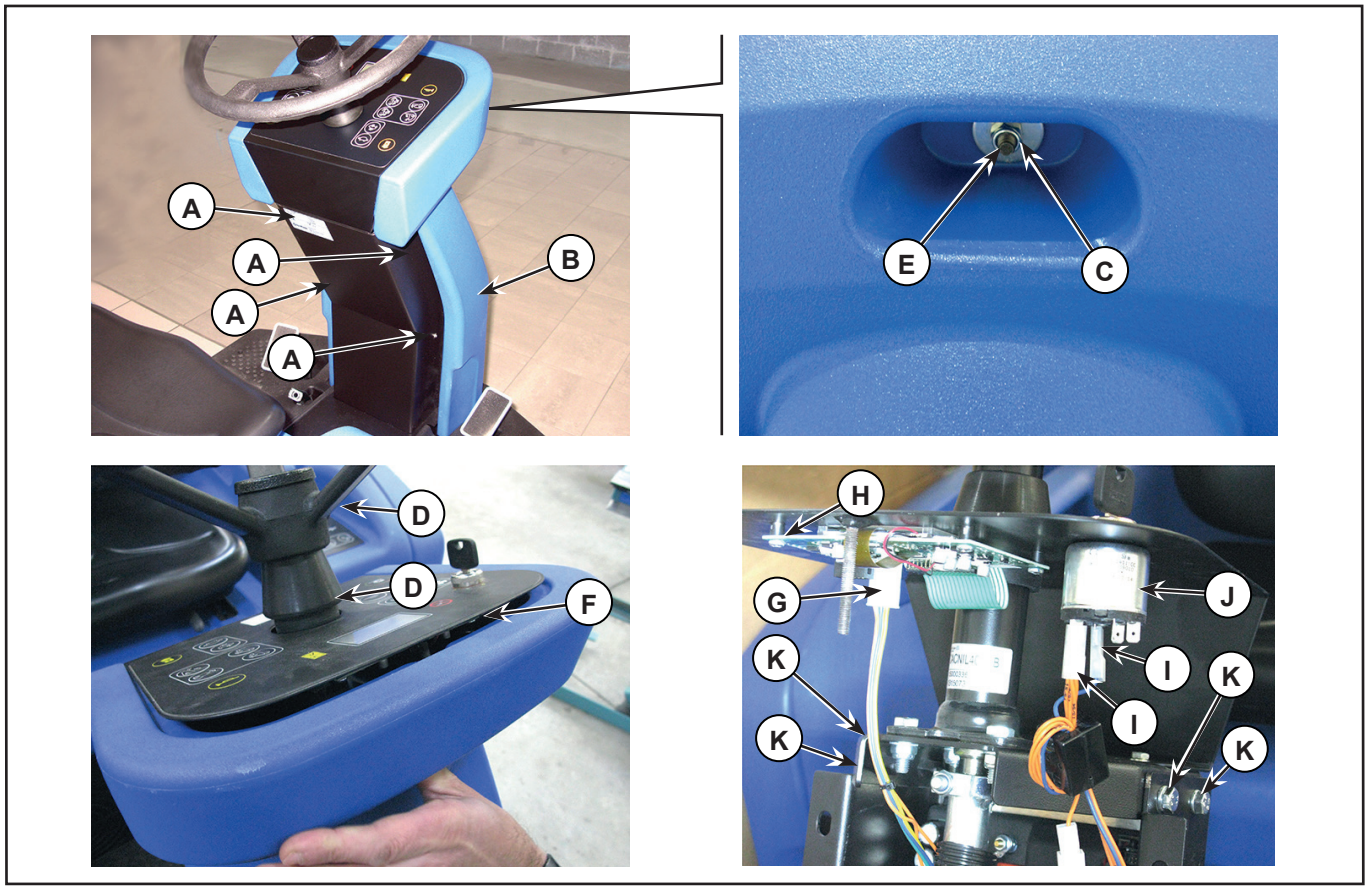


Figure 15:

Drive Wheel Controller (EB2) (Continues)

12. Remove the steering wheel with steering shafts assembly (L), gripping it as shown in the figure, and disengaging it from the shaft with key (M).

13. Disconnect all the electrical connections from the Drive Wheel Controller (N) after marking their various positions.

14. Unscrew the four nuts (P) and remove the Drive Wheel Controller (N).

Installation

15. Assemble the components in the reverse order of removal, and note the following:

    - Apply a thin layer of thermal paste such as ELECTROLUBE HTS to the entire rear surface (Q) of the Drive Wheel Controller.
    - If a new Drive Wheel Controller is being installed, the accelerator pedal must be calibrated.

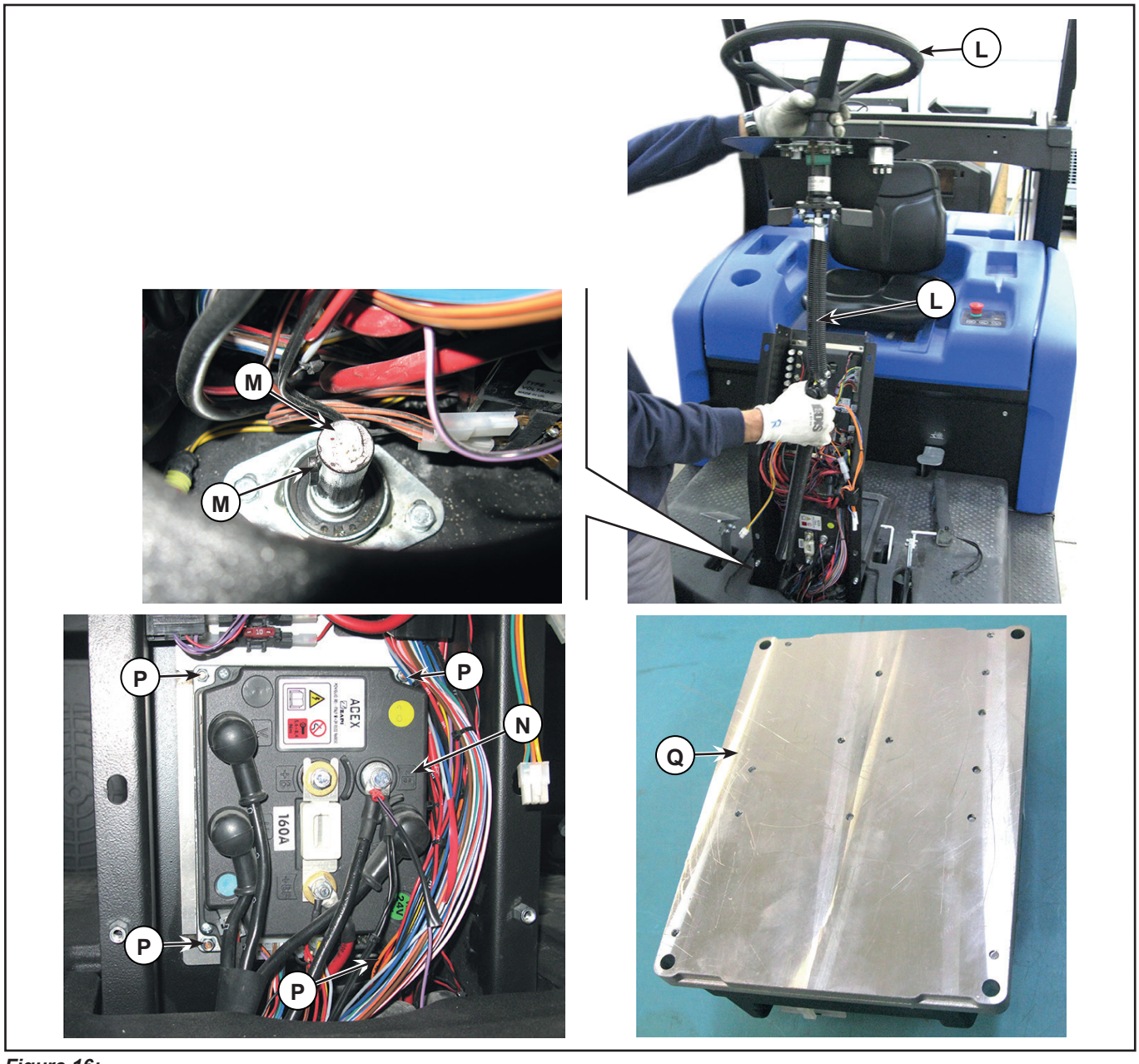


Figure 16:

Display Controller (EB3)

Removal

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Open the battery/engine compartment hood with the handle and fasten it with the support rod.
4. Disconnect the battery connector (Battery Version) - Disconnect the batteries (Diesel and LPG Version).
5. Unscrew the four screws (A) fastening the fairing (B).
6. Unscrew the nut (C) on the front.
7. Slide the sleeve (D) until it is flush on the steering wheel.
8. Press the stud (E), sliding it upwards (causing the Main Control Board (F) to lift slightly, then remove the fairing (B) by disengaging it from its seat and the stud (E).
9. Working from underneath the Main Control Board (F), disconnect the electrical connections (G) and (H) of the Display Controller (I).
10. Unscrew the four screws (J) and remove the Display Controller (I).

Installation

11. Assemble the components in the reverse order of removal.

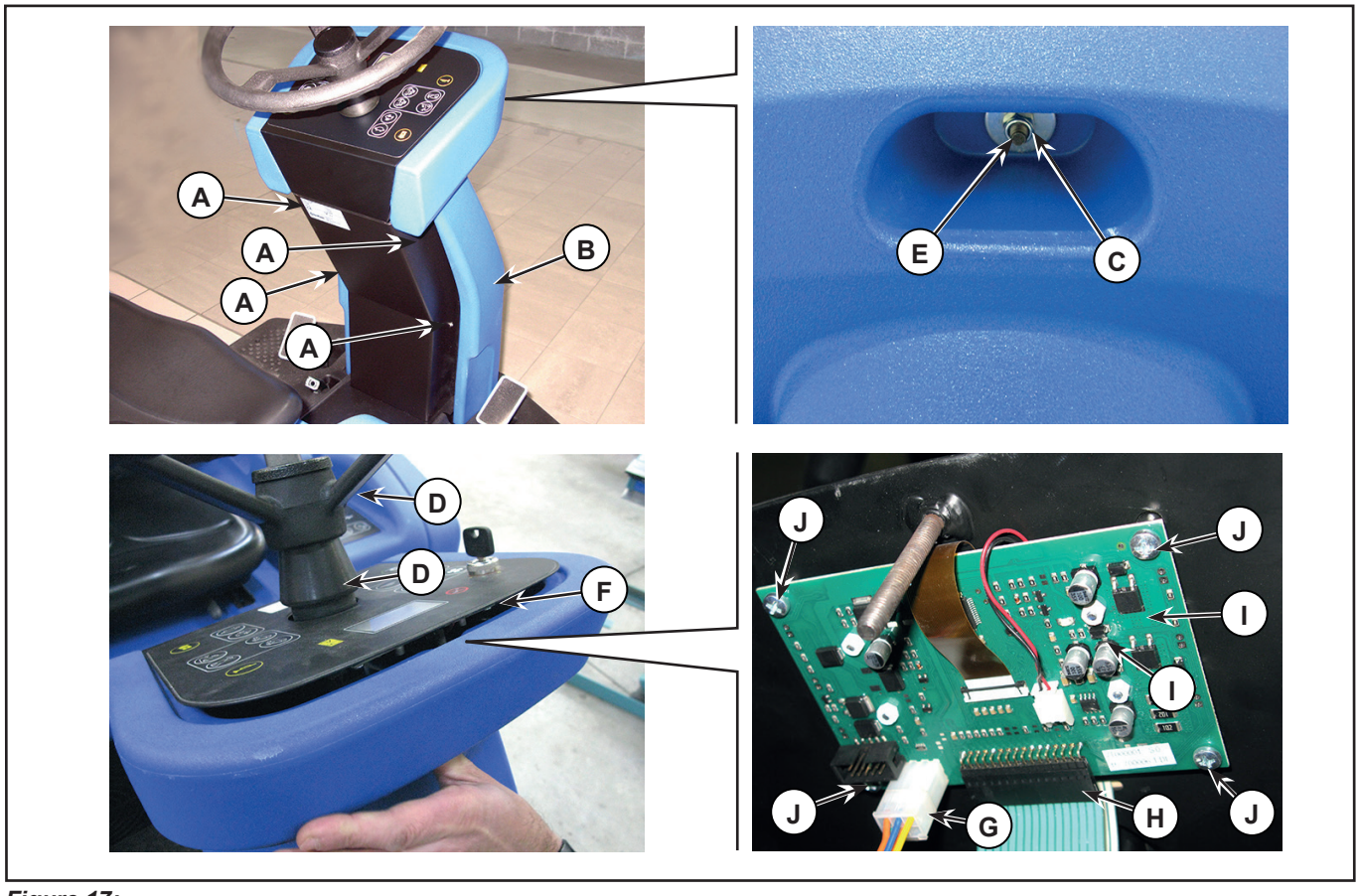


Figure 17:

Main Control Board (EB4)

Removal

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Open the battery/engine compartment hood with the handle and fasten it with the support rod.
4. Disconnect the battery connector (Battery Version) - Disconnect the batteries (Diesel and LPG Version).
5. Unscrew the four screws (A) fastening the fairing (B).
6. Unscrew the nut (C) on the front.
7. Slide the sleeve (D) until it is flush on the steering wheel.
8. Press the stud (E), sliding it upwards (causing the Main Control Board (F) to lift slightly, then remove the fairing (B) by disengaging it from its seat and the stud (E).
9. Remove the ignition key (G), if present.
10. Unscrew the ring nut (H).

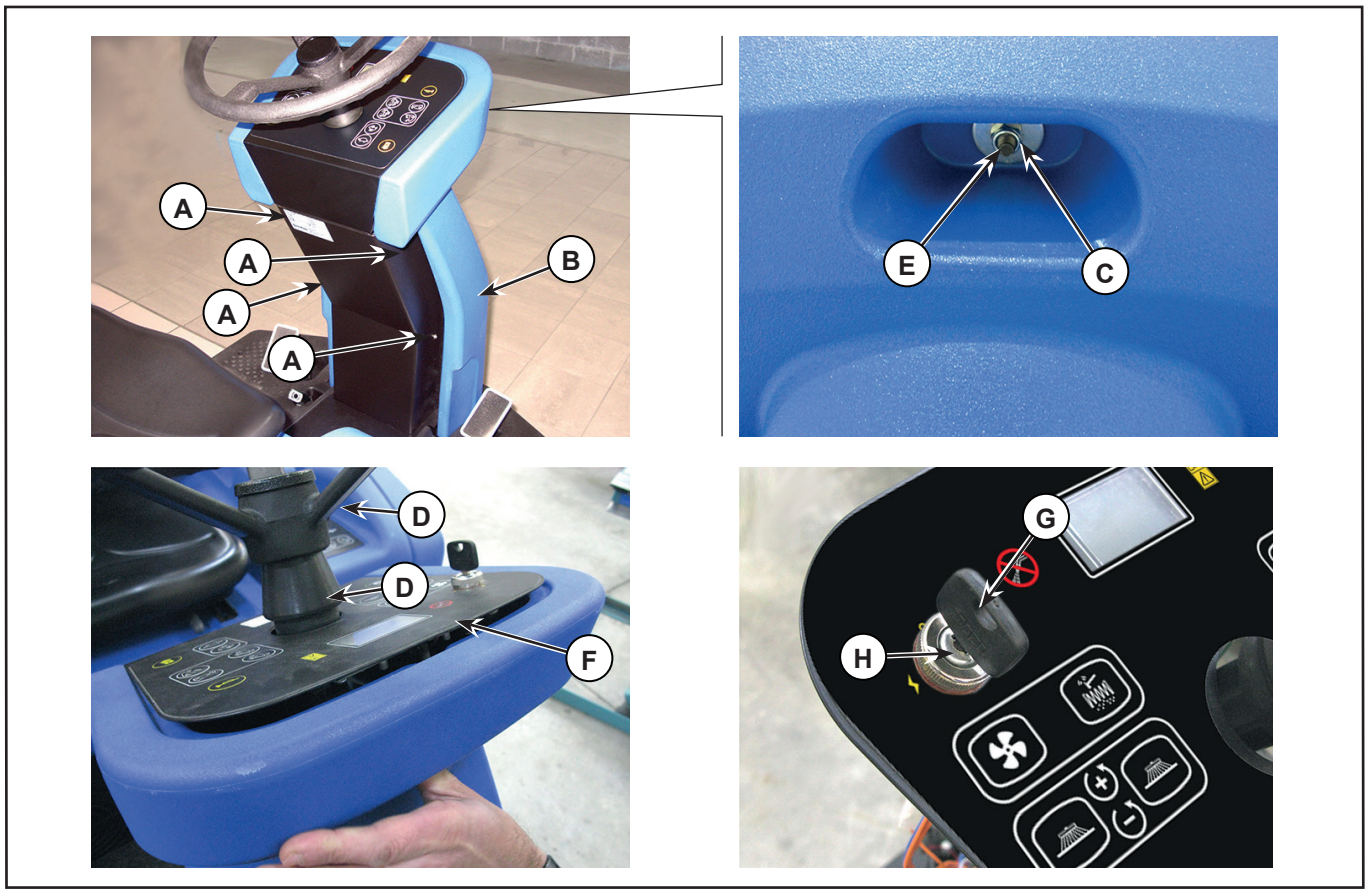


Figure 18:

Main Control Board (EB4) (continues)

11. Lower the ignition assembly (I).
    If necessary, disconnect the electrical connections (J) and remove (I).
12. Remove the steering wheel (see procedure in the Steering System chapter).
13. Remove the sleeve (K).
14. Disconnect the electrical connection (L) of the Main Control Board on the Display Controller (M).
15. Remove the screws (N) and lower the Display Controller (M).
16. Use a spatula to detach the Main Control Board (P), starting in a corner.
    If necessary, unscrew the screws (Q) and remove the board bracket (R) to facilitate the work.

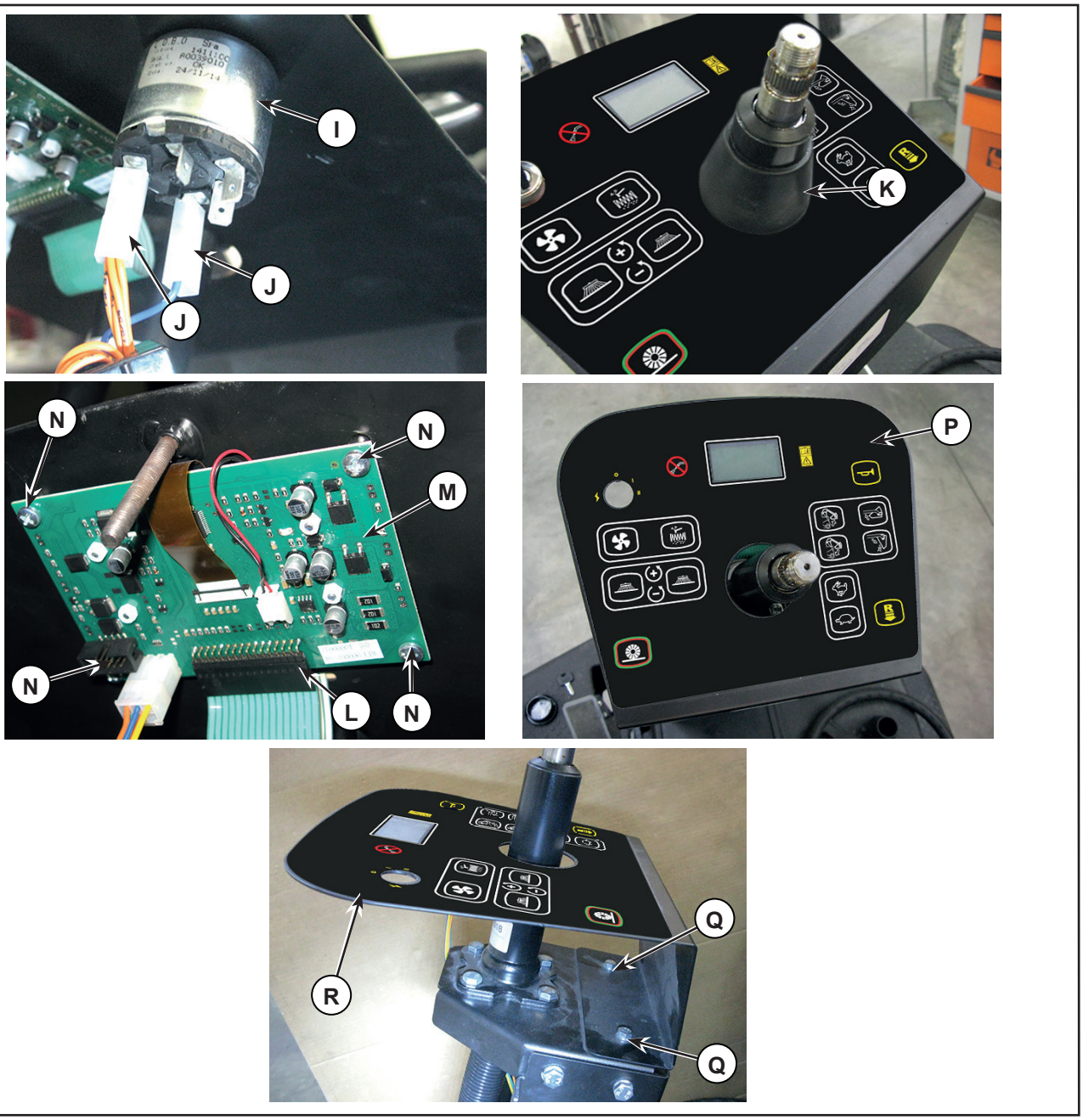


Figure 19:

Main Control Board (EB4) (continues)

Installation

17. Clean the seat of the Main Control Board (P) with solvent and remove any adhesive residue.
18. Install the new Main Control Board, centering it in its seat.
19. Assemble the components in the reverse order of removal.



Figure 20:

Side Main Control Board (EB5)

Removal

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Open the battery/engine compartment hood with the handle and fasten it with the support rod.
4. Disconnect the battery connector (Battery Version) - Disconnect the batteries (Diesel and LPG Version).
5. Working on the inner left side of the battery/engine compartment, unscrew the screws (A) and remove the guard (B).
6. Turn the fastener (C) downwards, then disconnect the emergency button electrical connector (D).
7. Disconnect the side Main Control Board electrical connection (E).
8. Unscrew the screws (F), and working from the opposite side remove the side Main Control Board (G).

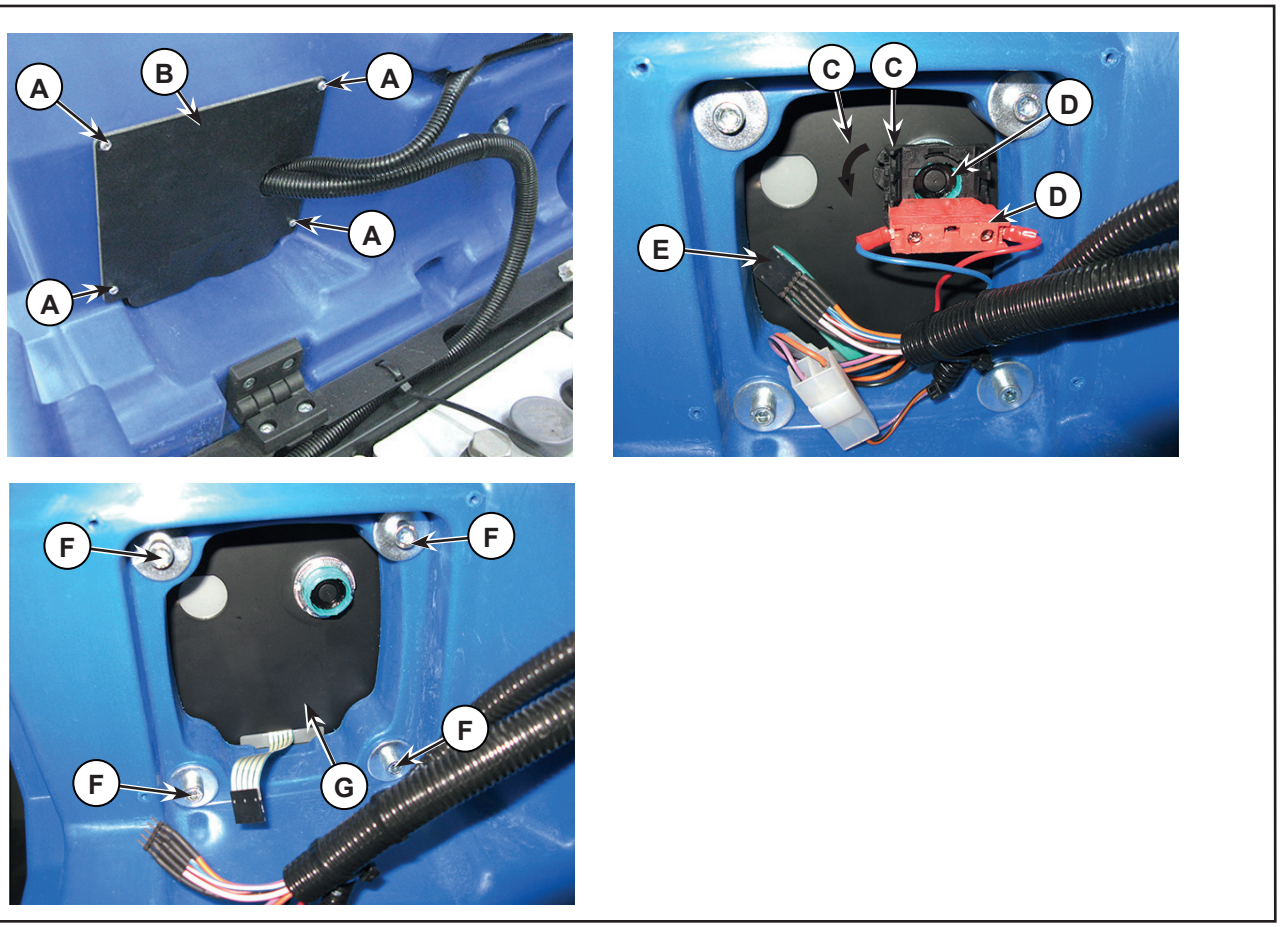


Figure 21:

Side Main Control Board (EB5) (continues)

9. Unscrew the ring nut (H) and remove the emergency button (I), disengaging its reference (J) from its seat (K).

10. Use a spatula to detach the side Main Control Board (L), starting in a corner.

Installation

11. Clean the seat of the side Main Control Board (L) with solvent and remove any adhesive residue.

12. Install the new side Main Control Board (L), centering it in its seat.

13. Assemble the components in the reverse order of removal.

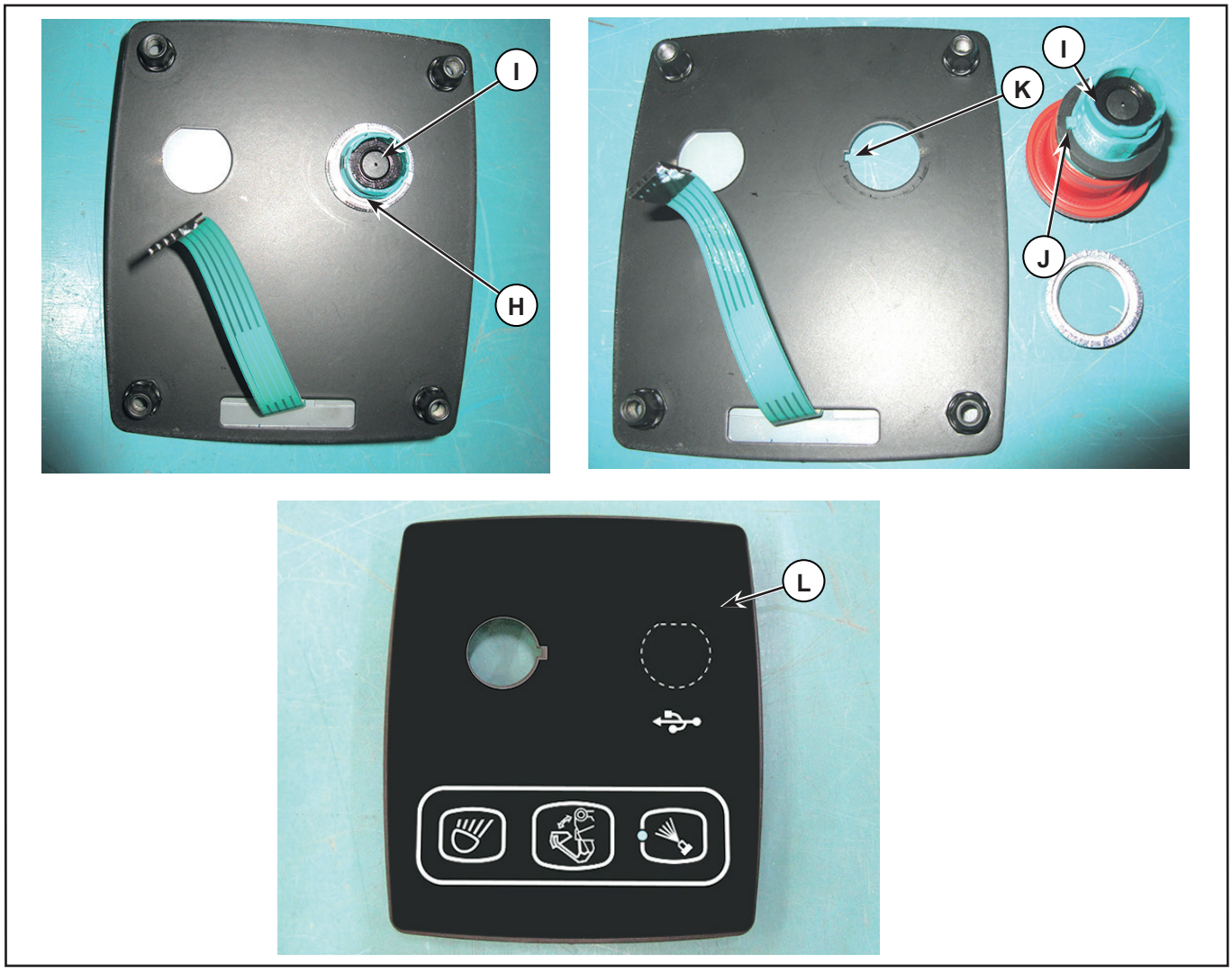


Figure 22:

Specifications

Main Machine Controller (EB1) Connectors

Battery Connection (M6 screw terminals)					
Ref.	Description	Controller in/out	V ref.	I max.	Connected to
B+	Main Machine Controller power supply +	in	24V	150A	BAT+
B-	Main Machine Controller power supply -	in	0V	150A	BAT-

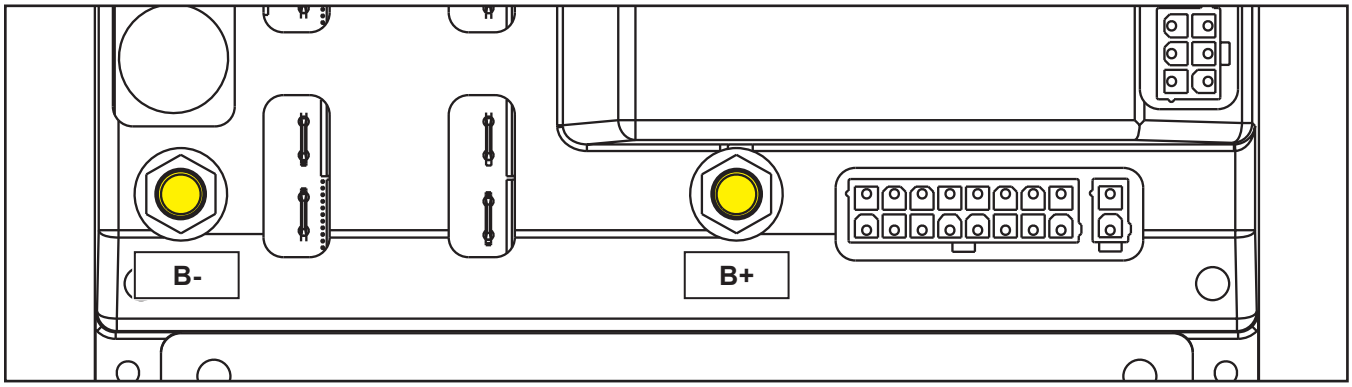


Figure 23:

Power Connections (M5 screw terminals)					
Ref.	Description	Controller in/out	V ref.	I max.	Connected to
BR+	Main broom motor +	out	24V	120A	M4+
BR-	Main broom motor -	out	0V	120A	M4-
PM+	Hopper lifting pump motor +	out	24V	90A S3 20”	M3+
PM-	Hopper lifting pump motor -	out	0V	90A S3 20”	M3-

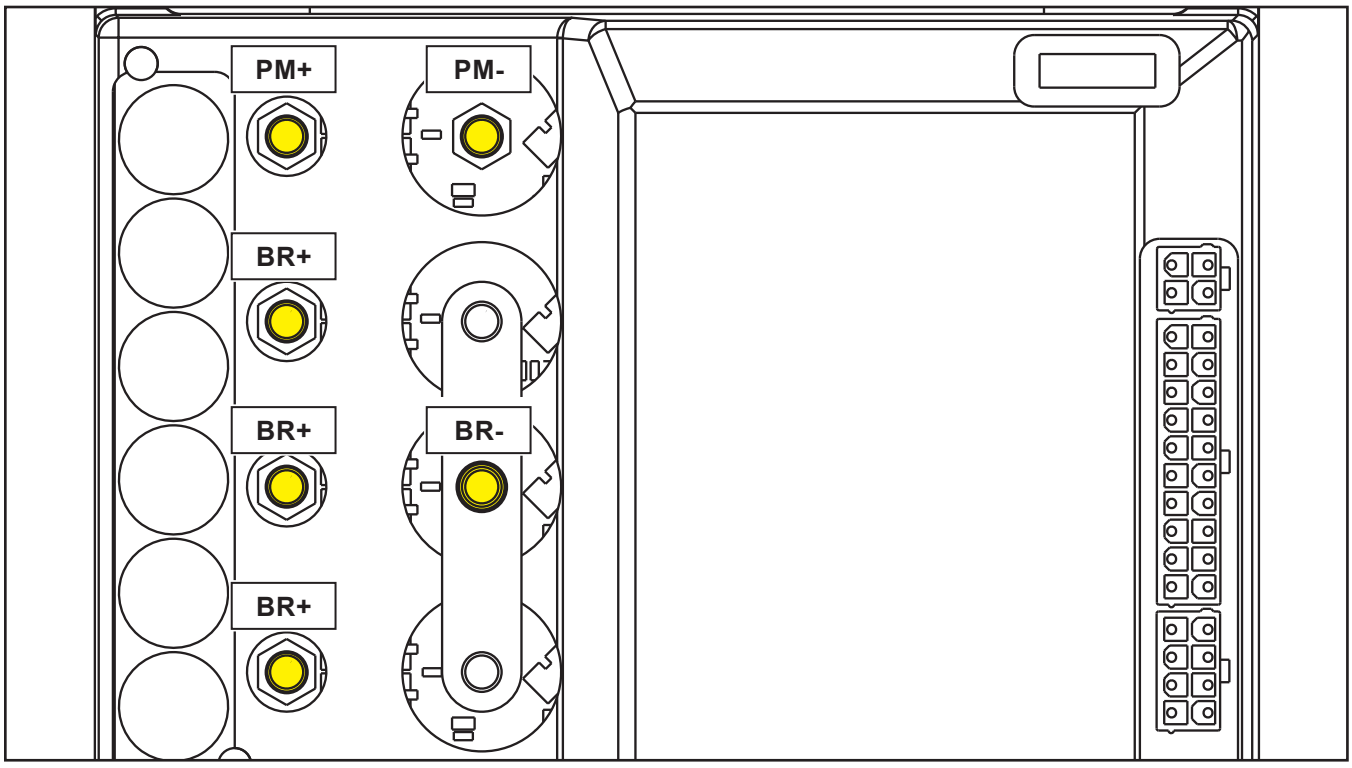


Figure 24:

Main Machine Controller (EB1) Connectors (Continues)

Power Connections (M5 screw terminals)					
Ref.	Description	Controller in/out	V ref.	I max.	Connected to
RSB+	Right side broom motor +	out	24V	10A (PWM)	M5+
RSB-	Right side broom motor -	out	0V	10A (PWM)	M5-
LSB+	Left side broom motor +	out	24V	10A (PWM)	M6+
LSB-	Left side broom motor -	out	0V	10A (PWM)	M6-
VA+	Vacuum system motor +	out	24V	20A	M1+
VA-	Vacuum system motor -	out	0V	20A	M1-
FS+	Filter shaker motor +	out	24V	20A S3 20”	M2+
FS-	Filter shaker motor -	out	0V	20A S3 20”	M2-
WP+	Water pump motor +	out	24V	10A	P1+
WP-	Water pump motor -	out	0V	10A	P1-

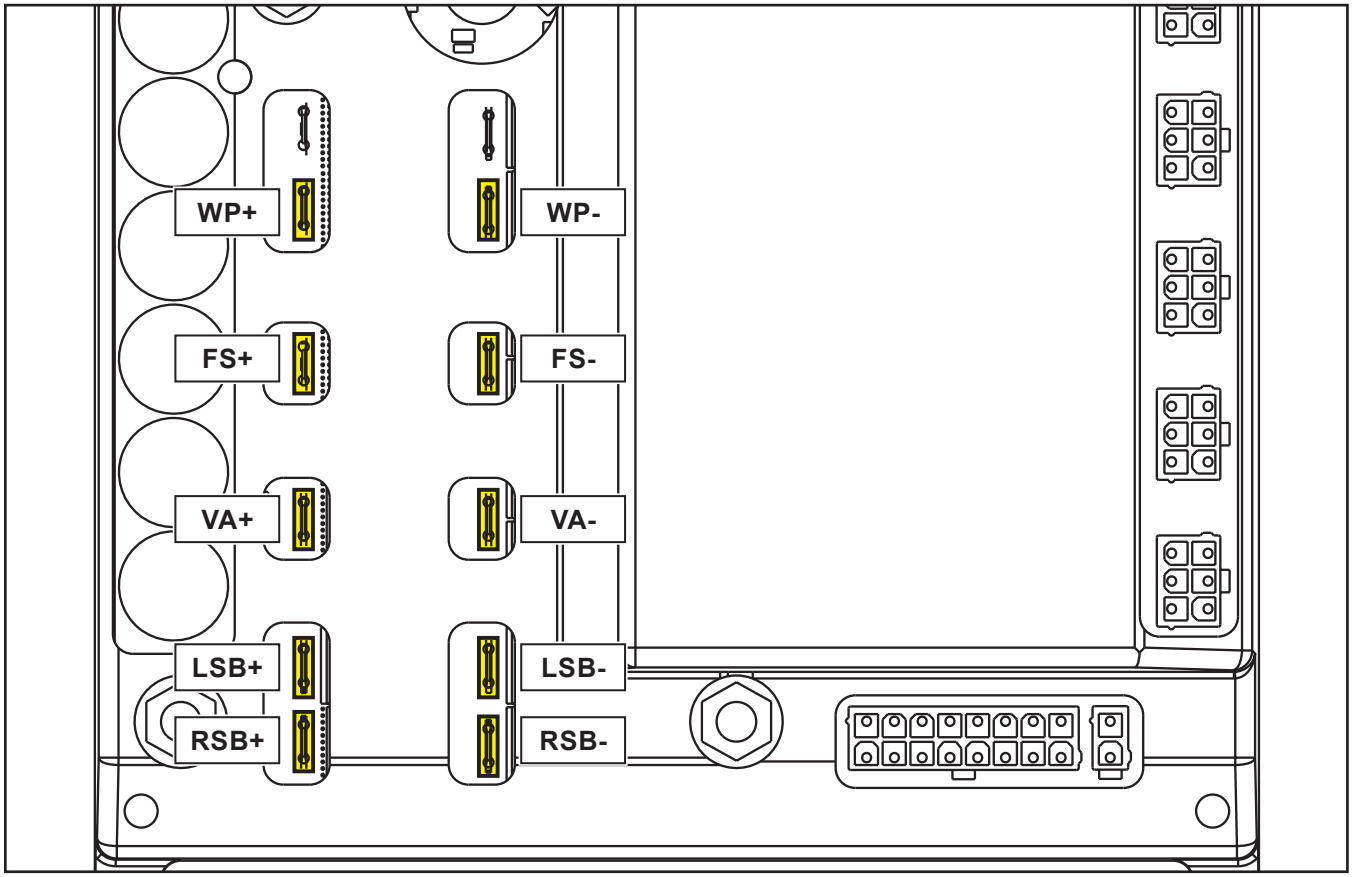


Figure 25:

Main Machine Controller (EB1) Connectors (Continues)

A1: Actuator 1 connection (main broom) (MOLEX MINIFIT type, 6-way vertical)					
PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	Main broom actuator supply +/- ()	out	0/24V	8A	A1
2	ENGINE VERS. CONFIG. input	in	0V	<1A	A1.6
3					(Not used)
4	Main broom actuator supply -/+ (1)	out	0/24V	8A	A1
5					(Not used)
6	End-of-stroke microswitch power supply	out	0V	<1A	A1.2

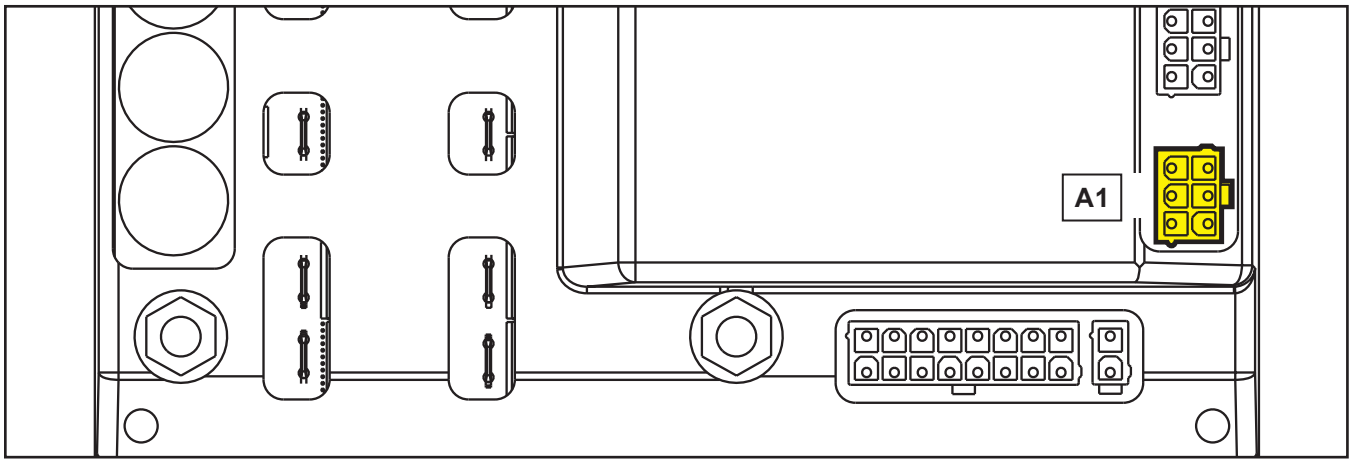


Figure 26:

A2: Actuator 2 connection (RH side broom) (MOLEX MINIFIT type, 6-way vertical)					
PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	Right side broom actuator supply +/- (1)	out	0/24V	8A	A2
2					(Not used)
3					(Not used)
4	Right side broom actuator supply -/+ (1)	out	0/24V	8A	A2
5					(Not used)
6					(Not used)

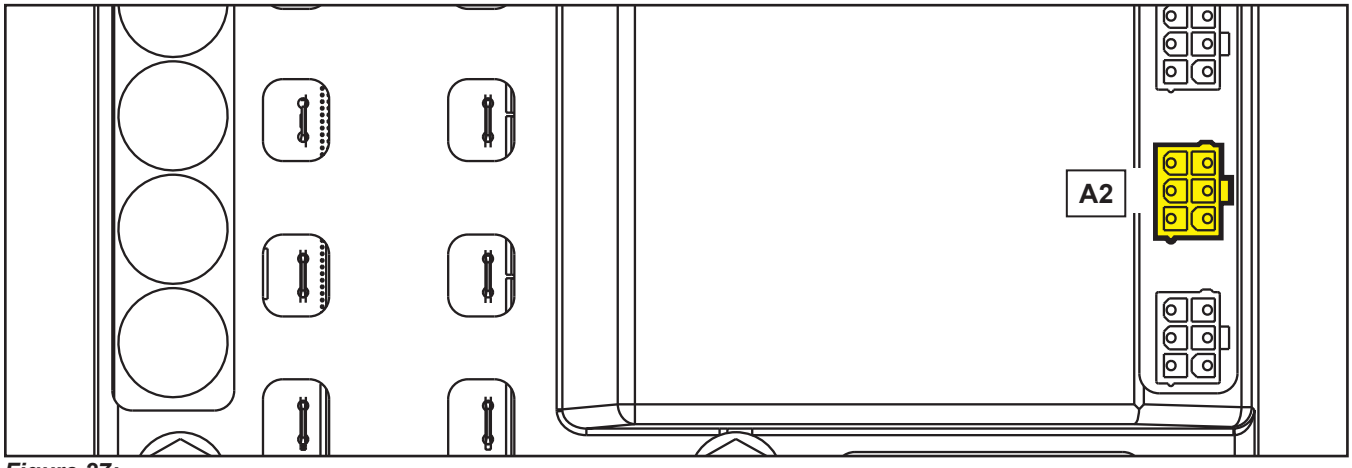


Figure 27:

Main Machine Controller (EB1) Connectors (Continues)

A3: Actuator 3 connection (LH side broom) (MOLEX MINIFIT type, 6-way vertical)					
PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	Left side broom actuator supply +/- (1)	out	0/24V	8A	A3
2					(Not used)
3					(Not used)
4	Left side broom actuator supply -/+ (1)	out	0/24V	8A	A3
5					(Not used)
6					(Not used)

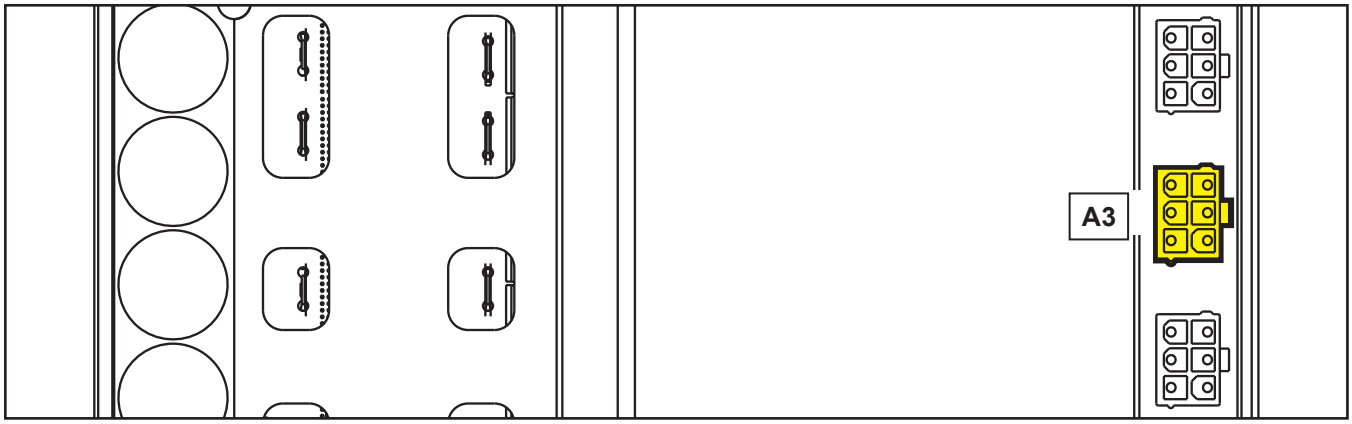


Figure 28:

A4: Actuator 4 connection (MOLEX MINIFIT type, 6-way vertical)					
PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	REVERSE GEAR enabling	out	0/24V	8A	EB2.B8
2					(Not used)
3	MAX SPEED REF.	out	0-5V	<1A	EB2.C9
4					(Not used)
5					(Not used)
6					(Not used)

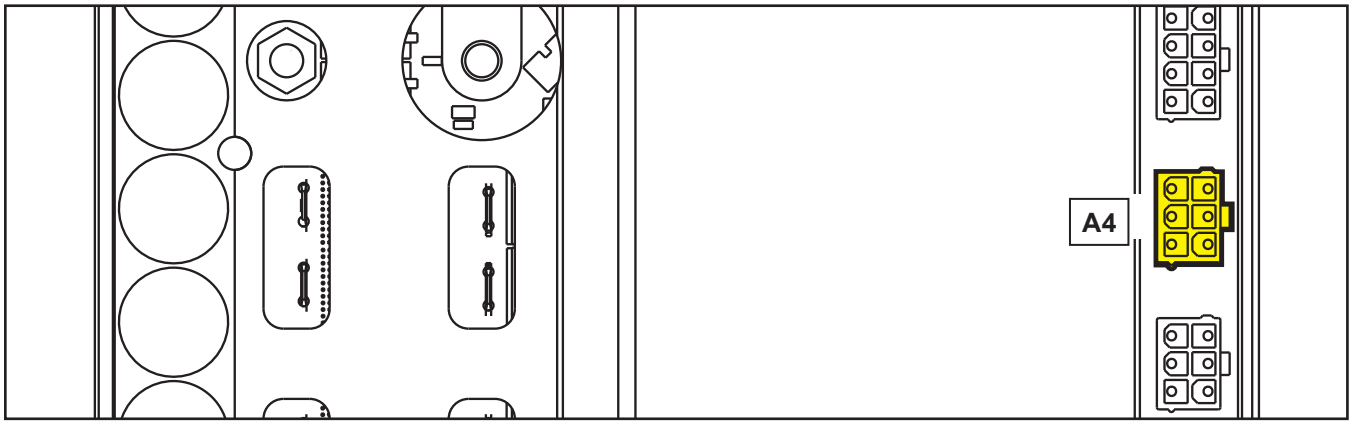


Figure 29:

Main Machine Controller (EB1) Connectors (Continues)

J1: Signal inputs connections (MOLEX MINIFIT type, 20-way vertical)					
PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	Return from KEY circuit	in	24V	<1A	EB3.5
2	HOPPER ENABLING button input	in	24V	<1A	EB5.3
3	Headlight button input	in	24V	<1A	EB5.2
4	WATER PUMP button input	in	24V	<1A	EB5.4
5	OPEN HOPPER input	in	24V	<1A	S1
6	LIFTED HOPPER input	in	24V	<1A	S2
7					(Not used)
8	FUEL RESERVE input	in	0V	<1A	S6
9	Signal power supply	out	24V	<1A	S1
10	Signal power supply	out	24V	<1A	S2
11	Drive system board enabling	out	24V	<1A	EB2.C1
12	MAIN BROOM WEAR input	in	24V	<1A	S4
13	RECTIFIER TEMP. input	in	0V	<1A	S8
14	ALTERNATOR input	in	24V	<1A	ALT
15	TURNED HOPPER input	in	24V	<1A	S3
16	BAT CHARGER DISAB input (NO)	in	24V	1A	CH.NO
17					(Not used)
18	LOW ENGINE OIL input	in	0V	<1A	S7
19	Signal power supply	out	24V	<1A	S3
20	Signal power supply	out	24V	<1A	S4

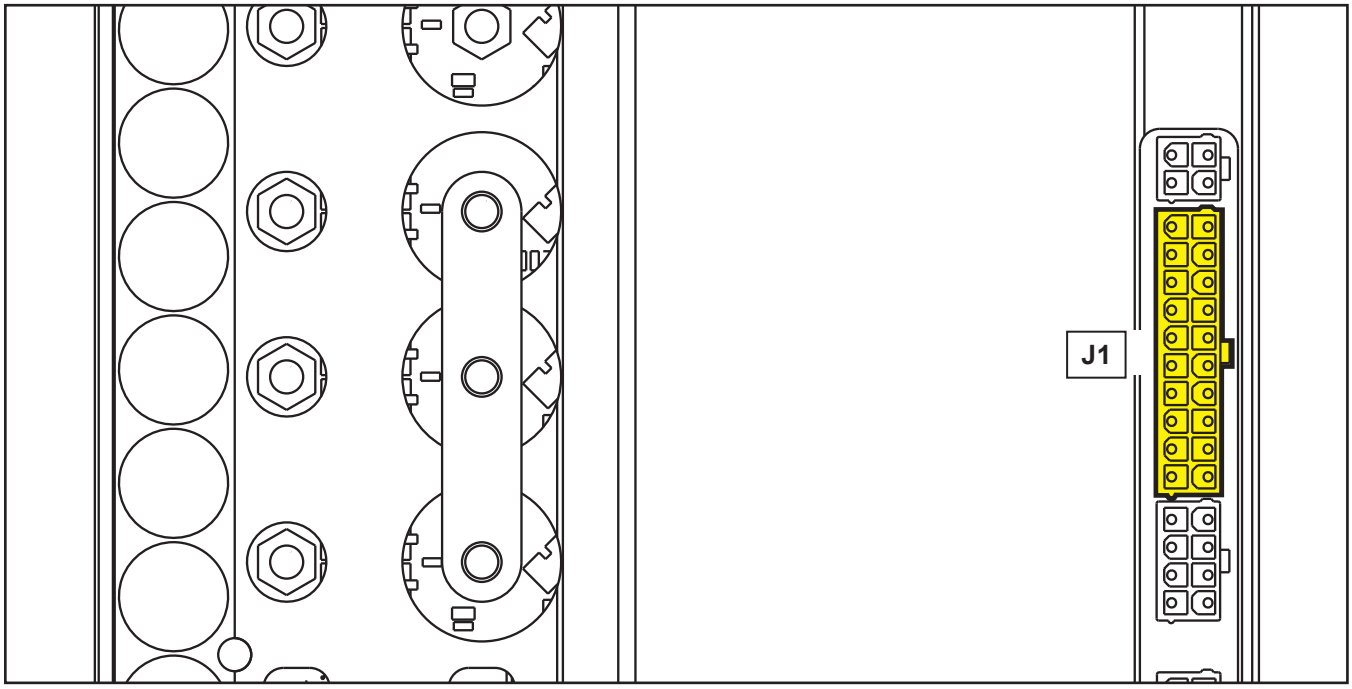


Figure 30:

Main Machine Controller (EB1) Connectors (Continues)

J2: Signal outputs connections (MOLEX MINIFIT type, 16-way vertical)					
PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	Hopper lifting pump valve output	out	0V	1A	EV1
2	Hopper lowering pump valve output	out	0V	1A	EV2
3	Hopper dumping valve output	out	0V	1A	EV3
4	Horn output	out	0V	1A	ES9
5	ENGINE / FAN RPM output	out	0V	1A	ES4, ES6
6	FUEL PUMP / VALVE output	out	0V	1A	EV4, P2
7	WATER PUMP warning light output	out	0V	1A	EB5.5
8	Working light output	out	0V	3A	L1
9	Common power supply + signal output	out	24V	3A	EV1,2,3
10					(Not used)
11					(Not used)
12	Common power supply + signal output	out	24V	3A	ES9
13	Common power supply + signal output	out	24V	3A	ES4
14	Common power supply + signal output	out	24V	3A	EV4, P2
15	Common power supply + signal output	out	24V	3A	L1
16					(Not used)

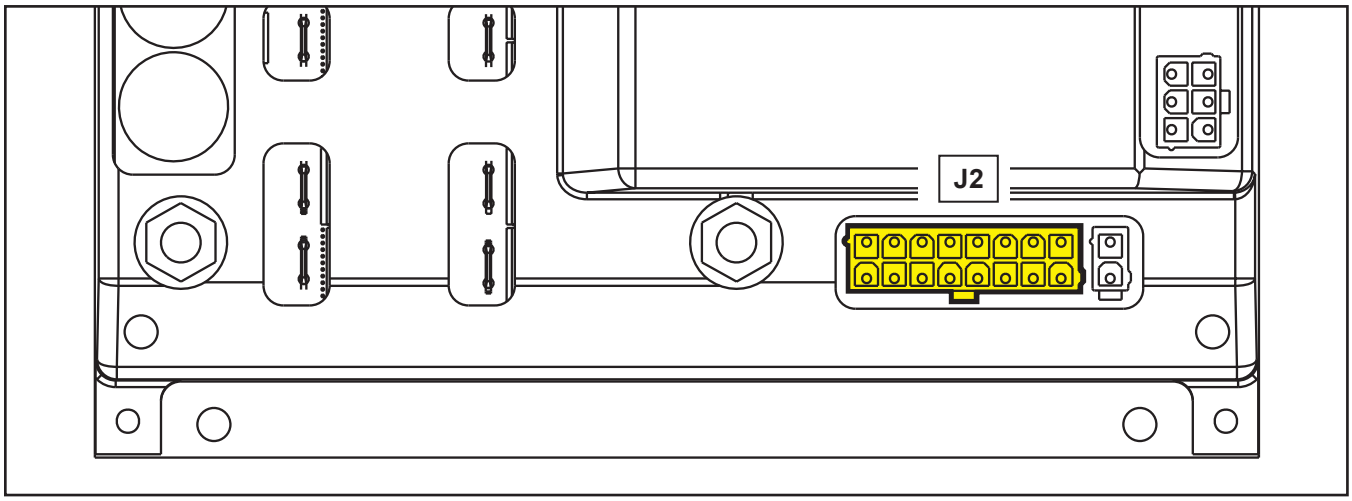


Figure 31:

Main Machine Controller (EB1) Connectors (Continues)

J3: Signal inputs / outputs connections (MOLEX MINIFIT type, 4-way vertical)					
PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	Main Control board serial connection	in/out	0-5V	<1A	EB3.2
2	Main Control board serial connection	in/out	0-5V	<1A	EB3.3
3					(Not used)
4	Main Control board board power supply -	out	0V	1A	EB3.4

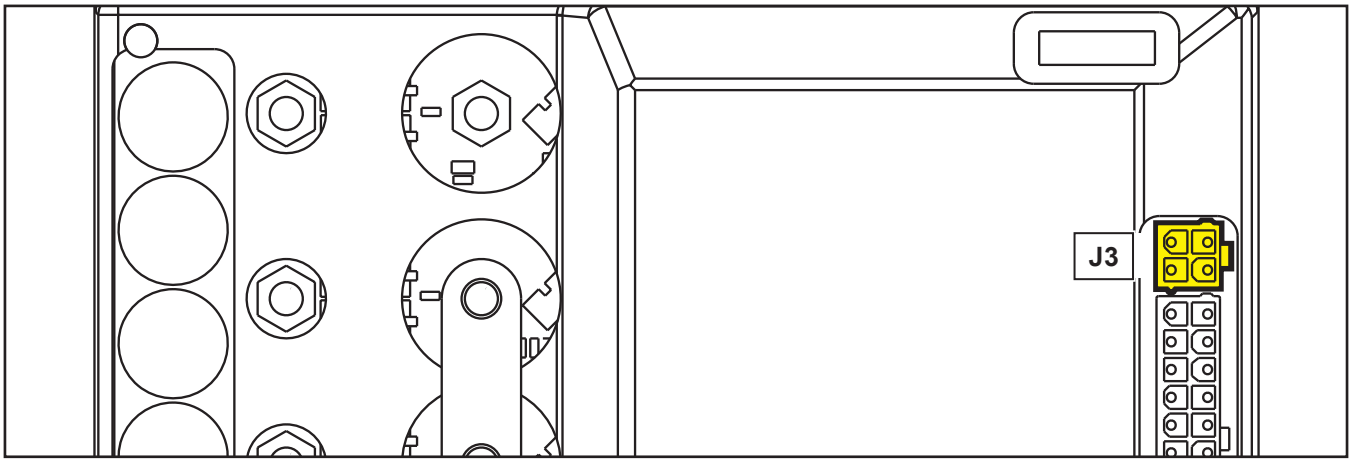


Figure 32:

J4: Signal inputs / outputs connections (MOLEX MINIFIT type, 2-way vertical)					
PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	Electromagnetic switch output -	out	0V	1A	ES1
2	Electromagnetic switch output +	out	24V	1A	ES1

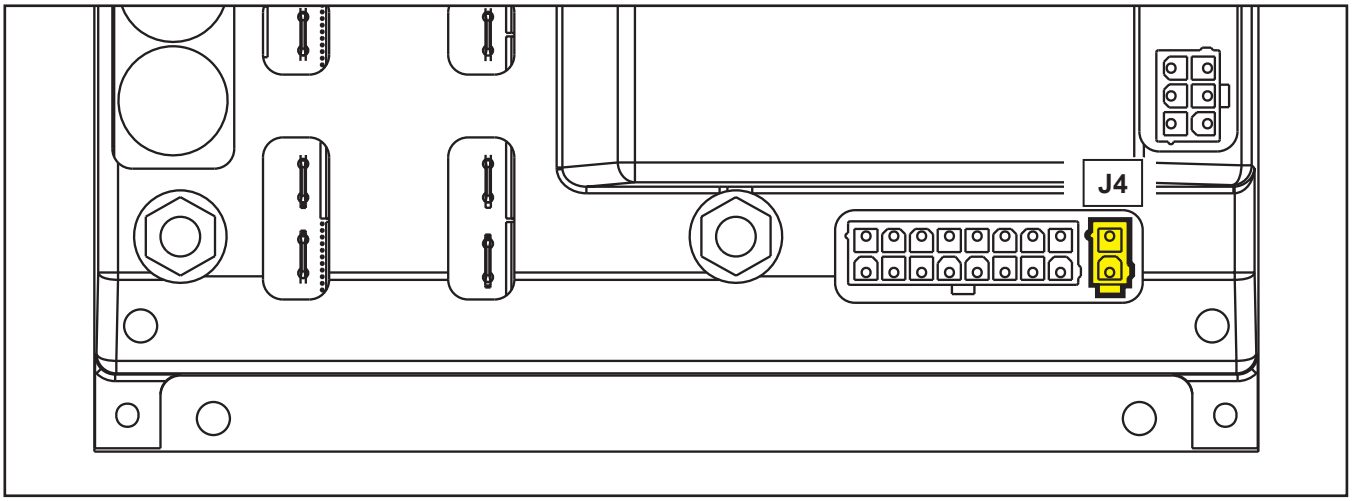


Figure 33:

Main Machine Controller (EB1) Connectors (Continues)

J5: Auxiliary power supplies connections (MOLEX MINIFIT type, 8-way vertical)					
PIN	Description	Controller in/out	V ref.	I max.	Connected to
1					(Not used)
2					(Not used)
3					(Not used)
4					(Not used)
5					(Not used)
6					(Not used)
7					(Not used)
8					(Not used)

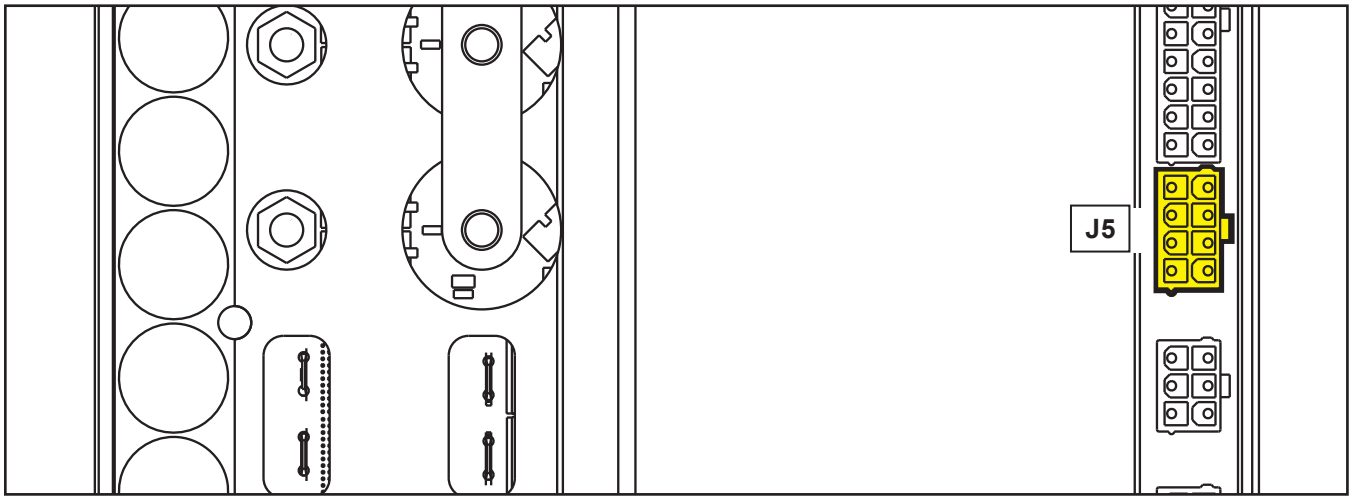


Figure 34:

Main Machine Controller (EB1) Connectors (Continues)

J6: TYCO MODU II type, 6-ways vertical					
PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	MACHINE ON signal	out	24V	<1A	TRK.BN
2	Power supply +24V	out	24V	<1A	TRK.RD
3	iButton input	in	0V	<1A	TRK.YE
4	BROOM ACTIVE FUNC. signal	out	0V	<1A	TRK.WH
5	Power -	out	0V	<1A	TRK.BU
6	DRIVE SYSTEM ACTIVE signal	out	24V	<1A	TRK.PK

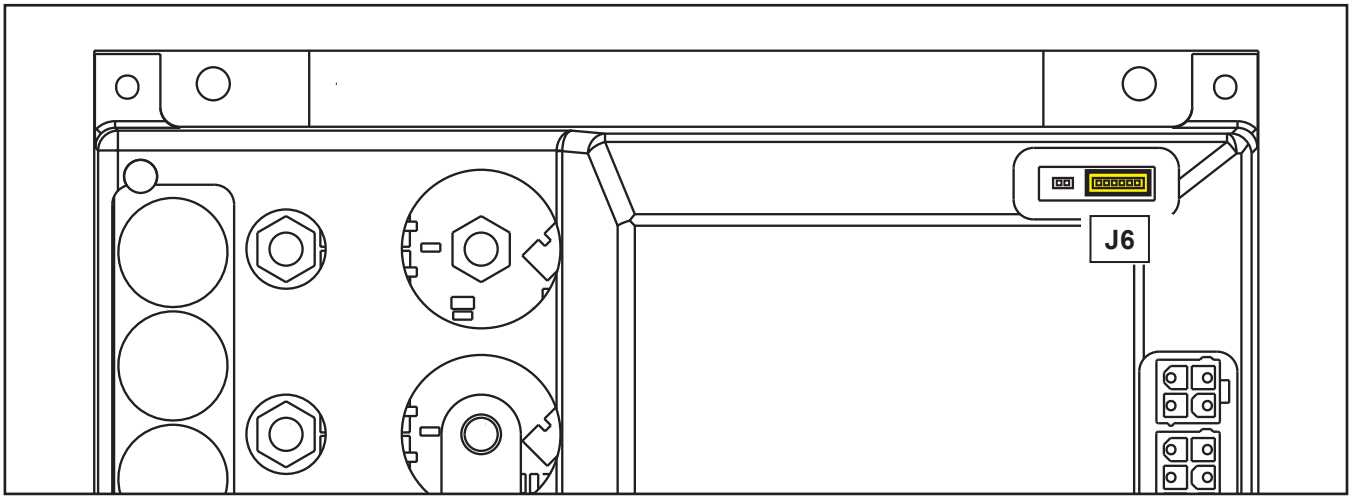


Figure 35:

J7: TYCO MODU II type, 2-ways vertical					
PIN	Description	Controller in/out	V ref.	I max.	Connected to
1	CAN-BUS H channel	in/out	5V	<1A	EB2.C5
2	CAN-BUS L channel	in/out	5V	<1A	EB2.C10

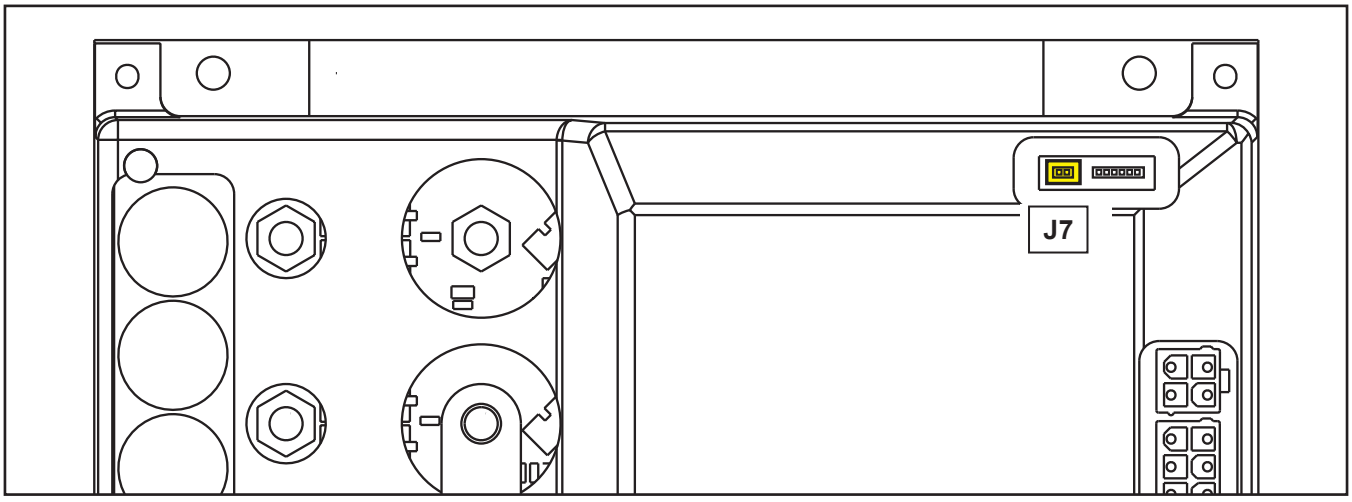


Figure 36:

Display Controller (EB3) Connectors

J1: MOLEX MINIFIT type, 6-ways vertical					
Ref.	Description	Controller in/out	V ref.	I max.	Connected to
1	Power +	in	24V	<1A	KEY.15/54
2	Main Control board serial connection +	in/out	0-5V	<1A	EB1.J3.1
3	Main Control board serial connection -	in/out	0-5V	<1A	EB1.J3.2
4	Power -	in	0V	<1A	EB1.J3.4
5	Power supply enabling	out	24V	<1A	EB1.J1.1
6					(Not used)

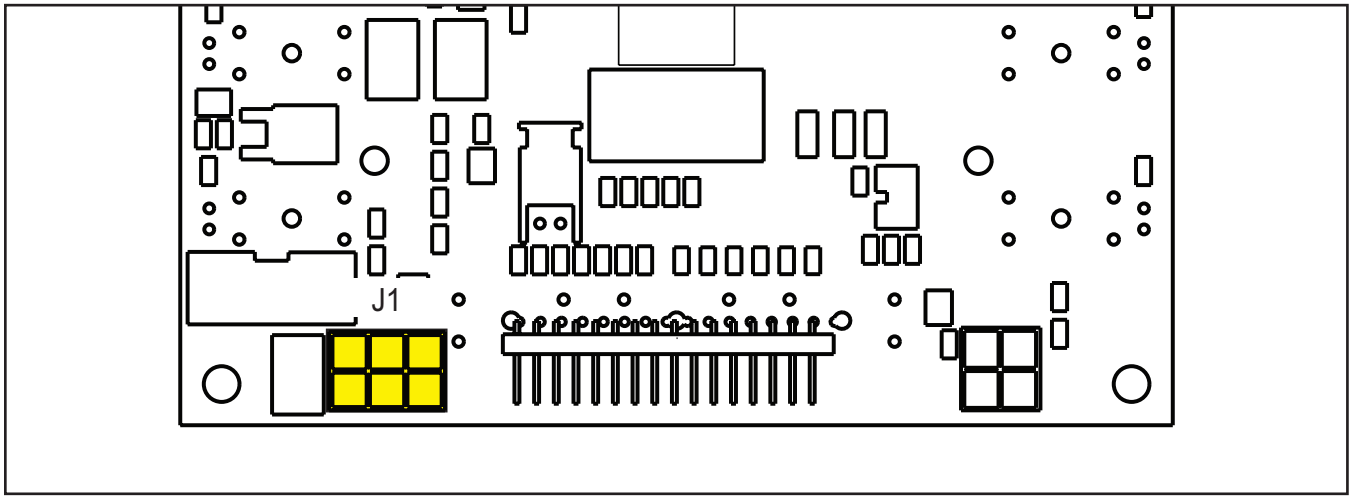


Figure 37:

Display Controller (EB3) Connectors (Continues)

J2: FCI DUFLEX (2.54 pitch) 16-way, male pins					
Ref.	Description	Controller in/out	V ref.	I max.	Connected to
1	Power supply - common	out	0V	<1A	EB4.J1.1
2	HOPPER UP button (P10)	in	0V	<1A	EB4.J1.2
3	HOPPER DOWN button (P11)	in	0V	<1A	EB4.J1.3
4	SPEED + button (P8)	in	0V	<1A	EB4.J1.4
5	SPEED - button (P9)	in	0V	<1A	EB4.J1.5
6	REVERSE GEAR button (P15)	in	0V	<1A	EB4.J1.6
7	HOPPER OPEN button (P12)	in	0V	<1A	EB4.J1.7
8	HOPPER CLOSE button (P13)	in	0V	<1A	EB4.J1.8
9	HORN button (P14)	in	0V	<1A	EB4.J1.9
10	VACUUM button (P6)	in	0V	<1A	EB4.J1.10
11	LEFT SIDE BROOM button (P3)	in	0V	<1A	EB4.J1.11
12	MAIN BROOM button (P1)	in	0V	<1A	EB4.J1.12
13	SIDE BROOM SPEED + button (P4)	in	0V	<1A	EB4.J1.13
14	SIDE BROOM SPEED - button (P5)	in	0V	<1A	EB4.J1.14
15	FILTER SHAKER button (P7)	in	0V	<1A	EB4.J1.15
16	RIGHT SIDE BROOM button (P2)	in	0V	<1A	EB4.J1.16

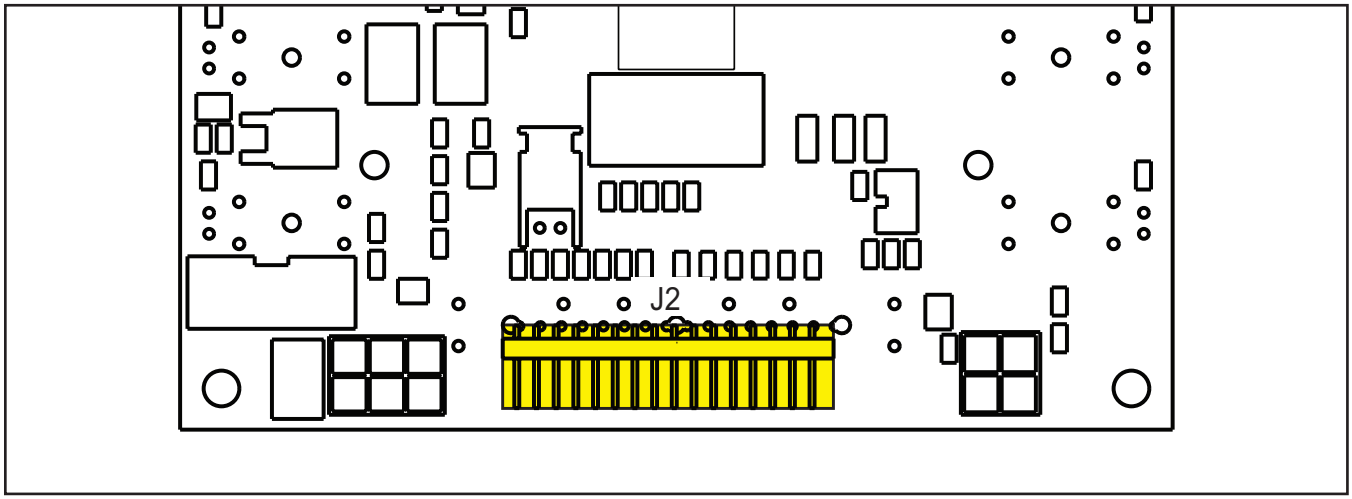


Figure 38:

Shop Measurements - Battery Powered Model

The following tables contain some “real world” shop voltage measurements to help you recognize what

“normal” looks like. All voltage values were measured with the black (Negative) voltmeter lead connected to

the main battery negative unless otherwise specified.

A battery powered machine was used for circuits that are common. Then engine powered machines were used for circuits unique to the engine applications.

Shop Measurements - Main Machine Controller (EB1)

Battery Connection

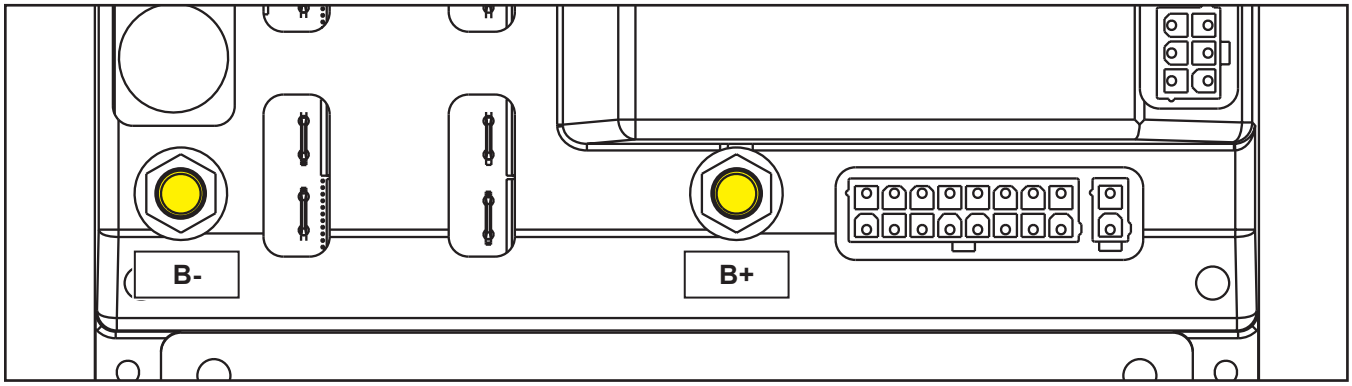


Figure 39:

PIN	Color	Description	Measured/Condition
B+	Red	Main Machine Controller power supply +	24.3V Sweeping System engaged
B-	Black	Main Machine Controller power supply -	0.28V Sweeping System engaged

Shop Measurements - Main Machine Controller (EB1) (continues)

Power Connections

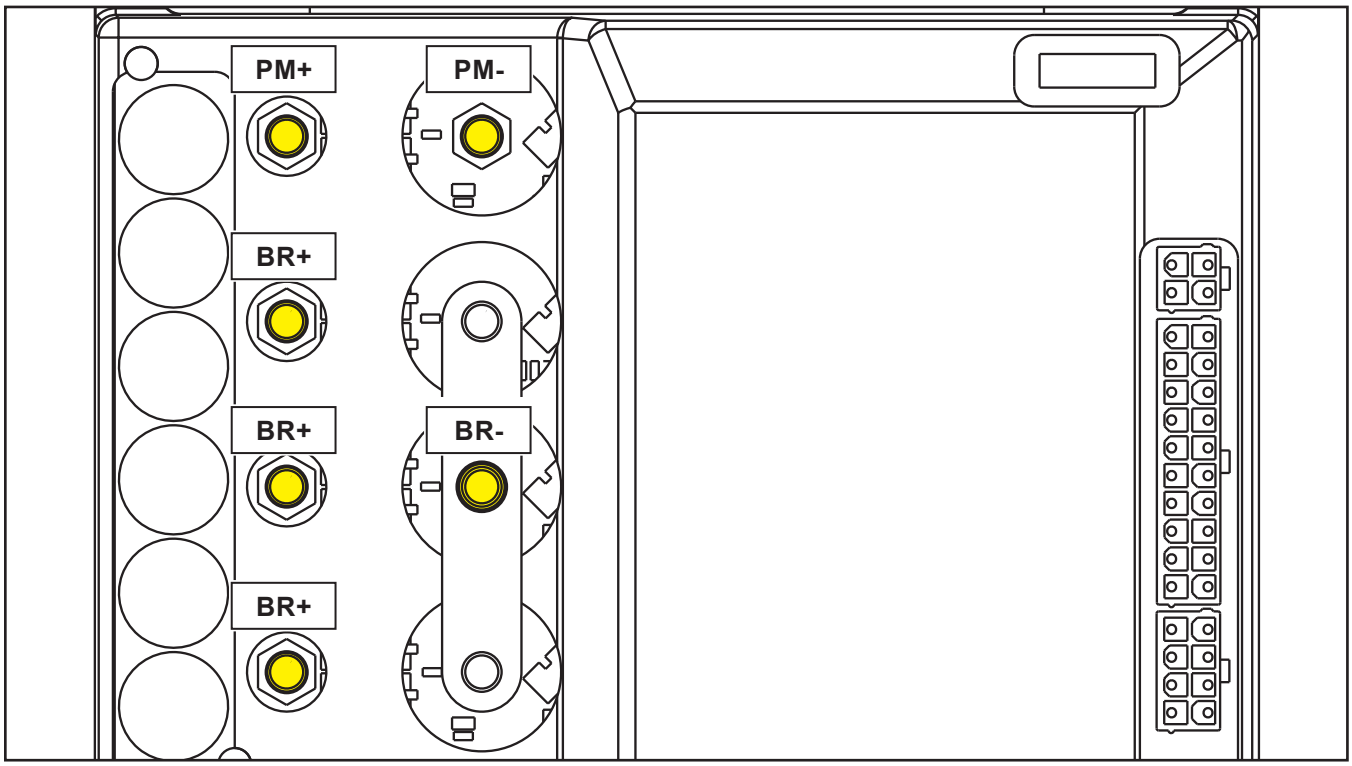


Figure 40:

PIN	Color	Description	Measured/Condition
BR+	Red	Main broom motor +	23.8V Main broom on
BR-	Black	Main broom motor -	0.4v Main broom on 24.8V main broom off
PM+	Red	Hopper lifting pump motor +	24.3V pump running
PM-		Hopper lifting pump motor -	0.3V pump running 24.8V pump off

Shop Measurements - Main Machine Controller (EB1) (continues)

Power Connections

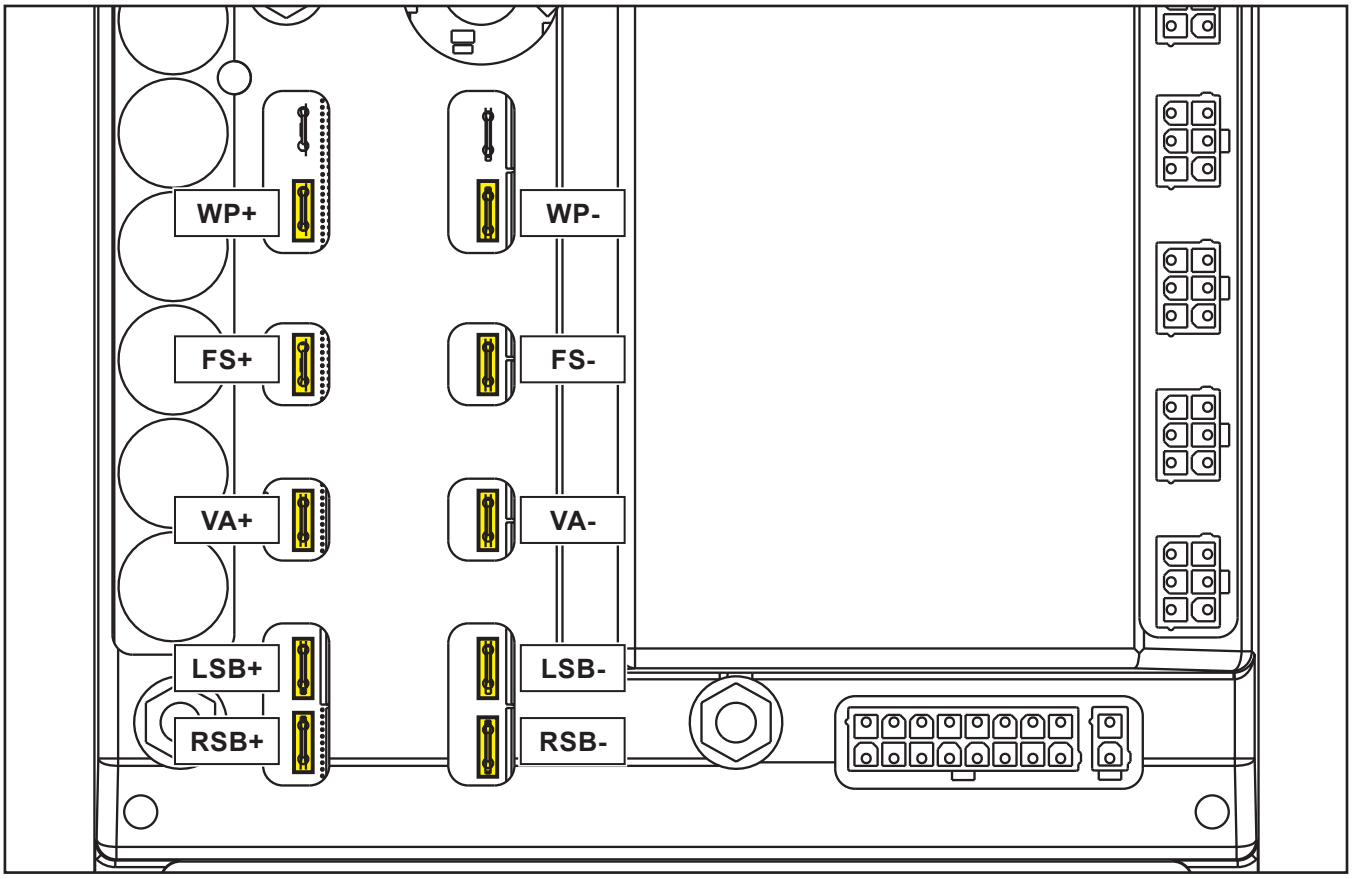


Figure 41:

PIN	Color	Description	Measured/Condition
RSB+	Red	Right side broom motor +	24.3v on
RSB-	Black	Right side broom motor -	0.3V on 24.9V off
LSB+		Left side broom motor +	
LSB-		Left side broom motor -	
VA+	Red	Vacuum system motor +	24.3V on
VA-	Black	Vacuum system motor -	0.3V on 24.9V off
FS+	Red	Filter shaker motor +	24.3V on
FS-	Black	Filter shaker motor -	0 or 24V cycling on and off
WP+		Water pump motor +	
WP-		Water pump motor -	

Shop Measurements - Main Machine Controller (EB1) (continues)

A1: Actuator 1 connection

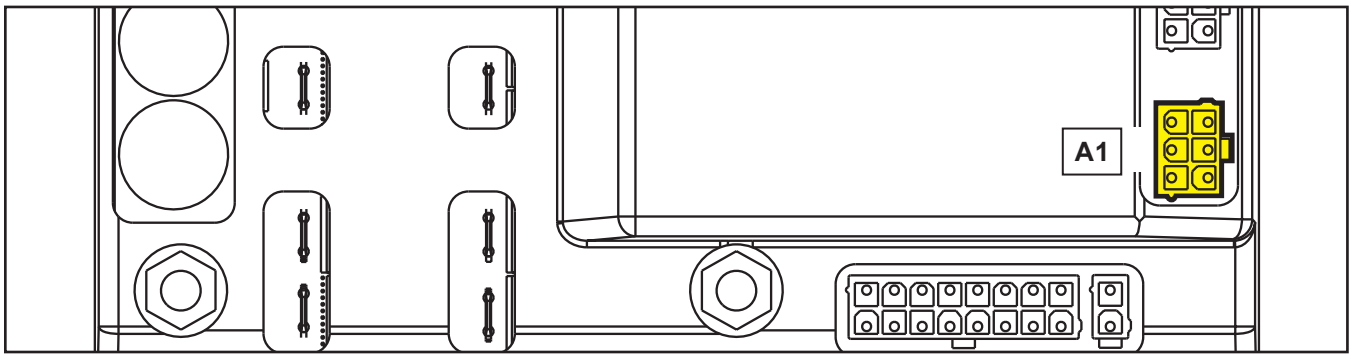


Figure 42:

PIN	Color	Description	Measured/Condition
1	Red	Main broom actuator supply +/- ()	Up 0.01V Down 25.1V Off 0.0V
2	Red/Black	Configuration - Battery or Engine	0.004V when loop is present
3			
4	Black	Main broom actuator supply -/+ (1)	Up 25.1V Down 0.1V Off 0.0V 1
5			
6	Red/Black	Configuration - Battery or Engine	0.004V when loop is present

A2: Actuator 2 connection

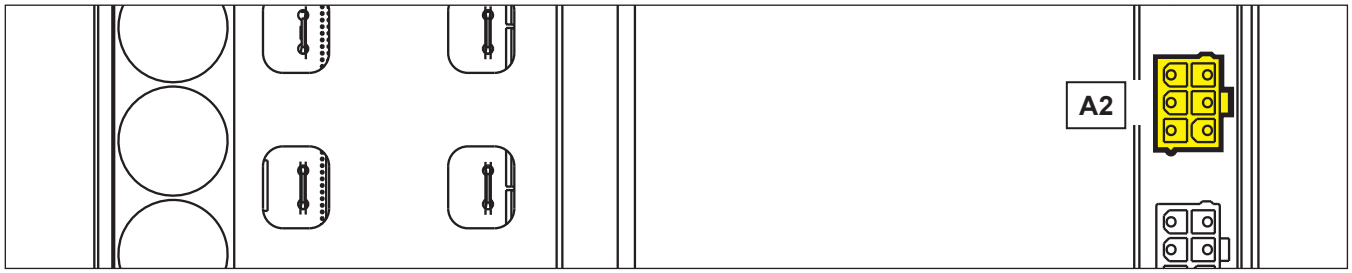


Figure 43:

PIN	Color	Description	Measured/Condition
1	Red	Right side broom actuator supply +/- (1)	Up 0.18V Down 25.2V Off 0.0V
2			
3			
4	Black	Right side broom actuator supply -/+ (1)	Up 25.1V Down 0.04V Off 0.0V
5			
6			

Shop Measurements - Main Machine Controller (EB1) (continues)

A3: Actuator 3 connection

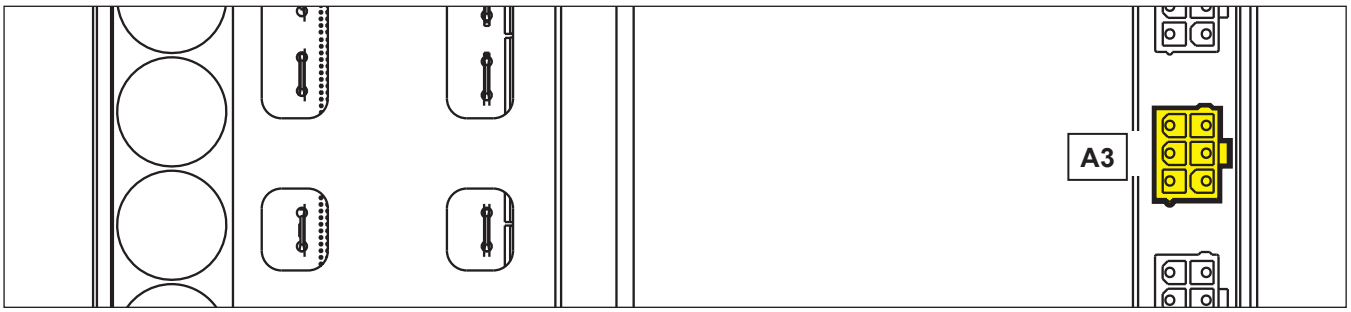


Figure 44:

PIN	Color	Description	Measured/Condition
1	Red	Left side broom actuator supply +/- (1)	Up 0.18V Down 25.2V Off 0.0V
2			
3			
4	Black	Left side broom actuator supply -/+ (1)	Up 25.1V Down 0.04V Off 0.0V
5			
6			

A4: Actuator 4 connection

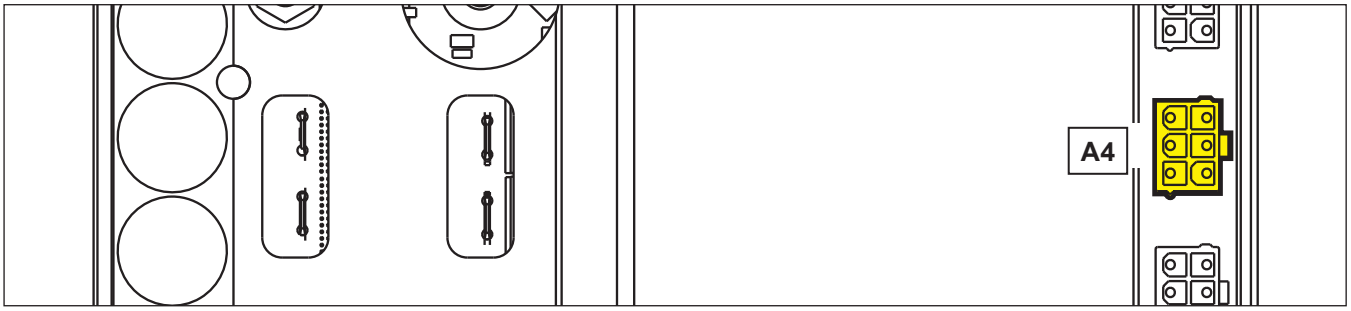


Figure 45:

PIN	Color	Description	El. board in/ out	V ref.	I max.	Measured/Condition
1		REVERSE GEAR enabling	out	0/24V	8A	EB2.B8
2		Position 0 microswitch return	in	?	<1A	(Not used)
3		MAX SPEED REF.	out	0-5V	<1A	EB2.C9
4		REMOTE VAC enablement +	out	24V	8A	(Not used)
5		Position 1 microswitch return	in	?	<1A	(Not used)
6		Microswitch power supply	out	0V	<1A	(Not used)

Shop Measurements - Main Machine Controller (EB1) (continues)

J1: Signal inputs connections

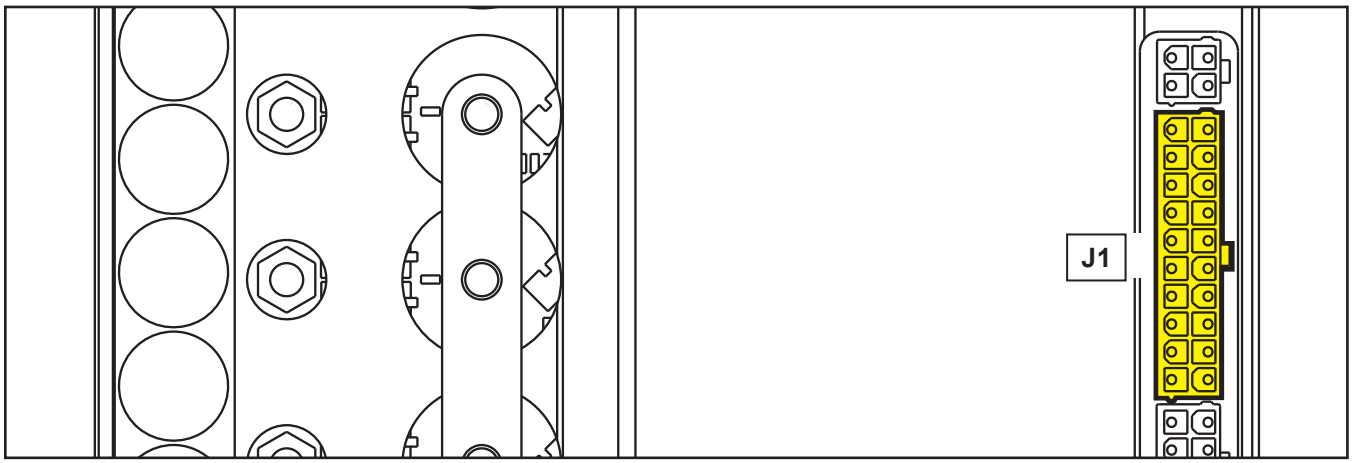


Figure 46:

PIN	Color	Description	Measured/Condition
1	Oange	Return from KEY circuit	Key Off - 0.02V Key On -23.9V
2	Red/White	HOPPER ENABLING button input	Pressed - 24.8V Not pressed - 0.01V
3	Balck/White	Headlight button input	Pressed - 24.8V Not pressed - 0.01V
4	Pink	WATER PUMP button input	Pressed - 24.8V Not pressed - 0.01V
5	Green	LIFTED HOPPER input	Down - 0.008V Up - 22.8V (Illuminated)
6	Blue	HOPPER POSITION input	Down - 0.008V Up - 22.8V (Illuminated)
7			-
8	Brown/Black	FUEL RESERVE input (Engine Only)	LPG 4.99V fuel OK 0.006 Low pressure
9	Green/White	Signal power supply	23.4V
10	Blue/White	Signal power supply	23.4V
11	Orange/ Black	Drive Wheel Controller enabling	Key On - 23.9V Key off - 0.02V
12	Brown	BROOM WEAR input	Normal Broom - 0.009V Worn out Broom - 22.8V (Illuuminated)
13	Pink/Black	RECTIFIER TEMP. input (Engine Only)	Normal Temp. 0.0V Excessive Temp 4.9V
14	Red/Black	ALTERNATOR input (Engine Only)	Engine OFF - 0.075V Cranking - 6V Engine Running (High Speed) -25.5V
15	Violet	DUMPED HOPPER input	Dumped - 0.01V Normal - 22.5V
16	Blue/Black	BAT CHARGER DISAB input (NO) (Engine Only with Hybrid System)	Not measured. Expect 0V for normal operation, Battery voltage when charger is plugged in.
17			
18	Yellow	LOW ENGINE OIL input (Engine Only)	Oil level okay - 4.9V Key Off Engine On
19	Violet/White	Signal power supply	23.4V
20	Brown/White	Signal power supply	23.4V

Shop Measurements - Main Machine Controller (EB1) (continues)

J2: Signal outputs connections

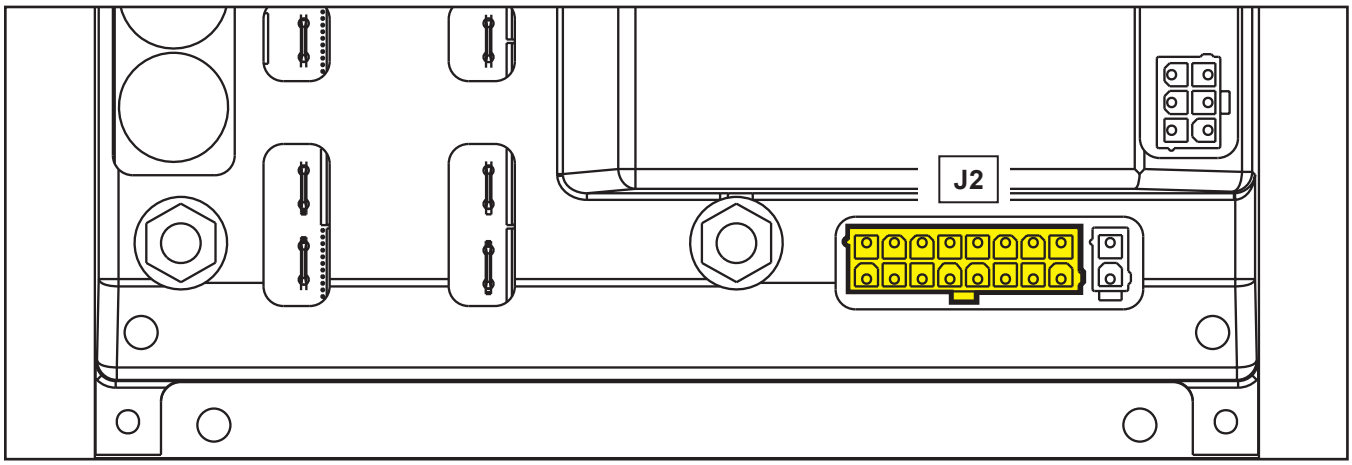


Figure 47:

PIN	Color	Description	Measured/Condition
1	Blue/Black	Hopper lifting pump valve output	Off - 25.2V On - 0.33V
2	Brown/Black	Hopper lowering pump valve output	Off - 25.2V On - 0.6V
3	Green/Black	Hopper dumping valve output	Off - 25.2V On - 0.6V
4	Violet/Black	Horn Relay output	Off - 25V ON - 0.02V
5	Grey/Black	Control for ENGINE FAN, Speed request and Charging output relay (Engine Only)	25.09V Off 0.15V On
6	Pink/Black	LPG - Starter relay and LPG safety shut down solenoid. FUEL PUMP / VALVE output (Engine Only)	LPG - Key on Initial 0.0V LPG - Key on after 10 seconds without Alternator output - 23.9V EV4, P2
7	Black	WATER PUMP warning light output	Off - 24.3V On - 0.008V
8	Yellow/Black	Working light output	L1
9	Red	Common power supply + signal output	25.2V
10			
11			
12	Violet	Common power supply + signal output	25.1V
13	Pink/Black	Common power supply + signal output (LPG Only)	ES4
14	Red/Black	Common power supply + signal output (Engine Only)	LPG - Key on- 24.5V EV4, P2
15	Violet	Common power supply + signal output	25.1V
16	Blue/Black		

Shop Measurements - Main Machine Controller (EB1) (continues)

J3: Signal inputs / outputs connections

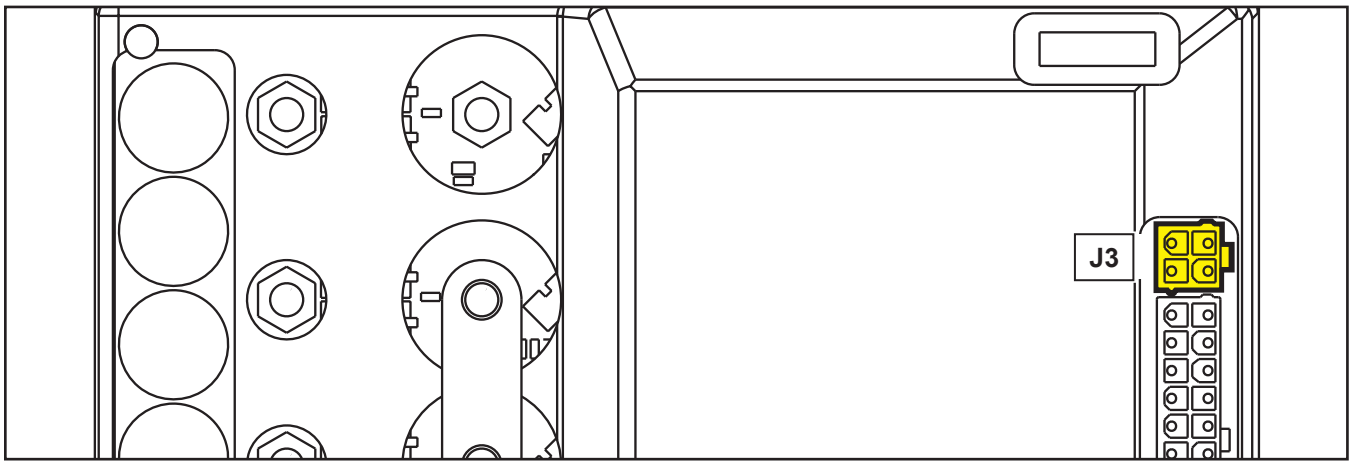


Figure 48:

PIN	Color	Description	Measured/Condition
1	Blue	Main Control board serial connection	4.09V
2	Yellow	Main Control board serial connection	2.4 - 2.7V
3			
4		Main Control board power supply -	0.004V

J4: Signal inputs / outputs connections

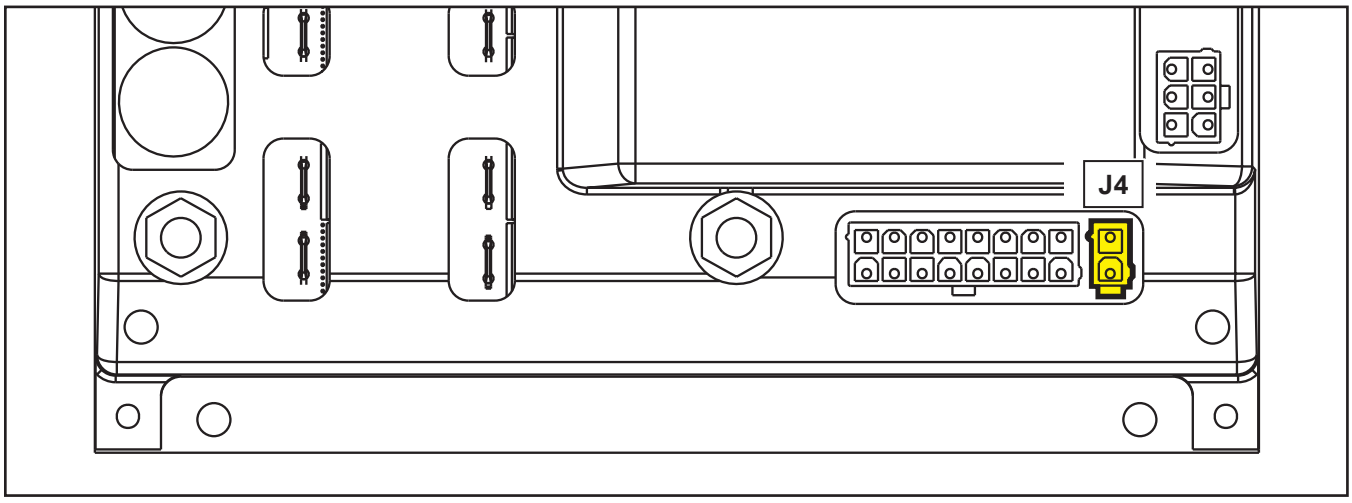


Figure 49:

PIN	Color	Description	Measured/Condition
1	Black	Electromagnetic switch output -	Key on 23.5V initially Drops to 0.056V when it turns on
2	Red	Electromagnetic switch output +	22.7V

Shop Measurements - Main Machine Controller (EB1) (continues)

J5: Auxiliary power supplies connections

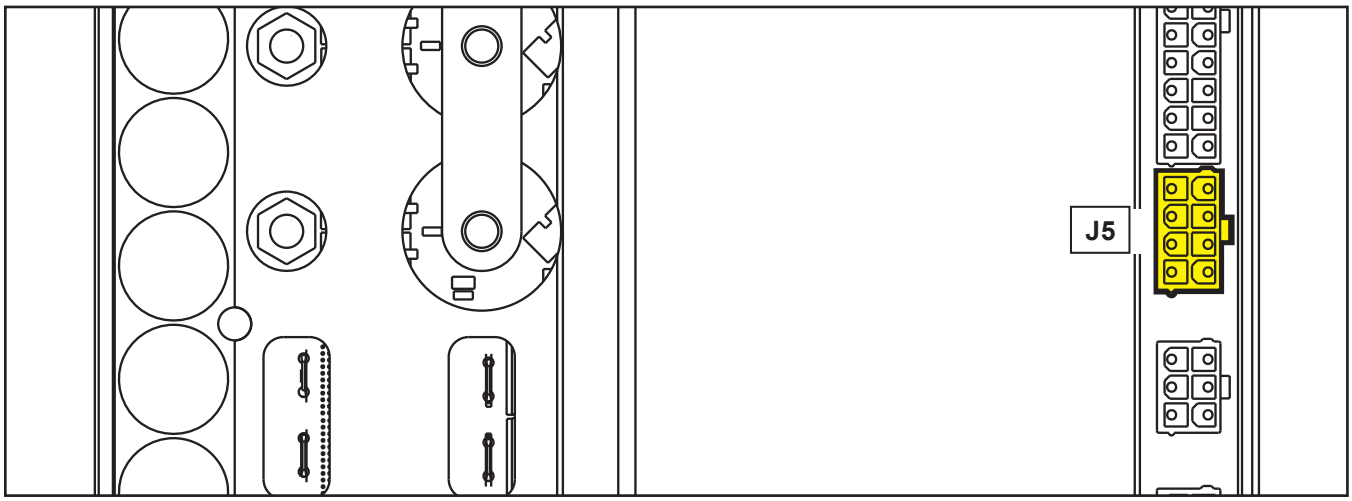


Figure 50:

PIN	Color	Description	Measured/Condition
1			
2			
3			
4			
5			
6			
7			
8			

Shop Measurements - Main Machine Controller (EB1) (continues)

J6: TYCO MODU II type

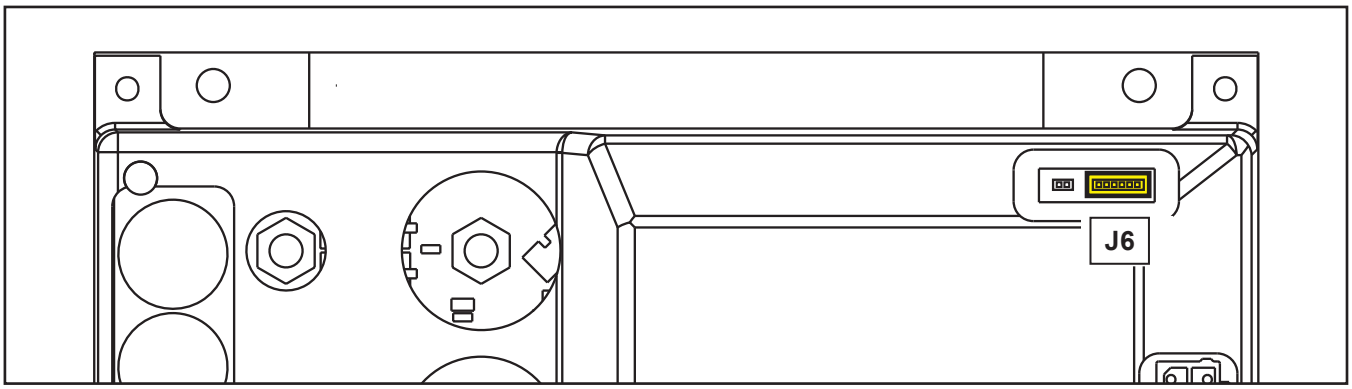


Figure 51:

PIN	Color	Description	Measured/Condition
1		MACHINE ON signal	TRK.BN
2		Power supply +24V	TRK.RD
3		iButton input	TRK.YE
4		BROOM ACTIVE FUNC. signal	TRK.WH
5		Power -	TRK.BU
6		DRIVE SYSTEM ACTIVE signal	TRK.PK

J7: TYCO MODU II type

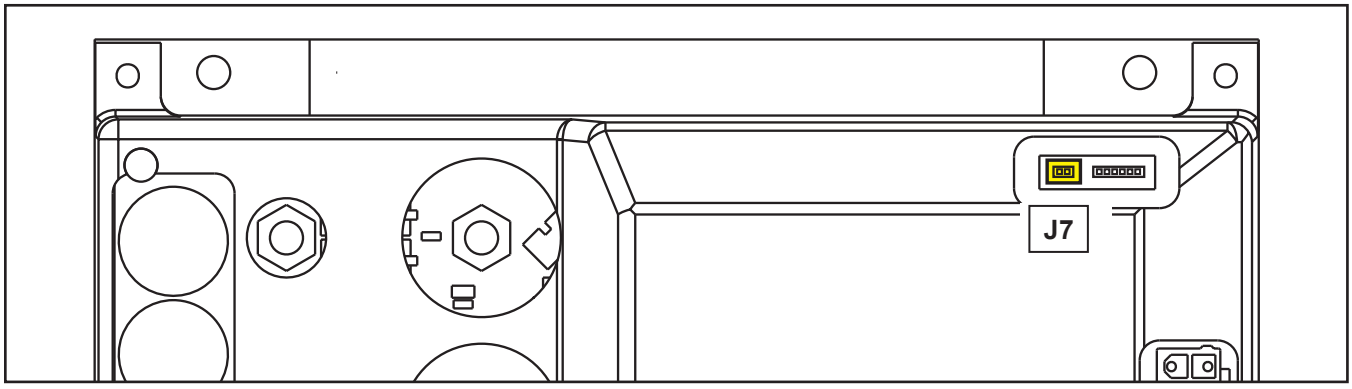


Figure 52:

PIN	Color	Description	Measured/Condition
1	Red	CAN-BUS H channel	2.45V
2	Black	CAN-BUS L channel	2.39V

Shop Measurements - Display Controller (EB3)

J1: MOLEX MINIFIT type

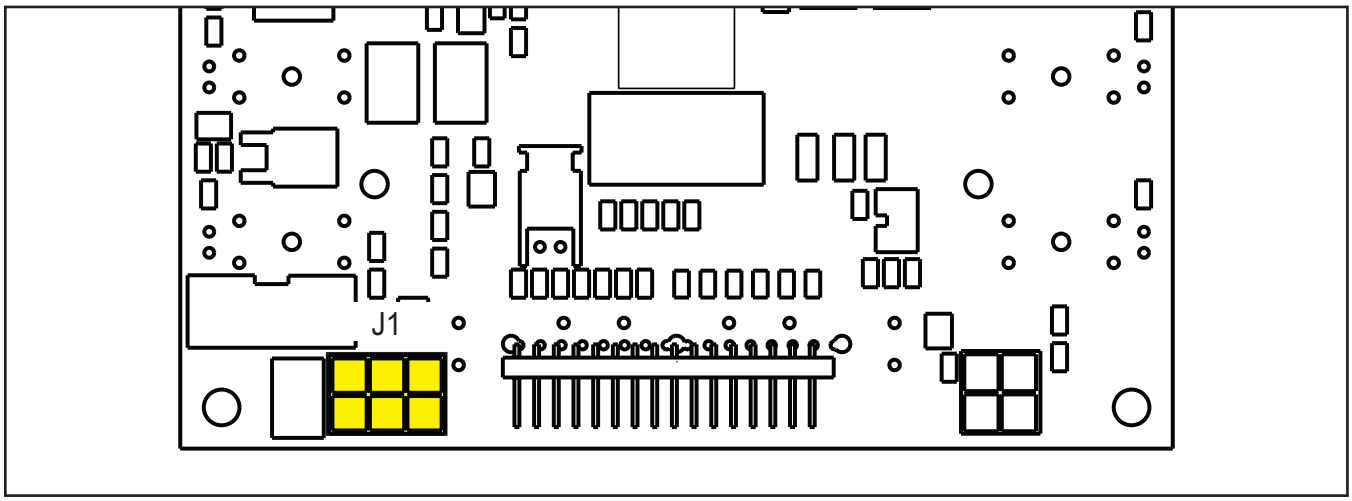


Figure 53:

PIN	Color	Description	Measured/Condition
1	Orange	Power +	Key Off - 0.4V Key On - 24.7V
2	Blue	Main Control board serial connection +	4.09V
3	Yellow	Main Control board serial connection -	2.4 - 2.7V
4	Green	Power -	0.06V
5	Orange	Power supply enabling	23.9V
6			

Shop Measurements - Display Controller (EB3) (continues)

J2: FCI DUFLEX type

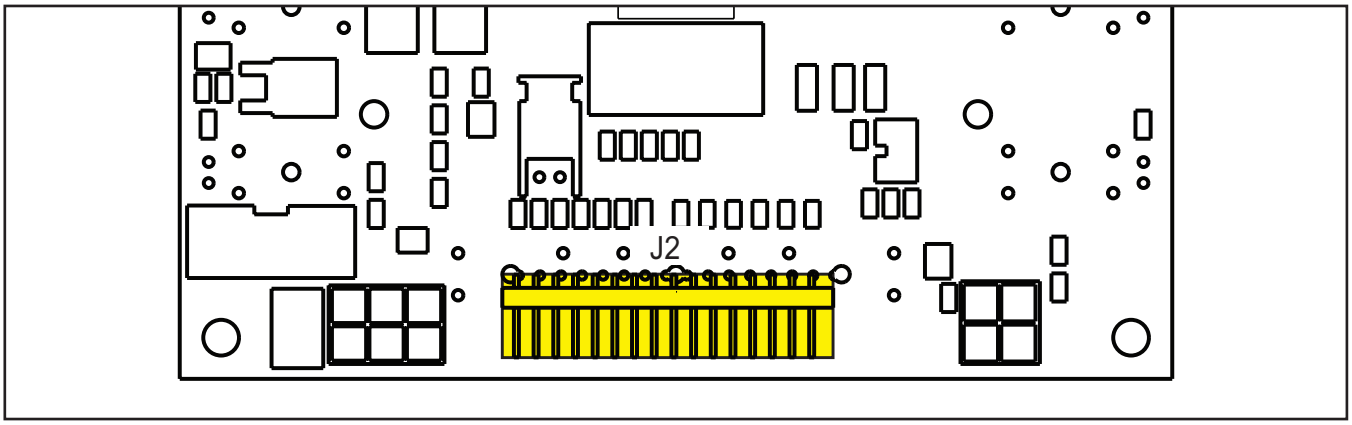


Figure 54:

PIN	Color	Description	Measured/Condition
1	Ribbon	Power supply - common	0.007V
2	Ribbon	HOPPER UP button (P10)	Not Pressed - 3.1V Presssed - 0.009V
3	Ribbon	HOPPER DOWN button (P11)	Not Pressed - 3.1V Presssed - 0.009V
4	Ribbon	SPEED + button (P8)	Not Pressed - 3.1V Presssed - 0.009V
5	Ribbon	SPEED - button (P9)	Not Pressed - 3.1V Presssed - 0.009V
6	Ribbon	REVERSE GEAR button (P15)	Not Pressed - 3.1V Presssed - 0.009V
7	Ribbon	HOPPER OPEN button (P12)	Not Pressed - 3.1V Presssed - 0.009V
8	Ribbon	HOPPER CLOSE button (P13)	Not Pressed - 3.1V Presssed - 0.009V
9	Ribbon	HORN button (P14)	Not Pressed - 3.1V Presssed - 0.009V
10	Ribbon	VACUUM button (P6)	Not Pressed - 3.1V Presssed - 0.009V
11	Ribbon	LEFT SIDE BROOM button (P3)	Not Pressed - 3.1V Presssed - 0.009V
12	Ribbon	MAIN BROOM button (P1)	Not Pressed - 3.1V Presssed - 0.009V
13	Ribbon	SIDE BROOM SPEED + button (P4)	Not Pressed - 3.1V Presssed - 0.009V
14	Ribbon	SIDE BROOM SPEED - button (P5)	Not Pressed - 3.1V Presssed - 0.009V
15	Ribbon	FILTER SHAKER button (P7)	Not Pressed - 3.1V Presssed - 0.009V
16	Ribbon	RIGHT SIDE BROOM button (P2)	Not Pressed - 3.1V Presssed - 0.009V

10 - Chassis System

Chassis (main parts)

- Front section supporting the steering assembly, drive wheel and side brooms (A).
- Central section supporting batteries/engine with alternator (B).
- Lower compartment for central broom (C).
- Rear side supporting the hopper and rear wheels on hubs (D).
- Side and central holder for separating wall between engine compartment/vacuum system compartment, and for supporting the hopper lifting linkages (E).

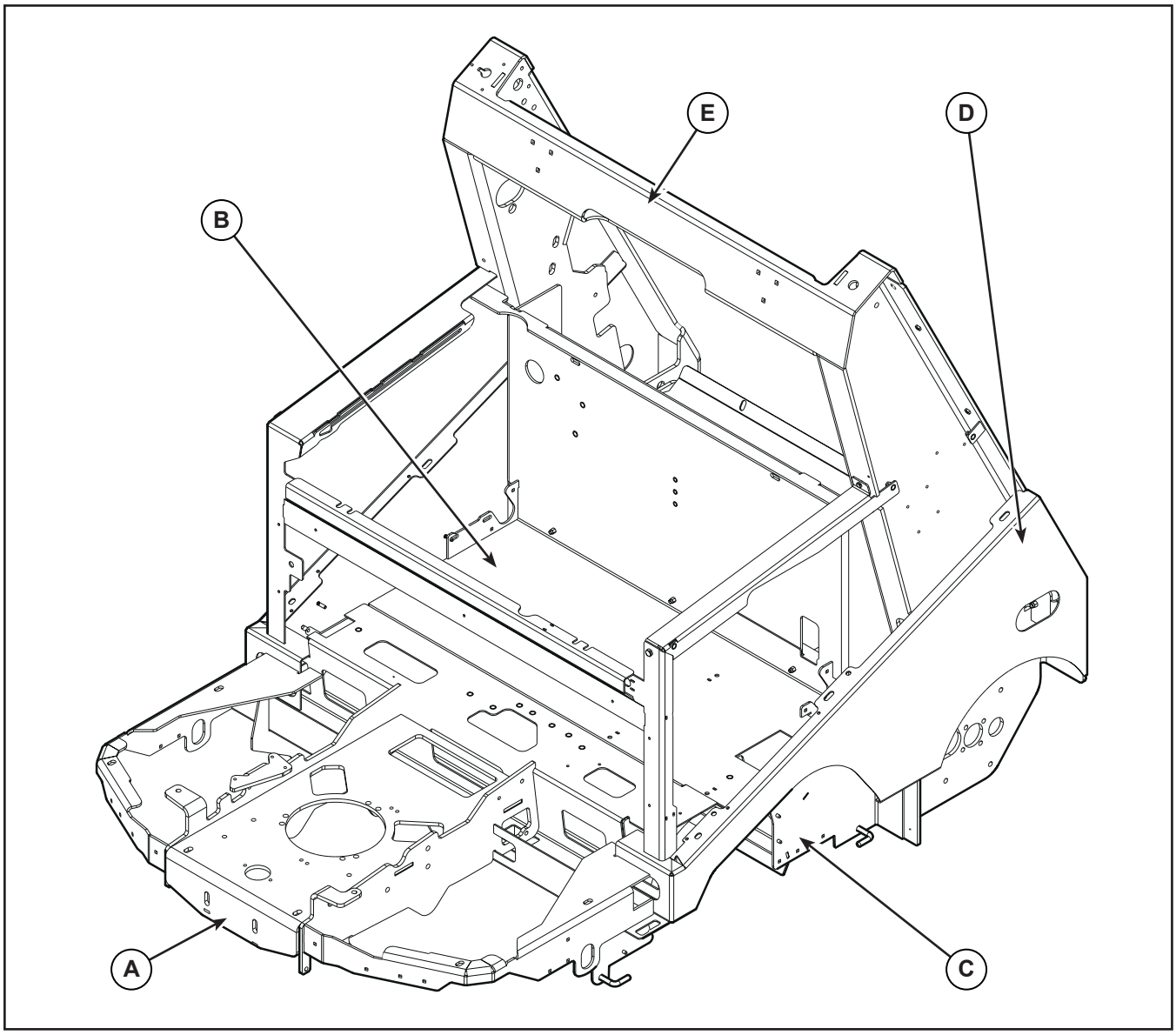


Figure 1:

14 - Wheel System, Non Traction

Functional Description

The rear wheels turns freely without any drive or stop system.

These are hold in place by means of a pin on eccentric flange, fastened to the chassis by means of screws.

On the Battery version, the standard wheels are super elastic non-marking (optionally black).

On Diesel and LPG versions, the standard wheels are foam (optionally super elastic non-marking or black).

Component Locations

- Rear wheels
- Hub
- Hexagon castle nut
- Drum brake
- Service brake pedal
- Parking brake lever

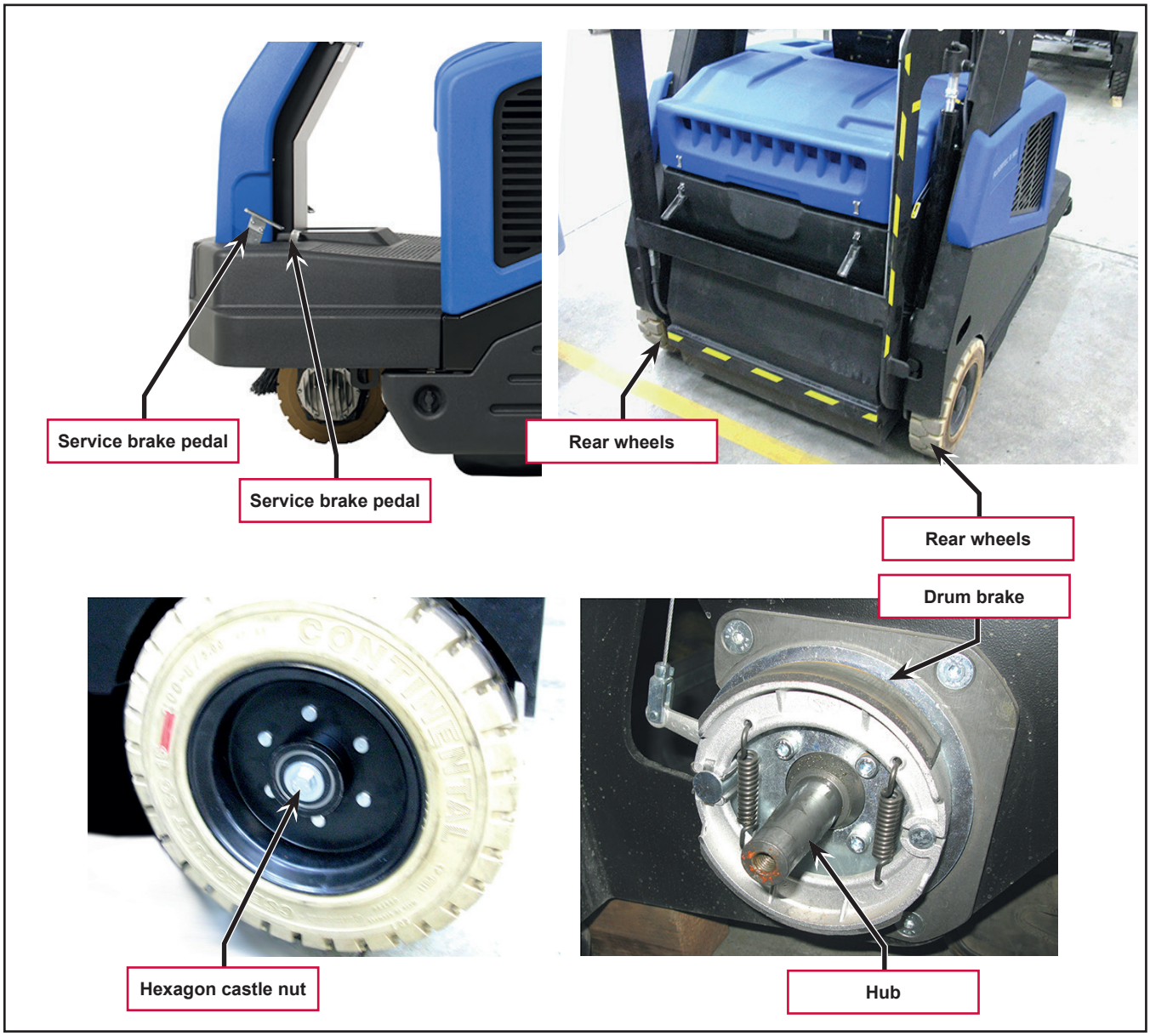


Figure 1:

Maintenance and Adjustments

Check and Adjusting Operation Drum Brake Cable

1. Drive the machine on a level floor.
2. Check that the parking brake is not engaged.
3. Ensure that the machine cannot move by placing opposing chocks (A) on the wheel opposite to the one to be checked.
4. Lift the hopper to the end-of-stroke.

WARNING: Place a safety rod under the lifted hopper.

5. Turn the fasteners and remove the left door.
6. Remove the right door after removing the relevant mounting screws.
7. Apply a suitable jack (B) underneath the chassis zone (C) and raise the machine a few cm so that the wheel to be checked (D) can turn freely.
8. For safety, place a suitable spacer (E) underneath the chassis zone (F) to prevent the machine from dropping accidentally.

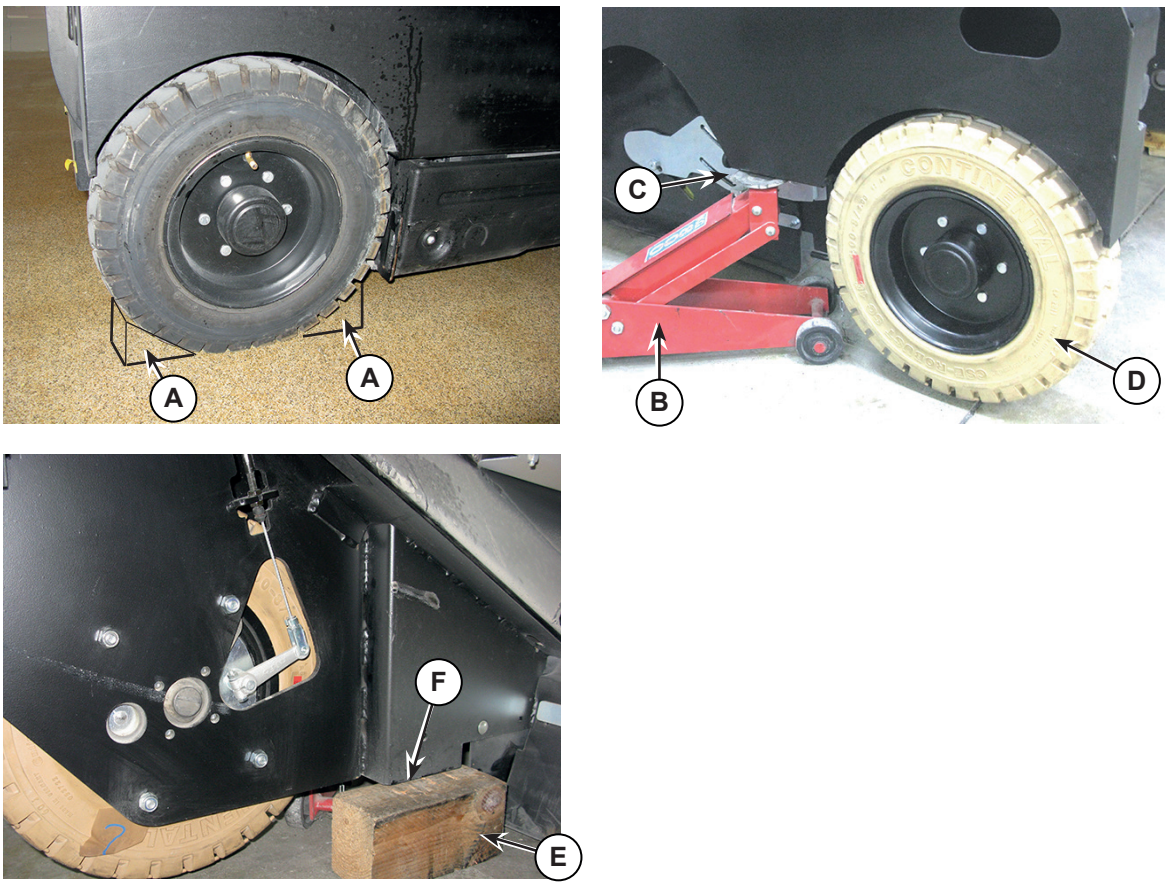


Figure 2:

Check and Adjusting Operation Drum Brake Cable (continues)

9. Lower the dust seal (J).
10. The parking brake is correctly regulated when:
    - With the parking brake disengaged, the wheel (D) turns freely, without touching the braking drums.
    - Keeping the brake lever (G) slightly turned upwards, the braking mass starts rubbing against the wheel (D).
11. Perform the check described in the previous step, and if necessary adjust the brake tie rod (H) as follows:
    - Slacken off the nuts (I) and adjust them until the situation described in the previous step is met; with the regulation complete, tighten down the nuts (I).
12. Perform in the reverse order steps 3. 7. 8. 9., Then repeat steps 3. 7. 8. 9. For the other rear wheel.
13. Perform steps 3. to 9. in the reverse order.
14. Perform a practical check on the effectiveness of the parking brake on the two rear wheels.

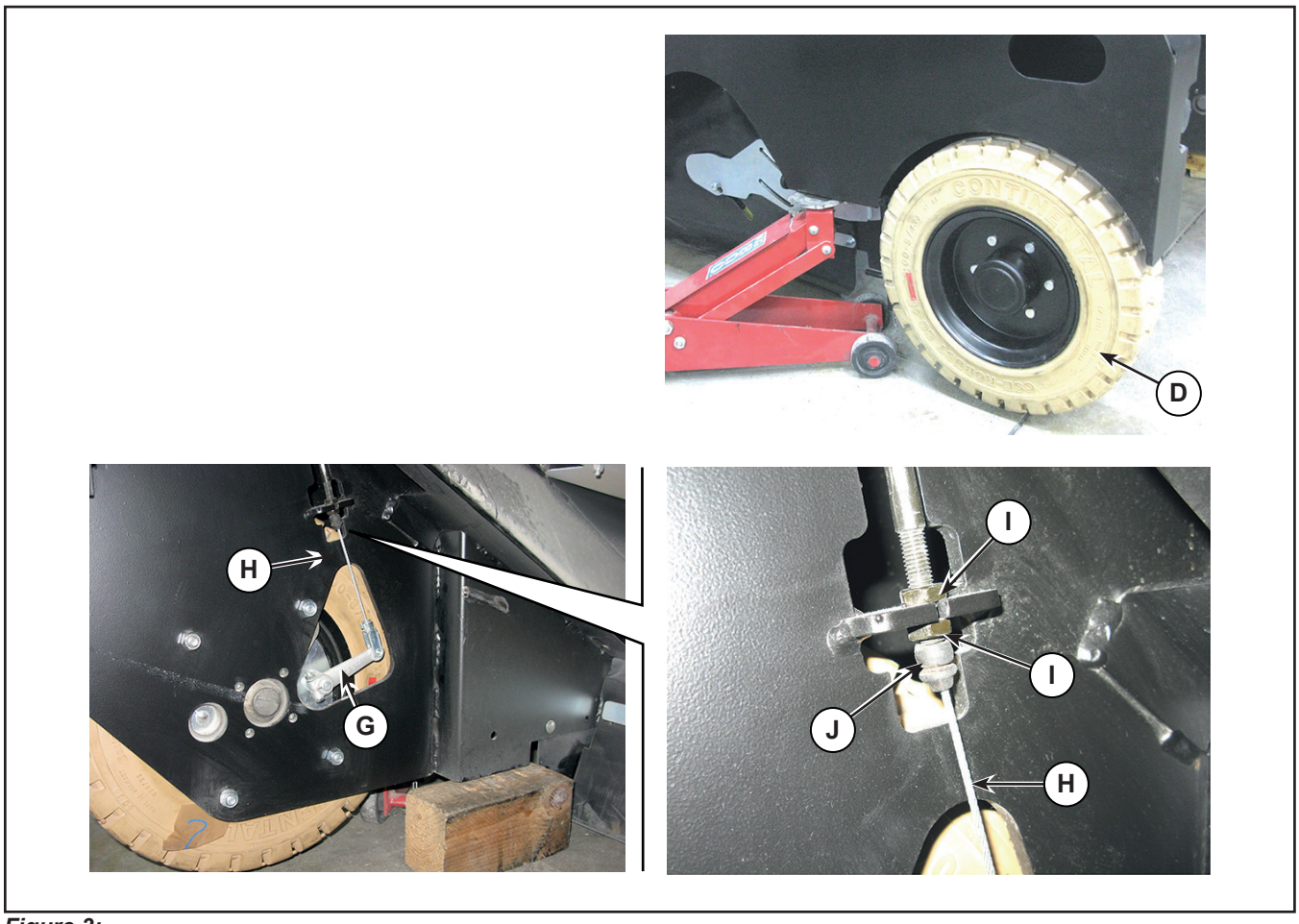


Figure 3:

Troubleshooting

Trouble	Possible causes	Remedy
Braking is unbalanced / the machine does not brake	Drum brake cables incorrectly regulated	Regulate
	The braking shoes are worn	Replace
	Wheel tread worn	Replace the wheels
Brakes squeal	Brake pedal in park position	Release parking brake

Removal and Installation

Drum Brake Braking Shoes

WARNING: It is advisable to replace the braking shoes on both rear wheels at the same time in order to achieve correct braking effectiveness of the parking brake.

Removal

1. Drive the machine on a level floor.
2. Check that the parking brake is not engaged.
3. Ensure that the machine cannot move by placing opposing chocks (A) on the wheel opposite to the one to be checked.
4. Lift the hopper to the end-of-stroke.

WARNING: Place a safety rod under the lifted hopper.

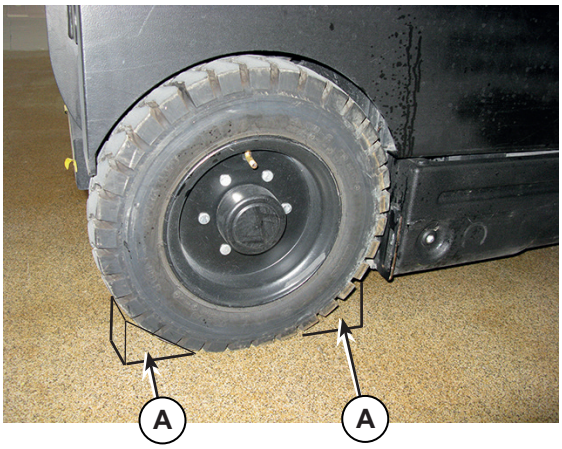


Figure 4:

Drum Brake Braking Shoes (continues)

5. Turn the fasteners and remove the left door.
6. Remove the right door after removing the relevant mounting screws.
7. Apply a suitable jack (B) underneath the chassis zone (C) and raise the machine a few cm so that the wheel to be checked (D) can turn freely.
8. For safety, place a suitable spacer (E) underneath the chassis zone (F) to prevent the machine from dropping accidentally.
9. Slacken off the cable (H) by unscrewing the nuts (I), then disconnect the terminal (J) of the cable from the brake lever (G).

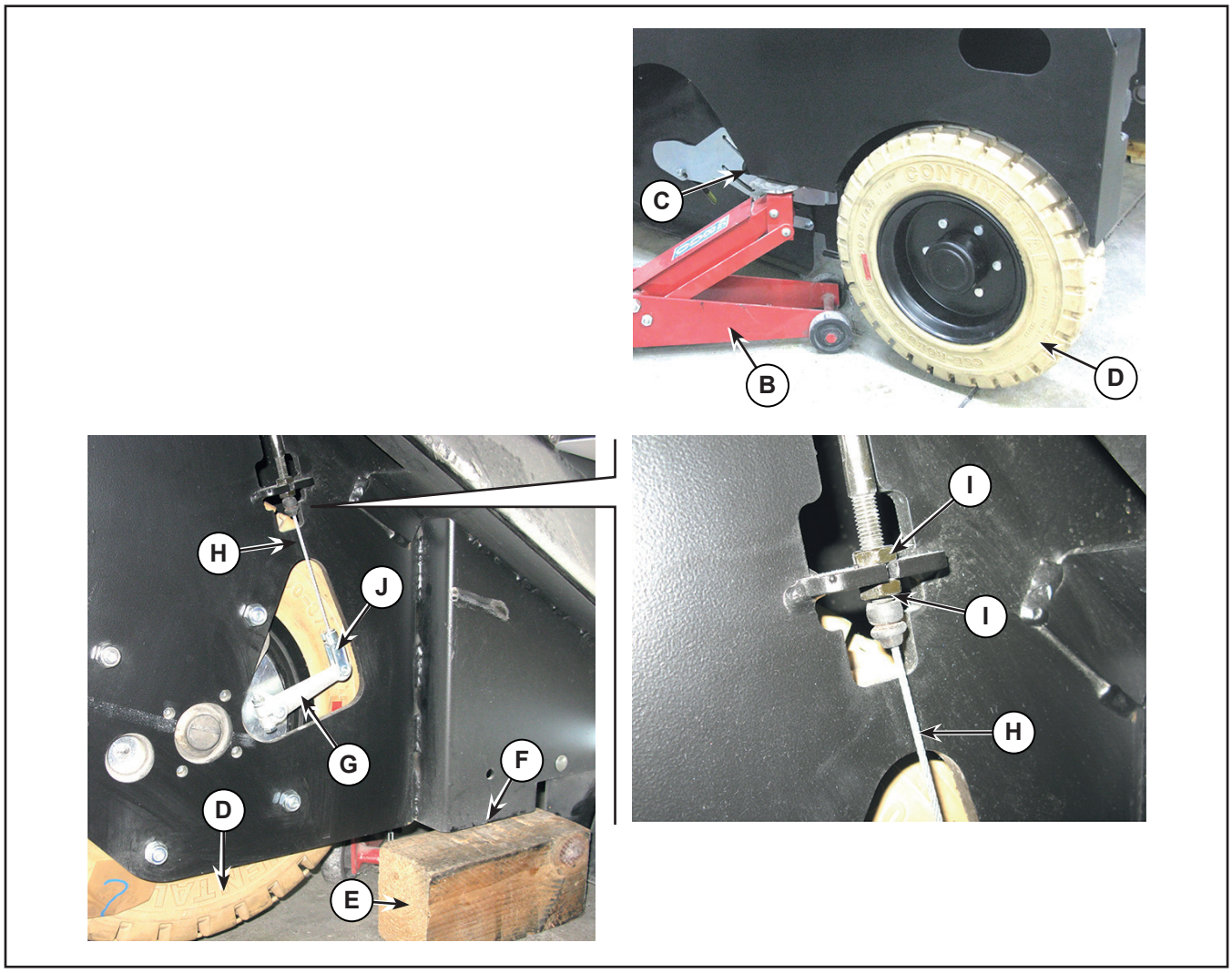


Figure 5:

Drum Brake Braking Shoes (continues)

10. Disengage the plastic cover and unscrew the screw (K) on the rear wheel (D).
11. Remove the rear wheel (D).
12. Disconnect the springs (L) from the braking shoes (M).
13. Remove the braking shoes (M).

Installation

14. Assemble the components in the reverse order of removal, and note the following:
    - Perform regulation of the drum brake cable (see procedure in the relevant paragraph).

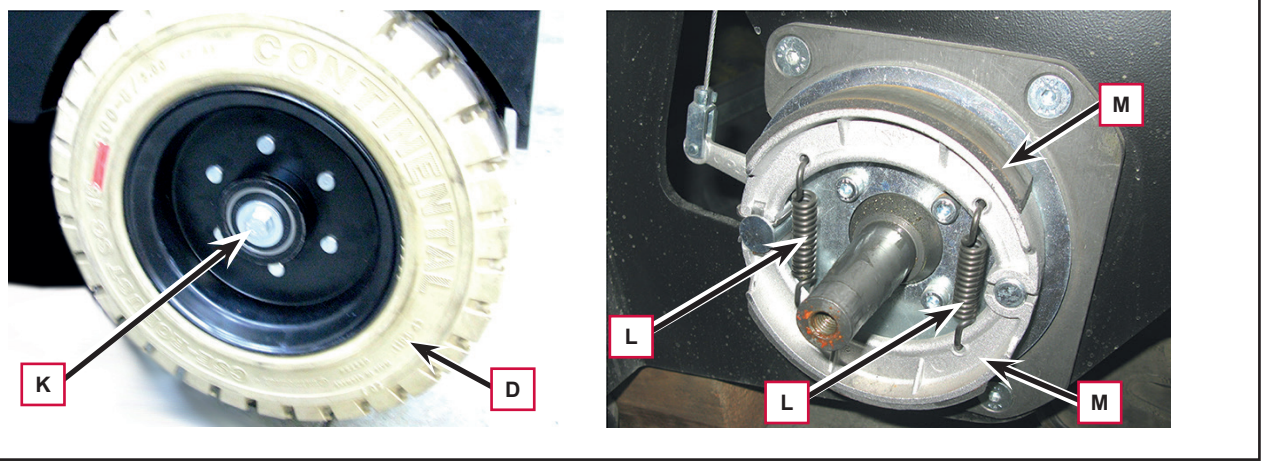


Figure 6:

Specifications

Model	SW5500 B FLOORTEC R 985 B	SW5500 D	SW5500 LPG FLOORTEC R 985 LPG
Rear wheels diameter	16 in (406 mm)		
Drum brake diameter	6.3 in (160 mm)		
Rear axle curb weight	1,320 lb (599 Kg)	1,067 lb (484 Kg)	1,115 lb (506 Kg)
Rear wheel specific pressure on the floor	116 psi (0.8 N/mm^2)	58 psi (0.4 N/mm^2)	72 psi (0.5 N/mm^2)

20 - Wheel System, Traction

Functional Description

The main drive components are the steered driving wheel assembly, the accelerator pedal (R1) and the Drive Wheel Controller (EB2).

The direction of travel is set with the button on the Main Control Board: when the machine is started, it is always set to forward movement. Pressing the reverse button  sets the direction of travel to reverse, and the reversing buzzer (BZ) begins to sound until forward movement is selected again.

The driving wheel is fitted with a three-phase electric motor (M0) which is powered by the Drive Wheel Controller (EB2).

The Drive Wheel Controller (EB2) is powered through the Drive Wheel Controller contactor (ES2).

The Drive Wheel Controller contactor (ES2) is activated by the same board, after the initial check on the conditions of the inputs and outputs, when it receives the start-up signal from the ignition switch circuit (KEY) via the relay (ES8).

The main control inputs of the Drive Wheel Controller (EB2) are composed of:

Analogue signal from hall sensor on accelerator pedal (R1)

Digital signal from safety microswitch inside accelerator pedal (R1) (open only in rest position)

Digital signal from seat operator presence microswitch (SW1)

Frequency signal of the drive motor (M0) encoder (ENC)

Analogue maximum machine speed setting signal from the Main Machine Controller (EB1)

Digital forward/reverse drive signal from the Main Machine Controller (EB1)

Digital signal from drive motor temperature sensor (S5)

The drive system is disabled when the seat microswitch (SW1) does not detect the operator on the driver's seat, while when the hopper open sensor (S1) detects that the hopper is lifted, the maximum machine speed is decreased to a safety value.

When the machine is started with the key switch (KEY), the system is always placed in forward mode. Pressing the reverse button changes to reverse mode until the button is pressed again. When reverse is selected, this is signalled by the icon on the display and the buzzer.



The position of the accelerator pedal (R1) determines the machine speed. The safety condition for drive system activation is that the accelerator pedal (R1) is totally released when the system is turned on with the ignition switch (KEY).

The drive motor encoder (ENC) provides feedback of the real speed of the motor with two 90° shifted square signals.

The voltage levels corresponding to the accelerator released and fully depressed positions are acquired by the drive board via a dedicated procedure; if this is not performed, the default values of 0.1V and 5.0V, respectively, are used.

If the drive motor temperature sensor (S5) is open (motor temperature over 150° C) the drive speed is reduced to about 23%.

If the Drive Wheel Controller (EB2) detects a fault with the drive system, this is signalled via an error code on the Display Controller (EB3) in the form "ALARM Traction XXX", where XXX is a 2- or 3-digit number. The alarm is communicated by the Drive Wheel Controller (EB2) to the Main Machine Controller (EB1) to be shown on the display using the CANOPEN protocol on the CAN-BUS line between connector J7 of the Main Machine Controller (EB1) and connector JC of the Drive Wheel Controller (EB2).

The CAN-BUS is also used to transfer from the drive board to the Main Machine Controller the information about the movement of the machine. This information is used by the Main Machine Controller to start and stop the brooms and vacuum motors.

Functional Description (continues)

The information on the assets and the movement of the car alarms are the only ones that use the CAN-BUS.

The drive system is fitted with an anti-overturning system based on the lateral acceleration signal from an accelerometer on the Main Machine Controller (EB1). In the event this lateral acceleration value is excessively high, the analogue maximum speed signal supplied by the Main Machine Controller to the drive system board is reduced in proportion to the measured acceleration (the voltage value of the speed signal depends also to the speed setting buttons  and varies tipically from 1 to 5 V).

Only on LPG/DIESEL version

The relay (ES8) is activated by the output of the auxiliary bridge rectifier D1, only when the engine is running.

The drive system, therefore, like the sweeping system, can only be activated with the engine running.



Figure 1:

Wiring Diagram

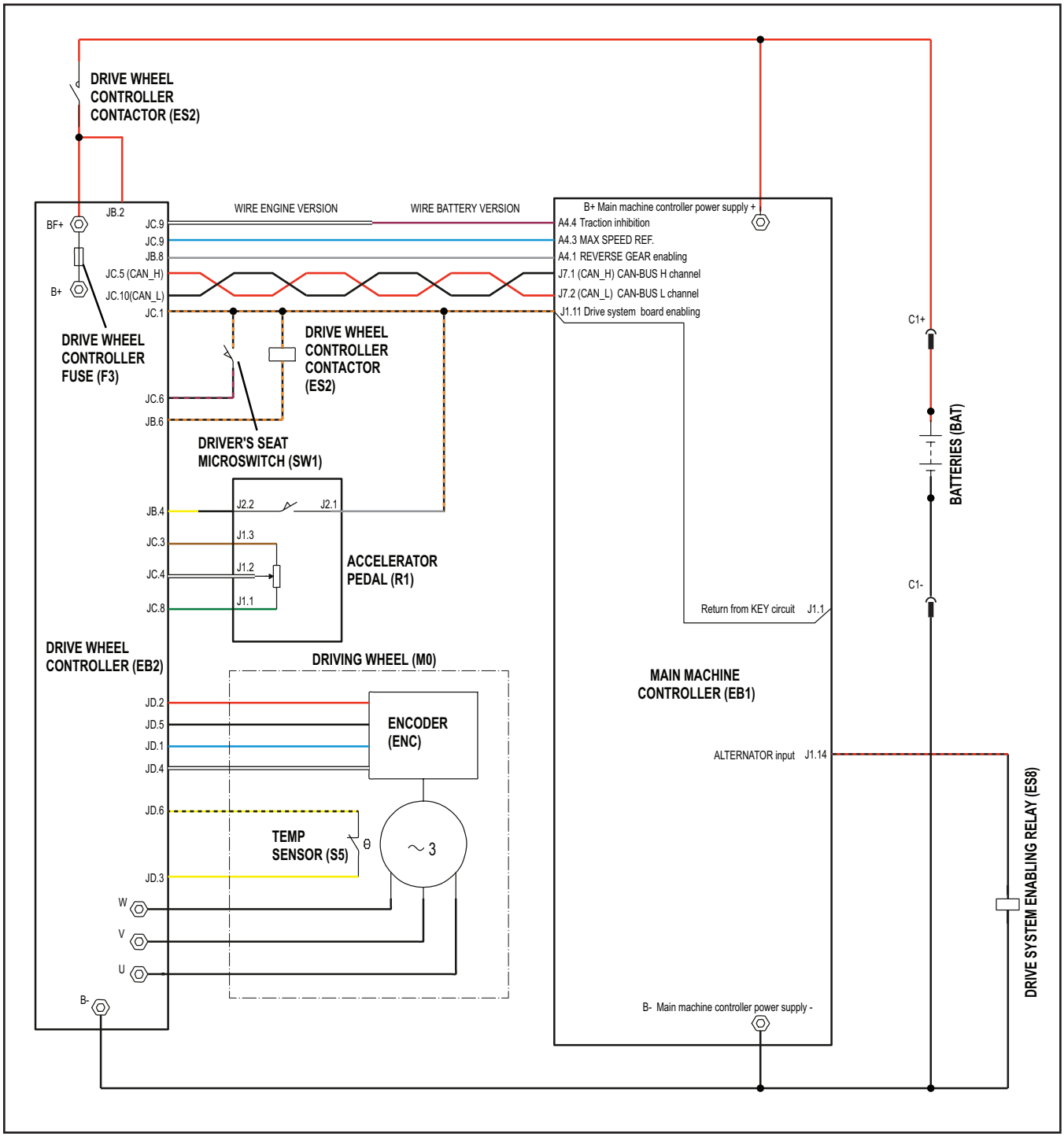


Figure 2:

Component Locations

- Increase maximum running speed button
- Decrease maximum running speed button
- Reverse gear/forward gear reset button
- Accelerator pedal (R1)
- Driver's seat safety microswitch (SW1)
- Service brake pedal
- Parking brake lever



Figure 3:

Component Locations (Continues)

- Driving wheel (M0)
- Drive Wheel Controller (EB2)
- Main fuse (160A) (F3)
- Drive Wheel Controller contactor (ES2)

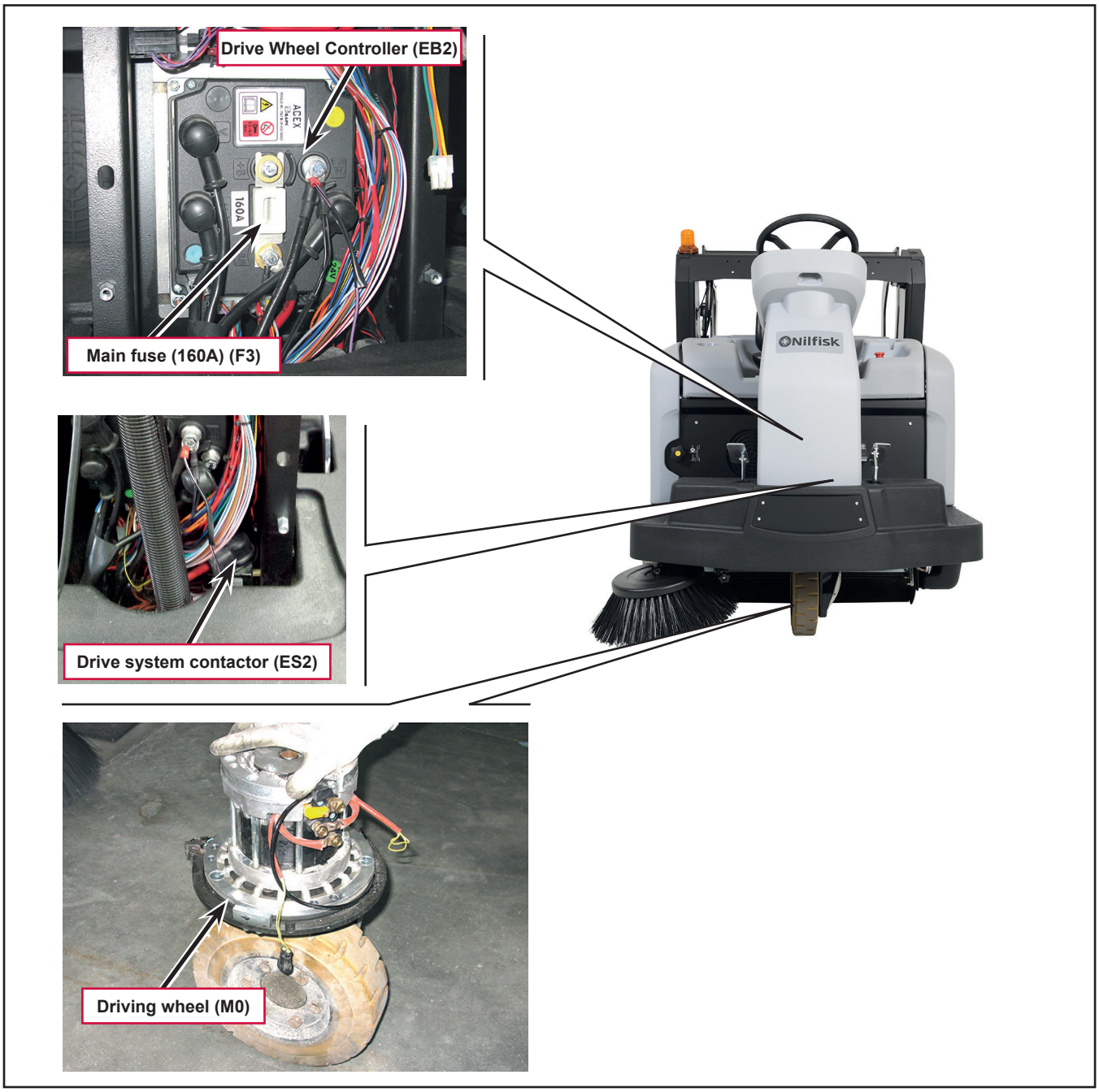


Figure 4:

Troubleshooting

Trouble	Possible causes	Remedy
The machine does not move	The batteries (BAT) are discharged or its connections are not efficient	Charge the batteries or clean/repair the connections
	The accelerator pedal (R1) is broken or badly adjusted	Recalibrate / replace
	Drive Wheel Controller (EB2) faulty	Replace
	The wiring harness is damaged	Check the electrical connections/repair the wiring harness
	The ignition key switch (KEY) is not working	Replace
	Driver seat safety microswitch (SW1) not working	Replace
	Driving wheel (M0) faulty	Replace
	Drive Wheel Controller contactor (ES2) faulty	Replace
	Drive system board fuse (F3) blown	Replace
The machine is moving at reduced speed	Encoder (ENC) faulty	Replace
	Hopper open	Close in position
	1 of the 3 hopper sensors not working / miscalibrated	Replace / recalibrate
	Brake pedal in park position	Release parking brake

Drive Board Error Codes Table

Drive Board Error Codes				
CODE - Description (shown on multifunction display)		*Meaning*	*First procedure*	*If the problem persists*
TR AL.8	**WATCHDOG**	Issue internal to the drive board.	Switch off and on the machine by key switch (KEY).	Replace the Main Machine Controller.
TR AL.13	**EEPROM KO**	Issue internal to the drive board.	Switch off and on the machine by key switch (KEY).	Replace the Main Machine Controller.
TR AL.17	**LOGIC FAILURE #3**	Issue internal to the drive board.	Switch off and on the machine by key switch (KEY).	Replace the Main Machine Controller.
TR AL.18	**LOGIC FAILURE #2**	Motor phase voltages alarm on starting.	Check for damage or short circuits into the power wires between the drive board and the drive motor (M0).	Replace the Main Machine Controller.
TR AL.19	**LOGIC FAILURE #1**	Battery voltage below 9.0V or above 35.0V.	Check the battery voltage. It could happens also if the machine is moved down a ramp at high speed releasing quickly the drive pedal, if the battery is too small or overcharged.	Substitute the batteries if defective. In case of LPG / D versions and issue related to ramps, use a bigger capacity battery.
TR AL.30	**VMN LOW**	Low voltage on motor phases.	Check the battery voltage.	Replace the Main Machine Controller.
TR AL.31	**VMN HIGH**	High voltage on motor phases – Possible short circuit on battery + or no battery –.	Check for damage or short circuits into the power wires between the drive board and the drive system motor (M0) and check the B+ and B- power connections to the drive board.	Replace the Main Machine Controller.
TR AL.37	**CONTACTOR CLOSED**	Issue internal to the drive board.	Switch off and on the machine by key switch (KEY).	Replace the Main Machine Controller.
TR AL.38	**CONTACTOR OPEN**	Contactor not closing.	Check the functionality of the Drive Wheel Controller contactor (ES2).	Check the wires between the Drive Wheel Controller and the Drive Wheel Controller contactor (ES2). Check the main drive system fuse (F3).
TR AL.53	**STBY I HIGH**	Issue internal to the drive board.	Switch off and on the machine by key switch (KEY).	Replace the Main Machine Controller.
TR AL.60	**CAPACITOR CHARGE**	Internal capacitor charging failed.	Check the battery voltage under load. Substitute the batteries if defective.	Replace the Main Machine Controller.
TR AL.62	**TH. PROTECTION**	High internal temperature.	Check the current drawn into the drive motor (M0). Check the proper installation of the drive board on the chassis, check for excess dirt in the steering column.	Replace the Main Machine Controller.

Drive Board Error Codes				
CODE - Description (shown on multifunction display)		*Meaning*	*First procedure*	*If the problem persists*
TR AL.65	**MOTOR TEMPERAT.**	Motor thermal sensor over 150° => max. speed reduced to 23%.	Check the current drawn into the drive motor (M0) and its temperature.	Substitute the temperature sensor (S5).
TR AL.66	**BATTERY LOW**	Battery below 10%.	Check the battery voltage.	Recharge or substitute the batteries if defective.
TR AL.74	**DRIVER SHORTED**	Issue internal to the drive board.	Switch off and on the machine by key switch (KEY).	Replace the Main Machine Controller.
TR AL.75	**CONTACTOR DRIVER**	Issue internal to the drive board.	Switch off and on the machine by key switch (KEY).	Replace the Main Machine Controller.
TR AL.78	**VACC NOT OK**	Pedal analogue output not correct at rest.	Check the accelerator pedal output (R1.WHITE WIRE).	Substitute the pedal.
TR AL.79	**INCORRECT START**	Pedal pressed on start (pedal microswitch closed).	Check the accelerator pedal (R1) stroke. Idle position end of stroke in particular.	Substitute the pedal.
TR AL.82	**ENCODER ERROR**	Encoder fails.	Check the drive system motor encoder connection (ENC). Check for debris in the drive system motor (M0) encoder track.	Replace the encoder (ENC).
TR AL.86	**PEDAL WIRE KO**	No pedal negative.	Check the accelerator pedal (R1) wires and connections.	Substitute the pedal.
TR AL.208	**EEPROM KO**	Issue internal to the drive board.	Switch off and on the machine by key switch (KEY).	Replace the Main Machine Controller.
TR AL.209	**PARAM RESTORE**	Issue internal to the drive board.	Switch off and on the machine by key switch (KEY).	Replace the Main Machine Controller.
TR AL.210	**WRONG RAM MEM.**	Issue internal to the drive board.	Switch off and on the machine by key switch (KEY).	Replace the Main Machine Controller.
TR AL.211	**STALL ROTOR**	Motor stall.	Check for drive system motor (M0) mechanical stuck.	Replace the Main Machine Controller.
			Check the wiring from the motor wheel Encoder (ENC) and the Drive Wheel Controller (EB2)	Repare the Encoder wiring or substitute the sensor
TR AL.212	**WRONG RAM**	Issue internal to the drive board.	Switch off and on the machine by key switch (KEY).	Replace the Main Machine Controller.
TR AL.218	**SENS MOT TEMP KO**	Motor thermal sensor out of scale.	Check the temperature sensor (S5) wires and connections.	Substitute the temperature sensor (S5).
TR AL.220	**KEY OFF SHORTED**	Short circuit on key circuit.	Check the wire from EB1. J1.11 to ES8 (only for LPG / D) to EB2.JC.1.	Replace the Main Machine Controller.
TR AL.221	**FLASH CHECKSUM**	Issue internal to the drive board.	Switch off and on the machine by key switch (KEY).	Replace the Main Machine Controller.

Drive Board Error Codes				
CODE - Description (shown on multifunction display)		*Meaning*	*First procedure*	*If the problem persists*
TR AL.223	**COIL SHOR. MC-EB**	Contactor coil short circuit.	Check the wires between the Drive Wheel Controller and the Drive Wheel Controller contactor (ES2).	Substitute the Drive Wheel Controller contactor (ES2).
TR AL.226	**VACC OUT RANGE**	Pedal analogue output beyond max.	Check the accelerator pedal output (R1.WHITE WIRE).	Substitute the pedal.
TR AL.228	**SEAT SWITCH OPEN**	Seat microswitch open.	Check the wires between the drive board and the seat switch (SW1). Check the driver's seat switch (SW1) functionality.	Replace the driver's seat switch (SW1).
TR AL.231	**WATCHDOG#2**	Issue internal to the drive board.	Switch off and on the machine by key switch (KEY).	Replace the Main Machine Controller.
TR AL.233	**POWER MOS SHORT**	Issue internal to the drive board.	Switch off and on the machine by key switch (KEY).	Replace the Main Machine Controller.
TR AL.236	**CURRENT GAIN**	Issue internal to the drive board.	Switch off and on the machine by key switch (KEY).	Replace the Main Machine Controller.
TR AL.247	**DATA ACQUISITION**	Issue internal to the drive board.	Switch off and on the machine by key switch (KEY).	Replace the Main Machine Controller.
TR AL.248	**NO CAN MSG.**	CANBUS communication problem.	Check the twisted pair between the drive board and EB1.J7.	Replace the Main Machine Controller.
TR AL.249	**CHECK UP NEEDED**	Issue internal to the drive board.	Switch off and on the machine by key switch (KEY).	Replace the Main Machine Controller.
TR AL.250	**THERMIC SENS. KO**	Issue internal to the drive board.	Switch off and on the machine by key switch (KEY).	Replace the Main Machine Controller.
TR AL.251	**WRONG BATTERY**	Battery voltage at ignition <18V or > 30V.	Check the battery voltage.	Check the key circuit (from fuse F2 to EB1.J1.1 and from EB1.J1.11 to EB2.JC.1).
TR AL.252	**WRONG ZERO**	Issue internal to the drive board.	Switch off and on the machine by key switch (KEY).	Replace the Main Machine Controller.
TR AL.253	**SLIP_PROFILE**	Issue internal to the drive board.	Switch off and on the machine by key switch (KEY).	Replace the Main Machine Controller.

Driving Wheel Motor Current Draw Check

WARNING: This procedure must be performed by qualified personnel only.

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Unscrew the four screws (A) fastening the fairing (B).
4. Unscrew the nut (C) on the front.
5. Slide the sleeve (D) until it is flush on the steering wheel.
6. Press the stud (E), sliding it upwards (causing the Main Control Board (F) to lift slightly, then remove the fairing (B) by disengaging it from its seat and the stud (E).
7. Position a suitable lifting device (G) at the centre of the front section of the machine, on the chassis bracket (H), then raise the front of the machine by 3-4 centimeters until the front wheel can turn freely without touching the ground.

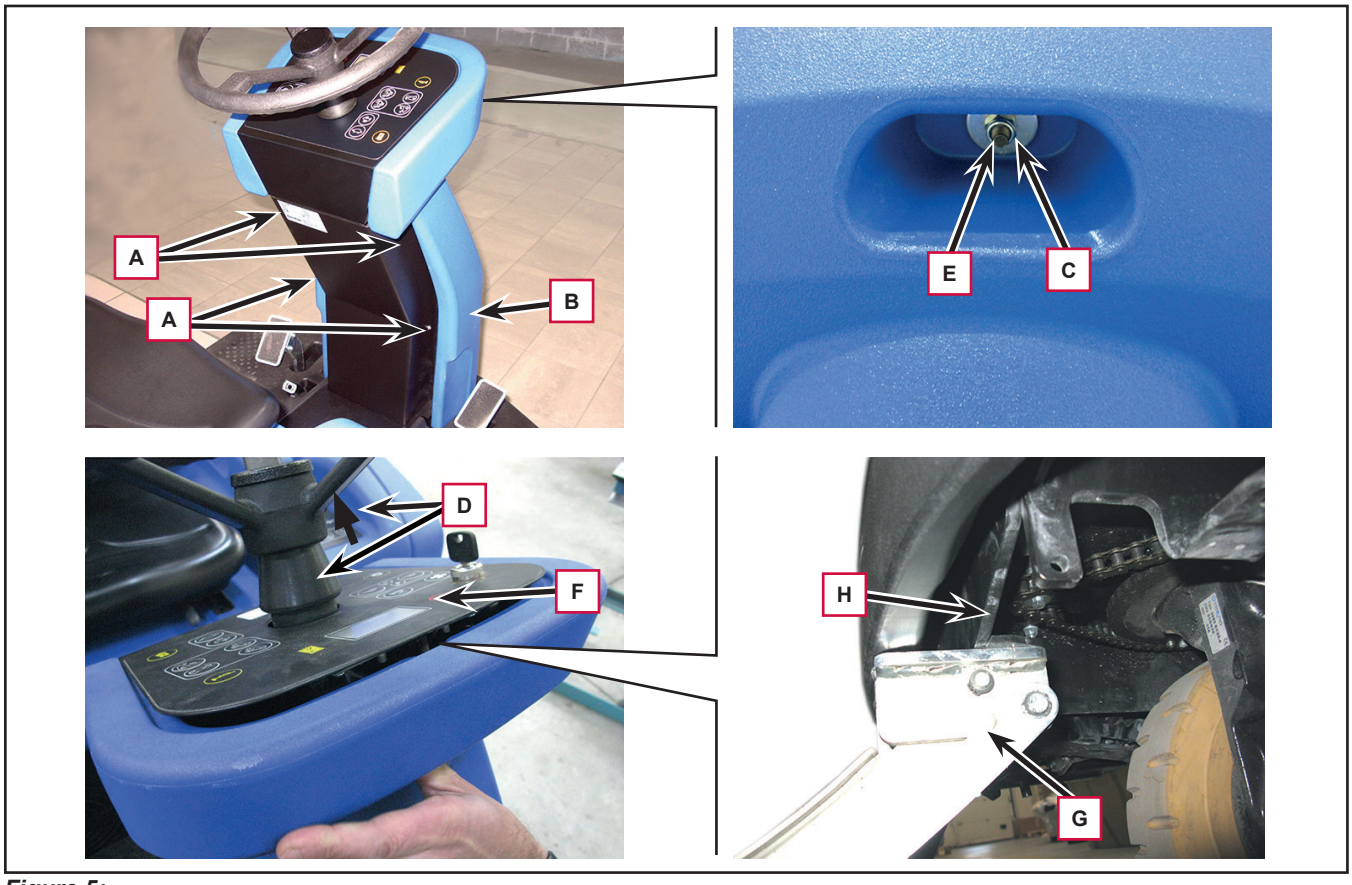


Figure 5:

Driving Wheel Motor Current Draw Check (continues)

8. For safety purposes, to prevent accidental lowering of the machine, apply two suitable spacers under the right (I) and left (J) side brackets.

9. Working on the drive board (M), apply the ammeter clamp (K) to the drive motor electrical cable (L).

10. Start the machine with the ignition key.

11. With the help of an assistant, carefully seat on the driver's seat to activate the microswitch, then turn on the drive system at the maximum speed and check that the driving wheel amperage is within 15 and 25A at 24Vac.
    Stop the drive system.
    Turn the ignition key to "0".
    Remove the ammeter clamp (K).
    If the amperage is higher, perform the following procedures to detect and correct it:

    - Check that there is no dust or debris (ropes, cables, etc.) on the driving wheel, that can prevent it from turning.

    - If necessary, disassemble the drive system motor (see procedure in the relevant paragraph), and check the condition of all its components.

    If the above-mentioned procedures do not lead to a correct amperage, the drive system motor must be replaced (see procedure in the relevant paragraph).

Reassembly

12. Perform steps 3. to 7. in the reverse order.

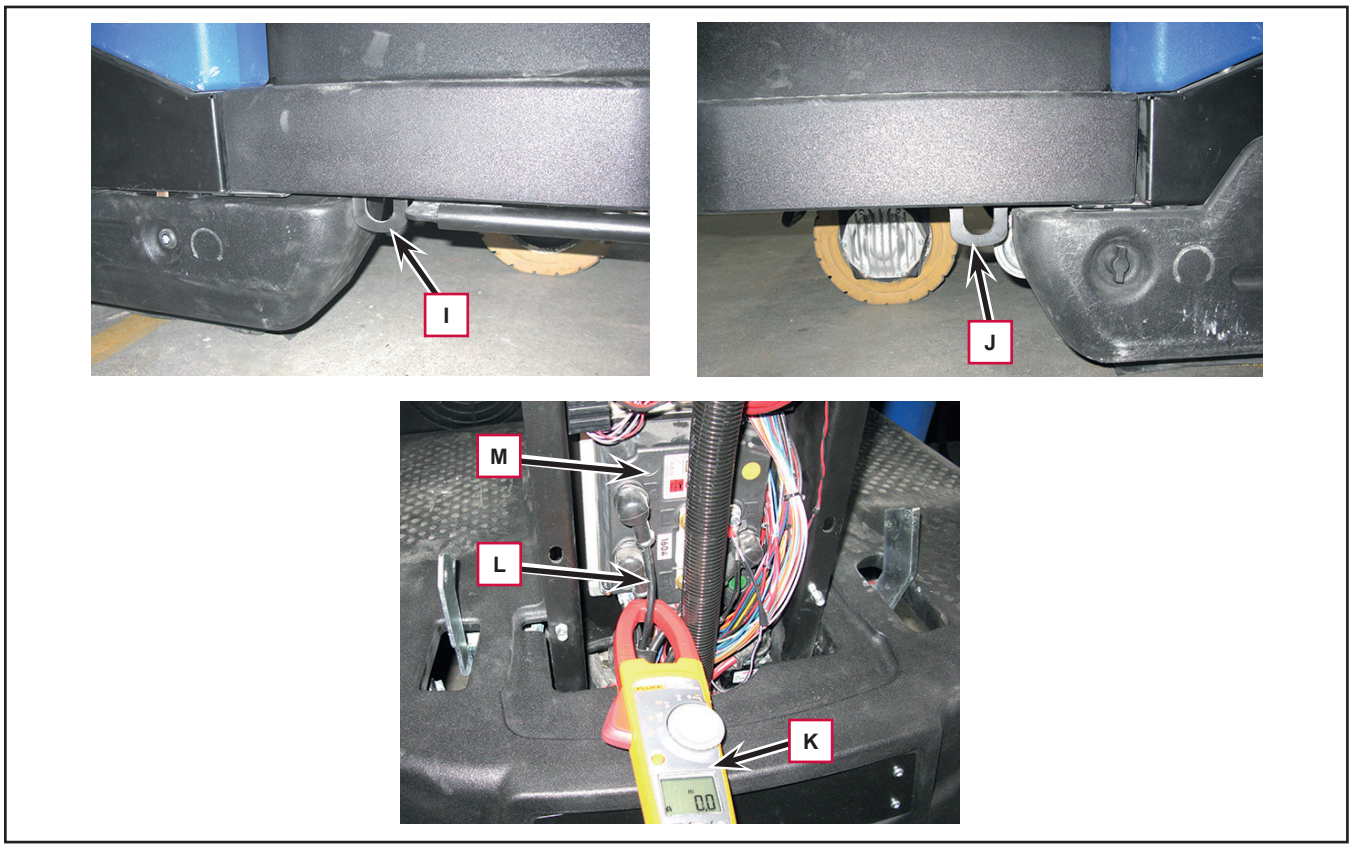


Figure 6:

Drive Board Connectors

Power Connections (male screw terminals M 6)					
Ref.	**Description**	**Drive board in/out**	**V ref.**	**I max.**	**Connected to**
BF	Drive board power supply +	in	24Vdc	250A	ES2
B+	Board power supply + (downline of fuse F3)	in	24Vdc	250A	F3
B-	Drive board power supply -	in	0Vdc	250A	BAT-
U	Drive motor phase U	out	0 - 24Vac	250A	M0.U
V	Drive motor phase V	out	0 - 24Vac	250A	M0.V
W	Drive motor phase W	out	0 - 24Vac	250A	M0.W

Shop Measurements - Drive Wheel Controller (EB2)

JB Connector:

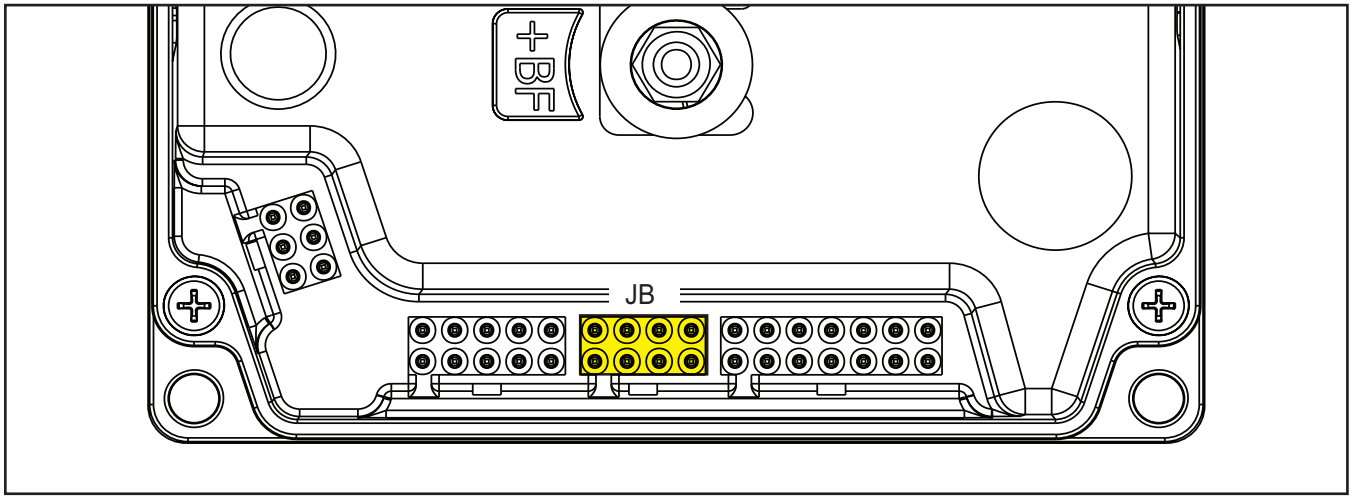


Figure 7:

PIN	Color	Description	Measured/Condition
1			
2	Red	Power Supply from ES2 contactor	Key off - 0v Key on - 25.3V
3			
4	Yellow	Drive Pedal Micro-switch input	Pedal not pressed -0V Pedal pressed - 23.9V
5			
6	Orange/ Black	ES2 Contactor Coil control	On - 0.82V
7			
8	Grey	Drive Direction Request	Forward - 0.0V Reverse - 6.9V

Shop Measurements - Drive Wheel Controller (EB2) (continues)

JC Connector:

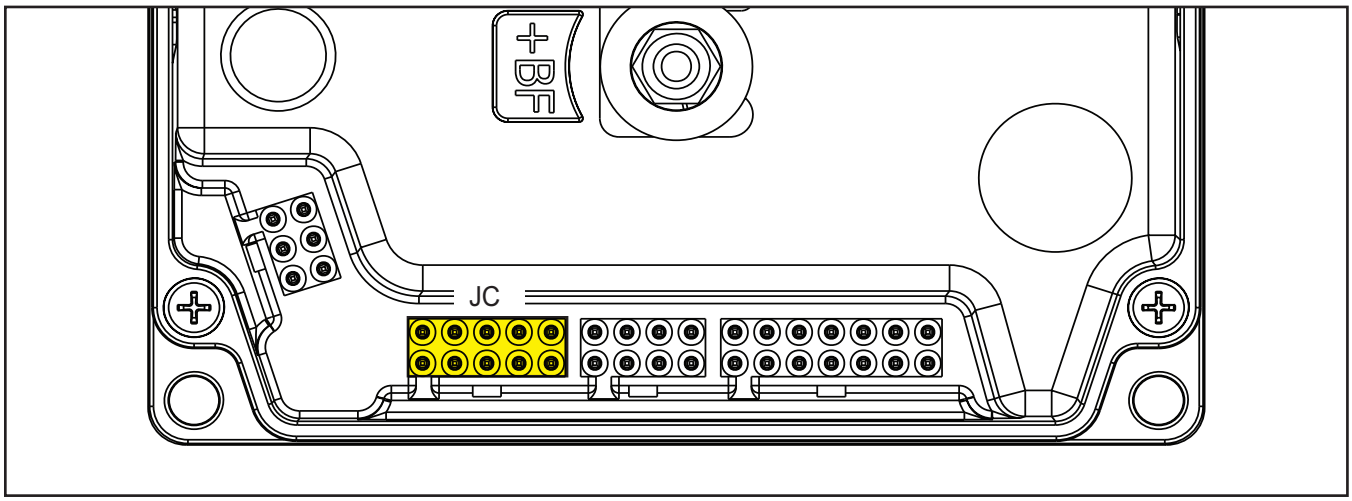


Figure 8:

PIN	Color	Description	Measured/Condition
1	Orange/ Black	“Key on” input from Main Machine Controller	Key Off - 0V Key On - 23.9?
2	Violet	Smart Key Communication (Optional)	
3	Brown	POT Low output	0.005V
4	White	POT Wiper	Pedal at rest - 0.014V Full forward - 4.9V
5	Red	CAN High	2.45V
6	Violet/Black	Seat Switch Input	Open - 0.005V Closed (On seat) - 23.9V
7			
8	Green	POT High	13.4V
9	Blue	Maximum Speed input from Main Machine Controller	Speed Select 1 - 1.21V 2 - 1.93V 3 - 2.66V 4 - 3.39V 5 - 4.13V
10	Black	CAN Low	2.39V

Shop Measurements - Drive Wheel Controller (EB2) (continues)

JD Connector:

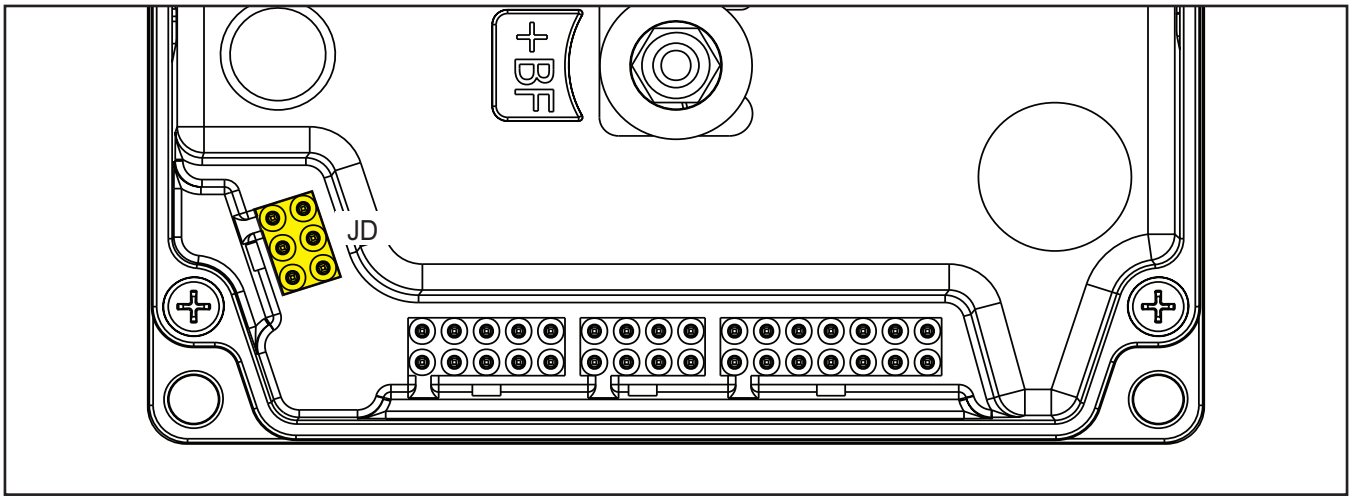


Figure 9:

PIN	Color	Description	Measured/Condition
1	Blue	Encoder Phase A	13.5V or 0.135V depending on location. You can move the wheel slightly by hand to confirm that it switches. Rotating - 6.7V Average
2	Red	Encoder positive supply	13.4V
3	Yellow	Motor Temp. Sensor input	1.38V @ 26 Deg C. 12.1V when circuit is open
4	White	Encoder Phase B	13.5V or 0.135V depending on location. You can move the wheel slightly by hand to confirm that it switches. Rotating - 6.7V Average
5	Black	Encoder negative supply	0.005V
6	Yellow/Black	Motor Temp. Sensor negative reference	0.005V

High Current Cables			
Measurment points	**Stationary**	**Low Speed No load**	**Full Speed Forward No load**
U to V U to W V to W	1.0 mVAC 0 HZ	2.4 VAC HZ 3.7 KHZ	19.12 VAC 105 HZ
Battery Positive to B+			0.005V
Battery Negative to B-			0.069V

Removal and Installation

Driving Wheel

Removal

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Position a suitable lifting device (A) at the centre of the front section of the machine, on the chassis bracket (H), then raise the front of the machine by a few centimeters until the driving wheel can be removed.
4. For safety purposes, to prevent accidental lowering of the machine, apply two suitable spacers under the right (C) and left (D) side brackets.
5. Unscrew the six screws (E).
6. Remove the wheel (F).

Installation

7. Assemble the components in the reverse order of removal.

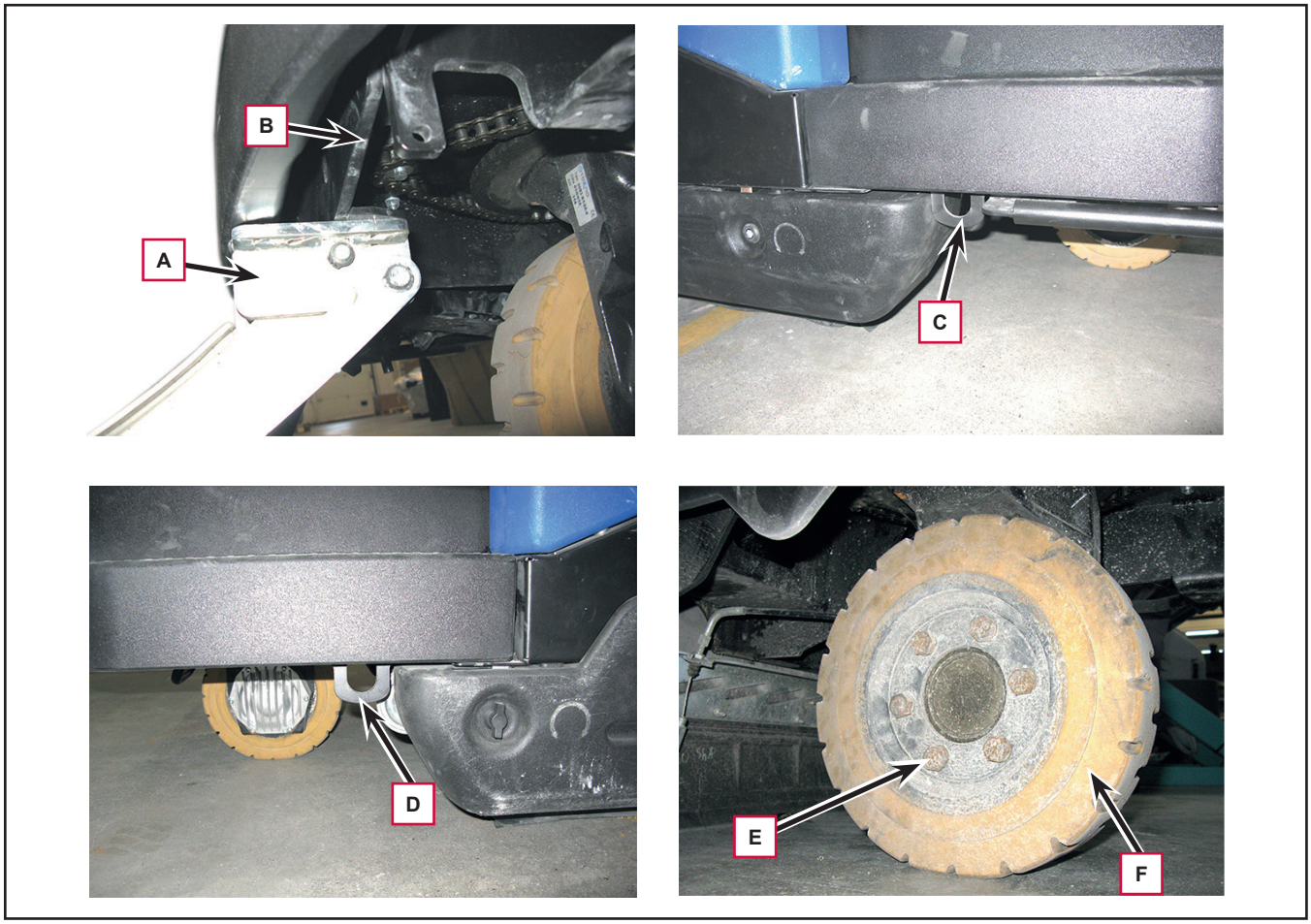


Figure 10:

Driving Wheel Assembly - Spare parts

1. Motorwheel (A).
2. Chain stretcher (B).
3. Non marking wheel (C).
4. Motor (D).
5. Steering plate (E).
6. Gear box for motorwheel (F).
7. Speed kit (G).

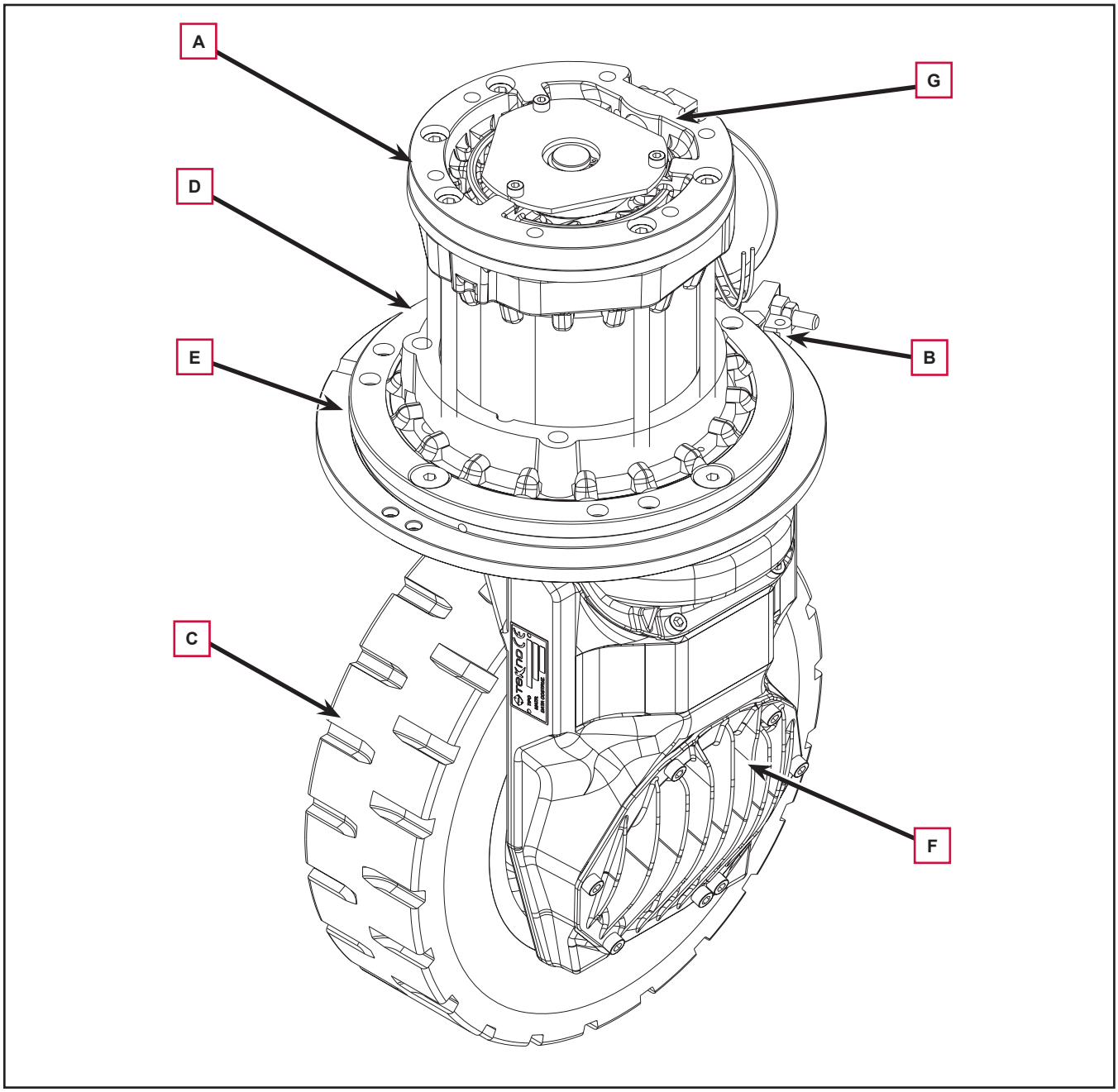


Figure 11:

Driving Wheel Assembly

Removal

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Open the battery/engine compartment hood with the handle and fasten it with the support rod.
4. Disconnect the battery connector (Battery Version) - Disconnect the batteries (Diesel and LPG Version).
5. Unscrew the four screws (A) fastening the fairing (B).
6. Unscrew the nut (C) on the front.
7. Slide the sleeve (D) until it is flush on the steering wheel.
8. Press the stud (E), sliding it upwards causing the Main Control Board (F) to lift slightly, then remove the fairing (B) by disengaging it from its seat and the stud (E).
9. Disconnect the electrical connection (G) from the Display Controller (H).
10. Disconnect the electrical connections (I) from the ignition key assembly (J).
11. Unscrew the four screws (K) on the Main Control Board support.

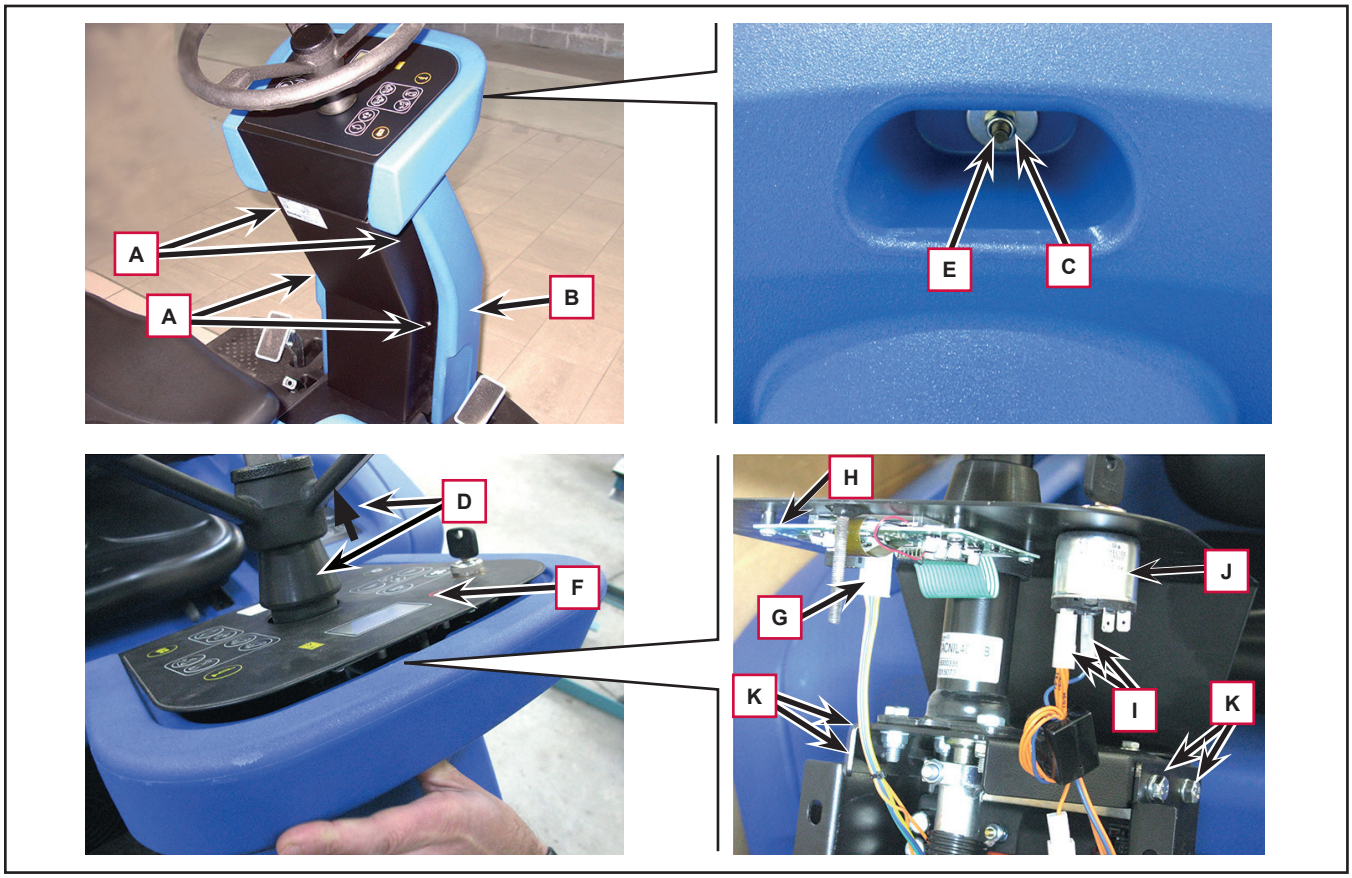


Figure 12:

Driving Wheel Assembly (continues)

12. Remove the steering wheel with steering shafts assembly (L), gripping it as shown in the figure, and disengaging it from the shaft with key (M).

13. Remove the screws (N) and remove the accelerator (P) and brake (Q) pedals.

14. Unscrew the handwheels (R) on the left-hand side of the machine and remove the left door (S).

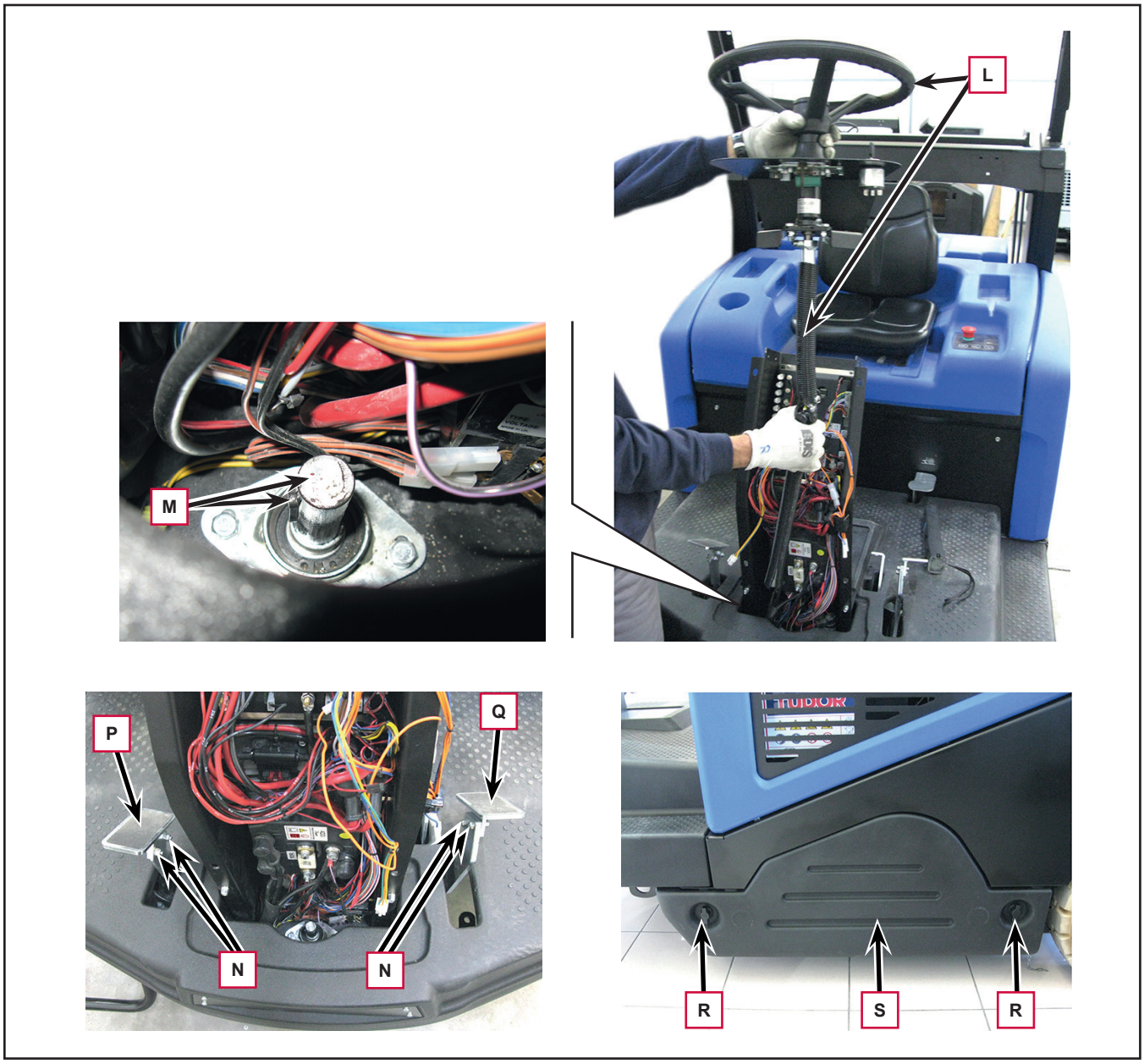


Figure 13:

Driving Wheel Assembly (continues)

15. Unscrew the screws (T) on the right-hand side of the machine and remove the right door (U).
16. Unscrew the two screws (V) and remove the cover (W) at the base of the steering column.
17. Working below the footboard (X), unscrew the screws in the fastening positions (Y) of the footboard itself.
18. Remove the footboard (X), freeing it from the steering column (Z).

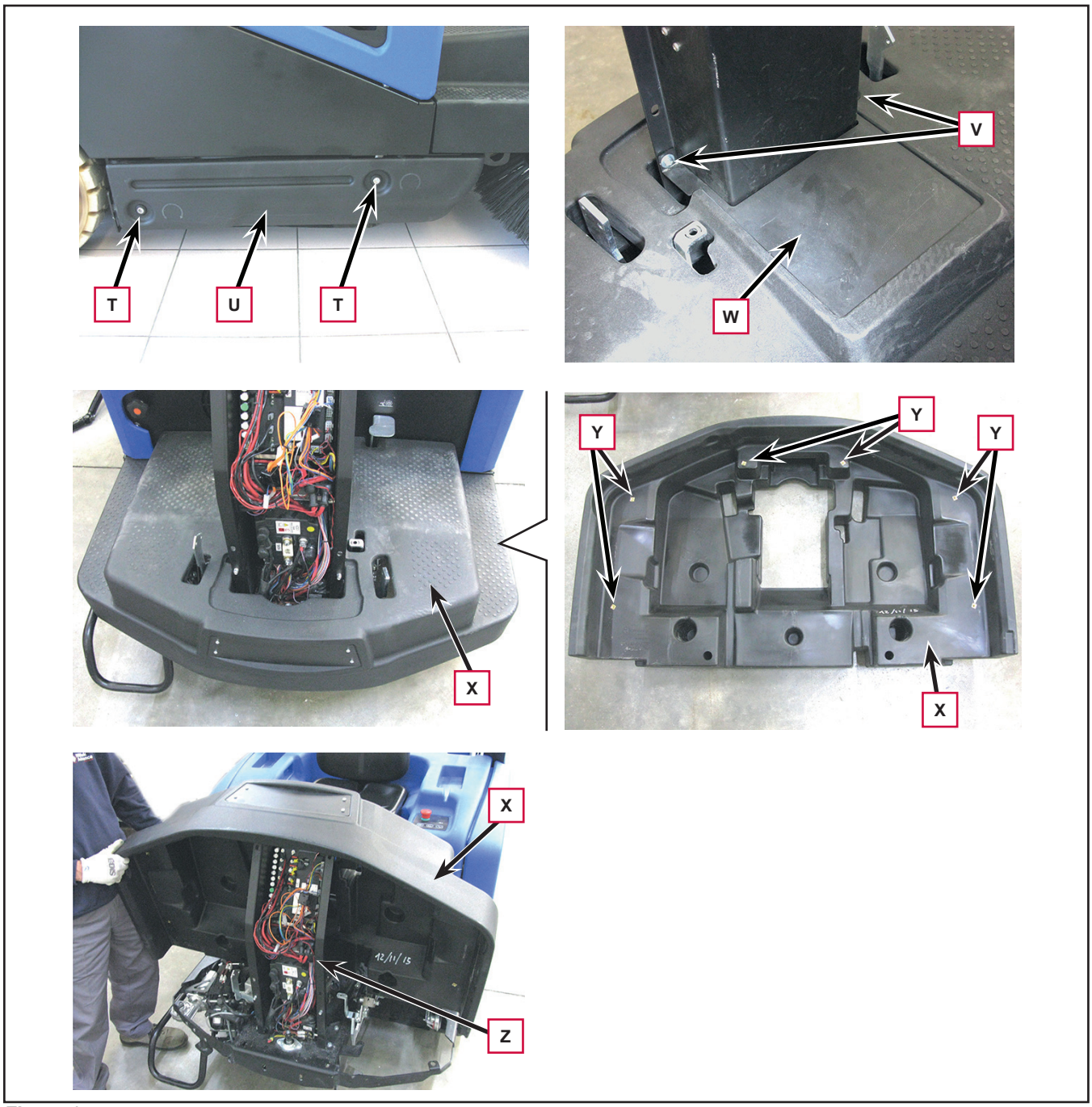


Figure 14:

Driving Wheel Assembly (continues)

19. Remove the steering chain (see procedure in the Steering System chapter).
20. Free the three caps (AA) and disconnect the three electrical connections (AB) of the driving wheel (AC), after unscrewing the corresponding nuts.
21. Disconnect the driving wheel temperature electrical connection (AD).
22. Disconnect the encoder electrical connection (AE).
23. Cut the fastening clamps (AF).

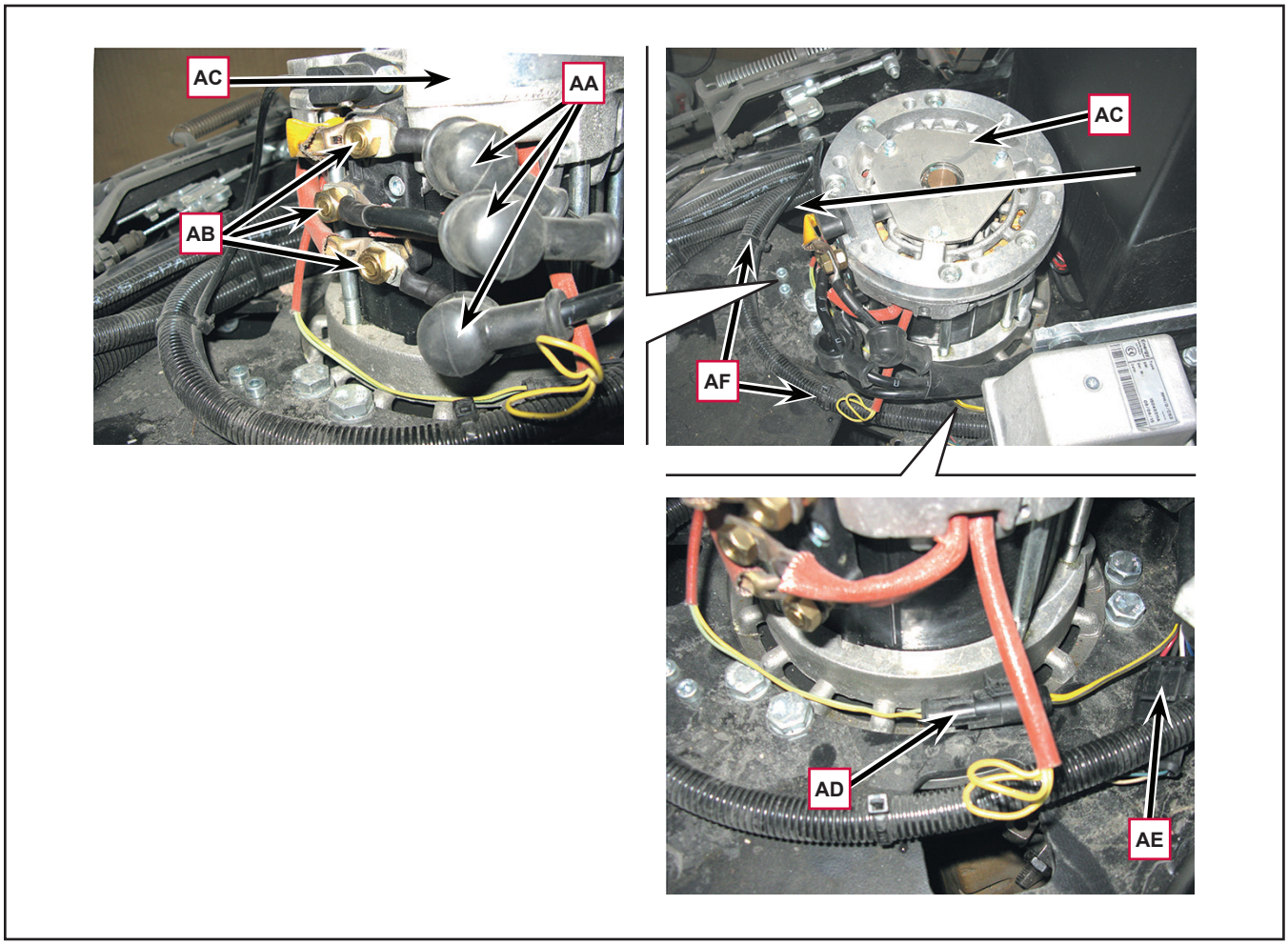


Figure 15:

Driving Wheel Assembly (continues)

24. Unscrew the six screws (AG) fastening the driving wheel (AC); lift the wiring (AH) slightly for the two left screws.

25. Position a suitable lifting device (AI) at the centre of the front section of the machine, on the chassis bracket (AL), then carefully raise the front of the machine by a few centimeters until the driving wheel (AM) can be removed; take care, as the driving wheel weighs 95 lb (43 Kg).

Installation

26. Assemble the components in the reverse order of removal, and note the following:

    - When positioning the driving wheel (AM), take care that it is correctly oriented in the corresponding seat of the machine chassis.

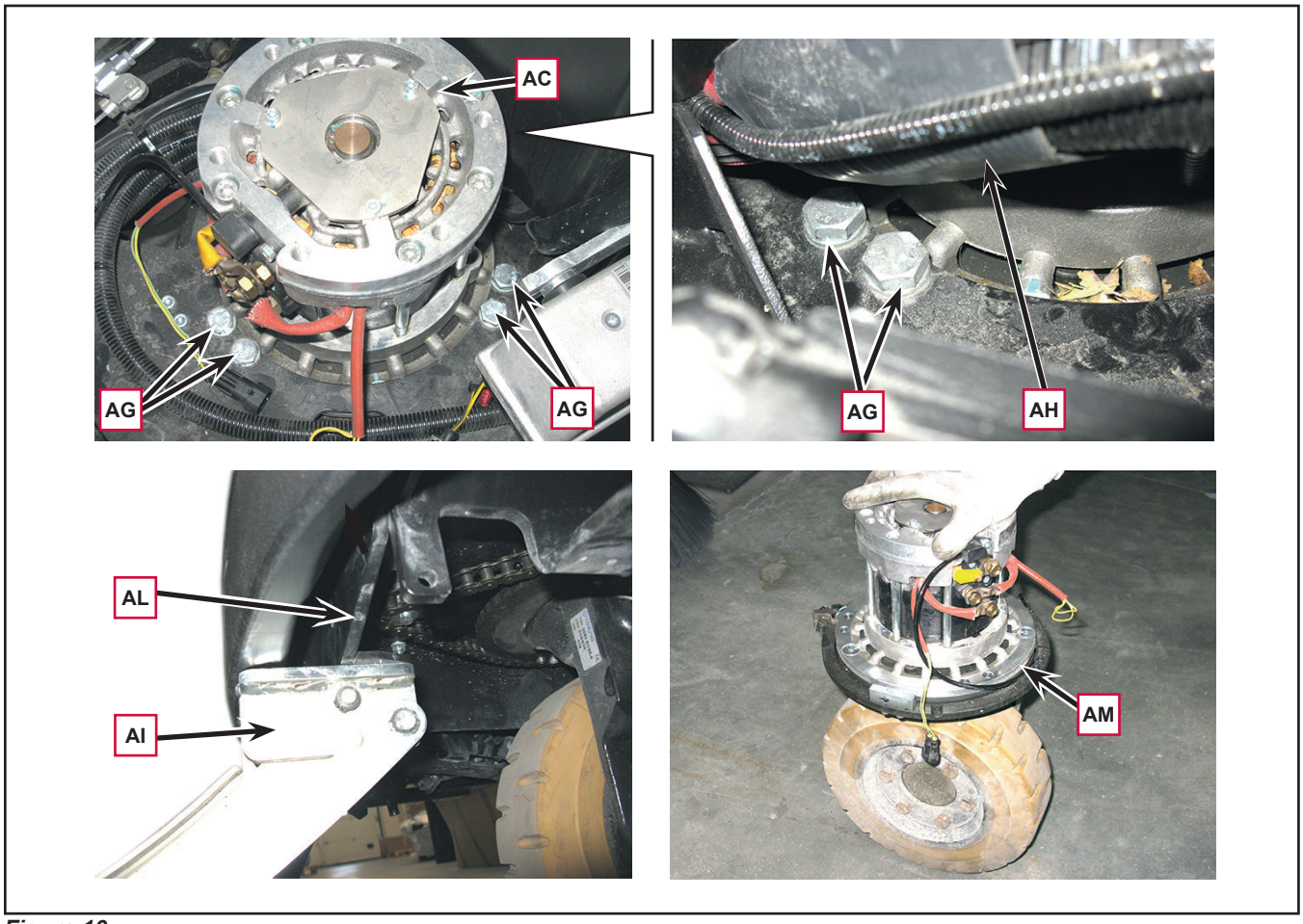


Figure 16:

Accelerator Pedal

Removal

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Open the battery/engine compartment hood with the handle and fasten it with the support rod.
4. Disconnect the battery connector (Battery Version) - Disconnect the batteries (Diesel and LPG Version).
5. Unscrew the four screws (A) fastening the fairing (B).
6. Unscrew the nut (C) on the front.
7. Slide the sleeve (D) until it is flush on the steering wheel.
8. Press the stud (E), sliding it upwards (causing the Main Control Board (F) to lift slightly, then remove the fairing (B) by disengaging it from its seat and the stud (E).
9. Disconnect the electrical connection (G) from the Display Controller (H).
10. Disconnect the electrical connections (I) from the ignition key assembly (J).
11. Unscrew the four screws (K) on the Main Control Board support.

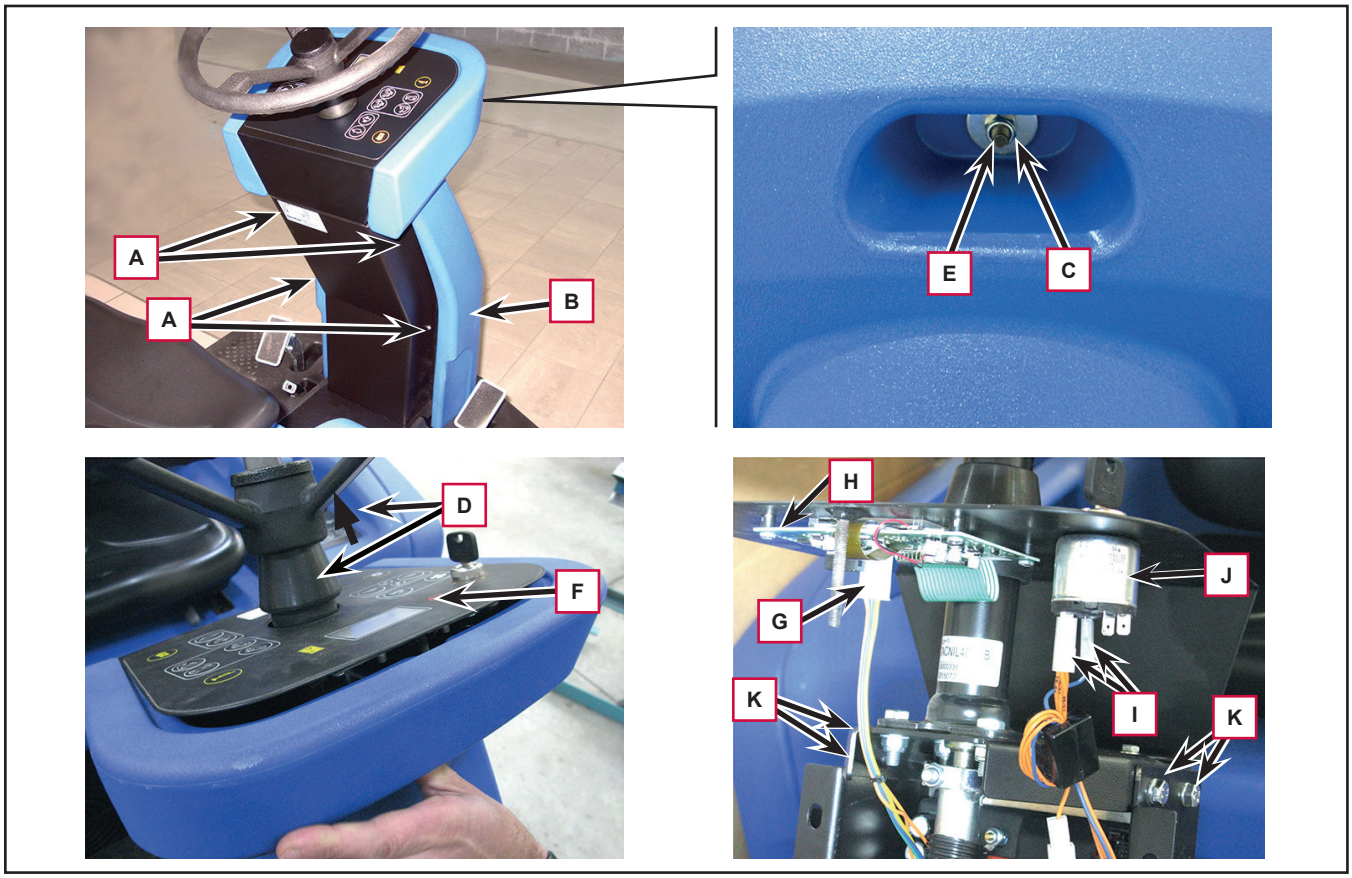


Figure 17:

Accelerator Pedal (continues)

12. Remove the steering wheel with steering shafts assembly (L), gripping it as shown in the figure, and disengaging it from the shaft with key (M).
13. Remove the side brooms (see procedure in the Side Broom System).
14. Remove the screws (N) and remove the accelerator (P) and brake (Q) pedals.
15. Unscrew the handwheels (R) on the left-hand side of the machine and remove the left door (S).

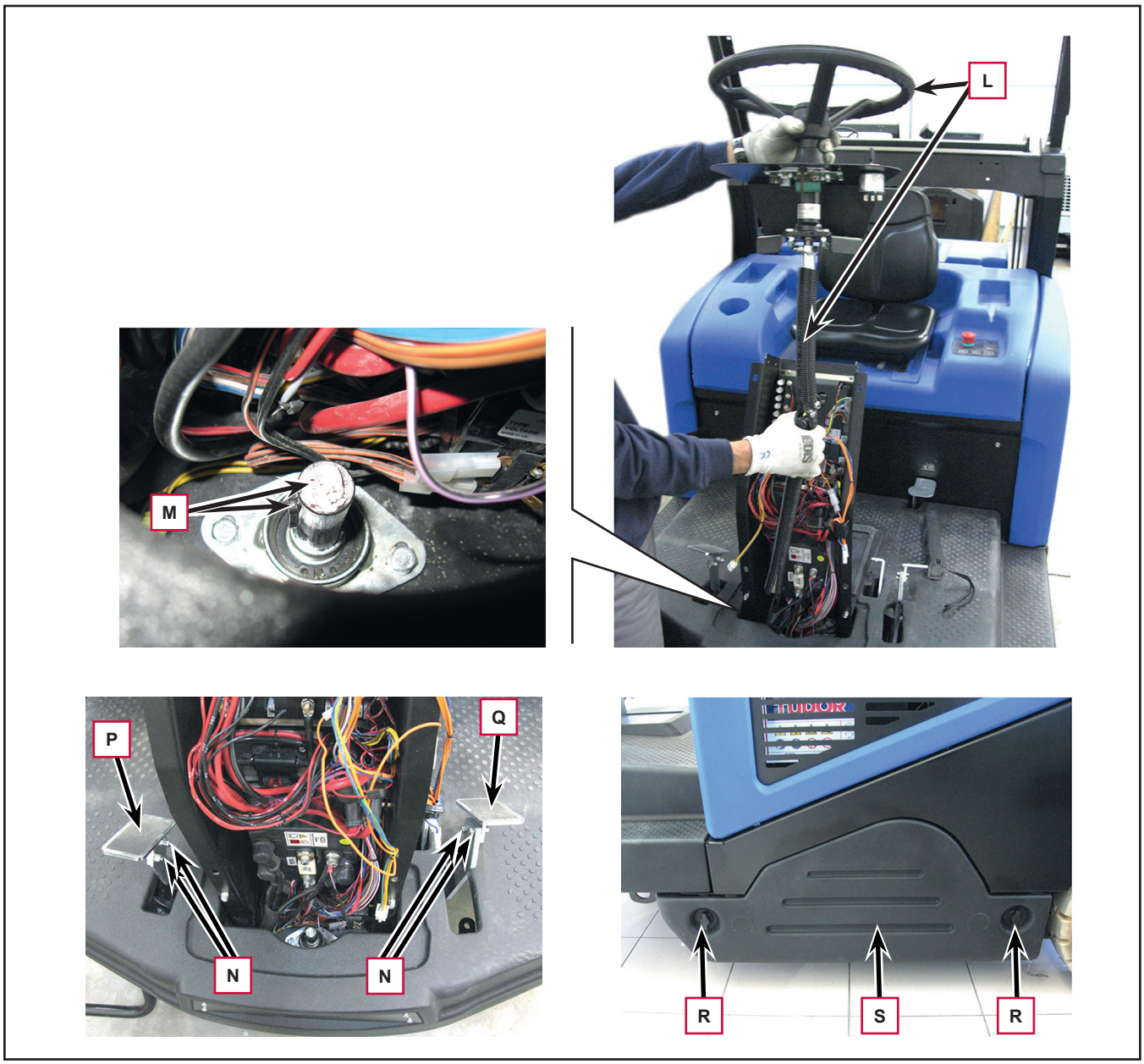


Figure 18:

Accelerator Pedal (continues)

16. Unscrew the screws (T) on the right-hand side of the machine and remove the right door (U).
17. Unscrew the two screws (V) and remove the cover (W) at the base of the steering column.
18. Working below the footboard (X), unscrew the screws in the fastening positions (Y) of the footboard itself.
19. Remove the footboard (X), freeing it from the steering column (Z).

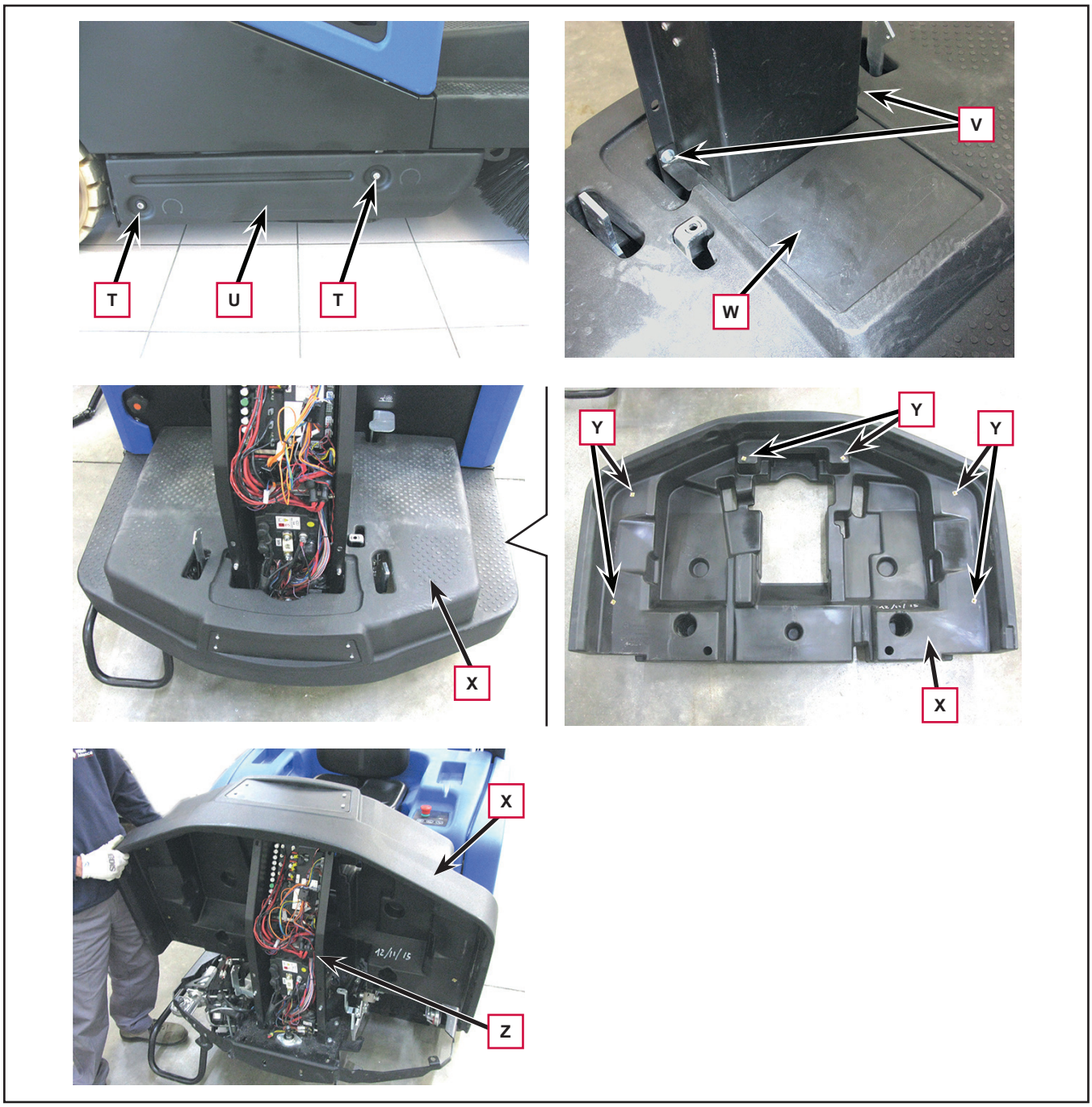


Figure 19:

Accelerator Pedal (continues)

20. Disconnect the two electrical connections (AA) of the accelerator pedal; if necessary, cut any clamps in the way.

21. Unscrew the screws (AB) and remove the accelerator pedal (AC).

22. If necessary, go to the workbench to unscrew the screw (AD) and remove the lever (AE) from the accelerator pedal (AC), freeing it from the shaft (AF) with seat.

Assembly

23. Assemble the components in the reverse order of removal, and note the following:

    - When re-installation is complete, check that the accelerator pedal is working correctly.

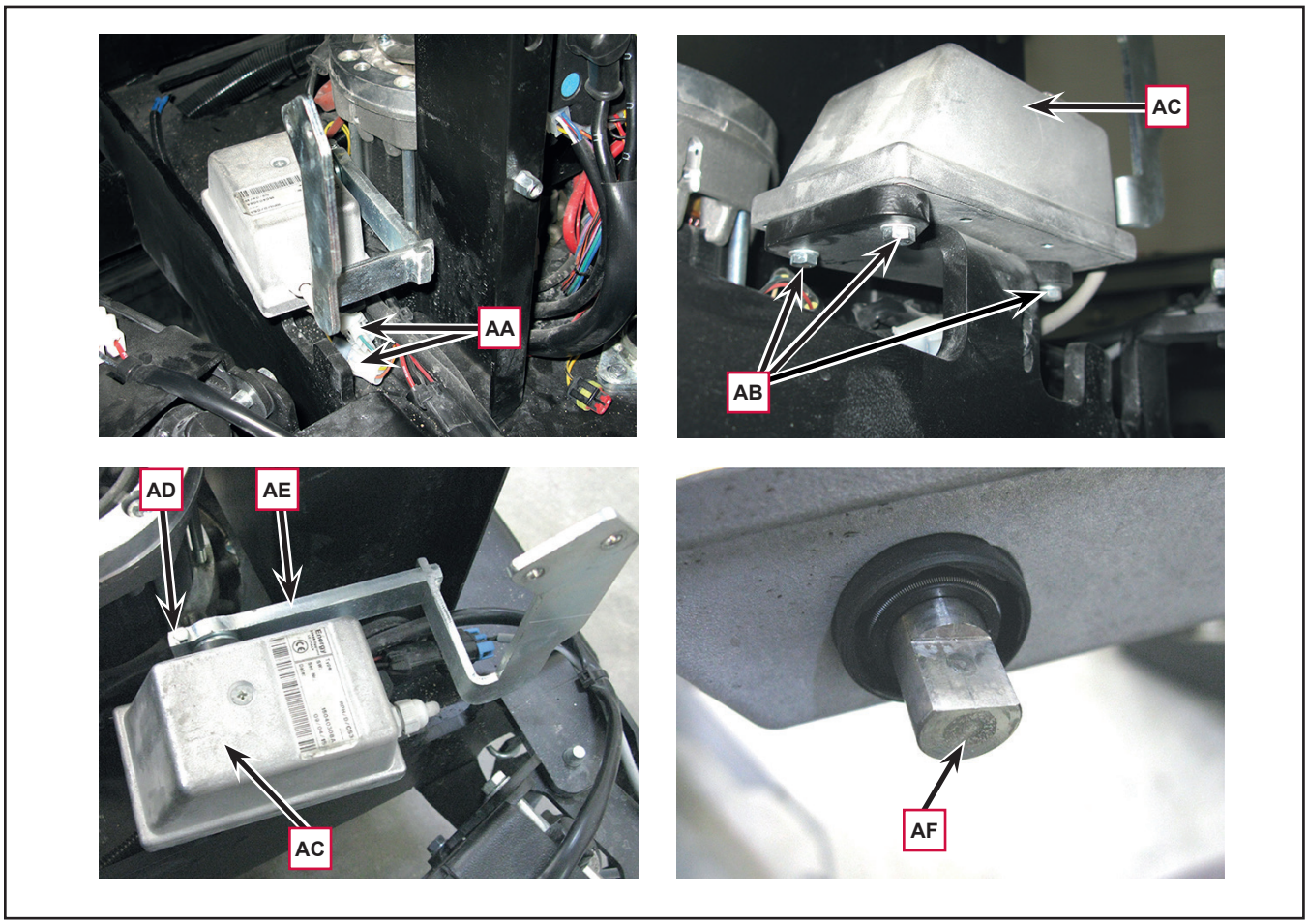


Figure 20:

Driver's Seat Microswitch

Removal

1. Drive the machine on a level floor.
2. Turn the ignition key to "0", then engage the parking brake.
3. Open the battery/engine compartment hood.
4. Disconnect the battery connector (Battery Version) - Disconnect the batteries (Diesel and LPG Version).
5. Working from the inside of the battery/engine compartment, disconnect the electrical connection (A) of the seat microswitch.
6. If necessary, also remove the seat rails by unscrewing the nuts (B).
7. Disengage the support rod (C) and close the battery/engine hood.
8. Operate the lever (D) and remove the seat (E) from the rails.
9. Free the seat cable (F) from the hole.
10. If necessary, remove the screws (G) and the rails (H).

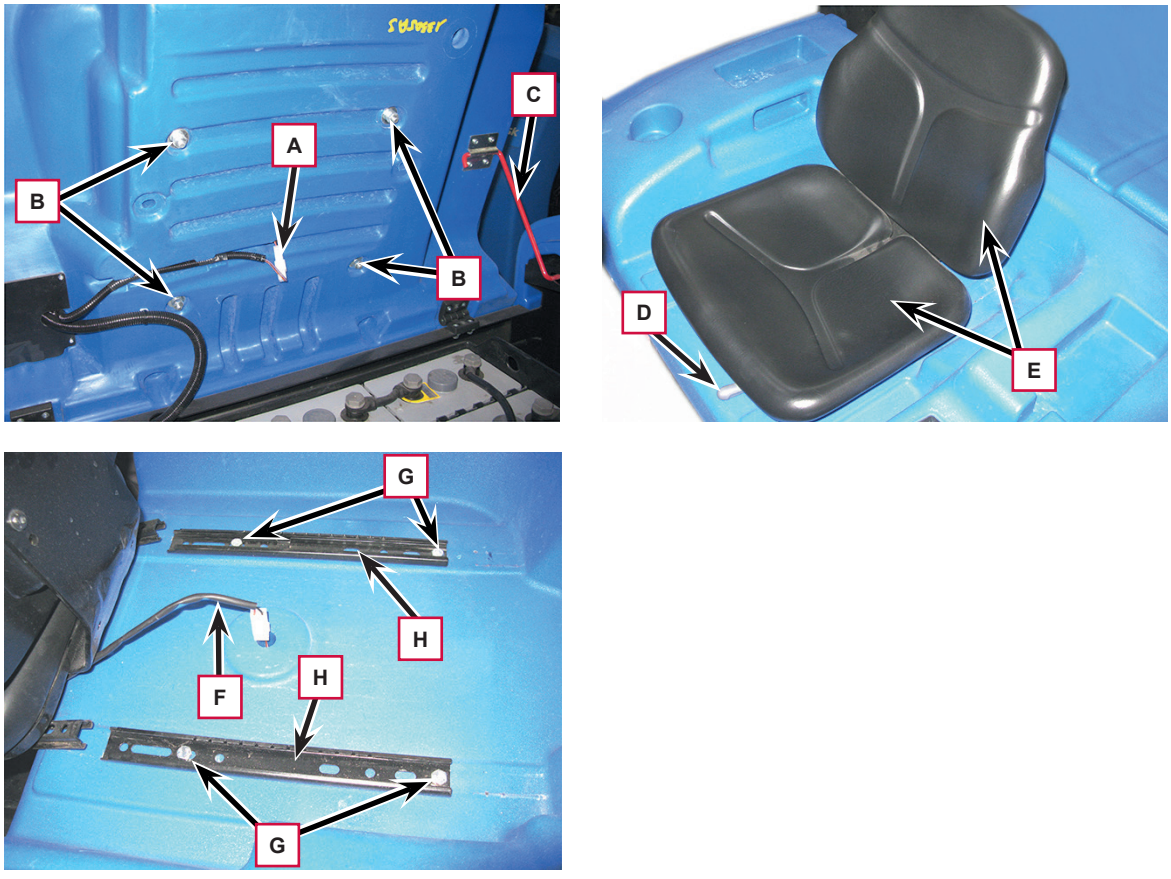


Figure 21:

Driver's Seat Microswitch (continues)

Installation

11. Assemble the components in the reverse order of removal, and note the following:

    - Before tightening the screws (G) check that the seat rails (H) are aligned
    - After the seat have been reinstalled, check that it slides properly on the rails, and also check that it engages properly in each position.
    - Also check correct operation of the seat microswitch by trying the start the machine without sitting in the seat

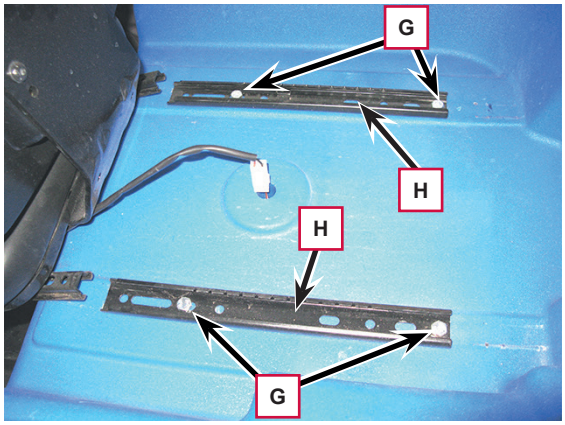


Figure 22:

Specifications

Model		SW5500 B FLOORTEC R 985 B	SW5500 D	SW5500 LPG FLOORTEC R 985 LPG
Drive	Type	Electrical on the front wheel		
	Gearmotor power	1.6 hp (1,200 W)		
	Max torque during acceleration	500 Nm		
	Ingress protection	IP20		
	Forward speed	5.6 mi/h (9 km/h)	6.2 mi/h (10 km/h)	
	Reverse speed	2.5 mi/h (4 km/h)	2.8 mi/h (4.5 km/h)	
Driving wheel diameter		12 in (300 mm)		
Maximum gradient when working		20 %		
Front axle weight in running conditions		1,106 lb (502 Kg)	780 lb (354 Kg)	804 lb (365 Kg)
Front wheel specific pressure on the floor		232 psi (1.6 N/mm^2)	101 psi (0.7 N/mm^2)	101 psi (0.7 N/mm^2)
U-turn space (right - left)		91 - 93.5 in (2,310 - 2,375 mm)		

22 - Steering System

Functional Description

The steering wheel is fastened to the steering column and connected to a shaft with a universal joint.

The movement is transmitted with pinion and chain to the ring gear, which determines the steering. The ring gear is fastened to the driving wheel.

Component Locations

- Steering wheel
- Steering column
- Universal joint
- Steering shaft
- Steering assembly
- Steering chain

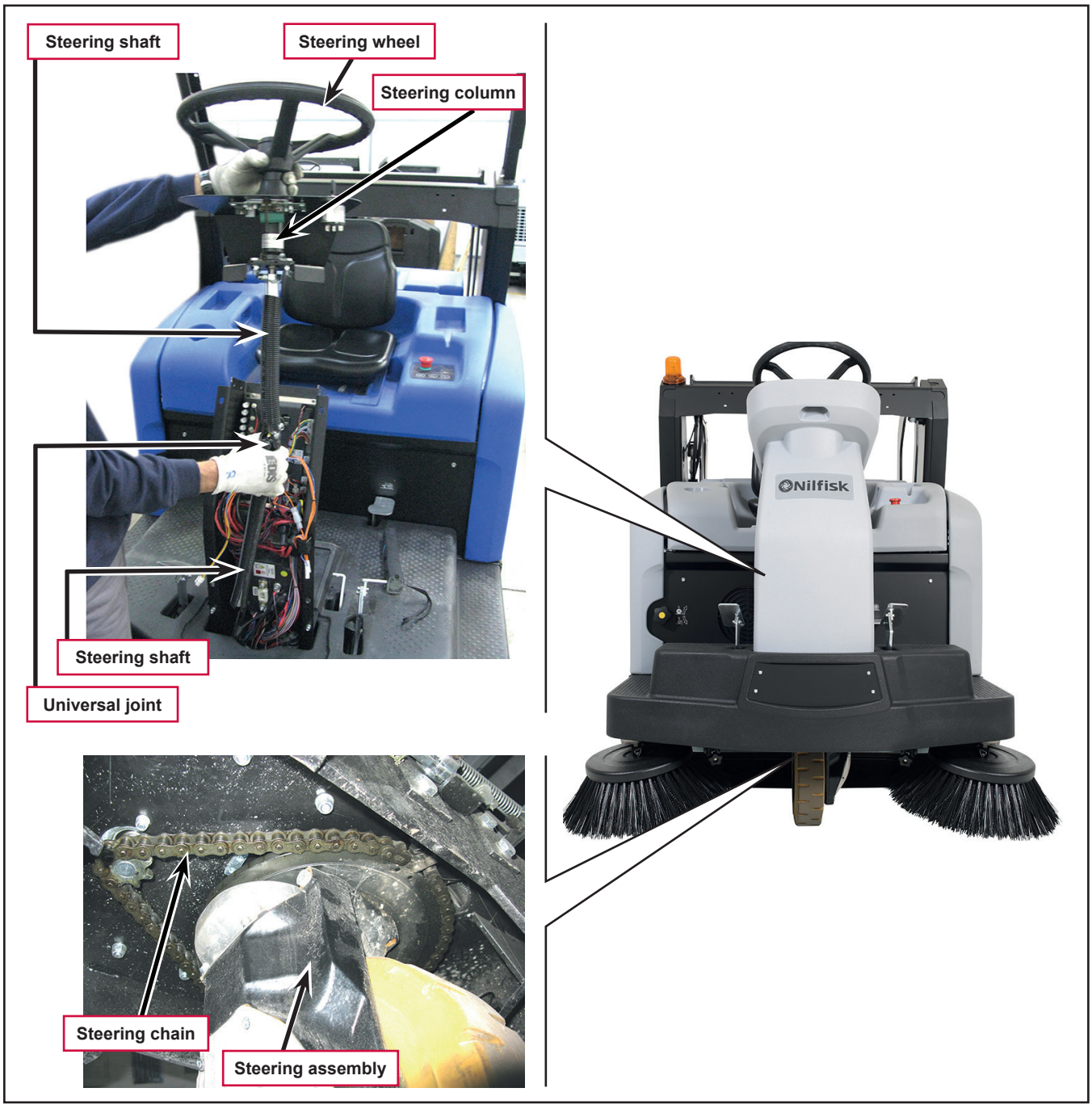


Figure 1:

Removal and Installation

Steering Wheel

Removal

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Detach and remove the steering wheel cover (A).
4. Unscrew the nut (B) and remove the washer (C).
5. With a suitable puller, remove the steering wheel (D) using the surface (E) of the steering shaft and the threaded holes (F) of the steering wheel.

Installation

6. Assemble the components in the reverse order of removal, and note the following:
   - Insert the steering wheel in its seat (D), ensuring the following conditions are met:
   - Driving wheel straight (not steered)
   - Steering wheel with circular impression (G) on the right and straight lower spoke (I), as shown in the figure.

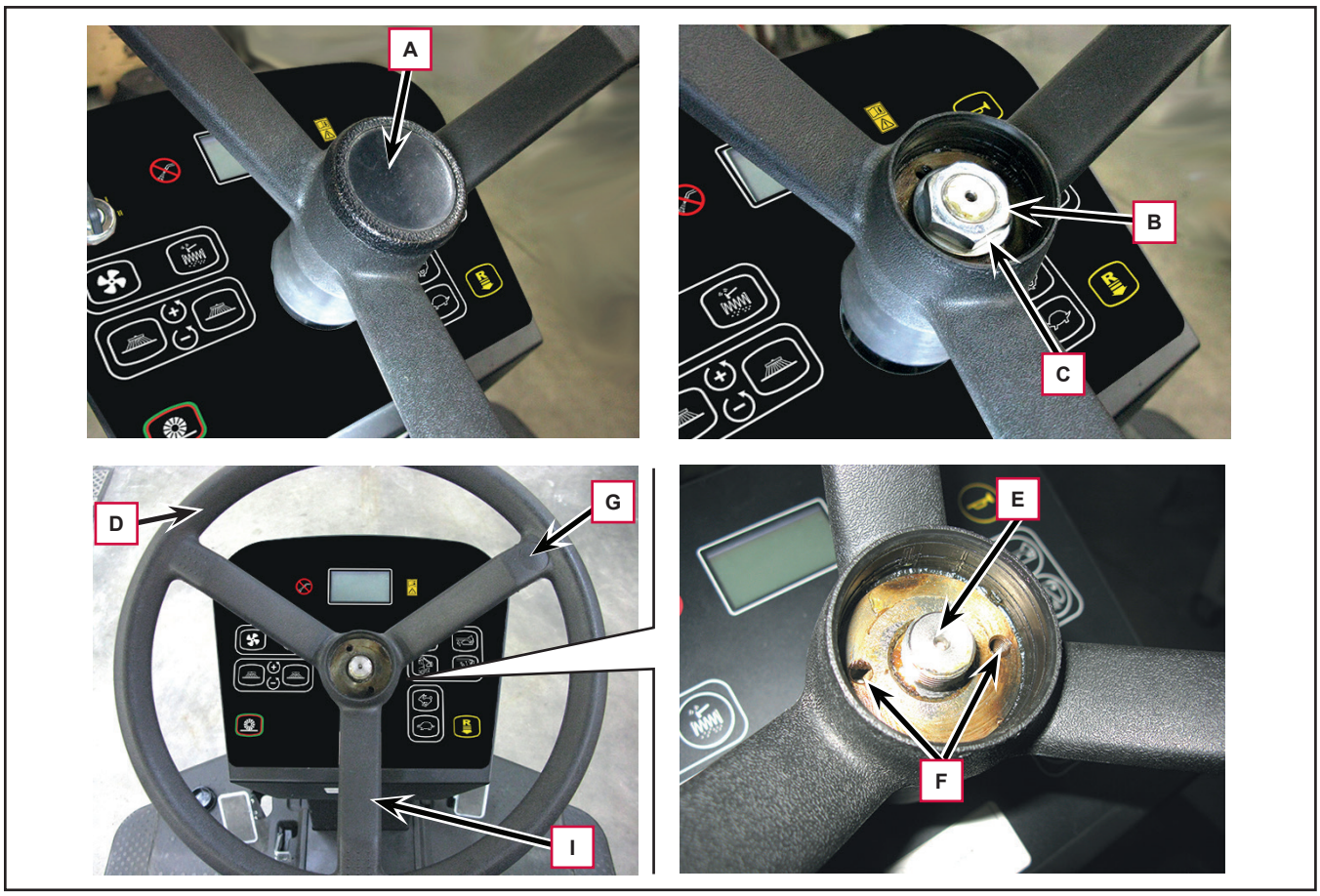


Figure 2:

Steering Chain

Removal

1. If possible, place the machine on a hoisting system.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Steer the front wheel until the linkage (A) of the steering chain (B) becomes visible.
4. Loosen the locknut (C) and the nut (D).
   If there is no footboard on the machine, the operations on the locknut (C) and the nut (D) can be performed from the upper section of the chassis, through the slot (E).
5. Remove the link (F) and remove the chain (B).

Installation

6. Assemble the components in the reverse order of removal, and note the following:
   - Do not lubricate the chain (B), otherwise dust and debris will stick to the lubricant.
   - The chain must be tensioned slightly using the nut (D); then lock in position using the locknut (C).

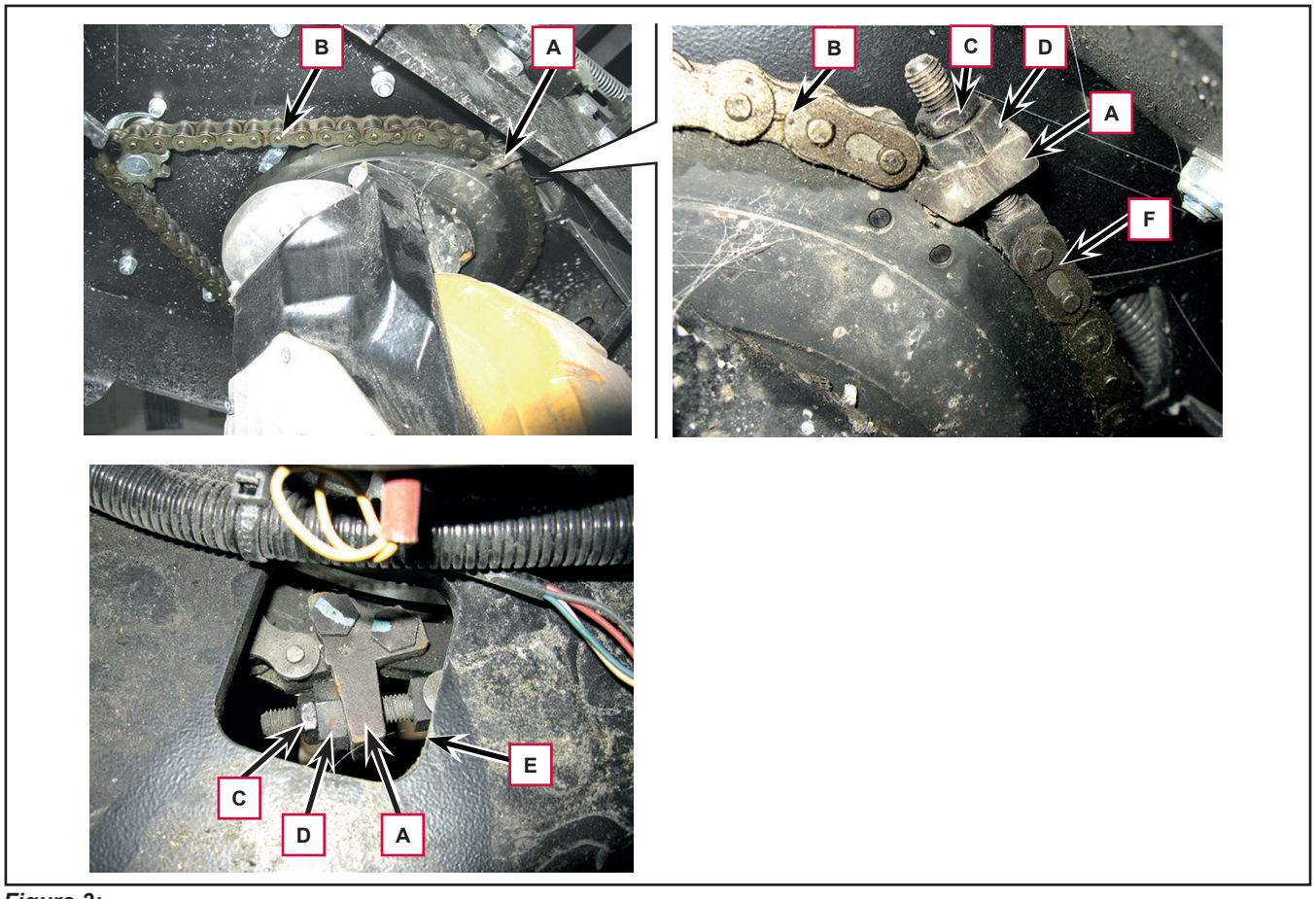


Figure 3:

24 - Electrical System

Functional Description - Battery Version

The electrical system is basically a 24Vdc nominal system of electronically managed motors.

The battery is connected to the system by means of the connector (C1). Downline of the connector a safety fuse is installed, (F1) before the power section of the Main Machine Controller (EB1), and (F3) before the power system of the Drive Wheel Controller (EB2). These fuses are sized to blow only if the power section of the boards becomes seriously damaged.

The key circuit, independent of the previous ones, is protected by the fuse (F2).

The on board battery charger (CH) is directly connected on the battery pins for the power side, to connector (C2) for the inhibition signal. When the battery charger is not connected to the electrical mains, the relay inside the battery charger closes the contact between the 2 wires connected to (C2), this contact opens when the battery charger is connected to the electrical mains. When the battery charger is not installed, the connector (C2) is closed by a jump connection. The connector contacts (C2) are upstream of the ignition key (SW0) and cut off the power supply to all control section of the electrical system.

For further details, see the descriptions of individual sub-systems.

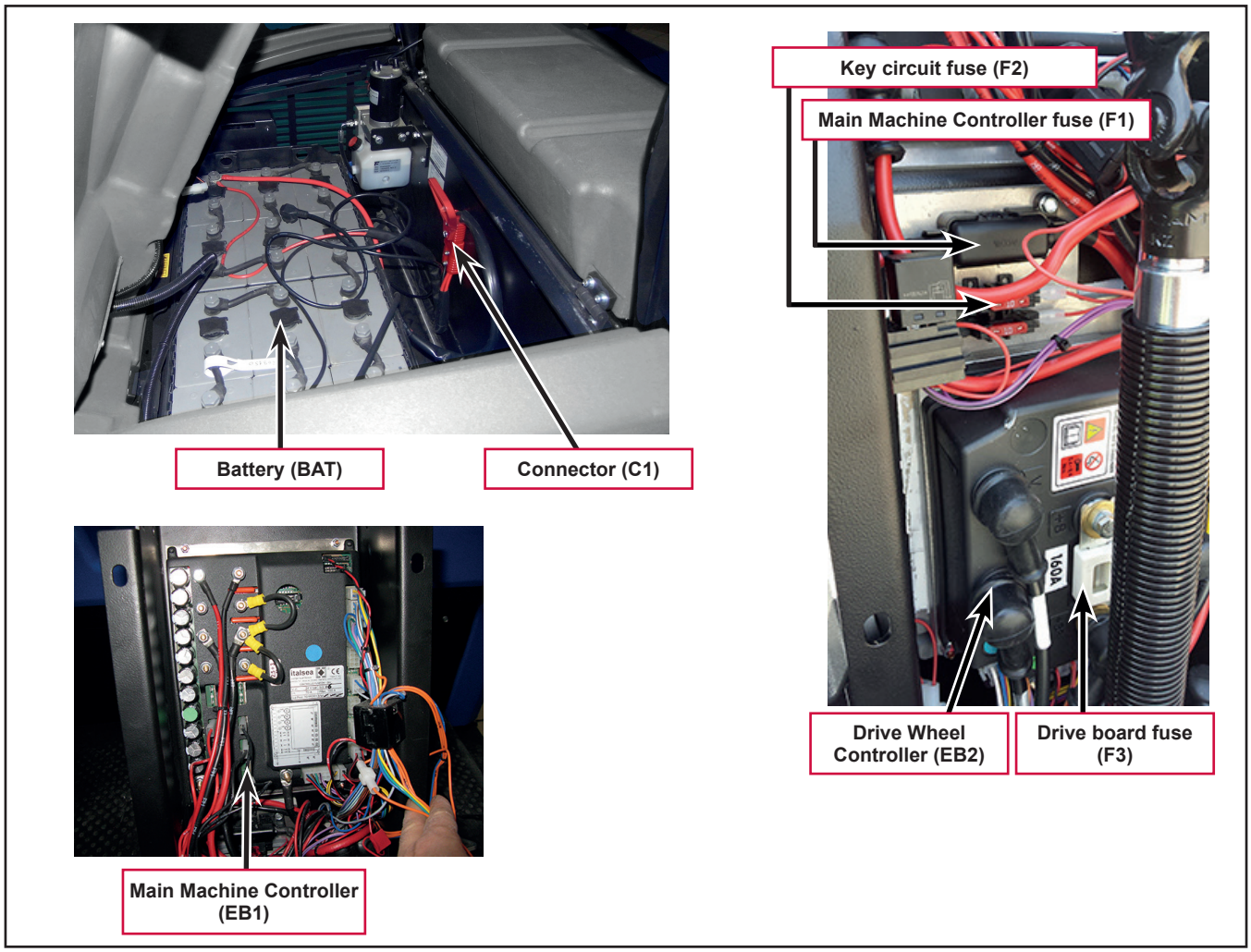


Figure 1:

Functional Description - Battery Version (continues)

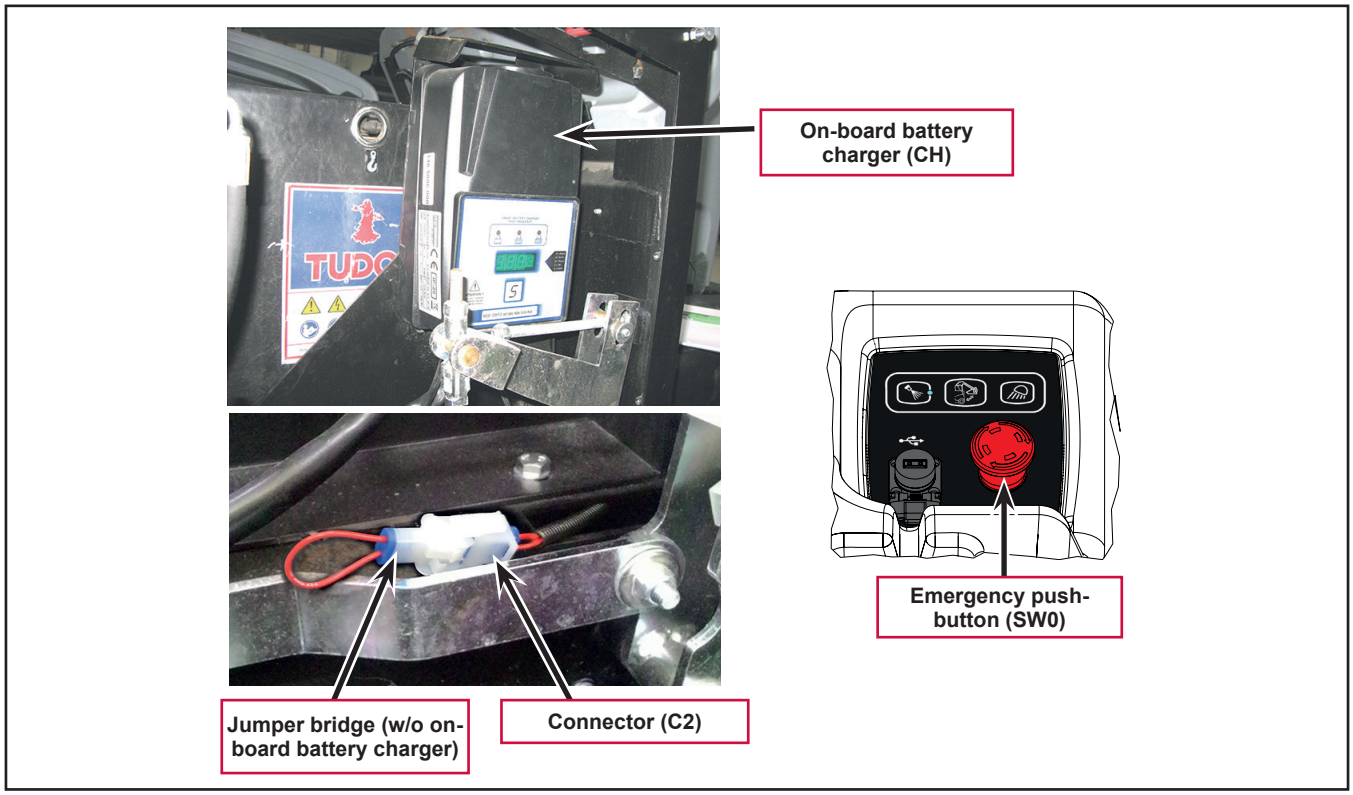


Figure 2:

Wiring Diagram (Battery ADVANCE Version)

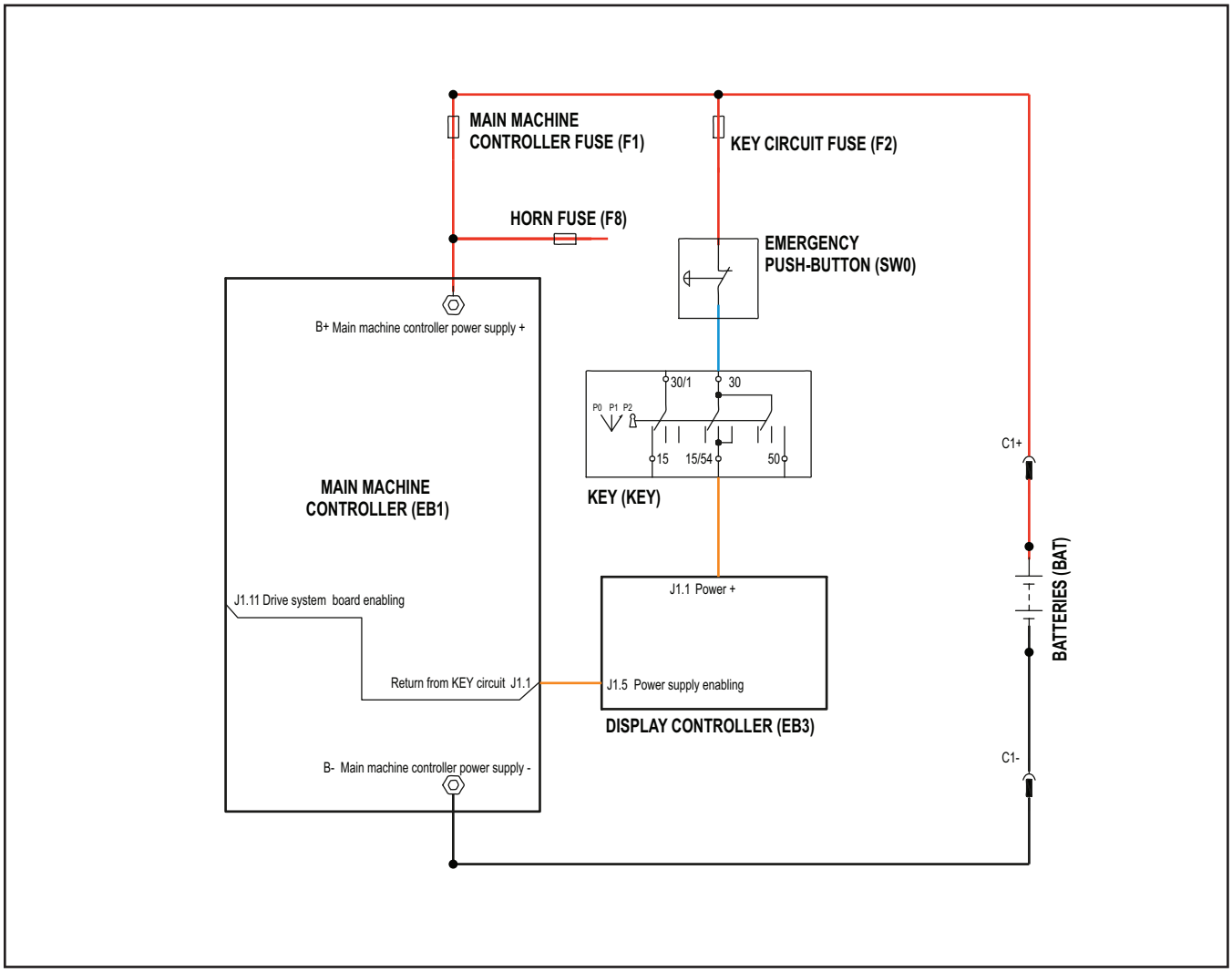


Figure 3:

Wiring Diagram (Battery NILFISK Version)

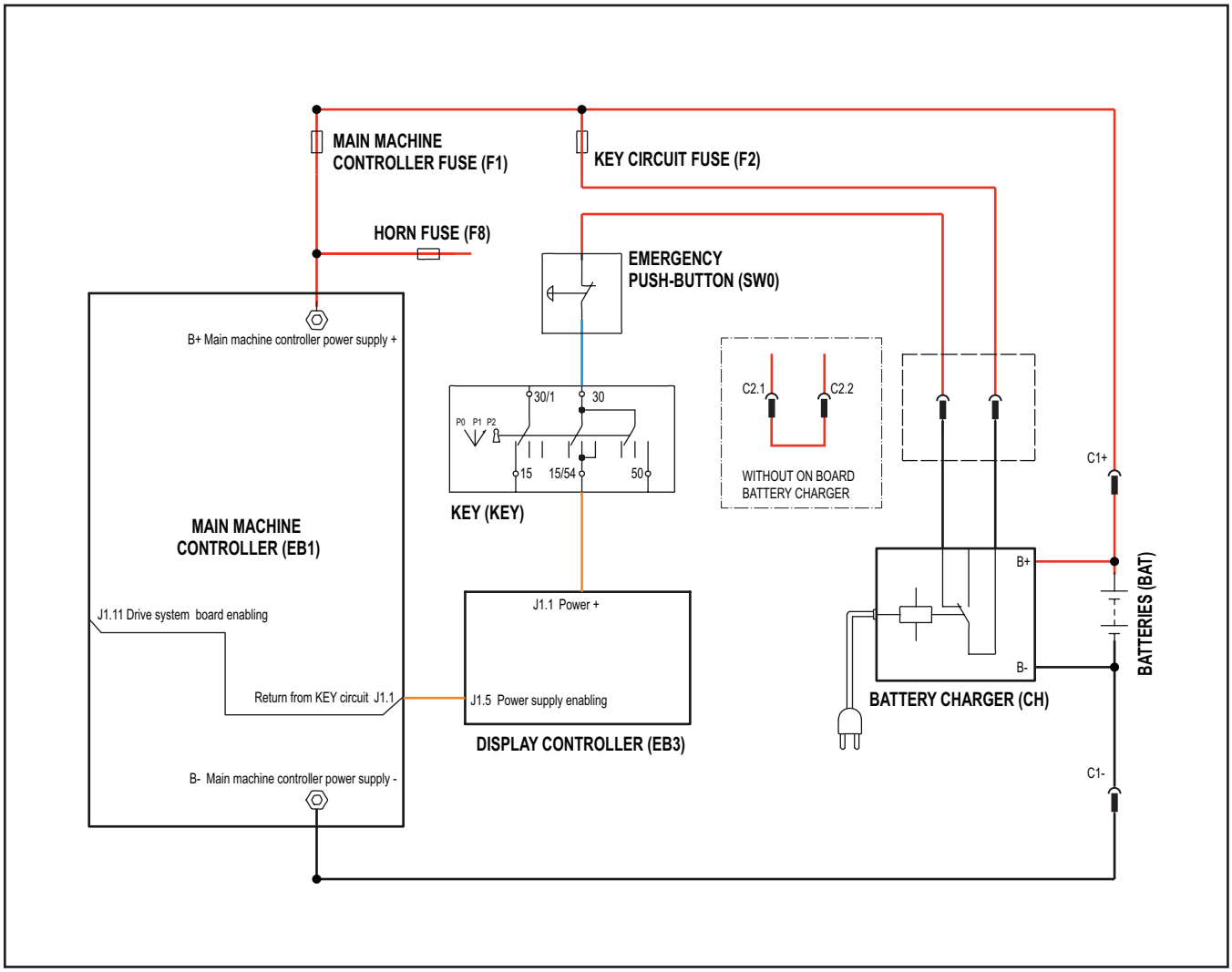


Figure 4:

Functional Description - Diesel, LPG Version

The electrical system of Diesel and LPG versions is substantially equal to that of the battery versions, the difference is that the 24V battery pack is replaced by one with lower capacity (2 x 12Vdc starter batteries) kept charged by a three-phase alternator and a three-phase power bridge rectifier.

Between the output of the bridge rectifier and the battery pack is the relay (ES10) contact and the charging system fuse (F4).

The relay (ES10) separates the output of the rectifier from the batteries when the engine is running with all services switched off for over 10 sec. or when the battery voltage reaches the limit value of 32V.

The Diesed and LPG engine are started via the starter motor (MST) when the key switch (KEY) is turned to position II.

The Main Machine Controller (EB1) continuously checks the alternator output voltage (D1, alternator input J1.14) to determine if the engine is on or off. With off engine the sweeping and vacuum functions are inhibited.

Only on LPG version

The electronic engine speed regulation system (EB6) reduces the engine speed from 3,000 rpm to 2,300 rpm when the relay (ES10) disconnects the rectifier output from the batteries. Commands to the electronic system of the engine are provided by opening the contacts of the relay (ES4) which is driven by the Main Machine Controller (EB1).

(NB: the reduction in engine speed may not be immediate as the engine electronic system takes other parameters into account such as engine temperature and carburation when deciding whether to reduce the set speed or not, even if the corresponding input is open).

The engine fuel supply system is fitted with a safety solenoid valve (EV4) which allows LPG to flow to the engine only when powered.

The solenoid valve (EV4) is powered when the key switch (KEY) is in position II, and for the first 10 seconds of operation when it is in position I. After these 10 seconds have passed, if the engine has not been started power is cut to the solenoid valve; otherwise, it remains active as long as the engine is running.

The solenoid valve is managed by the Main Machine Controller (EB1), via output J2.6. The Main Machine Controller (EB1) checks the status of the engine via input J1.14 connected to the secondary bridge rectifier (D1).

The entire electrical and electronic system of the engine (including the starter motor) runs on 12V, taken from one of the machine's two 12V batteries. The engine is equipped with an internal alternator which restores the energy taken from the 12V battery on starting.

Only on Diesel version

The engine fuel supply system is fitted with a safety solenoid valve (EV4) and a fuel pump (P2) which allow diesel to flow to the engine only when powered.

The solenoid valve (EV4) and the pump (P2) are powered when the key switch (KEY) is in position II, and for the first 10 seconds of operation when it is in position I. After these 10 seconds have passed, if the engine has not been started power is cut to them; otherwise, they remain active as long as the engine is running.

The solenoid valve and the pump are managed by the Main Machine Controller (EB1) via output J2.6 which activates relay (ES7). The Main Machine Controller (EB1) checks the status of the engine via input J1.14 connected to the secondary bridge rectifier (D1).

The solenoid valve (EV4) and the pump (P2) run at approx. 12V, reducing the battery voltage (24V) via the resistor (R4).

Functional Description - Diesel, LPG Version (continues)

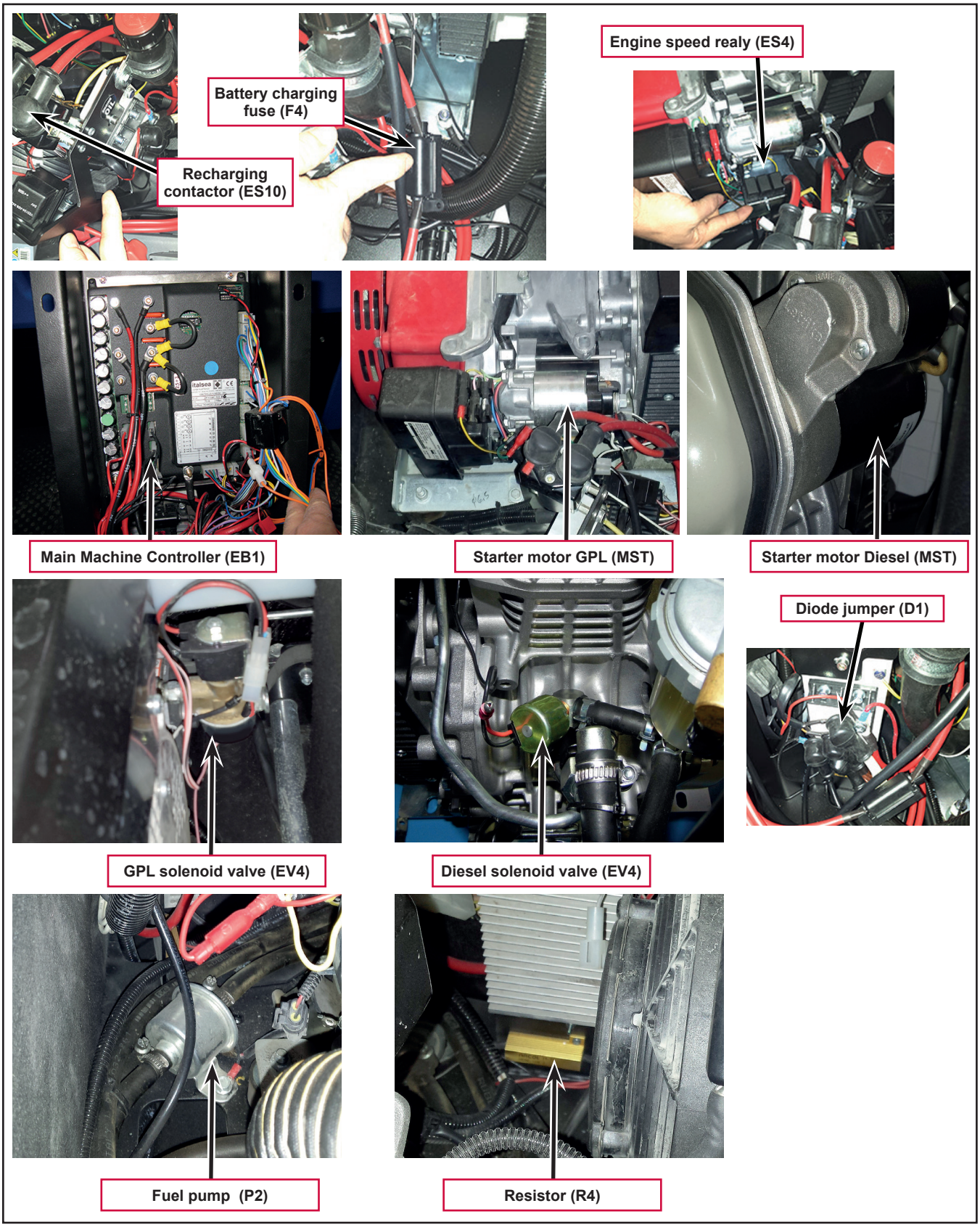


Figure 5:

Wiring Diagram (Diesel Version)

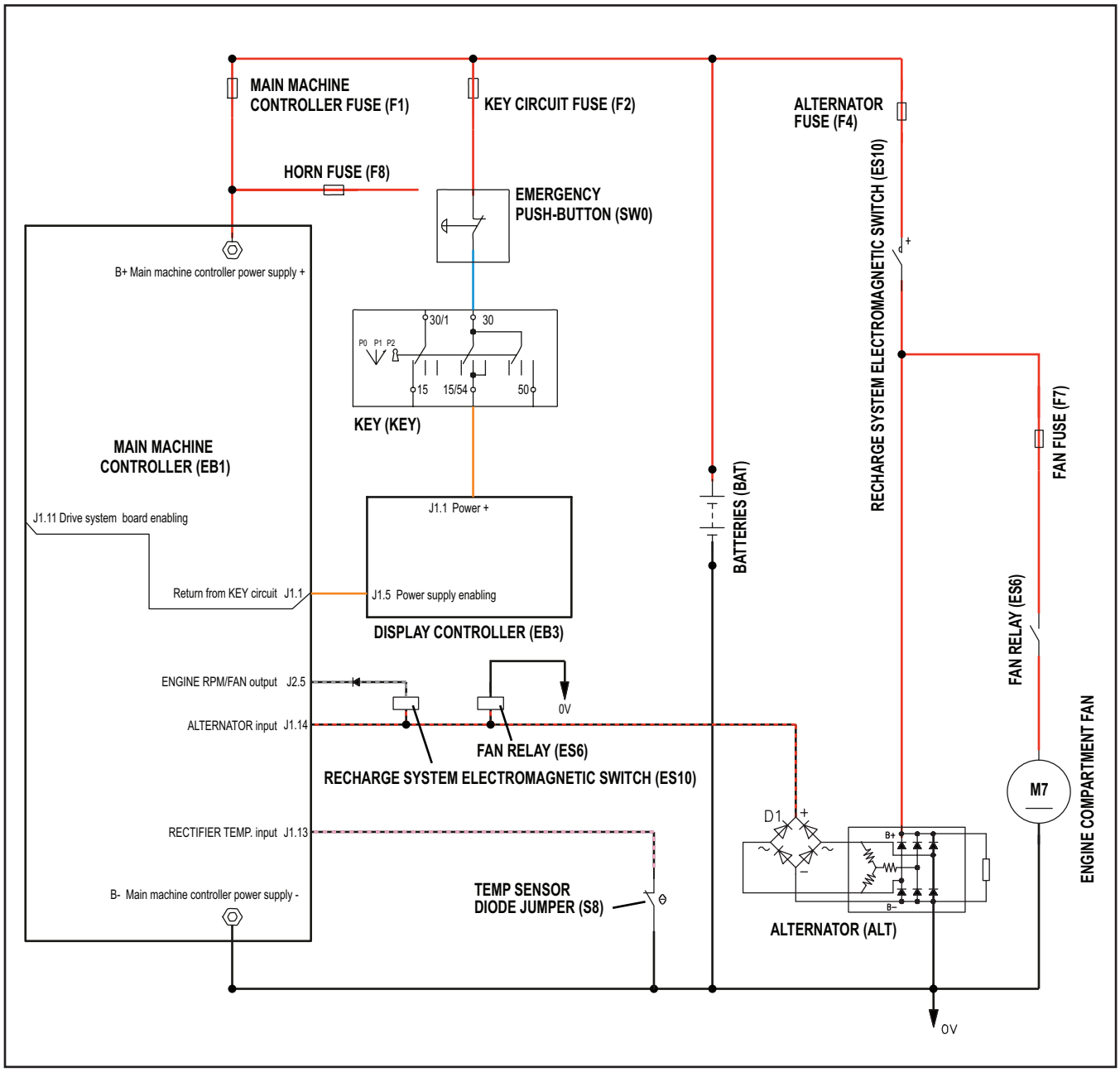


Figure 6:

Wiring Diagram (LPG Version)

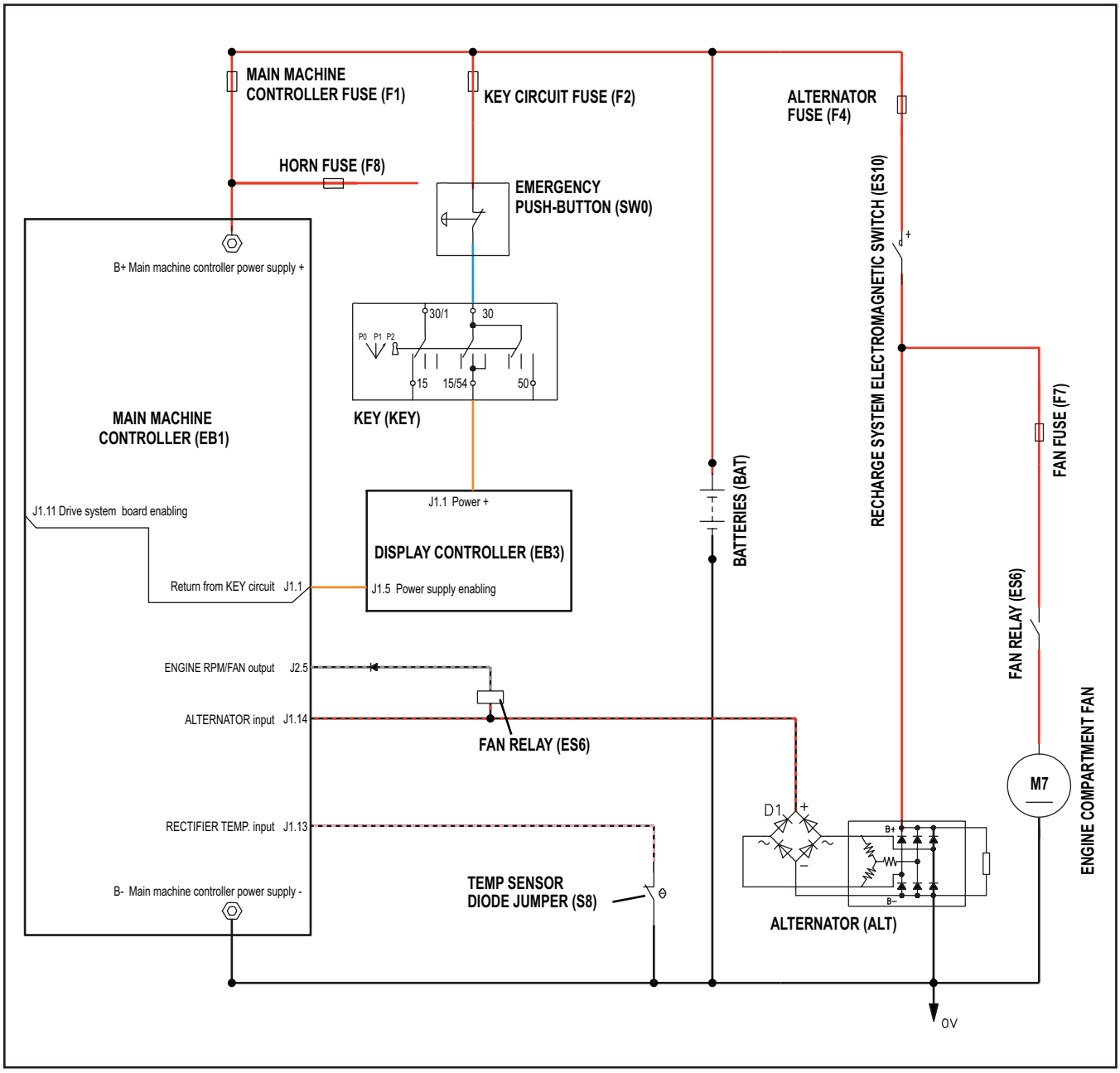


Figure 7:

Component Locations (Battery, Diesel, LPG versions)

- Emergency push-button (SW0)
- Beacon light (BE)
- Main Machine Controller fuse (150A) (F1)
- Key circuit fuse (10A) (F2)
- Drive system fuse (160A) (F3)
- Horn fuse (10A) (F8)
- Horn relay (ES9)
- Drive board electromagnetic switch (ES2)

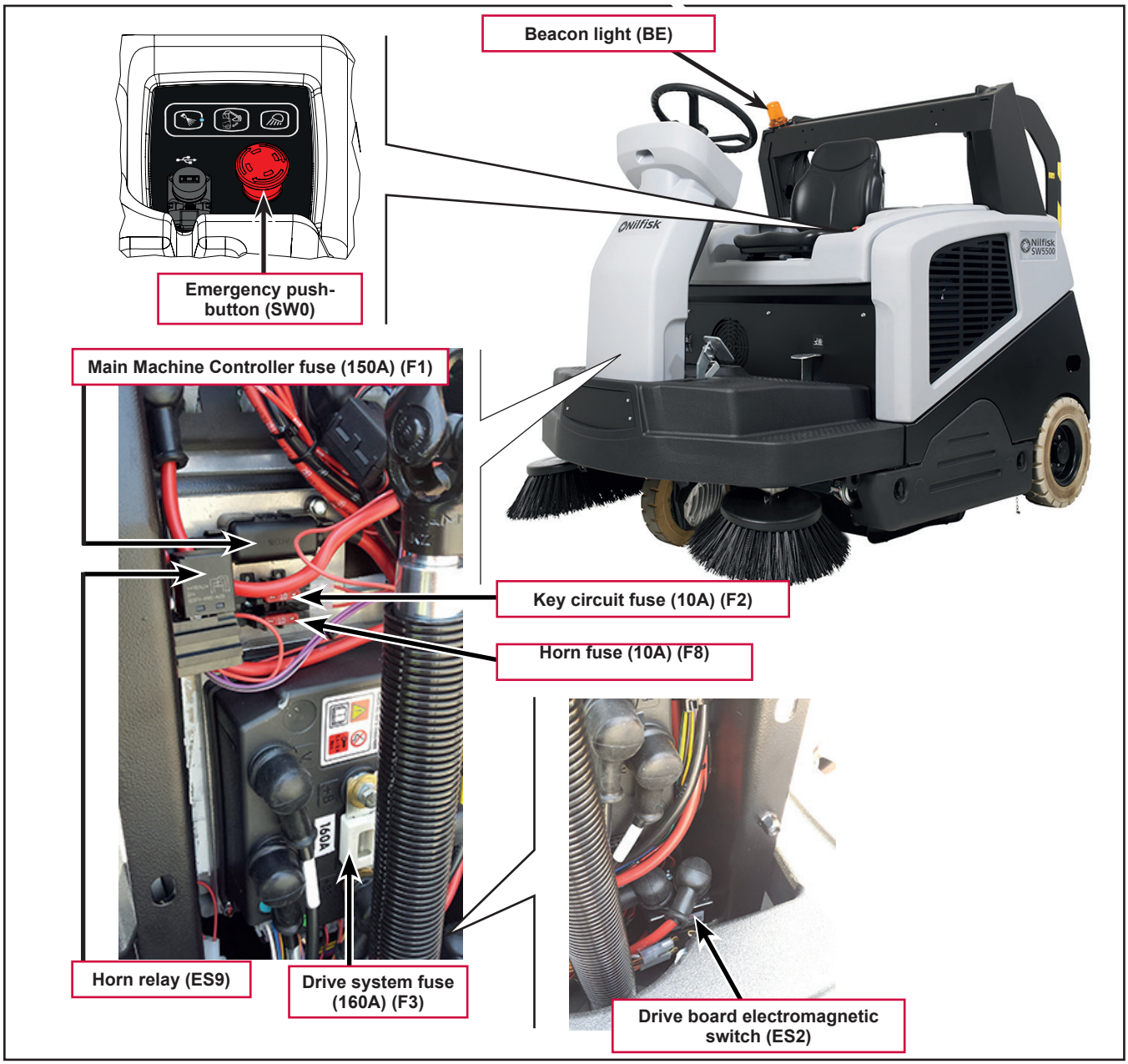


Figure 8:

Component Locations (Battery version)

- Battery charger (CH)
- Batteries (BAT)
- Wiring harnesses
- Battery connector (C1)
- Bridge jumper (without on-board battery charger)

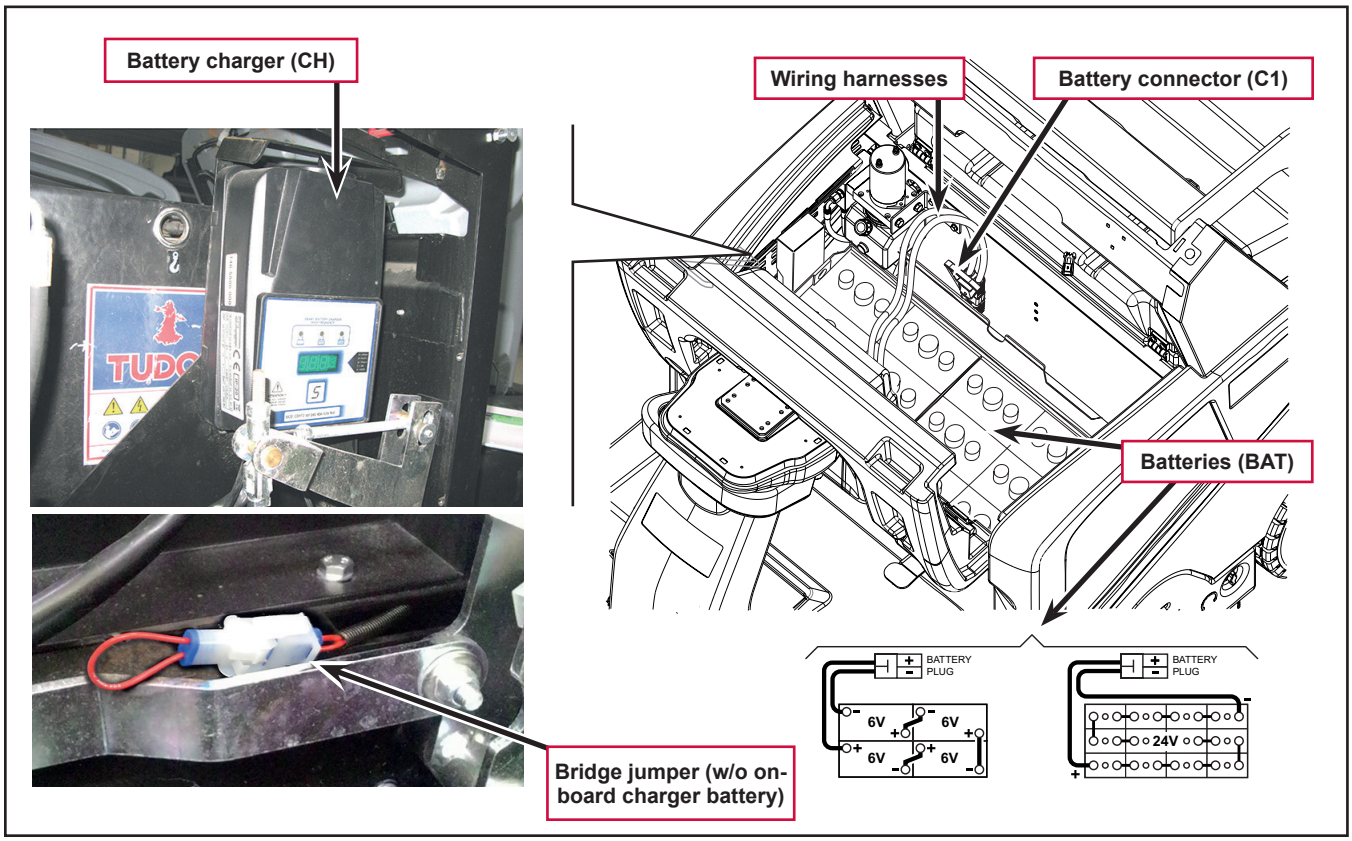


Figure 9:

Component Locations (Diesel version)

- Batteries (BAT)
- Alternator (ALT)
- Fuse for batteries (150A) (F0)
- Battery charging fuse (125A) (F4)
- Starter motor fuse (100A) (F6)
- Engine compartment fan fuse (20A) (F7)
- Drive system enablement relay (ES8)

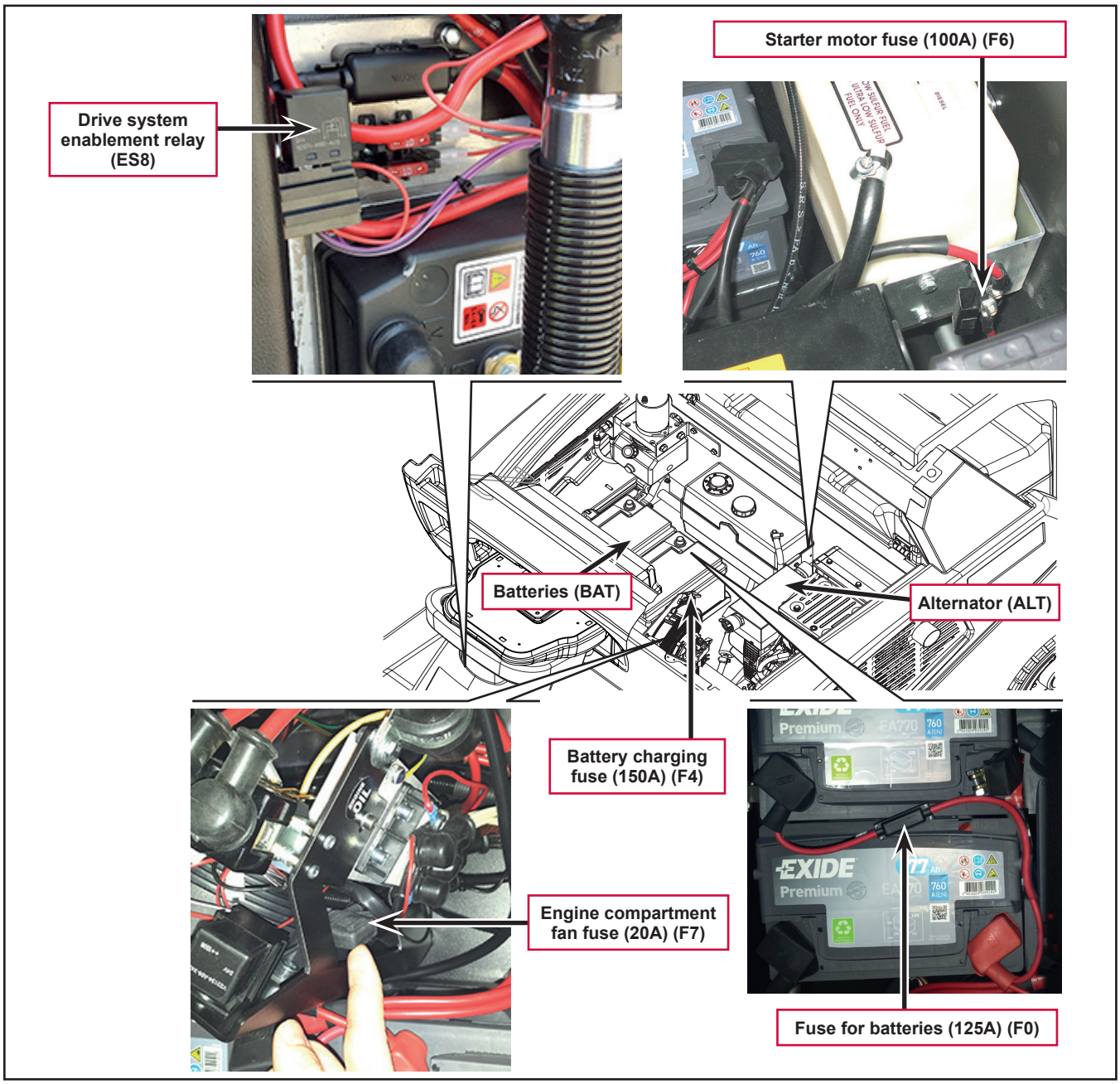


Figure 10:

Component Locations (LPG version)

- Batteries (BAT)
- Alternator (ALT)
- Fuse for batteries (125A) (F0)
- Battery charging fuse (160A) (F4)
- Starting command fuse (15A) (F6)
- Engine compartment fan fuse (20A) (F7)
- Engine fuse (F5) (Fuse inside engine)
- Fan relay (ES6)
- Recharging contactor (ES10)
- Diode jumper (D1)
- Engine on/off relay (ES3)
- Engine speed relay (ES4)
- Engine start realy (ES5)
- Drive system relay (ES8)
- Diode jumper temp. sensor (S8)

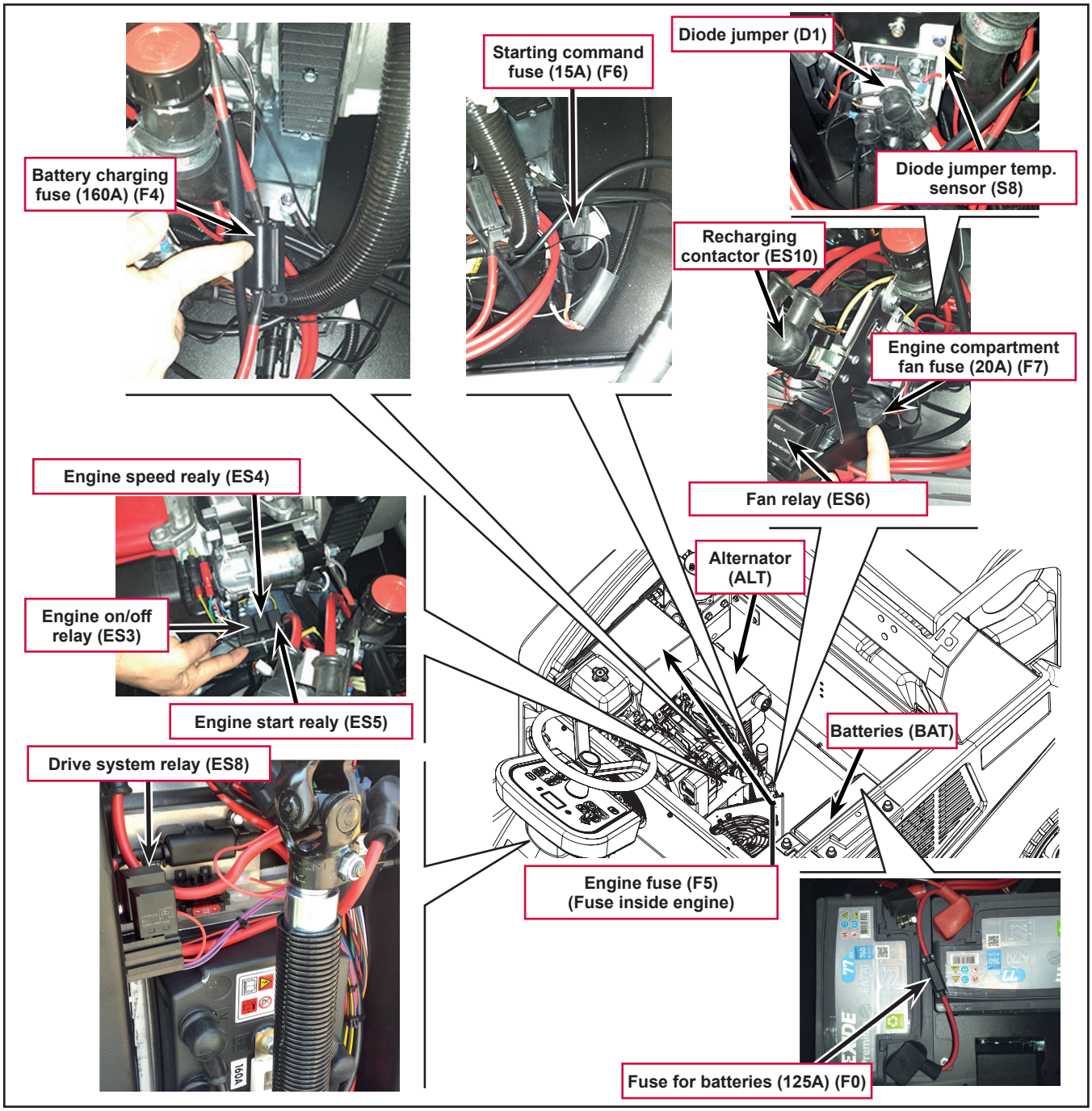


Figure 11:

Fuses

All circuits and components not managed directly by the Main Machine Controller (EB1) are protected by fuses.

Fuse		Battery		Diesel (YANMAR)		LPG (HONDA)	
Pos.	Type	Value	Protected Function	Value	Protected Function	Value	Protected Function
F0	CABLE-PRO	-		125A	BATTERY FUSE	125A	BATTERY FUSE
F1	MIDI	150A	MAIN MACHINE CONTROLLER	150A	MAIN MACHINE CONTROLLER	150A	MAIN MACHINE CONTROLLER
F2	UNIVAL	10A	KEY CIRCUIT	10A	KEY CIRCUIT	10A	KEY CIRCUIT
F3	MEGA	160A	DRIVE SYSTEM BOARD	160A	DRIVE SYSTEM BOARD	150A	DRIVE SYSTEM BOARD
F4	MIDI	-	-	150A	BATTERY CHARGING	160A	BATTERY CHARGING
F5	CYL.	-	-	-	-	-	ALTERN. HONDA
F6	UNIVAL \ MIDI	-	-	100A	STARTER MOTOR	15A	START COMMAND
F7	UNIVAL	-	-	20A	ENGINE COMPARTMENT FAN	20A	ENGINE COMPARTMENT FAN
F8	UNIVAL	10A	HORN	10A	HORN	10A	HORN

The components managed directly by the Main Machine Controller (EB1) are protected by current reading systems which switch off the component when specific maximum current draw values are exceeded for a time greater than the set value.

For details, see Main Machine Controller Alarm Code.

Relays / Contactors

	Description	Position	Manufacturer	Battery	Diesel	LPG
ES1	Main Machine Controller Contactor	Steering column	ALBRIGHT	X	X	X
ES2	Drive system contactor	Steering column	ALBRIGHT	X	X	X
ES3	Engine ON relay	LPG engine	TYCO			X
ES4	Engine speed relay	LPG engine	TYCO			X
ES5	Engine start relay	LPG Engine wiring	TYCO			X
ES6	Engine compartment fan relay	Main wiring	TYCO		X	X
ES7	Diesel engine power relay	Diesel Engine wiring	TYCO		X	
ES8	Drive system enabling relay	Main wiring	TYCO		X	X
ES10	Charging system contactor	Main wiring	ALBRIGHT		X	X

Maintenance and Adjustments

Battery Type Display (WET or GEL-AGM) (Battery Version)

1. Start the machine with the ignition key (A).
2. In the first two seconds after ignition, the multifunction display (B) will indicate:
   - The hours the machine has worked (C)
   - The type of batteries set (D)
   - The current machine maximum speed setting (E)
3. After two seconds have passed, it is possible to view the charge level of the batteries on the same icon (D) for the battery type set.

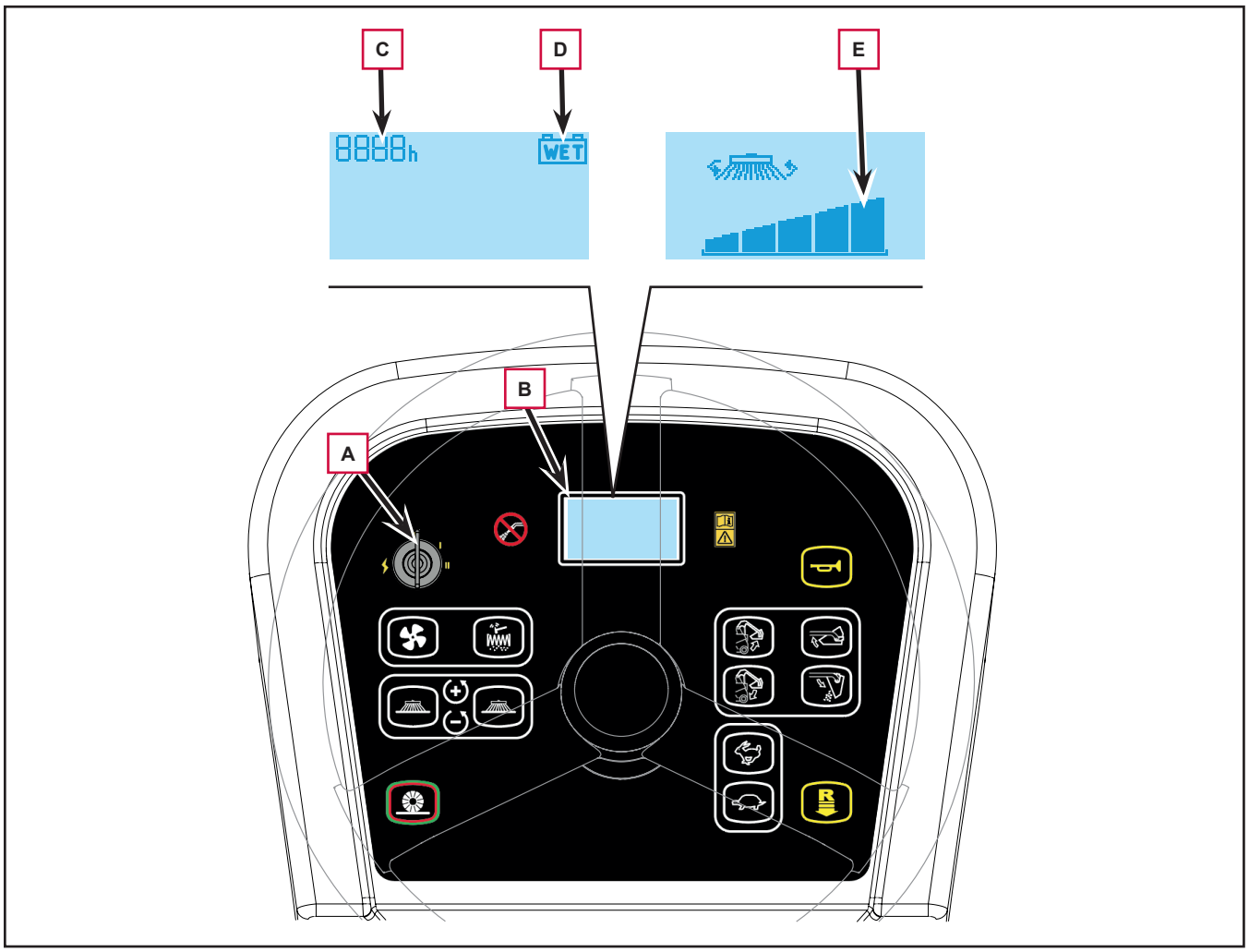


Figure 12:

Cecking the voltage of the batteries (Diesel, LPG Version)

The voltage of the batteries with components operational should be between 26V and 30V.

The voltage of the batteries with components switched off (wait 10 seconds with the machine stopped and components switched off) should be between 24V and 26V.

Battery Removal/Installation and Battery Type Setting (WET or GEL/AGM) (Battery Version)

WARNING: Do not tilt the lead batteries (WET) to prevent the highly corrosive acid from leaking out of the batteries.
Do not connect, not even accidentally, the battery positive and negative terminals by using tools, keys, etc. This could cause dangerous short-circuit.

Battery Installation

The batteries must be installed as shown in the diagram (A).

See Technical Data for approved battery types.

According to the battery dimensions, check if it is possible to place them inside the relevant plastic container, supplied with the machine.

If the batteries are larger than the container, use the square guides, supplied with the machine, to ensure the stability inside the battery compartment.

WARNING: Non-sealed WET batteries always need an appropriate container to prevent the acid form leaking. Do not install the WET batteries without an appropriate container.

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Open the battery compartment hood with the handle and fasten it with the support rod.
4. Disconnect the battery connector (B).
5. With the help of an assistant and an appropriate hoisting system, install the batteries (C) as shown in one of the diagrams (A).
6. Connect the batteries according to the chosen diagram (A).
7. Connect the battery connector (B).
8. Set the battery type (WET or GEL-AGM), according to the following procedure.

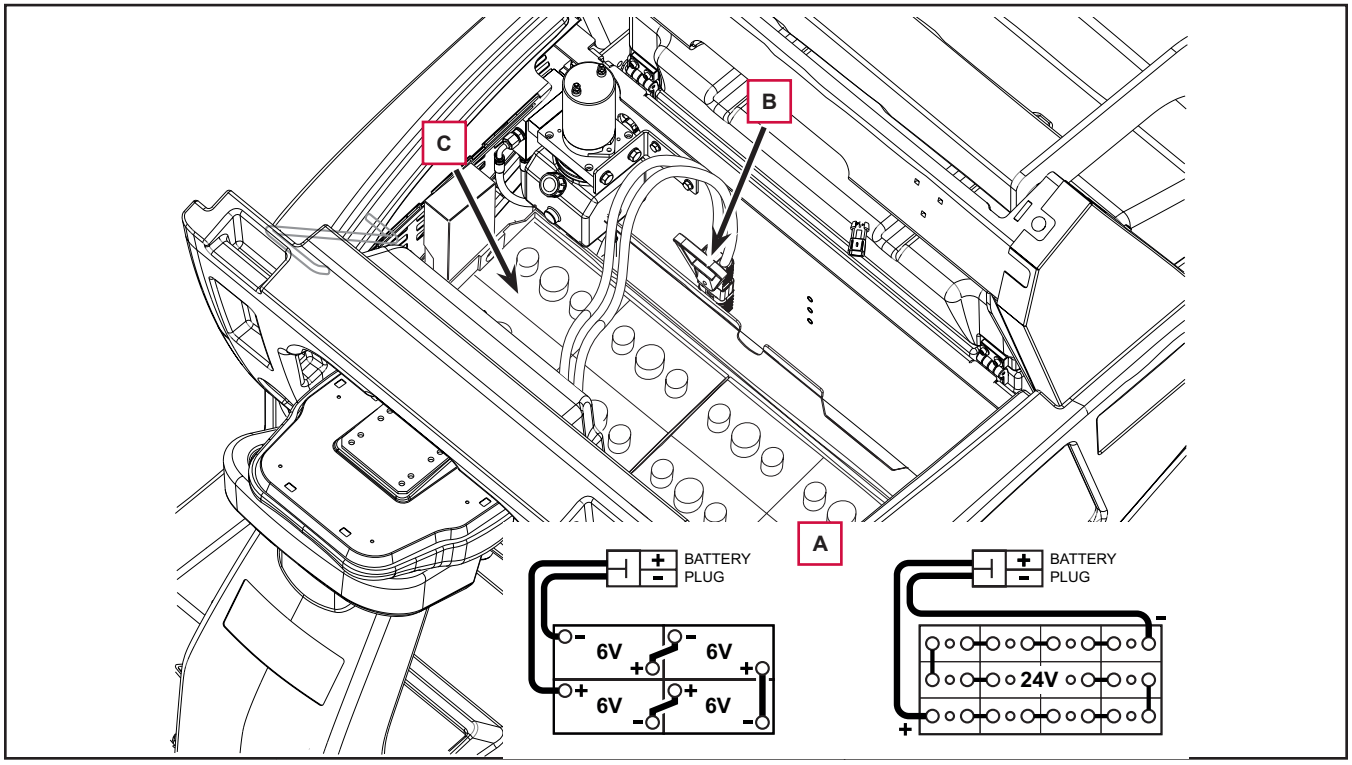


Figure 13:

Battery Removal/Installation and Battery Type Setting (WET or GEL/AGM) (Battery Version) (continues)

Battery Setting (WET or GEL-AGM)

9. Start the machine by turning the ignition key to “I”, while holding down buttons (D) and (E).
10. Enter the “Parameters” menu by pressing the hopper lifting button (F).
11. Scroll through the parameters by repeatedly pressing the hopper lifting button (F) until you reach the “BATTERY TYPE” parameter
12. If necessary, change the setting using the hare (G) and tortoise (H) buttons.

Battery Removal

13. Drive the machine on a level floor.
14. Turn the ignition key to “0”, then engage the parking brake.
15. Open the battery compartment hood with the handle and fasten it with the support rod.
16. Disconnect the battery connector (B).
17. Disconnect the battery wiring harnesses (C).
18. Remove any square guide or bracket fastening the batteries (C).
19. Check that WET battery caps (I) are closed, to prevent the highly corrosive acid from leaking out of the batteries.
20. With the help of an assistant and an appropriate hoisting system, remove the batteries (C).

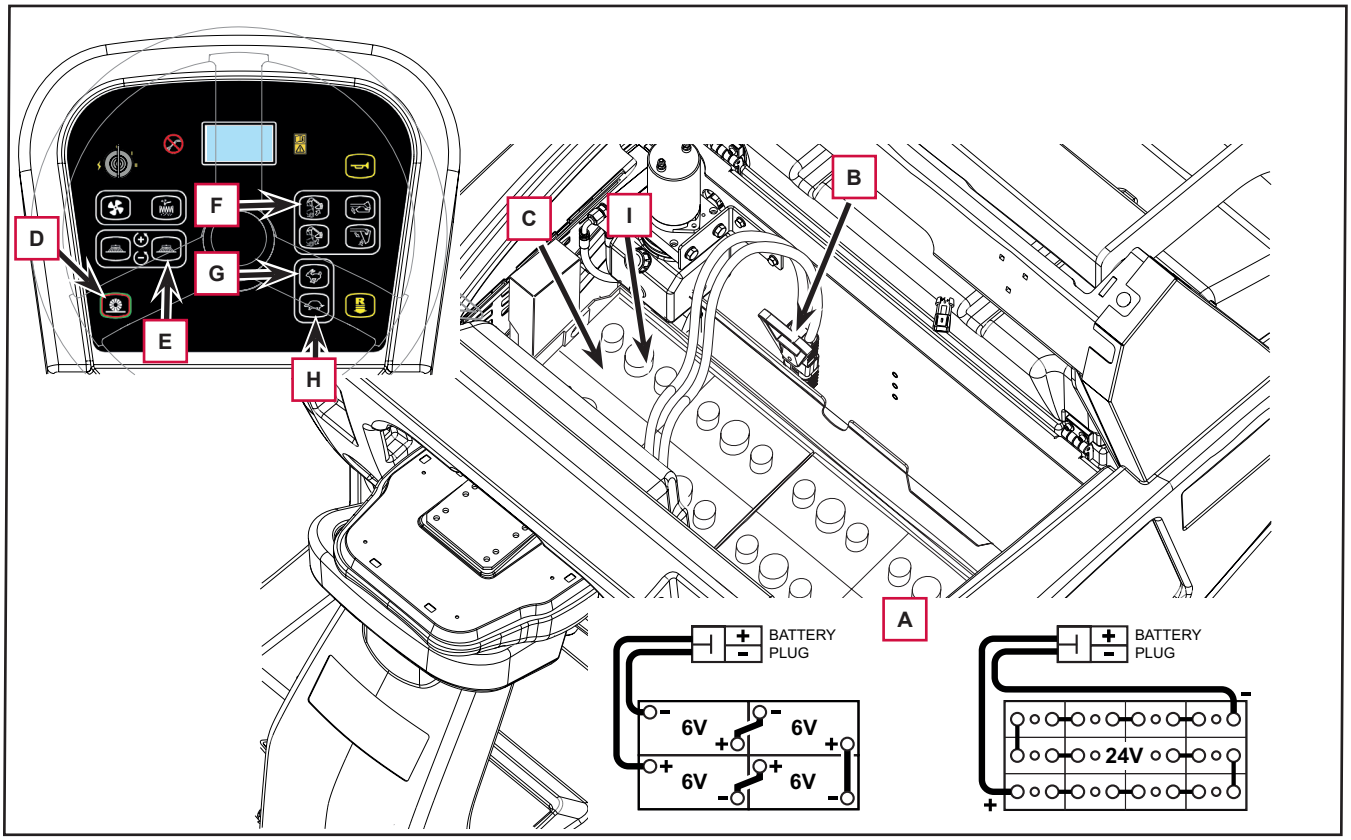


Figure 14:

Troubleshooting

Trouble	Possible causes	Remedy
The machine is not working	The batteries (BAT) are discharged or its connections are not efficient	Charge the batteries or clean/repair the connections
	The batteries (BAT) are broken	Check the battery no-load voltage/replace them
	(Battery Version) Battery charger (CH) faulty	Replace
	(Diesel and LPG Versions) Alternator (ALT) faulty	Repair/replace
	The fuses are open	Replace
	The wiring harness is cut or pressed or short circuited	Repair
	The ignition key switch (KEY) is not working	Replace
	Main Machine Controller (EB1) broken	Replace

Removal and Installation

Battery Charger (Battery NILFISK Version)

Removal

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Open the battery compartment hood with the handle and fasten it with the support rod.
4. Disconnect the battery connector (A).
5. Lift and remove the right side panel (B), disengaging it from the upper (C) and lower (D) fasteners.
6. Disconnect the wiring (E) from the terminals (F) and (G) of the batteries unit (H).

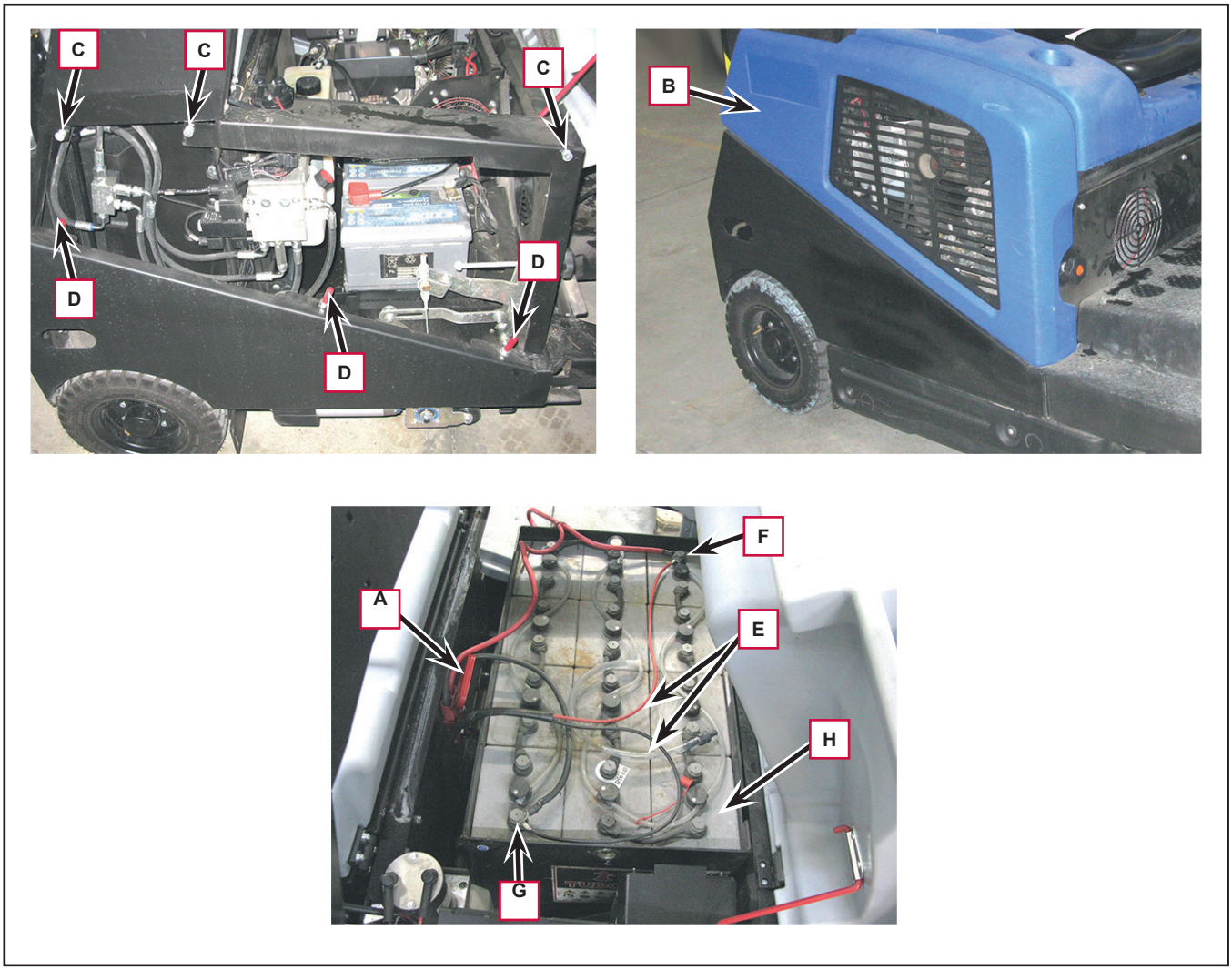


Figure 15:

Battery Charger (continues) (Battery NILFISK Version)

7. Working from underneath the battery charger (I), disconnect the electrical connection (J) of the connection cable to the Main Control Board.

8. Remove the four fastening screws (K) of the battery charger (I).

9. Remove the battery charger (I) with the electrical cables (L) connecting it to the batteries and (M) for connection to the mains.

Installation

10. Assemble the components in the reverse order of removal.

11. Set the type of battery installed (WET or GEL / AGM) with the switch on the battery charger.

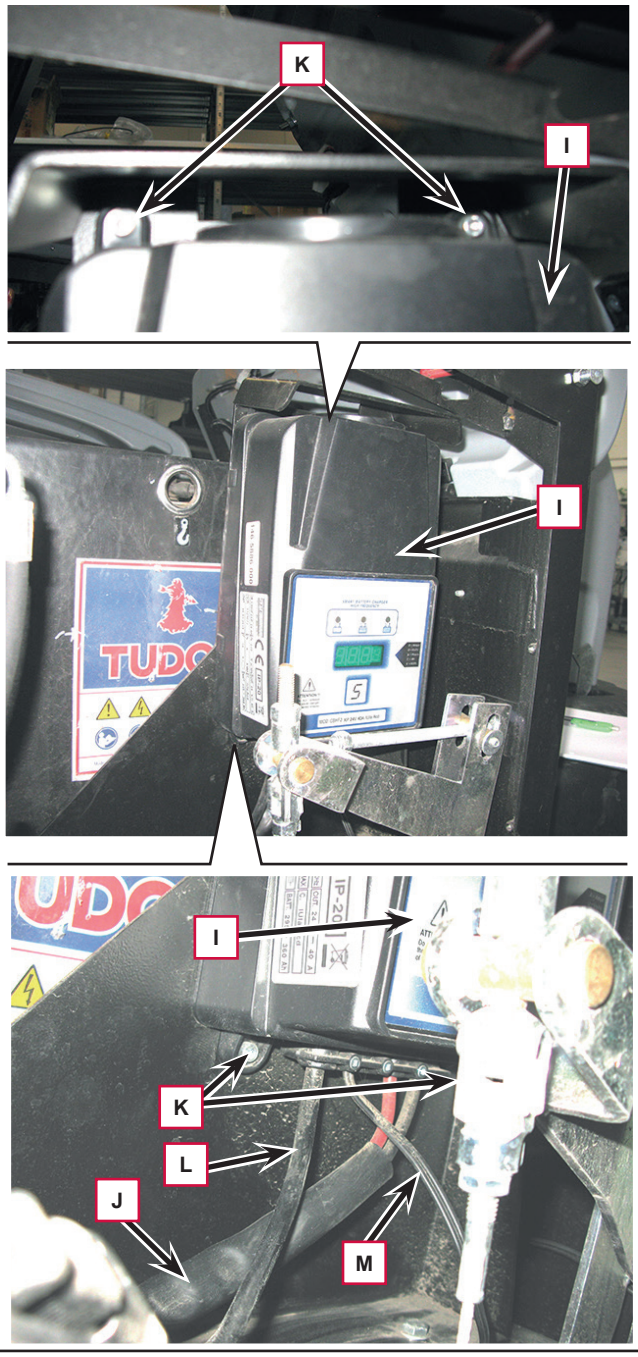


Figure 16:

Alternator (Diesel Version)

Removal

1. Remove the engine/alternator assembly (see procedure in the Engine System - Diesel chapter).
2. Working at the workbench, unscrew the perimeter screws (A,) and remove the cover (B).
3. Unscrew the screws (C) and remove the grid (D).
4. Unscrew the screw (E).
5. Unscrew the four screws (F).
6. Screw in an M12 screw (L), approximately 1,6 in (40 mm) in length, into the hole (G), bringing it into contact with the crankshaft (H) and use it as an extractor, screwing it in far enough to remove the alternator (I) from the engine.
7. If necessary, unscrew the four screws (J) and remove the coupling flange (I).

Installation

8. Assemble the components in the reverse order of removal, and note the following:
   - Position the grids (M) to the side, as shown in the figure.

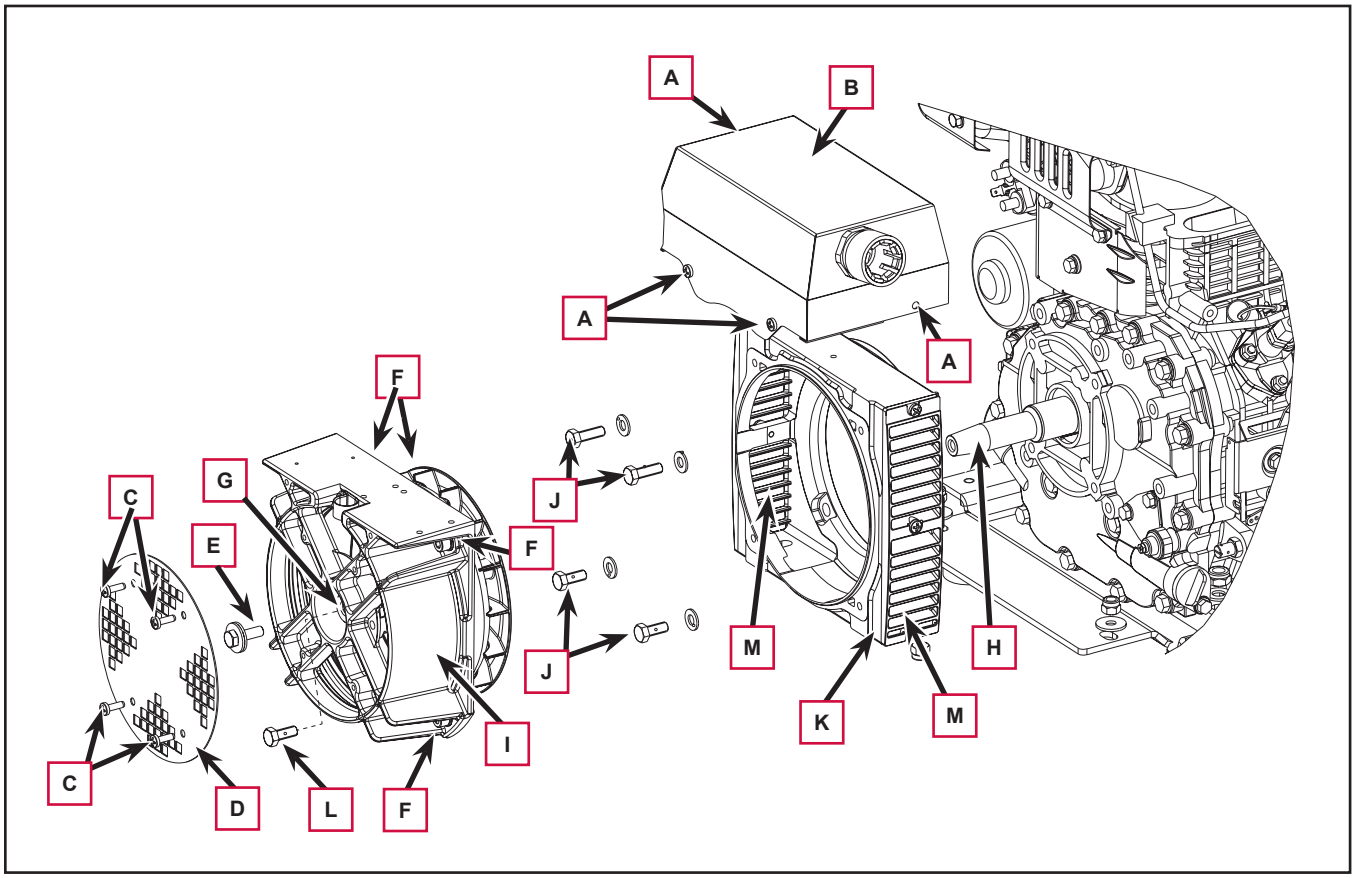


Figure 17:

Alternator (LPG Version)

Removal

1. Remove the engine/alternator assembly (see procedure in the Engine System - LPG chapter).
2. Working at the workbench, unscrew the perimeter screws (A) and remove the cover (B).
3. Unscrew the screws (C) and remove the grid (D).
4. Unscrew the screw (E).
5. Unscrew the four screws (F).
6. Screw in an M12 screw (L), approximately 1,6 in (40 mm) in length, into the hole (G), bringing it into contact with the crankshaft (H) and use it as an extractor, screwing it in far enough to remove the alternator (I) from the engine.
7. If necessary, unscrew the four screws (J) and remove the coupling flange (I).

Installation

8. Assemble the components in the reverse order of removal, and note the following:
   - Position the grids (M) to the side, as shown in the figure.

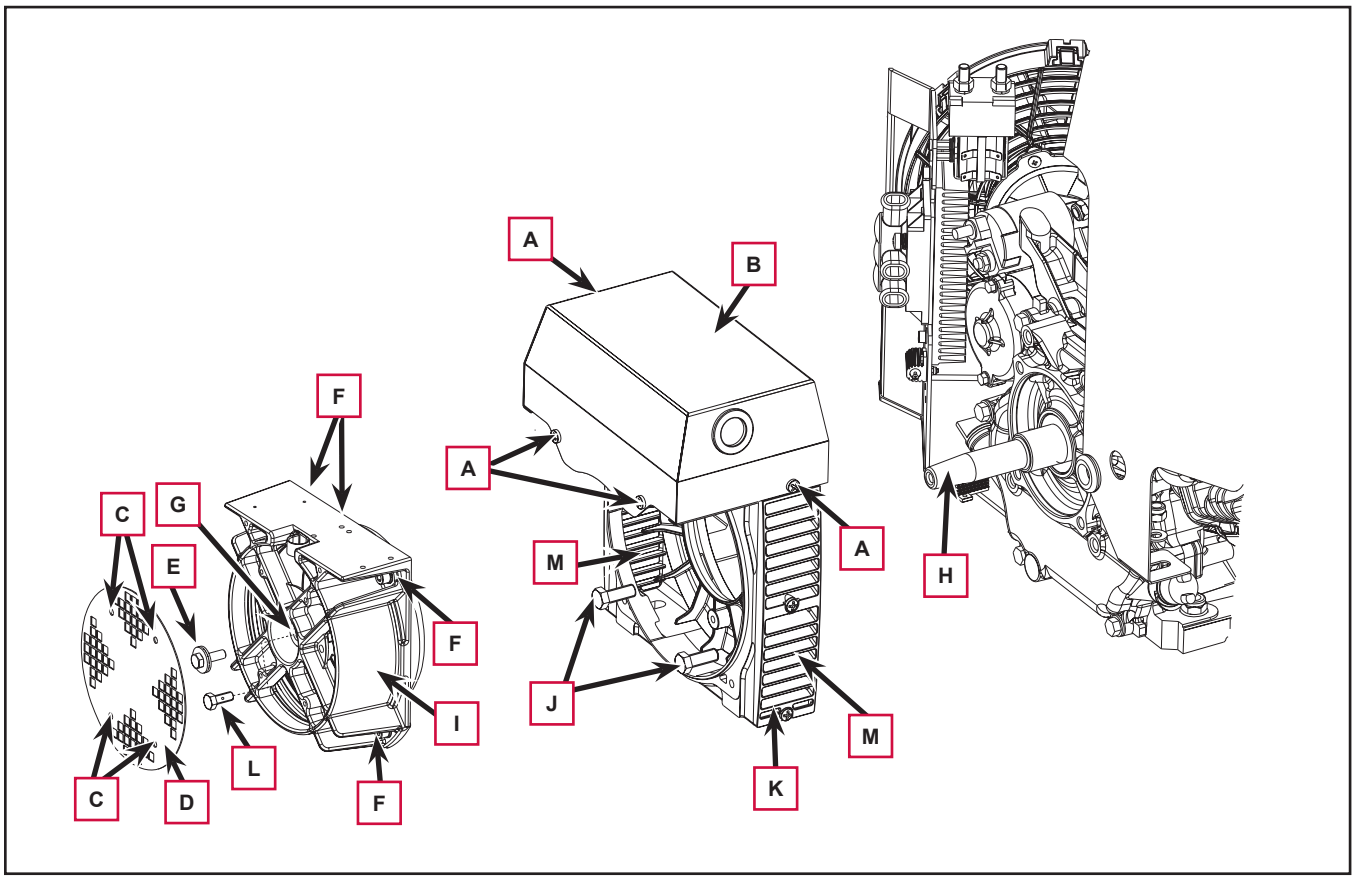


Figure 18:

General Wiring Diagram (Battery ADVANCE Version)

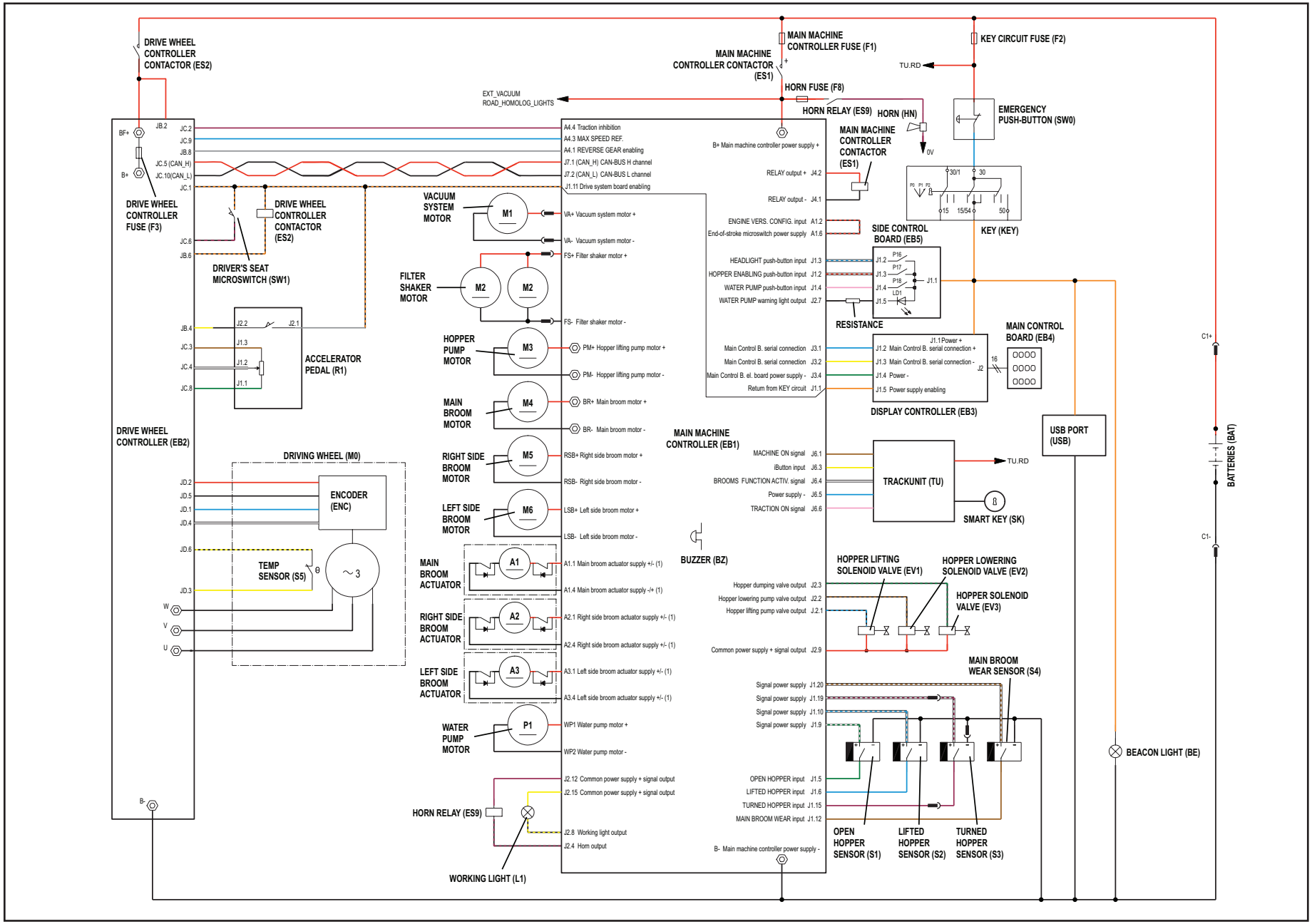


Figure 19:

General Wiring Diagram (Battery NILFISK Version)

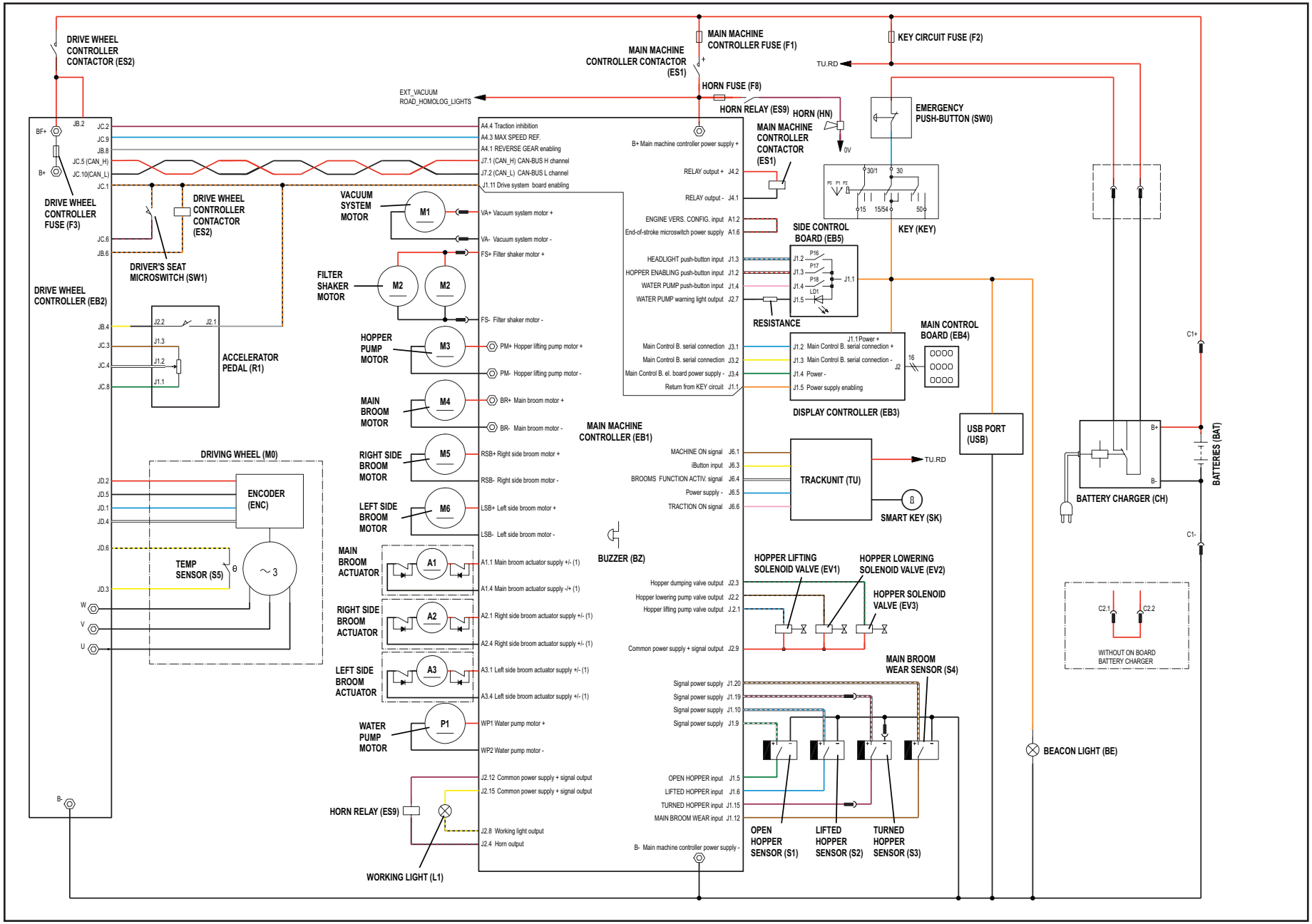


Figure 20:

General Wiring Diagram (Diesel Version)

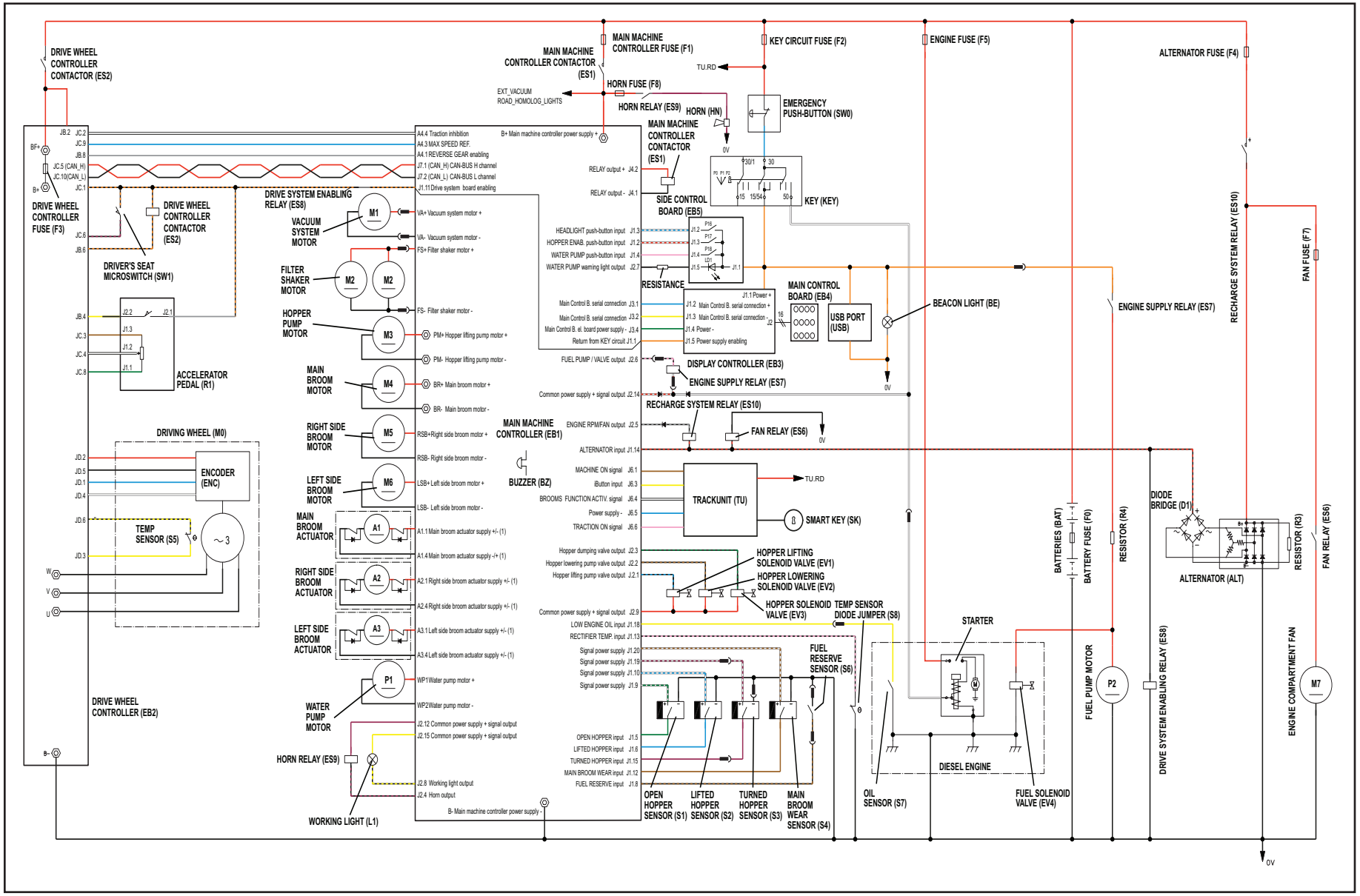


Figure 21:

General Wiring Diagram (LPG Version)

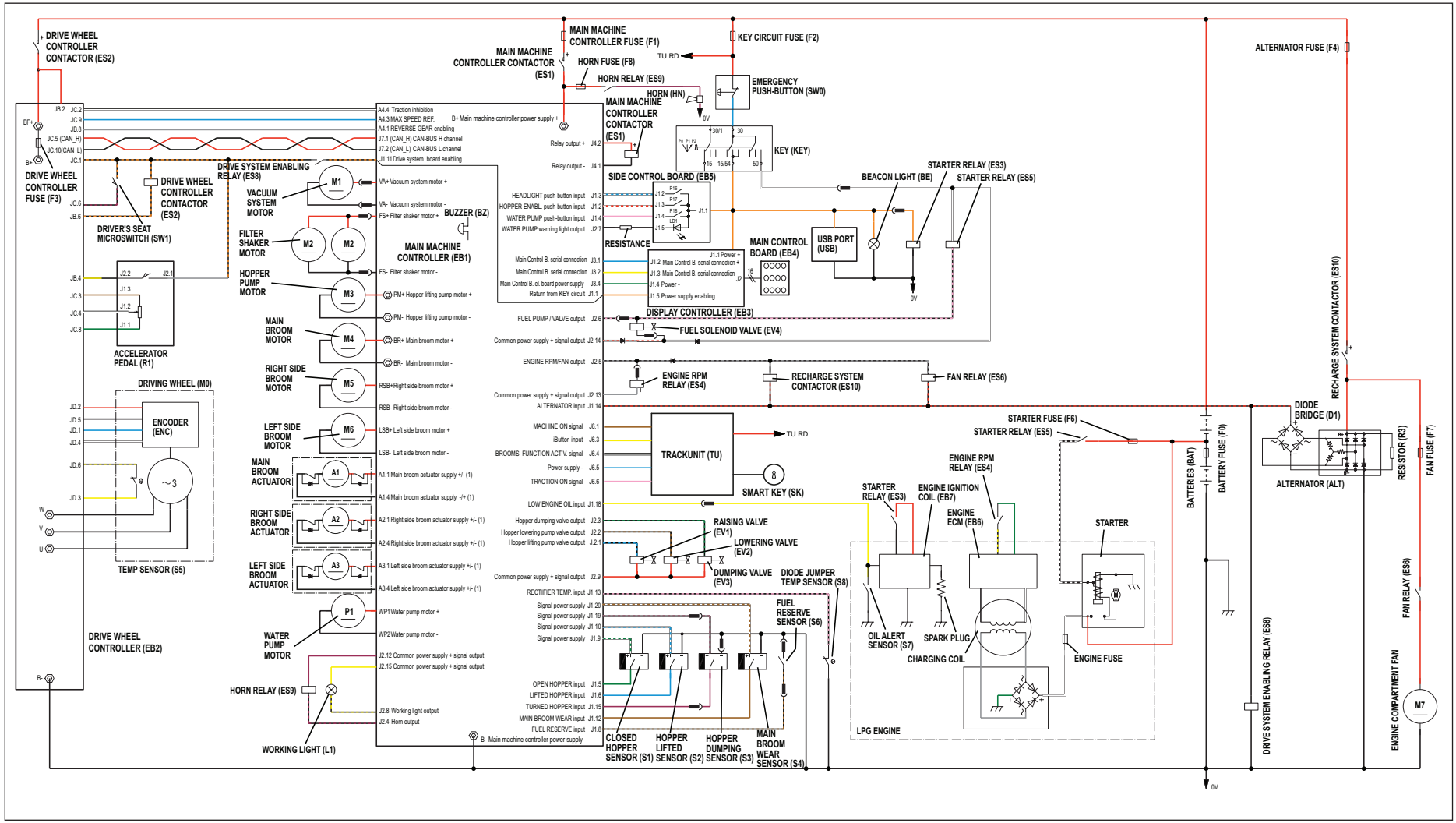


Figure 22:

28 - Engine System, Diesel

Functional Description

The engine system (YANMAR L70N) generates electric current for all machine functions.

The assembly consists of an internal combustion engine and alternator, which are both connected to the main crankshaft.

The engine is a single-cylinder air-cooled diesel fuel type.

Engine starting is performed by a starter motor.

At a later stage, the running engine supplies the power to generate the current and to power the electrical systems of the machine. The surplus current is used to charge the batteries.

The engine speed is fixed to 3,000 rpm, to grant a constant current to the electrical system.

The fuel tank is located inside the engine compartment, on the rear bulkhead. The tank has a fuel level indicator with float.

The fuel reserve icon is shown on the display when the remaining fuel in the tank is below 1 litre.

Wiring Diagram

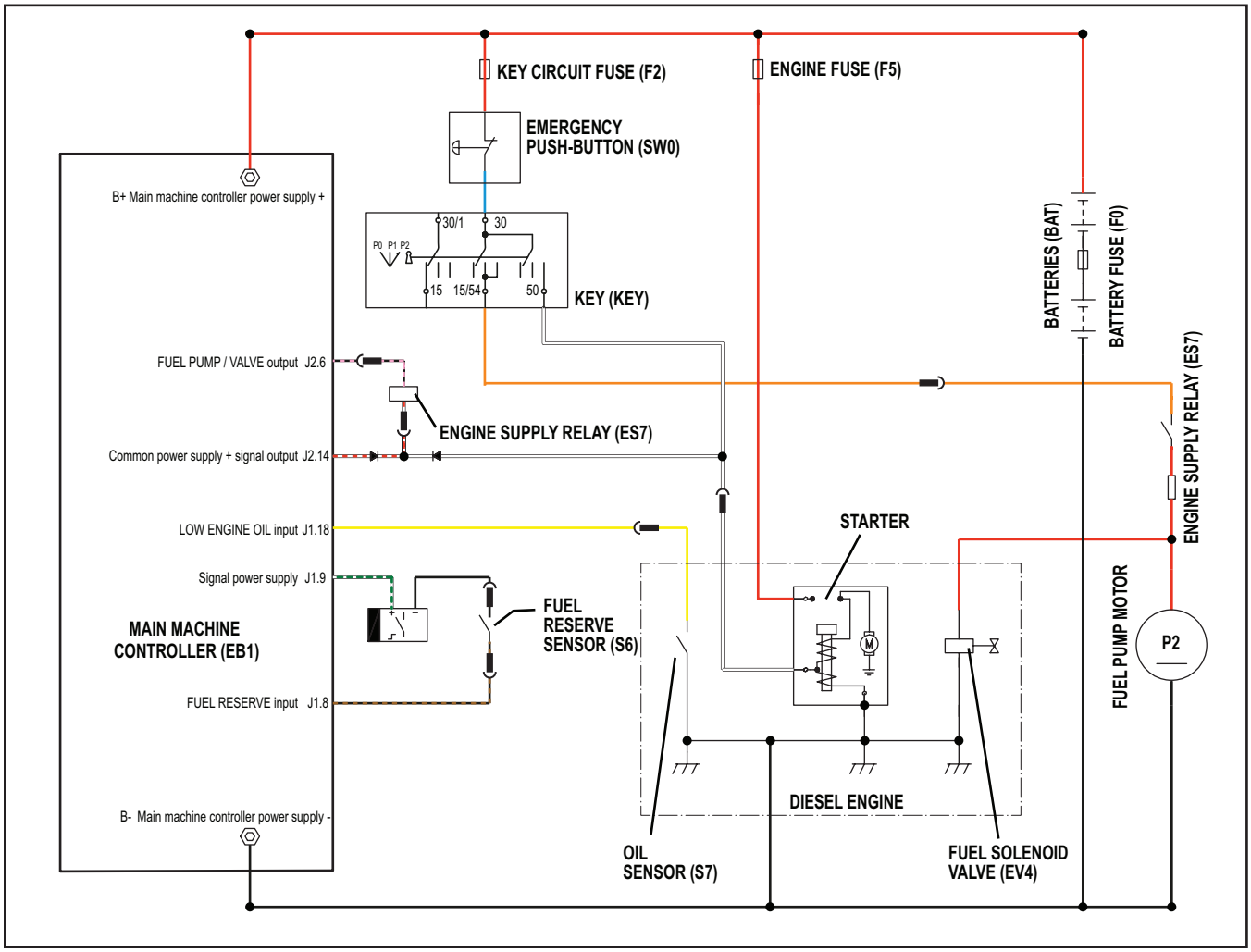


Figure 1:

Component Locations

- Diesel engine
- Filler neck
- Fuel tank
- Fuel opening/closing valve
- Fuel reserve sensor (S6)
- Engine oil pressure sensor
- Engine overheat sensor (S7)

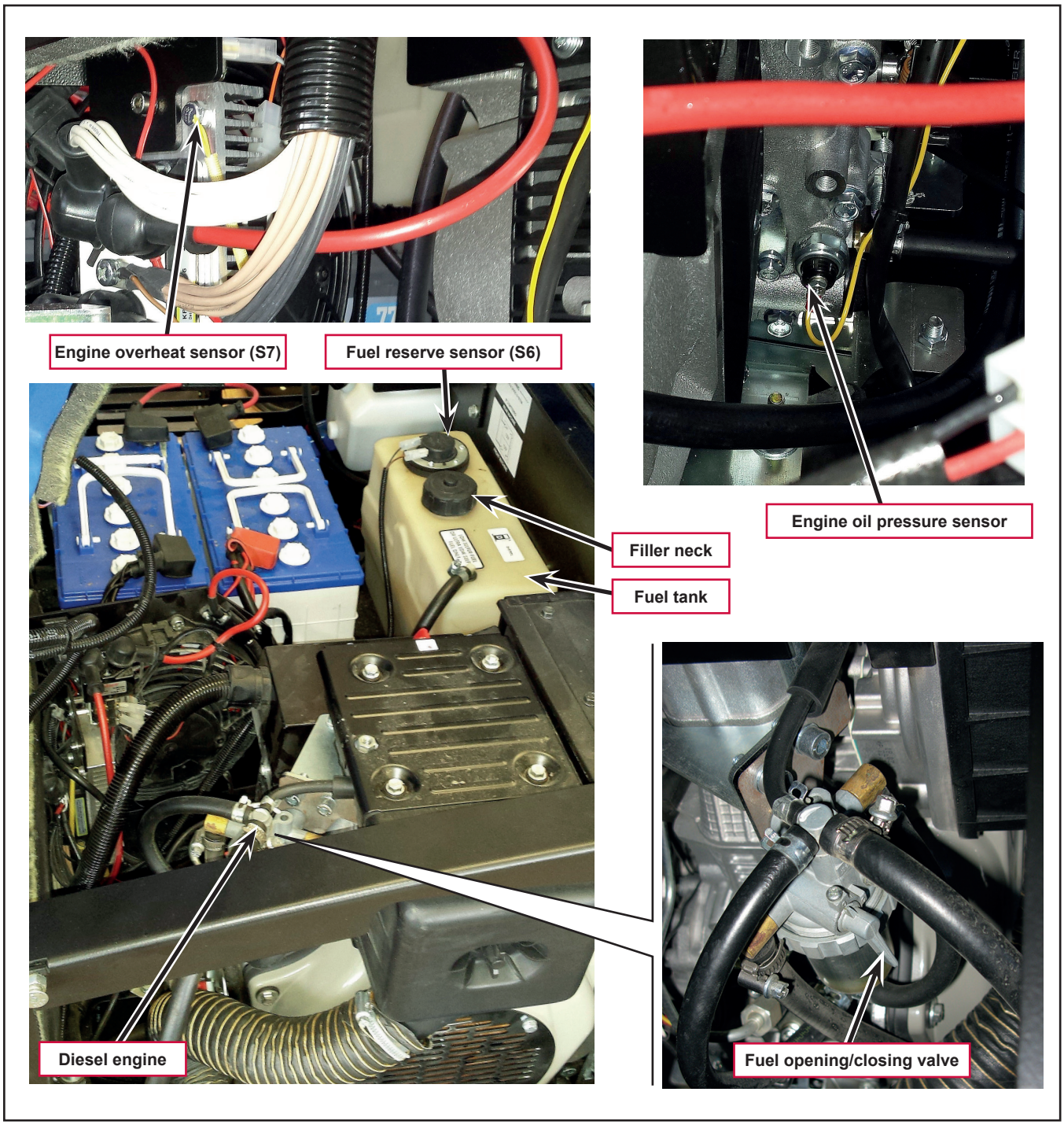


Figure 2:

Maintenance and Adjustments

Engine RPM Check

Check

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Lift and remove the left side panel, disengaging it from the upper and lower fasteners.
4. Check that the indicator (B) is present on the crankshaft, otherwise unscrew the screws (C) and remove the grid (D), then apply it.
   Reposition the grid (D) and screw down the screws.
5. Start the engine with the ignition key and wait for its speed to stabilise.
6. With an appropriate opticale revolution indicator, check the engine speed, which should be 3,200 rpm ± 150.
7. If necessary, reset the engine speed, taking the engine to a YANMAR service centre.

Reassembly

8. Position the left side panel (A) and clip it onto the upper and lower fasteners.

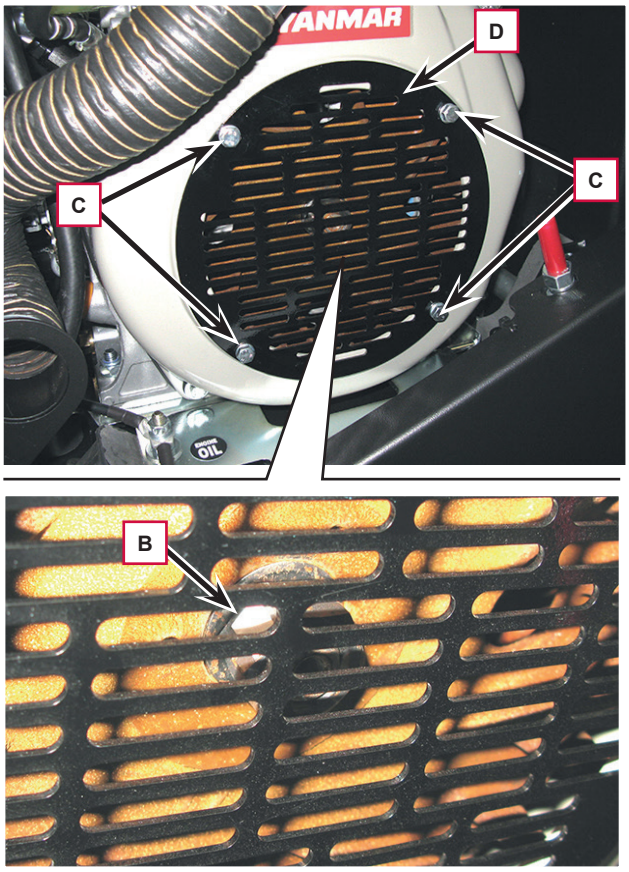


Figure 3:

Engine Air Filter Cleaning/Check

A dirty air filter limits the passage of air, thus reducing engine performance. When working in particularly dusty areas, clean or replace the filters more often than specified in the maintenance programme.

WARNING: Running the engine without air filters, or with damaged filters, can cause a faster engine wearing.

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Open the engine compartment hood with the handle and fasten it with the support rod.
4. Lift and remove the machine left side panel, disengaging it from the upper and lower fasteners.
5. Remove the wing nut (A) and remove the cover (B).
6. Remove the wing nut (C) and disassemble the filter element.
7. Separate the paper filter (D) from the foam filter (E).
8. Check both filters and replace them if necessary. Replace the paper filter (D) when required (see Scheduled Maintenance Table).
9. To reuse the filters, clean them both by blowing compressed air [at no more than 207 kPa (2.1 kgf/cm)] inside the filter. Do not use a brush, otherwise the fibre will be damaged.
10. Clean with a wet cloth the base and the cover (B) of the air filter. Take care to prevent dirt entering the air duct (G).
11. Fit the foam filter (E) on the paper filter (D), then install the assembled filter element. Screw down the filter element wing nut (C).
12. Install the cover (B) and screw down the wing nut (A).

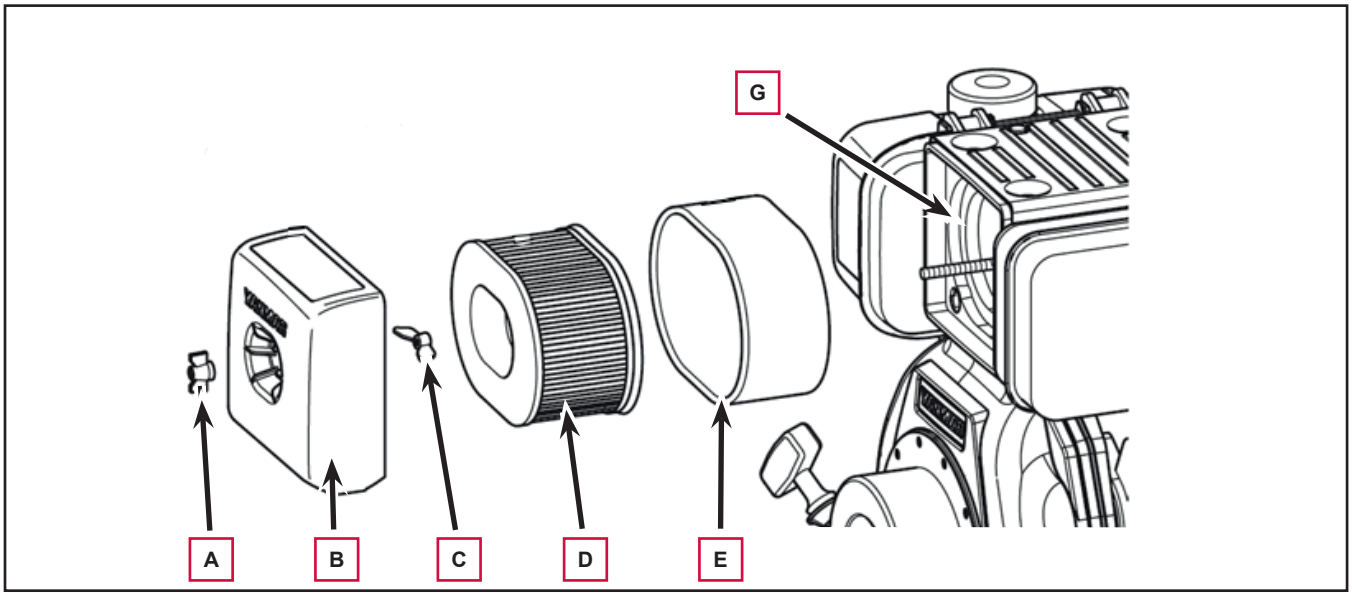


Figure 4:

Engine Oil Level Check

WARNING: Running the engine with a low oil level can damage the engine itself.

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Open the engine compartment hood with the handle and fasten it with the support rod.
4. Lift and remove the machine left side panel, disengaging it from the upper and lower fasteners.
5. Remove the cap (A).
6. Check the oil level. If it is below the upper limit (B), top up with the recommended oil until you reach the upper limit.
7. Reinstall the filler cap (A) safely.
8. Perform steps 3 and 4 in the reverse order.

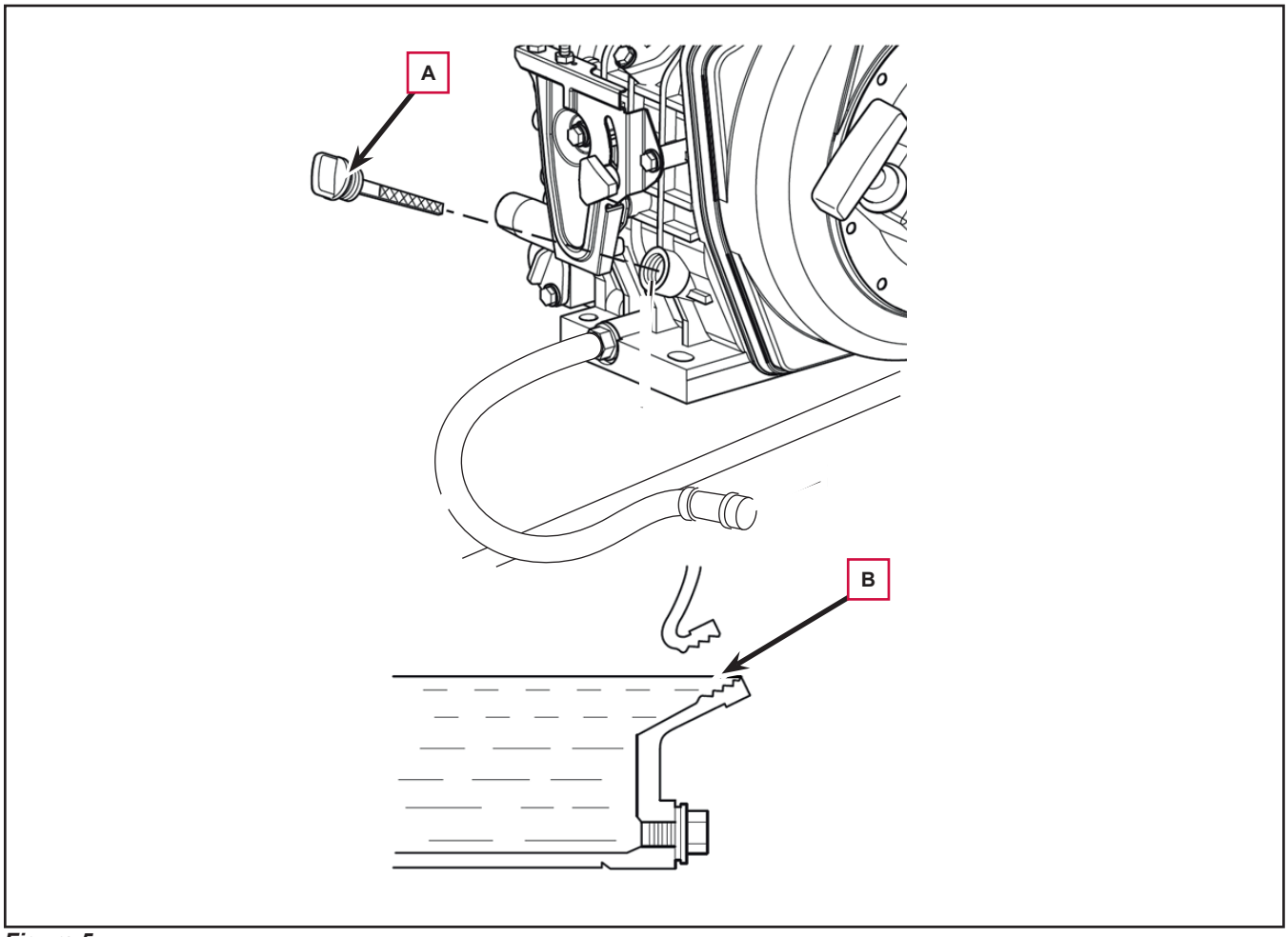


Figure 5:

Engine Oil Change

WARNING: The discharged engine oil must be disposed of properly according to the Law in force.

Note: *It is advisable to change the oil when the engine is still hot, to make the oil downflow easier.*

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Open the engine compartment hood with the handle and fasten it with the support rod.
4. Lift and remove the machine left side panel, disengaging it from the upper and lower fasteners.
5. Remove the cap (A).
6. Disengage the extension tube (B) with cap (C) on the engine oil drain hole from its fastener, in order to facilitate draining off the oil.
7. Pour the new oil through the filler (D) until it reaches the upper limit (E).

Note: *As for engine oil type and quantity, see Technical Data and the Yanmar Engine Manual.*

8. Perform in the reverse order steps 3. 4. 5.

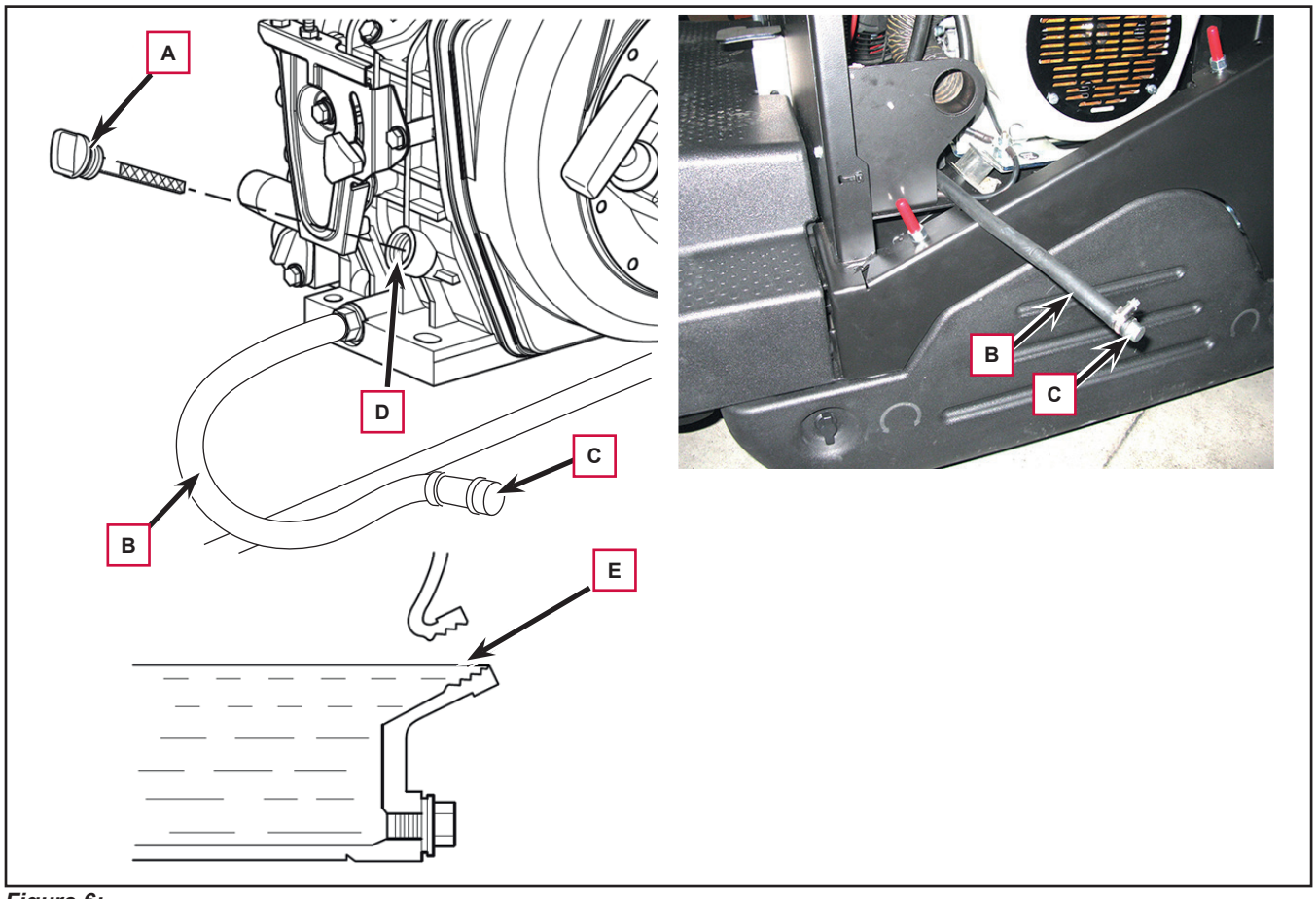


Figure 6:

Engine Oil Filter Check/Cleaning

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Open the engine compartment hood with the handle and fasten it with the support rod.
4. Lift and remove the machine left side panel, disengaging it from the upper and lower fasteners.
5. Remove the bolt (A).
6. Remove the cap (B) and remove the oil filter (C).
7. Clean the oil filter, or replace it if damaged.
8. Install the oil filter (C).
9. Ensure that the oil filter plug (B) is completely inserted.
10. Install and tighten the retaining bolt (A).
11. Add engine oil as recommended (see Technical Data and the Yanmar Engine Manual).

CAUTION: See Engine Oil Level Check for the oil top-up procedure.

12. Warm up the engine for 5 minutes and check for any engine oil leaks.
13. Once the engine is warm, switch it off and leave it to cool for 10 minutes.

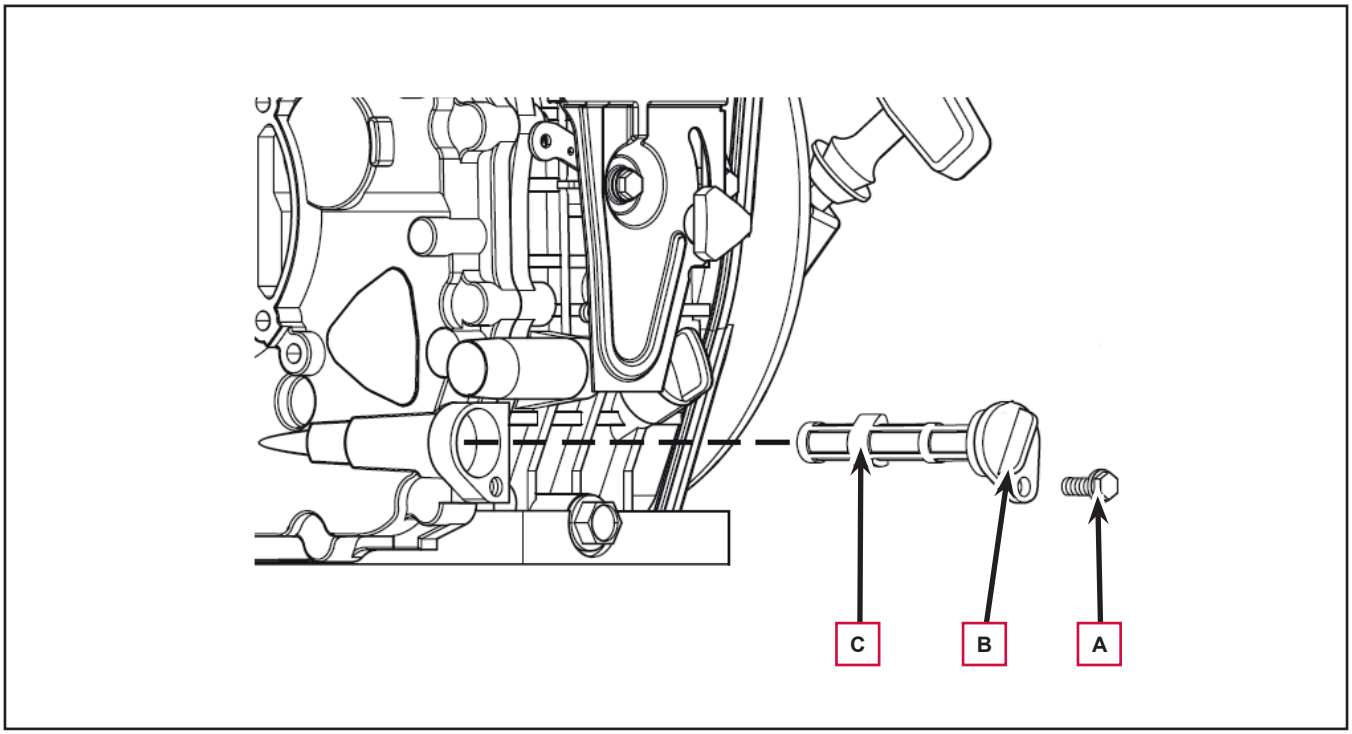
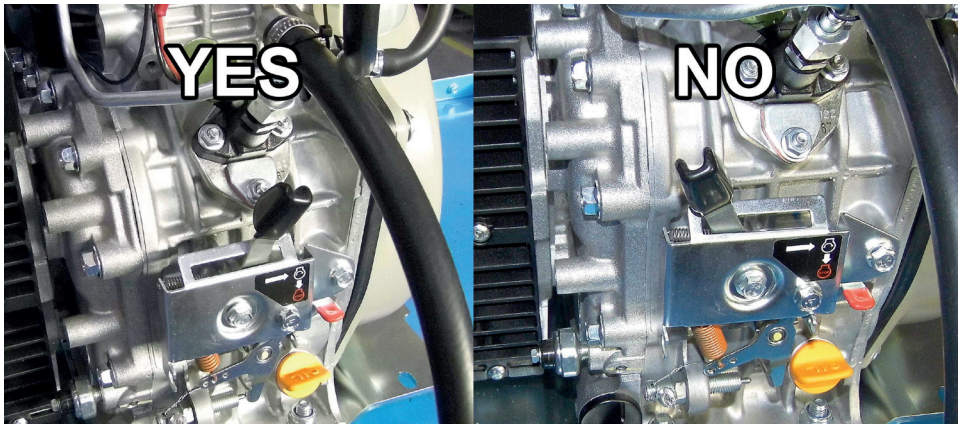
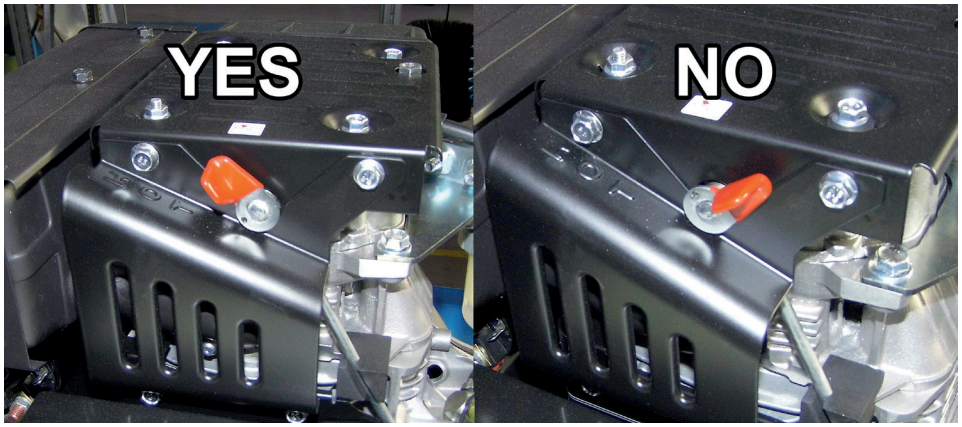


Figure 7:

Troubleshooting

Trouble	Possible causes	Remedy
The engine does not start	The oil level is low. Engine oil pressure sensor activation	Top up with the recommended oil to the proper level
	Batteries (BAT) flat	Recharge with a proper battery charger.
	Emergency push-button (SW0) pressed	Check and release the emergency push-button.
	Accelerator lever on engine not locked in position	Lock it
	 *Figure 8:*	
	Valves opening lever on engine blocked	Release it
	 *Figure 9:*	
	-	Insufficient time waited at ignition for the electronic system to reboot
	Engine power relay (ES7), fuel solenoid valve (EV4) and fuel pump motor (P2) faulty	Replace components as required
	Key circuit fuse (F2) open circuit	Replace
	The ignition key switch (KEY) is not working	Replace

Troubleshooting (continues)

Trouble	Possible causes	Remedy
The engine is overheating, shutting down, and activating the rectifier temperature sensor	Fan relay (ES6) faulty	Replace
	Fan fuse (F7) blown	Replace
	Fan (M7) faulty	Replace
The engine loses power or stops during operation.	The filter element or elements are clogged	Clean or replace the filter elements
	The fuel filter is clogged, the start system is broken, the valves are locked, etc.	Replace or repair the faulty components as necessary (take the engine to an authorized Honda service centre)
The machine shuts down	Battery fuse (F0) blown	Replace
The machine generates an alarm when powered (see Main Machine Controller Alarm Codes)	Alternator fuse (F4) blown	Replace
	Charging system contactor (ES10) faulty	Replace

Removal and Installation

Diesel Engine - Spare Parts

(A) Engine complete.

(B) Side exide muffler.

(C) Diesel Filter.

(D) Diesel cartridge filter.

(E) Dielsel oil pump.

(F) Starter Motor.

(G) Oil pressure sensor.

(H) Filter air.

(I) Inlet ait grid.

(J) Oil drain gasket.

(K) Fuel inject nozzle.

(L) Drain oil cap.

(M) Gauge oil cap.

(N) Hoses.

(O) Injector pump.

(P) Cover valves gasket.

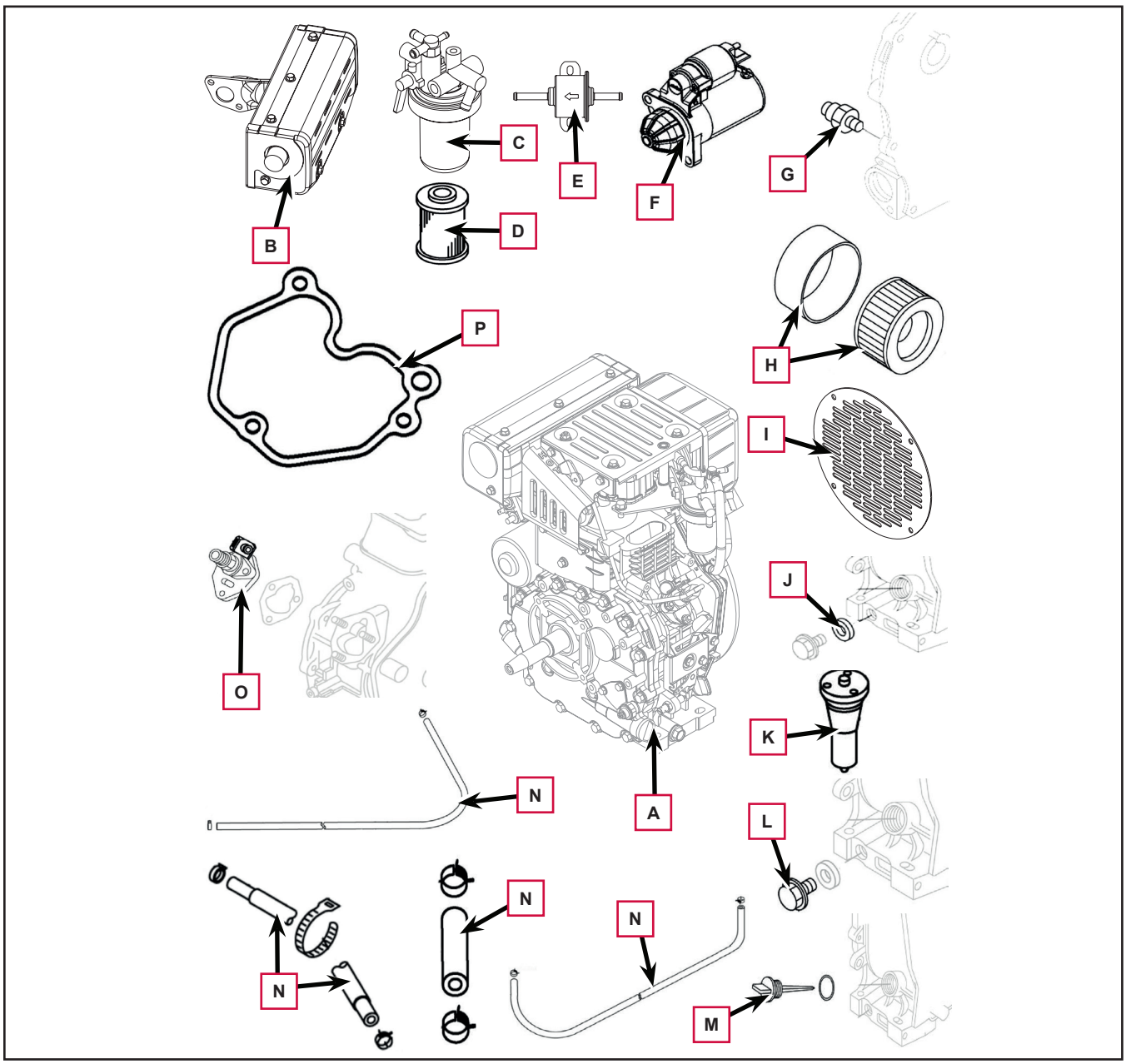


Figure 10:

Alternator - Spare Parts

(A) Alternator complete.

(B) Heat sink.

(C) Bridge rectifier.

(D) Resistor.

(E) Grid side.

(F) Temperature sensor.

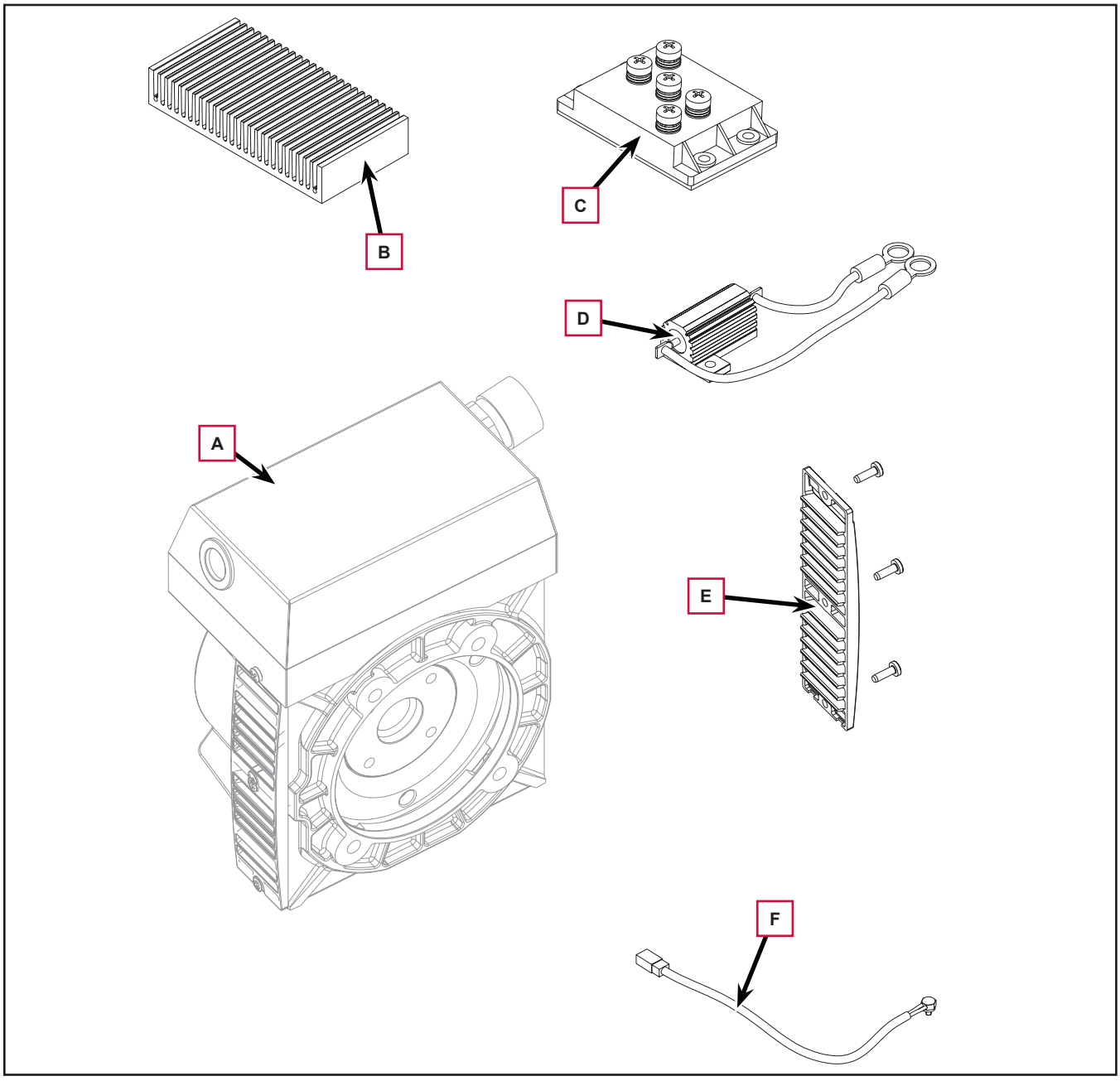


Figure 11:

Engine/Alternator Unit

Removal

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Open the engine compartment hood with the handle and fasten it with the support rod.
4. Disconnect the batteries.
5. Lift and remove the machine left and right side panels, disengaging them from their upper and lower fasteners.
6. Unscrew the screws (A) and remove the front panel (B) in the direction indicated by the arrow.
7. Disconnect the electrical connections (C) of the diesel engine wiring (D).
8. Disconnect the electrical connection (E) on the diesel valve and the electrical connection (F) on the oil pressure sensor.
9. Working from the other side of the diesel engine, disconnect the electrical connections (G) and (H) of the starter motor (I).

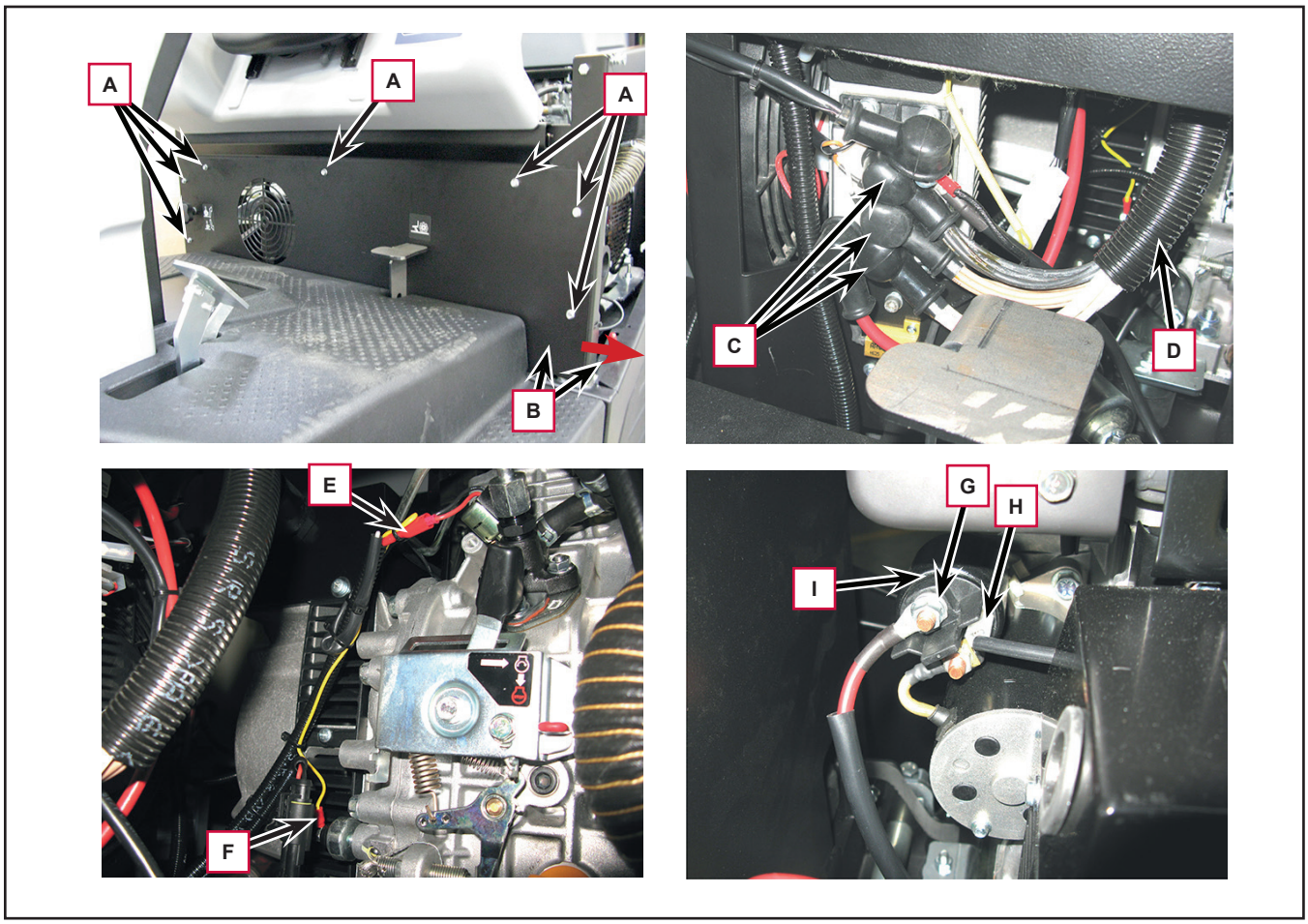


Figure 12:

Engine/Alternator Unit (Continues)

10. Loosen the retaining clamps and disconnect the hoses (J) and (K) on the diesel fuel lines; collect any fuel which leaks out.
    Close with sealing plugs the disconnected fittings immediately, to prevent foreign materials from entering into the system.
11. Loosen the retaining clamp (L) and disconnect the terminal (M) on the air vacuum hose.
12. Disconnect the engine oil drain line (N) from the fastener.
13. Unscrew the nut (P) and disconnect the two earth connections (Q).
14. Remove the two mounting nuts (R) on the left side of the engine/alternator unit.

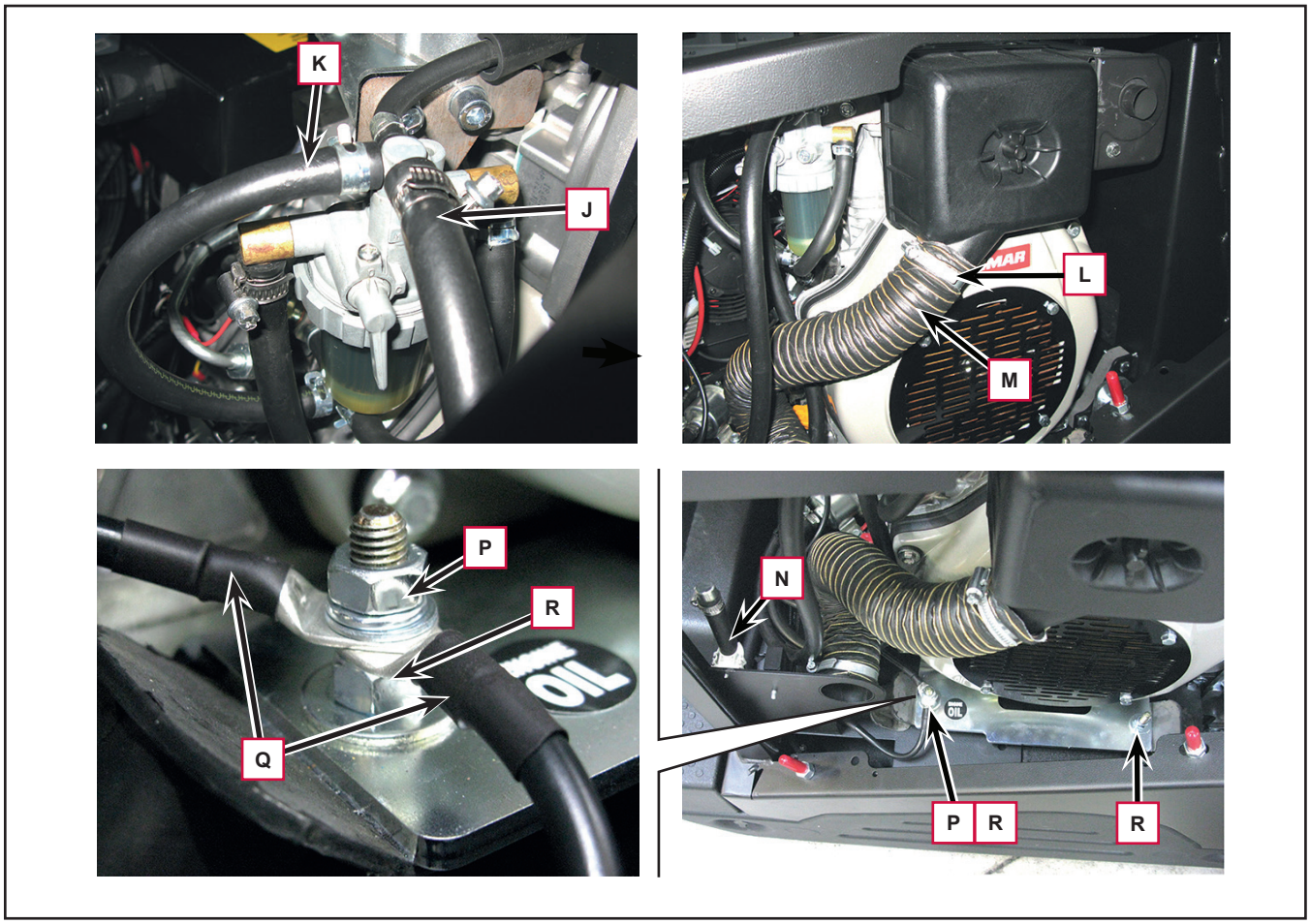


Figure 13:

Engine/Alternator Unit (Continues)

15. Unscrew the right-hand retaining nuts (S) and (T) on the engine/alternator unit.
16. Unscrew the nuts (U) and remove the cross-member (V).
17. Screw down the lifting eyebolt (W) onto the Diesel engine (X), then use appropriate lifting equipment to lift and remove the engine/alternator unit (weight of assembly approx. 121 lb (55 Kg)).

Installation

18. Assemble the components in the reverse order of disassembly.

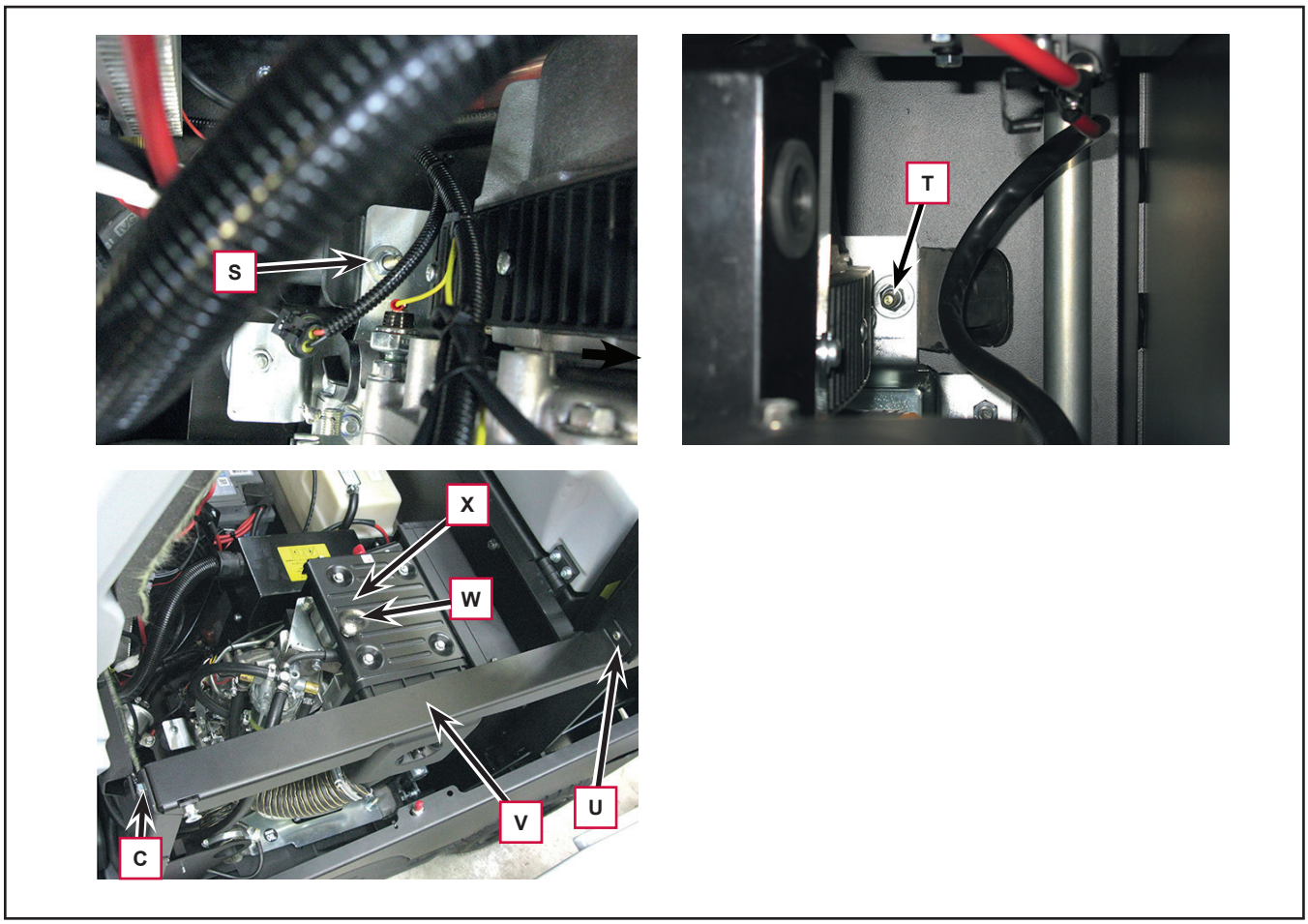


Figure 14:

Specifications

Model	SW5500 D
Make	Yanmar
Model	L70N
Dimensions	14.9 x 16.6 x 17.8 in (378 x 422 x 453 mm)
Dry weight	90 lb (41.0 Kg)
Displacement	320 cm^3
Power	4.1 kW (5.5 hp) @ 3,000 rpm
Oil type	SAE 15W-40 - SYNTHETIC API SJ
Fuel tank capacity	1.8 US gal (7 liters)
Engine oil quantity	1,1 US qt (1,05 liters)
Cooling system	Forced air
Starting system	Electrical starting

29 - Engine System, LPG

Functional Description

The engine system (Honda iGX 270) generates electric current for all machine functions.

The assembly consists of an internal combustion engine and alternator, which are both connected to the main crankshaft.

The engine is a single-cylinder air-cooled LPG type.

Engine starting is performed by a starter motor.

The running engine supplies the power to generate the current and to power the electrical systems of the machine. The surplus current is used to charge the batteries.

The engine speed is regulated from 2,300 to 3,000 rpm, on the basis of the load, and to provide constant current to the electrical system.

The LPG tank is fastened to the relevant holder in the rear side of the machine and connected to the power supply system with a hose and a double solenoid valve.

When turning the ignition key, the safety solenoid valve opens, the liquid gas passes through the filter in the fuel solenoid valve, thus reaching the pressure reducer.

The pressure reducer lowers the gas pressure, which then reaches the carburettor.

The LPG system is protected against any overpressure by a relief valve which activates at 27 atm (400 PSI). The fuel reserve icon is shown on the display when the sensor in the power supply system detects a pressure lower than 1.1 bar (16 psi).

For safety reasons, if the engine is not started (ignition key to “II”) within 10 seconds after turning on the Main Control Board (ignition key to “I”), the safety solenoid valve automatically closes the gas power supply.

The engine is equipped with an oil level sensor (Oil Alert), which purpose is to avoid damages caused by an insufficient oil quantity in the oil pan. Before the oil level goes below the safety limit, the system (Oil Alert) automatically stops the engine by short circuiting the spark plug to the chassis.

If the engine stops and do not restart, check the engine oil level before doing any other troubleshooting procedure.

The LPG solenoid valve is turned off by the Main Machine Controller (EB1) in the following three cases:

- After 10 sec. that the motor is detected off (through the entrance that verifies the alternator voltage)
- If the Oil Alert system will indicate a lack of oil.
- If an excessive temperature is detected on the heat sink of the alternator rectifier bridge (ALT)

STR Regulator Technical Features (Automatic Speed control)

This engine is equipped with a STR controller (automatic speed controller) that allows a start and a fast heating of the motor without any manual intervention before and after its start.

The STR controller controls the regulating valve and the air valve by means of a step motor to the throttle control step located inside the carburetor. The actuator, together with a unit wax-based thermally connected (actuator assembly), controls the air valve of starting up a hot or cold engine.

It is not necessary to use any battery for operating the STR controller. The recoil starter starts the STR controller.

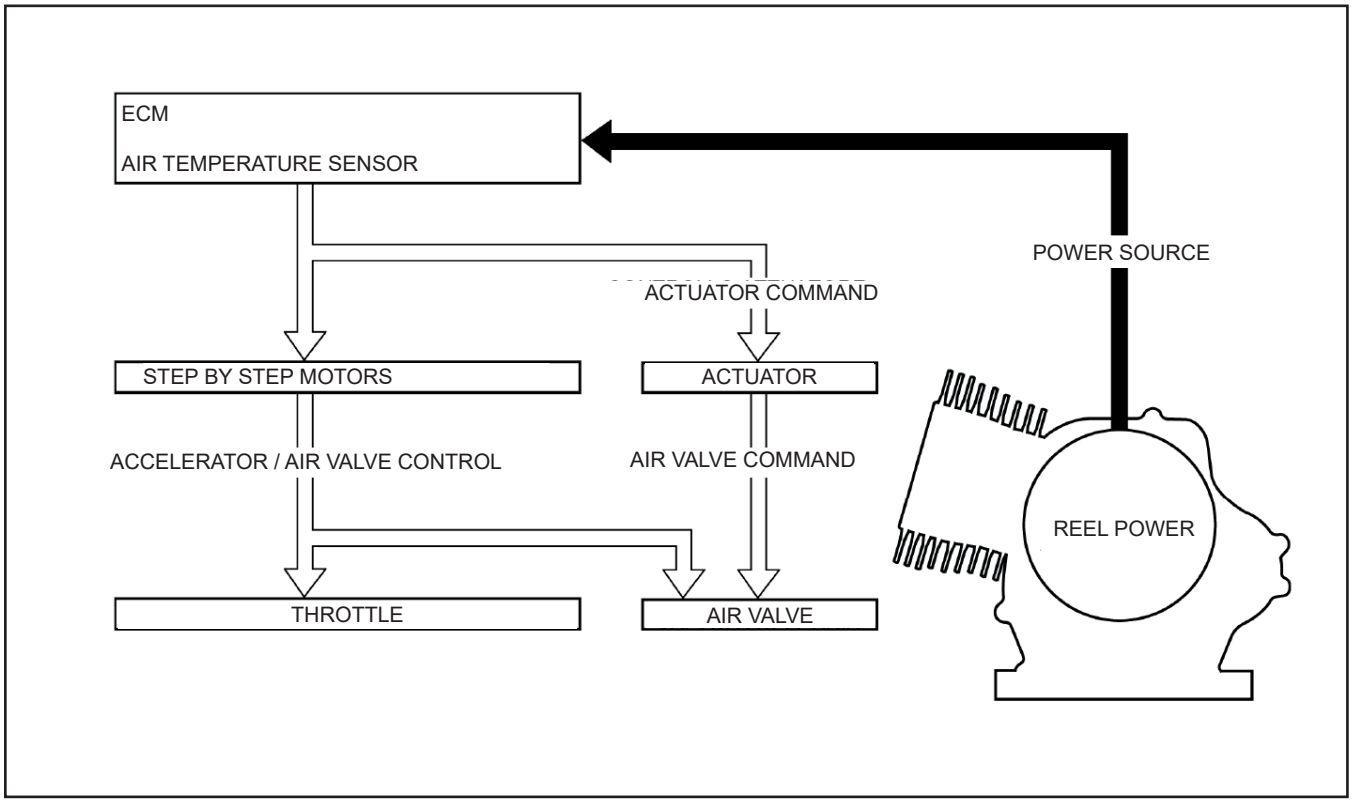


Figure 1:

Wiring Diagram

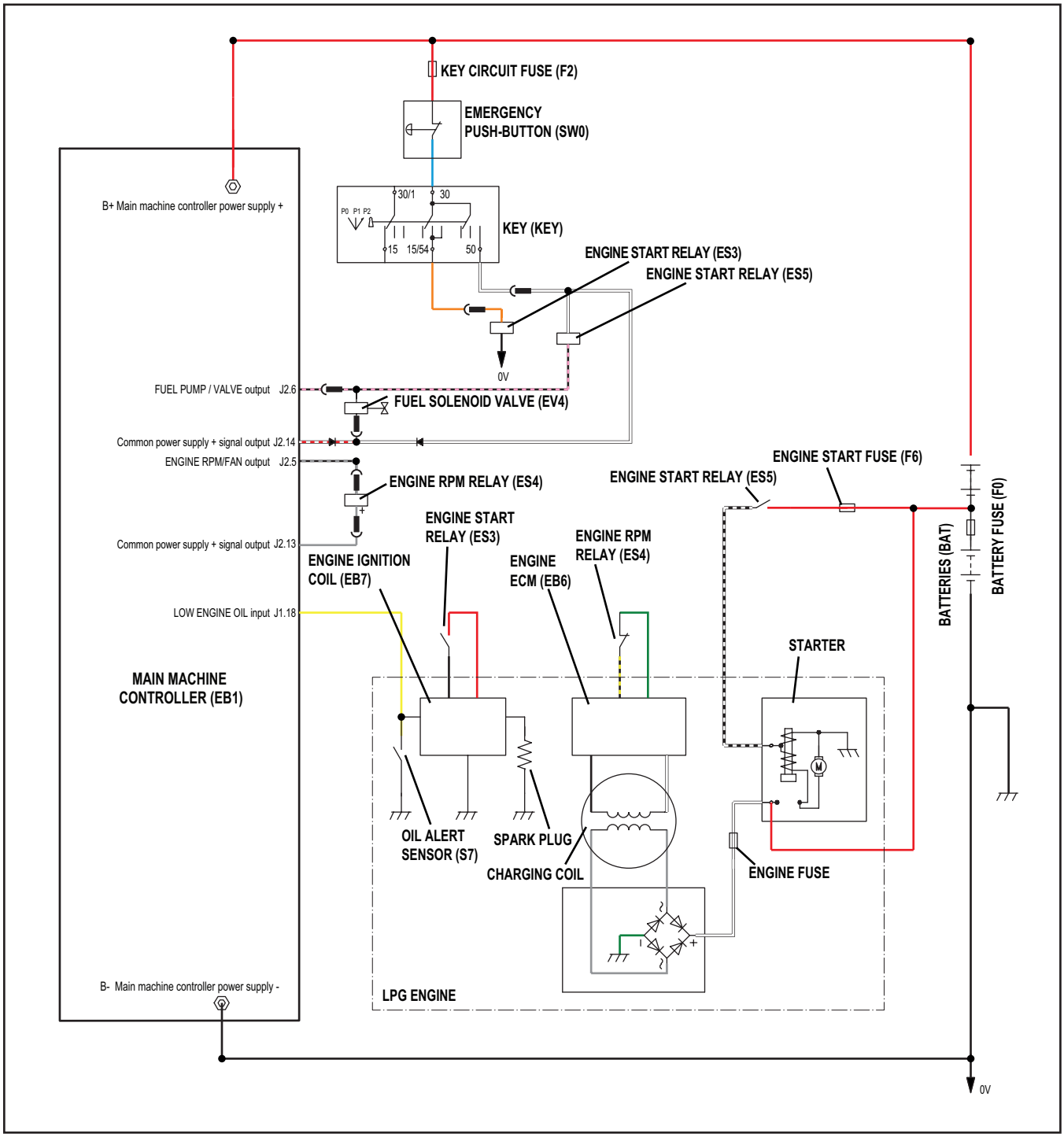


Figure 2:

Component Locations

- LPG tank fastening band
- LPG cylinder
- LPG tank opening/closing valve
- LPG tank fitting
- Hose
- Safety valve
- Pipe
- Hose

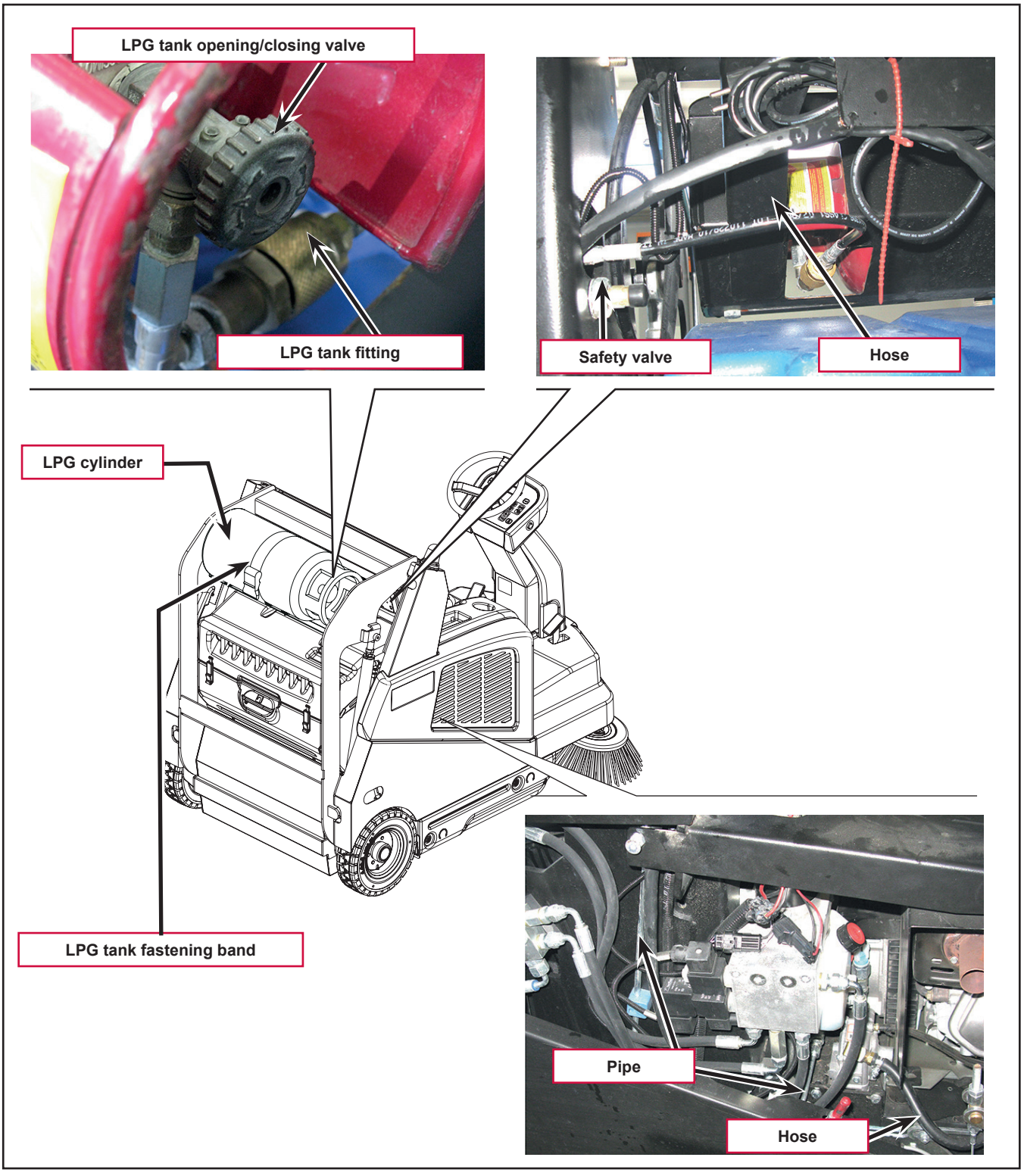


Figure 3:

Component Layout (Continues)

- LPG wiring harness
- Motor
- Hose
- LPG pressure regulator
- Fuel solenoid valve (EV4)
- Fuel reserve sensor (S6)

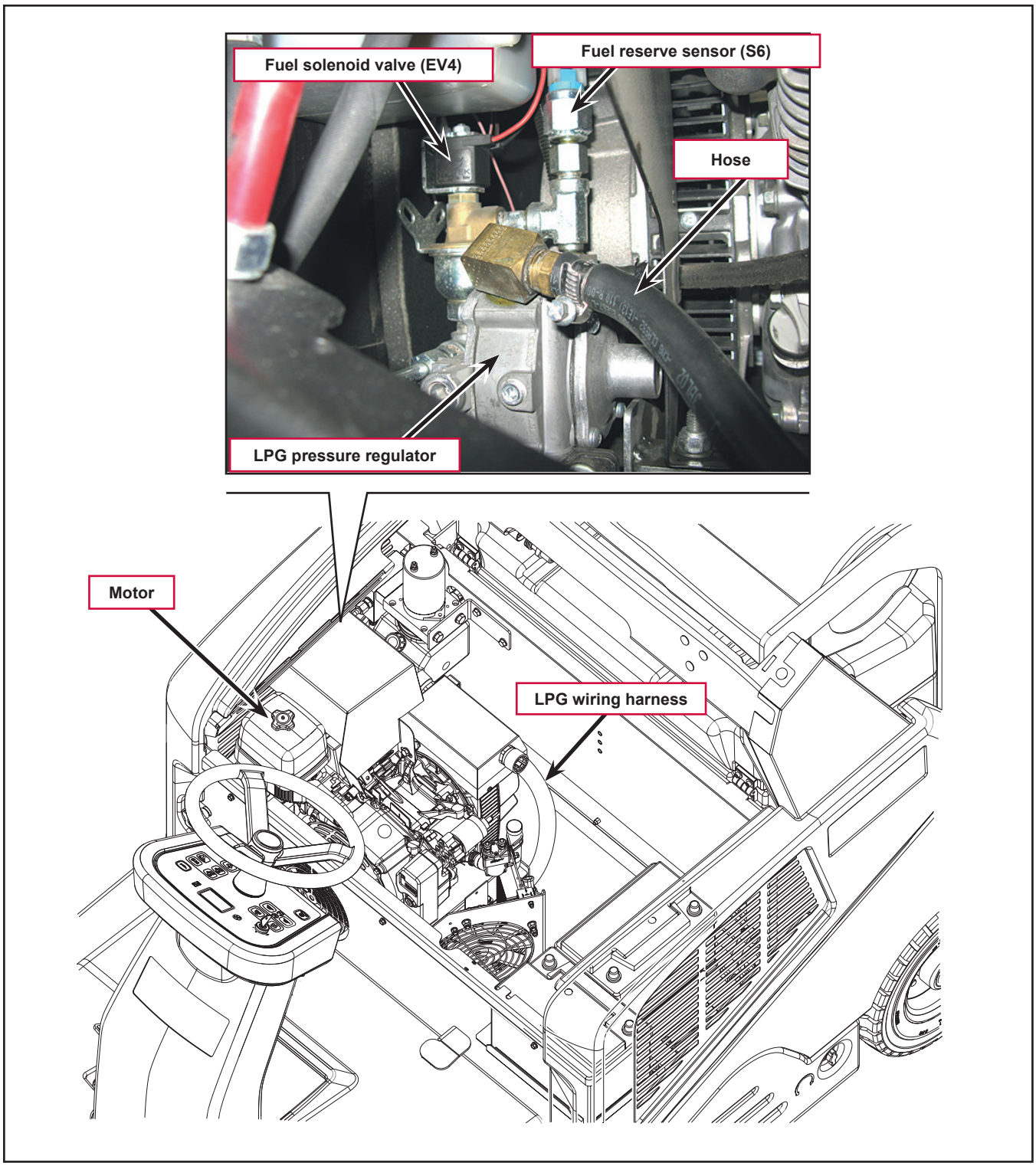


Figure 4:

Maintenance and Adjustments

Engine Air Filter Cleaning/Check

A dirty air filter limits the passage of air, thus reducing engine performance. When working in particularly dusty areas, clean or replace the filters more often than specified in the maintenance programme.

WARNING: Running the engine without air filters, or with damaged filters, can cause a faster engine wearing.

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Open the engine compartment hood with the handle and fasten it with the support rod.
4. Lift and remove the machine right side panel, disengaging it from the upper and lower fasteners.
5. Remove the wing nut (A) and remove the cover (B).
6. Remove the wing nut (C) and disassemble the filter element.
7. Separate the paper filter (D) from the foam filter (E).
8. Check both filters and replace them if necessary. Replace the paper filter (D) when required (see Scheduled Maintenance Table).
9. To reuse the filters, clean them both by blowing compressed air [at no more than 207 kPa (2.1 kgf/cm)] inside the filter. Do not use a brush, otherwise the fibre will be damaged.
10. Clean with a wet cloth the base and the cover (B) of the air filter. Take care to prevent dirt entering the air duct (G).
11. Fit the foam filter (E) on the paper filter (D), then install the assembled filter element. Ensure that the gasket (F) is properly placed under the filter element. Screw down the filter element wing nut (C).
12. Install the cover (B) and screw down the wing nut (A).
13. Perform in the reverse order steps 3. and 4. .

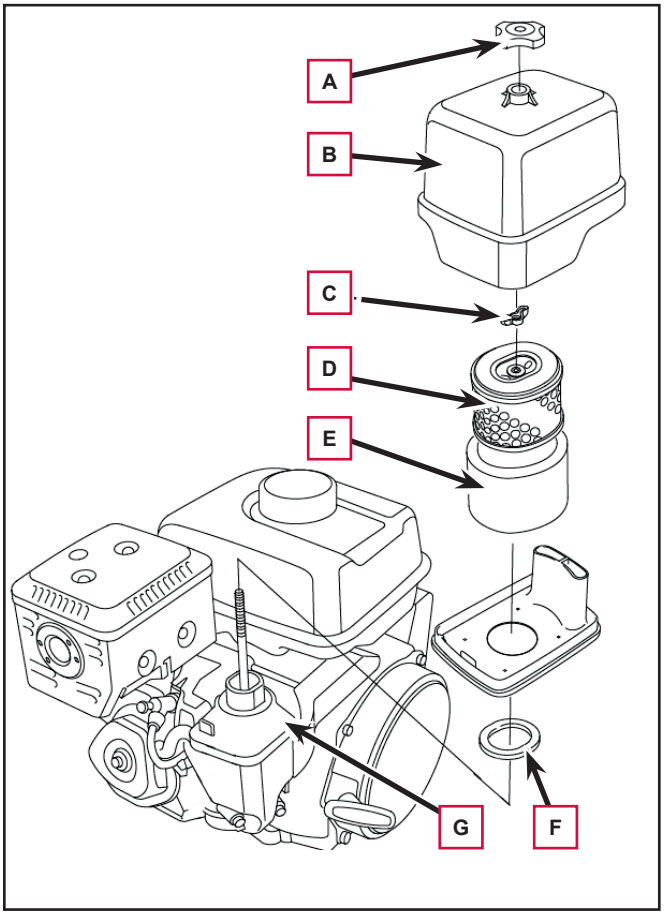


Figure 5:

Engine oil level check

WARNING: Running the engine with a low oil level can damage the engine itself.

Note: *The oil alert system will automatically stop the engine before the oil level goes down under the safety limit. To avoid a sudden engine stop, always check the oil level before each start-up.*

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Open the engine compartment hood with the handle and fasten it with the support rod.
4. Lift and remove the machine right side panel, disengaging it from the upper and lower fasteners.
5. Remove the cap (A).
6. Check the oil level. If it is below the upper limit (E), top up with the recommended oil until you reach the upper limit.
7. Reinstall the filler cap (A) safely.
8. Perform in the reverse order steps 3. and 4. .

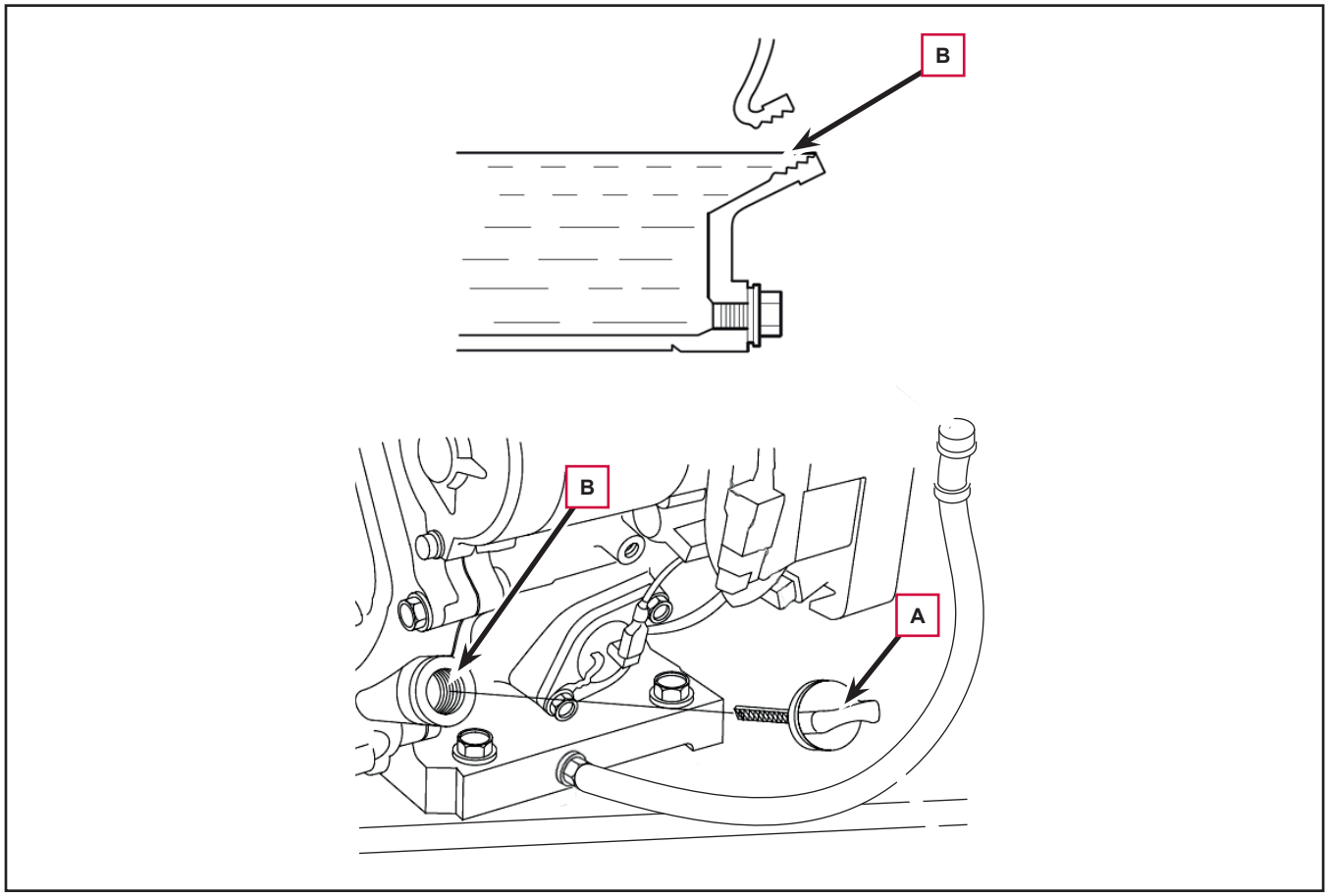


Figure 6:

Engine Oil Change

WARNING: The discharged engine oil must be disposed of properly according to the Law in force.

Note: *It is advisable to change the oil when the engine is still hot, to make the oil downflow easier.*

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Open the engine compartment hood with the handle and fasten it with the support rod.
4. Lift and remove the machine right side panel, disengaging it from the upper and lower fasteners.
5. Remove the cap (A).
6. Unhook the drain hose (B) and bring it towards the outside of the machine.
7. Remove the drain plug (C) from the hose and drain the oil into a suitable container, then refit the oil drain plug and return the hose to its initial location.
8. Remove the filler cap (D) and pour in the new oil through the filler until it reaches the upper limit (E) of the cavity.

Note: *As for engine oil type and quantity, see Technical Data and the Honda Engine Manual.*

9. Reinstall the filler cap (D) and the cap (A) safely.
10. Perform in the reverse order steps 3. and 4. .

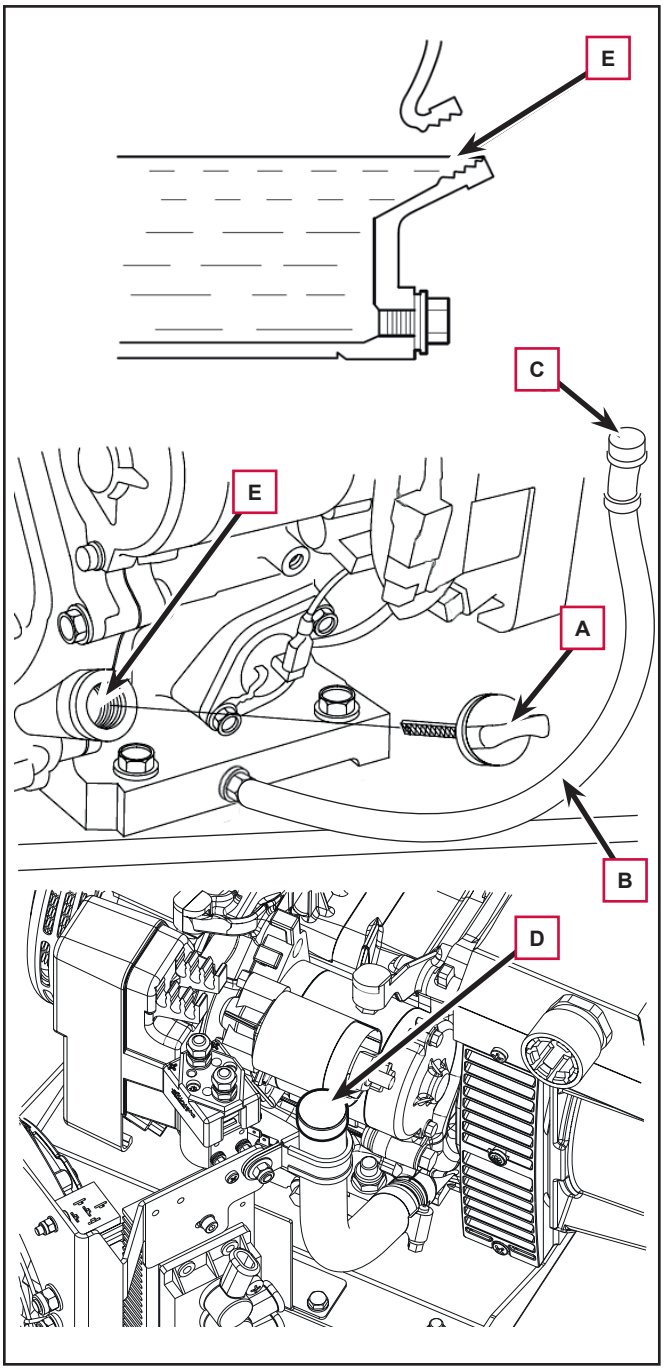


Figure 7:

Engine Spark Plug Check/Replacement

For the type of spark plug to be used, see Technical Data.

WARNING: A wrong spark plug can damage the engine.

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Open the engine compartment hood with the handle and fasten it with the support rod.
4. Lift and remove the machine right side panel, disengaging it from the upper and lower fasteners.
5. Disconnect the spark plug cap (A) and remove dirt around the spark plug (B).
6. Remove the spark plug with a suitable wrench (C).
7. Check the spark plug. Replace it if it is damaged, dirty, if the sealing washer (D) is damaged or if the electrode is worn.
8. Measure the distance between the spark plug electrodes with a feeler gauge. Correct the distance by bending carefully the side electrode (E). The distance between the electrodes must be of 0.70 - 0.80 mm.
9. Install the spark plug manually with great care, to avoid tightening it improperly.
10. Once the spark plug is in place, tighten it with a proper wrench to press the sealing washer.
11. When a new spark plug is installed, tighten 1/2 turn once the spark plug is in place to press the washer.
12. When the original spark plug is reinstalled, tighten 1/8 - 1/4 turn once the spark plug is in place to press the washer.

WARNING: A loose spark plug can overheat and damage the engine. Do not overtighten, otherwise the threads in the cylinder head can be damaged.

13. Connect the spark plug cap.

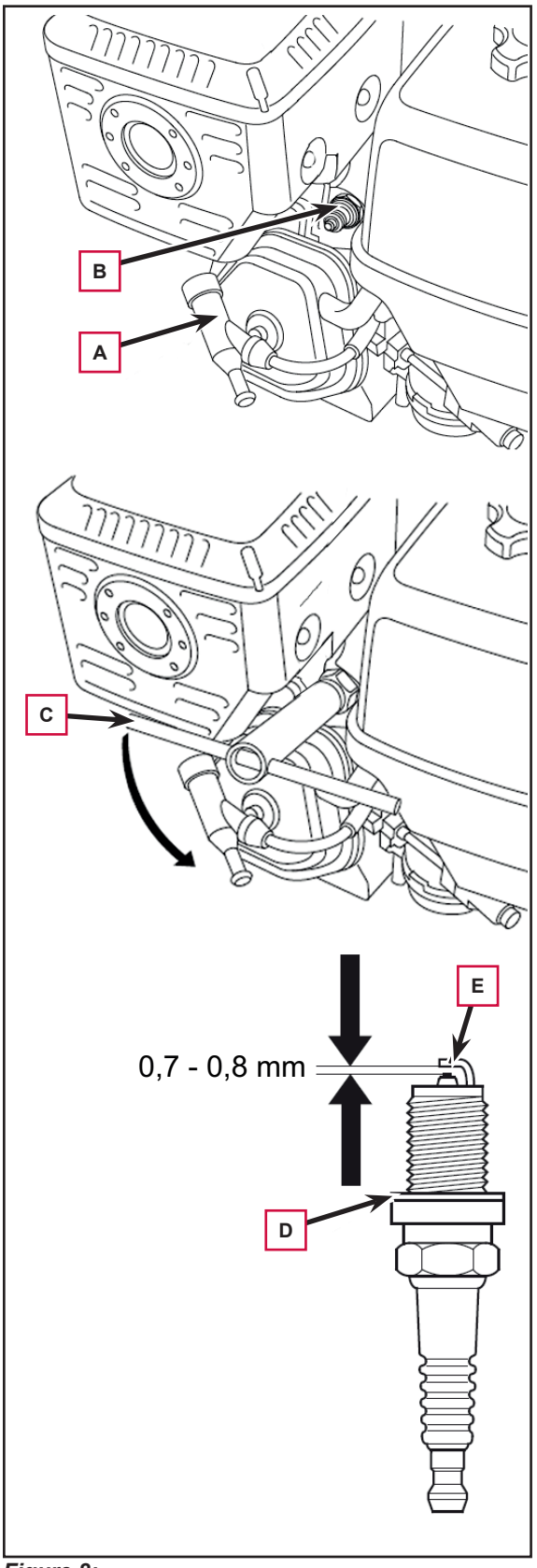


Figure 8:

LPG System Leakage Check

WARNING: This procedure must be performed by personnel qualified to handle the LPG systems, according to the law in force.
Moreover, it is necessary to wear accident-prevention clothes, according to the law in force (heavy gloves, antistatic non-synthetic clothes, suitable to cover the whole body, antistatic and antispark shoes, helmets with visor; etc.).

1. After any maintenance or replacement procedure involving operations on the fittings or movement of LPG system components, check for any LPG gas leaks as shown below.
2. Turn the ignition key to “0” and engage the parking brake.
3. Open the engine compartment hood with the handle and fasten it with the support rod.
4. Remove the machine right body side, by lifting it to disengage it from the fasteners.
5. If the engine is hot, wait that it cools down.
6. By proceeding as shown in the Instructions for use manual, check that the fitting (A) of the hose (B) is properly connected to the fitting (C) of the LPG tank (D). Check that the valve (E) of the LPG tank (D) is closed.

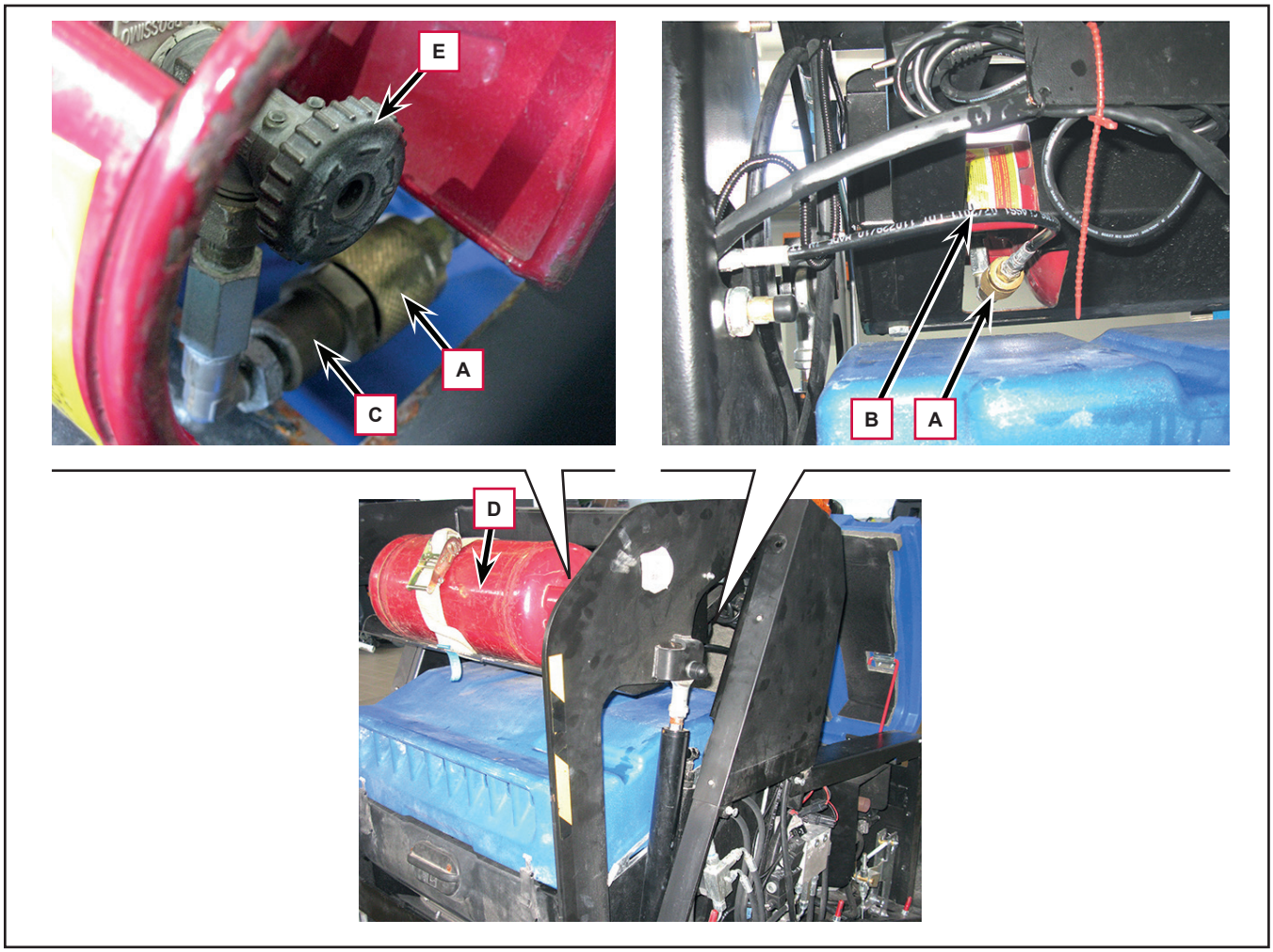


Figure 9:

LPG System Leakage Check (Continues)

7. Apply evenly the spry product that detects gas leaks “SUPER BALL, OFF. PROD. C.C.I.A.A. 186231 (VI)” (or equivalent) on all the fittings of the LPG system, starting from the fitting (A) of the LPG tank (D) to the fitting (F) between the hose and carburettor (G). Proceed according to the instructions on the package of the spry product.

8. Open the LPG tank valve (E), then check for LPG gas leaks, shown by gas bubble development, on all LPG system fittings, starting from LPG tank fitting (A) to the fuel solenoid valve (H).

9. Turn the ignition key to the first position “I”, then check for LPG gas leaks, shown by gas bubble development, on all LPG system fittings, starting from the fuel solenoid valve (H) to the hose fitting (F).

10. In case LPG leaks are detected, it is necessary to open the relevant fittings, manage them as described, then tighten them again (see procedure in the relevant paragraph).
Perform again LPG System Leakage Check.

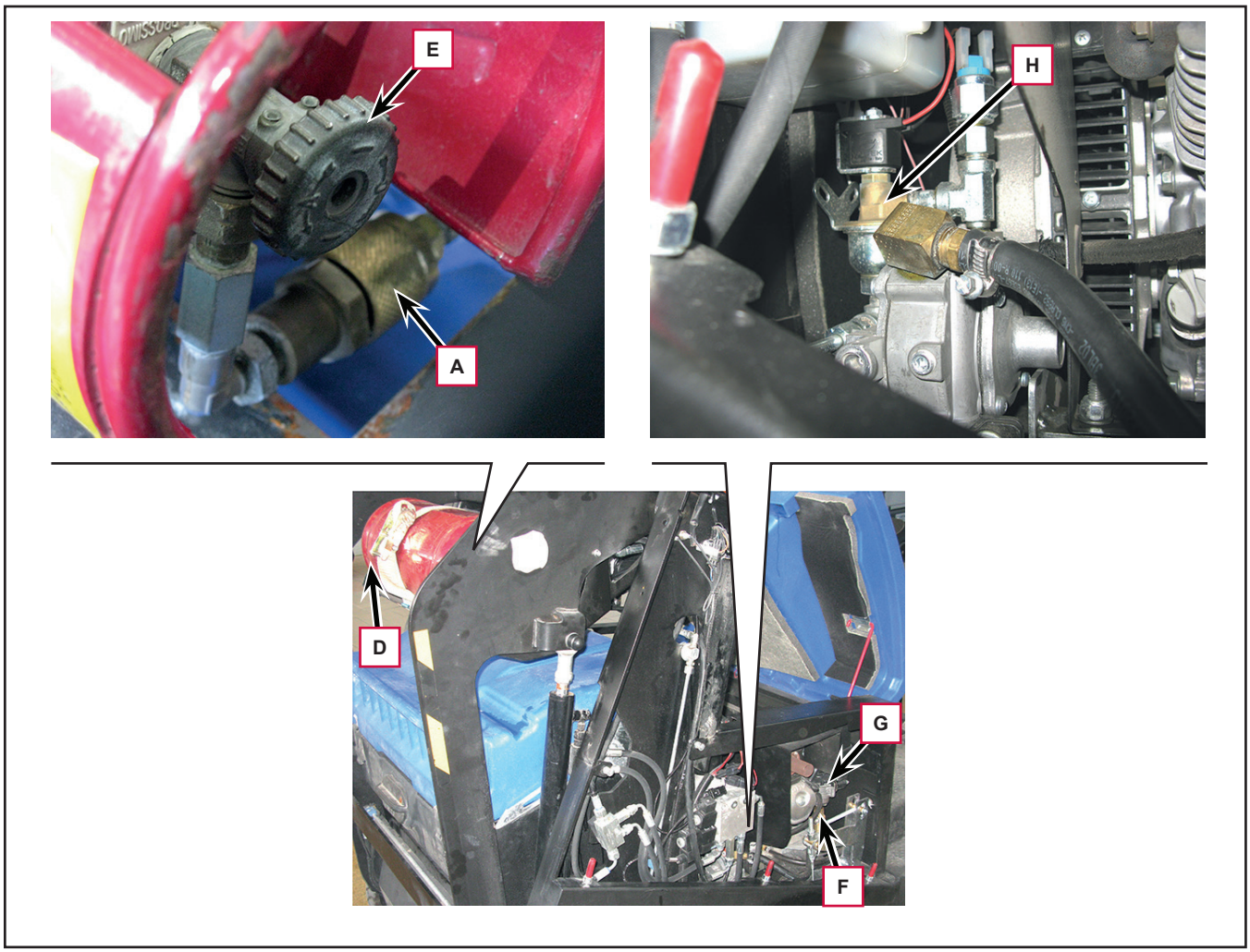


Figure 10:

Fuel Solenoid Valve Filter Cleaning

WARNING: This procedure must be performed by personnel qualified to handle the LPG systems, according to the law in force.
Moreover, it is necessary to wear accident-prevention clothes, according to the law in force (heavy gloves, antistatic non-synthetic clothes, suitable to cover the whole body, antistatic and antispark shoes, helmets with visor; etc.).

Disassembly

1. Remove the pressure regulator (see procedure in the relevant paragraph).

CAUTION: For removal / installation of the various hoses and fittings of the LPG system, see procedure in the relevant paragraph.

2. Unscrew the fitting (A) from the fuel solenoid valve on the workbench.

3. Remove the filter holder (B).
Inside the filter holder there is a cylinder with magnet (C) which will be cleaned and placed in the lower side of the filter holder itself (as shown in the figure).
The filter holder gasket (D) must be replaced with the corresponding spare part, before reassembly.

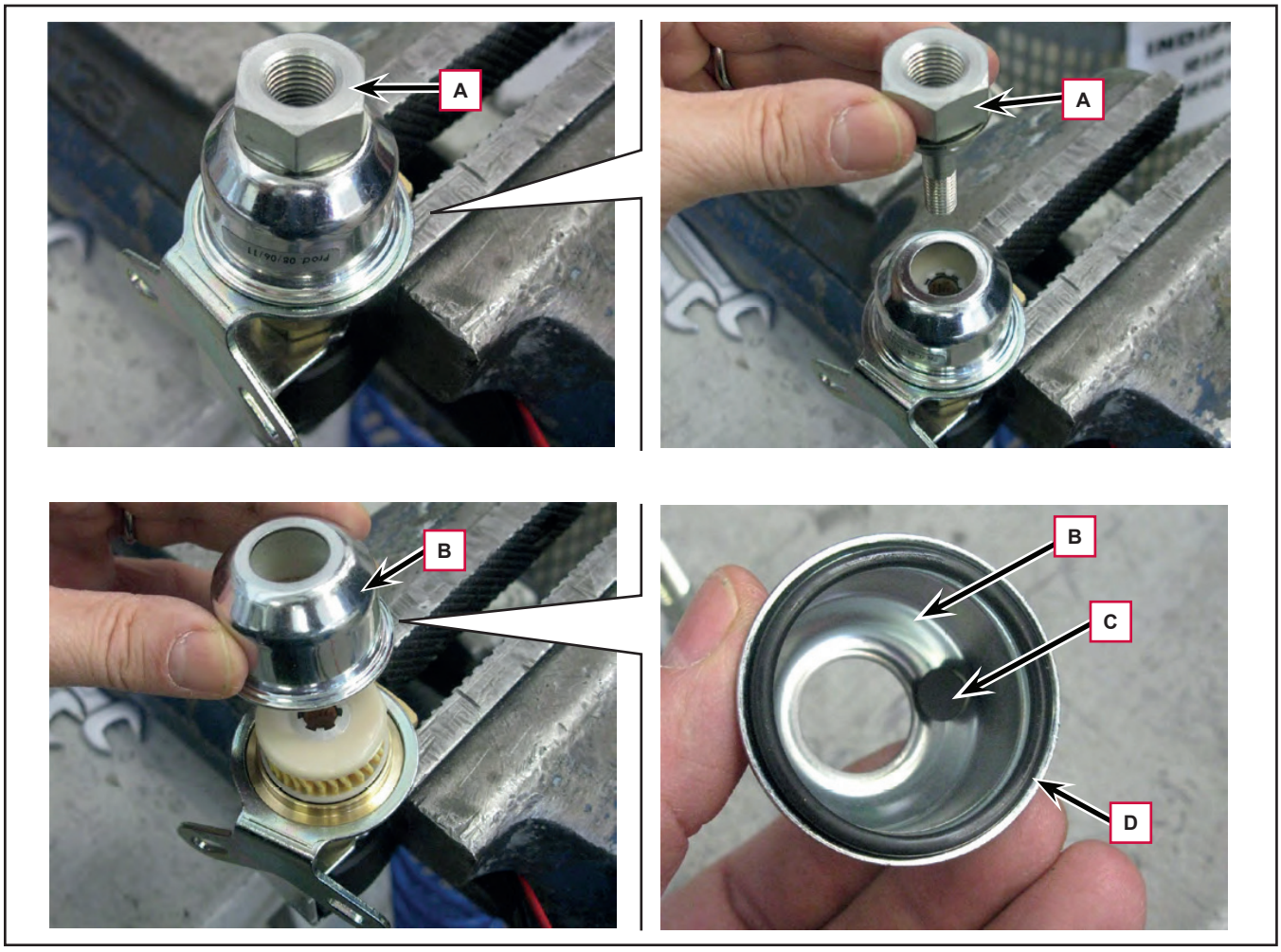


Figure 11:

Fuel Solenoid Valve Filter Cleaning (Continues)

4. Remove the filter (E).
   The filter holder gasket (F) must be replaced with the corresponding spare part, before reassembly.

5. Remove and discard the gaskets (F) and (G), then clean the filter (E), the flange (H) of the fuel solenoid valve body, the filter holder (I) and the fitting (J) with compressed air (maximum pressure 6 Bar). Clean the filter (E); replace if necessary.
   Take care in order not to damage the remaining part of the fuel solenoid valve; do not sink the coil in solvent or water.

Assembly

6. Assemble the components in the reverse order of disassembly, and note the following:
   - On the fuel solenoid valve, tighten the fitting (J) to a tightening torque of approximately 16.6 Nm (147 lb-in).

7. Check the LPG system for leaks (see procedure in the relevant paragraph).

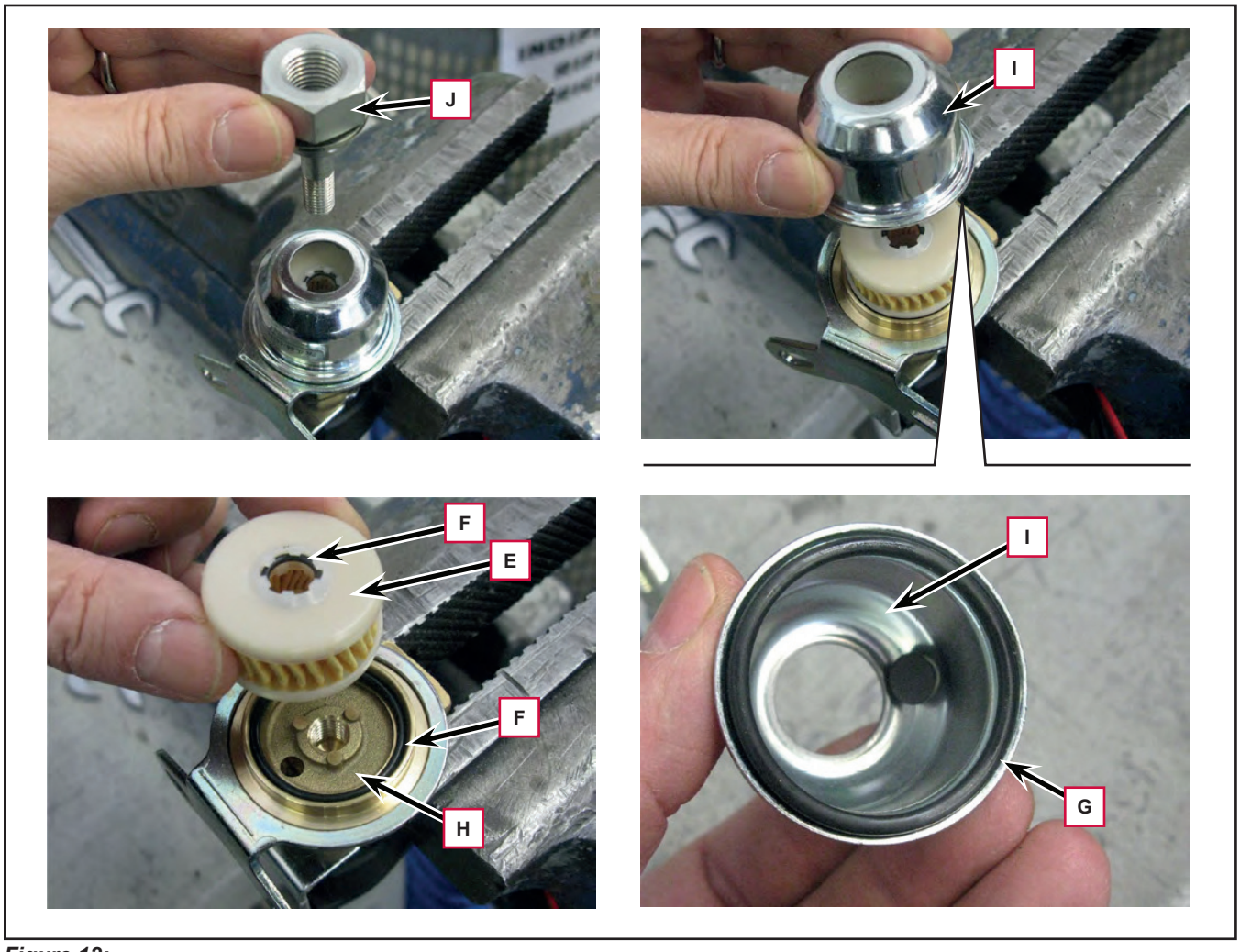


Figure 12:

CO Regulation

WARNING: This procedure must be performed by personnel qualified to handle the LPG systems, according to the law in force.

Note: *During the fumes analysis always make sure you check the following conditions:*

1. $CO = Co_{corr}$
2. $CO_2 > 10$
3. $CO_2 + CO = 12 \div 17$

If you can not make these reading conditions it means that we are in the presence of an external interference. Micro injuries of the smoke sensor pipes, vents air from the exhaust holes (tube or temperature sensor) can be a source of problems. The measurement is a very delicate and extremely sensitive to external disturbances.

Before proceeding to the connection of the analysis probe to verify that the device measures a quantity of oxygen comprised between 20 and 21%, that from the guarantee of correct operation of the oxygen sensor.

CO Emissions Check

1. Remove the two small screws from the exhaust manifold (A) and connect the analysis probes (temperature and gas). Also remove the set screw protection on the flow regulator:
   - black cap in anti-tampered device in case of US machine (B)
   - red cap in case of EU machine (C)

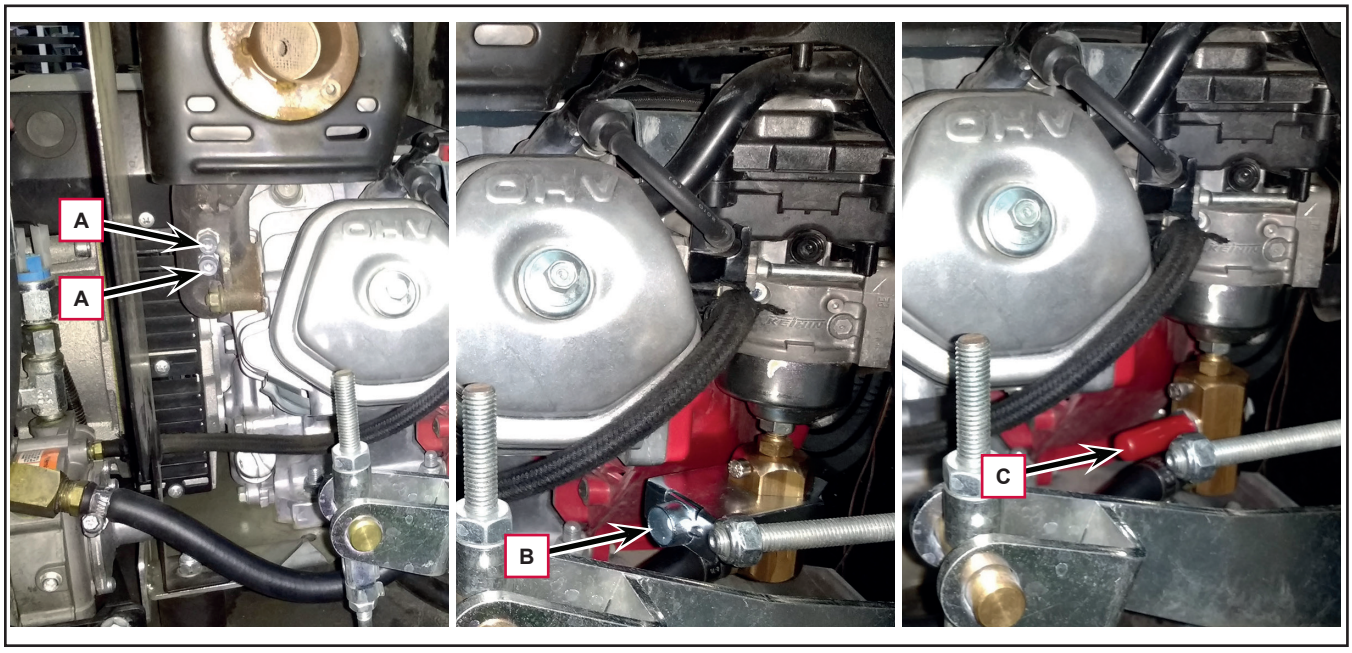


Figure 13:

CO Regulation (continues)

2. Screw the flow regulator fully in (regulator closed) and then unscrew it as follow:
   - 3 turns in case of new device setting (D)
   - 4 turns in case of old device setting (E)

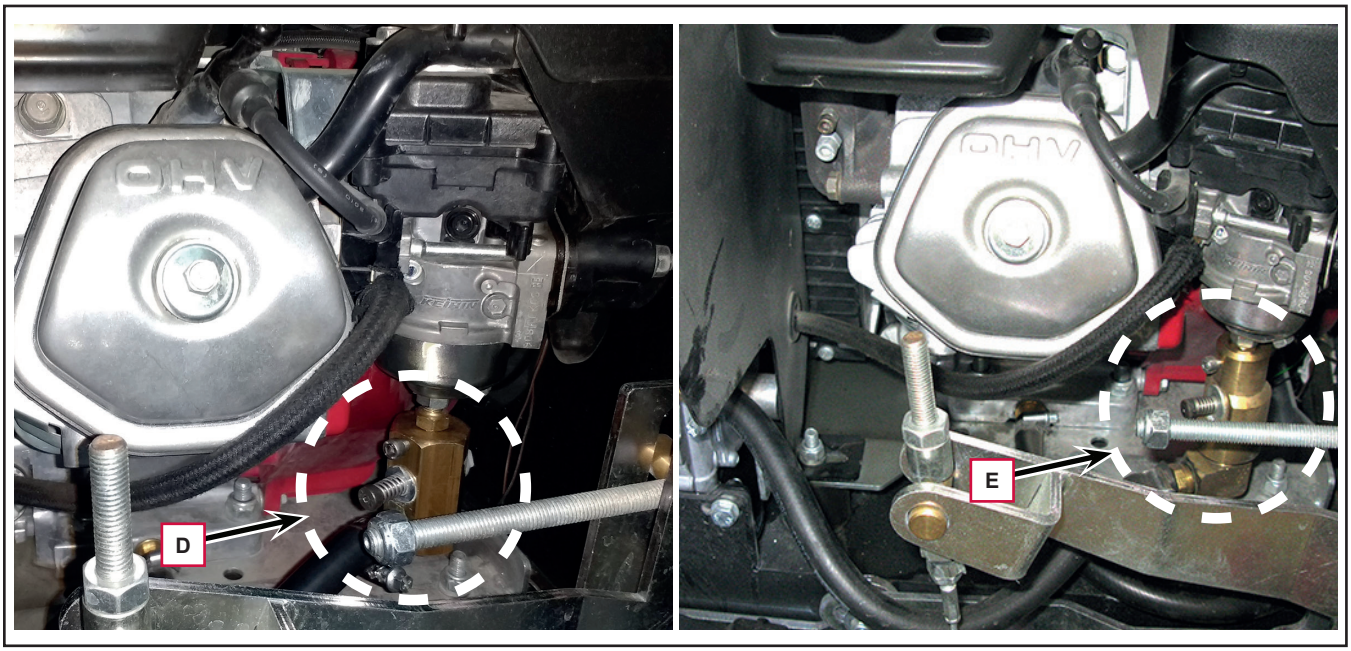


Figure 14:

3. Start the engine and in case of bad carburetion or ignition failure operate on the setting screw so to ensure the proper running, by turning it clock or counterclokwise.
4. Warm up the engine for about 15 min. until the stabilization of gas temperature (a variation of ±30°C is allowed).
5. Proceed with the exhaust gasses calibration by operating on the flow regulator's setting screw so to reach a CO% value of 3,5±0,1% without exceeding the temperature of 1211/1220°F (655/660°C) of the exhaust gas.

WARNING: (for Advance version only) The excessive overtaking [> of 212/248°F (100/120°C)] of the temperatures indicated in point 5, for a prolonged period of time (> of 10/15 sec.), it can cause of the irreversible damage to the catalytic muffler.

In case of the CO% setting corresponds to overheating of the engine proceed as follows:

– 5.1 Stop the engine, disconnect the vacuum hose from the carburettor and connect a syringe (or other device to create a controlled vacuum).

– 5.2 Disconnect the gas line from the flow regulator and connect a digital instrument for measuring pressure/vacuum (vacuum gauge).

CO Regulation (continues)

– 5.3 Place the sweeper ignition key on 1, wait for opening the safety valve and then slowly aspirate with the syringe to open the regulator's membrane. Hold in position during next phase.

– 5.4 Check the LPG output pressure and set it to +15 mmH2O driving the socket set screw on the LPG pressure regulator (remove the alluminium plug first (F) paying attention to don't demage it).

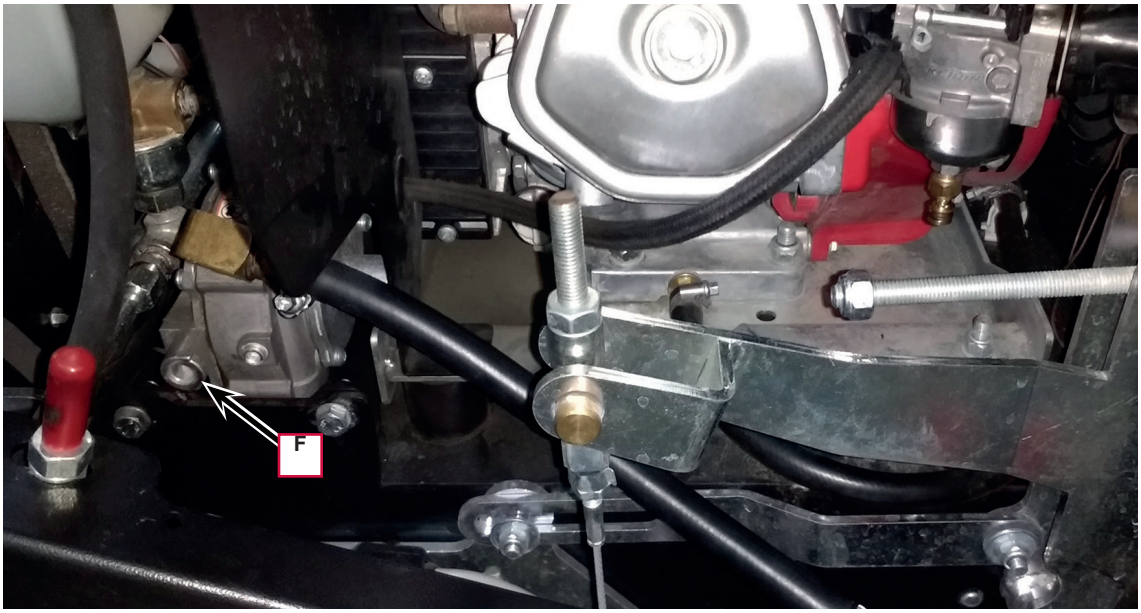


Figure 15:

– 5.5 Disconnect the syringe, the instrument and restore the connections with the carburetor.

– 5.6 Start engine and repeat the operation in point 5th.

– 5.7 If at a value of CO=3,5 corresponds still a higher temperature as indicated, increase the gas delivery pressure screwing on the socket set screw on the LPG pressure regulator, so as to decrease the exhaust gas temperature to the indicated level.

– 5.8 Go back to point 5th.

– 5.9 Continue in this way by repeating steps 5.6, 5.7 and 5.8 until the CO value and the exhaust temperature are in the indicated range.

6. When the setting is correct restore the cap on set screw of the flow regulator.

7. Plug the regulator with the dedicated alluminium plug.

Troubleshooting

Trouble	Possible causes	Remedy
The engine does not start	Fuel is not reaching the carburettor	Check that the LPG tank safety valve is open
	The oil level is low. The Oil Alert sensor (S7) is activated.	Top up with the recommended oil to the proper level
	The spark plug (SPK) is damaged, dirty or the distance between the electrodes is wrong	Correct the distance between the electrodes and replace the spark plug
	Batteries (BAT) flat	Recharge with a proper battery charger.
	Emergency push-button (SW0) pressed	Check and release the emergency push-button.
	Safety valve closed	Turn the key in the ignition again
	-	Insufficient time waited at ignition for the electronic system to reboot
	Engine start relay (ES3) faulty	Replace
	Engine start relay (ES5) faulty	Replace
	Starter motor fuse (F6) blown	Replace
	Key circuit fuse (F2) open circuit	Replace
	The ignition key switch (KEY) is not working	Replace
The engine is overheating, shutting down, and activating the rectifier temperature sensor	Fan relay (ES6) faulty	Replace
	Fan fuse (F7) blown	Replace
	Fan (M7) faulty	Replace
The engine loses power or stops during operation.	The filter element or elements are clogged	Clean or replace the filter elements
	Poor LPG fuel quality	Replace the LPG tank
	The fuel filter is clogged, the carburettor is broken, the start system is broken, the valves are locked, etc.	Replace or repair the faulty components as necessary (take the engine to an authorized Honda service centre)
	Pressure regulator dirty	Clean / replace
The machine shuts down	Battery fuse (F0) blown	Replace
The machine generates an alarm when powered (see Main Machine Controller Alarm Codes)	Alternator fuse (F4) blown	Replace
	Charging system contactor (ES10) faulty	Replace

Removal and Installation

LPG System Emptying

WARNING: This procedure must be performed by personnel qualified to handle the LPG systems, according to the law in force.
Moreover, it is necessary to wear accident-prevention clothes, according to the law in force (heavy gloves, antistatic non-synthetic clothes, suitable to cover the whole body, antistatic and antispark shoes, helmets with visor; etc.).

1. Before operating on the LPG system for maintenance/replacement of parts, bleed the LPG system, as shown below.
2. Close the LPG tank valve.
3. Start the engine and let it run until it stops because it has run out of LPG.

WARNING: This procedure must be performed where there is a proper ventilation and under the SAFETY conditions indicated in this Manual.

4. Turn the ignition key to “0” and engage the parking brake.
5. The LPG system is empty. In the next phases of LPG system part removal, consider that there may be some minimum residual LPG gas leaks.

WARNING: Avoid coming into direct contact with any residual LPG in the system.

LPG System Hose and Fitting

WARNING: This procedure must be performed by personnel qualified to handle the LPG systems, according to the law in force.
Moreover, it is necessary to wear accident-prevention clothes, according to the law in force (heavy gloves, antistatic non-synthetic clothes, suitable to cover the whole body, antistatic and antispark shoes, helmets with visor; etc.).

WARNING: The hoses (A) and (B) must be replaced periodically, according to the law in force.
The hose (B) must be of a specific length, in order to comply with the safety technical data; it must not be shortened for any reason.

Removal

1. Empty the LPG system (see procedure in the relevant parapgaph).
2. Turn the ignition key to “0”, then engage the parking brake.
3. Open the engine compartment hood with the handle and fasten it with the support rod.
4. If fitted, remove the machine right side panel by lifting it to disengage it from the fasteners.
5. If the engine is hot, wait that it cools down.
6. Check that the LPG tank valve is closed.
7. Unscrew and remove the relevant hoses (A), (B) or (C) and/or the relevant fittings, and note the following:

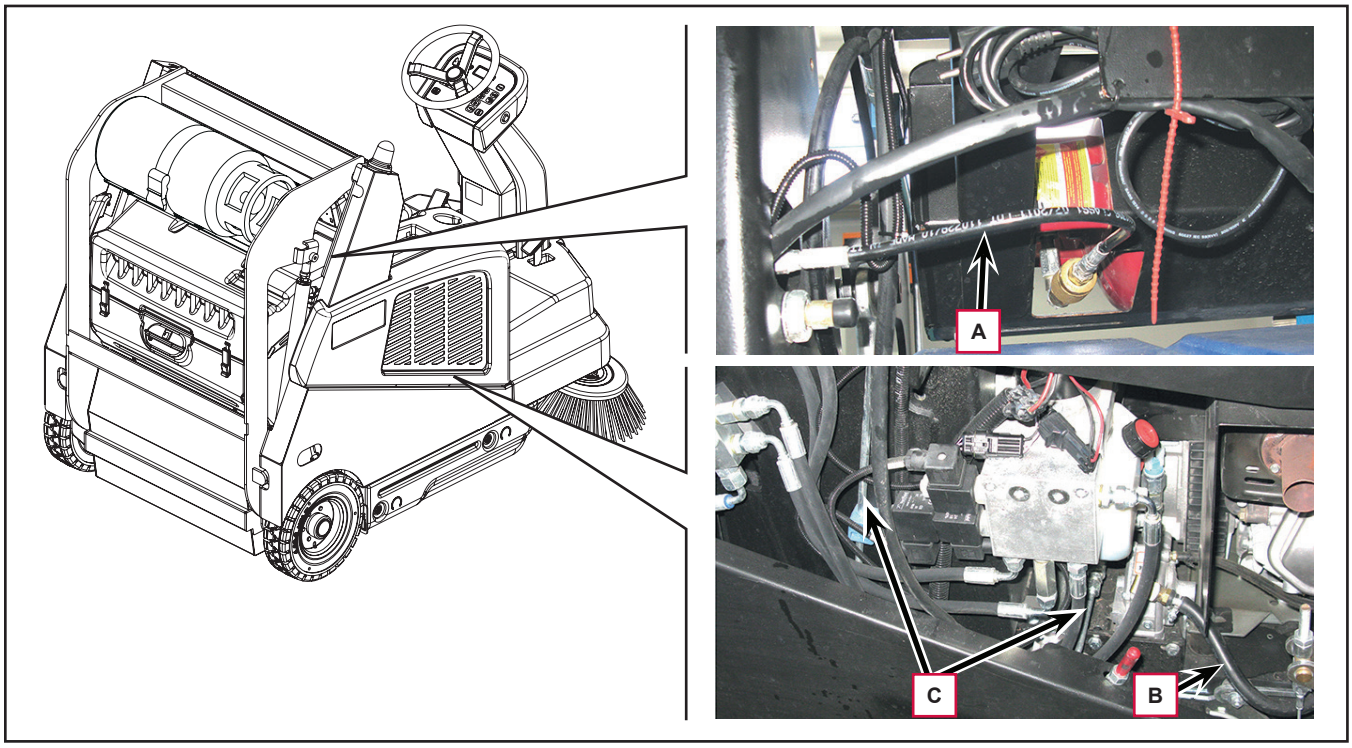


Figure 16:

LPG System Hose and Fitting (Continues)

- The fittings (D) have inner gaskets or conical couplings to seal them.
- The fittings (E) are provided with sealant.

WARNING: If the fittings (E) are turned very slightly, their tightness can be compromised (because the sealant "brakes"), thus those fittings must be unscrewed and screwed again after having applied new sealant, as shown below.

- The fittings (F) are equipped with fastening bands.

Assembly

8. Before re-tightening the fittings (D) clean them thoroughly and replace the inner gaskets.
9. Before screwing down the fittings (E) carefully remove any remaining of sealant, then apply the new sealant; use PTFE by WURTH saBesto, P/N 0893 511 050 – S/I (or equivalent). Proceed according to the instructions on the package of the product.
10. Before connecting the fittings (F) clean them accurately and replace the fastening bands.
11. After assembling the fittings (E) wait the time necessary for the sealant to harden, before the LPG gas enters the system.

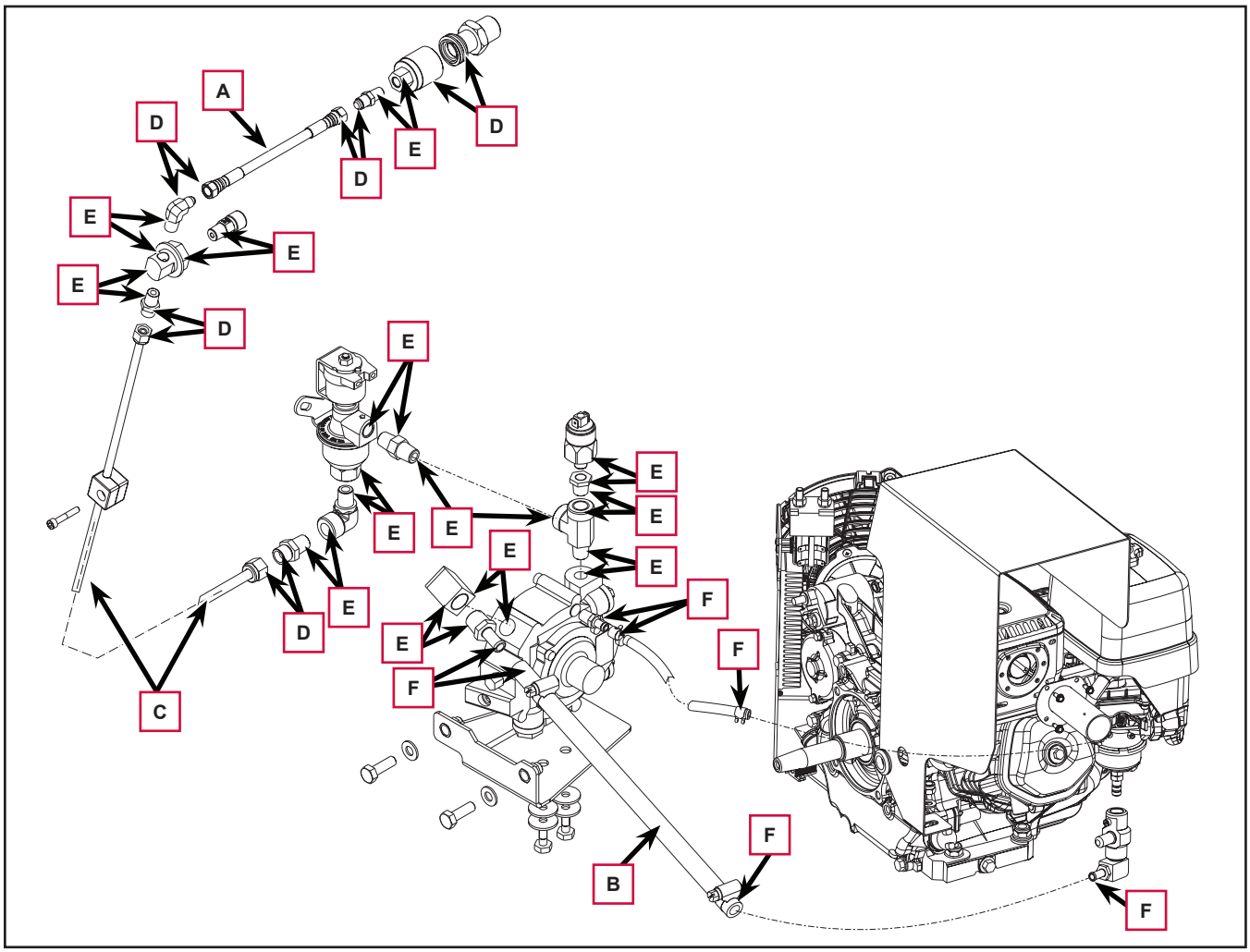


Figure 17:

Pressure Regulator

WARNING: This procedure must be performed by personnel qualified to handle the LPG systems, according to the law in force.
Moreover, it is necessary to wear accident-prevention clothes, according to the law in force (heavy gloves, antistatic non-synthetic clothes, suitable to cover the whole body, antistatic and antispark shoes, helmets with visor; etc.).

Removal

1. Drive the machine on a level floor.
2. Empty the LPG system (see procedure in the relevant paragraph).
3. Turn the ignition key to “0”, then engage the parking brake.
4. Open the engine compartment hood with the handle and fasten it with the support rod.
5. If fitted, remove the machine right side panel by lifting it to disengage it from the fasteners.
6. If the engine is hot, wait that it cools down.
7. Loosen the clamps (A) and disconnect the terminals (B) of the pressure regulator lines (C).

CAUTION: For removal / installation of the various hoses and fittings of the LPG system, see procedure in the relevant paragraph.

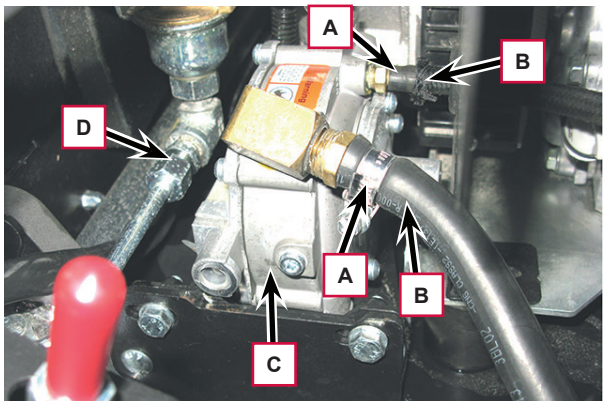
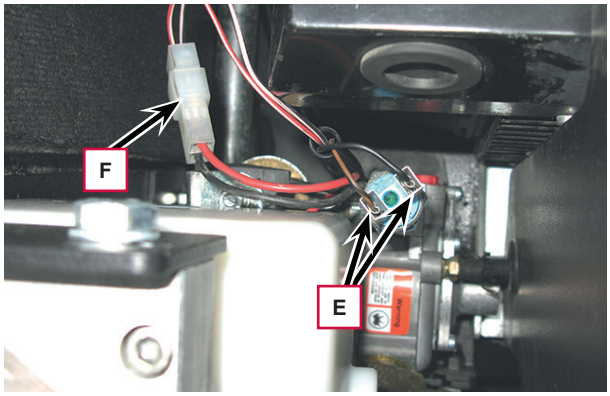


Figure 18:

Pressure Regulator (Continues)

8. Unscrew the fitting (D) on the line.
9. Disconnect the electrical connections (E) and (F).



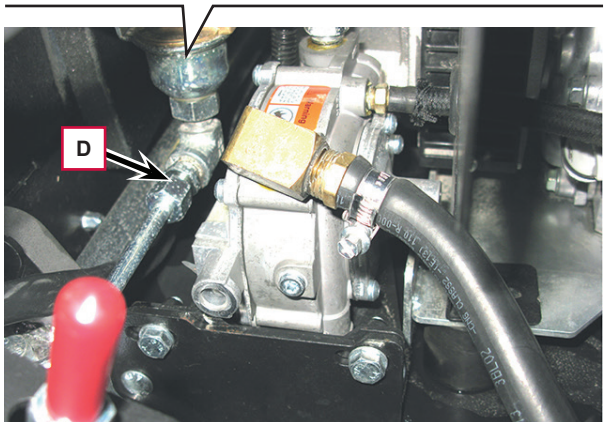


Figure 19:

Pressure Regulator (Continues)

10. Remove the fastening screws (G) of the pressure regulator assembly with valves (H).
11. Remove the pressure regulator assembly with valves (H).
12. If necessary, unscrew the fuel solenoid valve (I) from the fitting (J) at the workbench.
13. Unscrew the fitting (K) from the pressure regulator (C).
14. Retrieve the pressure regulator (C).
15. If necessary, unscrew the fittings (L) and (M) from the pressure regulator (C).

Installation

16. Assemble the components in the reverse order of removal.
17. Check the LPG system for leaks (see procedure in the relevant paragraph).
18. If a new pressure regulator has been installed, regulate the CO (see procedure in the relevant paragraph).

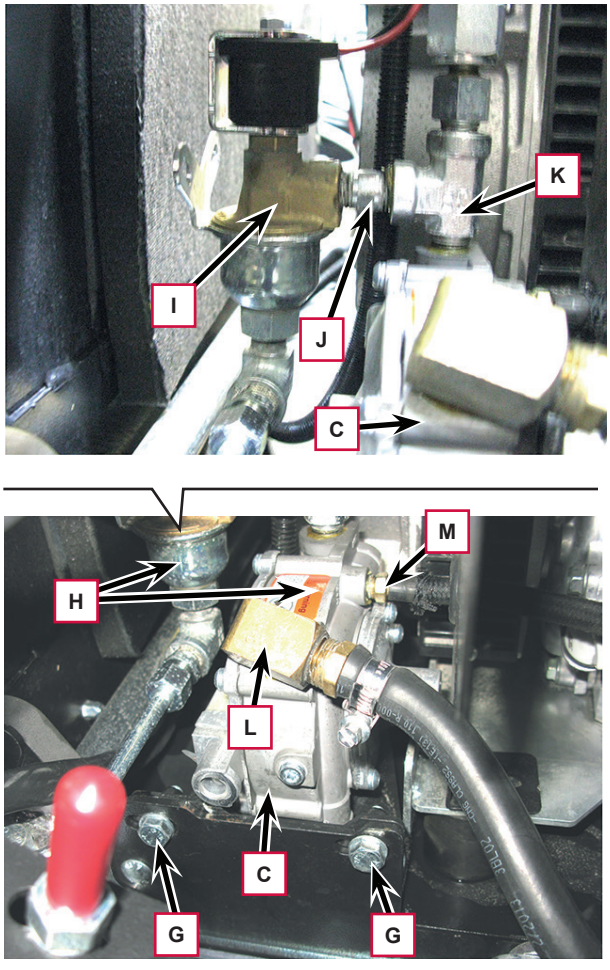


Figure 20:

Fuel Reserve sensor

WARNING: This procedure must be performed by personnel qualified to handle the LPG systems, according to the law in force.
Moreover, it is necessary to wear accident-prevention clothes, according to the law in force (heavy gloves, antistatic non-synthetic clothes, suitable to cover the whole body, antistatic and antispark shoes, helmets with visor; etc.).

Removal

1. Empty the LPG system (see procedure in the relevant parapraph).
2. Drive the machine on a level floor.
3. Turn the ignition key to “0”, then engage the parking brake.
4. Open the engine compartment hood with the handle and fasten it with the support rod.
5. If fitted, remove the machine right side panel by lifting it to disengage it from the fasteners.
6. If the engine is hot, wait that it cools down.
7. Disconnect the fuel reserve sensor (B) electrical connections (A).
8. Unscrew the fuel reserve sensor (B) while holding the fitting (C).

WARNING: For removal / installation of the various hoses and fittings of the LPG system, see procedure in the relevant paragraph.

Assembly

9. Assemble the components in the reverse order of removal.
10. Check the LPG system for leaks (see procedure in the relevant paragraph).

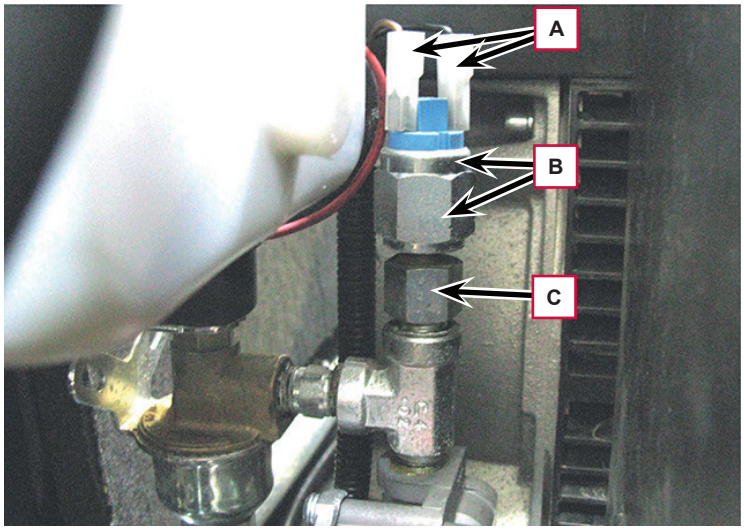


Figure 21:

Fuel Solenoid Valve

WARNING: This procedure must be performed by personnel qualified to handle the LPG systems, according to the law in force.
Moreover, it is necessary to wear accident-prevention clothes, according to the law in force (heavy gloves, antistatic non-synthetic clothes, suitable to cover the whole body, antistatic and antispark shoes, helmets with visor; etc.).

Removal

1. Remove the pressure regulator (see procedure in the relevant paragraph).
2. Unscrew the fuel solenoid valve (A) from the fitting (B) at the workbench.

WARNING: For removal / installation of the various hoses and fittings of the LPG system, see procedure in the relevant paragraph.

3. Remove the fuel solenoid valve (A).

Installation

4. Assemble the components in the reverse order of removal.
5. Check the LPG system for leaks (see procedure in the relevant paragraph).

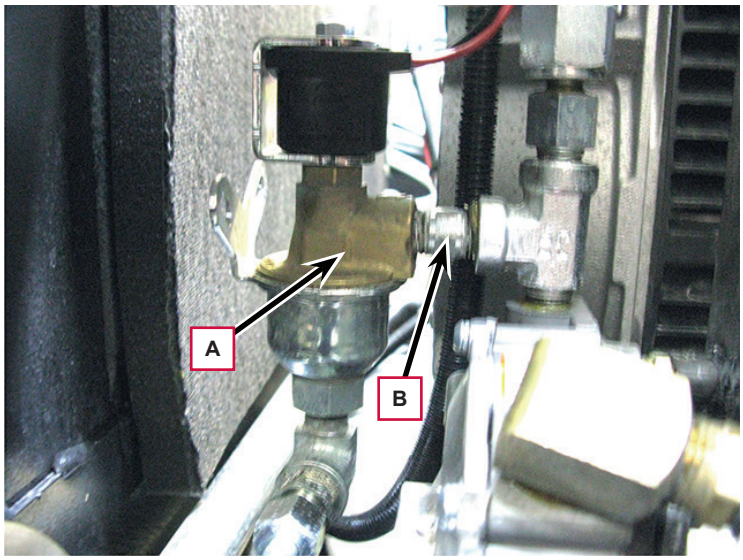


Figure 22:

Safety Valve

WARNING: This procedure must be performed by personnel qualified to handle the LPG systems, according to the law in force.
Moreover, it is necessary to wear accident-prevention clothes, according to the law in force (heavy gloves, antistatic non-synthetic clothes, suitable to cover the whole body, antistatic and antispark shoes, helmets with visor; etc.).

Removal

1. Empty the LPG system (see procedure in the relevant paragraph).
2. Drive the machine on a level floor.
3. Turn the ignition key to “0”, then engage the parking brake.
4. Open the engine compartment hood with the handle and fasten it with the support rod.
5. If fitted, remove the machine right side panel by lifting it to disengage it from the fasteners.
6. If the engine is hot, wait that it cools down.
7. Unscrew the screws (A) and remove the case (B).

WARNING: For removal / installation of the various hoses and fittings of the LPG system, see procedure in the relevant paragraph.

8. Unscrew the hose (C) from the safety valve (D).
9. Unscrew the pipe (E) from the safety valve (D).
10. Unscrew the ring nut (F) and remove the safety valve (D).

Installation

11. Assemble the components in the reverse order of removal.
12. Check the LPG system for leaks (see procedure in the relevant paragraph).

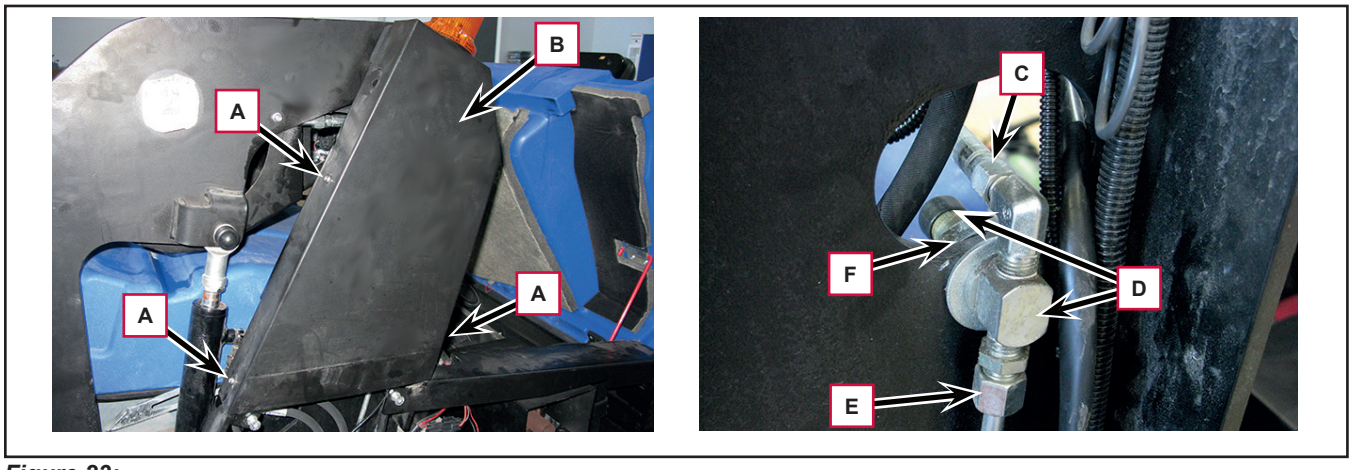


Figure 23:

LPG Engine - Spare Parts

(A) Engine complete.

(B) Oil cap.

(C) Engine coil ignition.

(D) Carburetor.

(E) Filter box cover.

(F) Air filter.

(G) Muffler gasket.

(H) Pipe exhaust gasket.

(I) Starter Motor.

(J) (for Advance model) Catalytic Muffler.

(L) (for Nilfisk model) Muffler.

(M) Gauge oil cap.

(N) Unit control.

(O) Air filter knob.

(P) Connectors.

(Q) Manifold exhaust.

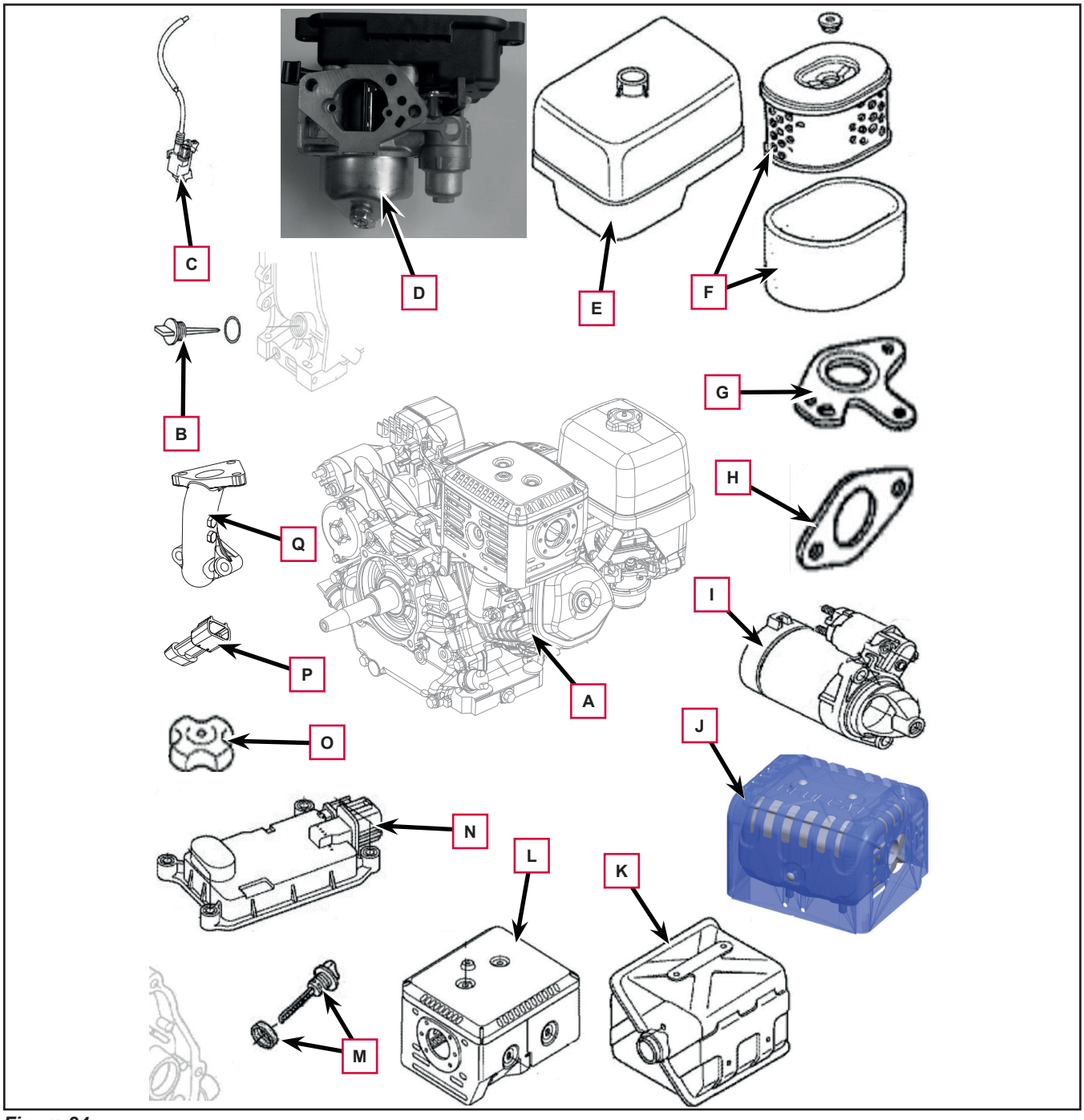


Figure 24:

Alternator - Spare Parts

(A) Alternator complete.

(B) Heat sink.

(C) Bridge rectifier.

(D) Resistor.

(E) Grid side.

(F) Temperature sensor.

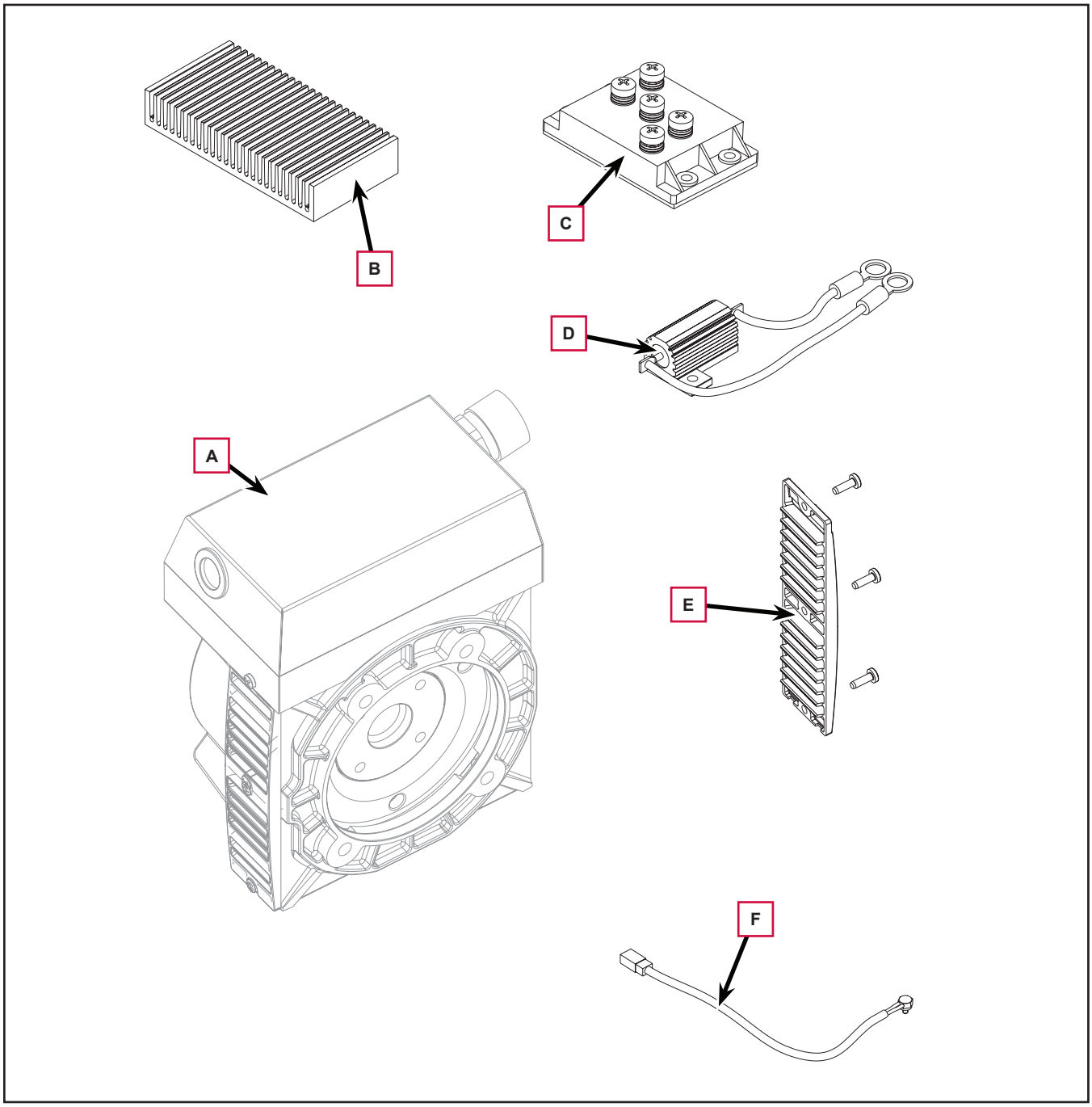


Figure 25:

Engine/Alternator Unit

Removal

1. Empty the LPG system (see procedure in the relevant paragraph).
2. Drive the machine on a level floor.
3. Open the engine compartment hood with the handle and fasten it with the support rod.
4. Disconnect both the negative and positive terminals from the batteries.
5. Remove the machine right and left side panels by lifting them to disengage them from the fasteners.
6. Disconnect the engine harness (B) electrical connections (A).
7. Disconnect the electrical connections (C) and (D) from the starter motor (E).
8. Disconnect the engine electrical connections (F) and (G).

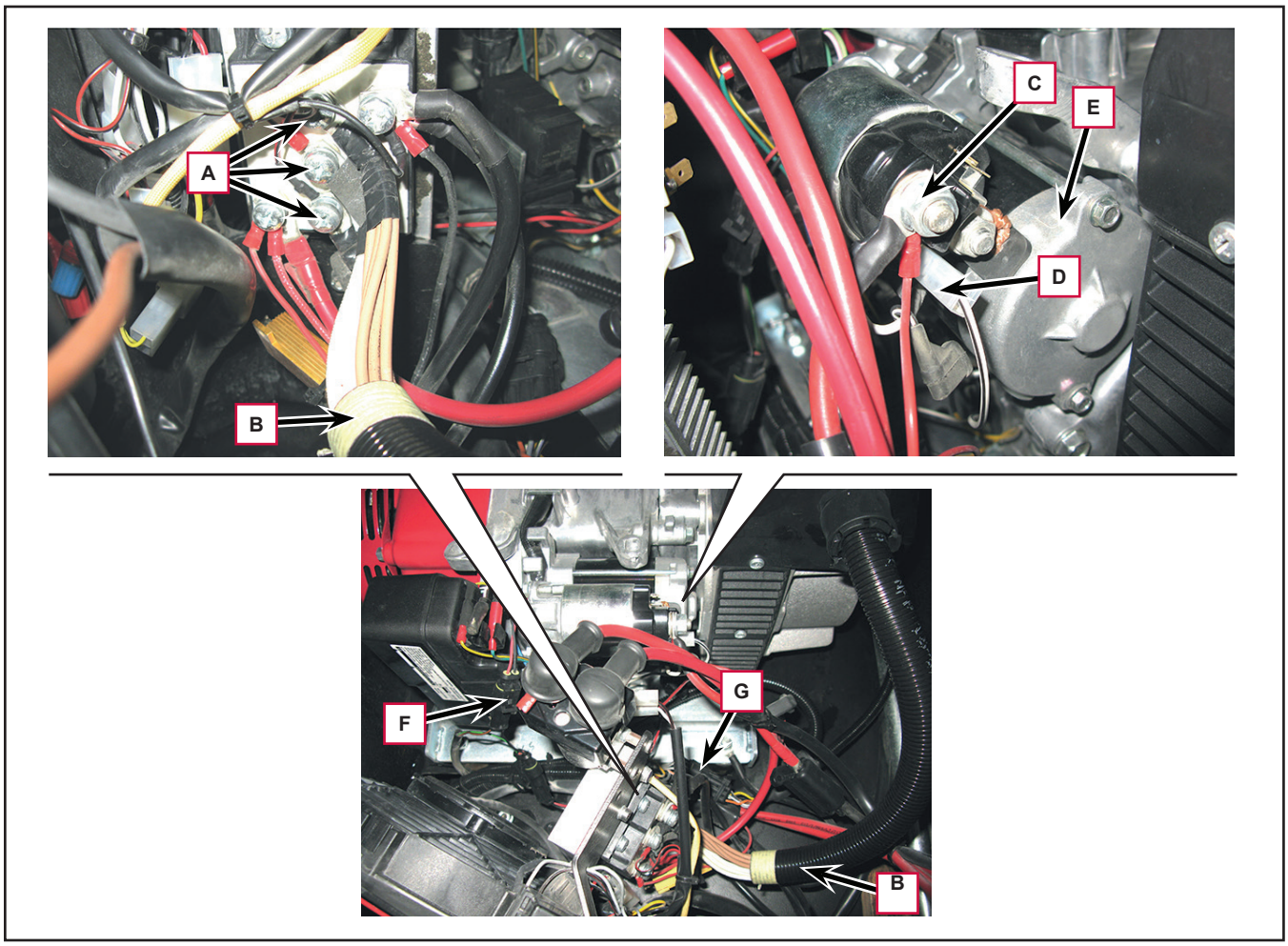


Figure 26:

Engine/Alternator Unit (Continues)

9. Loosen the clamp and disconnect the terminal (H) on the vacuum line.
10. Loosen the clamp and disconnect the terminal (I) on the LPG supply line.

WARNING: For removal / installation of the various hoses and fittings of the LPG system, see procedure in the relevant paragraph.

11. Unscrew the retaining screws (J) on the casing (K) protecting the exhaust pipe.
12. Unscrew the screw (L) fastening the casing (K) and the engine as well.
13. Remove the engine fastening screw (M).
14. Unscrew the engine fastening screws (N) and move the electrical cable (P).
15. Attach an appropriate lifting system to the two attachments (Q) on the engine, then carefully raise and remove the engine (R) (engine weight approx. 99 lb (45 Kg)).

Installation

16. Assemble the components in the reverse order of removal.

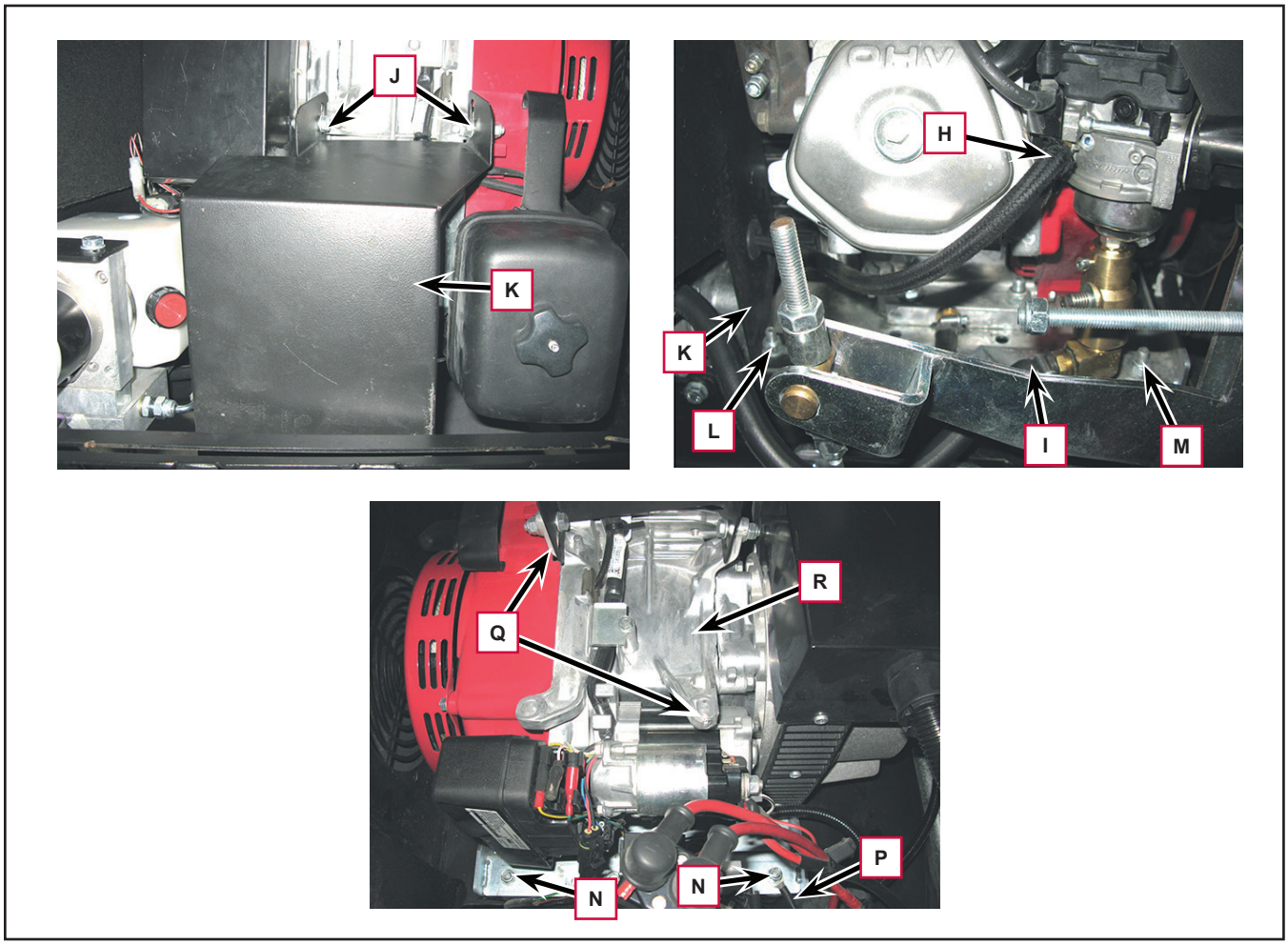


Figure 27:

Specifications

Model	SW5500 LPG FLOORTEC R 985 LPG
Make	Honda
Model	iGX-270
Dimensions	14 x 18.2 x 16.6 in (358 x 462 x 422 mm)
Dry weight	67 lb (30.3 Kg)
Displacement	270 cm^3
Power	6.3 kW (8.4 hp) @ 3,600 rpm
Max torque	19.1 Nm (1.98 kgfm) @ 2,500 rpm
Oil type	SAE 10W-30 - SYNTHETIC API SJ
LPG tank capacity	33 lb (15 Kg)
Engine oil quantity	0.3 US gal (1.1 liters)
Cooling system	Forced air
Starting system	CDI magneto
PTO shaft rotation	Counter-clockwise
Valve clearance (cold)	INTAKE: 0.15 ± 0.02 mm EXHAUST: 0.20/0.02 mm
Distance between the spark plug electrodes	0.028 - 0.031 in (0.70 - 0.80 mm)
Spark plug	BPR6ES (NGK) W20EPR-U (DENSO)

29 - Engine, Hybrid System

Functional Description

The “Hybrid System Kit” is applicable both to the LPG or Diesel engine versions with the aim of allowing the user to work even with switched off engine, getting energy from the batteries.

Compared to the standard system, the Kit application requires the following electrical system changes:

1. Replacement of the standard batteries with special batteries for cyclic uses. This permits the batteries usage with partial discharge and recharge cycles obtained by simply turning ON or OFF the engine according to the operator’s needs, regardless what is the batteries charging status, without drastically compromising the useful life of the batteries.

2. Addition of an on-board battery charger for the periodic recharging of the batteries with a suitable cycle at full charging of the batteries. This has fundamental importance for the batteries useful life, since the charging by means of the alternator does not allow the batteries to regenerate their selves in a correct and complete way, differently from the charging cycle executed with the proper charger. The charging cycle with on-board battery charger is therefore necessary at least periodically (see point 6.c).

3. Addition of the relay (S11) with the dual function of:

   – Inhibition of the machine functions while charging the batteries with on-board battery charger (open the key circuit to the battery charger connected network)

   – Signal to the Main Machine Controller (EB1) of the batteries recharging with on-board battery charger (high logic input with battery charger connected to the network)

4. Addition of the engine shut off switch (SW2) which allows the engine to be turned off while continuing the work on battery mode only, without being forced to completely stop machine by means of the main key switch. The shut off switch (SW2), with normally closed contact, for switching off the engine on the GPL version it opens the key input of the engine speed control unit (EB7), while on the diesel version it cuts off the supply of the fuel pump (P2).

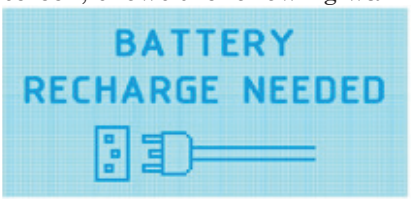
5. Bypass of drive system enabling relay (ES8) through a bridge wire installed between contacts “Common” and “Normally Open” instead of relay (ES8).” This change allows the activation of the Drive Wheel Controller (EB2) even with the shut off engine

6. Set HYB parameter on “YES”. This change allows:

   – Both the display of the battery charging status with a 3-segments icon on the display (like on Battery version) and functions inhibition, during battery mode, when the battery voltage reaches the security minimum level (as of Battery version).

   – The ability to activate the work functions (brooms, vacuum) even with engine shut off.

   – The counting, through a special hour counter, of the specific working hours in the “battery mode” (i.e. with the engine shut off) between a charging cycle with onboard battery charger and another one. When the number of hours since the last charging cycle reaches the value set in parameter HRC, the display, instead of the working screen, shows the following warning



   to alert the operator that a complete batteries charging cycle is needed using the proper on-board battery charger.

The hour counter will be reset and the message will disappear after the charger is connected to the network for a period longer than 1 hour.

Wiring Diagram (Diesel Version)

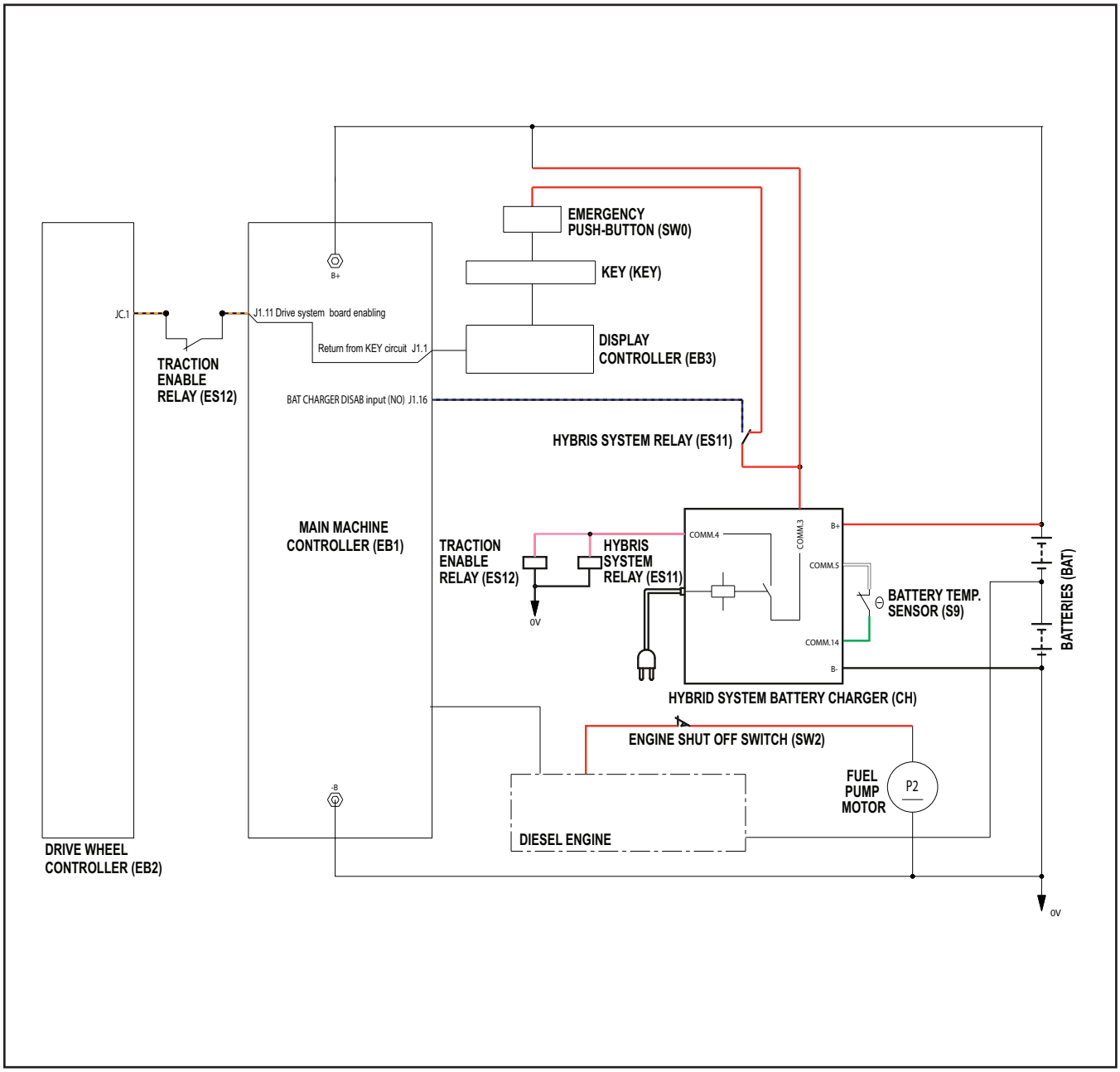


Figure 1:

Wiring Diagram (LPG Version)

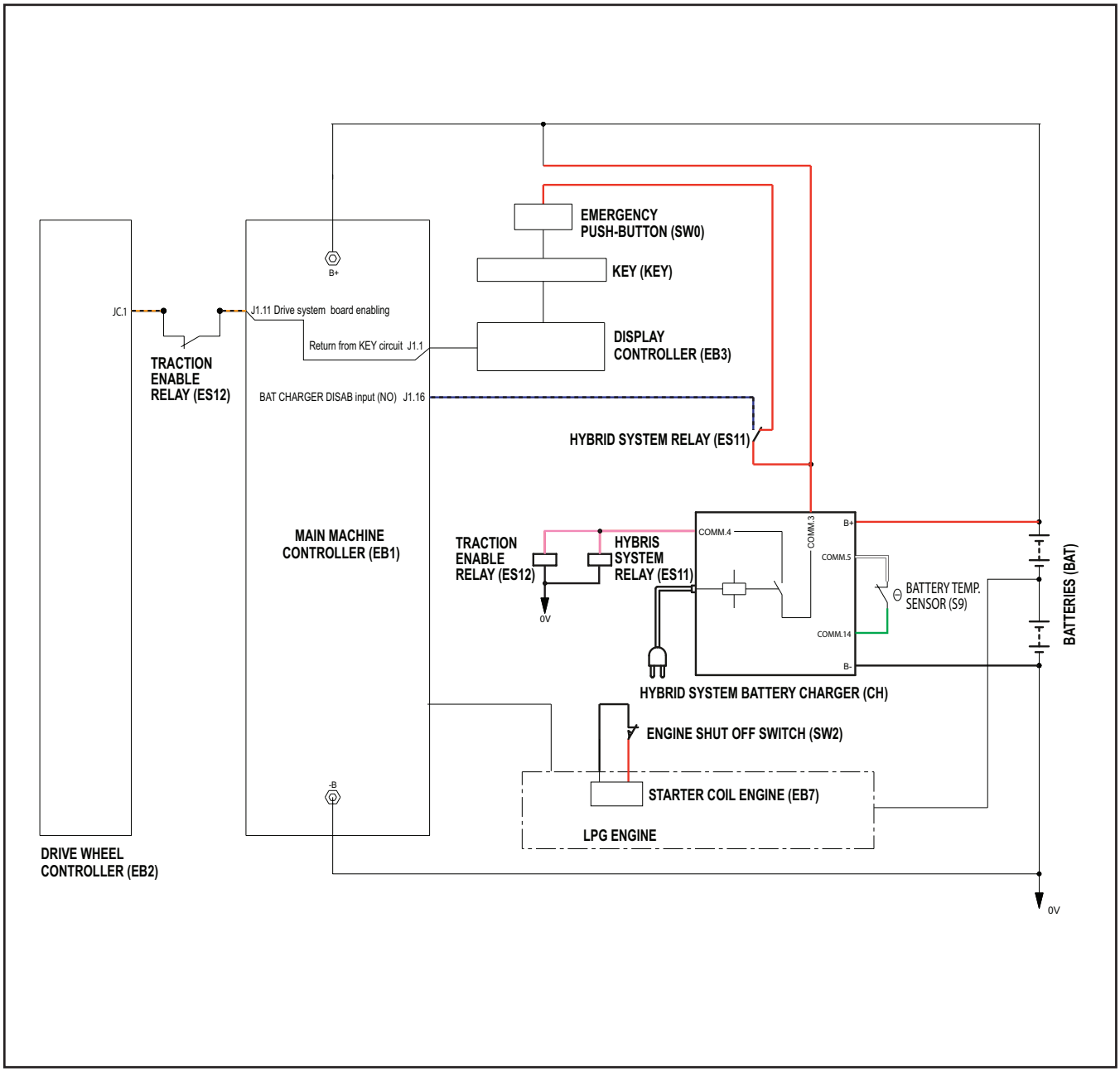


Figure 2:

Component Locations (Battery, Diesel, LPG versions)

- Engine shut off switch (SW2)
- Hybrid system battery charger (CH)
- Bridge wire on the (ES8) relay connection
- Hybrid system relay (ES11)

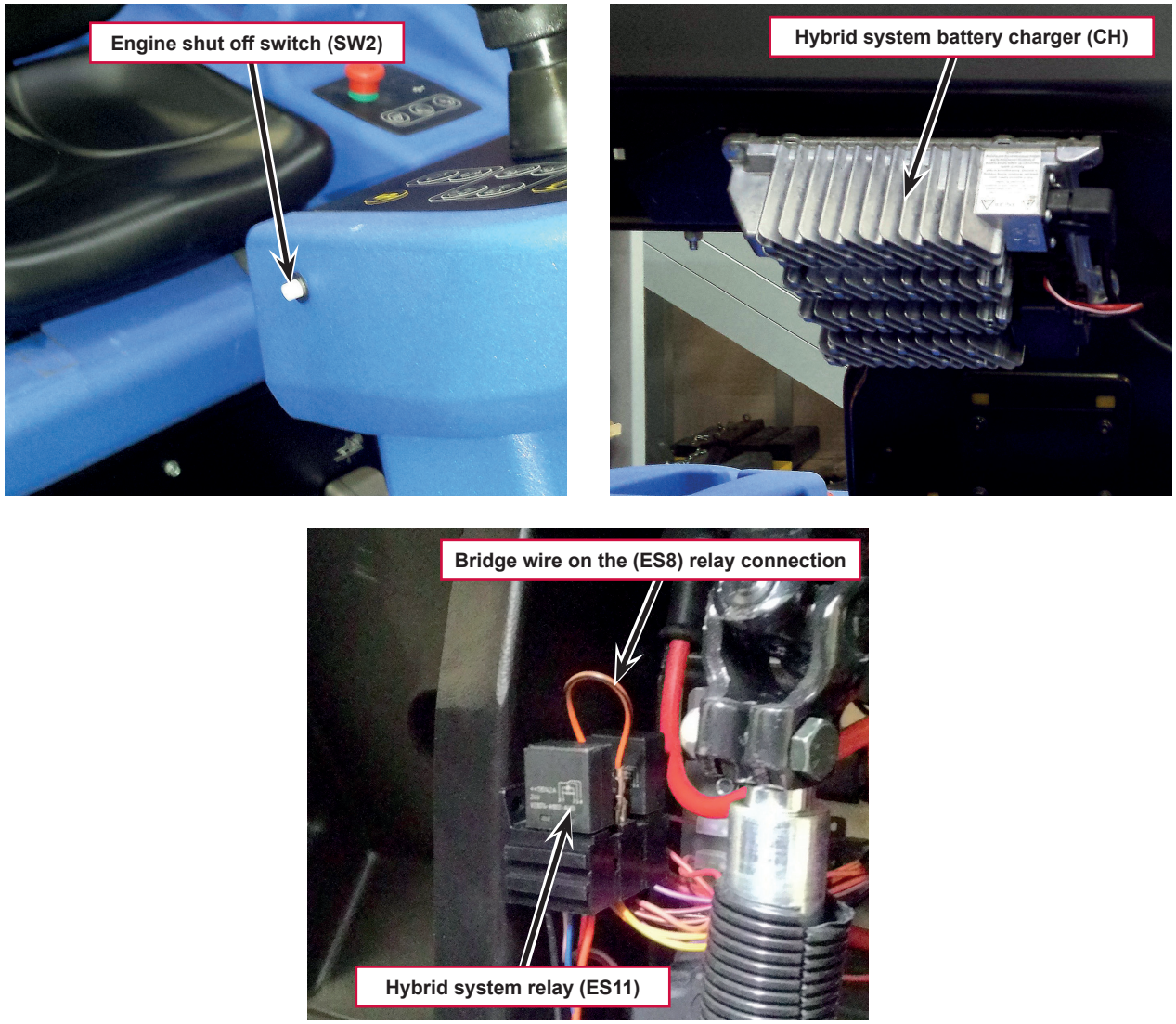


Figure 3:

Maintenance and Adjustments

Battery Charging

WARNING: Charge the batteries with the installed battery charger when the last segment of the battery icon (A) starts flashing, or at the end of each job. Keeping the batteries charged make their life last longer. Recharging is essential when the multifunction display shows screen (B).

WARNING: When the batteries are discharged, charge them as soon as possible, as that condition makes their life shorter.

1. Drive the machine on a level ground and engage the parking brake.
2. Turn the ignition key to "0".
3. Connect the battery charger plug (D) to a mains electrical socket.

WARNING: Check that the voltage and frequency shown on the battery charger plate (D) match the mains supply values.

Note: *When the battery charger is connected to the electrical mains, all machine functions are automatically cut off. The multifunction display shows the screen (C) as in the figure.*

4. When the battery charger green battery symbol (E) is flashing, the batteries are recharging.
5. When the battery charger green battery symbol (E) is lit steadily, the batteries are charged. For further information about the battery charger operation, see Battery Charger Manual.
6. Disconnect the battery charger cable from the electrical mains.

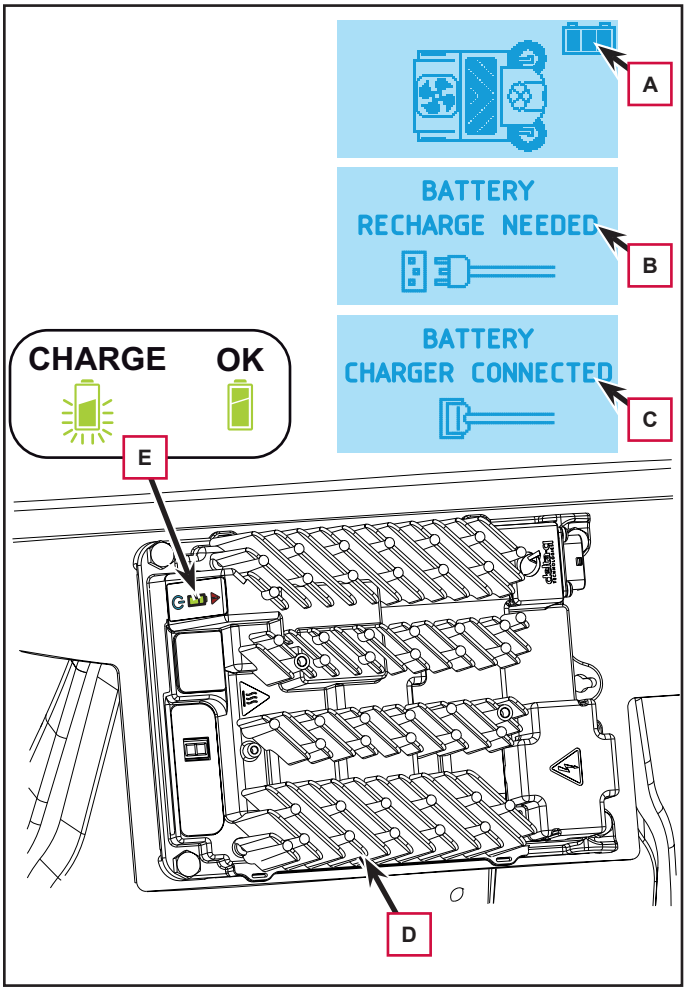


Figure 4:

Troubleshooting

Trouble	Possible causes	Remedy
The broom system is activated only when the engine is running	HYB parameter not correctly set to “YES”	Check the parameter setting (see hidden parameters table in the Machine Settings Screen)
The drive system does not work or works only when the engine is running	The bridge cable not properly installed instead of the hybrid system relay (ES8)	Check the bridge cable connection
The engine is not able to be switched on or it switches off as soon as it’s turned on	The engine shut off switch (SW2) not properly connected	Check the connection of the wiring switch
	The engine shut off switch (SW2) broken	Check that the engine shut off switch closes the circuit when in the rest position (normally closed contact)
The battery life is short	Time during which the engine is kept running not enough for recharging the batteries between a period of use in battery mode and the next one	Make a full recharge cycle with on board battery charger
The battery life (even after a full recharge cycle) decreased over time	Battery using too fragmented	Increase the frequency of complete recharge cycles, reducing the HRC parameter value than the default (= 10) (see hidden parameters table in the Machine Settings Screen)
The battery life (even after a full recharge cycle) decreased over time	Battery using too fragmented	Increase the frequency of complete recharge cycles, reducing the HRC parameter value than the default (= 10) (see hidden parameters table in the Machine Settings Screen)

42 - Sweep System, Main Broom

Functional Description

Pressing the One-Touch button  on the Main Control Board makes the main broom support system lower via the actuator (A1).

The actuator is powered for 5 seconds, within which time it should reach the requested end stroke position (the actuator has internal limit switches with bypass diodes).

The electric motor transmits the motion to the main broom via a reduction gear connected to a hexagonal driver that supports the broom.

The machine must be moving otherwise the main broom motor does not run. Information on the machine movement is detected by the drive motor (M0) encoder (ENC) connected to the Drive Wheel Controller (EB2). The Drive Wheel Controller (EB2) transmits this information to the Main Machine Controller (EB1) via the CANOPEN protocol on the CAN-BUS line between connector J7 of the Main Machine Controller (EB1) and connector JC of the Drive Wheel Controller (EB2).

The front skirt lifting pedal allows to collect medium size waste materials (cans, boxes, etc.). The front skirt must be lifted only when necessary, because it reduces the operation of the dust guard system.

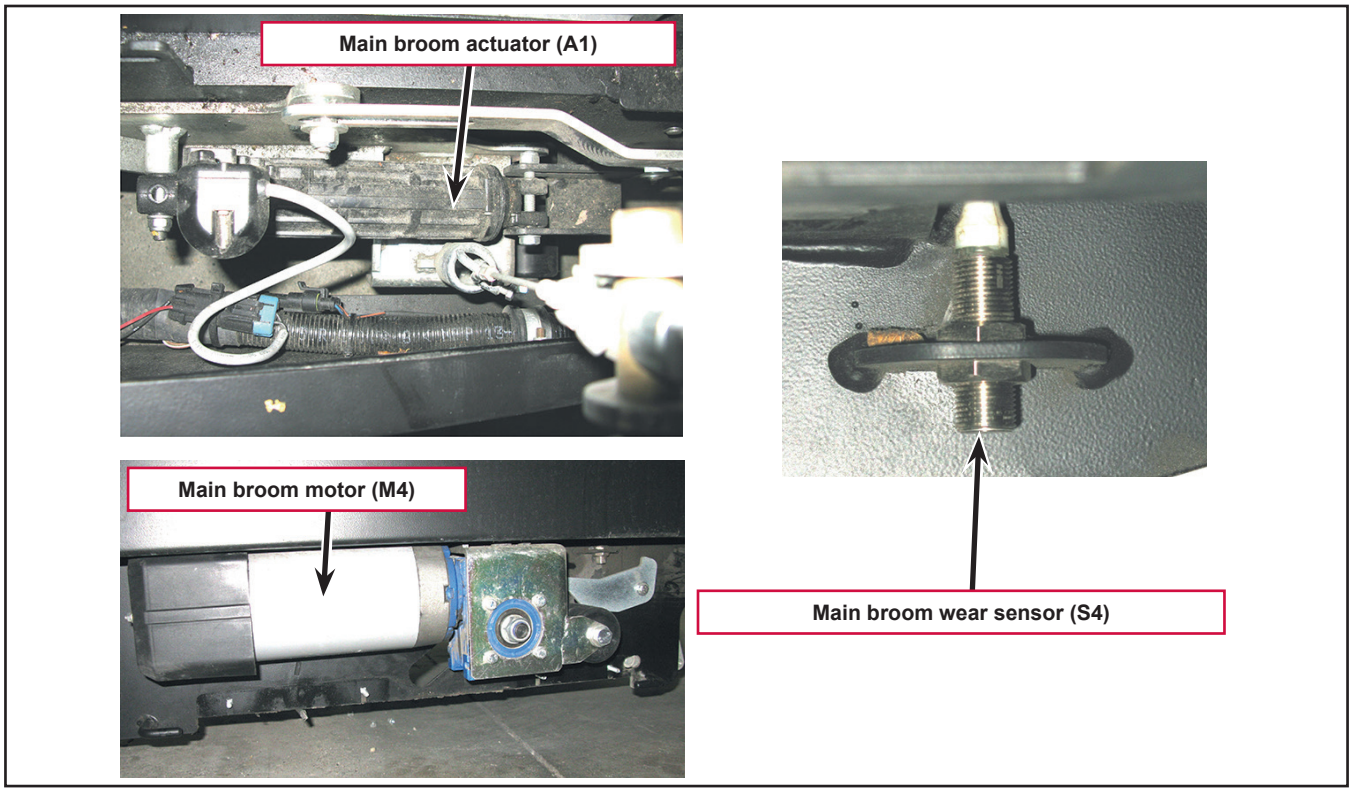


Figure 1:

Wiring diagram

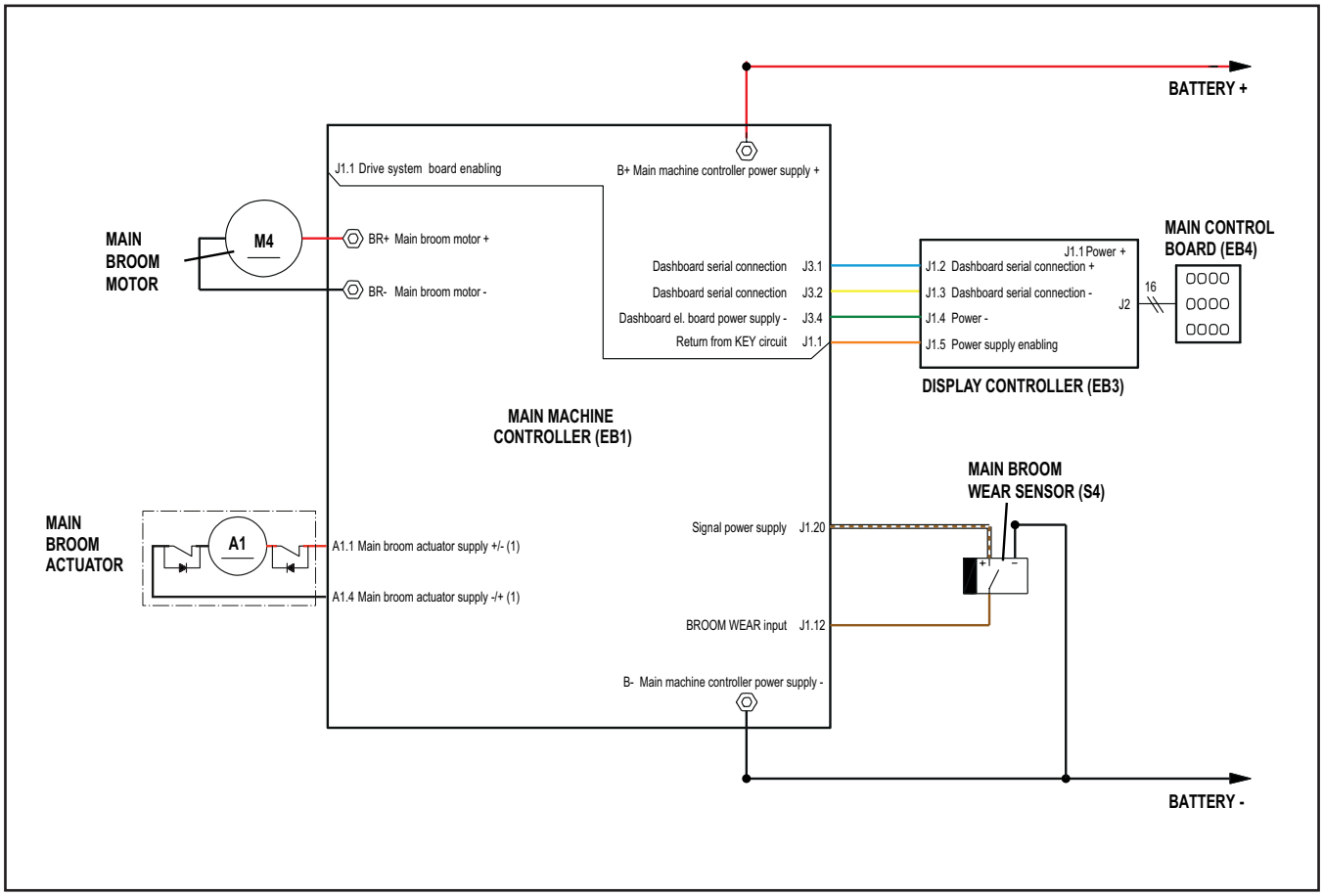


Figure 2:

Component Locations

- One-Touch sweeping/vacuum button (raising/lowering of main broom)
- Main broom height adjusting knob
- Front skirt lifting pedal
- Main broom
- Device to adjust the parallelism between the main broom and the floor



Figure 3:

Component Locations (Continues)

- Rear skirt
- Front skirt
- Left side skirt
- Right side skirt
- Main broom actuator (A1)
- Main broom wear sensor (S4)
- Main broom motor (M4)
- Main broom driver

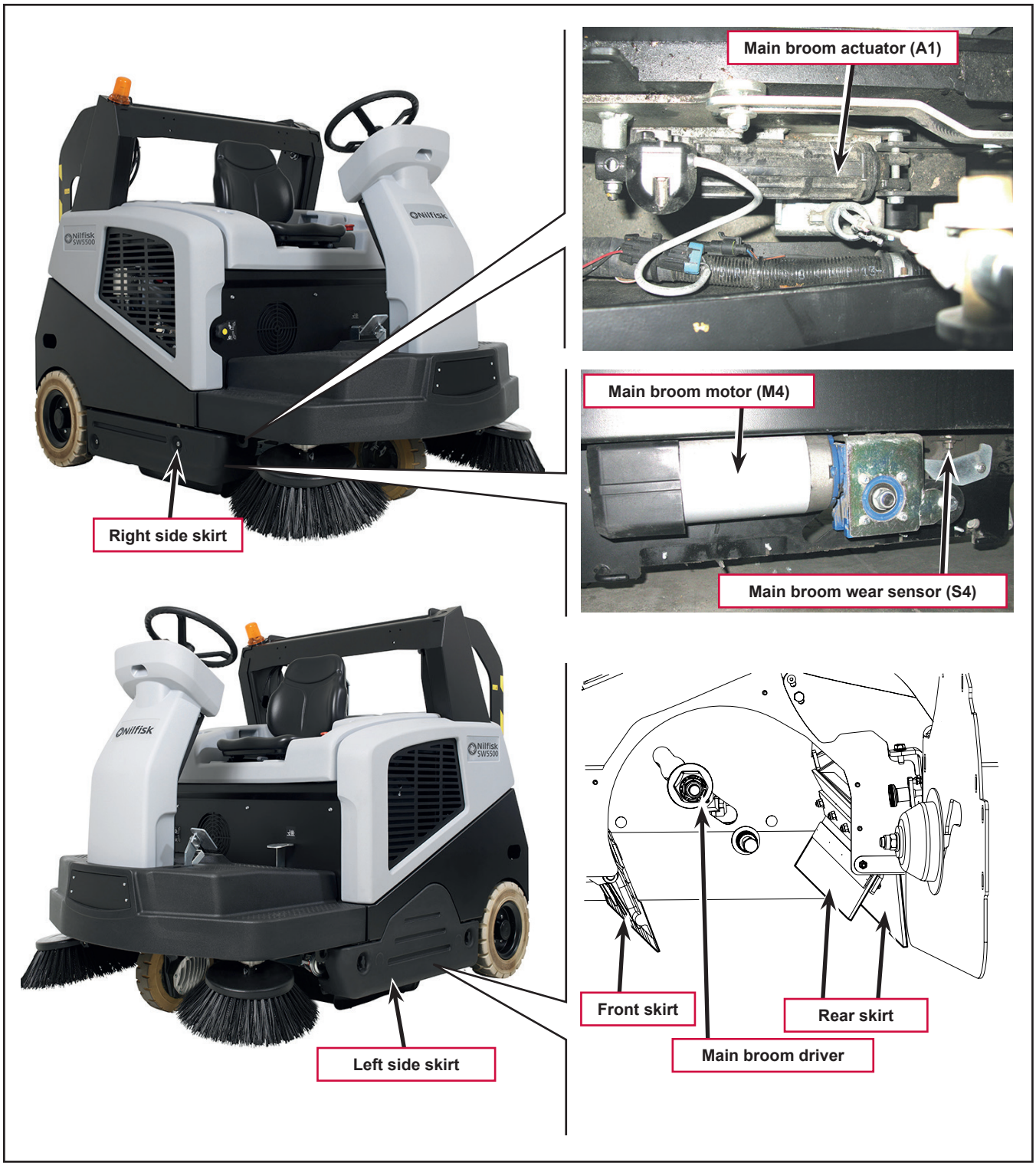


Figure 4:

Maintenance and Adjustments

Main Broom Height Check And Adjustment

Note: *Brooms with harder or softer bristles are available. This procedure is applicable to all types of brooms.*

1. Check the main broom height as shown below:
   - Drive the machine on a level floor.
   - Engage the parking brake.
   - Lower the main broom with the One-Touch button .
   - Rotate the broom by pressing the One-Touch button again and holding for at least 3 seconds: the broom will activate for 30 seconds, which is shown on the display (A).
   - After 30 seconds from broom activation, lift it by pressing the One-Touch button .
   - Check that the main broom print (B), along its length, is 2 to 4 cm wide.
   - If the print (B) is not within specifications, adjust the main broom height according to the following procedure.
2. Turn the knob (C), bearing in mind that:
   - to increase the print width, turn the knob counter-clockwise

Note: *The knob can be used both to adjust the print and to adjust the broom according to the bristle wear.*

3. Perform step 1 again to check that the main broom is at the correct distance from the ground.
4. When the icon (D) appears on the display, change the broom as described in the relevant paragraph.
5. If the print (B) cannot be properly adjusted, because the broom pressure differs from one end to another, proceed as follows.

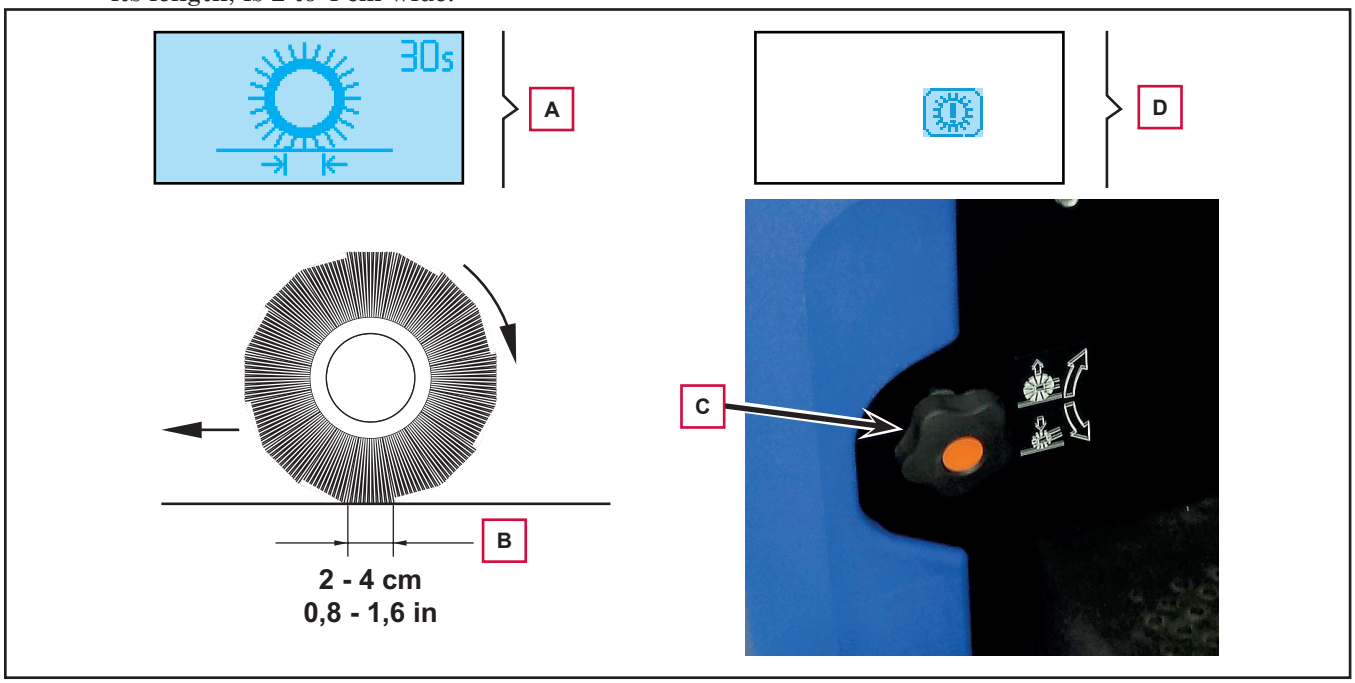


Figure 5:

Main Broom Height Check and Adjustment (Continues)

- Turn the fasteners and remove the left door (H).
- Loosen the nuts (E)
- Loosen the locknut (F)
- Turn the screw (G), bearing in mind the following:
  - Turning it clockwise will make the main broom lower to the left
  - Turning it anti-clockwise will make the main broom raise to the left
- When you have finished the adjustment, tighten the locknut (F) and the nuts (E).
- Fit the left side door (H) and engage the fasteners

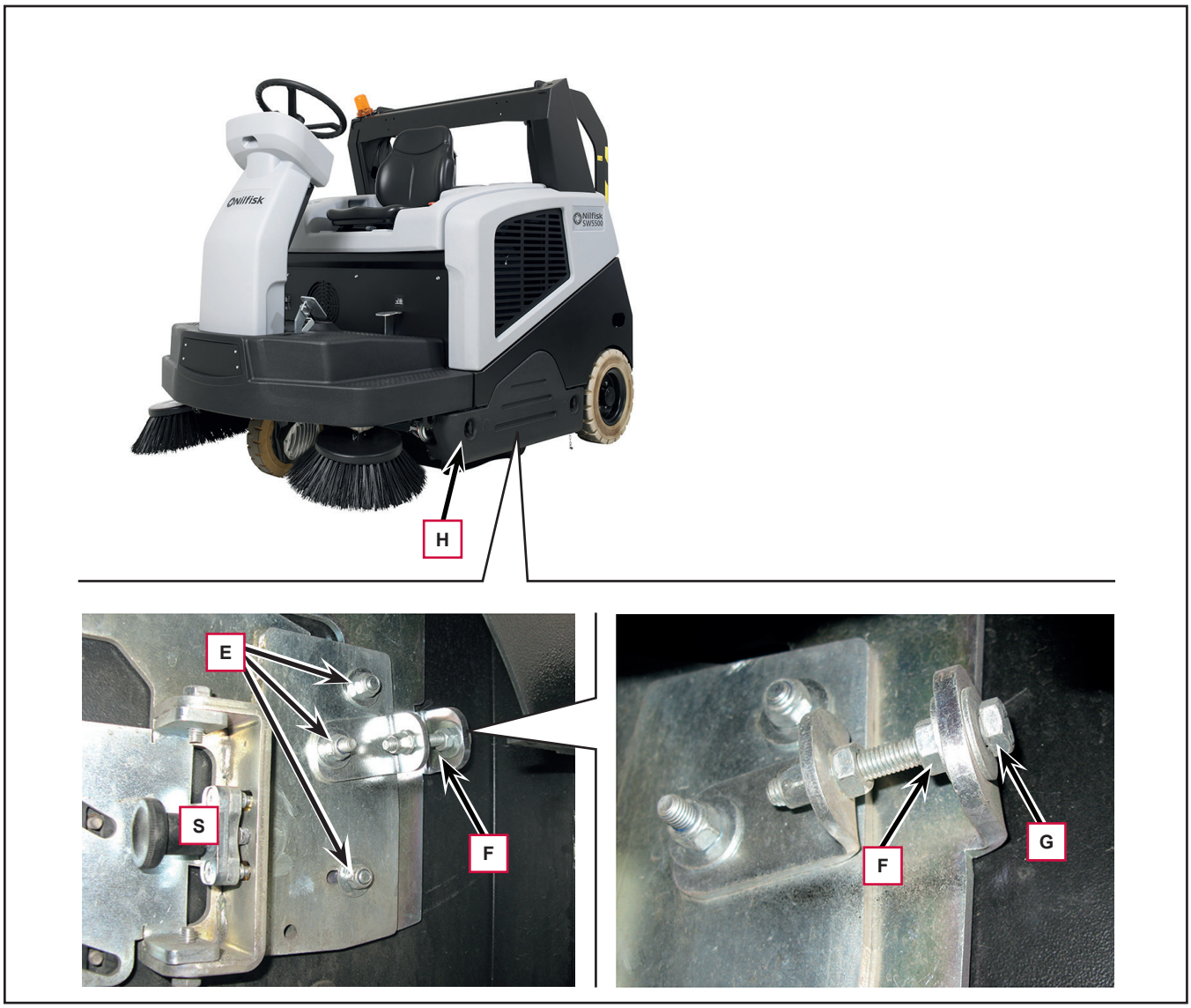


Figure 6:

Skirt Height and Operation Check and Adjustment

Preliminary Operations

1. Empty the hopper to prevent the weight of the debris affecting the skirt height check.
2. Drive the machine on a level ground that is suitable for checking the skirt height.
3. Turn the ignition key to “0”, then engage the parking brake.

Side Skirt Check

4. Remove the left door by turning the fasteners.
5. Remove the right door by unscrewing the screws.
6. Check the condition of the side skirts (A) and (B).
   Replace the skirts when they have cuts (C) larger than 0,8 in (20 mm) or cracks/tears (D) larger than 0,4 in (10 mm).
   To replace the skirts, see procedure in the relevant paragraph.
7. Check that the distance from the ground (E) of the side skirts (A and B) is 0 ÷ 0,12 in (0 ÷ 3 mm).
   If necessary, loosen the nuts (F) and adjust the skirt position. Finally, tighten the nuts (F).

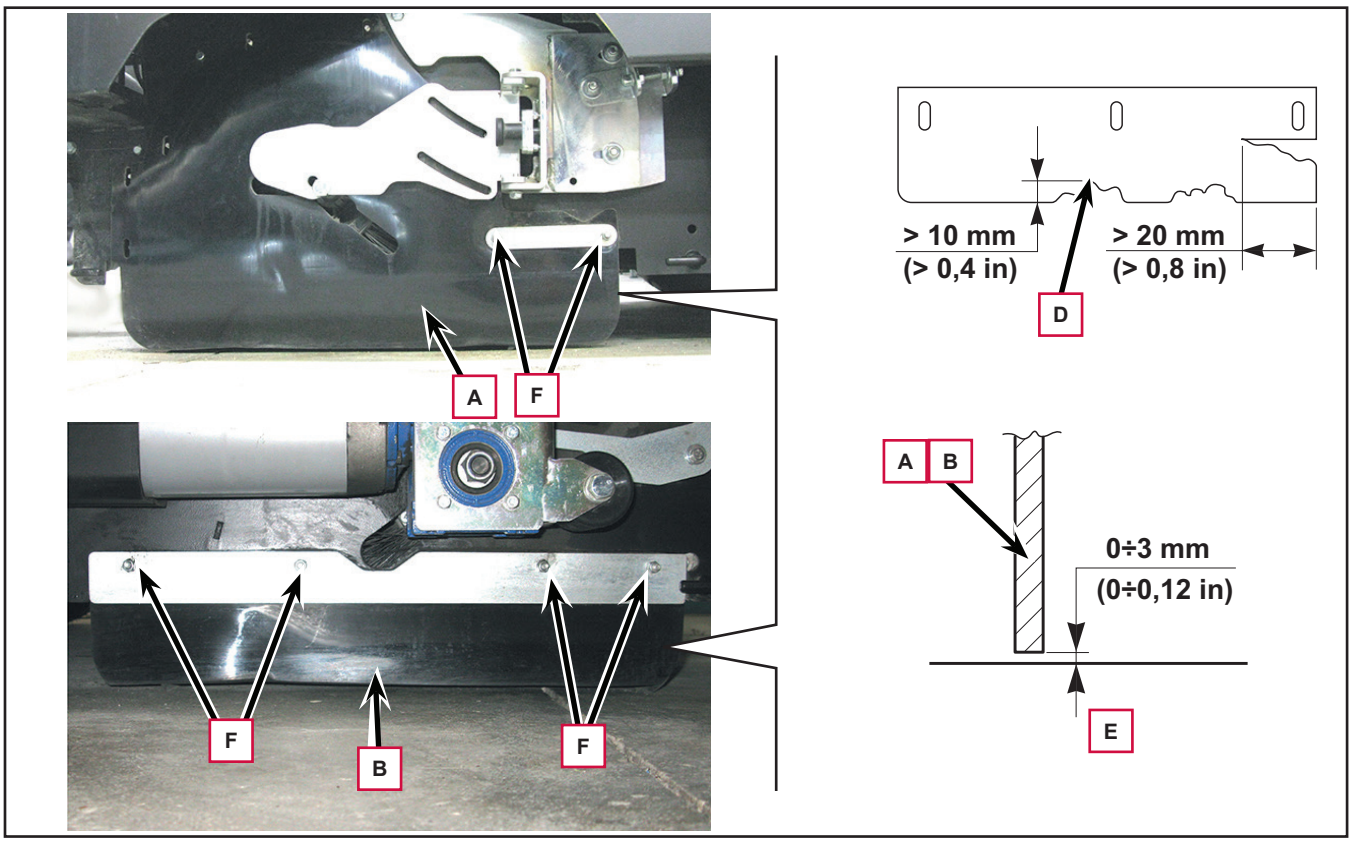


Figure 7:

Skirt Height and Operation Check and Adjustment (Continues)

Front and Rear Skirt Check

8. Remove the main broom (see procedure in the relevant paragraph).

9. Check the condition of the front (G) and rear skirts (H) and (I).
   Replace the skirts when they have cuts (C) larger than 0,8 in (20 mm) or cracks/tears (D) larger than 0,4 in (10 mm).

10. Check that the front skirt (G) and rear skirt (I) slightly rub the floor without coming off the ground (J).
    The front (G) and rear (I) skirts are not adjustable.
    To replace the skirts, see procedure in the relevant paragraph.

Installation

11. Assemble the components in the reverse order of removal.

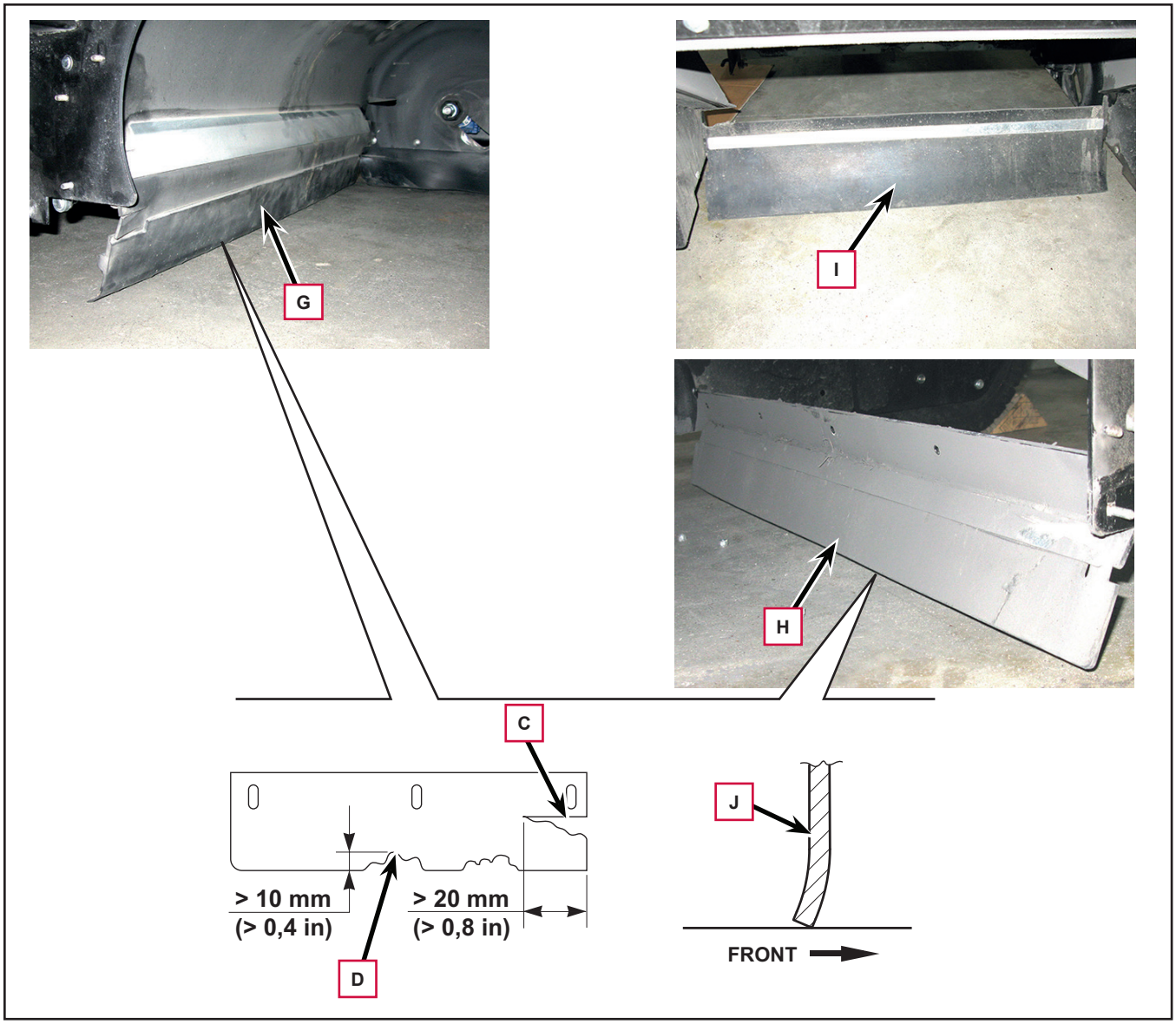


Figure 8:

Troubleshooting

Trouble	Possible causes	Remedy
The main broom does not work and ALARM is shown on the display	Main broom motor (M4) faulty	Check the motor amperage/replace
	Front skirt jammed in broom	Return it to position
	Front skirt incorrectly regulated and coming into contact with broom	Adjust it
	Debris in drive system / broom compartment	Clean the broom compartment area
	Hopper positioned too far forward, coming into contact with broom	Adjust it
	Hopper open	Close it
	The main broom has not been properly adjusted in height/parallelism	Adjust
	Excessive broom pressure on ground	Reduce pressure on ground with adjustment knob
	-	Check for any contact between the main broom and the skirts, cowling and other mechanical parts
The main broom does not clean properly	The main broom is too worn out	Replace / check operation of the main broom wear sensor
	The skirts are misadjusted or damaged	Adjust/replace
	Main broom not correctly adjusted	Adjust
	LH broom support not correctly closed and locked	Close correctly
The main broom does not lower / raise	Broom actuator (A1) not working	Repair/replace
	Spring / wire disconnected	Connect

Main Broom Motor Current Draw Check

WARNING: This procedure must be performed by qualified personnel only.

1. Remove the main broom (see procedure in the relevant paragraph).
2. Check that the main broom drive hub is free from dirt or foreign materials (ropes, rags, etc.) accidentally rolled up, which can prevent it from rotating.
3. Unscrew the four screws (A) fastening the fairing (B).
4. Unscrew the nut (C) on the front.
5. Slide the sleeve (D) until it is flush on the steering wheel.
6. Press the stud (E), sliding it upwards (causing the Main Control Board (F) to lift slightly, then remove the fairing (B) by disengaging it from its seat and the stud (E).
7. Position a suitable lifting device (G) at the centre of the front section of the machine, on chassis bracket (H), then raise the front of the machine by a few centimeters until the driving wheel can turn without brushing the ground.

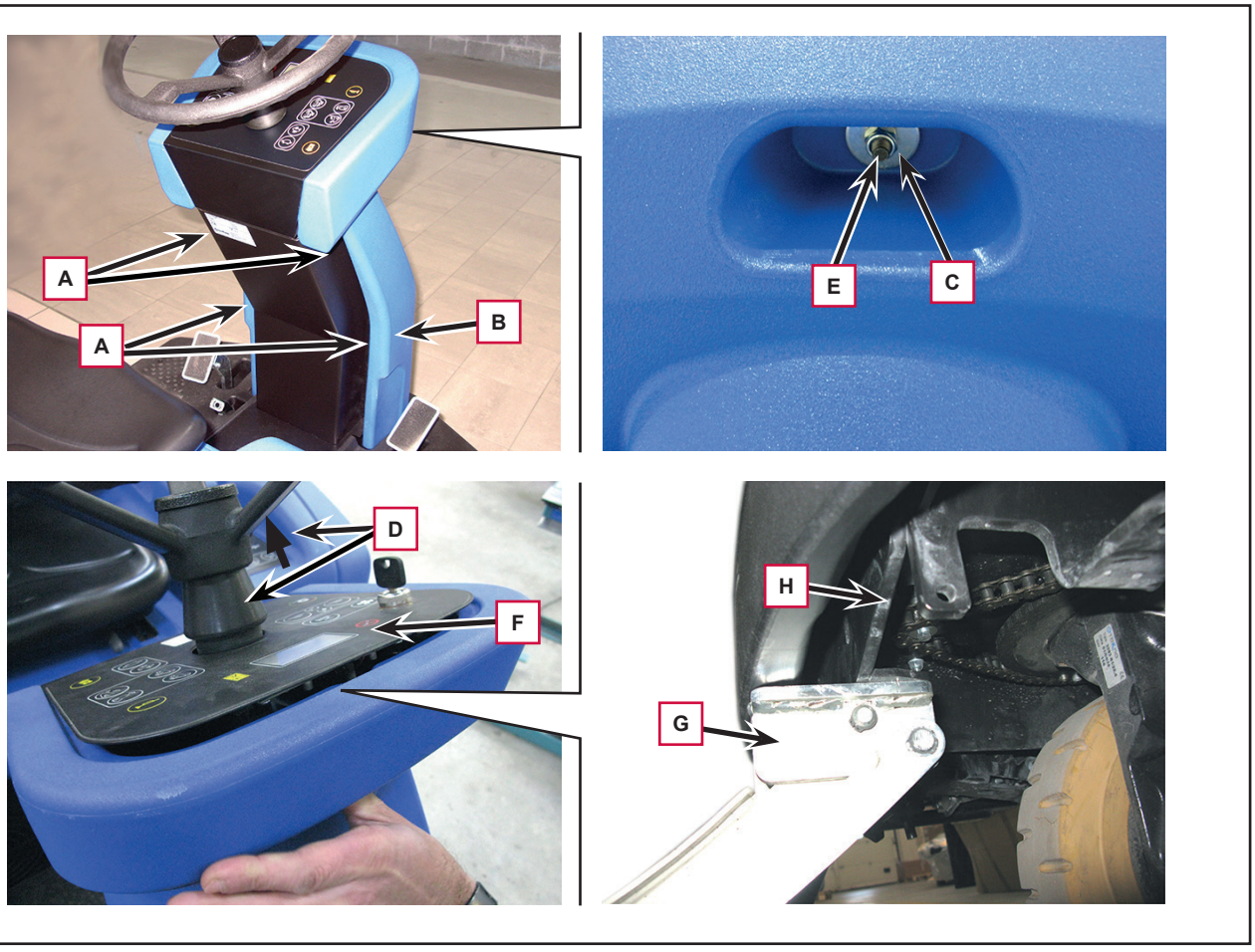


Figure 9:

Main Broom Motor Current Draw Check (Continues)

8. For safety purposes, to prevent accidental lowering of the machine, apply two suitable spacers under the right (I) and left (J) side brackets.
9. Apply the ammeter clamp (K) on a cable (L) of the main broom motor.
10. Start the machine with the ignition key.
11. Press the One-Touch button  to engage the sweeping system, then press the accelerator pedal.
12. Turn on the main broom and check that the amperage of the motor is 15 - 25A at 24V.
    - Stop the main broom rotation.
    - Turn the ignition key to “0”.
    - Remove the ammeter clamp (K).

If the amperage is higher, perform the following procedures to detect and correct it:

- Check if there is dust or dirt (cords, cables, etc.) on the broom drive hub.
- Check the carbon brushes of the electric motor (see procedure in the relevant paragraph)
- If necessary, disassemble the motor (see procedure in the relevant paragraph), and check the condition of all its components. If the above-mentioned procedures do not lead to a correct amperage, the motor must be replaced (see procedure in the relevant paragraph).

Installation

13. Perform steps 1. to 8. in the reverse order.

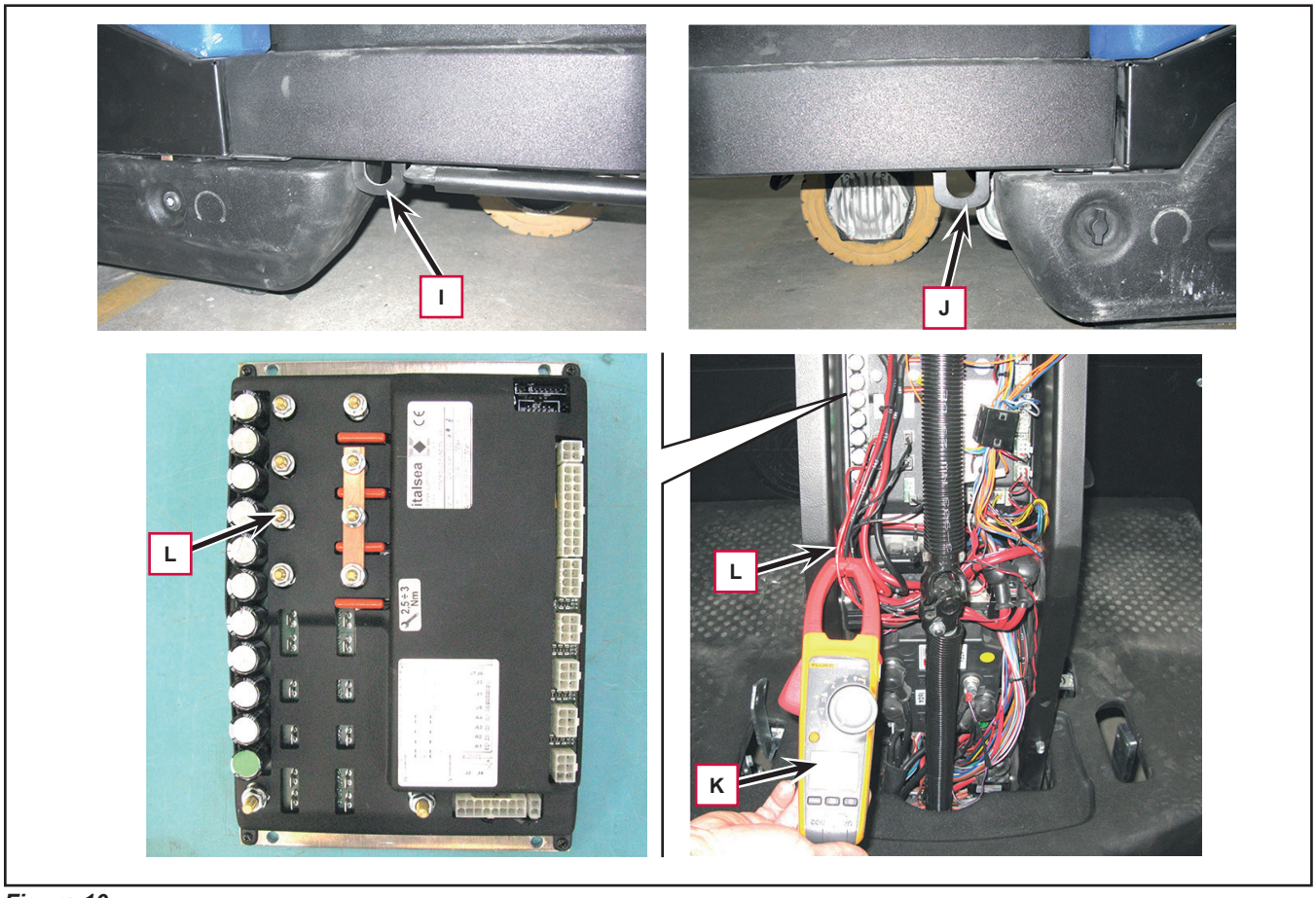


Figure 10:

Removal and Installation

Main Broom

Removal

WARNING: It is advisable to wear protective gloves when replacing the main broom because there can be sharp debris between the bristles.

1. Drive the machine on a level floor.
2. Ensure that the main broom is in the lifted position.
3. Turn the ignition key to “0”, then engage the parking brake.
4. Turn the fasteners (B) and remove the left door (A).
5. Pull the knob (C) as indicated by the arrow to disengage the closing support (D).
6. Open the closing support (D) together with the left side skirt (E), disengaging it from the various fasteners (H).
7. Remove the main broom (F).
8. Check that the drive hub (G) is free from dirt or foreign materials (cords, rags, etc.) accidentally rolled up.

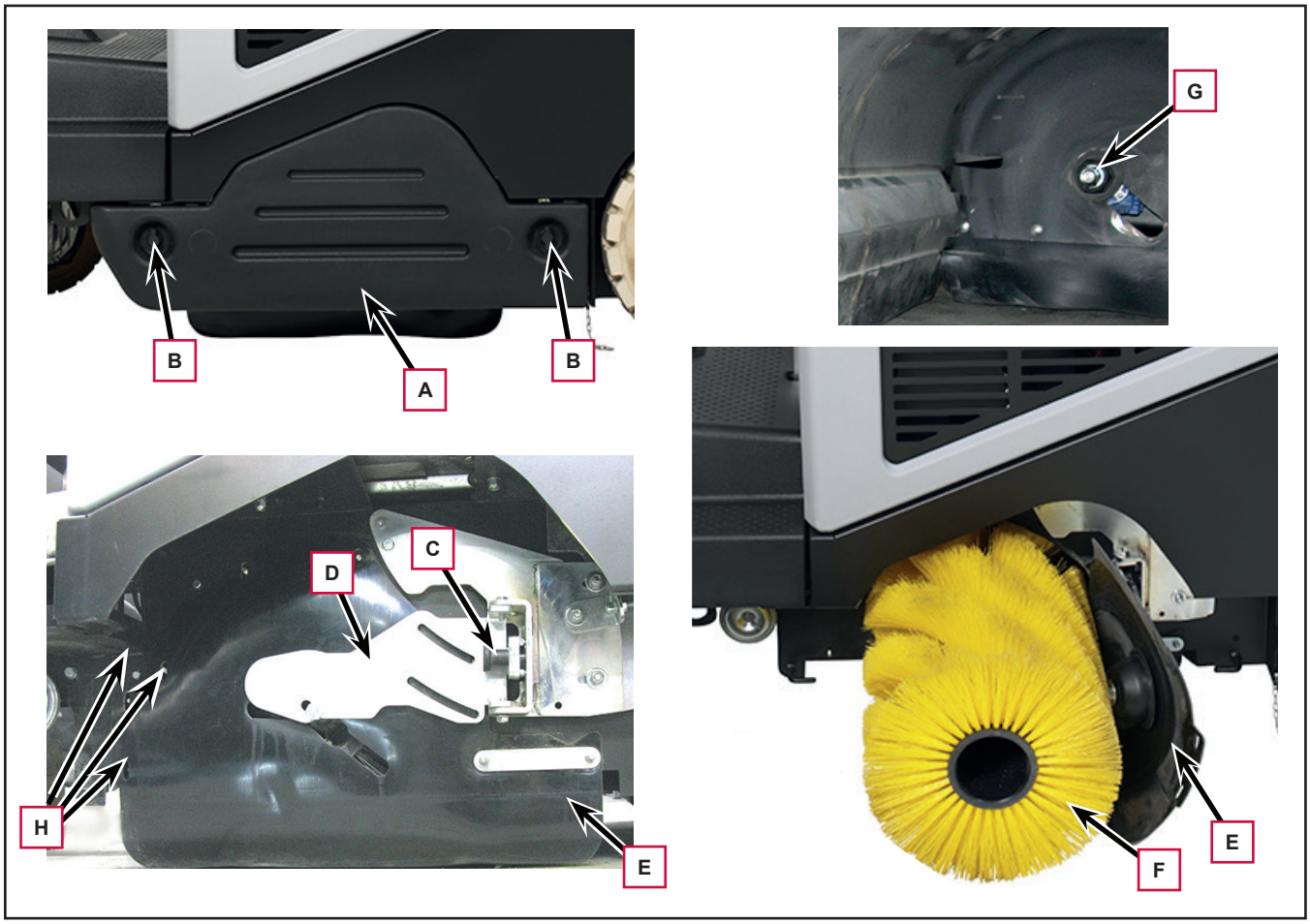


Figure 11:

Main Broom (Continues)

Installation

9. The main broom must be installed with the bristles (I) oriented as shown in the figure.
10. Install the new main broom and ensure that the hexagonal mesh (J) fits into the relevant drive hub (G).
11. Turn and close the closing support (D) together with the left side skirt (E), until the knob (C) clicks; attach the left side skirt (E) to the various fasteners (H).
12. Refit the left door (A) and turn the fasteners (B) back into the closed position.
13. Check and adjust the main broom height (see procedure in the relevant paragraph).

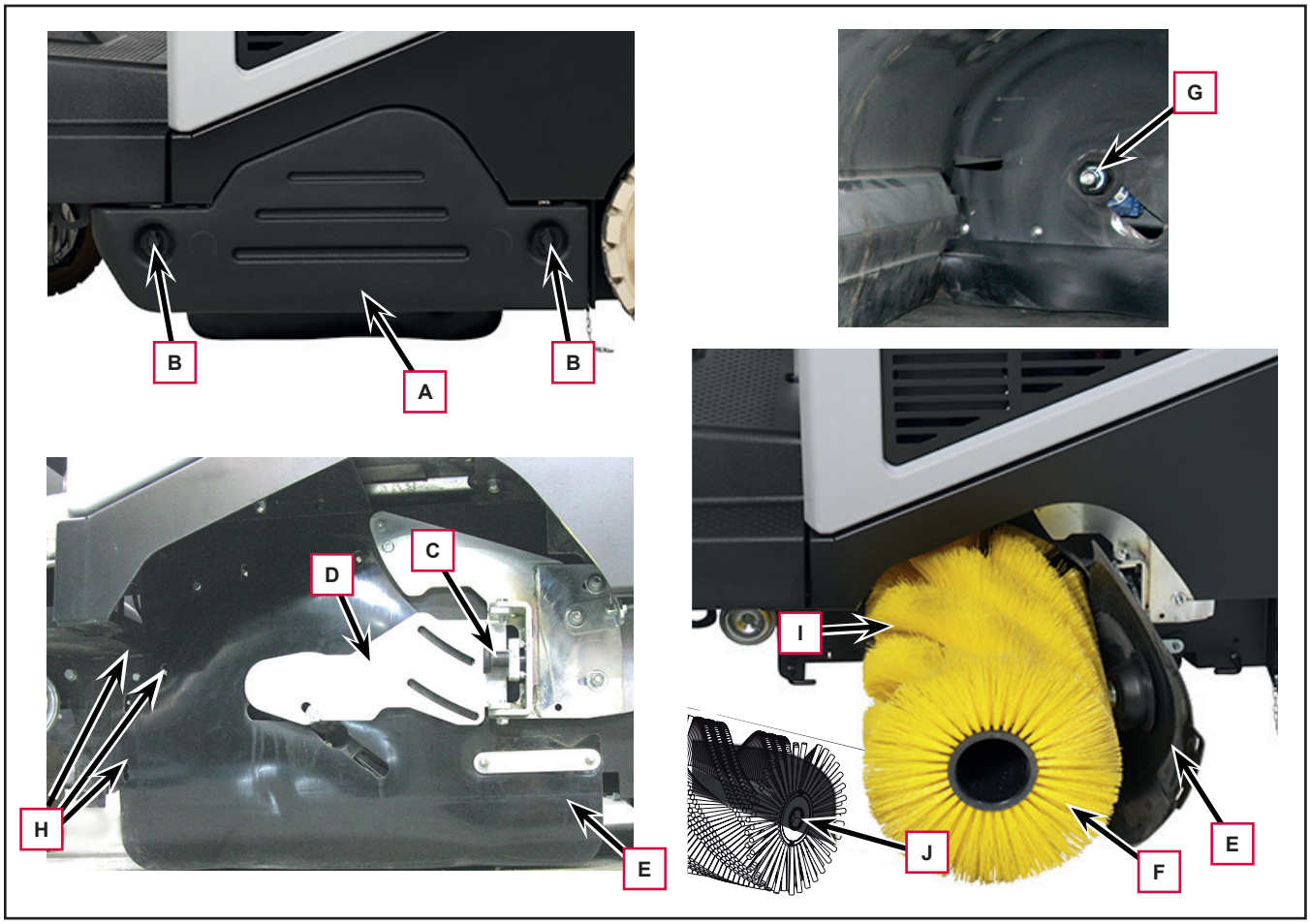


Figure 12:

Skirt

Left Side Skirt Removal and Installation

1. Empty the hopper (as shown in the Instructions for Use Manual), because the weight of the waste inside the hopper can affect the skirt height check.
2. Drive the machine on a level ground that is suitable for checking the skirt height.
3. Turn the ignition key to “0”, then engage the parking brake.
4. Turn the fasteners and remove the machine left door.
5. Unscrew the nuts (A) and remove the strap (B).
6. Pull and release the knob (C).
7. Open the skirt (D), freeing it from the pins (E).
8. Remove the skirt (D), freeing it from the hub (F).
9. Install the skirt (D) and the other removed components in the reverse order of removal, and note the following:
    - Check the skirt height (see procedure in the relevant paragraph).

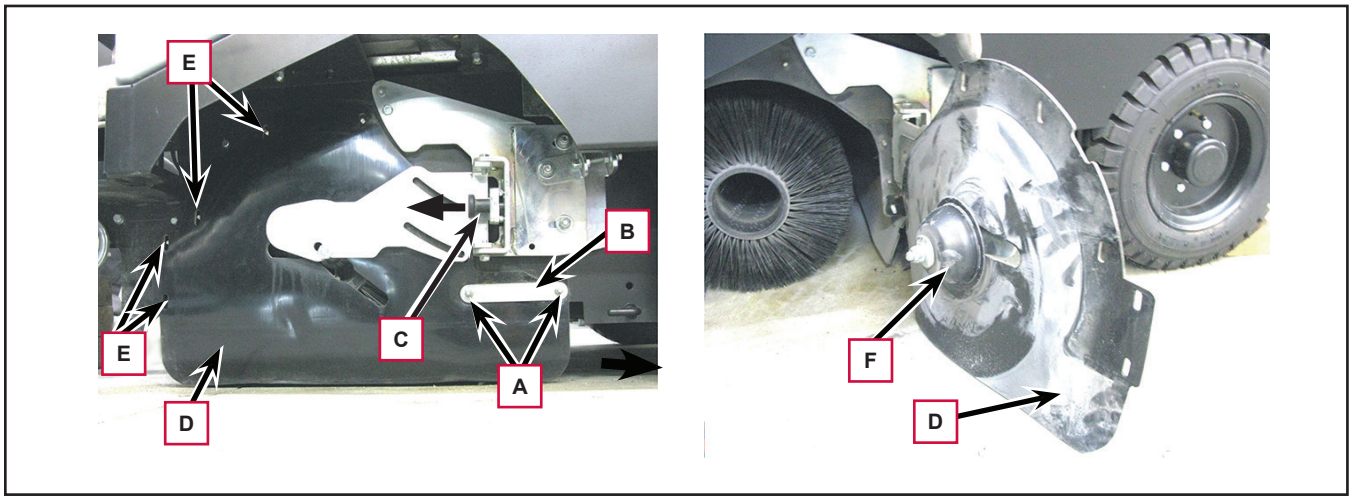


Figure 13:

Skirt (Continues)

Right Side Skirt Removal and Installation

10. Empty the hopper (as shown in the Instructions for Use Manual), because the weight of the waste inside the hopper can affect the skirt height check.
11. Drive the machine on a level ground that is suitable for checking the skirt height.
12. Turn the ignition key to “0”, then engage the parking brake.
13. Unscrew the screws and remove the machine right door.
14. Unscrew the nuts (G) and remove the strap (H).
15. Remove the skirt (I).
16. Install the skirt (I) and the other removed components in the reverse order of removal, and note the following:
    - Check the skirt height (see procedure in the relevant paragraph).

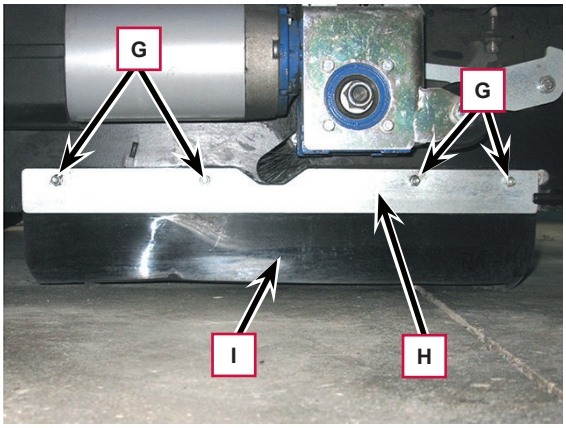


Figure 14:

Skirt (Continues)

Front Skirt Removal and Installation

17. Empty the hopper (as shown in the Instructions for Use Manual), because the weight of the waste inside the hopper can affect the skirt height check.
18. Drive the machine on a level ground that is suitable for checking the skirt height.
19. Turn the ignition key to “0”, then engage the parking brake.
20. Remove the side brooms (see procedure in the side broom system).
21. Remove the main broom (see procedure in the relevant paragraph).
22. Release the clips (A) and (B) and disconnect the corresponding tie rods from the front skirt (C).
23. Working from the two sides of the machine, unscrew the nuts (D).
24. Working inside the main broom compartment, remove the strap (E), the front skirt (F) and the rubber cowling (G).
25. Install the front skirt (F) and the other removed components in the reverse order of removal.

Note: *The front skirt cannot be adjusted.*

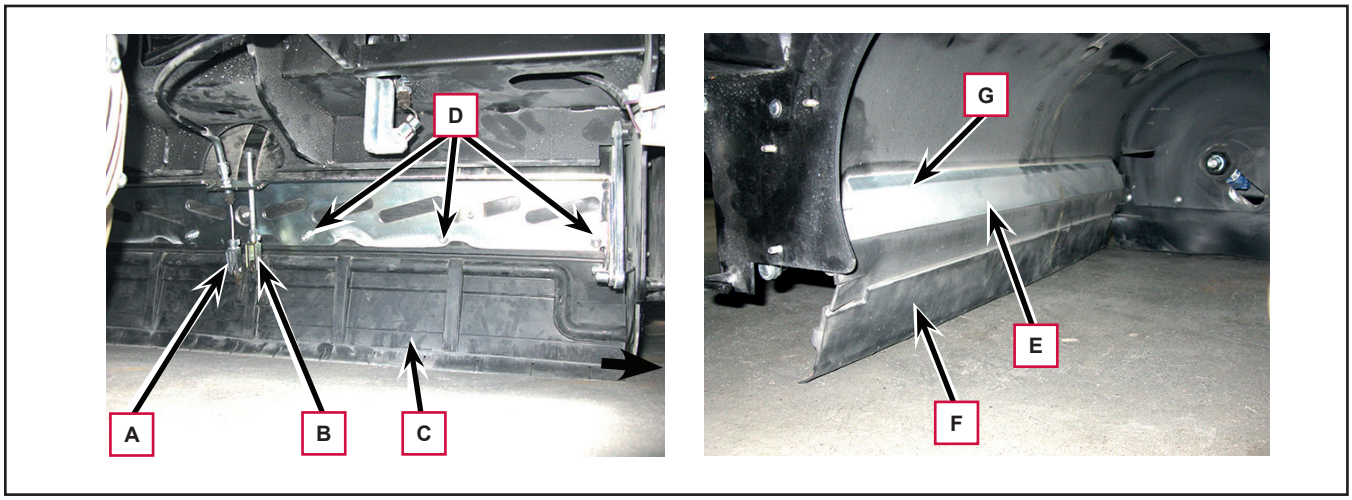


Figure 15:

Skirt (Continues)

Rear Skirts Removal and Installation

26. Empty the hopper, because the weight of the waste inside the hopper can affect the skirt height check.
27. Drive the machine on a level ground that is suitable for checking the skirt height.
28. Turn the ignition key to “0”, then engage the parking brake.
29. Remove the main broom (see procedure in the relevant paragraph).
30. Lift the hopper to the end-of-stroke.

WARNING: Place a safety rod under the lifted hopper.

31. Working inside the main broom compartment, unscrew the nuts (A) fastening the rear skirt (B).
32. Working from the hopper compartment, remove the rear skirt (B) and the strap (C).
33. If necessary, unscrew the nuts (D) on the recycling skirt (E). From the main broom compartment, remove the strap (F) and the recycling skirt (E).
34. Install the rear skirts (B) and the recycling skirt (E) and the other removed components in the reverse order of removal, and note the following:
    - Adjust in position until contact with the floor the rear skirt (B).

Note: *The recycling skirt (E) cannot be adjusted.*

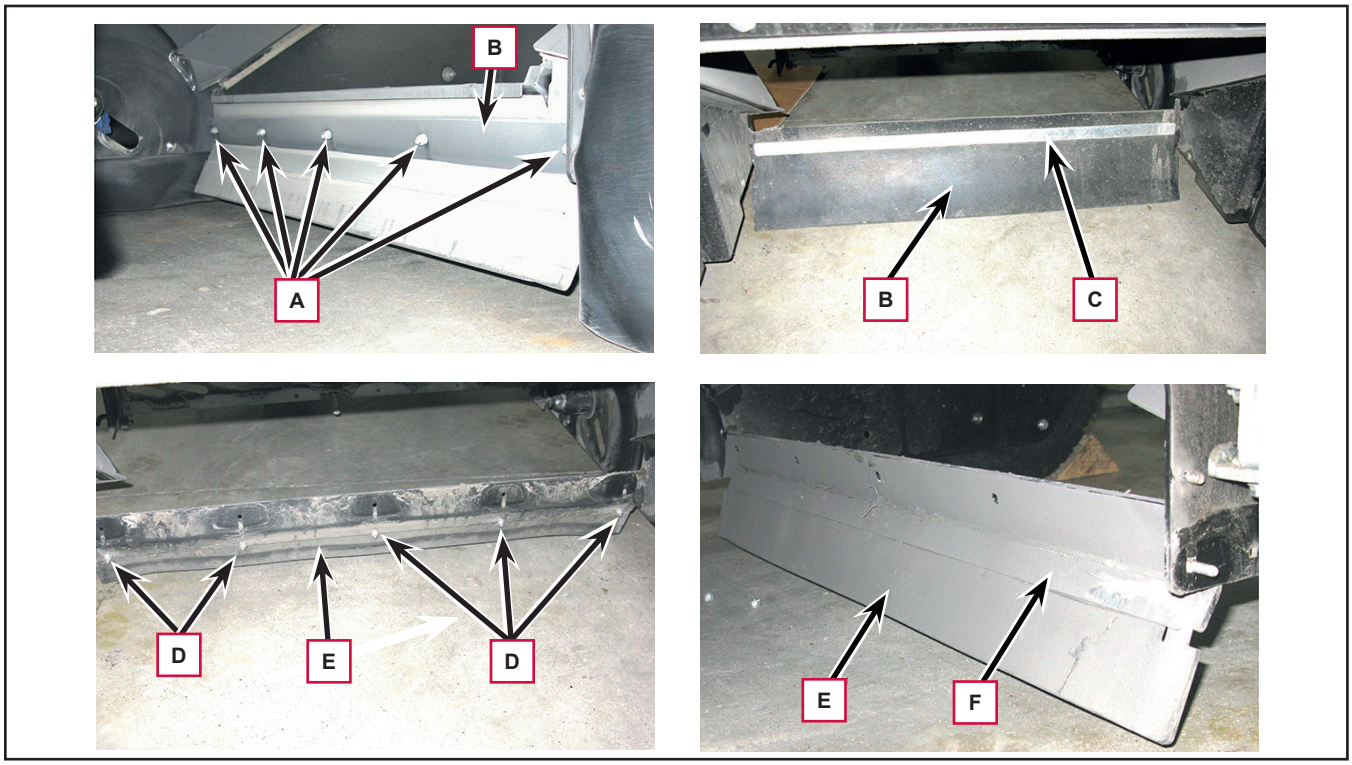


Figure 16:

Main Broom Motor

Removal

1. Drive the machine on a level floor.
2. Lift the hopper to the end-of-stroke.

WARNING: Place a safety rod under the lifted hopper.

3. Turn the ignition key to “0”, then engage the parking brake.
4. Open the battery/engine compartment hood with the handle and fasten it with the support rod.
5. Disconnect the battery connector (Battery Version) - Disconnect the batteries (Diesel and LPG Version).
6. Remove the main broom (see procedure in the relevant paragraph).
7. Unscrew the screws (A) and remove the right door (B).
8. Lift and remove the right side panel (C), disengaging it from the upper (D) and lower (E) fasteners.
9. Disconnect the main broom motor electrical connection (F).

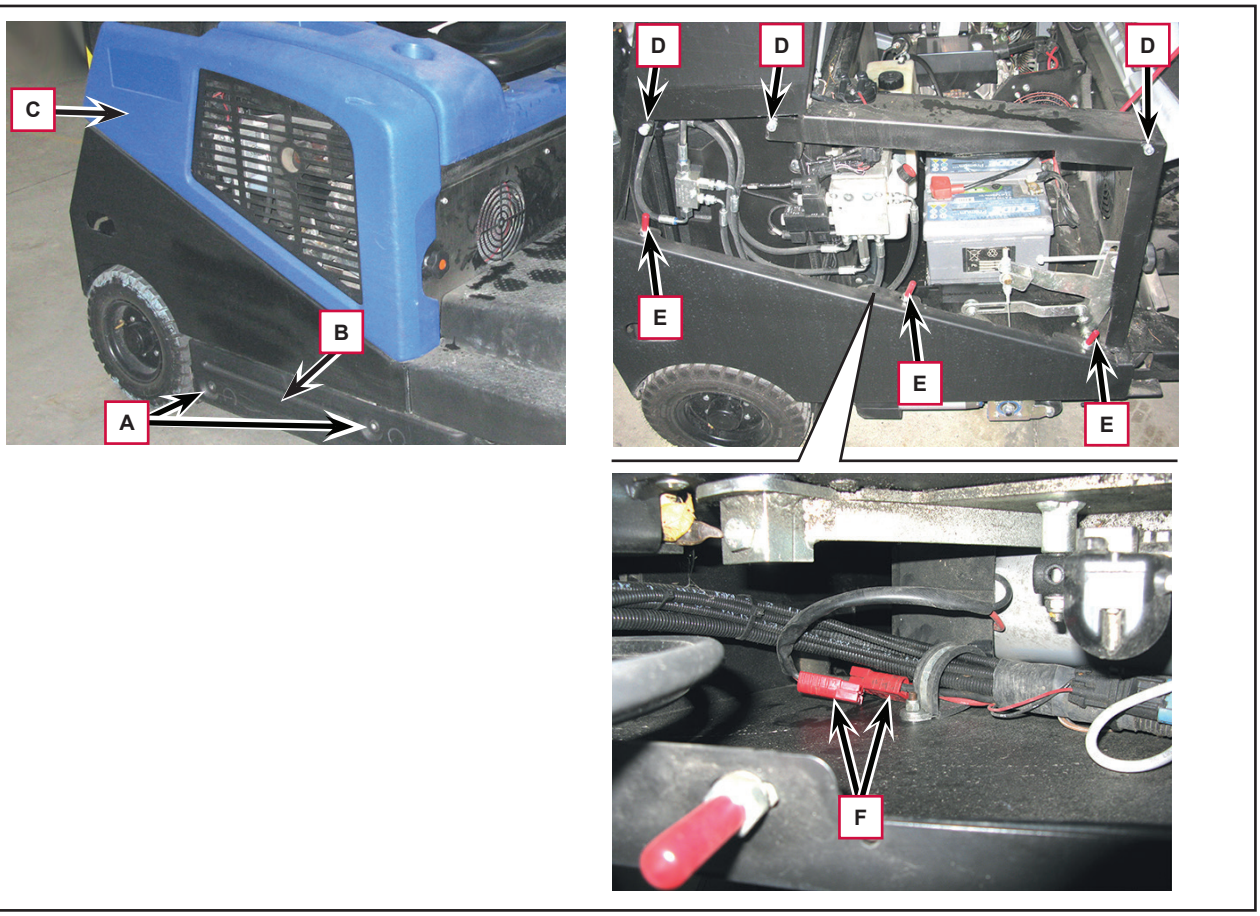


Figure 17:

Main broom motor (Continues)

10. Unscrew the nut (G) on the main broom motor (H).
11. Use a rubber mallet to tap the threaded pin (I) inwards, then remove it from the side broom compartment, complete with the drive hub (J).
12. Unscrew the four screws (K) and remove the main broom gear motor (H).
13. If necessary, remove the reduction unit from the motor on the workbench, according to the following procedure.
    - Mark the relative position (L) between the motor (M) and reduction unit (N).
    - Unscrew the four screws (P) and remove the reduction unit (N), detaching its shaft from the motor (M) with a spanner (unscrew the screws (P), gradually extracting the reduction unit).

Installation

14. Assemble the components in the reverse order of removal.

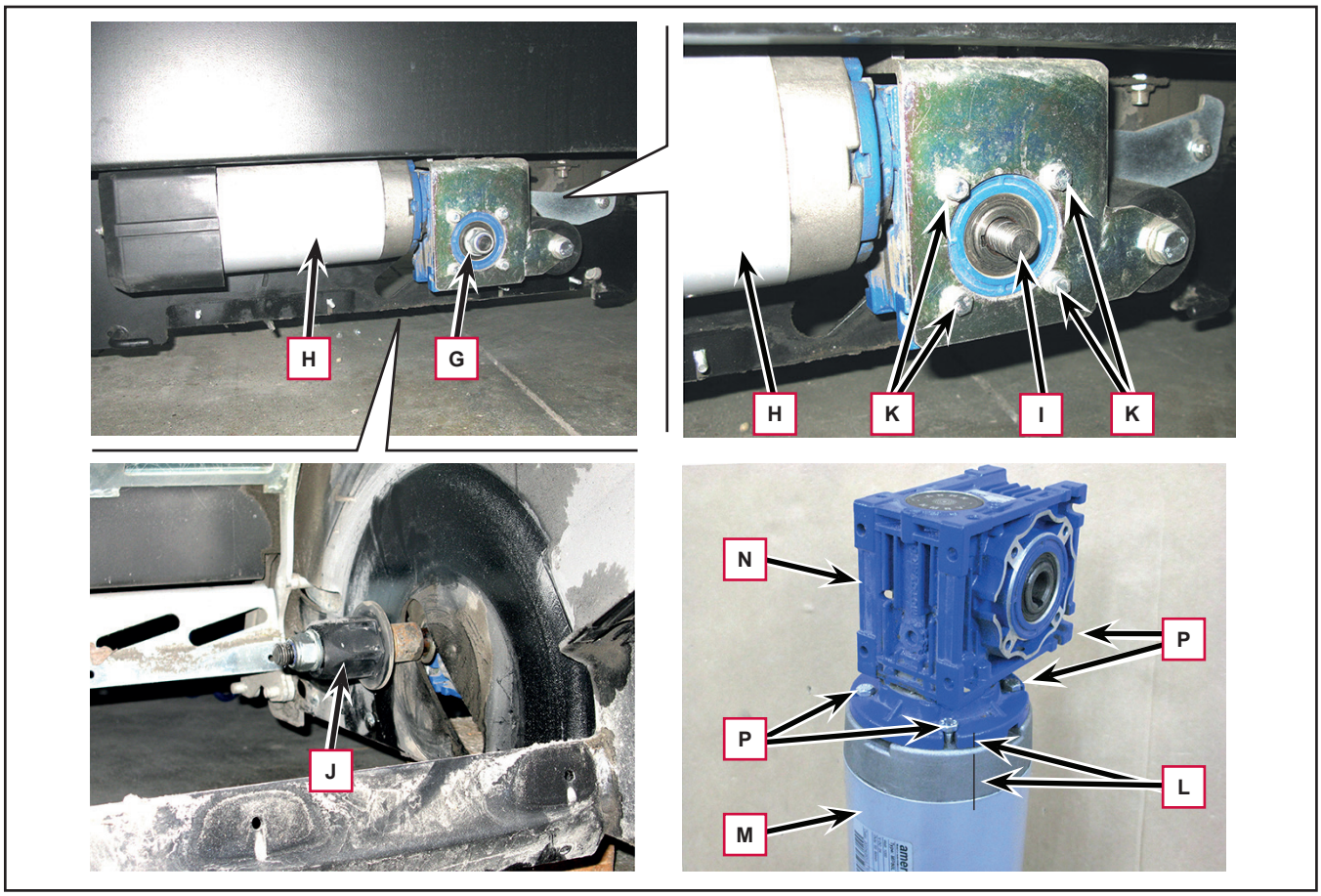


Figure 18:

Main Broom Motor Carbon Brush Check/Replacement

Disassembly

1. Remove the main broom motor (see procedure in the relevant paragraph).
2. At the workbench, remove the nuts (A) and the guard (B) of the main broom motor (C).
3. If necessary, clean the external side of the motor (C) in the area of the protection band (D).
4. Disengage the cam lever (E) and remove the protection band (D).
5. Remove the fastening screws (F) of the electrical connections of the four carbon brushes (G).
6. Remove the four carbon brushes (G) from their housings, by disengaging them from the retaining springs (H).
7. Check the two carbon brushes (G) for wear. Replace the carbon brushes when: the contact with the motor armature is insufficient, the carbon brushes are worn, the carbon brush contact surface is not integral, the thrust spring is broken, etc. If the length of the carbon brushes is insufficient, these must be replaced.
   In this cases, replace all motor carbon brushes.

Assembly

8. Assemble the components in the reverse order of disassembly.

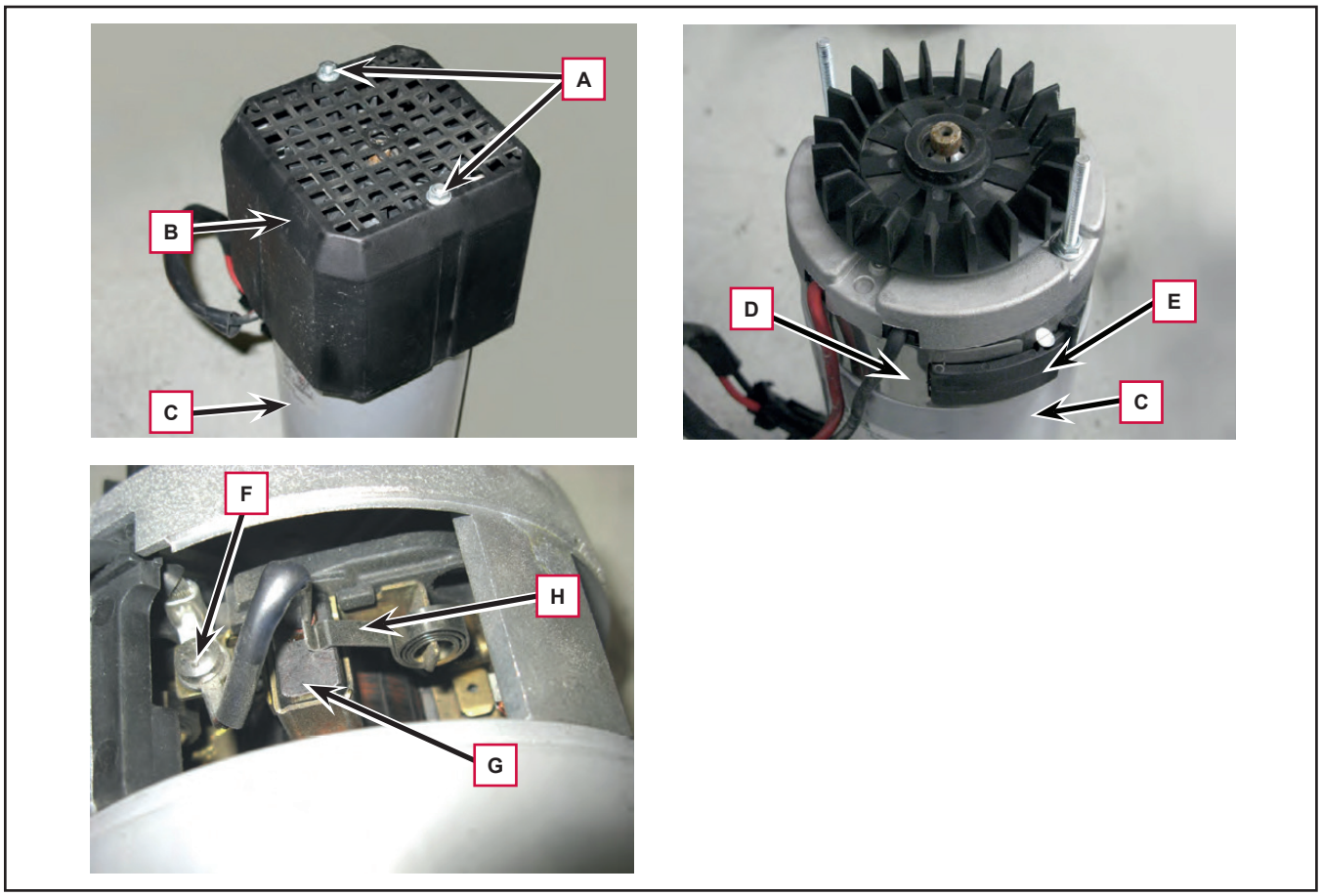


Figure 19:

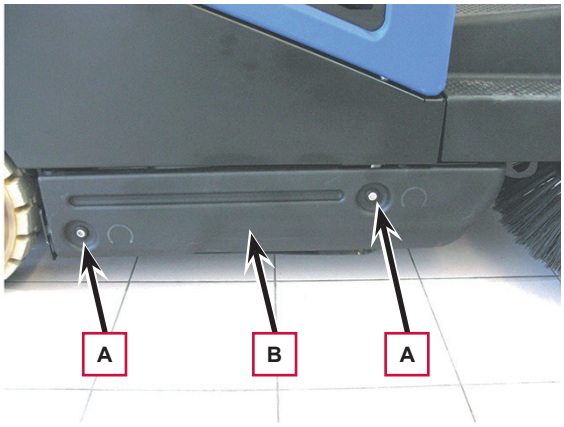
Main Broom Motor Driver

Removal

1. Drive the machine on a level floor.
2. Lift the hopper to the end-of-stroke.

WARNING: Place a safety rod under the lifted hopper.

3. Turn the ignition key to “0”, then engage the parking brake.
4. Remove the main broom (see procedure in the relevant paragraph).
5. Unscrew the screws (A) and remove the right door (B).
6. Unscrew the nut (C) on the main broom motor (D).



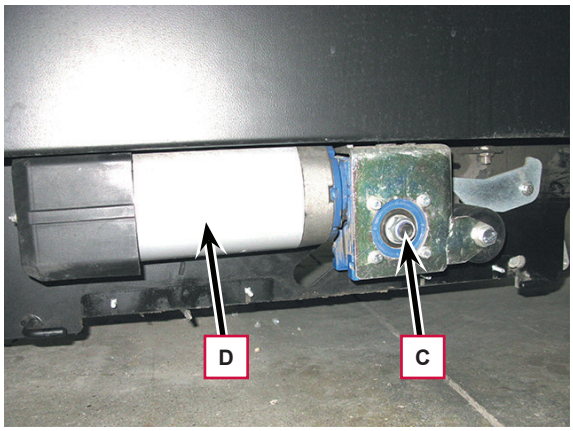


Figure 20:

Main Broom Motor Driver (continues)

7. Use a rubber mallet to tap the threaded pin (E) inwards, then remove it from the side broom compartment, complete with the drive hub (F).

8. If necessary, unscrew the hub lock nut (G) on the workbench and extract the driver (H), detaching it from the shaft with two spanners.

Installation

9. Assemble the components in the reverse order of removal, and note the following:

    - If necessary, replace the lock nut (G) to ensure correct fastening.

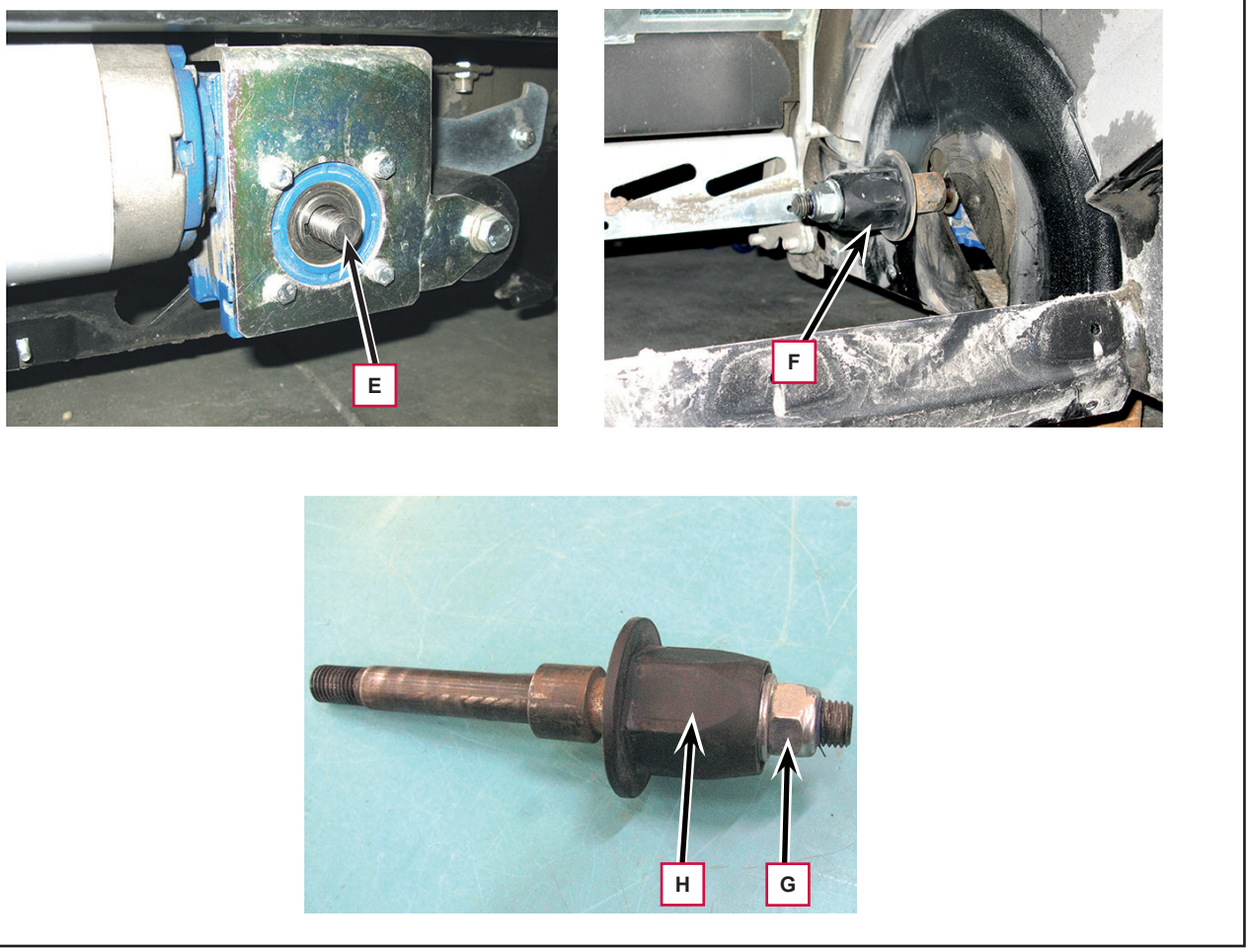


Figure 21:

Main Broom Actuator

Removal

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Remove the main broom (see procedure in the relevant paragraph).
4. Lower the main broom from the Main Control Board.
5. Open the battery/engine compartment hood with the handle and fasten it with the support rod.
6. Disconnect the battery connector (Battery Version) - Disconnect the batteries (Diesel and LPG Version).
7. Lift and remove the right side panel (A), disengaging it from the upper (B) and lower (C) fasteners.
8. Cut the retaining clamp (D), then disconnect the electrical connection (E) on the main broom actuator (F).
9. Unscrew the locknut (G).
10. Unscrew the locknut (H) and remove the screw (I).
11. Remove the main broom actuator (F).

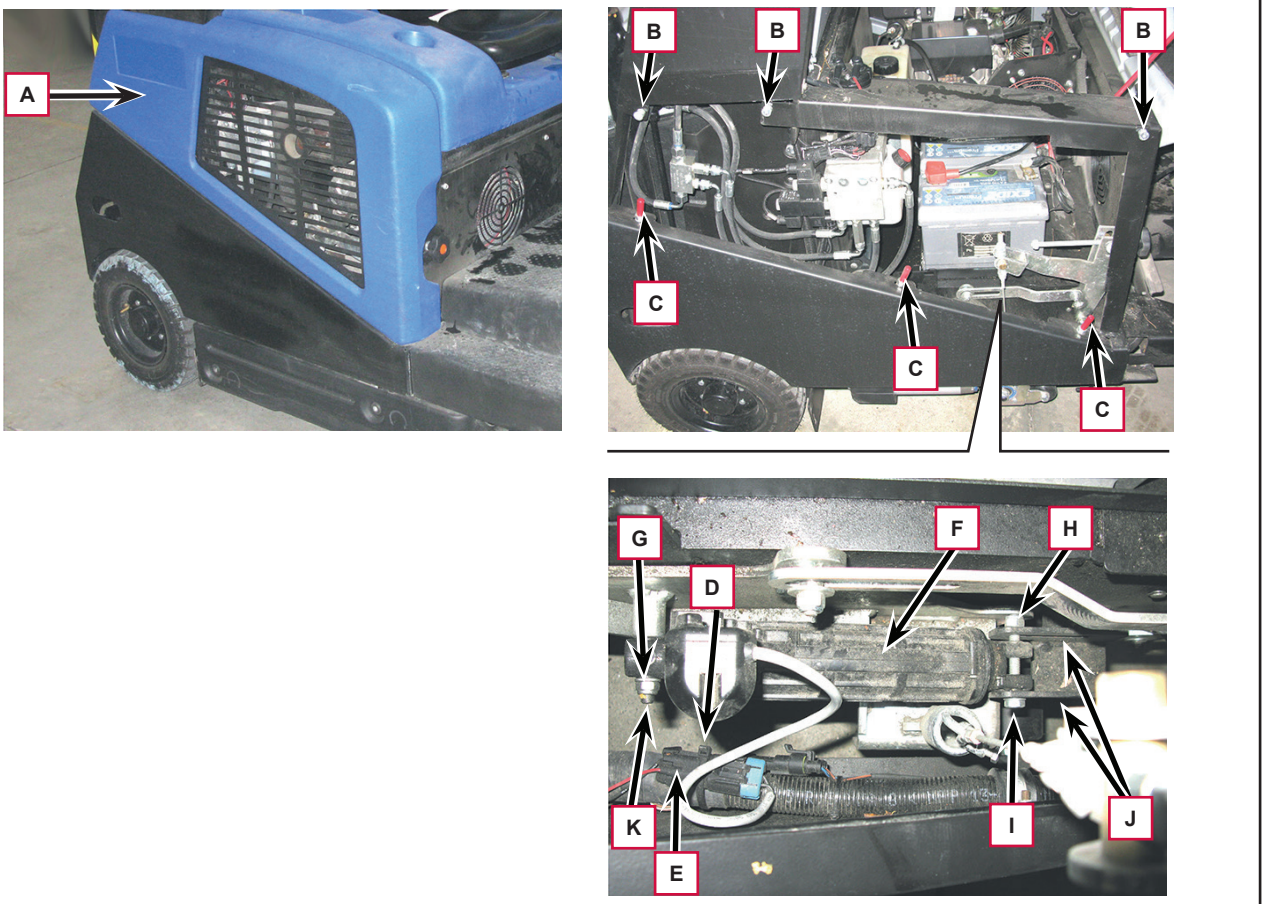


Figure 22:

Main Broom Actuator (continues)

Installation

12. Assemble the components in the reverse order of removal, and note the following:

    - If necessary, replace the lock nuts (G) and (H) of the screw to ensure correct fastening; also screw them down just enough to bring them together, ensuring free movement of the actuator (F) on the slots (J) and pin (K).

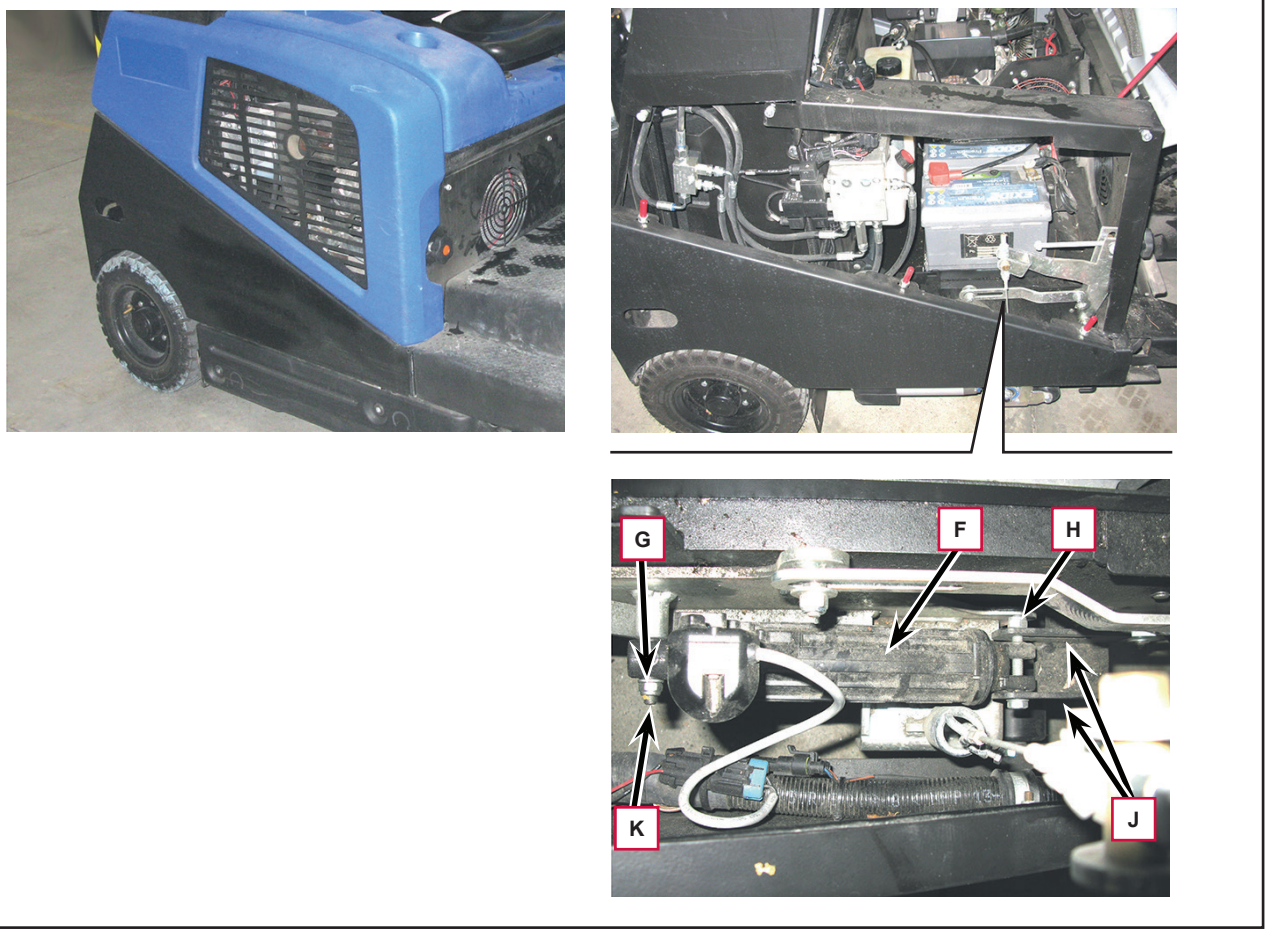


Figure 23:

Main Broom Wear Sensor and Adjustment

Removal

1. Drive the machine on a level floor.
2. Remove the main broom (see procedure in the relevant paragraph).
3. Turn the ignition key to “I”, and press the One-Touch button  to engage the sweeping system.
4. Turn the ignition key to “0”, then engage the parking brake.
5. Open the battery/engine compartment hood with the handle and fasten it with the support rod.
6. Disconnect the battery connector (Battery Version) - Disconnect the batteries (Diesel and LPG Version).
7. Unscrew the screws (A) and remove the right door (B).
8. Lift and remove the right side panel (C), disengaging it from the upper (D) and lower (E) fasteners.
9. Disconnect the electrical connection (F) of the broom wear sensor (G).
10. Open the retaining clamps and free the broom wear sensor (G) cable (H).
11. Unscrew the locknut (I) and remove the broom wear sensor (G) with wiring (H).

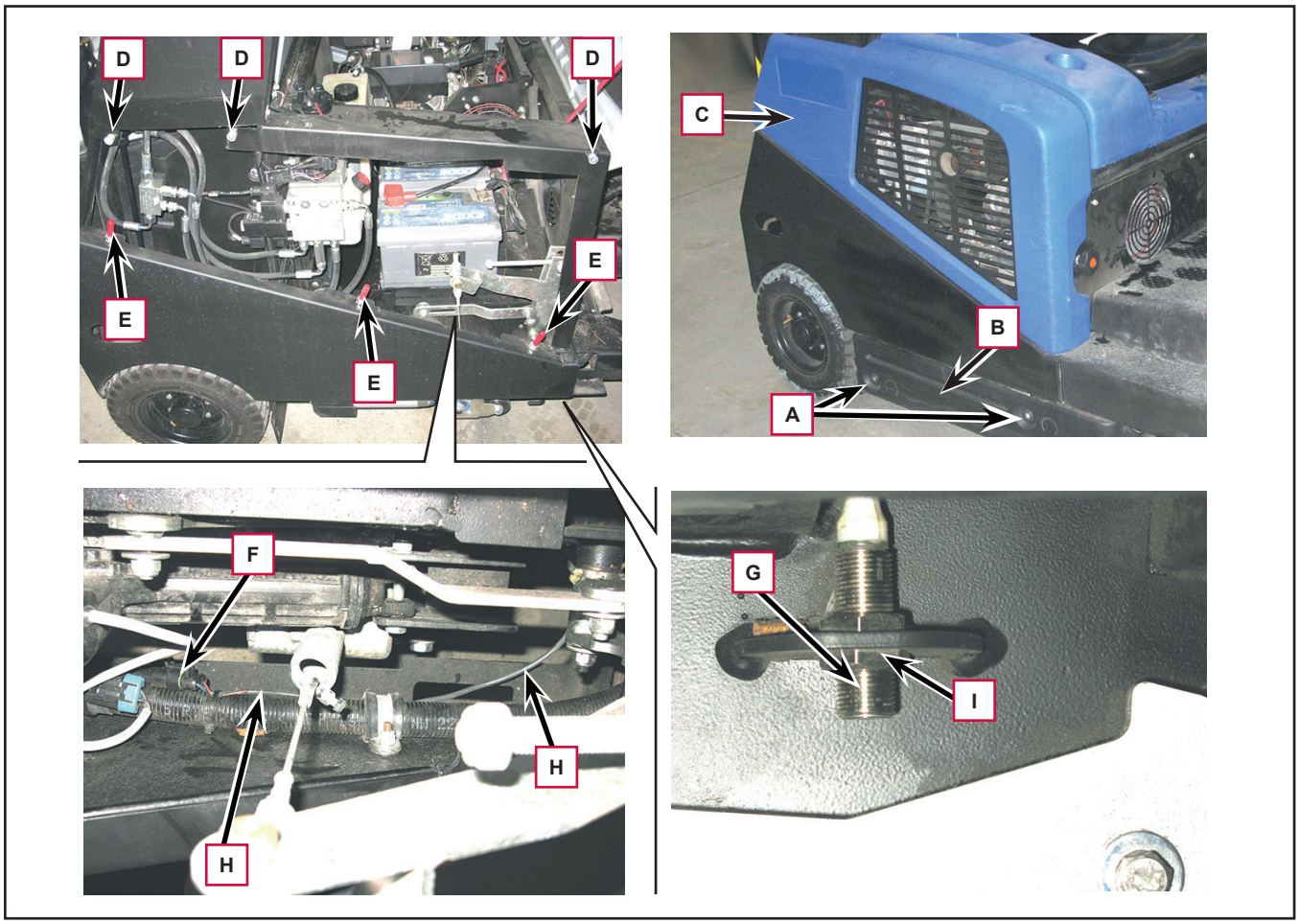


Figure 24:

Main Broom Wear Sensor and Adjustment (continues)

Adjustment

12. Use the knob (K) to lower the main broom until the end (L) of the lever (M) moves under the sensor (G), in position (N).

13. In this position, insert the sensor (G), the nut (J) and the locknut (I), then adjust the sensor (G) to the distance (P) of 4-5 mm; finally tighten the locknut (I) onto the nut (J).

14. Using the knob (K), raise the main broom, returning it to roughly its initial position.

Installation

15. Assemble the components in the reverse order of removal, and note the following:

    - After assembling the main broom, perform the height adjustment (see procedure in the relevant paragraph).

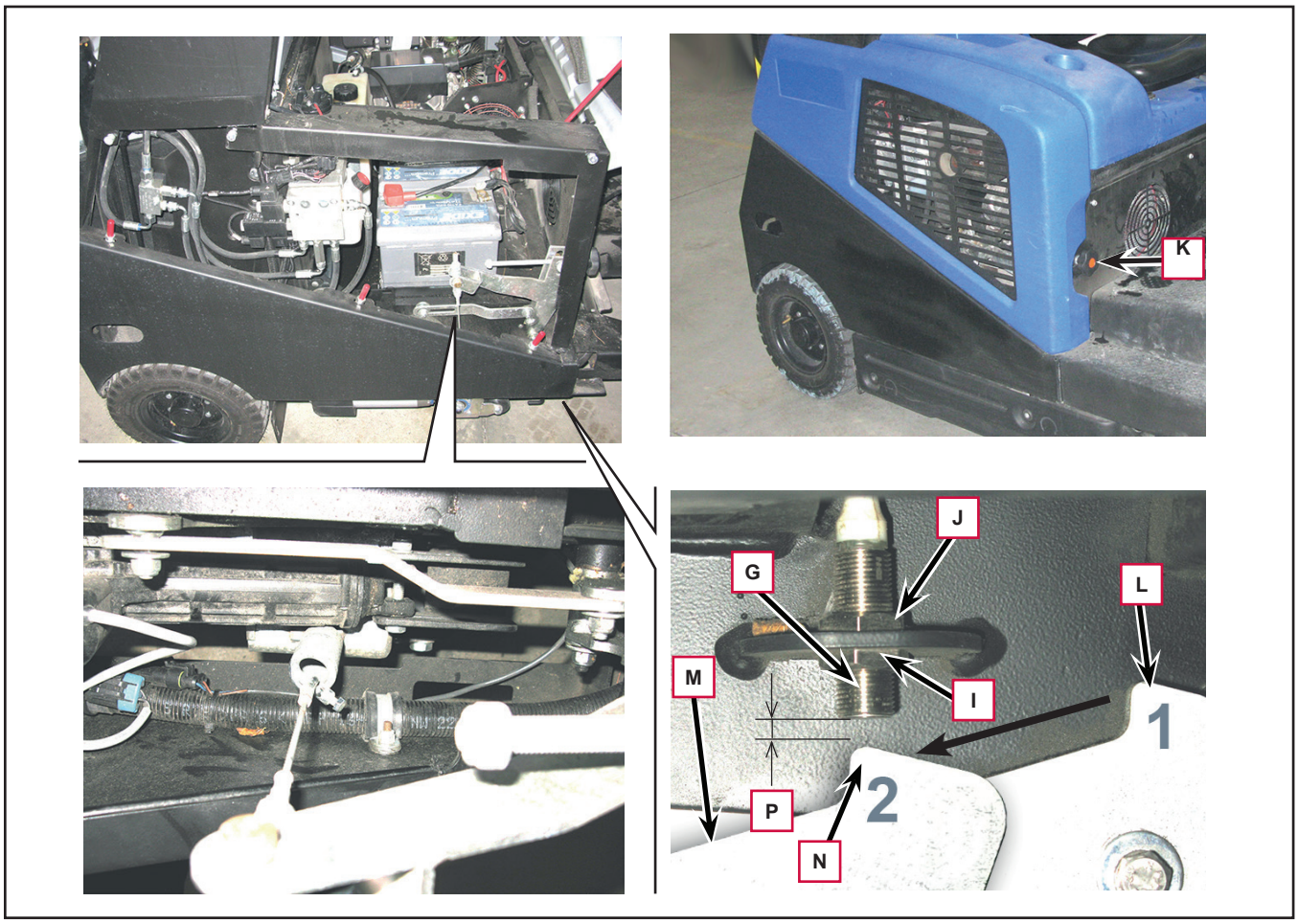


Figure 25:

Specifications

Model		SW5500 B FLOORTEC R 985 B	SW5500 D	SW5500 LPG FLOORTEC R 985 LPG
Main broom size (length x diameter)		33.5 x 14.2 in (850 x 360 mm)		
Theoretical working capacity	Main broom	6,338 yd^2/h (5,300 m^2/h)	6,697 yd^2/h (5,600 m^2/h)	
Main broom	Motor power	1.3 hp (1,000 W)	1.7 hp (1,250 W)	
	Speed	3,800 rpm	4,800 rpm	
	IP rating	44		
Actuator	Maximum force	350 N		
	Stroke	45 mm		
	Voltage	24V		
	Limit stop sensor	2		
	IP rating	54		

43 - Sweep System, Side Broom

Functional Description

Pressing the right (or left) side broom button  on the Main Control Board causes the corresponding side broom to lower via the corresponding actuator, right (A2) or left (A3).

Each actuator is powered for 5 seconds, within which time it should reach the requested end stroke position (each actuator has internal limit switches with bypass diodes).

In case of side impact, the system can return by means of a spring which absorbs the shock.

The broom is fastened to the reduction unit shaft with a safety pin.

The side broom motors turn only when the main broom is activated.

The side broom motors (M5 RHS, M6 LHS) are powered by the Main Machine Controller (EB1) at a voltage which can be adjusted via the side broom speed adjustment buttons.

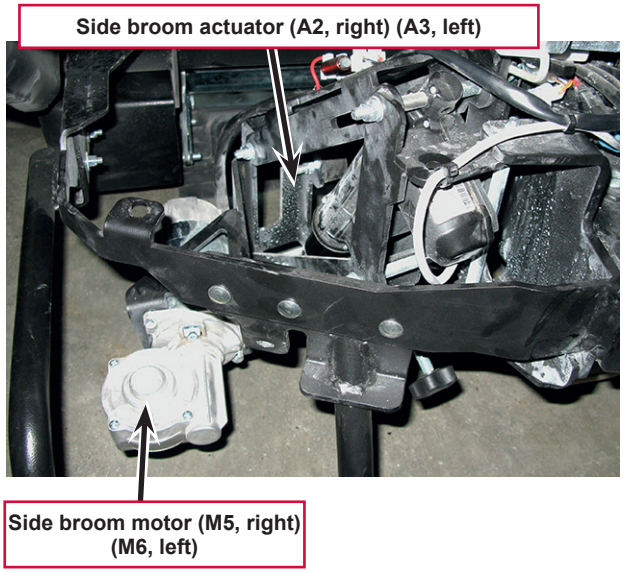


Figure 1:

Wiring diagram

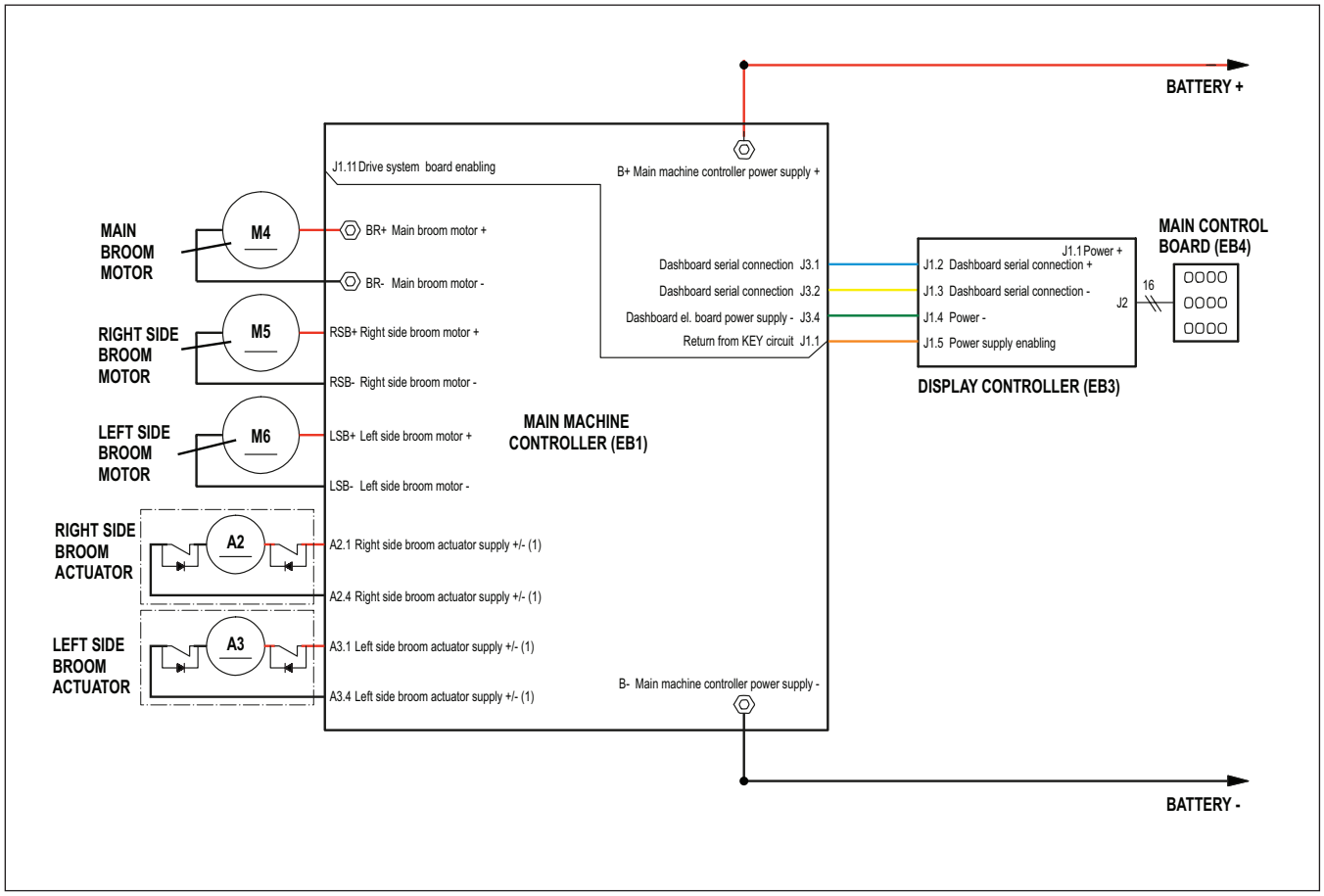


Figure 2:

Component Locations

- Right side broom lifting/lowering button
- Left side broom lifting/lowering button
- Side broom rotation speed adjustment buttons
- Broom height adjustment
- Side broom motor (M5) (M6)
- Side broom
- Side broom actuator
- Adjusting side broom tilt

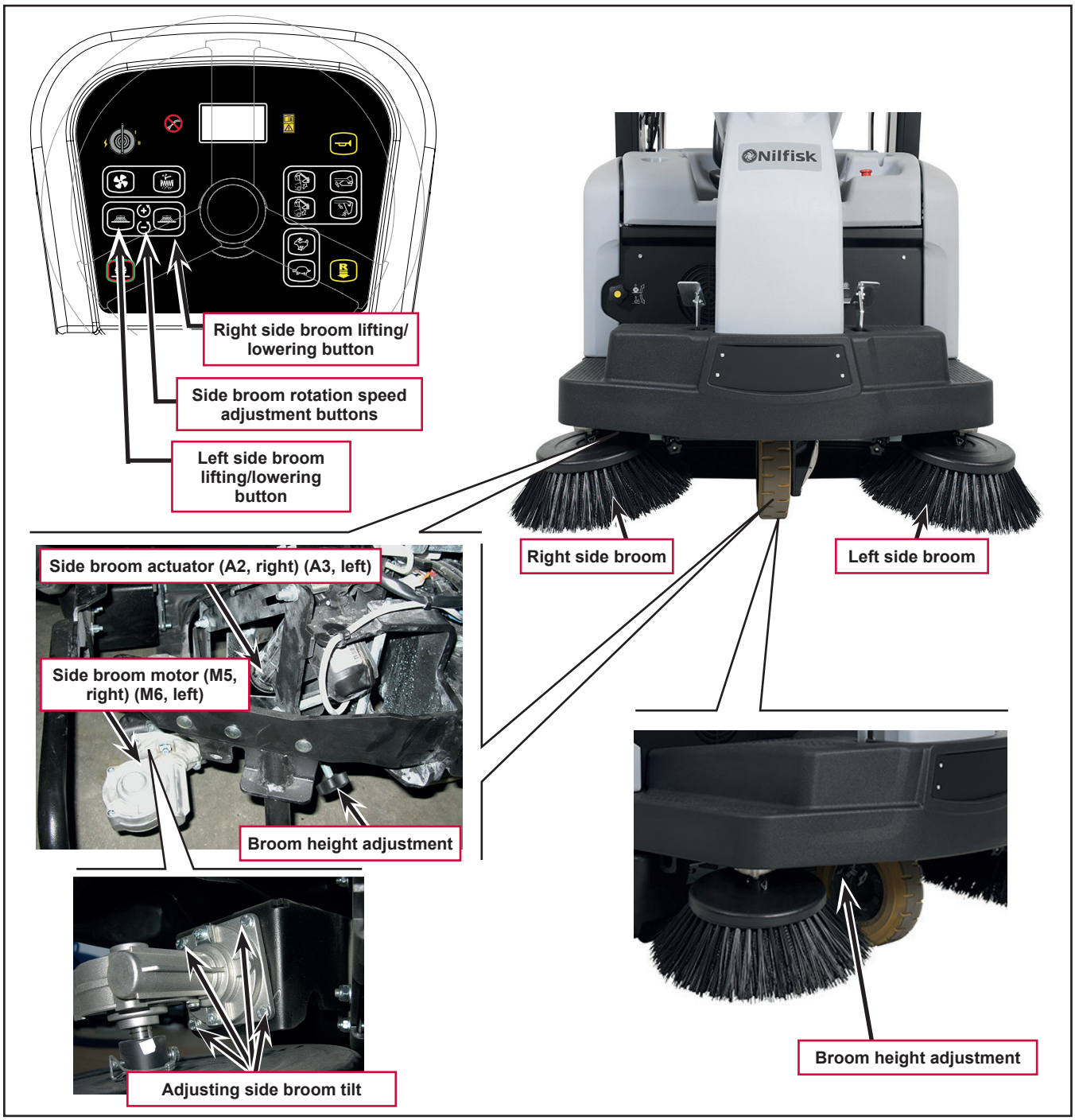


Figure 3:

Maintenance and Adjustments

Side broom height check and adjustment

Note: *Brooms with harder or softer bristles are available. This procedure is applicable to all types of brooms.*

Height Adjustment

1. Check the side broom distance from the ground, according to the following procedure:
   - Drive the machine on a level floor.
   - Keeping the machine stationary using the service brake, lower the side brooms and turn them on for a few seconds.
   - Stop and lift the side brooms, then move the machine.
   - Check that the side broom prints are as shown in the figure (A) and (B).

   If the print is not within specifications, adjust the side broom height according to the following procedure.
2. Turn the ignition key to “0”, then engage the parking brake.

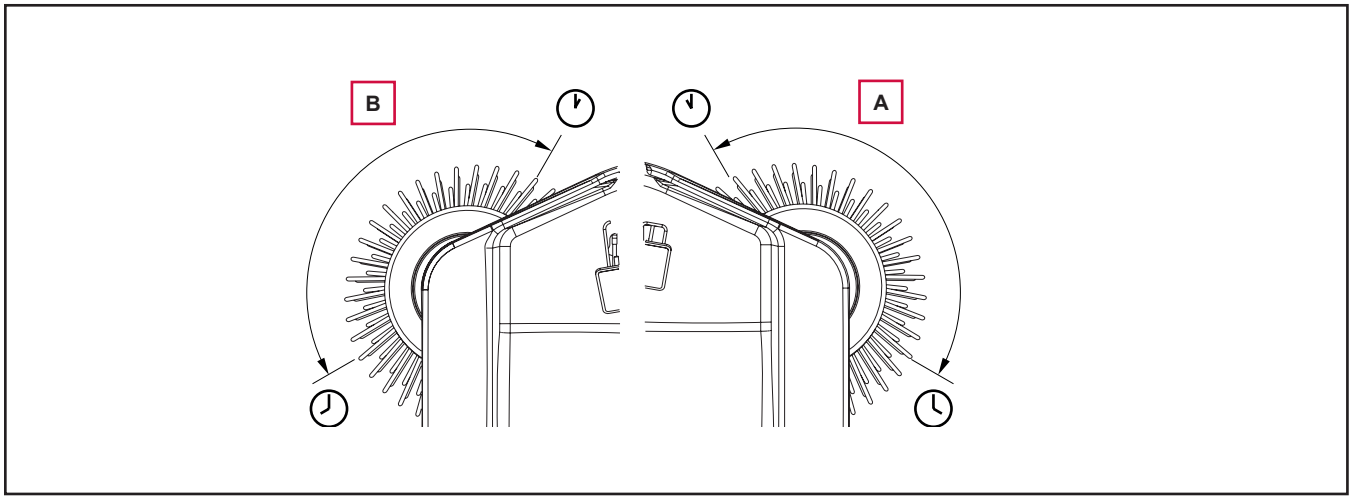


Figure 4:

Side broom height check and adjustment (continues)

3. For the right side broom, regulate by loosening the ring nut (C) and by adjusting the adjuster (D) until the correct print (A) is achieved. Finally lock the adjuster (D) into position with the ring nut (C).
   For the left side broom, operate on the adjuster by loosening the ring nut (E) and by adjusting the adjuster (F) until the correct print (B) is achieved. Finally lock the adjuster (F) into position with the ring nut (E).
4. Perform step 1 again to check the proper adjustment of the side broom height.
5. When the broom is too worn to be adjusted, replace it (see procedure in the relevant paragraph).
6. If necessary, adjust the side broom height, according to the following procedure.

Tilting Adjustment

7. Loosen the screws (G) fastening the side broom motor (H) and adjust the inclination.
   When the adjustment is completed, tighten the screws (G).

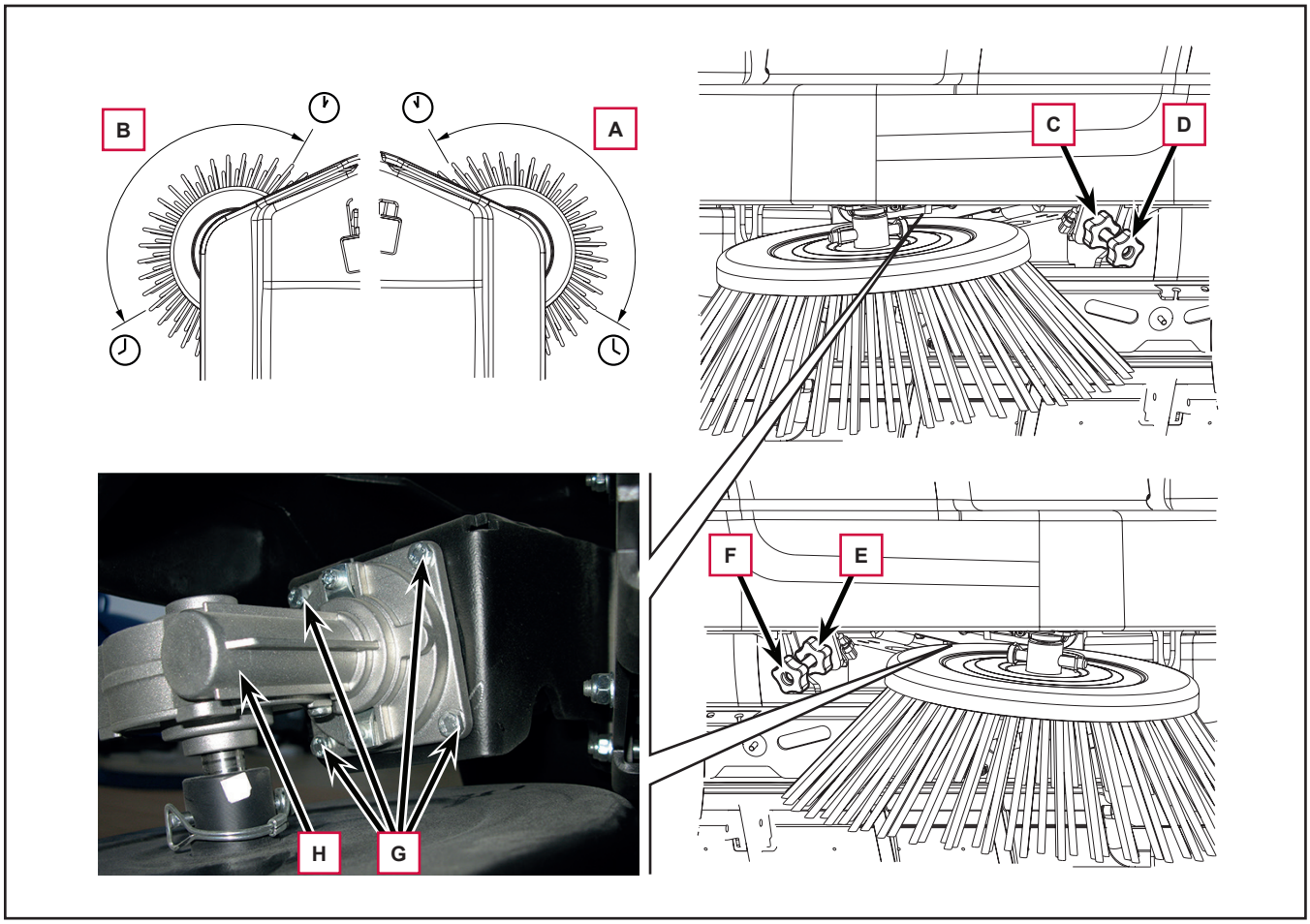


Figure 5:

Troubleshooting

Trouble	Possible causes	Remedy
The right/left side broom does not clean properly	The broom has not been properly adjusted in height/parallelism	Adjust
	The broom is excessively worn	Replace
The side brooms do not work	Side broom motor (M5), (M6) faulty	Check the motor amperage/replace
	Carbon brushes worn	Replace
	There are ropes or debris restraining the broom rotation	Remove and clean
The side broom does not lower / raise	Actuator (A2), (A3) not working	Repair/replace

Side Broom Motor Current Draw Check

WARNING: This procedure must be performed by qualified personnel only.

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Remove the side broom of the motor whose current draw has to be checked (see procedure in the relevant paragraph).
   Check that the main broom drive hub is free from dirt or foreign materials (ropes, rags, etc.) accidentally rolled up, which can prevent it from rotating.
4. Unscrew the four screws (A) fastening the fairing (B).
5. Unscrew the nut (C) on the front.
6. Slide the sleeve (D) until it is flush on the steering wheel.
7. Press the stud (E), sliding it upwards (causing the Main Control Board (F) to lift slightly, then remove the fairing (B) by disengaging it from its seat and the stud (E).
8. Position a suitable lifting device (G) at the centre of the front section of the machine, on chassis bracket (H), then raise the front of the machine by a few centimeters until the driving wheel can turn without brushing the ground.

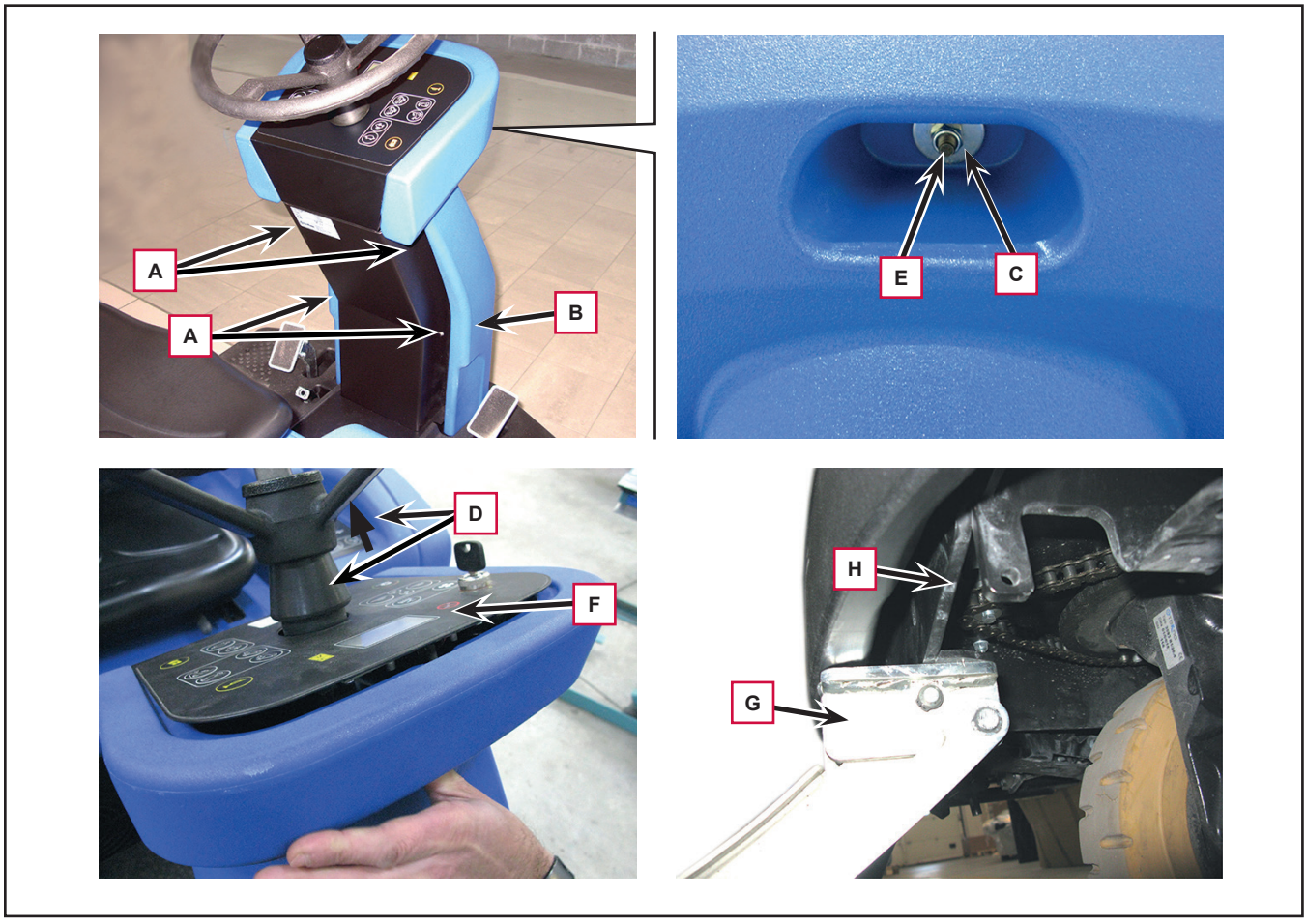


Figure 6:

Side Broom Motor Current Draw Check (Continues)

9. For safety purposes, to prevent accidental lowering of the machine, apply two suitable spacers under the right (I) and left (J) side brackets.

10. Working on the Main Machine Controller (K), apply the clamp ammeter (L) to an electrical cable (M) of the right side broom motor, or an electrical cable (N) of the left side broom motor.

11. Start the machine with the ignition key.

12. Press the One-Touch button  to engage the sweeping system, then press the accelerator pedal.

13. Check that the amperage of the relevant motor is 1.0 - 1.5A at 24V.
    Stop the side broom rotation.
    Turn the ignition key to “0”.
    Remove the ammeter clamp (L).

14. If the amperage is higher, perform the following procedures to detect and correct it:

    - Check if there is dust or dirt (cords, cables, etc.) on the side broom hub.
    - Check the carbon brushes of the electric motor (see procedure in the relevant paragraph)
    - If necessary, disassemble the motor (see procedure in the relevant paragraph), and check the condition of all its components.

    If the above-mentioned procedures do not lead to a correct amperage, the motor must be replaced (see procedure in the relevant paragraph).

Installation

15. Perform steps 3. to 9. in the reverse order.

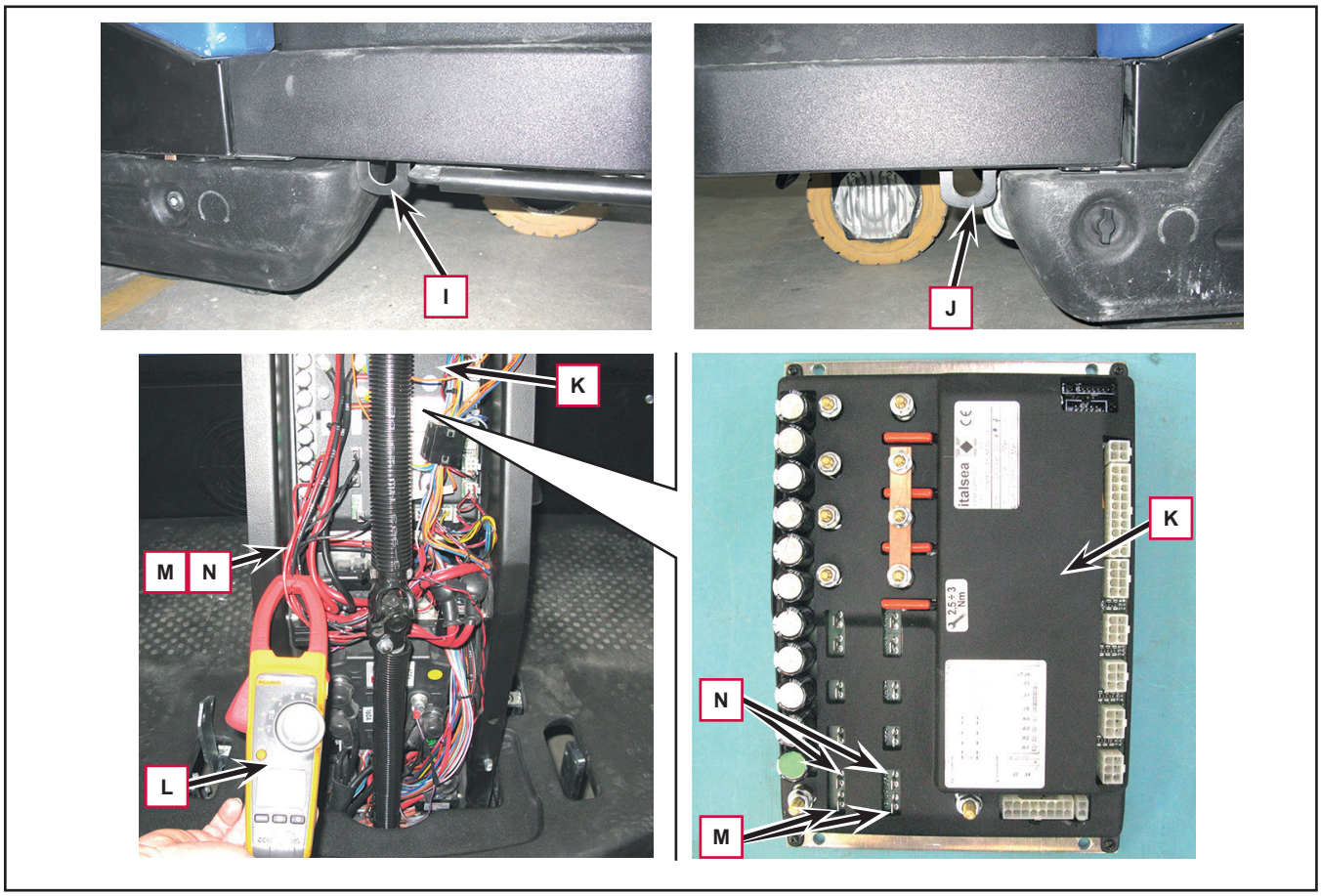


Figure 7:

Removal and Installation

Side Broom

Note: *Brooms with harder or softer bristles are available. This procedure is applicable to all types of brooms.*

CAUTION: It is advisable to wear protective gloves when replacing the main broom because there can be sharp debris between the bristles.

Removal

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Detach and remove the pin (A) from the hub (B) of the side broom (C).
4. Remove the side broom (C) from the hub (B) and remove the protection flange (D).

Installation

5. Install the protection flange (D) on the hub (B) along with the side broom (B).
6. Insert the pin (A) and engage its fastener.
7. Check and adjust the side broom height (see procedure in the relevant paragraph).

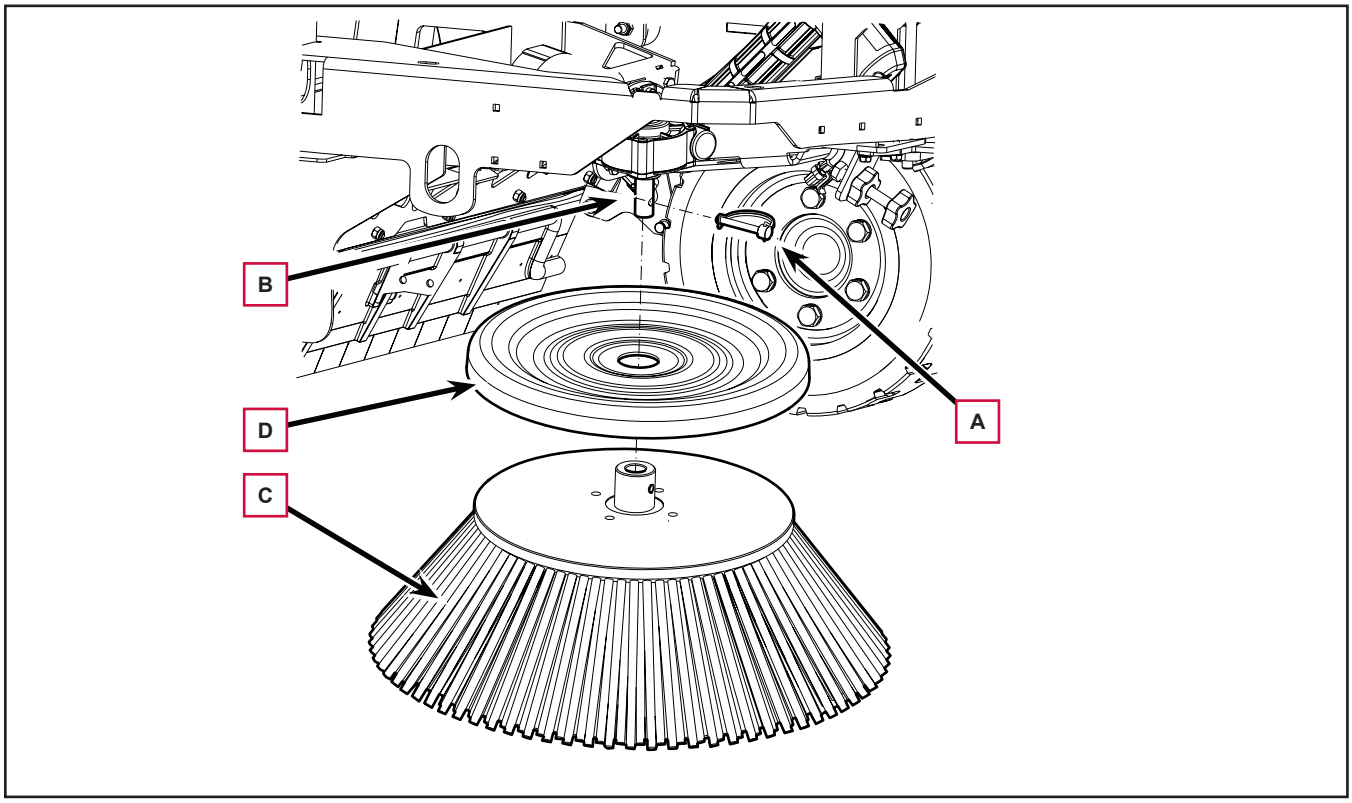


Figure 8:

Side Broom Motor

Removal

1. Remove the side broom of the motor to be removed (see procedure in the relevant paragraph).
2. Lower the side broom with the lever.
3. Use the adjustment knobs (A) to lower the side broom (B) motor all the way.
4. Turn the ignition key to “0”, then engage the parking brake.
5. Open the battery/engine compartment hood with the handle and fasten it with the support rod.
6. Disconnect the battery connector (Battery Version) - Disconnect the batteries (Diesel and LPG Version).
7. Disconnect the electrical connection (C) of the side broom motor (B), located above the motor itself (if necessary, cut any clamps in the way).
8. Remove the four fastening screws (D) of the motor (B).
9. Remove the motor (B) from its seat.

Installation

10. Assemble the components in the reverse order of removal.
11. Check and adjust the side broom height and tilt (see _ in the relevant paragraph).

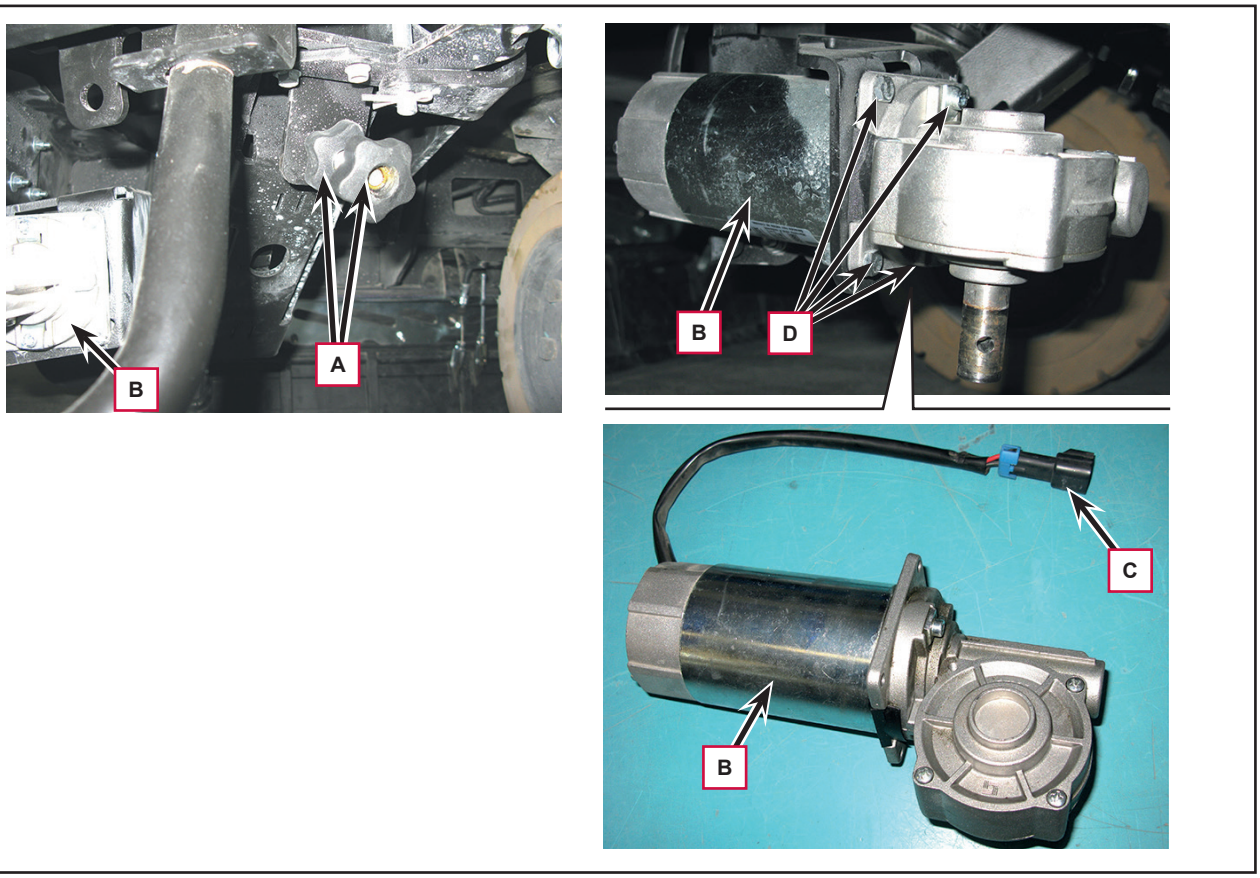


Figure 9:

Side Broom Motor Carbon Brush Check/Replacement

Disassembly

1. Remove the side broom motor (see procedure in the relevant paragraph).
2. Take the motor (A) to the workbench and, if necessary, mark the position (B) of the cap (C) as to the motor body (for proper reassembly).
3. Remove the screws (D).
4. Carefully remove the cap (C) by disengaging the carbon brushes inside the motor armature.
5. Inside the cap, disconnect the connections (E) and remove the carbon brushes with wiring harness (F).
6. Check the two carbon brushes (F) for wear. Replace the carbon brushes when: the contact with the motor armature is insufficient, the carbon brushes are worn, the carbon brush contact surface is not integral, the thrust spring is broken, etc. If the length of the carbon brushes is insufficient, these must be replaced.
   In this cases, replace all carbon brushes.

Assembly

7. Assemble the components in the reverse order of disassembly.

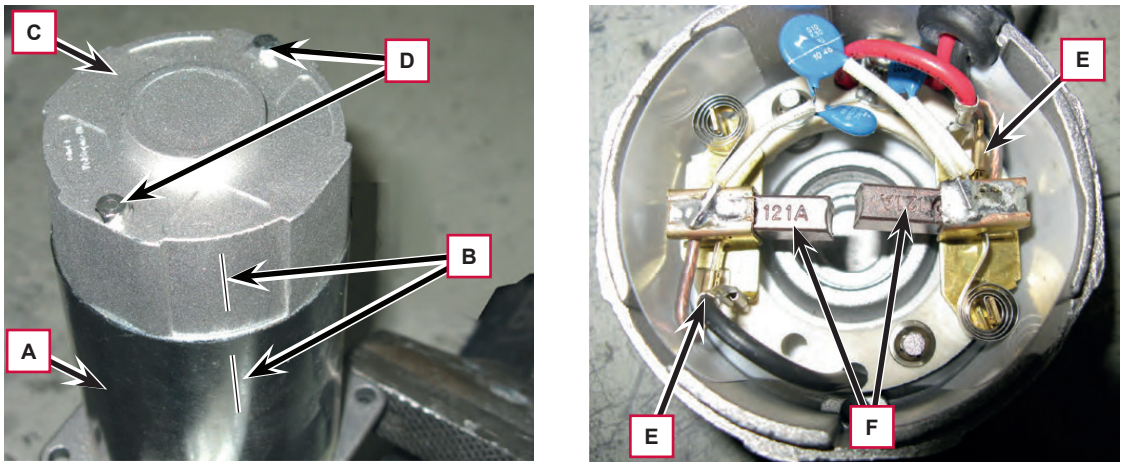


Figure 10:

Side Broom Actuator

Removal

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Open the battery/engine compartment hood with the handle and fasten it with the support rod.
4. Disconnect the battery connector (Battery Version) - Disconnect the batteries (Diesel and LPG Version).
5. Remove the side brooms (see procedure in the relevant paragraph).
6. Unscrew the four screws (A) fastening the fairing (B).
7. Unscrew the nut (C) on the front.
8. Slide the sleeve (D) until it is flush on the steering wheel.
9. Press the stud (E), sliding it upwards (causing the Main Control Board (F) to lift slightly, then remove the fairing (B) by disengaging it from its seat and the stud (E).
10. Remove the screws (G) and remove the accelerator (H) and brake (I) pedals.

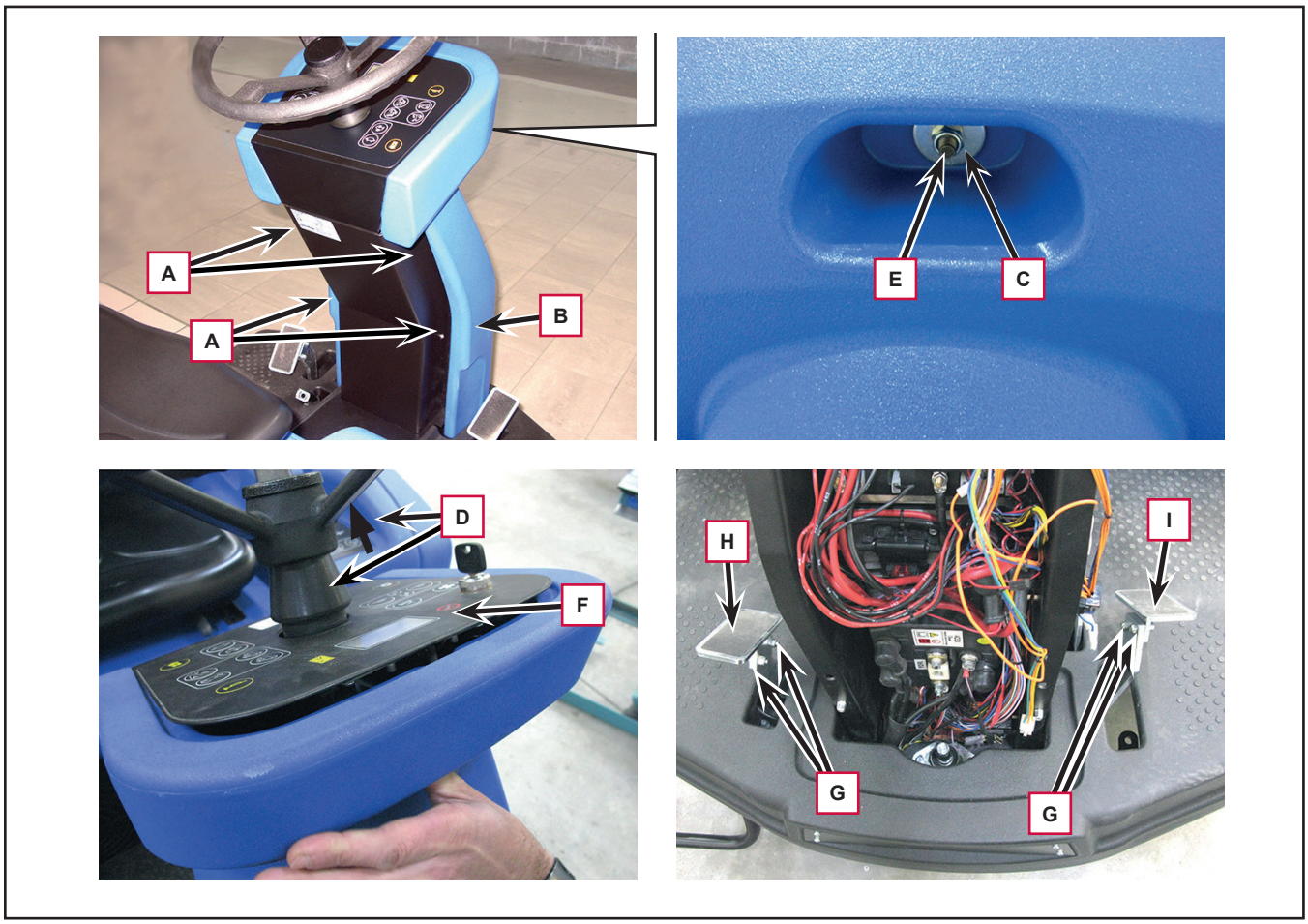


Figure 11:

Side Broom Actuator (continues)

11. Unscrew the two screws (J) and remove the cover (K) at the base of the steering column.
12. Unscrew the handwheels (L) on the left-hand side of the machine and remove the left door (M).
13. Unscrew the screws (N) on the right-hand side of the machine and remove the right door (M).
14. Working below the footboard (Q), unscrew the screws in the fastening positions (R) of the footboard itself.
15. Partially raise the footboard (Q) and support it with a rope (R).

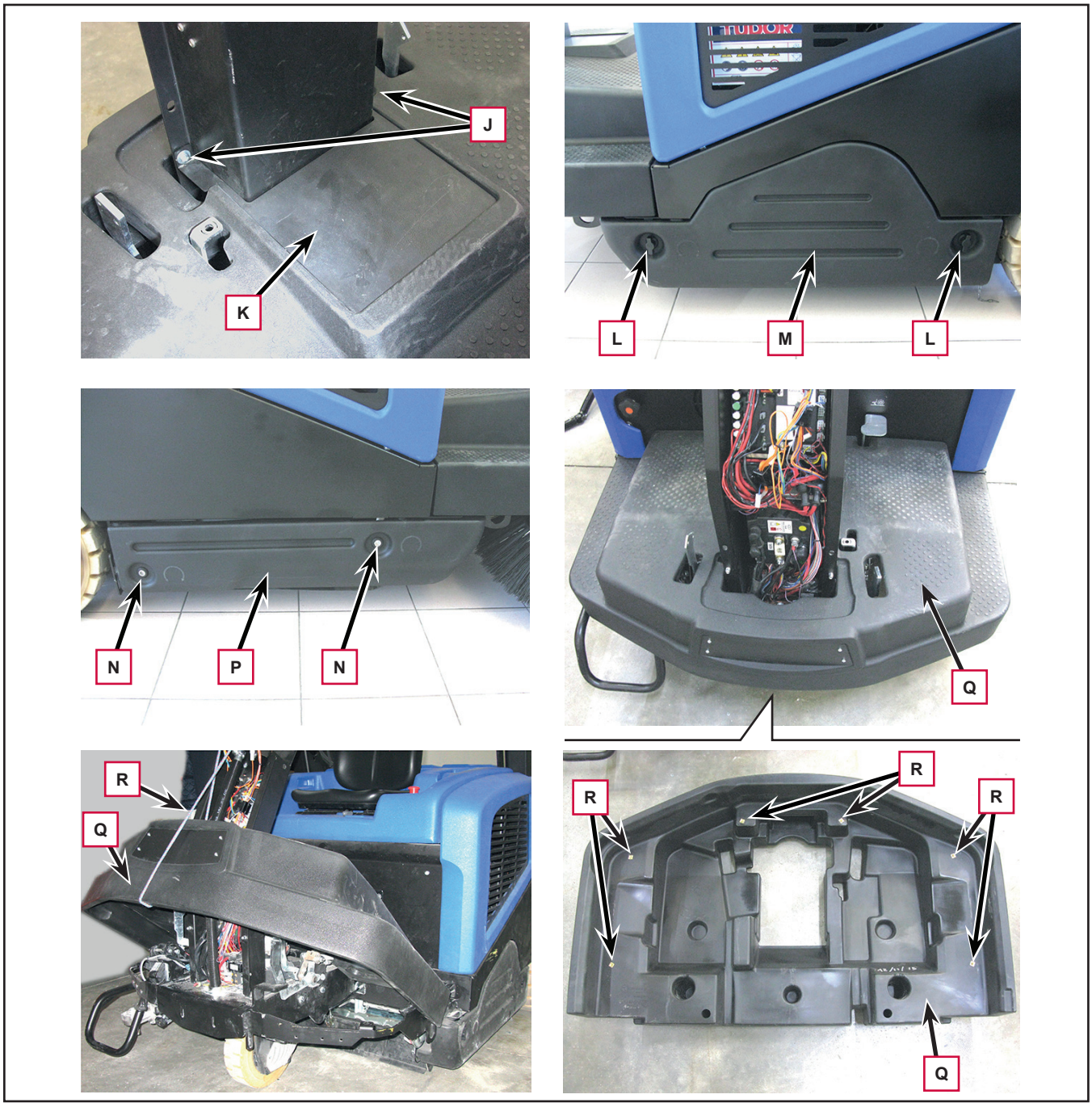


Figure 12:

Side Broom Actuator (continues)

16. Disconnect the electrical connection (S) of the side broom motor and the electrical connection (T) of the actuator.
17. Cut the cable clamp (U).
18. Disconnect the spring (V) from the side (W) by using a lever (X) in the slot (Y).
19. Remove the cotter (Z) and extract the pin (AA), then remove the actuator and broom motor assembly (AB).
20. At the workbench, remove the screws with nut (AC) and (AD); retain the spacers. (AE).
21. Remove the actuator (AF).

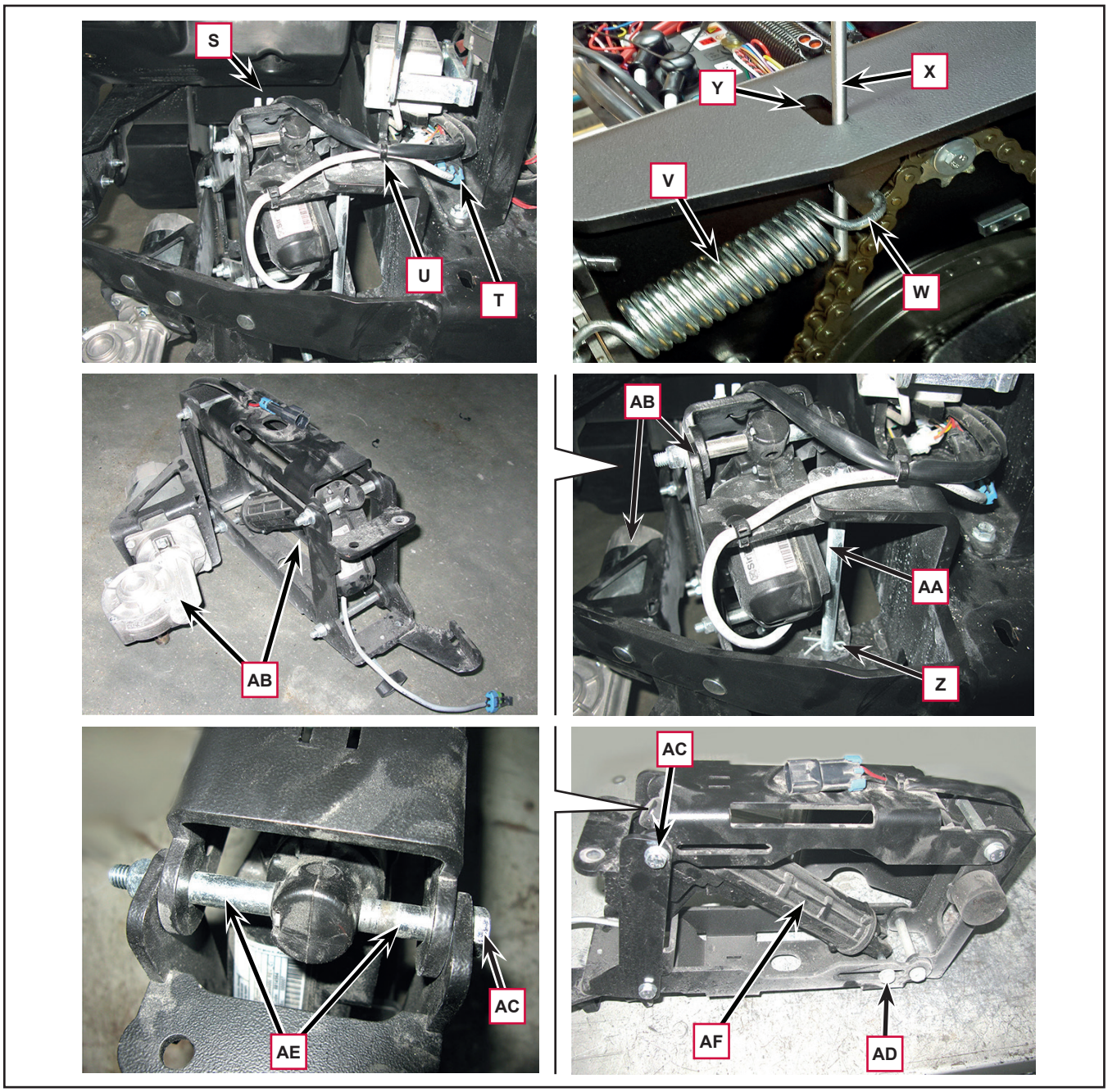


Figure 13:

Side Broom Actuator (continues)

Installation

22. Assemble the components in the reverse order of removal, and note the following:

    - If necessary, replace the lock nut on the screw (AD) to ensure correct fastening; also screw it down just enough to bring it flush, ensuring free movement of the screw (AD) on the slots (AG)

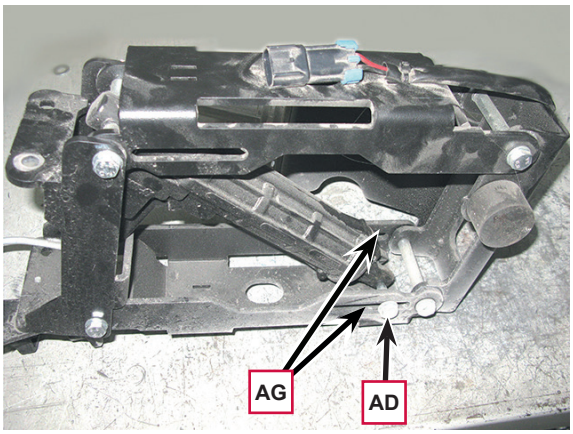


Figure 14:

Specifications

Model		SW5500 B FLOORTEC R 985 B	SW5500 D	SW5500 LPG FLOORTEC R 985 LPG
Cleaning width	With one side broom	46.3 in (1,175 mm)		
	With two side brooms	59 in (1,500 mm)		
Side broom diameter		20 in (500 mm)		
Theoretical working capacity	With one side broom	8,694 yd^2/h (7,270 m^2/h)		
	With two side brooms	11.050 yd^2/h (9,240 m^2/h)		
Side broom	Motor power	0.16 hp (120 W)		
	Speed	40/155 rpm		

50 - Dust Control System

Functional Description

The dust raised in the compartment of the main broom, is collected in the rear cargo area by a flow of air generated by the dust control system.

The filter located between the vacuum system and the hopper, retains dirt which is then conveyed through a feedbox into the hopper itself.

The operation of the system depends on the activation of the main broom.

By deactivating the main broom, the dust control system turns off automatically.

The vacuum system is composed of the vacuum system motor (M1) which is powered by the Main Machine Controller (EB1).

The vacuum system function is activated automatically when the main broom is lowered with the corresponding One-Touch button  , it can, however, be turned on or off independently with the vacuum button  , it turns off when the machine is stopped, when the hopper is lifted and during activation the electric filter shaker.

The electric filter shaker system is composed of two motors (M2) connected in parallel, which are powered by the Main Machine Controller (EB1).

When the filter-shaker button  is pressed, the system is activated for a cycle of 20 seconds during which the motors are powered 0.5 sec ON and 0.5 sec. OFF to continuously modulate the number of revolutions and the resulting vibration frequencies of the filter.

The vibrating motors shake the filter allowing dirt trapped in the folds of the same to fall by gravity into the hopper.

This reduces filter maintenance and helps to maintain proper airflow through the filter.

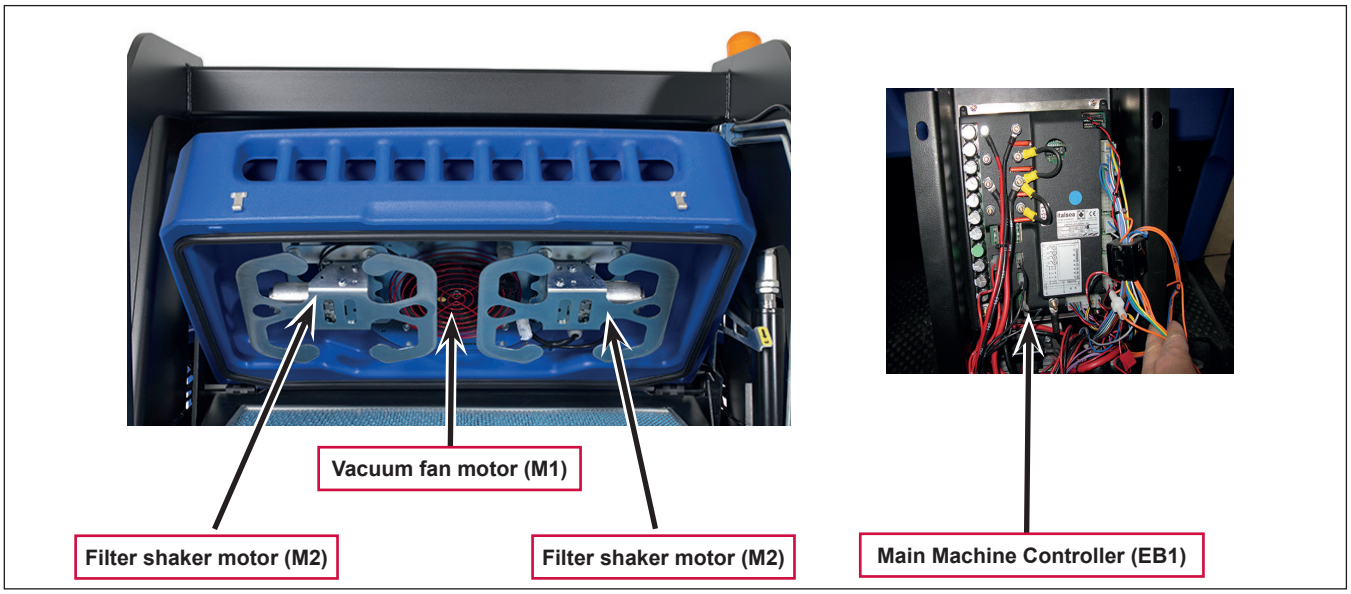


Figure 1:

Wiring Diagram

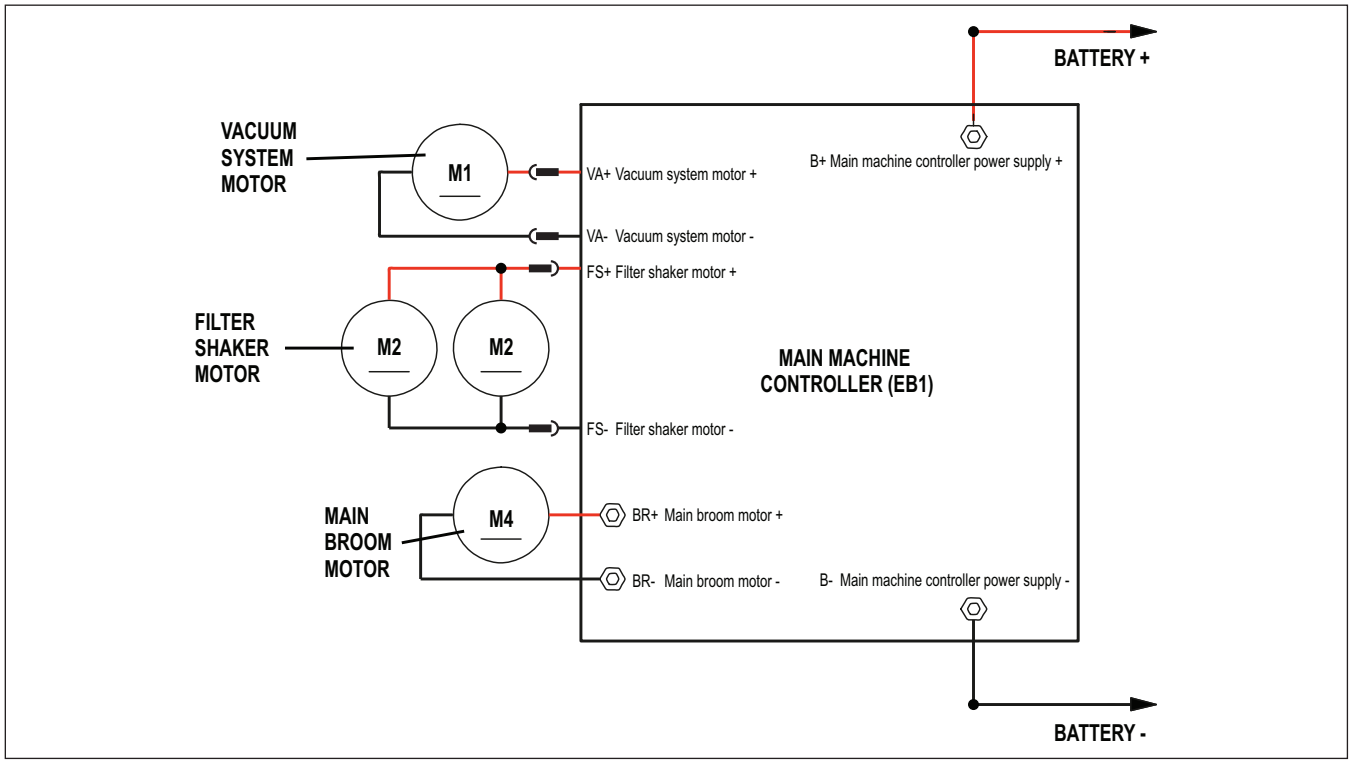


Figure 2:

Component Locations

- Vacuum button
- Filter shaker button
- Vacuum fan motor (M1)
- Filter shaker motor (M2 – M2)
- Panel filter
- Filter gasket

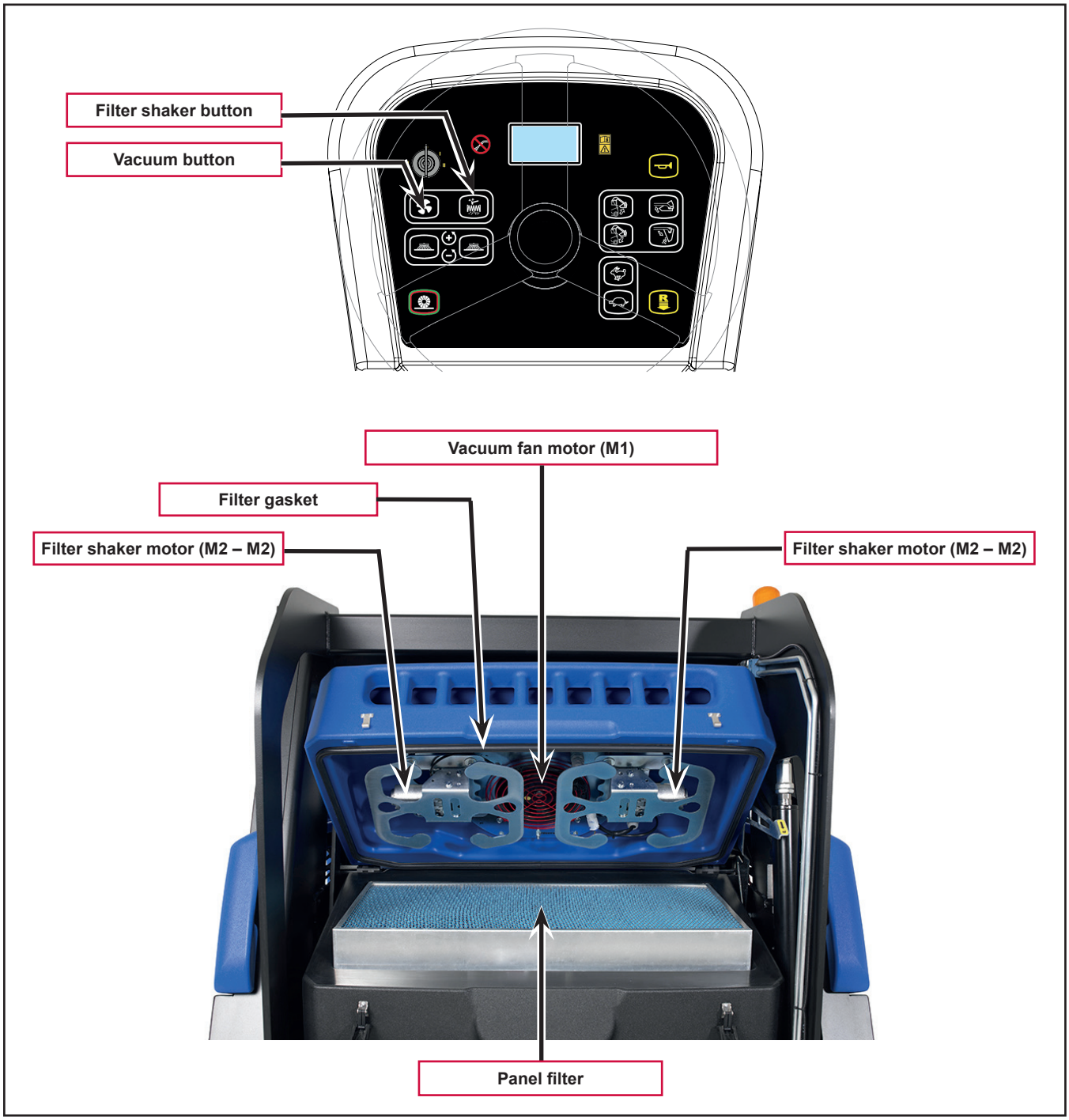


Figure 3:

Maintenance and Adjustments

Panel Dust Filter Cleaning and Integrity Check

The dust filter must be regularly cleaned to maintain the efficiency of the vacuum system. Follow the recommended filter service intervals for the longest filter life.

WARNING: Wear safety glasses when cleaning the filter.
Do not puncture the filter.
Clean the filter in a well-ventilated area.
Wear appropriate dust mask to avoid breathing in dust.

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Open the battery/engine compartment hood with the handle and fasten it with the support rod.
4. Release the fasteners (A) and open the vacuum system cover (B).
5. Lift the dust filter (C) and remove it from the machine.
6. Clean the dust filter (C) using one of the methods below:

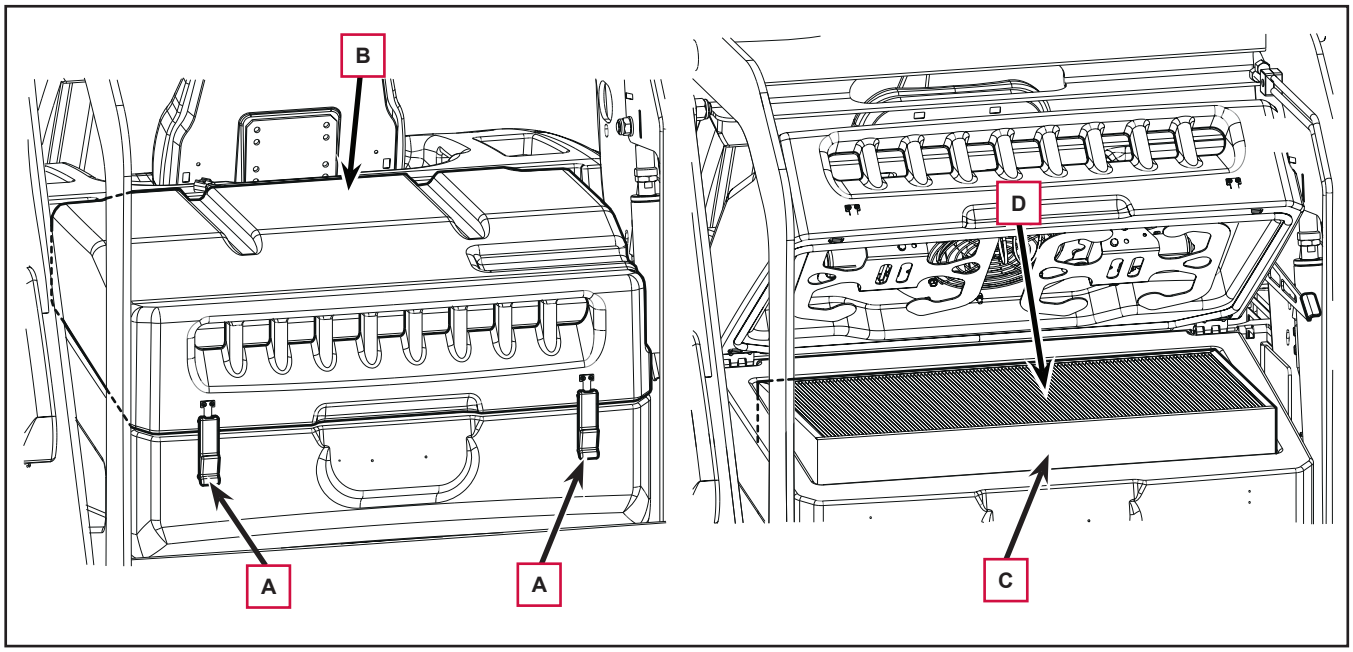


Figure 4:

Panel Dust Filter Cleaning and Integrity Check (Continues)

Method "A"

Collect dust from the filter. Gently tap the filter against a flat surface (with the dirty side down) to remove dust and dirt.

Take care not to damage the metal lip which extends past the gasket.

Method "B"

Collect dust from the filter. Blow compressed air (maximum pressure 6 Bar) into the clean side of the filter (in the opposite direction of the airflow).

Method "C"

Collect dust from the filter. Then soak the filter in warm water for 15 minutes, then rinse it under a gentle stream of water (maximum pressure 2.5 Bar). Let the filter dry completely before installing it back into the machine.

For a better cleaning, it is allowed to wash the filter with water and non-lathering detergents.

This provides better quality cleaning but reduces the life of the filter, which will have to be replaced more frequently. The use of inadequate detergents can damage the filter.

For the paper filter (optional): do not use water or detergents to clean it; the filter could be damaged.

7. Install the filter in the reverse order of removal and note the following:
   - Clean the filter housing.
   - Install the filter with the wire gauze (D) up.
   - If the filter gasket is damaged or missing, it must be replaced.
   - Press the lever (E) to disengage and close the cover (B).

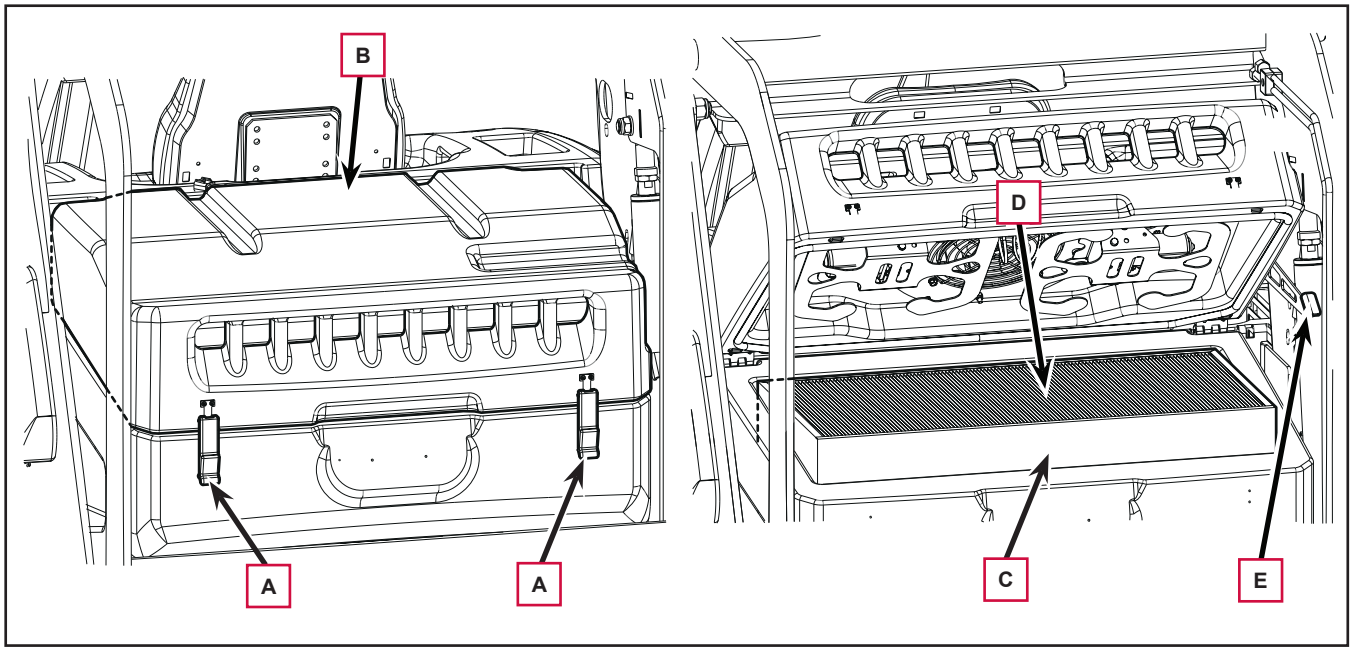


Figure 5:

Troubleshooting

Trouble	Possible causes	Remedy
No vacuuming	Vacuum system motor (M1) broken	Repair/replace
Dust/debris vacuuming is insufficient	The filter is clogged	Clean the dust filter by using the filter shaker or by disassembling it.
	The vacuum system compartment gasket is damaged	Repair/replace
		Check the operation of the skirts
Dust coming out of the fan compartment	Dust filter not seated correctly	Reposition the filter
	Filter broken	Replace
	Filter gasket damaged	Repair/replace
The filter shaker is not working	Filter shaker motor (M2) broken	Repair/replace

Vacuum Fan Motor Current Draw Check

WARNING: This procedure must be performed by qualified personnel only.

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Unscrew the four screws (A) fastening the fairing (B).
4. Unscrew the nut (C) on the front.
5. Slide the sleeve (D) until it is flush on the steering wheel.
6. Press the stud (E), sliding it upwards (causing the Main Control Board (F) to lift slightly, then remove the fairing (B) by disengaging it from its seat and the stud (E).
7. Position a suitable lifting device (G) at the centre of the front section of the machine, on chassis bracket (H), then raise the front of the machine by a few centimeters until the driving wheel can turn without brushing the ground.
8. For safety purposes, to prevent accidental lowering of the machine, apply two suitable spacers under the right (I) and left (J) side brackets.

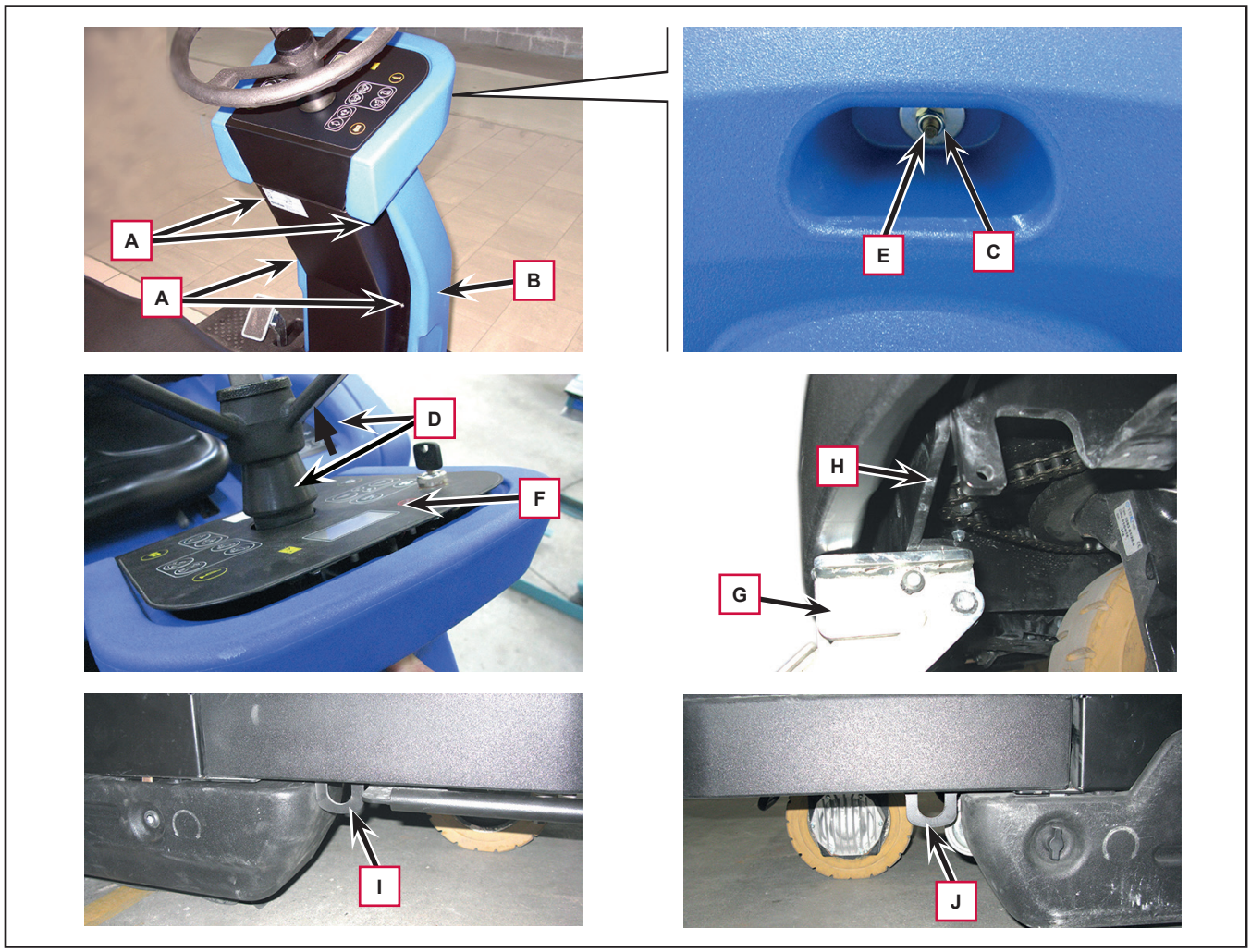


Figure 6:

Vacuum Fan Motor Current Draw Check (continues)

9. Release the fasteners (K) then lift the vacuum system cover hood (L) all the way.
10. Apply the clamp ammeter (M) on one cable (N) of the electric vacuum fan.
11. Start the machine with the ignition key.
12. Turn on the vacuum and check that the current draw of the fan motor is 8 - 10A at 24V.
    - Stop the vacuum system.
    - Turn the ignition key to “0”.
    - Remove the clamp ammeter (M).

    If the current draw is higher, remove the vacuum fan motor (see procedure in the relevant paragraph), and check the condition of all its components.

    If the above-mentioned procedures do not produce the correct readings for the electric fan motor amperage, the motor must be replaced (see procedure in the relevant paragraph).

Installation

13. Perform steps 3. to 9. in the reverse order.

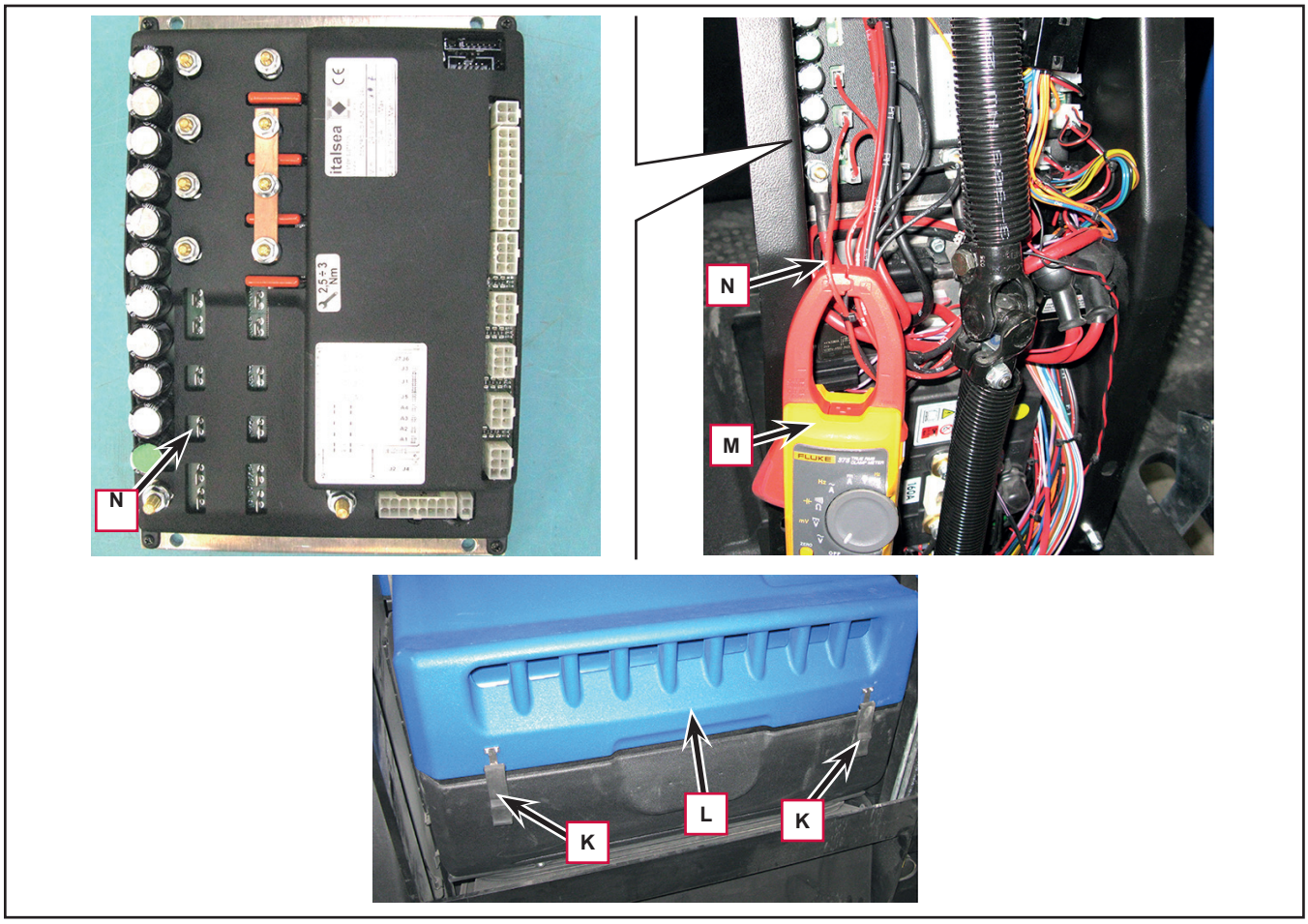


Figure 7:

Removal and Installation

Filter Shaker Motor

Removal

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Open the battery/engine compartment hood with the handle and fasten it with the support rod.
4. Disconnect the battery connector (Battery Version) - Disconnect the batteries (Diesel and LPG Version).
5. Release the fasteners (A) then lift the vacuum system cover hood (B) all the way.
6. Working on the filter shaker assembly requiring removal, disconnect the electrical connection (C) of the filter shaker motor.
7. Unscrew the four screws (D) and remove the filter shaker (E).
8. Unscrew the four screws (F) and remove the filter shaker motor (G).
9. If necessary, remove the grub screw from the hole (H) on the workbench, then remove the eccentric cylinder (I) from the filter shaker motor.

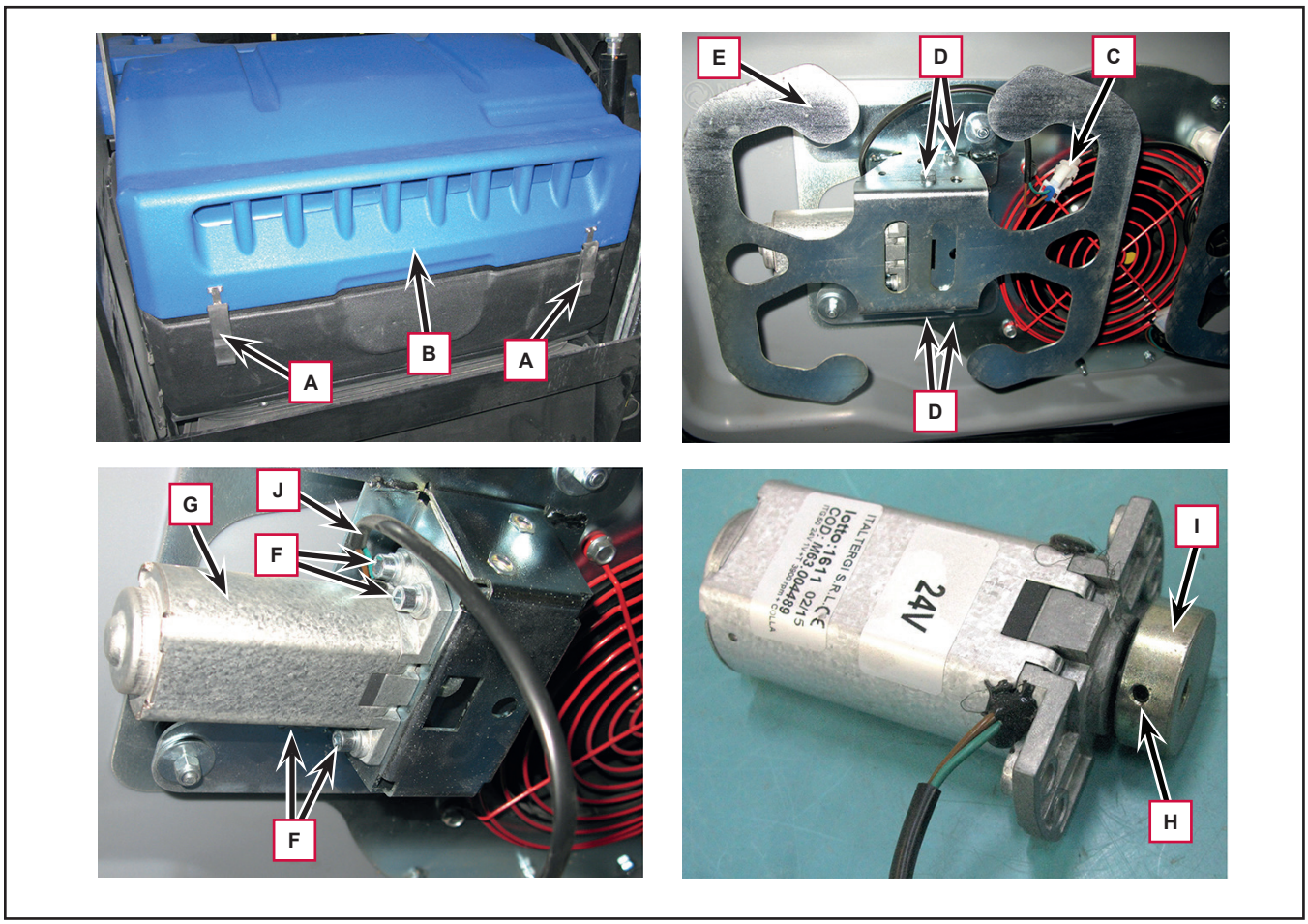


Figure 8:

Filter Shaker Motor (Continues)

Installation

10. Assemble the components in the reverse order of removal, and note the following:

    - When reinstalling the eccentric cylinder (I), respect the required position of the grub screw fastening surface
    - On reassembly, position the filter shaker motor (G) with the cable entry (J) on the upper side, as shown in the figure.

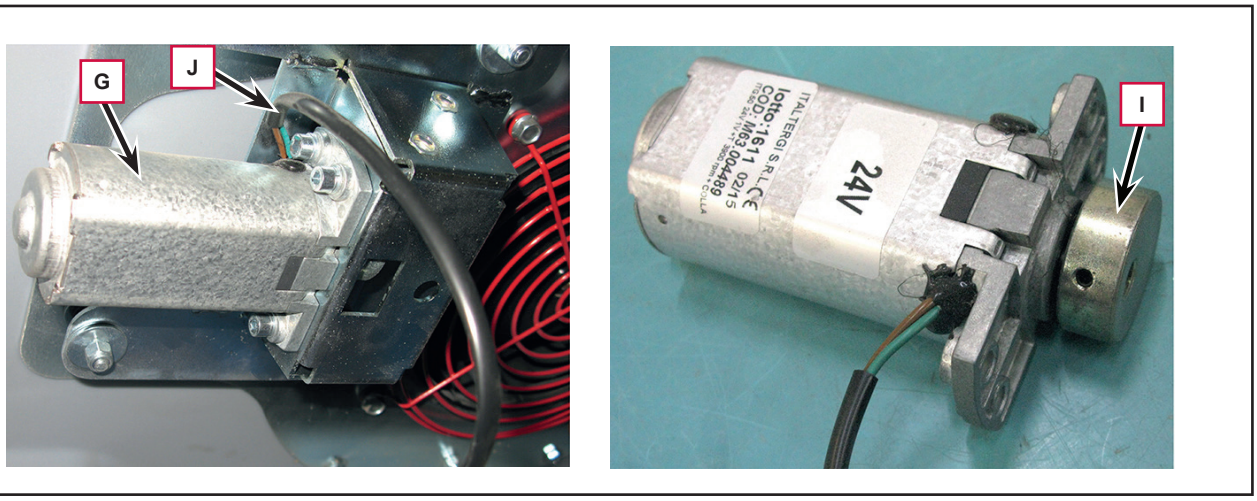


Figure 9:

Vacuum Fan Motor

Removal

1. Drive the machine on a level floor.
2. Lift the hopper to the end-of-stroke.

WARNING: Place a safety rod under the lifted hopper..

3. Turn the ignition key to “0”, then engage the parking brake.
4. Open the battery/engine compartment hood with the handle and fasten it with the support rod.
5. Disconnect the battery connector (Battery Version) - Disconnect the batteries (Diesel and LPG Version).
6. Lift and remove the right side panel (A), disengaging it from the upper (B) and lower (C) fasteners.
7. Disconnect the electrical connections (D) of the vacuum system electric fan and filter shaker.
8. Release the fasteners (E) of the vacuum system hood (F), without opening the hood itself.

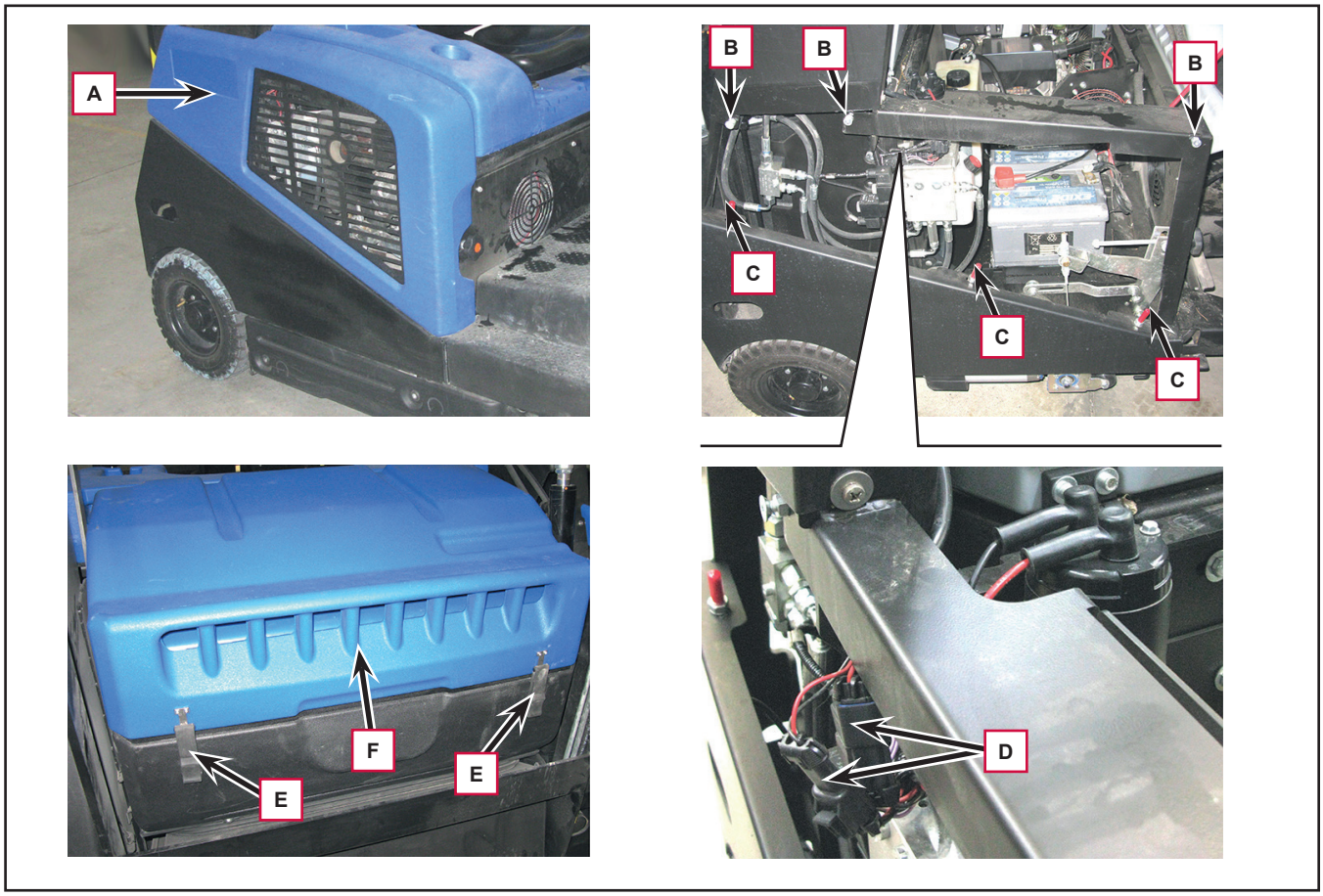


Figure 10:

Vacuum Fan (Continues)

9. Unscrew the hood hinge (F) screws (G).

10. Remove the hood (F), disengaging the slot (H) of the lever (I) for releasing the hood from the pin (L) on the machine chassis.

11. Cut the various cable clamps (M) on the workbench, then disconnect the electrical connections (N) of the two filter shaker motors and the electrical connection (P) of the electric fan.

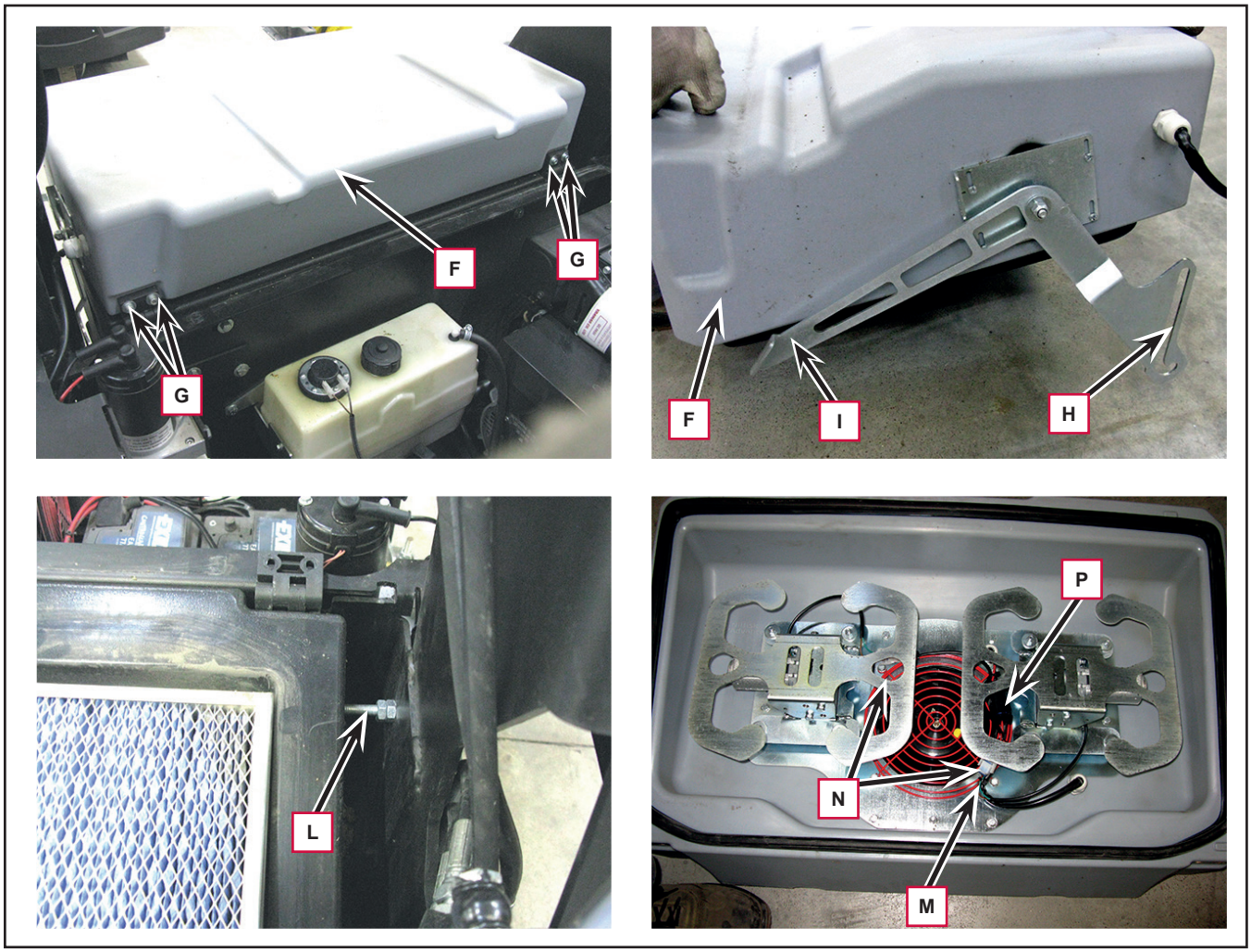


Figure 11:

Vacuum Fan (Continues)

12. Unscrew the screws (Q) and remove the assembly (R).
13. Disconnect the terminals of the electrical cables (S) from the connector (T), then extract the electrical cables from the cable grommet (U).
14. Unscrew the screws (V), then remove the vacuum fan motor assembly (W).
15. If necessary, unscrew the nuts (X) and remove the flange (Y) from the electric fan (W).

Installation

16. Assemble the components in the reverse order of removal.

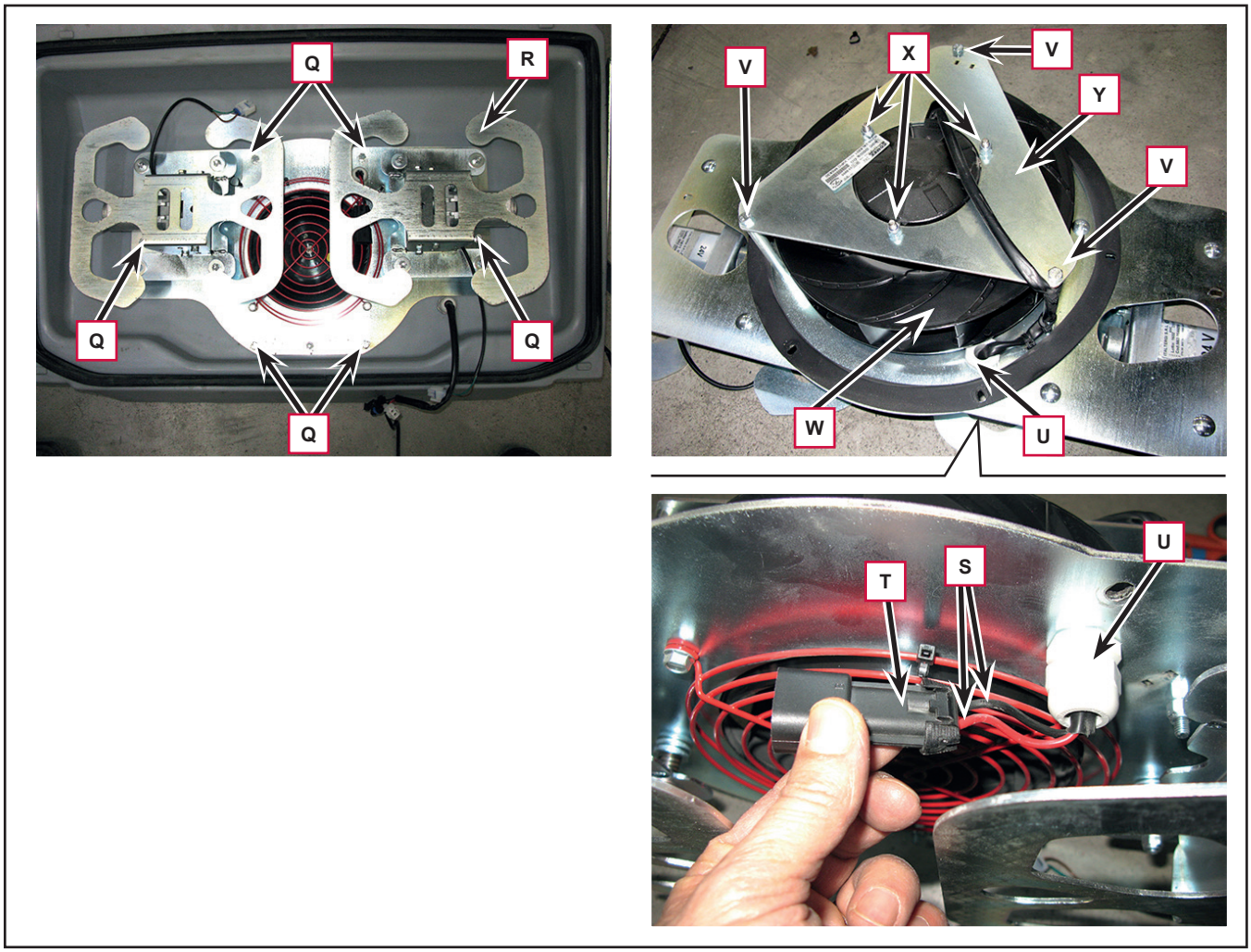


Figure 12:

Specifications

Model		SW5500 B FLOORTEC R 985 B	SW5500 D	SW5500 LPG FLOORTEC R 985 LPG
Filter	Area	75.3 ft^2 (7 m^2)		
	Filter efficiency	77% @ ,08 µm		
Vacuum	Motor power	0.35 hp (260 W)		
	Speed	rpm: 3,000		
	Fan diameter	9.8 in (250 mm)		
	Ingress protection	IP68		
Filter shaker (x2)	Motor power	12		
	Speed	rpm: 3,900 ± 200		

51 - Dust Guard System

Functional Description

The dust guard system sprays a thin film of water in front of each side broom, thus minimizing the dust raised by the broom itself.

The water used by the dust guard system is contained in a tank located inside the rear filter housing.

The system is composed of a pump motor (P1) which is powered by the Main Machine Controller (EB1).

The system is activated by pressing the DustGuard™ system button  (on the side Main Control Board), and the corresponding icon on the display indicates its operating status.

The pump is powered only when the function is active and at least one of the side brooms is moving.

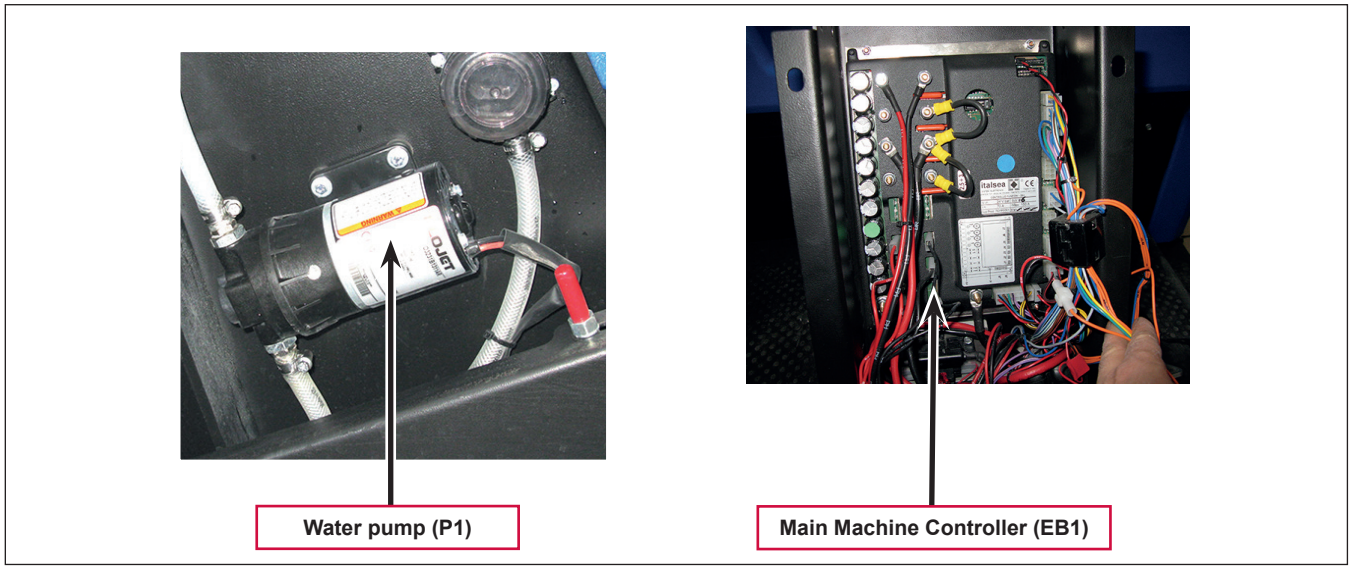


Figure 1:

Wiring Diagram

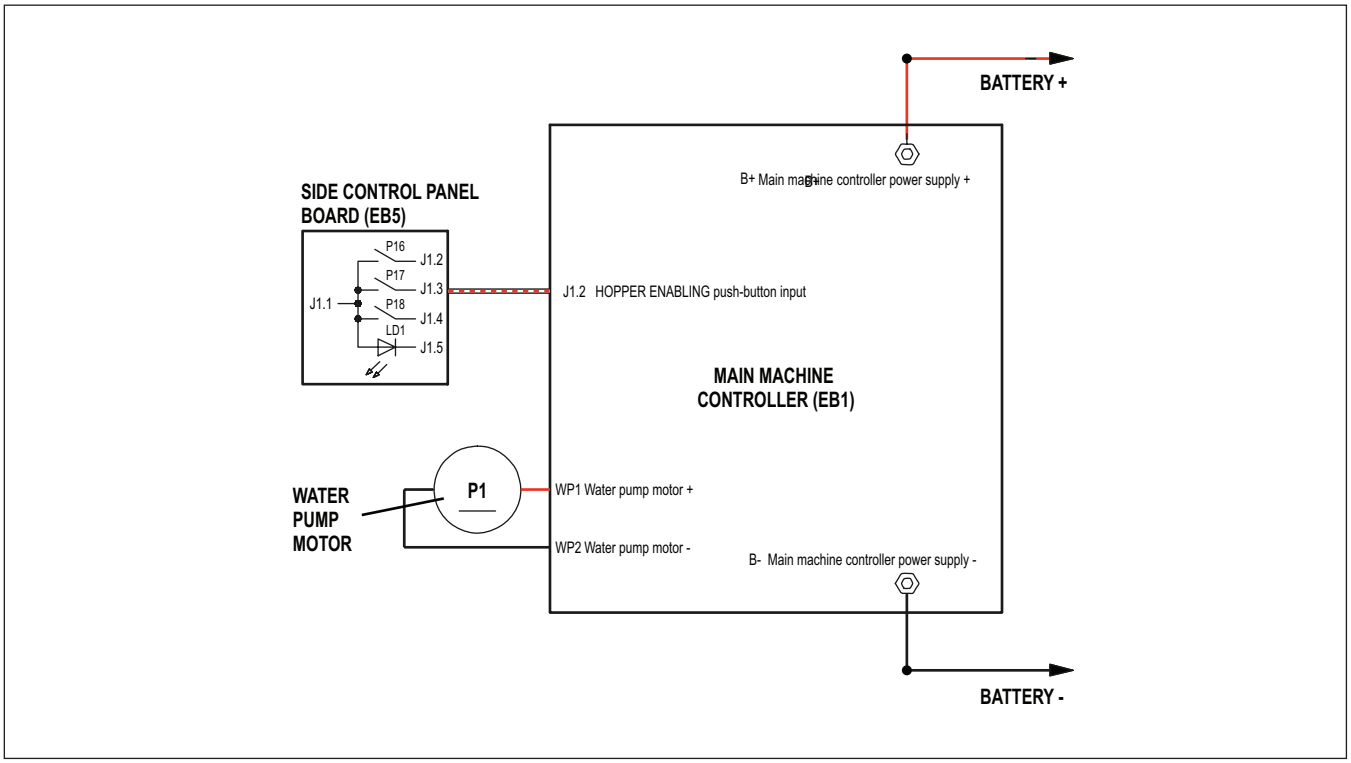


Figure 2:

Component Locations

- Dust guard system button
- Water tank
- Tank filler
- Water pump (P1)
- Water filter
- Spraying nozzle

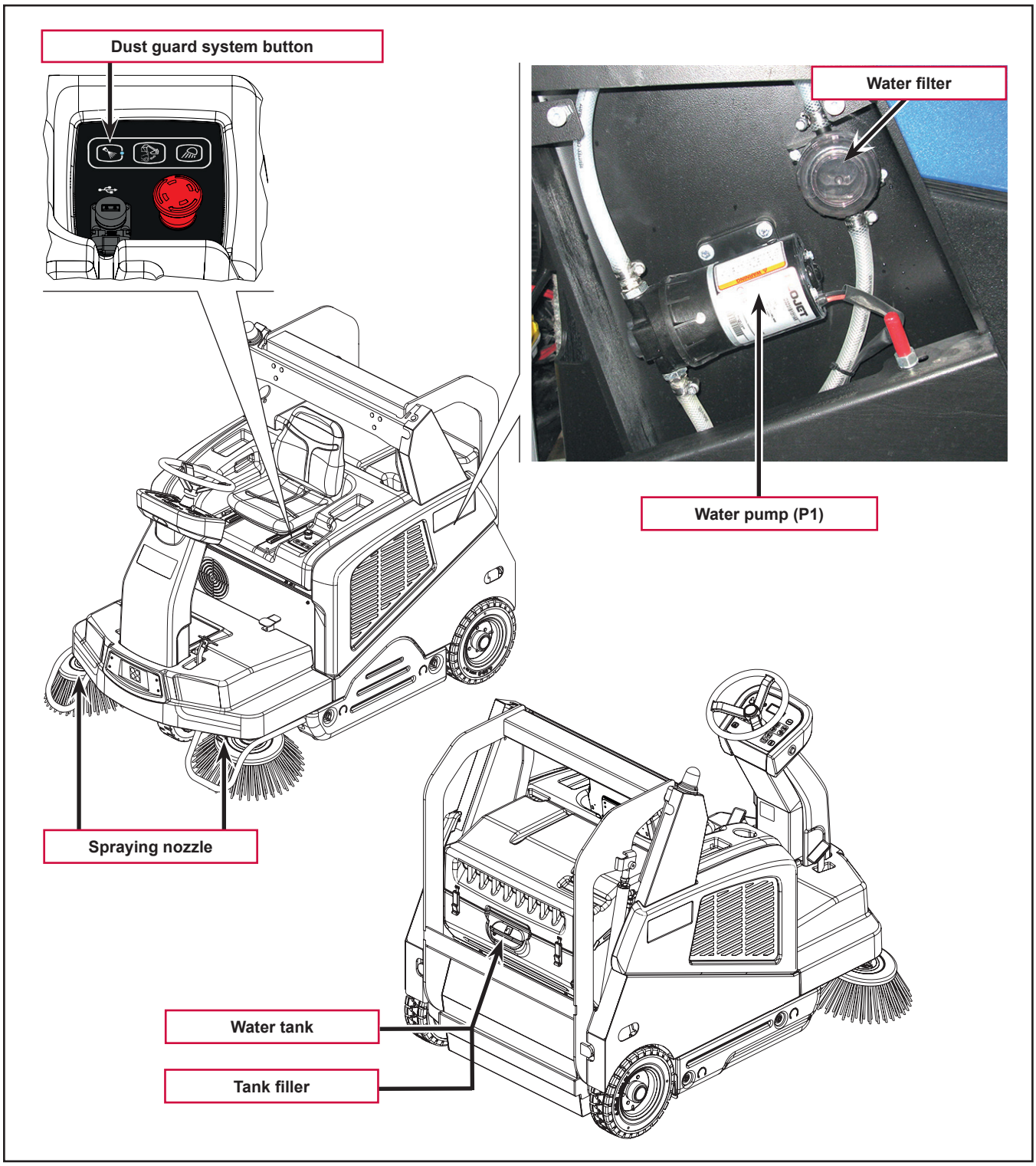


Figure 3:

Maintenance and Adjustments

Dust Guard System Water Filter Cleaning

Note: *It is not necessary to drain the water in the system in order to clean the filter; when removing the filter cover, usually only a minimal quantity of residual water will come out.*

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Lift and remove the left side panel, disengaging it from the upper and lower fasteners.
4. Unscrew the transparent cover (A) with its sealing gasket.
5. Remove the filter strainer (B) from the support (C).
6. Clean the filter strainer (B) and transparent cover (A) with sealing gasket; check that the gasket is in good condition.
7. Reposition the filter strainer (B) and screw down the transparent cover (A) with sealing gasket.

CAUTION: Ensure that the sealing gasket and filter strainer (B) are correctly positioned in the supporting seats and transparent cover (A).

8. Position the left side panel and clip it onto the upper and lower fasteners.

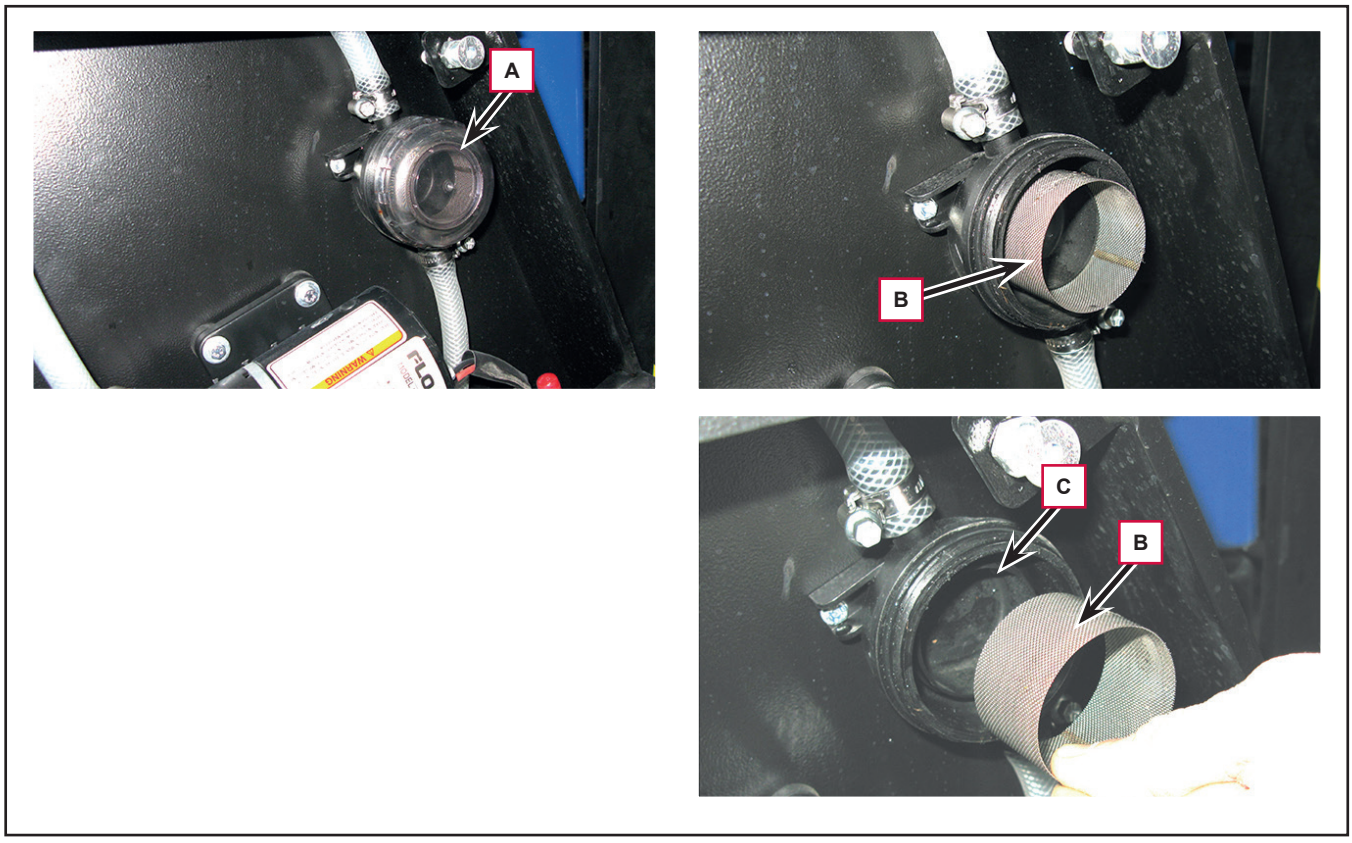


Figure 4:

Water Nozzles and Filter Cleaning

1. Drive the machine on a level floor.
1. Turn the ignition key to “0”, then engage the parking brake.
1. On the front side of the side brooms, remove the ring nuts (A) (bayonet connection).
1. Remove and clean the nozzles (B), the gaskets (C) and the filters (D) with compressed air. Remove any calcium deposit. If necessary, replace the filters (D).
2. Reinstall the filters, gaskets and the nozzles, then fasten them with the ring nuts.

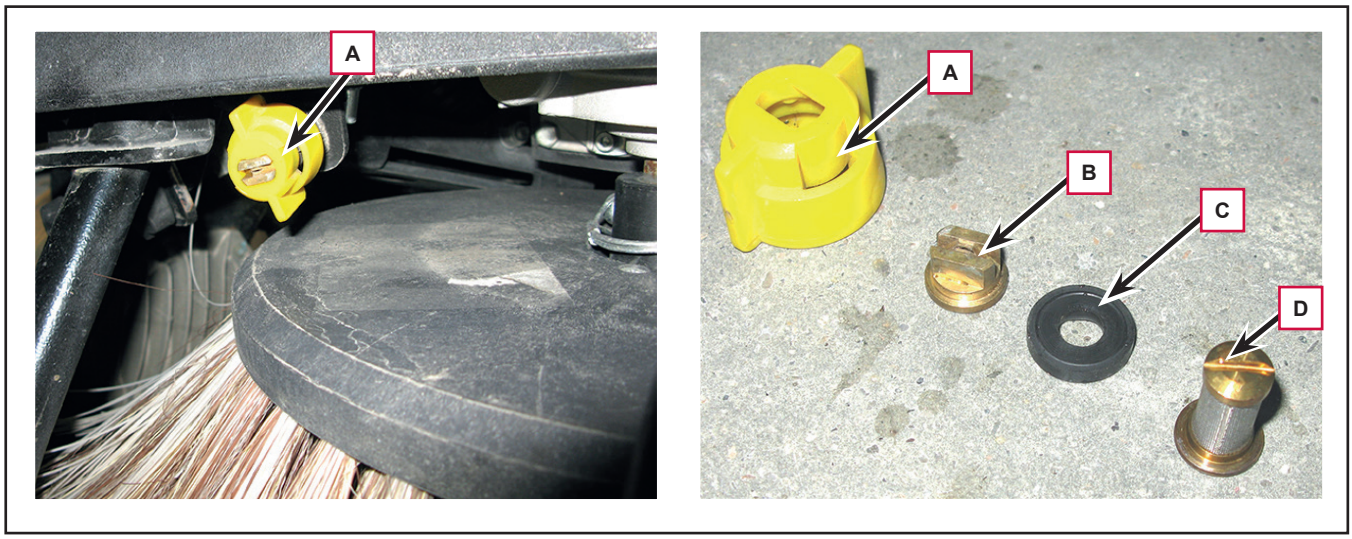


Figure 5:

Troubleshooting

Trouble	Possible causes	Remedy
Little water comes out from the spray nozzles	The nozzle filter and/or nozzle is clogged	Clean/replace
	The water filter is clogged	Clean/replace
	The pump is not working properly	Repair/replace
No water to the nozzles	The water filter is clogged	Clean/replace
	Possible blockage in water line from tank outlet	Drain the tank and clean with running water
	Water pump motor (P1) broken	Repair/replace

Removal and Installation

Dust Guard System Water Pump

Removal

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Open the battery/engine compartment hood with the handle and fasten it with the support rod.
4. Disconnect the battery connector (Battery Version) - Disconnect the batteries (Diesel and LPG Version).
5. Lift and remove the left side panel, disengaging it from the upper and lower fasteners.
6. Disconnect the pump (B) electrical connection (A).
7. Cut the cable clamp (C).
8. Loosen the clamps (D) and disconnect the lines (E) from the pump.
9. Unscrew the screws (F) and remove the pump (B).

Installation

10. Assemble the components in the reverse order of removal.

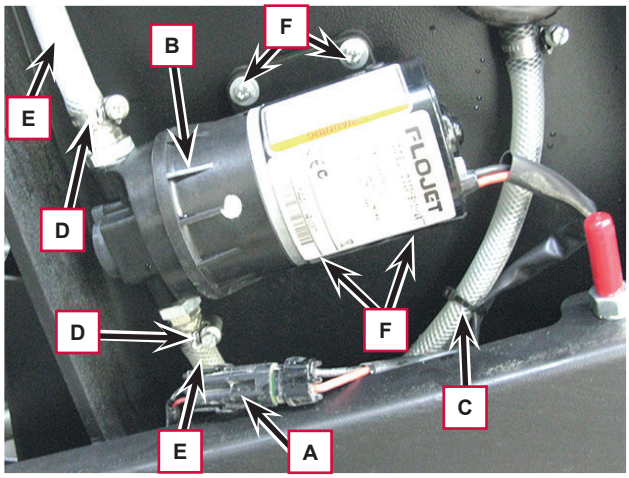


Figure 6:

Specifications

Model		SW5500 B FLOORTEC R 985 B	SW5500 D	SW5500 LPG FLOORTEC R 985 LPG
Dust guard system water tank capacity		8.4 US gal (32 liters)		
Pump	Current	3A		
	Voltage	24V		
	Capacity	1.5 US gal/min (5.7 l/min)		
	Pressure	49 psi (3.4 Bar)		

52 - Hopper System

Functional Description

The hopper lifting and dumping system is operated by two hydraulic cylinders driven by an hopper pump (M3) with integrated hydraulic unit.

The hopper pump (M3) is powered by the Main Machine Controller (EB1).

Activation of various solenoid valves allows the hopper pump (M3) to move the two hydraulic cylinders in the required direction, according to the following table:

ACTIVATION OF OUTPUTS FOR HOPPER MOVEMENTS					
Command	Button	HOPPER PUMP (M3)	RAISING VALVE (EV1)	LOWERING VALVE (EV2)	DUMPING VALVE (EV3)
Raise		**X**	**X**		
Lower		**X**		**X**	
Dumping		**X**			**X**
Return to horizontal position		**X**			

When the hopper comes out of its rest position, the hopper closed sensor (S1, light sensor on) provides its signal to the Main Machine Controller (EB1) in order to obtain the following automatic functions: reduction of machine maximum speed, sounding of the buzzer (BZ, on the Main Machine Controller), displaying the hopper lifting icon on the display, switching off the vacuum system motor (M1) and the broom motors (M4, M5, M6).

When the hopper reaches a height sufficient to activate the hopper lifted sensor (S2, light sensor on), rotation of the hopper can be activated with the dumping button to empty the hopper, and then the return button can be used to return the hopper to the horizontal position.

When the hopper dumping sensor (S3) detects that the hopper is not in the horizontal position, activation of the hopper lowering button is disabled.

When the hopper is not in the horizontal position, the hopper dumping sensor (S3, light sensor off) disables the activation of the hopper lowering button.

SENSORS HOPPER WORK			
Sensor	Light built-in sensor	Sensor output	Effect
S1	OFF	0V	-
	ON	24V	- Low gear speed - No vacuum - No brooms rotation - Buzzer ON
S2	OFF	0V	- No hopper dumping (inhibited dumping button)
	ON	24V	-
S3	OFF	0V	- No hopper lowering (inhibited lower button)
	ON	24V	-

Functional Description (continues)

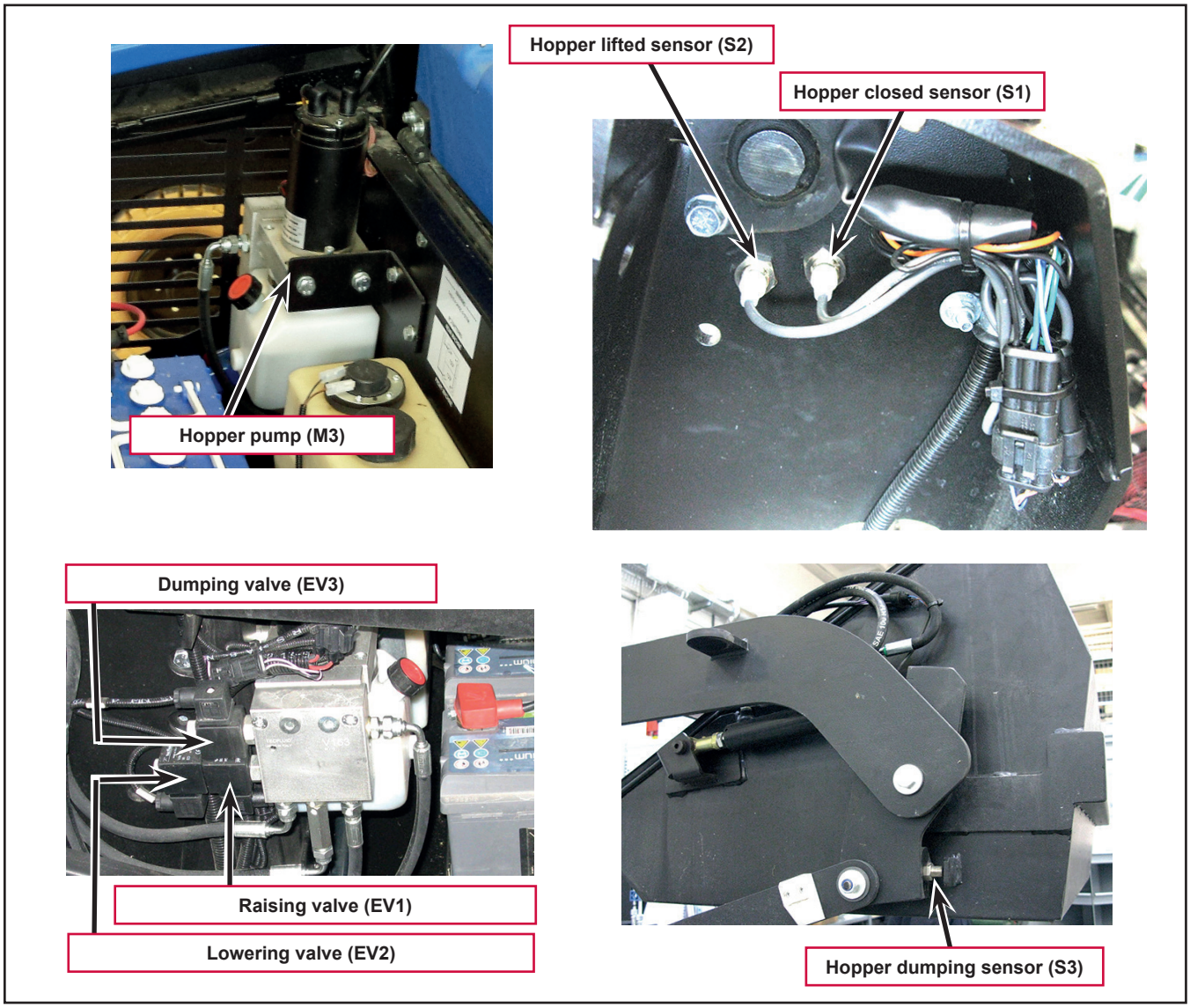


Figure 1:

Wiring Diagram

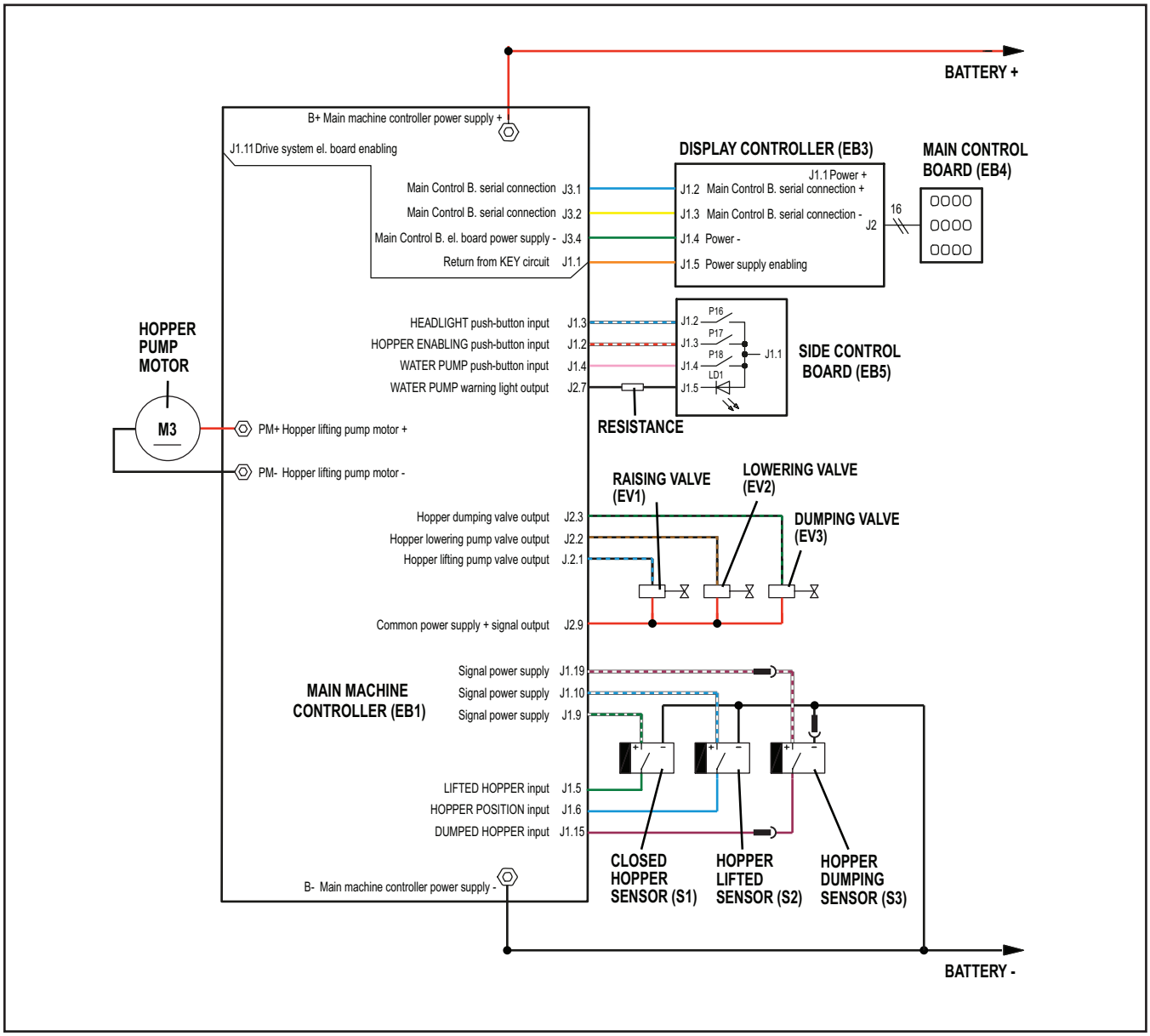


Figure 2:

Hopper System Hydraulic Diagrams

Hopper Down

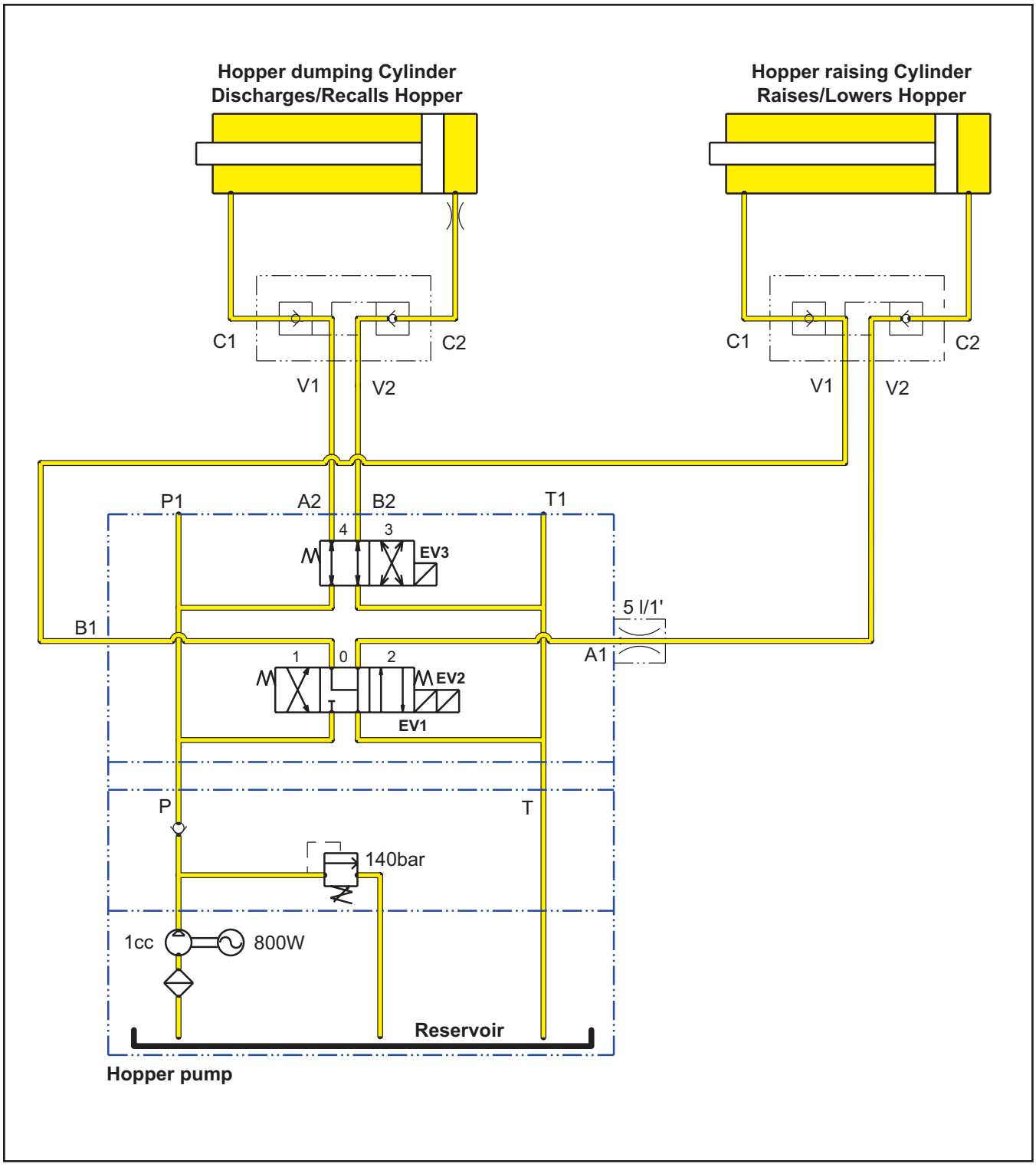


Figure 3:

Raise Hopper

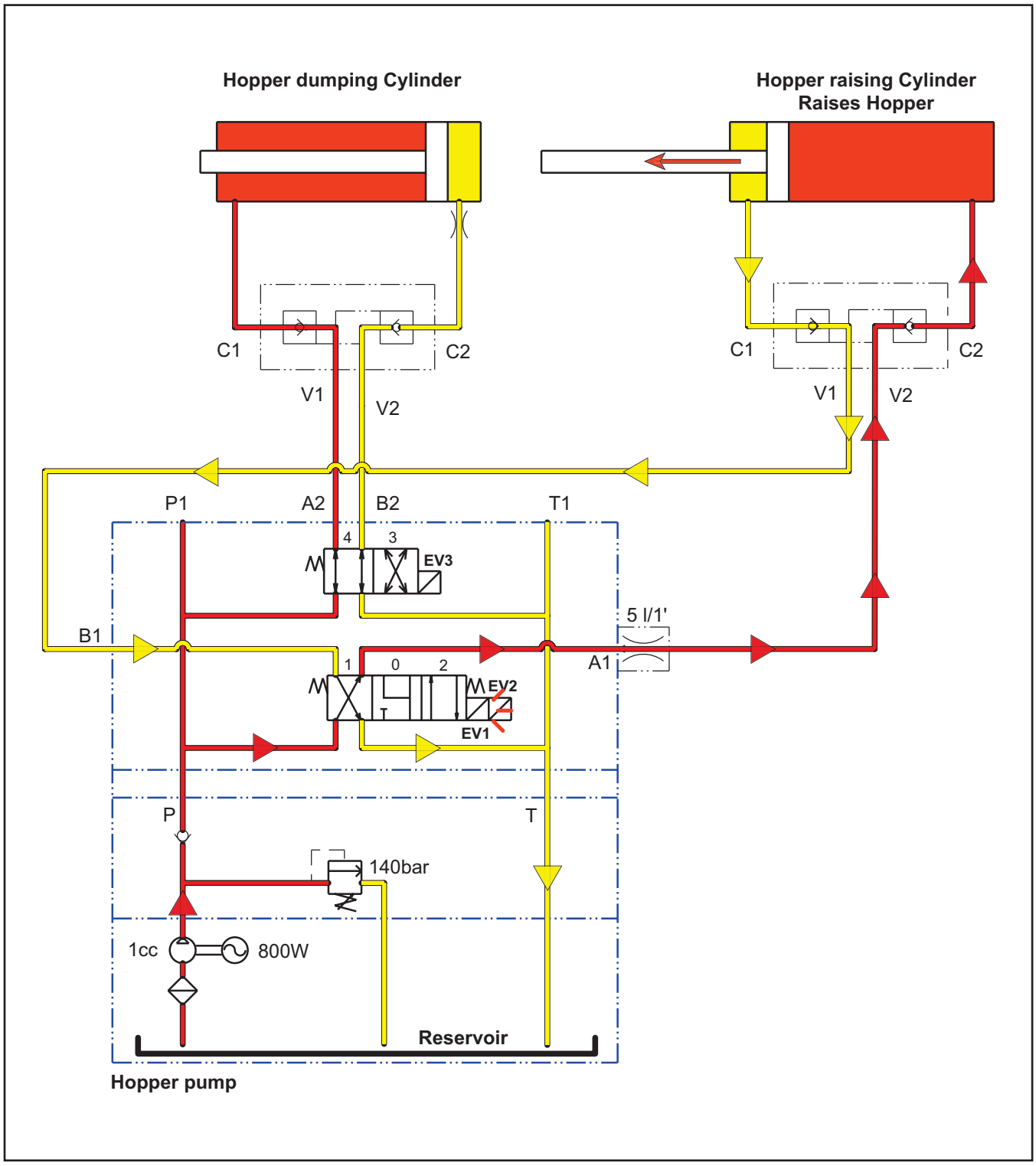


Figure 4:

Discharge Hopper

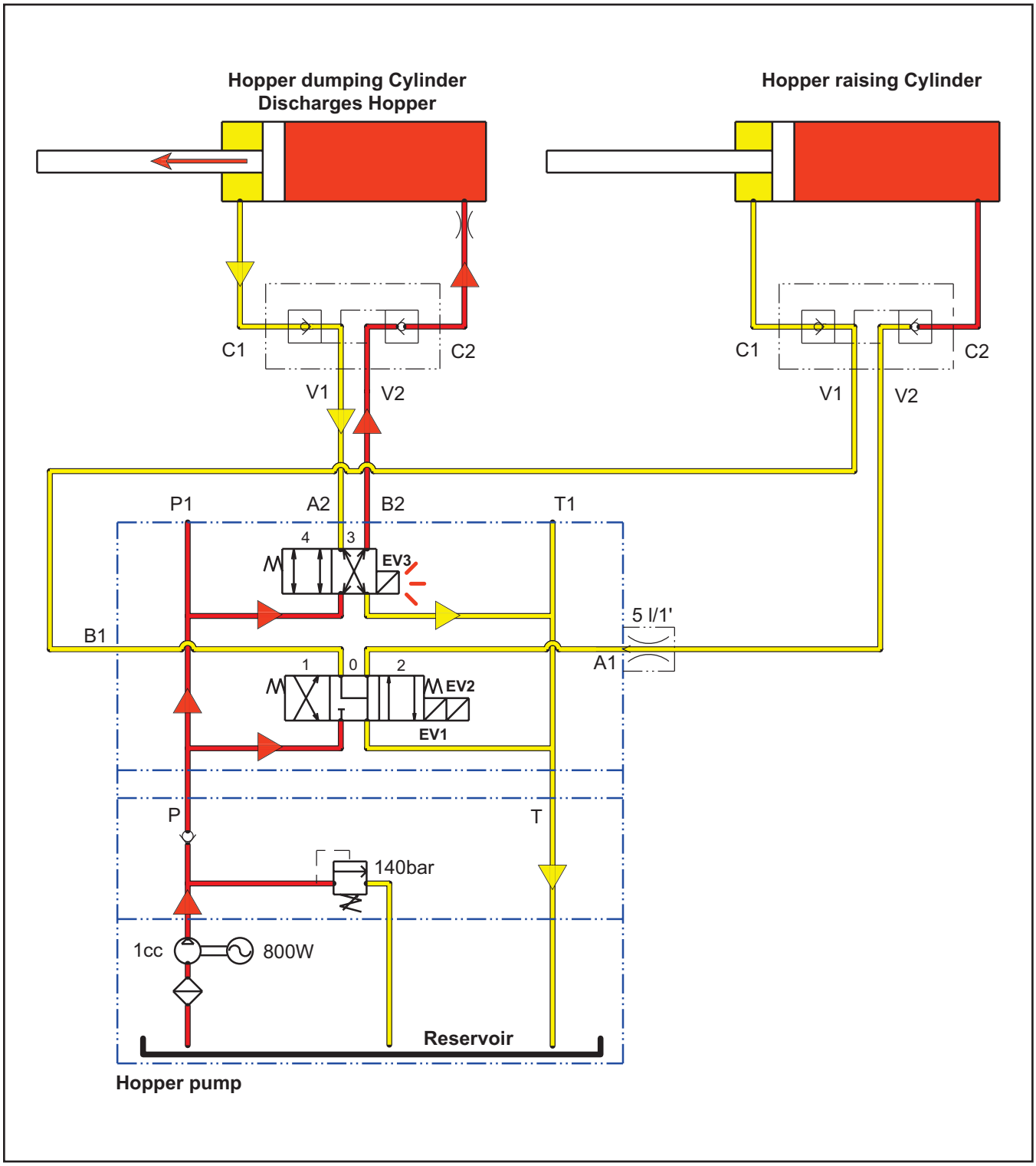


Figure 5:

Recall Hopper

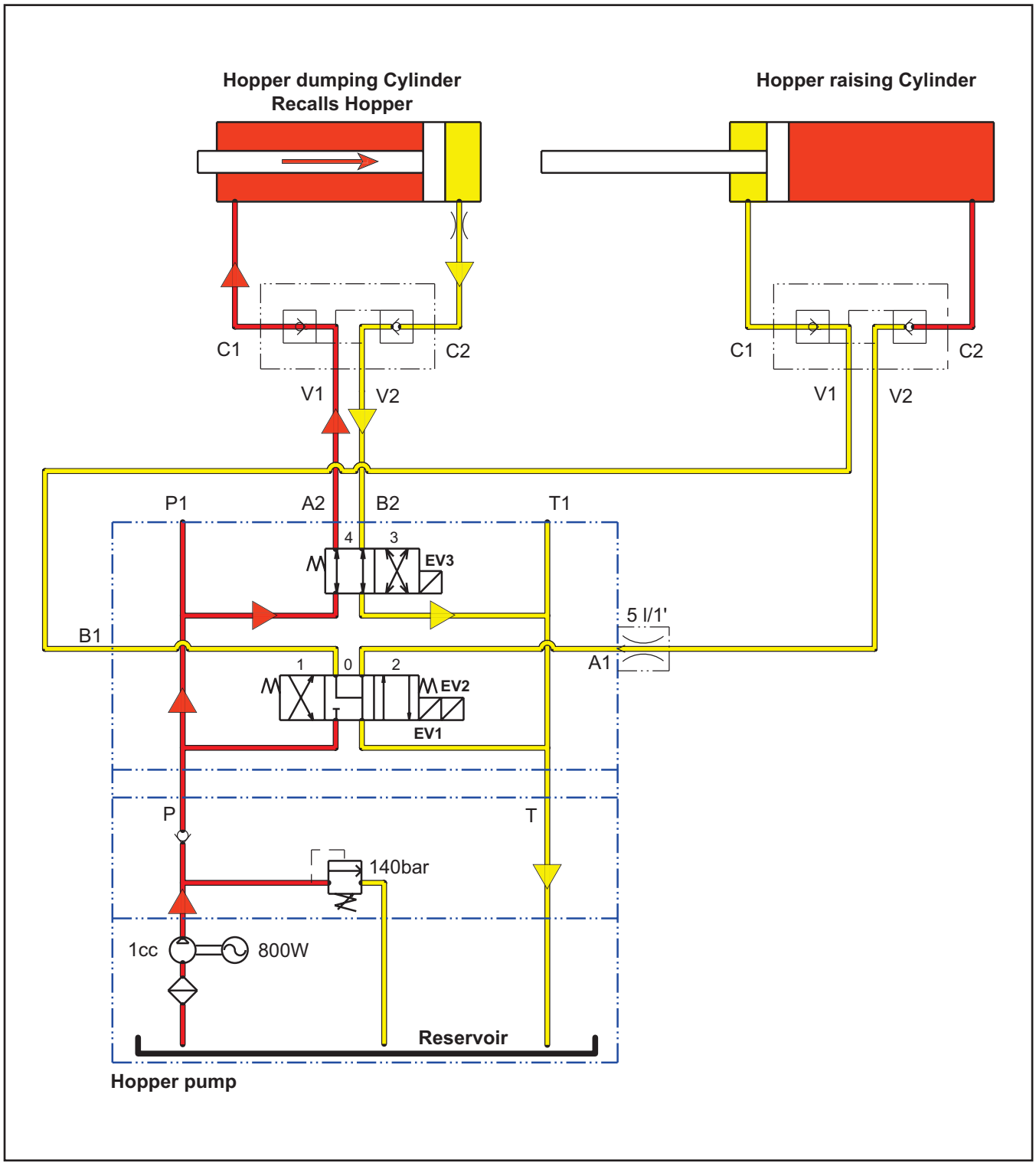


Figure 6:

Hopper Lowering

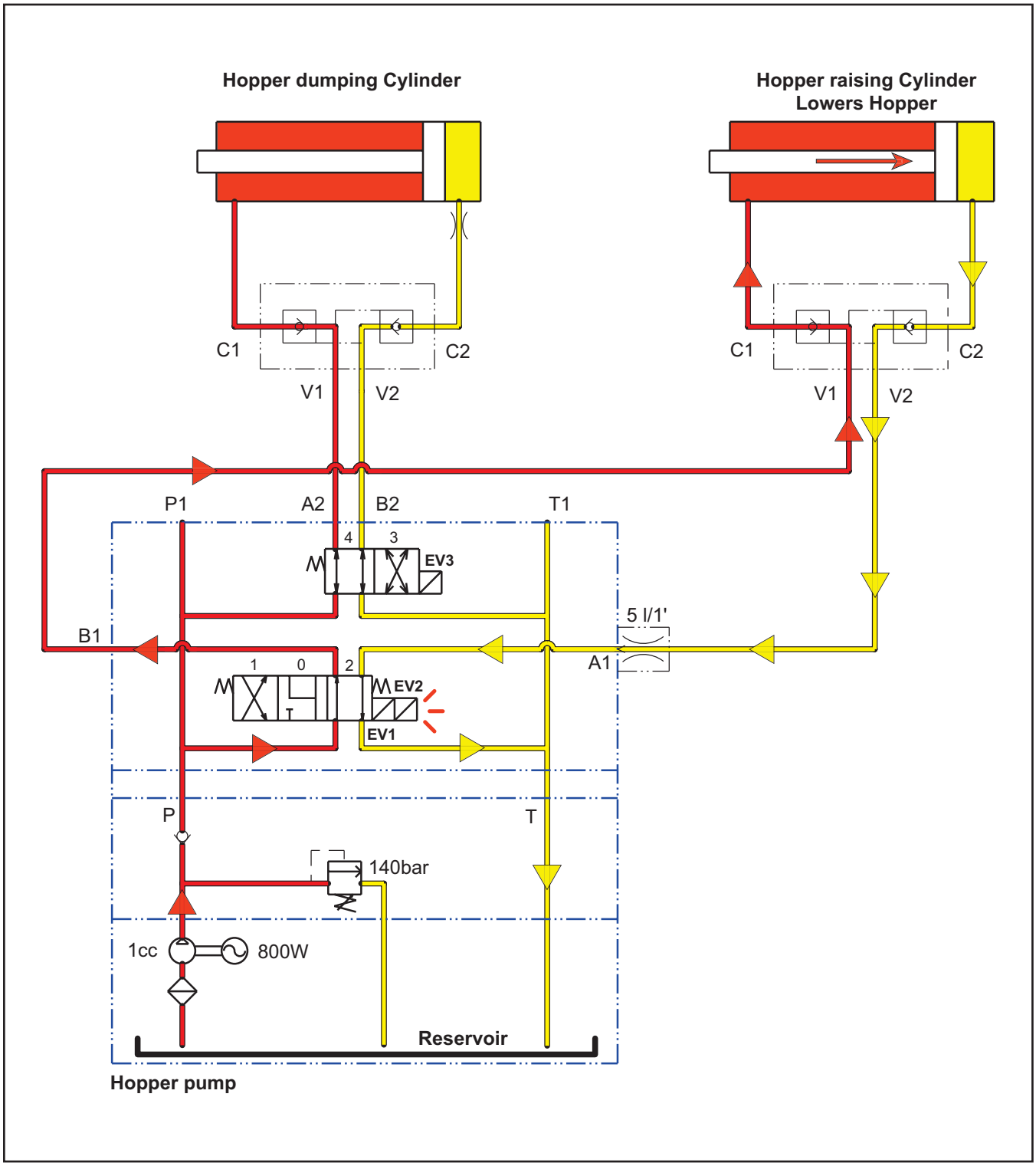


Figure 7:

Component Locations

- Hopper movement enabling button
- Hopper lifting button
- Hopper lowering button
- Hopper dumping button
- Hopper reset button
- Closed hopper sensor (S1)
- Hopper lifted sensor (S2)
- Hopper dumping sensor (S3)
- Hopper linkages
- Hopper

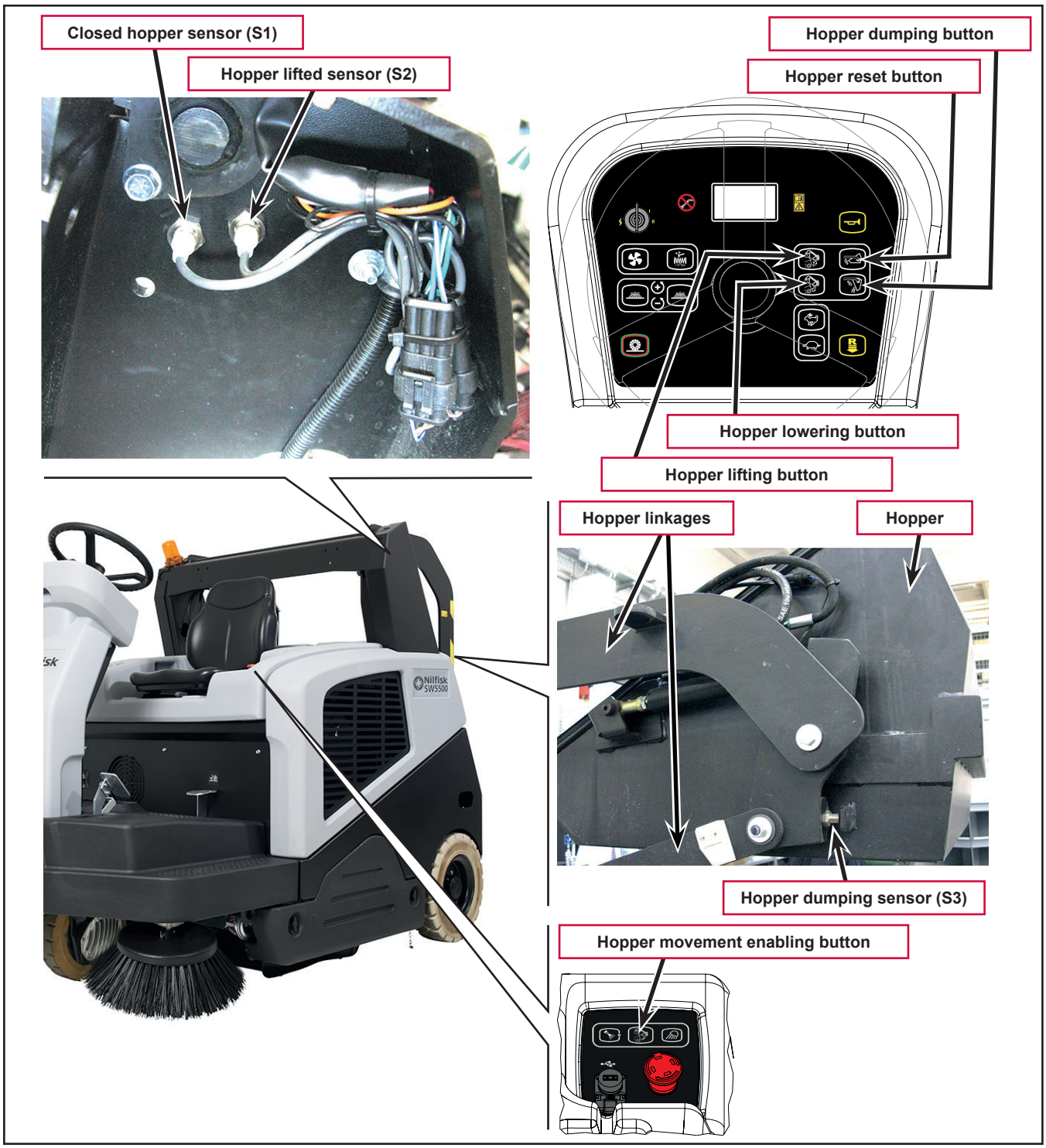


Figure 8:

Component Layout (Continues)

- Raising valve (EV1)
- Lowering valve (EV2)
- Dumping valve (EV3)
- Check valve
- Hydraulic hoses
- Hydraulic lifting cylinder
- Hydraulic dumping cylinder
- Hopper pump (M3)
- Hydraulic oil tank

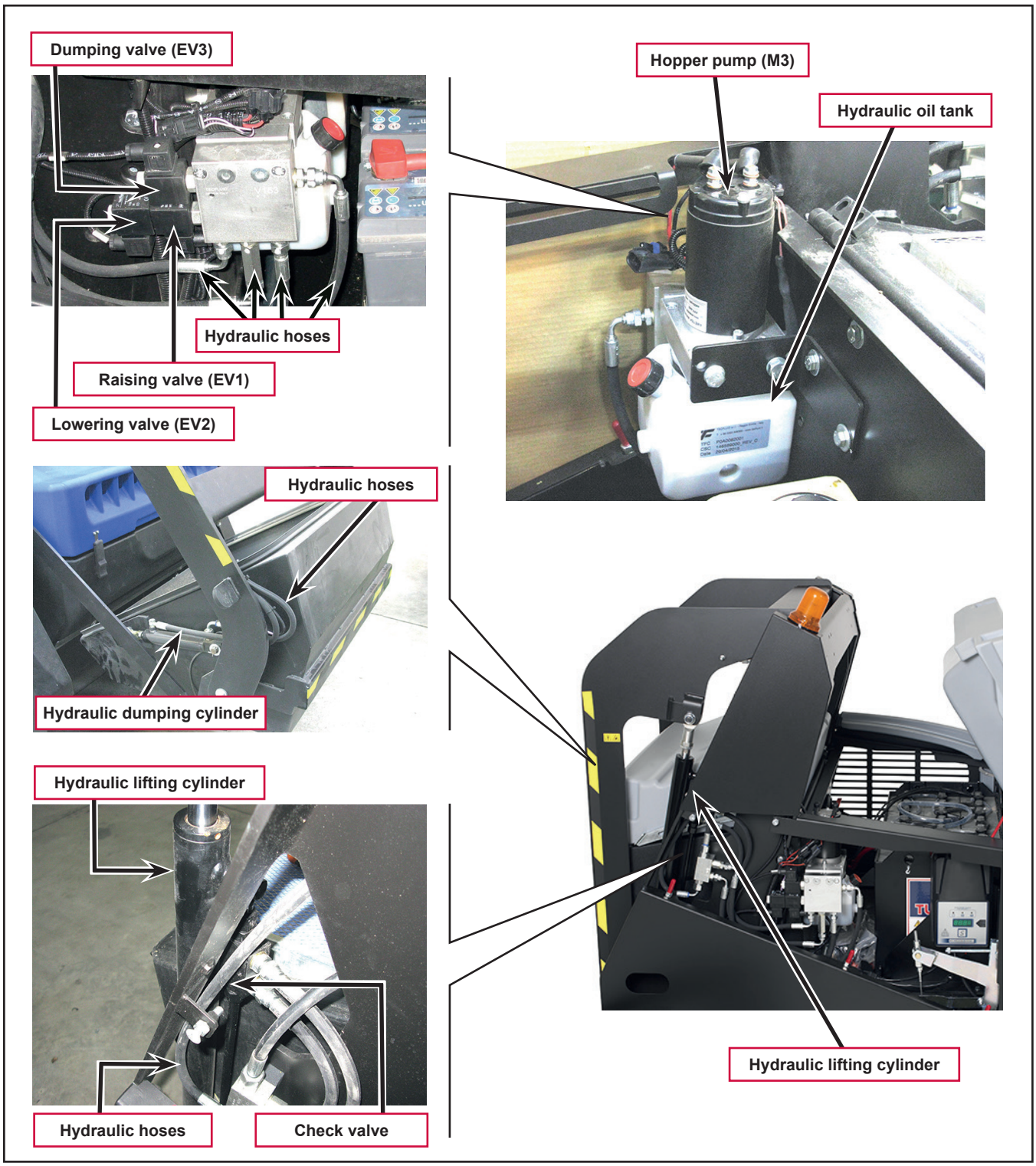


Figure 9:

Maintenance and Adjustments

Hydraulic System Oil Level Check

WARNING: Procedure to be performed with the hopper fully retracted.

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Open the battery/engine compartment hood with the handle and fasten it with the support rod.
4. Check that the oil level in the hydraulic unit tank (A) is between the minimum (MIN) (B) and maximum (MAX) (C) marks shown.
5. If necessary, top up the oil after removing the plug (D); use the oil specified in Technical Data section.

WARNING: Hydraulic system oil is highly corrosive.

WARNING: The hydraulic system oil should be disposed of properly according to the Law in force.

6. Remove the support rod and close the battery/engine hood.

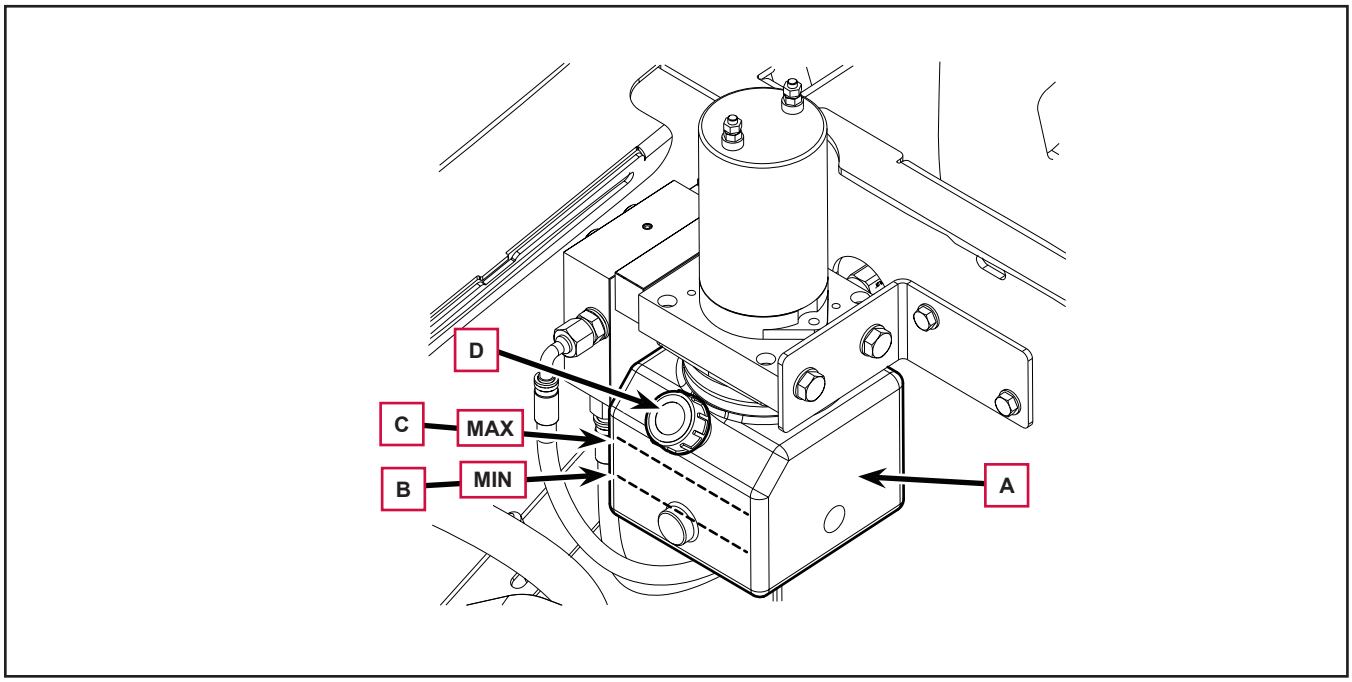


Figure 10:

Troubleshooting

Trouble	Possible causes	Remedy
The hopper does not dump.	The hopper is too low.	Lift the hopper at a minimum height of 13,7 in (350 mm).
	Hopper lifted sensor (S2) miscalibrated or broken.	Adjust/replace
	Dumping valve (EV3) faulty	Replace
The hopper does not give a signal of being closed.	Hopper open sensor (S1) miscalibrated or broken.	Adjust/replace
The hopper does not give a signal of being lifted.	Hopper lifted sensor (S2) miscalibrated or broken.	Adjust/replace
The hopper does not give a signal of being turned.	Hopper dumping sensor (S3) miscalibrated or broken.	Adjust/replace
The hopper will not raise.	Hydraulic system oil level incorrect.	Check the hydraulic system oil level in the tank.
	Operation on sloping surface 	Move the machine to level ground
	Hopper pump (M3) fault	Replace
	Raising valve (EV1) faulty	Replace
The hopper does not lower.	In case of low temperatures, the hydraulic system oil is slow in flowing through the safety valve.	Wait a few moments to let the hydraulic system oil flow.
	Hopper rotated	Return it to the closed position
	Hopper dumping sensor (S3) disconnected/ broken	Connect / replace
	Lowering valve (EV2) faulty	Replace

Removal and Installation

Closed Hopper Sensor

Removal

1. Drive the machine on a level floor.
2. Lift the hopper to the end-of-stroke.

WARNING: Place a safety rod under the lifted hopper.

3. Turn the ignition key to “0”, then engage the parking brake.
4. Open the battery/engine compartment hood with the handle and fasten it with the support rod.
5. Disconnect the battery connector (Battery Version) - Disconnect the batteries (Diesel and LPG Version).
6. Lift and remove the right side panel (A), disengaging it from the upper (B) and lower (C) fasteners.
7. Remove the screws (D) and the cover (E).

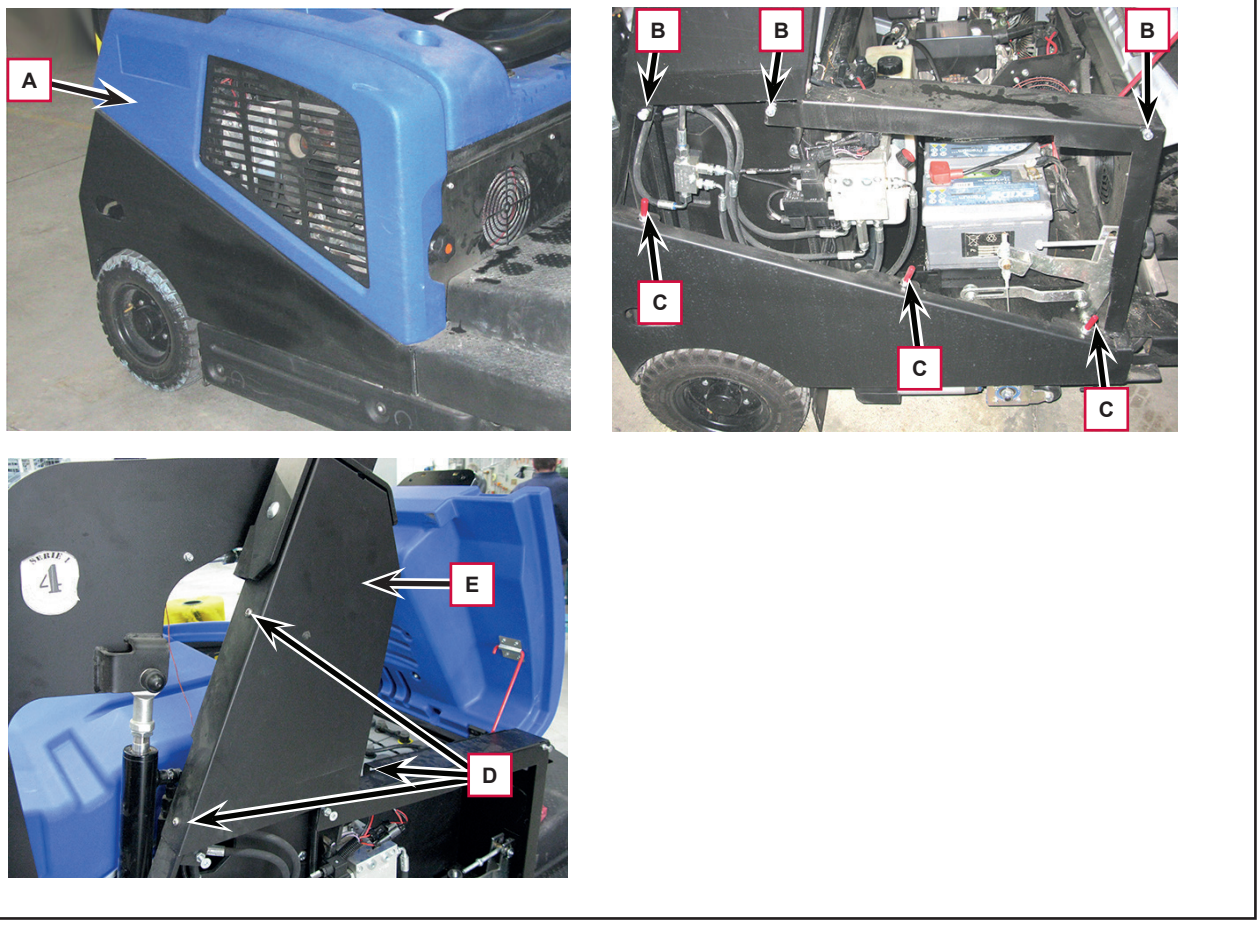


Figure 11:

Closed Hopper Sensor (Continues)

8. Free up and disconnect the electrical connection (F) of the hopper closed sensor (G).

9. Unscrew the nut (H) and remove the sensor (G) with wiring.

Installation

10. Assemble the components in the reverse order of removal.

Adjustment

11. Adjust the distance (I) between the sensor (G) and the flange (J) to 0,15-0,20 in (4-5 mm), then tighten the locknut (K) onto the nut (H).

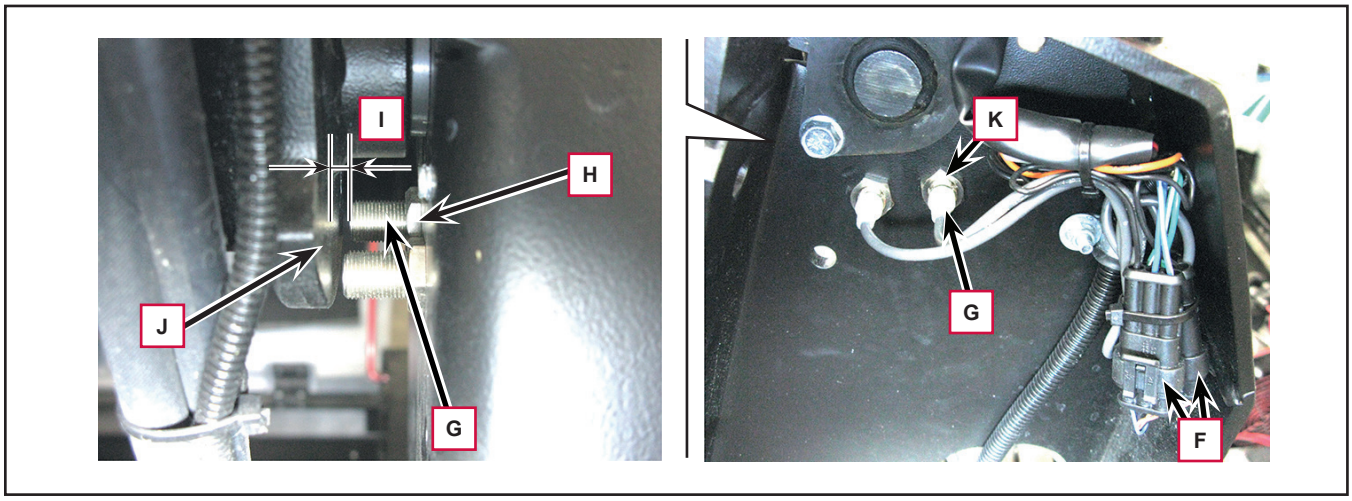


Figure 12:

Lifted Hopper Sensor

Removal

1. Perform the points from 1 to 7 of the Closed Hopper Sensor procedure.
2. Free up and disconnect the electrical connection (F) of the hopper lifted sensor (G).
3. Unscrew the nut (H) and remove the sensor (G) with wiring.

Installation

4. Assemble the components in the reverse order of removal.

Adjustment

5. Adjust the distance (I) between the sensor (G) and the flange (J) to 0,15-0,20 in (4-5 mm), then tighten the locknut (K) onto the nut (H).

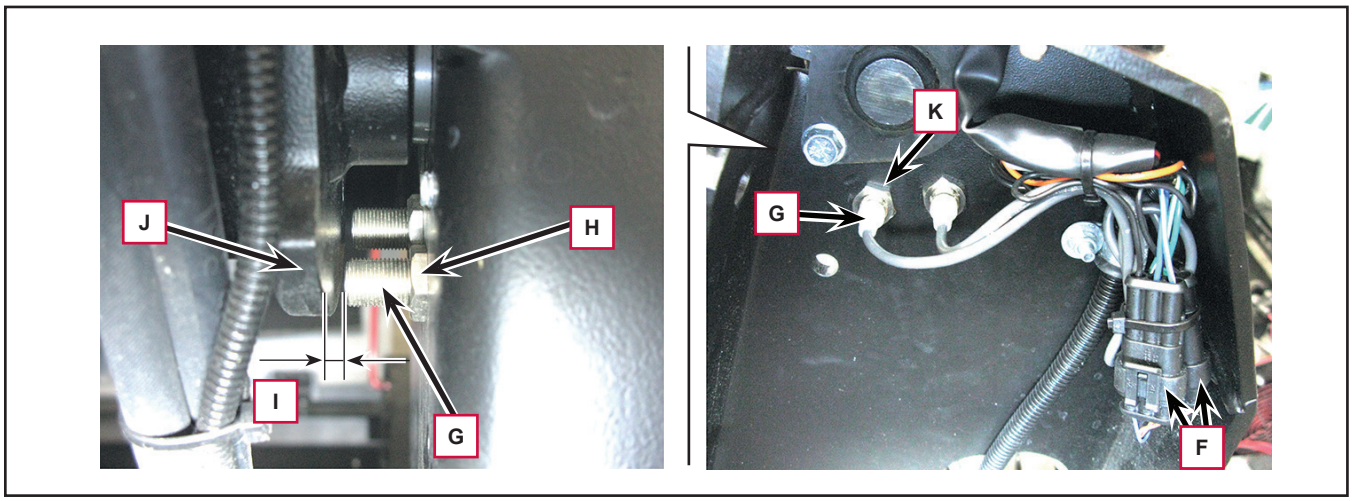


Figure 13:

Hopper Rotated Sensor

Removal

1. Drive the machine on a level floor.
2. Raise the hopper to head height; ensure that it is in the closed position.

WARNING: Place a safety rod under the lifted hopper.

3. Turn the ignition key to “0”, then engage the parking brake.
4. Open the battery/engine compartment hood with the handle and fasten it with the support rod.
5. Disconnect the battery connector (Battery Version) - Disconnect the batteries (Diesel and LPG Version).
6. On the left-hand side of the hopper, disconnect the electrical connection (A) of the hopper rotated sensor (B).
7. Cut the various clamps (C) for the sensor wiring (B).
8. Unscrew the nut (D) and remove the sensor (B) with wiring.

Installation

9. Assemble the components in the reverse order of removal.

Adjustment

10. Adjust the distance (E) between the sensor (B) and the bracket (F) to 0,15-0,20 in (4-5 mm), then tighten the locknut (E) onto the nut (G).

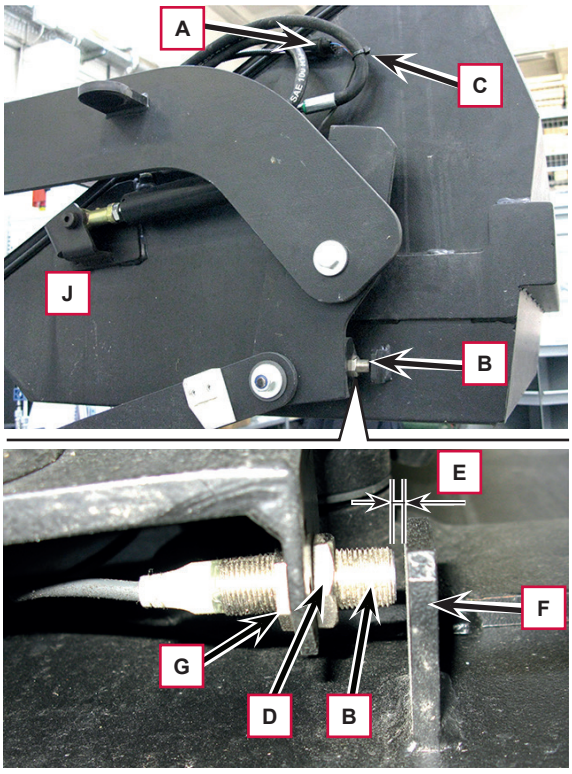


Figure 14:

Hopper

Removal

1. Drive the machine on a level floor.
2. Partially raise the hopper, then close it, making it rest on a platform (A) approx. 50 cm high.
3. Open the battery/engine compartment hood with the handle and fasten it with the support rod.
4. Disconnect the battery connector (Battery Version) - Disconnect the batteries (Diesel and LPG Version).
5. Remove the hopper dumping cylinder (B) (see procedure in relevant paragraph); it is not, however, necessary to disconnect its hoses, nor is it necessary to bring the hopper to head height.
6. Cut the retaining clamp and disconnect the sensor electrical connection (C).
7. Unscrew the two threaded pins (D), (E) and (F).
8. Remove the hopper (G) (weight approx. 66 lb (30 Kg)).

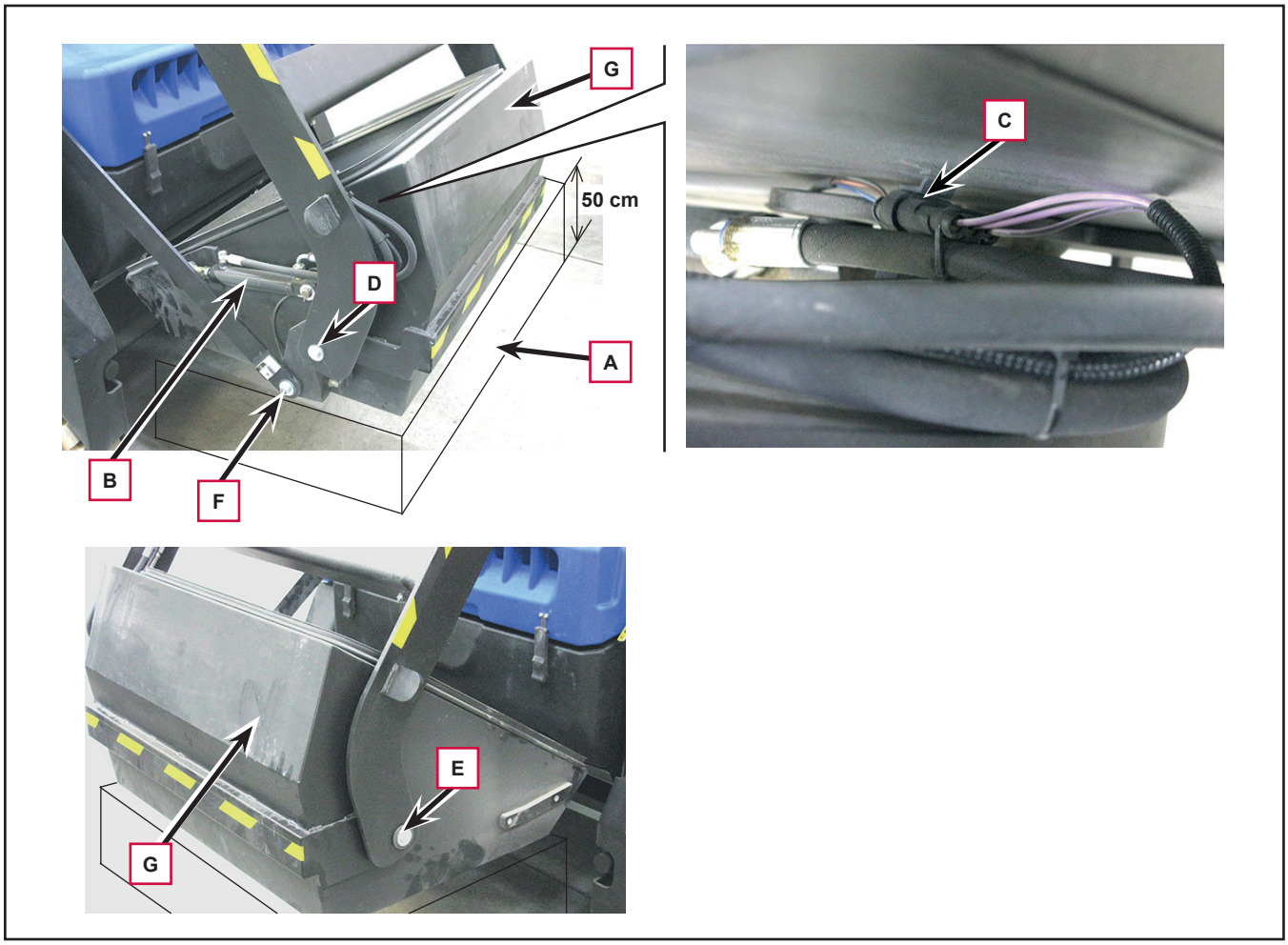


Figure 15:

Hopper (Continues)

Installation

9. Assemble the components in the reverse order of removal, and note the following:
    - If the hopper is changed, check the three hopper sensors in the following positions:
        - - Closed
        - - Lifted
        - - Rotated
        - (refer to the sensor installation/removal procedures)

Hydraulic Control Unit

Removal

1. Drive the machine on a level floor.
2. Ensure that the hopper is closed.
3. Turn the ignition key to “0”, then engage the parking brake.
4. Open the battery/engine compartment hood with the handle and fasten it with the support rod.
5. Disconnect the battery connector (Battery Version) - Disconnect the batteries (Diesel and LPG Version).
6. Lift and remove the right side panel (A), disengaging it from the upper (B) and lower (C) fasteners.
7. Working above the hydraulic unit (D), free the caps (E) and the disconnect the electrical terminals (F) after unscrewing the corresponding nuts.

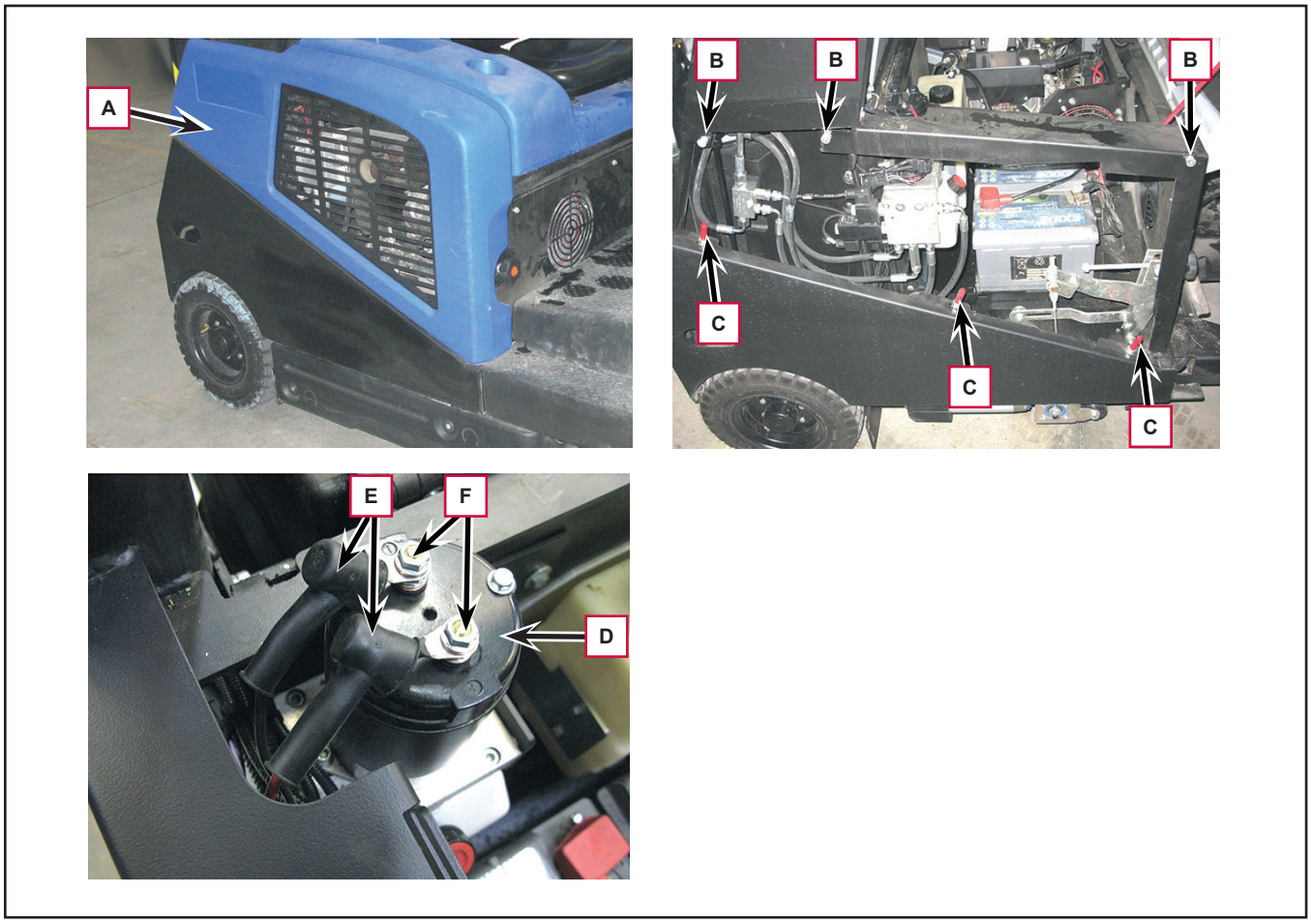


Figure 16:

Hydraulic Control Unit (Continues)

8. Disconnect the electrical connections (G) of the solenoid valves.

9. Unscrew the lines (H), collecting any hydraulic fluid which may come out in a suitable container; immediately plug the disconnected fittings to prevent impurities entering the hydraulic system.

WARNING: Hydraulic system oil is highly corrosive.

WARNING: The hydraulic system oil should be disposed of properly according to the Law in force.

10. Unscrew the screws (I) and remove the hydraulic unit (J).

Installation

11. Assemble the components in the reverse order of removal, and note the following:

    - After the installation of the hydraulic unit (either the same unit or a new one), fill the tank with hydraulic fluid up to the Max level, then perform some movements with the hopper (the hydraulic system is self-bleeding); then, check the hydraulic fluid level (see procedure in relevant paragraph).

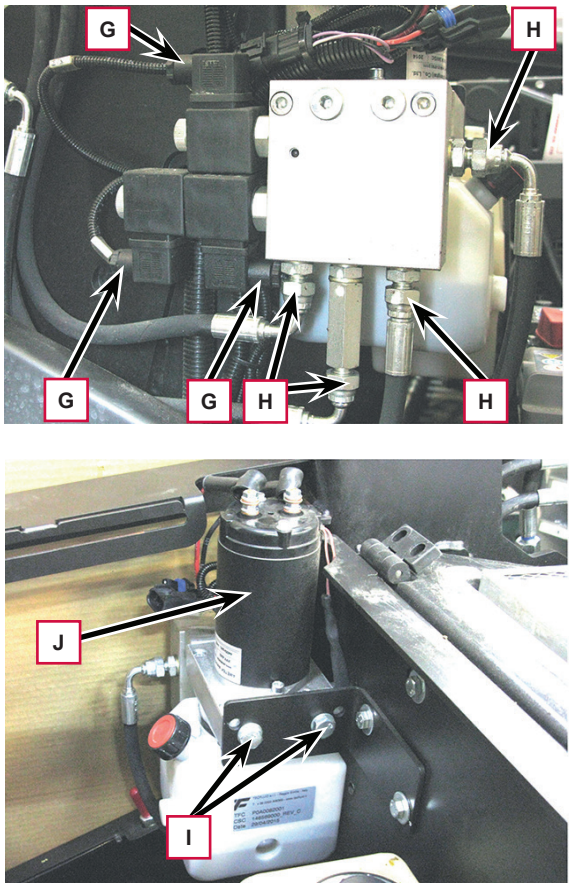


Figure 17:

Hopper Lifting Hydraulic Cylinder

Removal

1. Drive the machine on a level floor.
2. Ensure that the hopper is empty.
3. Raise the hopper slightly (A), then close it, resting it on two planks (B) 8-10 cm tall.
4. Turn the ignition key to “0”, then engage the parking brake.
5. Open the battery/engine compartment hood with the handle and fasten it with the support rod.
6. Lift and remove the right side panel (C), disengaging it from the upper (D) and lower (E) fasteners.
7. Unscrew the lines (F) and (G) from the hydraulic cylinder check valve, collecting any hydraulic fluid which may come out in a suitable container; immediately plug the disconnected fittings to prevent impurities entering the hydraulic system.

WARNING: Hydraulic system oil is highly corrosive.

WARNING: The hydraulic system oil should be disposed of properly according to the Law in force.

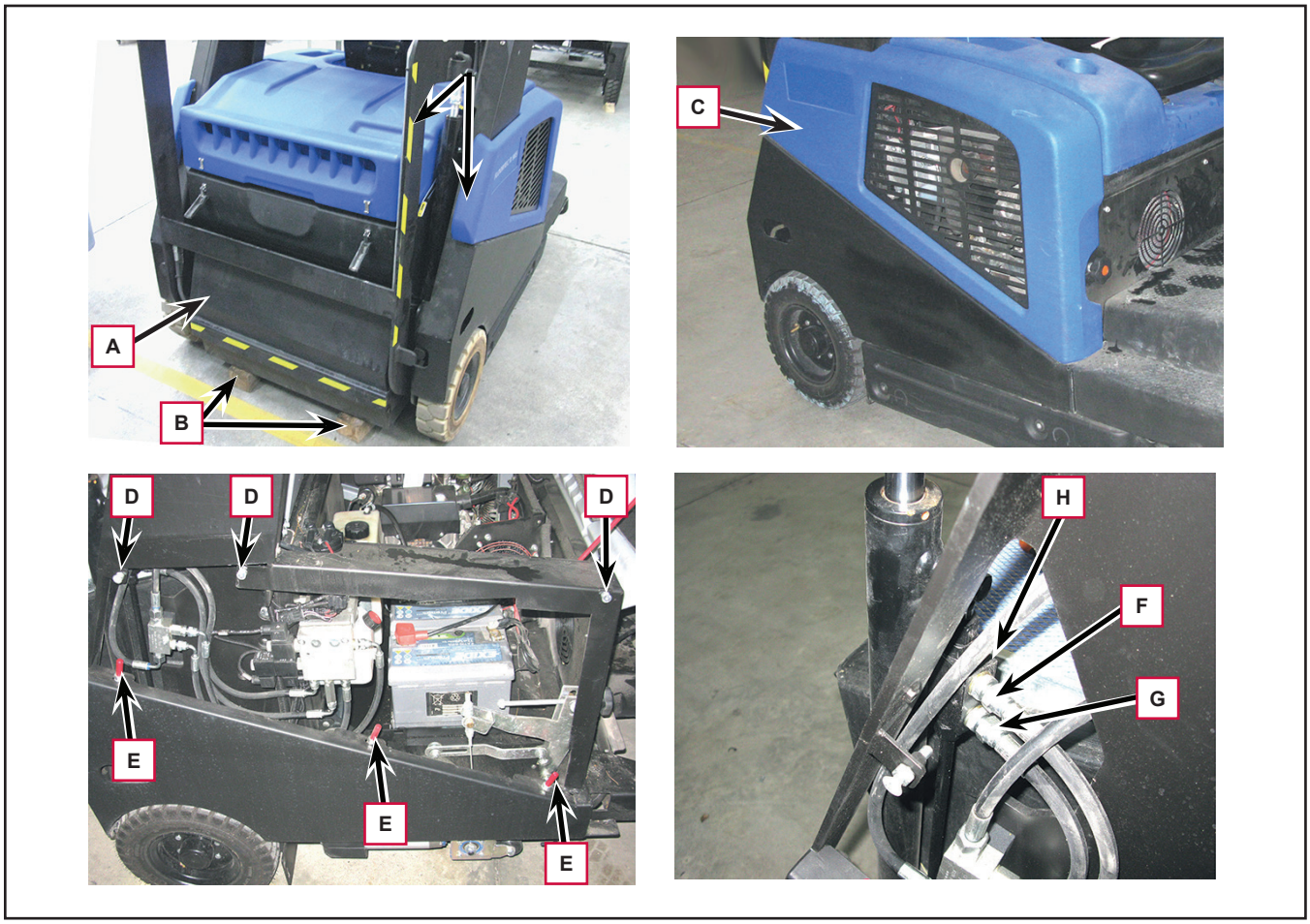


Figure 18:

Hopper Lifting Hydraulic Cylinder (continues)

8. Remove the cover (I), then unscrew the nut below and remove the corresponding upper nut on the hydraulic cylinder (J).

9. Working through the slot (K), unscrew the screw (L) and remove the lower pin (M) of the hydraulic cylinder (J).

10. Remove the hydraulic cylinder (M).

Installation

11. Assemble the components in the reverse order of removal, and note the following:

    - After the installation of the hydraulic cylinder (either the same or a new one), fill the tank with hydraulic fluid up to the Max level, then perform some movements with the hopper (the hydraulic system is self-bleeding); then, check the hydraulic fluid level (see procedure in relevant paragraph).

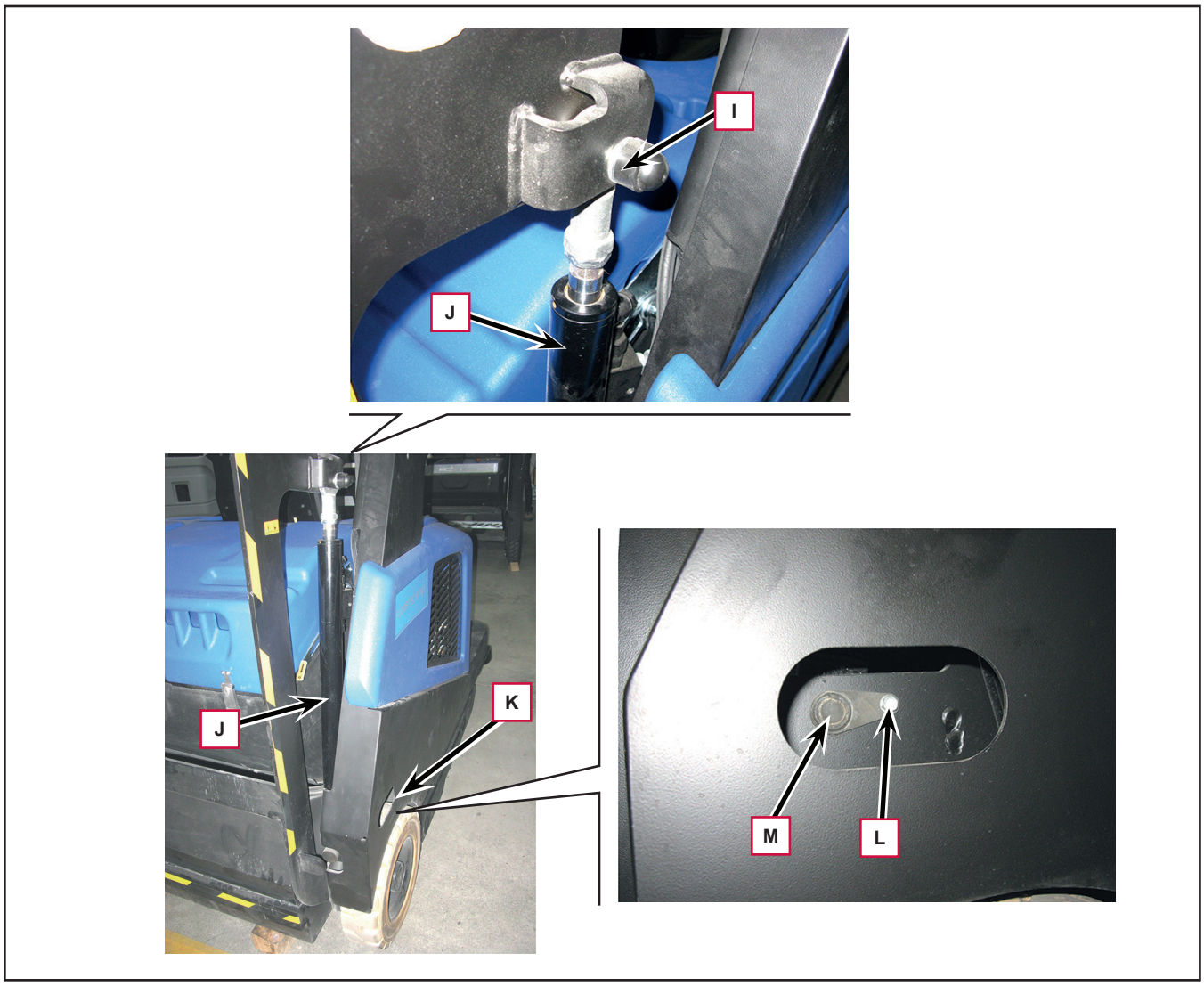


Figure 19:

Hopper Dumping Hydraulic Cylinder

Removal

1. Drive the machine on a level floor.
2. Ensure that the hopper is empty.
3. Lift the hopper to head height.

WARNING: Place a safety rod under the lifted hopper.

4. Turn the ignition key to “0”, then engage the parking brake.
5. Working from the left-hand side of the hopper, unscrew the nut (A) and remove the washer.
6. Supporting the hopper (B), disconnect the rod (C) from the pin, then rotate the hopper downwards.
7. Unscrew the hydraulic cylinder lines (D) and (E), collecting any hydraulic fluid which may come out in a suitable container; immediately plug the disconnected fittings to prevent impurities entering the hydraulic system.

WARNING: Hydraulic system oil is highly corrosive.

WARNING: The hydraulic system oil should be disposed of properly according to the Law in force.

8. Unscrew the screw (F).
9. Remove the cotter (G) and the washer.
10. Remove the hydraulic cylinder (H), disengaging it from the pin (I).

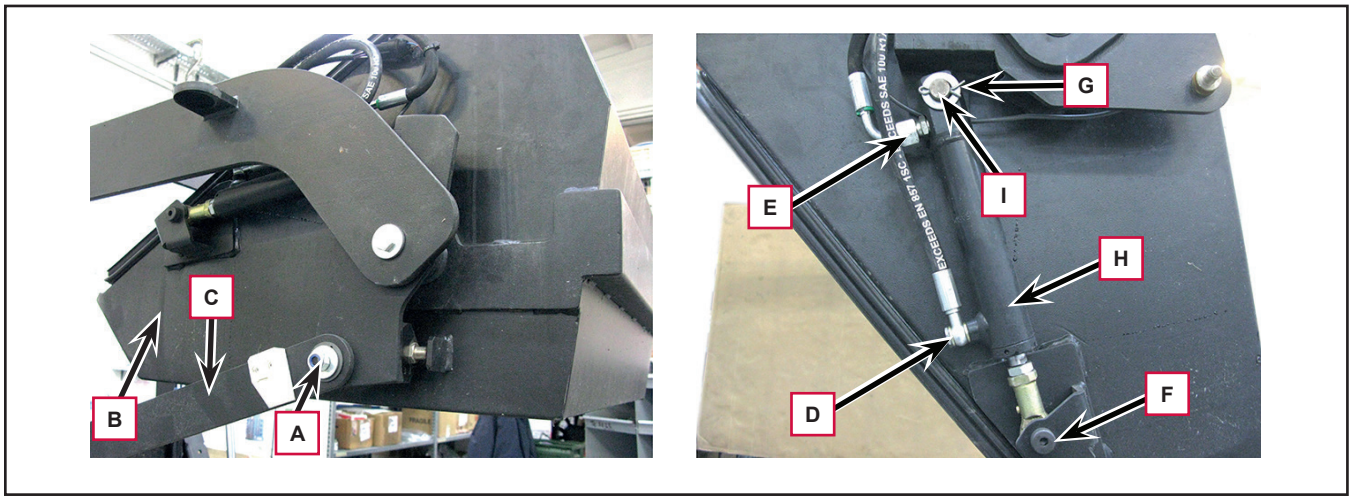


Figure 20:

Hopper Dumping Hydraulic Cylinder (continues)

Installation

11. Assemble the components in the reverse order of removal, and note the following:

    - After the installation of the hydraulic cylinder (either the same or a new one), fill the tank with hydraulic fluid up to the Max level, then perform some movements with the hopper (the hydraulic system is self-bleeding); then, check the hydraulic fluid level (see procedure in relevant paragraph).

Hydraulic Fluid Changing

WARNING: Procedure to be performed with the hopper fully retracted.

Removal

1. Drive the machine on a level floor.
2. Turn the ignition key to “0”, then engage the parking brake.
3. Open the battery/engine compartment hood with the handle and fasten it with the support rod.
4. Unscrew the cap (A) on the hydraulic unit tank, then use a syringe to remove all the hydraulic fluid in the tank.
5. Add the new hydraulic fluid to the tank, filling up to the (MAX) mark (B). Use the hydraulic fluid specified in the Technical Data section.

WARNING: Hydraulic system oil is highly corrosive.

WARNING: The hydraulic system oil should be disposed of properly according to the Law in force.

6. Screw down the cap (A).
7. Close the battery/engine compartment hood using its handle.
8. Following the indications in the Instruction Manual, raise and lower the hopper a few times.
9. Check the system hydraulic fluid level (see procedure in relevant paragraph).

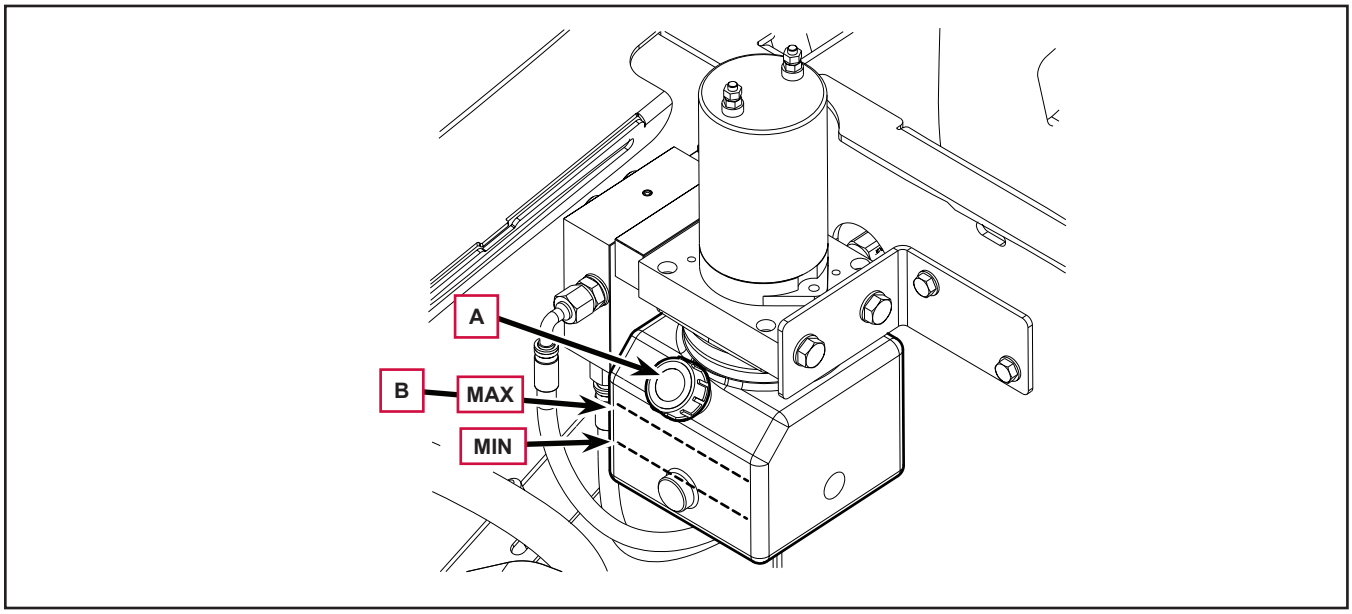
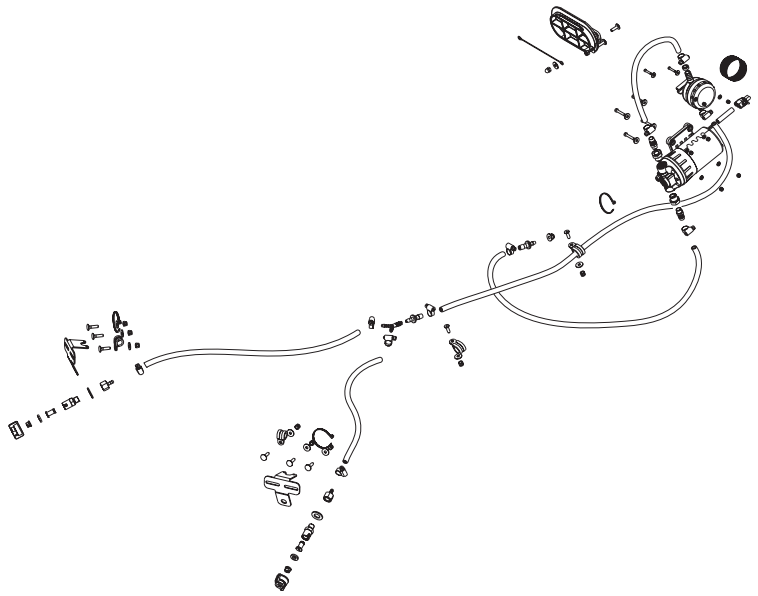
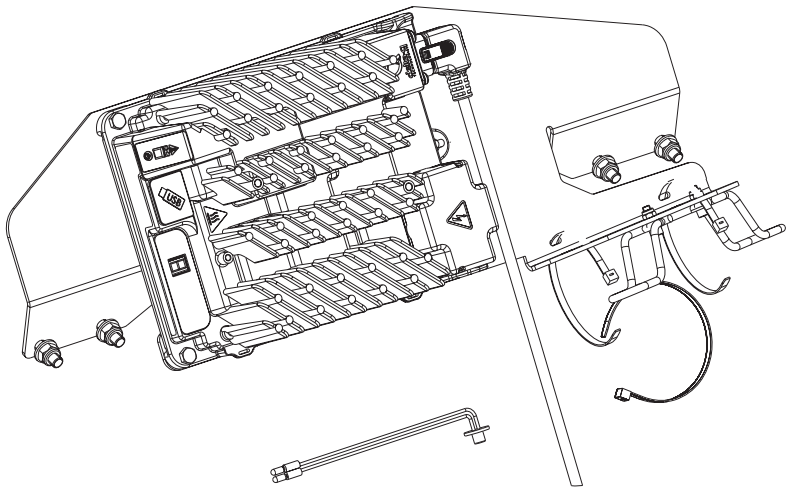
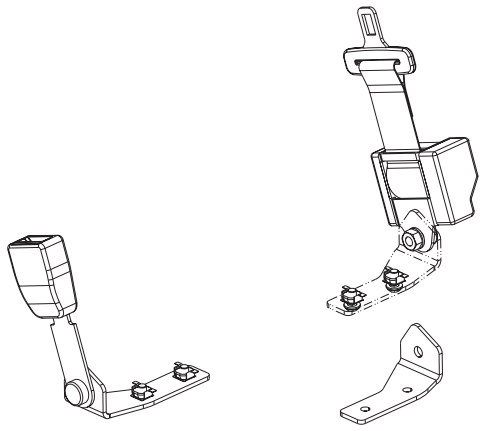


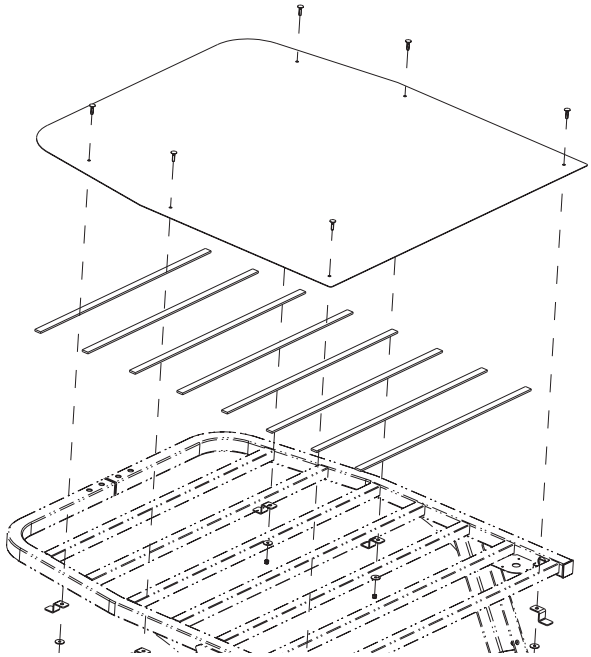
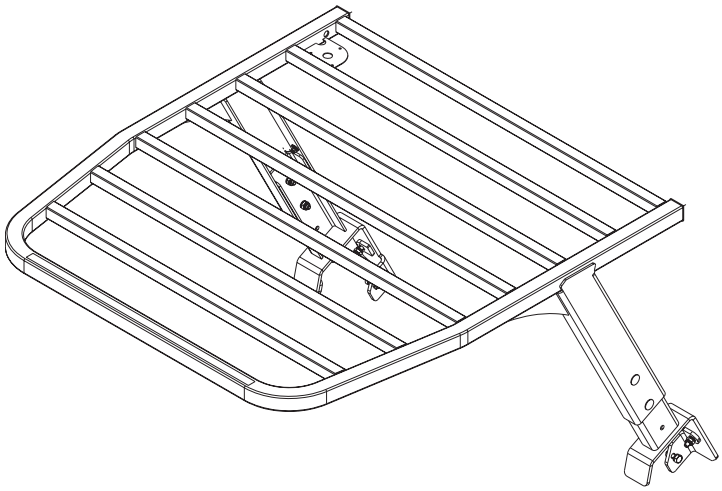
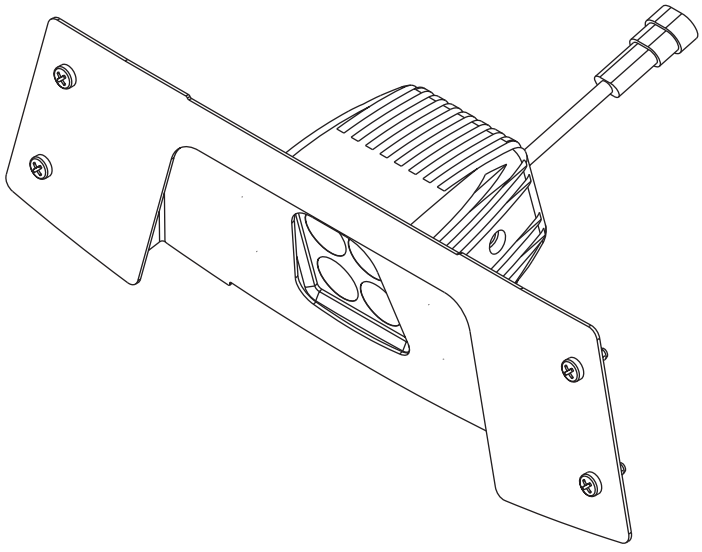
Figure 21:

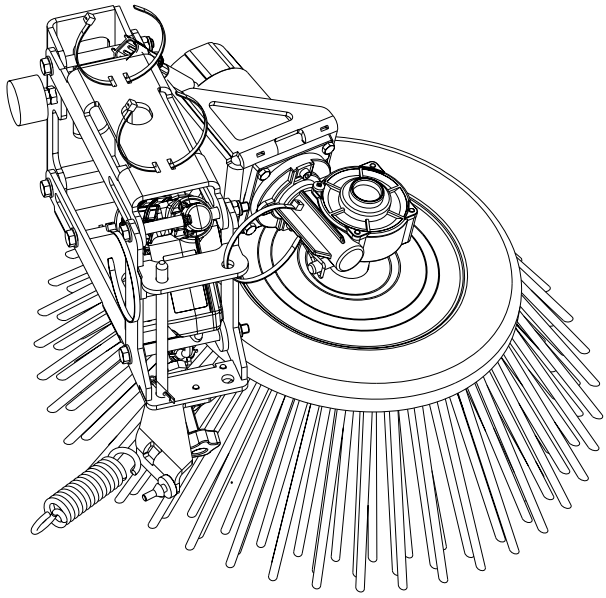
Specifications

Model		SW5500 B FLOORTEC R 985 B	SW5500 D	SW5500 LPG FLOORTEC R 985 LPG
Hopper	Capacity	5.3 ft³ (150 liters)		
	Maximum liftable weight	240 Kg		
	Maximum lifting height	65 in (1,650 mm)		
Hydraulic control unit	Voltage	24V		
	Power	0.8 kW		
	Oil tank capacity	1 litre		
	Hydraulic system oil type	Arnica 46		
	Displacement	1 cc		
	Pressure relief valve calibration	140 ± 2 bar (@ 3l/1')		

90 - Options

Description	Illustration
DUSTGUARD™ SYSTEM KIT (See Dust Guard System chapter)	
HYBRID KIT (See Hybrid System chapter)	
SAFETY BELT KIT	

Description	Illustration
ROOF COVER KIT	
PROTECTION ROOF KIT	
WORKING LIGHT KIT	

Description	Illustration
LEFT SIDE BROOM KIT	
SIDE BROOM GUARD KIT	