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INCOMING VEHICLE INSPECTION AND CHECK LIST

BFORE DELIVERY TRUCK LEAVES

Visually inspect the vehicle for any damage that may have occurred during shipping. Please note any damage on the carrier's bill immediately. Be sure to specify the nature of the damage.

AFTER DELIVERY

Check the vehicle for hidden damage and immediately notify the carrier if any damage has occurred.

BEFORE OPERATING THE VEHICLE

1. Check all electrical connections in the instrument panel to ensure none have loosened during shipping
2. Check tire pressure and check for loose wheel lug nuts.
3. Check all steering controls and the front steering gears to ensure that all are operating freely and are not damaged.
4. Check all battery connections for tightness and electrolyte levels in each battery using a Hydrometer.

INCOMING CHECKLIST

The following check list is provided for your convenience to properly inspect the electric vehicle for damage.

		YES	NO
1.	Have all accessories been received?	☐	☐
2.	Have all accessories been opened and inspected?	☐	☐
3.	Is the wiring visibly damaged?	☐	☐
4.	Are all electrical and battery connections tight?	☐	☐
5.	Do the batteries have proper electrolyte levels?	☐	☐
6.	Is the battery charger in good condition?	☐	☐
7.	Are the tires in good condition and properly inflated to 60 psi?	☐	☐
8.	Is the transmission fluid full?	☐	☐
9.	Are there dents or cracks on the vehicle?	☐	☐
10.	Are all controls operating freely and properly?	☐	☐

SAFETY

The responsibility for safety lies with four main groups: manufacturers, owners, operators, and maintenance personnel.

Our responsibility as manufacturer is to ensure that the customer is acquainted with the capabilities of the vehicle. We will also make safety recommendations based on these characteristics. These recommendations appear on labels mounted on the vehicle.

The owner of the vehicle is responsible to instruct personnel in its safe operation. He/she must explain the vehicle characteristics and the action of the controls. It is Wesley Pack Mule LLC's recommendation that the owner first become familiar with the conditions of the location of use or place of operation in order to assess their effect on safe operation.

The owner, or such appropriate personnel designated by the owner (head of engineering, safety director, director of training, or head of maintenance) should familiarize himself or herself with the provisions, requirements, standards, and recommendations of

1) ANSI/ASME B56.8-1993, *Safety Standard for Personnel and Burden Carriers*.

American National Standards Institute, Inc.
1430 Broadway
New York, New York 10018

2) ANSI/NFPA #505, *Powered Industrial Trucks.*

National Fire Protection Association
Batterymarch Park
Quincy, MA 02269

3) 29 CFR 1910.178, *Powered Industrial Trucks.*

Superintendent of Documents
U. S. Government Printing Office
Washington, DC 20402

The owner shall survey the specific operating conditions and establish and train its operators to comply with additional, specific safety practices.

The operators of the Wesley Pack Mule LLC should be selected on the basis of visual, auditory, physical and mental abilities to operate the vehicle in a safe manner. Such operators must observe safe driving rules, and be aware of the vehicle operating characteristics. He/she must also be aware of the manufacturer's safety recommendations, and should be trained to adhere strictly to the safety guidelines. The training of the operators should be done in accordance to a survey of the projected operating conditions and environment. Maintenance personnel must be aware that their activities affect the safe operation of the vehicle. Also, the service and maintenance processes involve hazards, which must be taken into account.

All vehicles described in this manual are designed for use on smooth surfaces in and around industrial plants, warehouses, nurseries, and greenhouses. These vehicles are not designed for use on public highways.

SAFETY GUIDELINES

- Do not operate your Wesley Pack Mule without reading this manual
- Do not Start the vehicle without checking the brakes first
- Do not mount or dismount the vehicle with the key in the ignition.
- If the accelerator requires excessive pressure do not drive.
- Do not park or operate near flammable objects or in flammable or hazardous environments.
- Use only necessary power.
- Keep both hands on the steering wheel while operating the vehicle.
- Accelerate and decelerate slowly
- Drive slowly and carefully when turning or cornering.
- Avoid sharp turns especially on an incline or at high speeds.
- Take special caution when driving in reverse.
- Keep arms and legs within the operator's platform while driving.
- Do not use if not operating properly.
- Do not use vehicle to push objects.
- Perform all maintenance procedures at the recommended intervals.
- Do not operate in sand, gravel, or snow.
- Do not exceed, under any conditions, the maximum speed the vehicle can obtain on level ground
- Do not use the accelerator to hold the vehicle at a stand still on an incline.
- Do not allow the tires to lose contact with the ground.
- Do not overload the vehicle above its rated capacity.
- Make sure that the area of operation is free and clear of trash, litter and other foreign objects.
- Proceed around low overhangs with caution. Make sure that there is enough clearance for the head of the operator and /or the ladder / backrest to clear easily.
- Never change direction abruptly.
- Adjust speed to surface conditions.
- Whenever going up an incline, drive directly up its face, never across.
- Position loads carefully and evenly.
- Remain in the operator's position while operating the vehicle.
- Never exceed occupant capacity

OPERATING SPECIFICATIONS

VEHICLE MODEL SC-775-6SB

DIMENSIONS
LENGTH:.....79 inches (200.7 cm)
WIDTH:.....32.25 inches (81.9 cm)
HEIGHT:.....49 inches (124.5 cm)

WEIGHT.....989 Lbs. with batteries

GROUND DRIVE.....Direct drive transaxle

MOTOR.....Permanent Magnet
INPUT VOLTAGE.....36 Volts DC
HP RATING.....7.5 HP
MAX RPM RATING.....3600 RPM

STEERING.....Precision track rack & pinion
MAX. TURNING.....75°
MIN. CIRCLE.....5 feet
INT. ASLE CLEARANCE.....58 inches

CONTROLS
POWER OPERATION.....Ignition Key
STEERING OPERATION.....Automotive Steering Wheel
FORWARD / REVERSE.....Toggle switch
SPEED CONTROL.....Foot operated electronic throttle control system

BRAKES
SERVICE BRAKE SYSTEM..Internal expanding rear drum brakes & programmable regenerative braking
PARKING BRAKE SYSTEM.....Deadman brake on accelerator pedal

CAPACITY
VEHICLE OCCUPANTS.....ONE (No Passengers permitted on deck)
FRONT DECK.....1250 Lbs.
TOWING (Smooth Level Surfaces Only) .....2000 Lbs.

SPEED.....Programmable
FORWARD.....approximately 10 MPH
REVERSE.....approximately 5 MPH

BATTERY CHARGER
POWER INPUT.....7.5 Amps @ 120 Volts
POWER OUTPUT.....25 Amps @ 36 Volts

TIRES & WHEELS
TIRE SIZE.....4.80 x 8 LRB
TIRE PRESSURE.....60 PSI
NUMBER.....4

BODY.....Unibody Construction
FRAME.....14-gage diamond plate exterior
COLOR.....Safety Yellow w/ black trim

SAFETY.....Padded backrest

AVAILABLE OPTIONAL EQUIPMENT ..... Flashing beacon, back-up alarm, front & rear lighting

This is a copy of the safety instructions affixed to your vehicle. Do not remove the label from the vehicle. If your vehicle does not have these instructions firmly affixed, please contact Wesley Pack Mule LLC and they will be sent to you immediately.

CAUTION AND SAFETY INSTRUCTIONS

CHARGER AND BATTERIES

Deck/lid must be opened and secured while batteries are charging.
Remember that battery and ignition cables carry high voltage currents. Use caution to avoid a short circuit.
Never connect or disconnect either battery or any other component while the power is on.
When connecting the battery cables pay particular attention to their polarities. Never connect the positive cable to a negative terminal or a negative cable to a positive terminal.
Keep batteries securely mounted.
Keep battery top clean and dry.
Keep terminals and connections clean, tight and coated with petroleum jelly or terminal grease.
Rinse off any spilled electrolyte immediately with solution of water and baking soda.
If vehicle is not being used for an extended period of time, disconnect cables.
Read instructions from battery manufacture for your own safety.

FUSES

Never install a wire instead of the proper fuse, even for a temporary fix. It may cause extensive damage and possibly a fire.
Do not use a screwdriver or any other metal object to remove fuses, as an electrical short circuit may occur and damage the system.
Do not modify or tamper with any part of the operating or speed control systems. All inspections and adjustments must be made by a qualified technician.

WHEELS & TIRES

When replacing wheels and tires for any reason, care should be taken to insure that the wheels and tires Are equivalent to those removed in diameter, rim width and off-set as well load range rating.
An incorrect sized wheel may adversely affect wheel and bearing life, braking and stopping ability, Handling characteristics, ground clearance and body to tire clearance.

GENERAL MECHANICAL

Please open and secure deck/lid completely before checking any portion of the drive train, batteries, ect.
Please chock wheels when appropriate.
Before placing deck/lid back in normal position, make sure battery charging plug has been disconnected from receptacle; battery-charging wires must be securely tied up: all tools have been removed.

OPERATING INSTRUCTIONS

The following are step-by-step operating procedures:

I. DISCONNECT THE BATTERY CHARGER

Remove the charger cord from the 120-Volt power outlet. Disconnect charger cord from the female receptacle located in the rear right hand side of the vehicle. Carefully wrap charger cord and store in its box located in the rear of operators station. Ensure that the area is clear of all obstructions.

II. TURN KEY SWITCH ON

Be sure that the direction switch is in the neutral position and the accelerator pedal is not depressed. Insert the key into the ignition switch located on the instrument panel. Turn completely to the right. The indicator light (BDI) located immediately above the ignition switch should come on. If not, do not attempt to operate the vehicle.

III. MOVE DIRECTION SWITCH TO THE DESIRED SETTING

Before operation, the accelerator pedal must not be depressed and the direction switch, which is located towards the left of the operator's panel, must be set to the middle or neutral position. The different settings are shown on a metal plate located immediately to the left of the toggle switch. For the forward position, move the toggle switch upwards. The reverse position is the toggle switch set downwards. If the direction switch is in the forward or reverse position and / or the accelerator depressed when the key switch is turned on the vehicle will not operate until the accelerator pedal is not depressed and the direction switch is placed in the neutral position first.

IV. PRESS ACCELERATOR

Depress the accelerator with the right foot. The speed of the vehicle will be proportional to the amount that the accelerator pedal is depressed. The controller (EV-E077) regulates the speed, acting as an automatic transmission.

V. STOPPING

In order to stop the vehicle, simply remove foot from the accelerator pedal. The brake automatically engages upon release of the accelerator. Additional braking is available by simply pushing down on the rear of the accelerator pedal with the heel of the right foot or by increasing the amount of programmable regenerative braking.

WARING: Be sure that the vehicle is completely stopped before changing direction. An attempt to rapidly change direction may cause vehicle cargo to shift resulting in possible operator injury. Vehicle damage caused by not operating a vehicle in accordance to the instructions of this manual is not covered by manufactures warranty.

MAINTENANCE

Safe and trouble-free operation of a Wesley Pack Mule electric vehicle is highly dependant upon the frequent and proper execution of preventive maintenance. One should follow these guidelines more frequently if the vehicle is used in multi-work shifts or in harsh environmental conditions.

WARNING: Never service your vehicle without disconnecting battery ground cable. Failure to do so may result in possible injury and /or vehicle damage.

The following chart has been provided to serve as a guide for the service of your Wesley Pack Mule electric vehicle.

Maintenance Service	Daily	Weekly	Monthly	3 to 6 Months	Yearly
Check all gauges	X				
Check horn	X				
Check brake linkage			X		
Check brake linings & other components for wear & deterioration			X		
Check BDI for battery charge	X				
Check all battery cells for water level		X			
Check battery cells with hydrometer*				X	
Check oil level in transaxle					X
Clean, inspect, repack and reseal front axle & steering fork bearings					X
Grease steering chain & sprockets					X

* A hydrometer is the device used to determine if a battery is properly charged. It measures the specific gravity of the electrolyte (liquid) in the battery. The electrolyte is heavier (about 1260 in specific gravity) when fully charged, and lighter (about 1100) when fully discharged.

MAINTENANCE

Maintenance Service	Daily	Weekly	Monthly	3 to 6 Months	Yearly
Check tire pressure with tires cold. The recommended tire pressure is 60 psi**		X			
Grease fork pivot fittings and gears with grease gun (automotive grease)				X	
Inspect steering operations, gear housing and linkage				X	
Oil all moving parts that do not have fittings with an oilier or brush (SAE 30)			X		
Plug in battery charger when the vehicle is not in service; also vehicle should be left on charge overnight if possible	X				
Tighten any loose battery terminals and coat terminals with petroleum jelly			X		
Tighten nuts and bolts			X		
Wash batteries with baking soda and water (be sure charger is not plugged in) Dry batteries thoroughly before returning to service				X	

NOTE: In freezing temperatures, recharge the batteries after adding distilled water to make sure that the water mixes properly with the electrolyte. Otherwise the water may freeze and damage the batteries.

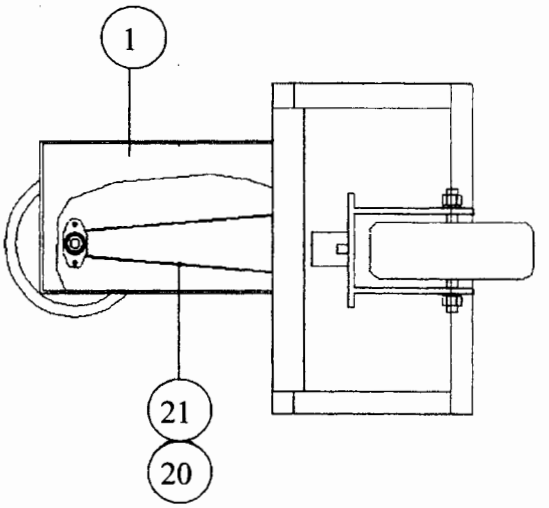
CAUTION

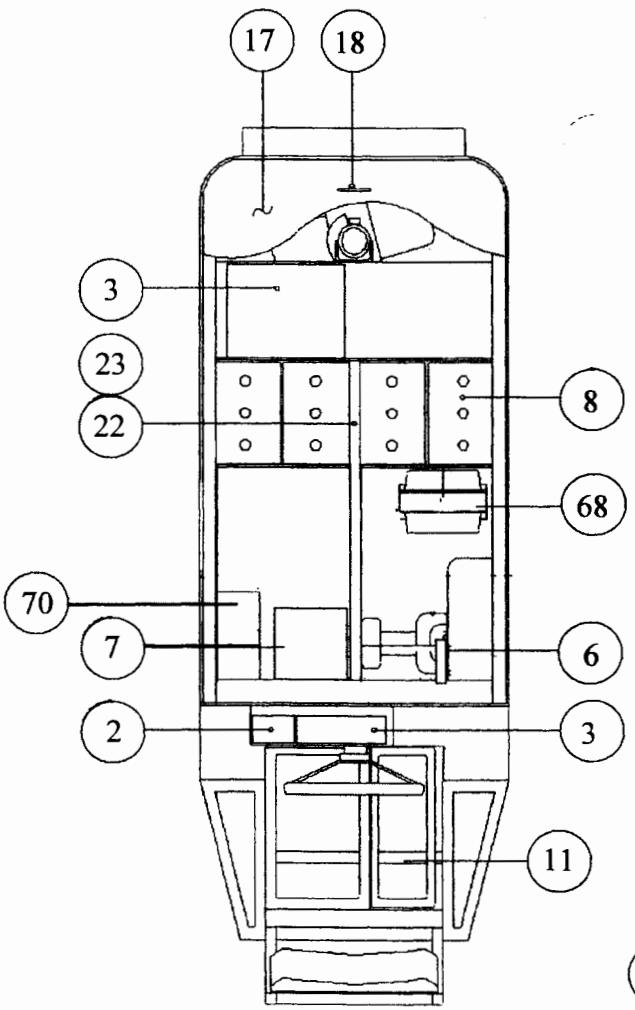
Do not expose the batteries to flames or electrical sparks. Hydrogen gas is generated during the battery charging operation. This hydrogen gas is explosive. Do not allow battery acid to come in contact with skin, eyes, clothing or painted surfaces. If it contacts eyes or skin, immediately flush with water for 15 minutes and seek medical attention immediately.

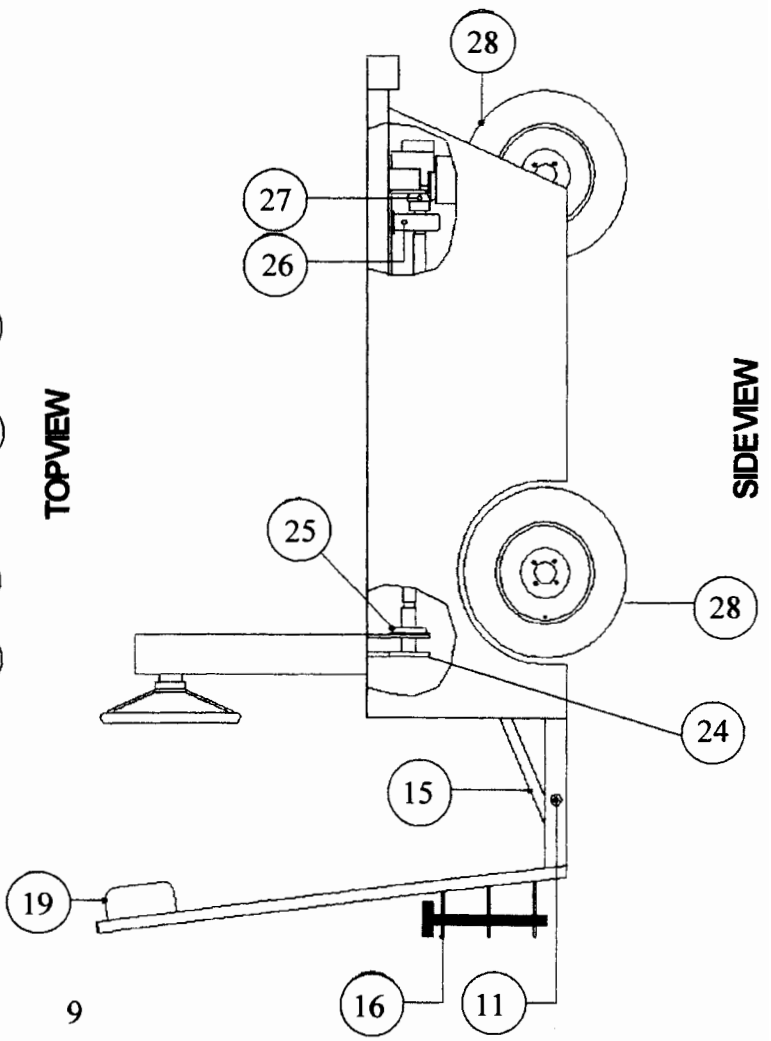
** Over inflation or under inflation can reduce tire life, adversely affect vehicle handling and lead to sudden tire failure. This could result in unexpected loss of vehicle control.

SC-775-6SB
STOCK CHASER

DWG.#	DESCRIPTION	P/N	QTY
1	PACK MULE DECAL	EV-A001	1
2	PACK MULE I.D. PLATE	EV-A002	1
3	CAUTION STICKER	EV-A003	2
6	TRANSAXLE	EV-D031	1
7	7.5 HP. MOTOR	EV-D038	1
8	BATTERY	EV-E036	6
11	TREADLE ROD	EV-F022	1
15	ACCELERATOR PEDAL	EV-F034	1
16	T-HANDLE HITCH	EV-F035	1
17	DECK (SPECIFY MODEL NUMBER)	EV-F038	1
18	DECK HANDLE	EV-F036	1
19	BACKREST	EV-F037	1
20	DRIVE CHAIN #40	EV-S001	1
21	MASTER LINK	EV-S002	1
22	STEER ROD, (SC-750)	EV-S008	1
23	INSULATOR, STEERING	EV-S009	1
24	LOWER STEERING SPROCKET	EV-S029	1
25	STEER ROD BEARING	EV-S011	3
26	PILLOW BLOCK	EV-S021	1
27	PINION GEAR	EV-S022	1
28	TIRE/RIM ASSEMBLY	EV-W002	4
54	4 TERMINAL SOLENOID (not illustrated)	EV-E014	0
61	6 TERMINAL SOLENOID (not illustrated)	EV-E021	0
66	CHARGER CORD (not illustrated)	EV-E026	1
68	CHARGER	EV-E075	1
70	CONTROLLER	EV-E077	1







MillipaK 4QPM Power Wiring

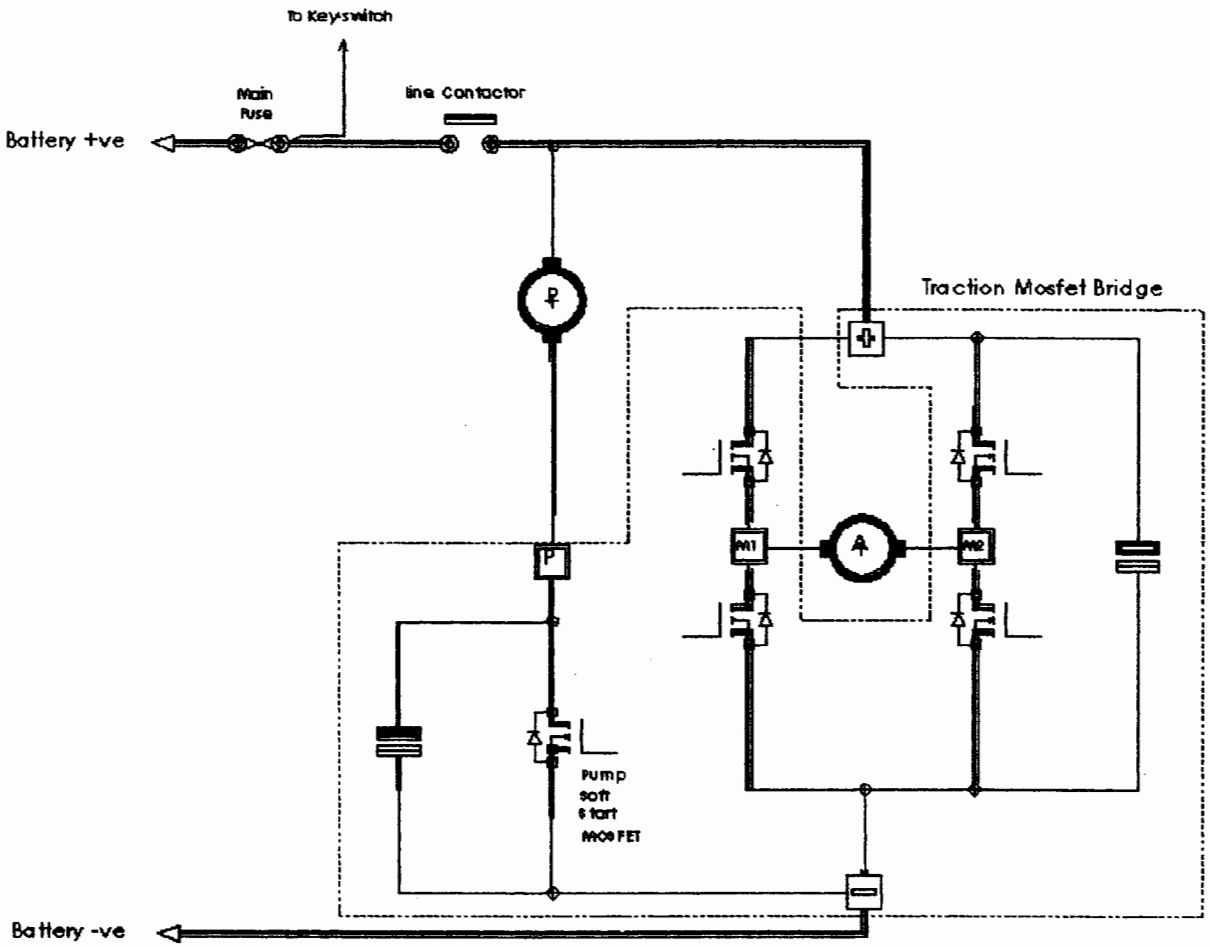
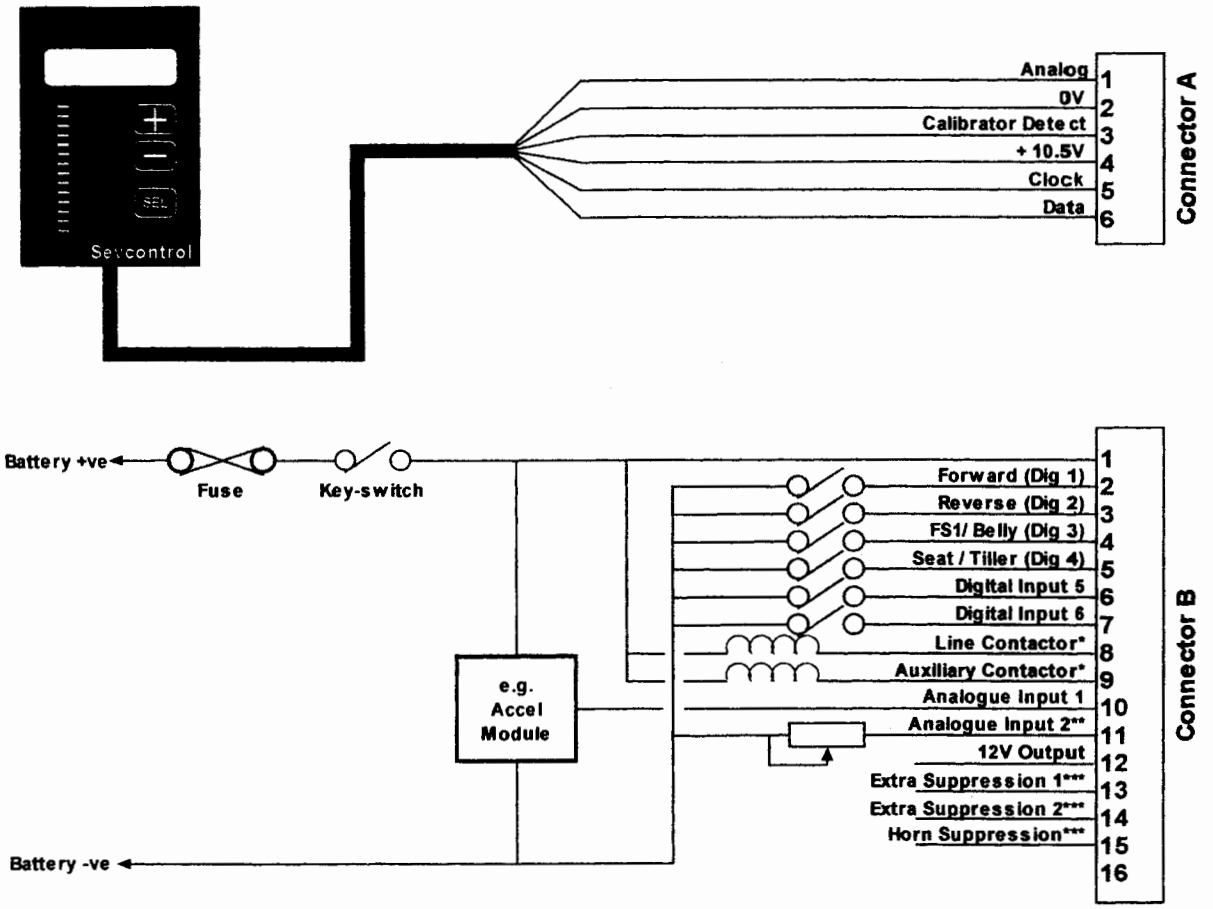


Figure 1: MillipaK 4QPM Power Wiring

NOTE: The Pump MOSFET's are optional (soft start versions only).

MillipaK Light Wiring example



NOTES:
*Contactor Coil Suppression fitted internally.
**Analogue Input 2 can also be configured as a digital input.
***Extra Suppression and Horn Suppression inputs to be used as shown below:

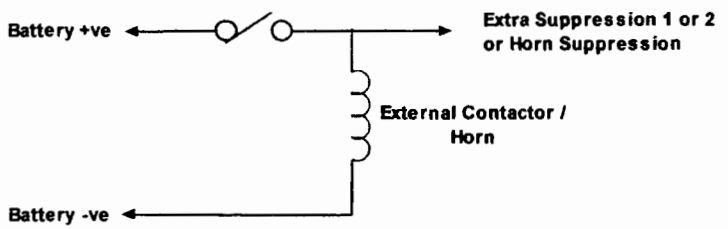


Figure 2: MillipaK Light Wiring

ELECTRICAL COMPONENTS PARTS LIST

PART DESCRIPTION	PART NUMBER	QTY.
7.5 HP MOTOR, BRIGGS & STRATTON	EV-D038	1
KEY SWITCH, 3 POSITION	EV-E100	1
HORN, 36 VOLT ELECTRIC VEHICLE	EV-E130	1
HORN, 48 VOLT ELECTRIC VEHICLE	EV-E130	1
BATTERY DISCHARGE INDICATOR	EV-E093	1
SOLENOID 4 TERMINAL, 24, 36 & 48 VOLT UNITS	EV-E014 HD	1
10 AMP FUSE	EV-E015	1
FUSE HOLDER	EV-E016	1
3-PRONG PLUG FOR CHARGER	EV-E018	1
CHARGER CORD (not illustrated)	EV-E026	1
BATTERY CHARGER, 48 VOLT	EV-E099	1
BATTERY CHARGER, 36 VOLT	EV-E075	1
DC MOTOR CONTROLLER, SEVCON 325 AMP	EV-E077	1
EXTERNAL RESISTOR FOR SEVCON CONTROLLER	EV-E125	0
THROTTLE POSITION DEVICE (24, 36 & 48 VOLT)	EV-E078	1
DIRECTION SWITCH	EV-E035	1
HORN BUTTON	EV-E041	1

TRANSAXLE MAINTENANCE AND REPAIR

Important considerations in assembling and disassembling the transaxle for the Pack Mules include cleanliness, replacement of bearings and seals, careful removal of snap rings, and the application of adequate torque on bolts, bearings and screws. For these procedures, the proper tools are required.
Some of the service operations require special tools, such as oil seal, bearing and slide hammer pullers.

Wesley pack Mule LLC recommends that " original equipment" service parts be used in the event that parts need to be replaced.

All maintenance personnel should be aware
That the transaxle is a precision assembly, and
As such, repair and replacement of parts must
be done with great care in a clean environment.
The following are general recommendations that
relate to work on the transaxle:

WARNING: Safety glasses should be worn at all times when assembling and disassembling the transaxle.

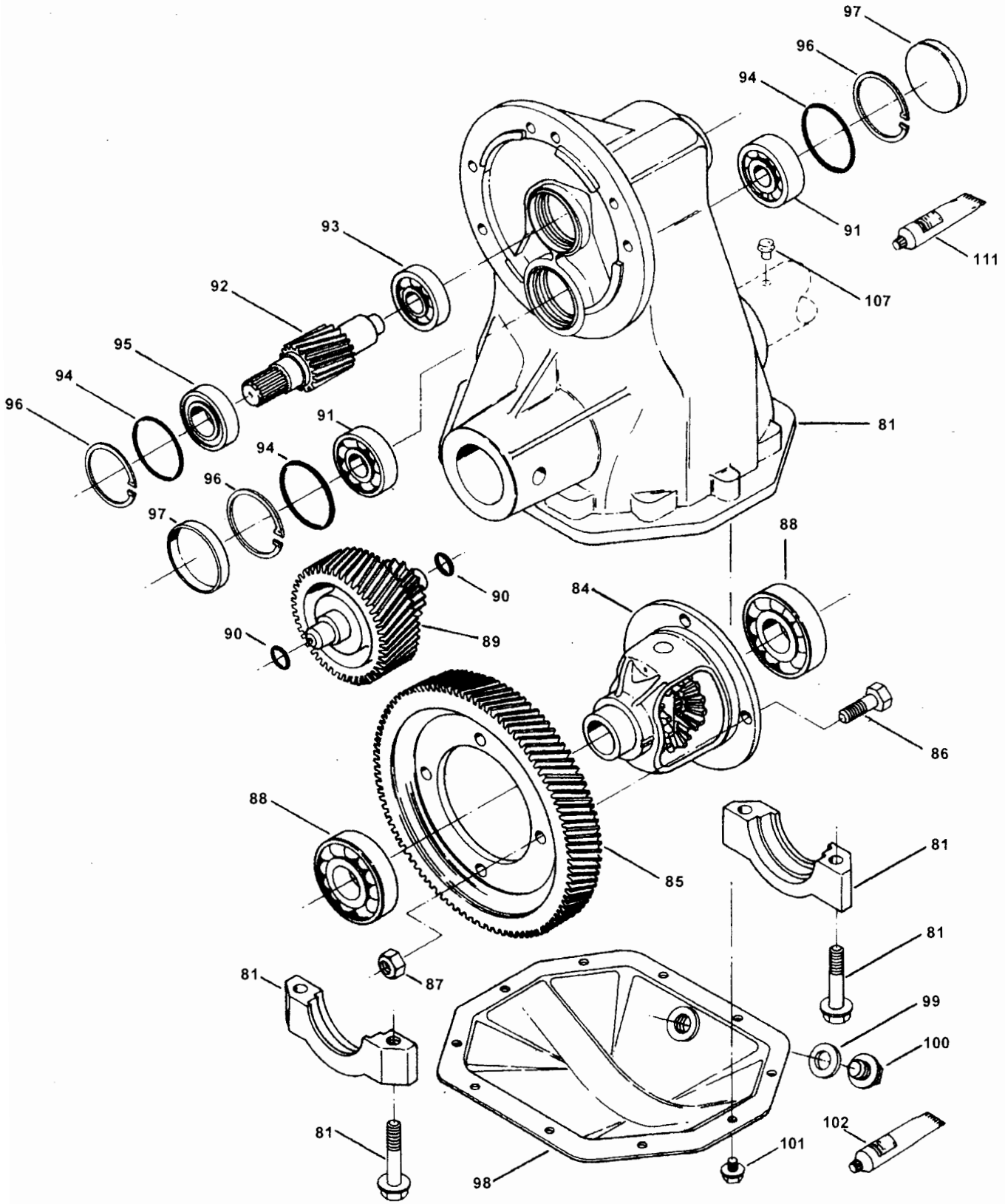
- Handle all gears with extreme care.
- Degrease transaxle assembly before disassembling.
- Clean parts in small wash tank prior to reassembly.
- Replace bearings, seals, and O-rings if removed, regardless of mileage.
- Replace nuts used on ring gear and brake installation during service regardless of mileage.
- Remove bearings and seals with special pullers.
- When removing the cover plate, position the transaxle over a drain pan.
- Bearing caps are marked for identification. Letter or numbers are stamped in horizontal or vertical positions. During reassembly, place them back in their original positions.
- Whenever disassembling, use caution as to not damage sealing surfaces suck as the housing sealing surfaces. Snap rings must be removed or installed with care to prevent damage to bearings, seals and bearing boxes.
- Use soft, clean, lintless towels to dry components after cleaning.
- Do not air dry bearings with compressed air.
- Apply anti-seize compound to the axle shaft spline to prevent wear and corrosion.
- Use Heavy Duty 90W Gear Oil.

TORQUE INFORMATION

Apply the following torque to the particular components listed:

Differential Bearing Caps	35-45 Ft. Lbs.
Ring Gear Bolts	35-45 Ft. Lbs.
Cover Plate Screws	18-25 Ft. Lbs.
Fill Plug	25-40 Ft. Lbs.
Brake Hardware	23-35 Ft. Lbs.
Spindle Nut	65-75 Ft. Lbs. Then tighten to next slot.

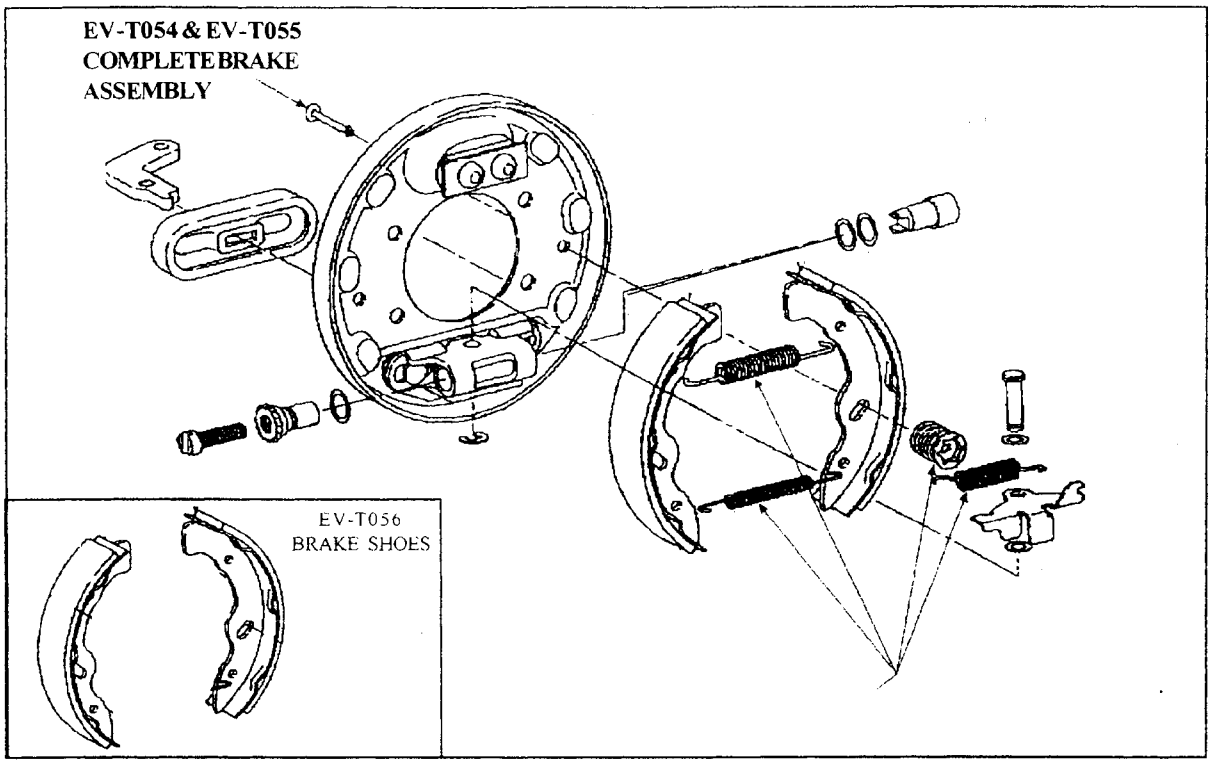
TRANSAXLE DIAGRAM



TRANSAXLE PARTS LIST

DWG.#	DESCRIPTION	P/N	QTY
81	CARRIER SUB-ASSEMBLY	EV-T001	2
84	DIFFERENTIAL CASE ASSEMBLY	EV-T004	1
85	GEAR OUTPUT	EV-T005	1
86	CAP SCREW	EV-T006	4
87	NUT	EV-T007	4
88	BEARING, BALL	EV-T008	2
89	INT. SHAFT & GEAR ASSEMBLY	EV-T009	1
90	O-RING	EV-T010	2
91	BEARING, BALL	EV-T011	2
92	INPUT SHAFT	EV-T012	1
93	BALL BEARING	EV-T013	1
94	O-RING	EV-T014	3
95	BALL BEARING	EV-T015	1
96	SNAP RING	EV-T016	3
97	PLUG, CUP	EV-T017	2
98	COVER CARRIER	EV-T018	1
99	FLAT WASHER	EV-T019	1
100	FILL PLUG	EV-T020	1
101	SCREW COVER PLATE	EV-T021	10
102	COVER PLATE SEALANT	EV-T022	1
103	SHAFT, AXLE L.H.	EV-T023	1
104	TUBE ASSY. - L.H.	EV-T024	1
105	SHAFT, AXLE, R.H.	EV-T025	1
106	TUBE ASSY. - R.H.	EV-T026	1
107	VENT	EV-T027	1
108	BEARING	EV-T028	2
109	SNAP RING	EV-T029	4
110	SEAL, OIL	EV-T030	2
111	ANAEROBIC SEALANT	EV-T031	1
113	BRAKE ASSEMBLY, SHOE TYPE, L.H.	EV-T054	1
114	BRAKE ASSEMBLY, SHOE TYPE, R.H.	EV-T055	1

BRAKE AND AXLE



DWG # 113 & 114. Brake Assembly, EV-T054, Left Hand (Illustrated)

Wesley Pack Mule LLC offers the following kits for the braking system:

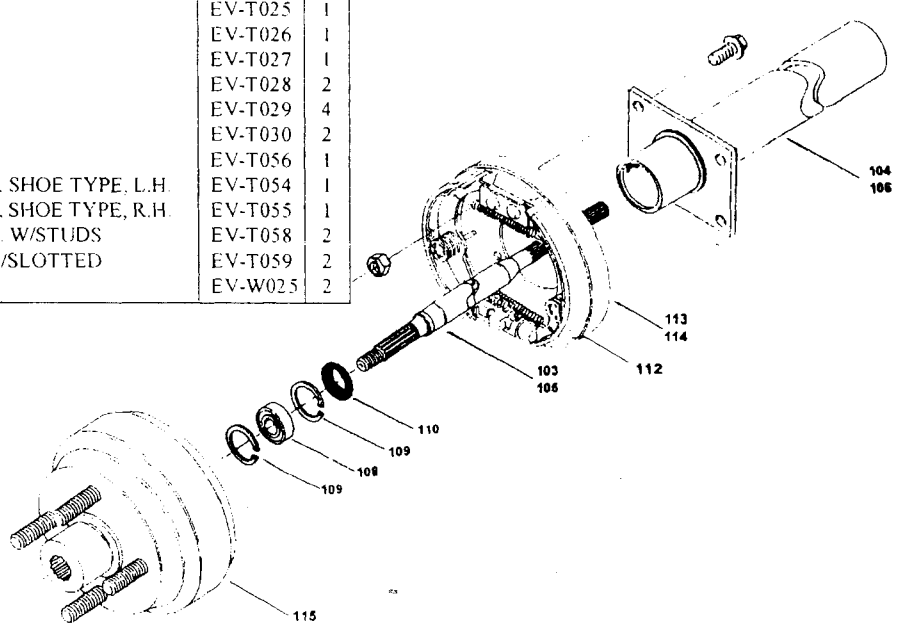
1) Brake Assembly (complete), EV-T054 (LH) AND EV-T055 (RH)

2) Brake Shoes (1 Wheel), EV-T056

HUB & DRUM, AXLE and BRAKE (Illustrated)

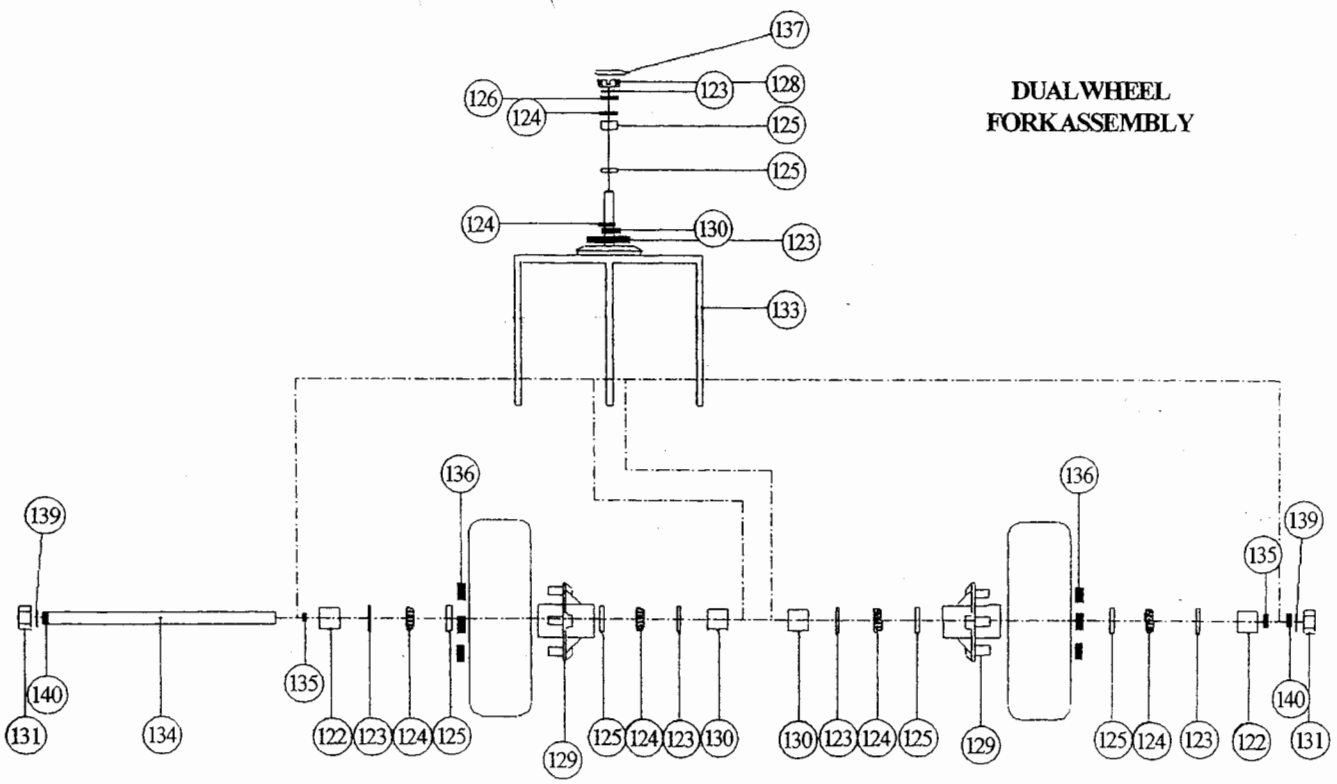
DWG#	DESCRIPTION	P/N	QTY
103	SHAFT, AXLE L.H.	EV-T023	1
104	TUBE ASSY. - L.H.	EV-T024	1
105	SHAFT, AXLE, L.H.	EV-T025	1
106	TUBE ASSY. - L.H.	EV-T026	1
107	*VENT	EV-T027	1
108	BEARING	EV-T028	2
109	SNAP RING	EV-T029	4
110	SEAL, OIL	EV-T030	2
112	BRAKE SHOES	EV-T056	1
113	BRAKE ASSEMBLY, SHOE TYPE, L.H.	EV-T054	1
114	BRAKE ASSEMBLY, SHOE TYPE, R.H.	EV-T055	1
115	HUB & DRUM ASSY. W/STUDS	EV-T058	2
116	*CASTLE JAM NUT/SLOTTED	EV-T059	2
117	*COTTER PIN	EV-W025	2

* NOT PICTURED!



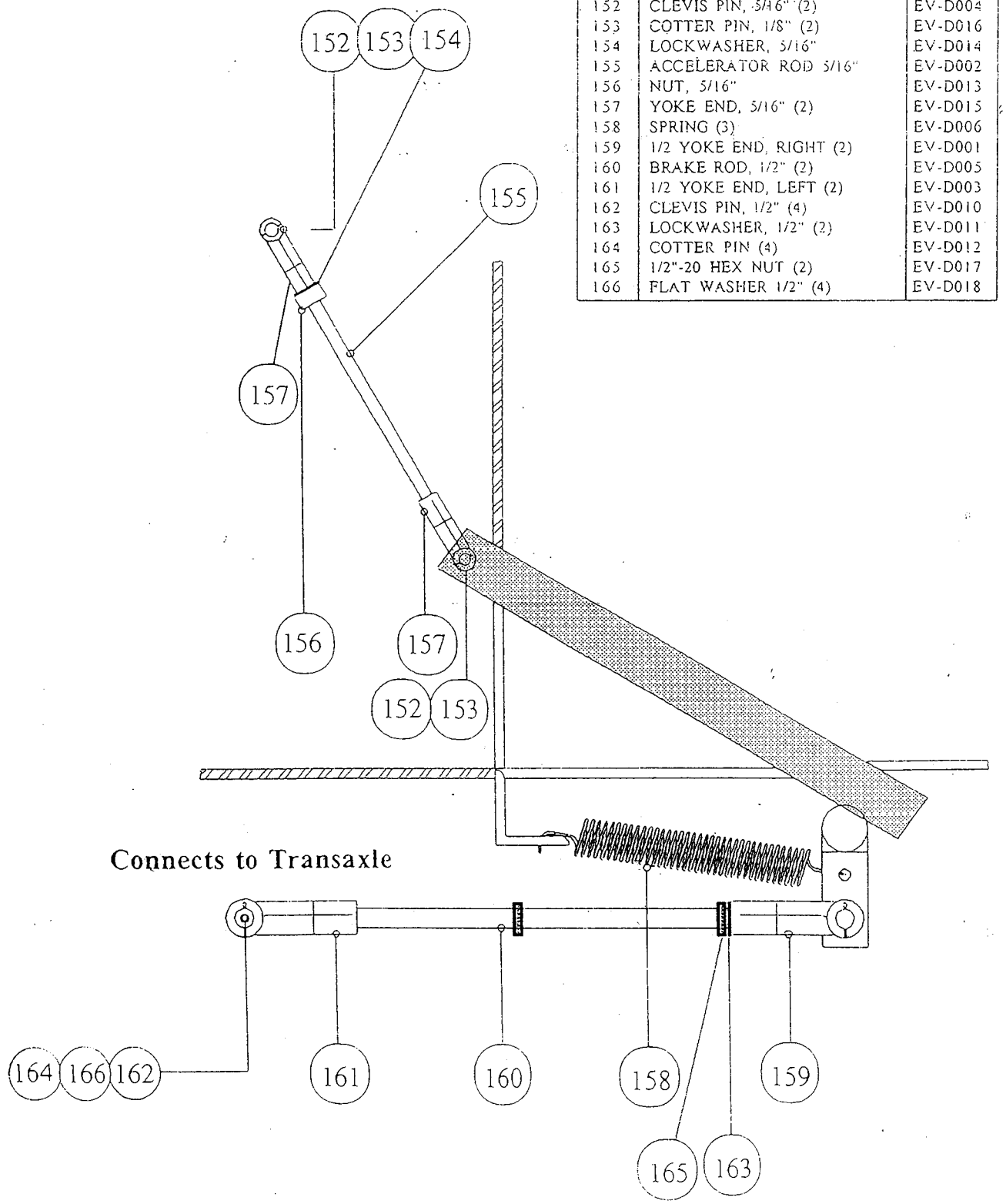
FRONT FORK WHEEL ASSEMBLY

ITEM	DESCRIPTION	P/N
121	FRONT WHEEL AXLE BOLT	EV-W003
122	FRONT BEARING SLEEVE (2)	EV-W007
123	OIL SEAL (4) (6 on Dual Wheel)	EV-W008
124	TAPERED ROLLER BEARING (4 or 6)	EV-W009
125	BEARING RACE (4) (6 on Dual Wheel)	EV-W010
126	BUSHINGS-SHORT	EV-W011
128	1" THIN SLOTTED HEX NUT	EV-W013
129	HUB W/STUDS (2 on Dual Wheel)	EV-W001
130	SPACER-LONG (1) (3 on Dual Wheel)	EV-W014
131	1" SLOTTED HEX NUT (2 on Dual Wheel)	EV-W006
132	FRONT WHEEL FORK ASSEMBLY	EV-W015
133	DOUBLE FORK ASSEMBLY	EV-W016
134	DUAL FRONT WHEEL AXLE	EV-W017
135	1" THIN HEX NUT (2 on Dual Wheel)	EV-S017
136	FRONT/REAR LUG NUTS (4 per Wheel)	EV-W023
137	COTTER PIN 3/16 - 1 1/4"	EV-W025
139	1" LOCK WASHER (2 on Dual Wheel)	EV-W026
140	1" FLAT WASHER (2 on Dual Wheel)	EV-W027



ACCELERATOR LINKAGE

ITEM	DESCRIPTION	P/N
152	CLEVIS PIN, 5/16" (2)	EV-D004
153	COTTER PIN, 1/8" (2)	EV-D016
154	LOCKWASHER, 5/16"	EV-D014
155	ACCELERATOR ROD 5/16"	EV-D002
156	NUT, 5/16"	EV-D013
157	YOKE END, 5/16" (2)	EV-D015
158	SPRING (3)	EV-D006
159	1/2 YOKE END, RIGHT (2)	EV-D001
160	BRAKE ROD, 1/2" (2)	EV-D005
161	1/2 YOKE END, LEFT (2)	EV-D003
162	CLEVIS PIN, 1/2" (4)	EV-D010
163	LOCKWASHER, 1/2" (2)	EV-D011
164	COTTER PIN (4)	EV-D012
165	1/2"-20 HEX NUT (2)	EV-D017
166	FLAT WASHER 1/2" (4)	EV-D018



TROUBLE-SHOOTING

Before checking or repairing any part of the vehicle, ensure that all safety precautions have been taken. Electrical control system adjustments should only be made by qualified personnel, due to the use of special equipment and instruments. If there is ever a question about the sensitivity of an adjustment or the difficulty of that adjustment, please feel free to contact Wesley Pack Mule LLC using our **toll free number 1-800-241-2869.**

SYMPTOM	POSSIBLE CAUSE	SOLUTION
VEHICLE DOES NOT RUN	Main fuse blown Short circuit	Trace the main power line from the fuse and check for a short circuit.
	Motor	Send motor to an authorized motor service center or replace motor.
	Small 10 Amp. Fuse blown	Trace wires from the fuse and check for a short (any bare wire that touches the chassis or common ground wire)
	Faulty control circuit Solenoid Battery Key switch Fuse	Replace fault component Check all connections to insure that all are clean and tight
	Malfunction of solenoid	Inspect or replace
	Faulty batteries	Check with hydrometer* charge batteries or replace faulty batteries if necessary
	Malfunction of solid state DC motor controller	Consult manufacture and replace if necessary
MOTOR RUNS IN THE WRONG DIRECTION	Reversed toggle switch wires	Check the forward and reverse toggle switch for proper connections.
VEHICLE LOSES LOW OR HIGH SPEED	Malfunction of pot box	Check pot box and replace potentiometer, Micro switch or spring if necessary
	Malfunction of solid state DC motor controller or accelerator	Consult manufacture and replace

TROUBLE-SHOOTING

SYMPTOM	POSSIBLE CAUSE	SOLUTION
ROUGH OR INSUFFICENT BRAKING	Worn brake shoes	Replace and adjust brake shoes
BATTERY CHARGER DOES NOT OPERATE	Blown fuse or tripped circuit breaker	Inspect circuit and replace fuse or reset circuit breaker
	Faulty connections	Check all battery & charger connections
	Batteries fully charged	Unplug charger
	Batteries damaged	Check batteries with hydrometer & replace if necessary
	Battery charger failure	Replace battery charger
BATTERIES UNABLE TO FULLY RECHARGE	Battery fluid level low	Check water level of batteries and fill with distilled water. (DO NOT OVER FILL)
	Batteries worn out	After allowing enough time for the batteries to recharge, check specific gravity with a hydrometer. Replace batteries if necessary

Fault Finding

The MillipaK controller includes a number of features designed to help the user track down operational faults, wiring faults or internal controller faults.
The **Diagnostic LED** mounted next to the calibrator connectors on the front of the controller serves a a simple diagnostic tool as explained below:

ON	No fault, normal condition
OFF	Internal controller fault
1 flash	Personality out of range
2 flashes	Illegal start condition (Traction)
3 flashes	MOSFET Short Circuit
4 flashes	Contactor fault or Motor Open Circuit
5 flashes	Not used
6 flashes	Accelerator wire off fault
7 flashes	Low or High battery voltage or BDI cutout operating
8 flashes	Over temperature or timed cutback
10 flashes	Power Up Autozero has not yet been completed

Table 1: Flash Fault Descriptions

In addition to the LED indication a more detailed description of any faults detected may be found by using the calibrator. Menu item number 13.01 gives a code which corresponds to the following detected faults:

ID	Fault	Description	Flash Fault
0	System OK		On
1	Thermal Cutback	Maximum power available to the motor has been reduced due to excessive Heatsink temperature.	8
2	Timed Current Limit Cutback	Maximum power available to the motor has been reduced by the Timed Current Limit Cutback function.	8
3	Accelerator Wire Off	Input wire from accelerator has been disconnected.	6
4	Accelerator Pressed at Power Up	Accelerator pedal pressed at power up	6
5	Belly Fault	The Belly switch function has occurred	2
6	Seat Fault	Drive selected and no seat switch closed.	2
7	Autozero Not Taken	No drive allowed until power up autozero has been taken	10
8	FS1 Recycle	FS1 switch remained closed during a direction change	2
9	SRO Fault	Direction switch selected for greater than 2 seconds with FS1 open.	2

ID	Fault	Description	Flash Fault
10	Two Direction Fault	Two directions selected together.	2
11	Sequence Fault	Direction or FS1 switch closed at power up.	2
12	Low Battery Fault	Battery voltage is too low.	7
13	High Battery Fault	Battery voltage is too high.	7
14	High Battery Fault with Line Contactor Open	Battery voltage is too high before the line contactor is closed	7
15	Configuration Range Fault	A personality is out of range.	1
16	Configuration CRC Fault	The personality CRC is incorrect	1
17	Line Contactor Welded Fault	Line contactor is welded.	4
18	Line Contactor did not Close Fault	Line contactor is open circuit.	4
19	-	Reserved for future use	-
20	Lower MOSFETs Short Circuit	Short circuit on Q2/Q4 Armature MOSFETs detected.	3
21	VA Detect Fail	12V Supply Failure	0
22	MOSFET Off	MOSFETs did not pulse during power on failsafe checks (failsafe circuit enabled).	0
23	MOSFET On	MOSFETs pulsed during power on failsafe checks (failsafe circuit disabled).	0
24	Upper MOSFETs Short Circuit	Short circuit Q1/Q3 Armature MOSFETs detected.	3
25	Drive 2 Off	Contactor 2 did not pulse during power on failsafe checks (failsafe circuit enabled).	0
26	Drive 2 On	Contactor 2 pulsed during power on failsafe checks (failsafe circuit disabled).	0
27	Drive 1 Off	Contactor 1 did not pulse during power on failsafe checks (failsafe circuit enabled).	0
28	Drive 1 On	Contactor 1 pulsed during power on failsafe checks (failsafe circuit disabled).	0

Table 2: Fault Numbers and Descriptions

Fault Clearance

Any fault indication will be cleared by re-initiating the start sequence after the cause of the fault has been removed.