



OPERATION & SERVICE MANUAL

**Model: 17-7524-0000
Mobile Air Conditioner
with LPG Motor-Gen Set
208 VAC 1 Phase 60 Hz**

09/2023 – Rev. 02

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

Phone: (419) 866-6301 | 800-426-6301
Web: www.tronair.com
Email: sales@tronair.com

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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 17-7524-0000 Mobile Air Conditioner is a complete portable aircraft ground cooling unit designed for corporate aviation departments, FBO's, and regional/commuter airlines.

The Mobile Air Conditioner provides pre-cooling prior to passenger arrival, as well as during ramp maintenance work.

The four (4) ton air conditioner provides cool air using R-410A, environmentally "safe" refrigerant.

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
Website: www.tronair.com

2.0 USAGE AND SAFETY INFORMATION

2.1 USAGE

The Tronair Model 17-7524-0000 Mobile Air Conditioner provides 45,000 Btu/Hr of cool air at 1,200-2,000 CFM for aircraft cabin comfort.

2.2 SAFETY PRECAUTIONS

To insure 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, or substantial property damage** if the warning notice is ignored.



CAUTION! – Caution is used to indicate the presence of a hazard that **will or can cause minor personal injury or property damage** if the caution notice is ignored.



Accidental Starts! Before servicing the equipment, always disconnect the power cord to prevent the air conditioner from starting accidentally. Ground leads to prevent sparks that could cause fires.



Rotating Parts! Keep hands, feet, hair, and clothing away from all moving parts to prevent injury. Never operate the air conditioner with covers, shrouds, or guards removed.



Hot Parts! Components can get extremely hot from operation. To prevent severe burns, do not touch these areas while the air conditioner is running or immediately after it is turned off. Never operate the air conditioner with heat shields or guards removed.



Electrical Shock! Never touch electrical wires or components while the air conditioner is running. They can be sources of electrical shock. Do not operate air conditioner with cabinet panels removed.



Lethal Exhaust Gases! Engine exhaust gases contain poisonous carbon monoxide. Carbon monoxide is odorless, color-less, and can cause death if inhaled. Avoid inhaling exhaust fumes, and never run the engine in a closed building or confined area.



Explosive Fuel! LPG is extremely flammable and its vapors can explode if ignited. Store only in approved containers, in well ventilated unoccupied buildings and away from sparks or flames.



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 diesel vapors are present.

Flammable Solvents! Carburetor cleaners and solvents are extremely flammable. Keep sparks, flames, and other sources of ignition away from the area. Follow the cleaner/solvent manufacturer's warnings and instructions on its proper and safe use. Never use Diesel as a cleaning agent.

2.3 SAFETY CONSIDERATIONS

Installation and servicing of air-conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair, or service air-conditioning equipment.

Untrained personnel can perform the basic maintenance functions of cleaning coils and filters and replacing filters. All other operations should be performed by trained service personnel. When working on air-conditioning equipment, observe precautions in the literature, tags and labels attached to the unit, and other safety precautions that may apply.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloth for un-brazing operations. Have fire extinguisher available for all brazing operations.



WARNINGS!

1. **Air conditioner unit must be on a level surface or it may not operate correctly.**
2. **Before performing service or maintenance operations on unit, turn off main power switch to unit.**
3. **Electrical shock could cause personal injury.**
4. **Read your generator and engine operator manuals carefully; know your equipment before you use it. Consider the application, limitations and potential hazards before operation.**
5. **The generating set is equipped with a ground terminal for your protection. Always complete the grounding path from the set to an external grounding source to prevent electrical shock. (Follow special isolated neutral instructions when using with an MTS-100 or MTS-200 manual transfer switch.)**
6. **Electric load applied to generating set must be within its rating. Overloading will damage set or shorten its life.**
7. **Generating set must reach operating speed before load is applied. Disconnect electrical loads before shutting engine down.**
8. **Maintain electrical cords in good condition. Worn, bare, frayed or otherwise damaged cords can cause electrical shock.**
9. **Never operate the generating set or handle any electrical equipment while standing in water, while barefoot, while hands are wet or while in the rain or snow to prevent dangerous electric shock.**
10. **A ground fault circuit interrupter (GFCI) should be used in damp or high electrical conductive areas and construction job sites to prevent electric shock.**
11. **Before working on the engine or the generator, always remove the spark plug or the spark plug wire to prevent accidental starting.**
12. **Check generating fuel system on a regular basis. Look for signs of leaks, deterioration, chafed or spongy fuel hose, loose or missing fuel hose clamps, rusted or damaged fuel tanks, defective fuel shut-off valve. Correct any defect before operation.**
13. **Always provide adequate ventilation. Do not operate set in any enclosed or narrow space. Engines consume oxygen and give off deadly carbon monoxide poisonous gas. Improper ventilation will cause damage to set and possible injury to people.**
14. **Avoid severe burns by not touching hot muffler, hot exhaust manifold, or engine cooling cylinders.**
15. **Keep generator and engine clean. Remove all oil or gasoline deposits, and accumulated dirt from set and immediate area. Poor housekeeping creates a fire hazard.**
16. **Keep a fire extinguisher close by your set and be familiar on how to use it. Consult your local fire department for correct extinguisher type.**
17. **The unit should never be operated under the following conditions:**
 - Change in engine speed, slow or fast
 - Overheating in load connecting devices
 - Sparking of arcs from set
 - Loss of electrical output
 - Damaged receptacles
 - Engine misfire
 - Excessive vibration
 - Enclosed compartments or confined areas
 - Flame or smoke
 - Rain, snow or water conditions
 - Operator non-attendance
18. **The unit must be operated under the following conditions:**
 - **Good ventilation. Avoid areas where vapors can be trapped. Air flow and temperature are important. Never operate set when ambient temperature is over 105° F.**
 - **Engine exhaust gas is poisonous and dangerous. The gas contains carbon monoxide, an odorless, invisible gas which causes serious illness or death is breathed. Always direct exhaust fumes away from humans.**

2.3 SAFETY CONSIDERATIONS *(continued)*



WARNINGS!

19. **California proposition 65 warning:** This is a warning to user that all exhaust fumes from this engine contain chemicals known to cause cancer, birth defects, or other reproductive harm. Do not breathe poisonous engine exhaust fumes.
20. **Battery posts, terminals and related accessories contain lead and lead compounds;** chemicals known to the State of California to cause cancer and reproductive harm.
21. **Wash hands after handling.**
 - If battery acid is ever required, battery must be brought to a full charge by commercial battery charger for 24 hours. Use extreme caution when handling the batteries. Battery acid is extremely dangerous and can cause severe burns to the eyes, skin and clothing. Flush contaminated areas immediately with water and call for medical assistance.
 - All electric start engines include a built-in battery charger which operates automatically when the engine runs. Provisions must be made to keep battery fully charged if the engine will not be operated frequently. This can be accomplished by a small commercial battery charger connected to battery and plugged into normal power.
22. **Wash hands after handling. (continued)**
 - Overcharging the battery will cause battery damage. Always use an automatically regulated charger so that as battery becomes charged, the rate of charge is automatically reduced. Check battery cells with a hydrometer. The specific gravity of each cell should be 1.280 at 75° F. If cells are low, add distilled water and recharge battery. Keep battery and battery terminals clean and dry. Terminals should have light grease or petroleum jelly applied to retard corrosion.
23. **Disconnect or connection of battery terminals while engine is running will cause violent spark and may result in explosion.** Never smoke or use open flame near battery. The area of battery use must be well ventilated because batteries give off a poisonous and explosive gas when being charged.
24. **Engine should be refueled in a well-lighted area.** Do not operate generator set where fuel spills have occurred until all excess fuel is cleaned up and removed. Avoid refueling near open flames, sparking electric devices, power tools, other high heat conditions or while the set is running.
25. **Good ventilation is mandatory for safe generator operation.** Avoid areas when fuel vapors and exhaust gases can be trapped. Proper air flow and temperatures are important for safe operation of air cooled sets. Never operate generator set when ambient temperature exceeds 105° F.
26. **Muffler and air cleaner should always be installed and in good condition.** They act as a flame arrestor if backfiring occurs.
27. **Some generator models are equipped with automatic GFCI receptacles.** If a ground fault exists (potential electric shock hazard), the receptacle will not produce power. When ground fault condition is removed, manually reset built-in circuit breaker. For maximum protection against electric shock hazard, manually operate test switch on GFCI protected receptacle while gen-set engine is running and before electric load is applied to receptacles.
28. **Always read engine manual thoroughly before initial start of your new gen-set.**
29. **High altitude creates a negative effect on engines and can severely reduce engine horsepower,** therefore reducing electric power output. All engine HP ratings meet SAE J1349 test codes. Reduce HP ratings 3.5% for each 1000 feet over 328 feet above sea level and 1% for every 10° F (5.65° C) rise above 77° F (25° C).
30. **This manual and the manufacturer cannot possibly anticipate every possible happening that might involve a hazard.** The listing, warnings and cautions in the manual and on tags and labels affixed to the gen-set are therefore, **NOT ALL INCLUSIVE.**
31. **If a certain procedure, work method, test method, or operating procedure that is not recommended by this manual is used, user must assume all responsibility that the procedure and/or method will be safe to use by all others.** If you modify or change this gen-set in any way from its original design, you must assume responsibility for its safe operation.
32. **All generators have been factory load tested.** All engines are "green" and have not had the (50) hour break-in time to develop peak horsepower.
33. **Local Fire Departments must be consulted concerning proper and safe handling procedures for fuels** such as gasoline, diesel, LPG, propane, or natural gas.

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 Mobile Air Conditioner.

3.2 TRAINING PROGRAM

The employer provided operator training program should cover safety procedures concerning use of the Mobile Air Conditioner 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 Mobile Air Conditioner.

NOTE: Maintenance and Troubleshooting are to be performed by skilled and trained technician(s).

4.0 FEATURES, BENEFITS AND RATINGS

Every compact one-piece unit arrives fully assembled, charged, tested and ready to run.

4.1 AIR CONDITIONER FEATURES/BENEFITS

- **Durable, Dependable Construction** – The air conditioner is designed for durability in any climate, the weather-resistant cabinets are constructed of galvanized steel, bonderized, and all exterior panels are coated with a pre-painted baked enamel finish. The paint finish is non-chalking, and is capable of withstanding ASTM B117 500-hour Salt Spray Test. All internal cabinet panels are primed, permitting longer life and a more attractive appearance for the entire unit. Totally enclosed condenser-fan motors and permanently lubricated bearings provide additional unit dependability.
- **Proven Compressor Reliability** – Design techniques feature computer-programmed balance between compressor, condenser and evaporator. Carrier-specified hermetic compressors are equipped with compressor over current and over temperature protection to ensure durability.
- Pre-coated aluminum fin coil
- High pressure switch
- Loss of charge/low pressure switch
- Freeze protection switch
- Non-corrosive, sloped condensate drain pan, meets ASHRAE 62-89 (IAQ)
- Two inch (2") return-air filters
- Includes exclusive Acutrol™ metering device to precisely control refrigerant flow (preventing slugging and flood-back) while maintaining optimum unit performance.
- The wheels lock with the towbar in the upright and locking position.
- 12 inch diameter x 25 ft long blower hose (with storage compartment), connects quickly and easily to the air conditioning unit. The hose will not fully inflate during the cooling or heating process.
- Unit is designed to cool and/or heat an aircraft through a window or door opening.

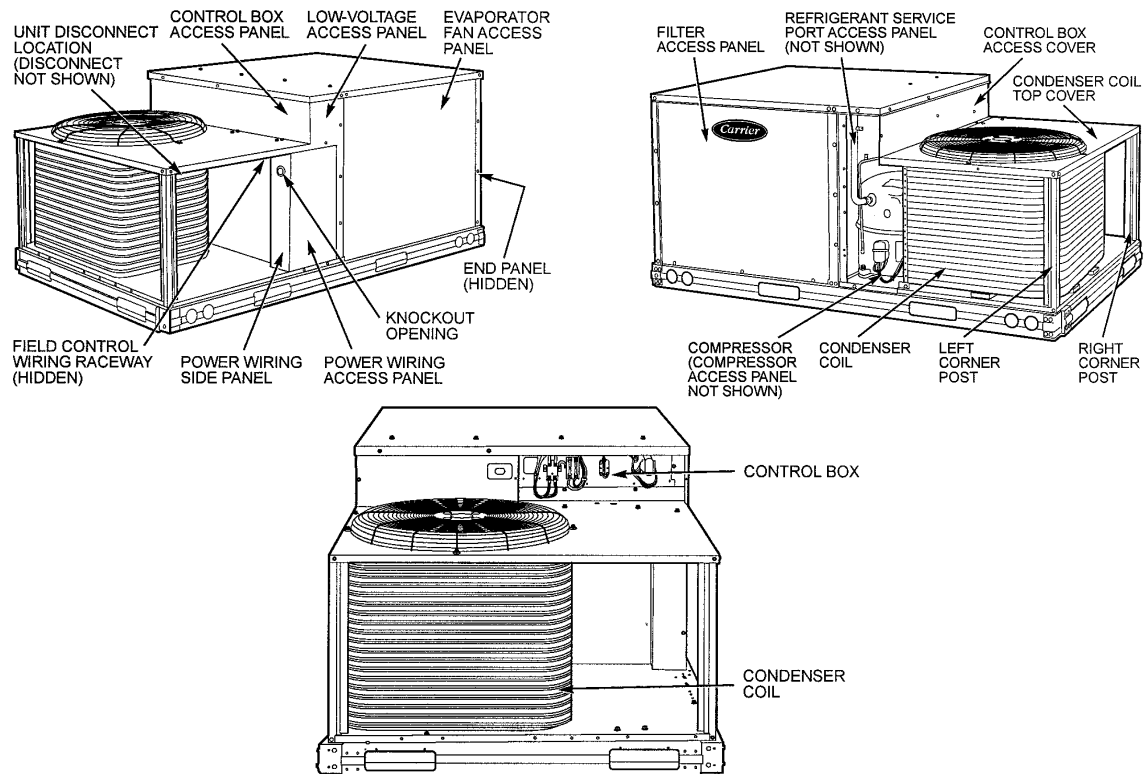


FIGURE 1 – Typical Component Location

4.2 AIR CONDITIONER RATINGS

AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI) CAPACITY RATINGS

Nominal Tons	Standard CFM	Net Cooling Capacity (BTUH)	Total kW	SEER	Sound Rating (db)
4	1200-2000	45,000	4.0	13.0	85

LEGEND

BTUH – British Thermo Unit/Hour **kW** – Kilowatt
SEER – Seasonal Energy Efficiency Ratio **db** – **decibels** - Sound Levels

NOTES:

1. Rated in accordance with ARI Standards 210/240-06 or 360/360-04.
2. Ratings are net values, reflecting the effects of circulating fan heat.

4.3 ELECTRICAL DATA

Nominal V-Ph-Hz	Voltage Range		Compr (each)		OFM			IFM	Power Supply		Disconnect Size	
	Min	Max	RLA	LRA	Quantity	Hp	FLA	FLA	MCA	MOCP ††	FLA	LRA
230-1-60	187	253	21.8	117	1	1/4	1.5	4.9	35.7	50	32	133

LEGEND

IFM – Indoor (Evaporator) Fan Motor **OFM** – Outdoor (Condenser) Fan Motor
RLA – Rated Load Amps **LRA** – Locked Rotor Amps
FLA – Full Load Amps **MCA** – Minimum Circuit Amps
MOCP – Maximum Overcurrent Protection **††** – Fuse or HACR Circuit Breaker

4.4 MOTOR/GENERATING SET FEATURES

- All generator sets are USA wound, built, and thoroughly tested. Complete production models are USA factory built.
- Full power capacity to start up a 5 ton A/C unit, equipped with Easy Start circuitry.
- All generator sets will accept 100% rated load in one step, per NFPA-110.
- All generators are UL-1446 certified.
- Capacitor load compensated (CLC) voltage regulation for ±3% is standard on all gen-sets.
- Mechanical engine governor incorporates a special actuator, which allows precise ±2% frequency regulation, from no load to full load. Built-in dual oil coolers yield longer engine service life.
- A brushless rotating field generator design with shunt wound excitation system and available at a broad range of voltages.
- Solid state, digital microprocessor logic and ultra-bright LED, annunciation display for different engine and generator functions, plus automatic fault shutdowns; high temp, over-crank, over-speed, low oil, and low battery.
- The heavy duty, rugged dry fueled engine is capable of delivering rated power at 3600 RPM (60 Hz).
- All generator set control systems components and accessories provide a 2-year limited warranty at time of initial start-up. Optional extended warranties are available. Generators and engines are governed by separate warranties.
- “Open” Generator Sets: There is no enclosure, so gen-set must be placed within a weather protected area, uninhabited by humans or animals, with proper ventilation.
- “Standard” Housing: Full weather protection and average sound attenuation for normal applications.
- “Super Silent” Housing: Full weather protection and superior sound attenuation for specific low noise applications.
- New, 3 year LTD. Warranty on all Subaru dry fuel engines.

4.5 GENERATOR SPECIFICATIONS

Type	2 Pole, 3600 RPM, revolving field design
Exciter	Brushless, shunt excited
Voltage Regulator.....	Capacitor load compensated (CLC)
Voltage Regulation	±3%, no load to full load
Frequency	60 Hz (50 Hz available)
Frequency Regulation	2% (2 cycles, no load to full load)
Unbalanced Load Capability.....	50% of nameplate rating
Motor Starting.....	4 HP, Code G with 35% dip on specific voltages
Total Stator and Rotor Insulation.....	Class H, 180°C
Temperature Rise.....	130°C R/R, standby rating @ 30°C amb 105°C R/R, prime rating @ 30°C amb
Bearing.....	1, pre-lubed and sealed
Power Leads	4 leads for dedicated single phase Optional 3 leads for dedicated and three phase
Coupling	Direct taper shaft
Total Harmonic Distortion	Max 6 ½ % (MIL-STD-705B)
Telephone Interference Factor	Max 250 (NEMA MG1-22)
Deviation Factor	Max 5% (MIL-STD-405B)
Alternator.....	Self-ventilating and drip-proof
Limited Standby Warranty	24 months or 1000 hrs, first to occur
Limited Prime Warranty	12 months or 500 hrs, first to occur

4.6 ENGINE SPECIFICATIONS

Manufacturer	Subaru
Model and Type.....	EH722LZ2640, 4 cycle
Aspiration	Naturally
Cylinder Arrangement	V-Twin, 2 cylinders
Displacement cu. in. (cm ³).....	43.9 (720)
Bore x Stroke in. (mm).....	3.31 x 2.56 (84 x 65)
Compression Ratio.....	8.3:1
Main Bearings & Style	Over-sized ball bearings
Cylinder Head.....	Aluminum
Crankshaft.....	Forged high carbon steel
Exhaust Valve	Hardened for dry fuel use
Governor	Mechanical
Frequency Reg (steady state)	±2%
Air Cleaner	(1) Replaceable main paper element
Oil Filter	(1) Replaceable spin-on
Special Limited Standby Subaru Engine Warranty.....	36 Months
Speed.....	60 Hz
Rated RPM.....	3600
Max Power, bhp Standby/LPG	25
Max Power, bhp Prime/LPG	23
Max Power, bhp Standby/Natural Gas	22.5
Max Power, bhp Prime/ Natural Gas.....	20

4.7 FUEL SYSTEM (EPA-CARB CERTIFIED)

Type	LPG or natural gas, vapor withdrawal
Fuel Pressure (kpa), in H ₂ O.....	(1.74-2.74) 7" – 15" water column
Secondary Fuel Regulator.....	LPG or NG vapor system
Auto Fuel Lock-Off Solenoid.....	(2) Solenoids
Add redundant fuel shutoff for safety precautions	

4.8 OIL SYSTEM

Type	Full pressure
Oil Pan Capacity qt (lt).....	1.24 (1.2)
Oil Pan Capacity w/filter & (2) oil coolers qt (lt)	1.80 (1.7)
All Weather, Year Round, Synthetic Oil Use	#OW-40

4.9 ELECTRICAL SYSTEM

Ignition System.....	Electronic
Engine Alternator:	
Ground.....	Negative
Volts DC.....	12
Max Amp Battery Charging Output.....	15
Min Battery Requirements.....	12 VDC, 55 Amp/Hr, Size BCI# 21R or 26R (8 ½ L x 7 W x 8 ¾ H), type "T", "L" or "X" terminals
Min Cold-Cranking Amps at 0° F (-17.8°C).....	390 CCA
Engine Starter Motor.....	12 VDC

4.10 TRAILER

Welded steel frame construction
 Tapered roller bearings; sealed (Can be lubricated when performing Maintenance.)
 Wheel..... 4 hole, 4 inch bolt circle
 Tires..... Size – 4.80 x 8 inch diameter Pressure – 50 psi (Rear)
 Size – 4 x 12.6 inch diameter Pressure – 85 psi (Front)

5.0 ELECTRICAL CONNECTIONS



CAUTION!

Voltage to compressor terminals during operation must be within voltage range indicated on unit nameplate.

NOTE: In compliance with NEC requirements for multi-motor and combination load equipment (refer to NEC Articles 430 and 440), the over current protective device for the unit shall be fuse or HACR breaker. See section 4.3 Electrical Data for size.

5.1 ON/OFF (DISCONNECT) SWITCH LOCATION

The On/Off switch (Disconnect) is mounted on the unit under the top panel and behind the condenser coil. **Reference Figures 1 and 2.**

This factory-installed, internally-mounted, NEC (National Electrical Code) and UL (Underwriters' Laboratories) approved non-fused On/Off switch (Disconnect) provides unit power shutoff.

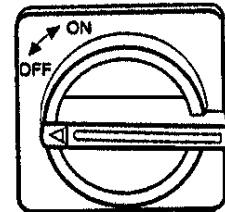


FIGURE 2
Unit Mounted Disconnect Switch

5.2 GROUND FAULT CIRCUIT INTERRUPTION (GFCI)

When certain adverse conditions exist, an electric shock potential is possible to the operator of electric generator sets. It is recommended by the National Electrical Code (NEC) and Occupational Health and Safety Administration (OSHA) to utilize a device that will automatically disconnect the electric load from the electric power source when these health and/or life threatening conditions exist.

The air conditioner on the Mobile Air Conditioner is equipped with a manual disconnect. If any other equipment is to be used with the motor/gen-set, it is the owner's responsibility to provide a manual and an automatic disconnect for that equipment. The gen-pro is equipped with an automatic two pole magnetic reacting circuit breaker. See Section 7.3, Receptacle Panel

This device protects you against hazardous electrical shock that may be caused if your body becomes a path through which electricity travels to reach ground potential. This could happen when you touch an appliance or cord which is "live" through faulty mechanism, damp or worn insulation, etc. Also, be cautious about touching plumbing or other mechanical paths to ground.

6.0 FUEL AND OIL FOR MOTOR/GEN-SET

Explosive Fuel! LPG is extremely flammable and its vapors can explode if ignited. Store only in approved containers, in well ventilated unoccupied buildings and away from sparks or flames.

6.1 DRY FUEL TECHNICAL BULLETIN**6.1.1 General Recommendations**

The purpose of this bulletin is to enable the user or service technician to better understand the special considerations of LPG (liquefied petroleum gas). Due to the many varieties of LPG in the world and environments the Mobile Air Conditioner can be used in, this is only a guide. This bulletin does not represent recommendations of the manufacturer.

6.1.2 Codes And Regulations

Gaseous fuel is governed by various local and state codes. These important codes usually reference NFPA (National Fire Protection Association) Standard Numbers 37, 54, and 58. Because of the variations in local codes, always consult your local gas distributor and your local fire department before any work is begun.

Important Excerpts from NFPA Pamphlet Number 58:

Tronair strongly recommends the user become familiar with current Pamphlet Number 58.

1. All piping, tubing, fittings, valves, and other components for use with vapor gaseous fuel shall be suitable for a working pressure of 300 psig.
2. LPG vapor fuel at pressures exceeding 20 psig (138 KPA) shall not be piped into any building for fuel purposes, except buildings or separate fire divisions of buildings, used exclusively for housing internal combustion engines.
3. Cast iron pipe fittings such as main fuel feed lines, elbows, tees, couplings, etc. shall be used. Aluminum tubing shall not be used in exterior locations or where it is in contact with masonry, plaster walls, or insulation.
4. Flexible connectors or hose complying with Section 235 or NFPA 58 may be used between the fuel tank and engine mounted regulator, or between the regulator and gas air mixer, with the approval for this application, of any of the authorities listed in Section 1300 in NFPA 58.
5. Do not make leak tests with a flame. Use soapy water and watch for bubbles.
6. Piping outside of buildings may be buried or remain above ground; but shall be well supported and protected against physical damage and vibration. Where condensation may occur, the piping shall be slanted back to the fuel container or other suitable means shall be provided for vaporization of the condensation.
7. Provisions must always be made for expansion, contraction, vibration and settling. This may be accomplished with flexible connectors. Fuel line sizes for diameters and lengths are determined by individual unit requirements and must include approved shut-off device. All hardware, lines, fittings, and components must meet local codes.

6.1.3 Types of Fuel

The basic fuel structure determines the amount of heat that a fuel can produce. This is measured in BTU (British Thermal Unit). LP (liquefied petroleum gas) is a commercial mixture of propane and butane. The ration of mixture between the two will vary with local temperatures and user needs. Propane will always vaporize at lower temperatures than butane, but butane has a higher BTU heat content. LPG is stored in tanks and at normal temperature is always in vapor form. By increasing pressures and lowering the temperature, LP gas will remain in liquid state until its withdrawal from its tank. A generating set using butane (approximately 3000 BTU), propane (approximately 2200 BTU) or a commercial mixture of both for LPG (approximately 1800 BTU), will deliver almost the same power from an engine as using gasoline.

Notice what happens when the BTU level of fuel is lowered:

1. 1200 BTU will deliver 90% of engine's gasoline rated power.
2. 1000 BTU will deliver 80% of engine's gasoline rated power.
3. 800 BTU will deliver 70% of engine's gasoline rated power.
4. 500 BTU will deliver 70% of engine's gasoline rated power.

It is extremely important to know and understand the BTU value of LPG (it varies throughout the world) so that maximum output is achieved from the generating set. Average value of LPG is 1200 BTU; therefore, de-rating engine horsepower and generator by 10%. Tronair does de-rate the engine horsepower and generator wattage output for use on LPG fuel mix on all published engine HP and wattage ratings.

7.0 PRE START-UP**7.1 PRIOR TO OPERATION**

Prior to operating the Mobile Air Conditioner, the user should become familiar with the Owner's operating manuals.

**CAUTION!**

1. **DO NOT jumper any safety devices when operating the unit.**
2. **DO NOT operate the compressor when the outdoor temperature is below 40°F (4°C) unless accessory low-temperature kit is installed.**
3. **DO NOT rapid-cycle the compressor. Allow five (5) minutes between "On" cycles to prevent compressor damage.**

**WARNING!**

Failure to observe the following warnings could result in serious personal injury:

1. **Follow recognized safety practices and wear protective goggles when checking or servicing refrigerant system.**
2. **Do not operate compressor or provide any electric power to unit unless compressor terminal cover is in place and secured.**
3. **Do not remove compressor terminal cover until all electrical sources are disconnected.**
4. **Relieve all pressure from both high- and low-pressure sides of the system before touching or disturbing anything inside terminal box if refrigerate leak is suspected around compressor terminals. Use accepted methods to recover refrigerant.**
5. **Never attempt to repair soldered connection while refrigerant system is under pressure.**
6. **Do not use torch to remove any component. System contains oil and refrigerant under pressure. To remove a component, wear protective goggles and proceed as follows:**
 - **Shut off electrical power to unit.**
 - **Relieve all pressure from system using both high- and low-pressure ports. Use accepted methods to recover refrigerant.**
 - **Cut component connecting tubing with tubing cutter and remove component from unit.**
 - **Carefully un-sweat remaining tubing stubs when necessary. Oil can ignite when exposed to torch flame.**

7.2 GENERAL INSPECTION

1. Remove all access panels on the air conditioner.
2. Read and follow instructions on all WARNING, CAUTION, and INFORMATION labels attached to and/or shipped with unit.
3. Make the following inspections:
 - a. Inspect for shipping and handling damages such as broken lines, loose parts, disconnected wires, etc.
 - b. Inspect for oil at all refrigerant tubing connections and on unit base. Detecting oil generally indicates a refrigerant leak. Leak-test all refrigerant tubing connections using electronic leak detector or liquid-soap solution. If a refrigerant leak is detected, see 5.3 Check for Refrigerant Leaks section.
 - c. Inspect all field and factory wiring connections. Be sure that connections are completed and tight.
 - d. Inspect coil fins. If damaged during shipping and handling, carefully straighten fins with a fin comb.
4. Remove all access panels on the air conditioner.
5. Read and follow instructions on all WARNING, CAUTION, and INFORMATION labels attached to and/or shipped with unit.
6. Make the following inspections:
 - a. Inspect for shipping and handling damages such as broken lines, loose parts, disconnected wires, etc.
 - b. Inspect for oil at all refrigerant tubing connections and on unit base. Detecting oil generally indicates a refrigerant leak. Leak-test all refrigerant tubing connections using electronic leak detector or liquid-soap solution. If a refrigerant leak is detected, see 5.3 Check for Refrigerant Leaks section.
 - c. Inspect all field and factory wiring connections. Be sure that connections are completed and tight.
 - d. Inspect coil fins. If damaged during shipping and handling, carefully straighten fins with a fin comb.
7. Verify the following conditions:
 - a. Make sure that condenser-fan blade is correctly positioned in fan orifice. Leading edge of blade should be two inches (2 in/51 mm) from condenser inlet grille and one-half inch (½ in/13mm) from fan deck.
 - b. Make sure that air filter(s) is in place.
 - c. Make sure that condensate drain pan and trap are filled with water to ensure proper drainage.
 - d. Make sure that all tools and miscellaneous loose parts have been removed.

7.3 CHECK FOR REFRIGERANT LEAKS

Locate and repair refrigerant leaks and charge the unit as follows:

1. Using both high-pressure and low-pressure ports, locate leaks and recover remaining refrigerant to relieve system pressure.
2. Repair leak following accepted practices.
3. Check system for leaks using an approved method.
4. Evacuate refrigerant system and recover refrigerant if no additional leaks are found.
5. Charge unit with R-410A refrigerant (Reference Appendix II – MSDS) using a volumetric-charging cylinder or accurate scale. *Refer to unit rating plate for required charge.* Be sure to add extra refrigerant to compensate for internal volume of filter drier.

7.4 CHECK COOLING EFFECTS

Plug in unit. Turn On/Off switch to "On" position. Fan should be on and blowing correctly. After approximately 30 seconds, condenser should "kick on". Observe that compressor, condenser fan, and evaporator blower motors start. Observe that cooling cycle shuts down when control setting is satisfied.

7.5 CHECK MOTOR/GEN-SET

1. Check the lubricating oil and maintain to proper level.

Oil-Guard: Protection against damage to engine resulting from low oil level. As the oil level falls below safe level, the engine automatically shuts down and the engine will not restart until oil is added.

**CAUTION!**

Never start engine when oil level is below normal level or when oil fill cap is removed.

2. Check fuel source. LPG should be vapor withdrawal.
3. Make sure that exhaust is directed away from people and animals.
4. Check circuit breakers to ensure they are set.
5. Ensure battery is fully charged and the battery cables are connected to both the engine and the battery.

8.0 OPERATION
 8.1 OPERATING INSTRUCTIONS

Operate the Mobile Air Conditioner in accordance with the operating instructions provided on the instrument panel. Reference **Figure 7**.

A description of each step of the STARTING and SHUTOFF sequence is given, along with a brief discussion of what is to be expected.

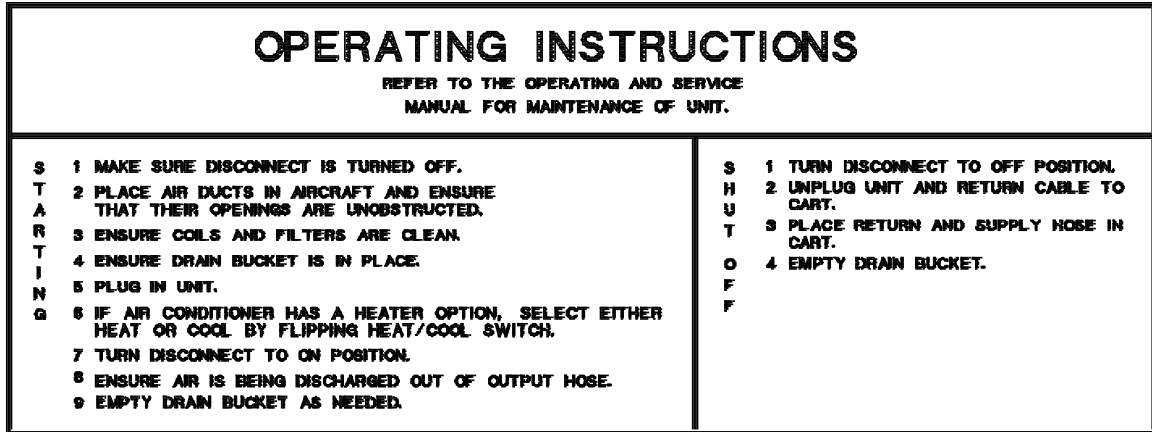


FIGURE 7 – Operating Instructions Label

8.2 STARTING MOBILE AIR CONDITIONER

1. Ensure On/Off switch (Disconnect) is turned to "Off" position. The On/Off (Disconnect) switch is "Off" when turned counter-clockwise. **Reference Figure 2.**



WARNING!
 Until ready for use, always leave this switch in the Off position.

2. Place air duct in aircraft and ensure that the opening is unobstructed. Remove yellow output air duct from the storage compartments located under the unit. Remove yellow dust caps from the input and output duct openings located on the back of the air conditioner and place in the storage compartment. Attach yellow output air duct to the air conditioner via the duct opening located on the back of the air conditioner. **See Figure 5.** Place other end of yellow duct into the aircraft.
3. Ensure coils and filters are clean. Refer to section 8.5 Air Conditioner Cleaning.
4. Ensure drain bucket is in place. The Mobile Air Conditioner unit does not have a factory supplied drain bucket. Depending on your usage, a drain bucket or any condensate collector device may not be needed. Below are two suggestions you may utilize if you do not want the condensation to collect on the floor/ramp:
 - a. Purchase a bucket with a lid on it and the lid has at least a 13/16 inch diameter hole. The hole in the bucket will receive the 3/4 inch diameter yellow condensate hose coming out of the Mobile Air Conditioner unit.
 - b. Buy a 1/2 inch diameter male garden hose coupler and attach it to the end of the 3/4 inch diameter yellow condensate hose coming out of the Mobile Air Conditioner unit. Also, purchase any length garden hose to attach to the 1/2 inch diameter garden hose coupler. By doing the above, you will be able to direct the condensate to any location.

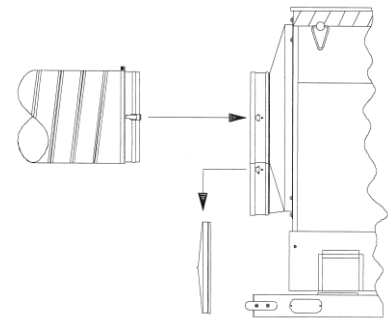


FIGURE 5



WARNING!
 The end of the garden hose can not be higher than the condensate trap located under the air conditioning unit. Damage to equipment and/or electrical shock may occur.

5. Plug unit into generator set or wall receptacle. See Section 4.0 Electrical Connections for important instructions concerning electrical connections. The air conditioner on Tronair model 17-7524-0000 Mobile Air Conditioner can receive power from either the motor/generator set or a wall receptacle. The following are instructions for both methods:
 - a. Wall Receptacle – Ensure that receptacle meets requirements in Section 4.3, N. 14-50R Plug
 - b. Motor/Gen-Set – Insert plug into motor/gen-set as shown in **Figure 6 – Receptacle Panel.**
6. If using generator set, follow instructions in generator engine manual for starting engine.

8.2 STARTING MOBILE AIR CONDITIONER *(continued)*

7. Turn On/Off switch (Disconnect) to "On" position. Turn On/Off switch (Disconnect) to "On" position by turning clockwise. Reference **Figure 2**.
8. Check supply air duct to ensure cool air is being discharged when condenser is on.
9. When unit is turned "On", the evaporator blower fan located inside the fan access panel (Reference **Figure 1**) begins rotating. After approximately 30 seconds, the compressor and condenser fan "kicks on".

NOTE: If the unit has been sitting for an extended amount of time without use and/or after considerable moving of unit (especially during shipping), the first 30 second delay may be as long as five (5) minutes due to removal of excessive pressure build-up against the head of the compressor.

These two items will continue to function until a temperature of 55° F is reached inside the air conditioner unit.

NOTE: If a temperature of less than 50° F is obtained, the freeze protection switch will open and the air conditioner unit will not function until the freeze protection switch is reset.

When a temperature of approximately 60° F is reached, the compressor and condenser fan will cycle back on. At no time will the evaporator blower fan cease to operate as long as the On/Off (Disconnect) switch is in the "On" position.

10. Empty drain bucket as needed to keep condensate from collecting on the floor/ramp.

8.3 SHUT OFF MOBILE AIR CONDITIONER

1. Turn Disconnect to "Off" position. The On/Off (Disconnect) switch is "Off" when turned counter-clockwise. **Reference Figure 2**
2. Turn tank valve to closed position.
3. Flip power switch on generator set to "Off" position. To stop gen-set, move the "Stop-Run" switch from the "Run" position to the "Stop" position. Engine will stop running.
4. Unplug unit and return cable to cart. The cable hanger is located on the side of the unit. Ensure the cable does not touch the ground.
5. Place supply hose in cart.
6. Empty drain bucket.

9.0 TROUBLESHOOTING

TABLE - COOLING SERVICE ANALYSIS		
Problem	Cause	Remedy
Compressor and condenser fan will not start	Power failure	Call Power Company
	Fuse blown or circuit breaker tripped	Replace fuse or reset circuit breaker
	Defective thermostat, contactor, transformer, or control relay	Replace component
	Insufficient line voltage	Determine cause and correct.
	Incorrect or faulty wiring	Check wiring diagram and rewire correctly
	Thermostat setting too high	Lower thermostat setting below room temperature
Compressor will not start but condenser fan runs	Faulty wiring or loose connections in compressor circuit	Check wiring and repair or replace
	Compressor motor burned out, seized, or internal overload open	Determine cause. Replace compressor
	Defective run/start capacitor, overload, start relay	Determine cause and replace
	One leg of three-phase power dead	Replace fuse or reset circuit breaker
Compressor cycles (other than normally satisfying thermostat)	Refrigerant overcharge or undercharge	Recover refrigerant, evacuate system, and recharge to nameplate
	Defective compressor	Replace and determine cause
	Insufficient line voltage.	Determine cause and correct
	Blocked condenser	Determine cause and correct
	Defective run/start capacitor, overload, or start relay	Determine cause and replace
	Defective thermostat	Replace thermostat
	Faulty condenser-fan motor or capacitor	Replace
	Restriction in refrigerant system	Locate restriction and remove
Compressor operates continuously	Dirty air filter	Replace filter
	Unit undersized for load	Decrease load or increase unit size
	Thermostat set too low	Reset thermostat
	Low refrigerant charge	Locate leak; repair and recharge
	Leaking valves in compressor	Replace compressor
	Air in system	Recover refrigerant, evacuate system, and recharge
Excessive head pressure	Dirty air filter.	Replace filter
	Dirty condenser coil	Clean coil
	Refrigerant overcharged	Recover excess refrigerant
	Air in system	Recover refrigerant, evacuate system, and recharge
	Condenser air restricted or air short-cycling	Determine cause and correct
Head pressure too low	Low refrigerant charge	Check for leaks; repair and recharge
	Compressor valves leaking	Replace compressor
	Restriction in liquid tube	Remove restriction
Excessive suction pressure	High head load	Check for source and eliminate
	Compressor valves leaking	Replace compressor
	Refrigerant overcharged	Recover excess refrigerant
Suction pressure too low	Dirty air filter	Replace filter
	Low refrigerant charge	Check for leaks; repair and recharge
	Metering device or low-side restricted	Remove source of restriction
	Insufficient evaporator airflow	Increase air quantity. Check filter and replace if necessary
	Temperature too low in conditioned area	Reset thermostat
	Outdoor ambient below 25° F	Install low-ambient kit

10.0 MAINTENANCE AND SERVICE**WARNINGS!**

CAUTION TO OPERATOR: Many engine manuals try to explain engine operations to fit all possible applications. This method of explanation will sometimes lead to conflicting rules of operation. The following are the most important of the conflicts of operation for generator users:

- Most engine manuals instruct user to start engine at half speed, let engine warm up, then move throttle to full speed and apply engine load. Consequent instructions are to remove load and run engine at half speed to cool engine down before stopping. **DO NOT FOLLOW THESE INSTRUCTIONS.** The engine governor is fixed at the proper speed and is not adjustable. Generators should be started at full speed and stopped at full speed. Changing the engine speed will ruin voltage and frequency output.
- All engines modified with dry fuel (LPG) and have the engine choke mechanism permanently fixed to that engine cannot be "choked" with this fuel. **DO NOT CHOKE ANY ENGINE WITH DRY FUEL MODIFICATION.**
- All engines are now EPA certified for compliance with minimal toxic exhaust emissions. Modification of muffler assembly, carburetor or air cleaner may alter and therefore cancel EPA certification.

10.1 GENERAL**WARNING!**

1. Be sure that all control panel switches are in the "Off" position before making battery disconnections.
2. Battery posts, terminals and related accessories contain lead and lead compounds; chemicals known to the State of California to cause cancer and reproductive harm.
3. Wash hands after handling.

Periodically inspect Mobile Air Conditioner for loose connections, abrasions to cables and wires, and overall general condition of unit. Make repairs as necessary.

If the Mobile Air Conditioner will be out of service for two months or more, use the following storage procedure:

- Clean the exterior surfaces of the unit, removing dirt and oil residue.
- Change the oil and oil filter in the Honda engine while the engine is still warm from operation.
- The engine fuel system must be completely emptied.
- Remove the spark plugs and add one tablespoon of engine oil into each spark plug hole. Install plugs and ground spark plug leads - do not connect the leads to the spark plug. Crank the engine two or three revolutions.
- Disconnect positive 12V battery cable.
- Store the Mobile Air Conditioner unit in a clean, dry place.

**WARNING!**

When servicing unit, shut off all electrical power to unit to avoid shock hazard or injury from rotating parts.

10.2 ENGINE

See Parts Lists and Illustrations Section of this manual for specific maintenance regarding the engine.

The single most important factor in long engine life is maintaining proper oil level and regularly scheduled changing of engine oil.

10.3 BATTERIES**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 hands after handling.

- Refer to the battery bulletin, Appendix I Johnson Controls MSDS, for specific maintenance regarding the batteries.
- It is suggested that once each year the battery be tested. Replace worn battery. Acceptable battery should be fully charged.

10.4 TRAILER SYSTEM

- Lubricate axle wheel bearings periodically (minimum once per year) with a multi-purpose lithium wheel bearing grease. Replace seals as required.
- Check and maintain tire pressure.

10.5 AIR CONDITIONER CLEANING



WARNING!

When servicing unit, shut off all electrical power to unit to avoid shock hazard or injury from rotating parts.

Inspect unit interior at the beginning of each heating and cooling season or as operating conditions require.

Evaporator Coil – Inspect and clean coil prior to each heating and cooling season, and as required by location.

1. Turn unit power off.
2. Slide filters (located in the hinged access panel) out of unit. Replace if dirty. **See Figure 9.**

NOTE: This panel permits quick and simple filter access and prevents panels from being dropped.

3. Clean coil using a commercial coil cleaner or dishwasher detergent in a pressurized spray canister. Wash both sides of coil and flush with clean water. For best results, back flush toward return-air section to remove foreign material.
4. Flush condensate pan.
5. Re-install filters.
6. Reconnect wiring.
7. Close filter-hinged access panel.

Condenser Coil – Inspect coil monthly. Clean condenser coil annually, and as required by location and outdoor air conditions.

One-Row Coils – To access one-row coils, remove screws securing condenser-fan grille to condenser coil top cover. Place grille on top of condenser coil top cover as shown in **Figure 10**. It is not necessary to remove the top cover.

Use a water hose or other suitable equipment to remove dirt and debris. Clean the outer surfaces with a stiff brush in the normal manner.

Reverse the procedure outlined above to re-install the condenser-fan grille and condenser fan top cover.

Condensate Drain – Check and clean each year at start of cooling season. In winter, keep drain dry or protect against freeze-up. Condensate drain and tray are located on the bottom of the air conditioner.

Filters – Clean or replace at start of each heating and cooling season, or more often if operating conditions require it. Replacement filters must be same dimensions as original filters.

10.6 AIR CONDITIONER LUBRICATION

Compressors – Each compressor is charged with the correct amount of oil at the factory.

Fan-Motor Bearings – Fan-Motor bearings are of the permanently lubricated type. No further lubrication is required. No lubrication of condenser or evaporator-fan motors is required.

10.7 CONDENSER-FAN ADJUSTMENT

1. Shut off unit power supply and tag disconnect
2. Remove condenser-fan assembly (grille, motor, motor cover,
3. Loosen fan hub setscrews.
4. Adjust fan height as shown in **Figure 11**.
5. Tighten setscrews.
6. Replace condenser-fan assembly.

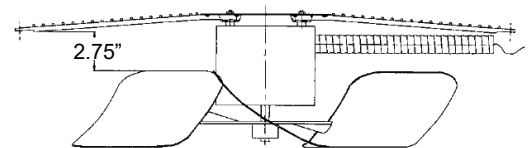


FIGURE 11
Condenser Fan Adjustment

10.8 CONDENSER COIL GRILLE

Condenser coil grille is shipped factory installed. No adjustments are required.

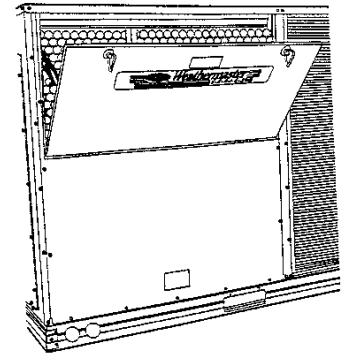


FIGURE 9
Filter Hinged Access Panel

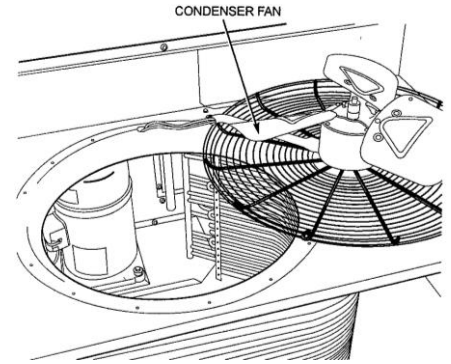


FIGURE 10
Condenser Coil Cleaning

10.9 REFRIGERANT CHARGE

Amount of refrigerant charge is listed on unit nameplate. Refer to Carrier Charging, Recovery, Recycling, and Reclamation Training Manual and the following procedures.

Unit panels must be in place when unit is operating during charging procedure.

No Charge – Use standard evacuating techniques. After evacuating system, weigh in the specified amount of refrigerant.

Amount of refrigerant charge is listed on unit nameplate. Refer to Carrier Charging, Recovery, Recycling, and Reclamation Training Manual and the following procedures.

Unit panels must be in place when unit is operating during charging procedure.

No Charge – Use standard evacuating techniques. After evacuating system, weigh in the specified amount of refrigerant.

Amount of refrigerant charge is listed on unit nameplate. Refer to Carrier Charging, Low Charge Cooling – Vary refrigerant until the conditions of the cooling chart. Note the charging chart is different from type normally used. Chart is based on charging the units to the correct superheat for the various operating conditions. Accurate pressure gage and temperature sensing device are required. Connect the pressure gage to the service port on the suction line. Mount the temperature sensing device on the suction line and insulate it so that outdoor ambient temperature does not affect the reading. Indoor-air CFM must be within the normal operating range of the unit.

To Use Cooling Charging Chart – Take the outdoor ambient temperature and read the suction pressure gage. Refer to chart to determine what suction temperature should be. If suction temperature is high, add refrigerant. If suction temperature is low, carefully reclaim some of the charge. Recheck the suction pressure as charge is adjusted.

11.0 PROVISION OF SPARES**11.1 SOURCE OF SPARE PARTS**

Spare parts may be obtained from the 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

Website: www.tronair.com

For Spare Parts, Operations & Service Manuals or Service Needs:

Scan the QR code or visit Tronair.com/aftermarket

**11.2 RECOMMENDED SPARE PARTS LISTS**

Reference the following page(s) for Replacement Parts and Kits available.

12.0 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.

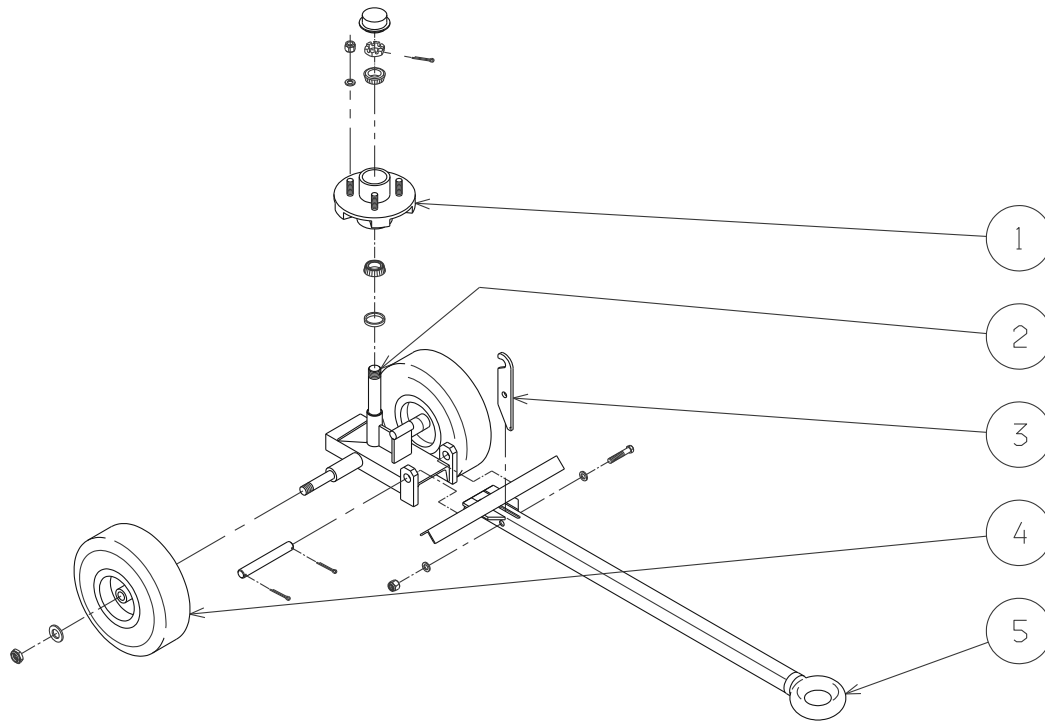
The obligations of Tronair expressly stated herein are in lieu of all other warranties or conditions expressed or implied. **Any unauthorized modification of the Tronair products or use of the Tronair products in violations of cautions and warnings in any manual (including updates) or safety bulletins 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.**

13.0 APPENDICIES

- APPENDIX I Johnson Controls Battery Warning SDS L8
- APPENDIX II SDS R-410A Refrigerant

Parts List

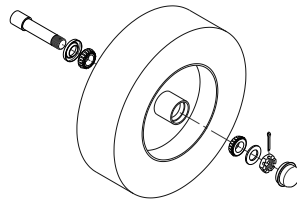
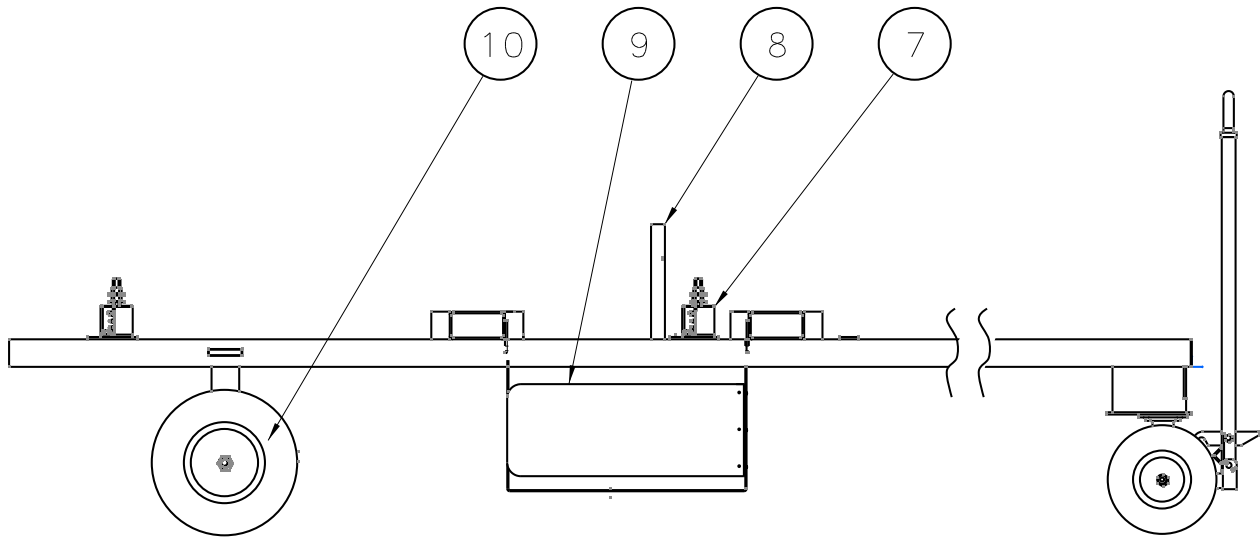
When ordering replacement parts/kits, please specify model, serial number and color of your unit.



Item	Part Number	Description	Qty
1	H-1335	Hub	1
2	Z-2449-01	Weldment, Steering Axle	1
3	K-1320	Kit, Lever; consists of:	
	G-1100-109522	Bolt, Hex Head, Grade 5, 1/2-20 x 2-1/4" long	1
	G-1202-1090N	Stopnut 1/2-20 Elastic	1
	G-1250-1090N	Flatwasher, 1/2 Narrow	2
	J-1626	Lever	1
4	K-2084	Kit, Wheel (Single); consists of:	
	G-1203-1115	Stopnut, 3/4-16 Elastic	1
	U-1041	Wheel, Pneumatic Tire	1
5	K-3361	Kit, Tongue; consists of:	
	G-1301-03	Pin, Cotter (1/8" diameter x 1-1/2" long)	2
	R-1122	Pin	1
	Z-4838-01	Weldment, Tongue	1

Parts List

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

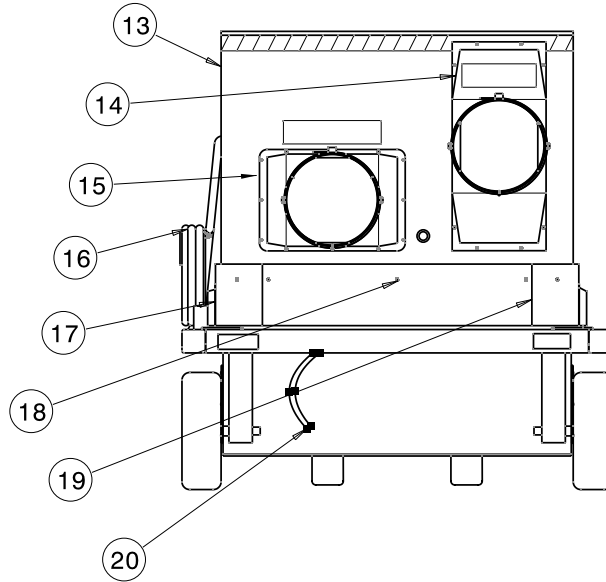


ITEM 10 DETAIL

Item	Part Number	Description	Qty
8	Z-4767-01	Weldment, Frame	1
10	Z-1217	Assembly, Wheel, Tire & Bearing	1
7	K-3344	Kit, Isolator; consists of:	
	G-1100-109514	Bolt, Hex Head, Grade 5, 1/2-20 x 1-1/2" long	2
	G-1202-1090N	Stopnut 1/2-20 Elastic	4
	G-1250-1090N	Flatwasher, 1/2 Narrow	2
	H-2396	Isolator	1
9	K-4120	Kit, Vent Hose Holder	1

Parts List

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



Item	Part Number	Description	Qty
13	H-5170	Air Conditioner	1
14	Z-6592	Assembly, Clamp	1
15	Z-6591	Assembly, Clamp	1
20	Z-4733	Assembly, Drain	1
N/S	EC-1971	Battery	1
N/S	H-3003	Hose, Insulated Vent	1
N/S	H-2459	Filter, Air Conditioner (16" x 25" x 2")	1
N/S	H-3438	Generator	1
16	K-3348	Kit, Electrical Cable; consists of:	
	EC-1176-04	Locknut, Conduit	1
	EC-1433-21	Connector, Strain Relief	1
	EC-1507-02*0600	Cable, Type 50 Electrical 600 V, 50 ft long	1
	G-1159-105010	Screw, Round Head Cross Recess Machine, 1/4-20 x 1" long	1
	G-1202-1050	Stopnut, 1/4-20 Elastic	1
	G-1250-1050N	Flatwasher, 1/4 Narrow	2
	H-1721-10	Clamp, Electrical	1
17	K-3362	Kit, Right Hand Shroud; consists of:	
	G-1189	Screw, Hex Washer Head, #10 x 3/4" long	7
	S-1686-01	Shroud	1
	S-1688-01	Shroud	1
18	K-3351	Kit, Front or Back Shroud; consists of:	
	G-1189	Screw, Hex Washer Head, #10 x 3/4" long	3
	S-1663-01	Shroud	1
19	K-3363	Kit, Left Hand Shroud; consists of:	
	G-1189	Screw, Hex Washer Head, #10 x 3/4" long	7
	S-1685-01	Shroud	1
	S-1687-01	Shroud	1



APPENDIX I

**Safety Data Sheet
Lead Acid Battery**



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/m ³
Lead Oxide	1309-60-0	TWA	0.05 mg/m ³
Lead Sulfate	7446-14-2	TWA	0.05 mg/m ³

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/m ³

US ACGIH Threshold Limit Values

Ingredient	CAS Number	Type	Value	Form
Lead	7439-92-1	TWA	0.05 mg/m ³	
Lead Oxide	1309-60-0	TWA	0.05 mg/m ³	
Lead Sulfate	7446-14-2	TWA	0.05 mg/m ³	
Sulfuric Acid	7664-93-9	TWA	0.2 mg/m ³	Thoracic Fractions

US NIOSH: Pocket Guide to Chemical Hazards

Ingredient	CAS Number	Type	Value
Lead	7439-92-1	TWA	0.05 mg/m ³
Lead Oxide	1309-60-0	TWA	0.05 mg/m ³
Sulfuric Acid	7664-93-9	TWA	1 mg/m ³

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 ₂ SO ₄ /H ₂ O)	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 damaged 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 ₂ O = 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 trace 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 SYMPTOMS 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
PS-HTR-ST-43-E_Lead Acid Battery		SDS US
Version #: 05 Issue Date: 04/01/2015 Revision Date: 03/16/2017		6 of 11

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

No data available.

toxicity -

single exposure

Specific target organ

Lead: May cause damage to organs (blood, central nervous system) through prolonged or repeated exposure.

toxicity -

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

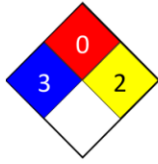
CANADIAN WHMIS CLASSIFICATION: This product has been classified according to the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

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.



APPENDIX II

Safety Data Sheet 410A Refrigerant

Genetron® 410A**00000009881**

Version 2.7

Revision Date 04/18/2014

Print Date 04/14/2015

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Genetron® 410A

MSDS Number : 00000009881

Product Use Description : Refrigerant

Manufacturer or supplier's details : Honeywell International Inc.
101 Columbia Road
Morristown, NJ 07962-1057

For more information call : 800-522-8001
+1-973-455-6300
(Monday-Friday, 9:00am-5:00pm)

In case of emergency call : **Medical: 1-800-498-5701 or +1-303-389-1414**
: **Transportation (CHEMTREC): 1-800-424-9300 or +1-703-527-3887**
:
: (24 hours/day, 7 days/week)

SECTION 2. HAZARDS IDENTIFICATION**Emergency Overview**

Form : Liquefied gas

Color : colourless

Odor : weak

Classification of the substance or mixture

Classification of the substance or mixture : Gases under pressure, Liquefied gas
Simple Asphyxiant

GHS Label elements, including precautionary statements

Genetron® 410A**00000009881**

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Symbol(s)

:



Signal word

: Warning

Hazard statements

: Contains gas under pressure; may explode if heated.
May displace oxygen and cause rapid suffocation.

Precautionary statements

: **Prevention:**
Use personal protective equipment as required.**Storage:**

Protect from sunlight. Store in a well-ventilated place.

Hazards not otherwise
classified: May cause eye and skin irritation.
May cause frostbite.
May cause cardiac arrhythmia.**Carcinogenicity**

No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP, IARC, or OSHA.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical nature : Mixture

Chemical Name	CAS-No.	Concentration
Pentafluoroethane	354-33-6	50.00 %
Difluoromethane	75-10-5	50.00 %

SECTION 4. FIRST AID MEASURES

Genetron® 410A**00000009881**

Version 2.7

Revision Date 04/18/2014

Print Date 04/14/2015

- Inhalation : Move to fresh air. If breathing is irregular or stopped, administer artificial respiration. Use oxygen as required, provided a qualified operator is present. Call a physician. Do not give drugs from adrenaline-ephedrine group.
- Skin contact : After contact with skin, wash immediately with plenty of water. If there is evidence of frostbite, bathe (do not rub) with lukewarm (not hot) water. If water is not available, cover with a clean, soft cloth or similar covering. If symptoms persist, call a physician.
- Eye contact : Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. In case of frostbite water should be lukewarm, not hot. If symptoms persist, call a physician.
- Ingestion : Unlikely route of exposure. As this product is a gas, refer to the inhalation section. Do not induce vomiting without medical advice. Call a physician immediately.

Notes to physician

- Treatment : Because of the possible disturbances of cardiac rhythm, catecholamine drugs, such as epinephrine, should be used with special caution and only in situations of emergency life support. Treatment of overexposure should be directed at the control of symptoms and the clinical conditions. Treat frost-bitten areas as needed.

SECTION 5. FIREFIGHTING MEASURES

- Suitable extinguishing media : The product is not flammable.
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
- Specific hazards during firefighting : Contents under pressure.
This product is not flammable at ambient temperatures and atmospheric pressure.
However, this material can ignite when mixed with air under pressure and exposed to strong ignition sources.
Container may rupture on heating.
Cool closed containers exposed to fire with water spray.

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Do not allow run-off from fire fighting to enter drains or water courses.

Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.

In case of fire hazardous decomposition products may be produced such as:

Hydrogen halides

Hydrogen fluoride

Carbon monoxide

Carbon dioxide (CO₂)

Carbonyl halides

Special protective equipment for firefighters : In the event of fire and/or explosion do not breathe fumes. Wear self-contained breathing apparatus and protective suit. No unprotected exposed skin areas.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions : Immediately evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Wear personal protective equipment. Unprotected persons must be kept away. Remove all sources of ignition. Avoid skin contact with leaking liquid (danger of frostbite). Ventilate the area. After release, disperses into the air. Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing. Avoid accumulation of vapours in low areas. Unprotected personnel should not return until air has been tested and determined safe. Ensure that the oxygen content is $\geq 19.5\%$.

Environmental precautions : Prevent further leakage or spillage if safe to do so. The product evaporates readily.

Methods for cleaning up : Ventilate the area.

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SECTION 7. HANDLING AND STORAGE**Handling**

Handling : Handle with care.
Avoid inhalation of vapour or mist.
Do not get in eyes, on skin, or on clothing.
Wear personal protective equipment.
Use only in well-ventilated areas.
Pressurized container. Protect from sunlight and do not expose to temperatures exceeding 50 °C.
Follow all standard safety precautions for handling and use of compressed gas cylinders.
Use authorized cylinders only.
Protect cylinders from physical damage.
Do not puncture or drop cylinders, expose them to open flame or excessive heat.
Do not pierce or burn, even after use. Do not spray on a naked flame or any incandescent material.
Do not remove screw cap until immediately ready for use.
Always replace cap after use.

Advice on protection against fire and explosion : The product is not flammable.
Can form a combustible mixture with air at pressures above atmospheric pressure.

Storage

Requirements for storage areas and containers : Pressurized container: protect from sunlight and do not expose to temperatures exceeding 50 °C. Do not pierce or burn, even after use.
Keep containers tightly closed in a dry, cool and well-ventilated place.
Storage rooms must be properly ventilated.
Ensure adequate ventilation, especially in confined areas.
Protect cylinders from physical damage.
Store away from incompatible substances.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Protective measures : Do not breathe vapour.

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- Avoid contact with skin, eyes and clothing.
Ensure that eyewash stations and safety showers are close to the workstation location.
- Engineering measures : General room ventilation is adequate for storage and handling. Perform filling operations only at stations with exhaust ventilation facilities.
- Eye protection : Wear as appropriate:
Safety glasses with side-shields
If splashes are likely to occur, wear:
Goggles or face shield, giving complete protection to eyes
- Hand protection : Leather gloves
In case of contact through splashing:
Protective gloves
Neoprene gloves
Polyvinyl alcohol or nitrile- butyl-rubber gloves
- Skin and body protection : Avoid skin contact with leaking liquid (danger of frostbite).
Wear cold insulating gloves/ face shield/ eye protection.
- Respiratory protection : In case of insufficient ventilation, wear suitable respiratory equipment.
Wear a positive-pressure supplied-air respirator.
Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.
For rescue and maintenance work in storage tanks use self-contained breathing apparatus.
- Hygiene measures : Handle in accordance with good industrial hygiene and safety practice.
Ensure adequate ventilation, especially in confined areas.
Avoid contact with skin, eyes and clothing.
Remove and wash contaminated clothing before re-use.
Keep working clothes separately.
- Hygiene measures : Handle in accordance with good industrial hygiene and safety practice.
Ensure adequate ventilation, especially in confined areas.
When using do not eat, drink or smoke.
Remove and wash contaminated clothing before re-use.
Keep working clothes separately.
Do not breathe vapour.
Avoid contact with skin, eyes and clothing.

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Exposure Guidelines

Components	CAS-No.	Value	Control parameters	Update	Basis
Difluoromethane	75-10-5	TWA : time weighted average	2,200 mg/m ³ (1,000 ppm)	2007	WEEL:US. AIHA Workplace Environmental Exposure Level (WEEL) Guides
Difluoromethane	75-10-5	TWA : time weighted average	(1,000 ppm)	1994	Honeywell:Limit established by Honeywell International Inc.
Pentafluoroethane	354-33-6	TWA : time weighted average	4,900 mg/m ³ (1,000 ppm)	2007	WEEL:US. AIHA Workplace Environmental Exposure Level (WEEL) Guides
Pentafluoroethane	354-33-6	TWA : time weighted average	(1,000 ppm)		Honeywell:Limit established by Honeywell International Inc.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state : Liquefied gas

Color : colourless

Odor : weak

pH : Note: neutral

Melting point/freezing point : Note: not determined

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Boiling point/boiling range : -48.5 °C

Flash point : Note: not applicable

Evaporation rate : > 1
Method: Compared to CCl4.

lower flammability limit : Note: None

upper flammability limit : Note: None

Vapor pressure : 14,844 hPa
at 21.1 °C(70.0 °F)
33,798 hPa
at 54.4 °C(129.9 °F)

Vapor density : 3 Note: (Air = 1.0)

Density : 1.08 g/cm3 at 21.1 °C

Water solubility : Note: no data available

Partition coefficient: n-
octanol/water : log Pow: 1.48
Test substance: Ethane, pentafluoro- (HFC-125)

log Pow: 0.21
Test substance: Difluoromethane (HFC-32)

Ignition temperature : > 750 °C

Decomposition temperature : > 250 °C

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Global warming potential (GWP) : 1,975
Ozone depletion potential (ODP) : 0

SECTION 10. STABILITY AND REACTIVITY

Chemical stability : Stable under normal conditions.

Possibility of hazardous reactions : Hazardous polymerisation does not occur.

Conditions to avoid : Pressurized container. Protect from sunlight and do not expose to temperatures exceeding 50 °C.
Decomposes under high temperature.
Some risk may be expected of corrosive and toxic decomposition products.
Can form a combustible mixture with air at pressures above atmospheric pressure.
Do not mix with oxygen or air above atmospheric pressure.

Incompatible materials to avoid : Finely divided aluminium
Potassium
Calcium
Powdered metals
Aluminium
Magnesium
Zinc

Hazardous decomposition products : In case of fire hazardous decomposition products may be produced such as:
Hydrogen fluoride
Carbonyl halides
Carbon monoxide
Carbon dioxide (CO₂)

SECTION 11. TOXICOLOGICAL INFORMATION

Acute inhalation toxicity
Pentafluoroethane : > 769000 ppm
Exposure time: 4 h

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	Species: rat
Difluoromethane	: LC50: > 520000 ppm Exposure time: 4 h Species: rat
Sensitisation Pentafluoroethane	: Cardiac sensitization Species: dogs Note: No-observed-effect level 75 000 ppm Lowest observable effect level 100 000 ppm
Difluoromethane	: Cardiac sensitization Species: dogs Note: No-observed-effect level >350 000 ppm
Repeated dose toxicity Pentafluoroethane	: Species: rat Application Route: Inhalation Exposure time: (4 Weeks) NOEL: 50000 ppm Subchronic toxicity
Difluoromethane	: Species: rat Application Route: Inhalation Exposure time: (90 d) NOEL: 50000 ppm Subchronic toxicity
Genotoxicity in vitro Pentafluoroethane	: Test Method: Ames test Result: negative
Difluoromethane	: Test Method: Ames test Result: negative
	: Cell type: Human lymphocytes Result: negative

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- Genotoxicity in vivo
Difluoromethane
- : Cell type: Chinese Hamster Ovary Cells
Result: negative
 - : Cell type: Human lymphocytes
Result: negative
Method: Mutagenicity (in vitro mammalian cytogenetic test)
 - : Test Method: Chromosome aberration test in vitro
Result: negative
- Teratogenicity
Pentafluoroethane
- : Species: mouse
Cell type: Bone marrow
Method: Mutagenicity (micronucleus test)
Result: negative
 - : Species: rabbit
Application Route: Inhalation exposure
NOEL, Teratog: 50,000 ppm
NOEL, Maternal: 50,000 ppm
Note: Did not show teratogenic effects in animal experiments.
 - : Species: rat
Application Route: Inhalation exposure
NOEL, Teratog: 50,000 ppm
NOEL, Maternal: 50,000 ppm
Note: Did not show teratogenic effects in animal experiments.
- Difluoromethane
- : Species: rat
Dose: NOEL - 50,000 ppm
Note: Did not show teratogenic effects in animal experiments.
 - : Species: rabbit
Dose: NOEL - 50,000 ppm
Note: Did not show teratogenic effects in animal experiments.
- Further information
- : Acute toxicity Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing. Rapid evaporation of the liquid may cause frostbite. May cause

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cardiac arrhythmia.

SECTION 12. ECOLOGICAL INFORMATION

Biodegradability
Pentafluoroethane : Result: Not readily biodegradable.
Value: 5 %
Method: OECD 301 D

Difluoromethane : Note: Minimal

Further information on ecology

Additional ecological information : This product is subject to U.S. Environmental Protection Agency Clean Air Act Regulations at 40 CFR Part 82. This product contains greenhouse gases which may contribute to global warming. Do NOT vent to the atmosphere. To comply with provisions of the U.S. Clean Air Act, any residual must be recovered.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods : Observe all Federal, State, and Local Environmental regulations.

Note : This product is subject to U.S. Environmental Protection Agency Clean Air Act Regulations Section 608 in 40 CFR Part 82 regarding refrigerant recycling.

SECTION 14. TRANSPORT INFORMATION

DOT UN/ID No. : UN 3163
Proper shipping name : LIQUEFIED GAS, N.O.S.
(Pentafluoroethane, Difluoromethane)

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Class	2.2
Packing group	
Hazard Labels	2.2

IATA	UN/ID No.	: UN 3163
	Description of the goods	: LIQUEFIED GAS, N.O.S. (Pentafluoroethane, Difluoromethane)
	Class	: 2.2
	Hazard Labels	: 2.2
	Packing instruction (cargo aircraft)	: 200
	Packing instruction (passenger aircraft)	: 200

IMDG	UN/ID No.	: UN 3163
	Description of the goods	: LIQUEFIED GAS, N.O.S. (PENTAFLUOROETHANE, DIFLUOROMETHANE)
	Class	: 2.2
	Hazard Labels	: 2.2
	EmS Number	: F-C, S-V
	Marine pollutant	: no

SECTION 15. REGULATORY INFORMATION**Inventories**

US. Toxic Substances Control Act : On TSCA Inventory

Australia. Industrial Chemical (Notification and Assessment) Act : On the inventory, or in compliance with the inventory

Canada. Canadian Environmental Protection Act (CEPA). Domestic Substances List (DSL) : All components of this product are on the Canadian DSL.

Japan. Kashin-Hou Law List : On the inventory, or in compliance with the inventory

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Korea. Toxic Chemical Control Law (TCCL) List : On the inventory, or in compliance with the inventory

Philippines. The Toxic Substances and Hazardous and Nuclear Waste Control Act : On the inventory, or in compliance with the inventory

China. Inventory of Existing Chemical Substances : On the inventory, or in compliance with the inventory

NZIOC - New Zealand : On the inventory, or in compliance with the inventory

National regulatory information

SARA 302 Components : SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components : SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards : Acute Health Hazard
Sudden Release of Pressure Hazard

California Prop. 65 : WARNING! This product contains a chemical known to the State of California to cause cancer.
Dichloromethane 75-09-2

Massachusetts RTK : Dichloromethane 75-09-2

New Jersey RTK : Difluoromethane 75-10-5

Pennsylvania RTK : Difluoromethane 75-10-5

WHMIS Classification : A: Compressed Gas

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

Global warming potential : 1,975

Ozone depletion potential (ODP) : 0

SECTION 16. OTHER INFORMATION

	HMIS III	NFPA
Health hazard	: 1	2
Flammability	: 1	1
Physical Hazard	: 0	
Instability	:	0

Hazard rating and rating systems (e.g. HMIS® III, NFPA): This information is intended solely for the use of individuals trained in the particular system.

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text. Final determination of suitability of any material is the sole responsibility of the user. This information should not constitute a guarantee for any specific product properties.

Changes since the last version are highlighted in the margin. This version replaces all previous versions.

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