

Minuteman[®]
Excellence Meets Clean



Parts and Instruction Manual
E17/E20 Scrubber

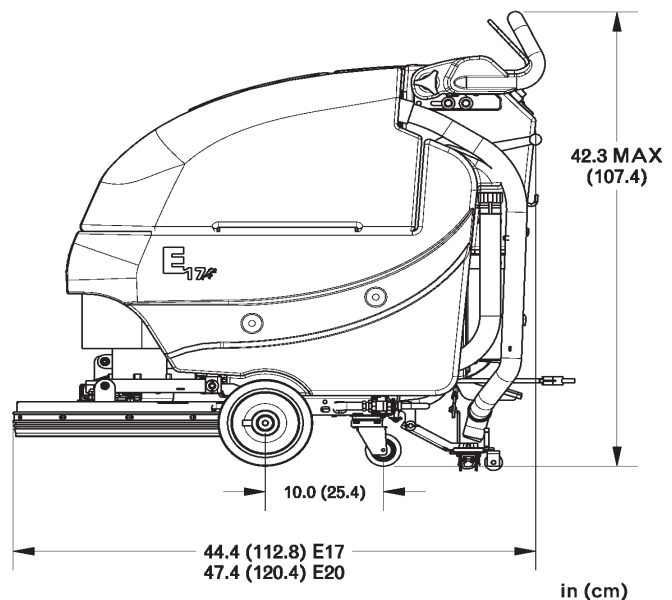
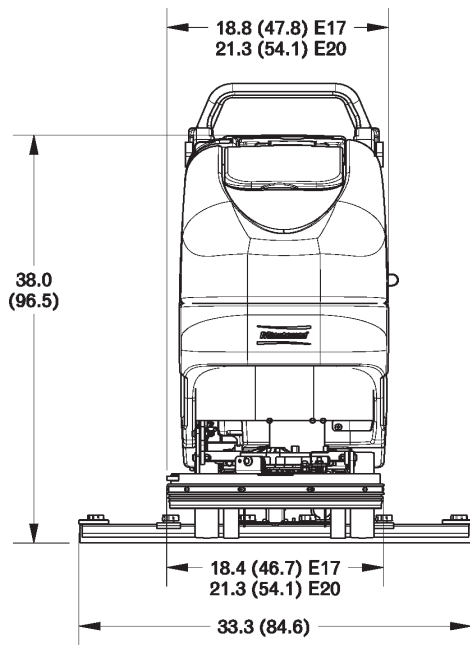
This manual is furnished with each new **MINUTEMAN E17/E20**. This provides the necessary operating and preventive maintenance instructions. Operators must read and understand this manual before operating or servicing this machine.

This machine was designed to give you excellent performance and efficiency. For best results and minimal cost, please follow the general guidelines below:

- Operate the machine with reasonable care.
- Follow the manufacturers suggested maintenance instructions as provided in this booklet.
- Use original Minuteman supplied parts.

TECHNICAL SPECIFICATIONS

Model	E17/E20		
 Model No.	E17BD / E17BDCE / E17BDQP / E17BDQPCE E17BDQPG / E17BDQPGCE E20BD / E20BDCE / E20BDQP / E20BDQPCE E20BDQPG / E20BDQPG		
 Current (Max)	32 amps	Working Width E17	17" (43cm)
Voltage, Batteries	24V	Working Width E20	20" (60cm) E20
Battery Capacity (Lead Acid)	105AH @ 20Hr	Working Speed	2.5 mph (4 km/hr)
Battery Capacity (Gel)	100AH @ 20Hr	Vacuum Flow	65 cfm (110 m ³ /hr)
Sound Level	69 dBA	Vacuum Waterlift	45 in.H ₂ O (112 mbar)
Gross Weight (with Batteries)	310 lbs (141 kg)	Vacuum Power	3/4hp (560W)
Gross Weight (w/o Batteries)	200 lbs (91 kg)	Brush Speed	180 RPM
Squeegee Width	33" (84cm)	Solution Tank Capacity	12 gal (45 ltr)
Working Grade Transport	2%	Recovery Tank Capacity	13 gal (50 ltr)
Working Grade Cleaning	2%		



in (cm)

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Important Safety Instructions

Operators must read and understand this manual before operating or maintaining this machine.

Do not operate this machine in flammable or explosive areas.

This machine is designed solely for scrubbing dirt and dust in an indoor environment. Minuteman does not recommend using this machine in any other capacity.

The following information below may cause a potential hazard to the operator and equipment. Read this manual carefully and be aware when these conditions can exist. Take necessary steps to locate all safety devices on the machine and train the personnel operating the machine. Report any machine damage or faulty operation immediately.

Do not use machine if it is not in proper operating condition.

For Safety During Operation

Keep hands and feet clear of moving parts while machine is in operation.

Make sure all safety devices are in place and operate properly. All covers, doors and latches must be closed and fastened before use.

During operation, attention should be paid to other persons in the work area and especially if small children are present.

Electric motors and components can cause an explosion when operated near explosive materials or vapor. Do not operate this machine near flammable materials such as solvents, thinners, fuels, grain dust, etc.

Store or park this machine on a level surface only. To prevent unauthorized use, machine should be stored or parked with the key removed.

This machine is designed for level operation only. **Do not operate on ramps or inclines greater than 2%.**

This machine is not suitable for picking up hazardous dusts.

Use caution when moving this machine into areas that are below freezing temperatures. Any water in the tanks or hoses can cause damage to the machine.

For Safety When Servicing or Maintaining Machine

Stop on level surface.

Disconnect the power to the machine by pulling the red Battery Connector located under the recovery tank near the batteries.

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

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

Do not clean machine with a pressure washer.

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

SAVE THESE INSTRUCTIONS

Inspection & Unpacking

Carefully unpack and inspect your **E17/E20 Walk-Behind Scrubber** for shipping damage. Follow unpacking instructions on shipping pallet. Each unit has been tested and thoroughly inspected before shipment. Any damage is the responsibility of the delivery carrier who should be notified immediately.

Electrical

This machine is battery operated and designed to operate on 24 volts DC (2) 12-volt batteries.

Batteries

The recommended batteries are rated 105Ah (Minuteman P/N 956712) or 100Ah (Minuteman P/N 956100). We do not recommend mixing AMP hour capacities. Alternate battery sets can be used if they equal physical size and capacity.

Operator Responsibility

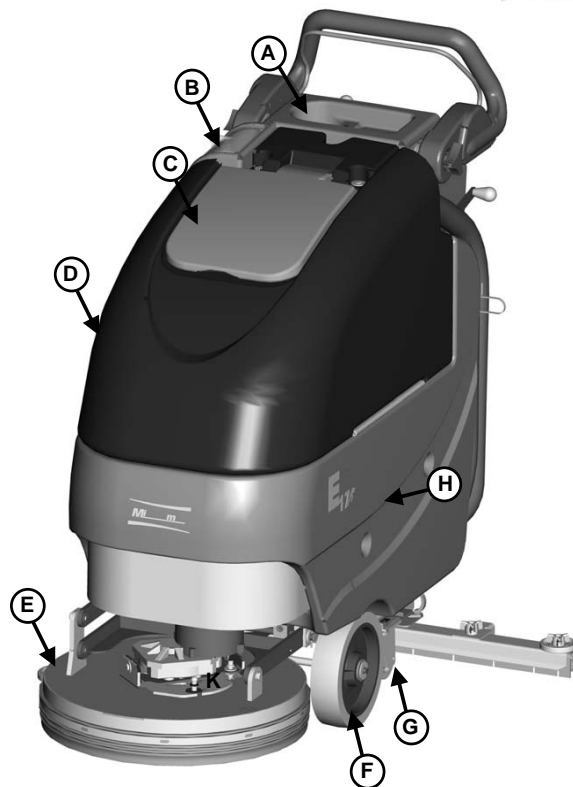
Read this manual carefully before operating this machine.

The operator is responsible in taking care of the daily maintenance and check ups of the machine to keep it in good working condition. The operator must inform the service mechanic or supervisor when the scheduled maintenance intervals are required as stated in the MAINTENANCE section of this manual.

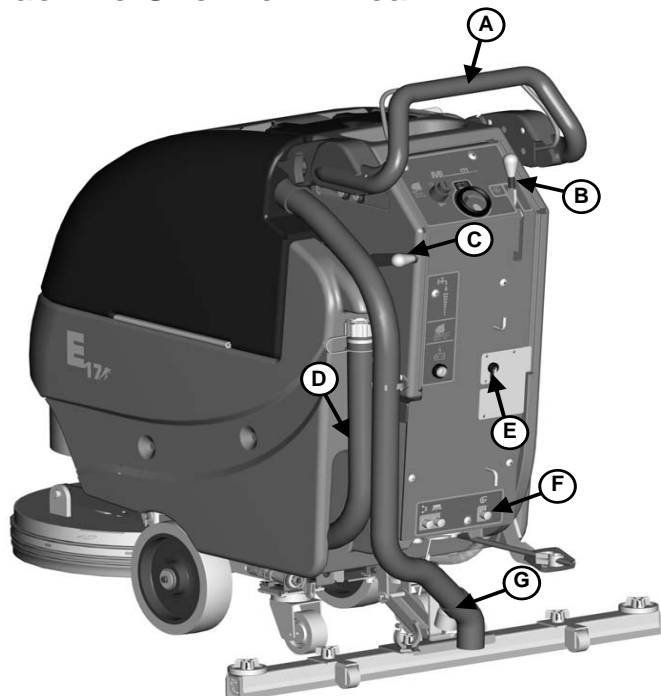
Before starting familiarize yourself with the machine and its controls (see “Machine Overview, Front”, “Machine Overview, Rear”, “Control Console” diagrams).

Machine Overview - Front

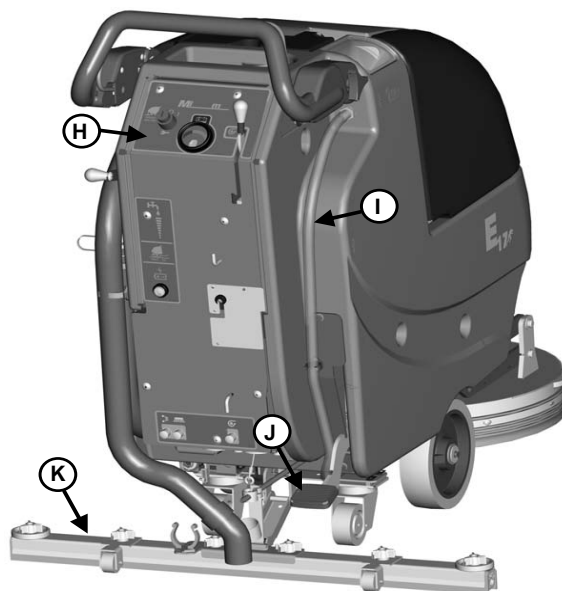
- A CUP HOLDER
- B SOLUTION FILL PORT
- C RECOVERY TANK LID
- D RECOVERY TANK
- E BRUSH DECK
- F FRONT WHEEL
- G REAR CASTER
- H SOLUTION TANK



Machine Overview - Rear



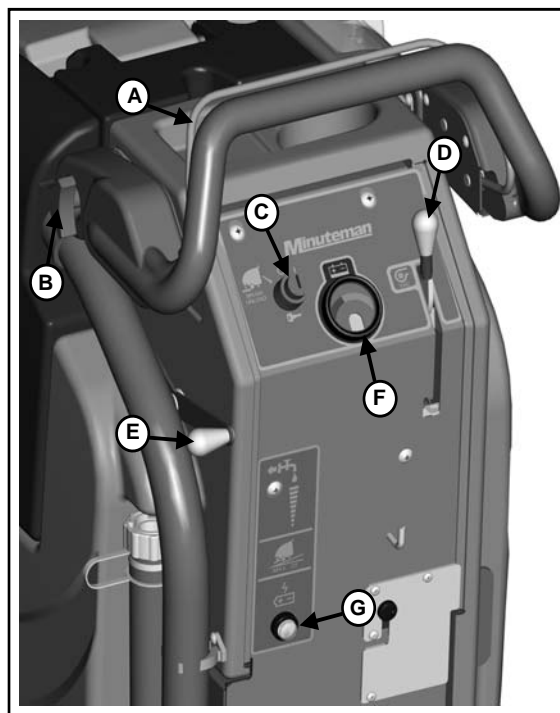
- A BAIL HANDLE
- B SQUEEGEE LIFT LEVER
- C SOLUTION CONTROL LEVER
- D RECOVERY TANK DRAIN HOSE
- E ONBOARD CHARGER CORD
- F CIRCUIT BREAKERS



- G RECOVERY HOSE
- H CONTROL PANEL
- I SOLUTION TANK DRAIN HOSE / LEVEL INDICATOR
- J BRUSH LIFT PEDAL
- K REAR SQUEEGEE

Machine Overview - Control Panel

- A** BAIL HANDLE
- B** HANDLE ADJUSTMENT KNOB
- C** KEY SWITCH
- D** SQUEEGEE LIFT LEVER
- E** SOLUTION CONTROL LEVER
- F** BATTERY GAUGE
- G** CHARGE STATUS INDICATOR



The Control Panel

For operator ergonomics, the control panel houses all the primary functions. Controls are grouped in a central area at the rear of the machine.

Bail Handle

(A) When the scrubdeck is lowered to the floor, The Bail Handle Enables the brush motor and moves the machine forward once depressed. This also allows the operator to automatically load the brush when the scrubdeck is lowered.

Handle Adjustment Knobs

(B) Allows the handle position to be raised or lowered.

Key Switch

(C) Controls the machine's power (Brush Unload/Off/On) with a key for safety. This switch, when turned counter clock-wise, operates the auto brush unload when scrubdeck is in the raised position. When it is turned to the on position, the machine will operate.

Squeegee Lift Lever

(D) When actuated to the top position, the squeegee is lowered and the vacuum motor is turned on. When locked in the bottom position, the squeegee is raised and the vacuum motor shuts off.

Solution Control Lever

(E) This lever controls the rate at which solution is put down. Moving the lever up will increase the amount of solution. Moving the lever down will decrease the solution rate. Moving the lever all the way down shuts off solution flow.

Battery Gauge

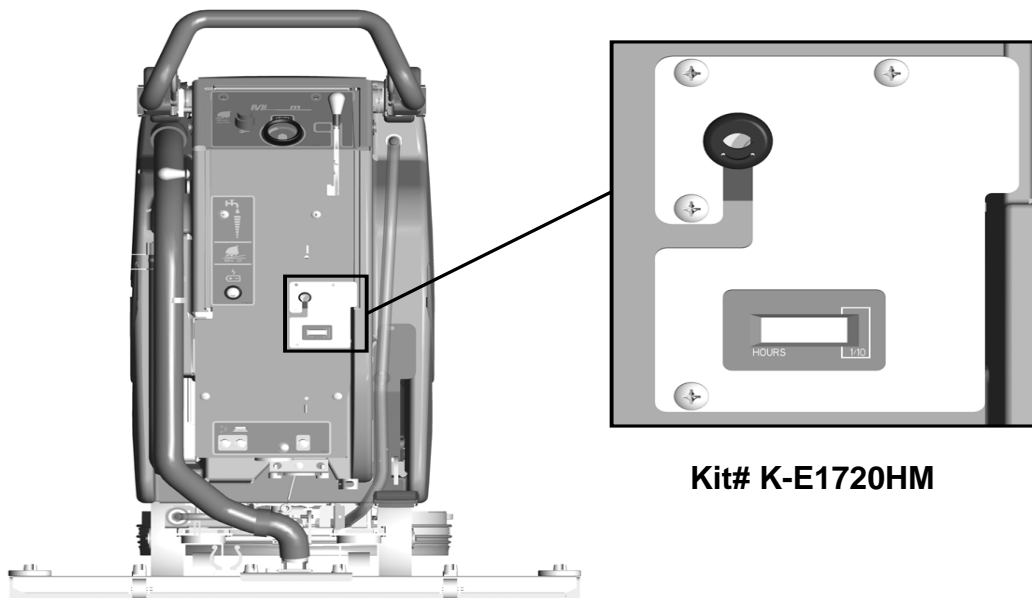
(F) This gauge displays the remaining battery charge.

Charge Status Indicator

(G) This gauge displays the status of the batteries during charging. The gauge has a readout of 3 LEDs. 1 Green, 1 yellow, 1 Red. Green indicating a full charge, Red indicating the batteries are charging.

Optional Hour Meter

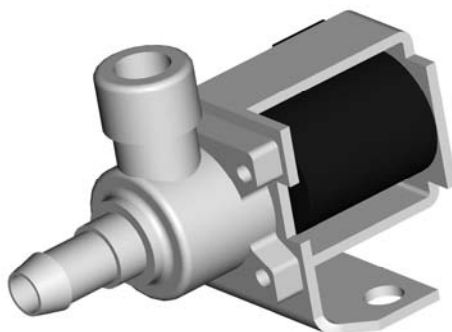
Minuteman offers an optional hour meter for the E17/E20. The optional kit replaces the power cord mounting bracket at the rear of the machine with one that contains an hour meter.



Kit# K-E1720HM

Optional Solution Solenoid

Minuteman offers an optional solution solenoid for the E17/E20. The optional solenoid automatically turns off the solution flow when the brush motor is not active.



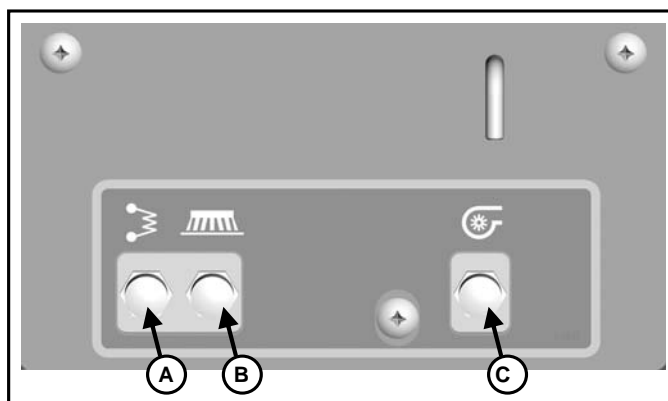
Kit# K-E1720S

Circuit Breakers

The circuit breaker is located at the bottom of the back panel of the machine. The 4-amp breaker **(A)** protects the main controls circuit, The 30-amp breaker **(B)** protects the brush motor circuit, and the 20-amp breaker **(C)** protects the vacuum motor circuit.

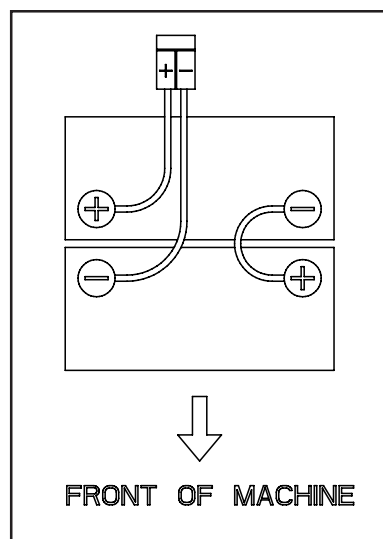
- A** **MAIN CONTROL BREAKER**
- B** **BRUSH MOTOR BREAKER**
- C** **VACUUM MOTOR BREAKER**

If any of the functions above are not operating, check if the circuit breaker buttons have tripped. Press to reset.



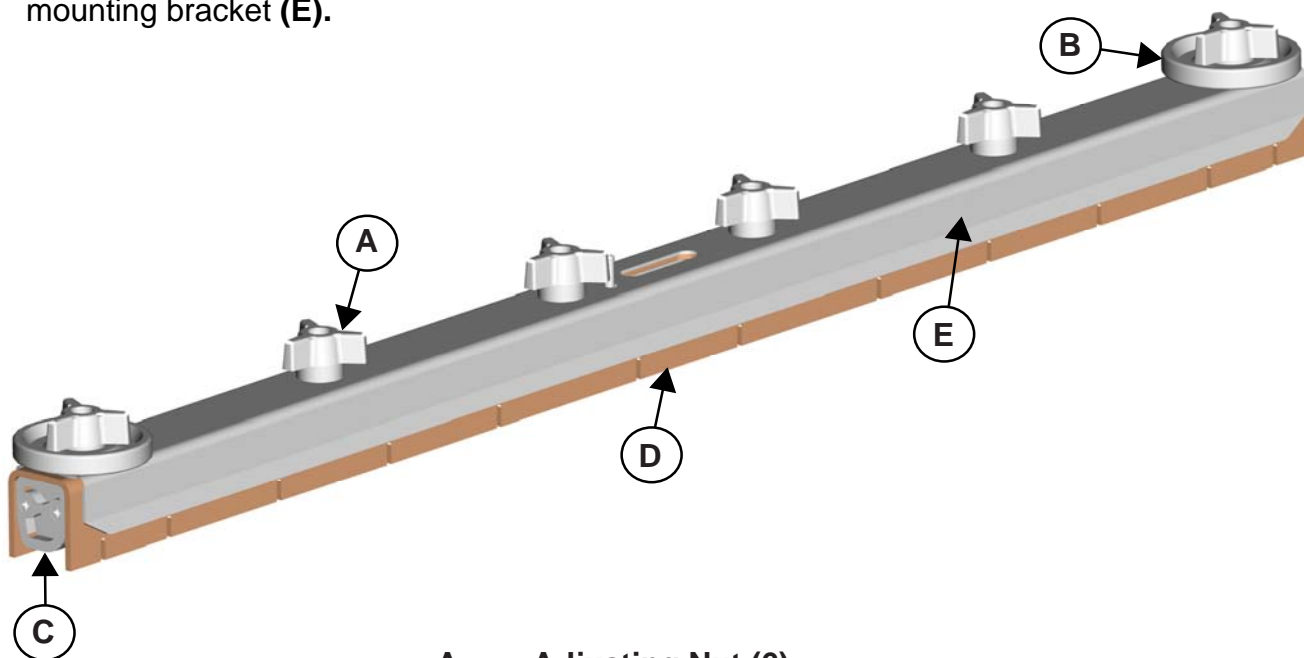
Battery Compartment

The battery compartment is located under the recovery tank. The Battery compartment can be accessed for servicing and maintenance by tilting the recovery tank (make sure recovery tank has been drained before tilting). The battery compartment contains two 12-volt batteries connected in series. Connect the batteries according to the battery connection diagram (see *diagram*). The recommended batteries are 105Ah (Minuteman P/N 956712) or 100Ah (minuteman P/N 956100) Gel. The battery tray may be drained if necessary using the orange drain hose located above the rear caster on the right side of the machine.



Rear Squeegee

The rear squeegee is the main element of the conduit that transfers the spent solution into the recovery tank. A daily maintenance check of this component is essential to have optimum machine performance. The blade configuration has two usable edges and can be turned inside out to utilize the opposite side of the blade. If streaking occurs it is time to turn the blade to good edge or replace if this has already been done. The blade can be accessed by removing the 6 adjusting nuts **(A)**, 2 bumper wheels **(B)**, and the squeegee mounting bracket **(E)**.



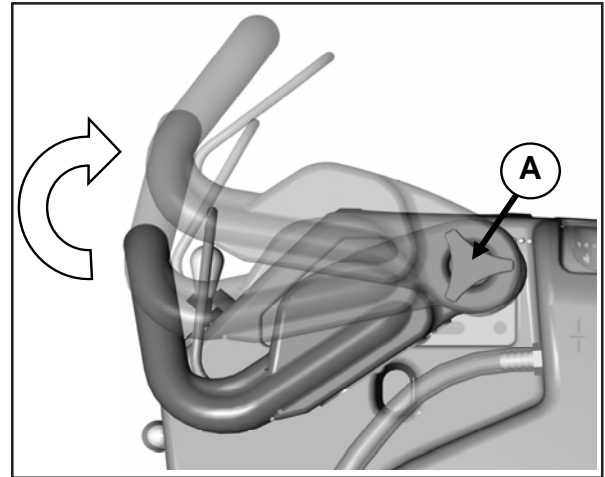
- A** Adjusting Nut (6)
- B** Squeegee Bumper Wheel (2)
- C** Squeegee Casting Assembly
- D** Squeegee Blade
- E** Squeegee Mounting Bracket

Handle Adjustment

The E17/E20 handle was designed with operator comfort in mind. The angle and horizontal position of the handle can be adjusted to suit the needs of the operator.

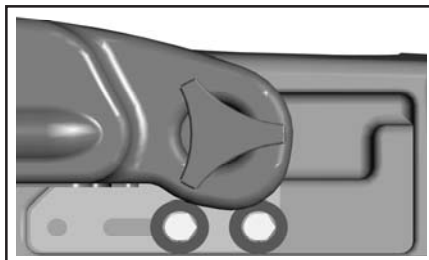
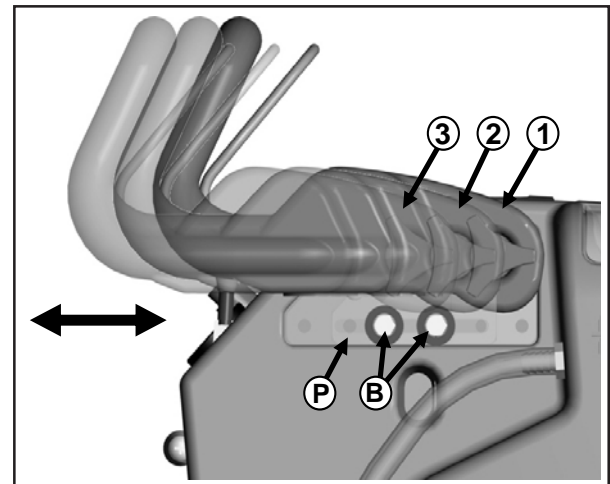
Angle Adjustment

The handle angle can be adjusted without tools by loosening the **angle adjustment knob (A)** on each side and rotating the handle to the desired position. There are 5 angular positions 11.25° apart for a total of 45° between the minimum and maximum position.



Horizontal Adjustment

The horizontal position can be adjusted by removing the 4 **mounting bolts (B)** (2 each side) with a 9/16" socket and sliding the **mounting plate (P)** to one of the 3 available positions. The machine is shipped from the factory in position 1.



**Plate Position 3
(Fully Extended)**

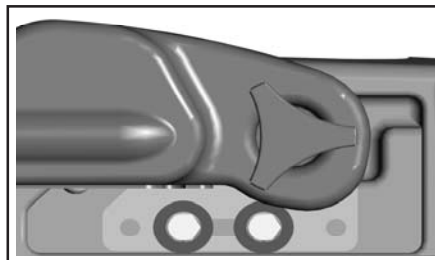
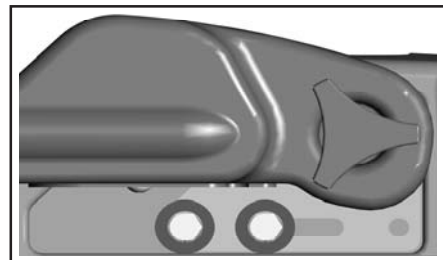


Plate Position 2

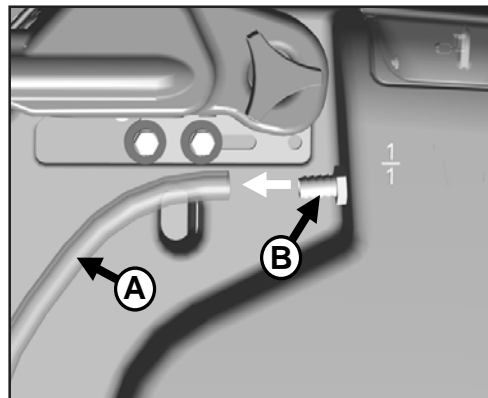


**Plate Position 1
(Shipping Position)**

Solution Tank Drain Hose / Level Indicator

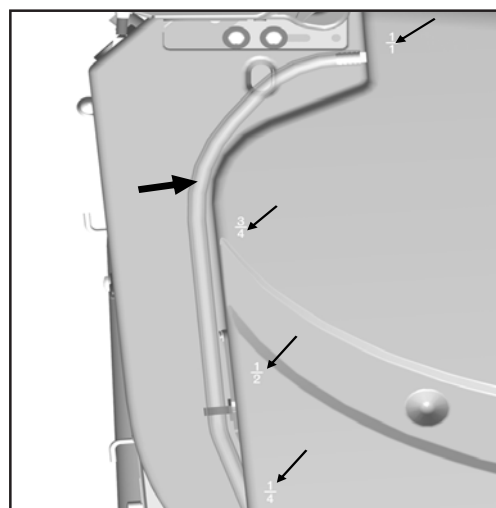
Solution Tank Drain Hose

The solution tank may be drained by removing the **Solution Tank Drain Hose (A)** from the **Hose Barb (B)** and routing the hose to a floor drain.



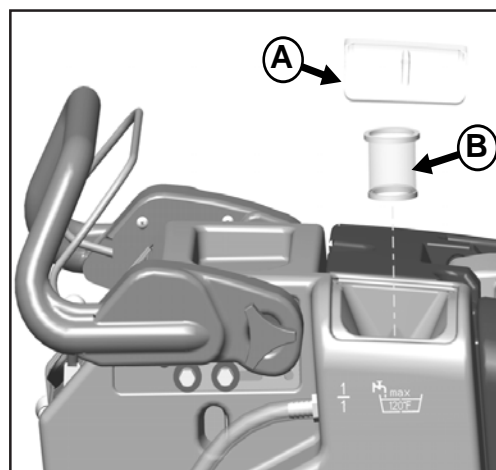
Solution Level Indicator

The Solution Tank Drain Hose also serves as a water level indicator for the solution tank. The amount of water remaining in the solution tank can be seen through the clear drain hose. Level markers molded into the solution tank are positioned at 1/4, 1/2, 3/4, and full levels.



Solution Fill Filter

The **Solution Fill Filter (B)** should be cleaned regularly. To remove, simply open the **Solution Tank Lid (A)** and pull the filter out.

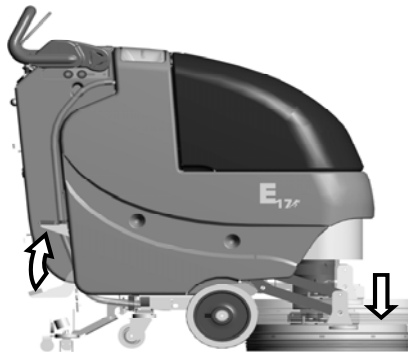


Brush Load / Unload

Loading Brush



To load the brush, first center the E17/E20 brush deck over the scrub brush.

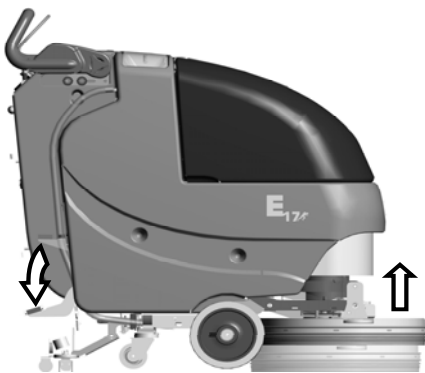


Lower the scrub deck by releasing the deck lift pedal.

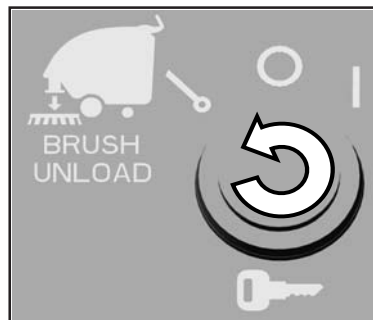


With the key turned on, pull the bail handle to spin the scrub brush onto the scrubdeck.

Unloading Brush



To unload the brush, first lift the scrub deck by pressing down on the deck lift pedal. Make sure the pedal is in the "home" position shown below.



Momentarily (1 to 2 seconds) turn the key to the "Brush Unload" position.

Note: The brush will release only when the key returns to the off position (O).



If done correctly the brush should release from the scrub deck and fall to the floor.

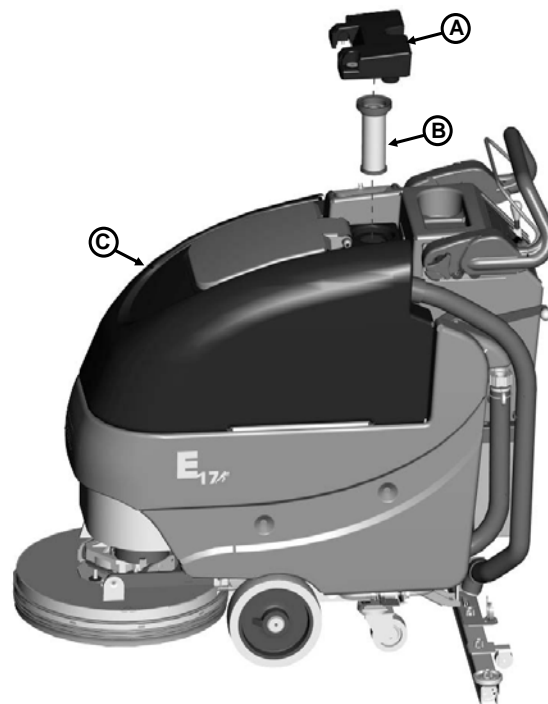
Screened Float

If the recovery tank (C) is overfilled or a large amount of foaming is present, the screened float (B) blocks the vacuum intake inside the tank protecting the vacuum motor and internal electronics from water damage. It is essential to keep the float in working order through regular maintenance.

The float should be cleaned daily by thoroughly rinsing with a hose. Removal of the screened float is not necessary for daily maintenance.

At least once a month the screened float should be completely removed, cleaned, and checked for any damage to the seal or metal screen.

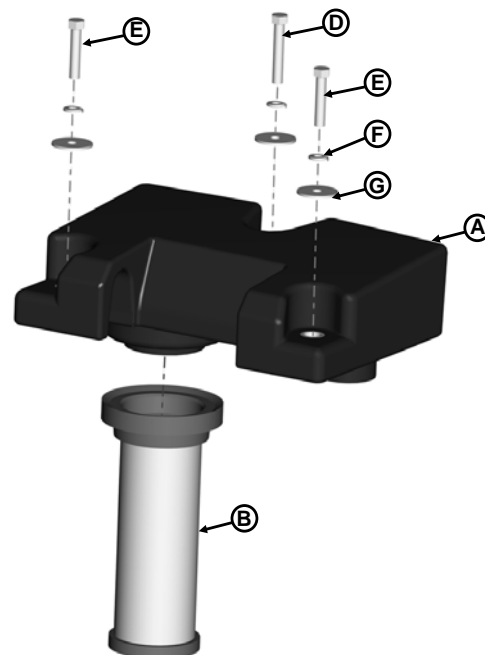
WARNING: Damage to the machine may occur if operated without the screened float properly in place.



Screened Float Removal

The screened float is positioned between the vacuum manifold (A) and recovery tank (C). The screened float (B) can be accessed by removing the 1.5" bolt (D) and two 1.25" bolts (E) that attach the manifold to the recovery tank using a 7/16" socket.

- A Vacuum Manifold
- B Screened Float
- C Recovery Tank
- D 1.5" Bolt
- E 1.25" Bolt (2)
- F Helical Washer (3)
- G Flat Washer (3)



The E17/E20

This machine was designed with total operator comfort and ease of use in mind. All machine components have been designed as a total system to efficiently clean dirty floors. The E17/E20 has two available scrub head types and sizes to fit specific applications. *Please contact your Minuteman representative for specific recommendations for the correct scrub head type, size, and brush type and chemical applications.*

Before using the machine, always perform the following steps to ensure proper machine operation:

- Check under the machine for leaks.
- Check the rear squeegee for wear and damage.
- Check the solution and recovery tank levels.

After using the machine, always perform the following steps:

- Check the battery charge level. Charge batteries if necessary.

When charging batteries, extra precaution is required:

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

Charging batteries generate explosive gasses. **DO NOT CHARGE BATTERIES WHEN OPEN FLAMES OR SPARKS ARE PRESENT. DO NOT SMOKE.** Charge the batteries in a well-ventilated area. Fluid levels should be checked before and after charging and maintained at the proper levels. If low, add distilled water until the metal plates are covered. If the machine is not used for an extended period of time, batteries should be kept fully charged with a boost charge once a week.

- Check for wire, string, or twine wrapped around the scrub brushes.
- Check the rear squeegee for wear and damage.
- Check the rear squeegee suction hose for obstructions.
- Drain and clean the recovery tank.
- Check under the machine for leaks.
- Check the service records to determine maintenance requirements.

WARNING!

Be sure you understand the machine controls and their functions.

While on ramps or inclines, avoid sudden stops when tanks are filled.

Avoid abrupt sharp turns. Slow down driving speed when going downhill.

Machine Operation

To Turn on Machine:

Turn key to operate position (I)

To Turn on Vacuum:

Lower squeegee into operate position, vacuum motor will turn on automatically.

To Turn on Brush Motor:

Move brush lift pedal from the “home” (down) position to the operating position (up). Depress the operator bail handle. Brush motor will turn on and assist to propel the machine forward.

To Turn on Cleaning Solution:

Move solution lever from closed (down) position up to the desired flow position.

NOTE: When you no longer want solution or stop the machine for an extended period of time, you must move the solution lever back to the closed (down) position. Otherwise, solution will continue to flow onto the floor.

To Unload Brush/Pad Driver

Raise the brush deck with the deck lift pedal, foot pedal must be in its “home” position for the brush to unload. Turn operator keyswitch to the Brush Unload position for approximately 1-2 seconds, then release keyswitch back to off position (O). Brush will release and fall to the floor.

CAUTION: Make sure brush deck is clear of all personnel and obstructions before operating Brush Unload.

To Charge Batteries:

When the battery status indicator reaches the red zone the batteries need to be recharged. Take the machine to a well ventilated area, unwind the battery charger power cord from the electrical box cover and plug into an appropriate power source. After approximately 10 seconds the battery charge status indicator will turn on. Be sure to check the battery water levels as recommended.

WARNING: Charging batteries generates explosive gasses. Do not charge batteries when open flames or sparks are present. Do not smoke. Charge the batteries in a well-ventilated area.

Optional Equipment Operation:

Hour Meter:

Hour meter will automatically record operating time of the brush motor.

Solution Solenoid:

Water solenoid will operate when the brush motor is turned on. The solution lever must be moved to the desired operating position, but does not need to be moved to the closed position when stopping for brief periods.

After Use

When finished scrubbing, lift the scrub deck and turn the solution lever off, water flow will cease. Lift the rear squeegee (the vacuum motor will turn off). Move the machine to a service area for daily maintenance and review items that may need service.

Empty the solution tank, by disconnecting the **solution tank drain hose** from the barb fitting over a drain. Rinse the tank with clean water to prevent any build-up of dried chemicals that could clog the plumbing.

Empty and clean the recovery tank by flushing with a hose. Be sure to also clean the float shut off screen.

Remove the **brushes** or pad holders and rinse them in warm water and hang to dry.

Remove the **rear squeegee**, rinse with warm water and reinstall after cleaning.

Check the **maintenance schedule** in the next section and perform any required maintenance before storing the machine.

Store the machine indoors in a clean dry place. Keep from freezing. Leave solution and recovery tank lids open for ventilation to prevent odor build-up.

Turn **Key switch OFF (O)** and remove key.

Maintenance

Daily	Weekly	Monthly	Yearly
Charge Batteries	Check Each Battery Cell(s) Water Level	Lubrication – Grease Fittings	Check Carbon Brushes
Check/Clean Tanks & Hoses	Inspect Scrub Housing Skirts		
Check/Clean/Rotate the Brushes/Pads	Inspect and Clean Solution Filter		
Check/Clean the Squeegee			
Check/Clean Vacuum Shut-Off Float in Recovery Tank			

Have a qualified service technician check the vacuum motor carbon motor brushes once a year or after 300 operating hours. The brush motor carbon brushes should be checked every 500 hours or once a year.

NOTE: Refer to the Service Manual for more detail on maintenance and service repairs.

Regularly scheduled lubrication of certain machine parts should be performed to insure trouble-free operation of the machine. *Apply a generous amount of grease into the fittings on the machine until grease seeps out around the bearings.*

The grease points are listed below:

Rear squeegee caster wheel axle (2)

Rear squeegee caster swivel (2)

Apply lubricant or light machine oil to lubricate the:

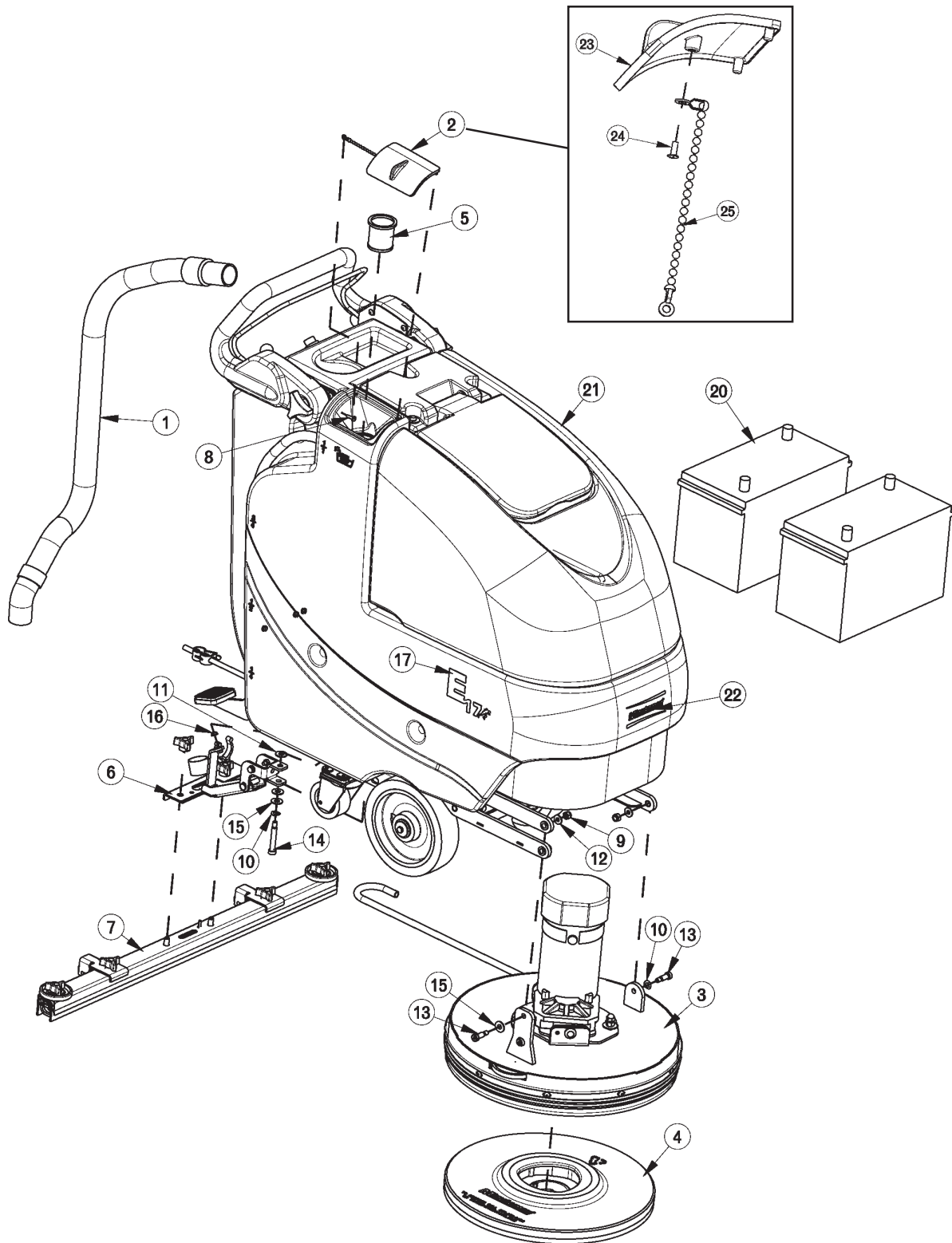
Rear squeegee general pivot points

Scrub deck linkages

General Machine Troubleshooting

Problem	Possible Cause	Remedy
Poor water pick-up	Worn or torn squeegee blades	Rotate or replace blades
	Recovery tank full	Empty recovery tank
	Recovery tank drain hose leak	Secure drain hose cap or replace
	Recovery tank lid gasket leak	Replace gasket lid cover properly
	Debris caught in squeegee	Clean squeegee
	Vacuum hose clogged	Remove debris and flush hose
	Using too much solution	Adjust solution control valves
	Recovery hose to squeegee or recovery tank disconnected or damaged	Reconnect or replace recovery hose
Poor scrubbing performance	Worn brushes	Rotate or replace brushes
	Wrong brush or cleaning chemical	Consult Minuteman
	Debris caught on scrub brushes	Remove debris
	Moving machine too fast	Slow down
	Not using enough solution	Adjust solution flow setting
	Low battery charge	Recharge batteries
Inadequate solution flow or no solution to the floor	Solution tank empty	Fill solution tank
	Solution lines, valves, filter or spray jets clogged	Flush lines, and clean solution filter and spray jets
	Solution Lever in down position	Move lever up
Machine does not operate	Tripped Control Power circuit breaker	Reset breaker
	Batteries have low charge	Recharge batteries
	Battery charger operating	Unplug battery charger when charge is complete
Vacuum motor does not turn on	Recovery tank full	Empty recovery tank
	Excessive foaming in recovery tank.	Empty recovery tank.
		Use less or change chemical.
		Use defoaming agent.
	Carbon Brushes worn	Replace carbon brushes
	Vacuum switch disconnected	Connect wiring
	Tripped vacuum motor circuit breaker	Reset breaker
	Broken vacuum limit switch	Replace switch
Squeegee in raised position	Lower squeegee	
Brushes do not unload	Foot pedal not in "home" position	Place pedal in notch
	Tripped brush motor circuit breaker	Reset breaker
	Broken brush motor switch	Replace switch
	Damaged brush block or drive hub	Replace

Exploded Views Main Assembly

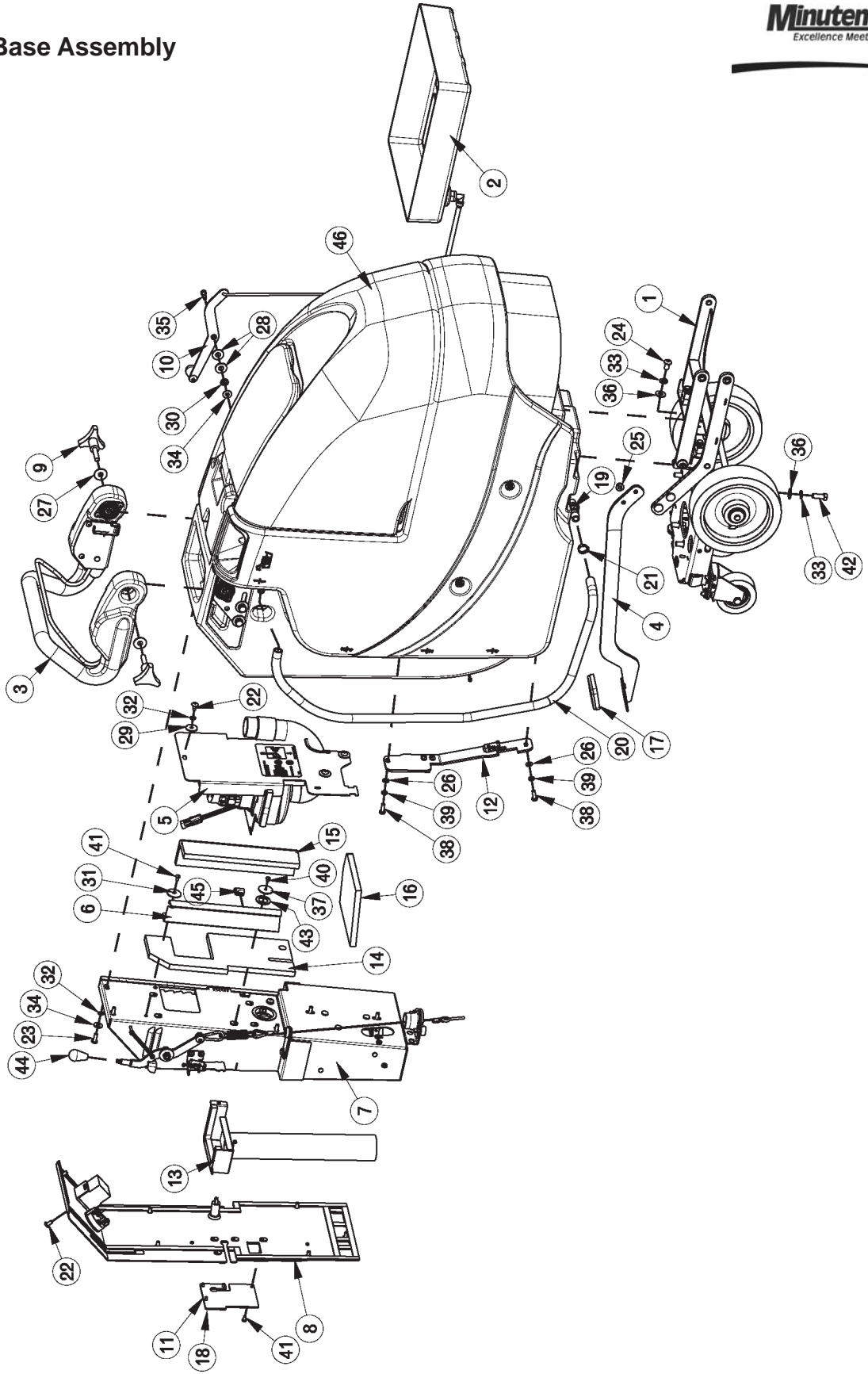


Main Assembly BOM

BILL OF MATERIAL			
ITEM	PART NO.	REQ'D	DESCRIPTION
1	172010	1	HOSE, CLEAR VAC W/ 45 CUFF
2	172018	1	SOLUTION TANK LID ASSY
3	172090	1	BRUSH DECK ASSY 17"
3A	172100	1	BRUSH DECK ASSY 20"
4	172117-2	1	17" PAD DRIVER
4A	172120-2	1	20" PAD DRIVER
5	172159	1	FILTER, FILL PORT, ES1720
6	172170	1	BD SQUEEGEE LIFT MECH ASSY
7	210080	1	SQUEEGE ASY COMP 20" STR
8	711118	1	SCR-ST-A 10 X .75 SS
9	711374	3	NUT-NYLOC 5/16-18
10	711523	3	WSR-WAVE .37X .68 X .08
11	711569	1	WSR-FLT .390 X .880 X .062 NYL
12	711575	3	WSR-FLT .31x.75x.06ST
13	712081	3	SHOULDER BLT 5/16-18 X 3/8 X .75
14	712143	1	BLT-SHLD 3/8 X 2.0, 5/16-18
15	712301	3	WSR-FLAT .37 X .87 X .06
16	712908	2	NUT-FLANGED WIZZ 10-24
17	715917	2	DECAL, E17
17A	715920	2	DECAL, E20
18	740164-1	1	JUMPER CABLE ASSY, RED 4G 12"
19	747649	1	CABLE ASSY, BATTERY E17
20	956712	2	BATTERY, 12V 105 AH
20G	956100	2	GEL BATTERY 12V 100AH
21	172001BD-120	1	BRUSH DRV BASE ASSY-120V CHARGER
21CE	172001BD-230	1	BRUSH DRV BASE ASSY-230V CHARGER
22	715914W	1	DECAL, MINUTEMAN W/SWOOSHES, WHITE
23	172008	1	SOLUTION TANK LID
24	712145	1	SCR-MC 6-32 X .37 PPH SS
25	172123	1	CHAIN, BEADED SS W/ EYELETS

OPTIONAL BRUSHES		
ITEM	PART NO.	DESCRIPTION
4.1	172117-1	BRUSH, 17" NYLON
4.2	172117-3	BRUSH, 17" NYLO GRIT
4.3	172117-4	BRUSH, 17" STRATA GRIT
4A.1	172120-1	BRUSH, 20" NYLON
4A.2	172120-3	BRUSH, 20" POLY GRIT
4A.3	172120-4	BRUSH, 20" STRATA GRIT

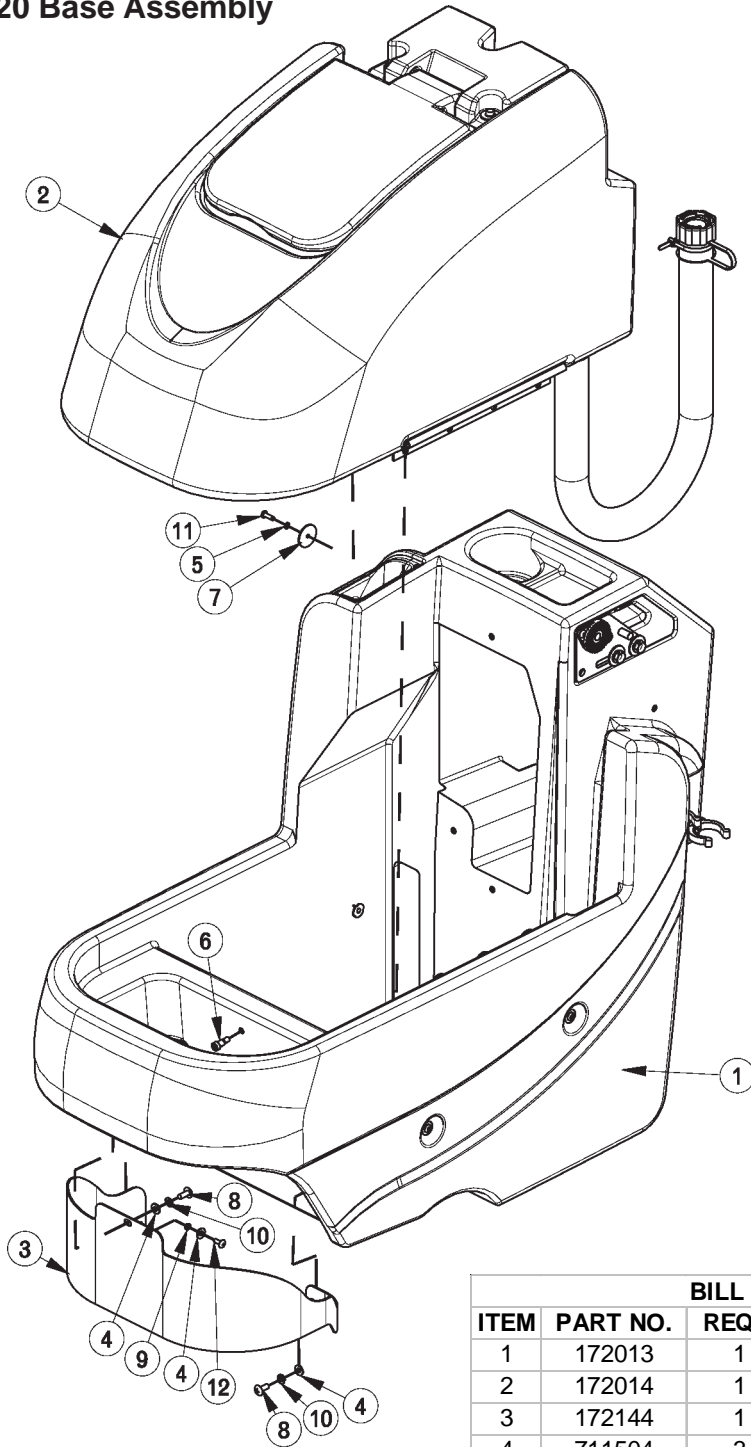
Brush Drive Base Assembly



Brush Drive Base Assembly BOM

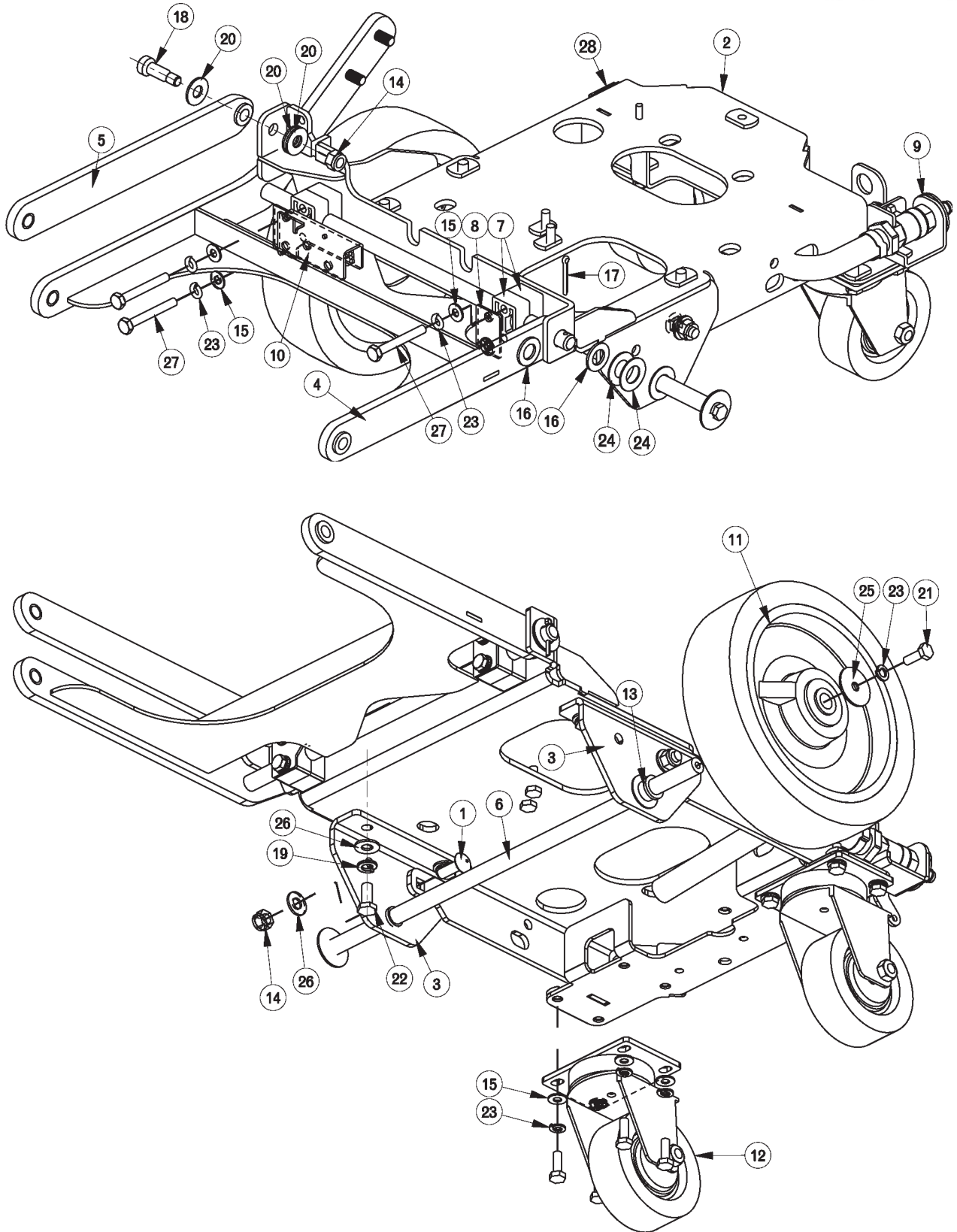
BILL OF MATERIAL - 172001BD-120/230			
ITEM	PART NO.	REQ'D	DESCRIPTION
1	172002	1	BD CHASSIS ASSY, ES1720
2	172012	1	BATTERY TRAY ASSY
3	172016	1	E1720 BD HANDLE ASSY
4	172032	1	LIFT PEDAL WMT
5	172050	1	VAC MOTOR ASSY
6	172055	1	BKT, VAC AREA INSIDE COVER
7	172070-120	1	ELEC BOX BD ASSY 120V
7A	172070-230	1	ELEC BOX BD ASSY 230V
8	172073	1	BD ELEC BOX COVER ASSY
9	172085	2	KNOB, 3/8-16 STUD, 3 LOBE
10	172112	1	SOL CONTROL ASSY
11	172129	1	BKT, PWR CORD MOUNT
12	172157	1	LIFT PEDAL STOP ASSY
13	172179	1	CHARGER INLET ASSEMBLY
14	172184	1	FOAM COVER, REAR 1
15	172185	1	FOAM COVER, REAR 2
16	172187	1	FOAM COVER, FRONT 2
17	210142	1	PEDAL PAD
18	293080	1	STRAIN RELIEF-HEYCO 1207
19	342440	1	FITTING, TEE 3/4MPT 1/2BARB PP
20	430156	1	HOSE, 1/2 X 42 CLEAR
21	450093	2	CRIMP CLAMP 3/4" STEPLESS
22	710178	10	SCR-MC 1/4-20 X .50 TRUSS STPL
23	710380	5	SCR-MC RD HD 1/4-20 X .75 STL PL
24	710985	2	SCR-SC 3/8-16 X .62 ST PL
25	711379	2	NUT, FLANGED WIZZ 5/16-18
26	711504	2	WSR-FLAT 1/4 ID SS
27	711507	2	WSR-FLAT .37 X 1.12 X .06
28	711508	2	WSR-FLAT .44X 1.0X.08
29	711519	3	WSR- FLAT .25 X 1.01 X .06
30	711523	1	WSR-WAVE .37X.68 X.08
31	711543	1	WSR-HELICAL #10
32	711544	9	WSR-HELICAL 1/4
33	711546	6	WSR-HELICAL 3/8
34	711575	6	WSR-FLT .31x.75x.06ST
35	712041	1	BLT- SHLDR 1/4-20 X .44 X .37
36	712301	6	WSR-FLAT .37 X .87 X .06
37	712312	2	WSR-FLAT .187 X 1.25
38	712562	2	BOLT-HH 1/4-20X3/4 SS
39	712758	2	WSR-HELICAL 1/4 SS
40	712800	1	SCR-MC 10-24 X .25 ST PL
41	712810	5	SCR-MC 10-24 X .37 ST PL
42	713042	4	BLT-HH 3/8-16 X 1 #5
43	717025	1	WSR-FLAT 13/16ID X 1.25 X .08
44	760592	1	KNOB, OVAL TAPERED
45	809443	1	CLIP-WIRE & CORD
46	172001BASE	1	ES1720 BASE ASSY

E17/20 Base Assembly



BILL OF MATERIAL - 172001BASE

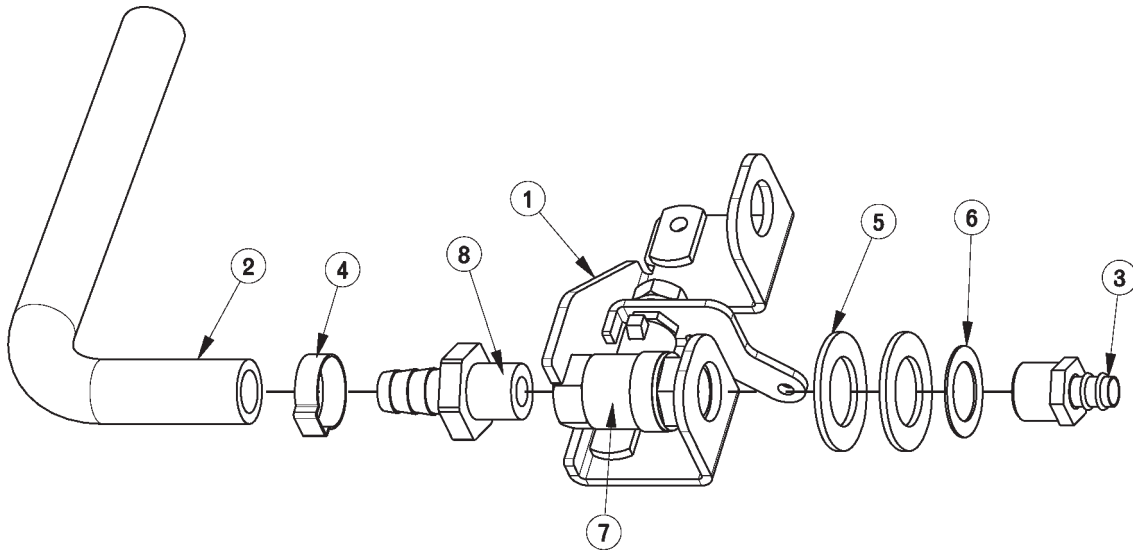
ITEM	PART NO.	REQ'D	DESCRIPTION
1	172013	1	SOL TANK ASSY, ES1720
2	172014	1	REC TANK ASSY
3	172144	1	PANEL, FRONT 1720
4	711504	3	WSR-FLAT 1/4 ID SS
5	711543	4	WSR-HELICAL #10
6	712041	1	BLT- SHLDR 1/4-20 X .44 X .37
7	712312	4	WSR-FLAT .187 X 1.25
8	712565	2	SCR-MC 1/4-20X.63 SS TR HD
9	712757	1	WSR - HELICAL #10 SS
10	712758	2	WSR-HELICAL 1/4 SS
11	712812	4	SCR-MC 10-24 X .62 PPH ST PL
12	712822	1	SCR-MC TR HD 10-24 X .50 SS



Chassis Assembly BOM

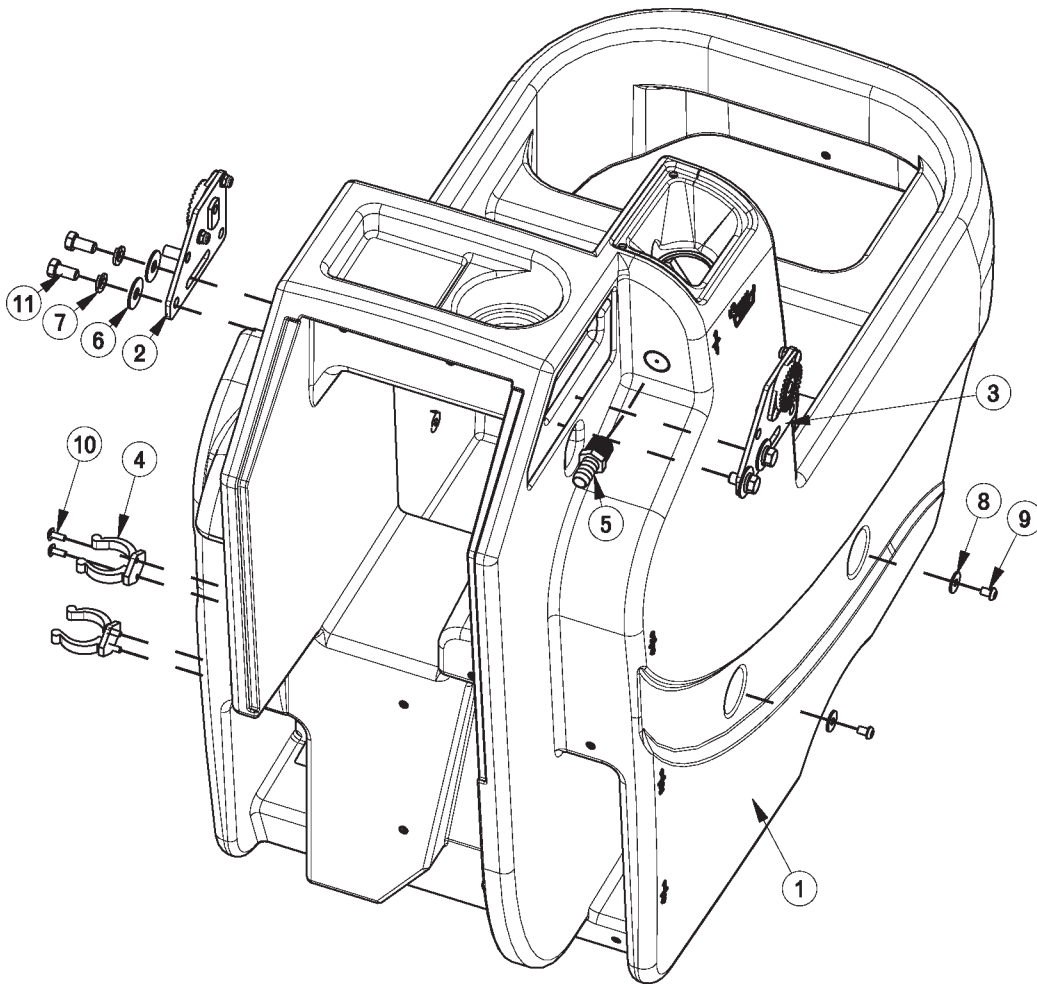
BILL OF MATERIAL - 172002			
ITEM	PART NO.	REQ'D	DESCRIPTION
1	70-516-16	2	BLT-CAR 5/16-18 X 1.00
2	172020	1	MAIN FRAME WMNT, ES1720
3	172024	2	WHEEL BRACKET, ES1720
4	172025	1	DECK LIFT ASSY
5	172030	1	BAR, UPPER DECK LIFT W/ BUSH
6	172035	1	WHEEL ROD, ES1720
7	172038	4	BEARING BLOCK
8	172039	1	BEARING BLOCK PLATE
9	172064	1	SOLUTION VALVE ASSY
10	172110	1	DECK SWITCH ASSY
11	172130	2	WHEEL 8 X 2.0 X .5 BORE
12	172167	2	CASTER, 3-1/2 POLYURETHANE
13	260041	2	OILITE FLANGE BUSHING
14	711374	3	NUT-NYLOC 5/16-18
15	711504	12	WSR-FLAT 1/4 ID SS
16	711592	2	WSR-FLAT .50 X .9 X .075 NYL
17	711809	1	COTTER PIN, 1/8 X 1.0
18	712081	1	SHOULDER BLT 5/16-18 X 3/8 X .75
19	712140	4	WSR-HELICAL 5/16 SS
20	712301	3	WSR-FLAT .37 X .87 X .06
21	712562	12	BOLT-HH 1/4-20X3/4 SS
22	712575	4	BLT-HH 5/16-18 X .75 SS
23	712758	14	WSR-HELICAL 1/4 SS
24	712760	4	WSR-FLAT .56X1.06X.04 SS
25	712761	2	WSR-FLAT .28 X 1.25 X .059SS
26	712772	6	WSR-FLAT .344 x .75 x .06 SS
27	713007	4	BLT-HH 1/4-20 X 2 #5
28	809444	1	CLIP-CORD

Solution Valve Assembly



BILL OF MATERIAL - 172064

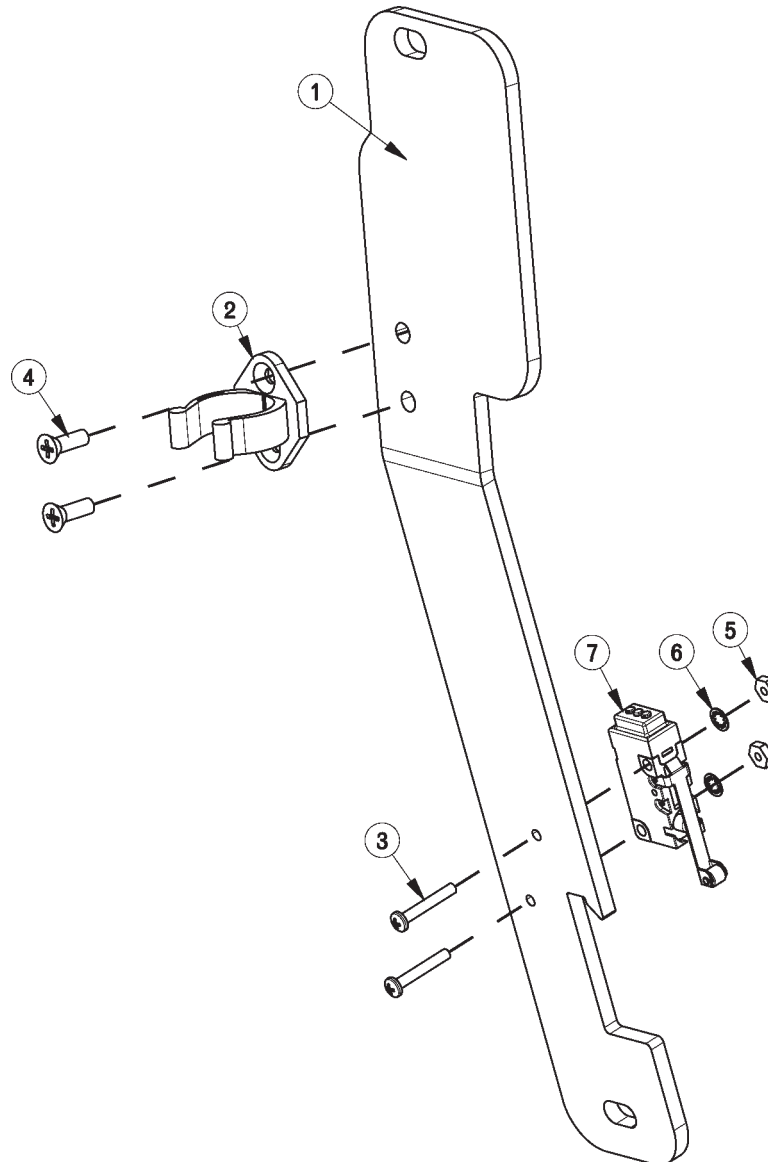
ITEM	PART NO.	REQ'D	DESCRIPTION
1	172063	1	BKT, SOL VALVE MOUNT
2	172158	1	HOSE, 1/2"ID X 7.5" NYLOBRAID
3	320265	1	FITTING DUBL 3/8HBx3/8MPT
4	383347	1	CRIMP CLAMP 1/2 HOSE SS 185R
5	711512	2	WSR-FLAT .75X1.37X.08
6	711513	1	WSR-FLAT .69 X 1.06 X .03 SS
7	809415	1	VALVE, 3/8 FPT, 45 OPEN/CLOSE
8	827008	1	FITTING, 3/8 MPT 1/2 HOSE



BILL OF MATERIAL - 172013

ITEM	PART NO.	REQ'D	DESCRIPTION
1	172003	1	SOLUTION TANK, ES1720
2	172080	1	HANDLE MOUNT ASSY, LEFT
3	172082	1	HANDLE MOUNT ASSY, RIGHT
4	260579	2	TOOL CLIP, 1.5" HOSE
5	342438	1	FITTING, 1/2 MPT 1/2 HB BRASS
6	711507	4	WSR-FLAT .37 X 1.12 X .06
7	711546	4	WSR-HELICAL 3/8
8	711550	4	WSR NYLON .25 ID X .75 OD
9	712146	4	SCR-SC BHCS 1/4-20 X .37 SS
10	712822	4	SCR-MC TR HD 10-24 X .50 SS
11	713041	4	BLT-HH 3/8-16 X 3/4 #5

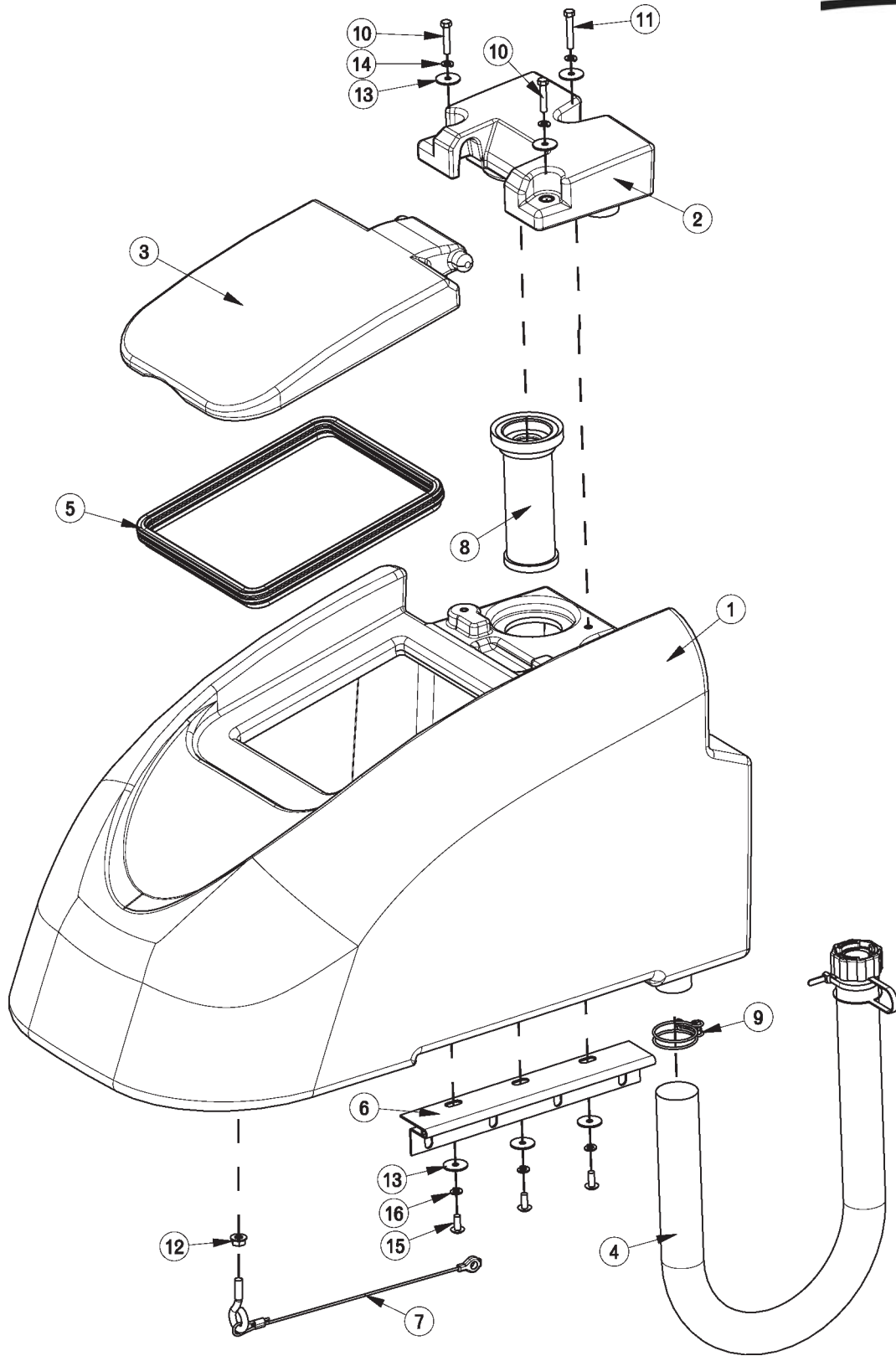
Lift Pedal Stop Assembly



BILL OF MATERIAL - 172157

ITEM	PART NO.	REQ'D	DESCRIPTION
1	172036	1	BKT, PEDAL STOP
2	172065	1	CLIP, FOR 1/2" ID HOSE
3	710493	2	SCR-MC 4-40 X .75 PAN HD
4	710530	2	SCR-MC FL HD 8-32 X .50 BRS
5	711428	2	NUT-HEX 4-40
6	712326	2	WSR-INT LOCK #4
7	747603-2	1	SWITCH ASY, MICRO ROLLER W/PACK/CONDUIT

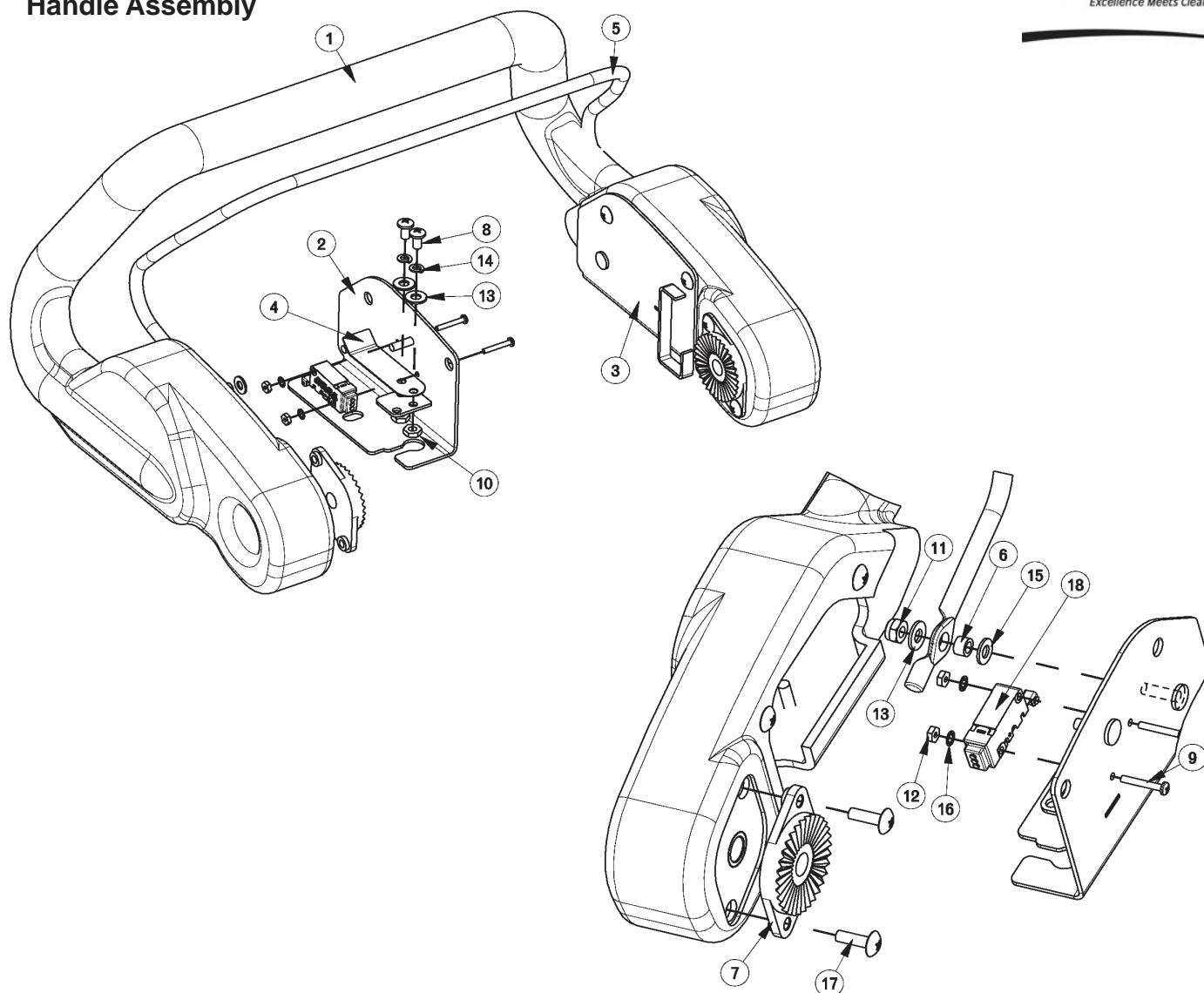
Recovery Tank Assembly



Recovery Tank Assembly BOM

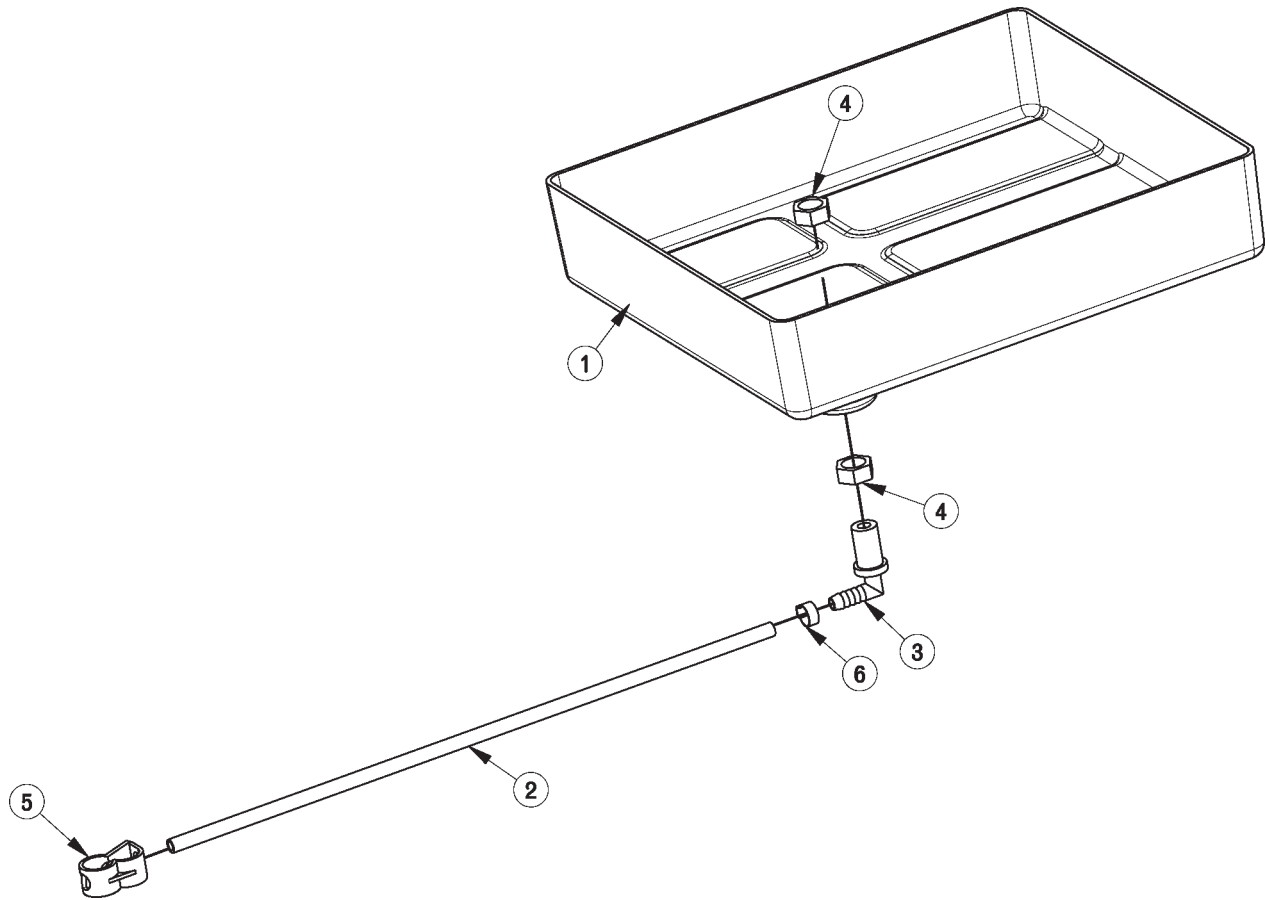
BILL OF MATERIAL - 172014			
ITEM	PART NO.	REQ'D	DESCRIPTION
1	172004	1	ES1720 RECOVERY TANK
2	172005	1	ES1720 VACUUM MANIFOLD
3	172007	1	ES1720 LID
4	172011	1	HOSE, PINCH-OFF W/ CAP, 36"
5	172017	1	GASKET, LID
6	172049	1	HINGE, RECOVERY TANK
7	172067	1	REC TANK CABLE ASSY 11.625
8	172132	1	SCREENED FLOAT
9	260203	1	WIRE GRIP HOSE CLAMP
10	711210	2	BLT-HH 1/4-20 X 1.25 STPL
11	711212	1	BLT-HH 1/4-20 X 1.50 STPL
12	711379	1	NUT, FLANGED WIZZ 5/16-18
13	711519	6	WSR- FLAT .25 X 1.01 X .06
14	711544	3	WSR-HELICAL 1/4
15	712565	3	SCR-MC 1/4-20X.63 SS TR HD
16	712758	3	WSR-HELICAL 1/4 SS

Handle Assembly



BILL OF MATERIAL - 172016

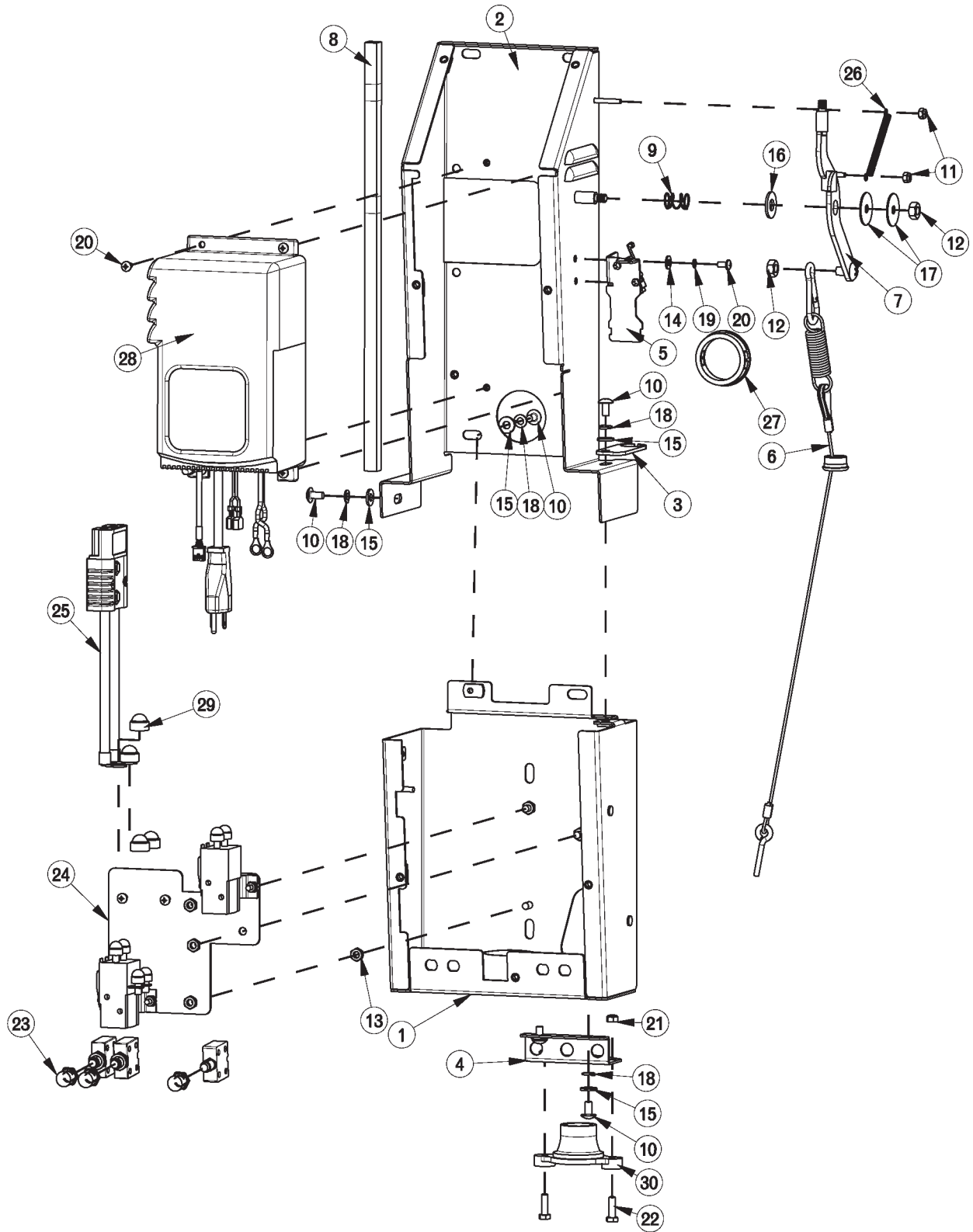
ITEM	PART NO.	REQ'D	DESCRIPTION
1	172006	1	ES1720 HANDLE
2	172053	1	BAIL PLATE WMT RH
3	172054	1	BAIL PLATE WMT LH
4	172057	2	ES1720 LEAF SPRING
5	172059	1	ES1720 BAIL, HANDLE
6	172074	2	SPACER, 5/16OD X 17GA, ALUM
7	270143	2	HANDLE PIVOT JAW
8	710353	4	SCR-MC 10-32 X .37 ST PL
9	710493	2	SCR-MC 4-40 X .75 PAN HD
10	711310	4	NUT, HEX 10-32 ST PL
11	711350	2	NUT-NYLOC 10-32
12	711428	2	NUT-HEX 4-40
13	711503	6	WSR, FLAT#10
14	711543	4	WSR-HELICAL #10
15	712320	2	WSR-NYLON .22 X .45 X .04
16	712326	2	WSR-INT LOCK #4
17	712830	10	SCR-MC 10-24 X .62 STLZ TR HD
18	747603-2	1	SWITCH ASY, MICRO ROLLER W/PACK/CONDUIT
19	747632	1	CABLE ASY, 5 COND 18G CONSOLE



BILL OF MATERIAL - 172012

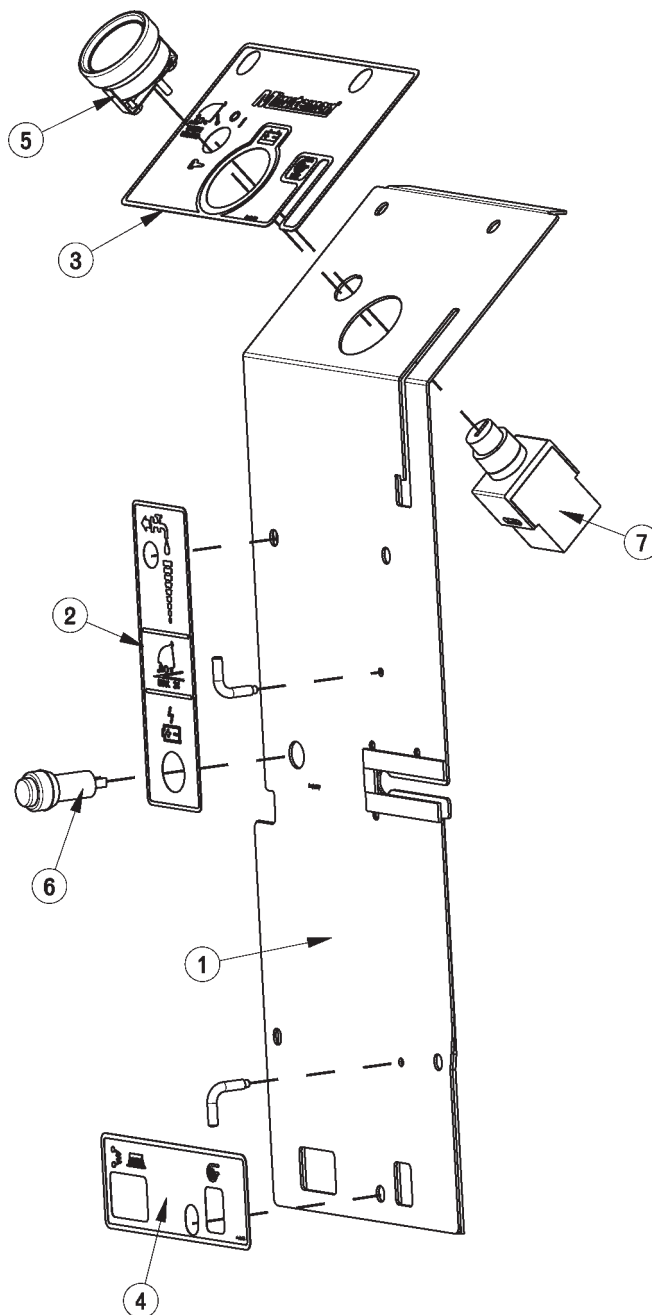
ITEM	PART NO.	REQ'D	DESCRIPTION
1	172116	1	ES1720 BATTERY BOX
2	260224	1	18" HOSE
3	320271	1	NOZZLE BODY-ELBOW
4	320272	2	NOZZLE BODY LOCKNUT
5	320273	1	HOSE SHUT-OFF CLAMP
6	828490	1	CRIMP CLAMP 140R

Electrical Box Assembly



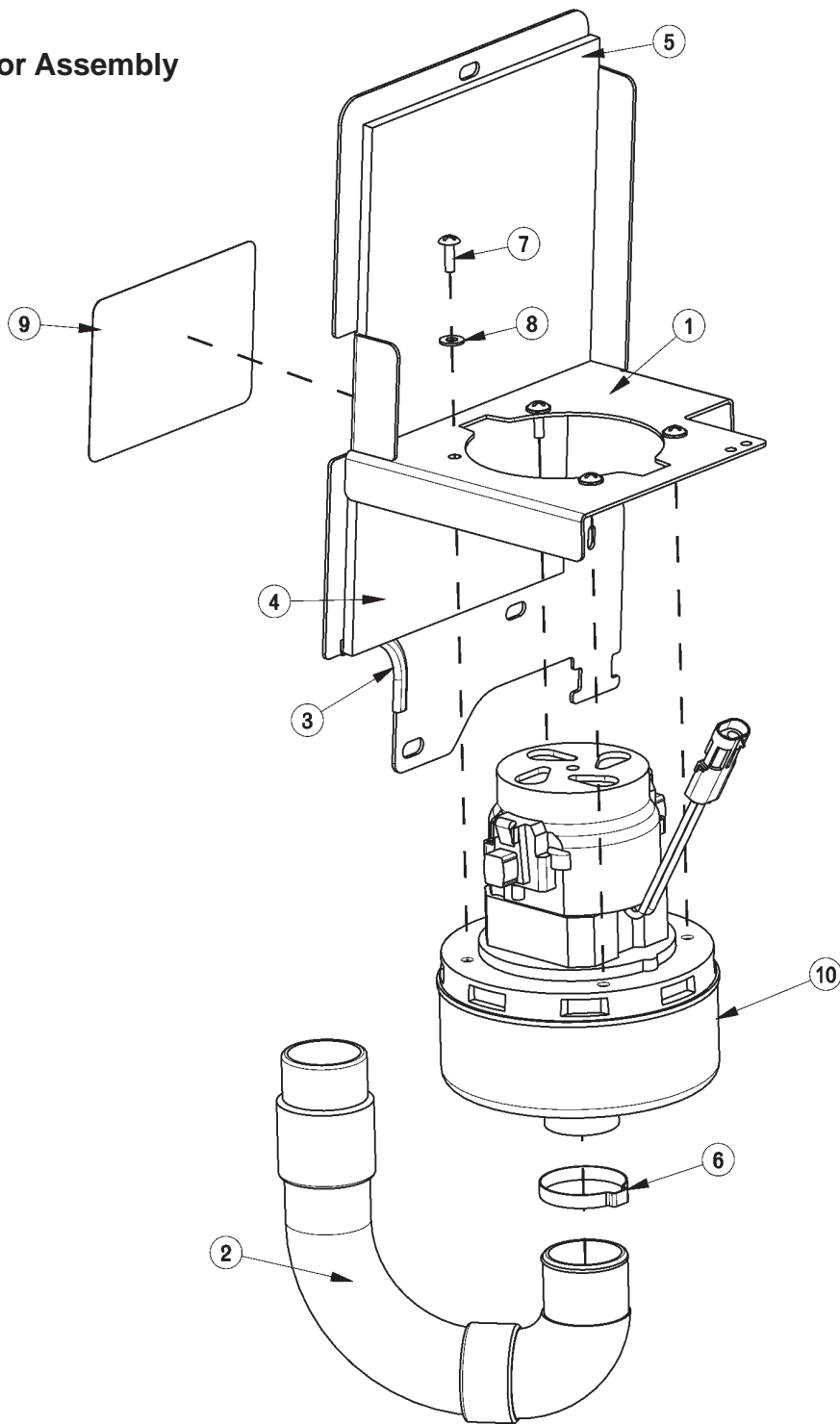
Electrical Box Assembly BOM

BILL OF MATERIAL - 172070-120/230			
ITEM	PART NO.	REQ'D	DESCRIPTION
1	172077	1	ELEC BOX-BOT HALF WMT
2	172088	1	ELEC BOX-TOP HALF WMT
3	172107	1	BKT, UPPER BUSHING MOUNT
4	172128	1	BKT, LOWER BUSHING MOUNT
5	172141	1	VAC SWITCH ASSY
6	172149	1	CABLE ASSY, SQUEEGEE LIFT
7	172152	1	VAC LEVER WMT
8	172188	1	FOAM TAPE, 1/2" SQ X 16.5"
9	670093	1	SPRING, COMPRESSION
10	710178	5	SCR-MC 1/4-20 X .50 TRUSS STPL
11	711372	2	NUT-NYLOC 8-32 STL ZINC
12	711383	2	NUT-HEX CLR LOC 5/16-18
13	711429	6	NUT-HEX 1/4-28 JAM STL Z
14	711503	2	WSR, FLAT#10
15	711505	5	WSR-FLAT 1/4
16	711508	1	WSR-FLAT .44X 1.0X.08
17	711516	2	WSR- FLAT .31 X 1.25 X .05
18	711544	5	WSR-HELICAL 1/4
19	712757	2	WSR - HELICAL #10 SS
20	712810	6	SCR-MC 10-24 X .37 ST PL
21	717018	2	NUT-NYLOC M6 X 1.0
22	717022	2	BOLT-HH M6X1.0 X 20
23	742748	3	CIRCUIT BREAKER BOOT
24	747630	1	ELEC PANEL ASSY, E1720BD
25	747637	1	WIRE ASY, MACHINE-BATTERY E1720
26	762084	1	SPRING-EXT
27	762400	1	HEYCO BUSHING 2.00"
28	957745	1	CHARGER,24VDC 12A ON-BOARD 120VAC
28A	957753	1	CHARGER,24VDC 12A ON-BOARD 230VAC
29	15592033	2	CAP, SAFETY NUT COVER M8
30	90508391	1	BUSHING, CABLE GUIDE, HAKO



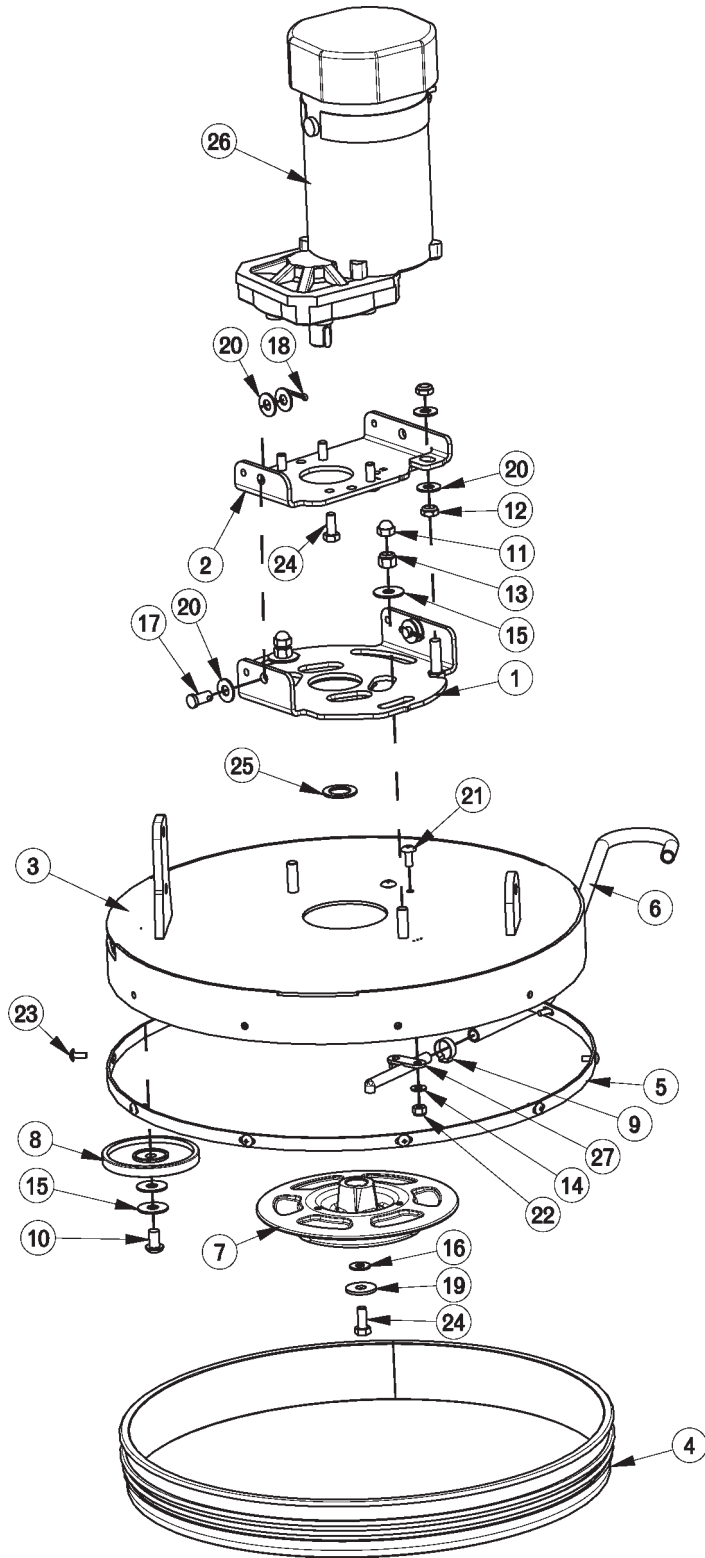
BILL OF MATERIAL - 172073			
ITEM	PART NO.	REQ'D	DESCRIPTION
1	172181	1	ELEC BOX, COVER, WMT
2	715672	1	DECAL, 1720 BD ELEC BOX
3	715673	1	DECAL, 1720 BD DASHBOARD
4	715675	1	DECAL, BD CIRC BKRS
5	740216	1	VOLT METER
6	747614	1	CHARGE STATUS INDICATOR
7	747617-1	1	KEYSWITCH ASY, KEYSWITCH + WIR

Vac Motor Assembly



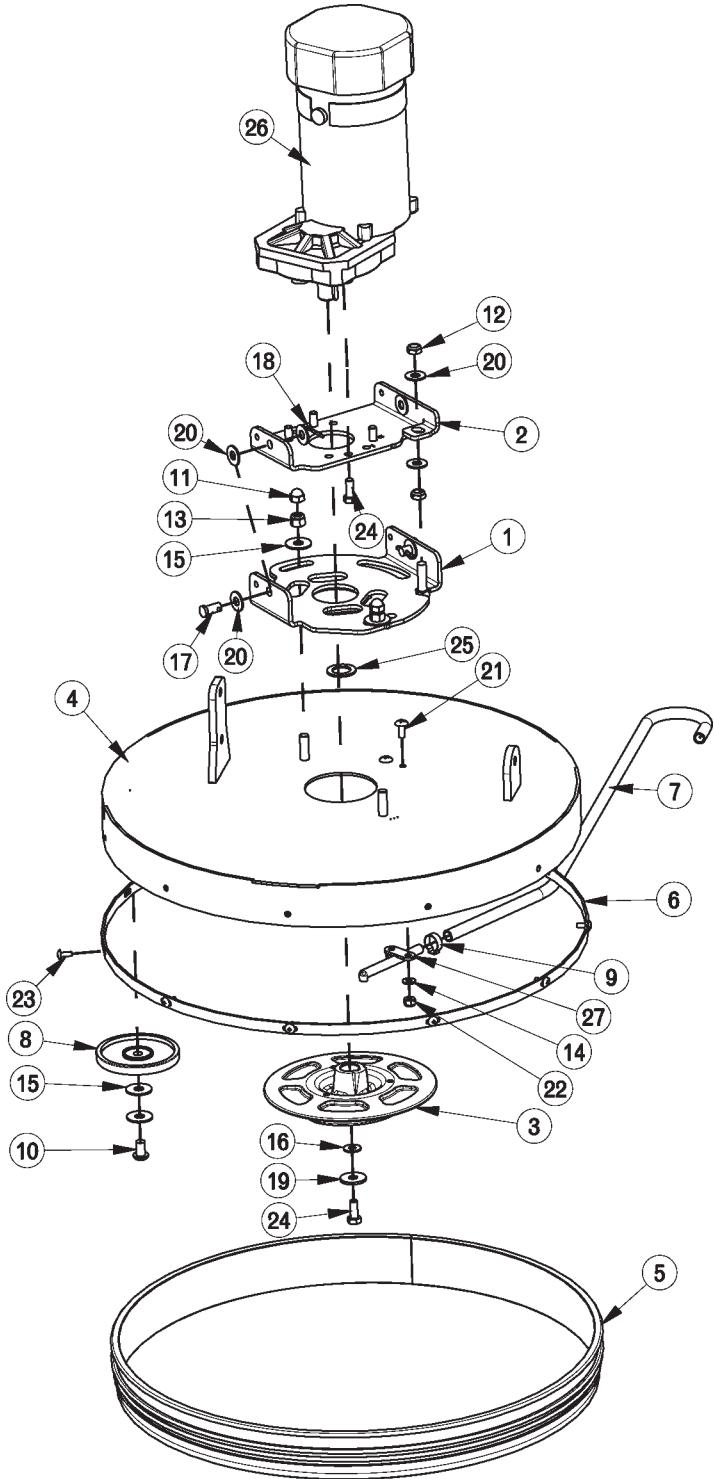
BILL OF MATERIAL - 172050			
ITEM	PART NO.	REQ'D	DESCRIPTION
1	172045	1	VAC MOUNT WMT, ES1720
2	172048	1	HOSE, STRETCH 13"
3	172124	1	EDGE TRIM, .063 X 3.0, BLACK
4	172186	1	FOAM COVER, FRONT 1
5	172187	1	FOAM COVER, FRONT 2
6	450095	1	CRIMP CLAMP, 1.75"
7	711160	4	#10 X 5/8 HI-LO
8	711503	4	WSR, FLAT#10
9	715676	1	DECAL, BATT CABLE ROUTE, E1720
10	747607-1	1	VAC MOTOR ASY, E1720

17" Brush Deck Assembly



BILL OF MATERIAL - 172090			
ITEM	PART NO.	REQ'D	DESCRIPTION
1	172040	1	DECK ANGLE ADJUST WMT
2	172044	1	PLATE, MOTOR MOUNT
3	172091	1	DECK COVER WMT 17"
4	172118	1	17" DECK SKIRT
5	172119	1	RETAINER, 17" DECK SKIRT
6	172154	1	HOSE-NYLO REINF 3/8 X 27"
7	172165	1	E17 BRUSH HUB ASSY
8	210153	1	ROLLER WHEEL
9	450076	1	CRIMP CLAMP SS 185R
10	710985	1	SCR-SC 3/8-16 X .62 ST PL
11	711354	2	NUT-ACORN 3/8-16 ST NI
12	711375	2	NUT-NYLOC 3/8-16 X 1/2 NUT
13	711380	2	NUT-NYLOC 3/8-16 NUT
14	711504	2	WSR-FLAT 1/4 ID SS
15	711507	4	WSR-FLAT .37 X 1.12 X .06
16	711575	1	WSR-FLT .31x.75x.06ST
17	711679	2	CLEVIS PIN 3/8 X 3/4
18	711809	2	COTTER PIN, 1/8 X 1.0
19	711855	1	WSR-FLT .37X1.12X10 STL Z HARD
20	712301	8	WSR-FLAT .37 X .87 X .06
21	712565	2	SCR-MC 1/4-20X.63 SS TR HD
22	712667	2	NUT, HEX 1/4-20 NYLOC SS
23	712822	10	SCR-MC TR HD 10-24 X .50 SS
24	717024	5	BOLT-HH M8X1.25 X 20
25	717025	1	WSR-FLAT 13/16ID X 1.25 X .08
26	747600	1	MOTOR, OFFSET PM GEAR, 550W
27	90311663	1	HAKO SOL FEED NOZZLE

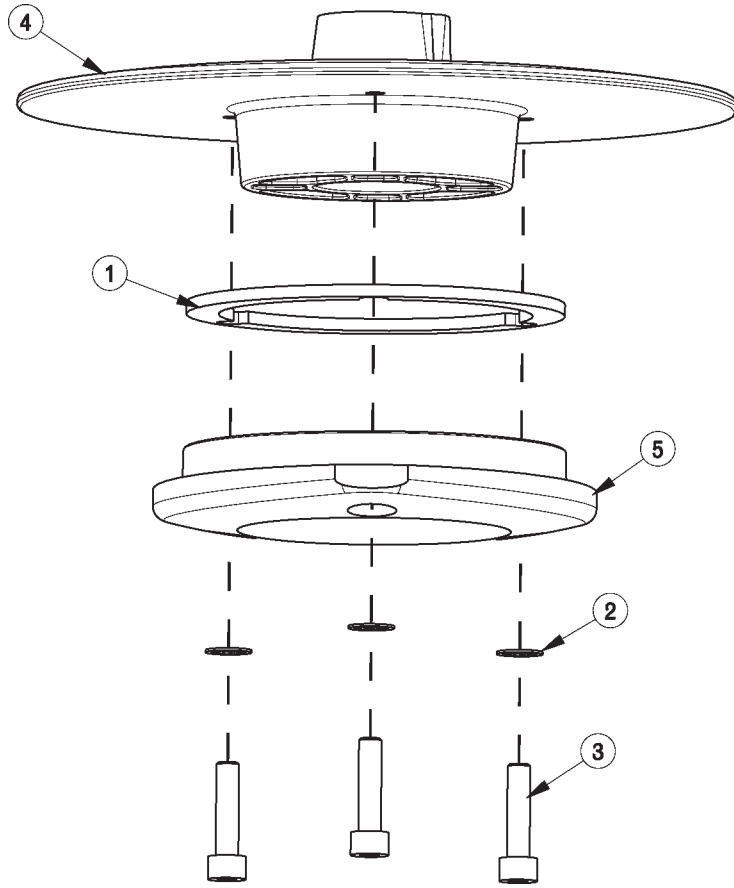
20" Brush Deck Assembly



20" Brush Deck Assembly BOM

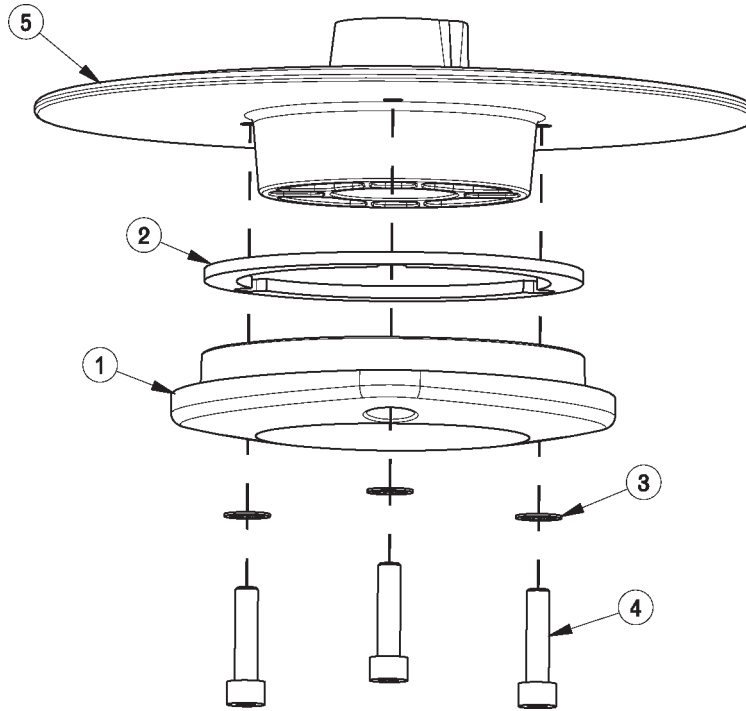
BILL OF MATERIAL - 172100			
ITEM	PART NO.	REQ'D	DESCRIPTION
1	172040	1	DECK ANGLE ADJUST WMT
2	172044	1	PLATE, MOTOR MOUNT
3	172095	1	E20 BRUSH HUB ASSY
4	172101	1	DECK COVER WMT 20"
5	172121	1	20" DECK SKIRT
6	172125	1	RETAINER, 20" DECK SKIRT
7	172153	1	HOSE-NYLO REINF 3/8 X 29"
8	210153	1	ROLLER WHEEL
9	450076	1	CRIMP CLAMP SS 185R
10	710985	1	SCR-SC 3/8-16 X .62 ST PL
11	711354	2	NUT-ACORN 3/8-16 ST NI
12	711375	2	NUT-NYLOC 3/8-16 X 1/2 NUT
13	711380	2	NUT-NYLOC 3/8-16 NUT
14	711504	2	WSR-FLAT 1/4 ID SS
15	711507	4	WSR-FLAT .37 X 1.12 X .06
16	711575	1	WSR-FLT .31x.75x.06ST
17	711679	2	CLEVIS PIN 3/8 X 3/4
18	711809	2	COTTER PIN, 1/8 X 1.0
19	711855	1	WSR-FLT .37X1.12X10 STL Z HARD
20	712301	8	WSR-FLAT .37 X .87 X .06
21	712565	2	SCR-MC 1/4-20X.63 SS TR HD
22	712667	2	NUT, HEX 1/4-20 NYLOC SS
23	712822	11	SCR-MC TR HD 10-24 X .50 SS
24	717024	5	BOLT-HH M8X1.25 X 20
25	717025	1	WSR-FLAT 13/16ID X 1.25 X .08
26	747600	1	MOTOR, OFFSET PM GEAR, 550W
27	90311663	1	HAKO SOL FEED NOZZLE

E17 Brush Hub Assembly



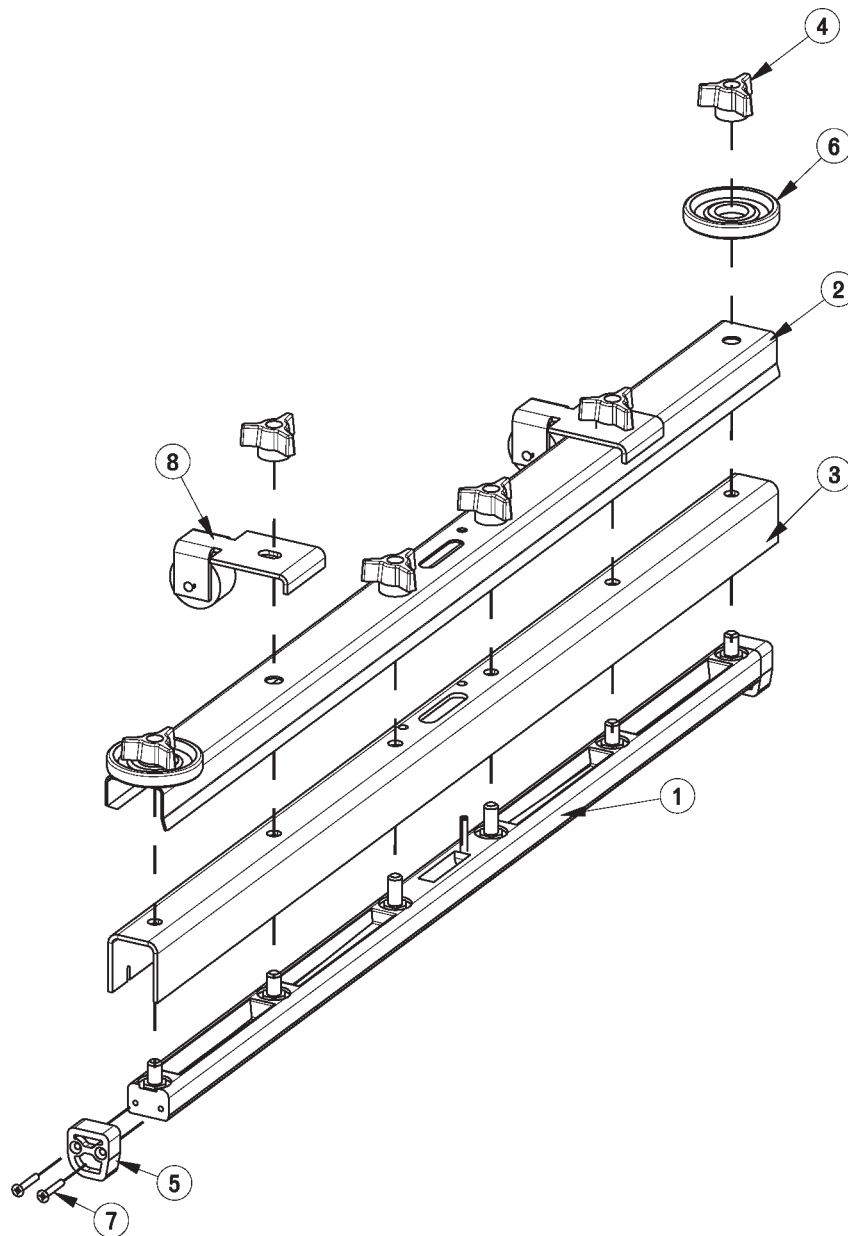
BILL OF MATERIAL - 172165			
ITEM	PART NO.	REQ'D	DESCRIPTION
1	172133	1	BRUSH HUB SPACER
2	711554	3	WSR-INTERNAL LOCK 1/4 ID
3	717026	3	SCR-SC SHCS M6X1.0 X 25 STL Z
4	172096MCH	1	BASE, DRIVE HUB WITH KEYWAY
5	172097MCH	1	HUB, MACHINED FOR E17

E20 Brush Hub Assembly



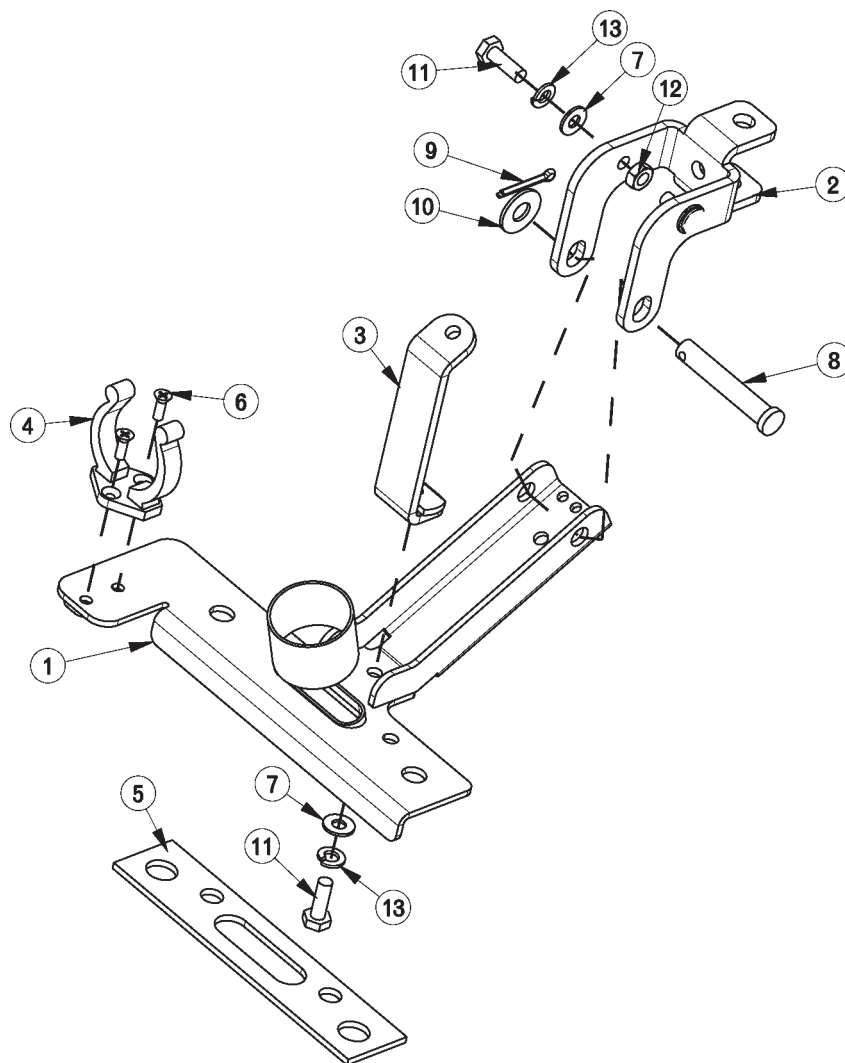
BILL OF MATERIAL - 172095			
ITEM	PART NO.	REQ'D	DESCRIPTION
1	172097	1	ES1720 BRUSH HUB BASE
2	172133	1	BRUSH HUB SPACER
3	711554	3	WSR-INTERNAL LOCK 1/4 ID
4	717026	3	SCR-SC SHCS M6X1.0 X 25 STL Z
5	172096MCH	1	BASE, DRIVE HUB WITH KEYWAY

Rear Squeegee Assembly



BILL OF MATERIAL			
ITEM	PART NO.	REQ'D	DESCRIPTION
1	210023	1	SQUEEGEE CASTING ASY
2	210024	1	SQUEEGEE MOUNT BKT
3	210065	1	SQUEEGEE BLADE 200 GUM
4	430074	6	ADJUSTING NUT 17B/E
5	430076	2	NYLON SQUEEGEE INSERT
6	430085	2	SQUEEGEE BUMPER WHEEL
7	712517	4	SCR-MC 8-32 X 1" ST PL - PH
8	831400	2	WHEEL ASSY

Squeegee Mechanism Assembly



BILL OF MATERIAL - 172170

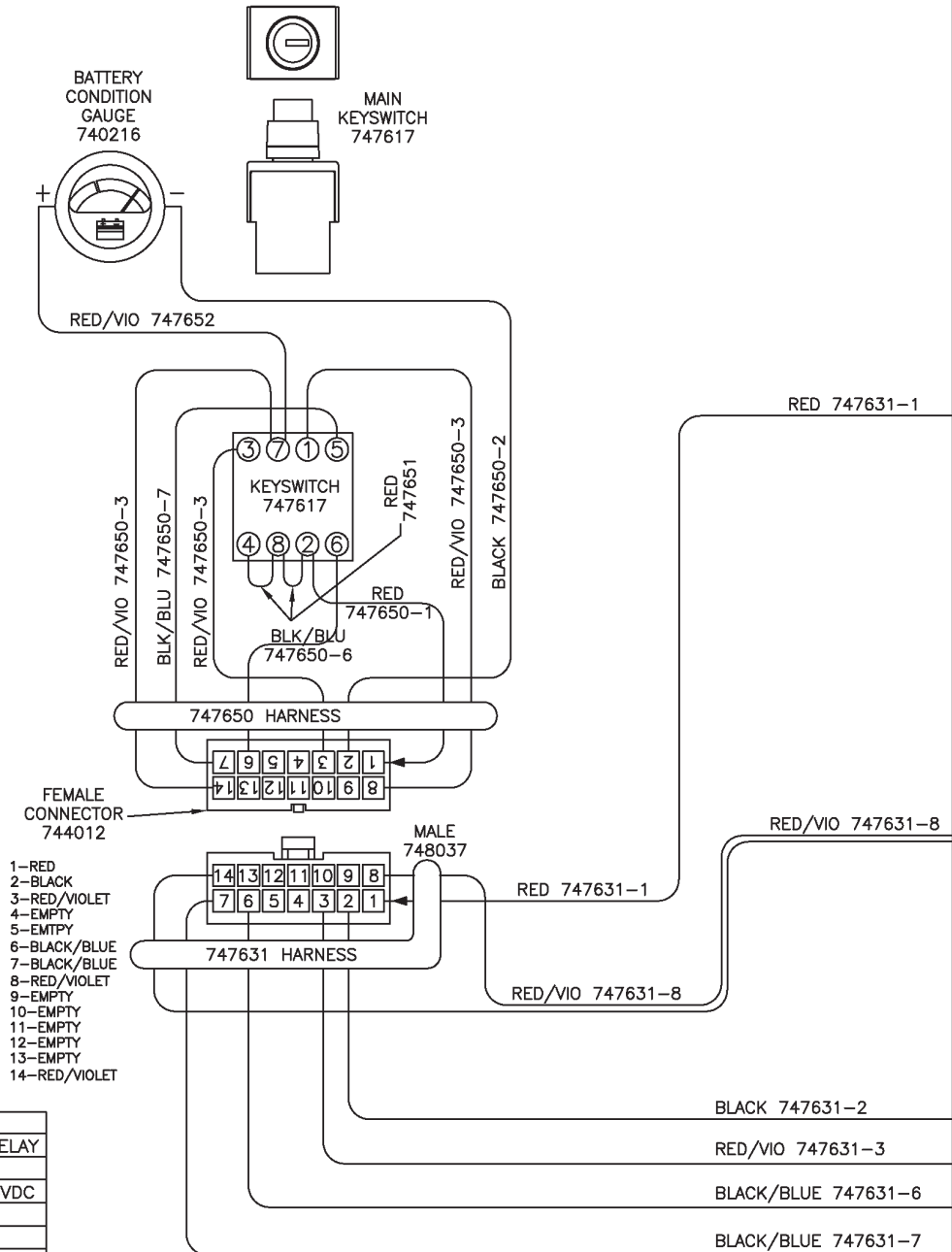
ITEM	PART NO.	REQ'D	DESCRIPTION
1	172171	1	SQUEEGEE MECH WMT
2	172173	1	BKT, MAIN SQUEEGEE HINGE
3	172175	1	BKT, STANDOFF
4	260579	1	TOOL CLIP, 1.5" HOSE
5	430073	1	GASKET DIE CUT PS BACK
6	710530	2	SCR-MC FL HD 8-32 X .50 BRS
7	711504	3	WSR-FLAT 1/4 ID SS
8	711678	1	CLEVIS PIN 3/8 X 2-1/4
9	711809	1	COTTER PIN, 1/8 X 1.0
10	712301	1	WSR-FLAT .37 X .87 X .06
11	712562	3	BOLT-HH 1/4-20X3/4 SS
12	712665	2	NUT-HEX 1/4-20 SS
13	712758	3	WSR-HELICAL 1/4 SS

1 Wiring Diagrams

PAGE LAYOUT



PAGES GO TOGETHER AS SHOWN TO SEE THE ENTIRE SCHEMATIC AS ONE.



- 1-RED
- 2-BLACK
- 3-RED/VIOLET
- 4-EMPTY
- 5-EMPTY
- 6-BLACK/BLUE
- 7-BLACK/BLUE
- 8-RED/VIOLET
- 9-EMPTY
- 10-EMPTY
- 11-EMPTY
- 12-EMPTY
- 13-EMPTY
- 14-RED/VIOLET

MAIN KEYSWITCH ASSEMBLY: 747617-1

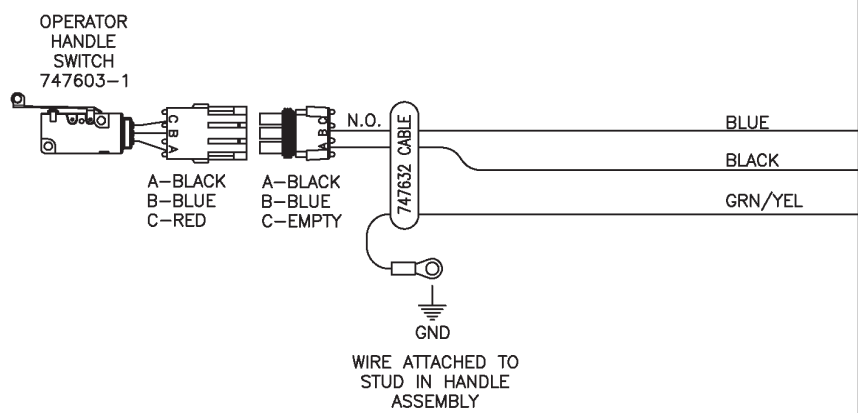
PIN #	COLOR	WHERE TO/FROM
1	RED	BATTERY CHARGER INTERNAL RELAY
2	BLACK	RELAY COILS: 0V
3	RED/VIOLET	BRUSH MOTOR RELAY COIL: 24VDC
4	EMPTY	-
5	EMPTY	-
6	BLACK/BLUE	BRUSH RELAY NORMALLY CLOSED
7	BLACK/BLUE	BRUSH UNLOAD SWITCH P:B
8	RED/VIOLET	MAIN RELAY COIL: 24VDC
9	EMPTY	-
10	EMPTY	-
11	EMPTY	-
12	EMPTY	-
13	EMPTY	-
14	RED/VIOLET	MAIN RELAY COIL: 24VDC

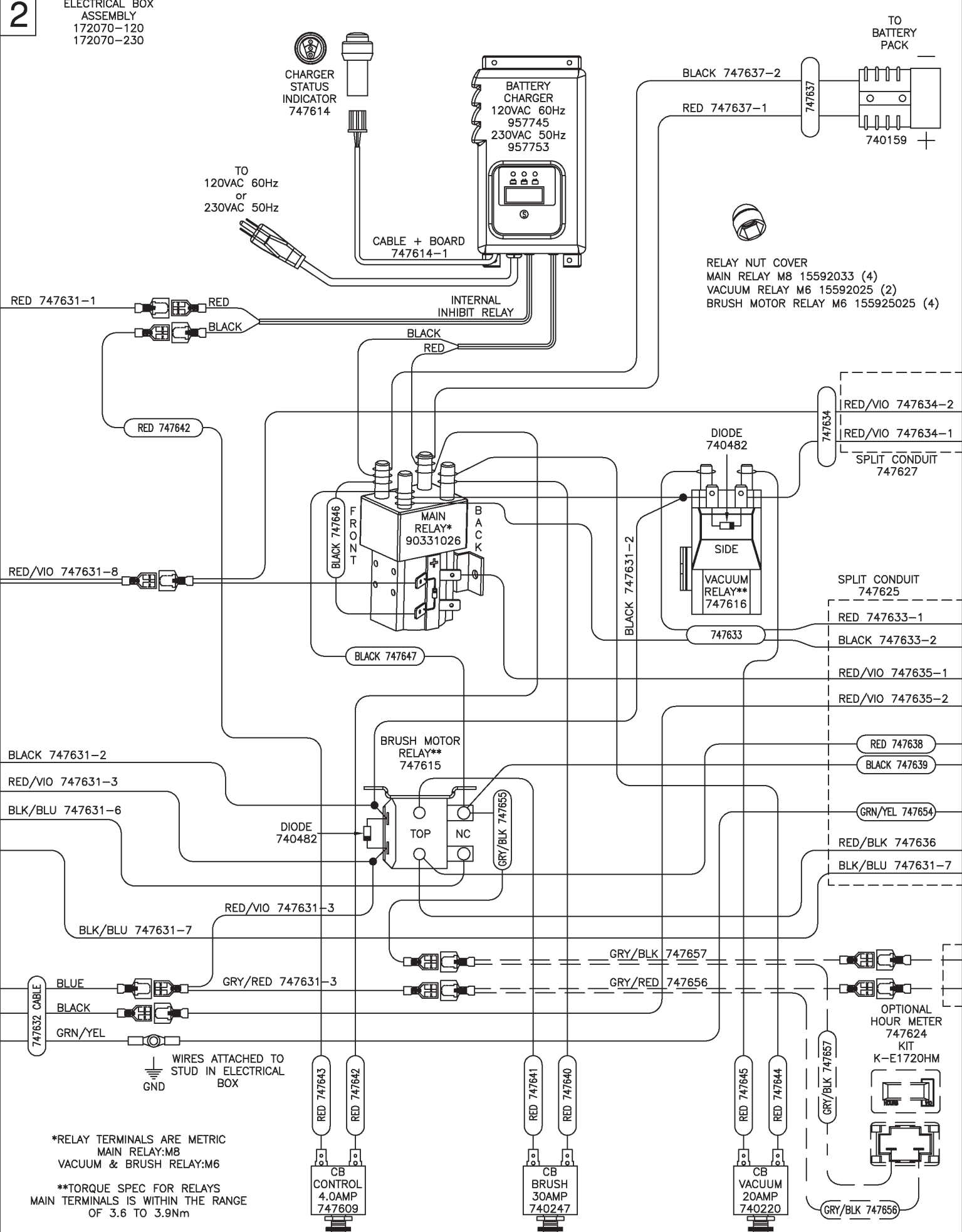
BATTERY CHARGER: 957745 or 957753

	COLOR	WHERE TO/FROM
1	RED	KEYSWITCH P:1
2	BLACK	CONTROL CB 4.0A
3	RED	MAIN RELAY + (REAR LEFT POST)
4	BLACK	MAIN RELAY - (FRONT LEFT POST)

OTHER WIRE COLORS

1	RED	BATTERY 24VDC: +
2	BLACK	BATTERY 0VDC: -
3	GREEN/YELLOW	GROUND
4	BLACK/BLUE	BRUSH UNLOAD CIRCUIT
5	RED/BLACK	BRUSH UNLOAD CIRCUIT: MICRO SWITCH
6	RED/VIOLET	24VDC AFTER MAIN KEYSWITCH
7	GREY/RED	OPTIONAL POWER 24VDC: 3A MAX
8	GREY/BLACK	OPTIONAL POWER 0VDC: 3A MAX

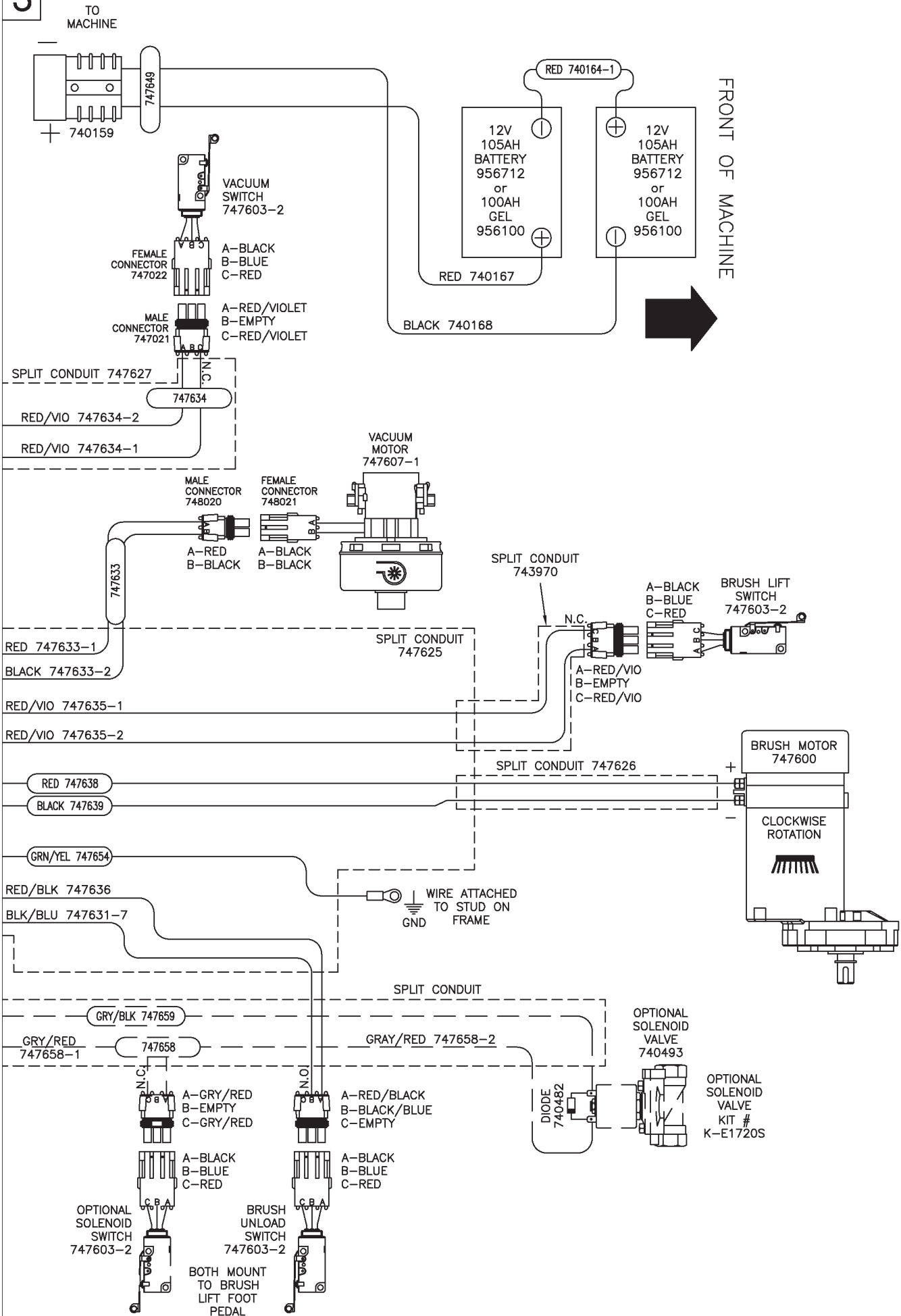




*RELAY TERMINALS ARE METRIC
MAIN RELAY:M8
VACUUM & BRUSH RELAY:M6

**TORQUE SPEC FOR RELAYS
MAIN TERMINALS IS WITHIN THE RANGE
OF 3.6 TO 3.9Nm

3



Minuteman International Made Simple Commercial Limited Warranty

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

This warranty does not apply to normal wear, or to items whose life is dependent on their use and care, such as belts, cords, switches, hoses, rubber parts, electrical motor components or adjustments. Parts not manufactured by Minuteman are covered by and subject to the warranties and/or guarantees of their manufacturers. Please contact Minuteman for procedures in warranty claims against these manufacturers.

Special warning to purchaser -- Use of replacement filters and/or prefilters not manufactured by Minuteman or its designated licensees, will void all warranties expressed or implied. A potential health hazard exists without original equipment replacement.

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

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

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

If a difficulty develops with this machine, you should contact the dealer from whom it was purchased.

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

Cord Electric Group..... Three years parts, two years labor, ninety days travel (Not to exceed two hours)

Exceptions..... Port-A-Scrub, one year parts, six months labor
MPV 13, one year parts
MPV 14 and 18, two years parts, one year labor
RapidAir blower, one year parts, one year labor
Explosion-Proof Vacuum, one year parts, one year labor
Pneumatic Vacuums, three years parts, one year labor
EX 12 and EX12H, one year parts, one year labor

Battery Operated Group..... Three years parts, two years labor, ninety days travel
(Not to exceed two hours)

Exceptions..... Sweepers, one year parts, one year labor, ninety days travel
(Not to exceed two hours)

Internal Combustion Group.... One year parts, one year labor, ninety day travel
(Not to exceed two hours)

Replacement Parts..... Ninety days

Batteries..... 0-3 months replacement, 4-12 months pro-rate

Polypropylene Plastic Tanks... Ten years, no additional labor