6 Commissioning/ Setting to work

6.1 Overview

No commissioning is required at or within the transceiver. The system is configured via the display sub-system or via a laptop computer connected to the relevant managed network switch. The procedures noted in this handbook do not detail the configuration of firewall or antivirus software on computing equipment. HENSOLDT UK can only offer technical assistance with the parameters directly related to the configuration of the Kelvin Hughes MK5 SharpEye™ transceiver.

COMMISSIONING WEB PAGE

In most applications it will NOT be necessary to access the commissioning web page.
Parameters within the web page must only be adjusted when specifically advised by HENSOLDT UK or as part of a system integration instructions.

CONFIGURATION: HENSOLDT UK SYSTEMS

For Kelvin Hughes display solutions, a list of applicable IP addresses, TCP, UDP Port configurations etc. can be found in the relevant display commissioning handbook.

CONFIGURATION: 3RD PARTY SYSTEMS

The system configuration will be set by the system integrator. The various settings should be confirmed prior to commencing this task.

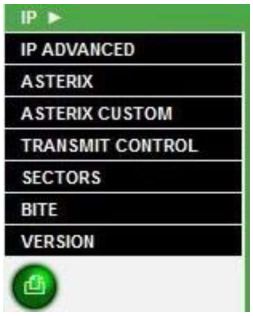
HELP/ CONTEXT HELP

With the cursor hovering over some buttons or functions within the webpage**, CONTEXT HELP**/ **SETTINGS GUIDANCE** will be temporarily displayed on the right hand side of the web page. The help guidance includes details about the function and suggested settings.

COMMON WEB PAGE FUNCTIONS

FUNCTION	OVERVIEW/ DESCRIPTION	
SAVE	Saves the current setting(s). • **Changes are not adopted until SAVE is pressed**. • When SAVE is pressed, warnings are presented. • When changing IP address details the system may automatically re-boot.	
	SAVED OK	When a change has been successfully saved, a green confirmation message is displayed at the base of the webpage.
	SAVE ERROR	If there is an error with a setting or parameter. A red error message is displayed at the base of the webpage.
RESET	Resets the page setting(s) to the factory defaults.	
+/-	Minimise/ maximise the details in a tab.	
	Return to the **Main Menu** (Back arrow).	
	A function or setting is ON, enabled, locked etc.	
	A function or setting is OFF, disabled, unlocked etc.	
	A function or feature is selected.	
	A function or feature is NOT selected.	
	Opens the PC's print functions (Printer symbol).	
	Hover over any status indicators to open the **Help/ Context help** function that describes the colour status of each indicator.	

6.2 System configuration



When access to the commission pages is required, connect a laptop computer to the managed network switch specifically associated with the Kelvin Hughes MK5 SharpEye™ being commissioned, open a web browser and enter the default IP address shown below.

A web page will open that has a number of tabs which are detailed in the following pages.

FACTORY DEFAULT IP ADDRESS

- **http://192.168.22.70:8008**

Where a setting, value or configuration has not been defined by the system integrator, the setting should be left at the factory default value.

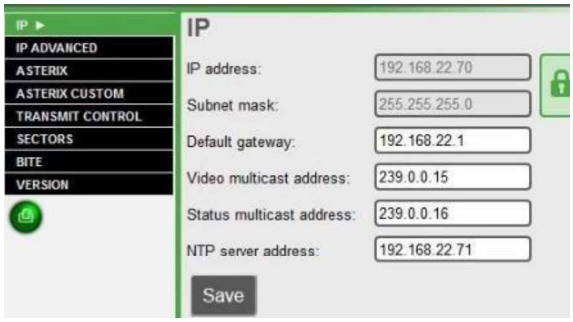
6.2.1 IP Tab

IP ADMINISTRATION PAGE (LOCKED/ UNLOCKED)

The IP address/ Subnet Mask sections of the IP Tab are **locked by default** via a separate **IP Administration** page.

The method of unlocking the IP address/ subnet mask is not detailed in this handbook.

Please contact HENSOLDT UK or the system integrator for details on accessing the IP Administration page.



IP tab **LOCKED** (see note above)

IP Tab **UNLOCKED**

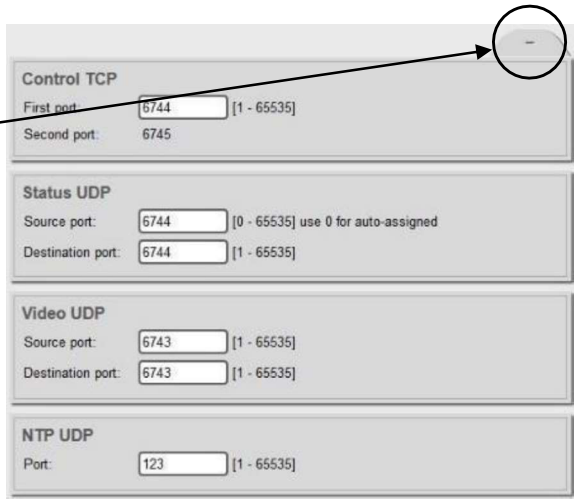
IP TAB

The IP tab is used to set the various IP address as defined by the system handbook or system integrator.

a) To change the IP address firstly unlock the page (see above),
b) Enter the required details and press the **Save** button,
c) When Save is pressed, the system will automatically reboot,
d) Where an IP address has been changed, the new IP address will have to be entered to re-open the web page,
e) Lock the IP address in the Administration page.

6.2.2 IP Advanced tab

IP Advanced tab MINIMISED



IP Advanced tab MAXIMISED

CONFIGURATION

The IP tab is used to set the advanced IP details as defined by the relevant display handbook or the system integrator. The Tab can be displayed **Minimised** or **Maximised** as shown.

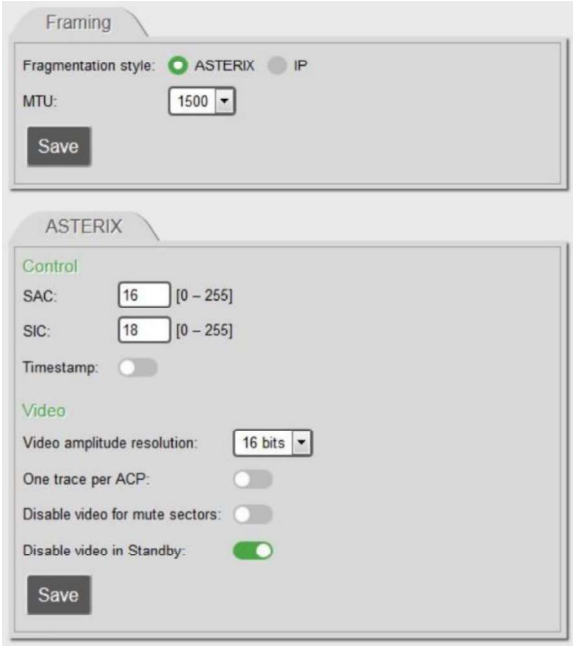
a) Enter the required details and press the **Save** button.
b) **Reset** reverts the settings to the factory defaults.

TAB COLOUR

When viewing the page Minimised, the selected tab is highlighted in Green as shown in the **Control** tab above.

6.2.3 ASTERIX tab

The ASTERIX tab is used to configure the networking as defined by the relevant display handbook or the system integrator.



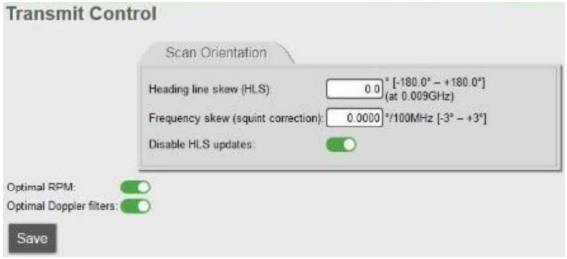
6.2.4 ASTERIX Custom tab

The ASTERIX custom tab is used to configure the Video Summary Message (VSM) as defined by the display handbook or system integrator.

6.2.5 Transmit control

HEADING LINE SKEW (HLS) ADJUSTMENT

See **Disable HLS updates** below before attempting this configuration.



a) Where possible and in the relevant radar setup/ configuration menu, make a note of the current SharpEye™ transmission frequency then set the frequency to the LOWEST available value.

b) From the radar screen, calculate the level of heading line skew required.

c) Enter the required heading line skew in degrees in the box marked Heading Line Skew (HLS) and press **Save**.

FREQUENCY SKEW (SQUINT)

a) In the relevant radar setup menu, set the SharpEye™ transmission frequency to the HIGHEST available value.

b) Observing the radar screen, adjust the Frequency Squint value so that the radar returns correctly align with the heading line. Values of between -3 to +3° can be entered.

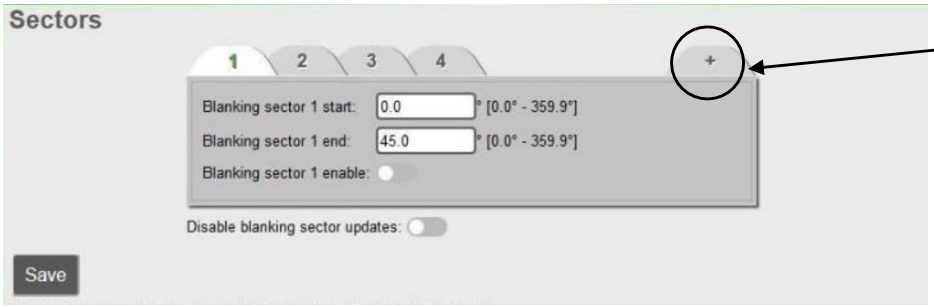
c) To observe a change on the radar screen, you will need to press **Save** after entering each value.

d) When the returns are correctly aligned, press **Save**.

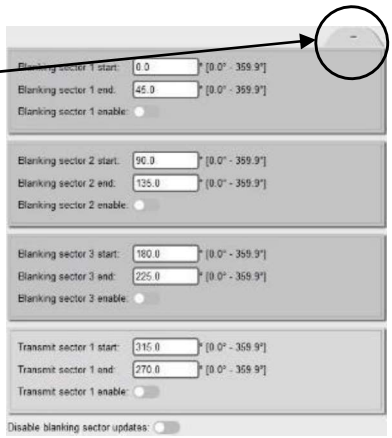
e) In the relevant radar Setup page, return the SharpEye™ transmission frequency to the original transmission frequency.

RECORD THE VALUES CONFIGURED IN THIS TABLE		
DISABLE HLS UPDATES	The Heading Line Skew (HLS) is set at the display sub-system.	Heading Line Skew (HLS) is set at the MK5 SharpEye™.
OPTIMAL RPM		
OPTIONAL DOPPLER FILTERS		

6.2.6 Sectors



Sectors tab **MINIMISED**



Sectors tab **MAXIMISED**

CONFIGURATION NOTES

- Blanking sectors should be set to ensure that the MK5 SharpEye™ does not transmit into ships superstructure or an object that could potentially generate false radar returns.
- Up to **three relative mute sectors** and **one true transmission sector** can be configured with Start and Stop bearing for each sector configurable between 0.0 to 359.9°.
- **BLANKING/ MUTE SECTORS** are relative to the vessel heading/ bearing (Grey arrow).
- **TRANSMIT SECTORS** are relative to True North (Green arrow).
- When the required sectors have been configured and enabled, press **Save**.

BROWSER & SCREEN REFRESH

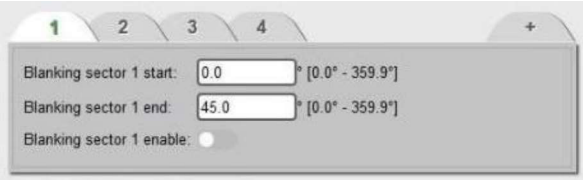
- Some early browsers will not display the sectors graphic.
- The graphic does not automatically update. To review an adjusted sector press the browser refresh button.

Blanking sector 1, 2 or 3 enable:	Blanking sector 1, 2 or 3 is enabled.	Blanking sector 1, 2 or 3 is disabled.
Transmit sector 1 enable	Transmit sector 1 is enabled.	Transmit sector 1 is disabled.
Disable blanking sector updates:	Each sector can be configured, enabled or disabled in the MK5 SharpEye™ webpage.	All blanking/ transmit sectors are disabled. This is used when the sectors are configured at the display sub-system.

COLOUR KEY

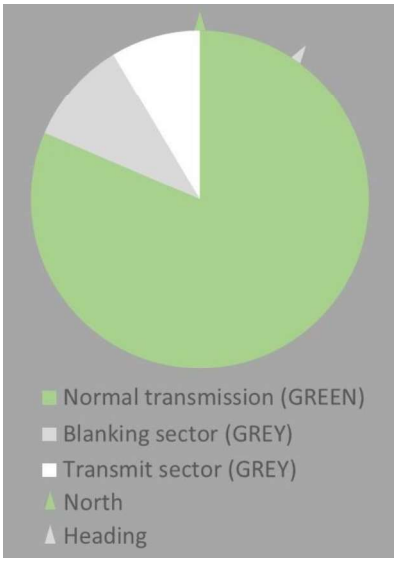
MINIMISED TABS

When the Sectors page is minimised, the tabs change colour as detailed below:



GREEN TAB:	The tab has been selected and can be edited.
GREY TAB:	Tab not selected and sector disabled.
BLACK TAB:	The tab has not been selected but a sector is enabled.

SECTORS GRAPHIC



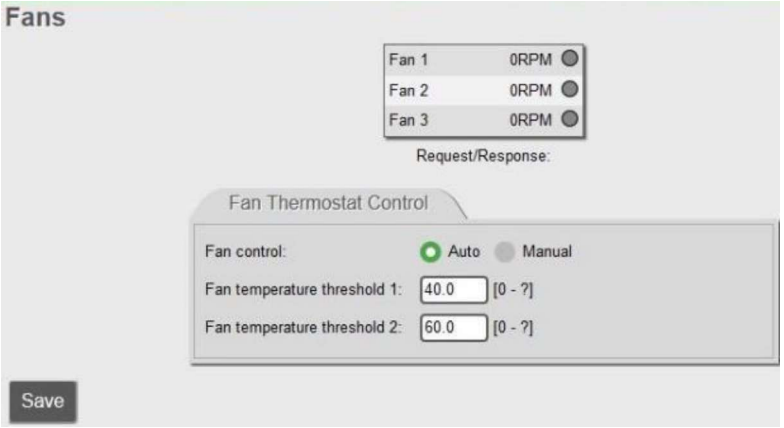
6.2.7 Fan status & configuration

FAN STATUS/ BITE DATA

Please refer to the BITE data section of Corrective Maintenance for details.

FAN CONFIGURATION

- **AUTO (DEFAULT SETTING):** The fans switch ON at *Fan temperature threshold 1* and increase to maximum RPM at *Fan temperature threshold 2*. Both values represent the required temperature in °C.
- **MANUAL:** Switches the fans permanently ON or OFF.



When the fans have been successfully configured, press **Save**.

FAN APPLICATION NOTES

FAN CONTROL AUTO: Unless specified by HENSOLDT UK or the system integrator, **Fan Control** should be left at the default setting of **Auto**.

FAN CONTROL MANUAL: In applications where the fans are not fitted or are not being used. Setting **Fan Control** to **Manual** will stop any fan failure alarms.

TYPICAL FAN SPEEDS: Typical approximate fan speeds are 6500 RPM for fans 1 & 2 (external) and 11500 RPM for Fan 3 (internal).

6.2.8 Status and Version tabs

The Status tabs can be used to check the condition of the Kelvin Hughes MK5 SharpEye™. Please refer to the Corrective Maintenance section for details.

6.2.9 Printer output/ system configuration

Pressing the Printer icon at the bottom of the menu opens the service/ commissioning computers printer/ print page allowing a summary of the system settings to be printed or saved as a PDF.

NOTICE: CONFIGURATION SETTINGS

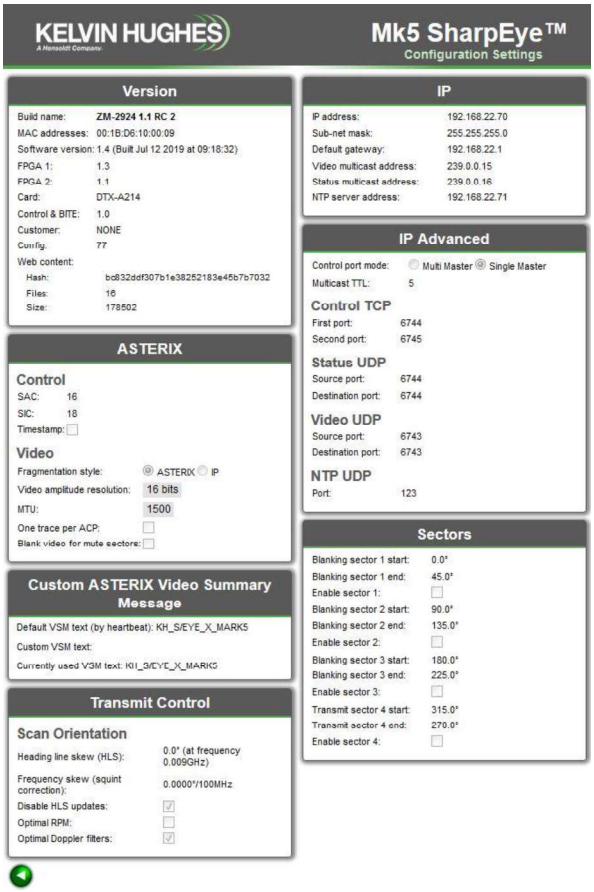
A copy of this page must be taken and distributed as detailed below.

This is essential as it shows the operator(s) details about the Heading line skew and blanking/ transmission sectors etc.

PRINT / SAVE

Copies of the Configuration Settings must be:

- Left with the vessel preferably within the systems handbook,
- Supplied as part of the service report for the installation,
- A copy must be returned to HENSOLDT UK.



Example of a printed configuration page

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KEVIN HUGHES

7 Installation checklist

ON COMPLETION OF THE INSTALLATION AND COMMISSIONING OF A MK5 SHARPEYE™, THE FOLLOWING CHECKLIST SHOULD BE PRINTED, COMPLETED AND RETURNED TO HENSOLDT UK AS PART OF THE INSTALLATION SERVICE REPORT.

MECHANICAL	The Anti-Vibration mounts from the fitting kit have been fitted (MANDATORY).	☐
	Ensure that all fastenings are securely tightened to the correct torque setting (where specified).	☐
	The safety wire rope/ cable between the Service Access Panel and the MK5 mounting point is securely fitted and locked into the carabiner.	☐
	Check that all cables are safety restrained, cannot present a hazard and that the cables do not place undue strain on connectors.	☐
	The overall finish of the transceiver has been checked for damage to finishes or metalwork.	☐
TERMINATION & COMMISSIONING	The power cable for the external DC fans is connected to PLC.	☐
	Ensure all connectors are correctly and securely fitted and appear to be watertight.	☐
	Grounding/ earth connection are connected and have been tested.	☐
	Earthing points, straps and fixings have been protected against corrosion.	☐
	Ensuring that the system is isolated from all sources of power, confirm that the maintainer's ON/ OFF switch located on the MK5 SharpEye™ is in the ON position.	☐
	Where possible, confirm the transceiver is fully operational prior to handing the system over to the customer.	☐
	Copy of the MK5 SharpEye™ commissioning settings has been taken and distributed as detailed below (*not required if default settings used*): • A copy left with the vessel preferably within the system(s) handbook, • A copy should be supplied as part of the service report for the installation, • A copy should be returned to HENSOLDT UK.	☐ Default settings used ☐
WARRANTY & GENERAL	The warranty card has been completed and returned to HENSOLDT UK. **WARRANTY CARD NOTES** • ALL relevant sections of the warranty card check list must be completed. • If an inspection on the warranty card checklist is NOT ticked it is assumed that the installation engineer has NOT carried out the inspection. Costs incurred due to attendance to repair incorrect or uninspected installations will be forwarded to the company responsible for the failure to correctly perform the work.	☐
	Ensure that all unused materials such as unused cables, wire cuttings etc. are tidied away and are safely disposed of in accordance with local waste disposal requirements. All working areas used shall be left clean and tidy.	☐

PART NUMBER:	**PCV-A1-******	**Optional PCV-A2**
SERIAL NUMBER:		
INSTALLED BY (PRINT NAME):		
INSTALLATION COMPANY:		
INSTALLATION DATE:		(dd/mm/yyyy)

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8 Operator instructions

8.1 Power ON, OFF & system isolation

SWITCH ON

a) The following procedure assumes the chassis mounted maintainer's switch is in the ON position and that it is safe for the system to transmit and for the antenna to rotate.

b) Switch the power to the MK5 SharpEye™ ON at the appropriate breaker/ switch.

c) As soon as DC power is applied, the system enters a 30 second boot-up period during which time the SharpEye™ processor carries out a number of self-checks.
After this time the system is available for use via the display sub-system.

SWITCH OFF/ POWER ISOLATION

a) At the display sub-system, place the system into Standby.

b) Electrically isolate and mechanically disconnect the Kelvin Hughes Mk5 SharpEye™ from the DC supply using the external breaker or switch. Mechanically isolate the system and lock the switching mechanism into the OFF position.

c) Where the system is running from the optional AC/DC power supply, ensure the AC to the power supply is electrically isolated, mechanically disconnected and locked into the OFF position.

CAUTION: PLA (DC POWER)

Unplugging PLA (DC power) on the Kelvin Hughes MK5 SharpEye™ must *never* be used as a method of isolating power to the transceiver.

8.2 Control & operation

CONTROL AND INDICATORS

The Kelvin Hughes MK5 SharpEye™ is controlled and interswitched via Ethernet LAN from the display sub-system. There are no operator controls, user functions or indicators located on or within the transceiver.

CONTROL VIA HENSOLDT DISPLAY(S)

For HENSOLDT UK systems please refer to the relevant display operator's handbook

CONTROL VIA THIRD PARTY DISPLAY SUB-SYSTEM(S)

The operation of third party external systems are not detailed in this handbook. Please refer to the manufacturer's operator handbooks supplied with the equipment for instructions.

8.3 Operational states

MODE/ STATUS	DESCRIPTION
OFF DC power OFF or the Maintainer's switch is in the OFF position.	The system is switched OFF but cannot be considered isolated.
ON / STANDBY DC power is ON but no RUN command is being received.	• At initial power up the system enters a 30 second initialisation period where the SharpEye™ processor carries out internal performance checks. • After the initialisation period the system enters a standby state waiting for a RUN command. • The SharpEye™ processor continues to monitor the system performance. • System warnings and BITE data are sent via LAN to the display sub-system. • If a system critical condition is detected, a warning is sent via LAN to the display sub-system and the system cannot be placed into Run mode.
RUN DC power is ON and a RUN command has been received.	• Antenna rotation is commenced and the system starts transmitting. • Radar data is sent to the display sub-system via the LAN. • The SharpEye™ processor continues to monitor the system performance. • System warnings and BITE data are sent via LAN to the display sub-system. • If a system critical condition is detected, a warning is sent via LAN to the display sub-system and the system reverts to standby.

MODE/ STATUS	DESCRIPTION
LOW POWER MODES	When the Kelvin Hughes MK5 SharpEye™ transceiver is connected to a processor/ display sub-systems that supports SharpEye™ configuration, Low/ High power modes, frequencies, range mode and BIT status may be selected. Low power may be used in close waters or in a high clutter environment where a high output power may produce excessive unwanted reflections from buildings, bridges and vessels. The transceiver will utilise the frame pattern for the selected range mode but with the output power reduced from the nominal 80W (49dBm) to approximately 12W (typical) 41dBm. When operating in low power, an alert is generated advising the operator that the system is operating at a reduced output power. Additionally, if the SharpEye™ detects a VSWR or a high temperature within the transceiver, it automatically switches to low power mode. **CAUTION: SYSTEM PERFORMANCE** As a result of reduced output power, range performance will be reduced and the system may not meet the expected operational detection performance.
FAULT MODE (a) DC power is ON	A RUN command has been received but the system has detected an internal processor fault condition and cannot be operated. See Corrective Maintenance for rectification action.
FAULT MODE (b) LOW POWER MODE DC power is ON A RUN command has been received	Should the SharpEye™ detect an internal fault condition which could lead to early failure of the transceiver, i.e. a high VSWR, then the transceiver switches to a Low Power state which permits low power transmission to continue in the short term. The built in test monitoring also outputs a "Low RF Power" warning message if the RF power output falls below 12W. The design is "fail-soft" thereby providing graceful degradation in the event of single or multiple transistor failures.
TRANSMISSION FREQUENCIES	Depending on the display software the channel numbers/ frequencies can be selected between 9.22 to 9.48 GHz in 20MHz steps (see section 10.4 for a full list of available frequencies).
PERFORMANCE MONITORING	The SharpEye™ transceiver processor constantly monitors the system's performance and will advise operators through warnings and alarms of any errors or performance related issues.
RANGE MODE	6, 12 and 24NM range modes can be selected. These provide continuous video from the SharpEye™ minimum range out to the stated range. Each mode utilises slightly different processing and different pulse patterns. It is generally preferable for the operator to use the lowest range mode which provides sufficient range for the task they are trying to achieve. In some instances additional radar modes are available, please contact HENSOLDT UK for further information.
BIT (Built in Test) STATUS	Depending on the communications interface in use, BIT data may be available indicating the status of the transceiver. A list of BIT data is available from HENSOLDT UK upon request.

8.4 Maintainer's switch

WARNING: MAINTAINER'S ON/ OFF SWITCH

When power switched ON and the Maintainers Switch is in the ON position the transceiver is operational and the antenna may rotate.

- **The chassis mounted maintainer's switch is not designed for general operator use and should only be used by system maintainers when the system has been fully isolated from all sources of power and a risk assessment has been carried out.**
- The maintainer's switch should only be used as part of a working aloft safety procedure.
- The switch is located on the base of the MK5 SharpEye as shown in section 5.2.
- With the Maintainer's switch in the OFF position, DC power is removed from the transceiver but the system cannot be considered to be isolated.

8.5 Fan operation

The Kelvin Hughes Mk5 SharpEye™ has two externally mounted fans and one internally mounted fan. The fans require no operator intervention and have two modes of autonomous operation that are dependent on system configuration:

MODE	DESCRIPTION
AUTO (Default setting)	The fans are automatically switched ON/ OFF depending on the temperatures (°C.) configured in the SharpEye™ configuration page during setting to work of the system.
MANUAL	When **MANUAL** is configured during system configuration, the fans constantly operate as soon as power is applied to the system and operate until power is disconnected.

8.6 System reset

In the unlikely event of a system freeze, system lock up or an error message, the system may need to be reset as follows:

a) Where possible switch the system to standby using the display sub-system.

b) Using the DC power breaker/ switch, isolate the power to the system and leave in an unpowered state for approximately 1 minute. This allows for any residual power in the system to drain away.

CAUTION: PLA (DC POWER)

Unplugging PLA (DC power) on the Kelvin Hughes MK5 SharpEye™ must *never* be used as a method of isolating power to the transceiver.

c) Restore DC power to the system and test.
If the fault condition persists please contact HENSOLDT UK for assistance.

8.7 Optional AC/DC power supply.

With the exception of switching OFF and isolating the AC supply voltage, there are no operator controls or indicators on or within the PCV-A2 power supply assembly.

WARNING: VOLTAGE HAZARDS

The PCV-A2 [Note] must never be operated or switched ON with the lid removed. Hazardous AC and DC voltages are present on exposed components and terminals within the unit when it is switched ON.

8.8 Interpreting the Radar display

A separate publication that is available upon request describes some of the factors that influence radar performance and the presentation of a radar image.

- **HBK-1000: RADAR INSTALLATION GUIDELINES & INTERPRETING THE RADAR DISPLAY.**

Copies of this handbook are available upon request.

Note: Early versions of the PCV-A2 carried the part number **PCV-A157** which is identical in all respects.

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9 Maintenance

9.1 IMPORTANT MAINTENANCE NOTES

HEALTH AND SAFETY

The Health & Safety warnings noted at the beginning of this handbook must be observed at all times when carrying out any planned or corrective maintenance work.

RECOMMENDED TOOLS

See **section 4.1.7** for a list of recommended tools.

TORQUE SETTINGS

See **section 4.1.8** for a list of torque settings that must be used when carrying out any Planned or Corrective Maintenance.

ADVERSE WEATHER CONDITIONS

It is recommended that the mounting bolt inspections noted in the planned maintenance procedure are carried out at the earliest safe opportunity after the system has been exposed to severe or adverse weather conditions, high impacts or severe vibrations.

SHARPEYE™ TRANSMITTER

Unlike the magnetron found in conventional radars, the transmitter within the Kelvin Hughes MK5 SharpEye ™ is a solid state unit that does not require regular maintenance or replacement.

DISPOSAL OF IN-LIFE CONSUMABLE

Please refer to the Safety Notices shown in section 2.

9.2 Planned maintenance

This section has been designed to be printed, completed and retained as a maintenance record. Maintenance must be carried out with the system fully isolated.

9.2.1 6-monthly planned maintenance

6-MONTHLY PLANNED MAINTENANCE RECORD SHEET			
TRANSCEIVER:	PART NUMBER:	SERIAL NUMBER:	
ANTENNA:	PART NUMBER:	SERIAL NUMBER:	
POWER SUPPLY:	PART NUMBER: PCV-A2 [Not fitted ☐]	SERIAL NUMBER:	
INSPECTED BY:	*Print:*	*Sign:*	*Date: (dd/ mm/ yyyy)*

TASK DESCRIPTION	✓
CLEANING: Clean the transceiver housing and antenna with a soft cloth moistened in a mild non-abrasive alcohol free soap solution.	
CLEANING NOTES • Cleaning the antenna is important as system performance can be degraded if the transmission face becomes obscured by salt deposits, soot or dirt. • Do not use solvents such as gasoline, acetone, M.E.K etc. as this will damage the antenna surface. • Water intrusion and subsequent equipment failure may occur if the equipment is subjected to commercial high pressure washing; Damage caused by high pressure washing is not covered in the equipment warranty.	☐
INSPECTION: Ensure that all fasteners retaining the system are tight, secure and show no signs of severe corrosion or damage.	
ADVERSE CONDITIONS This inspection should be carried out at the earliest safe opportunity after the system has been exposed to severe or adverse weather conditions, high impacts or severe vibrations. **INSPECTION NOTE** Over time, some white discolouration of the fasteners provided in the fitting kit is normal. This is due to the sacrificial zinc plating and not an indication of the stainless steel bolt rusting.	☐
INSPECTION: Check that the DC power, LAN and Fan cable connections (PLA, PLB & PLC) are securely fastened and appear to be watertight.	☐
INSPECTION: Check all accessible or exposed cables for signs of damage and ensure they are safely secured into/ onto cable trays or trunking.	☐
INSPECTION: The system should be checked to ensure there is no obvious external damage or potential fault conditions that could lead to a general failure of any part of the system.	☐
EARTH BONDING: Ensure that the earth bonding fasteners are tight and free from corrosion. If corrosion is present, clean and re-terminate	☐
EARTH BONDING: Test the earth bonding conductivity by attaching one lead of the test equipment (Safety ohmmeter, bridge Megger or Multimeter) to earth/ chassis and the other to the earth stud on the MK5 SharpEye™ transceiver. Check earth bonding for continuity. The resistance should not exceed 0.1 ohms. If a test fails, investigate the bonding, rectify and retest.	☐
FANS: Inspect the external fan vents and ensure that they are clean and free from dust or obstructions.	☐
FANS ELECTRICAL TESTS: The operation of the fans should be checked as follows: **a)** Where the facility exists to view the SharpEye™ configuration web page. Make a note of the fan threshold temperatures then switch the **Fan Control** from '**Auto**' to '**Manual**'. Note 1 **b)** Fans 1 & 2 should be running at approximately 6500 RPM **c)** Fan 3 should be running at approximately 11500 RPM. **d)** Return the **Fan Control** to '**Auto**'. If access to the webpage is not possible, checking fan operation is limited to listening for operation at a safe distance. Note 2	☐
Note 1: Where manual is already selected, the fans will operate as soon as the system is switched on. **Note 2:** Where Auto is selected, the fans do not operate continuously or may be running at a variable speed. It may be necessary to carry out this test during a period of elevated ambient temperature.	

9.2.2 5 years: External fan replacement

After **5 years** of operation, it is recommended that the externally **PCV-A125-*** Fan Assembly is replaced as the fans will have reached the end of their serviceable life.

REPLACEMENT NOTES AND PRECAUTIONS

- Refer to **section 2** prior to carrying out this task.
- The recommended spare fan must be used. The use of alternative spares is not recommended.

SPARES

- Replacement fan assembly:
  PCV-A125-S: **White casing (RAL 9003).**
  PCV-A125-BAAA-S: **Grey casing (RAL 7001).**

Example of PCV-A125 RAL9003 fan assembly

TOOLS

- PZ2 Pozidrive head driver.

EXTERNAL FAN REMOVAL PROCEDURE

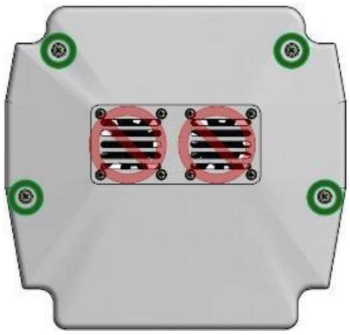
a) Observing all safety and system isolation requirements, place the Maintainer Switch into the **OFF** position.

NOTICE: During the removal process, do not loosen or remove the fans from the PCV-A125 assembly OR open the MK5 SharpEye™ housing (see illustration below).

b) Unplug and disconnect **PLC** from the MK5 SharpEye™ housing and release the cable from the clamp located on the mounting foot. The clamp is retained by a single **8mm (M5)** bolt but it does not need to be fully removed. It can be loosened enough so that the cable can be released.

c) From the front of the Fan Assembly, remove the four **M5** pozidrive drive fasteners indicated below. If any of the M5 pillars that attach to the main housing become loose during the removal process, retighten to a torque of **4.2Nm**.

d) The PCV-A125 Fan Assembly is now loose and may be removed.



Detail of fasteners to be removed
(circled in green)

Detail of cable clamp

REPLACEMENT PROCEDURE

a) If the Internal fan is to be replaced, do not carry out the panel replacement until the internal fans has been changed (see section 9.2.3).

b) The Replacement PCV-A125 assembly is fitted by reversing the removal process.

c) Tighten the four **M5** pozidrive drive fasteners to a torque of **4.2Nm**.

d) Tighten the **8mm (M5)** bolt retaining the cable clamp to a torque of **4.2Nm**.

e) Ensuring the system is fully isolated, ensure the Maintainer's Switch is in the **ON** position.

f) Apply power to the system and test the fans as per the planned maintenance recommendations shown in section 9.2.1.

9.2.3 5 years: Internal fan replacement

After **5 years** of operation, it is recommended that the internally mounted **PCV-A143-S** Fan Assembly is replaced as the fan will have reached the end of its serviceable life.

REPLACEMENT NOTES AND PRECAUTIONS

- Replacement of the internal fan requires the Mk5 SharpEye™ to be opened and the transceiver assembly to be removed.
- The recommended spare fan must be used. The use of alternative spares is not recommended.

SPARES

- Replacement fan assembly: **PCV-A143-S**.

Example of PCV-A143 fan assembly

TOOLS

- 5.5mm A/F (M3) spanner.

INTERNAL FAN REMOVAL PROCEDURE

a) Remove the **Fan Assembly** and **Outer Cover** as detailed in section **9.4.3**.

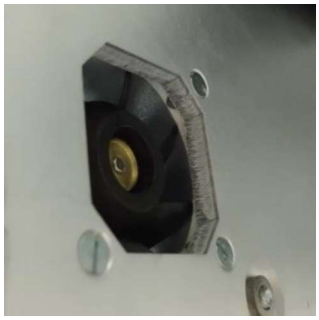
b) Remove the **Transceiver Assembly** as detailed in section **9.4.4**.

c) Disconnect the fan assembly from the Transceiver Assembly (see below for connector location).

d) Remove and retain the **three x M3** fasteners that hold the fan onto the chassis (see below for details). The fan is then loose and may be removed.

Note: There are only three fasteners holding the fan into position. These are countersunk and are NOT captive so will be loose when the fasteners have been removed.

Location of three fasteners and the connector.



Detail of the rear of the fan.

INTERNAL FAN REPLACEMENT PROCEDURE

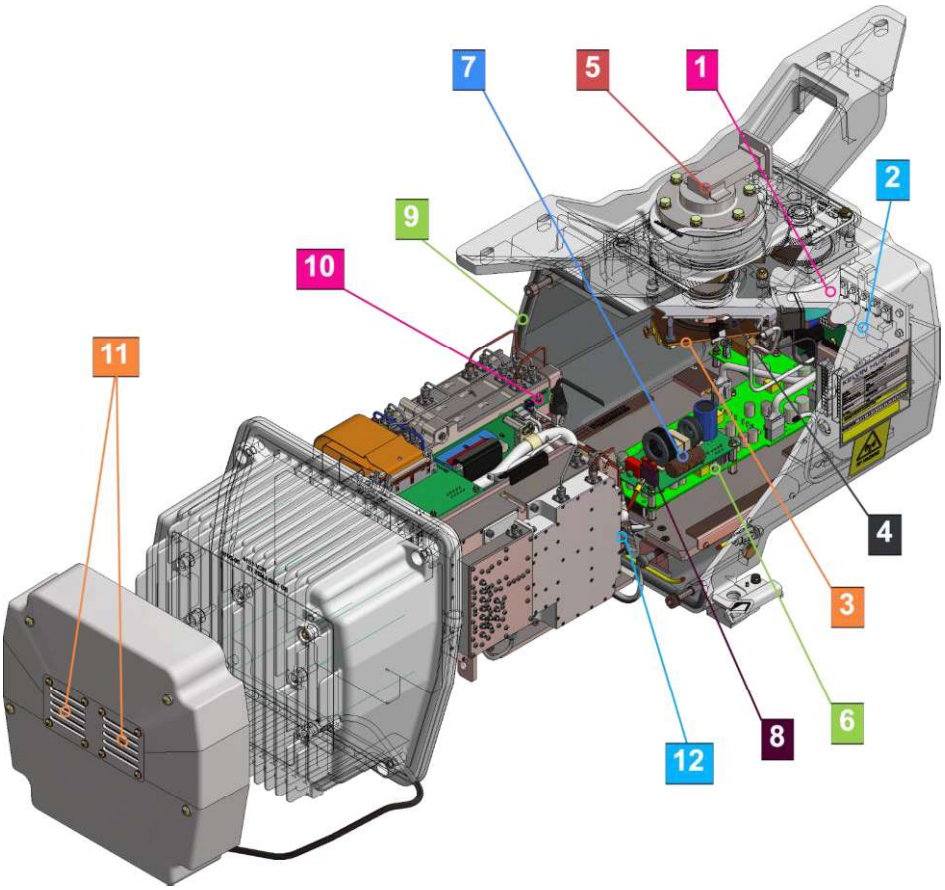
The internal fan is replaced by reversing the removal process.

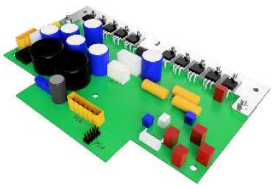
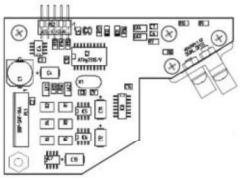
a) Replace the fan and tighten the three M3 fasteners to a torque of **1Nm**.

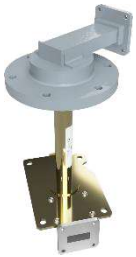
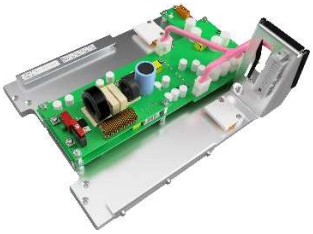
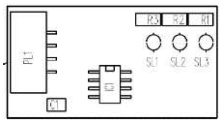
b) Replace the **Transceiver Assembly** as detailed in section **9.4.4**.

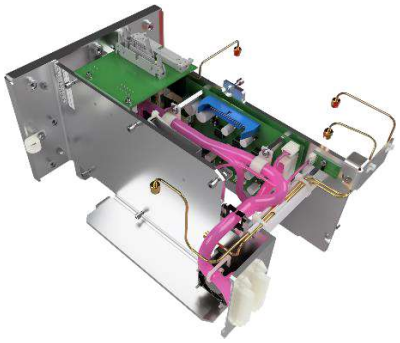
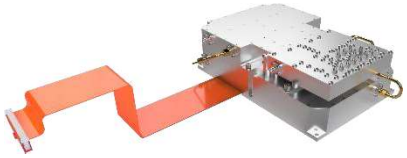
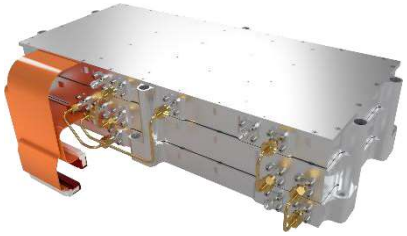
c) Replace the **Fan Assembly** and **Outer Cover** section **9.4.3**.

9.3 Illustrated Parts List



PART NUMBER		DESCRIPTION	NOTE: • Images are not to scale and are for guidance only. • Unless specified, colours may vary.
1	45-850-0001	**DC Motor, 60VDC**	
2	CAE-A429-1	**Motor Control Printed Circuit Assembly**	
3	PCV-A105	**PCV Encoder 90 to Quad** Opto couple PCB	
4	CAE-4005	**Disk Optical** Heading line and azimuth optical disk.	

	PART NUMBER	DESCRIPTION	NOTE: • Images are not to scale and are for guidance only. • Unless specified, colours may vary.
5	**PCV-A141** White (RAL 9003) **PCV-A141-BAAA** Grey (RAL 7001) **55-100-0586-001** O-ring	**Rotary joint (Ro-Jo)** complete assembly including 60mm O-RING Used when replacing the Rotating Joint	 PCV-A141 RAL 9003  PCV-A141-BAAA RAL 7001 55-100-0586-001 O-ring
6	**PCV-A129**	**PSU assembly**	
7	**PCV-A128**	**EMC filter assembly**	
8	**45-650-0032-002**	**Blade Fuse Orange (ATO) 40A**	
9	**5662-202**	**Neoprene cord sponge 6mm diameter.** Sealing cord used in Outer Cover	
10	**PCV-A119**	**Temperature sensor PCBs** • 3 off per system. • See section 9.4.13 for location details.	
11	**PCV-A125** White (RAL 9003) **PCV-A125-BAAA** Grey (RAL 7001)	**Complete replacement fan/ chassis assembly.**	 PCV-A125 RAL 9003 (white) PCV-A125-BAAA RAL 7001 (Grey)
12	**PCV-A143**	**Replacement fan (internal)**	

PART NUMBER		DESCRIPTION	NOTE: • Images are not to scale and are for guidance only. • Unless specified, colours may vary.
13	PCV-A113-C	**Transceiver assembly chassis** Chassis supplied without the SCV-A110 HPA-LNA and SCV-A110 Sync Converter assemblies.	
14	SCV-A111	**HPA-LNA Stack Assembly**	
15	SCV-A110	**Sync/ Converter assembly**	

9.4 Corrective maintenance

9.4.1 Troubleshooting

Fault finding the Kelvin Hughes Mk5 SharpEye™ transceiver is limited to:

- Resetting the system,
- Ensuring that DC input voltages are within acceptable limits,
- Troubleshooting using the procedures noted in this section of the handbook.

9.4.1.1 Possible fault conditions

FAULT CONDITION	POSSIBLE SOLUTION
LOSS OF VIDEO AND/ OR LOSS OF STATUS MESSAGES	Check that the DC voltages are within acceptable limits and that all fuses, switches and/ or breakers are operational.
	If video ceases to be displayed and the transceiver is installed in a position where a person can be within the RADHAZ beam of the antenna, as a precautionary measure the operator should cease transmission immediately and investigate the problem. Transmission can be stopped by switching the transceiver system OFF. This ensures that if the antenna has ceased rotation under fault conditions in such a position that it is facing a person and further software faults occur, nobody is accidentally irradiated in excess of the safe limits.
	If the system fails to communicate after the initialisation period, isolate the power to the system and ensure that both the DC and LAN cables are securely connected and free from damage. If the system randomly resets or is temporarily unavailable, check that the DC input to the system is stable under load conditions and does not drop below the recommended minimum DC input level noted in section 10.2. Standard network diagnostic tools and software may be used to ensure data is being output from the LAN connection. If the system operates on a network, try connecting the transceiver directly to the display from the LAN cable or diagnostic tools.
	If the unit appears to perform reliably in Low Power mode but resets when entering High Power mode, this suggests that the DC supply voltage may not be within acceptable limits under maximum load conditions. Check that the DC input to the system is stable under load conditions and does not drop below the recommended minimum DC input level noted in section 10.2.
SYSTEM SHOWING VIDEO AND/ OR STATUS MESSAGES BUT, INTERFERENCE OR POOR RETURNS ARE PRESENT ON THE DISPLAY SUB-SYSTEM	Ensure that there are no objects in the immediate vicinity of the system that may be blocking or reflecting RF radiation back towards the transceiver. If this is unavoidable, ensure that a blanking sector has been correctly configured to cover the affected area. It may be necessary to cover the objects with Radar Absorbent Material (RAM) to attenuate unwanted reflections. Where the display software permits: 1. Change the SharpEye™ transmission frequency. If the problem disappears it may be being caused by interference from other transmitters in the local vicinity. 2. Change the SharpEye™ power from High to Low power. Return the system to High power on completion of any tests. 3. Mute the system on each available range mode and see if any interference remains on screen. If a mute feature is not available, set a blanking sector that covers the area of interference or the whole display area (i.e. 360°).
FAULT REPORTING	If a problem persists and cannot be resolved, please contact HENSOLDT UK with the following details: **1. FAULT CONDITION:** Describe the condition being experienced, the modes or control commands that cause the issue and any error messages that have been observed. **2. BITE DATA**: If the display in use can display BITE data, please advise the messages being displayed. **3. SCREEN GRABS:** Where permissible and where the display software permits, take screen shots of the display showing the affected video. If there is no screen grab facility take a photograph or a short video. Photographs or diagrams of the installation, where permissible, may also prove useful. **4. INTERFERENCE:** If the issue relates to an object that cannot be observed on screen, describe the object, its distance from the radar and any other conditions (e.g. metrological) that may have an impact on target detection.

9.4.1.2 SharpEye error messages

The SharpEye™ processor fitted within the factory sealed unit constantly monitors system performance and will advise operators through warnings and alarms of any errors or performance related issues. Status and warning messages cannot be viewed or monitored at the transceiver; all messages are sent to the external display sub-system via the LAN.

The display of error messages is dependent on the display sub-system configuration.

Some error message conditions may be cleared by resetting the system. If the fault condition persists, please contact HENSOLDT UK stating the nature of the Error message.

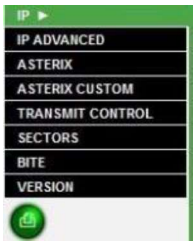
ERROR MESSAGE	DESCRIPTION
AZIMUTH STATUS (1)	Antenna rotation is checked for clockwise rotation (viewed from above). If anti-clockwise rotation is detected transmission is stopped within 60 seconds.
AZIMUTH STATUS (2)	If missing pulses between heading lines are detected transmission is stopped within 60 seconds.
DEGRADED (LOW POWER)	The transceiver continuously runs background performance checks on forward power, reverse power, receiver sensitivity and temperature. If any of these parameters falls outside predetermined levels the transceiver continues to operate, but with reduced performance and functionality.
FPGA2 FAILED	If the transceiver detects an internal hardware fault it switches to the degraded (low power) state of operation (see Degraded error message above).
HL NOT DETECTED	An azimuth or heading line pulse has not been detected. For safety reasons transmission is stopped within 60 seconds.
OVER TEMPERATURE	If the temperature of the RF power transistors in the transceiver exceeds a predetermined limit, the unit switches to the degraded 'low power' state. If the temperature exceeds a further pre-set limit the transceiver switches to the fault state and transmission is stopped. As the temperature returns to within the predetermined limits, the transceiver returns to the degraded state and then to normal operation.
PLO LOCK	The Phase Locked Oscillator (PLO) has not locked correctly, cycling the power may clear this condition.
RX SENSITIVITY	The minimum detectable signal has risen above a pre-set level.
SYNTHESIZER LOCK	The synthesiser has not initialised correctly, cycling the power may clear this condition.
TURNING INFO LOST	If the antenna stops rotating when not commanded to STOP, the transceiver switches to the fault state and transmission is stopped.
TX POWER	If the RF output power falls below a factory set threshold the transceiver switches to the degraded 'low power' state of operation.
VSWR WARNING	If the VSWR on the RF output is worse than approximately 1.4:1 the transceiver switches to the degraded 'low power' state of operation. If the VSWR on the RF output is worse than approximately 2.0:1 the transceiver enters *fault mode* and is shutdown.

9.4.1.3 BITE Data

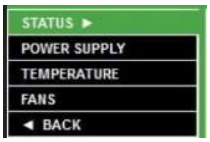
Where access to the configuration webpage is available, status, power supply, temperature & fan BITE data is available from the BITE tab.

CAUTION: CONFIGURATION SETTINGS

When viewing BITE data, do not change any of the commissioning parameters. Incorrectly configured parameters could render the unit inoperable.



Main menu



BITE menu

Press **BACK** to return to the Main menu.

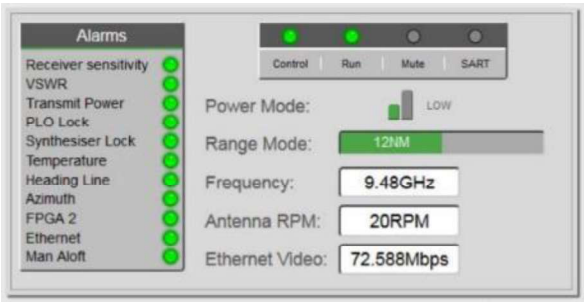
COMMUNICATION & REFRESH RATE

- BITE status is refreshed every 5 seconds.
- The **Request/ Response** text has arrows indicting communication between the SharpEye™ and the host PC. The up arrow is the request and the down arrow is the response from the SharpEye™.
- If no data is received within 3 attempted communications, BITE data stops being displayed.

INDICATOR COLOUR KEY/ HELP

Placing the cursor over any indictor opens the **Context Help** menu which will show the relevant parameters for the selected indicator.

STATUS BITE DATA



POWER SUPPLY BITE STATUS

TEMPERATURE BITE STATUS

FANS BITE STATUS

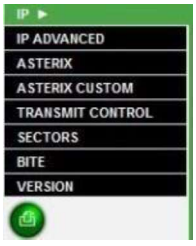
RPM indicates the current speed of the fan.

Fans 1 and 2 are the external mounted fans.

Fan 3 is the internally mounted fan.

9.4.1.4 Software version

The **Version** tab shows the Software version of the SharpEye™ unit.



CORRECTIVE MAINTENANCE

9.4.2 General precautions and notes

- The **Health & Safety and Precautionary Notices** shown in **section 2** must be observed at all times when carrying out any form or corrective or preventative maintenance.
- Any parts, components or sub-assemblies that are removed from the Kelvin Hughes MK5 SharpEye™ should be placed in a secure location where they cannot present a drop hazard.
- All equipment and removed components or assemblies should be protected against the weather and water/ dust ingress.
- Where ever possible, equipment being worked on should be removed to a workshop environment.
- Unless specifically noted, fasteners that are removed must be retained as they will be required during reassembly.

9.4.3 Fan & Outer Cover removal

OVERVIEW

This section details the removal and replacement of the external Fan Assembly and the main Outer Cover to gain access to the internal sub-assemblies within the unit.

TOOLS

The following tools will be required during this process:

- Number 2 Philips driver,
- 5mm Hex socket key.

FAN ASSEMBLY REMOVAL PROCEDURE

a) Observing all safety and isolation requirements, place the externally mounted Maintainer's switch into the **OFF** position.
b) Unplug and disconnect **PLC** from the Kelvin Hughes MK5 SharpEye™ housing.
c) Release the PLC cable from the clamp located on the mounting foot. The clamp is retained by a single **8mm (M5)** bolt.
d) From the front of the Fan Assembly, remove the four **M5x20** cross-head fasteners (No. 2 driver). If any of the M5 pillars that attach to the main housing become loose during the removal process, retighten to a torque of **4.2Nm**.
Do not loosen or remove the fans from the PCV-A125.
e) The Fan Assembly is secured to the front cover by a lanyard. Disconnect the lanyard from the Fan Assembly NOT the main housing.
f) The PCV-A125 Fan Assembly is now loose and may be removed.

OUTER COVER REMOVAL PROCEDURE

a) Remove and retain the exposed **four x 5x20mm hex** socket fasteners that hold the service access panel to the main casing.
b) Remove and retain the **eight x 5mm hex socket fasteners**. Note that these fasteners are NOT captive.
c) With all the above fasteners removed, the Outer Cover is lose and may be removed.
d) The outer cover is connected to one of the main mounting points by a wire rope/ cable secured into a carabiner. Do not unfasten the cable from the carabiner until you are ready to safely remove the cover.

THIS COMPLETES THE FAN ASSEMBLY & OUTER COVER REMOVAL PROCESS

REPLACEMENT PROCEDURE

Noting the following points, the Outer Cover and Fan Assembly are replaced by reversing the removal process.

Outer Cover seal
Part number 5662-202

a) If **the 6mm Neoprene cord seal** between the main chassis and the Outer Cover is damaged, it must be replaced using the recommended line replacement unit (LRU) part number **5662-202.**

b) Tighten the **four x M5x20** recessed pan head fasteners that retain the Outer Cover to the casework to a torque of **20Nm**.

c) Reconnect the wire rope/ cable into the carabiner located on the mounting point of the main housing.

d) Tighten the **eight x 5mm** hex socket fasteners to a torque of **5.6Nm**.

e) Tighten the **four x M5x20** cross-head fasteners that retain the Fan Assembly to the outer casing to a torque of **2.2Nm**.

Fan assembly power connector
with white 'dot' on top

f) Ensure the fan power cable is correctly seated in the clamp and tighten the captive **M5 x 25mm fastener** to a torque of **4.2Nm**.

g) Reconnect the fan power to **PLC.** The plug has a small **WHITE DOT** on the connector casing which should be pointing UP to ensure correct polarisation.

h) Ensuring the system is fully isolated, ensure the Maintainer's Switch is in the **ON** position.

i) Apply power to the system and test the fans as per the planned maintenance recommendations.

THIS COMPLETES THE FAN ASSEMBLY & OUTER COVER REPLACEMENT PROCESS

9.4.4 Transceiver removal

OVERVIEW

The following process details the removal and replacement of the transceiver assembly to gain access to other line replacement units within the housing or to replace the HPA-LNA Stack, Sync/ Converter modules or the temperature sensors located on the transceiver assembly.

PRECAUTIONS AND NOTES

WARNING: TRANSCEIVER OPERATION

DO NOT RUN THE TRANSCEIVER ASSEMBLY ON A BENCH OR WITH THE OUTER COVER DISCONNECTED / REMOVED.

Running the system without the heatsink will permanently damage components within the transceiver.

CAUTION: SEMI-RIGID RF CABLE HANDLING PRECAUTIONS

Take care when removing and re-installing the semi rigid RF coaxial cable. The rigid coaxial cable must not be bent, crushed, deformed or damaged. If the cable is accidently damaged or crushed, it must be replaced. Damage to the cable can reduce the transceiver performance or in the worst case stop transmission.

CAUTION: GENERAL PRECAUTIONS

- **TRANSCEIVER ASSEMBLY REMOVAL:** When removing the transceiver assembly, be careful not to damage any components or the rigid RF couplings located on the assembly.
- **ASSEMBLY WEIGHT:** The transceiver assembly weighs approximately **10Kg**. Care should be exercised when removing and lifting the unit.
- **ASSEMBLY TEMPERATURE:** When the transceiver assembly has been in operation or the system has been exposed to strong sunlight, the assembly will be very hot to the touch.
- **FACTORY SEALED UNIT(S):** Modules attached to the transceiver assembly are factory sealed units that must not be opened or dismantled. The warranty of the unit(s) is voided if the warranty seals are broken. The unit has no field serviceable or repairable parts and must be returned to the HENSOLDT UK for repair.

TOOLS

The following tools will be required during this process:

- Torque wrench (required during refitting).
- 4mm Hex socket fasteners.

REMOVAL PROCEDURE

a) Remove the **Fan Assembly** and **Outer Cover** as detailed in section **9.4.2**.

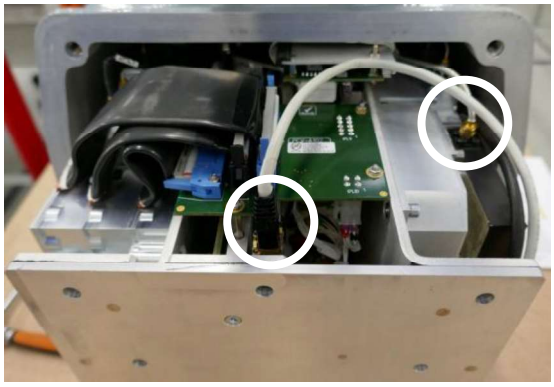
b) Unplug the network cable shown below.

c) Observing the precautions noted above, disconnect the semi-rigid coaxial cable.

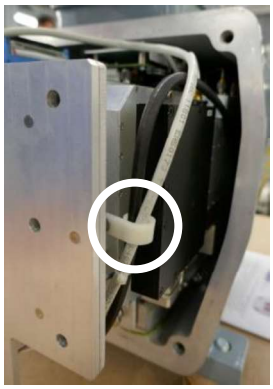
d) Unclip the network and power cables from the P-clip.

e) From the base of the transceiver assembly, remove the **two M6 hex socket shoulder fasteners (4mm key)**.

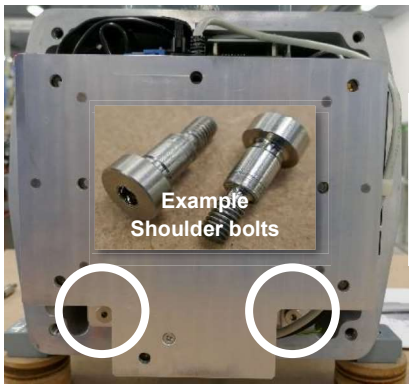
Note: These fasteners are NOT captive.



Location of the Network & semi-rigid coaxial cables



P-clip location



Location of M6 shoulder fasteners

f) With the two shoulder fasteners removed, the transceiver assembly is loose and can be carefully removed.

THIS COMPLETES THE TRANSCEIVER ASSEMBLY REMOVAL PROCESS

REPLACEMENT PROCEDURE

a) The Transceiver Assembly is replaced by reversing the removal process.

b) When sliding the transceiver assembly into the outer casing, ensure that:

- **i.** The two main connectors on the right hand side are aligned and have correctly mated.
- **ii.** The assembly chassis is correctly aligned/ restrained by the two clamps located at the rear of the power supply assembly.

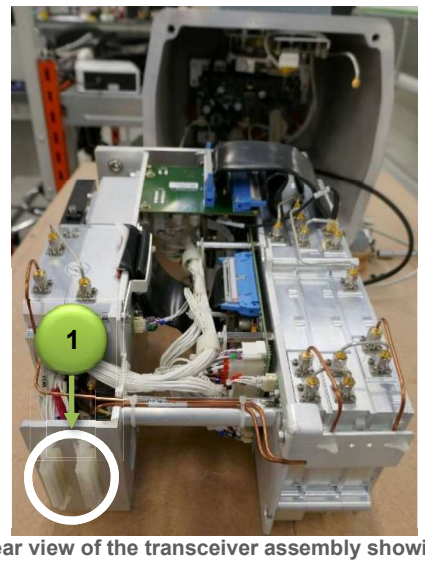
c) Lightly coat the thread of the **two M6 hex socket shoulder fasteners (4mm key)** with Loctite 243, replace them and tighten to a torque of **5.6Nm**.

d) Place the network and power cables into the p-clip.

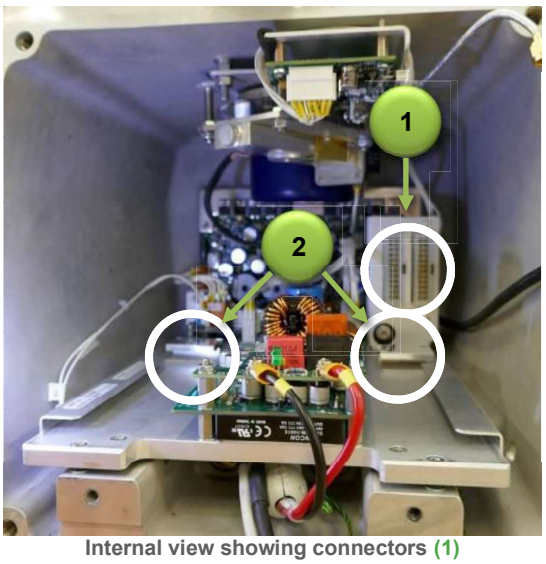
e) Reconnect the network cable.

f) Reconnect the RF coupling and tighten to a torque of **0.9Nm**.

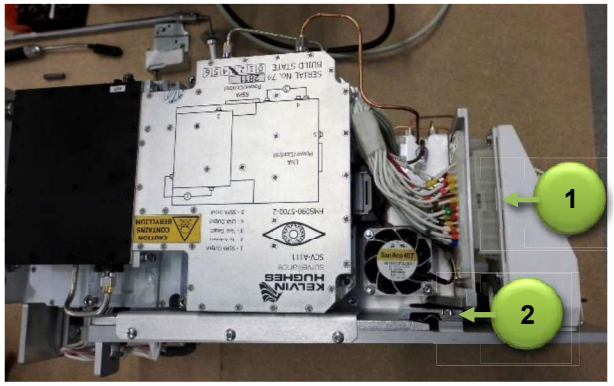
g) Replace the **Outer Cover** and **Fan Assembly** as detailed in section **9.4.3**.



Rear view of the transceiver assembly showing The connectors (1)



Internal view showing connectors (1) & restraining clamps (2)



Example of the Transceiver Assembly mounted onto the Power Supply plate with the connectors (1) mated and the Transceiver Assembly located into the Power Supply restraining clamps (2).
The equipment is shown assembled on a test bench for clarity.

Tightening the RF coupling to 0.9Nm

THIS COMPLETES THE TRANSCEIVER REPLACEMENT PROCESS

9.4.5 PSU fuse

The following process details the replacement of the internal fuse that is mounted on the Power Supply assembly.

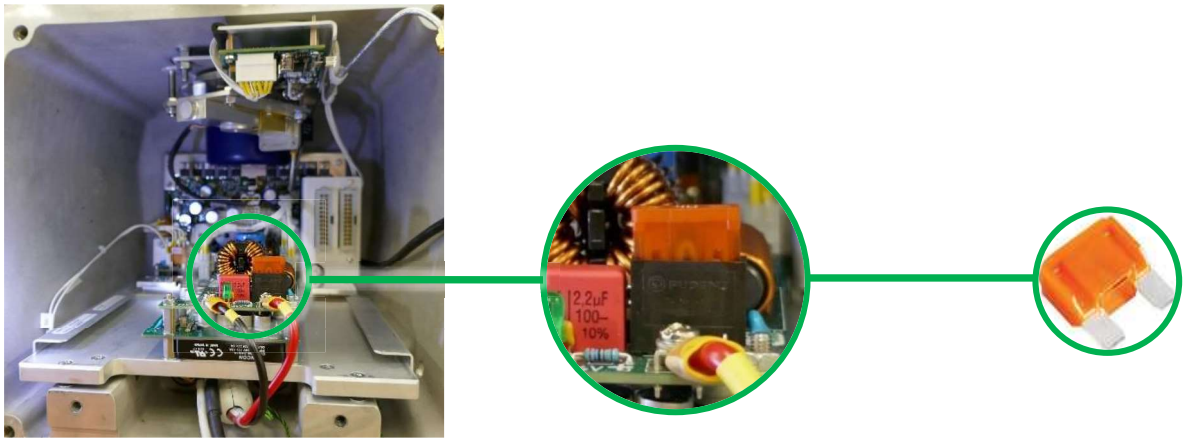
- Spare fuse part number: **45-650-0032-002.**
- The main fuse on located on the front of the PCV-A129 Power Supply assembly.
- **It is NOT necessary to remove the Power Supply to gain access to the fuse.**

FUSE REPLACEMENT PROCEDURE

a) Remove the **Fan Assembly** and **Outer Cover** as detailed in section **9.4.3**.
b) Remove the **Transceiver Assembly** as detailed in section **9.4.4**.
c) With the transceiver assembly removed, the fuse can be accessed and replaced (see images below).
d) When the fuse has been replaced, replace the **Transceiver Assembly** as detailed in section **9.4.4**.
e) Replace the **Fan Assembly** and **Outer Cover** as detailed in section **9.4.3**.

REPLACEMENT NOTES AND PRECAUTIONS

- The LRU spare fuse must be used. The use of alternative spares is not recommended.
- Do not apply power, switch ON or test the system with the transceiver assembly/ Outer Cover removed.



Internal view of the MK5 SharpEye with the Transceiver Assembly removed showing the fuse location.

THIS COMPLETES THE FUSE REPLACEMENT PROCESS

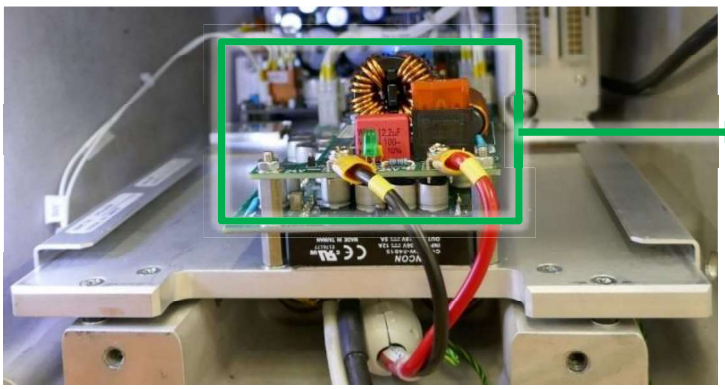
9.4.6 EMC filter (PCV-A128)

The following process details the removal and replacement of the PCV-A128 EMC filter assembly which is mounted on the PCV-A129 Power Supply assembly.

- **It is NOT necessary to remove the PCV-A129 Power Supply to gain access to the EMC Filter Assembly.**
- The PCV-A128 filters and regulates the DC input to the MK5 SharpEye™ and also protects against any input surges. The board is also fitted with a fuse (see section 9.4.5).

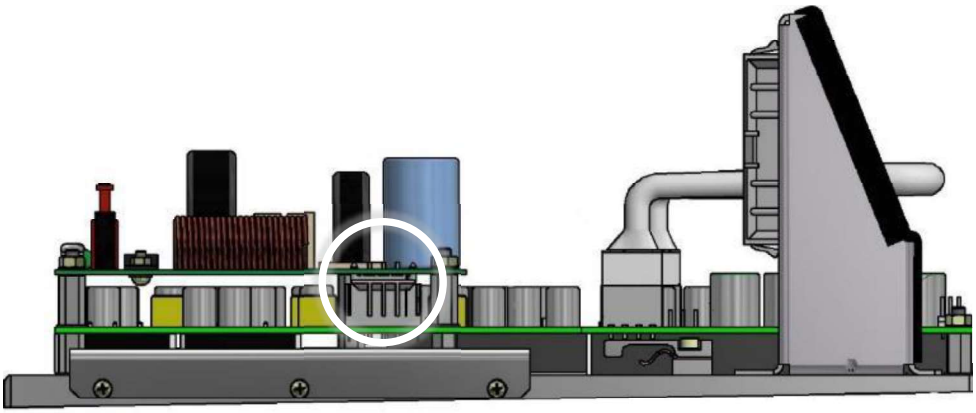
REMOVAL PROCEDURE

a) Remove the **Fan Assembly** and **Outer Cover** as detailed in section **9.4.3**.
b) Remove the **Transceiver Assembly** as detailed in section **9.4.4**.
c) Noting their position and polarity, disconnect **PL1/ 24+** and **PL2/ 24-** from the edge of the PCB.
d) Loosen and remove the **four x M4 fasteners** circled in the image below.
e) The EMC Filter Assembly connects to the PCV-A129 Power Supply via a single connector indicated in the image below. With the fasteners removed, the PCA can be gently separated from the power supply.



PCV-A129 PSU Assembly

PCV-A128 EMC Filter Assembly M4 fasteners



Side view of the PSU/ EMC Filter assemblies showing the location of the interconnection between the two boards (Circled)

REPLACEMENT PROCEDURE

a) Assemble the replacement PCV-A128 onto the Power Supply assembly ensuring that the connector is correctly aligned and mated.
b) Replace the **four x M4 fasteners** removed earlier and tighten to a torque of **2.2Nm**.
c) Reconnect **PL1/ 24+** and **PL2/ 24-** located on the edge of the PCB and tighten the M4 terminal fasteners to a torque of **2.2Nm**.
d) Replace the **Transceiver Assembly** as detailed in section **9.4.4**.
e) Replace the **Fan Assembly** and **Outer Cover** as detailed in section **9.4.3**.

THIS COMPLETES THE EMC FILTER ASSEMBLY REPLACEMENT PROCESS

9.4.7 PSU assembly (PCV-A129)

OVERVIEW

The following process details the removal and replacement of the power supply assembly or removal of the unit to gain access to other line replacement units within the housing.

PRECAUTIONS AND NOTES

- The PCV-A129 LRU spare is a complete assembly. Do not remove any PCBs or brackets.
- The PSC-A129 is not designed to be repaired in the field.
- Do not run or apply power to the unit on a test bench.

TOOLS

- Torque wrench (required during refitting).

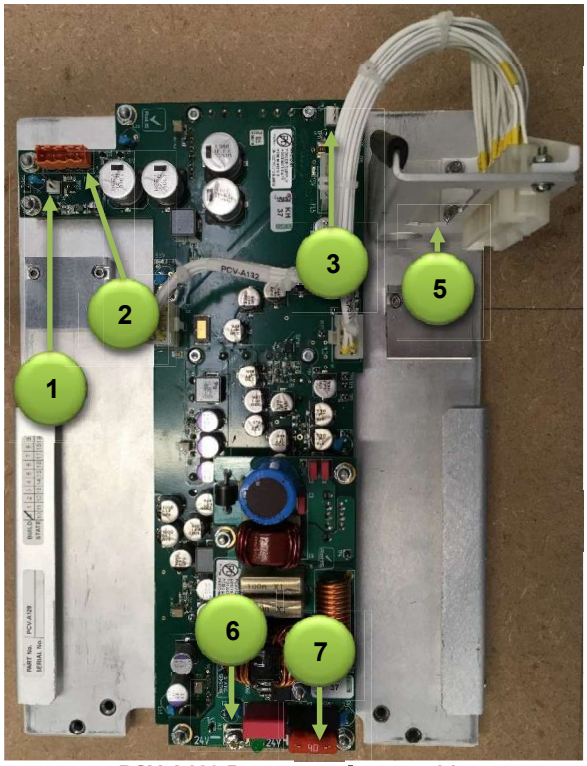
REMOVAL PROCESS

a) Remove the **Fan Assembly** and **Outer Cover** as detailed in section **9.4.3**.

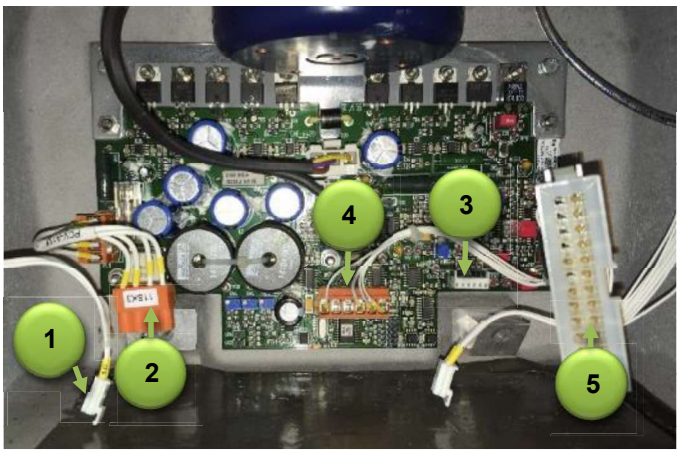
b) Remove the **Transceiver Assembly** as detailed in section **9.4.4**.

c) From both the Power Supply and Motor Control PCA, disconnect connectors **1 to 7** as indicated below

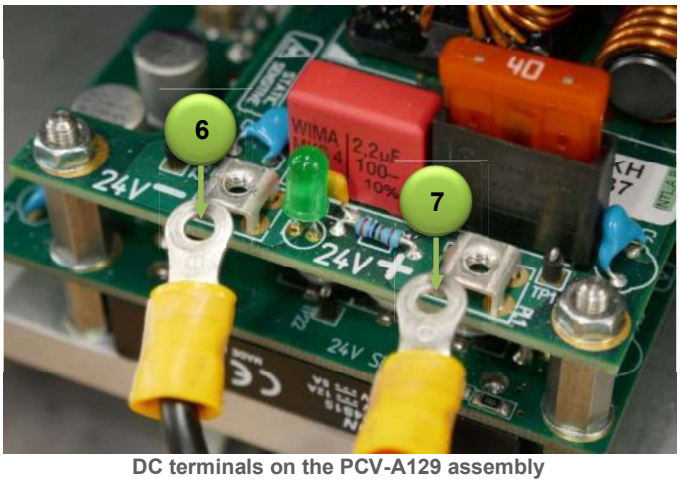
- The connector marked '**5**' must be unclipped from the PCV-A129 chassis. This can be done when the unit is partially withdrawn.
- Ensure you make a note of the location and polarity of all connectors especially the main DC connections '**6**' & '**7**'.



PCV-A129 Power supply assembly
(shown removed for clarity)
The terminal marked 7 is obscured in the image above.

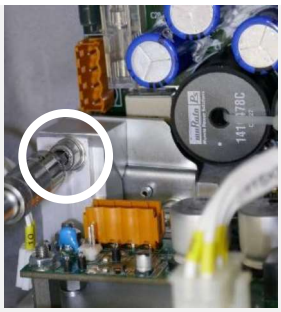


CAE-A429-1 Motor Control PCA
(shown with Power supply removed)

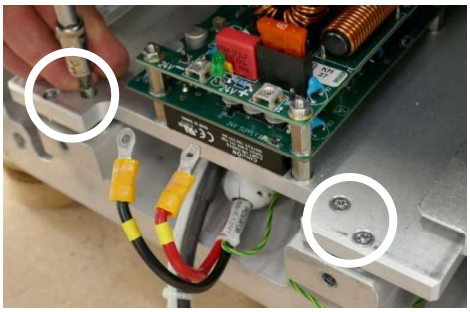


DC terminals on the PCV-A129 assembly

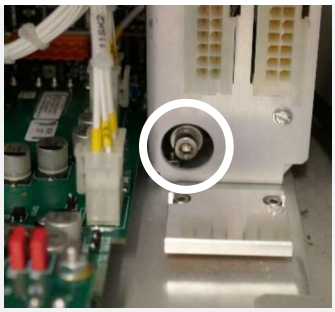
d) Remove or loosen the following fasteners:



Loosen but DO NOT REMOVE the 5mm hex fasteners located at the left hand/ rear of the PSU assembly.



Remove the four x M4 countersunk Philips fasteners. Refer to the *notes below regarding the spacers between the PSU & the chassis.*



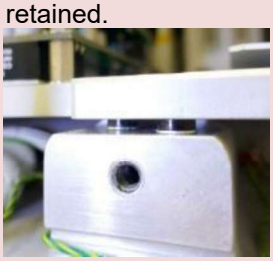
Loosen but DO NOT REMOVE the 5mm hex fasteners located at the right hand/ rear of the PSU assembly.

e) The PCV-A129 Power supply assembly is now loose and can be carefully removed from the chassis.

REMOVAL NOTES

- The base of the main chassis is lined with a heat transfer material. When removing the PSU assembly, ensure the surface is not damaged.

- The front four x M4 countersunk fasteners pass through washers detailed below that must be retained.



THIS COMPLETES THE POWER SUPPLY REMOVAL PROCESS

REPLACEMENT PROCEDURE

a) The PCV-A129 Power Supply is replaced by reversing the removal process.
b) Ensure that the chassis mounted heat transfer material is undamaged and is free from debris and dirt.
c) To prevent damage to the heat transfer material, slide the power supply in at a slight angle. During this process, ensure the main connector (marked '5' in the previous page) is placed firmly back into the chassis.
d) Ensuring that all four washers and spacers are securely in place, replace the four Philips countersunk fasteners at the front of the power supply and tighten to a torque of **2.2Nm**.
e) Tighten the **two x 5mm hex socket fasteners** at the rear of the assembly to a torque of **4.2Nm**. These clamp the power supply assembly to the chassis.
f) Reconnect all connectors as detailed in the removal process.
g) Tighten the DC ring terminals to a torque of **2.2Nm**.
h) Replace the **Transceiver Assembly** as detailed in section **9.4.4**.
i) Replace the **Fan Assembly** and **Outer Cover** as detailed in section **9.4.3**.

THIS COMPLETES THE POWER SUPPLY REPLACEMENT PROCESS

9.4.8 Motor Controller (CAE-A429-1)

OVERVIEW

The following process details the removal and replacement of the Motor Controller PCA which is located at the rear face of the transceiver housing.

PRECAUTIONS AND NOTES

- The CAE-A429-1 LRU spare is a complete assembly that is not designed to be repaired in the field.
- Do not run or apply power to the unit on a test bench.
- Depending on access, it *may* be necessary to remove the DC motor to gain access to one of the fasteners that retains the Motor Control PCA.
- When working on the unit, ensure that heat transfer material on the base of the chassis is protected from damage and dirt.

TOOLS

- Torque wrench (required during refitting).
- 5mm Hex socket fasteners.
- 5mm socket.
- M4 socket *and* open ended spanner.

REMOVAL PROCESS

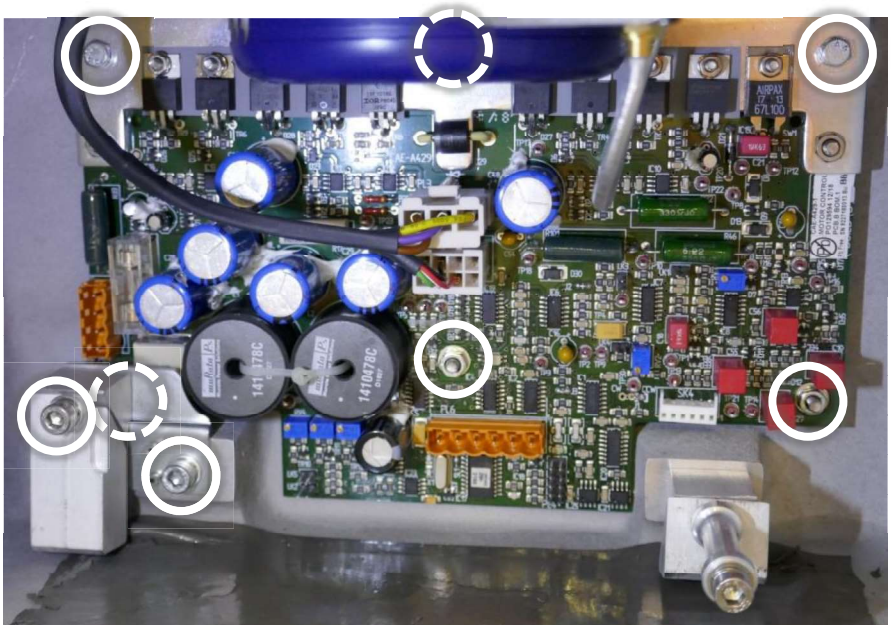
a) Remove the **Fan Assembly** and **Outer Cover** as detailed in section **9.4.3**.
b) Remove the **Transceiver Assembly** as detailed in section **9.4.4**.
c) Remove the **Power Supply Assembly** as detailed in section **9.4.7**
d) Noting the location & polarity, disconnect all remaining connectors from the Motor Control PCA.
e) Referring to the images on the following page, remove the left hand bracket and supporting plate which are retained by **two x 5mm hex socket fasteners**. It is NOT necessary to remove the right hand bracket.
f) Referring to the removal notes below, remove the **M4 fasteners** detailed on the following page that hold the PCA to the rear face of the casing.
g) With all connectors and fasteners removed, the Motor Control PCA can be removed from the casing taking care not to damage the heat transfer material on the base of the chassis.

REMOVAL NOTES

- Access to the middle upper nut on the PCA is severely restricted by the DC motor.
- It may be necessary to remove the motor to gain access as detailed in section **9.4.11**.
- The middle upper nut DOES NOT NEED TO BE FULLY REMOVED as the threaded stud is in a slot (see below). It can be loosened so that the PCA can slide out of the fastener.
- The RF cable may also be carefully removed from the LNFE to improve access.
- Exercise care when using an open ended spanner. Ensure that you do not damage components on the PCB.

Detail of top centre fastener showing its proximity to the DC motor.

Details of the top centre fastener shown with the DC motor removed.



Motor Control PCA shown with the lower brackets and DC motor fitted.

Fasteners that need to be removed are circled.
The two dashed circles indicate obscured fasteners.

Detail of left hand bracket and supporting clamp.

Left hand clamp removed exposing supporting clamp. When the clamp is removed, the PCA fastener is revealed.

REPLACEMENT PROCEDURE

Noting the below, the CAE-A429-1 Motor Control PCA is replaced by reversing the removal process.

a) With the PCA in place, tighten the **M4 fasteners** that retain the PCA to the rear of the casing to a torque of **2.2Nm.**

b) Using the **5mm hex socket fasteners**, replace but **DO NOT TIGHTEN THE LOWER BRACKET.** These MUST be slightly loose for refitting the Power Supply Assembly.

c) Where removed, replace the DC motor as detailed in section **9.4.11**.

d) Where removed, refit the RF coupling and tighten to a torque of **0.9Nm.**

e) Refit all connections ensure that they are securely mated.

f) Replace the **Power Supply Assembly** as detailed in section **9.4.7**.

g) Replace the **Transceiver Assembly** as detailed in section **9.4.4**.

h) Replace the **Fan Assembly** and Outer Cover as detailed in section **9.4.3**.

THIS COMPLETES THE MOTOR CONTROL PCA REPLACEMENT PROCESS

9.4.9 HL/ AZ encoder (PCA-A105)

Please contact HENSOLDT UK for details on the removal and replacement of the HL/ AZ encoder (PCA-A105). Contact details can be found in section 11.

9.4.10 HL/AZ disk (CAE-4005)

Please contact HENSOLDT UK for details on the removal and replacement of the HL/ AZ disk (CAE-4005). Contact details can be found in section 11.

9.4.11 DC Motor (45-850-0001)

OVERVIEW

The following process details the removal and replacement of the DC Motor within the MK5 SharpEye ™.

TOOLS

- 10mm socket with extension bar.
- 10mm and M6 open ended spanners.
- Torque wrench (required during refitting)

REMOVAL PROCESS

a) Remove the **Fan Assembly** and **Outer Cover** as detailed in section **9.4.3**.

b) Remove the **Transceiver Assembly** as detailed in section **9.4.4**.

c) Remove the **Power Supply Assembly** as detailed in section **9.4.7**.

d) Noting the connector positions and orientation, disconnect the two power sockets from the Motor Control PCA.

e) Access to the motor fasteners can be improved by carefully disconnecting the RF coupling from the LNFE.

f) The DC motor is held into the top of the MK5 SharpEye by **four x 10mm sleeve nuts and 'o' rings** (see image below). Initially, it is not possible to engage a socket on the 10mm sleeve nut located on the forward right hand side of the assembly. This will initially need to be loosened with an **open ended spanner**.

g) With all four sleeve nuts removed, the motor is loose and can be removed. It may be necessary to move the motor gently from side to side to remove it.

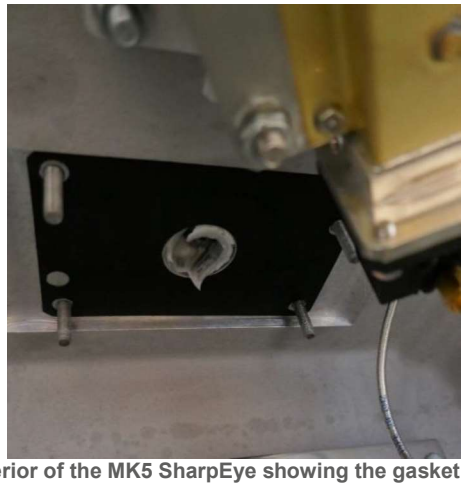
NOTE: Do not hit the motor or try to lever it out.

h) With the motor assembly removed from the casing, the motor can be removed from the metal supporting block by the removing the **four x M6 fasteners**.

Internal view with DC Motor fitted

The four 10mm Sleeve nuts that retain the DC Motor

The DC Motor and supporting block.



Interior of the MK5 SharpEye showing the gasket and the DC Motor removed.

REPLACEMENT PROCESS

Noting the below, the motor is replaced by reversing the removal process.

a) Fix the replacement motor onto the metal supporting block and tighten the **four M6 fasteners** to a torque of **5.6Nm**.

b) Gently replace the motor assembly into the casing and, ensuring the ‘o’ rings are in place, replace the **four M5 10mm sleeve nuts** and tighten to a torque of **4.2Nm**.

REPLACEMENT NOTES:

- Turning the yoke/ antenna can assist in aligning the worm drive into the gearbox.
- When tightening the motor fastenings take care not to damage components on the Motor Control PCA.
- When the motor is fitted, turn the Yoke/ Antenna and ensure that the rotation is smooth and that the motor drive gear has been successfully engaged.

c) If removed, reconnect the RF coupling to the LNFE and tightening to a torque of **0.9nM**.

d) Reconnect the two power connections disconnected during the removal process.

e) Ensure that all cables and components are clear of the main motor housing as this spins when the motor is in operation.

f) Replace the **Power Supply Assembly** as detailed in section **9.4.7**.

g) Replace the **Transceiver Assembly** as detailed in section **9.4.4**.

h) Replace the **Fan Assembly** and Outer Cover as detailed in section **9.4.3**.

EXAMPLE of tightening an RF coupling to 0.9Nm

THIS COMPLETES THE DC MOTOR REPLACEMENT PROCESS

9.4.12 Rotating joint (PCV-A141)

Please contact HENSOLDT UK for details on the removal and replacement of the Rotating Joint (PCV-A141).

Contact details can be found in section 11.

9.4.13 Temperature sensor (PCV-A119)

OVERVIEW

The following process details the removal and replacement of the Temperature Sensor PCBs (**PCV-A119**).

PCV-A119 Temperature Sensor PCB

There are **three (3)** PCBs located on the Transceiver Assembly as detailed below:

TOOLS

- **5.5mm (M3)** spanner/ nut spinner.

REMOVAL PROCESS

a) Remove the **Fan Assembly** and **Outer Cover** as detailed in section **9.4.3**.
b) Remove the **Transceiver Assembly** as detailed in section **9.4.4**.
c) Locate the PCV-A119 to be replaced and disconnect the connector.
d) The PCA is retained by a single **M3 fastener.**
e) With the fastener removed, the PCA can be removed.

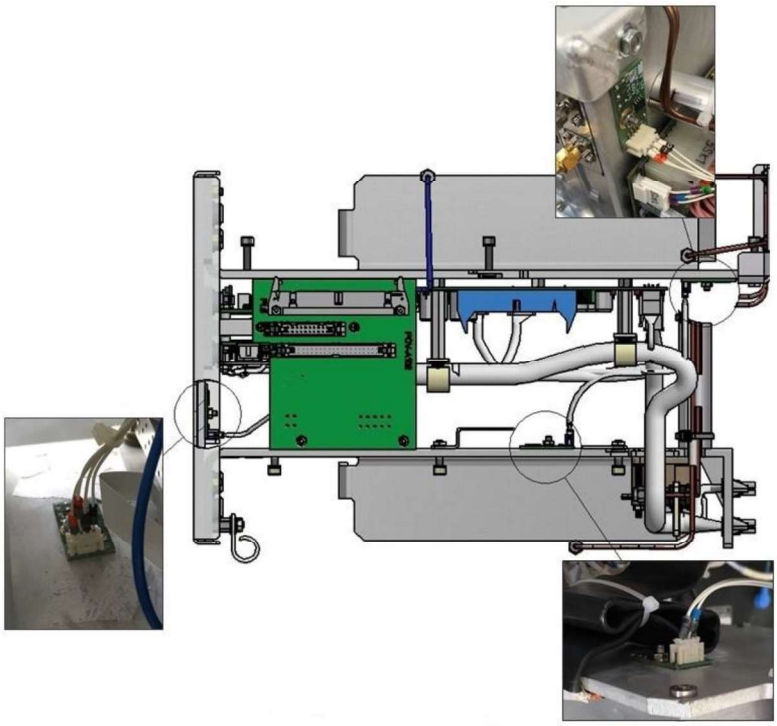


Illustration showing the location of the 3 x PCV-A119 boards.

REPLACEMENT PROCESS

Noting the following, the PCV-A119 is replaced by reversing the removal process.

a) Ensure that the surface below the PCA is clean and clear of dust or debris. The PCA mounts directly onto the metalwork as the non-component side of the board is the temperature sensor.
b) Tighten the **M3 fastener** retaining the PCV-A119 to a torque of **1.0Nm**.
c) Replace the connector.
d) Replace the **Transceiver Assembly** as detailed in section **9.4.4**.
e) Replace the **Fan Assembly** and Outer Cover as detailed in section **9.4.3**.

THIS COMPLETES THE TEMPERATURE SENSOR PCA REPLACEMENT PROCESS

9.4.14 Sync/ Converter assembly (SCV-A110)

OVERVIEW

The following process details the removal and replacement of the SCV-A110 Sync/ Convertor Assembly which is mounted onto the Transceiver Assembly.

PRECAUTIONS AND NOTES

- The SCV-A110 is a factory sealed unit that must not be dismantled.
- The unit is not designed to be repaired in the field and must be returned for evaluation.
- When lifting the SCV-A110, do not lift and handle the unit by the RF couplings (see caution below).

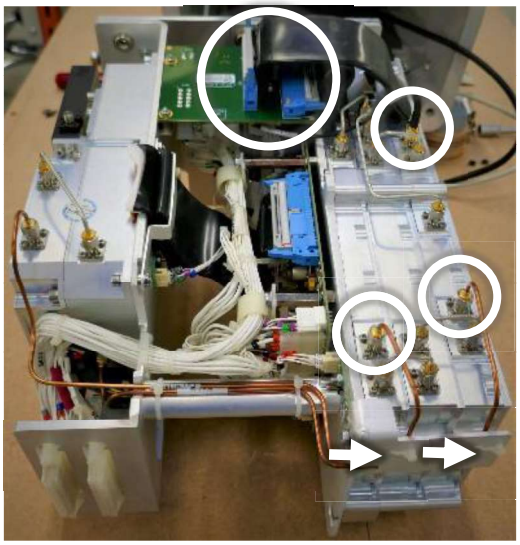
CAUTION: SEMI-RIGID RF CABLE HANDLING PRECAUTIONS

Take care when removing and re-installing the semi rigid RF coaxial cable or when handling equipment that is fitted with these cables. The rigid coaxial cable must not be bent, crushed, deformed or damaged. If the cable is accidently damaged or crushed, it must be replaced.
Damage to the cable can reduce the transceiver performance or in the worst case stop transmission.

TOOLS

- M4 Hex socket key,
- Torque wrench (required during refitting).

REMOVAL PROCESS

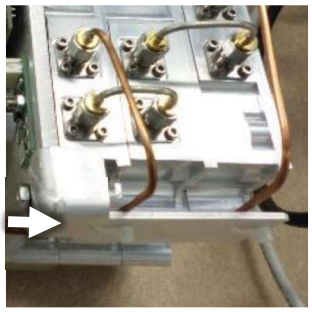


a) Remove the **Fan Assembly** and **Outer Cover** as detailed in section **9.4.3**.
b) Remove the **Transceiver Assembly** as detailed in section **9.4.4**.
c) Disconnect the **three (3) ribbon cables** that connect the SCV-A110 to the main assembly (circled opposite).
d) Disconnect the **three RF couplings** indicated opposite. DO NOT disconnect any of the other RF couplings.
e) Carefully cut the two cable ties indicated opposite that secure the RF coupling to the end bracket.
f) Referring to the drawing on the following page, remove the **six (6) x M4 hex socket fasteners** from the SCV-A100. Note that the fasteners have different lengths and one also retains a bracket as detailed below.

CAUTION: WARRANTY FASTENERS

Do not loosen or remove any other fasteners on the SCV-A110 assembly as this breaks warranty seals and may invalidate the warranty status of the unit.

g) There is a bracket at one end of the SCV-A110 that needs to be removed. This is held in place by one of the main M4 hex socket fasteners and some clear adhesive.
h) Carefully remove the adhesive ensuring that you do not bend or damage the RF couplings.
i) With the bracket and fasteners removed, the SCV-A110 assembly and if stuck to the chassis, the thermal heat transfer pad can be removed.
Where the old heat transfer pad is separated from the SCV-A110 assembly, it should be discarded in line with local waste disposal requirements.
Old thermal pads *must not be re-used*.



Cable tie location

REPLACEMENT PROCESS

Noting the following, the SCV-A110 is replaced by reversing the removal process.

a) Ensure that the replacement heat transfer pad is securely in place and is clean/ free of any contamination/ dirt. The previously used/ old heat transfer pad must NOT be used. **Note**

b) Replace the bracket and tighten the **six (6) x M4 HEX socket fasteners** to a torque of **2.2Nm**.

c) Apply a small amount of adhesive to the bracket to prevent it vibrating.

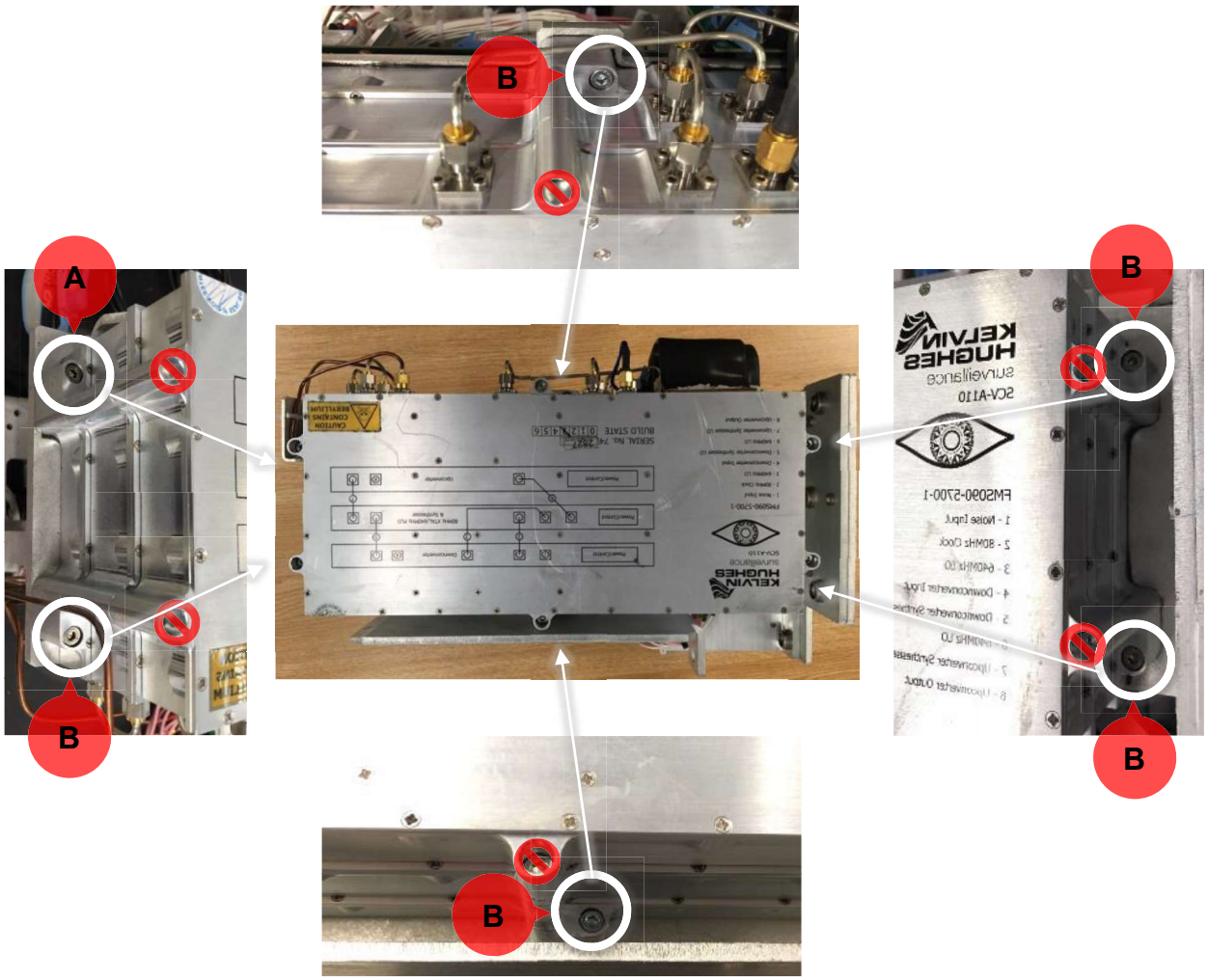
d) Reconnect the three **ribbon cables**.

e) Reconnect the three **RF couplings** tightening to a torque of **0.9Nm**.

f) Replace the **Transceiver Assembly** as detailed in section **9.4.4**.

g) Replace the **Fan Assembly** and Outer Cover as detailed in section **9.4.3**.

EXAMPLE of tightening an RF coupling to 0.9Nm



Location of SCV-A110 mounting fasteners

Fasteners marked A above: M4 x 25mm

Fasteners marked B above: M4 x 20mm

THIS COMPLETES THE SCV-A110 REPLACEMENT PROCESS

Note: The replacement heat transfer pad may be provided as a separate part or be pre-assembled onto the LRU assembly.

9.4.15 HPA-LNA stack assembly (SCV-A111)

OVERVIEW

The following process details the removal and replacement of the SCV-A111 HPA-LNA stack Assembly which is mounted on the Transceiver Assembly.

PRECAUTIONS AND NOTES

- The SCV-A111 is a factory sealed unit that must not be dismantled.
- The unit is not designed to be repaired in the field and must be returned for evaluation.
- When lifting the SCV-A111, do not lift and handle the unit by the RF couplings (see the Caution below).

CAUTION: SEMI-RIGID RF CABLE HANDLING PRECAUTIONS

Take care when removing and re-installing the semi rigid RF coaxial cable or when handling equipment that is fitted with these cables. The rigid coaxial cable must not be bent, crushed, deformed or damaged. If the cable is accidently damaged or crushed, it must be replaced.
Damage to the cable can reduce the transceiver performance or in the worst case stop transmission.

TOOLS

- M4 Hex socket key,
- Torque wrench (required during refitting).

REMOVAL PROCESS

a) Remove the **Fan Assembly** and **Outer Cover** as detailed in section **9.4.3**.

b) Remove the **Transceiver Assembly** as detailed in section **9.4.4**.

c) From the main Transceiver Assembly, disconnect the two **ribbon cables** circled in the images on the following page that connect the SCV-A111 to the main assembly.

Note: To top ribbon cable is held in place by a clamp that is removed later in the procedure.

d) Disconnect the two RF couplings circled in the images on the following page.

e) Referring to the drawing on the following page and noting the different bolt lengths, remove the **six (6) x M4 HEX socket fasteners**.

f) Two of the fasteners retain the unit to the chassis but also support the bracket for the ribbon cable. These are fitted with nuts and washers.

CAUTION: WARRANTY FASTENERS

Do not loosen or remove any other fasteners on the SCV-A111 assembly as this breaks warranty seals and may invalidate the warranty status of the unit.

g) With the interconnections disconnected and the fasteners removed, the SCV-A111 can be removed from the transceiver assembly and if stuck to the chassis, the thermal heat transfer pad can be removed.
Where the old heat transfer pad is separated from the SCV-A110 assembly, it should be discarded in line with local waste disposal requirements. Old thermal pads must not be re-used.

REPLACEMENT PROCESS

Noting the following, the SCV-A111 is replaced by reversing the removal process.

a) Ensure that the heat transfer pad is securely in place and is clean/ free of any contamination/ dirt. The previously used/ old heat transfer pad must NOT be used. **Note**

b) Noting the different bolt lengths shown of the following page, replace the ribbon cable support clamp and tighten the **six (6) x M4 Hex socket fasteners** to a torque of **2.2Nm**.

c) Reconnect the **two ribbon cables**.

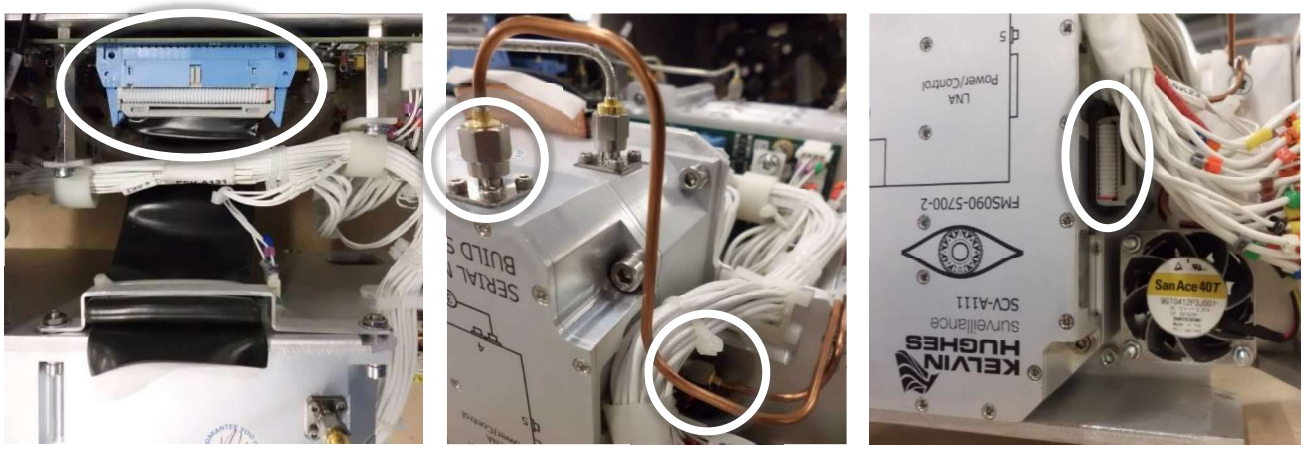
d) Reconnect the **two RF couplings** tightening to a torque of **0.9Nm**.

e) Replace the **Transceiver Assembly** as detailed in section **9.4.4**.

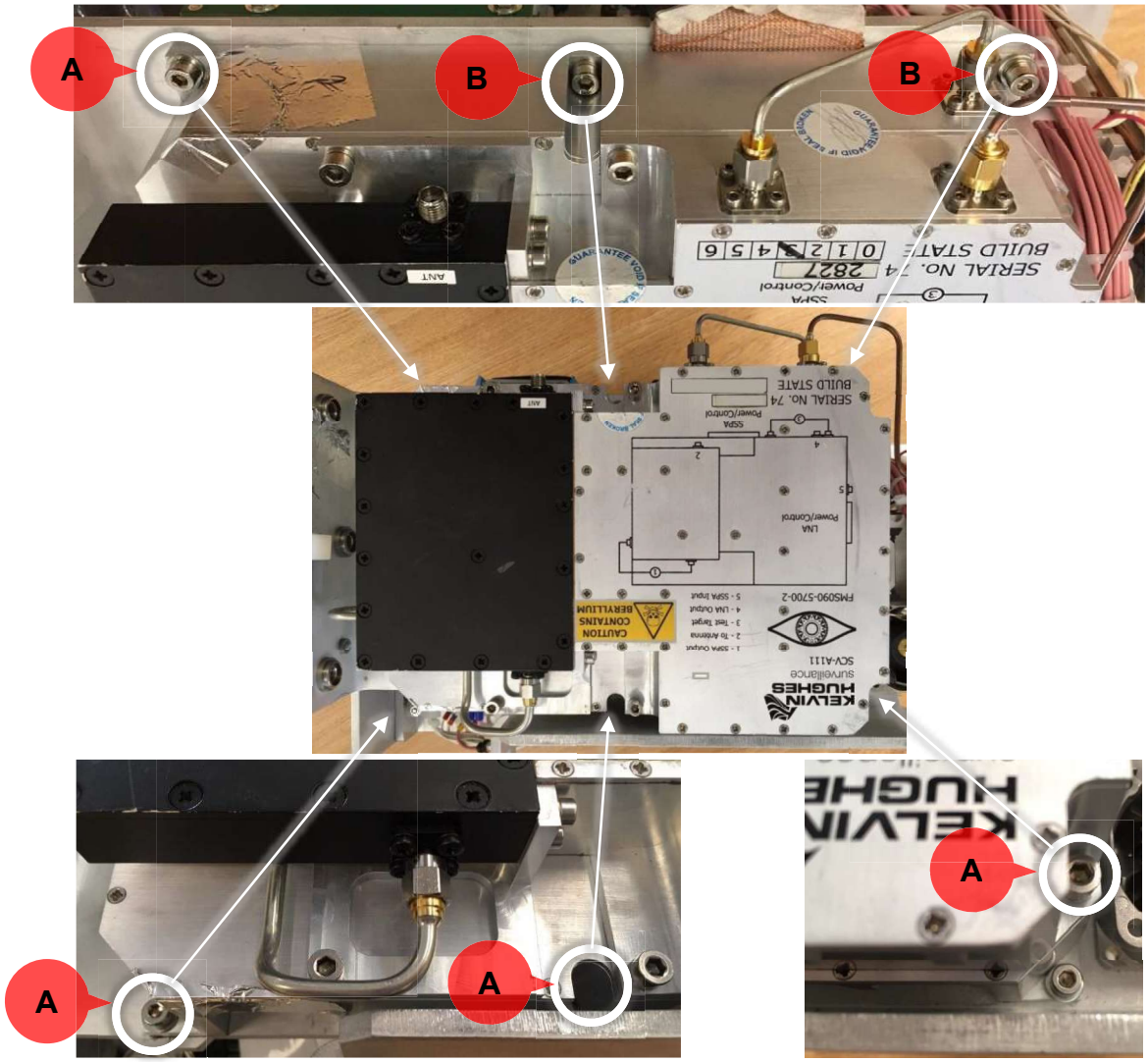
f) Replace the **Fan Assembly** and Outer Cover as detailed in section **9.4.3**.

EXAMPLE of tightening an RF coupling to 0.9Nm

Note: The replacement heat transfer pad may be provided as a separate part or be pre-assembled onto the LRU assembly.



SCV-A111 connector locations



Location of SCV-A111 mounting fasteners

Fasteners marked A above: M4 x 16mm.
Fasteners marked B above: M4 x 12mm.

THIS COMPLETES THE SCV-A111 REPLACEMENT PROCESS

10 Specifications & abbreviations

This section contains specification relevant to the installation and operation of the Mk5 SharpEye™. Please contact HENSOLDT UK where a full specification is required.

10.1 Weight/ Colour

	MK5 SharpEye™ fitted with 1.3m antenna	MK5 SharpEye™ fitted with 1.9m antenna	LPA-A13 1.3m antenna	LPA-A19 1.9m antenna	PCV-A2 (optional) AC/ DC PSU
WEIGHT:	≤45kg	≤47kg	6kg	8kg	7kg
COLOUR:	White (RAL 9003) or Grey (RAL 7001). Refer to section 3.2 for colour variant part numbers				

Note: All weights are approximate

10.2 Environmental

EMC:	EN60945:2002		
VIBRATION:	EN60945:2002		
SHOCK:	IEC 62388		
IP RATING:	IPx6		
THERMAL:	**Mk5 SharpEye**	**FUNCTIONAL:**	-25°C to +55°C
		STORAGE:	-40°C to +70°C
	LPA-A13 & LPA-A19	**FUNCTIONAL & STORAGE:**	-40°C to +70°C

10.3 DC Supply

DC INPUT:	Nominal recommended operation **+24VDC** (19VDC to 32VDC). Note 1		
	WARNING: MAXIMUM SUPPLY VOLTAGE		
	Connecting this product to an input voltage that is greater than the specified maximum rating may cause permanent damage to the unit.		
CABLE:	**DC CABLE LENGTH** Note 2 • The MAXIMUM CABLE LENGTH between the optional PCV-A2 and the Mk5 SharpEye™ transceiver is 15m (see note below). • Cables are available in lengths of 5, 10 or 15 metres.		
POWER:	≤300W	**BREAKER/ FUSE RATING:**	32A

NOTE 1: **DC SUPPLY:** DC supply voltages as measured at Mk5 SharpEye™ connector under load conditions.

NOTE 2: **DC CABLE >15m:** Please contact HENSOLDT UK where longer DC cable lengths are required. Where additional cabling is required, the cable must be of a sufficient gauge to ensure that the minimum voltage required by the Mk5 SharpEye™ is maintained under the worst case load conditions and never causes the DC supply measured at the transceiver to fall below +24VDC. For cable runs longer than 15m, HENSOLDT UK recommend a DC supply of at least +28VDC and/ or a cable and a DC supply that supports sensing lines.

10.4 AC/DC supply (optional PCV-A2)

AC INPUT:	115/230V nominal ±10%, overall range 90 to 264VAC
BREAKER/ FUSE RATING:	32A

10.5 Transceiver

ROTATION RATE:	Up to 44RPM nominal (Multiple antenna rotation speeds are typically available)			
FREQUENCY:	9.2 – 9.5 GHz			
NUMBER OF FREQUENCY CHANNELS:	**Channel**	**Centre frequency**	**Channel**	**Centre frequency**
	A	9.22 GHz +/- 10 MHz	**H**	9.36 GHz +/- 10 MHz
	B	9.24 GHz +/- 10 MHz	**I**	9.38 GHz +/- 10 MHz
	C	9.26 GHz +/- 10 MHz	**J**	9.40 GHz +/- 10 MHz
	D	9.28 GHz +/- 10 MHz	**K**	9.42 GHz +/- 10 MHz
	E	9.30 GHz +/- 10 MHz	**L**	9.44 GHz +/- 10 MHz
	F	9.32 GHz +/- 10 MHz	**M**	9.46 GHz +/- 10 MHz
	G	9.34 GHz +/- 10 MHz	**N**	9.48 GHz +/- 10 MHz
WARM UP TIME:	On detection of a master display, the unit will “wake up” from standby and be ready for transmission within 5 seconds. Due to the solid state nature of the unit, no warm-up time is required. From initial power up the MK5 SharpEye™ will boot up within 30 seconds.			
BLANKING/ MUTE:	Three blanking and one transmission sector can be configured during commissioning.			
INTERNAL MONITORING:	A continuous built in test mechanism monitors and reports the status of RF power, VSWR, transmitter temperature, communication and receiver sensitivity. Additional protection mechanisms avoid further hardware damage in the event of a fault.			

10.6 Abbreviations

ACH	Anti-Condensation Heater(s)
ACP	Azimuth Count Pulse
AIS	Automatic Identity System
ARPA	Automatic Radar Plotting Aid
AZ	Azimuth
BITE/ BIT	Built in Test Equipment/ Built in Test
EMC	Electromagnetic compatibility
ESD	Electrostatic Discharge
GPS	Global Positioning System
GNSS	Global Navigation Satellite System
HL	Heading Line
HLS	Heading Line Skew
IPL	Illustrated Parts List
LAN	Local Area Network
LNFE	Low Noise Front End
LPA	Low Profile Antenna
LRU	Line Replacement Unit
MOD	Modification
MTU	Maximum Transmission Unit
NM	Nautical Miles
Nm	Newton Metres

NOM	Nominal/ Nominally
PC	Personal Computer
PCA/ PCB	Printed Circuit Assembly/ Board
PCV	Patrol Craft Variant
PLO	Phase Locked Oscillator
PPE	Personal protective Equipment
PSU	Power Supply Unit
RADHAZ	Radiation Hazard
RF	Radio Frequency
RoHS	Restriction of Hazardous Substances
RPM	Revolutions per minute
SAC	System Area Code
SIC	System Identification Code
SOLAS	Safety Of Life At Sea
TM	Trade Mark
UPS	Uninterruptable Power Supply
UV	Ultra Violet
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio

11 Contact Details

HENSOLDT UK

Unit 4, Voltage
6 Mollison Avenue
Enfield
EN3 7XQ
UNITED KINGDOM

MAIN SWITCHBOARD

Phone: +44 (0)1992 805 200
Fax: +44 (0) 1992 805 310

INTERNET

www.uk.hensoldt.net

TECHNICAL ADVICE

Phone: +44 (0)1992 805 200
Email: surveillance.tech@hensoldt.net

SERVICE & SPARES

Phone: +44 (0)1992 805 200
Email: surveillance.support@hensoldt.net

HENSOLDT UK
Unit 4, Voltage
6 Mollison Avenue
Enfield
EN3 7XQ
UNITED KINGDOM

HENSOLDT UK is a trading name of
Kelvin Hughes Limited
Registered Office: Voltage, 6 Mollison Avenue
Enfield EN3 7XQ, UK
Incorporated in England No. 01030135