



**TECHNICAL MANUAL
UNDERWATER ACOUSTIC BEACON
MODELS DKM502/DKM504**

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REV 03**

**This manual should be read in its entirety
prior to any installation, operation, testing or
maintenance of the DKM502/DKM504
Underwater Acoustic Beacon.**

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SECTION I GENERAL INFORMATION

1.1. INTRODUCTION.

1.1.1. GENERAL. This manual contains the description, theory, installation and maintenance for the DKM502/DKM504 Underwater Acoustic Beacon manufactured by Dukane Seacom, Inc., 2900 Dukane Drive, St. Charles, Illinois, 60174. These beacons have been tested to, and meet, or exceed, all requirements of SAE AS8045.

1.2. GENERAL DESCRIPTION.

1.2.1. PHYSICAL CHARACTERISTICS. The DKM502/DKM504 beacon consists of a self-contained battery, an electronic module and a transducer. It is housed in a cylindrical watertight aluminum case capable of withstanding high-G impact shock and deep-water immersion. As shown in Table 1, the DKM502/DKM504 beacon operates for 30 days when immersed in water.

1.2.2. BEACON MOUNTING. The beacon is mounted to a data recorder by means of a mounting kit. See Section II.

1.2.3. BEACON SIGNAL. The beacon is a battery-powered device, which radiates a pulsed acoustic signal into the surrounding water upon activation by its water-sensitive switch pins located at each end of the beacon. See Figure 1. Search operations in water for beacon equipped vessel, can be conducted by utilizing a portable receiver equipped with a directional hydrophone such as the Seacom Model N30A5B Series Locator. This receiver system is operable from small boats or by free-swimming SCUBA divers. Vessels lost in deep water, i.e., in excess of 1829 meters, require special search gear. Beacon Specifications are listed in Table 1.

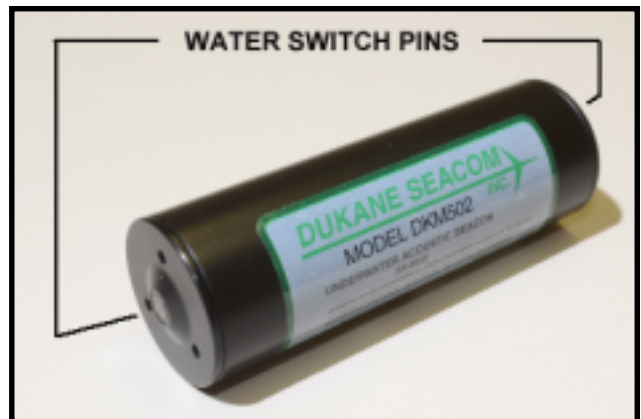


Figure 1. Water Switch Location

Table 1. BEACON SPECIFICATIONS

Operating Frequency.....	37.5 kHz ± 1 kHz
Operating Depth.....	Surface to 6096 meters
Pulse Length.....	10 milliseconds + 10%
Pulse Repetition Rate.....	Not less than 0.9 Pulse/Sec
Operating Life.....	30 days (minimum)
Battery Life In Beacon.....	60 months
Acoustic Output, Initial.....	1060 dynes/cm ² rms pressure at 1 meter (160.5dB)
Acoustic Output After 30 Days.....	700 dynes/cm ² rms pressure at 1 meter (157.0dB)
Operating Temperature Range.....	-2.2°C to +37.8°C
Actuation.....	Fresh or salt water
Radiation Pattern.....	Rated output over 80 percent of sphere
Size	
DKM502.....	1.30 cm diameter X 9.95 cm long
DKM504.....	1.30 cm diameter X 7.3 cm long
Weight, Beacon	
DKM502	170 grams
DKM504	139 grams
Storage Temperature Range.....	-54°C to 71°C

1.2.4. ENVIRONMENTAL TEST. The Beacon complies with the preceding operational performance standards after being subjected to environmental tests specified in SAE AS8045.

SECTION II INSTALLATION

2.1. GENERAL.

This section describes the installation of the DKM502/DKM504 beacon in the mounting kit.

2.2. INSTALLATION CRITERIA OF THE BEACON.

NOTE

All installations to data recorders should be in accordance with the recorder manufacturer's approved procedures and hardware.

2.3. SURVIVABILITY.

2.3.1. The beacon location should minimize the probability of physical damage to the device in the event of a disaster.

2.3.2. The area selected for the beacon mounting should be free of the possibility of heavy equipment tearing loose and striking the device.

2.3.3. Installation should be made to a substantial structural member, but kept as simple as possible and must not weaken the structural member.

2.4. ENVIRONMENTAL.

2.4.1. The DKM502/DKM504 beacon must not be disassembled, crushed, penetrated, incinerated or exposed to temperatures above 71°C.

2.4.2. The beacon is a battery-powered device and installed shelf life is affected by higher than normal temperatures. Maximum temperature must not exceed 71°C.

2.4.3. Inadvertent actuation of the water switch by any source of water, such as rain, salt spray, melting ice or snow, head or washroom overflow, foods and beverages, must be avoided as this will lead to exhaustion of the beacon power source.

2.4.4. In order to avoid accumulation of moisture on the water switch pins, the device should be mounted with the long axis of the beacon horizontal. A clean switch will allow moisture to collect into droplets and run off the switch, without activating the beacon.

2.4.5. Honeycomb structure, tarpaulin fabrics, clothing, cargo, etc., are sound-absorbing materials. Do not surround the device with these materials and if necessary, remove small areas of such materials from the immediate vicinity.

2.4.6. Any compartment that may not be expected to flood should not be used. Direct contact with the water switch pins and water is necessary for actuation and acoustic radiation.

2.5. MAINTENANCE.

In addition to observance of the preceding mandatory considerations, where possible the selection of a mounting location should provide for convenient beacon access during inspection intervals. The proper mounting location should also provide for clearance for removing the beacon from its mounting hardware.

SECTION III TESTING

3.1. GENERAL.

The DKM502/DKM504 beacon should be tested before and after installation in the mounting hardware and at recommended maintenance intervals. See Section IV.

3.2. OPERATIONAL TESTING.

The 42A12 Series Ultrasonic Test Set or the TS300 Portable Test Set can be used to perform operational tests on the beacon.

Because of the advanced power management system in operation, the water switch pins are not always active. As a result it may take as long as 10 seconds before a signal is transmitted by the beacon.

NOTE

The procedure for use of the test set is contained in the manual.

3.3. BATTERY TESTING.

Use the TS300 Ultrasonic Test Set or an industrial/commercial grade high impedance voltmeter (input impedance of 10 M Ohms) to measure the battery voltage. If a high impedance voltmeter is used, follow the procedure listed below:

A. Make sure the case and water switches are clean and dry prior to testing. If in doubt, wipe clean using mild detergent and a soft cloth.

B. Place the negative lead of the high impedance voltmeter on the water switch pin and the positive lead of the meter on the battery switch pin. See Figure 2.

C. Measure the battery voltage. The beacon battery voltage is acceptable if it has a range of 2.80 Volts or greater. If the battery voltage is below the minimum acceptable voltage remove the beacon from service and contact Dukane Seacom, Inc. for instructions.

NOTE

Because of the advanced power management system in operation, the water switch pins are not always active. For reasons of battery conservation the battery voltage can be expected to be active on the water switch pins for approximately 3 seconds then drop to nearly 0 Volts for 7 seconds. This cycle will be continuously repeated. The maximum reading is the true battery voltage.

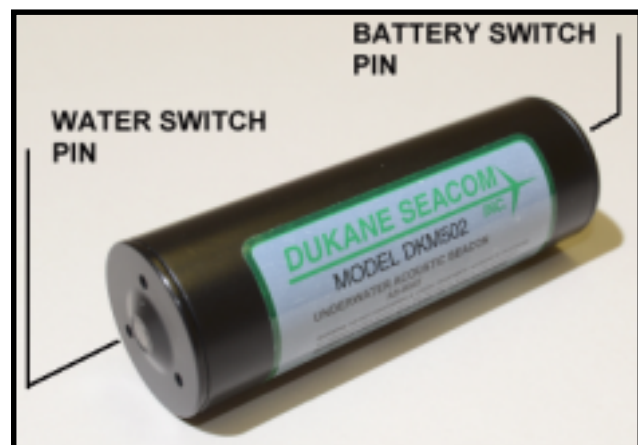


Figure 2. Water Switch Pin Location

SECTION IV MAINTENANCE DKM502/DKM504

4.1. GENERAL.

This section contains DKM502/DKM504 beacon cleaning, beacon testing, battery replacement and testing, disposal and storage procedures. Initially beacons must be tested at every installation or battery change. The recommended schedule for beacon cleaning and testing is every 12 months, when the beacon is installed on a recorder and the recorder is installed in accordance with manufacturers specifications. Otherwise, the recommended schedule is every six months. The required schedule for Battery Replacement and Off-Current Testing is every 60 months.

4.2. BEACON CLEANING.

Clean the water switch pins and beacon with a soft cloth and mild detergent, then dry thoroughly with a clean cloth. Clean the end insulator to prevent leakage currents from occurring across the water switch. This will affect battery life. The water switch should be cleaned at any time if dirt or dust becomes apparent.

4.3. BEACON TESTING.

4.3.1. Make sure that the beacon case is clean and dry prior to testing.

4.3.2. See Sections 3.2. and 3.3. for testing procedures.

4.4. PRECAUTIONS.

4.4.1. The DKM502/DKM504 Beacon must not be exposed to temperatures in excess of 71°C.

4.4.2. Any situation that could possibly crush or penetrate the case of the beacon should be avoided.

4.5. BEACON DISASSEMBLY.

Disassembly of the beacon is limited to battery replacement, as outlined in Section 4.6.

4.6. BATTERY REPLACEMENT AND TESTING.

WARNING

**INCORRECT INSTALLATION OF
BATTERY WILL CAUSE PERMANENT
DAMAGE TO THE BEACON.**

4.6.1. GENERAL. Battery replacement should be done in a maintenance shop under clean conditions to prevent dust from contaminating O-ring and lubricant. Because the old O-ring may have developed a set with age, O-ring replacement is mandatory at the time of battery change. O-ring lubrication should be applied to new O-ring and threads before installation.

NOTE

Replacement of the battery in the DKM502/DK504 beacon *must* be done by a qualified technician.

CAUTION

**TO AVOID INTERNAL DAMAGE, DO
NOT CLAMP THE BEACON IN A VISE,
UNLESS A VISE-CLAMP (P/N 810-546)
IS USED.**

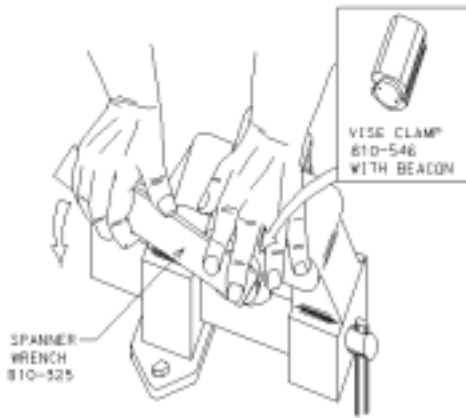


Figure 3. Battery End Cover Removal With Vise Clamp and Spanner Wrench

4.6.2. BATTERY REPLACEMENT.

A. Secure the beacon with Vise-Clamp (P/N 810-546) as shown in Figure 3.

B. Use Spanner Wrench (P/N 810-325) to remove the end cover containing 2 wrench holes by unscrewing counterclockwise. The breakaway torque is usually high so spanner wrench should be held firmly in contact with battery end cover in order to prevent damage to wrench holes.

C. Remove the old O-ring from the cover. Do not use a steel screwdriver or sharp tool because of danger of damaging O-ring groove.

D. Remove the old battery.

E. Clean the threads, O-ring groove in the body and the threads on the cover by wiping them thoroughly with solvent.

CAUTION

FOREIGN SUBSTANCES IN LUBRICANT ON SEALING SURFACES MAY DAMAGE THREADS AND/OR ALLOW WATER LEAKAGE THROUGH THE O-RING SEAL. SCRATCHES OR GOUGES ON SEALING SURFACES WILL ALSO CAUSE WATER LEAKAGE.

F. Carefully install a new O-ring on the battery cover. Apply a thin coating of O-ring lubricant to the O-ring, O-ring groove, and threads. Note: O-ring, lubricant, and battery are provided in battery replacement kit P/N 810-2016/K.

G. Install new battery. Be sure the end marked "INSERT THIS END FIRST " goes in first. See Figure 4. Contact Dukane Seacom, Inc. at (630) 762-4050 for replacement battery kits P/N 810-2016/K.

WARNING

REPLACE BATTERY WITH P/N 810-2016 BATTERY ONLY. USE OF AN UNAUTHORIZED BATTERY WILL VOID THE WARRANTY AND MAY CAUSE AN INOPERATIVE OR DANGEROUS CONDITION. USE OF AN UNAUTHORIZED BATTERY WILL PRESENT A RISK OF FIRE OR EXPLOSION.

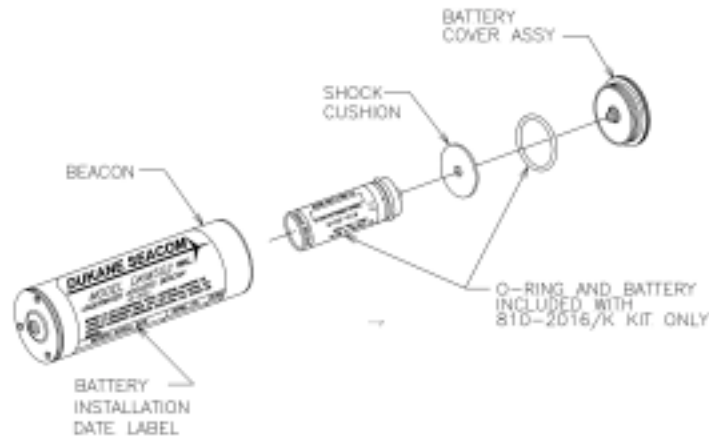


Figure 4. Beacon Exploded View Showing Relative Location of Battery and Related Parts

CAUTION

DO NOT RECHARGE, DISASSEMBLE, HEAT ABOVE 160°F (71°C) OR INCINERATE. DISPOSE OF THE BATTERIES PROMPTLY, KEEP AWAY FROM CHILDREN. THERE IS A RISK OF BATTERY FIRE, EXPLOSION, AND BURNS.

H. Perform OFF-CURRENT TEST as outlined in Section 4.7.

I. Replace the cover and tighten it until the cover flange contacts the body or leaves less than a 0.08 mm gap. Use hand force only on the wrench. Hold the beacon in a vise clamp as shown in Figure 3. Clean the beacon exterior of excess O-ring grease.

J. Perform operational test of beacon as outlined in Section III.

4.7. BEACON OFF-CURRENT TEST.

Connect test leads as shown in Figure 5 and check for current leakage between battery and beacon case. The battery OFF current must be less than 3 microamperes. Beacons with greater than 3 microamperes OFF current should be taken out of service immediately.

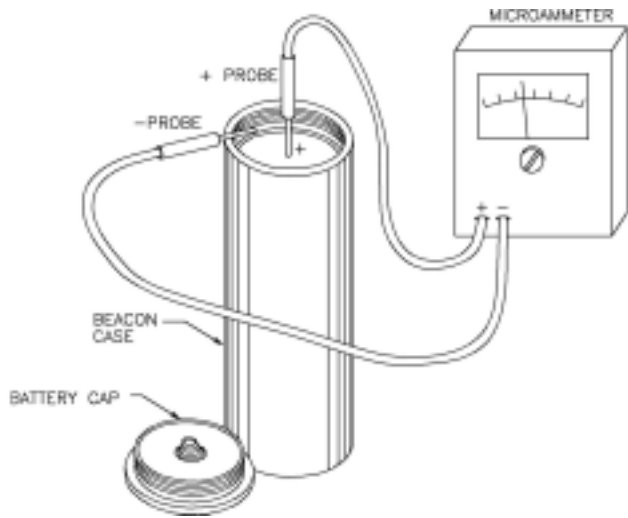


Figure 5. Beacon Off-Current Test Set-Up

4.8. BATTERY DISPOSAL.

Dispose of battery in accordance with all local, state and federal regulations. Dispose of batteries promptly, keep away from children.

4.9. BEACON STORAGE.

When long term storage of a beacon is required, the beacon should be stored in the original shipping container (or equivalent). Make sure it is stored in a cool dry environment. The beacon should be stored without battery.

WARNING

**DO NOT RECHARGE,
DISASSEMBLE, HEAT ABOVE 71°C
OR INCINERATE. THERE IS A RISK
OF BATTERY FIRE, EXPLOSION,
AND BURNS.**

SECTION V WARRANTY DKM502/DKM504

The Dukane Seacom, Inc. warrants that the electronics of the Model DKM502/DKM504 Underwater Acoustic Beacon (hereafter referred to as the "unit") will be free from defects in materials and workmanship for five years (60 months) from the date of shipment from Dukane Seacom, Inc.. Dukane Seacom, Inc. will remanufacture or replace any unit or battery found not to be in conformity with this warranty.

In accordance with the Technical Manual published by Dukane Seacom, Inc. the customer is responsible for the following items: (1) periodic testing of the units in service; (2) removing and shipping, prepaid, any inoperative units back to Dukane Seacom, Inc.; (3) installing any replacement units.

This warranty does not cover: (i) defects caused by the customer's failure to use, test or maintain any unit in accordance with Dukane Seacom, Inc. Technical Manual; (ii) product failures caused by abuse, misuse or neglect; (iii) corrosion, oxidation, abrasion, rust, surface damage, weather conditions, variations in environment that affect the appearance or operation of products; or (iv) any product where the customer has attempted any repair or service of the internal components.

Dukane Seacom, Inc. sole/exclusive liability under this warranty is limited to repair or replacement of a unit or battery that is defective.

Dukane Seacom, Inc. SHALL NOT BE LIABLE FOR ANY INCIDENTAL, SPECIAL CONSEQUENTIAL OR EXEMPLARY DAMAGES ARISING OUT OF THE INSTALLATION, USE, TESTING, SERVICING OR MAINTENANCE OF ANY UNIT.

THIS WARRANTY IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

SECTION VI SERVICE PROGRAM DKM502/DKM504

6.1. BEACON RETURN – DEFECTIVE.

6.1.1. In the case of a failure which is determined to be within the Warranty terms (Section V), the beacon will be replaced by Dukane Seacom, Inc. at no cost to the customer.

6.1.2. When a beacon is returned to the customer after warranty service, the remainder of the original warranty will be applied to the returned beacon.

6.2. BEACON RETURN - NO DEFECT.

If the beacon is returned to Dukane Seacom, Inc. and is found to be operational, the beacon will be returned to the customer shipping collect. In addition, the customer will be notified that an analysis fee applies.

6.3. BEACON RETURN - OUT OF WARRANTY.

If the beacon is returned to Dukane Seacom, Inc. and is found to be out of Warranty, the cost of an overhauled beacon will be determined and the customer will be notified for the appropriate approvals.

6.4. BATTERY CHANGE/OVERHAUL FOR THE DKM502/DKM504.

6.4.1. At or near the expiration date the beacon can be returned to Dukane Seacom, Inc. for battery change and overhaul to appropriate standards. (See Section 7.2.) Dukane Seacom, Inc. standard procedure is to not return the original serial number when a beacon is overhauled.

6.4.2. The Overhaul Program consists of:

- 1) a comprehensive series of operational tests to verify the performance of the beacon to its published specifications;
- 2) a replacement battery; and
- 3) an additional warranty for another two years.

Each shipment of overhauled beacons will include the necessary documentation to indicate that the product being returned meets its published specifications and that the product could be new or overhauled, at the discretion of Dukane Seacom, Inc.. A different unit with a different serial number will be supplied from Dukane Seacom, Inc. common stock.

Notes:

1. See Section VII for information about how to return the beacon to Dukane Seacom, Inc. for service.
2. Call Dukane Seacom, Inc. at (630) 762-4050 for appropriate service charges or further information about the Service Program.

SECTION VII

PROCEDURE FOR RETURNING DKM502/DKM504 BEACON TO FACTORY

7.1. BEACON SERVICE.

7.1.1. PACKAGING. Insure that proper protection for the beacon is provided i.e. protection from inadvertent shorting of the water switch and protection from surface scratches or abrasions.

7.1.2. INFORMATION TO BE INCLUDED WITH THE BEACON.

- A. Reason for the return.
- B. Serial Number of the beacon(s).
- C. Return Authorization Number (See 7.1.3.).
- D. Purchase Order (if required) for Beacon Replacement.

7.1.3. RETURN AUTHORIZATION. Prior to shipping the beacon to Dukane Seacom, Inc., a Return Authorization Number may be required and can be obtained from Dukane Seacom, Inc. Service Department by calling (630)762-4050, or via Fax (630)762-4049, or via e-mail at seacom@dukane.com.

7.1.4. SHIPPING INSTRUCTIONS. When the beacon is returned under warranty, ship to:

Attn: Dukane Seacom, Inc.
2900 Dukane Drive
St. Charles, IL 60174

7.2. BATTERY CHANGE/OVERHAUL.

7.2.1. PACKAGING. Insure that proper protection for the beacon is provided i.e. protection from inadvertent shorting of the water switch and protection from surface scratches or abrasions.

7.2.2. PROCEDURE-CUSTOMER.

A. Contact Dukane Seacom, Inc. Service Department, (630)762-4050, or via Fax (630)762-4049, or via e-mail at seacom@dukane.com. Provide the following information:

1. Quantity of beacons that are being returned.
2. Purchase Order, for beacon replacement.
3. Shipping and billing addresses.
4. Shipping carrier.
5. Collect account number for shipping carrier, if applicable.
6. Contact name and phone number.

B. Ship beacons to Dukane Seacom, Inc. per 7.1.4. along with a copy of the Purchase Order.