

Lithium batteries contained in equipment

- *important transport and safety data*

Technical Note IXD-613-TN Issue 3

1. Introduction

Lithium metal batteries are fitted into some Primayer products as single cell or multi-cell batteries. These batteries are classified as *dangerous goods* for the purpose of transportation and must be handled in accordance with the regulations governing air, road and sea transportation (see section 3 below). In addition to this transportation requirement, prior to being transported each type of lithium battery (used in the products) must have already successfully been certified to UN test requirements (see section 4 below). Primayer specifies only cells that meet the relevant UN certification.

This is a guide and should not be used as an alternative to the official regulations. The regulations are subject to change and this document is not intended to track those changes.

2. Primayer products containing lithium metal batteries

Current and recent Primayer products with lithium metal batteries are listed with lithium content;

Product	Lithium content (grams)
PrimeLog - single and dual channel	2.5
PrimeLog - four channel	5.0
PrimeLog+	5.0
XiLog+	10.0
XiLog+ double battery pack version	20.0
XiLog	10.6
XiLog+ double battery pack version	20.0
XiLog-S - single, dual and four channel	10.0
XiLog.wmr - IP66 and IP68	10.6
Phocus2 / Phocus.sms / Phocus.hr logger	2.5
Enigma logger	3.15
Primeprobe2	10.0
Socrates	20.0
ZetaCorr logger	2.5

3. Transportation

3.1 Applicable Regulations

The primary authorities responsible for issuing dangerous goods regulations are:

- **Air** - International Air Transport Association (IATA), Dangerous Goods Regulations (DGR)
- **Road** - European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR)
- **Sea** - International Maritime Organisation (IMO), International Maritime Dangerous Goods Code (IMDG)

Dangerous goods are assigned to UN numbers and proper shipping names according to their hazard classification. For Primayer's products the lithium metal batteries are contained in the equipment and the regulations identified by UN classification **UN3091 Lithium metal batteries contained in equipment, Class 9, Packing Group II, Packing Instruction 970**

Batteries used in Primayer products must not be transported separately from the equipment. Separate freighting is covered by another UN classification and not covered in this document.

Lithium batteries transported within the United States are subject to additional limitations as specified in the US national dangerous goods regulations contained in Code of Federal Regulations Title 49 (49 CFR). These limitations are not covered in this document.



3.2 Requirements

The person/company wanting to transport the goods is termed *The Shipper* and they must choose a *Freighting Agent* who is familiar with the UN3091 packing instruction. Only qualified personnel are permitted to process the packing and shipping of dangerous goods to ensure the correct packing and labeling are met as follows and as detailed in the applicable regulations.

- Correct packing of product
- Maximum quantity of lithium not exceeded
- Correct labelling of package which should include Class 9 hazard label and markings that identify *UN3091 Lithium metal batteries contained in equipment*
- Completion of a Shipper's Declaration for Dangerous Goods

3.3 Transportation from Primayer

Primayer Limited (UK) holds certification for meeting the above requirement. All new or repaired products leaving Primayer are packed in accordance with the regulations. If the product(s) is to be transported to a second destination (after leaving Primayer) it must be declared as *Dangerous Goods* to the *Freighting Agent* together with the information required by the above regulations. It is the responsibility of *the Shipper* to ensure they are working to the current regulations.

3.4 Transportation other than at 3.3 above

Lithium batteries that have been damaged or have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for transport. Therefore before equipment is transported it is essential that it is opened and the battery examined. If any sign of battery damage, or ingress of water to the product, is observed then the battery must be removed before transportation. For advice do contact **Primayer Customer Support** (contact details below).

4. UN test requirements and design safety

Primayer identifies Tadiran series SL-700 and SL-2700 cells in sizes AA, C and D as standard in its battery packs. Tadiran cells are safety tested in accordance with International Standard IEC 60086-4. Alternatives may be approved only by Primayer (UK) Engineering Department. Listed below are factors that affect the safety of fitting these batteries and how these have been addressed.

4.1 Cell short circuit protection

The SL-700/2700 cells are 'bobbin' types where the anode is rolled against the inner wall of the case. With reference to Tadiran Lithium Batteries – Technical Brochure, LTC-Batteries, section 3.2; *'This offers several advantages from the standpoint of safety. In the event of an unintentional short circuit, the discharge currents cannot exceed a limit that prevents hazardous situations.'* Primayer have carried out tests to verify that when short circuited to complete discharge the cells do not overheat or cause any observable safety hazard.

4.2 Multi-cell battery assembly

For multi-cell batteries Primayer adheres to the guidelines given in Tadiran Lithium Batteries – Technical Brochure. Packs are made of stacks of cells in series. The positive terminal of each stack combines to a common terminal via a diode to prevent a 'stronger' stack driving current into a 'weaker' stack. Cells are cold welded together to prevent heat damage to the lithium anode.

4.3 Water Ingress

Water ingress must be prevented as lithium will react with water to create hydrogen. The strong steel casing and welded construction of the SL-700/2700 cells provide protection from water ingress into the actual cells. The seals in Primayer data loggers are designed to meet submersion to IP68 (except the XiLog.wmr IP66 model which is not specified for submersion). Mechanical shock could cause cell damage thus reducing protection against ingress of water. The batteries are secured to a circuit board or held in place with foam to minimise the hazard of shock.

4.4 Temperature

The operating range of the SL-700/2700 cells is -55°C to +85°C. Underwriters Laboratory tests ensure safety up to 130°C. Low temperature does not directly cause a safety hazard.

5. Disposal

All batteries and cells must be disposed in accordance with local regulations.



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