MSDS No.- 3.6V based PP (Revision. -B)

MATERIAL SAFETY DATA SHEET

SECTION 1- CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Manufacturer Name- Tadiran Batteries Ltd.

Address- 2 Seaview Blvd. Port Washington NY 11050, www.tadiranbat.com

Emergency Telephone No – CHEMTREC: 1-800-424-9300
Tel. for information: 1-516-621-4980
Tel. for information 972-8-944-4503

Chemical Systems- Lithium/Thionyl Chloride system along with a modified Hybrid Layer Capacitor (HLC) system. Both are hermitically sealed.

Products Name: Non-rechargeable batteries covers all the **TLP** models followed with 5 digit number starting with **9**XXXX, and may include additonal slushes and letters and digits.

SECTION 2- COMPOSITION, INFORMATION ON INGREDIENTS

Ingredient Name	CAS #	%	ACGIH (TLV)	OHSA (PEL)
Lithium Metal (Li)	7439-93-2	<5%	Not Established	Not Established
Thionyl Chloride ($SOCl_2$)	7719-09-7	<40%	5 mg/m^3 (1 ppm)	5 mg/m^3 (1 ppm)
Carbon (C)	1333-86-4	<6%	3.5 mg/m^3	3.5 mg/m^3
Aluminum Chloride ($AlCl_3$)	7446-70-0	<5%	2 mg/m^3	2 mg/m^3
Lithium chloride (LiCl)	7447-41-8	<2%	Not Established	Not Established
Lithium Cobalt Nickel Oxide	12031-55-1 12031-65-1	<8%	- 0.02 mg/m3 as Co dust and fumes. - 0.1 mg/m3 as Ni soluble compounds.	- 0.1mg/m3 as Co dust, and fumes. - 0.015 mg/m3 as Ni
Graphite (various Carbons)	7782-42-5	<5%	2 mg/m^3 as respirable dust.	2.5 mg/m^3 as respirable dust
Ethylene Carbonate ($C_3H_4O_3$)	96-49-1	<5%	Not Established	
Dimethyl Carbonate	616-38-6	<5%	Not Established	
Diethyl Carbonate	105-58-8	<5%	Not Established	
Lithium hexaflourophosphate ($LiPF_6$)	21340-40-3	<1%	Not Established	
Copper (Cu)	7440-50-8	<4%	0.2 mg/m3, fume 1.0 mg/m3, dust or mist	0.1 mg/m3, fume. 1.0 mg/m3, dust or mist
Aluminum (Al)	7429-50-5	<2%	15.0 mg/m3 as dust	2 mg/m3, soluble salt.
Steel, nickel and inert components		Balance		

ACGIH: American Council of Governmental Industrial Hygienists.

TLV- Threshold Limit Value are personal exposure limits determined by ACGIH.

IMPORTANT NOTE: The above levels are not anticipated under normal consumer use conditions. Thus, the batteries should not be opened or exposed to water and heat.

SECTION 3- PHYSICAL DATA

BOILING POINT (760 mm Hg):	NA, unless individual components exposed
VAPOR PRESSURE (mm Hg, 25ºC):	NA, unless individual components exposed
VAPOR DENSITY (air=1):	NA, unless individual components exposed
DENSITY (gr/cc):	> 1 gr/cc
VOLATILE BY VOLUME (%):	NA
EVAPORATION RATE (butyl acetate=1):	NA, unless individual components exposed
PHYSICAL STATE:	Solid
SOLUBILITY IN WATER (% by weight):	NA, unless individual components exposed
PH:	NA, unless individual components exposed
APPEARANCE:	Geometric Solid Object

SECTION 4- FIRE AND EXPLOSION HAZARD

FLASH POINT: NA LOWER (LEL): NA

FLAMMABLE LIMIT IN AIR: NA UPPER (LEL): NA

HAZARDOUS COMBUSTION PRODUCTS:

Burning batteries may emit acrid smoke, irritating fumes, and toxic fumes of hazardous oxides of carbons, hydrofluoric acid and other toxic by-products.

EXTINGUISHING MEDIA:

1. If the fire is in adjacent area and the batteries that there are either packed in their original containers or unpacked, the fire can be fought based on fueling material, e.g., paper and plastic products. In these cases the use of copious amounts of **cold** water is effective extinguishing media. Storage area may employ sprinkler system with cold water.

2. Lith- X (Class D extinguishing media) is the **only** effective on fires involving a few lithium batteries. In this case **DO NOT USE:** WATER, SAND, CO_2, HALON, and DRY POWDER OR SODA ASH EXTINGUISHERS

AUTO-IGNITION: NA

SPECIAL FIRE FIGHTING PROCEDURES:

Personal: Fire may be fought, but only from safe fire-fighting distance. Evacuate all persons from immediate area of fire. DO NOT re-enter the area until it has been thoroughly ventilated (purged) of the fire vapors and the extinguishing agent.

Firefighters: Wear self-contained breathing apparatus to avoid breathing of irritant fumes (NIOSH approved SCBA & full protective equipment). Wear protective clothing and equipment to prevent body contact with electrolyte solution.

UNUSUAL EXPLOSION AND FIRE EXPLOSION:

Battery may explode when subject to excessive heat (above 150ºC), to recharge over discharge (discharge below 0V) puncture and crush. Generation of chlorine (Cl_2), sulfur dioxide (SO_2) during thermal decomposition.

SECTION 5 – HEALTH HAZARD DATA AND FIRST AID MEASURES

THRESHOLD LIMIT VALUE (TLV) AND SOURCE: NA

ROUTES OF ENTRY:

Eyes and Skin – When leaking, the electrolyte solution contained in the battery is irritant to ocular tissues.

Inhalation –Respiratory (and eye) irritation may occur if fumes are released due to heat or an abundance of leaking batteries.

Ingestion – The ingestion of battery can be harmful. Content of open battery can cause serious chemical burns of mouth, esophagus and gastrointestinal tract.

HEALTH HAZARDS (ACUTE AND CHRONIC):

None are in normal use and service. The chemicals and the metals are contained in hermetically sealed cans. Potential for exposure should not exist unless the battery leaks, exposed to high temperatures or is mechanically, physically or electrically abused.

Carcinogenicity- NTP: No
Carcinogenicity- IARC: No
Carcinogenicity- OSHA: No

Explanation of Carcinogenicity- No ingredient of a concentration of 0.1% or greater is listed as a carcinogen or suspected carcinogen.

Note: Cobalt compounds are listed as possible carcinogens by the International Agency for Research on Cancer (IARC).

SIGNS AND SYMPTOMS OF OVEREXPOSURE: Exposure to leaking electrolyte from ruptured or leaking battery can cause:

Inhalation- Burns, irritation of the respiratory system, coughing, wheezing, and shortness of breath may occur if fumes are released due to overheating or an abundance of leaking batteries.

Eyes- Redness, tearing, burns. The electrolyte is corrosive to all ocular tissues.

Skin- The electrolyte is corrosive and causes skin irritation and burns.

Ingestion- The ingestion of battery can be harmful. Content of open battery can cause serious chemical burns of mouth, esophagus and gastrointestinal tract.

Eyes and Skin – When leaking, the electrolyte solution contained in the battery is irritant to ocular tissues.

MEDICAL CONDITION AGGRAVATED BY EXPOSURE: Preexisting skin, asthma and respiratory diseases are generally aggravated by exposure to liquid electrolyte vapors or liquid.

EMERGENCY/FIRST AID PROCEDURE;

Eyes- First rinse with plenty of water for 15 minutes (remove contact lenses if easily possible), then take to a doctor. **Skin-** Removed contaminated clothes and rinse skin with plenty of water or shower. Refer to medical attention. **Inhalation-** Remove to fresh air, rest, half-upright position, artificial respiration if needed, refer to medical attention. **Ingestion-** rinse mouth, ***DO NOT*** induce vomiting, give plenty of water to drink, refer to medical attention.

SECTION 6- STABILITY AND REACTIVITY

STABLE OR NOT STABLE	Stable
INCOMPATIBILITY (MATERIAL TO AVOID)	Strong mineral acids, water and alkali solutions. Content is incompatible with strong oxidizing materials.
HAZARDOUS DECOMPOSITION PRODUCTS	1. Reaction of lithium with water: H_2, Lithium oxide (Li_2O), Lithium hydroxide (LiOH). 2. Thermal decomposition over 150ºC may produce hazardous oxides of carbon, phosphorous and sulfur as: Sulfur oxides, (SO_2, SO_3), Sulfur chlorides (SCl_2, S_2Cl_2), Chlorine (Cl_2) and hydrofluoric acid (HF). 3. Electrolytes with water at room temperature: Acids (HCl, HF and H_2SO_4).
DECOMPOSITION TEMPERATURE (ºF)	NA
HAZARDOUS POLYMERIZATION	May Occur____ Will Not Occur __X__
CONDITIONS TO AVOID	Avoid mechanical abuse such as crush and disassembly, electrical abuse such as short-circuiting, overcharge, over-discharge, (voltage reversal) and thermal abuse such as heating.

SECTION 7- FIRST AID AND MEDICAL EMERGENCY MEASURES

Eyes – Not anticipated. If battery is leaking and material contacts eyes, flush with copious amounts of clear, tepid water for at least 30 minutes (remove contact lenses if easily possible). Get medical attention at once.

Skin - Not anticipated. If battery is leaking and material contacts the skin, flush with copious amounts of clear, tepid water for at least 15 minutes.

Inhalation - Not anticipated. If battery is leaking, remove to fresh air. If irritation persists, consults a physician.

Ingestion - Not anticipated. If battery is leaking, rinse mouth and surrounding area with clear, tepid water for at least 15 minutes, ***DO NOT*** induce vomiting. Consult a physician immediately for treatment and to rule out involvement of the esophagus and other tissues.

SECTION 8- SPILL OR LEAKAGE PROCEDURES

PROCEDURES TO CONTAIN AND CLEAN UP LEAKS OR SPILLS: The material contained within the battery would only be released under abusive conditions.

In the event of battery rapture and leakage: contain the spill while wearing proper protective clothing and ventilate the area. Than, cover with sodium carbonate (Na_2CO_3) or 1:1 mixture of soda ash and slaked slime. Keep away from water, rain, and snow. Placed in approved container (after cooling if necessary) and disposed

according to the local regulations.

NEUTRALIZING AGENT: Sodium carbonate (Na_2CO_3) or 1:1 mixture of soda ash and slaked slime.

WASTE DISPOSAL METHOD: Product decomposed by water must be neutralized. May be added to waste water in sufficiently diluted form.

PRECAUTIONS IN HANDLING AND STORING; Avoid short-circuiting, over-charging and heating to high temperatures. Avoid any mechanical or electrical abuse. Store the batteries in dry and cool area and keep container dry and tightly closed in well-ventilated area. Store away from food and drink.

OTHER PRECAUTIONS; Batteries may explode or cause burns if disassembled, machined, punctured, crushed or exposed to fire or high temperatures or otherwise modify batteries.

SECTION 9- HANDLING AND STORAGE

A. Battery Charging:

The TLP (PulsesPlus) batteries are **not** designed to be recharged from external power sources. Connecting to any other power supply will results in fire or explosion.

B. Battery Disassembly

The batteries should never be disassembled, or mechanically abused.

Should a battery unintentionally crushed or opened, thus releasing its content, rubber gloves should be used to handle all battery components. The inhalation of any vapor that may be emitted should be avoided.

C. Short Circuiting of a Battery

As with any battery, short circuit causes heating. In addition, short circuit reduces the life of the battery and can lead to ignition of surrounding materials. Physical contact with to short-circuited battery can cause skin burns.

D. Reverse Polarity

Avoid revering the battery polarity within a battery pack, this can cause the battery or the battery to be damaged or flame.

E. Making a Battery

Tadiran Engineering department should approve any battery pack design, which includes the TLP (PulsesPlus) batteries. Mal-connection can cause damage to the battery or results in fire.

F. Soldering

If soldering or welding to the battery is required, consult you Tadiran representative to proper precautions to prevent damage to the integrity of the battery.

G. Storage

Storage preferably in cool (below 30ºC), in dry and in ventilated area, which is subject to little temperature change.

Do not place the battery near heating equipment, nor expose to direct sunlight for long periods. Elevated temperatures can result in shortened battery life and degrade performance.

Keep batteries in original packaging until use and do not jumble them.

Do not store batteries in high humidity environment for long periods.

H. Labeling

If the Tadiran label or package warning is not visible, it is important to provide the battery package or device label stating:

> **Warning: Do not short circuit, charge, puncture, incinerate, crush, immerse in water, force discharge, or expose to temperatures above the temperature range of the battery or battery. Risk of fire and explosion.**

I. Others

The batteries should not be immersed in water.

Applying pressure and deforming the battery may lead to disassembly followed by electrolyte leakage.

Follow manufacturer recommendations regarding maximum recommended current and operating temperature range.

SECTION 10 - EXPOSURE CONTROLS & PERSONAL PROTECTION

RESPIRATORY PROTECTION: None necessary under normal use. In case electrolyte leakage from battery, protect hand with chemical resistant rubber gloves. If battery is burning, leave the area immediately. In abuse, use NIOSH approved Acid Gas Filter Mask or Self-Contained Breathing Apparatus.

During fire fighting fireman shout use self- contained breathing, full-face respiratory equipment.

Fires may be fought but only from safe fire fighting distance, evacuate all persons from immediate area of fire.

VENTILATION: Not necessary under normal use. In case of abuse, use adequate mechanical ventilation (local exhaust) for battery that vent gas or fumes.

PROTECTIVE GLOVES: None under normal use. In case of spill use PVC, neoprene or Nitrile gloves of 15 mils (0.015 inch) or thicker.

EYE PROTECTION: None required under normal conditions. Use ANSI approved chemical worker safety goggles or face shield, if handling a leaking or ruptured battery.

SKIN PROTECTION: not necessary under normal use. Use rubber apron and protective working in case of handling of a ruptured battery.

OTHER PROTECTIVE EQUIPMENT: Chemical resistance clothing is recommended along with eye wash station and safety shower should be available meeting ANSI design criteria.

WORK HYGIENIC PRACTICES: Use good chemical hygiene practice. Wash hands after use and before drinking, eating or smoking. Wash hands thoroughly after cleaning-up a battery spill caused by leaking battery. No eating, drinking, or smoking in battery storage area. Launder contaminated cloth before reuse.

SUPPLEMENTARY SAFETY AND HEALTH DATA: If the battery is broken or leaked the main hazard is the electrolyte. The electrolyte is mainly solution of Lithium chloride (LiCl), Lithium bromide (LiBr) and aluminum chloride ($AlCl_3$) in Thionyl

chloride ($SOCl_2$), organic carbonate solvents and lithium hexaflourophosphate (LiPF6).

SECTION 11- ECOLOGICAL INFORMATION

A. When properly used or disposed, the TLP batteries do not present environmental hazard.

B. The battery does not contain mercury, cadmium, or lead at levels higher than the naturally occurring traces.

C. Do not let internal components enter marine environment. Avoid release to waterways, wastewater or ground water.

SECTION 12- DISPOSAL CONSIDERATIONS

A. Waste disposal must be in accordance with the applicable regulations.

B. Disposal of the TLP lithium batteries should be performed by permitted, professional disposal firms knowledgeable in Federal, State or Local requirements of hazardous waste treatment and hazardous waste transportation.

C. Incineration should never be performed by battery users, but eventually by trained professional in authorized facility with proper gas and fume treatment. For information contact Kinsbursky Brothers Inc. at (800) 548-8797 or see their website at www.kinsbursky.com

D. The TLP batteries contain recyclable materials. Recycling options available in your local area should be considered when disposing of this product, through licensed waste carrier.

E. The TLP batteries should have their terminal insulated in order to prevent short circuits during the transportation to the disposal site.

SECTION 13- TRANSPORTATION /SHIPPING

A. Within US or from the US

TLP batteries are subject to the Dangerous Goods Regulations, according to the US-DOT CFR 49, chapter 173.185, Lithium Batteries and Cells".

B. Worldwide besides the United State- TLP batteries are subject to the UN transportation regulations per UN numbers 3090 and 3091 (for transportation in instruments or with instruments).

Packaging Group- II, packing instruction 903.

The cells must be packed in accordance with Packing Instruction 903 of the applicable code, e.g., IATA, ICAO, IMO, and ADR.

SECTION 14- BATTERY LABEL DATA

Identification and labeling in compliance with the product drawing should include the battery title, nominal voltage, lot number and warning.

SECTION 15- REGULATORY INFORMATION

1. The transport of the lithium batteries is regulated by the United Nations, "Model Regulations on Transport of Dangerous Goods".

2. Lithium batteries and cells are subject to shipping requirements exceptions under 49 CFR 173.185.

3. Shipping of lithium batteries in aircrafts are regulated by the International Civil Aviation Organization (ICAO) and the International Air Transport Association (IATA) requirements in Special Provision "A45".

4. Shipping of lithium batteries on sea are regulated the International Maritime Dangerous Goods (IMDG) requirements of UN 3090.

5. The internal component (Thionyl chloride) is hazardous under the criteria of the Federal OHSA Hazard Communication Standard 29 CFR 1920.1200.

SECTION 16- OTHER INFORMATION/DISCLAIMER

The information and the recommendations set forth are made in good faith and believed to be accurate at the date of preparation. The present file refers to normal use of the product in question. Tadiran Batteries makes no warranty expressed or implied