



# **SBS-800 SERIES SHORE BASED RADAR SYSTEMS OPERATOR & PLANNED MAINTENANCE HANDBOOK**

**FIBRE SHARPEYE™ TRANSCEIVER SYSTEMS**

**KH-1601-2  
Issue 6**

***Detect and Protect.***

**KELVIN HUGHES**  
*A Hensoldt Company.*

**DOCUMENT HISTORY**

Issue number	Release date	Details
1	April 2013	<ul style="list-style-type: none"> <li>• First release</li> </ul>
2	October 2015	<ul style="list-style-type: none"> <li>• Updates to the handbook layout</li> <li>• General corrections</li> <li>• Addition of data for the SBS-800-3 system</li> </ul>
3	November 2016	<ul style="list-style-type: none"> <li>• Handbook format revised.</li> <li>• X-Band SharpEye™ details updated from GaAs to GaN.</li> <li>• S-Band fibre SharpEye™ details added.</li> </ul>
4	February 2017	<ul style="list-style-type: none"> <li>• RadHaz figures updated (see health &amp; safety section).</li> </ul>
5	July 2018	<ul style="list-style-type: none"> <li>• SBS-800-51 updated</li> <li>• Updates to inverter maintenance section</li> <li>• Updates to RDU menus</li> <li>• Updated KH branding.</li> </ul>
6	<b>March 2020</b>	<ul style="list-style-type: none"> <li>• <b>Health and Safety Warnings Updated</b></li> </ul>



This document is not contractual. Subject to change without notice.  
 Copyright © 2020 KELVIN HUGHES.  
 KELVIN HUGHES, its logo and the product names are registered Trademarks. All rights reserved.

When planning any aspect of the installation, commissioning, operation, maintenance or risk analysis (RADHAZ) of the system(s) described in this handbook, it is the responsibility of the individual carrying out the required task to ensure they are working from the latest issue/ revision of the relevant system(s) handbooks.

No parts of this publication may be reproduced, transmitted, transcribed, translated or stored in any form or by any means without the written permission of HENSOLDT UK Limited.

Where this document is translated or any translations that are included within this publication, the original English version of this document will remain the definitive document and should be referred to in any situation of doubt, confusion or conflict.

Specifications are subject to change without notice.

Printed copies of this document are unmaintained.

This publication supersedes all previous versions.

<b>1</b>	<b>Contents</b>	<b>3</b>
<b>1</b>	<b>Contents</b>	<b>3</b>
<b>2</b>	<b>Health and Safety Warnings</b>	<b>5</b>
2.1	English Health and Safety Warnings	5
2.2	Recommandations sanitaires et de sécurité	11
<b>3</b>	<b>Overview</b>	<b>17</b>
3.1	Unit Identification	17
3.2	Additional Documentation	17
3.3	Analogue & GaAs SharpEye™ Systems	18
3.4	RDU SBS-A4-3-* MOD STATE 0	18
3.5	Typical Systems	20
3.5.1	SBS-800-1/SBS-800-2	20
3.5.2	SBS-800-3	23
3.5.3	SBS-800-51	25
<b>4</b>	<b>Switch ON, OFF &amp; Emergency Stop</b>	<b>27</b>
4.1	ANTENNA ROTATION WARNING	27
4.2	Switch ON	28
4.3	Switch OFF	29
4.4	EMERGENCY ANTENNA STOP	30
4.5	System Isolation	31
<b>5</b>	<b>Anti-Condensation Heater (ACH)</b>	<b>33</b>
<b>6</b>	<b>Operation Overview</b>	<b>35</b>
6.1	Local/Remote Control States	35
6.2	Switching from Local to Remote Control	36
6.3	Safety & Security Switches	36
6.4	Transceiver Operational States	37
6.5	Performance Monitoring	38
6.6	Loss of Control Signal	38
<b>7</b>	<b>Local Control</b>	<b>39</b>
7.1	Local Control Overview	39
7.1.1	RDU Local Controls	39
7.1.2	Remote/Local Switch	40
7.1.3	LCD Panel Operation	41
7.1.4	LCD Display Button Functions	41
7.1.5	Alarms	42
7.2	Menus	43
7.2.1	Navigating Within Menus	43
7.2.2	Menus Overview	45
7.2.3	STATUS Menu	46
7.2.4	CONTROL Menu	53
7.2.5	SETUP/DEFAULT Menus	57
<b>8</b>	<b>Remote Control</b>	<b>59</b>
8.1	Remote Control Operator Instructions	59
8.2	Switch ON, OFF & EMERGENCY STOP	59

SBS-800 Series Operator & Planned Maintenance Handbook  
**Chapter 1: Contents**

8.3	External Commands.....	59
<b>9</b>	<b>Planned Maintenance .....</b>	<b>61</b>
9.1	Overview and Safety Notices .....	61
9.2	Annual Maintenance .....	62
9.3	10-year Maintenance .....	69
9.4	Earth Bonding Maintenance.....	70
<b>10</b>	<b>Contact Details .....</b>	<b>71</b>
<b>11</b>	<b>Abbreviations .....</b>	<b>73</b>
<b>12</b>	<b>Index .....</b>	<b>75</b>

## 2 Health and Safety Warnings

### 2.1 English Health and Safety Warnings

#### FCC NOTICES

##### IC RSS-GEN, Sec 8.4 Warning Statement- (Required for license-exempt devices)

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

##### IC RSS-GEN, Sec 8.3 Warning Statement-

This radio transmitter (identify the device by certification number, or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

When working on Kelvin Hughes equipment, operators, engineers and agents are expected to work within the health and safety guidelines noted in the handbook, as issued by their respective employer or as stated by site regulations, shipyard or vessel owner.

Risk assessments of a working area must be undertaken prior to commencement of any work and must be regularly reviewed.

#### HAZARDS

All Kelvin Hughes designed equipment is constructed so that access to high voltages may only be gained after having used a tool, such as a spanner or screwdriver. Warning labels are prominently displayed both within the equipment and on protective covers.

All Kelvin Hughes designed equipment is designed to meet the requirements of EN 60215, "Safety Requirements of Radio Transmitting Equipment".

#### WARNING: ELECTRICAL HAZARDS

##### SOME EQUIPMENT DOES NOT HAVE SAFETY INTERLOCKS FITTED.

Lethal single and three phase AC and DC voltages may be present when units are open and exposed. Before accessing any internal parts, ALL power sources to the equipment must be fully isolated; this must include the isolation of all UPS supported supplies to the system.

#### WARNING: MAINS VOLTAGES

All Kelvin Hughes equipment is supplied with mains input voltage set for 220v, 50/60 Hz ac unless otherwise stated on labels attached to the equipment.

#### WARNING: RESIDUAL VOLTAGES

Residual voltages may be present on large capacitors within the unit. When accessing the internal parts of the system, fully isolate all sources of power before removing the service access panels. This will allow time for the voltages to discharge whilst the panel is removed.

#### CAUTION: HOUSING TEMPERATURE

This unit will become hot during normal operation. When the system has been operating in strong sunlight or elevated temperatures, the transceiver, unit housing and antenna surfaces will be extremely hot.

#### CAUTION: COMBUSTIBILITY WARNING

Some equipment contains materials which may produce toxic fumes if burnt.

#### WARNING: BERYLLIUM

The SharpEye™ X and S Band transceivers are factory sealed units which contain no field serviceable parts. The SharpEye™ transceivers *must not* be dismantled in the field as some components within the factory sealed processor contain Beryllium which is hazardous to health.

#### CLASS 1 LASER PRODUCT

There is a class 1 laser within the sealed SharpEye™ transceiver processor which can represent a risk if the processor is dismantled. When fitted, the LAN fibre optic cable that connects the SharpEye™ transceiver to the Radar Distribution Unit is considered as a class 1 laser.

#### ANTENNA ROTATION

##### WARNING

When single phase AC and the Antenna Motor AC supply is connected to the system and switched ON, the antenna will rotate immediately regardless of the RUN command status.

Use the antenna rotation keyswitch or man aloft safety switches to stop antenna rotation in an emergency. Refer to the maintenance section of the operator's handbook for details on stopping the antenna and isolating a system.

SBS-800 Series Operator & Planned Maintenance Handbook  
**Chapter 2: Health and Safety Warnings**

**RADIATION HAZARDS**

**WARNING: RADIATION HAZARD- NON-IONISING**

Avoid exposure to the main beam of a stationary radar antenna.  
Avoid standing closer than 2 metres from the central front face of the antenna.  
Users of cardiac pacemakers should be aware of the possibility that radio frequency transmissions can damage some devices or cause irregularities in their operation. Anyone using such devices should understand the risks present before exposure.

**WARNING: RF LEAKAGE**

Radiation risks are greater from an unterminated, leaky or damaged waveguide. Ensure the system is not transmitting and is fully isolated from all sources of AC power prior to gaining access to the transceiver platform or before working on any part of the system.

**MICROWAVE RADIATION LEVELS**

The antenna safe distance for all SBS-800 systems is close to the antenna turning circle, although KH do not recommend any personnel to be in close proximity to a rotating antenna due to not only the RF exposure but also the high risk of injury that can be caused by a rotating antenna.

The range at which specified RF exposure limits can be exceeded is far greater for a non-rotating antenna. For that reason, RF transmission without antenna rotation is not a permitted operational mode for this equipment: The system includes interlocks to prevent this occurring.

The basic restriction level for the operating frequency of this product, as set out in 1999/519/EC (Annex III Table 2) and calculated in accordance with EN50385:2002. For normal operation, averaged over a six minute period, the EU basic restriction level for public exposure is only exceeded within range limits of the antenna centre as shown in the table below:

SBS-800 Antenna	Antenna State	Range limit 10W/m <sup>2</sup>	Range limit 50W/m <sup>2</sup>
<b>800-1</b> <b>X-Band 3.7m antenna</b>	Rotating	1.8m	0.8m
	Non-rotating	9.8m	1.8m
<b>800-2</b> <b>X-Band 5.5m antenna</b>	Rotating	1.8m	0.8m
	Non-rotating	6.3m	1.1m
<b>800-3 (FD)</b> <b>X-Band 5.5m antenna</b>	Rotating	1.8m	0.8m
	Non-rotating	6.3m	1.1m
<b>800-51</b> <b>S-Band 3.9m antenna</b>	Rotating	1.3m	0.6m
	Non-rotating	4.1m	0.4m

Two field strength thresholds are considered relevant to the current legislation. The 10W/m<sup>2</sup> limit is the reference level for general public exposure – Council Recommendation 1999/519/EC Annex III Table 2. The 50W/m<sup>2</sup> limit is the occupational limit recommended in the ICNIRP guidelines published in 1998 and 2009. Different countries or regions may use different levels, so it is the responsibility of the system integrator and the system administrators to ensure that applicable limits are identified and that the equipment installation recognises and mitigates against the non-ionising radiation risks associated with the installation and operational use of radars.

In all SharpEye™ systems, the fault condition following the loss of Heading Line and Azimuth data (e.g. the antenna has stopped rotating) is recognised to trigger the transceiver OFF condition within a few seconds. During essential update of the SharpEye™, the Kelvin Hughes Engineer must ensure that Transmission is disabled.

SBS-800 Series Operator & Planned Maintenance Handbook  
**Chapter 2: Health and Safety Warnings**

**WORKING ALOFT**

**CAUTION: SAFETY ALOFT**

When working aloft or near any radar scanners, moving or RF radiating equipment, ALL power sources to the platform and equipment including Anti-Condensation Heater (ACH) supplies must be fully isolated.  
 Prior to working aloft, all AC supply breakers to the system must be switched OFF and locked. Ensure someone in authority or at ground level knows of your intentions and ensure that suitable clear warnings are in place.  
 Ensure all means of access aloft are secure and beware of wet or slippery ladder rungs and working areas.  
 All working at height health and safety requirements and procedures, including the inspection and use of personal protective equipment (PPE) such as approved safety harnesses and gloves, must be adhered to at all times as required by your employer, site regulations, shipyard and/or vessel.

**CAUTION: SAFETY CORDON**

When working aloft, a safety cordon must be established and managed below the working area(s).

**CAUTION: DROP HAZARDS**

When working aloft, all tools, Line Replacement Units (LRUs) and any loose items must be safely stowed or secured so that they cannot present a drop hazard.

**CAUTION: WEATHER CONDITIONS**

When weather conditions are poor, a full risk assessment must be carried prior to working aloft as defined by an individual's employer or shipbourne safety procedures.  
 Poor weather conditions can include but are not restricted to high winds, heavy rain, snow, ice or if access is required at sea, risk of vessel pitch and roll.

**MAN ALOFT SWITCH/ANTENNA ISOLATION.**

Antenna rotation and transmission can be inhibited via a Man Aloft Switch (MAS) or an '*Antenna OFF/Free*' keyswitch. These mechanisms can be used by a person who sees a potential hazard such as a loose halyard and decides to protect the antenna. When activated, the reason for loss of turning is detected by the system and is reported to the local and remote users.

**SAFETY SWITCHES**

<b>Antenna Rotation keyswitch</b>	<p>The <i>Antenna Rotation</i> keyswitch is located on the door of the internally mounted Radar Distribution Unit (RDU)</p> <p>The key for the RDU keyswitch is captive when set to Free (enable rotation) but can be removed when the keyswitch is to OFF.</p> <p>When in the OFF position all AC power to the antenna and transceiver is isolated thus stopping antenna rotation and transmission.</p> <p>The key should be removed and retained by the person who intends to enter the potentially hazardous volume of the rotating antenna.</p>
<b>Man aloft switch (MAS)</b>	<p>The man aloft switch (MAS) is designed to be installed such that it is still viewable for the person who is carrying out maintenance tasks.</p> <p>When set to the '<i>OFF</i>' position the transceiver/gearbox is isolated from all AC power thus stopping the antenna rotation and transmission.</p>

The Man Aloft switch, Motor ON/OFF and Antenna Rotation keyswitch form part of a safety current loop. This safety loop is purely hardware (no software), when the current loop is opened, AC mains supplies to the transceivers and antenna inverter are switch OFF by use of contactors.

Kelvin Hughes recommends that the key switches noted above are used in conjunction with the man aloft switch but also recommend that radar users carry out a safety assessment and risk mitigation procedure in terms of interlocks *prior to approving any work on the equipment.*

Full details on isolating the systems from the AC supplies can be found in Section 4.5 of this handbook.

## SBS-800 Series Operator & Planned Maintenance Handbook

### Chapter 2: Health and Safety Warnings

#### ANTI-STATIC HANDLING

##### HANDLING OF ELECTROSTATIC-SENSITIVE SEMICONDUCTOR DEVICES

Certain semiconductor devices used in the equipment are liable to damage due to static voltage. Observe the following precautions when handling these devices in their un-terminated state, or sub-units containing these devices:

Persons removing sub-units from equipment containing these devices must be earthed by a wrist strap and a resistor at the labelled point provided on/within the equipment.

- Soldering irons used during authorised repair operations must be low voltage types with earthed tips and isolated from the mains voltage by a double insulated transformer.
- Outer clothing worn must be unable to generate static charges.
- Printed circuit boards fitted with these devices must be stored and transported in anti-static containers.
- Fit new devices in a special antistatic safe handling area.

Fully isolate and mechanically disconnect all sources of AC before attaching ESD protective wrist straps to the various points in the system.

#### RoHS STATEMENT

For details on RoHS statements please contact Kelvin Hughes; contact details can be found in at the end of this handbook.

#### END OF LIFE DISPOSAL

When the equipment detailed in this handbook has reached the end of its serviceable life, the various parts that make up the system must be disposed of in accordance with local industrial waste disposal regulations.

Please contact your local regulatory body for disposal instructions or contact Kelvin Hughes for a list of any potentially hazardous material contained within the system.

**SharpEye™ specific disposal notice:** The SharpEye™ transceiver(s) located within the turning unit/gearbox are factory sealed units that contains no field serviceable parts or lifed components. Components within the SharpEye™ processor (all variants) contain traces of **beryllium** and **trivalent chromium**. Please contact Kelvin Hughes regarding the repair of a SharpEye™ or its end of life disposal instructions. Contact details for Kelvin Hughes can be found at the end of this handbook.

#### GROUNDING/EARTH POINTS

All parts of the system must be fully and correctly connected to a proven earth point prior to connecting any source of AC power.

#### WARNING

#### DO NOT OPERATE WITH EARTH DISCONNECTED

The system must NOT be operated or have AC power switched ON with any earth/grounding points disconnected

**Connection point:** All Kelvin Hughes equipment is fitted with a single protective earth connection point which is indicated on the mechanical installation drawings.

**Conductivity tests:** During installation and maintenance, the earth connections must be tested for conductivity using a high current impedance meter such as a Megger or similar.

**Wrist Straps:** Fully isolate and mechanically disconnect all sources of AC before attaching ESD protective wrist straps to the various points in the system.

#### SERVICING AND REPAIR

#### CAUTION: LIFTING SPARES

Where spare parts are required for equipment located on a platform or access is via a ladder, heavy items must be lifted to the platform using a suitably rated lifting bag or lifting strop.

Heavy items must not be manually carried up ladders as they can present a drop hazard.

Service and equipment repair must only be undertaken by Kelvin Hughes or a Kelvin Hughes authorised service agent/engineer. Un-authorised repair or servicing of equipment during the warranty period may invalidate the warranty status of the equipment.



## SBS-800 Series Operator & Planned Maintenance Handbook

### Chapter 2: Health and Safety Warnings

#### SOFTWARE LICENSING

Only approved software may be used on Kelvin Hughes equipment. The use of unapproved or unlicensed software on any Kelvin Hughes equipment is strictly prohibited. The use of such software voids the warranty status of the unit.

Any Kelvin Hughes designed software supplied whether pre-installed, supplied on CD/DVD or other removable media, is the copyright of Kelvin Hughes Ltd, which will not accept any responsibility for any damage or loss caused in whatever way by the use or misuse of the software. This copyright applies to software that can be supplied in various formats including but not restricted to CD, DVD, USB memory device, email or obtained via the Kelvin Hughes agents download area.

Software supplied with Kelvin Hughes equipment may not be resold or re-distributed without the express permission of Kelvin Hughes Ltd.

3<sup>rd</sup> party software supplied with the system such as the RadarView program remains the copyright of the original manufacturer. See the manufactures documentation for copyright information.

#### VIRUS PRECAUTIONS

Many systems supplied by Kelvin Hughes Ltd including the optional Service Displays are now PC based and it should be noted that such systems do not have anti-virus protection installed. It is the responsibility of installation engineers, service engineers, maintainers and system users to ensure that virus threats are not transferred to the system via removable media.

#### WARNING: ANTIVIRUS WARNING

Prior to use, all removable media used on or in Kelvin Hughes products **MUST** be fully scanned for viruses on a PC installed with up to date anti-virus software. Any media containing potential virus infections must not be used.

Charges relating to systems found to be infected with a virus will be passed onto the company found to be using removable media that has not been suitably scanned.

Note: Kelvin Hughes cannot be held responsible for damage caused to systems by virus infections.

Removable media referred to includes but is not restricted to USB memory sticks, USB hard drives, floppy discs, CD/DVD's and all forms of removable media.

#### LIFTING EQUIPMENT:

#### WARNING

The turning unit/Gearbox and antennas are heavy items and must be hoisted to the fixing position using suitable lifting equipment, a secured block and tackle or by rope strops.

#### CAUTION

During installation, the equipment being lifted must be secured and supported at all times to prevent any risk of falling or slipping.

- All health and safety requirements must be checked and observed at all times when lifting any equipment. All appropriate personal protective equipment (PPE) must be worn.
- Where special equipment such as cranes hoists and jigs is required, consideration must be given to the authority to use such equipment.
- During lifting, a safety zone shall be established beneath the lifting area around any cranes or platforms. Safety personnel must ensure that persons do not encroach on the area of work.
- Consult with the lifting operator to obtain the best and safest method of securing lifting strops or ropes to the equipment and advise lifting operators of the areas of a system that are susceptible to damage such as antenna fascia's, swing castings etc.
- Check that the centre of gravity of the equipment cannot cause the lifting strops or ropes to slip or move.
- All straps, lifting cables or ropes must be thoroughly checked to ensure that there is no risk of the unit slipping or falling from the lifting strap or lifting equipment.
- Gearboxes must never be lifted by the antenna or swing casting.
- If lifting a gearbox with the antenna pre-assembled, the lifting equipment, ropes or straps must not place any pressure on any part of the antenna or the swing casting.
- Kelvin Hughes cannot be held responsible for any damage that occurs to supplied or 3<sup>rd</sup> party equipment as a result of incorrect lifting procedures or handling or equipment.

SBS-800 Series Operator & Planned Maintenance Handbook  
**Chapter 2: Health and Safety Warnings**

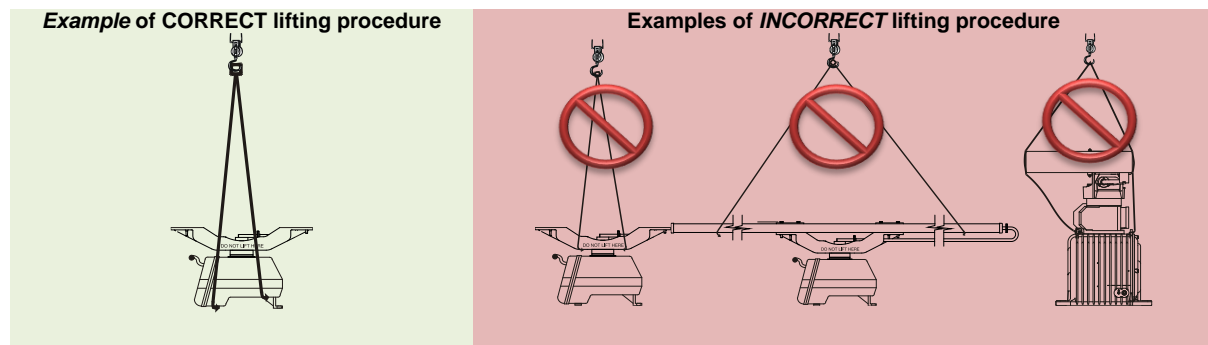
**ANTENNA LIFTING**

- Care should be taken when unpacking or lifting antennas to ensure that the waveguide is not bent, crushed or damaged during handling.
- Support the antenna near the ends when lifting it out of the packing and when fitting into position on the turning mechanism.
- Do not lift, handle or support the antenna by the waveguide.
- When rotating an installed antenna by hand, do not apply excessive force.
- The antenna and antenna fascia must never be painted or have non-approved labels attached.

**CAUTION**

During installation, the antenna must be secured and supported at all times to prevent any risk of falling or slipping. Antennas must never be left unsupported on the swing casting.

**CORRECT & INCORRECT LIFTING PROCEDURES**



**Illustration note:** The above drawings are shown for reference use only and may not represent the actual equipment supplied as part of an SBS series.

**CAUTION**

Equipment should only be installed and operated when all welding, grinding, sanding etc. within the installation area has been completed. All equipment is to be installed in a clean environment that is free from grinding dust, welding spatter, shot blast, moisture, excessive dust etc. Where this is not possible, then the equipment is to be protected to prevent dirt and contamination from work being carried out around the equipment. KH will not be held liable for damage to equipment as a result of poor environmental conditions encountered pre-commissioning.

Within the warranty period or prior to commissioning, the warranty will be void if the equipment is not correctly installed, operated or stored, installed or operated in an unsuitable environment. This includes any damage caused by improper transport and storage.

## 2.2 Recommandations sanitaires et de sécurité

### FCC STATEMENT

#### IC RSS-GEN, Sec 8.4 Warning Statement- (Required for license-exempt devices)

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

#### IC RSS-GEN, Sec 8.3 Warning Statement-

Le présent émetteur radio (identifier le dispositif par son numéro de certification ou son numéro de modèle s'il fait partie du matériel de catégorie I) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Les opérateurs et les ingénieurs travaillant sur l'équipement HENSOLDT doivent se conformer aux consignes relatives à la santé et la sécurité énoncées dans le présent manuel, conformément aux exigences de leurs employeurs respectifs ou comme énoncé dans la réglementation du site, ou par les propriétaires du chantier naval ou du navire.

Des évaluations des risques d'une zone de travail doivent être réalisées avant le démarrage de tout travail et doivent être régulièrement revues.

### AVERTISSEMENT

Tous les équipements conçus par HENSOLDT sont construits de manière à ce que l'accès aux hautes tensions ne puisse être obtenu qu'après avoir utilisé un outil, comme une clé ou un tournevis. Les étiquettes d'avertissement sont bien en vue à la fois dans l'équipement et sur les capots de protection.

Tous les équipements conçus par HENSOLDT sont conçus pour répondre aux exigences de la norme EN 60215, «Exigences de sécurité des équipements de transmission radio».

#### AVERTISSEMENT: RISQUES ÉLECTRIQUES

##### CERTAINS ÉQUIPEMENTS NE SONT PAS ÉQUIPÉS DE DISPOSITIFS DE VERROUILLAGE DE SÉCURITÉ

Des tensions mortelles monophasées et triphasées en courant alternatif et continu peuvent être présentes lorsque les appareils sont ouverts et exposés. Avant d'accéder à TOUTES les parties internes, TOUTES les sources d'alimentation de l'équipement doivent être complètement isolées; cela doit inclure l'isolation de toutes les alimentations du système supportées par l'onduleur et, le cas échéant, les alimentations du chauffage anti-condensation dans l'émetteur-récepteur.

#### AVERTISSEMENT: TENSIONS DE SECTEUR

Tous les équipements HENSOLDT sont alimentés par une tension d'entrée secteur réglée sur 220 V, 50/60 Hz, sauf indication contraire sur les étiquettes apposées sur les équipements.

#### AVERTISSEMENT: TENSIONS RÉSIDUELLES

Des tensions résiduelles peuvent être présentes sur les gros condensateurs de l'appareil. Lorsque vous accédez aux parties internes du système, isolez complètement toutes les sources d'alimentation avant de retirer les panneaux d'accès au service. Cela laissera le temps aux tensions de se décharger pendant que le panneau est retiré.

#### ATTENTION: TEMPÉRATURE DU LOGEMENT

Cette unité deviendra chaude pendant le fonctionnement normal. Lorsque le système a fonctionné en plein soleil ou à des températures élevées, l'émetteur-récepteur, le boîtier de l'appareil et les surfaces de l'antenne seront extrêmement chauds.

#### ATTENTION: AVERTISSEMENT DE COMBUSTIBILITÉ

Certains équipements contiennent des matériaux qui peuvent produire des fumées toxiques s'ils brûlent.

#### AVERTISSEMENT: BÉRYLLIUM

Les émetteurs-récepteurs SharpEye™ en bande X et S sont des unités scellées en usine qui ne contiennent aucune pièce réparable sur le terrain. Les émetteurs-récepteurs SharpEye™ ne doivent pas être démontés sur le terrain, car certains composants du processeur scellé en usine contiennent du béryllium qui est dangereux pour la santé.

#### PRODUIT LASER DE CLASSE 1

Il existe un laser de classe 1 dans le processeur émetteur-récepteur scellé SharpEye™ qui peut représenter un risque si le processeur est démonté. Lorsqu'il est installé, le câble à fibre optique LAN qui relie l'émetteur-récepteur SharpEye™ à l'unité de distribution radar est considéré comme un laser de classe 1.

### ROTATION DE L'ANTENNE

#### AVERTISSEMENT: ROTATION DE L'ANTENNE

Lorsque le courant alternatif monophasé et l'alimentation du moteur de l'antenne sont connectés au système et mis en marche, l'antenne tournera immédiatement, quel que soit l'état de la commande RUN. Utilisez l'interrupteur à clé de rotation de l'antenne ou les interrupteurs de sécurité en hauteur pour arrêter la rotation de l'antenne en cas d'urgence. Reportez-vous à la section sur la maintenance du manuel de l'opérateur pour obtenir des détails sur l'arrêt de l'antenne et l'isolation d'un système.

SBS-800 Series Operator & Planned Maintenance Handbook  
**Chapter 2: Health and Safety Warnings**

**RISQUES D'IRRADIATION**

**AVERTISSEMENT: RISQUE D'IRRADIATION NON-IONISANTE**

Évitez l'exposition au faisceau principal d'une antenne radar stationnaire.

Évitez de vous tenir à moins de 2 mètres de la face avant centrale d'une antenne rayonnant.

Les utilisateurs de simulateurs cardiaques doivent être conscients du fait que les émissions par radiofréquence risquent d'endommager certains appareils ou causent des irrégularités dans leur fonctionnement. Toute personne utilisant de tels appareils doit comprendre les risques existant avant une exposition.

**AVERTISSEMENT: FUITE**

Les risques d'irradiation sont plus importants lorsque le guide d'ondes n'est pas fermé, fuit ou est endommagé. Assurez-vous que le système ne transmet pas et qu'il est totalement isolé de toute source de courant alternatif avant d'accéder à la plateforme d'émission-réception ou avant de travailler sur une partie quelconque du système.

**LES NIVEAUX DE RAYONNEMENT DES MICRO-ONDES**

La distance de sécurité de l'antenne pour tous les systèmes SBS-800 est proche du cercle de rotation de l'antenne, bien que HENSOLDT ne recommande à aucun personnel de se trouver à proximité d'une antenne rotative en raison non seulement de l'exposition aux RF mais aussi du risque élevé de blessure pouvant être causé par une antenne rotative.

La portée à laquelle les limites d'exposition RF spécifiées peuvent être dépassées est bien plus importante pour une antenne non rotative. C'est pourquoi la transmission RF sans rotation d'antenne n'est pas un mode de fonctionnement autorisé pour cet équipement : Le système comprend des verrouillages pour éviter que cela ne se produise.

Le niveau de restriction de base pour la fréquence de fonctionnement de ce produit, tel que défini dans la directive 1999/519/CE (annexe III, tableau 2) et calculé conformément à la norme EN50385:2002. En fonctionnement normal, sur une période moyenne de six minutes, le niveau de restriction de base de l'UE pour l'exposition du public n'est dépassé que dans les limites de portée du centre de l'antenne, comme indiqué dans le tableau ci-dessous:

SBS-800 Antenna	Antenna State	Range limit 10W/m <sup>2</sup>	Range limit 50W/m <sup>2</sup>
<b>800-1</b> X-Band 3.7m antenna	Rotating	1.8m	0.8m
	Non-rotating	9.8m	1.8m
<b>800-2</b> X-Band 5.5m antenna	Rotating	1.8m	0.8m
	Non-rotating	6.3m	1.1m
<b>800-3 (FD)</b> X-Band 5.5m antenna	Rotating	1.8m	0.8m
	Non-rotating	6.3m	1.1m
<b>800-51</b> S-Band 3.9m antenna	Rotating	1.3m	0.6m
	Non-rotating	4.1m	0.4m

Deux seuils d'intensité de champ sont considérés comme pertinents pour la législation actuelle. La limite de 10W/m<sup>2</sup> est le niveau de référence pour l'exposition du public en général - Recommandation du Conseil 1999/519/CE Annexe III tableau 2. La limite de 50 W/m<sup>2</sup> est la limite professionnelle recommandée dans les lignes directrices de la CIPRNI publiées en 1998 et 2009. Les différents pays ou régions peuvent utiliser des niveaux différents, il est donc de la responsabilité de l'intégrateur du système et des administrateurs du système de s'assurer que les limites applicables sont identifiées et que l'installation de l'équipement reconnaît et atténue les risques liés aux rayonnements non ionisants associés à l'installation et à l'utilisation opérationnelle des radars.

Dans tous les systèmes SharpEye™, la condition de défaut suivant la perte des données de ligne de cap et d'azimut (par exemple, l'antenne a cessé de tourner) est reconnue pour déclencher la condition d'arrêt de l'émetteur-récepteur en quelques secondes.

SBS-800 Series Operator & Planned Maintenance Handbook  
**Chapter 2: Health and Safety Warnings**

**TRAVAIL DANS LA MÂTURE**

**ATTENTION : LA SÉCURITÉ EN ALTITUDE**

Lorsque vous travaillez en hauteur ou à proximité d'un scanner radar, d'un équipement mobile ou d'un équipement émettant des radiofréquences, TOUTES les sources d'alimentation de la plate-forme et de l'équipement, y compris le chauffage anticondensation (ACH), doivent être totalement isolées.

Avant de travailler en altitude, tous les disjoncteurs d'alimentation en courant alternatif du système doivent être éteints et verrouillés.

Assurez-vous qu'une personne en autorité ou au niveau du sol connaisse vos intentions et veillez à ce que des avertissements clairs et appropriés soient en place.

Assurez-vous que tous les moyens d'accès en hauteur sont sécurisés et faites attention aux barreaux d'échelle et aux zones de travail mouillés ou glissants.

Toutes les exigences et procédures de santé et de sécurité au travail en hauteur, y compris l'inspection et l'utilisation d'équipements de protection individuelle (EPI) tels que les harnais de sécurité et les gants approuvés, doivent être respectées à tout moment, comme l'exigent votre employeur, la réglementation du site, le chantier naval et/ou le navire.

**AVERTISSEMENT: CORDON DE SÉCURITÉ**

Lors d'un travail dans la mâture, un cordon de sécurité doit être établi et géré en-dessous de la ou des zones de travail.

**ATTENTION: RISQUES DE CHUTE**

Lors de travaux en hauteur, tous les outils, les unités de remplacement de ligne (LRU) et tous les articles détachés doivent être rangés ou sécurisés de manière à ne pas présenter de risque de chute.

**ATTENTION: CONDITIONS MÉTÉOROLOGIQUES**

Lorsque les conditions météorologiques sont mauvaises, une évaluation complète des risques doit être effectuée avant de travailler en altitude, conformément aux procédures de sécurité de l'employeur ou du navire. Les mauvaises conditions météorologiques peuvent inclure, sans s'y limiter, des vents violents, de fortes pluies, de la neige, de la glace ou, si un accès est nécessaire en mer, un risque de tangage et de roulis du navire.

**HOMME EN HAUTEUR ISOLATION DE L'INTERRUPTEUR/ANTENNE.**

La rotation et la transmission de l'antenne peuvent être empêchées par un interrupteur en hauteur (MAS) ou un interrupteur à clé "Antenna OFF/Free". Ces mécanismes peuvent être utilisés par une personne qui voit un danger potentiel tel qu'une drisse desserrée et décide de protéger l'antenne. Lorsqu'il est activé, la raison de la perte de rotation est détectée par le système et est signalée aux utilisateurs locaux et distants.

**SAFETY SWITCHES**

<b>Interrupteur à clé de rotation de l'antenne</b>	<p>L'interrupteur à clé de rotation de l'antenne se trouve sur la porte de l'unité de distribution du radar (RDU) montée à l'intérieur.</p> <p>La clé de l'interrupteur à clé RDU est captive lorsqu'elle est réglée sur Libre (permet la rotation) mais peut être retirée lorsque l'interrupteur à clé est sur OFF.</p> <p>Lorsque l'interrupteur est sur OFF, toute l'alimentation en courant alternatif de l'antenne et de l'émetteur-récepteur est isolée, ce qui arrête la rotation de l'antenne et la transmission.</p> <p>La clé doit être retirée et conservée par la personne qui a l'intention de pénétrer dans le volume potentiellement dangereux de l'antenne en rotation.</p>
<b>Un homme en haut de l'échelle (MAS)</b>	<p>L'interrupteur en hauteur (MAS) est conçu pour être installé de manière à ce qu'il soit toujours visible pour la personne qui effectue les tâches de maintenance.</p> <p>Lorsqu'il est en position "OFF", l'émetteur-récepteur/boîte de vitesse est isolé de toute alimentation en courant alternatif, ce qui arrête la rotation de l'antenne et la transmission.</p>

L'interrupteur Man Aloft, le commutateur marche/arrêt du moteur et l'interrupteur à clé de rotation de l'antenne font partie d'une boucle de courant de sécurité. Cette boucle de sécurité est purement matérielle (pas de logiciel). Lorsque la boucle de courant est ouverte, l'alimentation en courant alternatif des émetteurs-récepteurs et de l'inverseur d'antenne est coupée à l'aide de contacteurs.

HENSOLDT recommande que les interrupteurs à clé mentionnés ci-dessus soient utilisés en conjonction avec l'interrupteur homme en l'air mais recommande également que les utilisateurs de radars effectuent une évaluation de la sécurité et une procédure d'atténuation des risques en termes de verrouillage avant d'approuver tout travail sur l'équipement.

Des détails complets sur l'isolation des systèmes des alimentations en courant alternatif peuvent être trouvés dans la section de maintenance planifiée du manuel d'utilisation et de maintenance des systèmes concernés.

## SBS-800 Series Operator & Planned Maintenance Handbook

### Chapter 2: Health and Safety Warnings

#### TRAITEMENT ANTISTATIQUE

##### LA MANIPULATION DE DISPOSITIFS SEMI-CONDUCTEURS SENSIBLES À L'ÉLECTROSTATIQUE

Certains dispositifs à semi-conducteurs utilisés dans l'équipement sont susceptibles d'être endommagés par la tension statique. Respectez les précautions suivantes lorsque vous manipulez ces dispositifs à l'état non terminé, ou des sous-unités contenant ces dispositifs :

Les personnes qui retirent des sous-unités d'un équipement contenant ces dispositifs doivent être mises à la terre au moyen d'un bracelet et d'une résistance à l'endroit indiqué sur/à l'intérieur de l'équipement.

- Les fers à souder utilisés lors d'opérations de réparation autorisées doivent être de type basse tension avec des pointes mises à la terre et isolées de la tension du secteur par un transformateur à double isolation.
- Les vêtements extérieurs portés doivent être incapables de générer des charges statiques.
- Les cartes de circuits imprimés équipées de ces dispositifs doivent être stockées et transportées dans des conteneurs antistatiques.
- Installez les nouveaux dispositifs dans une zone spéciale de manipulation antistatique sûre.

Isoler complètement et déconnecter mécaniquement toutes les sources de courant alternatif avant de fixer les bracelets de protection ESD aux différents points du système.

#### RoHS DÉCLARATION

Pour plus de détails sur les RoHS déclarations, veuillez contacter HENSOLDT dont les coordonnées se trouvent à la fin de ce manuel.

#### L'ÉLIMINATION EN FIN DE VIE

Lorsque l'équipement décrit dans le présent manuel a atteint la fin de sa durée de vie utile, les différentes pièces qui le composent doivent être éliminées conformément aux réglementations locales en matière d'élimination des déchets industriels. Veuillez contacter votre organisme de réglementation local pour obtenir les instructions d'élimination ou contacter HENSOLDT pour obtenir une liste de toutes les matières potentiellement dangereuses contenues dans le système.

**SharpEye™ avis d'élimination spécifique:** Le ou les émetteurs-récepteurs SharpEye™ situés dans l'enceinte de l'émetteur-récepteur sont des unités scellées en usine qui ne contiennent aucune pièce réparable sur le terrain ni aucun composant en état de marche. Les composants du processeur SharpEye™ (toutes les variantes) contiennent des traces de béryllium et de chrome trivalent. Veuillez contacter HENSOLDT concernant la réparation ou un SharpEye™ ou ses instructions d'élimination en fin de vie. Les coordonnées de HENSOLDT se trouvent à la fin de ce manuel.

#### MISE À LA TERRE/POINTS DE TERRE

Toutes les parties du système doivent être entièrement et correctement connectées à un point de terre éprouvé avant de connecter toute source d'alimentation en courant alternatif.

#### AVERTISSEMENT : NE PAS FONCTIONNER AVEC LA TERRE DÉCONNECTÉE

Le système ne doit PAS être utilisé ou avoir une alimentation en courant alternatif avec des points de mise à la terre déconnectés

**Point de connexion:** Tous les appareils HENSOLDT sont équipés d'un seul point de raccordement à la terre de protection, qui est indiqué sur les plans d'installation mécanique.

**Tests de conductivité:** Lors de l'installation et de la maintenance, les connexions de terre doivent être testées pour la conductivité à l'aide d'un impédancemètre à courant élevé tel qu'un Megger ou similaire.

**Sangles de poignet:** Isoler complètement et déconnecter mécaniquement toutes les sources de courant alternatif avant de fixer les bracelets de protection ESD aux différents points du système.

#### L'ENTRETIEN ET LA RÉPARATION

##### ATTENTION : SOULEVER LES PIÈCES DE RECHANGE

Lorsque des pièces de rechange sont nécessaires pour un équipement situé sur une plate-forme ou que l'accès se fait par une échelle, les articles lourds doivent être soulevés jusqu'à la plate-forme à l'aide d'un sac de levage ou d'une sangle de levage de capacité appropriée. Les objets lourds ne doivent pas être portés manuellement sur une échelle car ils peuvent présenter un risque de chute.

L'entretien et la réparation des équipements doivent être effectués uniquement par HENSOLDT ou par un agent de service ou un ingénieur agréé par HENSOLDT. La réparation ou l'entretien non autorisé d'un équipement pendant la période de garantie peut invalider le statut de garantie de l'équipement.

## SBS-800 Series Operator & Planned Maintenance Handbook

### Chapter 2: Health and Safety Warnings

#### LICENCES DE LOGICIELS

Seuls les logiciels approuvés peuvent être utilisés sur les équipements HENSOLDT. L'utilisation de logiciels non approuvés ou sans licence sur tout équipement HENSOLDT est strictement interdite. L'utilisation d'un tel logiciel annule le statut de garantie de l'appareil.

Tout logiciel conçu par HENSOLDT, qu'il soit préinstallé, fourni sur CD/DVD ou tout autre support amovible, est protégé par les droits d'auteur de HENSOLDT, qui n'acceptera aucune responsabilité pour tout dommage ou perte causé de quelque manière que ce soit par l'utilisation ou la mauvaise utilisation du logiciel. Ce droit d'auteur s'applique aux logiciels qui peuvent être fournis sous différents formats, notamment mais pas exclusivement sur CD, DVD, clé USB, courrier électronique ou obtenus via la zone de téléchargement des agents HENSOLDT.

Le logiciel fourni avec l'équipement HENSOLDT ne peut être revendu ou redistribué sans l'autorisation expresse de HENSOLDT.

Les logiciels tiers fournis avec le système, tels que le programme RadarView, restent la propriété intellectuelle du fabricant d'origine. Consultez la documentation du fabricant pour obtenir des informations sur les droits d'auteur.

#### PRÉCAUTIONS CONTRE LES VIRUS

De nombreux systèmes fournis par HENSOLDT, y compris les écrans de service optionnels, sont maintenant basés sur des PC et il convient de noter que ces systèmes ne sont pas équipés d'une protection antivirus. Il est de la responsabilité des ingénieurs d'installation, des ingénieurs de service, des responsables de la maintenance et des utilisateurs du système de s'assurer que les menaces de virus ne sont pas transférées au système via des supports amovibles.

#### AVERTISSEMENT : ANTIVIRUS

Avant d'être utilisés, tous les supports amovibles utilisés sur ou dans les produits HENSOLDT DOIVENT faire l'objet d'un scan complet de virus sur un PC équipé d'un logiciel antivirus à jour.

Tout support contenant des infections virales potentielles ne doit pas être utilisé. Les frais relatifs aux systèmes infectés par un virus seront transmis à l'entreprise qui utilise des supports amovibles qui n'ont pas été correctement scannés. HENSOLDT ne peut être tenu responsable des dommages causés aux systèmes par des infections virales.

Les supports amovibles mentionnés comprennent, sans s'y limiter, les clés USB, les disques durs USB, les disquettes, les CD/DVD et toutes les formes de supports amovibles.

#### LIFTING EQUIPMENT

#### AVERTISSEMENT : ÉQUIPEMENT DE LEVAGE

La boîte de vitesses, les antennes et les boîtiers d'émetteurs-récepteurs sont des objets lourds et doivent être hissés en position de fixation à l'aide d'un équipement de levage approprié, d'un bloc et d'un palan sécurisés ou de cordes.

#### ATTENTION

Lors de l'installation, l'équipement soulevé doit être sécurisé et soutenu à tout moment pour éviter tout risque de chute ou de glissement.

- Toutes les exigences en matière de santé et de sécurité doivent être vérifiées et respectées à tout moment lors du levage de tout équipement. Tous les équipements de protection individuelle (EPI) appropriés doivent être portés.
- Lorsque des équipements spéciaux tels que des grues, des palans et des gabarits sont nécessaires, il convient d'envisager l'autorisation d'utiliser ces équipements.
- Pendant le levage, une zone de sécurité doit être établie sous la zone de levage autour de toute grue ou plate-forme. Le personnel de sécurité doit veiller à ce que les personnes n'empiètent pas sur la zone de travail.
- Consultez l'opérateur de levage pour obtenir la meilleure et la plus sûre méthode de fixation des sangles ou des câbles de levage à l'équipement et informez les opérateurs de levage des zones d'un système susceptibles d'être endommagées, telles que les fascias d'antenne, les pièces moulées pivotantes, etc.
- Vérifiez que le centre de gravité de l'équipement ne peut pas faire glisser ou bouger les sangles ou les câbles de levage.
- Toutes les sangles, câbles ou cordages de levage doivent être soigneusement vérifiés afin de s'assurer qu'il n'y a aucun risque que l'appareil glisse ou tombe de la sangle ou de l'équipement de levage.
- Les boîtes de vitesses ne doivent jamais être soulevées par l'antenne ou le balancier.
- Si vous soulevez une boîte de vitesses avec l'antenne prémontée, l'équipement de levage, les câbles ou les sangles ne doivent pas exercer de pression sur une partie quelconque de l'antenne ou de la pièce moulée pivotante.
- HENSOLDT ne peut être tenu responsable des dommages causés à l'équipement fourni ou à un équipement tiers à la suite de procédures de levage ou de manipulation ou d'un équipement incorrect.

SBS-800 Series Operator & Planned Maintenance Handbook  
**Chapter 2: Health and Safety Warnings**

**LEVAGE D'ANTENNE**

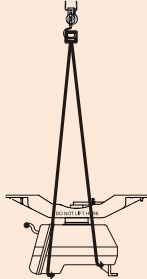
- Lors du déballage ou du levage des antennes, il convient de veiller à ce que le guide d'ondes ne soit pas plié, écrasé ou endommagé pendant la manipulation.
- Soutenez l'antenne près des extrémités lorsque vous la sortez de l'emballage et que vous la mettez en place sur le mécanisme de rotation.
- Ne pas soulever, manipuler ou soutenir l'antenne par le guide d'ondes.
- Lorsque vous faites tourner une antenne installée à la main, n'appliquez pas de force excessive.
- L'antenne et le tableau de bord de l'antenne ne doivent jamais être peints ou porter des étiquettes non approuvées.

**ATTENTION**

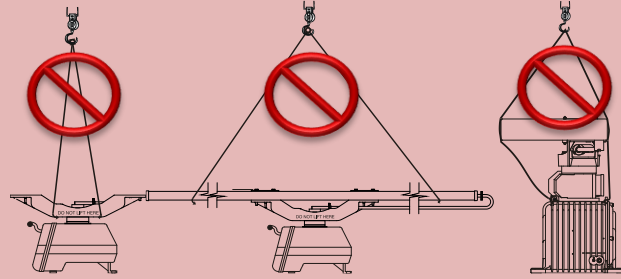
Lors de l'installation, l'antenne doit être sécurisée et soutenue à tout moment pour éviter tout risque de chute ou de glissement. Les antennes ne doivent jamais être laissées sans support sur la balançoire.

**PROCÉDURES DE LEVAGE CORRECTES ET INCORRECTES**

*Exemple de procédure de levage  
CORRECT*



**Exemples de procédures de levage INCORRECTES**



**Note d'illustration: les dessins ci-dessus sont présentés à titre de référence uniquement et ne peuvent représenter l'équipement réel fourni dans le cadre d'une série SBS.**

**ATTENTION**

L'équipement ne doit être installé et utilisé que lorsque toutes les opérations de soudage, de meulage, de ponçage, etc. dans la zone d'installation sont terminées. Tous les équipements doivent être installés dans un environnement propre, exempt de poussière de meulage, d'éclaboussures de soudage, de grenailage, d'humidité, de poussière excessive, etc. Lorsque cela n'est pas possible, l'équipement doit être protégé pour empêcher la saleté et la contamination des travaux effectués autour de l'équipement. La KH ne sera pas tenue responsable des dommages subis par l'équipement en raison de mauvaises conditions environnementales rencontrées avant la mise en service.


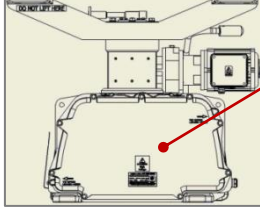


Pendant la période de garantie ou avant la mise en service, la garantie sera annulée si l'équipement n'est pas correctement installé, utilisé ou stocké, installé ou utilisé dans un environnement inadapté. Cela inclut tout dommage causé par un transport et un stockage inadéquats.



### 3 Overview

#### 3.1 Unit Identification

This handbook details SBS-800 SharpEye™ systems comprising of Fibre S-Band and Fibre GaN X-Band transceivers

<p><b>X or S-Band low profile antenna</b>                  LPA-A37 <i>all variants</i>                  LPA-A55 <i>all variants</i>                  LPA-A3 <i>all variants</i></p> <p><i>Note: An S-Band LPA is shown for reference; the label is in the same position on X-Band antennas.</i></p>	 <p>Part &amp; serial number label</p>
<p><b>Fibre GaN X-Band and Fibre S-Band SharpEye™ transceiver/gearboxes</b>                  DTX-A1 <i>all variants</i>                  DTX-A3 <i>all variants</i></p>	 <p>Part &amp; serial number label</p>
<p><b>Man aloft switch</b>                  SBS-A132</p>	 <p>Part &amp; serial number label</p>
<p><b>Radar distribution unit</b>                  SBS-A4-3-* <i>all variants</i></p>	 <p>Part &amp; serial number label</p>

#### 3.2 Additional Documentation

The contents of this handbook makes reference to the following documents some of which are available upon request from Kelvin Hughes Ltd.

Document number	Description
KH-1601-1	SBS-800 Installation & Termination Handbook
KH-1601-3	SBS-800 Commissioning Handbook <sup>Note</sup>
KH-1601-4	SBS-800 Supplementary Information Handbook <sup>Note</sup>
KH-1604	Service Displays for Shore Based Radar Systems (SBS)
KSD-4750	Serial Control of SBS Systems
SETD-1941	Product Specification for SBS-800 Series Shore Based Radar Systems
SETD-1943	Product Specification for SBS Antenna Sub-Systems (Standard)
SETD-1945	SBS Options
SETD-1948	SBS LAN Interface IRS ASTERIX

**NOTE:** Chargeable handbook supplied as part of a Kelvin Hughes Ltd authorised training course.

**3.3 Analogue & GaAs SharpEye™ Systems**

**This handbook details SBS-800 SharpEye™ system comprising of S-Band Fibre and X-Band GaN transceivers**

Earlier SBS-800 systems were fitted with GaAs and analogue SharpEye™ transmission systems which carry different part numbers. These are detailed in previous versions of the SBS-800 handbooks as detailed below.

**PREVIOUS SBS-800 PART NUMBERS**

<b>SBS-800</b>	<b>Transceivers</b>	<b>Analogue/GaAs compatible RDUs</b>
<b>SBS-800-1 SBS-800-2</b>	DTX-A3-AJHA/BJHA	SBS-A1-2
<b>SBS-800-3</b>	DTX-A3-AKJB/BKJB	SBS-A1-3
<b>SBS-800-51</b>	DTX-A1-ADDA/BDDA	SBS-A1-2

**SYSTEM HANDBOOKS (ANALOGUE AND/OR GaAs TRANSCEIVERS)**

If contacting Kelvin Hughes Ltd for GaAs system handbooks, please ensure that you specify the handbook issue number as detailed below.

<b>KH-1601-1 ISSUE 3</b>	<b>KH-1601-2 ISSUE 2</b>
SBS-800 Installation & Termination handbook	SBS-800 Operator & Maintenance handbook

**3.4 RDU SBS-A4-3-\* MOD STATE 0**

Previous SBS-800 RDUs at MOD STATE 0 contained an NTX-A462-7 at position A1 within the RDU and an unmanaged switch and media converter.

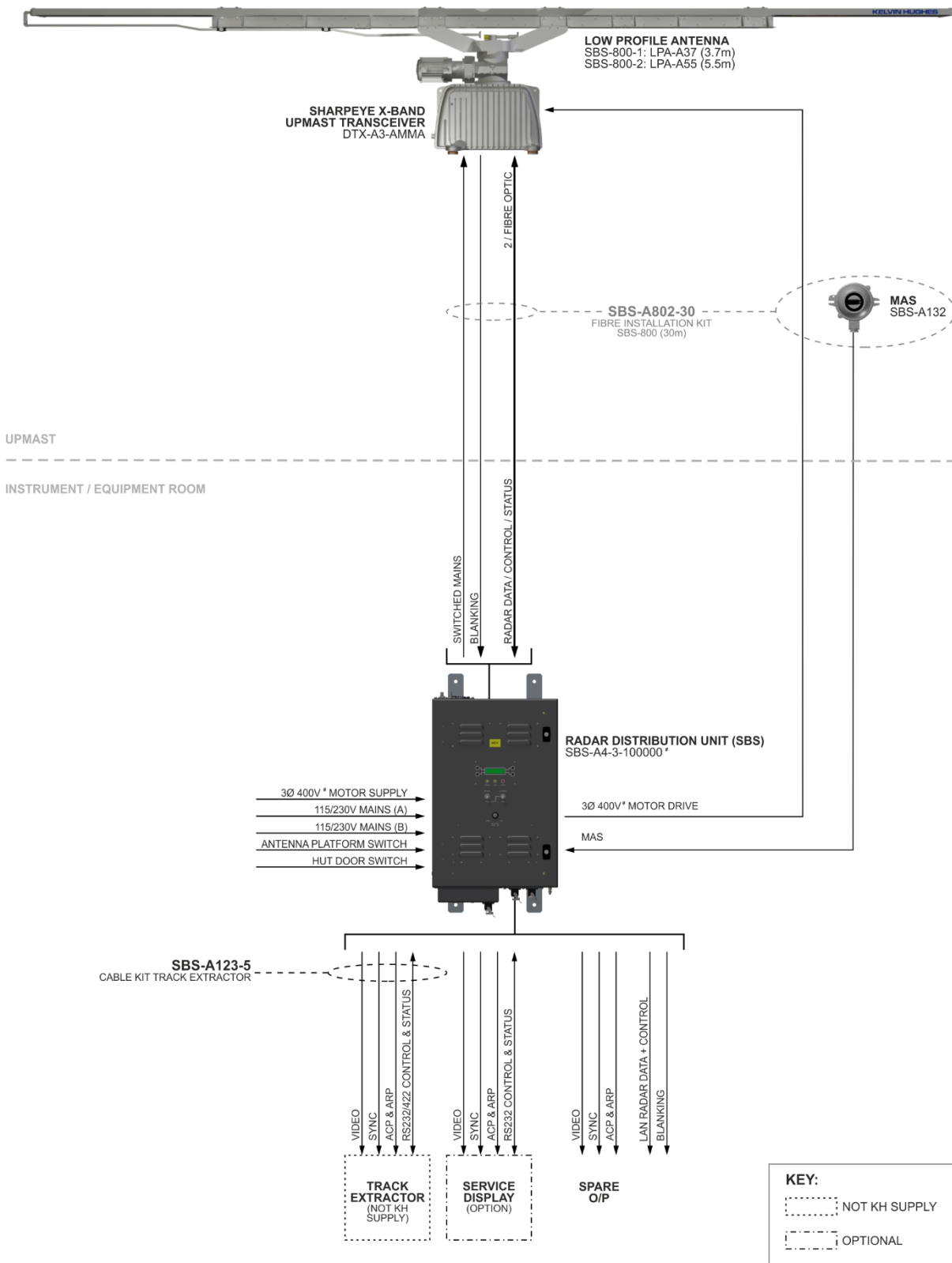
For details refer to KH-1601-2, Issue 4.

Page intentionally blank

SBS-800 Series Operator & Planned Maintenance Handbook  
**Chapter 3: Overview**

**3.5 Typical Systems**

**3.5.1 SBS-800-1/SBS-800-2**



**TYPICAL SBS-800-1 / SBS-800-2 SYSTEM**

CD-8255 | ISSUE 6 THIS DOCUMENT IS THE PROPERTY OF KELVIN HUGHES LIMITED  
 © KELVIN HUGHES LIMITED 2016


# 230V 1Ø & 200V 3Ø MOTOR SUPPLY  
 OPTIONS ARE AVAILABLE.  
 CONSULT KH FOR MORE DETAILS.

**SBS-800-1**  
**X-Band Doppler SharpEye™ with 3.7m low profile antenna**

The **SBS-800-1** system comprises of an **X Band SharpEye™** Transceiver/Turning Mechanism incorporating Solid State radar transceiver utilising enhanced Digital Pulse Compression and Pulse Doppler Processing with Kelvin Hughes **3.7m (12ft) Low Profile Antenna (LPA)**.

A fibre optic link is used to transfer data and signals to the Radar Distribution Unit which in turn interfaces the signals to the external track extractor, command & display system or optional service display PC.

The transceiver/turning mechanism and antenna are available in two colours as detailed below.


<b>DTX-A3-AMMA</b>	X-Band transceiver/turning mechanism.	<b>Colour</b> Signal white	
<b>LPA-A37</b>	3.7m (12ft) Kelvin Hughes Low Profile Antenna.		
<b>Or</b>			
<b>DTX-A3-BMMA</b>	X-Band transceiver/turning mechanism.	<b>Colour</b> Silver grey	
<b>LPA-A37-BAAA</b>	3.7m (12ft) Kelvin Hughes Low Profile Antenna.		
<b>SBS-A4-3-XXXXXX</b>	Radar Distribution Unit (RDU) <i>Fibre optic link to the transceiver/gearbox.</i>	Anthracite Grey to RAL 7016 (matt)	
<b>SBS-A802-30</b>	Fibre installation kit SBS-800 (30m). This kit is used to connect the RDU to the transceiver/turning mechanism. <b>Note:</b> <i>Kit includes man aloft switch and cables to the antenna sub-system</i> <i>Other lengths are available between 10 &amp; 100m; please consult Kelvin Hughes for details.</i>		
<b>SBS-A123-5</b>	Cable kit track extractor (5m). This kit is used to connect the RDU to the external track extractor or service display. <b>Note:</b> <i>Other cable lengths are available including 11m, 15m and 20m; please consult Kelvin Hughes for details.</i>		

**SBS-800-2  
X-Band Doppler SharpEye™ with 5.5m low profile antenna**

The **SBS-800-2** system comprises of an **X Band SharpEye™** Transceiver/Turning Mechanism incorporating Solid State radar transceiver utilising Enhanced Digital Pulse Compression and Pulse Doppler Processing with Kelvin Hughes **5.5m (18ft) Low Profile Antenna (LPA)**.

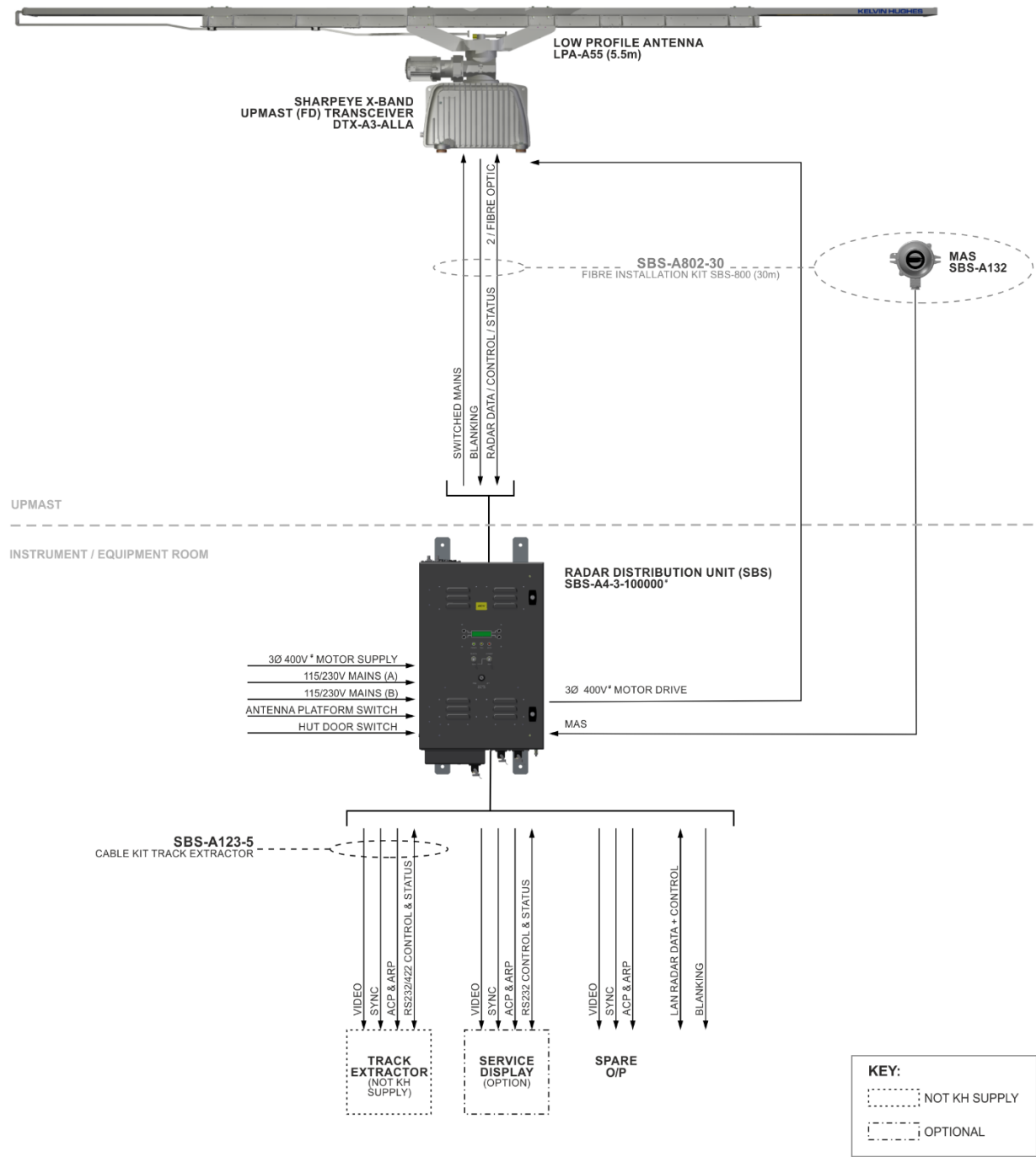
A fibre optic link is used to transfer data and signals to the Radar Distribution Unit which in turn interfaces the signals to the external track extractor, command & display system or optional service display PC.

The transceiver/turning mechanism and antenna are available in two colours as detailed below.

<b>DTX-A3-AMMA</b>	X-Band transceiver/turning mechanism.	<b>Colour</b> Signal white	
<b>LPA-A55</b>	5.5m (18ft) Kelvin Hughes Low Profile Antenna.		
<b>Or</b>			
<b>DTX-A3-BMMA</b>	X-Band transceiver/turning mechanism.	<b>Colour</b> Silver grey	
<b>LPA-A55-BAAA</b>	5.5m (18ft) Kelvin Hughes Low Profile Antenna.		
<b>SBS-A4-3-XXXXXX</b>	Radar Distribution Unit (RDU) <i>Fibre optic link to the transceiver/gearbox.</i>	Anthracite Grey to RAL 7016 (matt)	
<b>SBS-A802-30</b>	Fibre installation kit SBS-800 (30m). This kit is used to connect the RDU to the transceiver/turning mechanism. <b>Note:</b> <i>Kit includes man aloft switch and cables to the antenna sub-system Other lengths are available between 10 &amp; 100m; please consult Kelvin Hughes for details.</i>		
<b>SBS-A123-5</b>	Cable kit track extractor (5m). This kit is used to connect the RDU to the external track extractor or service display. <b>Note:</b> Other lengths are available including 11m, 15m & 20m; please consult Kelvin Hughes for details.		

SBS-800 Series Operator & Planned Maintenance Handbook  
**Chapter 3: Overview**

**3.5.2 SBS-800-3**



**TYPICAL SBS-800-3 SYSTEM**

CD-8254 | ISSUE 5 | THIS DOCUMENT IS THE PROPERTY OF KELVIN HUGHES LIMITED  
 © KELVIN HUGHES LIMITED 2016



# 230V 1Ø & 200V 3Ø MOTOR SUPPLY  
 OPTIONS ARE AVAILABLE.  
 CONSULT KH FOR MORE DETAILS.

**SBS-800-3**  
**X-Band Doppler & frequency diversity SharpEye™ with 5.5m low profile antenna**

The **SBS-800-3** system comprises of an **X Band SharpEye™** Transceiver/Turning Mechanism incorporating Solid State radar transceiver utilising Enhanced Digital Pulse Compression, Pulse Doppler Processing and Frequency Diversity with Kelvin Hughes **5.5m (18ft) Low Profile Antenna (LPA)**.

A fibre optic link is used to transfer data and signals to the Radar Distribution Unit which in turn interfaces the signals to the external track extractor, command & display system or optional service display.

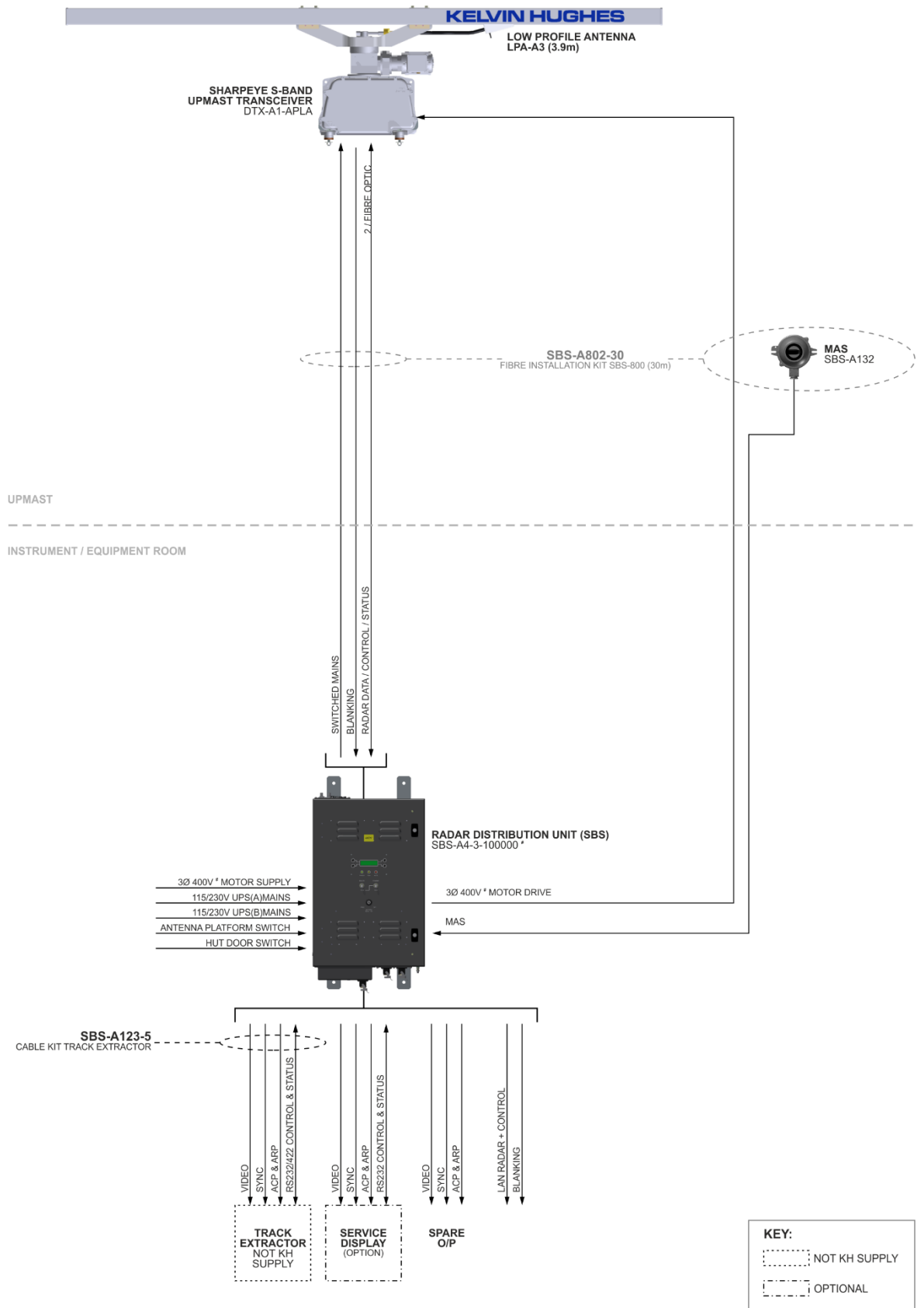
The transceiver/turning mechanism and antenna are available in two colours as detailed below.

<b>DTX-A3-ALLA</b>	X-Band transceiver/turning mechanism.	<b>Colour</b> Signal white	
<b>LPA-A55</b>	5.5m (18ft) Kelvin Hughes Low Profile Antenna.		
<b>Or</b>			
<b>DTX-A3-BLLA</b>	X-Band transceiver/turning mechanism.	<b>Colour</b> Silver grey	
<b>LPA-A55-BAAA</b>	5.5m (18ft) Kelvin Hughes Low Profile Antenna.		
<b>SBS-A4-3-XXXXXX</b>	Radar Distribution Unit (RDU) <i>Fibre optic link to the transceiver/gearbox.</i>	Anthracite Grey to RAL 7016 (matt)	
<b>SBS-A802-30</b>	Fibre installation kit SBS-800 (30m) This kit is used to connect the RDU to the transceiver/turning mechanism. <b>Note:</b> Kit includes man aloft switch and cables to the antenna sub-system Other lengths are available between 10 & 100m; please consult Kelvin Hughes for details.		
<b>SBS-A123-5</b>	Cable kit track extractor (5m) This kit is used to connect the RDU to the external track extractor or service display. <b>Note:</b> Other lengths are available including 11m, 15m & 20m; please consult Kelvin Hughes for details.		



SBS-800 Series Operator & Planned Maintenance Handbook  
**Chapter 3: Overview**

**3.5.3 SBS-800-51**



**TYPICAL SBS-800-51 SYSTEM**

CD-8260 | ISSUE 5 | THIS DOCUMENT IS THE PROPERTY OF KELVIN HUGHES LIMITED  
 © KELVIN HUGHES LIMITED 2018



# 230V 1Ø & 200V 3Ø MOTOR SUPPLY  
 OPTIONS ARE AVAILABLE.  
 CONSULT KH FOR MORE DETAILS.

**SBS-800-51**  
**S-Band Doppler SharpEye™ with 3.9m low profile antenna**

The **SBS-800-51** system comprises of an **S-Band SharpEye™** Transceiver/Turning Mechanism enclosure incorporating Solid State radar transceiver utilising Enhanced Digital Pulse Compression and Pulse Doppler Processing with Kelvin Hughes **3.9m (12.8ft) Low Profile Antenna (LPA)**.

A fibre optic link is used to transfer data and signals to the Radar Distribution Unit which in turn interfaces the signals to the external track extractor, command & display system or optional service display.

The transceiver/turning mechanism and antenna are available in two colours as detailed below.

<b>DTX-A1-APLA</b>	S-Band transceiver/turning mechanism.	<b>Colour</b> Signal white	
<b>LPA-A3</b>	3.9m (12.8ft) Kelvin Hughes Low Profile Antenna.		
<b>Or</b>			
<b>DTX-A1-BPLA</b>	S-Band transceiver/turning mechanism.	<b>Colour</b> Silver grey	
<b>LPA-A3-BAAA</b>	3.9m (12.8ft) Kelvin Hughes Low Profile Antenna.		
<b>SBS-A4-3-XXXXXX</b>	Radar Distribution Unit (RDU) <i>Fibre optic link to the transceiver/gearbox.</i>	Anthracite Grey to RAL 7016 (matt)	
<b>SBS-A802-30</b>	Fibre Installation kit SBS-800 (30m) This kit is used to connect the RDU to the transceiver/turning mechanism. <b>Note:</b> Kit includes man aloft switch and cables to the antenna sub-system Other lengths are available between 10 & 100m; please consult Kelvin Hughes for details.		
<b>SBS-A123-5</b>	Cable kit track extractor (5m) This kit is used to connect the RDU to the external track extractor or service display. <b>Note:</b> Other lengths are available including 11m, 15m & 20m; please consult Kelvin Hughes for details.		

## **4 Switch ON, OFF & Emergency Stop**

### **4.1 ANTENNA ROTATION WARNING**

#### **WARNING**

#### **ANTENNA ROTATION SAFETY NOTICE**

When antenna motor power is connected to the system and switched ON, the antenna will rotate immediately regardless of the RUN command status (see conditions below).

The system will only transmit when a RUN command is received from the track extractor, service display or the system is set to RUN using the Local controls located on door of the Radar Distribution Unit.

Antenna rotation can be stopped by using any of the processes described below.

#### **ANTENNA ROTATION SWITCH**

Place the *Antenna Rotation* keyswitch located on the front of the Radar Distribution Unit into the OFF position.

#### **MAN ALOFT SWITCH**

Place the masthead *Man Aloft* switch into the OFF position.

#### **RDU BREAKERS**

Isolate the three phase AC supply using the breaker located within the Radar Distribution Unit.

#### **SOFTWARE EMERGENCY STOP (Optional)**

Press the *Emergency Stop* button in the optional Service Display RadarView software (see caution below).

#### **WARNING**

#### **SOFTWARE EMERGENCY STOP**

The software *Emergency Stop* function from the Service Display MUST NEVER be used as the primary means of system isolation for working aloft.

**4.2 Switch ON**

**FIRST TIME SWITCH ON**

Ensure the setting to work of the system has been successfully completed and signed off.

**POWER**

Check that all sources of external AC power are available and are switched ON.

**ANTENNA**

Ensure the antenna is clear of all obstructions and that it is safe to rotate.

**TRANSMISSION**

Ensure it is safe to transmit.

The following describes the local switch-ON sequence for the SBS-800 series only and does not include the switch on procedures for the track extractor or optional service display.

<b>EXTERNAL BREAKERS</b>	Observing all health and safety notices and where safe to do so, ensure that all AC power to the system are switched ON at the appropriate breakers	
<b>SAFETY SWITCHES</b>	Man Aloft Switch	Ensure that the externally mounted <i>Man Aloft Switch</i> (MAS) is in the <b>FREE</b> position.
	Radar Distribution Unit	Ensure that the <i>Antenna Rotation</i> keyswitch on the front of the Radar Distribution Unit is in the <b>FREE</b> position.



*Man Aloft Switch*



*Keyswitch on door of RDU*

**WARNING**

**ANTENNA ROTATION SAFETY NOTICE**

When the antenna motor AC power is connected to the system and switched ON, the antenna will rotate immediately regardless of the RUN command status.

<b>AC POWER TO THE RADAR DISTRIBUTION UNIT</b>	<p>Within the Radar Distribution Unit, LED's will illuminate on each breaker indicating that AC mains inputs are present. <b>Note</b></p> <p>Noting the antenna warning above, place all RDU breakers into the <b>ON</b> position.</p> <p>When AC mains voltages are present and the breakers are all in the ON position, the Radar Distribution Unit will switch ON.</p>	<p><i>RDU AC breakers</i></p>
<b>GEARBOX HOUSING ACH</b> (Anti-Condensation Heaters)	Where connected and required, switch ON the independent AC supply to the anti-condensation heaters using the dedicated AC breaker. See section 5 for application details.	
<b>SYSTEM READY FOR USE</b>	With AC power available, switched ON and the switches set as shown above, the system is available for use and the antenna will rotate.	

**Note:** The LED indicators located on power breakers within the RDU are an indication that mains voltages are present. They are NOT an indication that the breakers are switched ON.

**4.3 Switch OFF**

**SWITCH OFF**

The following describes how to switch OFF the SBS-800 system for operational purposes.


The following does not include the switch OFF/shut down procedures for the track extractor, optional service display or external equipment attached to the system.

**SYSTEM ISOLATION**

Please refer to the maintenance section for details on isolating the system from the mains supplies for maintenance purposes or working aloft.

**CAUTION**

The following details switching the SBS-800 system OFF for operational purposes only. The following must not be used as a primary means of system isolation for maintenance procedures or working aloft.

<b>SWITCH TO STANDBY</b>	Using the service display, third party command and control system or the Standby/Run switch on the RDU (local control only), place the system into Standby mode.
<b>RADAR DISTRIBUTION UNIT SAFETY SWITCHES</b>	<p>Place the <i>Antenna Rotation</i> keyswitch on the front of the Radar Distribution Unit into the <b>OFF</b> position.</p> <p>This removes all AC power to the turning unit/gearbox SharpEye™ transceiver and the Antenna sub-system.</p> <p>As an additional safety precaution, when in the OFF position the key can be removed.</p> <div style="text-align: right;">  <p><i>Keyswitch on door of RDU</i></p> </div>
<p><b>WARNING</b></p> <p>The Antenna Rotation Keyswitch does not control or isolate the Anti-Condensation Heater supply. See section 5 for application details.</p>	
<b>AC POWER TO THE RADAR DISTRIBUTION UNIT</b>	<p>Place all three breakers within the Radar Distribution Unit to the <b>OFF</b> position.</p> <ul style="list-style-type: none"> <li>• The Radar Distribution Unit is switched OFF but is not isolated from the AC input supplies.</li> <li>• The transceiver/gearbox is switched OFF, antenna rotation and system transmission is stopped.</li> <li>• The LED indicators on the breakers remain illuminated. <i>Note</i></li> </ul>
<b>GEARBOX HOUSING ACH</b> (Anti-Condensation Heaters)	Where connected and required, switch ON the independent AC supply to the anti-condensation heaters using the dedicated AC breaker. See Section 5 for application details.

**WARNING:**

With the system switched OFF as described in the above procedure, AC supplies are still present within the Radar Distribution Unit. The system must be fully isolated and lock off from ALL AC supplies prior to opening any part of the unit or carrying out any tasks on the system.

**Note:** The LED indicators located on power breakers are an indication that mains voltages are present. They are NOT an indication that the breakers are switched ON.

**4.4 EMERGENCY ANTENNA STOP**

In an emergency, antenna rotation and system transmission can be stopped using ANY of the following mechanisms.

**STOP ANTENNA ROTATION**  
  
**USE ANY OF THE FUNCTIONS SHOWN**

**RDU keyswitch:** Place the *Antenna Rotation* keyswitch on the front of the Radar Distribution Unit into the **OFF** position.

As an additional safety precaution, when in the OFF position the key can be removed.



*Keyswitch on door of RDU*

**Man Aloft Switch (MAS):** Place the externally mounted masthead *Man Aloft* switch to the OFF position.

This has the same effect as using the Antenna Rotation keyswitch noted above.



*Man aloft switch*

**Optional Service Display:** RadarView software.

Please refer to the Service Display handbook reference KH-1604 for full operator instructions.

When the system is being operated via the service display (software must be On-line), select the **Emergency Stop** button.

When activated, the RadarView software EMERGENCY STOP function initiates an emergency stop confirmation box which when acknowledged causes the Radar Distribution Unit to power down the transmitter(s) and sets the inverter to "Stopped".



*Example of Manage Radar window in RadarView program*

**CAUTION:**

This EMERGENCY STOP function is DISABLED when the Service Display is OFF-LINE.

**EMERGENCY STOP - WHAT HAPPENS?**

When the *Antenna Rotation* or *Man Aloft* switches are set to OFF or if the *Emergency Stop* software function is activated, ALL AC power to the transceiver/gearbox is isolated thus stopping antenna rotation and RF transmission.

**SYSTEM ISOLATION**

Please refer to Section 4.5 for details on isolating the system from the AC mains supplies for maintenance purposes or working aloft.

**WARNING**

**AC PRESENT WITHIN THE RDU**

When any of the emergency stop functions are used, AC voltages are still present within the RDU.

**SYSTEM ISOLATION**

The Emergency Stop procedure(s) MUST NOT be used as a primary means of system isolation for maintenance procedures or working aloft.



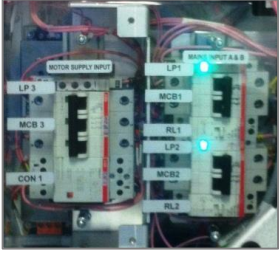
The system must be fully isolated before attempting any maintenance procedure.

**ANTI-CONDENSATION HEATER SUPPLY**

The Anti-Condensation Heater (ACH) supply is not controlled or isolated by any of the processes noted above.

**4.5 System Isolation**

In addition to the normal health and safety requirements, the system must be made safe prior to carrying out any maintenance task by fully isolating and locking OFF all AC power including any UPS supported supplies to the system and where connected the Anti-Condensation Heater (ACH) supply as shown below:

<p><b>RDU Antenna rotation keyswitch</b></p>	<p>Place the <i>Antenna Rotation</i> keyswitch on the front of the Radar Distribution Unit into the <b>OFF</b> position.</p> <p>The key should be <i>removed</i> and retained until the maintenance task being undertaken has been completed.</p>	
<p><b>Man aloft switch (MAS)</b></p>	<p>As an additional safety precaution, the Man Aloft Switch can be placed into the <b>OFF</b> position.</p> <p>This acts as a backup safety measure to removing the <i>Antenna Rotation</i> keyswitch.</p>	
<p><b>RDU AC power</b></p>	<p>Within the Radar Distribution Unit, ensure all breakers are in the <b>OFF</b> position.</p> <p><b>Note:</b> When switched OFF, the LED's on each breaker remain illuminated indicating that AC supplies are still connected to the RDU.</p>	
<p><b>External AC Supplies</b></p>	<p>The external AC supplies to the system consist of:</p> <ul style="list-style-type: none"> <li>• <b>2 x System supplies:</b> Two UPS supported single phase AC supplies to the Radar Distribution Unit.</li> <li>• <b>1 x Motor Supply:</b> A single AC antenna motor supply to the Radar Distribution Unit. Depending on the system, this may be a single or three phase supply.</li> <li>• <b>1 x ACH supply:</b> A single phase AC supply from a dedicated breaker supplying the anti-condensation heaters located within the transceiver/gearbox assembly.</li> </ul> <p>Isolate and disconnect ALL AC supplies to the Radar Distribution Unit and Transceiver/Gearbox Assembly including all UPS supported supplies.</p> <p>Physically remove all breaker sockets or lock the breakers into the OFF position.</p> <p>Ensure that suitable signs are in place indicating that the system is isolated.</p>	

**WARNING**

**UPS (Uninterruptable Power Supply)**  
 Where connected, ensure that UPS supplies to the RDU are fully isolated prior to carrying out any maintenance task on the system.

**WHEN CONFIGURED AS DETAILED ABOVE, THE SYSTEM IS ISOLATED FROM ALL SOURCES OF AC SUPPLY**

Page intentionally blank



## **5 Anti-Condensation Heater (ACH)**

### **CONNECTION**

The Anti-Condensation Heater is not connected as standard.

The ACH should only be connected where the SBS-800 system is to be switched OFF and left in an un-powered state when high humidity levels are anticipated.

Please consult with Kelvin Hughes Ltd for advice on when to connect the anti-condensation heater supply.

### **AC POWER**

- The Anti-Condensation Heater (ACH) is located within the SBS-800 transceiver/gearbox housing.
- It is strongly recommended that the AC power to the heater is connected via an independent source of single phase AC power controlled by a dedicated lockable breaker.
- Where no separate AC supply is available, the AC mains to the transceiver can be moved temporarily to the ACH supply terminals. <sup>Note</sup>

### **NOTICE**

The Anti-Condensation Heater is NOT controlled, switched or monitored by the SBS-800 system.

### **ACH USAGE**

- It is not necessary to have the ACH switched ON when the system is in normal use.
- When operating in areas of high humidity and the transmission system is to be left switched OFF for any length of time, it is recommended that the ACH heater supply is left switched ON to avoid condensation forming within the unit.
- The ACH supply should be switched OFF when the system is made operational/is switched back ON.

### **ACH SWITCH ON**

Switch ON the ACH AC supply to the transceiver/gearbox using a dedicated AC mains breaker or temporarily move the AC mains supply from the transceiver to the ACH. <sup>Note</sup>

- The heater switches ON
- The heater is self-regulating using a built-in resistive temperature controller.
- The heater level is factory set and needs no operator or maintainer adjustment. Once AC power is applied no further operator intervention is required.
- A red neon marked 'ACH' within the gearbox/turning unit illuminates when the ACH AC Power is switched on however this neon is NOT accessible to the operator.
- Suitable warning must be put in place to advise users and maintenance teams that ACH AC mains supply is present within the transceiver/gearbox.

### **ACH SWITCH OFF**

Switch OFF the AC supply to the transceiver/gearbox using the dedicated AC mains breaker.

- This removes power and switches the anti-condensation heater OFF.

### **SYSTEM ISOLATION**

Please refer to section 4.5 for details on isolating the system from all sources of AC power.

**Note:** All termination of the AC supply to the system must be carried out by a suitably qualified technician observing the AC termination requirements and health & safety system isolation requirements as described in the systems installation handbook reference KH-1601-1.

Page intentionally blank




**6 Operation Overview**

**6.1 Local/Remote Control States**

Instructions on operating the system in **Local** and **Remote** control are detailed in the following sections:

- **Local Control:** See Section 7
- **Remote Control:** See Section 8
- **Service display control:** See Section 8.1

The following gives a brief outline of the various control modes available on standard systems fitted with an optional service display:

System status		RDU in Remote control	RDU in Local control	Optional service display Local control
	<b>RDU:</b> Set to Local	Remote control not possible	Local control at the RDU is not possible	The service display has control of the system.
	<b>Service display:</b> On-line	System status information is available	System status information is available	
	<b>RDU:</b> Set to Local	Remote control not possible	In local mode, the RDU controls the system using the controls on the front of the unit.	The service display has no control.
	<b>Service display:</b> Off-line, Disconnected or Switched OFF	System status information is available		System status information is available
	<b>RDU:</b> Set to Remote	The system is controlled by the track extractor	Local control at the RDU is not possible.	The service display has no control.
	<b>Service display:</b> On or Off line		System status information is available	System status information is available

**6.2 Switching from Local to Remote Control**

When Local control is no longer required, the system **MUST** be switched to Remote.

The system can only be changed from *Local* to *Remote* control using the switch on the Radar Distribution Unit; it is not possible to remotely change from Local to Remote.



The system can be set to *Remote* before the track extractor is on-line or ready (see below), this may be desirable when handing the system back to the Remote operating station.

**NOTICE**  
 When set to Local, Remote operation and control is not possible.

<b>Local selected</b>		With <b>Local</b> selected use the front panel or service display to place the transceiver into <b>RUN</b> . Ensure the system is transmitting and is configured as required for operation.
<b>Switch to Remote</b>		Switch from <b>Local</b> to <b>Remote</b> . When the Track Extractor (or remote Service Display) is on line the system continues to transmit and is ready to accept control commands from the command & display system or track extractor.

**6.3 Safety & Security Switches**

**SAFETY SWITCHES**

A normally closed safety current loop is provided for the serial connection of safety switch contacts including an external Man Aloft switch.

**ANTENNA ROTATION SWITCH**

An Antenna Rotation safety keyswitch is provided on the RDU and is part of the safety current loop noted above. This switch can be set to OFF, removed and retained by the maintainer for safety.



RDU Antenna Rotation Switch

**MAN ALOFT SWITCH (MAS)**

An externally mounted switch that is part of the safety current loop noted above can be set to Free (antenna rotate) or OFF.



External Man Aloft Switch

**SWITCH ACTION**

When either the **Antenna Rotation keyswitch** or **Man Aloft** switch are set to **OFF** or if the safety current loop is broken/open, the single phase AC and antenna motor supplies from the RDU to the transceiver/gearbox are isolated thereby stopping Antenna Rotation and system transmission.

**SECURITY SWITCHES**

There is also provision for an optional set of normally closed *Antenna Platform* and *Hut Door* switches that can be used for monitoring purposes.

These switches do not isolate or control any part of the system. When fitted and enabled in the RDU menus, the system reports the status of these switches to the RDU.

**6.4 Transceiver Operational States**

The following table shows the various operation states of the X or S-Band SharpEye™ transceivers within the gearbox/turning unit:

Operation state	Description
OFF	Power is not applied to the transceiver and it is switched OFF.
Initialise	When power is applied to the system, the SharpEye™ initialises and switches to <i>standby</i> or, if any of the self-test checks fail, to <i>fault state</i> .  The system initialisation typically takes 30 to 40 seconds after which time the system becomes available for operation. Control settings and transceiver system parameters saved to the non-volatile memory of the RDU are loaded into the SharpEye™.
Standby	In standby the transceiver has established communication with the Radar Distribution Unit and reports its status.  The transceiver receives and acts on commands from the RDU.  In Standby the antenna rotates but the system does not transmit.
Transmit	When a RUN command is received from the Radar Distribution Unit and azimuth and heading line signals are present, the SharpEye™ transmits.  The transceiver initially outputs at low power. The radar returns are then processed enabling the VSWR to be checked without the risk of damage to the transceiver.  If the VSWR is within limits then the transceiver automatically switches to full power.  If the VSWR is high, indicating an antenna fault, a warning message is sent to the Radar Distribution Unit and the transceiver enters the degraded <i>Low Power</i> state.
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 a warning message is sent to the Radar Distribution Unit indicating the nature of the fault.  The transceiver continues to operate, but with reduced performance and functionality.
Fault	If the performance or functionality is degraded such that the transceiver cannot operate it enters the fault state and a fault message is sent to the display equipment.  The transceiver stops radiating RF and there is no video output to the Radar Distribution Unit.  A spurious fault <i>may</i> be cleared by re-powering the equipment.
Communication error	If communication is lost between the Radar Distribution Unit and the SharpEye™, the RDU reboots the SharpEye™ leading to a potential 60 second gap in coverage.

## **6.5 Performance Monitoring**

There are no user activated performance monitoring checks in the system. The SharpEye™ transceiver continuously runs background performance checks on forward power, reverse power, receiver sensitivity and temperature. If any of these parameters falls outside predetermined levels a warning message is sent to the Radar Distribution Unit indicating the nature of the fault.

It is strongly recommended that regular checks are made on a known good target for radar return quality, range and bearing.

## **6.6 Loss of Control Signal**

### **LOCAL MODE/CONTROL**

If communication is lost between the Radar Distribution Unit and the Service Display, track extractor or third party command and control system, the transceiver will continue to operate at the last known state.

A *COMM FAILURE* alert would be raised and displayed at the RDU.

### **REMOTE MODE/CONTROL**





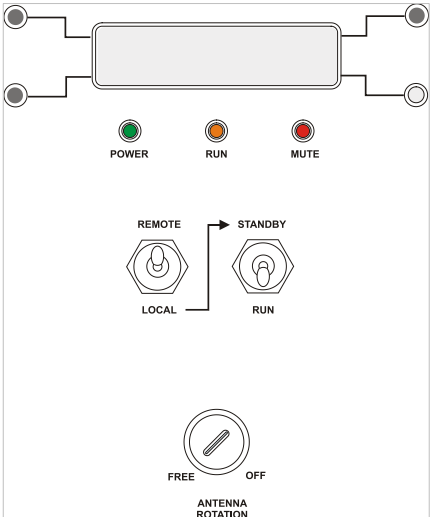
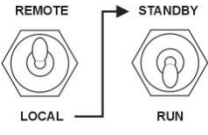
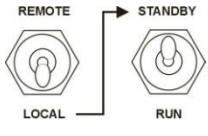
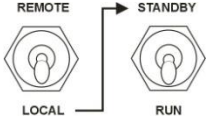

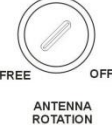
If communication is lost between the RDU and the transceiver, the power to the transceiver is removed briefly by the RDU to reset the equipment.

Corruption of control messages or poor azimuth data may cause a spurious lock-up of the transceiver that can be cleared by this automatic reset.

**7 Local Control**

**7.1 Local Control Overview**

**7.1.1 RDU Local Controls**

	LCD display		A backlit LCD display shows the system status, menus, error and alarm messages
	 Green LED Power	OFF	No power, the RDU is not switched ON
		ON	The power is switched ON and the system is being controlled <i>locally</i> or <i>remotely</i>
		Flashing	The power is switched ON but the system is not controlled (no master)
	 Yellow LED RUN	OFF	The system is in standby
		ON	The transceiver has entered RUN mode and is transmitting
		Flashing	The system is unable to run because: - The <i>man aloft</i> switch or <i>antenna keyswitch</i> are set in the OFF position - A fault is preventing transmission; check the status of the unit
	 Red LED MUTE	OFF	No Mute commands are being received, the system is transmitting for a full 360°
		ON	The transceiver is muted (no transmission)
		Flashing	The system is operating with sector blanking applied
 <p style="text-align: center;"><i>Radar Distribution Unit front panel</i></p>	Switch set to <b>Remote</b>		The system is in <i>Remote control</i> and is operated from the track extractor or remote command & display system. <i>The Standby/RUN switch has no function and can be in any position</i>
	Switches set to <b>Local &amp; Standby</b>		The system is in <i>local control</i> with the transceiver in <i>Standby</i> mode. The track extractor or remote command & display system has no control <b>Note</b> .
	Switches set to <b>Local &amp; RUN</b>		The system is in <i>local control</i> and the transceiver is set to <i>RUN</i> . The track extractor or remote command and display system has no control <b>Note</b> .
	Antenna rotation <b>OFF</b>		The antenna is inhibited. All AC mains power to the SharpEye™ transceiver and gearbox is isolated. <i>The system cannot be run.</i>
	Antenna rotation <b>FREE</b>		The antenna is free to rotate. Power is applied to the SharpEye™ transceiver and gearbox. <i>The system is available for use.</i>

**Note:** When an optional service display is connected, it must be 'off-line' to enable RDU local control. If it is 'on-line', the service display has control of the system and local control using the RDU is not possible. Where no service display is installed, local control will always be available when the switch is set to Local.

### 7.1.2 Remote/Local Switch

A switch on the front of the Radar Distribution Unit allows the selection of *Remote* or *Local* operation. The following explains the basic operation of the system in these two modes.

#### WARNING

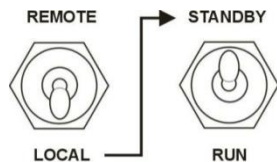
#### ANTENNA ROTATION

Depending on the position of the safety switches, the antenna will rotate regardless of the position of the *Remote/Local* or *Standby/Run* switches.

#### LOCAL OPERATION



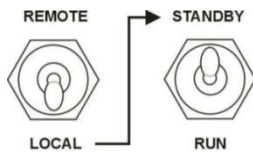
With **Local** selected, the system is in Local control and is used by the installation engineer or system maintainer to configure, test or locally control the system,



**Remote control of the system is not possible.**

With the optional Service Display off-line, system control, status and default information can be accessed, adjusted and viewed in the display panel which shows *control*, *status* and *defaults*:

See Section 7.1.3 onwards for full details on the operation of the front panel.



**Standby:** With the Standby/Run switch in the *Standby* position, the SharpEye™ is in a ready state but does not transmit.



**Run:** With the Standby/Run switch in the *Run* position, the SharpEye™ transmits.

#### Local control disabled?

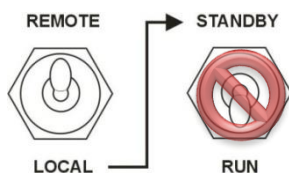
When the optional Service Display is connected and is '*on-line*', Local control at the RDU is not possible as the service display has control.

For RDU Local control, the optional service display must be '*off-line*'; see *Service Display control* in the following section for details on Service Display operation.

#### REMOTE OPERATION



When Remote is selected, the system is controlled by the external command and display system or track extractor.



**The *Standby Run* switch has no function and Local/Service Display control is not possible.**

System status and default information can still be accessed and viewed in the display panel which shows *status* and *defaults*:

See Section 7.1.3 onwards for full details on the operation of the front panel.

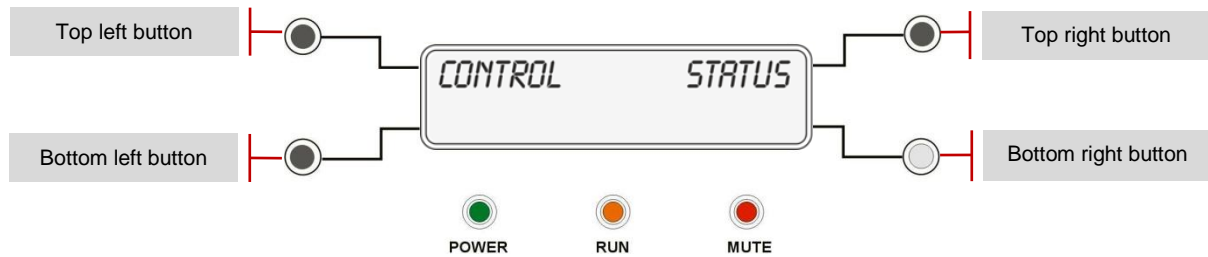


**7.1.3 LCD Panel Operation**

The LCD display on the front of the RDU is a backlit, two line 16 character display. Push buttons located either side of the display allow the control of the setup menus, local control and status monitoring.

The buttons are used in association with the information displayed in the LCD panel, for example in the following picture:

- The *top right* button would select the system *status* information.
- The *top left* would select the system *Control* menu.



Example of RDU front panel

**7.1.4 LCD Display Button Functions**

The display menus and functions are controlled using the four push buttons located around the LCD display. Adjustment & selection of the various menu functions depend on the symbol adjacent to each button as shown below:

←	Select menu item to the left, usually associated with the top left button.
→	Select menu item to the right, usually associated with the top right button.
⤴	Go to previous level menu, usually associated with the bottom left button.
⤵	Go to next level menu, usually associated with the bottom right button.
▶	Select the option to the right, usually associated with the bottom right button.
◀	Select the option to the left, usually associated with the bottom left button.
→ ■	Move the current cursor position to the right, usually associated with the bottom left button.
+	Increase the current item's value.
-	Decrease the current item's value.

### 7.1.5 Alarms

When the system is in local control <sup>Note</sup> and an alarm condition exists, the lower right button will flash red and an audible alarm will be generated.

**VIEW ALARM CONDITION:** To view the alarm message/condition, select the *status* menu and the alarm condition(s) will be displayed in the lower section of the LCD display.

Where present, the ► symbol against *the lower right* button indicates that additional alarm conditions exist. Pressing the ► button scrolls through any additional alarm messages.

**SILENCE THE AUDIBLE ALARM:** To silence the alarm, select the Status menu and then press the lower right hand (red/flashing) button.

The audible alarm will be silenced but the message will continue to display until the condition is cleared.

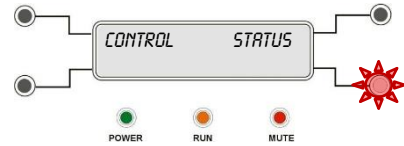
**EXAMPLE:** In the example shown below, an X-Band transceiver is in local control with a **PSUB PWR ALARM** displayed indicating that the AC mains input B has failed, is switched OFF or there is a fault with the power supply.

The ← and → arrows allow navigation away from the alarm messages to other functions available within the Status menu (see section 7.2.3).

Additional alarms conditions are present as indicated by the ► symbol.

The ⬆ symbol returns the display to the main menu.

When an alarm has been acknowledged and more than one alarm condition exists, the display automatically scrolls through the list of alarms.



Example of RDU front panel



Example of system status with active alarms

#### **NOTICE: ALARMS IN REMOTE MODE**

When the Radar Distribution Unit is set to Remote, Alarm messages are still generated and displayed on the RDU but the audible alarm is not sounded and flashing warning LED is not displayed.

**7.2 Menus**

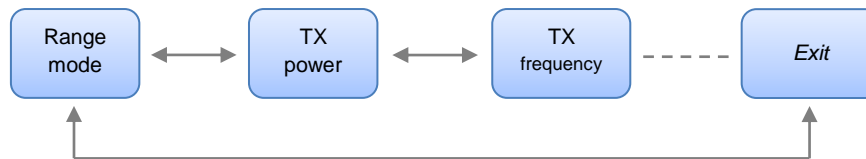
There are four menus that can be selected from the LCD display; the menus vary depending on system settings.

Each menu is detailed in the following sections:

Menu	Menu availability		Description
	Local control	Remote Control	
<b>Control menu</b>	✓	✗	This menu contains the operator and maintainer adjustable parameters for the system such as <i>range mode</i> , <i>Mute ON/OFF</i> , <i>sea and rain filters</i> etc.
<b>Status menu</b>	✓	✓	The current status of the system can be viewed but not adjusted. For example signal status, transceiver run-time and temperature figures etc.
<b>Setup menu</b>	✗	✗	The Setup menu is not available or required for 'normal' system operation. The menu is used by the system maintainer or commissioning engineer to configure the system.

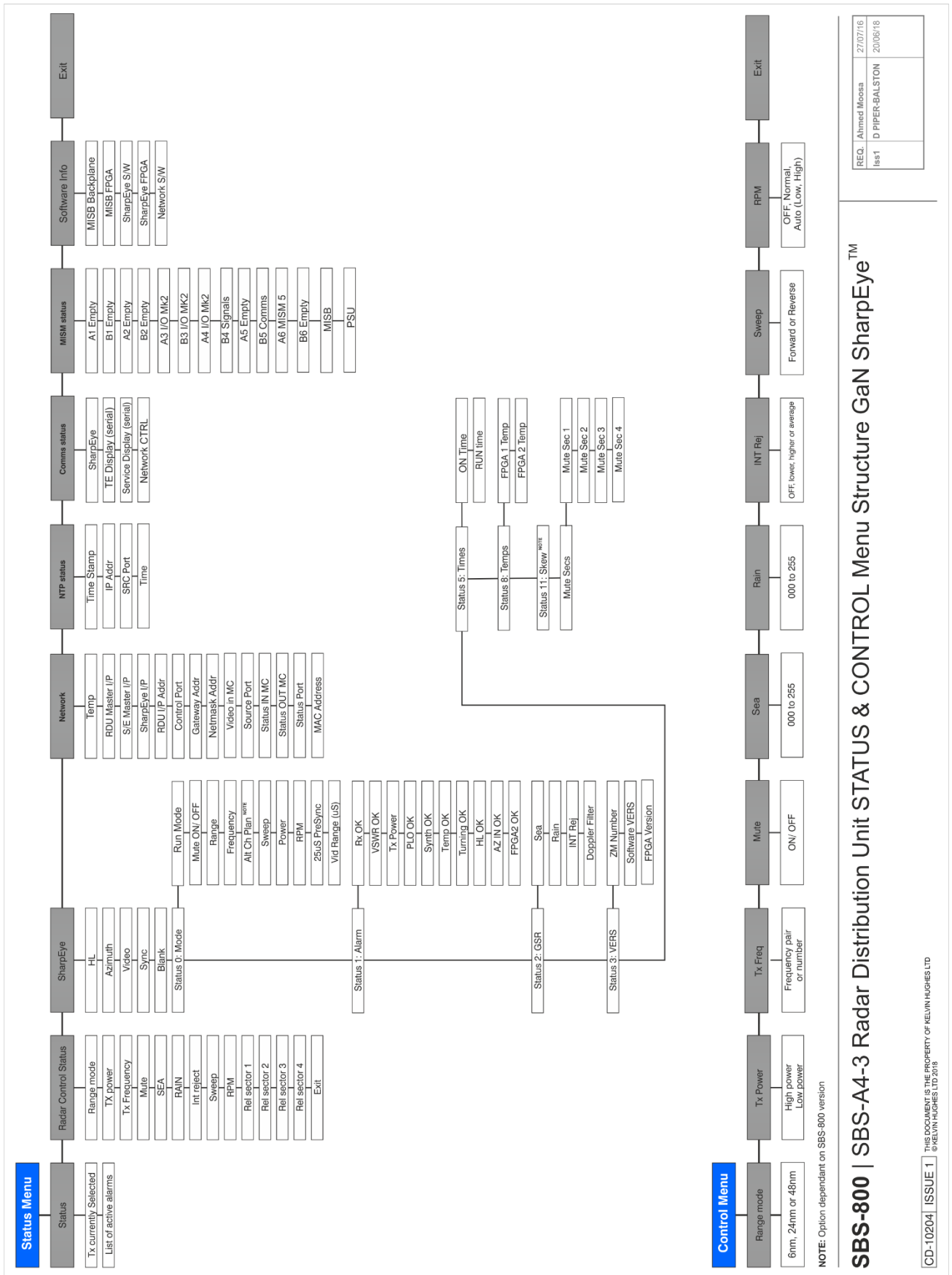
**7.2.1 Navigating Within Menus**

Within all menu structures it is possible to move back and forward between menus using the left ← and → right buttons i.e.



Page intentionally blank

**7.2.2 Menu Overview**

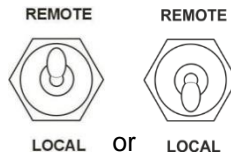


**SBS-800 | SBS-A4-3 Radar Distribution Unit STATUS & CONTROL Menu Structure Gan SharpEye™**

**7.2.3 STATUS Menu**

The **STATUS MENU** on the Radar Distribution Unit is used by the operator or the system maintainer to view but not configure or adjust the current system settings.

The *Status menu* is available on the RDU in both the **REMOTE** and **LOCAL** setting.



When Status is selected from the front panel, the various functions shown below can be selected and viewed as described in section 7.1.5.

An explanation of each function is shown on the following pages.

Status Menu								
Status	Radar Control Status	SharpEye	Network	NTP Status	Comms status	MISM status	Software Info	Exit

**7.2.3.1 System Status**

Status Menu								
<b>Status</b>	Radar Control Status	SharpEye	Network	NTP Status	Comms status	MISM status	Software Info	Exit

When the status menu is initially selected the system status is shown with any active alarms.

In the example shown below, an X-Band transceiver is in Local control with a PSUB PWR ALARM displayed indicating that the AC mains input B has failed, is switched OFF or there is a fault with the power supply.



Example of system status with active alarms

The ► symbol against *the lower right* button indicates that additional alarm conditions exist. Pressing the ► button scrolls through these alarms.

**ALARMS:** When an alarm condition exists, the lower right button will flash red and an audible alarm will sound. To silence the alarm, select the Status menu and press the *lower right* button. The audible alarm will stop however the alarm condition will continue to display until the condition is cleared.

Where an alarm has been acknowledged and more than one alarm condition exists, the display automatically scrolls through the list of alarms.

See section 7.1.5 for additional information on alarms.

7.2.3.2 Radar Control Status

Status Menu								
Status	<b>Radar Control Status</b>	SharpEye	Network	NTP Status	Comms status	MISM status	Software Info	Exit

By scrolling through the *radar control status* menus, the following system configurations and settings can be viewed but not adjusted.

A full description of each function is shown in the *Control menu* section 7.2.4.

Range mode	6nm (SBS-800-1,-2,-3 only), 24nm or 48nm
TX power	SharpEye™ Low or high power
TX frequency	Selected SharpEye™ transmission frequency (SBS-800-1,-2,-51) or frequency pair (SBS-800-3) e.g. 12 to 21.
Mute	Indicates if the Mute is switched ON or OFF
SEA	Shows the configured value of the Sea filter 000 (minimum) to 255 (maximum)
RAIN	Shows the configured value of the Rain filter 000 (minimum) to 255 (maximum)
Int rejection	Function not used in SBS-800 systems (OFF)
Sweep	Shows if the sweep is set to Forward (default) or Reverse
RPM	Shows the selected control of the antenna motor (Off, Low, Auto or High). When Auto is selected, the speed control is adjusted automatically to match the range mode selected.
Rel sector 1	Relative sectors 1 to 4 will show Enabled or Disabled. Blanking sectors can be set up to avoid obstructions or radar sensitive equipment. When Enabled, the start/stop bearings of the sector(s) are shown and the RDU MUTE LED flashes.
Rel sector 2	
Rel sector 3	
Rel sector 4	
Exit	Exits the Radar control status menu

SBS-800 Series Operator & Planned Maintenance Handbook  
**Chapter 7: Local Control**

7.2.3.3 SharpEye

Status Menu								
Status	Radar Control Status	<b>SharpEye</b>	Network	NTP Status	Comms status	MISM status	Software Info	Exit

By scrolling through the *SharpEye* menus, the following system conditions can be viewed but cannot be adjusted.

<b>SharpEye</b>	HL	Shows the antenna RPM based on HL frequency rate as calculated by the RDU or FAIL if it is not present. .	
	Azimuth	Shows the value of the azimuth (e.g. 4096) or Fail if it is not present	
	Video	Shows if the video is OK (present) or Fail if no signal is present.	
	Sync	Shows the current Sync value (PRF) or Fail if the level is below the threshold set during commissioning or if no signal is present.	
	Blank	Shows if blanking is OK (present) or Fail if no signal is present.	
	Status 0: Mode ▾	Run Mode	Standby or Run.
		Mute	ON or OFF.
		Range	6nm (SBS-800-1,-2,-3 only), 24nm or 48nm.
		Frequency	The SharpEye™ transmission frequency or frequency pair. <i>Note</i>
		Alt Ch Plan	Only available for SBS-800-3 systems.
		Sweep	Forward or reverse sweep.
		Power	High or Low power.
		RPM	Shows the RPM as detected by the SharpEye™
		25us Pre sync	Enabled or Disabled the pre-sync from the SharpEye™ transceiver.
		Video range	Show the instrumented video range in μs.
	Status 1: Alarm ▾	RX OK	Receiver OK or Fail
		VSWR OK	VSWR OK or Fail – if Fail the transceiver automatically switches to low power mode
		TX power	Output power OK or Fail
		PLO OK	Programmable local oscillator OK or Fail
		SYNTH OK	SharpEye™ internal synth OK or Fail
		Temp OK	Internal temperature OK, warning or shutdown
		Turning OK	Antenna turning data OK or Fail
		HL OK	Heading line OK or Fail
		AZ OK	Azimuth in OK, Reversed or Missing
		FPGA2 OK	FPGA 2 OK or Fail.
	Status 2: GSR ▾	Sea	Sea clutter: 000 (minimum) to 255 (maximum)
		Rain	Rain clutter: 000 (minimum) to 255 (maximum)
		Int Rej	Not used in the SBS-800 series.
		Doppler filter	No. of Doppler filters used e.g. 16, 32, 64 etc.
	Status 3: VERS ▾	ZM number	SharpEye™ software number (e.g. ZM-2846)
		Software VERS	The version number of the software (ZM-xxxx)
		FPGA version	Version of FPGA code loaded into the FPGA

**Note:** System dependant, please refer to the systems commissioning handbook reference KH-1601-3 or the system integrator for the available frequencies.

**Continued on following page**



SBS-800 Series Operator & Planned Maintenance Handbook  
**Chapter 7: Local Control**

<b>SharpEye</b> (continued)	Status 5: Times ↓	ON Time	Number of hours the SharpEye™ has been switched ON (HH:MM)
		Run-time	Number of hours the system has been transmitting (HH:MM)
	Status 8: Temp ↓	FPGA 1 temp	The current temperature of FPGA 1 (°C) in the SharpEye™ as reported by the SharpEye™
		FPGA 2 temp	The current temperature of FPGA 2 (°C) in the SharpEye™ as reported by the SharpEye™
	Status 11: Skew ↓	xxx.xx°	Displays the configured Skew value configured. (For SBS-800-3 systems this will include Squint & Skew).
	Mute Secs ↓	Mute Sector 1	Shows the status for each Mute sector (enabled/disabled).
		Mute Sector 2	
		Mute Sector 3	
		Mute Sector 4	

7.2.3.4 Network

Status Menu								
Status	Radar Control Status	SharpEye	<b>Network</b>	NTP Status	Comms status	MISM status	Software Info	Exit

The IP addresses and network status can be viewed but not adjusted.

Temp	The current temperature of the MISM 5 network card in °C.
RDU Master IP	Address of the equipment Mastered (controlled) by the RDU LAN control (normally the Remote display).
S/E Master IP	Address of the equipment Mastered (controlled) by the SharpEye™ LAN control (normally the MISM-5 address).
SharpEye IP	Address of the SharpEye™.
RDU IP Addr	Address of the LAN card (MISM-5).
Control Port	UDP Control Port number.
Gateway Addr	Status of the Gateway.
Netmask Addr	'Mask' of the IP address values e.g. 255 rejects messages from any other network; 0 (zero) permits any other value.
Video IN MC	SharpEye™ video multi-cast address to receive video.
Source Port	SharpEye™ video source port address.
Status IN MC	Status of the multi-cast address set for the MISM-5 LAN card to accept the SharpEye™ status (e.g. 239.000.000.016).
Status OUT MC	Status of the multi-cast address for the LAN MISM-5 card.
Status Port	Status of the port address for the LAN MISM-5 card.
MAC address	MAC address of the MISM-5 LAN card.
Exit	Exit the Network menu.

7.2.3.5 NTP Time

Status Menu								
Status	Radar Control Status	SharpEye	Network	<b>NTP Status</b>	Comms status	MISM status	Software Info	Exit

The configuration of the NTP time status can be viewed but not adjusted.

Time Stamp	ON/OFF
IP Address	Displays the NTP server IP address set during the commissioning of the system
SRC Port	Displays the NTP (source) port set during the commissioning of the system
Exit	Exit the NTP status menu.

7.2.3.6 COMMS Status

Status Menu								
Status	Radar Control Status	SharpEye	Network	NTP Status	<b>Comms status</b>	MISM status	Software Info	Exit

By scrolling through the **COMMS STATUS** menus, the following system conditions can be viewed but cannot be adjusted.

In the following Active/Inactive is defined as:

**Active:** A correctly configured and connected system is switched ON and sending serial command or status request messages.

**Inactive:** A correctly configured and connected system may be switched OFF, is not sending serial CANBus messages or in some systems no second transceiver is fitted

SharpEye	SharpEye™ network is Active or Inactive
TE display	Track Extractor (TE) is Active or Inactive on the remote serial port.
Service display	Optional Service display is Active or Inactive on the local serial port.
Network CTRL	Network Active or Inactive on the remote LAN port
Exit	Exits the Comms status menu

7.2.3.7 MISM Status

Status Menu								
Status	Radar Control Status	SharpEye	Network	NTP Status	Comms status	<b>MISM status</b>	Software Info	Exit

By scrolling through the *MISM status* (Modular Interface System Module) menus, the status of each of the 12 slots on the backplane can be viewed.

The results will vary depending on the cards fitted within the RDU. The following is a typical result:

A1 Empty	Empty
B1 Empty	Empty
A2 Empty	Empty
B2 Empty	Empty
A3 I/O Mk2	<b>POSSIBLE MISM CONDITIONS</b>
	<b>EMPTY:</b> A PCA is not fitted in the slot
B3 I/O Mk2	<b>ERROR:</b> The PCA is in the wrong slot for the RDU variant
	<b>MISSING:</b> The PCA required by the software is not present i.e. is not loaded
A4 I/O Mk2	<b>PRESENT:</b> The correct PCA is fitted
B4 Signals	<b>ERROR MESSAGE:</b> 0020 if a module is fitted in the wrong slot or is missing, the RDU will not function further than reporting the error.
A5	Empty
	<b>POSSIBLE MISM CONDITIONS</b>
	<b>EMPTY:</b> A PCA is not fitted in the slot
	<b>ERROR:</b> The PCA is in the wrong slot for the RDU variant
B5 Comms	<b>MISSING:</b> The PCA required by the software is not present i.e. is not loaded
	<b>PRESENT:</b> The correct PCA is fitted
	<b>ERROR MESSAGE:</b> 0020 if a module is fitted in the wrong slot or is missing, the RDU will not function further than reporting the error.
A6 MISM 5	<b>APP OK : Temp °C</b>
B6	Empty
MISB	Loaded
PSU	OK
Exit	Exits the MISM status menu

7.2.3.8 Software Info

Status Menu								
Status	Radar Control Status	SharpEye	Network	NTP Status	Comms status	MISM status	<b>Software Info</b>	Exit

By scrolling through the *software info* menus, the various software versions for the system can be identified:

MISB backplane	Software identification number for the backplane (e.g. ZM-2843 V8.1)
MISB FPGA	The FPGA version number for the backplane
SharpEye S/W	The SharpEye™ transceiver software version number (e.g. ZM-2846 V1.3)
SharpEye FPGA	The FPGA version number for the SharpEye™ transceiver.
Network S/W	Software version number of the network MISM-5 card (e.g. ZM-2914 V1.1).

7.2.3.9 Exit Status Menu

Status Menu								
Status	Radar Control Status	SharpEye	Network	NTP Status	Comms status	MISM status	Software Info	<b>Exit</b>

Selecting Exit closes the status menu and returns the display to the default menu. As no changes can be made to the menus there is no Save Settings function.

### 7.2.4 CONTROL Menu

When operating in Local mode, the **CONTROL MENU** on the Radar Distribution Unit is used by the maintainer to adjust the system settings.

#### MENU AVAILABILITY

The *control menu* is only available on the RDU when the *Remote/Local* switch is set to *Local* and the service display is off-line, is not connected or is switched OFF.



When Remote is selected, the Control menu is not available.

When *Control* is selected from the front panel, the various functions shown below can be selected and adjusted using the LCD display buttons as described in section 7.1.3.

There is not a **“SAVE CHANGES”** button or function, any adjustments are immediately adopted. Changes will be lost if the system is switched OFF or is reset.

Control Menu									
Range Mode	Tx Power	Tx Freq.	Mute	Rain	Sea	Int. Rejection	Sweep	RPM	Exit

#### CAUTION

Incorrect configuration in the Control menus can degrade the performance of the system or inhibit operation. The Control menus should only be used by a suitably trained technician/maintainer.

#### 7.2.4.1 Range Mode

Control Menu									
<b>Range Mode</b>	Tx Power	Tx Freq.	Mute	Rain	Sea	Int. Rejection	Sweep	RPM	Exit

Within the *Range mode* menu, the transceiver instrumented range can be selected between 6nm, 24nm and 48nm.

- 6nm:** Limits the transceiver to an instrumented range of 6nm (option only available for SBS-800-1, -2 and -3).
- 24nm:** Limits the transceiver to an instrumented range of 24nm. This offers twice the range discrimination of the 48nm range.
- 48nm:** Limits the transceiver to an instrumented range of 48nm.

7.2.4.2 TX Power

Control Menu									
Range Mode	<b>Tx Power</b>	Tx Freq.	Mute	Rain	Sea	Int. Rejection	Sweep	RPM	Exit

The output power of the SharpEye™ transceiver can be switched between High (*default*) and Low.

**High power:** The SharpEye™ transceiver transmits at full power; this is the recommended default setting.

**Low power:** Low power is 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 same frame pattern for the range mode but with the output power reduced from the nominal 300W (X-Band) or 200W (S-Band).

**CAUTION**

As a result of reduced output power, range performance will be reduced and the system will not meet the expected operational detection performance because the STC levels are not suitable.

When low power is selected, a *low power* status is automatically generated to advise the operator that the system is operating at a reduced output power.

Where the SharpEye™ detects a VSWR or a high temperature within the transceiver the system automatically switches to low power mode and generates system alarms.

7.2.4.3 TX Frequency

Control Menu									
Range Mode	Tx Power	<b>Tx Freq.</b>	Mute	Rain	Sea	Int. Rejection	Sweep	RPM	Exit

The frequency/frequency pair number of the SharpEye™ transceiver can be selected. This may prevent interference from other transceivers to obtain the best picture quality.

The frequency bands shown in the Tx Freq. menu are selected during setting to work of the system. The frequencies available for selection depends on the system type i.e. X or S-Band, Frequency Diversity (FD) or Non Frequency Diversity (Non-FD) as follows (please refer to KSD-4750 for additional information available from Kelvin Hughes Ltd upon request):

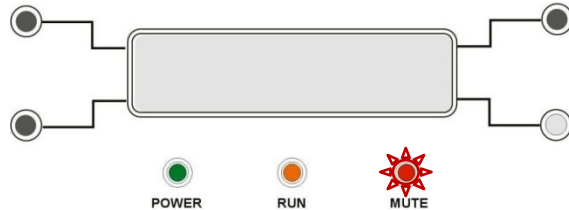
SBS-800 type	Frequency No. Available	X or S-Band
SBS-800-1	12 to 25 (non-frequency diversity)	X-Band 9.21 to 9.49GHz
SBS-800-2		
SBS-800-3	12 to 21 (frequency diversity pairs)	X-Band 9.21 to 9.49GHz or 9.20 to 9.5GHz
SBS-800-51	1 to 8 (non-frequency diversity)	S-Band 2.92 to 3.08GHz

7.2.4.4 Mute

Control Menu									
Range Mode	Tx Power	Tx Freq.	<b>Mute</b>	Rain	Sea	Int. Rejection	Sweep	RPM	Exit

The *Mute* function allows a 360° transmission inhibit to be Enabled/Disabled.

**Mute ON:** Transmission is muted/stopped i.e. no RF is radiated from the antenna however the antenna continues to rotate. The RED Mute LED on the front of the RDU illuminates.



**Mute OFF:** The system transmits fully for 360°. The RED Mute LED on the front of the RDU is OFF.

Mute LED illuminates when Mute is enabled

7.2.4.5 Rain & Sea

Control Menu									
Range Mode	Tx Power	Tx Freq.	Mute	<b>Rain</b>	<b>Sea</b>	Int. Rejection	Sweep	RPM	Exit

The level of *Sea and Rain* filtering can be adjusted between **000** (*minimum*) to **255** (*maximum*).

**Sea:** Filters out the effect of sea clutter on returns.

**Rain:** Filters out the effect of rain clutter on returns.

The levels are set using the ◀ (decrease value) and ▶ (increase value) buttons to produce the best quality picture in the prevailing conditions.

**CAUTION**

Care should be exercised when adjusting Sea and Rain filters as reducing the filter level can reduce signal returns from wanted/actual targets.

7.2.4.6 Int. Rejection

Control Menu									
Range Mode	Tx Power	Tx Freq.	Mute	Rain	Sea	Int. Rejection	Sweep	RPM	Exit

**THIS MENU IS NOT ENABLED IN SBS-800 SYSTEMS.**

This menu is not enabled as the system uses Doppler principles automatically. This menu will have no function in this system.

7.2.4.7 Sweep

Control Menu									
Range Mode	Tx Power	Tx Freq.	Mute	Rain	Sea	Int. Rejection	Sweep	RPM	Exit

Sweep sets the signal sweep direction of the SharpEye™ transceiver RF pulses during medium and long pulse transmissions only.

**Sweep FORWARD:** Frequency modulation is lower to higher value i.e. -10MHz to +10MHz. This is the default setting.

**Sweep REVERSE:** This reverses the sequence of the frequency modulation within the RF pulses and may assist in the reduction of in-band interference from other radars in the same locality thus potentially improving the quality of returns e.g. +10MHz to -10MHz.



7.2.4.8 RPM

Control Menu									
Range Mode	Tx Power	Tx Freq.	Mute	Rain	Sea	Int. Rejection	Sweep	<b>RPM</b>	Exit

The *RPM* function allows the operator to stop rotation (OFF), select Auto or one of three pre-defined antenna rotation speeds. <sup>Note 1</sup>

- Antenna speeds are configured at the factory and are enabled or disabled during setting to work (refer to KH-1601-3 for more information).
- The RPM value set by selecting low, normal and high cannot be configured by the operator.
- Depending on the system configuration, different antenna speeds may not be available.

**OFF:** Antenna rotation is stopped. <sup>Note 1</sup>

**Low:** Where enabled, the low antenna rotation speed configured during setting to work can be selected for 48NM range mode only.  
*Low speed has a minimal improvement in the probability of target detection for other range modes whilst reducing the update rate.*

**Normal:** The standard antenna rotation speed configured during setting to work suitable for 24NM range mode only.

**High** <sup>Note 2:</sup> Where enabled, the high antenna rotation speed configured during setting to work can be selected (subject to a suitable inverter/antenna combination) and only for 6nm X-Band range mode.  
*High speed increases the update rate whilst reducing the probability of detection for 24NM and 48NM modes.*

**Auto** <sup>Note 2:</sup> The system automatically selects the optimum antenna RPM for the selected range mode. This is the default configuration. 'Auto' speed offers the best overall detection performance for the selected range mode.

7.2.4.9 Exit control menu

Control Menu									
Range Mode	Tx Power	Tx Freq.	Mute	Rain	Sea	Int. Rejection	Sweep	RPM	<b>Exit</b>

Selecting Exit closes the Control menu and returns the display to the default menu. There is no **Save Changes** button or function as any adjustments are immediately adopted.

**7.2.5 SETUP/DEFAULT Menus**

The Setup (configuration) is disabled in normal operation and cannot be accessed. Please refer to the Commissioning handbook KH-1601-3 for details.

**CAUTION**

Incorrect configuration in the Setup menus can degrade the performance of the system or inhibit operation. The Setup menus must only be used by a suitably trained technician/maintainer.

**Note 1:** Setting the antenna speed to OFF in the RPM menu must NOT be used as a primary means of isolating the antenna and its sub-systems for safety critical purposes.

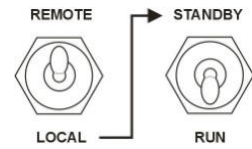
**Note 2:** Antenna speed selection is system dependant and is not available on all models. Please consult with Kelvin Hughes Ltd for additional details.

Page intentionally blank

## 8 Remote Control

When the Radar Distribution Unit is set to *Remote* operation, the external command and display system or track extractor has control of the system.

For test purposes, the optional service display can be configured for Remote control and be connected to the track extractor (TE) port to test the serial port functionality.



**RDU LOCAL CONTROL:** With the switch set to *Remote*, Local control of the system via the Radar Distribution Unit is NOT possible.

### 8.1 Remote Control Operator Instructions

#### EXTERNAL COMMAND AND DISPLAY AND TRACK EXTRACTOR

Operator instructions for the external command and display or track extractor systems are not included in this handbook; please refer to the suppliers' system handbooks for instructions.

#### POWER ON/RESTART IN REMOTE MODE

The saved parameters and control settings are all loaded by the Radar Distribution Unit on Remote Mode power-up, with the exception of the 'Standby/RUN' control which defaults to 'Standby' such that the motor control is ON but RF transmission remains inhibited.

Radar transmission is only enabled by the remote display/tracker system.

#### SERVICE DISPLAY (OPTIONAL)

Operator instructions for the service display are detailed in a separate handbook reference KH-1604 which is provided with the service display.

### 8.2 Switch ON, OFF & EMERGENCY STOP

The switch ON, OFF and emergency stop procedures for third party systems are NOT detailed in this handbook.

Please refer to the system manuals supplied with the equipment for details.

### 8.3 External Commands

The commands sent and received by the SBS-800 system are detailed in a separate document reference *KSD-4750: Serial Control of SBS Radar Systems* which is available upon request.

Page intentionally blank

## **9 Planned Maintenance**

### **9.1 Overview and Safety Notices**

This section provides information on the planned maintenance for all standard systems within the SBS-800 range.

#### **MAINTENANCE RECORD**

The following pages have been designed to be printed, completed and stored as a maintenance record for standard systems. Any damage that is identified as part of an inspection should immediately be reported to Kelvin Hughes and appropriate action taken to prevent further damage occurring.

#### **PROCEDURE**

Prior to carrying out any maintenance the system must be fully isolated from all sources of AC power including any UPS supported supplies, the required maintenance task(s) should be undertaken and on completion, the power restored and the system fully tested.

#### **SPARES**

Where required, only Kelvin Hughes approved spares must be used. The use of unapproved spares invalidates the warranty status of the unit and could lead to a malfunction of the system.

#### **ADVERSE WEATHER**

It is strongly recommended that the gearbox inspections noted in Annual Maintenance procedures are carried out at the earliest safe opportunity after the system has been exposed to severe or adverse weather conditions.

#### **HEALTH & SAFETY**

All safety warnings for the system noted at the beginning of this handbook must be observed at all times when working on, inspecting or maintaining any part of the system or its associated sub systems.

#### **TEST FAILURE**

Please contact Kelvin Hughes Ltd for instructions if one of the tests detailed in the following procedures fails.

#### **ENHANCED ANTENNA SUB-SYSTEMS**

This handbook does not detail the planned or preventative maintenance procedures for the Enhanced antenna sub-system. Please refer to the handbook supplied with the equipment for details.

#### **WARNING**

##### **HIGH VOLTAGES**

Lethal AC and DC voltages are present within the equipment. Prior to carrying out planned maintenance, the system must be fully isolated, refer to section 4.5 for details.

#### **CAUTION**

##### **GEARBOX TEMPERATURE**


When the system has been operating in strong sunlight or elevated temperatures, the transceiver, gearbox casing and antenna surfaces will be extremely hot.

SBS-800 Series Operator & Planned Maintenance Handbook  
**Chapter 9: Planned Maintenance**

**9.2 Annual Maintenance**

<b>EQUIPMENT DETAILS</b>			
Transceiver/gearbox		Low profile antenna	
Part number:	DTX-A	Part number:	LPA-A
Serial number:		Serial number:	
MOD strike		MOD strike	
Radar Distribution Unit (RDU)		Man Aloft Switch (MAS)	
Part number	SBS-A4-	Part number	SBS-A132 <input type="checkbox"/>
Serial number		Serial number	
MOD strike		MOD strike	
Inspected by:	<i>Print:</i> <input style="width: 100%;" type="text"/>	<i>Sign:</i> <input style="width: 100%;" type="text"/>	
Inspection date:	(DD/MM/YYYY)		
Tools required	<ul style="list-style-type: none"> <li>• Blower or soft brush</li> <li>• Medium flat head screwdriver (<i>for opening RDU</i>)</li> <li>• Mild detergent</li> <li style="padding-left: 20px;">Note: Do not use abrasive cleaners or products containing alcohol</li> <li>• Soft abrasive free cloth</li> <li>• Safety ohmmeter, bridge Megger or Multimeter</li> <li>• Spanners (<i>6mm, 10mm and as required for custom earth attachments</i>)</li> <li>• Wire brush or emery cloth</li> </ul>		
Skill level	Basic electrical training, working at heights awareness		
Time	Less than two hours depending on equipment location and accessibility		

**STANDARD ANTENNA SUB-SYSTEM INSPECTION**

Task	Description	Pass	Fail
Cleaning	Clean the antenna facia with a soft cloth moistened in a mild non-abrasive soap solution. <i>Note<sup>1</sup>: Cleaning the antenna is important as the system performance can be degraded if the antenna transmission face becomes obscured by dirt.</i> <i>Note<sup>2</sup>: The antenna facia must never be painted.</i>	<input type="checkbox"/>	<input type="checkbox"/>
Physical inspection	Ensure that all external fastenings are tight, secure and show no signs of severe corrosion or damage.	<input type="checkbox"/>	<input type="checkbox"/>
	Check that waveguide couplings are securely fastened and appear to be waterproof.	<input type="checkbox"/>	<input type="checkbox"/>
	The antenna should be checked to ensure that there is no obvious external damage, cracking or potential faults that could lead to a general failure of any part of the system.	<input type="checkbox"/>	<input type="checkbox"/>
	Check the antenna for signs of excessive vertical end play.  If the end play is more than +/-10mm please consult with Kelvin Hughes.	<input type="checkbox"/>	<input type="checkbox"/>

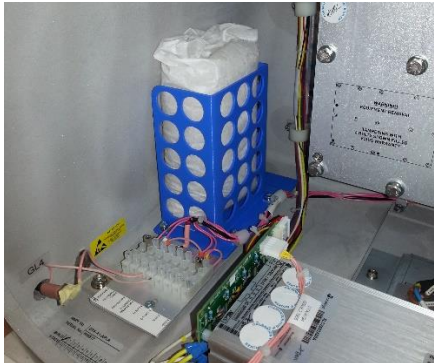
**CAUTION**

The following tests should only be undertaken when it is safe to manually rotate the antenna i.e. the system is fully isolated and disconnected from *all* sources of power and the antenna can be *safely* accessed.

Do not use excessive force or take unnecessary risk when turning the antenna such as reaching too far or leaning outside safety guardrails.

**THIS TASK SHOULD BE DISREGARDED IF THERE ARE ANY SAFETY CONCERNS.**

Manual antenna rotation	As noted above and where safe to do so manually rotate the antenna and ensure that it is free from obstruction and turns smoothly	<input type="checkbox"/>	<input type="checkbox"/>
		Antenna not accessible	<input type="checkbox"/>

<b>TRANSCEIVER/GEARBOX INSPECTION</b>			
<b>Task</b>	<b>Description</b>	<b>Pass</b>	<b>Fail</b>
General cleaning	Clean all exterior surfaces with a soft cloth moistened in a mild non-abrasive soap solution.	<input type="checkbox"/>	<input type="checkbox"/>
Physical inspection	Ensure that all securing bolts for the transceiver/gearbox and antenna are secure and show no signs of severe corrosion or damage. Pay particular attention to the four bolts that hold the transceiver gearbox assembly to the deck/mounting plate.	<input type="checkbox"/>	<input type="checkbox"/>
	Inspect the gearbox including all mounting points for <i>any</i> signs of stress damage. <b>SEVERE WEATHER</b> This inspection should be carried out at the earliest safe opportunity after the system has been exposed to severe or adverse weather conditions.	<input type="checkbox"/>	<input type="checkbox"/>
	Check that cable glands, cable entries and waveguide couplings are securely fastened and appear to be waterproof.	<input type="checkbox"/>	<input type="checkbox"/>
	Within reason and where safe to do so, check all accessible or exposed cables for any signs of damage and ensure they are safely secured into/onto the cable tray or trunking.	<input type="checkbox"/>	<input type="checkbox"/>
	The system should be checked to ensure that there is no obvious external damage or potential fault conditions that could lead to a general failure of any part of the system.	<input type="checkbox"/>	<input type="checkbox"/>
	Check for any signs of oil leaks from the gearbox assembly.	<input type="checkbox"/>	<input type="checkbox"/>
Earth bonding and continuity	Ensure that the earth bonding nuts and bolts are tight and free from corrosion. If corrosion is present, clean and re-terminate as described in Section 9.4.	<input type="checkbox"/>	<input type="checkbox"/>
	Test the earth bonding conductivity by attaching one lead of the test equipment <sup>note</sup> to earth/chassis and the other to an unpainted part of the equipment under test.  Check earth bonding for continuity, the resistance should not exceed 0.1 ohms. If a test fails, investigate the bonding, rectify (see Section 9.4) and repeat the test.  <b>Note:</b> Safety ohmmeter, bridge Megger or Multimeter.	<input type="checkbox"/>	<input type="checkbox"/>
Desiccator	For units fitted with a desiccant sachet, this should be replaced annually or every time the door hatch is opened. Part no. 55-100-397-001 is available through Kelvin Hughes.  	<input type="checkbox"/>	<input type="checkbox"/>



SBS-800 Series Operator & Planned Maintenance Handbook  
**Chapter 9: Planned Maintenance**

RADAR DISTRIBUTION UNIT (RDU)				
Task	Description		Pass	Fail
Cleaning	External surfaces	Clean with a soft, non-abrasive cloth lightly moistened in a mild soap solution.	<input type="checkbox"/>	<input type="checkbox"/>
	Internal surfaces	Open the door of the Radar Distribution Unit using a screwdriver. Clean the unit using blower and/or soft brush.	<input type="checkbox"/>	<input type="checkbox"/>
Physical inspection	External	Ensure that all mounting bolts are secure.	<input type="checkbox"/>	<input type="checkbox"/>
		Ensure all connectors are securely in place. Inspect cabling for condition and wear.	<input type="checkbox"/>	<input type="checkbox"/>
		Check that all air vents are clear of obstructions and dust.	<input type="checkbox"/>	<input type="checkbox"/>
	Internal	Ensure all PCBs and connectors are securely in place. Inspect internal cabling for condition and wear.	<input type="checkbox"/>	<input type="checkbox"/>
		Check that all air vents and fans are clear of obstructions and clear of dust accumulation.	<input type="checkbox"/>	<input type="checkbox"/>
General	The system should be checked to ensure that there is no obvious external damage or potential fault conditions that could lead to a general failure of any part of the system.	<input type="checkbox"/>	<input type="checkbox"/>	
Earth bonding and continuity	On the underside of the RDU, visually inspect the earth terminal for damage and corrosion. If corrosion is present, clean and re-terminate as described in Section 9.4.		<input type="checkbox"/>	<input type="checkbox"/>
	Check that the earth bonding strap between the radar distribution unit door and chassis is secure and has a good electrical connection.		<input type="checkbox"/>	<input type="checkbox"/>
	Test the earth bonding conductivity by attaching one lead of the test equipment <sup>note</sup> to earth/chassis and the other to an unpainted part of the equipment under test.		<input type="checkbox"/>	<input type="checkbox"/>
	Check the earth bonding for continuity, the resistance should not exceed 0.1 ohms (see section 9.4). If a test fails, investigate the bonding, rectify and repeat the test.  <b>Note:</b> Safety ohmmeter, Bridge Megger or Multimeter.		<input type="checkbox"/>	<input type="checkbox"/>
Inverter Fan Condition Check	Depending on the ambient temperature and loading conditions, the fan within the static inverter has a predefined service life (e.g. 10 years).  The fan run time must be checked annually to see if the fan needs replacement.		Run Time  Hrs.	
	<div style="background-color: red; color: white; padding: 2px; display: inline-block;"><b>WARNING:</b> Lethal single and 3-Phase AC supplies are present within the RDU.</div>			
	Check the Inverter fan run time (e.g. t0.50)		FAN OK <input type="checkbox"/>	Change Inverter <input type="checkbox"/>
Fan Inverter OK or Change Inverter?			<input type="checkbox"/>	<input type="checkbox"/>

**VF-nC3 Single Phase Inverter (SBS-A229): Checking the fan run-time**

- On the static inverter control panel, open the small access door, press the **MODE** button twice and ensure that **Fr-F** is displayed
- Rotate the thumb wheel until FE14 is displayed then press the thumbwheel to access the fan menu.

The run-time will be indicated by *tx.xx* where: *T0.01* = 1 hour, *t1.00* = 100 hours.

**Record the run-time and proceed to the next step**

- Rotate the thumb wheel until FE79 is displayed, press the thumbwheel to access the fan menu and 4 single height lines should be shown:

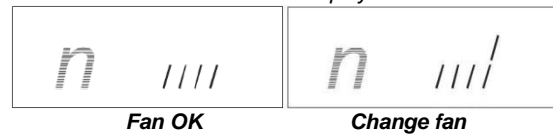
The fan should be changed when the last line changes to a double height line:

If any of the first three lines are double height, this indicates that the capacitors are at the end of their serviceable life and the inverter assembly should be replaced at the earliest opportunity.

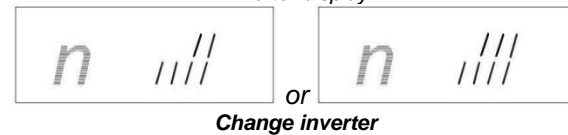
**Fan/ inverter replacement:** See section 9.3 for details on replacing the inverter.



*Inverter display*



*Inverter display*



**VF-S15 Three Phase Inverter (SBS-A403/SBS-A404): Checking the fan run time**

The procedure for checking the VF-S15 inverter is similar to the above however accessing the menu is as follows:

Press **MODE** button twice and rotate the thumb wheel until **FE79** is displayed.

ITEM DISPLAYED	PANEL OPERATED	LED DISPLAY	COMM NO	DESCRIPTION
Parts replacement alarm information.		<i>n . . . . .</i>	FE79	<p>The ON/OFF status of each of the cooling fan circuit board capacitor of parts replacement alarm, cumulative operation time or number starting are displayed in bits.</p> <p>e.g <i>n . . . . .</i> indicates failure</p>

Note: Parts replacement alarm is displayed based on the value calculated from the annual average ambient temperature specified using F634, the ON time of the inverter, the operating time of the motor and the output current (load factor). Use this alarm as a guide only, since it is based on a rough estimation.

SBS-800 Series Operator & Planned Maintenance Handbook  
**Chapter 9: Planned Maintenance**

<b>MAN ALOFT SWITCH</b>			
<b>Task</b>	<b>Description</b>	<b>Pass</b>	<b>Fail</b>
Physical inspection	Ensure that all fastenings are secure and show no signs of severe corrosion or damage.	<input type="checkbox"/>	<input type="checkbox"/>
Switch action	Ensure the switch operation is smooth and that both the <i>Free</i> and <i>OFF</i> positions can be selected.	<input type="checkbox"/>	<input type="checkbox"/>
Earth bonding and continuity	Test the earth bonding conductivity by attaching one lead of the test equipment <sup>note</sup> to chassis/earth and the other to an unpainted part of the equipment under test.	<input type="checkbox"/>	<input type="checkbox"/>
	Check the earth bonding for continuity, resistance should not exceed 0.1 ohms. If test fails, investigate the bonding, rectify and repeat the test.  <b>Note:</b> Safety ohmmeter, Bridge Megger or Multimeter.		

**COMPLETION OF MAINTENANCE TASKS**

**CAUTION**

**SWITCH ON SAFETY NOTICE**

Observing all health & safety precautions, on completion of the planned maintenance and noting that the following **will cause antenna rotation and possible system transmission**, restore AC power and control to the system and test as follows:

Security switches	<i>Place the Antenna rotation keyswitch</i> and Man Aloft Switch in the FREE positions.	<i>Antenna rotation</i>	<input type="checkbox"/>
		<i>Man aloft</i>	<input type="checkbox"/>
AC Breakers	Restore AC power to the system Switch the Single Phase AC and Antenna Motor AC supply breakers within the RDU ON.	<input type="checkbox"/>	
Local control test	With the RDU switches set to Local control test the system to ensure full functionality.	<input type="checkbox"/>	
Remote control test	Place the Remote/local switch on the RDU to the <i>Remote</i> position and test the system to ensure full functionality.	<input type="checkbox"/>	

**SAFETY SWITCH TESTS**

**SYSTEM CONFIGURATION**

The following tests should be carried out with power restored to the system and the transceiver placed into RUN.

**WARNING:**

When carrying out the following test, do not contravene any health and safety precautions regarding working aloft, antenna or electrical safety.

Task	Description	Pass	Fail
<b>Antenna rotation keyswitch</b>	<ul style="list-style-type: none"> <li>- Place the <i>antenna rotation</i> keyswitch (located on the door of the Radar Distribution Unit) to OFF</li> <li>- The yellow LED on the front panel of the radar distribution unit will flash</li> <li>- Ensure that the system stops transmitting, antenna rotation is stopped and that the appropriate system alarms are generated</li> <li>- Return to switch to the <i>free</i> position and ensure that normal operation is resumed</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Man aloft switch (MAS)</b>	<ul style="list-style-type: none"> <li>- Change the <i>man aloft switch</i> position to the <i>OFF</i> position</li> <li>- Ensure that the system stops transmitting, antenna rotation is stopped and that the appropriate system alarms are generated</li> <li>- Return to switch to the <i>free</i> position and ensure that normal operation is resumed</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Hut door switch</b> (Where fitted)	<ul style="list-style-type: none"> <li>- Where possible <i>and SAFE to do so</i>, open the hut door</li> <li>- Ensure the appropriate system alarms are generated</li> <li>- Close the HUT door and ensure that normal operation is resumed</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Antenna platform switch</b> (Where fitted)	<ul style="list-style-type: none"> <li>- Where it is possible <i>and SAFE to do so</i>, open the antenna platform access door</li> <li>- Ensure the appropriate system alarms are generated</li> <li>- Close the antenna platform access door and ensure that normal operation is resumed</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>
		<b>Not fitted</b>	<input type="checkbox"/>
<b>RDU fan operation</b>	- Open the door to the RDU	<input type="checkbox"/>	<input type="checkbox"/>
	<b>WARNING</b>		
	Lethal single phase and antenna motor AC supplies are present within the Radar Distribution Unit.		
	<ul style="list-style-type: none"> <li>- Visually confirm that the two fans on the dual redundant power supply are running</li> </ul>		

**END OF PLANNED MAINTENANCE TASKS**

**9.3 10-year Maintenance**

**CHANGING THE STATIC INVERTER IN THE RDU**

In addition to the annual maintenance requirements indicated earlier in this section, after 10-years of use, the static inverter located within the Radar Distribution Unit must be changed as over time, the electrolytic capacitors within the inverter can dry out.

Please contact Kelvin Hughes Ltd for details or to arrange for an engineer to change the inverter.

When contacting Kelvin Hughes Ltd please ensure that you have the full part and serial number of the Radar Distributing Unit as this assists in identifying the inverter fitted within the equipment.

The following can be used to record when the system was installed and when inverter replacement is necessary.

<b>10 YEAR INVERTER REPLACEMENT RECORD</b>		
<b>Radar Distribution Unit</b>	<b>Part number</b>	
	<b>Serial Number</b>	
<b>System Installation Date</b> (dd/mm/yyyy)		
<b>Change inverter by</b> (dd/mm/yyyy)		

**WARNING**

**Replacement Part/Spares**

Only Kelvin Hughes Ltd approved inverters must be used. The installation of an unapproved inverter can cause irreparable damage the system.

**WARNING**

**AC VOLTAGES**

Lethal single phase and antenna motor AC supplies are present within the inverter.

**CAUTION**

**INVERTER REPLACEMENT**

The inverter must be replaced by a suitable qualified technician.

**NOTICE**

Do not dismantle the inverter.

The inverter is a factory sealed unit that contains no serviceable or replaceable parts

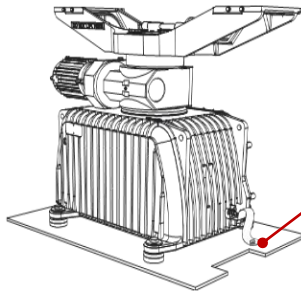
#### 9.4 Earth Bonding Maintenance

Where an earth/chassis bonding point has been found to be corroded or fails a conductivity test, the bonding joint should be dismantled, cleaned and reassembled as follows:

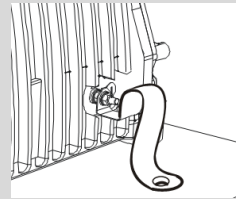
#### CAUTION

#### ISOLATE THE SYSTEM BEFORE COMMENCING THIS TASK.

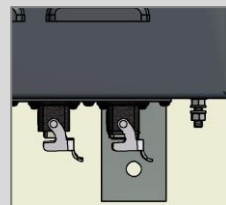
Under no circumstances should straps or equipment be disconnected from earth/chassis before all power supplies including UPS supplies are isolated at source.



SBS-800 Gearbox grounding strap



RDU M6 grounding/earth stud



#### EARTH BONDING CLEANING PROCEDURE:

- Fully isolate the equipment from the single and 3-phase AC power supplies.
- Release the nuts/bolts securing the equipment/straps.
- Clean the affected parts with a wire brush or emery cloth to provide bright metal surfaces.
- Refit the equipment/straps and tighten all nuts/bolts.
- Carry out a continuity check in accordance with the appropriate maintenance procedure.
- If the test is satisfactory, restore the equipment power supplies and test the system.

## 10 Contact Details

**Kelvin Hughes Ltd  
Voltage  
6 Mollison Avenue  
Enfield  
EN3 7XQ  
UNITED KINGDOM**



**Phone:** +44 (0)1992 805 200

**Fax** +44 (0) 1992 805 310

<b>Service</b>	email	surveillance.support@kelvinhughes.co.uk
	Phone	+44 (0)1992 805 200

<b>Technical Advice</b>	email	surveillance.tech@kelvinhughes.co.uk
	Phone	+44 (0)1992 805 200

<b>Spares</b>	email	surveillance.support@kelvinhughes.co.uk
	Phone	+44 (0)1992 805 200

<b>Internet</b>	Website	www.kelvinhughes.com
-----------------	---------	----------------------

Page intentionally blank



## 11 Abbreviations

The following abbreviations are used in Kelvin Hughes publications. Some may not appear in this handbook and are shown for reference only.

AC	Alternating Current	EPA	Electronic Plotting Aid
ACH	Anti-condensation heater	EPFS	External Position Fixing System
ACP	Azimuth Clock Pulse (azimuth pulses)	ERBL	Electronic Range & Bearing Line
ACK	Acknowledge	ERR	Error
ACQ	Acquire	ESM	Electronic Surveillance Measure
AFC	Automatic Frequency Control	ETA	Estimated Time of Arrival
AGC	Automatic Gain Control	ETD	Estimated Time of Departure or Enhanced Target Detection
AIS	Automatic Identification System	EXT	External
ALT	Altitude or Alternative	EZ	Exclusion Zone
ANCH	Anchor	FAT	Factory Acceptance Test
ANT	Antenna	FCS	Fire Control System
AP	Auto-Pilot	FD	Frequency Diversity
ARCS	Admiralty Raster Chart Service	FSM	Functional Status Message
ARP	Azimuth Reset Pulse (heading line)	FWD	Forward
AUD	Audio	GaN	Gallium Nitride
AZ	Azimuth	GC	Great Circle
BCR	Bow Crossing Range	GNSS	Global Navigation Satellite System
BCT	Bow Crossing Time	GPS	Global Positioning System
BIT	Built In Test	GZ	Guard Zone
BITE	Built in Test Equipment	HAP	Harbour Approach & Pilotage
BRG	Bearing	HDG	Heading
BRILL	Brilliance	HL	Heading Line
BWW	Bearing Waypoint to Waypoint	HRDPC	High Resolution Digital Pulse Compression
CAL	Calibrate or Calibration	H-UP	Head-UP
CANBus	Controller Area Network Bus	IALA	International Association of Lighthouse Authorities
CCRP	Consistent Common Reference Point	IBS	Integrated Bridge System
CCRS	Consistent Common Reference System	IEC	International Electrotechnical Committee
CENT	Centre	IF	Intermediate Frequency
CFAR	Constant false Alarm Rate	ILS	Integrated Logistic Support
GHG	Change	IMO	International Maritime Organisation
CLR	Clear	IND	Indicator
CNCL	Cancel	INS	Integrated Navigation System
CONT	Contrast	INT	Interval
CORR	Correction or Correlator	I/O	Input/Output
CPA	Closest Point of Approach	IP	Internet Protocol
CRS	Course	IR	Interference Rejection
CTW	Course Through Water	IRS	Interface Requirement Specification
C-UP	Course UP	KH	Kelvin Hughes
CSR	Cursor	KN	Knots
CW	Continuous Wave	LAN	Local Area Network
DAY/NT	Day/Night	LAT	Latitude
DC	Direct Current	LCD	Liquid Crystal Display
DDU	Data Distribution Unit	LED	Light Emitting Diode
DECR	Decrease	LIM	Limit(s)
DEL	Delete	LNFE	Low Noise Front End
DEP	Departure	LON	Longitude
DEST	Destination	LOP	Line(s) of Position
DEV	Deviation	LP	Long Pulse
DISP	Display	LPA	Low Profile Antenna
DIST	Distance	LR	Long Range
DG	Dangerous Goods	LRU	Line Replaceable Unit
DGPS	Differential Global Positioning System	m	Metre
DPTH	Depth	MAN	Manual
DR	Dead Reckoning	MAC	Media Access Control
DTG	Distance To Go	MAS	Man Aloft Switch
EBL	Electronic Bearing Line	MDP	MantaDigital™ Processor
EBRL	Electronic Bearing & Range Line	MDS	Minimum Detectable Signal
ECDIS	Electronic Chart Display & Information System	MISM	Modular Interface System Module
ECS	Electronic Chart System	MMI	Man Machine Interface
EDPC	Enhanced Digital Pulse Compression	MMSI	Maritime Mobile Service Identity
ENC	Electronic Navigation Chart	MOB	Man Over Board
ENH	Enhance	MON	Monitor
ENT	Enter	MP	Medium Pulse
EM	Electromagnetic	MTD	Moving target Detection
EMC	Electromagnetic Compatibility	MTTR	Mean Time To Repair
EMCON	Electromagnetic Control	MVR	Manoeuver
EP	Estimated Position		

SBS-800 Series Operator & Planned Maintenance Handbook  
**Chapter 11: Abbreviations**

NAV	Navigation
Nm	Nautical Mile
NMT	Not More Than
NORM	Normal
N-UP	North-UP
OOW	Officer On Watch
OS	Own Ship
PC	Personal Computer
PCB	Printed Circuit Board
PI	Parallel Index Line(s)
PL	Pulse Length
PM	Performance Monitor
POS	Position
PPI	Planned Position Indicator
PPR	Pulses Per Revolution
PRF	Pulse Repetition Frequency
PWM	Pulse Width Modulation
PWR	Power
RAD	Radius
RADAR	Radio Detection & Ranging Receiver
RACON	Radar Beacon
RAL	German Colour Standard
RCDS	Raster Chart Display System
R CRS	Relative Course
RDU	Radar Distribution Unit
REF	Reference
REL	Relative
RF	Radio Frequency
RIP	Radar Interlay Processor
RL	Rhumb Line
RM	Relative Motion
RM(R)	Relative Motion with Relative Trails
RM(T)	Relative Motion with True Trails
RNC	Raster Navigation Chart
RNG	Range
ROT	Rate Of Turn
RPM	Revolutions Per Minute
RR	Range Ring(s)
R SPD	Relative Speed
RTD	Real Time Display
Rx	Receive
SART	Search And Rescue Transponder
SAT	Satellite
SBS	Shore Based Systems
SC/SC	Scan to Scan
SEL	Select
SETD	Systems Engineering Technical Document
SOG	Speed Over Ground

SOLAS	Safety Of Life At Sea
SP	Short Pulse
SPD	Speed
STAB	Stability
STBY	Standby
STC	Sensitivity Time Control
STG	Speed to Go
STW	Speed Through Water
SYM	Symbol
SYNC	Synchronisation
T	True
TBA	To Be Advised
TBC	To Be Confirmed
TCP	Transmission Control Protocol
TCPA	Time to Closest Point of Approach
T CTW	True Course Through Water
TFT	Thin Film Transistor
TGT	Target
TM	True Motion or <sup>TM</sup> Trade Mark
TM(T)	True Motion with True Trails
TOA	Time Of Arrival
TOD	Time of Departure
TRK	Track
T STW	True Speed Through Water
TT	Target Tracking
Tx	Transmit
TWOL	Time to Wheel Over Line
U	Height unit of 19" rack system
UDP	Universal Datagram Protocol
UNSTAB	Un-Stabilised
UPS	Uninterruptable power supply
USB	Universal Serial Bus
VAR	Variable
VECT	Vector
VID	Video
VOY	Voyage
VRM	Variable Range Marker
VSWR	Voltage Standing Wave Ratio
WAN	Wide Area Network
WGS	World Geodetic System
WI	Work Instruction
WOL	Wheel Over Line
WOP	Wheel Over Point
WOT	Wheel Over Time
WPT	Waypoint
XTD	Cross Track Distance
XTE	Cross Track Error

**12 Index**

**A**

AC supply isolation..... 31  
 Adverse weather - Checks  
     after..... 61  
 Alarms  
     Silence audio..... 42  
     View alarm condition ..... 42  
 Antenna  
     Emergency STOP ..... 30  
     Isolation..... 7  
     Radiation hazard ..... 6  
     Rotates at switch on..... 27  
     Rotation safety notice..... 5  
 Anti-condensation heater ..... 33

**B**

Button functions (front panel)41

**C**

COMMS status menu..... 50  
 Control menu (RDU) ..... 53

**D**

**Default** Menu (RDU)..... 57

**E**

Emergency antenna stop ..... 30  
 End of life disposal ..... 8  
 External commands ..... 59

**F**

**Fan**  
     Check (VF-nC3 inverter) .. 66  
     Check (VF-S15 inverter) .. 66  
 Front panel  
     Buttons & control ..... 41

**H**

Health and Safety Warnings  
     English ..... 5

French .....11

**I**

Interference rejection menu ..56  
 Isolating the system .....31

**L**

Lifting  
     General notices.....9, 15  
 Local  
     Operator instructions .....39  
     RDU controls .....39  
     Switch .....40  
     Switch to Remote.....36

**M**

Maintenance  
     Earth bonding .....70  
     Planned maintenance  
         overview .....61  
 Menu  
     Control menu .....53  
     Default menu .....57  
     Navigation within menus...43  
     RDU menus .....43  
     Setup menu .....57  
     Status menu.....46  
 Microwave radiation levels..... 6  
 MISM errors .....51  
 MISM status menu.....51  
 Mute menu.....55

**P**

Part numbering .....18  
 Planned maintenance .....61  
 Power isolating the system ...31

**R**

Radar Control Status menu ..47  
 Radiation hazards..... 6  
 Range Mode menu .....53  
 Remote  
     Operation .....59

Switch..... 40  
 Residual voltages..... 5  
 RoHS..... 8, 14  
 RPM menu ..... 57

**S**

Safety aloft ..... 7  
 SBS-800-1  
     Overview ..... 20  
 SBS-800-3  
     Overview ..... 23  
 SBS-800-51  
     Overview ..... 25  
 Setup menu (RDU)..... 57  
 SharpEye menu ..... 48  
 Software info menu ..... 52  
 Software licensing ..... 9  
 Spares listing  
     Approved spares ..... 61  
 Static inverter  
     Removal ..... 69  
 Status menu (RDU)..... 46  
 Sweep menu ..... 56  
 Switching  
     OFF ..... 29  
     OFF Emergency STOP .... 30  
 System isolation ..... 31  
 System status menu..... 46

**T**

Transceiver  
     Operational states ..... 37  
 TX Frequency menu..... 54  
 TX Power menu ..... 54

**V**

Virus precautions ..... 9

Page intentionally blank





Page intentionally blank



**Kelvin Hughes Limited**

Voltage, Mollison Avenue  
Enfield EN3 7XQ, United Kingdom  
T +44 (0)1992 805200  
F +44 (0)1992 805310  
[www.kelvinhughes.com](http://www.kelvinhughes.com)

---

***Detect and Protect.***

Kelvin Hughes Limited  
Registered Office:  
Voltage, 6 Mollison Avenue, Enfield EN3 7XQ, UK.  
Incorporated in England No. 01030135