USERS MANUAL

OPERATING INFORMATION for the MantaDigital Navigation Displays RADAR MODE

PUBLICATION KH2060

ISSUE 5

Radar Software Version ZM-2144 V1.2

January 2009

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CONFORMITY STATEMENT

MantaDigital Radar is certified to conform to the requirements of MSC.192(79) and has been tested to IEC 62388.

The MantaDigital navigation radar display (processor, user interface and presentation screen) meets the requirements for Standard and High Speed Craft. The navigation radar display is offered in both Category 1 and Category 2 options. Category 1 is defined as all ships/craft ≥10,000 gt and Category 2 is defined as ships/craft from 500 gt to <10,000 gt and HSC <10,000 gt.

Radar sensors are provided in both X-band and S-band versions and meet the requirements for Standard and High Speed Craft.

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AMENDMENT RECORD

When an amendment is incorporated into this handbook, the details should be recorded below. If the equipment has been modified, the modification number is shown on the Amendment instruction page.

Amendment No.	Date Inserted	Initials	Mod Number
			-

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CONTENTS

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ELECTRIC SHOCK RESUSCITATION

1 **SHOUT FOR HELP.**
SWITCH OFF ELECTRICITY IF POSSIBLE.

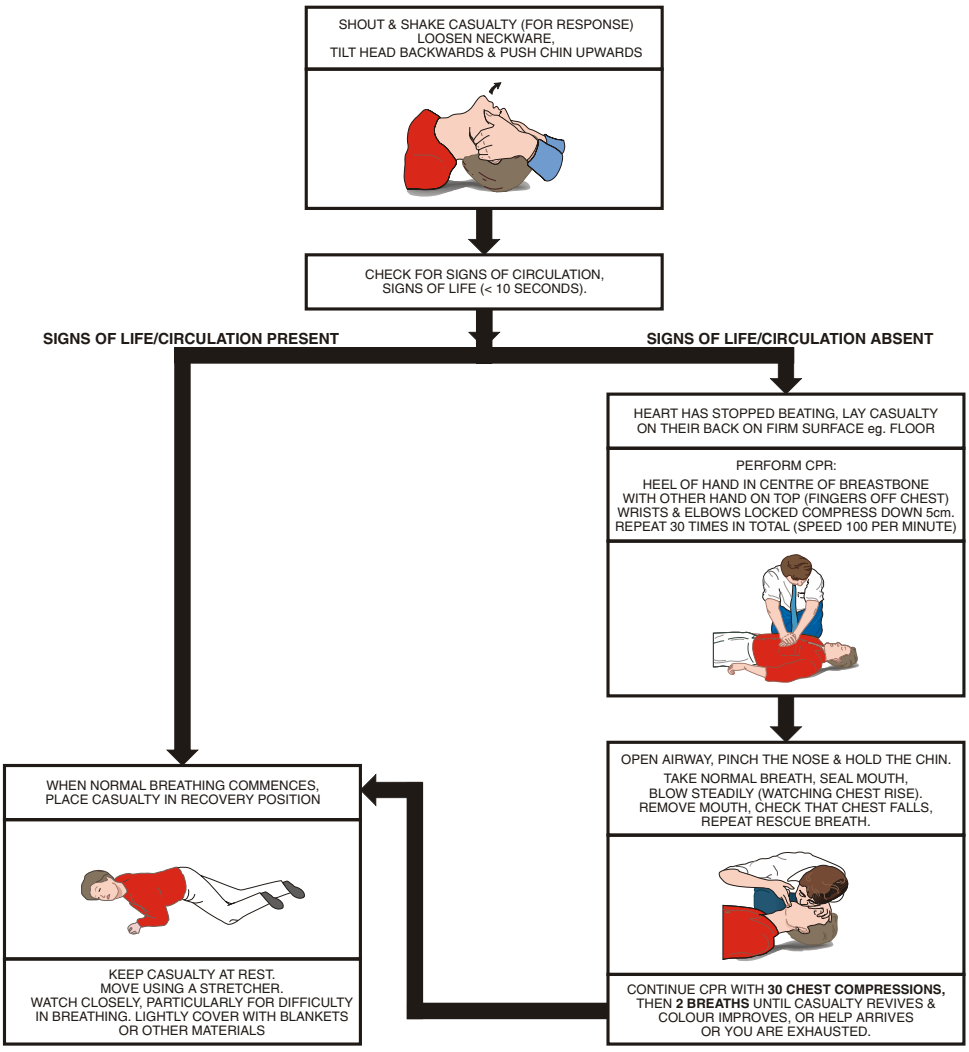
SWITCH OFF ELECTRICITY IMMEDIATELY. IF NOT POSSIBLE, DON'T WASTE TIME SEARCHING FOR A SWITCH

2 **REMOVE CASUALTY FROM DANGER.**

SAFEGUARD YOURSELF WHEN REMOVING CASUALTY FROM HAZARD.
IF CASUALTY IS STILL IN CONTACT WITH ELECTRICITY AND THE SUPPLY CANNOT BE ISOLATED, STAND ON A DRY NON-CONDUCTING MATERIAL (RUBBER MAT, WOOD, LINOLEUM). USE RUBBER GLOVES, DRY CLOTHING WOODEN BROOM, STOOL, CHAIR, LENGTH OF DRY ROPE OR WOOD TO PULL OR PUSH CASUALTY AWAY FROM THE HAZARD.

3 **REMOVE ANY OBVIOUS OBSTRUCTION TO BREATHING.**

IF CASUALTY IS NOT BREATHING, START RESUSCITATION AT ONCE.
GET HELP.



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MEDICAL ASSISTANCE MAY BE OBTAINED ON / AT .....

SAFETY WARNINGS

WARNING

THIS EQUIPMENT IS NOT FITTED WITH SAFETY INTERLOCKS. LETHAL VOLTAGES ARE PRESENT WHEN THE UNITS ARE OPEN AND EXPOSED. BEFORE REMOVING ANY SUB-UNIT OR PCB, ALL SUPPLIES MUST BE SWITCHED OFF.

A CURRENT OF 100 mA PASSING THROUGH THE HUMAN BODY FOR ONE SECOND CAN KILL. THIS CAN OCCUR AT VOLTAGES AS LOW AS 35 V AC OR 50 V DC. SOME EQUIPMENT IN THE SYSTEM USES ELECTRICAL POWER THAT CAN BE LETHAL.

WARNING

THIS EQUIPMENT CONTAINS MATERIALS WHICH PRODUCE TOXIC FUMES WHEN BURNT.

SAFETY WARNINGS

SERVICING

THE EQUIPMENT SHOULD BE SERVICED BY AUTHORISED AGENTS ONLY.

Mains Voltage

All Kelvin Hughes equipment is supplied with Mains Voltage set for 220V, 50/60 Hz AC unless stated otherwise on labels attached to the equipment.

Picture Freeze

The rare event of Processor failure is indicated by non-operation of the trackerball, no update of screen data, and the time shown on the Visual Display Unit will not be up-dated.

The Processor Unit is to be switched OFF and ON again to reset the Processor.

WARNING

The navigation systems and equipment supplied by Kelvin Hughes comply with the relevant SOLAS regulations and are provided as aids to navigation and should be used in accordance with the SOLAS regulations.

RADIATION HAZARD: NON-IONISING

ANTENNA RADIATION HAZARD: INJURY CAN RESULT FROM EXPOSURE TO THE MAIN BEAM OF A STATIONARY RADAR ANTENNA. DO NOT STAND LESS THAN 2m FROM THE CENTRAL FRONT FACE OF THE ANTENNA.

It is accepted in most countries that no significant hazard is presented by radio frequency mean power density levels up to 10mW/cm. RF power levels in excess of this may cause harmful effects, particularly to the eyes.

Users of cardiac pacemakers should be aware that radio frequency transmissions can damage some such devices or cause irregularities in their operation. Persons using a pacemaker should ascertain whether their device is likely to be affected before exposing themselves to the risk of malfunction.

X-RAY RADIATION

30 kW S- band and 25kW X- band magnetrons have a stray field of less than 0.00525 gauss at 4.6m. The latest X-band magnetrons have a stray field of less than 0.002 gauss at 2.1 m.
At a distance of 100 mm with S-band and X-band magnetrons operating normally into a matched load, no level of ionising radiation above the background is detectable.

SAFETY ALOFT

AERIAL ROTATION: BEFORE MAINTENANCE TO THE TURNING MECHANISM TAKES PLACE, DISABLE AERIAL ROTATION.

When working aloft, ensure that it is brought to the attention of someone in authority at deck or at ground level and that suitably placed warning notices are posted warning that work aloft is in progress. Ensure that the means of access aloft is secure and beware of wet or slippery ladder rungs and working areas.

When working on or near a radar scanner and other moving or RF radiating equipment, ensure that it is switched off and that the fuses have been removed and retained.

MICROWAVE RADIATION LEVELS.

Measurement of radiation levels were conducted on 10th July 2008 at QinetiQ. The manufacturer's representative assisted and enabled the antenna rotation to be disabled and transmission maintained. Test equipment used was a Narda survey meter mod 8718B and an isotropic probe mod 8721 ser no 13003. A table of results is presented below.

System	100 W/m^2 distance or power at Antenna face	50 W/m^2 distance	10 W/m^2 distance
25 kW S-Band CTX-A9 with 3.9 m Low profile S-Band Antenna LPA-A3	28.4 W/m^2	-	510 mm
25 kW X-Band CTX-A8-ACAC with 1.3 m Low profile X-Band Antenna LPA-A13	71.7 W/m^2	60 mm	880 mm
SharpEye DTX-A1 with 3.9 m Low profile S-Band Antenna LPA-A3	21.7 W/m^2	-	90 mm

CAUTION

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 unterminated state, or sub-units containing these devices:

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

Soldering irons used during the 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 (PCBs) fitted with these devices must be stored and transported in anti-static bags.

Fit new devices in a special handling area.

PREFACE

MantaDigital Radar is designed to be flexible and expandable making it ideal for use in Integrated Bridge Systems (IBS) and Integrated Navigation Systems (INS), as well as for standalone Radar Systems.

When used in Integrated Bridge Systems or Integrated Navigation Systems the MantaDigital Widescreen Display can be configured as a networked Multi-Functional Navigation Display, which can be switched between different functions, e.g. Radar, ECDIS, HAP or Conning Display, depending on the function required by the user. This allows a single display to control a number of functions, although only one function can be accessed at any time.

MantaDigital is designed so that, when required, the display units can be controlled from a remote position using an Ergopod.

The operation, installation and maintenance of MantaDigital is covered in the following manuals:

KH2060 - User Manual for the MantaDigital Radar Systems. This covers operation and maintenance of the MantaDigital Radar System, including the Radar Display and Radar Sensors. This manual provides all the information required for standalone radar systems, and for the networked multi-functional display in Radar Mode.

KH2061 - System Manual for the MantaDigital Radar Systems. This covers installation and commissioning of the MantaDigital Radar system, including stand alone Radar Systems, and the networked multi-functional multi-display systems.

Maintenance must only be undertaken by qualified service engineers or by Kelvin Hughes and their approved agents. Unauthorised repair of equipment during the Warranty period will invalidate the Warranty. If a third party wishes to undertake the maintenance of the equipment, ensure that the service engineers have undertaken a training course approved by Kelvin Hughes.

If a unit exhibits a fault, and therefore a service engineer is required to attend the vessel, please contact our Service Control Centre, giving full details of the following:

1. Name of vessel (Phone or Fax number if fitted)
2. Equipment type
3. Software status (version number) (if applicable)
4. Next port of call, ETA/ETD and ship's agents
5. Fault description (with as much detail as possible)
6. Purchase order number with invoicing details
7. Contact Name

You may contact our direct line, send a fax or send an email.

Kelvin Hughes, Customer Services Group, New North Road, Hainault, Essex IG6 2UR (UK)

Phone: Main UK Switchboard: 44 (0)20 8502 6887
Direct Service Line & Out of Hours Emergency Technical Support: 44 (0)20 498 1761

email: service@kelvinhughes.co.uk

If you have any technical queries or require any technical information regarding your Kelvin Hughes bridge equipment you may phone our direct Service Line. You may also contact our direct line, send or fax an email to:

technical.advice@kelvinhughes.co.uk

If you require information on our training facilities or would like to have a quote for training, please give as much detail as possible. You may contact our direct line, send a fax or send an email to:

training@kelvinhughes.co.uk

For quotation of spares, or if you require any information regarding availability, lead times etc, you may contact our direct line, send a fax or send an email to:

spares@kelvinhughes.co.uk

Please Note. All quote requests must have full contact details. Our preferred method of contact is email, but Fax or Post may be used. We normally supply the quotation by email.

For more information regarding our contract services or to arrange a meeting with a member of our team you may email us at the following address. Those customers already holding an agreement with us may also use this email address to request a service, providing the same information as mentioned for service (no purchase order number required). You may contact our direct line, send a fax or send an email to:

contract.support@kelvinhughes.co.uk

LIST OF ABBREVIATIONS

ACK	Acknowledge
ACQ	Acquire, Acquisition
ADJ	Adjust, Adjustment
AFC	Automatic Frequency Control
AGC	Automatic Gain Control
AIS	Automatic Identification System
ALT	Altitude
AM	Amplitude Modulation
ANCH	Anchor Watch
ANCH	Vessel at Anchor
ANT	Antenna
AP	Autopilot
API	Application Program Interface
APR	April
ARM	Armoured Protected Memory
ARCS	Admiralty Raster Chart Service
ARPA	Automatic Radar Plotting Aid
AUD	Audible
AUG	August
AUTO	Automatic
AUX	Auxiliary System/Function
AVAIL	Available
AZ	Acquisition Zone
AZI	Azimuth Indicator
BCR	Bow Crossing Range
BCT	Bow Crossing Time
BITE	Built In Test Equipment
BKGND	Background
BRG	Bearing
BRILL	Brilliance
BWW	Bearing Waypoint to Waypoint
C	Carried (for example, carried EBL origin)
CAL	Calibrate
cbl	cable length
CCRP	Consistent Common Reference Point
CCRS	Consistent Common Reference System
CCTV	Closed Circuit Television
CD	Compact Disk
CDROM	Compact Disk Read Only Memory
CENT	Centre
CHG	Change
CLR	Clear
CNCL	Cancel
COG	Course Over Ground
CONT	Contrast
CORR	Correction
CP	Circularly Polarised

LIST OF ABBREVIATIONS (CONT.)

CPA	Closest Point of Approach
cps	cycles per second
CPU	Central Processing Unit
CRS	Course
CSM	Crash Survivable Module
CTS	Course To Steer
CTW	Course Through the Water
C UP	Course Up
CURS	Cursor
D	Dropped (e.g. dropped EBL origin)
DAU	Data Acquisition Unit
DAY/NT	Day/Night
DEC	December
DECR	Decrease
deg	degrees
DEL	Delete
DEP	Departure
DEST	Destination
DEV	Deviation
DIU	Data Interface Unit
DISP	Display
DIST	Distance
DIVE	Vessel Engaged in Diving Operations
DG	Dangerous Goods
DGLONASS	**D**ifferential **GLO**bal'naya **NA**vigatsionnaya **S**putnikovaya **S**istema tr: Differential Global Navigation Satellite System
DGNS	Differential GNSS
DGPS	Differential GPS
DMTS	Discrete Monitor Timing Standard
DPTH	Depth
DR	Dead Reckoning
DRG	Vessel Engaged in Dredging or Underwater Operations
DRMS	Distance Root Mean Square
DSC	Digital Selective Calling
DTG	Distance To Go
E	East
EBL	Electronic Bearing Line
EBRL	Electronic Range & Bearing Line
ECDIS	Electronic Chart Display and Information System
ECS	Electronic Chart System
ECTAB	Electronic Chart Table (Kelvin Hughes)
EGNOS	European Geo-stationary Navigational Overlay System
ENC	Electronic Navigational Chart
ENH	Enhance
ENT	Enter
EP	Estimated Position
EPA	Electronic Plotting Aid

LIST OF ABBREVIATIONS (CONT.)

EPFS	Electronic Position Fixing System
EPIRB	Emergency Position Indicating Radio Beacon
EQUIP	Equipment
EPROM	Erasable Programmable Read Only Memory
ERBL	Electronic Range and Bearing Line
ERR	Error
ETA	Estimated Time of Arrival
ETD	Estimated Time of Departure
EUT	Equipment Under Test
EXT	External
EZ	Exclusion Zone
FEB	February
FISH	Fishing Vessel
FM	Frequency Modulation
fm	fathom
FREQ	Frequency
FSP	Field Service Program
ft	foot
FTC	Fast Time Constant
FWD	Forward
GAS	Grounding Avoidance System
GC	Great Circle
GDOP	Geometric Dilution of Precision
GEOG	Geographics
GHz	GigaHertz
GLONASS	Global Orbiting Navigation Satellite System
GMDSS	Global Maritime Distress and Safety System
GMT	Greenwich Mean Time (also known as Zulu time)
GND	Ground
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GRI	Group Repetition Interval
GRND	Vessel Aground
gt	gross tonnage
GZ	Guard Zone
HAP	Harbour Approach and Pilotage
HCS	Heading Control System
HDG	Heading
HDOP	Horizontal Dilution of Precision
HF	High Frequency
HL	Heading Line
hPa	HectoPascal
hr	hour
HS	Harmful Substances (applies to AIS)
HSC	High Speed Craft
H UP	head up

LIST OF ABBREVIATIONS (CONT.)

HVR	Hardened Voyage Recorder
Hz	Hertz
IBS	Integrated Bridge System
ID	Identification
IEC	International Electrotechnical Commission
IMO	International Maritime Organisation
INCR	Increase
IND	Indication
INF RED	Infrared
INFO	Information
INIT	Initialisation
INP	Input
INS	Integrated Navigation System
INT	Interval
I/O	Input/Output
IP	Internet Protocol
IR	Interference Rejection
IRCS	Integrated Radio Communication System
ISW	Interswitch
ITU-R	International Telecommunication Union - Radiocommunication sector
JAN	January
JUL	July
JUN	June
kHz	kiloHertz
km	kilometre
kn	knots
kPa	kiloPascal
LAT	Latitude
LBL	Label
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LF	Low Frequency
LIM	Limit
L/L	Latitude/Longitude
LON	Longitude
LOP	Line of Position
LOST TGT	Lost Target
LP	Long Pulse
LR	Long Range
LWY	Leeway
m	metres
MAG	Magnetic
MAN	Manual
MAR	March
MAX	Maximum
MF	Medium Frequency

LIST OF ABBREVIATIONS (CONT.)

MIN	Minimum
min	minute
MHz	MegaHertz
MKR	Marker
MMSI	Maritime Mobile Service Identity
MOB	Man Overboard
MON	Performance Monitor
MP	Medium Pulse
MP	Maritime Pollutant (applies to AIS)
ms	milli-seconds
MSI	Maritime Safety Information
MSTR	Master
MVR	Manoeuvre
N	North
NAV	Navigation
NLT	Not less than
NM	Nautical Miles
NMEA	National Marine Electronics Association
NMT	Nor more than
NORM	Normal
NOV	November
NUC	Vessel Not Under Command
N UP	North-Up
OCT	October
OOW	Officer On Watch
OS	Ownship
PAD	Predicted Area of Danger
PANEL	Panel Illumination
PAST POSN	Past Positions
PASSV	Passenger Vessel
PC	Personal Computer
PCB	Printed Circuit Board
PDOP	Positional Dilution of Precision
PERM	Permanent
PI	Parallel Index Line
PIN	Personal Identification Number
PILOT	Pilot Vessel
PL	Pulse Length
PM	Pulse Modulation
PM	Performance Monitor
PMC	Protective Memory Capsule
POB	Person Overboard
PORT	Port/Portside
POSN	Position
PPC	Predicted Point of Collision
PPI	Plan Position Indicator
PPR	Pulses Per Revolution

LIST OF ABBREVIATIONS (CONT.)

PRED	Predicted
PRF	Pulse Repetition Frequency
PRR	Pulse Repetition Rate
PWR	Power
RAD	Radius
RADAR	RAdio Detection And Ranging
RAIM	Receiver Autonomous Integrity Monitoring
RAM	Random Access Memory
RATS	Rate Aided Tracking System
RCDR	Receiver
RCDS	Raster Chart Display System
RCGA	Radar Control Gate Array
RCS	Radar Cross-Section (target size)
REF	Reference
REF	Echo Reference
REL	Relative
RIM	Vessel Restricted in Manoeuvrability
RIP	Radar Interlay Processor
RIU	Radar Interswitch Unit
RL	Rhumb Line
RM	Relative Motion
RM(R)	Relative Motion, Relative Trails
RM(T)	Relative Motion, True Trails
RMS	Root Mean Square
RNC	Raster Navigational Chart
RNG	Range
ROM	Read Only Memory
RORO	Roll On/Roll Off Vessel
ROT	Rate Of Turn
ROV	Remotely Operated Vehicle
RP	Radar Plotting
RPM	Revolutions Per Minute
RR	Range Rings
RTD	Real Time Display
RTK	Real-Time Kinematic
Rx	Receiver
S	South
SAIL	Sailing Vessel
SAM	Status and Alarm Unit
SAR	Search And Rescue
SART	Search And Rescue Transponder
SARV	Search And Rescue Vessel
SAT	Satellite
SATNAV	SATellite NAVigation
SC/SC	Scan to Scan (Correlation)
SDME	Speed and Distance Measuring Equipment
sec	second

LIST OF ABBREVIATIONS (CONT.)

SEL	Select
SEP	September
SEQ	Sequence
SF CNT	Safety Contour
SIM	Simulation
SINAD	SIgnal to Noise And Distortion
SNR	Signal to Noise Ration
SNTP	Standard Time Network Protocol
SOG	Speed Over Ground
SOLAS	Safety Of Life At Sea
SP	Short Pulse
SPD	Speed
STAB	Stabilised
STBD	Starboard/Starboard Side
STBY	Standby
STC	Swept Time Constant
STG	Speed To Go (Required Speed)
STN	Station
STW	Speed Through the Water
S-VDR	Simplified Voyage Data Recorder
SYM	Symbol
SYNC	Synchronised
T	True
TCPA	Time to Closest Point of Approach
TCP/IP	Transmission Control Protocol/Internet Protocol
TCS	Track Control System
TCVR	Transceiver
TD	Time Difference
TDOP	Time Dilution of Precision
TFTP	Text File Transfer Protocol
THD	Transmitting Heading Device
TIU	Transceiver Interface Unit
TGT	Target
TM	True Motion
TM(T)	True Motion, True Trails
TMTR	Transmitter
TOA	Time Of Arrival
TOD	Time Of Departure
TOW	Vessel Engaged in Towing Operations
TPL	Transferred Line of Position
TPR	Transponder
TRIG	Trigger Pulse
TRK	Track
TRKG	Tracking
TT	Target Tracking
TTG	Time To Go
TTL	Transistor Transistor Logic

LIST OF ABBREVIATIONS (CONT.)

Tx	Transmit
TWOL	Time to Wheel Over Line
UHF	Ultrahigh Frequency
ULB	Underwater Locator Beacon
UNSTAB	Unstabilised
UPS	Uninterruptible Power Supply
USB	Universal Serial Bus
UPS	Uninterruptible Power Supply
UTC	Co-ordinated Universal Time
UTM	Universal Transverse Mercator
UWE	Vessel Underway Using Engine
VAR	Variation
VCD	Vessel Constrained by Draught
VCR	Video Cassette Recorder
VDR	Voyage Data Recorder
VDU	Visual Display Unit
VECT	Vector
VESA	Video Electronics Standards Association
VHF	Very High Frequency
VID	Video
VLF	Very Low Frequency
VOY	Voyage
VRM	Variable Range Marker
VTS	Vessel Traffic Service
W	West
WAT	Water
WCV	Waypoint Closure Velocity
WGS	World Geodetic System
WOL	Wheel Over Line
WOP	Wheel Over Point
WOT	Wheel Over Time
WPT	Waypoint
XTD	Cross Track Distance
XTE	Cross Track Error
yd	yards

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INTRODUCTION AND GENERAL DESCRIPTION

CONTENTS

CONTENTS (CONT.)

ILLUSTRATIONS

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INTRODUCTION AND GENERAL DESCRIPTION

INTRODUCTION

1 The MantaDigital Radar System is designed and manufactured to be compliant with the IMO MSC.192(79) Radar Performance Standard. These advanced radar systems have been tested and certified to Test Standard IEC 62388.

2 The MantaDigital Radar System includes a radar sensor (transceiver and antenna / turning unit), and a navigation Radar Display (processor unit, visual display unit, trackerball and optional keyboard, optional MantaDigital Control Interface and optional Ergopod). The radar sensor consists of either a conventional non-coherent magnetron pulsed radar operating on X-band (9.41 GHz) or S-band (3.05 GHz) or optionally, utilises a new-technology coherent solid state S-band transceiver (***SharpEye***™) (frequency selectable in the band 2.93 GHz to 3.07 GHz). The transceivers operate with one of a range of low profile antennas and associated turning units.

3 The high performance navigation Radar Display processor unit interfaces and controls the radar sensor(s), provides display functionality including advanced digital signal processing, and handles the User inputs. The processor unit also provides the drive for a high resolution wide-aspect flat screen visual display unit. The user input is via a trackerball and three buttons and optionally, a MantaDigital Control Interface featuring dedicated hardware controls for the primary control functions, or a keyboard. All MantaDigital Radar Displays provide automatic target tracking and Automatic Identification System (AIS) functionality.

4 The display presentation recognises the IMO MSC.191(79) Presentation Standard to provide harmonisation with a new generation of navigation Radar Displays. A standard use of symbols, readability, screen performance and colour grouping has been adopted to aid the user and to reduce stress on the bridge of a ship.

5 The MantaDigital navigation Radar Display, as part of a certified system, is compliant with the IMO Radar Performance Standard. The MantaDigital Radar Display presentation benefits from the wide screen format and may be configured in various formats including presentations as a single radar presentation, a dual radar presentation, and a single radar presentation with harbour approach features; all of these presentations support the IMO Radar Performance Standard. Additional presentation options are regarded as Auxiliary Displays, for example the Harbour Approach and Pilotage Display. Such presentation configurations may be essential for the navigational task in hand and can provide partial radar functionality, however they are not regarded as part of an approved and certified radar system.

6 A system may be installed for example, as a radar presentation with map functions, a chart radar featuring electronic charts, a radar for high speed craft, or a combination of these. Equipment certification and category signify the suitability for each application and the User Manual addresses each equipment category.

7 MantaDigital may be used as stand-alone systems, or as part of an Integrated Bridge System (IBS) or Integrated Navigation System (INS). A radar installation can comprise a single stand-alone radar system or may include multiple radar systems with possibilities to interswitch sensors and displays.

8 This manual contains information on all the operational features of the MantaDigital Radar System. The operational features that are provided on individual systems may vary according to the customer's requirements. Therefore, the Visual Display Unit, User Interface, Processor Unit and Radar Sensor used on individual systems may not appear identical to those shown in this manual. Where a particular feature is not active, that feature and associated facilities will not be shown as a option in the menus or will be greyed out.

9 The MantaDigital Radar System is available as Radar only (MDP-A1) or as a Chart Radar (MDP-A9).

10 KH3200, the Radar operating information manual, which is bound with KH2060, provides the full operating procedures for the Radar software, and is applicable to all systems, regardless of the hardware installation.

11 The MantaDigital Radar System consists of a combination of the following items:

(1) MantaDigital Radar Display, comprising a MantaDigital Widescreen Visual Display Unit, a Processor Unit and a user interface (trackerball with optional keyboard and/or optional MantaDigital Control Interface). The Visual Display Unit is either Desk, Pedestal or Console mounted, and is available in two sizes (520 mm (20") with a 258 mm diameter Radar Operational Area and 650 mm (26") with a 328 mm diameter Radar Operational Area). The associated Processor Unit is either bulkhead mounted or located in the same Pedestal as the Visual Display Unit. Console mounted Visual Display Units have a separate Trackerball Unit, and a separate optional keyboard or optional MantaDigital Control Interface.

(2) Radar Sensor, available in S-Band (Mk7 and ***SharpEye***™) or X-Band (Mk4, Mk5 and Mk7), comprising a Radar Transceiver, Turning Mechanism and Antenna. The Mk7 S-Band is a magnetron radar, available in upmast or downmast configuration, and also uses a Drive Control Unit. The ***SharpEye***™ S-Band is a solid-state radar, available in upmast configuration only and also uses a Drive Control Unit. The X-Band radar sensors are magnetron radars, available in upmast configuration (Mk4 and Mk5) or downmast (Mk7) configuration, and also use a Tx Interface Unit.

(3) Radar Interswitch Unit (RIU). This unit is used where more than one Radar Sensor and/or more than one Radar Display are used on the system. It allows up to 6 Radar Sensors and 6 Radar Displays to be connected together, allowing each Radar Display to select any of the Radar Sensors connected to the RIU for viewing.

(4) Ergopod (optional), which is a remote control module, mounted on the end of a chair arm, and allows the user to control the radar display functions from the chair position rather than from the visual display unit position, this facility is normally used in addition to the standard trackerball control.

12 Typical MantaDigital Radar Systems are shown in Figures 1 to 5.

NOTE: The single radar systems shown in Figures 1 to 3 have no redundancy built in. In the event of a single equipment failure the whole radar system may cease to function.

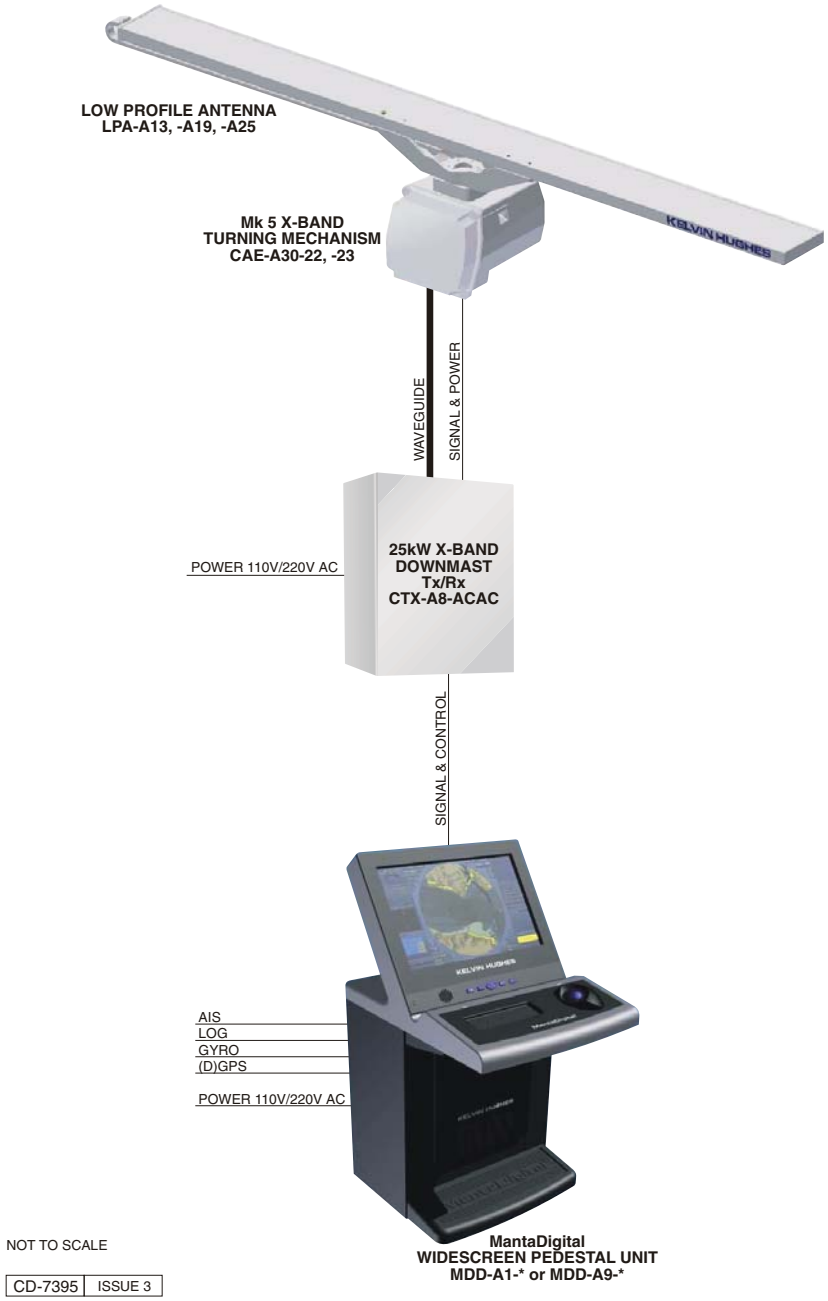

Figure 1 - Typical X-Band Downmast Single Radar System

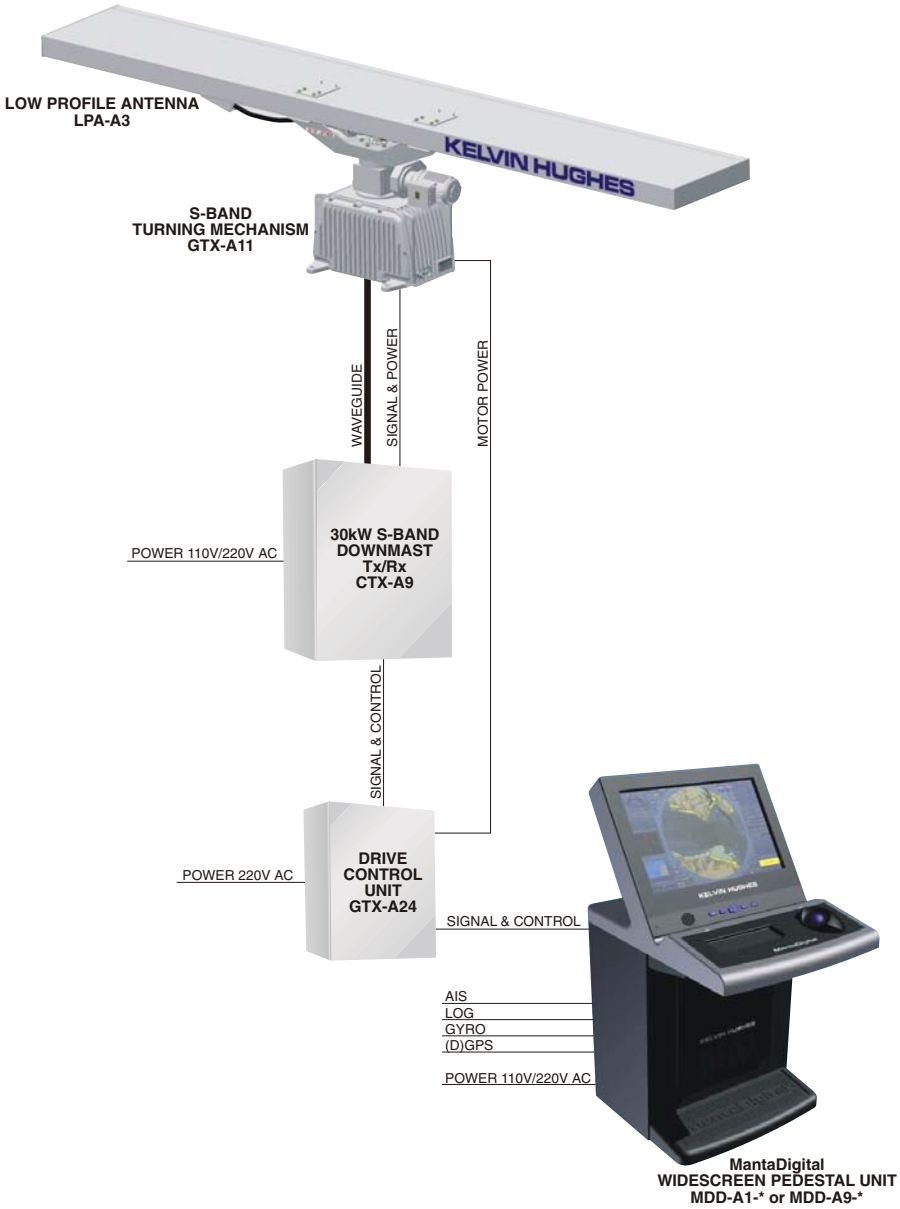

Figure 2 - Typical S-Band Downmast Single Radar System

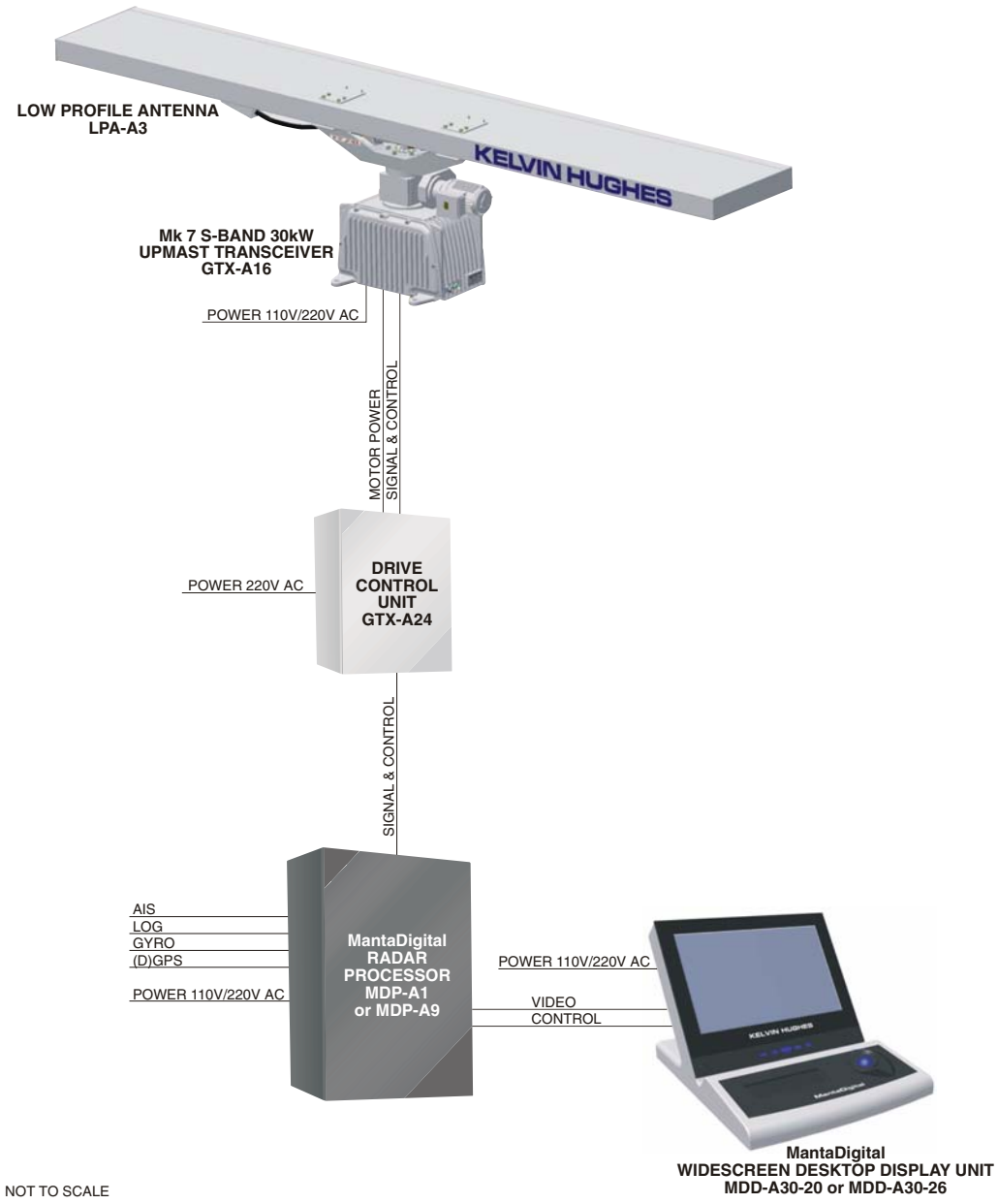

Figure 3 - Typical S-Band Upmast Single Radar System

NOTE: The dual radar systems shown in Figures 4 and 5 use the Radar Interswitch Unit to distribute the radar data from the radar sensors to the radar displays. In the event of the Radar Interswitch Unit failing, each radar sensor will be connected to its default radar display (as set up on installation) allowing the system to operate with reduced functionality. This allows the system to have some operational capability in the event of a single point of failure.

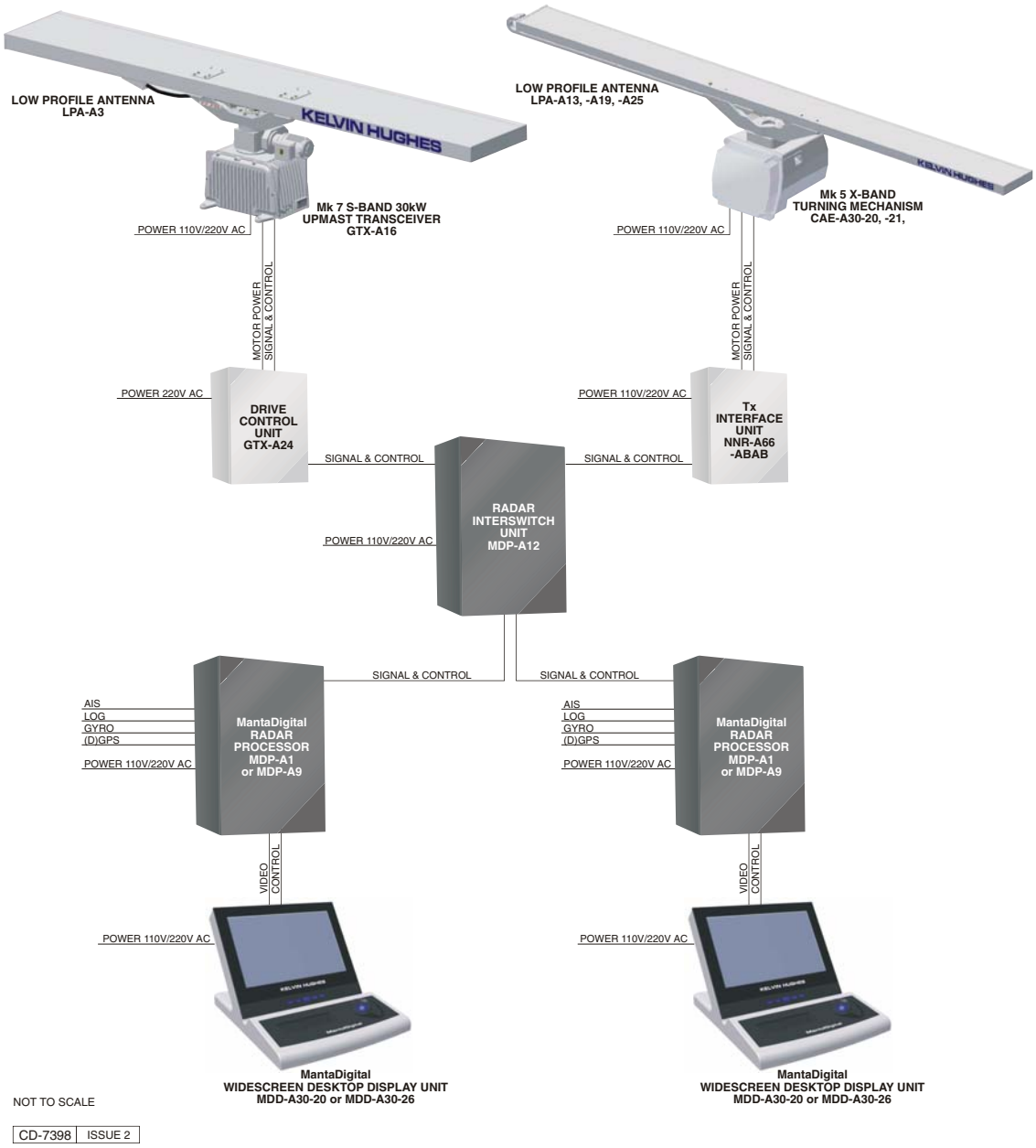

Figure 4 - Typical X-Band and S-Band Upmast Dual Radar System

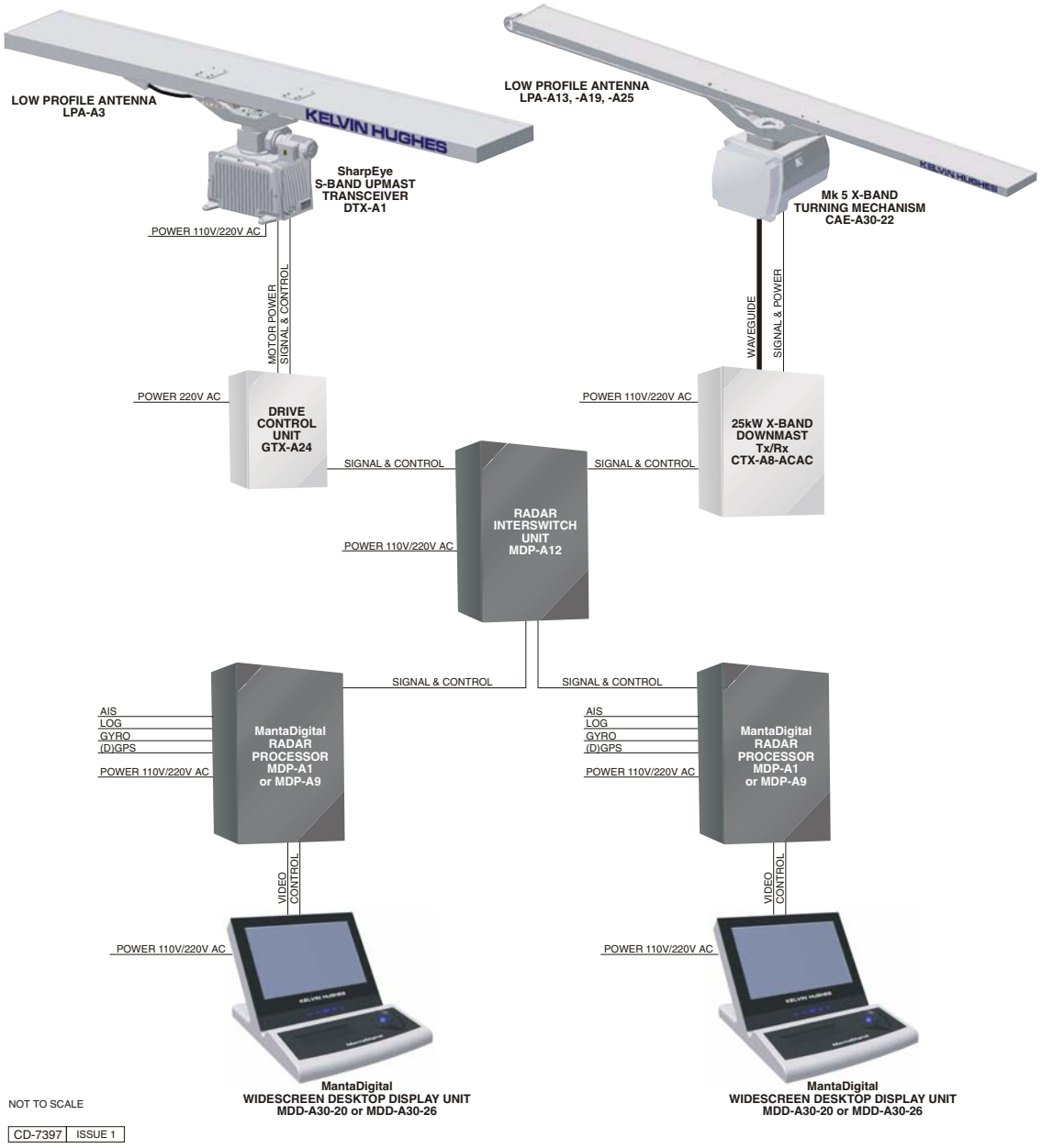

Figure 5 - Typical S-Band *SharpEye™* Upmast and X-Band Downmast Dual Radar System

RADAR DISPLAYS

13 The MantaDigital Radar Displays are available in the following configurations:

(1) Desk Top Mounted Radar Display, comprising a Visual Display Unit complete with trackerball and optional keyboard or MantaDigital Control Interface.

(2) Console Mounted Radar Display, comprising a Visual Display Unit with separate console mounted keyboard or MantaDigital Control Interface.

(3) Pedestal Mounted Radar Display, comprising a Visual Display Unit complete with trackerball and optional keyboard or MantaDigital Control Interface, mounted on a pedestal with the Processor Unit.

14 The main user interface is via the trackerball and three pushbuttons associated with the MantaDigital Widescreen Visual Display Units, or from the optional Ergopod. The Visual Display Unit has an ON/OFF switch, which is the main user on/off control. The MantaDigital Processor Unit and Radar Interswitch Unit also have ON/OFF switches, which are normally left in the ON position, and are only set to OFF for servicing. The MantaDigital Radar Processor Unit contains the DVD-ROM drive, which is used to load chart data onto the system (chart radars only).

Widescreen Visual Display Units

15 The MantaDigital Widescreen Visual Display Units use flat screen technology and are available in two sizes (520 mm (20") with a 258 mm diameter Radar Operational Area and 650 mm (26") with 328 mm diameter Radar Operational Area), with the option of desk mounting, console mounting, or pedestal mounting.

16 The Desk Mounted Visual Display Units have the trackerball and three pushbutton controls built in to the unit, and, if required, a keyboard or MantaDigital Control Interface; whereas the Console Mounted Visual Display Units are designed to be used in conjunction with a separate Trackerball (complete with three pushbuttons) and either a QWERTY keyboard or a MantaDigital Control Interface (MCI). The MantaDigital Control Interface provides dedicated controls for the primary radar functions.

17 The MantaDigital Widescreen Visual Display Units are designed to be connected to a MantaDigital Processor Unit.

18 The MantaDigital Radar Displays can be controlled from an optional Ergopod. However, as the Ergopod does not have a keyboard, the on-screen virtual keyboard is used.

Desk Top Mounted Radar Display (MDD-A30-*)

19 The Desk Top Radar Display Unit comprises a plastic moulding, which houses a flat screen LCD visual display unit, trackerball and an optional tactile feel compact keyboard or a MantaDigital Control Interface. The Desk Top Radar Display Unit is shown in Figure 6. The Desk Top Radar Display Unit is mounted on the Pedestal for pedestal mounted configurations.

Figure 6 - Desk Top Mounted Radar Display

20 A trackerball unit with three pushbuttons are mounted on the bezel in front of the visual display unit. Optionally a keyboard or MantaDigital Control Interface may be fitted to the unit.

Console Mounted Radar Display (MDD-A20-*)

21 The Console Mounted Radar Display Unit comprises a plastic bezel moulding, fitted around the flat screen LCD visual display unit.

22 The Console Mounted Radar Display Unit is shown in Figure 7.

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Figure 7 - Console Mounted Radar Display

23 The Console Mounted Radar Display Unit requires the use of a Trackerball Unit (MDD-A110) or a console mounted trackerball and pencil tray assembly (MDD-A100).

24 Optionally a console Mounted Trackerball and MantaDigital Control Interface (MCI) unit (MDD-A102) or a console mounted Trackerball and Keyboard Unit (MDD-A101) are available.

25 The Trackerball unit comprises a large diameter, backlit trackerball and three push buttons for control. The Keyboard is a 75 key QWERTY style. Both the Trackerball and Keyboard connect directly to the widescreen visual display unit.

Pedestal Mounted Radar Display (MDD-A1-* or MDD-A9-*)

26 The pedestal mounted Radar Display Unit provides a convenient self contained workstation containing a flat screen LCD visual display unit, a processor and a user control interface. The design is such that a number of pedestal units may be installed side-by side to create a unified console.

27 Two sizes of pedestal unit are available one with a 520 mm (20") visual display unit and one with a 650 mm (26") visual display unit.

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Figure 8 - Pedestal Mounted Radar Display

Visual Display Unit Controls and Indicators

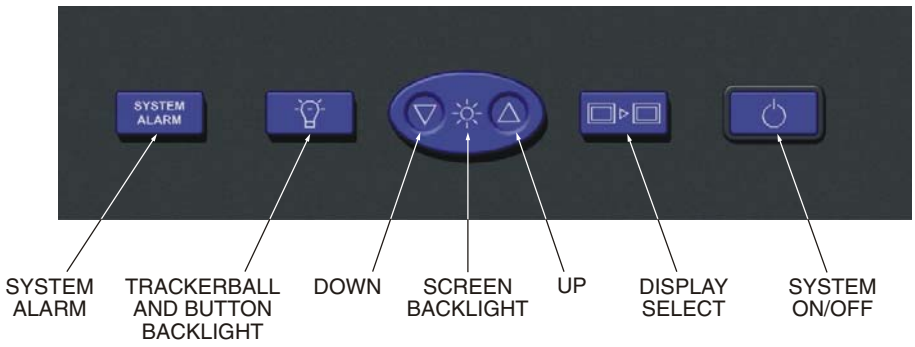

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Figure 9 - VDU Controls

28 The Visual Display Unit has the following controls and indicators:

(1) **System Alarm**. When a system alarm occurs the button is brightly lit and the audible alarm sounds. Press the button to acknowledge the alarm and the audible alarm is silenced.

(2) **Trackerball and button backlight** (light bulb symbol). Sets the level of backlighting for the trackerball. Pressing and holding the button increases the level of backlighting to the maximum level and then switches to minimum backlighting (off) and starts to increase the level again. Continually pressing and releasing the button increments the backlighting to maximum level, the next press switches the backlight to minimum level. Levels starts to increase again as the button is pressed.

(3) **Screen backlight** (down and up). Sets the level of backlighting for the visual display unit screen. The down button decreases the level of backlighting and the up button increases the level of backlighting. Note that pressing the down and up buttons together resets the screen backlight to a default setting. This allows the user to reset the backlight in the event of selecting the wrong lighting levels for the ambient conditions, which could cause the screen to appear black. Pressing and holding the down and up buttons for 3 seconds resets the brightness to the previously selected level, i.e. the previously selected Daylight, Dusk or Night setting.

(4) **Display Select**. This button allows the user to scroll through different system functions, e.g. radar, ECDIS, and select a function for viewing and control. It is only applicable to Integrated Bridge Systems or Integrated Navigation Systems using networked displays and processors. It is not used with stand-alone displays and processors.

(5) **System On/Off**. When pressed switches the complete system On or Off.

29 A loudspeaker is also incorporated within the visual display unit to provide an audible alarm.

Trackerball (MDD-A110)

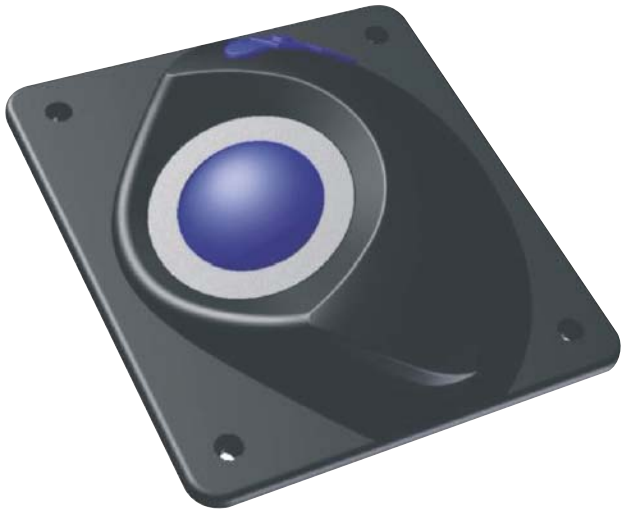

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Figure 10 - Trackerball

30 The trackerball controls the on-screen cursor and is used for example to change parameters, select modes, functions, objects, highlight data, select text. The cursor is shown as an arrow, cross-hair or square on the screen, depending on the function being used (refer to the operating instructions in KH3200 for full details).

31 Three pushbuttons are associated with the trackerball and are used to implement the functions. The 'Cursor Cue' window on the screen indicates the current function of the three pushbuttons.

32 The trackerball is blue and has LED backlighting. The brightness of the visual display unit and trackerball backlighting is fully controllable from the Visual Display Unit, thereby providing suitable backlighting levels for different ambient lighting conditions, e.g. day, dusk, night. The backlighting can be switched off, if required.

Console Mounted Trackerball and Keyboard (MDD-A101)

Figure 11 - Trackerball and Keyboard

33 The keyboard allows the user to input and edit text when required during chart radar operation (it is not essential if the system is not a chart radar, but is useful for the AIS function).

*NOTE: For buttons which have a second function shown in blue, the **Fn** button must be pressed and held down before pressing the required button to enable the alternative function (shown in blue). However, the alpha-numeric keys with a second function shown in blue are toggled between the functions by the **Num Lock** button not by the **Fn** button. To toggle the Num Lock function on or off press the **Num Lock** button.*

34 The keyboard also contains a brightness button (light bulb symbol) which allows the level of the keyboard backlighting to be set when pressed while the **Fn** button is held down. Pressing the button increases the brightness, until maximum brightness is reached. There are three levels: Off (no backlighting), Low and High. Pressing the button again sets the brightness to minimum (no backlighting), and the level then increases again as the button is pressed.

Console Mounted Trackerball and Pencil Tray (MDD-A100)

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Figure 13 - Trackerball and Pencil Tray

35 On systems that do not require either a keyboard or a MantaDigital Control Interface, a simple pencil tray is provided.

Console Mounted Trackerball and MantaDigital Control Interface (MDD-A102)

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Figure 12 - Trackerball and MantaDigital Control Interface (MCI)

36 The MantaDigital Control Interface contains dedicated controls for the primary radar functions. The MantaDigital Control Interface is supplied as an option.

37 The MantaDigital Control Interface (MCI) incorporates controls for:

(1) Gain rotary control.

(2) Rain anti-clutter rotary control.

(3) Sea anti-clutter rotary control.

(4) EBL 1 and EBL 2 On/Off buttons, with a rotary control to set the position of the selected EBL.

(5) VRM 1 and VRM 2 On/Off buttons, with a rotary control to set the range of the selected VRM.

(6) Chart On/Off button.

(7) Vector Mode select button to select True or Relative vectors.

(8) Brilliance button. This button sets the brilliance of the MantaDigital Control Interface backlight. Press the button to increase brilliance. Once maximum brilliance is achieved the MantaDigital Control Interface backlight goes to minimum brilliance and brilliance starts to increase brilliance again.

(9) PI On/Off button, switches parallel index lines on and off.

(10) AIS On/Off button, switches AIS on and off.

(11) HL Off button, when pressed temporarily removes heading line and all other graphics, except the radar image, from the Radar Operational Area.

(12) Range + and - buttons, to set the range scale.

(13) Alarm Cancel button, silences the audible alarm.

(14) F1 and F2 functions buttons are user configurable to meet operational requirements.

MantaDigital Radar Processor Unit (MDP-A1 or MDP-A9)

38 The Radar Processor Unit may be bulkhead mounted or fitted into a pedestal unit and provides the processing of radar data for presenting the radar image on the screen, refer to Figure 14.

39 The cabling to the unit is via an EMC clamp plate located on the base of the unit.

40 The key operated hinged flap on the front of the Radar Processor Unit provides access to the Floppy Disk Drive and DVD-ROM Drive. Both the ON/OFF switch on the Processor Unit and the ON/OFF switch on the Visual Display Unit must be ON for the system to operate. The DVD-ROM Drive and Floppy Disk Drive allow data to be loaded onto the Radar Processor, e.g. chart information on Chart Radars.

Figure 14 - MantaDigital Radar Processor (MDP-A1, -A9)

RADAR INTERSWITCH UNIT (RIU) (MDP-A12)

41 The Radar Interswitch Unit (RIU) is bulkhead mounted and provides the interface for up to 6 radar sensors and 6 radar displays.

42 The cabling to the unit is via EMC clamp plates located on the base of the unit.

43 The RIU has an On/Off switch for servicing purposes, located on the base of the unit.

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Figure 15 - Radar Interswitch Unit (MDP-A12)

TRANSMITTER INTERFACE UNIT (TIU) (NNR-A66-ABAB)

44 The Transmitter Interface Unit (TIU) is bulkhead mounted and provides the interface between the MantaDigital Processor Unit and the Kelvin Hughes Mk4 and Mk5 Radar Sensors.

45 The cabling is via EMC clamp plates located on the base of the unit.

46 The TIU has an On/Off switch for servicing purposes, located on the top of the unit.

ERGOPOD (NNR-A18)

47 The Ergopod is designed for mounting on the end of a chair arm. It allows the user to control the screen functions from the chair rather than the visual display unit.

48 The Ergopod provides the same basic operating facilities as the trackerball and three pushbuttons on the Radar Displays. In addition, the Ergopod is equipped with a plus (+) and minus (-) range button, a Clutter button (not used) and a screen select button (not used) - located on the underside of the main pushbutton area above the trackerball.

49 The Ergopod can be used 'Stand-alone' or in Dual configuration with two Ergopods configured as Master and Slave with shared radar displays.

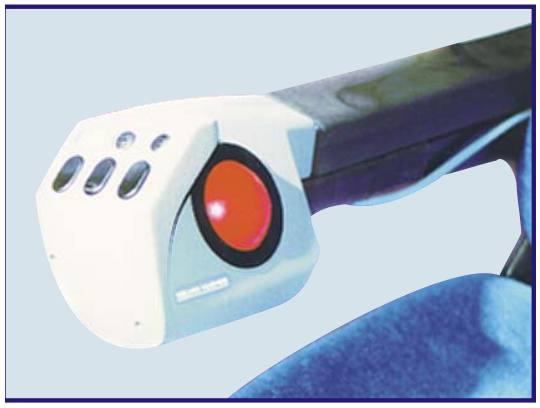


Figure 16 - Ergopod

Controls

Function Pushbuttons

50 The 3 Main pushbuttons are used together with the trackerball to activate/select a particular function. On-screen guidance as to which button to press is given in the 'Cursor Cue' window on the screen.

Range (-) & (+) Pushbuttons

51 The Range - and + pushbuttons provide a short-cut to the Range Function on a Radar Display:

(1) Pressing the minus (-) button decreases the range shown on the screen.

(2) Pressing the plus (+) button increases the range shown on the screen.

Trackerball

52 The Trackerball replicates the unit adjacent to the visual display unit and is used to position the cursor on the screen, near to or on the function to be activated and to change parameters once a function is activated.

SWITCHING ON AND OFF

Switching On

53 Press the **System ON/OFF** button on the Visual Display Unit to switch the system ON. The operating system will boot up and the Standby screen will be shown.

54 If the system does not switch on, check the following:

(1) Check that the units are switched on, as follows:

(a) If a Drive Control Unit is fitted, ensure the key on the top of the unit is set to ON. The MOTOR ON indicator will light indicating that power is applied to the antenna.

(b) If a Transmitter Interface Unit (TIU) is fitted, ensure the ON/OFF switch on top of the unit is set to ON.

(2) If a Radar Interswitch Unit (RIU) is fitted, ensure the switch on the base of the unit is set to ON (note that it is normally left in the ON position when the radar system is not in use).

(3) Check that the ON/OFF switch on the Processor Unit is switched on (note that it is normally left in the ON position when the radar system is not in use).

Switching Off

55 Under normal conditions the user should return to the Standby screen before switching the system off. This leaves the Radar system in a suitable state to be switched on again from the Visual Display Unit.

56 Press the **System ON/OFF** button on the visual display unit to set the unit to OFF.

57 The Processor Unit, RIU and radar sensors are normally left switched ON, and should only be switched OFF for maintenance purposes.

58 Refer to KH3200 for the shutdown procedure to return to the Standby screen.

TECHNICAL OVERVIEW

59 The basic MantaDigital Radar consists of a MantaDigital Visual Display Unit (with a user interface), and associated MantaDigital Radar Processor Unit; together with a Radar Sensor consisting of an antenna, turning mechanism and Radar Transceiver.

60 Up to 6 radar sensors and 6 radar displays can be combined into one system using a Radar Interswitch Unit (RIU). A typical schematic is shown in Figure 17.

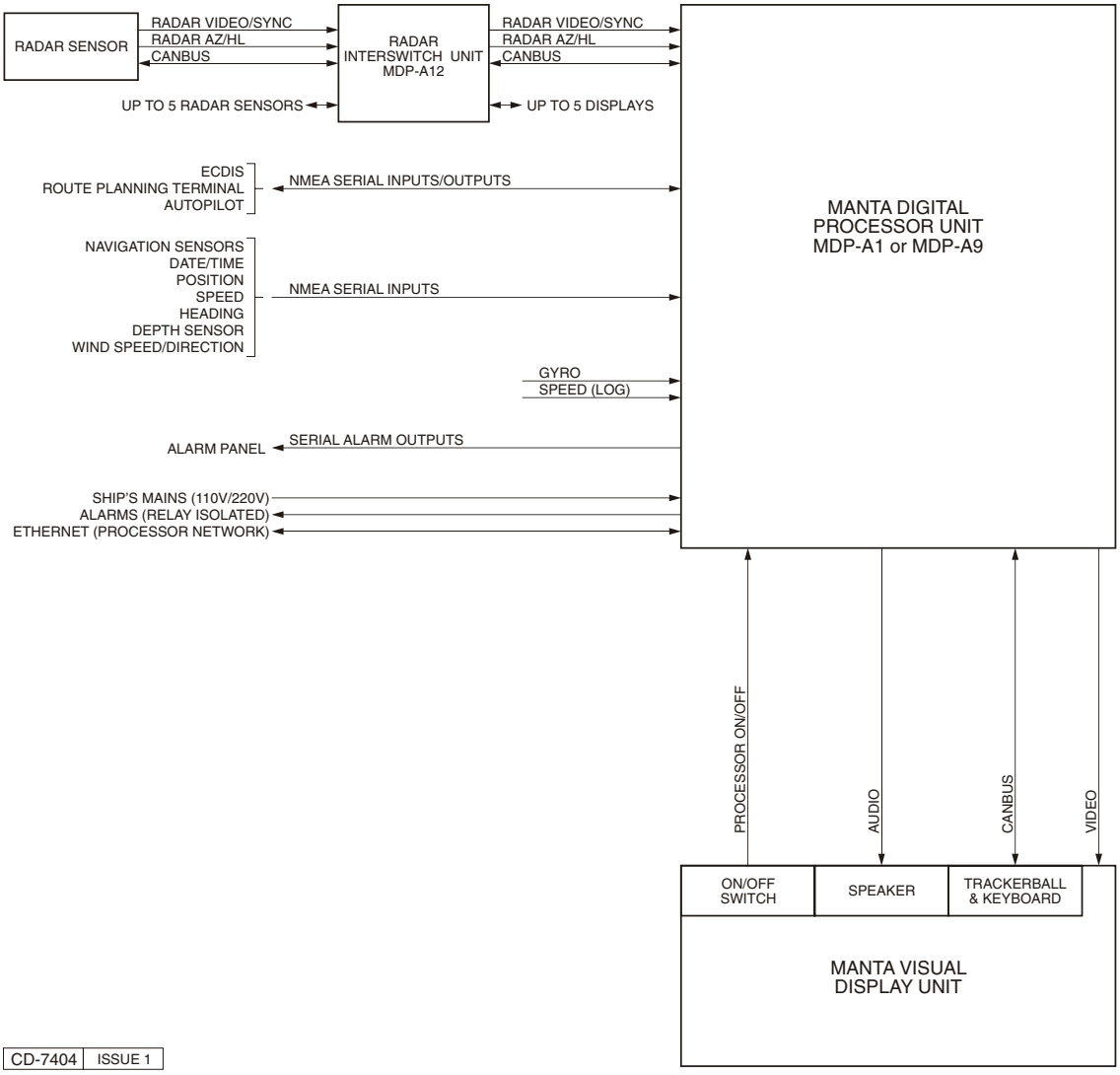


Figure 17 - Typical MantaDigital Radar System Schematic Diagram

MantaDigital Widescreen Visual Display Unit

61 The basic Widescreen display options are as follows:

MDD-A30-20	520 mm (20-inch) MantaDigital Widescreen Desk Top Visual Display Unit with pencil tray and Trackerball
MDD-A30-20-ABAA	520 mm (20-inch) MantaDigital Widescreen Desk Top Visual Display Unit with keyboard and Trackerball
MDD-A30-20-ACAA	520 mm (20-inch) MantaDigital Widescreen Desk Top Visual Display Unit with MCI and Trackerball
MDD-A30-26	650 mm (26-inch) MantaDigital Widescreen Desk Top Visual Display Unit with pencil tray and Trackerball
MDD-A30-26-ABAA	650 mm (26-inch) MantaDigital Widescreen Desk Top Visual Display Unit with keyboard and Trackerball
MDD-A30-26-ACAA	650 mm (26-inch) MantaDigital Widescreen Desk Top Visual Display Unit with MCI and Trackerball
MDD-A20-20	520 mm (20-inch) MantaDigital Widescreen Console Mounted Visual Display Unit
MDD-A20-26	650 mm (26-inch) MantaDigital Widescreen Console Mounted Visual Display Unit
MDD-A1-20 or MDD-A9-20	520 mm (20-inch) MantaDigital Widescreen Display, pedestal unit with Radar Processor Unit and Pencil tray and Trackerball
MDD-A1-20-ABAA or MDD-A9-20-ABAA	520 mm (20-inch) MantaDigital Widescreen Visual Display Unit, pedestal unit with Radar Processor Unit and Keyboard and Trackerball
MDD-A1-20-ACAA or MDD-A9-20-ACAA	520 mm (20-inch) MantaDigital Widescreen Visual Display Unit, pedestal unit with Radar Processor Unit and MCI and Trackerball
MDD-A1-26 or MDD-A9-26	650 mm (26-inch) MantaDigital Widescreen Visual Display Unit, pedestal unit with Radar Processor Unit and Pencil tray and Trackerball
MDD-A1-26-ABAA or MDD-A9-26-ABAA	650 mm (26-inch) MantaDigital Widescreen Visual Display Unit, pedestal unit with Radar Processor Unit and Keyboard and Trackerball
MDD-A1-26-ACAA or MDD-A9-26-ACAA	650 mm (26-inch) MantaDigital Widescreen Visual Display Unit, pedestal unit with Radar Processor Unit and MCI and Trackerball

62 The MantaDigital widescreen visual display units are designed to be connected to the MantaDigital Radar Processor unit (MDP-A1 (non-chart radar) or MDP-A9 (chart radar)).

63 The MantaDigital widescreen visual display unit may contain an integral trackerball and keyboard (desk top mounted) or a trackerball and keyboard (console mounted). The interfaces to the Radar Processor Unit are:

(1) ON/OFF control to the Processor Unit.

(2) Video from the processor unit to the visual display unit.

(3) An audio signal from the processor unit to the visual display unit to drive the loudspeaker.

(4) Dual Canbus connection combining data from both the trackerball, keyboard and display selection switch is located within the Desktop Visual Display Unit, but is mounted remotely from the Console Mounted Visual Display Units and is connected to the remote trackerball and keyboard. The processor has a Display Network Controller (DNC) interface built in.

Visual Display Unit

64 The MantaDigital widescreen visual display units utilise a colour high definition Thin Film Transistor (TFT) flat screen LCD display mounted in landscape orientation, together with associated interface and control circuitry. The visual display unit is designed for daylight and night viewing by means of a dimmable backlight. The visual display unit types are:

Display Size	Pixel Resolution	Aspect Ratio	Screen Size (mm)	Radar Operational Area dia
520 mm (20-inch)	1680 x 1050	16:10	433.4 x 270.9	258 mm
650 mm (26-inch)	1920 x 1200	16.10	550.1 x 343.8	328 mm

65 The optimal viewing distance for the visual display units are typically:

(1) 520 mm - suitable for seated operation, up to 1 m viewing distance.

(2) 650 mm - suitable for seated and standing operators >1 m viewing distance.

66 The MantaDigital Processor and Visual Display Unit are powered by the ship's 110 V/220 V 50/60 Hz ship's mains.

MantaDigital Radar Processor Unit (MDP-A1 or MDP-A9)

67 The Radar Processor Unit processes the incoming signals from Radar Sensors and formats the data for presentation as a radar image.

68 The Processor Unit is provided with 8 serial inputs/outputs (optionally expandable to 16). All these inputs/outputs have been designed to accept NMEA, RS232 or RS422 signals.

69 Provision is made for an analogue Log input and an analogue Gyro input to be connected directly to the processor unit. Analogue or digital serial log and gyro may be used.

70 The radar input consists of radar real time video, sync pulses, azimuth and heading line pulses. These are processed in the Radar Processor Unit to provide radar image on the Visual Display Unit.

71 The Processor Unit operates from the ship's 110 V/220 V 50/60 Hz AC mains.

72 Optionally, a UPS can be provided to maintain the supplies to both the processor and visual display unit in the event of a mains failure. If a UPS is not provided with the system, the Processor Unit must be powered from a UPS feed.

Radar Interswitch Unit (RIU) (MDP-A12)

73 The Radar Interswitch Unit (RIU) (MDP-A12) provides interfacing between up to 6 radar sensors (transceiver, turning mechanism and antenna) and up to 6 Radar Displays. Any of the Radar Displays can control or show signals from any of the radar sensors, but a radar sensor may only be controlled by one Radar Display at a time.

74 The RIU is powered by the ship's 110 V/220 V 50/60 Hz AC mains.

75 As a default condition, in the event of the RIU failing, the RIU should be powered off, and then each radar sensor will be automatically allocated to one of the radar displays. This allows limited operation of the system in the event of the RIU failing.

Transmitter Interface Unit (TIU) (NNR-A66-ABAB)

76 The Transmitter Interface Unit (TIU) (NNR-A66-ABAB) provides the interface between the Kelvin Hughes Mk4 and Mk5 radar sensors and the MantaDigital Processor Unit.

77 The TIU converts the CAN bus control data from the Processor Unit to parallel control signals for the Mk4 and Mk5. It also provides all the DC supplies required by the radar sensor.

78 The TIU is powered by the ship's 110 V/220 V 50/60 Hz AC mains.

Radar Sensor

79 The radar sensor may be either X-band or S-band and includes the antenna and turning mechanism, transceiver (upmast (mounted in the turning mechanism) or downmast). Note that the ***SharpEye***™ transceiver is always mounted upmast.

80 The following radar sensors are available for the MantaDigital system:

(1) MK4, X-band 25 kW upmast system, comprising an upmast transceiver/turning mechanism (CAE-A12-20) and antenna (LPA-A13, LPA-A19 or LPA-A25). The Mk4 requires the TIU to interface into the MantaDigital Processor Unit.

(2) Mk5, X-band 10 kW upmast system, comprising an upmast transceiver/turning mechanism (CAE-A30-20 for normal speed craft, or CAE-A30-21 for high speed craft) and antenna (LPA-A13, LPA-A19 or LPA-A25). The CAE-A30-20 has an antenna rotation speed of 25 rpm nominal and the CAE-A30-21 has an antenna rotation speed of 40 rpm nominal. The Mk5 requires the TIU to interface into the MantaDigital Processor Unit.

(3) Mk7, X-band 25 kW downmast system, comprising a downmast transceiver (CTX-A8-ACAC), an upmast turning mechanism (CAE-A30-22 for normal speed craft, or CAE-A30-23 for high speed craft) and antenna (LPA-A13, LPA-A19 or LPA-A25). The CAE-A30-22 has an antenna rotation speed of 25 rpm nominal and the CAE-A30-23 has an antenna rotation speed of 40 rpm nominal.

(4) Mk7, S-band 30 kW upmast system, comprising an upmast transceiver/turning mechanism (GTX-A16), antenna (LPA-A3) and drive control unit (GTX-A24). The GTX-A16 is used for normal and high speed craft and the antenna rotation speed is set by the drive control unit to either 22 rpm (normal speed craft) or 44 rpm (high speed craft). The drive control unit is powered by the ship's 220 V 50/60 Hz AC mains. Note that if the ship's mains is 110 V a step-up transformer is required to interface to the drive control unit.

(5) Mk7, S-band 30 kW downmast system, comprising a downmast transceiver (CTX-A9), turning mechanism (GTX-A11), antenna (LPA-A3) and drive control unit (GTX-A24). The GTX-A11 is used for normal and high speed craft and the antenna rotation speed is set by the drive control unit to either 22 rpm (normal speed craft) or 44 rpm (high speed craft). The drive control unit is powered by the ship's 220 V 50/60 Hz AC mains. Note that if the ship's mains is 110 V a step-up transformer is required to interface to the drive control unit.

(6) ***SharpEye***™ S-band upmast system, comprising an upmast transceiver/turning mechanism (DTX-A1), antenna (LPA-A3) and drive control unit (GTX-A24). The DTX-A1 is used for normal and high speed craft and the antenna rotation speed is set by the drive control unit to either 22 rpm (normal speed craft) or 44 rpm (high speed craft). The drive control unit is powered by the ship's 220 V 50/60 Hz AC mains. Note that if the ship's mains is 110 V a step-up transformer is required to interface to the drive control unit.

Ergopod

81 The Ergopod is either connected directly into the widescreen display, or is connected via Display Network Controller (DNC) Unit (FSD-A10) for a full multi-function display system.

SYSTEM SPECIFICATIONS

82 Table 1 provides a summary of the categories and basic differential capabilities for each category of SOLAS shipborne radar equipment. Note that either the 520 mm (20 inch) or 650 mm (26 inch) displays may be used for Cat 2 and Cat 3 ships/craft, but only the 650 mm (26 inch) display is compliant for Cat 1 ships/craft. Table 2 provides the equipment specification for the MantaDigital Radar Display.

Table 1: Performance Requirements for Categories of Ship/Craft for SOLAS V

	Category of Ship/Craft			
	Required			**Actual**
	Cat 3	**Cat 2**	**Cat 1**	
Size of ship/craft	<500 gt	500 gt to <10,000 gt and HSC <10,000 gt	All ships/craft ≥10,000 gt	
Minimum operational display area diameter	180 mm	250 mm	320 mm	
Minimum display area	195 mm x 195 mm	270 mm x 270 mm	340 x 340 mm	
Auto acquisition of targets	-	-	Yes	Yes
Minimum acquired Radar target capacity	20	30	40	200
Minimu8m activated AIS target capacity	20	30	40	500
Minimum sleeping AIS target capacity	100	150	200	500
Trial Manoeuvre	-	-	Yes	Yes
NOTE: The processing capacity of the AIS information should be in accordance with IEC 62388				

Table 2: Equipment Specification

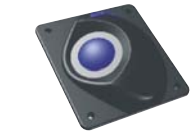
Function	Parameters
Display	520 mm (20 inch) TFT LCD Colour Flat Panel Radar Operational Area minimum diameter: 258 mm or 650 mm (26 inch) TFT LCD Colour Flat Panel Radar Operational Area minimum size: 328 mm Zoned operational data/control fields Operational controls facilitated by use of a trackerball and three pushbuttons. Day/Dusk/Night operation optimised by colour selection Optional MantaDigital Control Interface
Display Resolution	520 mm (20 inch) display 1680 x 1050 pixels 650 mm (26 inch) display 1920 x 1200 pixels
Display Brilliance, Contrast and Colours	Default conditions: Display brilliance set to: 650 mm (26") 520 mm (20") Day: 81% 87% Dusk: 67% 75% Night: 45% 53% Display contrast set to 80% Minimum brightness: 0.015 cd/m^2 (black video input) 0.08 cd/m^2 (white video input) Maximum brightness: 0.75 cd/m^2 (black video input) 200 cd/m^2 (white video input) Returns to default luminance when **Inc** and **Dec** buttons controls pressed simultaneously for 3 seconds Colours: supports 256 colours
Video Processing	Re-timed processed multi-level video. Multi-plane recycled raster memory. Manual/auto selectable STC, interference rejection, target enhancement and scan/scan correlation.
Video format	WUXGA video to display.
Transmission Frequency	X band - 9.41 GHz (magnetron pulsed radar) S band - 3.05 GHz (magnetron pulsed radar) - 2.93 to 3.07 GHz (SharpEye)
Antenna Rotation Rate	Approx 22 RPM for low speed craft (depends on radar sensor) Approx 44 RM for high speed craft (depends on radar sensor)

Function	Parameters
Antenna Sizes	"S" band - 3.8 m low profile antenna "X" band - 1.3 m, 1.9 m, or 2.5 m low profile antenna
Radar Trails	Relative and true trails variable from 0 to 30 minutes in 0.1 minute steps
Range Scales/Rings	Range scale (NM) / Range rings (NM) / No of rings / Pulse length (not SharpEye) 0.125 / 0.05 / 2 / Short 0.25 / 0.1 / 2 / Short 0.5 / 0.1 / 5 / Short 0.75 / 0.25 / 3 / Short (medium) 1.5 / 0.25 / 6 / Short (medium) 3.0 / 0.5 / 6 / Medium (long/short) 6.0 / 1.0 / 6 / Medium (long/short) 12.0 / 2.0 / 6 / Medium (long/short) 24.0 / 4.0 / 6 / Medium (long/short) 48.0 / 8.0 / 6 / Long (medium) 96.0 / 12.0 / 8 / Long
Motion Modes	Relative Motion, True Trails, RM(T) Relative Motion, Relative Trails, RM(R) True Motion, True Trails, TM(T) True Motion, Relative Trails, TM(R)
Presentation Modes	Head Up - stabilised Head Up - unstabilised (fallback mode) North Up Course Up
Gyro Input	All types of stepper, synchro, "M" type with 90:1, 180:1 and 360:1 ratios IEC 61162-2 High Speed Serial Gyro Interface. Update rate: 20 Hz
Primary Speed Input	Single Axis 100, 200, 400 Pulse/NM Manual, VHW
Secondary Speed Input	Fixed track target VTG from GPS VBW from Doppler Log
Drift Input	Manual: 0-99 kns, derived from VTG, VBW, ref target
Range Data	Minimum range: Better than 30m on $10m^2$ target with short pulse, 4.5m aerial height and 4.5m waveguide. Range discrimination: Better than 30m on 0.75 scale Range ring accuracy: 1% of range scale in use or 10m, whichever is greater
Lat/Lon	Readout of Own Ship's lat/lon and cursor range/bearing and lat/lon
Range	Variable Range Markers (1 and 2) VRMs variable from 0.001 to 96 nm displayed on screen

Function	Parameters
Bearing Data	Bearing scale: electronically generated 1°, 5°, and 10° from 0° to 359.9° Electronic Bearing Lines (EBL1 and EBL2) Variable in 0.1° increments. Parallel Index: Four navigation lines
Target Tracking	Maximum no of targets displayed: 200 Tracking out to 24 NM Auto Acquisition Zones: inclusion and exclusion zones
AIS	Shows Class A, Class B, Aids to Navigation (ATON), Air and Search Rescue (ASAR), AIS Base Station and Own ship targets. Maximum number of targets: 500 Filtered by Range, CPA and TCPA Each class of target can be activated or hidden.
Target Association	Selected using a combination of Range, Bearing, COG and SOG. The criteria are user adjustable.
Target Display and Tote	Up to 6 most dangerous targets displayed
Target Vectors	Vectors for radar and AIS targets, variable for 0 to 30 minutes in 0.1 minute steps
Target Past Positions	Past positions for radar and AIS targets, variable 0 to 30 minutes, dropped at 1 minute intervals
Charts	Shows vector charts- - CMAP (World and Professional+ - Official ENC (S57 and S63) Does not display raster (RNC) charts
Mapping	Allows user maps to be created, stored and retrieved. Maps are ground referenced
Routes	Routes created in route planning function. Includes Route Steering calculations.
Trial Manoeuvre	Allows trial manoeuvre to be set up, with - Course changes - Speed changes - Delay
Picture-in-Picture	Provides option of showing Picture-in-picture (PiP) on screen, e.g. CCTV
Depth Trend	Option to show current depth, and a depth trend to be observed.
Wind Display	Option to show True or Relative Wind.
Alarms	Audible and visual alarms
Display Pages	Shows pages for: - Single Radar Display - Dual Radar Display with option of: Secondary Radar Display, Harbour Approach and Pilotage, Docking, or Picture-in-Picture display (e.g. CCTV) - Harbour Approach and Pilotage - Chart Maintenance - Route Planning - Alarm Configuration
User Profiles	Allows individual User Profiles to be set up and stored. The screen can be customised for each user.

Function	Parameters
Power Supplies	110V nominal, 220V nominal (50-60Hz) - single phase 115V/380V/440V 3 phase with optional transformer. Power corruption protected default parameters.
Interfacing	Standard: 8 x NMEA input/output (RS422/RS232) Optional: 8 x NMEA input/output (RS422/RS232) MantaDigital Control Interface Inputs: NMEA 0183/IEC 61162-1 E2 DPT (depth) GGA, GLL, GNS (position) DTM (datum) VHW (water speed) VBW (ground/water speed) VTG (ground speed/course over ground) HDT (heading) ROT (rate of turn) RSA (rudder sensor angle) RPM (engine revs) AIS (automatic identification system) ZDA (UTC) Outputs: OSD (Own Ship data) TTM (target data) Standard azimuth interface: 4096:1 Remote monitor up to 20m separation Transceiver - full operation with Mk4/5/6/7/8 "X" band 10 & 25 kW Mk7/8 "S" band 30 kW and SharpEye"S" band transceivers Display/Transceiver separation - up to 60 metres standard VDR Interface: A WUXGA RGB video output is provided for a VDR or slave display. Resolution: 520 mm display; 1680 x 1050 pixels: 650 mm display; 1920 x 1200 pixels.

Function	Parameters
Mechanical	Construction: Processor and pedestal: Aluminium fabricated sheet metal Display: ABS moulding. Mounting: Desk top mount Console Mount Pedestal mount Viewing angle: 34 degrees to vertical 80 degrees (typical) to vertical and horizontal Orientation: landscape Display size (desktop): 520 mm (20 inch) display: Height: 419 mm Width: 520 mm Depth: 719 mm Weight: 23 kg 650 mm (26 inch) display: Height: 904 mm Width: 650 mm Depth: 786 mm Weight: 33 kg Display size (console): 520 mm (20 inch) display: Height: 425 mm Width: 520 mm Depth: 103 mm Weight: 14 kg 650 mm (26 inch) display: Height: 525 mm Width: 650 mm Depth: 120 mm Weight: 20 kg Display size (pedestal): 520 mm (20 inch) display: Height: 1120 mm Width 520 mm Depth: 718 mm Weight: 60 kg 650 mm (26 inch) display: Height: 1200 mm Width: 650 mm Depth: 784 mm Weight: 75 kg Configuration: Display Unit with separate Processor

Function	Parameters
Mechanical (cont)	Remote Trackerball with Pencil tray MDD-A100: Height: 90 mm Width: 486 mm Depth: 228 mm Weight: 1.5 kg  Remote Keyboard/Trackerball MDD-A101: Height: 90 mm Width: 486 mm Depth: 228 mm Weight: 1.8 kg  MCI Panel/Trackerball MDD-A102: Height: 90 mm Width: 486 mm Depth: 228 mm Weight: 2.2 kg  Remote Trackerball MDD-A110: Height: 82 mm Width: 170 mm Depth: 189 mm  Cooling: Fan re-circulated cooling Electrostatic damage: Provision for wrist strap point Environmental: To IEC 60945 Ed 04 Ergonomic design to ISO recommendations Cables: Individually clamped at entry. Cable entries to allow for bottom entry Provision for earthing bolt

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SWITCHING ON AND OFF

CONTENTS

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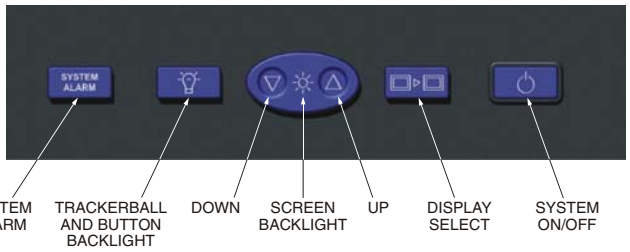
SWITCHING ON AND OFF

SWITCHING ON

1 Press the **System ON/OFF** button on the Visual Display Unit (located below the screen) to switch the system on. The operating system will boot up and the Standby screen will be shown. If necessary, using the **Trackerball and Button Backlight** and **Screen Backlight** controls set up the required level of backlighting.



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2 If the system does not start up, check the following:

(1) Check that the radar sensors are switched on, as follows:

(a) If a Drive Control Unit is fitted, ensure the key on the top of the unit is set to ON. The MOTOR ON indicator will light indicating that power is applied to the antenna.

(b) If a Transmitter Interface Unit (TIU) is fitted, ensure the ON/OFF switch on top of the unit is set to ON.

(2) If a Radar Interswitch Unit (RIU) is fitted ensure the switch on the base of the unit is set to ON (note that it is normally left in the ON position when the radar system is not in use).

(3) Check that the ON/OFF switch on the Processor Unit is switched on (note that it is normally left in the ON position when the radar system is not in use).

3 Refer to KH3200, bound in Section 2 of this manual, for the Radar operating procedures.

CONTROL FUNCTIONS

4 The **Display Select** control is only used on multi-function displays in an Integrated Bridge System or Integrated Navigation System, and allows the user to view Processor Units which have different functionality, e.g. Radar, ECDIS, Conning Display.

5 The **System Alarm** will be lit brightly in red and an audible alarm will sound if a system fail is detected. Pressing the button acknowledges the alarm and silences the audible alarm. A system alarm is initiated by the watchdog timer on the Processor Unit and indicates a problem in the Processor Unit.

SWITCHING OFF

6 Under normal conditions the user should return to the Standby screen before switching the system off. This leaves the Radar system in a suitable state to be switched on again from the Visual Display Unit.

7 Press the **System ON/OFF** button on the visual display unit to set the unit to off.

8 The Processor Unit, RIU and radar sensors are normally left switched on, and should only be switched off for maintenance purposes.

9 Refer to KH3200 for the shutdown procedure to return to the Standby screen.

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MAINTENANCE

CONTENTS

ILLUSTRATIONS

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MAINTENANCE

INTRODUCTION

1 This Chapter provides Maintenance information for the MantaDigital Radar displays. The Chapter is divided into three parts

(1) Preventive Maintenance

(2) Diagnostic Maintenance

(3) Corrective Maintenance

WARNING

LETHAL VOLTAGES ARE PRESENT INSIDE THE EQUIPMENT.
ALL CORRECTIVE MAINTENANCE MUST BE IMPLEMENTED WITH THE POWER SUPPLIES SWITCHED OFF

2 The following paragraphs outline the basic maintenance and fault finding procedures which can be implemented by the user. The fault finding/repair philosophy is limited to checking cable connections, changing fuses and checking equipment performance.

PREVENTIVE MAINTENANCE

3 Preventive Maintenance comprises keeping the equipment clean, particularly the screen, console cabinets and fan exhaust filters, and carrying out performance checks. External surfaces (but not screens) should be cleaned with a soft, non-abrasive cloth, moistened in a mild soap solution.

4 Screens are to be checked and cleaned regularly, using light pressure an approved screen cleaner. Under no circumstances use detergents as these will damage the screens.

3 Monthly Checks - Clean or Replace Fan Filters

5 Fan filters must be checked and cleaned every 3 months. To check and clean fan filters, ensure that the power supplies to the processor are isolated. Open the front panel and slide the fan filters up and remove. Inspect and if necessary clean as described in the next paragraph. Replace filters, close front panel and restore power supplies.

6 To clean a fan filter, vacuum clean the dust from it. If it is not possible to satisfactorily clean the filter, fit a new filter, Kelvin Hughes Part Number MDP-1039.

7 Check that all connections especially earth bonding are secure and in their correct positions.

Performance Checks - Monthly or Before Leaving Port

8 The performance of the magnetron, transmission line and receiver circuits is checked by carrying out a performance monitor check.

9 The performance monitors consist of:

(1) **Transmission Monitor** - comprises a monitor arm fitted to the outer case of the scanner unit. The monitor arm neon is ionised as the antenna passes over the arm, and a ‘plume’ is shown on the screen.

(2) **Receiver Monitor** - uses a resonant cavity (X-band) or signal source (S-band) to generate a reference signal. The signal is shown as 'fingers' on the screen for an S-band transceiver and as a 'sun' on the screen for an X-band transceiver.

10 To carry out the performance monitor check, proceed as follows:

(1) Switch the visual display unit power to ON.

(2) After the Tx warm-up period, go to transmit in either single or dual radar mode.

(3) Select the 12 nautical mile range. Ensure the radar image is correctly tuned.

(4) Left-click on the on-screen **PM** button.

(5) Using the VRM facility, measure the length of the 'plume'. Record the length of the 'plume' in the users record under the PERFORMANCE MONITOR heading in the TX.... nm. *This data must be recorded as it will be used to identify degradation in performance.*

(6) Select 1.5 nautical mile range (X-band) or leave on 12 nautical mile range (S-band) and PERF.MON, (this on-screen button is located at the top left-hand corner of the radar operational area).

(7) By using the VRM facility, measure the length of the radar 'fingers' or diameter of the 'sun' on the screen.

(8) Record the length of the 'fingers' or diameter of the 'sun' in the users record under the PERFORMANCE MONITOR heading in the RX.... nm. *This data must be recorded as it will be used to identify degradation in performance.*

(9) Compare the results with those previously recorded. If there is a significant degradation since the last reading, refer to the Performance Check Degradation paragraphs below.

INFORMATION TO FOLLOW

Figure 1 - Typical X-Band Tx/Rx Monitor Responses

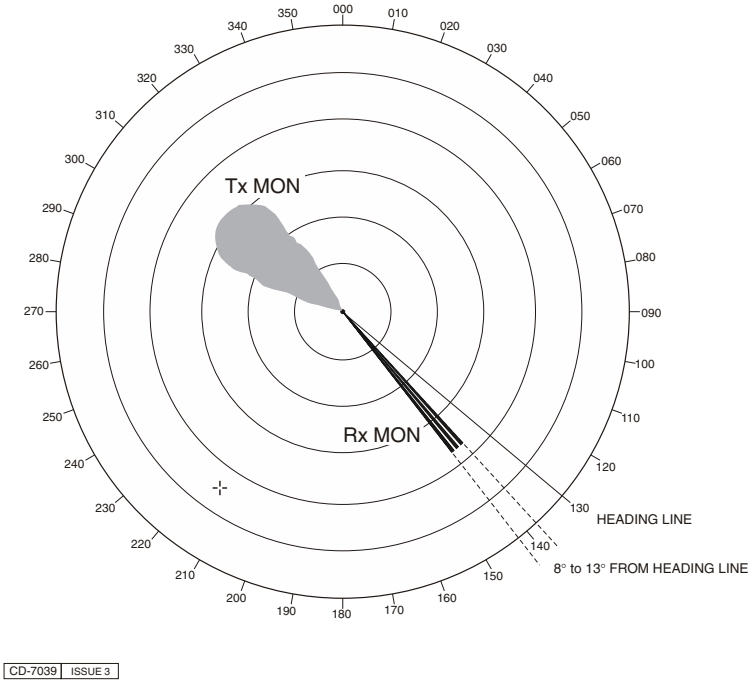

Figure 2 - Typical S-Band Tx/Rx Monitor Responses

DIAGNOSTIC MAINTENANCE

11 These paragraphs provides diagnostic maintenance procedures which the user may follow to restore normal operation. If normal operation cannot be restored, do not attempt to check inside any unit. Any repair work is best left to a qualified technician.

12 Warning messages are shown in the bottom right hand corner of the screen.

TABLE 1 - TROUBLESHOOTING

PROBLEM	CAUSE	REMEDY
Picture not updated or picture freeze-up. This is indicated by the UTC time not changing	Video freeze-up	Turn the power off and on again to restore normal operation. If normal operation is not restored call the Kelvin Hughes Service Control Centre or the agent.
Range changed but radar picture does not change	Video freeze-up	Try clicking on the range button several times to change the range. If that does not work, try turning the power off and on again to restore normal operation. If normal operation is not restored call the Kelvin Hughes Service Control Centre or the agent.
Failure Messages - Kelvin Hughes magnetron transceiver		One or more of these messages may appear in the alarm box of the screen if the signals are missing. Note the messages that are shown, as this information will assist the service engineer.
No Sync	The sync pulses from the transceiver are not being detected at the radar display	
No Video	The radar video from the transceiver is not being detected at the radar display	Refer to the relevant ship's manual for the sensor for further troubleshooting procedures.
No Azimuth	The azimuth pulses from the transceiver are not being detected at the radar display	If normal operation cannot be restored call the Kelvin Hughes Service Control Centre or the agent.
No Heading Line	The heading line pulses from the transceiver are not being detected at the radar display	

PROBLEM	CAUSE	REMEDY
Failure Messages - Kelvin Hughes *SharpEye*™ transceiver		One or more of these messages may appear in the alarm box of the screen if the signals are missing. Note the messages that are shown, as this information will assist the service engineer.
No Sync	The sync pulses from the transceiver are not being detected at the radar display	
No Video	The radar video from the transceiver is not being detected at the radar display	The ***SharpEye***™ transceiver will either enter Degraded mode, in which case the transceiver will continue to operate at reduced power with a loss of performance or functionality, or Fault mode in which case the transceiver will shut down.
No Azimuth	The azimuth pulses from the transceiver are not being detected at the radar display	
No Heading Line	The heading line pulses from the transceiver are not being detected at the radar display	Refer to the relevant ship's manual for the transceiver for further troubleshooting procedures.
Receiver Sensitivity Low	Indicates that the minimum detectable signal is below a preset threshold	Call the Kelvin Hughes Service Control Centre or the agent.
Antenna VSWR High	Indicates a mismatch in the VSWR into the antenna	
RF Power Low	The RF power output from the transceiver has fallen below 100 W	
PLO Lock	Indicates hardware fault in phase locked oscillator	
Synth Lock	Indicates hardware fault in frequency synthesiser	
Transmitter Over-temperature	The temperature of the RF power transistors is high	

PROBLEM	CAUSE	REMEDY
Failure messages - external equipment, e.g.		One or more of these messages may appear in the alarm box of the screen if the signals are missing. Note the messages that are shown, as this information will assist the service engineer.
Gyro Fail	The gyro input has not been detected.	Check the reading on the associated gyro unit. If a gyro repeater is fitted, check that the repeater is on and reading accurately.
Log Fail	The log input has not been detected.	Check the reading on the associated log unit. If a log repeater is fitted, check that the repeater is on and reading accurately.
GPS/EPFS Fail	The GPS or EPFS input has not been detected.	Check the position information from the GPS/EPFS is accurate. If the position sensing equipment is provided with a switch to enable/disable serially transmitted data, check that the message type GGA or GLL is enabled. Check that the position sensor is set to NMEA 0183.
Depth Fail	The depth sensor has not been detected.	Check the reading on the associated echo sounder. If an echo sounder repeater is fitted, check that the repeater is on and is reading accurately. Call the Kelvin Hughes Service Control Centre or the agent.
Poor discrimination in range	Sea anti-clutter control not set correctly	Adjust SEA anti-clutter control
Tuning adjusted correctly, but poor sensitivity	Dirt on antenna radiator face, water in antenna or waveguide, low magnetron, receiver failure	Carry out a performance monitor check. If the results shows degradation there is probably a fault in the transceiver. If the performance monitor is OK, clean the antenna radiator face. Refer to the relevant ship's manual for the transceiver for the procedure.
Target Tracking target not tracked correctly	Poor definition of targets in sea clutter	Adjust the SEA anti-clutter and RAIN anti-clutter controls to improve target definition.

Single Point of Failure

13 In systems with multiple Radar Sensors and Radar Displays, the Radar Sensors are interfaced with the Radar Displays via a Radar Interswitch Unit (RIU). The RIU is the critical point in the configuration as all signals are routed via the RIU.

14 If any one of the Radar Sensors or Radar Displays fails, the system will remain operational with reduced capability, i.e. loss of one Radar Sensor or one Radar Display.

15 If the RIU fails, each Radar Sensor will be allocated to a specific Radar Display (this is carried out in hardware and is determined on installation. The allocation cannot be changed by the user. Radar Sensor 1 is assigned to Radar Display 1, Radar Sensor 2 is assigned to radar Display 2 etc.). This limits each user position (Radar Display) to its allocated Radar Sensor, thus providing operation with reduced capability. An alarm is generated to warn the user that the radar sensor will revert to the default radar sensor assigned in the event of RIU failure.

16 In systems with a single Radar Sensor and Radar Display, failure of any critical unit may prevent the system from operating. There is no means of reconfiguring the system to provide some level of functionality.

Performance Check Degradation - Magnetron Transceivers

17 If the performance of the radar has deteriorated, and there are no failure messages, carry out the performance monitor check detailed above and compare the readings with those documented on installation and at the last routine check.

18 If the Tx Monitor Plume is <50% of the original logged value (the reading taken at installation), the Rx Monitor Sun (X-band) is <80% of the original logged value or the Rx Monitor Fingers (S-band) is <50% of the original logged value (the reading taken at installation) a fault is present in the radar sensor. Lower levels of degradation may also cause performance problems.

19 Note the following:

(1) Whether the degradation is in the 'plume' or the 'fingers'/'sun' or both.

(2) If there is a significant degradation in the 'plume', the transmitter power has reduced. The most likely cause of this is aging of the magnetron, and this will need to be replaced. Note that magnetrons are lifed items and as soon as significant degradation is detected, a visit to the ship by a service engineer should be arranged to check the transceiver, and if necessary replace the magnetron.

(3) If there is significant degradation in the 'fingers' or 'sun', there is likely to be a fault in the receiver circuits.

20 Contact the Kelvin Hughes Service Control Centre or the agent with full details of the degradation recorded to obtain advice.

NOTE: The magnetron in the transceiver is a lifed item, and should be replaced when the running hours approach the life of the magnetron. Refer to the relevant radar sensor Ship's Manual for details of life of a specific magnetron and for the procedures to replace the magnetron.

CORRECTIVE MAINTENANCE

WARNING

**LETHAL VOLTAGES ARE PRESENT INSIDE THE EQUIPMENT.
ALL CORRECTIVE MAINTENANCE MUST BE IMPLEMENTED WITH THE POWER SUPPLIES SWITCHED OFF**

CAUTION

This equipment contains Electrostatic Sensitive devices. To prevent damage to equipment; when implementing Corrective Maintenance procedures ensure that an earthing strap is used to connect the maintainer to the earth stud.

21 Corrective maintenance should only be implemented by qualified personnel. Corrective maintenance for this equipment is limited to the replacement of Fuses in the MantaDigital Processor.

Fuse Replacement

22 The locations of the fuses in the MantaDigital Processor Unit are shown in Figure 3. The fuses vary according to the particular processor unit but all fuse positions are shown in the figure.

(1) Ship’s mains supply. Two fuses on Power Supply Assembly.
Fuse Anti-Surge 10 A 250 V. Kelvin Hughes Part No. 45-615-162-50.

(2) +12V supply on FSD-A178 PCB.
Fuse Anti-Surge 3.15 A. Kelvin Hughes Part No. 45-615-161-30.

23 Switch off the power supply to the Processor unit.

24 Gain access to the fuses, as follows:

(1) Open the front cover of the Processor unit.

(2) The mains fuses are located on the power supply assembly behind the drop down mounting plate. Release the plate by lift the two, lever fasteners and lowering the plate forwards, refer to Figure 3.

(3) The other fuses are located on the PCB(s) on the front of the mounting plate, see Figure 1.

25 Fit the new fuse and secure it in the fuse holder.

26 Close the front cover.

27 Restore the power supply to the processor and check that the system is operating correctly.

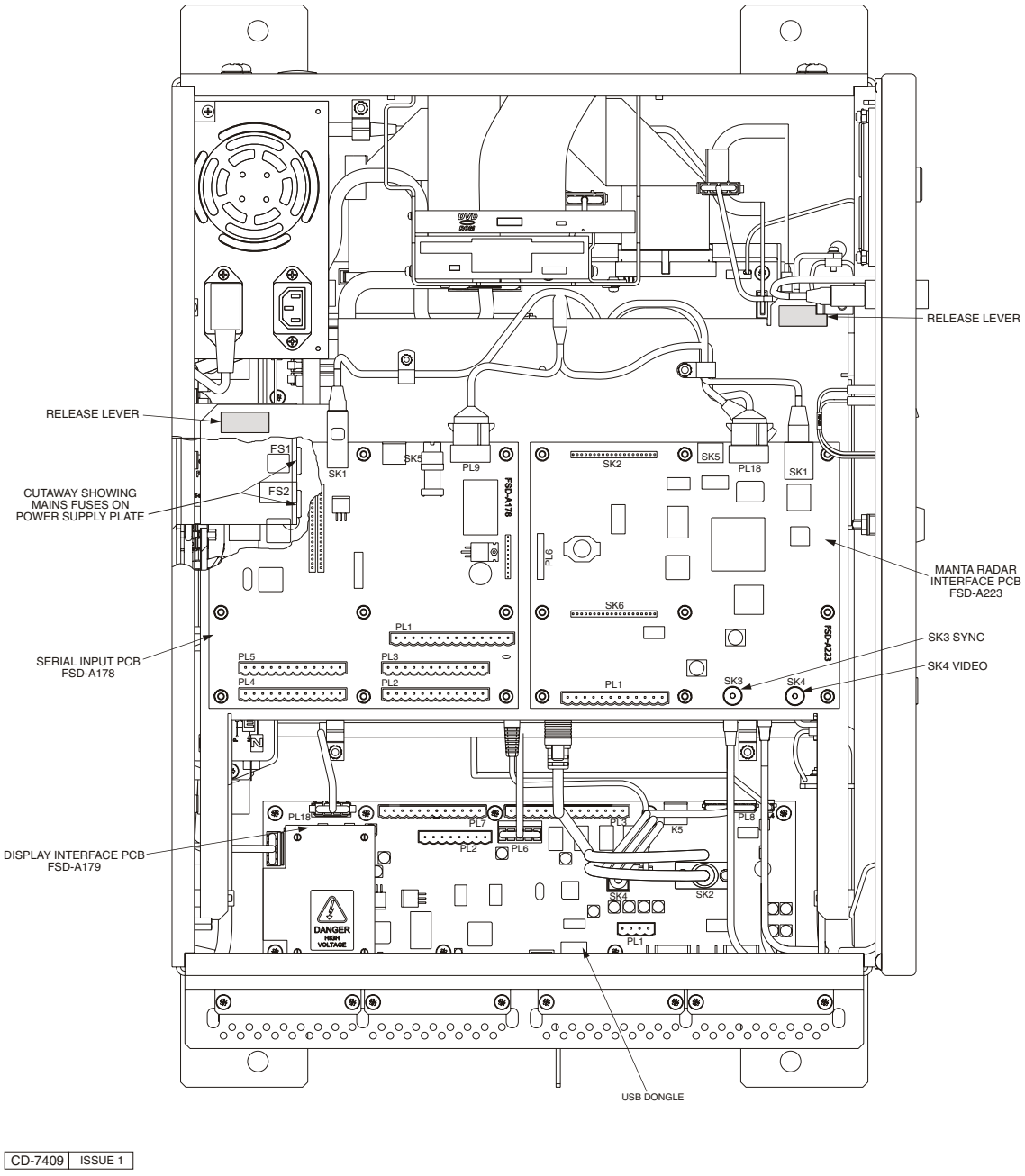

Figure 3 - MantaDigital Processor: Location of Fuses

Radar Sensor Maintenance

28 Radar Sensor maintenance is provided in the Ship's Manual for the radar sensor. The only information provided here is general information on working aloft and information on lifed components.

WARNING

ANTENNA ROTATION: BEFORE MAINTENANCE TO THE TURNING MECHANISM TAKES PLACE, DISABLE ANTENNA ROTATION.

29 When working aloft, ensure that it is brought to the attention of someone in authority at deck or at ground level and that suitably placed warning notices are posted warning that work aloft is in progress. Ensure that the means of access aloft is secure and beware of wet or slippery ladder rungs and working areas.

30 When working on or near a radar antenna and other moving or RF radiating equipment, ensure that it is switched off and that the fuses have been removed and retained.

31 If the Radar Sensor is fitted with a Drive Control Unit, ensure the keyswitch on the top of the unit is set to OFF and the key is withdrawn before going aloft. Note that the key is retained when set to the ON position and cannot be removed. Switching the Drive Control Unit to OFF and removing the key ensures the antenna cannot rotate.

32 On radar sensors fitted with a Transmitter Interface Unit, ensure the power On/Off switch is set to OFF and if possible, remove the fuses. This unit does not have a keyswitch.

33 Refer to the Ship's Manual for the Radar Sensor for further details of man aloft safety procedures.

Lifed Components

34 The conventional Radar Sensor contains a magnetron, which is a lifed item. Refer to the Ship's Manual for the Radar Sensor for details of the magnetron and its replacement procedure. The magnetron performance is checked using the performance monitor as described in this chapter.

35 The ***SharpEye***™ Radar Sensor has no lifed items.

36 The backlights in the LCD display have a nominal life of up to 50,000 operating hours. Therefore, the Visual Display Unit should be switched off when not in use to maximise the life of the backlights. Backlight replacement is a specialist task and must be undertaken by a Kelvin Hughes service engineer or approved agent.

37 The fan filters need to be replaced when they can no longer be cleaned. Refer to the Preventive Maintenance for details.

Restoration of System Configuration in the event of Hard Disk Failure

38 On installation the system configuration data is stored on the hard disk. A back-up of this data is taken after installation. This back-up must be stored so that it can be used to restore the system in event of hard disk failure. The menus used to backup and restore the configuration data are password protected and are not available to the user.

39 Map and route data is also stored on the hard disk. The user should take regular backups to removable media (memory stick) for restoration in the event of hard disk failure.

40 Therefore, in the event of hard disk failure the configuration data is restored from:

(1) The back-up data taken by the installer after installation is complete, which allows the configuration data to be restored.

(2) Map and Route data taken by the user at regular intervals, which allows the current maps and routes to be restored.

41 The data is restored from the removable media onto the new hard disk. Hard disk replacement and restoration of data must be undertaken by a Kelvin Hughes service engineer or approved agent.

NOTE: Data is restored from Set-Up Mode. This menu is password protected and is only available to authorised personnel. Refer to Ship's Manual KH2061 for further information.

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