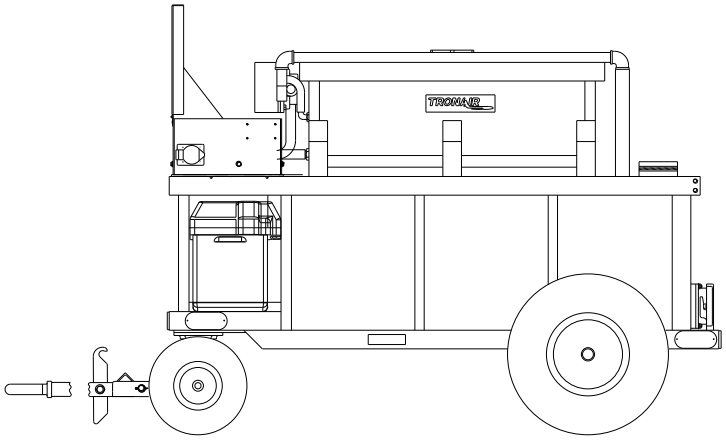
OPERATION & SERVICE MANUAL



Model: 10-6412-0000
Lavatory Service Unit

09/2024 – Rev. 02

Tronair, Inc.
1 Air Cargo Pkwy East
Swanton, OH 43558

Phone: (419) 866-6301 | 800-426-6301
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REVISION	DATE	TEXT AFFECTED
01	12/2013	Original release
02	09/2024	Major revision

TABLE OF CONTENTS

PAGE

This product can not be modified without the written approval of Tronair, Inc. Any modifications done without written approval voids all warranties and releases Tronair, Inc., its suppliers, distributors, employees, or financial institutions from any liability from consequences that may occur. Only Tronair OEM replacement parts shall be used.

1.0 PRODUCT INFORMATION

1.1 DESCRIPTION

The Tronair Model 10-6412-0000 Lavatory Service Unit (LSU) provides a clean, sanitary means of servicing the aircraft lavatory system and transporting the waste fluid to the dump station.

Some important features are:

- Easily maneuverable with towbar
- Brakes on front tires for locking in static position
- Drain back system on fill hose to prevent fluid spillage
- Storage provided for fill and dump hoses and connector
- Electric fill pump
- Fill and dump tanks made of non-corroding HD polyethylene material with UV inhibitor
- 3 inch I.D. gravity drain valve in dump tank with removable hose and fitting

1.2 MODEL & SERIAL NUMBER

Reference nameplate on unit

1.3 MANUFACTURER

***TRONAIR*, Inc.**
1 Air Cargo Pkwy East
Swanton, Ohio 43558 USA

Telephone: (419) 866-6301 or 800-426-6301
Fax: (419) 867-0634
E-mail: sales@tronair.com
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1.4 SPECIFICATIONS

Length .....64 in (162.6 cm)
Width .....37.5 in (95.3 cm)
Height.....49.5 (126 cm) in with towbar in up position
Weight .....600 lbs (272 kg) empty

1.5 FILL (FRESH) SYSTEM

- 31 gallon tank capacity; HD polyethylene
- 4.5 GPM pump
- Three (3) inch tank fill port with cover
- Eight (8) foot fill hose

1.6 DUMP SYSTEM

- 68 gal (257.5 L) tank capacity; HD polyethylene
- Six (6) inch tank clean out port with cover
- Four (4) inch aluminum tank flange for aircraft dump hose connection
- 18 inch long, three (3) inch I.D. dump tank hose with 45 connector

1.7 MECHANICAL

- Pneumatic tires front (steering) wheels with semi-sealed ball bearing (Tire size 410/350 x 4) 50 psi tire pressure maximum
- Pneumatic tired rear wheels with tapered roller bearings (Tire size 4.80/4.00 x 8) 50 psi tire pressure maximum
- Towing speed - 10 mph (16 kph) maximum

1.8 KITS

The following kits are available for Model: 10-6412-0000 LSU:
K-2410.....Kit, Fill Connector
K-2412.....Kit, Dump Connector with 5 foot hose
K-2029.....Kit, Dump Connector
K-2030.....Kit, Dump Connector; mates with K-2412
K-3606.....Kit, Hose Cap (Dump Hose)

2.0 SAFETY INFORMATION

2.1 USAGE AND SAFETY INFORMATION

To ensure safe operations please read the following statements and understand their meaning. Also refer to your equipment manufacturer's manual for other important safety information. This manual contains safety precautions which are explained below. Please read carefully.

WARNING!
Warning is used to indicate the presence of a hazard that can cause ***severe personal injury, death, and/or substantial property damage*** if the Warning Notice is ignored.

CAUTION!
Caution is used to indicate the presence of a hazard, which will or can cause ***minor personal injury or property damage*** is the Caution Notice is ignored.

2.2 GENERAL

The operation, maintenance, and trouble shooting of the Electric Lavatory Service Unit requires practices and procedures which ensure personal safety and the safety of others. Therefore, this equipment is to be operated and maintained only by qualified persons in accordance with this manual and all applicable codes.

Information presented in this manual and on various labels on this unit pertains to equipment specifications, Installation, Operation, Maintenance and Trouble Shooting which should be read, understood, and followed for the safe use of this equipment.

2.3 TRAINING

Read this entire manual prior to operation of the unit. All personnel using this Electric Lavatory Service Unit should understand and follow this manual and receive training. We encourage our customers to call Tronair to discuss any operating or testing requirements, telephone: (419) 866-6301 or (800) 426-6301.

3.0 TRAINING

3.1 TRAINING REQUIREMENTS

The employer of the operator is responsible for providing a training program sufficient for the safe operation of the unit.

3.2 TRAINING PROGRAM

The employer provided operator training program should cover safety procedures concerning use of the unit in and around the intended aircraft at the intended aircraft servicing location.

3.3 OPERATOR TRAINING

The operator training should provide the required training for safe operation of the unit.

NOTE: Maintenance and Trouble Shooting are to be performed by a skilled and trained technician.

4.0 PREPARATION FOR USE

This Lavatory Service Unit has been thoroughly inspected and tested prior to packaging and shipment. The unit is shipped completely assembled and is ready for use.
You are requested to generally check over the unit to assure the tightness of all nuts, bolts and screws that may have loosened during shipment. Bolts and elastic stopnuts should be tightened to a torque not to exceed industry standards for Grade "5" bolts. Tire pressure should not exceed 50 PSI.

5.0 OPERATING INSTRUCTIONS

1. Open access panel on aircraft. Remove drain and fill coupling caps.
2. Connect dump hose assembly to aircraft drain coupling and fill hose assembly to mating aircraft coupling.
3. Follow aircraft manufacturer's instructions to drain sewage from aircraft into dump tank.
4. To flush aircraft toilet, the ball valve after the fill pump must have its handle in the up position (perpendicular to valve). Follow aircraft manufacturer's requirements for flushing.
5. After flushing, position ball valve handle in down position (parallel to valves). This allows for fill hose to be partially drained prior to disconnecting from aircraft.
6. Remove dump and fill hoses from aircraft and stow.
7. Following aircraft manufacturer's instructions, replace coupling caps on aircraft fittings. Close access panel.
8. Drain sewage into approved disposal system. Refill fill tank as required. Lavatory Service Unit is now ready for re-use.

6.0 STORAGE

1. The tank must be drained before storage.
2. Disconnect all battery connections.
3. Store the unit in a clean, dry place when not in use.
4. Be sure that all hoses are capped and the unit is covered with a lint free covering.
5. After storage, clean the tank as outlined in the maintenance section of this manual.

7.0 TROUBLE SHOOTING

1. If fill pump fails during use, refer to Parts List and disassemble for inspection of pump internals. Replace any damaged parts. Failure to pump liquid may be caused by the following reasons:
   Pump Will Not Prime: Clogged Suction; check that suction tubes are clear.
   Not Enough Flow: Check suction and discharge hoses for clogging or pinching. Verify that nozzle is not clogged.
2. If dump pump fails during use, refer to Pump Parts List and disassemble for inspection of pump internals. Clean inside of pump. Replace any damaged parts.

8.0 MAINTENANCE

1. Lubricate wheel bearings with multi-purpose grease; every 6 months minimum.
2. Lubricate front caster swivel plate bearings with multi-purpose grease; every 6 months minimum.
3. Periodically check for leaks at hose connections and tighten hose clamps, as required.
4. Regularly wash tanks and hoses with a mild detergent according to local procedures and regulations.

8.1 BATTERY

WARNING!

Battery posts, terminals and related accessories contain lead and lead compounds; chemicals known to the State of California to cause cancer and reproductive harm.

Wash hand after handling.

EXPLOSIVE GAS! Batteries produce explosive hydrogen gas while being charged. To prevent a fire or explosion, charge batteries only in well ventilated areas. Keep sparks, open flames, and other sources of ignition away from the battery at all times. Keep batteries out of the reach of children. Remove all jewelry when servicing batteries.

Before disconnecting the negative (-) ground cable, make sure all switches are OFF. If ON, a spark will occur at the ground cable terminal, which could cause an explosion if hydrogen gas or gasoline vapors are present.

ELECTRICAL SHOCK! Never touch electrical wires or components. They can be sources of electrical shock.

1. Remove battery box cover.
2. Inspect battery connections for tightness and cleanliness.
3. Inspect condition of battery by sight glass located on top, should be green in color. If not, ensure battery is charged. If still not green, replace battery.
4. Re-install battery box cover and secure with strap.

9.0 GUARANTEES/LIMITATION OF LIABILITY

Tronair products are warranted to be free of manufacturing or material defects for a period of one year after shipment to the original customer. This is solely limited to the repair or replacement of defective components. This warranty does not cover the following items:

a) Parts required for normal maintenance
b) Parts covered by a component manufacturers warranty
c) Replacement parts have a 90-day warranty from date of shipment

If you have a problem that may require service, contact Tronair immediately. Do not attempt to repair or disassemble a product without first contacting Tronair, any action may affect warranty coverage. When you contact Tronair be prepared to provide the following information:

a) Product Model Number
b) Product Serial Number
c) Description of the problem

If warranty coverage is approved, either replacement parts will be sent or the product will have to be returned to Tronair for repairs. If the product is to be returned, a Return Material Authorization (RMA) number will be issued for reference purposes on any shipping documents. Failure to obtain a RMA in advance of returning an item will result in a service fee. A decision on the extent of warranty coverage on returned products is reserved pending inspection at Tronair. Any shipments to Tronair must be shipped freight prepaid. Freight costs on shipments to customers will be paid by Tronair on any warranty claims only. Any unauthorized modification of the Tronair products or use of the Tronair products in violation of cautions and warnings in any manual (including updates) or safety bulletins published or delivered by Tronair will immediately void any warranty, express or implied.

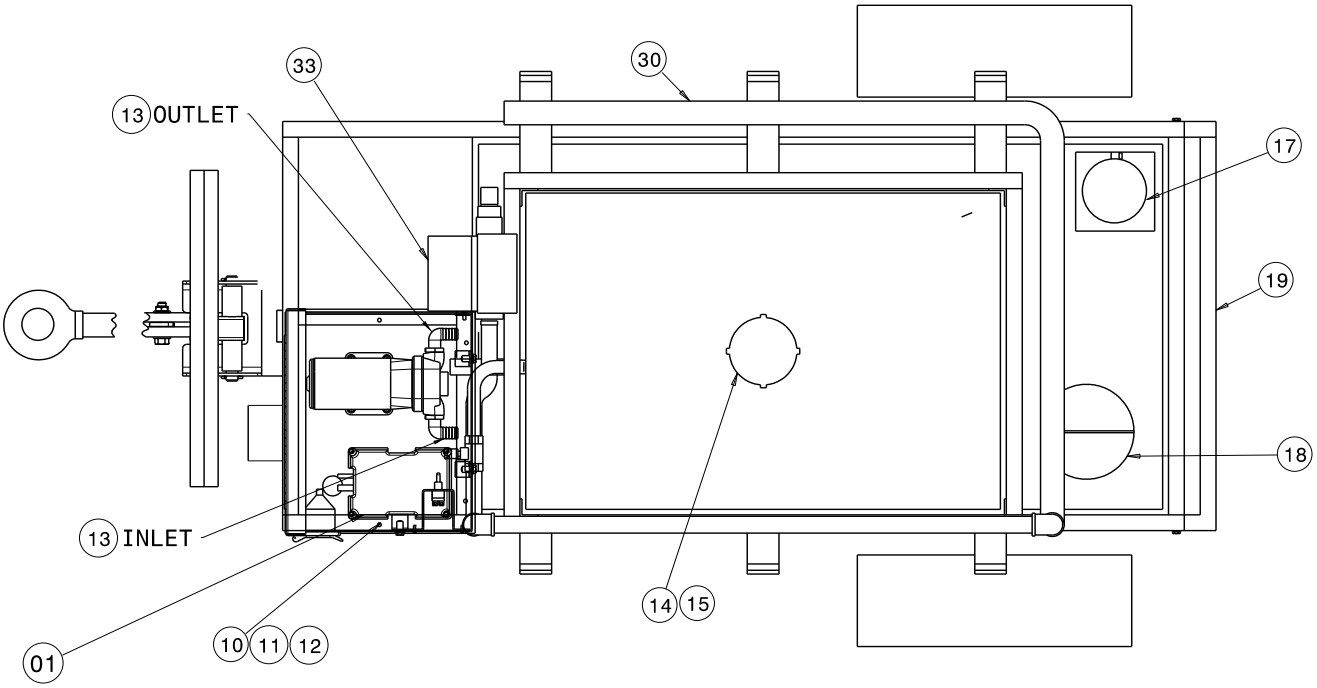
The obligations of Tronair expressly stated herein are in lieu of all other warranties or conditions expressed or implied. **Any unauthorized modification of the Tronair products or use of the Tronair products in violations of cautions and warnings in any manual (including updates) or safety bulletins published or delivered by Tronair will immediately *void any warranty, express or implied* and Tronair *disclaims any and all liability for injury (WITHOUT LIMITATION and including DEATH), loss or damage arising from or relating to such misuse*.**

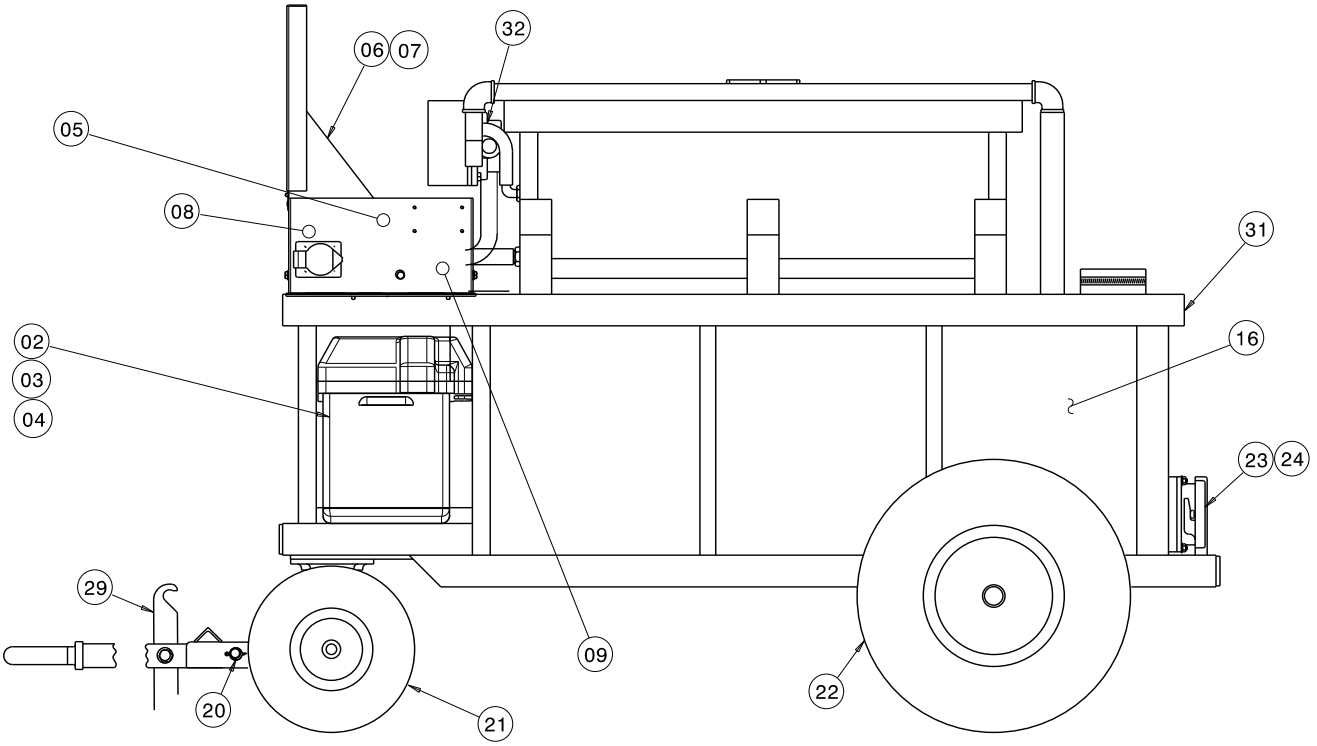
10.0 APPENDICES

APPENDIX I Johnson Controls Safety Data Sheet

Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.





Parts List

Item	Part Number	Description	Qty
1	Z-7425	ASSEMBLY, PUMP	1
2	H-1996	BOX, BATTERY	1
3	G-1235	NUT, SS BATTERY HOLD DOWN	2
4	EC-1656	BATTERY, 12 VOLT	1
5	V-1590	LABEL, PUMP SWITCH	6
6	Z-2051*12.0	LANYARD, ASSEMBLY	1
7	G-1351-18	RIVET, 3/16 OPEN END STEEL	1
8	V-1592	LABEL, 120 VAC OUTLET	1
9	V-2330	LABEL, CLEAN FILTER	1
10	G-1202-1050	ESN, ¼ - 20	6
11	G-1112-105030	BOLT, HH, GRADE 5, ¼ - 20 X 3.0 LONG	6
12	G-1250-1050N	FLATWASHER, ¼ NARROW	12
13	H-1426-04	CLAMP, ¾“ HOSE	4
28	Z-6182-01	WELDMENT, STEERING AXLE	1
30	TF-1005*96.0	HOSE, 1.0 ID X 96 LONG	1
31	Z-8350-01	WELDMENT, FRAME	1
32	HC-1137	VALVE, BALL	1
33	H-1416	FLOWMETER	1
14	**K-1256**	**KIT, FILL TANK REPLACEMENT**; *consists of*:	
	H-1316	TANK, 31 GALLON	1
	V-1033-01	LABEL, "TRONAIR"	1
15	**K-1688**	**KIT, LID REPLACEMENT**; *consists of*:	
	H-1626	COVER	1
	H-1627	GASKET	1
16	**K-1251**	**KIT, DUMP TANK REPLACEMENT**; *consists of*:	
	H-1331	TANK, 68 GALLON	1
	H-1286	CAP, PLASTIC	1
	K-1210	KIT, 4" FLANGE (SEE ITEM 6)	1
	K-1208	KIT, 6" FILLWELL (SEE ITEM 12)	1
	K-1246	KIT, DRAIN VALVE (SEE ITEM 19)	1
17	**K-1210**	**KIT, 4" FLANGE REPLACEMENT**; *consists of*:	
	G-1100-105010	BOLT, HEX HEAD, GRADE 5, 1/4-20 X 1" LONG	4
	G-1251-1050R	LOCKWASHER, 1/4 REGULAR	4
	H-1426-16	CLAMP, HOSE	1
	J-1403-02	FLANGE, INNER	1
	Z-1462	WELDMENT, FLANGED 4" ADAPTOR	1
18	**K-4916**	**KIT, FILLWELL REPLACEMENT**	
19	**K-1252**	**KIT, REAR TANK GATE REPLACEMENT**; *consists of*:	
	G-1100-105016	BOLT, HEX HEAD, GRADE 5, 1/4-20 X 1-3/4 " LONG	4
	G-1250-1050N	FLATWASHER, 1/4 NARROW	4
	G-1251-1050R	LOCKWASHER, 1/4 REGULAR	4
	Z-1508-01-01	WELDMENT, REAR TANK GATE	1

Parts List

Item	Part Number	Description	Qty
20	**K-3970**	**KIT, PIN REPLACEMENT**; *consists of*:	
	G-1301-02	PIN, COTTER, 1/8" DIAMETER X 1" LONG	2
	R-2096	PIN	1
21	**K-1550**	**KIT, WHEEL (SINGLE) REPLACEMENT**; *consists of*:	
	G-1203-1115	JAMNUT, 3/4-16 ELASTIC	1
	G-1250-1110N	FLATWASHER, 3/4 NARROW	1
	TR-1585	SPACER, WHEEL	1
	U-1027	WHEEL, PNEUMATIC TIRE	1
22	**K-1633**	**KIT, WHEEL BEARING & SEAL REPLACEMENT**; *consists of*:	
	U-1010	WHEEL/TIRE ASSEMBLY	1
	G-1230-01	NUT, AXLE, 1"-14 UNS THREAD	1
	G-1301-05	PIN, COTTER, 5/32" DIAMETER X 1-1/2" LONG	1
	H-1155-01	CAP, DUST	1
	H-1559-01	BEARING	2
	H-1561-05	SEAL, GREASE	1
	H-1676-01	CUP, BEARING	2
23	**K-1246**	**KIT, DRAIN VALVE REPLACEMENT**; *consists of*:	
	G-1100-105016	BOLT, HEX HEAD, GRADE 5, 1/4-20 X 2" LONG	4
	G-1202-1050	STOPNUT, 1/4-20 ELASTIC	4
	G-1250-1050N	FLATWASHER, 1/4 NARROW	4
	H-1334	SEAL, STAT-O	4
	H-1333	VALVE, DRAIN	1
24	**K-1245**	**KIT, VALVE MOUNTING REPLACEMENT**; *consists of*:	
	G-1100-105016	BOLT, HEX HEAD, GRADE 5, 1/4-20 X 2" LONG	4
	G-1202-1050	STOPNUT, 1/4-20 ELASTIC	4
	G-1250-1050N	FLATWASHER, 1/4 NARROW	4
	H-1334	SEAL, STAT-O	4
29	**K-3971**	**KIT, LEVER REPLACEMENT**; *consists of*:	
	G-1100-109522	BOLT, HEX HEAD GRADE 5, ½ - 20 X 2 ¼ LONG	1
	G-1203-1095	ESN, ½ - 20	1
	G-1250-1090N	FLATWASHER, ½ NARROW	1
	J-3427	LEVER	1

Parts List

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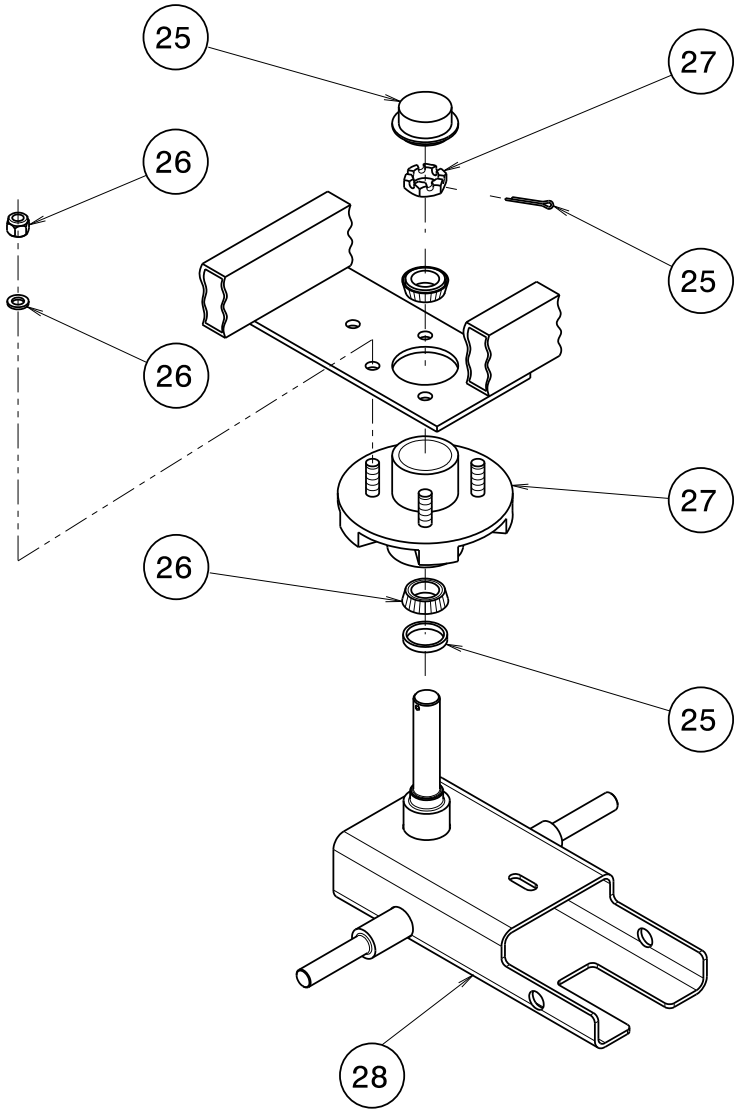
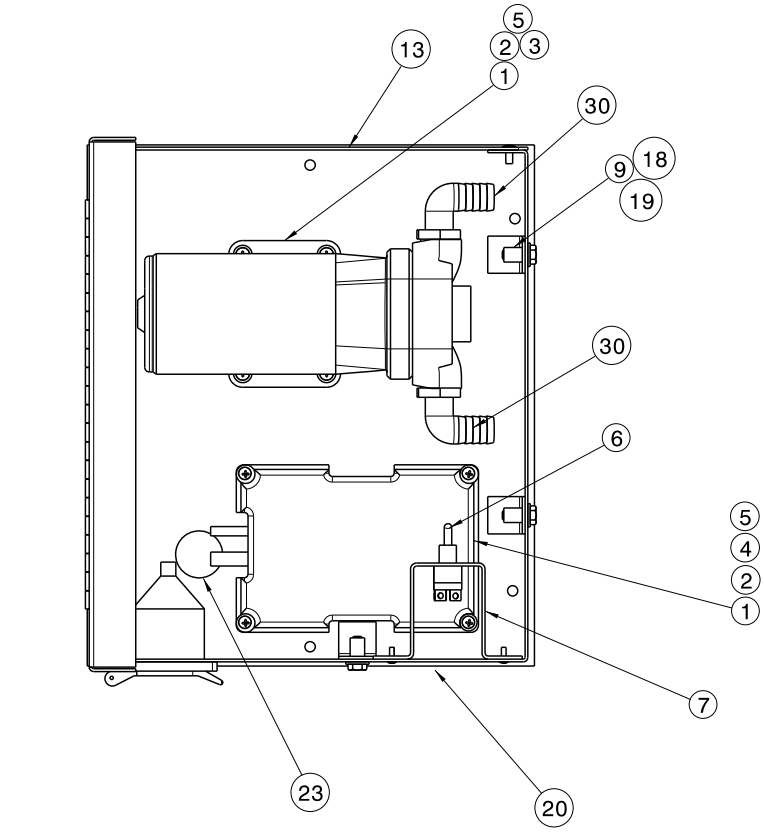
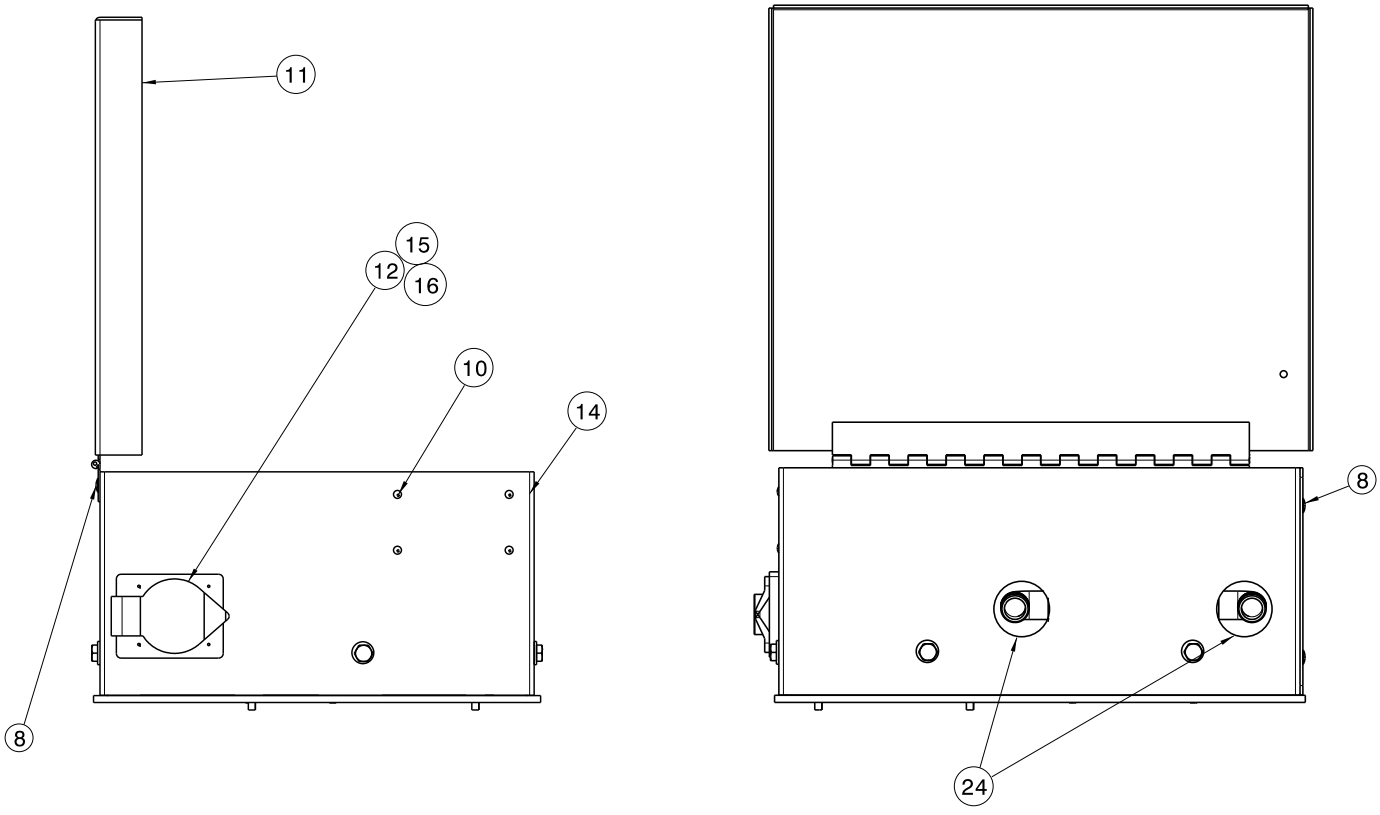


Item	Part Number	Description	Qty
25	**K-1253**	**KIT, BEARING & SEAL REPLACEMENT**; *consists of*:	
	G-1301-03	PIN, COTTER, 1/8" DIAMETER X 1-1/2" LONG	1
	H-1155-01	CAP, DUST	1
	H-1559-01	BEARING	2
	H-1561-05	SEAL, GREASE	1
26	**K-1254**	**KIT, HUB MOUNTING REPLACEMENT**; *consists of*:	
	G-1100-109514	BOLT, HEX HEAD, GRADE 5, 1/2-20 X 1-1/2" LONG	4
	G-1202-1095	STOPNUT, 1/2-20 ELASTIC	4
	G-1250-1090N	FLATWASHER, 1/2 NARROW	4
	G-1251-1090R	LOCKWASHER, 1/2 REGULAR	4
27	**K-1255**	**KIT, HUB REPLACEMENT**; *consists of*:	
	G-1202-1095	STOPNUT, 1/2-20 ELASTIC	4
	G-1250-1090N	FLATWASHER, 1/2 NARROW	4
	G-1230-01	NUT, AXLE, 1"-14 UNS THREAD	1
	G-1301-03	PIN, COTTER, 1/8" DIAMETER X 1-1/2" LONG	1
	H-1335	HUB, IDLER	1

Pump Assembly Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.





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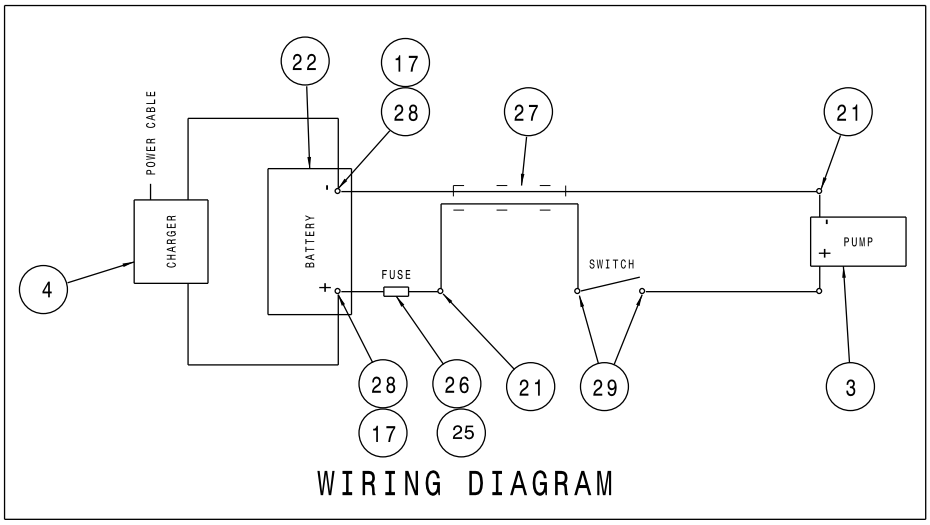

WIRING DIAGRAM

Item	Part Number	Description	Qty
	Z-7425	**ASSEMBLY, PUMP**; *consists of*:	
1	G-1159-103506	SCREW, #10-32 RD HD CRS REC	8
2	G-1250-1030N	FLATWASHER, #10 NARROW	8
3	HC-2465	ASSEMBLY, PUMP AND ELBOWS	1
4	EC-2215	CHARGER, BATTERY 50/60 HZ	1
5	G-1440-1035-S	NUTSERT, THICK WALL 10-32	8
6	EC-1010	SWITCH, TOGGLE	1
7	S-1499-01	BRACKET, SWITCH	1
8	G-1351-18	RIVET, 3/16 OPEN END	7
9	G-1439-1050-S	NUTSERT, OPEN END STEEL, ¼ - 20	5
10	G-1351-04	RIVET, 1/8 OPEN END	4
11	Z-7328-00	WELDMENT, LID	1
12	EC-1318	RECEPTACLE, FEMALE PANEL	1
13	S-2366-00	PANEL, END	1
14	S-2365-00	PANEL, FILL PUMP	1
15	G-1178-103004	SCREW, PN HD CR REC TPG #10 X ½“ LONG	4
16	EC-1180-18	TERMINAL, FORKED TONGUE 18-14 GA (BLUE)	3
17	G-1235	NUT, SS BATTERY HOLD DOWN	REF
18	G-1112-105006	BOLT, ¼ - 20 X ¾ HH SS	5
19	G-1250-1050N	FLATWASHER, ¼ NARROW	5
20	Z-7426-00	WELDMENT, BASE	1
21	EC-1178-02	BUTT, INSULATED #16-14 WIRE	2
22	EC-1656	BATTERY, 12 VOLT	REF
23	H-1901-26	GROMMET	1
24	H-1901-28	GROMMET	2
25	EC-1161-37	FUSE, SLO-BLO 15	1
26	EC-1328	HOLDER, FUSE	1
27	EC-1610-01*20.0	CABLE, CONTROL (14 AWG) X 20 LONG	1
28	EC-1180-27	TERMINAL, RING TONGUE, BLUE 3/8 HOLE	2
29	EC-1180-17	TERMINAL, RING TONGUE, BLUE #6 HOLE	2
30	N-2862	ELBOWS, HC-2451/HC-2468 PUMP	2

APPENDIX I

Johnson Controls
Safety Data Sheet

Johnson Controls

Safety Data Sheet

1. IDENTIFICATION

Product Name: Lead Acid Battery **Synonyms:** SLI Battery	**Product Use**: Vehicle Electrical System **Manufacturer/Supplier:** Johnson Controls Battery Group **Address:** P.O. Box 590 Milwaukee, WI 53201 US
General Information Number: (800)-333-2222 ext. 3138 **Contact Person:** Industrial Hygiene & Safety Department	**Emergency number:** CHEMTREC: 800-424-9300

NOTE: The Johnson Controls sealed cell/battery is considered an article as defined by 29 CFR 1910.1200 (OSHA Hazard Communication Standard). The information contained in this SDS is supplied at the customer's request for information only.

2. HAZARD(S) IDENTIFICATION

Health		Environmental	Physical
Acute Toxicity (Oral, dermal, inhalation)	Category 4	Aquatic Chronic 1 Aquatic Acute 1	Explosive Chemical, Division 1.3
Skin corrosion/irritation	Category 1A		
Eye Damage	Category 1		
Reproductive	Category 1A		
Carcinogenicity (lead)	Category 1B		
Carcinogenicity (acid mist)	Category 1A		
Specific target organ toxicity (repeated exposure)	Category 2		

Label Elements:

Health	Environmental	Physical
		
Hazard Statements **DANGER!** Causes severe skin burns and eye damage. Causes serious eye damage. May damage fertility or the unborn child if ingested or inhaled. May cause cancer if ingested or inhaled. Causes damage to central nervous system, blood and kidneys through prolonged or repeated exposure.	***Precautionary Statements*** Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Wear protective gloves/protective clothing, eye protection/face protection. Avoid breathing dust/fume/gas/mist/vapors/spray. Use only outdoors or in a well-ventilated area. Causes skin irritation, serious eye damage. Contact with internal components may cause irritation or severe burns. Avoid contact with internal acid. Irritating to eyes, respiratory system, and skin.	

May form explosive air/gas mixture during charging. Extremely flammable gas (hydrogen). Explosive, fire, blast or projection hazard.	

3. COMPOSITION / INFORMATION ON INGREDIENTS

INGREDIENTS (Chemical/Common Names):	CAS No.:	% by Wt:
Lead	7439-92-1	34
Lead Oxide	1309-60-0	31
Sulfuric Acid	7664-93-9	34
Lead Sulfate	7446-14-2	<1

Composition Comments — All concentrations are in percent by weight.

4. FIRST AID MEASURES

Note: Under normal conditions of battery use, internal components will not present a health hazard. The following information is provided for battery electrolyte (acid) and lead for exposures that may occur during battery production or container breakage or under extreme heat conditions such as fire.

Inhalation — Sulfuric Acid: Remove to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Consult a physician.
Lead: Remove from exposure, gargle, wash nose and lips; consult physician.

Skin contact — Sulfuric Acid: Flush with large amounts of water for at least 15 minutes; remove contaminated clothing completely, including shoes. If symptoms persist, seek medical attention. Wash contaminated clothing before reuse. Discard contaminated shoes.
Lead: Wash immediately with soap and water.

Eye contact — Sulfuric Acid and Lead: Flush immediately with large amounts of water for at least 15 minutes while lifting lids; Seek immediate medical attention if eyes have been exposed directly to acid.

Ingestion — Sulfuric Acid: Give large quantities of water; Do NOT induce vomiting or aspiration into the lungs may occur and can cause permanent injury or death; consult physician.
Lead: Consult physician immediately.

5. FIRE FIGHTING MEASURES

Flash Point — Not applicable unless individual components exposed.

Auto ignition Temperature — No data available.

Flammable Limits — LEL = 4.1% (Hydrogen Gas in air) ; UEL = 74.2%

Extinguishing Media — CO2; foam; dry chemical. Do not use carbon dioxide directly on cells. Avoid breathing vapors. Use appropriate media for surrounding fire.

Special Fire Fighting Procedures — Use positive pressure, self-contained breathing apparatus. Beware of acid splatter during water application and wear acid-resistant clothing, gloves, face and eye protection. If batteries are on charge, shut off power to the charging equipment, but note that strings of series connected batteries may still pose risk of electric shock even when charging equipment is shut down.

Unusual Fire and Explosion Hazard — Highly flammable hydrogen gas is generated during charging and operation of batteries. If ignited by burning cigarette, naked flame or spark, may cause battery explosion with dispersion of casing fragments and corrosive liquid electrolyte. Carefully follow manufacturer's instructions for installation and service. Keep away all sources of gas ignition and do not allow metallic articles to simultaneously contact the negative and positive terminals of a battery. Follow manufacturer's instructions for installation and service.

6: ACCIDENTAL RELEASE MEASURES

Protective Measures to be Taken if Material is Released or Spilled	Stop flow of material, contain/absorb small spills with dry sand, earth, and vermiculite. Do not use combustible materials. If possible, carefully neutralize spilled electrolyte with soda ash, sodium bicarbonate, lime, etc. Wear acid-resistant clothing, boots, gloves, and face shield. Do not allow discharge of un-neutralized acid to sewer. Acid must be managed in accordance with approved local, state, and federal requirements. Consult state environmental agency and/or federal EPA.
Waste Disposal Method	Dispose of as a hazardous waste. Dispose of in accordance with applicable local, state and federal regulations.

7. HANDLING AND STORAGE

Handling	Unless involved in recycling operations, do not breach the casing or empty the contents of the battery. Handle carefully and avoid tipping, which may allow electrolyte leakage. There may be increasing risk of electric shock from strings of connected batteries. Keep containers tightly closed when not in use. If battery case is broken, avoid contact with internal components. Keep vent caps on and cover terminals to prevent short circuits. Place cardboard between layers of stacked automotive batteries to avoid damage and short circuits. Keep away from combustible materials, organic chemicals, reducing substances, metals, strong oxidizers and water. Use banding or stretch wrap to secure items for shipping.
Storage	Store batteries under roof in cool, dry, well-ventilated areas separated from incompatible materials and from activities that may create flames, spark, or heat. Store on smooth, impervious surfaces provided with measures for liquid containment in the event of electrolyte spills. Keep away from metallic objects that could bridge the terminals on a battery and create a dangerous short-circuit. Room ventilation is required for batteries utilized for standby power generation. Never recharge batteries in an unventilated, enclosed space.
Charging:	There is a possible risk of electric shock from charging equipment and from strings of series connected batteries, whether or not being charged. Shut-off power to chargers whenever not in use and before detachment of any circuit connections. Batteries being charged will generate and release flammable hydrogen gas. Charging space should be ventilated. Keep battery vent caps in position. Prohibit smoking and avoid creation of flames and sparks nearby. Wear face and eye protection when near batteries being charged.
Other	Follow Manufacturers Recommendations regarding maximum recommended currents and operating temperature range. Do not overcharge beyond the recommended upper charging voltage limit. Applying pressure or deforming the battery may lead to disassembly followed by eye, skin and throat irritation.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational exposure limits

US OSHA Specifically Regulated Substances (29 CFR 1910.1001 – 1050)

Ingredient	CAS Number	Type	Value
Lead	7439-92-1	TWA	0.05 mg/m³
Lead Oxide	1309-60-0	TWA	0.05 mg/m³
Lead Sulfate	7446-14-2	TWA	0.05 mg/m³

US OSHA Table Z-1 Limits for Air Contaminants (29CFR 1910.1000)

Ingredient	CAS Number	Type	Value
Sulfuric Acid	7664-93-9	PEL	1 mg/m³

US ACGIH Threshold Limit Values

Ingredient	CAS Number	Type	Value	Form
Lead	7439-92-1	TWA	0.05 mg/m³	
Lead Oxide	1309-60-0	TWA	0.05 mg/m³	
Lead Sulfate	7446-14-2	TWA	0.05 mg/m³	
Sulfuric Acid	7664-93-9	TWA	0.2 mg/m³	Thoracic Fractions

US NIOSH: Pocket Guide to Chemical Hazards

Ingredient	CAS Number	Type	Value
Lead	7439-92-1	TWA	0.05 mg/m³
Lead Oxide	1309-60-0	TWA	0.05 mg/m³
Sulfuric Acid	7664-93-9	TWA	1 mg/m³

International Exposure Limits (mg/m³)

*Chemical & Common Name	Quebec PEV	Ontario OEL	EU OEL
Lead and Lead Compounds (inorganic)	0.05	0.05	0.15 (a)
Electrolyte (H_2SO_4/H_2O)	1	0.2	0.05 (b)

(a) As inhalable aerosol **(b)** Thoracic fraction

Biological limit values

ACGIH Biological Exposure Indices

Ingredient	Value	Determinant	Specimen	Sampling Time
Lead	300 µg/l	Lead	Blood	*
Lead Oxide	300 µg/l	Lead	Blood	*
Lead Sulfate	300 µg/l	Lead	Blood	*

* - For Sampling details please see the source document.

Engineering Controls (Ventilation):
Store and handle in well-ventilated area. If mechanical ventilation is used, components must be acid-resistant. Handle batteries cautiously, do not tip to avoid spills. Make certain vent caps are on securely. If battery case is damaged, avoid bodily contact with internal components. Wear protective clothing, eye and face protection, when filling, charging, or handling batteries. Do not allow metallic materials to simultaneously contact both the positive and negative terminals of the batteries. Charge batteries in areas with adequate ventilation. General dilution ventilation is acceptable.

Respiratory Protection (NIOSH/MSHA approved):
NONE REQUIRED FOR NORMAL HANDLING OF THE FINISHED PRODUCT.
When concentrations of sulfuric acid mist are known to exceed PEL, use NIOSH or MSHA-approved respiratory protection.

Skin Protection:
NONE REQUIRED FOR NORMAL HANDLING OF THE FINISHED PRODUCT.
If battery case is damaged, use rubber or plastic acid-resistant gloves with elbow-length gauntlet, acid-resistant apron, clothing and boots.

Eye Protection:
NONE REQUIRED FOR NORMAL HANDLING OF THE FINISHED PRODUCT.
If necessary to handle damage product where exposure to the organic electrolyte is a possibility, chemical splash goggles and a face shield are recommended.

Other Protection:
In areas where water and sulfuric acid solutions are handled in concentrations greater than 1%, emergency eyewash stations and showers should be provided, with unlimited water supply. Chemically impervious apron and face shield recommended when adding water or electrolyte to batteries. Wash Hands after handling.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance and Odor	Manufactured article; no apparent odor. Electrolyte is a clear liquid with a sharp, penetrating, pungent odor.
Odor Threshold	Not applicable.
pH	Not applicable
Boiling Point	Not applicable unless individual components exposed.

	Battery Electrolyte (Acid) - 230 - 233.6 °F (110 - 112 °C) Lead - 3191 °F (1755 °C)
Melting Point	Lead - 621.32 °F (327.4 °C)
Specific Gravity (H_2O = 1)	1.215 to 1.350
Flash Point	498.2 °F (259.0 °C) Hydrogen
Evaporation Rate (Butyl Acetate = 1)	< 1
Vapor Pressure (mm Hg @ 20 ° C)	Battery Electrolyte (Acid) 11.7
Flammability	
Upper/lower flammability or explosive limits	Hydrogen Flammability Limit Lower- 4.1 % Flammability Limit Upper – 74.2 %
Vapor Pressure	Not applicable.
Vapor Density	3.4 (Air = 1) Battery Electrolyte (Acid)
Relative Density	1.21 - 1.3 Battery Electrolyte (Acid)
Solubility	Lead and Lead dioxide are not soluble. 100 % Battery Electrolyte (Acid).
% Volatile by Weight	Not applicable unless individual components exposed.
Partition coefficient (n-octanol/water)	Not applicable
Auto-ignition temperature	1076 °F (580 °C) Hydrogen.
Decomposition temperature	Not applicable
Viscosity	Not applicable

10. STABILITY AND REACTIVITY

Stability	The sealed battery is considered stable.
Conditions to Avoid	Sparks and other sources of ignition; high temperature; over charging.
Incompatibility (materials to avoid)	Electrolyte: Contact with combustibles and organic materials may cause fire and explosion. Also reacts violently with strong reducing agents, metals, sulfur trioxide gas, strong oxidizers, and water. Contact with metals may produce toxic sulfur dioxide fumes and may release flammable hydrogen gas. Lead compounds: Avoid contact with strong acids, bases, halides, halogenates, potassium nitrate, permanganate, peroxides, nascent hydrogen, and reducing agents. Arsenic compounds: strong oxidizers; bromine azide. NOTE: hydrogen gas can react with inorganic arsenic to form the highly toxic gas – arsine
Hazardous Decomposition Products	Electrolyte: Sulfur trioxide, carbon monoxide, sulfuric acid mist, sulfur dioxide, hydrogen sulfide. Lead compounds: Temperatures above the melting point are likely to produce toxic metal fume, vapor, or dust; contact with strong acid or base or presence of nascent hydrogen may generate highly toxic arsine gas.
Hazardous Polymerization	Will not occur.

11. TOXICOLOGICAL INFORMATION

NOTE: Under normal conditions of use, this product does not present a health hazard. The following information is provided for organic electrolyte and lead exposure that may occur due to container breakage or under extreme conditions such as fire. Organic electrolyte – reacts with moisture/water to produce hydrofluoric acid in <u>trace</u> quantities. Hydrofluoric acid is extremely corrosive and toxic. In severe exposures it acts as a systemic poison and causes severe burns. The reaction may be delayed. Any contact with this material, even minor, requires immediate medical attention.

ROUTES AND METHODS OF ENTRY	
Inhalation	**EXPOSURE IS NOT EXPECTED FOR PRODUCT UNDER NORMAL CONDITIONS OF USE.** Sulfuric Acid: Breathing of sulfuric acid vapors or mists may cause severe respiratory irritation. Lead Compounds: Inhalation of lead dust or fumes may cause irritation of upper respiratory tract and lungs.
Skin Contact	**EXPOSURE IS NOT EXPECTED FOR PRODUCT UNDER NORMAL CONDITIONS OF USE.** Sulfuric Acid: Severe irritation, burns and ulceration. Lead Compounds: Not absorbed through the skin.
Skin Absorption	**EXPOSURE IS NOT EXPECTED FOR PRODUCT UNDER NORMAL CONDITIONS OF USE.** In the event of overcharging or damage to the unit, exposure to organic electrolyte solution/mist is possible. Extreme exposures to the organic electrolyte can be absorbed through the skin.
Eye Contact	**EXPOSURE IS NOT EXPECTED FOR PRODUCT UNDER NORMAL CONDITIONS OF USE.** Sulfuric Acid: Severe irritation, burns, cornea damage, and blindness. Lead Compounds: May cause eye irritation.
Ingestion	**EXPOSURE IS NOT EXPECTED FOR PRODUCT UNDER NORMAL CONDITIONS OF USE.** Sulfuric Acid: May cause severe irritation of mouth, throat, esophagus and stomach. Lead Compounds: Acute ingestion may cause abdominal pain, nausea, vomiting, diarrhea and severe cramping. This may lead rapidly to systemic toxicity and must be treated by a physician.
SIGNS AND SYMPTONS OF OVEREXPOSURE	
Acute Effects	**EXPOSURE IS NOT EXPECTED FOR PRODUCT UNDER NORMAL CONDITIONS OF USE.** Sulfuric Acid: Severe skin irritation, damage to cornea, upper respiratory irritation. Lead Compounds: Symptoms of toxicity include headache, fatigue, abdominal pain, loss of appetite, muscular aches and weakness, sleep disturbances and irritability
Chronic Effects	**EXPOSURE IS NOT EXPECTED FOR PRODUCT UNDER NORMAL CONDITIONS OF USE.** Sulfuric Acid: Possible erosion of tooth enamel, inflammation of nose, throat & bronchial tubes. Lead Compounds: Anemia; neuropathy, particularly of the motor nerves, with wrist drop; kidney damage; reproductive changes in males and females. Repeated exposure to lead and lead compounds in the workplace may result in nervous system toxicity. Some toxicologists report abnormal conduction velocities in persons with blood lead levels of 50 µg/100 ml or higher. Heavy lead exposure may result in central nervous system damage, encephalopathy and damage to the blood-forming (hematopoietic) tissues.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

Overexposure to sulfuric acid mist may cause lung damage and aggravate pulmonary conditions. Contact of sulfuric acid with skin may aggravate diseases such as eczema and contact dermatitis. Lead and its compounds can aggravate some forms of kidney, liver and neurologic diseases.

ADDITIONAL HEALTH DATA

All heavy metals, including the hazardous ingredients in this product, are taken into the body primarily by inhalation and ingestion. Most inhalation problems can be avoided by adequate precautions such as ventilation and respiratory protection covered in Section 8. Follow good personal hygiene to avoid inhalation and ingestion: wash hands, face, neck and arms thoroughly before eating, smoking or leaving the work site. Keep contaminated clothing out of non-contaminated areas, or wear cover clothing when in such areas. Restrict the use and presence of food, tobacco and cosmetics to non-contaminated areas. Work clothes and work equipment used in contaminated areas must remain in designated areas and never taken home or laundered with personal non-contaminated clothing. This product is intended for industrial use only and should be isolated from children and their environment.

The 19th Amendment to EC Directive 67/548/EEC classified lead compounds, but not lead in metal form, as possibly toxic to reproduction. Risk phrase 61: May cause harm to the unborn child, applies to lead compounds, especially soluble forms.

Toxicological Data

Constituents	Species	Test Results

Sulfuric Acid (CAS 7664-93-9)		
Acute		
Oral		
LD50	Rat	2140 mg/kg

CARCINOGENICITY

Sulfuric Acid: The International Agency for Research on Cancer (IARC) has classified "strong inorganic acid mist containing sulfuric acid" as a Category I carcinogen, a substance that is carcinogenic to humans. This classification does not apply to liquid forms of sulfuric acid or sulfuric acid solutions contained within a battery. Inorganic acid mist (sulfuric acid mist) is not generated under normal use of this product. Misuse of the product, such as overcharging, may result in the generation of sulfuric acid mist.

Lead Compounds: Lead is listed as a Group 2A- carcinogen, likely in animals at extreme doses. Per the guidance found in OSHA 29 CFR 1910.1200 Appendix F, this is approximately equivalent to GHS Category 1A. Proof of carcinogenicity in humans is lacking at present.

IARC Monographs. Overall Evaluation of Carcinogenicity	
Lead (CAS 7439-92-1)	2A Probably carcinogenic to humans.
Lead oxide (CAS 1309-60-0)	2A Probably carcinogenic to humans.
Lead sulfate (CAS 7446-14-2)	2A Probably carcinogenic to humans.
NTP Report on Carcinogens	
Lead oxide (CAS 1309-60-0)	Reasonably Anticipated to be a Human Carcinogen.
Lead sulfate (CAS 7446-14-2)	Reasonably Anticipated to be a Human Carcinogen.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)
Not listed.

Reproductive toxicity	May damage fertility or the unborn child.
Specific target organ toxicity - single exposure	No data available.
Specific target organ toxicity - repeated exposure	Lead: May cause damage to organs (blood, central nervous system) through prolonged or repeated exposure.
Aspiration hazard	Not classified.

12. ECOLOGICAL INFORMATION

Environmental Fate	Lead is very persistent in soil and sediments. No data on environmental degradation. Mobility of metallic lead between ecological compartments is slow. Bioaccumulation of lead occurs in aquatic and terrestrial animals and plants but little bioaccumulation occurs through the food chain. Most studies include lead compounds and not elemental lead
Environmental toxicity	Aquatic Toxicity:
Sulfuric Acid	24-hr LC50, freshwater fish (Brachydanio rerio): 82 mg/L 96 hr- LOEC, freshwater fish (Cyprinus carpio): 22 mg/L
Lead	48 hr LC50 (modeled for aquatic invertebrates): <1 mg/L, based on lead bullion
Additional Information	No known effects on stratospheric ozone depletion Volatile organic compounds: 0% (by Volume) Water Endangering Class (WGK): NA

13. DISPOSAL CONSIDERATIONS

Waste disposal method	Material should be recycled if possible. Lead-acid batteries are completely recyclable. Dispose waste and residues in accordance with applicable federal, state, and local regulations.
Hazardous waste code	D008: Lead
Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or packaging may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. TRANSPORT INFORMATION

Note: Transportation requirements do not apply once the battery pack has been installed in a vehicle as part of the vehicle's functional components.

United States DOT:

DOT rules specified in 49 CFR 173.159 regulate the transport of wet spillable batteries.

49 CFR 173.159 (e) specifies that when transported by highway or rail, electric storage batteries containing electrolyte or corrosive battery fluid are not subject to any other requirements of this subchapter, if all of the following are met:
(1) No other hazardous materials may be transported in the same vehicle;
(2) The batteries must be loaded or braced so as to prevent damage and short circuits in transit;
(3) Any other material loaded in the same vehicle must be blocked, braced, or otherwise secured to prevent contact with or damage to the batteries; and
(4) The transport vehicle may not carry material shipped by any person other than the shipper of the batteries.
If any of these requirements are not met, the batteries must be shipped as hazardous materials

GROUND – US-DOT/CAN-TDG/EU-ADR/APEC-ADR:

Proper Shipping name	Batteries, Wet, Filled with Acid
UN number	UN2794
Hazard classification	8
Packing group	N/A
Labels	Corrosive

AIRCRAFT – ICAO-IATA:

Proper Shipping name	Batteries, Wet, Filled with Acid
Packing group	None
Hazardous class	8
Label/Placard Required	Corrosive
UN Identification	UN2794
Environmental Hazards	No
ERG Code	8L
Reference	IATA packing instructions 870 (IATA DRG Edition 54)

VESSEL – IMO-IMDG:

Proper Shipping name	Batteries, Wet, Filled with Acid
Packing group	N/A
Hazardous class	8
Label/Placard Required	Corrosive
UN Identification	UN2794
Environmental Hazards	No
EmS	F-A, S-B
Reference	IMDG packing instructions P801

15. REGULATORY INFORMATION

This product is an article pursuant to 29 CFR 1910.1200 and as such is not subjected to the OSHA Hazard Communication Standard.

TSCA

TSCA Section 8b – Inventory Status:

Inventory Status: All chemicals comprising this product are either exempt or listed on the TSCA Inventory.

TSCA Section 12b (40 CFR Part 707.60(b))

No notice of export will be required for articles, except PCB articles, unless the Agency so requires in the context of individual section 5, 6, or 7 actions.

TSCA Section 13 (40 CFR Part 707.20)

No import certification required (EPA 305-B-99-001, June 1999, Introduction to the Chemical Import Requirements of the Toxic Substances Control Act, Section IV.A)

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Lead (CAS 7439-92-1)	Reproductive toxicity
	Central nervous system
	Kidney
	Blood
	Acute toxicity
Lead Oxide (CAS 1309-60-0)	Reproductive toxicity
	Central nervous system
	Kidney
	Blood
	Acute toxicity
Lead Sulfate (CAS 7446-14-2)	Reproductive toxicity
	Central nervous system
	Kidney
	Blood
	Acute toxicity

EPA SARA Title III

Section 302 EPCRA Extremely Hazardous Substances (EHS):

Sulfuric acid is a listed "Extremely Hazardous Substance" under EPCRA, with a Threshold Planning Quantity (TPQ) of 1,000 lbs. EPCRA Section 302 notification is required if 500 lbs. or more of sulfuric acid is present at one site (40 CFR 370.10). For more information consult 40 CFR Part 355.

Section 304 CERCLA Hazardous Substances:

Reportable Quantity (RQ) for spilled 100% sulfuric acid under CERCLA (Superfund) and EPCRA (Emergency Planning and Community Right to Know Act) is 1,000 lbs. State and local reportable quantities for spilled sulfuric acid may vary.

Section 311/312 Hazard Categorization:

EPCRA Section 312 Tier Two reporting is required for non-automotive batteries if sulfuric acid is present in quantities of 500 lbs. or more and/or if lead is present in quantities of 10,000 lbs. or more. For more information consult 40 CFR 370.10 and 40 CFR 370.40

Section 313 EPCRA Toxic Substances:

40 cfr section 372.38 (b) states: If a toxic chemical is present in an article at a covered facility, a person is not required to consider the quantity of the toxic chemical present in such article when determining whether an applicable threshold has been met under § 372.25, § 372.27, or § 372.28 or determining the amount of release to be reported under § 372.30. This exemption applies whether the person received the article from another person or the person produced the article. However, this exemption applies only to the quantity of the toxic chemical present in the article.

Supplier Notification:

This product contains toxic chemicals that may be reportable under EPCRA Section 313 Toxic Chemical Release Inventory (Form R) requirements. For a manufacturing facility under SIC codes 20 through 39, the following information is provided to enable you to complete the required reports:

RCRA

Spent Lead Acid Batteries are subject to streamlined handling requirements when managed in compliance with 40 CFR section 266.80 or 40 CFR part 273. Waste sulfuric acid is a characteristic hazardous waste; EPA hazardous waste number D002 (corrosivity) and D008 (lead).

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Lead (CAS 7439-92-1)
Lead Oxide (CAS 1309-60-0)
Lead Sulfate (CAS 7446-14-2)

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Lead Sulfate (CAS 7446-14-2)

Safe Drinking Water Act (SDWA)

Not regulated

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and 1310.04(f)(2) and Chemical Code Number

Sulfuric acid (CAS 7664-93-9) 6552

Drug Enforcement Administration (DEA). List 1 & 2 Exempt Chemical Mixtures (21 CFR 1310.12(c))

Sulfuric acid (CAS 7664-93-9) 20 % WV

DEA Exempt Chemical Mixtures Code Number

Sulfuric acid (CAS 7664-93-9 6552

US State Regulations

US. Massachusetts RTK – Substance List

Lead (CAS 7439-92-1)
Lead Oxide (CAS 1309-60-0)
Lead Sulfate (CAS 7446-14-2)

US New Jersey Worker and Community Right-to-know Act

Lead (CAS 7439-92-1)
Lead Oxide (CAS 1309-60-0)
Lead Sulfate (CAS 7446-14-2)
Sulfuric acid (CAS 7664-93-9)

US Pennsylvania Worker and Community Right-to-know Law

Lead (CAS 7439-92-1)
Sulfuric acid (CAS 7664-93-9)

US Rhode Island RTK

Lead (CAS 7439-92-1)
Lead Oxide (CAS 1309-60-0)
Lead Sulfate (CAS 7446-14-2)
Sulfuric acid (CAS 7664-93-9)

US. California Proposition 65

WARNING: This product contains chemicals known to the State of California to cause cancer.
Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the state of California to cause cancer and reproductive harm. Wash hands after handling.

*Battery companies not party to the 1999 consent judgment with Mateel Environmental Justice Foundation should include a Proposition 65 Warning that complies with the current version of Proposition 65.

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

Lead (CAS 7439-92-1)
Lead Oxide (CAS 1309-60-0)
Lead Sulfate (CAS 7446-14-2)
Sulfuric acid (CAS 7664-93-9)

International Inventories

Country(s) or Region	Inventory Name	On inventory (yes/no)*
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

* A “Yes” indicates this product complies with the inventory requirements administered by the governing country(s).
A “No” indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

CANADIAN ENVIRONMENTAL PROTECTION ACT: These products are manufactured articles and are exempt from regulation.

CANADIAN WHMIS CLASSIFICATION: This product has been classified according to the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

16. OTHER INFORMATION

Issue Date: 04/01/2015
Further information: NFPA Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3=Serious 4 = Severe

NFPA ratings

Disclaimer

Johnson Controls Battery Group, Inc. cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information in the sheet was written based on the best knowledge and experience currently available.