BridgeMaster E

Radar

Ancillary Units and Radar Systems Manual

Northrop Grumman Sperry Marine B.V.

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WARNINGS AND CAUTIONS

WARNING: LETHAL VOLTAGE HAZARD

When access covers are removed, lethal voltages may be exposed. Some capacitors used in the equipment take several minutes to discharge their stored voltages after switch OFF, this is a lethal voltage hazard. Always set the supply switch-fuse to OFF before removing the access covers of the equipment.

WARNING: HEALTH HAZARD

When cleaning the inside of the equipment, take care not to inhale dust. The dust is a temporary health hazard, depending on individual allergies.

WARNING: RADIATION HAZARD

Keep outside the hazard zone around an antenna or open waveguide radiating power. Refer to the table below for hazard zones. When it is necessary to work on the Scanner Unit, make sure that radar is switched OFF, and that the Mains Isolator is turned to the OFF position.

Never look directly into an open waveguide.

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/cm^2.

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

CAUTION: ELECTROSTATIC SENSITIVE DEVICES (ESSDs)

This equipment contains ESSDs. Full ESD precautions should be taken to avoid the risk of damage to these devices by the discharge of electrostatic voltages.

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REVISION RECORD

Suffix	Revision	Issue Date	Date Incorporated	Incorporated By
2		25/11/98		65800/080
3		25/02/99		65800/100
4	A	15/07/03		65800/306
5	A	29/07/03		65843/013

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PREFACE

HOW TO USE THIS SUPPLEMENT

This manual is intended to be used by the Installation/Service Engineer and Radar Operator. It is intended also to be used in conjunction with the User Guide 658000010A and other related documents (see Page (ix) for full list).

The supplement is divided into chapters as follows:

- **Chapter 1 - Display Compatibility Unit 65840A.** This chapter gives specifications of the unit with configuration and installation details.
- **Chapter 2- Transceiver Compatibility Unit 65841A.** This chapter gives specifications of the unit with configuration and installation details.
- **Chapter 3 - 2 Way Interswitch Unit 65842A.** This chapter gives specifications of the unit with configuration and installation details.
- **Chapter 4 - 6 Way Interswitch Unit 65846A.** This chapter gives specifications of the unit with configuration and installation details.
- **Chapter 5 - Interface Unit 65847A.** This chapter gives specifications of the unit with configuration and installation details.
- **Chapter 6 - Scanner Control Unit, Isolator Switch and Isolating Transformer.** This chapter gives specifications, configuration and installation details of the above items.
- **Chapter 7 – Radar Slave Interface Unit.** This chapter gives specifications of the unit with configuration and installation details.
- **Chapter 8 – Slave Junction Box.** This chapter gives specifications of the unit with configuration and installation details.
- **Chapter 9 - System Interconnections and Cable Details.** This chapter gives system interconnection diagrams and cabling information for all of the Ancillary Units.
- **Chapter 10 - Fault Reporting and First Line Servicing.** This chapter gives procedures for fault reporting and details of items that may be replaced as part of First Line Servicing procedures.
- **Chapter 11 - Maintenance.** This chapter gives details of any procedures required for routine maintenance of Ancillary Units.
- **Chapter 12 - Modification Sheets**. This chapter contains information not available at the time of printing and should be used to hold Modification Sheets as they are issued.

NOTICE

Northrop Grumman Sperry Marine B.V. have a policy of continuous development. This may lead to the equipment described in this manual being at variance with equipment manufactured after its publication.

BridgeMaster E Series Radar

Ancillary Units and Radar Systems Manual

OVERALL CONTENTS

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RELATED DOCUMENTS

Other documents in the series:

- Bridge Card ..... (Publication Ref 65800008)
- User Guide ..... (Publication Ref 65800010A)
- Ship's Manual..... (Publication Ref 65800010B)
- BridgeMaster II S-Band Supplement.....(Publication Ref 65601012)
- BridgeMaster II X-Band Supplement.....(Publication Ref 65601013)

Note that the BridgeMaster II S-Band Supplement, and the BridgeMaster II X-Band Supplement cover Hybrid Systems containing BridgeMaster II Series Display Units with BridgeMaster E Series Scanner Units.

* For original BridgeMaster, the 180/250 and 340 Display Technical Manuals are Publication Ref 65600011 and 65626011 respectively.

GLOSSARY OF TERMS

Scanner Unit	Comprises the Antenna and Turning Unit.
Antenna	Slotted waveguide array for transmitting and receiving microwave signals.
Turning Unit	Contains the Antenna rotation motor, the microwave rotating joint, and may contain an integral Transceiver.
Integral Transceiver	Transmitter/Receiver housed in the Turning Unit.
Bulkhead Transceiver	Transmitter/Receiver mounted below decks with microwave or co-axial connection to the Turning Unit.
Display Unit	The radar screen and control panel(s).
Display Console	Combined Display Unit and Pedestal/Plinth (340 Series only).
Performance Monitor	An optional unit which warns the operator of reduced radar performance. The unit is integral with both X-Band and S-Band turning units.
Scanner Control Unit	A unit which switches power to the S-Band Turning Unit, under the control of the Display.
Interswitch Unit	Enables two radar systems to be connected together so that either Display may be connected to either Scanner Unit.
Display Compatibility Unit	Converts Scanner Unit/Bulkhead Transceiver signals to BridgeMaster Display Unit format.
Transceiver Compatibility Unit	Converts Display Unit signals to BridgeMaster Scanner Unit/Bulkhead Transceiver format.

A	Ampere
AC	Alternating Current
ARPA	Automatic Radar Plotting Aid
CRT	Cathode Ray Tube
dB	decibel
DC	Direct Current
ft	feet
GPS	Global Positioning System
GMT	Greenwich Mean Time
Hz	Hertz (unit of Frequency)
I/O	Input/Output
Kt	Knot
kW	Kilowatt
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LNFE	Low Noise Front End
n.mile	Nautical Mile
NMEA	National Marine Electronic Association
NNF	Not Normally Fitted
PCB	Printed Circuit Board
PPI	Plan Position Indicator
PSU	Power Supply Unit
RFI	Radio Frequency Interference
rpm	revolutions per minute
SART	Search And Rescue Transponder
TX/RX	Transmitter/Receiver (Transceiver)
UTC	Universal Time Coordinate
V	Volt

SOFTWARE LICENCE AGREEMENT

When you receive your radar, it will include factory installed software, the use of which is subject to the following Licence Agreement below.

*** * * IMPORTANT * * ***

READ THE LICENCE TERMS PRINTED BELOW BEFORE USING THE EQUIPMENT. USE OF THE EQUIPMENT INDICATES YOUR ACCEPTANCE OF THE TERMS OF THE LICENCE AGREEMENT.

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CHAPTER 1

ANCILLARY UNITS

DISPLAY COMPATIBILITY UNIT

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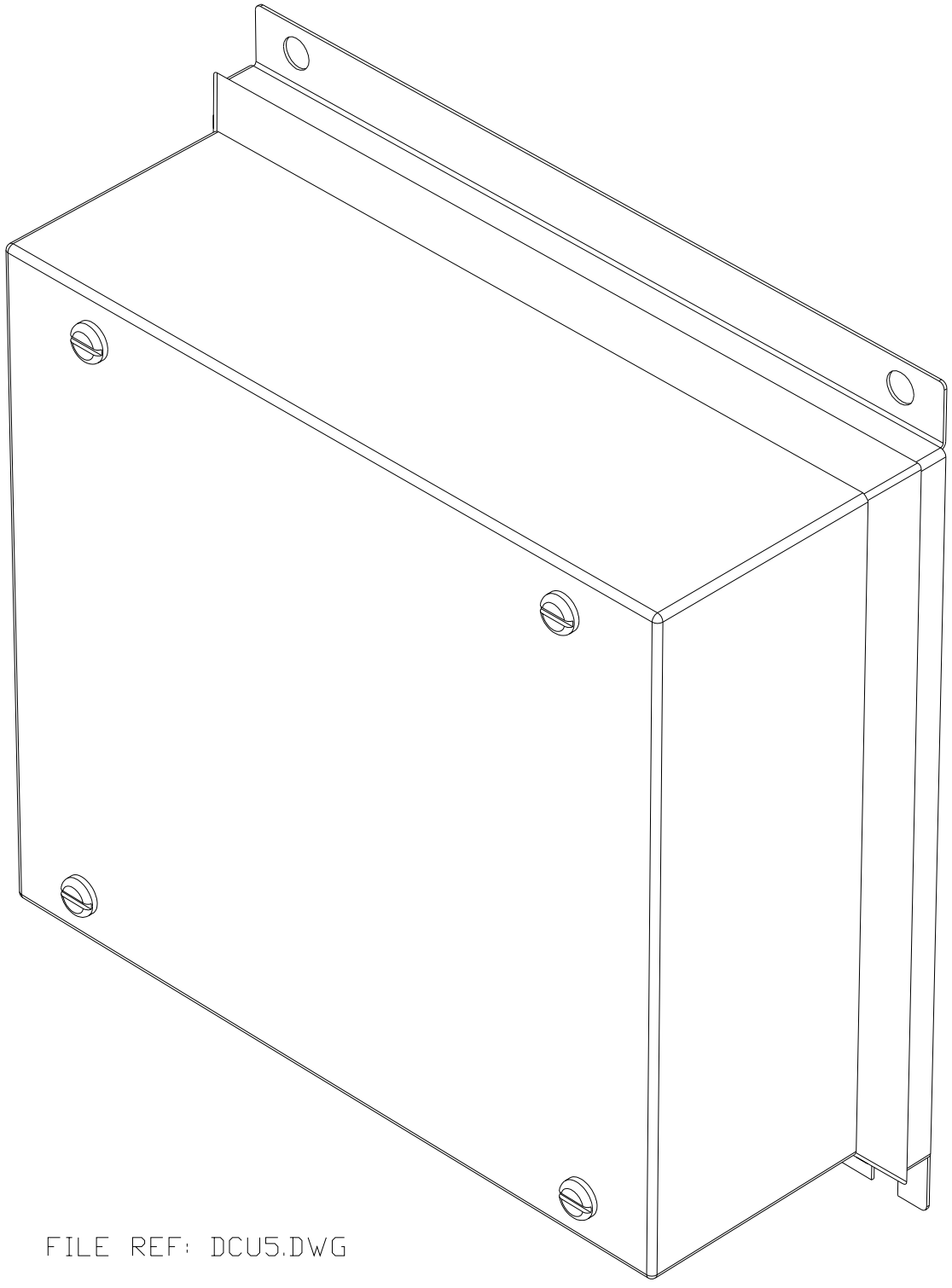


Figure 1.1 – Display Compatibility Unit 65840A – General View

GENERAL DESCRIPTION

The Display Compatibility Unit (DCU) Type 65840A is a small, single PCB, interface unit which converts signals from the BridgeMaster E Series Scanner Unit/Transceiver Unit into a form suitable for the earlier BridgeMaster Display Unit, and *vice versa*, either directly or via a BridgeMaster Interswitch Unit. Power for the unit, which is normally mounted in the vicinity of the Display (or Interswitch Unit) is derived from the Display as low voltage DC lines.

Interfacing involves the conversion of parallel data from the BridgeMaster Display Unit into the serial data commands recognised by the Transceiver, and the decoding of serial messages carried on twisted pair cables, into the individual signals required by the Display Unit. These include Heading Marker, Bearing, Radar Trigger, SART Video (if available), Tuning, Pulse Lengths, Performance Monitor, etc.

Inherent in the design is the use of a phase-locked loop circuit to convert the 4096 azimuth pulses per revolution into the BridgeMaster format of 90 or 360 pulses per revolution.

Radar Video is routed through the unit unchanged via a separate co-axial cable. Low voltage outputs from the Display (or Interswitch Unit) provide power for the unit. To minimise installation cabling, the DCU should be mounted in the vicinity of the Display Unit (or Interswitch Unit) - refer to the system diagrams and cabling schedules for details of the cabling requirements.

There are no operator controls associated with the unit but a commissioning procedure is carried out at installation to set up internal links and presets.

As no operator access is required, after commissioning, the unit may be installed in a display pedestal or other non-visible location.

There is currently only a single variant of DCU , 65840A, and a Despatch Kit 65840600 contains all necessary fixings and connectors.

SYSTEM CONFIGURATION

For a stand-alone system the Display Compatibility Unit (DCU) is interposed between the Transceiver and the Display.

For interswitched systems the following guidelines apply :

For earlier systems utilising the BridgeMaster Interswitch Unit Type 65642AA , the DCU is interposed between the Turning Unit/Transceiver and the Interswitch Unit. Refer to Figure 1.2.

For installations utilising the new 65842A (2-way) or 65846A (6-way) Interswitch Units, the DCU is mounted between the Display Unit and the Interswitch Unit, and can translate the required control and tell-back signals.

When using a BridgeMaster E 2-way Interswitch (65842A), the BM II display must be set to (65)642 at initialisation/set up.

For a BridgeMaster E 6-way Interswitch (65846A), the BM II display must be set to (65) 644 at initialisation/set up. In this instance the BM II display/DCU can only be connected to Display A→D positions and will only be able to access transceivers A→D.

The BridgeMaster II display cannot be used for E/F transceivers, or in E/F position for six way interswitch units.

Radar Video is routed through the unit unchanged via a separate co-axial cable. Low voltage outputs from the Display (or Interswitch Unit) provide power for the unit.

To minimise installation cabling, the DCU should be mounted below decks in the vicinity of the Display Unit (and Interswitch Unit) - refer to the system diagrams and cabling schedules within this manual for typical details of the cabling requirements.

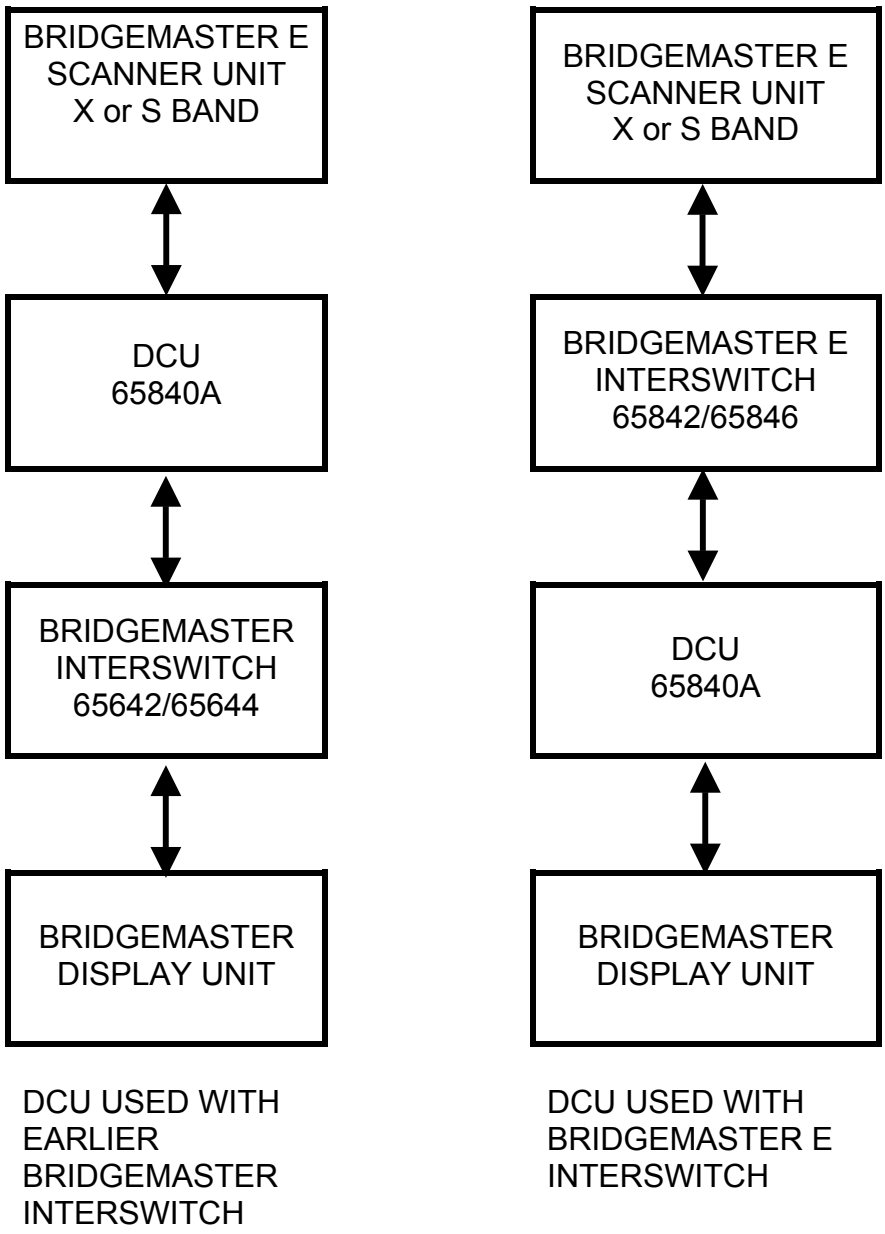


Figure 1.2 – Placement of DCU within Interswitched Systems

INSTALLATION AND COMMISSIONING

There are no operator controls associated with the unit but a commissioning procedure is carried out at installation to set up internal links and presets.

Refer to Chapter 9 in this manual for details of system interconnections and cable details.

As a diagnostic aid when commissioning and servicing, 5 LED's are fitted on the DCU PCB. These are numbered D1 to D5. Their functions are as follows:

Normal Operation is indicated by D2, D3, D4, D5 off, with D1 pulsing on/off.

D2 on - indicates that the Display is in slave mode.

D3 on - indicates that there is a communications failure to the Transceiver

D4 on - indicates that there is a data failure to the Transceiver.

D5 on - indicates that there is a communications failure to the Interswitch.
- Note that in Test Mode, D5 pulses on/off.

Link And Switch Setting

Refer to Figure 1.4 for details of settings.

Note that the configuration switches and links are only updated during start-up.
(However, momentarily shorting Test Link 7 will cause a forced reset which will update any changes in switch or link status.)

Preset Potentiometer Adjustment

Refer to Figure 1.4 for positions of DCU presets that require adjustment.

The PCB contains 4 presets as follows:

RV1 is the Coarse Tune control for Transceiver A

RV2 is the Coarse Tune control for Transceiver B

RV3 is the Coarse Tune control for Transceiver C

RV4 is the Coarse Tune control for Transceiver D

On a non-interswitched system, only RV1 will need adjustment.

PROCEDURE:

Refer to Figure 1.3 for positions of Display presets.

Set the BridgeMaster Display internal Coarse Tune Control, RV3 (under the lid of the Display) fully anticlockwise (= zero).

Set RV1 on the DCU to fully anticlockwise. (Note that RV1 is a 20 turn potentiometer).

Select Manual Tune mode (AFC = off), and start transmitting.

Adjust the (fine) Tune control on the Display Control Panel to mid-position.

Adjust RV1 on the DCU until best picture and optimum tuning indication is achieved.
(Tune for the maximum number of tuning ‘diamonds’ commensurate with the best picture).

Switch on AFC and confirm that the picture locks without degradation.

In an interswitched system, the above procedure must be repeated for additional Transceivers B, C, D using RV2, RV3, RV4 respectively.

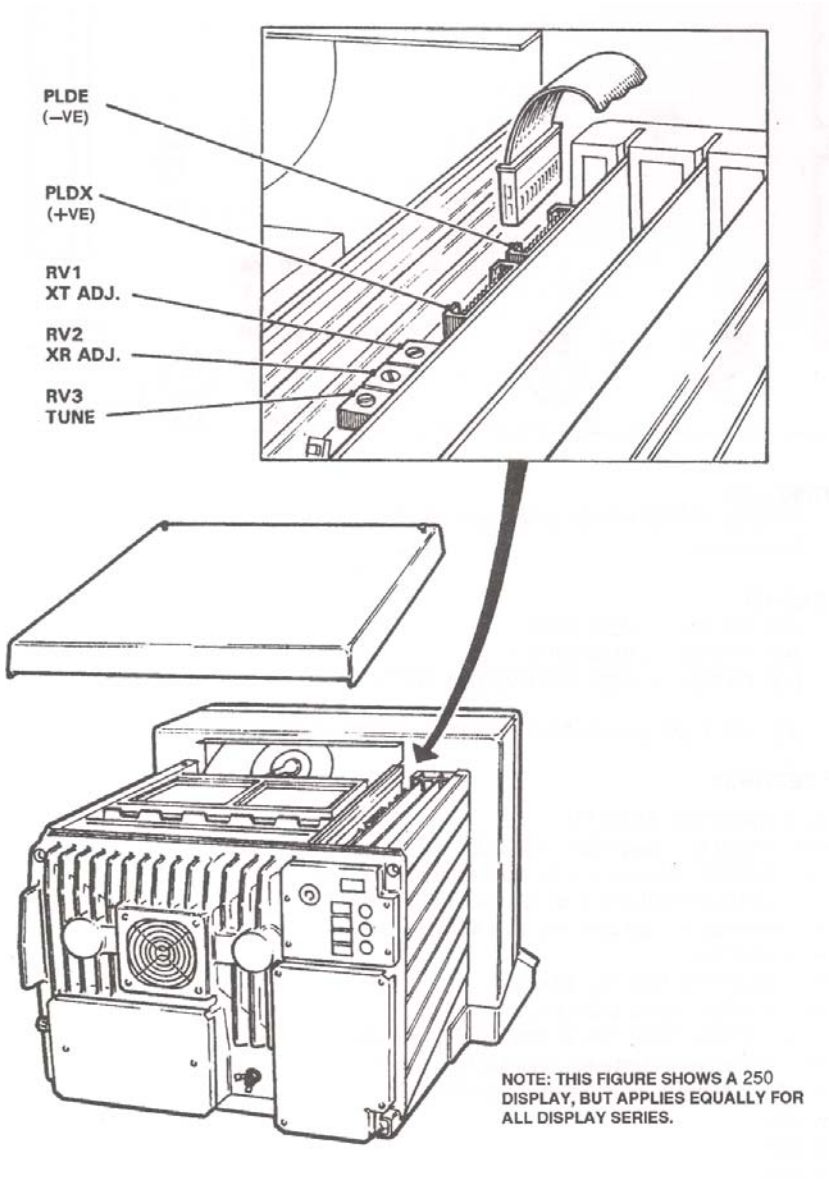
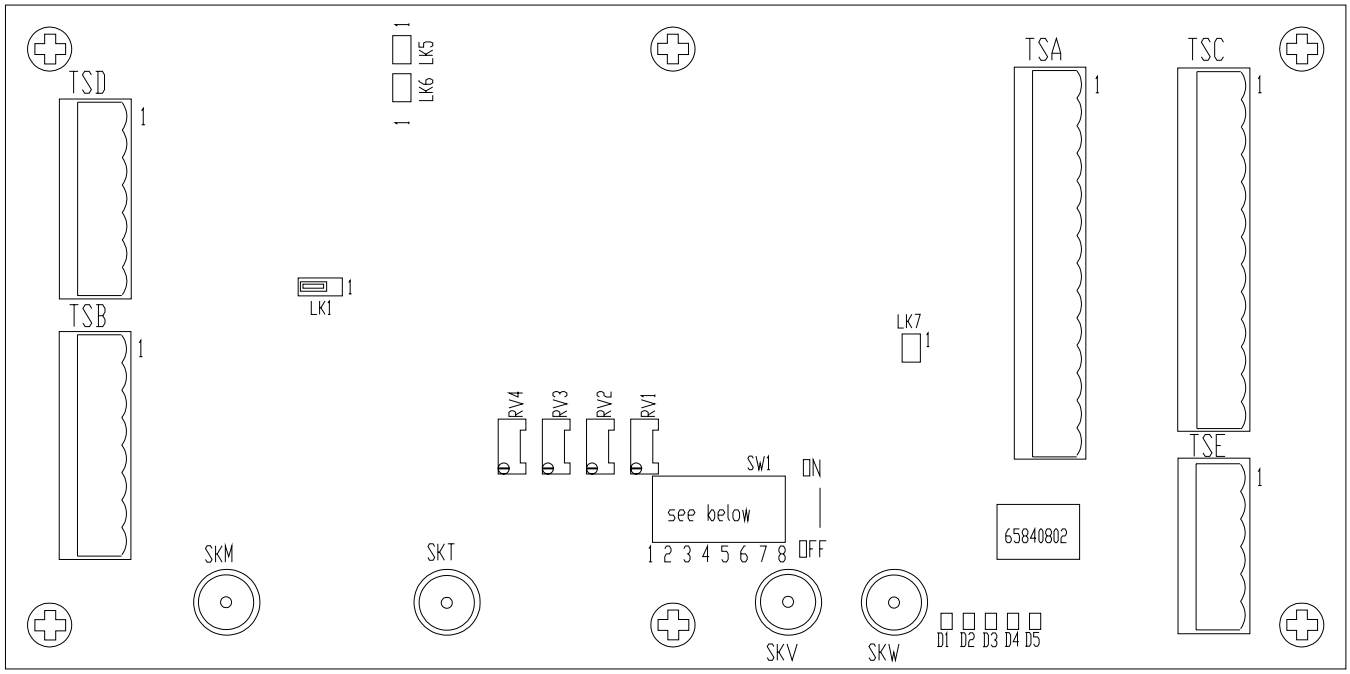


Figure 1.3 – Potentiometer and PCB Location: 180/250/340 Display Series



BEARING LINK
LK1 NORMAL OPERATION (90 pulses/rev) 2 - 3
LK1 360 pulses/rev 1 - 2

TEST LINKS
LK5 NOT FITTED (RESERVED)
LK6 NOT FITTED (RESERVED)
LK7 NOT FITTED (USED FOR FACTORY TEST)

Note: LK5, LK6, & LK7 are only fitted For Factory Test puposes.

SW1 SETTINGS

1 - ON = Swept Gain ENABLED
- OFF = NORMAL - Swept Gain DISABLED
2 - OFF = NORMAL (Display is to be used either as MASTER,
or MASTER/SLAVE in an interswitched system)
ON = If display is to be used only as a SLAVE.
3 - OFF = NORMAL
- ON = Serial Data Rate 19.2 kBaud
4 - OFF = NORMAL (serial data rate 76.8 kbaud)
ON = FACTORY TEST (serial data rate 38.4 kBaud).
5 - OFF = If used with Interswitch Type 65842, or 65846 .
ON = No Interswitch, or Interswitch Type 65642AA.
6 - not used
7 - not used
8 - not used

Note - SW1 and SW3 functions are effective from U12 part No. 3010D228 and above.

LINK AND SWITCH SETTINGS DISPLAY COMPATIBILITY UNIT PCB 65840802

Figure 1.4 – Display Compatibility Unit – Circuit Board Details

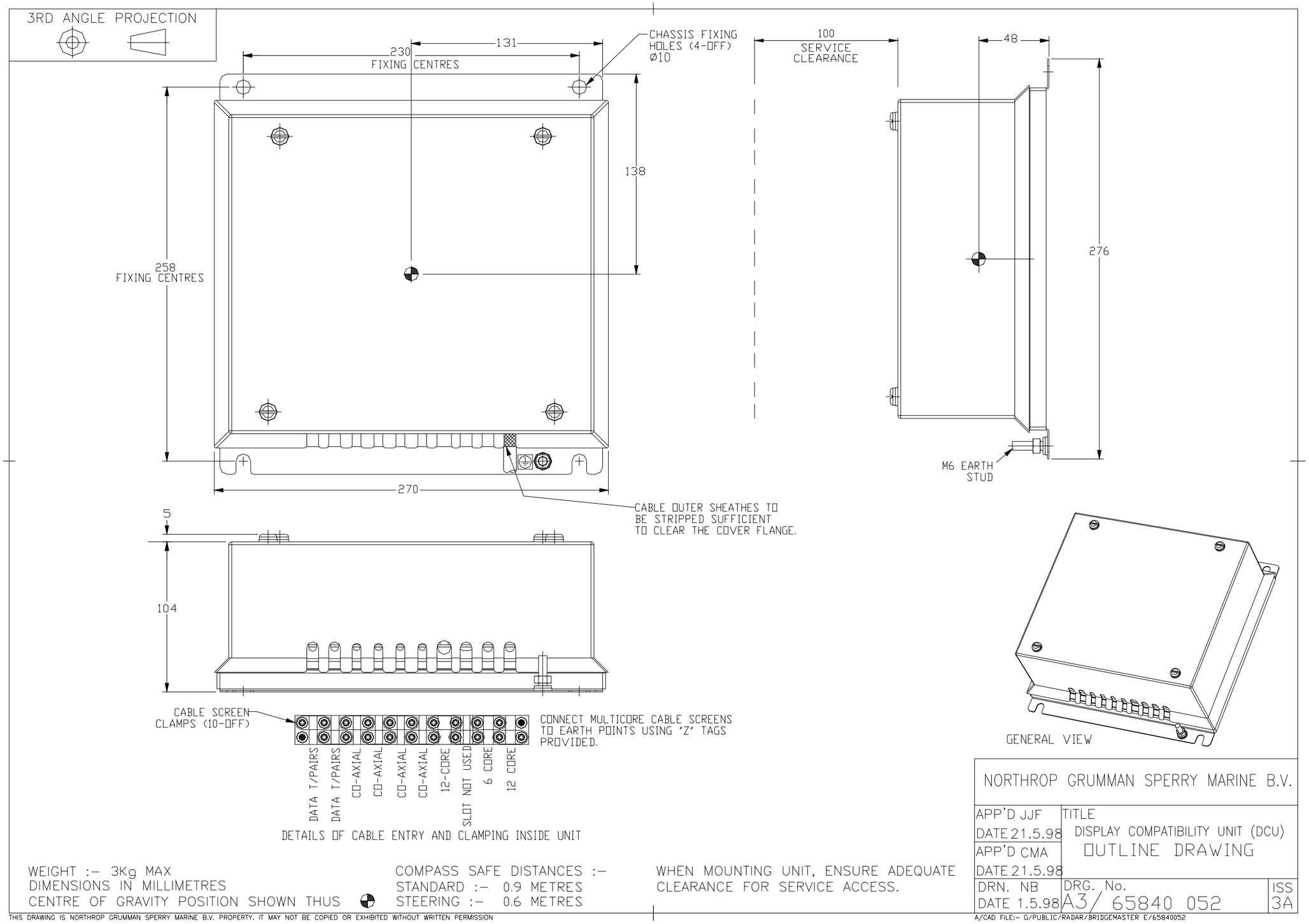


Figure 1.5 – Display Compatibility Unit – Installation Drawing

TECHNICAL SPECIFICATION

General Description

The primary functions of the Display Compatibility Unit (DCU) are as follows:

a) A serial communications interface to the Transceiver and Turning Unit

b) A second serial communications interface to control the Interswitch Unit type 65842 or 65846

c) A parallel interface to the BridgeMaster (or other) Display Unit for Interswitch and Transceiver control.

Effectively, the DCU appears 'transparent' to the Display, Scanner and Interswitch Units.

The DCU is powered from the Display Unit.

Transceiver Unit Interface

Serial Data from Transceiver. RS422 differential signal at a data rate of 76.8Kbaud, and a message rate derived from the Turning Unit antenna speed. This generates 4096 bytes of data per revolution of the antenna.

Serial Data from D.C.U. RS422 differential signal at a data rate of 76.8Kbaud. Each serial message is sent at an interval of a minimum of once per second.

Display Trigger Input. An RS422 differential signal carrying a Pulse of Width 0.25 to 10 uS. The leading edge of the pulse indicates t_o.

SART Video Input. An RS422 port reserved for SART Video.

Radar Video Input. Negative going video signal, 3V peak amplitude, 40MHz bandwidth, shoulder noise 0.25 V, Impedance 75ohm.

Display Interface. Inputs:

Standby/Transmit. Low = Transmit
Low input $\leq$1V, when drawing 10mA max.
High input $\geq$3V, leakage current $\leq$50μA

Pulse Length Controls (Voltage Specification as for Standby/Transmit as above)

Two control lines:	Pulse Length 1	Pulse length 2
Long Pulse	High	High
Medium Pulse	High	Low
Short Pulse	Low	High

L.O.Tune
Manual Tuning I/p 0V to +5V (overvoltage protected to $\leq$26V)

AFC/Manual Low = Manual
Voltage Specification as for Standby/Transmit as above.

Performance Monitor On/Off. Low = Off
Voltage Specification as for Standby/Transmit as above.

Performance Monitor Tx/Rx. High = Tx
Voltage Specification as for Standby/Transmit as above.

Performance Monitor XR Adjust 0 to +15V (+18V max)

Performance Monitor XT Adjust 0 to +15V (+18V max)

Performance Monitor Tune 0 to +5V (+7V max)

Display Interface. Outputs

Display Trigger Output
Positive going pulse, t_o defined by leading edge.
Trigger Amplitude 10V min - 15V max.
Trigger Duration 100ns min - 10µs max.
Above parameters when terminated in 75ohms.
(Input to output delay not to exceed 50ns)

Tune Indicator
Analogue output between 0V and +5V. Translated by interface to the 'on-tune' characteristics expected by the Display.

Radar Video Output. Positive or Negative going video signal, (inversion selectable by internal jumpers), 3V peak amplitude, 40MHz bandwidth, shoulder noise 0.25 V, terminated with 75ohm impedance.

SART Video Output. [Positive or Negative going Auxiliary Video Signal, (inversion selectable by internal jumpers), 3V nominal peak amplitude, 20MHz bandwidth, shoulder noise 0.25 V, terminated with 75 ohm impedance. 20MHz bandwidth, terminated with 75 ohm impedance.
Logic 0 $\leq$ 1V, Logic 1 $\geq$ 2V]

Fault Monitoring Interface.

A series of dc voltages multiplexed on to a single wire by the DCU to relay relevant parameters to the display.
Max admissible output voltage +5V

Bearing

Facilities to regenerate various types of bearing transmission are included. Selector switches permit the selection of the correct phase-lock loop scaling factors to create these from the 4096 azimuth pulses from the Transceiver.

Pulses Per Revolution	90, 256 or 360
Mark Space Ratio	Better than 1.5:1.
Amplitude (high).	12V max - 4.5V min. at Iout <1mA.
Amplitude (low)	<0.4V at Isink <50mA.

Heading Marker

Simulates a single closing contact, looking at a resistive load to -15V. Iout ≤ 50mA

Interswitch Interface

Serial Data to Interswitch type 65842 (or 65846). RS422 differential signal. Message rate is 4800 baud, 8 data bits, 1 stop bit, even parity, sent at a minimum of one byte per second.

Serial Data from Interswitch type 65842 (or 65846). RS422 differential signal. Message rate is 4800 baud ,8 data bits, 1 stop bit, even parity, sent a minimum of one byte per second.

Three Interswitch select lines ISW1 to ISW3 from the BridgeMaster Display. Each line complies with TTL thresholds, and is protected against overvoltages of up to 60V.

Three Interswitch tellback lines ISW4 to ISW6 to simulate interswitch Unit type 65642 or 65644. Each line complies with TTL thresholds and is protected against overvoltages of up to 60V.

Power Requirements

+15V	+15V ± 10%.
Current	150mA max.
-15V	-15V ± 10%.
Current	20mA max.

ENVIRONMENTAL SPECIFICATION

Temperature
Operating -15°C to +55°C
Storage -25°C to +70°C

Relative Humidity
95% at 40°C (non condensing)

Weights and Dimensions

	Height (mm)	Depth (mm)	Width (mm)	Nominal Weight (kg)
Display Compatibility Unit	108	276	270	3.0

Compass Safe Distances

	Standard	Steering
Display Compatibility Unit	0.9 m	0.6 m

CHAPTER 2

ANCILLARY UNITS

TRANSCEIVER COMPATIBILITY UNIT

CONTENTS

Figures

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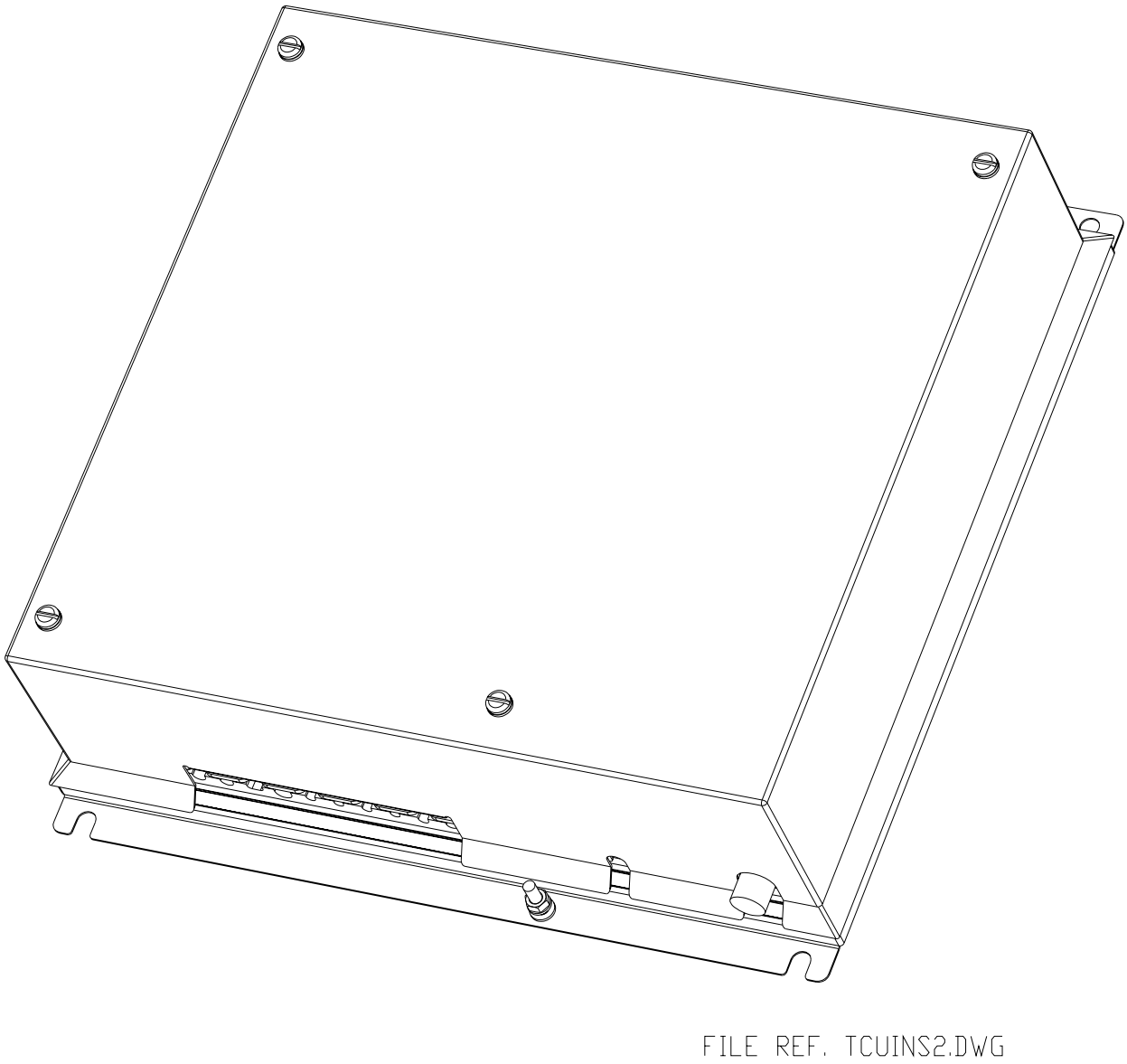


Figure 2.1 – Transceiver Compatibility Unit 65841A – General View

GENERAL DESCRIPTION

Introduction

The Transceiver Compatibility Unit has been designed as an interface between existing BridgeMaster X-Band and S-Band Transceivers and the new BridgeMaster E Series range of Displays. It can be used with any Transceiver with original BridgeMaster compatible signals. It converts the serial data format used by the BridgeMaster E Series of radar to a parallel control line format used by the original BridgeMaster series of radar. In addition, it converts the BridgeMaster E serial Interswitch control to that of the original BridgeMaster 2-Way Interswitch.

The TCU is a bulkhead mounted unit that comprises a power supply PCB with filtered mains input and a logic PCB. Apart from the external supply input (AC or DC option), all interconnections are made to the logic PCB. The power supply PCB supplies the Transceiver power as well as power to the 65642 Interswitch in installations where this is fitted. The logic PCB controls the overall operation of the TCU.

There are no operator controls associated with the unit but a commissioning procedure is carried out on installation to set up internal links and switch settings.

There are two variants of TCU:

65841A, which is AC powered.

65841D, which is DC powered.

There is a common Despatch Kit for all variants, 65841600, which contains all necessary fixings and connectors.

SYSTEM CONFIGURATION

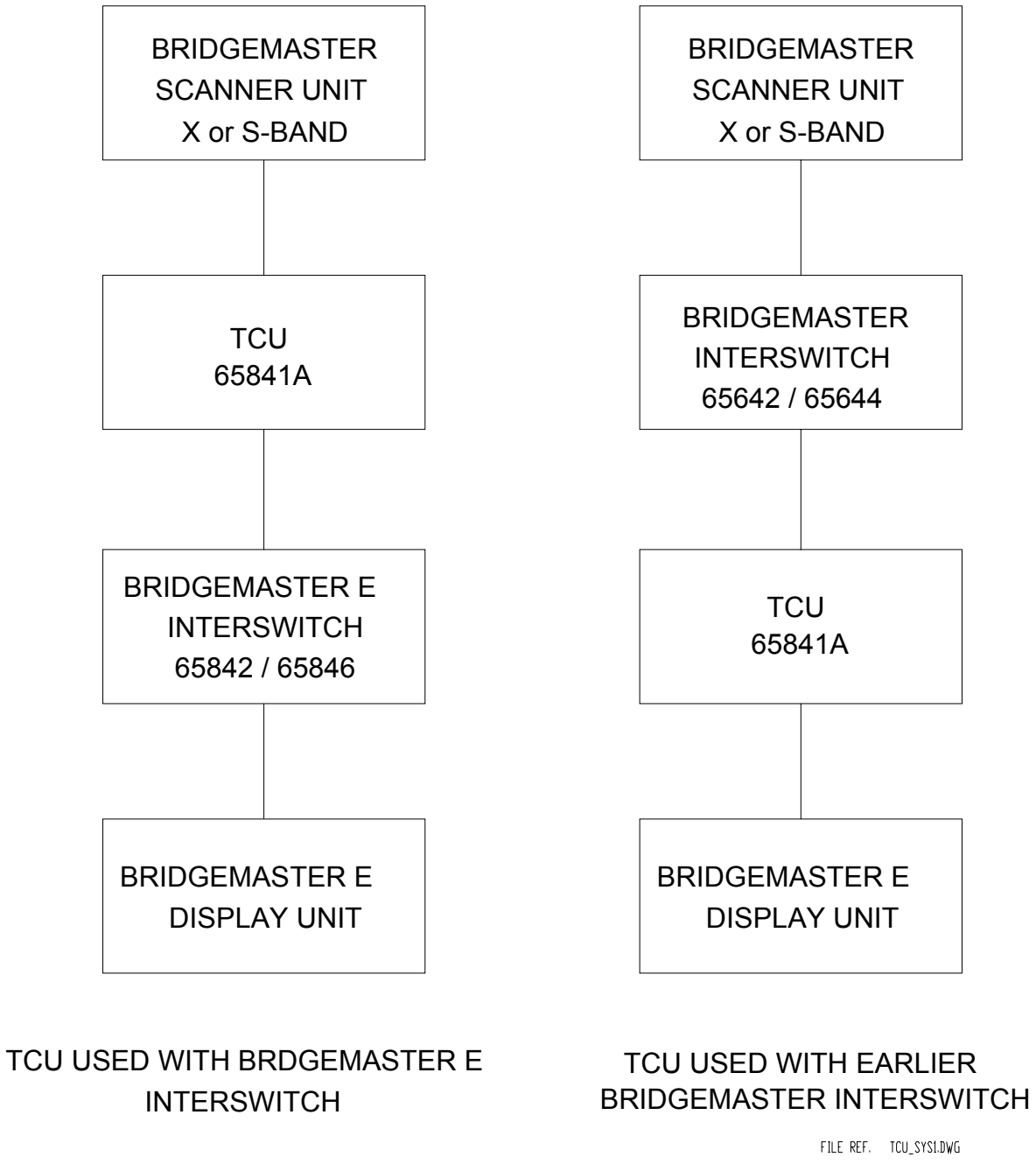


Figure 2.2 – Placement of TCU within Interswitched Systems

INSTALLATION AND COMMISSIONING

Link Settings

The link settings on the Power Supply PCB are intended for testing and fault finding purposes and are factory set for normal operation. They should only be moved/removed by a qualified Service Engineer.

The Logic PCB has one link that must be set on installation, LK2, which defines the type of bearing input from the Turning Unit. All other links are factory set for normal operation and should only be set/removed by a qualified Service Engineer.

Power Supply PCB

LKA - Start Test Link
Normal Operation FIT 2-3
Test Operation FIT 1-2

LK1 - High Voltage Isolation Link
Normal Operation FITTED
Test Operation NOT FITTED

LK2 & LK3 - Input Voltage Select Links
230V LK2 FITTED
115V LK3 FITTED

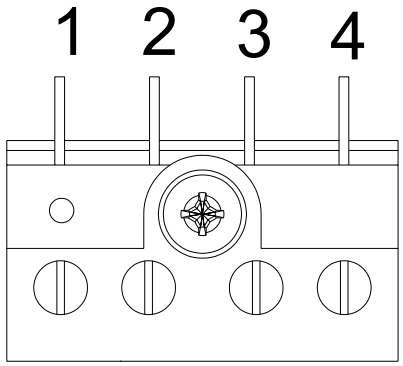
LK4L & H, LK5L & H - Motor Supply Select Links
Low Speed X-Band LK4L & LK5L FITTED
High Speed X-Band LK4H & LK5H FITTED

TCU Logic PCB

LK1 - ATE XTAL Bypass Link
Factory Setting FITTED
LK2 - Set Bearing Input Link
90 ppr Input FIT 1-2
360 ppr Input FIT 2-3

LK3 - ATE Test Link
Factory Setting NOT FITTED

LK4 - Alternative UART Link 1
LK5 - Alternative UART Link 2
Factory Setting NOT FITTED



TSP

FILE REF. MAINSIP.DWG

TSP	AC PSU	DC PSU
1	LINE	+VE
2	------	+VE
3	------	-VE
4	NEUTRAL	-VE
E/TAG	EARTH	EARTH

TCU INPUT SUPPLY CONNECTOR TSP

Dual-In-Line (DIL) Switch Settings

The TCU Logic PCB has an 8-way DIL switch that is used to set various parameters used by the TCU depending on the system configuration.

SW1 Defines which BridgeMaster E Display (either A or B) the TCU is connected to in a 65642 BridgeMaster Interswitched system.

SW2 Selects whether TCU is in Master (normal) operating mode or whether it is set to be in permanent Slave Mode

SW3 These three switches are used to define the type of Transceiver the TCU is
SW4 connected to in single and BM E interswitched systems. It also defines Transceiver A
SW5 when used in a 65642 BridgeMaster Interswitch system.

SW6 These three switches are used to define Transceiver B when used in a 65642
SW7 BridgeMaster Interswitched system.
SW8

SW	SWITCH-OFF	SWITCH-ON
1	Display A	Display B
2	Master (normal) Mode	Permanent Slave Mode
3	TxA S-Band	TxA X-Band
4	TxA 25kW (or 30kW)	TxA 10kW
5	TxA BridgeMaster (X-Band only)	TxA Non-BridgeMaster
6	TxB S-Band	TxB X-Band
7	TxB 25kW (or 30kW)	TxB 10kW
8	TxB BridgeMaster (X-Band only)	TxB Non-BridgeMaster

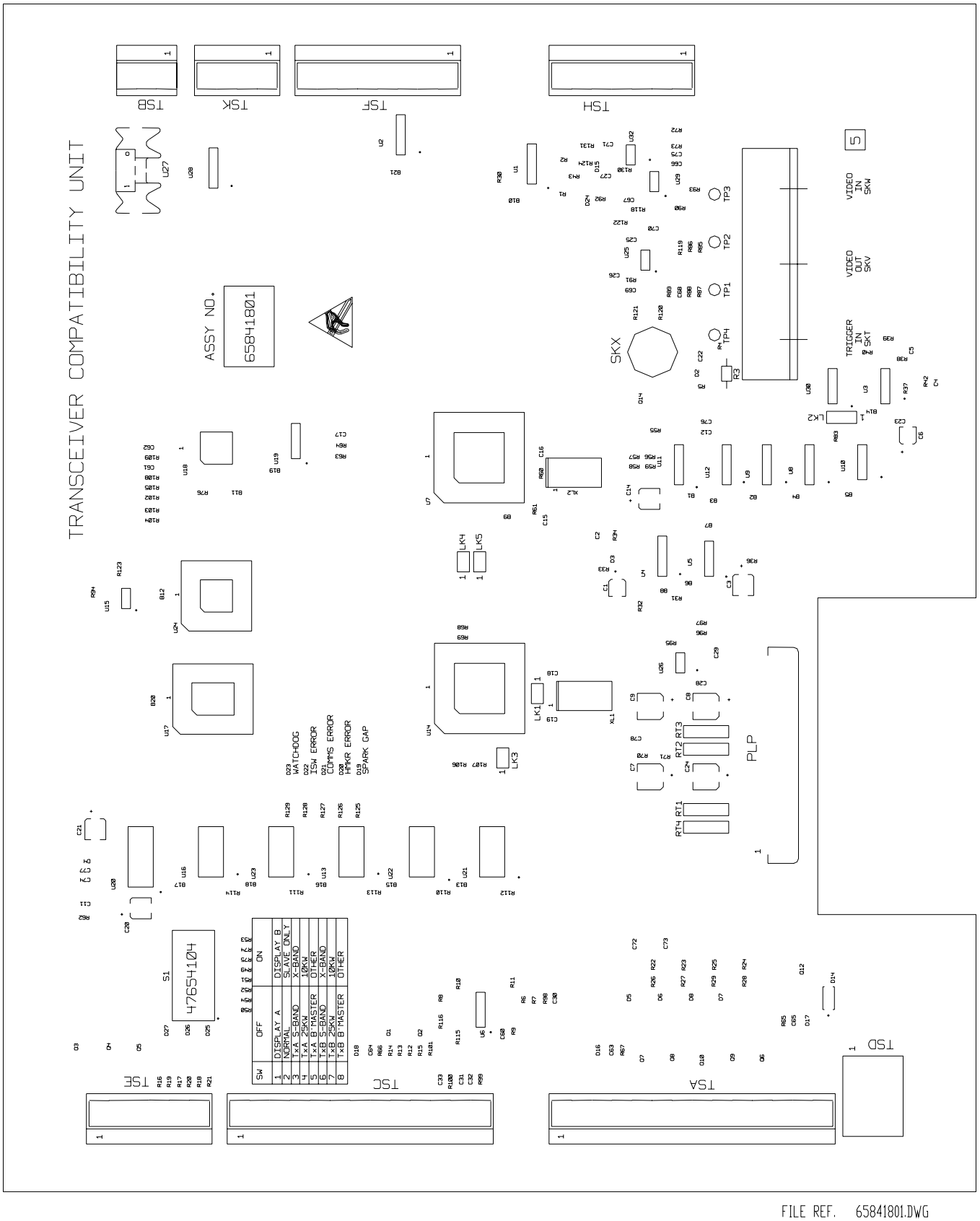


Figure 2.3 – Transceiver Compatibility Unit Logic PCB Assembly 65841801

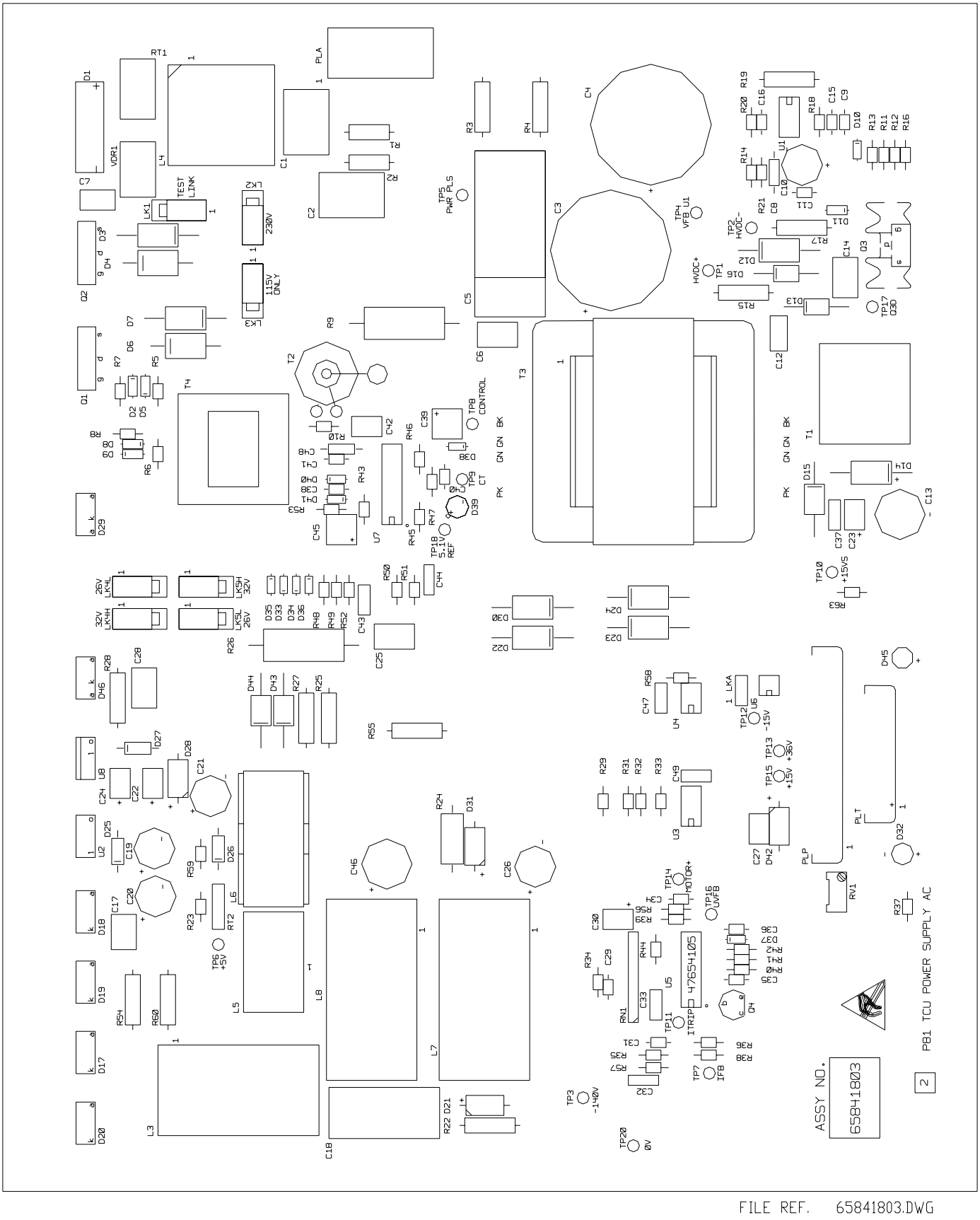


Figure 2.4 – Transceiver Compatibility Unit AC PSU 65841803

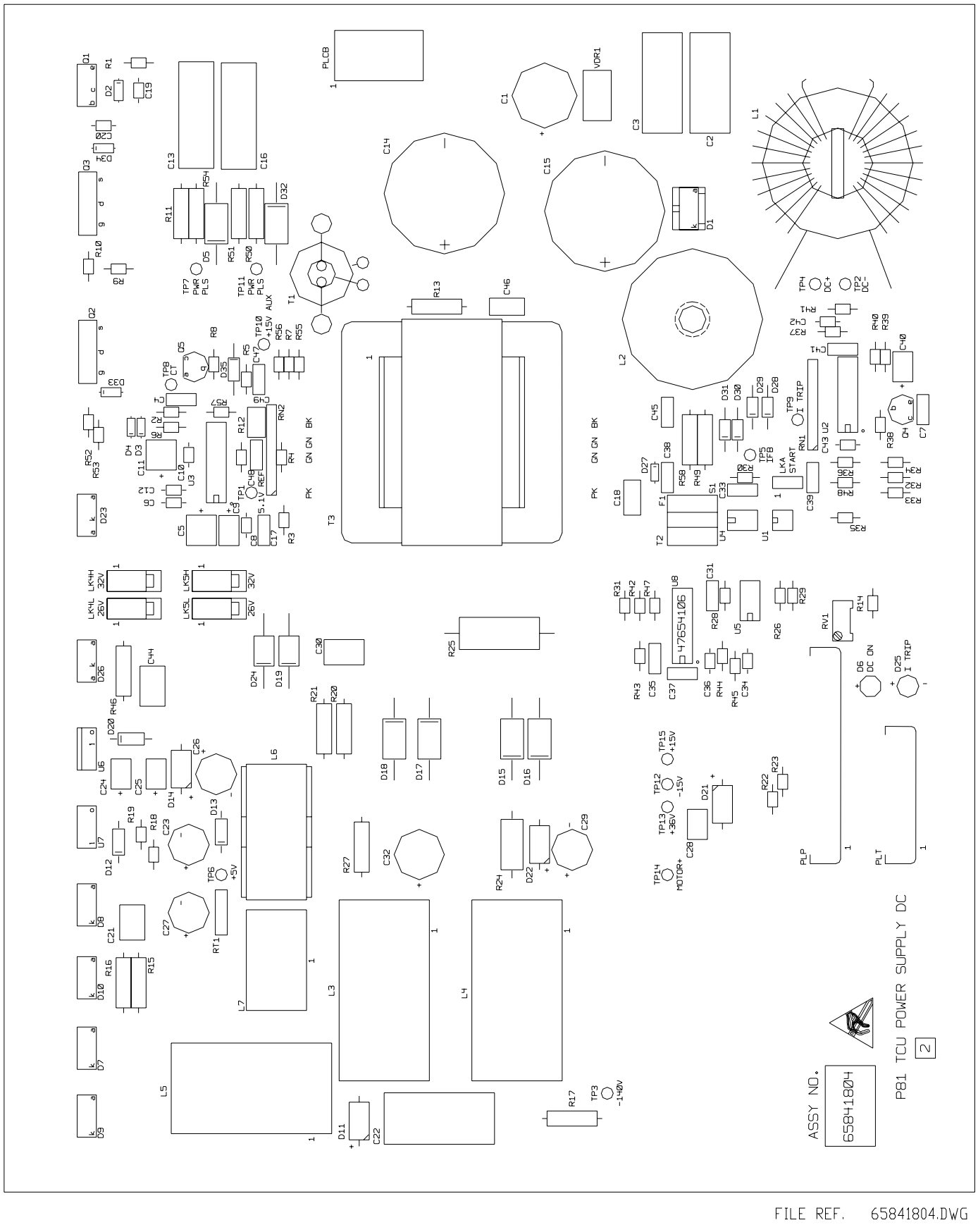


Figure 2.5 – Transceiver Compatibility Unit DC PSU 65841804

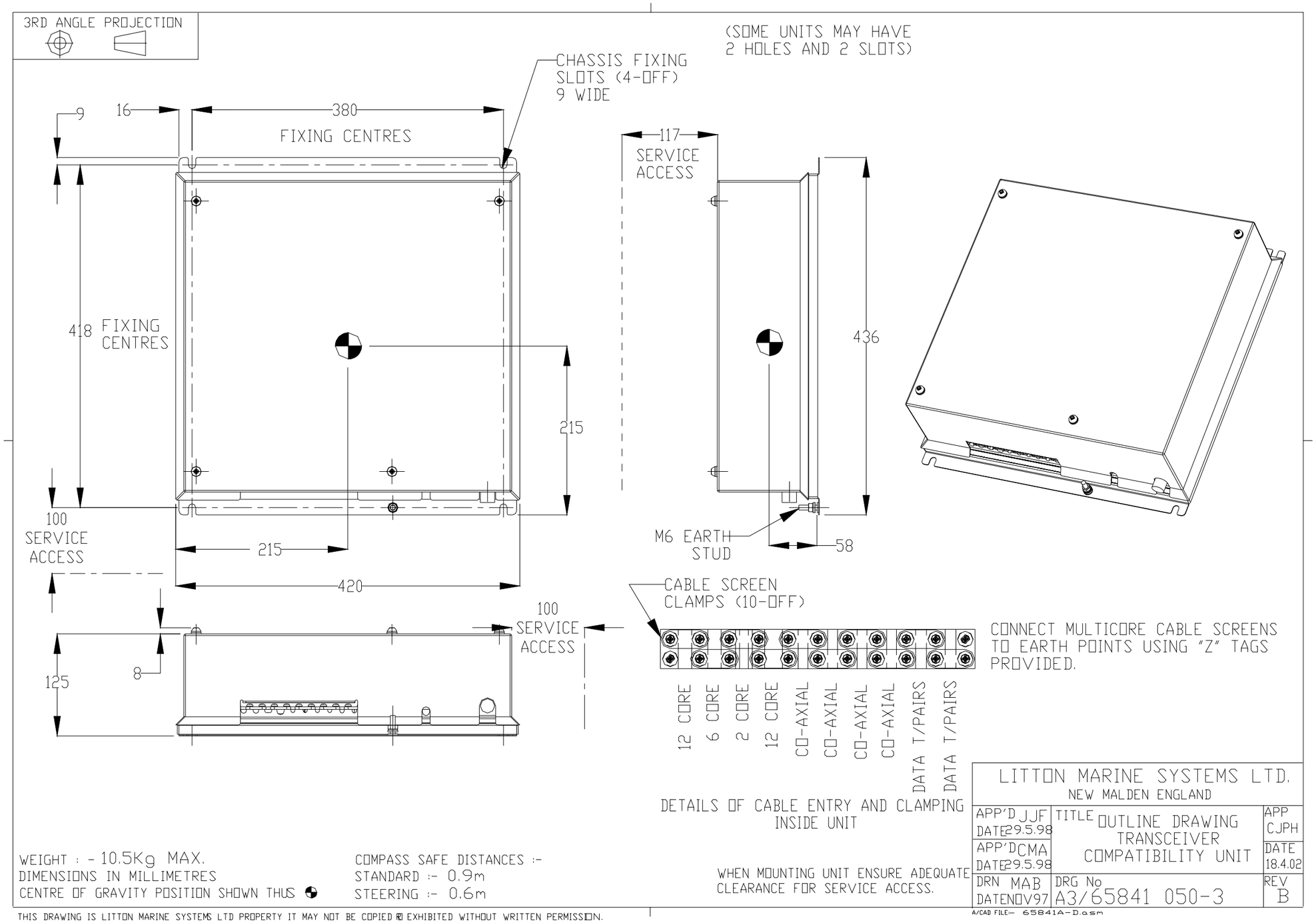


Figure 2.6 – Transceiver Compatibility Unit – Installation Drawing

TECHNICAL SPECIFICATION

General

The primary functions of the Transceiver Compatibility Unit (TCU) are as follows:

a) Serial communications interface with Display Unit for Transceiver control.

b) A second serial communications interface with the Display Unit for Interswitch control.

c) A parallel interface with the BridgeMaster Turning Unit and Transceiver.

d) A parallel interface to the BridgeMaster Interswitch Unit Type 65642

e) AC or DC Power supplies for the following BridgeMaster units: Transceiver, Turning Unit, Performance Monitor and Interswitch Unit.

Effectively the TCU appears ‘transparent’ to the Display and Scanner Units.

The external supply voltage (AC or DC option) is always applied to the unit. The PSU stays in standby until enabled by the presence of a voltage (either polarity) on the RS422 DU_DATA input fed via the logic board from the Display/Interswitch Unit. This initiates the internal power supply which will then turn on the external supply to the Transceiver.

Technical Description

There are two modes of operation for the TCU;

Master mode, where the display has control of the Transceiver and Slave mode where the Display simply listens to the state of the Transceiver but has no control over it. In Master mode the TCU has full functionality; it decodes control messages from the Display, sets the control lines to the Transceiver accordingly, compiles the current operating status and configuration of the Transceiver and sends this information back to the Display as serial data. In Slave mode the TCU ignores the incoming messages from the Display and has no control of the Transceiver, it simply compiles the current operating status and sends the information back to the display in serial format.

The default condition for the TCU is Master.

The TCU can be set to Slave Mode in a number of ways;

1 DIL switch 2, if set, configures the TCU to be permanently in Slave mode, (mainly used when connected to a radar simulator where there is no control allowed).

2 The Display, when connected to a BridgeMaster Interswitch, can request to be in Slave mode.

3 The Interswitch tellback signals can force the TCU into Slave Mode if requested by the second Display in the Interswitch system.

Video signals from the transceiver are buffered in the TCU before being sent to the Display down the standard 75ohm coaxial cable. Trigger signals from the Transceiver are fed into the TCU and converted to RS422 format before being sent to the Display.

Bearing information from the Transceiver is in either 90 or 360 pulses per antenna revolution. This is converted to 4096 pulses per antenna revolution before being used to initiate the serial message transmission. The conversion is done in a conventional phase-locked loop circuit. The microprocessor automatically detects whether the input is from a Standard Speed or a High Speed Turning Unit by measuring the interval between heading markers, and selects the correct oscillator timing components for the phase-locked loop.

Technical Specification

Display Unit Interface - TCU to/from Display

Serial Data to Display. RS422 differential signal at a data rate of 76.8Kbaud and a message rate derived from the Turning Unit azimuth signal. This generates 4096 bytes of data per revolution of the antenna.

Serial Data from Display. RS422 differential signal at a data rate of 76.8Kbaud, the serial messages are initiated by a timed scheduler within the Display software.

Display Trigger Output. An RS422 differential signal carrying a Pulse of Width 0.1 to 10 µs. The leading edge of the pulse indicates T_o.

Video Output. Negative video, 3V nominal peak into 75Ω termination, 40MHz bandwidth, shoulder noise 0.25V.

Transceiver Interface - TCU to Transceiver

Standby/Transmit. Low = Transmit
Low output £ 0.6V, capable of sinking 150mA min.
High output open circuit (To withstand 24V min.)

Pulse Length Control - Short Pulse
Drive requirements as above.

Pulse Length Control - Medium Pulse
Drive requirements as for above.

Pulse length control lines:	SP	MP
Long Pulse	High	High
Medium Pulse	High	Low
Short Pulse	Low	High

Sequence Control to invoke Long Pulse between Medium and Short Pulse transitions

Drive Requirements as above.

L.O. Tune
Manual Tuning o/p 0V to +25V

AFC/Manual Low = Manual
Low output £ 0.5V, capable of sinking 20mA min.
High output open circuit (To withstand 33V min.)

Tx/Rx Bite. Clocking signal for bite circuit, High to Low = CLK
Drive Requirements as above.

Performance Monitor On. Low = Off
Drive Requirements as above.

Performance Monitor Tx/Rx. High = Tx
Drive Requirements as above.

Performance Monitor XR Adjust.
To generate 0 to +15V, into 200K (+18V max)

Performance Monitor XT Adjust.
To generate 0 to +15V, into 200K (+18V max)

Performance Monitor Tune.
To generate 0 to +5V, into 100K (+7V max)

Transceiver Interface - TCU from Transceiver

Display Trigger Input.

Positive going pulse, t_o defined by leading edge.
Trigger Amplitude 8V min - 24V max.
Trigger Duration 100ns min - 10µs max.
Above parameters when terminated in 75ohms.
(Input to output delay not to exceed 50ns)

Video Input.

Negative video, 3V nominal peak into 75Ω termination, 40MHz bandwidth, shoulder noise 0.25V

Tune Indicator
Analogue input between 0V and +5V. Translated by interface for 'on-tune' characteristics of the transceiver.

Tx/Rx Status.

Fault monitoring within the Transceiver is in the form of a series of DC voltages multiplexed on to a single wire. The TCU relays these relevant parameters to the display.

Max admissible input voltage +5V

Bearing

Facilities to accept various types of bearing transmission shall be included, the design is to contain selector switches to permit the selection of the correct phase-lock loop scaling factors to generate 4096 azimuth pulses per revolution.

Pulses Per Revolution	90 or 360
Mark Space Ratio	Better than 1.5:1.
Amplitude (high).	2.4V min - 5V max. at Iout <1mA.
Amplitude (low)	<0.8V at Isink <50mA.

Heading Marker.

Single closing contact to 0V. Iout £ 50mA max. Compatible with -15V referenced heading marker signals.

Interswitch Interfaces

Serial Data from 65800 Series Display Unit. RS422 differential signal.

Serial Data to 65800 Series Display Unit. RS422 differential signal.

Three Interswitch select lines ISW1 to ISW3 to control interswitch Unit type 65642. Drive requirements as above.

Three Interswitch tellback lines ISW4 to ISW6 from interswitch Unit type 65642. Each line accepts TTL thresholds, and is protected against overvoltages of up to 60V.

Operation

Pulse length changing and standby/transmit.

When changing pulse length, the transceiver is set to standby for 100ms before changing the pulse length control lines and 200ms afterwards, before going back to transmit.

When switching from standby to transmit (except during pulse length changing) the transceiver is prevented from going straight into Long Pulse. If Long Pulse is selected when switching from standby to transmit, the Transceiver is forced to Medium Pulse for 2.5s and will then switch to Long Pulse.

Tx/Rx Bite

This will only be active when the TCU is connected to a BridgeMaster Transceiver, if connected to any other Transceiver, the best values sent to the Display, other than those pertinent to the TCU itself, will be set to zero.

The Tx/Rx bite clocking signal is a pulse of 100ms duration from +5V to 0V.

Only two of the BridgeMaster bite values are monitored by the TCU; standby/transmit (Test 1) will be used to detect whether the timer in the Transceiver is on or off and the Magnetron Current (Test 8) will be sent down as a best value and used to detect whether the spark gap is arcing over.

Test 1 is only done during standby to detect whether the timer has expired. The magnetron current is only monitored during transmit. The counter in the BridgeMaster Transceiver is reset during standby so that every time the TCU sets the Transceiver to standby, even during pulse length changes or sector blanking, the TCU has to clock the bite circuit on 7 times before reading the value.

The +36V and +15V power supply lines in the TCU are monitored and a scaled reading is fed back to the Display. The Modulator Volts are not monitored and the reading sent back to the Display is set to zero.

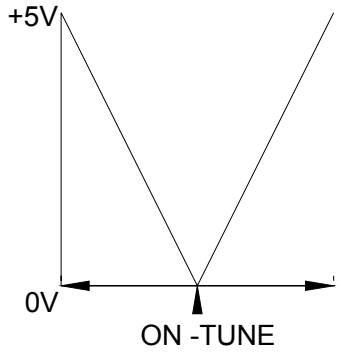


Fig 2 - E Tune Ind

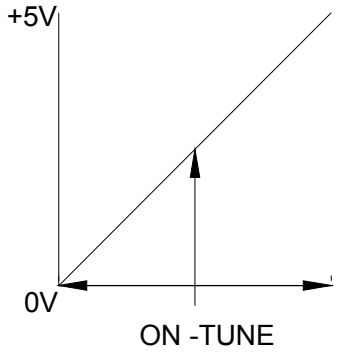


Fig 3 - BridgeMaster Tune Ind

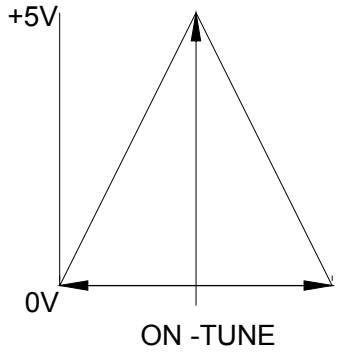


Fig - Integrated Video Tune Ind

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Tune Indicator

There are two methods of reading the tune indicator values depending on whether the Transceiver is a BridgeMaster or another type. A BridgeMaster tune indicator signal ranges from 0V to +5V where ‘ON TUNE’ is 2.5V (fig.3). This will be read into the TUNE IND input of the adc and converted to the BridgeMaster E format (fig.2). When a non BridgeMaster transceiver is to be used, the tune indicator will be generated by integrating the radar video signal. This will generate the tuning characteristics shown in fig.4. This value will be fed into a separate input of the ADC and converted to the BridgeMaster E format.

Master/Slave Operation

The TCU will monitor and convert the Interswitch control messages from the BridgeMaster E Display to determine whether it is currently a Master or Slave Display. If there are no messages the TCU assumes it is a Master display. If the permanent Slave bit has been set the Interswitch processing is disabled and the TCU becomes a Slave only. To exit from this mode, the DIL switch must be reset and the unit turned off then on again.

Interswitch Control

When the TCU is connected between a BridgeMaster E Display and a BridgeMaster Interswitch it will operate in the following manner:

On power-up the message sequence between the Display and TCU is as follows:

	Display Sends:	TCU Sends:
1.	Null Byte	
2.		Display Reference
3.	Display Reference	
4.		Local Config Byte
5.	Null Byte	
6.		Display Reference
7.	Null Byte	
8.		Display Reference
9.	Etc..	

The Display then sends a null byte approximately every second as a keep alive signal. Each time the TCU receives a null byte it will reply with the Display reference.

When the operator requires a change in configuration the sequence is as follows:

	Display Sends:	TCU Operation:
1.	Local Config Byte	
2.		Set ISW Lines 1 & 2
3.		Wait 1 Second
4.		Read ISW Tellbacks 4 & 5
5.		Either: send Error Message and Old Config Byte
6.		Or: Send New Config Byte
7.	Null Byte	
8.		Display Reference
9.	Etc...	

The Display Reference is set using the DIL switch S1 and results in the Display Reference Byte being set to 09 hex or 0a hex for Tx A and B respectively.

Config. Message from TCU

D7	D6 D5 D4	D3	D2 D1 D0
Slave = 0 Master = 1	TxRx A = 001 TxRx B = 010	1	DuA = 001 DuB = 010

Where D4 - D7 are obtained by decoding the ISW4 & 5 lines and the display number is set within the TCU hardware.

Power Supplies

Inputs:

Single Phase AC input	95V min 47Hz min	276V max 64Hz max
Over-voltage Transients	40% above nominal for 1 sec max without causing damage. At or above this level, the input fuse may blow.	
Pulsed transients	± 1200V peak, rise time 2 to 10us, duration ≤20us. Common or differential mode.	
Under-Voltage	Mains dropout is monitored and may cause the system to reset.	
Low Voltage DC Input	21.6V - 32V measured at the compatibility unit input.	
Over-Voltage Transients	Voltages over 51V will cause an automatic shutdown.	
Pulse Transients	Symmetrical (line-line): 500V, source impedance 12Ω, rise/fall time 100ns, duration 10µs. Line-ground: 500V, source impedance 12Ω, rise/fall time 100ns duration 60µs.	
Reverse Protection	Provision is to made to protect against reversal of the external supply. This may cause a fuse to blow.	
Under-Voltage	DC input dropout is monitored and may cause the system to be reset.	

Outputs:

Modulator HT.	Voltage	-140V ± 10%.
Current	10kW	600mA mA max.
	25kW.	800mA mA max.
+15V for Bite & Bearing		+15V ± 6%. at 400mA max
+15V		+15V ± 10%. at 1.5A max
-15V		-15V ± 10%. at 100mA max
+24V		+24V ± 20% at 2A mean (4.6A peak).

Internal Circuit Power Supplies

+15V	+15V ± 5%. at 100mA max
+5V	+5V ± 5% at 250mA max
-15V	-15V ± 5%. at 50mA max
+36V	+36V ± 5% at 50mA max

ENVIORNMENTAL SPECIFICATION

Temperature
Operating -15°C to +55°C
Storage -25°C to +70°C

Relative Humidity
95% at 40°C (non condensing)

Weights and Dimensions

	Height (mm)	Depth (mm)	Width (mm)	Nominal Weight (kg)
Transceiver Compatibility Unit	436	420	130	10.0

Compass Safe Distances

	Standard	Steering
Transceiver Compatibility Unit	0.9 m	0.6 m

TCU Power Supply Fuse

AC PSU
5 Amp, 31mm, Ceramic Body, Antisurge
Code Number: 2180413

DC PSU
15 Amp, 31mm, Ceramic Body, Antisurge
Code Number: 2162342

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CHAPTER 3

ANCILLARY UNITS

2-WAY INTERSWITCH UNIT

65842A

CONTENTS

Figures

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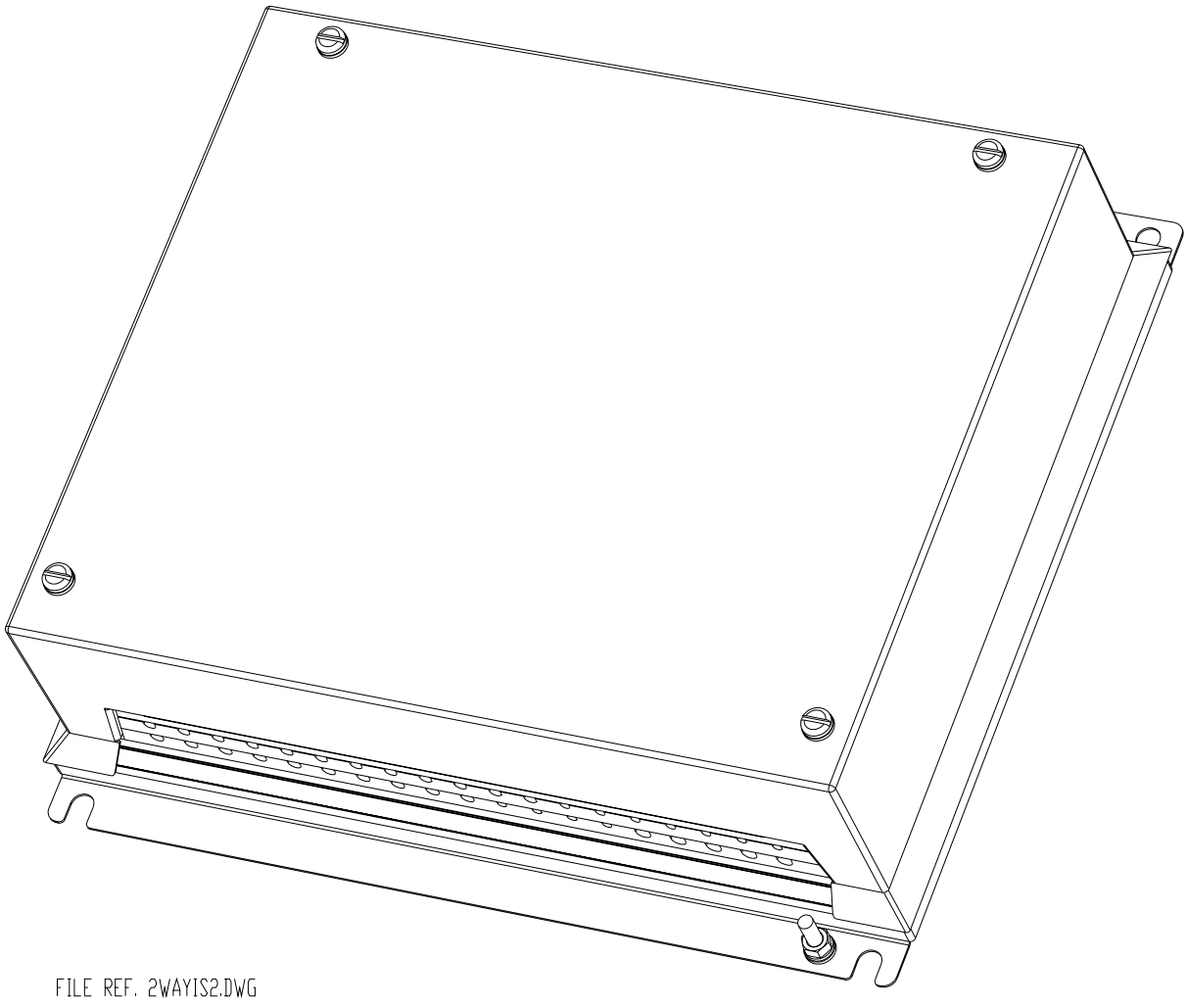


Figure 3.1 – 2-Way Interswitch Unit 65842A – General View

GENERAL DESCRIPTION

The Interswitch Unit is 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, ie, 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.

The BridgeMaster E Series Interswitch Unit works directly with the BridgeMaster E Series range of Displays and Scanner Units, but requires compatibility units for interfacing with the original BridgeMaster or Master Series units in hybrid systems.

The 2-Way Interswitch allows one or two Transceivers to be connected to up to four Displays.

The Interswitch Unit is housed in a purpose designed enclosure with the electronic circuitry contained on a single PCB.

Connects are fitted to the PCB to enable manual bypassing of the Interswitch control logic in the event of an Interswitch failure .

Surface mount devices are used throughout the design.

Power for the Interswitch Unit is derived from the System Display or Display Compatibility units, with any display capable of powering the Interswitch Unit.

A Despatch Kit, 65842600, contains all necessary fixings and connectors.

Refer to Chapter 9 – System Interconnections and Cable Details in this manual for typical system installation details.

SYSTEM CONFIGURATION

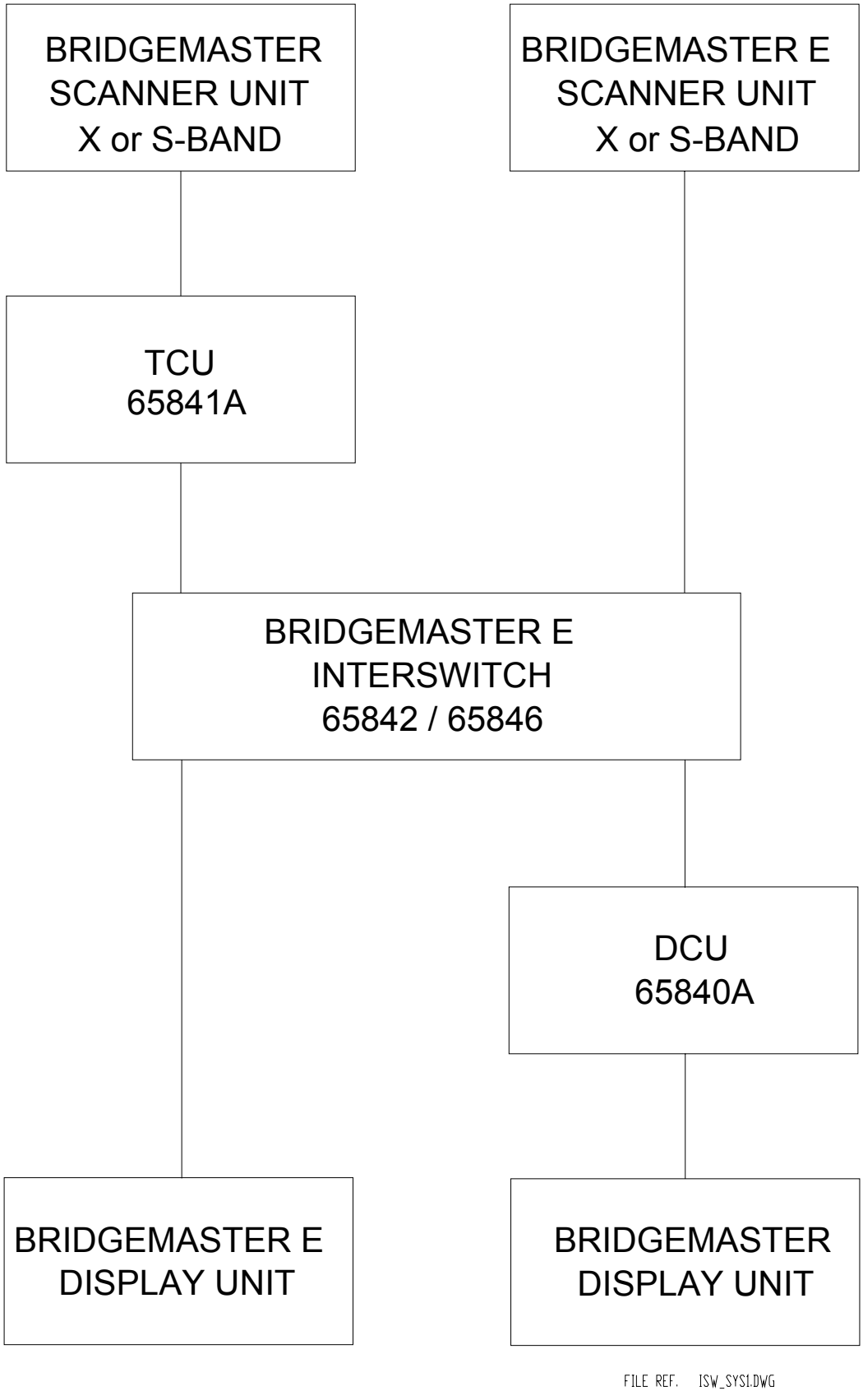


Figure 3.2 – Placement of Interswitch Unit in Hybrid System

INSTALLATION AND COMMISSIONING

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.

Interswitch Hardware Configuration

Dil Switches

In order to indicate which Displays and Transceivers are connected to the Interswitch, set the appropriate switches to the 'off'position.

There are two 4-way DIL Switches on the 2-Way Interswitch PCB board. SW1 selects Display Units while SW2 selects Transceivers.

Link Settings

Mode	Link	Setting
Global	LK1	2-3
Local	LK1	1-2
Normal	LK2	12
Reset Defaults	LK2	2-3

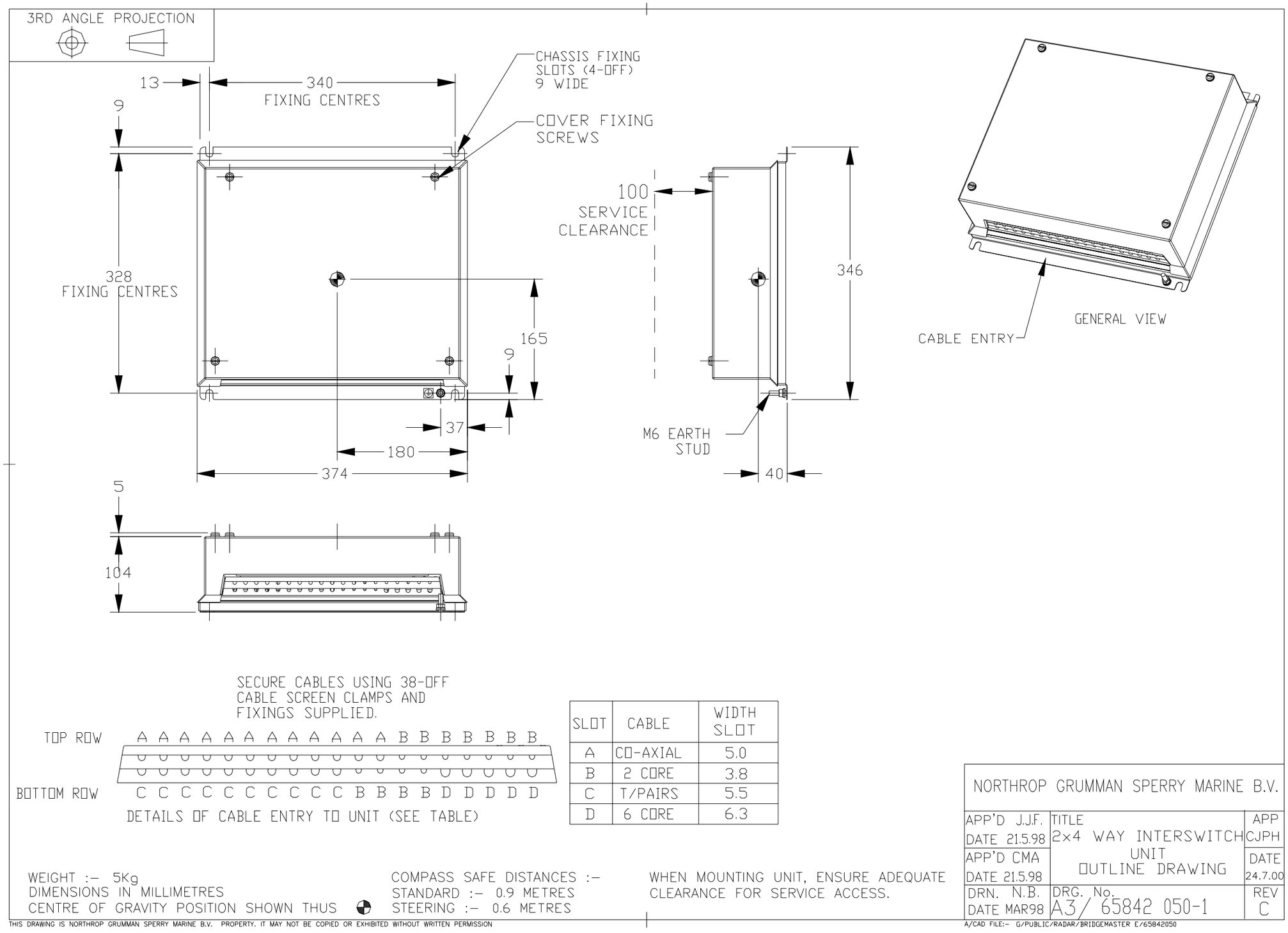
Link 1 selects LOCAL or GLOBAL setting. If the system is in the Local Mode, a Display Unit can only change the Transceiver to which it is connected and select either master or slave mode. If the system is in the Global Mode, any display can completely re-configure the entire system.

Inserting Link 2 at position 2-3 loads the default settings at power-up. For a fully populated system, the default state will be one-to-one connections as shown below:

DUA master to TXA DUB master to TXB
DUC slave to TXA DUD slave to TXA

Links 3 & 4 are for test and diagnostic purposes only.

Link Settings	
LK3	Factory set 1-2
LK4	Not fitted



SLOT	CABLE	WIDTH SLOT
A	CO-AXIAL	5.0
B	2 CORE	3.8
C	T/PAIRS	5.5
D	6 CORE	6.3

Figure 3.3 – 2-Way Interswitch Unit – Installation Drawing

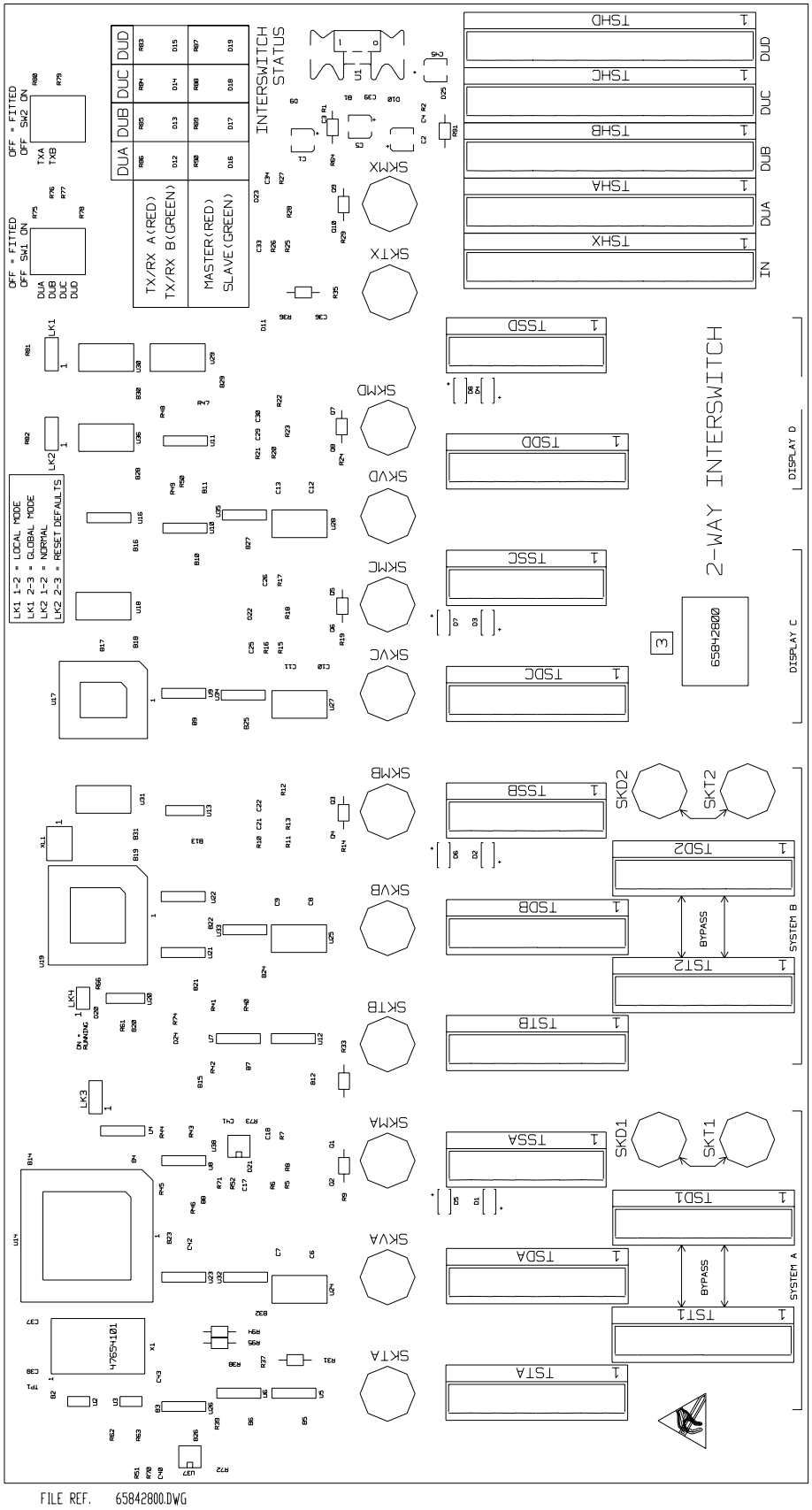


Figure 3.4 – 2-Way Interswitch PCB Assembly 65842800

Interface to Transceiver

There is a bi-directional serial port to send signals to and receive them from the transceiver. This is an RS422 differential signal. 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.

Radar Video Input	Peak amplitude	-2.5V to -5.5V
	Shoulder noise	-0.25V minimum
	Input Impedance	75Ω ± 10%

Interface to Display Unit (Transceiver Information)

There is a bi-directional serial port to send signals to and receive them from the display or compatibility unit. These are RS422 differential signals. Trigger, Video and SART video are sent down separate cables. The Trigger and SART video are also sent as RS422 differential signals. The video is sent via a coax cable.

Radar Video Output	Peak amplitude	-2.5V to -5.5V
	Shoulder noise	-0.25V minimum
	Input Impedance	75Ω ± 10%

Interface to Display Unit (Control)

There is a bi-directional serial port to send and receive signals from the display or compatibility unit. These are RS422 differential signals. One receives the configuration requests from the Display, the second one returns acknowledge and configuration signals back to the display or Display Compatibility Unit. Two additional twisted pair cables bring in the power supply to the Interswitch Unit from the display or Display Compatibility Unit.

Bypass Connections

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.

General Distribution Connectors

These enable LOG, COMPASS, NAV I/P etc to be distributed to all the display units via parallel connected terminal blocks. It comprises :

1 input terminal block and 4 output terminal blocks on the Interswitch PCB.

System Status

Visual indication of the system status is provided.
Green and Red LEDs 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 LED will not be illuminated.

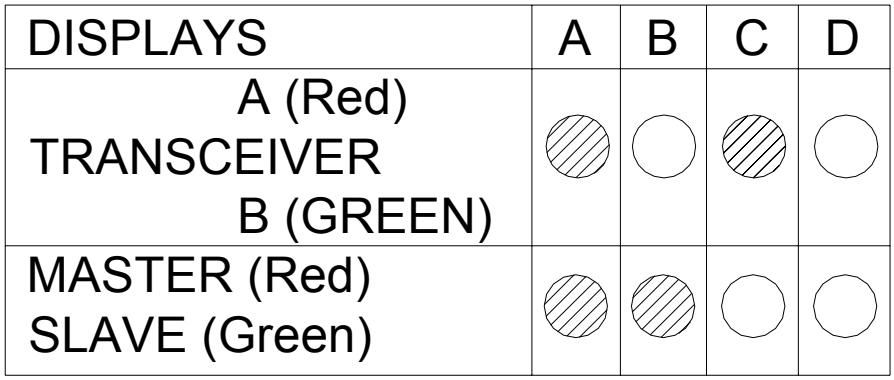


Figure 3.5 – Typical Examples of Status Panel Read-Outs

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.

Interconnections

All inputs and outputs enter and leave on the underside of the Interswitch Unit. All connections 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 and four co-ax Display MIST outputs.

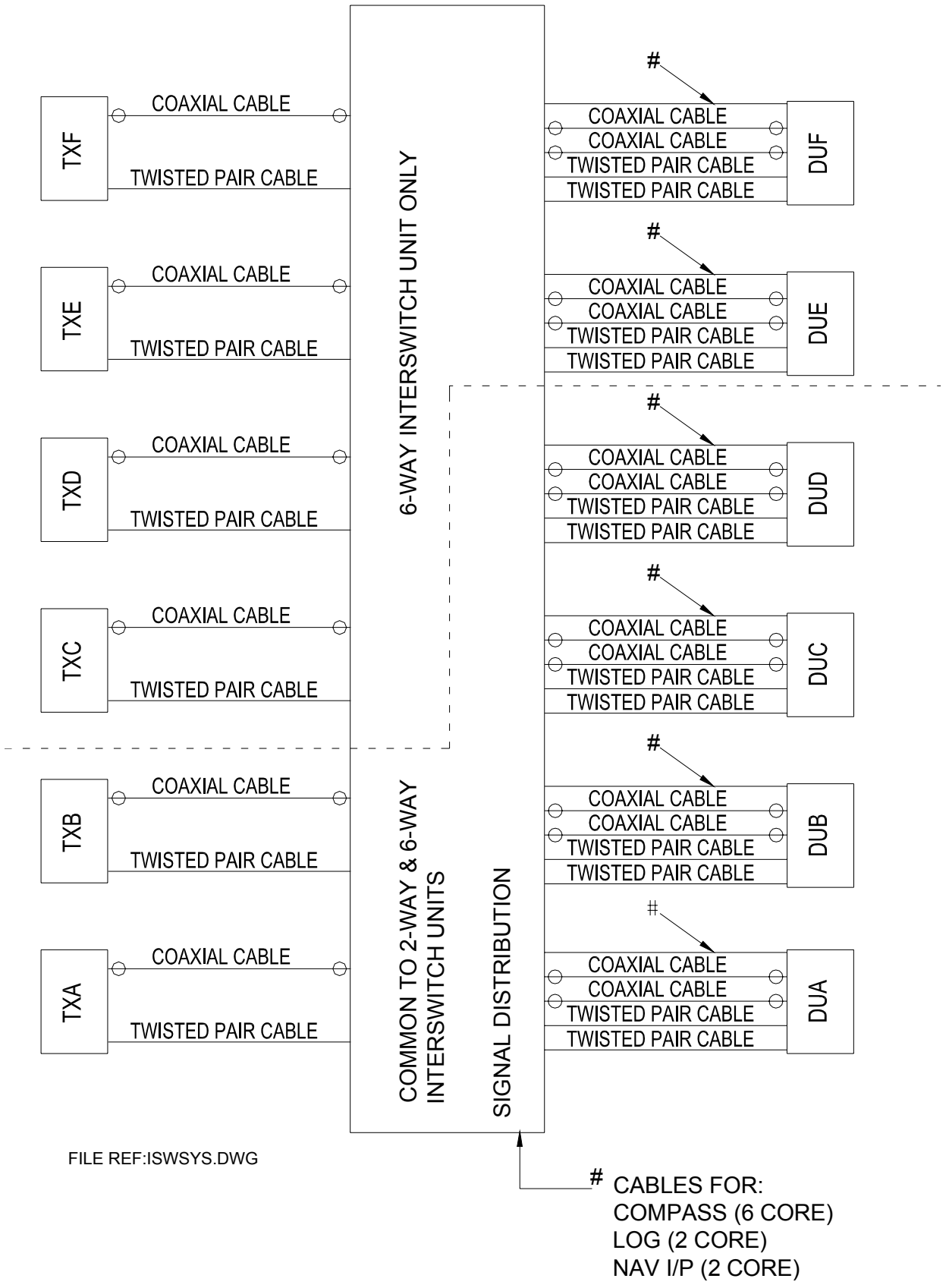


Figure 3.6 – Block Diagram – Interswitched System

TECHNICAL SPECIFICATION

Interswitch Power Supply

Each Display Unit supplies +12V (+15V) & -12V (-15V) to the Interswitch.
The +12V (+15V) inputs are diode OR'd to produce ≈ +11V (+14V).
The -12V (-15V) inputs are diode OR'd to produce ≈ -11V (+14V).
An on-board regulator produces +5V for the logic.

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.

A Quad UART is used for the bi-directional serial communication with the Display Units or Compatibility Unit. 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.

Logic multiplexers are used to route the signals between the Display Units and Transceivers and analogue 'T' switches route the video.

The microcontroller also drives an LED status display.

ENVIRONMENTAL SPECIFICATION

Temperature
Operating -15°C to +55°C
Storage -25°C to +70°C

Relative Humidity
95% at 40°C (non condensing)

Weights and Dimensions

	Height (mm)	Depth (mm)	Width (mm)	Nominal Weight (kg)
2-Way Interswitch Unit 65842A	346	109	374	5.0

Compass Safe Distances

	Standard	Steering
2-Way Interswitch Unit 65842A	0.9 m	0.6 m

CHAPTER 4

ANCILLARY UNITS

6-WAY INTERSWITCH UNIT

65846A

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Figures

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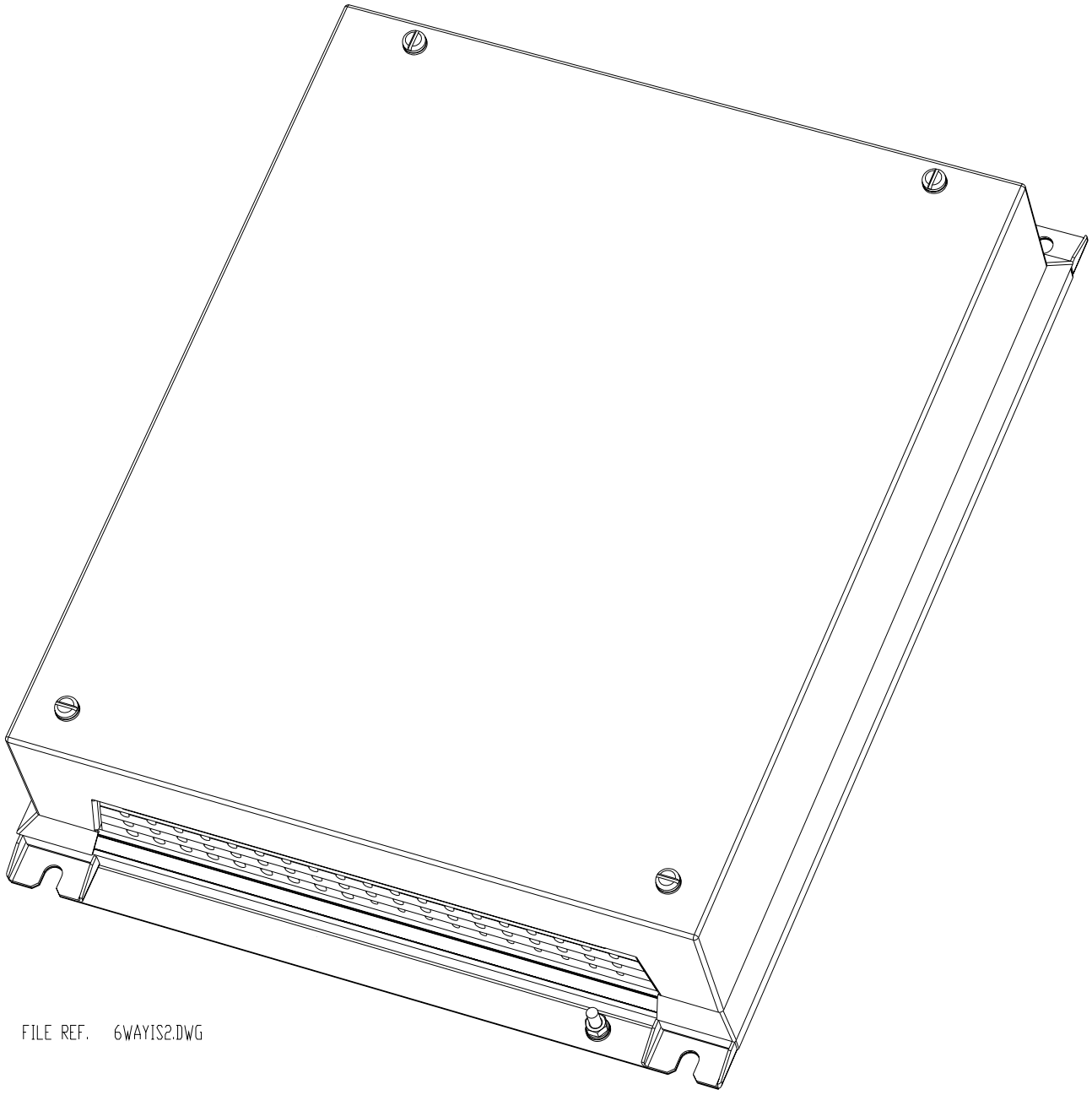


Figure 4.1 – 6-Way Interswitch Unit 65846A – General View

GENERAL DESCRIPTION

Note that this Chapter should be read in conjunction with that for the 2-Way Interswitch Unit 65842A. Both units have been designed with a high degree of commonality, including that of the software.

The Interswitch Unit is 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, ie., 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.

The BridgeMaster E Series Interswitch Unit works directly with the BridgeMaster E Series range of Displays and Scanner Units, but requires compatibility units for interfacing with the original BridgeMaster or Master Series units in hybrid systems.

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 PCB 65846800. Surface mount devices are used throughout the design. A separate Bypass PCB, 65846801, 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.

A Despatch Kit, 65846600, contains all necessary fixings and connectors.

Refer to Chapter 9 - System Interconnections and Cable Details in this manual for typical system installation details.

SYSTEM CONFIGURATION

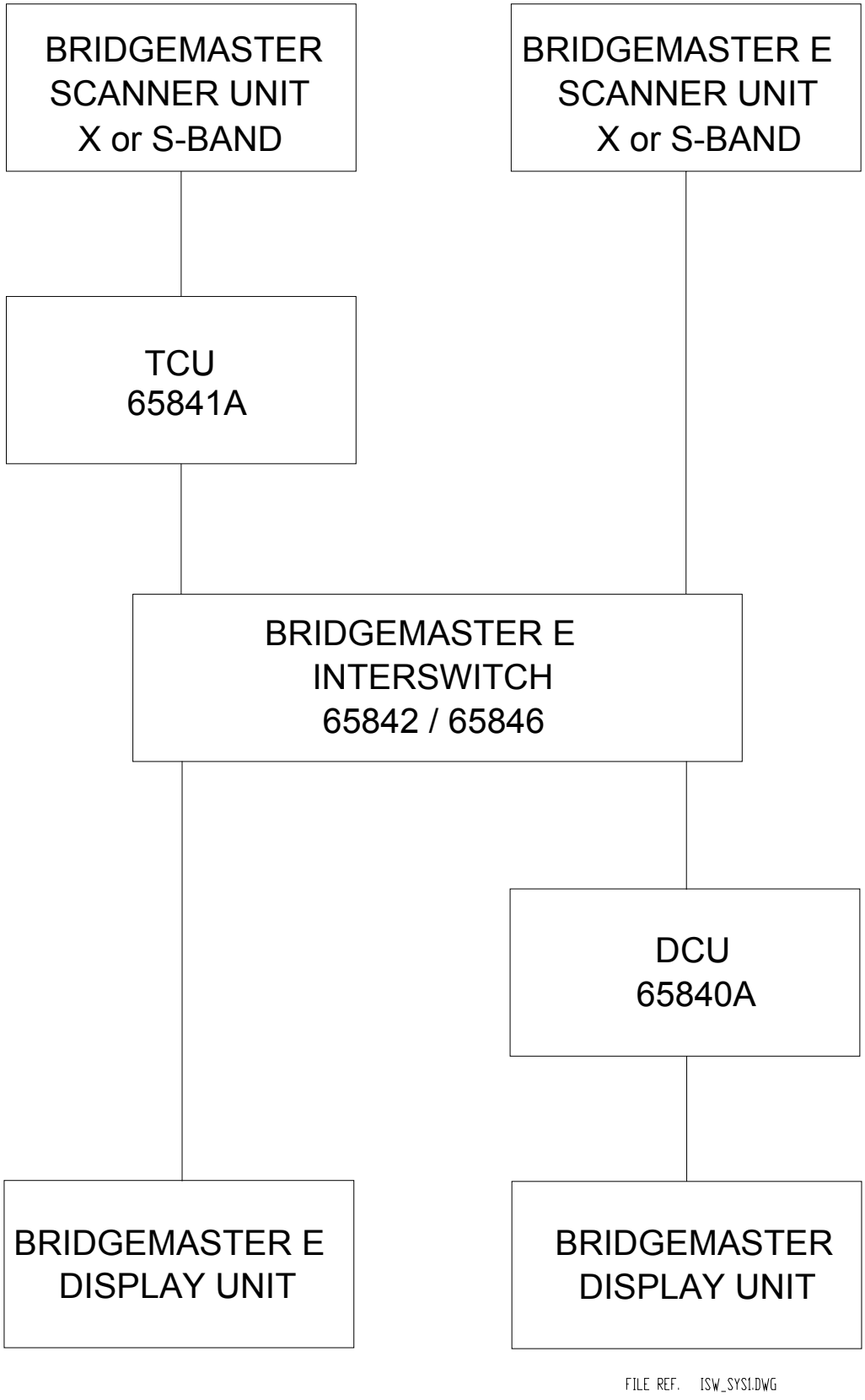


Figure 4.2 – Placement of Interswitch Unit in Hybrid System

INSTALLATION AND COMMISSIONING

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 n additional cable should be used for the +/-12V power connections between the interswitch and the display.

Interswitch Hardware Configuration

Dil Switches

In order to indicate which Displays and Transceivers are connected to the Interswitch, set the appropriate switches to the 'off'position.

There are two 6-way DIL Switches on the 6-Way Interswitch PCB board. SW1 selects Display Units while SW2 selects Transceivers.

Link Settings

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 fully populated system, the default state will be one-to-one connections as shown below:

DUA master to TXA	DUB master to TXB
DUC master to TXC	DUD master to TXD
DUE master to TXE	DUF master to TXF

If there are more Displays than Transceivers, the excess Displays will be allocated in slave mode, eg, DUA (master) – TXA, DUB (master) – TXB, DUC (slave) – TXA, DUD (slave) – TXA.

Links 3 & 4 are for test and diagnostic purposes only.

Link Settings	
LK3	Factory set 1-2
LK4	Not fitted

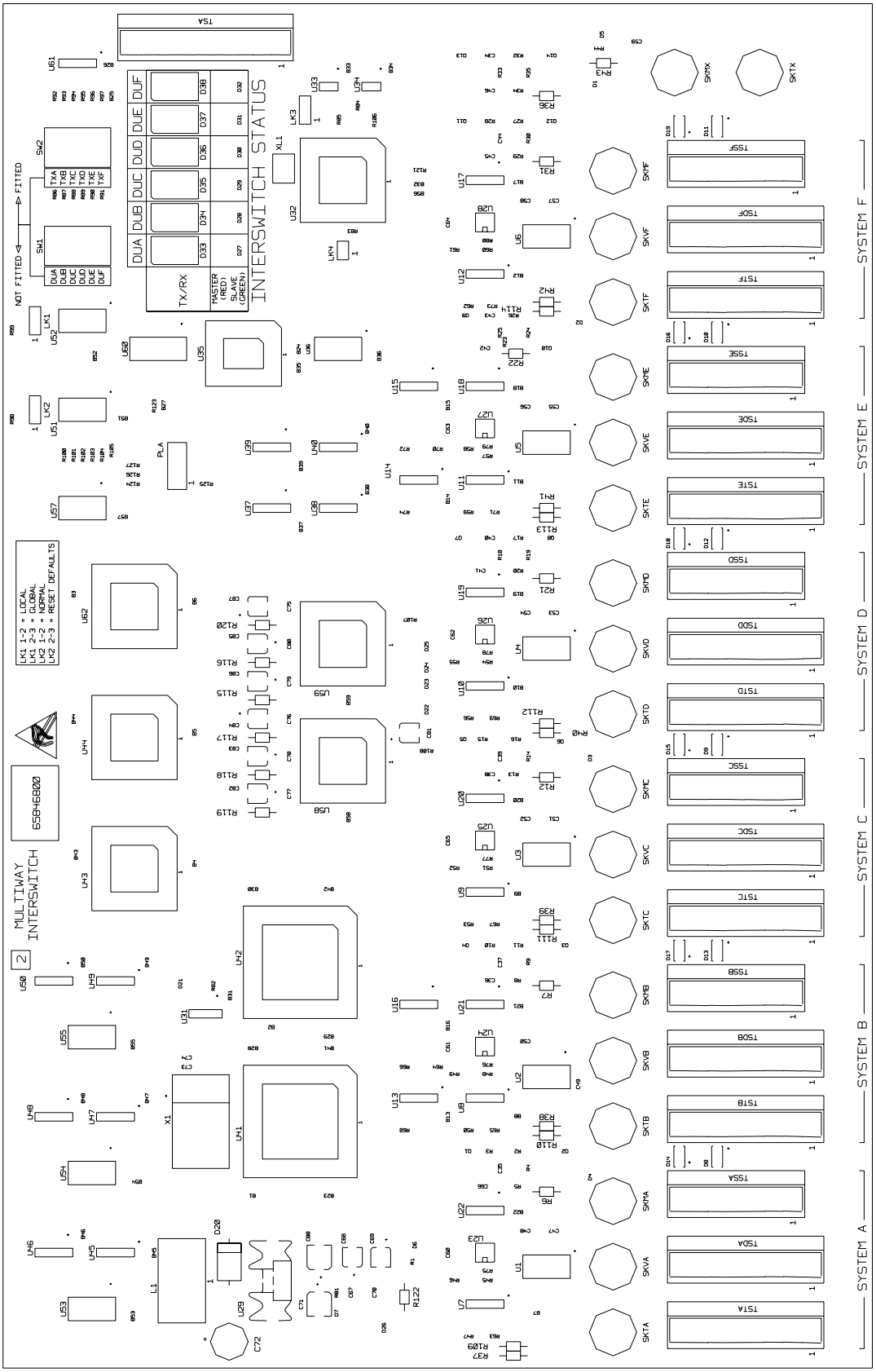


Figure 4.3 – 6-Way Interswitch PCB Assembly 65846800

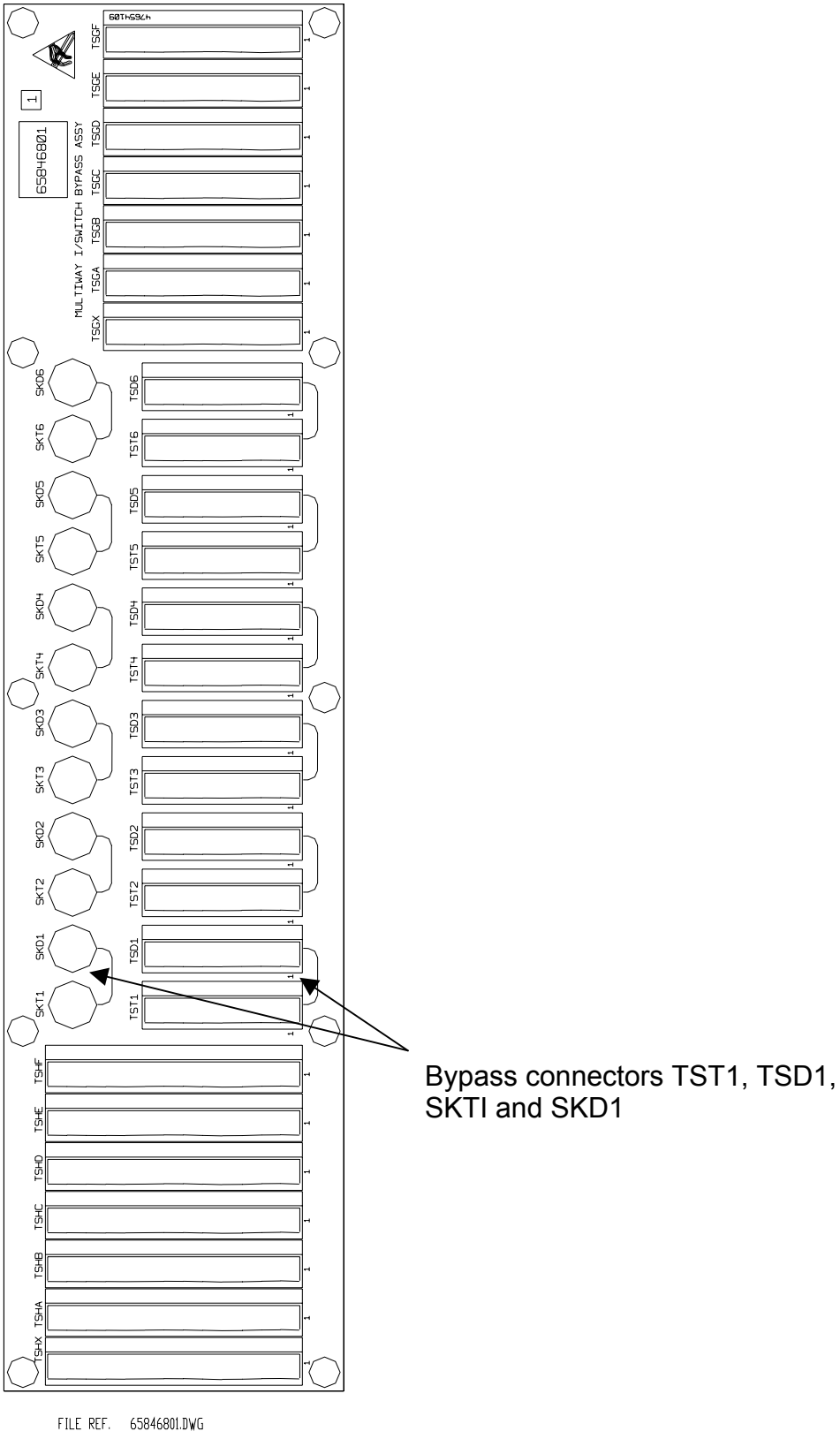
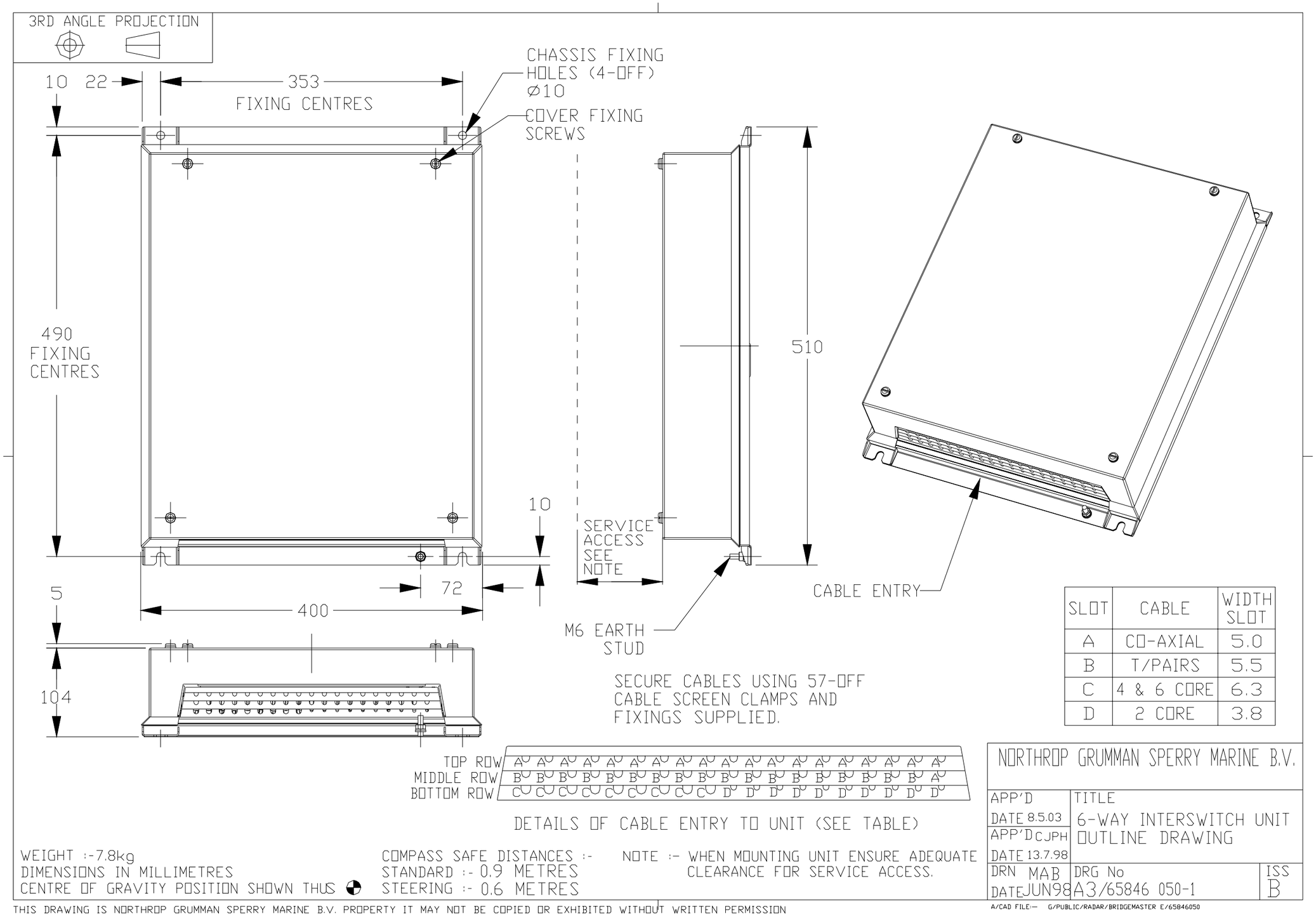


Figure 4.4 – 6-Way Interswitch Bypass PCB Assembly 65846801



SLOT	CABLE	WIDTH SLOT
A	CO-AXIAL	5.0
B	T/PAIRS	5.5
C	4 & 6 CORE	6.3
D	2 CORE	3.8

Figure 4.5 – 6-Way Interswitch Unit – Installation Drawing

Interface to Transceiver

There is a bi-directional serial port to send signals to and receive them from the transceiver. This is an RS422 differential signal. 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.

Radar Video Input	Peak amplitude	-2.5V to -5.5V
	Shoulder noise	-0.25V minimum
	Input Impedance	75Ω ± 10%

Interface to Display Unit (Transceiver Information)

There is a bi-directional serial port to send signals to and receive them from the display or compatibility unit. These are RS422 differential signals. Trigger, Video and SART video are sent down separate cables. The Trigger and SART video are also sent as RS422 differential signals. The video is sent via a coax cable.

Radar Video Output	Peak amplitude	-2.5V to -5.5V
	Shoulder noise	-0.25V minimum
	Input Impedance	75Ω ± 10%

Interface to Display Unit (Control)

There is a bi-directional serial port to send and receive signals from the display or compatibility unit. These are RS422 differential signals. One receives the configuration requests from the Display, the second one returns acknowledge and configuration signals back to the display or Display Compatibility Unit. Two additional twisted pair cables bring in the power supply to the Interswitch Unit from the display or Display Compatibility Unit.

Bypass Connections

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:

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, 5or 6)

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.

General Distribution Connectors

These enable LOG, COMPASS, NAV I/P etc to be distributed to all the display units via parallel connected terminal blocks. It comprises :

1 input terminal block and 6 output terminal blocks on the Interswitch PCB.

System Status

Visual indication of the system status is provided.
Six off, seven segment display, one for each Display Unit, indicate which Transceiver (A-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 LED will not be illuminated.

DISPLAYS	A	B	C	D	E	F
TRANSCEIVER	*A*	*C*	*C*	*A*	*E*	*F*
MASTER (Red) SLAVE (Green)						

6- WAY INTERSWITCH
FILE REF: ISW6TABLE.DWG

Figure 4.6 – Typical Examples of Status Panel Read-Outs

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.

Interconnections

All inputs and outputs enter and leave on the underside of the Interswitch Unit. All connections physically plug directly into the Logic or Bypass PCBs.

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 for Trigger, SART, Video, bi-directional serial data interswitch control data, positive and negative power and a co-ax cable for Video and a further co-ax cable for the MIST.

The 6-Way Interswitch Unit has one External Transceiver MIST co-ax inuput, one External Display MIST co-ax output and 6 Display MIST outputs.

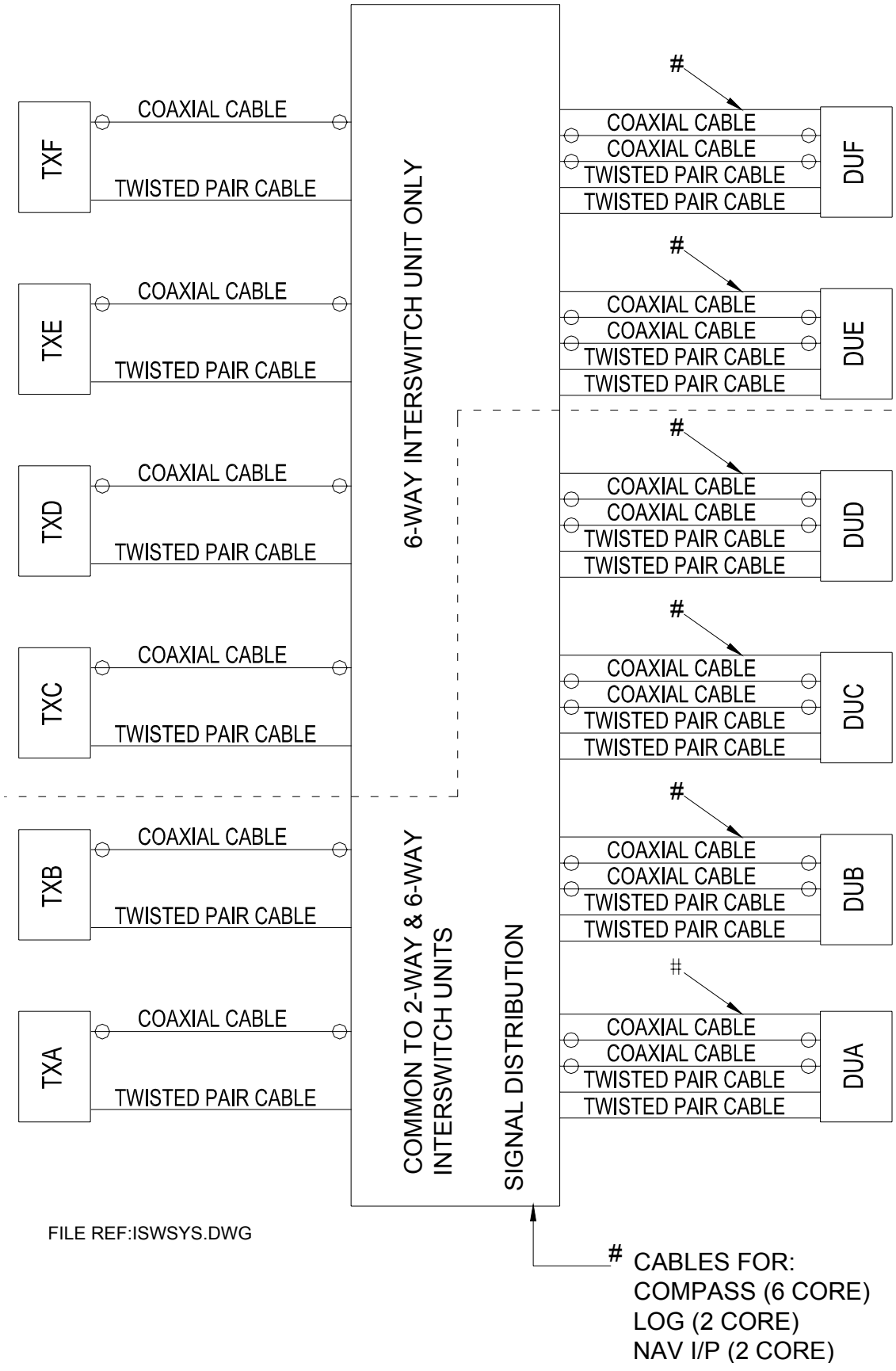


Figure 4.7 – Block Diagram – Interswitched System

TECHNICAL SPECIFICATION

Interswitch Power Supply

Interswitch Power Supply

Each Display Unit supplies +12V (+15V) & -12V (-15V) to the Interswitch.
The +12V (+15V) inputs are diode OR'd to produce » +11V (+14V).
The -12V (-15V) inputs are diode OR'd to produce » -11V (+14V).
An on-board regulator produces +5V for the logic.
In addition a second regulator produces -5V on the 6-Way Interswitch.

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 ie. Display is master or slave, which Transceiver is connected to which Display. A watchdog facility is also provided.

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. 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 a 7-segment LED status display.

ENVIRONMENTAL SPECIFICATION

The interswitch units are capable of operating in a protected ship borne environment under the following conditions.

Temperature
Operating -15°C to +55°C
Storage -25°C to +70°C

Relative Humidity
95% at 40°C (non condensing)

Weights and Dimensions

	Height (mm)	Depth (mm)	Width (mm)	Nominal Weight (kg)
6-Way Interswitch Unit 65846A	510	109	400	7

Compass Safe Distances

	Standard	Steering
6-Way Interswitch Unit 65846A	0.9 m	0.6 m

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CHAPTER 5

ANCILLARY UNITS

SERIAL INTERFACE UNIT

65847A

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Figures

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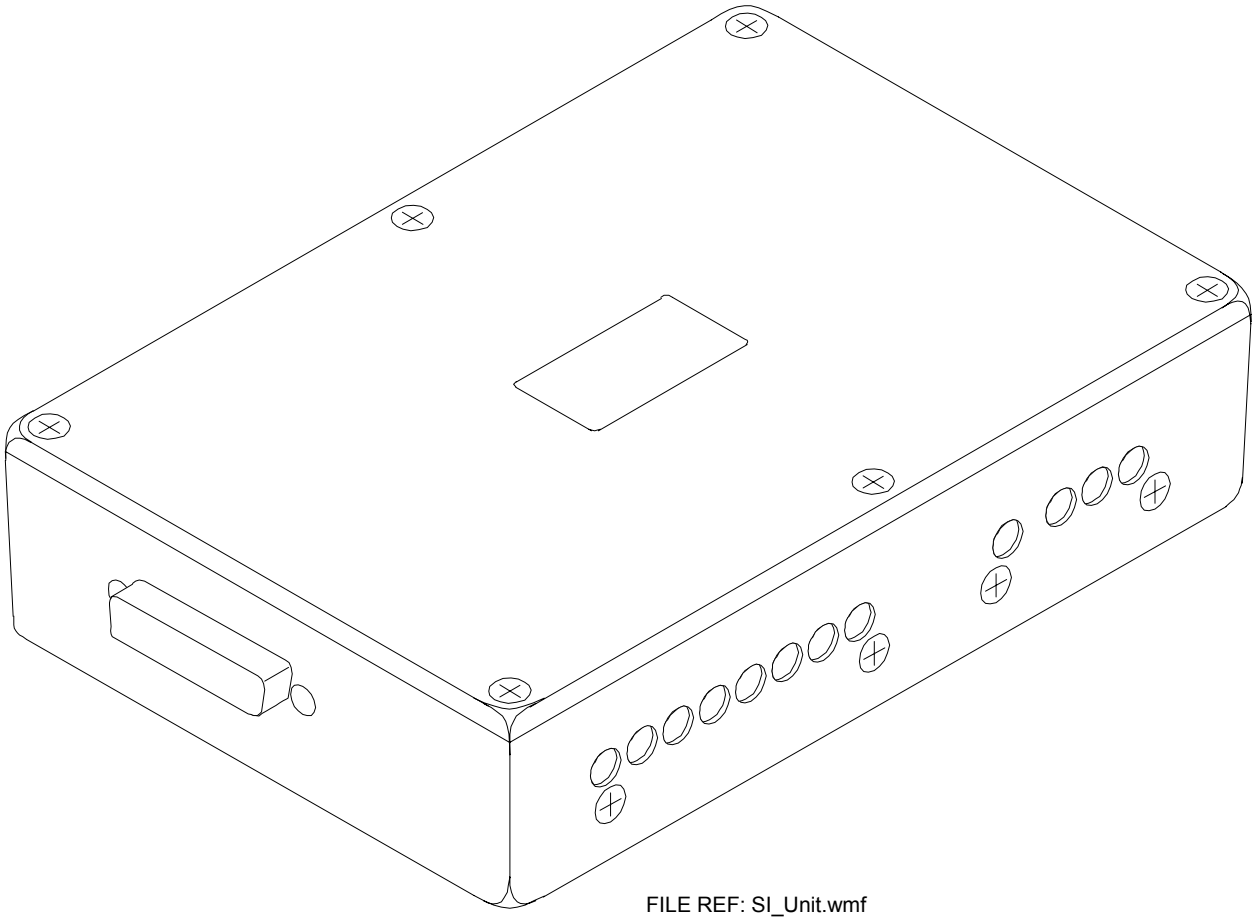

Figure 5.1 – Serial Interface Unit 65847A – General View

GENERAL DESCRIPTION

The Interface Unit, type 65847A, is designed to expand the range of input/output options available to the standard BridgeMaster E Series range of Displays.

The unit has three serial inputs with opto-isolation, three serial outputs, three relay outputs, and several miscellaneous signals. The three serial inputs (3, 4 & 5) are in addition to the standard two inputs fitted to the Display.

All relays provide both normally open and normally closed contacts. One relay is used to start external equipment (or may be used as a power fail indicator). The second and third relays are called ALARM1 and ALARM2. The Display software controls the categories of alarm.

The Interface Unit also has the following miscellaneous signals:

1. Track Data – serial data about Own Ship and tracked targets.
2. Freeze Frame – when grounded, this stops the radar picture updating.
3. Buzzer+ and Buzzer Return – provides an external repeat of the internal buzzer.

There is no configuring or setting up procedure required for this unit.

Power supplies for the unit are taken from the Host Display Unit via the supplied 2 metre long interface cable 65800514.

All items required for installation including the Interface Cable 65800514 are supplied with the unit.

SYSTEM CONFIGURATION

Refer to System Interconnection and Cable Details – Chapter 9, in this manual for information about the placement of the Interface Unit within expanded systems.

There is no configuring or setting up procedure required for this unit.

Power supplies for the unit are taken from the Host Display Unit via the supplied 2 metre long interface cable 65800514 (Cable 241 on the System Interconnection diagrams).

INSTALLATION AND COMMISSIONING

Refer to the Installation Drawing A3/65847050, contained in this chapter.

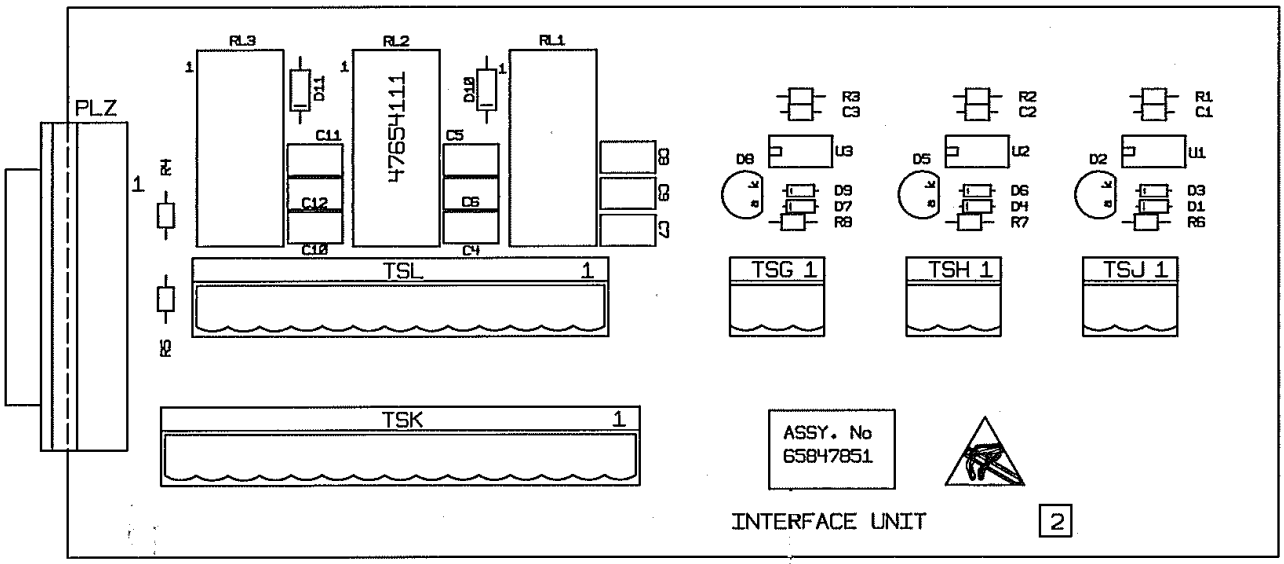

Figure 5.2 – Serial Interface Unit 65847A – PCB Assembly

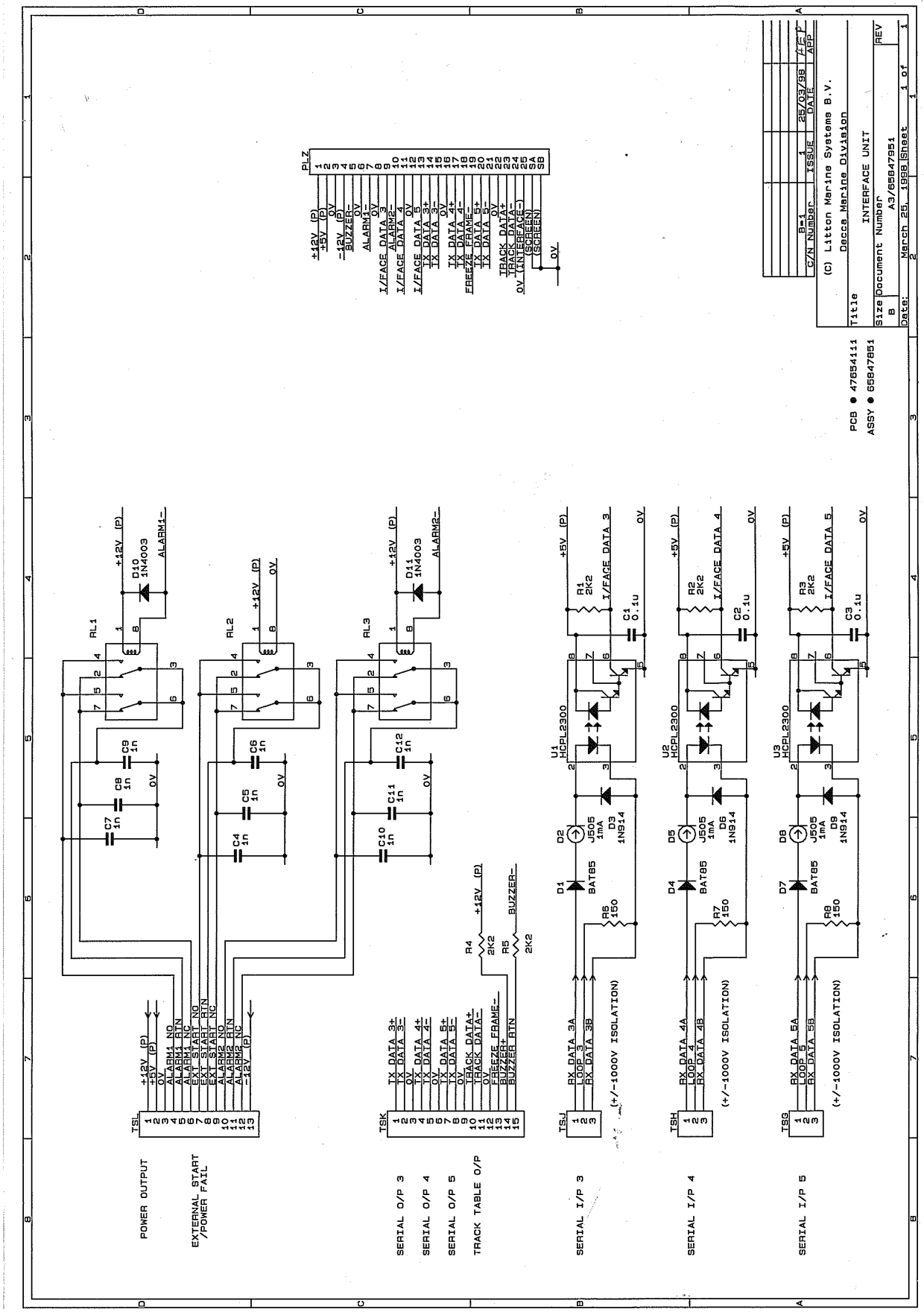

Figure 5.3 – Serial Interface Unit 65847A – Circuit Diagram

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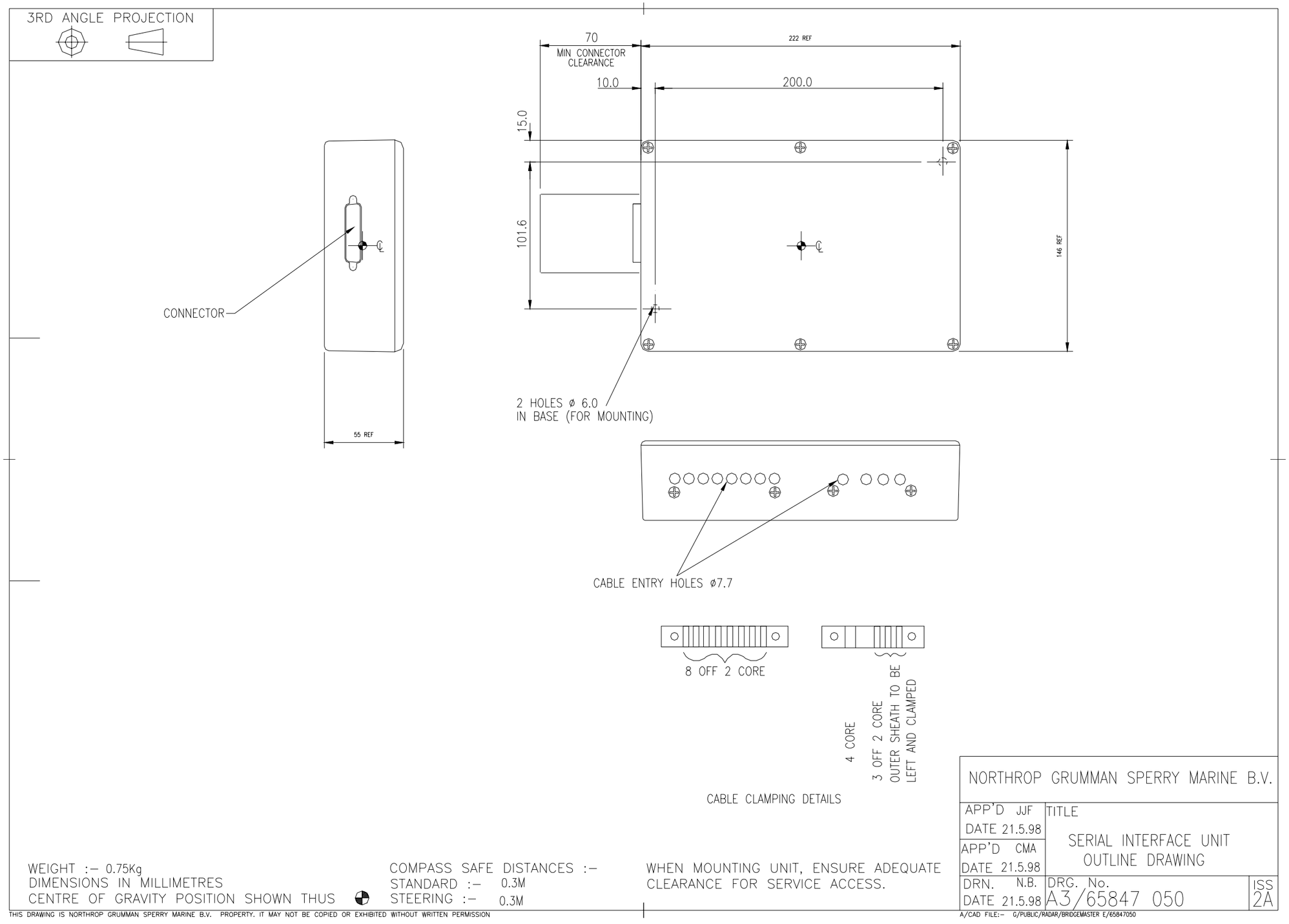

Figure 5.4 – Serial Interface Unit – Installation Drawing

TECHNICAL SPECIFICATION

ENVIRONMENTAL SPECIFICATION

Temperature
Operating -15°C to +55°C
Storage -25°C to +70°C

Relative Humidity
95% at 40°C (non condensing)

Weights and Dimensions

	Height (mm)	Depth (mm)	Width (mm)	Nominal Weight (kg)
Interswitch Unit 65847A	146	55	222	0.75

Compass Safe Distances

	Standard	Steering
Interswitch Unit 65847A	0.3 m	0.3 m

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CHAPTER 6

ANCILLARY UNITS

SCANNER CONTROL UNIT, ISOLATOR SWITCH, ISOLATING TRANSFORMER

CONTENTS

Figures

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SCANNER CONTROL UNIT 65837A

INSTALLATION

Single Phase (1ϕ) Or Three Phase (3ϕ) Mains Supply Voltage.

If the power supply for the S-Band Scanner Unit is Single Phase, refer to Figure 6.3, or for a Three Phase supply, refer to Figure 6.4 and the relevant cabling schedules in Chapter 7 for connection details for the Scanner Control Unit (SCU).

Mounting Position

The SCU must be mounted in such a position that it allows access by a Service Engineer for the isolation of the mains supply to the Turning Unit motor. For this reason, it is preferable to mount the SCU close to the Mains Isolator. Normally, the SCU is mounted so that it is accessible to the Radar Operator.

Scanner Speed Option

Two scanner speed options, `Standard' and `High', are available, depending on the type of Scanner motor. Standard speeds are covered by motor types 91003751, 52, 57 & 58, and High speeds by 91003753, 54, 59 & 60.

Note: The table below defines the Thermal Current Trip settings for each variant which must be set at the time of installation.

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

Scanner Control Unit Type Numbers and Thermal Trip Current Settings

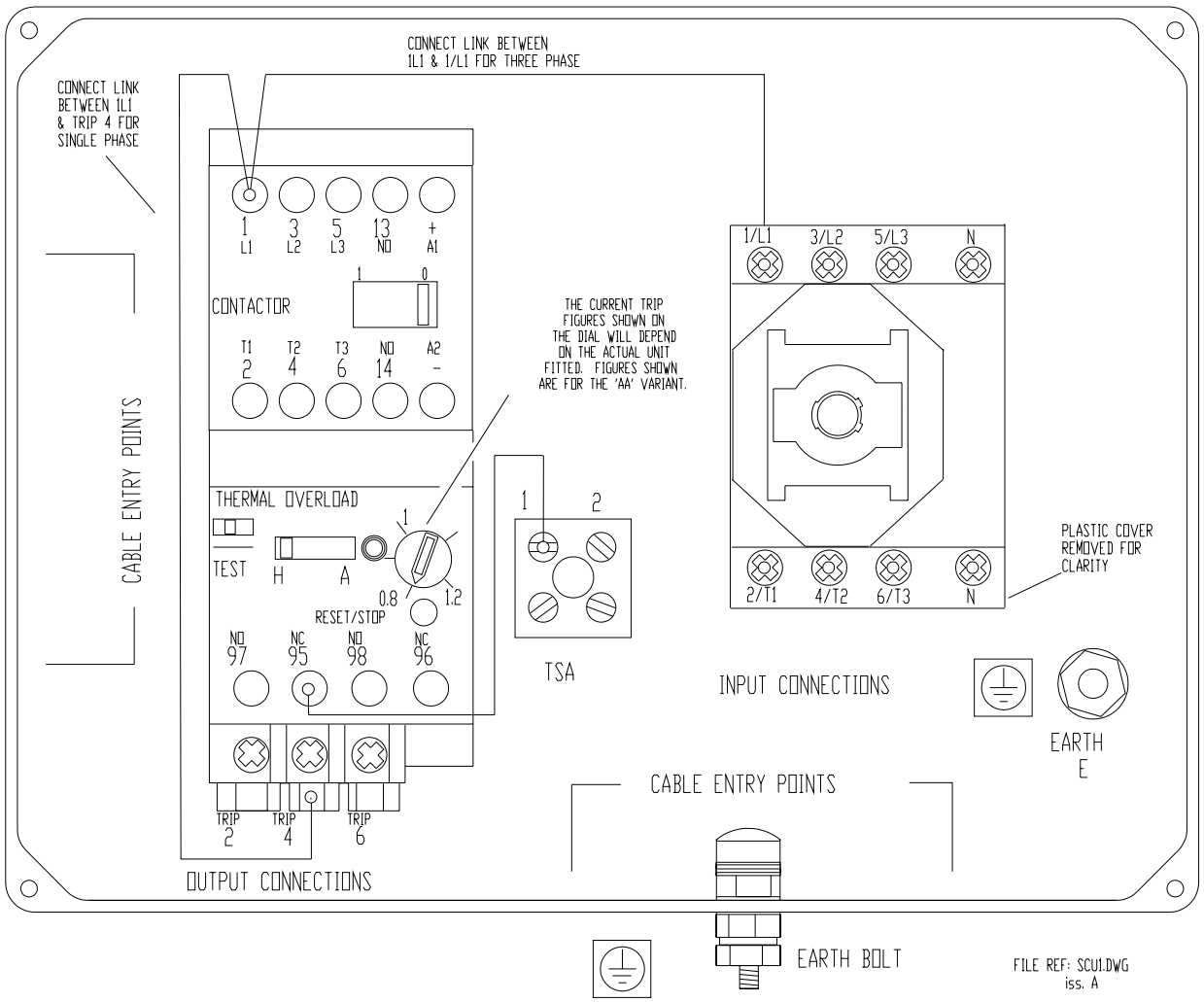


Figure 6.1 – Scanner Control Unit – Internal Layout

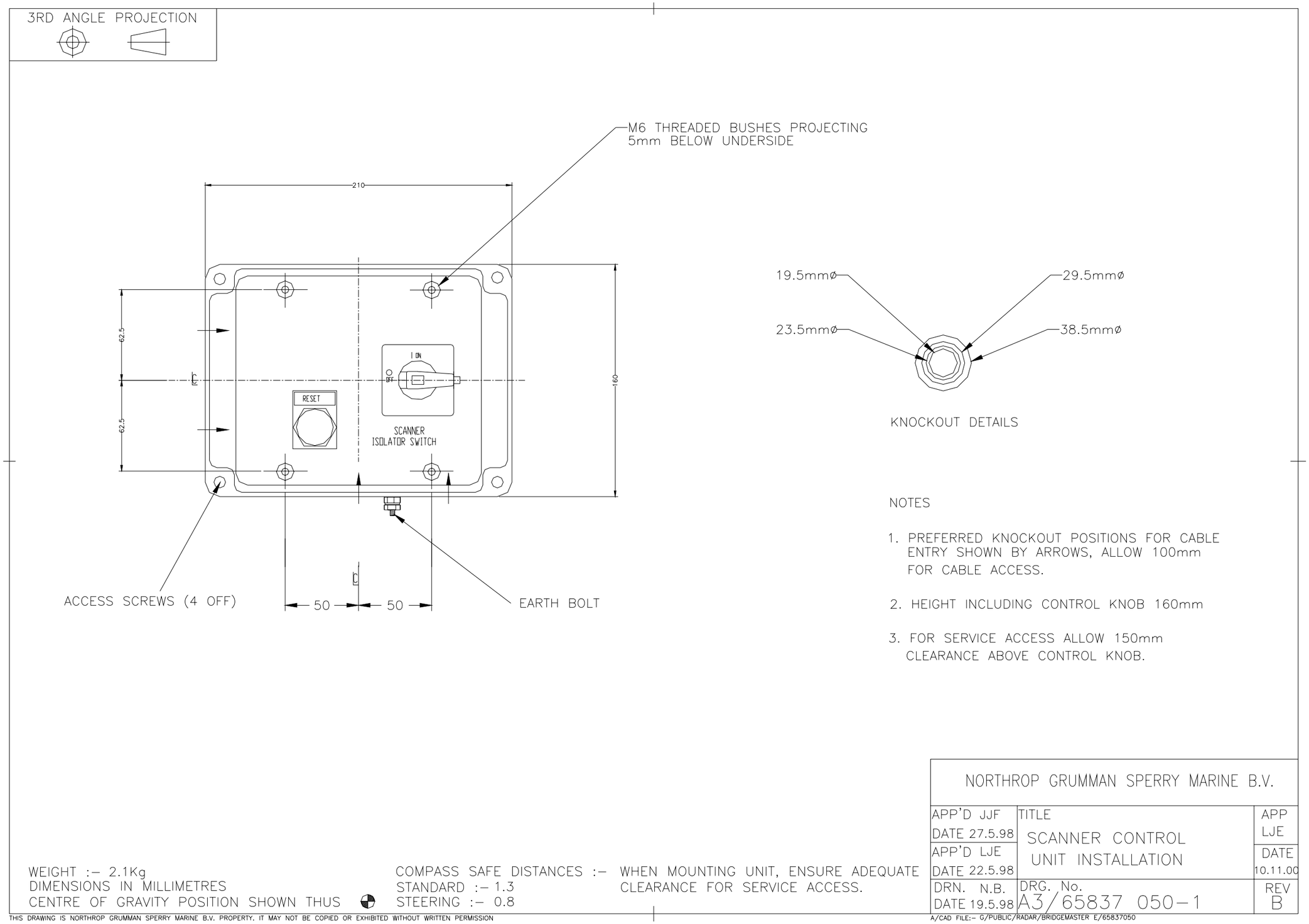
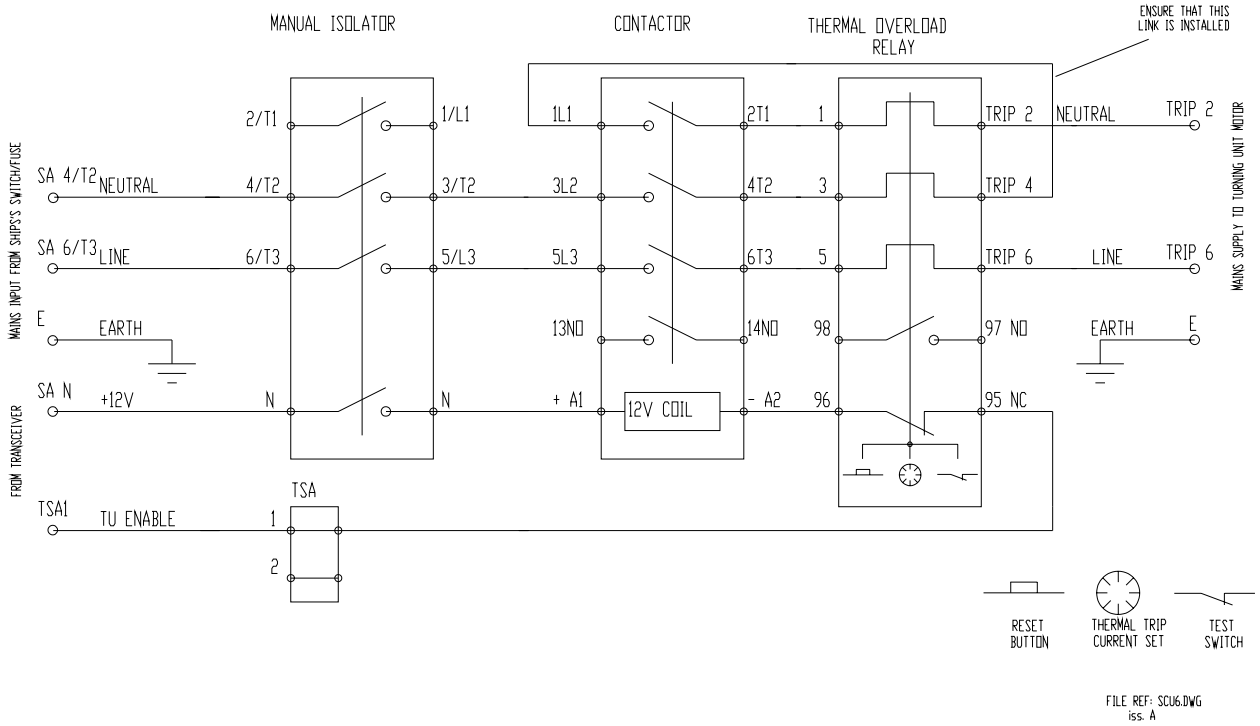


Figure 6.2 – Scanner Control Unit – Installation Drawing



SCANNER CONTROL UNIT 65837 - SINGLE PHASE ARRANGEMENT

Figure 6.3 – Scanner Control Unit – Single Phase Supply Arrangement

Note 1: Refer to the Cable Schedules in Chapter 9 for details of connections to the Ship's supply and the Turning Unit Motor.

Note 2: For Thermal Trip Current Settings refer to the earlier table.

Note 3: Cable Type TP3149 may be used for 220/240V Supplies.

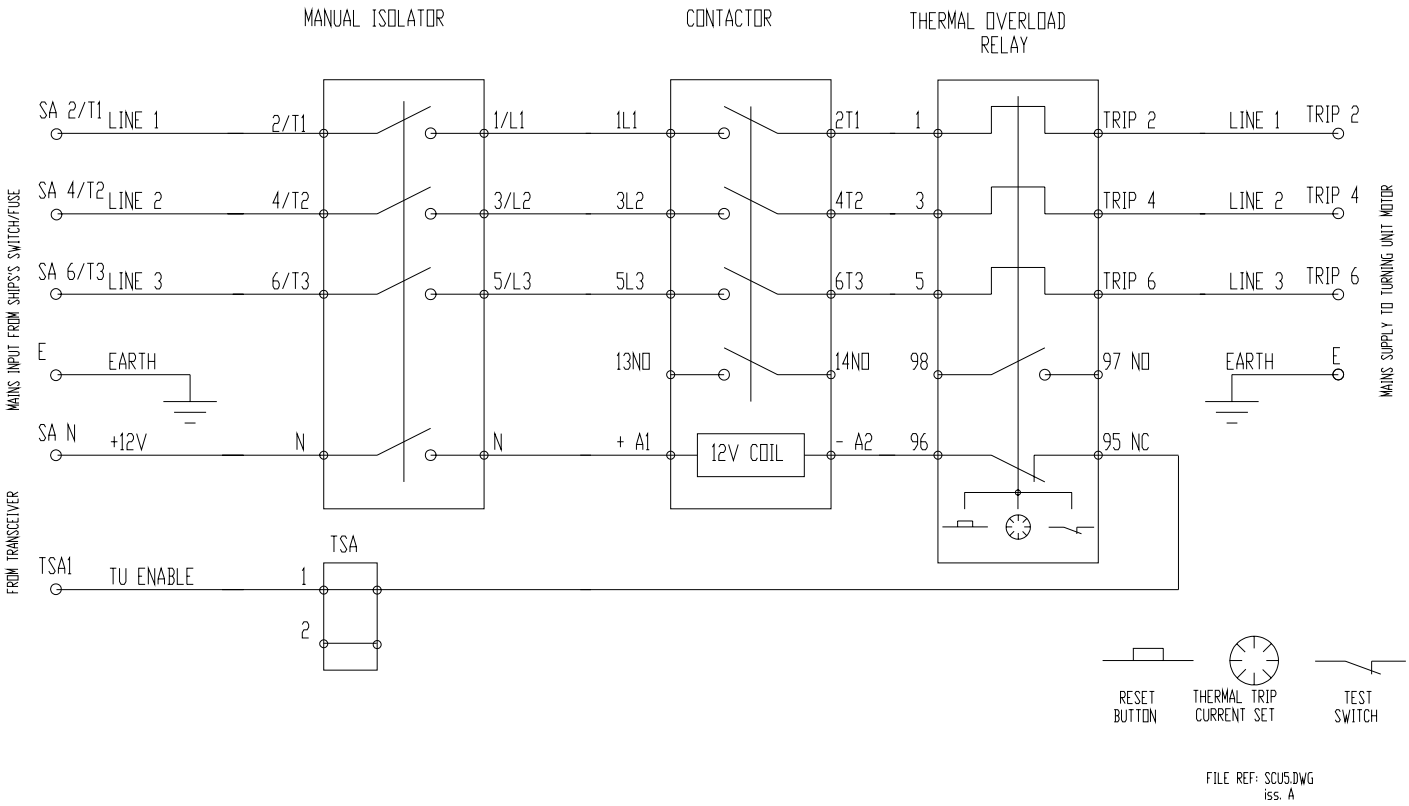


Figure 6.4 – Scanner Control Unit – Three Phase Supply Arrangement

Note 1: Refer to the Cable Schedules in Chapter 9 for details of connections to the Ship's supply and the Turning Unit Motor.

Note 2: For Thermal Trip Current Settings refer to Table on page 6.1.

MAINS ISOLATOR SWITCH 65800700

GENERAL

Mains Isolator switch Type 65800700 must be included in the system wiring. Its function is to enable the Scanner Unit (with the exception of the Motor Supply in S-Band systems) and the Display Unit to be isolated by a single switch. The Scanner Unit Motor Supply is isolated separately via the Scanner Control Unit. From a safety standpoint, the Mains Isolator should be mounted adjacent to the SCU so that the complete system can be isolated from a single location. If required, the Mains Isolator may be locked in the OFF position by means of a suitable padlock.

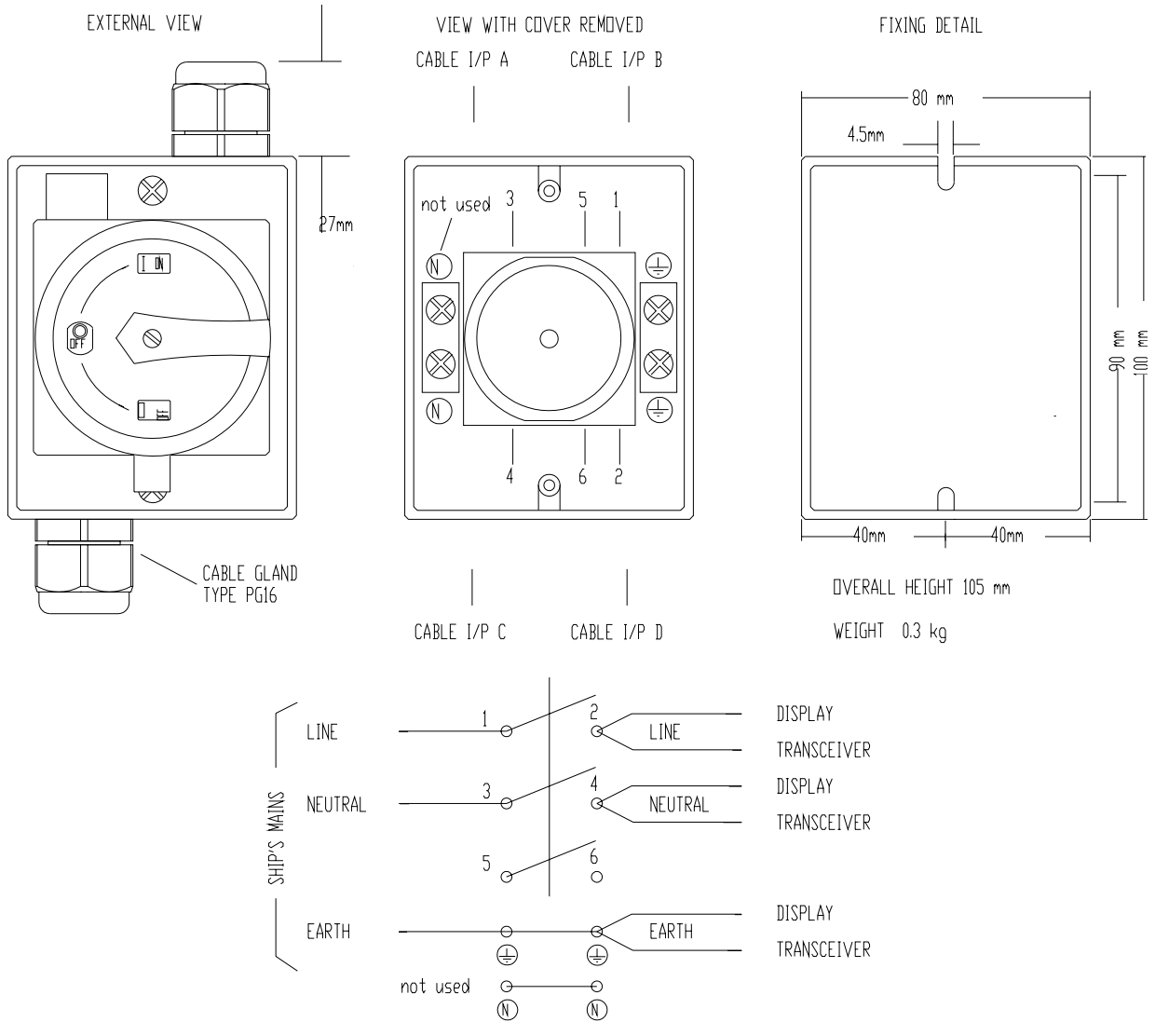


Figure 6.5 – Mains Isolator Switch 65800700

Note:Refer to System diagrams and cable schedules in Chapter 9 for connectiondetails

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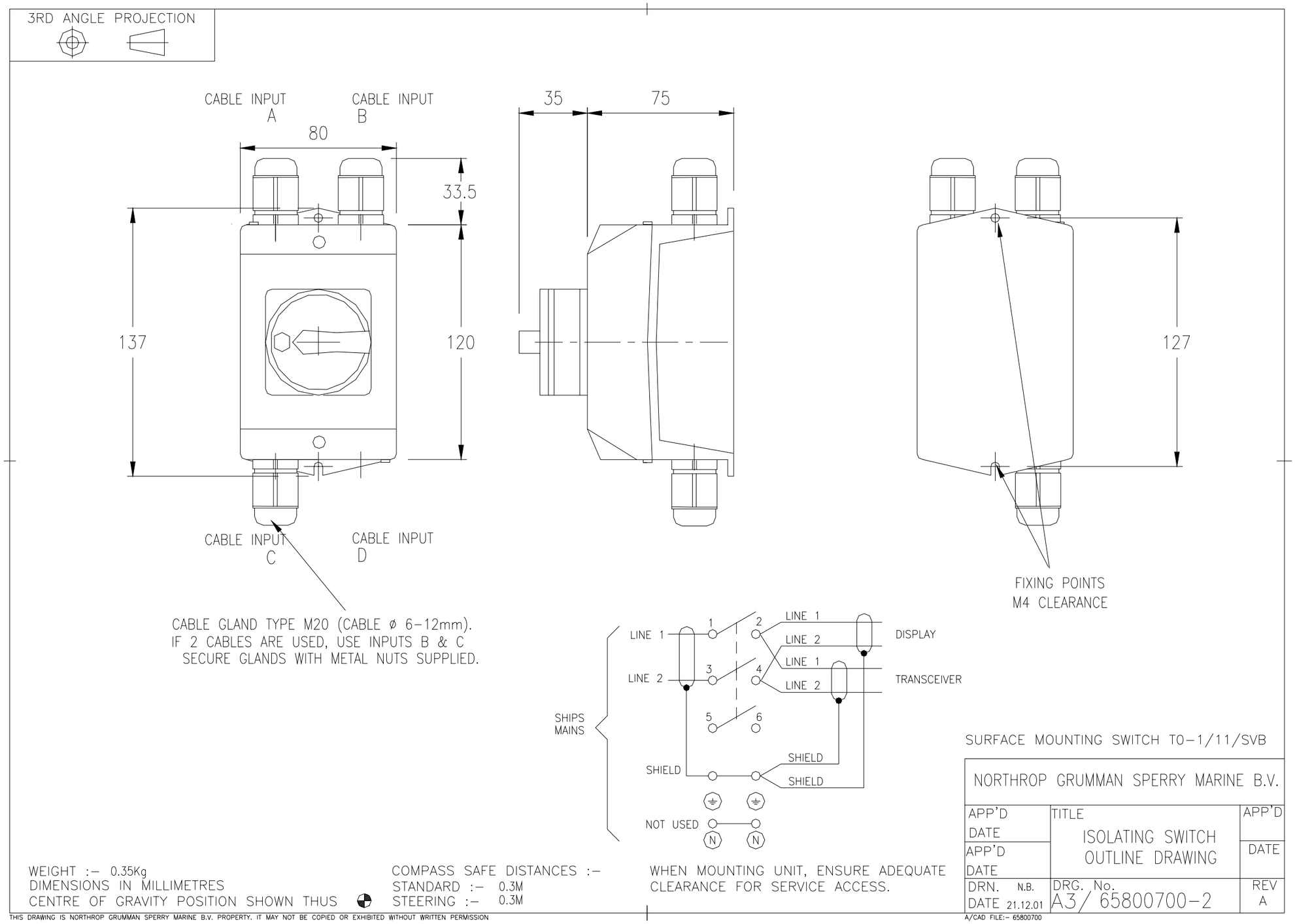
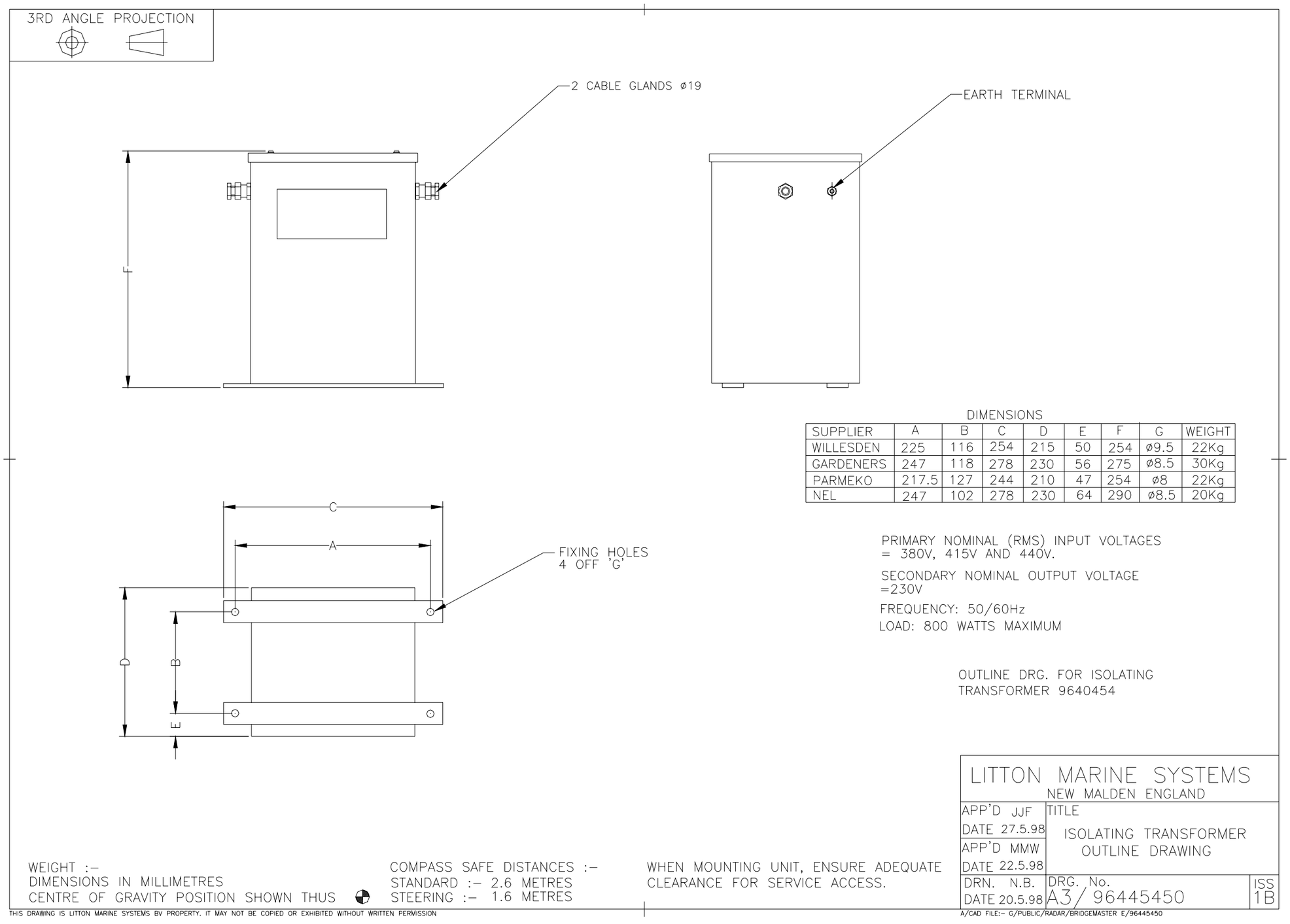


Figure 6.6 – Isolator Switch – Installation Drawing



DIMENSIONS

SUPPLIER	A	B	C	D	E	F	G	WEIGHT
WILLESDEN	225	116	254	215	50	254	ø9.5	22Kg
GARDENERS	247	118	278	230	56	275	ø8.5	30Kg
PARMEKO	217.5	127	244	210	47	254	ø8	22Kg
NEL	247	102	278	230	64	290	ø8.5	20Kg

PRIMARY NOMINAL (RMS) INPUT VOLTAGES
= 380V, 415V AND 440V.

SECONDARY NOMINAL OUTPUT VOLTAGE
=230V

FREQUENCY: 50/60Hz

LOAD: 800 WATTS MAXIMUM

OUTLINE DRG. FOR ISOLATING
TRANSFORMER 9640454

WEIGHT :-
DIMENSIONS IN MILLIMETRES
CENTRE OF GRAVITY POSITION SHOWN THUS

COMPASS SAFE DISTANCES :-
STANDARD :- 2.6 METRES
STEERING :- 1.6 METRES

WHEN MOUNTING UNIT, ENSURE ADEQUATE CLEARANCE FOR SERVICE ACCESS.

LITTON MARINE SYSTEMS
NEW MALDEN ENGLAND

APP'D JJF DATE 27.5.98	TITLE ISOLATING TRANSFORMER OUTLINE DRAWING
APP'D MMW DATE 22.5.98	
DRN. N.B. DATE 20.5.98	DRG. No. A3/ 96445450 ISS 1B

A/CAD FILE:- G/PUBLIC/RADAR/BRIDGEMASTER E/96445450

Figure 6.7 – Isolator Transformer – Installation Drawing

CHAPTER 7

ANCILLARY UNITS

RADAR SLAVE INTERFACE UNIT

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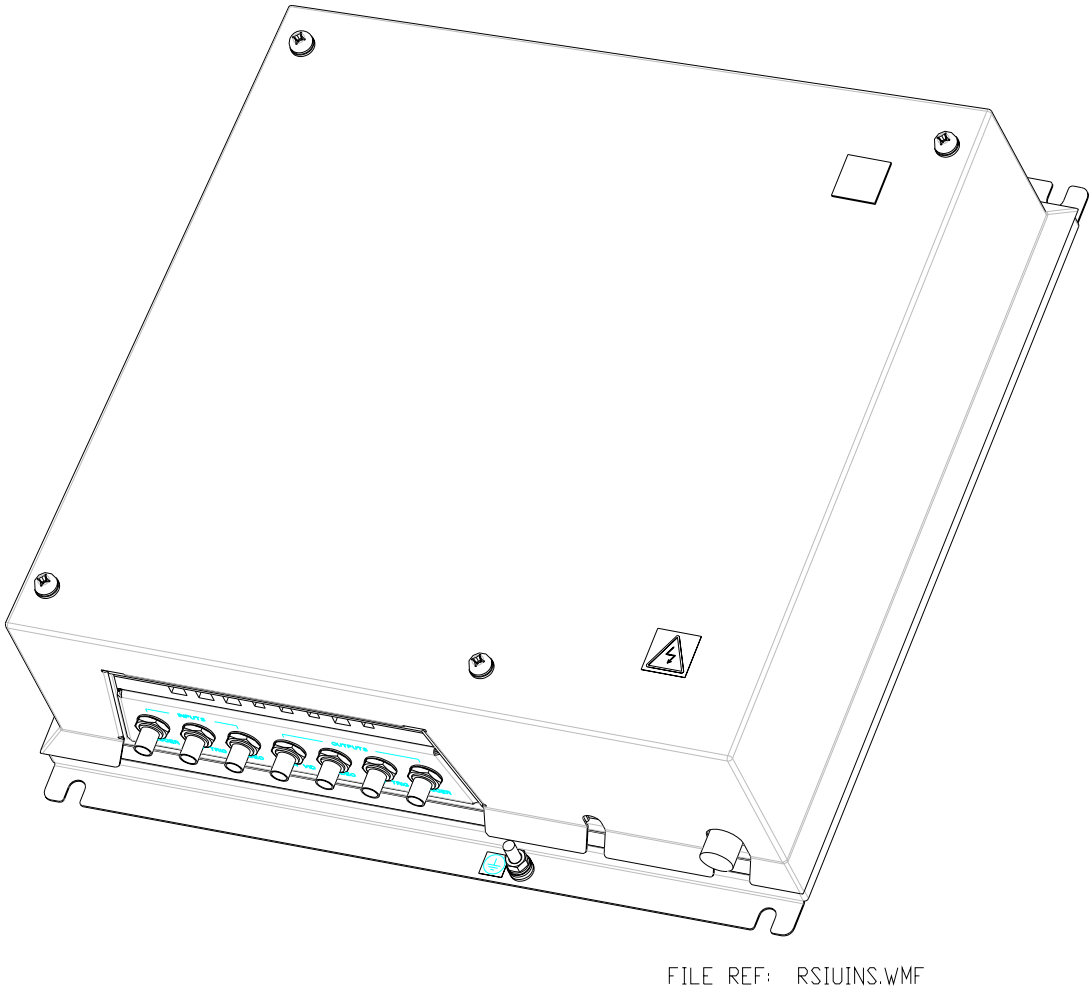


Figure 7.1a - Radar Slave Interface Unit 65843xx – General View

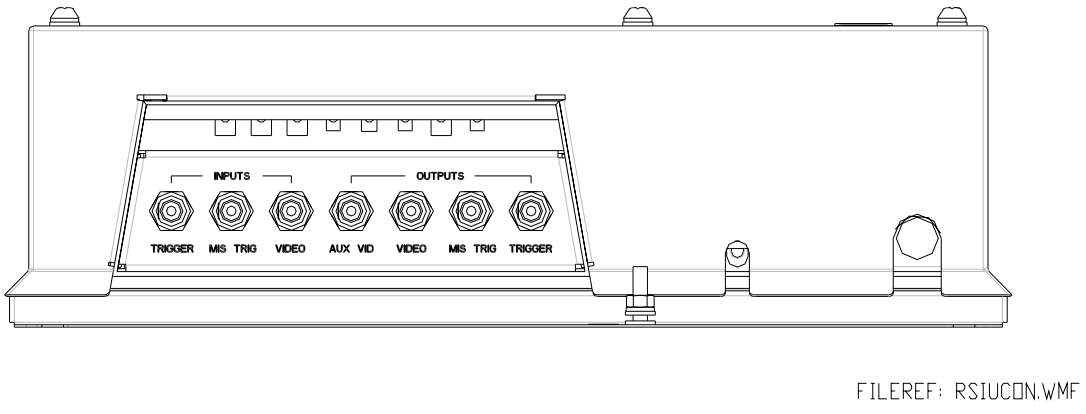


Figure 7.1b - RSIU Input Connector and Cable Entry

GENERAL DESCRIPTION

Introduction

The Radar Slave Interface Unit (RSIU) has been designed as a 'slave only' interface between a variety of proprietary Transceivers and the new BridgeMaster E Series range of Displays. It can be customised to make it compatible with most Transceivers by including a large number of programmable links. This enables it to be set up on site, and act as a 'transparent link' into either a BridgeMaster E Display or Interswitch.

It converts such data as is received from the transceiver into the serial data format used by the BridgeMaster E Series of Displays. It CANNOT generate control to the Transceiver

The RSIU is a bulkhead mounted unit that comprises a power supply PCB with filtered mains input, and a logic and bearing PCB. Apart from the external supply input (AC or DC option), almost all signal interconnections are made (either directly or indirectly) to the logic and bearing PCB. (Some future options may require external connections to a daughter board).

The power supply PCB supplies the RSIU Logic and bearing board and any daughter boards fitted for customised option facilities. It also makes power available for some of the BridgeMaster E ancillary units where they are fitted. The logic and bearing PCB controls the overall operation of the RSIU.

There are no operator controls associated with the unit but a commissioning procedure is carried out on installation to set up internal links and switch settings. The unit also contains a simple transceiver simulator function, which enables system installation to be verified without the input radar needing to be operational

There are two primary variants of RSIU:

65843Ax, which is AC powered.

65843Dx, which is DC powered.

Each of the above variants uses the same Logic and bearing circuit boards, which itself is customiseable, and also can accept daughter boards to generate further options. As far as is possible, all external connections will be made to the main board rather than the daughter boards.

The primary option is the inclusion of a synchro daughter board to permit interfacing to scanner units with relative bearing output in synchro format.

Available (or planned) System Variants :

65843AE a.c. powered incremental pulse or sinusoidal bearing interface.
65843AF a.c. powered with relative synchro interface.
65843AG a.c. powered with relative resolver interface.

For the d.c. powered versions, change the first letter from "A" to "D"

Future options to be defined as and when released:

Model with full synchro de-stabilization facility.
Model with serial daughter board.

There is a common Despatch Kit, 65843600, which contains all necessary fixings and connectors for the core unit and standard variants.

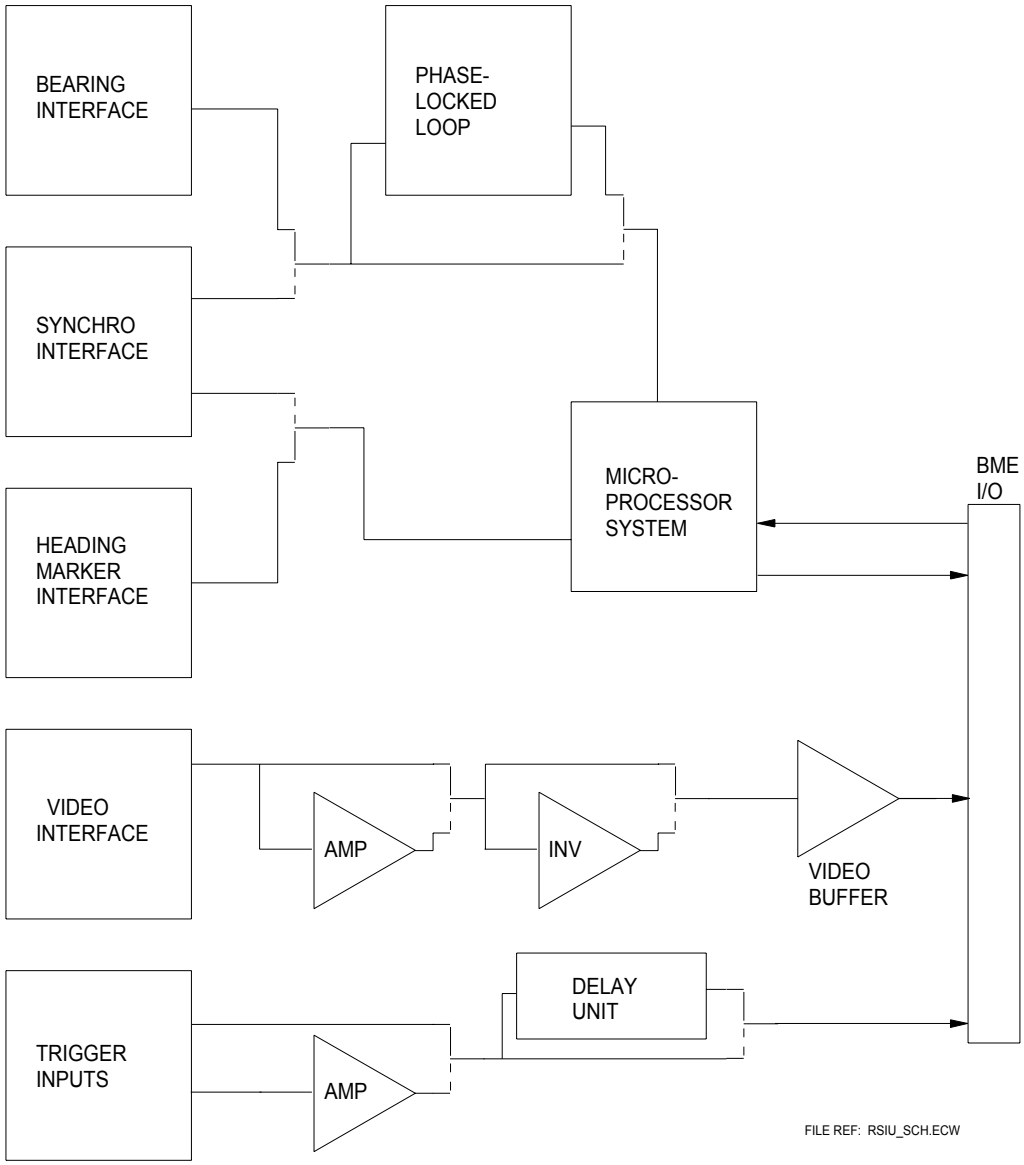


Figure 7.2 - Simplified Schematic

SYSTEM CONFIGURATION

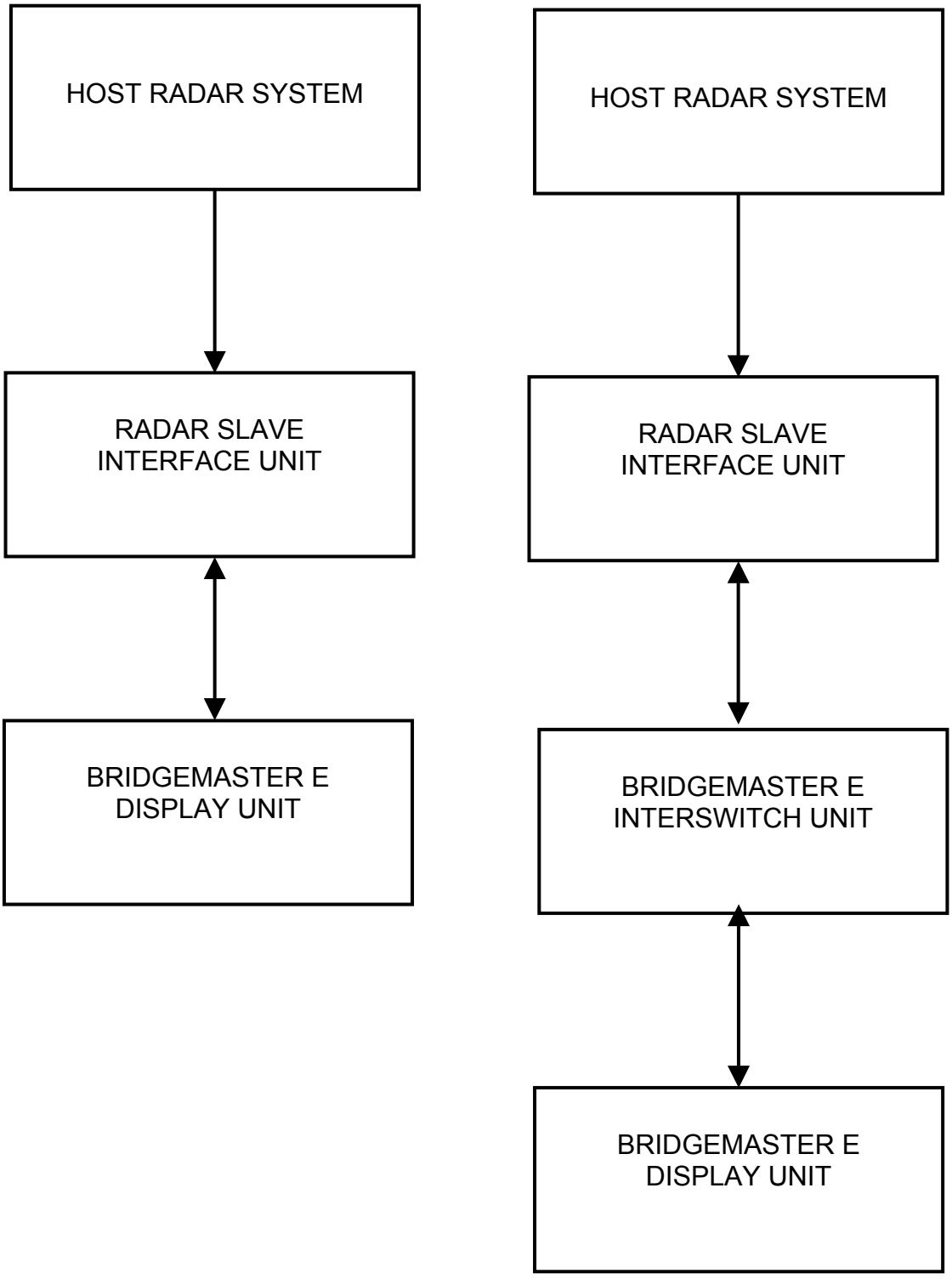


Figure 7.3 - Placement of RSIU within BME System

INSTALLATION AND COMMISSIONING

CONFIGURATION

The link settings on the Power Supply PCB are intended for testing and fault finding purposes and are factory set for normal operation. They should only be moved/removed by a qualified Service Engineer. (Refer also to the setting up procedures section.)

Power Supply PCB

LKA – Start Test Link

Normal Operation	FITTED in position 2 - 3
Test Operation	FITTED in position 1 - 2

LK1 - High Voltage Isolation Link

Normal Operation	ALWAYS FITTED

(This link is only removed for Factory Testing)

LK2 or LK3 - Input Voltage Select Links (AC power supply only)

230V	LK2 FITTED
115V	LK3 FITTED

LK4L, LK4H, LK5L LK5H - Motor Supply Select Links.

For RSIU use, The setting of these links is not relevant as this output from the PSU is not used by the RSIU, the normal factory setting is :

LK4L	FITTED
LK5L	FITTED

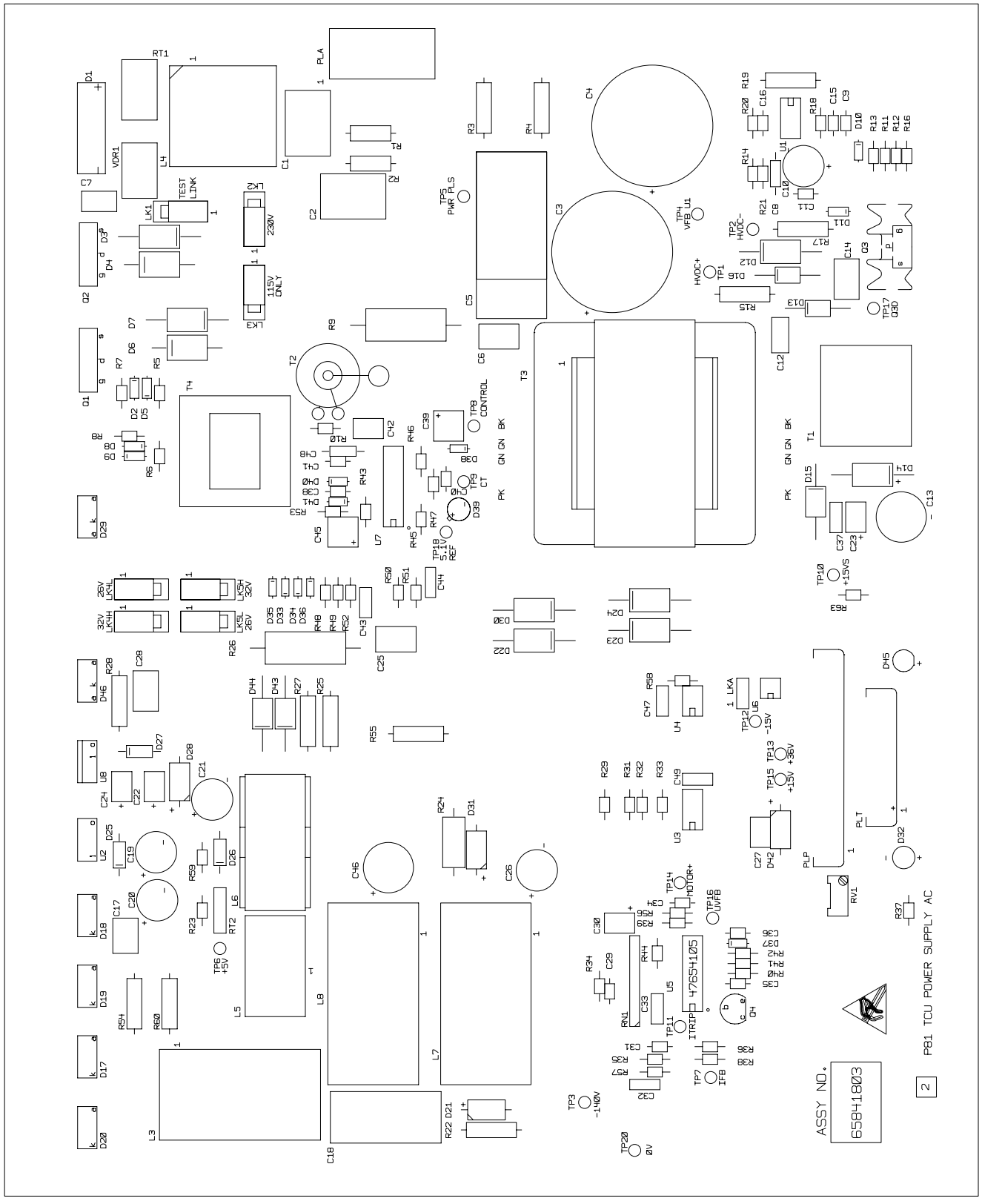


Figure 7.4 - Radar Slave Interface Unit AC PSU PCB Assembly 65841803

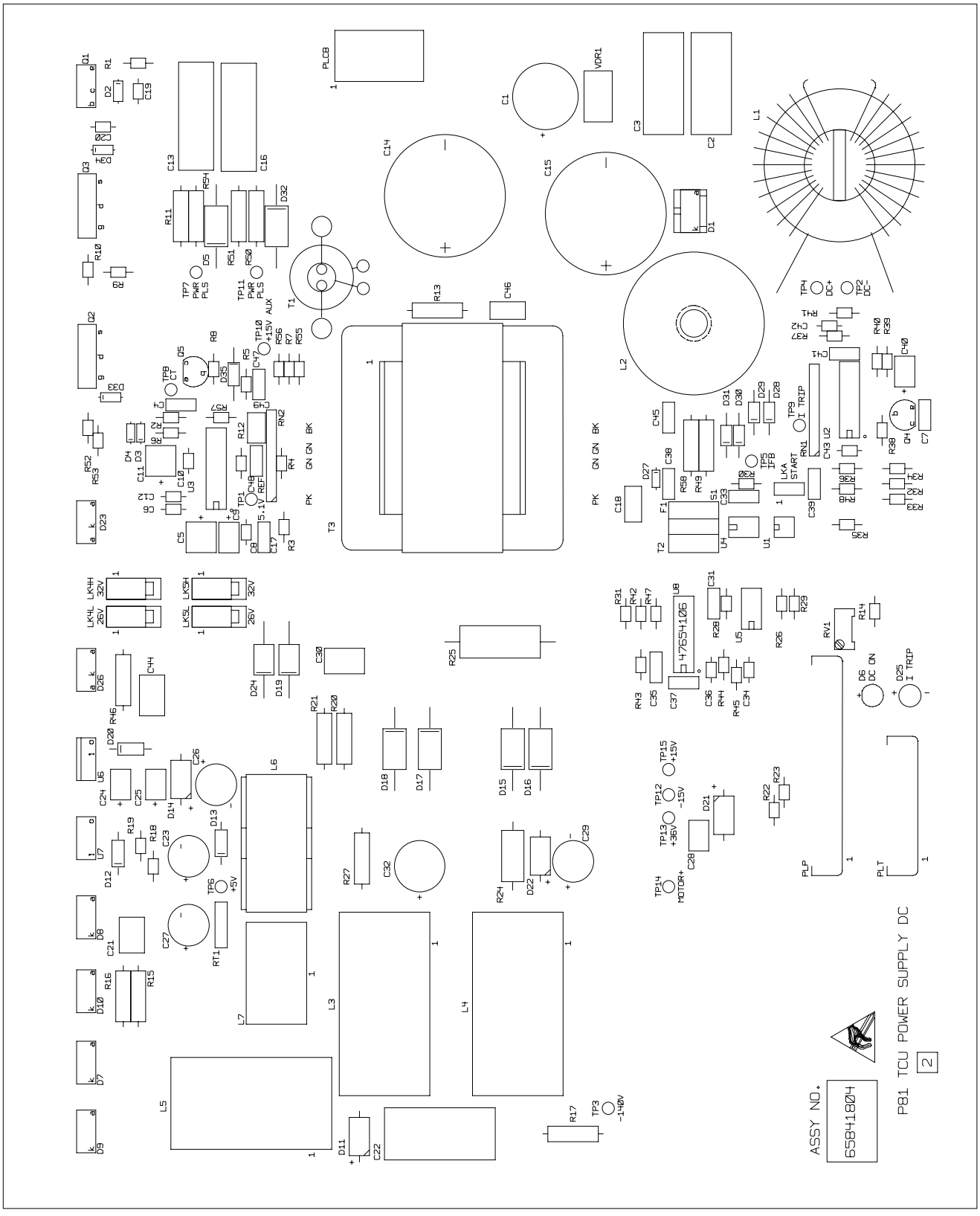


Figure 7.5 - Radar Slave Interface Unit DC PSU PCB Assembly 65841804

RSIU Logic and Bearing PCB

The Logic and bearing PCB has a series of links that must be set on installation.

Links LK1 & LK2 are factory set for normal operation and should only be set/removed by a qualified Service Engineer.

All other links define the system configuration, and should be set according to following information. Refer to Table 1 for the default settings, and Figure 7.6 for the link references incorporated into the Functional Block Schematic.

AZIMUTH INPUT (Link Settings)
Note only synchro option available on units Ser. Nos 100003973/1 to 4 and 100004041/1 to 6)

LK3, LK4, LK5, LK6, LK7 - Azimuth Selection:

These links select the type of azimuth input: RS422, synchro, 2048 pulses,4096 pulses 8192 pulses or others.

Input	LK3	LK4	LK5	LK6	LK7
Synchro or Resolver (via daughter board)**	1-2	7-8	2-3	1-2	1-2
2048 pulses	1-2	1-2	2-3	1-2	1-2
2048 pulses RS422	1-2	3-4	2-3	1-2	1-2
4096 pulses	1-2	1-2	2-3	1-2	2-3
4096 pulses RS422	1-2	3-4	2-3	1-2	2-3
8192 pulses	1-2	1-2	1-2	2-3	2-3
8192 pulses RS422	1-2	3-4	1-2	2-3	2-3
Other (use X & Y counters)	2-3	1-2	2-3	2-3	2-3
Internal Azimuth Simulator	X	9-10	X	X	X

**65843AF, 65843AG, 65843DF, and 65843DG only.

LK14 - Coupling:
DC Coupled Fitted 1 – 2
AC Coupled Fitted 2 – 3

LK15 – RS422 Termination:
No Termination Fitted 1 – 2
120ς Termination Fitted 2 – 3

The no termination option should only be used if a short “T” connection is made to an already terminated cable

LK18 – Azimuth Polariity**:**
Negative Pulses Fitted 1 – 2
Positive Pulses Fitted 2 – 3

LK19 – Azimuth Amplitude:
Amplitude 2V - 10V Fitted 1 – 2
Amplitude 10V – 24V Fitted 2 – 3

Typical settings for azimuth configuration links:

Type	LK3	LK4	LK5	LK6	LK7	LK14	LK18	LK19
RS422 (2048)	1-2	3-4	X	1-2	1-2	X	X	X
RS422 (4096)	1-2	3-4	X	1-2	2-3	X	X	X
RS422 (8192)	1-2	3-4	1-2	2-3	2-3	X	X	X
RS422 (other)*	2-3	3-4	2-3	2-3	2-3	X	X	X
Berger (90)*	2-3	1-2	2-3	2-3	2-3	2-3	1-2	2-3
Pulse (2048)	1-2	1-2	X	1-2	1-2	1-2	2-3	P
Pulse (4096)	1-2	1-2	X	1-2	2-3	1-2	2-3	P
Pulse (8192)	1-2	1-2	1-2	2-3	2-3	1-2	2-3	P
Pulse (other)*	2-3	1-2	2-3	2-3	2-3	1-2	2-3	P
Synchro/ Resolver**	1-2	7-8	X	1-2	1-2	X	X	X

* For these settings, the X (SD, SC)& Y (SA, SB) counters must also be preset for the Phase-locked loop circuit to generate 4096 pulses per revolution from the incoming azimuth signal.
KEY: X = Don't care; P = polarity, selected to suit installation.
**65843AF, 65843AG, 65843DF, and 65843DG only.

HEADING MARKER INPUT (Link Settings)
Note only synchro option available on units Ser. Nos 100003973/1 to 4 and 100004041/1 to 6)

LK8, LK29 – Heading Marker Input Selection:
These links select the type of Heading Marker input for : RS422, pulse, closing contact, resolver or synchro derived.

Heading Marker Input	LK8	LK29
RS 422	5 – 6	Parked
Pulse or Closing Contact (True)	1 – 2	Parked
Pulse or Closing Contact (Inv)	3 – 4	Parked
Input Derived from Synchro or Resolver**	7 – 8	2 – 3
Internally Generated***	9 – 10	Parked

**65843AF, 65843AG, 65843DF, and 65843DG only
*** This disables any incoming heading marker signals, permitting the software generated one to operate when selected at DIL switch STX, section 8 (grey)

LK16 – RS422Heading Marker Input Termination**:**
No Termination Fitted 1 – 2
120ς Termination Fitted 2 – 3

The no termination option should only be used if a short "T" connection is made to an already terminated cable.

LK33 – Heading Marker Amplitude:
Amplitude 2V - 10V Fitted 1 – 2
Amplitude 10V – 24V Fitted 2 – 3

LK34 – Heading Marker Polarity:
Negative Pulses Fitted 1 – 2
Positive Pulses Fitted 2 – 3

For negative pulses, heading marker is valid on falling edge of pulse. (To invert, use LK8.)
For positive pulses, heading marker is valid on rising edge of pulse. (To invert, use LK8.)

LK35 – Heading Marker Bias
+15V Bias Fitted 1 – 2
-15V Bias Fitted 2 – 3

Bias is only required if the Heading Marker Input is an uncommitted closing contact or a semiconductor device such as a open collector transistor or an open drain FET. Refer to Transceiver Manufacturers Manual if in doubt

VIDEO INPUT (Link Settings)

LK9 – Video Input Polarity
Negative Fitted 1 – 2
Positive Fitted 2 – 3

LK10 – Radar Video/ Simulated Video:
This link selects either the radar video , or the internally generated simulated video.
Radar Video Fitted 1 – 2
Simulated Video Fitted 2 – 3

The simulated Video is a service aid. For normal radar operation the link must be set 1-2.

LK11 – Radar Video Input Termination:
75ς Termination Fitted 1 – 2
No Termination Fitted 2 – 3
50ς Termination Fitted 3 – 4

The 'no termination' option should only be used if a short "T" connection is made to an already terminated cable.

LK12 – Radar Video Input Amplitude:
Amplitude 1V Fitted 1 - 2
Amplitude 5V Fitted 2 – 3
Amplitude 3V Fitted 3 – 4

Typical settings for Radar video configuration links: (Default setting)

3V negative video, terminated in 75ς

Video input, negative	LK11	LK12	LK9	LK10
3V nominal, 75ς	1-2	3-4	1-2	1-2

TRIGGER INPUT (Link Settings)

LK13 – Coaxial Trigger Input Termination:
75ς Termination Fitted 1 – 2
No Termination Fitted 2 - 3
50ς Termination Fitted 3 – 4

The 'no termination option' should only be used if a short "T" connection is made to an already terminated cable.

LK17 – RS422 Trigger Input Termination:
No Termination Fitted 1 – 2
120ς Termination Fitted 2 – 3

The 'no termination' option should only be used if a short "T" connection is made to an already terminated cable.

LK22 – Radar Trigger Simulated Trigger:
This link selects either the radar trigger, or the internally generated simulated trigger.
Simulated Trigger Fitted 1 – 2
Radar Trigger Fitted 2 – 3

The simulated trigger is a service aid. For normal radar operation the link **MUST** be set 1-2.

LK25 –Trigger Input Polarity:
Negative Polarity Fitted 1 – 2
Positive Polarity Fitted 2 – 3
For negative polarity, the timing reference is valid on falling edge of the pulse.
For positive polarity, the timing reference is valid on rising edge of the pulse.

LK24, LK31, LK36 –Trigger Delay
These links are used to select the delay between the trigger input and the trigger output of the RSIU.

Trigger Delay	LK24	LK31	LK36
Minimum Delay	2-3	2-3	1-2
230ns – 2.3us	1-2	2-3	2-3
2.3us – 20us	1-2	1-2	2-3

LK27 – Trigger Input Amplitude:
Amplitude 2V - 10V Fitted 1 – 2
Amplitude 10V – 24V Fitted 2 – 3

LK32, – Trigger Source:
These two links select between coaxial, or RS422 trigger input
Coaxial Input Fitted 1 – 2
RS422 Input Fitted 2 – 3

Typical setting for Radar Trigger configuration links: (Default setting)

For 8 to 24volt positive going pulsed inputs, (leading edge indicating $T_{0)}$, and 75ς termination required, and no delay introduced.

Display Trigger	LK13	LK27	LK25	LK32	LK24	LK36	LK22
Positive, 8-24V, 75R	1-2	2-3	2-3	1-2	2-3	1-2	2-3

MIS TRIGGER INPUT (Link Settings)

LK23 – MIS Trigger Input Termination:
75ς Termination Fitted 1 – 2
No Termination Fitted 2 – 3
50ς Termination Fitted 3 – 4

The 'no termination' option should only be used if a short "T" connection is made to an already terminated cable.

LK26 –MIS Trigger Input Polarity:
Negative Polarity Fitted 1 – 2
Positive Polarity Fitted 2 – 3

For negative polarity, the timing reference is valid on the falling edge of the pulse.
For positive polarity, the timing reference is valid on the rising edge of the pulse.

LK28 – MIS Trigger Input Amplitude:
Amplitude 2V - 10V Fitted 1 – 2
Amplitude 10V – 24V Fitted 2 – 3

Typical settings for MIS Trigger configuration links: (Default setting)

For 8 to 24volt positive going pulsed input, and 75ς termination required.

MIS Trigger	LK23	LK28	LK26
Positive, 8-24V, 75ς	1-2	2-3	2-3

FUTURE OPTION LINK

LK30 –For future option:
Normal Fitted 1 – 2

Configuration Link functions:

Link	Function	Options	Default
1	ATE Link	Always fitted	In
2	Test Link	Used for factory test only.	Out
3	Azimuth	Enable or disable PLL	2-3
4	Azimuth	Source selector, (including Simulated)	1-2
5	Azimuth	8192 to 4096 or PLL o/p	2-3
6	Azimuth	4096 direct or scaled	2-3
7	Azimuth	Frequency multiplier	2-3
8	Heading Marker	Source selector	1-2
9	Video i/p	Input Video Polarity selector	1-2
10	Video i/p	Normal/simulated selector	1-2
11	Video terminate	50/75/high impedance selector	1-2
12	Video i/p	High/medium/low gain select	3-4
13	Trigger terminate	50/75/high impedance selector	1-2
14	Azimuth	Ac or dc input selector	2-3
15	Azimuth RS422	RS422 terminator in/out	2-3
16	HM RS422	RS422 terminator in/out	2-3
17	Trigger RS422	RS422 terminator in/out	2-3
18	Azimuth	Polarity selector	2-3
19	Azimuth	High/low level i/p select	2-3
20	Azimuth Test	Slow/fast selector	2-3
21		Not fitted	
22	Trigger	Normal/simulated selector	2-3
23	MIS terminate	50/75/high impedance selector	1-2
24	Trigger	Delay Selector	2-3
25	Trigger I/p	Polarity selector	2-3
26	MIS i/p	Polarity selector	2-3
27	Trigger I/p	High/low level i/p select	2-3
28	MIS i/p	High/low level i/p select	2-3
29	HM from Synchro	Source selector	2-3
30	Azimuth Scaling	Local/Remote Y-Counter	1-2
31	Trigger delay	Short/long delay selector	1-2
32	Trigger input	Pulse/RS422 selector	1-2
33	HM input	High/low level i/p select	2-3
34	HM input	Input signal polarity selector	2-3
35	HM input	Input Bias polarity selector	None
36	Trigger delay	Delay enabled Selector	1-2

TABLE 1 – List of Customer Settable Links, with default settings

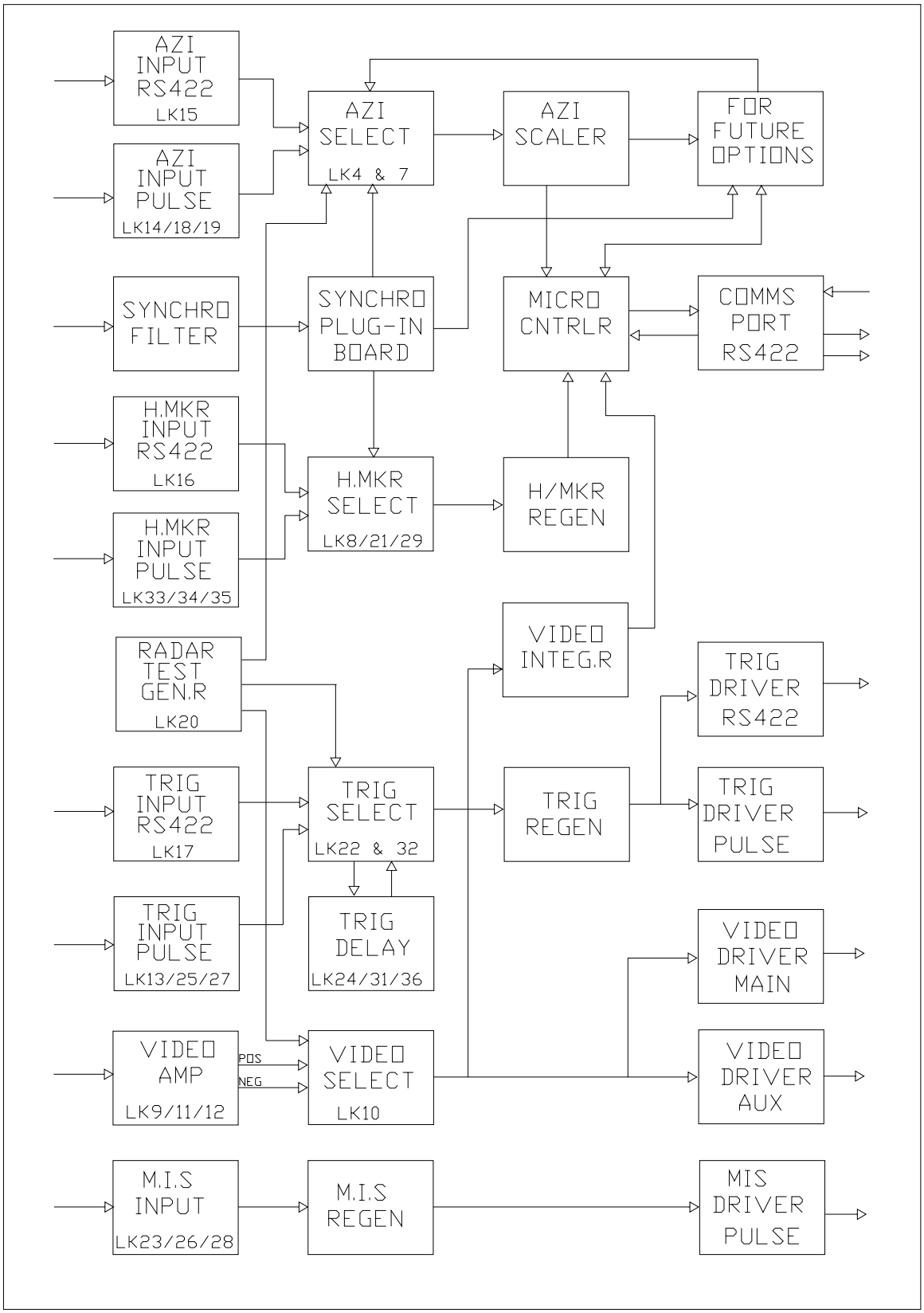


Figure 7.6 - Functional Block Schematic

Showing programming links against the relevant sub-sections

SA, SB, SC, SD –Phase Lock Loop Multiplier Divider Ratios:
The following only applies when LK3, 5 and 6 are all set 2-3.
A "1" in the tables indicates the switch is set to ON.

These switches set the multiplication and division ratios for the phase lock loop.
The input pulses per rev are multiplied by the (binary number+1) set by SA and SB (Y multiplier), the result is then divided by the (binary number+1) set by SC and SD (X divider). The setting of the multiplication and division ratios must be such that the result is 4096.

Ideally the result of multiplying the input by the value set by SA and SB should be 184320, which represents an input to phase lock loop of 368640 pulses per rev.

For example consider an input of 360ppr; 184320/360=512. This would be the (1+binary number to be set by SA and SB).

Then 184320/4096=45. This would be the (binary number +1) set by SA and SB.
So SA, SB setting would be 511, and SC, SD setting would 44.

For example.

Switch:	SA								SB			
Factor	1 (LSB)	2	3	4	5	6	7	8	1	2	3	4 (MSB)
512	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF

Switch:	SC								SD			
Factor	1 (LSB)	2	3	4	5	6	7	8	1	2	3	4 (MSB)
45	OFF	OFF	ON	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF

Some typical values are.

Input PPR	Output PPR	SA-SB Value	Factor	SC-SD Value	Factor	Input to PLL PPR
48	4096	3839	3840	44	45	368640
80	4096	2303	2304	44	45	368640
90	4096	2047	2048	44	45	368640
96	4096	1919	1920	44	45	368640
180	4096	1023	1024	44	45	368640
360	4096	511	512	44	45	368640
464	4096	255	256	28	29	237568

General Notes
The phase-locked loop should desirably operate at 368640 pulses per rev, and the absolute frequency and the filter bandwidth are then set according to the scanner rpm.

Some typical factors for switch settings are:

Switch:	SA (or SC)								SB (or SD)			
Factor	1 (LSB)	2	3	4	5	6	7	8	1	2	3	4 (MSB)
45	0	0	1	1	0	1	0	0	0	0	0	0
48	1	1	1	1	0	1	0	0	0	0	0	0
675	0	1	0	0	0	1	0	1	0	1	0	0
720	1	1	1	1	0	0	1	1	0	1	0	0
512	1	1	1	1	1	1	1	1	1	0	0	0
1024	1	1	1	1	1	1	1	1	1	1	0	0

SE –Phase Lock Loop Range:
These switches select the operating frequency range and filter bandwidth of the phase lock loop.
A “1” in the tables indicates the switch is set to ON.
The settings are dependant on the antenna rotation rate, and assume that the setting for SA through SD results in the input to the phase lock loop being 38640 pulse per rev.

Antenna Speed rpm	SE			
	1	2	3	4
5 to 12	1	1	1	1
10 to 25	0	0	1	1
15 to 35	1	1	0	1
20 to 45	0	1	0	0
25 to 55	1	0	0	0
35 to 60	0	0	0	0

If the input to the phase lock loop is not 368640 as in the case of 464 pulse per antenna rotation the required setting for SE may differ from that listed in the table.

As the input to the phase lock loop is less than 368640 pulses per revolution SE1-3 need to be set for a lower antenna speed.

To optimize the settings for SE1-3 where the input to the phase lock loop is not 368640 ppr:
With the antenna rotating, monitor the voltage at TP19 and change the settings on SE13 to set the voltage as close to 2.5V as possible.

Transceiver Configuration Settings

STX –Transceiver Type:
STX sets into the RSIU data regarding the transceiver type to which it is connected.
See table below:

STX	SWITCH-OFF	SWITCH-ON
1	S-Band	X-Band
2	25kW (or 30kW)	10kW
3	BridgeMaster Transceiver *	Non- BridgeMaster Transceiver
4	Decca Transceiver *	Non Decca Transceiver
5	Not used at present	Not used at present
6	Not used at present	Not used at present
7	Not used at present	Not used at present
8	Input Heading Marker	Simulated Heading Marker (Test only)

Note * - The distinction between “BridgeMaster” and “Decca” transceivers is defined by the presence of a “TX-Status“ communication signal which is only present in the BridgeMaster I and II transceivers. Earlier Decca transceivers (such as solid state and Master series) have the same polarity pulse length and standby transmit signals and can be connected to generate valid tellback data to the display.

The software takes the BridgeMaster signal as priority, so if ‘3’ is off and ‘4’is on, the system will recognise this as valid. Non-Decca configuration only applies if ‘3’ & ‘4’ are both on.

Error and Indication LEDs

There are seven LEDs mounted on the Logic Board, and one on the Power Supply Board. The latter is a yellow LED and indicates the presence of primary power (ac or dc, whichever applies)

The LEDs on the Logic Board are grouped as a set of 5 on the right hand side, and two further single ones towards the left. They are highly useful when commissioning the system.

On the right hand side are:

D23 – Watchdog. This indicates that the program is running and should cycle on and off at approximately 1 second intervals.

D22 – Low Video. This indicates that the video level through the integrator is less than 50% of optimum for the display. It either means that the video input is missing, the selector is set wrongly, or the gain setting is wrong.

D21 – Comms Error This LED should only be lit if there is corrupted data coming from the Display. If the data is either inverted or improperly connected the error

LED will be constantly lit. In high noise environments this may pulse if interference is present.

D20 – HMKR Error This LED will be lit if a heading marker has not been received for at least 20 seconds. It applies to external signals, so if a heading signal is selected to be generated by software, it can only occur if this LED is lit. A genuine input will ALWAYS over-ride the synthetic generated signal, regardless of the position of DIL switch STX bit 8 (grey)

D19 – Bearing error This LED will be lit when no valid bearing signals are being received. This may indicate a wrong setting of LK4, or connection to a turning unit that is stationary. (Note, if the Phase-locked loop is connected in circuit, this LED should never be lit, as the PLL circuit generates a minimum azimuth rate with no external bearing signals being received)

On the left hand side are:

D24 – Heading This LED will pulse on for every genuine Heading Marker pulse received. The pulse will last for about 300ms, to indicate the speed of rotation of the antenna

D18 – Reference This only applies to synchro or resolver board options. If this LED is ever lit it shows that a valid reference signal is not being received by the sub-board(s).

Simulated Radar for Testing

There is included with the board design a radar simulator. This generates azimuth pulses at two speeds, Display Trigger, and a low level video signal. They can be selected individually, but would loose coherence if they were used to generate a 'live' picture.

The azimuth signal is selected by LK4 in position 9-10. Low speed is achieved with LK20 set 1-2. This simulates approximately 7 r.p.m. Changing LK20 to 2-3 simulates about 28 r.p.m. Setting LK7 into position 1-2 will double each of the above, permitting simulation of 7, 14, 28 or 56 r.p.m.

The Display Trigger rate is generated by the programming within U37, as is the video pattern. The video comprises concentric rings superimposed with a 3.6MHz noise level, appearing from 0.5nm up to about 90nm.

The simulated Display Trigger is selected by setting LK22 to 1-2, and the simulated video is selected with LK10 in 2-3.

A software routine to generate heading markers every 4096 bearing pulses is selected by setting DIL switch STX bit 8 (grey) to ON. A feature of the software is that this can only operate when no genuine heading marker input signals are present. Therefore, when simulated headings are being produced via the software, the heading error LED (D20) will be lit and an error bit will <u>always</u> be set within the BIST message.

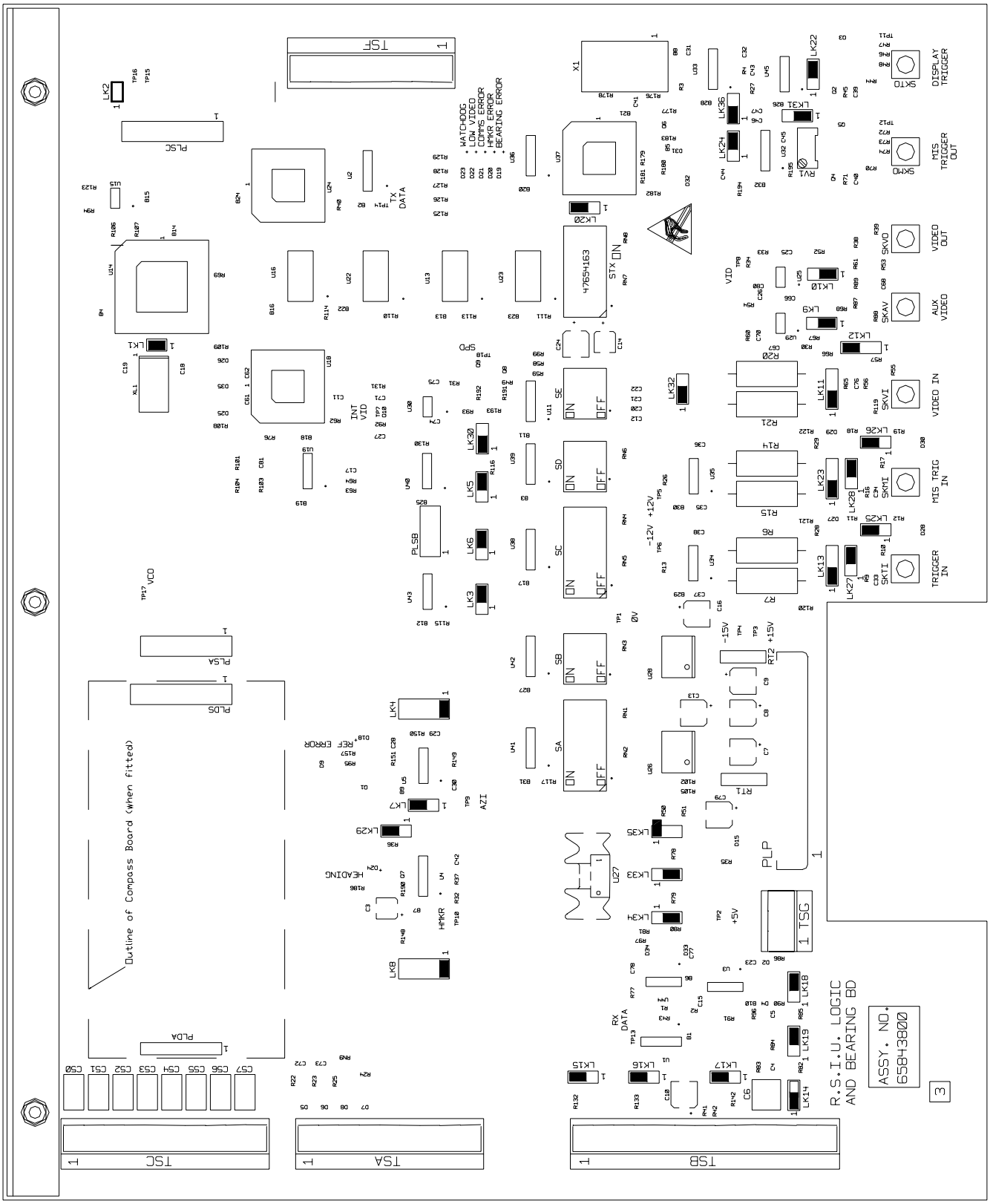


Figure 7.7 - Radar Slave Interface Unit Logic PCB Assembly 65843800

Synchro Compass PCB

LK1 and LK2 -Line to Line Voltage Selector:

Line to Line Voltage		
32V rms – 126V rms	LK1 Fitted	LK2 Not Fitted
9.3V rms – 37V rms	LK2 Fitted	LK1 Not Fitted

LK3 -.Reference Voltage Selector

Reference Voltage	LK3
150V rms	Fitted 2 - 4
115V rms	Fitted 3 - 4
50V rms	Fitted 1 – 2
26V rms	Fitted 1 – 3

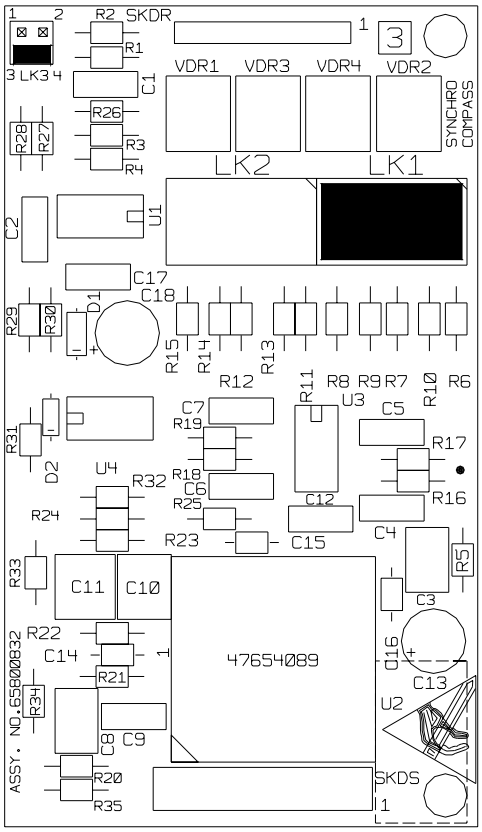
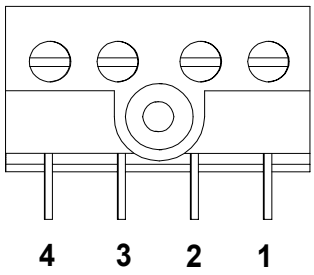


Figure 7.8 - Synchro Compass Board 65800832* and Resolver Compass Board 65800853**

(*Fitted to unit type 65843AF and 65843DF only)
(*Fitted to unit type 65843AG and 65843DG only)



TSP	AC PSU	DC PSU
1	LINE	+VE
2	—	+VE
3	—	-VE
4	NEUTRAL	-VE
E/TAG	EARTH	EARTH

RSIU MAINS INPUT CONNECTIONS

Intentionally blank

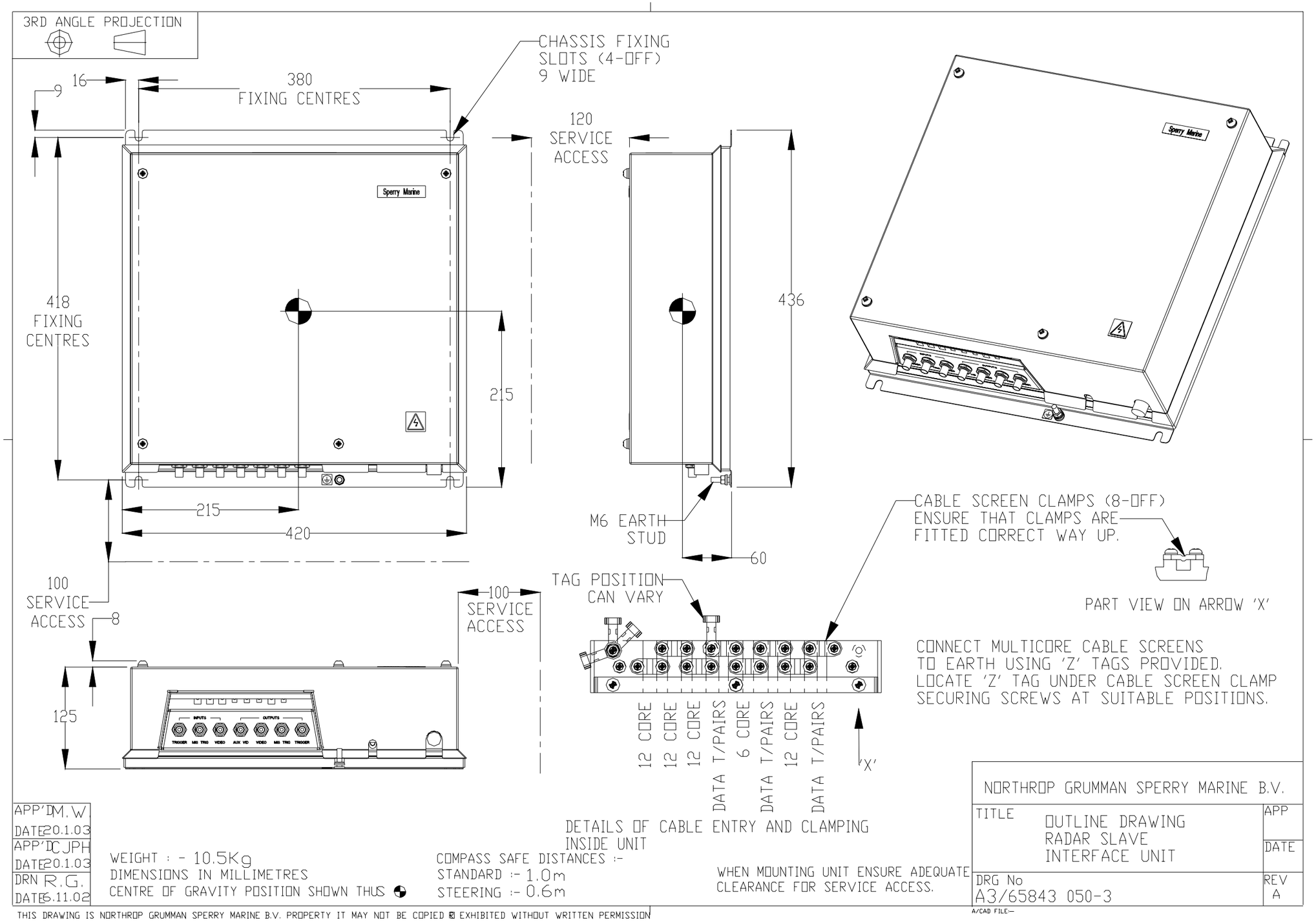


Figure 7.9 - Radar Slave Interface Unit Installation Drawing

TECHNICAL SPECIFICATION

Operation

The Radar Slave Interface Unit operates always as a transparent device between a transceiver operated by a remote control, and a BridgeMaster E display, either directly or through a BridgeMaster E Interswitch Unit. There are no control functions transmitted to, or through, the RSIU to the transceiver, the only control feature being that the RSIU power supply is switched on and off by the Display connected to it. When the RSIU is connected via an Interswitch system, then the RSIU is powered up when the Interswitch Unit is powered up. (This can be over-ridden with a link on the power supply unit, see the link settings in the Installation and Commissioning Notes)

The operation of the RSIU can be understood by referring to the Functional Block Schematic drawing (Figure 7.6). The device comprises a number of “circuit modules” which are interconnected via selector links, to enable the unit to be customised to accept a bearing input, a heading marker, a Display Trigger and associated Video.

To assist in setting a system to work, a small radar synthesizer is incorporated into the design, but this is only for commissioning use and system test and diagnosis.

Circuit Description

Both the bearing and heading marker inputs have two input options. Either a balanced pair (RS422) input can be used, with optional terminators fitted to the Logic Board, or a single ended analog input is accepted through an alternative connection. The interface for the analog signal has a high or low input setting (for 1 to 5 volt, or 4 to 20 volt signals), and a polarity selector. Additionally the heading marker has an optional positive or negative bias selectable, for use when volt-free contacts are the only input source.

The Display and Mutual Interference Suppression Trigger inputs have the same high and low input selection and polarity options, and in addition have 50 ohm or 75 ohm terminations to match the coaxial cable run, selectable through further link options.
Additionally the Display trigger has a balanced pair RS422 input option, with optional 120ς terminations .

The Video input has similar impedance matching for the coaxial input, but the first stage of the interface has three gain settings, to suit nominal 1 volt, 3 volt or 5 volt peak input signals. (A continuously variable gain control is not required as the BridgeMaster E Display has a wide tolerance to input signals, but expects a nominal 3 volt peak video). Once the first stage gain is selected, there is an optional unity gain inversion stage, to allow for positive or negative input video, before finally feeding the video integrator and the output driver.

When the turning unit azimuth data is from a synchro source, a daughter board is required which fits on the connectors PLDA and PLDS. This is usually the same board as is fitted within the Display units for synchro compass inputs, type number is 65800832, and it is described elsewhere within the BridgeMaster E documentation. This extracts the azimuth signals from the least significant bit of the 12-bit output, generating 2048 pulses per revolution. The heading marker reference is (usually) extracted using the most significant bit of the same output.

Features for further daughter board options have been designed into the Logic Board but they will be described, by supplements, as and when fitted.

Once the input options have been configured for the appropriate configuration, the chosen inputs must then be routed into the remainder of the system by selection links (listed in the link table within the Installation and Commissioning section). In the case of the azimuth selection, this is a 5-way selection option, depending on whether the source is from analog, RS422, synchro, relative azimuth (derived from absolute via an extra daughter board) or from the simulator. [When the azimuth source is 2048 ppr, an extra frequency doubler stage is invoked by setting LK7 to 1-2, otherwise it is set at 2-3].

The heading marker selection is also done with a 5-way selection at LK8. This has the option of selecting analog true or inverted, RS422 or synchro. The fifth option is a parked position to enable simulated headings to be generated by removing any external input. A visible indication of the heading marker presence is fitted on LED D24 as an aid due to the low repetition rates often encountered. The absence of any heading input is displayed on error LED D20.

The Display Trigger selection between analog and RS422 is done at LK32. Then the optional trigger delay is incorporated or not, according to requirements, first by selecting the input to the 1µsec output monostable, using LK24. If the system requires minimal delay, then LK36 must be set to the normal position (1-2), otherwise it is left in the delayed setting. The regenerated Trigger is then selected using LK22. When a delayed trigger is required, the Trigger regeneration monostable is fired from the output from the delay monostable, selected at LK24, and this has the options of a short or long delay, selected by LK31.

The setting up procedure for the delayed trigger is as follows. It is recommended that the delay adjustment within the BridgeMaster E Display is first checked to see if sufficient range exists without using any extra from the RSIU. This is accessed on the screen via SYSTEM and then TX SETTINGS. If sufficient range is not available, then it is suggested that the internal delay is set at mid range, which is about 200, and then adjust RV1 on the RSIU to obtain a delay of the right order, preferably looking at a live picture. The final setting is then done using the adjustment on the Display, which has the finer resolution.

An additional option is available on all of the RS422 inputs, by the provision of a 2volt bias signal on connector TSB. This permits the balanced inputs of the RS422 receivers to be used in single-ended mode (RS423), and selection of the used and biassed inputs in each case enables the commissioning engineer to select true or inverted response from the single-ended signal.

Finally, the simulator is purely a crystal oscillator feeding a binary counter, with the outputs being fed through a Programmable Logic Array to generate the Display Trigger and Video signals. Two convenient outputs from the counter also provide a low or high speed azimuth signal at LK20. [Note, by use of LK7 it is possible to increase the speed options to four, and thus it is possible to simulate video at approximately 7, 14, 28 or 56 rpm.]

One other facility is the phase-locked loop azimuth scaler. This uses a voltage controlled oscillator to generate a multiple of the incoming azimuth signal frequency, which is then divided down via a presettable “down counter” (called the “Y” counter) to stay in phase with the incoming azimuth signals. The multiplied frequency is simultaneously divided down through a second “down counter” (called the “X” counter) to produce a 4096 ppr source for the microprocessor. The last stage of the X counter is a straight divide by two, to create symmetric signals into the micro-controller (as the actual output from the X counter can have a very low duty cycle), and this last stage can be used independently of the phase-locked loop circuit if the transceiver has azimuth signals of 4096 or 8192 ppr. Selection is done using LK5 and LK6.

The logic board is powered primarily from the ± 15 volt, and +5volt logic supplies from the power supply. Sufficient power is available to power additional peripherals, provided that they only require ± 15 volts.

Technical Specification

RSIU Interface to Display Unit

Serial Data to Display. RS422 differential signal at a data rate of 76.8Kbaud and a message rate derived from the Turning Unit azimuth signal. This generates 4096 bytes of data per revolution of the antenna.

Serial Data from Display. RS422 differential signal at a data rate of 76.8Kbaud, the serial messages are initiated by a timed scheduler within the Display software.

Display Trigger Output. An RS422 differential signal carrying a Pulse of Width 0.1 to 10 µs. The leading edge of the pulse indicates To.

Video Output. Negative video, 3V nominal peak into 75Ω termination, 40MHz bandwidth, shoulder noise 0.25V.

RSIU Interface from Host Radar

Video Input

Amplitude	1V, 3V, 5V (nominal peak into the selected termination)
Polarity	Positive or negative. (link selectable)
Format	Preferably logarithmic. (performance may be degraded with linear video).
Shoulder Noise	10% of peak for optimal display perfomance.
Input Impedance Options	High (<2K), 75ς or 50ς (link selected).

Display Trigger

Amplitude (analogue I/P)	2Vmin	24Vmax (when terminated in selected termination)
(RS422)		Std levels
Polarity		Positive or negative.
T_0		Defined by the leading edge. (to ensure correct timing display trigger should lead video by 70ns min)
Trigger Duration		100ns min 10µs max.
Input Impedance Options		High (<2K), 75ς or 50ς (link selected).
(RS422)		High, or 120ς
Internal Delay Adjustable		0.5us min 20us max
Minimum Fixed Delay		50ns max

Maximum Duty Cycle to limit input power to 1W when terminated in 75 or 50 ohms.

Bearing

Facilities to accept various types of bearing transmission are included.

DIL switches permit the selection of the correct phase-locked-loop scaling factors, to generate 4096 azimuth pulses per revolution from the input., and links select the type and amplitude of the input.

Antenna Speed	6rpm min	60rpm max (including instantaneous variations

A Pulse or Sinusoidal Input: **(Note: not available on units Ser. Nos 100003973/1 to 4 and 100004041/1 to6)**

Pulses/Cycles Revolution	48 to 8192 (not all ratios are acceptable)
Amplitude	
Sinewave	4 to 20V p to p
Pulse	2 to 24v pulse, positive or negative (w.r.t. ground)
RS422	Std Levels
Duration Pulse	20us min
Mark Space Ratio(RS422)	Better than 1.5:1.
Input Impedance	
Pulse/Sinewave	>1kς
RS422	High, or 120ς

B Synchro Input, or Resolver Input:
From 1:1 Ratio, 3-phase synchro, (reference externally supplied)

Line to Line Voltage	9.3V rms min	37V max or
	32V rms min	126V max (link selectable)
Frequency	50hz, 60hz, 400Hz, 1000hz	
Input Impedance	>100kς	
Reference Voltage	26V rms nom.	
	50V rms nom	
	115V rms nom	
	150V rms nom	
Frequency	50hz, 60hz, 400Hz, 1000hz	
Input Impedance	>100kς	

Heading Marker

To accept either:

Type
Closing Contact to 0V, **(Note: not available on units Ser. Nos 100003973/1 to 4 and 100004041/1 to 6)**

Current Loading	10mA max
Bias Voltage	±15V max (Polarity selectable by link).
Closure Time	1ms minimum

Pulse **(Note; not available on units Ser. Nos 100003973/1 to 4 and 100004041/1 to 6)**

Amplitude	2V min	10V max (link selectable)
	10V min	24V max

Polarity	Positive or negative. (link selectable)
RS422	Std levels
RS423	1.8V min
Duration	2us min
Timing Reference	Leading edge

Synchro or Resolver.
Internally generated from synchro, or resolver azimuth input.

Status inputs

The system can accept the following status input signals as and when available from the transceiver. If they are not present then the RSIU will, when suitably configured, generate suitable response information to the Display and not generate alarm messages.

Input Parameters

High	+2.4Vmin	40V max
Input Current	<20uA	
Low		0.6V max
Sink Requirement	5mA min	

Standby/Transmit.

Sense	Low = Transmit
Default no Connection	Standby
Default (non Decca)	Transmit

Pulse Length

Pulse length control lines:	SP	MP
Long Pulse	High	High
Medium Pulse	High	Low
Short Pulse	Low	High
Default no Connection	Long Pulse	
Default (non Decca)	Display indicates Pulse not available	

AFC/Manual

Low	Manual

Tune Indicator
An analogue input between 0V and +5V, when available from the transceiver. Insertion of a link to 0V will cause the Display to indicate no tuning status at all.

The RSIU assumes that when the transceiver is a non-Decca type, it generates a tune indication by integrating the radar peak video signal. This generates a measure of the performance based upon the premise that the stronger the video signal, the nearer the system is to optimum tune. The resultant signal is digitised by the ADC and used instead of the direct tune input. Whichever source is used, the selected value is then encoded serially in order that it is recognised by the BridgeMaster E Display.

Amplitude	0V min	5V max
Input Resistance	>10kς	

Power Supplies

Inputs:

Single Phase A.C. input

Input Voltage	115V nom (link selectable) 230V nom
Tolerance	±20%
Frequency	47Hz min 64Hz max
Power	Dependant on external load.
Over-voltage Transients	40% above nominal for 1 sec max without causing damage. At or above this level, the input fuse may blow..
Pulsed transients	± 1200V peak, rise time 2 to 10us, duration ≤20us. Common or differential mode.
Under-Voltage	Mains dropout is monitored and may cause the system to reset.
Low Voltage DC Input	21.6V - 32V measured at the compatibility unit input.
Over-Voltage Transients	Voltages over 51V will cause an automatic shutdown.
Pulse Transients	Symmetrical (line-line): 500V, source impedance 12Ω, rise/fall time 100ns, duration 10μs. Line-ground: 500V, source impedance 12Ω, rise/fall time 100ns duration 60μs.
Reverse Protection	Provision is to made to protect against reversal of the external supply. This may cause a fuse to blow.
Under-Voltage	DC input dropout is monitored and may cause the system to be reset.

Outputs:

+15V	+15V ± 10%. at 1.5A max
-15V	-15V ± 10%. at 100mA max

Internal Circuit Power Supplies

+15V	+15V ± 5%. at 100mA max
+5V	+5V ± 5% at 250mA max
-15V	-15V ± 5%. at 50mA max

Outputs:

+15V	+15V ± 10%. at 1.5A max
-15V	-15V ± 10%. at 100mA max
+24V	+24V ± 20% at 2A mean (4.6A peak).

Internal Circuit Power Supplies

+15V	+15V ± 5%. at 100mA max
+5V	+5V ± 5% at 250mA max
-15V	-15V ± 5%. at 50mA max
+36V	+36V ± 5% at 50mA max

ENVIORNMENTAL SPECIFICATION

Temperature
Operating -15°C to +55°C
Storage -25°C to +70°C

Relative Humidity
95% at 40°C (non condensing)

Weights and Dimensions

	Height (mm)	Depth (mm)	Width (mm)	Nominal Weight (kg)
Radar Slave Interface Unit	436	420	130	10.3

Compass Safe Distances

	Standard	Steering
Radar Slave Interface Unit	1.0 m	0.6 m

TCU Power Supply Fuse

AC PSU
5 Amp, 31mm, Ceramic Body, Antisurge
Code Number: 2180413

DC PSU
5 Amp, 31mm, Ceramic Body, Antisurge
Code Number: 2180413

APPENDIX A - SETTING UP RECORD SHEET

Link	Function	Options	Std.	Record.
1	ATE Link	Always fitted	In	
2	Test Link	Used for factory test only.	Out	
3	Azimuth	Enable or disable PLL	2-3	
4	Azimuth	Source selector, (including Simulated)	1-2	
5	Azimuth	8192 to 4096 or PLL o/p	2-3	
6	Azimuth	4096 direct or scaled	2-3	
7	Azimuth	Frequency multiplier	2-3	
8	H. Marker	Source selector	1-2	
9	Video i/p	Input Video Polarity selector	1-2	
10	Video i/p	Normal/simulated selector	1-2	
11	Video terminate	50/75/high impedance selector	1-2	
12	Video i/p	High/medium/low gain select	3-4	
13	Trigger terminate	50/75/high impedance selector	1-2	
14	Azimuth	Ac or dc input selector	2-3	
15	Azimuth RS422	RS422 terminator in/out	2-3	
16	HM RS422	RS422 terminator in/out	2-3	
17	Trigger RS422	RS422 terminator in/out	2-3	
18	Azimuth	Polarity selector	2-3	
19	Azimuth	High/low level i/p select	2-3	
20	Azimuth Test	Slow/fast selector	2-3	
22	Trigger	Normal/simulated selector	2-3	
23	MIS terminate	50/75/high impedance selector	1-2	
24	Trigger	Delay Selector	2-3	
25	Trigger I/p	Polarity selector	2-3	
26	MIS i/p	Polarity selector	2-3	
27	Trigger I/p	High/low level i/p select	2-3	
28	MIS i/p	High/low level i/p select	2-3	
29	HM source	Synchro Source selector	2-3	
30	Azimuth Scaling	Local/Remote Y-Counter (NNF)	1-2	
31	Trigger delay	Short/long delay selector	1-2	
32	Trigger input	Pulse/RS422 selector	1-2	
33	HM input	High/low level i/p select	2-3	
34	HM input	Input signal polarity selector	2-3	
35	HM input	Input Bias polarity selector	None	
36	Trigger delay	Delay enabled Selector	1-2	

Switch:	SA OFF/ON								SB OFF/ON			
Factor	1 (LSB)	2	3	4	5	6	7	8	1	2	3	4 (MSB)

Switch:	SC OFF/ON								SD OFF/ON			
Factor	1 (LSB)	2	3	4	5	6	7	8	1	2	3	4 (MSB)

Antenna Speed rpm	SE OFF/ON			
	1	2	3	4
5 to 12				
10 to 25				
15 to 35				
20 to 45				
25 to 55				
35 to 60				

STX OFF/ON							
1 (LSB)	2	3	4	5	6	7	8

CHAPTER 8

ANCILLARY UNITS

SLAVE JUNCTIONBOX

65849A

CONTENTS

Figures

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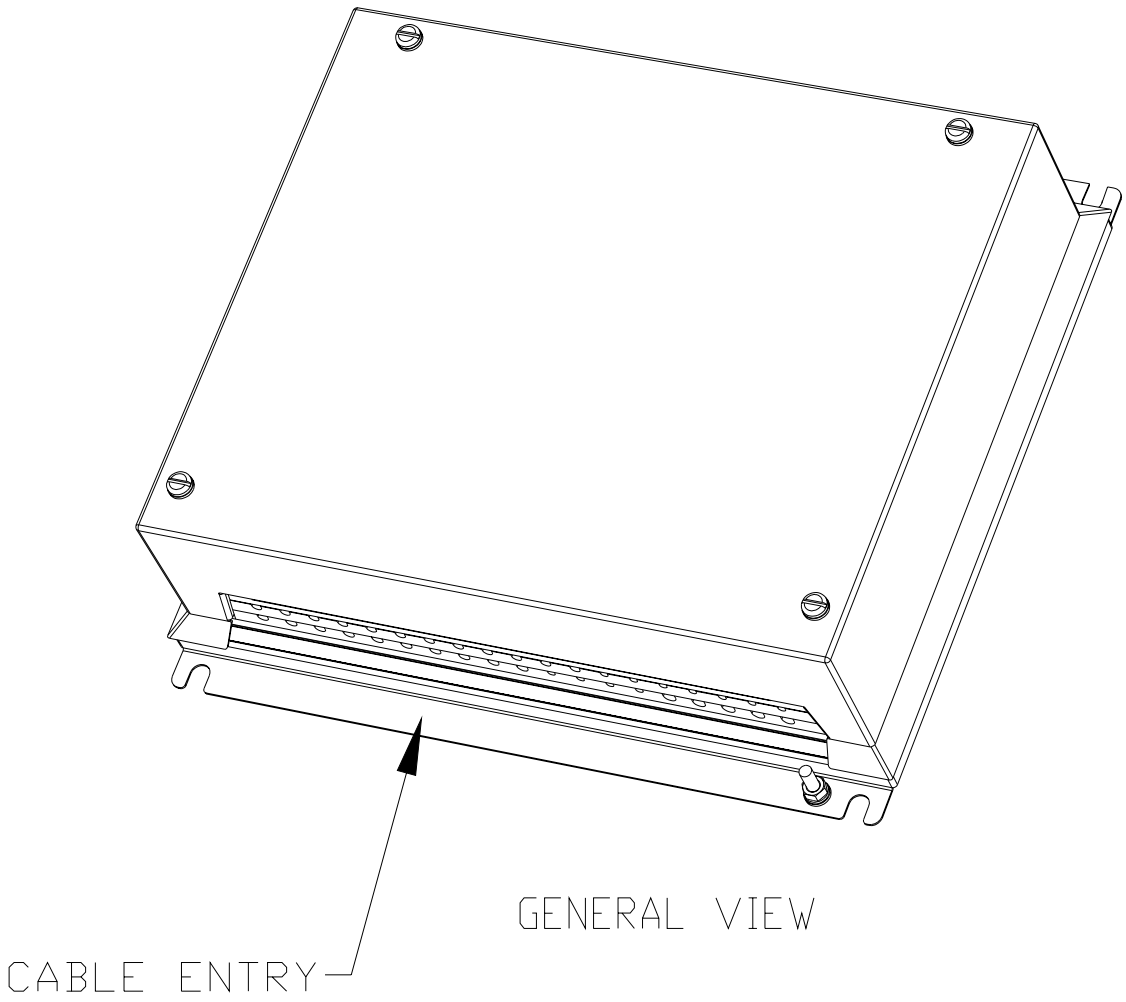


Figure 8.1 – Slave Junction Box – General View

GENERAL DESCRIPTION

The Slave Junction Box is used as part of a Marine Radar System for installation below decks.

The Slave Junction Box allows up to 3 slave radar displays to be connected to a radar transceiver, in addition to the master display. It also allows for the buffering of Mutual Interference Suppression Triggers (MIST) to these displays (only required in multi-transceiver systems). Provision is also made for Log, Nav and Compass cable distribution to the displays (non-buffered).

Connections between the transceiver and master display are not buffered, ensuring the highest integrity of communication between these units in the event of a fault condition arising in the Slave Junction Box. In the event of the master display malfunctioning, it can be replaced by re-connecting, (by transferring the connectors), a slave display in its place in the Slave Junction Box.

Power for the Slave Junction Box is derived from the Master Display.

A Despatch Kit, 65849600, contains all necessary fixings and connectors.

SYSTEM CONFIGURATION

Slave Junction Box Hardware Configuration

There are no hardware configuration links or switches needed on the Slave Junction Box PCB

INSTALLATION

Refer to the Installation Drawing A3/65849050, contained in this chapter, and Cable Details in Chapter 9 of this manual.

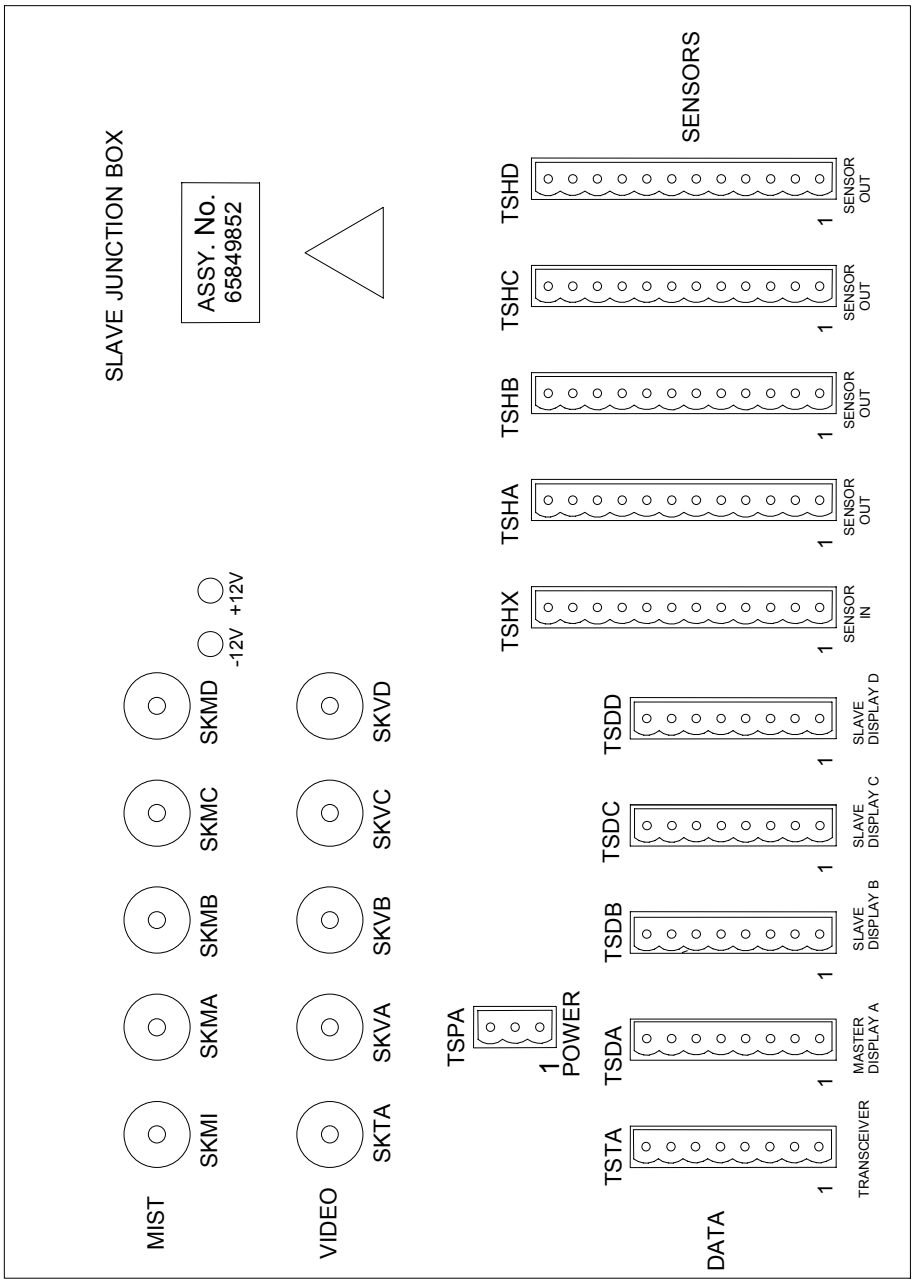


Figure 8.2 – Connector Layout for Slave Junction Box PCB Assembly 65849852

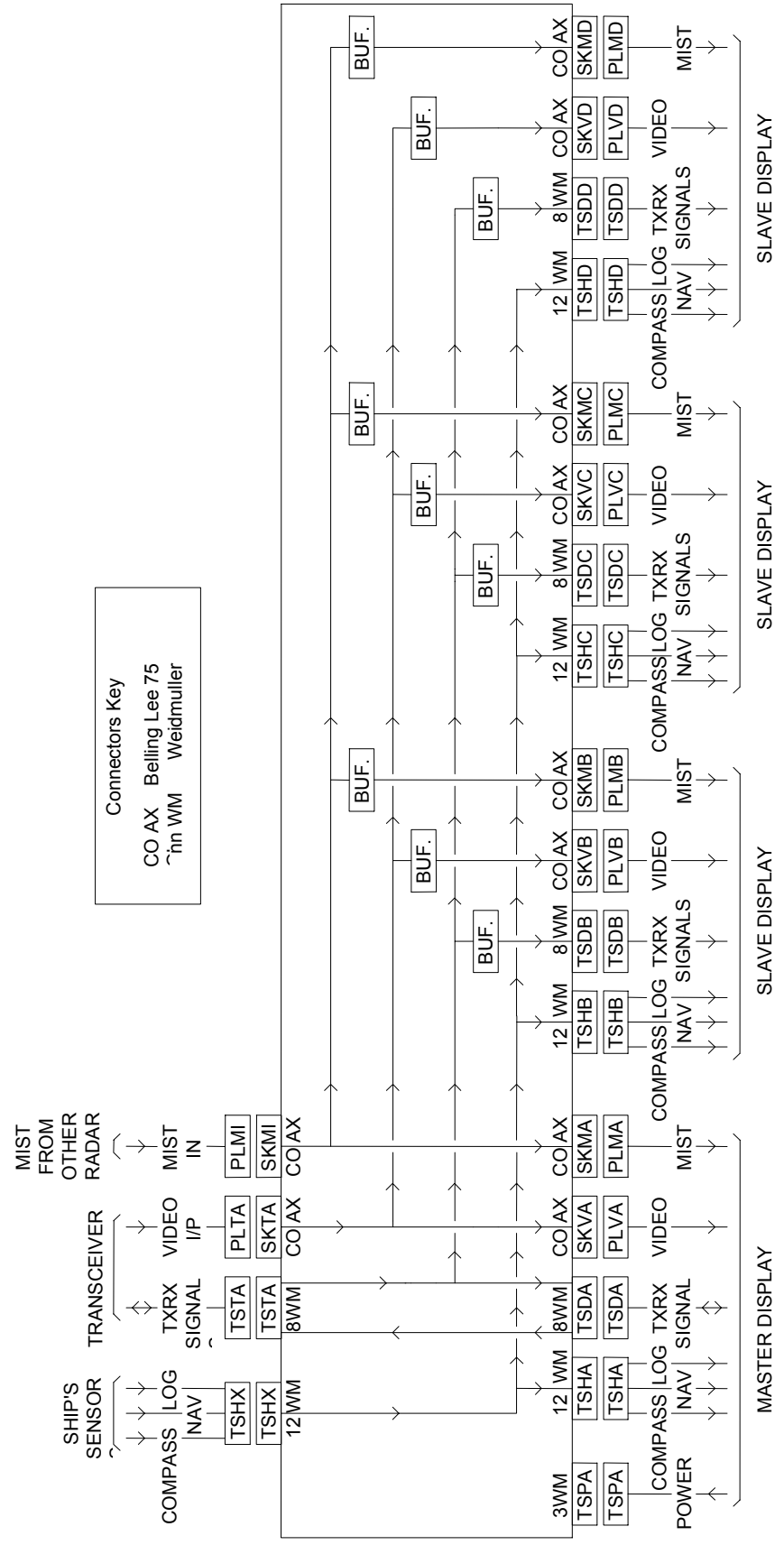
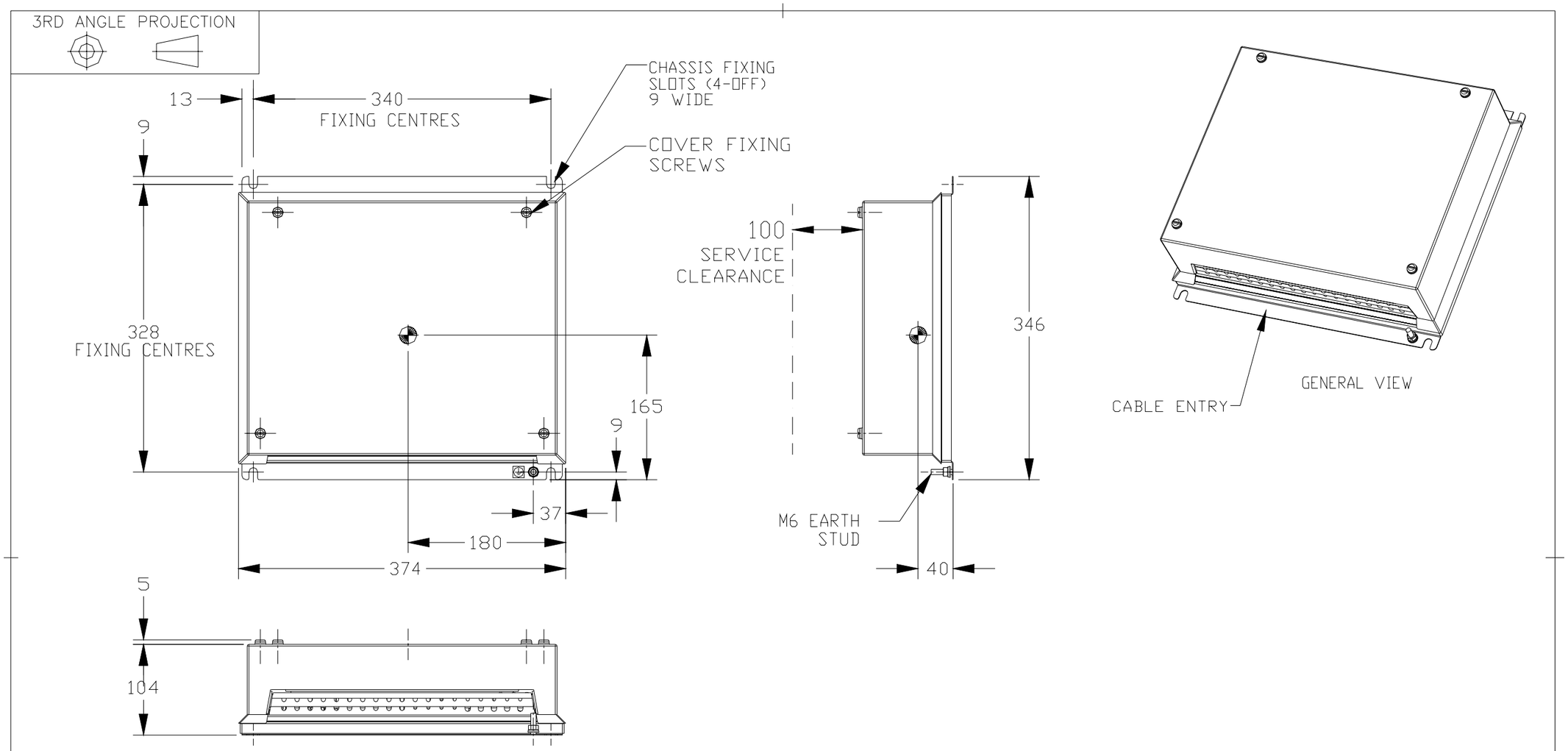


Figure 8.3 – Block Diagram of slave Junction Box PCB Assembly 65849852



SECURE CABLES USING UP TO 31 CABLE SCREEN CLAMPS AND FIXINGS SUPPLIED.

TOP ROW A A A A A A A A A A A B B B B B B B

BOTTOM ROW C C C C C C C C C C B B B B D D D D D

DETAILS OF CABLE ENTRY TO UNIT (SEE TABLE)

SLOT	CABLE	WIDTH SLOT
A	CO-AXIAL	5.0
B	2 CORE	3.8
C	T/PAIRS OR 4 CORE	5.5
D	6 CORE	6.3

WEIGHT :- 5Kg
DIMENSIONS IN MILLIMETRES
CENTRE OF GRAVITY POSITION SHOWN THUS

COMPASS SAFE DISTANCES :-
STANDARD :- 0.9 METRES
STEERING :- 0.6 METRES

WHEN MOUNTING UNIT, ENSURE ADEQUATE CLEARANCE FOR SERVICE ACCESS.

NORTHROP GRUMMAN SPERRY MARINE B.V.

APP'D JJF	TITLE	APP
DATE16.4.99	SLAVE JUNCTION BOX	CJPH
APP'D RJS	OUTLINE DRAWING	DATE
DATE22.4.99		24.7.00
DRN. N.B.	DRG. No.	REV
DATE MAR99	A3/ 65849 050-1	B

A/CAD FILE:- G/PUBLIC/RADAR/BRIDGEMASTER E/65849050

Figure 8.4 – Serial Interface Unit – Installation Drawing

TECHNICAL SPECIFICATION

ENVIRONMENTAL SPECIFICATION

Temperature
Operating -15°C to +55°C
Storage -25°C to +70°C

Relative Humidity
95% at 40°C (non condensing)

Weights and Dimensions

	Height (mm)	Depth (mm)	Width (mm)	Nominal Weight (kg)
Slave Junction Box 65849A	346	109	374	5.0

Compass Safe Distances

	Standard	Steering
Slave Junction Box 65849A	0.9 m	0.6 m

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CHAPTER 9

ANCILLARY UNITS

SYSTEM INTERCONNECTIONS AND CABLING DETAILS

CONTENTS

Figures

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CABLE SCHEDULE ABBREVIATIONS

Refer also to BridgeMaster E Ship's Manual (Publication Ref: 65800010B).

Cabling Schedule Abbreviations

Abbreviation	Meaning
CLR	Colour
COMP	Compass
DCU	Display Compatibility Unit
DP	Distribution Panel – Gyro
DU	Display Unit
E/TAG	Earth Tag
GCU	Gyro Control Unit
ISO	Mains Isolator
ISW	Interswitch Unit
M	Motor – Compass Repeater
PM	Performance Monitor
S/F	Switch/Fuse
SK	Socket
S/TAG	Solder Tag
SCU	Scanner Control Unit
SU	Scanner Unit
SYNCH	Synchro
TCU	Transceiver Compatibility Unit
TU	Turning Unit
TX/RX	Transceiver

CONTROL CABLE INFORMATION

The control cables detailed on the Inter-Unit Cabling diagrams may be used up to a maximum length of 67m, unless otherwise stated.

All cables, apart from the DATA cable, conform to IEC 92/3 and DEF STAN 61-12 Part 5. 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 cable is -25°C to +85°C.

The DATA cable conforms to UL Type CL2, AWM 2919 and CSA PCC FT4.

Service Code	Cable Diameter	Number of Cores	Core Strands/Diameter	Core CSA	Resistance per 1000m (at 20°C)	Current Rating	Voltage (RMS)
	mm		mm	Mm^2	Ω	A	V
TP3141	6.9	2	19/0.2	0.5	40.1	2.5	440
TP3143	7.7	4	16/0.2	0.5	40.1	2.5	440
TP3144	8.7	6	16/0.2	0.5	40.1	2.5	440
TP3145	11.0	12	16/0.2	0.5	40.1	2.5	440
TP3149	10.3	2	37/0.32	2.88	6.79	13	440
TP3150	11.8	4	37/0.32	2.88	6.79	13	440
DATA*	8.4	4 pairs	7/0.2	0.23	-	-	30

* Decca Marine Code Number MA00007419

CABLE CORE COLOUR CODING

a) Multicore Cables

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

b) DATA cable (4 Twisted Pairs)

B/W	Blue/White
W/B	White/Blue
G/W	Green/White
W/G	White/Green

BN/W	Brown/White
W/BN	White/Brown
O/W	Orange/White
W/O	White/Orange

Note: Blue/White is predominately Blue with a narrow white trace, and White/Blue is predominately White with a narrow Blue trace. Similarly with the other pairs.

CO-AXIAL CABLES

Signal Coaxial Cables

The signal cables (co-axial) detailed on the Inter-Unit cabling diagrams may be used up to a maximum length of 67m. These cables are double screened, and have a nominal impedance of 75Ω.

Service Code	Cable Diameter mm	Nominal Impedance Ω	Attenuation at 10MHz DB/100m	Comments
PT1YM	6.0	75	3.9	Double screened, with Mylar insulation between screens

SYSTEM CABLE SCHEDULES

A33

37-3-2R (TP3149) - 2 CORE

DU	FUNCTION	CLR	ISW
TSD1	MOTOR +	R	TSA1
TSD2	MOTOR -	B	TSA2
E/TAG	EARTH (0V)	SCR	E/TAG

A34

16-2-12C (TP3145) - 12 CORE

DU	FUNCTION	CLR	ISW
TSA1	MOD HT	R	TSA3
TSA3	+15V	W	TSA4
TSA4	TX/RX STATUS	Y	TSA5
TSA5	-15 V	B	TSA6
TSA6	0V	BK	TSA7
TSA7	MEDIUM PULSE	BN	TSA8
TSA8	SHORT PULSE	V	TSA9
TSA9	STBY/TRANSMIT	O	TSA10
TSA10	L.O TUNE	P	TSA11
TSA11	AFC/MANUAL	L/G	TSA12
TSA12	TUNE IND	GY	TSA13
TSA13	TX/RX BITE	G	TSA14
E/TAG	EARTH (0V)	SCR	E/TAG

A35

16-2-6C (TP3144) - 6 CORE

DU	FUNCTION	CLR	ISW
TSC1	+15V	R	TSA19
TSC1	+15V	W	TSA19
TSC1	+15V	G	TSA19
TSC2	BEARING	B	TSA20
TSC3	0V	BK	TSA21
TSC4	HEADING MKR	Y	TSA22
E/TAG	EARTH (0V)	SCR	E/TAG

A36

16-2-6C (TP3144) - 6 CORE

DU	FUNCTION	CLR	ISW
TSE3	ISW 1	R	TSA25
TSE4	ISW 2	B	TSA26
TSE5	ISW 3	BK	TSA27
TSE6	ISW 4	Y	TSA28
TSE7	ISW 5	W	TSA29
TSE8	ISW 6	G	TSA30
E/TAG	EARTH (0V)	SCR	E/TAG

SINGLE PHASE
110/120V AND 220/240V SYSTEMS

40

37-3-4R (TP3150) - 4 CORE *

SCU	FUNCTION	CLR	TU
TRIP 6	AC LINE	R	TSC1
TRIP 2	AC NEUTRAL	B	TSC2
TRIP 6	AC LINE	G	TSC1
TRIP 2	AC NEUTRAL	Y	TSC2
E/TAG	EARTH (0V)	SCR	E/TAG

THREE PHASE
110/120V AND 220/240V
380/440V SYSTEMS

40

37-3-4R (TP3150) - 4 CORE

SCU	FUNCTION	CLR	TU
TRIP 2	AC LINE 1	R	TSC1
TRIP 4	AC LINE 2	B	TSC2
TRIP 6	AC LINE 3	Y	TSC3
-	NOT USED	G	-
E/TAG	EARTH (0V)	SCR	E/TAG

Warning: It is important that the earth connection is made as this is the safety earth.

41

16-2-2C (TP3141) – 2 CORE

TU	FUNCTION	CLR	SCU
TSB12	MOTOR +	R	SA N
TSB3	MOTOR -	B	TSA1
E/TAG	EARTH (0V)	SCR	E/TAG

SINGLE PHASE
110/120V AND 220/240V SYSTEMS

43 37-3-4R (TP3150) - 4 CORE *

S/F	FUNCTION	CLR	SCU
-	AC LINE	R	SA T
-	AC NEUTRAL	B	SA S
-	AC LINE	G	SA T
-	AC NEUTRAL	Y	SA S
E/TAG	EARTH (0V)	SCR	E/TAG

* TP3149 may be used for 220/240 V Supplies

THREE PHASE
110/120V AND 220/240V
380/440V SYSTEMS

43 37-3-4R (TP3150) - 4 CORE

S/F	FUNCTION	CLR	SCU
-	AC LINE 1	R	SA R
-	AC LINE 2	B	SA S
-	AC LINE 3	Y	SA T
-	NOT USED	G	-
E/TAG	EARTH (0V)	SCR	E/TAG

A44 16-2-6C (TP3144) - 6 CORE

TU	FUNCTION	CLR	ISW
TSB3	EARTH	BK	TSA52
		R	
TSB4	BEARING	B	TSA51
		G	
TSB1	HEADING MKR	Y	TSA50
		W	
E/TAG	EARTH (0V)	SCR	E/TAG

A45 16-2-12C (TP3145) - 12 CORE

TU	FUNCTION	CLR	ISW
TSA1	MOD HT	R	TSA33
TSA3	+15V	G	TSA34
TSA3	+15V	L/G	TSA34
TSA4	+15V	B	TSA45
TSA4	+15V	W	TSA45
TSA5	-15V	Y	TSA36
TSA6	EARTH	BK	TSA37
TSA7	MEDIUM PULSE	BN	TSA38
TSA8	SHORT PULES	V	TSA39
TSA9	STBY/TRANSMIT	LO	TSA40
TSA10	L.O TUNE	P	TSA41
		GY	
E/TAG	EARTH (0V)	SCR	E/TAG

A46 37-3-2R (TP3149) - 2 CORE

SCU	FUNCTION	CLR	ISW
SA N	MOTOR +	R	TSA31
TSA1	MOTOR -	B	TSA32
E/TAG	EARTH (0V)	SCR	E/TAG

B51 PT1YM - 75Ω CO-AX

ISW	FUNCTION	CLR	DCU
SKB7	TRIGGER	-	SKT

B52 PT1YM - 75Ω CO-AX

ISW	FUNCTION	CLR	DCU
SKB8	VIDEO	-	SKV

B53 16-2-6C (TP3144) – 6 CORE

ISW	FUNCTION	CLR	DCU
TSB49	+15V	R	TSC1
TSB49	+15V	B	TSC1
TSB50	BEARING	G	TSC2
TSB51	0V	Y	TSC3
TSB52	HEADING MKR	W	TSC4
TSB53	-15V	BK	TSC5
E/TAG	EARTH (0V)	SCR	E/TAG

B54

16-2-12C (TP3145) - 12 CORE

ISW	FUNCTION	CLR	DCU
TSB34	+15V	R	TSA3
TSB34	+15V	B	TSA3
TSB35	TX/RX STATUS	G	TSA4
TSB37	0V	Y	TSA6
TSB37	0V	BK	TSA6
TSB38	MEDIUM PULSE	BN	TSA7
TSB39	SHORT PULSE	V	TSA8
TSB40	STBY/TRANSMIT	O	TSA9
TSB41	L.O TUNE	P	TSA10
TSB42	AFC/MANUAL	L/G	TSA11
TSB43	TUNE IND	GY	TSA12
TSB44	TX/RX BITE	W	TSA13
E/TAG	EARTH (0V)	SCR	E/TAG

A55

PT1YM - 75Ω CO-AX

ISW	FUNCTION	CLR	DU
SKA1	TRIGGER	-	SKT

A56

PT1YM - 75Ω CO-AX

ISW	FUNCTION	CLR	DU
SKA3	MIS TRIGGER	-	SKM

A57

PT1YM - 75Ω CO-AX

ISW	FUNCTION	CLR	DU
SKA5	VIDEO	-	SKV

164

16-2-2C (TP3141) -2 CORE

TU	FUNCTION	CLR	SCU
TSB9	CONTR. +12V	R	SA N
TSB10	TU ENABLE	B	TSA1
E/TAG	EARTH (0V)	SCR	E/TAG

165

37-3-2R (TP3149) –2 CORE

ISO	FUNCTION	CLR	TU
2	AC LINE	R	TSE4
4	AC NEUTRAL	B	TSE3
E/TAG	EARTH (0V)	SCR	E/TAG

SINGLE PHASE CONNECTIONS
110/120V AND 220/240V SYSTEMS

166

37-3-4R (TP3150)– 4 CORE

SCU	FUNCTION	CLR	TU
TRIP 2	AC LINE	R	TSH1
TRIP 6	AC NEUTRAL	B	TSH2
TRIP 2	AC LINE	G	TSH1
TRIP 6	AC NEUTRAL	Y	TSH2
E/TAG	EARTH (0V)	SCR	E/TAG

Warning: It is important that the earth connection is made as this is the safety earth.

THREE PHASE CONNECTIONS
110/120V AND 220/240V SYSTEMS
380/440V SYSTEMS

166

37-3-4R (TP3150) -4 CORE

SCU	FUNCTION	CLR	TU
TRIP 2	AC LINE 1	R	TSH1
TRIP 4	AC LINE 2	B	TSH2
TRIP 6	AC LINE 3	Y	TSH3
-	NOT USED	G	-
E/TAG	EARTH (0V)	SCR	E/TAG

Warning: It is important that the earth connection is made as this is the safety earth.

170

16-2-12C (TP3145) -12 CORE

DU	FUNCTION	CLR	DCU
TSA3	+15V	R	TSA3
TSA3	+15V	B	TSA3
TSA4	TX/RX STATUS	G	TSA4
TSA6	0V	Y	TSA6
TSA6	0V	BK	TSA6
TSA7	MEDIUM PULSE	BN	TSA7
TSA8	SHORT PULSE	V	TSA8
TSA9	STBY/TRANSMIT	O	TSA9
TSA10	LO TUNE	P	TSA10
TSA11	AFC/MANUAL	L/G	TSA11
TSA12	TUNE IND	GY	TSA12
TSA13	TX/RX BITE	W	TSA13
E/TAG	EARTH (0V)	SCR	E/TAG

171 16-2-6C (TP3144) – 6 CORE

DU	FUNCTION	CLR	DCU
TSC1	+15V	R	TSC1
TSC1	+15V	B	TSC1
TSC2	BEARING	G	TSC2
TSC3	0V	Y	TSC3
TSC4	HEADING MKR	W	TSC4
TSC5	-15V	BK	TSC5
E/TAG	EARTH (0V)	SCR	E/TAG

172 PT1YM - 75Ω CO-AX

DCU	FUNCTION	CLR	DU
SKV	VIDEO	-	SKV

173 PT1YM - 75Ω CO-AX

DCU	FUNCTION	CLR	DU
SKT	TRIGGER	-	SKT

174 DATA CABLE (4 T/PAIRS)

TU	FUNCTION	CLR	DCU
TSB1	DU DATA+	B/W	TSB1
TSB2	DU DATA-	W/B	TSB2
TSB3	TX DATA+	O/W	TSB3
TSB4	TX DATA-	W/O	TSB4
TSB5	TX TRIG+	G/W	TSB5
TSB6	TX TRIG-	W/G	TSB6
TSB7	TX SART+	BN/W	TSB7
TSB8	TX SART-	W/BN	TSB8
E/TAG	EARTH (0V)	SCR	E/TAG

175 PT1YM - 75Ω CO-AX

TU	FUNCTION	CLR	DCU
SKV	TRIGGER	-	SKW

176 16-2-6C (TP3144) – 6 CORE

DU	FUNCTION	CLR	DCU
TSC8	0V	R	TSC8
TSC9	PM ON	B	TSC9
TSC10	PM TX/RX	G	TSC10
TSC11	XR ADJUST	Y	TSC11
TSC12	XT ADJUST	W	TSC12
TSC13	PM TUNE	BK	TSC13
E/TAG	EARTH (0V)	SCR	E/TAG

177 DATA CABLE (4 T/PAIRS)

TX	FUNCTION	CLR	DCU
TSB1	DU DATA+	B/W	TSB1
TSB2	DU DATA-	W/B	TSB2
TSB3	TX DATA+	O/W	TSB3
TSB4	TX DATA-	W/O	TSB4
TSB5	TX TRIG+	G/W	TSB5
TSB6	TX TRIG-	W/G	TSB6
TSB7	TX SART+	BN/W	TSB7
TSB8	TX SART-	W/BN	TSB8
E/TAG	EARTH (0V)	SCR	E/TAG

178 PT1YM - 75Ω CO-AX

TX/RX	FUNCTION	CLR	DCU
SKV	VIDEO	-	SKW

179 37-3-2R (TP3149)–2 CORE

ISO	FUNCTION	CLR	DU
2	AC LINE	R	TSK3
4	AC NEUTRAL	B	TSK2
E/TAG	EARTH (0V)	SCR	E/TAG

180 16-2-2C (TP3141)–2 CORE

TX/RX	FUNCTION	CLR	SCU
TSB9	CONTR. +12V	R	SA N
TSB10	TU ENABLE	B	TSA1
E/TAG	EARTH (0V)	SCR	E/TAG

181 PT1YM - 75Ω CO-AX

DCU	FUNCTION	CLR	EXT
SKW	2ND TRIGGER	-	

182 37-3-2R (TP3149) - 2 CORE

SF	FUNCTION	CLR	ISO
	AC LINE	R	1
	AC NEUTRAL	B	3
E/TAG	EARTH (0V)	SCR	E/TAG

SINGLE PHASE
110/120V AND 220/240V SYSTEMS

183 37-3-2R (TP3149) – 2 CORE

SF	FUNCTION	CLR	SCU
	AC LINE	R	6/T3
	AC NEUTRAL	B	4/T2
E/TAG	EARTH (0V)	SCR	E/TAG

SINGLE PHASE
110/120V AND 220/240V SYSTEMS

183 37-3-4R (TP3150) - 4 CORE

SF	FUNCTION	CLR	SCU
	AC LINE	R	6/T3
	AC NEUTRAL	B	4/T2
	AC LINE	Y	6/T3
	AC NEUTRAL	G	4/T2
E/TAG	EARTH (0V)	SCR	E/TAG

THREE PHASE
110/120V AND 220/240V SYSTEMS
380/440V SYSTEMS

183 37-3-4R (TP3150) - 4 CORE

SF	FUNCTION	CLR	SCU
	AC LINE 1	R	2/T1
	AC LINE 2	B	4/T2
	AC LINE 3	Y	6/T3
	NOT USED	G	
E/TAG	EARTH (0V)	SCR	E/TAG

184 37-3-2R (TP3149) – 2 CORE

ISO	FUNCTION	CLR	TX/RX
2	AC LINE	R	TSE3
4	AC NEUTRAL	B	TSE4
E/TAG	EARTH (0V)	SCR	TSE1

193 PT1YM - 75Ω CO-AX

TX/RX	FUNCTION	CLR	DU
SKV	VIDEO	-	SKV

194 DATA CABLE (4 T/PAIRS)

TX/RX	FUNCTION	CLR	DU
TSB1	DU DATA+	B/W	TSA1
TSB2	DU DATA-	W/B	TSA2
TSB3	TX DATA+	O/W	TSA3
TSB4	TX DATA-	W/O	TSA4
TSB5	TX TRIG+	G/W	TSA5
TSB6	TX TRIG-	W/G	TSA6
TSB7	TX SART+	BN/W	TSA7
TSB8	TX SART-	W/BN	TSA8
E/TAG	EARTH (0V)	SCR	E/TAG

195 PT1YM - 75Ω CO-AX

DU	FUNCTION	CLR	EXT
SKX	MIS TRIG OUT	-	

196 PT1YM - 75Ω CO-AX

DU	FUNCTION	CLR	EXT
SKM	MIS TRIG IN	-	

197

LOG	FUNCTION	CLR	DU
	LOG		TSD7
	LOG RETURN		TSD8
	LOG STATUS		TSD9
	EARTH (0V)	SCR	E/TAG

198

COMP	FUNCTION	CLR	DU
	S1		TSC1
	S2		TSC2
	S3		TSC3
	S1 RTN		TSC4
	S2 RTN		TSC5
	S3 RTN		TSC6
	SYNCH Ref Low		TSC7
	SYNCH Ref Med		TSC8
	SYNCH Ref High		TSC9
	SYNCH REF RTN		TSC10
	EARTH (0V)		E/RAG

199 16-2-2C (TP3141) – 2CORE

	FUNCTION	CLR	DU
	RX DATA 1A		TSE1
	LOOP 1		TSE2
	RX DATA 1B		TSE3
Note: DO NOT Earth Cable Screen at DU			

200 16-2-2C (TP3141) – 2CORE

	FUNCTION	CLR	DU
	RX DATA 2A		TSF1
	LOOP 2		TSF2
	RX DATA 2B		TSF3
Note: DO NOT Earth Cable Screen at DU			

204 37-3-2R (TP3149) – 2 CORE

ISO	FUNCTION	CLR	TX/RX
2	AC LINE	R	TSE4
4	AC NEUTRAL	B	TSE3
EARTH	EARTH (0V)	SCR	E/TAG

205 37-3-2R (TP3149) – 2 CORE

ISO	FUNCTION	CLR	DU
2	AC LINE	R	TSP2
4	AC NEUTRAL	B	TSP4
EARTH	EARTH (0V)	SCR	E/TAG

206 16-2-12C (TP3145) – 12 CORE

TU	FUNCTION	CLR	TX/RX
TSC1	PM ON	R	TSC1
TSC2	PM Tx/Rx	B	TSC2
TSC3	PM TUNE	G	TSC3
TSC4	XR ADJUST	Y	TSC4
TSC5	XT ADJUST	W	TSC5
TSC6	+12V (PM)	BK	TSC6
TSC7	+12V (PM)	BN	TSC7
TSC8	0V	V	TSC8
TSC9	-12V (PM)	O	TSC9
TSC10	-12V (PM)	P	TSC10
TSC11	AZI PULSES	L/G	TSC11
TSC12	HEADING MARKER	GY	TSC12
E/TAG	EARTH (0V)	SCR	E/TAG

207 PT1YM - 75Ω CO-AX

TU	FUNCTION	CLR	TX/RX
SKP	PERF MON TRIG	-	SKP

208 37-3-2R (TP3149) – 2 CORE

TX/RX	FUNCTION	CLR	TU
TSA1	MOTOR +	R	TSA1
TSA2	MOTOR -	B	TSA2
E/TAG	EARTH (0V)	SCR	E/TAG

209 16-2-2C (TP3141) -2 CORE

TX/RX	FUNCTION	CLR	TU
TSB9	CONTR. +12V	R	TSB9
TSB10	TU ENABLE	B	TSB10
E/TAG	EARTH (0V)	SCR	E/TAG

210 16-2-2C (TP3141) – 2 CORE

	FUNCTION	CLR	DU
	0V		SKY22
	TX DAT 1+		SKY23
	TX DAT 1-		SKY24
	EARTH (0V)	SCR	E/TAG

Note: For RS232 use SKY 22/23
For RS422 use SKY 23/24

211A PT1YM - 75Ω CO-AX

ISW	FUNCTION	CLR	DU
SKVA	VIDEO	-	SKV

211B PT1YM - 75Ω CO-AX

ISW	FUNCTION	CLR	DU
SKVB	VIDEO	-	SKV

212A PT1YM - 75Ω CO-AX

ISW	FUNCTION	CLR	DU
SKMA	MIS TRIGGER	-	SKM

212B PT1YM - 75Ω CO-AX

ISW	FUNCTION	CLR	DU
SKMB	MIS TRIGGER	-	SKM

213A DATA CABLES (4 T/PAIRS)

ISW	FUNCTION	CLR	DU
TSDA1	DU Data +	B/W	TSA1
TSDA2	DU Data -	W/B	TSA2
TSDA3	TX Data +	O/W	TSA3
TSDA4	TX Data -	W/O	TSA4
TSDA5	TX Trig +	G/W	TSA5
TSDA6	TX Trig -	W/G	TSA6
TSDA7	TX SART +	BN/W	TSA7
TSDA8	TX SART -	W/BN	TSA8
E/TAG	Earth (0V)	SCR	E/TAG

213B DATA CABLES (4 T/PAIRS)

ISW	FUNCTION	CLR	DU
TSDB1	DU Data +	B/W	TSA1
TSDB2	DU Data -	W/B	TSA2
TSDB3	TX Data +	O/W	TSA3
TSDB4	TX Data -	W/O	TSA4
TSDB5	TX Trig +	G/W	TSA5
TSDB6	TX Trig -	W/G	TSA6
TSDB7	TX SART +	BN/W	TSA7
TSDB8	TX SART -	W/BN	TSA8
E/TAG	Earth (0V)	SCR	E/TAG

214A DATA CABLES (4 T/PAIRS)

ISW	FUNCTION	CLR	DU
TSSA1	ISW REQ+	B/W	TSB1
TSSA2	ISW REQ-	W/B	TSB2
TSSA3	ISW ACK+	O/W	TSB3
TSSA4	ISW ACK-	W/O	TSB4
TSSA5	+12V	G/W	TSB5
TSSA6	0V	W/G	TSB6
TSSA6	0V	W/BN	TSB6
TSSA7	-12V	BN/W	TSB7
E/TAG	Earth (0V)	SCR	E/TAG

214B DATA CABLES (4 T/PAIRS)

ISW	FUNCTION	CLR	DU
TSSB1	ISW REQ+	B/W	TSB1
TSSB2	ISW REQ-	W/B	TSB2
TSSB3	ISW ACK+	O/W	TSB3
TSSB4	ISW ACK-	W/O	TSB4
TSSB5	+12V	G/W	TSB5
TSSB6	0V	W/G	TSB6
TSSB6	0V	W/BN	TSB6
TSSB7	-12V	BN/W	TSB7
E/TAG	Earth (0V)	SCR	E/TAG

215 37-3-2R (TP3149) – 2 CORE

ISO	FUNCTION	CLR	TCU
2	AC LINE	R	TSP1
4	AC NEUTRAL	B	TSP4
EARTH	EARTH (0V)	SCR	E/TAG

216B DATA CABLES (4 T/PAIRS)

ISW	FUNCTION	CLR	TCU
TSTB1	DU Data +	B/W	TSF1
TSTB2	DU Data -	W/B	TSF2
TSTB3	TX Data +	O/W	TSF3
TSTB4	TX Data -	W/O	TSF4
TSTB5	TX Trig +	G/W	TSF5
TSTB6	TX Trig -	W/G	TSF6
TSTB7	TX SART +	BN/W	TSF7
TSTB8	TX SART -	W/BN	TSF8
E/TAG	Earth (0V)	SCR	E/TAG

217B PT1YM - 75Ω CO-AX

ISW	FUNCTION	CLR	TCU
SKTB	VIDEO	-	SKV

218 PT1YM - 75Ω CO-AX

TCU	FUNCTION	CLR	TX/RX
SKW	VIDEO	-	SKV

219 PT1YM - 75Ω CO-AX

TCU	FUNCTION	CLR	TX/RX
SKT	TRIGGER	-	SKT

220 16-2-12C (TP3145) – 12 CORE

TCU	FUNCTION	CLR	TX/RX
TSA1	MOD HT SUPPLY	R	TSA1
TSA2	SCANNER STOP	B	TSA2
TSA	+15v (BITE)	G	TSA3
TSA4	TX/RX STATUS	Y	TSA4
TSA6	EARTH	BK	TSA6
TSA7	MEDIUM PULSE	BN	TSA7
TSA8	SHORT PULSE	V	TSA8
TSA9	STBY/TRANSMIT	O	TSA9
TSA10	L.O. TUNE	P	TSA10
TSA11	AFC/MANUAL	L/G	TSA11
TSA12	TUNE IND	GY	TSA12
TSA13	TX/RX BITE	W	TSF1
E/TAG	EARTH (0V)	SCR	E/TAG

221 PT1YM - 75Ω CO-AX

TU	FUNCTION	CLR	TX/RX
SKP	PERF MON	-	SKP

222 37-3-2R (TP3149) – 2 CORE

TCU	FUNCTION	CLR	TU
TSD1	MOTOR +	R	TSD1
TSD2	MOTOR -	B	TSD2
E/TAG	EARTH (0V)	SCR	E/TAG

223 16-2-6C (TP3144) – 6 CORE

TCU	FUNCTION	CLR	TU
TSC8	0V	BK	TSB8
TSC9	PM ON	R	TSB9
TSC10	PM TX/RX	B	TSB10
TSC11	XR ADJUST	G	TSB11
TSC12	XT ADJUST	Y	TSB12
TSC13	PM TUNE	W	TSH1
E/TAG	EARTH (0V)	SCR	E/TAG

224 16-2-6C (TP3144) – 6 CORE

TCU	FUNCTION	CLR	TU
TSC1	+15V (PM)	R	TSB1
TSC2	BEARING	B	TSB2
TSC3	0V	BK	TSB3
TSC4	HEADING MKR	Y	TSB4
TSC5	-15V (PM)	W	TSB5
TSC7	SCANNER STOP	G	TS6
E/TAG	EARTH (0V)	SCR	E/TAG

225A PT1YM - 75Ω CO-AX

ISW	FUNCTION	CLR	TX/RX
SKTA	VIDEO	-	SKV

225B PT1YM - 75Ω CO-AX

ISW	FUNCTION	CLR	TX/RX
SKTB	VIDEO	-	SKV

226A DATA CABLES (4 T/PAIRS

ISW	FUNCTION	CLR	TX/RX
TSTA1	DU Data +	B/W	TSB1
TSTA2	DU Data -	W/B	TSB2
TSTA3	TX Data +	O/W	TSB3
TSTA4	TX Data -	W/O	TSB4
TSTA5	TX Trig +	G/W	TSB5
TSTA6	TX Trig -	W/G	TSB6
TSTA7	TX SART +	BN/W	TSB7
TSTA8	TX SART -	W/BN	TSB8
E/TAG	Earth (0V)	SCR	E/TAG

226B DATA CABLES (4 T/PAIRS

ISW	FUNCTION	CLR	TX/RX
TSTB1	DU Data +	B/W	TSB1
TSTB2	DU Data -	W/B	TSB2
TSTB3	TX Data +	O/W	TSB3
TSTB4	TX Data -	W/O	TSB4
TSTB5	TX Trig +	G/W	TSB5
TSTB6	TX Trig -	W/G	TSB6
TSTB7	TX SART +	BN/W	TSB7
TSTB8	TX SART -	W/BN	TSB8
E/TAG	Earth (0V)	SCR	E/TAG

229 PT1YM - 75Ω CO-AX

TU	FUNCTION	CLR	DU
SKV	VIDEO	-	SKV

230 DATA CABLES (4 T/PAIRS)

TU	FUNCTION	CLR	DU
TSB1	DU Data +	B/W	TSA1
TSB2	DU Data -	W/B	TSA2
TSB3	TX Data +	O/W	TSA3
TSB4	TX Data -	W/O	TSA4
TSB5	TX Trig +	G/W	TSA5
TSB6	TX Trig -	W/G	TSA6
TSB7	TX SART +	BN/W	TSA7
TSB8	TX SART -	W/BN	TSA8
E/TAG	Earth (0V)	SCR	E/TAG

231 16-2-2C (TP3141) – 2CORE

	FUNCTION	CLR	IF
	RX DATA 3A		TSJ1
	LOOP 3		TSJ2
	RX DATA 3B		TSJ3
Note: DO NOT Earth Cable Screen at DU			

232 16-2-2C (TP3141) – 2CORE

	FUNCTION	CLR	IF
	TX DATA 3+		TSK1
	TX DATA 3-		TSK2
	0V		TSK3

233 16-2-2C (TP3141) – 2CORE

	FUNCTION	CLR	IF
	RX DATA 4A		TSH1
	LOOP 4		TSH2
	RX DATA 4B		TSH3
Note: DO NOT Earth Cable Screen at DU			

234 16-2-2C (TP3141) – 2CORE

	FUNCTION	CLR	IF
	TX DATA 4+		TSK4
	TX DATA 4-		TSK5
	0V		TSK6

235 16-2-2C (TP3141) – 2CORE

	FUNCTION	CLR	IF
	RX DATA 5A		TSG1
	LOOP 5		TSG2
	RX DATA 5B		TSG3
Note: DO NOT Earth Cable Screen at DU			

236 16-2-2C (TP3141) – 2CORE

	FUNCTION	CLR	IF
	TX DATA 5+		TSK7
	TX DATA 5-		TSK8
	0V		TSK9

237 16-2-2C (TP3141) – 2CORE

	FUNCTION	CLR	IF
	TRACK DATA +		TSK10
	TRACK DATA -		TSK11
	0V		TSK12

238 16-2-6C (TP3144) – 6CORE

	FUNCTION	CLR	IF
	ALARM 1 NO		TSL4
	ALARM 1 RTN		TSL5
	ALARM 1 NC		TSL6
	ALARM 2 NO		TSL10
	ALARM 2 RTN		TSL11
	ALARM 2 NC		TSL12

239 16-2-2C (TP3141) – 2CORE

	FUNCTION	CLR	IF
	EXT START NO		TSK7
	EXT START		TSK8
	EXT START NC		TSK9

240 16-2-2C (TP3141) – 2CORE

	FUNCTION	CLR	IF
	BUZZER+		TSK14
	BUZZER-		TSK15
	EARTH	SCR	E/TAG

242 16-2-2C (TP3141) – 2CORE

	FUNCTION	CLR	DU
	TX DATA 1+		TSD 1
	TX DATA 1 -		TSD 2
	0 V		TSD 3

276 PT1YM - 75Ω CO-AX
* is A,B,C, or D

SJB	FUNCTION	CLR	DCU
SKV*	Video	-	SKW

275 DATA CABLES (4 T/PAIRS)
* is A,B,C, or D

SJB	FUNCTION	CLR	DCU
TSD*1	DU Data +	B/W	TSB1
TSD*2	DU Data -	W/B	TSB2
TSD*3	TX Data +	O/W	TSB3
TSD*4	TX Data -	W/O	TSB4
TSD*5	TX Trig +	G/W	TSB5
TSD*6	TX Trig -	W/G	TSB6
TSD*7	TX SART +	BN/W	TSB7
TSD*8	TX SART -	W/BN	TSB8
E/TAG	Earth (0V)	SCR	E/TAG

241 2METRE CABLE 65800514 SUPPLIED WITH INTERFACE UNIT

DU	FUNCTION	CLR	IF
SKY1	+12V OUT		SKZ1
SKY2	+5V OUT		SKZ2
SKY3	0V		SKZ3
SKY4	-12V OUT		SKZ4
SKY5	BUZZER		SKZ5
SKY6	0V		SKZ6
SKY7	ALARM1		SKZ7
SKY8	0V		SKZ8
SKY9	I/FACE DATA 3		SKZ9
SKY10	ALARM2-		SKZ10
SKY11	I/FACE DATA 4		SKZ11
SKY12	0V		SKZ12
SKY13	I/FACE DATA 5		SKZ13
SKY14	TX DATA 3+		SKZ14
SKY15	TX DAT 3-		SKZ15
SKY16	0V		SKZ16
SKY17	TX DATA 4+		SKZ17
SKY18	TX DATA 4-		SKZ18
SKY19	FREEZE FRAME		SKZ19
SKY20	TX DATA 5+		SKZ20
SKY21	TX DATA 5-		SKZ21
SKY22	0V		SKZ22
SKY23	TRACK DATA +		SKZ23
SKY24	TRACK DATA -		SKZ24
SKY25	0V (INTERFACE)		SKZ25
E/TAG	EARTH (0V)	SCR	E/TAG

242 16-2-2C (TP3141) – 2CORE

	FUNCTION	CLR	DU
	TX DATA 1+		TSD1
	TX DATA 1-		TSD2
	0V		TSD3

243 16-2-2C (TP3141) – 2CORE

	FUNCTION	CLR	DU
	TX DATA 2+		TSD4
	TX DATA 2-		TSD5
	0V		TSD6

244 PT1YM - 75Ω CO-AX

TU	FUNCTION	CLR	DCU
SKV	VIDEO	-	SKW

245 DATA CABLES (4 T/PAIRS)

TU	FUNCTION	CLR	DCU
TSB1	DU Data +	B/W	TSB1
TSB2	DU Data -	W/B	TSB2
TSB3	TX Data +	O/W	TSB3
TSB4	TX Data -	W/O	TSB4
TSB5	TX Trig +	G/W	TSB5
TSB6	TX Trig -	W/G	TSB6
TSB7	TX SART +	BN/W	TSB7
TSB8	TX SART -	W/BN	TSB8
E/TAG	Earth (0V)	SCR	E/TAG

248 37-3-4R (TP3150) – 4CORE

SF	FUNCTION	CLR	TU
	DC-	B	TSE3
	DC-	G	TSE4
	DC+	Y	TSE1
	DC+	R	TSE2
	EARTH (0V)	SCR	E/TAG

249 37-3-4R (TP3150) – 4CORE

SF	FUNCTION	CLR	DU
	DC-	B	TSP3
	DC-	G	TSP4
	DC+	Y	TSP1
	DC+	R	TSP2
	EARTH (0V)	SCR	E/TAG

250 DATA CABLES (4 T/PAIRS)

TCU	FUNCTION	CLR	DU
TSF1	DU Data +	B/W	TSA1
TSF2	DU Data -	W/B	TSA2
TSF3	TX Data +	O/W	TSA3
TSF4	TX Data -	W/O	TSA4
TSF5	TX Trig +	G/W	TSA5
TSF6	TX Trig -	W/G	TSA6
TSF7	TX SART +	BN/W	TSA7
TSF8	TX SART -	W/BN	TSA8
E/TAG	Earth (0V)	SCR	E/TAG

251 PT1YM - 75Ω CO-AX

TCU	FUNCTION	CLR	DU
SKV	VIDEO	-	SKV

252 37-3-4R (TP3150) – 4CORE

SF	FUNCTION	CLR	TCU
	DC-	B	TSP3
	DC-	G	TSP4
	DC+	Y	TSP1
	DC+	R	TSP2
	EARTH (0V)	SCR	E/TAG

254 16-2-6C (TP3144) – 6 CORE

DU	FUNCTION	CLR	DCU
TSE3	ISW1	R	TSE1
TSE4	ISW2	B	TSE2
TSE5	ISW3	BK	TSE3
TSE6	ISW4	Y	TSE4
TSE7	ISW5	W	TSE5
TSE8	ISW6	G	TSE6
E/TAG	EARTH (0V)	SCR	E/TAG

255A DATA CABLES (4 T/PAIRS

ISW	FUNCTION	CLR	DCU
TSDA1	DU Data +	B/W	TSB1
TSDA2	DU Data -	W/B	TSB2
TSDA3	TX Data +	O/W	TSB3
TSDA4	TX Data -	W/O	TSB4
TSDA5	TX Trig +	G/W	TSB5
TSDA6	TX Trig -	W/G	TSB6
TSDA7	TX SART +	BN/W	TSB7
TSDA8	TX SART -	W/BN	TSB8
E/TAG	Earth (0V)	SCR	E/TAG

255B DATA CABLES (4 T/PAIRS

ISW	FUNCTION	CLR	DCU
TSDB1	DU Data +	B/W	TSB1
TSDB2	DU Data -	W/B	TSB2
TSDB3	TX Data +	O/W	TSB3
TSDB4	TX Data -	W/O	TSB4
TSDB5	TX Trig +	G/W	TSB5
TSDB6	TX Trig -	W/G	TSB6
TSDB7	TX SART +	BN/W	TSB7
TSDB8	TX SART -	W/BN	TSB8
E/TAG	Earth (0V)	SCR	E/TAG

256A DATA CABLES (4 T/PAIRS)

ISW	FUNCTION	CLR	DCU
TSSA1	ISW REQ+	B/W	TSD1
TSSA2	ISW REQ-	W/B	TSD2
TSSA3	ISW ACK+	O/W	TSD3
TSSA4	ISW ACK-	W/O	TSD4
TSSA5	+12V	G/W	TSD5
TSSA6	0V	W/G	TSD6
TSSA6	0V	W/BN	TSD6
TSSA7	-12V	BN/W	TSD7
E/TAG	Earth (0V)	SCR	E/TAG

256B DATA CABLES (4 T/PAIRS)

ISW	FUNCTION	CLR	DCU
TSSB1	ISW REQ+	B/W	TSD1
TSSB2	ISW REQ-	W/B	TSD2
TSSB3	ISW ACK+	O/W	TSD3
TSSB4	ISW ACK-	W/O	TSD4
TSSB5	+12V	G/W	TSD5
TSSB6	0V	W/G	TSD6
TSSB6	0V	W/BN	TSD6
TSSB7	-12V	BN/W	TSD7
E/TAG	Earth (0V)	SCR	E/TAG

257A PT1YM - 75Ω CO-AX

ISW	FUNCTION	CLR	DCU
SKVA	VIDEO	-	SKW

257B PT1YM - 75Ω CO-AX

ISW	FUNCTION	CLR	DCU
SKVB	VIDEO	-	SKW

258 PT1YM - 75Ω CO-AX

SJB	FUNCTION	CLR	
SKMI	MIS TRIG IN	-	

Note: Only if required for system configuration

259* PT1YM - 75Ω CO-AX
* is A, B, C or D

SJB	FUNCTION	CLR	DU
SKV*	VIDEO	-	SKV

260*

PT1YM - 75Ω CO-AX
* is A, B, C or D

SJB	FUNCTION	CLR	DU
SKM*	MIS TRIGGER	-	SKM

261*

DATA CABLE (4 T/PAIRS)

SJB	FUNCTION	CLR	DU
TSD*1	DU DATA+	B/W	TSA1
TSD*2	DU DATA-	W/B	TSA2
TSD*3	TX DATA+	O/W	TSA3
TSD*4	TX DATA-	W/O	TSA4
TSD*5	TX TRIG+	G/W	TSA5
TSD*6	TX TRIG-	W/G	TSA6
TSD*7	TX SART+	BN/W	TSA7
TSD*8	TX SART-	W/BN	TSA8
E/TAG	EARTH (0V)	SCR	E/TAG

262

PT1YM - 75Ω CO-AX

SJB	FUNCTION	CLR	TU
SKTA	VIDEO	-	SKV

263

DATA CABLE (4 T/PAIRS)

SJB	FUNCTION	CLR	TU
TSTA1	DU DATA+	B/W	TSB1
TSTA2	DU DATA-	W/B	TSB2
TSTA3	TX DATA+	O/W	TSB3
TSTA4	TX DATA-	W/O	TSB4
TSTA5	TX TRIG+	G/W	TSB5
TSTA6	TX TRIG-	W/G	TSB6
TSTA7	TX SART+	BN/W	TSB7
TSTA8	TX SART-	W/BN	TSB8
E/TAG	EARTH (0V)	SCR	E/TAG

273

DATA CABLE (4 T/PAIRS)

SJB	FUNCTION	CLR	DU
TSPA1	+12V	B/W	TSB5
TSPA2	0V	W/B	TSB6
TSPA3	-12V	O/W	TSB7
E/TAG	EARTH (0V)	SCR	E/TAG

275

DATA CABLES (4 T/PAIRS)

SJB	FUNCTION	CLR	DCU
TSDB1	DU Data +	B/W	TSB1
TSDB2	DU Data -	W/B	TSB2
TSDB3	TX Data +	O/W	TSB3
TSDB4	TX Data -	W/O	TSB4
TSDB5	TX Trig +	G/W	TSB5
TSDB6	TX Trig -	W/G	TSB6
TSDB7	TX SART +	BN/W	TSB7
TSDB8	TX SART -	W/BN	TSB8
E/TAG	Earth (0)	SCR	E/TAG

276

PT1YM - 75Ω CO-AX

SJB	FUNCTION	CLR	DCU
SKTA	VIDEO	-	SKW

286

DATA CABLES (4 T/PAIRS)

DU	FUNCTION	CLR	TCU
TSB1	ISW REQ+	B/W	TSH1
TSB2	ISW REQ-	W/B	TSH2
TSB3	ISW ACK+	O/W	TSH3
TSB4	ISW ACK-	W/O	TSH4
TSB5	+12V	G/W	TSH5
TSB6	0V	W/G	TSH6
TSB6	0V	W/BN	TSH6
TSB7	-12V	BN/W	TSH7
E/TAG	Earth (0V)	SCR	E/TAG

290

TP3149 (37-3-2R)

ISO	FUNCTION	CLR	RSIU
2	AC LINE	R	TSP1
4	AC NEUTRAL	B	TSP4
EARTH	EARTH (0V)	SCR	E/TAG

291

TP3149 (37-3-2R)

	FUNCTION	CLR	RSIU
	DC +		TSP1
	DC -		TSP4
EARTH	EARTH (0V)	SCR	E/TAG

292 PT1YM - 75Ω CO-AX

RSIU	FUNCTION	CLR	DU
VIDEO OUTPUT	VIDEO (OUT)	-	SKV

293 DATA CABLE (4 T/PAIRS)

RSIU	FUNCTION	CLR	DU
TSF1	DU DATA+	B/W	TSA1
TSF2	DU DATA-	W/B	TSA2
TSF3	TX DATA+	O/W	TSA3
TSF4	TX DATA-	W/O	TSA4
TSF5	TX TRIG+	G/W	TSA5
TSF6	TX TRIG-	W/G	TSA6
TSF7	TX SART+	BN/W	TSA7
TSF8	TX SART-	W/BN	TSA8
E/TAG	EARTH (0V)	SCR	E/TAG

294 PT1YM - 75Ω CO-AX

RSIU	FUNCTION	CLR	DU
MIS TRIG OUT	MIS TRIG (OUT)	-	SKM

295 TP3145 (16-2-12C)

RSIU	FUNCTION	CLR	HOST
TSA1	*MEDIUM PULSE	R	
TSA2	*SHORT PULSE	B	
TSA3	*STBY/TRANSMIT	G	
TSA4	*AFC/MANUAL	Y	
TSA5	0V	BK	
TSA6	SPARE	BN	
TSA7	SPARE	V	
TSA8	*TUNE IND	O	
TSA9	0V	P	
E/TAG	EARTH (0V)	SCR	E/TAG

*TELLBACKS FROM HOST RADAR, NOT CONTROL SIGNALS

296 See note

RSIU	FUNCTION	CLR	HOST
TSB1	BRG 2+ (RS422)		
TSB2	BRG 2- (RS422)		
TSB3	0V		
TSB4	H MKR 2+ (RS422)		
TSB5	H MKR 2- (RS422)		
TSB6	0V		
TSB7	BIAS		
TSB8	TRIG 2+ (RS422)		
TSB9	TRIG 2- (RS422)		
TSB10	BRG 1		
TSB11	H MKR 1		
TSB12	DUAL SPEED		
TSB13	0V		
E/TAG	EARTH (0V)	SCR	E/TAG

Cable type dependant on installation, if RS442 inputs are used suitable T/Pair double screened cable should be used characteristic impedance 100ς - 120ς.
For other inputs use cables to DEF STAN 61-12 (part 5) or similar.

297 PT1YM - 75Ω CO-AX

RSIU	FUNCTION	CLR	HOST
VIDEO INPUT	VIDEO (IN)	-	

298 PT1YM - 75Ω CO-AX

RSIU	FUNCTION	CLR	HOST
TRIGGER INPUT	TRIGGER (IN)	-	

299 PT1YM - 75Ω CO-AX

RSIU	FUNCTION	CLR	HOST
MIS TRIG INPUT	MIS TRIGGER (IN)	-	

300 TP3145 (16-2-12C)

RSIU	FUNCTION	CLR	HOST
TSC1	BRG S1 (for synchro)	R	
	COMMON (for resolver)		
TSC2	BRG S2 (for synchro)	B	
	BRG COS (for resolver)		
TSC3	BRG S3 (for synchro)	G	
	BRG SIN (for resolver)		
TSC4	S1 RTN	Y	
TSC5	S2 RTN	W	
TSC6	S3 RTN	BK	
TSC7	REF 1	BN	
TSC8	REF 2	V	
TSC9	0V	O	
TSC10	0V	P	
E/TAG	EARTH (0V)	SCR	E/TAG

301 See note

ISO	FUNCTION	CLR	MU
2	AC LINE	BN	LINE1
4	AC NEUTRAL	BE	NEUTRAL
EARTH	EARTH (0V)	GN/Y	EARTH

Unit is supplied with 2 metre mains cable, if necessary this can be extended using 3 core 0.75mm^2 supplied by shipyard.

302 PT1YM - 75Ω CO-AX

DCU	FUNCTION	CLR	
SKV	VIDEO	-	

303 PT1YM - 75Ω CO-AX

DCU	FUNCTION	CLR	
SKT	TRIGGER	-	

304 16-2-12C (TP3145) - 12 CORE

	FUNCTION	CLR	DCU
	+15V	R	TSA3
	+15V	B	TSA3
	TX/RX STATUS	G	TSA4
	0V	Y	TSA6
	0V	BK	TSA6
	MEDIUM PULSE	BN	TSA7
	SHORT PULSE	V	TSA8
	STBY/TRANSMIT	O	TSA9
	L.O TUNE	P	TSA10
	AFC/MANUAL	L/G	TSA11
	TUNE IND	GY	TSA12
	TX/RX BITE	W	TSA13
	EARTH (0V)	SCR	E/TAG

305 16-2-6C (TP3144) - 6 CORE

	FUNCTION	CLR	DCU
	BEARING	G	TSC2
	0V	Y	TSC3
	HEADING MKR	W	TSC4
	EARTH (0V)	SCR	E/TAG

306 16-2-6C (TP3144) - 6 CORE

	FUNCTION	CLR	DCU
	0V	R	TSC8
	PM ON	B	TSC9
	PM TX/RX	G	TSC10
	XR ADJUST	Y	TSC11
	XT ADJUST	W	TSC12
	PM TUNE	BK	TSC13
	EARTH (0V)	SCR	E/TAG

307 16-2-6C (TP3144) - 6 CORE

	FUNCTION		DCU
	+15V	R	TSC1
	+15V	Y	TSC1
	0V	BK	TSC3
	0V	W	TSC3
	-15V	B	TSC5
	-15V	G	TSC5
	EARTH (0V)	SCR	E/TAG

308 16-2-6C (TP3144) – 6 CORE

ISW	FUNCTION	CLR	TCU
TSB19	+15V	R	TSC1
TSB19	+15V	B	TSC1
TSB19	+15V	G	TSC1
TSB20	BEARING	Y	TSC2
TSB21	0V	W	TSC3
TSB22	HEADING MKR	BK	TSC4
E/TAG	EARTH (0V)	SCR	E/TAG

309 PT1YM - 75Ω CO-AX

ISW	FUNCTION	CLR	TCU
SKB1	TRIGGER	-	SKT

310 PT1YM - 75Ω CO-AX

ISW	FUNCTION	CLR	TCU
SKB5	VIDEO	-	SKW

311 16-2-6C (TP3144) – 6 CORE

ISW	FUNCTION	CLR	TCU
TSB25	ISW1	R	TSE1
TSB26	ISW2	B	TSE2
TSB27	ISW3	G	TSE3
TSB28	ISW4	Y	TSE4
TSB29	ISW5	W	TSE5
TSB30	ISW6	BK	TSE6
E/TAG	EARTH (0V)	SCR	E/TAG

312 16-2-12C (TP3145) – 12 CORE

ISW	FUNCTION	CLR	TCU
TSB3	MOD HT	R	TSA1
TSB4	+15V (BITE)	B	TSA3
TSB5	TX/RX STATUS	G	TSA4
TSB6	-15V	Y	TSA5
TSB7	0V	BK	TSA6
TSB8	MEDIUM PULSE	BN	TSA7
TSB9	SHORT PULSE	V	TSA8
TSB10	STBY/TRANSMIT	O	TSA9
TSB11	L.O TUNE	P	TSA10
TSB12	AFC/MANUAL	L/G	TSA11
TSB13	TUNE IND	GY	TSA12
TSB14	TX/RX BITE	W	TSA13
E/TAG	EARTH (0V)	SCR	E/TAG

Note: Link TSA5 to TSC5 in TCU for –15V supply to S90 S-Band TxRx

313 37-3-2R (TP3149) – 2 CORE

ISW	FUNCTION	CLR	TCU
TSB1	MOTOR +	R	TSD1
TSB2	MOTOR -	B	TSD2
E/TAG	EARTH (0V)	SCR	E/TAG

314 PT1YM - 75Ω CO-AX

ISW	FUNCTION	CLR	TU
SKA8	VIDEO	-	SKS

315 PT1YM - 75Ω CO-AX

ISW	FUNCTION	CLR	TU
SKA7	VIDEO	-	SKT

316 PT1YM - 75Ω CO-AX

ISW	FUNCTION	CLR	DU
SKB3	MIS TRIGGER	-	SKM

317A DATA CABLES (4 T/PAIRS

ISW	FUNCTION	CLR	TU
TSTA1	DU Data +	B/W	TSB1
TSTA2	DU Data -	W/B	TSB2
TSTA3	TX Data +	O/W	TSB3
TSTA4	TX Data -	W/O	TSB4
TSTA5	TX Trig +	G/W	TSB5
TSTA6	TX Trig -	W/G	TSB6
TSTA7	TX SART +	BN/W	TSB7
TSTA8	TX SART -	W/BN	TSB8
E/TAG	Earth (0V)	SCR	E/TAG

317B DATA CABLES (4 T/PAIRS

ISW	FUNCTION	CLR	TU
TSTB1	DU Data +	B/W	TSB1
TSTB2	DU Data -	W/B	TSB2
TSTB3	TX Data +	O/W	TSB3
TSTB4	TX Data -	W/O	TSB4
TSTB5	TX Trig +	G/W	TSB5
TSTB6	TX Trig -	W/G	TSB6
TSTB7	TX SART +	BN/W	TSB7
TSTB8	TX SART -	W/BN	TSB8
E/TAG	Earth (0V)	SCR	E/TAG

318A PT1YM - 75Ω CO-AX

ISW	FUNCTION	CLR	TU
SKTA	VIDEO	-	SKV

318B PT1YM - 75Ω CO-AX

ISW	FUNCTION	CLR	TU
SKTB	VIDEO	-	SKV

Intentionally blank

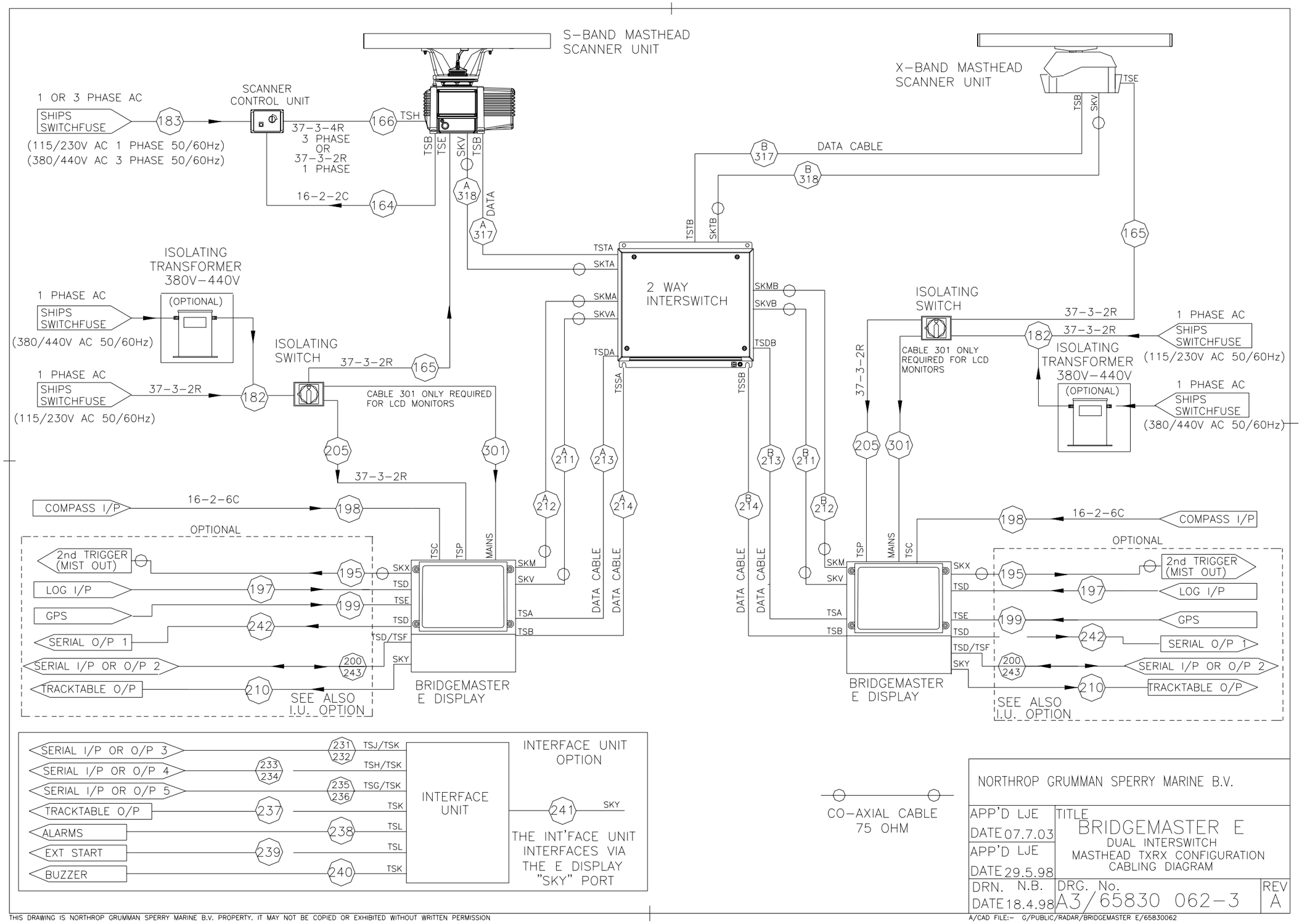

Figure 9.1 – BridgeMaster E X+S-Band Masthead Tx/Rx

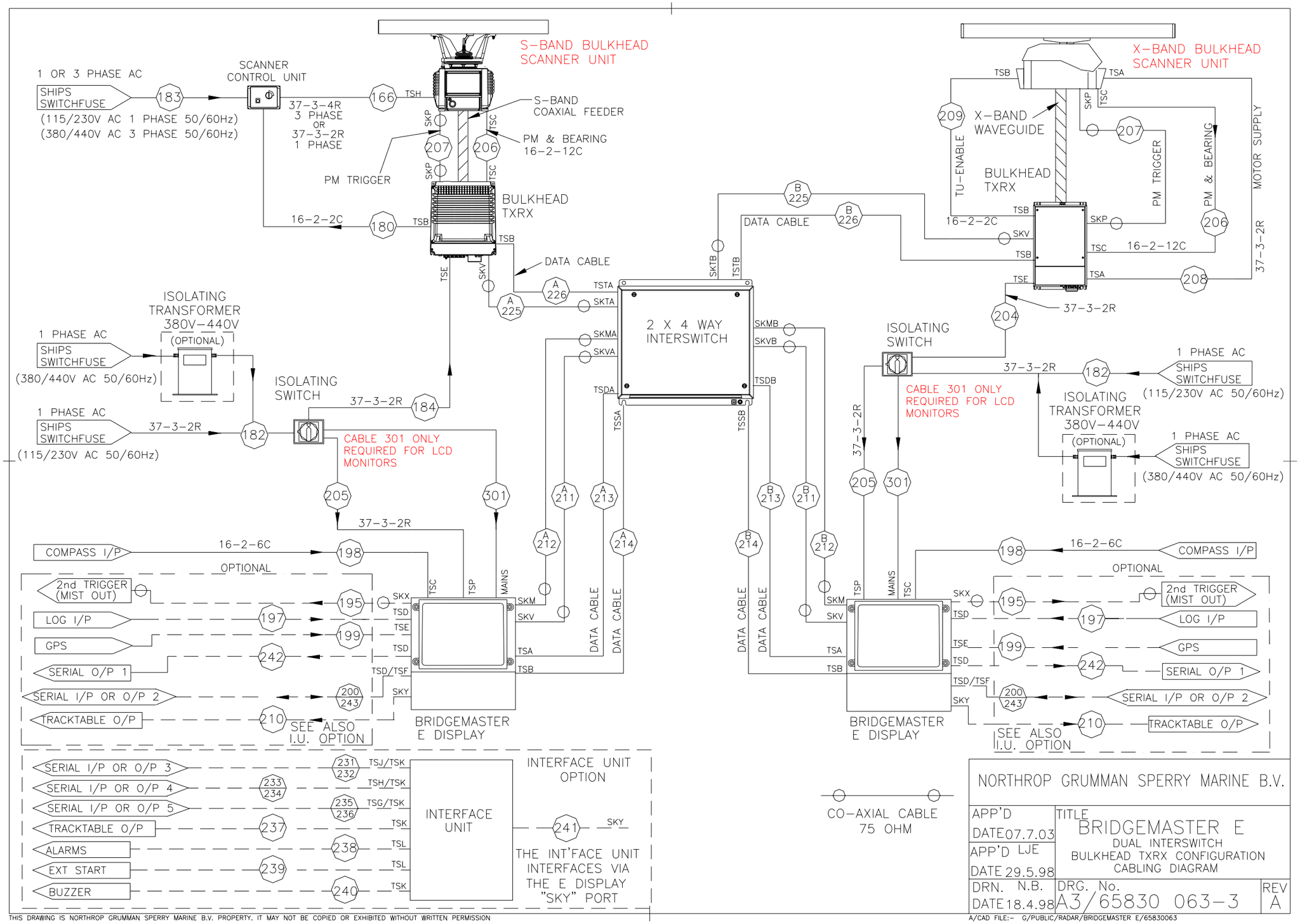

Figure 9.2 – BridgeMaster E X+S-Band Bulkhead Tx/Rx Dual Interswitch Configuration

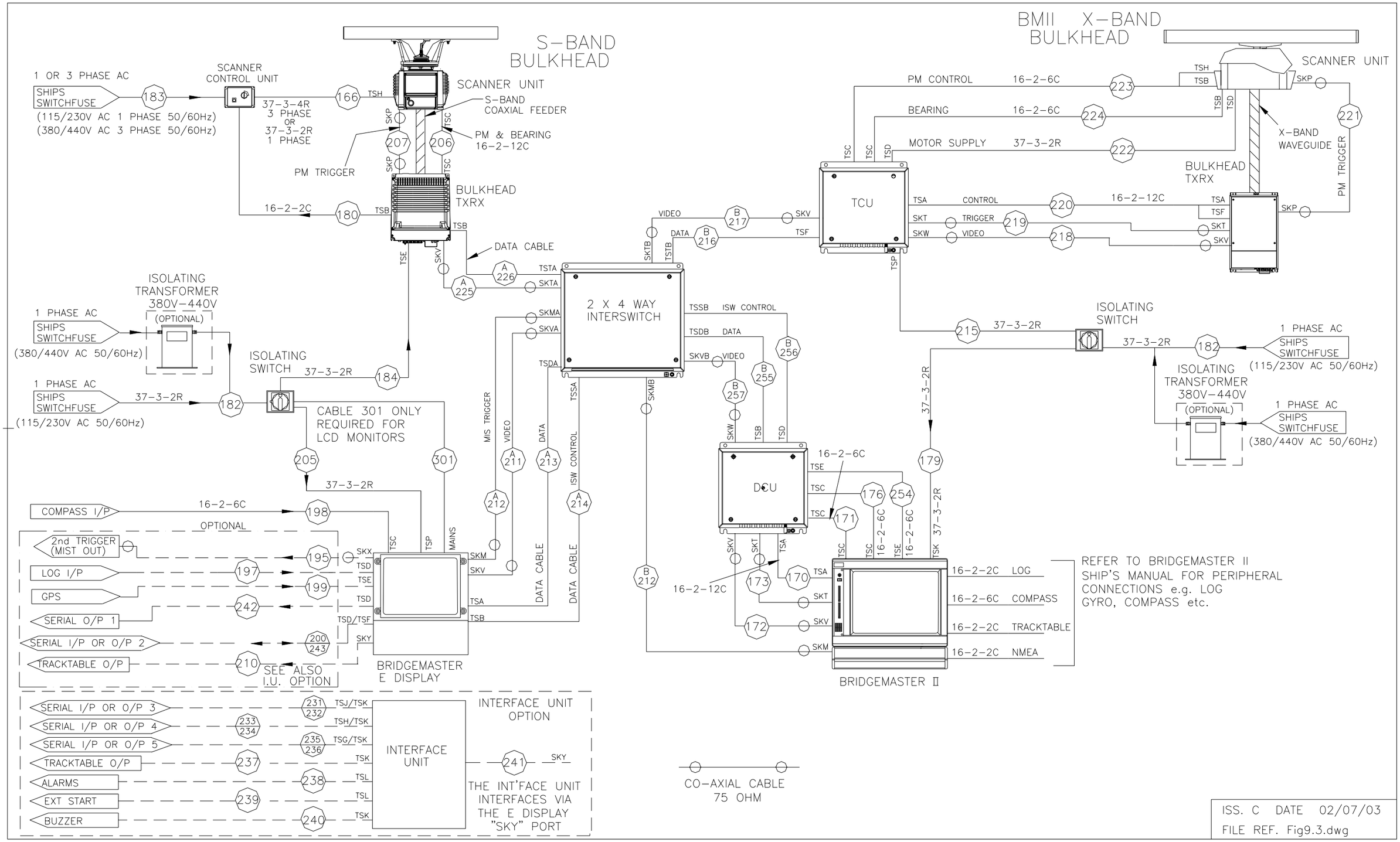

Figure 9.3 – BridgeMaster E S-Band Bulkhead System Dual Interswitched with Bridgemaster II Bulkhead System (using TCU and DCU)

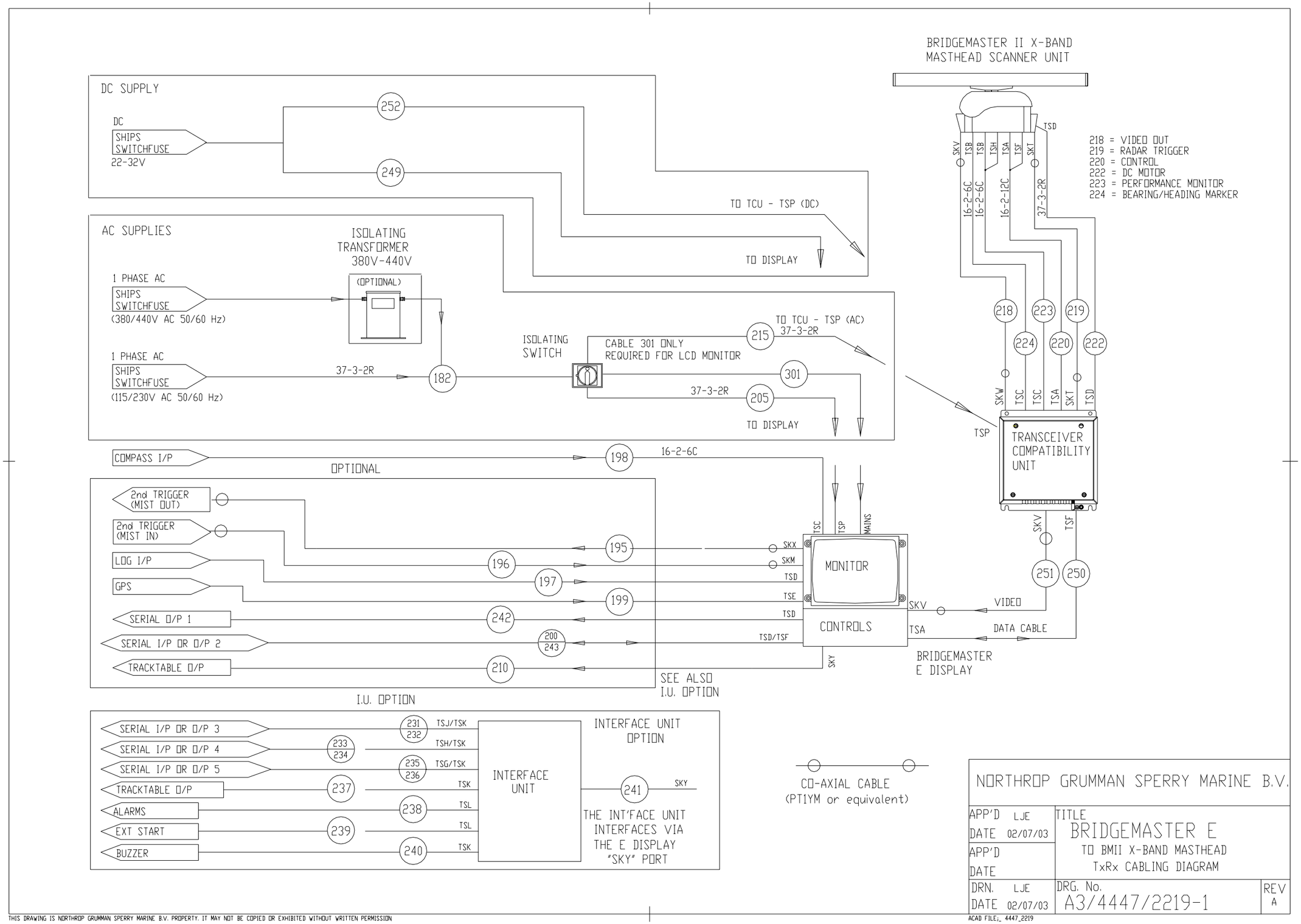

Figure 9.4 – BridgeMaster II Hybrid X-Band Masthead Tx/Rx BridgeMaster E Display with Transceiver Compatibility Unit (TCU)

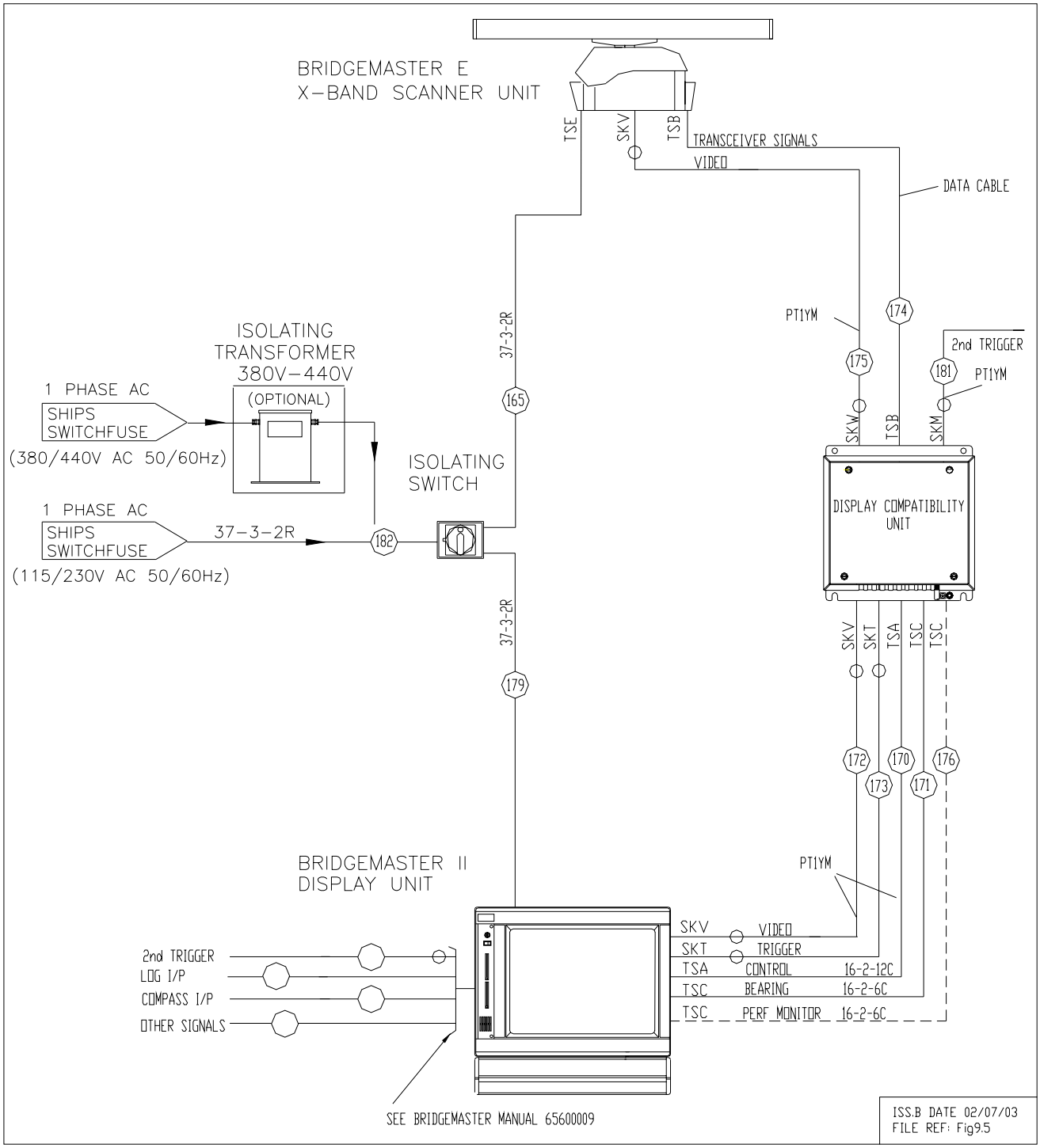

Figure 9.5 – BridgeMaster II X-Band Masthead Hybrid System (BridgeMaster II Display/BridgeMaster E Scanner Unit)

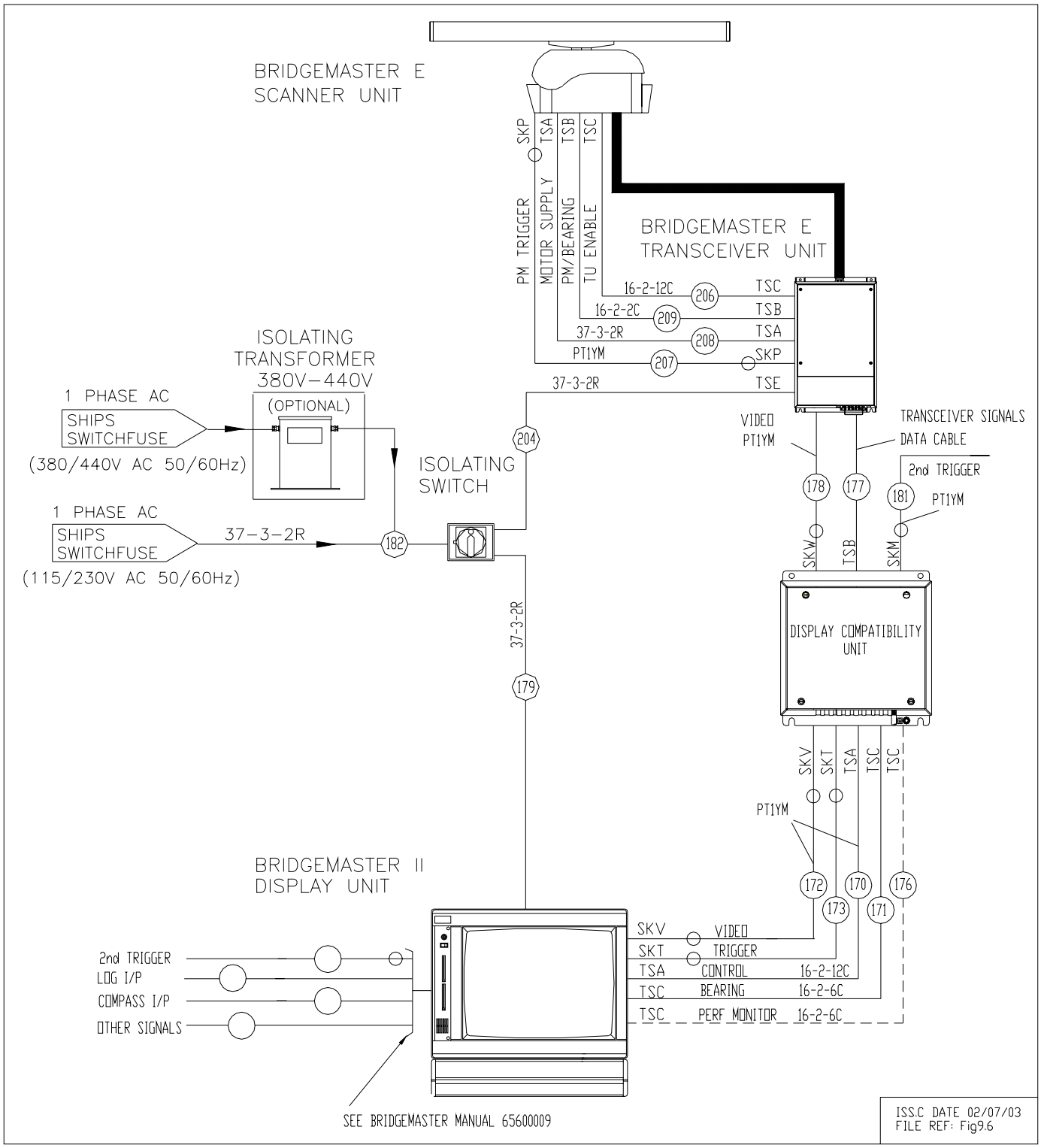

Figure 9.6 – BridgeMaster II X-Band Bulkhead Hybrid System (BridgeMaster II Display/BridgeMaster E Scanner Unit)

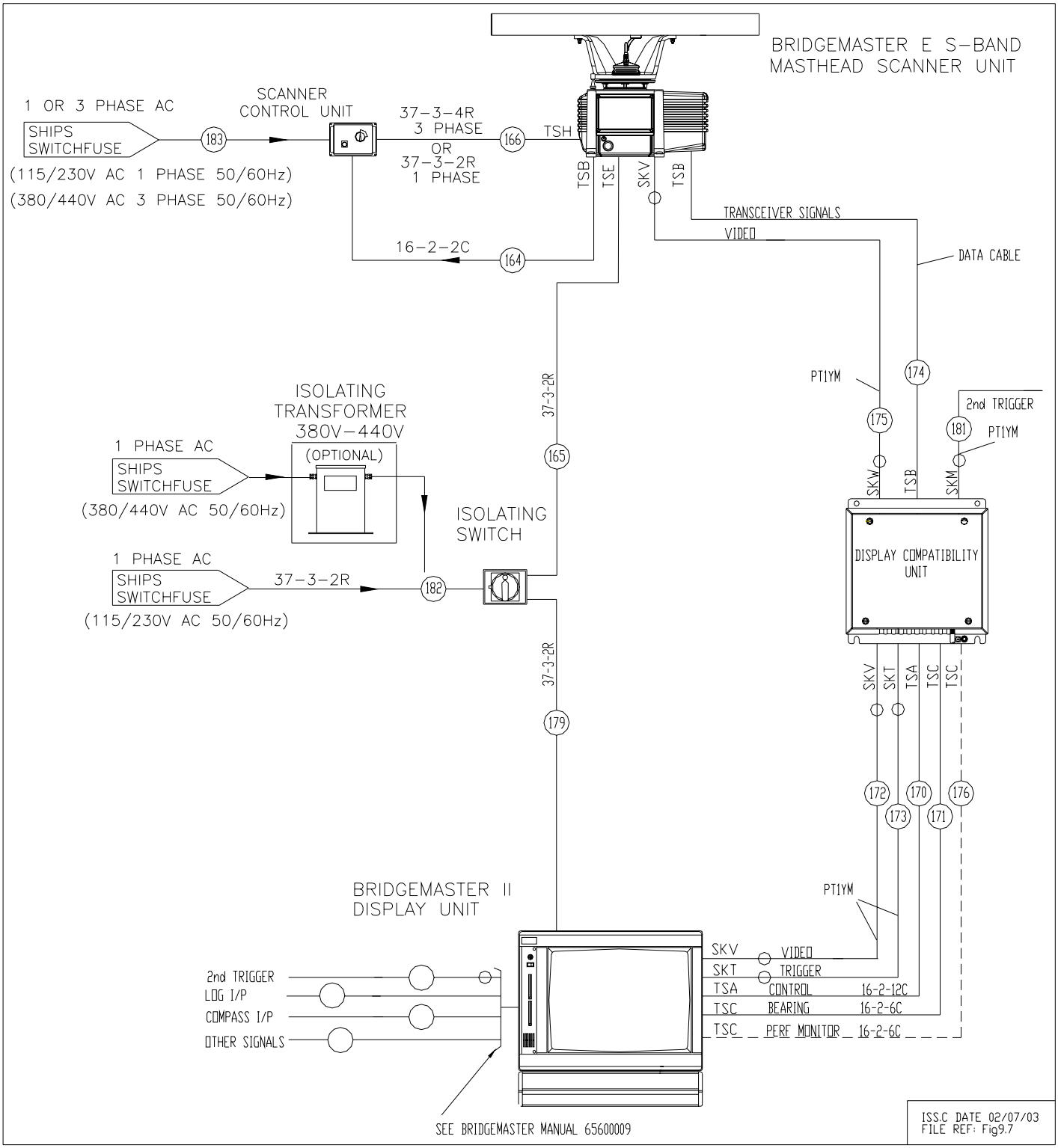

Figure 9.7 – BridgeMaster II S-Band Hybrid System (BridgeMaster II Display/BridgeMaster E Scanner Unit)

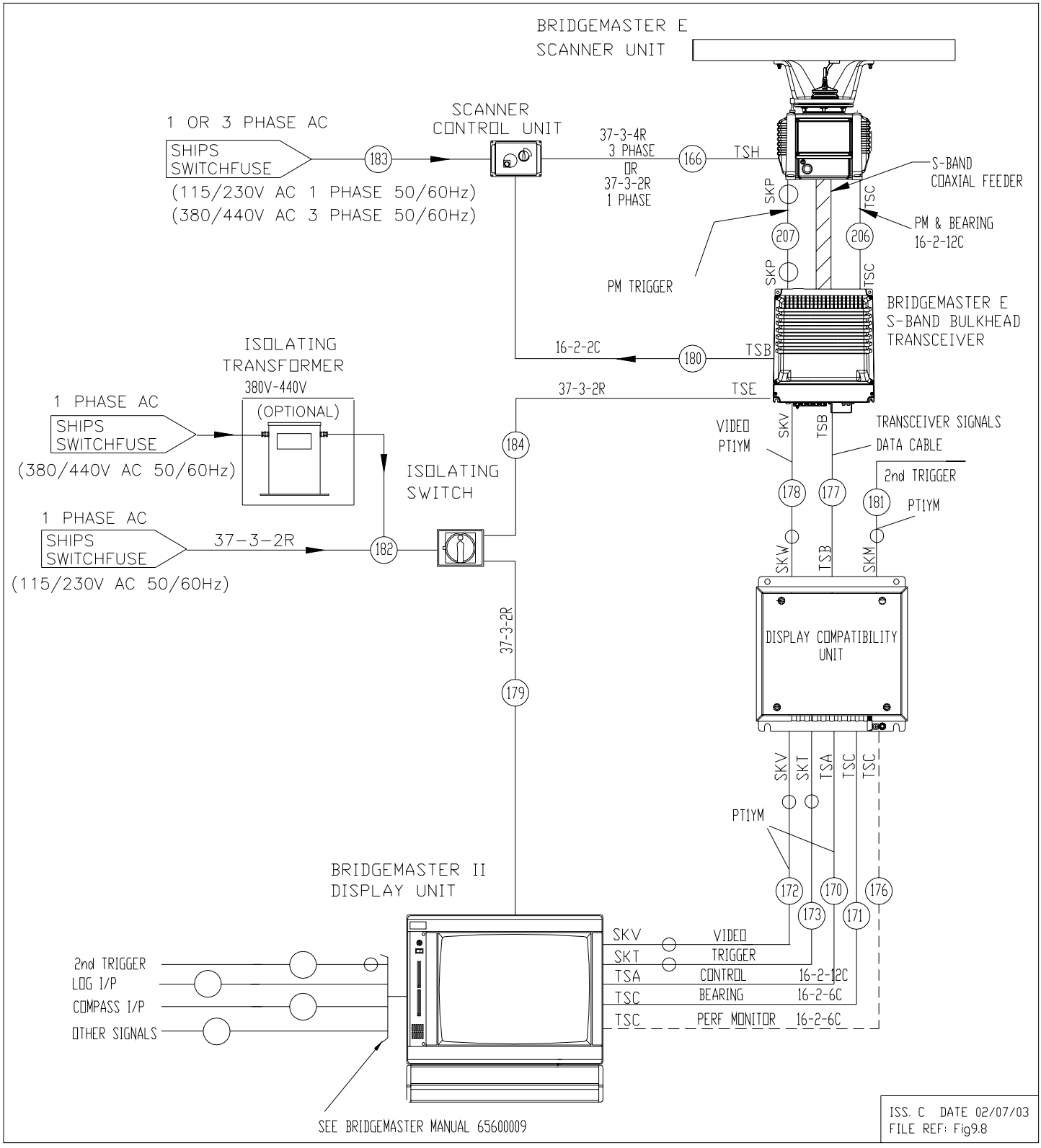

Figure 9.8 – BridgeMaster II S-Band Bulkhead Hybrid System (BridgeMaster II Display/BridgeMaster E Scanner Unit)

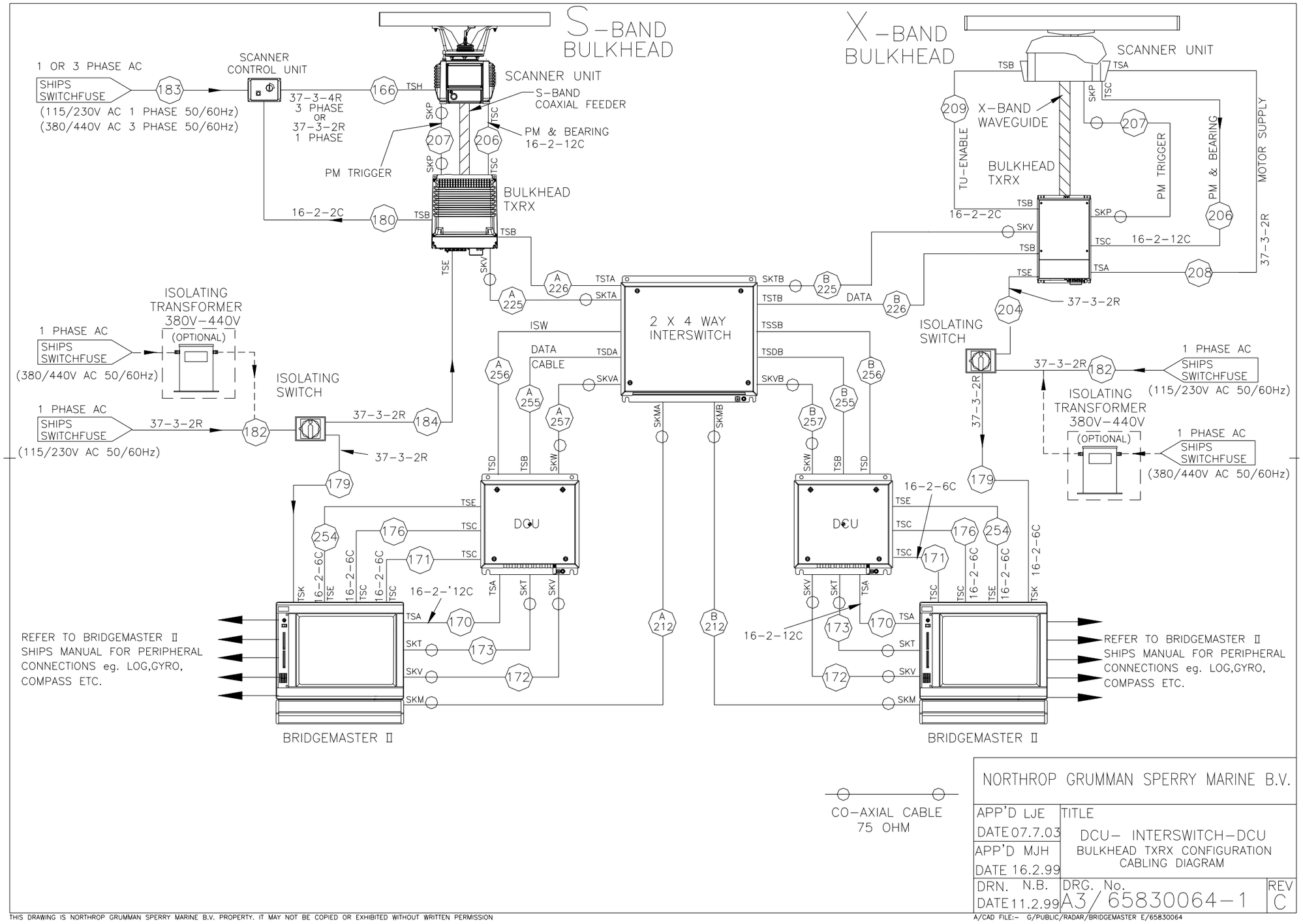

Figure 9.9 – BridgeMaster E Hybrid X+S-Band Bulkhead Tx/Rx Dual Interswitch Configuration with BridgeMaster II Displays

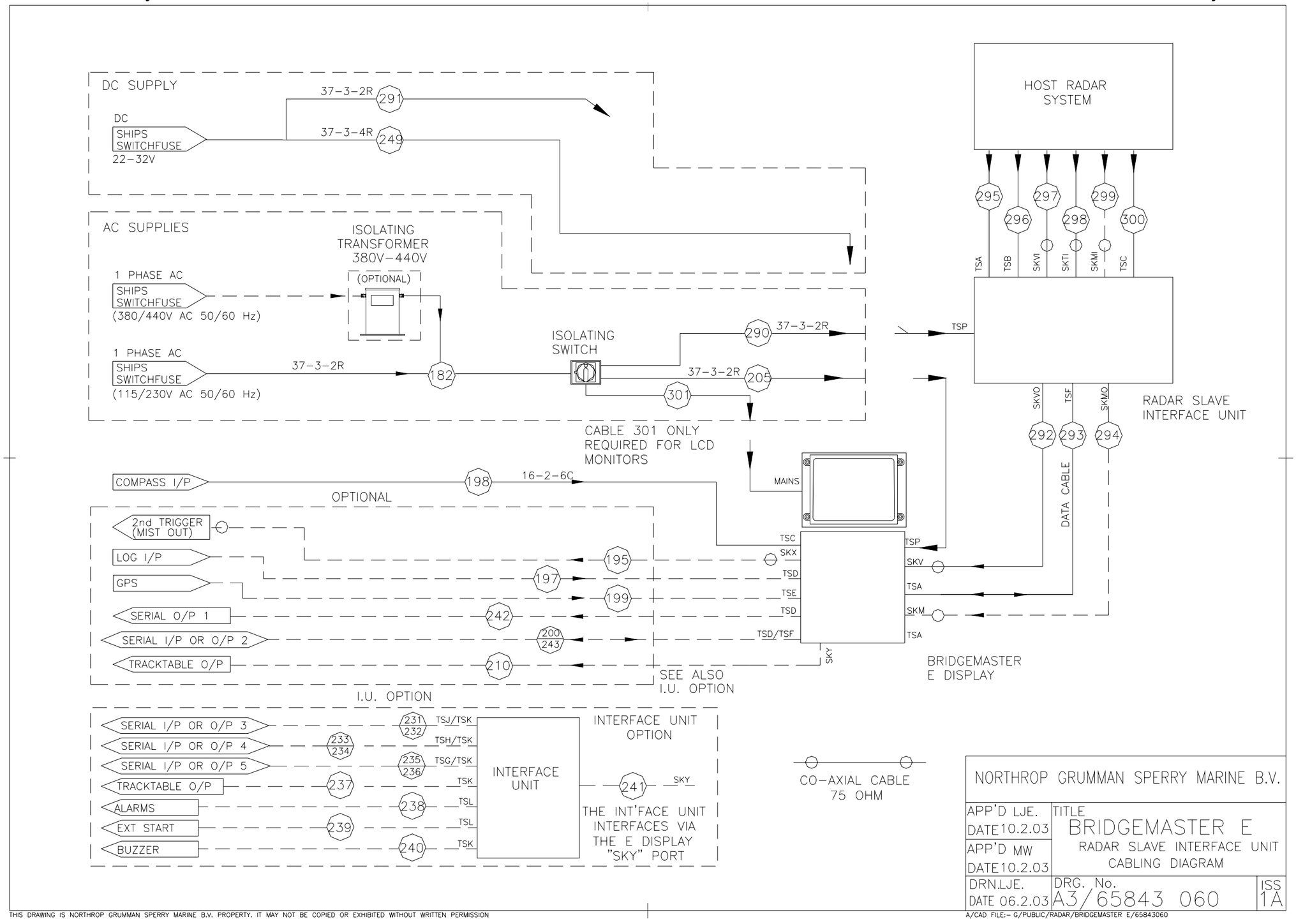

Figure 9.10 – BridgeMaster E Display Configured with Radar Slave Interface Unit

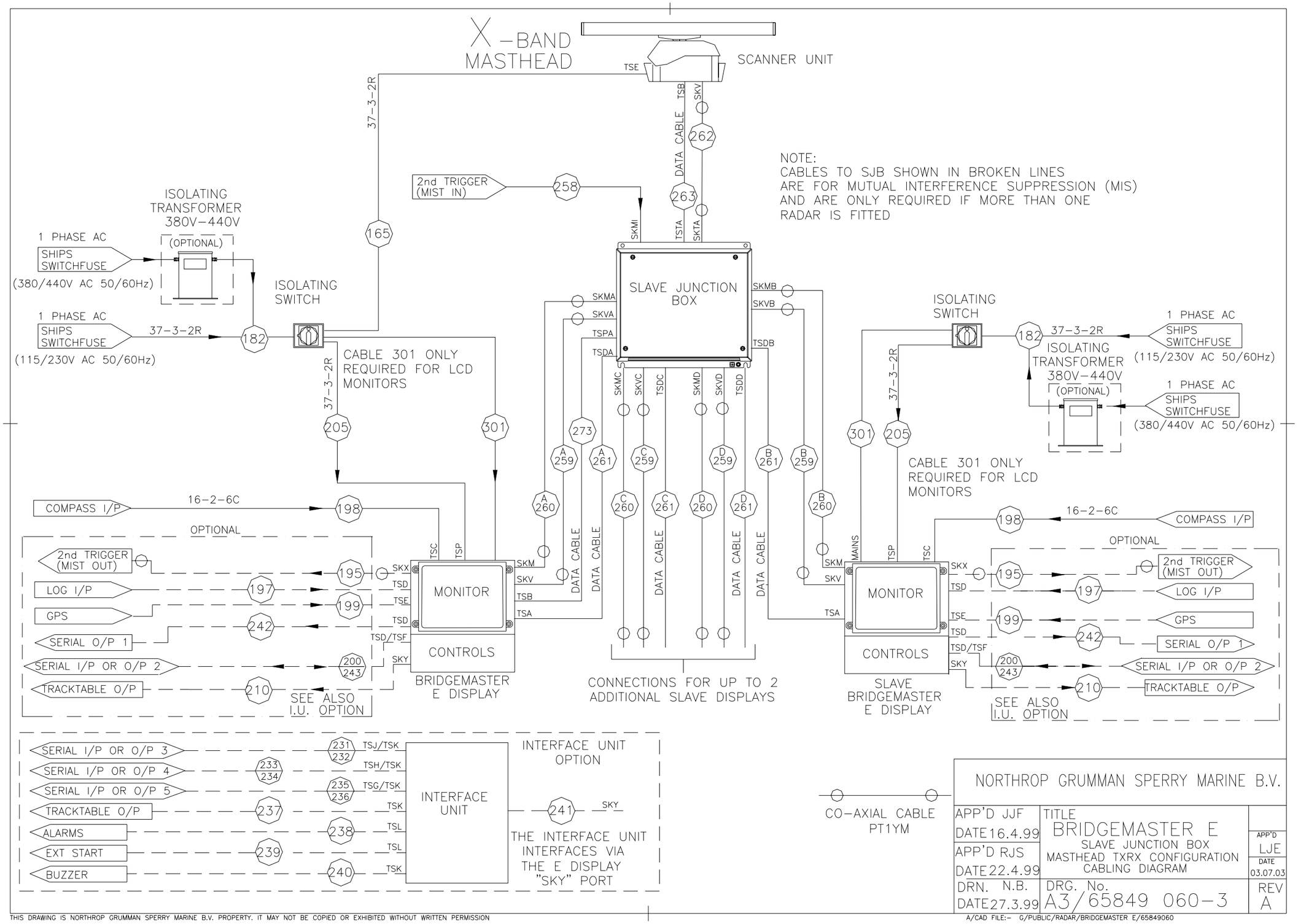

Figure 9.11 – BridgeMaster E Displays Configured with Slave Junction Box

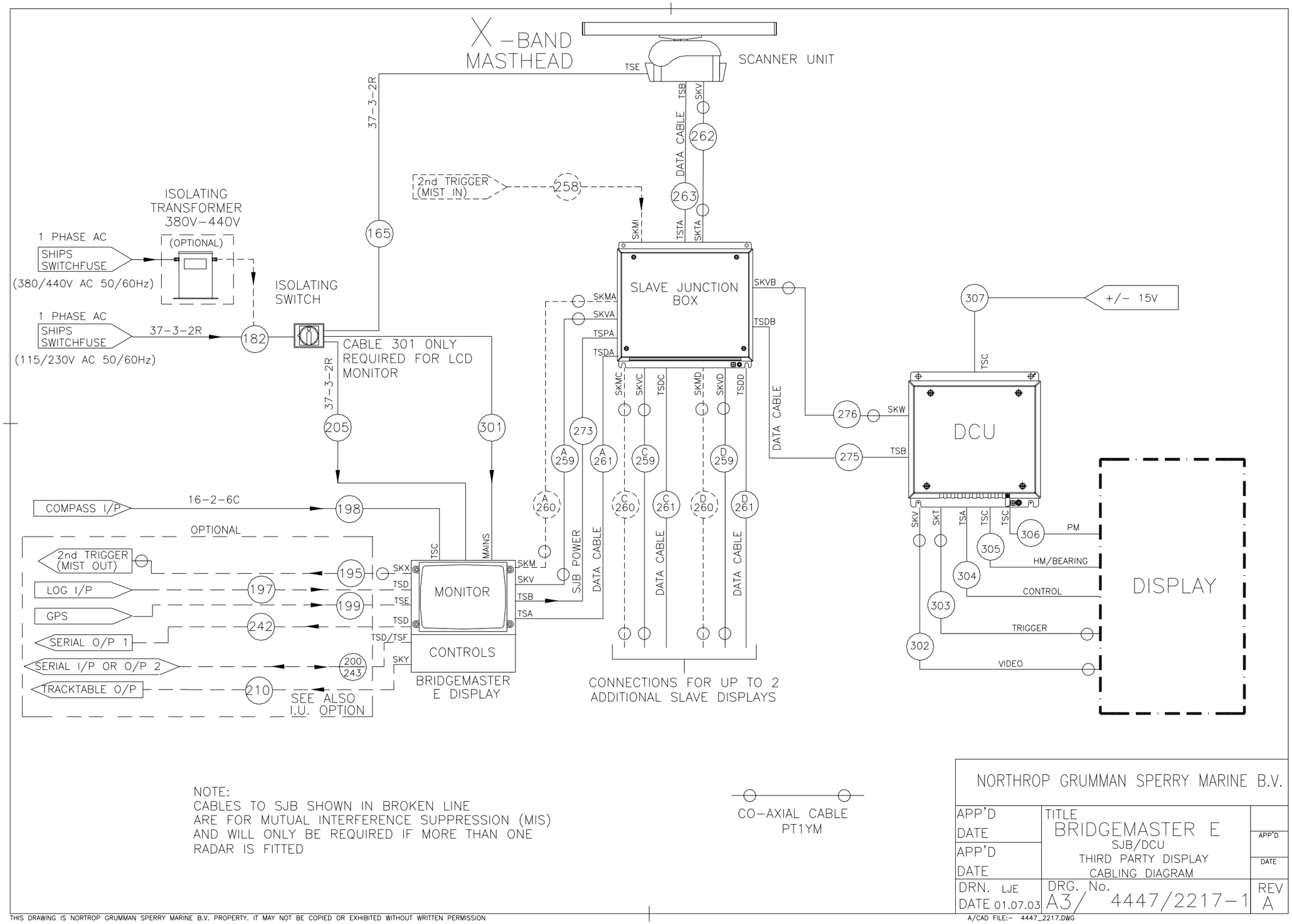

Figure 9.12 – BridgeMaster E Display and Scanner Unit Configured with Slave Junction Box and DCU to Third Party Display

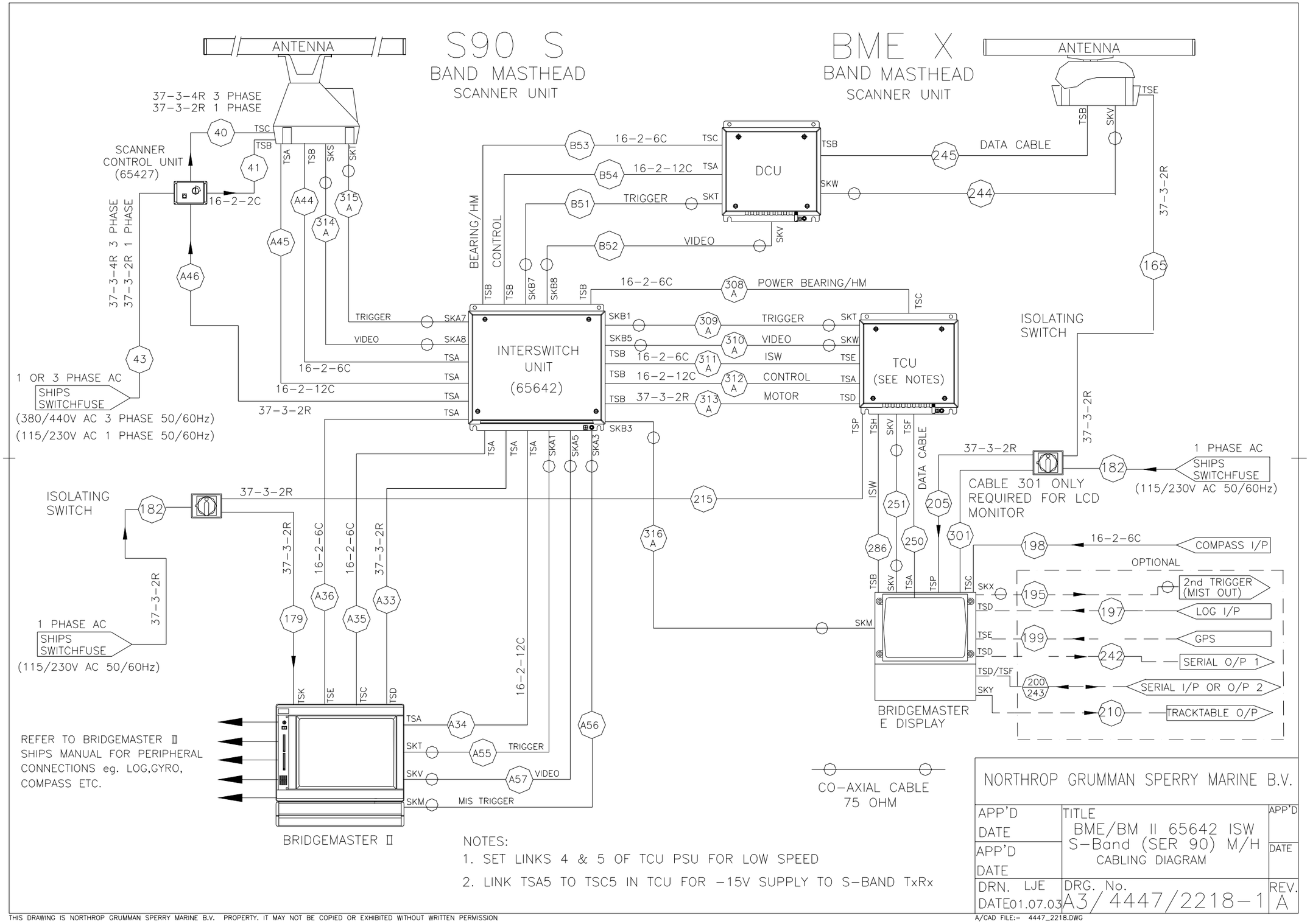

Figure 9.13 – BridgeMaster E Display and Scanner Unit Configured with Slave Junction Box and DCU to Third Party Display

CHAPTER 10

ANCILLARY UNITS

FAULT REPORTING AND FIRST LINE SERVICING

CONTENTS

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FAULT REPORTING

Fault diagnosis to component level is not possible without the use of special test equipment.

The majority of the PCB's 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.

CONTACT

If a unit exhibits a fault, please contact your supplier or local Dealer, or if on International trade, contact:

Northrop Grumman Sperry Marine B.V.
SERVICE CONTROL
118 Burlington Road
New Malden
Surrey KT3 4NR
England UK

Telephone: +(44) (0) 20 8329 2000
Fax: +(44) (0) 20 8329 2415

INFORMATION REQUIRED FOR SERVICE

Please give the following details:

1. Name of vessel (Satcom or Fax number if fitted).

2. Equipment type, including prefix and suffix letters.

3. Software status (version number).

4. Next port of call, ETA and ship's agents.

5. Fault description (with as much detail as possible).

6. Contact name

FAULT IDENTIFICATION and ISOLATION

Refer to the following associated manuals for assistance in identifying and isolating System faults:

65601012	BridgeMaster II S-Band Supplement (Hybrid Systems) Also covers DCU and Scanner Control Unit faults.	- Chapter 6
65601013	BridgeMaster II X-Band Supplement (Hybrid Systems) Also covers DCU faults.	- Chapter 6
65800010B	BridgeMaster E Series Ship's Manual	- Chapter 6

FIRST LINE SERVICING

DISPLAY COMPATIBILITY UNIT (DCU) 65840A

First Line Servicing to this unit is limited to field replacement of PCB assembly 65840802.

TRANSCEIVER COMPATIBILITY UNIT (TCU) 65841A (AC) or 65841D (DC)

First Line Servicing to this unit is limited to field replacement of the following items:

PCB ASSEMBLY	65841801
AC PSU ASSEMBLY	65841803
DC PSU ASSEMBLY	65841804
AC FUSE 5 AMP	2180413
DC FUSE 16AMP	2162342

2-WAY INTERSWITCH 65842A

First Line Servicing to this unit is limited to field replacement of PCB assembly 65842800.

RADAR SLAVE INTERFACE UNIT (RSIU) 65843AE, 65843AF, 65843AG, OR 65843DG

First Line Servicing to this unit is limited to field replacement of the following items:

PCB ASSEMBLY	65843800 (65843AX only)
AC PSU ASSEMBLY	65841803 (65843Dx only
DC PSU ASSEMBLY	65841804
SYNCHRO COMPASS PCB	65800832 (65843AF, 65843DF only)
RESOLVER COMPASS PCB	65800853 (65843AG, 65843DG only)
FUSE 3.15 AMP	MA00007245 (for units with AC PSU)
FUSE 5 AMP	2180413 (for units with DC PSU)
MAINS FILTER DC	91003686 (65843Ax only)
MAINS FILTER AC `	1586513 (65843Dx only)

6-WAY INTERSWITCH 65846A

First Line Servicing to this unit is limited to field replacement of the following items:

PCB ASSEMBLY	65846800
BYPASS PCB ASSEMBLY	65846801

INTERFACE UNIT 65847A

First Line Servicing to this unit is limited to field replacement of PCB assembly 65847851

SLAVE JUNCTION BOX 65849A

First Line Servicing to this unit is limited to field replacement of PCB assembly 65849852.

LIMITED SPARES FOR FIELD REPLACEMENT

1. **DISPLAY COMPATIBILITY UNIT (DCU) 65840A**

PCB ASSEMBLY	65840802

2. **TRANSCEIVER COMPATIBILITY UNIT (TCU) 65841A (AC) or 65841D (DC)**

PCB ASSEMBLY	65841801
AC PSU ASSEMBLY	65841803
DC PSU ASSEMBLY	65841804
AC FUSE 5 AMP	2180413
DC FUSE 16 AMP	2162342

3. **2-WAY INTERSWITCH 65842A**

PCB ASSEMBLY	65842800

3. **RADAR SLAVE INTERFACE UNIT 65843AE, 65843AF, 65843AG (AC) or 65841DE, 65843DF, 65843DG (DC)**

PCB ASSEMBLY	65843800
AC PSU ASSEMBLY	65841803
DC PSU ASSEMBLY	65841804
SYNCHRO COMPASS PCB	65800832 (65843AF, 65843DF only)
RESOLVER COMPASS PCB	65800853 (65843AG, 65843DG only)
FUSE 3.15 AMP	MA00007245 (for units with AC PSU 65843Ax)
FUSE 5 AMP	2180413 (for units with DC PSU 65843Dx)
MAINS FILTER DC	91003686 (for units 65843Ax only)
MAINS FILTER AC `	1586513 (for units 65843Dx only)

4. **6-WAY INTERSWITCH 65846A**

PCB ASSEMBLY	65846A

5. **SERIAL INTERFACE UNIT 65847A**

PCB ASSEMBLY	65847851

6 **65849A SLAVE JUNCTION BOX**

PCB ASSEMBLY	65849852

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CHAPTER 11

ANCILLARY UNITS

MAINTENANCE

CONTENTS

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GENERAL

WARNING: HEALTH HAZARD

Before any maintenance tasks or service procedures are commenced, the equipment must be isolated from the mains supplies, by means of both the Ship's Switch Fuse and the Mains Isolator Switch.

MAINTENANCE PLAN

There are no specific maintenance requirements for any of the items covered by this manual.

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CHAPTER 12

MODIFICATIONS

CONTENTS

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INTRODUCTION

This chapter is intended to provide the user with information on modifications that may become necessary to the Ancillary Units contained within this manual.

As the modification sheets are issued, they should be stored in this chapter.

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