



VISIONMASTER FT®

Ship's Manual


Northrop Grumman Sperry Marine B.V.


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PREAMBLE

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Warnings and Cautions

	WARNING! – LETHAL VOLTAGE HAZARD
<p>Lethal voltages may be exposed when access covers are removed. Some capacitors take several minutes to discharge their stored voltages after the equipment is switched OFF: this is a lethal voltage hazard. Always set the supply switch-fuse to OFF and remove the fuses before removing the access covers of the equipment.</p>	

	WARNING! – HEALTH HAZARD
<p>When cleaning the inside of the equipment, take care not to inhale dust. The dust is a temporary health hazard, depending on individual allergies.</p>	


	WARNING! – RADIATION HAZARD
<p>Keep outside the hazard zone around an antenna or open waveguide radiating power. Refer to the table below for hazard zones. When you need to work on the Scanner Unit, make sure the radar is switched OFF, and that both the Mains Isolator and the Scanner Control Unit are turned to the OFF position. Never look directly into an open waveguide.</p>	

Radar and other forms of RF radiation can cause Cardiac Pacemakers to malfunction. If you use a Cardiac Pacemaker and suspect a malfunction, leave the vicinity of the radar system immediately and seek medical advice.

Most countries accept that there is no significant radiation hazard at RF power density levels of up to 10 mW/cm².

Table 1: Hazard Zones

Antenna Length	10 mW/cm ²	1 mW/cm ²
1.2m X-band	1.7m	17m
1.8m X-band	1.05m	10.5m
2.4m X-band	0.75m	7.5m
2.7m S-band	0.73m	7.3m
3.7m S-band	0.55m	5.5m

	WARNING! – ELECTROSTATIC SENSITIVE DEVICES (ESSDS)
<p>The equipment contains ESSDs. Take care not to damage these devices by discharge of electrostatic voltages.</p>	

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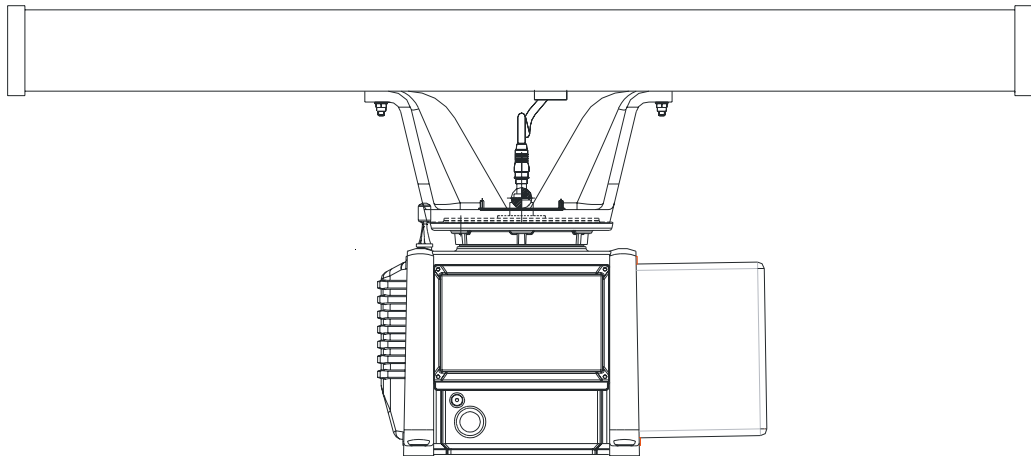
Revision Record

Table 2: Revision Record

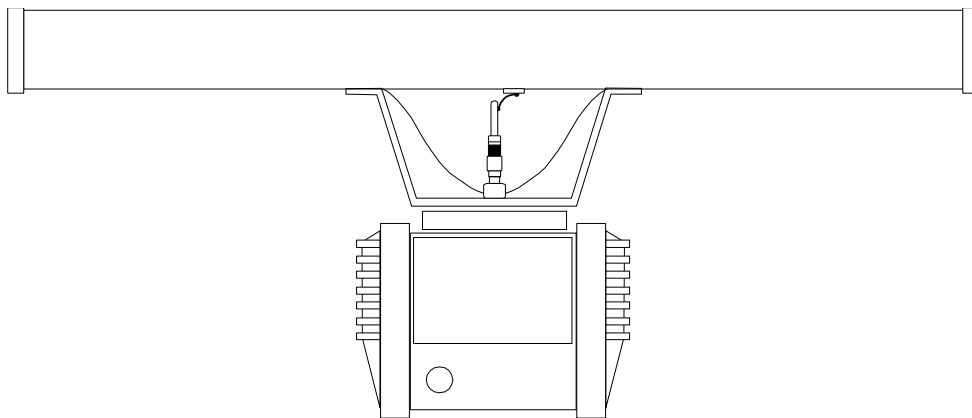
Revision No	Issue Date	Date Incorporated	Incorporated By
Issue 1	November 2006		

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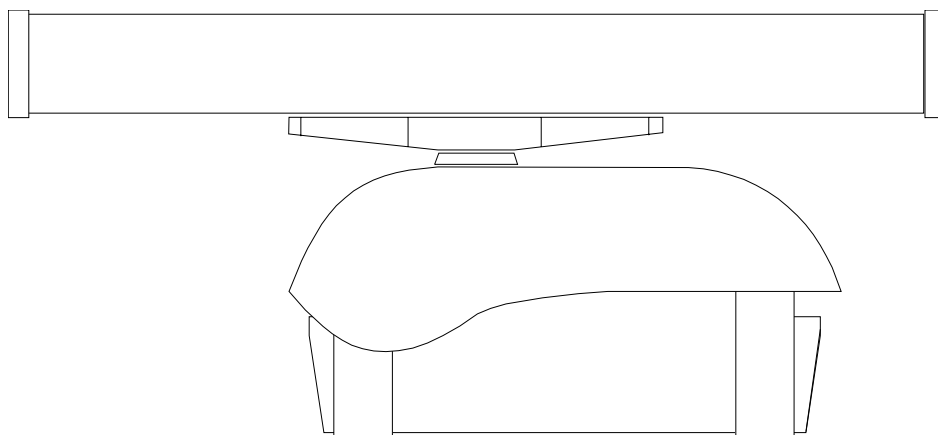
Modules and Assemblies



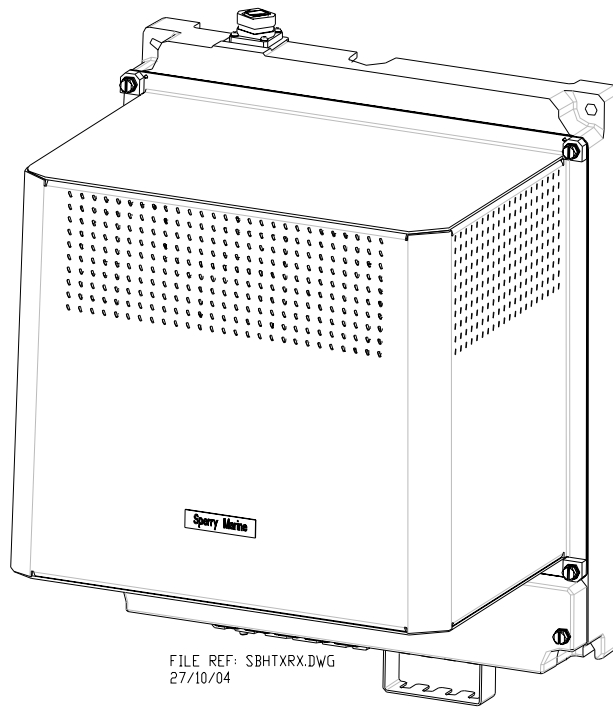
VisionMaster - S-band Scanner Unit (with integral Transceiver)



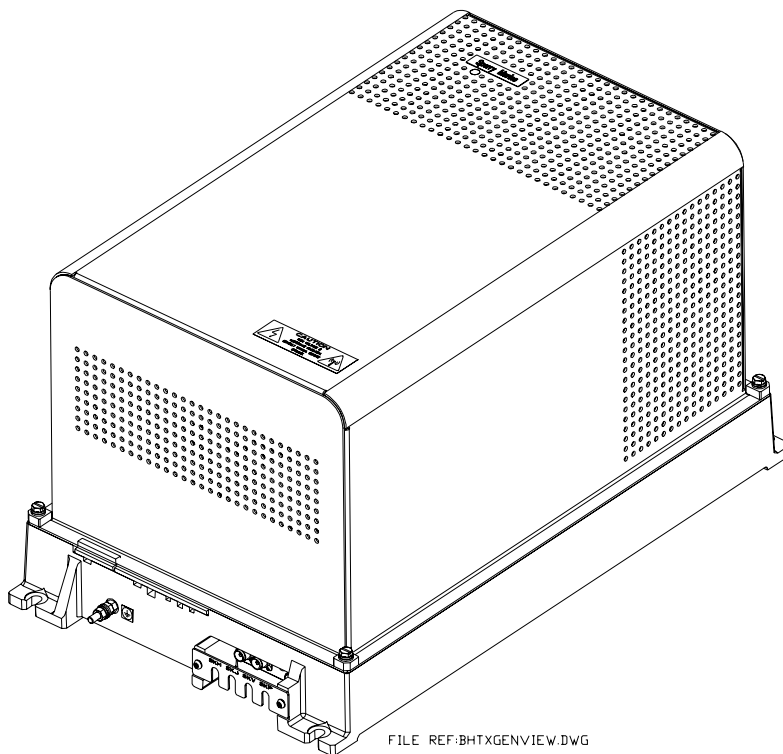
VisionMaster - S-band Scanner Unit (for use with bulkhead Transceiver)



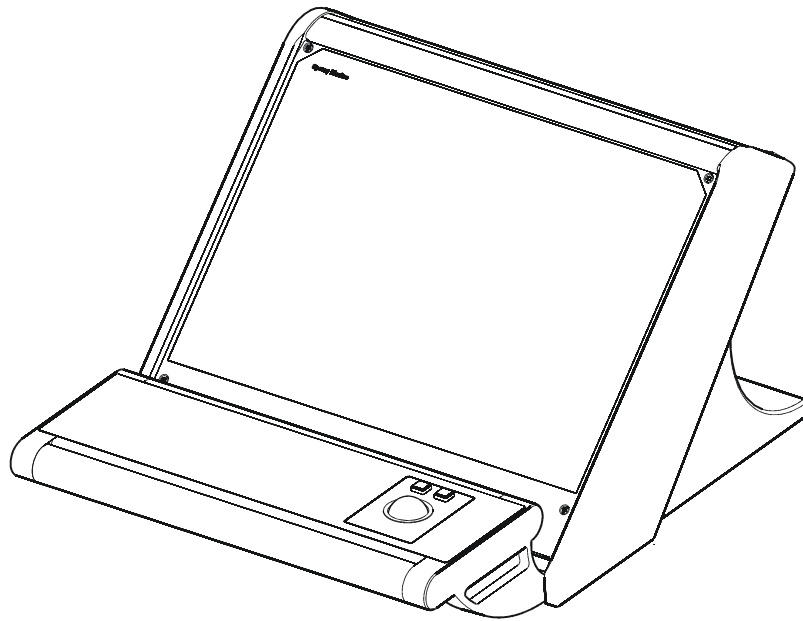
VisionMaster - X-band Scanner Unit (with integral or bulkhead Transceiver)



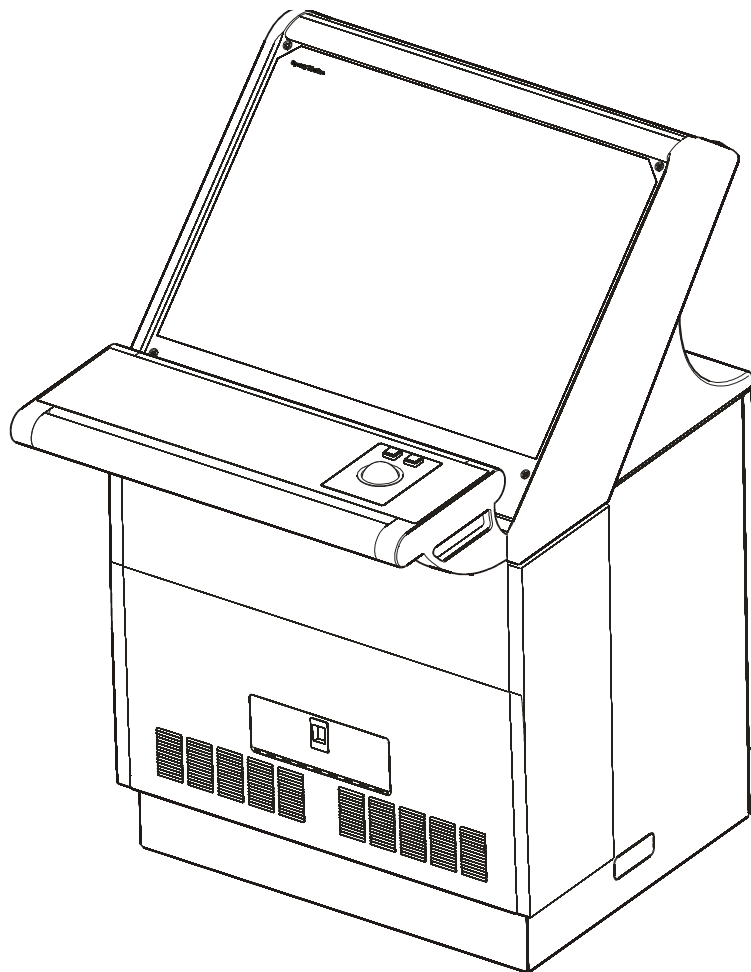
VisionMaster - S-Band Bulkhead Transceiver



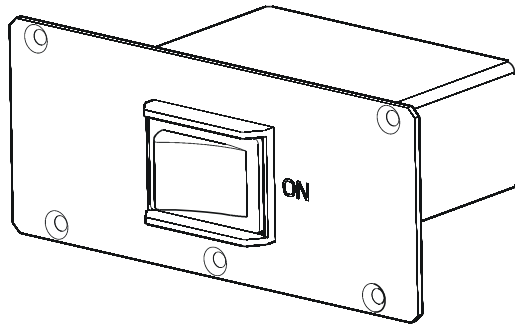
VisionMaster - X-Band Bulkhead Transceiver



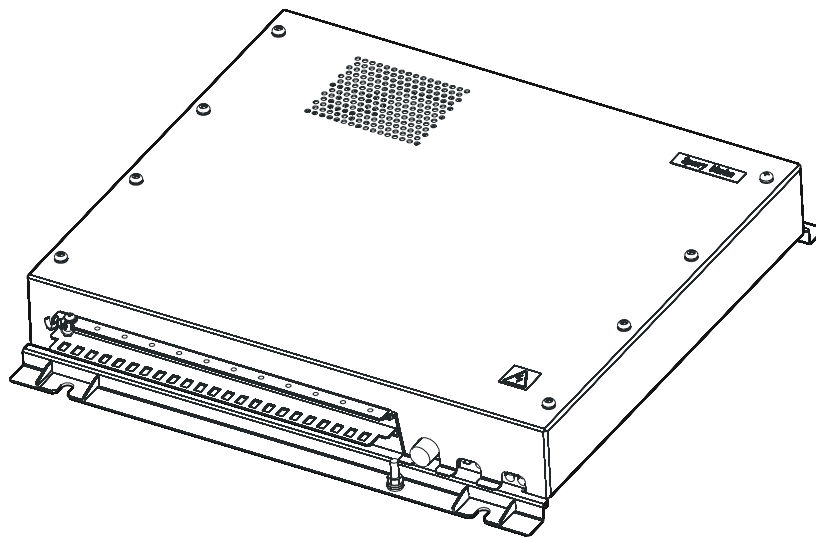
VisionMaster - 340 Table Mounted Console



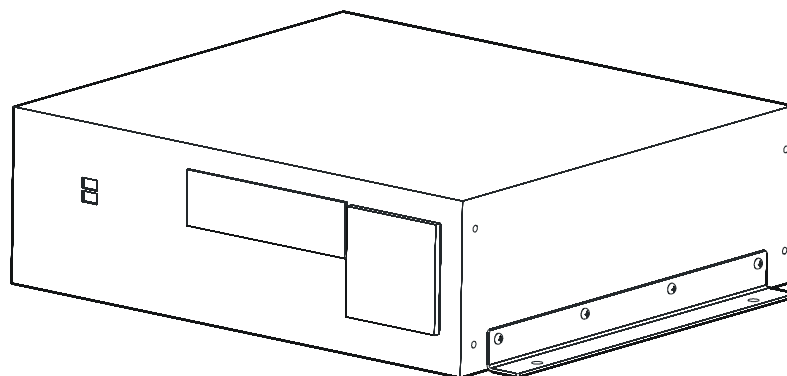
VisionMaster - 340 Pedestal Console



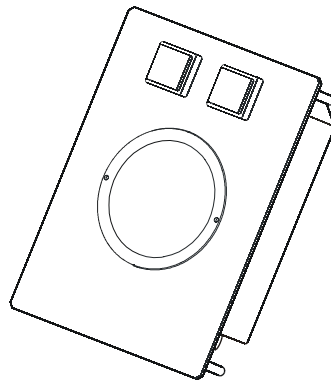
On/Off Switch



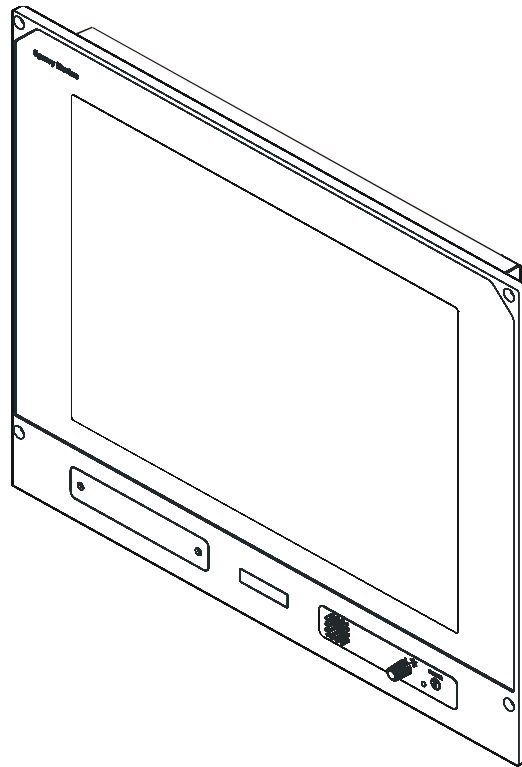
PCI/O Unit



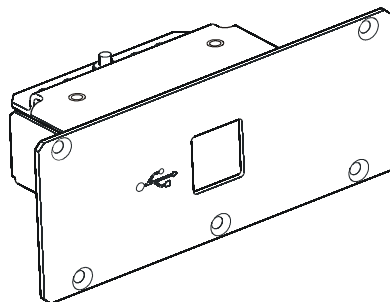
Processor Unit



Trackball



Flat Panel Monitor



USB Connector

Preface

HOW TO USE THIS MANUAL

This manual is intended for use by the installation and service engineer. The structure and design of the manual should help you to quickly find the information that you need. Consistent presentation techniques are used throughout the manual. For ease of use, the manual is divided into the following chapters:

- **Chapter 1 - Technical Specification.** Includes a full specification of the VisionMaster FT Radar Series, both operational and technical.
- **Chapter 2 - System Identification.** Details the system's identity labels and unit type numbers.
- **Chapter 3 - Installation.** Includes descriptions of cable types and system component installations, including installation diagrams and inter-unit cabling information.
- **Chapter 4 - Configuration.** Details the configuration procedures for the VisionMaster FT system using the configuration tool.
- **Chapter 5 - Diagnostics and Commissioning.** Describes the diagnostics and commissioning functions in the VisionMaster FT System menu.
- **Chapter 6 - Chart Installation.** Describes the use of the Sperry Chart Installer utility. Appendix A details C-MAP eToken registration; Appendix B comprises the SevenCs Chart Handler User Guide.
- **Chapter 7 - Fault Reporting and First Line Servicing.** Describes the procedures for fault reporting and details all first line servicing permitted.
- **Chapter 8 - Routine Maintenance.** Describes the procedures for routine maintenance.
- **Chapter 9 - Modifications.** Used for recording system and equipment modifications after release of publication.
- **Chapter 10 - Interswitch Units.** Describes 2-way and 6-way Interswitch units.
- **Chapter 11 - Additional Features.** Details the special options for transceivers and turning units, covering the specification, installation, commissioning and servicing.

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Related Documents

Other publications in the VisionMaster FT series are listed in Table 3 below:

Table 3: Related Documents

Document Title	Document Number
ECDIS Bridge Card	65900008
ARPA Radar/Chart Radar Bridge Card	65900009
ARPA Radar/Chart Radar User's Guide	65900010
ECDIS User's Guide	65900012

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(iii) COMPANY shall distribute the Update Image or Supplemental Code directly to a licensed end user of the Embedded System and sublicense the Update Image or Supplemental Code to the licensed end user by means of a EULA;

(iv) COMPANY shall configure the Update Image or Supplemental Code in such a manner to ensure that it executes solely on the applicable Embedded System, and will not function, download or install on the Embedded System until a commercially reasonable authentication process of the Embedded System is performed;

(v) Upon installation, (A) the Update Image will completely replace the existing Image (end user data and/or end user configuration settings may remain intact); and (B) Supplemental Code will update certain portions of the Licensed Product Binaries included in the existing Image. COMPANY shall comply with all terms and conditions and be subject to all restrictions on use and distribution of the Supplemental Code as described in the documentation or other agreement from MS accompanying the Supplemental Code, including the distribution of any required supplemental EULA terms;

(vi) Upon request of a licensed end user, a single unit or copy of Update Image or Supplemental Code media may be used by the licensed end user or COMPANY or an authorized service representative of either the licensed end user or COMPANY, to install the Update Image or Supplemental Code on the licensed end user's additional units of the same Embedded System which contain the same Image (for example, the Update Image or Supplemental Code may be installed via the licensed end user's internal network);

(A) in the event that COMPANY elects to provide the licensed end user with only a single unit of the Update Image or Supplemental Code (as the case may be) media for installation on more than one Embedded System as set forth above, COMPANY shall advise the licensed end user in writing that the Update Image may only be installed onto the additional units of the same Embedded System; and

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- (B) additionally, with regard to each licensed end user, COMPANY shall confirm the number of copies of Update Images required by the end user prior to distribution of the Update Image and shall clearly specify the confirmed number on the EULA accompanying the Update Image (e.g., COMPANY may print the following conspicuously on the EULA "Authorized Number of Installations of Software = ___").
- (vii) The Update Image or Supplemental Code shall be maintained by the licensed end user on its original media solely for use as an archival copy for recovery purposes for the updated Embedded System; and
- (viii) COMPANY shall comply with the Media Packaging Guidelines set forth on the ECE for the labels and packaging of the Update Image and Supplemental Code.
- (ix) COMPANY shall not pay an additional royalty to MS for the Licensed Product Binaries included as a component of the Update Image or Supplemental Code, provided that COMPANY distributes the Licensed Product Binaries as part of the Update Image or Supplemental Code at no charge except for reasonable shipping and handling charges.
- (e) COMPANY shall comply with the following provisions when distributing Recovery Images:
- (i) COMPANY shall reproduce the Recovery Image only (A) on COMPANY premises by (1) COMPANY's employees or (2) individuals under COMPANY's direct supervision and control who are engaged to perform such services pursuant to a contract that includes appropriate non-disclosure and other covenants sufficient to satisfy COMPANY's obligations under the Agreement, or (B) via an MS Distributor;
- (ii) COMPANY may distribute no more than one (1) copy of the Recovery Image with each Embedded System;
- (iii) the Recovery Image shall be an exact duplicate of the Image that COMPANY distributes installed on the Embedded System. COMPANY may distribute additional software together with the Recovery Image, provided that (i) such additional software is necessary for the installation or operation of the Recovery Image, and (ii) COMPANY owns or maintains effective licenses for such additional software;
- (iv) COMPANY shall configure the Recovery Image to ensure that it executes solely on the applicable Embedded System, and that it will not function, download or install on the Embedded System until a commercially reasonable authentication process of the Embedded System is performed;
- (v) One (1) copy of the Recovery Image shall be distributed either (A) on external media included with the Embedded System or (B) on a separate partition of the Embedded System hard disk drive, or (C) on a separate hard disk drive in the Embedded System which is reserved for backup utility programs and files to repair or reinstall the Image that may be accessed only if the Image installed on the main drive fails;
- (vi) Upon installation, the Recovery Image shall completely replace the existing Image;
- (vii) A single unit or copy of the Recovery Image may be used by the licensed end user, COMPANY, or the authorized service representative of either the licensed end user or COMPANY, to install the Recovery Image on the licensed end user's additional units of the same Embedded System which contain the same Image (for example, the Recovery Image may be installed via the licensed end user's internal network);
- (viii) The Recovery Image shall be maintained by the licensed end user on its original external media solely as an archival copy, and shall be licensed for use solely to reinstall the Image originally installed on the applicable Embedded System; and
- (ix) COMPANY shall comply with the Media Packaging Guidelines set forth on the ECE for the labels and packaging of the Recovery Image.
- (x) COMPANY shall not pay an additional royalty to MS Distributor for the Licensed Product Binaries included as a component of the Recovery Image, provided that COMPANY distributes the Recovery Image at no charge except for reasonable shipping and handling charges.
- (f) The terms and conditions of this Agreement, including Additional Licensing Provisions, shall control over any conflicting or inconsistent terms regarding the Licensed Product contained in any document or information that COMPANY may receive from any MS Distributor.
- (g) (i) COMPANY shall (a) permanently affix a COA to an accessible location on each Embedded System, and distribute the remaining APM, if any, with each Embedded Systems.
- (ii) COMPANY shall not (A) make the COA or EULA available through any other means or channel or (B) sell, give, or otherwise transfer COA to any third party.
- (h) COMPANY shall distribute a EULA with each Embedded System.
- (i) COMPANY shall comply with the Additional Licensing Provisions and any terms and conditions that accompany the Supplemental Code.
- (j) (i) COMPANY agrees to display its own valid copyright notice which shall be sufficient to protect MSCORP's copyright in the Licensed Product. COMPANY shall not remove or obscure any copyright, trademark or patent notices that appear in the Licensed Product as delivered to COMPANY.
- (ii) COMPANY shall not use any name or trademark confusingly similar to or undertake any other action that will interfere with or diminish MS or MSCORP right, title or interest in, any Licensed Product trademark(s) or trade name(s), and will comply with reasonable guidelines provided by MSCORP from time to time for reference to, and use of, such Licensed Product mark(s) or name(s).
- (iii) MSCORP may designate one or more logos for use with the Licensed Product. To obtain additional information regarding availability and licensing of logo(s), COMPANY should contact MS Distributor.
- (iv) COMPANY shall not use or display any logo of MS or its Suppliers (including without limitation any stylized representation of the Microsoft name used by MS or MSCORP) in COMPANY's materials or packaging. To obtain additional information regarding logo licenses, COMPANY should contact MS Distributor.
- (k) COMPANY shall not advertise, provide a separate price for, or otherwise market the Licensed Product or Image as separate items from the Embedded System.
- (l) Embedded Systems shall be marketed, licensed, and distributed only under COMPANY's brand names and trademarks, unless COMPANY and MS have executed a valid Microsoft OEM Customer License Agreement for Use of Third Party Brand Names and Trademarks.
- (m) Upon MS Distributor's request, COMPANY shall identify the general features/functionality of COMPANY's Embedded Systems, as well as the general purposes/industry segments for which COMPANY's Embedded Systems will be used.
- (n) COMPANY shall not reverse engineer, decompile or disassemble the Licensed Product or License Product Deliverables except and only to the extent that such activity is expressly permitted by applicable law notwithstanding this limitation. To the extent applicable legislation implementing Article 6 of the European Community's Directive for the Legal Protection of Computer Programs, OJL 122/42 (17 May 1991)

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(the "Directive") may provide COMPANY the right to decompile the Licensed Product or Licensed Product Deliverables in order to obtain information necessary to achieve the interoperability of an independently created computer program, prior to exercising any such possible rights under the Directive COMPANY agrees to (i) first notify MS of COMPANY's good faith belief that information necessary to achieve the interoperability of an independently created computer program is not otherwise available and that decompilation is indispensable within the meaning of the Directive; and (ii) provide MS with a commercially reasonable amount of time to respond to COMPANY regarding the foregoing assertions.

(o) THE TERMS OF THIS AGREEMENT EXPRESSLY PROHIBIT COMPANY FROM MANUFACTURING, MARKETING OR DISTRIBUTING EMBEDDED SYSTEMS THAT ARE DESIGNED TO USE LICENSED PRODUCT IN OPERATION OF NUCLEAR FACILITIES, IN AIRCRAFT NAVIGATION, IN AIRCRAFT COMMUNICATION, IN AIRCRAFT FLIGHT CONTROL, IN AIRCRAFT AIR TRAFFIC CONTROL SYSTEMS, OR IN OTHER DEVICES OR SYSTEMS IN WHICH SERIOUS INJURY OR DEATH TO THE OPERATOR OF THE DEVICE OR SYSTEM, OR TO OTHERS DUE TO A MALFUNCTION (INCLUDING, WITHOUT LIMITATION, SOFTWARE RELATED DELAY OR FAILURE) COULD REASONABLY BE FORESEEN.

(p) COMPANY shall make no representation, or any express or implied warranty to third parties (including, without limitation, to any end users), on behalf of MS.

(q) MS reserves all rights not expressly granted in this Agreement.

3. NATURE OF LICENSED PRODUCT; NO WARRANTIES.

(a) NOTICE REGARDING LICENSED PRODUCT. The Licensed Product is complex computer software. Performance of the Licensed Product will vary depending upon hardware platform, software interactions, and Licensed Product configuration. COMPANY acknowledges that software bugs may be identified when the Licensed Product is used in COMPANY's particular Embedded System. COMPANY therefore accepts the responsibility of satisfying itself that each Licensed Product is suitable for use in COMPANY's Embedded System. This includes conducting exhaustive testing of COMPANY's Image on the Embedded System. COMPANY agrees that it will implement for its use of the Licensed Product such measures as may be required by Section below.

(b) NO WARRANTIES. TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, LICENSED PRODUCT IS PROVIDED "AS IS" AND WITH ALL FAULTS. THE ENTIRE RISK AS TO SATISFACTORY QUALITY, PERFORMANCE, ACCURACY, AND EFFORT IS WITH COMPANY. TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, MS AND ITS SUPPLIERS DISCLAIM ALL REPRESENTATIONS AND WARRANTIES, WHETHER EXPRESS, IMPLIED, OR STATUTORY, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE AND ANY IMPLIED WARRANTY ARISING FROM COURSE OF DEALING OR USAGE OF TRADE. TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, MS AND ITS SUPPLIERS ALSO DISCLAIM ANY COMMON-LAW DUTIES RELATING TO ACCURACY OR LACK OF NEGLIGENCE. THERE IS NO WARRANTY AGAINST INTERFERENCE WITH COMPANY'S ENJOYMENT OF THE LICENSED PRODUCT OR AGAINST INFRINGEMENT. THE PARTIES ACKNOWLEDGE THAT THE PROVISIONS OF THIS SECTION 3(b) ARE REASONABLE GIVEN, AMONG OTHER FACTORS, THE ROYALTIES PAYABLE HEREUNDER AND EACH PARTIES'

KNOWLEDGE OF THE EXISTENCE OF THE PROVISIONS OF THIS SECTION 3(b).

4. COMPANY'S DUTIES.

COMPANY SHALL BE SOLELY RESPONSIBLE FOR DETERMINING THAT LICENSED PRODUCT INCLUDING SUPPLEMENTAL CODE IS SUITABLE IN QUALITY AND PERFORMANCE FOR USE IN COMPANY'S EMBEDDED SYSTEM(S). BECAUSE LICENSED PRODUCT IS NEITHER FAULT TOLERANT NOR FREE FROM ERRORS, CONFLICTS, INTERRUPTS, ETC., COMPANY AGREES THAT ITS TESTING WILL INCLUDE FAILURE MODE AND EFFECTS ANALYSIS. COMPANY SHALL IMPLEMENT SUCH MEASURES OR PROTECTIONS AS ARE NECESSARY TO PREVENT INJURY OR LOSS ARISING FROM FAILURE OR MALFUNCTION OF LICENSED PRODUCT IN CONNECTION WITH FORESEEABLE USES OF COMPANY'S EMBEDDED SYSTEM(S). COMPANY SHALL ALSO BE SOLELY RESPONSIBLE FOR DETERMINING THE SUITABILITY OF AND FOR PROVIDING ANY NOTICES OR WARNINGS TO TRANSFEREES OR USERS OF COMPANY'S EMBEDDED SYSTEM(S) OR OTHERS WHO MAY BE AFFECTED BY SUCH USE.

5. LICENSED PRODUCT SUPPORT.

This Agreement does not include technical support by MS to COMPANY, its Channel, or end users. COMPANY is solely responsible for end user support, and shall advise end users accordingly.

6. INTELLECTUAL PROPERTY INFRINGEMENT.

(a) MS agrees to defend COMPANY in a lawsuit or other judicial action, and pay the amount of any adverse final judgment (or settlement to which MS consents) from such lawsuit or judicial action, for any third party claim(s) that the Licensed Product(s) infringe any copyright or trademark rights enforceable in any Included Jurisdictions (defined in Section 6(e), below) ("Claim"). With regard to any Claim, MS' obligations are subject to the following conditions:

(i) COMPANY must promptly notify MS in writing of the Claim;

(ii) MS shall have sole control over defense and/or settlement of the Claim; and

(iii) COMPANY shall provide MS with reasonable assistance in the defense of the Claim.

(b) In the event that MS is required to defend a lawsuit or other judicial action pursuant to Section 6(a) above and such lawsuit or other judicial action includes allegations (other than a Claim) with respect to non-MS products, then COMPANY shall retain, at its sole expense, separate counsel to defend against such allegations, and agrees to reimburse MS for any and all attorney's fees and costs incurred by MS with respect to defending against such allegations. Moreover, MS and its Suppliers shall have no liability for any intellectual property infringement claim (including a Claim) based on COMPANY's manufacture, use, sale, offer for sale, importation or other disposition or promotion of the Licensed Product or trademark after MS' notice that COMPANY should cease manufacture, use, sale, offer for sale, importation or other disposition or promotion of such Licensed Product or trademark due to such claim. COMPANY shall indemnify and defend MS and its Suppliers from and against all damages, costs and expenses, including reasonable attorneys' fees incurred due to COMPANY's continued distribution of the allegedly infringing Licensed Product after MS provides such notice.

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(c) In addition to the obligations set forth in Section 6(a) above, if MS receives information concerning a Claim, MS may, at its expense, but without obligation to do so, undertake further actions such as:

(i) procuring for COMPANY such copyright or trademark right(s) or license(s) as may be necessary to address the Claim, or

(ii) replacing or modifying the Licensed Product or trademark to make it non-infringing (in which case COMPANY shall immediately cease distribution of the allegedly infringing Licensed Product or use of the allegedly infringing trademark).

(d) With regard to any claim (other than a Claim) that the Licensed Product infringes any third party intellectual property rights, COMPANY shall promptly notify MS in writing of such claim. MS shall have no obligation to defend COMPANY or pay damages arising out of such claim. Notwithstanding the absence of any such obligation(s), MS reserves the option, in its sole discretion and at its expense, to assume at any time the defense of any such claim. In the event that MS assumes the defense of any such claim, (i) MS shall notify COMPANY in writing of that election; (ii) MS shall have sole control over defense and/or settlement of the claim; (iii) COMPANY shall provide MS with reasonable assistance in the defense of the claim; (iv) MS shall thereafter defend COMPANY against that claim; and (v) MS shall pay any adverse final judgment (or settlement to which MS consents) resulting from such claim (or in the case of a claim based on an allegation of patent infringement, MS shall pay up to an amount not to exceed a reasonable royalty based on the per copy price paid by COMPANY for copies of the Licensed Product subject to the claim).

(e) Neither MS nor its Suppliers shall have any obligation to COMPANY for any Claims that arise outside the geographical boundaries of the Included Jurisdictions. "Included Jurisdictions" means Australia, Canada, the European Union, Japan, Norway, Switzerland and the United States.

7. **AUDIT.**

(a) During the term of this Agreement and for three (3) years thereafter, and within fourteen (14) days of MS' or MS Distributor's written request, COMPANY shall make available at a single, readily accessible location all records (including complete financial statements) relating to the distribution of COAs, acquisition, reproduction, installation distribution, destruction or other disposition and inventory level of each copy of each Licensed Product and/or Embedded System distributed or otherwise disposed of by or for COMPANY.

(b) To verify compliance with the terms of the Agreement, MS or MS Distributor may cause an audit or inspection to be performed by its independent and internationally recognized certified public accounts or chartered accountants during regular business hours at COMPANY's premises upon not less than fourteen (14) days written notice. COMPANY agrees to provide such designated audit or inspection team with access to all COMPANY relevant records and premises provided that:

(i) Such access shall be limited to those areas related to the installation of Licensed Product(s), storage of COAs and APM and to those records COMPANY is obligated to provide under this Section 7; and

(ii) Designated auditors may be escorted by COMPANY personnel when on COMPANY premises and shall not unreasonably interfere with COMPANY's normal course of business.

(c) If the audit reveals discrepancies exceeding the lesser of twenty-five thousand dollars (US \$25,000.00) or two percent (2%) of amounts paid by COMPANY to MS Distributor during the period audited, or an intentional breach of any COMPANY obligation (individually referred

to as a "Material Discrepancy"), COMPANY shall pay MS or MS Distributor (as applicable) the costs of the audit.

(d) Provided that a Material Discrepancy is not disclosed in an immediately preceding audit, audits under this Section 7 shall not be performed more frequently than on an annual basis. Upon written request of COMPANY and only after the conclusion of an audit, MS shall provide COMPANY with a summary of the findings and conclusions of such audit.

(e) If COMPANY distributes any Licensed Product in violation of the terms of the Agreement, then MS, without limiting its remedies, may demand and COMPANY agrees to pay MS or MS Distributor for each copy distributed in violation of this Agreement an additional amount equal to thirty percent (30%) of the amount charged by MS or MS Distributor for such Licensed Product. COMPANY shall pay such additional amount within thirty (30) days of receipt of MS' or MS Distributor invoice. The parties acknowledge that (i) distribution in violation of terms of the Agreement would result in damages to MS which are impractical and difficult to ascertain, and (ii) the additional royalty represents a reasonable and genuine estimate of the loss that will be suffered by MS.

8. **TRACKING AND RETURNS**

(a) COMPANY may return Licensed Product to MS Distributor in accordance with MS Distributor's return policies if:

(i) COMPANY refuses to accept ALPs and returns the unopened Licensed Product package; or

(ii) The Licensed Product is incomplete or defective in Licensed Product media and/or Licensed Product materials.

(iii) MS has established an end of life date for a Licensed Product, COMPANY may return the unopened Licensed Product package up to two (2) calendar months after its end of life date.

(b) COMPANY shall manage all COAs and other APM in the following manner:

(i) COMPANY shall maintain accurate and complete distribution records of COAs and other APM distributed by or for COMPANY; and

(ii) For COAs damaged irreparably during the ordinary course of COMPANY's business, COMPANY shall:

(A) maintain a log of each damaged (or destroyed) COA that includes the date damaged (or destroyed), Licensed Product name, COA number, and cause of damage (or destruction);

(B) return each damaged COA to the MS Distributor from which such COA was purchased

(iii) On a monthly basis, COMPANY will account for and reconcile all COAs in inventory, both on an individual basis for COMPANY and each Third Party Installer, if applicable, and on a consolidated basis. The reconciliation will account for beginning and ending COA inventory, COA acquisitions from MS Distributors, COA distribution with Embedded Systems, customer returns, and COAs affixed to Embedded Systems or other APM that cannot be distributed for any reason. COMPANY will make this reconciliation available to MS or MS Distributor upon request. COMPANY shall pay the royalty applicable to the Licensed Product for the difference between (A) the number of Embedded Systems distributed by COMPANY with COAs properly affixed or included, and the number of COAs acquired from MS Distributors, less (B) the number of COAs that can be shown to the reasonable satisfaction to be in COMPANY's possession or properly returned to the MS Distributor. (iv) If for any reason COMPANY encounters a situation requiring the return of COAs, COMPANY shall

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manage such return in accordance with the instructions provided by MS Distributor.

9. DAMAGE EXCLUSIONS / LIMITATION OF LIABILITY / EXCLUSIVE REMEDY.

(a) LIMITATION OF AMOUNTS OF LIABILITY; EXCLUSIVE REMEDY. For each Licensed Product, COMPANY agrees that in no event will MS, its Suppliers, MS Distributors, and/or their respective officers, employees, and agents (collectively, "MS Representatives") be liable to COMPANY, whether in contract (including any provision of this Agreement), tort, or otherwise, in any amount that exceeds one hundred percent (100%) of the amount paid by COMPANY to MS Distributor for that Licensed Product during a period not to exceed two (2) years immediately preceding the date on which such liability or liabilities first accrued. COMPANY's exclusive remedy for any breach of this Agreement by MS or by MS Representatives will be the recovery of COMPANY's direct damages incurred in reasonable reliance, limited to the foregoing amount.

(b) EXCLUSION OF CERTAIN DAMAGES AND LIMITATION OF TYPES OF LIABILITY. EXCEPT AS PROHIBITED BY LAW, IN NO EVENT WILL MS OR ANY MS REPRESENTATIVES BE LIABLE TO COMPANY OR TO ANY THIRD PARTY FOR ANY ECONOMIC (I.E., DAMAGES FOR LOSS OF PROFITS OR REVENUES, BUSINESS INTERRUPTION, AND LOSS OF BUSINESS INFORMATION OR DATA), SPECIAL, CONSEQUENTIAL, INCIDENTAL OR INDIRECT DAMAGES, REGARDLESS OF THE THEORY OF LIABILITY (INCLUDING WITHOUT LIMITATION PRODUCT LIABILITY OR NEGLIGENCE), OR FOR ANY LOST DATA, PRIVACY OR SECURITY, OR FOR ANY PUNITIVE DAMAGES, ARISING OUT OF OR RELATED TO THE USE OF OR INABILITY TO USE LICENSED PRODUCT, EVEN IF MS OR MS REPRESENTATIVES HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. THIS EXCLUSION AND LIMITATION SHALL APPLY EVEN IF ANY REMEDY FAILS OF ITS ESSENTIAL PURPOSE. THE PARTIES ACKNOWLEDGE THAT THE PROVISIONS OF THIS SECTION 9(b) ARE REASONABLE GIVEN, AMONG OTHER FACTORS, THE ROYALTIES PAYABLE HEREUNDER AND EACH PARTIES' KNOWLEDGE OF THE EXISTENCE OF THE PROVISIONS OF THIS SECTION 9(b).

(c) RELEASE. COMPANY releases MS and MS Representatives from all liability in excess of the limitations set forth above.

10. NONDISCLOSURE.

COMPANY shall keep confidential, the Licensed Product (other than Licensed Product Binaries and end user documentation authorized by this Agreement), the terms and conditions of this Agreement, and any other non-public information disclosed to COMPANY by MS Distributor, MS or MSCORP (for example, pricing information, MS or MSCORP licensing negotiations or terms and conditions, MS and MSCORP business policies, practices, or know-how).

11. ASSIGNMENT.

(a) This Agreement shall not be assigned or sublicensed by COMPANY in whole or in part (by contract, merger, operation of law, or otherwise). Any assignment or sublicense in violation of this provision shall be void and of no effect.

(b) This Agreement, and any related agreement(s) to which MS is a party or by which MS is benefited, including all rights and obligations there under, may be assigned by MS to a MS affiliate, provided that

such assignment does not constitute an unreasonable and material impairment of the ability of COMPANY to obtain the performance to which it is entitled under the Agreement. MS shall provide COMPANY with notice of such assignment, provided, however, that failure to provide notice shall not affect the effectiveness of any such assignment. From and after such assignment, all references to "MS" contained in the Agreement, or any related documents or items shall refer to the assignee identified in the applicable assignment notice to COMPANY, and all references to Suppliers shall include assignor.

12. TERM.

(a) The duration of this Agreement shall run from the Effective Date until one (1) year from the end of the calendar month in which the MS signs the Agreement.

(b) MS and COMPANY may agree to extend the term of this Agreement for an additional one (1) year term. This Agreement may be extended by MS sending notice to COMPANY at least sixty (60) days prior to the end of the first year of the Agreement. Provided, however, that COMPANY may, after receiving such notice, elect not to extend by providing notice to MS prior to the end of the first year of the Agreement.

13. NONCOMPLIANCE AND CANCELLATION.

(a) In addition to other remedies under applicable law, MS may suspend any rights granted to COMPANY under this Agreement and/or require MS Distributors to refuse to fulfill or to limit orders placed by COMPANY, and/or cancel this Agreement, in its entirety or as to any individual Licensed Product(s), upon any of the following events:

(i) If COMPANY materially breaches any provision of this Agreement or any other agreement between COMPANY and MS or MSCORP (without limitation, material breach includes any failure to comply with Sections 2, 4, 6, 7, 9, or 10);

(ii) If COMPANY manufactures or distributes any MS or MSCORP product which, as manufactured or distributed by COMPANY, is not properly licensed under a valid agreement with MS Distributor, MS, MSCORP or another licensee of MS or MSCORP; or

(iii) If, subject to applicable law, COMPANY becomes insolvent, enters bankruptcy, reorganization, composition or other similar proceedings under applicable laws, whether voluntary or involuntary, or admits in writing its inability to pay its debts, or makes or attempts to make an assignment for the benefit of creditors.

(b) In the event of COMPANY's material breach of Sections 2, 4, 6, 9 or 10, any suspension, instruction to MS Distributors or cancellation shall be effective upon notice to COMPANY.

(c) If any of the events in this Section 13(a)(iii) above occurs, any cancellation shall be effective upon notice to COMPANY or as soon thereafter as is permitted by applicable law.

(d) In the event of breach of any provision of the Agreement, except those identified in Section 13(b) and (c) above, COMPANY shall have thirty (30) days from the date of notice to cure such breach. If COMPANY does not cure such breach within thirty (30) days, MS may suspend or cancel the Agreement effective upon notice.

(e) Within ten (10) business days after cancellation or expiration of the Agreement, COMPANY shall, at COMPANY's expense, return the Licensed Product Deliverable(s) and all remaining Licensed Product, including any APM, in accordance with MS Distributor's return policies. Notwithstanding the foregoing, COMPANY may keep one (1) unit of Licensed Product Deliverables of each Licensed Product for support purposes only.

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(f) Upon cancellation or expiration of this Agreement, COMPANY shall cease distribution of all Licensed Product, and all of COMPANY's license rights herein shall cease.

(g) Sections 3(b), 6(d), 7, 9, 10, 13, 15(a), and 17 of this Agreement shall survive cancellation or expiration of this Agreement.

14. NOTICES.

(a) MS, through an authorized MS representative, may give company notices, authorizations and requests

(i) by posting them to the ECE,

(ii) by electronic mail (email) at the email address listed in the Addresses Schedule,

(iii) by facsimile transmission at the fax number listed in the Addresses Schedule or

(iv) in writing at the address(es) indicated in Addresses Schedule.

(b) COMPANY may give MS notices, authorizations and requests

(i) by facsimile transmission on company letterhead by an authorized representative of COMPANY at the fax number listed in the Addresses Schedule or

(ii) in writing on company letterhead by an authorized representative of COMPANY at the address(es) indicated in the Addresses Schedule.

(c) Communications are deemed given:

(i) if by posting by MS on the ECE, on the day of the posting of such communication;

(ii) if by facsimile transmission or email, on the day the facsimile or email was transmitted; or

(iii) if in writing, seven (7) after they are deposited in the European Union ("EU") or European Free Trade Association ("EFTA") mail, prepaid recorded delivery, provided COMPANY's address for notices is located in the EU or EFTA, or sent by international air express courier, charges prepaid.

(d) COMPANY shall keep all information required in the Addresses Schedule complete and current. Within ten (10) days of any change of any individual, address or other information required in the Addresses Schedule, COMPANY shall notify MS of such change as set forth in Section 14.

(e) Information posted on the ECE may change without additional notice until the effective date of such information. MS may correct errors in information posted on the ECE or update posted documents after the beginning of a month by sending notice to COMPANY.

15. CHOICE OF LAW; JURISDICTION AND VENUE; ATTORNEY'S FEES.

(a) This Agreement, and all related matters shall be governed by and interpreted under the laws of Ireland, without regard to its conflict of law rules. Venue over all disputes arising under the Agreement and all related matters shall be exclusively in the courts of Ireland. COMPANY hereby agrees for the benefit of MS and MS affiliates, that the courts of Ireland shall have jurisdiction to hear and determine any suit, action or proceedings that may arise out of or in connection with this Agreement and all related matters, and for such purposes COMPANY hereby irrevocably submits to the jurisdiction of such courts. Each party irrevocably consents to the exercise of personal jurisdiction by such courts and acknowledges and agrees that the court will apply the laws of Ireland. Notwithstanding the foregoing, MS may pursue injunctive relief against COMPANY in any forum in order to protect intellectual

property rights. Process may be served on either party as authorized by applicable law or court rule. In the event injunctive relief is pursued in a forum other than those specified herein, MS shall provide prior notice thereof to COMPANY; provided, however, that no notice shall be required if MS has reasonably determined that the provision of prior notice will prevent it from reasonably protecting its intellectual property. The United Nations Convention on Contracts for the International Sale of Goods does not apply to this Agreement.

(b) If either party employs attorneys to enforce any rights arising out of or relating to this Agreement, the primarily prevailing party shall be entitled to recover its reasonable attorneys' fees, subject to the limitation set forth in Section 8(a) above.

16. GOVERNMENT REGULATIONS.

(a) COMPANY acknowledges that Licensed Product is subject to U.S. and European Union export jurisdiction. COMPANY agrees to comply with all applicable international and national laws that apply to Licensed Product, including the U.S. Export Administration Regulations, as well as end-user, end-use, and destination restrictions issued by U.S. and other governments. For additional information, see <http://www.microsoft.com/exporting/>.

(b) All Licensed Product provided to the U.S. Government pursuant to solicitations issued on or after December 1, 1995 is provided with the commercial license rights and restrictions described elsewhere herein. All Licensed Product provided to the U.S. Government pursuant to solicitations issued prior to December 1, 1995 is provided with "Restricted Rights" as provided for in FAR, 48 CFR 52.227-14 (JUNE 1987) or DFAR, 48 CFR 252.227-7013 (OCT 1988), as applicable. The reseller is responsible for ensuring Licensed Product is marked with the "Restricted Rights Notice" or "Restricted Rights Legend," as required. All rights not expressly granted are reserved.

17. GENERAL.

(a) This Agreement does not constitute an offer by MS and is not effective until signed by both COMPANY and MS. Upon execution by COMPANY and MS, this Agreement shall constitute the entire agreement between them, superseding and merging all prior and contemporaneous communications. There are no third party beneficiaries of the promises made by MS in this Agreement. MS Distributors and Suppliers are intended to be and shall be third party beneficiaries of the provisions in this Agreement in which they are named. In addition, MS Distributors are intended to be third party beneficiaries of and may enforce for their own benefit the promises and limitations set forth in Sections 2(o), 3, 4, 14, 15, and 16. Except as otherwise expressly provided herein, this Agreement shall not be modified except by a written agreement signed on behalf of COMPANY and MS by their respective duly authorized representatives. Any statement appearing as a restrictive endorsement on a check or other document that purports to modify a right, obligation, or liability of either party shall be of no force and effect.

(b) The parties confirm and agree that neither the existence nor the terms of this Agreement or any previous version of the Agreement shall be construed as creating a (a) partnership, joint venture, or agency relationship, or as granting a franchise or (ii) altering or otherwise affecting the surviving rights or obligations of either party under such previous version(s) if any.

(c) If any provision of this Agreement shall be held by a court of competent jurisdiction to be illegal, invalid, or unenforceable, such illegality, invalidity or unenforceability shall not affect the remaining provisions and license for remaining Licensed Product(s), as applicable,

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which shall remain in full force and effect, provided that the allocation of risks described herein is given effect to the fullest extent possible.

(d) No waiver of any breach of any provision of this Agreement shall constitute a waiver of any prior, concurrent, or subsequent breach, and no waiver shall be effective unless made in a writing signed by an authorized representative of the waiving party.

(e) As used in this Agreement, "writing" or "written" means a non-electronic record or a facsimile and "days" means calendar days unless provided otherwise in the applicable provision. The headings and titles of the provisions of the Agreement are intended for convenience only and shall not affect the construction or interpretation of any provision.

(f) If as a result of fire, casualty, an act occasioned exclusively by forces of nature, riot, terrorist act, war, labor dispute, material changes in applicable law or regulation, or decree of any court (each individually referred to as a "Force Majeure Event"), either of the parties shall be unable to perform its obligations under the Agreement, provided the party subject to the Force Majeure Event provides notice thereof to the other party within a commercially reasonable amount of time, such inability shall not constitute a breach of the Agreement, and such

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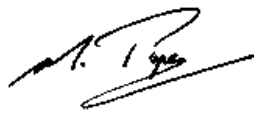

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Sperry Marine			
Manufacturer:		Northrop Grumman Sperry Marine B.V. 118 Burlington Road New Malden, Surrey, KT3 4NR United Kingdom	
Declaration: It is hereby certified that the Equipment listed conforms with the Council Directive for Marine Equipment 96/98/EC, as amended by Commission Directives 2002/75/EC and 2002/84/EC, and has been Type examined by Notified Body No 0191 as shown on Certificates of Type Examination No QQ-MED-19/06-01R, QQ-MED-20/06-01R, QQ-MED-21/06-01R and QQ-MED-22/06-01R.			
Equipment:		VisionMaster FT	
Type Number	Description	Type Number	Description
65901AR	Processor - Radar/ARPA	65801BAR or CA◇	Turning Unit
65900AA or AB	VMFT PCIO Interface Unit	65830B*R or C*◇	Turning Unit
65903KF	Control Panel (Kit Form)	65837A*	Scanner Control Unit
65903AA or AF	Control Panel (Deck Console)	65604A	X-Band Antenna 4ft
32SDV001 or 002	Security Device	65606A	X-Band Antenna 6ft
65817G	250 LCD Monitor (Kit Form)	65608A	X-Band Antenna 8ft
65823A	340 LCD Monitor (Kit Form)	65609A	S-Band Antenna 9ft
65923C or M	340 LCD Monitor	65612A	S-Band Antenna 12ft
65923605	Monitor Chassis	65842A	2 Way Interswitch Unit
65923665 or 675	Pedestal	65846A	6 Way Interswitch Unit
65810 ◎A◇	Transceiver/Turning Unit (10kW)	65849A	Slave Junction Box
65825 ◎A◇	Transceiver/Turning Unit (25kW)		
65830 M*R or N*◇	Transceiver/Turning Unit (30kW)		
65810A,B,E,F,G,H,L,P,T or W	Transceiver (10kW)		
65825A,B,E,F,G,H,L,P,T or W	Transceiver (25kW)		
65831A or B	Transceiver (30kW)		
Option Codes:		* E, F, G, H, J, K, L, M, P, Q, R or S ◎ M, N, P, T or W ◇ R, T or U * B, C, E, F or H	
Standards Applied:-			
EN 60936-1: 2000	Marine Shipborne Radar Equipment		
EN 60936-2: 1999	Shipborne Radar for High Speed Craft		
EN 60936-3: 2002	Radar with Chart facilities		
EN 60945: 2002	General Requirements for Marine Navigation Equipment		
EN 60872-1: 1998	Automatic Radar Plotting Aids (ARPA)		
EN 61162-1: 2000	Digital Interfaces		
EN 61162-2: 2001	Digital Interfaces		
IEC/PAS 60936-5: 2003	Guidelines for the use and display of AIS		
	24 th October 2006	 DOC 019	
Mike Pope, Technical Director - Europe	Date of Issue	Certificate Number	

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1 Radar System Performance

Table 1: Radar System Performance

Parameter	Detail
Minimum Range	Less than 35m using 10m ² target, measured with short pulse, 4.5m antenna height, on 0.25 and 0.5nm range scales.
Range Discrimination	Better than 35m on 0.75nm range.
Bearing Discrimination (typical figures)	2.5° with 4 ft antenna (X-Band). 1.7° with 6 ft antenna (X-Band). 1.3° with 8 ft antenna (X-Band). 4.0° with 9 ft antenna (S-Band). 2.4° with 12 ft antenna (S-Band) on 1.5 nm range using 10 m ² reflector at a range of 1.0 nm.
Range Ring Accuracy	1% of the maximum range of the scale in use or 25m whichever is the greater.
Variable Range Marker Accuracy	1% of the maximum range of the scale in use or 25m whichever is the greater.
Radar System Bearing Accuracy	Better than $\pm 1^\circ$

2 Antenna Specification (X-band)

Operating frequency: 9410MHz \pm 30MHz

Table 2: Antenna Specification – X-band

Parameter	Aperture Size		
	1.2m (4ft)	1.8m (6ft)	2.4m (8ft)
Horizontal Beam Width, -3dB (maximum)	2.0°	1.3°	1.0°
Vertical Beam Width, -3dB (nominal)	24°	24°	24°
Sidelobes within 10° of Beam (minimum)	-23dB	-23dB	-23dB
Sidelobes outside 10° of Beam (minimum)	-30dB	-30dB	-30dB
Gain (nominal)	29dB	30dB	31dB
Polarisation	Horizontal	Horizontal	Horizontal
Limiting Relative Wind Speed	100kt	100kt	100kt

The rotational speeds shown in Table 3 apply to all sizes of X-band antenna.

Table 3: Rotational Speeds – X-band

Rotational Speed	rpm
Standard	28rpm
High	45rpm

3 Antenna Specification (S-band)

Operating frequency: 3050MHz ± 10MHz

Table 4: Antenna Specification – S-band

Parameter	Aperture Size	
	2.7m (9ft) *	3.7m (12ft)
Horizontal Beam Width, -3dB (maximum)	2.8°	2.0°
Vertical Beam Width, -3dB (nominal)	30°	30°
Sidelobes within 10° of Beam (minimum)	—	-23dB
Sidelobes within 15° of Beam (minimum)	-23dB	—
Sidelobes outside 10° of Beam (minimum)	—	-30dB
Sidelobes outside 15° of Beam (minimum)	-28dB	—
Gain (nominal)	25dB	26dB
Polarisation	Horizontal	Horizontal
Limiting Relative Wind Speed	100kt	100kt

* The 2.7m (9ft) antenna is only Type Approved for use in high-speed craft.

The rotational speeds shown in Table 5 apply to all sizes of S-band antenna.

Table 5: Rotational Speeds – S-band

Rotation Speed	Mains Supply Frequency	
	50Hz	60Hz
Standard	25rpm	30rpm
High	48rpm	48rpm

4 Transceiver Specification

The following specification applies equally to X-band and S-band Transceivers (except where shown).

4.1 Mounting Arrangements

The transceiver can be mounted inside the Antenna Turning Unit or it can be a separate module inside the ship's bulkhead.

Table 6: Mounting Arrangements

Option	X-band	S-band
Masthead	Aloft within Turning Unit	
Bulkhead	Waveguide feed to Turning Unit	Co-axial feed to Turning Unit

4.2 Transmitter

Table 7: Transmitter Specifications

Parameter	X-band	S-band
Magnetron Frequency	9410MHz ± 30MHz	3050MHz ± 10MHz
Magnetron Peak Power (nominal)	10kW or 25kW	30kW
Pulse Length/PRF (nominal)	0.05µs/1800Hz (Short Pulse) 0.05µs/3000Hz (Short Pulse optional X-band only) 0.25µs/1800Hz (Medium Pulse) 0.75µs/785Hz (Long Pulse)	
Pulse Generator	Solid-state with Pulse Forming Network driving the Magnetron.	

4.3 Receiver

Table 8: Receiver Specifications

Parameter	Detail
Type	Logarithmic, with Low Noise Front End (LNFE)
Tuning	AFC/Manual
IF (Intermediate Frequency)	Centred at 60MHz
IF Bandwidth (nominal)	20MHz on short and medium pulses 3MHz on long pulse
Noise Factor (nominal)	5.0dB
Dynamic Range (nominal)	80dB

4.4 Performance Monitor

Type Approved systems require a Performance Monitor to be present in the system.

Table 9: Performance Monitor Specifications

Parameter	Detail
Monitored Performance	Radar Receiver and entire Radar System
Type	Transponder
Presentation	Four concentric arcs on the Display Unit. The arcs are of reducing brightness outwards. They show degradation in performance (including the antenna) in 5dB increments relative to the inner arc.

4.5 Options

4.5.1 High Pulse Repetition Frequency

This option, available on 10kW and 25kW X-band Transceivers, increases the short pulse repetition frequency to 3kHz. This can be combined with the 'additional-features' option listed below.

4.5.2 Antenna Rotation in Standby

This isolated closing-contact input is used to make the antenna rotate when the Transceiver is in standby.

This option cannot be used with the Speed Select Input option, see Section 4.5.3.6 '*Speed Select Input (X-band systems only)*'.

4.5.3 Additional Features

The 'additional features' versions of the Tuning Units and Transceivers give the extra Input and output capabilities listed below.

The Synchro or Resolver Output is only available as an option on Scanner Units with 'additional features'.

4.5.3.1 Heading Marker Output

Output 1

Output 1 is an uncommitted contact output from a solid-state relay.

Output 2

Output 2 is an RS422 output, used to drive a differential line.

Both outputs share a common adjustment to correct for small errors in Heading Marker alignment.

4.5.3.2 Azimuth Data Output

4096 Pulse Bearing Output

This incremental output is available either in RS422 format (to drive a differential line), or as an open drain output (to drive a single-ended input).

Synchro or Resolver Bearing Data Output

The Scanner Unit can be fitted with a size 11 Synchro or Resolver. This is not aligned: any alignment must be given externally.

The synchro may be a Control Transmitter (CX) or a Control Differential Transmitter (CDX).

4.5.3.3 External Trigger Input

This 75ohm coaxial input lets the Transmitter synchronise with other equipment on the ship.

When there is a signal at the external trigger input, external trigger will be automatically chosen as the mode of operation.

Transmission occurs approximately 11µs after the leading edge of the pulse.

4.5.3.4 Radar Silence Input

On receipt of this input, the transmitter is switched to standby within one pulse-repetition interval. The transmitter remains on standby as long as the signal occurs.

The input signal format can be selected to be: RS422, RS423 or uncommitted contact.

The sense of the signal can be selected to be active high or active low.

4.5.3.5 Pre-trigger Output

This 75ohm coaxial output lets other equipment on the ship synchronise with the Transmitter.

The leading edge of the positive output pulse occurs approximately 11µs before the magnetron output.

4.5.3.6 Speed Select Input (X-band systems only)

This isolated closing-contact input lets you remotely select between high and low antenna rotation speed.

This option cannot be used with the Antenna Rotation in Standby option, see Section 4.5.2 '*Antenna Rotation in Standby*'.

5 Console Description

The VisionMaster FT console comprises the following:

- PC Input/Output (PCIO) Unit
- Processor Unit
- Display Unit
- Control Panel

Console assemblies are supplied as a standalone pedestal version (i.e. deck mounted) or a kit version (i.e. without pedestal for installation into an existing console suite).

The standalone console version is supplied with display side cheeks and pedestal side panels.

5.1 PCIO Unit

The PCIO unit is the interface to the external sensors and the connection interface to the top unit assembly.

There are two PCIO Unit variants; one fitted with a standard compass board and one fitted with a special compass board.

The following inputs are provided:

- analogue compass data (stepper or synchro)
- analogue log (pulse) data
- nine serial data inputs, (one being a dedicated serial compass input).

The following outputs are provided:

- six serial data outputs
- three relay outputs for vigilance alarm, remote alarm and system operational
- one buzzer output to monitor.

Note: *Two of the serial input/outputs are used for Interswitch and Monitor Control.*

5.2 Processor Unit

The Processor unit is based on an Intel Pentium Processor running Windows XP at 1280 x 1024 resolution, 32 bit colour at 60Hz. It contains the interface PCB (SC2 card) that processes data from the top unit.

The Processor unit has the following inputs and ports:

- two PS2 inputs, one of which is used by the trackball
- one serial input
- one parallel input
- six USB ports (two ports go to the control panel, two are used for USB security devices, one is used for the PCIO and one is spare).

5.3 Display Unit

The display unit is supplied with one of the following flat panel monitors:

Table 10: Monitors Specification

Radar Circle Diameter (mm)	Screen Diagonal (inches)	Aspect Ratio
250	19.0	5:4
340	23.1	4:3

The monitor has a power switch, which controls the monitor only, and a brightness adjustment control.

5.4 Control Panel

The Control Panel includes the following:

- Trackball, with left and right keys
- Power On/Off switch
- USB socket

6 Watch Mode

VisionMaster FT supports the following configurable Watch Modes:

- Radar
- Chart Radar
- ECDIS
- Conning Information Display
- Central Alarm Management
- CCTV

The availability of the watch modes listed above is dependent on the product type and security device installed at initialisation.

7 Radar Specification

7.1 Range Scales & Range Rings

Table 11: Range Scales and Range Rings

Range Scales	Range Rings	Available Pulse Lengths				
		NM	NM	Short	Medium	Long
0.125	0.025			✓		
0.25	0.05			✓		
0.5	0.1			✓	✓	
0.75	0.25			✓	✓	
1.5	0.25			✓	✓	
3	0.5			✓	✓	✓
6	1				✓	✓
12	2				✓	✓
24	4				✓	✓
48	8					✓
96	16					✓

7.2 Range Rings and Bearing Scale

Table 12: Range Ring and Bearing Scale Parameters

Parameter	Detail
Fixed Range Ring accuracy	1% of maximum of scale in use, or 25m, whichever is the greater.
Fixed Bearing Scale	Electronically generated scale markers at 1°, 5° and 10° with bearing annotation every 10°.

7.3 Own Ship

There are two types of symbol used to display own ship's position and heading, defined as follows:

- **Outline Symbol:** This symbol is drawn such that its length and width represent the configured length and beam of the ship. Based on the size of the ship it may be displayed as outline at a range of 6 NM and below.
- **Circle Symbol:** The circle symbol is displayed if the outline symbol cannot be resolved at the given range scale.

Whenever own ship symbols are displayed, the system displays a dot at the screen position representing the location of the consistent common reference point (CCRP).

Either symbol is shown in red if the position data is invalid or degraded. Additionally the outline symbol is displayed in red if the presentation mode is not Head Up (H UP).

7.3.1 Heading Line

The ship's heading line (HL) is shown as a single line starting from own ship's CCRP and drawn to the edge of the radar video display.

The bearing of the HL is dependent on the presentation mode.

- In head up (H UP) mode the heading line is always drawn vertically.
- In course up (C UP) mode the heading line is initially drawn vertically and then changes dependent on the heading bearing.
- In north up (N UP) mode the heading line is drawn at the correct compass heading.

The HL may be shown as a stern line (SL) drawn behind own ship. The type of marker (HL or SL) can be selected for one or more transceivers during top unit configuration, see *Chapter 4, Configuration*.

7.3.2 Beam Line

The Beam Line is a line displayed at right angles to the Heading line and extends each side of own ship's CCRP. The beam line can be turned on or off and the length of the line changed.

7.3.3 Own Ship Vector

A vector of own ship is drawn with a length corresponding to the distance on the video display that own ship will cover, given its current speed, in the current vector time.

Own ship vector is shown with a double arrowhead when in ground stabilisation mode, and a single arrowhead when in water stabilisation mode.

7.4 Centring

If the screen has been off centred or panned it can be redrawn with own ship's CCRP at the centre of the video display. All chart data and target positions are also moved in accordance.

7.5 Max View

Max View off-centres the video display at approximately 70% of the range scale radius so that a line drawn from it in the direction of the current course passes through the centre of the video circle.

Max View is not available at a range scale of 96 NM.

In unstabilised presentation mode (Head Up), the direction is reciprocal to the heading marker.

In stabilised presentation mode (North Up or Course Up), the direction is reciprocal to the course over ground (COG), or heading marker if COG is unavailable.

7.6 Off Centring, Panning and GoTo

7.6.1 Off Centring

Own ship's CCRP can be moved anywhere within approximately 70% of the range scale radius. Also a selected screen position (chart marker or object) can be positioned at the centre of the display with own ships position and all other chart and target positions moved in accordance.

Off Centring is not available at a range scale of 96 NM.

7.6.2 Panning

Panning moves a selected chart position or object to the centre of the display. Own ship's position, chart data and target positions are all moved in accordance.

Panning is only available in Standby mode.

7.6.3 GoTo

GoTo moves the centre of the video display to a specific LAT/LON position or a location name specified by the operator.

GoTo is only available in Standby mode.

7.7 Video Processing

Table 13: Video Processing

Function	Detail
Manual Control	Variable controls for gain, anti-clutter sea and anti-clutter rain.
Anti-clutter Auto	Advanced adaptive rain and sea clutter suppression circuits, applied without manual adjustment.
Enhance	Operation available on range scales of 0.75nm and above. Target enhancement is shown over entire video circle, except for a small area around the radar origin. Special circuitry for identifying weak/fading targets.
Scan Filtering	Scan integration for the reduction of noise and radar interference.
Peak Intensification	High level video which by-passes filtering process.
Video Build Up	Scan integration build up of persistent targets.
Video Fade and Trails Decay	Fast fade of video levels and slow decay of trails over the whole image.

7.8 Cursor Readout

The position of the cursor is used to provide the positional coordinates of targets located within the display. The cursor position is displayed as either True or Relative bearing to own ship in Latitude and Longitude.

Table 14: Cursor Readout

Parameter	Detail
Range	Defined as the distance between the CCRP and cursor position as measured in nautical miles.
Bearing	Angle from the CCRP to the cursor position, displayed as true or relative.
Reciprocal Bearing	Defined as bearing from the cursor position to the CCRP, displayed true or relative.
Latitude/Longitude	Corresponding to the current cursor position.
Time To Go	Estimated from the geographical distance between the CCRP and the cursor position divided by speed over ground (in ground stabilised mode) or speed through water (in water stabilised mode).

LAT/LON readings are not available if the following happen:

- own ship's position is lost when in Transmit
- the compass is unaligned
- there is a compass error

7.9 Presentation Modes

Table 15: Presentation Modes

Parameter	Detail
Head-Up (unstabilised)	Available with Relative Motion (Relative Trails). Maintained relative to the ship's fore/aft axis.
North-Up	Available with Relative Motion (Relative Trails), Relative Motion (True Trails) and True Motion. maintained relative to a fixed true bearing
Course-Up	

North-Up and Course-Up are only available with a valid compass input.

7.10 Motion Modes

7.10.1 Relative Motion - Relative Trails

Relative Motion - Relative Trails (RM(R)) is available in all presentation modes (Head-Up, North-Up, or Course-Up) and on all range scales. If the display is unstabilised, the presentation mode is Head Up and only RM (R) mode can be selected.

In RM(R) mode, own ship is maintained at a selected point on the display and the motion of all target trails are shown relative to own ship. Stationary targets will have trails if own ship is moving.

7.10.2 True Motion, and Relative Motion - True Trails

True Motion (TM) and Relative Motion - True Trails (RM(T)) are available with North-Up or Course-Up stabilised presentation modes (sea or ground stabilised). TM is available on range scales of 0.5NM to 48NM; RM(T) is available on range scales of 0.5NM and above.

Heading and speed through water (STW) inputs from compass and a water locked log provide a water stabilised presentation.

Course over ground (COG) and speed over ground (SOG) inputs, obtained when a position sensor such as GPS is providing data, or locked to an echo fixed with respect to ground, provide a ground stabilised presentation.

7.10.3 True Motion (TM) – Water Stabilised

Own ship moves across the radar picture according to the input of heading (derived from the compass) and STW (derived from the log or manually estimated).

Echoes from land and all other stationary targets are presented as objects, which are steady except for the movement due to tide or current experienced by own ship.

With water stabilisation, Trails attached to fixed targets give a direct indication of tide or current set and rate experienced by own ship. Leeway effects, if significant, will modify the trails on stationary targets.

Moving targets generate trails, representing their true heading and speed, but modified by the tide or current effects referred to above.

7.10.4 True Motion (TM) – Ground Stabilised

Own ship moves across the radar picture according to the inputs derived either from tracking a fixed echo (echo reference) or from a navigation sensor.

Echoes from land and all other stationary targets are presented as fixed objects, i.e. without trails.

Moving targets generate True Trails, representing their COG and SOG.

A disadvantage of the TM presentation mode is that the radar display range ahead of own ship decreases as own ship moves across the display. The display has to be reset, automatically either when own ship reaches approximately 70% of display radius, or manually as required.

With TM selected, target trails may be selected or not as required.

7.10.5 Relative Motion (True Trails) – RM(T) – Water Stabilised

In this mode, own ship is maintained at a selected point on the radar screen, and True Trails of targets are built-up in memory. As with the True Motion presentation, all trails are modified from True by the effect of tidal set and drift experienced by own ship.

The advantage of RM (T) is that a constant range ahead of own ship is maintained making it not necessary to reset the display as in TM.

7.10.6 Relative Motion (True Trails) – RM(T) – Ground Stabilised

As in sea stabilised presentation, the position of own ship remains at a pre-selected position on the screen. With inputs derived either from tracking a fixed echo (echo reference) or from a navigation sensor, echoes from stationary targets move on the screen relative to own ship, but do not generate trails.

All moving targets, such as ships underway, generate True Trails representing their COG and SOG.

7.11 Trails

Long, Short and Permanent trails are selectable. Trails can be removed from the display by selecting Off, or the trails time reset to zero by selecting Reset. The long and short trail lengths are shown on the display, and are dependent on the selected range as follows:

Table 16: Trails Parameters

Range Scale		
NM	Short Time	Long Time
0.125	10 seconds	30 seconds
0.25	10 seconds	30 seconds
0.5	15 seconds	45 seconds
0.75	15 seconds	45 seconds
1.5	30 seconds	90 seconds
3	30 seconds	90 seconds
6 and above	1 minute	3 minutes

Permanent trails are timed for up to 60 minutes, and can be displayed until manually reset.

7.12 Colour Management

The Colour Management feature utilises common colour sets comprised of RGB values that are calibrated for the monitor in use by the system.

Table 17: Colour Sets

Colour Set	Inside Radar Circle	Outside Radar Circle
Day Bright	Blue background, yellow radar video	White text on light grey background
Day Black	Black background, yellow radar video	Off white text on darker grey background
Dusk	Black background, yellow radar video	Light grey text on dark grey background
Night	Black background, yellow radar video	Grey text on black background
Night Red	Black background, red radar video	Red text on black background

7.12.1 Brilliance Groups

The brilliance groups feature initially provides eight brilliance groups, which can be independently adjusted by the operator.

7.12.2 SENC Data

The SENC feature ensures adjustments made to the brightness and contrast settings on the monitor will enable SENC data such as coastlines, safety contour and other objects to be adequately displayed.

7.13 Synthetics Control

The Synthetics control suppresses all synthetics other than the radar video.

7.13.1 Synthetics Colours

- Readout Data is invalid and unusable : Red
- Readout Data is degraded : Amber
- Readout Data is valid : Green
- Own Ship Invalid Synthetics : Red

7.14 EBLs, VRMs & ERBLs

7.14.1 Variable Range Marker (VRM)

Two independent VRMs are available. Each VRM is a ring of long dashes, the first and second VRMs having different mark/space ratio of line dashes.

The default range values on power up for the two VRMs are 2.5 NM and 4.5 NM. The default position for the VRM is centred on the CCRP.

VRMs can be offset or dropped to a LAT/LON referenced position. If the VRM is offset from the CCRP, the centre of the VRM is indicated by a dot. If the VRM is activated and the range scale is changed the VRM maintains its range.

7.14.2 Electronic Bearing Line (EBL)

There are two EBLs, variable from 0° to 359.9° in 0.1° increments. EBLs can extend up to 500 NM from their origin. Each EBL is a line of dashes, the first and second EBLs having different mark/space ratio of dashes.

When an EBL is turned on the value of its associated VRM is also shown.

The origin of an EBL can be offset or dropped to a LAT/LON referenced position. If the EBL is offset from the CCRP, its origin is indicated by a dot.

7.14.3 Electronic Range and Bearing Line (ERBL)

When a VRM is turned off, the VRM function is merged with the EBL to form an ERBL. There is a small cross on the ERBL where the VRM intersects to indicate the range setting of the VRM.

7.15 Trial Manoeuvre

A Trial Manoeuvre is based on speed, rate of turn and course through water values entered for own ship. The following parameters are used to define the manoeuvre:

- A true course to follow after the manoeuvre.
- A true speed to be maintained during and after the manoeuvre.
- A delay time before the manoeuvre is to start.
- A rate of turn for the manoeuvre.

Table 18: Trial Manoeuvre

Parameter	Detail	Power on default
Final True Course	0 to 359.9°, in 0.1° increments.	000.0°
Manoeuvre Speed	0 to 75kts.	15kt
Delay Time	0 to 30 minutes, in 0.1 minute increments.	0.0 min
Rate of Turn	1°/min to maximum set rate of turn in initialisation	Ownship's commissioned standard rate of turn
Alarm raised	30 seconds before manoeuvre starts.	

The manoeuvre course and speed is either STW or SOG, depending on the currently selected stabilised mode (ground or water).

7.16 Alarms and Warnings

All alarms and warnings are indicated by both audible and visual means.

Alarms are initially displayed on the Alarm Status Indicator, from where they can be acknowledged. Some alarms are automatically cleared by the system. A list of all currently active and unacknowledged alarms and warnings is shown in the Alarms Display.

There are two types of announcement sources: internal and external. Internal announcements are generated by the VisionMaster FT system. External announcements are those relayed to the alarm management system from other equipment.

Table 19: Alarms and Warnings

Type	Indication	Display Area
Unacknowledged Active Alarm	Flashing red	Indicator and Display
Unacknowledged Active Warning	Flashing orange	Indicator and Display
Unacknowledged Inactive Alarm or Warning	Flashing grey	Indicator and Display
Acknowledged Active Alarm	Steady red	Display only
Acknowledged Active Warning	Steady orange	Display only
Acknowledged Inactive Alarm or Warning	No indication	Removed from both areas

7.16.1 Prompts

Prompts appear directly underneath the Alarms and Warnings field and can be either temporary or permanent.

Permanent prompts denote a state or mode of operation, provide instruction to the operator, or may display settings.

Temporary prompts are general system responses to a user interaction and are displayed briefly for a commissioned time period.

7.16.2 Alarm Buzzer

The alarm buzzer is located in the monitor and controlled by the PCIO Unit.

7.17 Sensors

7.17.1 Serial Interfacing

The system supports acquisition of sensor data via serial interfaces having 1000V optical isolation, connected to the PCIO board.

The sensor data must comply with international specifications IEC 61162-1 and IEC 61162-2.

All serial inputs can accept RS232 or RS422 format.

The system can accept the following sentences (defined at system configuration) to obtain the types of data listed in Table 20.

Table 20: Sentences and Sensor Data

Sentence	Data
ALR	Alarm message
DPT	Depth Below Keel, Depth Below Transducer, Depth Below Waterline
DTM	Datum Information
GGA	Geodetic Position, Positioning System Mode, Time of Day
GLL	Geodetic Position, Positioning System Mode, Time of Day
GNS	Geodetic Position, Positioning System Mode, Time of Day
HDG	Magnetic Deviation, Magnetic Heading, Magnetic Variation
HDT	True Heading
MWV	Relative Wind Velocity, True Wind Velocity
ROT	Rate of Turn
RTE	Route Data
TLB	Target labelling
VBW	Speed through water (single and dual axis)
VDM	AIS Data
VDO	AIS Data (ownship)
VHW	True Heading, Magnetic Heading, Speed Through Water (single axis only).
VTG	Course Over Ground, Speed Over Ground (single and dual axis), Magnetic Course Over Ground, Positioning System Mode
WBL	Waypoint data
ZDA	Date and Time, Local Time Offset

The following table lists the PCIO unit serial inputs available and configurable for IEC 61162-1 and IEC 61162-2 sensor data.

Table 21: PCIO unit serial inputs

IEC Type	Baud Rate	Serial Input
IEC 61162-1	4800	HDG and HDT sentences via serial input TSCD of PCIO. All other IEC 61162-1 sensors via serial inputs TSCE, TSCF, TSCG TSCH and TSCJ.
IEC 61162-2	38400	HDG and HDT sentences via serial input TSCA of the PCIO. All other IEC 61162-2 sensors via serial inputs TSCB and TSCC. TSCB and TSCC may be configured to accept 4800 and 9600 baud.

Serial inputs TSCF, TSCG TSCH and TSCJ can be configured to operate at 9600 baud, although these serial inputs cannot be configured as a heading source.

All serial outputs are available in RS232 and RS422 format (on different terminal positions).

7.17.2 Azimuth Stabilisation

A standard compass board allows interfacing to most stepper and 360:1 ratio synchro compass types. A special compass board provides interfacing to 180:1, 90:1, 36:1 and 1:1 ratio synchros. This interface board is mounted in the PCIO unit.

Interfacing with compasses that have a serial output is also available. However, the preferred interface is a stepper or synchro compass.

If the only compass available for tracking is a serial, then the message rate must be approximately 50Hz.

- Maximum Rate of Turn 1200°/m
- Course Accuracy within 0.5° of input source.

See Chapter 3 'Installation', Section 7.2 'Compass Cabling and Link Settings' for details of compass types and cabling details.

7.17.3 Pulse Log Input

The system supports acquisition of single axis water speed data via a pulse log interface. The pulses can be TTL or 'closed contact' type. The open circuit potential for the Pulse Log input is approximately 5V.

The following interface options can be selected:

- Whether or not a pulse log is connected, default is 'not connected'.
- The polarity of the pulses (positive or negative).
- The pulse log rate, 100 to 2560 pulses per nautical mile.

Table 22: Pulse Log Input

Parameter	Detail
Speed Range and Input	0 to 75Kt
Steady State Speed Accuracy	±5% or ±0.25Kt, whichever is the greater, ignoring errors defined from the input source.

7.17.4 Manual Sensor Data

Sensor data can be manually entered by the operator to the following criteria.

Table 23: Sensor Data Manual Entry

Data Type	Manual Entry Requirements
Course Over Ground Heading Vessel Set	A range of 0.0° to 359.9°, and resolution of 0.1°.
Geodetic Position	A range of 89°48.000' south to north latitude and 180°00.000' east to west longitude, and resolution of 0.001 minute, in latitude and in longitude.
Speed Over Ground (single axis only) Vessel Drift Speed Through Water (single axis only)	A range of 0.0 to 99.9 knots, and resolution of 0.1 knots.

7.17.5 Computed Data

The term “computed data” is used to indicate the source of data when the system itself is responsible for computing this data, usually based on other types of sensor data received conventionally via an interface.

7.17.5.1 Radar Target Based Data

The system provides the following target based data:

- echo referenced velocity
- echo referenced position

The values of both target based data is determined by the operator selecting a fixed-position radar target, for an echo referenced position a geographic position is also assigned. The system then determines the ship's ground velocity or position based on changes in the range and true bearing to the target.

7.17.5.2 Other Computed Data

The system provides the following additional computed data:

- Set and Drift
- Ground Velocity (including ground speed and course over ground)
- Water Speed
- Rate of Turn (calculated on selected Heading source).

7.17.6 Dead Reckoning of Position

Where valid position data for own ship is not received the system establishes a computed position by dead reckoning from the last valid position received using own ship's direction and speed.

The timeout limit applied to valid dead reckoning values defaults to 30 seconds.

The system considers position data to be invalid if the most recent usable sample data received from a position sensor is older than the timeout limit.

7.18 Target Data

7.18.1 Tracked Targets

The Tracker allows targets to be acquired manually by the operator or automatically by the auto-acquisition zones. The tracker parameters are shown below.

Table 24: Tracker Parameters

Parameter	Value
Tracking range	0.25 to 40.0 nm
Acquisition range	0.25 to 40.0 nm
Cancellation range	0.0 to 40.0 nm
Max number of tracked targets	100
Max tracking velocity	150 knots relative
Time to display motion trend vector	After 16 good plots from acquisition
Lost Target	No good plot after 6 attempts
Vector Length	1 to 60 minutes in 0.1 minute increments.
CPA/BCR Alarm Settings	0.1 to 20 nm in 0.1 nm increments.
TCPA/BCT Alarm Settings	1 to 99 minutes in 1 minute increments.

All tracked targets are monitored for Lost Target. Only established tracked targets are monitored for CPA/TCPA and bow crossing infringements.

All distances and times displayed are relative to the own ship's physical location.

The velocity of the tracked target is through the water if own ship's selected speed is water stabilised or over the ground if own ship's selected speed is ground stabilised.

When a tracked target's predicted range is less than the minimum tracking range the tracked target is dead reckoned using a constant velocity without any Lost Target alarms being raised.

Any VisionMaster FT console required to meet the target accuracy scenarios of IEC60872-1 or IEC60872-2 must be supplied with compass information in analogue form, or in serial form conforming to IEC61162-2.

If a serial compass is used for tracking, then the message rate must be approximately 50Hz.

7.18.1.1 Automatic Dropping of Targets

An auto-drop mode can be enabled in which individual AIS or tracked targets, deemed not to be a threat to own ship, are automatically dropped by the tracker without an alarm being raised.

Tracked targets are dropped automatically if they meet all of the following criteria:

- The target is not in an auto-acquisition zone
- It is not the echo reference target
- It does not infringe the CPA/TCPA or Bow Crossing alarm criteria
- It is fully established, i.e. it has a motion trend vector displayed
- The TCPA is more than 3 minutes ago
- The target is astern of own ship
- The target's range is more than 10 NM from own ship
- The target is not currently selected for display in the target tote.

7.18.2 AIS Targets

All AIS targets are displayed in a Sleeping or Activated state. AIS targets can become activated either manually or automatically. An activated AIS target can be manually changed to Sleeping.

An activated AIS target is displayed with heading and speed/course vector, if heading data is invalid the course vector is shown in place of the heading line.

Sleeping targets will become automatically activated:

- when selected by the operator
- when the target infringes the CPA/TCPA limits
- when the target enters an auto-acquisition zone

The following alarm states apply to all AIS targets:

- Infringe bow crossing limits (range and time)
- Dangerous target (CPA/TCPA infringement)
- Enter acquisition zone
- Lost (sleeping targets do not raise a Lost alarm)

The system uses ship categories and intervals to define when a target is shown as lost.

AIS targets are prioritised as Class A or Class B, according to importance. The system can display class A targets only (default setting), class B targets only, or class A and B.

Table 25: Ship Categories and Lost Target Intervals

Ship Category	Lost Target Interval (Class A)	Lost Target Interval (Class B)
anchored or moored and speed <= 3 knots	18 minutes	18 minutes
anchored or moored and speed > 3 knots	60 seconds	N/A
0 <= speed <= 14 knots	60 seconds	180 seconds
0 <= speed <= 14 knots and changing course	60 seconds	-
14 < speed <= 23 knots	36 seconds	90 seconds
14 < speed <= 23 knots and changing course	36 seconds	-
speed > 23 knots	12 seconds	30 seconds
speed > 23 knots and changing course	12 seconds	-

When an AIS target is activated the system displays alphanumeric information on the target.

In addition to the tracker parameters shown in Table 24, for AIS targets the system displays the additional information of the target's current heading.

Up to 200 AIS targets can be displayed in the video circle at any one time.

When AIS targets are not shown, received AIS transmissions continue to be stored so that the targets can be rendered quickly when conditions indicate rendering should proceed. The system can simultaneously store information on up to 500 AIS targets.

7.18.3 Auto-acquisition Zones

Two annular auto-acquisition zones can be defined by the operator. Any target that enters these areas is automatically acquired and tracked by the system. Each acquisition zone can be turned on or off. Auto acquisition zones are relative to own ship's heading and are disabled after a heading data becomes unusable.

Any targets found in an auto acquisition zone are marked by a flashing zone infringement symbol and raise an AZ entry alarm. The AZ infringement symbol is displayed over existing target symbols (AIS and radar) and over acquiring target symbols when the AZ entry alarm is active; the symbol is not displayed after the alarm is acknowledged.

The default auto-acquisition zones are two sections of an annulus. The zone annulus is defined from the start bearing clockwise to the end bearing, i.e. the arcs will extend clockwise from the start position. The ranges and depths are the same, irrespective of whether a metric, nm, or sm display has been selected.

If an attempt is made to define a zone with a subtended angle of $>354^\circ$, the result will be a 360° zone.

Table 26: Auto Acquisition Zone Parameters

Limits on Annulus		
Parameter	Min	Max
Range	1.0 NM	40.0 NM
Depth	0.4 NM	2.0 NM
Bearing (when not a full annulus)	6°	354°

The initial auto-acquisition zone definitions (i.e. the first time the system is run) are shown below.

Table 27: Auto Acquisition Default Zone Definitions

Default Zone Definitions	
Zone 1	
Range	4 to 5 NM
Bearing	270° to 90°
Zone 2	
Range	12 to 14 NM
Bearing	270° to 90°

7.18.4 Cancel All Targets

When this option is selected tracked targets are dropped and AIS targets set to a sleeping state if they meet the following criteria:

- it is not the echo reference target
- the target is an AIS target that does not infringe the CPA/TCPA or Bow Crossing alarm criteria
- the target is an AIS target and is not in an auto-acquisition zone.

7.18.5 Past Position Dots

It is possible to display up to four past position dots indicating the past positions of all tracked targets, depending on how long the target has been tracked.

Table 28: Past Position Dots Intervals

Parameter	Detail
Dot time intervals	15 sec
	30 sec
	1 min
	2 min
	4 min
	8 min
	16 min

The position of the dots will match the trails, i.e. they will be true position dots when the trails are true, and relative dots when the trails are relative. Past position dots are available in all presentation and motion modes on systems with a working compass. When the dots are selected, the time interval between dots will be displayed as a permanent prompt.

The selected interval will not alter when the range is changed. The default time interval is 1 minute. The past position data will start to build up as soon as tracking of the target commences. It will only be cleared when the target is cancelled. The operator may switch the display of the dots off and on.

7.18.6 Test Targets

Test targets are shown as a fixed test target pattern which is stationary relative to own ship. Test targets' video is mixed with the radar video so that they can be displayed and tracked in exactly the same manner as live targets. The targets are generated every 45 degrees starting at 0 degrees relative to own ship's heading and at 0.5nm, 1nm, 2nm, 4nm, 6nm, and increasing in 2nm increments to 40nm. The targets are fixed size in both azimuth and range.

When test targets are displayed on live video the letter X is displayed at the bottom of the presentation area flashing at a rate of 0.5 to 1.0 Hz. When test targets are displayed on a simulated radar video the letters XX are displayed.

7.18.7 Track Table Output

Track table transmits data for own ship, system information and all target data in the system. Includes course, speed, position, type (e.g. tracked, AIS etc.) and source of target (e.g. tracker).

The system provides RS232 and RS422 serial output of the track table data with the following options:

- No output (default)
- Output as IEC 61162-1 (i.e. serial interface operating at 4800 Baud)
- Output as IEC 61162-2 (i.e. serial interface operating at 38400 Baud)

The track table output contains the following messages:

- Own ship data (OSD) - output every two seconds
 - Ship's heading and status
 - Vessel's course and speed
 - Reference for course and speed (e.g. manual or log)
 - Speed units
 - Manually entered set and drift
- Radar system data (RSD) - output every two seconds
 - Origin 1 range/bearing
 - VRM 1 range
 - EBL 1 bearing
 - Origin 2 range/bearing
 - VRM 2 range
 - EBL 2 bearing
 - Cursor range/bearing
 - Range scale
 - Range units
 - Display presentation
- Tracked target message (TTM) - maximum of 10 being output every two seconds
 - Target number
 - Target range from own ship
 - Target bearing from own ship, TRUE
 - Target speed
 - Target course, TRUE
 - CPA Distance
 - Time to CPA (TCPA)
 - Speed/distance units
 - Target name

- Target status
- Echo reference target
- Acquisition calculation time in UTC
- Acquisition type

The CCRP is used as the data reference point.

During commissioning the target data can be selected to be output as:

- Tracked targets only
- All targets

7.19 Navigation Tools

7.19.1 Navigation Marks

At least 100 cross-shaped navigation (Nav) marks can be defined anywhere within the video circle by the operator. Each Nav mark corresponds to a LAT/LON position and can be dropped or carried relative to own ship.

7.19.2 Parallel Index Lines

Up to five parallel index (PI) lines can be displayed simultaneously, on range scales of 0.25 NM and above. Multiple sets of PI lines can be defined and stored on the system. Each PI Line spans the video circle, they are displayed and available for editing in both Standby and Transmit modes.

Sets of PI lines can be imported or exported between consoles.

7.19.3 Mapping Objects

A selection of pre-defined mapping objects (lines, danger points, areas, buoys, nav marks and beacons) can be defined in the presentation area.

Mapping objects can be saved by the operator as groups. Grouped objects and geographic mark-up areas can be saved, or saved and retrieved from a shared database and imported and exported to or from other nodes or external drives.

7.19.4 Parallel Cursor

A rotating parallel cursor, centred on the CCRP, can be displayed. The parallel cursor consists of two orthogonal lines (axes) extending to the edge of the video circle with their axis crossing point at CCRP, the end points of each line are marked with a semi-circular marker at the edge of the video circle. A series of equally spaced parallel lines, spaced at the currently set range ring interval, are shown on either both sides of the CCRP (full mode) or one side of the CCRP (half mode).

The parallel cursor bearing can be true or relative. In True Bearing the parallel cursor is azimuth stabilised (i.e. maintains a constant orientation with respect to north). In Relative Bearing the parallel cursor is unstabilised (i.e. maintains a constant orientation with respect to ship's heading).

7.19.5 Ownship Display Settings

7.19.5.1 Beam Line

The beam line length defaults to 10mm (minimum), and can be set up to 99.9mm (maximum).

7.19.5.2 Predicted Vector

Predicted vector enables a vector arc with a radius computed from current speed, rate of turn and stabilisation mode to be drawn from own ship's CCRP. The vector arc is drawn up to six minutes out with a dot indicating each minute.

7.19.5.3 Vector Tick Marks

Tick marks along own ship vector can be displayed at one minute intervals, with every sixth tick mark shown as double thickness.

7.19.6 Next Turn EBL

Next Turn EBL is data transferred from an external Voyage Management System (VMS), which can then be represented graphically in the video circle.

A valid compass input is required to display the Next Turn EBL graphics. If the heading is unusable then the graphics will not be displayed.

The system uses the following VMS information to display the Next Turn EBL:

- Bearing of initial line, degrees with respect to north
- Length of initial line, in NM (can be zero if initial line is not to be drawn)
- Radius of arc, in NM
- Bearing of final line, degrees with respect to north
- Display status of Next Turn EBL, on or off
- Position of origin of Next Turn EBL, in NM fore/aft and port/ starboard, with respect to the centre of the ship.

The final line is always drawn to the circumference of the video circle.

7.19.7 Grid

A LAT/LON grid can be displayed on the video circle, the grid values are taken from the latest valid position of the CCRP, as reported by the position sensor.

The grid can display between three and six LAT/LON lines, based on the scale of the display.

The LAT/LON grid will not be displayed when the chart orientation is 45° to 135° and from 225° to 315°.

7.20 Routes

A route plan is a geographical referenced synthetic which can contain up to 200 defined waypoints.

Up to 100 route plans can be saved to a database. Route plans saved to a database can be editable from any node on the network. If the same route plan is being edited on more than one node at the same time, the operators at the other editing nodes are notified when the plan is saved.

The following types of route plan are available:

- Temporary Plan - these can be created and executed at any time; temporary plans are not saved to the database.
- External Route Plan.

7.20.1 External Route Plans

External Route Plans (ERPs) are route plans that were created and stored on a GPS unit, a legacy VMS unit, or some other device external to VisionMaster FT. These route plans may be displayed if they are sent using IEC 61162 RTE and WPL sentences over a serial connection.

Only basic monitoring (cross-track distance, distance to waypoint, and estimated time to waypoint) is provided for ERPs. Track control, return-to-plans, alarms, and the ability to save are not provided for ERPs.

7.21 Charts

The Charts facility allows vector charts to be displayed. The system supports both C-MAP and SevenCs chart engines.

7.21.1 C-MAP Chart Formats

The C-MAP chart engine supports the following chart formats:

- ENC (C-MAP's proprietary chart format)
- CM93v3
- Professional +

C-MAP presentation libraries are supported.

7.21.2 SevenCs Chart Formats

The SevenCs chart engine supports the following chart formats:

- S-57 (unencrypted)
- S-63.

SevenCs presentation libraries are supported.

7.21.3 Chart Display Mode

Charts can be displayed in the following modes:

- Chart Filled - the land colour fill shows as a different colour than the water and chart objects are filled with the applicable colours.
- Chart Unfilled - the land and sea are the same colour and coastlines, safety contours and other objects are shown in outline only.
- Charts/Maps Off - no chart information is displayed.

The display of charts is suppressed if the presentation mode is in Head Up, i.e. unstabilised.

7.21.4 Chart Feature Sets

The following types of chart feature sets can be selected: Base (default), Standard and Other.

Base is the bare minimum allowable feature set. Standard is a superset of Base that includes additional information. Other is also a superset of Base, but may contain information not available in Standard.

Some features are common across chart formats, while others are particular to a specific format. A chart feature set can be customised by applying specifically selected features.

The selection of chart feature sets and the application of custom features is governed by the current range scale. All feature sets are available and custom features can be applied at range scales of 12 NM and below.

At higher range scales the following feature sets can be applied.

- at 96 NM Base chart set only is available;
- at 48 NM Base and Standard chart sets are available;
- at 24 NM Base, Standard and Other chart sets are available.

7.21.5 Chart Match

Chart Match allows the operator to correct any discrepancy between the radar video and the chart display. By selecting the radar object and the chart object to be matched, an offset can be created that is applied to the chart display. This offset persists until the chart match is cancelled, or until the chart cells displayed on the screen at the time of the selection are no longer on the screen.

Chart Match includes the capability to specify a range and bearing adjustment to be applied to any loaded chart in order to alter the chart's relative position to the own ship's CCRP plotted position.

7.21.6 Chart Updates

All chart updates made by the operator are logged in the chart engines. A record of C-MAP updates is kept in the C-MAP database; the SevenCs engine keeps a record of updates in a log file.

The log file or database record contain, for each update applied to or rejected, the following information:

- Date and time of application/rejection.
- Complete and unique identification number of update as described in the S-57 product specification.
- Any anomalies encountered during application.
- Type of application: manual/automatic.

A summary of S63 (encrypted S-57) chart updates can be viewed via a secondary window. This summary window shows the following data:

- Reference name of the updated chart
- Chart issue date
- Application date
- Edition number and date of cell involved
- Update numbers
- Number of objects in the affected cells
- Chart type
- Status

If an update is not properly applied or the update is out of sequence the update is terminated, an update rejection is logged by the system and a warning of this action is given.

7.21.7 Chart Installation

Chart Installation enables the loading of charts onto the system hard drive from a chart installer utility. If the chart type supports network installation, chart installation can be made from any node of the system.

Charts can be installed using a USB key. Where C-MAP charts are being installed the key used will be pre-assigned with a unique user ID.

Where S-57 charts are being installed the key used will include information such as the S-57 user permit.

For information on the chart installer see Chapter 6 '*Chart Installation*'.

7.21.8 Chart Permissions

Information on chart license and permit expiration can be viewed via a secondary window. The Permissions window shows the following data:

- License*
- Expiration Data
- Database
- Region
- Subscription Status

When a chart license or permit is about to expire a warning is generated. If the C-MAP license has expired the system stops displaying the respective charts.

7.21.9 Chart Depths

The following depth threshold values can be applied to charts:

Table 29: Chart depth threshold values

Depth	Default	Min	Max
Deep Contour	30 metres	7 metres	100 metres
Safety Depth	30 metres	2 metres	30 metres
Shallow Contour	2 metres	0 metres	10 metres

* Applicable to C-MAP charts only, replaced with cell permit if S-63 charts are being used.

7.21.10 Chart Query

The chart query facility enables detailed information on geographic objects and specific chart areas to be made.

The following query options can be selected:

- Filter - search by geographic type (points, lines, areas and/or 3D and cluster points)
- Area Size - search area as a factor of scale (small, medium, large)

The Query Area Size is based on the current selected range scale. The default values for query area size are as follows:

- Small = 10% of the range scale
- Medium = 20% of the range scale
- Large = 30% of the range scale

7.22 Time Management

Time Management provides the operator with the option of entering a manual date and time offset from GMT in hours and minutes. The time zone offset is then used by the system to display local time.

The operator can also select, if available a sensor source, for example GPS, as the time source. The selected time sensor is used by the system to synchronize the time of all nodes.

8 Transceiver Interface

8.1 Standby/Transmit

The display and the transceiver are in one of two operational modes, standby or transmit. In addition, when the transceiver is in standby it may also be warming up.

Note: *The operational mode of the display is considered separate from the operational mode of the transceiver to which it is connected.*

In the event of a Transceiver error the display switches from Transmit to Standby.

When a display is powered on in an Interswitch system the interswitch allocates a transceiver for the display to be connected to.

8.1.1 Warm Up

Upon power-on of a “cold” transceiver, a warm up period is required to prevent damage to the magnetron before it can start transmitting.

Note: *The power-on of a display will not necessarily mean the connected transceiver will start in warm up, as an interswitch in the system may maintain power to the transceiver even if no displays are currently connected to it.*

Note: *BME transceivers give an indication of warm up in the serial messages transmitted to the display. For use with non-BME transceivers a transceiver compatibility unit (TCU) must be used. If a TCU is not used then the interfacing equipment must conform to the protocols detailed in 65800/HIS/001 Display – Transceiver Interface.*

When a display is connected to a transceiver that is in warm up, either because of interswitching or from power-on, a count for the warm up period is displayed, starting at 0 and incrementing each second up to a maximum of 999. When the warm up period has ended the count is removed and the display is in Standby.

8.1.2 Master/Slave Control

The method of selecting Master or Slave Display operation is dependent on whether an interswitch is fitted.

1. Where no interswitch is fitted the system defaults to Master. The Master/Slave Display selection is done as part of Commissioning and the transceiver identification is fixed at A.
2. Where an Interswitch is fitted the Master/Slave selection and Transceiver identification (A to F) is determined by the Interswitch.

When operating as a Slave Display on power-on the display defaults to standby but the connected transceiver does not change its operational mode.

8.2 Pulse Length

Three pulse length options are available:

- Short Pulse
- Medium Pulse
- Long Pulse.

Pulse lengths can only be selected on a Master Display, when the display is in Transmit.

The pulse lengths available depend on the selected range scale.

Where a change of range scale results in the pulse length having to change then the pulse length closest to the existing range scale is automatically selected. If the display's requested pulse length does not match the pulse length of its connected transceiver a pulse length error alarm is raised.

8.3 Transceiver Tuning

Two transceiver tuning modes are available, Automatic Frequency Control (AFC) and Manual. The current level of tuning is indicated by a shaded bar adjacent to the caption.

For a Master Display there are three tuning controls:

- AFC On/Off (power on default)
- Coarse Tune
- Manual Fine Tune

For a Slave Display the tuning mode and tune level are not controlled by the display but mirror the values of the connected transceiver.

The coarse tune level control allows the centre tune frequency to be set up for the transceiver to which a display is connected. This control is typically done at Commissioning with the system default set to the centre value of the AFC tune range. A different level is stored for each transceiver and restored both at power on and when the transceiver is selected.

During the coarse tuning process any configured Sector Blanking is suppressed, when coarse tuning is complete the Sector Blanking is restored to its original setting.

When AFC is turned off manual fine tune is available for the operator to tune the connected transceiver.

8.4 Sector Blanking

Two blanking sectors can be set up for each Transceiver during Commissioning. These sectors inhibit radar transmission over an angular width of up to 180°, with a combined maximum blanking of 340°. Each sector is aligned and maintained with respect to own ship's head in all presentation modes for both centred and off-centred video displays.

Sector blanking is suppressed when:

- Coarse tuning the transceiver
- Performance monitor is on
- Video level is being adjusted.

9 Power Requirements

9.1 Power Requirements and Unit Characteristics

The main power source must have a voltage between 92 and 276V rms at a frequency between 47 and 64Hz.

For high-voltage multiphase supplies, a step-down transformer is available.

Table 30: Power Requirements

Unit	Maximum Input Power
Consoles (Including Monitor, PCIO and Processor Units)	
250 Console (with 19" LCD)	310VA
340 Console (with 23" LCD)	310VA
19" LCD	100VA
23" LCD	100VA
Processor Unit	150VA
PCIO Unit	60VA
X-band Scanner Motor and Transceiver	
Standard Speed Unit	250VA
High-Speed Unit	370VA
S-band Transceiver	
S-band Transceiver Unit	120VA
S-band Scanner Motor	
Standard Speed Unit - single phase	750VA
High-Speed Unit - single phase	750VA
Standard Speed Unit - 3 phase (per phase)	500VA
High Speed Unit - 3 phase (per phase)	600VA

Table 31: Unit Characteristics

Parameter	All Units except S-band Scanner Motor Unit
Power Factor Correction	Better than 0.9
Transient protection	Over-voltage transient of up to 40% above nominal input voltage with maximum duration of one second. Pulse transient of up to ± 1200V peak, with a rise time of 2 to 10µs and duration up to 20µs.
Protection facilities	Output short circuit. High and low input voltage. Output over-voltage. Slow start.

10 Mechanical Specification

10.1 Weights and Dimensions

Table 32: Weights and Dimensions

Console Assembly (including modules)	Height (mm)	Depth (mm)	Width (mm)	Weight (kg)
250 Console deck mounted	1102(1223 [*])	843	680	130
340 Console deck mounted	1102(1223 [*])	843	680	135
Console Assembly (not including modules)				
340 Console desktop	450(585 [*])	843	680	46
Console Modules				
250 Monitor (19" LCD) kit version	444	82	483	11.2
340 Monitor (23" LCD)	534	86	632	19
250 Monitor (19" LCD) in 340 console	534	86	632	14
Processor Unit (including mounts)	172.5	382	518.5	14
PCIO Unit	84	452	457	8.5
X-band Units				
Scanner Unit with 1.2m Antenna	440	586	1305 [†]	49 42 [‡]
Scanner Unit with 1.8m Antenna	440	586	1914 [†]	52 44 [‡]
Scanner Unit with 2.4m Antenna	440	586	2550 [†]	55 47 [‡]
Bulkhead Transceiver (658xxA, B, P, T, W)	607	327	370	23
Bulkhead Transceiver (658xxE, F, G, H, L)	607	330	370	19
S-band Units				
Scanner Unit + 2.7m Antenna + integral Transceiver	800	718	2800 [†]	163.5
Scanner Unit + 2.7m Antenna. No integral Transceiver	800	675	2800 [†]	150.5
Scanner Unit + 3.7m Antenna + integral Transceiver	800	718	3700 [†]	176.5
Scanner Unit + 3.7m Antenna. No integral Transceiver	800	675	3700 [†]	163.5
Bulkhead Transceiver Unit	515	318	402	25

* When monitor is in service position

† Antenna Turning Circle

‡ Excluding Transceiver

Refer to individual drawings in Chapter 3 '*Installation*' for dimensions and weights of smaller components, such as the Control Panel Modules.

10.2 Console Mounting Options

The console components are supplied either as integrated unit (deck mounting) or as a kit for fitting into customer specified consoles. See Chapter 3 '*Installation*' for installation details.

11 Compass Safe Distance

Table 33: Compass Safe Distance

Console Assembly	Standard	Steering
250 Console deck mounted	TBA	TBA
340 Console desktop	TBA	TBA
340 Console deck mounted	2.9 m	1.9 m
Console Modules		
250 Monitor (19" FPD)	1.8 m	1.8 m
340 Monitor (23.1" FPD)	2.6 m	2.6 m
Processor Unit	2.0 m	1.3 m
PCIO Unit	2.2 m	1.5 m
On-Off Switch Module	0.3 m	0.3 m
Trackball Module	0.3 m	0.3 m
USB connector	0.3 m	0.3 m
X-band Units		
Scanner Unit 10kW	1.4 m	0.8 m
Scanner Unit 25kW	3.3 m	2.0 m
Scanner Unit (without Transceiver)	0.4 m	0.3 m
Bulkhead Transceiver 10kW	1.3 m	0.7 m
Bulkhead Transceiver 25kW	3.3 m	2.0 m
S-band Units		
Scanner Unit 30kW	4.1 m	2.4 m
Scanner Unit (without Transceiver)	0.8 m	0.5 m
Bulkhead Transceiver 30kW	4.3 m	2.6 m
Scanner Control Unit	0.8 m	0.4 m

12 International Specifications

This equipment meets the requirements of the following International Standards for maritime navigation equipment:

Table 34: International Specifications

Number	Version	Title
IEC 60872-1	1998	Maritime Navigation and Radiocommunication Equipment and Systems - Radar Plotting Aids - Automatic Radar Plotting Aids (ARPA) - Methods of Testing and Required Test Results
IEC 60936-1	2002	Maritime Navigation and Radiocommunication Equipment and Systems - Radar - Part 1: Shipborne Radar - Performance Requirements - Methods of Testing and Required Test Results
IEC 60936-2	1998	Maritime Navigation and Radiocommunication Equipment and Systems - Shipborne Radar For High-Speed Craft (HSC) - Methods of Testing and Required Test Results
IEC 60936-3	2002	Maritime Navigation and Radiocommunication Equipment and Systems - Radar - Part 3: Radar with chart facilities. Performance requirements - Methods of testing and required test results
IEC 60936-5	2003	Maritime Navigation and Radiocommunication Equipment and Systems - Radar - Part 5: Guidelines for the use and display of AIS information on radar
IEC 60945	2002	Maritime Navigation and Radiocommunication Equipment and Systems - General Requirements - Methods of Testing and Required Test Results
IEC 61162-1	2000	Maritime Navigation and Radiocommunication Equipment and Systems - Digital Interfaces - Part 1: Single Talker and Multiple Listeners
IEC 61162-2	1998	Maritime Navigation and Radiocommunication Equipment and Systems - Digital Interfaces - Part 2: Single Talker and Multiple Listeners, high-speed Transmission

CHAPTER 2

SYSTEM IDENTIFICATION

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1 Introduction

The alphanumeric System Number allocated to the VisionMaster FT Series of Radars details the various units of the particular system to which the number refers. Each System Number consists of up to seven identifying labels, which are listed below. The description below covers all variants except dual channel radars, some of which are not commercially available.

The various labels (from 1 to 7) of VisionMaster FT Series Part Numbers, shown below, are explained in more detail in Section 2 'System Identification Labels'.

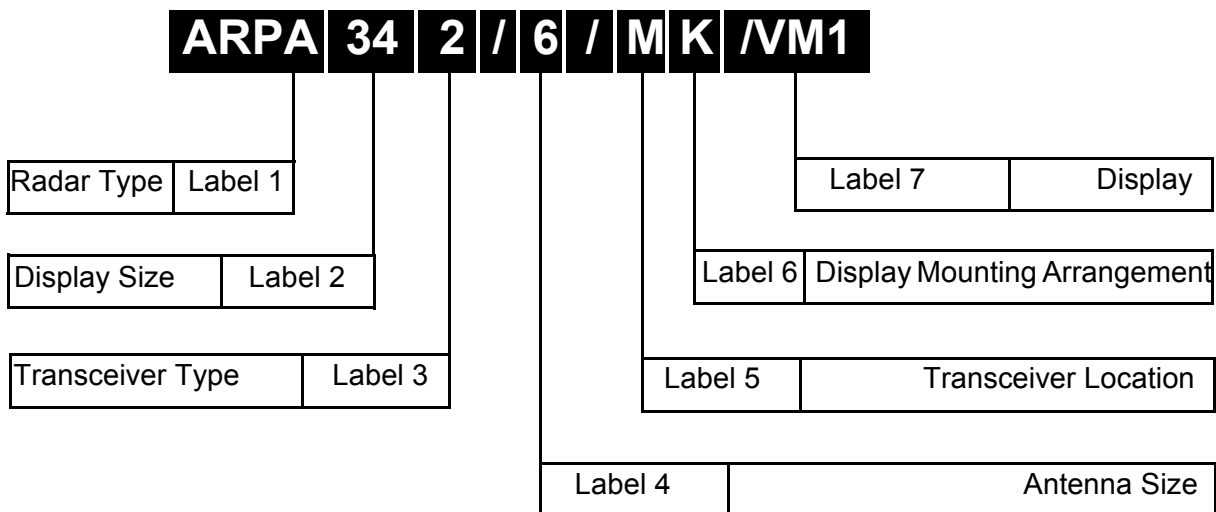


Figure 2.1 VisionMaster FT Series Part Numbers

2 System Identification Labels

2.1 Label 1 Radar Type

Label	Radar Type
ARPA	ARPA Radar
ARPACR	Chart Radar

2.2 Label 2 Display Size

Label	Display Size
25	250mm Display PPI "12 inch"
34	340mm Display PPI "16 inch"

2.3 Label 3 Transceiver Type

Label	Transceiver Type
1	10kW X-band AC Ship's Mains
2	25kW X-band AC Ship's Mains
3	30kW S-band AC Ship's Mains

2.4 Label 4 Antenna Type

Label	Antenna Size
4	4ft (X-band)
6	6ft (X-band)
8	8ft (X-band)
9	9ft (S-band)
12	12ft (S-band)

2.5 Label 5 Transceiver Location

Label	Transceiver Location
M	Masthead Transceiver
B	Bulkhead Transceiver

2.6 Label 6 Display Mounting Arrangement

Label	Display Mounting Arrangement
K	Kit format for mounting in console
T	Tabletop mounted
Blank	Standard Configuration Deck Standing

2.7 Label 7 Display Technology

Label	Monitor Type
VM1	VisionMaster

3 Unit Type Numbers

A VisionMaster FT Radar System is configured from among the following unit types:

- Monitor Unit
- Processor Unit
- Security Block
- PCIO Unit
- Tray Assembly / HMI & Control Assemblies
- Antenna Unit
- Turning Unit (with or without Integral Transceiver)
- Bulkhead Transceiver Unit
- Scanner Control Unit (S-Band)
- Interswitch Unit

3.1 Monitor Unit

The Monitor Unit type number consists of a five-figure number (e.g. 65923) followed by a single letter suffix (e.g. C). A typical complete Monitor Unit Type Number may therefore be 65923C. A further breakdown of the number is as follows:

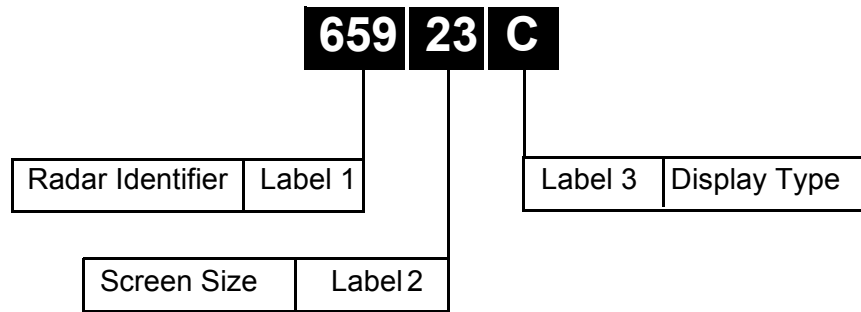


Figure 2.2 Monitor Unit Label

3.1.1 Label 1 VisionMaster FT Identifier

Fixed as **659**

3.1.2 Label 2 Screen Size

Label	Diagonal
19	19" FST (250mm radar circle)
23	23" FST (340mm radar circle)

Note: The 23" and 19" BridgeMaster E monitors (type 65823A and 65817G respectively) may be used in kit systems.

3.1.3 Label 3 Monitor Type

Label	Monitor Series	Variant and Size
C	250/340	340 console (Hatteland)
M	340	340 console (Melford)
T	250/340	Desktop

Note: There is an independent On/Off switch for all monitors.

Note: All monitors have a buffered video output.

3.2 Processor Unit

The type numbers for the Processor Unit are as follows:

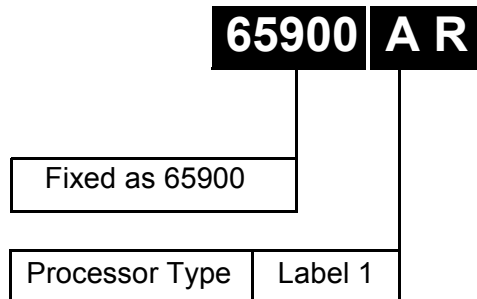


Figure 2.3 Processor Electronics Unit label

3.2.1 Label 1 Processor Type

Label	Processor Type
AR	ARPA Radar / Chart Radar

3.3 Security Block

There are two types of security block:

- 32SDV001 for ARPA Radar systems
- 32SDV002 for Chart Radar systems

3.4 PCIO Unit

There are two types PCIO unit:

- 65900AA for Standard Compass (stepper & 360:1 synchro)
- 65900AB for Special Compass (1:1, 36:1, 90:1 & 180:1 synchro)

The standard compass PCIO unit will be supplied for all serial compass input systems.

3.5 Control Panel Assembly

This includes HMI (trackball), On/Off switch and USB assemblies as follows:

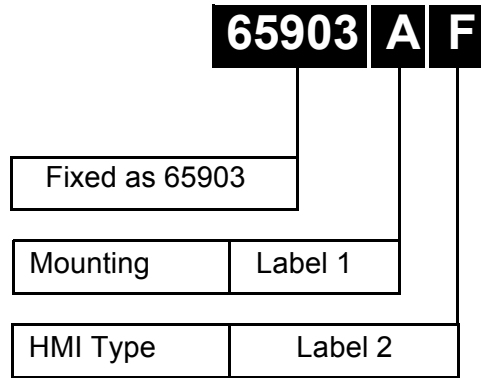


Figure 2.4 Tray Assembly / HMI & Control Assemblies

3.5.1 Label 1 Mounting

Label	Mounting
A	Integral
K	Kit

3.5.2 Label 2 HMI Type

Label	HMI Type
F	Trackball only

3.6 Antenna Unit

The Antenna unit type numbers are as follows:

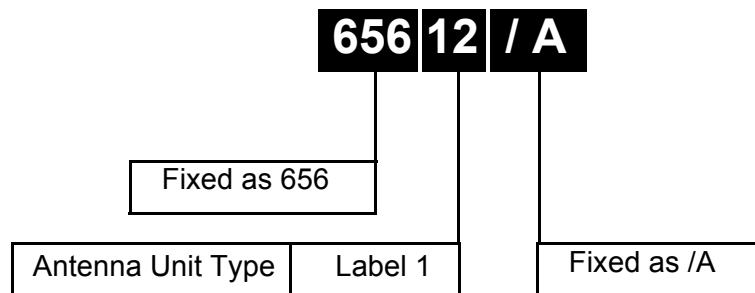


Figure 2.5 Antenna Unit Label

3.6.1 Label 1 Antenna Type

Label	Radar Type
04	4ft (X-band)
06	6ft (X-band)
08	8ft (X-band)
09	9ft (S-band)
12	12ft (S-band)

3.7 Turning Units and Integral Transceivers

The type numbers for Turning Units and Integral Transceivers are as follows:

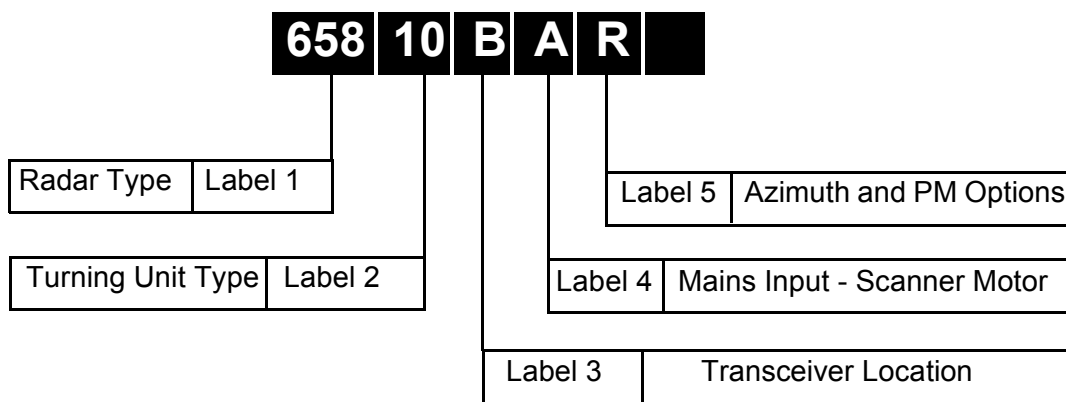


Figure 2.6 Turning Unit and Integral Transceiver label

3.7.1 Label 1 BridgeMaster E Identifier

Fixed as 658

3.7.2 Label 2 Turning Unit Type

Label	Turning Unit Type
01	X-band without Transceiver
10	X-band with 10kW Transceiver
25	X-band with 25kW Transceiver
30	S-band with 30kW Transceiver

X-band Turning Units are supplied set to 'Standard Speed'. Speed changes are effected by link changes within the unit. S-band Turning Units are correctly set for their turning speed.

3.7.3 Label 3 Transceiver Location and Type

Label	Transceiver Location
B	Bulkhead
M	Masthead with biased Limiter
W	Masthead with non-biased Limiter

3.7.4 Label 4 Mains Input – Scanner Motor

Label	Phases	Voltages (V)	Frequency (Hz)	Speed	Band*
A	1	110/240	50/60	S/H	X
E	1	110 – 120	50/60	S	S
F	1	220 – 240	50/60	S	S
G	3	110 – 120	50/60	S	S
H	3	220 – 240/380 – 440	50/60	S	S
J	1	110 – 120	50	H	S
K	1	220 – 240	50	H	S
L	3	110 – 120	50	H	S
M	3	220 – 240/380 – 440	50	H	S
P	1	110 – 120	60	H	S
Q	1	220 – 240	60	H	S
R	3	110 – 120	60	H	S
S	3	220 – 240/380 – 440	60	H	S

*. For **X-band** Turning Units the motor is powered from the transceiver. This supply matches the Processor Electronics Unit supply.
 For **S-band** Turning Units the motor is fed from its own supply via a Scanner Control Unit and can differ from the Transceiver/Processor Electronics Unit supply.

3.7.5 Label 5 Azimuth and Performance Monitor Options

Label	Performance Monitor	Synchro/Resolver	Synchro Type
P	No	No	N/A
R	Yes	No	N/A

3.8 Bulkhead Transceiver Unit

The type numbers for the Bulkhead Transceiver Unit are as follows:

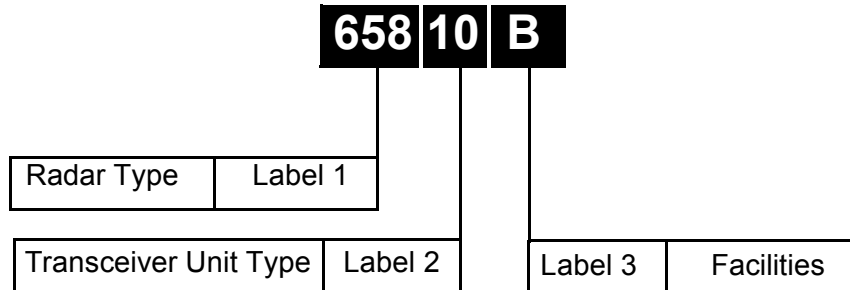


Figure 2.7 Bulkhead Transceiver Unit label

3.8.1 Label 1 BridgeMaster E Identifier

Fixed as **658**

3.8.2 Label 2 Transceiver Type

Label	Transceiver Type
10	10kW X-band
25	25kW X-band
31	30kW S-band

3.8.3 Label 3 Facilities

Label	Facilities
A	Standard with biased limiter
H	Standard non-biased limiter

3.9 Scanner Control Unit

The type numbers for the Scanner Control Unit are as follows:

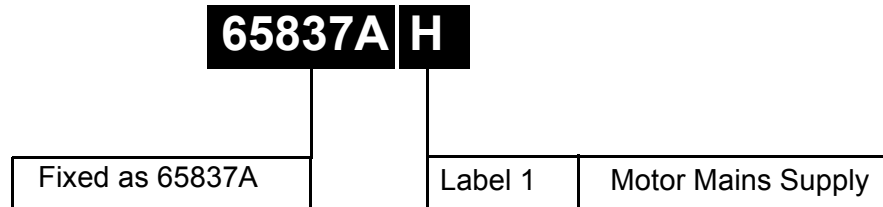


Figure 2.8 Scanner Control Unit label

3.9.1 Label 1 Motor Main Supply

Label	Phases	AC Voltage	Antenna Speed
B	3	380/440	Standard
C	3	220/240	Standard
	3	380/440	High
E	1	220/240	Either
	3	110/120	Standard
	3	220/240	High
F	3	110/120	High
H	1	110/120	Either

Scanner Control Units (SCU) are adjusted internally for thermal trip current and the number of phases (1 or 3).

3.10 Interswitch Unit

Interswitch Type	System Configuration
65842A	Up to 4 Displays and 2 Top Units
65846A	Up to 6 Displays and 6 Top Units

4 Configuring a Typical System

The following shows how a typical system is configured using the information above. The requirement is for an S-band ARPA radar with the following characteristics:

- | | | |
|----|---------------------|--|
| 1. | Display Unit | Deck mounted 23" (340mm) flat panel monitor. |
| 2. | Processor Unit | Standard |
| 3. | Security Block | ARPA Radar |
| 4. | PCIO Unit | Standard Compass |
| 5. | Tray Assembly | Trackball |
| 6. | Antenna | 12ft S-band, standard speed |
| 7. | Transceiver | 30kW Masthead mounted with Performance Monitor |
| 8. | Ship's Mains Supply | 220/240V AC, 50Hz, 1 Phase |

The System Identification number for the system specified above would be:

ARPA | 34 | 3 | / | 12 | / | M | | /VM1

The individual Type Numbers for the specified units would be:

Monitor Unit **659 | 23 | C**

Processor Unit **65900 | AR**

Security Device **32SDV001**

PCIO Unit **65900 | AA**

Tray Assembly **65903A | F**

Antenna **656 | 12 | /A**

Turning Unit (including Transceiver) **658 | 30 | M | F | R**

Scanner Control Unit **65837A | E**

Note: *The modular method for configuring VisionMaster FT systems results in a large number of possible combinations, not all of which are commercially available. Consult NORTHROP GRUMMAN SPERRY MARINE for full details.*

5 Options and Kits

9640454 Step down transformer for use with 380-440V 50/60Hz
3-phase mains.

65800700 Isolation Switch

Various kits with different lengths of installation cable are available.

Consult NORTHROP GRUMMAN SPERRY MARINE for full details.

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CHAPTER 3

INSTALLATION

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1 General Information

The Installation Engineer is responsible for providing the work needed for the installation and making sure the Contractor completes the work.

1.1 Preparation

The preparation required for installation is as follows:

1. If necessary, the structure of the ship should be strengthened to support the system components (*see Chapter 1, Technical Specification*).
2. The supplying and fitting of mounting facilities for the system components.
3. The supplying of power supplies terminated by a switch-fuse box. The Installation Engineer will specify the voltage level and current rating of the supplies.
4. The supplying and installation of cable trays, battens and/or conduits for the interconnecting cables of the system.
5. When a mast is to be mounted on a wooden deck, earth leads or strips must be supplied for connection to the mast.

1.2 Installation Procedure

Installation includes the following operations:

1. The Contractor will install the mast. If required, the Contractor will supply and install adjustable stays for the mast, and take suitable precautions to minimise vibration.
2. Unpacking and external inspection of the system components.
3. Installation of the Scanner Unit.
4. If required, installation of waveguide brackets and/or deck glands.
5. Installation of the other system components. If a bulkhead transceiver is to be installed a mounting pad must be supplied.
6. Planning and laying of cables.
7. Installation of Console Assembly.

2 Cable Details

Refer to the Cabling Schedules section below for details of cables and related terminations. Inter-unit cabling diagrams are given in Section 7.1. For details of the X-band RF waveguide, RF termination and installation see Section 6. Details of the S-band coaxial RF Feeder are given in Section 6.5.3.

2.1 Supply Cables

The following points should be considered when you decide which size of cable to use to connect the ship's supply to the radar:

- a. The voltage drop from the supply to the radar must not exceed 2% of the supply voltage.
- b. The current required by the radar must not exceed the current rating of the cable

If the radar system is to be supplied by a three-phase supply, the radar system must be connected between two of the three phase lines. If it is a high-voltage supply, an isolating transformer must be supplied to reduce the voltage to 220/240V at the system input.

Note: *S-band Turning Unit motors are fed directly from the AC supply via the appropriate Scanner Control Unit (SCU); see Section 6.6 for details of the SCU.*

2.2 Power Consumption

The power consumption of the radar is given in Chapter 1 '*Technical Specification*'.

2.3 Switch Fuses

The radar is connected to the power supply of the ship by two Switch Fuses. The Switch Fuses are not supplied with the radar, and are therefore of local manufacture. The fuse ratings of the Switch Fuses are given in Section 7.5 '*System Fuses*' page 154.

2.4 Control Cables

The control cables detailed on the Inter-unit Cabling diagrams may be used up to a maximum length of 180m, unless otherwise stated. Special cable kits are available for cable lengths up to 300m.

The DATA cable (Service Code MA00007419) conforms to UL Type CL2, AWM 2919 and CSA PCC FT4.

The other multicore cables conform to IEC 92/3 and DEF STAN 61-12 Part 5.

The LSZH (low smoke zero halogen) cables follow the construction of DEF STAN 61-12 Part 5 but have polyethylene insulation over the cores instead of PVC.

The cables are multicore stranded or bunched, and have tinned copper wire conductors.

Each conductor is insulated with PVC to form cores. The cores are screened with braided tinned copper wire, and the complete cable is sheathed with PVC. The temperature range of the cables is -25°C to +70°C.

Table 1: Standard Cable details

Ref.	Service Code	Cable Diameter mm	Number of Cores	Core Strands/ Diameter mm	Resistance per 1000m (at 20°C) W	Current Rating A	Voltage (RMS) V	Min Bend Radius mm
16-2-2C	3218376	6.9	2	16/0.2	40.1	2.5	440	50
16-2-4C	3209342	7.7	4	16/0.2	40.1	2.5	440	60
16-2-6C	3211274	8.7	6	16/0.2	40.1	2.5	440	65
16-2-12C	3211266	11.0	12	16/0.2	40.1	2.5	440	85
37-3-2R	3228207	10.3	2	37/0.32	6.79	13	440	80
37-3-4R	3214044	11.8	4	37/0.32	6.79	13	440	90
—	MA00007419	8.4	4 pairs	7/0.2	—	—	30	80
PT1YM	3236862	6	1	1X0.6	95	—	—	36
FSJ1-75	MA00012534	7.4	1		49.2	—	—	25
FSJ4-75A	MA00012880	13.2	1	1X3	4.9	—	—	32

Note: PT1YM characteristic impedance is 75Ω, and is double screened; each screen provides 95% coverage.

Table 2: Low Smoke Zero Halogen (LSZH) Alternatives to Standard Cables

Reference	Service Code	Cable Diameter mm	Number of Cores	Core Strands/ Diameter mm	Resistance per 1000m W	Current Rating A	Voltage (RMS) V	Min Bend Radius mm
16-2-2C	MA00014100	6.9	2	16/0.2	40.1	2.5	440	50
16-2-4C	MA00014167	7.7	4	16/0.2	40.1	2.5	440	60
16-2-6C	MA00014175	8.7	6	16/0.2	40.1	2.5	440	65
16-2-12C	MA00014183	11.0	12	16/0.2	40.1	2.5	440	85
37-3-2R	MA00014191	10.3	2	37/0.32	6.79	13	440	80
37-3-4R	MA00014209	11.8	4	37/0.32	6.79	13	440	90
—	MA00014126	8.4	4 pairs	7/0.2	—	—	30	80
PT1YM	91005248	6	1	1X0.6	95	—	—	36
FSJ1RN-75A	MA00014142	7.4	1	—	49.2	—	—	25
FSJ4RN-75A	MA00016089	13.2	1	1X3	4.9	—	—	32

















Note: 91005248 characteristic impedance is 75Ω, and is double screened; each screen provides 95% coverage.

2.5 Cable Core Colour Coding

2.5.1 Multicore Cables

R		Red	BN		Brown
B		Blue	V		Violet
G		Green	O		Orange
Y		Yellow	P		Pink
W		White	L/G		Light Green
BK		Black	GY		Grey

2.5.2 Data Cables

Data Cable (four twisted pairs)			Data Cable (four twisted pairs) Low Smoke Zero Halogen alternative		
B/W	 Blue/ White	Twisted Pair	B	 Blue	Twisted Pair
W/B	 White/ Blue		BK	 Black	
G/W	 Green/ White	Twisted Pair	G	 Green	Twisted Pair
W/G	 White/ Green		BK	 Black	
BN/W	 Brown/ White	Twisted Pair	W	 White	Twisted Pair
W/BN	 White/ Brown		BK	 Black	
O/W	 Orange/ White	Twisted Pair	R	 Red	Twisted Pair
W/O	 White/ Orange		BK	 Black	

2.6 Coaxial Cables

2.6.1 Signal Coaxial Cables

The coaxial signal cables detailed on the Inter-unit Cabling diagrams can be used up to a maximum length of 300m depending on the type of cable chosen. These cables are double screened, and have a nominal impedance of 75Ω. Braiding is made from tinned copper to reduce corrosion problems

Table 3: Signal Coaxial Cable Details

Service Code	Cable Diameter mm	Nominal Impedance Ω	Attenuation at 10MHz dB/100m	Comments
3236862 91005248	6.0	75	3.9	Double screened, Mylar insulation between screen (PT1YM), use with cable runs <67m
MA00012534 MA00014142	7.4	75	1.87	Low-loss, copper-clad steel inner, solid copper screen, use with cable runs <180m
MA00012880 MA00016089	13.2	75	0.96	Ultra-low-loss, solid-copper inner and screen, use with cable runs <300m.

2.6.2 S-band Coaxial Cable

This is a 7/8" foam dielectric RF feeder cable. The cable has a minimum bend radius of 250mm (10"), and may be used up to a maximum recommended length of 30m. Longer lengths may be used at the owner's discretion, but performance will be significantly degraded for lengths over 30m.

Table 4: S-band Coaxial Cable Details

Service Code	Cable Diameter mm	Nominal Impedance Ω	Attenuation at 3GHz dB/100m	Comments
9648577	28	50	8.31	Andrew Type LDF-50A


2.7 X-band Elliptical Waveguide

This is a 33.5 x 22.9mm corrugated elliptical waveguide. The waveguide has a minimum bend radius of 200mm in the 'H' plane and 480mm in the 'E' plane. It can be used to a maximum recommended length of 30m. Longer lengths may be used at the owner's discretion, but performance will be significantly degraded for lengths over 30m.

Table 5: Waveguide Details

Service Code	Waveguide Size mm	Attenuation at 9.4GHz dB/100m	Comments
9037748	33.5 x 22.9	9.96	Andrew Type EW85

3 Safety Earthing

All company equipment with internal voltages greater than 50V AC (rms) and contained in a protective metal chassis must have the chassis connected directly to earth. This is to stop the chassis becoming live under fault conditions. The earth link is made by connecting a low resistance conductor between the equipment's 6mm stainless steel safety earth stud (marked with ) and the main ship's earth.

Particular care must be taken when protecting the connections from environmental and electro-chemical corrosion. Before assembly, you must make sure the contact areas are oxide-free and that they are coated with a thin layer of conducting paste to seal the joints. The most suitable materials for making connections between the equipment's earthing bolt and the ship's earth are aluminium or tinned copper straps that give a large contact area.

If an aluminium strap is connected to a ship's stainless steel earth a zinc-plated washer must be used between the strap and the ship's earth.

If a tinned copper strap is connected to a ship's aluminium earth an aluminium washer (rather than steel) must be used between the strap and the ship's earth.



CAUTION

The connecting of the bonding straps must be made from each piece of equipment to the ship's earth. You must not loop from unit to unit. To ensure this is a non-current-carrying connection no other connection must be made to the earth bolt.

The safety earth must never be removed during normal use or servicing. It is only safe to remove it once the equipment has been isolated from all external power sources.

4 Electromagnetic Continuity Screening

The purpose of EMC screening is to:

- restrict the emission of electro-magnetic energy from the equipment; and
- reduce its susceptibility to external electro-magnetic influence.

Individual items of equipment are EMC screened by their protective chassis. However, the screening should be extended to cover both input and output connections and cabling. This will maintain overall electro-magnetic efficiency.

Care must be taken when bonding the braids of interconnecting cables where indicated in the appropriate cable schedules.

5 Siting

5.1 General considerations

The performance of the system depends on the correct siting of the system Scanner Unit (Turning Unit and Antenna). When siting the Scanner Unit you should consider the following:

1. Compass safe distance.
2. Satisfactory short-range and long-range performance of the radar.
3. Protection of the equipment (cables and waveguide if applicable) from damage.
4. Ease of access for safe servicing.
5. Minimum practical length of waveguide or S-band coaxial cable, if applicable.
6. Freedom from blind arcs and false echoes, particularly on the starboard side of the vessel as own ship usually has to give way to vessels approaching from this direction. Port side visibility is also extremely important for monitoring approaching vessels, as these normally pass own ship on the port side. This is particularly important for vessels that navigate in narrow channels or canals.

Ship features which commonly obstruct the radar beam are funnels, masts, Samson posts and crosstrees. A funnel usually throws a shadow aft, which may or may not be considered serious. However, it is a probable source of false echoes aft. Shadows thrown by Samson posts and masts will vary in extent with their size and proximity to the scanner.

If there are obstacles around the selected site, it may be necessary to position the scanner towards the starboard side of the vessel (Figure 3.1 identifies this as position B). In this example, position B gives the antenna an unobstructed area for direction of traffic on own ship's starboard side. In practice, in the direction of the ship's bow, a mast or crane can often reflect or suppress signals transmitted from the antenna.

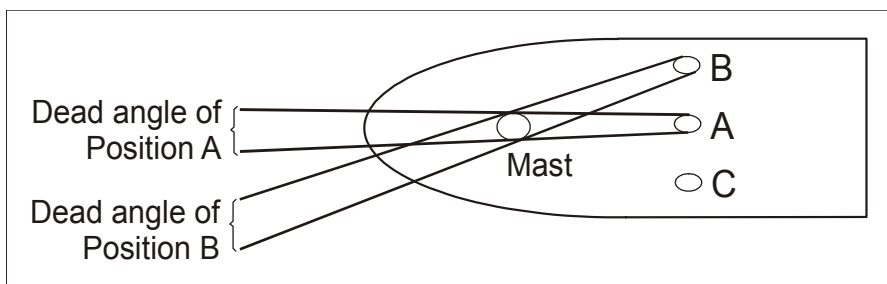


Figure 3.1 Scanner Siting

This type of obstruction can cause the system to show large false returns on the Display and/or fail to detect target returns within a certain dead angle. On AIS systems this may also cause the radar to lose automatically-tracked targets that move into the dead area. If the obstacle forms a significant obstruction, the scanner height may have to be changed to make sure the angle of depression is a minimum of 5 degrees (see Figure 3.2)

The scanner must be installed only as high as is necessary to clear major objects. It must also be remembered that when the scanner height is minimised the short-range performance is improved along with the effects of sea clutter. Therefore, position the scanner high enough to secure 5 degrees or greater angle of depression. The angle is measured between the horizontal line drawn from the antenna and the top of the mast or obstacle.

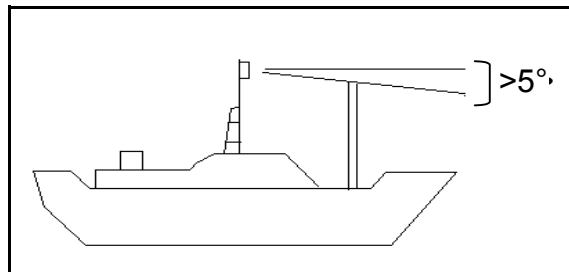


Figure 3.2 Minimum angle of Depression

7. To avoid interference from an adjacent radar antenna the vertical separation between antennas should be as large as practicable. As a minimum, the glare angle between antennas should be less than 45° (see Figure 3.3).

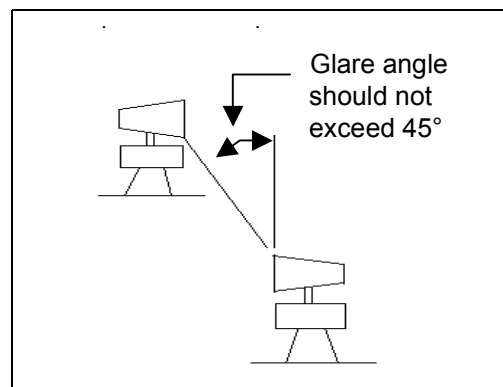


Figure 3.3 Dual Scanner Positioning (glare angle)

8. Local wind effect due to ship's structure.
9. Local vibration environment.

5.2 Bulkhead Specific Considerations

The site and method of mounting the below-decks equipment should be chosen to comply, as far as possible, with the wishes of the owner or master of the vessel. The following points should also be considered:

1. Compass safe distance.
2. Ease of access for servicing.
3. Positioning to avoid the ingress of moisture.
4. Positioning away from doors or ports that are used frequently.
5. Positioning to minimise accidental damage.
6. Environmental considerations such as adequate ventilation, dust, dirt and clean air.
7. Position the Workstation assembly away from strong magnetic fields.
8. Position the Display Screen away from direct sunlight.
9. Local vibration environment.

6 Securing of System Components

6.1 Mains Isolator (Optional Fit)

It is good practice to include Mains Isolator Switches Type 65800700 in the system wiring of AC powered systems. Their function is to let the Scanner Unit (with the exception of the Motor Supply in S-band systems), the PCIO unit, the Processor Unit, and Display be isolated from the ship's mains supply.

The Scanner Unit Motor supply in S-band systems is isolated separately by the Scanner Control Unit. For safety reasons, the Mains Isolator must be mounted next to the SCU so that the S-band system can be isolated from a single location.

If needed, the Mains Isolator can be locked in the **OFF** position using a suitable padlock.

In multiple radar systems more than one isolating switch may be needed.

Note: Refer to Section 7 'System Component Interconnections' for connection details.

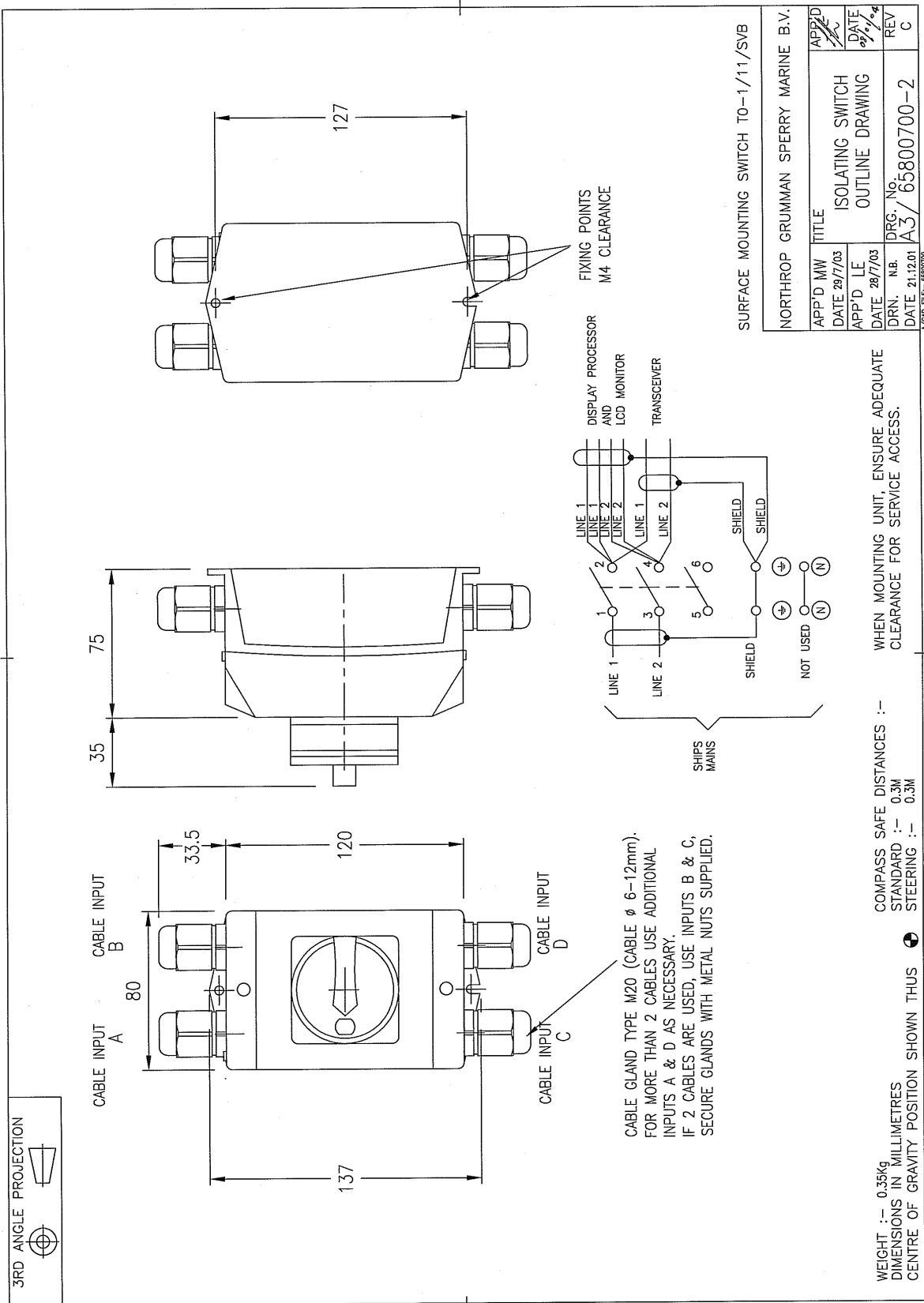


Figure 3.4 Isolation Switch Installation

6.2 X-band Scanner Assembly

The X-band Scanner assembly is made up of the following sub-assemblies. Each of these is supplied in its own packing, with relevant installation drawings:

Turning Unit With/without Masthead Transceiver (10 or 25kW)
Despatch Kit 65801660
(Installation Drawing 65801050)

Note: A Bulkhead system would also be supplied with the following:

Bulkhead Transceiver (10 or 25kW)
Despatch Kit 65825660
(Installation Drawing 65825050 OR 65825055)

Turning Units or Turning Units with integral Transceivers fitted with the 'additional features' option are supplied with a supplementary despatch kit 65825661 in addition to the above.


Antenna 4ft, 6ft or 8ft
Despatch Kit is supplied in Antenna carton.
(Installation Drawing 65601275)

To install the X-band Scanner assembly carry out the following operations, preferably in the sequence outlined below:

1. Prepare the site (refer to Section 5 'Siting').
2. Bolt the Turning Unit to the mounting platform (ship's structure) as shown in Installation Drawing 65801050 supplied with the Turning Unit, and in Figure 3.5.
3. Bolt the Antenna to the Support Casting as shown in Installation Drawing 65601275 supplied with the Antenna, and in Figure 3.12.
4. Lay in and install the cables for the Turning Unit following the Cabling Schedules in Section 6.2.6 'Cabling Information'.
5. Make sure the Turning Unit, the Motor Drive Board and the Pulse Bearing Board are correctly set for the required high or low-speed option, set using their relevant jumper links, see Section 6.2.5 'Turning Unit Link Settings'.

Figures 3.6 to 3.11 shows X-band Scanner outline drawings that are intended to duplicate those provided with the equipment. However, as changes may occur to the details that may not be reflected in this manual, the installation drawings supplied with the equipment take precedence in the event of differences arising.

6.2.1 Turning Unit

	WARNING
<p>The Turning Unit must be lifted using the four fixing holes at the base of the unit. The weight and spread of the Antenna can cause a freestanding Turning Unit to topple over. The Turning Unit must therefore be bolted onto its mounting platform before attaching the Antenna to the Turning Unit. When working on the X-band Turning Unit with the top casting raised, always make sure the locking bolt or latch on the stay is in the locked position.</p>	

The Turning Unit is bolted to the mounting platform with four Neoprene isolating pads (65601251) between the Turning Unit casting and the mounting platform, to prevent galvanic corrosion.

Additional washers or pads may be added to level the mounting so that the Turning Unit casting does not twist when the bolts are tightened. M10 washers can be used as shims, or purpose made parts, produced locally, may be used.

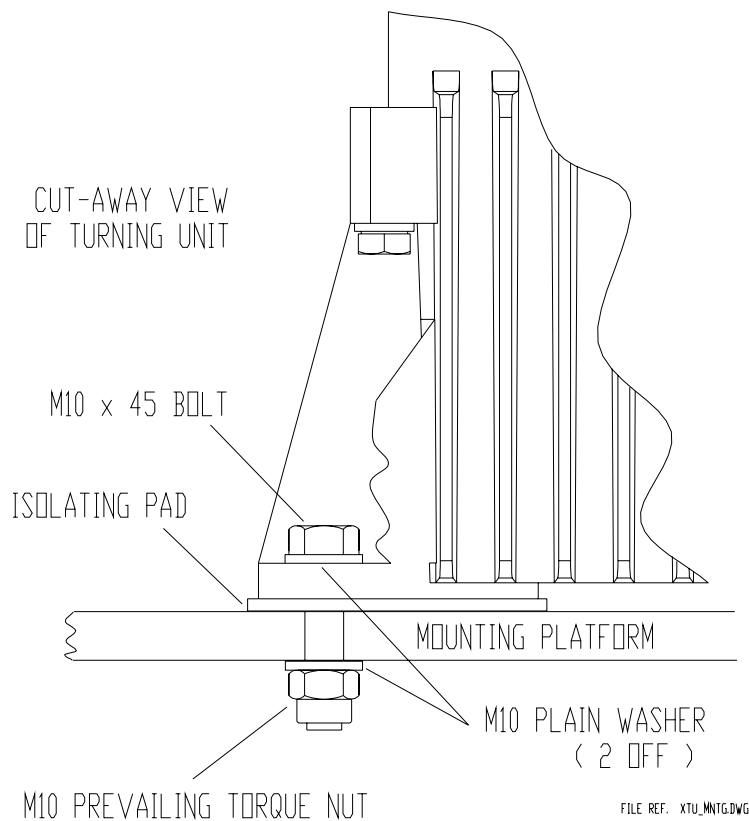


Figure 3.5 Fixing the Turning Unit to the Mounting Platform

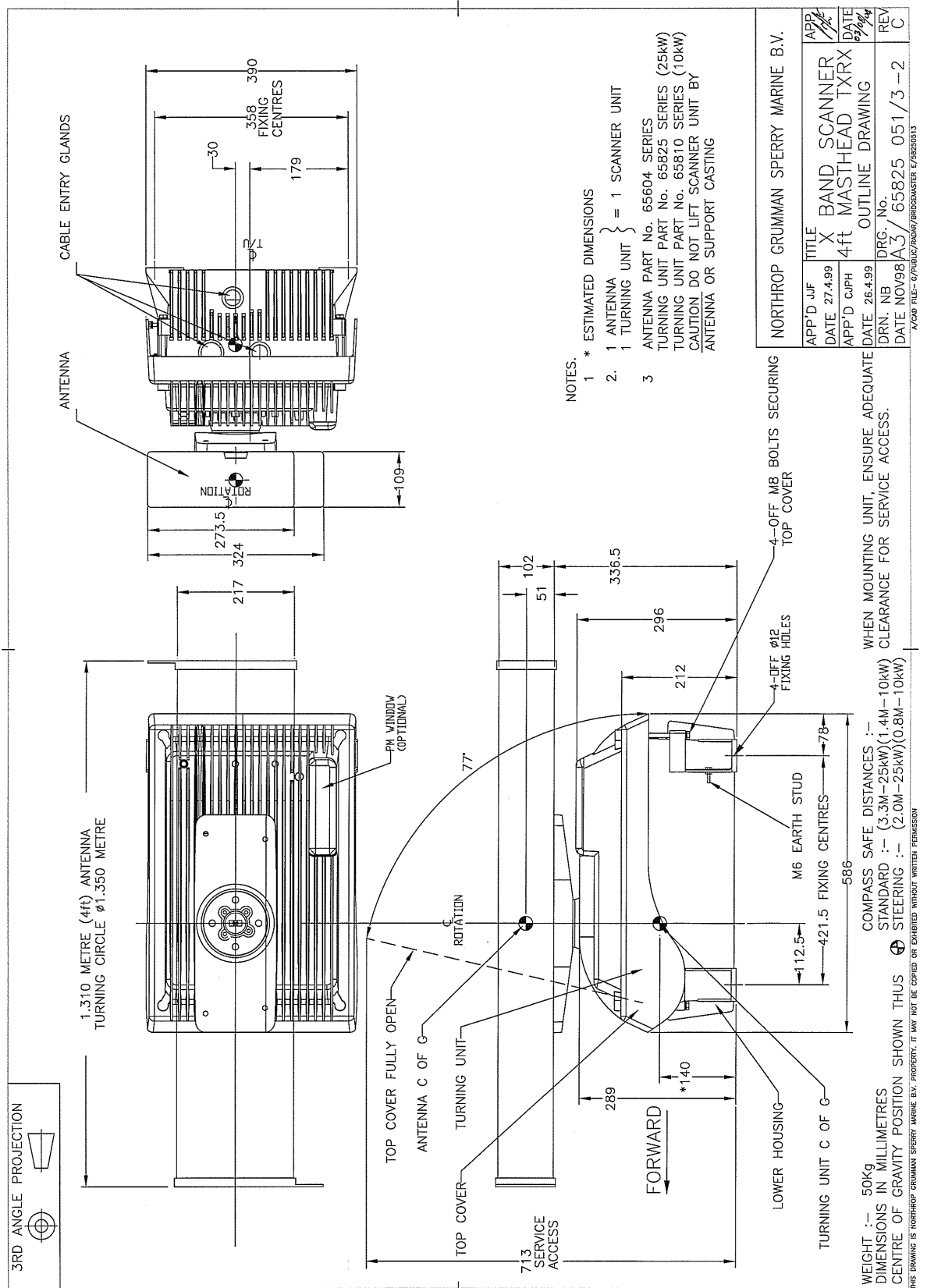


Figure 3.6 X-band Scanner 4ft Masthead Tx/Rx Installation

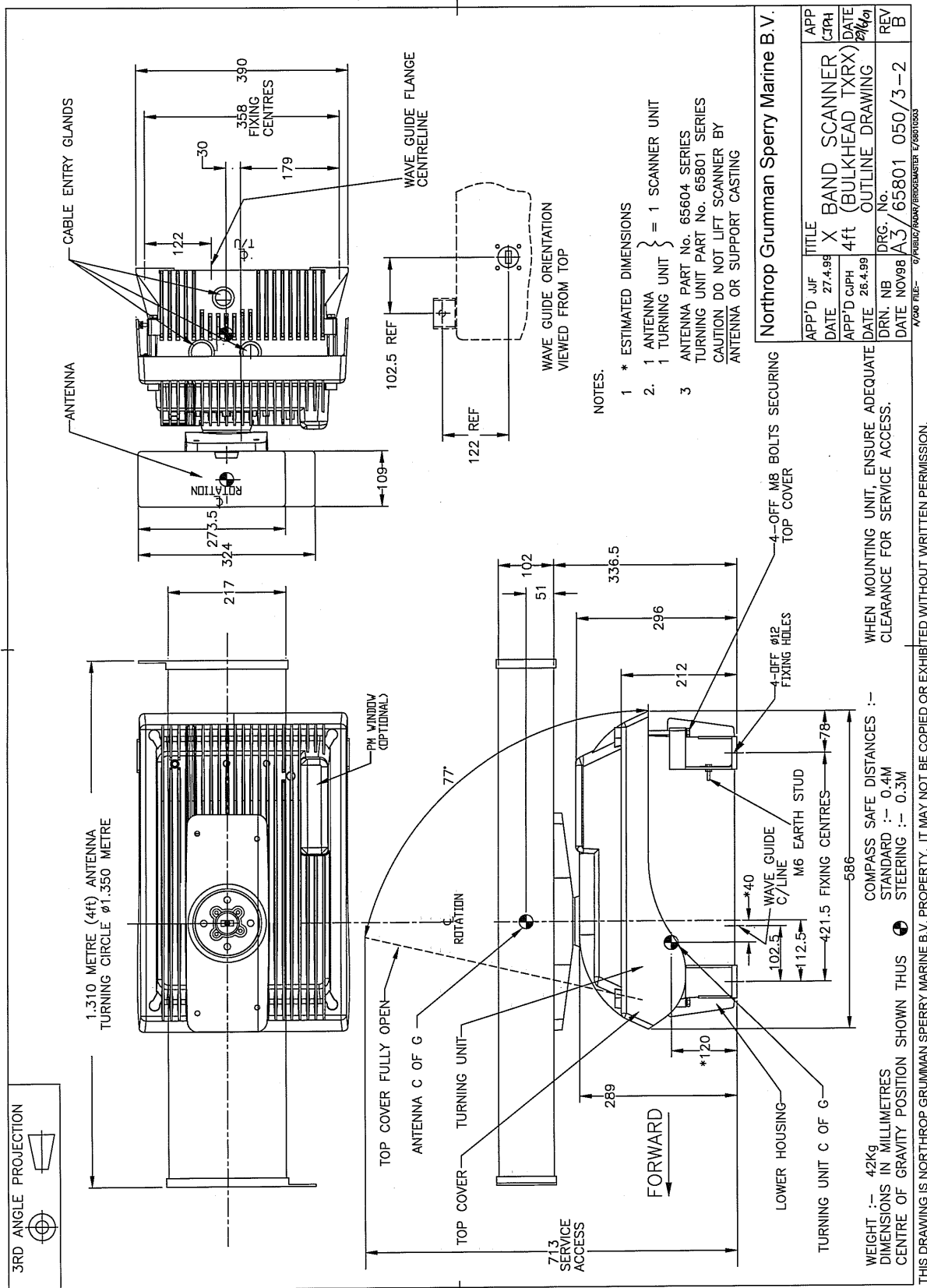


Figure 3.7 X-band Scanner 4ft Bulkhead Tx/Rx Installation

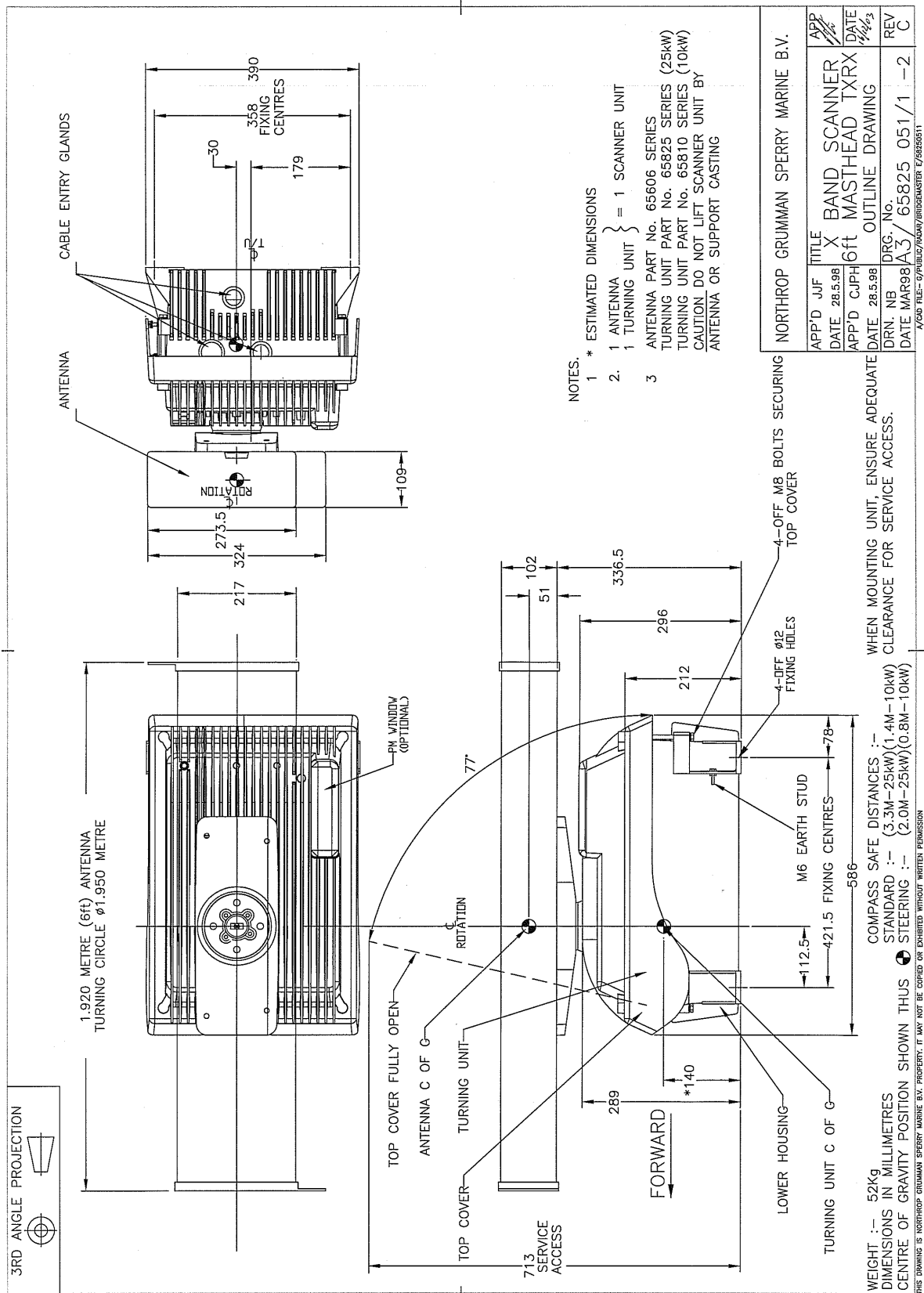


Figure 3.8 X-band Scanner 6ft Masthead Tx/Rx Installation

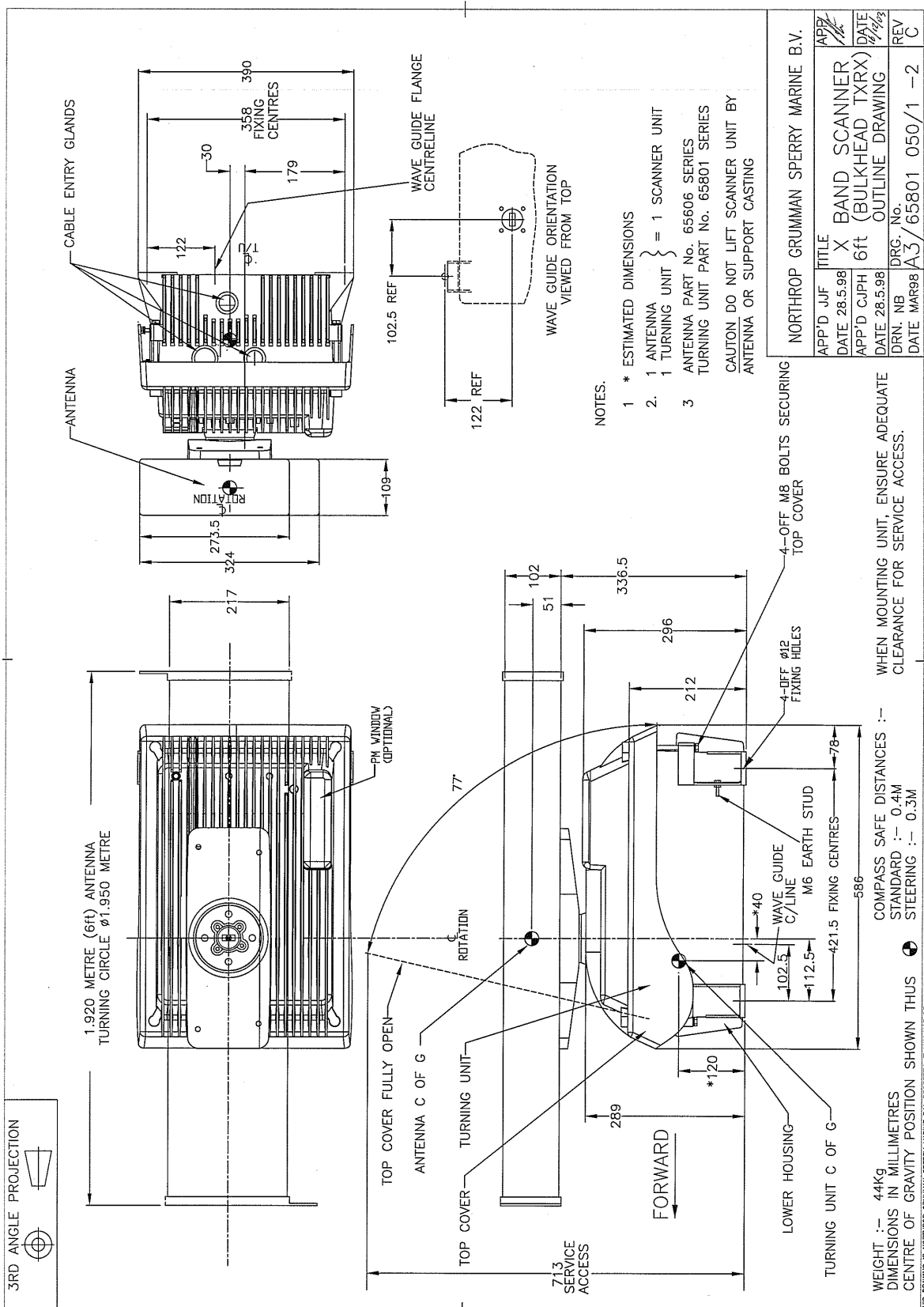


Figure 3.9 X-band Scanner 6ft Bulkhead Tx/Rx Installation

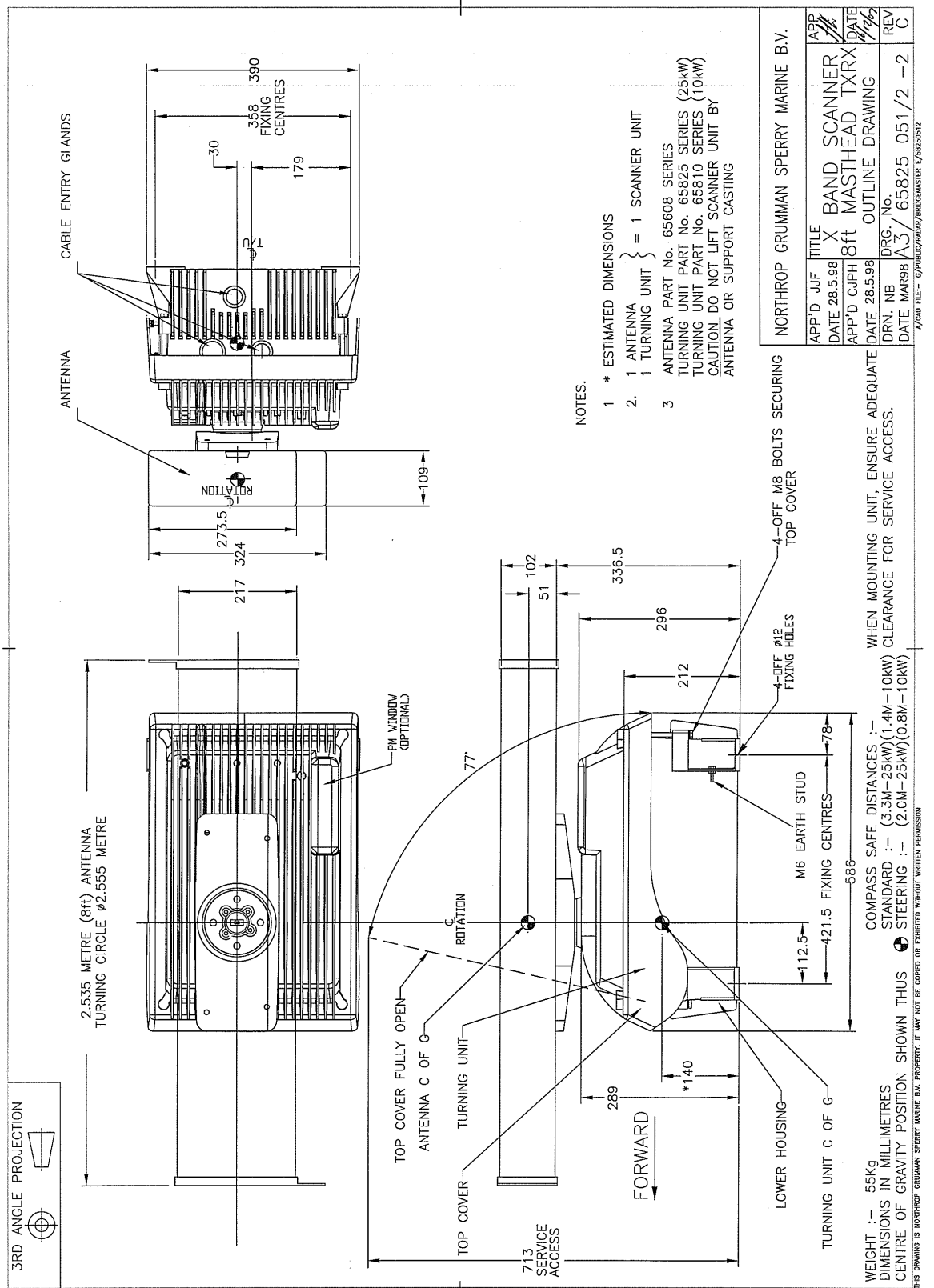


Figure 3.10 X-band Scanner 8ft Masthead Tx/Rx Installation

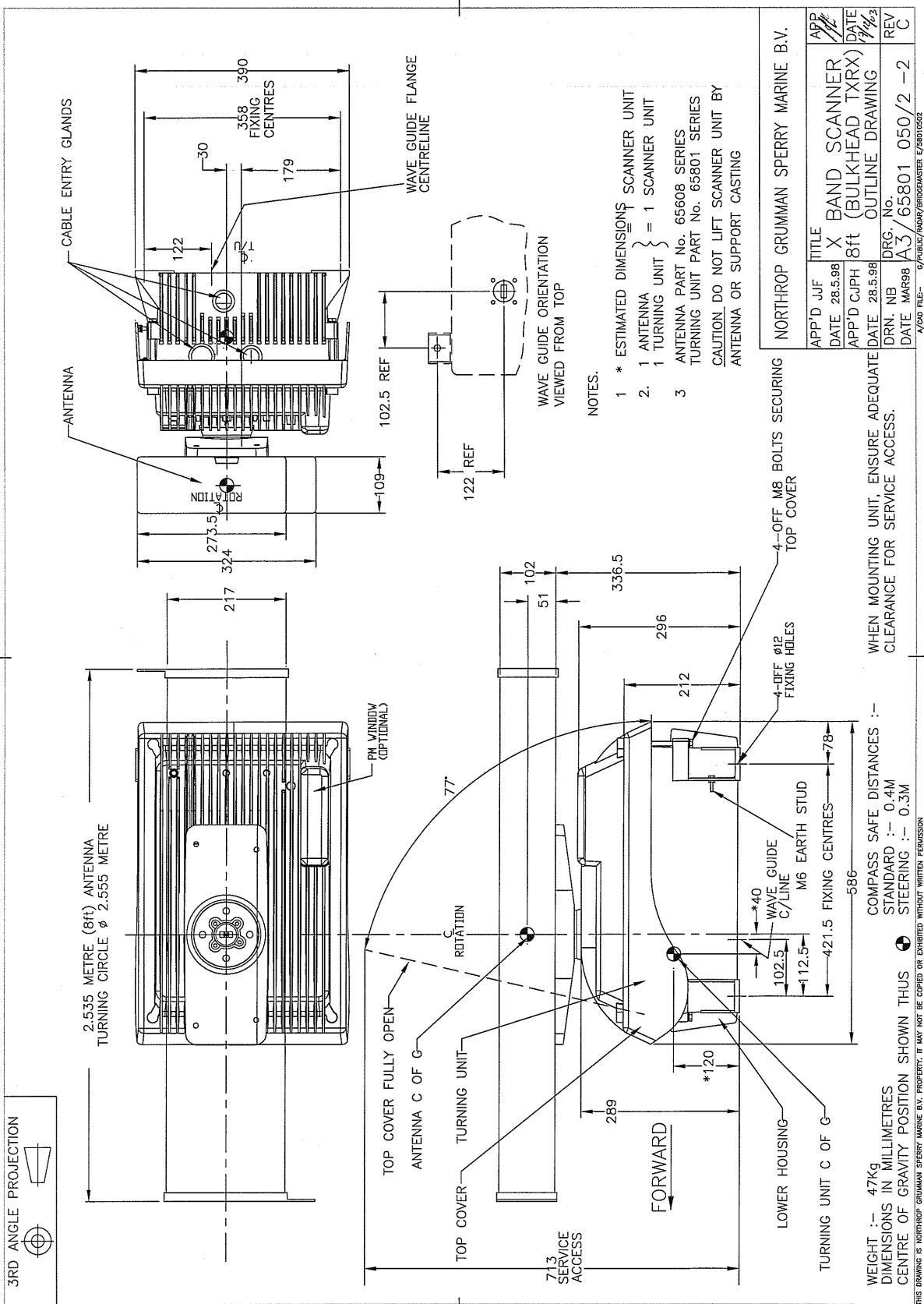


Figure 3.11 X-band Scanner 8ft Bulkhead Tx/Rx Installation

6.2.2 Support Casting

The Support Casting is factory fitted to the Turning Unit and needs no further assembly during installation.

6.2.3 Performance Monitor

The Performance Monitor consists of the Performance Monitor module and a control cable. The equipment is normally factory fitted.

6.2.4 Antenna

The Antenna is fitted to the Support Casting using the parts listed below (supplied with the antenna).

4 x M8 Stainless Steel Plain Nut (grade 316S16)	4411544
2 x Washer with locking tab	65602122

The holes in the support casting are asymmetrically placed to prevent the antenna being fitted backwards. The support casting has the word 'FRONT' visible from above to help with initial antenna location.

Figure 3.12 shows how these are fitted.

Make sure the four Antenna fixing bolts are well coated with Denso Paste before securing to the turning unit.

Note: The lock tab ends must be bent as shown in Figure 3.12 to prevent rotation of the nuts.

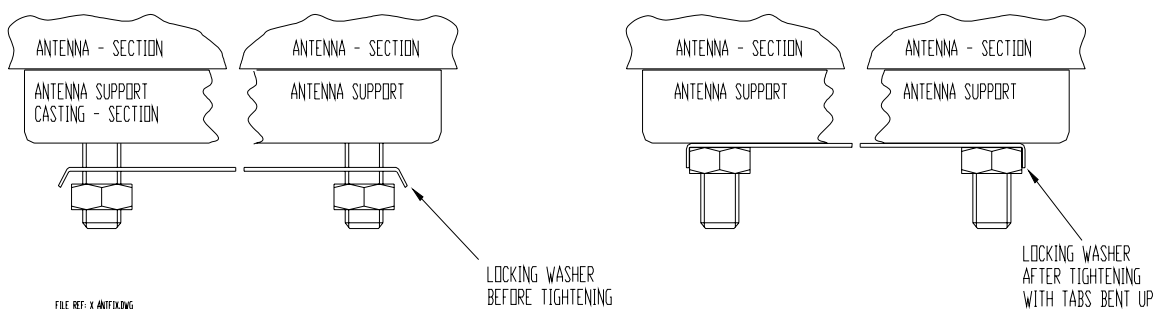


Figure 3.12 Fixing the Antenna to the Support Casting

After assembling and securing the Antenna to the turning unit apply a bead of sealant around the joint between the Antenna and support casting. Smooth the sealant finish with a damp cloth.

6.2.5 Turning Unit Link Settings

To access the PCBs housed in the Turning Unit loosen the four bolts securing the top casting to the bottom casting. Lever the top casting up and secure in position with the stay locking bracket, see Figure 3.35, page 53.

Standard Turning Units include the following types:

65801Bxx

65810Mxx, 65810Pxx, 65810Sxx, 65810Wxx

65825Lxx, 65825Mxx, 65825Pxx, 65825Wxx

For link settings on 'additional features' turning units, see Section 3 'Installation and Interconnections' in Chapter 11 'Additional Features'

'Additional features' turning units include the following types:

65801Cxx

65810Nxx, 65810Txx

65825Nxx, 65825Txx

For the standard turning units, two scanner speed settings are available: 'LOW' and 'HIGH', depending on the following settings of the Motor Drive Board and the Pulse Bearing PCB Assembly.

For the 'additional features' turning units fitted with Motor Drive Board 65801827 and Pulse Bearing Board 65801826, there is a third option that lets you remotely select between the two scanner speed settings.

6.2.5.1 Motor Drive PCB Assembly (65801811)

For Motor Drive PCB Assembly 65801827 (fitted to 'additional features' turning units) see Section 3.3.5 in Chapter 11 'Additional Features'.

Setting link LK1 on the Motor Drive Board 65801811

This link is set during installation and commissioning, and requires no tools to change it.

The factory default setting is 'NORMAL' speed. If no jumper is fitted, the rotational speed defaults to high-speed.



CAUTION

Under no circumstances should the link position be moved whilst the motor is running.

With the jumper in the position marked 'LO' (pins 1 and 2 – left hand pair), the nominal scanner speed is 28 rpm, see Figure 3.13.

With the jumper in the position marked 'HI' (pins 2 and 3 – right hand pair), the nominal scanner speed is 45 rpm.

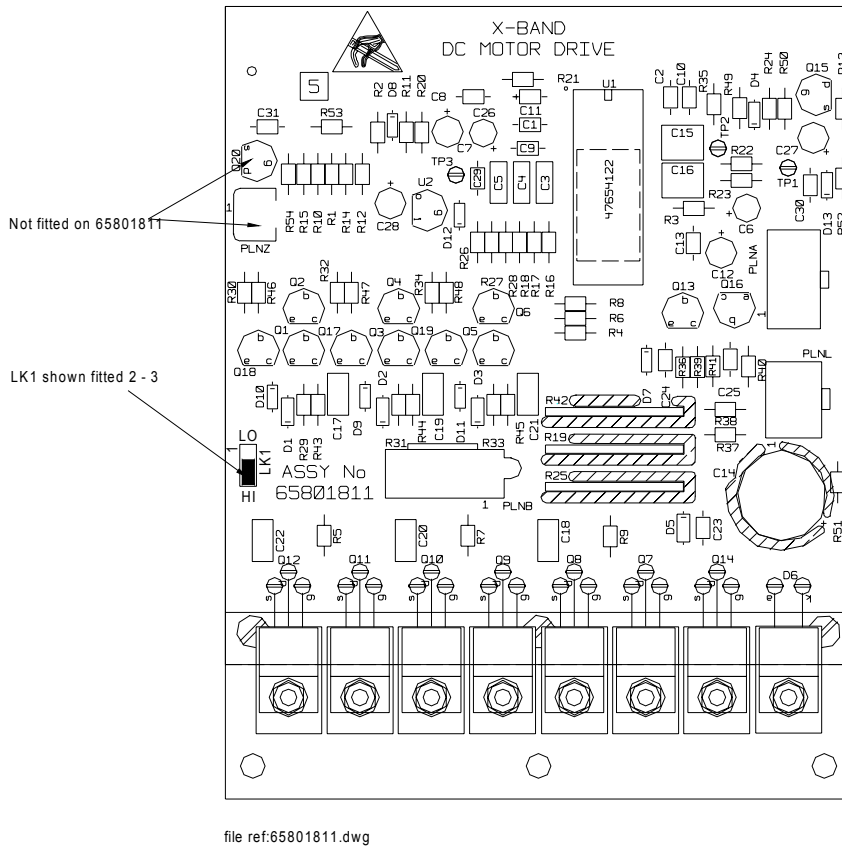



Figure 3.13 Motor Drive Board 65801811 – Showing Link Position

6.2.5.2 Pulse Bearing PCB Assembly (65801805)

For Pulse Bearing PCB Assembly 65801826 (fitted to 'additional features' Turning Units) see Section 3.3.4 in Chapter 11 'Additional Features'.

Setting link LK1 on the Pulse Bearing PCB Assembly 65801805

This link does not change the rotational speed of the scanner, but does alter the ability of the phase-locked loop within the board to track the scanner rotational speed. The factory default setting is optimised for 'LOW' speed. If no jumper is fitted, the Pulse Bearing PCB Assembly is optimised for high-speed.

	CAUTION
	Under no circumstances should the link position be moved whilst the motor is running.

1. Set the jumper in the position marked '1' (pins 1 and 2 – the lower pair) when the nominal scanner speed is 28 RPM ('LOW'), see Figure 3.14.

- Set the jumper in the upper pair position (pins 2 and 3) when the nominal scanner speed is 45 RPM ('HIGH').

The link is set during installation and commissioning. The link can be moved with the PCB in place using long nose pliers. This is not easy because the PCB mounting bracket obscures the position of the link.

The recommended method is:

- Loosen the two Pozidriv screws that hold the mounting bracket in place.
- Slide the whole assembly to the right using the slotted screw holes in the mounting bracket.
- Move the assembly forward into a more accessible position for the link to be moved.

During removal and refitting of the mounting bracket, take care not to damage the teeth on the pulse disc assembly that run between opto-couplers mounted on the rear of the Pulse Bearing PCB. Before re-tightening the two Pozidriv screws, check that both pairs of plain and single coil washers are above the top surface of the mounting bracket and not trapped beneath it.

For an easier installation, it is recommended that you complete this operation, if it is required, before mounting the Turning Unit aloft.

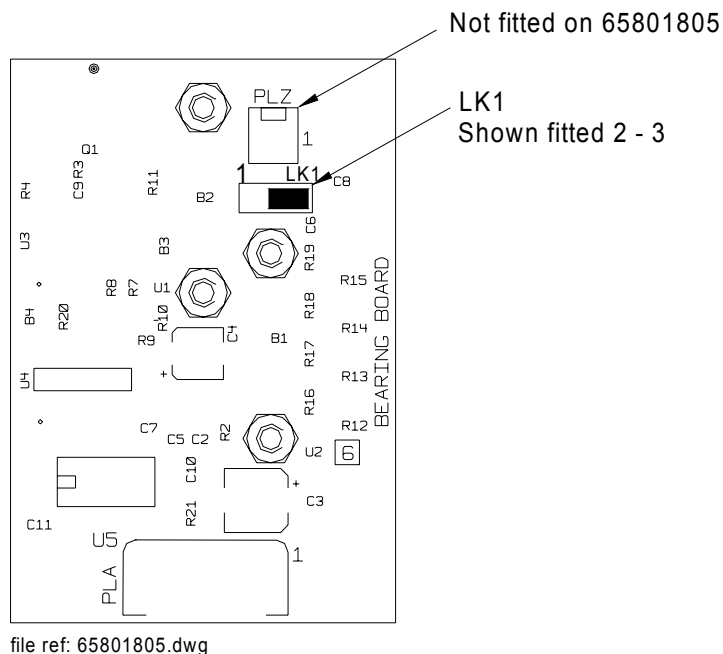


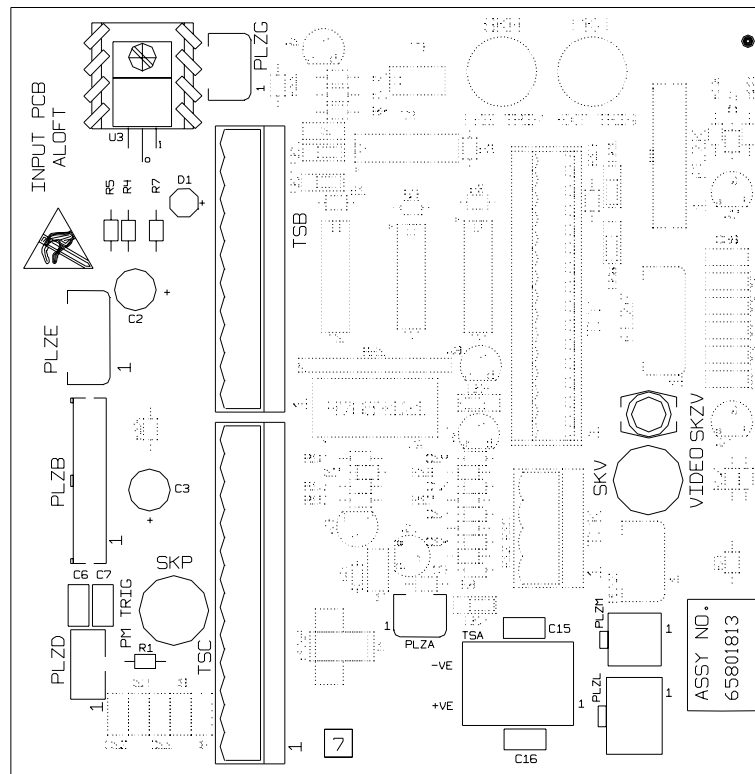
Figure 3.14 Pulse Bearing Board 65801805 - Showing Link Position

6.2.5.3 Turning Unit Input PCB Assembly 65801813 (fitted to standard Turning Units)

For Input PCB Assembly 65801819 (fitted to 'additional features' Turning Units), see Section 3.3.2 in Chapter 11 'Additional Features'.

The diagram below shows details of the Turning Unit Input Board 65801813. To access the board:

1. Release the four retaining bolts (see Figures 3.6 to 3.11).
2. Lift up the upper casting cover on its hinges.
3. Remove the screening cover.



file ref:65801813.dwg

Figure 3.15 Turning Unit – Input Board Details

Note: The video cable does not plug into the Input Board, but goes directly to the Receiver. Refer to Section 6.2.7 'Fitting the Cable Glands' for further details.

6.2.5.4 Turning Unit Mains Input Connector (Aloft Transceiver)

Figure 3.16 shows details of the Mains Input Connector TSE (Integral Transceiver only). These are accessed by removing the support plate that is held by four fixing screws (see below).

Note: *The screws only need to be partially undone to let the plate slide out.*

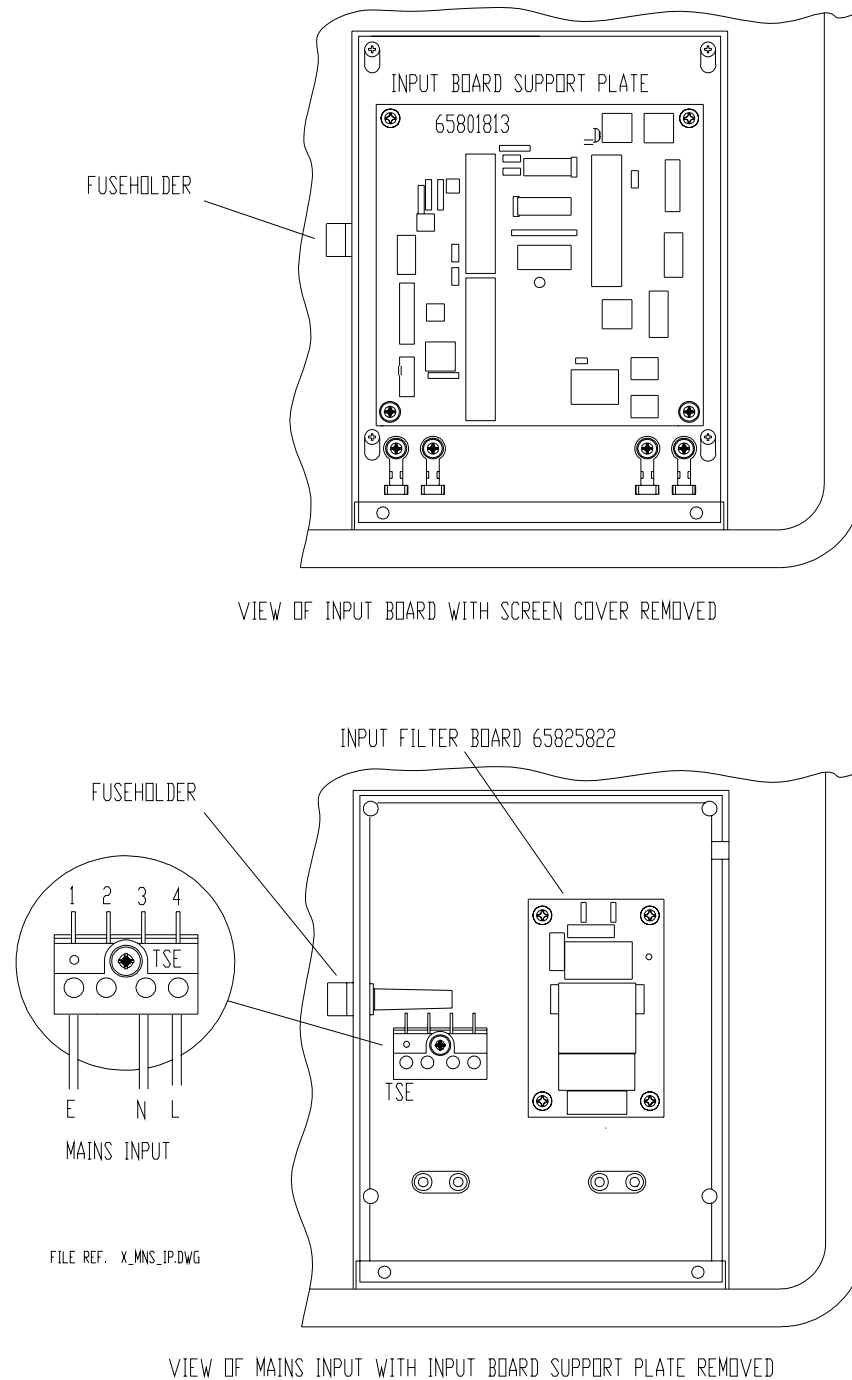


Figure 3.16 Turning Unit – Mains Input Details

6.2.6 Cabling Information

Before fitting the cables in the Turning Unit loosen the four bolts securing the top casting to the bottom casting. Lever the top casting up and secure in position with the stay locking bracket, see Figure 3.35.

Table 6 shows the route each cable uses to enter the turning unit (with or without an integral transceiver). Figure 3.17 shows the cable entry points; three of these are via cable glands labelled 1, 2 and 3.

Note: For cable entry details for turning units with 'additional features', see Section 3.2 'Interconnections' in Chapter 11 'Additional Features'.

The RF feeder (waveguide) input is only needed when the transceiver is mounted below decks (bulkhead). The bulkhead lower casting is different from the masthead variant because the X-band waveguide flange is mounted on the underside face. See Figure 3.7, Figure 3.9 or Figure 3.11 for details.

A 6mm bolt is fitted so that the unit can be connected to the ship's structure. This **must not** be used for any other connection.

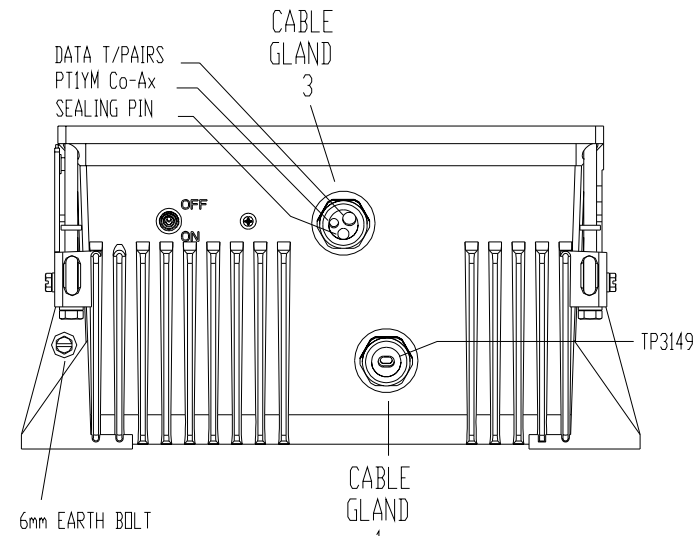
For details of how to terminate the cables into their connector blocks, see the Interconnection Diagrams and Cabling Schedules in Section 7 'System Component Interconnections'.

Each cable gland has a waterproof seal and a separate EMC seal. These must be installed as shown in Figure 3.19.

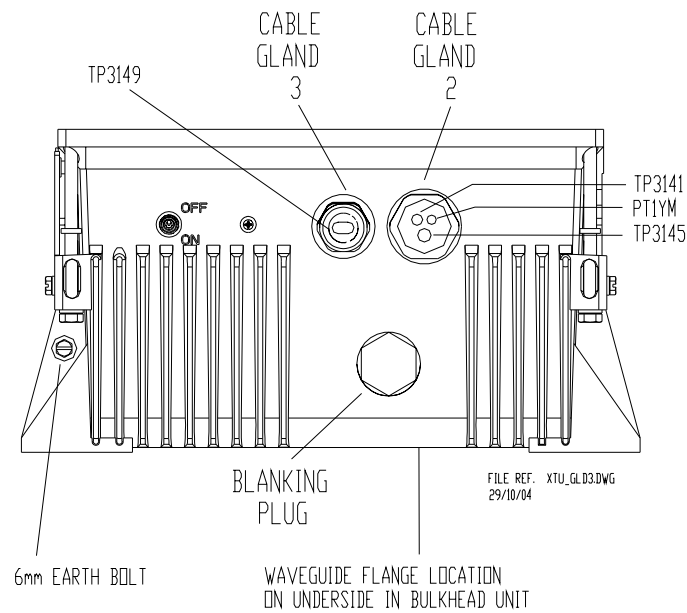
Details for terminating the RF feeder (waveguide) are given in Section 2.7 'X-band Elliptical Waveguide'.

Table 6: X-band Cable Gland Details

Cable Gland	Turning Unit without Integral Transceiver		Turning Unit with Integral Transceiver	
	Description	Cable Type	Description	Cable Type
Cable Gland 1	Blanking Plug	—	Mains Input AC	37-3-2R
Cable Gland 2	PM/Bearing	16-2-12C	Blanking Plug	—
Cable Gland 2	PM Trigger	75Ω co-ax	—	—
Cable Gland 2	TU Enable	16-2-2C		
Cable Gland 3	Motor 50V	37-3-2R	Radar Video	75Ω co-ax
Cable Gland 3	—	—	Data	T/Pairs
RF Connector	RF Feed	X-band Waveguide	—	—



Turning Unit for Use with Aloft Transceiver



Turning Unit for Use with Bulkhead Transceiver

Figure 3.17 Turning Unit - Cable Entry Positions

6.2.7 Fitting the Cable Glands

The installation cables are connected into the turning unit via the correct cable glands (see Table 6). The body of the gland fits through a hole in the casting and is held in position by the Top Nut. An 'O' ring seal is fitted below the casting surface (input side).

A waterproof seal and an EMC gasket are provided with each gland as shown in Figure 3.18 and Figure 3.19. Some glands are designed for a single cable; others are intended for several cables. Unused glands are fitted with a blanking plug. Unused cable entries are fitted with a sealing pin to maintain the seal integrity.

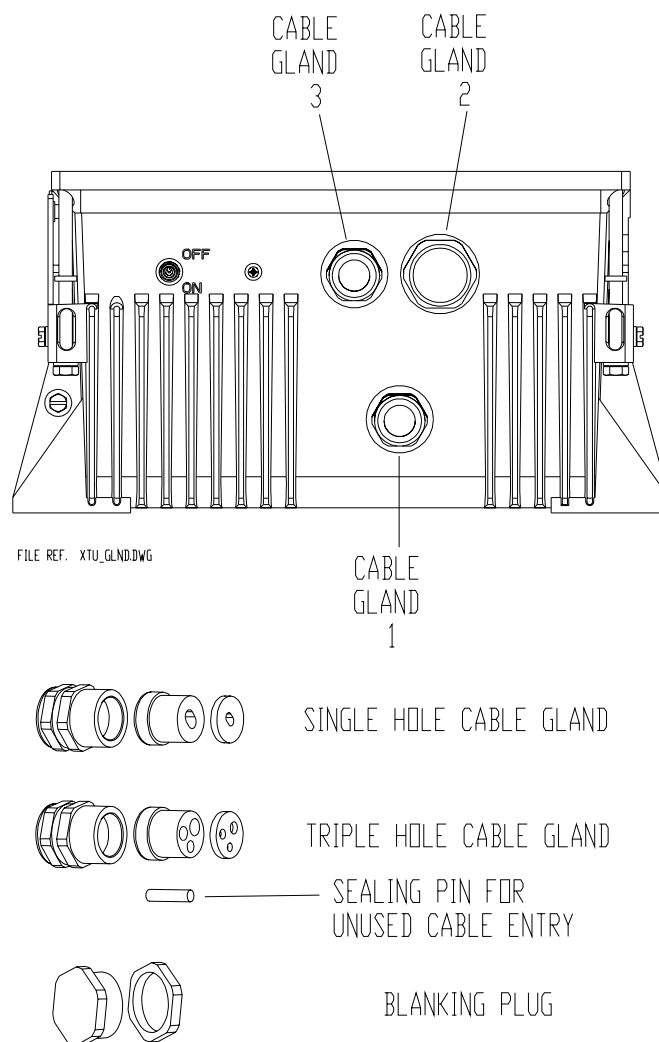


Figure 3.18 Turning Unit (Bulkhead Transceiver) – Cable Entry Positions

Note: Cable Glands and Blanking Plugs are normally factory fitted to the Turning Unit. Turning Units for aloft transceivers do not have cable gland holes.

6.2.8 Cable Installation: X-band Scanner Unit

The waterproof seal works by clamping onto the cable PVC sheath. The EMC gasket clamps onto the cable braid.

Note: Do not to force the outer sheath through the EMC gasket as the gasket can split.

The braid is also formed into a tail that is grounded by means of an adjacent earth tag. The fitting procedure is shown in Figure 3.19.

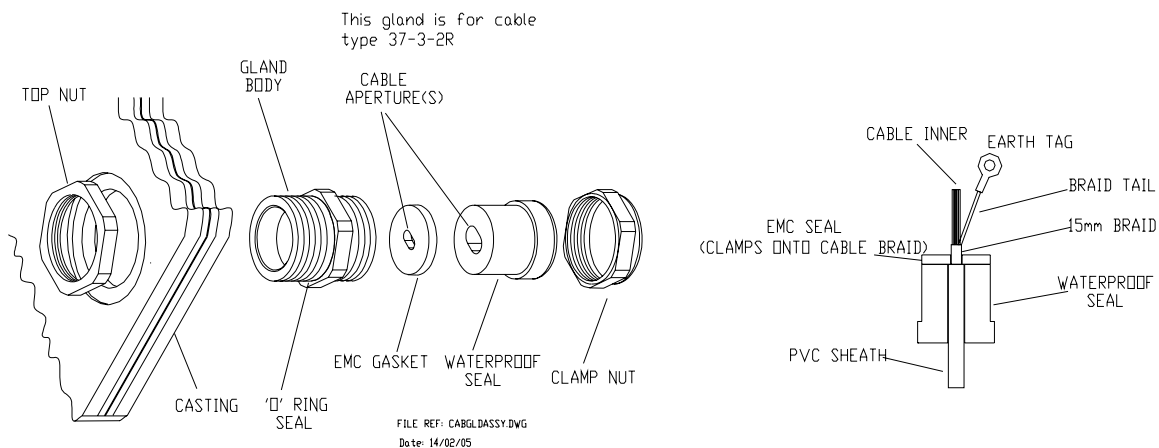


Figure 3.19 Detailed view of Cable Gland Assembly

To Install the Cables:

1. Unscrew the gland nut.
2. Remove the waterproof seal and the EMC gasket.
3. Feed the cables through the gland nut and waterproof seal.
4. Strip the outer sheath to expose approximately:
300mm of braid for the multicore cables.
1200mm of braid for the video coaxial cable.
5. Push the braid back to expose approximately 50mm of the inner cores.
6. Trim 50mm off the inner cores.
7. Pull the braid back and twist into a point.
8. Feed the cable through the EMC gasket until it is positioned as shown in Figure 3.19.
9. For the Multicore Cable: flare the braid out to within approximately 15mm of the EMC gasket and form a tail.
10. For the Coaxial Cable: do not fit the connector at this time.

6.2.8.1 Cable Assembly into Scanner Unit:

To assemble the cables into the scanner unit:

1. Feed the assembled cables and seals into the gland body.
2. Tighten the gland nut to compress the waterproof seal.
3. Crimp the earth tags to the braids of the multicore cables, keeping them as short as possible.
4. Attach the earth tags with the screws provided.
5. Trim and attach the cable inners to the appropriate connectors.
6. The video coaxial cable does not plug into SKV on the Input PCB, but is connected to SKV on the Receiver Assembly.
7. Sleeve the braid of the coaxial cable with the 6mm sleeving supplied.
8. Route the cable through the slot at the end of the filter box cover, along the cable loom on the right hand side of the scanner unit.
9. Use cable ties to clip it to the loom.
10. Trim to length and fit the coaxial plug.
11. For systems using below-decks transceivers the Performance Monitor Trigger coaxial cable is terminated in the same way, but only needs to be stripped back 200mm, as it is plugged into SKP on the Input PCB.

6.2.8.2 Cable Assembly into Turning Unit

To assemble the cables into the turning unit:

1. Feed the assembled cables and seals into the gland body.
2. Tighten the gland nut until the EMC seal is compressed.
3. Crimp the earth tags provided to the braids of the multicore cables
4. Attach them to the earth studs adjacent to the cables. The tails should be as short as is practicable.
5. Trim and make off the cable inners to the appropriate terminal blocks.
6. Trim the coaxial cables to length.
7. Slide the plastic sleeve supplied in the despatch kit over the exposed braid.
8. Fit the coaxial connectors.
9. Plug them into the appropriate sockets.

6.3 X-band Bulkhead Transceiver

The Bulkhead Transceiver, type 65810A to 65810W (10kW) or 65825A to 65825W (25kW), is installed below decks in a suitable location such as the ship's equipment room.

The installation should consider accessibility for maintenance and servicing, and the distance between the Transceiver and the Scanner Unit. For maximum performance, this should be kept as short as practicable: the loss per metre of the X-band waveguide is typically 10dB per 100 metres (2dB for 20 metres). This loss applies to both the transmitted RF pulse and the received signals.

The maximum recommended cable length using standard coaxial cable (PT1YM) is:

- 30 metres between the Turning Unit and the Transceiver Unit; and
- 67 metres between the Transceiver and Display.

Greater separation is possible by using a lower loss cable. Contact Northrop Grumman Sperry Marine B.V. if greater separation is required.

When choosing the installation location for the Transceiver, routing of the RF Feeder (waveguide) should be carefully considered.

The Transceiver may be attached to the bulkhead by several methods. The actual method chosen will depend on individual circumstances, with due regard given to the likely vibration and shock loading which may be experienced. The available methods include through bolting to the bulkhead, or mounting on studs supplied by the shipyard. Slotted mounts are supplied at the bottom for ease of installation.

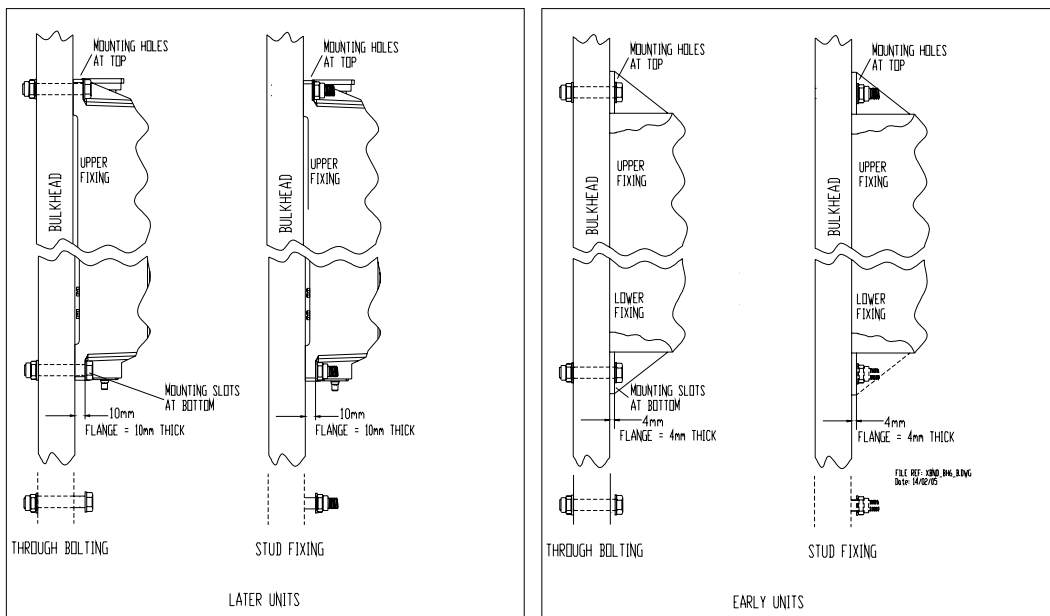


Figure 3.20 X-band Bulkhead Transceiver – Mounting Alternatives

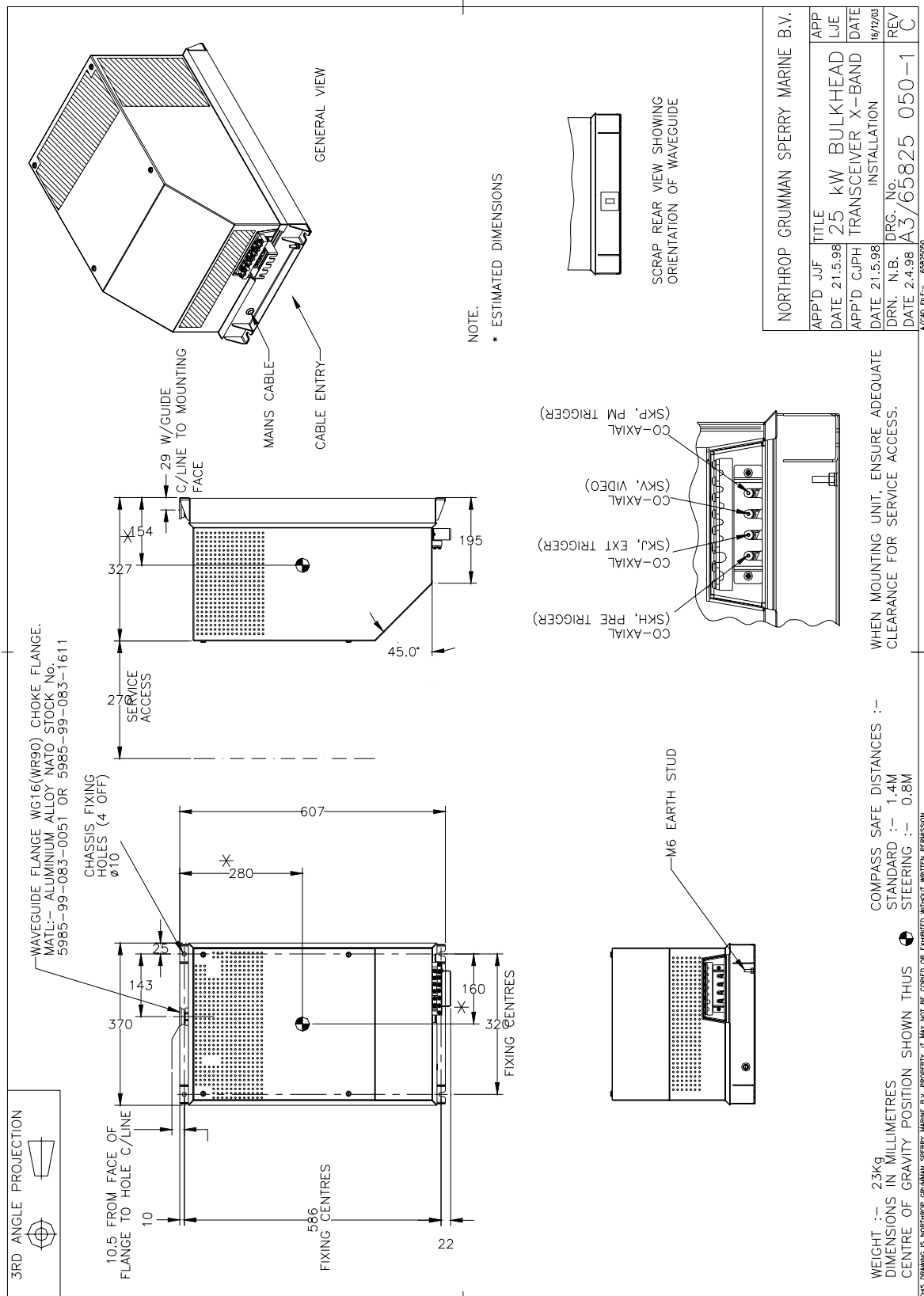


Figure 3.21 X-band Bulkhead Transceiver 25kW Installation

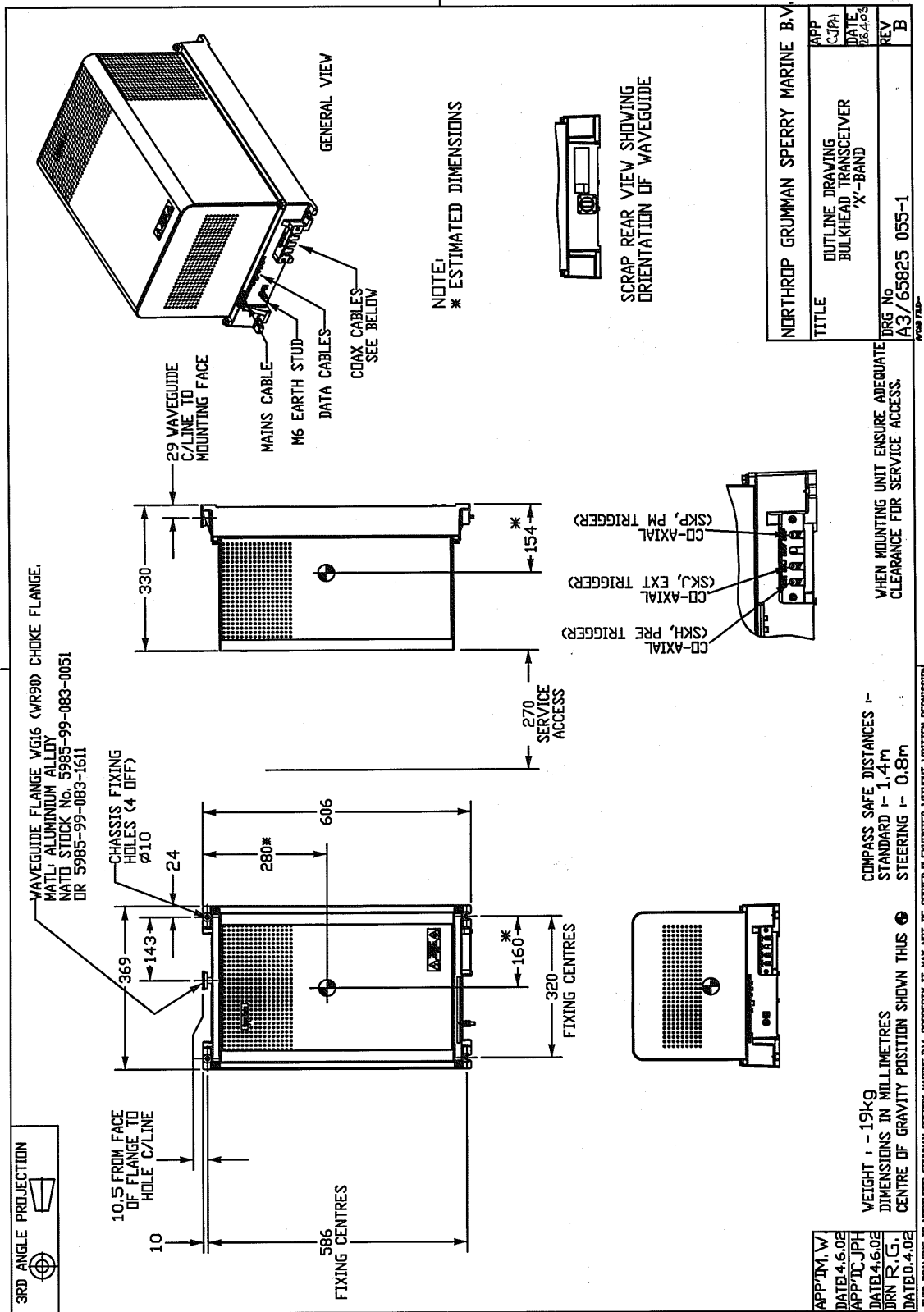


Figure 3.22 X-band Bulkhead Transceiver 25kW (later version) Installation

6.3.1 Bulkhead Transceiver Cabling Information

Figure 3.24 shows details of the cable input. The Transceiver cover, which is secured by four fixing screws, is shown removed. A cable-retainer holds the coaxial cables in place. The cables must be fitted to the retainer after the cables are in place.

All other cables, with the exception of the X-band RF feeder (waveguide), are individually clamped on their cable braids to provide EMC shielding. The braids are also made off as tails and connected to earth tags supplied.

The AC mains input is connected to TSE located underneath the cover plate as shown in Figure 3.24.

6.3.1.1 Bulkhead Transceiver Input PCB Details

Figure 3.23 shows details of the Input PCB Assembly 65801814.

Access to the board is made by removing the main Transceiver cover and the Filter Box cover. Refer to the cabling schedules in Section 7 'System Component Interconnections' for details of the connections, which are made by using the two-part connectors supplied.

For 'additional features' transceivers fitted with PCB 65801815 or 65801821, see Section 3.3 'Configuring Printed Circuit Boards.' in Chapter 11 'Additional Features'.

Configuration for normal operation is by link settings as follows:

LK2 Link pins 2 and 3

LK3 Link pins 2 and 3

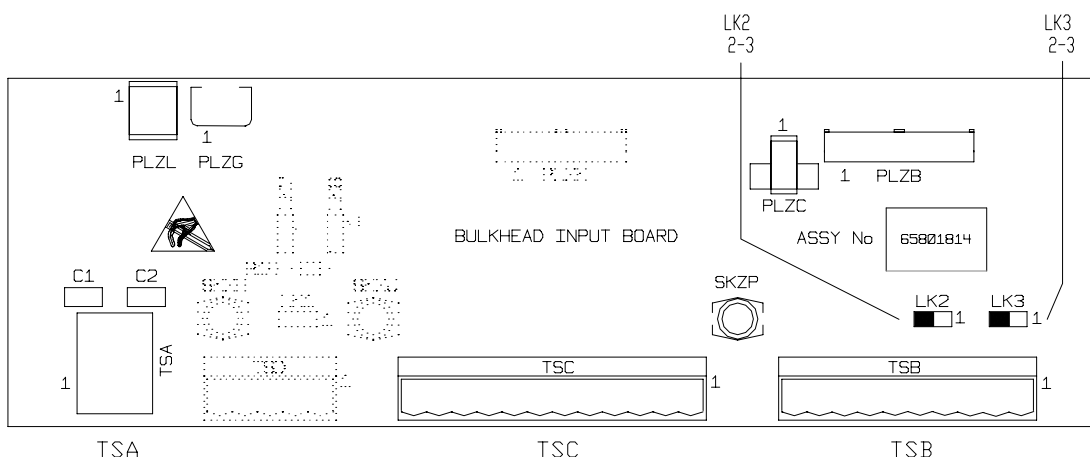


Figure 3.23 X-band Bulkhead Transceiver - Input Board Details

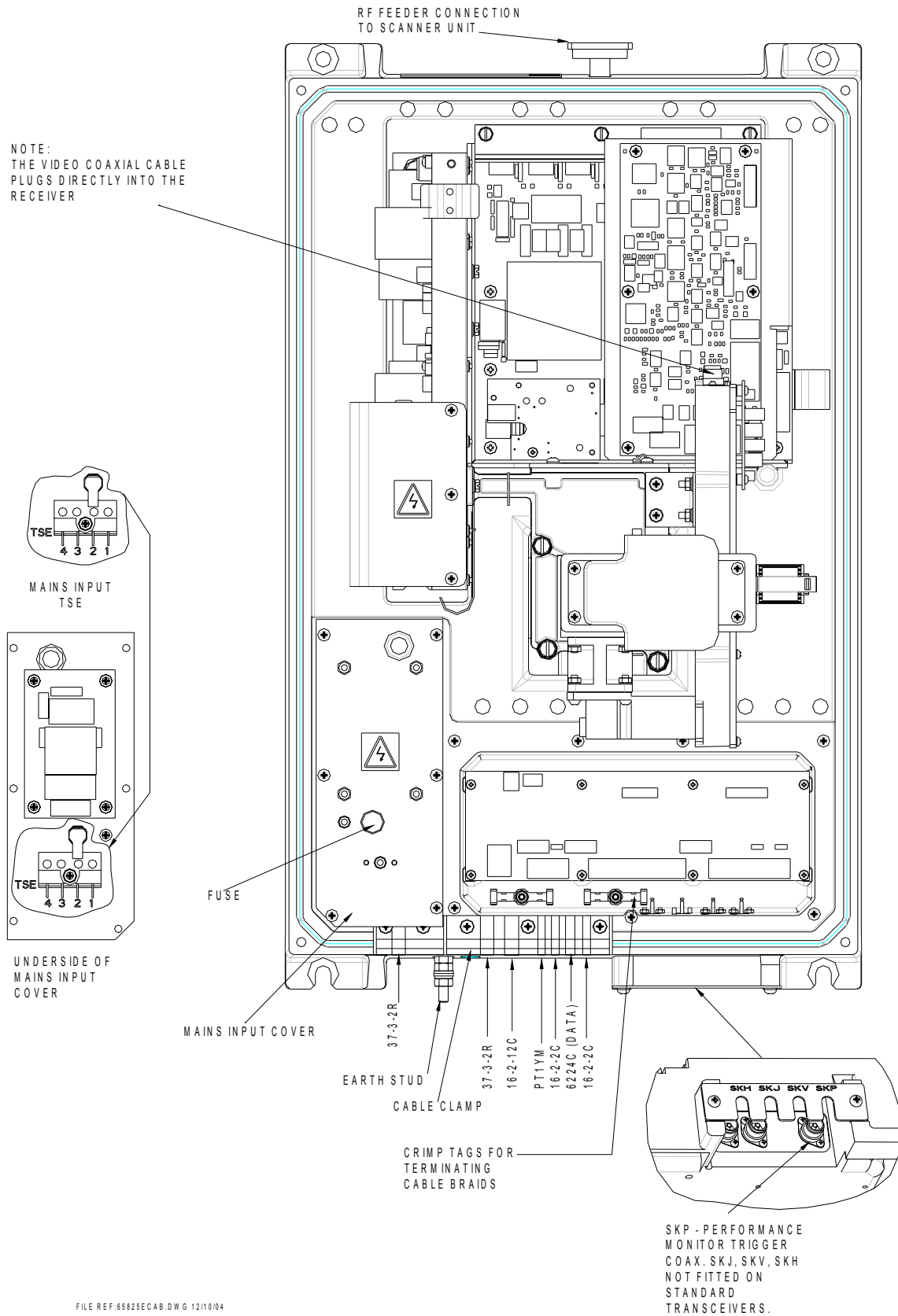


Figure 3.24 X-band Bulkhead Transceiver – Cable Input Details

6.3.2 Fitting the RF Elliptical Waveguide (X-band)

For X-band radars a 33.5mm x 22.9mm corrugated elliptical waveguide is used for the run between the Bulkhead Transceiver Unit and the Turning Unit. The waveguide used is Andrew Antennas Type EW85.

A 12" flexible waveguide (Part No 1189.z, supplied) must be fitted between the elliptical waveguide and the turning unit.

Although apparently robust, the waveguide must be protected against strain and kinking, and must be treated with great care at all times. The ends of the waveguide must be kept sealed against the ingress of moisture before the connectors are assembled. The maximum permissible twist is 3°/metre (39").

Bends should have the largest bending radius practicable. A single bend may be made when necessary with a minimum bending radius (measured from the axis of the waveguide) of 203mm (8in) in the 'E' plane, and 482mm (19in) in the 'H' plane.

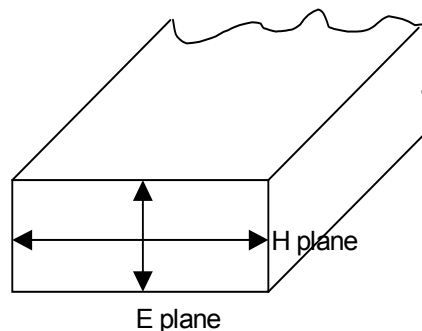


Figure 3.25 Waveguide Planes

For convenience, the upper (Turning Unit) connector can be fitted before installation of the waveguide (waveguide kits supplied by Sperry Marine have one connector fitted) but the following precautions must be taken:

1. Any bend required within 1m (3ft) of the waveguide end must be formed before carrying out the cutting and assembly procedure described in subsequent paragraphs. No bend may be nearer than 250mm (10in) from the end of the waveguide.
2. Whenever possible, to allow for movement between the Turning Unit and mast, a double bend should be formed in the waveguide to produce an offset immediately below the Turning Unit.
3. The waveguide and assembled connector should be fitted to the Turning Unit so that a minimum amount of distortion of the waveguide occurs between the connector and the pre-formed bend.

- The waveguide should be installed and secured in position (using the waveguide supports shown in Figure 3.34) as far as is practicable before the lower Transceiver Unit connector is fitted to the waveguide. The precautions given in paragraph 1 above must be observed if a bend is required adjacent to the Transceiver Unit.

6.3.2.1 Assembling the Connectors to the Waveguide

Figures 3.26 to 3.31 are reproduced by permission of Andrew Antennas.

General

A straight connector (Type 185BC) is used to terminate the waveguide at each end.

Tools required

You will need a hacksaw (with a fine-toothed blade) and 1-15/16" open-ended spanner to fit the connectors to the waveguide.

Procedure

The procedure that follows applies to the straight connectors at each end of the waveguide. It is very important that swarf and other foreign matter is prevented from entering the waveguide.

Prepare the waveguide end and assemble the connector as follows:

- Make sure the end of the waveguide is straight for at least 250mm (10in). The ends of the waveguide must be cut squarely, to ensure this wrap a straight edged piece of paper around the waveguide. Tilt the waveguide downwards to prevent copper swarf entering. Remove a 24mm (15/16in) length of the polyethylene jacket. Clean the external copper with Comothene (or Ultraclean) solvent and the interior with a bottlebrush, see Figure 3.26.

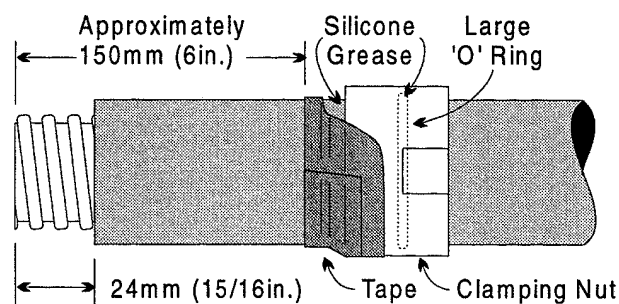


Figure 3.26 Cut Jacket

- Apply a thin film of silicone grease (MS4 or similar) to the large 'O'-ring and insert it in the internal groove of the clamping nut. Apply a thin film of grease to the smooth internal surface of the clamping nut and slip the nut over the end of the waveguide, as shown in Figure 3.26. Wrap several turns of tape around the clamping nut and jacket to prevent foreign matter from entering.

- Grease the cut edge of the jacket. Slip the chamfered end of the compression ring over until the recessed edge bottoms against the jacket (align the pin in holes facing away from the jacket), as shown in Figure 3.27 and Figure 3.28.

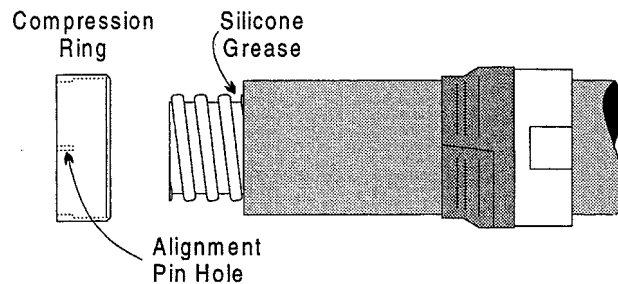


Figure 3.27 Fit Compression Ring

- Turn the gasket inside out and fit it on to the end of the waveguide. Apply a thin film of silicone grease to the gasket threads. Roll the gasket over to the correct position and against the compression ring, see Figure 3.28, and apply a thin film of grease to the outside surface of the gasket. Clean any grease from the exposed copper with solvent.

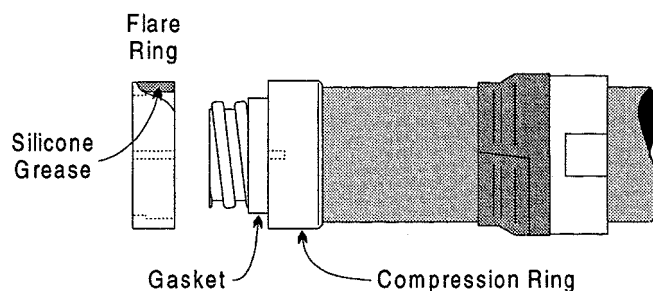


Figure 3.28 Fit Flare Ring

- Fit the recessed side of the flare ring over the gasket, with alignment holes of the flare ring and compression ring corresponding. Push the flare ring firmly against the compression ring.

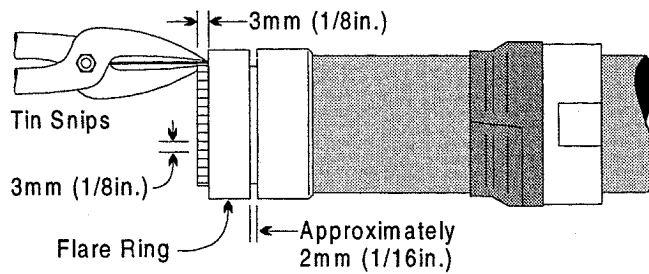


Figure 3.29 Cut Tabs

6. With tin-snips, cut the bared end of the waveguide into tabs 1/8in wide and 1/8in deep – as close to the flange as possible, see Figure 3.29. Flatten the tabs against the flare ring with a mallet using minimum force. Heavy blows will reduce the thickness of the copper, see Figure 3.30. Trim off any tab protruding beyond the edge of the flare ring. Clean the tabs with solvent to remove any silicone grease.

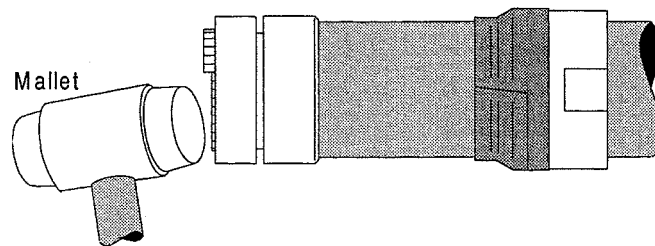


Figure 3.30 Flare End

7. Make sure the mating RF contact face of the Type 185AC connector body is clean and thoroughly grease-free. Clean the inside of the waveguide with a bottlebrush.
8. Fit the smaller 'O'-ring to the external groove on the connector body without any grease, see Figure 3.31. Apply a thin film of grease to the rear outer surface of the compression ring (so that the large 'O'-ring in the clamping nut will slide over the compression ring and seat in the recess).

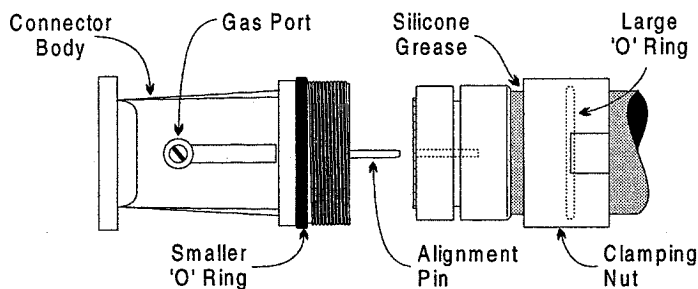


Figure 3.31 Fit Connector

9. Place the connector body against the flare ring. Insert the alignment pin in the holes of the flare ring and compression ring. Remove the tape from the clamping nut. Slide it over the rings and screw it to the thread on the connector body.
10. Hold the rectangular part of the connector body with an adjustable spanner and tighten the clamping nut with 1-15/16in set spanner across the flats. DO NOT turn the connector body.

6.3.2.2 Fitting the Deck Gland

The EW85 waveguide passes through its own separate deck gland (part number 9391991 (sks86347/a), positioned near the foot of the mast. The kit consists of a deck gland, gasket, upper and lower pressure plates, four m6 x25 screws and four split gaskets.

To fit the deck gland:

1. Cut the deck and fit the flange using suitable fixings (not supplied – see Figure 3.32).
2. Assemble the deck flange split gaskets (refer to note below) loosely around the waveguide section from below.
3. Slide the assembly upwards into the deck gland, see Figure 3.33.
4. Secure the waveguide down the mast.
5. Tighten the four split gasket screws carefully. Do **not** over-tighten the screws. This avoids possible distortion of the waveguide.
6. Fill the space between the waveguide and deck gland with hermetic oil-proof compound.

Note: *Split gaskets must be fitted in alternative positions to make sure the split does not line up with the split of an adjacent gasket.*

Initially, assemble the gaskets loosely before inserting them into the deck flange, see Figure 3.33. The assembly may be inverted to give you better access to the screws.

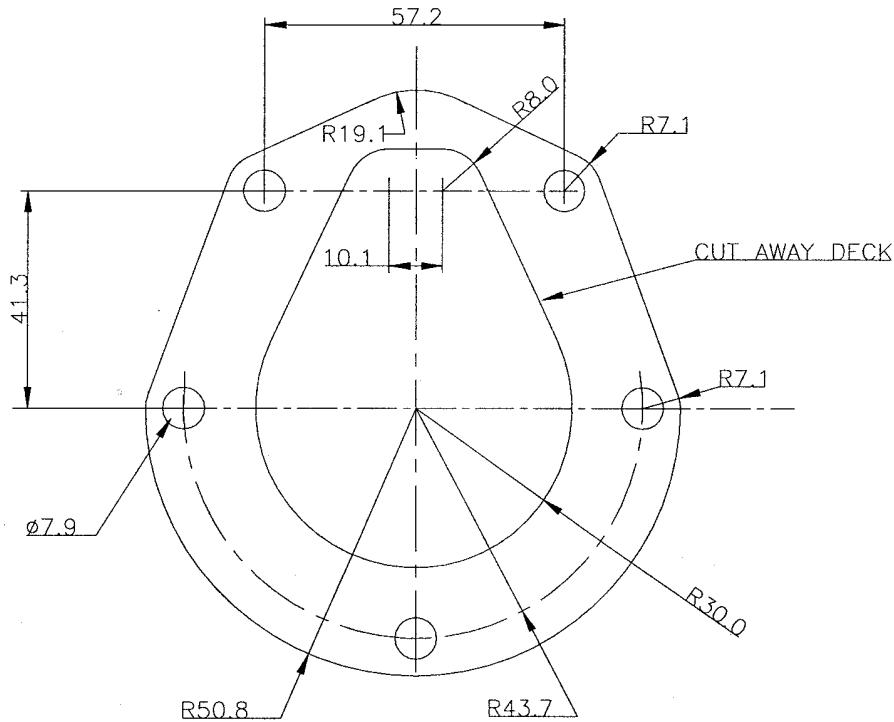


Figure 3.32 Deck Gland Fixing

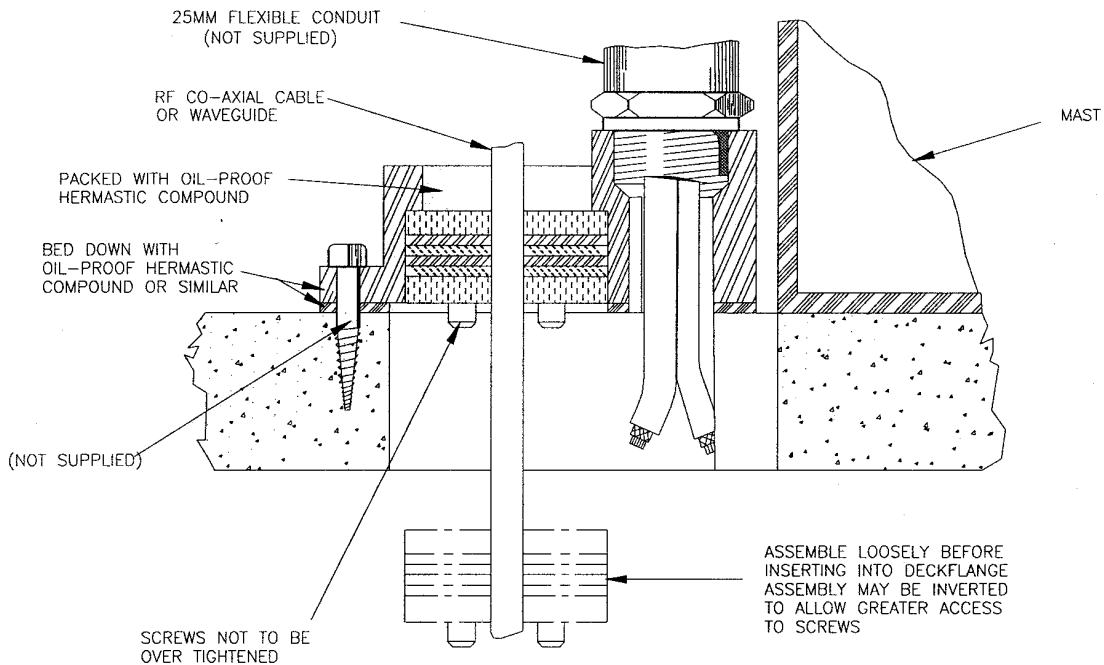


Figure 3.33 Deck Gland Details

Note: If cables are not routed via conduit into a deck gland, make sure the cable entry hole is fully sealed using a suitable silicone sealant.

6.3.2.3 Installing the Waveguide

Waveguide hangers are supplied (Andrew hanger kit type 42396a-5) for supporting the waveguide along its run between the scanner unit and the bulkhead transceiver. Each kit contains 10 hangers.

Their associated support assembly (Andrew type 1116.b) and fixing kit (Andrew type 31769-1) are included as part of the installation kit.

Normally, a hanger is attached to a cable entry tray using suitable bolts at the recommended spacing of 0.9 metres (3ft). The support brackets must be fitted to the hangers to prevent distortion when the hanger is wrapped around the waveguide, as show in Figure 3.34.

Figure 3.34 also shows additional hardware (not supplied in the installation kit) that can be used for special mounting arrangements. If required, these can be purchased from Andrew Corporation.

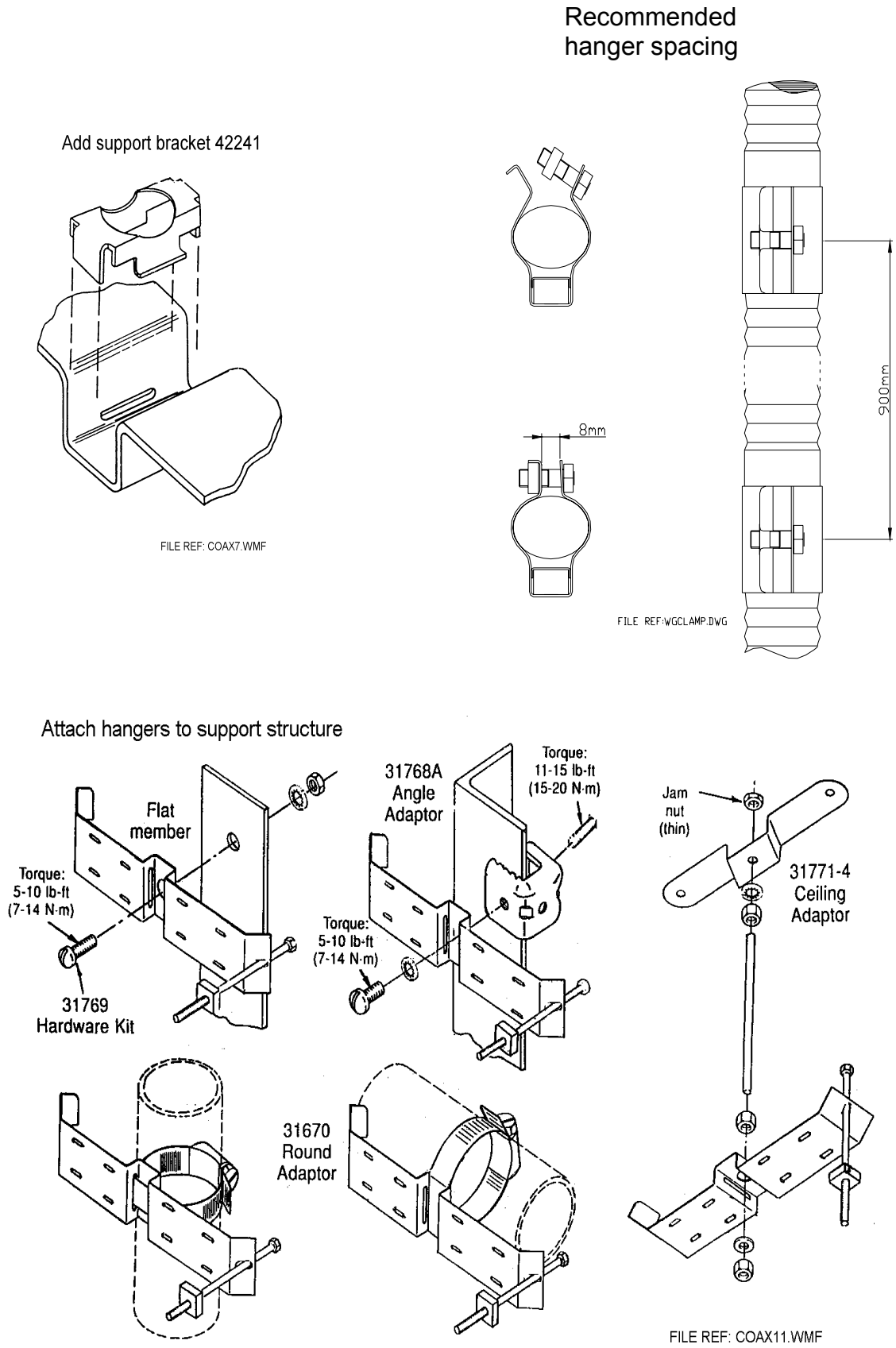


Figure 3.34 Waveguide Support Details

6.3.3 Sealing the Turning Unit

Before securing the top casting and bottom casting of the Turning Unit ensure the seal groove in the top casting and the mating faces of the top casting and lower casting are liberally coated with the petroleum jelly supplied (MA00013789).

Apply denso paste (9037446) to the four top casting retaining bolts.

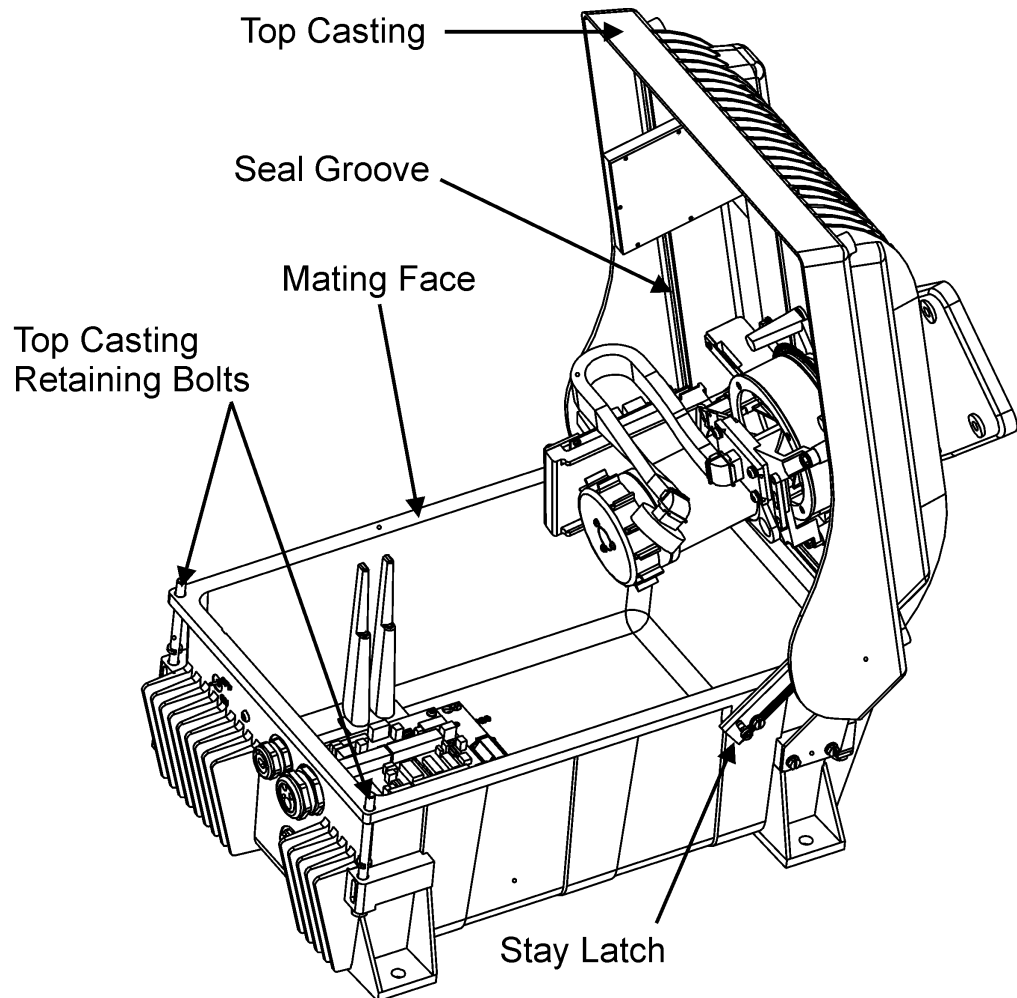


Figure 3.35 Sealing the Turning Unit

6.4 S-band Scanner Assembly

The S-band Scanner assembly is made up of the following sub-assemblies. Each component is supplied in its own packing, together with relevant installation drawings:

Turning Unit	With/without Integral Transceiver (30kW) Despatch Kit 65830660 (Installation Drawing 65830050)
NB: a Bulkhead system would also be supplied with the following:	
Bulkhead transceiver	(30kW) Despatch Kit 65831660 (Installation Drawing 65831050)
Antenna	12ft or 9ft
Antenna Despatch Kit	65612610 (Installation Drawing 65612050-054)

To install the S-band Scanner assembly carry out the following operations, preferably in the sequence outlined below:

1. Preparation of the site (refer to Section 5 '*Siting*').
2. Bolting the Turning Unit to the mounting platform (ship's structure) as detailed in Installation Drawing 65830050 supplied with the Turning Unit, and in Figure 3.42.
3. Bolting the Support Casting to the Turning Unit as detailed in Installation Drawing 65612050-054 supplied with the Antenna Despatch Kit, and in Figure 3.43.
4. Bolting the Antenna to the Support Casting as detailed in Installation Drawing 65612050-054 supplied with the Antenna Despatch Kit, and in Figure 3.44.
5. Laying in and installing the cables for the motor and the Turning Unit in Section 6.4.6 '*Cabling Connections*'.

Figures 3.36 to 3.40 show S-band Scanner outline drawings that are intended to duplicate those provided with the equipment. However, as changes may occur to the details that may not be reflected in this manual, the installation drawings supplied with the equipment take precedence in the event of any differences.

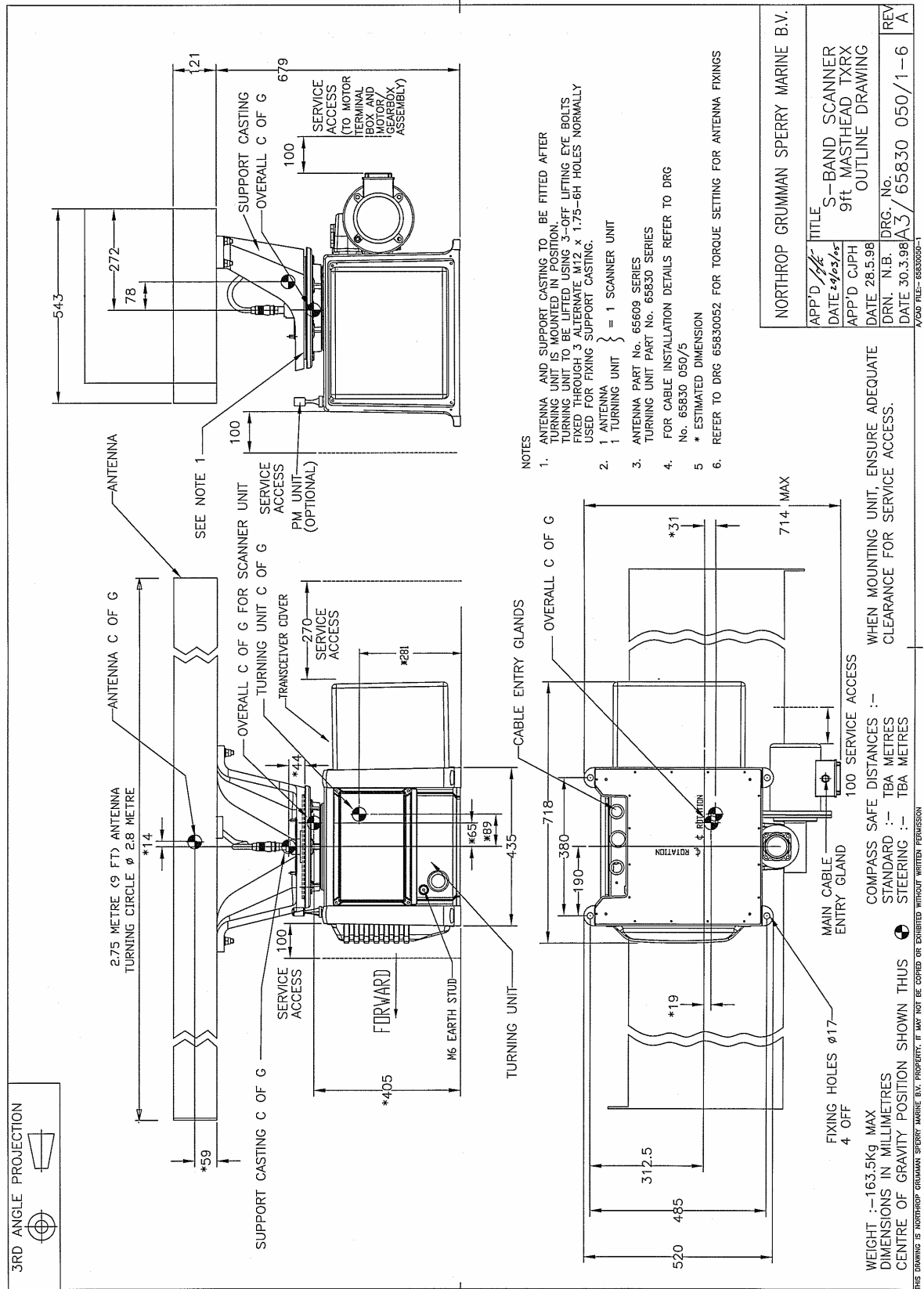


Figure 3.36 S-band Scanner 9ft Masthead Tx/Rx 30kW Installation

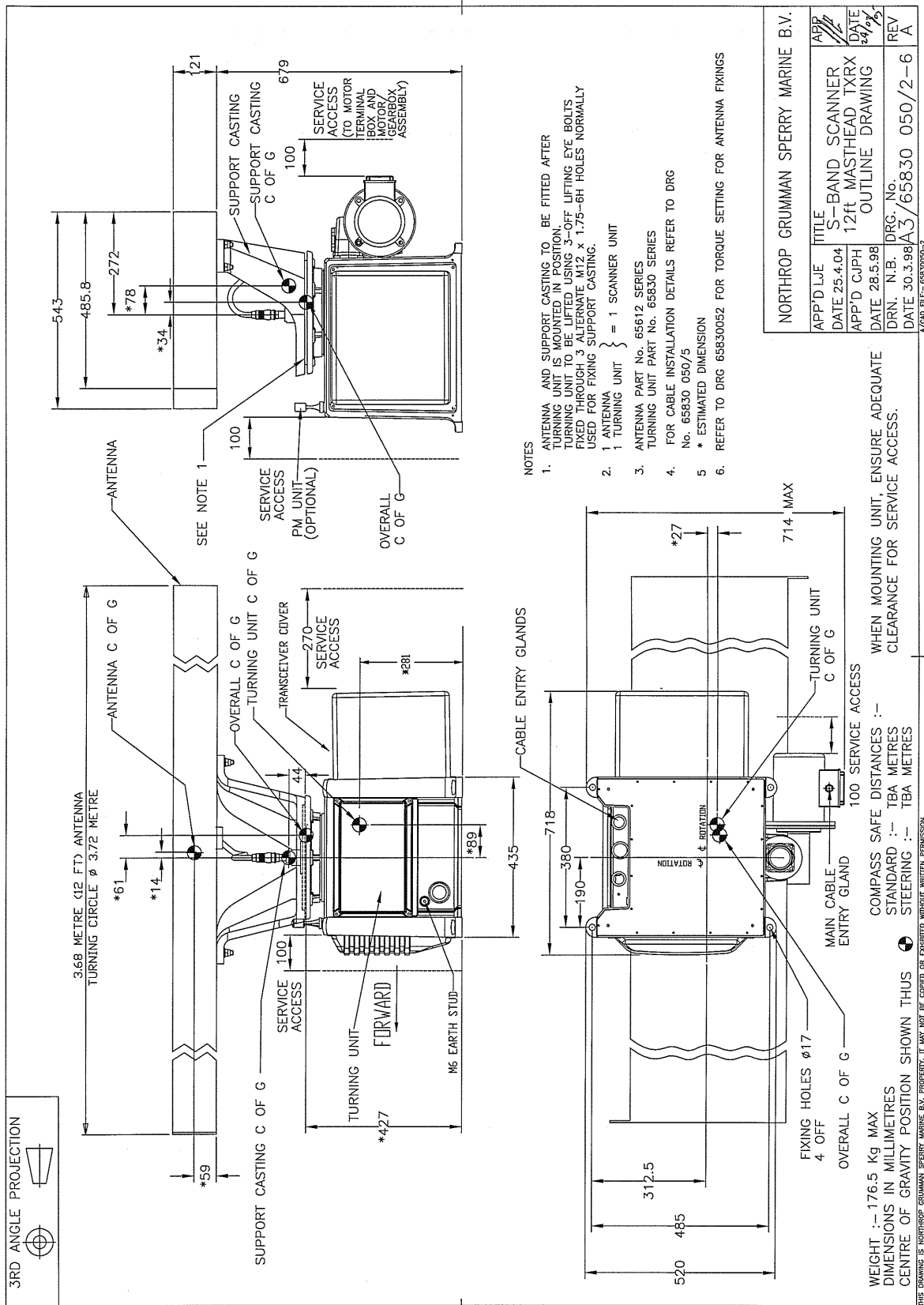


Figure 3.37 S-band Scanner 12ft Masthead Tx/Rx 30kW Installation

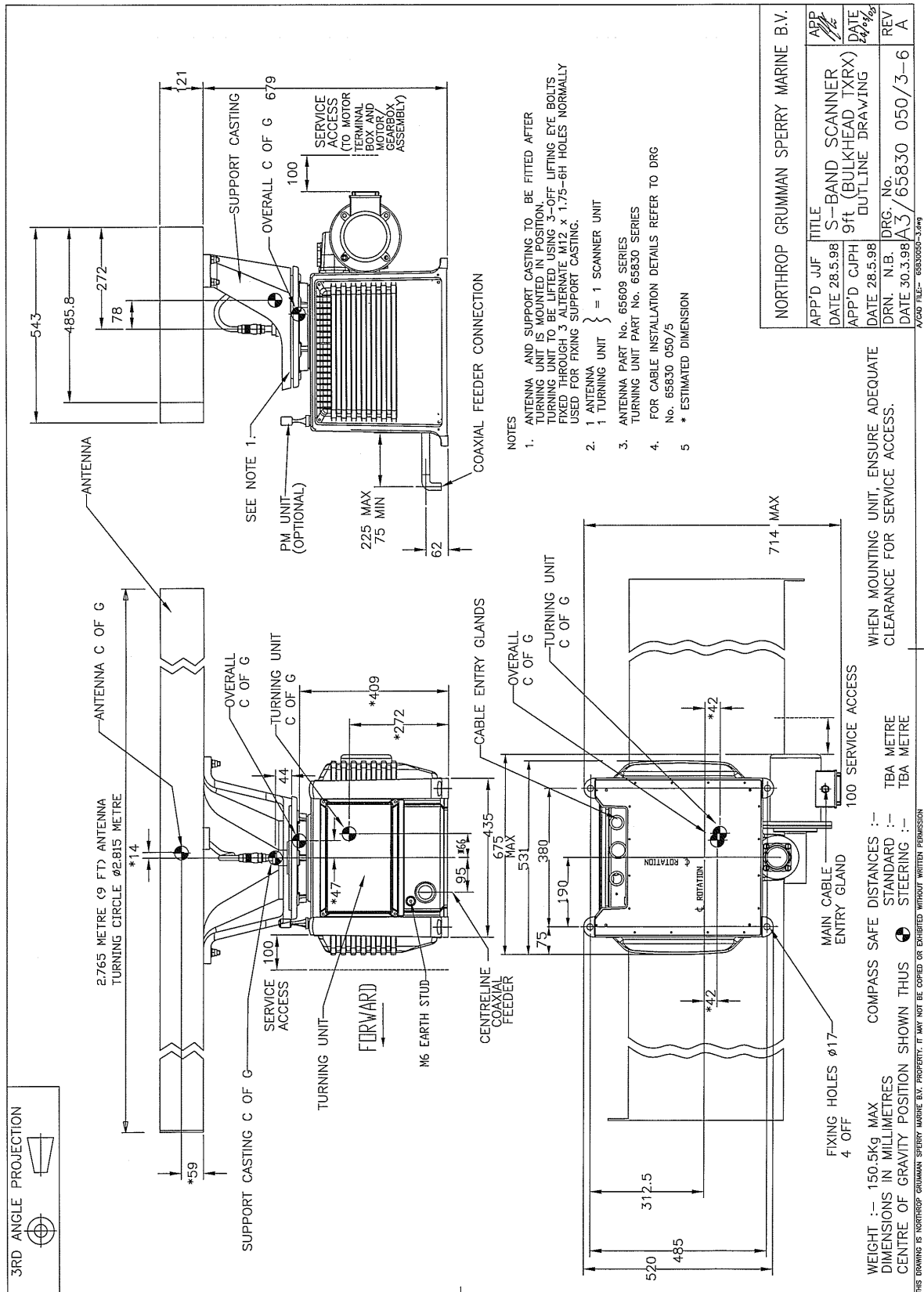


Figure 3.38 S-band 9ft Bulkhead Tx/Rx Installation

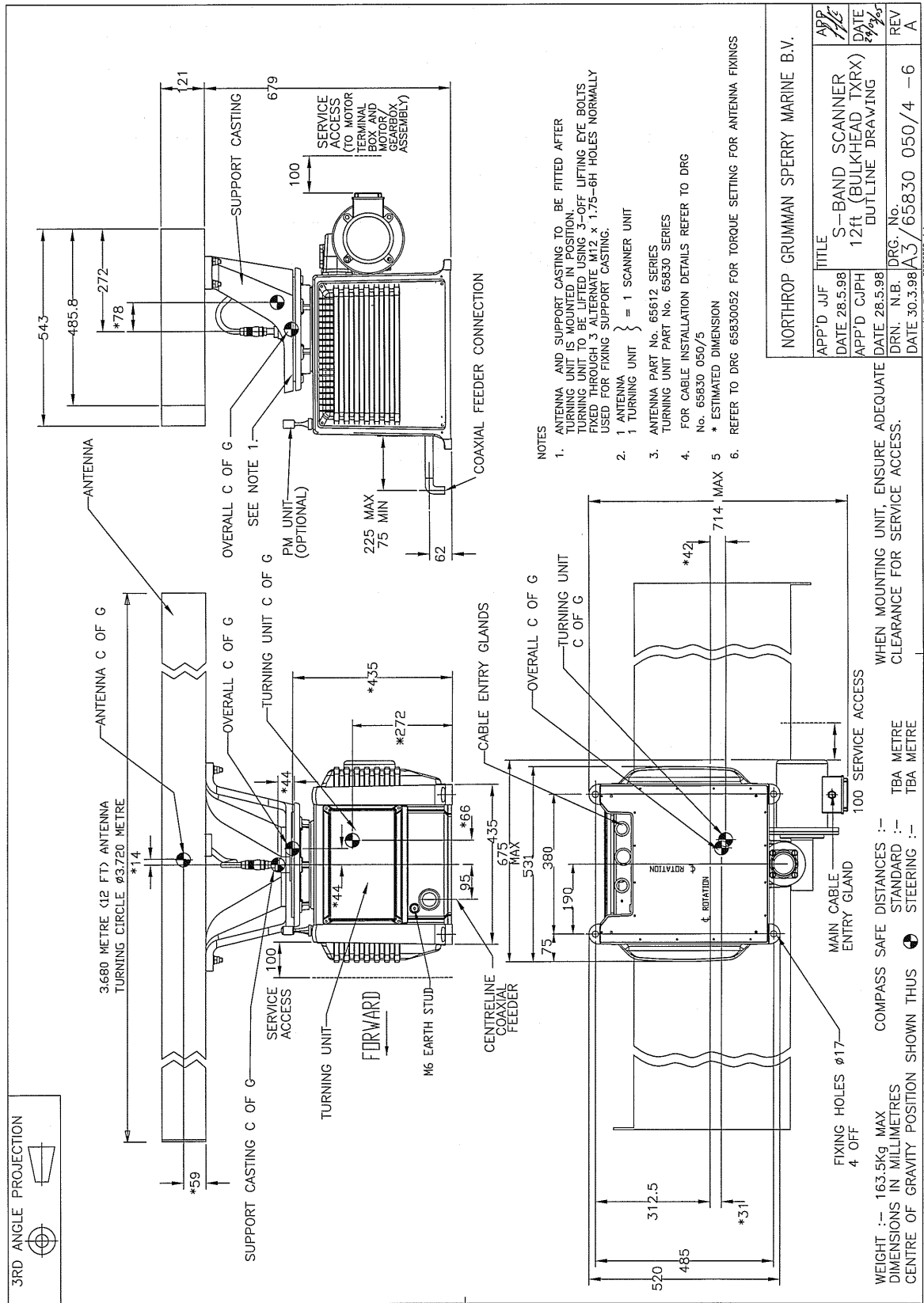


Figure 3.39 S-band Scanner 12ft Tx/Rx Installation

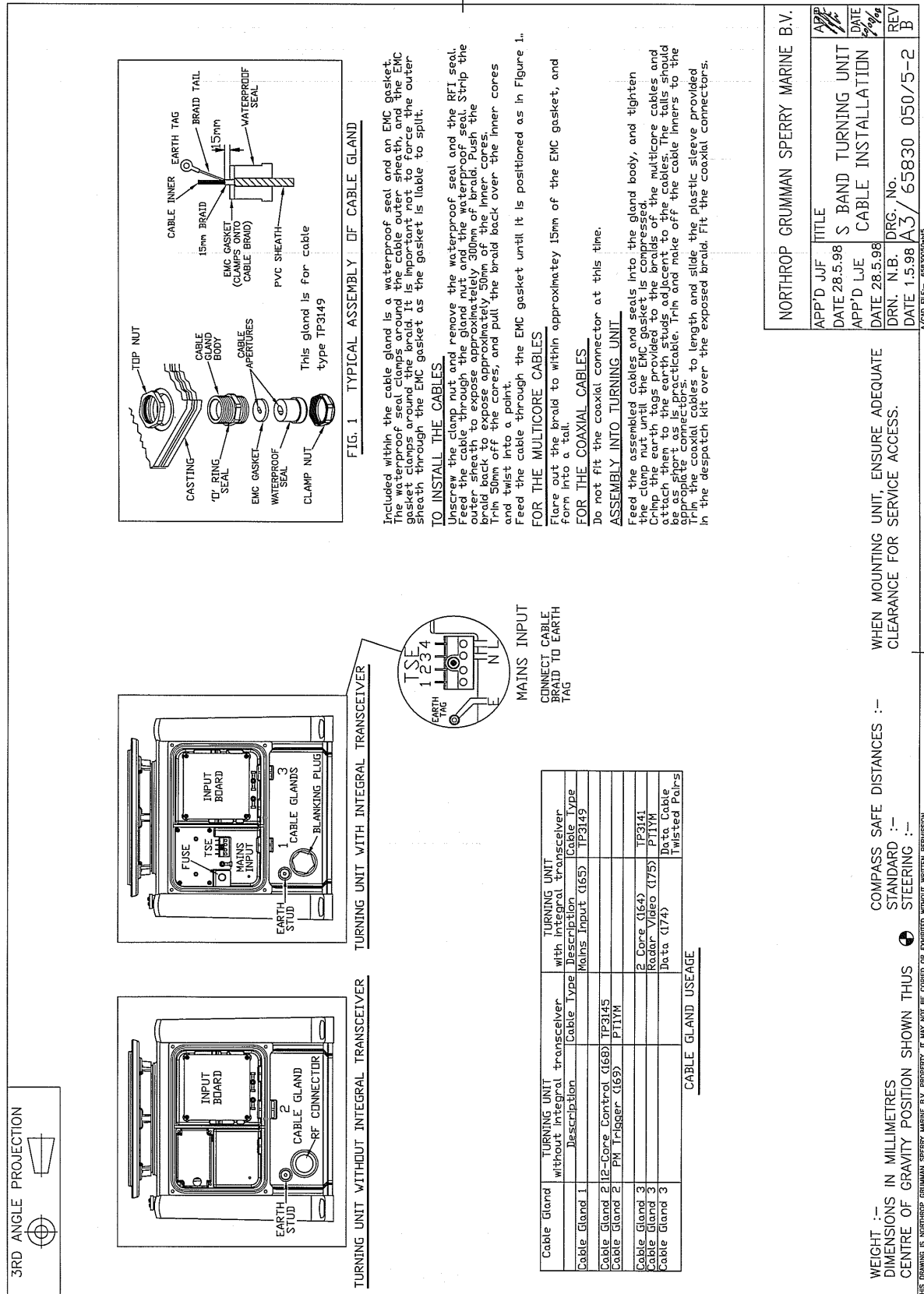


Figure 3.40 S-band Turning Unit Cable Installation

6.4.1 Turning Unit



WARNING! HEAVY WEIGHT

The Turning Unit must be lifted by crane, do not attempt to lift the Turning Unit by hand.
Never lift a combined Turning Unit and Antenna Unit by the Antenna Unit. This is dangerous and would cause damage to the Antenna Unit.



CAUTION

The weight and spread of the Antenna can cause a freestanding Turning Unit to topple over. The Turning Unit should be bolted down onto its mounting platform before attaching the Antenna and Support Casting to the Turning Unit.

To lift the turning Unit onto the mounting platform:

1. Screw three M12 lifting eyebolts into the torque tube in the three positions shown in Figure 3.41. The eyebolts are fitted in a symmetrical pattern in three of the six holes normally used for attaching the Support Casting to the Turning Unit; only three of the holes are tapped.
2. Remove the eyebolts after the Turning Unit has been bolted to the mounting platform. Refer to “BS4278 Eyebolts for Lifting Purposes” and the safe use of lifting equipment in accordance with the Health and Safety Work Act, Part 1, Section 6.

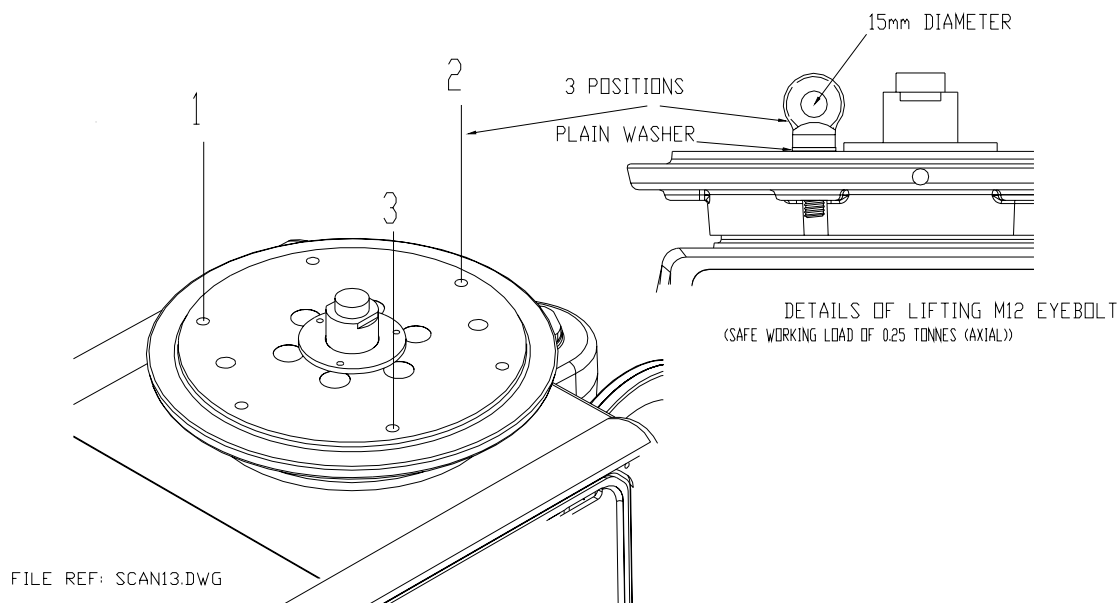


Figure 3.41 Attachment of Lifting Eyebolts

The Turning Unit is attached to the mounting platform using the fixings supplied in the Turning Unit Despatch Kit 65830660.

Figure 3.42 shows how these are fitted. Before assembly make sure all threads and bushes are coated with Denso Paste.

Note: *The Turning Unit is bolted directly to the mounting platform. No intervening washer or pad is used, except for the purpose of levelling the mounting. This stops the Turning Unit casting from twisting when the bolts are tightened. M16 washers may be used as shims, or purpose made parts, produced locally, may be used.*

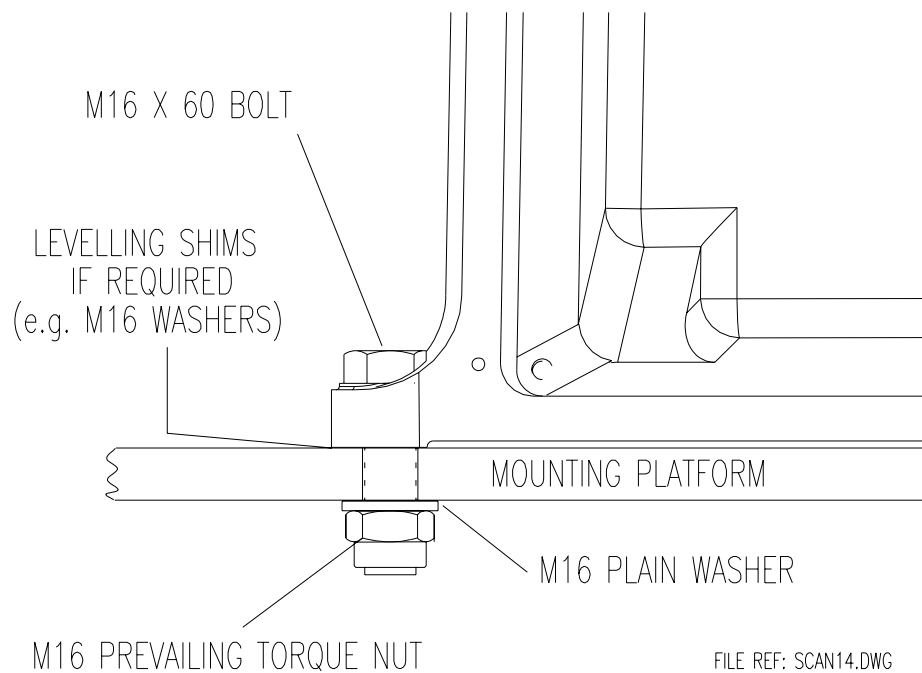


Figure 3.42 Fixing the Turning Unit to the Mounting Platform

6.4.2 Support Casting

The Support Casting is fitted to the Turning Unit torque tube using Fixing Kit 65612611, which is part of the Antenna Despatch Kit 65612610.

Figure 3.43 shows how these are fitted. Ensure that all threads and bushes are coated with Denso paste.

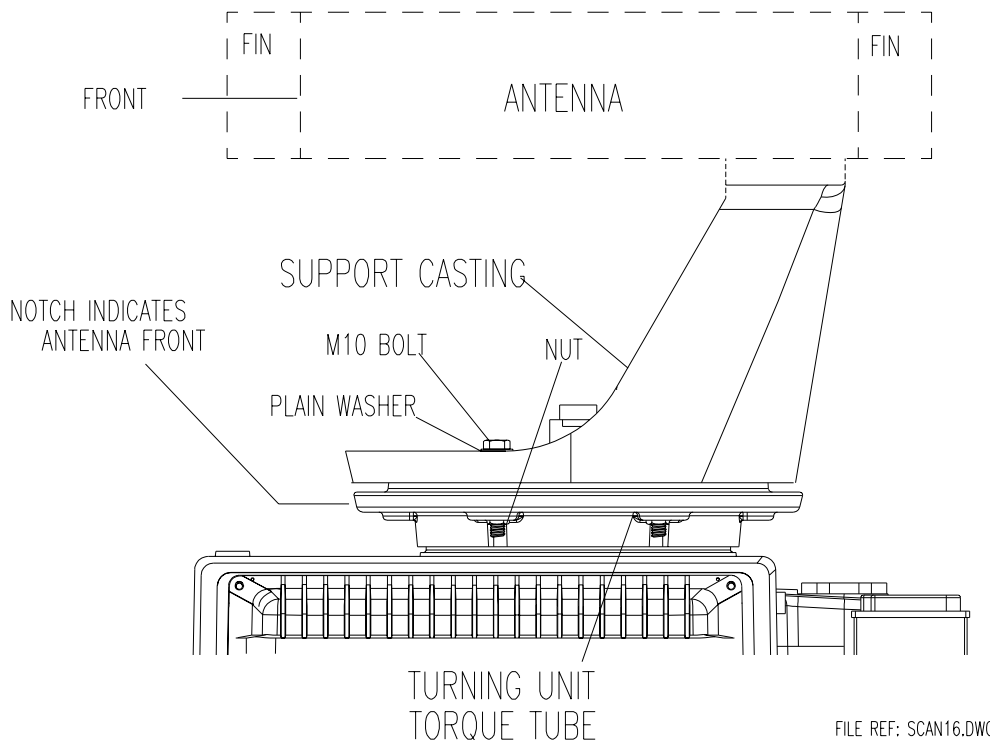


Figure 3.43 Fixing the Support Casting to the Torque Tube

6.4.3 Performance Monitor

The Performance Monitor consists of the Antenna, the Performance Monitor module and an associated cable. The equipment is normally factory fitted.

6.4.4 Antenna

The Antenna is fitted to the Support Casting using the parts listed below which are supplied with the antenna:

- 4 x M12 Plain Nuts
- 6 x Spacers
- 2 x Lock Tabs

Figure 3.44 shows where these are fitted. Make sure all threads and bushes are coated with Denso Paste. For full fitting instructions see drawing 65830052 supplied with the equipment.

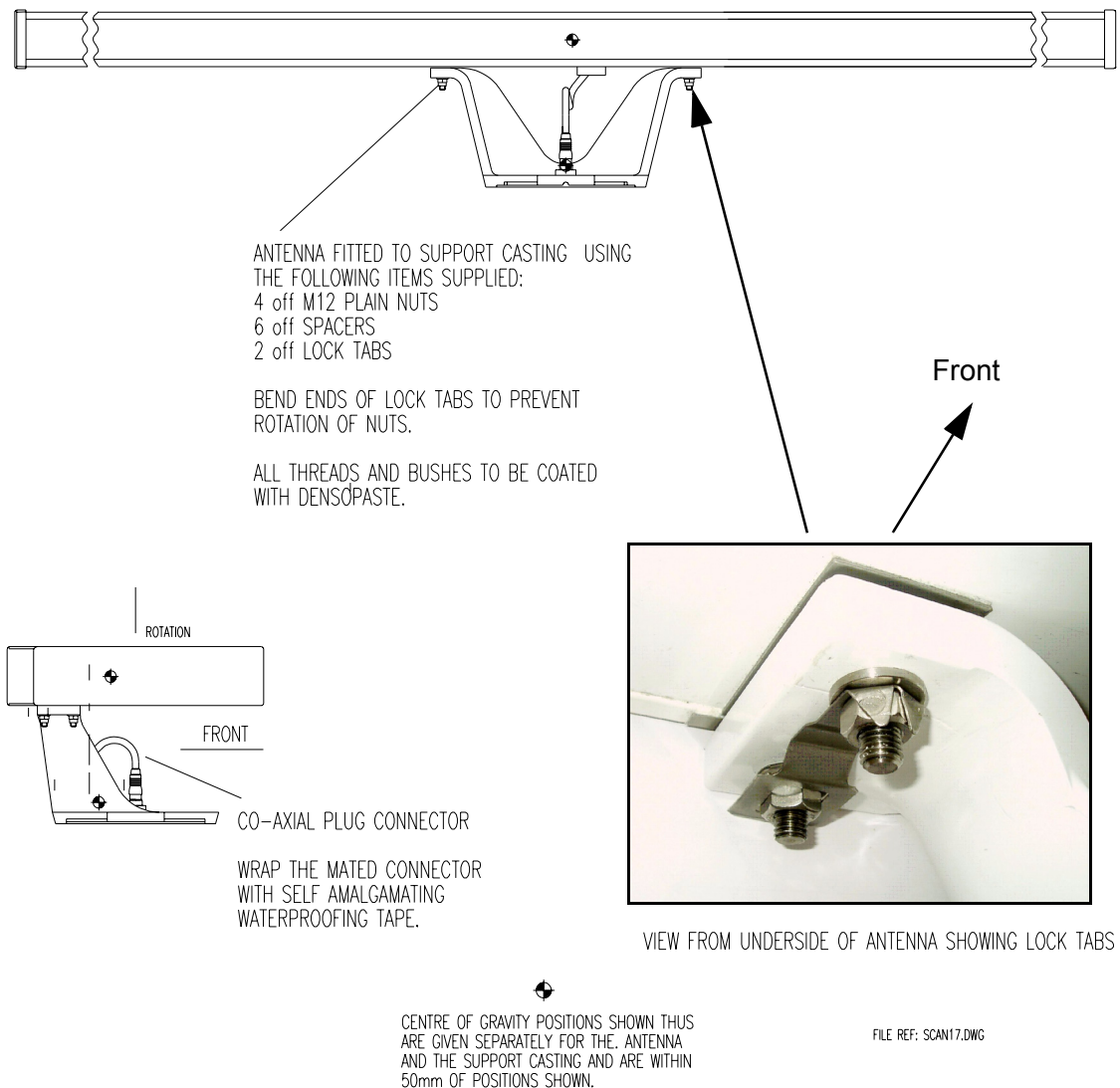


Figure 3.44 Fixing the Antenna to the Support Casting

Note: The lock tab ends must be bent as shown in Figure 3.44 to stop the nuts rotating.

The next step is to connect the S-band coaxial cable from the Antenna to the Turning Unit RF connector as shown in Figure 3.44. The mated connector must then be wrapped with self-amalgamating tape as an additional precaution against water ingress.

6.4.5 Motor Connections

Various motor types are available for different mains supplies and standard/high-speed antenna rotation rate variants.

The following table gives the motor types that are available:

Table 7: Motor Types

Mains Supply Characteristics	Motor Type for Standard Speed Antenna	Motor Type for High-Speed Antenna
110/120/220/240 Volts, 1 ϕ (50/60 Hz)	91003757	91003759
110/120 Volts, 3 ϕ (50/60 Hz)	91003752	91003754
220/240/380/440 Volts, 3 ϕ (50/60 Hz)	91003751	91003753

CAUTION



As referenced in Table 7, dual voltage motors are used for both single and 3 phase supplies. 110-120/220-240Volts for single phase; 220-240/380-440Volts for 3 phase. In addition to the wiring of the mains supply to these motors, the windings must also be correctly configured for the appropriate voltage. Incorrect configuration will adversely affect the unit's performance – refer to connection details below.

For all motor types:

1. First, feed the mains cable through the cable gland on the motor termination box housing.
2. Connect the cable braid to the motor chassis.
3. Connect the individual insulated conductors to the appropriate terminals as detailed for each motor type in the following section.
4. Make sure the cable is not under strain in the termination box area, and sufficient slack is available to remake the connection, should this ever be necessary, for example, if a motor is changed in service.
5. Make sure the insulated conductors are terminated appropriately:
 - using ring crimp terminals on threaded studs; or
 - stripping insulation back by 5mm for screw compression pillars.
6. Ensure that any gasket fitted for sealing the terminal box cover is correctly seated when the cover is re-secured.

6.4.5.1 Single Phase Motor Connections

Make connections according to the label on the inside of the termination box cover. Ensure that the rated motor volts are matched to the supply. If the radar antenna rotates in the wrong direction, re-configure the connections on the motor according to the diagram on the motor housing (the radar antenna should rotate anti-clockwise when viewed from below).

For dual voltage single phase motors connection details are shown in Figure 3.45.

There are 6 wires from the motor housing to the terminal block, numbered 1, 2, 3, 4, 5 and 8. Connect the wires to the terminal block as detailed in Figure 3.45 for the required motor supply voltage.

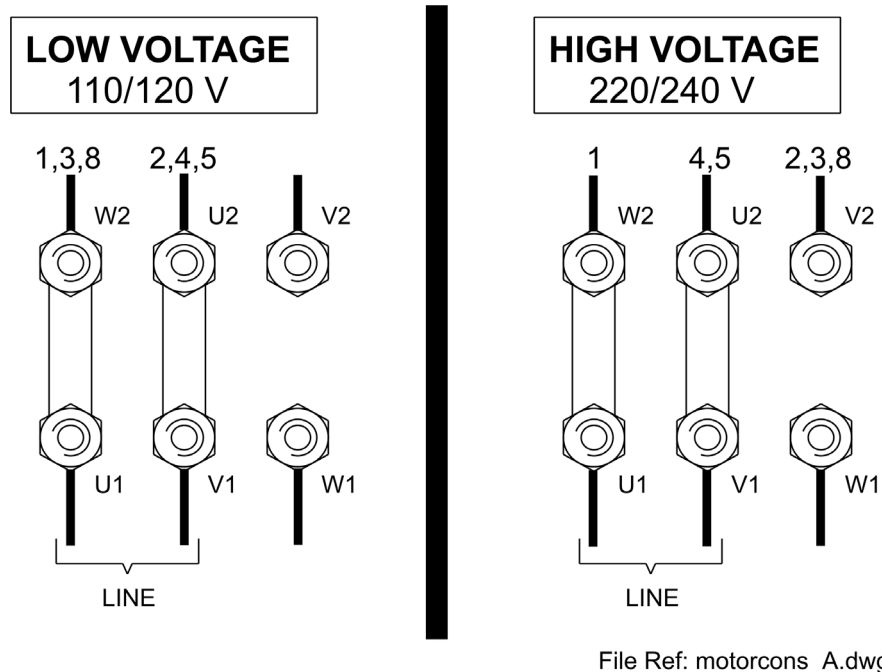


Figure 3.45 Dual Voltage Single Phase Motor Connections

Table 8: Single Phase Motor Cable Data

Wiring Diagrams 65900061 or 65900062	Description	Motor Label Reference
TSH1	AC LINE	L, L1 or U1
TSH2	AC NEUTRAL	N, L2, U2 or V1

6.4.5.2 Three Phase Motor Connections

For dual voltage three phase motors, ensure that windings are configured for the appropriate voltage, see Figure 3.46. Delta (triangle) connected windings are for low voltage operation, Star (Y) for high voltage.

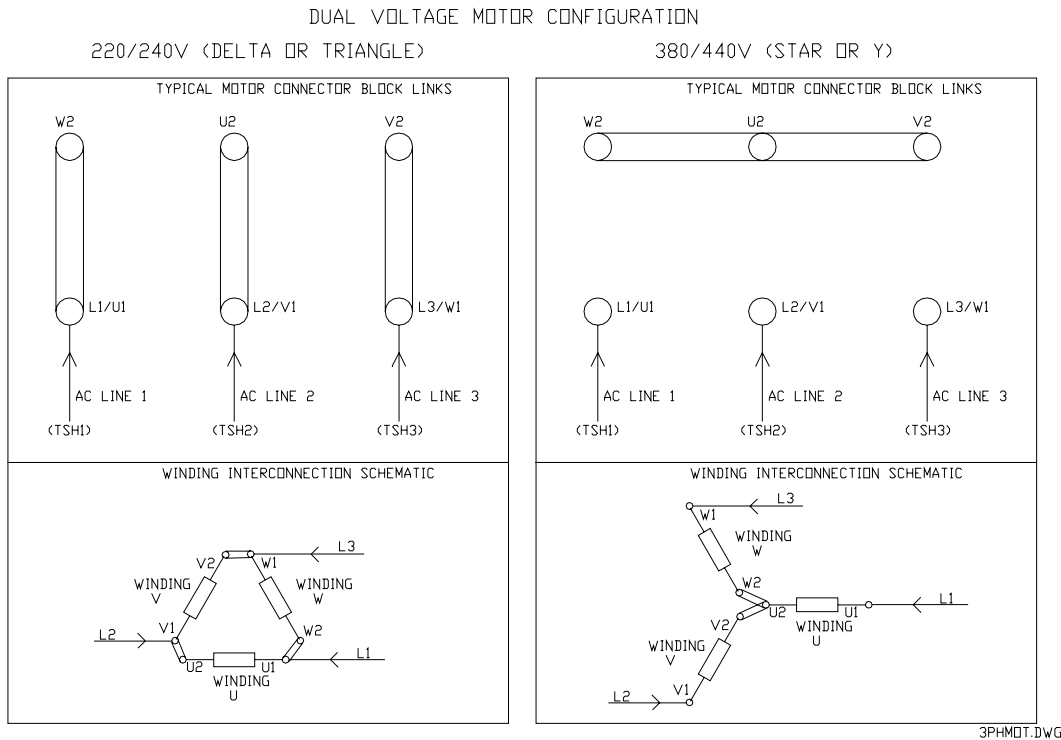


Figure 3.46 Dual Voltage 3 Phase Motor Configuration

The label on the inside of the termination box cover gives details of mains supply connections, and of the winding re-configuration details for alternate voltages if appropriate.

Ensure that the rated motor volts are matched to the supply. If the radar antenna rotates in the wrong direction, reversal of any two phases will correct this (the radar antenna should rotate anti-clockwise when viewed from below).

Table 9: Three Phase Motor Cable Data

Wiring Diagrams 65900061 or 65900062	Description	Motor Label Reference
TSH1	AC LINE 1	L1 or U1
TSH2	AC LINE 2	L2 or V1
TSH3	AC LINE 3	L3 or W1

6.4.6 Cabling Connections

Figure 3.47 shows the cable entry points. Three of these are via cable glands labelled 1, 2 and 3. Details of these cable glands are given in Table 10.

The RF cable input is only needed when the Transceiver is mounted below decks (Bulkhead).

The motor supply cable is connected directly to the motor termination blocks mounted in the box on the side of the motor.

A 6mm stud is fitted to let the unit bond to the ship's structure: this must **not** be used for any other connection.

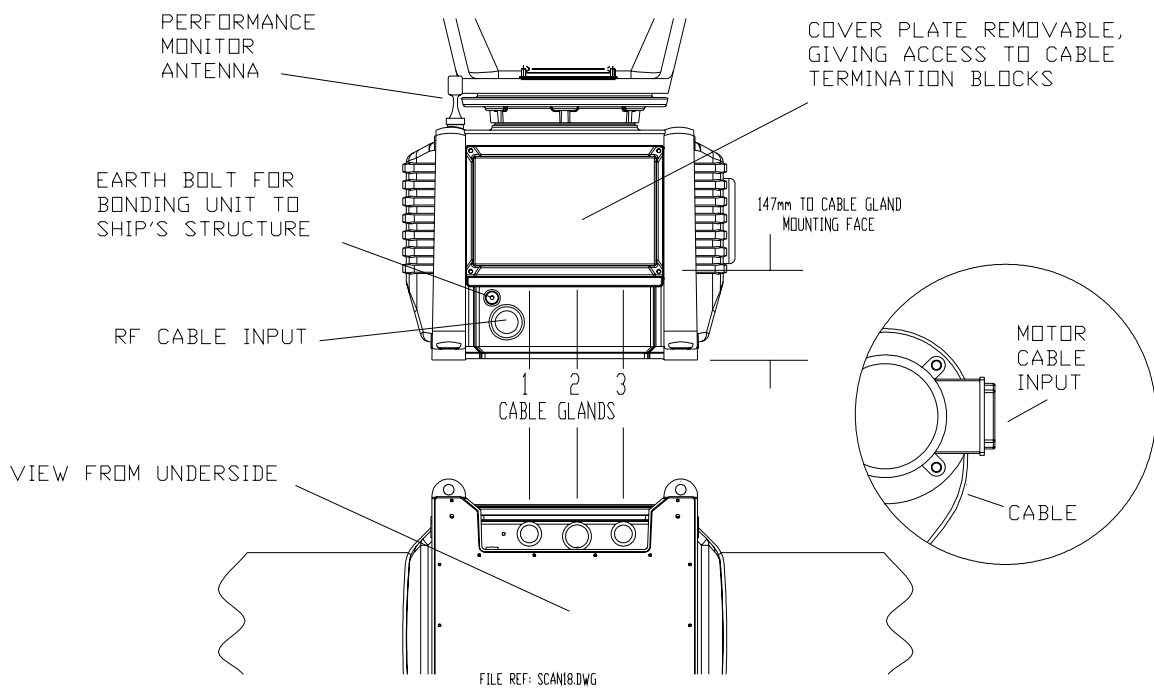


Figure 3.47 Turning Unit – Cable Entry Locations*

* This drawing is for a turning unit without integral Transceiver. Refer to the Table 10 for details of cable fitted for different variants.

Figure 3.48 shows details of the Input Board 65801813 (or 65801819) and the Mains Input connector (integral transceiver only) TSE.

The input board is accessed by removing the cover plate, which is held by four fixing screws (see Figure 3.47). Links LK3 and LK4 on the Input Board should be set as shown in Figure 3.48. Link LK5 is fitted.

For information on input board 65801819 see Section 3.3.2 in Chapter 11 'Additional Features'.

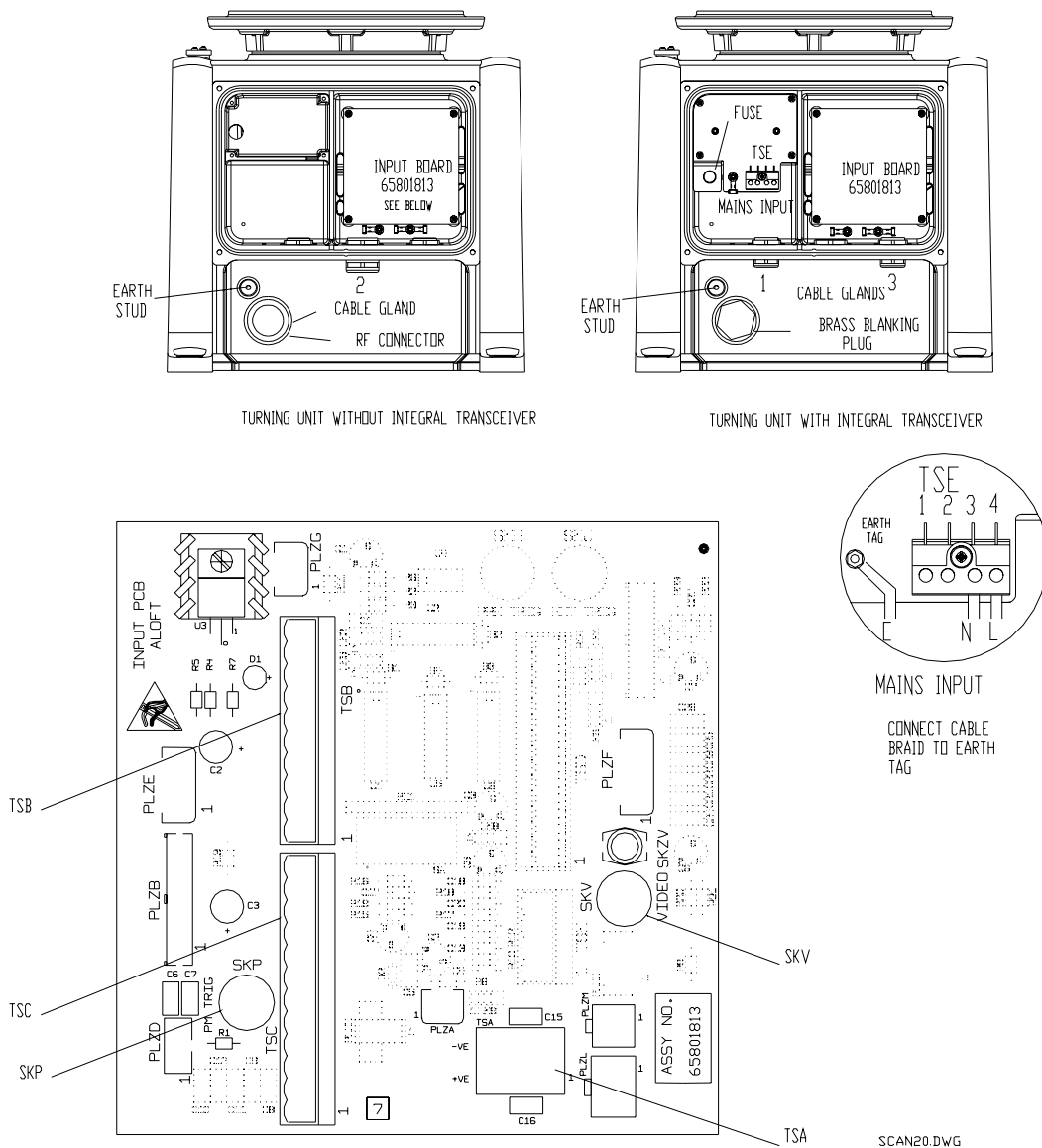


Figure 3.48 Turning Unit – Input Board and Mains Input Details

6.4.7 Fitting the Cable Glands

The installation cables are connected into the Turning Unit (with or without an Integral Transceiver) via the appropriate cable glands, see Table 10 below.

For systems with 'additional features' see the relevant figures in Chapter 11 'Additional Features'.

Table 10: S-band Cable Gland Details

Cable Gland	Turning Unit without Integral Transceiver		Turning Unit with Integral Transceiver	
	Description	Cable Type	Description	Cable Type
Cable Gland 1	—	—	Mains Input	37-3-2R
Cable Gland 2	12-Core	16-2-12C	—	—
Cable Gland 2	PM Trigger	75Ω co-ax	—	—
Cable Gland 3	—	—	2-Core	16-2-2C
Cable Gland 3	—	—	Radar Video	75 Ω co-ax
Cable Gland 3	—	—	Data	T/Pairs
RF Connector	RF Feed	S-Band co-ax	—	—

The body of the gland fits through a hole in the casting and is held in position by the Top Nut. An 'O' ring seal is fitted below the casting surface (input side), see Figure 3.49.

A waterproof seal and an EMC gasket are supplied with each gland as shown in Figure 3.50. Some glands are designed for a single cable; other glands are used for several cables.

Note: *Cable Glands and Blanking Plates are normally factory fitted to the Turning Unit.*

Information about fitting and terminating the RF feeder cable (S-band coaxial) are in Section 6.5.3.

For information on how to terminate the cables into their connector blocks, see Section 7.1 'Cabling and Interconnection Diagrams'.

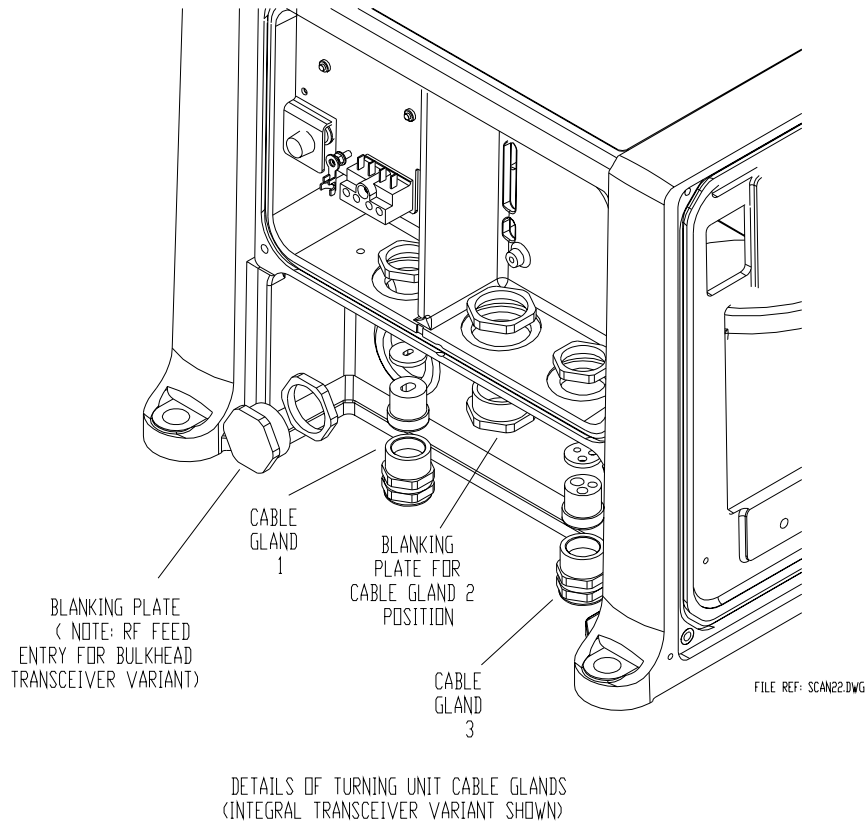


Figure 3.49 General View of the Cable Glands

The waterproof seal works by clamping onto the cable PVC sheath. The EMC seal clamps onto the cable braid.

Note: *Do not force the outer sheath through the EMC gasket; the gasket can split.*

The braid is also formed into a tail that is grounded by means of an adjacent earth tag. The fitting procedure is detailed in Figure 3.51.

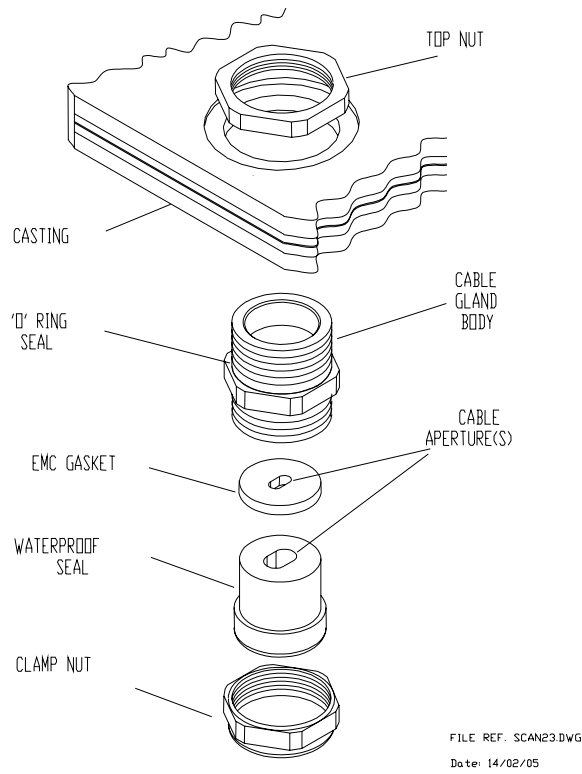


Figure 3.50 Detailed view of a Cable Gland

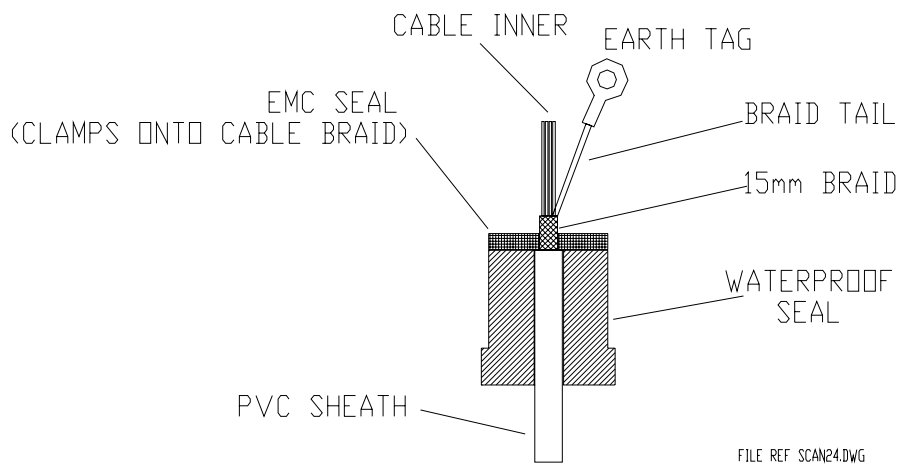


Figure 3.51 Cable Installation Details

6.4.8 Installing the Cables

To install the cables:

1. Unscrew the gland nut.
2. Remove the waterproof seal and the EMC seal.
3. Feed the cable through the gland nut and the waterproof seal.
4. Strip the outer sheath to expose approximately 300mm of braid.
5. Push the braid back to expose approximately 50mm of the inner cores.
6. Trim 50mm off the inner cores.
7. Pull the braid back over the inner cores and twist into a point.
8. Feed the braid through the EMC seal until the cable is positioned as in Figure 3.51.

For the multicore cables:

Flare out the braid to within approximately 15mm of the EMC seal, and form it into a tail.

For the coaxial cables:

Do not fit the coaxial connector at this time.

6.4.8.1 Assembling cables into Turning Unit

To assemble the cables into the turning unit:

1. Feed the assembled cables and seals into the gland body.
2. Tighten the gland nut until the EMC seal is compressed.
3. Crimp the earth tags provided to the braids of the multicore cables
4. Attach them to the earth studs adjacent to the cables: the tails should be as short as is practicable.
5. Trim and make off the cable inners to the appropriate terminal blocks.
6. Trim the coaxial cables to length.
7. Slide the plastic sleeve supplied in the despatch kit over the exposed braid.
8. Fit the coaxial connectors.
9. Plug them into the appropriate sockets.

6.5 S-band Bulkhead Transceiver

The S-band Bulkhead Transceiver, 65831A, is installed below decks in a suitable location such as the ship's equipment room. The installation should consider accessibility for maintenance and servicing, and the distance between the Transceiver and the Scanner Unit.

For maximum performance, this should be kept as short as practicable as the loss per metre of the S-band coaxial cable is typically 8.31dB per 100 metres (1.7dB for 20m). This loss applies to both the transmitted RF pulse and the received signals.

The maximum recommended cable length using standard coaxial cable (PT1YM) is:

- 30 metres between the Turning Unit and the Transceiver Unit; and
- 67 metres between the Transceiver and Display.

Greater separation is possible by using a lower loss cable. Contact Northrop Grumman Sperry Marine B.V. if greater separation is needed.

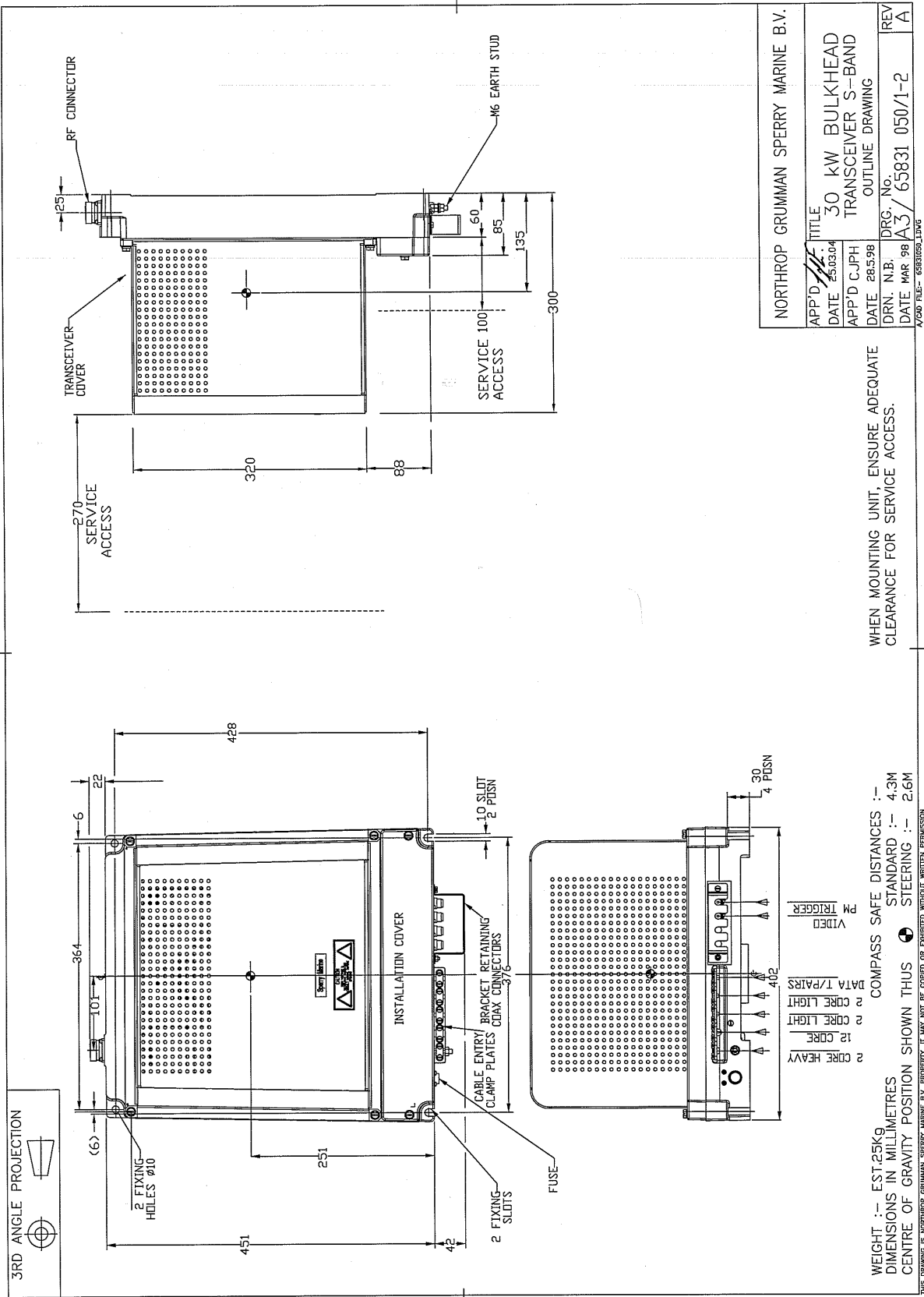


Figure 3.52 S-Band Bulkhead Transceiver 30kW Installation

6.5.1 Assembling the Bulkhead Transceiver

The Transceiver may be attached to the bulkhead by several methods. The actual method chosen will depend on individual circumstances: consider the likely vibration and shock loading which may be experienced. The available methods include through bolting to the bulkhead, or mounting on studs supplied by the shipyard, see Figure 3.53 below. Slotted mounts are supplied at the bottom for ease of installation.

Note: *The positions of the four fixings for the unit are not on a rectangle. The horizontal spacing of the top fixings is 364mm compared with 376mm for the lower fixings. When choosing the installation location for the Transceiver, consider how the RF feeder coaxial cable is to be routed.*

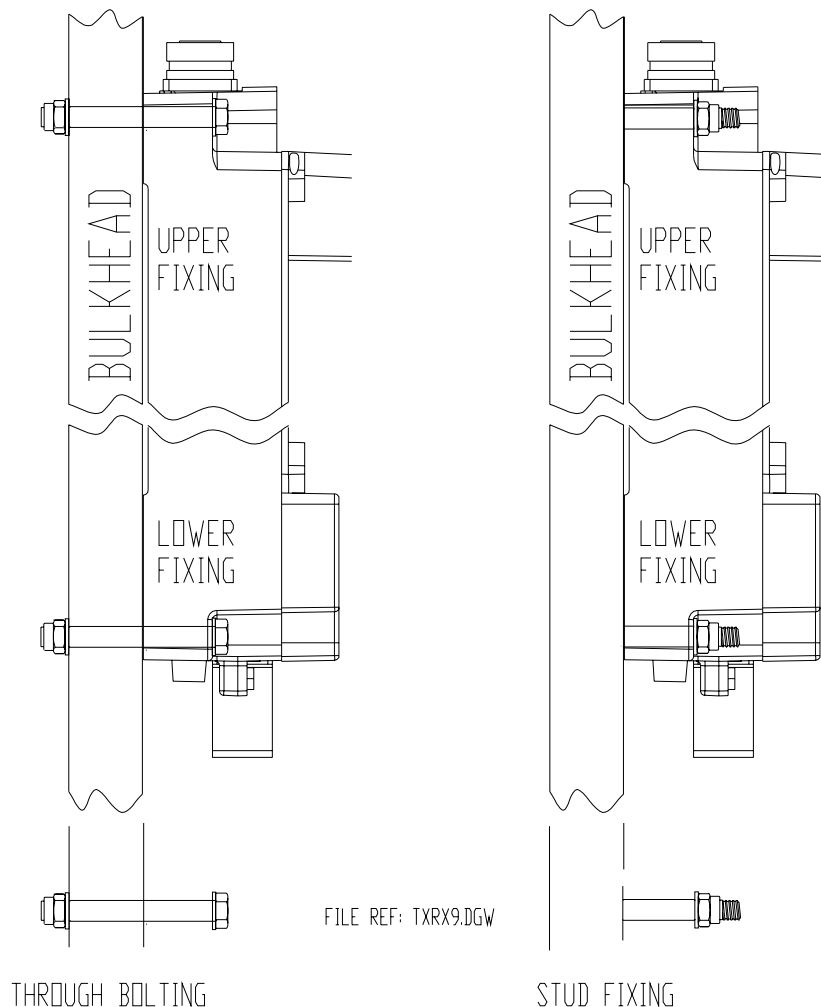


Figure 3.53 Bulkhead Transceiver – Mounting Alternatives

6.5.2 Cabling Information

Figure 3.54 below shows details of the cable inputs. The cable cover plate, which is secured by two fixing screws, is shown removed.

Note: A cable retainer holds the coaxial cables. This must be fitted after the cables are in place.

All other cables, with the exception of the RF feeder S-band coaxial cable, are individually clamped on their cable braids to provide EMC shielding. The braids are also made off as tails and connected to earth tags provided. The AC mains input is connected to TSE as shown.

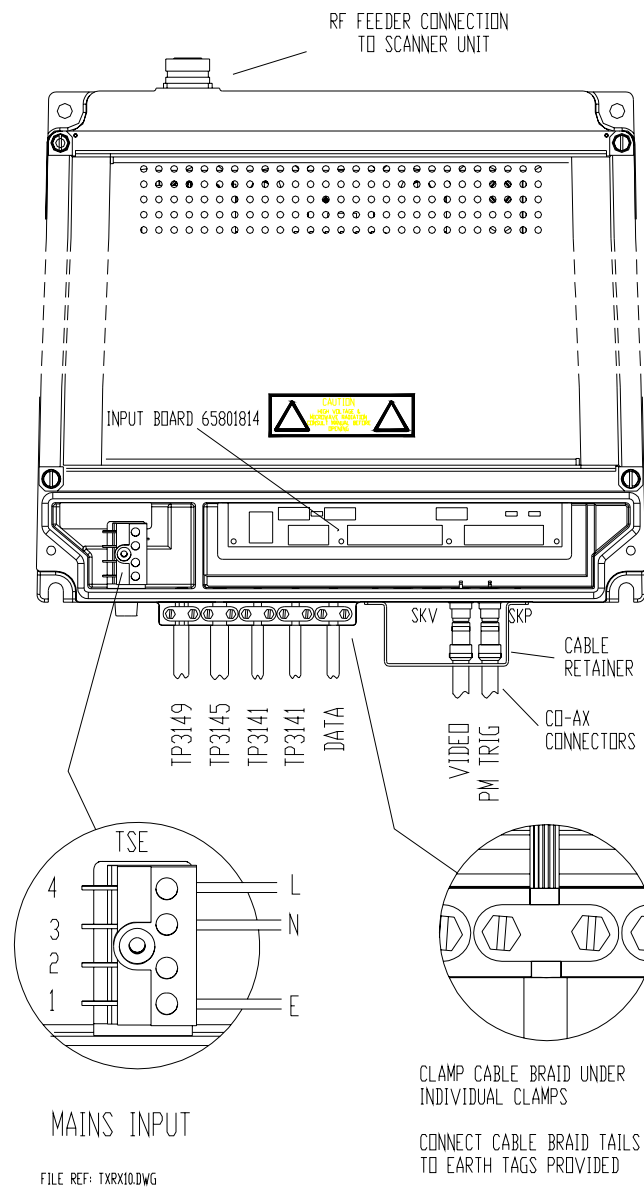


Figure 3.54 Bulkhead Transceiver – Cable Input Details

Figure 3.55 shows details of the Input Board, 65801814. Refer to the cabling schedules for details of the connections, which are made via the two part connectors provided. Links LK2 and LK3 on the Input Board should be set as shown. Link LK1 is not fitted.

Refer to Section 3.3.1 in Chapter 11 'Additional Features' for details of PCB 65801815 fitted to 'additional features' Transceivers.

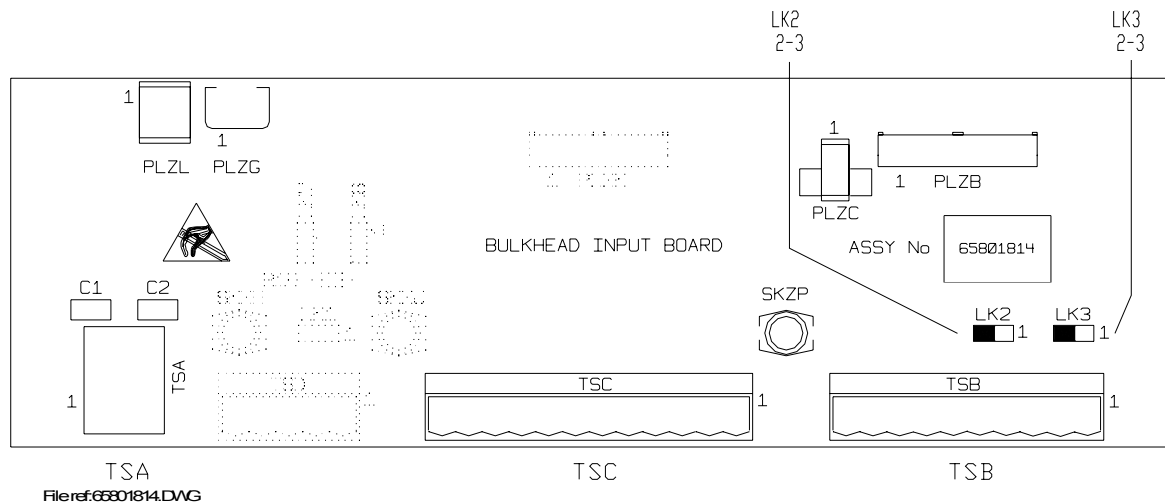


Figure 3.55 Bulkhead Transceiver – Input Board Details

6.5.3 Fitting the RF Feeder Cable (S-band Coaxial Cable)

6.5.3.1 General Information

A RF coaxial cable is used for the run between the Bulkhead Transceiver Unit and the Turning Unit with S-band radars. The cable used is Andrew Antennas Heliac LDF5-50A 7/8in 50 ohm – overall diameter 28mm (1.1in).

Although robust, the cable must be protected against strain and kinking, and must be treated with the greatest care at all times. The ends of the cable must be kept sealed against the ingress of moisture before the connectors are assembled.

Wherever possible, bends should have as great a bending radius as practicable. A single bend may be made when necessary with a minimum bending radius (measured from the axis of the cable) of 250mm (10in).

For convenience, the upper (Turning Unit) connector can be fitted before you install the cable. Because of the possibility of movement of the inner conductor relative to the outer conductor the following precautions must be taken:

1. Any bend required within 1m (3ft) of the cable end must be formed before carrying out the cutting and assembly procedure detailed in subsequent paragraphs. No bend may be closer than 250mm (10in) from the end of the cable.

2. To allow for movement between the Turning Unit and mast, whenever possible, a double bend should be formed in the cable to produce an offset immediately below the Turning Unit.
3. The cable and assembled connector should be fitted to the Turning Unit so that a minimum amount of distortion of the cable occurs between the connector and the pre-formed bend.
4. The cable should be installed and secured in position (using the waveguide supports) as far as is practicable before the lower (Transceiver Unit) connector is fitted to the cable. The precautions given in paragraph 1 above must be observed if a bend is required adjacent to the Transceiver Unit.

6.5.3.2 Assembling the Connectors

Figures 3.56 to 3.64 are reproduced by permission of Andrew Antenna.

General

A straight connector assembly (Type L45DM) is used to terminate the feeder cable at each end. The assembly comprises a clamping nut, spring ring, outer connector, cable cutting guide and compression cap.

Tools required

A fine-toothed blade hacksaw, a 1 $\frac{1}{4}$ in open-ended spanner and a 1 $\frac{3}{8}$ in open-ended spanner will be sufficient for fitting the connectors to the cable.

Procedure

The procedure that follows applies to the straight connectors at each end of the feeder cable. It is very important that swarf and other foreign matter is prevented from entering the cable.

Prepare the cable end and assemble the connector as follows:

1. Using a knife, remove approximately 2in (50mm) from the end of the jacket.

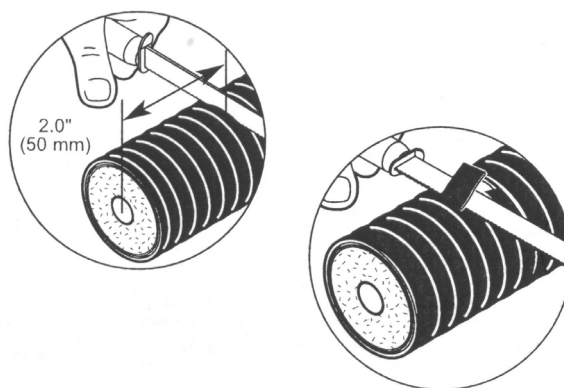


Figure 3.56 Removing Cable Jacket

2. Make sure the end of the cable is straight by attaching the cable cutting guide approximately 1 1/2 in (38mm) from the jacket and cutting the end of the cable using a hacksaw, see Figure 3.57.

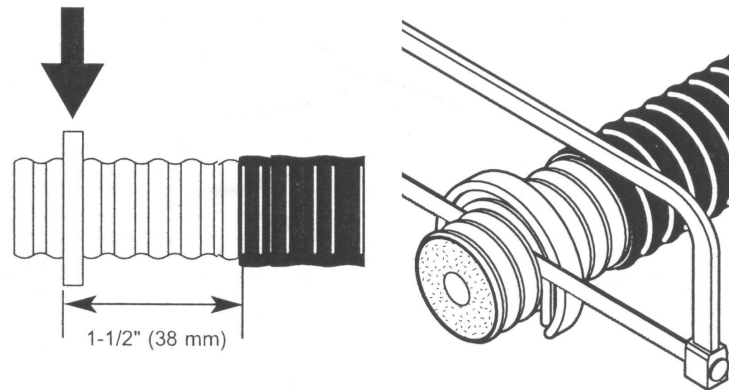


Figure 3.57 Cutting the Cable End

3. Deburr the inside edge of the inner conductor and the inside edge of the outer conductor, see Figure 3.58.

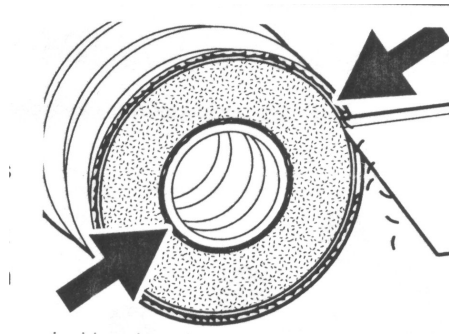


Figure 3.58 Deburring inside edges of conductor

4. Deburr the outside edge of the outer conductor, see Figure 3.59. Be sure outer conductor is round and undistorted.

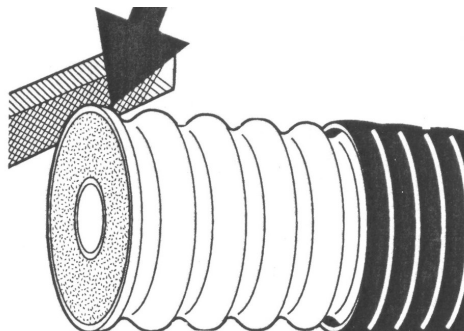


Figure 3.59 Deburring outside edge of conductor

Fitting the RF Feeder Cable (S-band Coaxial Cable)

Installation

5. Using a wire brush carefully remove debris from the end of the cable.
6. Add the clamping nut to the end of the cable, push the nut up the cable until it covers the jacket end, see Figure 3.60.

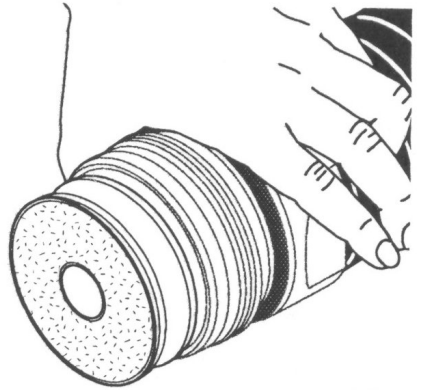


Figure 3.60 Adding Clamping Nut to Cable

7. Add the spring ring to the cable end, see Figure 3.61.

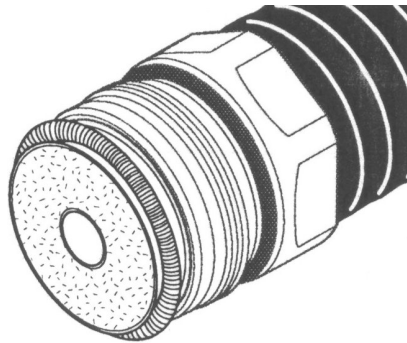


Figure 3.61 Adding the Spring Ring

8. Attach the compression cap to the cable end and using a twisting motion compress the cable foam against the clamping nut, see Figure 3.62.

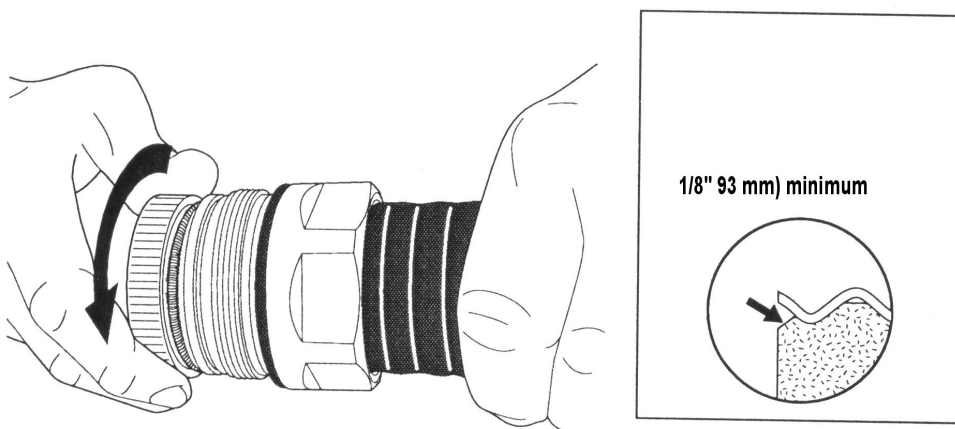


Figure 3.62 Attaching end cap and compressing foam

9. Attach the outer connector to cable end and screw onto the clamping nut, see Figure 3.63.

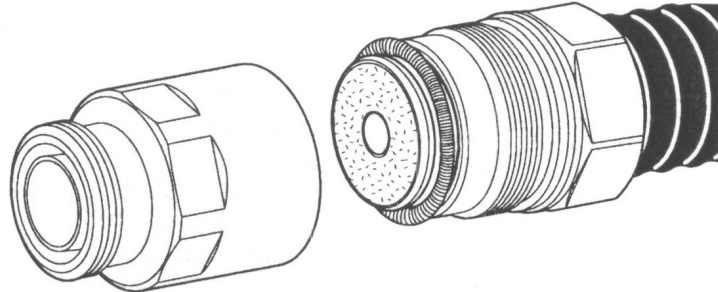


Figure 3.63 Attaching Connector to Body

10. Tighten the outer connector using the 1¼in and 1⅜in spanners. Hold the outer connector with one spanner and turn the clamping nut; do **not** turn the outer connector. Make sure there is good metal to metal contact between the clamping nut and outer connector, see Figure 3.64.

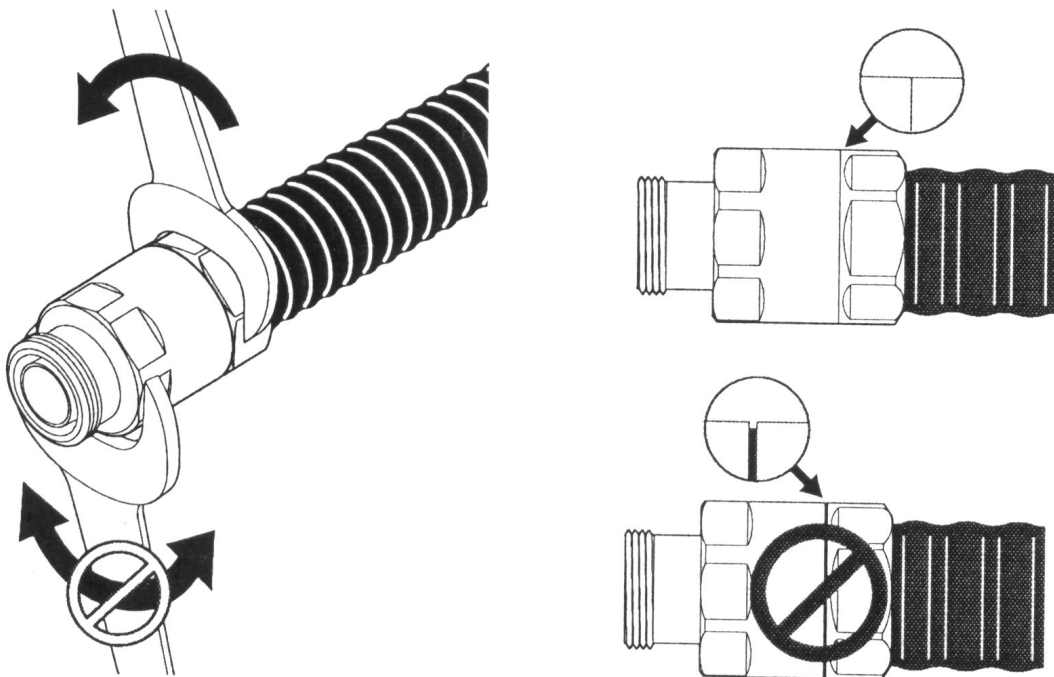


Figure 3.64 Screwing the Connector to the Clamping Nut

6.5.3.3 Fitting the Deck Gland

The 7/8in RF feeder cable passes through its own separate deck gland (Andrew Feed-Thru Kit Type 40656-1), positioned near the foot of the mast. The gland kit consists of:

- a rubber boot
- metal flange halves
- eight Lock-o-seal washers
- an adjustable clamp (Jubilee clip).

In addition you will need (see Figure 3.65):

- eight 1/4in bolts (of suitable length)
- flat washers
- lock washers
- nuts.

To fit the deck gland do the following:

1. Cut a 75mm (3in) diameter hole in the deck and, having installed and secured the cable from the Turning Unit downwards, pass the Transceiver Unit end down through the hole.
2. Apply silicone grease to the hole and to the slit and tapered edge of the rubber boot.
3. Place the boot around the feeder, slide the boot down into the hole in the deck and then mark the location of the eight holes for the fixing bolts.
4. Withdraw the boot from the hole and drill eight 8mm (5/16in) mounting holes through the deck.
5. Slide the boot back into the hole in the deck and position the flange halves in the groove in the boot.
6. Align the flange holes with the boot holes and secure the assembly in position with eight 1/4in bolts, flat washers, lock washers and nuts, together with the Lock-o-seal washers provided in the gland kit. The bolts are inserted downwards and the Lock-o-seal washers only go under the bolt heads.
7. Fit the adjustable clamp (Jubilee clip) around the boot and tighten to ensure a leak proof seal.

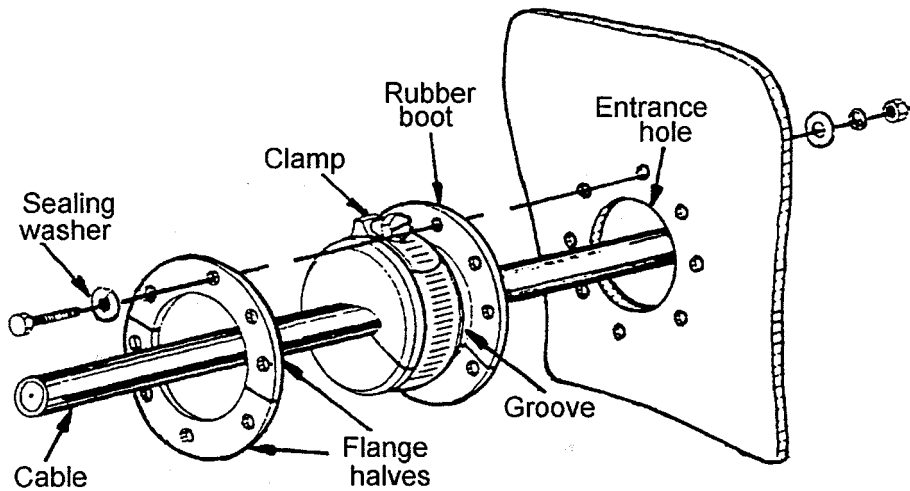


Figure 3.65 Deck Gland Details

6.5.3.4 Installing the Cable

Cable Hangers are supplied (Andrew Hanger Kit Type 42396A-5) to support the cable along the cable run between the Scanner Unit and the Bulkhead Transceiver. Each kit contains 10 Hangers. Their associated Fixing Kit (Andrew Type 31769-1) is included as part of the Installation Kit.

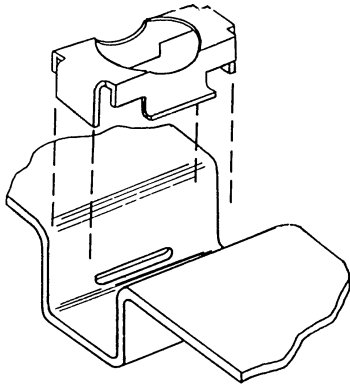
Normally, a hanger is attached to a cable tray, using suitable bolts, at a recommended spacing of 0.9 metres (3 feet). The support brackets must be fitted to the hangers to prevent distortion when the hanger is wrapped around the coaxial cable as shown in Figure 3.66.

Figure 3.66 also shows additional hardware (not supplied in the Installation Kit) that helps with special mounting arrangements. If required, these can be purchased from Andrew Corporation.

Fitting the RF Feeder Cable (S-band Coaxial Cable)

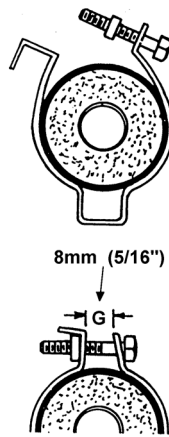
Installation

Add support bracket 42241

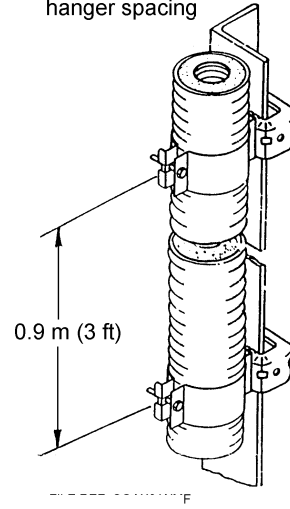


FILE REF: COAX7.WMF

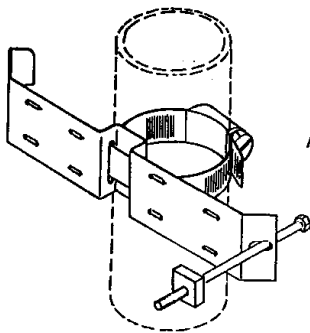
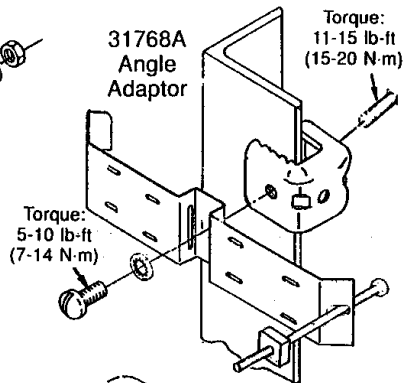
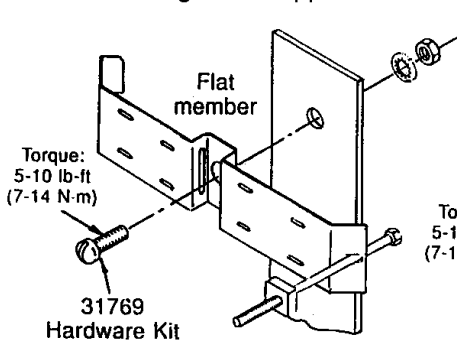
FILE REF: COAX10.WMF



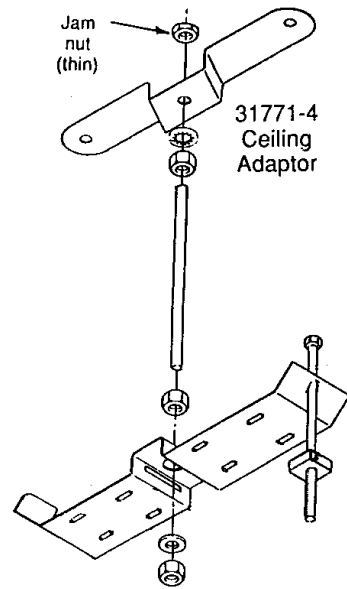
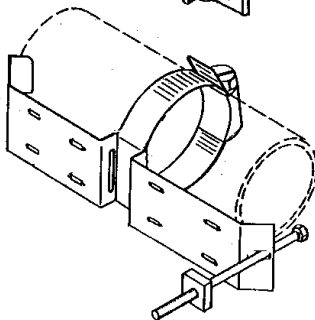
Recommended hanger spacing



Attach hangers to support structure



31670 Round Adaptor



FILE REF: COAX11.WMF

Figure 3.66 Cable Support Details

6.6 Scanner Control Unit

6.6.1 Mounting Position

Normally, the Scanner Control Unit (SCU) is mounted so that it is accessible to the radar operator. Also it must be mounted so that a service engineer can get access to the isolator for the mains supply to the Turning Unit motor. Therefore, it is preferable to mount the SCU close to the Mains Isolator, see Figure 3.68 for the SCU Installation drawing.

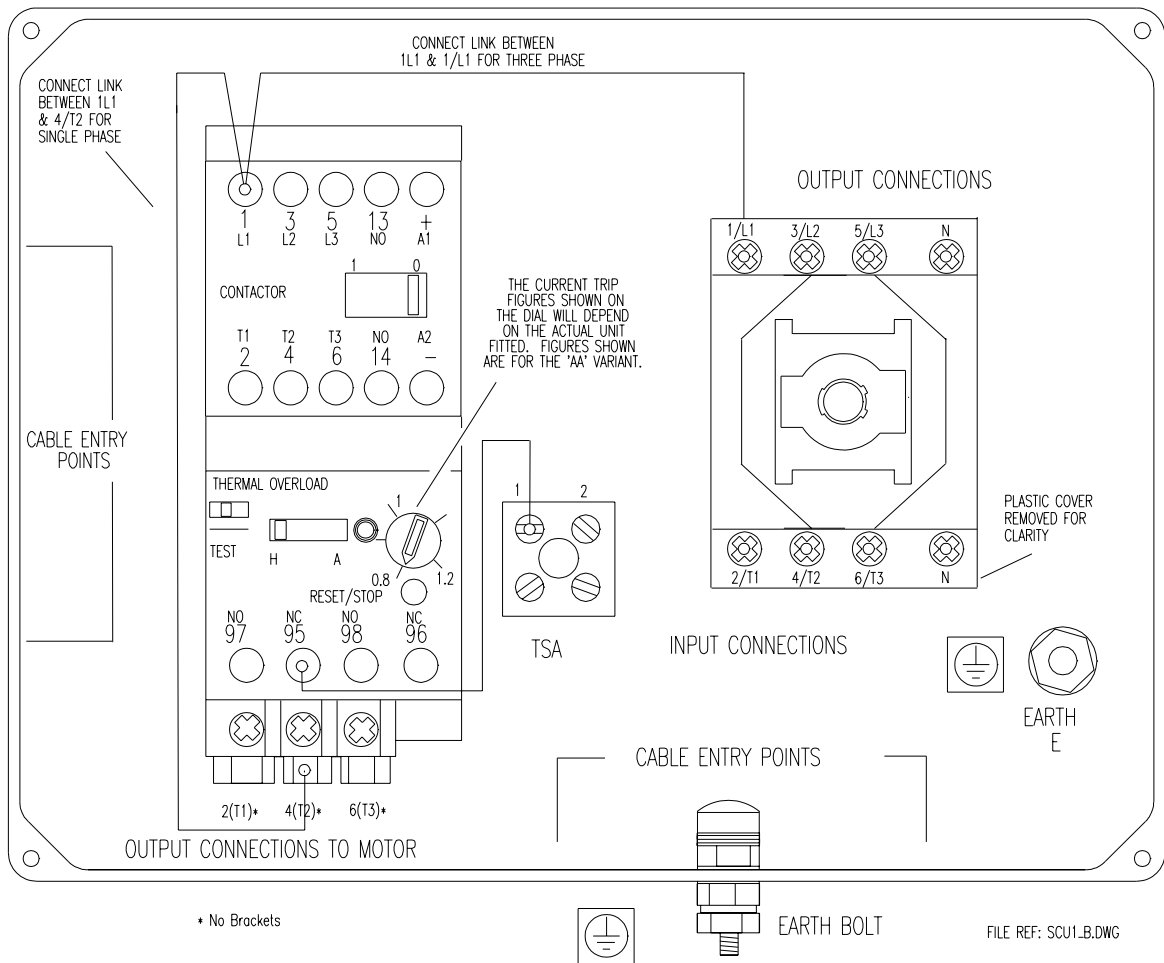


Figure 3.67 Scanner Control Unit - Internal Layout

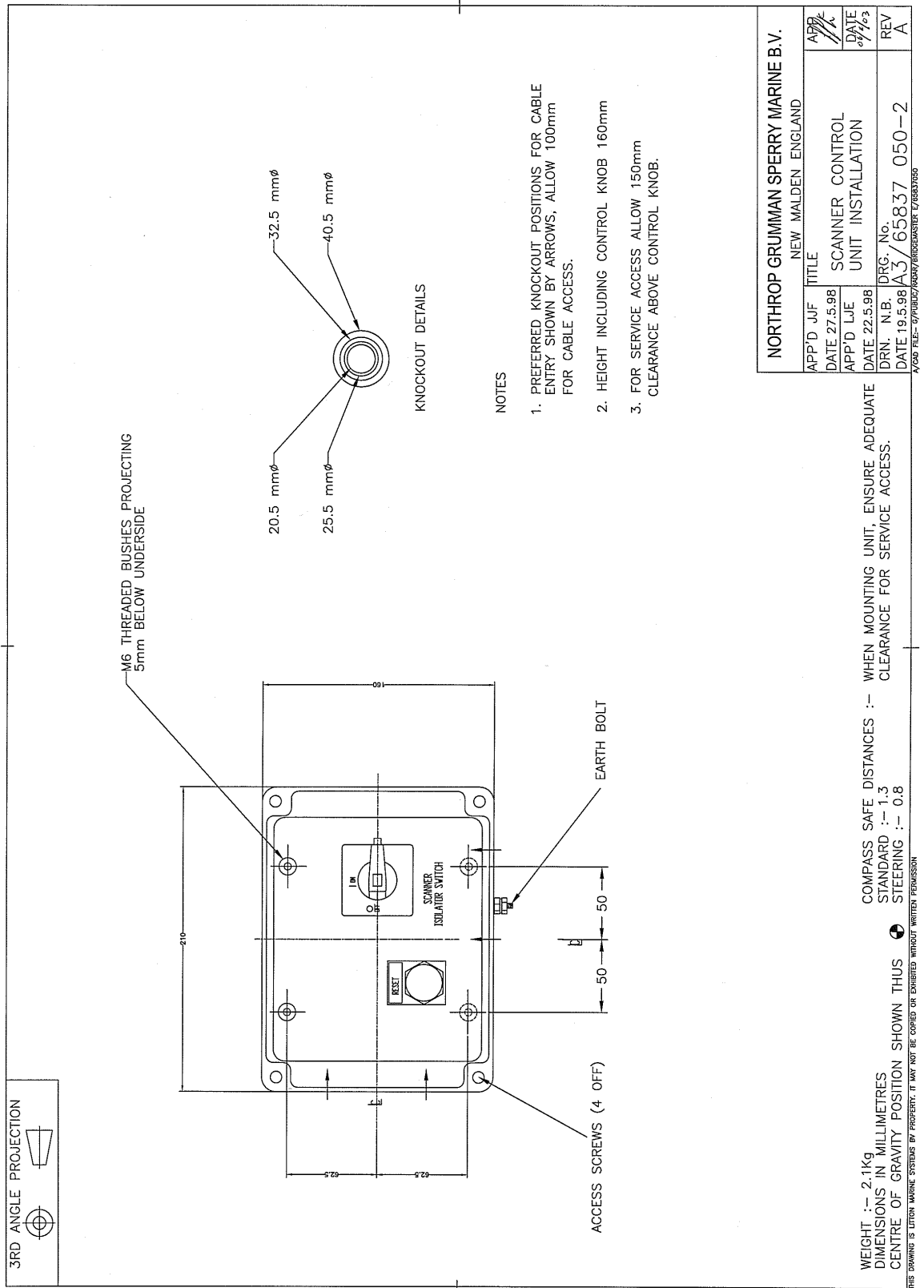


Figure 3.68 Scanner Control Unit Installation

6.6.2 Single Phase or Three Phase Mains Supply Voltage

The connection details and relevant cabling schedules for a single-phase supply (1φ) SCU and three-phase supply (3φ) SCU are shown in Figure 3.69 and Figure 3.70 respectively.

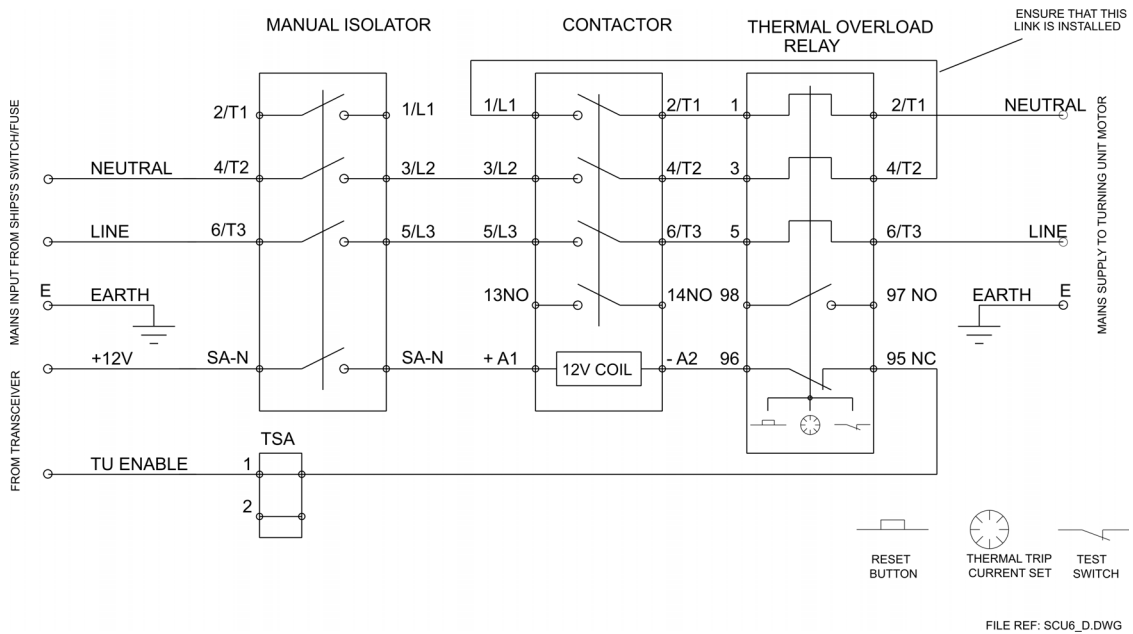


Figure 3.69 Scanner Control Unit – Single Phase Supply Arrangement*

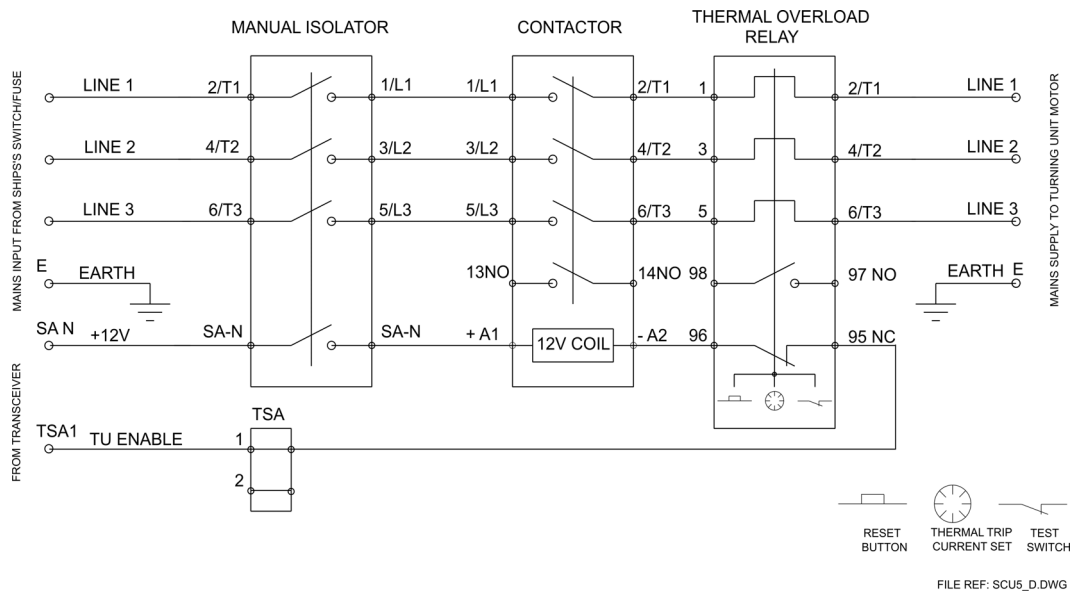


Figure 3.70 Scanner Control Unit – Three-Phase Supply Arrangement*

* Refer to Cable Schedules for details of connections to the ship's supply and the Turning Unit motor.

For Thermal Trip current settings, refer to Table 11 in Section 6.6.3.

Cable type 37-3-2R may be used for 220/240V supplies.

6.6.3 Scanner Speed Option

Two scanner speed options, 'Standard' and 'High', are available, depending on the type of scanner motor. Motor types 91003751, 52, 57 and 58 are standard speed; 91003753, 54, 59 and 60 are high-speed.

See Section 6.5.3.4 '*Installing the Cable*' for connection details.

Table 11 below defines the Thermal Current Trip settings for each variant. These settings must be set during installation.

Table 11: Thermal Current Trip Settings

Mains Supply Voltage	Standard Speed Scanner		High-Speed Scanner	
	50Hz	60Hz	50Hz	60Hz
110/120 Volts 1 ϕ	8.0A	8.0A	8.0A	8.0A
	65837AH	65837AH	65837AH	65837AH
220/240 Volts 1 ϕ	4.0A	4.0A	4.0A	4.0A
	65837AE	65837AE	65837AE	65837AE
110/120 Volts 3 ϕ	5.2A	5.2A	6.4A	6.4A
	65837AE	65837AE	65837AF	65837AF
220/240 Volts 3 ϕ	2.2A	2.2A	4.0A	4.0A
	65837AC	65837AC	65837AE	65837AE
380/440 Volts 3 ϕ	1.3A	1.3A	1.8A	1.8A
	65837AB	65837AB	65837AC	65837AC

6.7 Isolation Transformer Unit

Refer to Figure 3.71 for the installation of this unit.

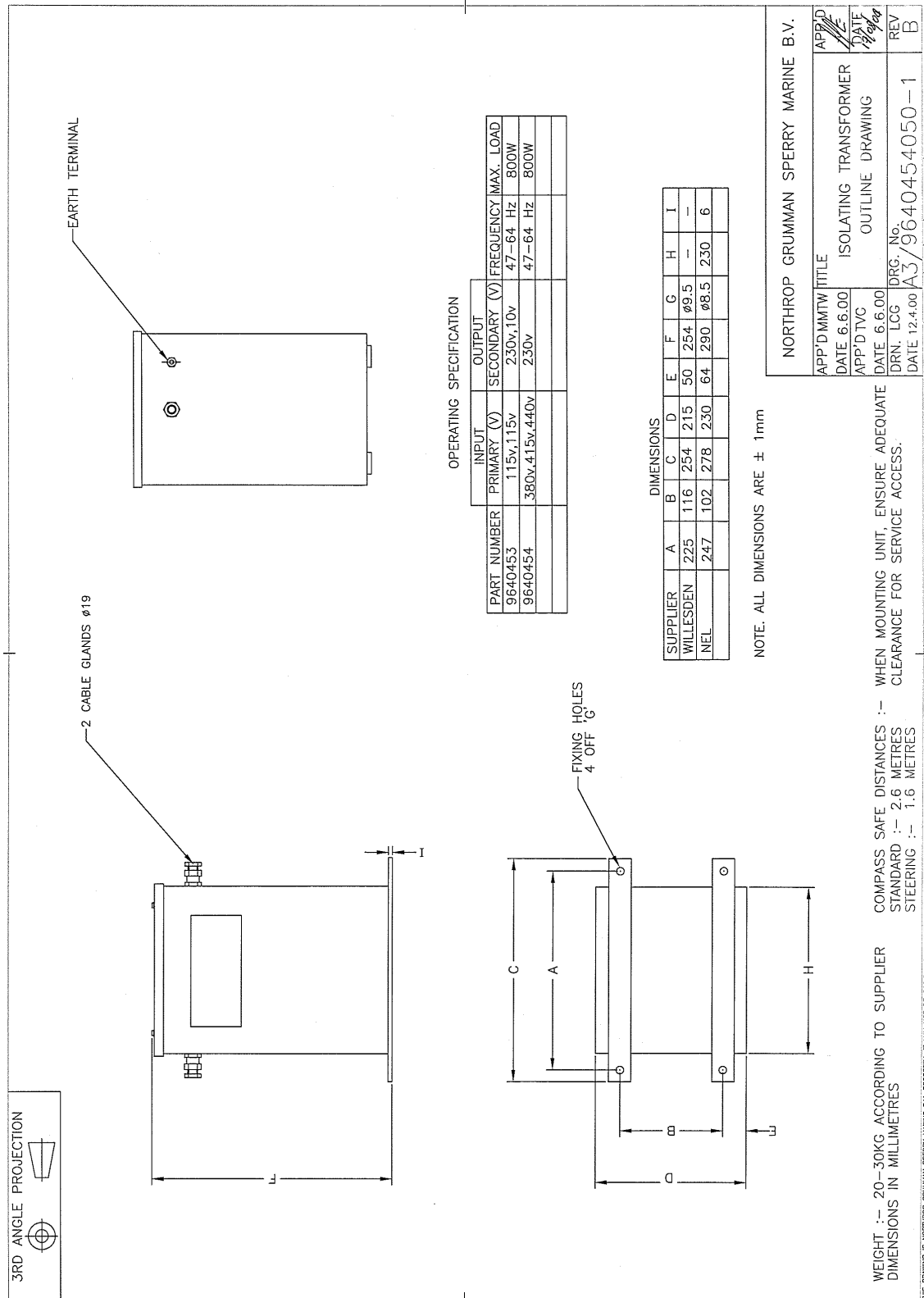


Figure 3.71 Isolation Transformer Unit Installation

6.8 Console Assembly

The VisionMaster console assembly can be supplied in either of the following variants:

- a 340 mm deck mounted modular unit
- a 340 mm table top unit

Each unit comprises the following sub assemblies and modules:

- Display Unit - comprises a flat panel monitor and chassis assembly
- Control Panel assembly - comprises a trackball, On/Off switch and USB socket.
- PCIO Unit
- Processor Unit

The deck mounted unit also includes a Pedestal, which includes two shelves for the PCIO unit and Processor unit.

The deck mounted unit and table top unit can be supplied either as a standalone console, or installed in an existing console suite. A standalone version comes with the addition of display side cheeks and pedestal side panels.

Refer to Figure 3.72 and Figure 3.73 (sheets 1 and 2) for the deck mounted console outline drawings, standalone version.

Refer to Figure 3.74, Figure 3.75 and Figure 3.76 (sheets 1 to 3) for the deck mounted console assembly outline drawings for installation into an existing console suite.

Refer to Figure 3.77 for the table top console assembly outline drawing.

Note: *The console assembly outline drawings do not include the PCIO and Processor units.*

The assembly instructions are given in the order they should be done. To assemble the console units from their supplied parts, refer to the documentation supplied with the parts and the following sub-sections:

- Section 6.9.1 '*Installing a Standalone Pedestal to the Deck*'
- Section 6.9.1.1 '*Installing the Control Panel to the Display Chassis*'.
- Section 6.9.1.2 '*Installing the Control Panel/Display Chassis to the Pedestal*'.
- Section 6.9.6 '*Installing the Monitor to the Display Chassis*'.

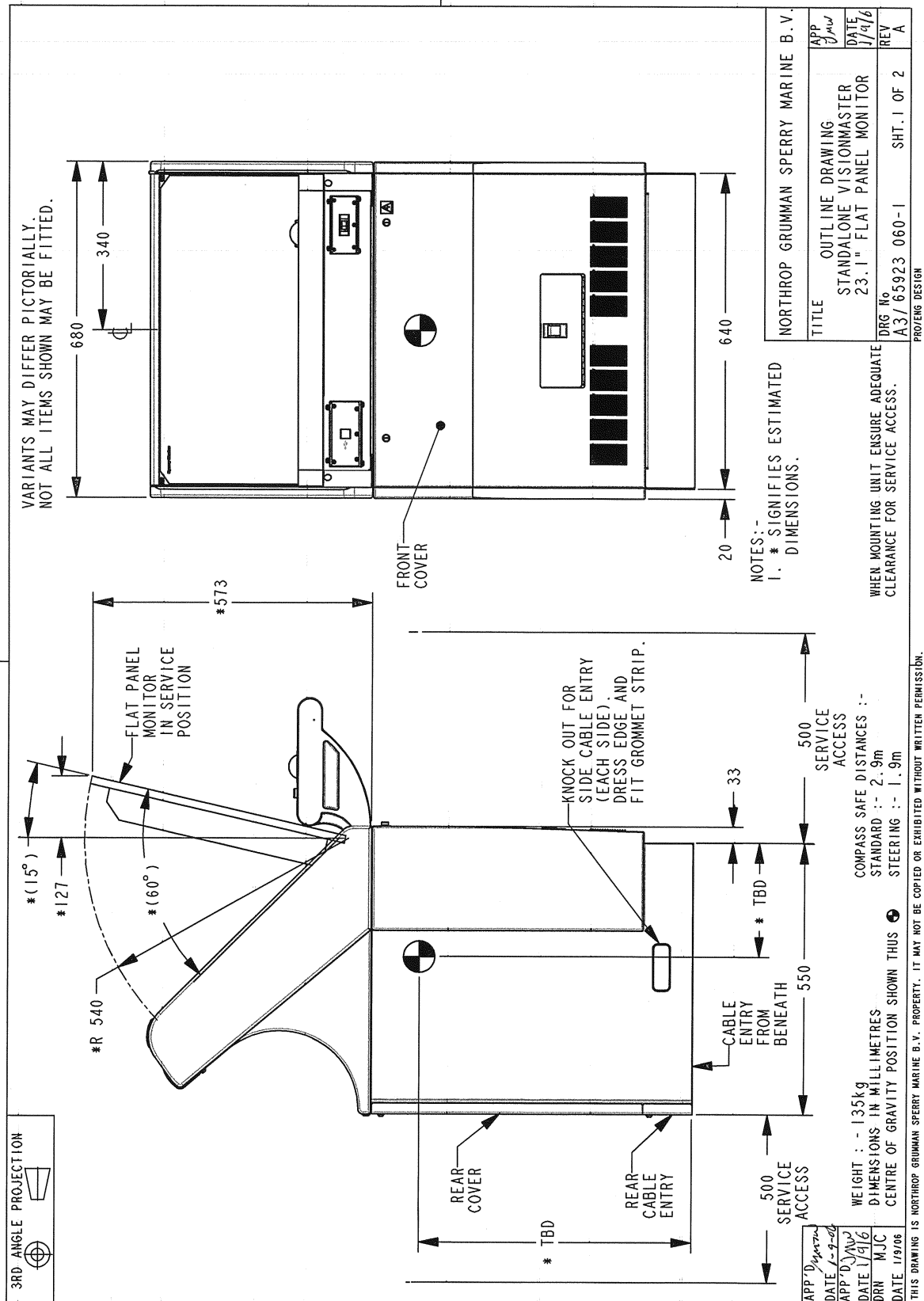


Figure 3.72 Deck Mounted Console Assembly Outline Drawing Standalone Version - Sheet 1

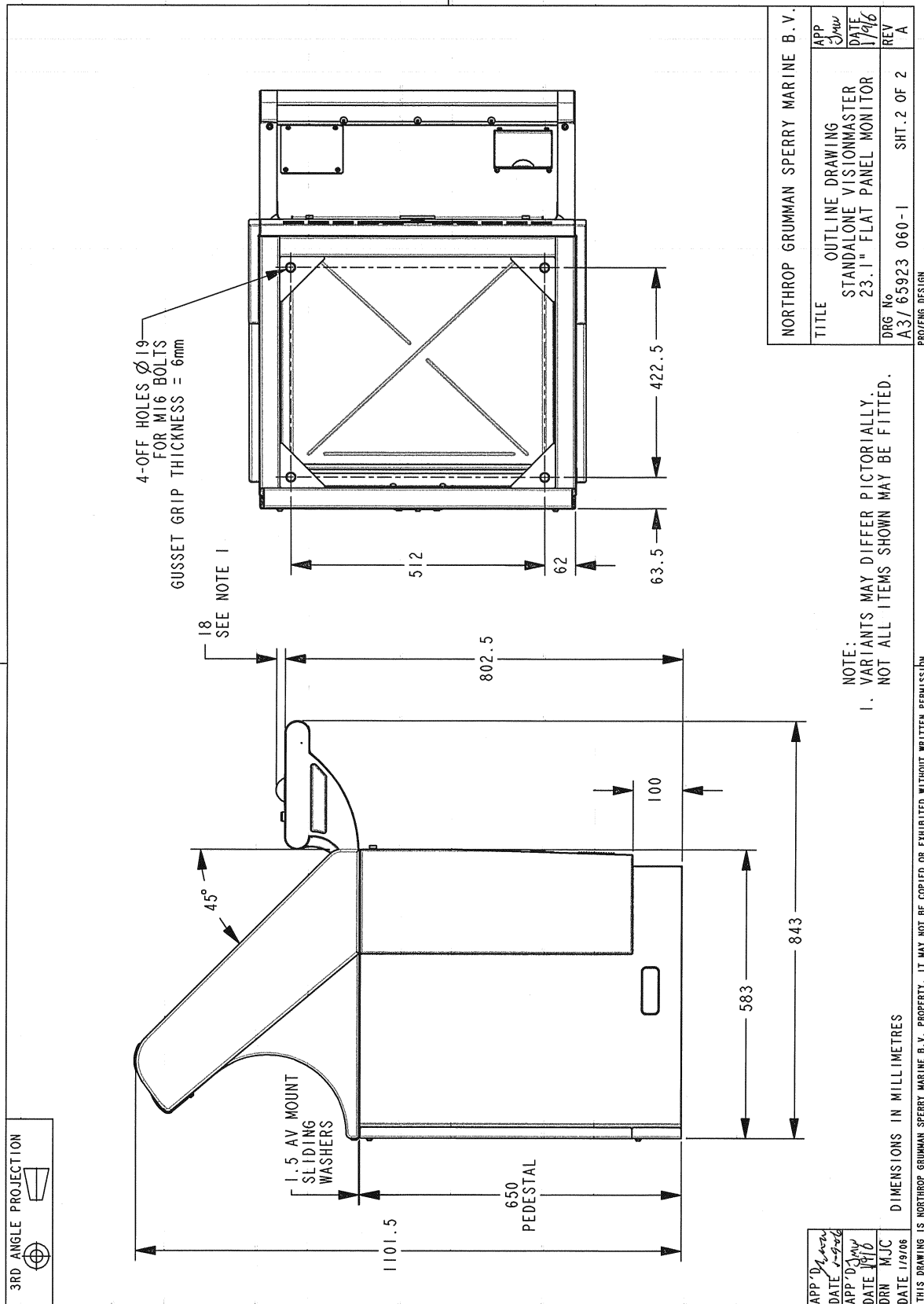


Figure 3.73 Deck Mounted Console Assembly Outline Drawing Standalone Version - Sheet 2

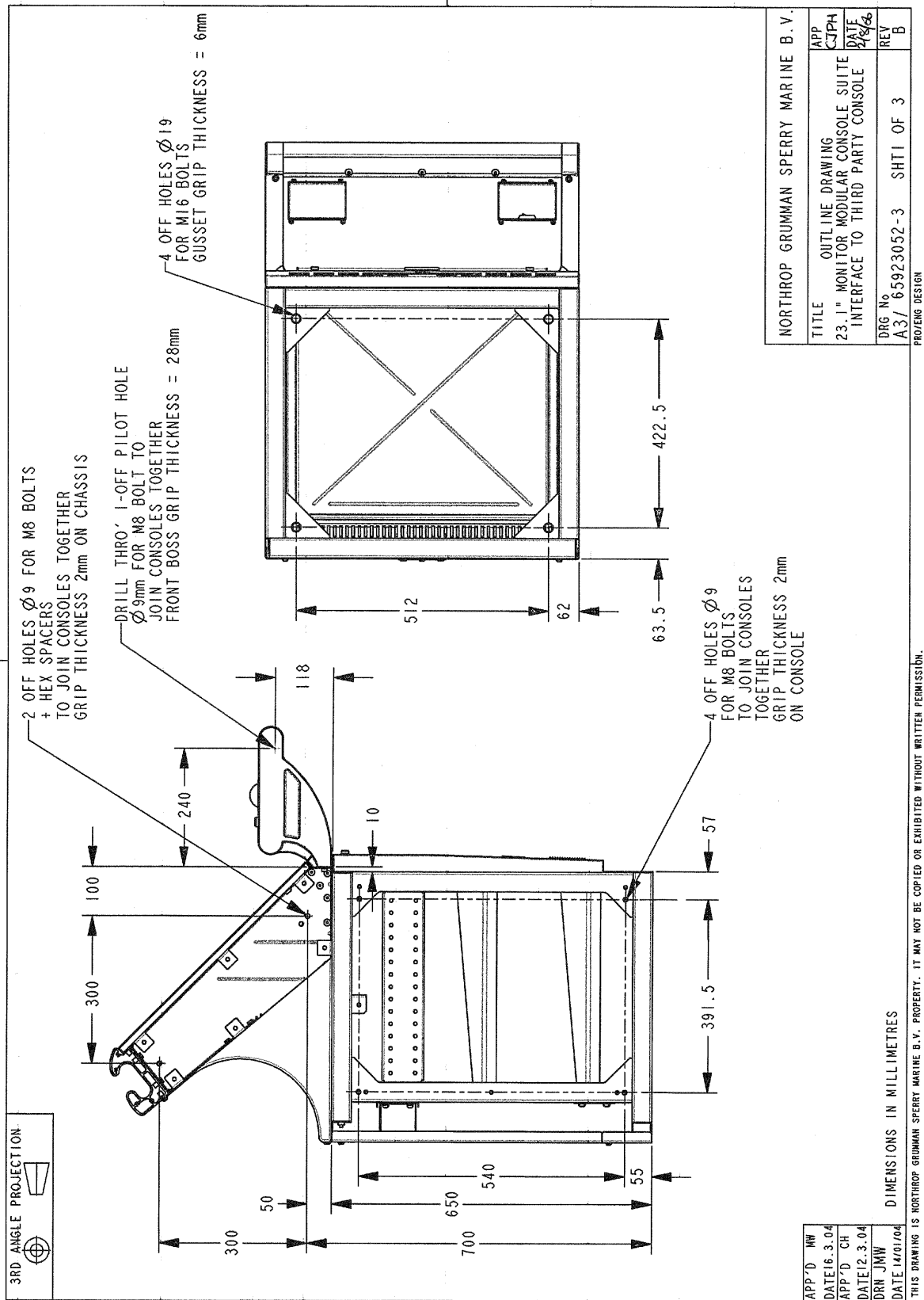


Figure 3.74 Deck Mounted Console Assembly Outline Drawing for installation into a Console Suite - Sheet 1

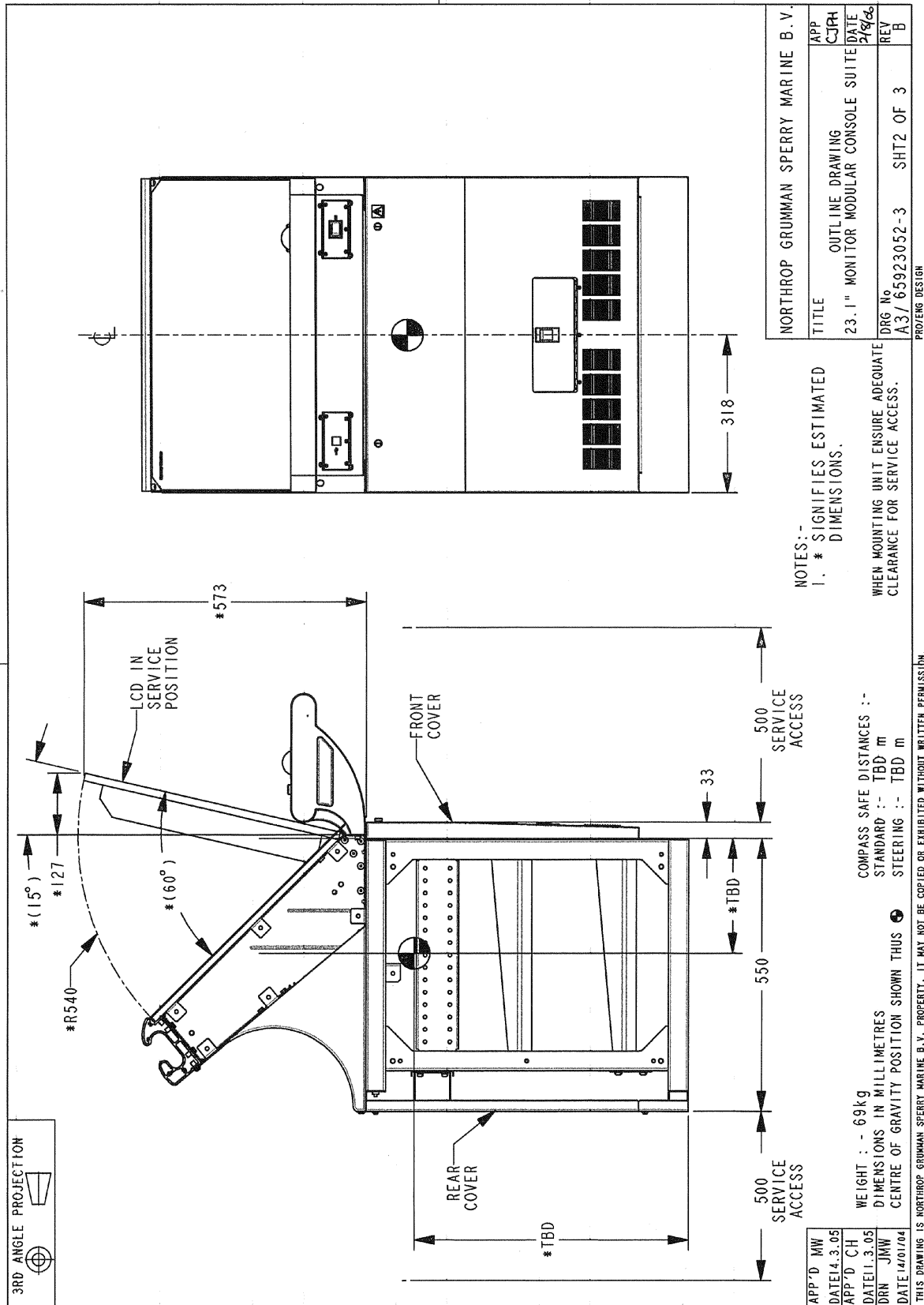


Figure 3.75 Deck Mounted Console Assembly Outline Drawing for installation into a Console Suite - Sheet 2

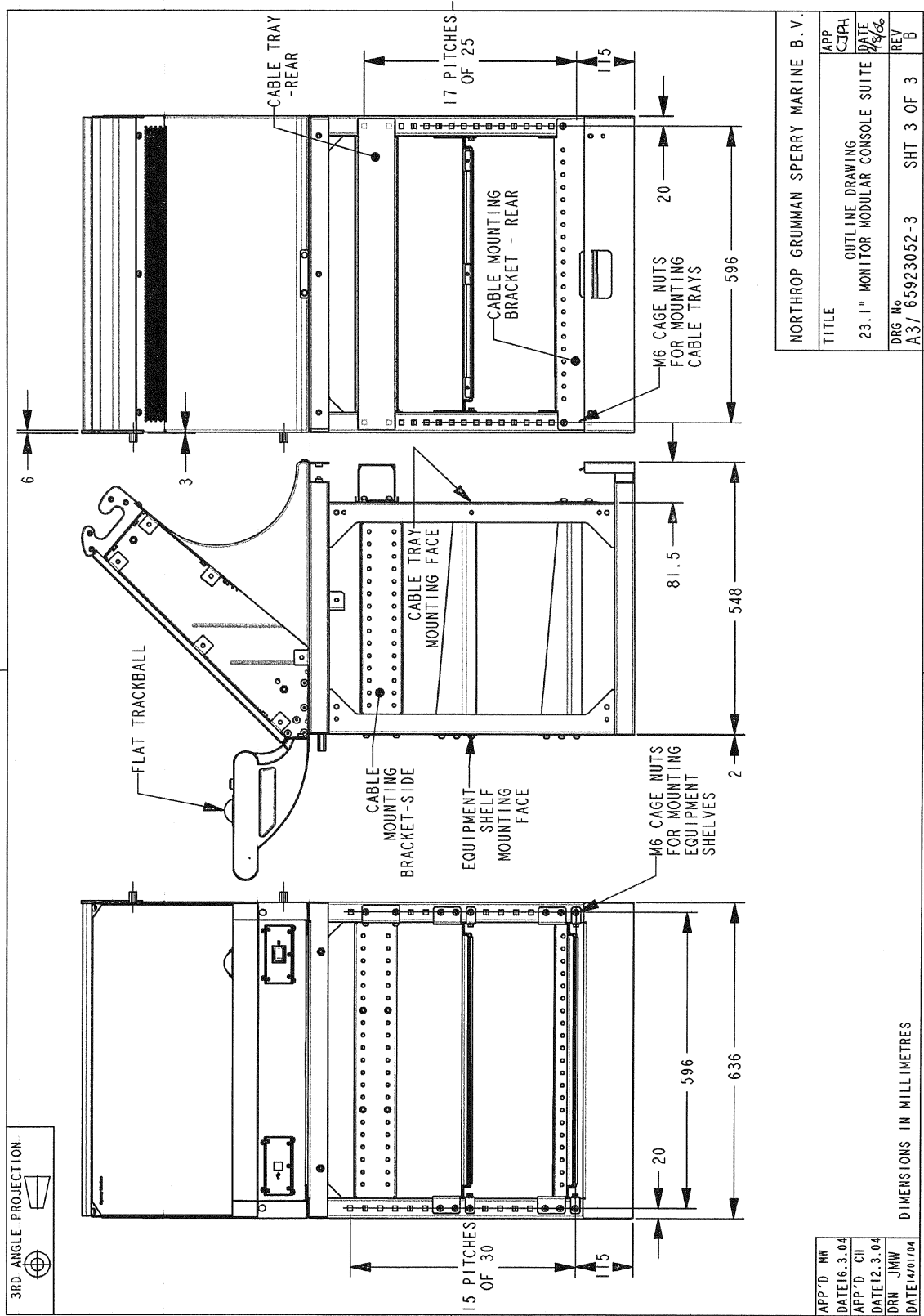


Figure 3.76 Deck Mounted Console Assembly Outline Drawing for installation into a Console Suite - Sheet 3

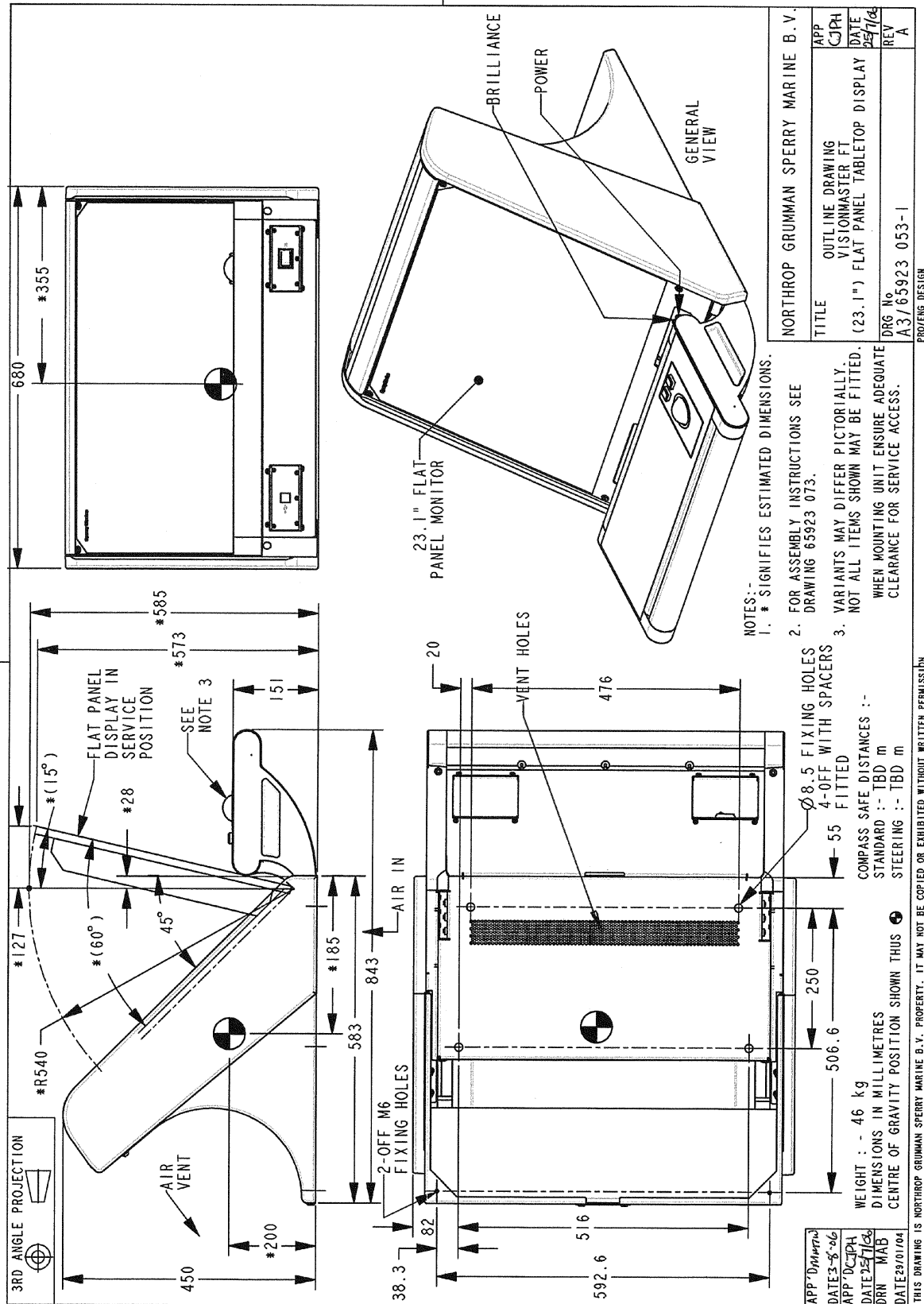


Figure 3.77 Console Assembly Table Top Version Outline Drawing

6.8.1 Display Unit

The Display Unit assembly includes a 19" (250mm) or 23.1" (340mm) flat panel monitor for use with a 110/220 V AC power supply.

The monitor includes an independent On/Off switch and brilliance control.

The monitor is housed in a chassis. On the deck mounted console version the chassis is attached to a pedestal; on the table top version the chassis is mounted to the table top.

In the standalone console version the chassis is supplied with left and right hand side cheeks.

Refer to the following figures for general information on the display unit.

- Figure 3.78 for the 340 Flat Panel Monitor outline drawing.
- Figure 3.79 for the Display Unit chassis with side cheeks
- Figure 3.80 for the Display Unit chassis with side cheeks removed (for an existing console suite).

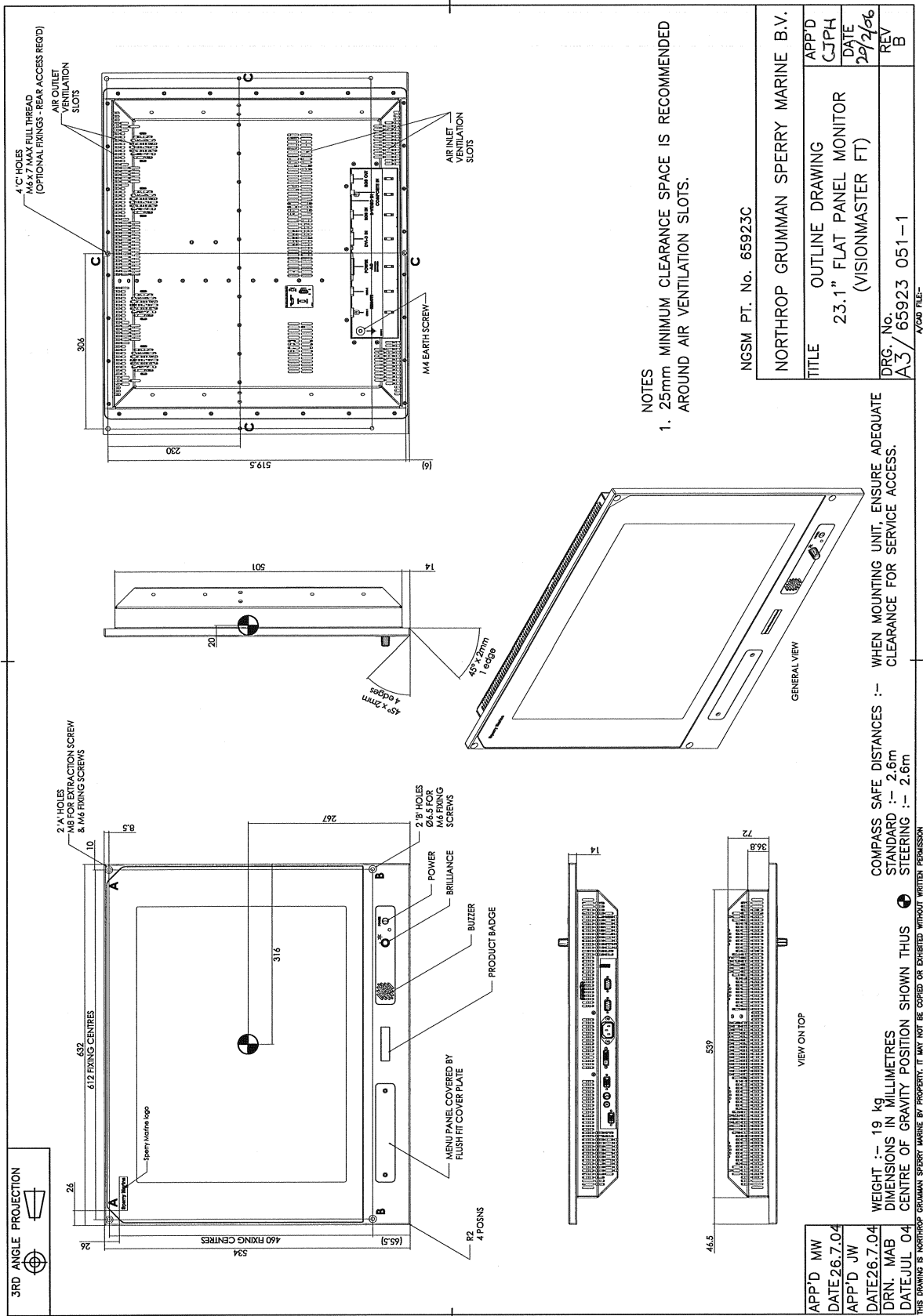


Figure 3.78 340 Flat Panel Monitor - Outline Drawing

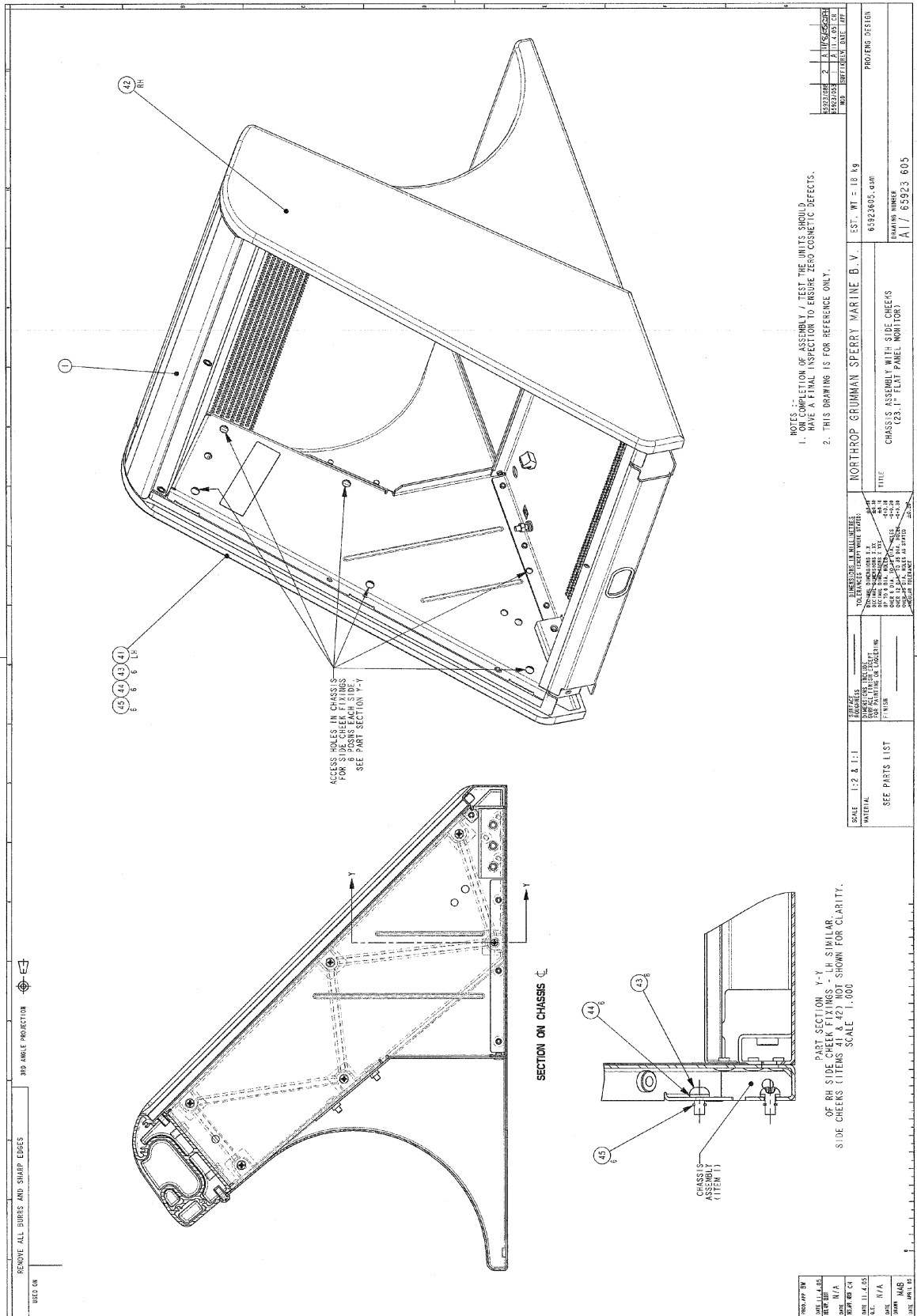


Figure 3.79 Chassis Assembly with side cheeks

6.8.2 Control Panel Assembly

The control panel assembly comprises the following modules:

- Trackball
- On/Off switch
- USB connector.

To install the control panel modules listed above refer to the following sections:

- Section 6.8.2.1 '*Installing the Trackball*'
- Section 6.8.2.2 '*Installing the USB Connector*'
- Section 6.8.2.3 '*Installing the On/Off Switch*'

In order to install any of the three control panel modules the module mounting plate must be detached from the control panel.

When the modules have been installed secure the mounting plate by doing the following:

1. Place the mounting plate into the recess at top of the control panel housing.
2. From the underside of the control panel secure the mounting plate at the left and right front ends with two cap head screws (4006224) and two washers (4709195).
3. Between the two screws secure the mounting plate with three insert nuts (4415787).

The following outline drawing are provided for control panel module kit versions only:

- Figure 3.81 Flat Trackball console mounted and kit outline drawing.
- Figure 3.82 for USB connector kit outline drawing.
- Figure 3.83 and Figure 3.84 for On/Off switch kit outline drawings.

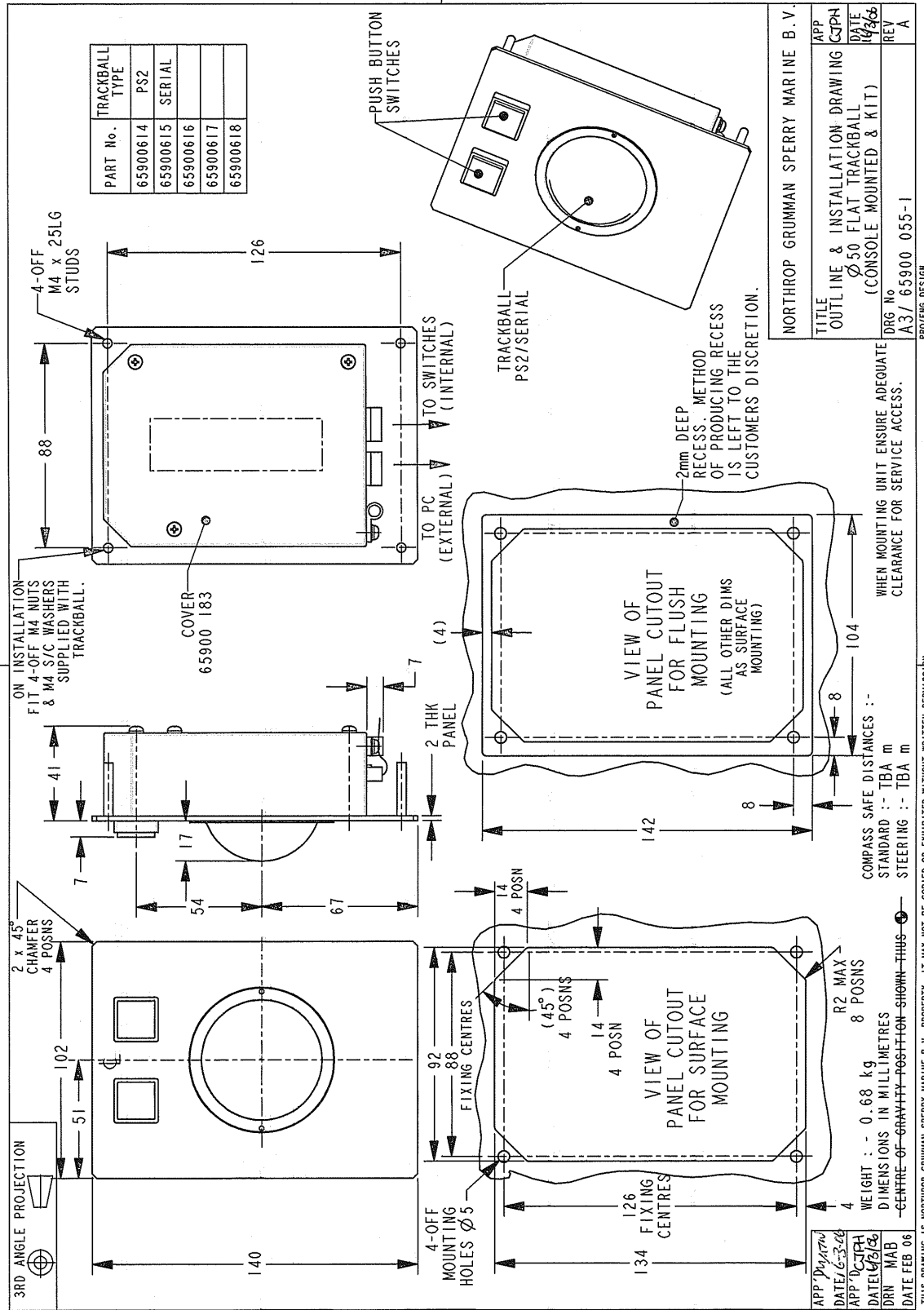


Figure 3.81 Flat Trackball Console Mounted and Kit Outline Drawing

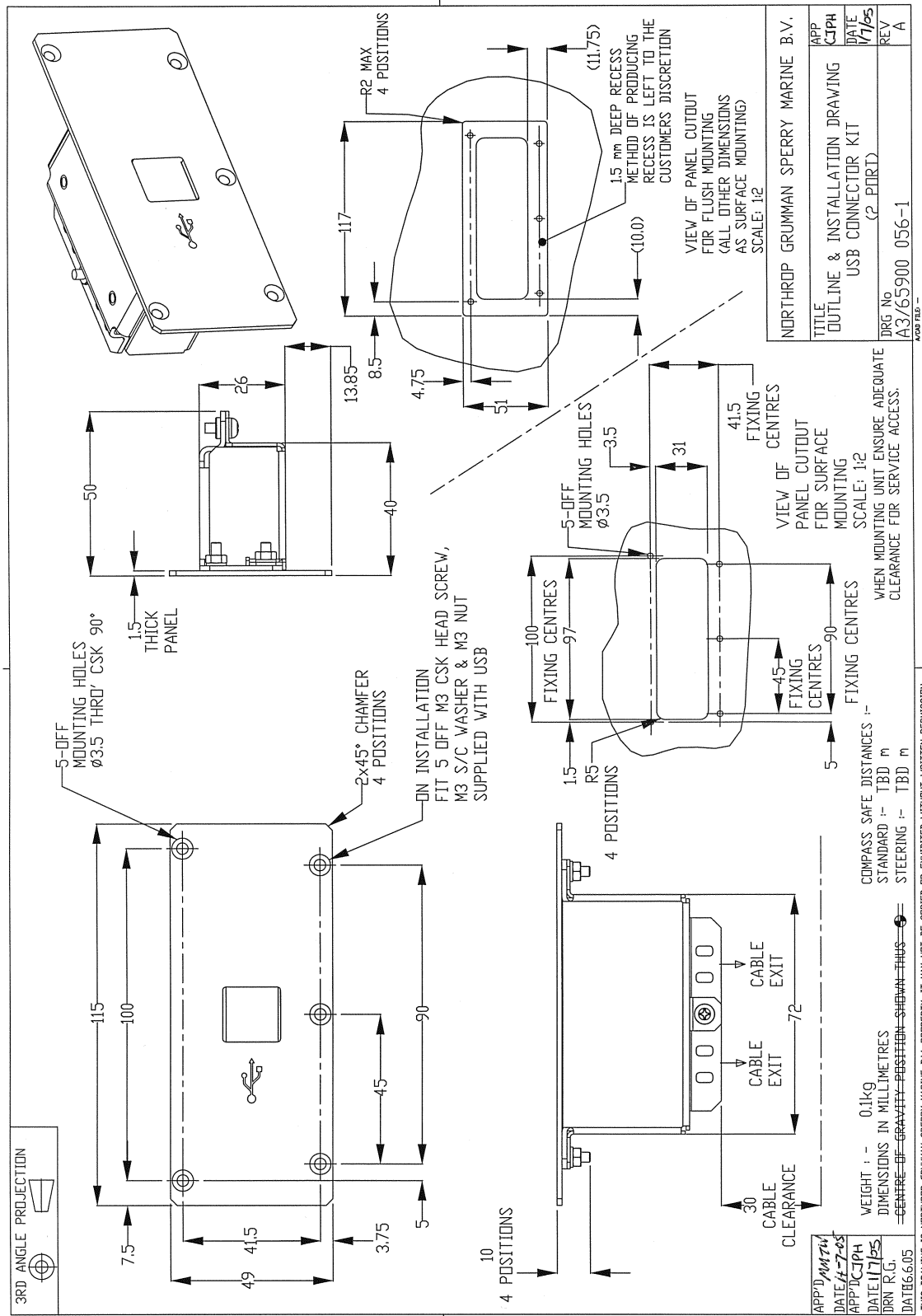


Figure 3.82 USB Connector Kit Outline Drawing

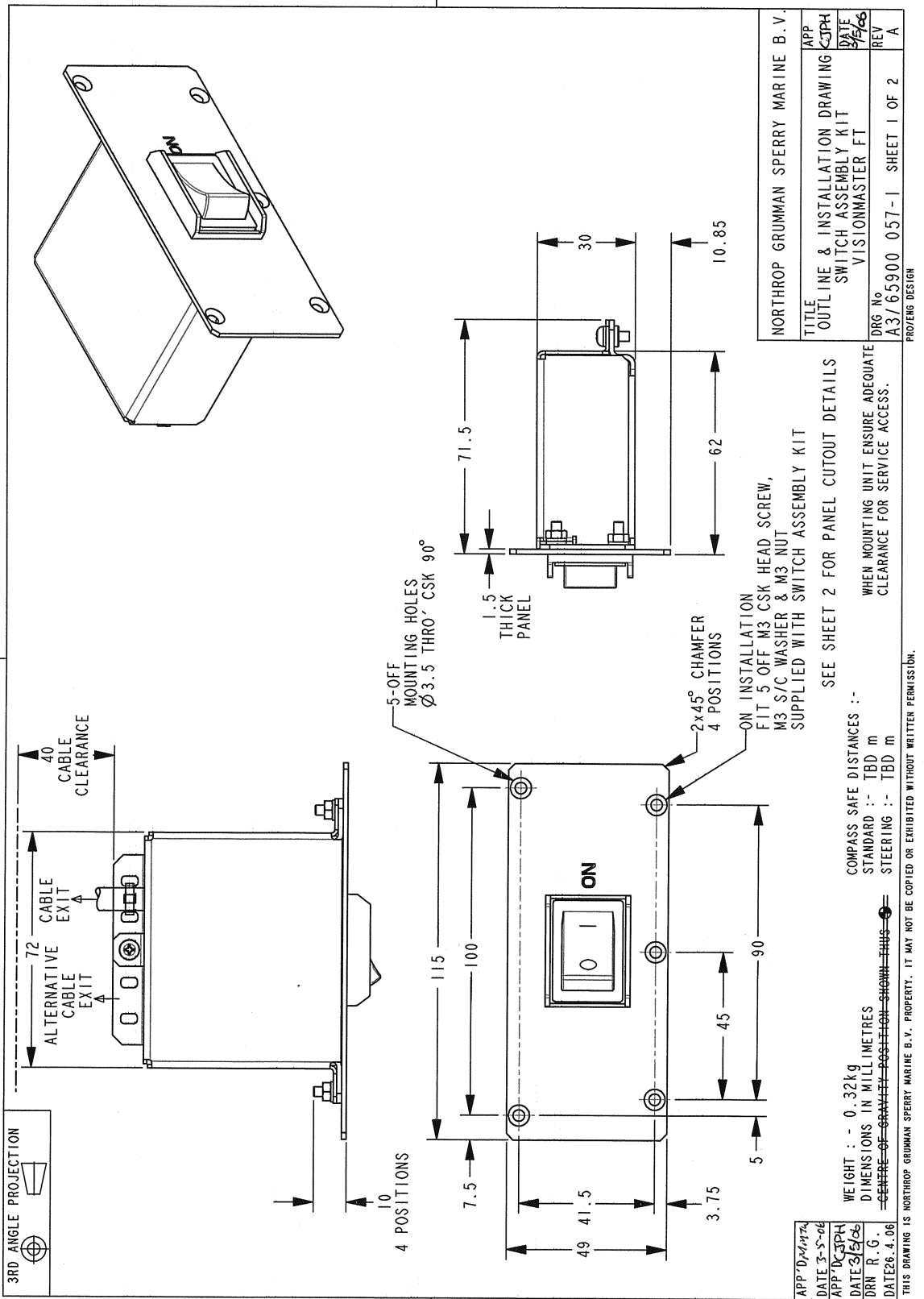


Figure 3.83 On/Off Switch Kit Outline Drawing - Sheet 1

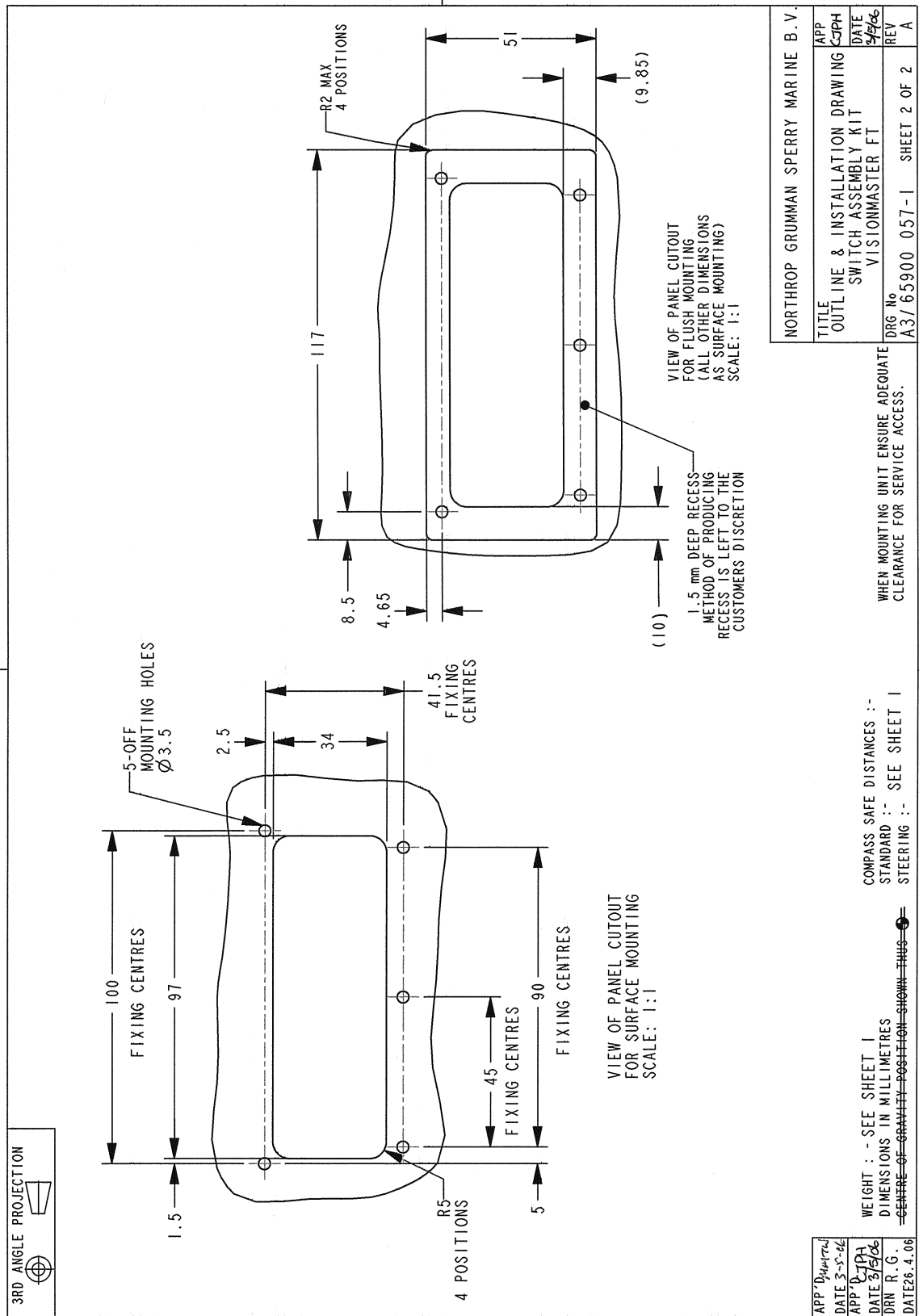


Figure 3.84 On/Off Switch Kit Outline Drawing - Sheet 2

6.8.2.1 Installing the Trackball

To fit the Trackball to the Control Panel do the following:

- a. Install trackball into the connecting holes of the module mounting plate and secure with four M4 nuts and four S/C washers supplied with trackball kit.
- b. Connect the trackball cable from Plug P2 to the PS2 socket on the Processor unit as shown on Figure 3.105.
- c. Install the trackball and mounting plate to the control panel as described in page 101.

6.8.2.2 Installing the USB Connector

To fit the USB assembly to the Control Panel do the following:

- a. Install the USB assembly into the Control Panel housing and secure with four M4 countersunk screws.
- b. Plug the USB connector cables to the front USB connector on the processor unit, as shown on Figure 3.105.

6.8.2.3 Installing the On/Off Switch

To fit the On/Off switch assembly to the Control Panel do the following:

- a. Install the switch assembly into Control Panel housing and secure with four M4 countersunk screws.
- b. Connect the On/Off switch cable to the PCIO unit, as shown on Figure 3.105.

6.8.3 Processor Unit and PC/IO Unit

The Processor Unit and PC/IO unit are secured to removable trays in the pedestal.

To assemble the Processor Unit and PCIO Unit, refer to Section 6.9.7 '*Installing the Processor and PCIO Unit to the Console*'.

For information on the connecting cables between the Processor unit and the I/O unit, see Section 6.9.8 '*Installing Processor and PCIO connector cables*'.

Refer to the following figures for general information on the Processor Unit and I/O Unit.

- Figure 3.85 for an outline drawing of the PCIO Unit
- Figure 3.86 for an outline drawing of the Processor Unit.

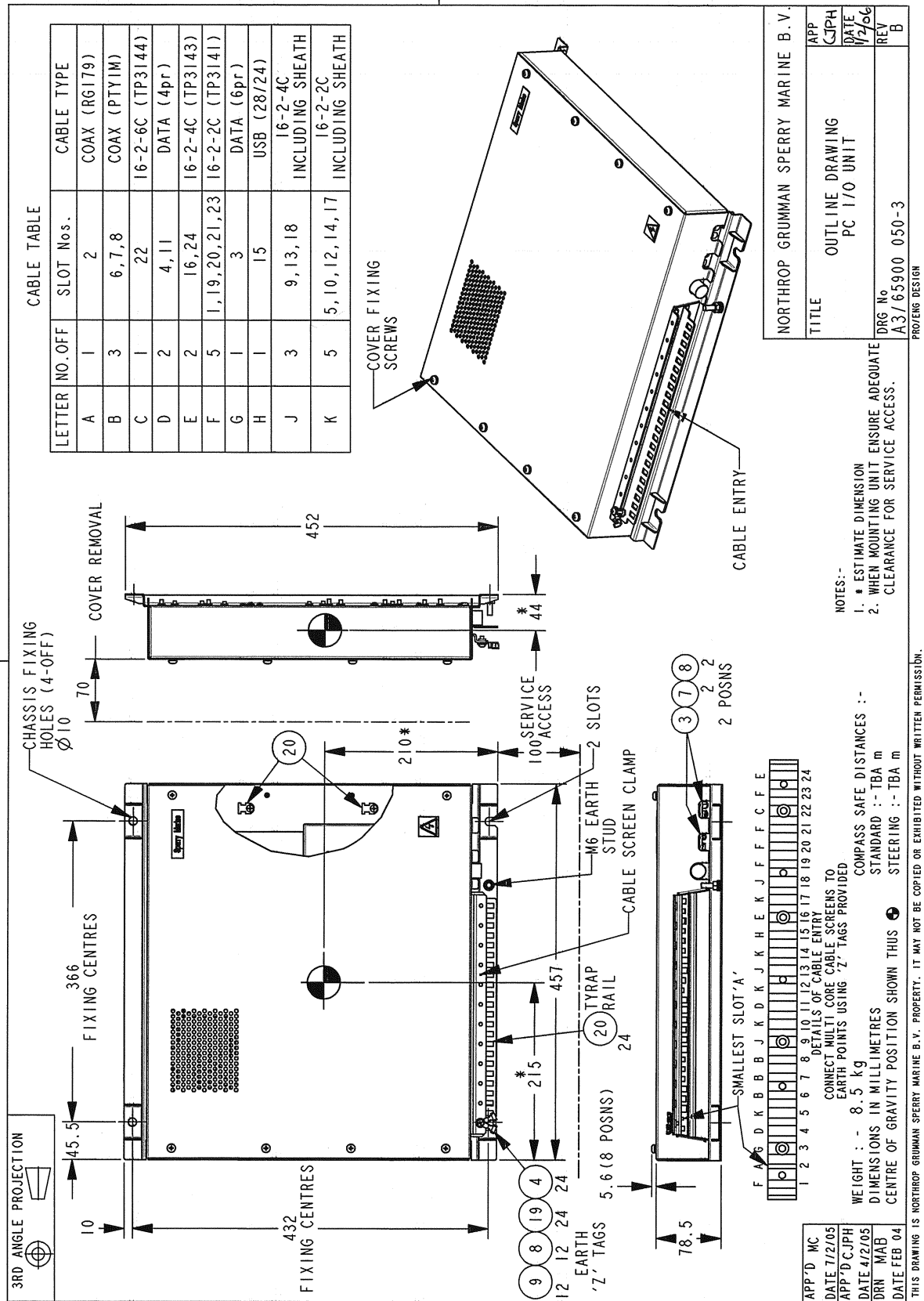


Figure 3.85 PCIO Unit - Outline Drawing

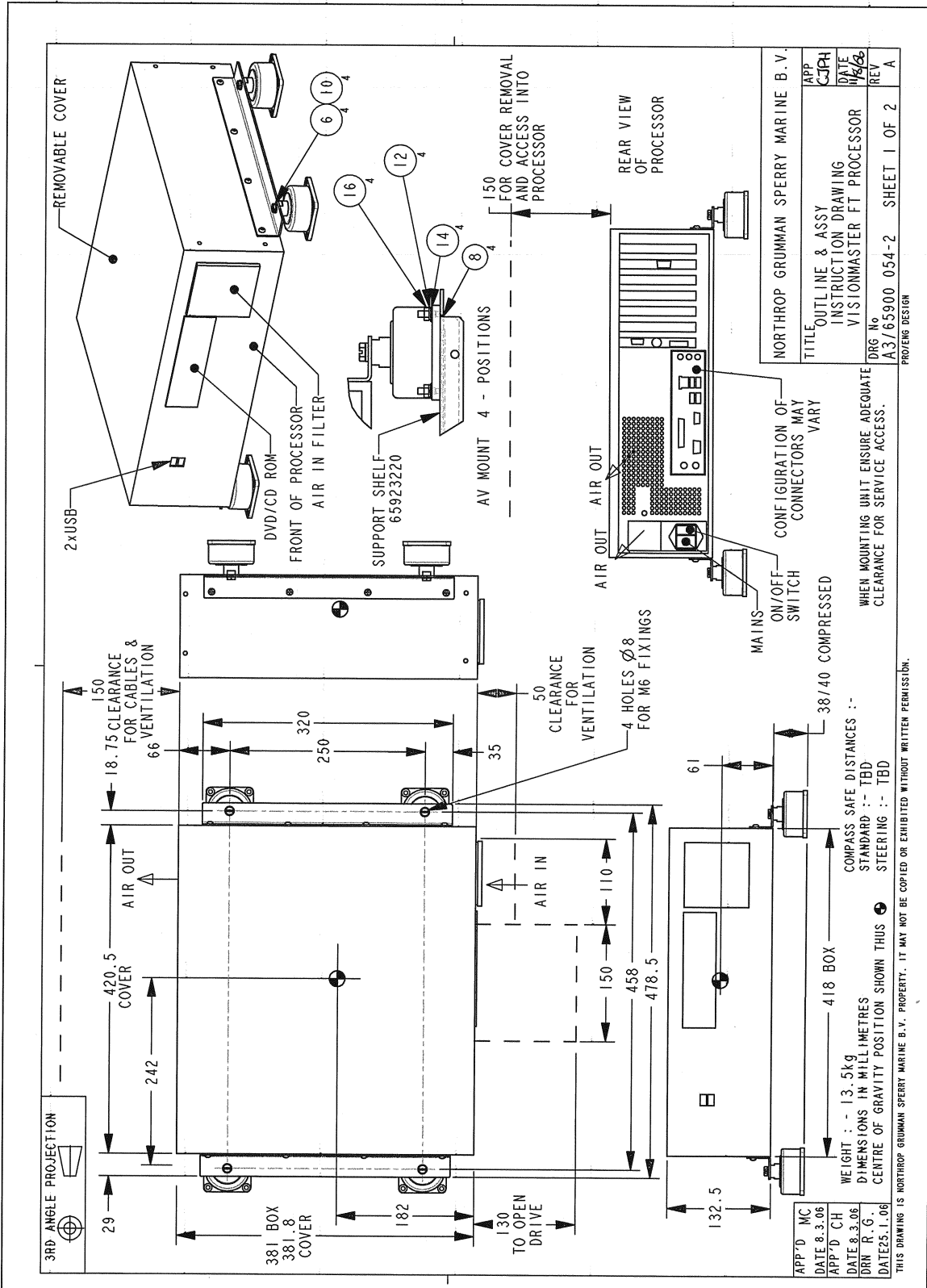


Figure 3.86 Processor Outline Drawing - Sheet 1

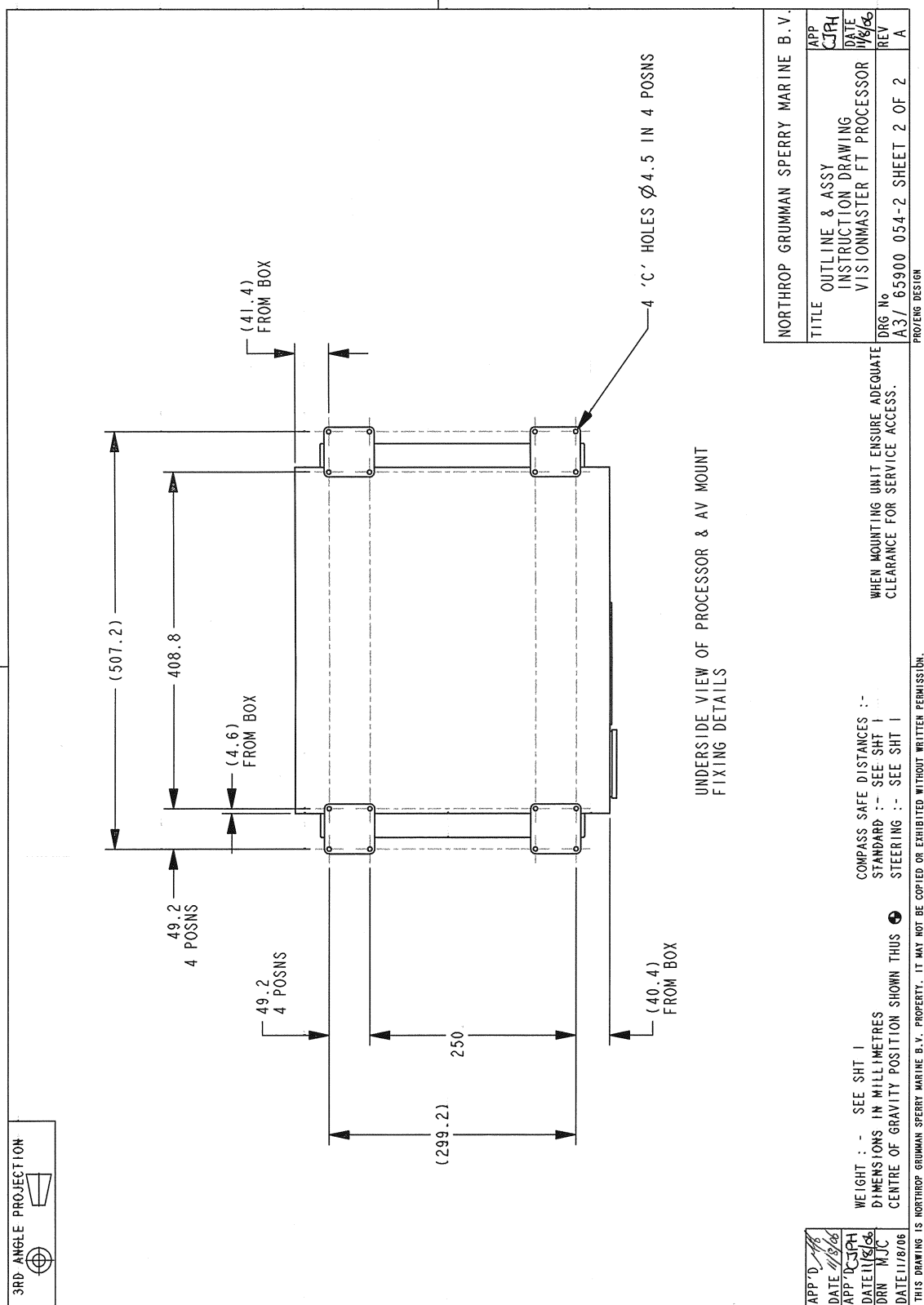


Figure 3.87 Processor Outline Drawing - Sheet 2

6.9 Installing the Console Assembly

6.9.1 Installing a Standalone Pedestal to the Deck

The pedestal assembly is secured to the ship's deck or foundation by four hex head bolts, supplied by the shipyard.

Note: *To enable ease of position it is advisable to install the pedestal to the deck before the control panel and display chassis are attached to the pedestal.*

To assemble a standalone pedestal you will need the following:

- four M16 hex head steel bolts, A2 or A4-70 (length to suit foundation/deck)
- eight M16 plain steel washers (4709322)
- four M16 S/C steel washers (4709241)
- four M16 hex head steel nuts (4411579).

To assemble the pedestal do the following:

1. Drill four 19mm holes in the foundation /deck to the dimensions shown in the plan view of Figure 3.74.
2. Undo the two captive screws at the top of the front cover panel and remove the front cover.
3. Remove the five screws attaching the rear cover to the pedestal and remove the rear cover.
4. Remove the four screws attaching the lower cable support shelf to the pedestal (two at the front and two each side) and remove the shelf.
5. Remove 'knockout' panels from either the lower side panel (for side cable entry) or lower rear panel (for rear cable entry). Fit grommet strip (MA00010173) to the edges where the panel has been removed.
6. Bolt down the pedestal to the foundation/deck using the bolts, washers and nuts, as shown in Figure 3.88.
7. Refit front cover, rear cover and cable support shelf to pedestal.

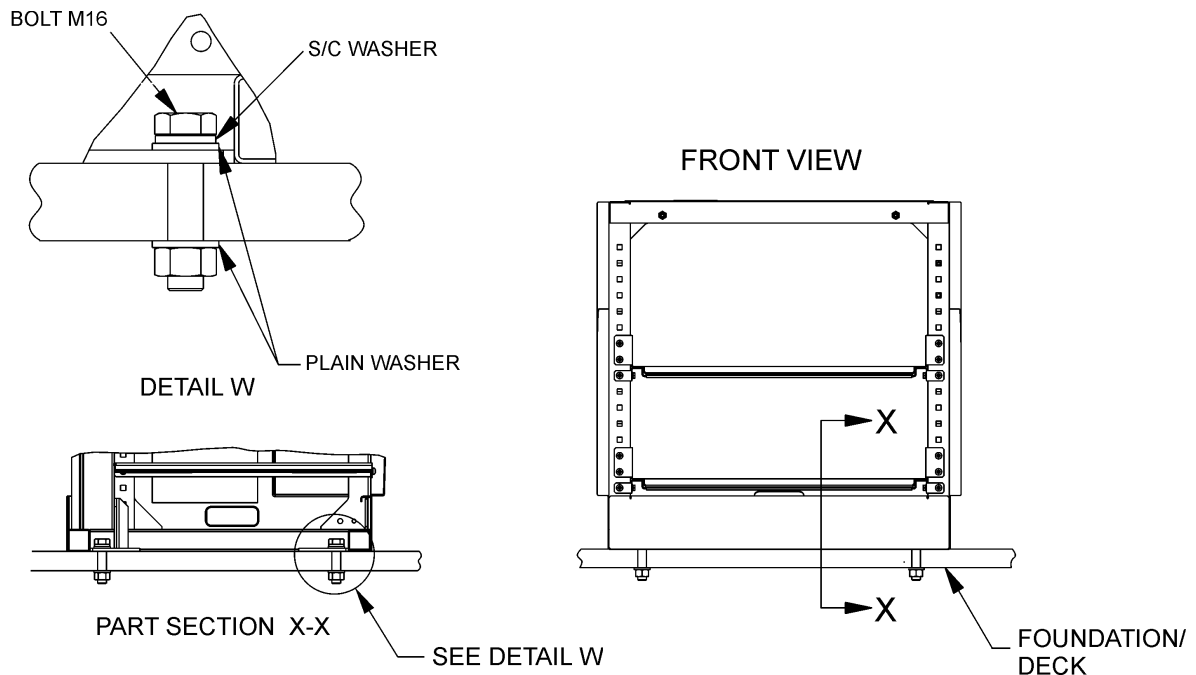


Figure 3.88 Installing a Standalone Pedestal to Foundation/Deck

6.9.1.1 Installing the Control Panel to the Display Chassis

To assemble you will need the following:

- six M6 x 20 cap head screws (4006267)
- two M6 x 16 cap head screws (4006259)
- eight M6 S/C washers (4709209)
- two shims (65900145)

To assemble the control panel to the display chassis do the following:

1. Attach the control panel to the chassis using six M6 x 20 screws and six S/C washers (three either side). Do not fully tighten the screws.
2. If required, fit shims between arm of control panel and chassis, left and right side.
3. Attach control panel to the bottom of the chassis using two M6 x 16 screws and M6 S/C washers.
4. Fully tighten all eight screws.

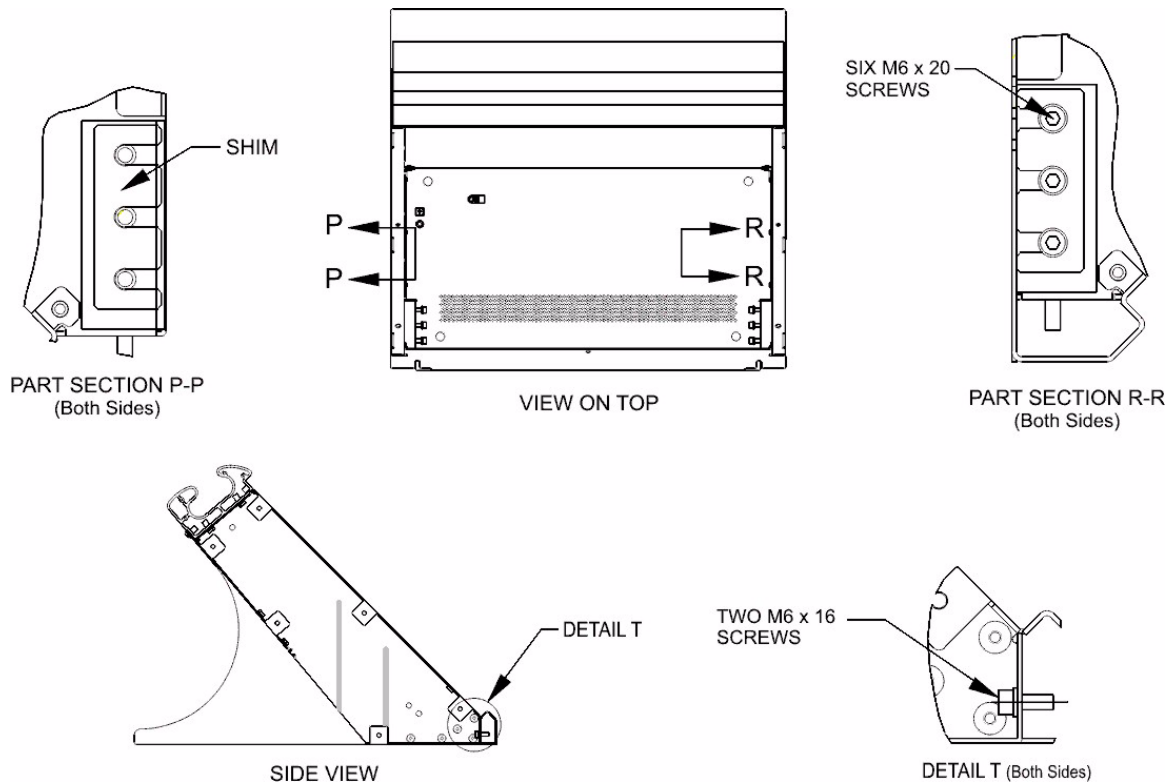


Figure 3.89 Installing Control Panel to Display Chassis

6.9.1.2 Installing the Control Panel/Display Chassis to the Pedestal

To assemble you will need the following:

- two M6 studs (65900 131)
- six sliding washers (65900 137)
- four M8 studs (65900 130)
- six 'O' rings (MA00015271)
- six isolator assemblies (65900 640)
- twelve M6 x 12 cap head screws (4012690)
- twelve M6 S/C washers (4709209)
- twelve M6 retaining washers (MA00006650)

To assemble the Control Panel/Display Chassis to the Pedestal do the following:

1. Fit two M6 studs to the underside of rear cover chassis, remove backing from sliding washers and affix around studs.
2. Fit four M8 studs to pedestal frame, remove backing from sliding washers and affix around studs.
3. Fit four 'O' rings to the four M8 studs.
4. Place the control panel/chassis assembly onto the M8 pedestal studs and ensure that the two rear cover chassis M6 studs fit in the corresponding pedestal holes.
5. From the chassis side attach four isolator assemblies to the four M8 studs. Do not fully tighten the isolators.
6. Fit two 'O' rings to the two isolators, from the underside of the pedestal attach the two isolator assemblies to the chassis studs.
7. Fully tighten all six isolator assemblies.

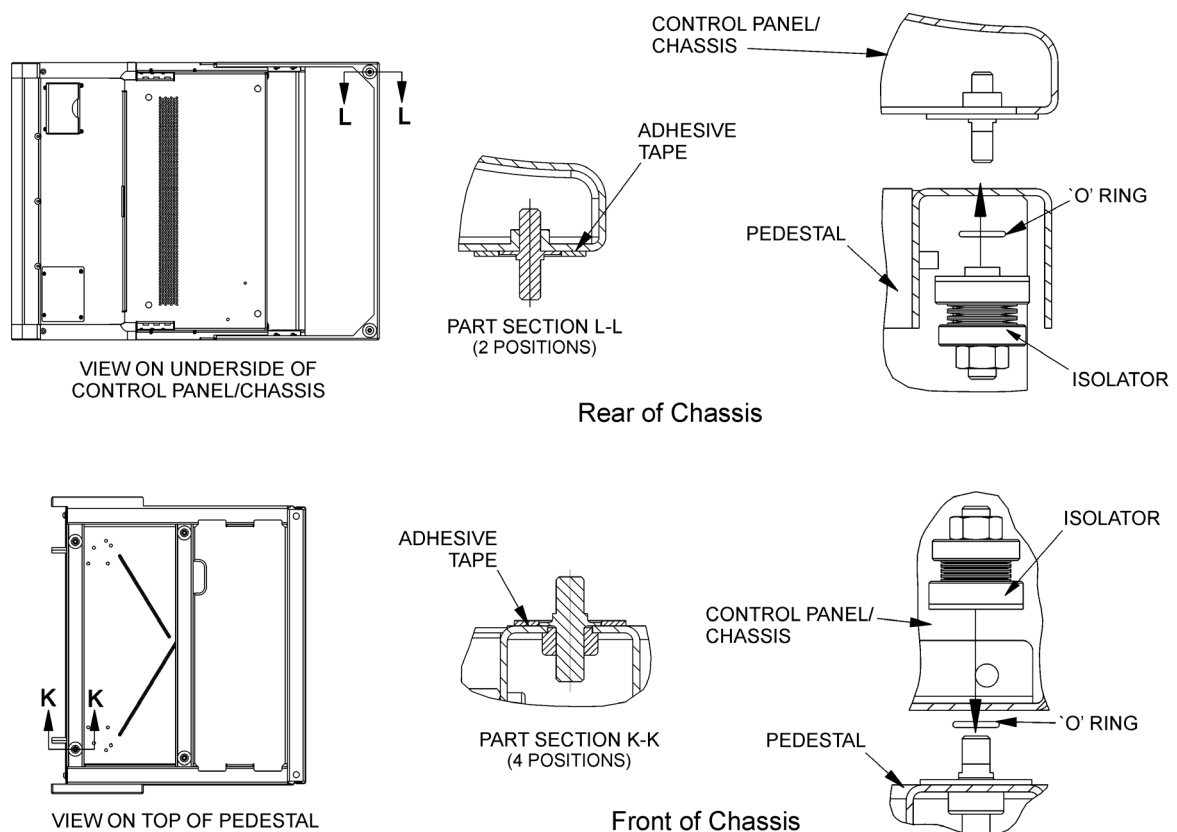


Figure 3.90 Installing Control Panel and Display Chassis to Pedestal

6.9.2 Installing a Pedestal Assembly to a Console Suite

The pedestal assembly is secured to the ship's deck or foundation by four hex head bolts, supplied by the shipyard.

To assemble a pedestal to the ship's deck or foundation you will need the following items:

- four M16 hex head steel bolts, A2 or A4-70 (length to suit foundation/deck)
- eight M16 plain steel washers (4709322)
- four M16 S/C steel washers (4709241)
- four M16 hex head steel nuts (4411579)

To assemble a pedestal assembly to an existing console suite you will need the following items:

- ten hex head M8 x 16 screws (3610462)
- one hex head M8 x 75 screw (3610594)
- four csk M4 x 16 thread forming screws (4080416)
- two hex head M6 x 12 screws (4009088)
- thirteen M8 single coil washers (4709217)
- two M6 single coil washers (4709209)
- seven M8 nuts (4411544)
- one spacer - handrail (65923120)
- two hex spacers (MA00014787)
- four M8 spacers (65900138)
- two M6 spacers (65900139)

To fit the pedestal to the ship's deck, do the following:

1. Drill four 19mm holes in the foundation /deck to the dimensions shown in the plan view of Figure 3.74.
2. Undo the two captive screws at the top of the front cover panel and remove the front cover.
3. Remove the five screws attaching the rear cover to the pedestal and remove the rear cover.
4. From the front of the pedestal remove the four screws attaching the shelf to the pedestal and remove the shelf.
5. Bolt down the pedestal to the foundation/deck using the bolts, washers and nuts, as shown in Figure 3.91.

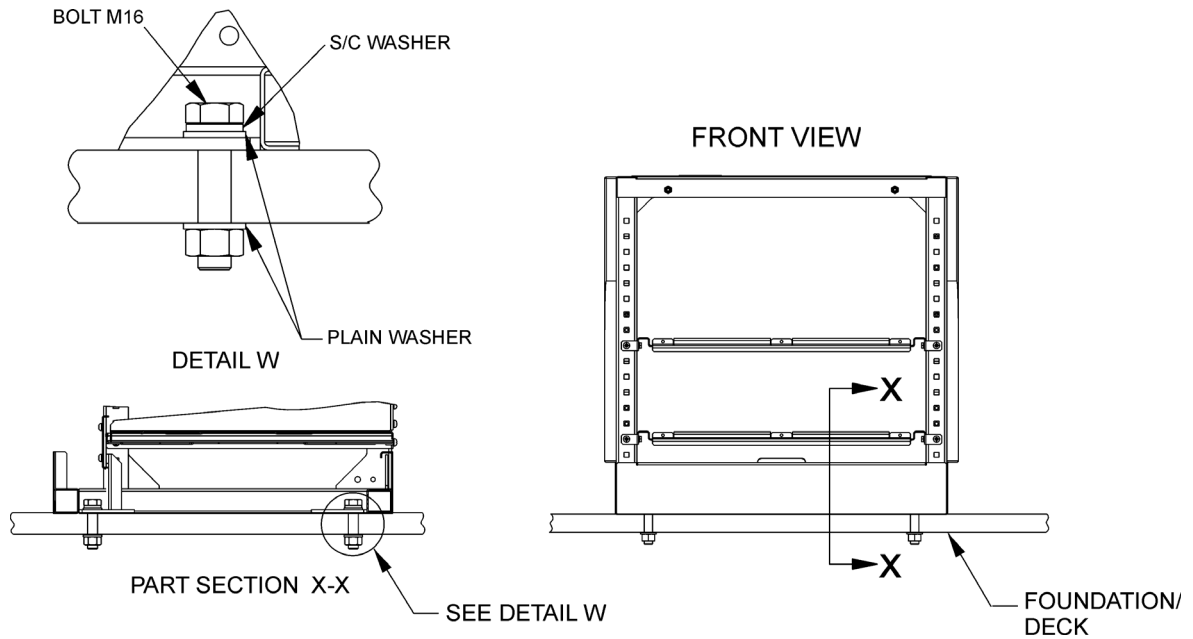


Figure 3.91 Installing a Console Suite Pedestal to Foundation/Deck

To fit the pedestal to an existing console suite do the following:

1. Using the four M8 x 16 screws, washers and nuts attach each side of the pedestal to the adjoining pedestal as shown in Figure 3.92.
2. Repeat step 1 for each additional pedestal added to the console suite.

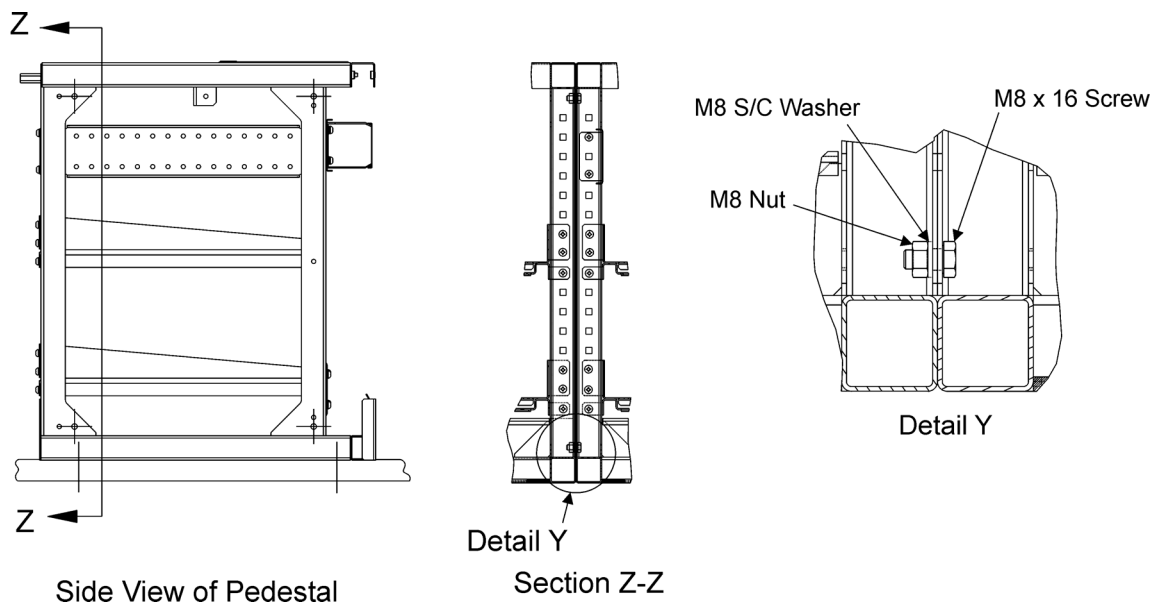


Figure 3.92 Attaching the pedestal to the existing consoles

6.9.2.1 Preparing the Control Panel for installation into a Console Suite

Before fixing the control panel assembly to the display chassis do the following:

1. Drill a 9mm diameter hole through the 1mm diameter front pilot hole on both sides of the control panel casting, see Figure 3.93.

Note: Do NOT drill a hole in the final left hand or right hand end control panel of the console suite.

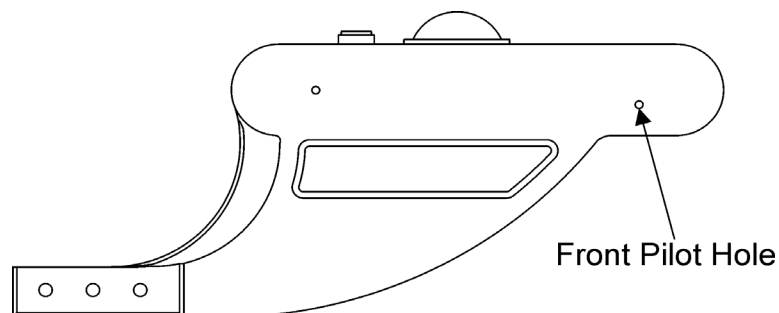


Figure 3.93 Front Pilot Hole on side of Control Panel

For information on fitting the Control Panel assembly to the console chassis, see Section 6.9.1.1 'Installing the Control Panel to the Display Chassis'.

6.9.2.2 Fitting Spacers to the Display Chassis

With reference to Figure 3.94 below, attach the display chassis/control panel assembly to the pedestal using the spacers and fixings.

1. To fill the gap between each chassis handrail fit the handrail spacer (65923120) to the right hand side of the display chassis using the four M4 x 16 csk screws.
2. Attach the two M8 hex spacers (MA00014787) to the right side of display chassis using M8 S/C washers and M8 nuts. Fully tighten nuts.

Note: Do NOT fit the handrail spacer or the M8 hex spacers to the final right hand end display chassis.

3. From the top of the display chassis fit the four M8 spacers (65900138) using M8 x 16 screws and M8 S/C washers.
4. From underneath the pedestal at the display rear attach the two M6 spacers (65900139) using M6 x 12 screws and M6 S/C washers.

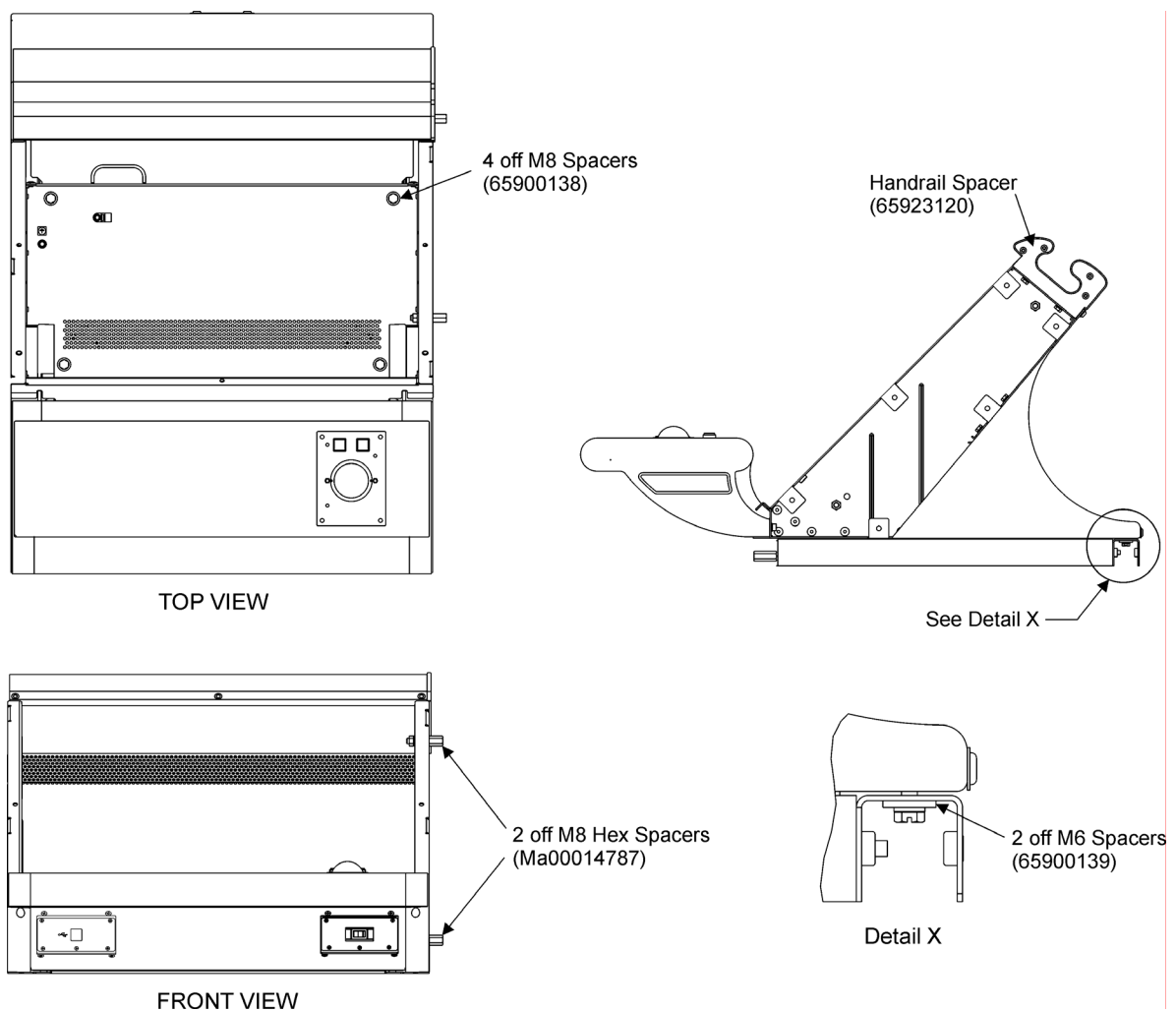


Figure 3.94 Location of Spacers on Display Chassis Assembly

6.9.2.3 Attaching Console Assemblies together

With reference to Figure 3.95, attach the control panel assemblies and display chassis assemblies together as described below:

1. Attach each control panel assembly together using one M8 x 75 bolt (3610594), M8 S/C washer and M8 nut, inserted through the 9 mm hole in the side of the control panel.
2. Attach each display chassis assembly together using two M8 x 16 hex head screws (3610462) and M8 S/C washers. See Figure 3.74 for location of the two holes in side of display chassis.

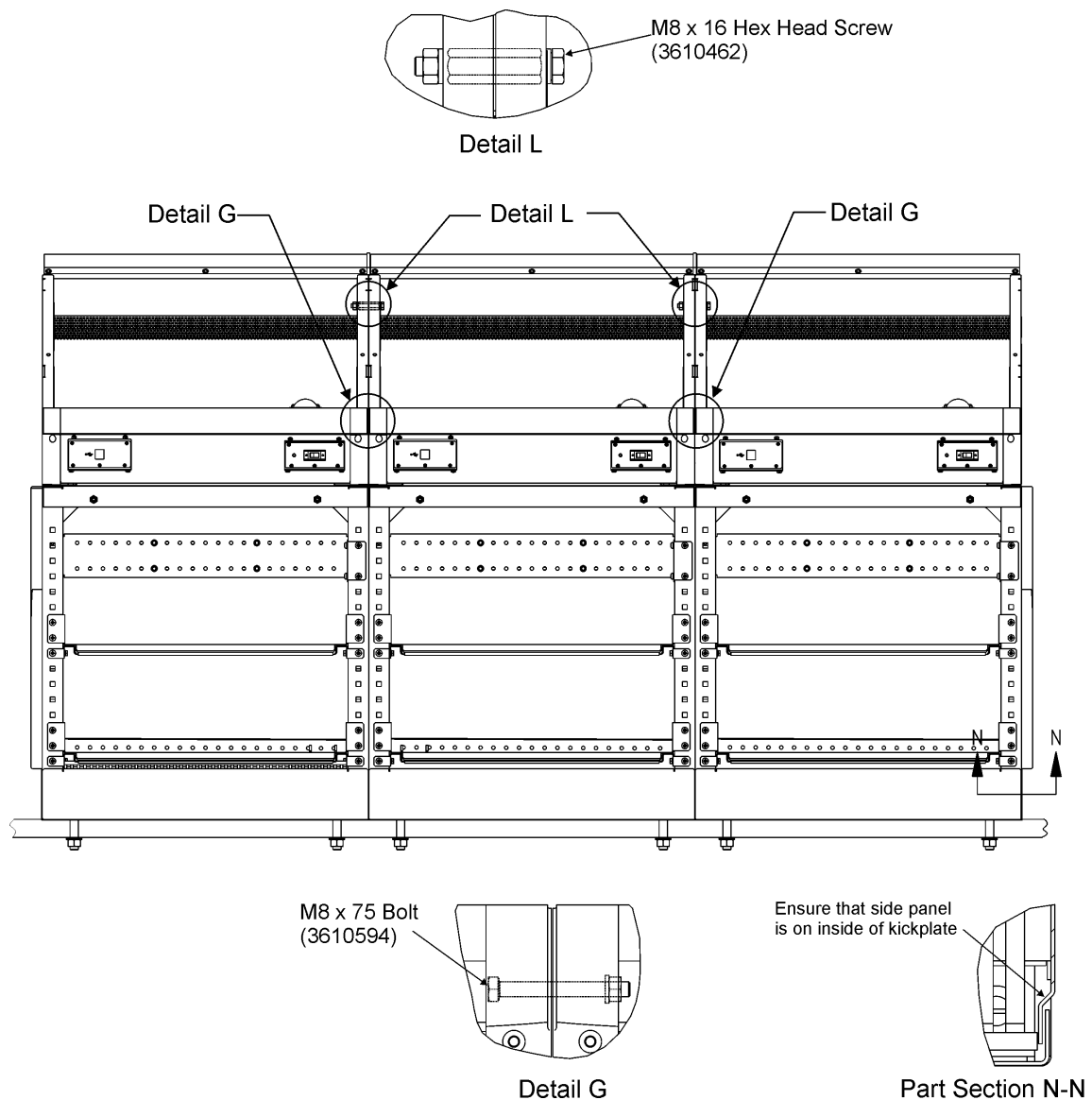


Figure 3.95 Attaching Console Assemblies together

6.9.3 Installing the Cable Tray and Mounting Plates

The cable mounting plates are attached to the pedestal framework and can be fitted at any convenient height and on either side of the framework. The data cable tray is attached to the top rear mounting plate and pedestal framework.

To assemble the mounting plates and data cable tray you will need the following:

- twelve M6 x 16 pan head screws (4012704)
- twelve M6 single coil washers (4709209)
- four M6 plain washers (4709284)
- four M6 nuts (4411536)
- twelve M6 cage nuts (MA00014738)

With reference to Figure 3.96, attach the rear mounting plate, side mounting plate and cable tray to the required position as described below:

1. Attach the lower mounting plate and side mounting plate using four M6 x 16 screws, single coil washers and cage nuts.
2. Remove the lid from the cable tray and attach each end of the tray to the upper mounting plate and pedestal framework using four M6 x 16 screws, single coil washers and cage nuts.
3. Secure the cable tray to the upper mounting plate using four M6 x 16 screws, plain washers and M6 nuts.
4. Re-install the cable tray lid.

Additional mounting plates and/or cable trays can be fixed to the pedestal by using the fixings supplied in despatch kits 65923 681 (cable tray) and 65923 682 (mounting plates).

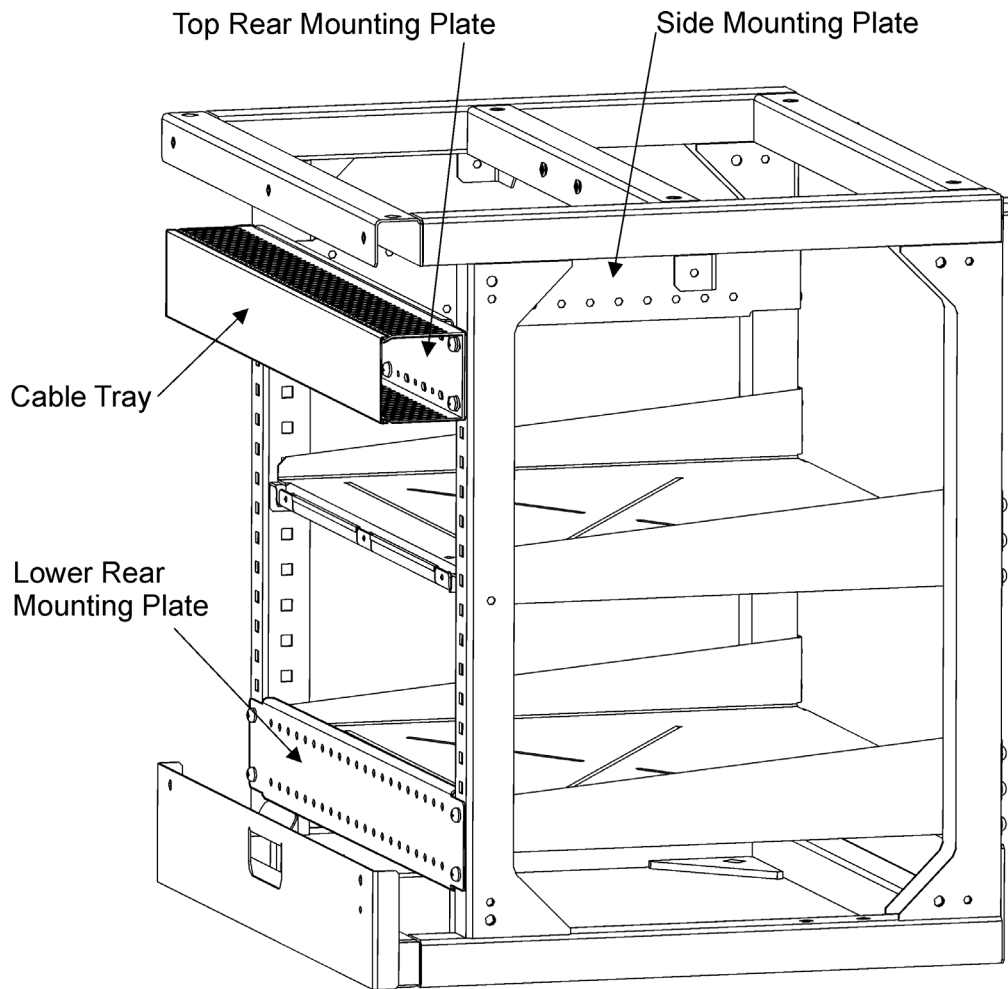


Figure 3.96 Mounting Plates and Cable Tray Location

6.9.4 Attaching Side Panels and Side Cheeks

The left hand and right hand side cheeks (65923110 and 111) are attached to each side of the console, or each end of a console suite.

The left hand and right hand side panels (65923197 and 198) are attached to each side of the pedestal, or each end of a console suite.

To assemble the side panels you will need the following:

- twelve (six each side) M6 grounding washers (MA00016477)
- twelve (six each side) M6 nuts (4411536)

To assemble the side cheeks you will need the following:

- twelve (six each side) M6 x 12 pan head screws (4012690)
- twelve (six each side) M6 single coil washers (4709209)
- twelve (six each side) M6 retaining washer (MA00006650)

6.9.4.1 Attaching the Side Panels

1. Insert the six threaded studs attached to each side panel through the corresponding holes on the pedestal framework.
2. From inside the pedestal assembly place the six grounding washers over the side panel bolts, ensuring the cutting edges of the washers are against the pedestal framework.
3. Attach the M6 nuts to the side panel studs and secure each panel by fully tightening the nuts.

6.9.4.2 Attaching the Side Cheeks

1. Position the left hand and right hand side cheeks on each end of the display chassis.
2. From the access holes of the display chassis (see Figure 3.97) attach the side cheeks using the M6 screws, S/C washers and retaining washers, six positions each side. Fully tighten the screws gradually in rotation.

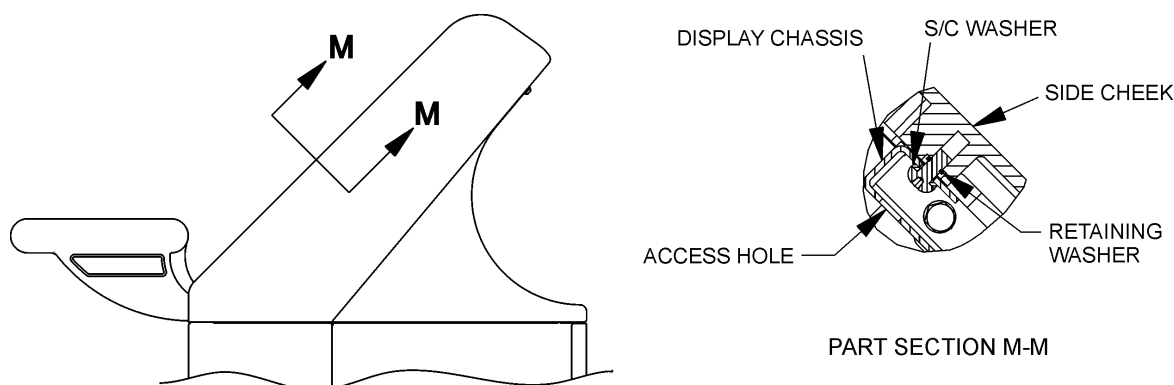


Figure 3.97 Installing side cheeks to console chassis

6.9.5 Installing the Display Assembly to a Table Top

To assemble you will need the following:

- four M8 x 40 hex head screws (4008553)
- four M8 Washers (4709217)
- four M8 Nuts (4411544)
- four M8 Spacers (65900138) or four Woodscrews (4107624) and M6 Washers (4711203).

To fit the display assembly to a table top do the following:

1. With reference to Figure 3.98 'Fixing Hole dimensions for Table Top Display'. Mark the four holes for the M8 screws.
2. If the display is to be attached to a wooden top, drill four blind holes to a dimension smaller than the M8 screws.
3. Attach display using either the four M8 screws, spacers, nuts and washers, or the woodscrews and washers.

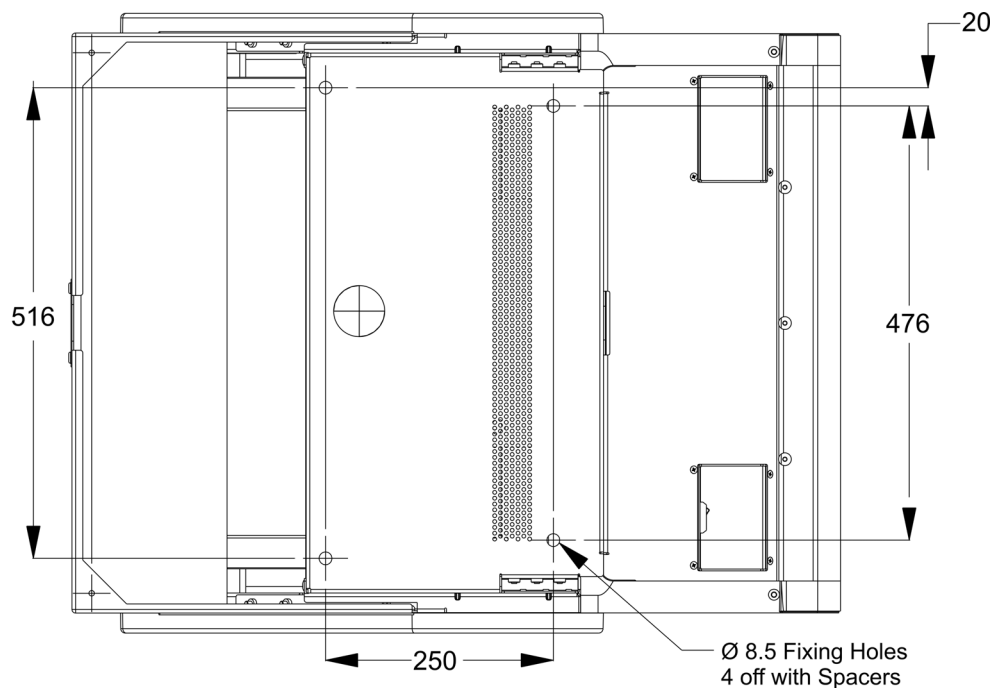


Figure 3.98 Fixing Hole dimensions for Table Top Display

6.9.6 Installing the Monitor to the Display Chassis

To assemble you will need the following:

- two M8 x 40 hex head screws (4008553)
- four M6 x 20 cap head screws (65923125)

To fit the Monitor to the display chassis do the following:

1. Attach the two M8 screws to the upper set of holes in the monitor and use these to lower the monitor into the chassis aperture, allowing the lower edge of the monitor to sit along the chassis.
2. When the monitor is correctly positioned in the chassis remove the M8 screws, which can then be discarded or retained for service applications.
3. Attach the Monitor to the chassis using the four M6 screws. Fully tighten the screws.
4. Fit cables to the Monitor as shown in Table 12 below.
5. Tywrap cables together and clip through the cable restraint attached to chassis.

Table 12: Cable Installation

Part No.	Description	From	To
65823512	Cable assy. - Video	Video In (monitor)	Processor unit
65900531	Cable assy. - Earth	Earth Tag (monitor chassis)	Earth Tag (pedestal)
65900532	Cable assy. - Earth	Earth Tag (monitor Chassis)	Earth Tag (monitor)
Power Cable	Cable - Mains	Mains In (IEC)	PCIO unit

6.9.7 Installing the Processor and PCIO Unit to the Console

To assemble the Processor unit you will need the following:

- four AV mounts (MA00018036)
- four M6 x 16 Hex head slotted screws (4009053)
- four M6 S/C washers (4709209)
- sixteen M4 x 16 Csk screws (4013026)
- sixteen M6 SC washers (4709209)
- sixteen M4 SC washers (4709187)
- sixteen M4 nuts (4410149).

To assemble the PCIO unit you will need the following:

- four M8 x 16 Hex head bolts (3610462)
- four M8 S/C washers (4709217)
- two M8 plain washers (4709292)
- four M8 nuts (4411544).

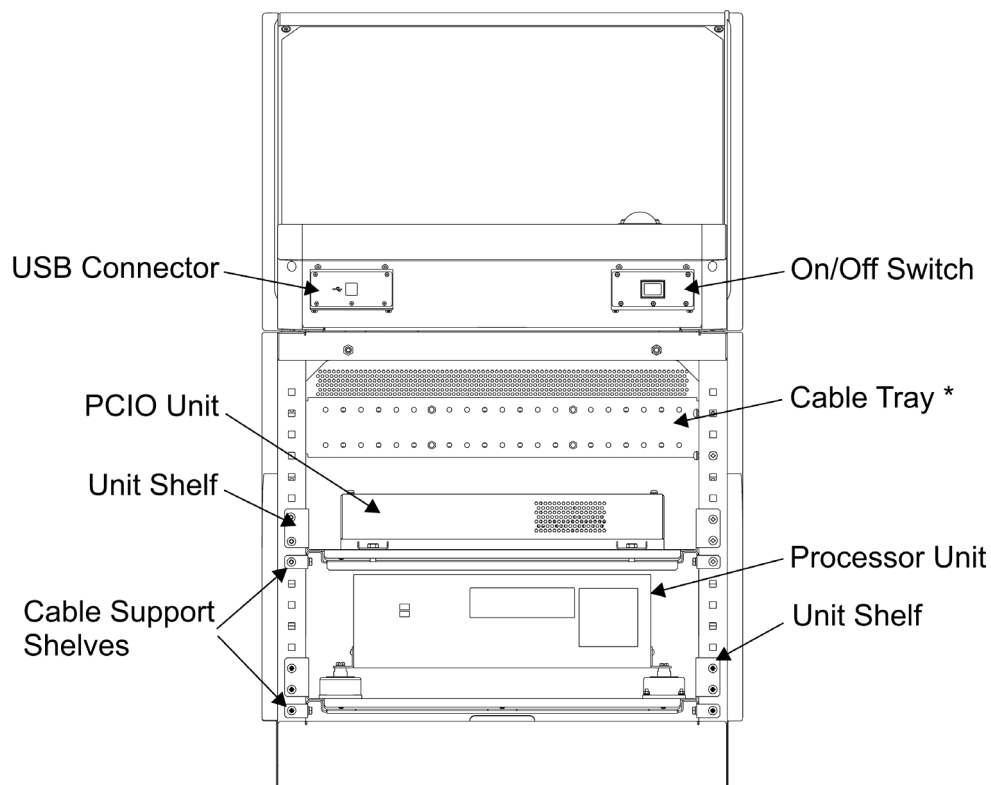


Figure 3.99 Front View of Console showing PC and PCIO Units installed*

* The cable tray assembly is only fitted in the Console suite, see drawing 65923 072 for details.

6.9.7.1 Installing the Processor Unit to the Console

To install the Processor unit into the console assembly do the following:

1. Attach the four AV mounts to the Processor unit shelf using the sixteen M4 screws, M4 SC washers, M4 plain washers and M4 nuts. The AV mount fixing holes are marked on the shelf as 'C', see Figure 3.100.
2. Attach the Processor unit to the AV mounts using the four M6 x 16 screws (4009053) and M6 washers (4709209), as shown in Figure 3.86.
3. Fit the assembled Processor unit and shelf to the pedestal, directly above the lower cable support shelf using the four screws and washers. Ensure the unit shelf rear locators are properly engaged in the cable support shelf.

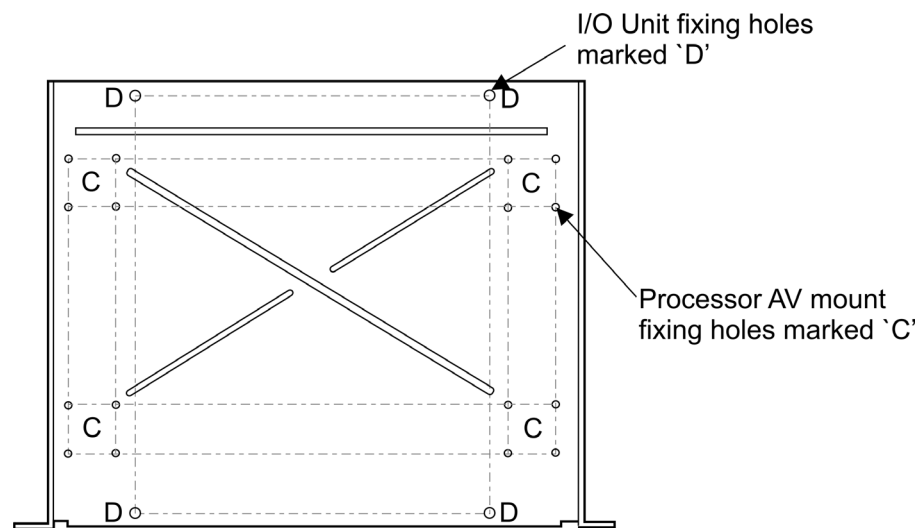


Figure 3.100 Fixing hole positions for Processor and PCIO Unit

6.9.7.2 Installing the PCIO Unit to the Console

To fit the PCIO unit to the console assembly do the following:

1. Attach the PCIO unit to the unit shelf using the four bolts, washers, nuts and two plain washers listed above. The two plain washers are fitted to the PCIO unit's rear attachment brackets. The two front holes for the PCIO unit are marked on the shelf as 'D', see Figure 3.100.
2. Fit the assembled PCIO unit and shelf to the pedestal, directly above the upper cable support shelf using the four screws and washers. Ensure the unit shelf rear locators are properly engaged in the cable support shelf.

6.9.8 Installing Processor and PCIO connector cables

Table 13 below lists description and connection details of all the cables to and from the Processor and PCIO unit.

Cables are tywrapped together and clipped through the cable restraints provided on the console chassis.

Table 13: Cable Installation Details

Part Number	Description	From	To
65823 512	Cable Assy - Video	Monitor	Processor Unit
Power Cable	Cable - Mains	PCIO Unit	Monitor
Power Cable	Cable - Mains	PCIO Unit	Processor Unit
65900 520	Cable Assy - SC2	PCIO Unit	Processor Unit
65900 521	Cable Assy - USB	PCIO Unit	Processor Unit
65900 523	Cable Assy - Trackball	Trackerball	Processor (PS2 Input)
65900 528	Brilliance & Buzzer cable	PCIO Unit	Monitor
65900 530	Cable Assembly Earth	Processor Unit	Pedestal Earth
65900 530	Cable Assembly Earth	PCIO Unit	Pedestal Earth
65900 621	Cable Assembly Power Control Switch	Switch	PCIO Unit
65900 624	Cable Assembly USB Connector	USB	Processor Unit (front)

6.9.9 Installing the Termination Assembly

The installation of the termination assembly is an optional requirement.

To assemble the termination assembly to the pedestal framework you will need the following:

- four M6 x 16 pan head screws (4012704)
- four M6 single coil washers (4709209)
- four M6 cage nuts (MA00014738)

To install the termination assembly to the pedestal framework do the following:

1. Remove any mounting plate and/or cable tray that may have been previously installed in the required position.
2. Using the four M6 screws, washers and nuts, attach the termination assembly to the rear of the framework at a convenient height. It is recommended to fit the assembly as high up the pedestal framework as possible.

6.9.10 Installing cables from the Termination Assembly to the PCIO

The following three cable types are used for connection between the Termination assembly and the PCIO unit:

- part number 3218376 (16-2-2C)
- part number 3209342 (16-2-4C)
- part number 3211274 (16-2-6C)

The table below lists cable type, signal and connection details of external cables from the termination block to the PCIO unit.

Table 14: Cable connections in Termination Block and PCIO

Termination Block			PCIO Unit		
No.	Cable Type	Colour	Slot	Connector	Signal
1	16-2-2C	Red	5	TSCA (Input)*	Serial Compass - COM 3 (38400)
2		Blue			
3		Screen			
4	16-2-4C	Red	9 *	TSCB (Input)	AIS - COM 5 (38400)
5		Blue			
6		Green		TSCN (Output)	
7		Yellow			
8		Screen		TSCB	
9	16-2-2C	Red	10	TSCG (Input)	Comms - COM 7 (4800)
10		Blue			
11		Screen		See Footnote ¹	
12	16-2-2C	Red	12	TSCR (Output)	Comms - COM 7 (4800)
13		Blue			
14		Screen		See Footnote ¹	
15	16-2-4C	Red	13 *	TSCC (Input)	Comms - COM 7 (38400, I/O)
16		Blue			
17		Green		TSCP (Output)	
18		Yellow			
19		Screen		TSCC	
20	16-2-2C	Red	14	TSCD (Input)	Comms - COM 3 (4800)
21		Blue			
22		Screen		See Footnote ¹	
23	16-2-4C	Red	18	TSCJ (Input)	Comms - COM 9 (4800, I/O)
24		Blue			
25		Green		T SCT (Output)	
26		Yellow			
27		Screen		See Footnote ¹	
28	16-2-2C	Red	19	TSL	Pulse Log
29		Blue			
30		Screen		See Footnote ⁺	
31	16-2-2C	Red	20	TSR	Relay Output
32		Blue			
33		Screen		See Footnote ⁺	
34	16-2-2C	Red	21	TSR	Relay Output
35		Blue			
36		Screen		See Footnote ⁺	

Installing cables from the Termination Assembly to the PCIO

Installation

37	16-2-6C	Red	22	TSC (type dependant)		Analogue compass
38		Blue				
39		Green				
40		Yellow				
41		White				
42		Black				
43	Screen	See Footnote [†]				
44	16-2-2C	Red	17	TSCE (Input)	1	
45		Blue			2	
46		Screen			See Footnote [†]	
47	16-2-4C	Red	16	TSR	7	Relay Output (and Digital output)
48		Blue			9	
49		Green		(TSD)		
50		Yellow				
51	Screen	See Footnote [†]				
L	16-2-2C	Red	Cable Clamp**	TSA	1	
N		Blue			2	
E		Screen			E5	

*. Clamp over outer sheath.

†. Clamp over outer sheath, strip braid away with outer sheath as required.

‡. Clamp braid and connect ring terminal, screw to plate.

** . Connect braid to ring terminal.

Secure cables to the termination assembly using the ty-raps (MA00009928).

6.9.10.1 Crimping the co-axial cables

The co-axial cables must be prepared for insertion into BNC connectors as described below.

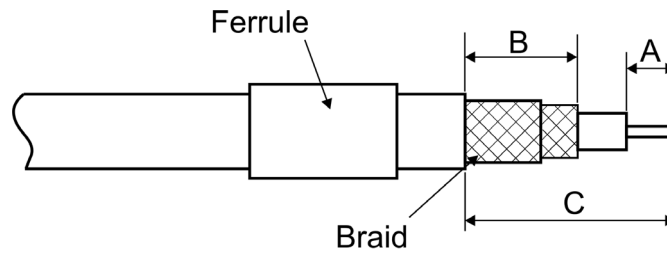
Tools Required

You will need a crimping tool (MA00018119).

Procedure

Prepare the cable end as follows:

1. Slide the ferrule onto the cable and strip away the outer cable cover to dimension C as shown in Figure 3.101.
2. Where the cable is double screened strip back the outer braid, remove the clear mylar sheath separating the outer and inner braids and strip back the inner braid and inner dielectric to the lengths shown in Figure 3.101.



A = 4mm (0.157inch)
 B = 8.5mm (0.335inch)
 C = 15mm (0.591inch)

Figure 3.101 Preparing Cable End

- Slide centre contact onto inner copper wire until the contact bottoms against cable dielectric. Crimp centre contact using crimping tool.

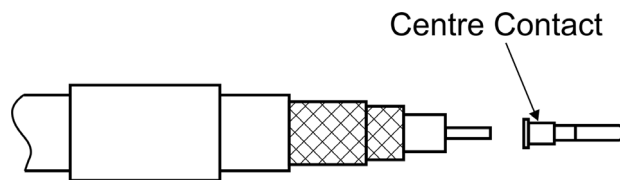


Figure 3.102 Inserting Centre Contact

- Fan braids out and slide cable into connector body until the cable bottoms against insulator. Slide ferrule over braids in the direction shown in Figure 3.103.

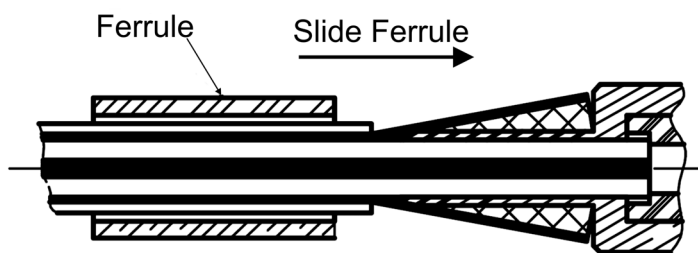


Figure 3.103 Inserting Cable into connector body

- Crimp the ferrule with crimping tool, Cut excess braid if necessary, see Figure 3.104.

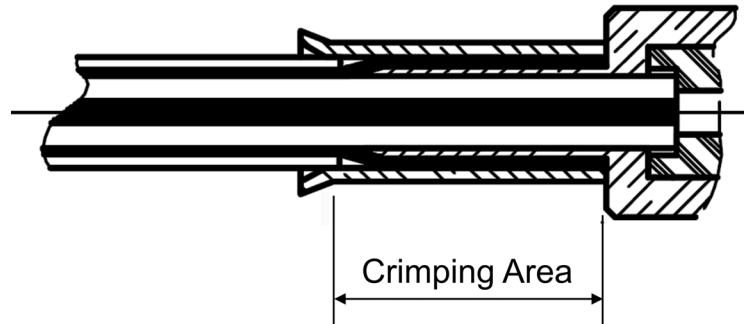


Figure 3.104 Crimping the ferrule

6.9.11 Connecting the USB Security Device to the Processor

Before the VisionMaster FT system can be run the USB pre-programmed Security device, supplied with the system, must be installed in one of the three USB sockets at the rear of the Processor unit (the fourth USB socket is used to connect the Processor to the PCIO unit).

The following USB security device part numbers define the product type installed:

- 32SDV 001 ARPA only
- 32SDV 002 ARPA / Chart Radar

6.10 Despatch Kits

To help assemble the equipment, Despatch Kits, including assembly instructions, are sent as shown in the following table:

Table 15: Despatch Kits

Unit	Despatch Kit
Processor and PCIO Kits	
PCIO Unit	65900600
Processor Unit	65900637
Display Kits	
Tabletop Console	65923608
Deckstand Console	65923609
Modular Console	65923610
Control Panel	65923611
Pedestal Kits	
Pedestal Shelf	65923680
Cable Tray	65923681
Mounting Plate	65923682
Display Unit Side Panel	65923683
Termination Kit	65923688
S-band Systems	
Turning Unit	65830660
Antenna Unit	65612610
Bulkhead Transceiver	65831660
X-band Systems	
Turning Unit	65801660
Bulkhead Transceiver	65825660

6.11 Installation Kits

6.11.1 S-band

There are three Installation Kits for S-band Bulkhead Transceiver installations:

- 10 metre S-band Coaxial Cable Kit Type 112/MIK/10
- 20 metre S-band Coaxial Cable Kit Type 112/MIK/20
- 30 metre S-band Coaxial Cable Kit Type 112/MIK/30

There are various length installation kits common to all S-band installations:

- 33 metre S-band Cable Kit Type 115/MIK/33
- 67 metre S-band Cable Kit Type 115/MIK/67
- 100 metre S-band Cable Kit Type 115/MIK/100
- 130 metre S-band Cable Kit Type 115/MIK/130
- 150 metre S-band Cable Kit Type 115/MIK/150
- 180 metre S-band Cable Kit Type 115/MIK/180

6.11.2 X-Band

There are three installation kits for X-band Bulkhead Transceiver installations:

- 10 metre X-band Waveguide Kit Type 116/MIK/10
- 20 metre X-band Waveguide Kit Type 116/MIK/20
- 30 metre X-band Waveguide Kit Type 116/MIK/30

There are various length Installation Kits common to all X-band Installations:

- 33 metre X-band Cable Kit Type 119/MIK/33
- 67 metre X-band Cable Kit Type 119/MIK/67
- 100 metre X-band Cable Kit Type 119/MIK/100
- 130 metre X-band Cable Kit Type 119/MIK/130
- 150 metre X-band Cable Kit Type 119/MIK/150
- 180 metre X-band Cable Kit Type 119/MIK/180

6.11.3 Connector Kit for Long Cable Runs

A special connector kit is available for installations where cable lengths of up to 300m require the use of low loss video cable type FSJ4-75.

- Video Connector Kit Type 117/MIK

Most of the above kits can be supplied with LSZH equivalent cables.

7 System Component Interconnections

This section contains information on the interconnection of system components, any setting up that is required and details of all system fuses.

7.1 Cabling and Interconnection Diagrams

The following figures give cabling and interconnection details of the S-Band and X-Band VisionMaster FT systems.

- Figure 3.105 '*Intermodule Cabling*'
- Figure 3.106 '*Cabling Diagram for S-Band Bulkhead Transceiver -Sheet 1*'
- Figure 3.107 '*Interconnection Diagram for S-Band Bulkhead Transceiver - Sheet 2*'
- Figure 3.108 '*Cabling Diagram for S-Band Masthead Transceiver -Sheet 1*'
- Figure 3.109 '*Interconnection Diagram for S-Band Masthead Transceiver - Sheet 2*'
- Figure 3.110 '*Cabling Diagram for X-Band Bulkhead Transceiver -Sheet 1*'
- Figure 3.111 '*Interconnection Diagram for X-Band Bulkhead Transceiver - Sheet 2*'
- Figure 3.112 '*Cabling Diagram for X-Band Masthead Transceiver -Sheet 1*'
- Figure 3.113 '*Interconnection Diagram for X-Band Masthead Transceiver - Sheet 2*'
- Figure 3.114 '*PCIO Connections*'
- Figure 3.115 '*Interswitch Cabling Diagram*'

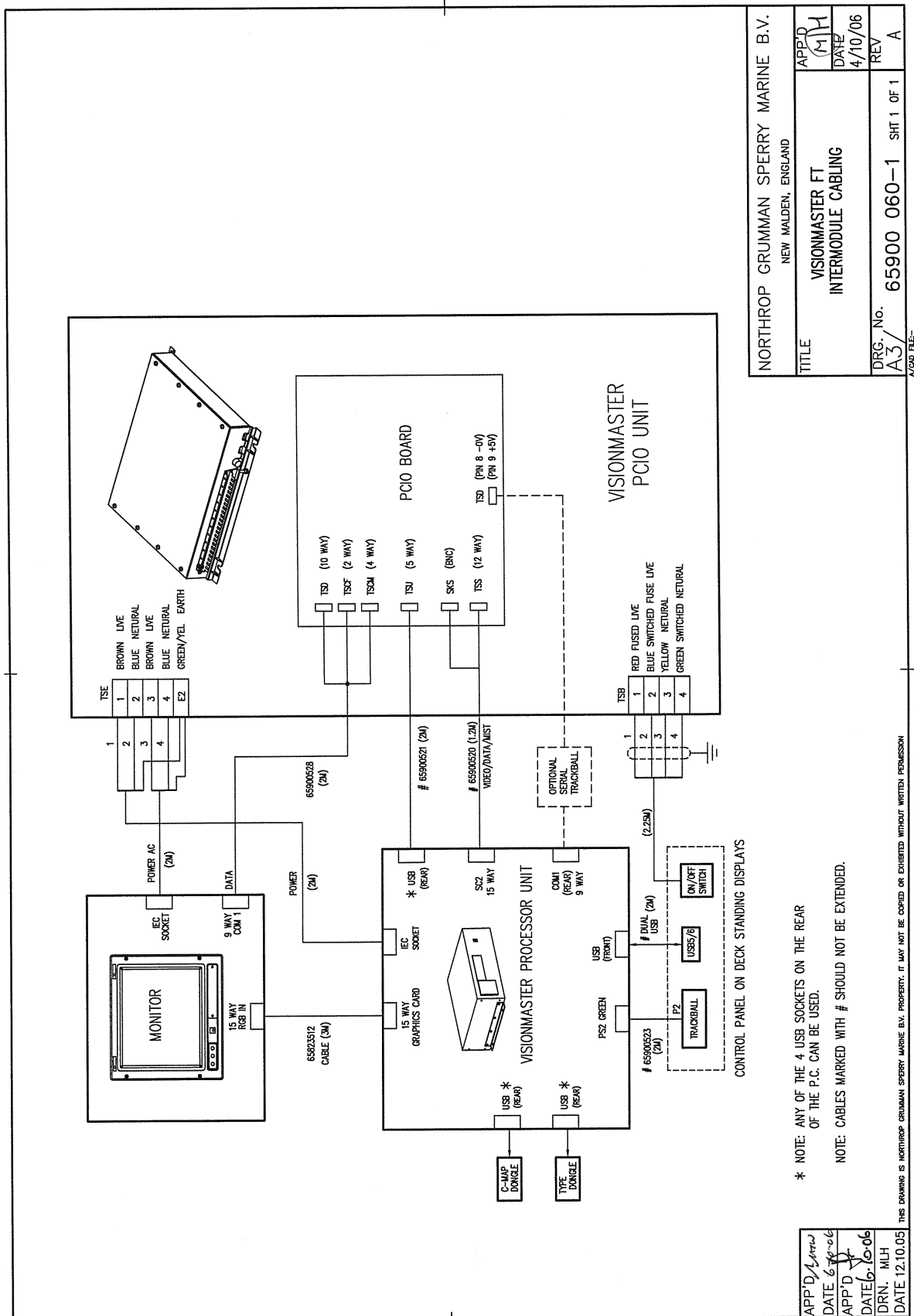


Figure 3.105 Intermodule Cabling

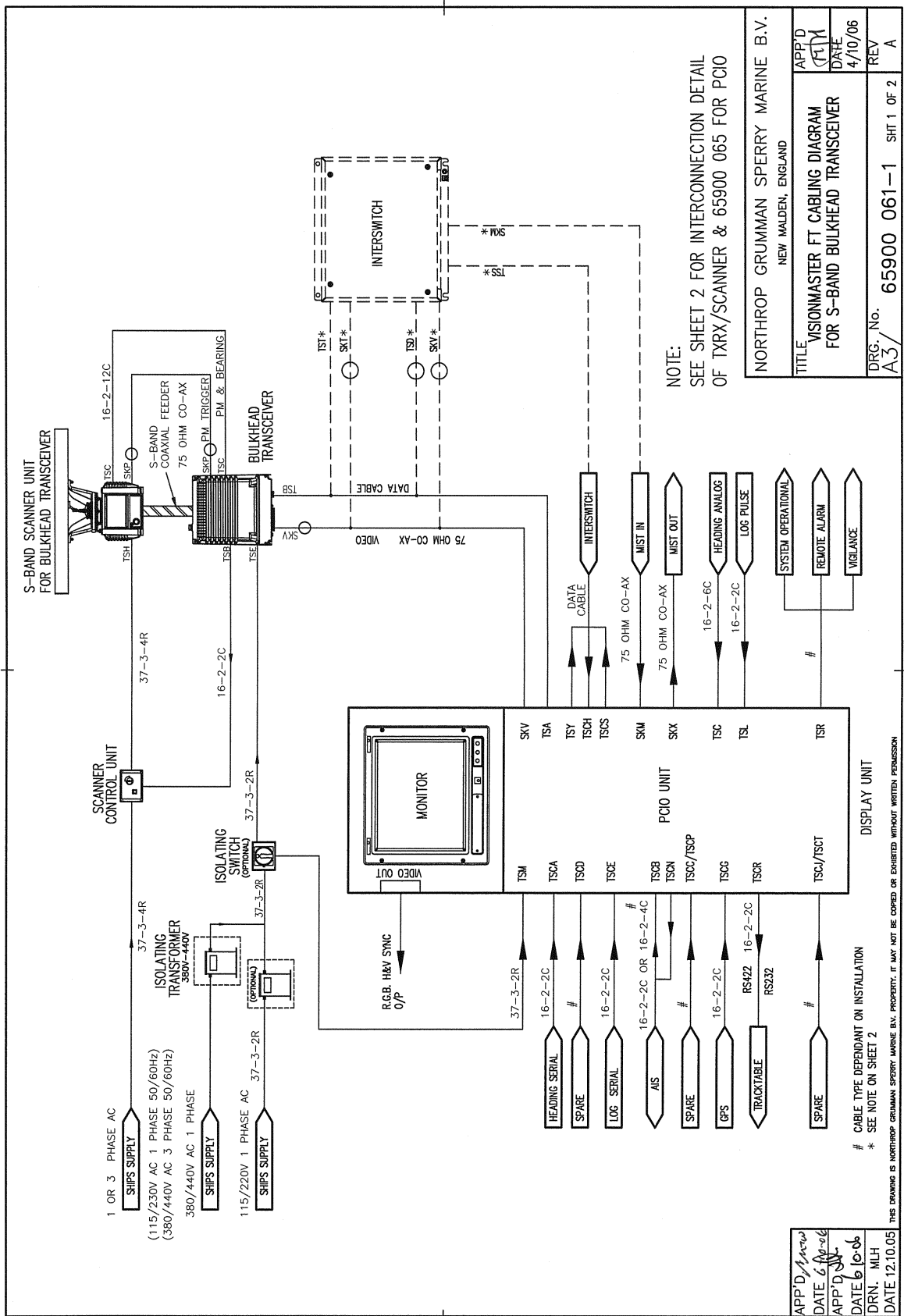


Figure 3.106 Cabling Diagram for S-Band Bulkhead Transceiver -Sheet 1

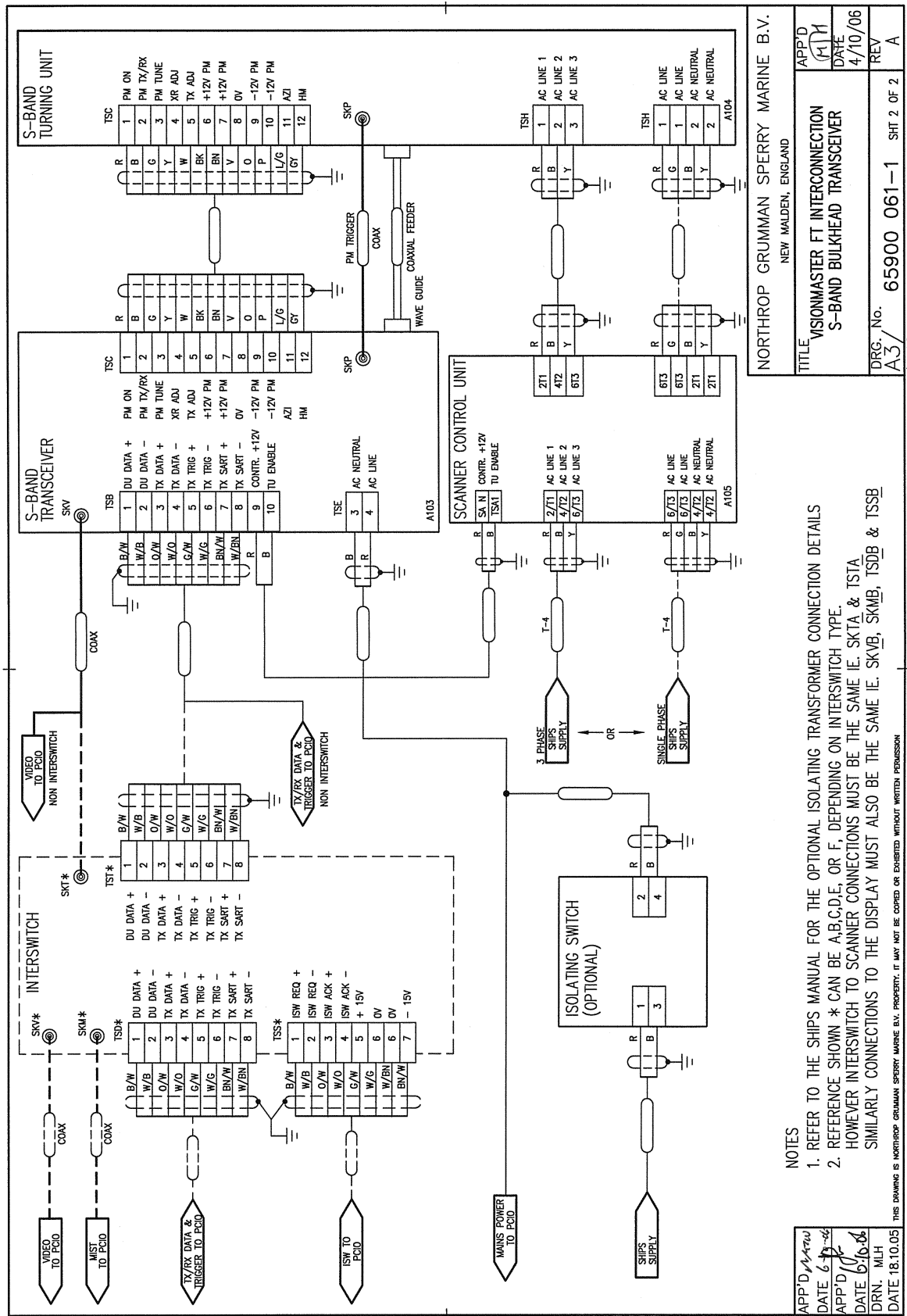


Figure 3.107 Interconnection Diagram for S-Band Bulkhead Transceiver -Sheet 2

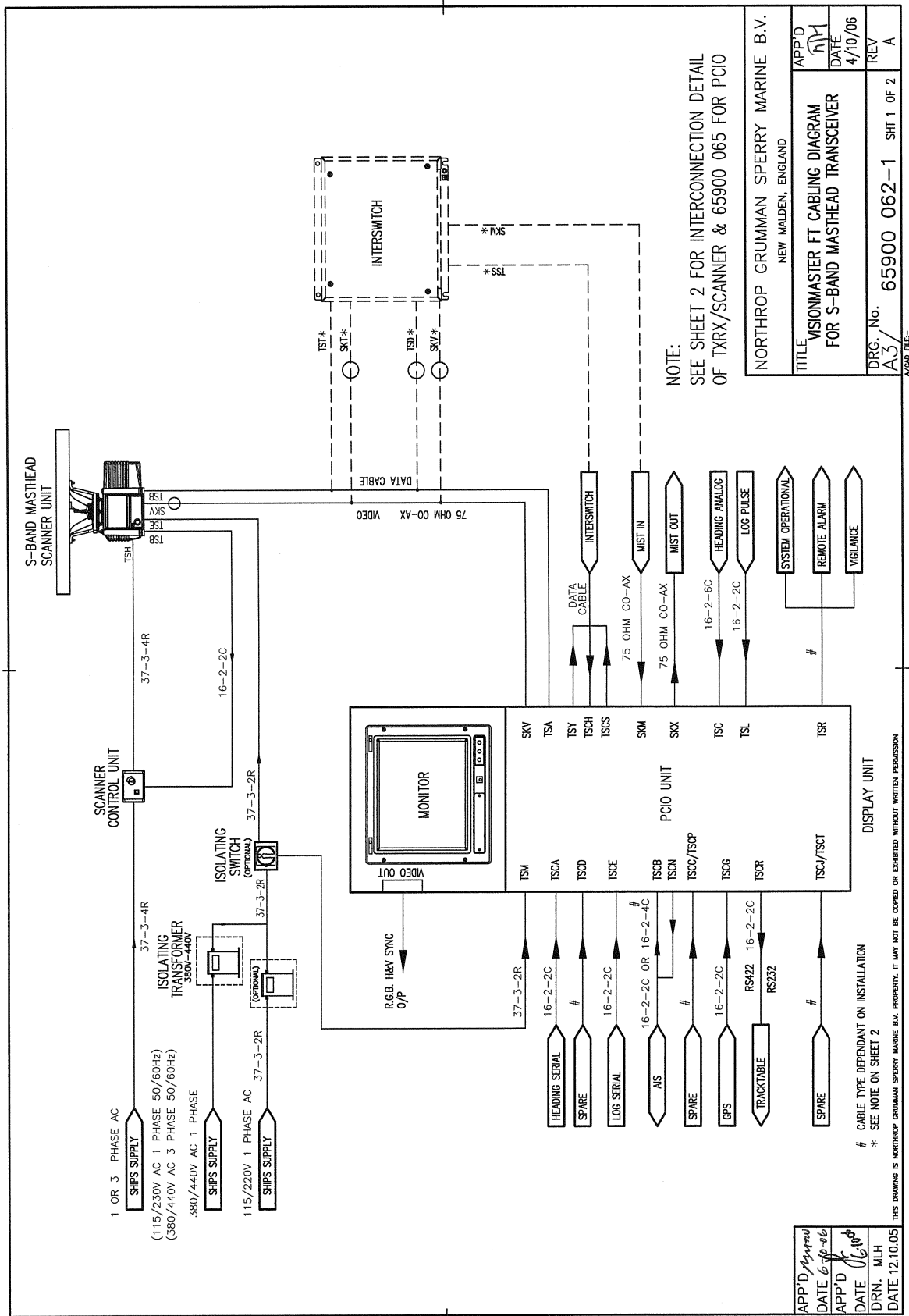


Figure 3.108 Cabling Diagram for S-Band Masthead Transceiver -Sheet 1

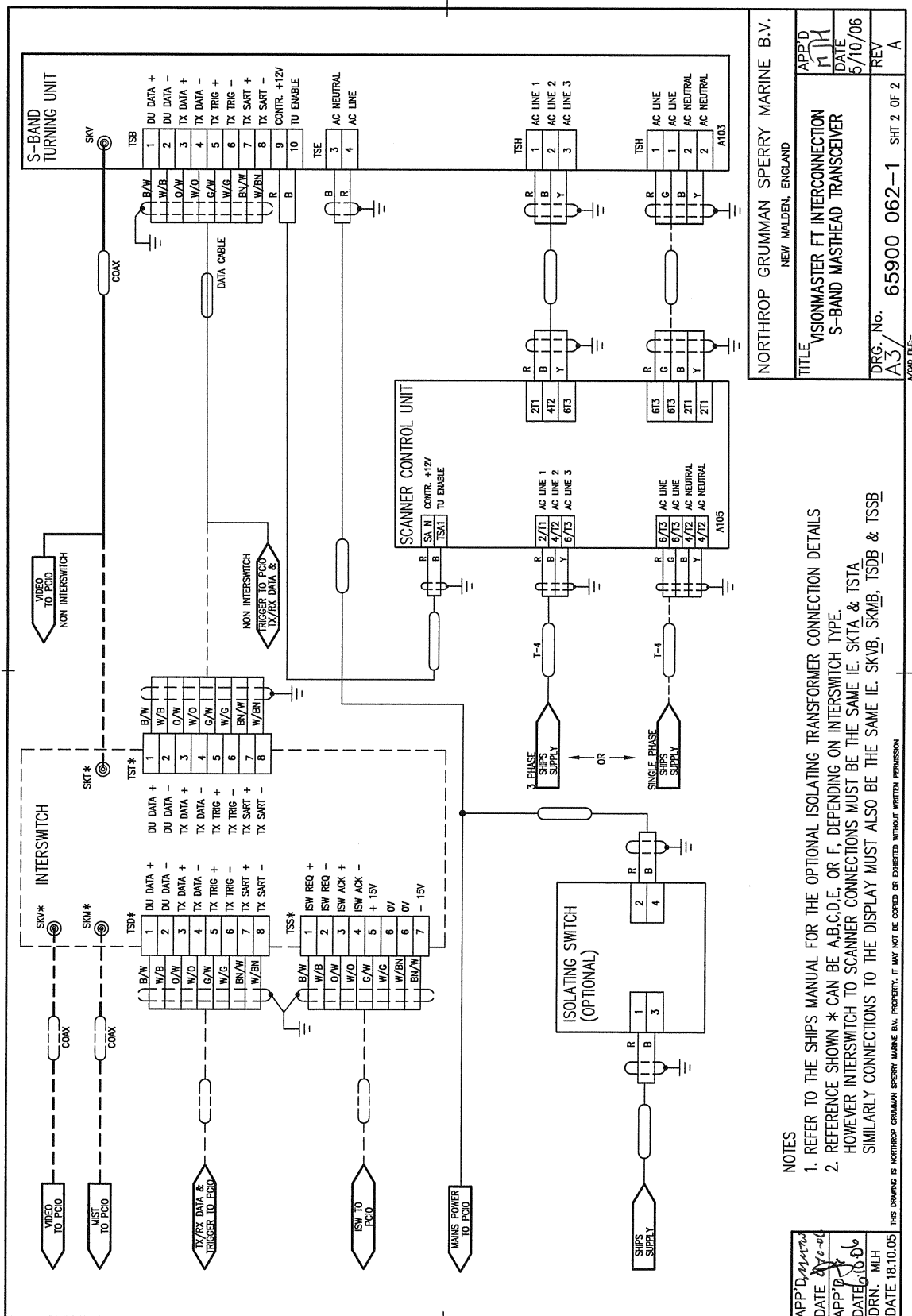


Figure 3.109 Interconnection Diagram for S-Band Masthead Transceiver -Sheet 2

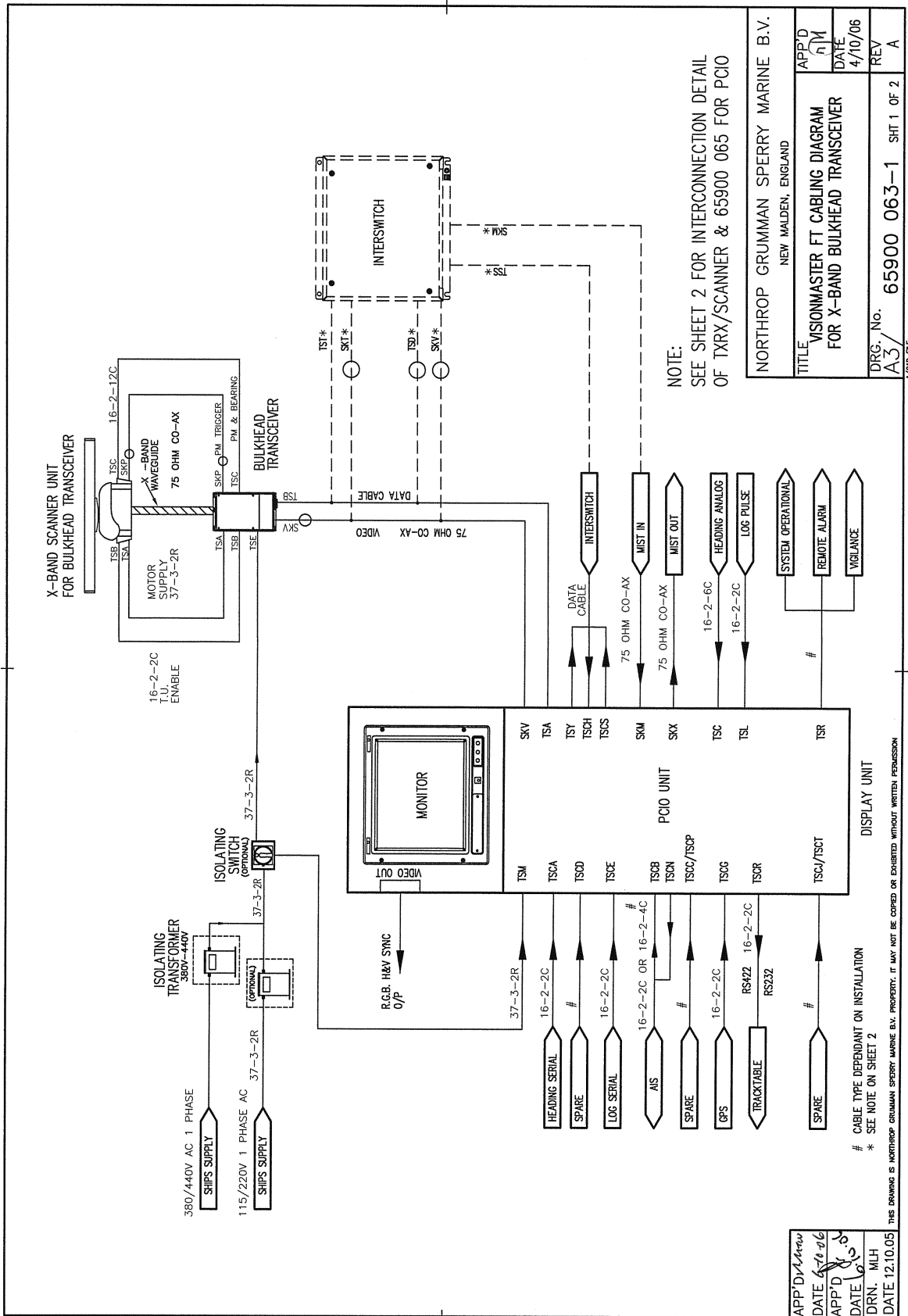
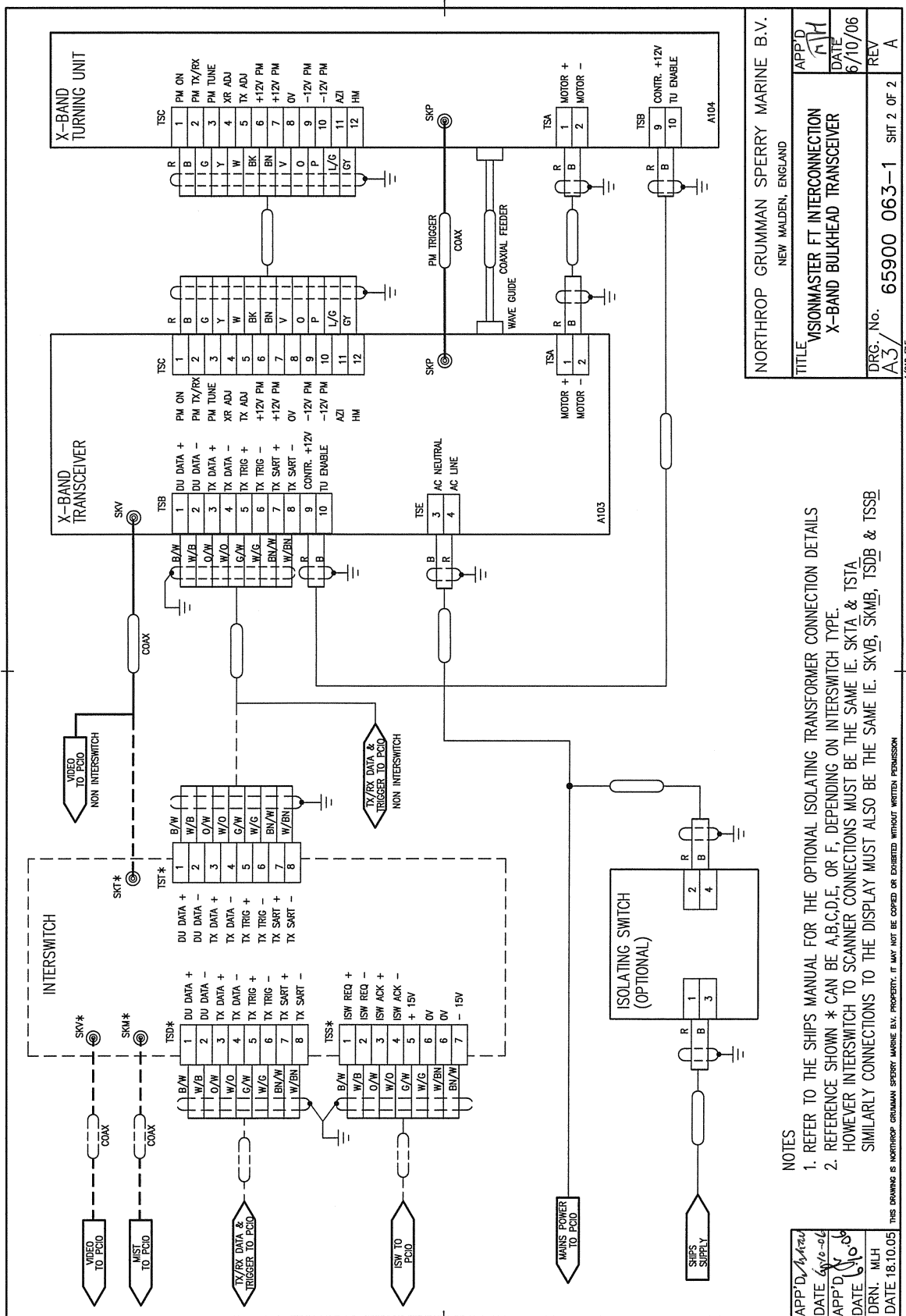


Figure 3.110 Cabling Diagram for X-Band Bulkhead Transceiver -Sheet 1



NORTHROP GRUMMAN SPERRY MARINE B.V.
 NEW MALDEN, ENGLAND

TITLE: VISIONMASTER FT INTERCONNECTION
 X-BAND BULKHEAD TRANSCEIVER

APP'D: *[Signature]*
 DATE: 6/10/06
 REV: A

DRG. No. 65900 063-1 SHF 2 OF 2

Figure 3.111 Interconnection Diagram for X-Band Bulkhead Transceiver -Sheet 2

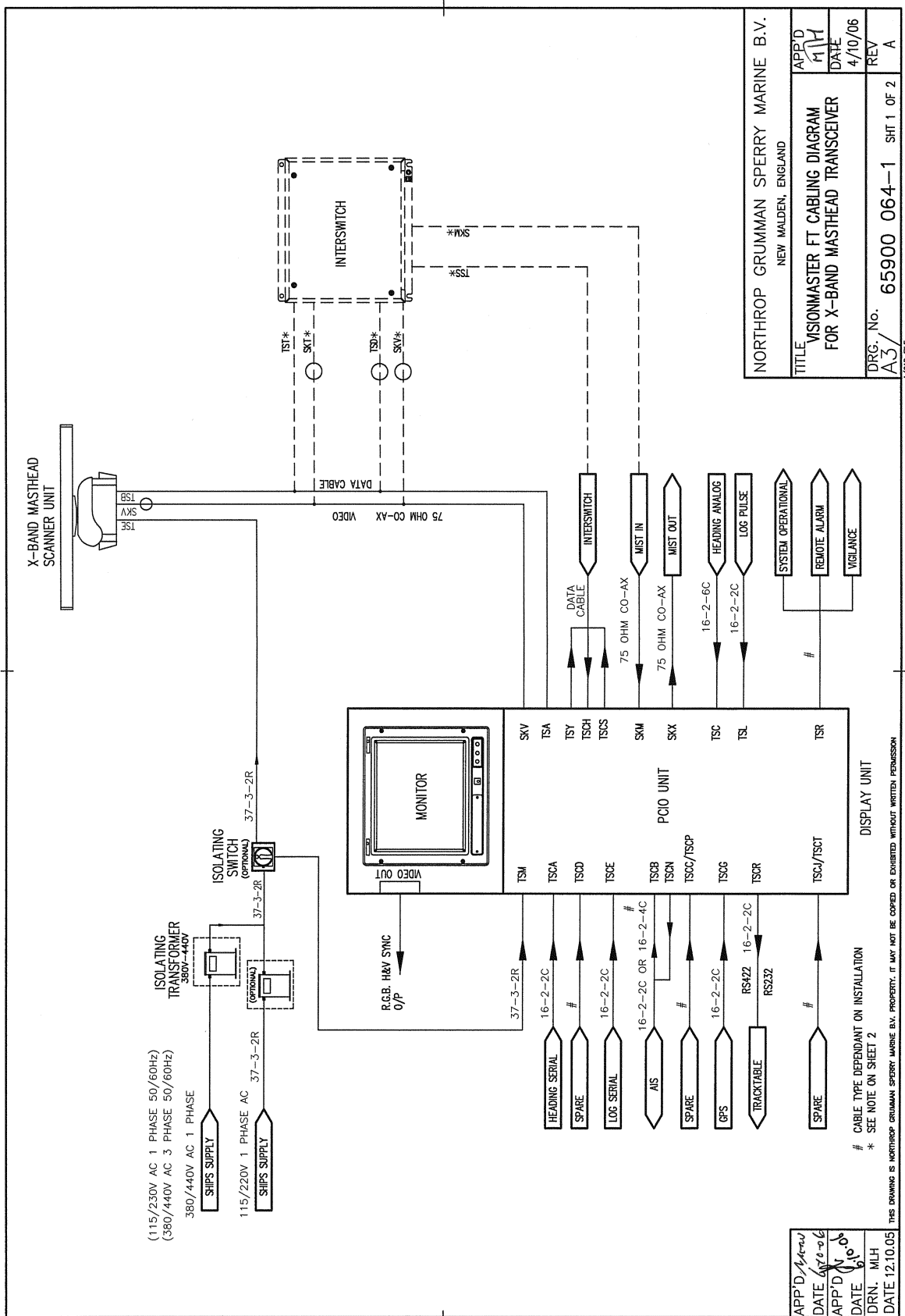


Figure 3.112 Cabling Diagram for X-Band Masthead Transceiver -Sheet 1

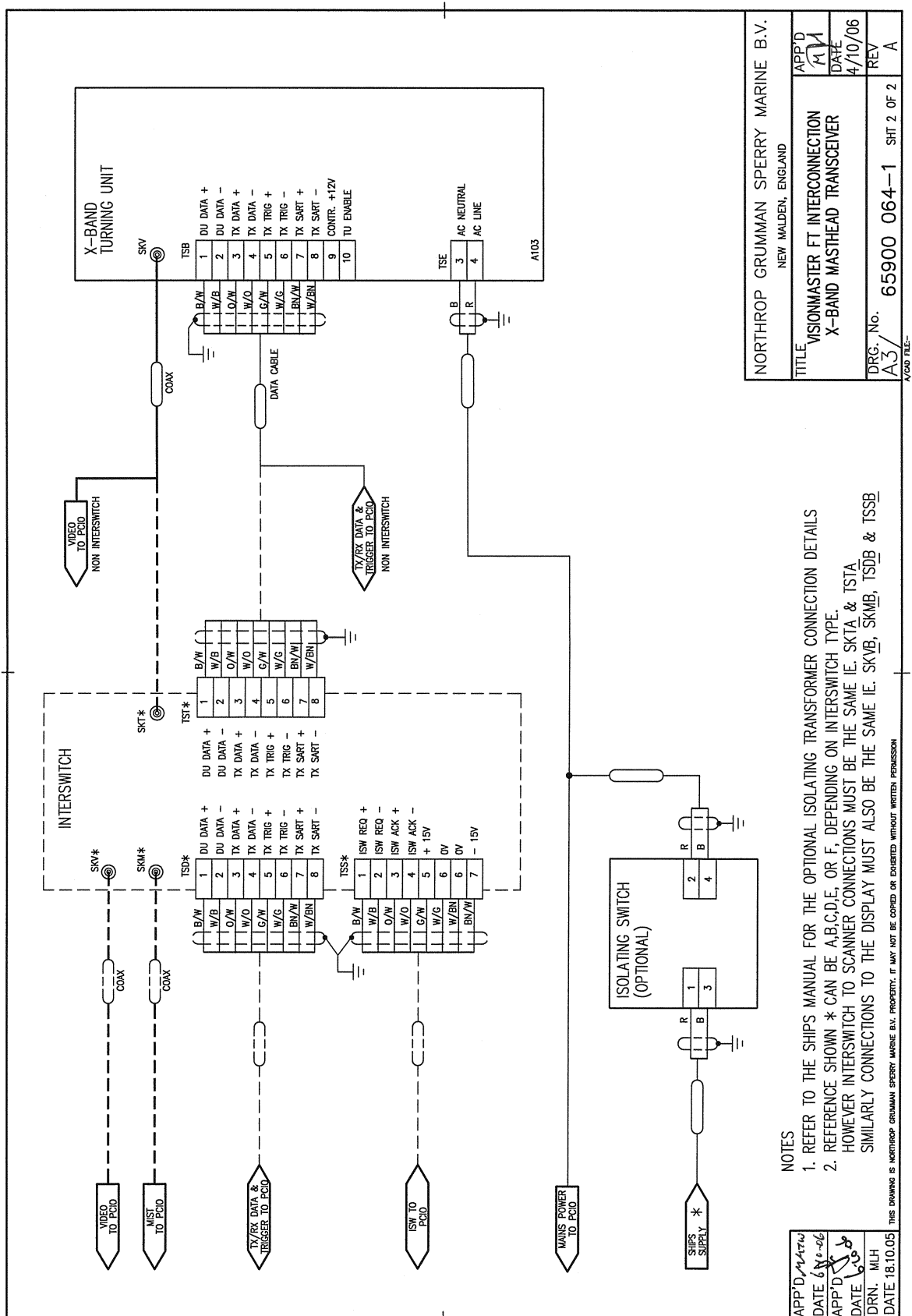


Figure 3.113 Interconnection Diagram for X-Band Masthead Transceiver -Sheet 2

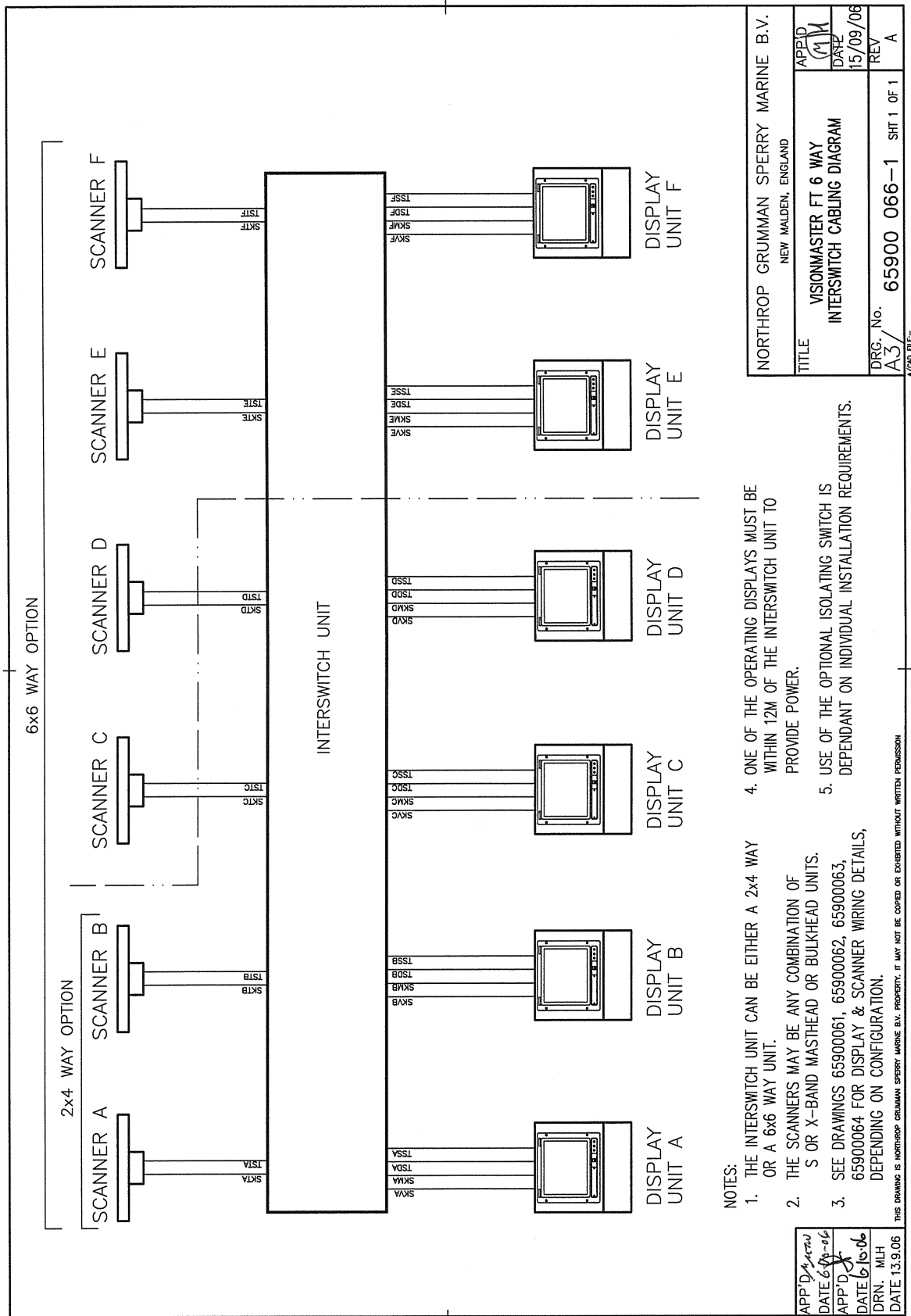


Figure 3.115 Interswitch Cabling Diagram

7.2 Compass Cabling and Link Settings

Compass cabling and linking information for VisionMaster FT Series Radars is detailed below for stepper and synchro type compasses.

Note: *Details of cabling information for compasses with a serial output are described in Section 7.2.1 'Standard Compass Board Links and Interconnections' and Section 7.2.2 'Special Compass Board Links and Interconnections'.*

The Compass Interface board is mounted as a daughter board onto the PCIO board in the PCIO Unit.

The type of compass interface board fitted will determine the type of compass that can be used with the system. Two compass interface boards are available: Standard and Special.

Table 16: Compass Interface Boards - Standard & Special

Interface Board	Compass Type	Ratio	Signal Voltage	Impedance
Standard 65800831	Stepper – S Type	360:1	16-100V DC line-line	10kΩ Min
	Stepper – M Type	180:1	8-100V DC line-line return.	
	Synchro (50–500Hz)	360:1	16-100V RMS line-line	10kΩ Min
			25-165V RMS reference	47kΩ Min
Special 65800832	Synchro (50-500Hz)	180:1	9.3-37V RMS line-line	40k to 60kΩ
		90:1	32-126V RMS line-line	133k to 200kΩ
		36:1		
		1:1	26-150V RMS reference	100kΩ Min

At system power up, the system detects the type of compass interface board (standard or special), if any.

During system configuration, the compass type must be selected if the standard compass interface board is fitted, and the number of cycles per compass revolution (ratio) selected if the special compass interface board is fitted. For information on configuring the compass type and ratio settings refer to Section 6.4.1.3 'Sensor Peripherals' in Chapter 4 'Configuration'.

7.2.1 Standard Compass Board Links and Interconnections

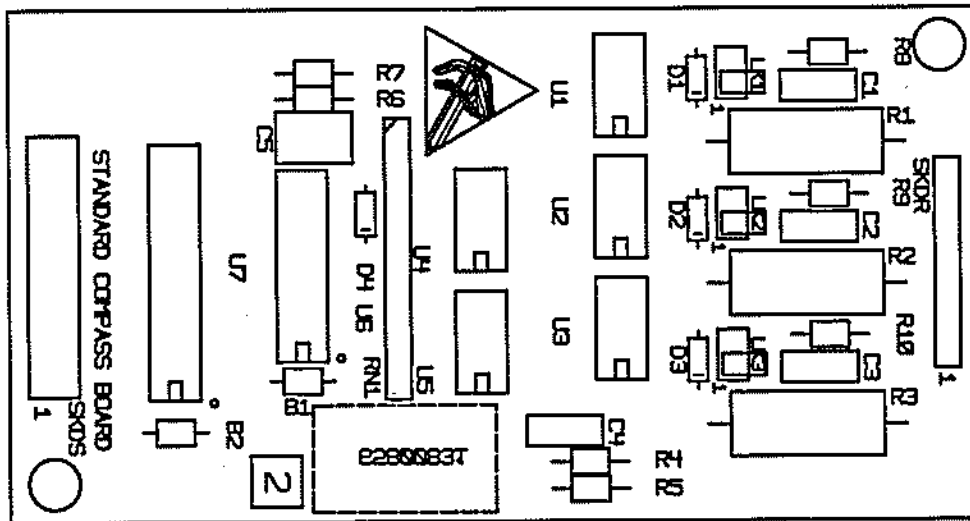


Figure 3.116 Standard Compass Interface PCB

There are three links on the Standard Compass Board, LK1, LK2 and LK3. These need only be fitted between the pins if the 'OFF' state current from an 'S' type stepper compass is too high and causes the board to generate compass errors, otherwise leave in the parked position as shown in Figure 3.116.

Compasses should be connected in accordance with Table 17 and Table 18.

Table 17: Stepper Compass Settings

Stepper Compass					
S Type +ve Ref.		S Type -ve Ref.		M Type	
PCIO Panel		PCIO Panel		PCIO Panel	
TSC1	Common Ref.	TSC1	S1	TSC1	S1
TSC2	Common Ref.	TSC2	S2	TSC2	S2
TSC3	Common Ref.	TSC3	S3	TSC3	S3
TSC4	S1	TSC4	Common Ref.	TSC4	Common Ref.
TSC5	S2	TSC5	Common Ref.	TSC5	Common Ref.
TSC6	S3	TSC6	Common Ref.	TSC6	Common Ref.
TSC7	no connection	TSC7	no connection	TSC7	no connection
TSC8	no connection	TSC8	no connection	TSC8	no connection
TSC9	no connection	TSC9	no connection	TSC9	no connection
TSC10	no connection	TSC10	no connection	TSC10	no connection

Table 18: Synchro Compass Settings

Synchro Compass					
Ref. Below 61V RMS		Ref. 61V - 115V RMS		Ref. Above 115V RMS	
PCIO Panel		PCIO Panel		PCIO Panel	
TSC1	S1	TSC1	S1	TSC1	S1
TSC2	S2	TSC2	S2	TSC2	S2
TSC3	S3	TSC3	S3	TSC3	S3
TSC4	-- +	TSC4	-- +	TSC4	-- +
TSC5	-- + Link	TSC5	-- + Link	TSC5	-- + Link
TSC6	-- +	TSC6	-- +	TSC6	-- +
TSC7	Synchro Ref.	TSC7	no connection	TSC7	no connection
TSC8	no connection	TSC8	Synchro Ref.	TSC8	no connection
TSC9	no connection	TSC9	no connection	TSC9	Synchro Ref.
TSC10	Ref. Return	TSC10	Ref. Return	TSC10	Ref. Return

7.2.2 Special Compass Board Links and Interconnections

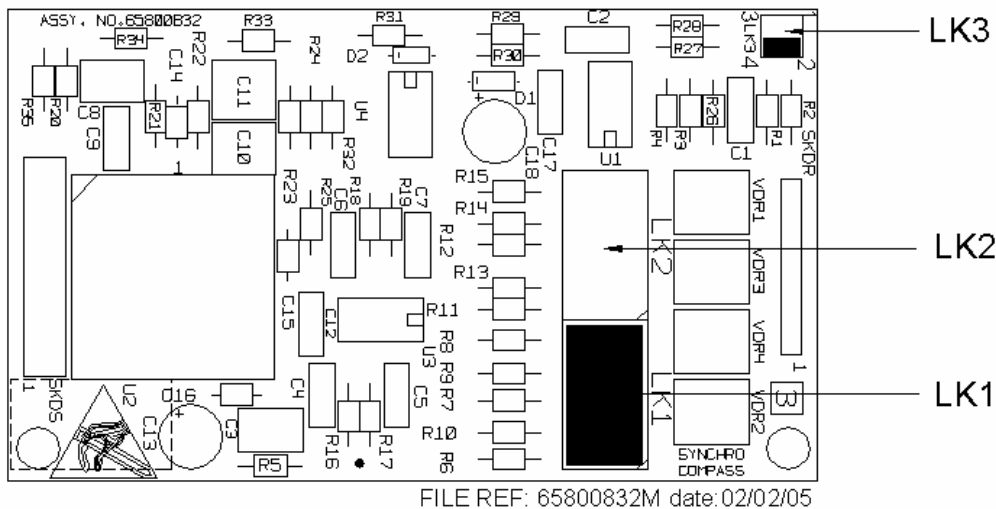


Figure 3.117 Special Compass Board Interface PCB

There are three links on the Special Compass Board, LK1, LK2 and LK3.

The voltage at the S1, S2 & S 3 inputs defines whether a shorting link is fitted to position LK1 or LK2.

If the input voltages are greater than 32V RMS, the link must be fitted in position LK1, otherwise, fit the link in position LK2.

The default setting is with the link fitted in position LK1.

The reference voltage shown in Table 19 determines the setting of LK3.

Table 19: Reference Voltage for LK3

Reference Voltage	LK3
150V RMS	2 - 4
115V RMS	3 - 4
50V RMS	1 - 2
26V RMS	1 - 3

The default setting is with pins 2 and 4 of LK3 linked.

Compasses should be connected in accordance with the following table:

Table 20: Compass Settings

Synchro Compass	
I/O Panel	Compass
TSC1	S1
TSC2	S2
TSC3	S3
TSC4	(no connection)
TSC5	(no connection)
TSC6	(no connection)
TSC7	Syncro Ref
TSC8	(no connection)
TSC9	(no connection)
TSC10	Ref. Return

7.3 Log Cabling

A dual axis serial log is connected to a two way serial input (TSCE).

The log input can accept signals from a water-locked, single axis, pulse or Doppler log with 100 to 2560 pulses per nm at a speed range of 0 to 99.9 knots. The signal can be from a closing contact or be a TTL compatible signal (1=2.4 to 5V, 0=0 to 0.4V).

The log signal is connected to TSL 1, the log return to TSL 2.

7.4 PCIO Board

The PCIO Board has three high speed serial inputs (38400 baud) and six low speed serial inputs (4800 and 9600 baud).

Communication to the Processor unit is via an embedded USB hub (TSU). Video and data to the Scan Converter 2 (SC2) card is via an 12 way connector (TSS).

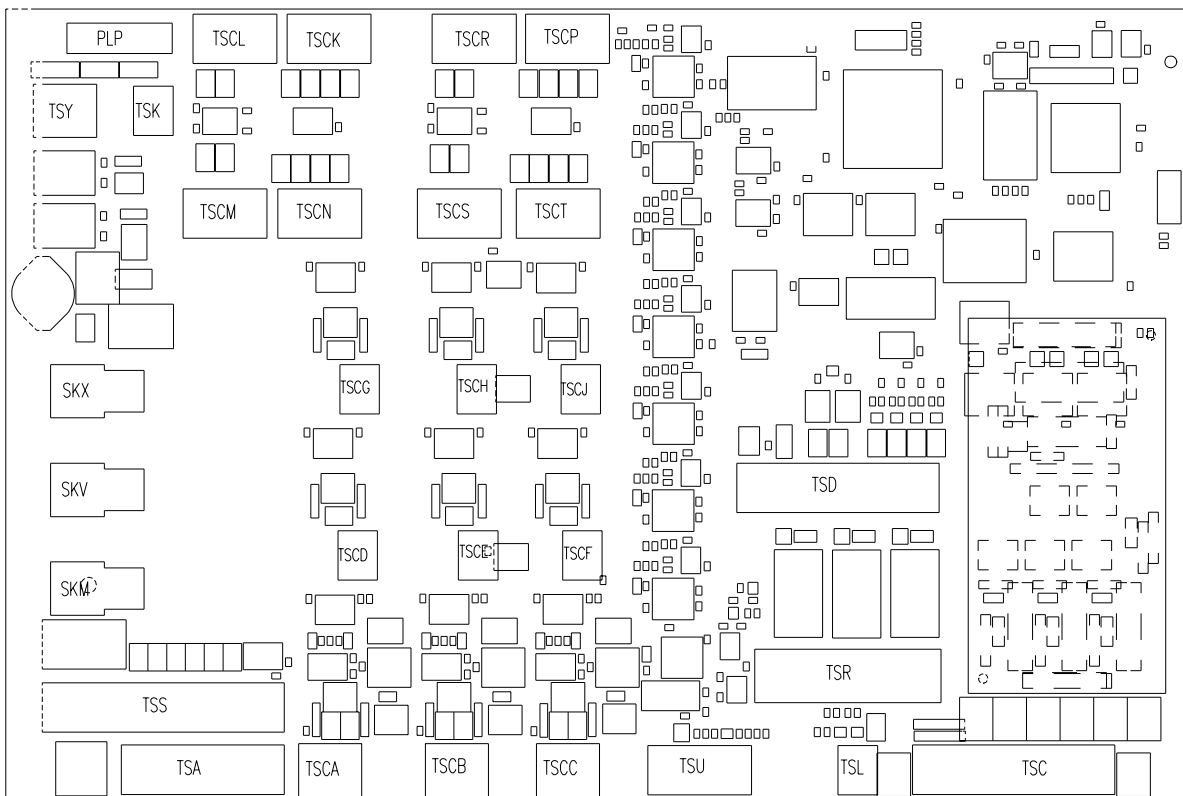


Figure 3.118 PCIO Board

7.4.1 PCIO Board - Serial Inputs and Outputs

Table 21 below gives details of the serial input and output connections.

Table 21: PCIO Board Serial Inputs and Outputs

Port	Terminal	Function	Features
COM 3	TSCA 1	Data B (RS422 or RS232 rtn)	Heading input, 38400 baud*
	TSCA 2	Data A (RS422 or RS232 signal)	
	TSCA 3	Isolated earth	
	TSCD	Spare	Input only
	TSCE 1	Data B (RS422 or RS232 rtn)	Log Input, 4800 baud *
	TSCE 2	Data A (RS422 or RS232 signal)	
COM 4	TSCF 1	Data B (RS422 rtn)	Monitor control input, 9600 baud
	TSCF 2	Data A (RS422 signal)	
	TSCM 1	Data B (RS422)	Monitor control output, 9600 baud
	TSCM 2	Data A (RS422)	
COM 5	TSCB 1	Data B (RS422 or RS232 rtn)	AIS input, 38400 baud *
	TSCB 2	Data A (RS422 or RS232 signal)	
	TSCB 3	Isolated earth	
	TSCN 1	Data B (RS422)	AIS output, 38400 baud (optional)
	TSCN 2	Data A (RS422)	
	TSCN 3	Data A (RS232 signal)	
	TSCN 4	0 V	
COM 6	TSCC	Spare Input	
	TSCP	Spare output	
COM 7	TSCG 1	Data B (RS422 or RS232 rtn)	GPS, 4800 baud (input only) *
	TSCG 2	Data A (RS422 or RS232 signal)	
	TSCR 1	Data B (RS422)	Tracktable output, 4800 baud
	TSCR 2	Data A (RS422)	
	TSCR 3	Data A (RS232 signal)	
	TSCR 4	0 V	
COM 8	TSCH 1	Data B (RS422 or RS232 rtn)	Interswitch input, 4800 baud
	TSCH 2	Data A (RS422 or RS232 signal)	
	TSCS 1	Data B (RS422)	Interswitch output, 4800 baud
	TSCS 2	Data A (RS422)	
COM 9	TSCJ	Spare Input	
	TSCT	Spare Output	

*. Do not earth cable on these serial inputs

7.4.2 Additional Input and Outputs

The PCIO board provides the following additional ports:

- Transceiver connections
- Pulse Log
- System Operational indicator via relay contacts
- Remote Alarm via relay contacts
- Vigilance Alarm via relay contacts
- Buzzer output via Discrete I/O

Table 22: Additional PCIO Inputs and Outputs

Port	Terminal	Function	Features
Transceiver	TSA 1	DU DATA +	Data to Transceiver
	TSA 2	DU DATA -	
	TSA 3	TX DATA +	Data from Transceiver
	TSA 4	TX DATA -	
	TSA 5	TX TRIG +	Trigger from Transceiver
	TSA 6	TX TRIG -	
	TSA 7	TX SART +	Not used
	TSA 8	TX SART -	
Transceiver (BNC connectors)	SKX	MIST OUT	MIS Trigger from SC2 card
	SKM	MIST IN	MIS Trigger to SC2 card
	SKV	VIDEO IN	Video from Transceiver
Pulse Log	TSL 1	LOG	
	TSL 2	LOG RTN (0V)	
System Operational	TSR 1	System Op (N/O)	System Operational with Relay Contacts. Normally Open (N/O) and Normally Closed (N/C) available. N/C shorts to return in alarm condition.
	TSR 2	System Op (N/C)	
	TSR 3	System Op (Common)	
Remote Alarm	TSR 4	Remote Alarm (N/O)	Remote Alarm with Relay Contacts. Normally Open (N/O) and Normally Closed (N/C) available. N/C shorts to common in non- operational condition.
	TSR 5	Remote Alarm (N/C)	
	TSR 6	Remote Alarm (Common)	
Vigilance Alarm	TSR 7	Vigilance Alarm (N/O)	Vigilance Alarm with Relay Contacts. Normally Open (N/O) and Normally Closed (N/C) available. N/O shorts to return during output pulse.
	TSR 8	Vigilance Alarm (N/C)	
	TSR 9	Vigilance Alarm (Common)	
Buzzer	TSD 6	Buzzer signal	Buzzer signal goes to low volts to sound buzzer.
	TSD 10	Buzzer (+12 V)	

7.4.3 Ancillary and Interswitch Outputs

The PCIO board provides the following power output ports:

- Ancillary Power Output (+24 V)
- Interswitch Power Output (+/- 15 V)

Table 23: Ancillary and Interswitch Outputs

Port	Terminal	Function	Features
Ancillary Power Output	TSX 1	+ 24 V	< 700 mA
	TSX 2	0 V	
Interswitch Power Output	TSY 1	+ 15 V	< 700 mA
	TSY 2	0 V	
	TSY 3	- 15 V	< 300 mA

7.5 System Fuses

Switch – Fuse Current Ratings

The table below shows the ratings for the ship's switch fuse for the radar and the S-band motor.

Ship's Supply	Radar	S-Band Motor	
		Single Phase	Three Phase
110/120V AC	10A	10A	10A
220/240V AC	5A	5A	5A
380/440V AC	-	-	5A

Processor Electronics Unit Fuses

	Supply	Rating	Code No.	Location
Mains Fuse (FS1) (external)	110/120V AC	5A	2180413	On outside of PCIO unit
	220/240V AC			
Mains Fuse (FS1) (internal)	110/120V AC	3.15A	2162326	On PSU PCB inside the PCIO unit
	220/240V AC			

Transceiver Unit Fuses

For X-Band fuse location refer to Figure 3.16 (masthead transceiver) and Figure 3.24 (bulkhead transceiver).

For S-Band fuse location refer to Figure 3.48 (masthead transceiver) and Figure 3.52 (bulkhead transceiver).

	Supply	S-Band	X-Band	Code No.
Mains Fuse (FS1)	110/120V AC	3.15A	-	MA00007245
	110/120V AC	-	5A	2180413
	220/240V AC	3.15A	3.15A	MA00007245

Fuse Types

MA00007245 - 3.15A, 1¼" (31mm) ceramic, anti surge, cartridge.

2180413 - 5A, 1¼" (31mm) ceramic, anti surge, cartridge.

2162326 - 3.15A, 20mm ceramic, anti surge, cartridge.

CHAPTER 4

CONFIGURATION

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1 Introduction

The Configuration program provides the service engineer and/or developer with the tool to commission and service the VisionMaster system.

Note: *This chapter describes the system configuration when a user is logged on as a service engineer. A user logged on as a Developer will have access to additional configuration features not covered in this chapter.*

In general, the order of configurable sections as presented by the Configuration tool is designed to be the order in which the engineer should progress through the system configuration.

As features and values are configured the Configuration tool gives a graphical indication of each item's configuration status by means of colored status buttons in the navigation column, see See "Status Buttons" on page 12.

The Validation window also gives a summary of any incorrect data and values entered. You can validate your configuration settings at any time by accessing **Validate** from the **File** menu. See "Validating, Saving and Exporting" on page 77.

2 Accessing the Configuration Tool

To access the VisionMaster configuration tool do the following:

1. In the VisionMaster FT system log in as a service engineer, for details refer to Section 3.1 'Login' in Chapter 5 'Diagnostics and Commissioning'.
2. Navigate to **Shutdown** in the System menu and click on the **Service Mode** button. The VisionMaster system shuts down and the Windows desktop is displayed.
3. Double click on the **Configure VMFT** icon on the desktop, the VisionMaster FT system configuration window is opened.

The VisionMaster FT Configuration window comprises an active title line, and a toolbar which includes File, View and On-Screen Keyboard drop down menus.

The main area of the window is divided into two size-editable columns; the left column contains the configuration navigation tree, and the right column is the main content area.

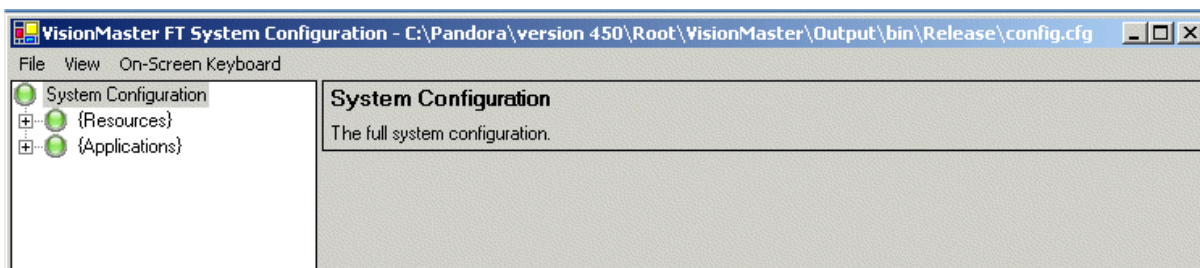


Figure 4.1 Configuration Tool Window

2.1 Changing the Login Status

When you access the configuration tool the system automatically opens the application in Service mode. To change the current login status (for example, from 'service' to 'developer'):

1. Click on the **File** drop down menu and select **Log In**. The Configuration Login In window appears.

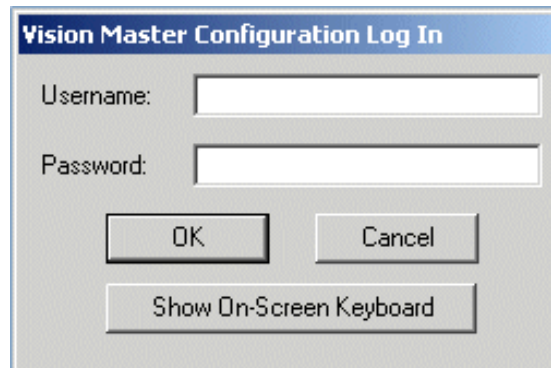


Figure 4.2 Login Window

2. Enter a valid user name and password in the respective fields and click the **OK** button. The system authenticates the data against a database of known users.
3. If the data entered is authenticated the configuration options listed in the navigation tree may change dependant on the logged in operator's access level.

2.2 Accessing the On-Screen Keyboard

If you require access to a screen keyboard in order to enter data click on the **On-Screen Keyboard** drop down menu and select **Show**. A keyboard appears below the Configuration window.



Figure 4.3 On -screen Keyboard.

3 Opening and Saving a Config File

When the VisionMaster FT configuration tool is first opened the system loads a baseline configuration file with settings suitable for Production Test.

The system also includes default configuration files for each of the following product types:

- Standalone Radar (StandaloneRadarConfig.cfg)
- Standalone Chart Radar (StandaloneChartRadarConfig.cfg)
- Standalone ECDIS (StandaloneEcdisConfig.cfg)

When you first access VisionMaster FT Configuration you must open the configuration file which matches the product type you are using. After opening the product file save as the default config file (named config.cfg) which will automatically be used by the VisionMaster FT system.

3.1 Opening a Product Configuration

1. To open a product configuration click on the **File** drop down menu and select **Open**.
2. A navigation window appears superimposed over the System Configuration window from where you can select from the list of configuration files.

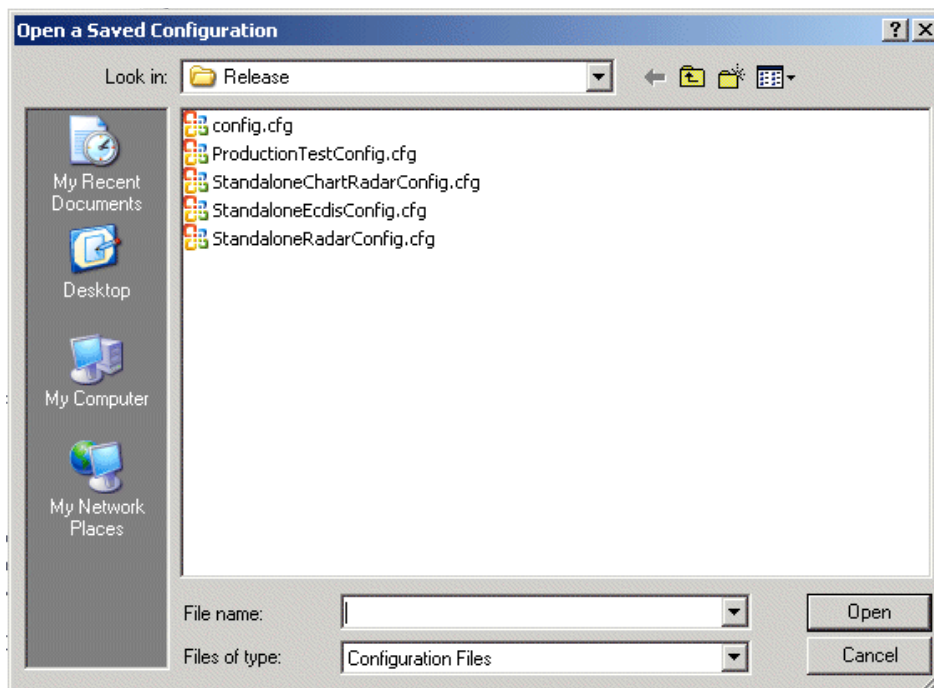


Figure 4.4 Accessing the Configuration files.

3. Highlight the configuration file you want to open and with the file name shown click on the **Open** button. The navigation window disappears and the file selected is shown in the active title line at the top of the System Configuration screen.

3.2 Saving a Config File

1. To save an opened product configuration file click on the **File** drop down menu and select **Save As**.
2. In the **Save Configuration** window enter **Config** and confirm replacement. The **.cfg** extension is added automatically.

4 Viewing Options

When a valid configuration file has been opened the System Navigation tree displays the following main menu items:

- Resources
- Applications

To access their sub-menu functions either click on the **+** button to the left of the menu items, or click on the **View** drop down menu and select **Expand All**, all the topics relevant to the opened configuration file are displayed in the navigation tree.

To return to displaying the Resources and Applications menu items only, select **Collapse All** from the View drop down menu.

4.1 Status Buttons

Each configuration topic has an accompanying status button to the left of the function in the navigation tree. When the topic's configuration status is valid the button colour is displayed as green. If a configuration setting is invalid, either because the topic has not been correctly configured, or the configuration setting made is not available, then the topic's status button is displayed as red and all it's hierarchical sub-menu functions up to System Configuration are displayed as orange.

Figure 4.5 below shows an example where **Customizable Sensor (No Name)** has not been configured.

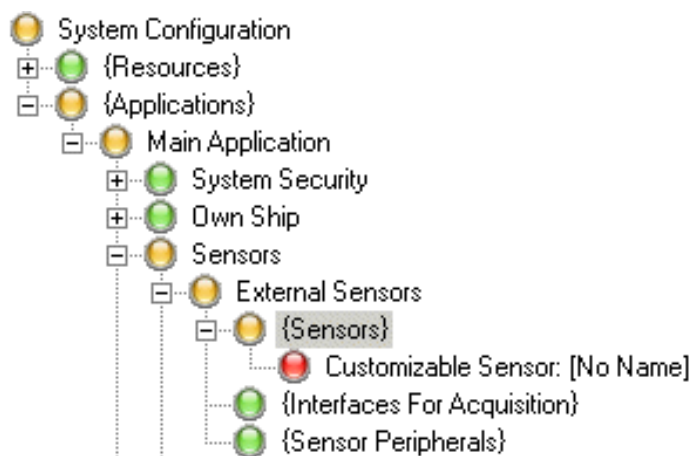
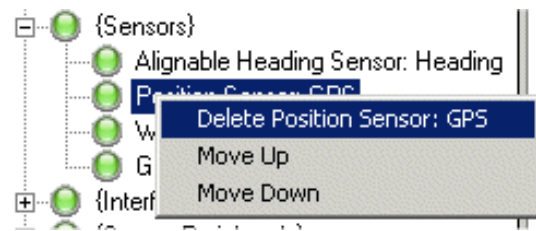


Figure 4.5 Status Buttons

4.2 Deleting and Moving Topics in the Navigation Tree

If topics have been added to a standard configuration, they can be deleted or moved up or down within the topic's sub-menu tree by right clicking on the topic line and selecting the relevant option.



5 Resources

The Resources menu allows the configuration of general-purpose components of the system that are not necessarily associated with any specific feature. These are typically hardware components that may have different uses on different systems. For example, an I/O port is a resource which may be used to support any number of different functions (sensor data acquisition, track table output, etc.).

The Resources menu includes the following sub-menu functions:

- Nodes - configures the nodes of the system by specifying a identity name, a network host name and product type of the node.
- I/O Port Manager - configures all the input and output ports on the system.
- Monitors - configures the network monitors and their communications ports.
- Discrete I/O Summary - provides an overview of discrete I/O outputs and inputs provided by various components configured into the system (e.g. PCIO boards), and of the functions in the system that use these.



5.1 Nodes

The nodes window lists all the current nodes on the VisionMaster network, the network host name and product type.

The following configuration settings can be made from the Nodes window:

- Specify the number of nodes on the system.

Note: A security string is required for a multi-node system, refer to Section 6.2 'System Security'.

- Change the base node name from the default and auto-generate names based on the name created.
- Change the network host name from the default.
- Specify the product type of radar system being used (Chart Radar, ECDIS, MFW or ARPA).

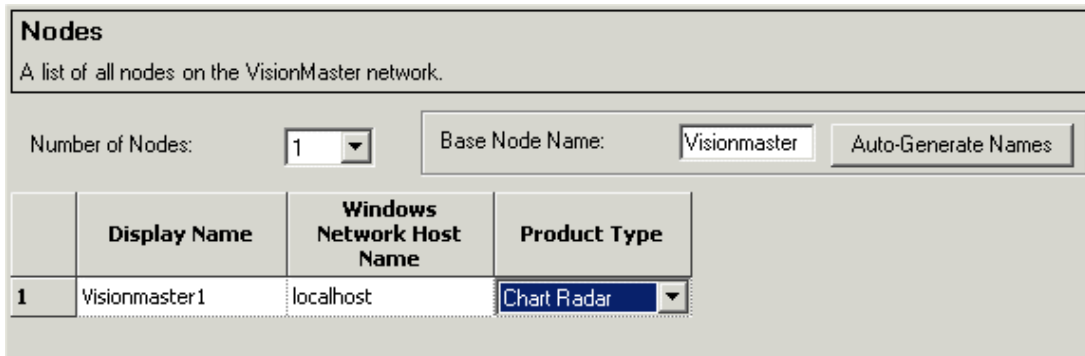
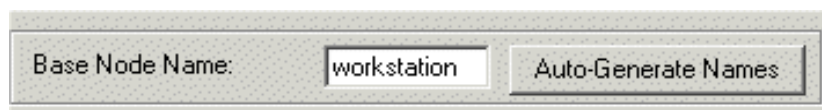
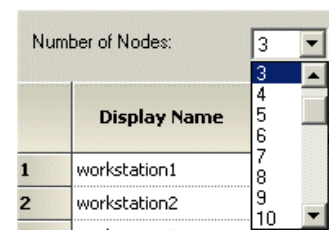


Figure 4.6 Nodes Window

5.1.1 Changing Node Configuration Settings

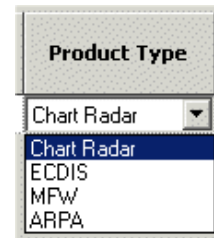
1. To specify the number of nodes on the network click on the **Number of Nodes** drop down arrow and select from the list. Nodes are added or subtracted to the table list below with the base node name and number auto generated.
2. To change the node name from the default click in the **Base Node Name**: field, delete the default name, enter a new name and click on the **Auto-Generate Names** button. All the node display names on the network are changed accordingly.



3. To change host name click in the Windows Network Host Name field and enter the required name.

Note: In a multi-node system each separate node requires a Windows host name, which cannot be 'localhost'.

4. To change the product type click on the drop down arrow and select from the product list.



5.2 I/O Port Manager

The I/O Port Manager content area includes a left and right hand window (Selected I/O Ports and All I/O Ports), see Figure 4.7 below.

The All I/O Ports window lists all the available types of I/O ports on the system. The Selected I/O Ports window lists all of the ports that the user has configured into the system. This window also includes ports associated with all nodes in the system.

All the selected I/O ports are listed below the Ports heading as hyperlinks to the respective Serial Port window.

The Users list includes hyperlinks to hardware and functions connected to the serial ports, such as monitor, interswitch and AIS communications, which have been previously configured in Applications. Note that when ports are first configured the Users column will be empty.

I/O Port Manager
Manages all of the serial ports in the system

I/O Ports: The set of I/O ports in the system.
Select the I/O Ports to include in the I/O Port Manager:

Selected I/O Ports

PCI0 Serial Control Port: VisionMaster1:PCI0 Control Port;
 PCI0 Serial Port: VisionMaster1:PCI0 TSCG/TSCR; NMEA (4;
 PCI0 Serial Port: VisionMaster1:PCI0 TSCB/TSCN; AIS

All I/O Ports

PCI0 Serial Control Port
 PCI0 Serial Port
 Serial Port
 UDP Multicast Input Port

Ports	Users
VisionMaster1: PCI0 Control Port In TSCA,TSCD,TSCE; COM3; 115200;	PCI0 Board on VisionMaster1
VisionMaster1: In TSCG; Out TSCR; COM7; 4800; NMEA (4800 Baud)	GPS - VisionMaster1:PCI0 TSCG/TSCR; NMEA (4800 Baud)
	External Route Plan Provider:GPS
	Track Table Output
VisionMaster1: In TSCB; Out TSCN; COM5; 38400; AIS	AIS Communications

Figure 4.7 I/O Port Manager

To configure the selected I/O Port click on the hyperlink. The I/O Port window for the selected option appears, see Figure 4.8, page 19.

5.2.1 I/O Ports

The I/O Ports window enables you to configure a selected port. Table 1 below shows the standard input /output configuration for the Visionmaster system.

In addition to the serial ports the I/O port manager also manages, serial control ports, a UDP multicast input port to the PC and any other port types that may be defined in the future.

Table 1: Standard Input/Output Configuration

Serial I/O*	COM Port	Baud Rate†	Input		Output	
			Connector	Device	Connector	Device
1	COM 3	38400	TSCA	Serial Compass (HDT)	Not available	
2	COM 3		TSCD			
3	COM 3	4800	TSCE	Dual axis log (VBW)		
4	COM 4	9600	TSCF	Monitor control	TSCM	Monitor control
5	COM 5	38400	TSCB	AIS (VDO, VDM, ALR)	TSCN	AIS (ACK)
6	COM 6		TSCC		TSCP	
7	COM 7	4800	TSCG	GPS	TSCR	Track table output
8	COM 8	4800	TSCH	Interswitch	TSCS	Interswitch
9	COM 9		TSCJ		TSCT	

*. All serial inputs can work at 4800 baud; serial inputs 1, 5, and 6 can additionally work at 38400 baud.

†. The baud rate of the input/output must be the same.

5.2.2 Configuring a PCIO Serial Port

To configure a PCIO serial port from the I/O Port Manager window:

1. Highlight the port in the All I/O Ports list and click on the < arrow. The port is moved to the Selected I/O Ports list as an unconfigured port with an unconfigured (red) status button, a hyperlink for the unconfigured port also appears in the Ports column below.
2. To remove a port from the I/O Port Manager highlight the port in the Selected I/O/ Ports list and click on the > arrow, the port is de-selected and moved back to the All I/O Ports list and the hyperlink is removed.
3. The configuration window for the port can be accessed in one of three ways:
 - a. double click on the port in the Selected I/O Ports list;
 - b. click on the hyperlink in the Ports list; or
 - c. double click on the port status line in the navigation tree.

When the configuration window is accessed, the following typical PCIO Serial port configuration window is displayed, see Figure 4.8 below.

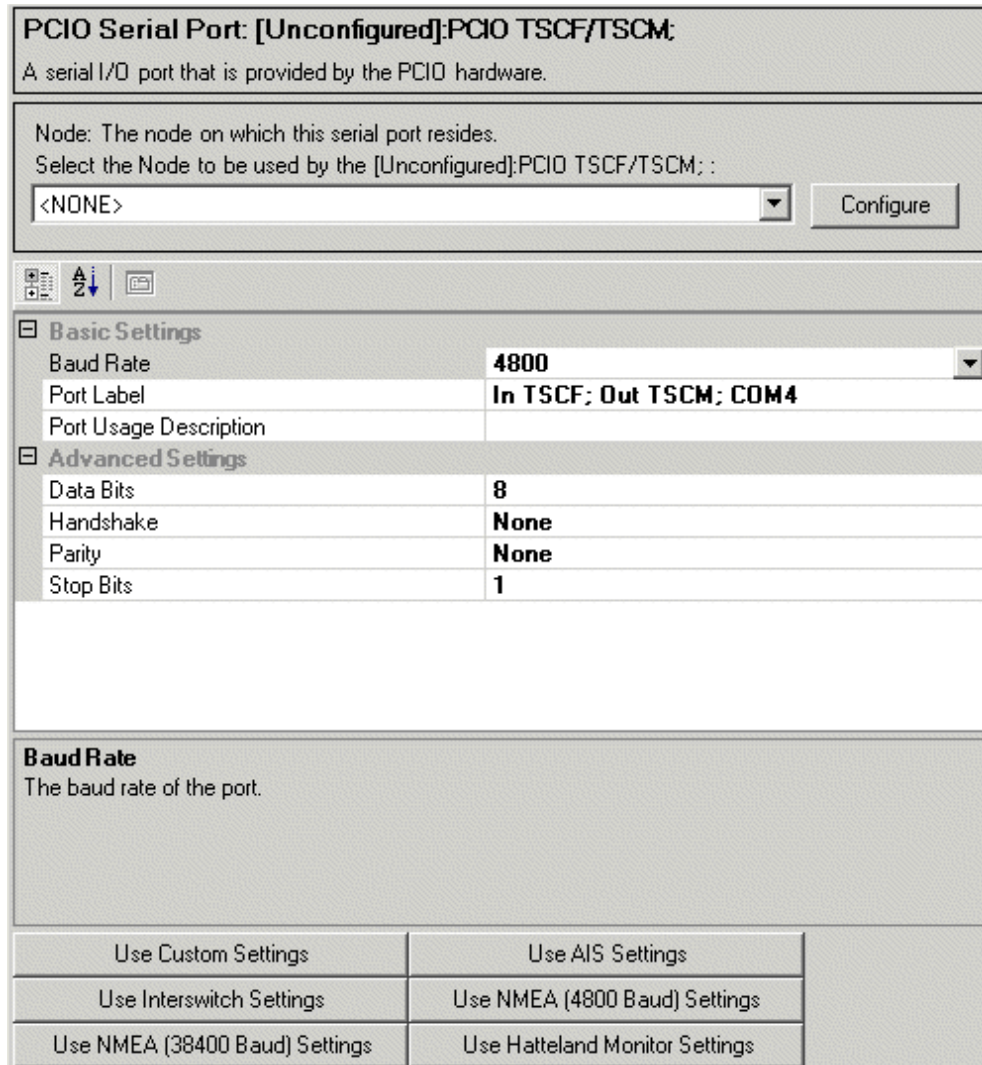


Figure 4.8 I/O Serial Port Configuration Window

The window displays certain default settings for a PCIO serial port including the baud rate (4800), the input/output labels (TSCF/TSCM) and the COM port (4). All default settings are configurable.

5.2.2.1 Selecting the Port Node

On an unconfigured port the Node field shows **<NONE>**. To select the node on which the serial port resides click on the Node drop down arrow to the right of the field and select the node name from the list displayed.

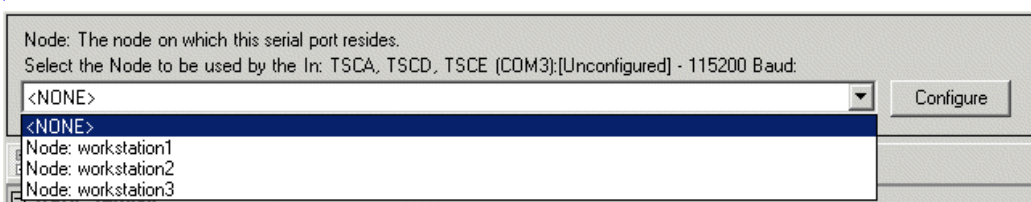


Figure 4.9 Select Node

If the system is single node only one selection can be made, which is the Display Name in Nodes window. If the system is multi-node you can select or change the node on which the selected port resides.

To change the node configuration click on the **Configure** button, the Nodes content area appears, see Section 5.1 'Nodes'

5.2.2.2 Changing Basic Settings

The basic settings include the following:

- Baud rate
- Port name or label
- Port usage description

Baud Rate

All serial ports can work to a minimum of 4800 baud, which is the default setting. To check if the serial port baud rate can be increased, refer to Table 1.

Note: For PCIO Serial ports the configuration will not validate if an invalid baud rate is selected.

To change the baud rate click inside the rate field and click on the drop down arrow to the right of the field. Select the required baud rate from the drop down list.

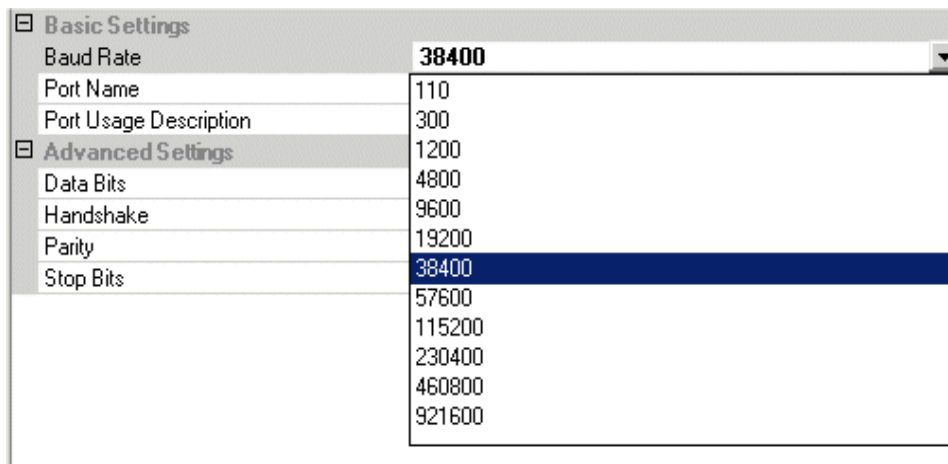


Figure 4.10 Baud Rates

Port Name/Label

The port label lists the physical input and output connections on the PCIO board that the port represents. The port name is the name of the selected port, i.e COM1, COM2 etc.

To change the port connections and name click on the drop down arrow to the right of the field. Select the required settings from the drop down list, Figure 4.11 below shows the list of port connections and names.

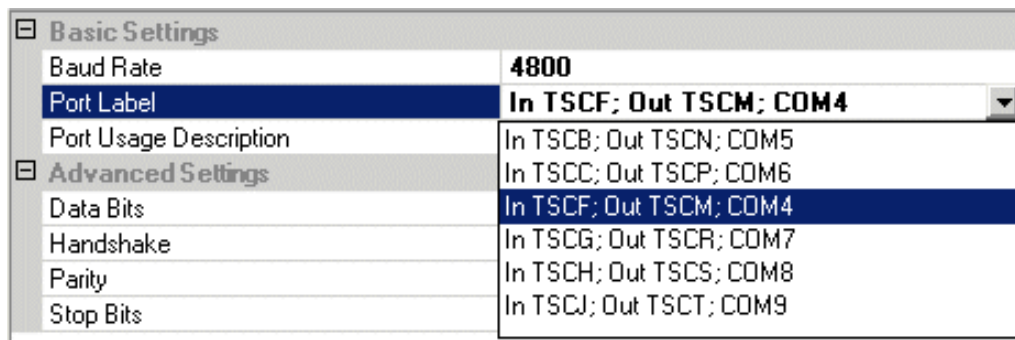


Figure 4.11 Port Label

Port Usage Description

The port usage description includes a summary of the port usage, i.e. the hardware or function connected to the PCIO serial port and listed in the Users column in I/O Port Manager.

To enter a port usage description click on one of the default setting buttons arranged at the bottom of the configuration window. The selected setting is entered in the Port Usage Description field.

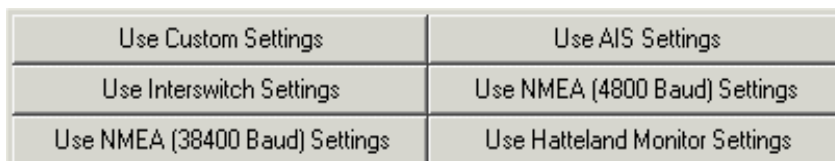


Figure 4.12 I/O Settings Buttons

Note: When a Port Usage is entered certain Basic and Advanced config settings may automatically change, dependant on the port usage selected.

The port usage also appears in the PCIO serial port heading and the text line in the navigation tree.

5.2.2.3 Changing Advanced Settings

The advance settings include the following:

- Data bits
- Handshake
- Parity
- Stop bits

Data Bits

The number of data bits is usually set to eight. To change the number of data bits delete the current number in the field and enter the required number.

Handshake

Handshake represents the handshaking protocol for serial port transmission of data. To change the value click on the drop down arrow to the right of the field and select the required value from the drop down list.

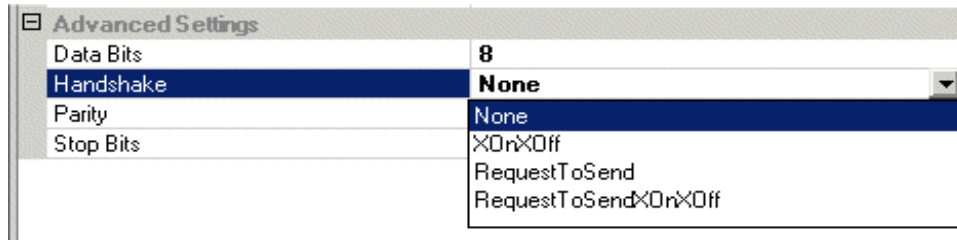


Figure 4.13 Handshake

Parity

The Parity value defaults to **None**, except where Interswitch Settings are selected for Port Usage when the value changes to **Even**. To change the parity of the port click on the drop down arrow to the right of the field and select the required value from the drop down list.

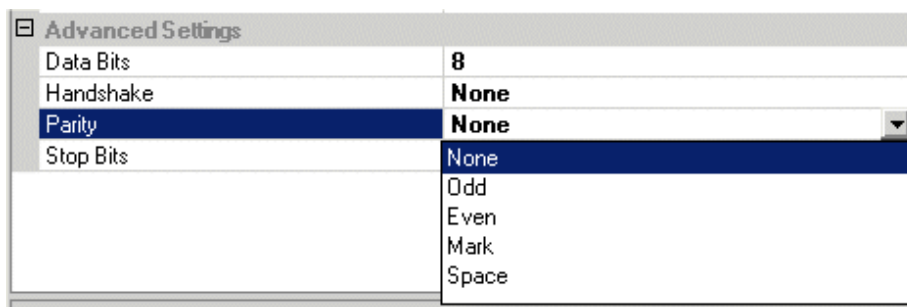


Figure 4.14 Parity

Stop Bits

The number of stop bits defaults to 1, the other values are 1.5 and 2. To change the value click on the drop down arrow to the right of the field and select the required value from the drop down list.

5.2.3 Configuring a PCIO Control Port

To configure a PCIO control port from the I/O Port Manager window, move the control port into the Selected I/O Ports list in I/O Port Manager and access its configuration window as described previously.

When the configuration window is accessed, the following typical PCIO Control port configuration window is displayed, see Figure 4.15 below.

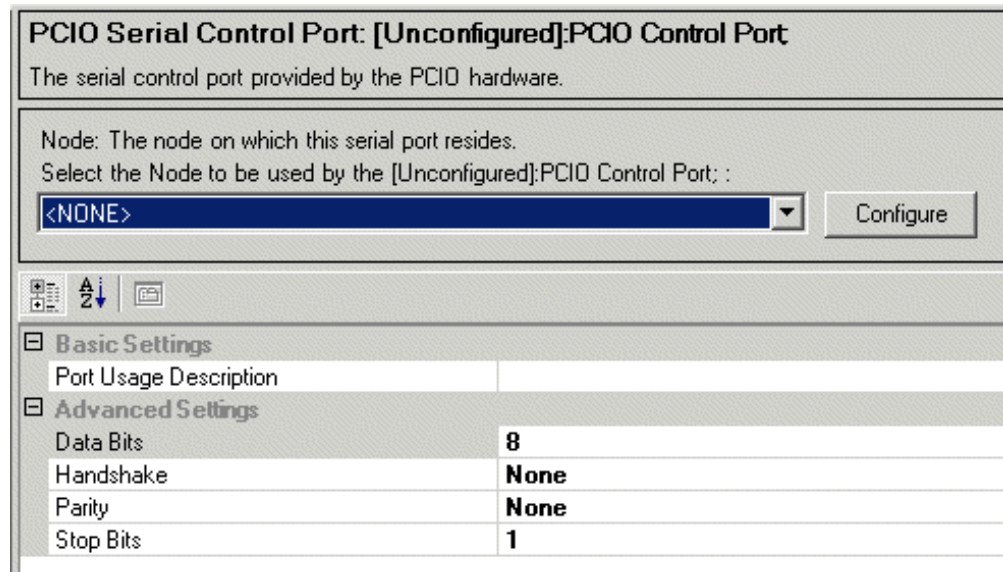


Figure 4.15 I/O Control Port Configuration Window

The PCIO Control port is the channel used for receiving and transmitting data between the PCIO and the Processor (PC). The baud rate for a PCIO control port is always set to a default rate of 115200, which is not configurable.

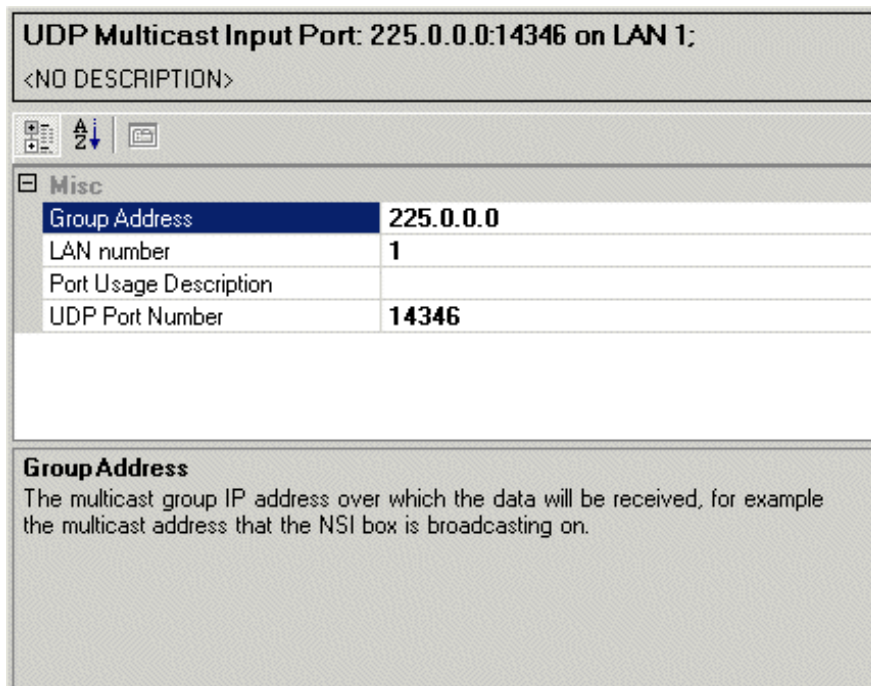
As the baud rate and connections for a control port are defined, the configuration window does not require a Port Usage. Consequently there are no I/O setting buttons at the bottom of the window, although a description of the control port can be entered in the Port Usage Description field.

Configuration of the Control Port Node and Advanced Settings are the same as described previously for the PCIO Serial Port.

5.2.4 Network Port from I/O to PC

The I/O Port Manager enables you to configure multicast network input ports from the I/O unit to the Processor. The following configuration settings on the input port can be made:

- Group IP address
- LAN connection
- Port Usage Description
- UDP port number



UDP Multicast Input Port: 225.0.0.0:14346 on LAN 1;
<NO DESCRIPTION>

Misc	
Group Address	225.0.0.0
LAN number	1
Port Usage Description	
UDP Port Number	14346

Group Address
The multicast group IP address over which the data will be received, for example the multicast address that the NSI box is broadcasting on.

Figure 4.16 UDP Multicast Input Port

5.2.4.1 Changing the Multicast Input Port Settings

To change any of the miscellaneous settings in the UDP multicast input port click in the field and enter the required setting.

Group Address

The Group Address is the multicast IP address over which data will be received.

LAN Number

The number of the LAN connection used by this port, if the system only has one network card then this number is 1.

Port Usage Description

A description of what the port is to be used for (e.g. Nav Lines) can be entered.

UDP Port Number

The UDP port number over which the data will be received.

5.3 Monitors

The Monitors window enables you to configure the monitor settings for each node on the system.

The following node specific configuration settings can be made from the Monitors window:

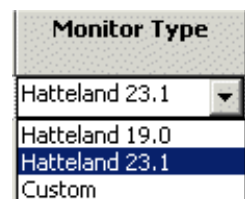
- select the monitor type;
- specify the picture height in millimetres, where Custom monitor type has been selected;
- select the monitor communication port.

Monitors			
Configure the monitor settings for each node in the system.			
	Monitor Type	Picture Height (mm)	Monitor Communications Port
1	Hatteland 23.1	353	<None>
2	Custom	300	<None>
3	Hatteland 19.0	301	<None>

Figure 4.17 Monitors

5.3.1 Changing Monitor Settings

1. To change the monitor type click on the drop down arrow and select from the list.
2. When Custom monitor type is selected specify the **Picture Height** by clicking on the top and bottom arrows to the right of the current value.
3. To select the Monitor communications port click on the drop down arrow and select from the list of ports previously configured in I/O Port Manager.



5.4 Discrete I/O Summary

The Discrete I/O summary window provides an overview on how the discrete inputs and outputs of the PCIO board will be used in the system.

Where a PCIO board has been selected from the Sensor Peripherals window, (see Figure 4.34) the discrete I/O summary window lists all the discrete inputs and outputs automatically generated by the system and shown as sub-menu items in the PCIO board navigation tree, see Figure 4.35, page 42.

If a sensor peripheral has not been selected from the Sensors sub-menu the window is blank.

Discrete I/O Summary	
Provides an overview of how discrete inputs and outputs will be used in the system.	
Discrete I/O Signals	Users
DO-1 (Buzzer) for PCIO on Visionmaster1	
DO-2 for PCIO on Visionmaster1	
RO-1 (System Operational) for PCIO on Visionmaster1	
RO-2 (Remote Alarm) for PCIO on Visionmaster1	
RO-3 (Vigilance) for PCIO on Visionmaster1	
DI-1 for PCIO on Visionmaster1	
DI-2 for PCIO on Visionmaster1	
DI-3 for PCIO on Visionmaster1	
DI-4 for PCIO on Visionmaster1	

Figure 4.18 Discrete I/O Summary window

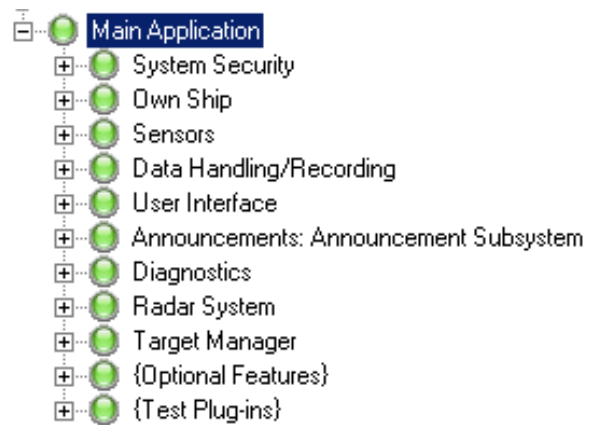
The window is divided into Discrete I/O Signals and Users, with all listed data displayed as hyperlinks. To view and/or configure an I/O signal or user click once on the hyperlink, the relevant window for the selected line topic is displayed.

6 Applications

The Application menu specifies functions, and defines which functions use which resources.

The Main Application menu includes the following sub-menus:

- System Security
- Own Ship
- Sensors
- Data Handling/Recording
- User Interface
- Announcements
- Diagnostics
- Radar System
- Target Manager
- Optional Features



Each sub-menu includes a number of functions, for information refer to the relevant section.

6.1 Main Application

The Main Application window enables you to select the Radar System and Target Manager for the system application and navigate to their configuration settings. Optional features can also be included in the main application from the window.

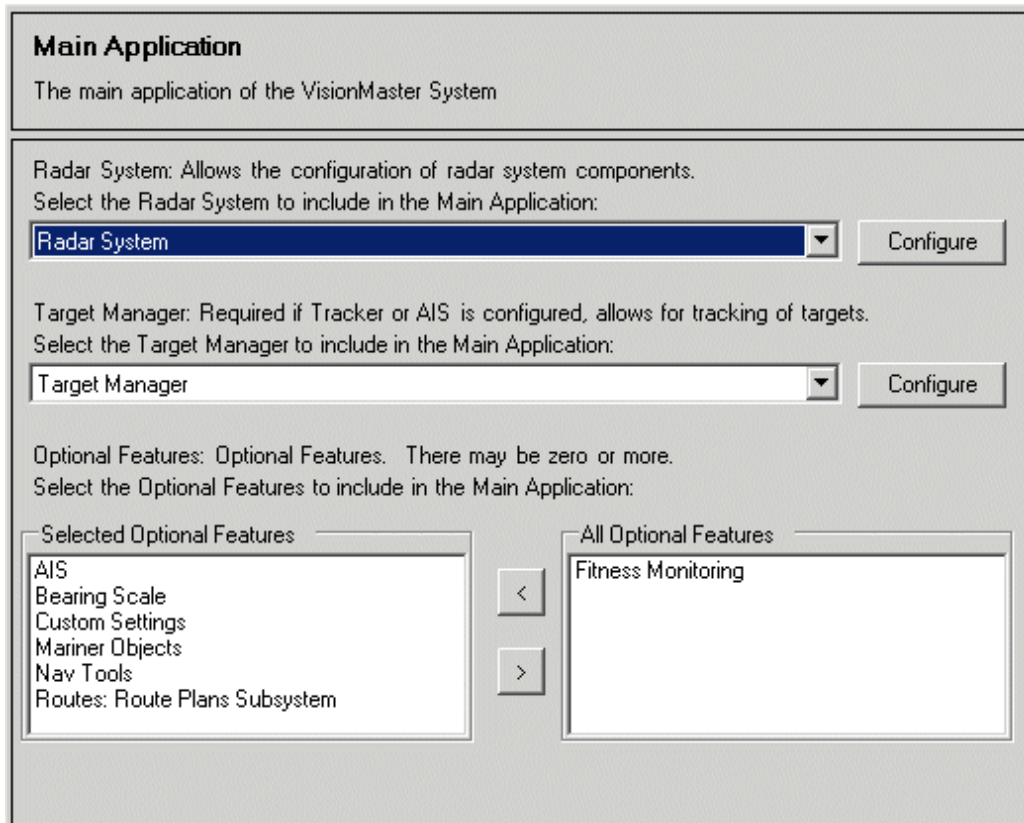


Figure 4.19 Main Application Window

6.1.1 Configuring the Main Application

1. To configure the Radar select **Radar System** from the drop down list and click on the **Configure** button. The Radar System configuration window appears, for details on this configuration, see Section 6.8 '*Radar System*', page 57.
2. To configure the Targets select **Target Manager** from the drop down list and click on the **Configure** button. The Target Manager window appears, for details on target settings, see Section 6.9 '*Target Manager*', page 63.
3. To select optional features for the main application highlight the feature in the **All Optional Features** list and click the < button, the feature is moved to the **Selected Optional Features** list. Removing selected features from the main application is the reverse of this procedure.

6.2 System Security

System Security data is required when the system is to be configured for multi-node. The facility defines the system level authorisation parameters available when a security string has been entered.

6.2.1 Entering a Security String

A security string is provided, where necessary, by your VisionMaster supplier.

1. On receipt of a valid security string click on System Security in the Main Application navigation tree, enter the code in the **Security String** field and press the Return key on the on-screen keypad.
2. When a valid code has been entered the window displays auto-generated information derived from the code, including a PIN, a list of product types available, the maximum number of nodes that can be configured, and purchased features information (if applicable).

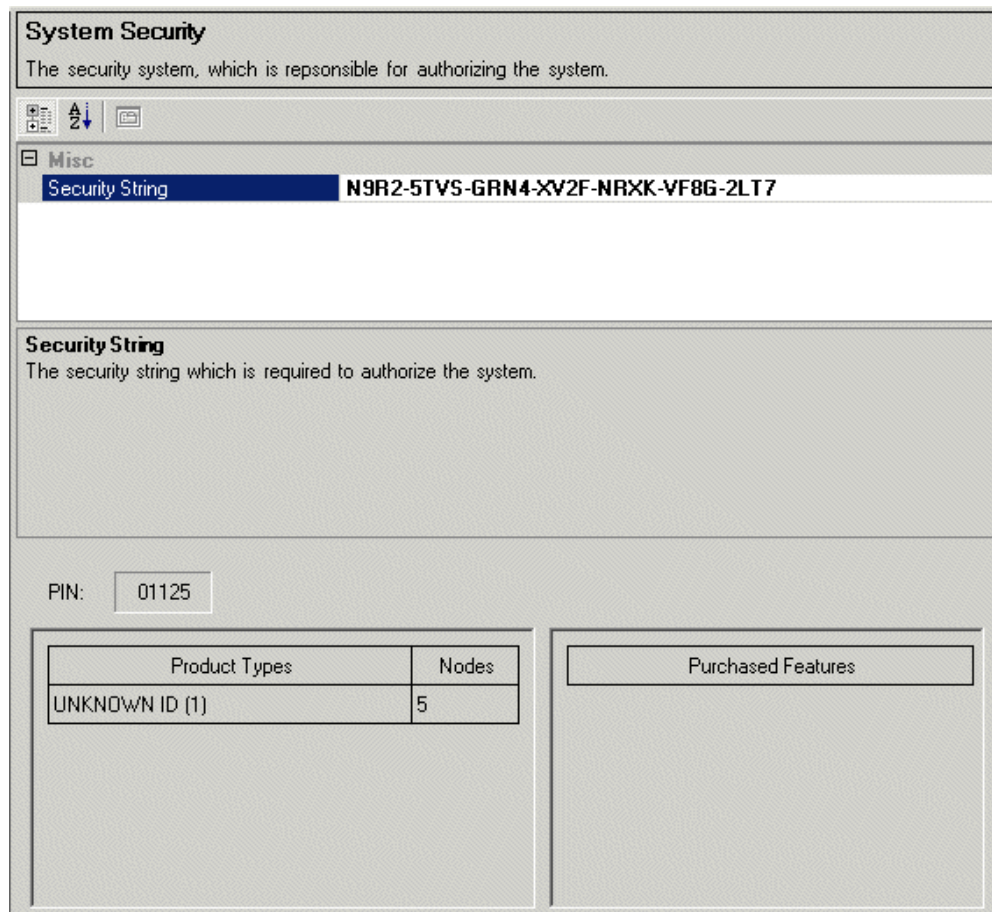


Figure 4.20 System Security

When a security string has been validated the operator can configure multi-nodes for the system, refer to Section 5.1 'Nodes', page 15.

6.2.2 Auto Logout Manager

The Auto Logout Manager enables the time an inactive user is allowed to be logged in to be set, after which the system automatically logs out the user, requiring their password to be re-entered.

The default auto logout timeout period is one minute. To change this value click on **Auto Logout Manager** and enter the required time out period between 1 minute (minimum) and 30 minutes (maximum).

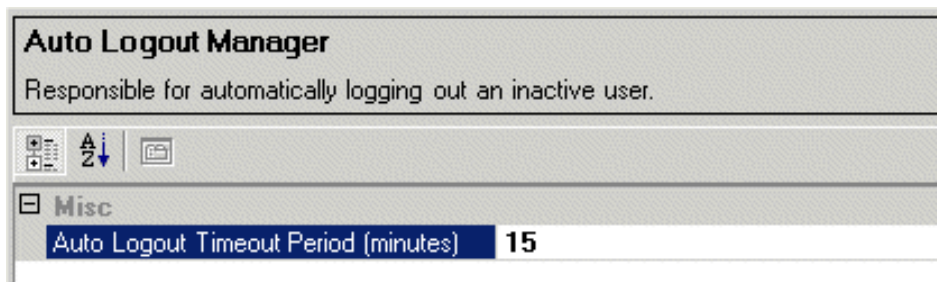


Figure 4.21 Auto Logout Manager

6.3 Own Ship

The Own Ship facility allows you to configure static data related to own ship.

6.3.1 Own Ship Static Data

The Own Ship Static Data list settings related to the vessel that do not change. The dimensions settings include own ship's beam and length, both of which default to 1 metre; the miscellaneous settings include the track advance of own ship, which defaults to 100 metres.

To access click on Own Ship Static Data in the navigation field.

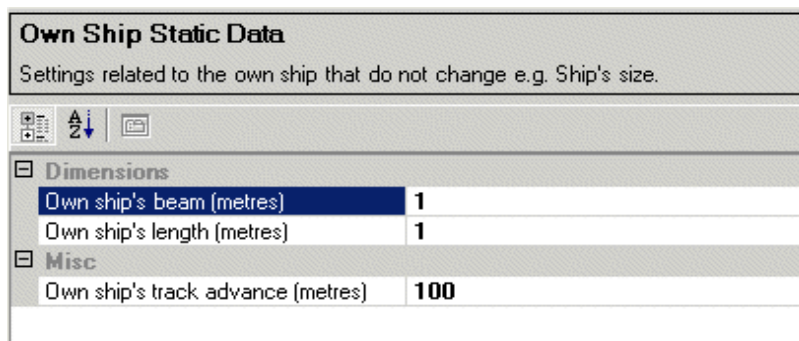


Figure 4.22 Own Ship Static Data

Own ship beam represents the width of the vessel's beam; own ship length represents the length of the vessel, measured from the bow to the stern. To change the current default values click in the field and enter the required value.

The following own ship data parameters can be entered:

Table 2: Own Ship Static Data Parameters

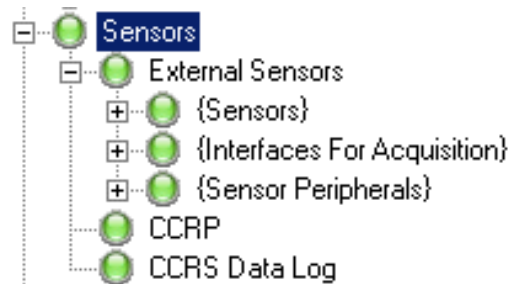
Beam		Length		Track Advance	
Default	Min and Max	Default	Min and Max	Default	Min and Max
1 metre	0 to 999 metres	1 metre	0 to 9999 metres	100 metres	0 to 99999 metres

6.4 Sensors

The Sensors menu details the configuration of all sensor data acquisition and usage. The menu also includes the configuration of the CCRP (consistent common reference point) with regards to own ship and the configuration of the CCRS (consistent common reference system) data log.

The Sensors menu is divided into the following sub-menu functions:

- External Sensors, including:
 - Sensors
 - Interfaces for Acquisition
 - Sensor Peripherals
- CCRP
- CCRS Data Log



6.4.1 External Sensors

The External Sensors sub menu lists all the configurable external sensors on the system, the interfaces over which those sensors provide data, and any sensor peripheral devices such as PCIO boards.

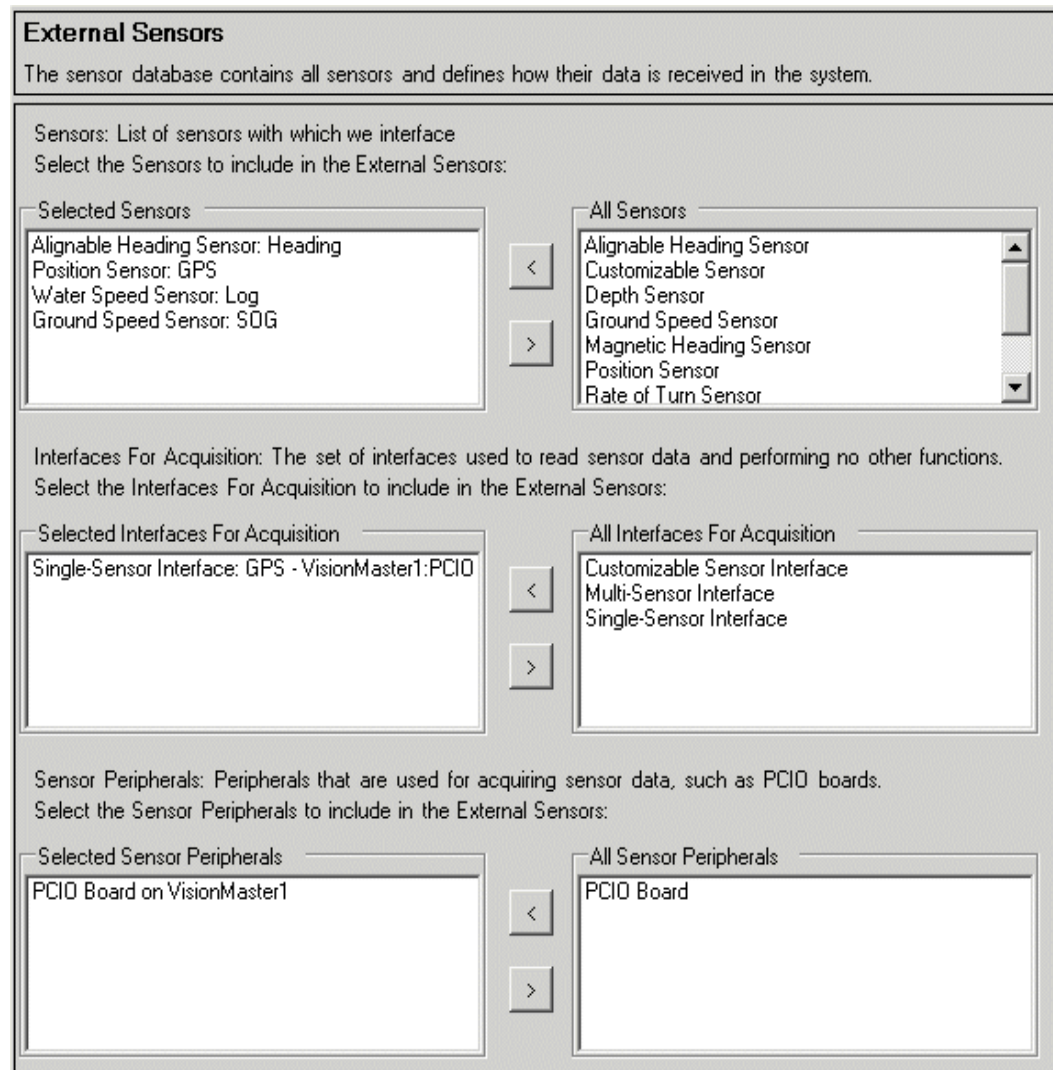


Figure 4.23 External Sensors

External Sensors is divided into the following three areas:

- Sensors - lists all the existing physical sensors on the system and a list of the sensors that have been configured by the user.
- Interfaces for Acquisition - lists all of the interfaces over which sensors can provide data to the system and a list of the interfaces that have been configured by the user.
- Sensor Peripherals - lists all of the peripherals that can be used for acquiring sensor data (e.g. PCIO board) and a list of the peripherals that have been configured by the user.

6.4.1.1 Sensors

The Sensors area of the window enables you to select the sensors which the system will interface to.

To add one or more sensors from the All Sensors list highlight the sensor name and click on the < button. The highlighted sensor is moved to the Selected Sensors field and the navigation tree lists the sensors selected under the Sensors sub-menu.

Note: *When a sensor is initially selected, and before it has been configured, the sensor item topic shows [No Name] and its status button is displayed as red. After a sensor has been correctly configured its status button is displayed as green see Figure 4.24 below.*

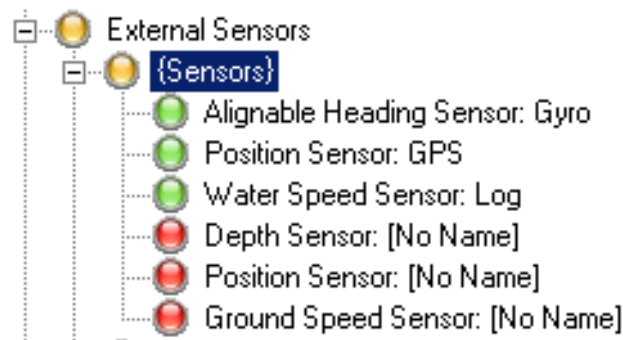


Figure 4.24 List of configured Sensors and unconfigured Sensors

Configuring a Sensor

To configure a sensor click on the Sensor topic in the navigation tree, the configuration window for the selected sensor appears. Figure 4.25 below shows the settings for an unconfigured Position Sensor.

Position Sensor: [No Name]

A position sensor, such as a GPS or GLONASS receiver. The system will automatically dead-reckon position data to fill in gaps from the external sensor.

Misc

Sensor Name: [No Name]

Position

Distance from the bow (metres): 0

Distance from the centre line (metres; port = -): 0

Distance from the bow (metres)

The position of the sensor, measured from the bow toward the stern.

Sensor Abbreviation

Abbreviation: [None] This abbreviation will be used to identify the sensor when there is not enough space to display the full name. The abbreviation must fit entirely within the preview box.

Preview: [None]

Data types provided by this sensor

- Course Over Ground
- Date and Time
- Datum Offset
- Position
- Speed Over Ground

All data types

- Depth Below Keel
- Depth Below Transducer
- Depth Below Waterline
- Local Time Offset
- Magnetic Course Over Ground
- Magnetic Deviation
- Magnetic Heading
- Magnetic Sensor Heading
- Magnetic Set and Drift
- Magnetic Variation
- Rate of Turn
- Set and Drift

Figure 4.25 Configuration Window for Sensor

The Sensor configuration window contains the following elements:

- A description of the type of sensor selected.
- Miscellaneous information, including but not restricted to sensor name
- Position data, defaults to zero when initially selected.
- Sensor Abbreviation - the abbreviated sensor name entered in the Abbreviation field and displayed on the Visionmaster system. Before an a name has been entered the sensor description shows [No Name].
- Data Types - a list of data types provided by the sensor and a list of all data types.

To configure the Sensor do the following:

1. Enter a unique name to identify the sensor in the Sensor Name field. This is usually the descriptive name of the sensor hardware, for example if a Leica GPS is to be used then name the position sensor 'Leica GPS'.
2. If precise distance and height position values of the sensor to the vessel are available enter the position data of the sensor in the relevant fields.
3. Enter an abbreviation which will be used to identify the sensor when there is not enough space to display the full name (e.g. if the position sensor is a GPS then enter this value). When an abbreviation is entered the name appears in the preview box as green characters, if too many characters are entered, the text colour changes to red.
4. The Sensor configuration window automatically selects the data types provided for this sensor. These data types may be configured where necessary. For example, if your GPS unit does not provide datum offset information (DTM NMEA messages), remove the **Datum Offset** data type. Or, if you have a GPS-Gyro that provides position and heading, add True Heading to the list of data types provided by the GPS.

When the sensor has been correctly configured the sensor status changes to green on the navigation tree and the topic displays the sensor name entered.

6.4.1.2 Interfaces for Acquisition

The VisionMaster system supports the acquisition of received sensor data via serial interfaces on the PCIO board. The serial interfaces comply with IEC 61162-1 and IEC 61162-2 (i.e. serial interfaces operating at 4800 and 38400 baud respectively).

Data from a single sensor or data from multiple sensors can be received either over a single I/O interface or multiple I/O interfaces.

To access the sensor interfaces click on the Interfaces For Acquisition topic in the Navigation tree, the window shows a list of all interfaces and the currently selected interfaces.

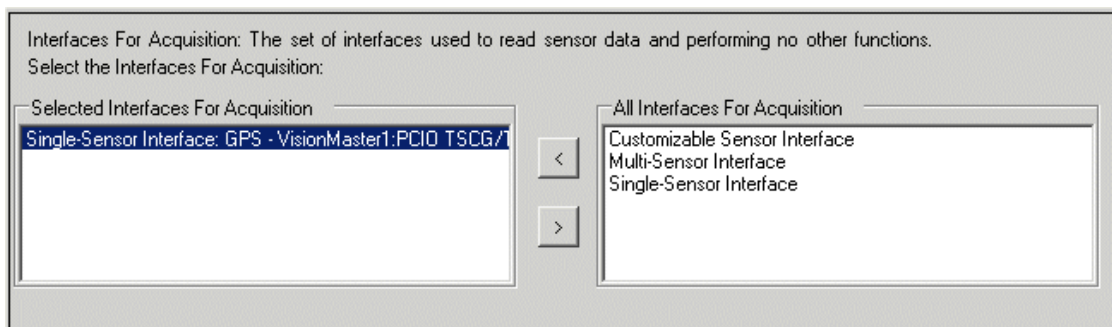


Figure 4.26 Interfaces for Acquisition

For all interface types that use a NMEA parser the sentences listed in Table 3 are used to obtain the data listed in the table.

Table 3: Supported Sentences and Data

Sentence	Data
DBK	Depth Below Keel, Depth Below Transducer, Depth Below Waterline
DPT	Depth Below Keel, Depth Below Transducer, Depth Below Waterline
DTM	Datum Offset
GGA	Geodetic Position
GLL	Geodetic Position
GNS	Geodetic Position
HDG	Magnetic Deviation, Magnetic Heading, Magnetic Variation
HDT	True Heading
ROT	Rate of Turn
VBW	Water Speed or Ground Speed (single and dual axis)
VHW	True Heading, Magnetic Heading, Water Speed (single axis only)
VTG	Course Over Ground, Ground Speed (single and dual axis), Magnetic Course Over Ground.
ZDA	Date and Time, Local Time Offset

The following table shows the support for sensor acquisition via specific external interfaces on the PCIO board.

Table 4: PCIO Serial Input Connections

Connector Name	COM Port	Messages received	Caveats
Serial Input 1/TSCA	3 (control port)	HDG/HDT	Cannot be used if any heading is configured for Serial Input 2
Serial Input 2/TSCD	3 (control port)	Any NMEA sensor sentences *	The same Talker/Sentence ID must not also be configured on Serial Input 1 or 3. Can be used for low speed heading input only if serial input 1 is unused
Serial Input 3 / TSCE	3 (control port)	Any NMEA sensor sentences *	The same Talker/Sentence ID must not also be configured on Serial Inputs 1 or 2
Serial Input 4 / TSCF	4	Any	
Serial Input 5 / TSCB	5	Any	
Serial Input 6 / TSCC	6	Any	
Serial Input 7 / TSCG	7	Any	
Serial Input 8 / TSCH	8	Any	
Serial Input 8 / TSCJ	9	Any	

*. No IIVBW messages can be input if a pulse log is also configured

When an interface has been selected the interface type is listed in the navigation field under the Interfaces for Acquisition sub-menu. When first selected the interface shows [Unconfigured] and its status button is displayed as red.

To configure a sensor interface do the following:

1. Click on the Sensor Interface topic in the navigation area, the configuration window for the interface appears.
2. Select the port that the interface will receive data over by clicking the drop down arrow on the Port field. The field shows a list of ports previously configured in I/O Port Manager, see Figure 4.27 below.

Note: *If no ports have been configured the field will display <NONE> only.*

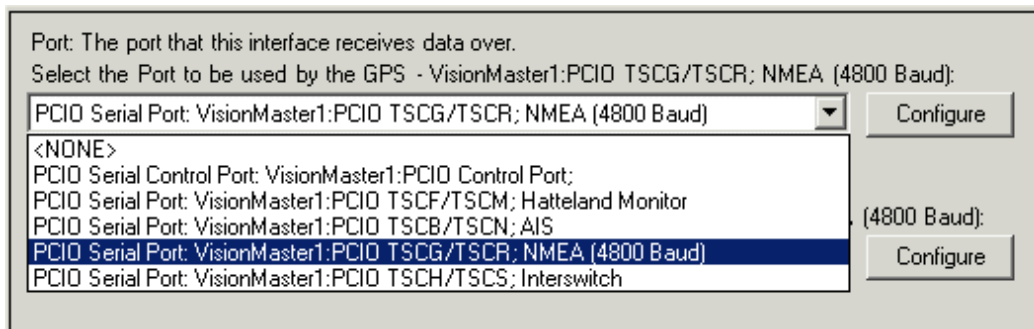


Figure 4.27 Single-Sensor Interface Ports available

3. To change the port settings click the **Configure** button, the port configuration window for the selected port is displayed, see Figure 4.8, page 19.
4. For a Single-Sensor Interface select the sensor that will provide data via the interface by clicking the drop down arrow on the Sensor field. The field shows a list of external sensors previously configured in Sensors, see Figure 4.27 below.

Note: *If no sensors have been configured the field will display <NONE> only.*

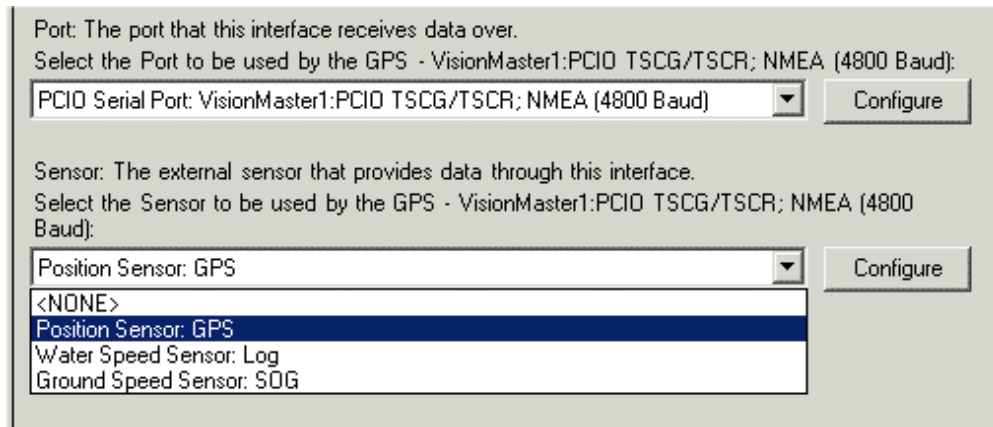


Figure 4.28 Single-Sensor Interface Sensors available

5. To change the sensor settings click the **Configure** button, the configuration window for the selected sensor is displayed, see Figure 4.25, page 35.
6. For a Multi-Sensor Interface select the sensor that will provide data via the interface from the All Sensors field and click on the < button. The field shows a list of all previously configured external sensors.

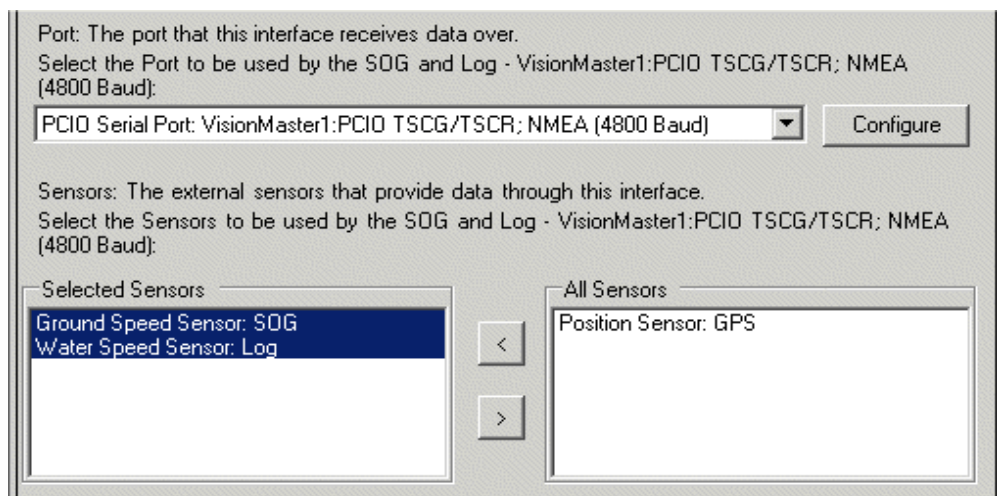


Figure 4.29 Multi-Sensor Interface Sensors available

Parsers

When a single or multi sensor interface is configured a NMEA 0183 Parser is added as a sub menu item to the interface.

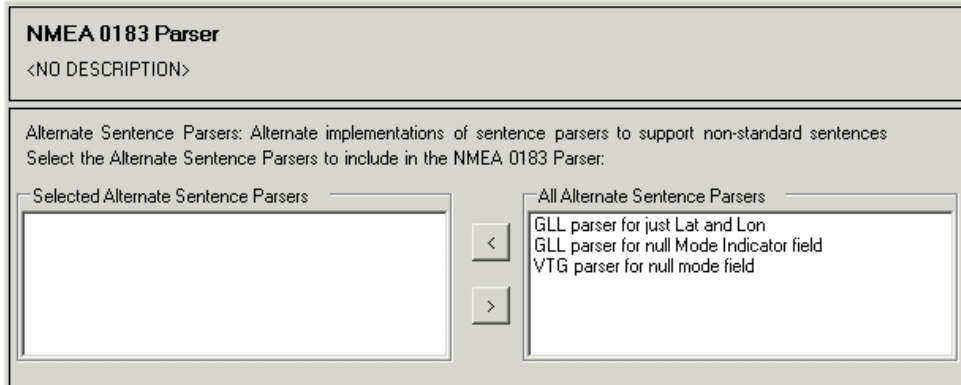


Figure 4.30 NMEA 0183 Parser

The NMEA 0183 Parser window includes a list of alternate sentence parsers that can be included in the NMEA parser to support non-standard equipment.

Customizable Sensor Interface

When a customizable sensor interface has been selected from the Interface for Acquisition window the system adds Message Parser and Standard Message Usage Map files as sub-menu items in the Navigation tree.

The Message Parser window enables you to select the type of parser from a drop down list and to configure the selected message parser for the I/O interface.

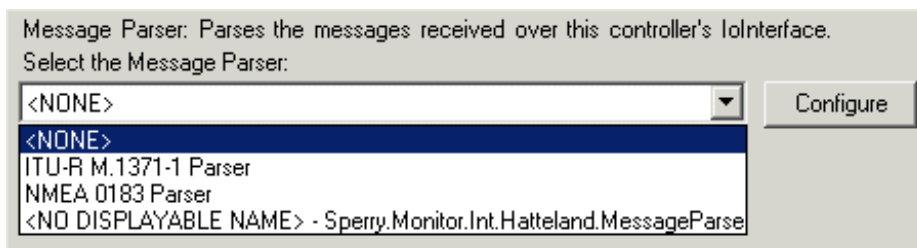


Figure 4.31 Message Parser for Customizable Interface

The standard message usage map provides mapping between received data samples and the set of previously configured external sensors. To select the source devices to be used on the standard message usage map highlight the devices and click on the < button.

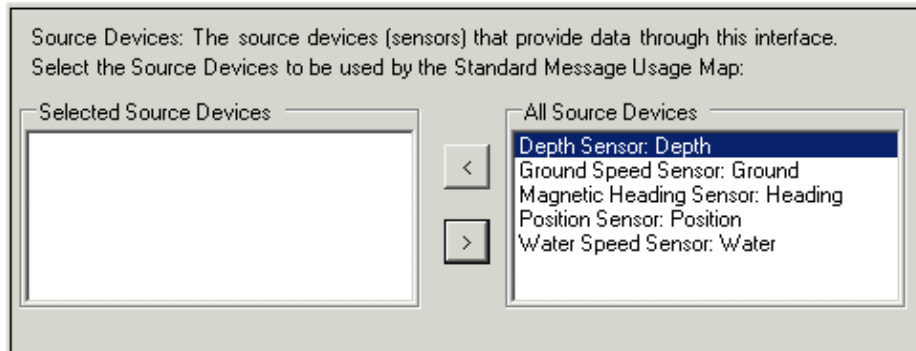


Figure 4.32 Standard Message Usage Map

When the message parser and usage map for the customizable sensor interface have been configured, you can view and edit the configuration settings by clicking on the customizable sensor interface item in the navigation area.

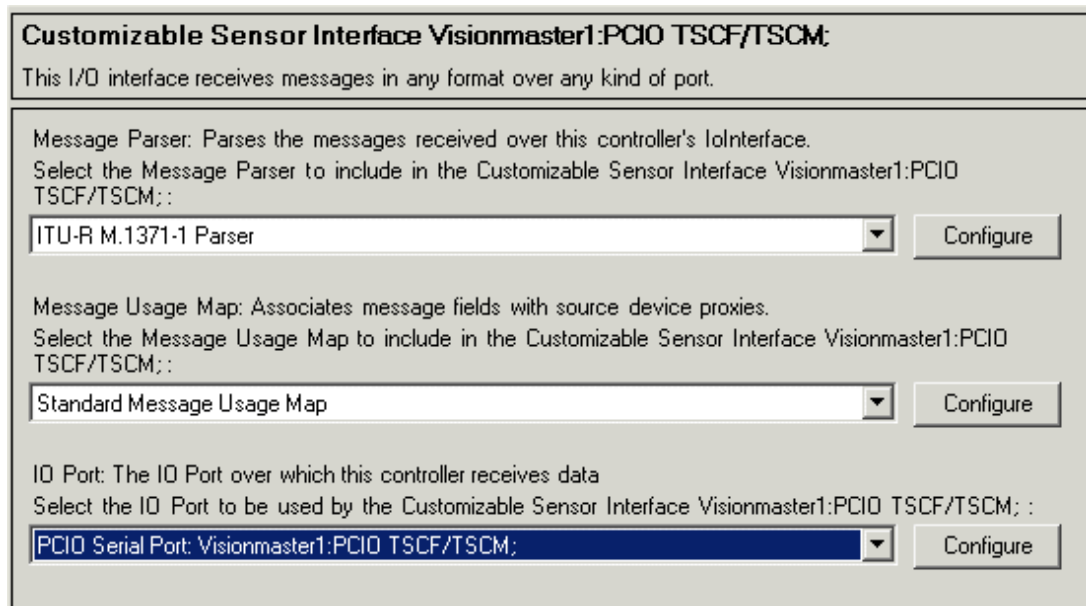


Figure 4.33 Customizable Sensor Interface Settings

6.4.1.3 Sensor Peripherals

The Sensor Peripherals window lists the peripherals that can be used for acquiring sensor data, such as a PCIO board.

Note: *A separate sensor peripheral must be configured for each node on the system. For example, if the system has 3 nodes, each with a PCIO board, then all PCIO boards should be configured.*

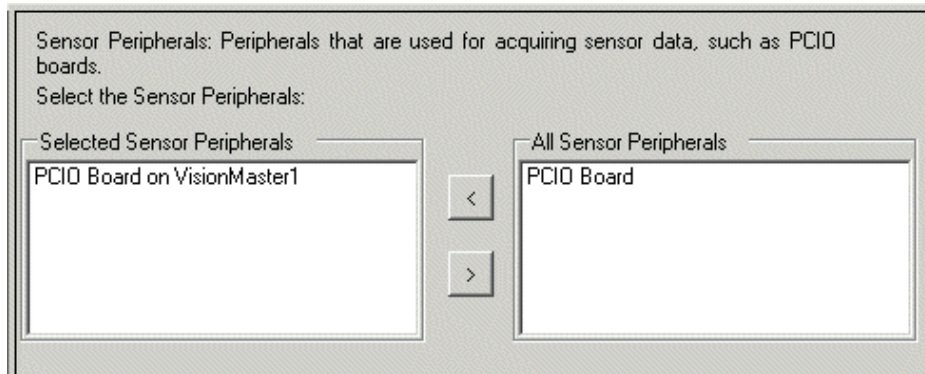


Figure 4.34 Sensor Peripherals window

To select a sensor peripheral highlight the device in **All Sensor Peripherals** list and click the < button. The selected peripheral is moved to the Selected list and the system adds the sensor peripheral as an unconfigured line. If the peripheral is a PCIO board the system also adds a list of discrete outputs and inputs in the navigation tree with their possible identity and usage.

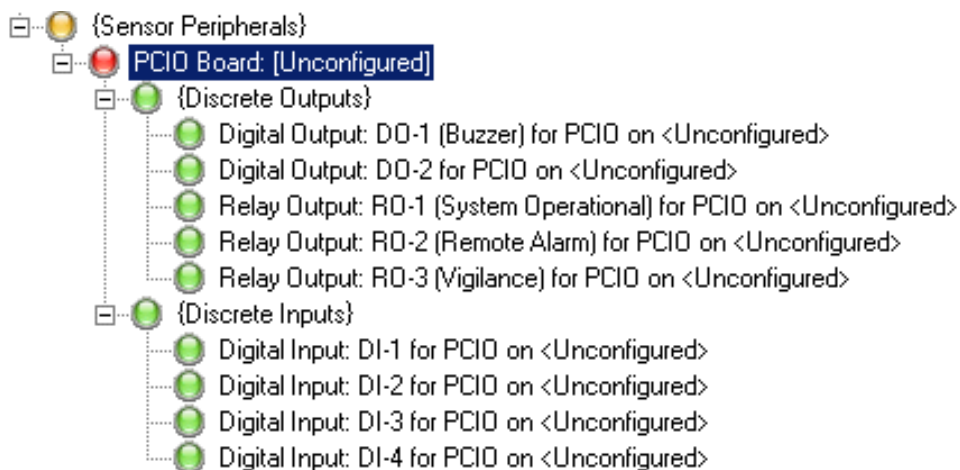


Figure 4.35 Unconfigured Sensor Peripheral - navigation tree

Configuration of PCIO Board

To configure a PCIO board click on the unconfigured topic in the Navigation tree. The following typical configuration screen is displayed, see Figure 4.36 below.

PCIO Board: [Unconfigured]
 Configuration of the sensors used by the PCIO

Serial Port: The serial port to use for communications with the PCIO.
 Select the Serial Port to be used by the [Unconfigured]:

Pulse Log Sensor: The water speed generated by the pulse log from the Pulse Per Nautical Mile input
 Select the Pulse Log Sensor to be used by the [Unconfigured]:

Analog Compass Heading Sensor: Supplies heading from the analog compass input
 Select the Analog Compass Heading Sensor to be used by the [Unconfigured]:

High Speed Serial Compass Sensor: Supplies serial compass data from the 38400 baud TSCA input
 Select the High Speed Serial Compass Sensor to be used by the [Unconfigured]:

Sensors on TSCD: The external sensors that provide data from the TSCD input on the PCIO.
 Select the Sensors on TSCD to be used by the [Unconfigured]:

Selected Sensors on TSCD	<input type="button" value="<"/> <input type="button" value=">"/>	All Sensors on TSCD Alignable Heading Sensor: Gyro Position Sensor: GPS Water Speed Sensor: Log
--------------------------	--	--

Sensors on TSCE: The external sensors that provide data from the TSCE input on the PCIO.
 Select the Sensors on TSCE to be used by the [Unconfigured]:

Selected Sensors on TSCE	<input type="button" value="<"/> <input type="button" value=">"/>	All Sensors on TSCE Alignable Heading Sensor: Gyro Position Sensor: GPS Water Speed Sensor: Log
--------------------------	--	--

Heading Settings
 Compass Ratio:

Pulse Log Sensor

Pulse Log Enabled	Yes
Pulse Log Polarity	Negative Pulses
Pulse Per Nautical Mile	200

Transmission Retries

Maximum number of retries	3
---------------------------	---

Compass Ratio
 Used for syncro or stepper compasses. (Default is S-stepper)

Figure 4.36 Sensor Peripheral PCIO Board - configuration

The configuration window for the PCIO unit includes the following selection options:

- Serial Port - the serial port to be used for communications with the PCIO board.
- Pulse Log Sensor - the water speed generated by the pulse log from the Pulse per Nautical Mile input.
- Analog Compass Heading Sensor - the sensor supplying heading from the analog compass input.
- High Speed Serial Compass Sensor - supplies serial compass data from the 38400 baud TSCA input.
- Sensors on TSCD - the external sensors that provide data from the TSCD input on the PCIO board.
- Sensors on TSCE - the external sensors that provide data from the TSCE input on the PCIO board.

To change the current settings for the serial port and sensors click on the drop down arrows at the end of each data field and select from the previously configured I/O port and sensor lists.

Note: *The serial ports numbers 3 to 9 cannot be used as a heading source on a PCIO board fitted to a node that is also fitted with an SC2 board, see Table 5 below.*

Table 5: PCIO Serial Port Baud Rates

Port Name	Commissionable Baud Rates
Serial Input 3	4800 and 9600
Serial Input 4	110, 300, 1200, 4800 and 9600
Serial Input 5	110, 300, 1200, 4800, 9600, 19200, 38400 and 57600
Serial Input 6	110, 300, 1200, 4800, 9600, 19200, 38400 and 57600
Serial Input 7	110, 300, 1200, 4800 and 9600
Serial Input 8	110, 300, 1200, 4800 and 9600
Serial Input 9	110, 300, 1200, 4800 and 9600

Select the sensors for TSCD and TSCE to be used by the PCIO board by highlighting the sensors in the All Sensors lists and clicking on the < button.

Heading Settings

The heading settings enables the selection of compass ratio settings. applicable where an analog heading sensor is connected to the system. Heading data is acquired via a synchro interface or stepper motor interface connected to the PCIO board, the default is **S-stepper**.

To select a different compass ratio click on the drop down arrow.

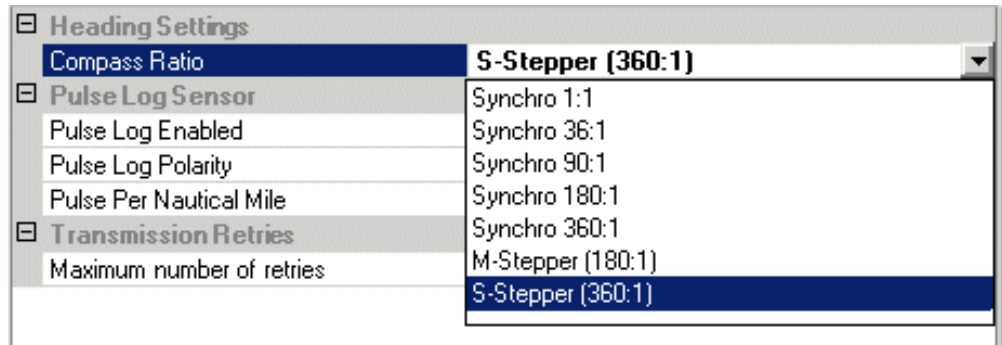


Figure 4.37 Compass Ratio Settings

The ratio settings that apply to a synchro interface are: 1:1, 36:1, 90:1, 180:1, or 360:1.

The ratio setting for the S-Stepper is 360:1. The ratio setting for the M-Stepper is 180:1.

Pulse Log Settings

The acquisition of single axis water speed data is made via a pulse log interface connected to the PCIO board. The following pulse log configuration settings are available, applicable where a pulse log sensor is connected to the system:

- Pulse Log Enabled - denotes whether or not a pulse log is connected to the system, defaults to **Yes**. To disable the pulse log click on the drop down arrow and select **No**.
- Pulse Log Polarity - defaults to Negative pulses, to change settings click on the drop down arrow and select **Positive Pulses**.
- Pulse per nautical mile - the pulse log rate, defaults to 200, a rate between 100 and 2560 pulses per nautical mile can be entered.

Transmission Retries

Specifies the number of times a message will be sent to the PCIO if no acknowledgement is received. The default setting is 3, to change the setting click in the field and enter the required number.

6.4.2 CCRP

The CCRP (consistent common reference point) is the location on own ship to which all data is referenced. The CCRP is typically the antenna position of the ship.

CCRP	
The common reference point for all data in the system.	
<div style="display: flex; align-items: center;"> A 2 ↓ </div>	
<div style="display: flex; align-items: center;"> ☰ CCRP </div>	
Distance from the bow (metres.)	0
Distance from the centre line (metres; port = -).	0
Height above the bow (metres; below bow = -).	0

Figure 4.38 CCRP configuration

The exact location of the CCRP can be configured from the specific values listed below.

- Distance from the bow [metres] - the position of the CCRP, measured from the bow to the stern.
- Distance from the centre line [metres; port = -] - the position of the CCRP from the center line.
- Height above bow [metres; below bow = -] - the vertical position of the CCRP, measured from the level of the bow.

All distance values default to zero, to change one or more values delete the 0 and enter the required value.

6.4.3 CCRS Data Log

The CCRS (consistent common reference source) data log enables configuration of the way sensor data is logged.

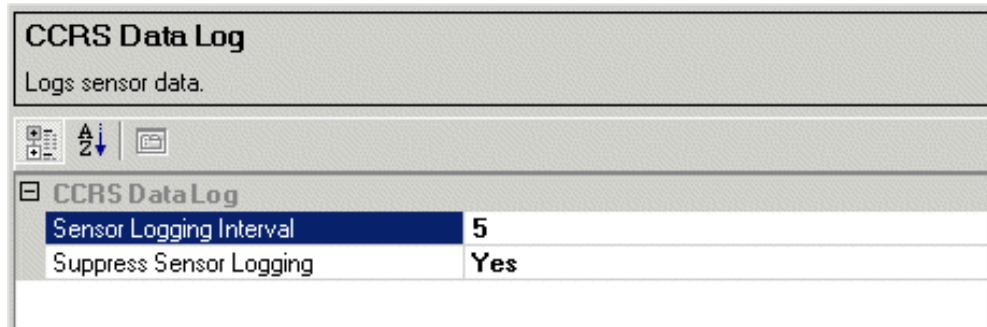


Figure 4.39 CCRS Data Log

The window lists the following settings:

- Sensor Logging Interval - the time increment, in seconds, in which sensor data is logged. The default time is 5 seconds.
- Suppress Sensor Logging - the system automatically suppresses the logging of sensor data.

To change the sensor logging interval click in the field, delete the current value and enter a value between 1 second (minimum) and 60 seconds (maximum).

To enable sensor logging click on the drop down arrow and select **No**.

6.5 Data Handling/Recording

Data handling/recording includes a Data Log and Node Data Log facility. Data Log enables the archive drive where the data resides to be configured. Node Data Log enables you to configure the periodic rate at which the system logs data and the node state information to be suppressed.

6.5.1 Data Log

To access the Data Log click on the + button of the Data Handling/Recording menu and click the Data Log topic.

Data Log
Allows the selection of the rates at which data is logged.

Node Data Log: Logs node state data.
Select the Node Data Log to include in the Data Log:
Node Data Log

Data Log	
Archive Drive	c:
Archive Interval	1
Archive Retention	90
Required Archive Space	5

Figure 4.40 Data Log

The Data Log fields display the following data and values:

- Archive Drive - the drive used for data log archive files, defaults to c: The archive drive must be valid for all nodes.
- Archive Interval - time increment in hours with which to archive data log, defaults to 1 hour. The time range is between 0.25 and 2 hours.
- Archive Retention - the number of days that archive files are retained, defaults to 90. The archive retention range is between 90 and 120 days
- Required Archive Space - the disk space, in gigabytes, required for data log archive files. The default is 5 gigabytes. The archive space range is between 1 and 10 gigabytes.

To change the default values click in the relevant field and enter the required value.

To configure the Node Data Log, either click on the **Configure** button in the Data Log window, or click on the Node Data Log line topic in the navigation tree.

6.5.1.1 Node Data Log

The Node Data Log window enables the logging of node state data to be configured.

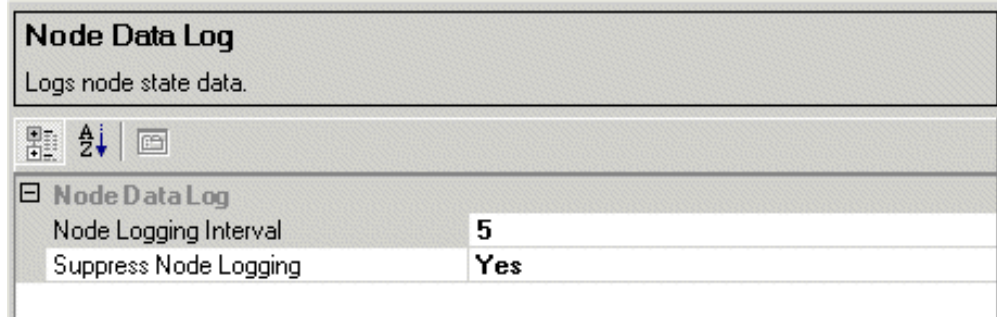


Figure 4.41 Node Data Log

The window includes the following settings:

- Node Logging Interval - the time interval, in seconds, in which node state data is logged. The default is 5 seconds.
- Suppress Node Logging - the system automatically suppresses the logging of node data.

To change the node logging interval click in the field, delete the current value and enter a value between 1 second (minimum) and 60 seconds (maximum).

To enable node logging click on the drop down arrow and select **No**.

6.6 User Interface

User Interface allows the configuration of keypad settings to be made.

6.6.1 Display Options

The Display Options sub-menu includes a keypad settings option. The Keypad Settings window enables the time before the screen keypad is removed from the screen, when no keys have been pressed, to be configured. The default timeout value is 30 seconds.

To change the timeout click in the value field and enter the required value.

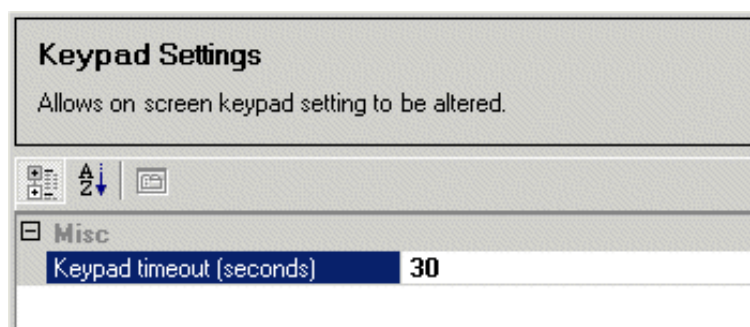


Figure 4.42 Keypad Settings

6.7 Announcements

The Announcements facility enables the following configurations and selections to be made:

- configuration of all announcements, including Alarms, Warnings and Prompts;
- selection and configuration of the audio playback output to be used by the announcements;
- selection of the alarm input/output through configured ports or relays;
- display of announcements to be limited to a single node or shown on all nodes.

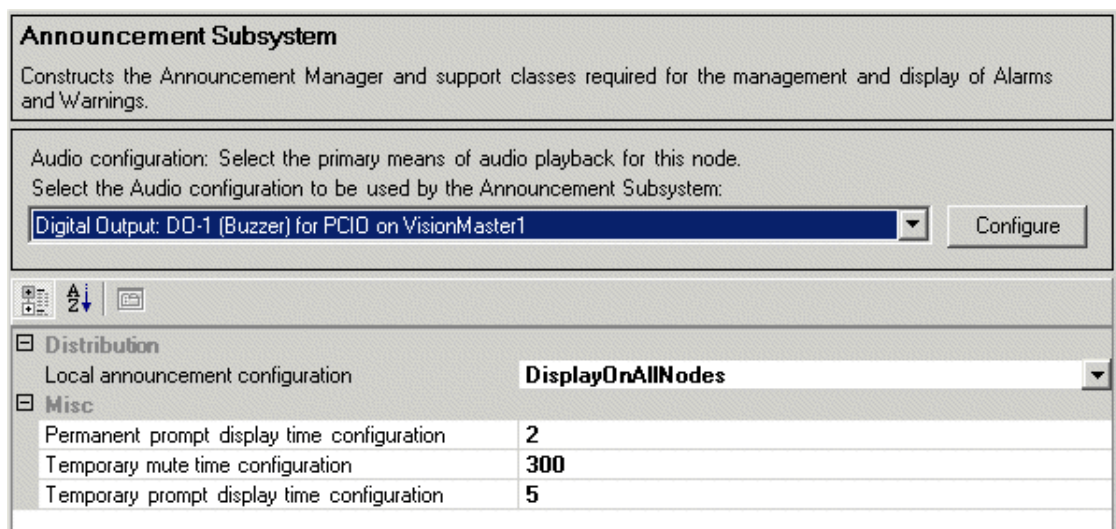


Figure 4.43 Announcements Subsystem

6.7.1 Announcement Subsystem

The Announcement subsystem window divides into the following two areas:

- an Audio output selection option and link to the selected output configuration;
- announcement distribution and display time configuration settings.

6.7.1.1 Audio Configuration

Enables selection and configuration of a discrete output (digital or relay) on the PCIO board for audio playback on the selected node.

Note: *In order for an audio playback output to be selected here, a set of digital and relay outputs for the PCIO board must have been previously configured. See “Sensor Peripherals” on page 42.*

1. To select a audio playback output click on the output drop down arrow. A list is displayed where discrete input/outputs have been generated.

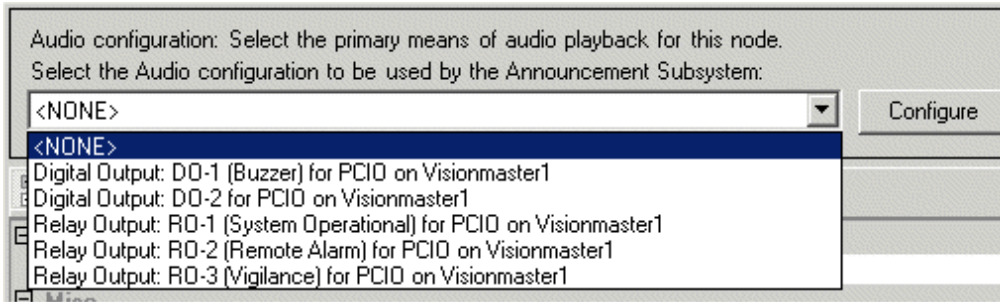


Figure 4.44 Selecting Audio Output

2. Select the required PCIO digital or relay output from the drop down list.
3. To view or configure settings for the output click on the **Configure** button. The window for the selected output appears and the navigation tree highlights the output in the **{Discrete Outputs}** sub-directory of the PCIO board.

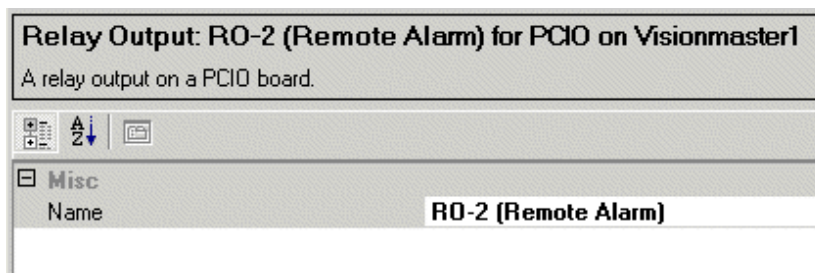


Figure 4.45 Relay Output for Audio

4. Only the name of the output can be changed. To change the output name click in the **Name** field, delete the current name and enter a new one.

6.7.1.2 Distribution and Miscellaneous Settings

The Distribution sub-menu enables you to select whether local announcements will be displayed only on the node that generated them or all nodes on the system.

To change the current configuration click on the drop down arrow in the field and select from **DisplayOnAllNodes** or **LocalNodeOnly**.

The Miscellaneous sub-menu displays the following configuration settings for the Announcements:

- Permanent Prompt display time - the length of time, in seconds, that each permanent prompt will be displayed. The default time is 2 seconds. The time range that can be entered is a figure greater than 0 and less than 10 seconds.

- Temporary Mute Time - the length of time, in seconds, that the audio will be muted when the temporary mute button is clicked. The default time is 300 seconds, the maximum time is 999 seconds. For permanent mute select 0 seconds.
- Temporary Prompt Display Time - the length of time, in seconds, that each temporary prompt will be displayed. The default time is 5 seconds. The time range that can be entered is a figure greater than 0 and less than 30 seconds.

To change the default values click in the value field and enter the required value.

6.7.2 Announcement IO Manager

The announcement IO manager window enables the selection of a announcement I/O output port to be made. The output options include Discrete I/O (digital/relay) and Port I/O (serial) The process for configuring a discrete I/O port and a serial I/O port is described in the following sections.

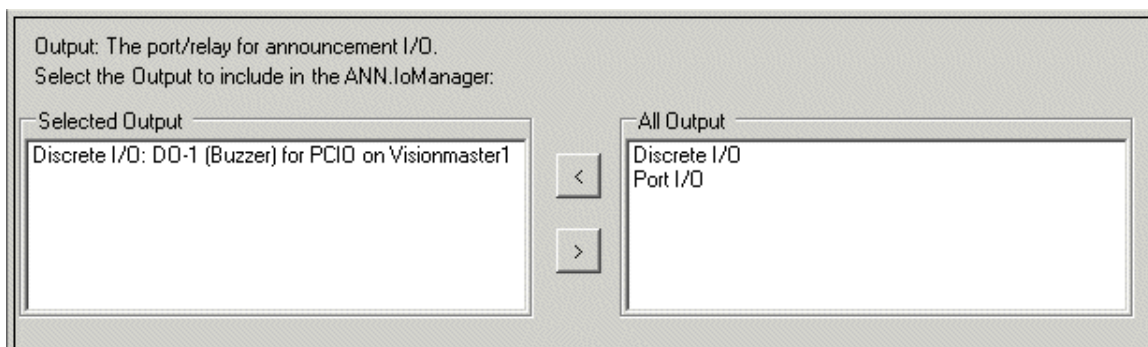


Figure 4.46 Announcement IO Manager

1. Select the output to use for the announcements by highlighting the option in the **All Output** field (Discrete I/O or Port I/O) and clicking on the **<** button. The output is moved to the **Selected Output** field and an unconfigured output line is added to Announcement IO manager in the navigation tree.
2. To configure the output either double click on the selected output or click on the line topic in the navigation tree. A configuration window for the selected output appears.

6.7.2.1 Configuring a Discrete I/O Port

1. Select the relay to be used for the output by clicking on the drop down arrow and selecting from the list of digital/relay outputs. The list shows the configured discrete outputs on the PCIO board in Sensor Peripherals.

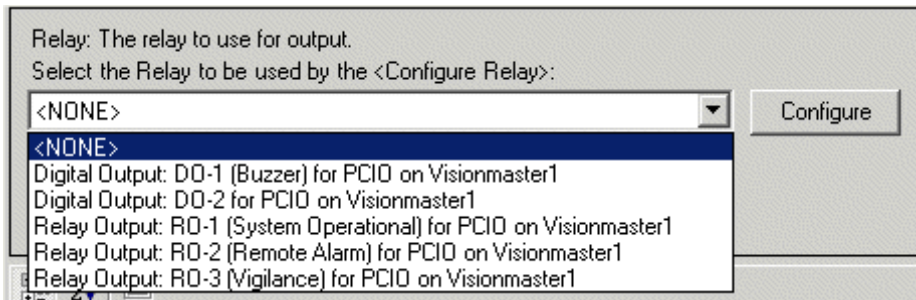


Figure 4.47 List of Discrete I/O Digital/Relay Outputs

2. If the output requires configuration click on the **Configure** button. The digital/relay output configuration window for the selected relay appears.
- Note:** Where a discrete output has been selected only the output name can be changed.
3. By default an active relay is interpreted as an inactive alarm. To change this default setting click on the **Relay Energized On Alarm Inactive** drop down arrow and select **Relay Energized On Alarm Active**.

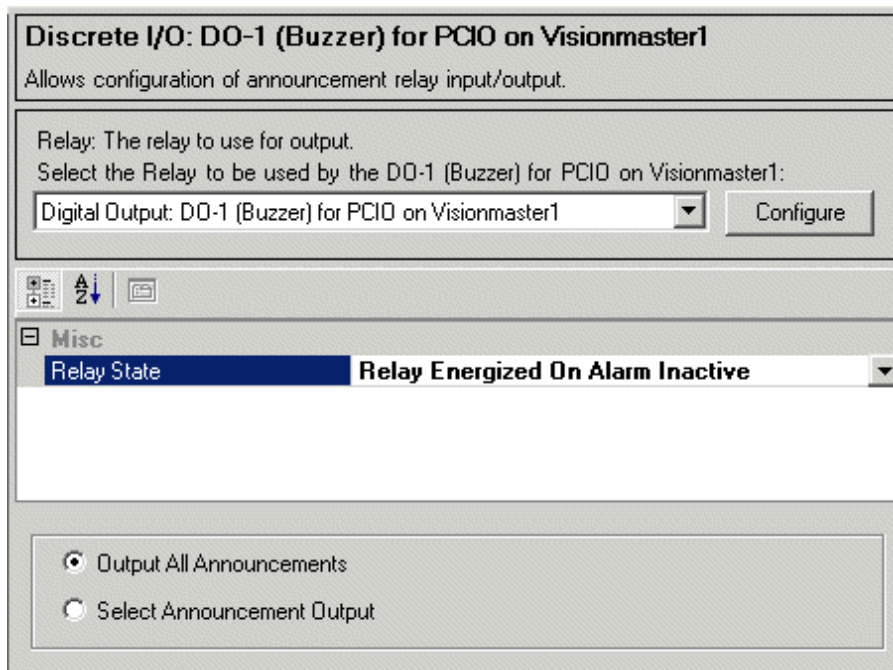


Figure 4.48 Announcement I/O Configuration

6.7.2.2 Configuring a Serial I/O Port

1. Select the port to be used for the output by clicking on the drop down arrow and selecting from the list of serial outputs. The list shows all the previously configured I/O serial outputs in the I/O Port Manager.

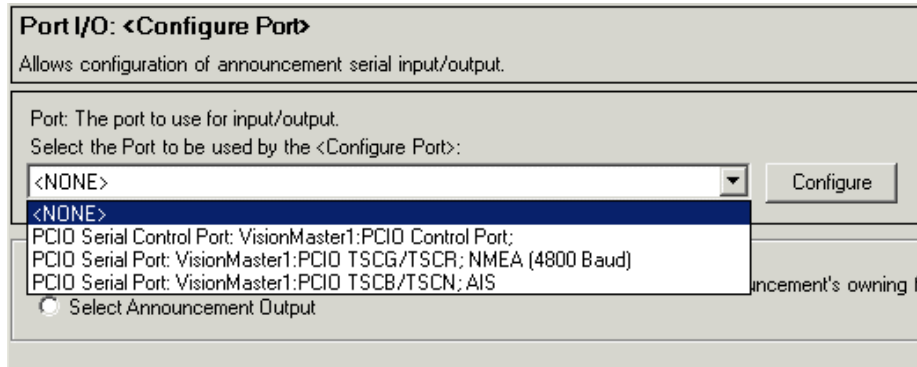



Figure 4.49 List of I/O Serial Outputs

2. If the output requires configuration click on the **Configure** button. The serial port window for the selected port appears, see Figure 4.8, page 19.

6.7.2.3 Configuring the Announcement Output

The output on all output options defaults to **Output All Announcements**, to select specific groups of announcements click the **Select Announcement Output** button, the subsequent screen lists details of all announcements.

1. To select a group of announcements click on the shaded button to the left of the announcement line, an arrow appears in the button and each announcement in the group is highlighted.
2. With the required announcements highlighted click the  button. The selected items are moved to the Announcements to Output on this Port field.

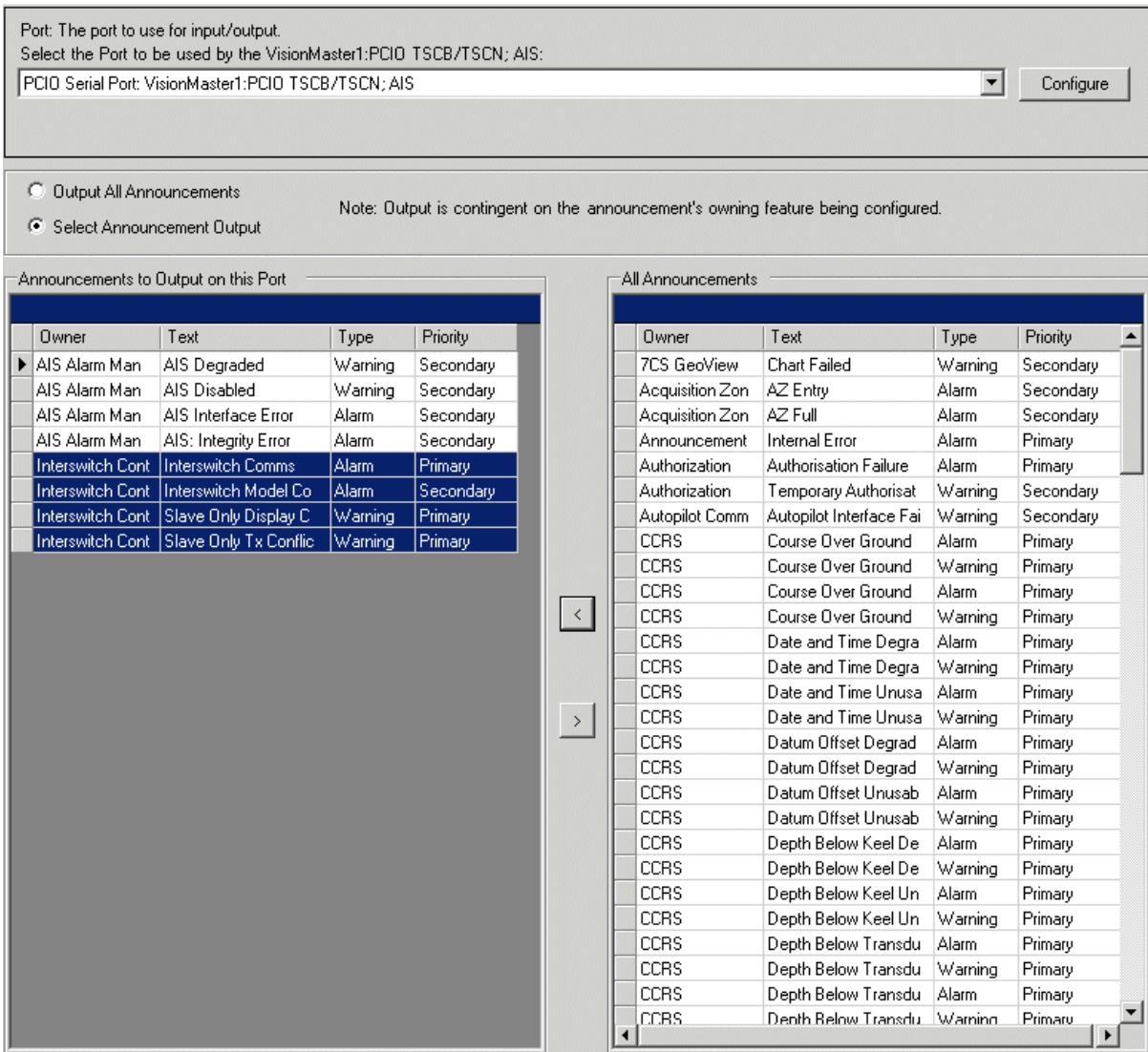



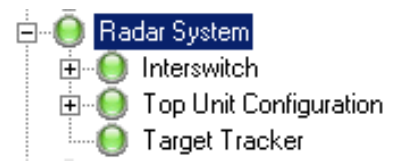
Figure 4.50 I/O Configuration - select announcement output

- To remove items from the Announcements to Output on this Port field highlight the items and click on the  button. The selected items are moved back to the All Announcements field.

6.8 Radar System

The Radar System facility enables you to configure the following radar system components:

- Interswitch
- Top Units
- Target Tracker



6.8.1 Interswitch

The interswitch is a radar video/data matrix switch that allows multiple nodes to view and/or control multiple turning units.

The Interswitch is connected to a serial port on the PCIO unit and interfaced to the Processor unit via the USB connection.

1. To select the interswitch click on **Interswitch** in the navigation tree and select the serial port to be used for interswitch communications by clicking on the drop down arrow.

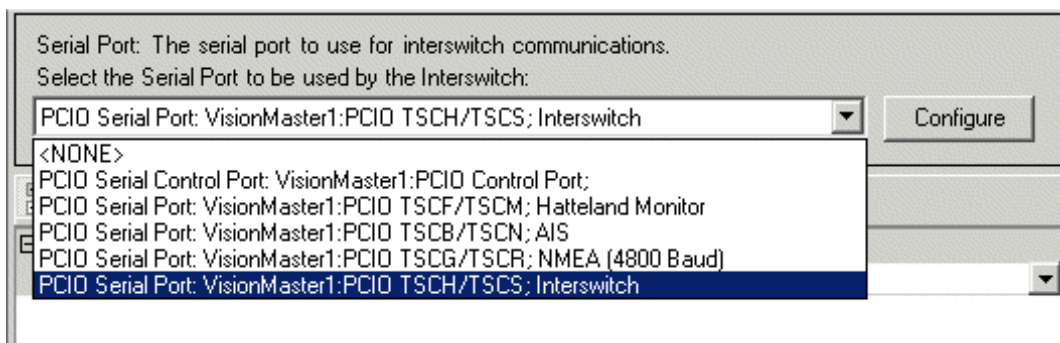
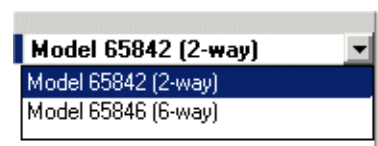


Figure 4.51 Interswitch selection

2. To configure the Interswitch port click on the **Configure** button. The subsequent screen enables you to configure the interswitch serial port and node, see Figure 4.8, page 19.
3. The system supports both 65842 (2 way) and 65846 (6 way) interswitches. To change the model from the default (2-way) click the drop down arrow and select from the list.



6.8.1.1 Displays: Slave Only and Node Association

When an Interswitch has been configured the system automatically creates a **Displays: Slave Only and Node Association** topic below the Interswitch on the navigation tree.

This window enables you to select slave only displays (i.e. the displays without an interswitch control connection) and which transceiver the displays are to be connected to.

Displays	Nodes	Transceivers
Display A	No name	No Transceiver
Display B	No name	No Transceiver
Display C	No name	No Transceiver
Display D	No name	No Transceiver
Display E	No name	No Transceiver
Display F	No name	No Transceiver

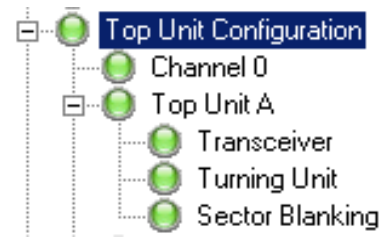
Figure 4.52 Displays: Slave Only and Node Association

The displays are listed alphabetically, the number of displays shown is dictated by the Interswitch model selected; A to F for a 6-way interswitch and A to D for a 2-way interswitch.

- To select a node for each display click on the Display drop down arrow and select from the list of nodes previously configured in Nodes, see Section 5.1 'Nodes'
- To select the transceiver for the display click on the Transceivers drop down arrow and select from the list. The transceivers are listed alphabetically, with the number dictated by the interswitch model previously selected; A to F for a 6-way interswitch and A to B for a 2-way interswitch.

6.8.2 Top Units Configuration

The Top Units sub-menu enables you to separately configure all the top units that can be connected to the display. Each top unit must be separately configured for each Display.



The following sub-menu functions are available:

- Channel - master/slave state of a display in a non- interswitched system.
- Top Units - a list of all the top units.

6.8.2.1 Channel

If no Interswitch is fitted the Channel window enables you to select whether the display is master capable or is a permanent slave, by clicking on the drop down arrow and selecting **Master** or **Slave**.

Note: *If an Interswitch is fitted this setting has no effect on the system.*

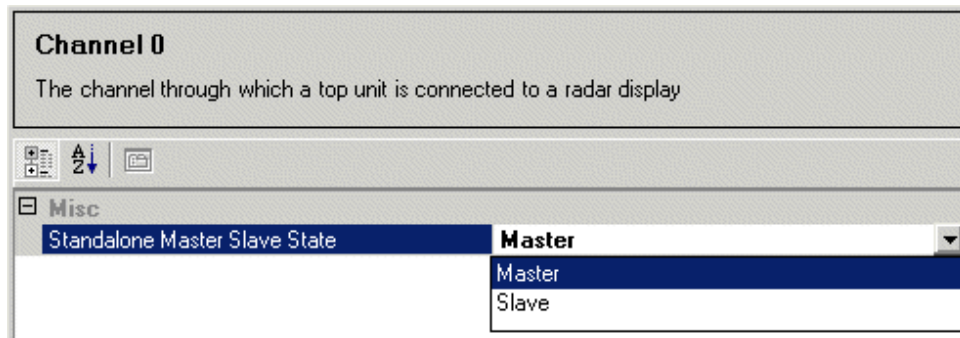


Figure 4.53 Channel Configuration

6.8.2.2 Top Units

The Top Units sub menu lists the top units available for configuration. The number of units is dependant on the Interswitch model selected. Where the two way model has been selected then units A to B only are configurable; where the six way model has been selected then units A to F are configurable.

To configure click on the specific top unit field in the navigation column, a configuration window for the selected top unit appears.

Top Unit A
Allows the configuration of the settings for this top unit.

Transceiver: Configurable settings of the transceiver
Select the Transceiver to include in the Top Unit A:
Transceiver [▼] [Configure]

Turning Unit: Configurable settings of the turning unit
Select the Turning Unit to include in the Top Unit A:
Turning Unit [▼] [Configure]

Sector Blanking: Specification of blank sectors
Select the Sector Blanking to include in the Top Unit A:
Sector Blanking [▼] [Configure]

Figure 4.54 Top Unit Configuration

The window includes the following configurable settings for the top unit:

- Transceiver
- Turning Unit
- Sector Blanking

To change the top unit settings either click on the **Configure** button, or click on the corresponding topic in the navigation column.

Transceiver

The Transceiver fields display the following data and values:

- Allow slave only operation? - Selecting **Yes** allows this transceiver to operate in slave only mode when an Interswitch is fitted. The default is **No**.
- RF Feeder Length - enter the distance, in metres, from the transceiver to the turning unit.

Note: *Changing this setting from a default of 0 is only applicable if the transceiver location is a bulkhead. The maximum feeder length for a bulkhead transceiver is 99 metres.*

- Transceiver Location - select either Bulkhead or Aloft (masthead mounting)
- Transceiver Name - enables entry of an optional user name for the transceiver.

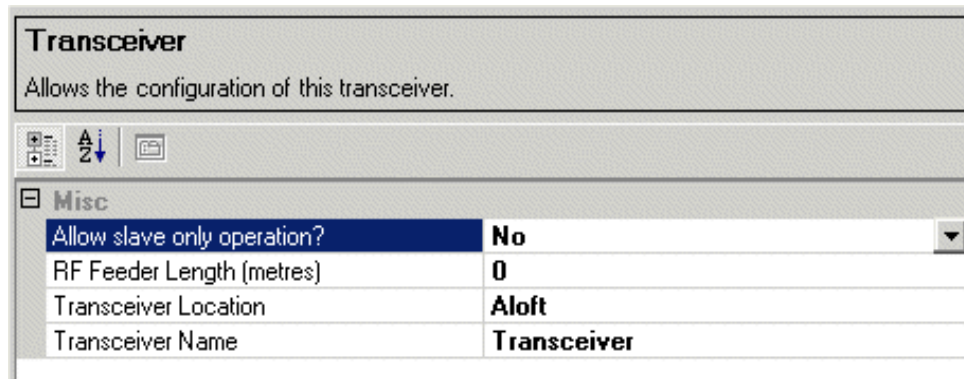


Figure 4.55 Top Unit - Transceiver

Turning Unit

The Turning Unit window includes Miscellaneous and Position sub-menu functions.

The Miscellaneous sub menu shows the following data and values:

- Antenna Beamwidth - the beamwidth, in degrees, of the radar antenna. The values are: 0.5, 1.0, 1.3, 1.6, 2.0, 2.4, 2.8, 3.3. The default value is 2.0. To change click on the drop down arrow and select the beamwidth currently installed.
- Type of Marker - to change the marker type click on the drop down arrow and select between **Heading** and **Stern**.

The Position sub menu enables the following values to be entered, the maximum value for all position settings is 999 metres:

- Distance from the bow (metres) - the position of the turning unit, measured from the bow towards the stern.
- Distance from the center line (metres; port = -) - the position of the turning unit, measured from the center line.
- Height above the bow (metres; below bow = -) - the vertical position of the turning unit, measured upward from the level of the bow.

Turning Unit	
Allows the configuration of this turning unit.	
Misc	
Antenna Beamwidth	2.0 (BME 4' X, BME 12' S)
Type of Marker	Heading
Position	
Distance from the bow (metres).	0
Distance from the centre line (metres; port = -).	0
Height above the bow (metres; below bow = -).	0

Figure 4.56 Top Unit - Turning Unit

Sector Blanking

The Sector Blanking window enables the configuration of blanking sectors for the selected top unit.

Up to two blanking sectors are available for each top unit. A transceiver will not transmit in any active blanked sector defined for it and the video in that sector is blanked.

The sectors are set up so they do not overlap and do not blank more than 340 degrees of the radar picture. If both the start and the stop angle are identical, the sector will not be active.

By system default, neither sector is active. The default start and stop angles are set at 0 degrees for blank sector 1 and 180 degrees for blank sector 2.

To change the blank sector angles click in the start and stop fields and enter the required values.

Sector Blanking	
Allows the configuration of blanking sectors for this top unit.	
Misc	
Blank sector 1 start angle	0
Blank sector 1 stop angle	0
Blank sector 2 start angle	180
Blank sector 2 stop angle	180

Figure 4.57 Top Unit - Sector Blanking

6.8.3 Target Tracker

The Target Tracker window enables the configuration of the software port number used to communicate with the Target Tracker.

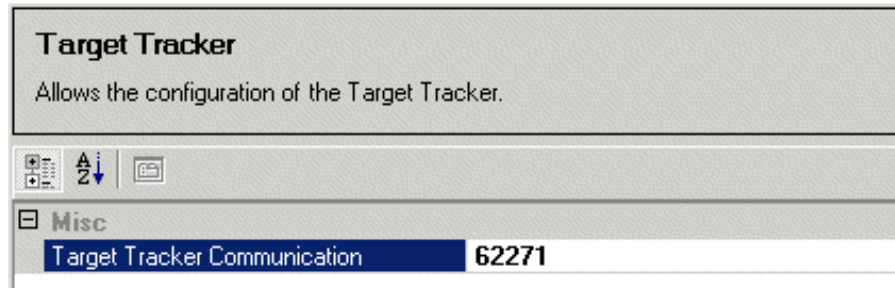


Figure 4.58 Target Tracker

It should not normally be necessary to change the software port number default value.

6.9 Target Manager

The Target Manager sub menu allows the configuration of the display of targets on the system. Various sources of target data (e.g Tracker or AIS) can be configured separately.

The following functions are available from the Target Manager sub-menu:

- Target Manager
- Track Table Output
- Target Rename Input: TLB Communications

6.9.1 Target Manager - Reset Defaults

The Reset Defaults on Target Manager enables collision avoidance to reset its persistent data to default values on start up. The default setting is **No**, to enable the setting click on the drop down arrow and select **Yes**.

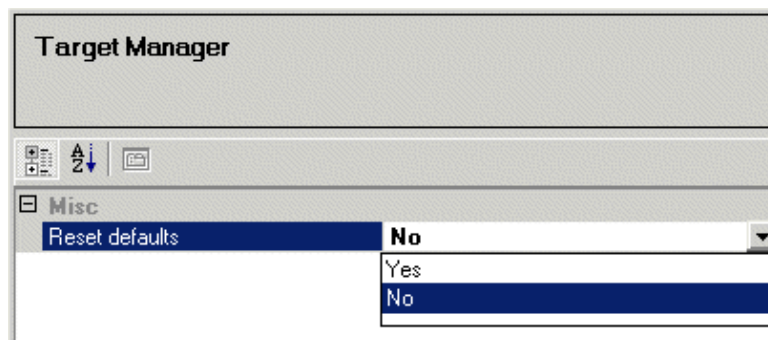


Figure 4.59 Target Manager - Reset Defaults

6.9.2 Track Table Output

A track table is a list of all targets in the system and the data associated with each, including course, speed, position, type (e.g. tracked, AIS etc.) and source of target (e.g. tracker).

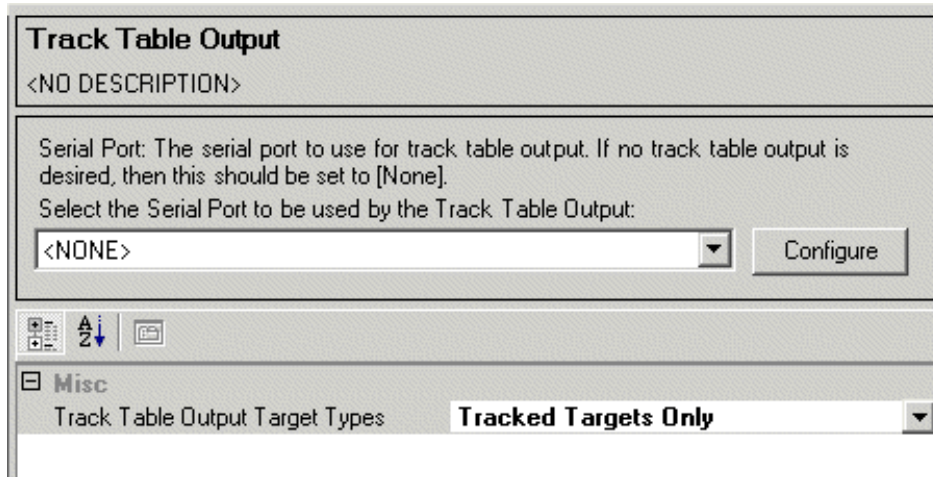
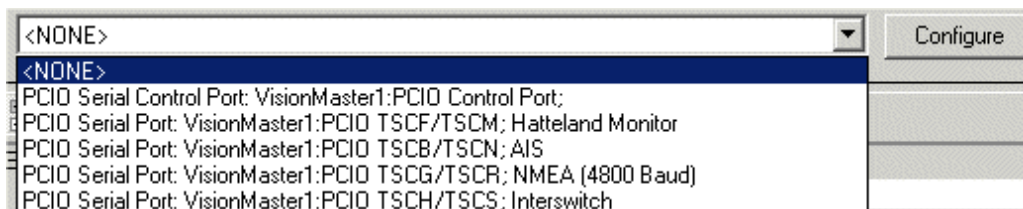


Figure 4.60 Track Table Output

The Track Table Output window enables the selection of the serial port for the track table output, the default is **NONE**. To select a serial port for tracked table output:

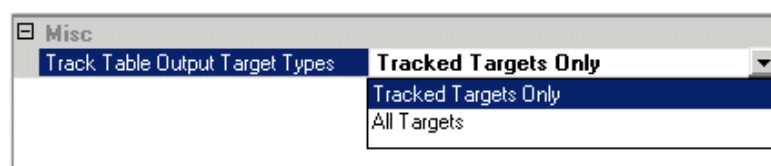
1. Click on the serial port drop down arrow, a list of serial ports previously configured in I/O Port Manager appears.



2. Select the serial port to be used from the drop down list.
3. To configure the selected serial port click on the **Configure** button, the Serial I/O Port configuration window appears, see Figure 4.8, page 19.

The Tracked Table Output Target Types specifies which type of targets will be output, with the default as **Tracked Targets Only**.

To change to **All Targets** click on the drop down arrow and select from the list.



6.9.3 Target Rename Input

The target rename input window enables the selection of the PCIO serial port used for TLB (target label) communications for tracked targets.

TLB communications allows all nodes on the system displaying tracked target data to use a common set of labels.

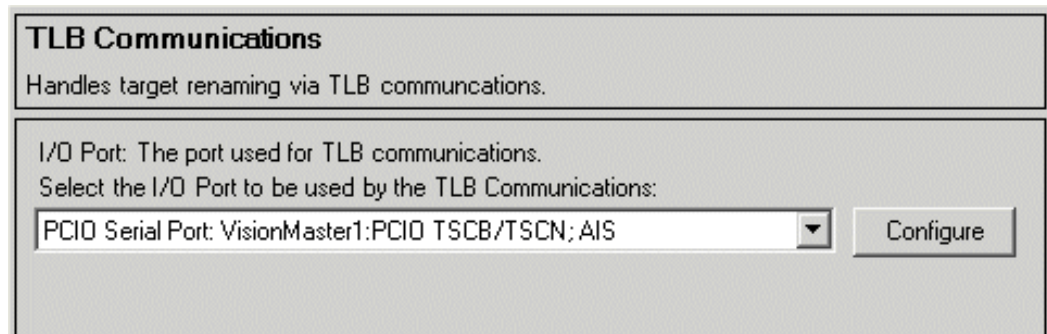


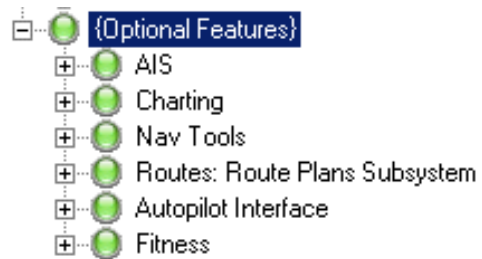
Figure 4.61 TLB Communications

To select a serial port for target rename input:

1. Click on the port drop down arrow, a list of PCIO serial ports previously configured in I/O Port Manager appears.
2. Select the serial port to be used from the drop down list.
3. To configure the selected serial port click on the **Configure** button, the Serial I/O Port configuration window appears, see Figure 4.8, page 19.

6.10 Optional Features

The Optional Features menu enables you to select optional features for the radar configuration. The window displays in the left field a list of features currently selected, and in the right field a list of all optional features available.



To select a feature highlight the line in the All Optional Features list and click on the < button.

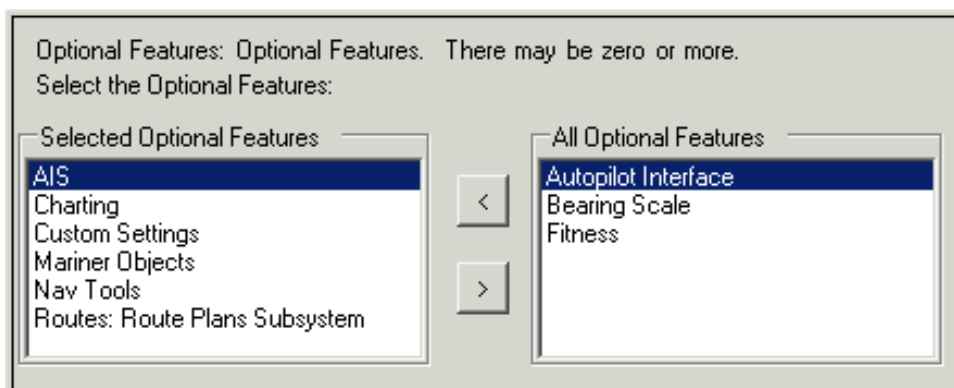


Figure 4.62 Optional Features

Where all optional features are selected the navigation column creates the following sub-menu configurations:

- AIS - AIS communications
- Charting - Chart Engines assigned
- Nav Tools - EBL communications
- Routes - external route plan configuration
- Autopilot Interface - NMEA Autopilot controller
- Fitness - Monitoring

6.10.1 AIS

The AIS facility includes an AIS Communications window, which enables the selection and configuration of the I/O port used for AIS communications.

1. To select the I/O port click on the **AIS Communications** topic in the navigation tree and click on the I/O Port drop down arrow.

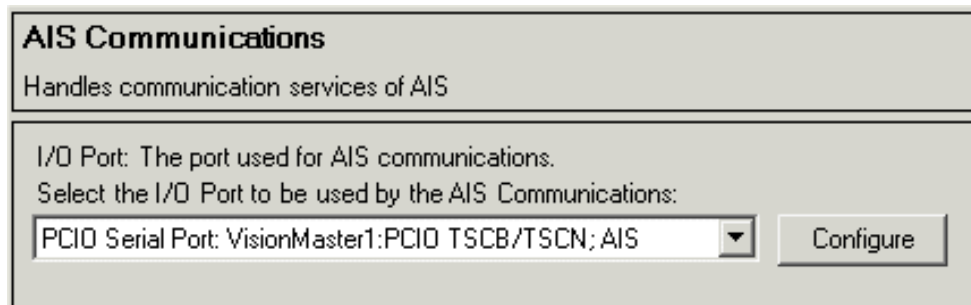


Figure 4.63 AIS Communications

2. Select the required I/O port from the drop down list.
3. To configure the I/O port click on the **Configure** button, the configuration window for the selected serial port is displayed, see Figure 4.8, page 19.

Note: *On the VisionMaster system the serial port for AIS communications should have a baud rate of 38400 (usually COM 5), see Table 1 on page 17 for details.*

6.10.2 Charting

The Charting facility allows for the selection and configuration of available chart engines. Chart Engines can be configured by accessing the charts installation directory.

The Charting window lists the currently selected chart engine all available chart engines.

To select a chart engine highlight the file in the **All Chart Engines** field and click on the < button. The file is moved into the **Selected Chart Engines** field and is listed and available for configuration in the Chart Engines navigation tree. De-selection of chart engines is a reversal of this procedure.

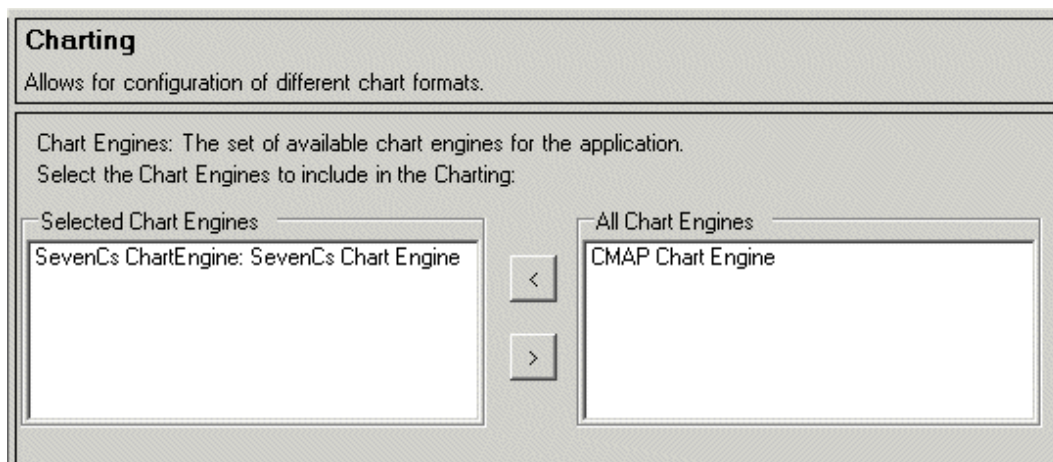


Figure 4.64 Charting

6.10.2.1 Supported Chart Engines

The VisionMaster system supports both CMAP and SevenCs chart engines.

The CMAP chart engine supports the following chart formats:

- CM93v3 (CMAP)*
- ENC (CMAP)†
- Professional+ (C-MAP)

The SevenCs chart engine supports the following chart formats:

- S-63 (encrypted S-57)‡
- S-57
- DirectEnc (ChartWorld)

* CMAP's proprietary and unofficial chart format.

† Official S-57 encrypted charts converted to CMAP's proprietary chart database format.

‡ Implementation of this format is based on IMO S63 standard.

If the chart type supports network installation, chart installation can be initialised from any node in the system.

For a description of the chart installation program refer to Chapter 6 'Chart Installation'.

6.10.2.2 Chart Engines

When a chart engine is selected the Charting navigation tree creates a topic for the file under the Chart Engines sub directory. To configure the selected chart engine click on the file in the navigation tree.

The Chart Engine window enables you to configure the chart installation directory for the selected chart format (CMAP or SevenCs).

Figure 4.65 shows the chart engine window for SevenCs charts.

Figure 4.66 shows the chart engine window for CMAP charts. Note that CMAP defines separate directories for each CMAP chart format.

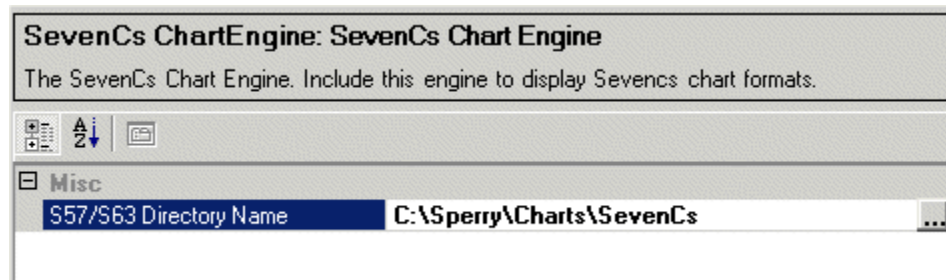


Figure 4.65 SevenCs Chart Engine

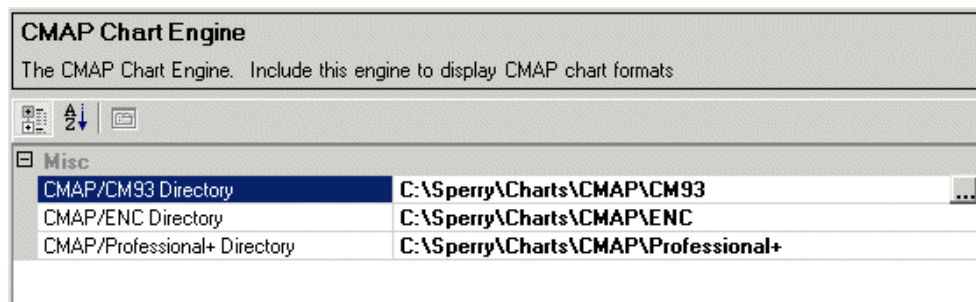


Figure 4.66 CMAP Chart Engine

To access the chart file directories click on the browse button to the right of the chart format file. When the Browse button is accessed a Browse For Folder window appears from where the selected chart installation directory can be configured, see Figure 4.67.

The installation directory selected at this window is the read-only chart destination directory that appears in the Sperry Chart Installer facility, refer to Chapter 6 'Chart Installation'.

Note: The default chart installation directories reside on the C: drive. Unless there are valid reasons for changing this directory, the C drive default should remain.

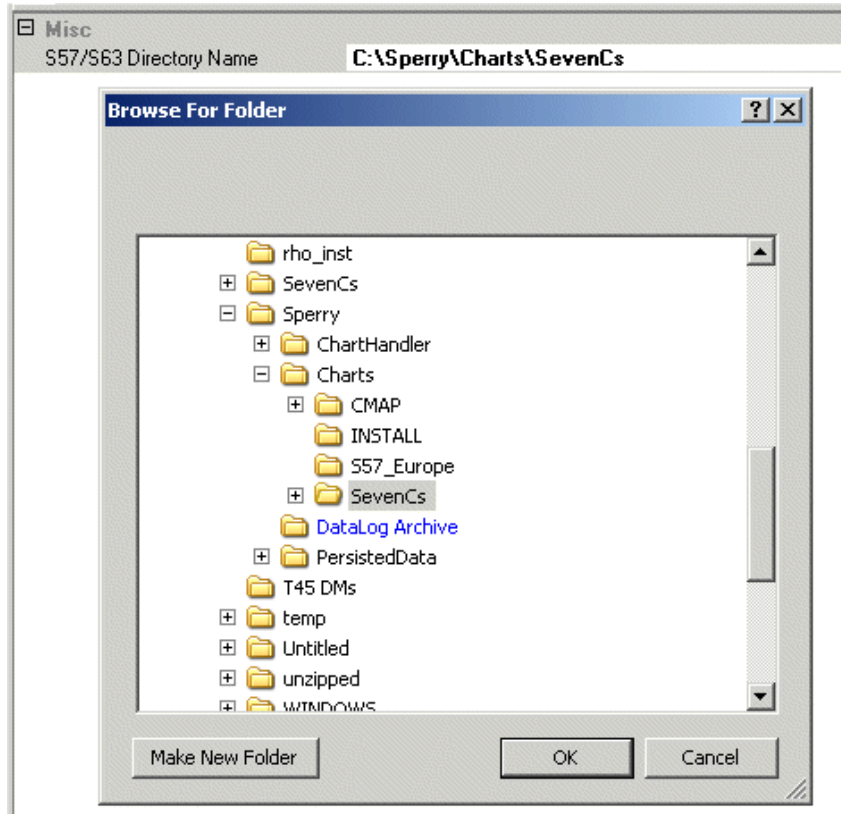


Figure 4.67 Browse For Folder Chart Engine

To move the chart engine directory to a different drive:

1. Either copy or move the chart directory and files from their existing location by right clicking on the main directory and selecting the required option.
2. Navigate to the drive where you want the chart directory to reside and paste the contents.
3. Click the **OK** button in the Browse for Folder window. The window is removed and the chart directory name shows the new directory path.

To move the chart engine directory to a new directory folder:

1. Navigate within the Browse for Folder window where you want the chart files to reside and click on the **Make New Folder** button. A blank folder is created.
2. Name the blank folder then cut and paste the chart files to the folder.
3. Click the **OK** button in the Browse for Folder window. The window is removed and the chart directory name shows the new directory path.

6.10.3 Nav Tools

The Nav Tools facility includes an EBL Communications window, which enables the selection and configuration of the I/O port used for next turn EBL communications.

1. To select the I/O port click on the **Next Turn EBL: EBL Communications** topic in the navigation tree and click on the I/O port drop down arrow.

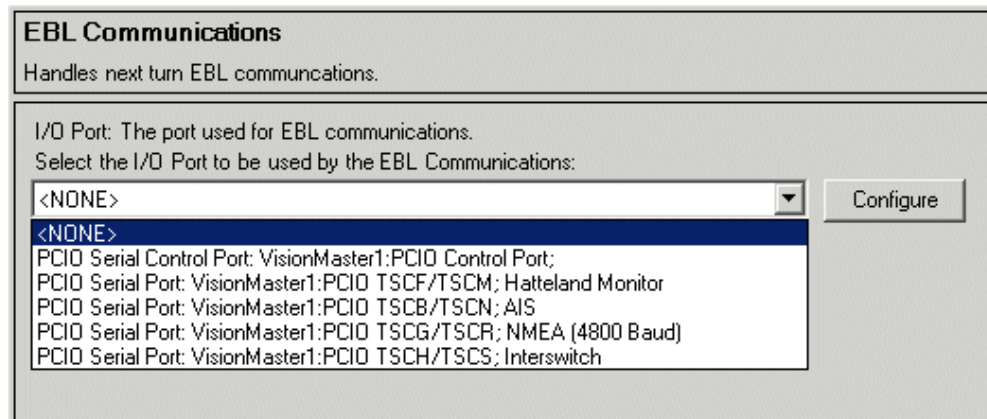


Figure 4.68 EBL Communications

2. Select the required I/O port for EBL communications from the drop down list.
3. To configure the I/O port click on the **Configure** button, the configuration window for the selected serial port is displayed, see Figure 4.8, page 19.

6.10.4 Routes

The Route Plans Subsystem window provides the ability to configure the route plan values.

The following default values are shown:

- Off Track Limit - defaults to 100 metres (maximum 9999 metres)
- Route Speed - defaults to 10 knots (maximum 99 knots)
- Turn Radius - defaults to 1 NM (maximum 10 NM).

To change the default values click in the respective field and enter the required value.

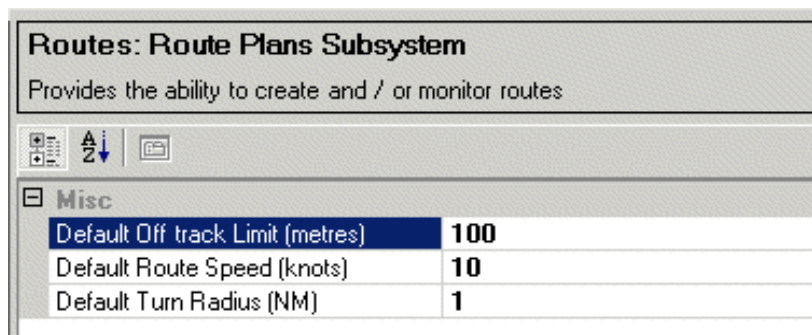


Figure 4.69 Route Plan Subsystem Values

6.10.4.1 External Route Plans

The External Route Plans sub-menu allows the monitoring of routes from an external input.

External Route Plans (ERPs) are route plans that were created and stored on a GPS unit, a legacy VMS unit, or some other device external to the VisionMaster system. ERPs can be displayed on VisionMaster if they are sent using NMEA 0183 (also known as IEC 61162-1) RTE and WPL sentences over a serial connection.

Note: *In some cases transferring additional route details such as waypoint names from certain GPS units may cause problems when the route is transferred to the system. If transfer problems occur try disabling some of the optional route details.*

Refer to the device documentation for detailed information regarding the configuration of RTE and WPL messages.

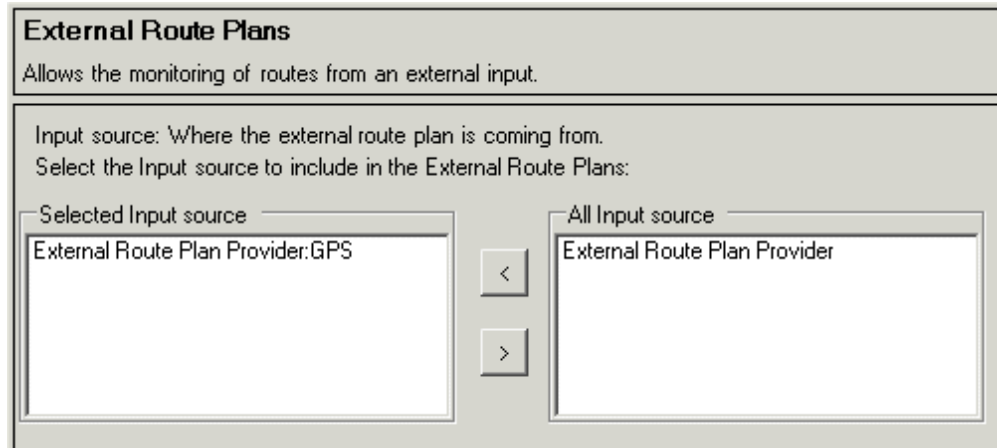


Figure 4.70 External Route Plan Input

To configure an ERP input:

1. Click on the **External Routes: External Route Plans** topic in the navigation tree.
2. Highlight **External Route Plan Provider** in the All Input Source field and click the < button. The navigation column adds the line **External Route Plan Provider** to the External Routes sub-menu.
3. Click on the **External Route Plan Provider** topic in the navigation tree. The following ERP provider configuration window is displayed.

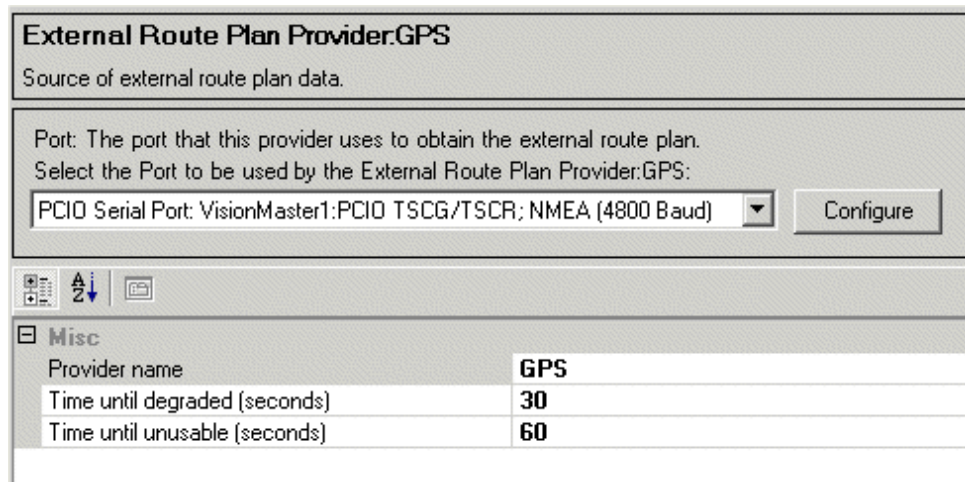


Figure 4.71 External Route Plan Provider

4. Select the I/O port to be used by the ERP provider by clicking on the drop down arrow and selecting from the list of configured I/O ports.
5. To configure the I/O port click on the **Configure** button, the configuration window for the selected serial port is displayed, see Figure 4.8, page 19.

6. In the Provider Name field enter a name to use for the ERP input. When a name is entered the ERP input is validated, i.e. its configuration status button colour changes to green and the ERP name is shown in the title and navigation topic.

The remaining Miscellaneous values are:

- Time until degraded (seconds) - denotes how long an external route plan data may be displayed in the ungraded color without any updates from the input source. Default value is 30 seconds.
- Time until unusable (seconds) - denotes how long an external route plan may be used without any updates from the input source. Default value is 60 seconds.

To change the default values click in the respective field and enter the required value.

Note: *There are no minimum and maximum values for route plan data.*

6.10.5 Autopilot Interface

The Autopilot Interface facility provides the ability to interface to an autopilot. The window enables the selection and configuration of the controller which interfaces with the autopilot.

1. To select the interface click on **Autopilot Interface** in the navigation tree. The default controller shown is Standard NMEA Autopilot Controller.

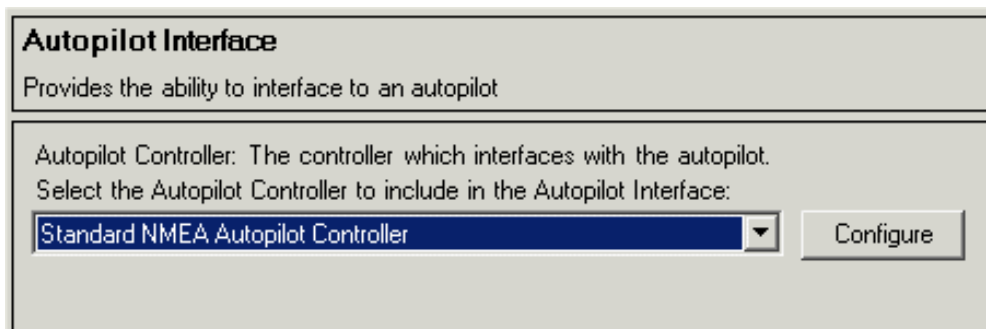


Figure 4.72 Autopilot Interface

2. To configure the autopilot controller click on the **Configure** button, the following typical screen is displayed, see Figure 4.73.

6.10.5.1 Autopilot Controller configuration

The Autopilot Controller configuration screen enables selection of the interface port to be used by the standard NMEA Autopilot Controller and miscellaneous configuration settings.

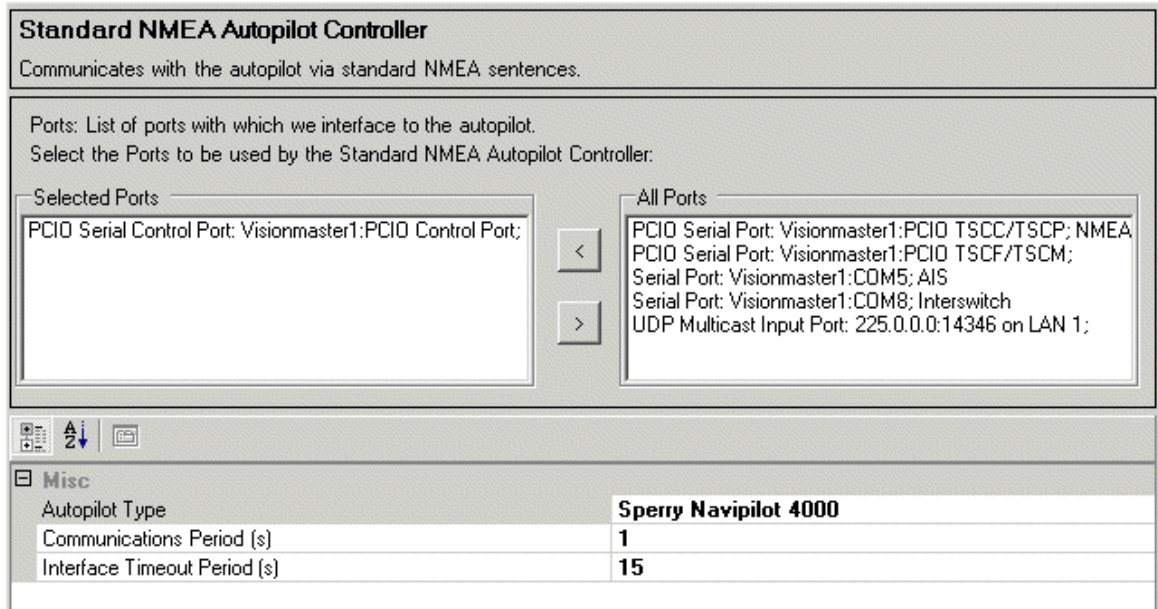


Figure 4.73 Autopilot Controller Configuration

1. To select the required port highlight from the list of ports (previously configured in I/O Port Manager) in the **All Ports** window and click on the < button. The selected port is moved to the **Selected Ports** window.
2. To configure the port double click on the line in the **Selected Ports** window, the configuration screen for the port is displayed, see Figure 4.8, page 19.

Changing Miscellaneous Settings

1. The autopilot type defaults to **Sperry Navipilot 4000**. To change the type of autopilot the controller is communicating with click on the **Autopilot Type** drop down arrow and select from the list.

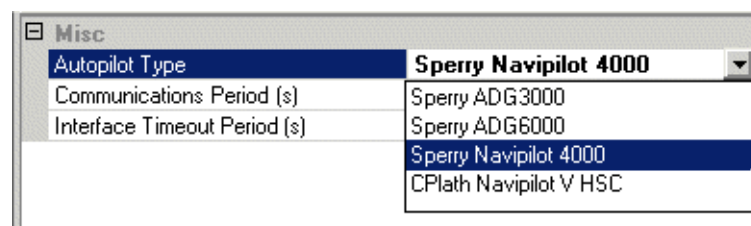


Figure 4.74 Autopilot Type

2. The communications period defines the period, in seconds, that the controller will send commands to the autopilot. The default period is one second. To change click in the field and enter the required period.
3. The interface timeout period defines the period, in seconds, that the controller must receive a message from the autopilot before raising an alarm. The default period is 15 seconds. To change click in the field and enter the required period.

6.10.6 Fitness Monitor

The Fitness Monitor window enables monitoring of operator activity or response by monitoring the use of the mouse.

1. Select the discrete I/O port to be used by the fitness monitor (i.e. the discrete outputs previously configured for the PCIO board, see Section 6.4.1.3 '*Sensor Peripherals*') by clicking on the drop down arrow and selecting from the list.

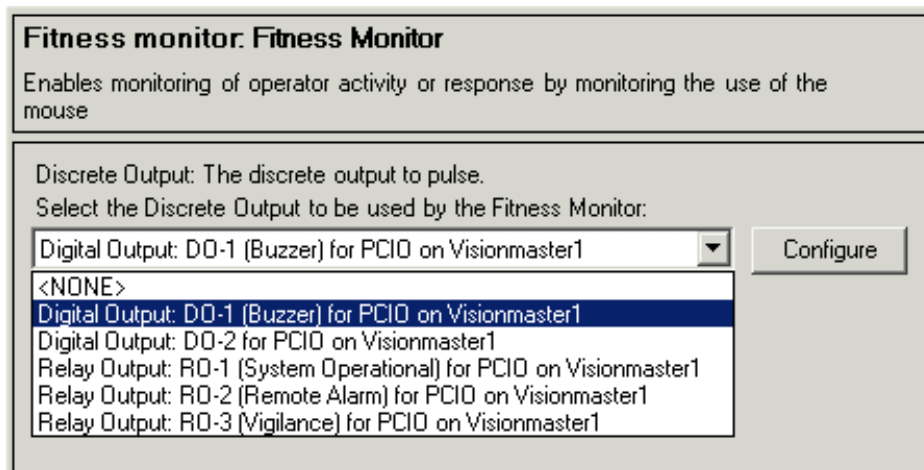


Figure 4.75 AIS Communications

2. To configure the discrete output click on the **Configure** button, the configuration window for the selected output is displayed.

Note: On a discrete output only the output name can be changed.

7 Validating, Saving and Exporting

7.1 Validating a Configuration

The Validate function on the File menu provides a method of checking the reason for any invalid settings made to the configuration.

You can access the function at any time by clicking on the File drop down menu and selecting **Validate**. Where a configuration setting is invalid the Validate window provides a brief description of the validation errors, if more than one error exists then these are listed.

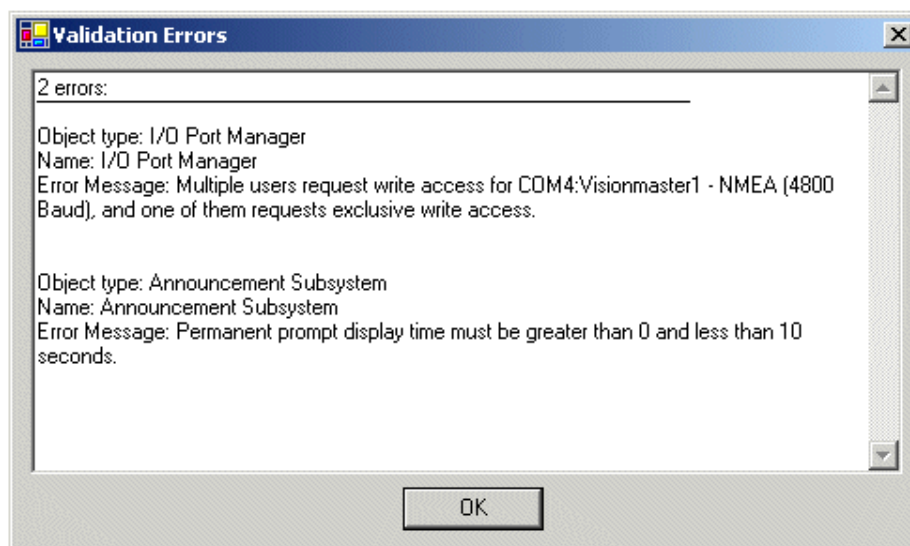


Figure 4.76 Validation Errors

To resolve validation errors check the colour of the status buttons in the navigation tree, the invalid configuration will be the item topic with the red status button.

Where there are no validation errors in the configuration file the Validate window confirms this.

7.2 Saving a Configuration

The following save options are available:

- Save - saves changes made to the configuration under the same name.
- Save As - save changes to the configuration under a different name.
- Save and Distribute - saves changes to the configuration and distributes the saved configuration file across nodes.

7.3 Exporting a Configuration

This function enables a saved configuration file to be saved as a readable .txt file to a external port (usually a USB key).

To export a configuration file:

1. Click on the File drop down menu and select **Export Summary**. a browse window appears enabling you to navigate to the required external port.

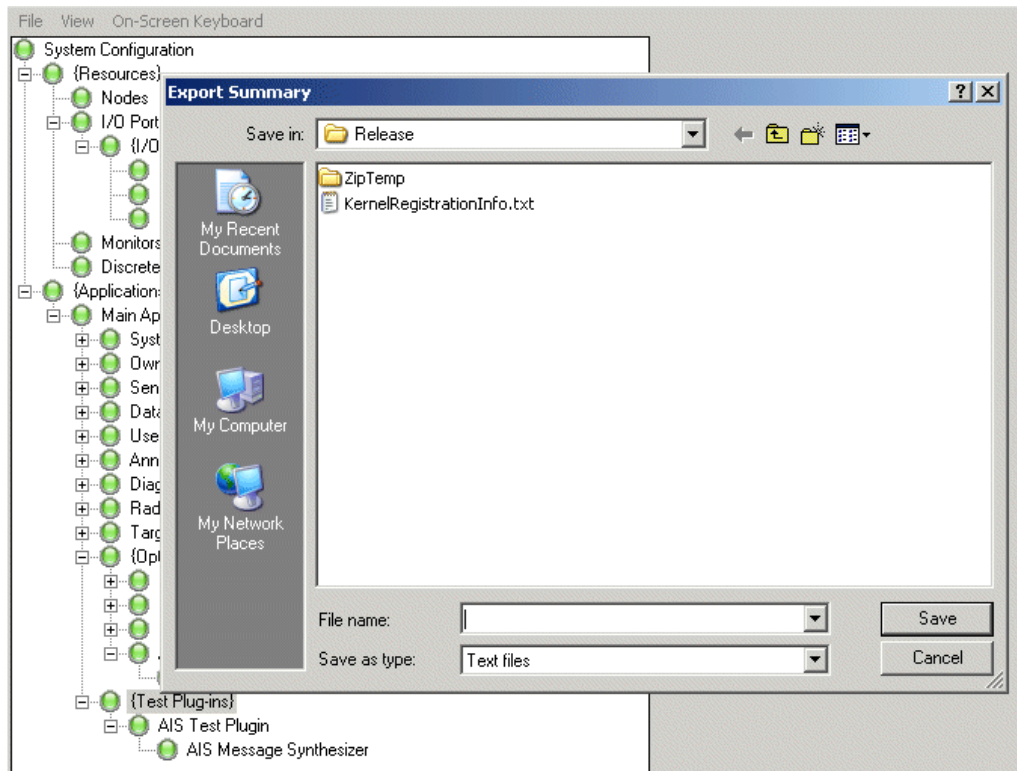


Figure 4.77 Export Summary

2. With the external drive displayed name the file in the **File name:** field and click the **Save** button. The file is saved as a .txt file and can be opened in a basic text editor program.

8 Restart and Shutdown System

Restart System is selected if any errors or faults occur during the running of the system. This option will cause the System Configuration tool, and all other currently opened programs to close, the Windows system will power down and then restart.

Shutdown System is selected when the operator requires to shut down the system for a prolonged period of time. This option will cause the System Configuration tool, and all other currently opened programs to close and the Windows system to power down.

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CHAPTER 5

DIAGNOSTICS AND COMMISSIONING

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1 Introduction

This chapter describes the Diagnostic and Commissioning facilities in the System menu which contain system data and values, some of which may be edited by a logged on user in Service mode.

Note: *This chapter describes the functions available to a logged on user up to service only. A user logged on as a Developer will have access to additional features not covered in this chapter.*

2 Diagnostics

The Diagnostics menu includes the following diagnostic sub-menu functions as a series of tab folders:

- Software (S/W)
- Report
- Buzzer
- Version
- Tx/Rx Configuration
- Tx/Rx Data
- Tx/Rx BITE
- Performance Monitor (PM)
- Time

All diagnostic sub-menu functions, with the exception of Software, are available to a non-logged in user. All diagnostic functions, with the exception of Report, Buzzer and PM display read-only information.

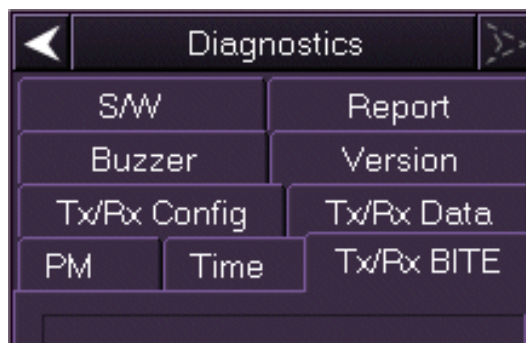


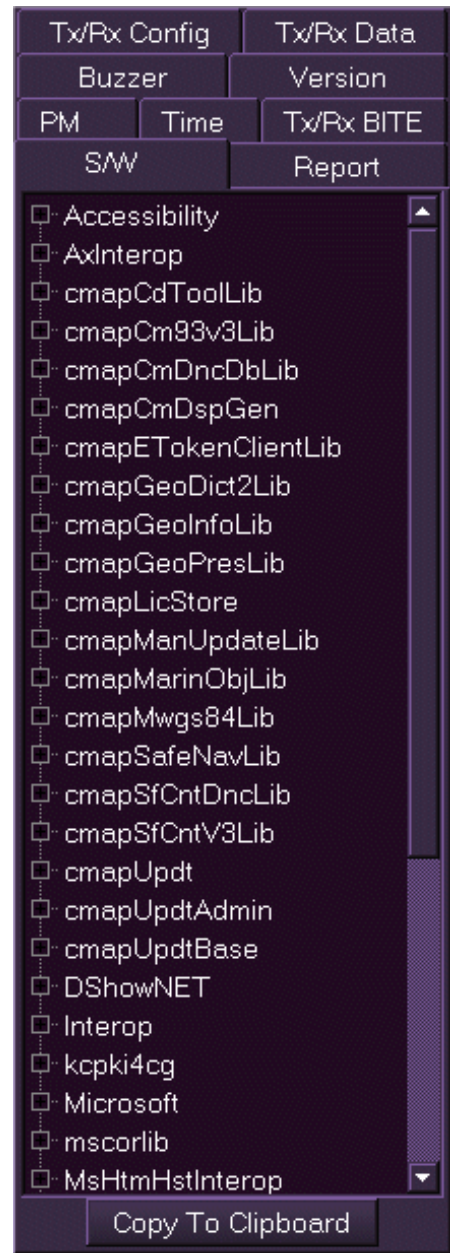
Figure 5.1 Diagnostics Menu

2.1 (S/W) Software

The S/W (Software) folder includes version information of all the operational software included on the system, including charting (CMAP and/or SevenCs) data.

Data used during operation and stored in the Software folder is protected in such a way, that necessary modifications and amendments by the user cannot endanger its integrity and correctness.

You can copy all the Software data by clicking on the **Copy To Clipboard** button at the bottom of the folder. The information is saved to the Windows clipboard and from there can be pasted to an external program.



2.2 Report

The Report folder enables the user to export a system fault report to an external device such as a USB memory stick.

There are three types of export options available for reports:

- **Screenshot only** - this option will contain only a screenshot of the system
- **Concise** - this option will generate a smaller report than verbose, making it easier to transfer over slow internet connections.
- **Verbose** - this option contains the same information as the concise report, however more detail is included, making the report file larger.

The default export option is concise.

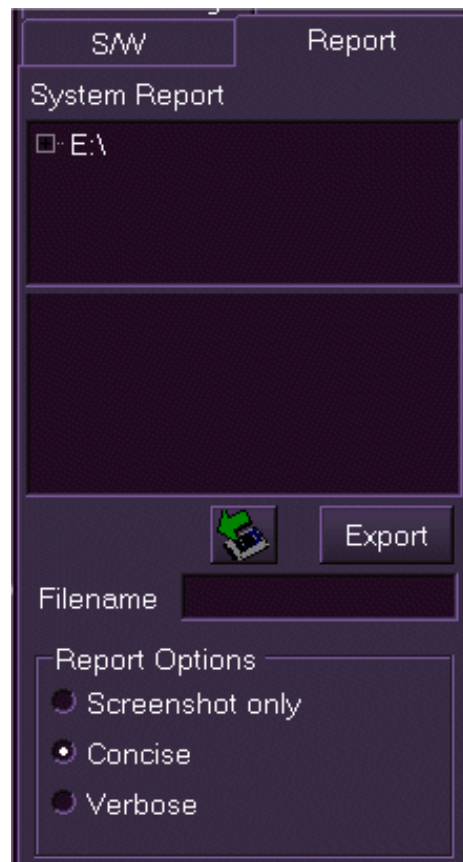
With the exception of 'screenshot only' the fault report will include the following file types:

- .xml schema files
- .txt files
- .png file (screenshot)
- .cfg file (config file)

You can quickly access the Reports folder by right clicking on the **iHelp** button at the top right of the screen.

To export a fault report do the following:

1. If the report is to be saved on a USB, select the drive and folder in the navigation field. This will typically be E:\.
2. Click in the Filename field and, using the on-screen keypad, enter a name for the report. The name would typically be related to the fault, i.e 'track fault' or 'video error 3'.
3. Select the report type from the three options listed above.
4. If required enter a description of the report in the Description field.
5. Click on the Export button to generate the report. After the files have been saved to the external device a temporary prompt should appear confirming that the export was successful.
6. Click on the remove USB icon and when prompted remove the USB device from the PC.

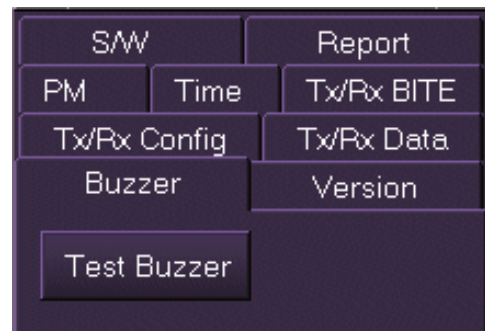


2.3 Buzzer

The Buzzer folder enables the user to test the operation of the buzzer (the buzzer is located in the Console Monitor).

To test click on the **Test Buzzer** button. The alarm buzzer should sound.

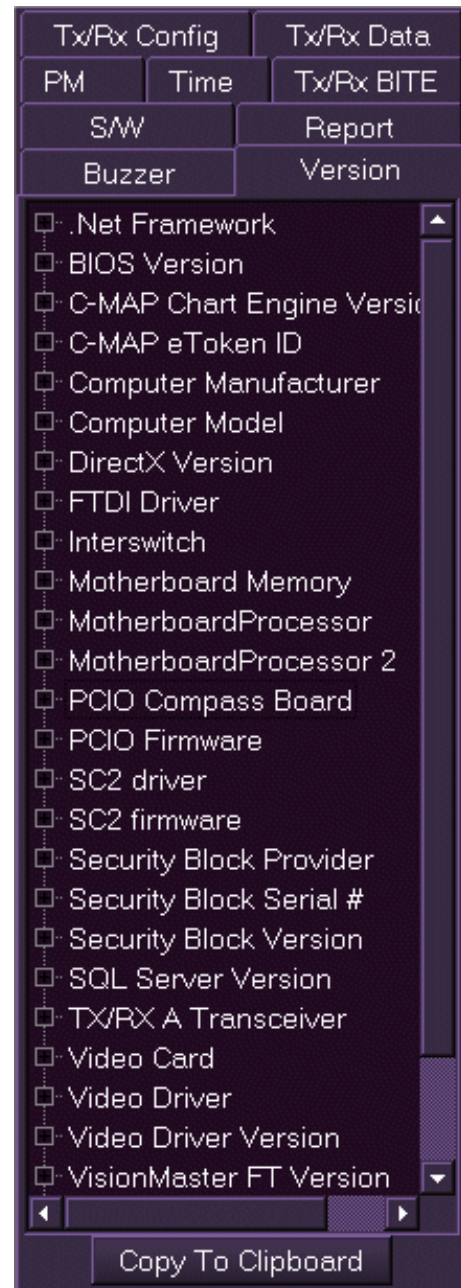
If there are any problems with the alarm buzzer refer to Section 6.7 'Announcements' in Chapter 4 'Configuration'.



2.4 Version

The Version folder includes information on the following components currently used by the system:

- Net Framework
 - .Net runtime service packs
- BIOS Version
 - ROM BIOS version
- C-MAP Chart Engine Version*
 - chart engine version number
- C-MAP eToken ID
 - Sperry Marine eToken ID number
- Computer Manufacturer
 - name of PC manufacturer
- Computer Model
 - name and number of PC model
- Direct X Version
 - version number
- FTDI Driver
 - driver number
- Interswitch
 - version number
- Motherboard Memory
 - amount of memory in MB
- Motherboard Processor
 - type and power of CPU
- PCIO compass board
 - standard or special
- PCIO firmware
 - version number
- SC2 driver/firmware
 - status and firmware version of scan converter (SC) card
- Security Block Provider
 - Aladdin eToken



* If C-MAP files are configured, shows the C-MAP chart engine version

- Security Block Serial #
 - serial number
- Security Block Version
 - version number
- SevenC's Chart Engine Version*
 - chart engine version number
- SevenC's Presentation Library
 - SevenCs presentation library version number
- SQL Server Version
 - Microsoft SQL Server version
- Video Card
 - type and version of video card
- Video Driver/Version
 - type and version of video driver
- VisionMaster FT Version
 - system software version
- Windows Service Pack
 - service pack number
- Windows Version
 - Microsoft Windows version

* If SevenCs files are configured, shows the SevenCs chart engine version

2.5 TX/RX Configuration

The following data received periodically from the currently selected transceiver (transmitter/receiver) is displayed for information in the Configuration folder:

- **Transceiver Type** BridgeMaster (BM) E, BM generation or Unknown.
- **Transceiver Band** X band (3 cm), S band (10 cm) or Unknown.
- **Transmitter Power**
X band is 10 kW, 25 kW or Unknown.
S band is 30 kW or Unknown.
- **PM** (Performance Monitor) Fitted or Not Fitted.
- **Slave Only** Yes if the transceiver is configured as Slave only, otherwise No.

Tx/Rx Config		Tx/Rx Data	
TX/RX C - S Band			
Transceiver Type		BM E	
Transceiver Band		S (10 cm)	
Transmitter Power		30 kW	
PM		Fitted	
Slave Only		No	

For other manufacturers' transceivers all data shown, apart from the Transceiver Type, is displayed as Not Available.

2.6 TX/RX Data

The following data for the currently selected transceiver (transmitter/receiver) is displayed in the Tx/Rx Data folder.

- Azimuth Pulse Count (between heading markers)
- Pulse Repetition Frequency (PRF)
- Current Heading Marker (1 or 0)
- Antenna revs per minute (RPM)

Tx/Rx Config		Tx/Rx Data	
TX/RX C - S Band			
Azimuth PPR		4096	
PRF		1691	
Heading Marker		1	
Antenna RPM		50	

2.7 TX/RX BITE

When connected to a BridgeMaster (BM) E or BM II transceiver the following test results, except where indicated, are displayed on the transceiver's Built In Test Equipment (BITE) folder.

- Instantaneous magnetron current.
- Instantaneous +30V supply line voltage.
- Instantaneous +12V supply line voltage.
- Instantaneous modulator volts - BME transceivers only.
- Software Version
- Swept gain setting (on/off) - BME transceivers only.

If the connected transceiver is not a BME or a BM II all the BITE data is displayed as being unavailable. The BITE data is available for display irrespective of the display's Master/Slave or standby/transmit state.

The state of the following parameters for the currently selected transceiver is periodically monitored in both standby and transmit. If any of the available parameters indicate a failure, a BITE alarm is raised.

- Spark gap
- Corrupt data
- Message failure
- Heading marker
- Charge trigger - BME transceivers only.
- Modulator trigger - BME transceiver only.

PM	Time	Tx/Rx BITE
TX/RX C - S Band		
	Magnetron Current	7.4 A
	+30V Supply	29.9 V
	+12V Supply	12.1 V
	Modulator Volts	-576.5 V
	Software Version	2.1
	Swept Gain	Off
	Spark Gap	Pass
	Corrupt Data	Pass
	Message Failure	Pass
	Heading Marker	Pass
	Charge Trigger	Pass
	Modulator Trigger	Pass

2.8 Performance Monitor

The Performance Monitor (PM) facility allows the operator to detect degradation in the performance of the transceiver.

The PM facility is available when:

- the display is a Master display and is in Transmit mode.
- the connected transceiver is fitted with performance monitoring equipment.

The PM has two modes of operation:

- System Mode (default) which monitors the performance of the overall system.
- Receiver Mode which monitors the receiver path for incoming signals, including the receiver located in the Transceiver unit.

The following table summarises which values are adjustable in each mode:

Table 1: Performance Monitor - modes of operation

PM Mode		System PM tune level	Receiver PM tune level	XR adjust	XT adjust
Normal operation	System monitoring	Yes	No	No	No
	Receiver monitoring	No	Yes	No	No
Commissioning	System monitoring	Yes	No	Yes	No
	Receiver monitoring	No	Yes	No	Yes

While the PM is On any configured Sector Blanking is suppressed with an appropriate warning. If Video Build-Up is On it is automatically turned off.

2.8.1 Performance Monitor Operation

The PM folder displays the current operational Transceiver (Tx/Rx), selected from the Radar menu, see '*Interswitch Control*' in the VisionMaster FT User Guide.

With reference to the User Guide, select the following operating parameters:

- Master Display (Interswitch systems)
- Transmit mode
- Range scale of 12 NM
- Long Pulse (LP) transmission pulse rate
- Manual clutter selection with A/C Rain and A/C Sea set to minimum
- Radar tuning mode to AFC on
- Gain setting at optimum level (if the setting is too low or too high the four tuning arcs may not be visible).

2.8.1.1 Adjusting the PM in Service Mode

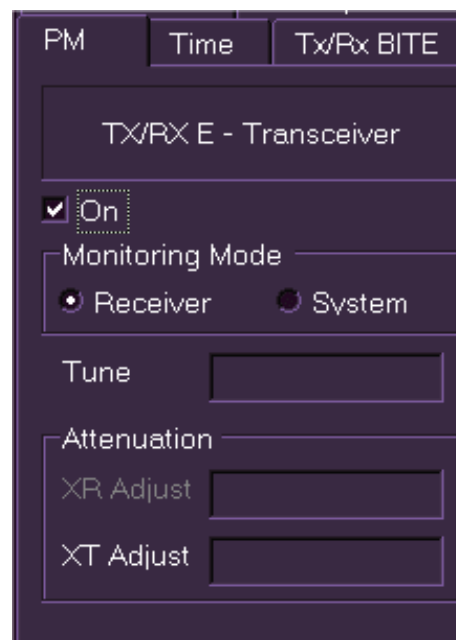
To turn on the PM tick the check box next to On.

Note: *If sector blanking is active the system displays a warning prompt informing the operator that sector blanking is inhibited while the PM is switched on.*

When the PM is accessed in Service mode the Monitoring Mode (Receiver or System) and Attenuation (XR or XT) tune levels can be adjusted. The default for the tune values is the lowest value of the performance monitor tune range.

The monitoring mode selected will determine the attenuation adjustment available. Receiver mode enables XT to be adjusted; System mode enables XR to be adjusted.

Note: *When the PM is operational and the monitoring mode tuning level is being adjusted, four arcs are shown on the video circle. These arcs are approximately 0.3NM apart and start at a range of 8NM. The arcs extend from 290° to 320° (S Band), or from 155° to 185° (X Band), with respect to the heading line. The precise bearing value will alter depending on the Heading/Stern line offset value.*

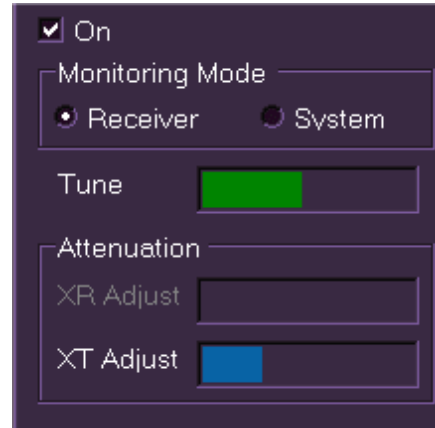


**CAUTION!**

The adjustment of the attenuation (XR or XT) tune levels should only be done when a major component such as the magnetron or receiver is changed.

To adjust the Performance Monitor, do the following:

1. Select Receiver monitoring mode by clicking the Receiver radio button, the XT Adjust in the Attenuation area becomes active.
2. Left click in the XT Adjust bar to activate the control, the bar will appear blue.
3. Move the trackball to the left to set the XT Adjust to minimum.
4. Left click in the **Tune** bar to activate the control. The current tuning level is shown as a green bar.
5. Move the trackball to the left to set the tune bar to minimum, while adjustment is in progress the tuning bar colour changes to blue.
6. Slowly move the trackball to the right to display maximum presentation of the four PM arcs that should be visible in the following video sectors: 290° to 320° for S -band and 155° to 185° for X-band.
7. Left click in the XT Adjust bar again and slowly move the trackball to the right to increase the XT bar until the outermost arc is just visible in the noise background.
8. Repeat steps 4 to 6, moving the trackball to left and right to achieve maximum visibility of the four arcs.
9. If necessary repeat step 7 so that the outermost arc is just visible in the noise background.
10. Select System monitoring mode and repeat the steps listed above but adjusting the XR attenuation rather than the XT.



If any value is adjusted the new value is stored and restored both upon power up and when interswitching as Master to a transceiver. A different set of tune values are maintained for each transceiver.

2.8.1.2 Adjusting the PM in Operator Mode

A non-logged on user can operate the PM and adjust the monitor mode (Receiver or System) tune levels to determine if there has been a drop in performance.

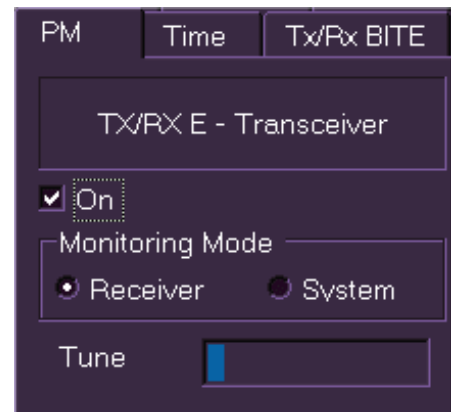
The ability to adjust the attenuation (XR or XT) tune levels is not available in operator (non-logged on) mode.

Note: *In Operator mode the PM switches off automatically after 10 seconds.*

To adjust the PM in Operator mode, do the following:

1. With the Monitoring Mode check box On select Receiver by clicking the **Receiver** radio button. The current tuning level is shown as a green bar.
2. Left click in the **Tune** bar to activate the control and move the trackball to the left to set the tune bar to minimum. While adjustment is in progress the tuning bar colour changes to blue.
3. Slowly move the trackball to the right to display maximum presentation of the four PM arcs that should be visible in the following video sectors: 290° to 320° for S -band and 155° to 185° for X-band. The number of arcs displayed shows the current performance.
4. Select System monitoring mode and repeat steps 1 to 3.

Note: *The arcs are spaced at 5dB intervals. If during operation performance decreases below the second arc, it shows a 10dB drop in performance.*



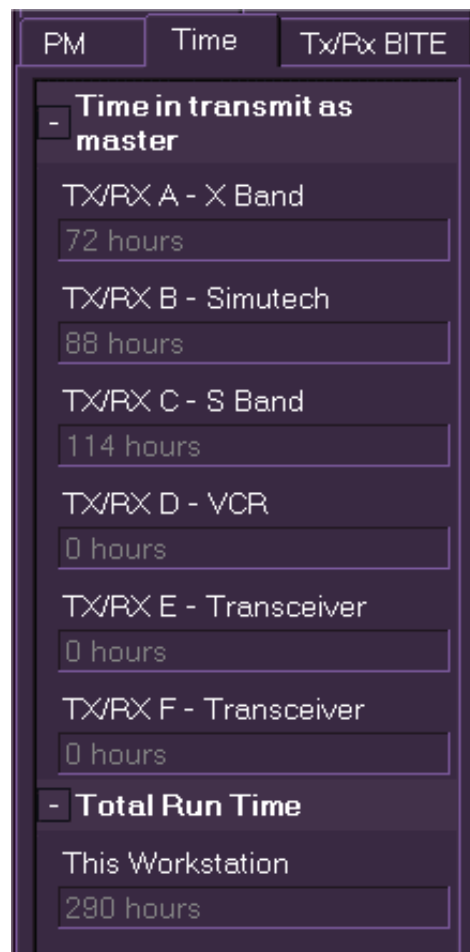
2.9 Time

The Time folder displays transmission and total persisted runtime data.

The information listed in the Time window is divided between **Time in Transmit** and **Total Run Time**.

Time in Transmit displays the total transmission time on all the available transceivers as listed in 'Interswitch Control' in the Radar menu.

Total Run Time displays the total operational time on the selected Workstation.



3 Commissioning

The Commissioning menu includes the following security, configuration and service settings:

- Login
- Video
- Tx/Rx
- Authorization
- Security
- Service.

The Login, Video, Tx/Rx and Authorization functions are available to a non-logged in user, although the data shown in the Video, Tx/Rx and Authorization folders is read only. Changes to data in these folders can only be made when a user is logged on in Service mode.

When the user is logged on in Service mode the Commissioning menu shows the additional functions Security and Service.

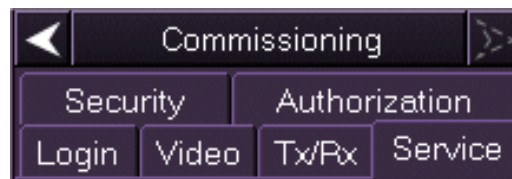


Figure 5.2 Commissioning Menu

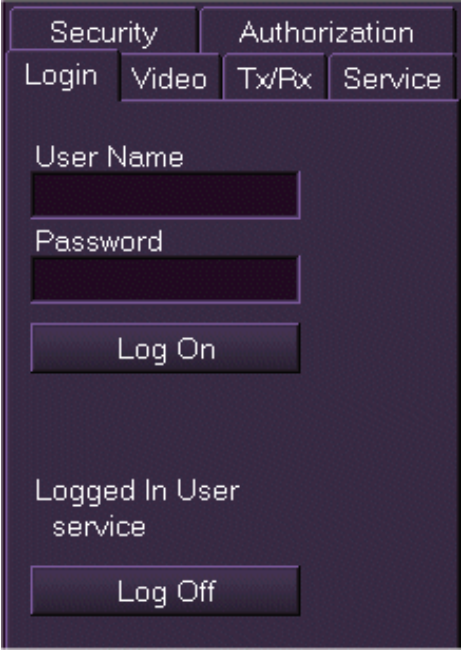
3.1 Login

This function enables a suitably qualified user to access locked system processes by entering a user name and password.

When the Login function is accessed the window confirms the current login functionality. If no user has logged on the authenticated user is shown as `None`. When a user has successfully logged on the window confirms the login status, e.g. **Logged In User service**.

The system defines the following set of user roles:

- Developer
- Field Engineer
- Seaman



Each role includes access to system processes that may not be available to the user role lower in the list. The role of `Seaman` usually refers to a user of the system with no Login rights.

To log onto the system do the following:

1. Left click in the **User Name** field, the alphanumeric keypad appears.
2. Enter a user name using the keypad, e.g. **service**.
3. Move the cursor to the **Password** field and enter a password which should be supplied by your administrator.
4. With the username and password entered click on the **Log On** button. The system authenticates the data entered against a database of known users. Where the Login data is authenticated the system displays additional system processes, including Security and Service.

3.2 Video

The Video folder shows the video enablement settings and read-only data transmitted from the Transceiver. The information is divided into the following two areas:

1. Current Status
2. Commissioning

The Commissioning area comprises four tick boxes which control the Scan Filter and Video Build Up enablement in the Current Status area.

Note: *The Commissioning settings can only be made by a user logged on as a service engineer. If the user has not logged on, or has no Login rights, these settings are disabled.*

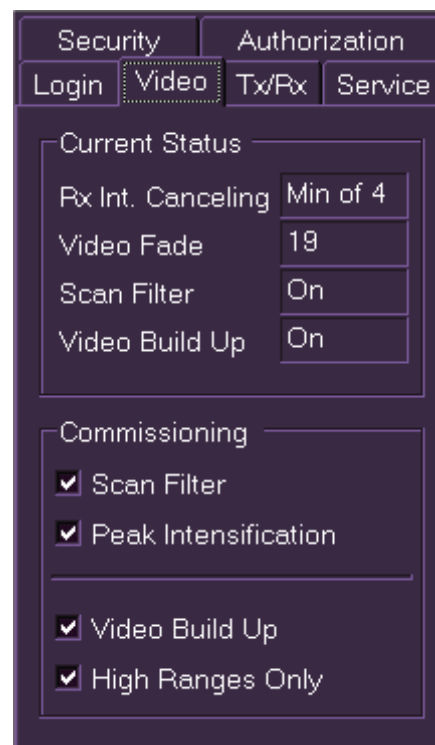
The Current Status area displays the following:

- **Receiver Int. Canceling** - the receiver interference-canceling value is selected automatically and is read only.
- **Video Fade** - shows the decrement readout being applied to fade the video. The readout updates in real time.
- **Scan Filter** - Scan Filter can be turned On or Off by ticking the **Scan Filter** check box in the Commissioning area. If Scan Filter is **On** then **Peak Intensification** can be enabled by ticking its check box. If Scan Filter is **Off** then this setting is not available.

The system default is for Scan Filter to be enabled with peak intensification selected. Scan Filter is available on range scales of 0.75NM or greater. If the range scale is less than 0.75NM then **Scan Filter** is automatically turned Off.

- **Video Build Up** - Video build up can be turned On or Off by ticking the **Video Build Up** check box in the Commissioning area. If Video Build Up is **On** then **High Ranges Only** can be enabled by ticking its check box. If **Video Build Up** is **Off** then this setting is not available.

The system default is for video build up to be enabled only on range scales of 3 NM or greater. If the range scale is less than 3 NM then video build up is automatically turned Off.



3.3 Tx/Rx Settings

A group of settings are stored in each display for all the Transceivers with which the display can operate.

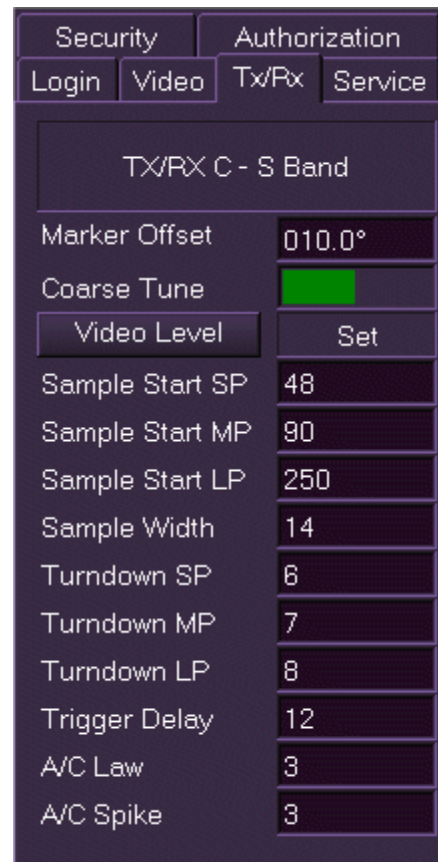
3.3.1 Selecting the Required Transceiver

If a six way Interswitch is fitted, settings can be entered for up to six transceivers, which are identified by letter ranging from A to F. If a two way Interswitch is fitted then only Transceivers A and B may be selected.

To select the required Transceiver:

1. Left click on the Tx/Rx field above the Transmit/Standby button. The Interswitch Control window appears with a list of Transceiver types available.
2. To select the required transceiver left click in the Transceiver selection button.

Note: *The settings for each Transceiver must be the same on all displays in the system.*



3.3.2 Setting the Tx/Rx Parameters

The following transceiver parameters require the display to be in Transmit mode for visual feedback of the video. If the display is part of an interswitched system it must be connected to the appropriate transceiver if the parameters are to be reset. All the data is stored in real time when altered and restored at power on.

The procedure for adjusting all of the parameters in the Tx/Rx menu, except the Video Level and Coarse Tune settings, is as follows.

1. Position the screen cursor over the setting to be changed and left click. the text changes to green (editable).
2. Move the trackball left or right to change the setting to that required and left click to exit edit mode.

Alternatively, a right click will reveal a drop down numeric keypad from which a setting can be entered.

Information on the individual parameters of the Tx/Rx settings is given below.

3.3.2.1 Marker Offset

The marker offset is the value of the heading marker, offset in degrees, and is the angular amount required to align the heading marker with the compass of the ship. This adjustment is present to allow compensation for the combined errors in physical positioning of the scanner unit and the 'squint angle' of the antenna.

The marker offset values are: minimum = 0°, maximum = 359.9°, system default = 10°.

3.3.2.2 Coarse Tune

The coarse tune level allows the centre tune frequency to be set up for the transceiver, the system default is set to the center value of the AFC tune range. A different level can be stored for each transceiver and restored both at power on and when the transceiver is selected.

The current level of coarse tuning is indicated by the green shaded bar adjacent to the **Coarse Tune** caption. This bar indicates the tune level with the minimum to the left, and maximum to the right.

It will only be possible to set the coarse tuning if the Display is a master to the transceiver and the user is logged on as a service engineer.

Before coarse tune adjustment can be made, do the following:

1. Select Transmit mode and select LP (long pulse) for the transmission pulse length.
2. Select a range scale of 12 NM or above.
3. Set the radar tuning indicator at the bottom left corner of the screen to **Man** (Manual) tuning (i.e. AFC off).

To adjust the coarse tuning:

1. Left click on the coarse tune bar to make the bar active. The bar colour changes from green to blue.
2. Move the trackball left to reduce the coarse tuning bar to minimum, then slowly move the trackball to the right to increase the tuning bar percentage.
3. Adjust the coarse tuning bar so that the fine tuning bar at the bottom left of screen is at maximum after its first minimum point has been reached.
4. Left click to set the level and de-activate the coarse tuning bar. The bar will return to its green shaded state.
5. If radar returns are available, select AFC, and confirm that the radar returns are not seriously degraded. If they are, repeat the adjustment and ensure that the first tuning maximum is selected.

3.3.2.3 Video Level

The signal level of the video received from the transceiver is monitored at regular intervals when the display is in transmit.

If the level falls below a low video level threshold a video alarm is raised. The video alarm is automatically cleared if the monitored video level is greater than the low video level threshold, or the transceiver is in standby.

The Video Level indicates whether the radar video input level to the display processor has been set up.

Note: *It is essential that the Coarse Tune level is set before setting the Video I/P level.*

The Video Level should ONLY be set when the Master is transmitting in LP (long pulse). The default is **Unset**, but after the set up procedure has been initiated, it will show **Set**, **Low** or **High** as appropriate.

When video is set too low, or there is no video input **Low** is displayed, where video input is present **Set** or **High** are displayed. If the set-up procedure is unable to set the video level **Unset** is displayed.

1. Click on the **Video Level** button to initiate the set up procedure. The button changes to **Setting** and the procedure begins.
2. When the procedure is complete the button changes back to **Video Level**. The result of the set up procedure is shown after a period in the field adjacent to the button.

3.3.2.4 Sample Start

Displays the sample pulse start for all pulse lengths (SP, MP and LP) in units of metres. Minimum for all pulse lengths = 6, maximum for all pulse lengths = 350. The system default values are: 45 (SP), 90 (MP) and 250 (LP).

The following table summarises which values should be input, according to the height of the antenna above sea level.

Table 2: Sample Start

Antenna Height (metres)	Short Pulse (SP)	Sample Start Medium Pulse (MP)	Long Pulse (SP)
0-10	48	90	250
11-20	75	150	250
21-30	100	150	250
31-40	130	180	250
41-50	160	200	260
51-60	180	200	280

3.3.2.5 Sample Width

Displays the sample pulse width in units of metres (minimum = 6, maximum = 70, system default = 14).

3.3.2.6 Turndown

Displays the video turndown for all pulse lengths (SP, MP and LP) in dimensionless units.

Minimum video turndown for all pulse lengths = 0, maximum video turndown for all pulse lengths = 15. The system default values are: 6 (SP), 7 (MP) and 8 (LP).

It should not normally be necessary to change these settings from their default values.

3.3.2.7 Trigger Delay

Displays the trigger delay in units of metres. (minimum = 6, maximum = 350, system default = 12).

Note: *Default is adjusted by RF feeder length in initialisation if Bulkhead Transceiver is fitted.*

For this setting, the radar must be set to the shortest practicable range, and the value adjusted to display known features at the correct range. Echoes from quaysides should appear straight with no 'pushing' or 'pulling' near the centre of the picture.

3.3.2.8 A/C Law

Displays the Anti-Clutter (A/C) law in dimensionless units. (minimum = 0, maximum = 7, system default = 3).

Refer to the table below for the required setting for the A/C Law.

Table 3: A/C Law Settings

Antenna Height above sea level (m)	A/C LAW Setting
32 and above	7
28 - 31	6
24 - 27	5
20 - 23	4
16 - 19	3
12 - 15	2
4 - 11	1
3 and below	0

Selecting and Setting other Transceivers in Interswitched Systems

Diagnostics & Commissioning

3.3.2.9 A/C Spike

Displays the A/C spike in dimensionless units. (minimum = 0, maximum = 3, system default = 3).

It should not normally be necessary to change this setting from its default value.

3.3.3 Selecting and Setting other Transceivers in Interswitched Systems

1. Use the procedure given in Section 3.3.1 to select the next transceiver.
2. Use the procedures given in Section 3.3.2 to set the TX parameters for the selected transceiver.

Repeat steps 1 and 2 above until all system transceivers have been set up.

3.3.4 Transceiver Alarms

A transceiver communications alarm is raised if a valid message has not been received from the transceiver for more than 3 seconds. The alarm is raised regardless of the display's standby/transmit status.

A trigger error alarm is raised when the transceiver is in transmit and there are fewer valid triggers than expected.

An azimuth error alarm is raised when the transceiver is in transmit and either:

- the number of azimuth pulses between heading markers is greater or less than a margin of error of 5 pulses centered on a nominal value of 4096 pulses; or
- the number of pulses per revolution is within the margin of error, but a small error persists for a period of time (e.g. 4095 pulses per rev are received continually).

The azimuth error alarm are cleared when:

- Neither of the alarm conditions is satisfied; or
- The transceiver is switched to standby.

When the transceiver is in transmit a heading marker error alarm is raised if a heading marker has not been received for more than 10 seconds. If a heading marker has not been received for more than 30 seconds the Master Display automatically switches the connected transceiver to standby.

The heading marker error alarm is cleared when:

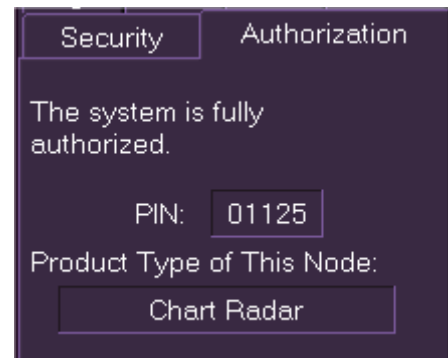
- A heading marker is received; or
- The transceiver is switched to standby.

3.4 Authorization

The Authorization folder displays authorization data on the system. The data includes a PIN which is required to authorize the system and the current product type.

To view authorization data:

1. Left click on the Authorization field. If the system is fully authorized the folder displays a five digit PIN, which is encrypted when the system is initially commissioned, and the product type (e.g. Radar or Chart Radar) for the particular node.



3.4.1 Unauthorized System

If the system is not authorized the folder states that the system is in a degraded state of functionality and prompts to enter a temporary authorization password.

A temporary password can be supplied by your VisionMaster supplier on request. The password will contain: System PIN, product type and expiration date (typically 30 days from the time it is requested).

To authorize the system:

1. Enter the supplied authorization password in the Password field and click on the **Submit** button. The system verifies the password and, if correct the system is temporarily authorized.

Note: *When a temporary password is being used a daily warning is displayed indicating the password will expire.*

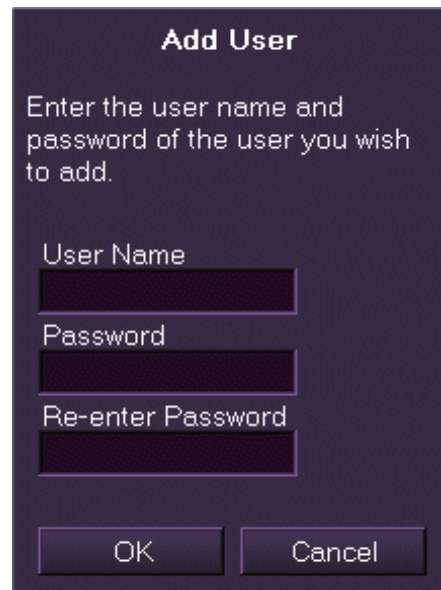
3.5 Security

The Security management folder enables a logged on user to create a group of members. The members of a group will be in roles lower than the currently logged on user. For example, a field engineer may assign ship administrators and seamen to a group, whereas a ship administrator can only assign seamen to their group.

When group members have been assigned, the group administrator (logged on user) may add or remove members and change member's password details.

To create and edit a security group:

1. Click on the Security tab and select the current user role from the **Group** drop down list.
2. To add group members click on the **Add..** button. The Add User window appears prompting to enter a user name and a password of the user you wish to add to the group.
3. Enter the name and password, re-enter the password and click the **OK** button. The user's name appears in the Members list and a **User Added** prompt is temporarily displayed.
4. To remove a member from the group highlight the user to be removed from the Members list and click on the **Remove..** button. The screen prompts for confirmation of the action.
5. To confirm click the **Yes** button. The user is removed from the group and the Security window re-appears with the member's name removed from the list.
6. To change the password of a group member highlight the name in the list and click on the **Change Password..** button. The screen prompts to enter the old and new password for the member.
7. Enter the user's old password, then enter the new password, re-enter and confirm by clicking the **OK** button.
8. The new password details are logged in the system and the Security window re-appears.



3.6 Service

When logged on as a service engineer the Service folder displays the following tree menu item:

- Communications
 - Port Monitor

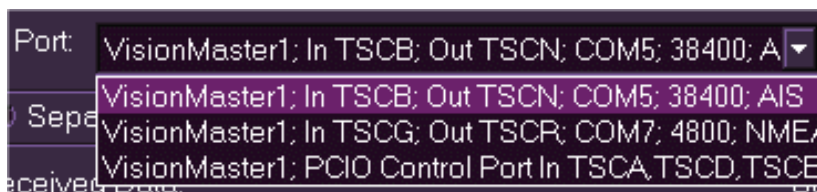


Note: The Service folder displays more service options when the operator is logged on as a Developer.

The folder enables the service engineer to view data received from a selected port and data sent to the port via the display.

3.6.1 Display Port Monitor Data

1. To view Port Monitor data click on the Communications + button, highlight Port Monitor in the tree menu and click on the **Display Selected** button at the bottom of the tab folder. A Port Monitor communications window is displayed over the radar video display which can be moved and scaled to suit.



2. The Port Monitor window lists the ports previously configured for the system (see Section 5.2 'I/O Port Manager' in Chapter 4 'Configuration'). To select another port to monitor other than the displayed port click on the Port drop down arrow and select from the list of currently configured ports.
3. The Port Monitor window view options default to separate Received and Sent data fields and data viewed as ASCII (see Figure 5.3). To change these default options click in the **Combined** button to view all data in the same field and click in the **Binary** button to view data as binary code.
4. With all required settings made click on the **Start** button. The Port Monitor window displays real time received and sent data for the selected port and the Start button changes to Stop, see Figure 5.3 below.

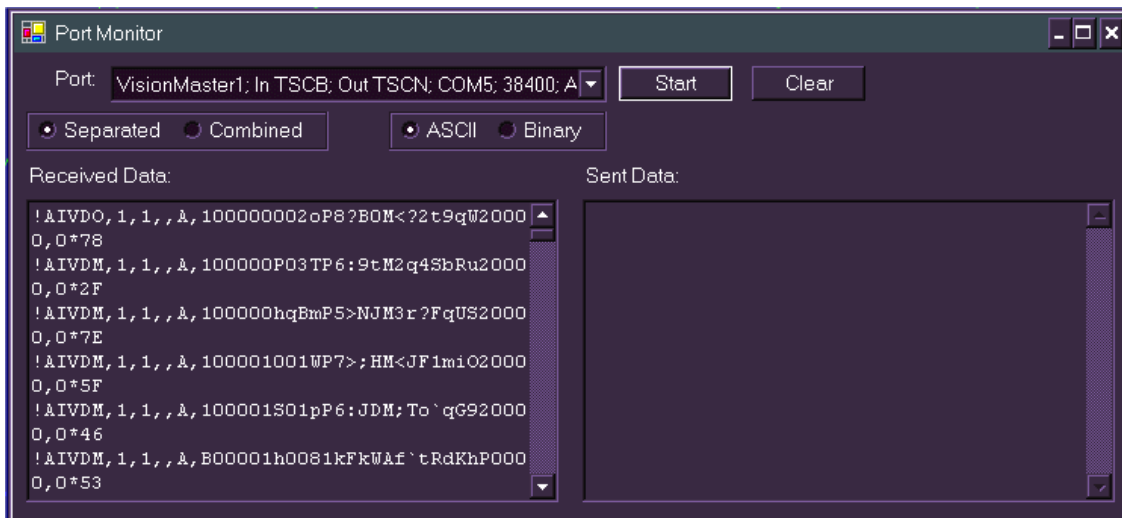


Figure 5.3 Port Monitor Comms Window

5. To halt the monitor process click on the **Stop** button. The port stops transmitting data. To clear the data from the Port Monitor window click on the **Clear** button.

CHAPTER 6

CHART INSTALLATION

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APPENDICES

Appendix A Registering C-MAP eToken

Appendix B 7Cs ChartHandler User's Guide

1 Introduction

Charts can be loaded onto a local Workstation by accessing the Chart Installer utility from the VisionMaster FT Charts menu. Charts can be loaded from a DVD or a USB key. If the chart type supports network installation, charts can be installed from any node of the system.

In order to run the Sperry Marine Chart Installer program you must first connect the Sperry Marine Chart Radar USB key into one of the available USB sockets at the rear of the PC.

Note: *If CMAP charts are to be installed an additional USB key, supplied by CMAP, must also be connected to an available USB socket at the rear of the PC.*



CAUTION!

.CMAP charts can only be installed after the eToken registration program has been run in Service Mode, see 'Appendix A Registering C-MAP eToken'. EToken registration should be run only once, after the CMAP USB key has first been installed.

1.1 Accessing the Chart Installer Program

1. To access the chart installer utility in VisionMaster FT switch to Standby mode, navigate to the Chart Tools menu and click on the **Chart Installation** button, see *Figure 6.1 below*.

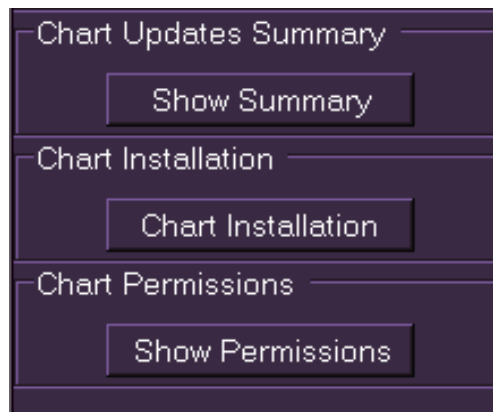


Figure 6.1 Chart Installation screen



CAUTION!

.Switching to the Chart Installer utility requires shutting down all navigation functions

2. When Chart Installation is accessed the screen prompts to confirm the switch to chart installation mode. To confirm click the **Yes** button on the confirmation window.
3. The VisionMaster system powers down and the welcome screen of the Chart Installer wizard appears, see Figure 6.2 below.

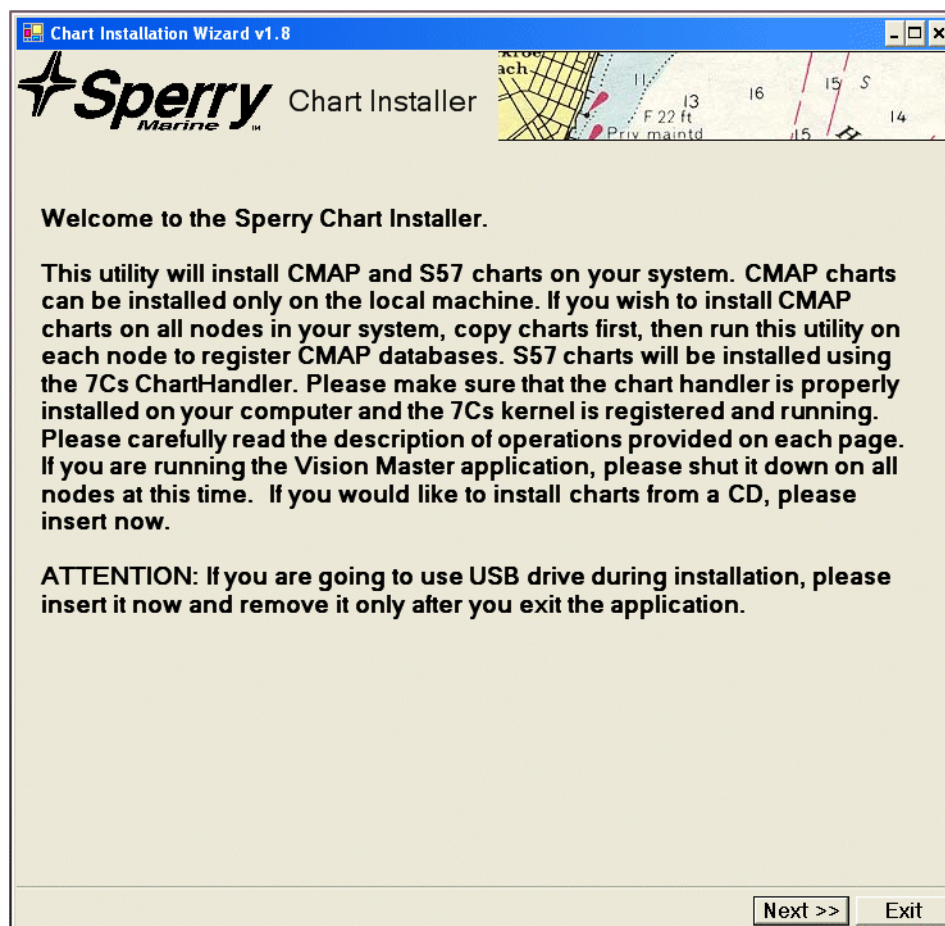


Figure 6.2 Chart Installer Welcome screen

2 Chart Installer

The Chart Installer utility installs CMAP and SevenCs (S-57 and S-63) charts onto the system.

Initially CMAP charts can only be installed on a local workstation. To install CMAP charts on all nodes of the system, copy the charts onto a local workstation then run the chart installer utility on each node to register CMAP databases.

S57 and S-63 charts are installed using the SevenCs chart handler, which is a separate program accessed via the Chart Installer utility. The 7Cs Chart Handler program is run from the Chart Installer screen after S-57 or S-63 chart formats have been selected, see Figure 6.11, page 16.

In the case of CMAP, the system automatically provides registration of the databases and a record of updates is kept in the CMAP database. Respectively, SevenCs engine keeps a record of updates in a log file. The log file or database record contains, for each update applied to or rejected, the following information:

- Date and time of application/rejection.
- Complete and unique identification number of update.
- Any anomalies encountered during application.
- Type of application: manual or automatic.

2.1 Running the Chart Installer

1. With the Chart Installer Welcome page displayed click on the **Next>>** button.
2. The following screen prompts to select from the chart formats:
 - CMAP/CM63*
 - CMAP/Professional+
 - CMAP/ENC
 - S-57 (unencrypted)†
 - S-63

Note: The chart formats available on this screen are dependant on the particular chart engine configured in the System Configuration tool, see Section 6.10 'Optional Features' in Chapter 4 'Configuration'. If the CMAP has been configured then the S-57 and S-63 are unavailable; if SevenCs has been configured then the CMAP formats are unavailable.

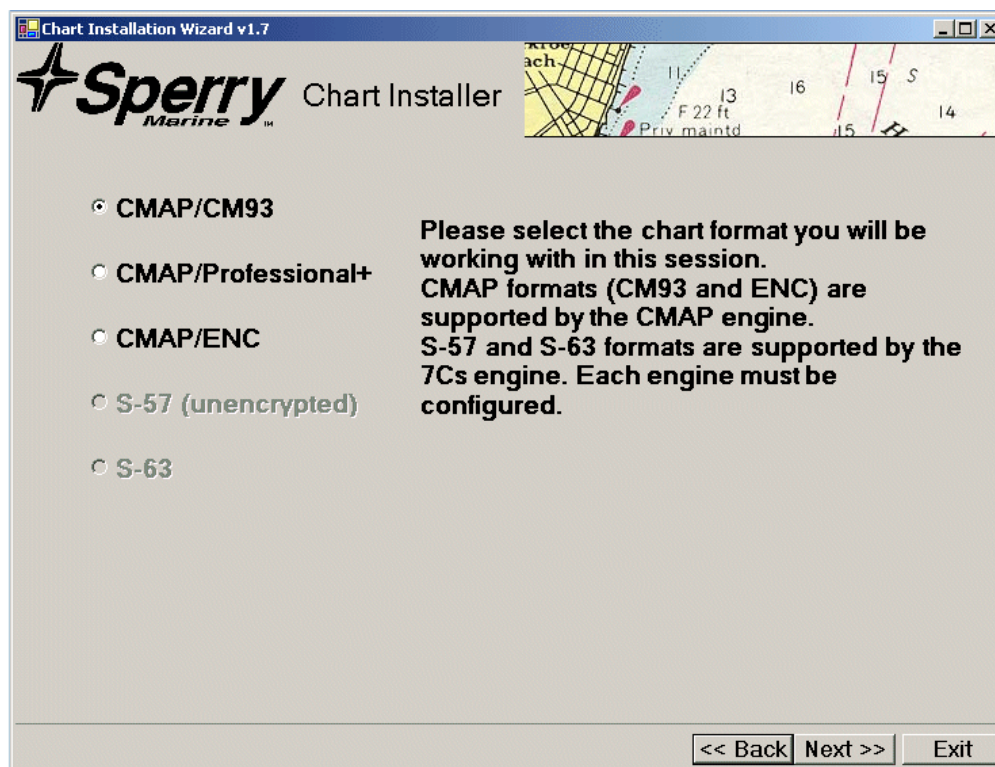


Figure 6.3 Select Chart Format

*. CM63 and ENC chart formats are supported by the CMAP chart engine, which is part of the Sperry Chart Installer.

†. S-57 and S-63 formats are supported by the SevenCs chart engine, which is a separate chart handler utility.

3. Select the radio button of the chart format you wish to install and click on the **Next>>** button.

The subsequent screens shown are dependant on the selection made here, for CMAP chart installation see Section 2.1.1 '*Installing CMAP charts*' below, for SevenCs chart installation, see Section 2.1.2 '*Installing SevenCs charts*', page 16.

2.1.1 Installing CMAP charts

Where CMAP/CM93, CMAP/Professional+ or CMAP/ENC chart formats are selected from the Select Chart Format screen the next screen prompts to select the action you require to take.

If you are installing a new database the following actions must be performed in the order listed:

- Copy Database on Hard Drive - when installing a new database you must copy the database from the source directory (e.g. DVD) to your hard drive, or copy the database to hard drives on other nodes.
- Register/Unregister Databases - register the database on the local workstation or register the database on all nodes (where the database has already been copied).
- View/Apply Licenses - view or apply for a chart license on the local workstation, or on all nodes.
- Create Order for Updates - enables you to open the installer on each other node in the system by navigating to the page, register the database and apply license.
- Apply Updates - applies updates to an installed CMAP database

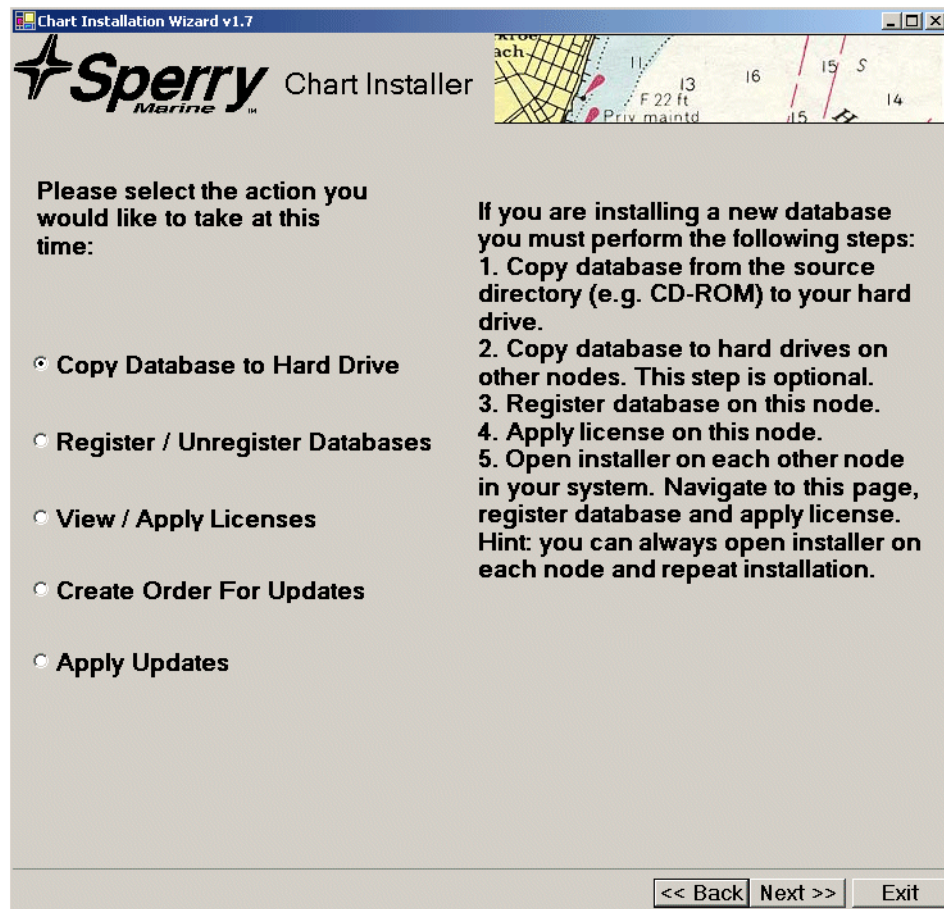


Figure 6.4 Select Action

2.1.1.1 Copy Database on Hard Drive

Where **Copy Database on Hard Drive** is selected from the Select Action screen the following screen is displayed.

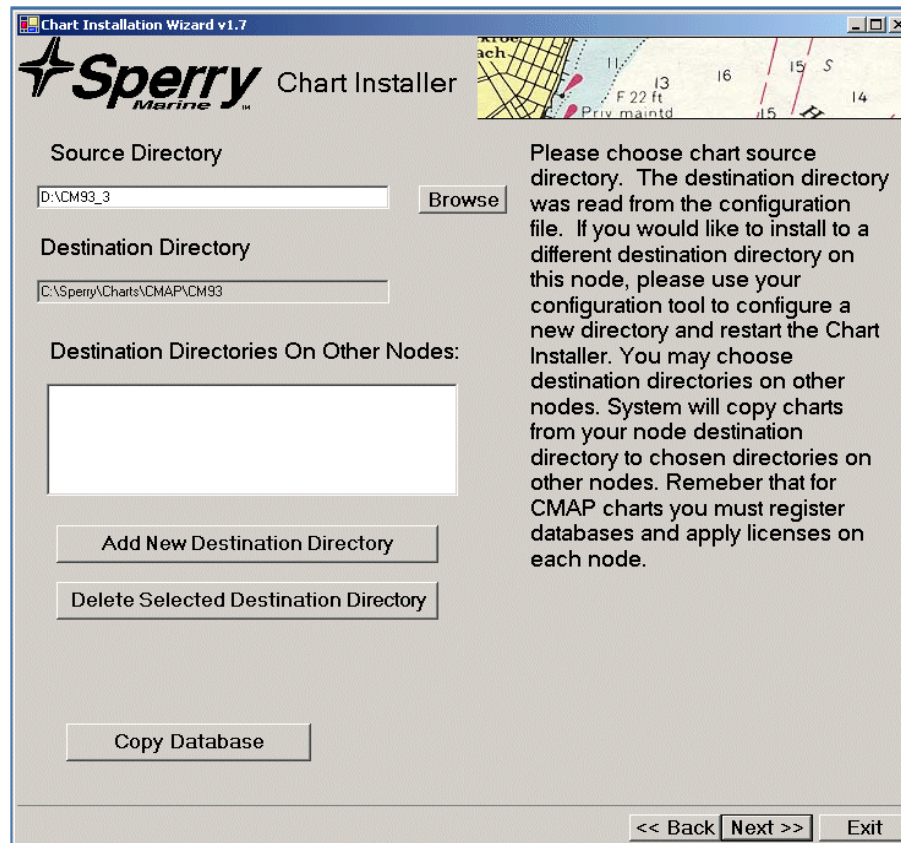


Figure 6.5 CMAP Source and Destination Directories

1. Navigate to the source directory of the charts (i.e. where the charts to be copied reside) by clicking on the **Browse** button.
2. The Destination Directory is a read-only field which is set in System Configuration. To change the destination directory navigate to the Charting sub-menu in the Configuration tool, for details see Section 6.10.2.2 'Chart Engines' in Chapter 4 'Configuration'.

Note: *If you require a different destination directory you must exit the Chart Installer and change the directory in the Configuration tool, see Section 6.10.2 'Charting' in Chapter 4 'Configuration'.*

3. To select additional destination directories on other nodes of the system click on the **Add New Destination Directory** button, the **Browse for Folder** navigation window appears from where you can navigate to the required directory. The system will copy the charts from your local destination directory to the selected node directories.

Note: Where other node destination directories have been selected chart databases must be registered and licences applied on each node.

4. To delete a previously selected destination node directory highlight the line in the field and click on the **Delete Selected Destination Directory**.
5. To copy the chart file database from the source directory click on the **Copy Database** button. A **Copying..** window appears and the chart database is copied to the destination directory.

2.1.1.2 Register/Unregister Databases

All CMAP databases must be registered prior to use. The Register database screen appears when Register/Unregister databases is selected from the Select Action screen.

The screen lists any currently registered databases on the destination directory. If no databases have been registered the message **No Databases Installed** appears in the **Registered Databases** field.

1. To register a chart database click on the **Browse** button, navigate to the location where the database has been previously copied and click the **OK** button.

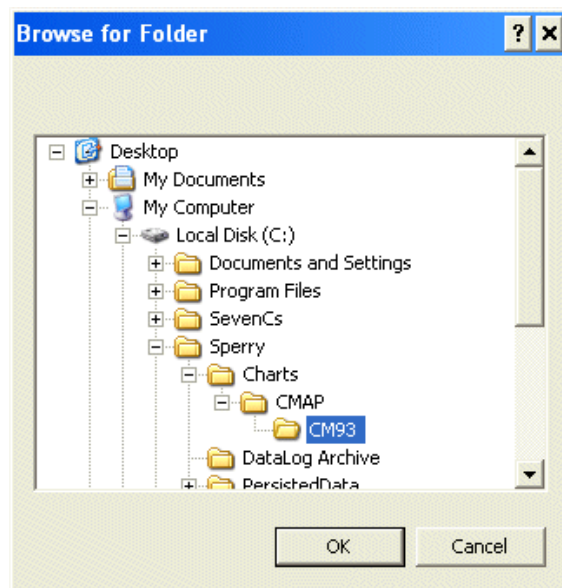


Figure 6.6 Browse for Folder

2. When the required database is shown in the Enter Location for new database field, click on the **Register DB** button. The database is registered and appears in the Registered Databases list.

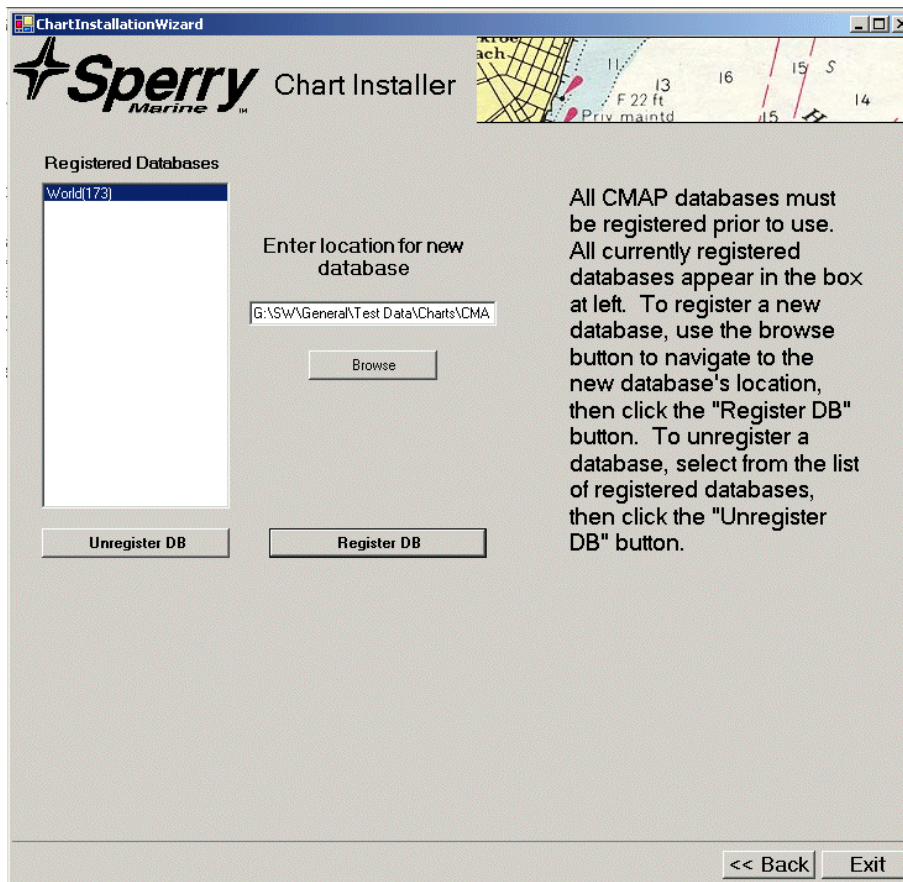


Figure 6.7 Register/Unregister Databases

3. To unregister a database highlight the database in the list and click on the **Unregister DB** button. The database is removed from the list of Registered Databases.

2.1.1.3 View/Apply Licenses

When View/Apply Licenses is selected from the Select Action screen the following screen enables you to view previously applied licenses, apply a new chart license to another directory.

1. To apply a new license, click the **Browse** button and navigate to the license file. The file will be on the CMAP charts DVD or USB key and will have the name 'password.usr'.

Note: Before you enter the license the CMAP database must be registered in the system. Each license file relates to a specific eToken reference number. This number is located on the CMAP USB key.

2. With the file appearing in the field click on the **Apply License** button. The selected license is applied to the local node only and the file appears in the Applied Licenses window.

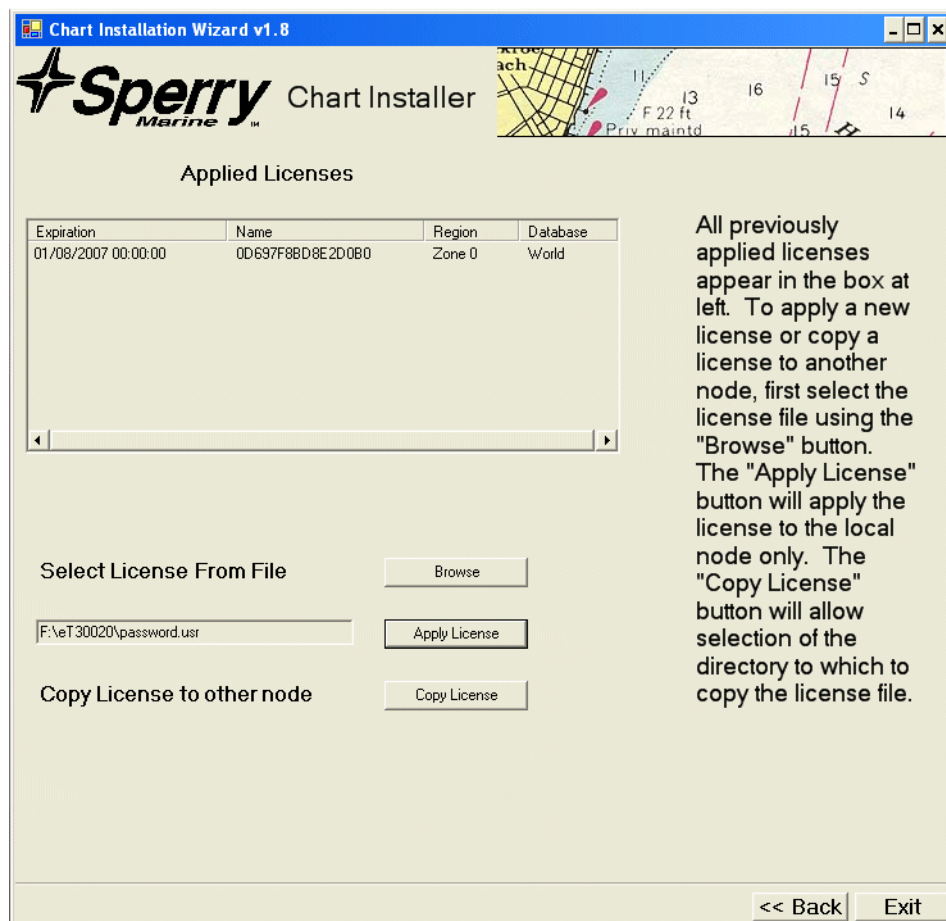


Figure 6.8 Applied License

3. To copy a license to another node, highlight the license in the Applied Licenses field and click on the **Copy License** button. A Browse window opens from where you can navigate to the required directory. The system will copy the license from your local directory to the selected node.

Note: A copied license may only be applied from the node it was copied from.

2.1.1.4 Create Order for Updates

When Create Order for Updates is selected from the Select Action screen the following screen enables you to select a directory where you can save an order file. Order files and updates must be mailed CMAP.

1. Select the directory to save the order file by clicking on the **Browse** button and navigating to the directory.
2. With the required directory shown in the directory field, click on the **Create Order** button. Confirmation of the order file creation is shown on the screen with a reminder to email the file to: updates@c-map.no.

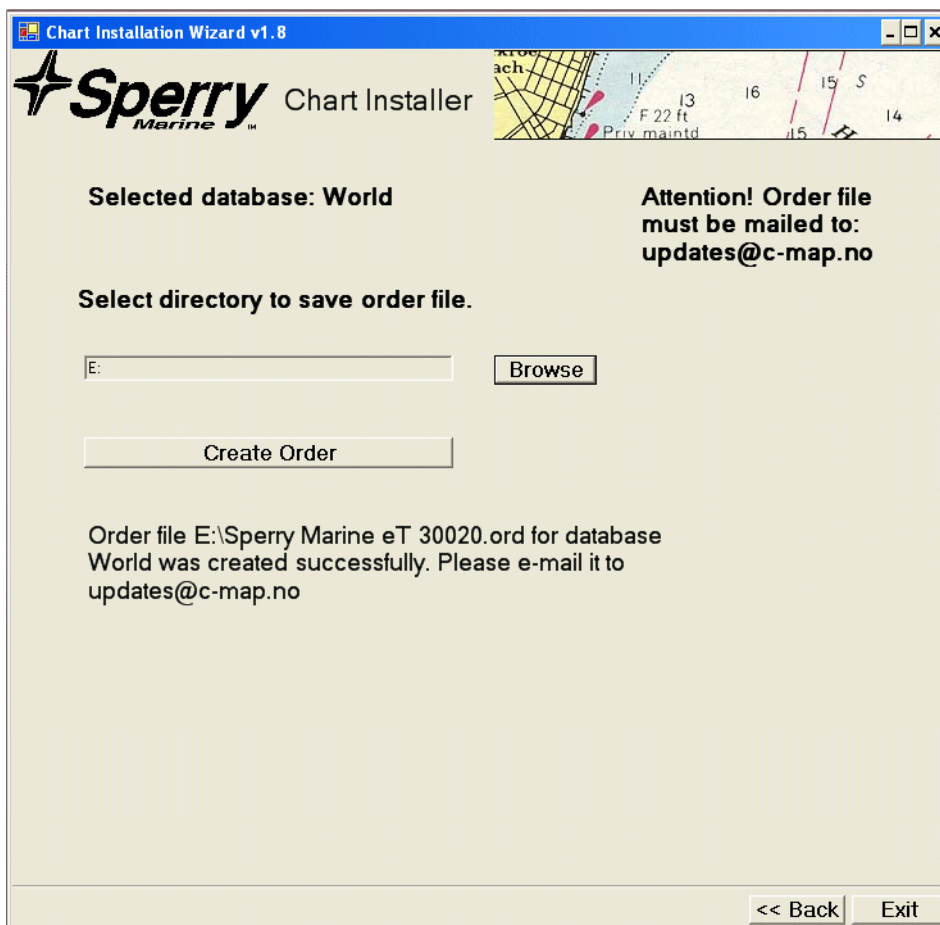


Figure 6.9 Create Order for Updates

2.1.1.5 Apply Updates

When Apply Updates is selected from the Select Action screen the following screen enables you to apply updates to an installed and registered CMAP database.

1. Select the directory with the *.ans file by clicking on the **Browse** button and navigating to the directory.

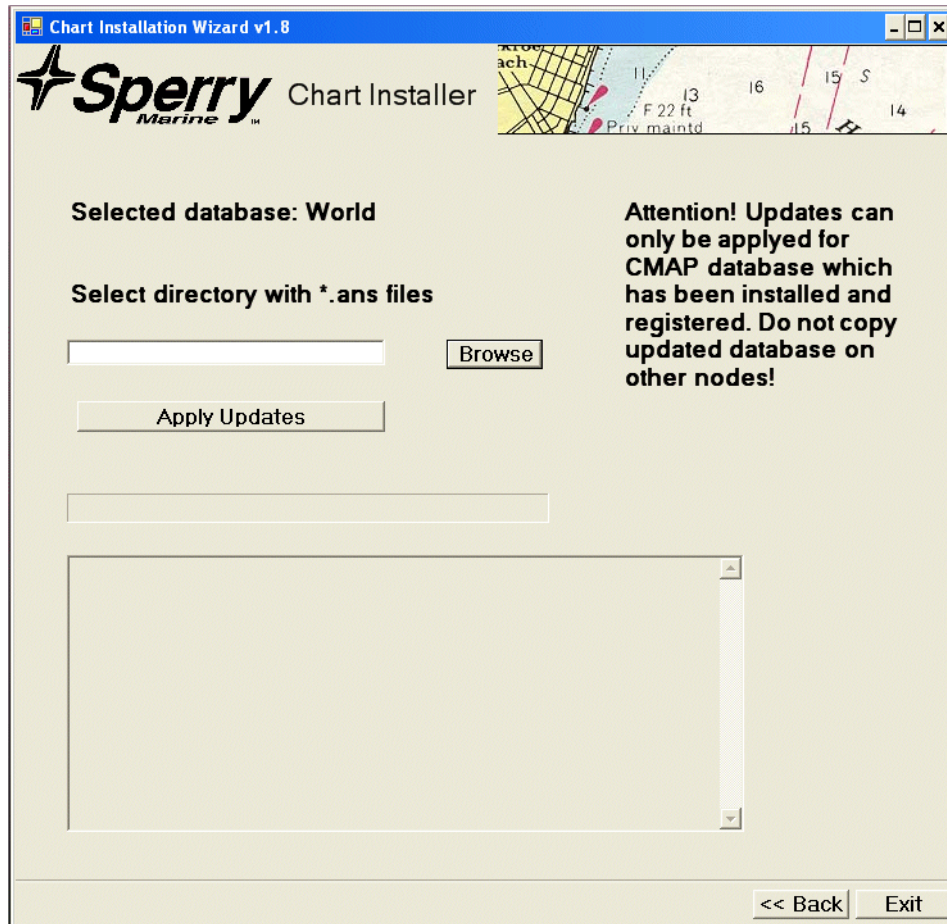


Figure 6.10 Apply Updates

2. With the *.ans file displayed in the Browse field, click on the **Apply Updates** button. A progress bar appears and information in the lower window displays the number of updates and whether a particular update has been applied.

2.1.2 Installing SevenCs charts

Installing SevenCs charts requires running an additional chart handler utility accessed from the Sperry Chart Installer.

2.1.2.1 Installing S-57 Charts

Where S-57 (unencrypted) format is selected from Select Chart Format the following screen appears.

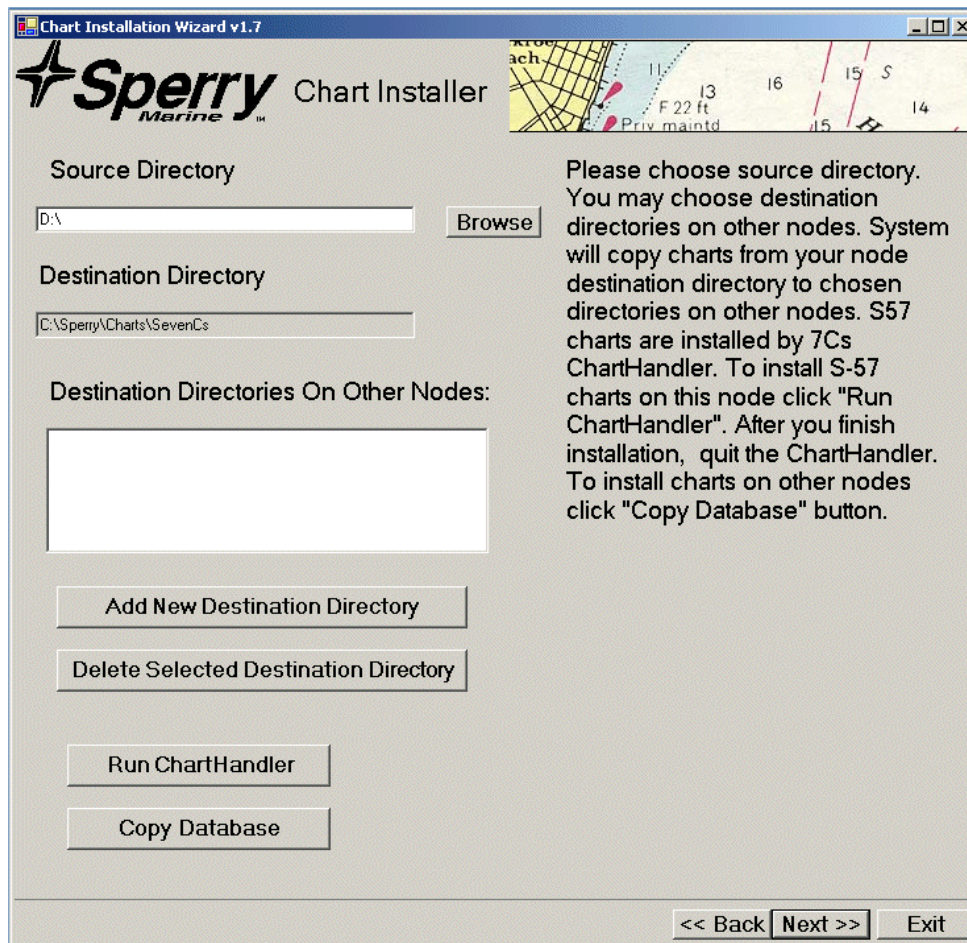


Figure 6.11 Installing S-57 Charts

The screen shows the same Source Directory, Destination Directory and Destination Directories on other Nodes navigation options as displayed when installing CMAP charts.

1. If the chart source directory is a DVD or USB key insert the external device in the correct drive and navigate to the directory by clicking on the **Browse** button.

Important Note: *In order to correctly install S-57 charts you must first delete the backslash from the source directory, i.e. If the source directory is D:\ click in the directory field and change the directory name to D:*

2. If required, add a destination directory on other nodes as described previously for CMAP charts, see See “Copy Database on Hard Drive” on page 10.
3. To install charts from the source directory onto other nodes click on the **Copy Database** button. A **Copying..** window appears and the chart database is copied to the Destination on other Nodes directories.

Running the SevenCs Chart Handler

1. To install the S-57 charts click on the **Run ChartHandler** button, the SevenCs chart handler appears as an additional utility, see Figure 6.12.

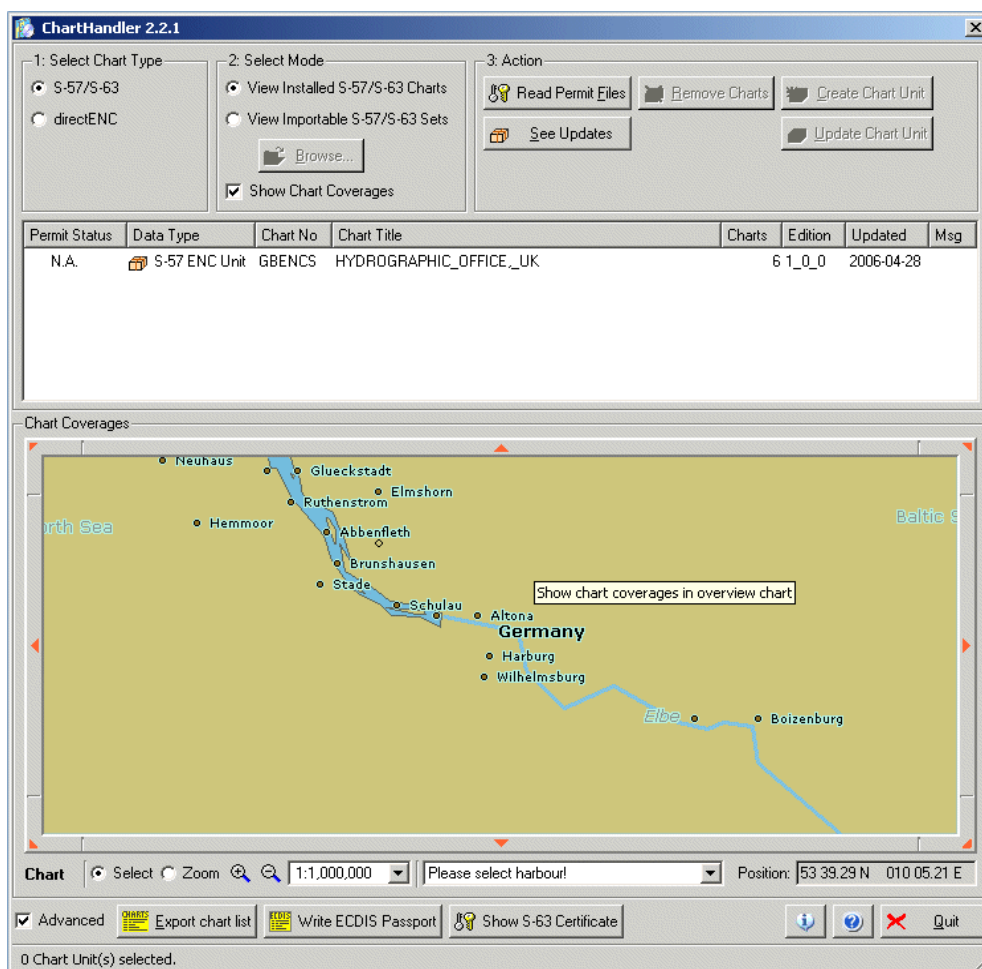


Figure 6.12 SevenCs Chart Handler

2. Select the chart type, mode and action from the navigation area at the top of the screen, the coverage of the selected chart is shown in the overview window below.

3. For instructions on operating the SevenCs Chart Handler click the Help icon at the bottom right of the screen. The Chart Handler User's Guide appears as an Acrobat pdf file. See *Appendix B, 7Cs Chart Handler User Guide* for details.
4. When you have installed the S-57 charts quit the ChartHandler by clicking the **Quit** button. The Chart Installer screen re-appears, see Figure 6.11.

2.1.2.2 Installing S-63 Charts

Where S-63 format is selected from Select Chart Format the following screen appears.

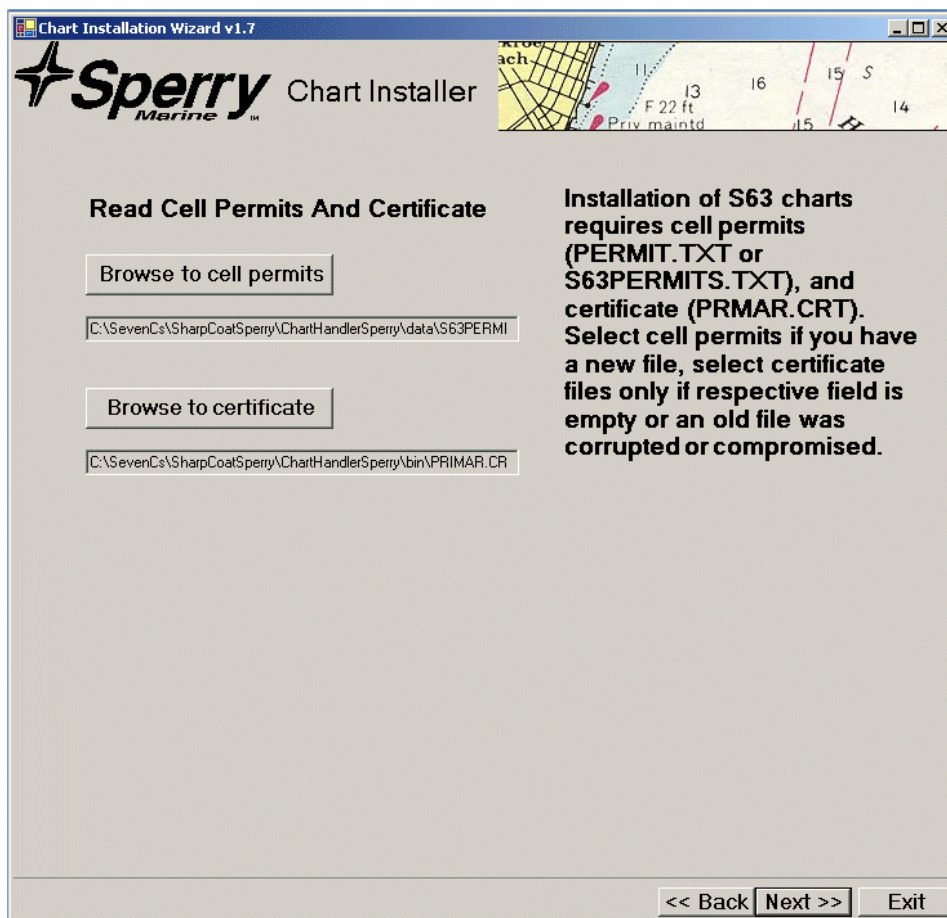


Figure 6.13 Installing S-63 Charts

The installation of S63 charts requires cell permits (**permit.txt** or **s63permits.txt**) and certificate (**prmar.crt**). The cell permit and certificate files reside in the chart handler directory on the VisionMaster C: drive, both fields should be populated with the correct file path.

Note: *You should only enter a cell permit file if the field is blank, or if you have received a new file (permit.txt) from your chart supplier.*

2.1.2.3 Updating the Cell Permit File

Select **Browse to cell permits** only if you have a new **permit.txt** file, or the field is blank.

Note: *If you receive your cell permit file on a 3 ½ “ floppy disk you must first transfer the file to a USB key before following the cell update procedure below.*

To update a S63 cell permit file do the following:

1. Navigate to the USB key where the file resides and click OK.
2. Click on the **Next >>** button, and from the subsequent screen click on **Run ChartHandler**. The SevenCs Chart Handler appears as an additional utility.
3. Check that the cell permit file is listed in the SevenCs ChartHandler dialogue window and that the file permit status is valid, if the permit file has an expiry date this will be shown in the Permit Status column. For a list and description of the different types of permit status and the permit status icons, see section 2.1 'Chart Information Displayed' in *Appendix B, SevenCs ChartHandler User's Guide*.
4. With the cell permit file correctly loaded click on **Quit** in Chart Handler. The Sperry Chart Installer re-appears.
5. Click on **Exit** in the Sperry Chart Installer.



CAUTION!

.Do NOT remove the USB key until you have exited the Chart Installer.

Select **Browse to certificate** only if you have a new **primar.crt** file, the respective field is empty or a previous certificate file was corrupted or compromised.

To install S-63 charts do the following:

1. Where the cell permit and certificate files are valid click on the **Next >>** button. The subsequent procedure for installing S-63 charts is now the same for S-57 charts, see “Installing S-57 Charts” on page 16.

2.2 Exiting the Chart Installer Program

When CMAP or SevenCs charts have been successfully installed and the **Next >>** button clicked the following screen appears.

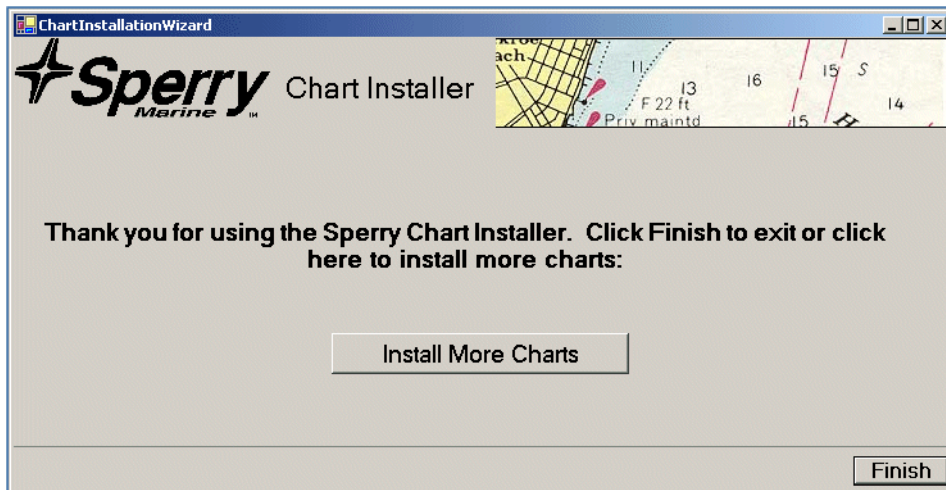


Figure 6.14 Install more Charts or Finish

1. To install more charts click on the **Install More Charts** button, the Chart Installer Welcome page re-appears.
2. Or to exit the utility click the **Finish** button, the Chart Installer program terminates.

APPENDIX A

REGISTERING C-MAP ETOKEN

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A.1 Registering the C-MAP eToken

The C-MAP eToken is registered from the Service desktop. To access the service desktop a suitably qualified user logs on as a service engineer via the VisionMaster Login window, see Section 3.1 'Login' in Chapter 5 'Diagnostics and Commissioning'. After a successful login the user status is shown on the login screen, e.g. 'Logged In User service'.

A.1.1 Accessing the Service Desktop

1. In VisionMaster, navigate to the System menu and select **Shutdown**. When logged on the Service Mode button in the Shutdown menu is enabled, see Figure A.1 below.

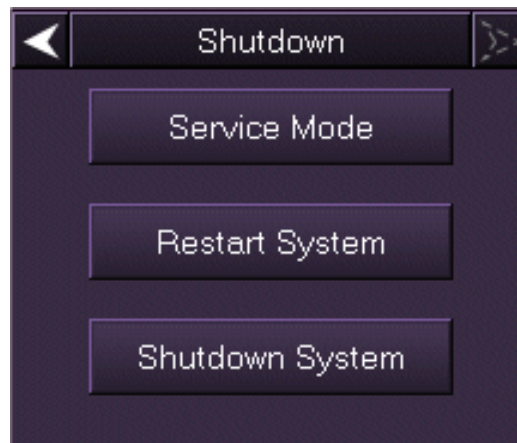


Figure A.1 Shutdown menu with Service Mode button enabled

2. Left click on the **Service Mode** button. The screen prompts to confirm that you want to switch to service mode. Click the **Yes** button to confirm, or click the **No** button to cancel and return to VisionMaster.
3. When switch to service mode is confirmed the VisionMaster system and any other open applications power down and the windows desktop displays two icons; Service Mode and Operator Mode.
4. Click on the Service Mode icon, the following typical service mode desktop appears, see Figure A.2.

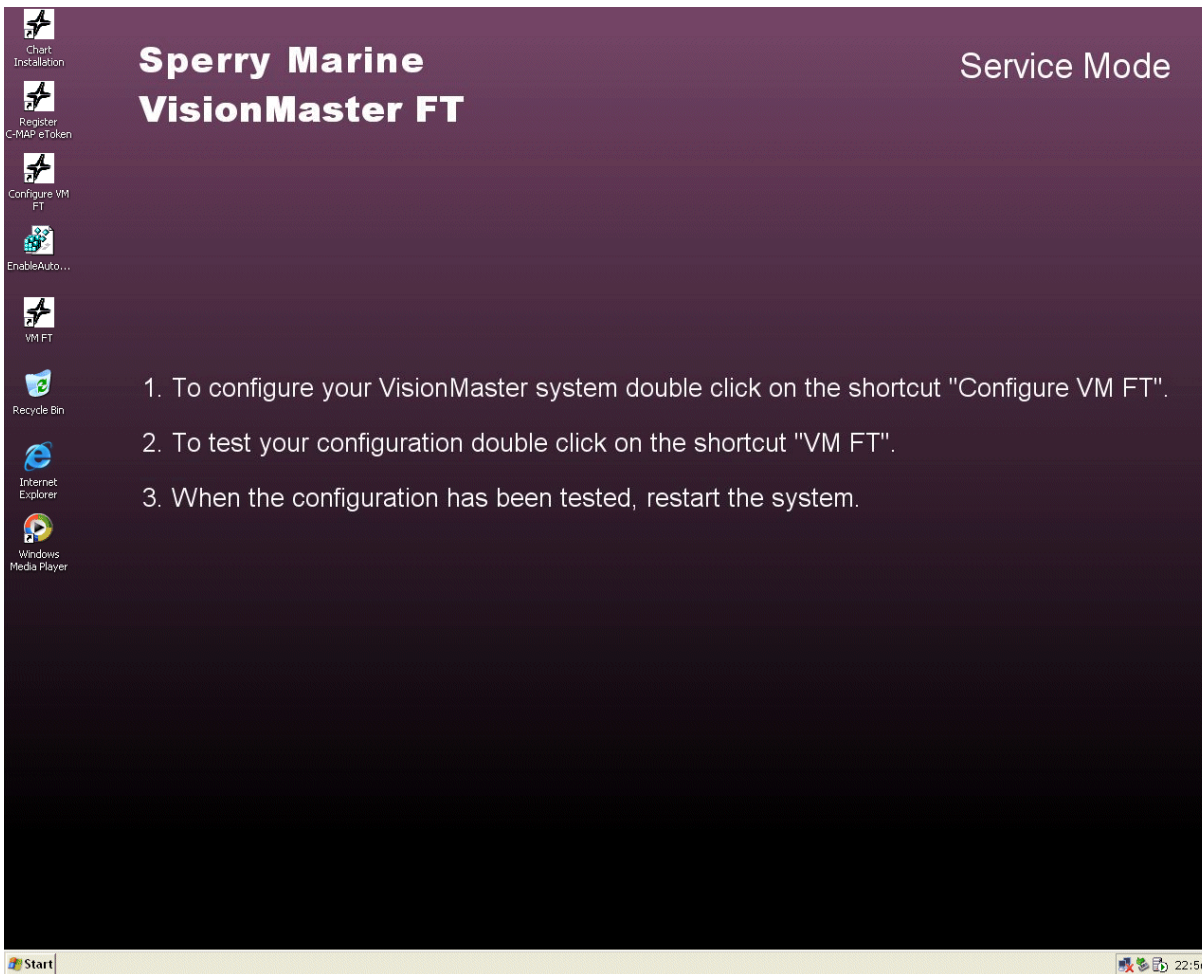


Figure A.2 Service Mode Desktop

A.1.2 Running E-Token Registration

To run the eToken registration click on the **Register C-MAP eToken** icon on the Service desktop. A MS-DOS window opens and the registration process begins.

The registration process takes approximately 10 to 15 seconds. When the process is complete the MS-DOS window automatically closes. No further action is required by the operator.

APPENDIX B

7Cs CHARTHANDLER USER'S GUIDE



ChartHandler
Version 2.2

User's Guide

2005

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Preface

ChartHandler considerably simplifies loading, viewing and deleting electronic charts. This applies to charts in the SevenCs directENC format as well as to charts in S-57 / S-63 and in TX-97 (Transas) format.

This guide gives a brief description of the various functions of *ChartHandler*.

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1 Introduction

1.1 Conventions Used in this Document

Times New Roman font is used for:

- plain text in this document

Italic font is used for:

- program and component names

Boldface is used for:

- chapter and section headlines
- important notes

`Courier New` font is used for:

- any text typed by the user
- file content and names

Note:

Displays important information which should not be ignored.

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2 Select Chart Type

ChartHandler facilitates loading, viewing and deleting charts. This applies to charts in the SevenCs directENC format as well as to charts in S-57 / S-63 and in TX-97 (Transas) format.



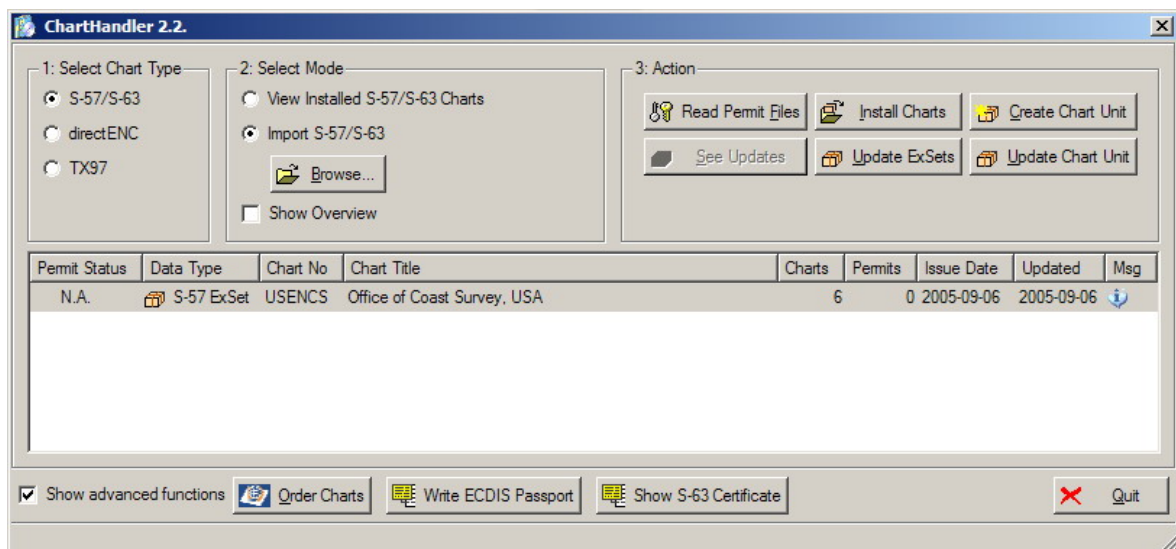
Splash Screen ChartHandler

After calling *ChartHandler* the dialogue window opens. Top left under *Select Chart Type* the format of the charts to be displayed can be selected. This can be

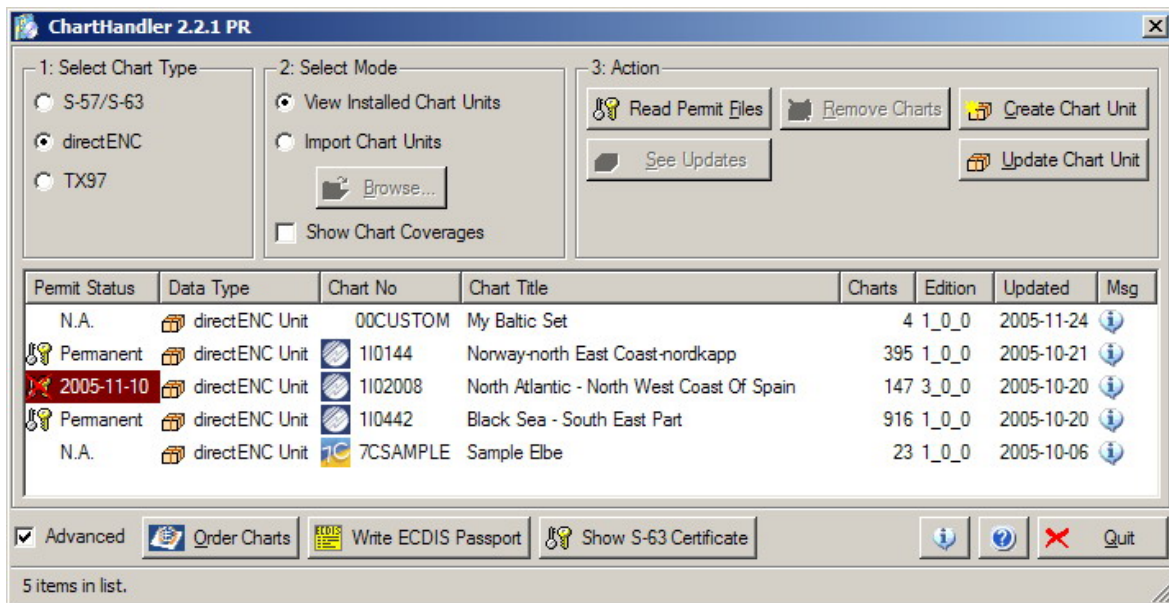
S-57/S-63, directENC or TX-97 (Transas).

Note:

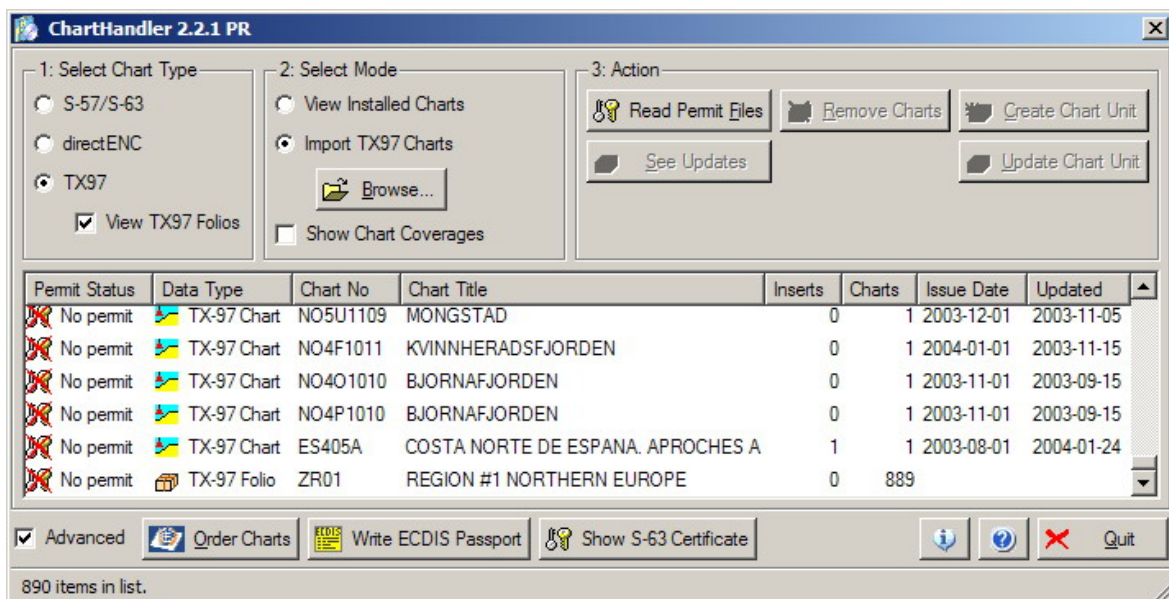
Depending on the *Chart Type* ticked there are three different variations of the dialogue window (see figures below).



Dialogue window ChartHandler for Chart Type S-57/S-63



Dialogue window ChartHandler for Chart Type directENC



Dialogue window ChartHandler for Chart Type TX-97 (Transas)







To close the *ChartHandler* dialogue click on *Quit* in the bottom right corner.

2.1 Chart Information Displayed

2.1.1 Common for all Chart Types

Permit Status

Displays whether charts can be installed (Import), or whether installed charts have a valid subscription status and can be used. The *Permit Status* may be

- N.A. (not applicable)
- Permanent  Permanent
- Temporarily Valid (expiry date shown)  2005-11-10
- Some Charts Temporarily Valid (expiry date shown)  2006-04-11
- Expire Soon (expiry date shown)  2005-11-10
- Expired (expiry date shown)  2005-11-10
- No Permit  No permit

Data Type

Shows the technical data type. Possible data types are

- directENC
- TX-97 Chart : Single TX-97 Chart
- TX-97 Folio: Folio of TX-97 Charts
- S-57 ExSet: Unencrypted S-57 Charts organised in an Exchange Set structure (S-57 Update: consisting exclusively of Update Cells)
- S-63 ExSet: S-57 Charts, encrypted by S-63 Protection Scheme and organised in an Exchange Set structure (S-63 Update: consisting exclusively of Update Cells)
- **S63x** ExSet: S-57 Charts, encrypted by S-63 Protection Scheme and organised in an Exchange Set archive defined by **S63x** industry standard (**S63x** Update: consisting exclusively of Update Cells)

Chart No

The unique number the chart producer has assigned to the chart unit. This number may be preceded by an icon symbolizing the respective chart producer.

Chart Title

Chart description.

Charts:

The number of charts contained in the Chart Unit/ TX-97 Folio/ S-57/S-63/S63x Exchange Set.

Edition

Chart Edition <Major>_<Minor>_<SubMinor>

Issue Date

(“Import” Mode): Date of issue of chart product.

Updated

(“View Installed” Mode): Date of the last update of the chart product.

2.1.2 Display While Showing S-57/S-63 Exchange Sets**Data Server**

Shows the icon and the two-letter token of the data server who compiled the chart data.

Permits

The number of charts contained in the S-57/S-63/S63x Exchange Set with valid permits installed on the system.

Charts

The number of update cells contained in the S-57/S-63/S63x Exchange Set.

2.1.3 Display While Showing TX-97 Exchange Sets**Inserts**

The number of subcharts and plans contained in the TX-97 folio.

3 Select Mode

Installed Chart Units is always ticked by default. This lists all chart units of the respective chart format currently installed.

Import S-57/S-63 or *Import Chart Units* (direct ENC) or *Import TX-97 Charts* (the name varies according to the chart format) starts the import of charts. Clicking on the *Browse* button below allows for searching various data sources.

Ticking *Show Overview* offers various possibilities to select and view charts. For more information see chapter **6 Overview Mode**.

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4 Action

4.1 Read Permit Files

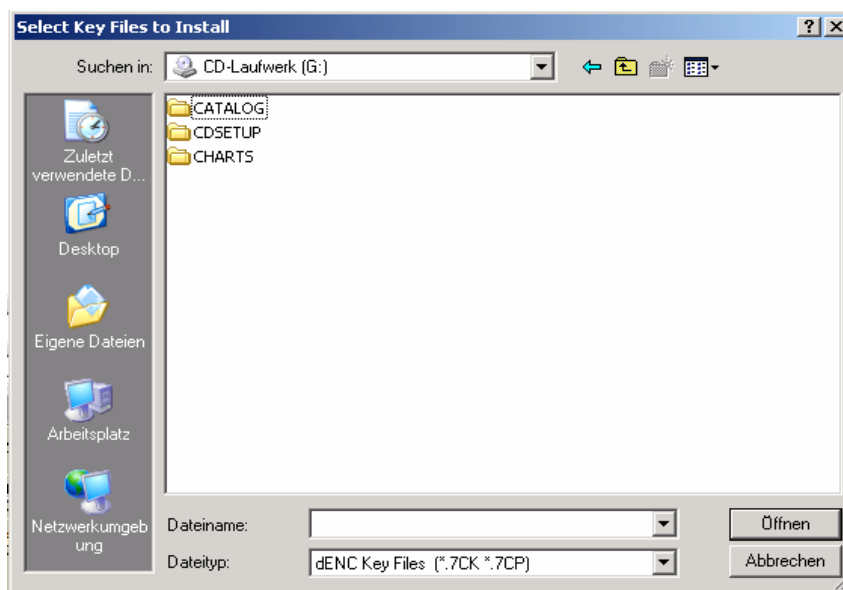
When ordering charts you receive one permit per ordered chart. Provided these permits are stored on the same CD or floppy with the chart units you can start installing the charts immediately (see chapter **4.2 Install Charts**).

ChartHandler supports the following Key / Permit formats:

- dENC: 7CK, 7CP,
- S-57/S-63/S63x: PRM (ChartWorld-Format), TXT
- TX-97: *.7PT (ChartWorld-Format), TXT

However, if the chart permits are kept separately they must be loaded first.

Having once been loaded the chart permits will be permanently stored. Thus the respective charts can be read and displayed at any time. Even if you should ever delete one of these charts you will still be able to smoothly reload it.



Dialogue window Select Keys

How to load chart permits:

1. In *ChartHandler*, Click *Read Permit Files*.
The dialogue window *Select Keys* opens.
2. Select the data medium or the directory containing the chart permits.
The chart permits are displayed.
3. Select the chart permit(s) to be loaded.

TIP:

It is recommended always to load all chart permits. This will ensure that all ordered charts can be smoothly loaded.

4. Click *Open*.
The chart permits are loaded.





4.2 Install Charts

Note:

Import S-57/S-63/S63x, *Import Chart Units* or *Import TX-97 Charts* must be selected. Otherwise the button *Install Charts* is not visible.

To enable *Install Charts* at least one entry must be selected.

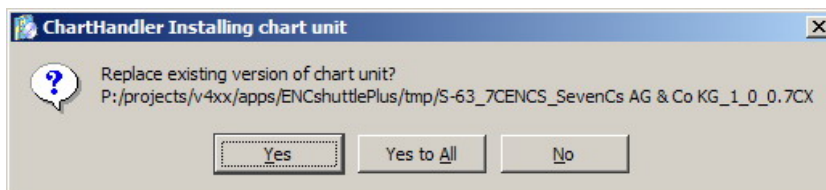
To enable chart installation the *Permit Status* (see chapter **2.1.1 Common for all Chart Types**) must be one of the following:

- N.A. (not applicable)
-  Permanent (permanent)
-  2005-11-10 (temporary)
-  2005-11-10 (expiring within one month)
-  2006-04-11 (valid for several charts)

After they have been loaded the charts can be used without any restriction until they are removed.


directENC Only

In case a chart unit of the same name already exists *ChartHandler* asks whether this unit shall be replaced (see below).



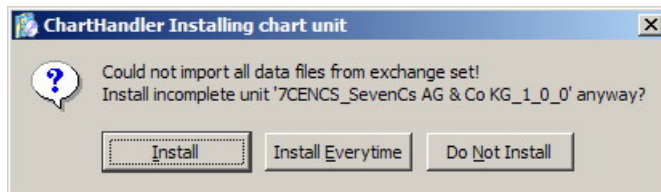
Warning: chart unit already exists

S-63/S63x Only

In case the *Permit Status* is  2006-04-11 (valid for several charts) only those charts with valid permits will be installed (see chapter **4.1 Read Permit Files**).

For example, although the Primar Base CD contains world coverage only those charts the permits of which have been previously installed will be transferred.

Thus it may happen that some data files of an exchange set could not be imported. In that case *ChartHandler* asks whether the incomplete chart unit shall be installed anyway (see below).



Warning: could not import all data

How to install charts:

NOTE:

Before you can load charts the respective chart permits must be loaded (see chapter **4.1 Read Permit Files**). Otherwise the *Install Charts* button will not be available.

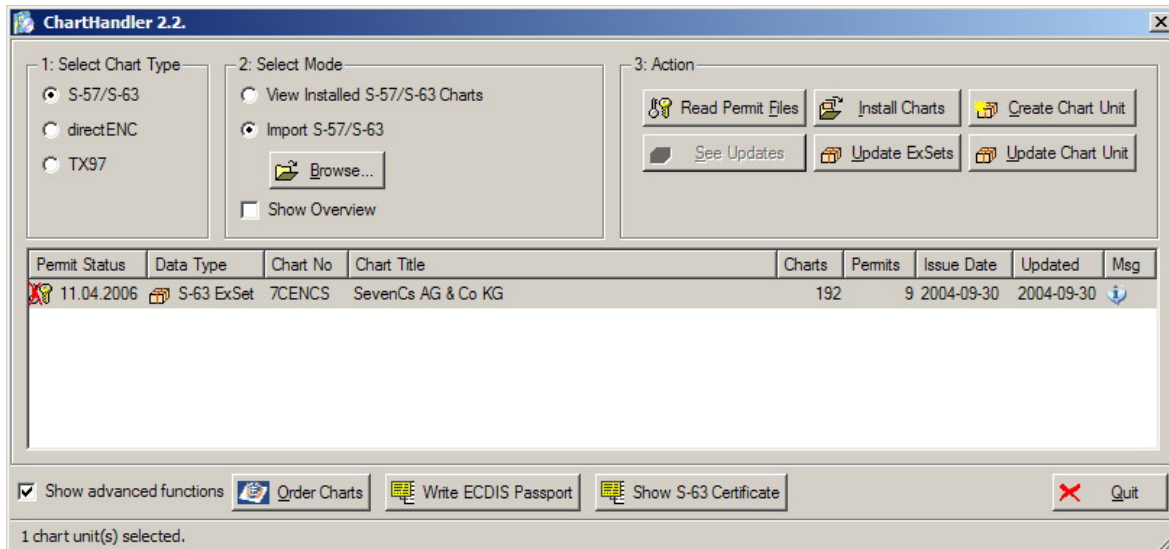
1. In *ChartHandler*, click on *Install Charts*.
The dialogue window *Select Chart Units* opens.
2. Select the charts to be loaded.
3. Click *Open*.
The charts are loaded.

NOTE:

If charts to be loaded include a disclaimer, this text will be displayed first in a separate window. Please read the text and accept it. Then the charts will be loaded.

4.3 Update ExSets

Exchange sets in S-57/S-63 format the exchange sets available can be updated.



Dialogue window Import S-57/S-63

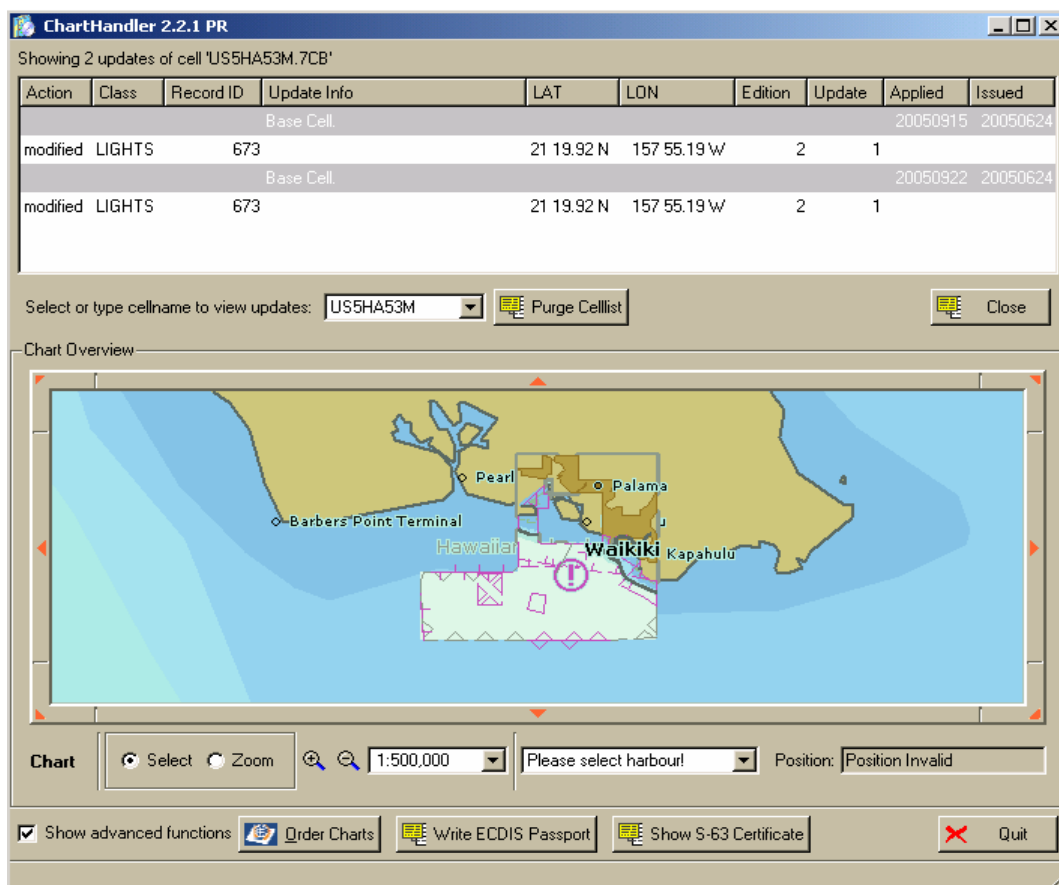
To do this, click on *Update ExSets*.

Note:

This button is only available when mode Import S-57/S-63 is selected.

4.4 See Updates

This one allows to view available updates in a modified version of the overview window (see chapter 6 **Overview Mode**).



Displaying updates

At the top of the window the available updates are listed. Below this list you can select the name of a cell you need updates for from a drop down list. Alternatively, after clicking in the edit pane you can type the first letters of the name of that cell to find it faster.

Purge Cell List deletes all update messages listed for the respective chart unit.

Close on the right hand side closes the update display and returns to the previous view.

4.5 Remove Charts

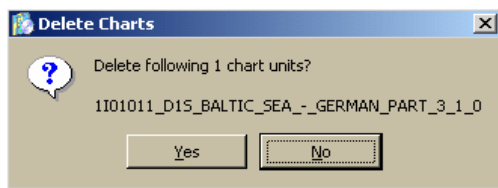
You can remove charts if they are no longer needed.

NOTE:

There is no problem if you have accidentally removed a chart or if you want to access a chart again which has already been removed. You only must reload the respective chart, e.g. from the CD. The original chart permit remains stored even after the chart has been removed.

How to remove charts:

1. In *ChartHandler*, select at least one Chart Unit to be deleted.
The button *Remove Charts* is enabled.
2. Click on *Remove Charts*.
A confirmation window opens (see below).
3. Click on *Yes*.
The selected charts are deleted.

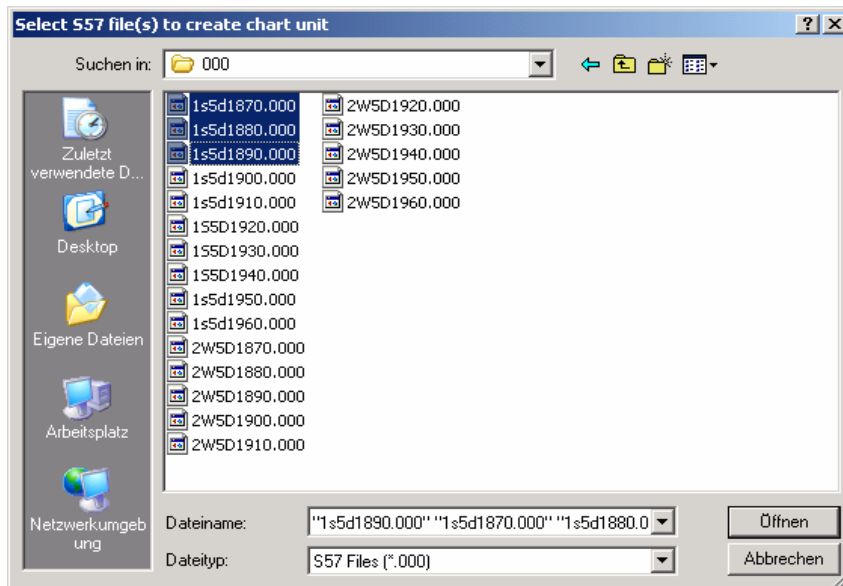


Confirmation window Remove Charts

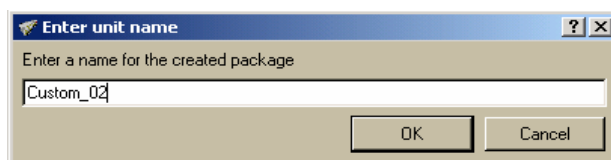
4.6 Create Chart Unit

(Disabled for TX-97 / Transas)

ChartHandler not only administers official chart units but also offers the user to create individual chart units from single cells.



Dialogue window Select File(s)



Dialogue window Enter Unit Name

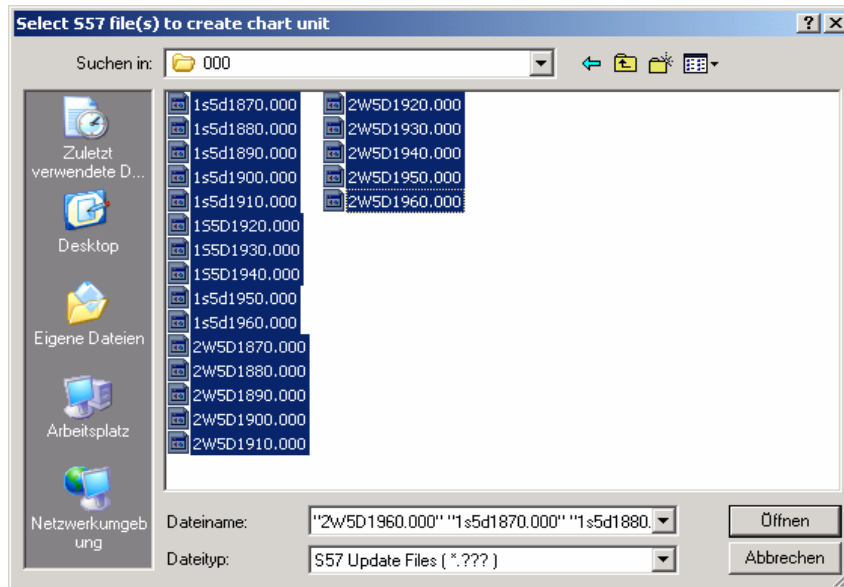
How to create chart units:

1. In *ChartHandler*, click on *Create Chart Unit*.
The window *Select File(s)* opens.
2. Select one or more files to be included in the new chart unit.
3. Click on *Open*.
The window *Enter Unit Name* opens
4. Enter the name of the chart unit.
5. Click on *OK*.
The unit is stored, and its name is added to the list in *ChartHandler*.

4.7 Update Chart Unit

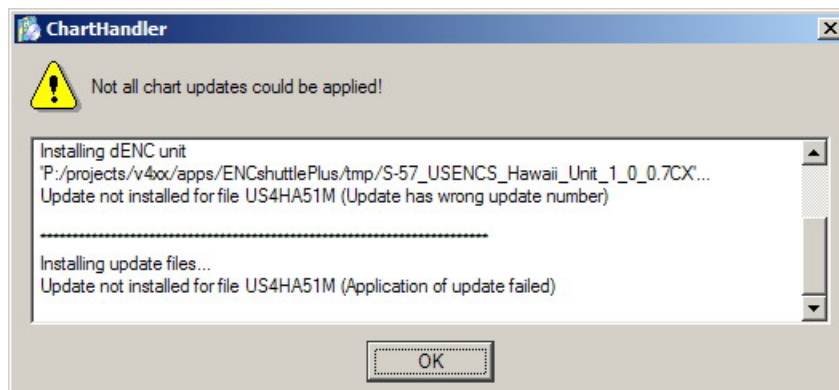
(Disabled for TX-97 / Transas)

The charts contained in the database can easily be updated. However, this requires update files to be available. These files can be marked from .000 up to .999.



Dialogue window Select File(s)

Due to various reasons, e.g. a wrong update number, it may happen that updates cannot be completely applied. In that case a warning message will be displayed (see below).



Warning update incomplete

How to update chart units:

1. In *ChartHandler*, click on *Update Chart Unit*.
The window *Select File(s)* opens
2. Select the update files.
3. Click on *Open*.
The charts are updated.

5 Advanced Functions

When *Show advanced functions* in the bottom left corner of the dialogue window is ticked, three additional buttons will be displayed. They are (left to right):

- Order Charts
- Write ECDIS Passport
- Show S-63 certificate

5.1 Order Charts / Export Chart List

This name of the button is *Order Charts* provided the *SevenCs ChartBrowser* is installed on the system. Otherwise the button is named *Export Chart List*. Anyway, clicking this button will export the list of installed Charts into a file. If *ChartBrowser* is installed *ChartHandler* will launch it. With that software it is possible to check the installed Chart Units against current product catalogues of *Chartworld* and order updates via the Internet immediately.

5.2 Write ECDIS Passport

The *ECDIS Installation Passport* is needed whenever you want to order additional charts, but also when contacting support.

It is recommended to create the *Passport* immediately after starting the respective application for the first time, and store the *Passport*.

If you want to create the *Installation Passport* later you can do this at any time. Just click on *Write ECDIS Passport* in the *ChartHandler* dialogue window.

Create ECDIS Installation Passport / Classic enabled

Note:

There are two versions of the *Installation Passport*, *Classic* and *Advanced*. While the *Classic* version just requires the *Installation Name*, the *Advanced* version offers to enter further information, e.g. *Vessel Name*, *Vessel Type*, etc. Some of these fields are mandatory

How to create an ECDIS Installation Passport:

1. Click on Write ECDIS Passport in the *ChartHandler* window. The window Create ECDIS Installation Passport opens.
2. Select Classic or Advanced.
3. Enter the *Installation Name*. The name can be chosen freely.

NOTE:



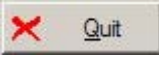
If you use more than one dongle you must create one Installation Passport with a distinct name per dongle.

4. For the *Advanced* version, enter further information.
5. Click *OK*.

5.3 Show S-63 Certificate

Opens a window which displays the S-63 User Permit which is needed for ordering S-63 encrypted charts, plus the content of the Certificate as issued by the S-63 Scheme Administrator.

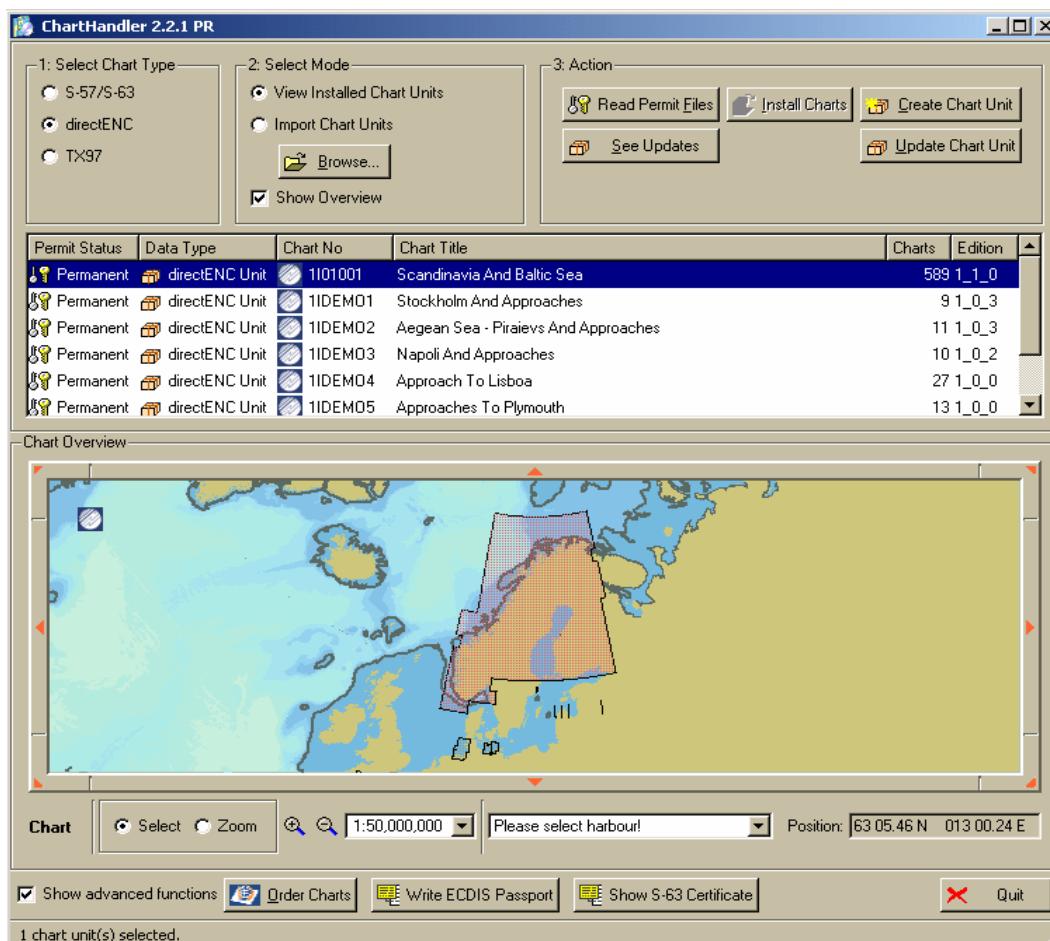
5.4 Basic Functions

- Clicking on the *About* button  will display information on the update history of *ChartHandler*.
- Clicking on the *Help* button  will display this document using Acrobat provided it is installed on the system.
- Clicking on *Quit*  will return to the ECS/ECDIS that has launched *ChartHandler*.

This page intentionally left blank.

6 Overview Mode

ChartHandler can be switched to Overview mode by ticking *Show Overview* top right in the window. This adds a chart display and various functions at the bottom of the *CharHandler* window.



Dialogue window *ChartHandler* in Overview mode

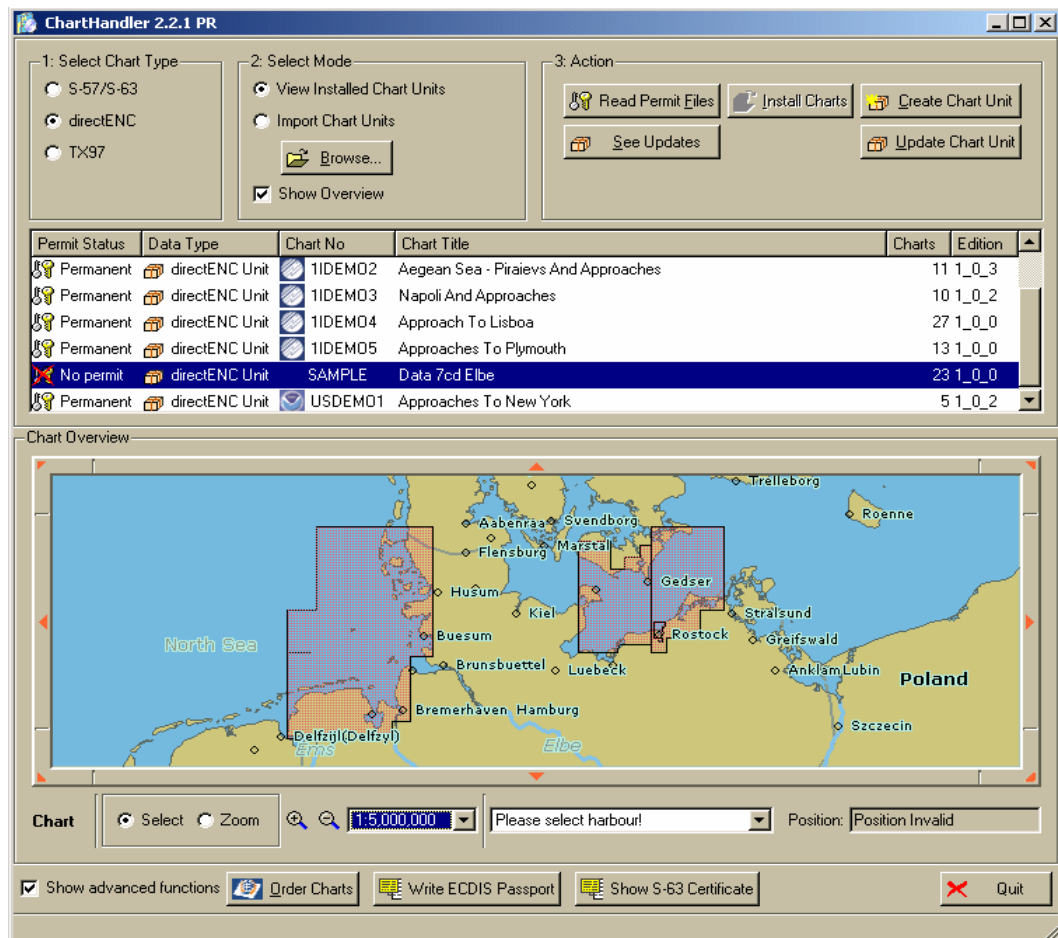
6.1 The Display in *ChartHandler* Overview

In the display at the bottom of the *ChartHandler* window those areas are outlined for which charts are currently available in the database.

The chart section displayed can be shifted by clicking on the eight red arrows surrounding the display.

Moreover, the size of the chart section can be enlarged by resizing the window using the left mouse button.

Ticking *Select* bottom left allows to select charts.



Dialogue window ChartHandler with selected charts

How to select charts in ChartHandler:


1. Tick *Select*.
2. Position the cursor on the map.
3. Press the left mouse key.
4. Draw a frame enclosing the area which shall be covered by charts. The respective charts (provided there are any) are highlighted in the list.

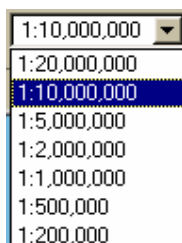
ChartHandler offers various methods to zoom in and out.

How to zoom in in ChartHandler:

1. Tick *Zoom*.
2. Position the cursor on the map.
3. Press the left mouse key.
4. Draw a frame enclosing the area to be enlarged.

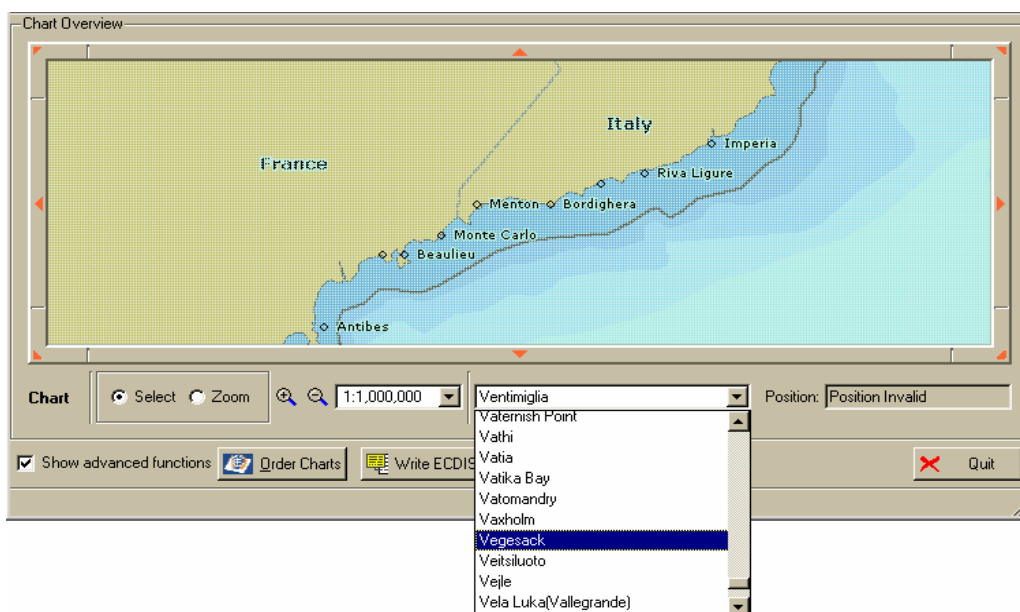
How to zoom in and out in ChartHandler:

1. Click on one of the magnifier symbols , or open the drop-down list, and select the scale.



Drop down list Scale

It is possible to centre the chart section displayed on a port.



Drop down list of ports

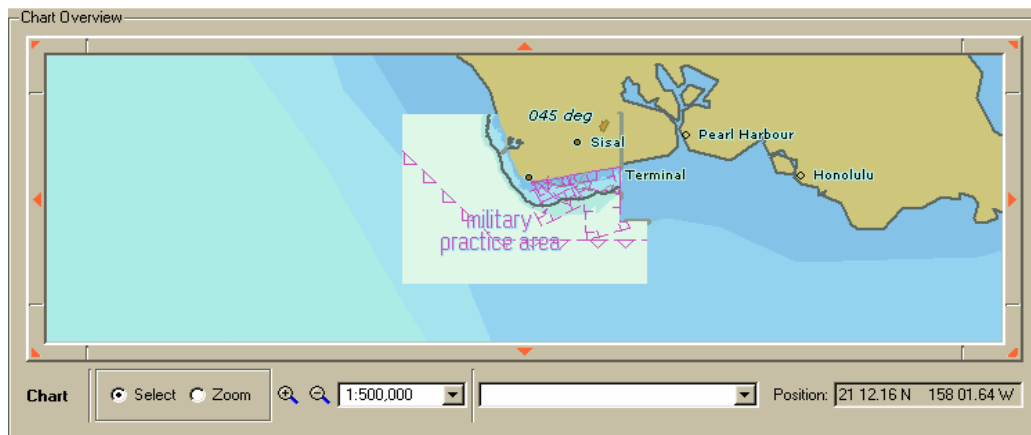
How to centre the chart section on a port:

1. Open the drop down list of ports. Tick *Zoom*.
2. Select one port.
The chart is redrawn with the selected port at its centre. Position the cursor on the map.

Tip:

Instead of searching the list, which sometimes might be rather tedious, you can also enter the name of the desired port.

Finally, in the bottom right corner of the *ChartHandler* window the current position of the cursor is displayed in latitude and longitude.



Position of cursor displayed

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CHAPTER 7

FAULT REPORTING AND FIRST LINE SERVICING

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1 Introduction

Fault diagnosis to component level is not possible without the use of specialised test equipment.

The majority of the printed circuit boards (PCBs) are assembled using surface-mount techniques.

Service repair is therefore by module (PCB) replacement only.

The module may be covered by the Service Exchange scheme.

1.1 Contact

If a unit has a fault, please contact your supplier or local dealer, or if on International trade, contact:

Northrop Grumman Sperry Marine B.V.

SERVICE CONTROL

Telephone: +(44)(0) 208 329 2400

Burlington House

Or +(44)(0) 208 329 2000

118 Burlington Road

New Malden

Fax: +(44)(0) 208 329 2458

Surrey KT3 4NR

England

or:

Request support online by going to www.sperrymarine.northropgrumman.com and clicking on the customer support link.

For general non-urgent enquiries, the following e-mail address is also available:


service.uk@sperry.ngc.com

1.2 Information Required for Service

Please give the following details when reporting a fault:

- Name of vessel (Satcom or Fax number if fitted).
- Equipment type, including prefix and suffix letters.
- Software status (version number).
- Next port of call, ETA (estimated time of arrival) and ship's agents.
- Fault description (with as much detail as possible).
- Contact name.


2 Fault Identification and Isolation

	WARNING! – Lethal Voltage Hazard
	<p>Lethal voltages are exposed when the covers are removed from the units. Only qualified persons should work on the equipment when power is applied. ALWAYS isolate the unit from the mains supply when removing or replacing the cover. To make the units safe it is necessary to isolate them from the mains supply. It is not adequate to turn the unit off: there are high voltages present at any Power Supply that is not mains isolated.</p>

2.1 VisionMaster FT System Fundamentals

To help simplify the diagnosis of system faults, the following paragraphs describe some fundamental characteristics of the VisionMaster FT units.

2.1.1 Power Supply Start-up

	WARNING! – Lethal Voltage Hazard
	<p>Once mains is applied to the PSU board in the Transceiver, high-voltage DC is present on all primary power components. This voltage is present even when the unit is switched off. The high voltage is only removed if the unit is isolated from the mains supply.</p>

For the Power Supply to operate the DU Data+ and DU Data- signal lines must be active. It is not necessary for serial data to be present: a DC voltage >2.5V between the lines will start the Power supply.

Note: A test link LKA on Power Supply PCBs can be set to position 1–2 to make the Power Supply operate independently of the DU Data input. This link must only be used in this position as a service aid. It must be reset to position 2–3 for normal operation otherwise the PCIO will not be able to switch the Transceiver on or off.

2.1.2 Azimuth and Comms

There are four separate signals between the PCIO unit and the Transceiver:

- serial control messages from the PCIO;
- video;
- RS422 trigger; and
- serial tellback messages from the Transceiver.

The tellback messages are a serial message stream. They contain the azimuth, heading marker information, BIST and status tellback bits. The messages are made up of a number of characters.

As the antenna rotates azimuth pulses are produced. Each pulse causes the Transceiver or TCU to send one character of data. If the antenna stops rotating, synthetic azimuth pulses are produced by the Pulse Bearing PCB to maintain the serial comms between the Transceiver and the PCIO. The frequency of the messages is reduced under this condition.

If azimuth pulses are lost no messages will be sent to the PCIO causing a "TX Comms" alarm.

2.1.3 Fault Identification and Isolation

Each of the various signals in the radar system may pass through several of the units before reaching its final destination. Therefore, a low video alarm on a Display could be caused by a failure in the Transceiver, PCIO unit, Processor unit, Interswitch (if fitted) or cabling. The fault in a particular unit may then be due to defective hardware or lack of power to that unit.

With many of the faults it is only possible to identify a particular missing signal. It is then simply a case of using an oscilloscope to trace inputs to and outputs from each unit in turn in order to isolate the fault. Once this has been done, the faulty unit can be examined in more detail using the diagnosis charts in the relevant manual.

Note: *The service engineer must check the following before proceeding with fault diagnosis:*

1. *Ships mains is present at each of the units where expected;*
2. *All isolating switches are in the correct operating position.*

2.2 Monitor Unit

There are two basic types of flat panel monitor:

- 250mm radar circle, 19" screen diagonal
- 340mm radar circle, 23" screen diagonal

2.2.1 Normal Operation Controls

The monitor controls include an On/Off button and a brightness adjustment control.

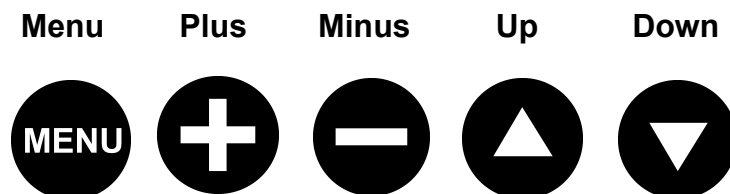
An LED between the On/Off button and the brightness control shows the operational status of the monitor.

- A Green LED shows when the power supply is active;
- A Red LED shows if the monitor is switched off or there is a power supply trip.

2.2.2 Monitor Test Controls

The On Screen Display (OSD) controls are located under a small metal cover located on the lower left side of the monitor fascia. To access the OSD controls, remove the cover, which is held by two screws

The following monitor OSD controls are available:



Before using the OSD controls turn the brightness control fully clockwise. Check that the LED adjacent to the brilliance control is illuminated green.

To use the OSD controls:

- Press **Menu**. The OSD main menu will appear superimposed over the lower right area of the VisionMaster screen.
- The OSD includes sub menu icons at the top and bottom of the screen. To move to each successive icon press **Menu**.
- Select options within a sub menu by pressing **Up** or **Down**, the selected option will turn yellow.
- Use the **Plus** or **Minus** buttons to increase/decrease values.
- Use the **Plus** or **Minus** buttons to move the selection left or right, the selected option will appear green.
- To confirm a selection press **Plus**, to abort press **Minus**.

There are two OSD main menus:

- Simplified OSD menu, which includes five icons across the top of the OSD and four icons across the bottom of the OSD.
- Advanced OSD menu, which includes six icons across the top of the OSD and six icons across the bottom of the OSD.

Note: *It should not normally be necessary to access the Advanced OSD menu. Only those functions that are relevant to the operation of the VisionMaster FT radar are described in detail in Section 2.2.2.2 'Advanced OSD menu'.*

To access the Advanced OSD menu, press and hold the **Down** button while switching the power on.

2.2.2.1 Simplified OSD Menu

The simplified OSD main menu includes the following nine sub menus:

The five top icons are:

- Frequency and Phase
- Status
- Position
- Picture in Picture
- Language

The four bottom icons are:

- Video Source
- Utilities
- Volume
- Exit

Frequency and Phase

These functions modify the image horizontal size and fine-tune the image quality.

- **Frequency** has a default value of 0 and should not be changed.
- **Phase** adjusts the image quality and has a default value of 100%. Use the **Plus** and **Minus** buttons to fine tune the data sampling position. It is not possible to give a typical figure for this parameter, as each unit may be different.
- **Picture Type** should be at a default setting of **Still**.

Status

This sub menu displays, but cannot adjust, the monitor resolution and frequency as follows:

Table 1: Monitor Resolution and Frequency Status

Parameter	Horizontal	Vertical
Resolution	1280	1024
Frequency	63.9kHz	60kHz

Position

These functions move the image within the display area.

- The **Plus** and **Minus** buttons move the image right and left respectively.
- The **Up** and **Down** buttons move the image up and down respectively.

Picture in Picture

The picture in picture (PIP) parameters include PIP size, PIP source and horizontal/vertical position.

- **PIP Size** - ensure that the PIP window size is set to **Off** if the menu displays Off, Size1, Size2 and Size 3.
- **PIP Source** - select the video input source to be displayed.
- **Horizontal/Vertical** - adjust the PIP window horizontally and vertically (defaults to 0%).

Language

This sub menu allows the user to choose between English, Danish and Simplified Chinese for the text and messages in the OSD menus.

Video Source

This menu displays the video source. It is preset to Analog RGB and must not be changed.

Utilities

This menu displays several sub menus but only the OSD Settings will be of use for a VisionMaster FT Display.

The **OSD Setting** sub menu displays the following parameters with their default values:

Table 2: Monitor OSD Settings

Parameter	Default Value	Notes
OSD H-Position	100	Do not change
OSD V-Position	100	Do not change
OSD Background	Translucent	User may prefer Opaque
OSD Menu Rotate	Normal	Do not change
User time Out	10 seconds	User may need to increase this

**CAUTION**

Do not change settings in Utilities sub menus Direct Access, Calibrate RGB gain or Load Factory Defaults.

Volume

This menu has no function for a VisionMaster FT Display.

Exit

Selecting this sub menu will exit the OSD main menu. Press the **Plus** or **Minus** buttons to save the current settings and then exit.

2.2.2.2 Advanced OSD menu

If **Load Factory Defaults** is activated in error, or the brilliance or aspect ratio are incorrectly set, then it will be necessary to use the Advanced OSD menu functions to check and, if necessary, set certain parameters.

All of the Simplified Menu functions are repeated on the Advanced OSD menus. Only the additional functions are described below.

Brightness and Contrast

The values set by activating Load Factory Defaults are 50 for the Brilliance and 50 for the Contrast.

Color Temperature

The default value is 8000K and must be set to this value.

Graphic Scaling Modes

The default setting is **Fill to Aspect Ratio** and must be set to this value.

Utilities

Additional sub menus are shown compared with the Simplified OSD menu but the parameters must be set to their default values as follows:

Table 3: Advanced Utilities Settings

Sub Menu	Parameter	Default Setting
User Setting	DPMS	Enable
	Display Input	Enable
	Auto Source Select	Off
	Gamma	1.0
Freeze		Not frozen
Zoom	Zoom Level	0
	Horizontal Pan	0
	Vertical Pan	0
Display Orientation	Orientation	Normal

2.2.3 Monitor Cables

Check the connector security of the following Monitor cables:

- AC power from the PCIO to the IEC power input
- 15 way video cable from the Processor unit
- 9 way comms and buzzer cable from the PCIO unit.

2.3 Control Panel

The control panel assembly houses the following serviceable modules:

- Trackball
- On/Off switch
- USB connector

2.3.1 Control Panel Cables

Check the connector security of the following control panel cables:

- Trackball to Processor unit
- Power control switch to PCIO unit
- USB connector to Processor unit

2.4 Processor Unit

2.4.1 General Description

The Processor unit is based on an Intel Pentium Processor running Windows XP at 1280 x 1024 resolution, 32 bit colour at 60Hz. It contains the interface PCB (SC2 card) that processes data from the top unit.

The front of the Processor unit includes the following:

- Power On LED and HDD (hard disk drive) LED
- two USB ports (both going to the control panel)
- one DVD/CD ROM drive
- an Air In filter (air out is at the rear of the unit)

The rear of the Processor unit includes the following:

- two PS2 inputs, one of which is used by the trackball
- one serial input
- one parallel input
- four USB ports (two ports can be used for security devices, one is used for the PCIO and one is spare)
- one mains power input
- Processor unit On/Off switch

2.4.2 Physical Arrangements

Two metal brackets attached to the left and right side of the Processor unit are used for the attachment of four AV mounts. The assembly is then attached to the lower pedestal support shelf.

2.4.3 Processor Unit Cables

Check the connector security of the following Processor unit cables:

- AC power from the PCIO to the IEC power input
- Rear USB port to PCIO unit
- Processor SC2 card (15 way) to PCIO unit
- Processor graphics card (15 way) to Monitor unit
- PS2 port to trackball
- Front USB port to control panel

2.5 PCIO Unit

2.5.1 General Description

There are two PCIO Unit variants; one fitted with a standard compass board and one fitted with a special compass board.

The following inputs are provided on the PCIO PCB:

- analogue compass data (stepper or synchro)
- analogue log (pulse) data
- nine serial data inputs, (one being a dedicated serial compass input).

The following outputs are provided:

- six serial data outputs
- three relay outputs for vigilance alarm, remote alarm and system operational
- one buzzer output to monitor.

2.5.2 Technical Description

2.5.2.1 PCIO Microcontroller PCB

The PCIO is operated by a microcontroller. This supervises the receipt and transmission of external data to the Processor in a number of formats.

Serial Inputs/Outputs

Three serial inputs (1, 2 and 3) are connected to the microcontroller, via a 4-channel UART and are transmitted to the Processor Control Port at a baud rate up to 38400. Only IEC 61162 format sentences are accepted at these inputs. The drive to these inputs may be either RS422 or RS232.

External 61162-2 heading data sentences may be received at Serial Input 1. These will be used, when the serial heading source mode 1 is selected, to supply heading data into the PCIO. They will be checksum checked before use by the PCIO to generate heading output messages.

External 61162-1 heading data sentences may be received at Serial Input 2. These will be used, when the serial heading source mode 2 is selected, to supply heading data into the PCIO. They will be checksum checked before use by the PCIO to generate heading output messages.

External 61162-1 sentences may be received at the Serial Input 3. These messages, when recognised as complete sentences, will be combined with other sentences appearing at the Processor Control Port output. These input sentences are not checksum checked by the PCIO but passed through to the Processor and are checked there.

Heading data sentences presented at the Serial Input 1 and 2 will also be combined at the Processor Control Port output, limited to a maximum message rate of 10Hz, with the other sentences received and generated.

Six serial inputs/outputs (4 through to 9) are provided that transmit external character based messages. These inputs and outputs are associated with USB devices 2 through 7, see Section 2.5.2.2 '*USB Port*'.

Serial messages received from the Processor are announced by interrupts to the microcontroller. The data is collected and the message type is interpreted by the microcontroller. The stored data either effects a configuration and control function or is stored ready for output message generation.

Relay Outputs

Three Relay outputs are provided for vigilance alarm, remote alarm and system operational. Each output provides a set of contacts; Normally Open Normally Closed and Common. The relay will be set ON for a logic '1' written to the appropriate latch bit. These may be used to switch external circuits with current/voltages up to 2.0A/15VDC.

Discrete Outputs

Two discrete (digital) outputs are provided. These outputs are pulled up to +5v via diodes so that the output may pull down an externally provided higher voltage (15V/1A max). The output will be pulled down for a logic '1' written to the appropriate latch bit. They are clamped to chassis for protection by transient suppressors.

Internal Timer

The internal timer is configured to generate an interrupt every 5ms. This generates the highest priority event timing for the main program and will drive a scheduler. This will initiate all the transmission of serial data and regulates the accesses to the various other inputs and outputs. External interrupts will have higher priority. Events requiring lower rates will occur less often in the scheduler.

2.5.2.2 USB Port

The USB port communicates all message and control data between the PCIO and the Processor. The PCIO contains seven USB UART devices that are connected via a USB Hub to the associated Processor USB Port.

The USB device number and serial ports associated with each UART are shown below.

USB No.	Serial Port
1	PC Control Port
2	Serial Input/Output 4 Port
3	Serial Input/Output 5 Port
4	Serial Input/Output 6 Port
5	Serial Input/Output 7 Port
6	Serial Input/Output 8 Port
7	Serial Input/Output 9 Port

The Input/output signals for each serial port are shown on the PCIO PCB by flashing red LEDs.

The baud rate for USB device 1 is set to 115200 by default. For USB devices 2 to 7, the baud rate required is defined by the requirements of the associated serial inputs and outputs.

2.5.2.3 Compass PCB

The compass PCB (standard or special) is mounted onto the microcontroller PCB. Appropriate input interfacing for the Stepper or Synchro inputs is provided on this PCB and a binary input is made available to be read by the microcontroller. The compass type is indicated by a three bit compass type code. Only one byte of the data can be read at a time. The interrupts are disabled during a read and each byte is read twice to ensure a valid correctly aligned value is obtained.

2.5.2.4 Watchdog Timer

The watchdog timer is driven by a toggling Watchdog output signal. This signal is shown by a flashing red LED on the microcontroller PSB. If a failure of the software lasts for a period longer than the Watchdog device delay, (approximately 1½ seconds), the LED will stop flashing and the watchdog device will generate a hardware reset to the microcontroller. This will ensure that a 'hung' system will always try to recover.

The Watchdog link is normally set at pin1 to pin2. If the link is set pin2 to pin3, the reset will repeatedly occur, if the link is not fitted at all the reset will not be generated except at power-up.

2.5.2.5 Power Supply Unit PCB

The power supply unit PSB provides a 24V external supply and a +/-15v external supply for an Interswitch (if fitted). It also supplies +/-15v to the PCIO PCB, which uses regulators to provide +/-12V, +5V and +3.3V.

2.5.3 PCIO Cables

Check the connector security of the following PCIO cables:

- Mains power to TSM terminal

Cables to Transceiver or Interswitch:

- 75 ohm Co-Ax from SKV terminal - Video In
- 75 ohm Co-Ax from SKM terminal - MIST IN
- 75 ohm Co-Ax from SKX terminal - MIST OUT
- Data cables from COM ports 3 to 7.
- Data cable from COM 8 to Interswitch (if fitted)

Cables to Processor:

- Video/Data cable (combined coax)
- USB cable from TSU terminal

2.6 Fault Isolating Flow Charts (Console Assembly)

Flowcharts for the isolation of faults on the console assembly (Monitor, PCIO unit and Processor unit) are shown on page 20 to page 29.

Flowcharts 2, 3 and 4 cover the monitor picture faults. Flowcharts 5 to 10 cover the error messages that may appear which are relevant to the Console assembly hardware.

The Flowcharts should be read in conjunction with the following notes.

Note: *Before using the following fault finding flow charts visually check the console modules to make sure there are no loose plugs or connections.*

Note: *After checking the module connection status always check that the configuration of all components on the system is correct by accessing the Configuration tool, see Chapter 4, 'Configuration'.*

If faults cannot be rectified after reference to the console assembly fault finding flowcharts you may need to contact the VisionMaster FT service department to resolve the problem.

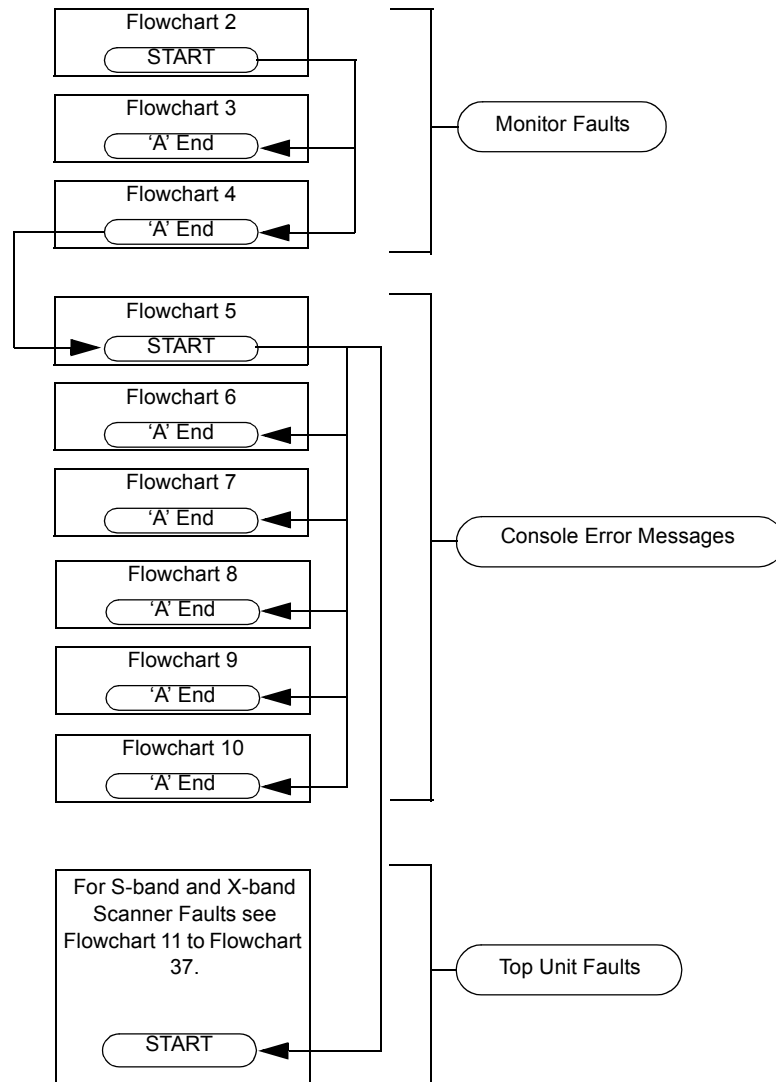
Prior to contacting the service department use Table 4 to help specify the problem you may have with the console assembly.

Table 4: Queries and Symptoms on Console faults

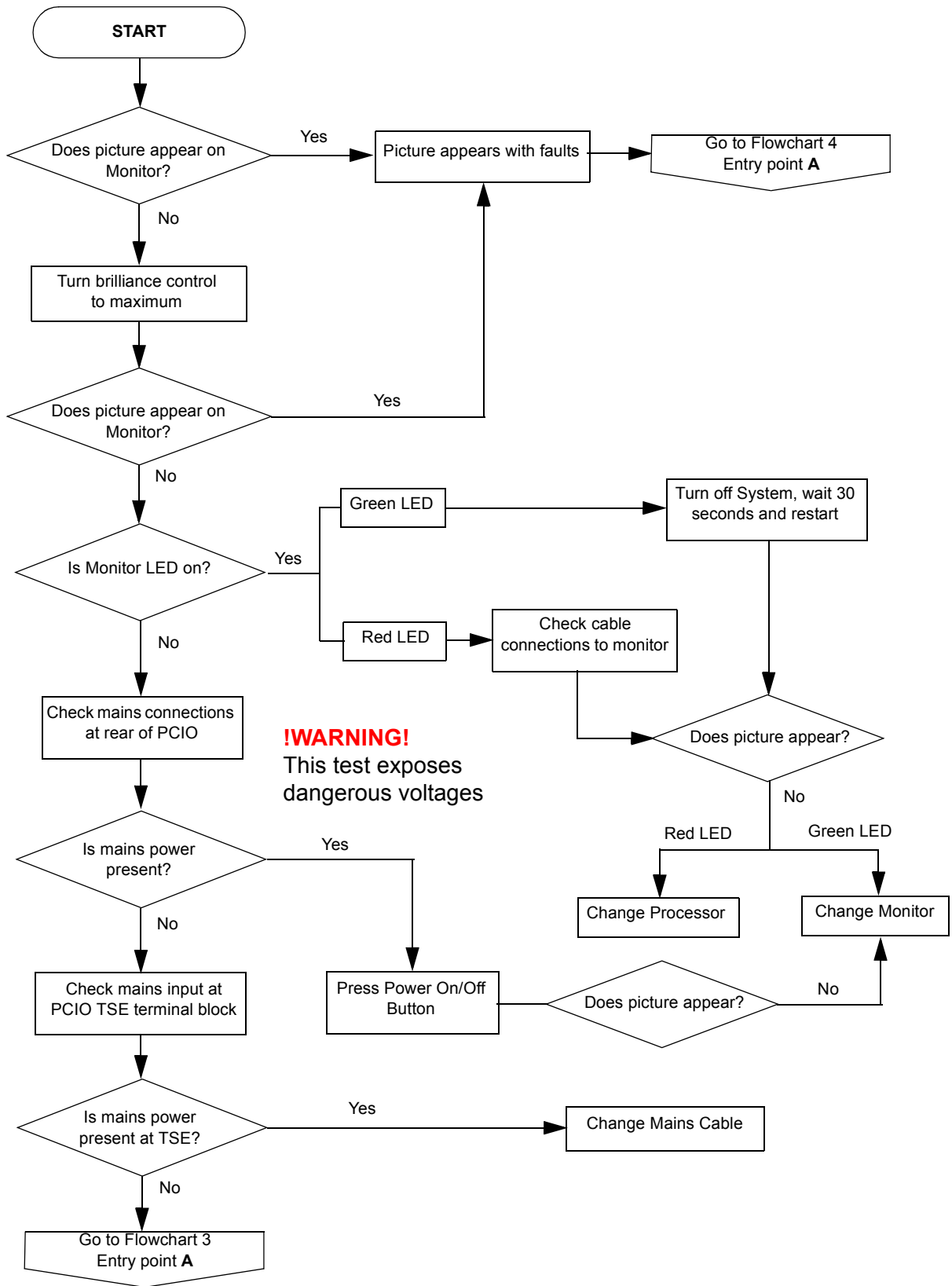
General Query	Specific Query	Example Symptoms
Is the display distorted?	Digital Distortion	Broken or missing text, misaligned text.
	Size Distortion	Non-circular range rings. Or picture too large/too small for the screen.
Are the colours correct?	Incorrect Colours	Different colours shown from those set.
	Discolouration	Set colours vary.
Where is the fault in the picture?	Within Radar Circle	Missing targets, no gain, strange patterns.
	Text and Synthetics outside radar circle	Missing text or strange patterns.
Is picture showing incorrect data?	Picture is OK but data is incorrect, or operation is incorrect	Incorrect data in menu. Non-function of menu.
Is the picture frozen?	Picture is partially frozen	Radar video updates appear but synthetics are frozen.
	Picture is fully frozen	No visible changes on screen and no audible alarm.
		No visible changes on screen and audible alarm.

Fault Isolating Flow Charts (Console Assembly Fault Reporting and First Line Servicing)

FLOWCHART 1 Overall Flowchart - Console Assembly

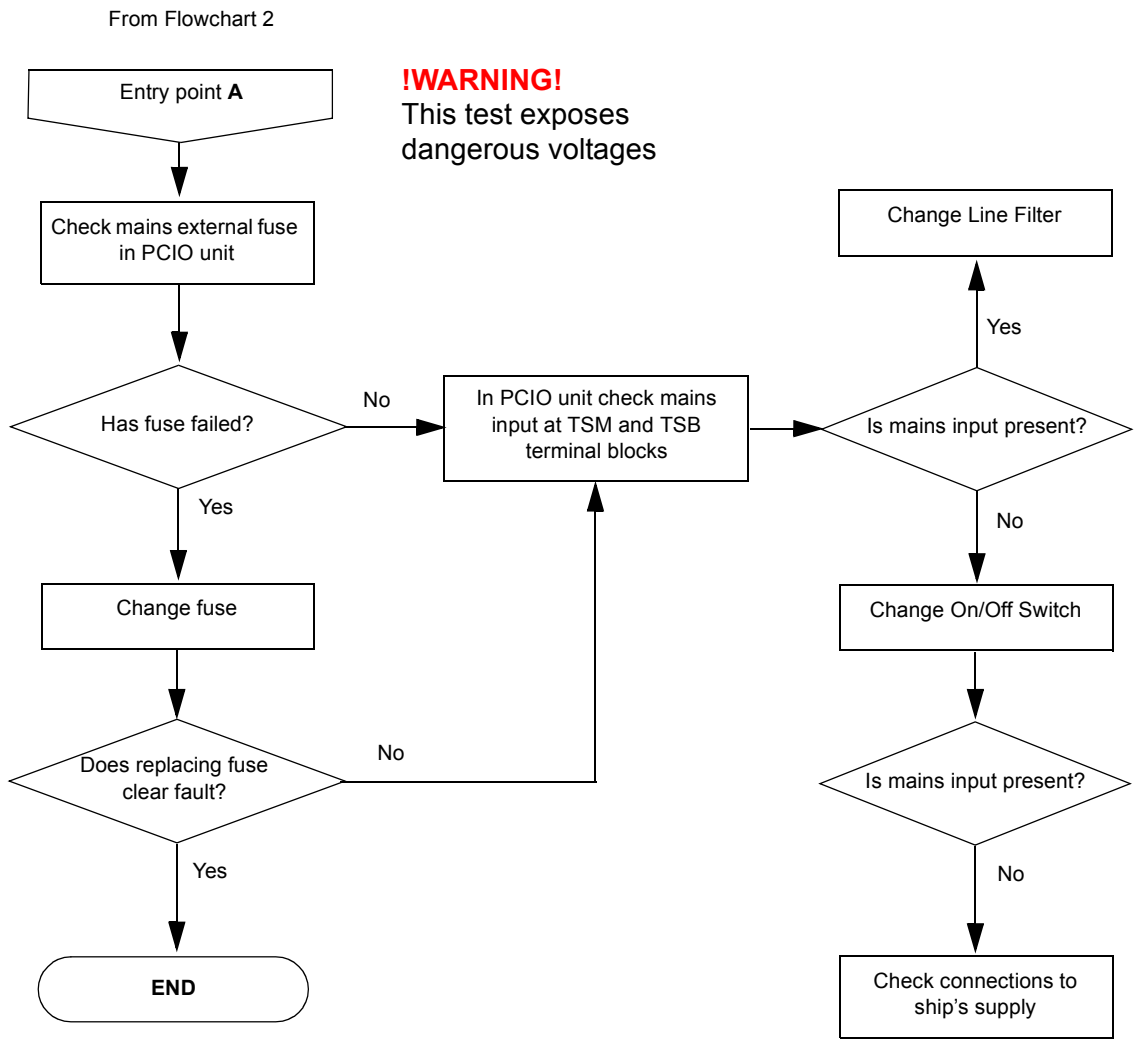


FLOWCHART 2 Console Faults (No Picture)

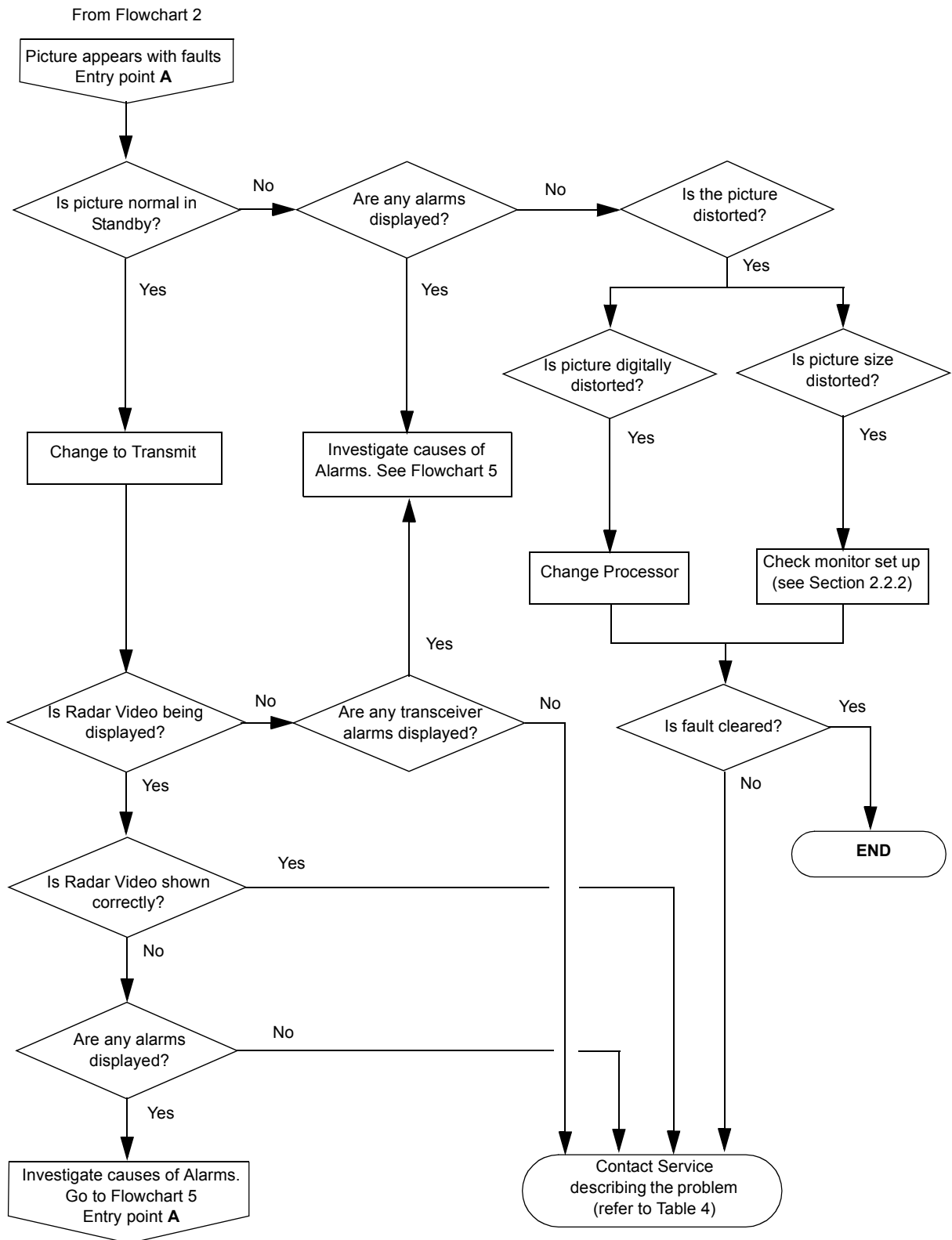


Fault Isolating Flow Charts (Console Fault Reporting and First Line Servicing Assembly)

FLOWCHART 3 Console Faults (No Picture contd.)

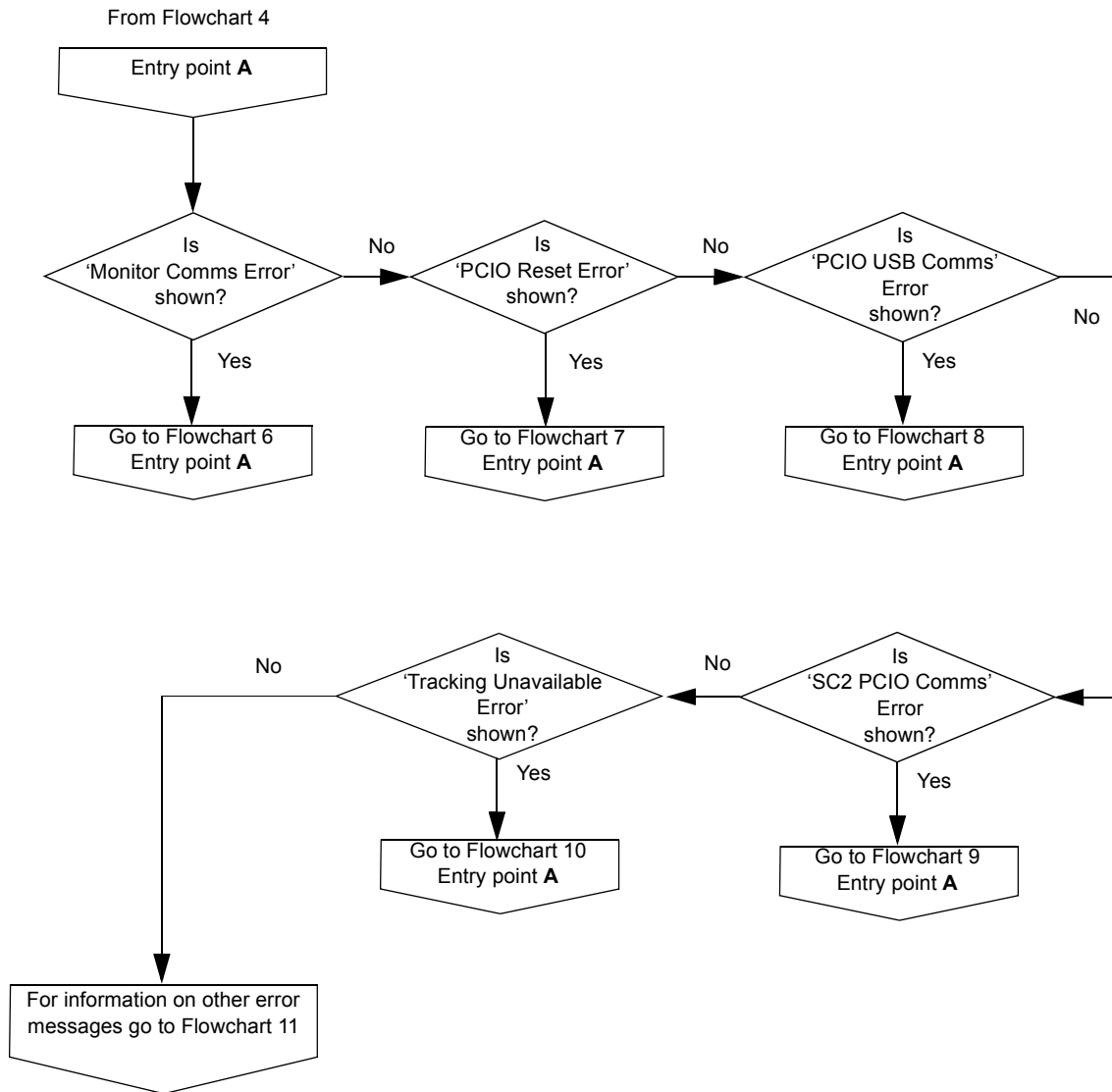


FLOWCHART 4 Console Faults (Picture appears with faults)

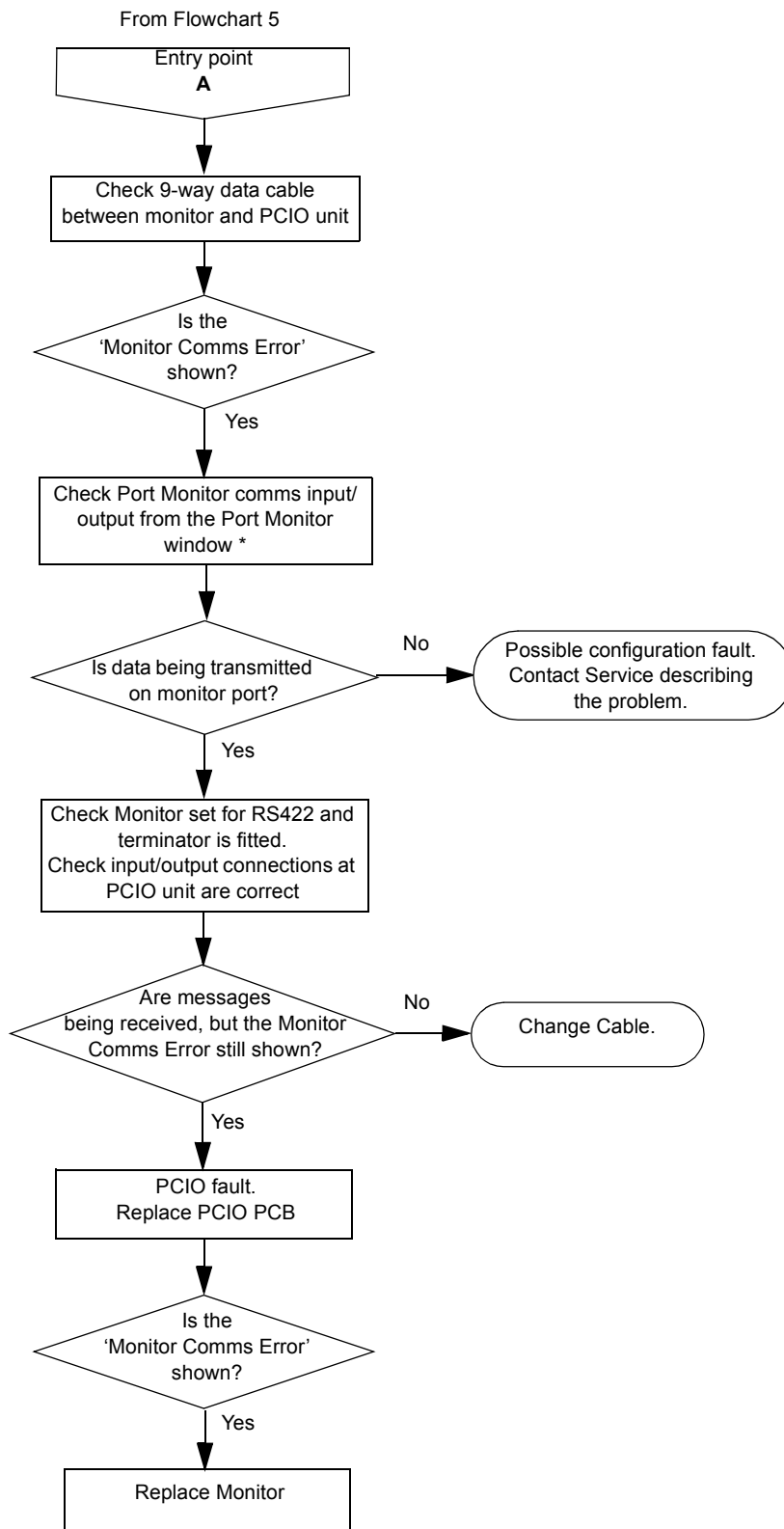


Fault Isolating Flow Charts (Console Fault Reporting and First Line Servicing Assembly)

FLOWCHART 5 Console Hardware Error Messages

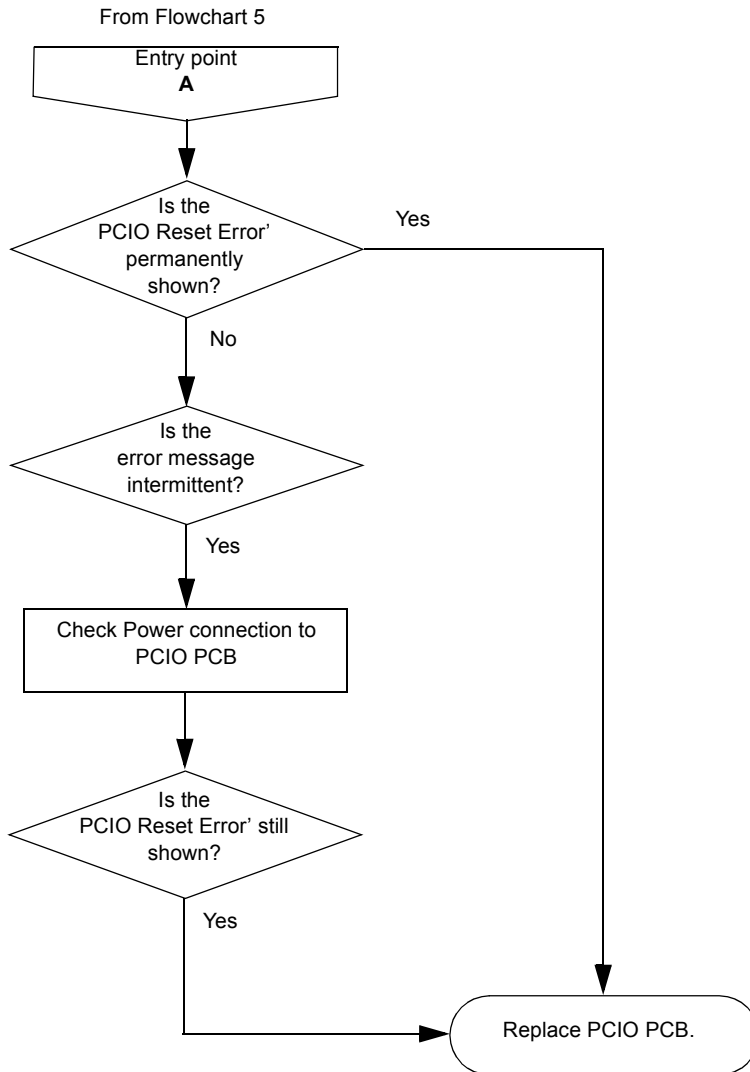


FLOWCHART 6 Error Messages (Monitor Comms Error)

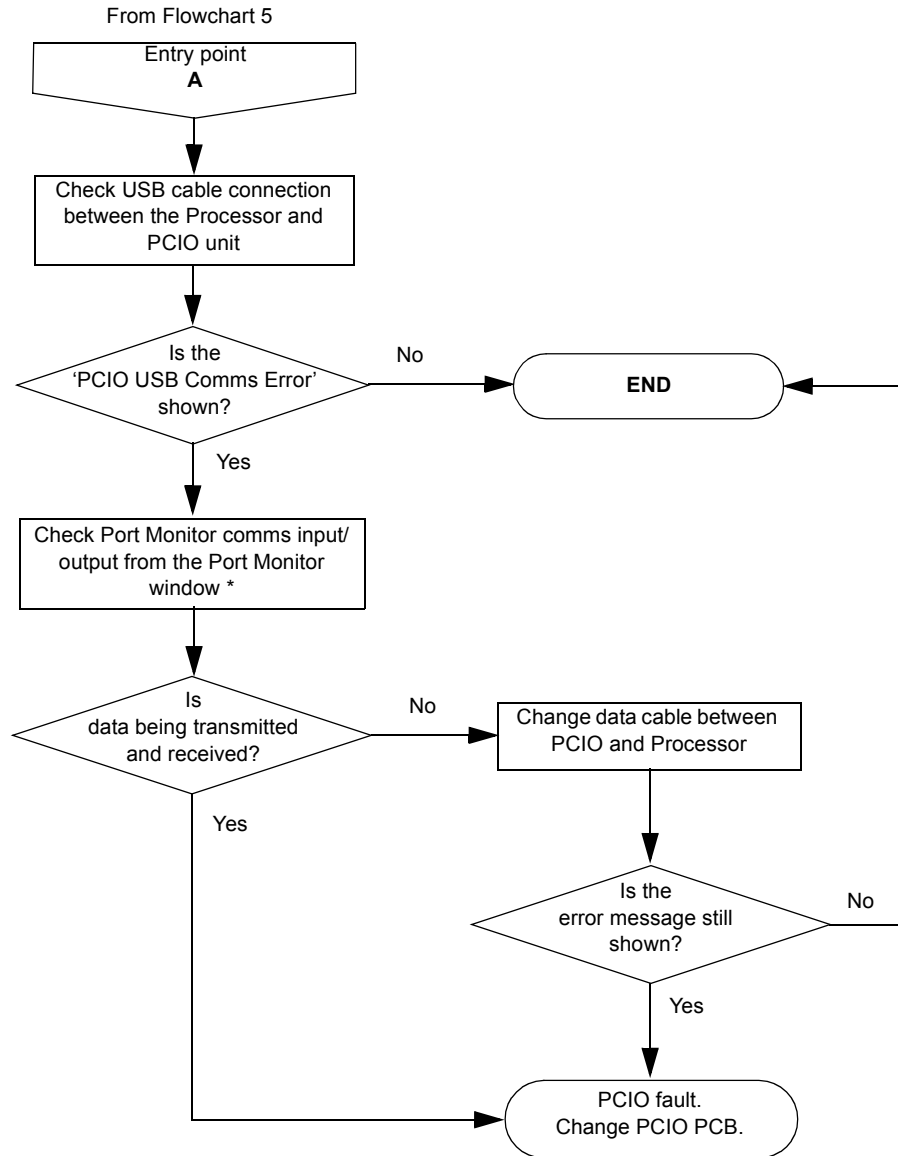


*. See Service (Commissioning) section in Chapter 5 'Diagnostics and Commissioning'

FLOWCHART 7 Error Messages (PCIO Reset Error)

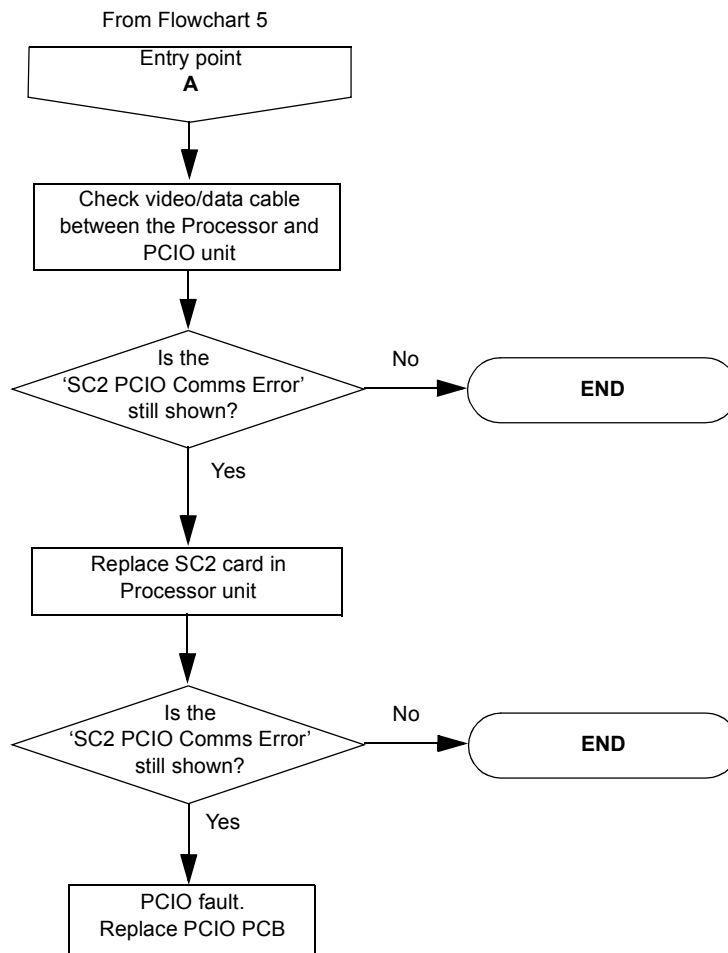


FLOWCHART 8 Error Messages (PCIO USB Comms Error)

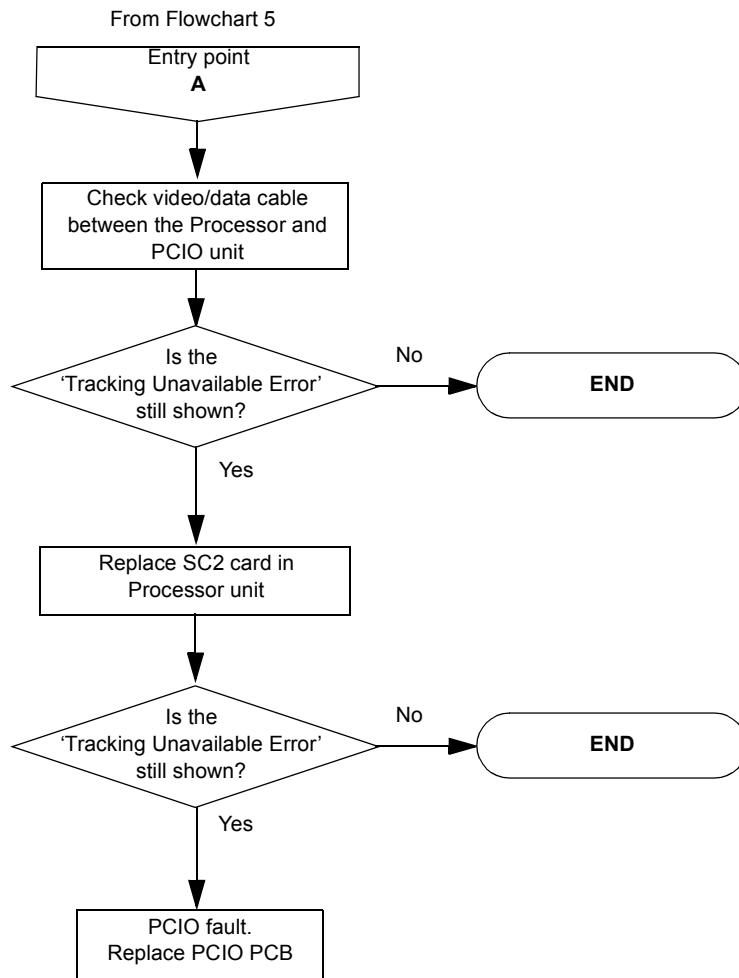


*. See Service (Commissioning) section in Chapter 5 'Diagnostics and Commissioning'

Fault Isolating Flow Charts (Console Fault Reporting and First Line Servicing Assembly)

FLOWCHART 9 Error Messages (SC2 PCIO Comms Error)

FLOWCHART 10 Error Messages (Tracking Unavailable Error)



2.7 Scanner Unit (S-band and X-band)

2.7.1 Technical Description

There are four basic types of Scanner Unit:

- S-band with an integral transceiver module
- S-band without an integral transceiver (bulkhead mounted)
- X-band with an integral transceiver module
- X-band without an integral transceiver (bulkhead mounted)

Each type has variants dependent on motor supply and the options that are fitted.

Each Scanner Unit includes the following assemblies:

- Antenna
- Antenna Support Casting
- Turning Unit.

The Turning Unit includes the following items:

- Motor and Gearbox
- Bearing and Heading Marker PCB
- Input PCB
- optional Performance Monitor
- optional integral Transceiver module.

The Transceiver Unit includes the following items:

- Base casting
- Cover
- Transceiver module
- Input PCB.

A serial data link is used to communicate between the Transceiver and the Console. If a separate Transceiver Unit is used, an RF feeder (coaxial for S-band; waveguide for X-band) is used to transfer the microwave energy between the Transceiver unit and the Turning Unit.

2.7.2 S-Band Unit Physical Arrangements

The S-band Turning Unit is constructed from a central aluminium casting, with a motor and gearbox attached to one side. The terminal strips for interconnecting cables to other units are under a cover on the opposite side to the motor and gearbox.

At either end of the Turning Unit there is an aluminium cover. The Performance Monitor (if fitted) is housed under the front cover. The integral Transceiver Unit is housed under the rear cover. If Transceiver Unit is bulkhead mounted, a shallower cover is used.

The Transceiver Unit can be removed for below decks servicing.

Four M16 bolts are used to attach the Scanner Unit to the radar platform or wheelhouse roof. The Antenna is attached to the Turning Unit by the Antenna Support Casting. An RF feeder cable is used to transfer the microwave signals between the Turning Unit and the Antenna.

Interconnections between the Scanner Unit and other units in the system are made using screened cables. All the cables that enter the Scanner Unit do so via waterproof cable glands that use an EMC gasket which makes contact with the cable braid.

The bulkhead mounted Transceiver is attached using four M8 bolts, studs or screws (coachbolts).

2.7.3 X-Band Unit Physical Arrangements

The X-band Turning Unit is constructed from upper and lower aluminium castings. The upper casting is hinged at one end to the lower casting for service and installation. The motor, gearbox and drive assembly are bolted to the upper casting. The transceiver module, when fitted, is bolted to the upper casting and can be removed as a unit for below-decks servicing.

The terminal strips for the interconnecting cables to other units are under a screen cover on the base of the lower casting. The Performance monitor is housed beneath the upper casting and has a microwave-transparent cover protecting it, fitted on the top surface of the upper casting.

Four M10 x 45 bolts are used to attach the Scanner Unit to the radar platform or wheelhouse roof. The Antenna Support Casting attaches the Antenna to the Turning Unit. This directly transfers the microwave signals between the Turning Unit and the Antenna.

Interconnections between the Scanner unit and other units in the system are made using screened cables. The exception is the Bulkhead system, where the microwave signals are carried between the Turning Unit and the Transceiver via a waveguide.

All the cables that enter the Scanner Unit through waterproof cables glands. These incorporate an EMC gasket that makes contact with the cable braid.

The separate Transceiver is designed to be bulkhead mounted and is attached using four M8 bolts, studs or screws (coachbolts).

2.7.4 Transceiver Module Overview

The Transceiver module can be fitted in the Turning Unit, or mounted on a casting for below-decks bulkhead mounting as a separate unit.

Both Transceiver units (integral and bulkhead mounted) contain the following modules:

- Modulator PCB;
- Power Supply PCB;
- Trigger PCB;
- Receiver;
- microwave components.

Communication between the Transceiver unit and the PCIO unit is via two serial data links; one from the Transceiver to the PCIO unit, and one from the PCIO unit to the transceiver.

This data is transmitted using a special cable that consists of four twisted pairs:

- two pairs are used for data transmission as above
- one pair is used for the trigger
- the other pair is spare

The data passed from the Transceiver to the PCIO includes:

- Heading Marker
- Incremental Bearing
- Transceiver Status
- Error Messages
- Built In Test Equipment (BITE) data
- Tuning Indicator

The data transmitted from the PCIO to the Transceiver includes:

- Standby/Transmit
- Pulse Length
- Tuning
- AFC/Manual
- Sector Blanking
- Performance Monitor control, and Installation Settings

2.7.4.1 Power Supply

The power supply operates from the ship's AC mains, and supplies all of the power requirements for the electronic modules within the Turning Unit and Transceiver. The AC mains is always present at the power supply even when the radar is switched off at the Display.

The presence of data on the serial data link, when the Display is switched on, is detected by the power supply, which then becomes active.

The power supply includes a Power Factor Correction circuit, and a number of switching regulators to generate the necessary voltage supplies.

Overcurrent detection circuits protect the power supply against overloads on its outputs.

2.7.4.2 Trigger PCB

The Trigger PCB processes the serial data from the PCIO Unit, and generates the required control signals for the Transceiver. It monitors functions within the Transceiver and the Heading Marker and then encodes the information for transmission to the PCIO.

The data is transmitted each time a bearing pulse is received from the Turning Unit.

The Trigger PCB generates the various timing signals required by the Transceiver, including the Pulse Repetition Frequency (PRF).

2.7.4.3 Modulator PCB

The Modulator PCB generates the high-voltage negative pulses needed to drive the magnetron. The modulator pulse widths and timing signals are controlled from the Trigger PCB.

A spark gap on the modulator is fired if the magnetron fails to operate. Continual operation of the spark gap is detected, and a signal is fed back to the Trigger PCB. When the Trigger PCB detects this signal it switches the radar to standby, and generates an error signal that is sent to the PCIO Unit via the serial data link. The error signal causes the display to switch to standby and generate an error alarm.

2.7.4.4 Microwave

The Transceiver uses a conventional three-port circulator to direct the path of the microwave energy to and from the antenna. A magnetron, coupled to the circulator, produces the RF energy that is transmitted.

A solid-state limiter, coupled to the circulator, protects the Receiver from high-powered microwave signals from the magnetron, or adjacent radars. On Scanner Units and Transceivers fitted with 'additional features' options, a biased limiter is fitted in place of the standard limiter.

A signal from the Trigger PCB is used to enable swept attenuation to be applied to the solid-state limiter. This reduces the system sensitivity at short ranges.

2.7.4.5 Receiver

The receiver consists of the following:

- low noise amplifier;
- mixer;
- linear pre amplifier;
- logarithmic amplifier;
- video amplifier.

The mixer has a 60MHz output, which is amplified by the linear pre-amplifier followed by the logarithmic amplifier. When the output is detected, the resulting video signal is then further amplified before transmission to the PCIO.


The Receiver also includes an AFC system. Once the Receiver has been tuned, the AFC system makes sure the Receiver remains in tune during variations in tuning due to thermal drift of the mixer, magnetron etc.

The operator can select between manual tuning and automatic tuning. A signal from the Trigger PCB is used to select the mode of operation. A signal from the AFC circuit is fed to the trigger circuit to indicate the state of tune of the Receiver. This signal is at its minimum value when the Receiver is correctly tuned.

2.7.5 Automatic Start-up Sequence

The automatic start-up sequence described below, should be read in conjunction with Figure 7.19 '*S-band Turning Unit Schematic*' for S-band scanners and Figure 7.36 '*X-Band Turning Unit (Aloft) Schematic*' for X-band scanners.

2.7.5.1 Start-up

	WARNING! - LETHAL VOLTAGE HAZARD
	<p>When mains power is applied to the Transceiver PSU board the Power Factor Correction (PFC) circuitry starts and generates 390V.</p> <p>When mains power is applied, the PFC is active and cannot be manually switched off.</p> <p>The start circuitry only controls the flyback converter. High-voltage DC is present on primary power components whenever mains power is present on the board.</p>

The Power Supply in the Transceiver is only active during normal operation when there is a PCIO connected to it. The RS422 serial data stream from the PCIO is used to drive an opto-coupler in the PSU. This detects the presence of either polarity voltage and enables the flyback converter in the PSU.

The RS422 serial data stream from the PCIO enters the Input Board on connector TSB1, 2 (as "DU DATA +" and "DU DATA-"). It is then passed to the Trigger Board via PLYB 16, 17, and then on to the PSU via PLTH 11, 12 (as "PSU START" and "PSU START RTN").

For test purposes the PSU can be turned on in the absence of a serial data stream by linking pins 1–2 on LKA (PSU).

2.7.5.2 Transmit Enable

When the operator selects Transmit the TU Enable signal is activated LOW on the Trigger PCB (PLYH 10).

On the S-band Scanner Unit this signal is fed, via the Power Supply Unit, to the Input PCB and, via TSB 10, to the Scanner Control Unit to start the antenna rotating.

On the X-band Scanner Unit, this signal is fed to the Power Supply Unit and via the Turning Unit On/Off and Input PCB to the Motor Drive PCB to start the antenna rotating.

Once the antenna has done one complete revolution, transmission is started. When standby is selected transmission is immediately halted and, after one complete revolution of the antenna, TU Enable is disabled.

The Modulator starts to generate radar pulses when the Trigger PCB sends MOD TRIGGER pulses (to PLVC 9).

Note: *The CHARGE TRIGGER pulse (on PLVC 8) is present even in Standby mode.*

A signal indicating that the Magnetron has fired is fed via MAG SAMPLE from PLVC 7 on the Modulator PCB to the Trigger PCB. This signal is processed on the Trigger PCB and outputs as TX TRIG (PLYB 20 and 21) to the Input PCB (PLZB 20 and 21) and then to the PCIO Unit via TSB 5 and 6.

Note: *TX DATA is sent from the Transceiver to the PCIO. DU DATA is sent from the PCIO to the Transceiver.*

The Trigger PCB processes the serial data input from the PCIO, and generates the required control signals for the Transceiver. The data is transmitted each time a bearing pulse is received from the Turning Unit.

The Trigger PCB generates the various timings signals required by the Transceiver including the Pulse Repetition Frequency (PRF).

2.7.5.3 Magnetron Operation

The Modulator PCB generates the high-voltage negative pulses required to drive the magnetron. The modulator pulse widths and timing signals are controlled from the Trigger PCB.

A spark gap on the Modulator is fired if the magnetron fails to operate. Continual operation of the spark gap is detected and a signal is fed back to the Trigger PCB.

On detection of this signal, the Trigger PCB switches the radar to Standby, and generates an error signal. This is transmitted to the Display Unit via the serial data link. The error signal causes the Display Unit to switch to Standby and generates an error alarm.

When Standby is selected, rotation of the Antenna is inhibited. Transmission from the radar is inhibited if the Antenna is not rotating (unless in Test Mode).

On the Trigger PCB, there is a timer circuit. This is basically a capacitor that slowly discharges (between 4 seconds and 18 seconds) when power is removed from the PCB. On power-up the microcontroller measures the charge remaining on the capacitor. It determines whether the Transceiver has been switched off for long enough to require inhibiting transmit. Transmit is inhibited for three minutes until the magnetron heaters have had time to warm up again.

The other analogue signals into the Trigger PCB come from the Modulator. The Modulator supply voltage and the magnetron current (only when transmitting) are measured and sent to the PCIO as an aid to fault finding.

The spark gap detect signal is generated by the modulator when the magnetron arcs over. If it reaches a predetermined level the microcontroller inhibits transmission for approximately one second and sends an error message to the Display.

2.7.6 Turning Unit Overview (S-band)

2.7.6.1 Drive System

The scanner motor is an AC induction motor. It drives either a 12:1 or a 20:1 reduction gearbox. The output of the gearbox drives the final output helical gear via a pinion. This gives an overall reduction between the motor and Antenna of approximately either 30:1 or 60:1 dependent on whether the Turning Unit is a high-speed variant or not.

A Scanner Control Unit connects the scanner motor to the ship's AC Supply. This unit includes a contactor, controlled by the Transceiver, to switch the scanner motor on.

When standby is selected, rotation of the Antenna is inhibited. Transmission from the radar is inhibited if the Antenna is not rotating (unless in test mode). An isolating switch is supplied, for AC systems, to switch the scanner motor supply off for safe servicing.

2.7.6.2 Bearing and Heading Marker System

A disc with 128 teeth is attached to the antenna torque tube and, combined with an opto-coupler, generates 128 pulses per rotation of the Antenna.

A second opto-coupler together with a flag on the toothed disc generates a Heading Marker. This is approximately 10° before the Antenna is pointing dead ahead. Correct alignment of the Heading Marker is set at system configuration.

Sometimes it is not possible to adjust the Heading Marker alignment at configuration. Optional extra circuitry can be fitted to the Input PCB to let the alignment be set electronically within the Turning Unit. When this option is fitted an additional (isolated) Heading Marker output is supplied.

As an option, for special applications, a size 11 synchro can be fitted as an alternative source of bearing information.

2.7.6.3 Interconnections

AC power to the motor is by direct connection to terminal strips in the terminal box attached to the motor. The terminations for interconnections for the Transceiver and the Turning Unit are under a cover on the side of the Turning Unit. The AC power from the isolating switch is terminated at a terminal block within the filter box. All other connections are made to plugs or removable terminal strips on the input PCB.

2.7.7 Turning Unit Overview (X-band)

2.7.7.1 Drive System

The scanner motor is a 3-phase electronically commutated DC motor. The motor commutation drive signals are supplied by the Motor Drive PCB, which can give high- and low-speed operation by link selection.

The motor drives an integral 32:1 reduction gearbox. The output of the gearbox drives a pulley system with a single toothed belt having a reduction ratio of 3:1. The final pulley is attached to the Antenna torque tube assembly. The overall reduction between the motor and Antenna is approximately 96:1.

When standby is selected, rotation of the Antenna is inhibited. Transmission from the radar is inhibited if the Antenna is not rotating (unless in test mode).

A switch is provided on the Scanner Unit to inhibit rotation for safe servicing.

2.7.7.2 Motor Drive Board (Including the Dynamic Brake Facility)

The Motor Drive PCB generates the supply and control signals for the 3-phase electronically commutated DC motor that turns the Scanner Unit.

Link LK1 is used to select between high- or low-speed operation. The link should be set between pins 1 and 2 for low-speed operation (Factory Default). For high-speed operation, the link is parked on pin 1, or not fitted. For remotely selectable antenna speed the link should be set between pins 2 and 3. If no link is fitted, the default is high-speed operation.

On Scanner units fitted with the 'additional features' option, additional circuitry allows the links to be selected by a remotely mounted switch. This gives the operator the option to change the antenna rotation speed.

The Motor Drive PCB is supplied with +50VDC from the Transceiver power supply (in both Aloft and Bulkhead versions).

Pulling control line 'TU Enable' below 1.5 volts starts a slow build up of speed up to the maximum set by the speed selection link. The 6 output FET switches, which perform the commutation are protected by a current sensing and limiting circuit, in the event of overload or stall.

Signals from the Hall Sensors in the motor are used to control the commutation sequence, and are also used to provide a degree of speed compensation in high wind load conditions. An additional feature of the PCB is a Dynamic Brake that prevents the antenna from 'windmilling' when the radar is turned off or on standby. This circuit is passive and will operate with no supply voltage.

2.7.7.3 Bearing and Heading Marker System

A disc with 128 teeth is attached to the Antenna torque tube and, combined with an opto-coupler, generates 128 pulses per rotation of the Antenna.

A second opto-coupler together with a flag on the toothed disc generates a Heading Marker approximately 10° before the Antenna is pointing dead ahead. Correct alignment of the Heading Marker is set at system configuration.

Both opto-couplers are on the Pulse Bearing PCB. The Pulse Bearing PCB multiplies the 128 bearing pulses by 32 to generate 4096 pulses per antenna revolution. The 4096 azimuth pulses and the heading marker are routed through the Input PCB to the Trigger PCB. They are then incorporated into the serial data to be transmitted to the PCIO Unit.

Link LK1 is used to select between high- or low-speed operation. The link should be set between pins 1 and 2 for low-speed operation (Factory Default). For high-speed operation, the link is parked on pin 1. For remotely selectable antenna speed, the link should be set between pins 2 and 3. If no link is fitted, the default is high-speed operation.

On Scanner units fitted with the additional features option an additional relay allows the links to be selected by the same remotely mounted switch used to select the antenna rotation rate. This makes sure speed settings match those remotely selected on the motor drive PCB.

On scanner units fitted with the additional features option, a method is given (on the Input PCB) to allow the heading marker alignment to be made electronically within the Turning Unit. When this option is fitted an additional (isolated) Heading Marker output is supplied. As an option for special applications a size 11 synchro can be fitted as an alternative source of bearing information.

2.7.7.4 Interconnections

The terminations for interconnections for the Transceiver and the Turning Unit are under a cover on the inside of the lower casting of the Turning Unit. The AC power from the isolating switch is terminated at a terminal block within the filter box on the inside of the lower casting of the Turning Unit. All other connections are made to plugs or removable terminal strips on the Input PCB.

2.7.8 Trigger PCB

2.7.8.1 General Description

The Trigger PCB controls the operation of the Transceiver, under instruction from the PCIO. There are two serial links, which are used to transfer control messages from the PCIO to the Trigger PCB and Transceiver information back to the PCIO.

The Trigger PCB generates the control and tuning signals required by the Modulator, Receiver, Performance Monitor (PM) and Biased Limiter. The PSU is enabled with a signal from the Trigger PCB.

Signals To/From the Trigger PCB

To/From the PCIO unit:

- Serial Data to PCIO
- Serial Data from PCIO
- Trigger to PCIO

To/From the Modulator:

- Pulse Length select lines
- Charge and Modulator Triggers
- Magnetron Heater Turndown signal (only used for S-band, Long Pulse operation)
- Voltage/Current Monitor signals
- 10/25kW and S-band/X-band Configuration signals

To/From the Receiver:

- Tuning Voltage signal
- Bandwidth Control signal
- AFC/Manual control
- AFC Trigger
- Tune Indicator signal

To Biased Limiter

- Trigger signal

To the Performance Monitor:

- On/Off signal
- Mode Control signal
- Tuning Voltage signals

To/From the Power Supply PCB:

- +30V, +12V, +5V, 0V and -12V Supply lines
- Turning Unit Enable
- Power Supply Start and Return

2.7.8.2 Functional Description (Trigger PCB)

The 80C51 family microcontroller supplies overall control of the Trigger PCB functions. Program memory and RAM are included within the microcontroller IC. Serial I/O is handled by the microcontroller's internal UART and an external RS422A driver and receiver. Baud rate is fixed at 76800 baud for operational use but is link selectable to 19200 or 38400 baud for test purposes. The serial data format is 8-bit data, 1 stop bit and even parity.

The PCIO sends serial messages consisting of four or five characters depending on the message content. Control messages are four bytes long and tuning messages are five.

The tuning voltage levels are sent as 12-bit values. These are converted on the Trigger PCB using a four-channel DAC. They are then amplified/buffered and distributed to the Receiver and PM.

The Bearing signal from the Turning Unit is used to start serial transmission from the Trigger PCB. Each time one of the 4096 azimuth pulses per revolution is generated and fed into one of the microcontroller's interrupt pins, a character (one byte) is sent to the PCIO. One bit in each of the characters sent is dedicated to the heading marker. On every new heading marker pulse from the Turning Unit, the bit is toggled.

The Power Supply in the Transceiver is only active during normal operation when there is a PCIO connected to it. The RS422 serial input from the PCIO is used to drive an opto-isolator, which detects the presence of either polarity voltage and enables the PSU.

2.7.8.3 Trigger Outputs

The following trigger signals are generated by the Trigger PCB:

- Pre-Trigger
- Charge Trigger
- Modulator Trigger
- PCIO Trigger
- Performance Monitor Trigger
- AFC Trigger
- Swept Attenuation Initiate

The Charge Trigger is the timing signal used to recharge the Modulator PFN. This is generated by the microcontroller using an internal timer routine set to the appropriate PRF for the pulse length selected.

A wobble factor is added to the basic timing to make sure no two radar transmissions are locked together. The wobble is calculated according to the number of serial messages received before going to transmit and the position of the antenna between each trigger pulse.

An optional Pre-trigger will be produced approximately 11 μ s before the Modulator trigger. This is not normally fitted and is intended for use in Special Options applications.

The Modulator Trigger is used to let the charge out of the PFN into the magnetron and is the trigger that starts the modulator firing. It is delayed from the Charge Trigger by 100 μ s and gated off when the Transceiver is in standby.

In standby, the PCIO and PM Triggers are generated from the Modulator Trigger pulse. When the transceiver is in transmit mode the triggers begin on the leading edge of the magnetron sample pulse and end after a preset time, adjustable using RV1.

The AFC Trigger is used by the Receiver when in AFC mode and is only generated when the Transceiver is in transmit mode. The pulse is started on the front edge of the Modulator Trigger and terminates on the back edge of the magnetron sample pulse.

The Swept Attenuation Initiate pulse is the timing signal fed to the Limiter Drive PCB, which generates the control for the biased limiter. It is started by the edge of the Pre-trigger (approximately 2 μ s prior to magnetron firing) and terminated 2.5 μ s after the leading edge of the magnetron sample pulse.

The PCIO and PM Triggers are essentially the same trigger and are present at all times when the radar is powered up. They are initiated by the Modulator Pulse and last for approximately 2.5 μ s.

2.7.8.4 Analogue Outputs

The Trigger PCB generates four tuning signals:

- LO Tune
- PM Tune
- Xr Adjust
- Xt Adjust

These signals are coded as 12-bit digital values and incorporated into the serial messages from the PCIO. A 12-bit, four-channel DAC is used to generate the tuning signals from the message data. Additional buffering is added to the LO and PM Tune outputs of the DAC and $\times 3.5$ amplification to the Xr and Xt Adjust signals.

LO Tune is the 0V to +5V receiver tuning control and PM Tune the 0V to +5V PM main tuning control. Xr and Xt Adjust are 0V to +15V signals used to control the receive and transmit attenuators in the PM.

2.7.8.5 Analogue Inputs

There are various analogue inputs to the Trigger PCB from other PCBs in the Transceiver. There are also some on-board signals that are fed into an eight channel 8-bit ADC, and converted to digital values. These are used for further processing by the microcontroller, or are passed to the PCIO via the serial message link.

The signals on the Trigger PCB that are measured are the dropout timer and +12V and +30V supplies. The timer circuit is basically a capacitor that slowly discharges (between 4s and 18s) when power is removed from the PCB.

The microcontroller determines whether the transceiver has been switched off for long enough to require inhibiting transmit. Transmit is inhibited for three minutes until the magnetron heaters have had time to warm up again. The power supply levels are measured and the results sent to the PCIO as an aid to fault diagnosis.

One channel of the ADC is used to detect if a PM has been fitted to the system. The voltage on this channel will be lower than a preset value if a PM is present otherwise it will be pulled to the +5V supply rail. This information is encoded and sent as part of the configuration message to the PCIO.

The Receiver sends a tune indicator signal to the Trigger PCB, which shows how close it is to being on tune. This signal is coded as part of the serial message and sent to the PCIO.

The other analogue signals into the Trigger PCB come from the Modulator. The Modulator supply voltage and the magnetron current (only when transmitting) are measured and sent to the PCIO as an aid to fault finding.

The spark gap detect signal is generated by the modulator when the magnetron arcs over. If it reaches a predetermined level the microcontroller inhibits transmission for approximately one second and sends an error message to the PCIO.

2.7.8.6 Digital Outputs

The digital outputs from the Trigger PCB are all simple on/off control signals to various parts of the transceiver.

Signals to the Receiver select wide or narrow bandwidth (Wideband) and AFC (AFC On) or manual tuning mode. Narrowband is selected when the modulator is transmitting in long pulse and briefly during pulse length changing. AFC or manual mode is selected by the radar operator and is part of the control message sent from the PCIO.

Modulator signals MP and SP are used to set the pulse length as requested by the radar operator:

- SP set to 0V indicates short pulse operation
- MP set to 0V indicates medium pulse operation
- Both SP and MP set to +5V indicates long pulse operation.

- SP and MP both set to 0V is an illegal state and will not happen in normal operation.

Turndown enable is used to reduce the heater current in the magnetron. It is only set when an S-band magnetron is fitted and is transmitting in long pulse.

The control signals PM On/Off and PM Tx/Rx are used to switch the PM on and to switch it between system test mode and receiver test mode.

TU Enable is the control signal fed to the Motor Drive PCB to start the antenna rotating. When the operator selects transmit, the TU Enable signal is activated to start the antenna rotating.

Once the antenna has done one complete revolution transmission is started. When standby is selected, transmission is immediately halted and, after one complete revolution of the antenna, TU Enable is disabled.

2.7.8.7 Optional I/O

There are several optional I/O signals for use with Special Options variants of the PCB:

- Pre-trigger (as describe in the section on triggers)
- External Trigger Input
- Radar Inhibit

The External Trigger input is used when the modulator needs to be triggered from an external source rather than the Trigger PCB. Trigger signals fed to this input are PRF limited to prevent damage to the modulator.

Radar Inhibit is a method of inhibiting transmission without using the appropriate command in the serial message. An active signal at this input will cause the microcontroller to inhibit transmission within one trigger pulse at either of the internal PRFs.

2.7.9 Built In Self Test (BIST)

The microcontroller performs several self-test operations and reports the results to the PCIO as part of the serial message link.

Error situations that are monitored in the Transceiver are:

- Serial message corruption
- Loss of PCIO messages
- Loss of Heading Marker signal
- Loss of either Charge or Modulator Trigger
- Magnetron arcing

Error situations will in all cases cause the microcontroller to inhibit transmission until the error has been cleared. The other signals that are monitored and sent directly to the PCIO without further action by the microcontroller are the power supply lines and magnetron current (described in Section 2.7.8.2 '*Functional Description (Trigger PCB)*').

2.7.9.1 Test Modes

There are two test modes for the Trigger PCB. The production test mode is used solely during production testing of the PCB and is initiated by fitting the test link LK4. This must only be done on the production test bed as connecting this link when incorporated into a Transceiver could lead to unpredictable and possibly dangerous operation.

The second test mode, of use to service engineers, can be initiated by fitting the two links LK5 and LK6 to position 2–3. When in this mode the Transceiver can be removed from the turning unit, reconnected to the PCIO below decks (with suitable test cables) and run as per normal operation. A dummy load **MUST** be connected to the RF output.

In this mode, the Transceiver has been removed from the Turning Unit and the Pulse Bearing PCB outputs. The bearing and heading marker information normally required for Trigger PCB operation is simulated on a section of test circuitry on the Trigger PCB.

2.7.10 Transceiver Power Supply

2.7.10.1 General Information

The power supply is an AC to DC inverter that generates the supplies for the Transceiver. The inverter is housed on a single board and is powered by an AC supply of nominal 110/120V (low voltage) or 220/240V (high voltage) in the frequency range 50 to 60Hz.

The power unit uses a boost converter front-end to supply a regulated high-voltage DC to a flyback converter supplying the output. Some of these supplies use additional switch mode converters to supply regulated outputs.

The outputs supplied by this power supply are:

- Variable -600V
- +30V
- +20V
- Magnetron heaters (via further regulator, +12V, -12V and +5V)
- +50V for the Motor Drive PCB (for the X-band Turning Unit variant).

The power unit has the following features:

- -600V adjustable over the range -550V to -650V for control of magnetron current via modulator.
- Output short circuit protection.
- Universal input from 95V to 276V without tap changing. Power factor corrected providing a PF of better than 0.9.

The opto-coupler detects the presence of a serial data stream from the PCIO at PLTH 11, 12. The flyback converter switches on and the photo-transistor in U5 is turned on, pulling down the gate of Q2 to below its threshold voltage. Q2 turns off, letting the voltage increase on compensation pin 1 of U4. The output of IC U4 is enabled. In the PSU off state, Q2 is kept on by current in R37 from Vcc.

For test purposes the PSU can be turned on in the absence of a serial data stream by linking 1–2 on LKA.

Note: *After the mains supply is applied to the PSU board, the Power Factor Correction (PFC) circuit starts and generates 390V. While mains power is applied, the PFC is active and cannot be manually switched off. The start circuitry only controls the flyback converter and so high-voltage DC is present on primary power components whenever mains is present on the board.*

2.7.11 Modulator PCB

2.7.11.1 Functional Description

The principal function of the Modulator PCB is to generate an 8kV, 8A negative pulse to drive the cathode of the magnetron. An SCR is used to resonantly charge a Pulse Forming Network (PFN) to -1200V from the -600V Modulator HT supply. The Charge Trigger starts the charging cycle. The number of sections of the PFN can be selected by the replays that are controlled by the Pulse Length Control Lines. The number of sections of the PFN used defines the length of the output pulse.

At a defined time after the PFN is fully charged it is discharged by three series-connected Insulated Gate Bipolar Transistors through a pulse transformer. The Modulator Trigger starts the discharge. The Pulse Transformer, which has a set-up ratio of 12:1, transforms the resulting pulse to 8kV. A saturable reactor, connected across the primary of the pulse transformer, speeds up the back edges of the medium and short pulses.

Other functions include:

- regulating the magnetron heater supply;
- monitoring a spark gap to make sure the magnetron operates correctly; and
- generation of a timing reference for the Radar Trigger.

2.7.11.2 Inputs to the Modulator PCB

- -600V Modulator HT Supply
- +20V Modulator Trigger Supply
- +16V - +27V Magnetron Heater Bulk Supply
- +12V
- -12V

Short Pulse Control Line	When 0V selects short pulse.
Medium Pulse Control Line	When 0V selects medium pulse.
Charge Trigger	Starts charging of Pulse Forming Network. Typically 1Amp current pulse.
Modulator Trigger	Starts discharging of Pulse Forming Network. Typically 4 μ s, 3.5V positive pulse.
Turn Down Enable	DC voltage controls the magnetron heater voltage. 0V on long pulse, 3.5V Standby Medium and Short Pulse.

2.7.11.3 Outputs from the Modulator PCB

Primary sample	Positive pulse sample from pulse transformer used to initiate Radar Trigger. Typically 40V amplitude.
Magnetron current sample	A DC voltage proportional to the magnetron current derived from the secondary of the pulse transformer. Typically +2.5V.
TX Active	A signal that is normally 0V that rises to >2.5V if the spark gap operates continuously for 2 seconds. This signal is used by the Trigger PCB to indicate a transmitter fault to the PCIO.
HT Sense	Sample of Modulator HT Supply fed to Trigger PCB for inclusion in BITE message sent to PCIO.
TX Define	Link settings used to define modulator type to Trigger PCB. 0V or 3.5V dependant on link settings.

2.7.11.4 Magnetron Heater Supply

The magnetron heaters are derived from the Magnetron Heater Supply at PLVD1 and PLVD2. This supply may vary between 16V and 27V.

The setting of link LK1 (fitted to the Modulator PCB) configures the Modulator PCB for the intended magnetron. Refer to Figure 7.10 '*Modulator PCB Link Settings*' for further information.



WARNING!

NEVER measure the heater voltage while the Transceiver is transmitting.

Table 5: X-band & S-band Magnetron Heater Supply

System	Mode	Required Magnetron heater voltage (measured between TSJ1 and TSJ2)
10kW X-band	Standby, Short Pulse, Medium Pulse and Long Pulse	6.1V
25kW X-band	Standby, Short Pulse and Medium Pulse	6.1V
	Long Pulse	Can be reduced to 5.1 V depending on the type of magnetron fitted
30kW S-band	Standby, Short Pulse and Medium Pulse	6.1V
	Long Pulse	Can be reduced to 5.1 V depending on the type of magnetron fitted

2.8 Error Messages and Tellbacks for Transceivers

2.8.1 Error Messages

The following errors may be reported by the Transceiver:

2.8.1.1 Message Failure

The Transceiver expects to receive a message from the PCIO at least once per second. If the message rate drops below this level, the transmitter is switched to Standby and a 'Message Fail' error is shown. The Transmitter will remain in Standby until the next message is received which contains a 'transmit request bit' set to transmit.

Possible causes

- Controlling device failure.
- Inter unit cabling.
- Inter PCB cabling in Transceiver.
- Defective Input PCB (signal is only looped through).
- Defective Trigger PCB.

2.8.1.2 Corrupt Data

The Transceiver checks the parity of each character in an incoming message and verifies the checksum for each complete message. If enough corrupt messages are received a Corrupt Data error is returned.

The Transceiver stays in the state it was in when it received the last valid message. Normal operation will be resumed, and the Corrupt Data error will be cleared, when the next valid message is received.

Possible causes

- Controlling device failure.
- Bad connections or earth bonding on inter unit cabling between Transceiver and controlling device.
- Defective Inter PCB cabling in Transceiver.
- Defective Input PCB (signal looped through only).
- Defective Trigger PCB.

2.8.1.3 Spark Gap Detect

The Modulator contains a spark gap to protect the pulse transformer from excessive voltage if the magnetron misfires.

If the spark gap operates for more than two seconds this is detected and a Spark Detect error is signalled. The Transmitter is switched to Standby.

Possible causes

- Magnetron instability at end of its life.
- Missing magnetron heaters, due to Modulator PCB failure.
- Failure of Magnetron Heater Supply from the Power Supply PCB.
- Defective Inter PCB cable from Power Supply to Modulator PCB.
- Defective Modulator PCB.
- Defective Trigger PCB.

2.8.1.4 Heading Marker Failure

When operating normally the transmitter will not transmit unless the antenna is rotating. Antenna rotation is confirmed by checking for the presence of the Heading Marker.

If the Heading Marker is missing, but azimuth pulses are still present, the Transceiver will be switched to Standby and a Heading Marker Failure error message is shown on the Display.

Transmission is restored if a Heading Marker is detected, provided the PCIO has not switched the transmitter to standby.

Possible causes

- Defective Inter unit cabling from Transceiver to Scanner unit.
- Defective Digitiser or Pulse Bearing Board in Turning Unit.
- Incorrectly configured Input PCB.
- Defective Input PCB.

2.8.1.5 Mod Trig Fail, Charge Trig Fail

The Trigger PCB generates the Modulator, and Charge Triggers. If either pulse is detected as missing a Trigger Error message is returned.

Possible causes

- Defective Trigger PCB.

2.8.2 Transceiver BITE Data

The following information is transmitted from the Transceiver to the PCIO unit to be shown in the TxRx BITE folder of the Diagnostics sub menu.

Table 6: Transceiver BITE data

Parameter	Normal Range	Remarks
Magnetron Current	6.0A to 9.5A	25kW and 30kW
+12V Supply	+11V to +13.4V	
+30V Supply	+26V to +36V	
Modulator Volts	-500V to -680V	
Swept Gain	On or Off	BME transceivers only
Spark Gap	Pass	
Corrupt Data	Pass	
Message Failure	Pass	
Heading Marker	Pass	
Mod Trigger	Pass	
Charge Trigger	Pass	

Transceiver BITE data is only approximate and must not be used for making adjustments. A deviation from the above values shows a possible fault condition.

2.8.3 Tellbacks

Within the serial data transmitted by the Transceiver are a number of status tellbacks to show the Transceiver status. This data is monitored and shown on the Display unit.

The following tellbacks are used:

2.8.3.1 Transmit

This bit is set if the controlling device requests transmit and:

- The transceiver has completed its warm up.
- The Heading Marker has not failed.
- There is not a Message Fail error.
- There is not a Spark Gap error.

2.8.3.2 Inhibit

This bit is set whenever the Display unit requests 'Transmit' and the transmitter is inhibited. For example, when the Radar Silence input is active on units fitted with the 'additional features' option.

2.8.3.3 Medium Pulse and Short Pulse

These bits reflect the status of the pulse length control signals within the Transceiver. They show the status as follows:

Table 7: SP and MP bits

Selection	SP Bit	MP Bit	Receiver Bandwidth
Short Pulse	1	0	Wide
Medium Pulse	0	1	Wide
Long Pulse	0	0	Narrow
(Illegal Code)	1	1	Undefined

2.8.3.4 Wide-band

This bit shows the bandwidth selected for the receiver; when set to “1” “wideband” is selected.

The selected bandwidth is linked to the pulse-width as shown in Table 7.

2.8.3.5 AFC On

This bit indicates the tuning mode selected for the receiver; when set to “1” AFC mode is selected. For some Transceivers, this bit may be permanently set to “1” as a result of internal link settings.


2.8.3.6 Timer

This bit indicates the status of the magnetron “warm-up” timer within the Transceiver. It is set to “0” for a preset period of 180 seconds after the Transceiver is turned on. The timer lets the magnetron cathode reach its operating temperature before the HT is applied.

After the warm-up delay the Transceiver can be turned off. If it is turned back on within 10 seconds the timer will be overridden, letting it immediately return to the transmit condition.

Fault Isolating Flowcharts for S-band Fault Reporting and First Line Servicing and X-band Scanner Units.

2.9 Fault Isolating Flowcharts for S-band and X-band Scanner Units.

WARNING! LETHAL VOLTAGE HAZARD	
	<p>When the covers are removed from the equipment, dangerous voltages are exposed.</p> <p>Only qualified persons should work on the equipment when power is applied.</p> <p>Always isolate the turning unit from the ship's supply before working on it.</p> <p>Always isolate the transceiver from the ship's supply while removing or replacing the transceiver cover.</p>

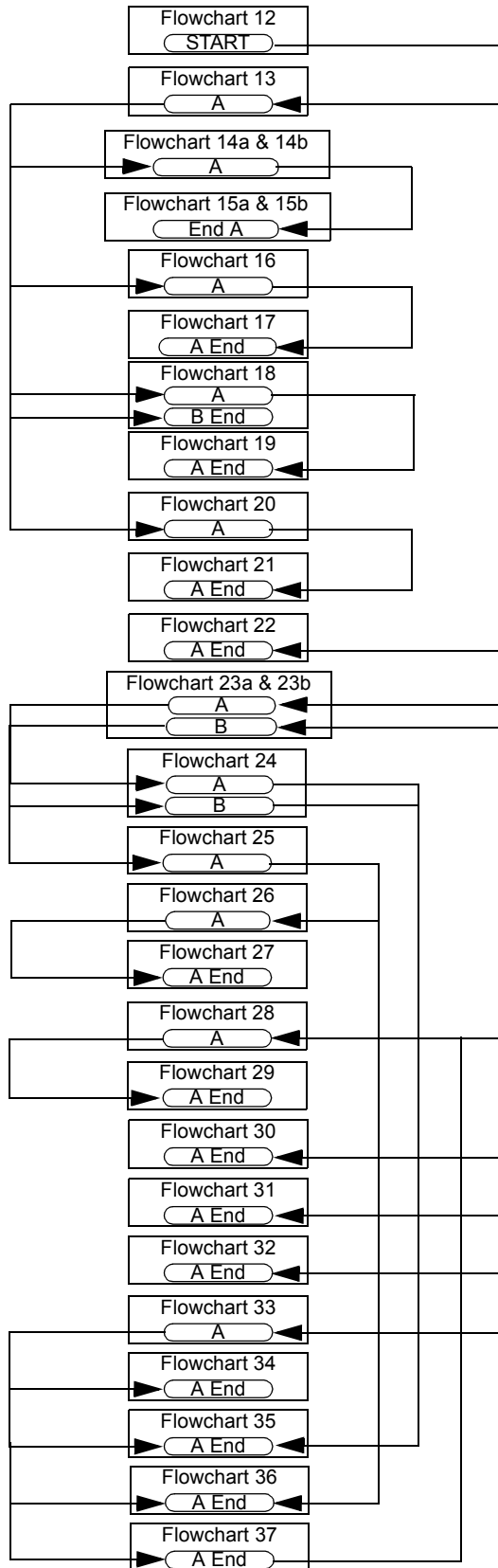
Flowcharts for isolating faults for S-band and X-band Scanner Units are given on the following pages. Flowchart 11 shows the overall flow through Flowchart 12 to Flowchart 37.

The Flowcharts should be read in conjunction with the following notes.

Note: *Before using the following fault finding flow charts visually check the components to make sure there are no loose plugs or connections.*

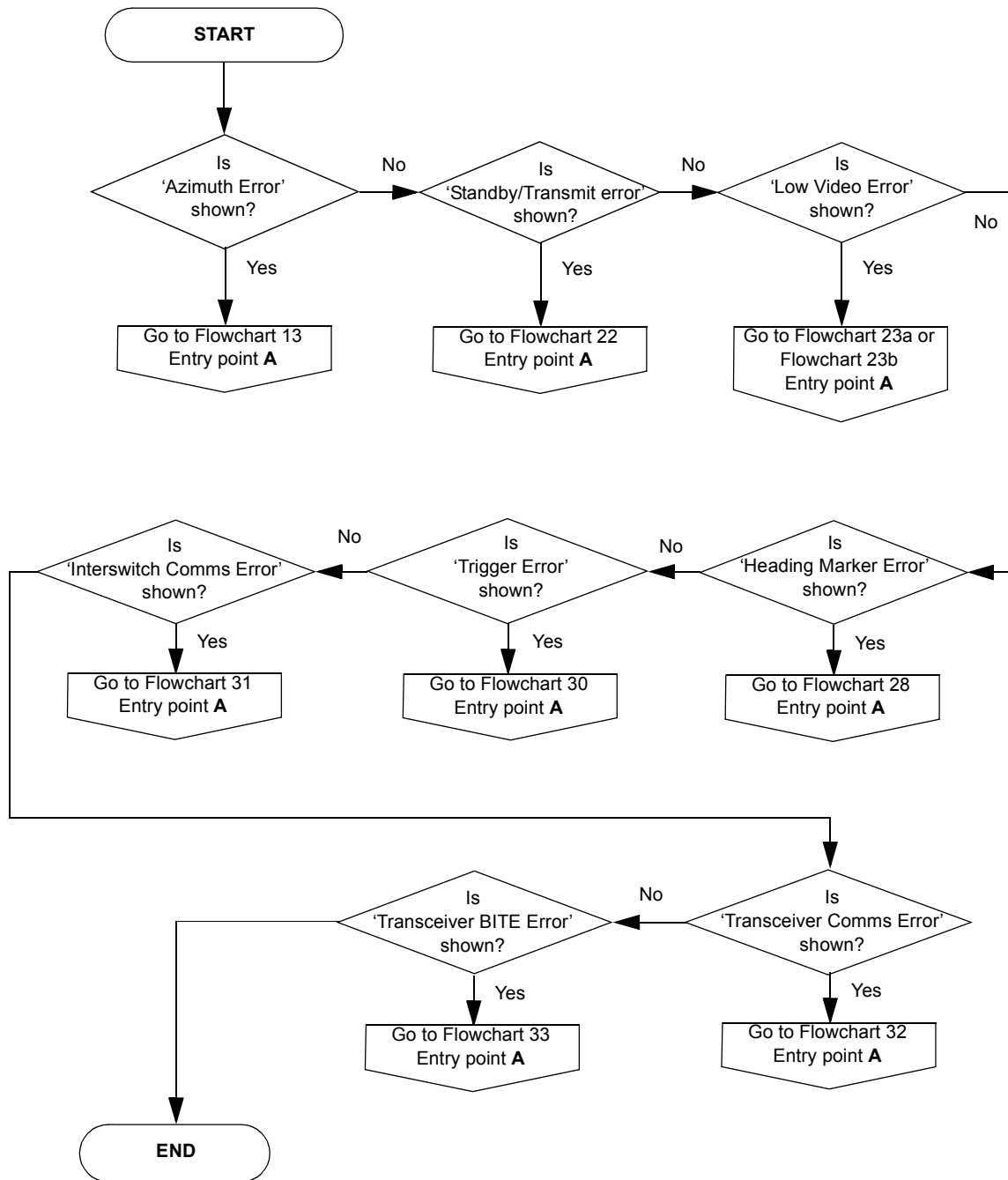
Note: *After checking the connection status of the components always check that the configuration of all components on the system is correct by accessing the Configuration tool, see Chapter 4, 'Configuration'.*

FLOWCHART 11 Overall Flowchart - Scanner Units

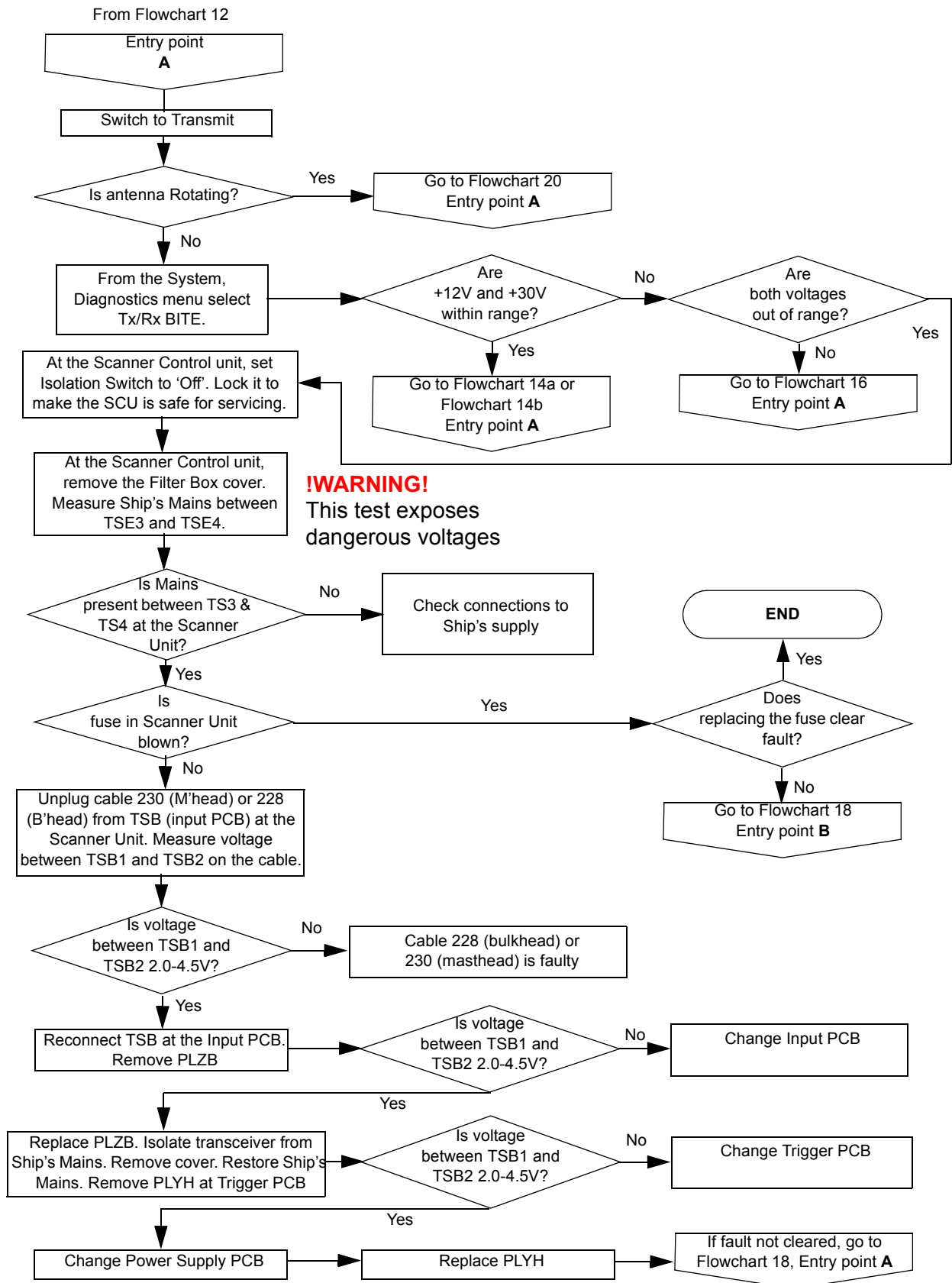


Fault Isolating Flowcharts for S-band Fault Reporting and First Line Servicing and X-band Scanner Units.

FLOWCHART 12 S-band and X-band Hardware Error Messages

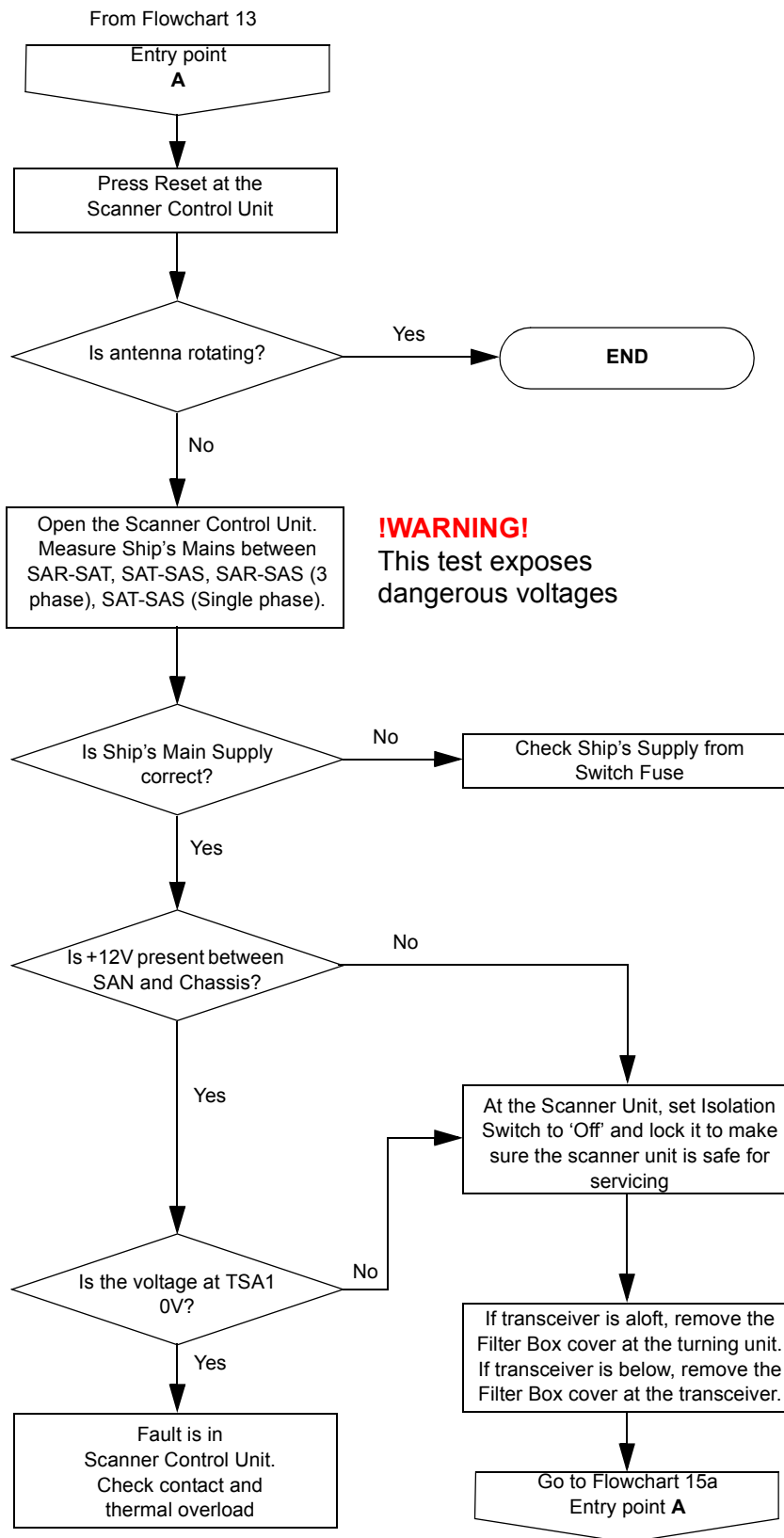


FLOWCHART 13 Azimuth Error Message

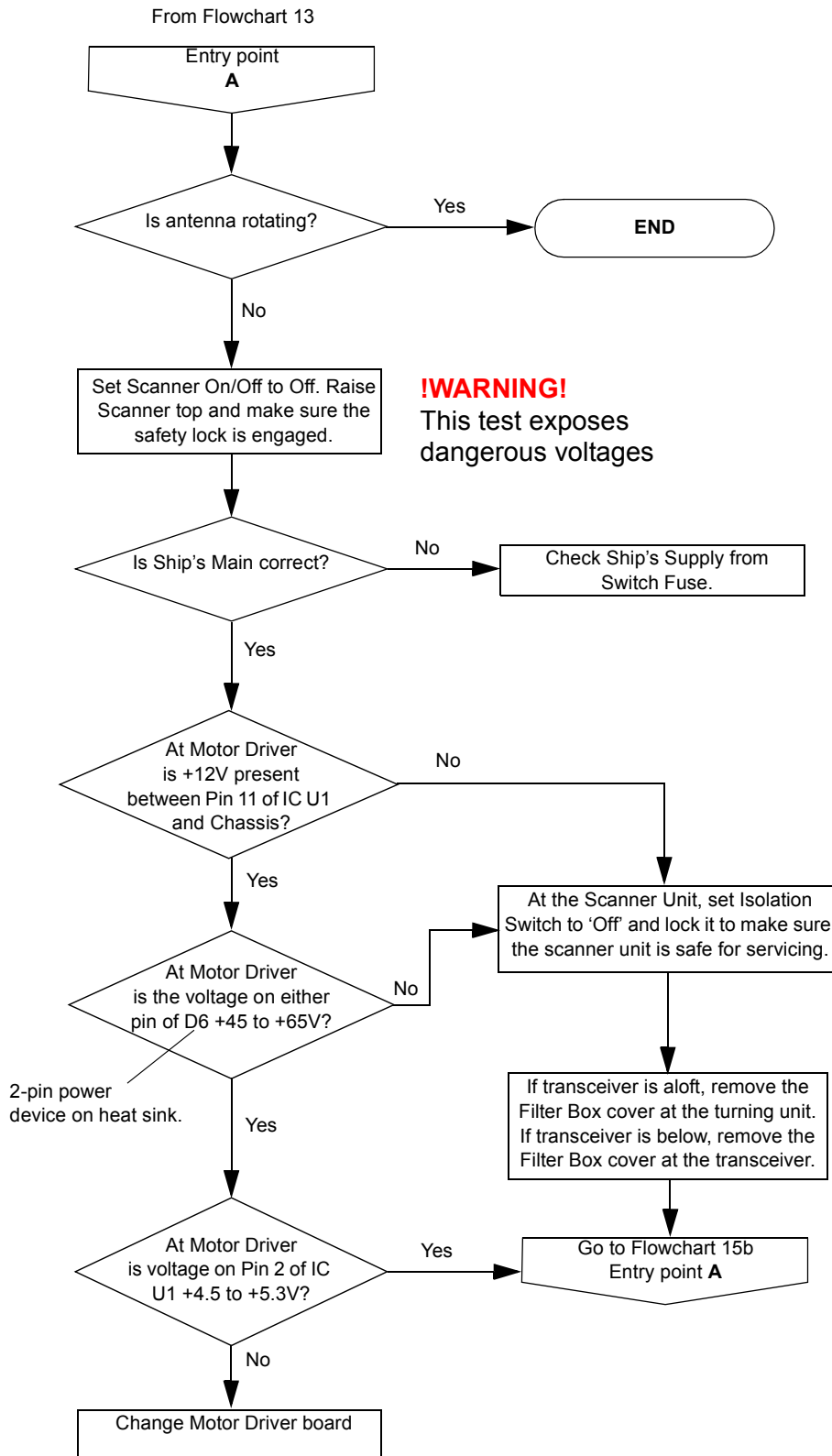


Fault Isolating Flowcharts for S-band Fault Reporting and First Line Servicing and X-band Scanner Units.

FLOWCHART 14A Azimuth Error Message (S-band Scanner)

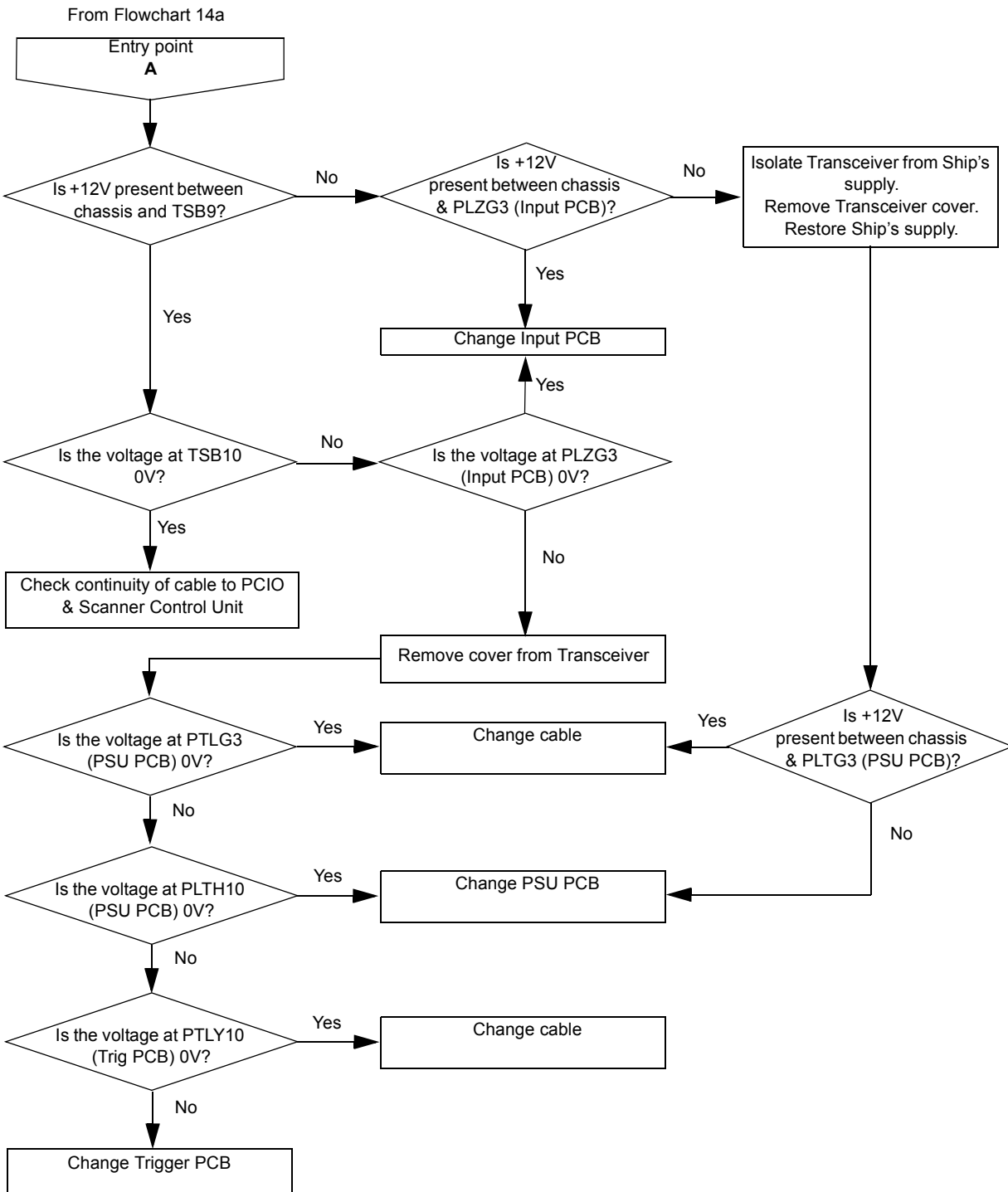


FLOWCHART 14B Azimuth Error Message (X-band Scanner)

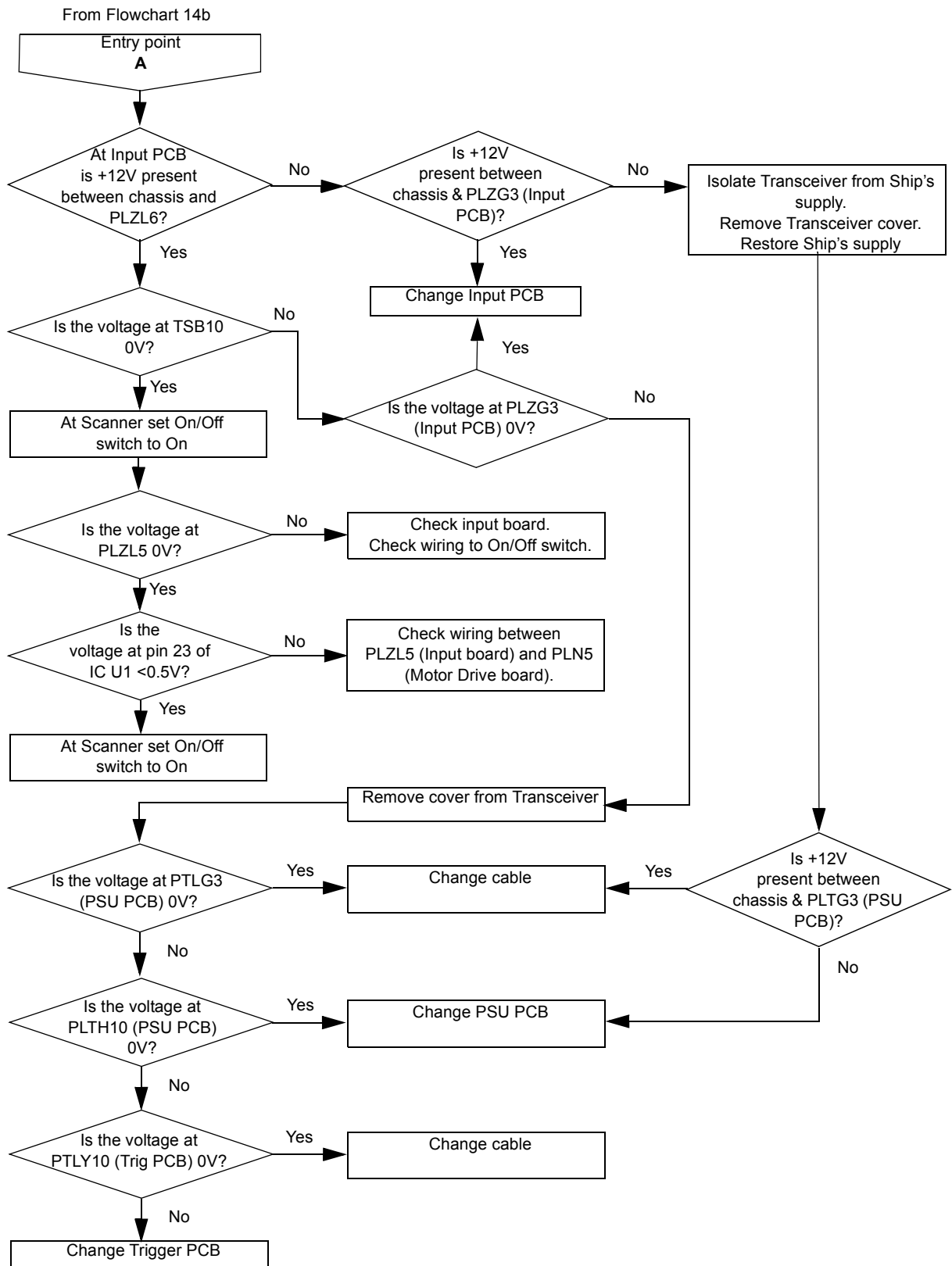


Fault Isolating Flowcharts for S-band Fault Reporting and First Line Servicing and X-band Scanner Units.

FLOWCHART 15A Azimuth Error Message (S-band Scanner)

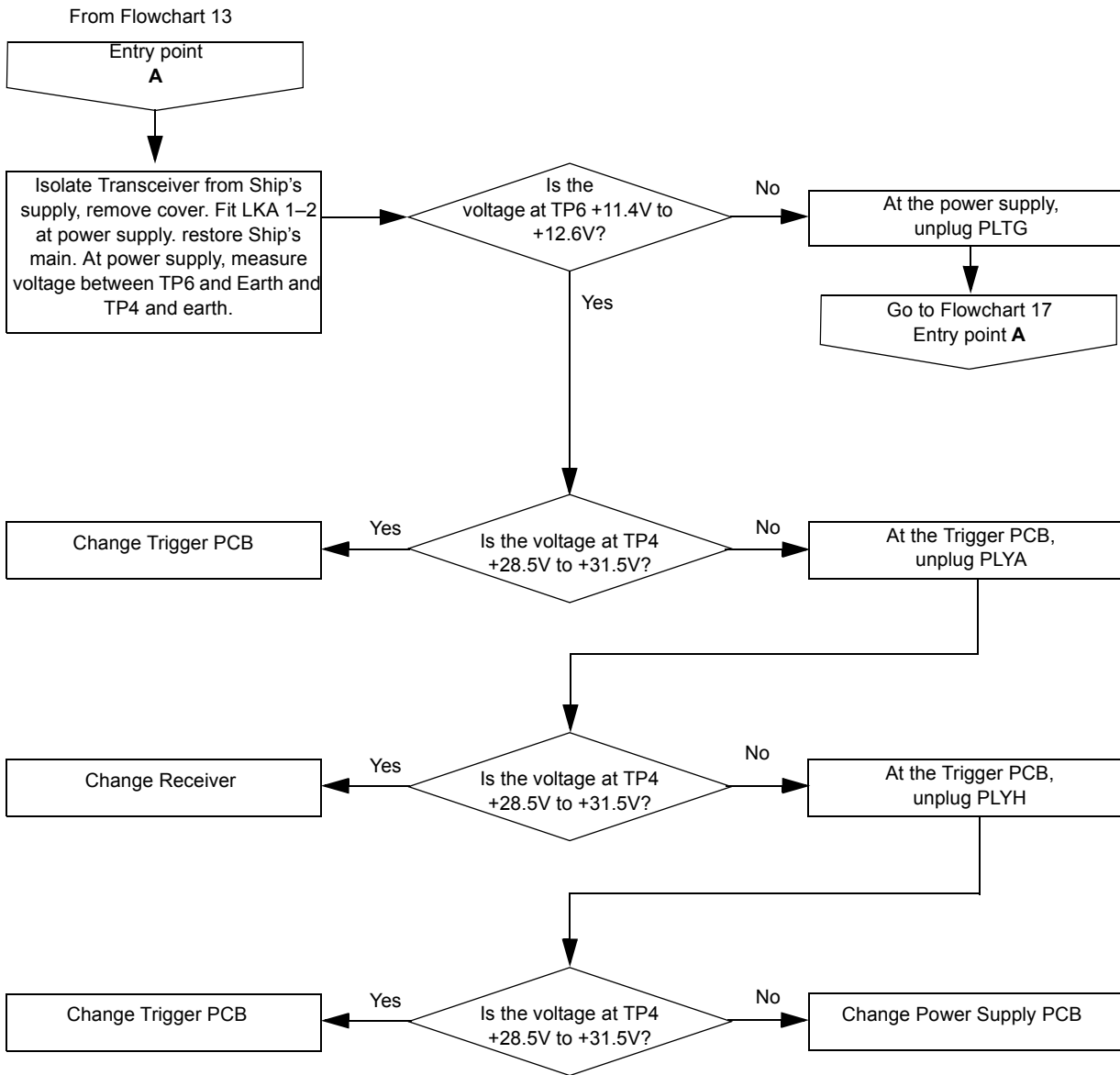


FLOWCHART 15B Azimuth Error Message (X-band Scanner)

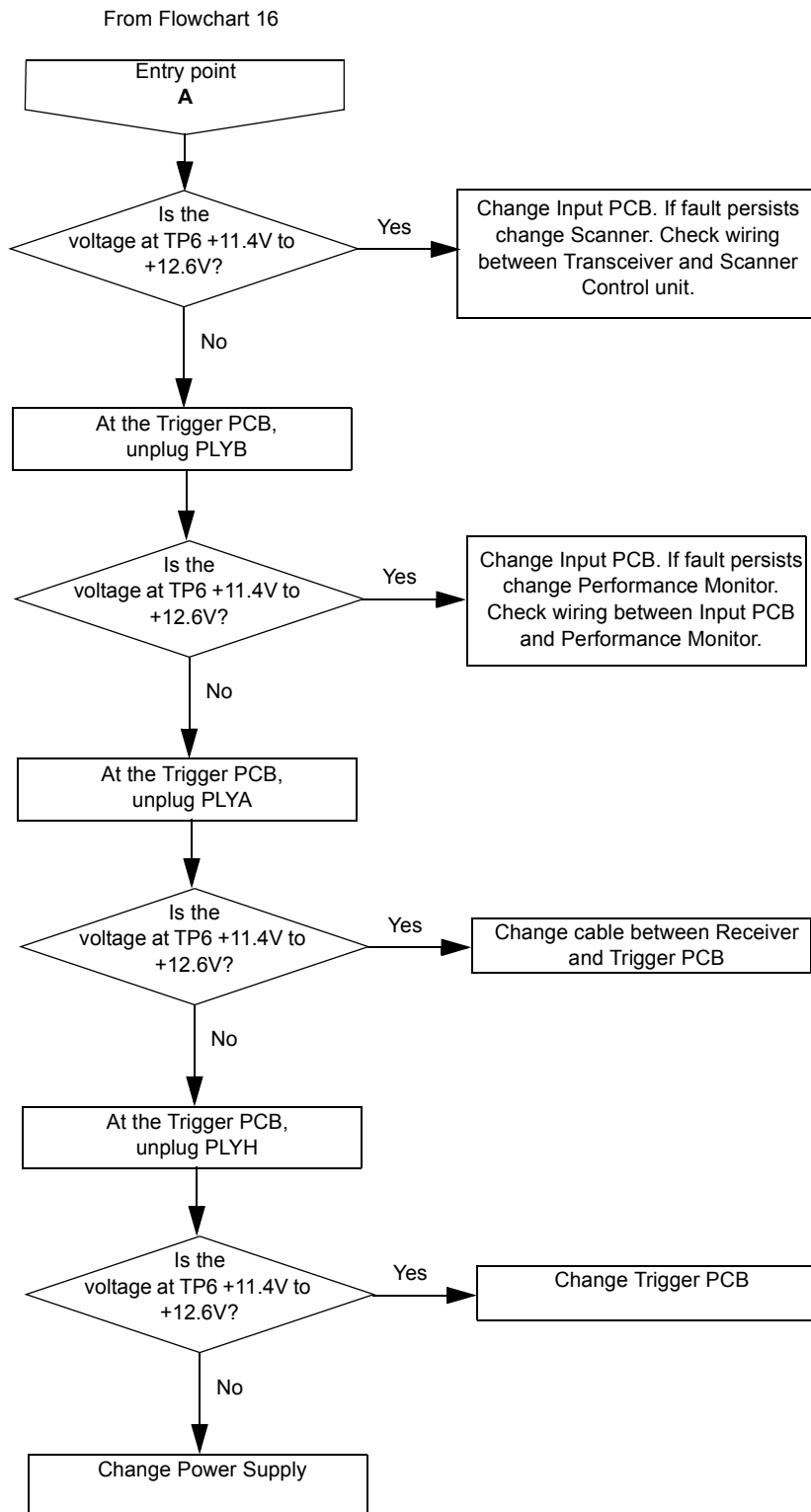


Fault Isolating Flowcharts for S-band Fault Reporting and First Line Servicing and X-band Scanner Units.

FLOWCHART 16 Azimuth Error Message (contd.)

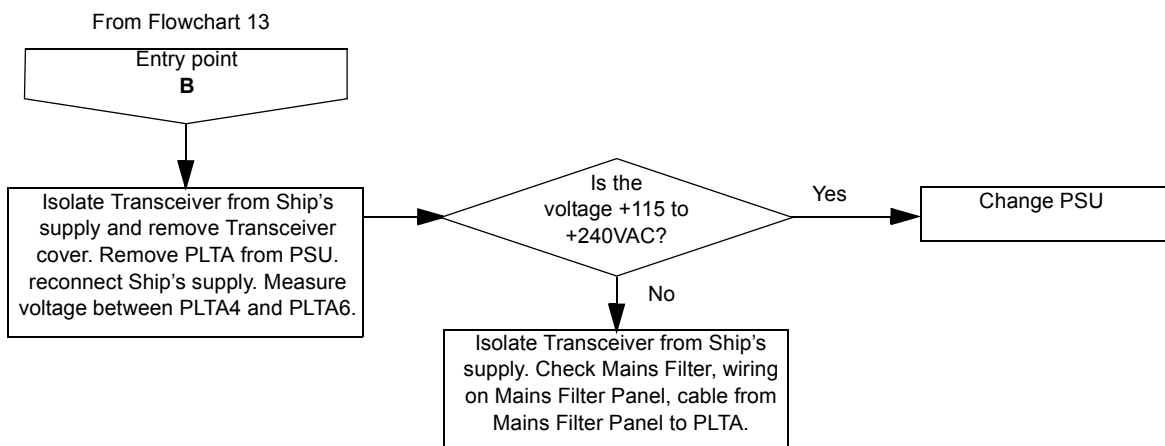
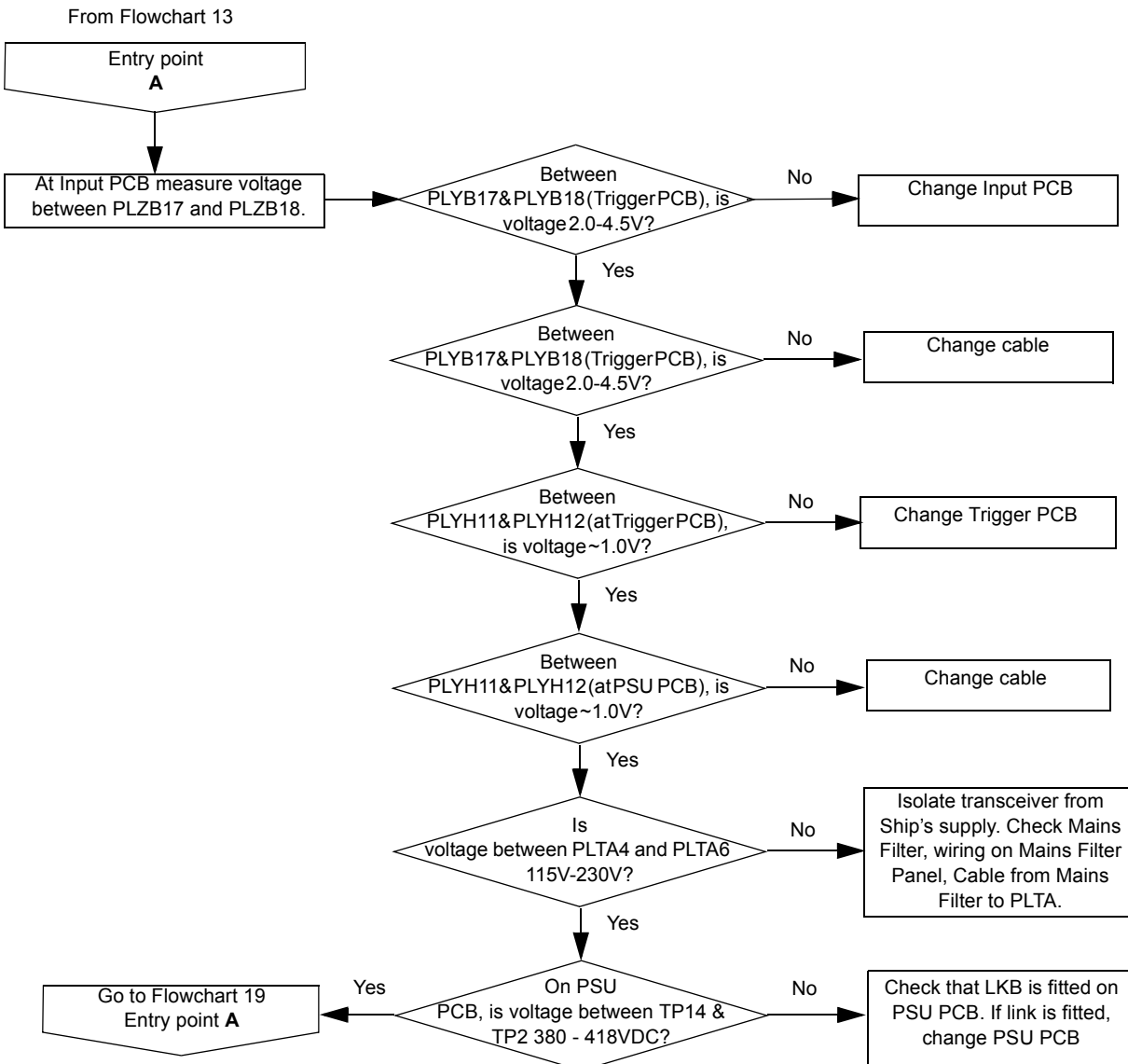


FLOWCHART 17 Azimuth Error Message (contd.)

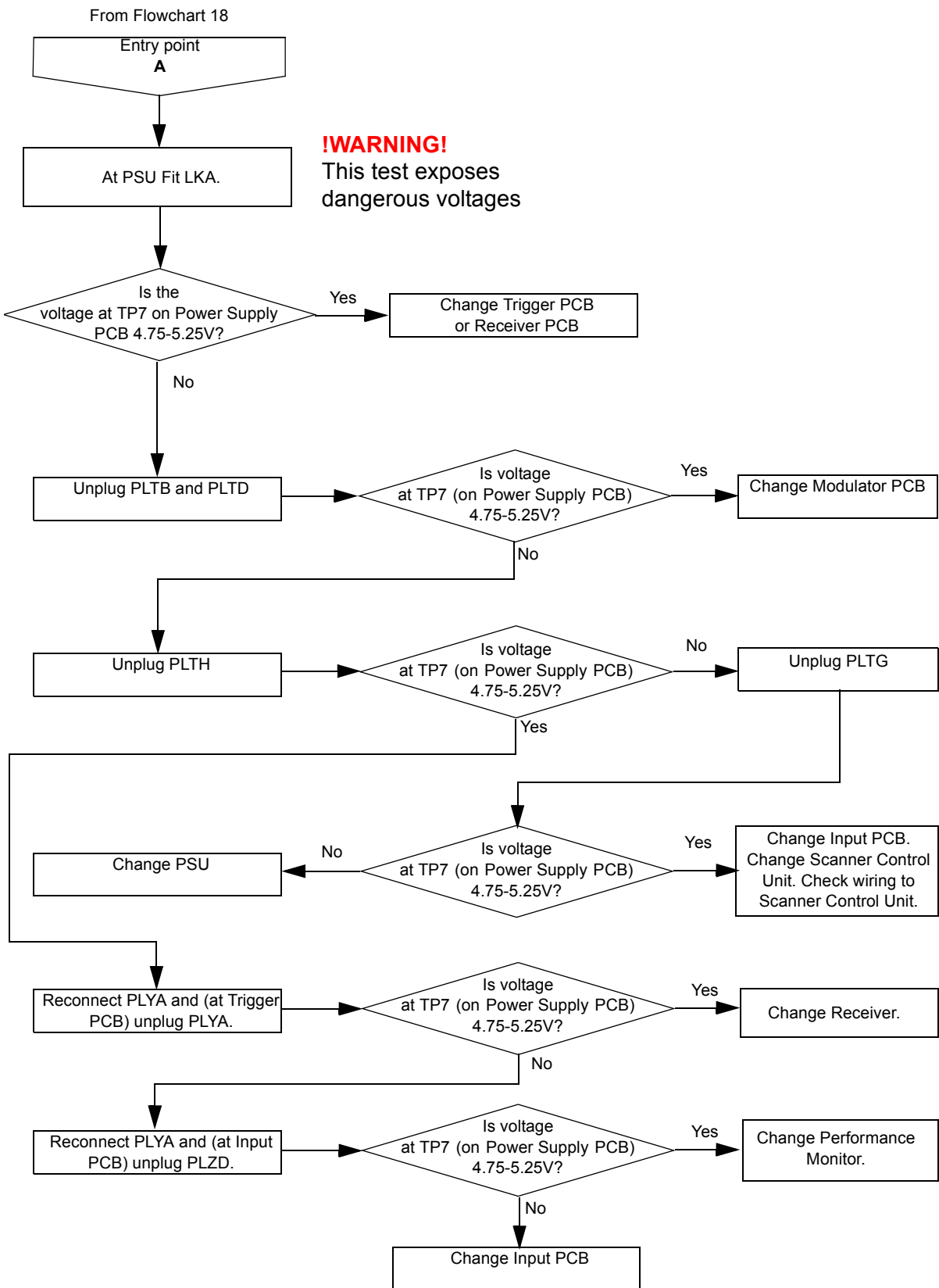


Fault Isolating Flowcharts for S-band Fault Reporting and First Line Servicing and X-band Scanner Units.

FLOWCHART 18 Azimuth Error Message (contd.)

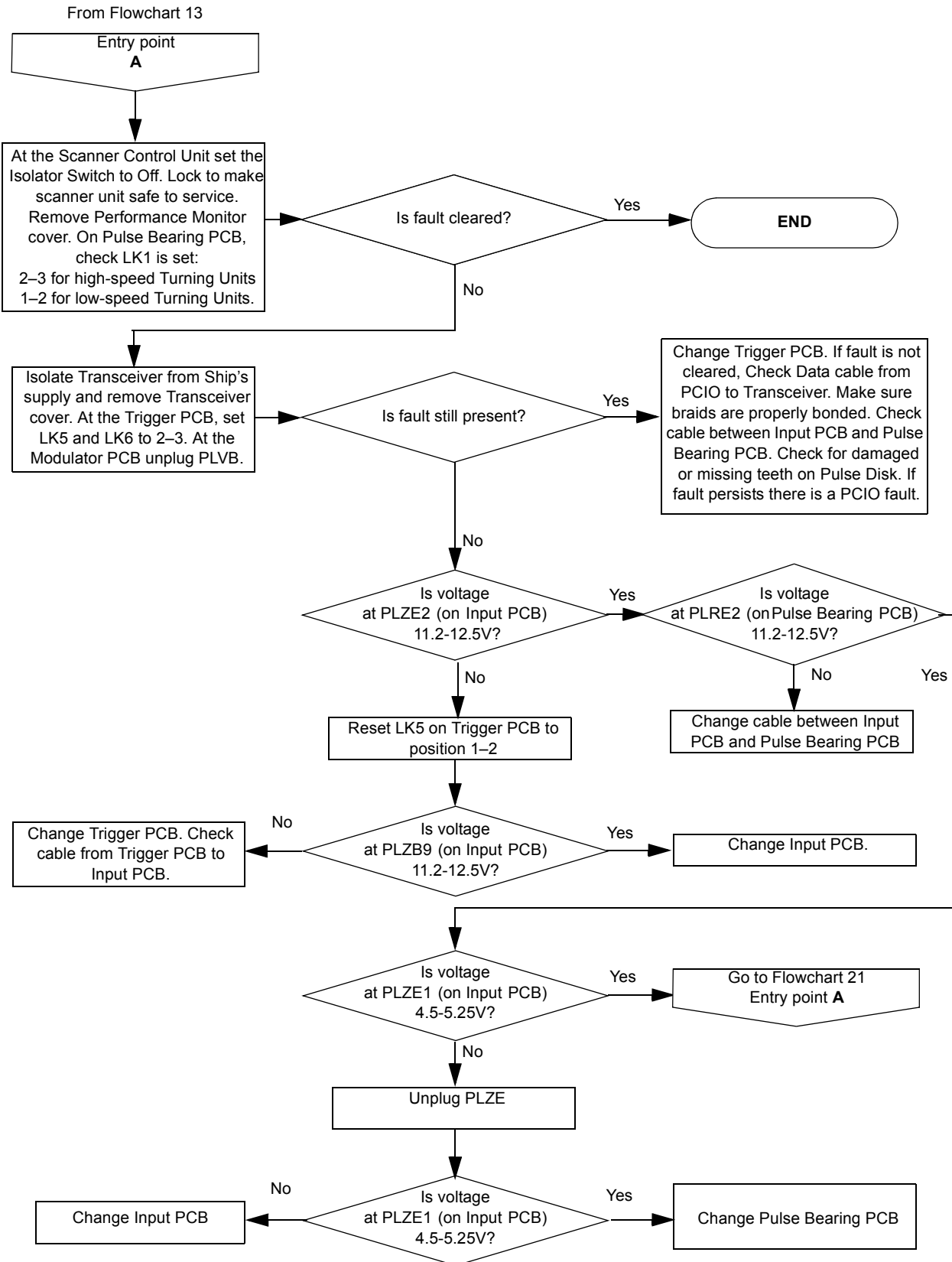


FLOWCHART 19 Azimuth Error Message (contd.)

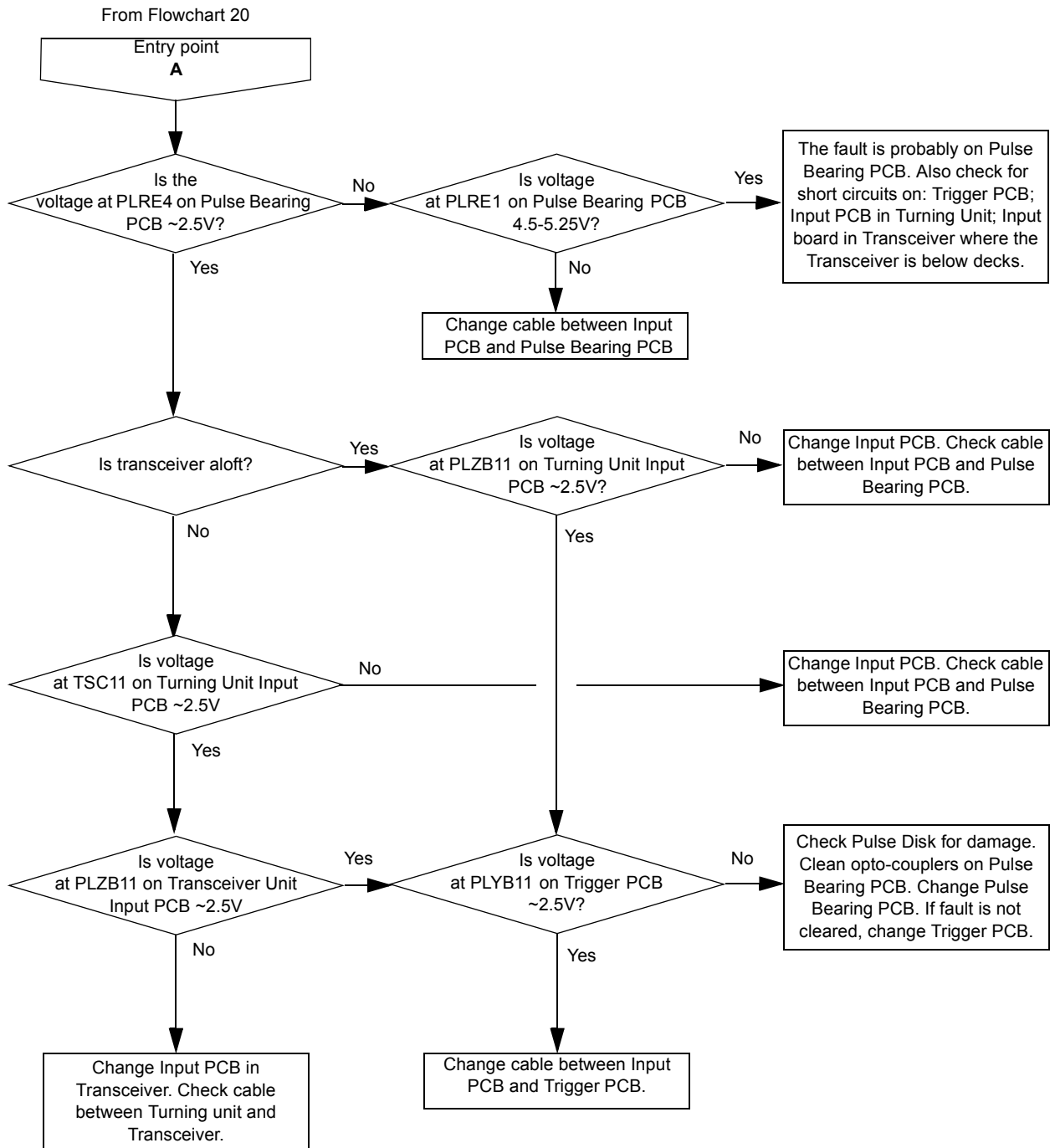


Fault Isolating Flowcharts for S-band Fault Reporting and First Line Servicing and X-band Scanner Units.

FLOWCHART 20 Azimuth Error Message (contd.)

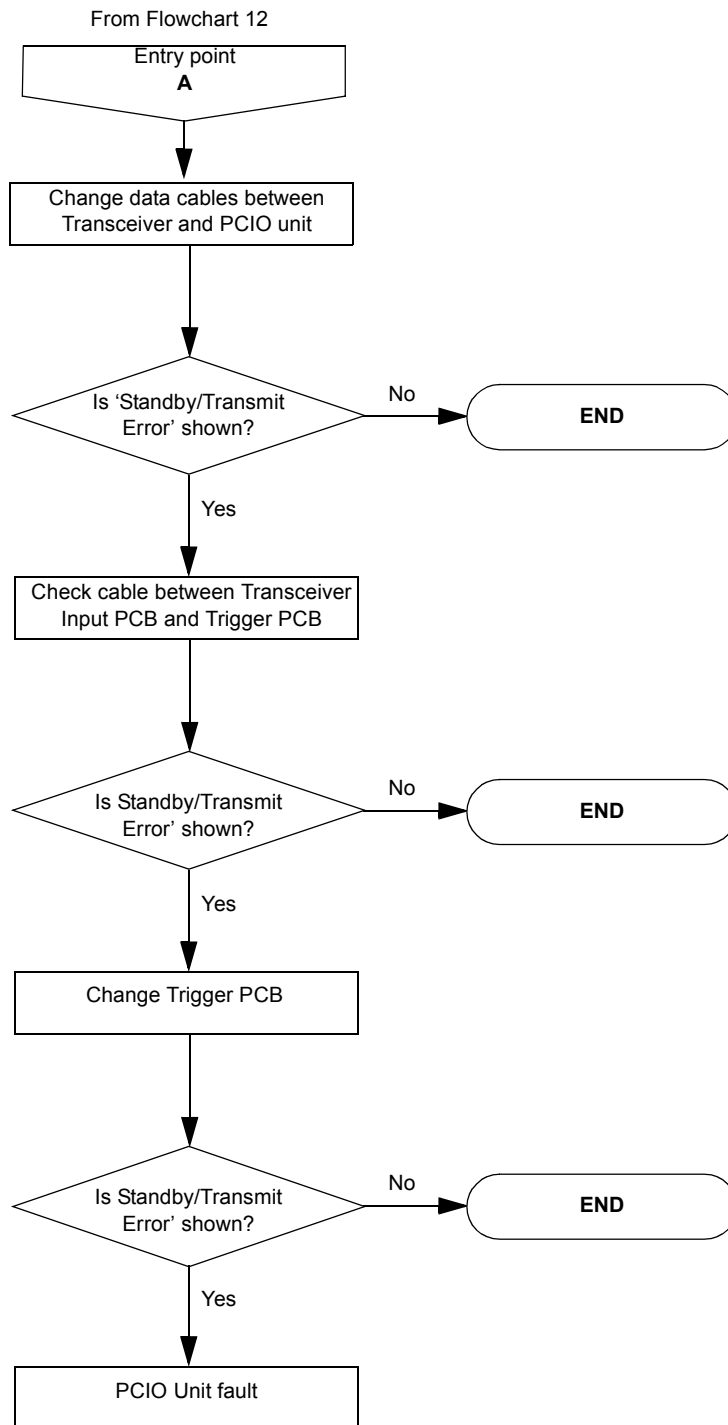


FLOWCHART 21 Azimuth Error Message (contd.)

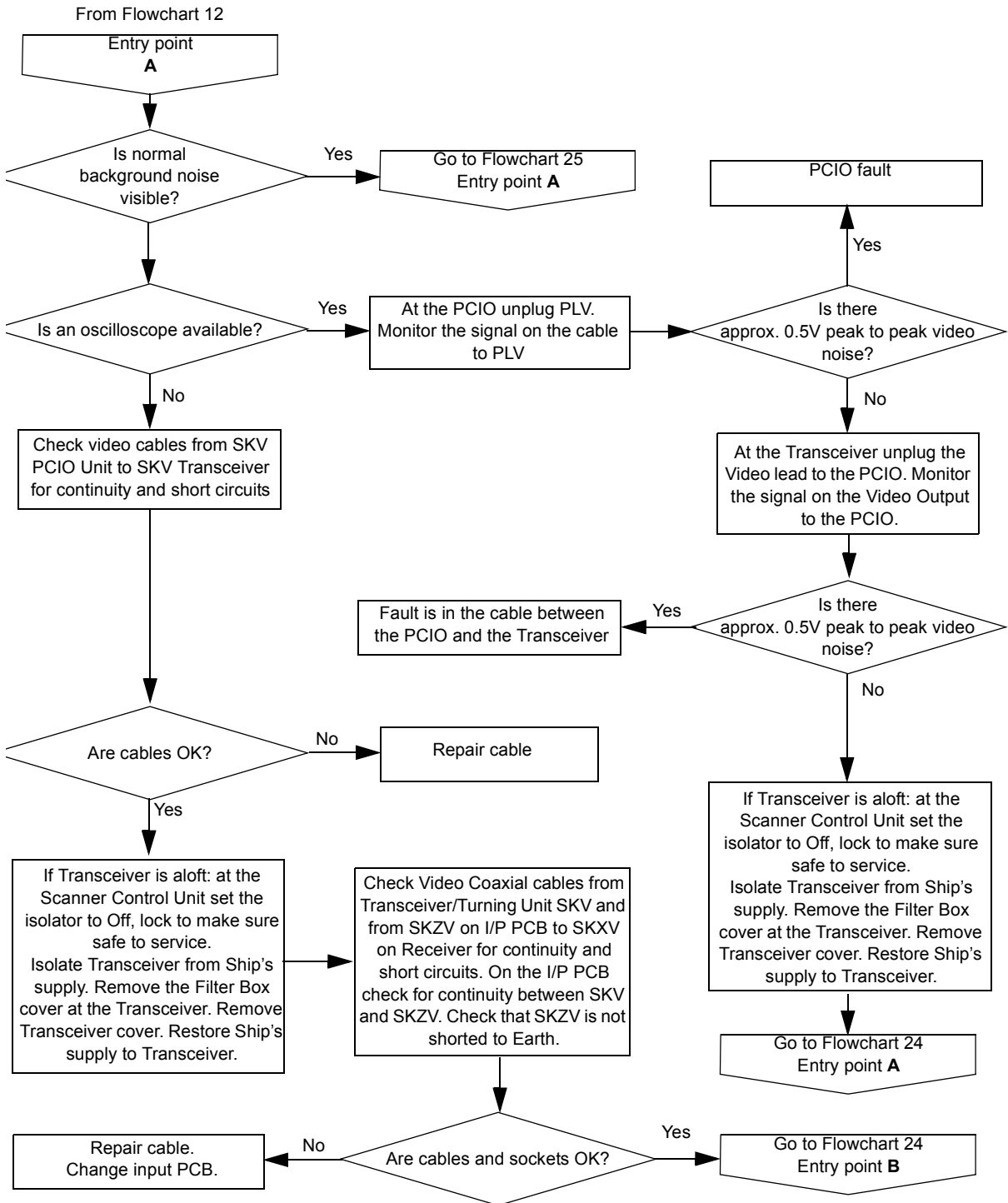


Fault Isolating Flowcharts for S-band Fault Reporting and First Line Servicing and X-band Scanner Units.

FLOWCHART 22 Standby/Transmit Error Message

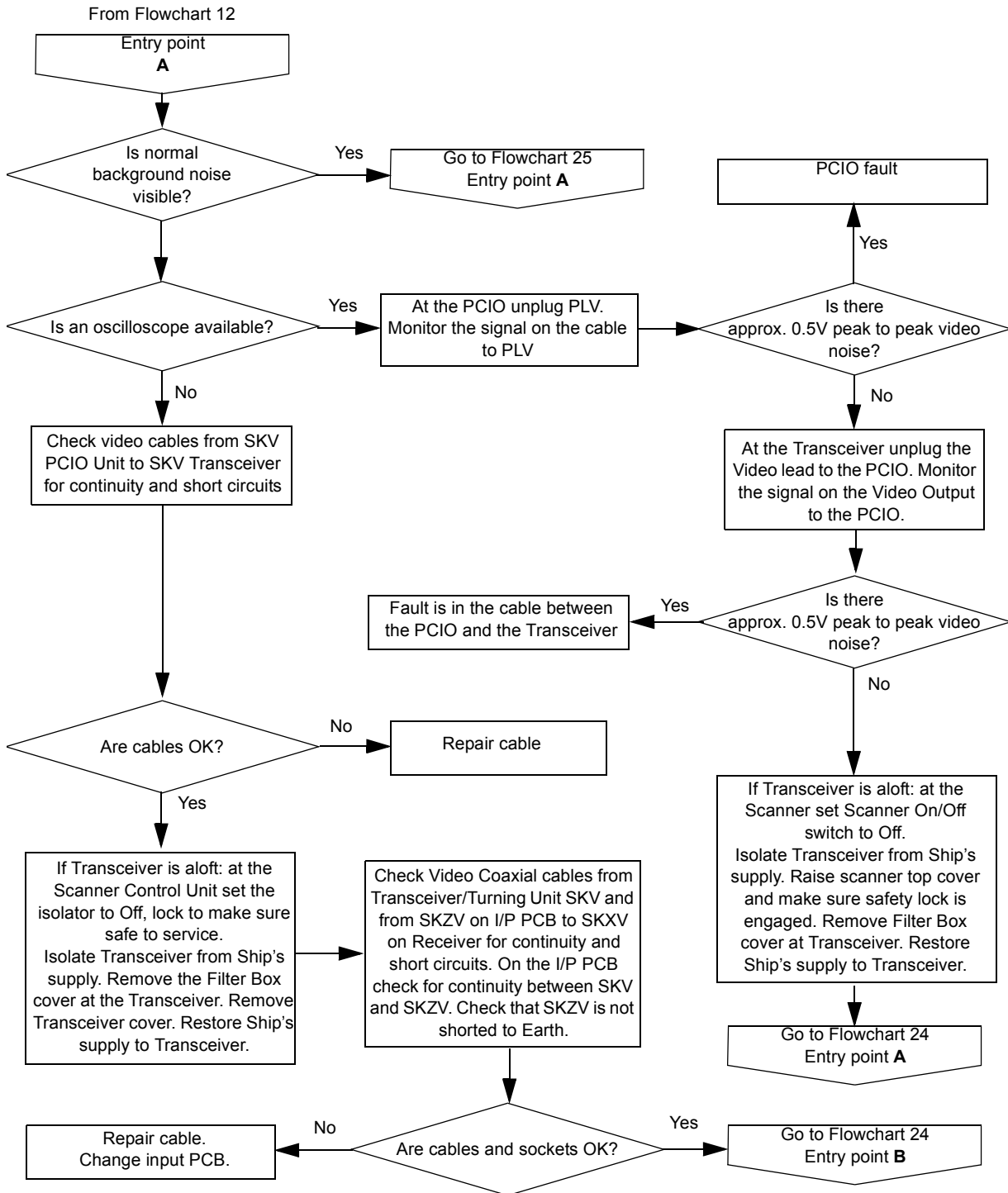


FLOWCHART 23A Low Video Error Message (S-band Scanner)

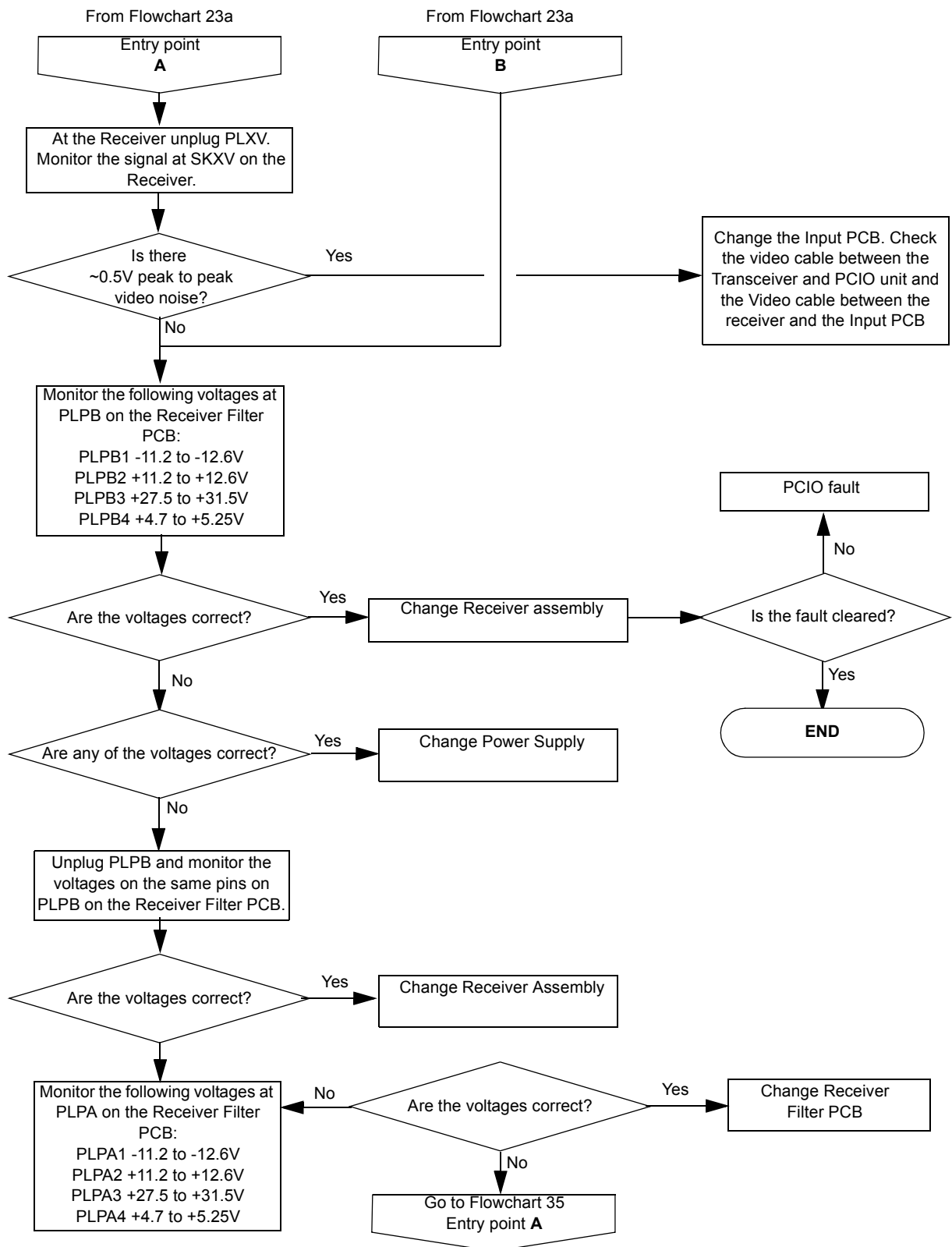


Fault Isolating Flowcharts for S-band Fault Reporting and First Line Servicing and X-band Scanner Units.

FLOWCHART 23B Low Video Error Message (X-band Scanner)

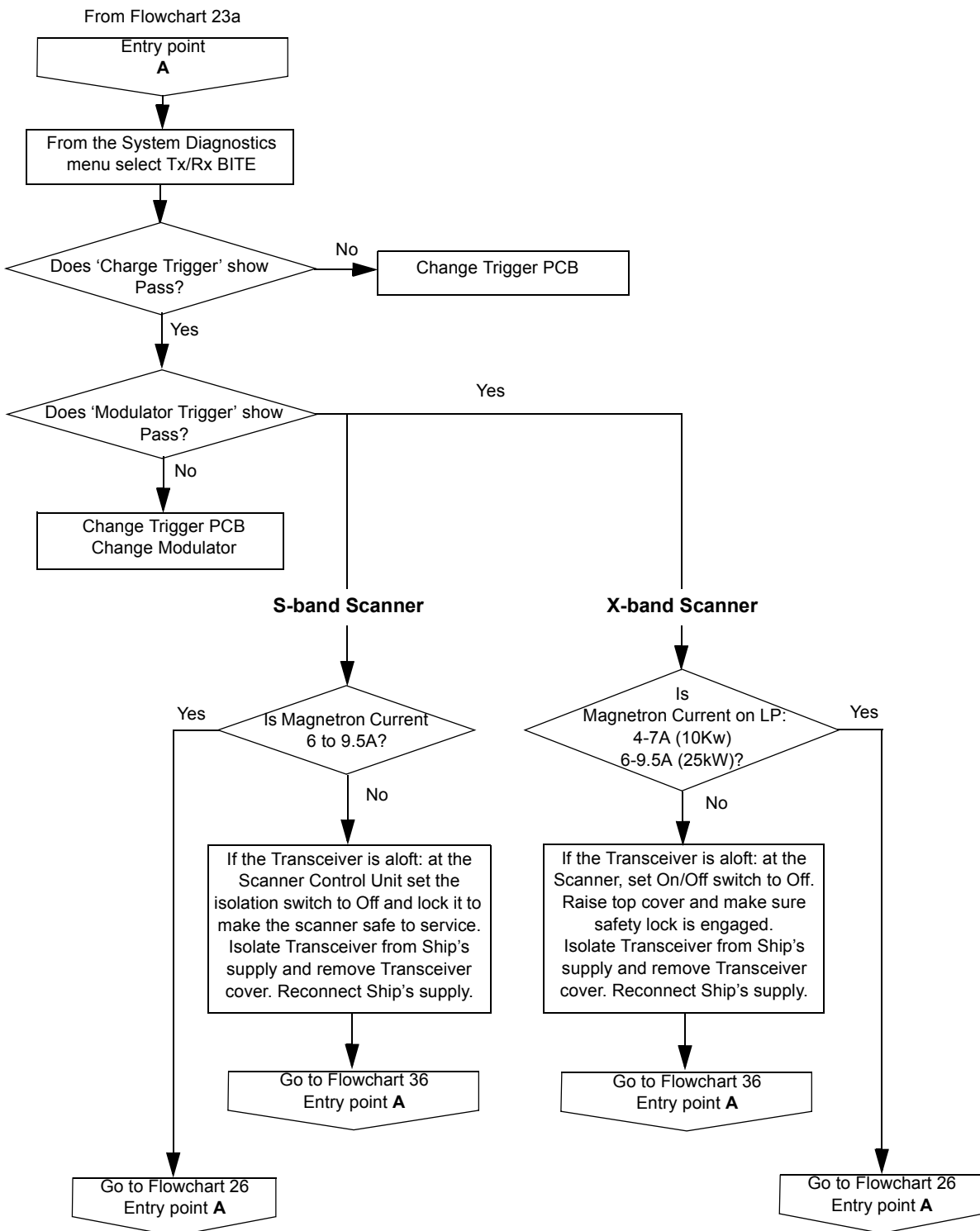


FLOWCHART 24 Low Video Error Message (contd.)

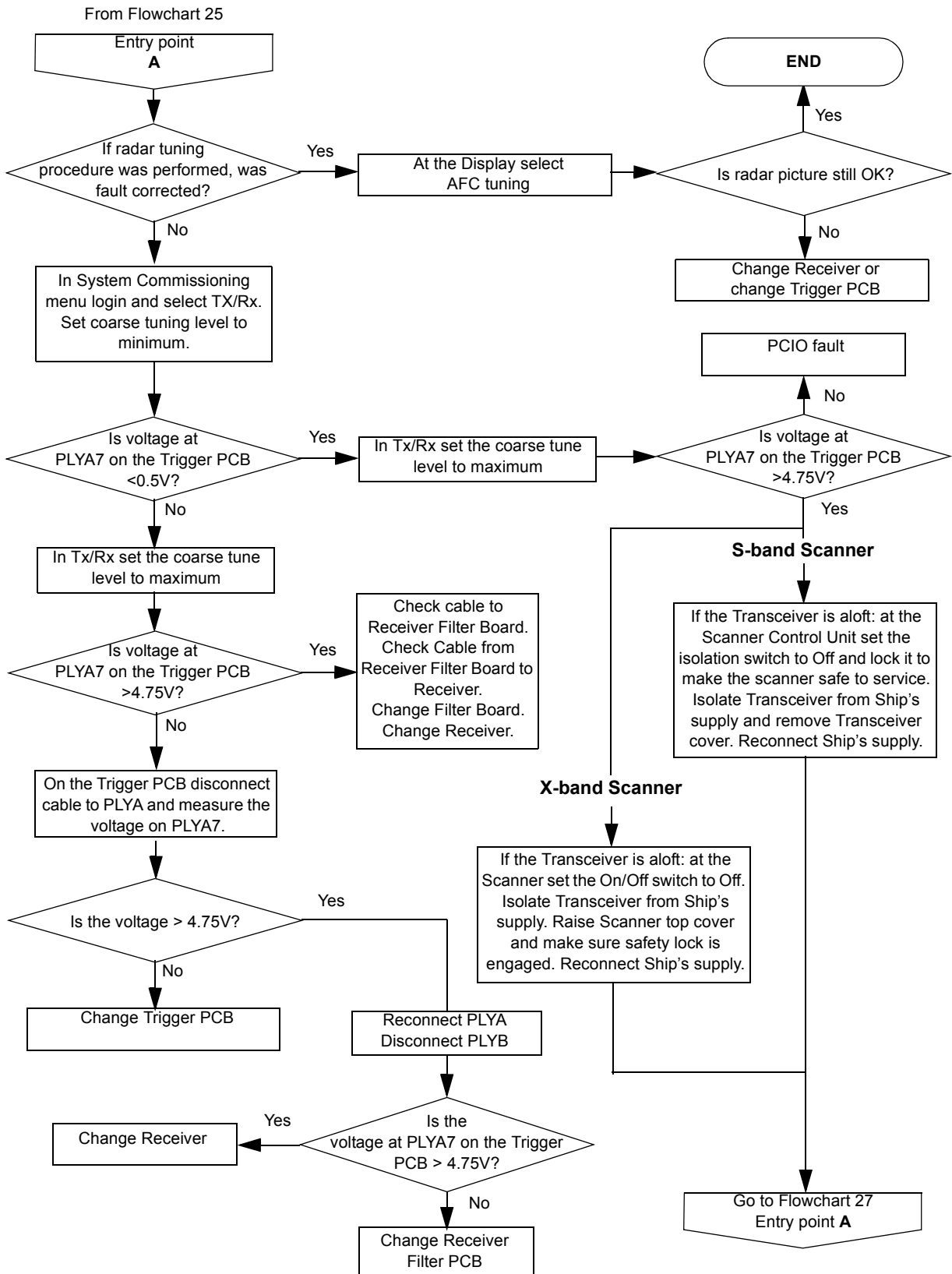


Fault Isolating Flowcharts for S-band Fault Reporting and First Line Servicing and X-band Scanner Units.

FLOWCHART 25 Low Video Error Message (contd.)

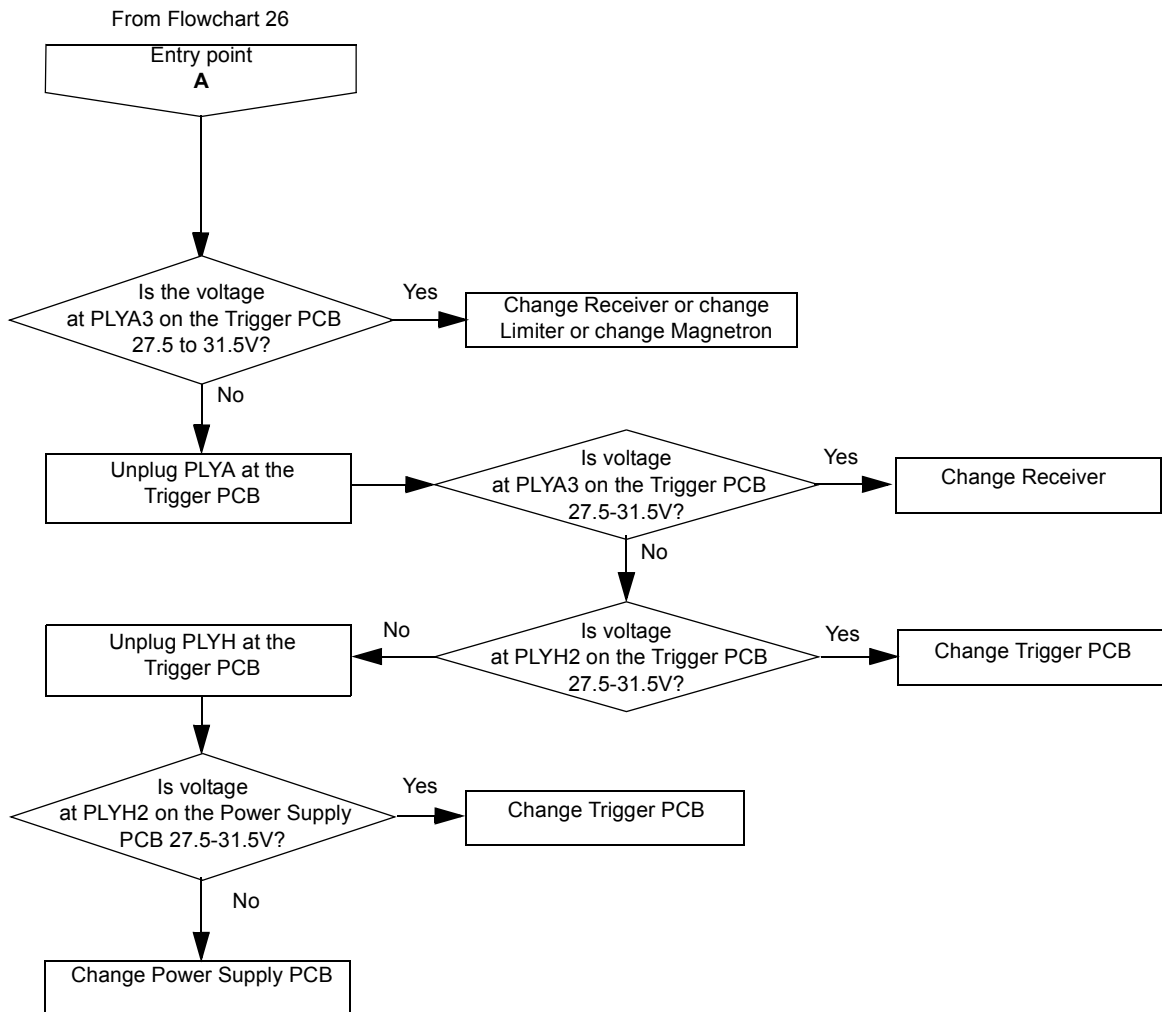


FLOWCHART 26 Low Video Error Message (contd.)

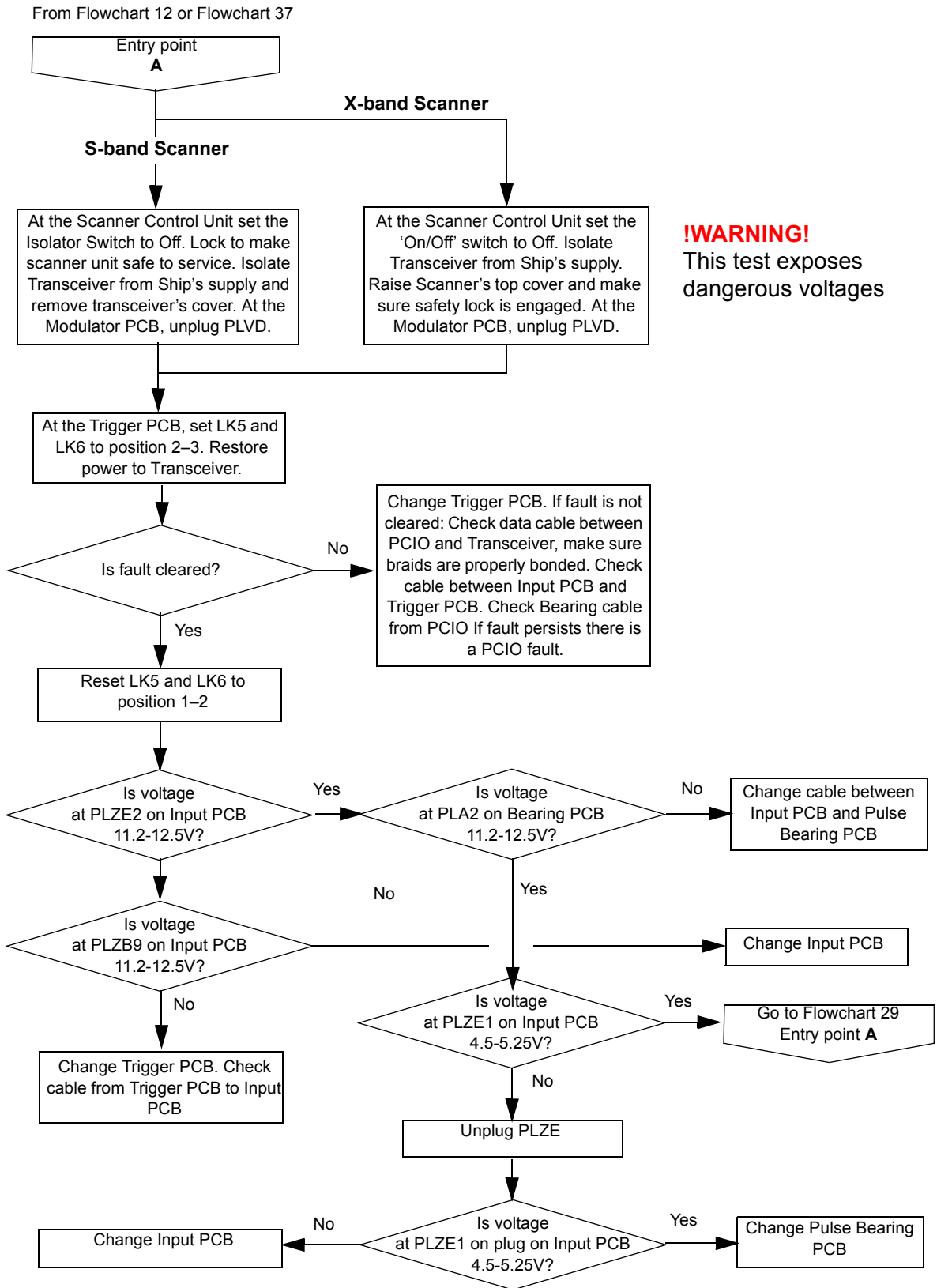


Fault Isolating Flowcharts for S-band Fault Reporting and First Line Servicing and X-band Scanner Units.

FLOWCHART 27 Low Video Error Message (contd.)

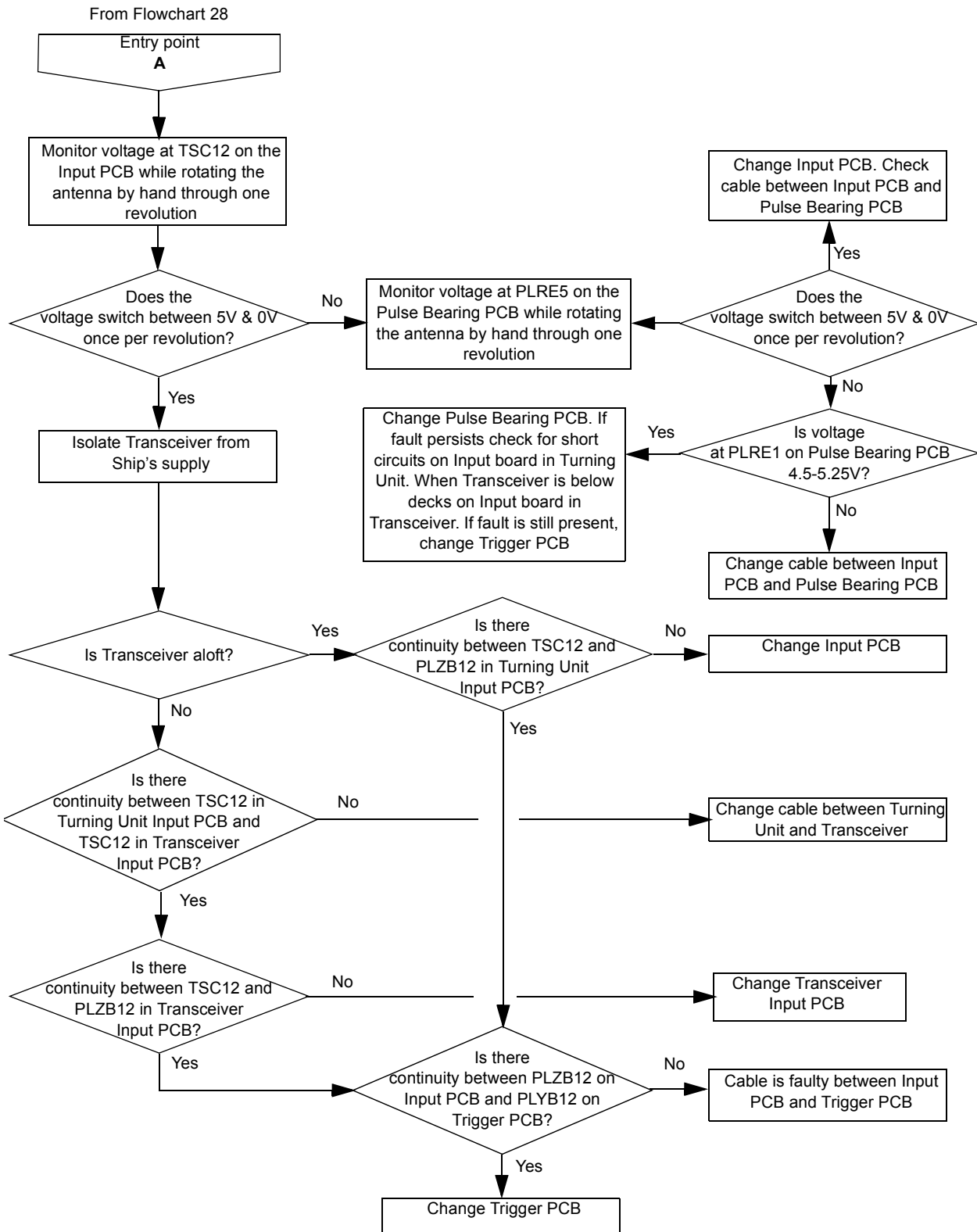


FLOWCHART 28 Heading Marker Error Message

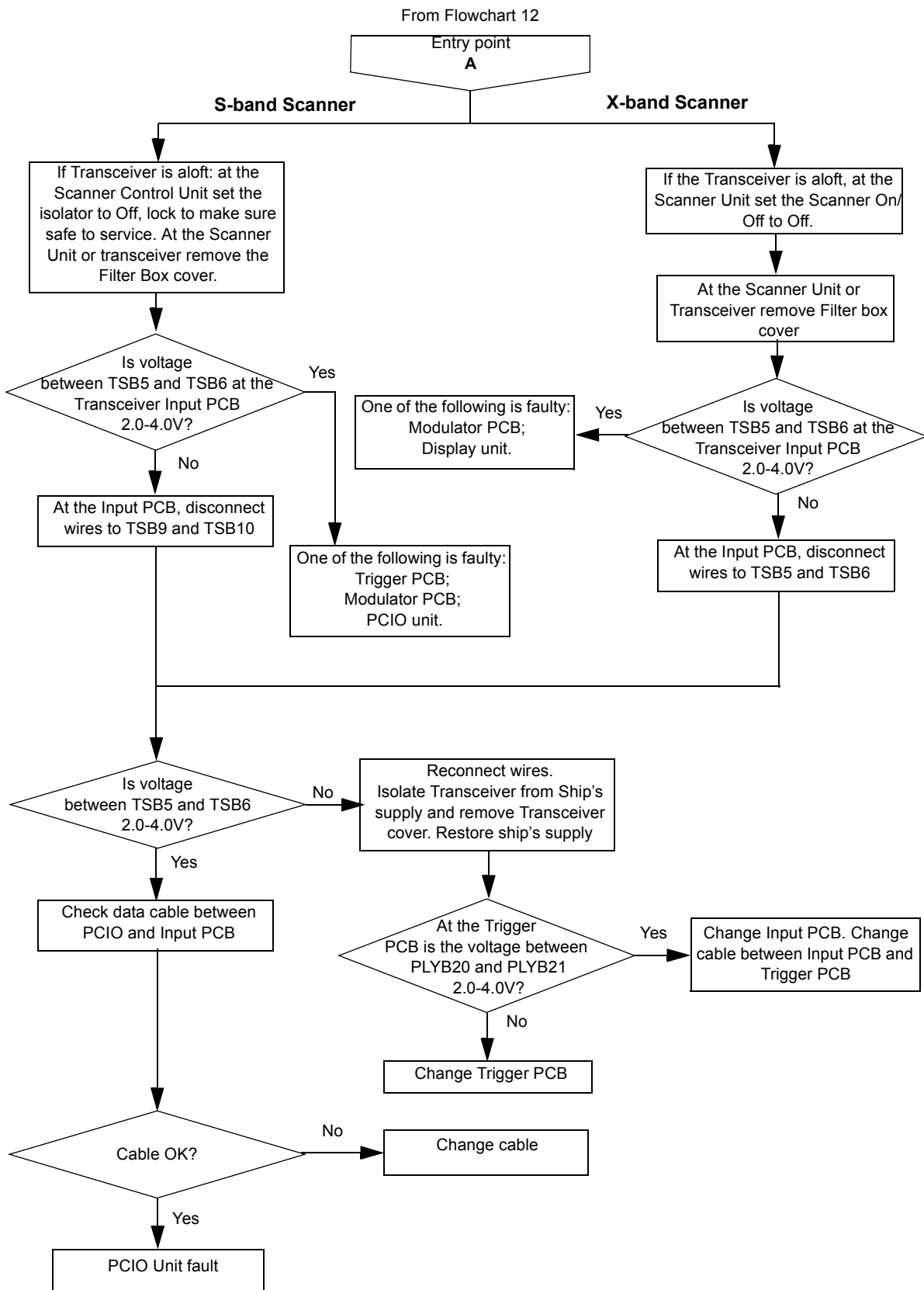


Fault Isolating Flowcharts for S-band Fault Reporting and First Line Servicing and X-band Scanner Units.

FLOWCHART 29 Heading Marker Error Message (contd.)

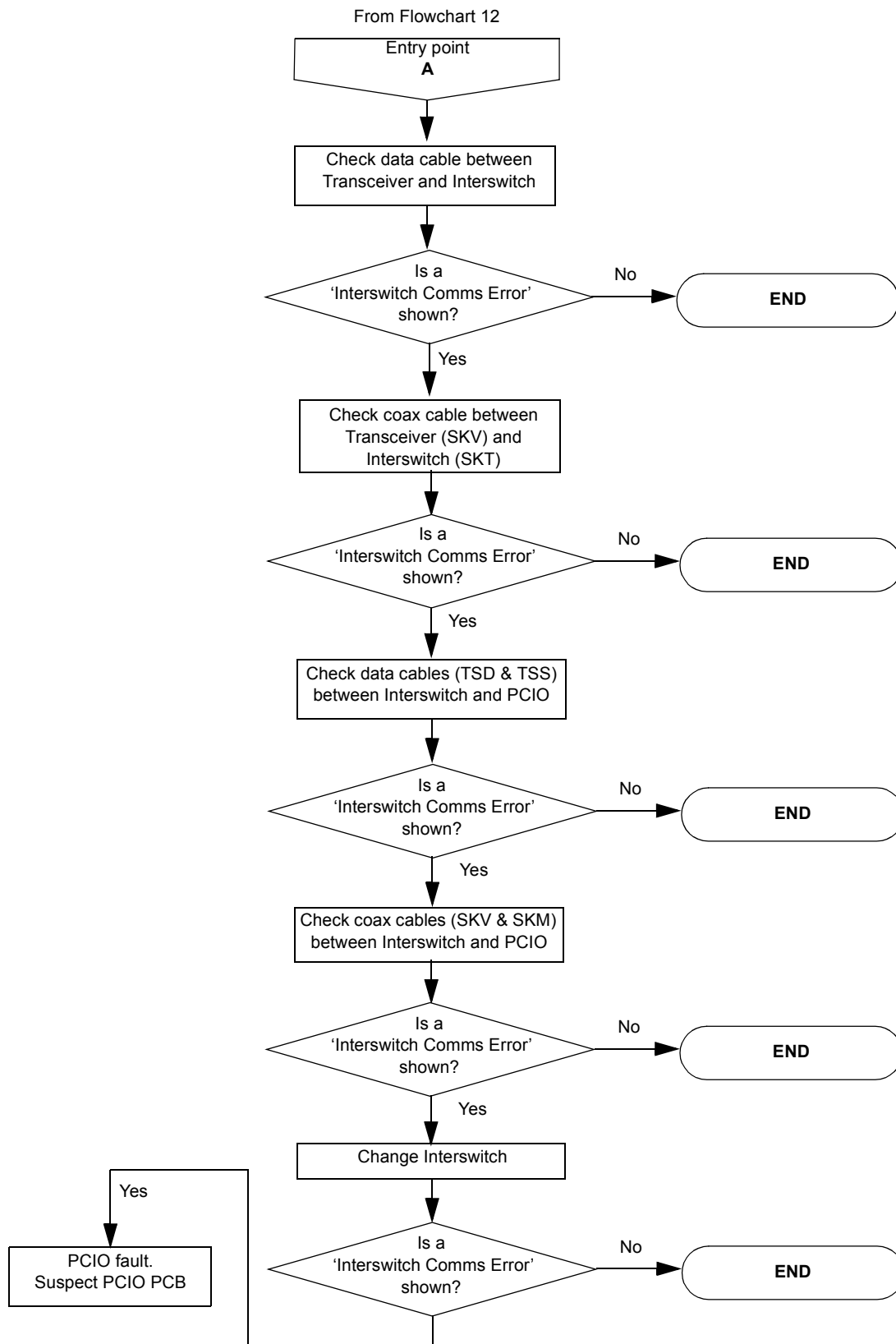


FLOWCHART 30 Trigger Error Message

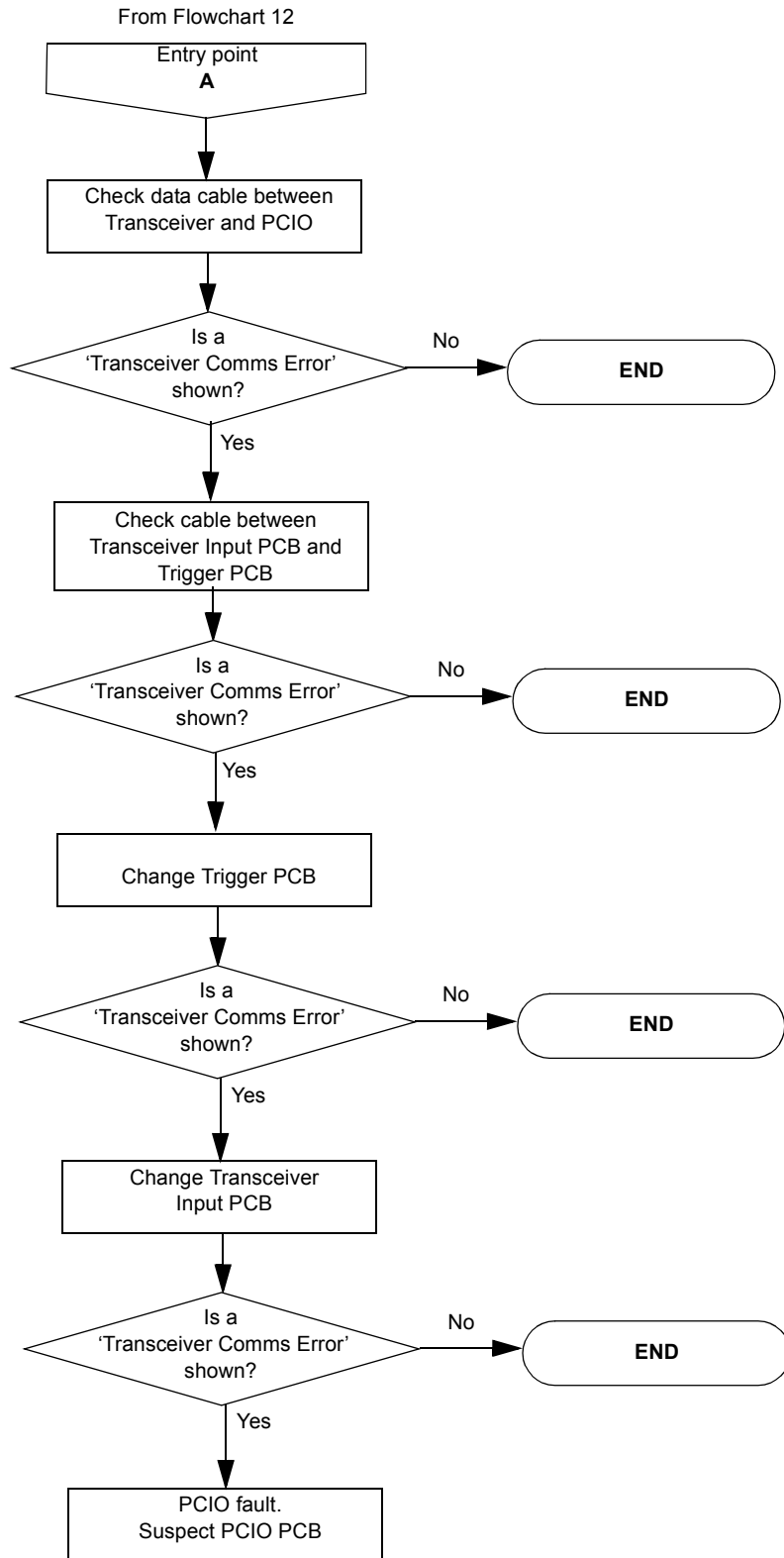


Fault Isolating Flowcharts for S-band Fault Reporting and First Line Servicing and X-band Scanner Units.

FLOWCHART 31 Interswitch Comms Error Message

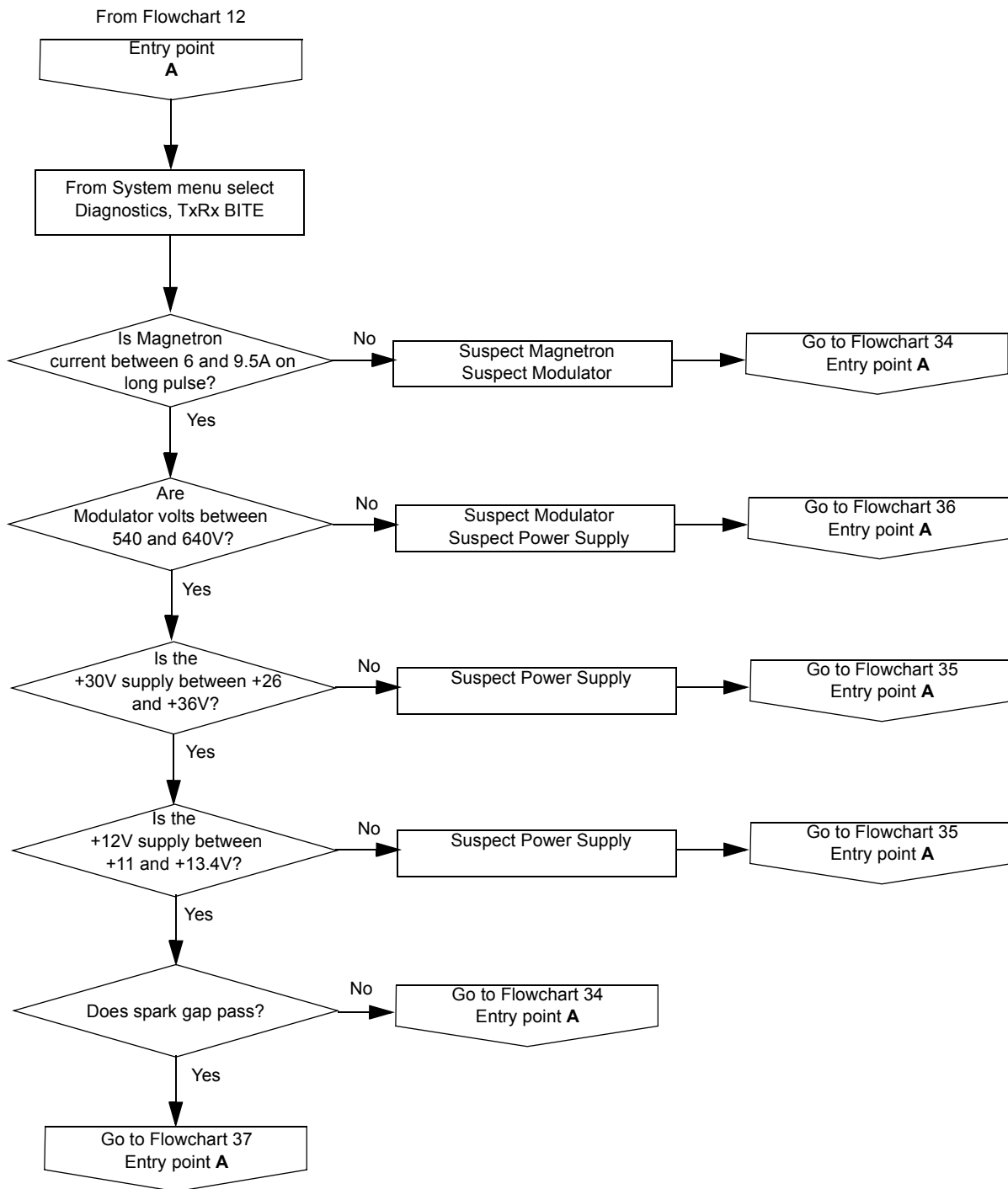


FLOWCHART 32 Transceiver Comms Error Message

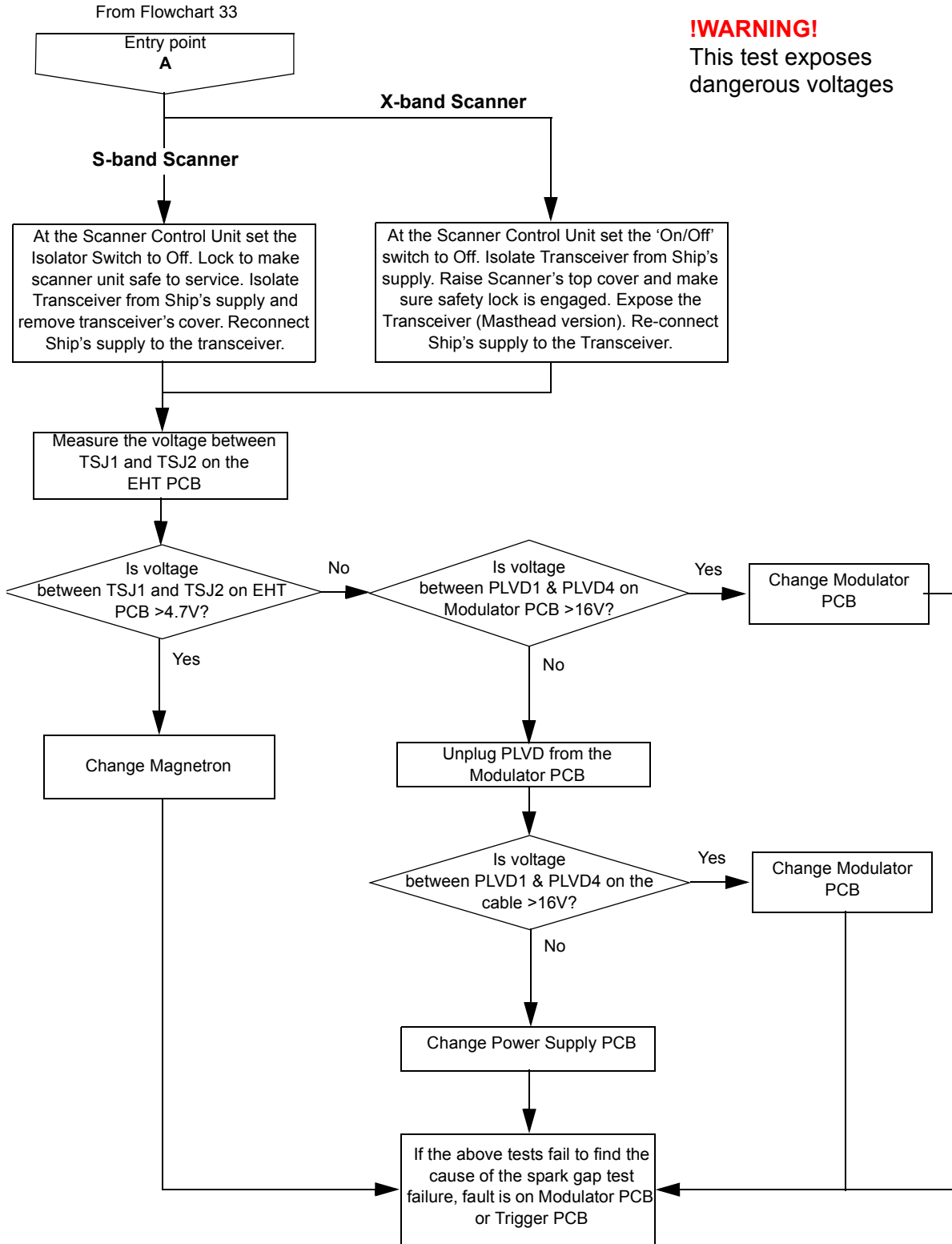


Fault Isolating Flowcharts for S-band Fault Reporting and First Line Servicing and X-band Scanner Units.

FLOWCHART 33 Transceiver BITE Error Message

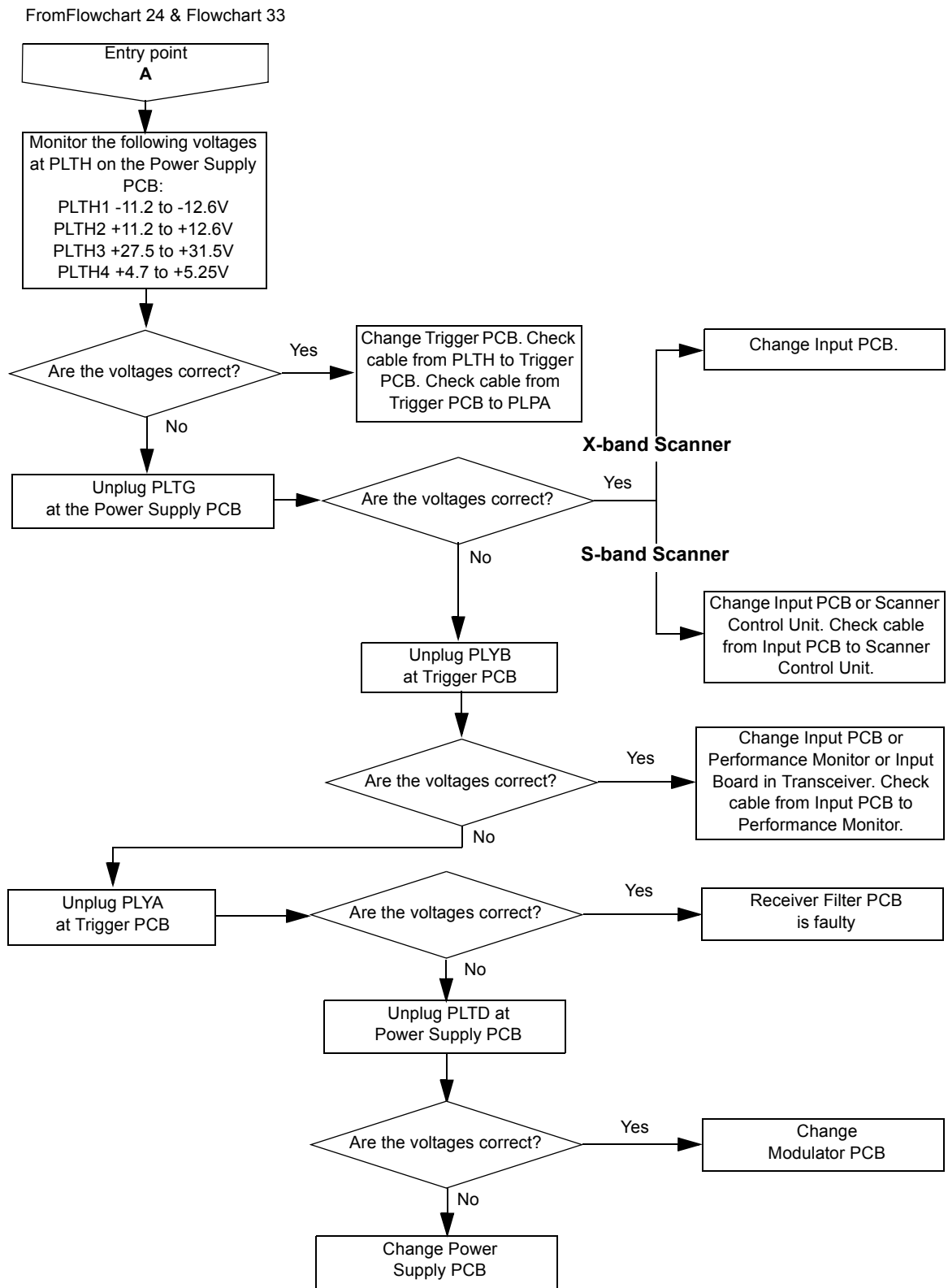


FLOWCHART 34 Transceiver BITE Error Message (Spark Gap Test Failure)

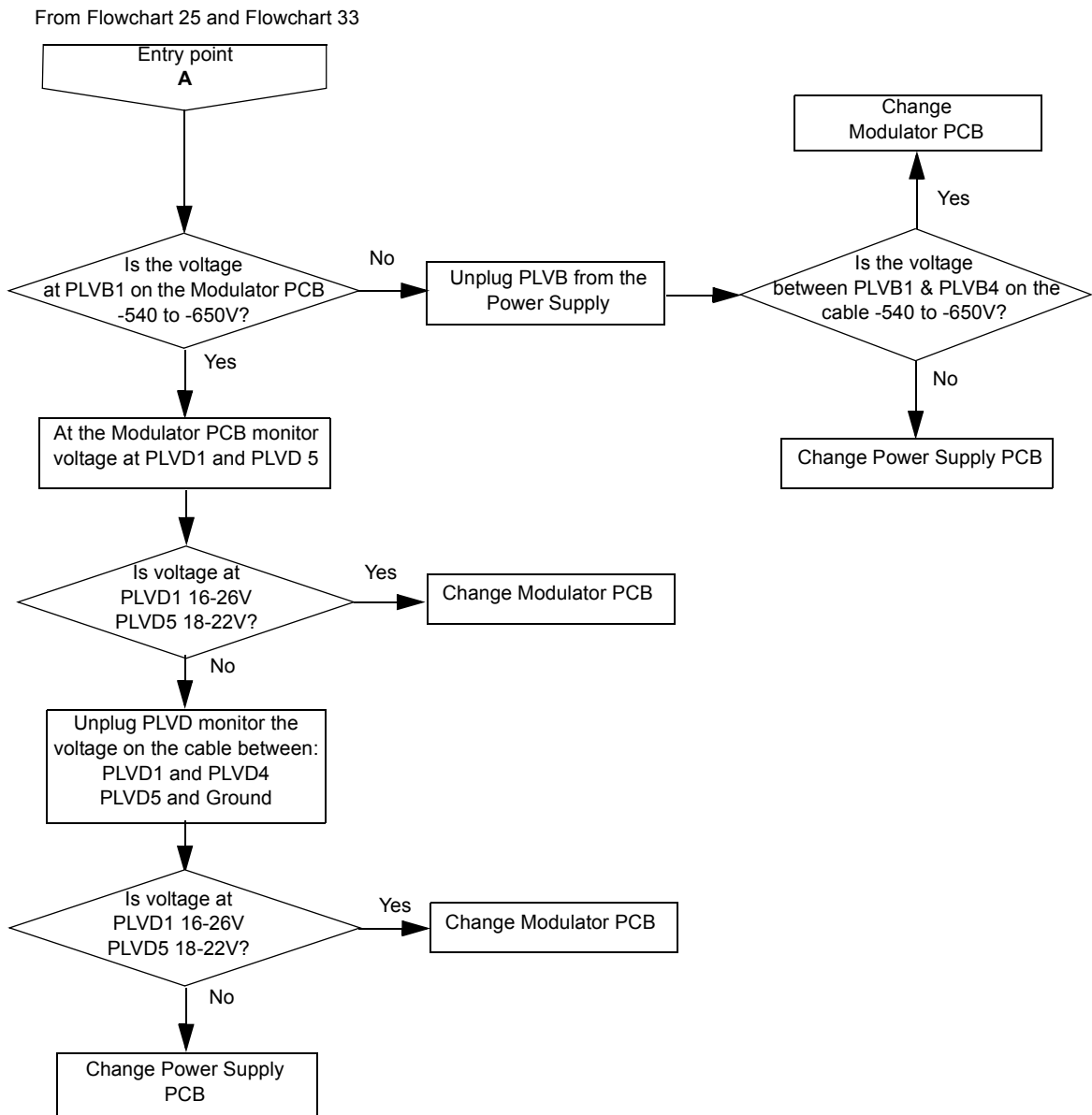


Fault Isolating Flowcharts for S-band Fault Reporting and First Line Servicing and X-band Scanner Units.

FLOWCHART 35 Transceiver BITE Error Message (contd.)

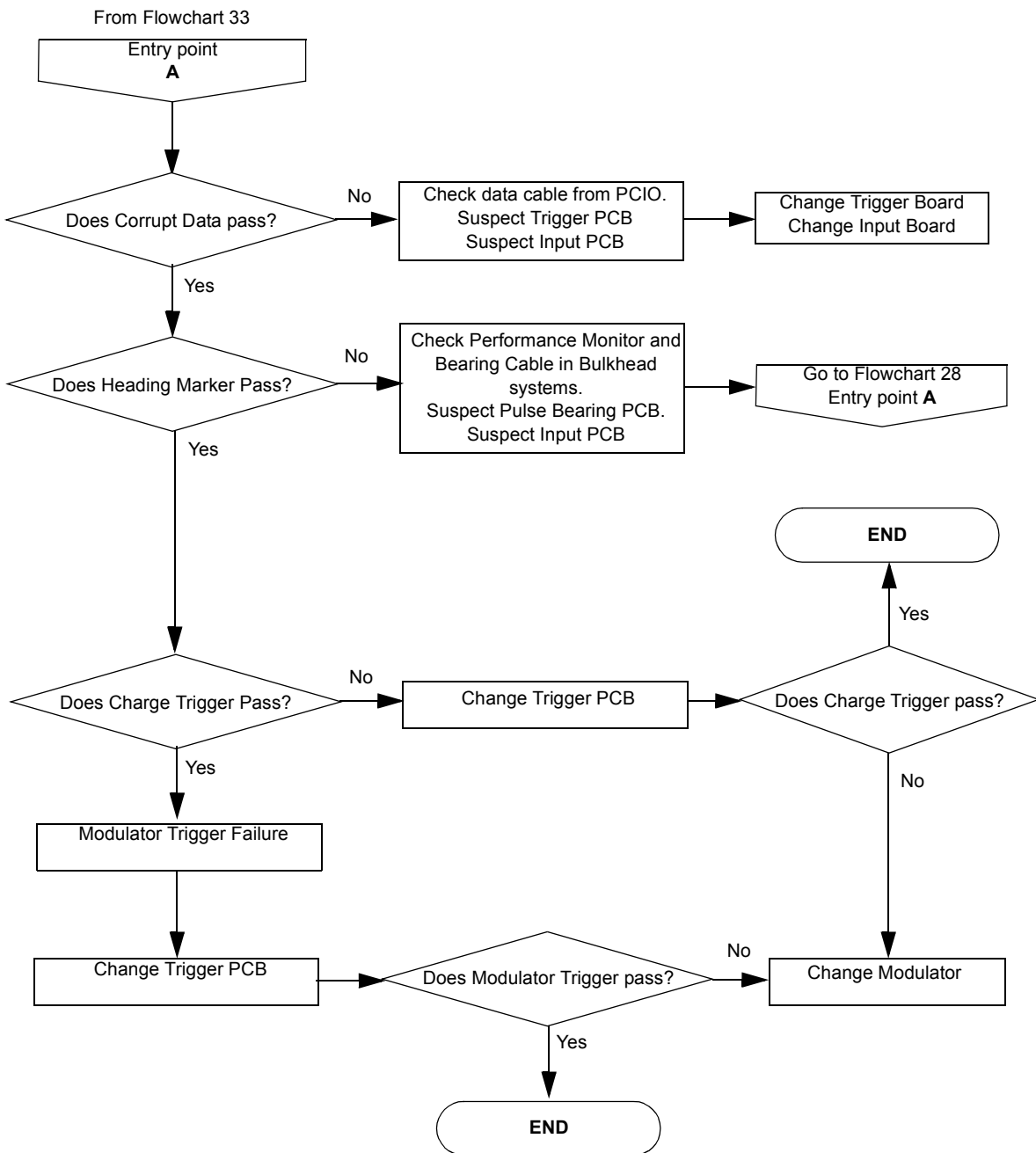


FLOWCHART 36 Transceiver BITE Error Message (contd.)



Fault Isolating Flowcharts for S-band Fault Reporting and First Line Servicing and X-band Scanner Units.

FLOWCHART 37 Transceiver BITE Error Message (contd.)



3 First-line Servicing

3.1 S-band Scanner Unit

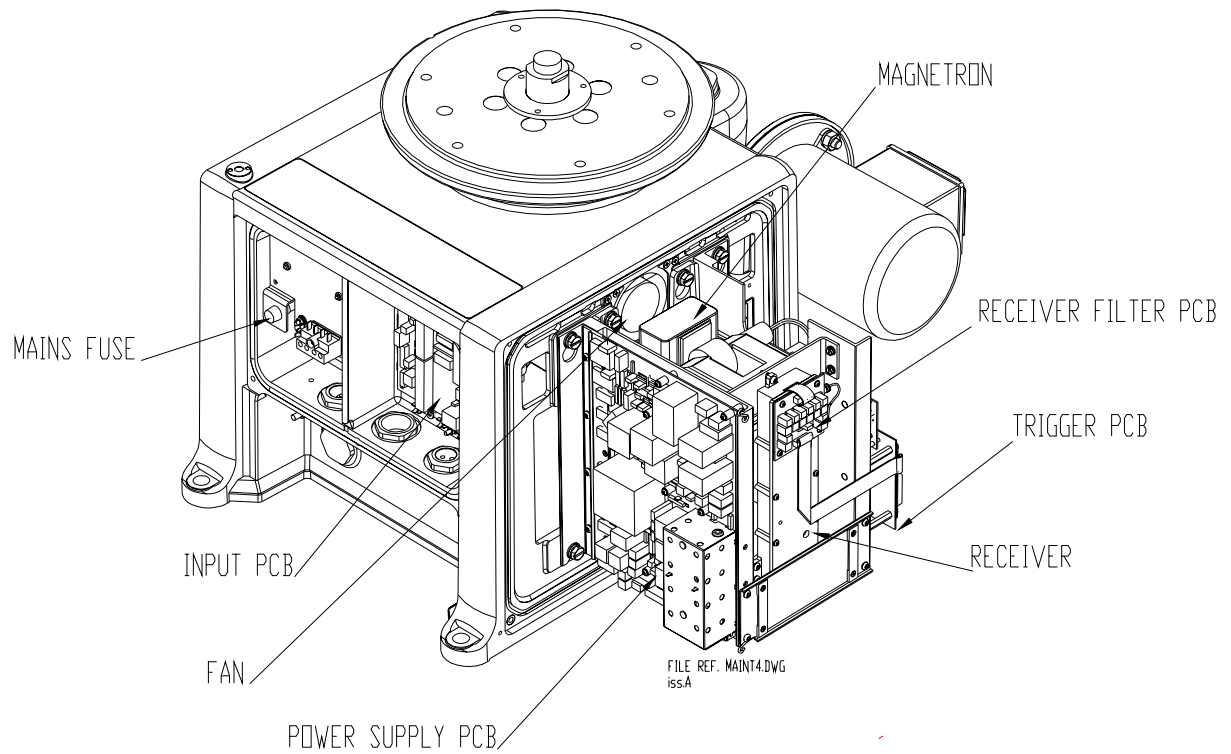


Figure 7.1 Location of Major Parts

3.1.1 Access to Masthead Transceiver

See Figure 7.2 for instructions on how to access the masthead transceiver.

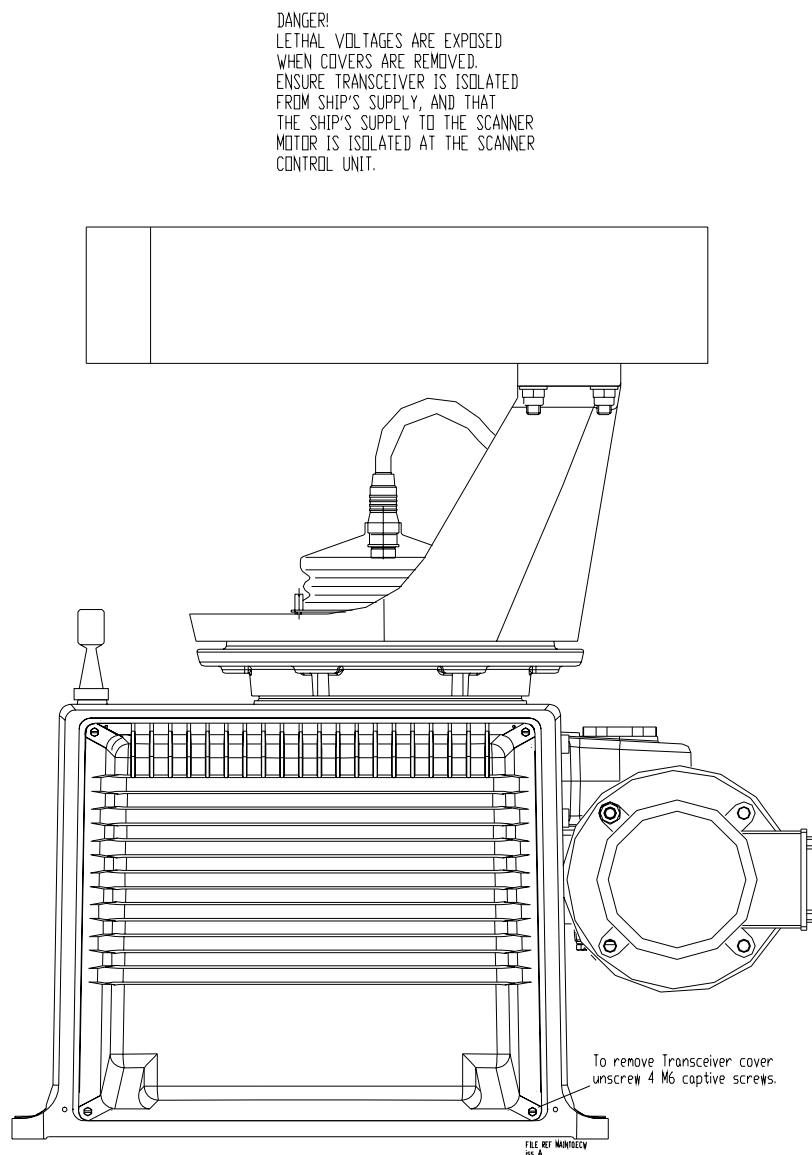


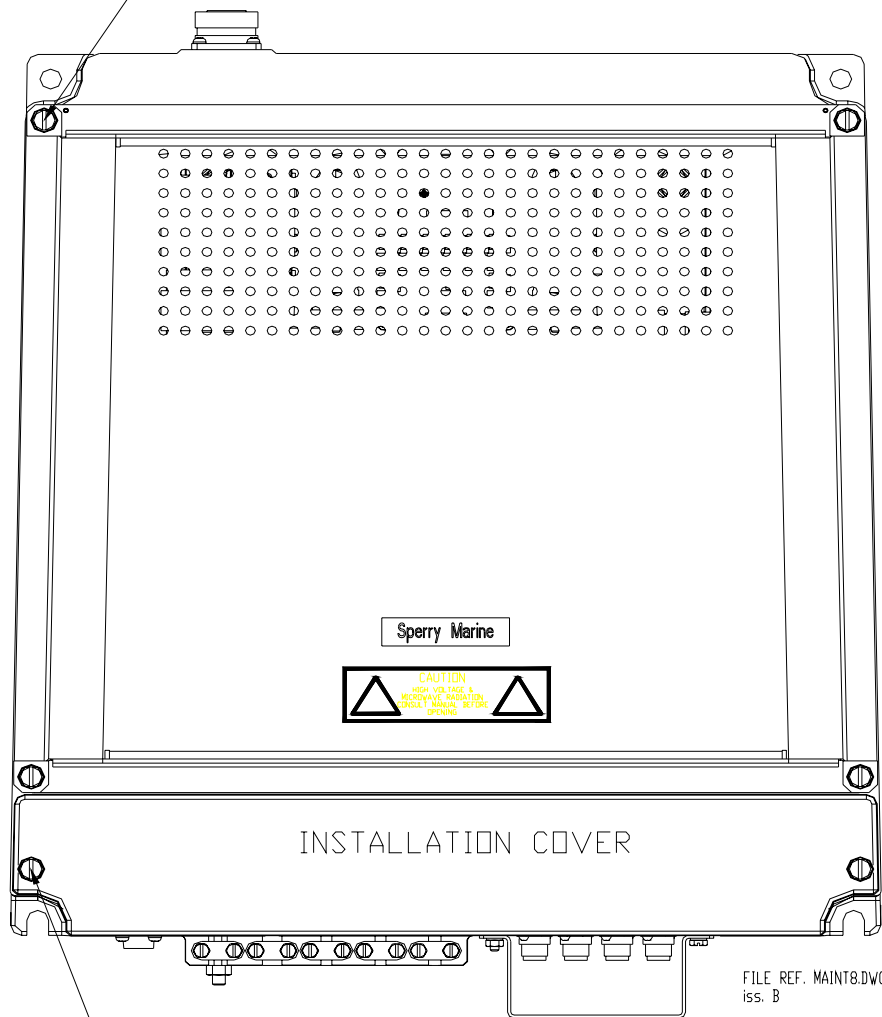
Figure 7.2 Access to Transceiver – Masthead Transceiver

3.1.2 Access to Bulkhead Transceiver

See Figure 7.3 for instructions on how to access the bulkhead transceiver.

DANGER!
LETHAL VOLTAGES ARE EXPOSED
WHEN COVERS ARE REMOVED.
ENSURE THAT TRANSCEIVER IS
ISOLATED FROM SHIP'S SUPPLY
BEFORE REMOVING COVERS.

To remove Transceiver cover
unscrew four M 6 captive screws.



To remove filter box cover
unscrew two M 6 captive screws.

Figure 7.3 Access to Transceiver – Bulkhead Transceiver

Replacing the Transceiver in the Masthead Turning Unit

Fault Reporting and First Line Servicing

3.1.3 Replacing the Transceiver in the Masthead Turning Unit

See Figure 7.4 for instructions on removing and replacing the Transceiver from the masthead Turning Unit.

DANGER!
LETHAL VOLTAGES ARE EXPOSED
WHEN COVERS ARE REMOVED.
ENSURE TRANSCEIVER IS ISOLATED
FROM SHIP'S SUPPLY BEFORE
REMOVING TRANSCEIVER

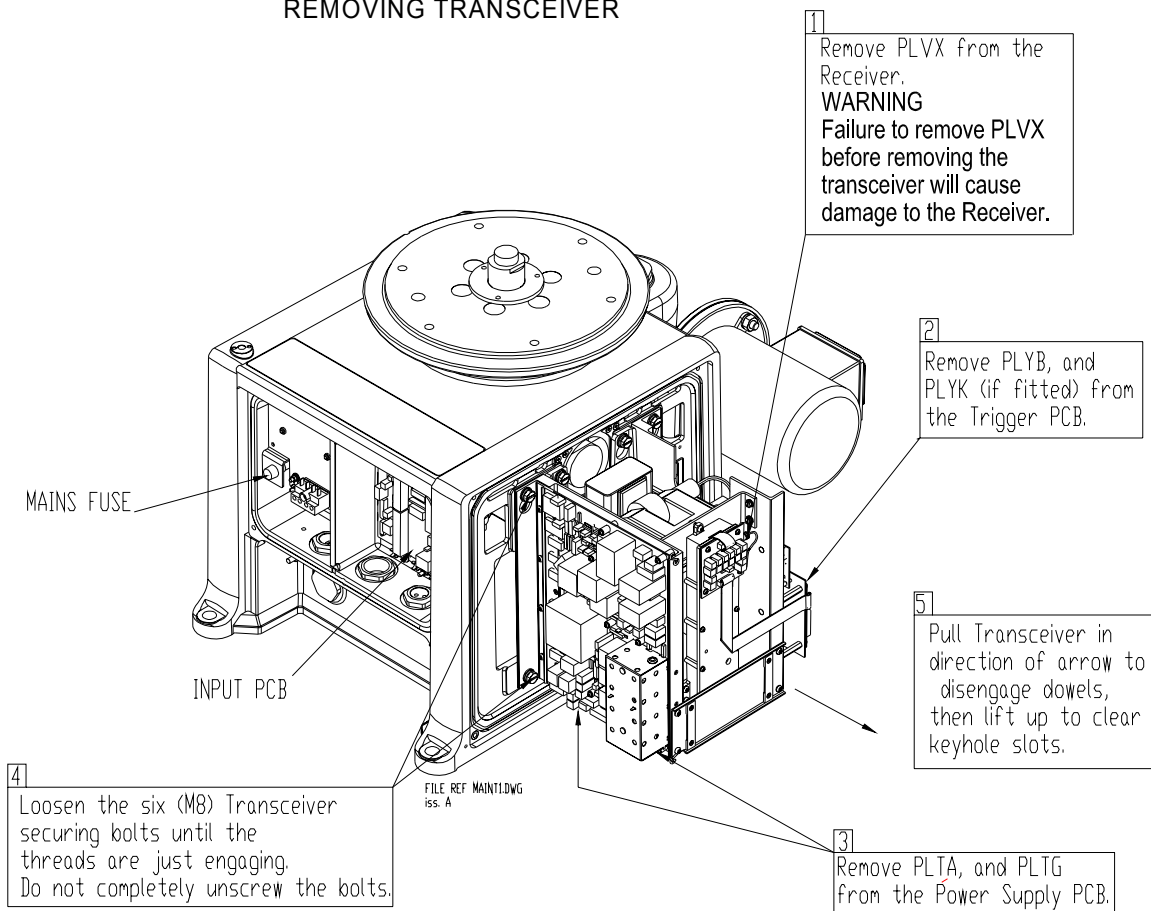


Figure 7.4 Removing the Transceiver from the Masthead Turning Unit

3.1.4 Replacing the Transceiver in the Bulkhead Turning Unit

See Figure 7.5 for instructions on removing and replacing the Transceiver from the bulkhead Tuning Unit.

DANGER!
LETHAL VOLTAGES ARE EXPOSED
WHEN THE COVERS ARE REMOVED.
ENSURE TRANSCEIVER IS ISOLATED
FROM THE SHIP'S MAINS SUPPLY
BEFORE REMOVING COVERS.

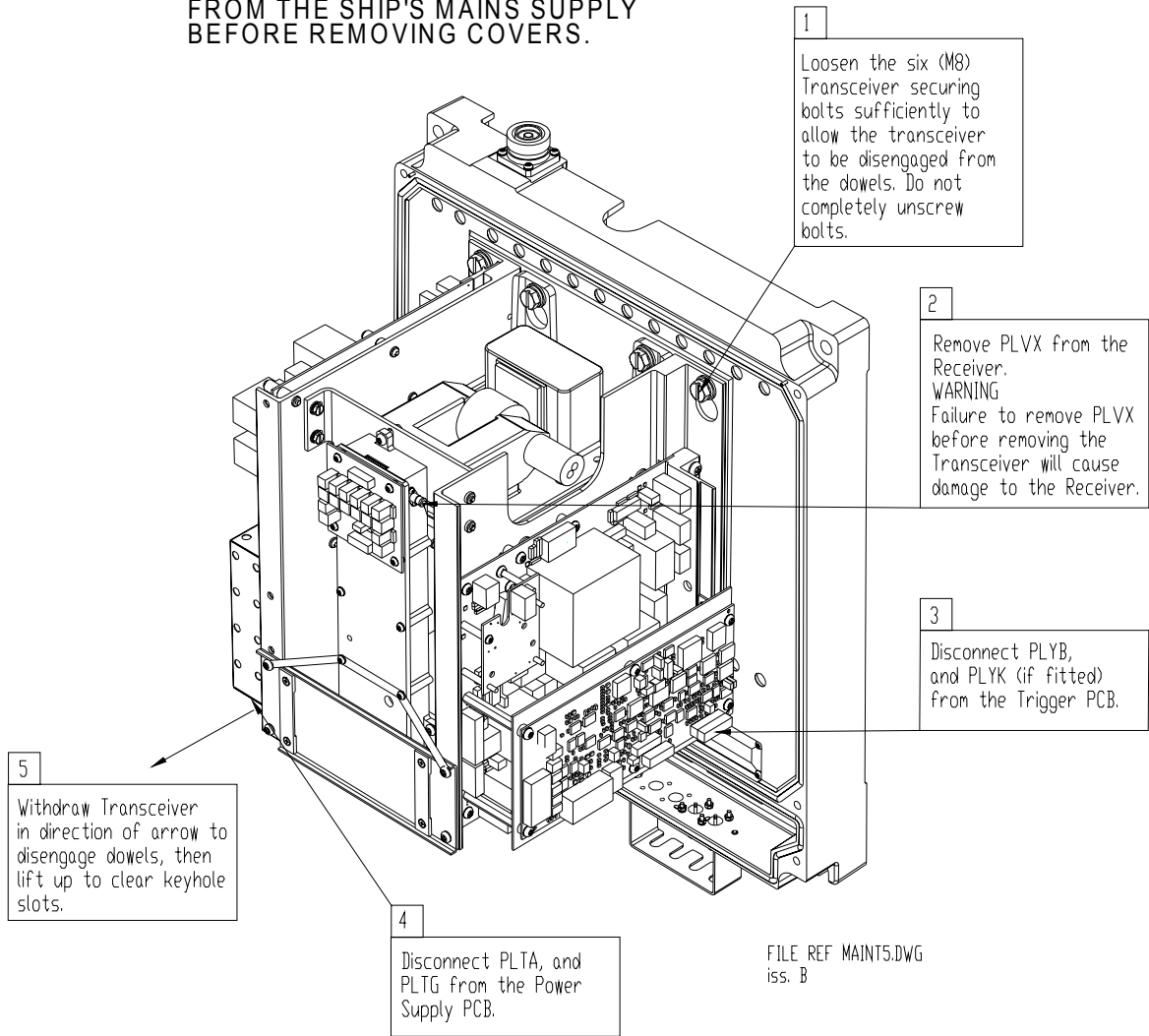


Figure 7.5 Removing Transceiver Assembly 65830630 – Bulkhead Transceiver

Magnetron Replacement – Masthead Fault Reporting and First Line Servicing Transceiver

3.1.5 Magnetron Replacement – Masthead Transceiver

1. At the Scanner Control Unit set the isolating switch to the 'OFF' position and lock it.
2. Rotate the antenna until the front face is pointing away from the Transceiver.
3. Isolate the radar from the ship's mains supply using the isolating switch supplied.
4. Refer to Figure 7.2, and remove the Transceiver cover from the scanner unit.
5. Refer to Figure 7.6, and follow the procedure for removing and replacing the magnetron.

When a magnetron is replaced, the magnetron current must be set as follows:

6. On the Trigger PCB set links LK5 and LK6 to position 2–3.
7. Reconnect the ship's mains supply, and switch the radar ON.
8. Wait 3 minutes for the magnetron time delay to expire, and select long pulse.
9. Set the magnetron current as detailed in Section 3.1.7.
10. Isolate the radar from the ship's mains supply using the isolating switch supplied.
11. Reset LK5 and LK6 to position 1–2.
12. Replace the Transceiver cover.

3.1.6 Magnetron Replacement – Bulkhead Transceiver

1. Isolate the radar from the ship's mains supply using the isolating switch supplied.
2. Refer to Figure 7.3 and remove the transceiver cover.
3. Refer to Figure 7.6, and follow the procedure for removing and replacing the magnetron.

When a magnetron is replaced, the magnetron current must be set as follows:

4. Reconnect the ship's mains supply, and switch the radar ON.
5. Wait 3 minutes for the magnetron time delay to expire, and select long pulse.
6. Set the magnetron current as detailed in Section 3.1.7.
7. Isolate the radar from the ship's mains supply using the isolating switch supplied.
8. Replace the transceiver cover.

3.1.7 Setting the Magnetron Current

1. On the Trigger PCB set LK5 and LK6 to 2–3.
This is the service position and will let the transmitter transmit when the antenna is stationary.
2. Restore the ship's supply to the Transceiver.
3. Select Long Pulse, transmit at the Display.
4. Measure the voltage between TP100 and ground on the Modulator PCB.
A DVM with an input impedance >10 Mohms must be used for this measurement. Use of a meter with lower impedance could cause damage to the magnetron.
5. Adjust RV1 on the Power Supply PCB to give the correct voltage on TP100. The voltage is recorded on the label on the pulse transformer on the Modulator PCB.
6. Switch off
7. On the Trigger PCB set LK5 and LK6 to 1–2.

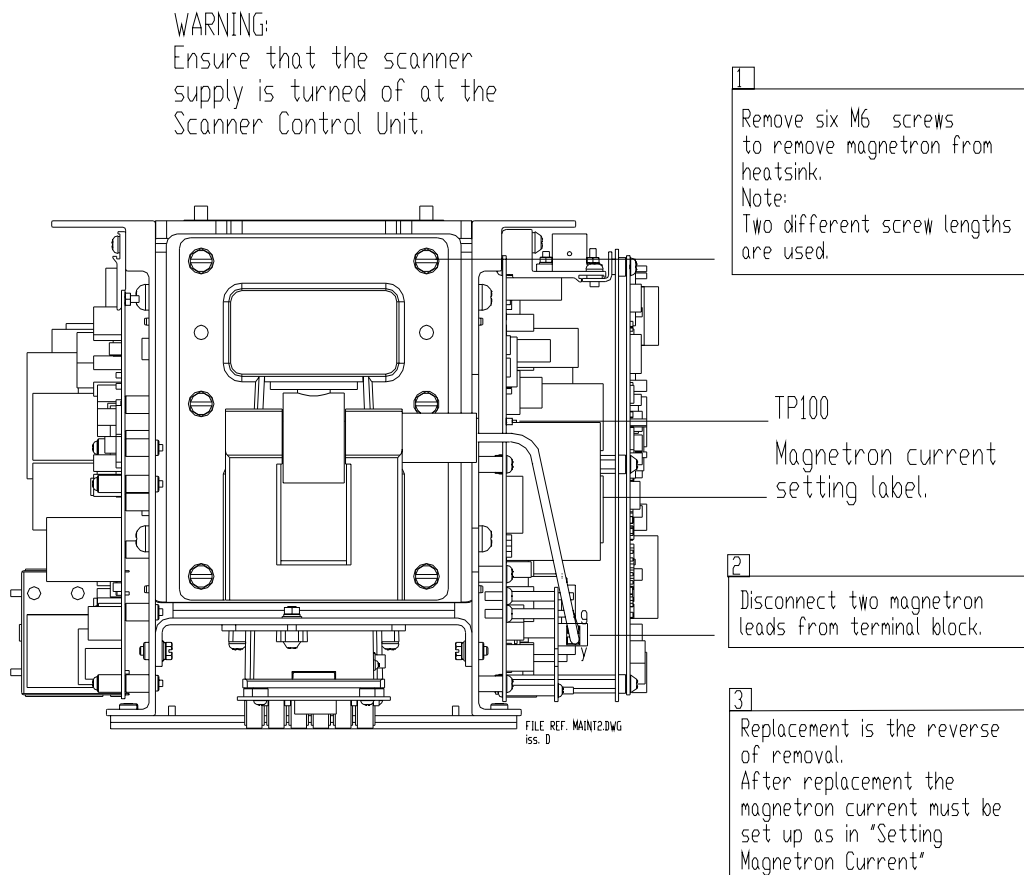


Figure 7.6 Magnetron Replacement

3.1.8 Trigger PCB – Replacement

See Figure 7.7 and Figure 7.8 for instructions on replacement of the Trigger PCB.

Set the links as shown in Figure 7.8.

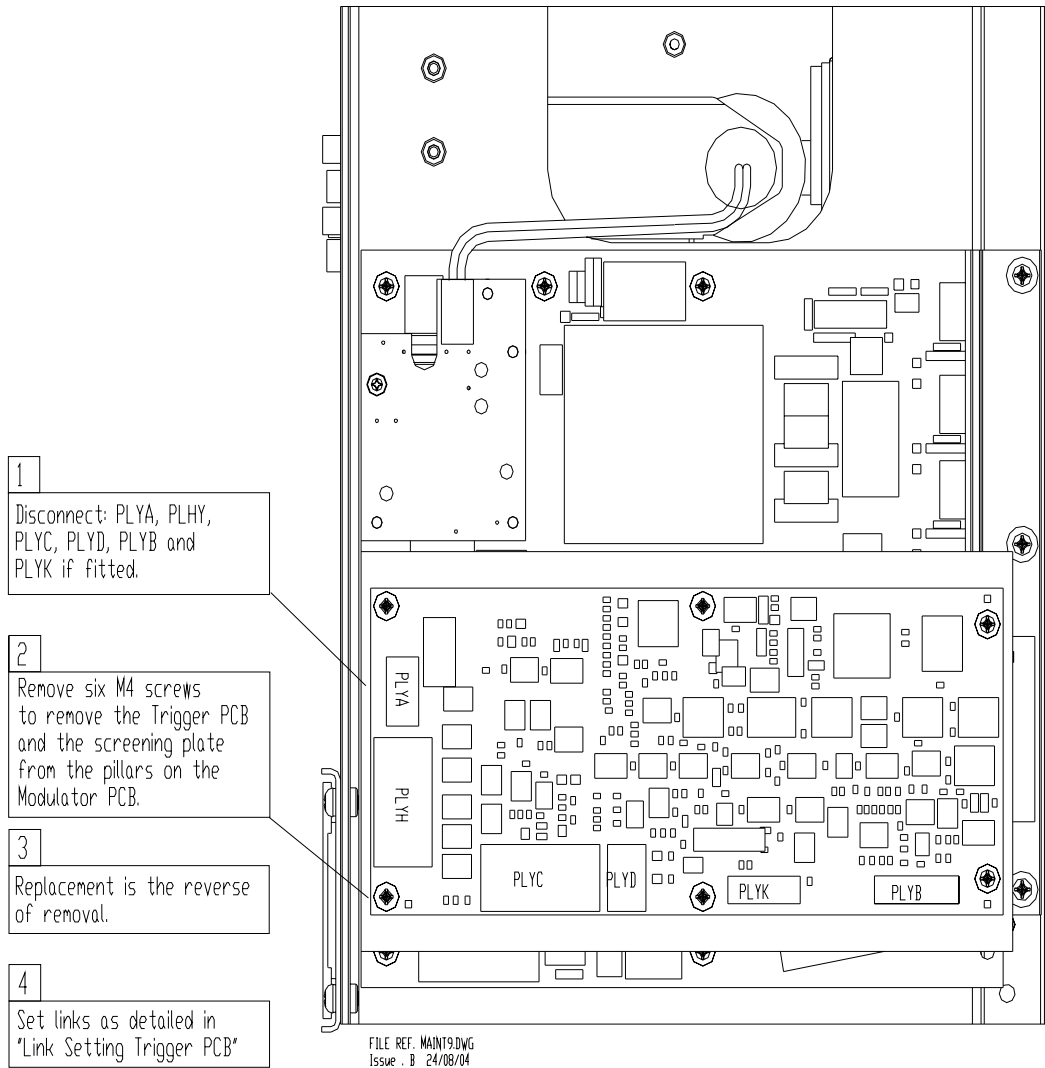
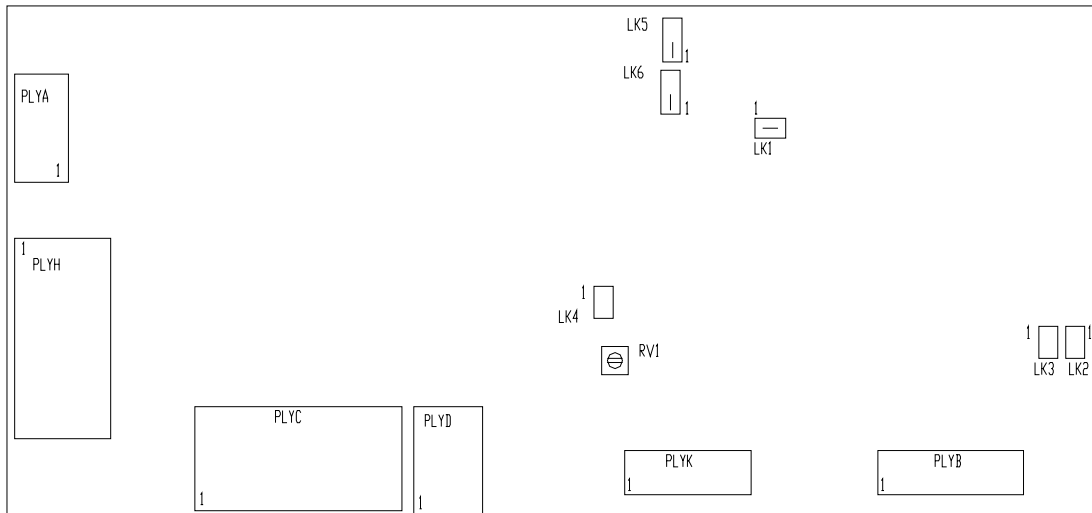


Figure 7.7 Replacing the Trigger PCB



FILE REF. TRIGGER.DWG
 ISS. C 24/08/04

ATE TEST LINKS
 LK1 FITTED
 LK4 NOT FITTED

BAUD RATE LINKS
 LK2 NOT FITTED
 LK3 NOT FITTED

SERVICE LINKS
 LK5 NORMAL OPERATION FITTED 1 - 2
 LK6 NORMAL OPERATION FITTED 1 - 2

LK5 SERVICE FITTED 2 - 3
 LK6 SERVICE FITTED 2 - 3
 WHEN FITTED 2 - 3 THE TRANSMITTER
 WILL OPERATE WHEN THE ANTENNA IS
 STOPPED.

RV1 SWEPT GAIN DELAY
 FACTORY SET DO NOT ADJUST

Figure 7.8 Trigger PCB Link Settings

3.1.9 Modulator PCB – Replacement

See Figure 7.9 and Figure 7.10 for instructions on replacement of the Modulator PCB.

Set the links as shown in Figure 7.10.

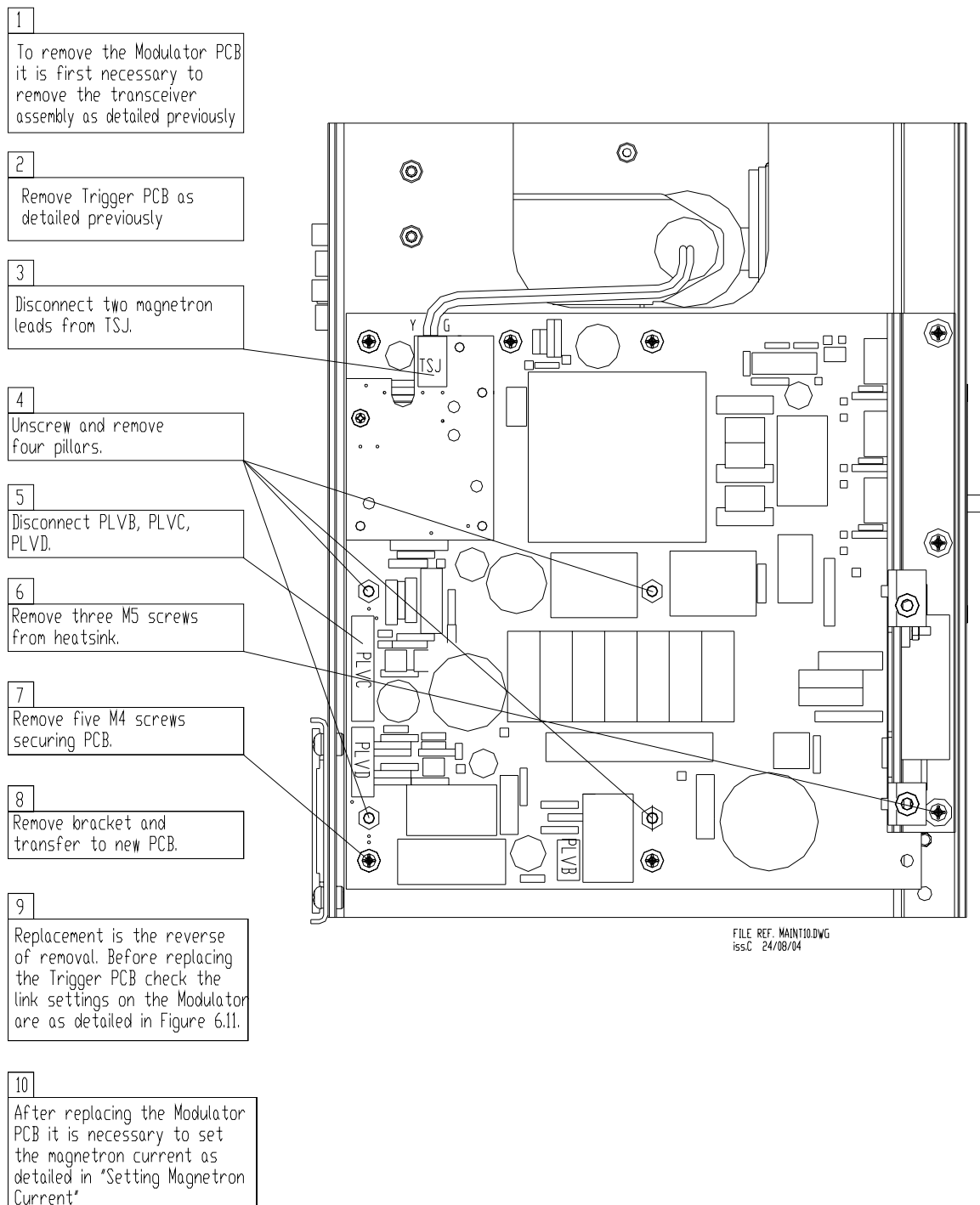
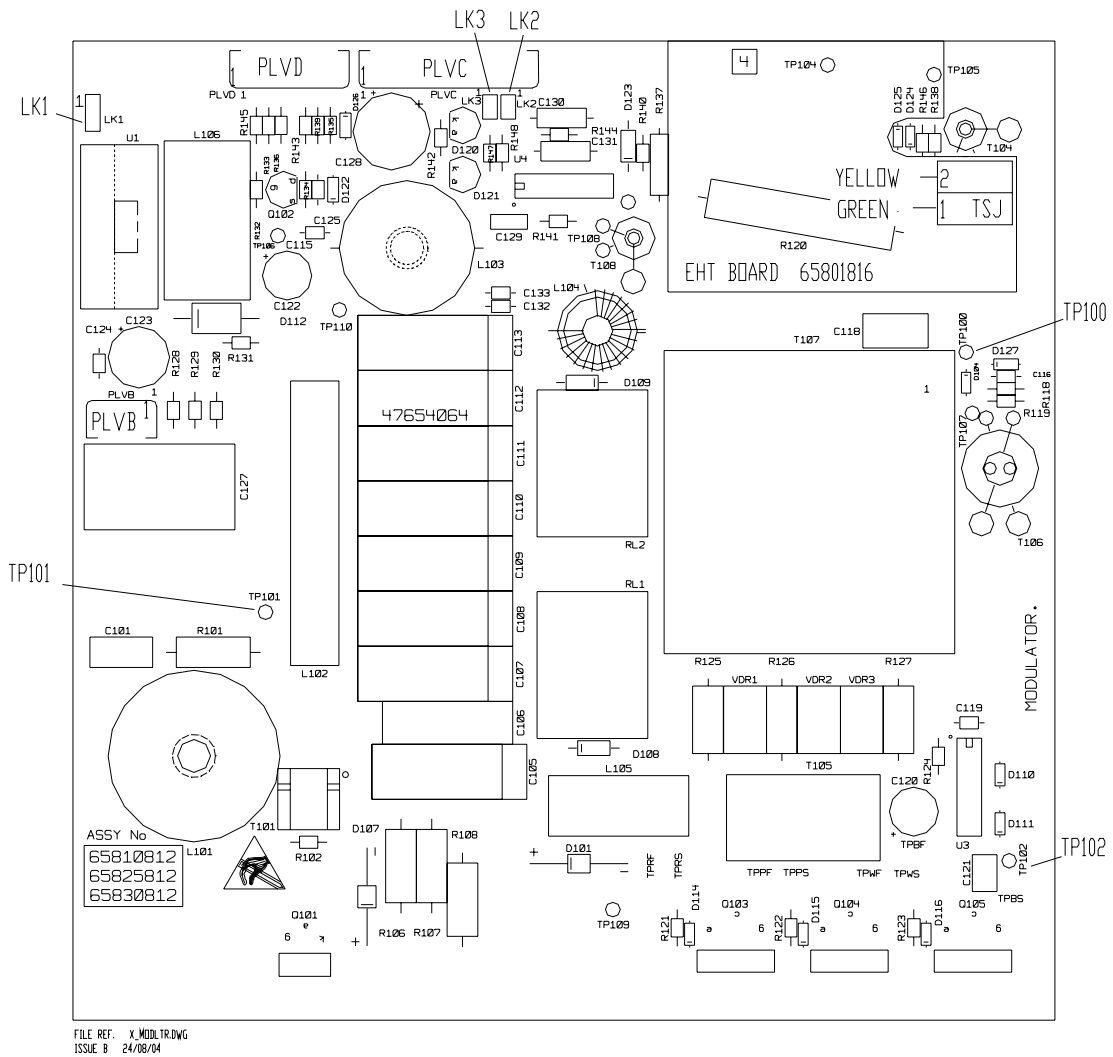


Figure 7.9 Replacing the Modulator PCB



MODULATOR LINK SETTINGS FOR 65810812 / 65825812 / 65830812

	S-BAND	10 kW X-BAND	25 kW X-BAND
LK1	FITTED 2 - 3	FITTED 1 - 2	FITTED 1 - 2 FOR MAGNETRON MG5424
LK1			FITTED 2 - 3 FOR MAGNETRON M1458
LK2	FITTED	NOT FITTED	NOT FITTED
LK3	NOT FITTED	FITTED	NOT FITTED

NOTE THAT LINK 1 IS CONFIGURABLE FOR HEATER TURNDOWN ON 25kW X-BAND
 NOTE THAT LINKS 2 & 3 ARE HARDWIRED FOR SPECIFIC USAGE ON LATER MODULATORS.

TEST POINTS:
 TP100 MAGNETRON CURRENT MONITOR
 TP101 CHARGE TRIGGER
 TP102 MODULATOR TRIGGER

Figure 7.10 Modulator PCB Link Settings

3.1.10 Power Supply PCB Replacement

See Figure 7.11 and Figure 7.12 for instructions on replacement of the Power Supply PCB.

Set the links as shown in Figure 7.12.

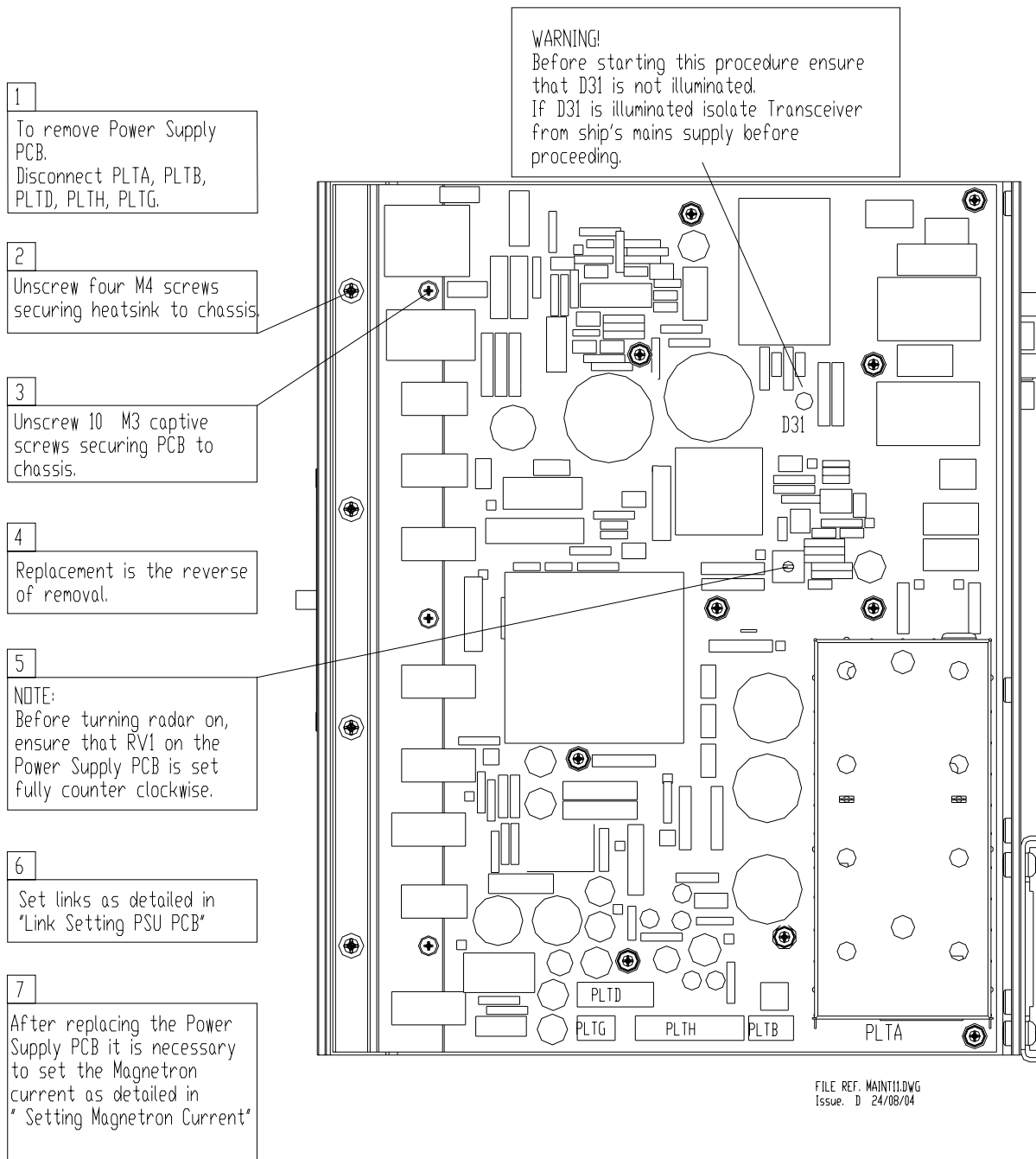


Figure 7.11 Replacing the Power Supply PCB

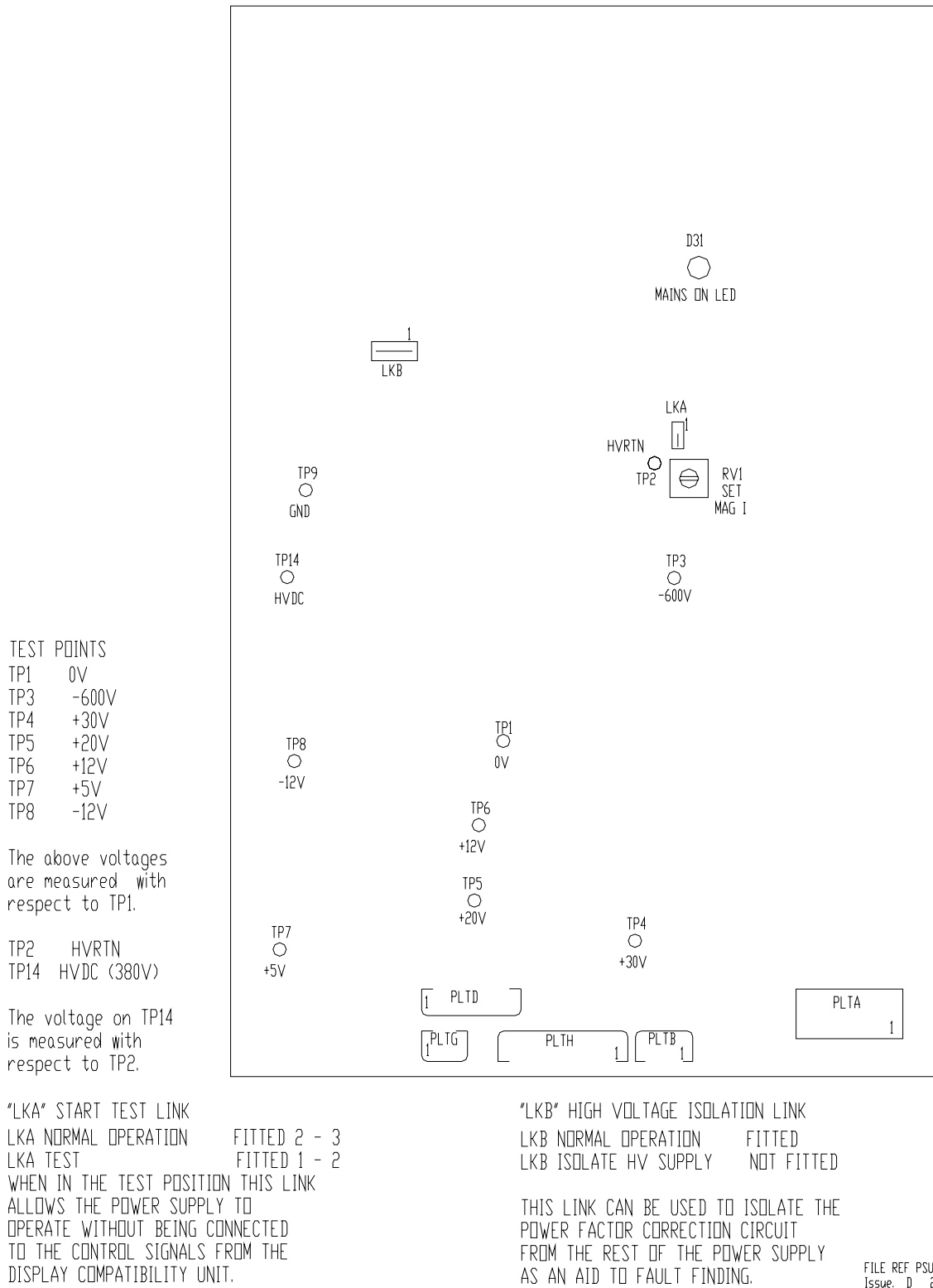


Figure 7.12 Power Supply PCB Link Settings

3.1.11 Receiver Assembly – Replacement

See Figure 7.13 and Figure 7.14 for instructions on replacement of the Receiver Assembly:

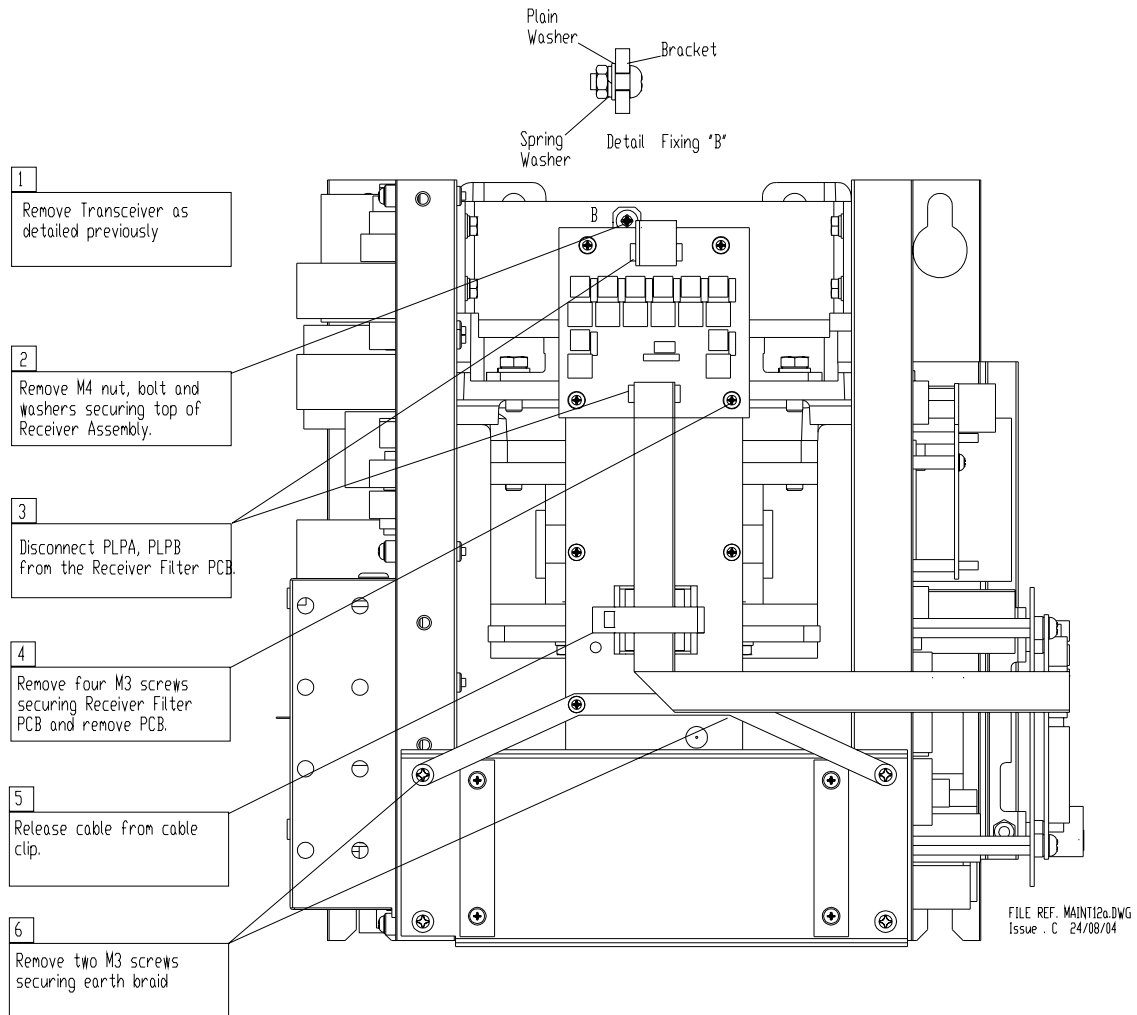


Figure 7.13 Replacing the Receiver Assembly 65830616

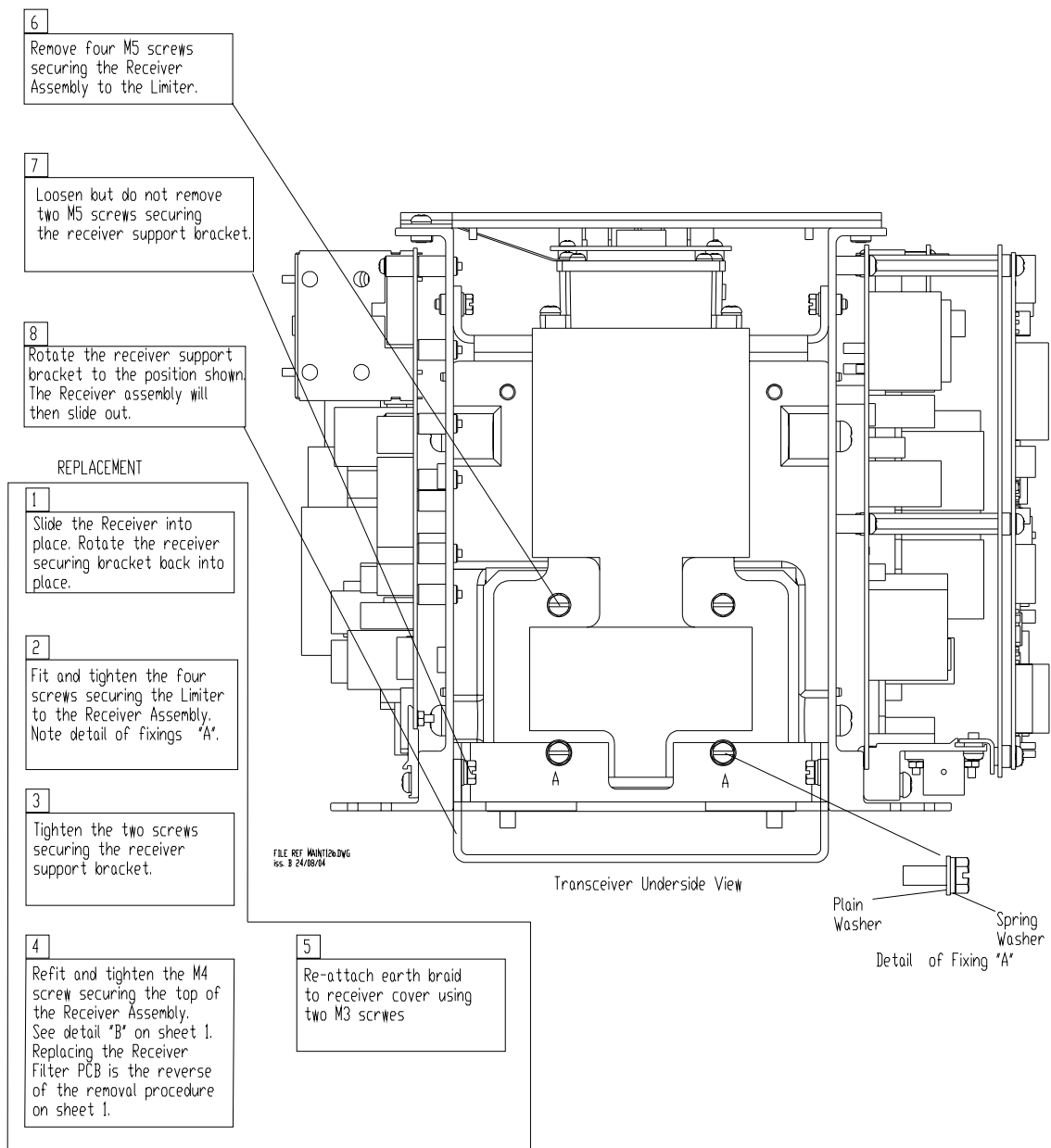


Figure 7.14 Replacing the Receiver Assembly 65830616

3.1.12 Bearing and Heading Marker PCB – Replacement

1. At the Scanner Control Unit set the isolating switch to the 'OFF' position and lock it.
2. Rotate the antenna until the front face is pointing away from the transceiver.
3. Isolate the radar from the ship's mains supply using the isolating switch supplied.
4. Refer to Figure 7.15, and remove the Performance Monitor cover.
5. The location of the Pulse Bearing PCB is shown in Figure 7.16.

Bearing and Heading Marker PCB – Fault Reporting and First Line Servicing Replacement

6. Remove the two securing screws and remove the PCB.
7. Replace the PCB and secure with the two screws (two dowels of different diameters locate the PCB in the correct orientation).
8. Align the Heading Marker using the configuration tool.

DANGER!
LETHAL VOLTAGES ARE EXPOSED
WHEN COVERS ARE REMOVED.
ENSURE TRANSCIVER IS ISOLATED
FROM SHIP'S SUPPLY, AND THAT
THE SHIP'S SUPPLY TO THE SCANNER
MOTOR IS ISOLATED AT THE SCANNER
CONTROL UNIT.

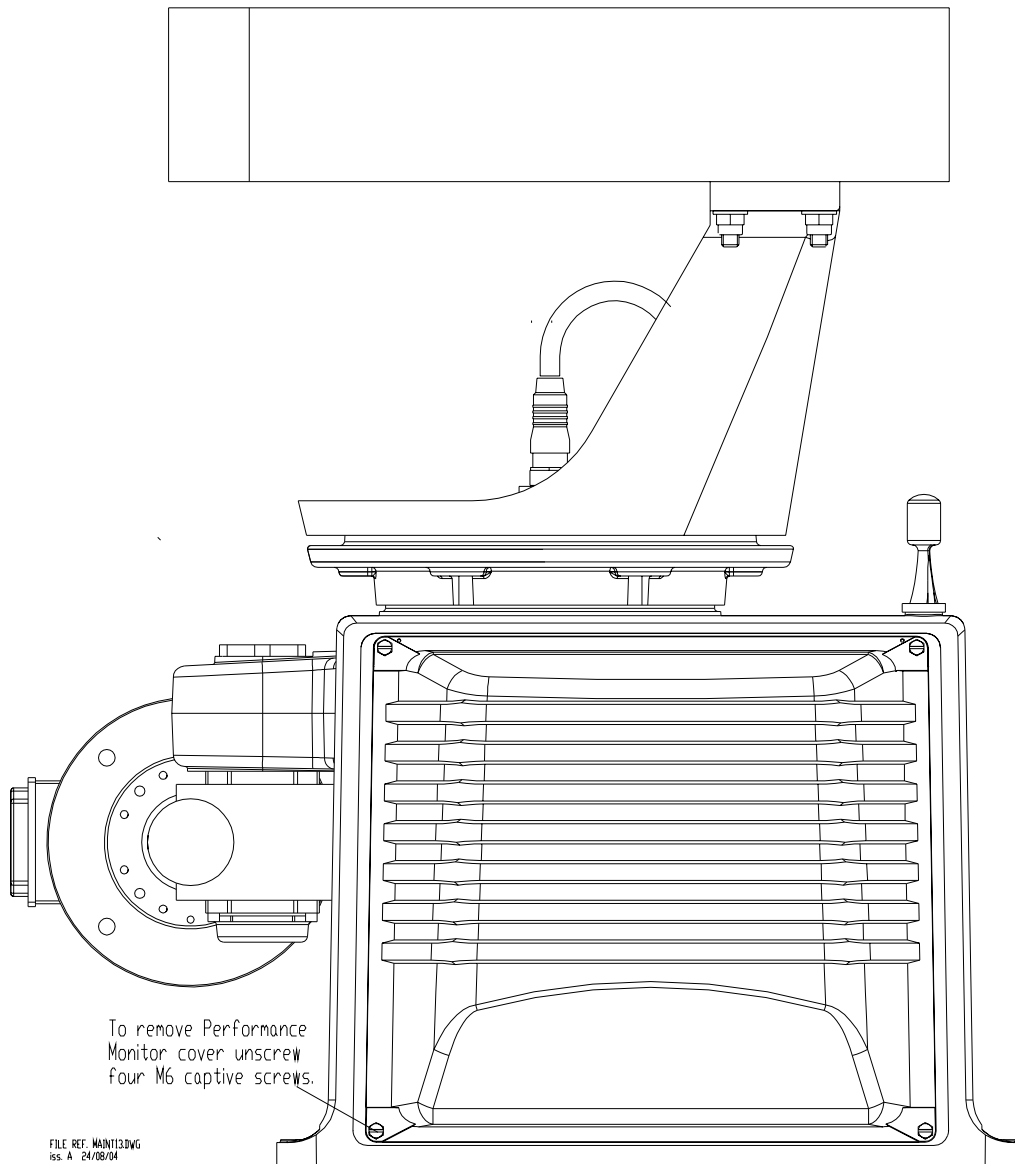


Figure 7.15 Access to Performance Monitor, Bearing and Heading Marker PCB

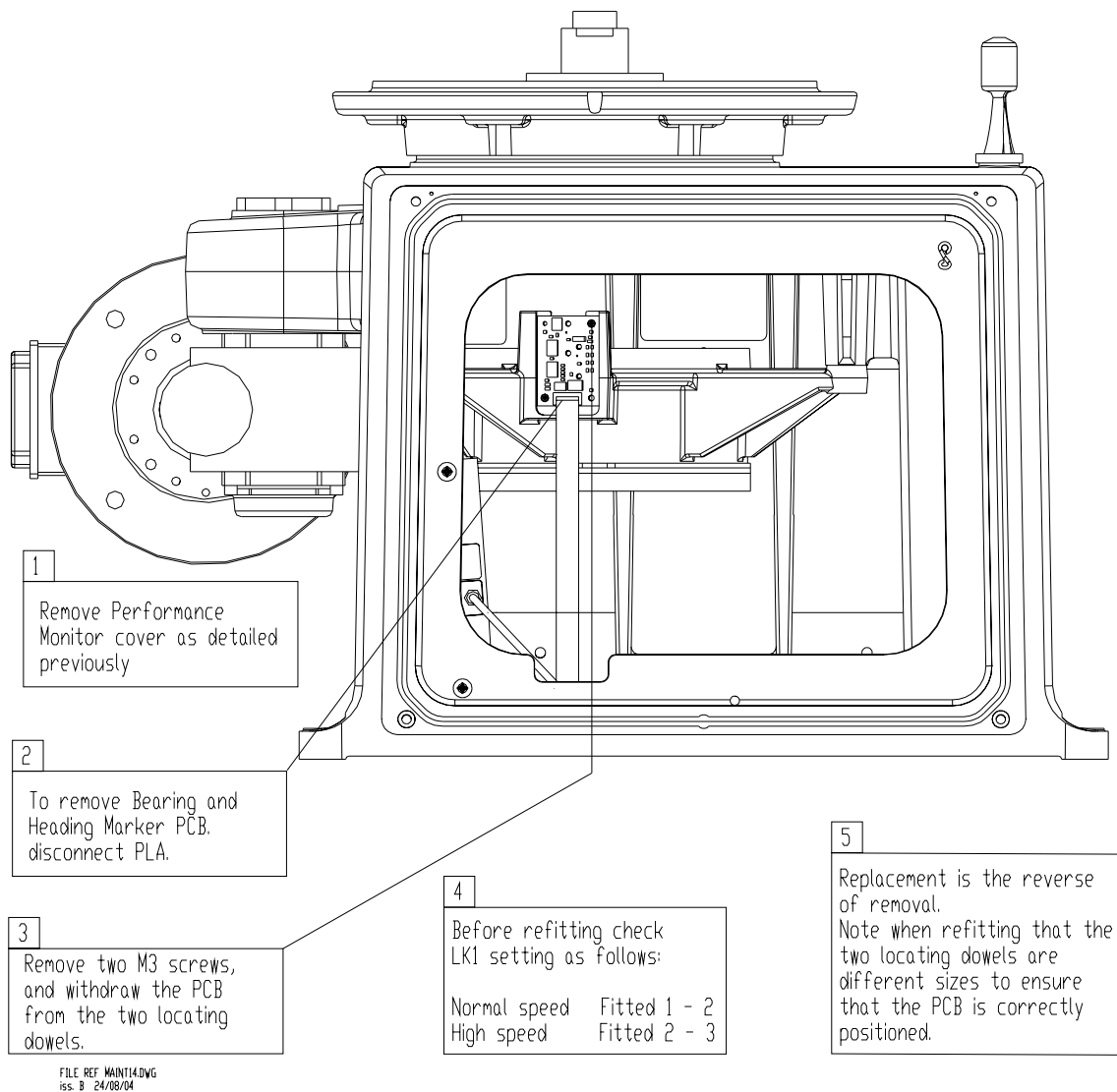


Figure 7.16 Replacing the Bearing and Heading PCB

3.1.13 Performance Monitor – Replacement

See Figure 7.15 and Figure 7.17 for instructions on replacement of the Receiver Assembly:

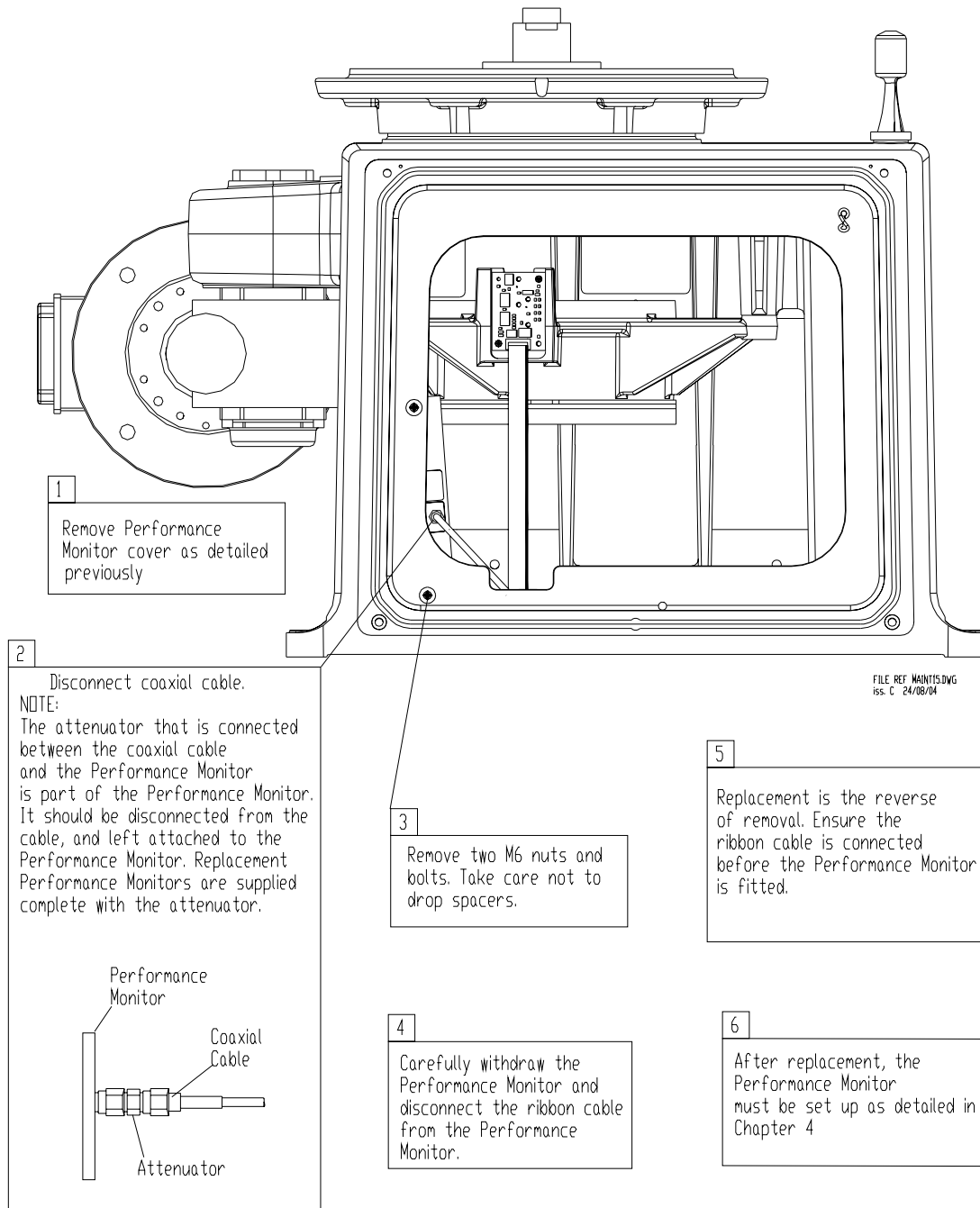


Figure 7.17 Replacing the Performance Monitor

3.1.14 Fan Assembly – Replacement

See Figure 7.18 for instructions on replacement of the Fan Assembly:

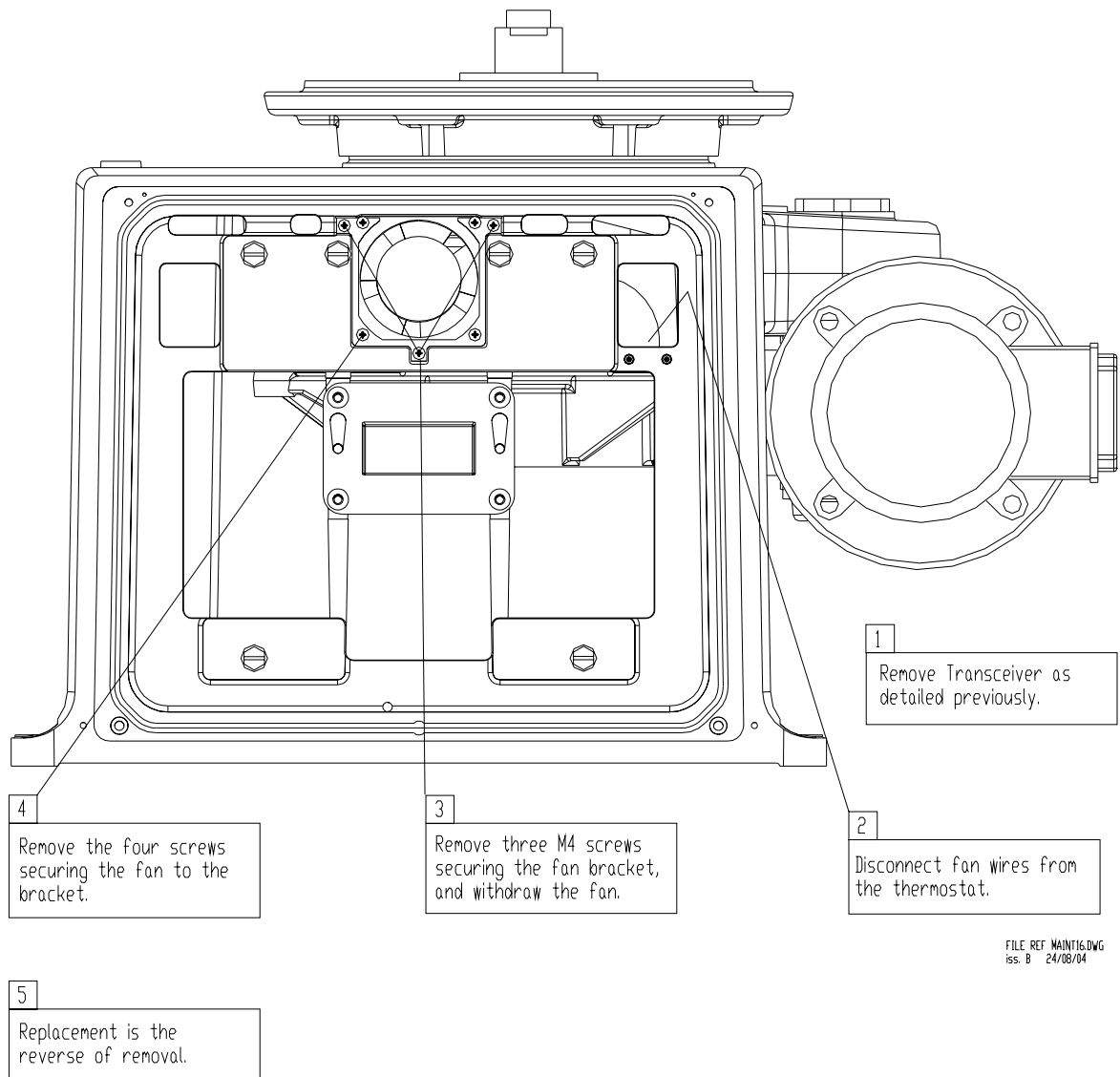


Figure 7.18 Replacing the Fan Assembly

INTENTIONALLY LEFT BLANK

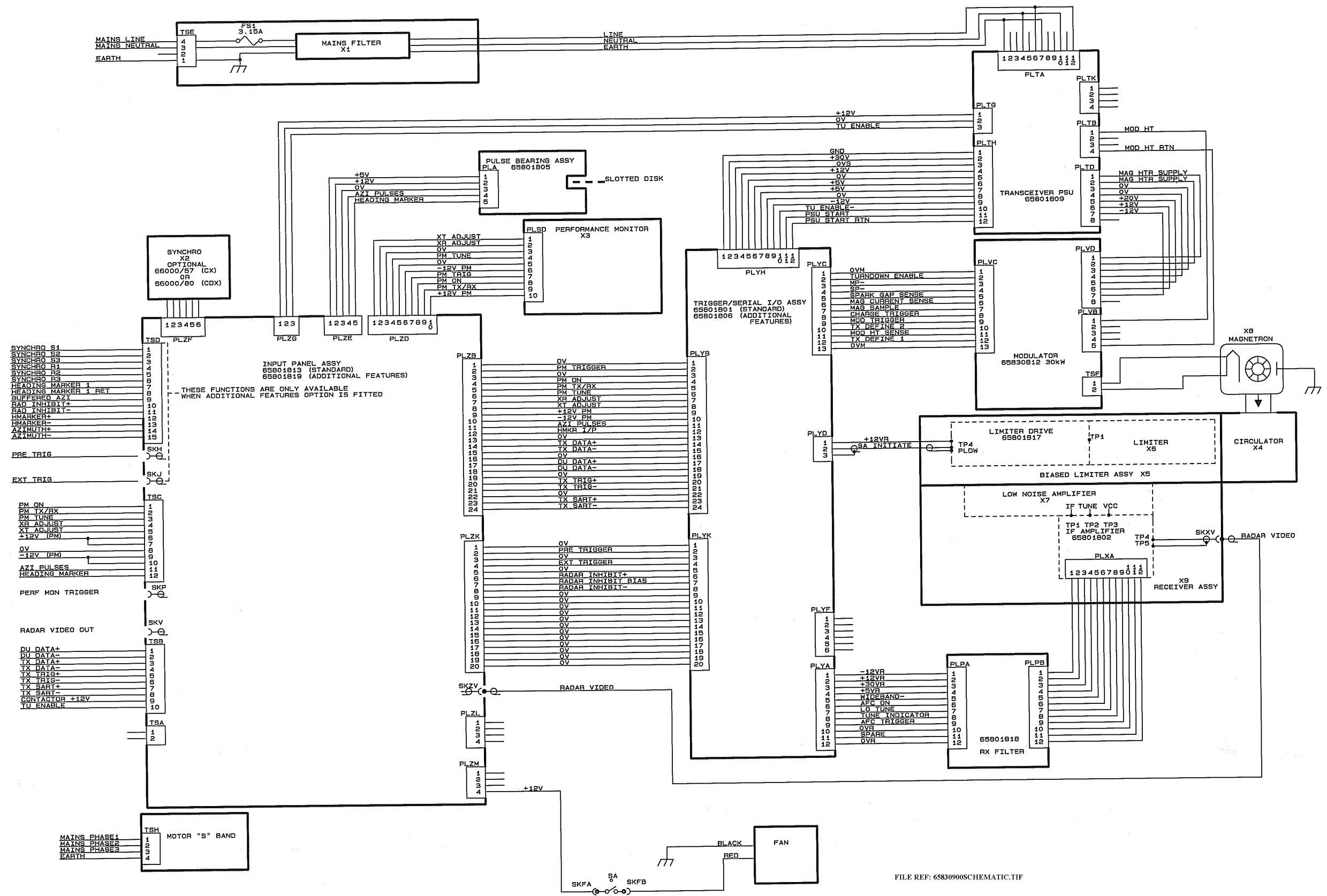


Figure 7.19 S-band Turning Unit Schematic

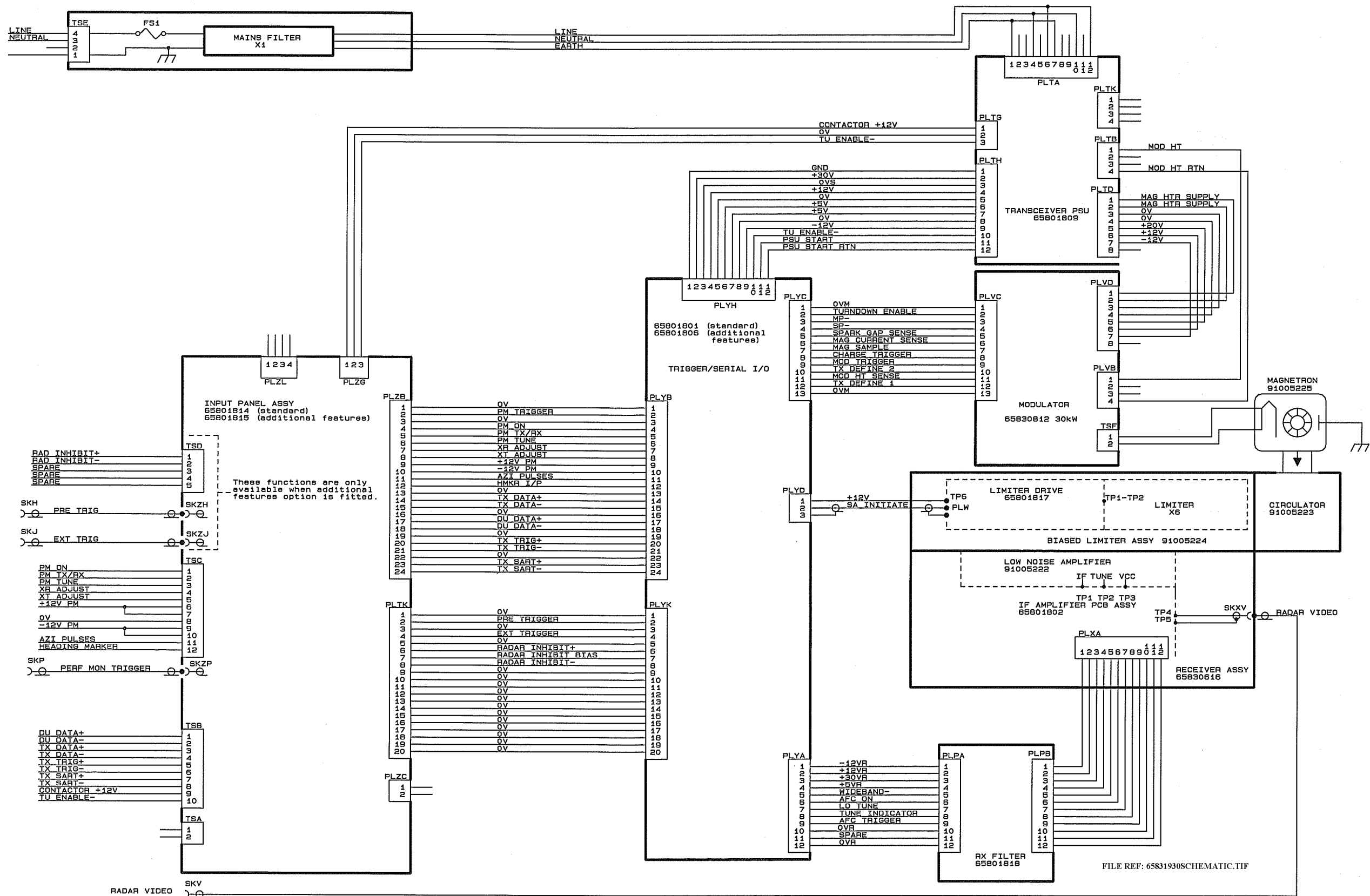


Figure 7.20 S-band Bulkhead Transceiver Schematic

3.2 X-band Scanner Unit

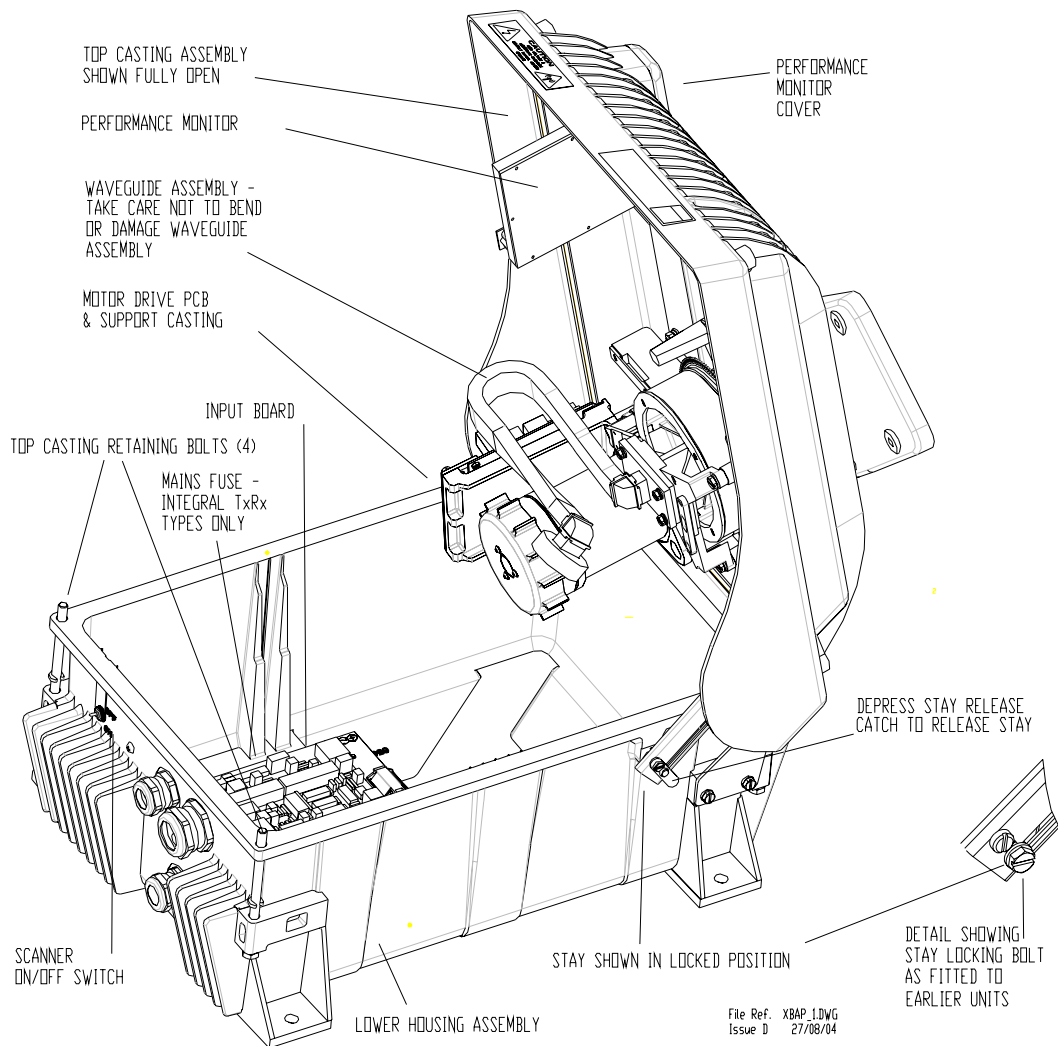


Figure 7.21 Main Assemblies of X-band Bulkhead Turning Unit

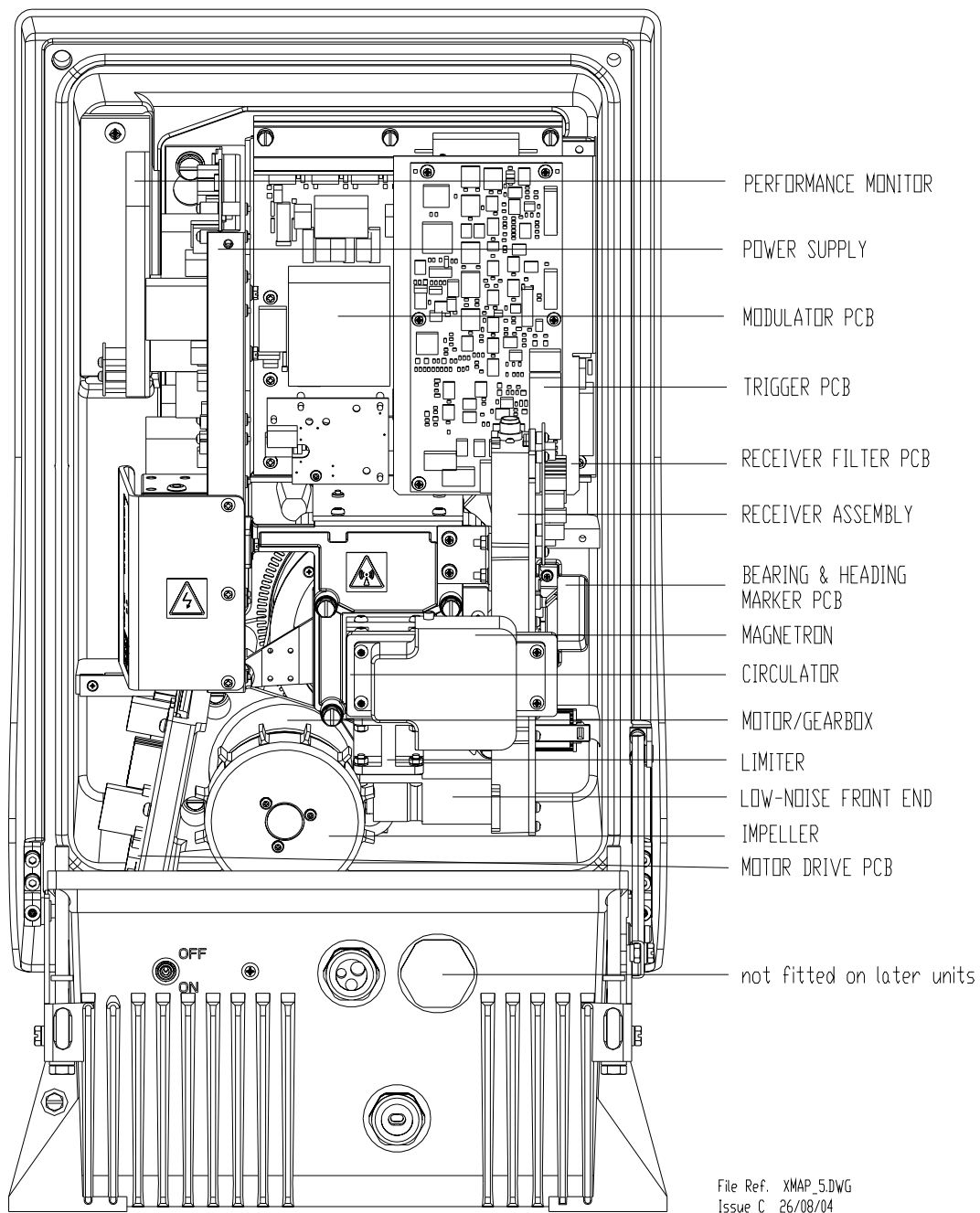


Figure 7.22 Main Assemblies of X-band Masthead Turning Unit

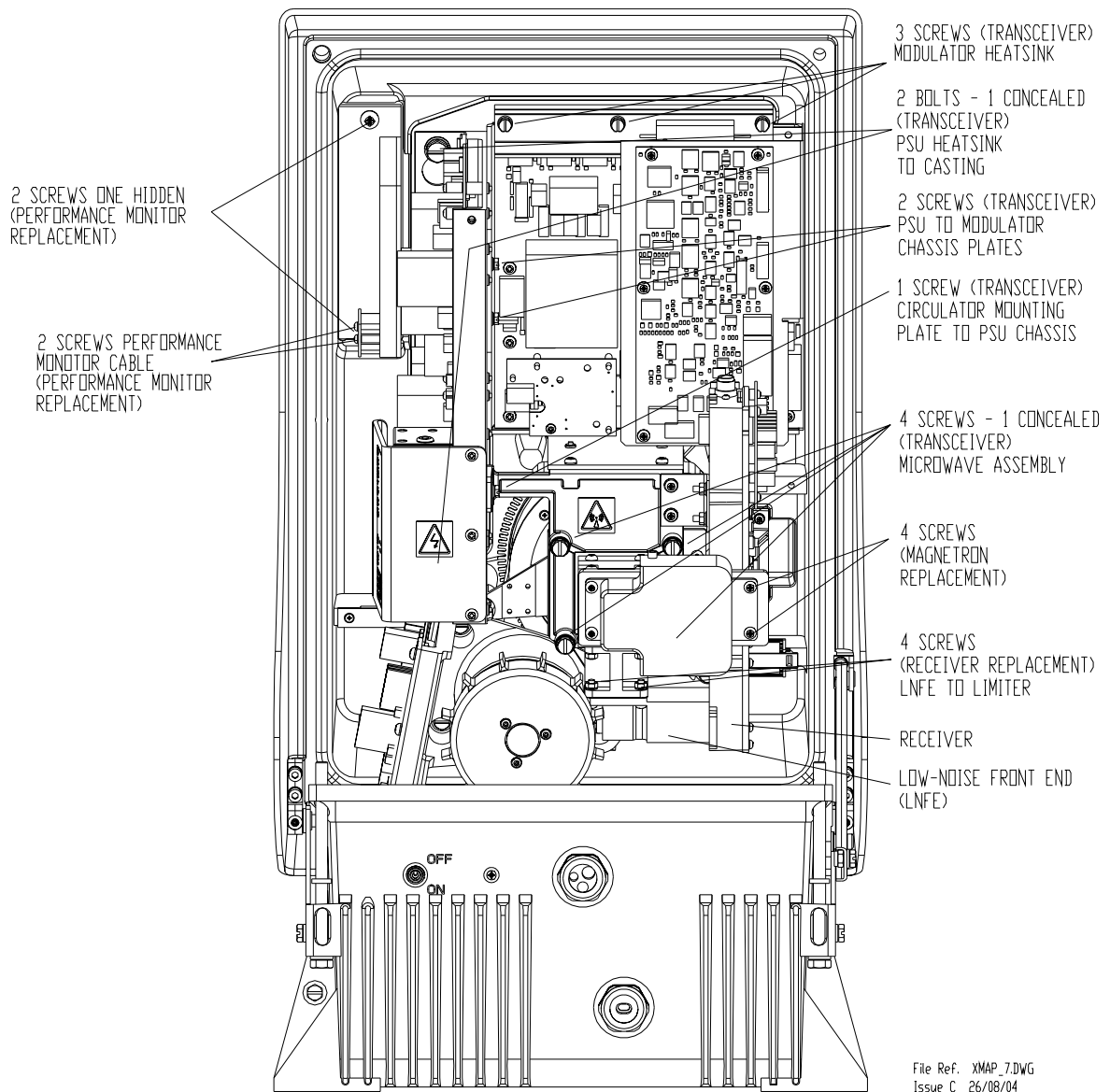


Figure 7.23 Fitment of Main Assemblies on X-band Masthead Turning Unit

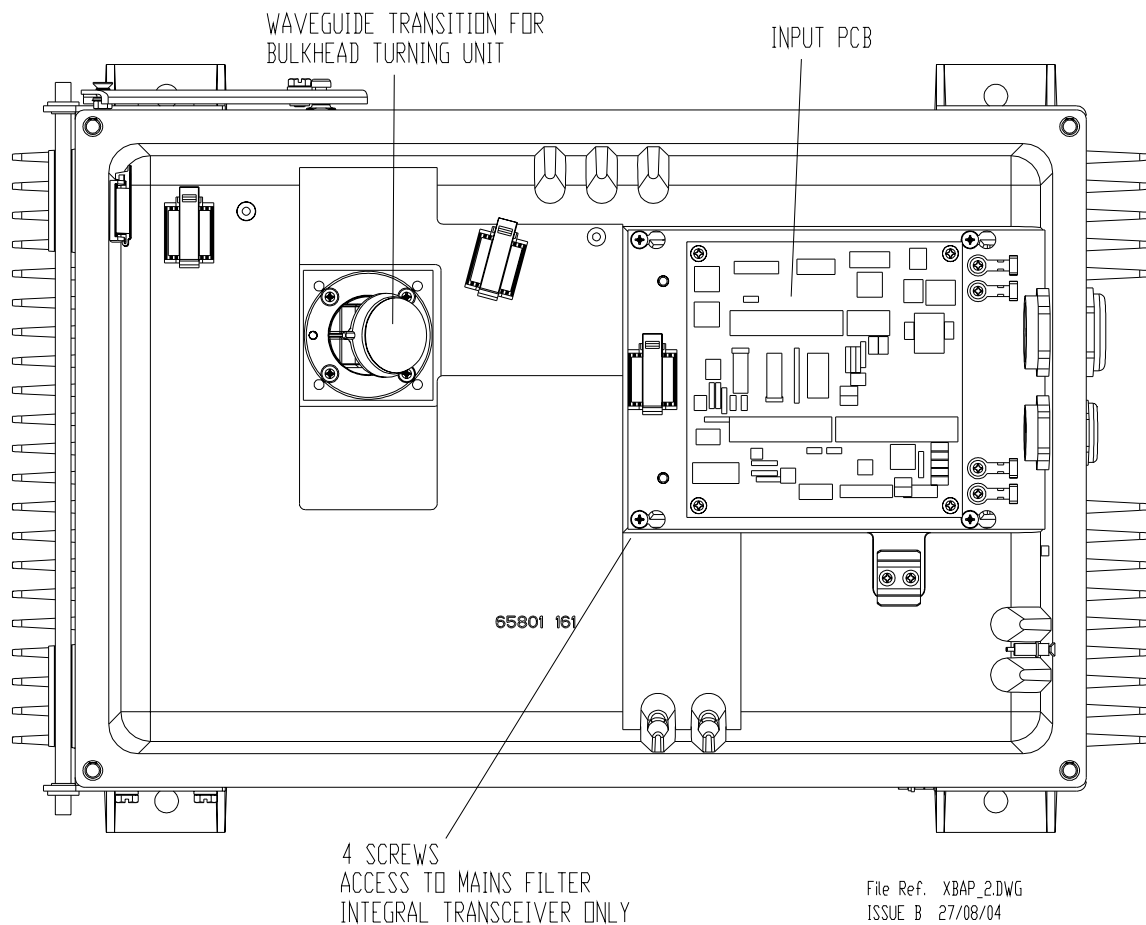


Figure 7.24 Assemblies Fitted to Lower Casting – Bulkhead Turning Unit

3.2.1 Access to Masthead Transceiver

1. Select **Shutdown System** in the Display System menu and wait for the VisionMaster FT application and Windows to fully power down.
2. Switch the Control Panel On/Off switch to Off.
3. Isolate and remove both Ship's Switch Fuses in DC systems.
4. Isolate the radar from the ship's mains supply using the Isolating Switch provided for AC systems.
5. Turn the antenna into the service position: across the Transceiver axis, clear of any obstructions.
6. Undo the four captive bolts on the underside of each upper casting (these secure the upper casting to the base casting).
7. Raise the upper casting into the upright position and make sure the support stay engages in the locked position.

- On earlier units the sliding locking bolt should be pushed to the bottom of the slot in the stay to prevent inadvertent release of the upper casting. Refer to Figure 7.25.

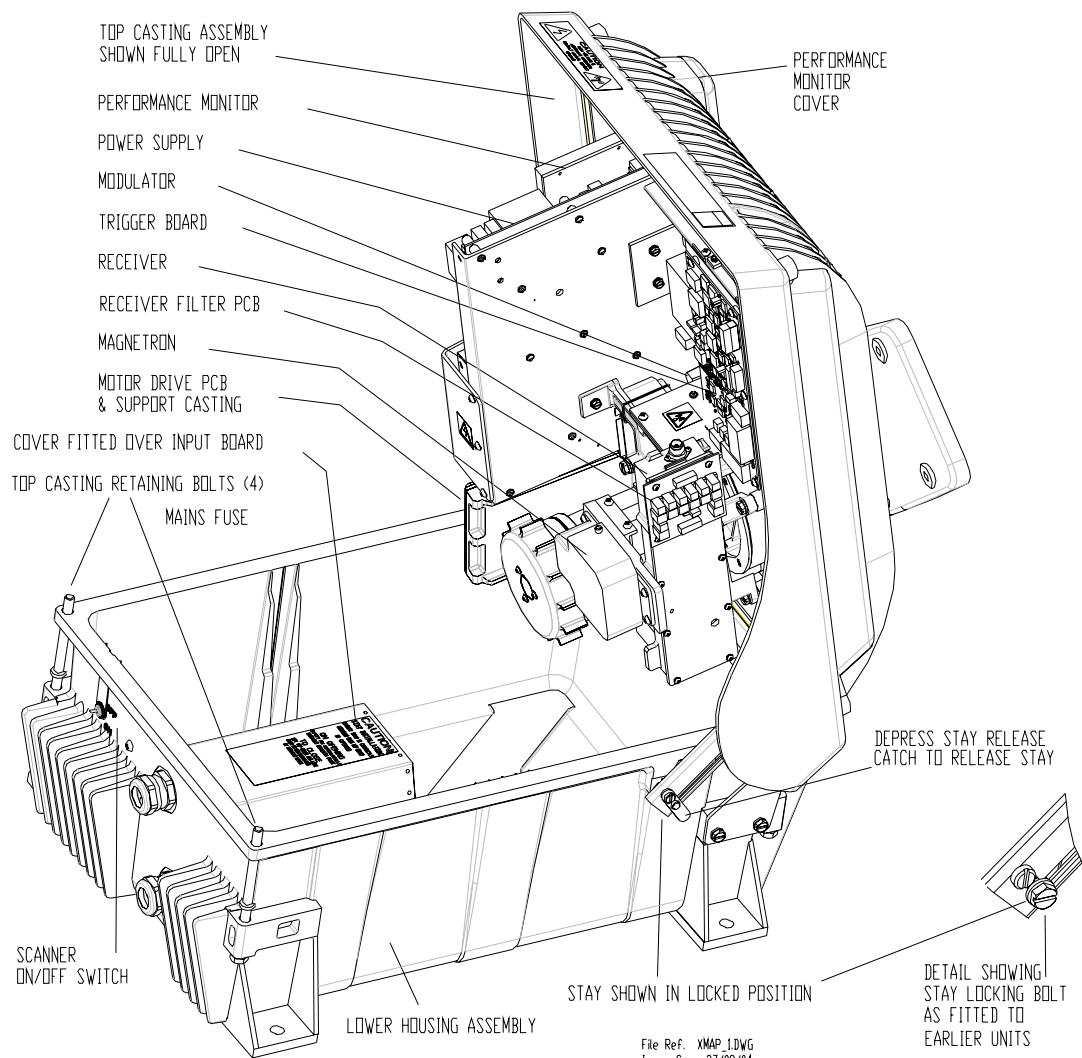


Figure 7.25 Internal view of X-band Masthead Turning Unit (showing Transceiver)

3.2.2 Access to Bulkhead Transceiver

- Select **Shutdown System** in the Display System menu and wait for the VisionMaster FT application and Windows to fully power down.
- Switch the Control Panel On/Off switch to Off.
- Isolate and remove both Ship's Switch Fuses in DC systems.
- Isolate the radar from the ship's mains supply using the Isolating Switch provided for AC systems.
- Undo the four screws that retain the upper cover to the lower chassis and lift clear.

Replacing the Transceiver in the Masthead Turning Unit

Fault Reporting and First Line Servicing

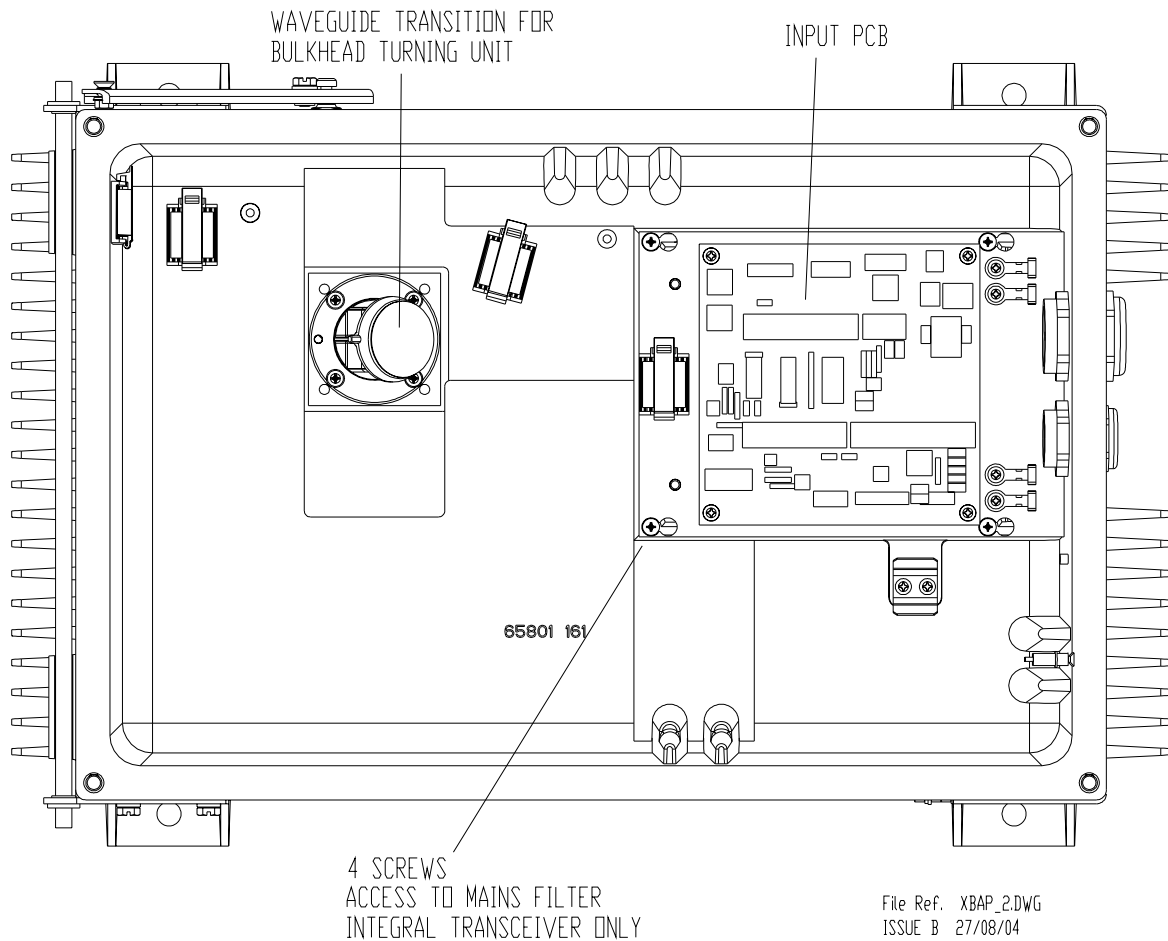


Figure 7.26 X-band Bulkhead Turning Unit – assemblies fitted to lower casting

3.2.3 Replacing the Transceiver in the Masthead Turning Unit

1. Refer to Section 3.2.1 'Access to Masthead Transceiver', paying attention to all safety aspects.
2. Check that the transceiver is fully isolated from the ship's supply.

Note: *The Masthead and Bulkhead Transceiver Units are identical and only minor differences exist in terms of fixtures.*

3. Disconnect the cables from the following sockets:

SKV	Video co-axial cable to receiver assembly.
PLYB	Ribbon cable to Trigger PCB.
PLTK	Cable from PSU to Motor Drive PCB.
PLTA	Cable from PSU to Input Filter PCB (mains supply).
PLTG	Cable from PSU to Input PCB.

4. Refer to Figure 7.23.
5. Release the four M6 captive screws that hold the microwave assembly to the waveguide transition (around the base of the Circulator plate).
6. Remove the three screws that hold the Modulator heat sink to the chassis.
7. Slacken the two large bolts that hold the PSU heat sink to the chassis.
8. Before sliding up and removing the Transceiver, make sure that no cables are caught on any of the metalwork to avoid damage.
9. The PSU heat sink has slotted holes: slide upwards (towards the microwave output transition) and remove without fully removing the two bolts.

The replacement sequence is as follows:

10. Place the Transceiver approximately onto the upper casting using the two large slotted holes in the PSU heat sink.
11. Slacken the two screws that hold the PSU chassis plate to the Modulator chassis plate, see Figure 7.23.
12. Slacken the screw that holds the Circulator mounting plate to the PSU chassis plate.
13. Fit and only **partially** tighten the three screws in the Modulator heat sink.
14. Fully tighten the four M6 microwave assembly-retaining screws.
15. Fully tighten the three screws in the Modulator heatsink.
16. Fully tighten the two large bolts in the slotted holes in the PSU heat sink.
17. Fully tighten the two screws that hold the PSU chassis plate to the Modulator chassis plate.
18. Fully tighten the screw that holds the circular mounting plate to the PSU chassis.

Note: *This sequence is important to make sure the microwave alignment takes priority in terms of mechanical tolerances.*

19. Replace all cables removed earlier.

Replacing the Transceiver in the Masthead Turning Unit

Fault Reporting and First Line Servicing

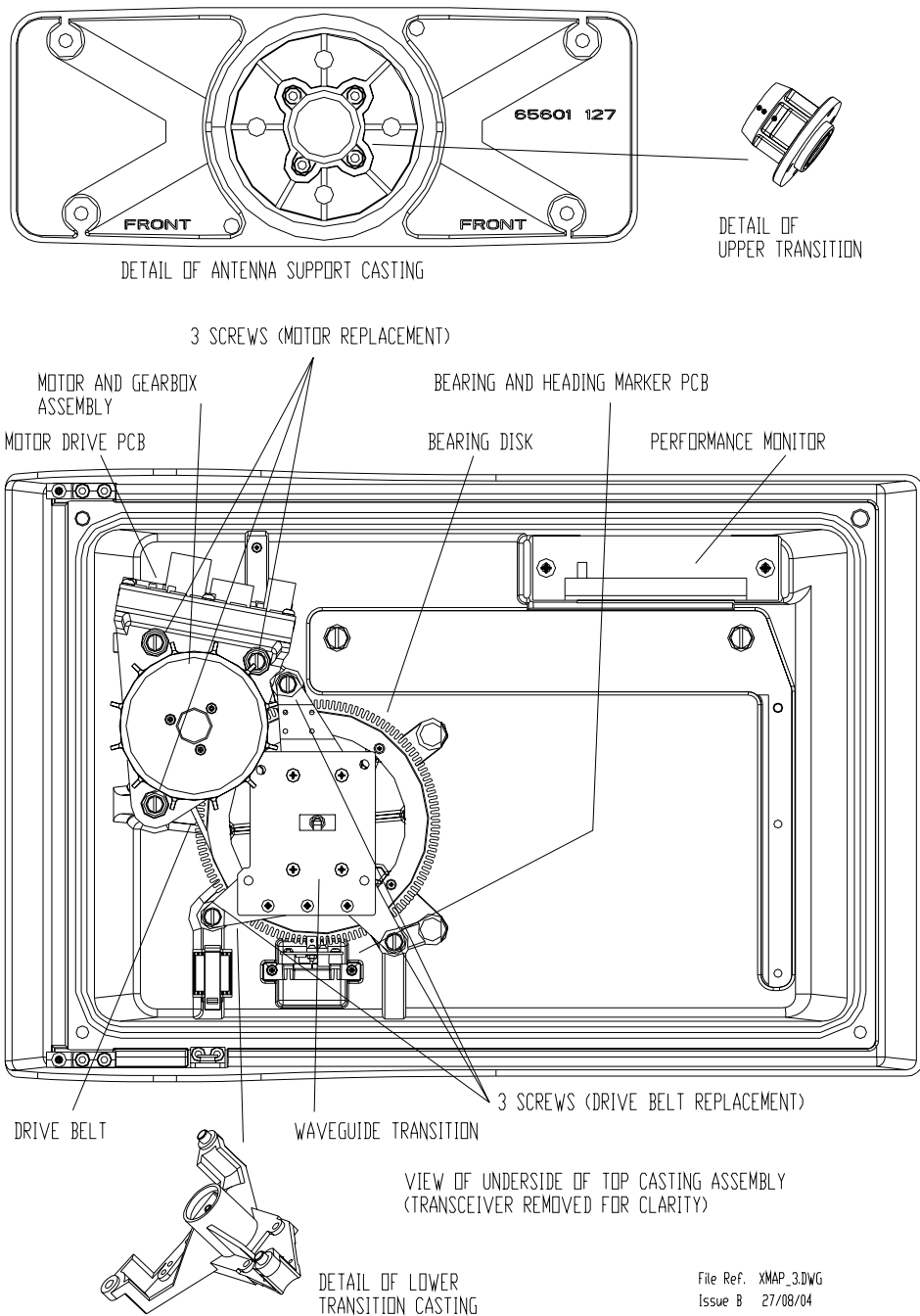


Figure 7.27 View inside Upper Casting with Transceiver removed

3.2.4 Replacing the Transceiver in the Bulkhead Turning Unit

1. Refer to Section 3.2.2 'Access to Bulkhead Transceiver', paying attention to all safety aspects.
2. Check that the Transceiver is fully isolated from the ship's supply.

Note: *The Masthead and Bulkhead Transceiver Units are identical and only minor differences exist in terms of fixtures.*

3. Disconnect the cables from the following sockets:

SKV	Video co-axial cable to receiver assembly.
PLYB	Ribbon cable to Trigger PCB.
PLTK	Cable from PSU to Input PCB (motor supply).
PLTA	Cable from PSU to Input Filter PCB (mains supply).
PLTG	Cable from PSU to Input PCB.

4. Refer to Figure 7.23 and Figure 7.28.
5. Release the four M6 captive screws that hold the microwave assembly to the waveguide transition (around the base of the Circulator plate).
6. Remove the three screws that hold the Modulator heat sink to the chassis.
7. Slacken the two large bolts that hold the PSU heat sink to the chassis.
8. Before sliding up and removing the Transceiver, make sure that no cables are caught on any of the metalwork to avoid damage.
9. The PSU heat sink has slotted holes: slide upwards (towards the microwave output transition) and remove without fully removing the two bolts.

Note: *On Bulkhead Transceivers, a small clip is fitted to the chassis to retain the lower edge of the Modulator PCB and support plate. This is purely a slide-in fixture and does not require undoing.*

The replacement sequence is as follows:

10. Locate the Transceiver approximately onto the chassis using the two large slotted holes in the PSU heatsink.
11. Make sure the small clip fitted to the chassis engages the lower edge of the Modulator PCB and support plate during the replacement process.
12. Slacken the two screws that hold the PSU chassis plate to the Modulator chassis plate, refer to Figure 7.28.
13. Fit and **partially** tighten the three screws in the Modulator heat.
14. Fully tighten the four M6 microwave assembly-retaining.

Replacing the Transceiver in the
Bulkhead Turning Unit

Fault Reporting and First Line Servicing

15. Fully tighten the three screws in the Modulator heat sink.
16. Fully tighten the two large bolts in the slotted holes in the PSU heat sink.

Note: *This sequence is important to make sure the microwave alignment takes priority in terms of mechanical tolerances.*

17. Replace all cables removed earlier.

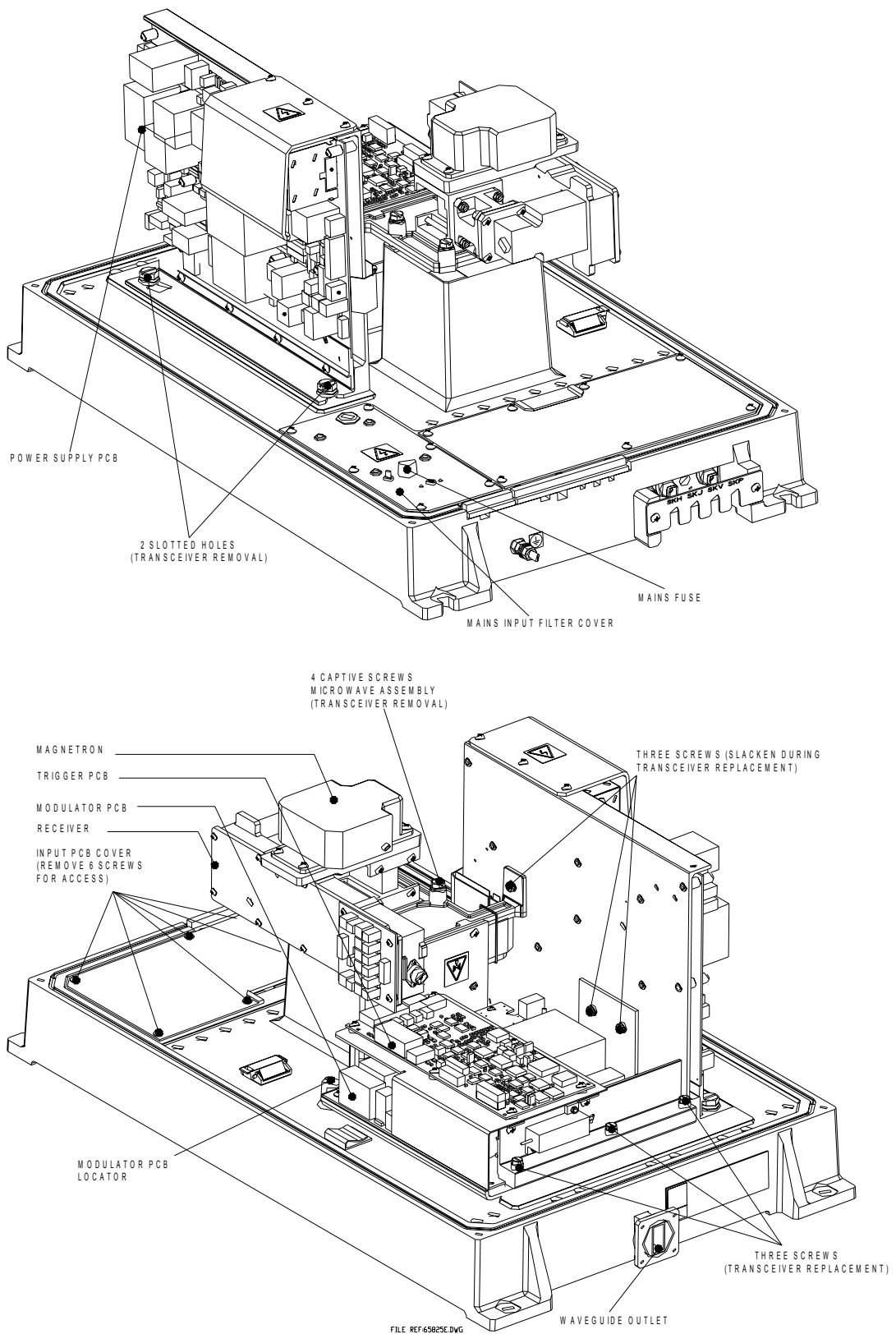


Figure 7.28 Bulkhead Transceiver - View with Cover Removed

Magnetron Replacement – Masthead Fault Reporting and First Line Servicing and Bulkhead Transceivers

3.2.5 Magnetron Replacement – Masthead and Bulkhead Transceivers

1. Refer to Section 3.2.1 '*Access to Masthead Transceiver*' or Section 3.2.2 '*Access to Bulkhead Transceiver*', paying attention to all safety aspects.
2. Check that the Transceiver is fully isolated from the ship's supply.
3. Refer to Figure 7.23.
4. Disconnect the two EHT leads from the Modulator PCB terminal block.
5. Remove the four screws holding the Magnetron to the Circulator plate.

The replacement sequence is as follows:

6. Replacement is the reverse of the removal process.
7. Make sure the polarity of the EHT leads is correct. The PCB is marked 'Y' for yellow and 'G' for green.
8. Make sure any earth bonding leads to the Magnetron are refitted.

After replacement the magnetron current must be set up as in the following sub-section.

3.2.6 Setting the Magnetron Current

1. On the Trigger PCB set LK5 and LK6 to 2–3.
This is the service position and will let the Transmitter transmit when the antenna is stationary.
2. Restore the ship's supply to the Transceiver.
3. Select Long Pulse, transmit at the Display.
4. Measure the voltage between TP100 and ground on the Modulator PCB.
A DVM with an input impedance >10 Mohms must be used for this measurement. Use of a meter with lower impedance could cause damage to the magnetron.
5. Adjust RV1 on the Power Supply PCB to give the correct voltage on TP100. The voltage is recorded on the label on the pulse transformer on the Modulator PCB.
6. Switch off.
7. On the Trigger PCB set LK5 and LK6 to 1–2.

3.2.7 Trigger PCB – Replacement

1. Refer to Section 3.2.1 'Access to Masthead Transceiver' or Section 3.2.2 'Access to Bulkhead Transceiver', paying attention to all safety aspects.
2. Check that the Transceiver is fully isolated from the ship's supply.
3. Refer to Figure 7.29 and Figure 7.30 for the necessary procedure for replacing the Trigger PCB.
4. Set the links as shown in Figure 7.30.

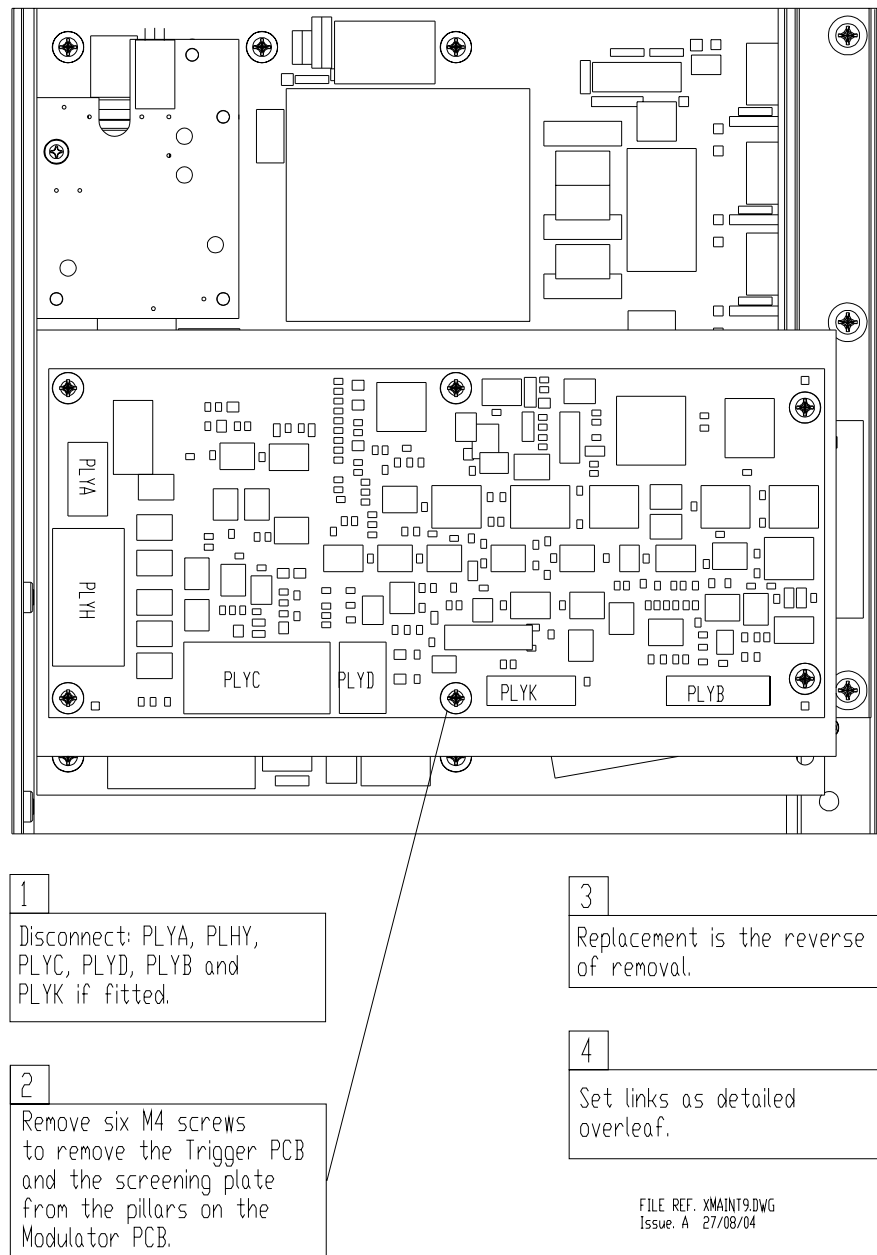
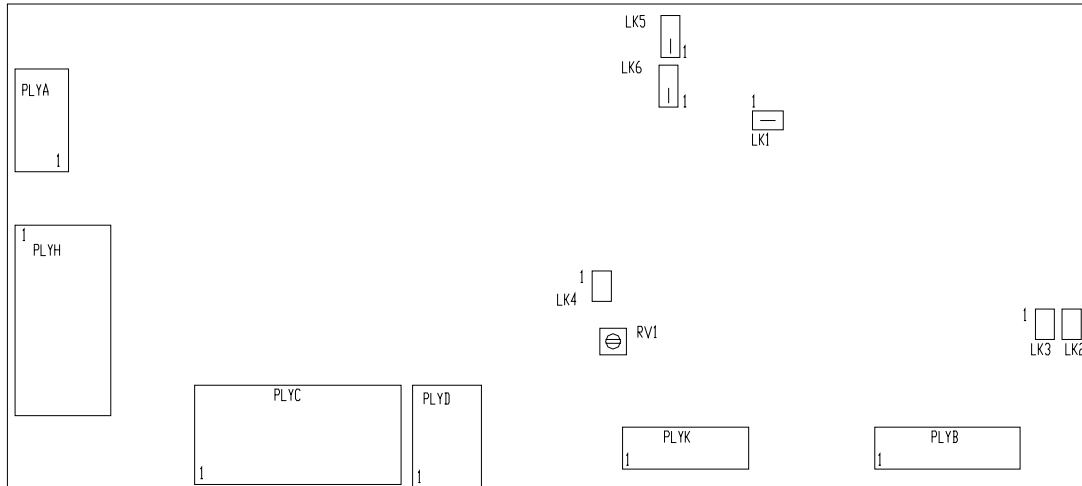


Figure 7.29 Replacing the Trigger PCB



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ATE TEST LINKS
 LK1 FITTED
 LK4 NOT FITTED

BAUD RATE LINKS
 LK2 NOT FITTED
 LK3 NOT FITTED

SERVICE LINKS
 LK5 NORMAL OPERATION FITTED 1 - 2
 LK6 NORMAL OPERATION FITTED 1 - 2

LK5 SERVICE FITTED 2 - 3
 LK6 SERVICE FITTED 2 - 3
 WHEN FITTED 2 - 3 THE TRANSMITTER
 WILL OPERATE WHEN THE ANTENNA IS
 STOPPED.

RV1 SWEPT GAIN DELAY
 FACTORY SET DO NOT ADJUST

Figure 7.30 Trigger PCB Link Settings

3.2.8 Modulator PCB – Replacement

1. Refer to Section 3.2.1 'Access to Masthead Transceiver' or Section 3.2.2 'Access to Bulkhead Transceiver', paying attention to all safety aspects.
2. Check that the Transceiver is fully isolated from the ship's supply.
3. Refer to Figure 7.31 and Figure 7.32 for the necessary procedure for replacing the Modulator PCB.
4. Set the links as shown in Figure 7.32.

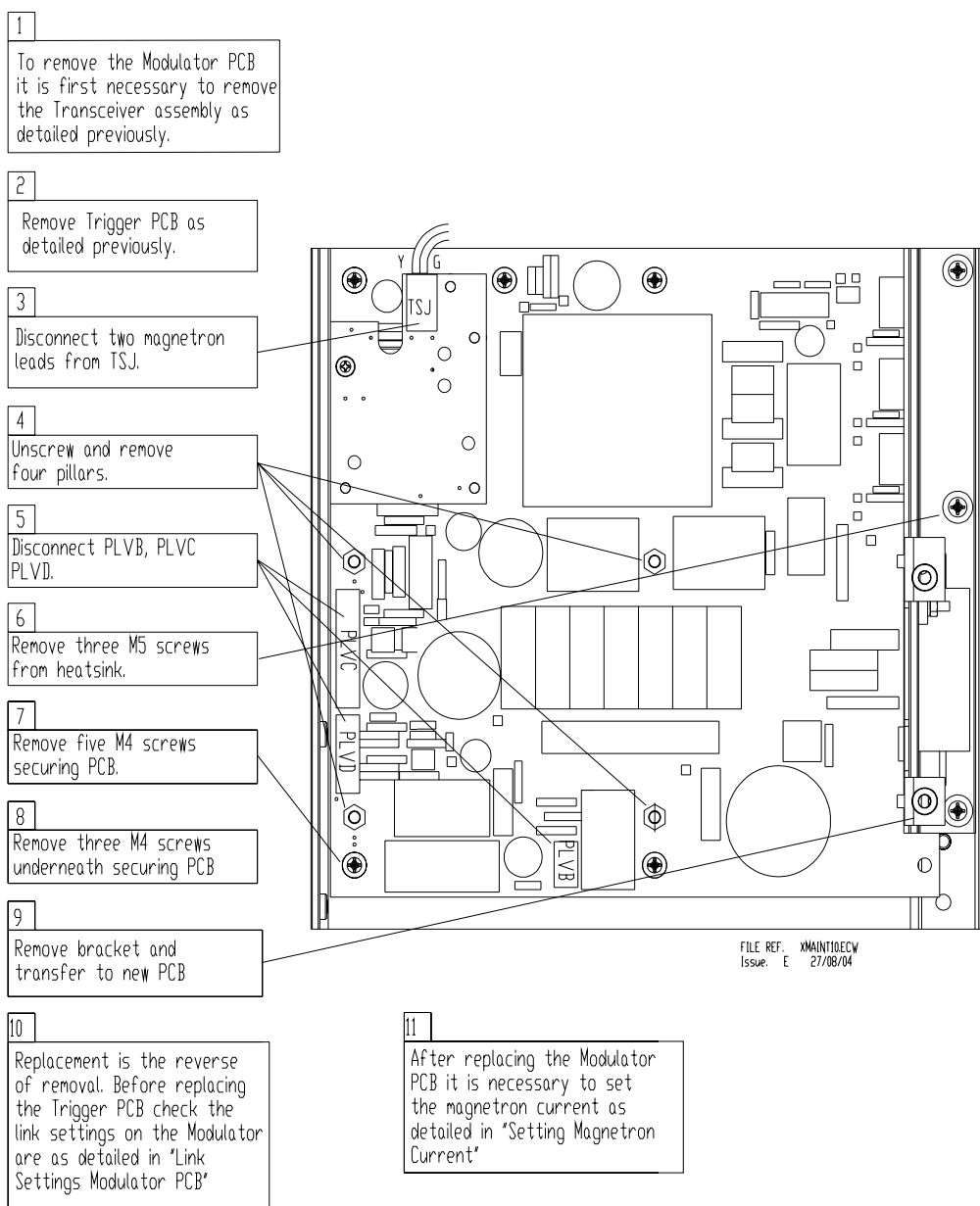
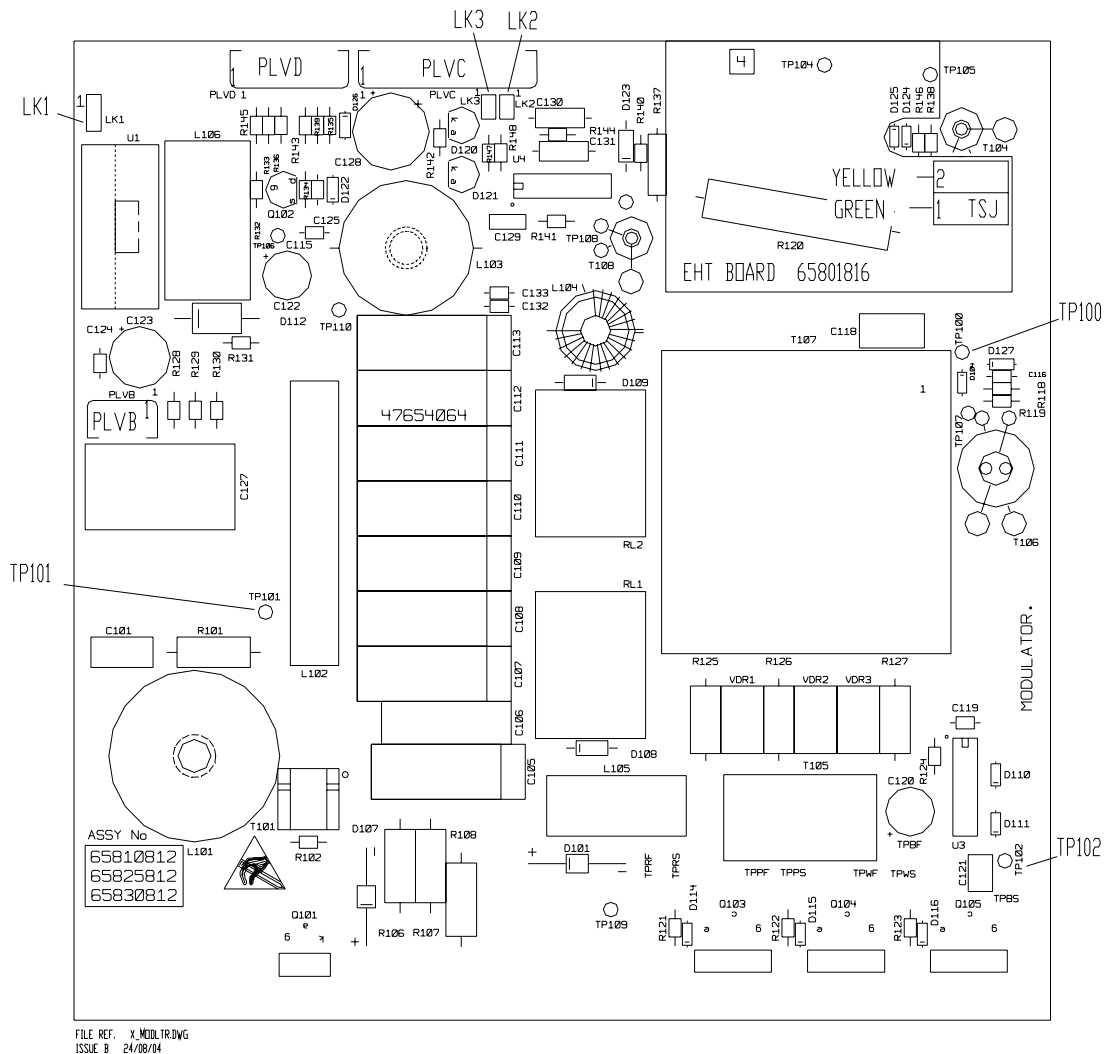


Figure 7.31 Replacing the Modulator PCB



MODULATOR LINK SETTINGS FOR 65810812 / 65825812 / 65830812

	S-BAND	10 kW X-BAND	25 kW X-BAND
LK1	FITTED 2 - 3	FITTED 1 - 2	FITTED 1 - 2 FOR MAGNETRON MG5424
LK1			FITTED 2 - 3 FOR MAGNETRON M1458
LK2	FITTED	NOT FITTED	NOT FITTED
LK3	NOT FITTED	FITTED	NOT FITTED

NOTE THAT LINK 1 IS CONFIGURABLE FOR HEATER TURNDOWN ON 25kW X-BAND
 NOTE THAT LINKS 2 & 3 ARE HARDWIRED FOR SPECIFIC USAGE ON LATER MODULATORS.

TEST POINTS:
 TP100 MAGNETRON CURRENT MONITOR
 TP101 CHARGE TRIGGER
 TP102 MODULATOR TRIGGER

Figure 7.32 Modulator PCB Link Settings

3.2.9 Power Supply PCB – Replacement

1. Refer to Section 3.2.1 'Access to Masthead Transceiver' or Section 3.2.2 'Access to Bulkhead Transceiver', paying attention to all safety aspects.
2. Check that the Transceiver is fully isolated from the ship's supply.
3. Refer to Figure 7.33 and Figure 7.34 for the necessary procedure for replacing the PSU PCB.
4. Set the links as shown in Figure 7.34.

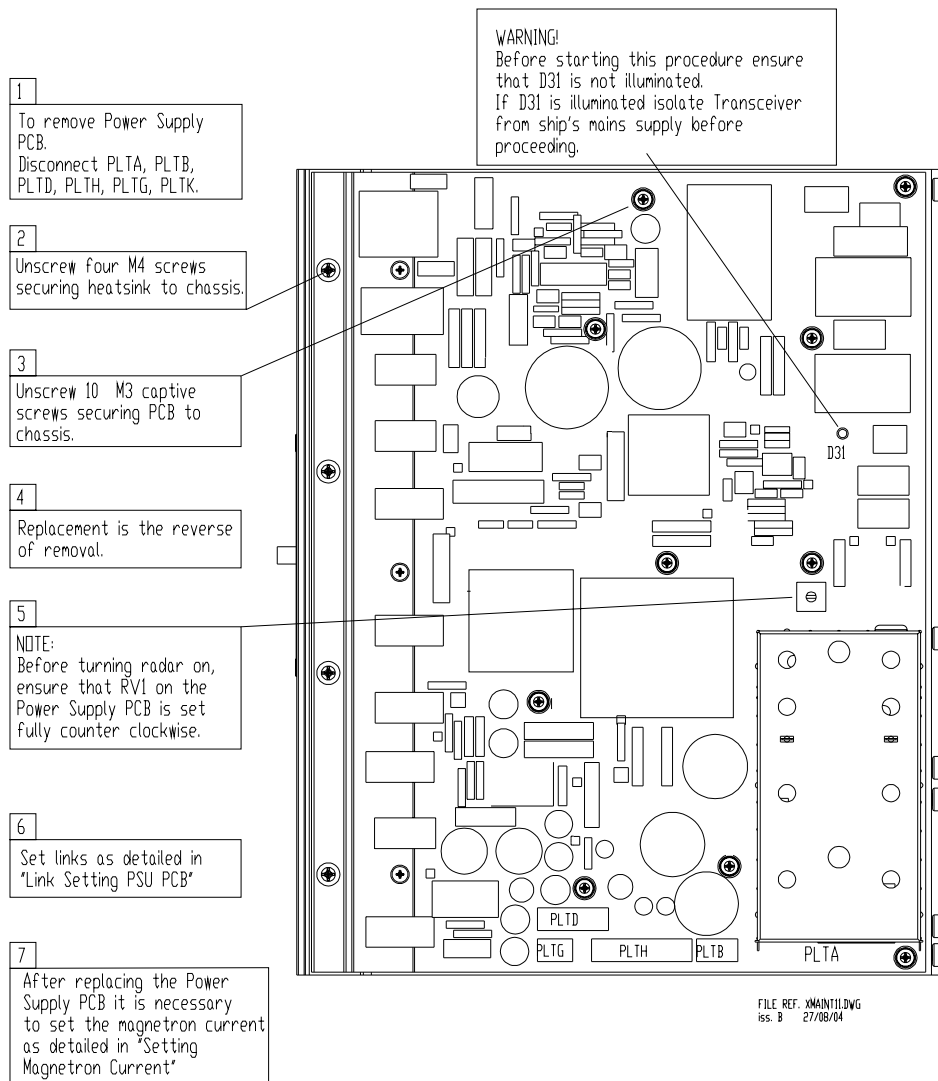
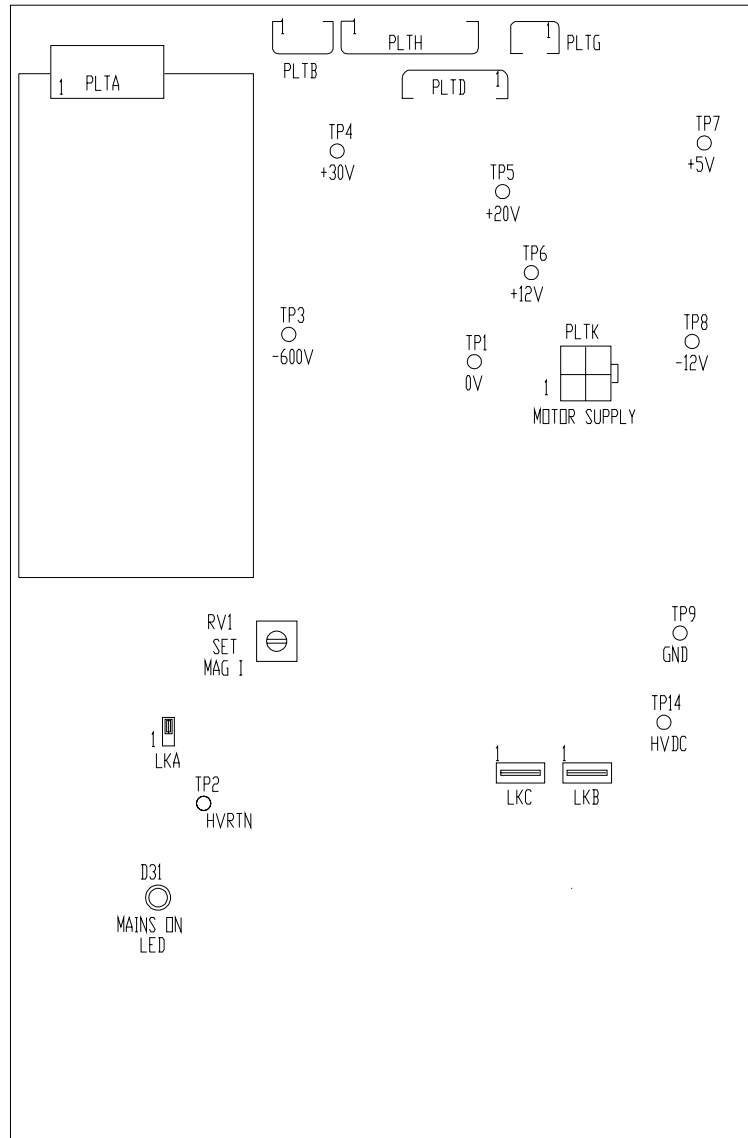


Figure 7.33 Replacing the Power Supply PCB



LKA START TEST LINK
 LKA NORMAL OPERATION FITTED 2 - 3
 LKA TEST FITTED 1 - 2
 WHEN IN THE TEST POSITION THIS LINK
 ALLOWS THE POWER SUPPLY TO
 OPERATE WITHOUT BEING CONNECTED
 TO THE CONTROL SIGNALS FROM THE
 DISPLAY UNIT.

HIGH VOLTAGE ISOLATION LINK
 LKB NORMAL OPERATION FITTED
 LKB ISOLATE HV OPERATION NOT FITTED
 THIS LINK CAN BE USED TO ISOLATE
 THE POWER FACTOR CORRECTION
 CIRCUIT FROM THE REST OF THE
 POWER SUPPLY AS AN AID TO
 FAULT FINDING

LKC - MOTOR SUPPLY ISOLATION LINK NORMALLY FITTED

TEST POINTS
 TP1 0V
 TP3 -600V
 TP4 +30V
 TP5 +20V
 TP6 +12V
 TP7 +5V
 TP8 -12V

THE ABOVE VOLTAGES
 ARE MEASURED
 WITH RESPECT TO TP1
 TP2 HVRTN
 TP14 HVDC (380V)
 THE VOLTAGE ON TP14
 IS MEASURED
 WITH RESPECT TO TP2.

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 ISS. B 24/08/04

Figure 7.34 Power Supply PCB Link Settings

3.2.10 Receiver Assembly – Replacement (Masthead)

1. Refer to Section 3.2.1 'Access to Masthead Transceiver', paying attention to all safety aspects.
2. Check that the Transceiver is fully isolated from the ship's supply.
3. Remove the Transceiver Assembly as described at Section 3.2.3.
4. Unplug the ribbon cable from the Receiver to the Receiver Filter PCB.
5. Unplug the ribbon cable from the Receiver Filter PCB to the Trigger PCB.
6. Refer to Figure 7.23 for location of the screws securing the Low Noise Front End (LNFE) to the Limiter.

Note: *The replacement Receiver is supplied with the LNFE already fitted.*

7. Remove the four screws that hold the LNFE to the Limiter.
8. Remove the bracket that secures the Receiver to the microwave assembly at the Receiver end.
9. Remove the whole Receiver assembly.
10. Before fitting the replacement assembly, remove the Receiver Filter PCB from the old unit, and fit it to replacement unit.
11. Replacement is the reverse of the removal process.

3.2.11 Receiver Assembly – Replacement (Bulkhead)

1. Refer to Section 3.2.2 'Access to Bulkhead Transceiver', paying attention to all safety aspects.
2. Check that the Transceiver is fully isolated from the ship's supply.
3. Refer to Figure 7.23 and Figure 7.28.
4. Unplug the ribbon cable from the Receiver to the Receiver Filter PCB.
5. Unplug the ribbon cable from the Receiver Filter PCB to the Trigger PCB.
6. Unplug the video co-axial cable from the Receiver.
7. Refer to Figure 7.23 for the location of screws securing the Low Noise Front End (LNFE) to the Limiter.

Note: *The replacement Receiver is supplied with the LNFE already fitted.*

8. Remove the four screws that hold the LNFE to the Limiter and remove the whole assembly.
9. Before fitting the replacement assembly, remove the Receiver Filter PCB from the old unit, and fit it to replacement unit.
10. Replacement is the reverse of the removal process.

Bearing and Heading Marker PCB – Fault Reporting and First Line Servicing Replacement

3.2.12 Bearing and Heading Marker PCB – Replacement

1. Refer to Section 3.2.1 'Access to Masthead Transceiver' or Section 3.2.2 'Access to Bulkhead Transceiver', paying attention to all safety aspects.
2. Check that the Transceiver is fully isolated from the ship's supply.
3. Refer to Figure 7.23.
4. The PCB is attached to a support casting and should be removed as a combined assembly as follows:
 - a. Slacken the two screws retaining the support casting.
 - b. Slide it towards the outside of the upper casting to clear the screws.
5. Unplug the cable from the PLRE.
6. Remove the PCB and support casting.

Note: When refitting the PCB to the support casting there are dowel pegs of different diameters used to locate the PCB in the correct orientation.

7. Before refitting the assembly, check that the link LK1 is set for either normal-speed (pins 1–2) 28 RPM or high-speed (pins 2–3) 45 RPM.
8. For PCB assembly 65801826 see Section 3.3.4 in Chapter 11 'Additional Features'.

3.2.13 Heading Marker Alignment

Alignment of the Heading Marker is set at system configuration, see *Chapter 4 'Configuration'*.

3.2.14 Performance Monitor – Replacement

1. Refer to Section 3.2.1 'Access to Masthead Transceiver' or Section 3.2.2 'Access to Bulkhead Transceiver', paying attention to all safety aspects.
2. Check that the Transceiver is fully isolated from the ship's supply.
3. Remove the two retaining screws that hold the Performance Monitor to the upper casting (see Figure 7.23) and withdraw the unit.
4. Un-screw the bar that retains the RF absorber to the body of the Performance Monitor.
5. Disconnect the ribbon cable to the Performance Monitor.
6. Replacement is the reverse of the removal process.
7. Make sure the ribbon cable is reconnected to the Performance Monitor, the RF absorber is refitted.

Note: After replacement, the Performance Monitor must be set up as described in *Chapter 5 - Diagnostics and Commissioning*.

3.2.15 Motor Drive Board – Replacement

1. Refer to Section 3.2.1 '*Access to Masthead Transceiver*', paying attention to all safety aspects.
2. Check that the Transceiver is fully isolated from the ship's supply.
3. Unplug the three cable assemblies from the Motor Drive PCB.
4. Remove the three screws (refer to Figure 7.35).
5. Slide the PCB out of the retaining clip at the opposite end of the PCB.
6. Before fitting the replacement PCB, make sure the speed setting link LK1 is correctly set for the intended operational speed.
 - a. Position 1 & 2 marked 'LO' is for 28 RPM operation.
 - b. Position 2 & 3 marked 'HI' is for 45 RPM operation.
7. If in doubt, compare the setting with the old PCB.
8. For PCB Assembly 65801827 see Section 3.3.5 in Chapter 11 '*Additional Features*'.
9. Replacement is the reverse of the removal process.
10. Make sure all three cable-assemblies are reconnected to the PCB.

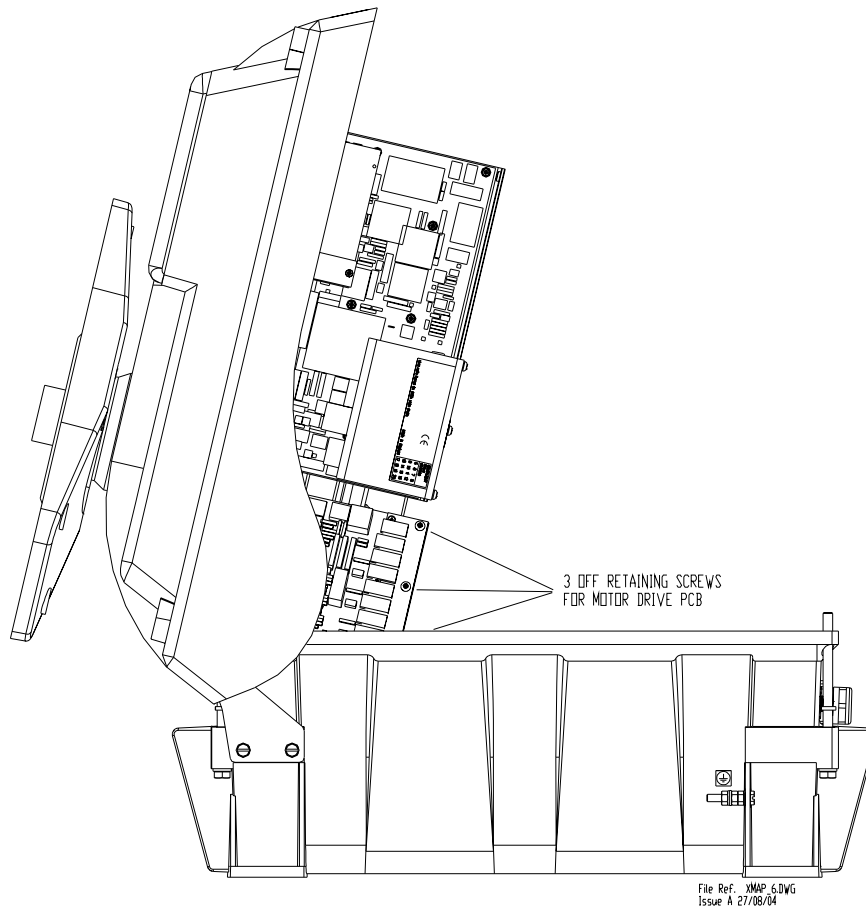


Figure 7.35 Motor Drive Board Retaining screws

3.2.16 Motor and Gearbox Assembly – Replacement

1. Refer to Section 3.2.1 'Access to Masthead Transceiver', paying attention to all safety aspects.
2. Check that the Transceiver is fully isolated from the ship's supply.
3. Refer to Figure 7.27 for the location of the three screws that retain the motor support casting to the upper casting.
4. Remove the screws.
5. Withdraw the motor support casting complete with Motor Drive PCB from the belt drive.
6. Remove the four screws that retain the motor and gearbox assembly to the support casting.

Note: *These four countersink screws are fitted with screw retaining fluid. When fitting the new motor, these screws should be refitted using 'Loctite Screwlock 222' low breaking-strength fluid.*

7. Remove the impeller from the old motor
8. Fit the replacement impeller.

9. Replacement is the reverse of the removal process, taking care to engage the motor pulley into the drive belt.

3.2.17 Drive Belt – Replacement

1. Refer to Section 3.2.1 'Access to Masthead Transceiver', paying attention to all safety aspects.
2. Check that the Transceiver is fully isolated from the ship's supply.
3. Remove the Transceiver as detailed at Section 3.2.3.
4. Remove the motor support casting and motor assembly as detailed in Section 3.2.16.
5. Refer to Figure 7.27.
6. Remove the three bolts (as shown in Figure 7.22) that attach the waveguide transition support casting to the rotating joint.

Note: *Since the waveguide transition support casting has two sleeve-inserts to aid accuracy in alignment, some resistance may be felt when removing it.*

7. Care should be exercised when removing the casing to avoid damage to the assembly or to the brass microwave probe at the centre of the hub.
8. Fit the replacement drive-belt.
9. Re-assembly is the reverse of the removal process.
10. Care should be exercised to avoid damage to the brass microwave probe at the centre of the hub during re-insertion into the transition.
11. Make sure the motor pulley is correctly engaged into the drive-belt.

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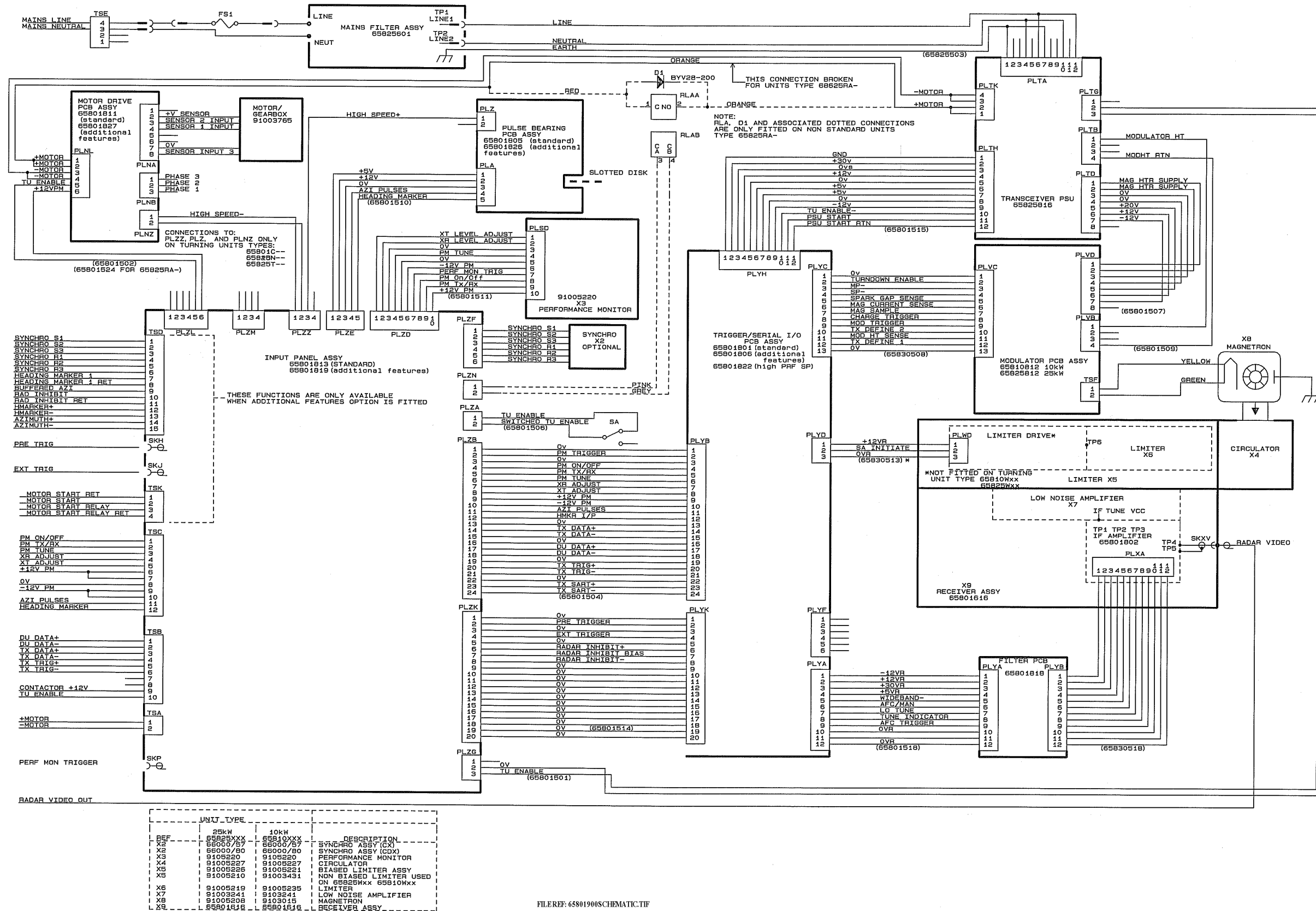


Figure 7.36 X-band Turning Unit (Aloft) Schematic

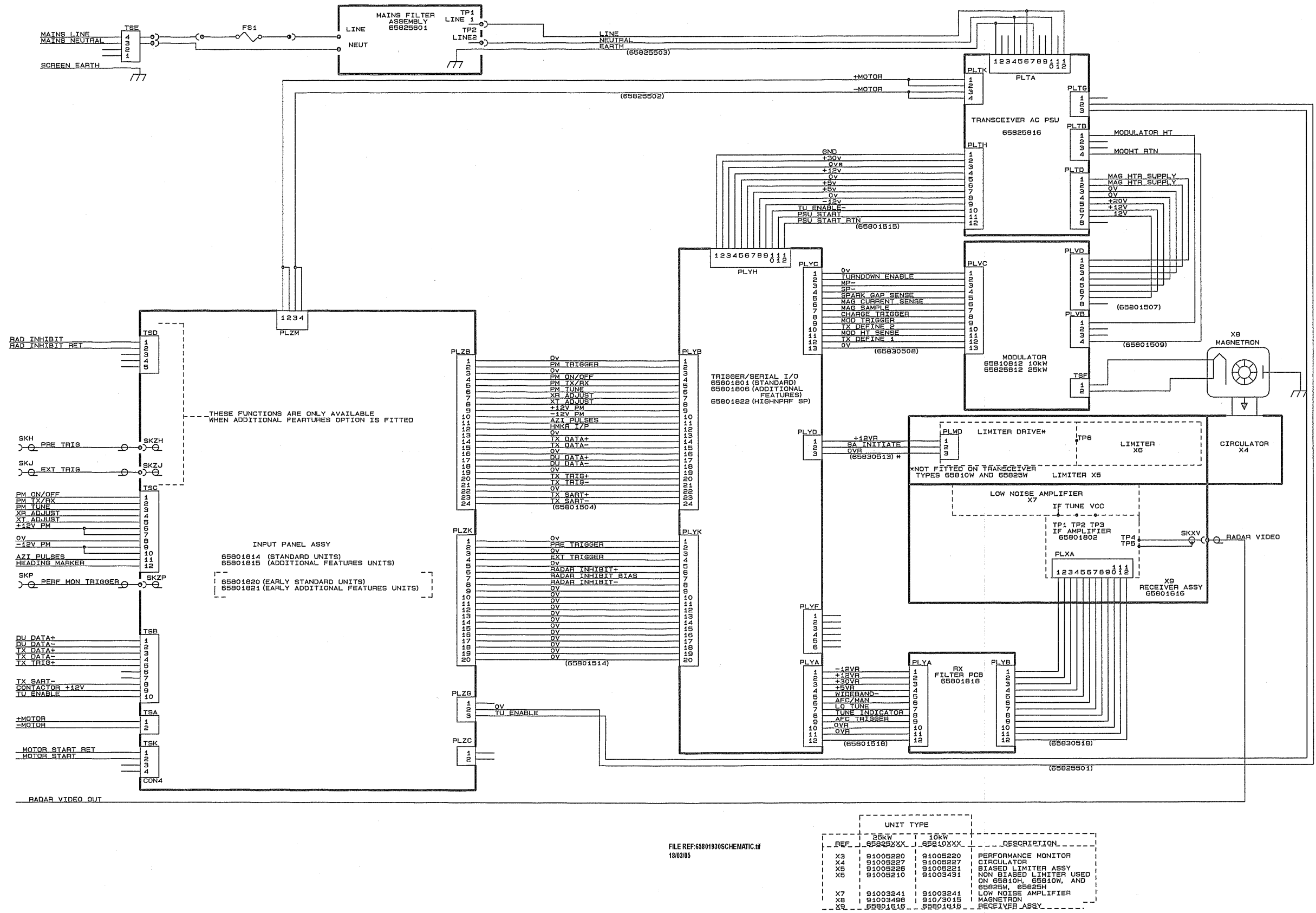
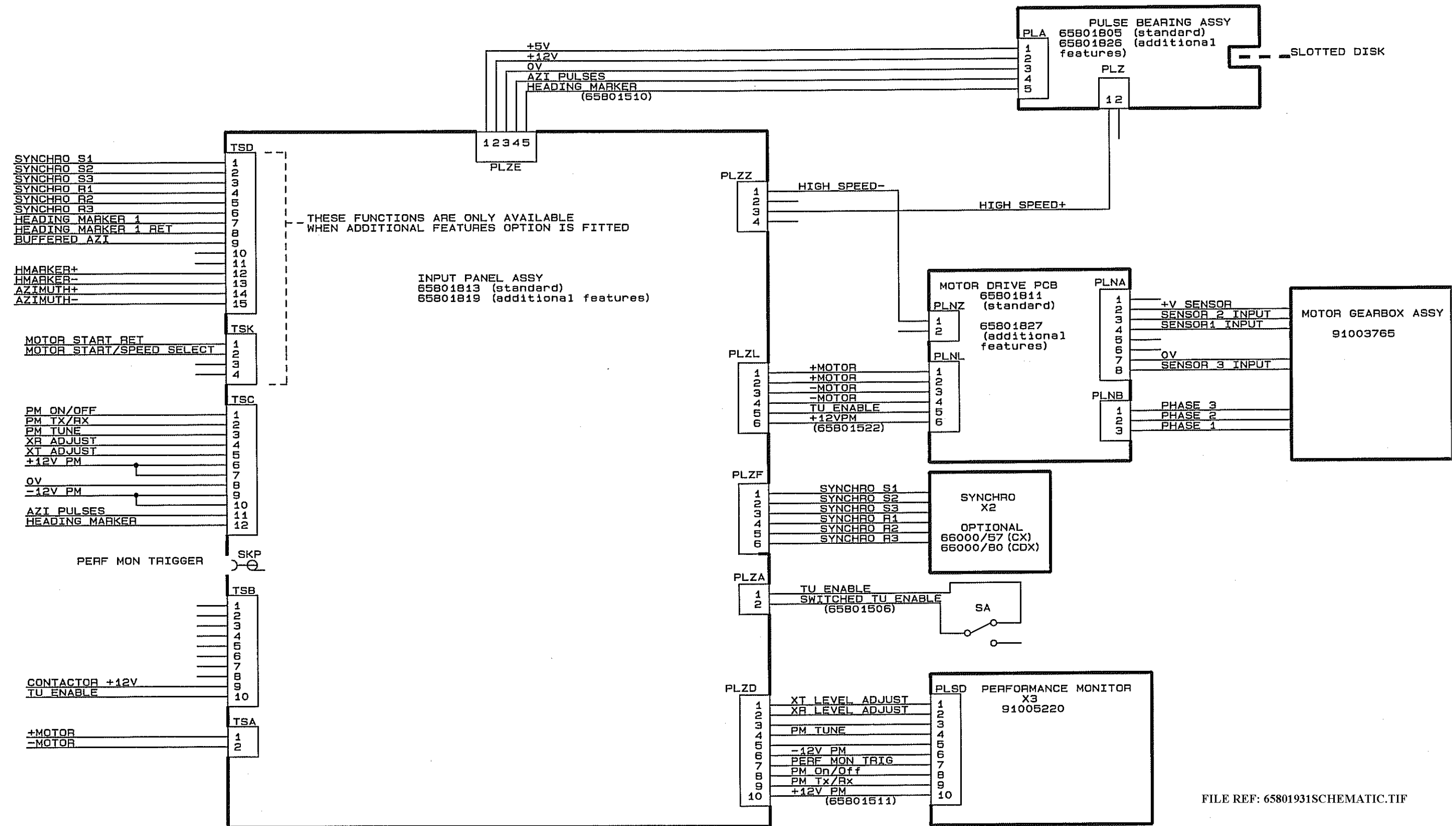


Figure 7.37 X-band Transceiver Schematic

Fault Reporting and First Line Servicing



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Figure 7.38 X-band Turning Unit (Bulkhead) Schematic

3.3 Monitor Unit - Replacement

1. Shut down the system from the VisionMaster FT application, and when fully powered down, switch the On/Off switch located on the underside of the Control Panel to OFF.
2. Switch the Monitor power switch to OFF, if not switched off from main On/Off switch.
3. Remove the four M6 screws securing the monitor to the display chassis.
4. Attach the two M8 extraction screws to the upper holes of the monitor (marked as 'A' in Figure 7.39) and use these to pull the monitor forward until it rests on the edge of the control panel.
5. From the underside of the monitor, disconnect the mains power cable, video cable and two earth tags (one from the pedestal and one from the display chassis). Remove Monitor from chassis.
6. Attach the M8 screws to the upper holes of the replacement monitor and gently lower the monitor into the chassis.
7. Attach the power cable, video cable and earth tags to the monitor.
8. Secure replacement monitor using the four M6 screws.

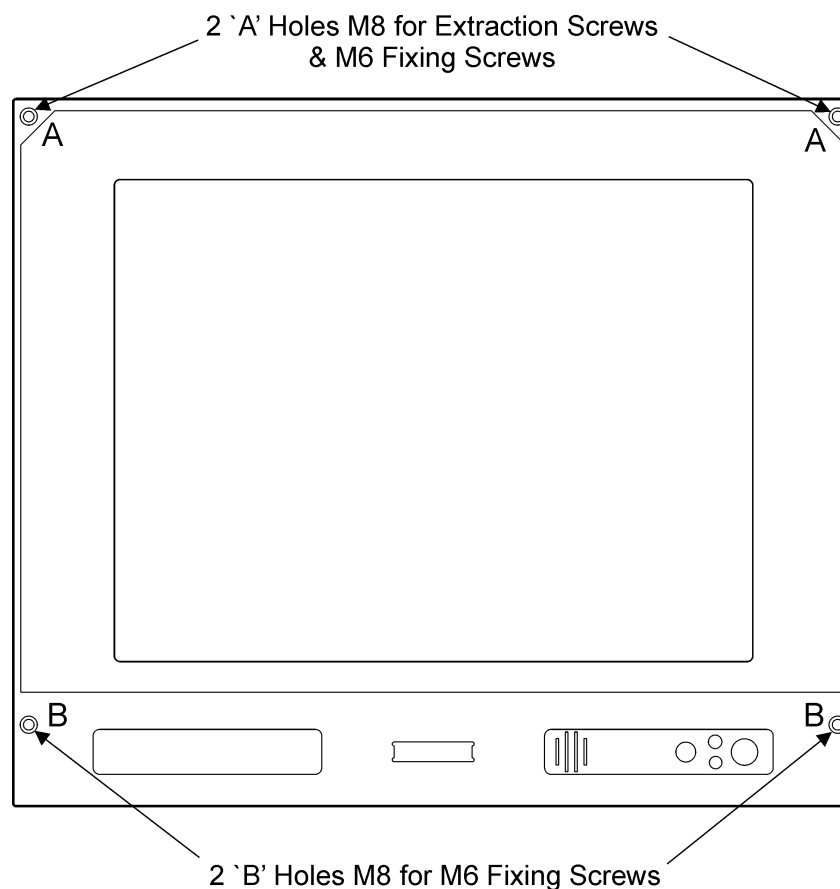


Figure 7.39 Monitor Unit

3.4 Control Panel

Before replacing any control panel modules shut down the system from the VisionMaster FT application, and when fully powered down, switch the On/Off switch located on the underside of the Control Panel to OFF.

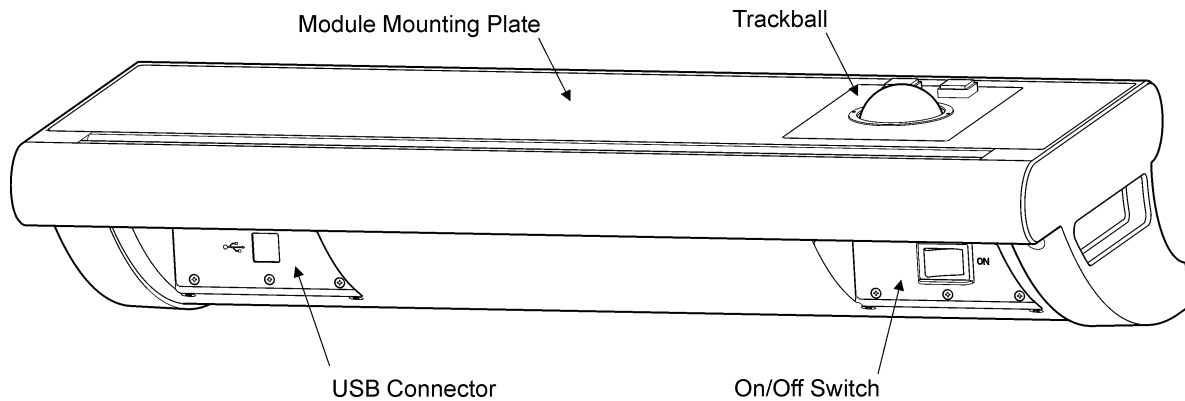


Figure 7.40 Control Panel Assembly

3.4.1 Replacing the Trackball Assembly

1. Remove the module mounting plate from the control panel by unscrewing the two M5 cap head screws and three nylon inserts, these are located on the underside of the Control Panel.
2. Lift up the mounting plate and remove the connecting cable between the trackball and processor unit.
3. Unscrew the four M4 nuts securing the existing trackball and remove nuts S/C washers and trackball assembly from mounting plate.
4. Secure replacement trackball to the mounting plate with the four M4 nuts and S/C washers. Coat the trackball mounting plate screw threads with screwlock provided.
5. Connect the cable to trackball P2 plug.
6. Place assembled trackball and mounting plate into the control panel housing and secure the mounting plate with the two M5 cap head screws and three nylon inserts.

3.4.2 Replacing the Power Control Switch

1. With the module mounting plate removed (see Section 3.4.1), remove the cable tie and disconnect the switch cable and associated earth lead from the rear of the power switch unit.
2. Unscrew and remove the five M3 countersunk screws securing the existing power control switch to the bracket and remove the unit.
3. Secure replacement power control switch to the bracket with the five M3 countersunk screws. Coat the screw threads with screwlock provided.

4. Connect the cable from the PCIO unit to the rear of the switch unit, connect the earth lead on the cable assembly to the earth stud between the two plain washers.
5. Secure cable with tie wrap assembled through two slots on the rear of the switch bracket.

3.4.3 Replacing the USB Connector

1. Disconnect the dual USB cables from the front of the Processor unit.
2. Unscrew and remove the five M3 countersunk screws securing the existing USB connector assembly to the bracket and remove the unit.
3. Secure replacement USB connector assembly to the bracket with the five M3 countersunk screws. Coat the screw threads with screwlock provided.
4. Connect the dual USB cables from the USB connector board to the front of the Processor unit.

3.5 Processor Unit



WARNING! – Lethal Voltage Hazard

Lethal voltages may be exposed when access covers are removed...Only qualified persons should work on the equipment when power is applied. ALWAYS isolate the unit from the mains supply when removing or replacing covers.



CAUTION – Electrostatic Sensitive Devices (ESSDs)

The Processor unit contains ESSDs. Take care not to damage these devices by discharge of electrostatic voltages.

Before replacing the processor SC2 PCB shut down the system from the VisionMaster FT application, and when fully powered down, switch the On/Off switch located on the underside of the Control Panel to OFF.

3.5.1 Replacing the SC2 PCB

1. Turn the On/Off switch at the rear of the processor unit to Off.
2. From the front of the processor unit disconnect the two USB cables from the control panel USB port.
3. Remove the four screws and washers securing the Processor shelf to the console frame. Pull the Processor and shelf forward and lever the unit down to access the rear cables.

4. From the rear of the Processor disconnect the following two cables (the remaining cables to the Processor do not need to be disconnected) :
 - a. power cable from the PCIO unit
 - b. video/data cable from the PCIO unit
5. Unscrew the nine pan head screws securing the top cover of the Processor unit.
6. Unscrew the one pan head screw securing the SC2 PCB to the processor frame (the SC2 PCB is positioned to the left of the processor box looking forward).
7. Carefully disengage the SC2 PCB from the main processor PCB and remove from the processor box.
8. Installation of a replacement SC2 PCB is a reversal of removal.

Note: Before inserting a new SC2 PCB adjust the six S1 switches on the side of the PCB to the same positions as the previous SC2 PCB. See Figure 7.41 for the location of the S1 switches.

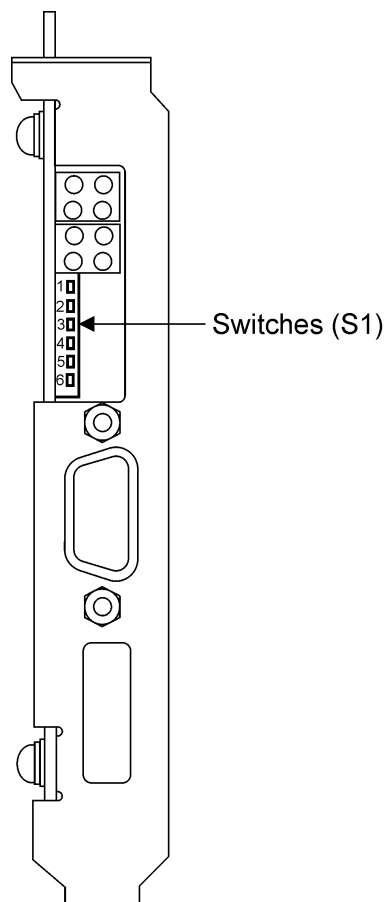


Figure 7.41 Location of S1 switches on SC2 PCB

3.6 PCIO Unit

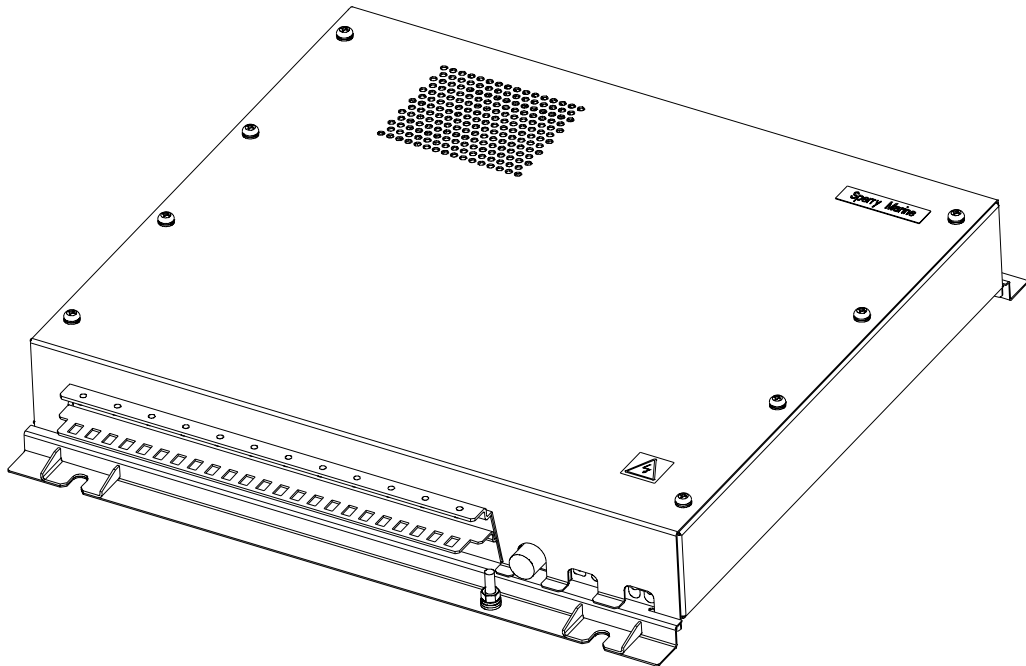




Figure 7.42 PCIO Unit

	WARNING! – Lethal Voltage Hazard
	Lethal voltages may be exposed when access covers are removed. Only qualified persons should work on the equipment when power is applied. ALWAYS isolate the unit from the mains supply when removing or replacing covers.

	CAUTION – Electrostatic Sensitive Devices (ESSDs)
	The PCIO unit contains ESSDs. Take care not to damage these devices by discharge of electrostatic voltages.

Before replacing the serviceable modules in the PCIO unit shut down the system from the VisionMaster FT application, and when fully powered down, switch the On/Off switch located on the underside of the Control Panel to OFF.

Before disconnecting cables and removing modules within the PCIO unit note the polarity and orientation of all components.

3.6.1 Removing the PCIO Unit

Although completely removing the PCIO unit from its support shelf is not always necessary when replacing individual modules, it may be preferable, depending on ease of access for servicing. If the preference is for removing the PCIO refer to step 5 below.

1. Remove the four screws and washers securing the PCIO support shelf to the pedestal chassis. Disengage the self rear locators and slide the PCIO unit shelf forward until all the top of the unit is accessible.
2. Remove the eight M5 pan head screws, S/C washers and plain washers securing the PCIO unit cover. Carefully lift and remove the top cover away from the unit.
3. To disconnect incoming cables from the rear of the unit remove the five M4 countersunk screws securing the cable clamp top plate.
4. Disconnect cable tie wraps, earthing tags and internal cable connections from the PCIO modules.
5. With all external cable connections disconnected remove the four M8 bolts, S/C washers, plain washers and nuts securing the PCIO unit to the support shelf. Carefully lift and remove the PCIO unit away from the pedestal assembly.

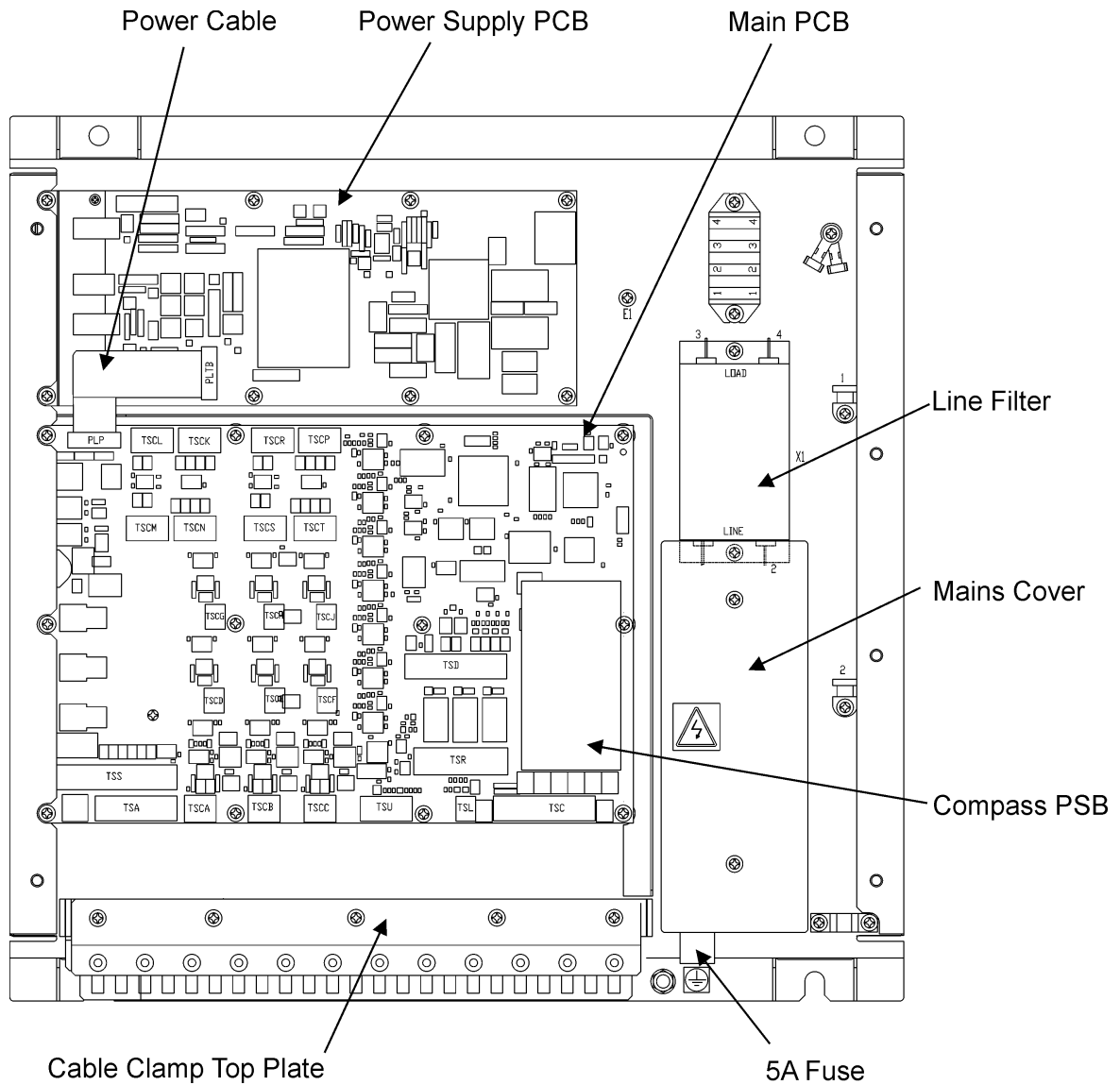


Figure 7.43 PCIO Unit with top cover removed

3.6.2 Replacing the Main PCB

1. With all cables disconnected from main PCB, remove fastener securing the 9-way ribbon power cable to the PSB shield and disconnect cable from the PLP terminal.
2. Unscrew the 12 PCB retaining screws and remove the PCB from the unit.
3. Remove the compass PCB from the main PCB.
4. Replacing the main PCB is a reversal of removal.

3.6.3 Replacing the Power Supply PCB

1. Disconnect the cable from the 4-way terminal block to the power supply PLTA terminal.
2. Disconnect the 9-way ribbon cable from the main PSB to the power supply PLTB terminal.
3. Unscrew the six power supply PCB retaining screws and remove the PCB from the unit.
4. Replacing the power supply PCB is a reversal of removal.

For a circuit diagram of the Power Supply PCB see Figure 7.44.

3.6.4 Replacing the Compass PCB

The compass board PCB is attached to the main PCB by a 20 pin connector at PLS terminal and an eight pin connector at PLR terminal.

To remove lift the compass PCB on either side to disengage the connectors from the main PCB.

3.6.5 Replacing the Line Filter

1. To access one of the two attaching screws for the line filter remove the two pan head screws, S/C washers and spacers securing the mains cover.
2. Disconnect the live and neutral connectors to the line filter terminals 3 and 4 from the TSE terminal block.
3. Disconnect the live, neutral and earth connectors to the line filter terminals 1 and 2 from the TSB terminal block.
4. Remove the two pan head screws and S/W washers securing the line filter to the PCIO unit.
5. Replacing the line filter is a reversal of removal.

3.6.6 Replacing the 5A Fuse

Unscrew the fuse holder on the side of the main box, remove fuse and replace.

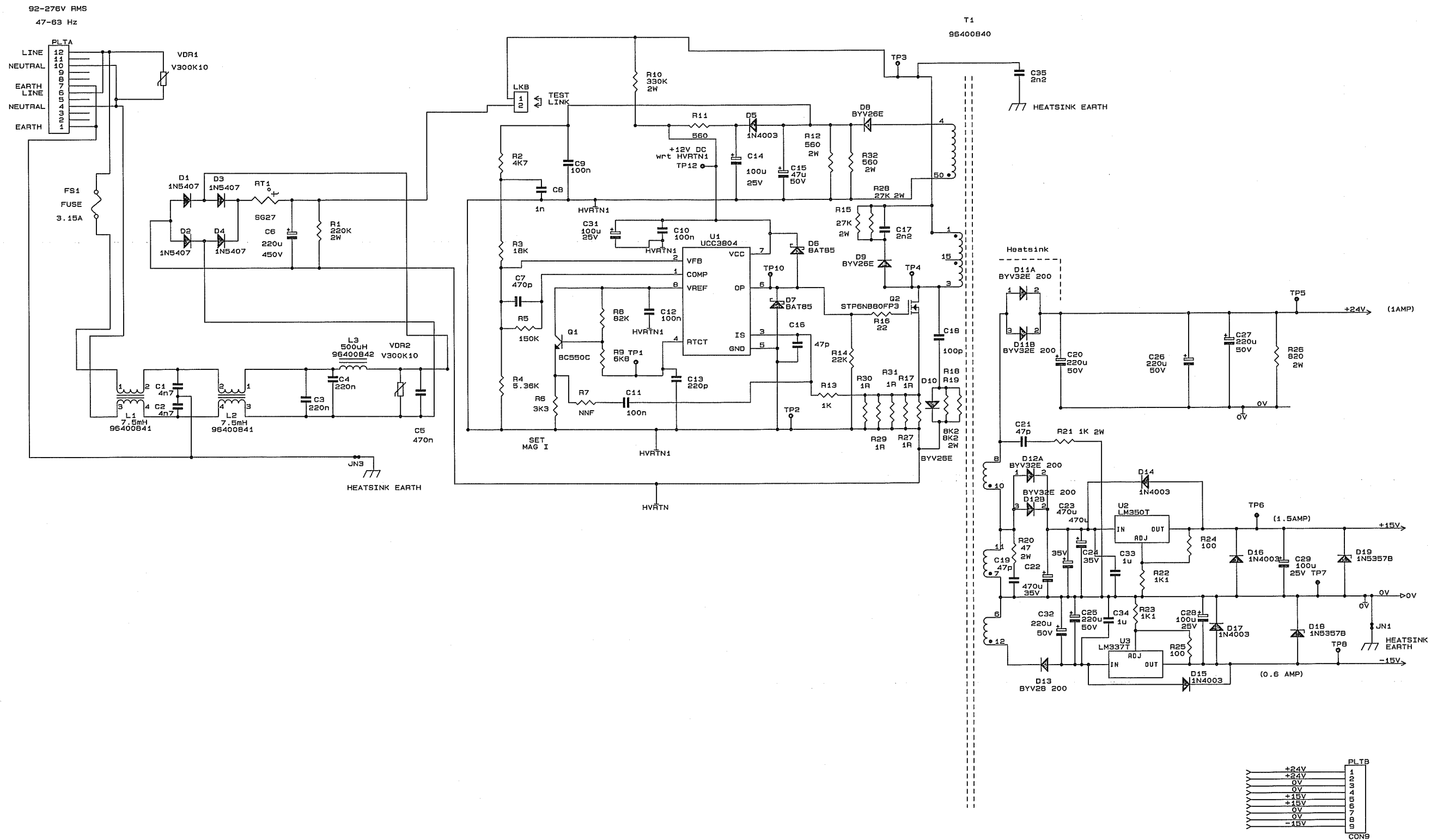


Figure 7.44 Power Supply PCB - circuit diagram

4 Limited Spares List for Field Replacement

4.1 Console Assembly

Module	Part Number
19" Kit (Monitor Unit)	65817G
23.1" Monitor Unit (Hatteland)	65923C
23.1" Monitor Unit (Melford)	65923M
Processor Unit (with SC2 Card)	65901AR
Processor Unit (no SC2 Card)	65901AN
PCIO Unit (standard compass)	65900AA
PCIO Unit (special compass)	65900AB

4.1.1 Processor Unit

Assembly	Part Number
SC2 Card PCB	T65900810

4.1.2 PCIO Unit

Assembly	Part Number
Main PCB	T65900800
Power Supply PCB	T65900801
Compass Standard PCB	T65800831
Compass Special PCB	T65800832
Line Filter	1585800
Fuse 5 A (External)	2180413
Fuse 3.15 A (Internal)	2162326

4.1.3 Control Panel Modules

Assembly	Part Number
Trackball	T65900614
USB Ports	T65900635
On/Off Switch	T65900625

4.2 2-Way Interswitch 65842A

Assembly	Part Number
PCB ASSEMBLY	T65842800

4.3 6-Way Interswitch 65846A

Assembly	Part Number
PCB ASSEMBLY	T65846800
BYPASS PCB ASSEMBLY	T65846801

4.4 Spares for Transceivers and Turning Units

The tables below list the spares for standard Transceivers and Turning Units. For units fitted with 'additional features' options see Section 4 in Chapter 11 '*Additional Features*'.

In the tables below replace "xx" with 10 or 25 as appropriate. (e.g 658xxA becomes 65825A or 65810A), and "yy" with suffix as described in Chapter 2 '*System Configuration*' (e.g 65825WAR is a 25KW Turning Unit without biased limiter, with performance monitor, and AC mains input).

4.4.1 S-band Turning Units (Masthead and Bulkhead)

Assembly	Part Number
TRIGGER PCB ASSEMBLY	T65801801
INPUT PCB ASSEMBLY (MASTHEAD TRANSCEIVER)	T65801804 or T65801813*
INPUT PCB ASSEMBLY (BULKHEAD TRANSCEIVER)	T65801814
POWER SUPPLY PCB ASSEMBLY	T65801809
BEARING AND HEADING MARKER PCB ASSEMBLY	T65801805
RECEIVER FILTER PCB ASSEMBLY	T65801818
RECEIVER ASSEMBLY	T65830616
MODULATOR PCB ASSEMBLY	T65830812
LIMITER ASSEMBLY	T91005224
MAGNETRON	T91005225
CIRCULATOR	T91005223
PERFORMANCE MONITOR	T91003746
MOTOR 110/120V AND 220/240V Normal Speed	T91003757
MOTOR 110/120V AND 220/240V High-Speed	T91003759
MOTOR 220/240V AND 380/440 3 ϕ Normal Speed	T91003751
MOTOR 110/220V 3PH Normal Speed	T91003752
MOTOR 220/240V AND 380/440V 3 ϕ High-Speed	T91003753
MOTOR 110/220V 3 ϕ High-Speed	T91003754
MAINS FILTER PCB ASSEMBLY	T91005228
FUSE	MA00007245
FAN – AXIAL 80x80x25 24VDC (MASTHEAD Tx/Rx)	T65830656
THERMAL SWITCH (FOR FAN – MASTHEAD Tx/Rx)	MA00007765

*. 65801804 can be replaced with T65801813
65801813 must be replaced with T65801813

Standard X-band Turning Units and Transceivers Fault Reporting and First Line Servicing Transceivers

4.4.2 Standard X-band Turning Units and Transceivers

65825A, 65825G, 65825H, 65825P, 65825W, 65825Lyy, 65825Myy,
65825Pyy, 65825Wyy,

65810A, 65810G, 65810H, 65810P, 65810W, 65810Myy, 65810Pyy,
65810Wyy

Assembly	Part Number
TRIGGER PCB ASSEMBLY (STANDARD)	T65801801
TRIGGER PCB ASSEMBLY (FOR UNITS PART No. 658xxP, 658xxG, 658xxPyy)	T65801822
INPUT PCB ASSEMBLY (TURNING UNIT)	T65801813
INPUT PCB ASSEMBLY (TURNING UNIT) (FOR TURNING UNIT PART No.65825Lyy)	T65801819
INPUT PCB ASSEMBLY (FOR BULKHEAD TRANSCEIVERS PART No. 658xxH, 658xxG)	T65801814
INPUT PCB ASSEMBLY (FOR BULKHEAD TRANSCEIVERS PART No. 658xxA, 658xxP, 658xxW)	T65801820
POWER SUPPLY PCB ASSEMBLY AC MAINS INPUT	T65825816
POWER SUPPLY PCB ASSEMBLY DC MAINS INPUT	T65810816
BEARING AND HEADING MARKER PCB ASSEMBLY	T65801805
RECEIVER FILTER PCB ASSEMBLY	T65801818
RECEIVER ASSEMBLY	T65801616
MODULATOR PCB ASSEMBLY	T65810812
LIMITER ASSEMBLY (10kW) (NITS FOR UNITS PNo 65810A, 65810P, 65810G, 65810Myy, 65810Pyy, 65810SDy,	T91005221
LIMITER (10KW) (FOR UNITS PNo. 65810W, 65810H, 65810Wyy	T91003241
LIMITER ASSEMBLY (25KW) FOR UNITS PNo. 65825A, 65825G, 65825Lyy, 65825Myy, 65825Pyy,	T91005226
LIMITER 25KW FOR UNITS PNo. 65825H, 65825W, 65825Wyy	T91005210
MAGNETRON (10kW)	T91003582
MODULATOR PCB ASSEMBLY (25kW) (STANDARD)	T65825812
MODULATOR PCB ASSEMBLY (25Kw HIGH PRF) FOR UNITS PNo. 65825P, 65825Pyy.	T65825813

MAGNETRON (25kW)	T91003496
CIRCULATOR	T91005227
PERFORMANCE MONITOR	T91005220
MOTOR DRIVE & DYNAMIC BRAKE PCB ASSEMBLY	T65801811
MOTOR & GEARBOX ASSEMBLY	T91003765
IMPELLER	65801136
MAINS FILTER PCB ASSEMBLY	T65825601
FUSE	MA00007245
BELT DRIVE (40W)	MA00008979
FAN – AXIAL 80x80x25 24VDC (BULKHEAD Tx/Rx)	T65830656
THERMAL SWITCH (FOR FAN – BULKHEAD Tx/Rx)	MA00007765
CABLE ASSY – SCANNER ON/OFF (INC SWITCH)	T65801506

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CHAPTER 8

ROUTINE MAINTENANCE

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1 Introduction

The VisionMaster FT System is designed to function reliably for many years. To make sure of the best possible performance, you must complete specific maintenance tasks at regular intervals. This chapter has details of the recommended maintenance plan.

2 Maintenance Plan



WARNING! – Lethal Voltage Hazard

Before the following maintenance tasks are started (except the 3 monthly actions), the equipment must be isolated from the mains supply. No components or assemblies should be touched for at least five minutes after isolation. This is to make sure any high-voltage capacitors have discharged.

Interval	Action	Notes
3 Monthly	Check the Monitor screen for dirt.	Use a soft cloth to clean the screen. If available, use an anti-static spray. Water, isopropyl, alcohol and similar non-abrasive cleaning fluids may also be used to clean the screen. Solvents must not be used as a cleaning agent.
3 Monthly	Clean the Processor Unit fan filter.	For good reliability, air must continuously circulate inside the Processor unit. To avoid dust build up on the air intake clean the fan filter. To access the filter remove the plastic cover at the front of the unit.

Interval	Action	Notes
6 Monthly	Check the window of the Antenna for excessive dirt.	Excessive dirt or carbon deposits from the ship's funnels may cause reduced radar performance. Use hot soapy water to clean the antenna window. Never use solvents.
6 Monthly	Check all external nuts, bolts and washers on the Scanner Unit, for corrosion and for correct tightness.	The nuts, bolts and washers must be replaced if they are heavily corroded, and suitable anti-corrosion compound applied.
6 Monthly	In the S-band Scanner unit check for oil leaks in the gearbox. In the X-band Scanner unit check for condition of the drive belt.	If leaks are detected, contact the VisionMaster FT Service Engineer.

If damage to any of the items being checked during routine maintenance is observed, call for a service repair.

CHAPTER 9

MODIFICATIONS

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9.1 Introduction

This chapter will be used for recording system and equipment modifications (including the issue of Modification Leaflets), and for conveying information released after publication.

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CHAPTER 10

INTERSWITCH UNITS

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1 Interswitch Units - General View

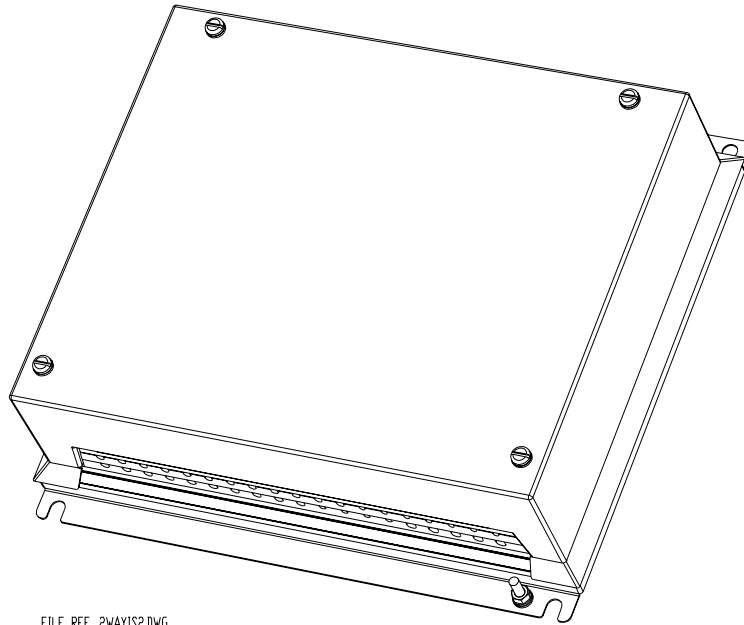


Figure 10.1 2-Way Interswitch Unit 65842A – General View

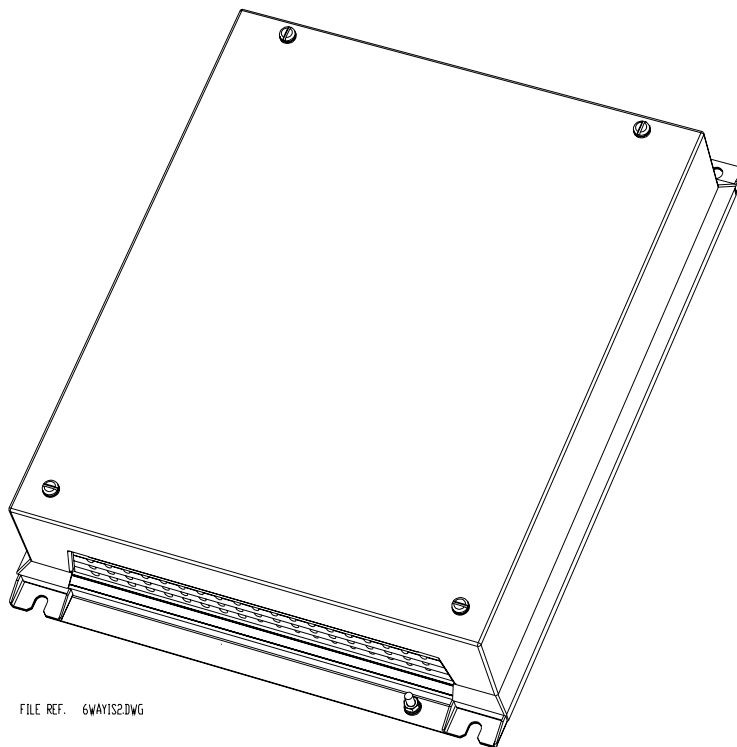


Figure 10.2 6-Way Interswitch Unit 65846A – General View

2 Interswitch Units - General Description

The Interswitch Units are used as part of a Marine Radar System for installation in ships' bridges and wheelhouses.

An Interswitched system comprises more than one radar combined so that the whole system can be controlled and configured from any display position. This is often desirable when only one operator is on duty, as it gives the choice of selecting a particular radar for a particular condition, i.e, S-Band in heavy rain and open waters, or X-Band for high definition in congested areas. It also permits multiple display operation when required and allows for standby radars to be immediately operational in the event of a failure.

Note: *The Interswitch Units work directly with the BridgeMaster E Series range of Scanner Units and VisionMaster FT range of Displays, but requires compatibility units for interfacing with the original BridgeMaster or Master Series units in hybrid systems. For information on compatibility units, refer to the Ancillary Units and Radar Systems manual, 65800012.*

The 2-Way Interswitch allows one or two Transceivers to be connected to up to four Displays.

The 6-Way Interswitch Unit allows a combination of up to 6 Displays with up to 6 Transceivers.

The Interswitch Unit is housed in a purpose designed enclosure with the electronic circuitry contained on a single PCB. Surface mount devices are used throughout the design. A separate Bypass PCB houses the bypass and distribution connectors.

Connectors are fitted to the Bypass PCB to enable manual bypassing of the Interswitch control logic in the event of an Interswitch failure. The Bypass PCB enables the logic PCB to be removed for servicing without affecting the bypass function.

Power for the Interswitch Unit is derived from the System Display or Display Compatibility units, with any display capable of powering the Interswitch Unit.

The following Despatch Kits contain all necessary fixings and connectors:

- for 2-Way Interswitch Despatch Kit, 65842600
- for 6-Way Interswitch Despatch Kit, 65846600

Refer to Chapter 3, Installation for typical system installation details.

3 System Configuration

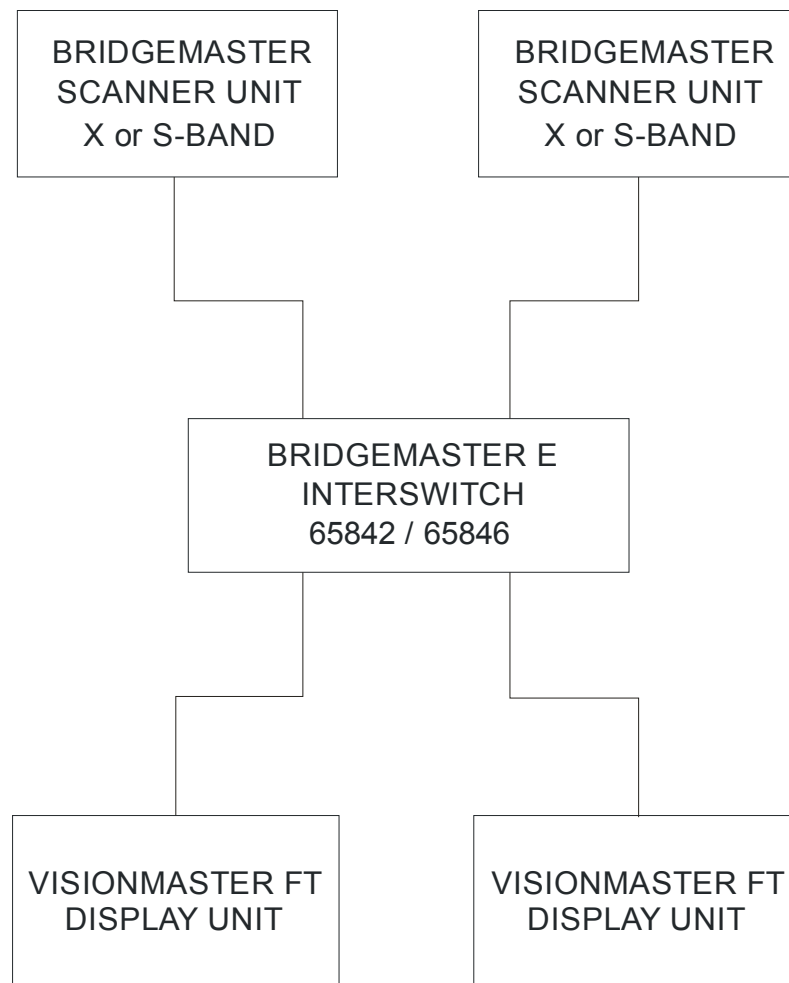


Figure 10.3 Placement of Interswitch Unit in typical VisionMaster System

4 Installation and Commissioning

4.1 Siting Considerations

The maximum separation between the Interswitch and an operating display should not exceed 12 metres. (i.e. if only one display in the system may be functioning, and the other displays are turned off; the distance between the interswitch and the display that is functioning must not exceed 12 metres).

If this is not practicable to achieve, then an additional cable should be used for the +/-12V power connection between the interswitch and the display.

4.2 Interswitch Hardware Configuration

4.2.1 DIL Switches

In order to indicate which Displays and Transceivers are connected to the Interswitch, set the appropriate switches to the 'off' position.

On the 2-Way Interswitch PCB board there are two 4-way DIL switches. SW1 selects Display Units while SW2 selects Transceivers.

On the 6-Way Interswitch PCB board there are two 6-way DIL switches. SW1 selects Display Units while SW2 selects Transceivers.

Table 1: Link Settings 1 & 2

Mode	Link	Setting
Global	LK1	2-3
Local	LK1	1-2
Normal	LK2	12
Reset Defaults	LK2	2-3

Link 1 selects LOCAL or GLOBAL setting. If the system is in the Local Mode, a Display Unit can only change the Transceiver to which it is connected and select either master or slave mode. If the system is in the Global Mode, any display can completely re-configure the entire system.

Inserting Link 2 at position 2-3 loads the default settings at power-up. For a 2-way Interswitch that is fully populated, the default state will be as shown below:

- DUA master to TXA DUB master to TXB
- DUC slave to TXA DUD slave to TXA

For a 6-way Interswitch the default setting will be one to one connection.

Links 3 & 4 are for test and diagnostic purposes only.

Table 2: Link Settings 3 & 4

Link Settings	
LK3	Factory set 1-2
LK4	Not fitted

4.2.2 Installation Drawings

For installation of the 2-Way Interswitch and 6-Way Interswitch, refer to Figure 10.4 and Figure 10.5.

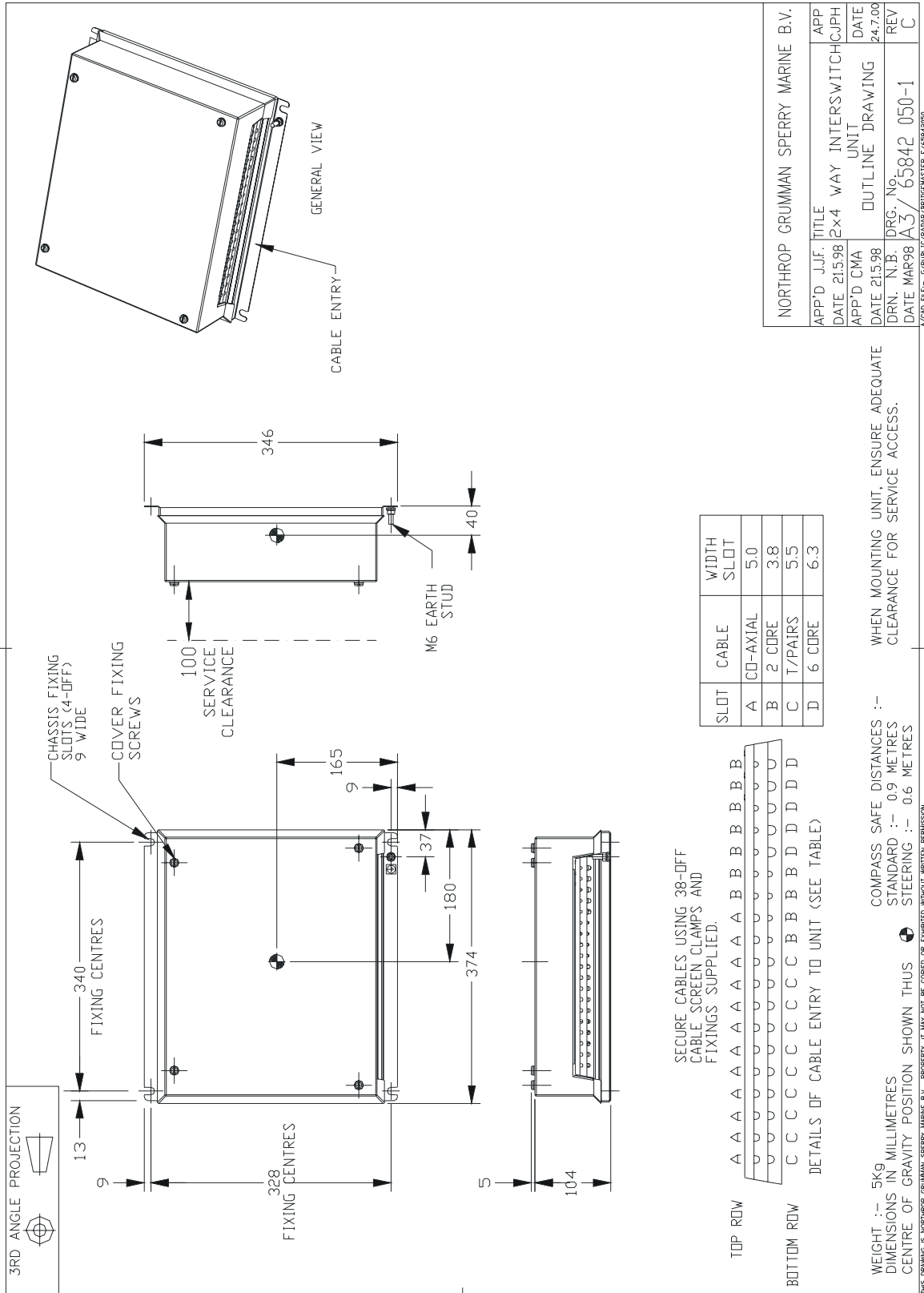


Figure 10.4 2-Way Interswitch Unit – Installation Drawing

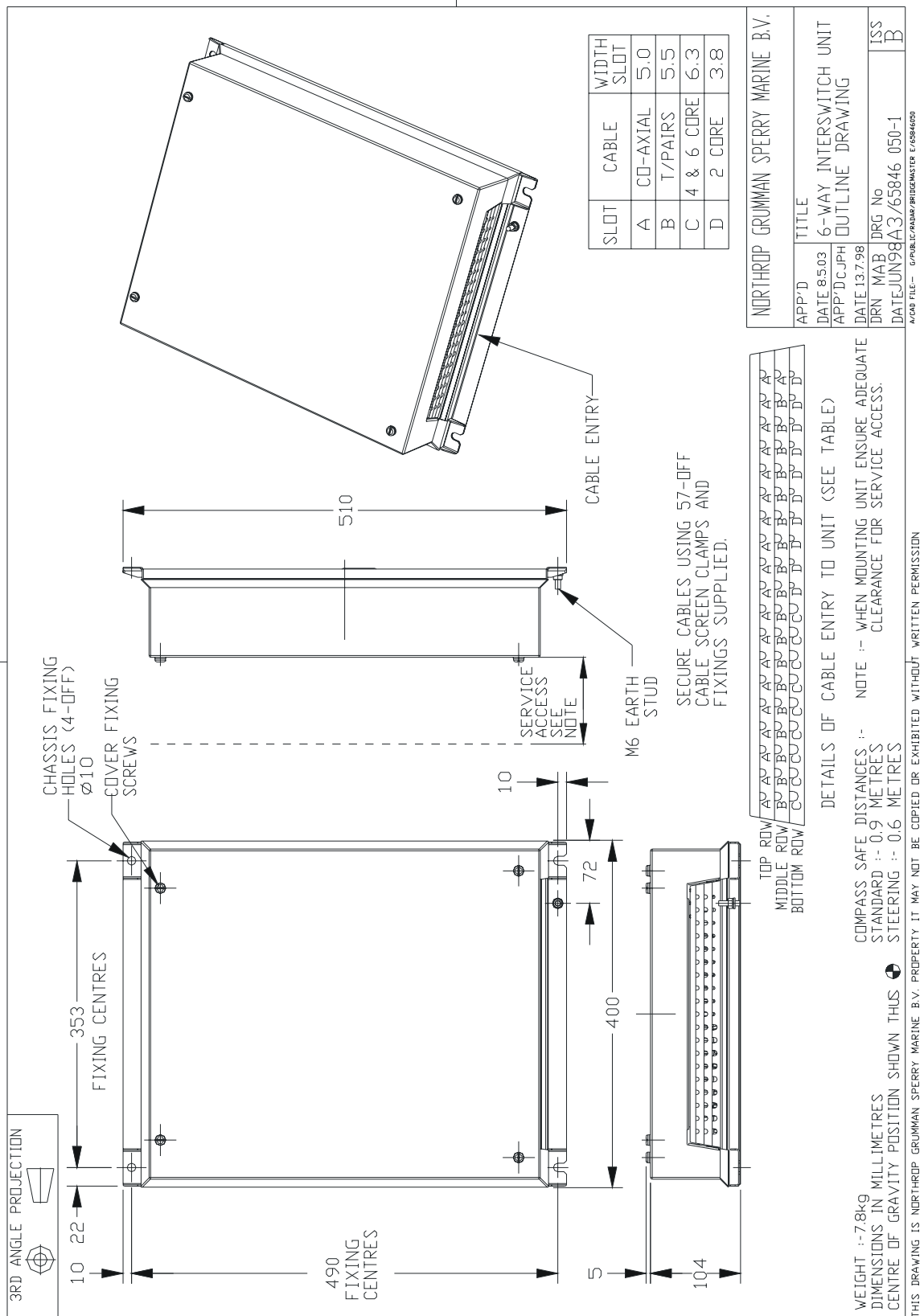


Figure 10.5 6-Way Interswitch Unit – Installation Drawing

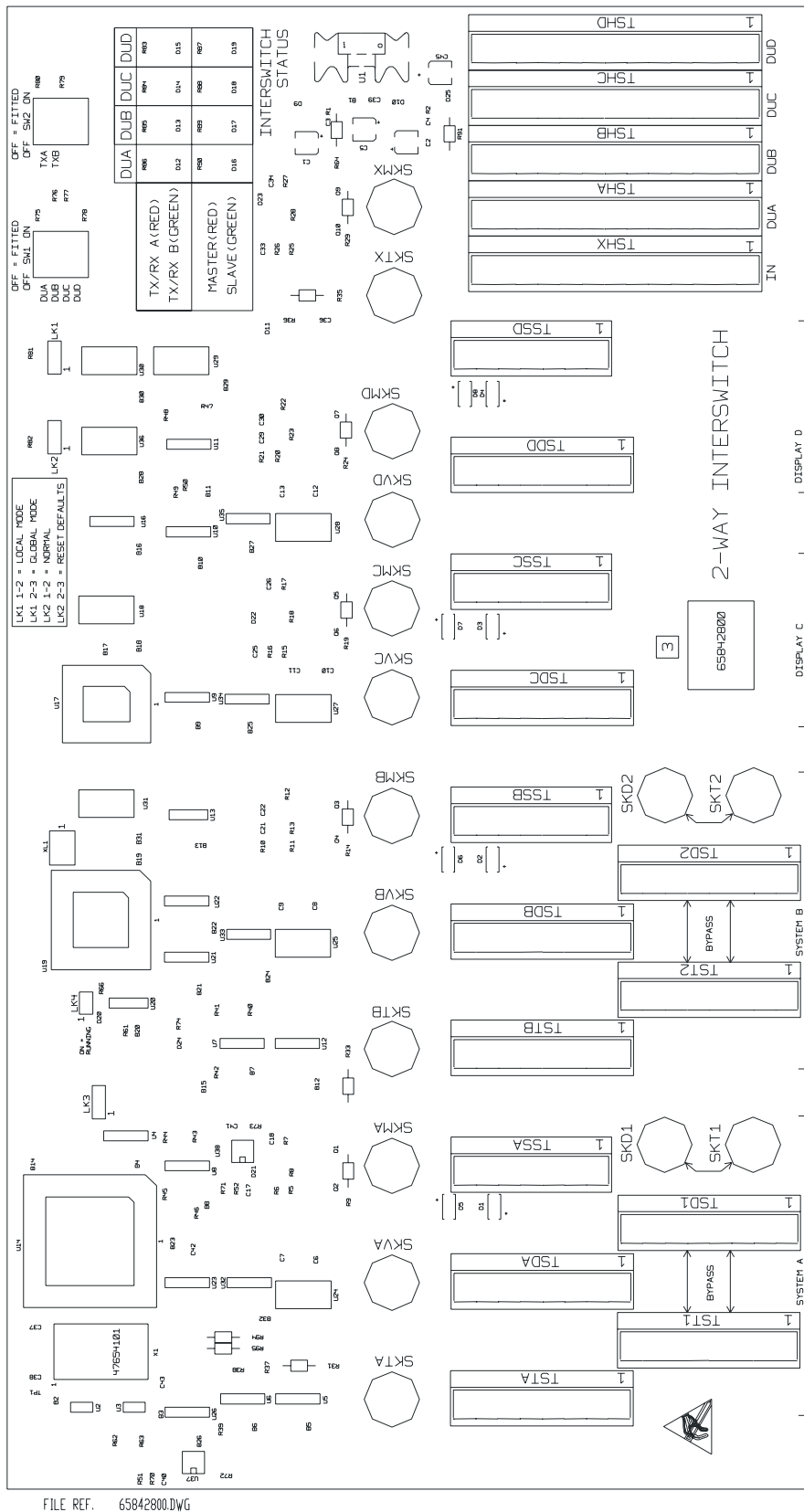
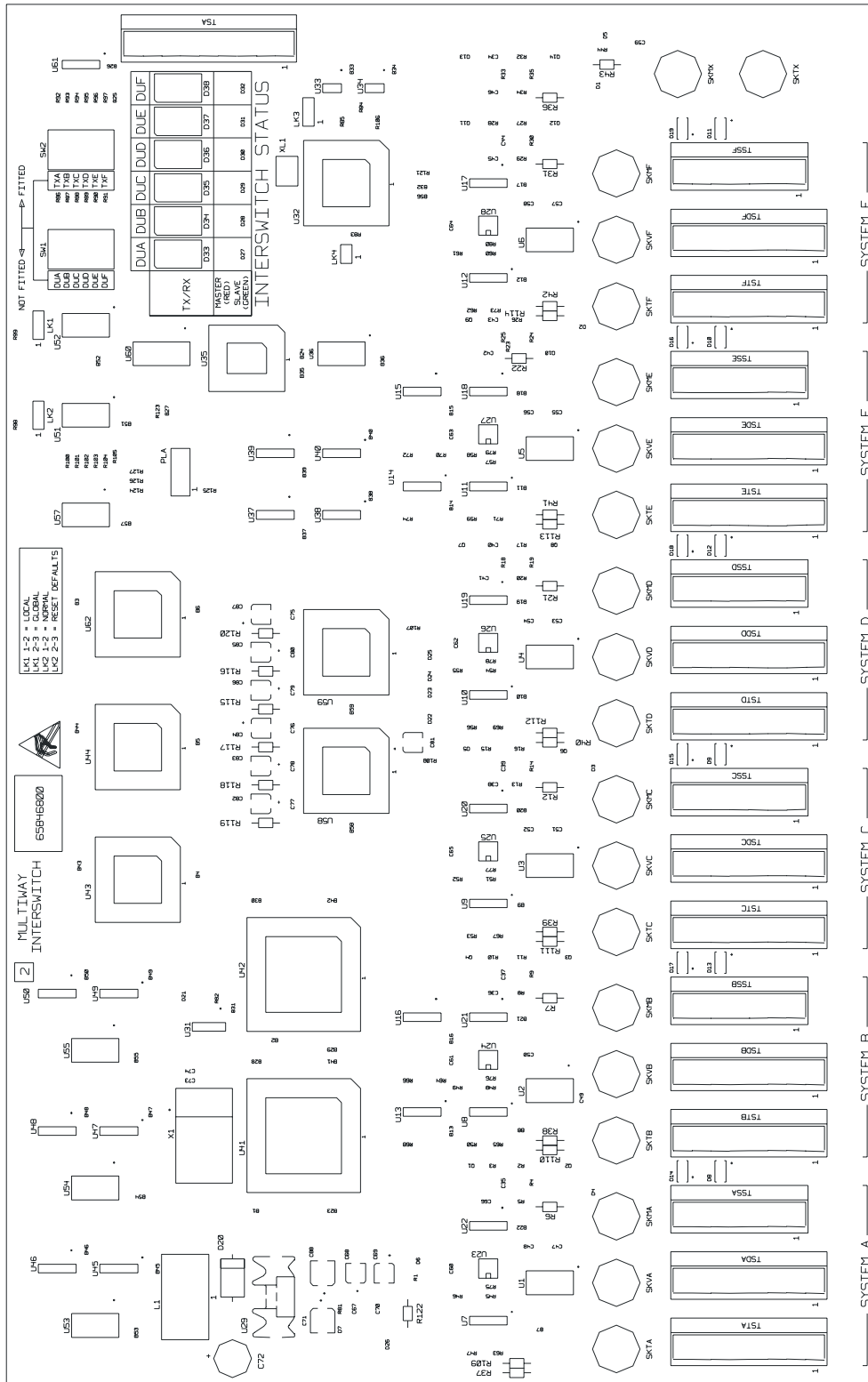


Figure 10.6 2-Way Interswitch PCB Assembly 65842800



FILE REF: 65846800.DWG

Figure 10.7 6-Way Interswitch PCB Assembly 65846800

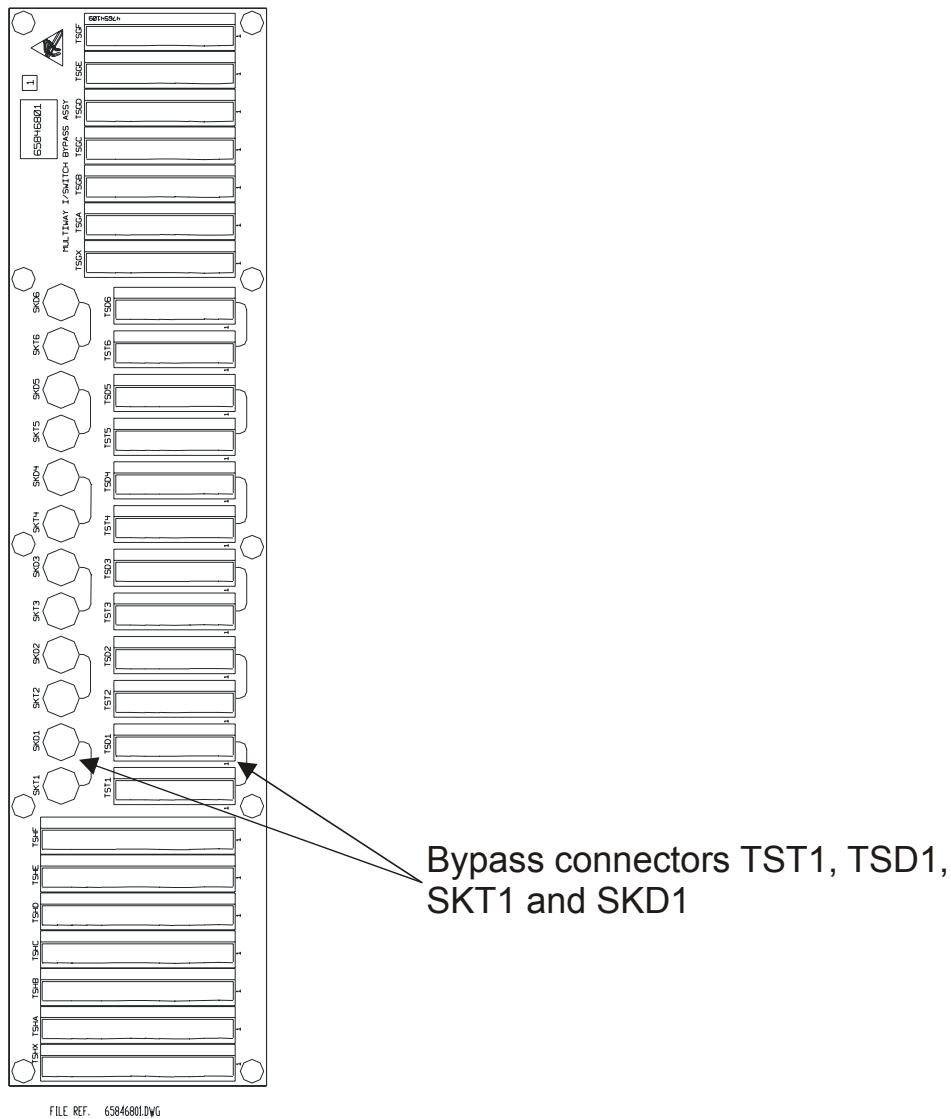


Figure 10.8 6-Way Interswitch Bypass PCB Assembly 65846801

4.2.3 Interface to Transceiver and Display Unit

There is a bi-directional serial port to send and receive signals between the display unit and the transceiver. The signals sent and received are RS422 differential. One receives the configuration requests from the display, the second one returns acknowledge and configuration signals back from the Transceiver to the display unit.

Trigger, Video and SART video are sent down separate cables. The Trigger and SART video are also received as RS422 differential signals. The video is received via a coaxial cable.

Two additional twisted pair cables bring in the power supply to the Interswitch Unit from the display or Display Compatibility Unit.

Table 3: Radar Video Input

Parameter	Values
Peak amplitude	2.5V to -5.5V
Shoulder noise	-0.25V minimum
Input Impedance	75 Ω \pm 10%

4.2.4 Bypass Connections for 2-Way Interswitch

On the Interswitch PCB, additional connectors are provided. These allow a display to be connected to a Transceiver, bypassing the Interswitch. This permits TXA to be connected to one Display and TXB to be connected to another of the 4 possible Displays. 2 displays will be therefore out of action.

Note: *MIST will not be available to any Display in Bypass Mode.*

4.2.5 Bypass Connections for 6-Way Interswitch

On the Bypass PCB, 65846801, additional connectors are provided. These allow each display to be connected to one Transceiver, bypassing the Interswitch logic PCB 65846800. This precludes any slave Transceiver operation.

To bypass the Interswitch Unit in the event of an Interswitch Unit failure:

1. Remove the transceiver cables from TSTA and SKTA on Interswitch PCB Assembly 65846800 and connect them to TST1 and SKT1 on the Interswitch Bypass PCB assembly. This can be repeated for each transceiver using TST**, and SKT** (where ** can be 1, 2, 3, 4, 5 or 6)
2. Remove the cables for the display that it is required to connect to the transceiver from TSD* and SKD* on the Interswitch PCB assembly (where * can be A, B, C, D, E or F), and connect them to TSD1 and SKD1 on the Interswitch Bypass PCB assembly.

This can be repeated for the other displays by using TSD** and SKD** (where ** can be 1, 2, 3, 4, 5, or 6).

Note: *MIST will not be available to any Display in Bypass Mode.*

4.2.6 General Distribution Connectors









These enable LOG, COMPASS, NAV I/P etc to be distributed to all the display units via parallel connected terminal blocks. The parallel terminal blocks on the interface PCB comprise:

- For the 2-Way Interswitch: 1 input terminal block and 4 output terminal blocks.
- For the 6-Way Interswitch: 1 input terminal block and 6 output terminal blocks.

4.2.7 System Status for the 2-Way Interswitch

Visual indication of the system status is provided by green and red LEDs which show whether a display is connected to Transceiver A or Transceiver B. Additional green and red LEDs show whether the Display Unit is master or slave to the Transceiver. If a Display has not been configured, then the associated LEDs will not be illuminated.

Table 4: Typical Examples of Status Panel Read-Outs for 2-Way

Displays	A	B	C	D
Tx/Rx A (Red)				
Tx/Rx B (Green)				
Master (Red)				
Slave (Green)				



Red LED









Green LED

4.2.8 System Status for the 6-Way Interswitch

Visual indication of the system status is provided by seven segment displays which indicate which Transceiver (A to F) is connected to which display unit. Additional green and red LEDs show whether the display unit is Master or Slave to the Transceiver. If a Display is not configured, then the associated LEDs will not be illuminated.

Table 5: Typical Examples of Status Panel Read-Outs for 6-Way

Displays	A	B	C	D	E	F
Transceiver	A	C	C	A	E	F
Master (Red)						
Slave (Green)						



Red LED



Green LED

4.2.9 Mutual Interference Suppression Trigger (MIST)

There is one input from an external source which is mixed with the triggers from each Transceiver. The combined signal is fed out as an external display MIST. Each Display is supplied with this composite trigger excluding the trigger from the Transceiver that the Display is currently connected to.

4.2.10 Interconnections

All connections to the Interswitch physically plug directly into the Interswitch logic PCB.

The cables to the Turning Units/Transceivers consist of a quad twisted pair cable with overall screen for Trigger, SART Video and the bi-directional serial data, and a co-ax cable for Video.

The cables to the Display Units consist of two quad twisted pair cables. One provides the Transceiver signals for Trigger, SART Video, bi-directional serial data, bi-directional interswitch control data, positive and negative power. The Transceiver video input and output are via co-ax cables, as is the output MIST.

The Interswitch Unit has one External Transceiver MIST co-ax input, one External Display MIST co-ax output. The 2-Way Interswitch has four co-ax Display MIST outputs; the 6-Way six co-ax Display MIST outputs.

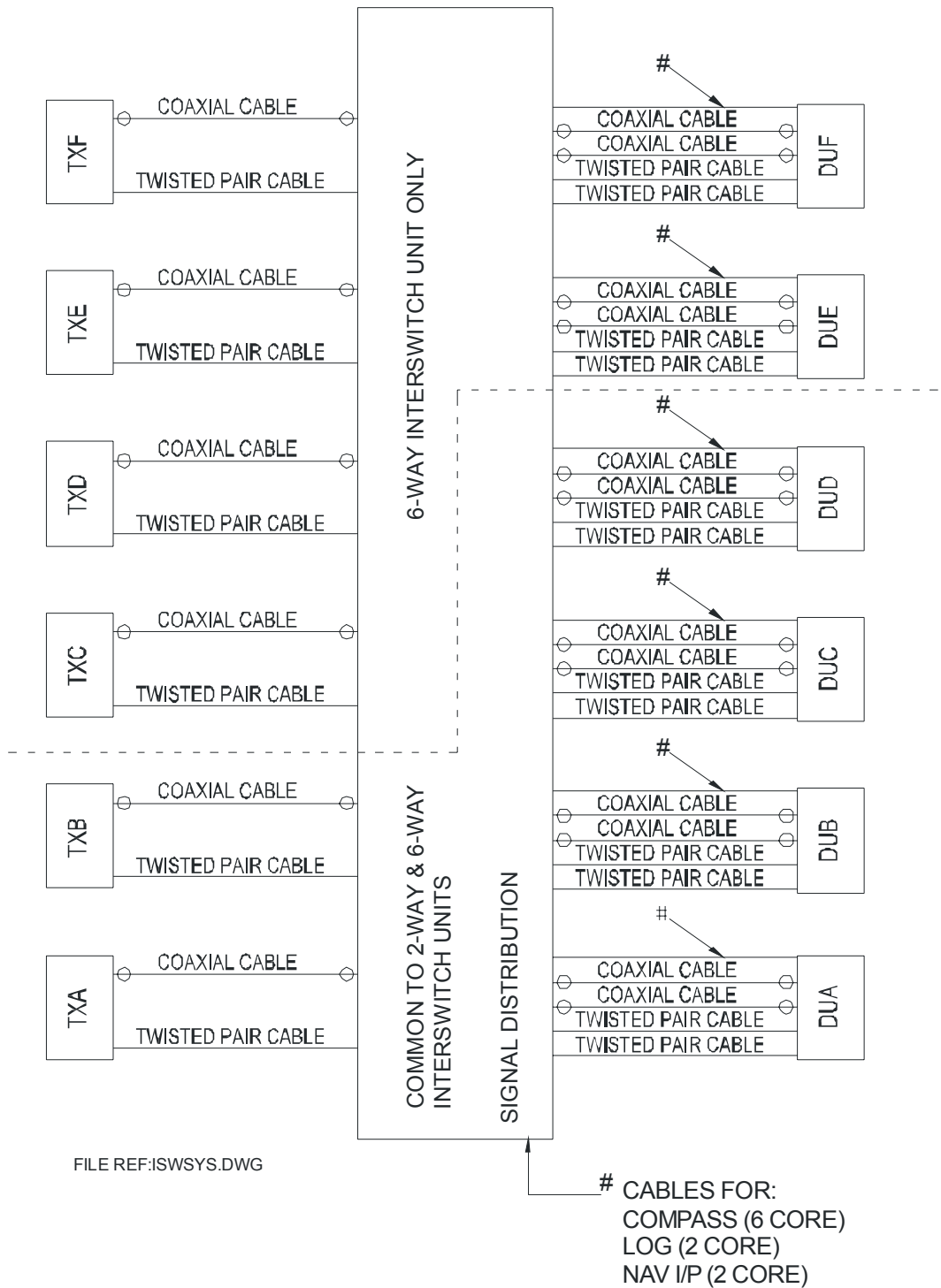


Figure 10.9 Block Diagram – Interswitched System

5 Technical Specification

5.1 Interswitch Power Supply

Each Display Unit supplies +12V (+15V) & -12V (-15V) to the Interswitch.

The +12V (+15V) inputs are diode OR'd to produce \approx +11V (+14V).

The -12V (-15V) inputs are diode OR'd to produce \approx -11V (+14V).

An on-board regulator produces +5V for the logic.

For the 6-Way Interswitch a second regulator produces -5V.

5.2 Interswitch Unit Hardware Description

An 89C52 microcontroller with on-board Flash memory running at 12 MHZ communicates with the Display Units via bi-directional serial links. The data transferred includes status i.e. Display is master or slave, which Transceiver is connected to which Display. A watchdog facility is also provided.

For a 2-Way Interswitch one Quad UART is used for the bi-directional serial communication with the Display Units or Compatibility Unit. For a 6-Way Interswitch two Quad UARTs are used for the bi-directional serial communication with the Display Units.

Received data generates interrupts for the microcontroller which reads the data from the UART and acts upon that data. A message is then returned with the new status. Any change of status is stored in an EEPROM allowing the Interswitch to return to the current status in the event of a power failure.

For the 2-Way Interswitch Logic multiplexers are used to route the signals between the Display Units and Transceivers and analogue 'T' switches route the video.

For the 6-Way Interswitch CPLDs are used to route the signals between the Display Units and Transceivers and analogue Cross-point switches are used to route the video.

The microcontroller also drives the LED status display.

6 Environmental Specification

6.1 Temperature

Operating -15°C to +55°C

Storage -25°C to +70°C

6.2 Relative Humidity

95% at 40°C (non condensing)

6.3 Weights and Dimensions

	Height (mm)	Depth (mm)	Width (mm)	Nominal Weight (kg)
2-Way Interswitch Unit 65842A	346	109	374	5.0

	Height (mm)	Depth (mm)	Width (mm)	Nominal Weight (kg)
6-Way Interswitch Unit 65846A	510	109	400	7

6.4 Compass Safe Distances

	Standard	Steering
2-Way & 6-Way Interswitch Units	0.9 m	0.6 m

CHAPTER 11

ADDITIONAL FEATURES

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1 Introduction

This chapter contains the additional information required to cover the installation and operation of radar systems equipped with the 'Additional Features' option.

The additional features are as follows:

- Isolated Ship's Heading Marker output, RS422, and uncommitted relay contacts
- 4096 Pulse Bearing Data output, RS422, and open drain FET output
- External Triggering input
- Pre-trigger output
- Radar Silence input (transmission inhibit control). Selectable for RS422, RS423 voltage levels, and on later units closing contact input.
- Antenna Rotation in Standby Input (X-band only)
- Remote selection of high and normal rotation rates for antenna.
- Optional synchro or resolver bearing output.

Note: Some options are mutually exclusive.

2 Technical Specification

2.1 General

This section only gives details of the technical specification for the 'additional features', for all other parameters see Chapter 1 '*Technical Specification*'.

Except where indicated, the following specification applies equally to X-band and S-band Transceivers, and Turning Units.

2.2 Isolated Ship's Heading Marker Output

Output 1

Table 1: Heading Marker Output 1

Parameter	Value
Output Type	Uncommitted contact (solid-state relay)
Voltage Rating	24V DC maximum
Current Rating	0.7A maximum
Closure Duration	20° approx.
Adjustment Range	±10° approx. w.r.t. true heading
Adjustment Increment	0.088°
Reference	Leading edge
Sense	Selectable to be rising or falling edge

Output 2

Table 2: Heading Marker Output 2

Parameter	Value
Output Type	RS422 (differential)
Output Drive	To drive 120ohm twisted pair
V _{out} high	2.0V min. I _{source} -20mA
V _{out} low	0.5V max. I _{sink} 20mA
Closure Duration	20° approx.
Adjustment Range	±10° approx. w.r.t. true heading
Adjustment Increment	0.088°
Reference	Leading edge
Sense	Selectable to be rising or falling edge

2.3 Pulse Bearing Output

Output 1

Table 3: Pulse Bearing Output 1

Parameter	Value
Output Type	Open drain FET (referenced to 0V)
Pulses per Revolution	4096
Voltage Rating	25V DC maximum
Current Rating	100mA maximum
Mark Space Ratio	<1.5:1

Output 2

Table 4: Pulse Bearing Output 2

Parameter	Value
Output Type	RS422 (differential)
Pulses per Revolution	4096
Output Drive	To drive 120ohm twisted pair
V _{out} high	2.0V min. I _{source} -20mA
V _{out} low	0.5V max I _{sink} 20mA
Mark Space Ratio	<1.5:1

2.4 Synchro and Resolver Bearing Output

The turning unit may be fitted with one size 11 synchro or resolver. This is not aligned, any alignment must be made externally.

Control transmitter (CX) or control differential transmitter (CDX) synchro options are available.

The reference supply is assumed to be from an external source.

The standard synchros that are available are:

11CX4c

Table 5: Synchro 11CX4c Outputs

Parameter	Value
Type	Control transmitter
Ratio	1:1
Reference Voltage	115V rms
Output Voltage	90V rms line to line
Frequency	400Hz

11CDX4b

Table 6: Synchro 11CDX4b Outputs

Parameter	Value
Type	Differential control transmitter
Ratio	1:1
Input Voltage	78V rms line to line
Output Voltage	90V rms line to line
Frequency	400Hz

The standard resolver that is available is:

11M6P1

Table 7: Resolver 11M6P1 Outputs

Parameter	Value
Type	Data transmission
Ratio	1:1
Input Voltage	26V rms line to line
Output Voltage	11.8V rms line to line
Frequency	400Hz

2.5 Pre-trigger Output

Table 8: Pre-trigger Outputs

Parameter	Value
Amplitude	8V min. 15V max
Duration	1.0 μ s nominal
Polarity	Positive
Rise Time (10% - 90%)	<100ns
Time wrt Magnetron Output	-11 μ s typical
Drive Capability	75 ohms

2.6 Radar Silence Input

RS422

Table 9: RS422 Inputs

Parameter	Value
Input Type	RS422 (differential)
Response Time	Within 1 PRI
Input Impedance	120 ohms

Closing Contact**Table 10: Closing Contact Inputs**

Parameter	Value
Input Type	Uncommitted closing contact
Voltage on Open Contact	6V max
Sink Current Through Closed Contact	4mA max
Response Time	Within 1 PRI
Sense	Selectable

RS423**Table 11: RS423 Inputs**

Parameter	Value
Input Type	RS423 bipolar
Response Time	Within 1 PRI
Minimum Differential Input Voltage	+/-2V
Input Voltage	+/-7V max
Input Current	<-10mA for Vin -7V other input at 0V
Sense	Selectable

2.7 External Trigger Input

Table 12: External Trigger Inputs

Parameter	Value
Amplitude	4.0V min. 40.0V max
Duration	0.2µs min. 40µs max
Polarity	Positive
Rise Time (10% - 90%)	<50ns
Delay to Magnetron Output	11µs approx.
Input PRF	5.5kHz max 200Hz min. (Output PRF limited within the TxRx)
Input Impedance	75 ohms
Average Input Power*	0.4W max

* Trigger pulse amplitude, duration and PRF must be considered in limiting the input power.

The presence of a signal at the external trigger input will automatically select external trigger operation.

2.8 Forced Antenna Rotation in Standby Input

An isolated closing contact can be connected to an X-band turning unit to force the antenna to rotate when it is in standby mode. Rotation is forced when the contact is closed.

Note: This function cannot be used in conjunction with the remote speed change option. They are mutually exclusive.

Table 13: Forced Antenna Rotation

Parameter	Value
Input Type	Uncommitted closing contact
Voltage Applied to Open Contact	5.5V max
Sink Current Through Closed Contact*	1mA max
Sense	Rotation enabled when contact is closed

* The switch or contacts should be specified for switching low currents.

2.9 Antenna Speed Selection Input

An isolated closing contact can be connected to the X-band turning unit to enable remote selection between normal and high speed antenna rotation.

In the absence of the closing contacts, links are used to preset the rotation speed to normal or high speed.

Note: This function cannot be used in conjunction with the Forced Antenna Rotation in Standby feature. They are mutually exclusive.

For 10kW DC systems, high-speed operation should only be used where a 1.2m (4ft) antenna is fitted to the Turning Unit. For 1.8m (6ft) and 2.4m (8ft) antennas the antenna rotation speed must be preset to the Normal setting.

Table 14: Antenna Speed Selection

Parameter	Value
Antenna Speed Normal	28 rpm nom.
Antenna Speed High	45 rpm nom
Control Signal Type	Uncommitted closing contact
Signal Sense	Closed contacts select 28rpm Open contacts select 45rpm
Voltage Applied to Open Contact	< 5.5V DC
Sink Current Through Closed Contact	<500 μ A

3 Installation and Interconnections

3.1 General

To make use of the 'additional features', extra cables need to be fitted to the Turning Unit or Transceiver.

To help with fitting the extra cables, the Turning Units are supplied with additional cable glands.

For details see Figure 11.1 and Figure 11.2.

3.2 Interconnections

Only the extra connections needed for 'additional features' are listed in this section. For all other connections see Chapter 2 'System Identification'.

3.2.1 X and S-band Turning Unit Connections

Cable No:		EMC CAT –		Cable Type: PT1YM (75ohm coax)	
From Turning Unit			To:		
Unit Connector No: SKH			Unit Connector:		
Cable Connector Type: L734PNI			Cable Connector Type:		
Manufacturer; Belling Lee			Manufacturer:		
Line No.	Function	Pin No.	Colour	Pin No.	Remarks
1	PRE-TRIGGER O/P	PIN	INNER	PIN	Masthead transceiver only
2	SCREEN	OUTER	BRAID	OUTER	

Cable No:		EMC CAT –		Cable Type: PT1YM (75ohm coax)	
To: Turning Unit			From:		
Unit Connector No: SKJ			Unit Connector:		
Cable Connector Type: L734PNI			Cable Connector Type:		
Manufacturer; Belling Lee			Manufacturer:		
Line No.	Function	Pin No.	Colour	Pin No.	Remarks
1	EXT-TRIGGER I/P	PIN	INNER	PIN	Masthead transceiver only
2	SCREEN	OUTER	BRAID	OUTER	

X and S-band Turning Unit
Connections

Additional Features

Cable No:		EMC CAT –		Cable Type: 16 - 2 - 6C	
From: Turning Unit			To:		
Unit Connector No: TSD			Unit Connector No:		
Cable Connector Type: 159749 BL3.5/15			Cable Connector Type:		
Manufacturer: Weidmuller			Manufacturer: Connector:		
Line No.	Function	Pin No.	Colour	Pin No.	Remarks
1	SYNCHRO S1	1	R		
2	SYNCHRO S2	2	B		
3	SYNCHRO S3	3	G		
4	SYNCHRO R1 (Ref)	4	Y		
5	SYNCHRO R2 (Ref Ret)	5	W		
6	SYNCHRO R3	6	BK		
7	SCREEN	ETAG	BRAID		

Cable No:		EMC CAT –		Cable Type: 16 - 2 - 6C	
From: Turning Unit			To:		
Unit Connector No: TSD			Unit Connector No:		
Cable Connector Type: 159749 BL3.5/15			Cable Connector Type:		
Manufacturer: Weidmuller			Manufacturer: Connector:		
Line No.	Function	Pin No.	Colour	Pin No.	Remarks
1	RESOLVER S1	1	R		
2	RESOLVER S2	2	B		
3	RESOLVER S3	3	G		
4	RESOLVER R1	4	Y		
5	RESOLVER S4	5	W		
6	RESOLVER R3	6	BK		
7	SCREEN	ETAG	BRAID		

Additional Features

X and S-band Turning Unit
Connections

Cable No:		EMC CAT –		Cable Type:	
From: Turning Unit			To:		
Unit Connector No: TSD			Unit Connector No:		
Cable Connector Type: 159749 BL3.5/15			Cable Connector Type:		
Manufacturer: Weidmuller			Manufacture:		
Line No.	Function	Pin No.	Colour.	Pin No.	Remarks
1	ISOLATED HMKR	7			
2	ISOLATED HMKR RET	8			
3	PULSE BEARING 4096	9			
4	RADAR SILENCE	10			Masthead Transceiver only
5	RADAR SILENCE RET	11			
6	HEADING MKR+ (RS422)	12			Twisted Pair
7	HEADING MKR- (RS422)	13			
8	PULSE BEARING+ (RS422)	14			Twisted Pair
9	PULSE BEARING- (RS422)	15			
Unit Connector No: TSK			Unit Connector No:		
Cable Connector Type: 171634 BL5.08/4			Cable Connector Type:		
Manufacturer: Weidmuller			Manufacture:		
Line No.	Function	Pin No.	Colour.	Pin No.	Remarks
10	SPEED SELECT/ MOTOR START	1			X-band only Function depends on link settings
11	SPEED SELECT RET/ MOTOR START RET	2			
12	SCREEN	E/TAG	Braid		

* Cable gland is designed to fit 8-core cable type 6224C (MA00007419). Any alternative cable should have similar dimensions to 6224C.

X and S-band Transceiver
Connections

Additional Features

3.2.2 X and S-band Transceiver Connections

Cable No:		EMC CAT –		Cable Type: PT1YM (75ohm coax)		
From Transceiver Unit				To:		
Unit Connector No: SKH				Unit Connector:		
Cable Connector Type: L734PNI				Cable Connector Type:		
Manufacturer; Belling Lee				Manufacturer:		
Line No.	Function	Pin No.	Colour	Pin No.	Remarks	
1	PRE-TRIGGER O/P	PIN	INNER	PIN		
2	SCREEN	OUTER	BRAID	OUTER		

Cable No:		EMC CAT –		Cable Type: PT1YM (75ohm coax)		
To: Transceiver Unit				From:		
Unit Connector No: SKJ				Unit Connector:		
Cable Connector Type: L734PNI				Cable Connector Type:		
Manufacturer; Belling Lee				Manufacturer:		
Line No.	Function	Pin No.	Colour	Pin No.	Remarks	
1	EXT-TRIGGER I/P	PIN	INNER	PIN		
2	SCREEN	OUTER	BRAID	OUTER		

Cable No:		EMC CAT –		Cable Type: 16 - 2 - 2C or 6224C		
To: Transceiver Unit				From:		
Unit Connector No: TSD				Unit Connector No:		
Cable Connector Type: 171635 BL5.08/5				Cable Connector Type:		
Manufacturer: Weidmuller				Manufacturer: Connector:		
Line No.	Function	Pin No.	Colour	Pin No.	Remarks	
1	RADAR SILENCE	1			If RS422 use twisted pair	
2	RADAR SILENCE RET	2				
3	SCREEN	ETAG	BRAID			

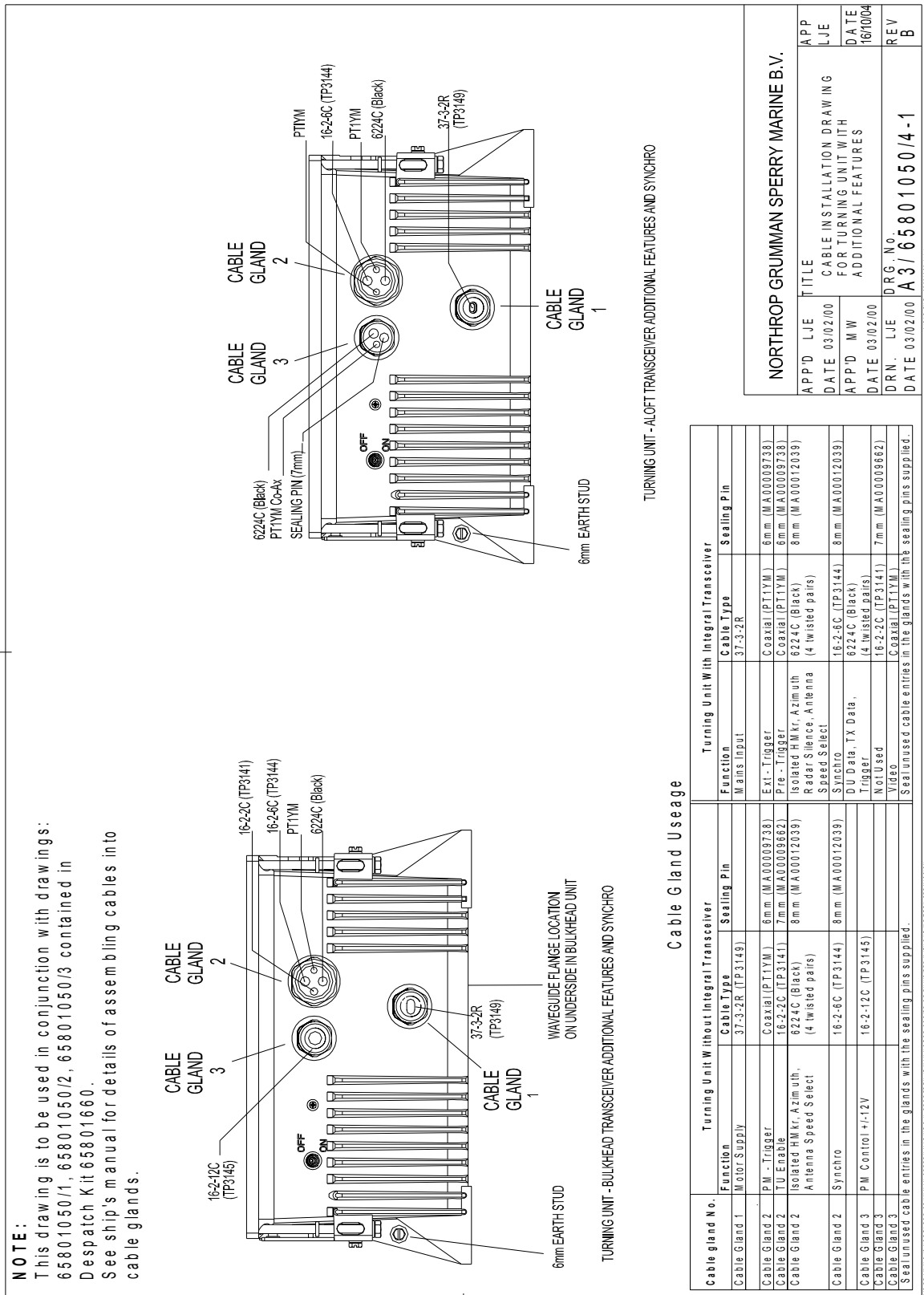


Figure 11.1 X-band Turning Unit Cable Entry Installation Drawing

X and S-band Transceiver Connections

Additional Features

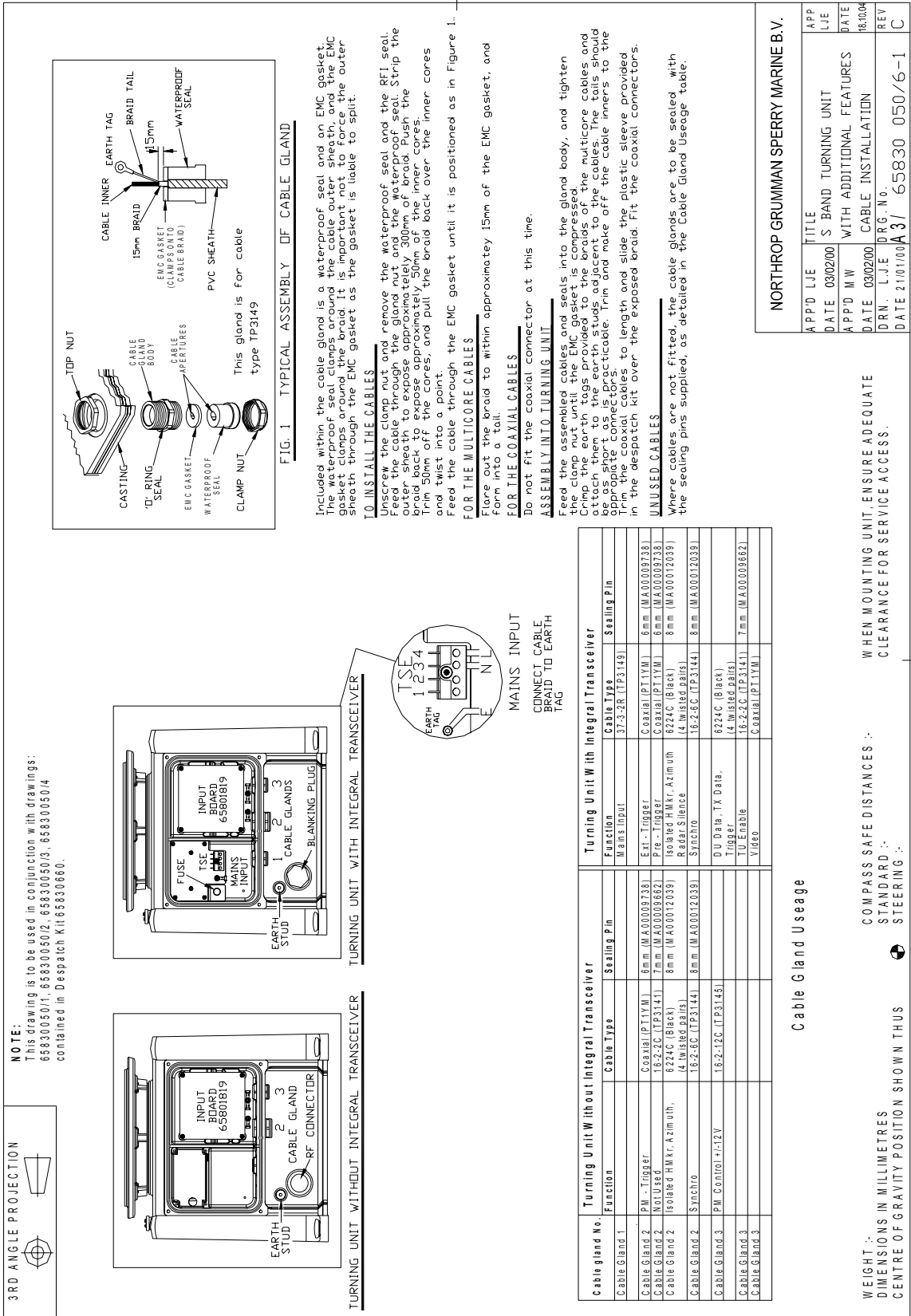


Figure 11.2 S-band Turning Unit Cable Entry Installation Drawing

3.3 Configuring Printed Circuit Boards.

3.3.1 Input PCB Assembly 65801815

Used in S-band and X-band bulkhead transceiver types 65810F, 65810L, 65825F, 65825L, 65831B

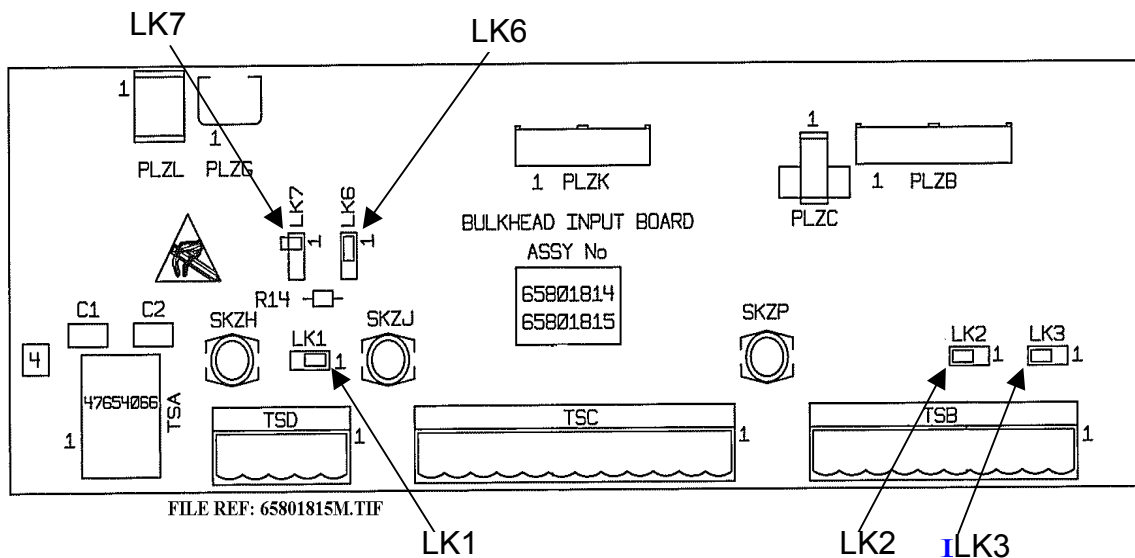


Figure 11.3 Input PCB Assembly 65801815

3.3.1.1 Default Settings

Table 15: Default Settings for Input PCB Assembly

Unit Type		LK1	LK2	LK3	LK6	LK7
65810F	65825F	1–2	2–3	2–3	1–2	Parked
65810L	65825L	1–2	2–3	2–3	1–2	Parked
65831B		1–2	2–3	2–3	1–2	Parked

3.3.1.2 LK1, LK6 and LK7: Radar Silence

These links let the radar silence input be configured for different signal types.

When LK6 is fitted in position 2–3 a 120 ohm terminating resistor is connected across the input. If a termination is not required (for example, for daisy-chained inputs) fit the link in position 1–2.

3.3.1.3 Input types

RS422

LK1 not fitted or parked on pin 1 (in other words, not linking two pins.)

LK6 fitted 2–3

LK7 not fitted (park on pin 1)

Transmission is inhibited when the input at TSD1 is positive wrt that at TSD2

To change the sense of operation of the input reverse the connections to TSD1 and 2

RS423

LK1 not fitted or parked on pin 1 (in other words, not linking two pins.)

LK6 fitted 1–2

LK7 fitted 1–2

Connect the input to TSD1

Transmission is inhibited when the voltage at TSD1 is positive.

To change the sense of operation of the input:

LK1 not fitted or parked on pin 1 (in other words, not linking two pins.)

LK6 fitted 1–2

LK7 fitted 2–3

Connect the input to TSD2.

Transmission is inhibited when the voltage at TSD2 is negative.

Closing Contact or No Input (default setting)

Closing contact option not available on early units fitted with Trigger PCB 65801803

LK1 fitted 1–2

LK6 fitted 1–2

LK7 not fitted (park on pin 1)

Connect input to TSD2

Transmission is inhibited when TSD2 is shorted to 0V. (TSC8)

To change the sense of operation of the input:

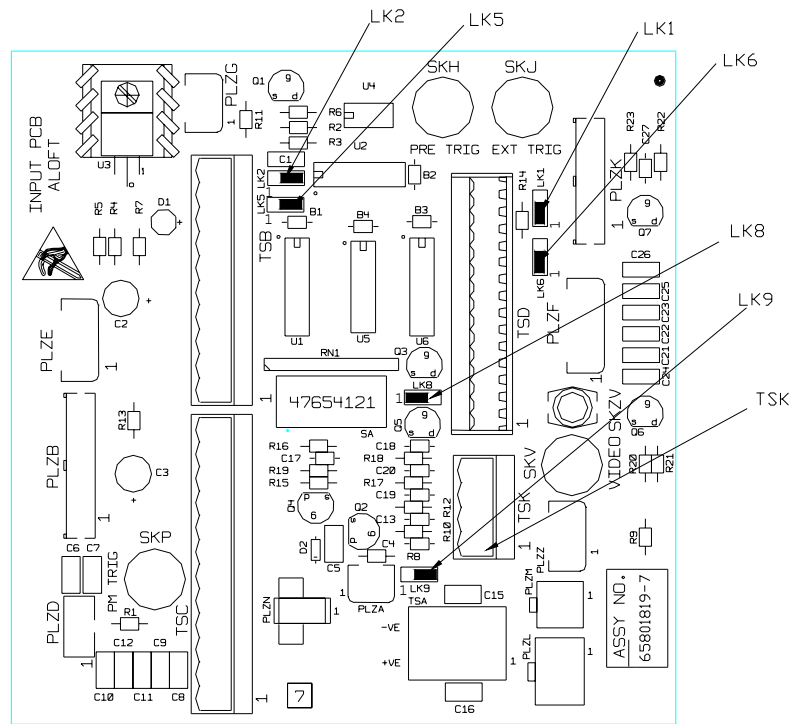
- LK1 fitted 2–3
- LK6 fitted 1–2
- LK7 not fitted (park on pin 1)

Connect input to TSD1

Transmission is enabled when TSD1 is shorted to 0V. (TSC8)

3.3.2 Input PCB Assembly 65801819

Used in S-band and X-band Turning Units



file ref:65801819.dwg

Figure 11.4 Input PCB Assembly 65801819

3.3.2.1 Default Settings

The default setting for Turning Units 65801Cxx, 65825Nxx, 65825Txx, 65810Nxx, 65810Txx is for high-speed rotation.

To select normal speed rotation link TSK1 to TSK2.

Table 16: Default Settings for Input PCB Assembly 65801819

Unit Type	LK1	LK2	LK5	LK6	LK8	LK9
65801CAx	x*	2-3	2-3	x	1-2	2-3
65810Nxx	1-2	2-3	2-3	1-2	1-2	2-3
65810Txx	1-2	2-3	2-3	1-2	1-2	2-3
65825NAx	1-2	2-3	2-3	1-2	1-2	2-3
65825TAx	1-2	2-3	2-3	1-2	1-2	2-3
65830Cxx	x	2-3	2-3	x	1-2	parked
65830Nxx	1-2	2-3	2-3	1	1-2	parked
65830Txx	1-2	2-3	2-3	1	1-2	parked
65825Lxx	x	x	x	x	1-2	1-2

* 'x' doesn't matter for this unit.

Remote selection of antenna rotation speed is not available on turning unit type: 65825Lxx, 65830Cxx, 65830Nxx.

3.3.2.2 LK1, LK6 and LK 8: Radar Silence

Only applicable to Turning Unit Types 65810Nxx, 65810Txx 65825Nxx, 65825Txx, and 65830Nxx, 65830Txx.

These links let the radar silence input be configured for different signal types.

When LK6 is fitted in position 2-3 a 120 ohm terminating-resistor is connected across the input. If a termination is not required (for example, daisy-chained inputs) fit the link in position 1-2.

3.3.2.3 Input Types

RS422

LK1 not fitted or parked on pin 1 (in other words, not linking two pins.)

LK6 fitted 2–3

LK8 fitted 1–2

Transmission is inhibited when the input at TSD10 is positive with respect to TSD11

To change the sense of operation of the input, reverse the connections to TSD10 and TSD11.

RS423

LK1 not fitted or parked on pin 1 (in other words, not linking two pins.)

LK6 fitted 1–2

LK8 fitted 1–2

Link TSD11 to 0V on TSC8

Connect the input to TSD10

Transmission is inhibited when the voltage at TSD10 is positive.

To change the sense of operation of the input:

LK1 not fitted or parked on pin 1 (in other words, not linking two pins.)

LK6 fitted 1–2

LK8 fitted 1–2

Link TSD10 to 0V on TSC8.

Connect the input to TSD11.

Transmission is inhibited when the voltage at TSD11 is negative.

Closing Contact or No Input (default setting)

No closing contact option available on units with Trigger PCB 65801803

LK1 fitted 1–2

LK6 fitted 1–2

LK8 fitted 1–2

Connect input to TSD11

Transmission is inhibited when TSD11 is shorted to 0V (TSC8)

To change the sense of operation of the input:

LK1 fitted 2–3

LK6 fitted 1–2

LK8 fitted 1–2

Connect input to TSD10

Transmission is enabled when TSD10 is shorted to 0V (TSC8)

3.3.2.4 LK2: Heading Marker Polarity Selection**Heading Marker Polarity Normal**

LK2 fitted 2–3

Defined as valid on falling edge of signal on TSD12 and rising edge of signal on TSD13 or, contact closure between TSD5 and TSD7.

Heading Marker Polarity Inverted

LK2 fitted 1–2

Defined as valid on rising edge of signal on TSD12 and falling edge of signal on TSD13 or, contact opening between TSD5 and TSD7.

3.3.2.5 LK5: Fixed/Adjustable Heading Marker Selection

This link lets you select between an adjustable heading marker that can be preset to lead or lag the true heading, or a fixed heading marker. Usually the link will be set to the adjustable heading marker position.

The standard heading marker output (on TSC12) occurs approximately 10° before ship's head. The timing of the isolated heading marker output can be delayed in increments of 0.088° from this, covering an approximate range of ±10° about ship's head.

Adjustment is achieved by setting DIL switch SA in a binary sequence. Switch 1 sets the least significant bit. When all switches are set to OFF (binary 00000000) the output is set to approximately 10° before ship's head. When all switches are set to ON (binary 11111111) the heading marker is delayed to approximately 10° after ship's head. A binary setting of 10000000 (when only switch 8 is ON) equates approximately to ship's head (0°).

Fixed Heading Marker Position

LK5 fitted 1–2

The fixed Heading marker precedes true heading by approximately 10°

The fixed heading marker output is only available in RS422 format.

Adjustable Heading Marker Position

LK5 fitted 2–3

Heading marker can be preset to lead the or lag the true heading.

3.3.2.6 LK9

This link is used to select one of two options. Remote selection of antenna rotation speed, or forced antenna rotation.

The two functions are mutually exclusive.

LK9: Remote Speed Selection LK9

This link has to be set in conjunction with LK1 on the Pulse Bearing PCB (65801826), and LK1 on the Motor Drive PCB (65801827).

When LK9 is set to enable remote selection of antenna rotation speed a short circuit between TSK1 and TSK2 selects normal speed, and an open circuit selects high-speed.

Remote Speed Selection Enabled

LK9 fitted 2–3

Remote Speed Selection Disabled

LK9 not fitted or parked on pin1 (in other words, not linking two pins)

LK9: Forced Antenna Rotation

Only applicable to Turning Unit Type 65825LAR, 65801Cxx, 65810Nxx, 65810Txx, 65825Nxx, 65825Txx.

This link allows an external switch to override the internal control logic to force the antenna to rotate when it would normally be inhibited, for example when the Transceiver is switched to standby.

The function can only be used if the Remotely Selectable Antenna Speed facility is not required.

Forced Rotation Enabled

LK9 fitted 1–2

Forced Rotation Disabled

LK9 fitted 2–3 or parked on pin1(in other words, not linking two pins)

If TSK1 is shorted to TSK2 the antenna will rotate and override the internal control logic.

3.3.3 Input PCB Assembly 65801821

Used in X Band bulkhead transceiver types 65810B, 65810T, 65825B, 65825T.

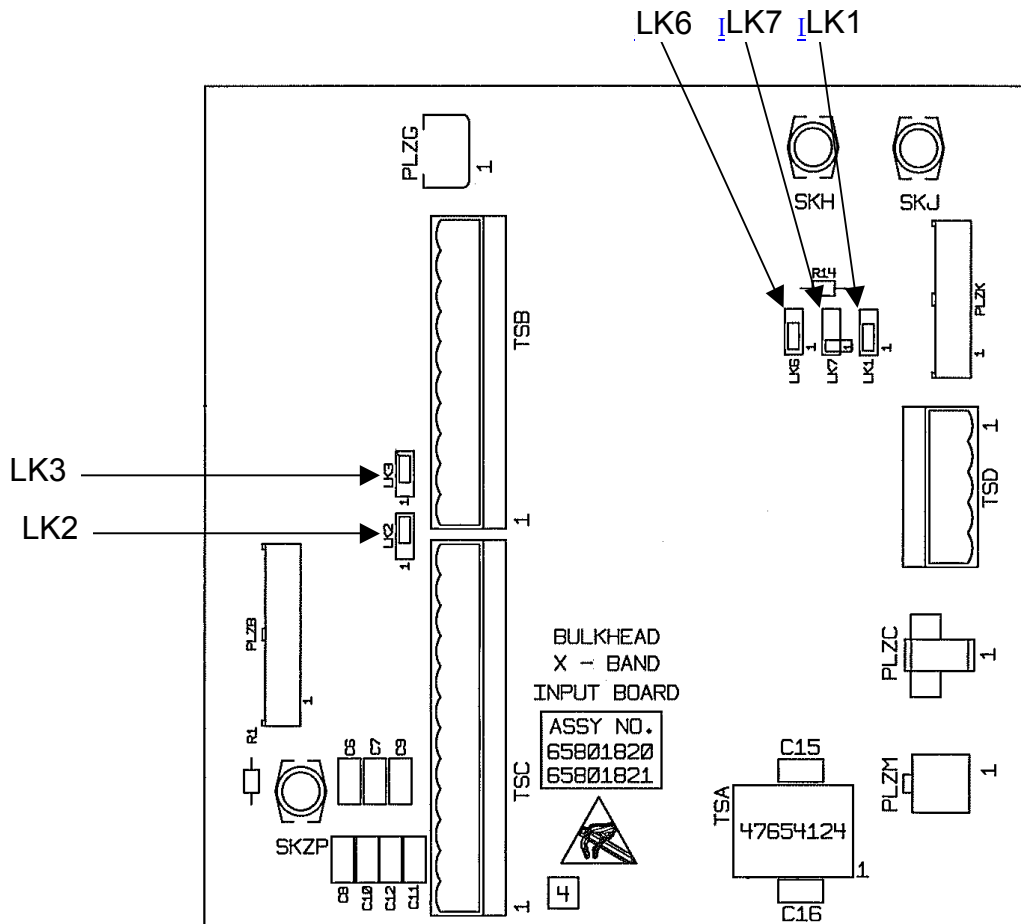


Figure 11.5 Input PCB Assembly 65801821

3.3.3.1 Default Settings

Table 17: Default Settings for Input PCB Assembly 65801821

Unit Type		LK1	LK2	LK3	LK6	LK7
65810B	65825B	1-2	2-3	2-3	1-2	Parked
65810T	65825T	1-2	2-3	2-3	1-2	Parked

3.3.3.2 LK1, LK6 and LK7: Radar Silence

These links let you configure the radar silence for different signal types.

When LK6 is fitted in position 2-3 a 120 ohm terminating resistor is connected across the input. If a termination is not required (for example, for daisy-chained inputs) fit the link in position 1-2.

3.3.3.3 Input Type**RS422**

LK1 not fitted or parked on pin 1 (in other words, not linking two pins.)

LK6 fitted 2–3

LK7 not fitted (park on pin 1)

Transmission is inhibited when the input at TSD1 is positive wrt that at TSD2

To change the sense of operation of the input reverse the connections to TSD1 and 2

RS423

LK1 fitted 2–3

LK6 fitted 1–2

LK7 fitted 1–2

Connect the input to TSD1

Transmission is inhibited when the voltage at TSD1 is positive.

To change the sense of operation of the input:

LK1 fitted 1–2

LK6 fitted 1–2

LK7 fitted 2–3

Connect the input to TSD2.

Transmission is inhibited when the voltage at TSD2 is negative.

Closing Contact or No Input (default setting)

Closing contact option not available on units fitted

LK1 fitted 1–2

LK6 fitted 1–2

LK7 not fitted (park on pin 1)

Connect input to TSD2.

Transmission is inhibited when TSD2 is shorted to 0V (TSC8).

3.3.4.1 LK1: Speed Select

Normal Speed Selected

LK1 fitted 1–2

High-Speed Selected

LK1 not fitted or parked on pin1 (in other words, not linking two pins)

Selectable Speed Selected

LK1 fitted 2–3

3.3.5 Motor Drive Board 65801827

Fitted to X-band Turning Unit types 65801Cxx, 65810Nxx, 65810Txx, 658825Nxx, 65825Txx.

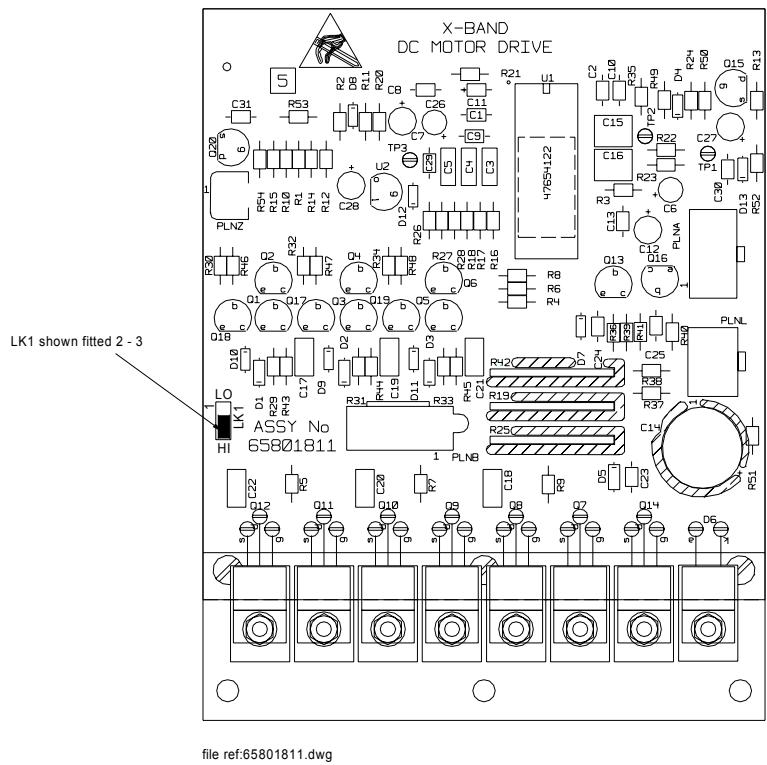


Figure 11.7 Motor Drive PCB Assembly 65801827

3.3.5.1 LK1: Speed Select**Normal Speed Selected**

LK1 fitted 1–2

High-Speed Selected

LK1 not fitted or parked on pin1 (in other words, not linking two pins)

Selectable Speed Selected

LK1 fitted 2–3

4 Spares List for Field Replacement Modules

Standard PCBs are replaced by Additional Features variants in systems with additional features. The following list shows the boards that are different in the Additional Features systems. During the life of the equipment there has been some rationalisation and modifications to some of the PCBs. As a general rule the PCBs fitted to later units can be used as replacements for those used in earlier units.

Input PCB T65801819 can be used to replace **Input PCB** T65801804

Pulse Bearing PCB T65801826 can be used to replace **Pulse Bearing PCB** T65801805

Motor Drive PCB T65801827 can be used to replace **Motor Drive PCB** T65801811

Trigger PCB T65801806 can be used to replace **Trigger PCB** T65801803, but if the radar silence input is being used with the RS422 format it will be necessary to connect a 120 ohm resistor between input terminals on the tagstrip.

4.1 X-band Turning Unit (Masthead Transceiver)

Table 18: X-band Turning Unit (Masthead Transceiver) Spares

Description	Spare Part Number		
Turning Unit Type	65810Nxx, 65825Nxx,	65810Txx, 65825Txx	65825Lxx
Trigger Board*	T65801803 or T65801806	T65801825	T65801801
Input Board	T65801819	T65801819	T65801819
Pulse Bearing PC	T65801826	T65801826	T65801805
Motor Drive PCB	T65801827	T65801827	T65801811

* 65801806 can be used to replace T65801803 fitted to earlier units, but if the radar silence input is being used with the RS422 format it will be necessary to connect a 120 ohm resistor between TSD10 and TSD11

4.2 S-band Turning Unit (Masthead Transceiver)

Table 19: S-band Transceiver (Masthead Transceiver) Spares

Description	Spare Part Number
Trigger Board*	T65801803 or T65801806
Input Board	T65801819

* T65801806 can be used to replace T65801803, but if the radar silence input is being used with the RS422 format it will be necessary to connect a 120 ohm resistor between TSD1 and TSD2.

4.3 X-band Turning Unit (for use with Bulkhead Transceiver)

Table 20: X-band Turning Unit (Bulkhead Transceiver) Spares

Description	Spare Part Number
Input PCB	T65801819
Pulse Bearing PCB	T65801826
Motor Drive PCB	T65801827

4.4 S-band Turning Unit (for use with Bulkhead Transceiver)

Table 21: X-band Turning Unit (Bulkhead Transceiver) Spares

Description	Spare Part Number
Input Board	T65801819

4.5 X-band Bulkhead Transceiver 65810F, 65810L, 65825F, 65825L

Table 22: Transceiver 65810F, 65810L, 65825F, 65825L Spares

Description	Spare Part Number	
Transceiver Type	65810F, 65825F	65810L, 65825L
Trigger Board*	T65801803 or T65801806	T65801825
Input Board	T65801815	T65801815

* T65801806 can be used to replace T65801803, but if the radar silence input is being used with the RS422 format it will be necessary to connect a 120 ohm resistor between TSD1 and TSD2.

4.6 X-band Bulkhead Transceiver 65810B, 65810T, 65825B, 65825T

Table 23: Transceiver 65810B, 65810T, 65825B, 65825T Spares

Description	Spare Part Number	
Transceiver Type	65810B, 65825B	65810T, 65825T
Trigger Board*	T65801803 or T65801806	T65801825
Input Board	T65801821	T65801821

* T65801806 can be used to replace T65801803, but if the radar silence input is being used with the RS422 format it will be necessary to connect a 120 ohm resistor between TSD1 and TSD2.

4.7 S-band Bulkhead Transceiver Unit 65831B

Table 24: Transceiver Unit 65831B Spares

Description	Spare Part Number
Trigger Board*	T65801803, T65801806
Input Board	T65801815

* T65801806 can be used to replace T65801803, but if the radar silence input is being used with the RS422 format it will be necessary to connect a 120 ohm resistor between TSD1 and TSD2.

5 Circuit Diagrams

This sections includes circuit diagrams for the Input PCBs, for the main unit schematic diagrams see Chapter 7 '*Fault Reporting and First Line Servicing*'.

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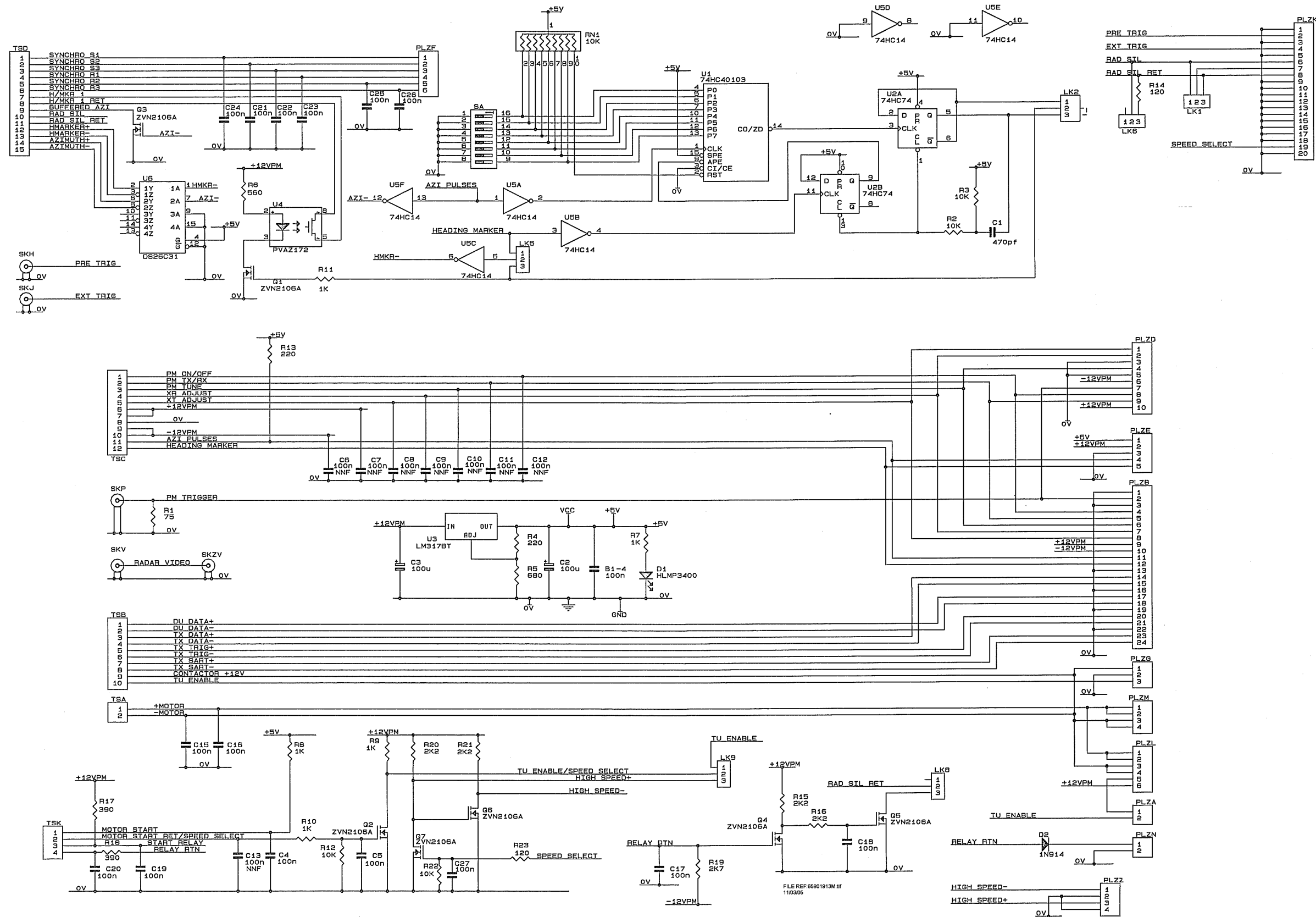


Figure 11.8 Circuit Diagram Input PCB 65801819

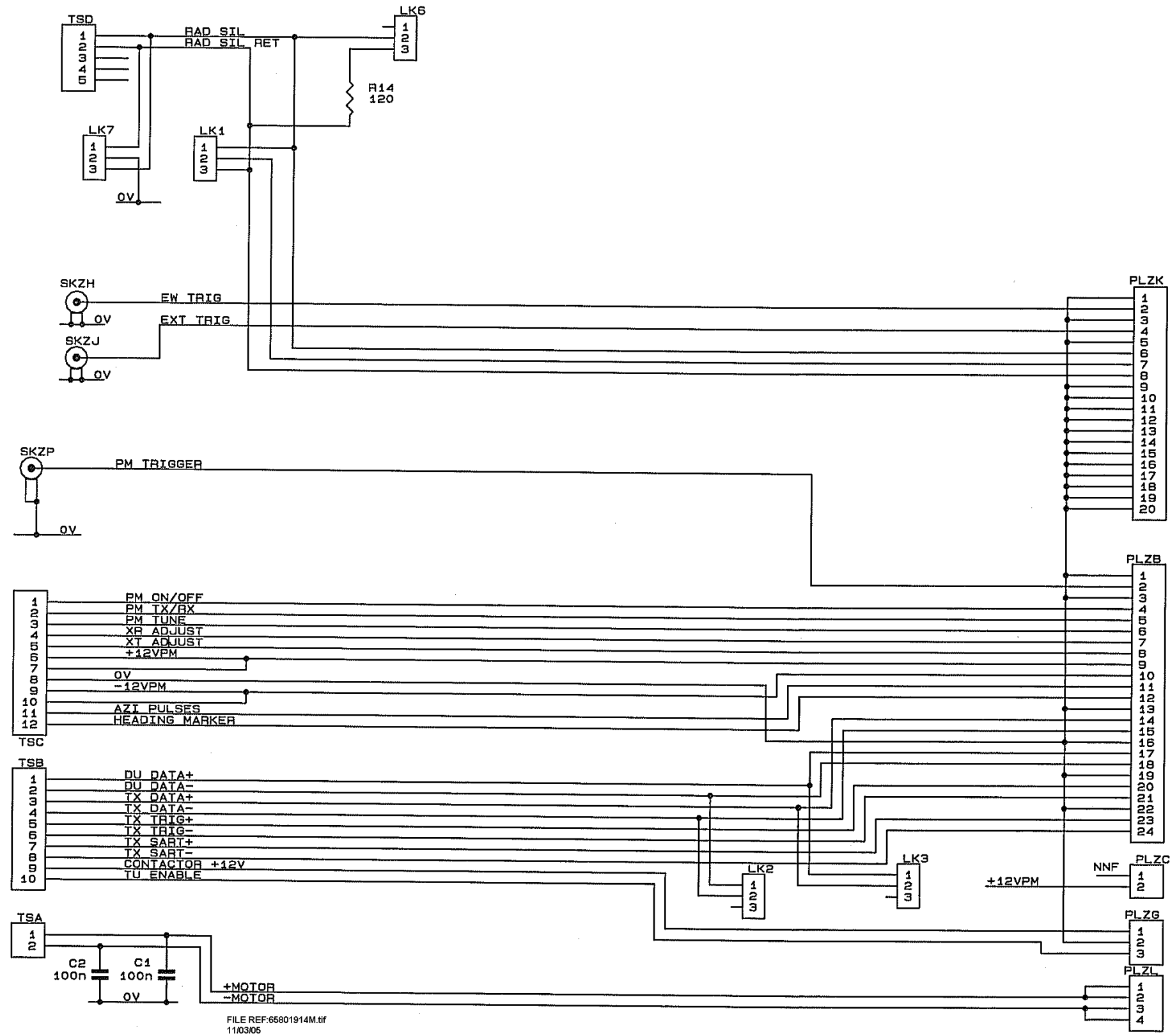
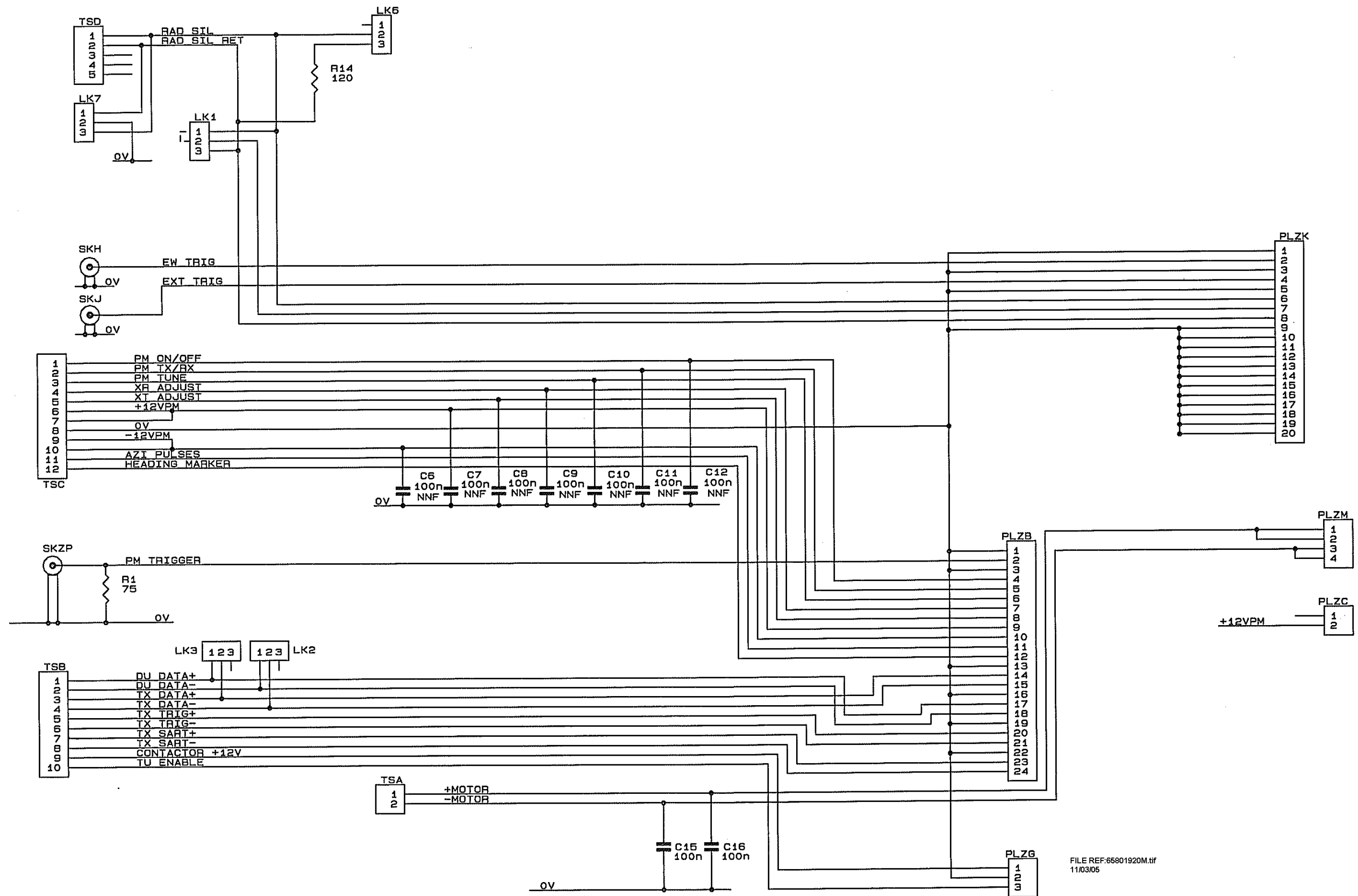


Figure 11.9 Circuit Diagram Input PCB 65801815



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Figure 11.10 Circuit Diagram Input PCB 65801821

GLOSSARY

Glossary of Terms

A

Acquisition Zone	An area on the video circle that has been defined by the operator. Any target that enters this zone is automatically acquired and tracked.
Activated Target	A symbol representing the automatic or manual activation of a sleeping target for the display of additional graphically presented information including: a vector (speed and course over ground); the heading; and ROT or direction of turn indication (if available) to display actually initiated course changes.
Automatic Identification System (AIS)	A system capability which enables ships and shore stations to obtain identifying and navigation information about other ships at sea, using an automated transponder.
Antenna	Slotted waveguide array for transmitting and receiving microwave signals. 10cm S-band (9 or 12ft aperture) or 3cm X-band (4, 6 or 8 ft aperture)
Anti-clutter	Removal of unwanted reflections on the radar screen caused by rain, sleet etc. (see Clutter).
Azimuth	The number of degrees from North (or other reference direction) that a line runs, measured clockwise.
ARCS	Admiralty Raster Chart Service. A service of British Admiralty, suppliers of electronic charts with world coverage, in the HCRF data format.
Automatic Radar Plotting Aid (ARPA)	A system wherein radar targets are automatically acquired and tracked and collision situations computer assessed and warnings given.
Azimuth Pulse	Azimuth (AZ): The number of degrees from North (or other reference direction) that a line runs, measured clockwise.

B

BSB Electronic Charts	A supplier of raster-format electronic charts. Electronic charts based on the paper charts supplied by NOAA or CHS are available in the data format established by BSB.
Bulkhead Transceiver	Transmitter/Receiver mounted below decks with microwave or co-axial connection to the Turning Unit.

C

C-MAP	C-Map Cartographic Service. Commercial supplier of vector-format navigational charts, which are not fully compliant with ECDIS standards as defined by IMO.
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Consistent Common Reference Point (CCRP)	The CCRP is a location on own ship, to which all horizontal measurements such as target range, bearing, relative course, relative speed, closest point of approach (CPA) or time to closest point of approach (TCPA) are referenced, typically the conning position of the bridge.
Checksum	A numeric value used to verify the integrity of a block of data. When data is transmitted from point to point in a packet, the sending computer counts the bytes and adds a check digit at the end of the packet. The receiving computer calculates the bytes received and compares the sender's count with the receiver's count to determine if there is any change that might indicate tampering with the information.
Clutter	Unwanted reflections on a radar screen, commonly from rain, snow or sleet.
CM93v3	CMAP's proprietary and unofficial chart format.
Cross-Track Error	The distance by which the ship's actual position deviates left or right from the Route Plan track.
Course-up	Stabilised display – the ship's bearing is shown at the top of the video circle with 000° elsewhere on the circle (representing True North).
D	
Datum	Any point, line, or surface used as a reference for a measurement of another quantity.
Digitized Chart	A data format for electronic charts that are made using a digitizer device with paper navigational charts. On ships equipped to make digitized charts, these charts can be used for operating in areas for which electronic charts from official or commercial sources are not available. Digitized charts do not conform to any standards for chart display.
Denso Paste	Soft brown petrolatum primer containing moisture-displacing corrosion-inhibiting compounds. Apply using a stiff brush or gloved hand.
DGPS	Differential GPS (see also GPS). Position sensor intended for precise commercial navigation in coastal waters. The DGPS employs an additional receiver for the reception of correction signals from a land-based transmitter to be applied to the satellite-based GPS position information.
DnV	Det norske Veritas. Independent maritime organization performing classification, certification, quality-assurance and in-service inspection of ships and mobile offshore units with the objective of safeguarding life, property and the environment.

Dead Reckoning	A method of estimating the position of a ship without astronomical observations, as by applying to a previously determined position the course and distance traveled since.
Distance To Go (DTG)	Distance to next action, such as a turn, while running a Voyage Plan.
Dynamic Brake	Braking is accomplished by electrically switching motors to act as generators that convert motion into electricity instead of electricity into motion.

E

Electronic Bearing Line	An EBL control is used to show the relative or true bearing of a target on the display. The EBL is moved with the cursor, and the bearing is read of the screen in degrees. One end is always anchored, either at the center of the screen or at a operator-defined point on the video circle.
ECDIS	Electronic Chart Display and Information System. A standard of the International Maritime Organization (IMO), governing electronic navigational systems.
ECS	Electronic Charting System. A chart display system that does not comply fully with the ECDIS standard as defined by IMO.
ENC	Electronic Nautical Chart. Chart data conforming to specification published in IHO Special Publication No. 57 (S57). Charts complying with this specification are available from various suppliers.
ENC (C-MAP)	Official S-57 encrypted charts converted to CMAP's proprietary chart database format.

F

Flyback Converter	Power supply switching circuit. During the first half of the switching period, the transistor is on and energy is stored in a transformer primary. During the second half period, this energy is transferred to the transformer secondary and the load.
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G

Gain	<p>The ratio of the signal output of a system to the signal input of the system expressed in dB. A gain of 10 would imply that the signal power had increased by a factor of 10. There are two general usages of the term in radar:</p> <p>(a) antenna gain (or gain factor) is the ratio of the power transmitted along the beam axis to that of an isotropic radiator transmitting the same total power; and</p> <p>(b) receiver gain (or video gain) is the amplification given a signal by the receiver.</p>
GGA	NMEA sentence which provides the GPS current fix data.
Greenwich Mean Time (GMT)	The international time standard, based on local standard time at longitude 0° 0' 0" (in Greenwich, England). Also called Coordinated Universal Time (UTC).
Global Positioning System (GPS)	A system by which receivers anywhere on earth can obtain accurate position data. The term "GPS" is also used to refer to the receiver device.
Great Circle	A circle drawn around the Earth such that the center of the circle is at the center of the Earth. Following such a circle plots the shortest distance between any two points on the surface of the Earth.
Guard Zone	An adjustable zone around the vessel. Once a guard zone is set, any target that enters the guard zone will trigger an alarm.

H

Head-up (H UP)	Unstabilised display – the ship's heading marker is always shown vertically upwards indicating straight ahead movement.
HCRF	Hydrographic Chart Raster Format. Electronic format used for BA-ARCS charts.
Heading Line	Line that projects forward showing where own ship is headed relative to the targets seen on the video circle.
Heading Marker	A heading marker on the display provides an important reference to direction. When the antenna is pointing ahead, it sends a pulse to the radar display that causes a line to show on the screen that represents the vessel's head. You can refer echoes displayed on the screen to your vessel's head and get the relative bearing of the echo. If the heading marker is not pointing exactly ahead, relative bearings will be wrong. You can quickly check for any such mistake by heading toward a small prominent visible object and see if the radar echo appears under the heading marker.

Heatsink Device used to conduct away and disperse the heat generated by electronic components.

HSC Heading-to-Steer Command. Heading order sent to an autopilot from an external electronic navigation aid, such as the ECDIS.

I

IHO International Hydrographic Office. IHO has developed an ENC product specification as the standard for ECDIS data, and has published this specification in its Special Publication No. 57 (S-57).

Integral Transceiver Transmitter/Receiver housed in the Turning Unit.

Interswitch Unit Enables radar systems to be connected together so that any Display Unit may be connected to any Scanner Unit.

L

Local Time Offset Offset between local time and UTC.

Lock-o-seal Two piece seal element (rubber 'O'-ring with a metal backup ring) designed specially for bolts, studs and other fasteners.

Lost Target A target representing the last valid position of a target before its data was lost. The target is displayed by a "lost target" symbol.

M

Magnetron Device that is comprised of an electric circuit inside a strong but variable magnetic field, designed to generate coherent microwaves.

Master Display A Master Display has complete control over a Transceiver. A Transceiver can only have one Master Display. A Master Display can only have one Transceiver.

Modulator A modulator is a circuit or device that combines two different signals in such a way that they can be pulled apart later.

Monitor The viewing unit, a Flat Panel Monitor (also known as FPD or LCD).

Multi-target Tote A display panel showing details of multiple acquired targets.

N

NIMA National Imagery and Mapping Agency. An agency of the United States government, supplying navigational charts to the United States Navy.

Nautical mile (NM)	The nautical mile is closely related to the geographical mile which is defined as the length of one minute of arc on the earth's equator. By international agreement, the nautical mile is now defined as 1852 meters (1.15 standard miles).
National Marine Electronics Association (NMEA)	An association of manufacturers that has published widely used standards for navigation and other marine sensor communication. Their published standards include NMEA 0183, Standard for Interfacing Marine Electronic Navigational Devices, Version 1.5, December 1987, and Version 2.0, January 1992. This standard is commonly referred to as simply "NMEA 0183." The ECDIS is designed to use messages from any navigation, weather, or machinery sensor that conforms to this standard.
NOAA	National Oceanic and Atmospheric Administration. Agency of the US government, supplying navigational charts. NOAA charts are available in the BSB electronic format.
North-up (N UP)	Stabilised display – the bearing scale shows 000° at the top of the video circle (assumed to be True North). The ship's heading marker is shown at the appropriate bearing.
O	
Opto-coupler	A component capable of optically transferring an electrical signal between two circuits and, at the same time, electrically isolating these circuits from each other. It consists of an infrared LED emitting section at its input, and a silicon photodetector, at its output, with other circuitry sometimes included as part of the device.
P	
Parallel Index Lines	A set of parallel lines placed on the video circle to aid navigation.
Parity	An error-checking procedure in which the number of 1s must always be the same – either even or odd – for each group of bits transmitted without error.
Past Position Dots	Equally time-spaced past position marks of a tracked or reported target and own ship. The co-ordinates used to display past positions may be either relative or true.
Performance Monitor	A unit, which warns the operator of reduced radar performance. May be integral with the Turning Unit (X-band) or separate (S-band).
Pulse Repetition Frequency	The number of radar pulses transmitted each second. The pulse transmission rate is automatically lengthened for longer ranges.

R

Random Access Memory	Memory used in computer systems. RAM is volatile memory, which does not hold data when the power is turned off
Range Rings	A set of concentric circles labeled by distance from the central point, useful for judging distance (especially from own ship).
Relative Motion – Relative Trails	Own ship is shown at a fixed point in the video circle (normally the centre). All target trails are shown relative to own ship's movement. This means stationary targets will have trails if own ship is moving.
Relative Motion – True Trails	Own ship is shown at a fixed point in the video circle (usually the centre). Target trails show their direction. Stationary targets do not produce trails.
Resolver	A type of rotary electrical transformer that is used for measuring the angle of a rotating machine such as an antenna platform. The primary winding of the transformer, fixed to the rotor, is excited by a sinusoidal electric current, which by electromagnetic induction causes currents to flow in two secondary windings fixed at right angles to each other on the stator. The relative magnitudes of the two secondary currents are measured and used to determine the angle of the rotor relative to the stator.
Rhumb Line	A line on a sphere that cuts all meridians at the same angle; the path taken by a ship or plane that maintains a constant compass direction.
Route	A set of waypoints that define the intended path of travel.
S	
S-band	The S-band, or 10 cm radar short-band, is the part of the microwave band of the electromagnetic spectrum ranging roughly from 1.55 to 5.2 GHz.
S57	Internationally accepted standard for electronic charts in the ENC vector-format. ENC data is standardized according to ECDIS specifications published in IHO Special Publication No. 57. Charts complying with this specification are available from various suppliers.
Scanner Unit	Comprises the Antenna and Turning Unit.
Scanner Control Unit	A unit which switches power to the S-band Turning Unit, under the control of the Display.

System Electronic Navigational Chart (SENC)	SENC means a database resulting from the transformation of the ENC by ECDIS for appropriate use, updates to the ENC by appropriate means, and other data added by the mariner. It is this database that is actually accessed by ECDIS for the display generation and other navigational functions, and is the equivalent to an up-to-date paper chart. The SENC may also contain information from other sources.
Sentence	A self contained line of data
SevenCs	A chart engine format
Slave Display	Display that is used to observe a radar image. It has limited functionality.
Sleeping Target	A target symbol indicating the presence and orientation of a vessel equipped with AIS in a certain location. No additional information is presented until activated thus avoiding information overload.
SOLAS	Safety of Life At Sea. A set of conventions adopted by the IMO and all of its signatory countries in 1974. These conventions regulate many of the features of ships used in international trade, including navigation equipment and its functionality
Standard Display (STD)	The standard set of chart objects (buoy information, conspicuous landmarks, etc.) specified for ECDIS display, in compliance with IMO standards.
Stern Line (SL)	A line, drawn across the video circle, showing the stern's direction. A stern line can be useful when ownship is backing into port or harbour.
Synchro	A motorlike device containing a rotor and a stator and capable of converting an angular position into an electrical signal, or an electrical signal into an angular position.

T

Target	Object of interest on a radar display. Targets can be labelled (acquired) and tracked.
Trial Manoeuvre	Facility used to assist the operator to perform a proposed manoeuvre for navigation and collision avoidance purposes, by displaying the predicted future status of all tracked and AIS targets as a result of own ship's simulated manoeuvres.
Trigger PCB	A control board housed in the Transceiver. It controls the Modulator, Magnetron and sends signals to the Display to indicate when the magnetron has fired a pulse.
True Motion	Own ship moves across the video circle. Stationary targets do not produce trails.

TTMG Track To Make Good. In the context of the ECDIS, TTMG denotes a temporary plan which may be activated at any time, and which by default consists of a 500 nm track line on present heading.

Turning Unit Contains the Antenna rotation motor, the microwave rotary joint, and may contain an integral Transceiver.

U

Universal Time Coordinated (UTC) The international standard of time, kept by atomic clocks around the world. Formerly known as Greenwich Mean Time (GMT), local time at zero degrees longitude at the Greenwich Observatory, England. UTC uses a 24-hour clock.

V

Variable Range Marker An adjustable range ring used to measure the distance to a target. When the VRM is adjusted over the leading edge of a return with the cursor control, the distance to the object is shown on the screen.

Vector Direct connection between two points, either given as two sets of coordinates (points), by direction and distance from one given set of coordinates (True Vector), or a point in a vector space defined by one set of coordinates relative to the origin of a coordinate system (Relative Vector).

Video Circle The area on the Display that shows the radar image.

W

Watch Alarm The purpose of a watch alarm system is to monitor bridge activity and detect operator disability which could lead to marine accidents. The system monitors the awareness of the Officer of the Watch (OOW) and automatically alerts the Master or another qualified OOW if for any reason the OOW becomes incapable of performing the OOW's duties. This purpose is achieved by a series of indications and alarms to alert first the OOW and, if he is not responding, then to alert the Master or another qualified OOW.

Additionally, the watch alarm may provide the OOW with a means of calling for immediate assistance if required. The watch alarm should be operational whenever the ship's heading or track control system is engaged, unless inhibited by the Master.

Waveguide Hollow rectangular, oval or round tube used to convey microwave RF energy from one point to another in a radar transmitter or receiver.

Waypoint	A geographical location (for example, latitude and longitude) on a route indicating a significant event on a vessel's planned route (for example, course alteration point, calling in point, etc.).
WGS-84	World Geodetic System 1984. Chart datum specified in accordance with the IMO ECDIS standard.
Wobulation	Low frequency modulation of the Pulse Repition Frequency (PRF) to help suppress interference.

X

X-band	The X-band (3 cm radar spot-band) of the microwave band of the electromagnetic spectrum roughly ranges from 5.2–10.9 GHz. The relative short wavelength at X-band frequencies makes possible high-resolution imaging radars for target identification and target discrimination.
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Glossary of Abbreviations

Symbols

μA Microamp (0.000001 amps)

μs Microsecond (0.000001 seconds)

Ω Ohms

ϕ Phase

A

A Ampere

AC Alternating Current

ADC Analog to Digital Converter

AFC Automatic Frequency Control (fine tuning)

AIS Automatic Identification System

ARPA Automatic Radar Plotting Aid – a system wherein radar targets are automatically acquired and tracked and collision situations computer assessed and warnings given.

AZ Acquisition Zone

B

BA British Admiralty.

BCR Bow Crossing Range

BCT Bow Crossing Time

BIST Built-In Self-Test

BITE Built-In Test Equipment

BSH German Federal Maritime and Hydrographic Agency (BSH) that provide type approval to EC Council Directives

C

CD ROM Compact Disk Read-Only Memory

CDX Control differential transmitter

CHS Canadian Hydrographic Service

COG Course Over Ground

CPA Closest Point of Approach [to own ship]

C UP Course-up

CRT	Constant Radius Turn
CSE	CourSE [through water]
CX	Control transmitter
D	
dB	Decibel.
DC	Direct Current
E	
EBL	Electronic Bearing Line
EMC	Electromagnetic Compatibility
EPA	Electronic Plotting Aid
ERBL	Electronic Range and Bearing Line
ETA	Estimated Time of Arrival
ETD	Estimated Time of Departure
F	
ft	Foot or feet
FPD	Flat Panel Display
G	
GMT	Greenwich Mean Time
GPS	Global Positioning System
GZ	Guard Zone
H	
HDG	Heading
HL	Heading Line
HO	Hydrographic Office.
H UP	Head-up
Hz	Hertz (unit of Frequency)
HT	High tension (meaning high voltage)
I	
in	Inch
I/O	Input/Output

K

Km	Kilometre
kt	Knot (one nautical mile per hour – 1.15 mph)
kV	Kilovolt (1000 Volts)
kW	Kilowatt (1000 Watts)

L

LAN	Local-Area Network
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LNFE	Low Noise Front End
LP	Long Pulse (available from 3 NM and upwards)

M

m	Metre
mA	Milliamp (0.001 Amps)
MHz	Megahertz (1000000 Hertz)
MIS TRIG OUT	Mutual Interference Suppression Trigger Out – trigger used to suppress the video for 12µs to inhibit interference from other radars.
MMSI	Maritime Mobile Service Identity
MOB	Man overboard
Mod Trigger	Modulator Trigger
MP	Medium Pulse (available in the 0.5 NM to 24 NM range)

N

nm	Nautical mile.
NDI	Nautical Data International. Licensed distributor of CHS charts in the BSB electronic format.
NM	Newton Metre
NMEA	National Marine Electronic Association
NNF	Not Normally Fitted
ns	nanosecond (0.000000001 seconds)
N UP	North-up

P

PCB	Printed Circuit Board
PCIO	PC Input/Output
PEU	Processor Electronics Unit
PFC	Power Factor Correction
PFN	Pulse Forming Network
PM	Performance Monitor
PPI	Plan Position Indicator
PRF	Pulse Repetition Frequency
PRI	Pulse Repetition Interval
PSU	Power Supply Unit

R

RAIM	Receiver Autonomous Integrity Monitoring
RAM	Random Access Memory
RF	Radio Frequency
RFI	Radio Frequency Interference
RM(R)	Relative Motion – Relative Trails
rms	Root mean square (AC voltage that equals DC voltage that will do the same amount of work)
RM(T)	Relative Motion – True Trails
ROT	Rate of Turn
rpm	Revolutions per minute
RR	Range Rings
RVAP	Radio Video Adaptive Processor

S

SART	Search and Rescue Transponder
SCU	Scanner Control Unit
SL	Stern Line
sm	Statute mile – A mile as measured on land, 5,280 feet or 1.6 kilometers. Distances at sea are measured in nautical miles.
SOG	Speed Over the Ground

SP	Short Pulse (available below 3 NM)
STW	Speed Through Water
T	
T BRG	Target Bearing/True Bearing
TCPA	Time to Closest Point of Approach [to own ship]
TM	True Motion
TRP	Temporary Route Plan
TTG	Time To Go. Time to next action, such as a turn, while running a Route Plan.
Tx/Rx	Transmitter/Receiver (Transceiver)
TX BIST	Transceiver Built-In Self Test
TX COMMS	Transceiver Communications
U	
UTC	Universal Time Coordinated
V	
V	Volt
VA	Volt amperes
VMS	Voyage Management System
VRM	Variable Range Marker
W	
W	Watts
X	
XTE	Cross-Track Error

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