

Fibre-optic Hydrophone and System Maintenance



CONTENTS

INTRODUCTION	4
Safeguard System Advisory Notices	4
EQUIPMENT NEEDED	5
FIBRE-OPTIC HYDROPHONE SYSTEMS	6
FIBRE-OPTIC HYDROPHONES	8
Handling the Sensor	8
Cleaning the Sensor Optical Connector	9
Connecting the Sensor	12
WARRANTY	13
SUPPLIER DETAILS.....	13

AUTHOR:

Marina Bakarić

VERSIONS

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1.0	First released version to accompany launch of the EasyGet2 inspector camera.	17/01/24

INTRODUCTION

This document serves as a supplemental guide for cleaning and maintaining Precision Acoustics Fibre-optic Hydrophones and Systems (FOHS), complementing the initial user guide. Fibre-optic hydrophone systems (FOHS) should be checked and if necessary, cleaned before each use. This process is the same for both version 1 and version 2 hydrophones and systems, and utilises the EasyGet2 Portable Fibre Endface visual inspector and Neoclean-E fibre optical fibre connector cleaner, both of which are available for purchase from Precision Acoustics.

Before using the system, the optical connections must be cleaned before connecting the sensor to the adaptor on the front panel of the system.

The connection between the system and the sensor is optical. Thus, it is vitally important that both the connector ferrule and the system adaptor (Sensor In) remain clean. **Any contamination of the interface between the sensor and the system will lead to degradation of the acoustic sensitivity of the system.** Please adhere to the following guidelines to ensure optimum performance of the hydrophone system.

1. Avoid contamination of the connector

- Always ensure the dust-cap mechanism fully covers the optical connector of the sensor when not attached to the system.
- DO NOT allow the connector to get wet or submersed in water*.

* If the connector is dropped into water or gets wet, allow to dry thoroughly and then use a lint-free clean optical wipe to clean the connector ferrule thoroughly. Allow to dry again and then use the Neoclean-E Optical Fibre Connector cleaner prior to connecting the sensor to the system.

2. Avoid contamination of the front panel adaptor

- When the system is not in use, the front panel adaptor dust cap should be attached at all times.
- DO NOT insert anything other than a sensor connector, the supplied Neoclean-E Optical Fibre Connector cleaner or EasyGet2 fibre inspector into the adaptor.

Safeguard System Advisory Notices

The Fibre-optic Hydrophone System (FOHS) contains a class 1M laser device emitting invisible laser radiation. The optical output power from the connector on the front panel of the system does not exceed 1 mW at an optical wavelength of 1550 nm and as such should be "eye safe". However, care should always be taken to avoid looking directly at the output when the laser is on.

WARNING: DO NOT DIRECTLY VIEW THE OUTPUT FROM THE SYSTEM WITH MAGNIFYING OPTICAL INSTRUMENTATION.

EQUIPMENT NEEDED

1. Neoclean-E fibre optical fibre connector cleaner
2. EasyGet2 portable fibre endface inspector with additional tips:
 - a. FC/APC-F (for FOHS V1);
 - b. 2.5mm/APC-M (for V1 sensors);
 - c. E2000/APC-F (for FOHS V2);
 - d. E2000/APC-M (for V2 sensors)
3. Optional:
 - IPA (2-propanol).*
 - Dry lint-free clean wipes.*
 - PPE (gloves and goggles).*

* Not supplied by Precision Acoustics.



Figure 1. Equipment needed for fibre-optic hydrophone and system assessment and cleaning.

FIBRE-OPTIC HYDROPHONE SYSTEMS

The process for cleaning and inspection of Fibre-Optic Hydrophone Systems (FOHS) remains consistent across both version 1 (serial numbers up to and including 199) and version 2 (serial numbers including and above 200) systems. In instances where procedural variations exist between the two versions, visual instructions for FOHS V1 are presented on the left, while FOHS V2 instructions are displayed on the right.

The process uses the Neoclean-E Optical Fibre Connector cleaner and EasyGet2 portable fibre endface inspector with additional tips:

- FC/APC-F (for FOHS V1),
- E2000/APC-F (for FOHS V2).

1. Make sure the Fibre-Optic Hydrophone System is switched off.
2. Prepare the Neoclean-E Optical Fibre Connector cleaner by fully removing the blue cap (FOHS V1, left) or opening the blue top cap (FOHS V2, right) as shown in Figure 2. Check the cleaner is on the 'Clean' setting by twisting it and checking the option arrows on the handle are aligned.

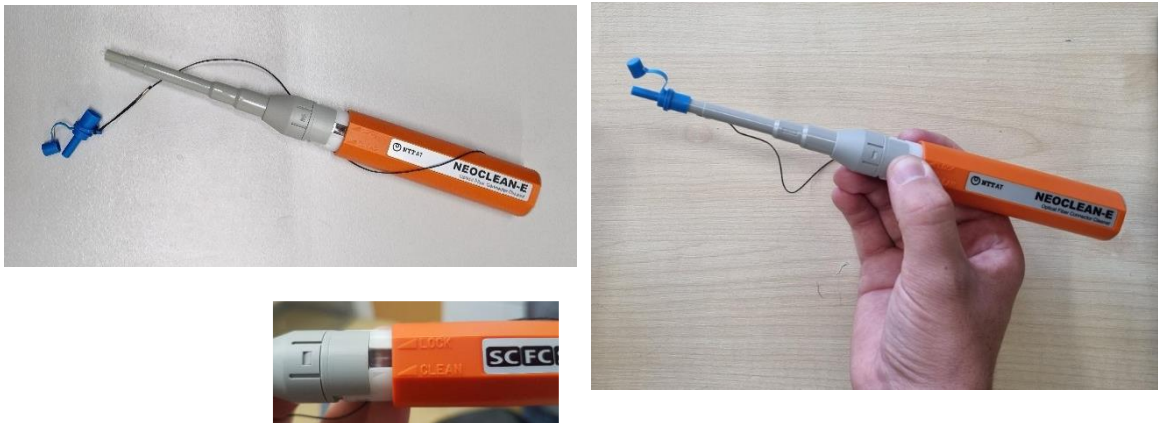


Figure 2. Preparing the Neoclean-E Optical Fibre Connector cleaner.

3. Remove the dust cap from the 'Sensor In' adaptor on the front panel of the Fibre-Optic Hydrophone System (Figure 3).



Figure 3. Removing the dust cap from the 'Sensor In' adaptor.

4. Push the end of the Neoclean-E Optical Fibre Connector cleaner into the 'Sensor In' adaptor and engage the cleaner by pushing the handle 3-4 times (Figure 4).



Figure 4. Cleaning the fibre-optic hydrophone system 'Sensor In'.

5. Next, insert the EasyGet2 portable fibre endface inspector with the correct adaptor tip into the 'Sensor In' adaptor on the Fibre-Optic Hydrophone System and inspect the cleanliness of the internal fibre. For instructions on how to use the EasyGet2 inspector, please refer to the manufacturer's user manual supplied with the inspector. A clean optical connector should look as shown below (Figure 5). In case of any signs of debris, repeat the cleaning and inspection process as necessary. Should the issue persist, please contact the manufacturer providing details about the cleaning procedures undertaken and include photos of the 'Sensor In' adaptor captured using the EasyGet2 inspector.



Figure 5. Inspecting the fibre-optic hydrophone system 'Sensor In' using the EasyGet2 portable fibre endface inspector.

FIBRE-OPTIC HYDROPHONES

Handling the Sensor

The optical fibre used in the sensor download comprises a thin glass fibre (OD 125 μm) surrounded with a thin acrylate primary buffer layer (OD 250 μm) and encased in a flexible plastic jacket (OD 900 μm). Terminology related to the Precision Acoustics fibre-optic hydrophone (FOH) V1 and V2 sensors is shown in Figure 6 below.

A – sensor tip

B – sensor download

C – optical connector

D – connector ferrule

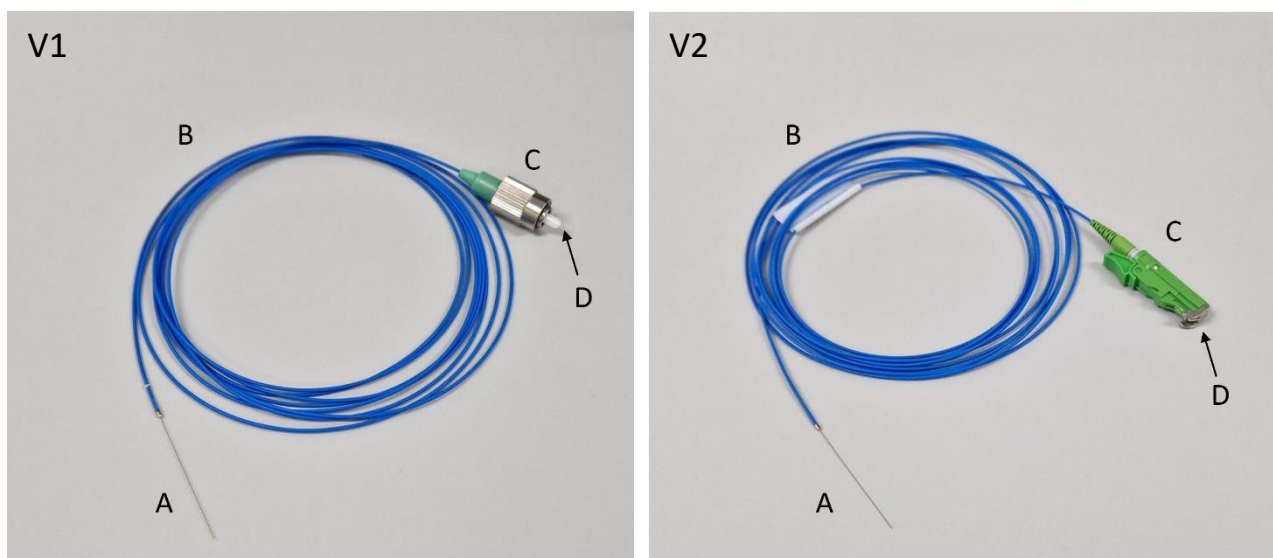


Figure 6. Fibre-optic hydrophone (sensor) diagram.

Optical fibre is very flexible in nature, however, it is important to remember that the light carrying part of the fibre is made of glass and careful handling is important to ensure the longevity of the sensor download. If the glass fibre is broken, light will no longer reach the sensing element and measurements will be impossible.

In particular, when handling the sensor download the following guidelines should be observed:

- Avoid tight bends in the fibre to prevent sensor damage
 - Bend radii less than 10 mm should be avoided.
- Avoid knotting the fibre.
 - Tangles and knots in the fibre should be careful undone without pulling the fibre taut.
- When in use, ensure the sensor download is kept clear of mechanical equipment (such as translation stages etc.) so that it does not become entangled in moving parts.

Cleaning the Sensor Optical Connector

The process for cleaning and inspection of Fibre-Optic Hydrophone sensors (FOH) is the same for both version 1 (serial numbers with prefix FP- or TFS-) and version 2 (serial numbers with prefix FSV2-) sensors.

The process uses the Neoclean-E Optical Fibre Connector cleaner and EasyGet2 portable fibre endface inspector with additional tips:

- 2.5mm/APC-M (for V1 sensors),
 - E2000/APC-M (for V2 sensors).
1. Prepare the Neoclean-E Optical Fibre Connector cleaner by opening the blue top cap. Check the cleaner is on the 'Clean' setting by twisting it and checking the option arrows on the handle are aligned (Figure 7).



Figure 7. Preparing the Neoclean-E Optical Fibre Connector cleaner.

2. To clean the sensor optical connector ferrule, prepare the optical connector by removing the cap (V1 sensors) or revealing the ferrule (V2 sensors) as shown below. Insert the Neoclean-E cleaner into the revealed optical connector ferrule, and engage the cleaner by pushing the handle 3-4 times whilst holding the fibre steady (Figure 8).

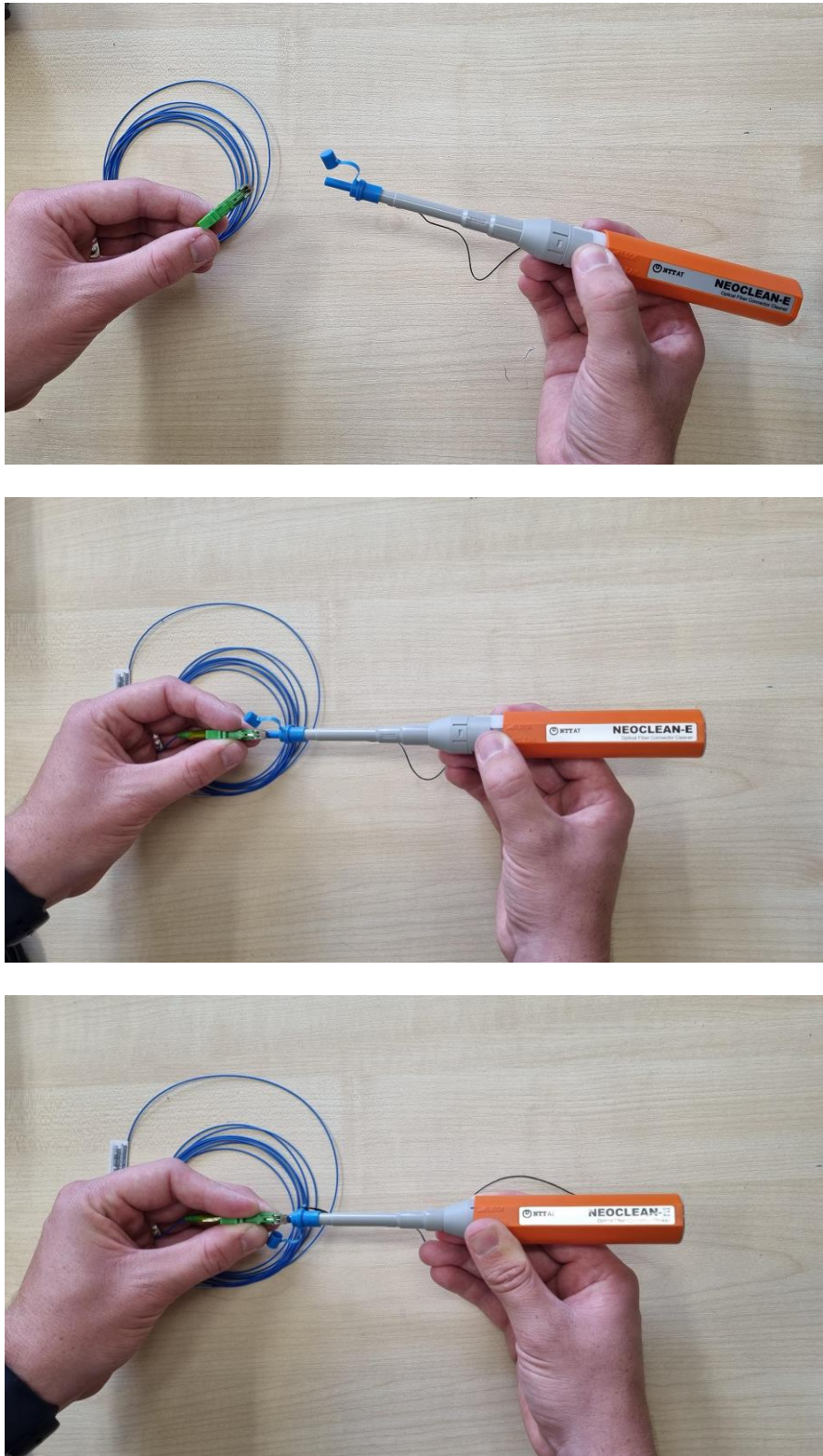


Figure 8. Cleaning a fibre-optic hydrophone using the Neoclean-E Optical Fibre Connector cleaner.

- Using the supplied EasyGet2 portable fibre endface inspector with the correct adaptor tip, insert the sensor optical connector ferrule into the adaptor and inspect the cleanliness of the ferrule. A clean optical connector should look as shown below (Figure 9). If there are any indications of debris, repeat the cleaning and inspection steps as needed.



Figure 9. Inspecting the sensor optical connector ferrule using the EasyGet2 portable fibre endface inspector.

- When cleaning the connector endface using IPA (2-propanol), ensure the required PPE is worn (gloves and goggles). Using a lint-free clean wipe, gently soak it with IPA and use it to clean the connector endface (Figure 10). Wipe with a dry lint-free clean wipe and repeat steps 2 and 3.



Figure 10. Cleaning the connector ferrule using IPA and a lint-free clean wipe.

- Should the issue persist, please contact the manufacturer providing details about the cleaning procedures undertaken and include photos of the sensor optical connector ferrule captured using the EasyGet2 inspector.

Connecting the Sensor

Once both the fibre-optic hydrophone 'Sensor In' and the hydrophone sensor optical connector ferrule are thoroughly cleaned, carefully insert the connector into the adaptor on the front panel of the FOHS. For V1 systems (shown on the left of Figure 11), align the notch on the panel adapter and the key on the fibre connector, then screw it in until light resistance is felt. For V2 systems (shown on the right) a click should be felt when correctly inserted.

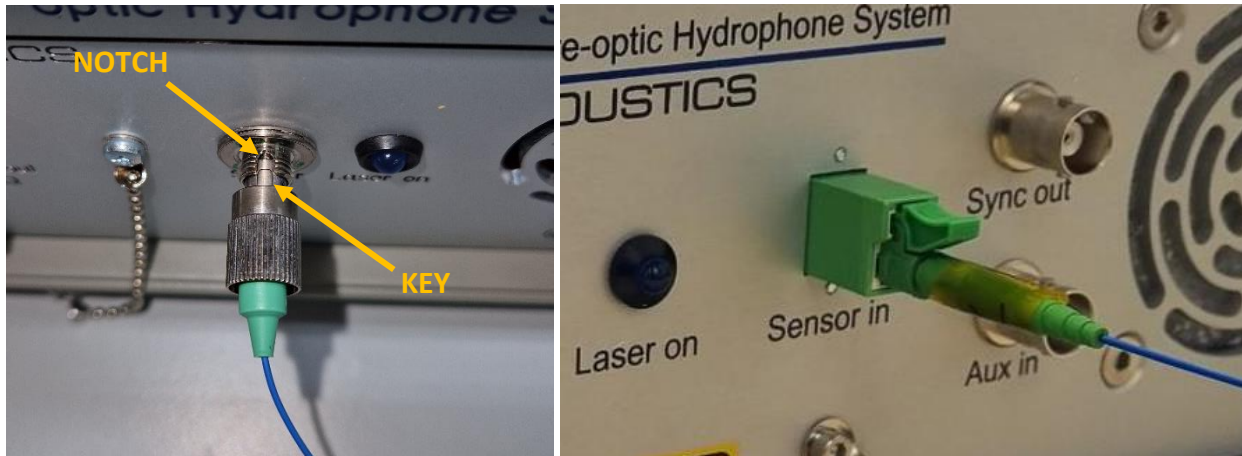


Figure 11. Connecting the sensor to the system.

WARRANTY

Products are covered against defect of manufacturing or workmanship only.

Warranty period: Control unit and accessories 12 months.

If a warranty claim is made on devices that have been calibrated at NPL London a charge will be made for the used part of the calibration (e.g. failure of sensor at 3 months charge for recalibration at NPL is 50% of calibration charge).

SUPPLIER DETAILS

Precision Acoustics Ltd.

Hampton Farm Business Park, Higher Bockhampton, Dorchester, DT2 8QH

Tel: +44 1305 264669

Fax: +44 1305 260866

www.acoustics.co.uk

For any issues contact office@acoustics.co.uk