

VALOR ROV SYSTEM

Operation & Maintenance Manual

5 Port VALOR

VAL-OMM-0001

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Notices

Whenever you see the symbols shown below, i.e. 'Warning', 'Caution' or 'Notice' heed their instruction!

Always follow safe operating and maintenance practices.

WARNING

This warning symbol identifies special instructions or procedures, which if not correctly followed, could result in personal injury, or loss of life.

CAUTION

This indicates special instruction or procedures, which if not strictly observed, could result in damage to, or destruction of the equipment.

NOTE: *This indicates points of particular interest for more efficient or convenient operation*

Reference Drawing No:

VAL-000-0000 This refers to drawing of interest for more detail

Reference:

This refers to documentation of interest for more efficient or convenient operation.

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Table of Contents

1.0 Introduction 7
1.1 General 7
1.2 Safety 8
1.3 List of Common Abbreviations 10
2.0 Scope of Supply 11
2.1 General System Description 12
2.1.1 ROV Specification 13
2.1.2 Control Console 16
2.1.3 Tether Storage Reel (Optional) 17
3.0 VALOR Operation and Maintenance 18
3.1 Surface Control Console 18
3.1.1 General 18
3.1.2 SCU and ROV Power Requirements 19
3.1.3 System Processor 20
3.1.4 10G Managed Ethernet Switch 20
3.1.5 Accessing the Web Management Interface 21
3.1.6 Surface Control Unit (SCU) Operation 23
3.1.7 Earth Fault Monitoring System 23
3.1.8 Back panel Connectors 24
3.2 Pilots Hand Control Unit (HCU) General 25
3.2.1 Pilots Hand Control Unit (HCU) 26
3.2.2 Plots Hand Control Unit (HCU) Operation 27
3.3 VALOR ROV 30
3.3.1 Frame 30
3.3.2 Buoyancy 30
3.3.3 Thrusters 31
3.3.4 Oils and Lubricants (ROV) 33
3.3.5 Pressure Compensation 33
3.4 Comms Pod 34
3.4.1 General 34
3.4.2 User Ports 36
3.4.3 Comms Pod Control PCBA (VAL-PCB-001) 38
3.4.4 USP PCBA - Universal Serial & Power (VAL-USP-001) 39

3.4.5 Vacuum Port (Comms Pod) 50
3.5 Power Pod 51
3.5.1 Power PCBA (VAL-PCB-003) 53
3.5.2 USP Universal Serial & Power (VAL-USP-001) 54
3.5.3 10A Motor Driver (VAL-PCB-006) 54
3.5.4 Mini Ethernet Switch (VAL-PCB-007) 55
3.5.5 Vacuum Port (Power Pod) 55
4.0 Vehicle Sensors 57
4.1.1 Cameras 57
4.1.2 Poseidon Subsea GNSS Antenna 57
4.1.3 Depth Sensor 58
4.1.4 INS Pod (Inertial Navigation System) 58
4.1.5 Altimeter 58
5.0 Vehicle Equipment 60
5.1 Standard Vehicle Equipment 60
5.1.1 Camera Tilt Unit 60
5.1.2 Lights 61
5.1.3 Vehicle Interconnecting Cables 61
5.2 Optional Vehicle Equipment 63
5.2.1 Sonar 63
5.2.2 2 Function Manipulator 63
5.2.3 CP Probe 63
5.2.4 Tilt Unit – Skid Mounted 64
5.2.5 Navigation Skid 64
6.0 General Safety Procedure 65
6.1 Safety 65
6.1.1 Electrical 65
6.1.2 Electrical Safety Guidelines 65
6.1.3 AC Power Supplies 66
6.1.4 Heavy Weights 67
6.1.5 Underwater Connectors 67
6.1.6 'O'-Rings 67
6.1.7 Tools 68
6.1.8 Spare Parts 68
7.0 Integration, Operation & Emergency Procedures 69

7.1 System Installation & Integration 69
7.1.1 Connecting the Tether to the ROV 69
7.1.2 Initial Checks 69
7.1.3 AC Power Supply Requirements 70
7.1.4 Control Console 70
7.1.5 ROV Subsea Connectors 70
7.1.6 Payload 70
7.2 Operation Guidelines 71
7.2.1 Buoyancy, Trim and Setup 71
7.2.2 Powering Up 72
7.2.3 Pre-dive Checks 72
7.2.4 Diving and Operation 73
7.2.5 Deployment by hand 74
7.2.6 ROV Thrust and Tether Handling 75
7.2.7 Using the auto-functions: 75
7.2.8 Dive Records 76
7.3 System Recovery 76
7.3.1 System Recovery by crane or LARS 76
7.3.2 System Recovery by hand 76
7.3.3 Immediately after each Dive 76
7.4 Post-Dive Checks 76
7.5 VALOR Fault Diagnosis 78
8.0 Warranty 80
8.1 Service, Support & Spares 80
9.0 Drawing Package 81
9.1 Mechanical Drawings. 81
9.2 Electrical Drawings 82

1.0 Introduction

Congratulations on purchasing the VALOR ROV system from Seatronics Ltd (an ACTEON Company), the marine technology specialists.

This vehicle is a truly Versatile and Lightweight Observation ROV (VALOR) and is a professional ROV system suitable for onshore and offshore use. It provides a stable platform for a range of video inspection and sonar surveys. The ROV is also capable of carrying neutrally buoyant compact work skids and compact multifunction manipulators.

1.1 General

This manual is intended to serve as a "user point of reference" for the safe operation, maintenance, repair and the identification of manufacturer's proprietary replacement parts.

WARNING

The VALOR is a high voltage (640VDC) system. Before attempting to power up or operate the system, please read this manual thoroughly.

The manual has been devised with the intention of being simple, yet informative. This manual is to be used to complement the appropriate assembly drawings, to show how the unit is built in a step by step manner, allowing a technician to carry out any maintenance or repair work in the field.

Before commencing any work on the product please read this manual thoroughly.

If the purchaser or the end user is not familiar with underwater ROV systems, it is recommended that product training in the operation and maintenance of the system be obtained from the manufacturer.

This manual relates to the VALOR ROV System supplied and includes details of a range of standard equipment and available optional tools, including tools that may not have been supplied initially with this system.

This manual is written assuming that the user is competent with electrical, electronic and hydraulic principles and understands ROV operations.

1.2 Safety

Safety regarding high voltages and the handling of heavy loads has been recognised as a key issue; therefore, this subject is highlighted in detail throughout the manual.

WARNING

The VALOR ROV is supplied with 640VDC. Training on high voltage electrical systems should be obtained by the user before operating or maintaining the system.

WARNING

Potentially lethal AC and DC voltages are present throughout the system. To prevent the risk of electric shock, ensure that power to the surface control unit is disconnected before attempting to service or repair any part of the ROV system.

CAUTION

Thruster propellers rotate at high speeds and high torque. The propeller blades can cause serious injuries to hands and fingers if touched when rotating. Ensure that all personnel are clear of the thrusters before applying power to the vehicle. Do not touch the thruster propellers when power is applied to the vehicle.

WARNING

The ROV tether carries 640VDC. Do not handle the tether when power is supplied to the ROV.

Safety procedures are a vital aspect of the operation of ROV's. Procedures should be carefully studied, and the principles contained therein applied to the everyday operation of the ROV system.

Always switch off ROV power during deployment and recovery.

A permit to work system appropriate to the location, controlled by the ROV Supervisor or Pilot should be implemented for the repair and maintenance of the ROV System. This system should ensure that power is isolated before repair or maintenance work commences.

- The only person permitted to apply electrical power to the ROV is the Appointed Supervisor / Pilot.
- Remove watches, rings and jewellery when working with electrical equipment.

  Always isolate the system power supply before opening, or working on, any part of the ROV system.

- Never operate equipment that has an insulation fault to ground.
- When the ROV is on deck it should be fitted with a dedicated earth bonding conductor to ensure proper operation of the Line Insulation Monitoring (LIM) system.
- Ensure that power to the ROV is switched off before lifting or moving the vehicle, as it is possible for thrusters to operate without joystick commands if the auto-functions are selected.
- Ensure that all personnel in the proximity of the system are notified when power is to be applied to the system.

1.3 List of Common Abbreviations

Table of Abbreviations	
Abbreviations	**Description**
atm	Atmosphere (pressure; 101.325 kPa)
BNC	Type of Coaxial Video Connector
COAX	Coaxial Cable typically used for video signals
CW	Clockwise
CCW	Counter-clockwise (Anti Clockwise)
COM	DC Voltage Common, Typically 0 Volts
CN	Connector Number (Refers to wiring diagram details)
CP	Cathodic Potential (Measure of Corrosion)
ESD	Electrostatic Discharge
FO	Fibre Optic
FWD	Forward (Refers to position on the ROV)
GUI	Graphical User Interface (Graphics Based Display and Control)
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HCU	Hand Control Unit
HV	High Voltage, typically 300V and above
IC	Integrated Circuit (Electronic Component)
INS	Inertial Navigation System
I/O	Input / Output
L	Live - (AC Power Live)
LED	Light Emitting Diode
LIM	Line Insulation Monitor
LV	Low Voltage
MSW	Metres Sea Water
N	Neutral - (AC Power Neutral)
PBOF	Pressure Balanced Oil Filled (Type of cable assembly)
PC	Personal Computer
PCBA	Printed Circuit Board Assembly
PE	Protective Earth
PS	Power Supply (Electronic Component on PCB)
PSU	Power Supply Unit
ROV	Remotely Operated Vehicle
RL	Relay (Refers to wiring diagram details)
SCU	Surface Control Unit
STBD	Starboard
STP	Screened Twisted Pair – (Two conductor with screen signal cable)
USP	Universal Serial and Power (refers to a VALOR Control PCBA)

2.0 Scope of Supply

The basic scope of supply is as follows: (See following page for details)

- VALOR ROV System, 300m rated as standard (1000m rated is an option)
- Surface Control Unit
- Pilot's Hand Control Unit – Portable
- GigE Colour Camera
- GigE Monochrome Camera
- Tilt Unit
- INS (incorporating depth sensor and connected subsea GNSS antenna)
- GNSS Antenna
- ROV Tether Length 300metres standard.

Possible Options: (See following page for details)

- Sonar options (scanning or multibeam)
- CP Probe
- Ultrasonic Thickness Probe
- Cleaning Brush
- Hand driven or electrically driven storage winch
- 1, 2, or 3 Function Electric Gripper
- 5 or 7 Function Electric Manipulator Skid
- Laser Scanning Skid
- Observation Skid (Auxiliary Tilt Unit)
- ROV Enhanced Spares Packages

Other items are available but may require additional engineering and design.

2.1 General System Description

Reference Drawing No:

VAL-800-0009	Vehicle Layout
VAL-800-0004	SCU Interconnection Diagram

The VALOR ROV is a computer controlled, electrically powered ROV system utilising the OPENSEA control system from Greensea Systems Inc.

The system requires a three-phase power supply input and the PSU in the SCU generates the 640VDC power which is supplied via the tether to the ROV. The 640VDC supply is used to power all the ROV functions, from thrusters to controls and sensors. All communication (control data, sensor data or video) is all carried via high-speed Ethernet over the fibre optic link. The vehicle has the capability of carrying a wide range of cameras and sensors such as DVL's, Sonars, Laser Scanners and Altimeters etc. It also has the capability to carry manipulators.

The VALOR has been designed to carry out a wide range of underwater tasks including, but not limited to:

- Diver monitoring and support
- Inspection of structures
- Port / Harbour Security
- Oceanography & Research / Scientific Survey
- Light Recovery / Intervention
- Wreck Survey
- Aquaculture
- Inland Waterways
- Dam / Tunnel Inspection

A brief technical description of the system follows. Refer to the appropriate Section of the Manual for a detailed description of each of these systems and components.

2.1.1 ROV Specification

Propulsion System:	6 off Forum SPE-75 Brushless DC Thruster
Forward Thrust:	71kgf
Lateral Thrust:	71kgf
Vertical Thrust:	43kgf

Reference Drawing No:

VAL-800-0009	Vehicle Layout
VAL-80-00040	System Interconnection Diagram

Weights and Dimension

Depth Rating:	300msw or 1000msw optional
Weight in Air: (Basic Vehicle)	90Kg
Height:	548mm
Width:	590mm
Length:	860mm
Payload: (In saltwater)	21Kgs

NOTE: *Payload includes any trim weights that may be required*

Automatic Functions:

Auto-heading:	Accuracy 5°
Auto-Depth:	Accuracy ±0.5m
Auto-Altitude:	Requires DVL/Altimeter
Auto-Hover:	Adequate for Short Durations

Power Requirements

SCU/PSU Electronics Rack	3-ph, 373-456VAC @12kW minimum for specified operation.
	Note: other 3-phase input ranges are optionally available.

Camera Expansions:	2 x GigE Vision cameras as standard; 2064 x 1544 pixels
	2 x 3G HD-SDI (*with optional hardware expansion)*
	Maximum of 5 x GigE Vision / IP Cameras (using all user ports)
Camera Tilt Unit:	Single tilt unit supplied as standard.
Compass Module:	Advanced Navigation Spatial INS unit as standard.
	Note: Other INS units are optionally supported
Lighting Interfaces:	4 x 1500 Lumen LED Lamps – Controlled Individually
LED Lamps:	Teledyne Bowtech LED 24V 14W
Standard User Ports:	5 x User ports as standard, each supporting:
	Variable 12VDC-48VDC (software configurable; set for 3A Max)
	Gigabit Ethernet
	RS232/422/485 (Software Selectable)
	1 PPS output signal

Electronics Pressure Housings

The vehicle contains three pressure housings containing various electronics packages. These electronic housing are:

Comm's Pod Housing:	Vehicle Control System and Software
	Subsea USP modules
	Camera interfaces
	User Port interfaces

Power Pod Housing: Vehicle Power Supplies

Light power supplies & control circuitry

Thruster Power Electronics

Tilt Drive Electronics

INS Pod Housing: Depth Sensor

Advanced Navigation Spatial INS unit

INS interface PCBA

Frame

The frame is manufactured from HDPE sheet to form a strong, corrosion and maintenance-free structure. The frame incorporates various attachment points for the mounting of additional equipment. The HDPE sections are fastened together using M6 stainless steel, button head Allen screws and cross dowels/barrel nuts.

Buoyancy

Subsea Corecell™ styrene acrylonitrile (SAN) rated to 300msw operation (or 1000msw if that option has been selected) with a PVC shell. The free vehicle payload is subsequent of standard cameras & thrusters however if additional or differing equipment is specified this will be inclusive in the payload. The payload is made up of lead ballast unless optional equipment is fitted.

2.1.2 Control Console

The VALOR Control Console consists of five main modules: the SCU, the PSU, the Router and the two monitors. These are all housed in a 4U 19”-rack mount chassis in the main control console transit case. The PSU is the heaviest unit if the control console is located in the very bottom of the rack.

Surface Control Unit (SCU) houses the computer module, the main 10Gb Ethernet switch, topside USPs modules, and power supplies as well as the power switching modules. The SCU also includes a Line Insulation Monitor (LIM) which protects the ROV main power supply. The main PSU for the ROV is a Magnapower 10kW PSU; this is the 2U rack module (separate to the main SCU, in the bottom of the rack). This provides power to the ROV via the main front panel breaker and LIM protection module.

Located at the top of the rack, are the two 1U retractable monitors. Both monitors slide out and fold up (top monitor) or down (bottom monitor) for to allow viewing. One monitor is a 17.3” HD monitor and the other is a 1U 13.3” HD touchscreen monitor. Both monitors allow access to control software GUI and video overlay. The standard vehicle cameras are displayed within a window in the main control GUI software.

Also connecting to the SCU, is the pilots HCU. This contains all the necessary switches, joysticks & inputs to fly and control the ROV. The pilots console communicates with the SCU via USB and is connected directly to the main control software.

The system PC located in the SCU is based on an ASUS WS-C422 Pro/SE (Xeon-W) motherboard and is at the heart of the surface control system. This utilises the state-of-the-art OPENSEA control software from Greensea systems Inc. This software package includes a graphical user interface (GUI) and can be customised to suit client requirements. There are password protected configuration settings to allow the user to modify some parts of displays or operational behaviour (Refer to the Greensea software manual for full details). Finally, there are diagnostic features that allow the user to diagnose problems while the system is still in operation.

Reference Drawing No:

VAL-500-0001	S.C.U. Assembly
VAL-500-5400	S.C.U. Wiring Diagram

Reference:

Refer to separate Greensea software manual within the VALOR Auxiliary Equipment Manual for further details on the operating system.

2.1.3 Tether Storage Reel (Optional)

General

The deck tether storage reel is used to store and deploy the ROV tether. A Seatronics supplied storage reel is available in either a hand-operated or an electrically powered version. Both storage reels are as compact as possible with the drum sized to hold the full length of a standard tether. These compact units are designed to be as portable as possible allowing either to be moved from ship to ship or land site as required.

Both types of winch are supplied with a slip ring fitted. It is possible to operate a VALOR ROV without a winch provided enough space is available to secure the tether and to arrange in a figure-of-eight arrangement. However, this is only practical for relatively short lengths of tether and not recommended for long term use. The storage reels are only intended for storage of the tether, not as a means of recovering or lifting the ROV (i.e., they are not designed for, nor have any cable-pull rating).

3.0 VALOR Operation and Maintenance

3.1 Surface Control Console

WARNING

The Surface Control Console is the means to control all functions of the ROV. It is essential that the SCU operator is fully aware of all functions. Thrusters may start to rotate without warning if Auto Functions are left enabled. Never perform maintenance on the ROV or SCU without first isolating power.

Reference Drawing No:

VAL800-0004	SCU Interconnection Diagram
VAL-500-0001	Control Console Assembly Drawing
VAL-500-0002	SCU Assembly Drawing
VAL-500-5400	SCU Wiring Diagram
VAL-500-5005	Pilots Hand Controller Unit

Reference:

Refer to separate Greensea Systems Inc Software Manual within the VALOR Auxiliary Equipment Manual

3.1.1 General

The VALOR is supplied with a Surface Control Console which contains the SCU, PSU and Monitors. The SCU houses the control PC, 10G Ethernet Switch and Topside USP's required to power the ROV. The Control PC is a compact single board PC mounted within the SCU, the SCU itself is a 4U, 19" rack mount unit. The main functions of the PC are to run the Graphical User Interface (GUI) Screen application and pilots Hand Control Unit (HCU) which are used to control the ROV.

The SCU is the interface between Pilot/Operator and the ROV. The unit contains all of the necessary power supplies and electronic interfaces required for communicating with and controlling the ROV from the surface. The SCU monitors and switches electrical power to the ROV and can control other optional equipment that may have been fitted to the ROV.

A video overlay system provides the Operator with on-screen vehicle information such as time, date, heading, depth, and altitude.

Because the SCU is designed as a 19" unit it can be quickly and conveniently mounted into a standard 19" rack along with any other related equipment such as Sonar SCU, Video recorders and switchers and UPS Units. It is however routinely supplied in a self-contained unit allowing the system to be moved quickly and safely between different locations. The SCU is designed to be operated in a sheltered environment protected from rain and condensation. It therefore should not be operated on the deck of a small boat where spray would be present. In general, the pilot

monitor may be difficult to view in sunlight due to reflections; this is another reason why the unit is best operated under cover.

The Surface Control Console is supplied in an 8U flight/transit case as standard.

CAUTION

The SCU unit is fitted with a PC installed with software. This PC must be shut down in software before the main SCU power is disconnected. Failure to do so can lead to software and data corruption.

3.1.2 SCU and ROV Power Requirements

The VALOR ROV provides a very high power to weight ratio, with approx. 70kgf from a small vehicle. As with any system a high energy output requires a matching high energy input. The VALOR SCU should be connected to a power supply capable of providing 12.5kVA of power at 415VAC. The SCU is provided with suitably rated cable but the user may have to provide a suitable power plug as it is not possible for Seatronics Limited to provide a universally acceptable plug. The user should take care to select a suitable plug that is rated for voltage, current and the environment, i.e. splash resistant if used on deck or exposed to rain.

3.1.2.1 Operating on Limited Power

It is not always possible to find a convenient power source such as a 12.5KVA generator or heavy-duty power source. In these circumstances it may be possible to make use of a lower powered workshop supply, or for example a 5KVA generator, boat supply or workshop power point. If this is required, then the operator should adjust the thruster demand pots (% Vertical etc) on the HCU to reduce the likely demand. Exactly levels of % thrust should be determined by observing the ROV supply current meter while operating the ROV, the load supply limit being calculated based on the following.

- ROV Power = Max Supply Power x 90%.
- ROV Current = ROV Power / 320VAC

This does reduce the thrust produced by the ROV but will allow the pilot to operate in less demanding environments.

NOTE: *That the 90% figure quoted represents the available power for the ROV after the losses are taken into account. If there is a limit on power then where possible supply all external equipment such as Sonar SCU, video recorder or additional monitor from a second supply.*

3.1.3 System Processor

The System Processor is an Asus WS C422 Pro/SE (Xeon-W) PC running Greensea systems Inc OPENSEA software which communicates with all the sub-components forming the whole of the ROV control system. Without the System Processor running the Greensea systems Inc OPENSEA GUI software it is impossible to control the ROV.

Reference:

Refer to separate ASUS User Manual within the VALOR Auxiliary Equipment Manual

3.1.4 10G Managed Ethernet Switch

The SCU contains the main interconnection component of the subsea communication link, namely the topside 10G Ethernet switch. This managed switch is located in the SCU under the main PC and interfaces directly to the fibre link to communicate with a similar switch subsea, therefore establishing a 10Gb Ethernet link (minimum) over the fibre connection. Although this managed switch is also a router, it is not configured or used as a router and all network routing functions are provided for by the Asus Router located at the rear of the SCU. Under normal operations, the configuration of the switch should not be changed in any way otherwise system performance may be impacted or even a loss of connection between the SCU and the ROV.

The 10G managed Ethernet switch/router provides high density, high port count switching and routing with 10G up/downlinks. The switch has a total of 36 ports, with 32 of those ports accessible in the topside when the switch module is fitted to the carrier/breakout board. The 32-ports are 4x 10G SFP+, 4x 1G SFP ports and 24x 1G copper 10/100/1000Mbps.
The carrier board accepts 12Vdc (supplied by the ATX power supply) and holds the cages for the fibre optic transceivers (for the SFP/SFP+ transceiver modules).

In the normal configuration, the switch is connected via a bidirectional 10G SFP+ optical transceiver. This should normally be in switch cage port 33. This transceiver is the main up/downlink to the ROV over the optical fibre.

Also connected into one of the 10G ports, is the SFP+ to SFP+ Direct Attach Copper (DAC) cable. This cable serves and the main connection between the PC and the Switch and allows for a 10G connection between the network interface card in the PC and the Switch. A 10G link is required between the PC and the Switch to allow the PC to access all the network video data (from the GigE cameras on the ROV) as well as all network sensor data. Only passive DAC cables are supported in this configuration.

The remaining 1G copper Ethernet ports are allocated to connections for the router, main PSU module, the console USP cards (5-off) and the front panel user network connections (5-off). These front panel network connections allow any user to connect to the VALOR system with a standard network cable and then for any external system to access any network data, e.g., sonar data, User port serial data, IP video streams etc., (note: the standard ROV (GigE) cameras are currently only supported in Unicast mode (and access by the control software on the PC for displaying in the GUI) so are therefore not concurrently available on the front panel network connections as well).

The switch has a setup and monitoring page that can be viewed via any web browser. This shows diagnostics of the network and allows the user to check for network traffic on any ethernet

connection so can be useful to check a new sensor just added the system is active and streaming data.

3.1.5 Accessing the Web Management Interface

The Switch has the default IP address of: **192.168.48.100** (for the SCU unit), or: **192.168.48.200** (for the Comms pod mounted unit).

In order to connect to this address, follow the steps below:

Either

- Open a web browser on the VALOR desktop and enter the IP address: 192.168.48.100 (or .200) in the address bar.

Or

- Alternatively, directly connect to any port of 10G Switch to your host PC using a standard Cat5e ethernet cable (e.g. via the front pane network ports).
- Setup your host PC's IP address to be either fully DCHP or set it to be on the same subnet as the VALOR system (i.e. 255.255.0.0) and set an IP address between the range: 192.168.48.30 and 192.168.48.99.
- Now on the host PC, open a web browser and go to the 192.168.48.100 (or.200) address.

Now you should see the login screen for the 10G Switch. The default username is **admin** and the default password is blank (no entry).

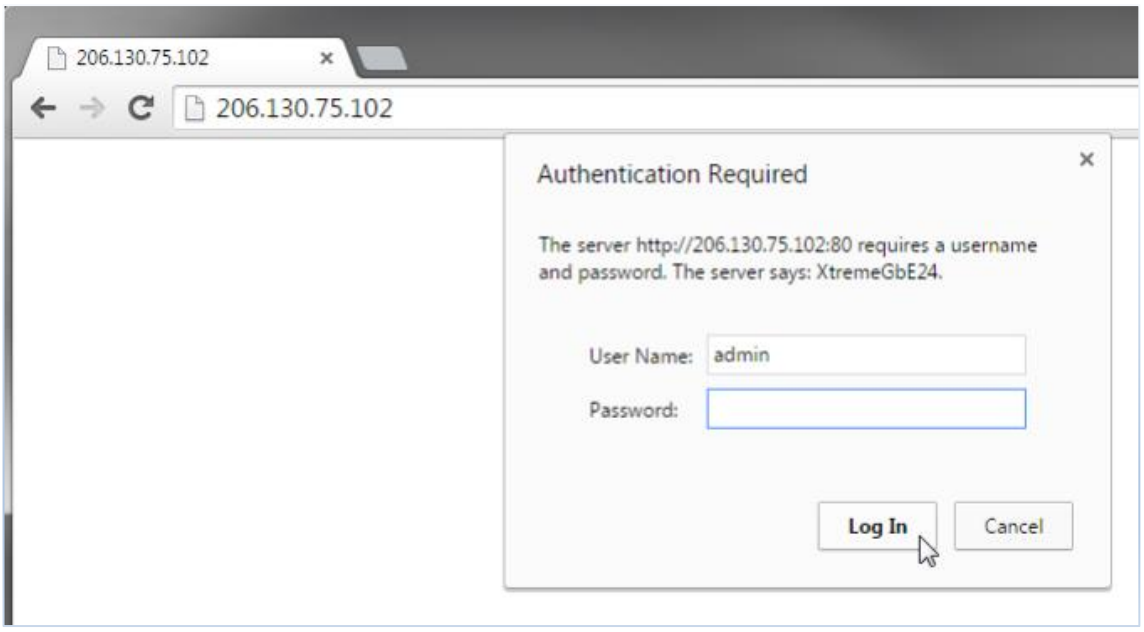


Figure 3.1.5-1: 10G Switch Login Page

You will now be presented with the Web Management Interface overview page:

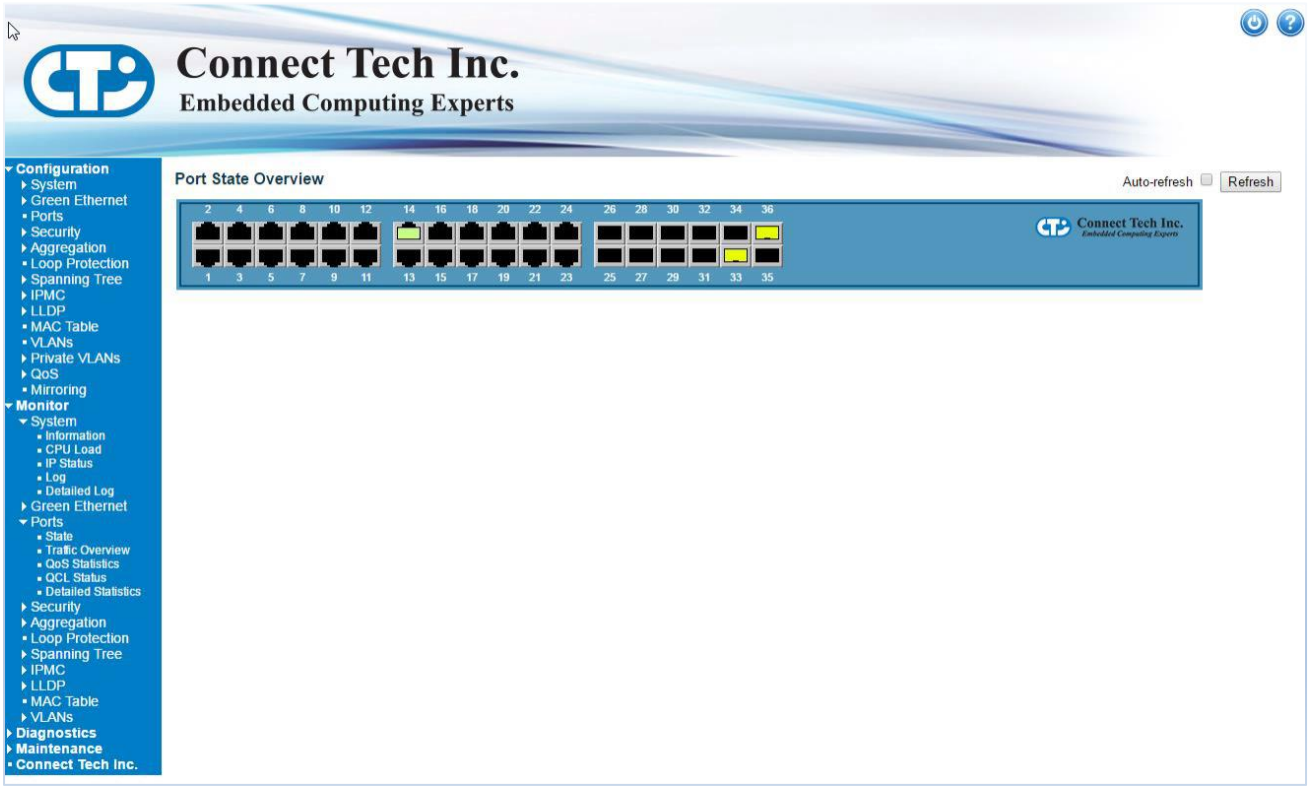


Figure 3.1.5-2: 10G Switch Web Management Interface

3.1.6 Surface Control Unit (SCU) Operation

The Surface Control Unit and Hand Controller Unit are designed for operation in a dry, clean and well-ventilated area. They should not be exposed to moisture or seawater. Exposure to moisture or seawater may result in damage to the system.

CAUTION

CAUTION!! The SCU contains high voltage. It is vital that Users understand the principle of electricity, that are fully trained in electrical operating and safety procedures before attempting to service any part of the electrical system including the tether. Only suitably qualified personnel should work on high voltage electrical systems. The front panel SCU switch does not provide complete isolation of the incoming power. Always disconnect the SCU from the external power supply before opening.

Reference Drawing No:

VAL-500-1000	SCU Electronics Wiring Schematic.

SCU Power Switch

The main incoming power is routed to the rotary isolation switch on the front panel. This switch isolates all power from any modules inside the SCU. This rotary isolator must be in the 'ON' position for anything in the SCU to operate.

Power to the ROV is controlled by user buttons on the software main page. The main vehicle HV power supply also contains a front panel switch to isolate power on this PSU. This switch should normally be left in the 'ON' position so that the PSU powers up and is discoverable by the software (output power will not be enabled until commanded to turn on).

3.1.7 Earth Fault Monitoring System

NOTE: *Do not rely on this system to protect personnel from injury when working on an open pod with live power.*

800VDC Line Insulation Monitor

The SCU contains a Line Insulation Monitoring (LIM) system to protect against any insulation faults in the tether and HV supply on the ROV. The LIM device is connected between the live supply conductors and earth and superimposes a measuring voltage onto the live conductors. In the event of an insulation fault, the fault closes the measuring circuit between the supply and earth, thus generating a measuring current that is proportional to the insulation fault. This measuring current generates a corresponding voltage value in the measuring unit, which is evaluated by the electronics.
If this voltage exceeds a specific value (equivalent to the insulation resistance), a signal is output, and the value displayed on the LIM display. If the insulation resistance drops to predefined alarm level, a warning is given on the GUI. If the insulation resistance drops further, the LIM module output signal triggers the circuit breaker to trip and remove power from the system to prevent any further breakdown or damage to equipment. At this point, the vehicle should be recovered so that the cause of the fault can be investigated.

Insulation monitoring devices serve as early warning systems, providing operators with the information they need in order to have appropriate maintenance measures taken in good time. IEC 61557-8 specifies that insulation monitoring devices must support a prescribed measuring principle which enables them to monitor both symmetrical and asymmetrical deteriorations in insulation.

Earth Fault Alarm Levels

The second setting is 80K ohms and will shut down the supplies to the ROV. A meter is provided for indication of line fault resistance.
⚠**Note:** The alarm levels are preset and should not be changed in normal operation. Any issues with the LIM operation should be referred to Seatronics ROV Support.

Earth Fault Test and Reset

The LIM unit performs a self-test every time it is powered on. This is indicated by the output power circuit breaker being tripped when power is first applied. This circuit breaker cannot be reset until the LIM has completed its self-test (the contactor inside the SCU also energises at this time as well). The front panel LEDs on the LIM display unit also flash while it is performing the self-test.
⚠**Note:** No attempt should be made to bypass or interfere with the LIM self-test.

GUI Display Low Voltage Ground Fault Monitor

The control software constantly communicates with the LIM unit over a RS485 link. This allows the software to read the real-time insulation value and display this on the GUI screen. In the status page of the control software, under the 'SPU & LIM' tab, the readings from the LIM are displayed. In the case of an insulation fault, a yellow alarm box will pop up in the upper right corner of the GUI indicating the alarm condition.

Reference:

Auxiliary Equipment Manual for manufacturer's data sheet and user manual on the Bender isoEV425 Line Insulation Monitor with AGH420 coupler.

3.1.8 Back panel Connectors

Reference Drawing No:

VAL-500-1000	SCU Module Wiring Schematic

Back Panel Connections

At the rear of the control console are mounted a number of signal and power connectors. Under normal operation these should remain connected as provided and not changed.
These connections cover the interconnections between the monitors (power, HDMI and USB for the touchscreen), network connections for the router and the power supply and the main power interconnections between the console and the power supply. The main input power into the SCU is a trailing lead, glanded into the console. This can be stored down the side of the rack/console assembly, so once the tether and hand controller are disconnected, no other cables need to be disconnected. This makes setting up and storage of the system extremely quick.

Front Panel Connectors

The front panel of the console contains all the user interface connections. On the left-hand side are the serial 9-way D-type connections that connect to the surface USP boards. These can be used for input or output of serial data with the system, or for 'tunnelling' serial data from the subsea user port connections (refer to section 3.4.4).
Above these serial connections are the USB connections. These USB connections connect to the PC and are used to connect the Pilot's hand controller unit (two USB connections) and any external storage devices (for saved video or data storage.
To the right of this are the user-network connections. These connection plug into the main 10Gb Ethernet switch and allow for any additional external computers or networked equipment to be connected into the network. For example, one method for using an Ethernet based sonar on the system would be to run the sonar viewing/control application on a laptop or PC alongside the VALOR system. In order to get the sonar data to this external computer, you would connect that computer to one of these user-network ports with this computer's IP address set to 'DHCP' and therefore the router in the SCU will allocate an appropriate IP address. The sonar head will now be visible to the computer and the sonar image displayed on this machine.
Next to the right of the network ports are the video output coaxial connectors. The function of these connections depends on the build configuration and specification of the SCU; contact should be made to Seatronics ROV Support for assistance with these connections.
The next two coaxial connections along the top to the right are the 1PPS out and the GNSS antenna (input) connections. These two connections are both explained in the next section.

Timing and Synchronisation

The VALOR system provides for accurate survey equipment timing and synchronisation via an inbuilt pulse per second (1PPS) signal that is transmitted through the system. This 1PPS signal is present on all the user port connections and is also output on a front panel coaxial connector for external survey equipment input. The 1PPS timing is generated by a pair of Oscilloquartz OSA5401 Syncplug™ SPF modules; one located in the SCU 10G Ethernet switch (master) and one located in the subsea 10Gb Ethernet switch (slave).
The master syncplug requires an input from a standard 3.3Vdc GNSS antenna (supplied) and provides a 72-channel, multiband, dual-frequency GNSS engine. The syncplug pair then generate a standard 1PSS signal, repeated as an output in the SCU and buffered and presented on all the subsea user ports. The standard termination impedance is recommended as 50-Ohm and this will provide a specified 2.0V pulse with a rise time of 10ns and a pulse width of 20us. The accuracy is stated as 50ns (i.e., G.8272/G.8273.1 compliant PRTC (±100nsec from UTC, MTIE<100nsec) while locked to GNSS).
Note: This GNSS antenna input has no connection or application to vehicle positioning or mapping. This is purely for timing and synchronisation and the system can be operated normally without the GNSS antenna input connected if 1PPS is not required.

3.2 Pilots Hand Control Unit (HCU) General

The Portable Pilots HCU as the name suggests is a self-contained unit that can be picked up positioned to suit the operator. This unit contains all the controls that are required to operate and fly the ROV during a typical mission, and includes standard controls for the tilt unit, two or five function manipulators, lights and thruster gains, in addition to thruster speed control.

Signals and power to and from the HCU are via USB plugged into the front of the SCU. This then plugs directly into the system PC to allow for controls through the system. The HCU can be

plugged into any of the 4 available ports on the front panel of the SCU. These are identical connectors and no set up changes are required.

3.2.1 Pilots Hand Control Unit (HCU)

The pilot's Portable HCU is a Logitech X56 HOTAS Throttle and Joystick pair, with 6-degrees of freedom (DOF): forwards, backwards, up, down, left and right together with over 189 programmable control button options over three modes. The main joystick uses contact-free hall-effect sensors ensuring an extremely long life and low-noise positioning detection. The joystick is delivered with four spring options of differing tensions to allow for the operator to choose the appropriate and desired stick force therefore ensuring low fatigue levels.



Figure 3.2.1-1 : Hand Control Unit: Throttle (left) and Joystick (right)

The HCU is connected to the SCU via two USB connections (normally on the front panel), one for the joystick and one for the throttle control. All power and communications are passed through these two USB connections. The supply voltage to the joystick is +5Vdc over the USB connection. When in the centre position the outputs are referenced to 0V.

Both the throttle and joystick are normally attached to the base of the transit case which provides a firm, stable base to work from as well as a secure transport or storage option with the hard-shell cover in fitted.

Reference:

Logitech X56 HOTAS User Manual located in the Auxiliary Equipment Manual for operating instructions.

3.2.2 Plots Hand Control Unit (HCU) Operation

Operational Description

The pilot's Hand Control Unit (HCU) console in combination with the Graphical User Interface (GUI) is used to control the ROV. The HCU contains all the necessary switches and joysticks etc. to fly and control the basic ROV with the touchscreen GUI providing the remaining special controls.



Figure 3.2.2-1 : HCU button labels

The pilot's console incorporates the following controls for the ROV:

Main Joystick and Vertical Control

The main joystick controls 3-axes of the four vectored thrusters: axial (fore and aft movement), lateral (port/starboard sideways movement) and spin. The vertical thrusters are controlled by a second single axis control on the throttle rotary switch of the HCU (rotary 1 on the top of the throttle; marked 'A' in Figure 3.2.2-1 : HCU button labels).

Tilt Unit control

The tilt unit toggle switch controls the up and down movements of the tilt unit thus controlling the movement of the vehicle cameras. The tilt unit can also be controlled on the GUI main screen via the tilt up and tilt down buttons.

Vehicle Auto Function Controls

The following ROV Auto Functions are selected from the GUI.

Gyro Hold	Uses the accelerometer data from the Spatial unit in the INS Pod. When selected the ROV is controlled to maintain the smoothest heading and prevent any rotation while underway. During spin commands, the ROV will snap to a stop once the spin demand from the joystick is removed. This is not necessarily a fixed bearing and any use of the joystick will take priority over the Gyro Hold command.
Depth Hold	Uses the Depth sensor output as a feedback signal. When selected the ROV vertical thrusters are used to maintain the ROV at a fixed depth. The selected depth can be adjusted by use of the vertical thruster control which takes priority and once the command is returned to zero (demand) the new current depth is used as the depth hold reference value.
Alt Hold	Uses a signal from the Altimeter (if fitted) as a feedback signal. When selected the ROV vertical thrusters are used to maintain the ROV at a fixed height above the seabed. The selected altitude can be adjusted by use of the vertical thruster control which takes priority and once the command is returned to zero-demand, the new current altitude is used as the alt- hold reference value. An altimeter or a DVL must be fitted for this function to work. If Depth Hold and Alt Hold are both selected, Depth Hold takes priority.
Head Hold	Uses the signal from the Spatial unit in the INS Pod as a feedback signal. When selected the ROV is controlled to maintain a fixed heading. The selected heading can be adjusted by use of main pilot joystick which takes priority. The Head Hold command can be used in conjunction with the Gyro Hold command so that the ROV moves smoothly in a fixed direction. ⚠**Note:** the heading is directly affected by being in close proximity to metal/magnetic structures.

Vehicle Light Dimmer Control Potentiometers

The lights levels can be controlled via the main GUI page or via the row of three toggle buttons at the bottom of the Throttle controller (labelled in Figure 3.2.2-1). The buttons represent port, centre (optional extra) and starboard light pairs respectively (lights are controlled in pairs via the toggle switches but each individual light head can be controlled via the GUI or ganged together as one bank of lights).
The toggle switches are toggled forward for increasing light levels and toggled back to reduce the light levels. They can be held to ramp up/down the light output level or toggled in discrete steps.

Thruster Enable Functions

The thrusters can be disabled via the slide control on the throttle stick (labelled in Figure 3.2.2-1). This control sets the disable bit in the thruster control telegram but it does not remove or isolate power from the thrusters so care must still be taken around the thrusters even with this control set to disable.

Thruster Gains

The gains, or maximum output level of the thrusters can be set with the two rotary pot controls on the throttle controller. Turning this control anti-clockwise, reduces the maximum demand sent to the thrusters for the same joystick movement. Turning this control clockwise, increases the maximum demand sent to the thrusters up to 100% for a full joystick movement. This allows for fine or delicate control of the ROV in close quarter manoeuvres or for delicate positioning tasks.

Button Mapping

The controls of most buttons or toggles on the joystick can be remapped to different functions as required, e.g., if additional tooling is added to the vehicle. For example, a button map already exists for a wire-cleaning brush can be added as a seventh thruster motor (with brush head instead of propellor) and the rotary dial below the Verts on the throttle used to set the brush speed, and the main joystick fore-finger trigger used to enable and disable the brush.

Care must be taken to ensure that any additional button mapping does not interfere with the current controls and settings. Therefore, contact Seatronics ROV support for further advice on modifying the control mappings.

3.3 VALOR ROV

Reference Drawing No:

VAL-100-0001	VALOR 300m Base Build
VAL-800-0009	Vehicle Layout

The above drawing shows the standard VALOR ROV. The various sub-assemblies are described below.

3.3.1 Frame

Reference Drawing No:

VAL-100-0002	300m Main Frame Base Build

The frame is manufactured from high density polyethylene sheet to form a strong corrosion and maintenance-free structure. The frame incorporates various attachment points for the mounting of additional equipment. The HDPE sections are fastened together using M6 stainless steel, button head Allen screws and cross dowels/ barrel nuts.

The frame assembly includes a lifting structure that directs the load from additional equipment and skids to a central lifting point.

A lifting point is provided at the top centre of the frame to which a lifting hook and wire can be attached. Hooking onto the vehicle can be done using a suitable pole to guide the lifting hook to the lift bar fitted to the vehicle.

For more demanding applications, the ROV can be fitted with a gimbal and bullet system allowing the use of a lock latch that is guided to the vehicle by the tether. This allows the ROV to be launched and recovered with a crane or deck winch and sheave wheel or lifting block.

Care should always be taken to ensure that the total weight of the system does not exceed the maximum gross weight rating on the vehicle load test plate located on the side frame of the ROV.

3.3.2 Buoyancy

Reference Drawing No:

VAL-200-0003	300m FWD Buoyancy
VAL-200-0004	300m AFT Buoyancy

The main buoyancy provides the vehicle with payload (See Section 2) including cameras etc. The payload is made up from cameras, sonar and lead ballast. If optional equipment is fitted to the ROV, the equivalent weight of lead must be removed. The buoyancy is made up in sections from subsea Corecell ™ of styrene acrylonitrile (SAN) with a P.V.C. shell. Ensure that the buoyancy is bolted to the frame before deployment. Never deploy the vehicle with any part of the buoyancy removed or adversely damaged.

Minor Damage to the buoyancy can be repaired in the short-term using 2-part epoxy adhesives or fillers. However, any damaged buoyancy should be replaced as soon as possible.

3.3.3 Thrusters

Reference:

OMM-00075 Operation & Maintenance Manual – SPE-075 Thruster

Refer to Appendix I at the end of this manual.

The VALOR ROV is fitted with six Forum-Sub-Atlantic SPE-075 brushless DC electric thrusters. The following precautions should always be noted and observed.

CAUTION

Vehicle thrusters rotate at high speeds. Do not touch the propeller blades if the vehicle is powered up. Do not operate the vehicle thrusters unless you are sure that all personnel are clear of the vehicle. When maintaining thrusters fitted to the ROV, ensure vehicle power is isolated and locked off.

WARNING

High voltage electricity is present in the thrusters. High voltage electricity can injure and kill. Ensure that all relevant safety procedures are followed. Only suitably qualified personnel should attempt to service or repair thrusters

General

The VALOR is propelled by six Sub-Atlantic SPE-75 Brushless DC thrusters; four positioned in an axial equal-vectored configuration and two vertically positioned, pitched at 30°. The vector angle of the axial thrusters has been selected so that all four thrusters work together to propel the ROV forward, laterally or for rotation. The thrusters have been designed with two cavities internally: the rotor cavity and the stator/electronics cavity. The reason for this is to keep the electrical side free from any potential water ingress path such as if a shaft seal fails. If water does then enter the rotor cavity, it cannot reach the electrical components due to a sealed stainless-steel liner between the rotor and stator. The rotor cavity is oil-filled and pressure-compensated using an integral compensator built into the thruster end cap. The stator/electronics cavity is at 1-atm on the standard 300m rated thruster units (the optional 1000m thruster units have an additional integrated compensator for the electronics housing; refer to the thruster manual in the Appendix).

The thrusters have integrated cables assemblies and connect to 9-way bulkheads on the power pod. The thruster cable assembly carries the 320VDC supply, control voltage and control signals to the thruster. It is, therefore, essential that the electrical connectors are clean and dry before mating to the thruster junction pod. **Note:** The power must be turned off before the thruster connectors are mated or unmated with the power pod or irreparable damage will occur to the connectors.

The thrusters are all controlled on a RS485 communications link, in a multidrop format. Therefore, to allow the control system to identify each individual thruster, each thruster must have an associated address. The thruster bulkhead on the power pod sets the address for the attached thruster, therefore any thruster can be connected to any bulkhead and it will then adopt

that position on the ROV. This means that individual thrusters do not have to be individually set when being installed on the ROV (or exchanged due to damage etc.).

The anodised aluminium body of the thruster is protected from corrosion by an anode. The anode will slowly corrode and disappear over time and will require periodic renewal. If the anode is not replaced when depleted, the body of the thruster will begin to corrode. Replace the anode when it is half depleted. If the protective anodising becomes scratched or damaged, clean and cover the damaged area with a suitable paint or coating.

Thruster Removal

To remove a thruster from the vehicle, first power down the ROV and ensure the power is isolated and cannot be reapplied by accident. Then disconnect the electrical connector from the power pod. Remove the two retaining screws securing the thruster to the thruster mount. When refilling with oil, ensure that all the air is removed from the thruster before refitting to the vehicle. Re-fitting is a reversal of removal and care should be taken to ensure that the electrical connector is securely fitted.

The nozzle is an important part of the thruster assembly, never run the thrusters in water without the nozzle. This will result in a drastic reduction in thrust and an increase in thruster current causing the thrusters to overheat and drastically alter the handling of the ROV (as the thrust forces will be so extremely different in each axis, the control system may not be able to compensate).

Although the thrusters can be tested in-air for reasonably long periods they are designed to be water-cooled. When the system is on the surface, ensure that thruster power and the auto-functions are always switched off to prevent accidental operation of the thrusters. For extended deck operation, the ROV must be operated in the 'Deck Power' mode via the power supply and GUI control.

Thruster Maintenance

The thruster has been designed to be a low maintenance unit. The following periodic maintenance should be carried out:

- Ensure the thrusters have been charged with oil before use.
- Replace the anode when it is half depleted.
- Ensure that the thruster connectors are clean and dry and apply silicone grease to connector 'O'-rings before connecting thrusters to the power pod.
- If the protective anodising becomes scratched or damaged, clean and cover the damaged area with a suitable paint or coating.
- After each dive a visual inspection should be carried out on the thrusters for leaks which may be indicated by a drop in level on the pressure compensator. If a thruster has any sign of leaks remove the unit and replace the seals or 'O'-rings as necessary.
- Check propeller-retaining nuts for tightness (3.4 Nm) once a week. Loose propellers will result in flooding of the rotor cavity.

3.3.4 Oils and Lubricants (ROV)

Various sub-assemblies on the ROV are oil-filled and pressure- compensated. Use the oil type as specified below. Wear the required protective clothing when oil filling assemblies:

- Coveralls
- Boots
- Safety Glasses
- Gloves

Thruster

The oil type used in the thruster motors is Shell Diala S4 ZX-1, or equivalent transformer oil.

Power Pod

The oil type used in the junction boxes is Panolin HLP Synth 32, or equivalent synthetic oil.

3.3.5 Pressure Compensation

Reference Drawing No:

VAL-800-0009	Vehicle Layout

The Thrusters and Power Pod tether termination contain internal cavities which may contain small amounts of air or gas. To prevent the ingress or pressure of seawater damaging these assemblies they are oil filled and compensated. The thruster motor stator and drive shaft are protected by individual compensators mounted on the rear of the motor body. The Power Pod tether termination is linked to a pressure balanced oil filled cable (PBOFC) which self-compensates the tether termination void. The compensators and PBOFC should always be filled with clean oil using a small, pressurised compensator charger assembly such as VAL-900-5500. Drained oil should not be reused; new oil should be as recommended in Section 3.1.4. Where more than one type of oil is used on the ROV it is recommended that separate Compensator Charge Assemblies are used.

3.4 Comms Pod

Reference Drawing No:

VAL-400-0001	Comms Pod Assembly
VAL-400-5400	Comms Pod Layout
VAL-400-5401	Comms Pod Wiring Schematic

WARNING

High voltage (640VDC) electricity is present in the comm's pod which could prove fatal if touched or misused. Ensure power to the pod is isolated before opening. Do not open this pod unless you are qualified to do so.

3.4.1 General

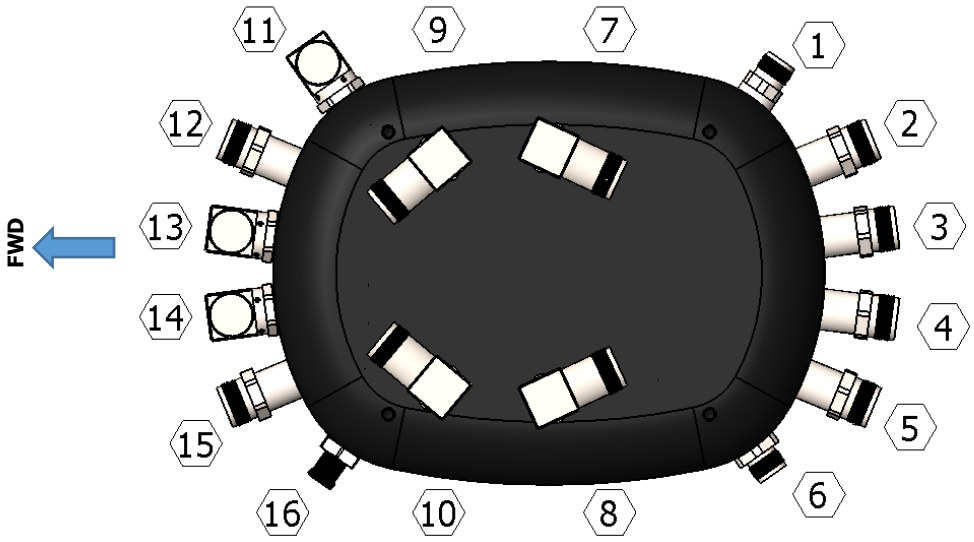
The Comm's Pod enclosure contains all the vehicles telemetry and controls PCB's. This includes circuits to control cameras, INS. and all user ports. This Section of the manual discusses the operation and function of the Comms Pod Control PCB, sensors and components within this pod. The Comms pod should only be opened in a clean electronic workshop or covered area to prevent moisture or dust entering and anti-static handling measures should be followed especially if handling any of the PCBAs.

The Comms Pod is a hard anodised aluminium single-atmosphere housing designed for use underwater. A number of underwater connectors connect the pod to the various external devices on the ROV.

To open the Comms pod enclosure to access the Comms Pod PCBA, USPs and Ethernet Switch, it is only necessary to remove the pod top cover. This is achieved by removing the securing screws and lifting the lid. Immediately after opening use a cloth or tissue to remove any trace of water that may remain on the 'O' ring surfaces. The pod is designed so that USPs can be removed or replaced without disturbing either internal or external connections. See diagram and the table below for the layout of the ports and applications (Comm's Pod is Viewed from Underneath).

The Comms Pod is supplied with a 43VDC (nominal) supply from the power modules in the Power Pod via a dedicated Power & Ethernet penetrator cable assembly with a 13-way connector (at the Comms Pod end). The 43VDC (nominal) supply is connected directly to the Comms Pod Control PCBA (VAL-PCB-001) and distributed from there.
A fibre optic link also connects the Power Pod and Comms Pod. The link is directly from the tether termination (in the pressure compensated section of the Power Pod) via a fibre optic hose/cable assembly to a fibre optic bulkhead connector on the Comms Pod. This fibre optic cable assembly has two fibre passes although only one pass is required for the vehicle system (one channel is spare in case of damage to the main pass, or for future expansion).

If the pod's protective anodised coating becomes scratched, or damaged, clean and apply a suitable paint or coating. **Replace the protective anodes when they are half depleted.**



Port	Function – 5-port System	Function – 10-port System	Port Size
1	INS	INS	5/8”-18UNF
2	User Port 2 (USP7)	User Port 2 (USP-7)	5/8”-18UNF
3	User Port 3 (USP8)	User Port 3 (USP-8)	5/8”-18UNF
4	User Port 4 (USP9)	User Port 4 (USP-9)	5/8”-18UNF
5	User Port 5 (USP10)	User Port 5 (USP-10)	5/8”-18UNF
6	Fibre Optic Connector	Fibre Optic Connector	5/8”-18UNF
7	Coax Port 2	Coax Port 2	5/8”-18UNF
8	Coax Port 1	Coax Port 1	5/8”-18UNF
9	Blank	User Port 7 (USP-2)	5/8”-18UNF
10	Blank	User Port 6 (USP-1)	5/8”-18UNF
11	Power & Ethernet Link	Power & Ethernet Link	5/8”-18UNF
12	User Port 1 (USP6)	User Port 1 (USP-6)	5/8”-18UNF
13	GigE Camera Port 2 (USP5)	GigE Camera Port 2 (USP-5)	5/8”-18UNF
14	GigE Camera Port 1 (USP4)	GigE Camera Port 1 (USP-4)	5/8”-18UNF
15	Blank	User Port 8 (USP-3)	5/8”-18UNF
16	Vacuum Port	Vacuum Port	5/8”-18UNF

The Comm’s pod is fed with 43VDC supply from the tether termination in the Power Pod via a dedicated Power & Ethernet cable with a 13-way connector. The 43VDC (nominal) supply is fed to the Comm’s/controls PCB (VAL-PCB-001)

If the pod’s protective anodised coating becomes scratched, or damaged, clean and apply a suitable paint or coating. **Replace the protective anodes when they are half depleted.**

3.4.2 User Ports

The Comms Pod contains a number of 'User Ports'. These ports are intended for the connection of any user required additional equipment such as sonars, altimeters, digital CP probes, ultrasonic thickness sensors, FMD sensors etc.

The User Ports all provide a software-selectable, variable voltage output (12-48Vdc); 10/100/1000Gb Ethernet; serial RS232/RS422/RS485 (again, software selectable) and 1-PSS timing pulse. The Comms Pod bulkheads are all wired in the exact same pinout therefore making additional equipment integration extremely straight forward.

The User port bulkhead is CR Encapsulation BRB28FBA116418. A standard connector for a cable to be mated with that bulkhead is a CR Encapsulation PLB28M.

As standard, cable tails for the user ports that are Ethernet tails are moulded with a BLUE over-mould at the PLB28M side. Cables tails that only have the serial functions connected are moulded with RED over-moulding. This allows a quick identification of what configuration the pre-made tails are wired to. Ideally any custom or special cables should not use those colours of over-mould.

The pinout for the user port is shown in the next table along with representative cable connections for both serial and Ethernet based cables.

Pin	Function	Conductor for GigE tail	Conductor for Serial tail
1	Variable 12-48vDC @ ~200W	Red	Red
2	Variable 12-48vDC @ ~200W	Red	Red
3	Power 0V	White	White
4	Power 0V	White	White
5	GPIO1		
6	GPIO2		
7	Gigabit Ethernet A+ / 10/100-BaseT Tx+	TSP Orange/White	
8	Gigabit Ethernet A- / 10-100 BaseT Tx-	TSP Orange	
9	Gigabit Ethernet B+ / 10-100 BaseT Rx+	TSP Green/White	
10	Gigabit Ethernet B- / 10-100 BaseT Rx-	TSP Green	
11	Gigabit Ethernet C+	TSP Blue/White	
12	Gigabit Ethernet C-	TSP Blue	
13	Gigabit Ethernet D+	TSP Brown/White	
14	Gigabit Ethernet D-	TSP Brown	
15	RS232 RTS / RS422 TX+ / RS485+ (B)		TSP Orange/White
16	RS232 TX / RS422 TX- / RS485- (A)		TSP Orange
17	RS232 RX / RS422 RX+		TSP Green/White
18	RS232 CTS / RS422 RX-		TSP Green
19	1PPS Out	Black	Black
20	Matrix In / Sync1		TSP Blue/White
21	Matrix Out / Sync2		TSP Blue
22	Analogue In - (-10-0-10v, 16-bit)		White
23	Data Gnd		White
24	Analogue In + (-10-0-10v, 16-bit)		TSP Brown/White
25	Earth	Green	Green
26	Analogue Out (-10-0-10v, 12-bit)		TSP Brown
27	Unused		
28	Unused		

Table 3-1 : User Port bulkhead pinout

3.4.3 Comms Pod Control PCBA (VAL-PCB-001)

CAUTION

The Comm's PCBA (VAL-PCB-001) should always be handled with care. ESD can damage electrical components present on the P.C.B. It is recommended that technicians should ensure they are working on grounding mats or wearing antistatic wrist straps

Reference Drawing No:

VAL-PCB-001-SCH	Comms Pod Control PCBA Schematic
VAL-PCB-001-ASY	Comms Pod Control PCBA Layout

The Comms Pod Control PCBA provides all communication and power routing for the VALOR ROV. The Comms Pod Control PCBA essentially acts as a carrier and breakout board for the multiport network switch and the USP daughter cards, routing the multitude of ethernet and power supply channels to the appropriate board headers (for connection to the wiring assemblies and therefore subsea bulkhead connectors).

The board provides provision for the connection of up to ten USP boards (for a full 10-port Elite VALOR system).

The board also contains the small-form factor plus (SFP+) cages for the Ethernet to fibre transceivers as well as the other specialist SFP+ modules (e.g., for timing generation (1PPS) and composite or SDI video to Ethernet conversion). The board provides for up to six SFP+ modules to be fitted. However, SFP+ modules should only be swapped or replaced under the direct supervision and agreement of Seatronics as any changes may affect the network setup and cause vehicle control issues.

The controls PCBA provides connectors to accept the main network switch over which all VALOR communications are carried. The daughter card that is the network switch provides a managed Ethernet Switch with a high density, high port count Layer 2 switching fabric and a Layer 3 routing function with 10Gb bidirectional links. A total of 36 switchable ports are provided for, with 4 x 10Gb, 8 x 1Gb (SGMII) and 24 x 1Gb (Copper 10/100/1000Mbps) being available.
The main vehicle uplink is provisioned over two a 10Gb link configured via a bidirectional SFP + module. All traffic to and from the ROV runs over this connection (including any video sources (via the corresponding conversion modules), sensor data etc.).

The controls PCB accepts an input supply between 26VDC and 43VDC and has the capacity to distribute a maximum of 1500W of user port power via the USP modules. All board power supplies are derived from this input supply either onboard via discrete components or via USP module #9 and #10 (i.e. for the board to operate correctly those USP modules must be fitted and operating correctly).

3.4.4 USP PCBA - Universal Serial & Power (VAL-USP-001)

CAUTION

The Universal Serial & Power (VAL-USP-001) P.C.B. should always be handled with care. ESD can damage electrical components present on the P.C.B. It is recommended that technicians should ensure they are working on grounding mats or wearing antistatic wrist straps

Reference Drawing No:

VAL-PCB-USP-001-SCH	U.S.P. Schematic
VAL-PCB-USP-001-LAS	U.S.P. Board Layout

As standard, seven USP modules will be fitted and present in the Comms Pod. As outlined, USP#9 and USP#10 are required to allow the board to function correctly. Depending on the system specification there will then be a further five USP modules fitted to cover the standard 5-port system.

The VAL-USP-001 carries out several functions within the Comm's Pod:

- 1 x RS232/485/422 serial port (includes software-switchable RS232 loopback & RS485 120Ω termination resistor)
- 1 x 3.3V level UART serial Port
- 1 x PWM out intended to be used through an RC network as an Analogue Output
- 2 x GPIO (GPIO1 is also PWM-capable to allow variable speed drive of an H-Bridge)
- 1 x Variable 12-48V regulated output, switched & monitored for current/voltage

The architecture of the USP is arranged around two sections: one section containing three main power modules the second section around a network switch and two networked modules connected to this switch.
On the rear can be found the power conversion components and, on the front, there is the network comprised of a 32bit microcontroller and a 'Lantronix' serial to Ethernet module (containing a 16-bit microprocessor). There are also components for the output current measurement and other diagnostic and feedback functions.

An outline block diagram of the USP is shown below along with the pinout for the USP module.

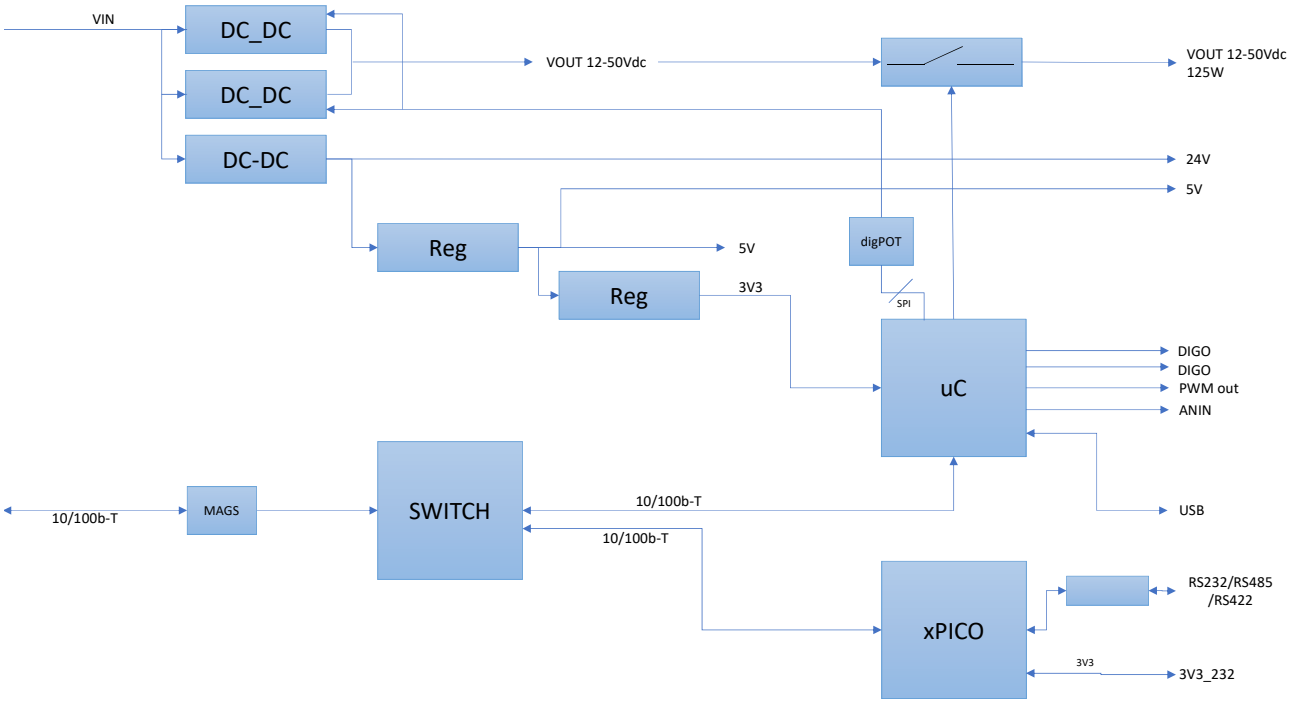


Figure 3.4.4-1 : USP Block Diagram

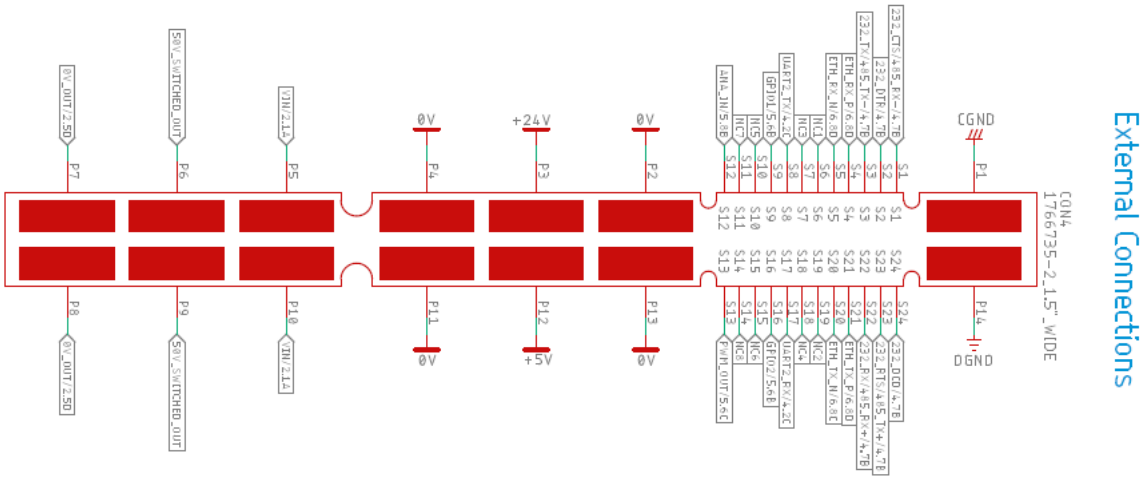
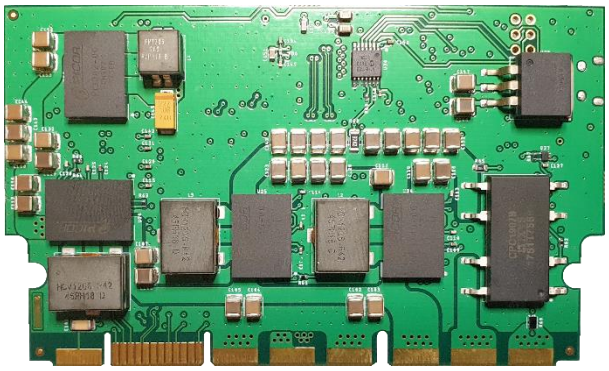


Figure 3.4.4-2 : USP Pinout

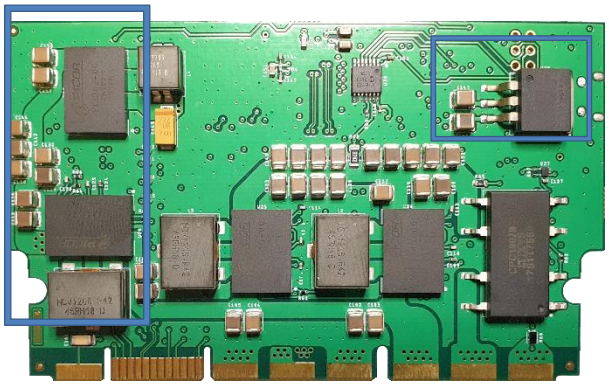
Power

The USP takes a single 8-60Vdc unregulated input voltage and generates all required voltages on board. The control electronics of the USP are powered by a 3.3Vdc linear regulator which is powered from a 5V and 24V regulator. This multi-stage design gives smooth clean 3.3V for the control electronics independent of any input voltage variance or noise and means that power for other devices can be taken directly from the board. **Note:** There is no galvanic isolation provided by the USP.



Regulated 5V and 24V

The 24v regulator can supply 70W, with the 5V being able to supply up 35W. Tracks and thermal dissipation limit the actual power that can be provided for extended periods. In use the USB on-board functions draw a fraction of this capacity, making it available to external devices with suitable external protection to over current situations.



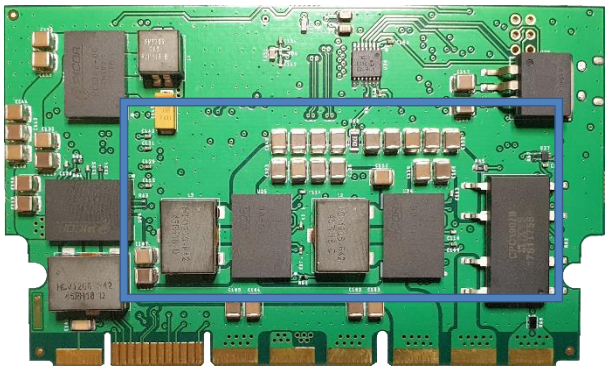
Switched Variable Supply

The variable supply uses a pair of synchronised regulators kept entirely out-of-phase, this provides a high power, very low noise variable voltage output.

The voltage feedback is set to be within 0.5V of the "true" value as measured by a calibrated meter, with the returned current value being accurate to 0.1A under load. These values are not calibrated and are for indication/diagnostic purposes only.

A solid-state relay (SSR) is also included on the board. This gives the user the ability to verify that the provided voltage is appropriate for the device that will be powered before any power is applied. The SSR is rated for 6A continuous current with a 12A peak, this provides the limiting factor to the power delivery of the board.

Inrush current support is something to be very mindful of when powering additional external equipment. The low capacitance of the USP means that very little charge is stored in comparison to traditional PSUs with large electrolytic bulk capacitance. This means that equipment or devices with extremely high inrush currents may have issues on power start-up, even though in their powered state they can work without issue. Options are available to cover such situations and Seatronics support should be contacted to discuss viable solutions.

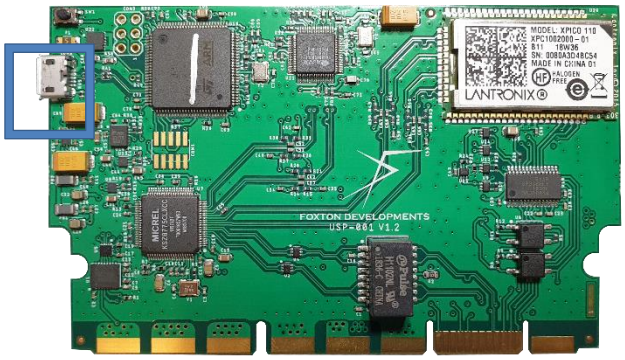


USB

For bench testing and in-situ diagnostics, the USP can be powered via a micro-USB lead. This provides power to the STM Microcontroller, the serial to Ethernet interface and Ethernet switch, thus allowing configuration of all aspects of the device without the need for an external power supply.

When powering via the micro-USB Port only the 5v power output will be available and current will be limited in comparison to an external power supply (and the variable supply will not operate).

When selecting a micro-USB cable to be used with the USP make sure it provides both power and data, some diagnostic functions are available via USB and will not be available with a power only lead.



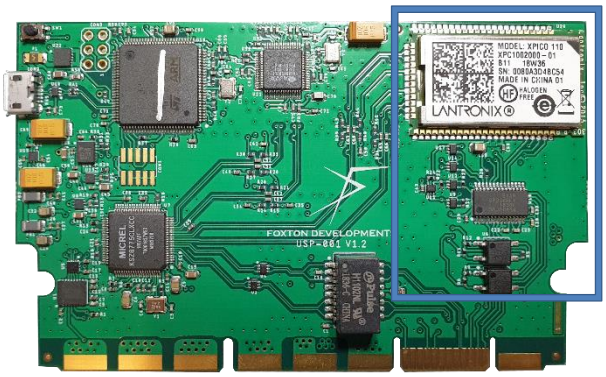
Serial Ports

The serial ports on the USP can support Baud rates from 300bps to 921kbps on all protocols, and for the user-exposed ports include RTS/CTS pins for serial flow control. This is controlled through a convenient web interface which can be password protected if necessary.

For more advanced requirements, the USP can also provide up to 256-bit AES Encryption, serial "tunnelling" from ROV ports to physical Control Console ports as well as remote device servers. The USP is also able to carry out conversion between RS232/485/422, differing baud rates, etc.

The serial to Ethernet functionality is provided by an industrial grade "LANTRONIX" device, this provides a well-proven method of transmitting serial data over an Ethernet connection.

The Serial number on the "LANTRONIX" unit is also its MAC address, a unique identifier for that module. This is used as the serial number for the whole USP. When reporting damage or a failure this number should be quoted to Seatronics.



Identification

To identify which serial port corresponds to which module, first refer to the system map provided with your VALOR. By default, this is:

Port Number	Topside USP	IP Address	User Port Number	Subsea USP	IP Address
1	1	192.168.48.141	6	1	192.168.48.241
2	2	192.168.48.142	7	2	192.168.48.242
3	3	192.168.48.143	8	3	192.168.48.243
4	4	192.168.48.144	4	4	192.168.48.244
5	5	192.168.48.145	5	5	192.168.48.245
6	6	192.168.48.146	1	6	192.168.48.246
7	7	192.168.48.147	2	7	192.168.48.247
8	8	192.168.48.148	3	8	192.168.48.248
9	9	192.168.48.149	4	9	192.168.48.249
10	10	192.168.48.150	5	10	192.168.48.250

When the requirement arises to change the settings on any User Port serial channel, a webpage interface is used to access the serial to Ethernet module on any USP and thus access the settings pages.
To identify the address required for each user port setting page, reference should be made to the 'Subsea USPs' page of the GUI. Each USP device is listed there with its IP address. The IP address of the serial to Ethernet module is 30 more than the base IP address of each USP.



For example, if the requirement was to access the serial settings of USP#1, then looking at the above GUI tab you can see that that USP has the IP address = **192.168.48.211**
Therefore, the Lantronix serial to Ethernet module will have the IP address = **192.168.48.241**
Inserting that address into address bar of a web browser, will open the settings page for that UPS-Lantronix module and allow for any settings relating to the serial port and the tunnelling to be accessible.

Command Interfaces

Each USP-Lantronix has its own Web Interface, this provides a convenient user-friendly way of configuring the unit. It can be password protected or disabled for security reasons, by default it is not.

Configuring encryption should be done through a local connection to the serial port of the USP device server, or via a secured network connection. Initial configuration information, including the encryption key, is sent in clear text over the network.

Detailed information on how to configure the "LANTRONIX" units can be found in the modules "user" manual which will be included in the VALOR Auxiliary equipment Manual. For simplicity, only the basic functions of the web interface will be covered in this document.

Web Interface

Load a web browser in any device connected to the VALOR Network and direct it to the I.P. Address of the "LANTRONIX" module on your target USP. The device status page shown below will be displayed.

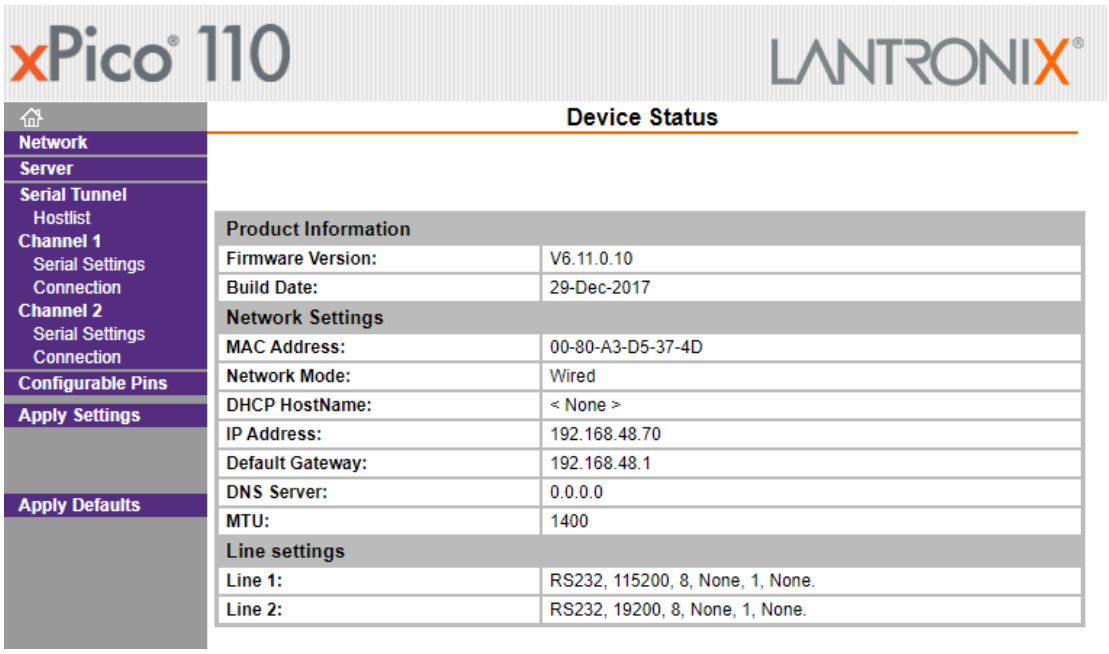


Figure 3.4.4-3 : USP-Lantronix Main Web page

The list on the left is the menu for set-up pages, with the table to the right detailing critical information about the "LANTRONIX" module. Channel 1 is the User Port, with Channel 2 being a special function port which **MUST NOT** be changed.

3.4.4.1 Serial Port Set Up

CAUTION

Users **MUST NOT** Configure Serial Port 2's connection or serial settings unless specifically instructed by Seatronics ROV Support team.

Serial Port 1 on both the topside and subsea USP's are exposed to the user connector so can be changed freely. But Serial port 2 is used for secondary functions so SHOULD NOT be altered at all.

The Serial Port Settings can be set using the web interface. From the "LANTRONIX" main menu, click on Channel 1 serial settings (highlighted in yellow in the following image) and the available port settings will be shown. Details of the functionality of the lower two panes can be found in the XPico user manual in the supplied auxiliary equipment manual.

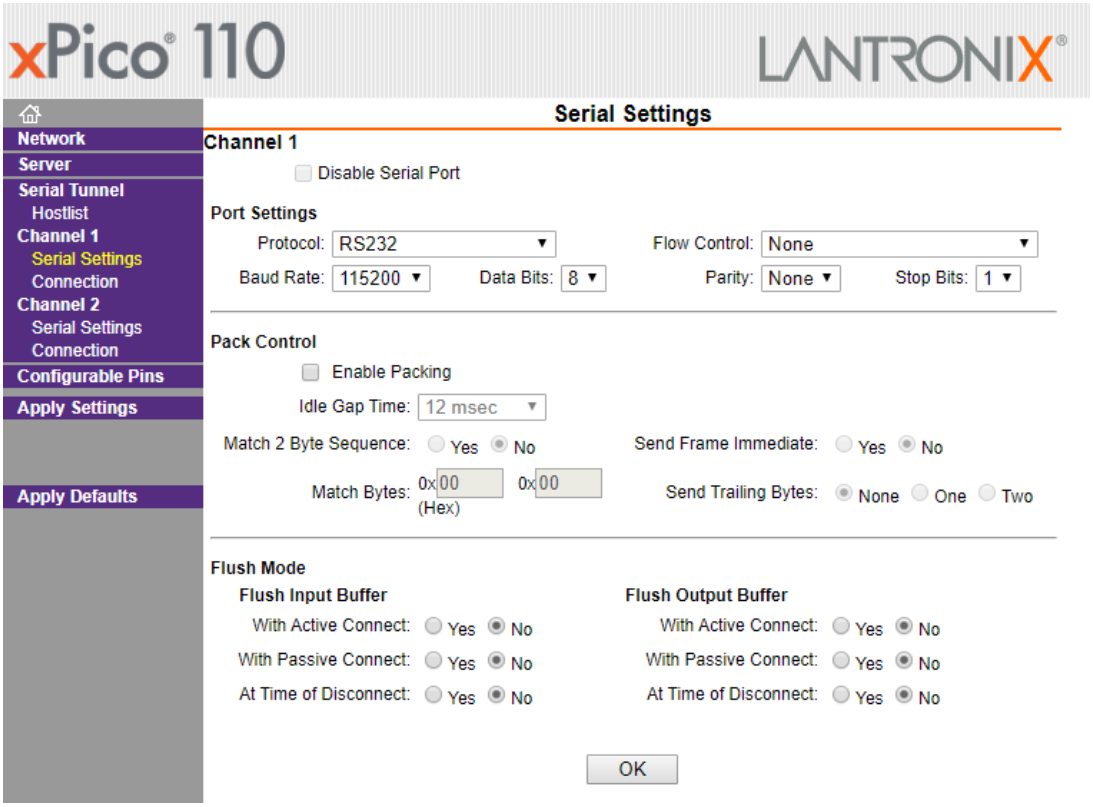


Figure 3.4.4-4 : USP-Lantronix Channel 1 Serial Settings

The top pane includes the most common port settings i.e., Protocol, Baud rate & Parity settings etc. Simply choose a value from each drop-down box, press the "OK" button at the bottom of the page, and then press "Apply Settings" (located in the menu list in the left-hand pane). The board will then reboot and will display the device status page with the updated configuration.

Telnet & Serial Interfaces

The telnet and serial interfaces allow extra features to be enabled. The serial interface can be accessed by sending commands from the user port connector into the USP module, and the Telnet interface can be accessed by connecting over the network. Either can be password protected or disabled entirely.

3.4.4.2 Tunnelled Connections

A "Tunnel" is a transparent serial link where data flowing into one port flows out of another but across the network connection, just like a long 'virtual' serial cable. These can be set-up between two USPs and normally this would be between a subsea User Port and a Topside serial port to provide a serial port pass-through function. However, the pass through could be between two topside ports to act as a protocol conversion (baud rate must always match however, but e.g., RS232-RS485 conversion is possible), or two subsea user ports to allow sensors to share data etc.

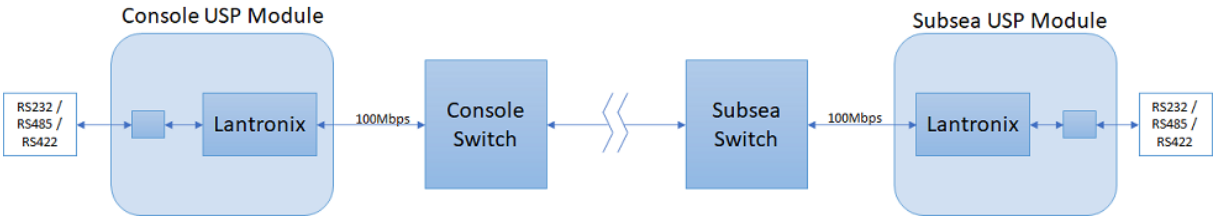


Figure 3.4.4-5 : Serial Port Tunnelling Block Diagram

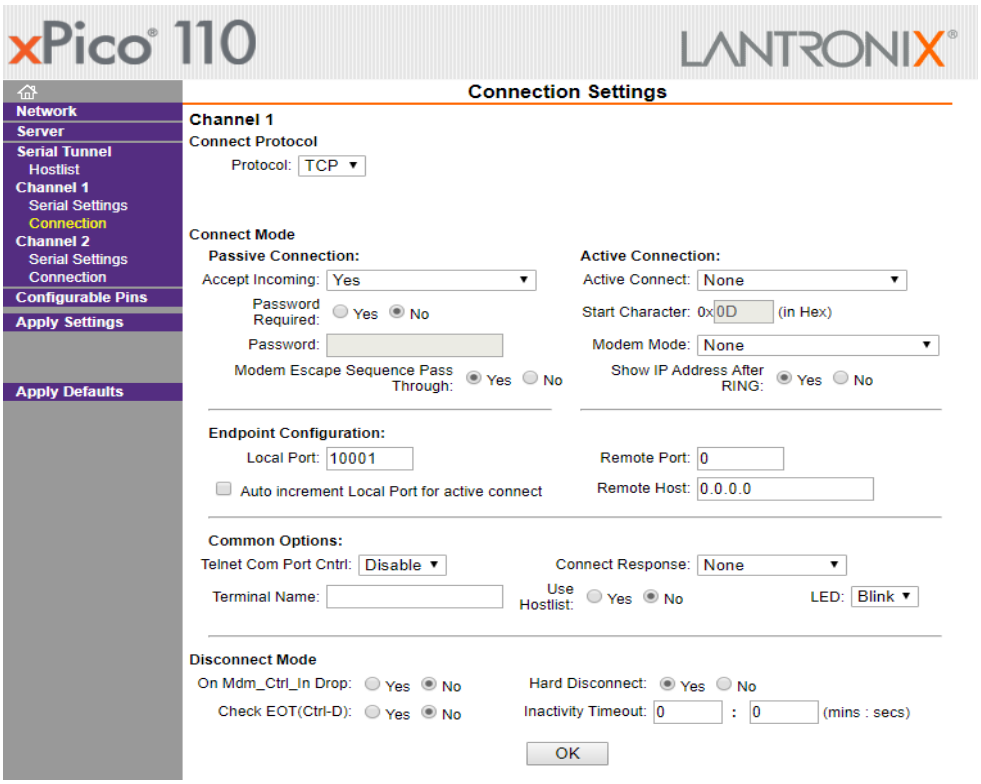


Figure 3.4.4-6 : Lantronix Web Connection Settings Page

The image above is the setting for a non-tunnelled serial port connection. When connecting between Topside and Subsea USPs, one of the USPs' must be configured to discover and connect to another USP module, and then initialise the link. At start up there is a delay between Subsea USPs & Topside USPs receiving power, with the Topside powering up first. As the subsea module is the latter device to be available on the network, the link should be initialised by a subsea module. A link initiated from a topside module would attempt to discover and connect to the subsea module at start up and fail to make a connection which could prevent a connection.

Which module initiates the link has no effect on data flow rates or other aspects of the serial communications; once the link is made data is passed transparently along the bidirectional, full duplex link. The tunnelled connection is a 100Mbps Ethernet link and this prevents any bottlenecks even at higher serial port bitrates.

Tunnelling Set Up

To set up a tunnelled connection, open the webpage of the subsea USP that will initialise the serial tunnel. Then go to the Serial Port 1 connections page. Set the active connect parameter to Auto Start, and in the 'Remote Port' box, type the IP address of the receiving USP's LANTRONIX module. The port should always be the default value (10001) except during very specific diagnostics cases; in this case, Seatronics ROV support will instruct as to what value is required. The screen shot below shows a module tunnelled to topside Serial Port 1.
Once set, the 'OK' button must be clicked and then the 'Apply Settings' menu item on the left selected to store these new settings – note: the Lantronix module will reboot at this point.

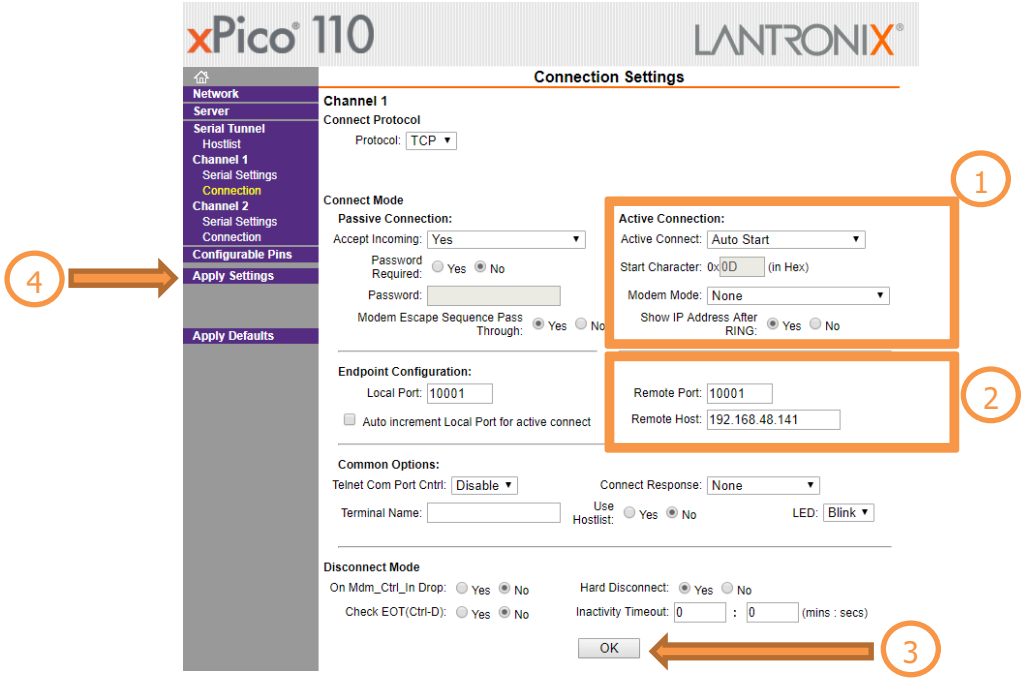


Figure 3.4.4-7 : Example Tunnelling Settings

These settings are repeated for the topside UPS module except for the 'Active Connection' should be set to 'None' to allow the subsea USP to initiate the connection.

⚠**Note:** Serial Channel 2 settings are used for VALOR standard equipment and should never be changed. The 'Apply Defaults' should also never be selected.

Virtual COM Ports

In many cases a tunnel is not the most efficient or elegant way of serial data transfer. For example, if both a serial and ethernet sensor are required then a separate cable for each sensor would be needed. Similarly, if multiple serial sensors are being utilised then multiple cables would be required.
In these circumstances, Seatronics recommends accessing the data over an Ethernet connection using a virtual COM Port. This allows all the LANTRONIX ports to be shared over a single ethernet cable, as well as giving access to the Ethernet devices on the ROV

3.4.5 Vacuum Port (Comms Pod)

The pod is not able to operate with a vacuum due to the fans & heat generated by the internal electronics. The vacuum port is used for test purposes only. The vacuum should be released once testing is complete.

Always vacuum-test the pod to 0.5 bar (500mbar) (0.5 bar below ambient) Minimum for a period of 30 minutes after opening and reassembly. The vacuum **must** be removed before operating the system. This is done by removing the tube from the vacuum pump and connecting it to the vacuum port. This will allow air to enter the housing. Before operation the Vacuum port should be sealed.

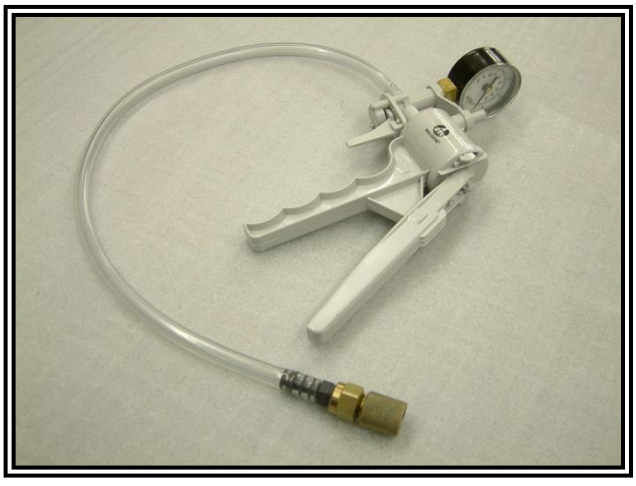
CAUTION

Ensure that the end of the tube is not lying in water whilst carrying out this process or water will be sucked into the housing causing catastrophic damage.

WARNING

It is important that the vacuum port cover is replaced as deployment without it will result in the pod flooding causing a catastrophic failure.

Seatronics can supply a vacuum kit containing a hand- operated vacuum pump, vacuum gauge, tube and fittings.



3.5 Power Pod

Reference Drawing No:

VAL-400-0002	Power Pod Assembly
VAL-400-5402	Power Pod Layout
VAL-400-5403	Power Pod Wiring Schematic

WARNING

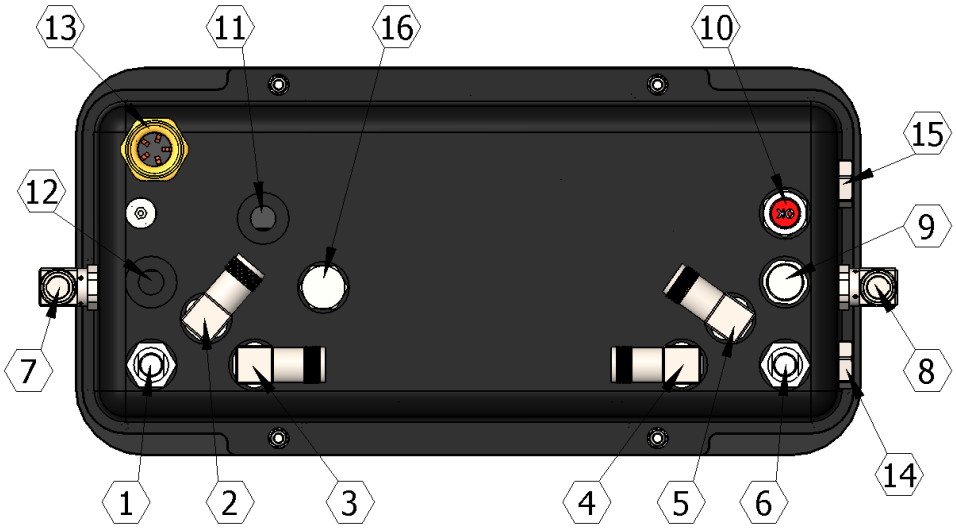
High voltage (640VDC) electricity is present in the power pod which could prove fatal if touched or misused. Ensure power to the pod is isolated before opening. Do not open this pod unless you are qualified to do so.

General

The Power Pod enclosure is where the vehicle tether terminates as well as passing power and fibre to the Comm's Pod. It also contains all the vehicles power and controls PCB's, this includes circuits to control Thrusters, Lights and Tilt unit and a mini-Ethernet switch. This Section of the manual discusses the operation and function of the Power PCB, sensors and components within this pod. The Power pod should only be opened in a workshop or covered area to prevent moisture or dust entering.

The Power Pod is a hard anodised aluminium single-atmosphere housing with an oil filled tether termination point designed for use underwater. A number of underwater connectors connect the pod to the various external devices on the ROV.

To open the electronics enclosure to access the Power PCB, USPs and Tilt Unit Drive you must first drain the oil from the oil filled section. To remove the Pod Base Cover, unfasten the securing screws and lift the cover. Immediately after opening use a cloth or tissue to remove any trace of water that may remain on the 'O' ring surfaces. If access to only the Oil filled tether termination point is required, drain the oil and remove the dedicated Tether Junction point cover. Immediately after opening use a cloth or tissue to remove any trace of water that may remain on the 'O' ring surfaces. See Diagram & Table below for Ports and applications. (Power Pod is viewed from above)



Port	Function	Size
1	PORT Lights	5/8″-18UNF
2	PORT FWD Thruster	5/8″-18UNF
3	PORT AFT Thruster	5/8″-18UNF
4	STBD AFT Thruster	5/8″-18UNF
5	STBD FWD Thruster	5/8″-18UNF
6	STBD Lights	5/8″-18UNF
7	PORT VERT Thruster	5/8″-18UNF
8	STBD VERT Thruster	5/8″-18UNF
9	Tilt Unit	5/8″-18UNF
10	Vacuum Port	5/8″-18UNF
11	PBOF Fibre Pass	5/8″-18UNF
12	Power & Ethernet	5/8″-18UNF
13	Tether	¾″ NPT
14	Spare – Thruster 7	5/8″-18UNF
15	Spare	5/8″-18UNF
16	Spare	5/8″-18UNF

The power pod is fed with 700VDC supply directly from the tether via the tether termination. The 700VDC supply is passed to the Power Pod PCBA (VAL-PCB-003)

If the pod's protective anodised coating becomes scratched, or damaged, clean and apply a suitable paint or coating. **Replace the protective anodes when they are half depleted.**

If any bulkheads are replaced, ensure the correct torque figure is used for replacement. This figure is listed in the power pod assembly diagram.

3.5.1 Power PCBA (VAL-PCB-003)

CAUTION

The Power Pod contains lethal voltages and working on the internals of the pod presents high risk of electrocution or even death. Only suitably qualified and experienced technicians should attempt any internal operations on the the pod.

Safe HV electrical working practices must be followed before any work is attempted on the Power pod

Reference Drawing No:

VAL-PCB-003-SCH	Power Distribution PCB Schematic
VAL-PCB-003-ASY	Power Distribution PCB Board Layout

The power pod termination PCB provides all power and switching distribution (out with the low voltage switching contained in the Comms pod).

The incoming HV tether voltage is reduced to a more usable voltage in a series of steps – one for the thrusters (340Vdc nominal) and one to supply the Comms Pod (43Vdc nominal). The board also houses three USP modules that provide local low voltage power and switching and serial channels for the modules directly connected to the power pod (thrusters, lights and tilt unit). **Note:** Extreme care must be observed when working inside the power pod as there are potentially live terminals present at up to 700Vdc.

The power pod PCB is controlled via an ethernet link from the network switch in the Comms Pod PCBA. All thruster, lights and tilt commands are provided from the SCU over this network link to the three USP modules on the power pod PCB. The bulkhead connectors on the power pod body directly connect headers on the Power Pod PCBA.

The thrusters all operate over a RS485 network and this is provided for in the power pod over a serial to ethernet server, via one of the UART channels on one of the USP modules. Similarly the lights operate in the same way over another RS485 channel from a different USP module. Finally the tilt unit operates on the last USP module and it's serial channel (in RS232 mode).

The USP modules in the Power Pod are all pre-set for normal operation and there is no requirement to amend their settings.

3.5.2 USP Universal Serial & Power (VAL-USP-001)

CAUTION

The Universal Serial & Power (VAL-USP-001) PCBA should always be handled with care. ESD can damage electrical components present on the PCBA. It is recommended that technicians should ensure they are working on grounding mats or wearing antistatic wrist straps

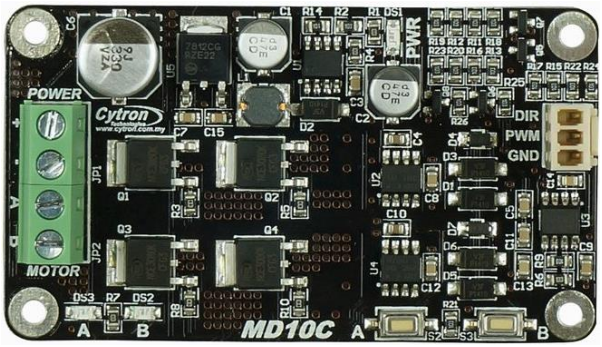
There are 3 VAL-USP-001 PCB's present in the Power Pod and their function is to provide a regulated 24Vdc supply for the Thrusters, Tilt Unit and Lights. For a detailed overview of USP's please refer to **section 4.2.**

3.5.3 10A Motor Driver (VAL-PCB-006)

CAUTION

The 10A Motor Driver (VAL-PCB-006) PCBA should always be handled with care. ESD can damage electrical components present on the PCBA. It is recommended that technicians should ensure they are working on grounding mats or wearing antistatic wrist straps

The 10A motor driver PCB (VAL-PCB-006) is designed to drive high current brushed DC Motors up to 13A continuously with a 30A Peak (10 Seconds) from a supply voltage of 5V to 30V. On VALOR it is used to drive the tilt unit motor.



Board Capabilities & Features:

- Bi-directional control for one DC Brushed motor, Single channel.
- Supports motor voltage ranges from 5V to 30V.
- Maximum current up to 13A continuous with 30A peak (10 Seconds).

- 3.3V & 5V Logic level input.
- Solid State components to enable faster response times and eliminate wear.
- Full NMOS H-Bridge for better efficiency with no heatsink requirements.
- Speed control PWM frequency up to 20KHz (Output frequency matches Input).
- Support both locked-antiphase and sign-magnitude PWM Operation.
- Support TTL PWM from micro-controller.

Reference:

Refer to the separate Cytron Technologies user manual within the VALOR Auxiliary Equipment Manual for further detail on the 10A Motor Driver.

3.5.4 Mini Ethernet Switch (VAL-PCB-007)

A small sub-PCBA on the power pod board provides an ethernet switch function to allow for the three ethernet channels to each of the three USP modules to be provisioned over a single ethernet link to the Comms Pod (i.e., 4-port unmanaged switch; one external channel and three internal channels).

This comms pod ethernet link is a 10/100Mbps link and is carried over the Power and Comms penetrator cable assembly to the Comms pod.

The switch board contains five LEDs to indicate status. If each Ethernet channel is operating correctly, a red LED will flash indicating ethernet comms on that channel. There is a further green LED indicating power is being received by the board. This is an unmanaged switch and contains no user settable functions.

3.5.5 Vacuum Port (Power Pod)

The pod is not able to operate with a vacuum due to the heat generated by the internal electronics. The vacuum port is used for test purposes only. The vacuum should be released once testing is complete.

Always vacuum-test the pod to 0.5 bar (500mbar) (0.5 bar below ambient) for a period of 30 minutes after opening and reassembly. The vacuum **must** be removed before operating the system. This is done by removing the tube from the vacuum pump and connecting it to the vacuum port. This will allow air to enter the housing. Before operation the Vacuum port should be sealed.

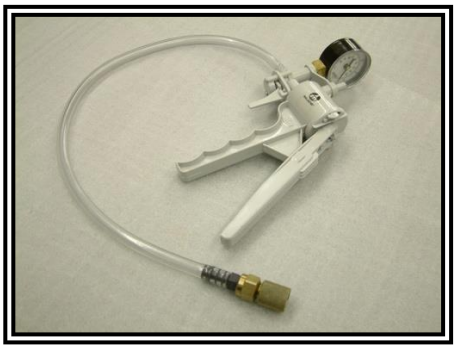
CAUTION

Ensure that the end of the tube is not laid in any water or fluid whilst carrying out this process or water will be sucked into the housing causing catastrophic damage.

WARNING

It is important that the vacuum port cover is replaced as deployment without it will result in the pod flooding causing a catastrophic failure.

Seatronics can supply a vacuum kit containing a hand- operated vacuum pump, vacuum gauge, tube and fittings.



4.0 Vehicle Sensors

The ROV is supplied with a range of sensors as shown on the Vehicle Layout Diagram. The following section describes all standard and some of the optional sensors that are currently fitted or available for the VALOR ROVs. Refer to the Vehicle Cabling Diagram for clarification of the sensors fitted to this particular ROV.

Reference Drawing No:

VAL-100-1000	Vehicle Layout

4.1.1 Cameras

General

The vehicle is supplied as standard with two GigE cameras (one Colour and one Monochrome), however the dedicated camera ports on the comm's pod are capable of interfacing with many differing cameras. Each GigE camera is connected to the Comm's Pod via a 12-way connecting lead. The camera interfaces are wired to a standard format so either camera can be connected to either port.
The outputs from the cameras are connected to the Comm's/Controls (VAL-PCB-001) where the signals are passed to the Ethernet switch for transmission through the tether over the Ethernet backbone (on fibre).

Reference:

Section 4.0 for details of the Comm's Pod wiring detail

The cameras are attached to a bracket which is mounted to the tilt unit.

Reference:

Refer to the separate Manufacturer's Manual within the VALOR Auxiliary Equipment Manual for further information on the cameras.

Reference Drawing No:

VAL-600-5109	VALOR User Port to Teledyne GigE Camera Cable

4.1.2 Poseidon Subsea GNSS Antenna

The GNSS antenna is a rugged subsea device from Advanced Navigation. Its compact and lightweight design and 3000msw rating make it ideal for the VALOR ROV. The Poseidon supports all current and future satellite navigation systems including GPS, L1/L2, Glonass G1/G2 and Galileo E1/E5. The Antenna is fed from a 5Vdc supply via the Spatial Unit within the INS pod, the Spatial unit also acts as the GNSS receiver for the antenna allowing accurate and reliable navigation/orientation when on surface.

Reference:

Refer to the Advanced Navigation Poseidon manual within VALOR Auxiliary Equipment Manual

4.1.3 Depth Sensor

The depth sensor is mounted to the INS Pod. The standard depth sensor is a Blue Robotics BAR30 (300msw) sensor which incorporates a high-resolution TE Connectivity Pressure and temperature sensor with a resolution of 2mm. The sensor is fed from a 5VDC supply in the INS pod which also converts the sensor's data to standard RS232 format (for input to the INS unit). The data supplied from this sensor is communicated to the surface by the telemetry system and is used for auto depth control functions. There are no user adjustments available on this unit.

Reference:

Refer to the separate Blue Robotics data sheet within VALOR Auxiliary Equipment Manual

4.1.4 INS Pod (Inertial Navigation System)

Reference Drawing No:

VAL-400-0003	INS Pod Assembly

The INS pod assembly is supplied with a bulkhead connector; refer to the Vehicle cabling diagram for details.

The vehicle uses an advanced navigation spatial unit with 3-axis, GNSS receiver along with temperature calibrated accelerometers, gyroscopes and magnetometers. The control board (an Arduino UNO) contains power and RS232 protection circuitry and voltage regulation from 24V to 3.3V. The carrier board also includes LEDs to indicate power and RS232 communications. The main function of this board is to translate the I^2C data in both format and voltage level to a standard RS232 telegram (and voltage).

The unit is housed in a one-atmosphere pod located near the rear of the vehicle. A 12-way connecting lead is used to connect the INS Pod to the vehicle's Comms Pod. This lead supplies the control board with 24VDC and connects the RS232 output of the Spatial unit to the vehicle Comms Pod PCBA and thus transmission to the surface via the vehicle telemetry system where it is used on the control software for both auto-functions and also display on the pilot's video monitor.

NOTE: *The INS Pod needs to be mounted so that the Spatial Unit will transmit data correctly. There is an orientation line on the pod indicating the X axis which MUST face FWD*

The compass should be calibrated while fitted to the vehicle following the procedure in the manufacturer's manual.

Reference:

Manufacturer's Manual located in the VALOR Auxiliary Equipment Manual for more information on the spatial unit.

4.1.5 Altimeter

An altimeter may be fitted to the ROV. A number of manufacturers can supply units that are compatible with the ROV provided they accept a 24VDC supply and output a industry standard format RS232 telegram. If fitted, the output may be used for the auto-altitude function. The

output is also displayed on the Control Console Monitor. Current recommended Altimeters are the Tritech PA500 model or the Impact Subsea ISA500 model.

Reference:

Manufacturer's manual located in Auxiliary Equipment Operations & Maintenance Manual for more information on any Altimeter fitted to the system.

CAUTION

Auto-altitude may not be as reliable as auto-depth. This is because the altimeter relies on sending and receiving sound waves to and from the seabed, if for some reason the altimeter fails to receive a signal the output defaults to 0V. This may cause the ROV to fly up or down without notice.

Care should be taken when using auto-altitude as the altitude value is based on reflected sound pulses returned from the seabed. These pulses can in certain circumstances produce random errors and may result in the ROV attempting to suddenly rise or fall.

5.0 Vehicle Equipment

5.1 Standard Vehicle Equipment

Standard vehicle equipment covers standard units that are fitted to every VALOR ROV such as Cameras, LED Lamps and Tilt units or Standard Options such as the Electric Manipulators or DVL. Refer to Scope of Supply and Vehicle Layout Schematic for details of equipment fitted.

Reference Drawing No:

VAL-100-1000	Vehicle Cabling Schematic

5.1.1 Camera Tilt Unit

Reference Drawing No:

VAL-700-0001	Tilt Unit Assembly

On the VALOR, the tilt platform is mounted directly to the tilt unit, and the tilt unit is mounted to the forward buoyancy via two pivot supports. The tilt platform is designed to carry up to two cameras and one light. Route the camera and light cables to prevent snagging over the full range of the tilt unit movement ensuring that this wiring cannot be sucked into the thrusters.

Tilt Unit Specification:

- Input Voltage: 30Vdc nominal; 48Vdc max.
- Nominal Current: 0.9Amps
- Specific Torque: 10 Nm/Amp
- Nominal Torque: 8 Nm.
- Nominal Current: Nominal Output Speed: 5 RPM
- Stall Torque: 13 Nm.
- Stall Current: 15.6 Amps abs max.

Electrical

The Seatronics tilt unit provides vertical rotation of the cameras.

The unit is powered by 24Vdc and has a normal operating current of approx. 900mA. The stall current is 15.6 Amps with a stall torque of 13Nm. The motor is protected by a current limiting and speed controller board within the power pod. This board takes control signals from the user interface via one of the USP serial channels.

Mechanical

The unit is manufactured from hard anodised aluminium which provides a corrosion-free and rigid structure for a subsea environment. Within the housing end cap there is a bearing to transmit axial loads and two quad-ring seals for sealing of the output shaft.

Preventative Maintenance

Maintenance of the tilt unit is minimal and generally consists of carrying out the following checks:

- Check locking bolt on Tilt Unit Pivot Support before and after each dive.
- Change bearing in the end cap after 10000 hours of ROV running time.
- Check for excessive backlash in the in the output shaft.
- Inspect and repair any damage as necessary.

5.1.2 Lights

Reference Drawing No:

VAL-100-0011	LED Light Bracket Assembly
VAL-600-5107	LED VALOR Dual LED Lights Cable Assembly

The standard vehicle is fitted with 4 LED lamps; normally mounted on the vehicle side frames.

LED Lamp Configuration

An LED power supply circuit located on the Power Pod PCB is capable of driving 4 x 14-watt 24V LED Lamps. Each lamp is connected to the Power Pod via a cable assembly.

Lighting Control

The LED lights are dimmable with the dimming circuit built into each LED light head. The dimming level is controlled over a RS485 circuit with one RS485 network per light pair. The dimming control inputs (potentiometers) are provided on the Pilot's HCU, read in by the control software and transmitted to each light.

The vehicle lights are attached to the mounting brackets as shown in the above referenced drawings.

Reference:

Manufacturer's Manual located in Auxiliary Equipment Manual for operation and maintenance instructions.

5.1.3 Vehicle Interconnecting Cables

Reference Drawing No:

VAL-100-1000	Vehicle Cabling Schematic

The above drawing shows the inter-connecting cables between the various items of equipment on the ROV and the cables used with sensors.

Reference:

Section 5 for details of sensor cable assemblies.

Metal shell connectors are used on the system to connect pods and equipment together. Care should be taken to prevent water entering the connector by cleaning before separating. Ensure that the connectors are completely free of water before being reconnected. If an item is removed from the vehicle, the connectors should be cleaned and 'O'-rings greased with suitable silicone grease. The 'O'-rings are located in the lead half of the connector. To clean 'O'-rings; remove the "Spiro Clip" behind the brass-locking nut which can be pulled back allowing access to the 'O'-rings.



Figure 5.1.3-1 - connector showing locking collar in operating position.



Figure 5.1.3-2 - connector showing "Sirol Clip" and locking collar pulled back allowing access to the 'O'-Rings

Cables should be inspected regularly for signs of damage and deterioration and replaced as required.

5.2 Optional Vehicle Equipment

The VALOR ROV is designed as standard to accept a range of optional equipment although weight, size and power will limit what can be fitted at any one time. The equipment listed below may not be supplied with every system but may be easily added to a standard ROV design if space permits.

The VALOR system has been designed so that any additional optional equipment is attached to the ROV via the standard User Ports. These User Port connectors are all wired identically and power + serial (red moulded) or power + Ethernet (blue moulded) standard cables tails are readily available from Seatronics to allow any cables to be created quickly as cost effectively for any additional equipment.

5.2.1 Sonar

A sonar may be fitted to the ROV and several manufacturers can supply units that are compatible with the VALOR system. In a standalone mode, most sonar systems can be operated on the VALOR system provided they accept a 12-48VDC supply at under 150W and output over either serial (RS232/RS485) or Ethernet. In this format, the user would require to display the sonar data on a separate laptop or PC as the sonar data cannot be displayed as integrated in the VALOR control software.
At time of issuing this manual, if a Tritech Gemini sonar is used, then output data is transmitted to the surface via the Comm's/Controls PCB and can be displayed on the Control Console Monitor in a panel on the GUI. The Tritech Gemini 720ik is the preferred option due to its compact form and ethernet output, it has a range of 0.2m – 120m. Support for integration of other sonars into the control software will be added over time (support is planned for the Blueprint Oculus later in 2021 for example). Contact Seatronics ROV support for further updates and details on this.

There are numerous mounting brackets available dependent on type of sonar fitted.

Reference:

Manufacturer's manual located in Auxiliary Equipment Manual for more information on the altimeter

5.2.2 2 Function Manipulator

The 2-function electrical manipulator has 3 basic functions. Jaw Open / Close and Rotate Clockwise / Anti Clockwise. The electric motors are driven from a bipolar ±24VDC Supply with each motor being current limited to 1 Amp per function.

Reference:

The Electric manipulator manual in the auxiliary section of your vehicle system manual.

5.2.3 CP Probe

A CP probe can be directly mounted to the vehicle or can also be mounted to the 2-function jaw grabber assembly. A digital CP probe (serial) is the preferred option for fitment and this would connect to a standard user port.

If required, there is capacity to run a traditional analogue CP (proximity) probe directly over the screen-twisted pair conductors in the tether. In order to do this, the 'Aux' port must be fitted and wired on the power pod. As that port is an optional requirement and can be user specific, contact Seatronics ROV support for more details if this is required.

5.2.4 Tilt Unit – Skid Mounted

It is possible to mount a second tilt unit onto a skid in order to support moving a second camera independently to the main ones, or to fit a multibeam sonar (e.g. ARIS3000). This tilt unit is the same as described in section 6.1.2; however it is not normally possible to use the position feedback feature. The tilt unit will typically be connected to the 3F Manipulator connector which has ±24V bipolar outputs suitable for the tilt unit. This connector does not however have position feedback.

5.2.5 Navigation Skid

Reference Drawing No:

VAL-150-0008	Navigation Skid

An optional Navigation skid can be fitted to the bottom of VALOR ROV. It has been designed to be fitted with various combinations of Survey Equipment, such as DVL units and survey grade INS assemblies.

When the Navigation Skid is fitted, the Client Junction Box option is also required to provide a connection interface for power and control signals to the skid.

6.0 General Safety Procedure

6.1 Safety

Safety procedures are a vital aspect of the operation of ROVs. They should be carefully studied and the principles contained therein applied to the everyday operation of the ROV system.

Reference:

Any appropriate National / International Health & Safety laws / Guidelines.

Company Health & Safety Policy.

Company specific Risk Assessments

First Aid Manual.

6.1.1 Electrical

Potentially lethal AC and DC voltages are present throughout the system.

Before applying any electrical supply voltages to any part of the system it is vital that a visual check be performed to ensure that personnel are not performing any maintenance work on the system.

Ensure that all personnel in the proximity of the system are notified that power is to be applied to the system.

Ensure you know which parts become active when power is applied.

CAUTION

It is important that the dust cap, or blanking plug, is replaced as deployment without them will result in the pod flooding causing a catastrophic failure.

WARNING

The SCU module umbilical and ROV are powered by 320vdc power supply. The incoming supply must be isolated and locked off before attempting to carry out any repairs, or maintenance, on any part of the system.

6.1.2 Electrical Safety Guidelines

The ROV should always be grounded by means of a flexible grounding strap each time the system is returned to deck. The grounding strap must always be attached to exposed metalwork on the ROV such as a bolt or exposed anode.

Do not use an anodised component as a grounding point, if the anodising remains intact there is no earth and if the anodising is broken then corrosion will set in. Always switch off thruster power during deployment and recovery.

- The ground strap must remain connected to the frame until just before launch.
- The ground strap must be reattached immediately after recovery.
- The ground strap must be reattached before the system is powered on-deck. Resistance between the ROV earth should be regularly checked for continuity to ships earth and recorded. Test to be carried out with ground strap removed to verify system earth.
- The ONLY person permitted to apply electrical power to the ROV is the Appointed ROV Supervisor.
- Remove watches, rings and jewellery when working with electrical equipment.
- Always turn equipment off, and wherever possible lock off equipment power or otherwise isolate when troubleshooting.
- Never open electrical enclosures when high voltages are present.
- Never operate equipment that has low insulation to ground.

6.1.3 AC Power Supplies

The VALOR is designed as a portable ROV and may be used in a variety of locations and powered from a variety of power supplies.

- Always check the boat, ship or generator supply before plugging the system in.
- Check the voltage range is within tolerance.
- Check the earth continuity.
- Check the supply capacity and what else is connected. Your supply may be shared with other equipment and not capable of operating both systems.
- When using workshop or building supplies check the fuse or circuit breaker rating. Do not change fuses or circuit breakers to achieve higher currents as this may cause damage to the building wiring.
- Portable generators for use on site will not be earthed unless an earth cable has been added. When using a generator, it may be necessary to add a separate earth cable either from the SCU or from the generator to the boat hull. Fit and test any earth cables to ensure good earth continuity between the SCU and earth.
- When working on Plastic or Wooden hulled boats it may be impossible to achieve an earth connection that includes the deck and water, the boat power supply may even be isolated from earth and protected by its own ground fault monitor. Consult the boat electrician and local wiring regulations for information. In these circumstances the ROV Earth Fault Monitoring System will still work using the pod housing as the return path but may be less sensitive. Consult a competent electrician and carry out a risk assessment on the system before applying power.

6.1.4 Heavy Weights

- No person should attempt to walk under any load suspended beneath any lifting device.
- Any person giving orders to a crane operator shall be familiar with the standard hand-signals used to guide crane operators.
- No person shall lift any heavy weight without following recognised procedures for the lifting of heavy weights.

6.1.5 Underwater Connectors

Metal shell connectors are used on the system. Care should be taken to prevent water entering the connector by cleaning before separating. Ensure the connectors are completely free of water before being reconnected.

The correct handling of underwater connectors is vital to the correct functioning of the system. When connectors have been disconnected, they should always be inspected, cleaned and 'O'-rings greased using a suitable silicone grease, (MS4). The 'O'-rings are located in the lead half of the connector.

To clean 'O'-rings: Remove the "Spiro Clip" behind the brass locking nut and pull back the nut. This will allow access to the 'O'-rings.

On rubber-type connectors: Apply a thin film of silicone grease to rubber surfaces that will come into contact with one another. Do not apply excessive silicone grease as this may block holes preventing the correct engagement of the connectors.

6.1.6 'O'-Rings

The correct handling of 'O'-rings is vital to the integrity of the underwater system components.

NOTE: *Full guides to the handling of 'O'-rings are available*

This Section is designed as a general overview only.

Pressure housings may develop a semi-vacuum state due to cold temperatures inside resulting in difficulties in opening the housings. If this is the case, under no circumstances should sharp, or metallic items, be used to open the pressure housing. This will cause damage to the anodising resulting in electrolytic decay of the housing. It could also damage the precision faces upon which the 'O'-rings sit, or it could damage the 'O'-ring itself. Vacuum Ports can be opened to equalise the pressure.

Always clean 'O'-rings with a lint-free cloth and carefully inspect. 'O'-rings may be re-used only if they are free from any imperfections or defects. **If the 'O'-ring is not in perfect condition replace it.**

Clean 'O'-ring grooves with solvent and lint-free material prior to reassemble. Apply a thin layer of silicon lubricant to 'O'-ring before reassembling. Be careful not to trap or damage 'O'-rings during re-assembly.

- A recommended lubricant is Silicon Grease.
- Do not over apply lubricant to 'O'-rings.
- Do not force items with 'O'-rings; gently reassemble.
- Always use the correct 'O'-rings as specified in the manual drawings. Failure to do so may result in flooded pressure housings.

6.1.7 Tools

- Always use the correct tool for the job.
- Never improvise.
- Never use damaged tools.
- Ensure electrical measurement devices are calibrated at regular intervals.

6.1.8 Spare Parts

Always use the manufacturer's spare parts. Failure to adhere to this may result in damage to the system and may invalidate the warranty. Use the parts lists provided on the system drawings to quote part numbers when ordering spare parts.

Reference:

Any appropriate National / International Health & Safety laws / Guidelines.

Company Health & Safety Policy.

First Aid Manual.

7.0 Integration, Operation & Emergency Procedures

7.1 System Installation & Integration

Reference Drawing No:	
VAL-600-1000	Tether Wiring Detail
VAL-600-5120	VALOR Power Pod Fibre Hose Cable Assembly
VAL-400-5402	Power Pod Layout Schematic
VAL-400-5403	Power Pod Wiring Schematic

The deck cable is the link between the SCU and the Deck Winch if a deck winch is used. The tether cable is then connected to the deck cable through the slip ring in the winch. If no deck winch is used, then the tether is plugged directly into the front of the SCU.

NOTE: *If an EXE or similar winch is supplied the winch connectors are replaced by a gland on a junction box. In that case refer to the suppliers' manual in the vendors' equipment manual.*

7.1.1 Connecting the Tether to the ROV

The connection is made via the supplied tether cable.

The tether is terminated into the Power Pod. It is fed through the subsea cable gland and through into the oil-filled junction box section of the power pod. Once in position, the power and ground can be terminated and connected to the appropriate terminal block location. Next the fibres can be terminated, and the main fibre connected to the appropriate fibre tail from the compensated fibre hose assembly. All connections should have continuity and insulation checks from top to bottom before connection to confirm correct placement.
Ensure the tether gland is secured and tightened. The oil-filled junction box lid can now be fitted, and the section filled and bled of air. This is achieved by placing the fibre cable connector higher than the power pod assembly. Using the compensator assembly, the oil-filled junction box section can be charged with oil and the vent plug on the top of the fibre cable connector used to bleed the air out of the whole compartment (oil-filled JB and oil-filled cable assembly).

The tether is anchored to the ROV by means of the cable grip, which is connected to the frame via a stainless-steel shackle. The shackle should be secured with cable-ties to prevent it working loose.
⚠**Note:** The tether and the tether anchoring components are not designed to, or intended for lifting the ROV and should not be used to do so. For lifting the ROV, a bullet and lock-latch arrangement is available, contact Seatronics ROV Support.

7.1.2 Initial Checks

Before applying system power, the following checks should be carried out.

SCU.

The VALOR SCU. should be connected to a power supply capable of providing 12.5kVA of power at 415VAC (nominal; other voltage ranges are available – refer to your specific system delivery).

The SCU is provided with fixed, suitably rated mains input cable provided with a red industrial power plug (normally a 5-pin) but the user is responsible for the termination at the supply side of the VALOR system (as it is not possible for Seatronics Limited to provide a universal solution for each installation). Where the ROV is a hire system or is used in different locations frequently, it is often worthwhile making up a number of adapter plugs, each fitted to a short length of power cable, all with the same trailing socket on the end with the socket being a match for the single plug on the SCU cable.

7.1.3 AC Power Supply Requirements

The user should take care to select a suitable plug that is rated for voltage, current and the environment, i.e., splash proof if used on a generator that is running outside. The ROV requires 12.5kVA to operate at maximum performance but the VALOR can be operated successfully on lower power supplies if the conditions are suitable. If a 12.5kVA supply is not available, then it is possible to operate the VALOR is a reduced power mode. The user should restrict the power demanded by thrusters by reducing the thruster limit settings on the HCU. The minimum power required to operate the ROV is 7.5KVA if in stable suitable conditions, i.e., low water current and a relatively short amount of tether deployed. The pilot can monitor the current demanded by the system on the SCU ammeter and adjust the thruster limit for the thrusters based on this. All four horizontal thrusters should be kept at one common value to ensure equal and stable handling of the vehicle is maintained. The maximum ROV steady state current is approximately 12 Amps.

If a generator is being used to supply the system power, select a unit that is capable of 12.5kVA or better. Using a generator with a larger capacity produces a much more even supply in response to the rapidly varying load produced by the ROV thrusters. Some models of generator fail to 'keep up' with the rapidly varying load demand and thus cause voltage dips and dropouts.

7.1.4 Control Console

Ensure all the connectors on the front and rear panel are fully connected. The HCU is connected via two USB connectors to the front panel USB ports on the console. All rear panel connections should be secure (these do not need to be unplugged in normal operation so should always remain connected).

7.1.5 ROV Subsea Connectors

Ensure that all the connectors on the ROV are fully connected. Any spare, or unused, connectors should be protected by fitting the appropriately sized blanking caps.

7.1.6 Payload

The ROV has a rated payload (see section 2 specification for details of individual ROV) which is the weight (in salt water) of customer specified equipment that can be attached to the ROV.

1. The payload includes the Cameras, sonar, altimeter and manipulator if fitted.
2. If operating in fresh water the payload is reduced by approximately 2Kgs due to the lower density of fresh water compared to salt water.
3. The payload includes any brackets and cables used to mount the sensors.

The payload includes any lead trim weights that are required to achieve a balanced trimmed ROV. When locating any sensors on the ROV, the lead ballast weight will need to be adjusted and possibly redistributed around the frame to ensure the vehicle buoyancy remains neutral (or slightly positive) trimmed, and the vehicle sits in the water in a balanced attitude.

7.2 Operation Guidelines

This Section contains basic ROV operational procedures and may be of use to both experienced and inexperienced pilots and operators.

Buoyancy, Trim, Setup and General Operation of the ROV

The ease of use and reliability of the ROV can be greatly improved by the correct set up and operation of the ROV and Surface Control System. The following guidelines should be followed but it is impossible to cover these in any detail and to cover all situations and problems that may occur. If in doubt, there are guidebooks available giving much more detailed guidelines on the operation of a small ROV. If the ROV is being used by a number of different people for differing tasks, then it would be worth considering sourcing one of these guidebooks as a reference.

7.2.1 Buoyancy, Trim and Setup

These are some basic factors that affect all ROV tasks.

- When setting up the VALOR System at a new location select a good site with adequate space to work. You should be able to figure of eight the tether without having to stand on it to recover the ROV; ideally the figure of eight cable should be hung over large hooks or horns to prevent it becoming entangled. There should be a safe means to deploy and recover the ROV.
- The surface control system should be undercover and protected from rain or sea spray. It is also easier if the S.C.U. monitors are not in direct sunlight as the reflections can make it difficult or even impossible to view the detail.
- Whenever the ROV is first used in a new configuration or when moving between fresh and salt water the ROV trim will need to be adjusted. Add or remove lead trim weights to achieve an evenly balanced ROV that is slightly buoyant. A badly trimmed ROV is harder to control.
- The ROV should be trimmed to be slightly buoyant for two reasons. When operating in slow moving water and harbour areas there is likely to be silt and sediment on the bottom. If the ROV is slightly buoyant the vertical thruster will be used to push the ROV down. If the vertical thruster were to be used to push the ROV up then the silt and sediment would be disturbed reducing visibility. The second reason is that in the event of a power failure or similar problem the ROV should slowly float up to the surface which is usually safer than sinking down to the bottom. In some circumstances on specific projects the ROV may need to be made slightly negatively buoyant, this decision will always be at the systems supervisor's discretion.
- When transporting, manhandling or deploying the ROV, handle it gently. Despite its rugged construction, the ROV electronic connectors and components within the pod can be shaken loose and sensors damaged. When deploying the ROV lower it gently into the water, do not drop it from a height nor bump it unnecessarily against the hull or wall.

7.2.2 Powering Up

Before powering up the system:

- Check that all power leads to the Surface Control Console are connected and intact.
- Check that all ROV tether connectors are secure and in good condition.
- Check that there is no debris, tools etc in ROV or around launch site.
- Check all personnel are clear of the vehicle thrusters etc.
- The breaker at the front of the SCU should be in the up position and the rotary isolator should be in the off position. Apply the 415VAC supply to the main SCU.
- Turn the rotary switch at the front of the SCU to the 'on' position, the breaker at the front of the SCU should shut down as soon as the power is applied to the system. The system will now perform a LIM test before the breaker at the front will be allowed to reset.
- The LIM at the front of the SCU will only be possible to be reset when the reading is at 4M ohm, there will be an audible 'click' when the reading has reached this and a green LED appears on the LIM.
- The system monitors and system GUI will now power up. The top monitor power switch at the front will need to be pushed as it does not come on automatically.
- When the GUI and the monitors have run up then it is safe to power up the system, this will activate power and communication from the topside to the bottom side of the system. **Ensure that all personnel are clear of the ROV**
- Press the 'Deck check (450V)' button on the GUI. This will now provide the subsea USPs with power.
- Once you have communication with the topside and bottom side then the relevant subsea USPs can be switched on to allow Cameras and other ancillary items that are connected to the comms pod.
- Thrusters can now be activated on the HCU so that deck checks can be carried out.

7.2.3 Pre-dive Checks

Before power is applied to the ROV:

- Make sure all air has been bled from the power pod and comms pod and that the vacuum plugs are secure.
- Visually check that the compensator of the thrusters are fully charged.
- Make sure that all connector cables are secure and are well clear of the thrusters.
- Check that the buoyancy is secure and in good condition.
- Check that all thrusters operate in the correct direction when given the appropriate commands from the pilot's joystick.
- Check cameras, lights, & tilt unit.
- Check manipulator functions if fitted.
- Check that the sonar is functioning and communicating with the surface control unit.
- Check that line insulation monitor is clear, and no alarms are present on the LCD display.

Once the above checks have been successfully carried out, the system is ready to dive.

7.2.4 Diving and Operation

Do not attempt to put the ROV into the water until all the Power-Up and Pre-Dive checks have been successfully carried out. When these checks have been successfully carried out the vehicle may be deployed and used to perform the underwater tasks that are required of it.

Always launch the system with the ROV power switched OFF if it is necessary to man handle the ROV and tether.

Deployment by crane or LARS

If the vehicle is to be launched using a bullet and lock-latch, a crane or some form of lifting gear will normally be used to deploy and recover the vehicle. The bullet is fitted to the top central point of the vehicle with the tether passing through the centre. The latch, which is attached to the crane, slides down the tether and latches onto the bullet. The vehicle can then be lifted. Care should be taken when lifting the vehicle. Personnel should keep clear of the suspended load.

When the vehicle hits the water, the latch should be released as soon as the weight comes off the lift wire to minimise the effects of shock loading on the lifting equipment.

When the vehicle is undocked, the latch should be lifted with the crane and removed from the tether. The vehicle can now be flown down to the required working depth.

7.2.5 Deployment by hand

If the vehicle is to be launched by hand then the user should proceed with care noting the following points.

CAUTION

Deployment by hand is a more complicated process because it may involve third party equipment, different locations and possibly different people. Always plan ahead and prepare properly.

- Before deploying the ROV – Plan the sequence and ensure that everyone involved understands their place in that plan and is capable of carrying out their role.
- The VALOR ROV in its basic form weighs 80Kg and must be handled by two or more people. Follow safety procedures for lifting weights.
- You will be working near or over water, always wear appropriate buoyancy aids and never work alone.
- A lifting point is provided between the upper Buoyancy. This is rated to lift the ROV and can be used as an attachment point for small harbour cranes, hoists, boat derrick or lifting ropes. The bar can be used as an attachment point for a boat hook or rope to lower the ROV into the water.
- Slip ways and sloping shores are convenient points from which to launch an ROV for a harbour or boat survey as the ROV can be progressively pushed into the water but again care should be taken to avoid slips and falls. Slipways and sloping shores may also have hidden holes or obstructions.
- When working in a harbour or dock area place the tether and power leads such that other users do not need to step or drive over the tether and power cables. Ensure that you have sufficient working space to layout the tether in a figure of eight or operate the winch.
- If working from shore, be aware of the tide and its effect on access to the water.
- Once the ROV has been released the power can be applied. The ROV should not be manhandled with power applied to avoid the risk of any electric shocks and the risk of injury from rotating thrusters. Thrusters would rotate if the Auto Heading function were left active while the ROV is being moved around.

CAUTION

Do not apply sudden high thrusts to the ROV when someone is handling the tether. This may catch them off guard and pull them into the water.



7.2.6 ROV Thrust and Tether Handling

One of the features of the VALOR ROV is its high thrust levels compared to its weight. During operations it is normal to have someone handling the tether to control the amount in the water. They may be standing near the edge of the deck or harbour feeling for the pull of the ROV in order to gauge the rate at which they pay out tether. DO NOT suddenly apply high levels of thrust without first warning the assistant of your intentions. The sudden application of 70Kgs of pull can quite easily pull your assistant off their feet and into the water. For this reason, there should always be a safety rail between the assistant and the water. If there is no safety rail, for example when working on a dock side location, then the assistant should stand well back from the edge. Always wear a buoyancy aid.

7.2.7 Using the auto-functions:

The auto-functions are engaged by pressing the relevant button on the HCU. The rate gyro is used to stabilise and keep the vehicle flying smoothly and in a relatively straight line. When the rate gyro is also used along with the compass controlled auto-heading function, the ROV will also hold a specific compass bearing.

NOTE: *Note that metal structures and pipelines can affect the magnetic compass.*

The auto-depth will hold the vehicle within 0.5 Metres of a selected depth. The use of the vertical joystick overrides the depth hold and allows the vehicle to fly up or down. When the joystick is returned to the centre position, the auto-depth will be re-selected and the new depth will be held. The same applies to the auto-altitude.

If auto-depth and altitude are selected together, auto-depth will take priority.

Joystick commands override the gyro and auto-function commands.

7.2.8 Dive Records

For all but the simplest jobs tasks it can be useful to maintain a record of the dive. This can often take the form of a video record of dive recording the pilot monitor image but should also include a plan of the work done in the form of a map onto which significant features are marked and a written log of the dive showing start times, heading, depth and duration. Results noted, navigational features observed, obstacles to be avoided, problems observed on the ROV. This can be a useful reference if problems are encountered, or the site needs to be revisited later.

7.3 System Recovery

7.3.1 System Recovery by crane or LARS

Slowly fly the vehicle upwards at the same time as recovering the tether to the deck. When the vehicle is in sight, fly the vehicle towards the recovery point below the lifting crane. Place the lock latch onto the tether and lower it onto the ROV bullet. As soon as the bullet is latched and the crane has tension on the lift wire, switch off ROV power and recover the vehicle to the surface as quickly as possible to minimise the effects of shock loading caused by wave action. When the vehicle is on the deck, attach the earth strap and rinse off with fresh water before carrying out the post dive checks.

7.3.2 System Recovery by hand

Slowly fly the vehicle upwards at the same time as recovering the tether to the deck, jetty, slipway or pontoon. When the vehicle is in sight, fly the ROV towards the recovery point. If a crane or derrick is available use this, otherwise manoeuvre the ROV towards the exit point. Attach a rope or hook to the lift point and switch off ROV power. Lift or drag the ROV out of the water taking care not to catch cable or thrusters on debris or protrusions.

7.3.3 Immediately after each Dive

With the ROV recovered to a safe position quickly inspect the ROV for damage and debris, particularly around thrusters; this is a particular risk if the ROV has been working in a harbour or similar area. Debris such as fishing line or nylon net cord will damage a thruster seal if it becomes entangled.

7.4 Post-Dive Checks

ROV

- At the end of each day's work and particularly before storing / transporting the ROV for any length of time, wash down the ROV with clean fresh water. The following is a minimum outline of the checks to make following a dive:
- Apply power to ROV.
- Check proper operation of thrusters.
- Check proper operation of cameras.
- Check proper operation of lights.
- Switch off ROV power.

- Check all cables are secure. Pay particular attention to any connector recently refitted.
- Check for obstructions in thrusters and damage to propeller blades.
- Check for any obvious signs of damage to frame or buoyancy.
- Check that the ROV Cable grip is still secure and has not slipped on the tether.
- Check anodes for wear & overall corrosion levels.
- Check thruster compensator oil levels.
- Check tether termination gland for security and the oil-filled fibre cable has no air bubbles.
- Hose down the ROV with fresh water after each day's work.

7.5 VALOR Fault Diagnosis

Fault Symptom	Probable Cause	Corrective Action
ROV does not power on	SCU Circuit Breaker OFF	Reset breaker (breaker is tripped every power on cycle as part of LIM test)
	PSU front panel switch off	Turn on PSU switch (delay until Ethernet comms are established)
	PSU not powered on	Check LIM reading and output
	No DC supply to ROV	Check PSU output and tether connection
	No power to Comms Pod	Check interconnection between Power Pod and Comms pod. Verify PSU output current on GUI (~0.4A at initialisation)
	Power module failure in Power Pod	Power off ROV and disconnect Comms Pod. Power on ROV and check bulkhead voltages
No Comms to ROV	Tether Issue	Verify tether connection and fibre optic connections
	Damaged Fibre Connections	Verify fibre oil-filled cable and connections
	Missing network connection	Verify all network connections, particularly PC to Console 10Gb Switch (DAC Cable) and Switch to Router
	No power to Comms Pod	Verify power output from Power Pod
	Faulty Fibre Optic Transceiver	Bypass tether connection (e.g., network cable from PC to user port) and verify network connection – replace SFP if confirmed
	Switch Failure	Verify if both switches are visible on network. Replace if not
No Thruster Control	Thrusters Disabled	Enable thrusters on Throttle Stick
	No comms to thrusters	Check Power Pod USP connections are all valid (GUI) – check power

		pod connection if not. Check USP 28 for thruster comms is present on network – replace if not.
Vehicle handling inconsistent	Auto-functions enabled	Turn off auto-functions
	One or more thrusters not operating	Check thruster operation Check thruster output equal RPM Check thrusters drawn equal power
	INS module not calibrated	Perform on system INS calibration
	Joystick noise or failure	Verify joystick thruster control input signals. Replace joystick if signals are at issue
Depth Reading does not change	Wrong depth reading source selected	Verify Depth reading source in the process view in software
	No comms with INS pod	Verify connection to INS pod and INS readings. Check appropriate USP connection if issue.
	Faulty depth sensor	Replace INS pod
No video present	Cameras not enabled	Power on cameras – USP4 and USP5 in GUI (if standard system cameras)
	Camera cable faulty	Verify connection. Replace cable.

8.0 Warranty

Seatronics Limited warrants their ROV systems on a back-to-base basis for a period of 12 months. Replacement parts will not be issued until the defective items have been returned for inspection. Costs of returning defective components to Seatronics Limited shall be at the buyer's expense. This warranty does not apply to any product that has been misused, modified or damaged by accident. The warranty does not include shaft seals, Bearings, O-Rings and any other part subject to wear under normal operating conditions. Seatronics Limited will not warrant any unauthorised modifications to their products and will not accept liability for such alterations. Equipment sold by, but not manufactured, by Seatronics Limited such as cameras, video monitors, sonar heads and processors etc will be warranted only to the extent and in the manner of that warranted to Seatronics limited by the seller and then only to the extent that the seller is able to enforce such a warranty.

Please note that the integration of any additional 3rd party equipment without prior knowledge or written approval of Seatronics Limited may invalidate all warranty agreements.

8.1 Service, Support & Spares

Seatronics Limited operates a comprehensive sales support and technical after sales service based in Aberdeen, Scotland. Most spare parts will be held in stock at our premises. When ordering spare parts, the Seatronics part number or bulk number references on the drawings should be quoted.

Any technical queries should be directed to our technical department. A 24-hour helpline is normally in operation. A number will be available on the answering system after normal working hours.

If you should have cause to call our Technical Support Service, please have a system manual and the following details to hand before calling about technical queries as this will help our technical department to answer any questions.

- System Serial Number
- Product Part Number (if applicable)
- Fault Description
- Any remedial action already implemented.

To contact Seatronics please refer to Page 2 of this manual.

9.0 Drawing Package

This section of the manual contains all mechanical and electrical drawings for the ROV as per the scope of supply in Section 2.1, Page 12 of this manual.

9.1 Mechanical Drawings.

Drawing No.	Drawing Title
ROV	
VAL-100-0001	VALOR 300m Base Build
VAL-100-0002	VALOR 300m Frame Assembly
VAL-100-0003	300m Tilt Assembly
VAL-100-0007	Camera Bracket Assembly
VAL-100-0011	L.E.D. Light Bracket Assembly
VAL-200-0003	300m FWD Buoyancy
VAL-200-0004	300m AFT Buoyancy
VAL-400-0001	Comm's Pod Assembly
VAL-400-0002	Power Pod Assembly
VAL-400-0003	I.N.S. Pod Assembly
VAL-400-0007	Vacuum Port Assembly
Control Console	
VAL-500-0001	S.C.U. Assembly
Optional Items	
VAL-150-0006	VALOR Standard Skid
VAL-150-0008	VALOR Manipulator Skid

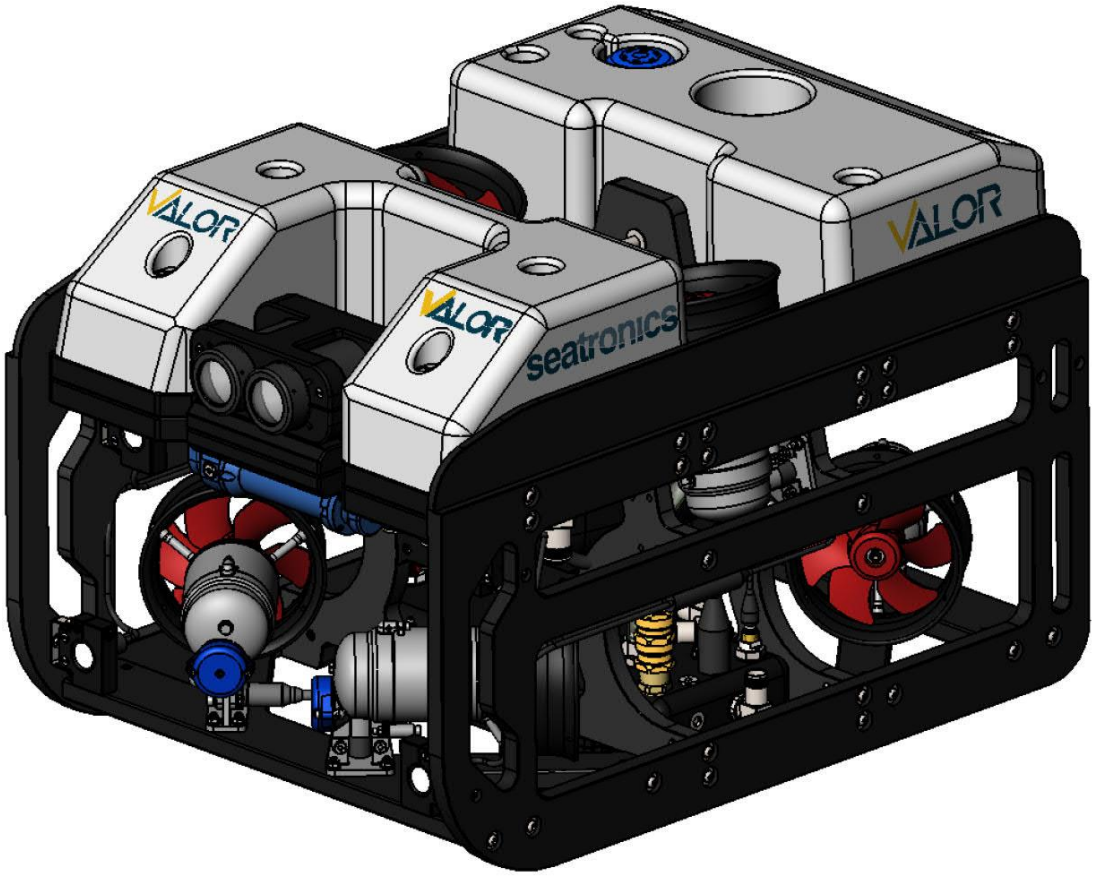
9.2 Electrical Drawings

Drawing No.	Drawing Title
System	
VAL-800-0009	Vehicle Layout
VAL-800-0004	System Wiring Diagram
ROV	
VAL-400-5400	Comm's Pod Layout
VAL-400-5401	Comm's Pod Wiring Schematic
VAL-400-5402	Power Pod Layout Schematic
VAL-400-5403	Power Pod Wiring Schematic
VAL-PCB-001-SCH	Comm's/Controls PCB Schematic
VAL-PCB-001-LAS	Comm's/Controls PCB Layout
VAL-PCB-USP-001-SCH	U.S.P. Schematic
VAL- PCB-USP-001-LAS	U.S.P. Board Layout
VAL-PCB-003-SCH	Power Pod Termination PCB Schematic
VAL-PCB-003-LAS	Power Pod Termination PCB Layout

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THIRD ANGLE PROJECTION

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ITEM NO.	QTY.	PART NUMBER	Bulk #	DESCRIPTION	Material
1	1	VAL-100-0002	-	300m VALOR Frame Assembly	-
2	1	VAL-100-0007	-	Camera Bracket Assembly	-
3	1	VAL-100-0005	-	300m Tilt Assembly	-
4	1	VAL-200-0003	-	300m FWD Buoyancy	-
5	1	VAL-200-0004	-	300m AFT Buoyancy	-
6	3	VAL-300-0001-RH	903012	300m SPE-75 Thruster (Right Hand)	-
7	3	VAL-300-0001-LH	903012	300m SPE-75 Thruster (Left Hand)	-
8	1	VAL-400-0001	-	Comm's Pod Assembly	-
9	1	VAL-400-0002	-	Power Pod Assembly	-
10	1	VAL-400-0003	-	I.N.S. Pod Assembly	-
11	2	VAL-600-5107	903429	LED Lights Cable Assembly	-
12	1	VAL-900-0005	903189	GPS Antenna	-
13	8	VAL-950-0056		Socket Head Button Screw M6 x 40	Stainless Steel A4-70
14	16	VAL-950-0055		Socket Head Cap Screw M6 x 30	Stainless Steel A4-70
15	24	VAL-950-0008	903215	M6 Nyloc Nut	Stainless Steel A4-70
16	48	VAL-950-0014	903300	M6 Washer	Stainless Steel A4-70
17	4	VAL-950-0064		Socket Head Cap Screw M4 x 50	Stainless Steel A4-70
18	4	VAL-950-0051		M4 Spring Washer	Stainless Steel A4-70
19	4	VAL-950-0050		M4 Form A Flat Washer	Stainless Steel A4-70

NOTES:-

1, APPLY AQUA-LUBE OR EQUIVALENT TO ALL MATING FACES/THREADED FASTENERS

2, APPLY LOCTITE 243 (BLUE) TO SPECIFIED THREAD FACES

3, APPLY SLIP-WAX OR EQUIVALENT TO ALL O-RINGS

REV	DATE	ECR	DESCRIPTION	BY	CHK	APP
1	09/04/2019	N/A	ISSUED FOR PRODUCTION	ABL		

RECORD OF REVISIONS

MATERIAL: SEE B.O.M.

SURFACE FINISH: -

U.S.O. TOLERANCES TO BE (DIMENSIONS ARE IN mm)

DECIMALS: X. = ± 1.0
.X = ± 0.5

ANGLES : = ± 0°30'

PAINT/SPECIAL FINISH SPEC: -

WT AIR 88 kg (E)

WT WATER -8 kg (E)

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SCALE (U.S.O.) 1:10

ORIG. SIZE A3

PROJECT VALOR ROV

TITLE

VALOR BASE BUILD (300m)

ASSEMBLY DRAWING

Sheet 1 of 6

DOC. No. VAL-100-0001

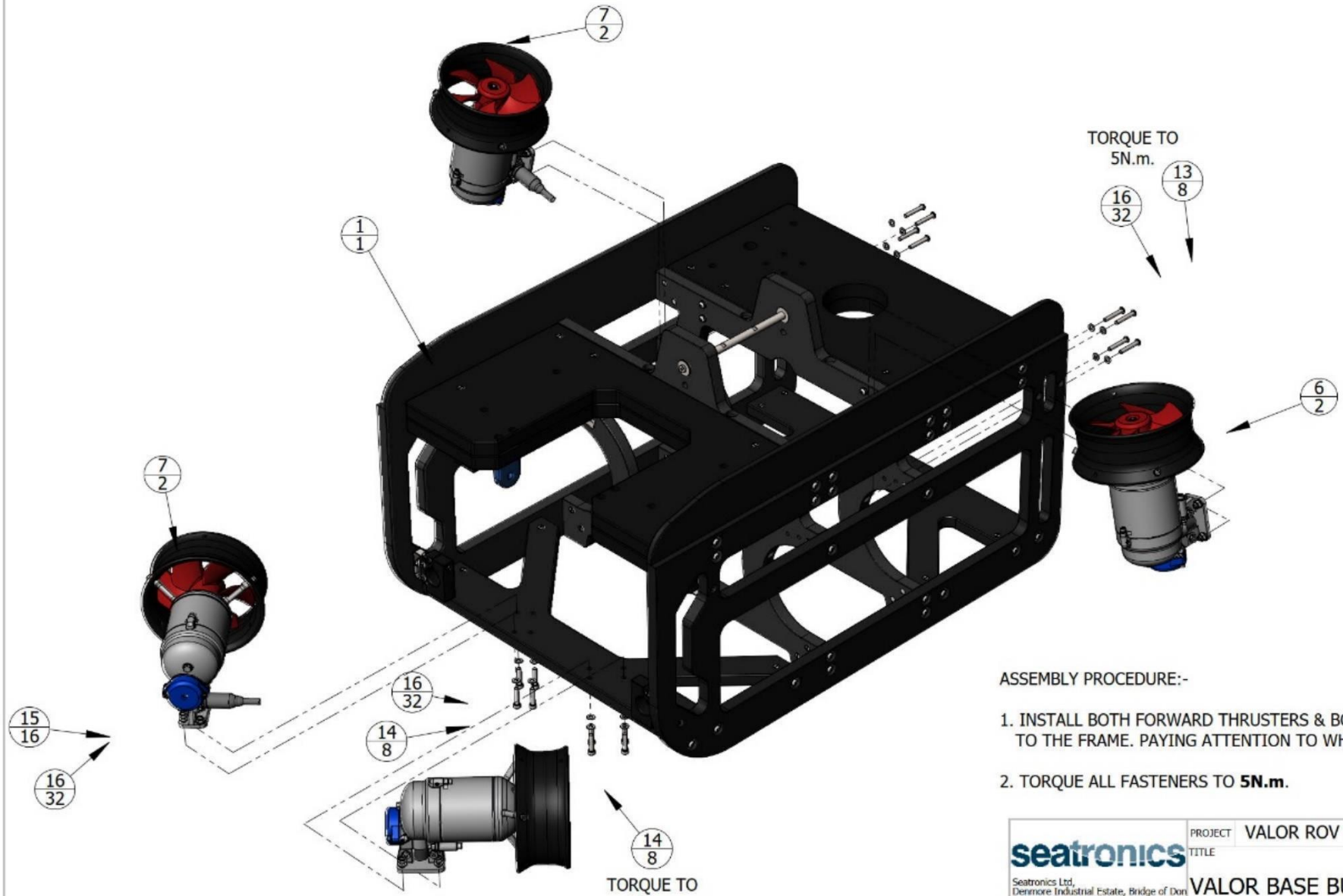
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ASSEMBLY STAGE 1



ASSEMBLY PROCEDURE:-

1. INSTALL BOTH FORWARD THRUSTERS & BOTH VERTICAL THUSTERS TO THE FRAME. PAYING ATTENTION TO WHICH SIDE THE CABLE EXITS.

2. TORQUE ALL FASTENERS TO **5N.m**.

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PROJECT	VALOR ROV
TITLE	VALOR BASE BUILD (300m)
	ASSEMBLY DRAWING
	Sheet 2 of 6

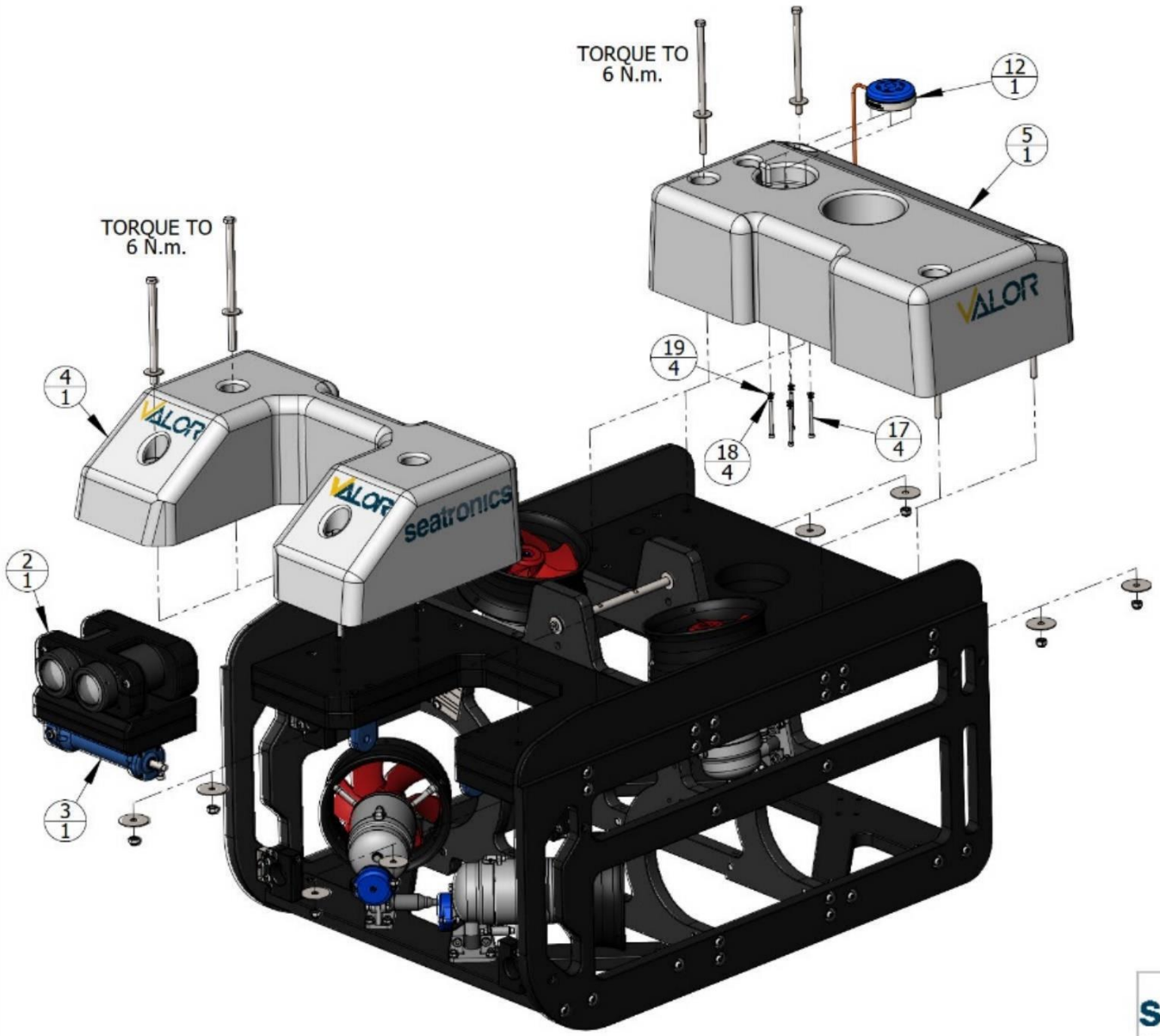
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88 kg (E)	-8 kg (E)	1:5	A3	VAL-100-0001	1

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ASSEMBLY STAGE 2



ASSEMBLY PROCEDURE (cont):-

1. ATTACH THE CAMERA BRACKET ASSEMBLY (VAL-100-0007) TO THE TILT ASSEMBLY (VAL-100-0005) UTILISING THE 3-OFF M6 x 55 SOCKET HEAD BUTTON SCREWS & **TORQUE TO 2N.m.**

2. ATTACH THE ASSEMBLED UNIT TO THE FRAME VIA THE TILT UNIT PIVOT SUPPORTS (VAL-100-5023). THIS WILL REQUIRE ONE OF THE PIVOTS TO BE REMOVED FROM THE FRAME. LOCK IN PLACE USING THE M5 x 22 SOCKET HEAD CAP SCREW (VAL-950-0020) & **TORQUE TO 5N.m**.

3. LOCATE THE GPS ANTENNA (VAL-900-0005) INTO THE ANTENNA RECESS OF THE AFT BOUYANCY MODULE, ENSURING TO ROUTE THE CABLE INTO THE DEDICATED CABLE CONDUIT. SECURE WITH 4-OFF M4 x 50 SOCKET HEAD CAP SCREWS (VAL-950-0064) & **TORQUE TO 1.2N.m.**

4. ATTACH THE FORWARD & AFT BOUYANCY MODULES UTILISING THE M8 x 150 (VAL-950-0010) & M8 x190 (VAL-950-0013) HEX HEAD BOLTS. & **TORQUE TO 6N.m**.

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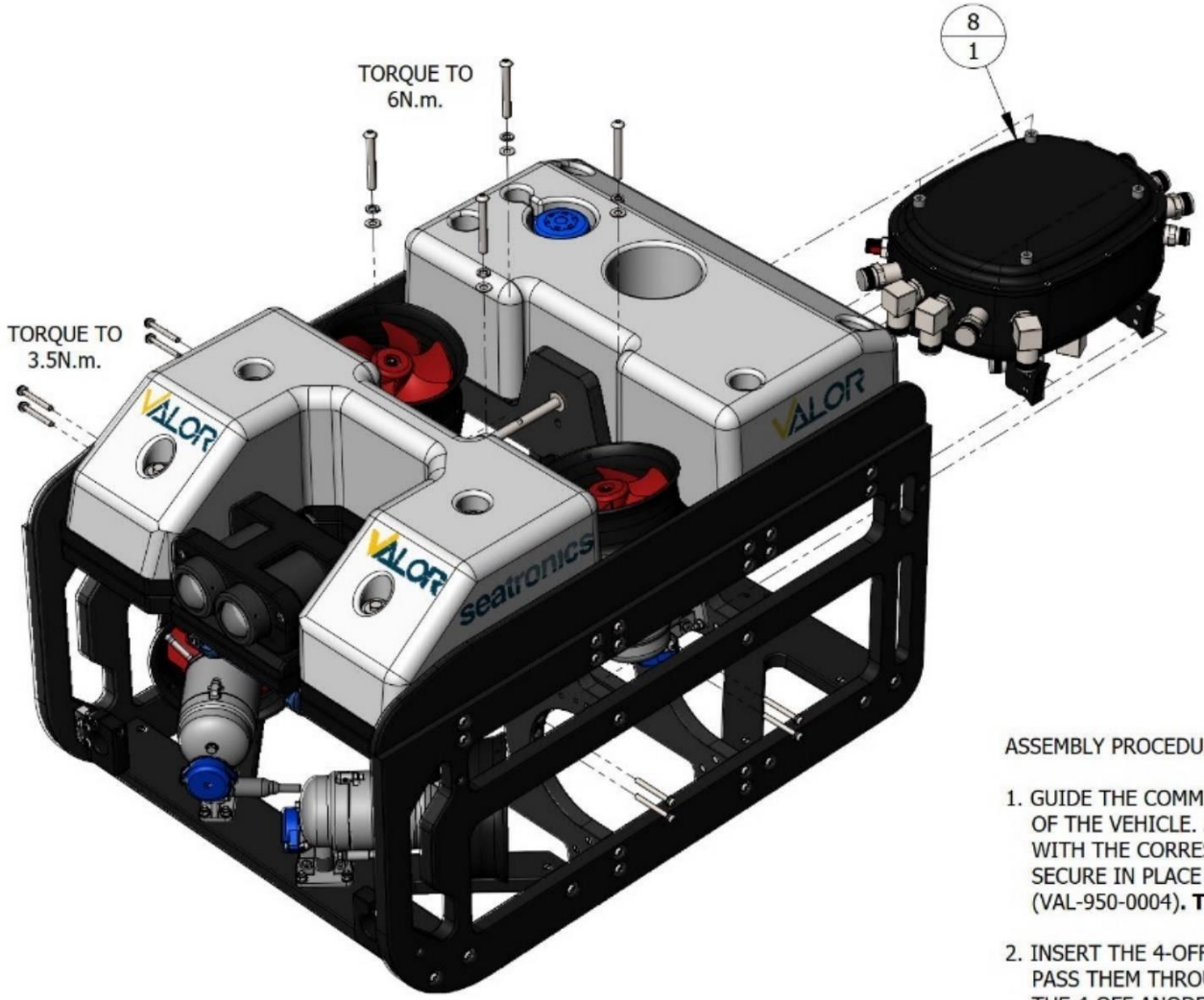
PROJECT	VALOR ROV
TITLE	VALOR BASE BUILD (300m)
	ASSEMBLY DRAWING
	Sheet 3 of 6

WT AIR	WT WATER	SCALE (U.S.O.)	ORIG. SIZE	DOC. No.	REV
88 kg (E)	-8 kg (E)	1:6	A3	VAL-100-0001	1

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ASSEMBLY PROCEDURE (cont):-

1. GUIDE THE COMM'S POD (VAL-400-0001) INTO THE FRAME FROM THE AFT OF THE VEHICLE. ALIGN THE LIFT FRAME POD SUPPORTS (VAL-100-5004) WITH THE CORRESPONDING HOLES IN THE LIFT FRAME (VAL-100-5000) & SECURE IN PLACE WITH 8-OFF M6 x 55 SOCKET HEAD BUTTON SCREWS (VAL-950-0004). **TORQUE TO 3.5N.m.**

2. INSERT THE 4-OFF M8 x 70 SOCKET HEAD BUTTON SCREWS (VAL-950-0035), PASS THEM THROUGH THE LIFT FRAME (VAL-100-5000) THREADING THROUGH THE 4-OFF ANODES (VAL-400-5007) INTO THE COMM'S POD LID (VAL-400-5001). **TORQUE TO 6N.m.**

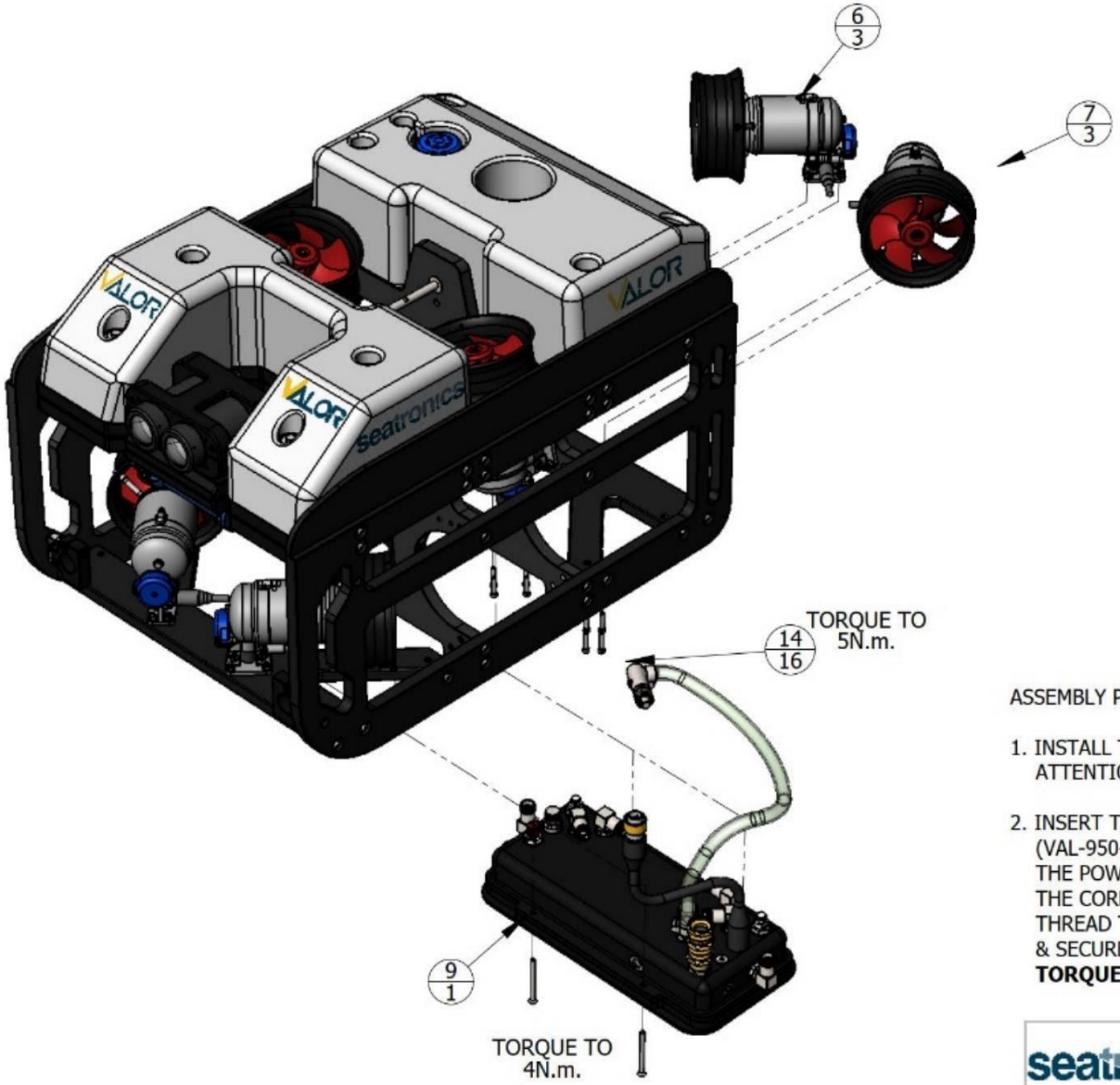
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WT AIR 88 kg (E)	WT WATER -8 kg (E)	SCALE (U.S.O.) 1:5	ORIG. SIZE A3	PROJECT VALOR ROV	
				TITLE VALOR BASE BUILD (300m)	
				ASSEMBLY DRAWING	Sheet 4 of 6
				DOC. No. VAL-100-0001	REV 1

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ASSEMBLY PROCEDURE (cont):-

1. INSTALL THE AFT THRUSTERS TO THE VEHICLE FRAME PAYING ATTENTION TO WHICH SIDE THE CABLES EXIT**. TORQUE TO 5N.m.**

2. INSERT THE 4-OFF M6 x 80 SOCKET HEAD COUNTERSUNK SCREWS (VAL-950-0030), PASS THEM THROUGH THE MOUNTING FLANGE ON THE POWER POD ASSEMBLY (VAL-400-0002) & PASS THEM THROUGH THE CORRESPONDING HOLES IN THE LIFT FRAME (VAL-100-5000). THREAD THE FASTENERS THROUGH THE BARREL NUTS (VAL-100-5010) & SECURE IN PLACE WITH 4-OFF M6 NYLOC NUTS (VAL-950-0008). **TORQUE TO 4N.m.**

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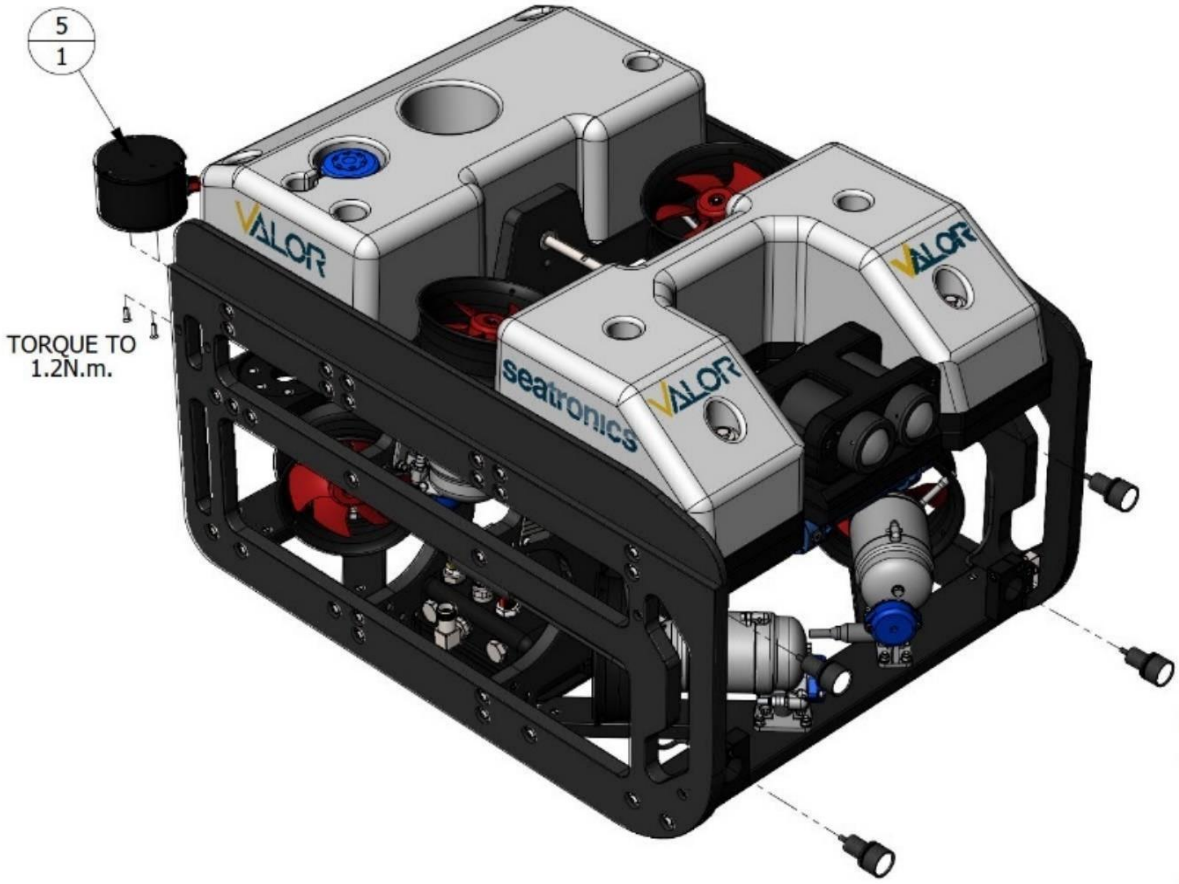
PROJECT	VALOR ROV
TITLE	VALOR BASE BUILD (300m)
	ASSEMBLY DRAWING
	Sheet 5 of 6

WT AIR	WT WATER	SCALE (U.S.O.)	ORIG. SIZE	DOC. No.	REV
88 kg (E)	-8 kg (E)	1:6	A3	VAL-100-0001	1

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THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!



ASSEMBLY PROCEDURE (cont):-

1. INSTALL THE 2-OFF L.E.D. LIGHTS (VAL-600-5107) INTO THE LIGHT BRACKET ASSEMBLY SECURING IN PLACE WITH THE M6 x 30 SOCKET HEAD CAP SCREWS (VAL-950-0055) & **TORQUE TO 3N.m.**

2. POSITION THE I.N.S. POD (VAL-400-0003) ONTO THE I.N.S. POD BRACKET (VAL-100-5020), ENSURING CORRECT ALIGNMENT & ORIENTATION. SECURE IN PLACE WITH 2-OFF M4 x 18 SOCKET HEAD COUNTERSUNK SCREWS (VAL-950-0028) & **TORQUE TO 1.2N.m.**

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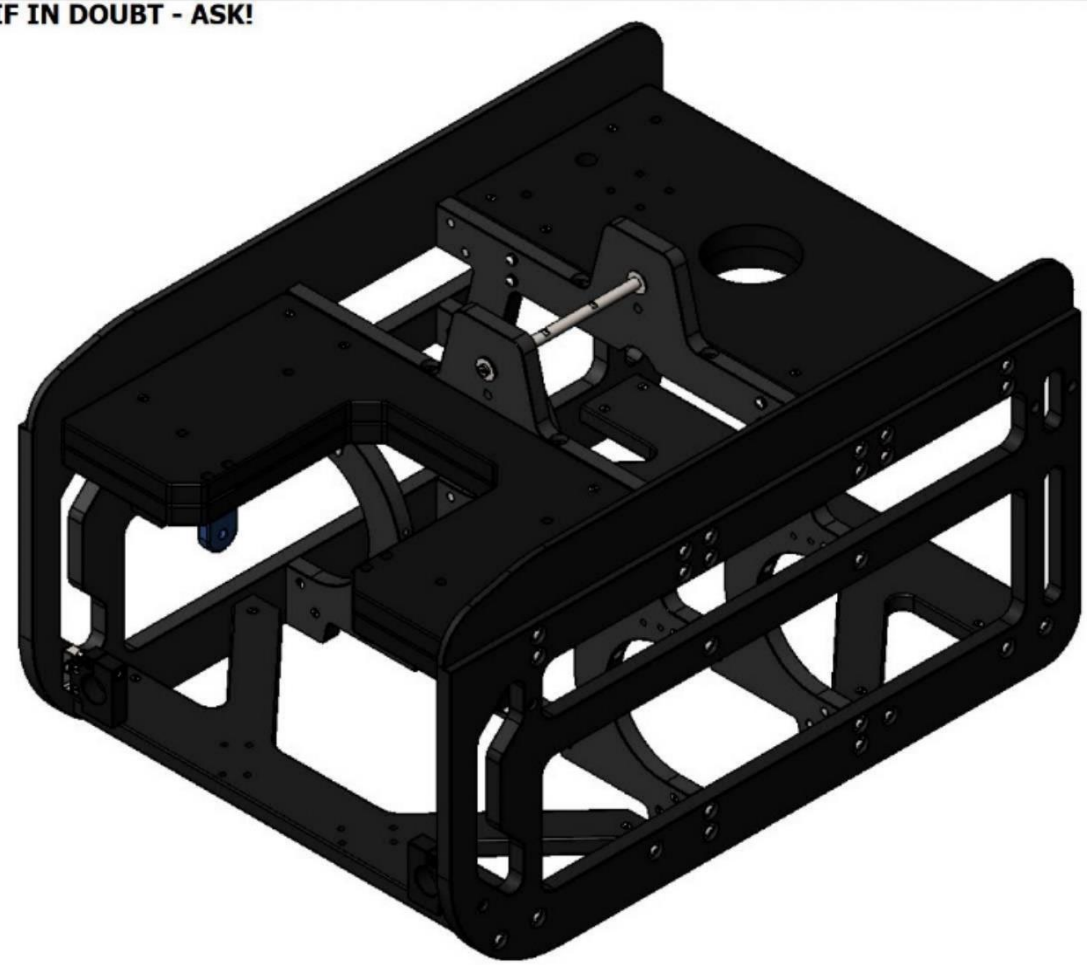
PROJECT	VALOR ROV
TITLE	VALOR BASE BUILD (300m)
	ASSEMBLY DRAWING — Sheet 6 of 6

WT AIR	WT WATER	SCALE (U.S.O.)	ORIG. SIZE	DOC. No.	REV
88 kg (E)	-8 kg (E)	1:10	A3	VAL-100-0001	1

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THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!



ITEM NO.	QTY	PART NUMBER	Bulk #	DESCRIPTION	MATERIAL
1	2	VAL-100-5000	903001	Lift Frame	PE High Density
2	1	VAL-100-5001	903252	PORT Side Frame	PE High Density
3	1	VAL-100-5002	903253	STBD Side Frame	PE High Density
4	2	VAL-100-5003	903004	K-Brace	PE High Density
5	2	VAL-100-5005	903002	300m FWD Upper Deck	Gurit Corecell S1200
6	2	VAL-100-5006	903003	300m AFT Upper Deck	Gurit Corecell S1200
7	1	VAL-100-5008	903101	Lift Bar	Stainless Steel 316
8	24	VAL-100-5009	903165	Cross Dowel M6x10x25	Stainless Steel 316
9	36	VAL-100-5010	903019	Cross Dowel M6x10x20	Stainless Steel 316
10	3	VAL-100-5019	903307	Cross Dowel M6x10x15	Stainless Steel 316
11	1	VAL-100-5020	903306	T.N.S. Pod Bracket	PE High Density
12	2	VAL-100-5023	903376	Tilt Unit Pivot Support	Aluminium 6082-T6
13	1	VAL-100-5032		VALOR Safe Working Load Plate	Stainless Steel 316
14	2	VAL-950-0001		Shoulder Bolt M6 x 8 x 25lg	Stainless Steel A4-70
15	6	VAL-950-0002	903138	M8 x 25 Penny Washer	Stainless Steel A4-70
16	8	VAL-950-0005	903261	Socket Head Button Screw M6 x 65	Stainless Steel A4-70
17	34	VAL-950-0004	903292	Socket Head Button Screw M6 x 55	Stainless Steel A4-70
18	17	VAL-950-0009	903262	Socket Head Button Screw M6 x 45	Stainless Steel A4-70
19	2	VAL-950-0043		Socket Head Button Screw M6 x 35	Stainless Steel A4-70
20	51	VAL-950-0006	903402	M6 x 20 Penny Washer	Stainless Steel A4-70
21	59	VAL-950-0007	903164	M6 Spring washer	Stainless Steel A4-70
22	12	VAL-950-0014	903300	M6 Washer	Stainless Steel A4-70
23	2	VAL-950-0008	903215	M6 Nyloc Nut	Stainless Steel A4-70
24	2	VAL-100-0011		STBD Light Bracket Assembly	-
25	2	VAL-100-0011		PORT Light Bracket Assembly	-

NOTES:-

1. APPLY ANTI-GALLING COMPOUND TO ALL MATING FACES/THREADED FASTENERS
2. APPLY LOCTITE 243 (BLUE) TO SPECIFIED THREAD FACES
3. APPLY SLIP-WAX OR EQUIVALENT TO ALL O-RINGS

REV	DATE	ECR	DESCRIPTION	BY	CHK	APP
1	08/04/2019	N/A	ISSUED FOR PRODUCTION	ABL		

RECORD OF REVISIONS

MATERIAL: SEE B.O.M.

SURFACE FINISH: -

U.S.O. TOLERANCES TO BE (DIMENSIONS ARE IN mm)

DECIMALS: X. = ± 1.0, .X = ± 0.5

ANGLES : = ± 0°30'

PAINT/SPECIAL FINISH SPEC: -

WT AIR 19.038 kg (E)

WT WATER -9.355 kg (E)

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SCALE (U.S.O.) 1:5

ORIG. SIZE A3

PROJECT VALOR ROV

TITLE MAIN FRAME BASE BUILD

ASSEMBLY DRAWING

Sheet 1 of 3

DOC. No. VAL-100-0002

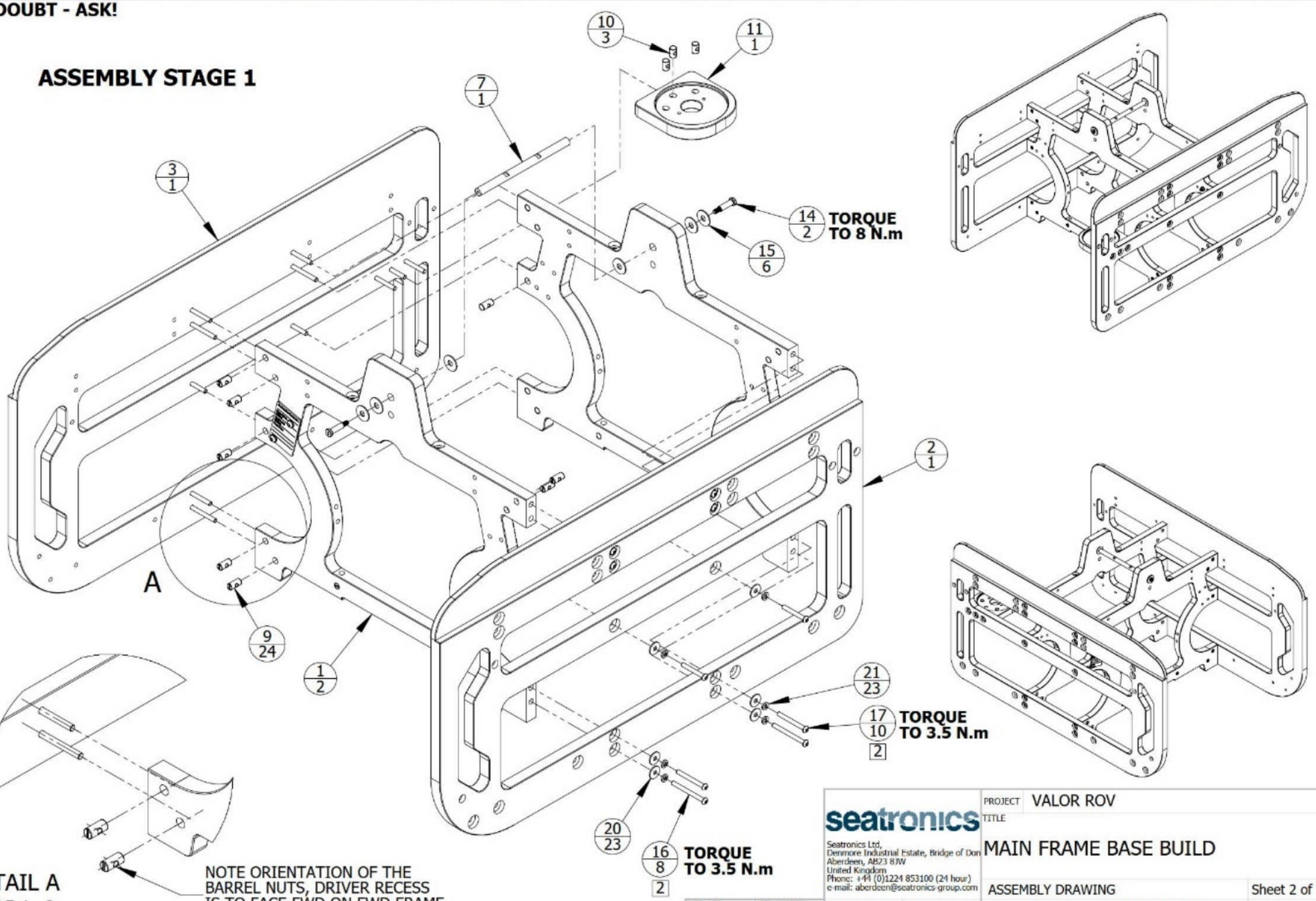
REV 1

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THIRD ANGLE PROJECTION

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ASSEMBLY STAGE 1



DETAIL A
SCALE 1 : 3

NOTE ORIENTATION OF THE BARREL NUTS, DRIVER RECESS IS TO FACE FWD ON FWD FRAME & AFT ON AFT FRAME.

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PROJECT	VALOR ROV
TITLE	MAIN FRAME BASE BUILD
	ASSEMBLY DRAWING
Sheet	2 of 3
DOC. No.	VAL-100-0002
REV	1

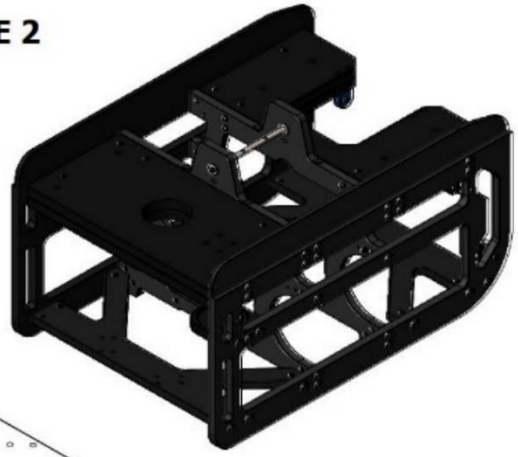
WT AIR	WT WATER	SCALE (U.S.O.)	ORIG. SIZE
19.038 kg (E)	-9.355 kg (E)	1:5	A3

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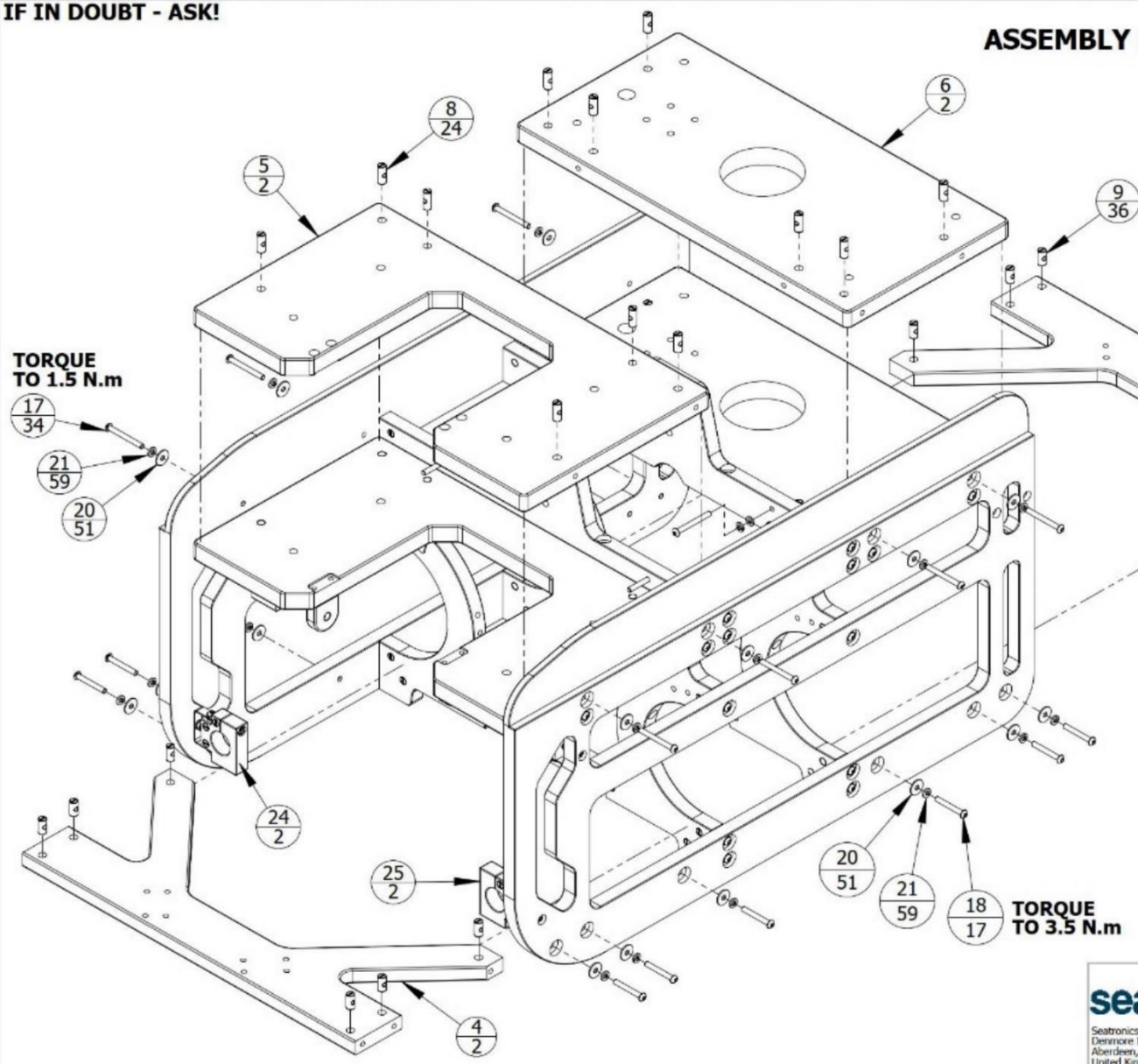
THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!

ASSEMBLY STAGE 2







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WT AIR 19.038 kg (E)	WT WATER -9.355 kg (E)	SCALE (U.S.O.) 1:5	ORIG. SIZE A3

PROJECT: VALOR ROV

TITLE: MAIN FRAME BASE BUILD

ASSEMBLY DRAWING

Sheet 3 of 3

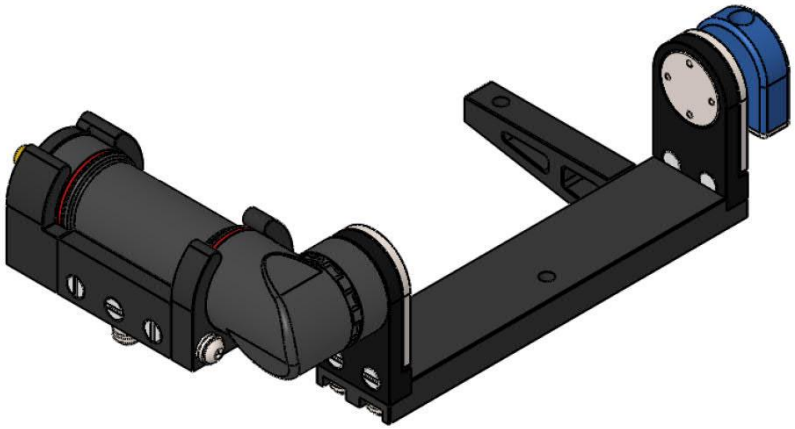
DOC. No. VAL-100-0002

REV 1

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THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!



ITEM NO.	QTY.	Bulk #	PART NUMBER	DESCRIPTION	MATERIAL
1	1	903625	VAL-900-0010	Blueprint Lab RA-1400 Rotator	-
2	1	903737	VAL-700-5005	Blueprint RA-1400 Saddle	Acetal
3	1	903738	VAL-700-5006	Blueprint RA-1400 End Support	Acetal
4	2	903739	VAL-700-5007	Tilt Yoke Arm	Acetal
5	2	903740	VAL-700-5008	Tilt Yoke Arm Stiffening Plate	Stainless Steel 316
6	1	903741	VAL-700-5009	Tilt Yoke	Acetal
7	1	903742	VAL-700-5010	Tilt Support Shaft	Stainless Steel 316
8	2	903743	VAL-700-5011	Tilt Unit Yoke Arm Brace	Acetal
9	1	903744	VAL-700-5012	Blueprint RA-1400 Front Support	Acetal
10	1	903376	VAL-100-5023	Tilt Unit Pivot Support	Aluminium 6082-T6
11	1	903736	VAL-100-5048	Tilt Unit Pivot Support Spacer	Stainless Steel 316
12	2	903019	VAL-100-5010	Barrel Nut M6x10x20	Stainless Steel 316
13	6	903307	VAL-100-5019	Barrel Nut M6x10x15	Stainless Steel 316
14	4	903727	VAL-100-5036	Barrel Nut M6x10x12	Stainless Steel 316
15	2	903519	VAL-950-0043	Socket Head Button Screw M6 x 35	Stainless Steel A4-70
16	2	903494	VAL-950-0062	Socket Head Button Screw M6 x 25	Stainless Steel A4-70
17	8	903754	VAL-950-0092	Socket Head Button Screw M6 x 16	Stainless Steel A4-70
18	12	903164	VAL-950-0007	M6 Spring washer	Stainless Steel A4-70
19	12	903300	VAL-950-0014	M6 Washer	Stainless Steel A4-70
20	4	903753	VAL-950-0091	Socket Head Countersunk Screw M3 x 16	Stainless Steel A4-70
21	4	903755	VAL-950-0094	Socket Head Countersunk Screw M3 x 12	Stainless Steel A4-70
22	4	903669	VAL-950-0041	Socket Head Button Screw M3 x 6	Stainless Steel A4-70
23	4	903423	VAL-950-0034	M3 Washer	Stainless Steel A4-70
24	4	903422	VAL-950-0033	M3 Spring Washer	Stainless Steel A4-70

NOTES:-

1, APPLY AQUA-LUBE OR EQUIVALENT TO ALL MATING FACES/THREADED FASTENERS

2, APPLY LOCTITE 243 (BLUE) TO SPECIFIED THREAD FACES

3, APPLY SLIP-WAX OR EQUIVALENT TO ALL O-RINGS

REV	DATE	E.C.R.	DESCRIPTION	BY	CHK	APP
1	19/07/2021	N/A	ISSUED FOR PRODUCTION	ABL	JNE	DOW

RECORD OF REVISIONS

MATERIAL: SEE B.O.M.

SURFACE FINISH: -

U.S.O. TOLERANCES TO BE (DIMENSIONS ARE IN mm)

DECIMALS: X. = ± 1.0
.X = ± 0.5

ANGLES : = ± 0°30'

PAINT/SPECIAL FINISH SPEC: -

WT AIR 1.13 kg (E)

WT WATER 0.617 kg (E)

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SCALE (U.S.O.) 1:2

ORIG. SIZE A3

PROJECT VALOR ROV

TITLE

TILT UNIT ASSEMBLY RA-1400

ASSEMBLY DRAWING

Sheet 1 of 2

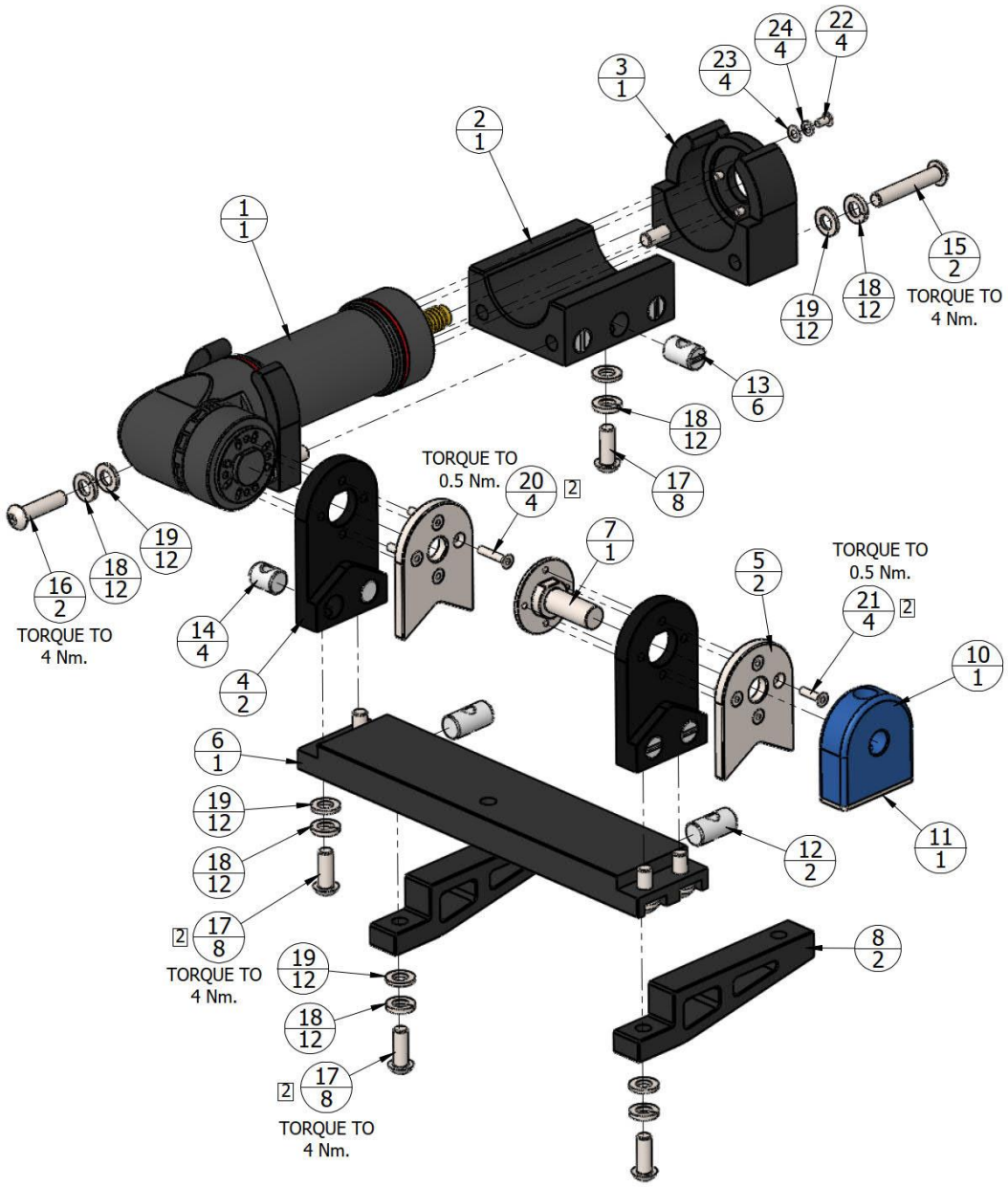
DOC. No. VAL-700-0002

REV 1

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THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!



ASSEMBLY PROCEDURE

1. SLIDE THE FRONT SUPPORT (VAL-700-5012) OVER THE BODY OF THE ROTATOR UNIT (VAL-900-0010) TO THE POSITION SHOWN OPPOSITE. INSERT THE 2-OFF M6 x 25 SOCKET HEAD BUTTON SCREWS (VAL-950-0062) WITH ACCOMPANYING M6 WASHERS (VAL-950-0014) & M6 SPRING WASHERS (VAL-950-0007)

2. INSERT 2-OFF M6x10x15 BARREL NUTS (VAL-100-5019) IN THE CORRESPONDING HOLES OF THE ROTATOR SADDLE (VAL-700-5005) ENSURING THE M6 THREAD ALIGNS WITH THE FORWARD FACING HOLES. SEAT THE SADDLE (VAL-100-5005) BELOW THE ROTATOR UNIT (VAL-900-0010). THREAD THE 2-OFF M6 x 25 SOCKET HEAD BUTTON SCREWS (VAL-950-0062) INTO THE BARREL NUTS (VAL-100-5019) & TORQUE TO 4 Nm.

3. INSERT 2-OFF M6x10x15 BARREL NUTS (VAL-100-5019) IN THE HOLES TO THE REAR OF THE ROTATOR SADDLE (VAL-700-5005) ENSURING THE M6 THREAD ALIGNS WITH THE REARWARD FACING HOLES. GUIDE THE ROTATOR END SUPPORT (VAL-700-5006) OVER THE REAR OF THE ROTATOR UNIT (VAL-900-0010). INSERT THE 2-OFF M6 x 35 SOCKET HEAD BUTTON SCREWS (VAL-950-0043) WITH ACCOMPANYING M6 WASHERS & M6 SPRING WASHERS (VAL-950-0014 & VAL-950-0007) & TORQUE TO 4 Nm.

4. INSERT 4-OFF M3 x 6 SOCKET HEAD BUTTON SCREWS (VAL-950-0041) WITH THE ACCOMPANYING M3 WASHERS (VAL-950-0034) & M3 SPRING WASHERS (VAL-950-0033) INTO THE THREADED HOLES TO THE REAR OF THE ROTATOR UNIT (VAL-900-0010) & TORQUE TO 0.5 Nm. GUIDE 1-OFF TILT YOKE ARM (VAL-700-5007) OVER THE OUTPUT SHAFT OF THE ROTATOR UNIT (VAL-900-0010) ALONG WITH 1-OFF YOKE ARM STIFFENING PLATE (VAL-700-5008) & SECURE IN PLACE WITH THE 4-OFF M3 X 16 SOCKET HEAD COUNTERSUNK SCREWS (VAL-950-0091) USING LOCTITE 243 & TORQUE TO 0.5 Nm.

5. GUIDE THE TILT SUPPORT SHAFT (VAL-700-5010) THROUGH THE OTHER TILT YOKE ARM (VAL-700-5007), GUIDE THE YOKE ARM STIFFENING PLATE (VAL-700-5008) OVER THE TILT SUPPORT SHAFT (VAL-700-5010) & SECURE IN PLACE WITH THE 4-OFF M3 x 12 SOCKET HEAD COUNTERSUNK SCREWS (VAL-950-0094) USING LOCTITE 243 & TORQUE TO 0.5 Nm.

6. INSERT THE 2-OFF M6x10x20 BARREL NUTS (VAL-100-5010) INTO THE TILT YOKE (VAL-700-5009) ENSURING THE M6 THREADS ALIGN WITH THE THROUGH HOLES. GUIDE 2-OFF M6 X 16 SOCKET HEAD BUTTON SCREWS (VAL-950-0092) WITH ACCOMPANYING M6 WASHER & M6 SPRING WASHERS (VAL-950-0014 & VAL-950-0007) THROUGH THE 2-OFF YOKE ARM BRACES (VAL-700-5011) THREAD INTO THE 2-OFF BARREL NUTS (VAL-100-5010) USING LOCTITE 243 & TORQUE TO 4 Nm.

7. INSERT 4-OFF M6x10x12 BARREL NUTS (VAL-100-5036) INTO THE TILT YOKE ARMS (VAL-700-5007) ENSURING THE M6 THREAD ALIGNS WITH THE THROUGH HOLES. GUIDE 4-OFF M6 X 16 SOCKET HEAD BUTTON SCREWS (VAL-950-0092) THROUGH THE TILT YOKE (VAL-700-5009) WITH ACCOMPANYING M6 WASHER & M6 SPRING WASHER (VAL-950-0014 & VAL-950-0007) THREAD INTO THE M6x10x12 BARREL NUTS USING LOCTITE 243 & TORQUE TO 4 Nm.

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PROJECT: VALOR ROV

TITLE: TILT UNIT ASSEMBLY RA-1400

ASSEMBLY DRAWING | Sheet 2 of 2

WT AIR	WT WATER	SCALE (U.S.O.)	ORIG. SIZE	DOC. No.	REV
1.13 kg (E)	0.617 kg (E)	1:2	A3	VAL-700-0002	1

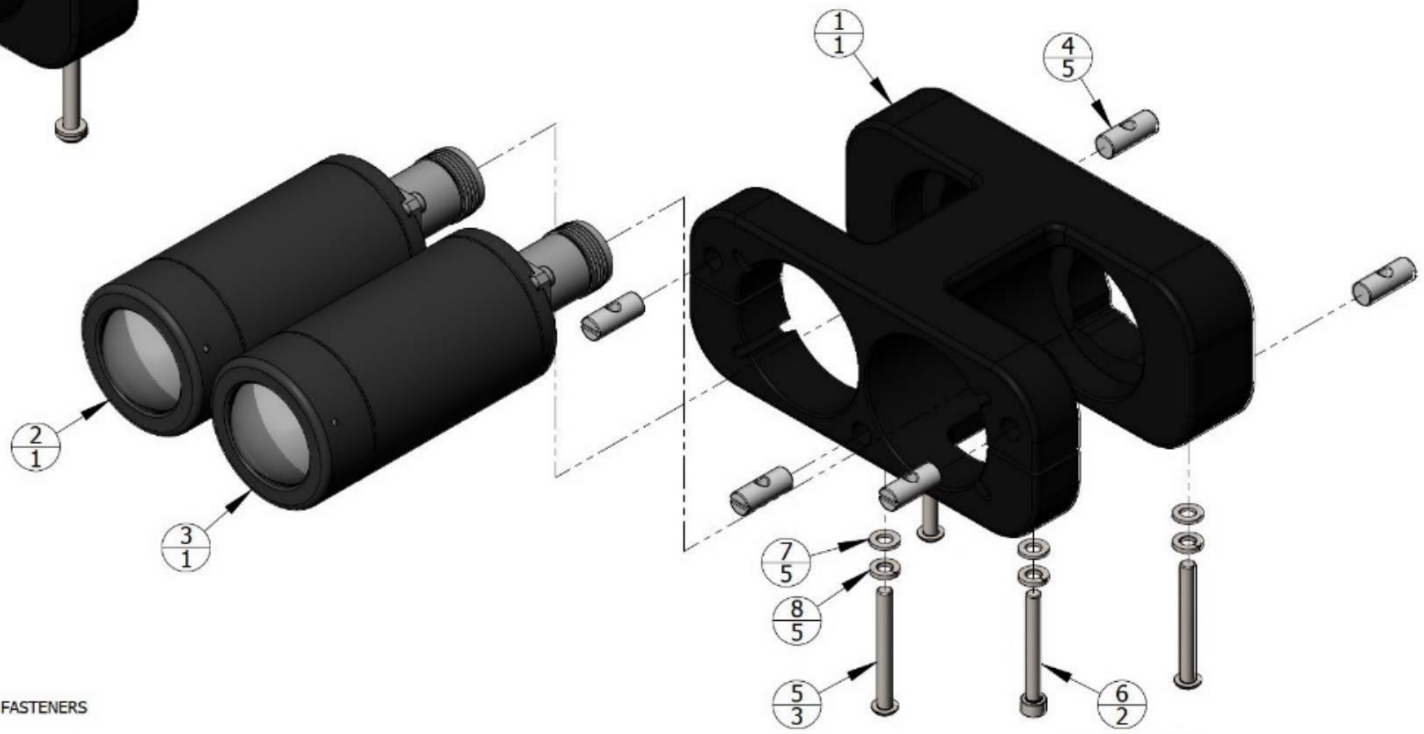
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THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!

ITEM NO.	QTY.	Bulk #	PART NUMBER	DESCRIPTION	Material
1	1	903214	VAL-100-5014	Camera Bracket	Acetal
2	1	903068	VAL-900-0002	Colour Camera	-
3	1	903069	VAL-900-0003	Monochrome Camera	-
4	5	903165	VAL-100-5009	Cross Dowel M6x10x25	Stainless Steel 316
5	3	903292	VAL-950-0004	Socket Head Button Screw M6 x 55	Stainless Steel A4-70
6	2	903425	VAL-950-0023	Socket Head Cap Screw M6 x 50	Stainless Steel A4-70
7	5	903300	VAL-950-0014	M6 Washer	Stainless Steel A4-70
8	5	903164	VAL-950-0007	M6 Spring washer	Stainless Steel A4-70





TORQUE TO 5 N.m.

NOTES:-

1, APPLY AQUA-LUBE OR EQUIVALENT TO ALL MATING FACES/THREADED FASTENERS

2, APPLY LOCTITE 243 (BLUE) TO SPECIFIED THREAD FACES

3, APPLY SLIP-WAX OR EQUIVALENT TO ALL O-RINGS

REV	DATE	ECR	DESCRIPTION	BY	CHK	APP
1	10/07/2019	N/A	ISSUED FOR PRODUCTION	ABL		

RECORD OF REVISIONS

MATERIAL: SEE B.O.M.

SURFACE FINISH: -

U.S.O. TOLERANCES TO BE (DIMENSIONS ARE IN mm)

DECIMALS: X. = ± 1.0
.X = ± 0.5

ANGLES : = ± 0°30'

PAINT/SPECIAL FINISH SPEC: -

WT AIR 1.934 kg (E)

WT WATER 0.294 kg (E)

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SCALE (U.S.O.) 1:2

ORIG. SIZE A3

PROJECT VALOR ROV

TITLE

CAMERA BRACKET ASSEMBLY

ASSEMBLY DRAWING

Sheet 1 of 1

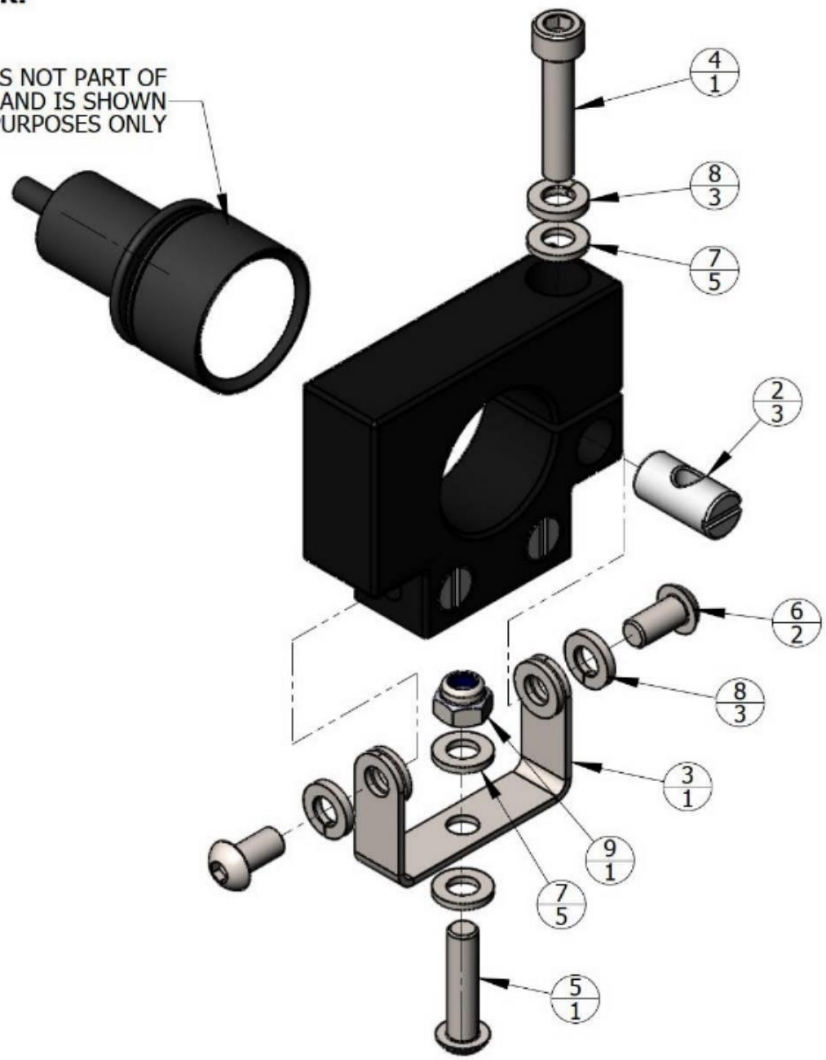
DOC. No. VAL-100-0007

REV 1

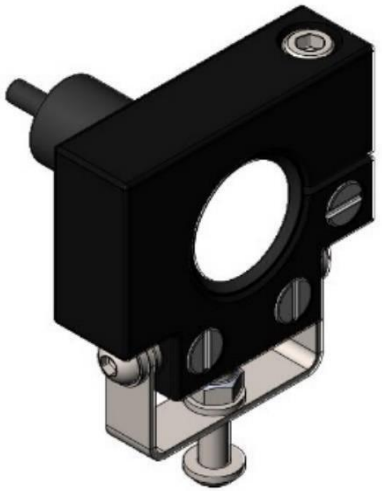
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THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!



ITEM NO.	QTY.	PART NUMBER	Bulk #	DESCRIPTION	Material
1	1	VAL-100-5024	903048	Lamp Clamp	Acetal
2	3	VAL-100-5010	903019	Cross Dowel M6x10x20	Stainless Steel 316
3	1	VAL-100-5033		Lamp Bracket	Stainless Steel 316
4	1	VAL-950-0055		Socket Head Cap Screw M6 x 30	Stainless Steel A4-70
5	1	VAL-950-0062		Socket Head Button Screw M6 x 20	Stainless Steel A4-70
6	2	VAL-950-0015		Socket Head Button Screw M6 x 12	Stainless Steel A4-70
7	5	VAL-950-0014	903300	M6 Washer	Stainless Steel A4-70
8	3	VAL-950-0007	903164	M6 Spring washer	Stainless Steel A4-70
9	1	VAL-950-0008	903300	M6 Nyloc Nut	Stainless Steel A4-70



NOTES:-

1, APPLY AQUA-LUBE OR EQUIVALENT TO ALL MATING FACES/THREADED FASTENERS

2, APPLY LOCTITE 243 (BLUE) TO SPECIFIED THREAD FACES

REV	DATE	ECR	DESCRIPTION	BY	CHK	APP
1	09/10/2019	N/A	ISSUED FOR PRODUCTION	ABL		

RECORD OF REVISIONS

MATERIAL: SEE B.O.M.

SURFACE FINISH: -

U.S.O. TOLERANCES TO BE (DIMENSIONS ARE IN mm)

DECIMALS: X. = ± 1.0
.X = ± 0.5

ANGLES : = ± 0°30'

PAINT/SPECIAL FINISH SPEC: -

WT AIR 0.147 kg (E)

WT WATER 0.045 kg (E)

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SCALE (U.S.O.) 1:1

ORIG. SIZE A3

PROJECT VALOR ROV

TITLE

L.E.D. LIGHT BRACKET ASSEMBLY

ASSEMBLY DRAWING

Sheet 1 of 1

DOC. No. VAL-100-0011

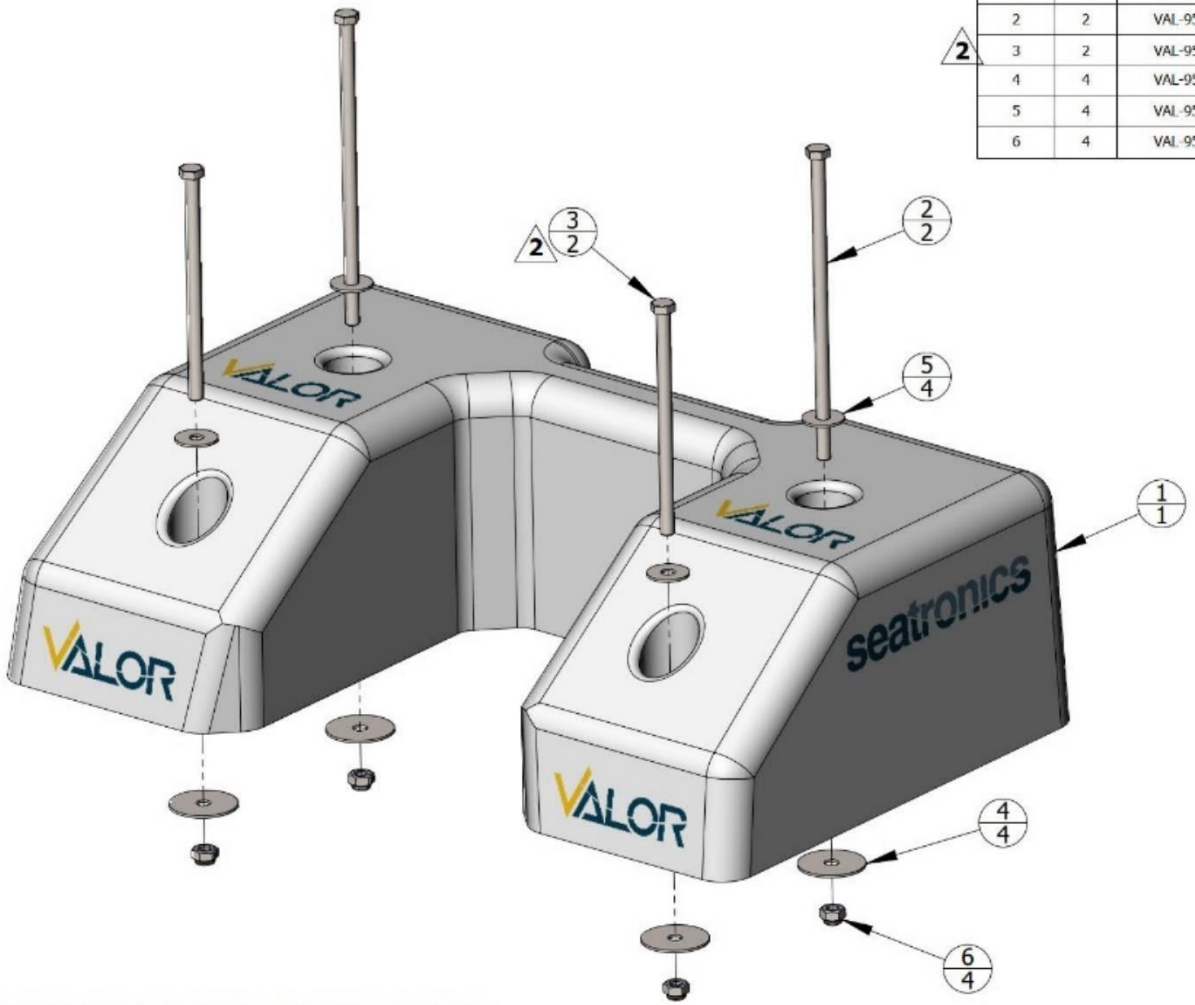
REV 1

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THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!

ITEM NO.	QTY.	PART NUMBER	Bulk #	DESCRIPTION	Material
1	1	VAL-200-5002	903020	300m FWD Bouyancy	
2	2	VAL-950-0013	903264	Hex Head Bolt M8 x 190	Stainless Steel A4-70
3	2	VAL-950-0069	903546	Hex Head Bolt M8 x 140	Stainless Steel A4-70
4	4	VAL-950-0012	903265	M8 x 40 Penny Washer	Stainless Steel A4-70
5	4	VAL-950-0002	903138	M8 x 25 Penny Washer	Stainless Steel A4-70
6	4	VAL-950-0011	903140	M8 Nyloc Nut	Stainless Steel A4-70



NOTES:-

1, APPLY AQUA-LUBE OR EQUIVALENT TO ALL MATING FACES/THREADED FASTENERS

2, APPLY LOCTITE 243 (BLUE) TO SPECIFIED THREAD FACES

3, APPLY SLIP-WAX OR EQUIVALENT TO ALL O-RINGS

REV	DATE	ECR	DESCRIPTION	BY	CHK	APP
2	11/06/2020	N/A	ITEM 3 WAS M8 x 150	ABL	JNE	DOW
1	18/06/2019	N/A	ISSUED FOR PRODUCTION	ABL	JNE	DOW

RECORD OF REVISIONS

MATERIAL: SEE B.O.M.

SURFACE FINISH: -

U.S.O. TOLERANCES TO BE (DIMENSIONS ARE IN mm)

DECIMALS: X. = ± 1.0
.X = ± 0.5

ANGLES : = ± 0°30'

PAINT/SPECIAL FINISH SPEC: -

WT AIR 5.222 kg (E)

WT WATER -11.691 kg (E)

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SCALE (U.S.O.) 1:3

ORIG. SIZE A3

PROJECT VALOR ROV

TITLE 300m FWD BUOYANCY

ASSEMBLY DRAWING

Sheet 1 of 1

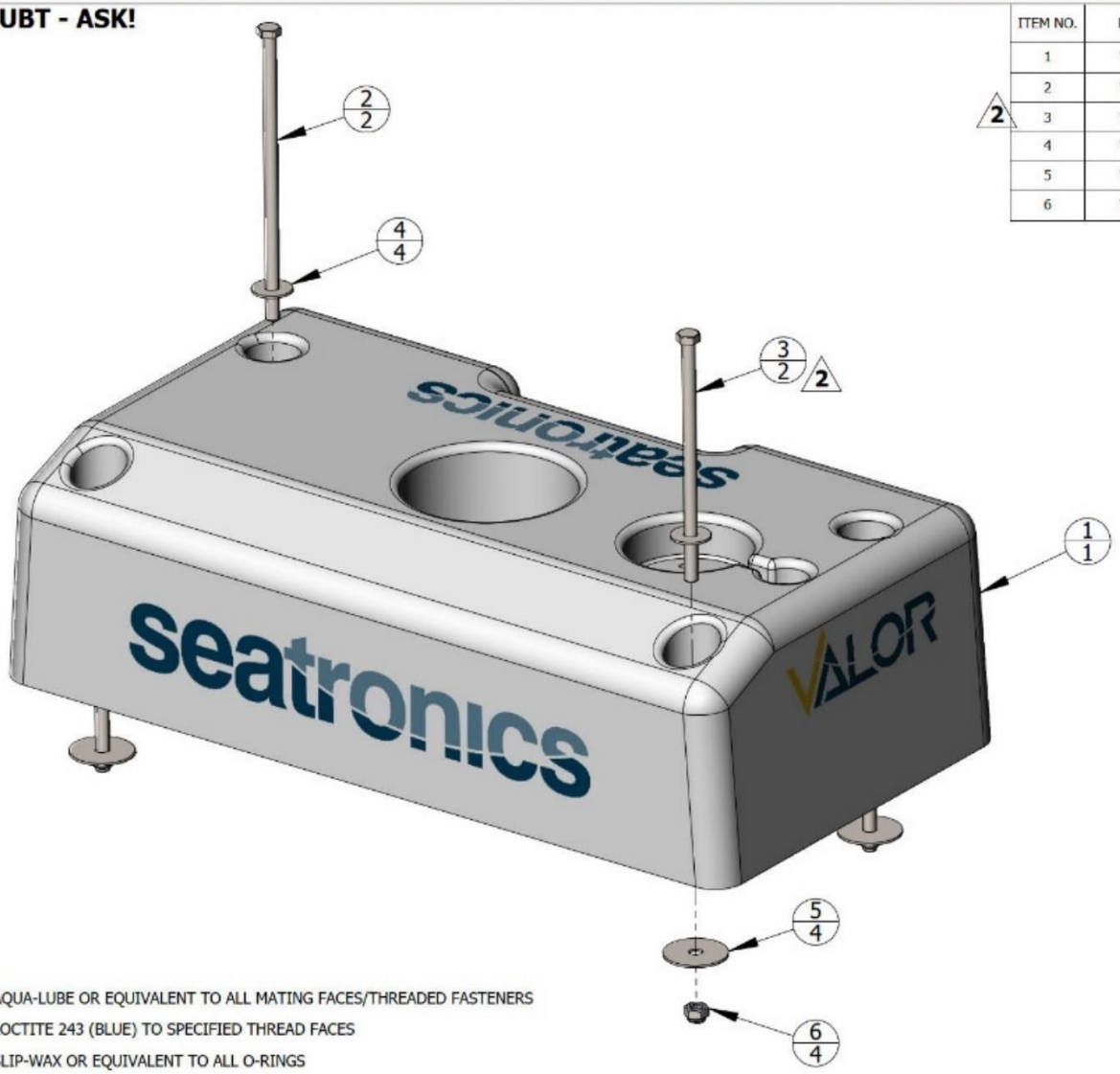
DOC. No. VAL-200-0003

REV 2

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THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!



ITEM NO.	PART NUMBER	Bulk #	DESCRIPTION	Material
1	VAL-200-5003	903020.01	300m AFT Buoyancy	-
2	VAL-950-0013	903264	Hex Head Bolt M8 x 190	Stainless Steel A4-70
3	VAL-950-0070	903547	Hex Head Bolt M8 x 160	Stainless Steel A4-70
4	VAL-950-0002	903138	M8 x 25 Penny Washer	Stainless Steel A4-70
5	VAL-950-0012	903265	M8 x 40 Penny Washer	Stainless Steel A4-70
6	VAL-950-0011	903140	M8 Nyloc Nut	Stainless Steel A4-70

NOTES:-

1, APPLY AQUA-LUBE OR EQUIVALENT TO ALL MATING FACES/THREADED FASTENERS

2, APPLY LOCTITE 243 (BLUE) TO SPECIFIED THREAD FACES

3, APPLY SLIP-WAX OR EQUIVALENT TO ALL O-RINGS

REV	DATE	ECR	DESCRIPTION	BY	CHK	APP
2	11/06/2020	N/A	ITEM 3 WAS M8 x 150	ABL	JNE	DOW
1	18/06/2019	N/A	ISSUED FOR PRODUCTION	ABL	JNE	DOW

RECORD OF REVISIONS

MATERIAL: SEE B.O.M.

SURFACE FINISH: -

U.S.O. TOLERANCES TO BE (DIMENSIONS ARE IN mm)

DECIMALS: X. = ± 1.0
.X = ± 0.5

ANGLES : = ± 0°30'

PAINT/SPECIAL FINISH SPEC: -

WT AIR 6.296 kg (E)

WT WATER -14.716 kg (E)

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SCALE (U.S.O.) 1:3

ORIG. SIZE A3

PROJECT VALOR ROV

TITLE 300m AFT BUOYANCY

ASSEMBLY DRAWING

Sheet 1 of 1

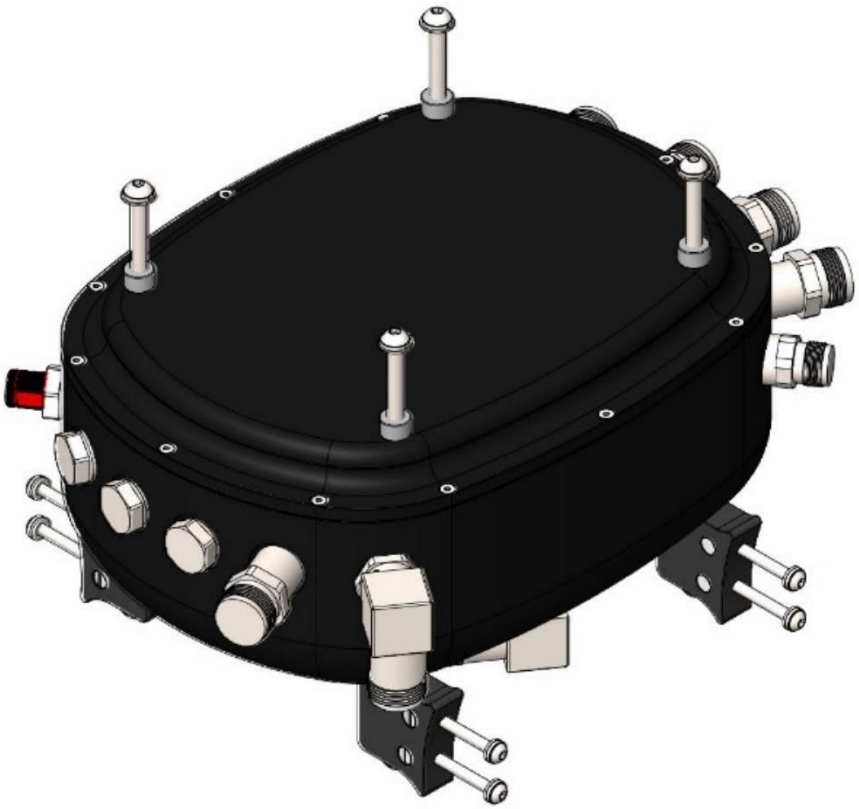
DOC. No. VAL-200-0004

REV 2

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THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!



ITEM NO.	QTY.	PART NUMBER	Bulk #	DESCRIPTION	Material
1	1	VAL-400-0001P	903985.01	Comm's Pod Pressure Tested	
2	1	VAL-PCB-001	903259	Comm's/Controls PCB	-
3	7	VAL-USP-0001	903179	VALOR USP	PCB Material
4	2	VAL-400-5502	903399	Pod Fan	Acetal
5	1	VAL-PCB-005	903177	10G Ethernet Switch	PCB Material
6	1	VAL-PCB-005-HS	-	Switch Heatsink (Part of VAL-PCB-0005)	Aluminium 5083-O
7	1	VAL-600-5500	903081	OSA5401 Sync Plug	-
8	1	VAL-600-5510	903093	Video Encapsulator	-
9	1	VAL-600-5513	903535	Bi-Directional SFP 1270 Tx & 1330 Rx	-
10	1	VAL-600-5514	903095	PAL/NTSC Dual Rx HD-BNC	-
11	4	VAL-100-5004	903357	Lift Frame Pod Support	PE High Density
12	8	VAL-100-5010	903019	Cross Dowel M6x10x20	Stainless Steel 316
13	4	VAL-400-5007	903333	Comm's Pod Anode	Zinc
14	4	VAL-950-0035	903296	Socket Head Button Screw M8 x 70	Stainless Steel A4-70
15	4	VAL-950-0054	903484	Socket Head Button Screw M8 x 60	Stainless Steel A4-70
16	8	VAL-950-0037	903297	M8 Form B Flat Washer	Stainless Steel A4-70
17	8	VAL-950-0003	903298	M8 Spring Washer	Stainless Steel A4-70
18	8	VAL-950-0004	903292	Socket Head Button Screw M6 x 55	Stainless Steel A4-70
19	8	VAL-950-0007	903164	M6 Spring washer	Stainless Steel A4-70
20	8	VAL-950-0014	903300	M6 Washer	Stainless Steel A4-70
21	2	VAL-950-0090	903718	Socket Head Cap Screw M3 x 40	Stainless Steel A4-70
22	3	VAL-950-0044	903407	Socket Head Cap Screw M3 x 5	Stainless Steel A4-70
23	2	VAL-950-0074	903191	M3 Nyloc Nut	Stainless Steel A4-70
24	4	VAL-950-0034	903423	M3 Washer	Stainless Steel A4-70
25	2	VAL-950-0089	903717	Socket Head Cap Screw M2.5 x 20	Stainless Steel A4-70
26	2	VAL-500-5542	903278	System PC PSU Mounting Bracket	Galvanized Steel
27	4	VAL-950-0087	-	M2.5 x 5 Pozidrive (Part of VAL-PCB-0005)	-
28	2	VAL-950-0088	-	M2.5 x 16 Pozidrive (Part of VAL-PCB-0005)	-
29	4	VAL-400-6006	-	M3 x 8 Hex spacer (Part Of VAL-PCB-0005)	Aluminium 5083-O

NOTES:-

1. APPLY AQUA-LUBE OR EQUIVALENT TO ALL MATING FACES/THREADED FASTENERS
2. APPLY LOCTITE 243 (BLUE) TO SPECIFIED THREAD FACES
3. APPLY SLIP-WAX OR EQUIVALENT TO ALL O-RINGS
4. SEE FOLLOWING SHEETS FOR BUILD/ASSEMBLY PROCEDURE

REV	DATE	ECR	DESCRIPTION	BY	CHK	APP
2	26/06/2021	0012	ADD 5 PORT VARIANT	ABL	JNE	DOW
1	24/06/2019	N/A	ISSUED FOR PRODUCTION	ABL	JNE	DOW

RECORD OF REVISIONS

MATERIAL: SEE B.O.M.

SURFACE FINISH: -

U.S.O. TOLERANCES TO BE (DIMENSIONS ARE IN mm)

DECIMALS: X. = ± 1.0
.X = ± 0.5

ANGLES : = ± 0°30'

PAINT/SPECIAL FINISH SPEC: -

WT AIR kg (E)

WT WATER kg (E)

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SCALE (U.S.O.) 1:2.5

ORIG. SIZE A3

PROJECT VALOR ROV

TITLE COMM'S POD ASSEMBLY

ASSEMBLY DRAWING

Sheet 1 of 3

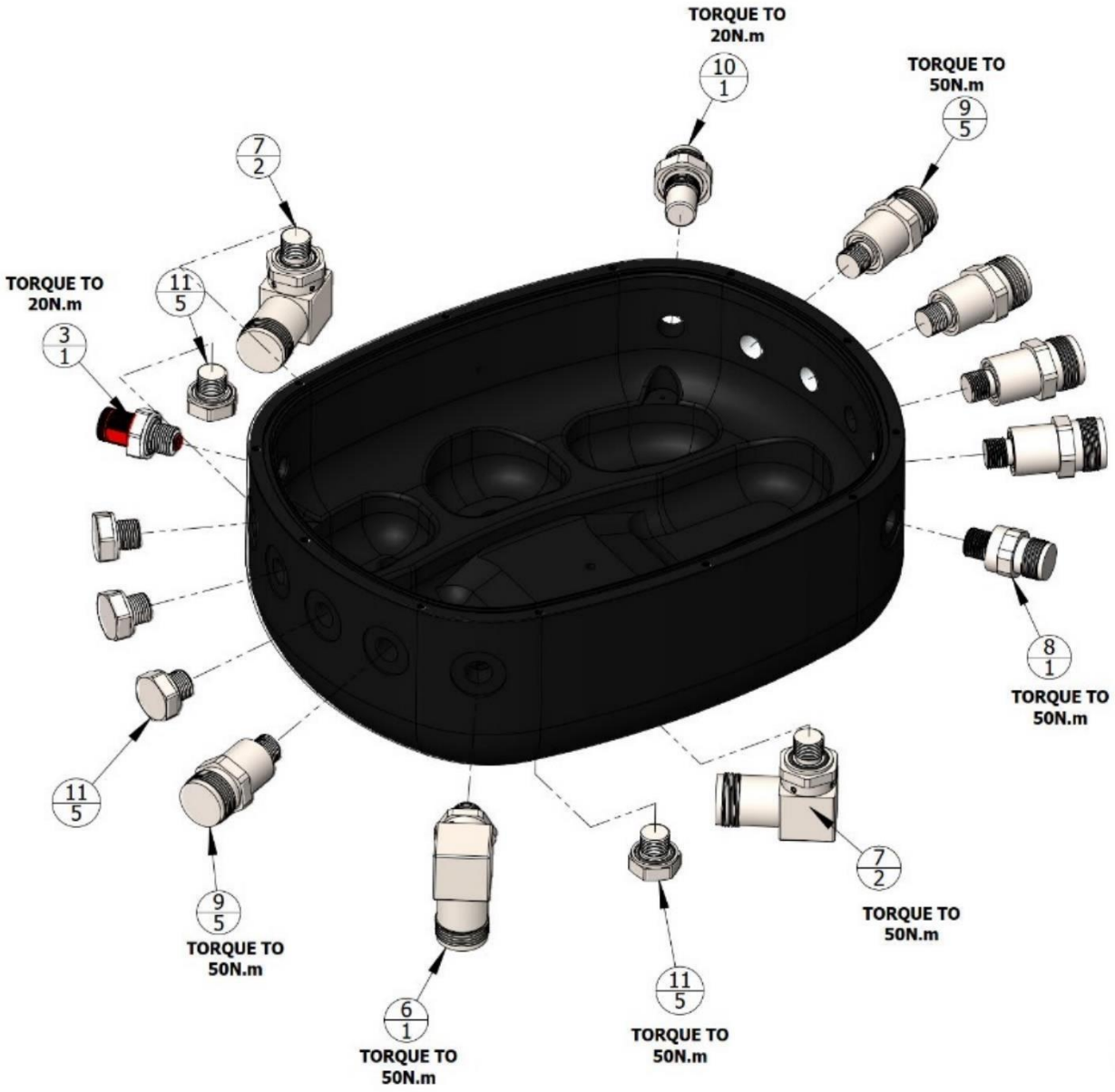
DOC. No. VAL-400-0001

REV 2

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THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!



ASSEMBLY PROCEDURE:-

1. THOROUGHLY CLEAN THE COMM'S POD HOUSING (VAL-400-5000) TO REMOVE ANY RESIDUAL DEBRIS FROM THE MANUFACTURING PROCESS , PAYING PARTICULAR ATTENTION TO ALL SPOTFACES & THE UPPER O-RING GROOVE.
2. REFER TO THE COMM'S POD WORK INSTRUCTION FOR CORRECT BULKHEAD WIRING AND CABLE LENGTHS.
3. ONCE ALL NECESSARY BULKHEADS HAVE BEEN WIRED & BUILT, POPULATE IN THE ARRANGEMENT SHOWN. ENSURE ALL O-RINGS ARE PRESENT, FREE FROM CONTAMINATION & LUBRICATED.
4. 1-OFF (VAL-600-5002-03) IS TO BE TORQUED TO 50N.m.
5. 2-OFF (VAL-600-5002-04) ARE TO BE TORQUED TO 50N.m.
6. 1-OFF (VAL-600-5003-01) IS TO BE TORQUED TO 50N.m.
7. 5-OFF (VAL-600-5004-01) ARE TO BE TORQUED TO 50N.m.
8. 1-OFF (VAL-600-5005) IS TO BE TORQUED TO 20N.m.
9. 5-OFF (VAL-600-5006) ARE TO BE TORQUED TO 50N.m.
10. INSTALL 1-OFF VACUUM PORT ASSEMBLY (VAL-400-0007) ENSURE O-RING IS PRESENT, FREE FROM CONTAMINATION AND FULLY LUBRICATED. TORQUE TO 20N.m.

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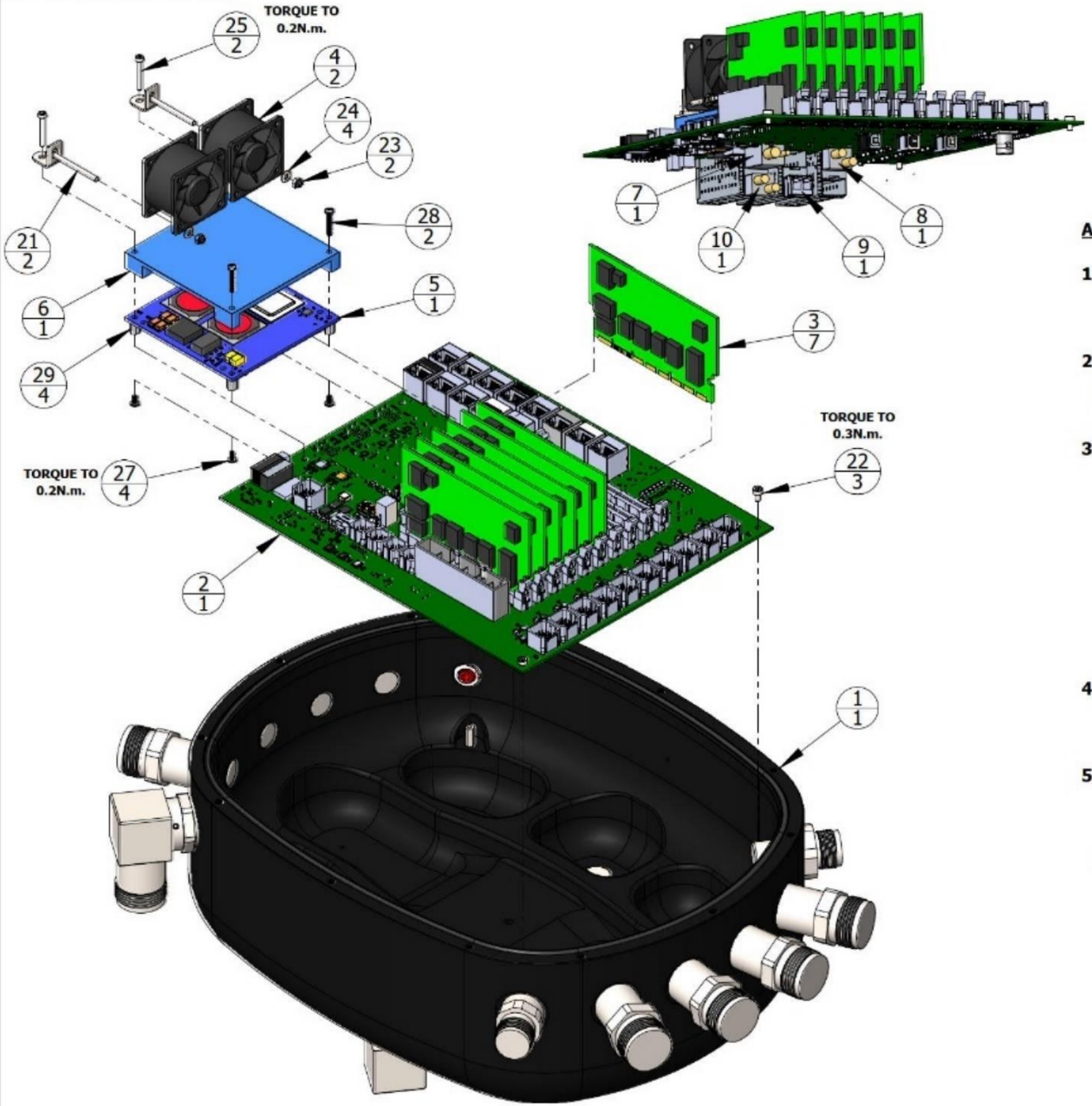
PROJECT	VALOR ROV
TITLE	COMM'S POD ASSEMBLY (FOR PRESSURE TESTING)
	ASSEMBLY DRAWING
	Sheet 2 of 3

WT AIR	WT WATER	SCALE (U.S.O.)	ORIG. SIZE	DOC. No.	REV
kg (E)	kg (E)	1:2.5	A3	VAL-400-0001P	1

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ASSEMBLY PROCEDURE:-

1. CAREFULLY REMOVE THE LID FROM THE PRESSURE TESTED COMM'S POD UNIT (BULK# 903985.01) TAKING CARE NOT TO DAMAGE THE O-RINGS ON DIS-ASSEMBLY.

2. FOR ASSEMBLY OF THE COMM'S/CONTROLS P.C.B. (VAL-PCB-001) & 10G ETHERNET SWITCH (VAL-PCB-005) PLEASE REFER TO THE COMM'S POD WORK INSTRUCTION.

3. NOTE THE POSITION/LOCATION OF THE SFP MODULES.
   VAL-600-5500 (OSA5401 SYNC PLUG)
   VAL-600-5510 (VIDEO ENCAPSULATOR)
   VAL-600-5513 (BI-DIRECTIONAL SFP)
   VAL-600-5514 (PAL/NTSC DUAL RX)
   THEY MUST BE LOCATED IN THE CORRECT CARRIER IN ORDER FOR THE 10G ETHERNET SWITCH (VAL-PCB-005) TO FUNCTION CORRECTLY. PLEASE REFER TO THE COMM'S POD WORK INSTRUCTION FOR INSTALLATION OF THE SFP MODULES AND SET UP OF THE 10G ETHERNET SWITCH (VAL-PCB-005).

4. CAREFULLY LOCATE THE COMM'S/CONTROLS PCB ONTO THE M3 x 12 STAND-OFFS (VAL-400-6005) & SECURE IN PLACE WITH 3-OFF M3 x 5 SOCKET HEAD CAP SCREWS (VAL-950-0044) & TORQUE TO 0.3N.m

5. INSERT 7-OFF USP CARDS (VAL-USP-001) INTO THE CORRECT SLOTS ON THE COMM'S/CONTROLS PCB (VAL-PCB-001). ENSURING THEY ALL FACE THE CORRECT DIRECTION AND PROPERLY SECURED WITH THE SLOT CLIPS. REFER TO THE COMM'S POD WORK INSTRUCTION FOR THE CORRECT LOCATIONS.

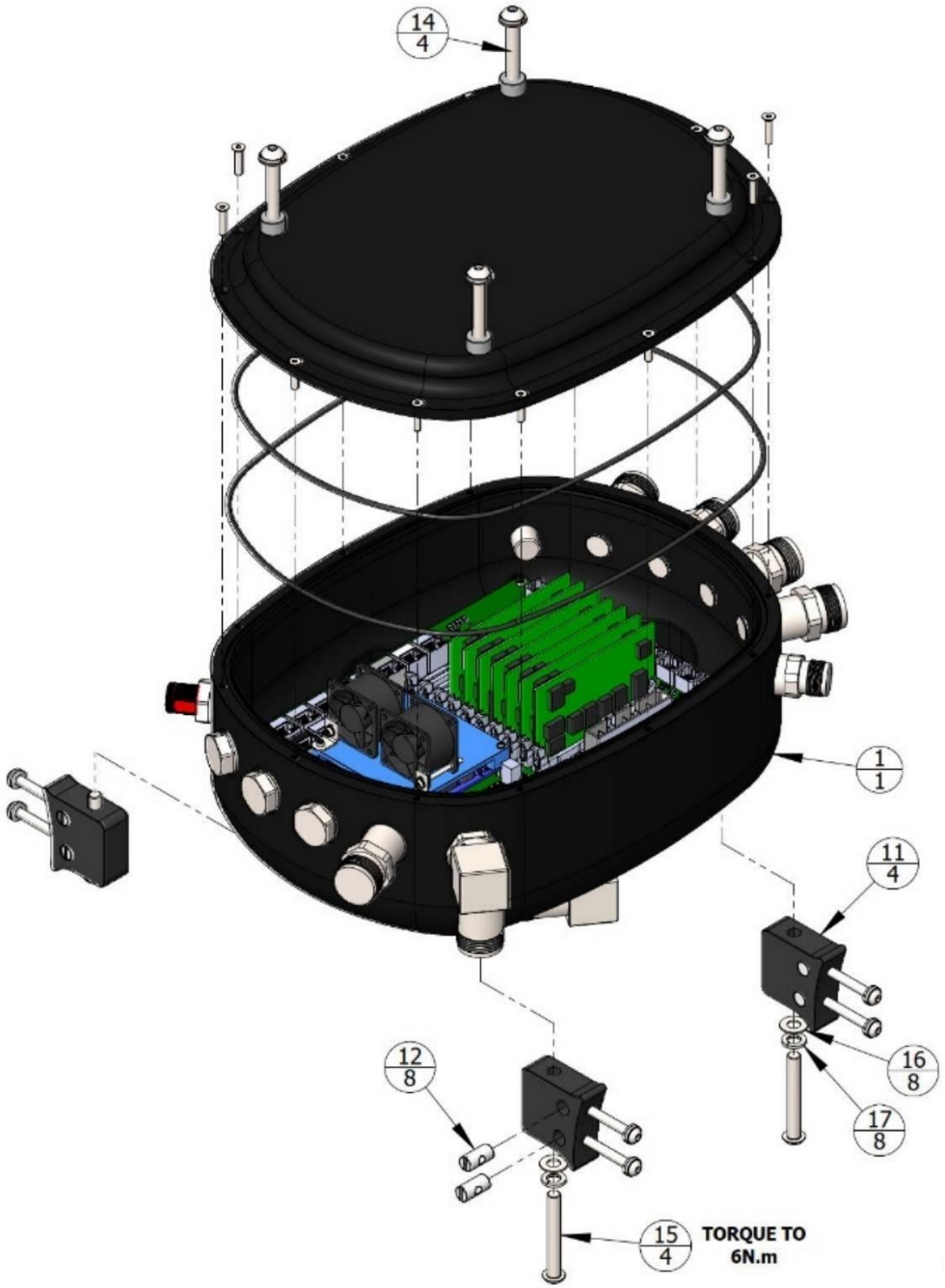
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PROJECT	VALOR ROV
TITLE	COMM'S POD ASSEMBLY
	ASSEMBLY DRAWING
Sheet	2 of 3
DOC. No.	VAL-400-0001
REV	2
WT AIR	kg (E)
WT WATER	kg (E)
SCALE (U.S.O.)	1:2.5
ORIG. SIZE	A3

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THIRD ANGLE PROJECTION

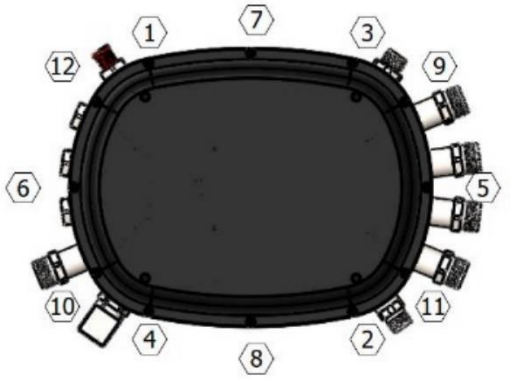
IF IN DOUBT - ASK!



ASSEMBLY PROCEDURE (cont):-

1. **THOROUGHLY CLEAN THE O-RING GROOVE IN THE COMM'S POD HOUSING (VAL-400-5000) & INSTALL 1-OFF HOUSING O-RING (VAL-400-5016) ENSURING IT IS FREE OF CONTAMINATION & FULLY LUBRICATED.THOROUGHLY CLEAN THE O-RING GROOVE ON THE COMM'S POD LID (VAL-400-5001) & INSTALL 1-OFF LID O-RING (VAL-400-5035) ENSURING IT IS FREE OF CONTAMINATION & FULLY LUBRICATED.**

2. **LOCATE THE COMM'S POD LID (VAL-400-5001) ONTO THE COMM'S POD HOUSING (VAL-400-5000) & SECURE WITH 12-OFF M4 x 20 SOCKET HEAD COUNTERSUNK SCREWS (VAL-950-0024) MAKE UP HAND TIGHT AND THEN FINAL TORQUE TO 1.2N.m. FOLLOWING THE TIGHTENING SEQUENCE BELOW.**



TIGHTENING SEQUENCE

3. **MOUNT 4-OFF POD SUPPORT FEET (VAL-100-5004) TO THE COMM'S POD HOUSING WITH 4-OFF M8 x 60 SOCKET HEAD BUTTON SCREWS (VAL-950-0054) & TORQUE TO 6N.m.**

4. **INSERT 8-OFF CROSS DOWELS (VAL-100-5010) INTO THE SUPPORT FEET (VAL-100-5004). HAND ENGAGE 8-OFF M6 x 55 SOCKET HEAD BUTTON SCREWS (VAL-950-0004), 4-OFF ANODES (VAL-400-5007) & 4-OFF M8 x 70 SOCKET BUTTON HEAD SCREWS (VAL-950-0035) TO BE UTLISED FOR MOUNTING TO THE VEHICLE FRAME SEE DRAWING VAL-100-0001.**

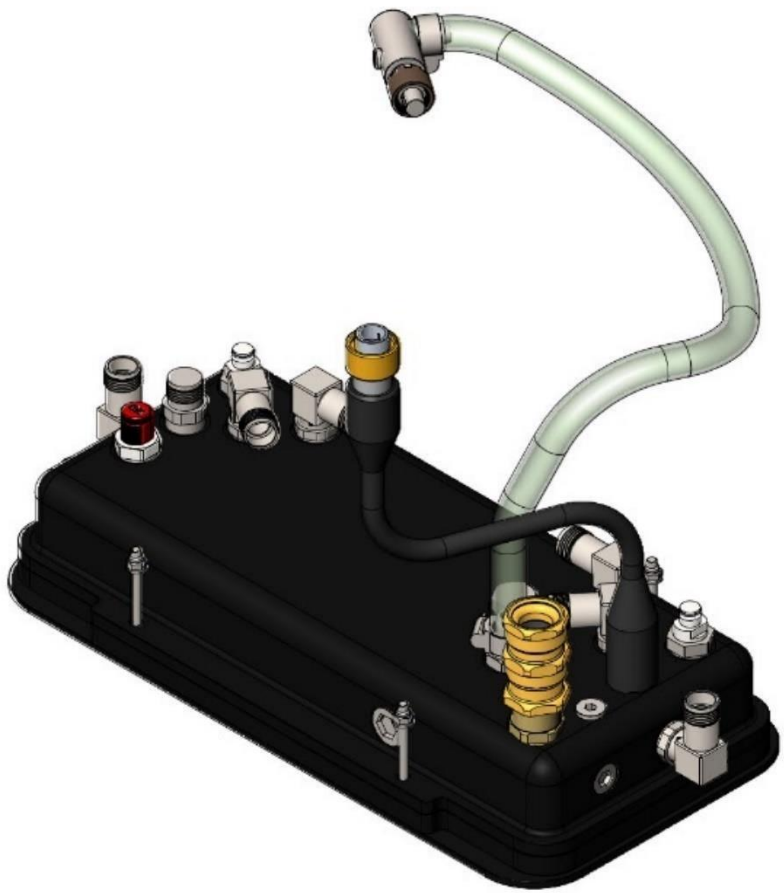
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PROJECT	VALOR ROV
TITLE	COMM'S POD ASSEMBLY
	ASSEMBLY DRAWING
Sheet	3 of 3
WT AIR	kg (E)
WT WATER	kg (E)
SCALE (U.S.O.)	1:3
ORIG. SIZE	A3
DOC. No.	VAL-400-0001
REV	2

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THIRD ANGLE PROJECTION

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ITEM NO.		PART NUMBER	Bulk #	DESCRIPTION	Material
1	1	VAL-400-5002	903282	Power Pod Enclosure	Aluminium 6082-T6
2	1	VAL-400-5003	903283	Power Pod Base	Aluminium 6082-T6
3	1	VAL-400-5004	903289	Power Pod Base Cover	Acetal
4	1	VAL-400-5005	903290	Power Pod Junction Box Cover	Acetal
5	1	VAL-400-5008	903344	Power Pod Anode	Zinc
6	1	VAL-400-5013	903379	Power Pod O-Ring 360I/D x 4.0	Nitrile 70 IRHD
7	1	VAL-400-5014	903380	Power Pod O-Ring 129.77I/D x 3.53	Nitrile 70 IRHD
8	1	VAL-400-5015	903381	Junction Box Cover O-Ring 126.67I/D x 2.62	Nitrile 70 IRHD
9	20	VAL-400-6000		M3 x M3 PCB Stand-Off	Brass CZ112
10	20	VAL-400-6001		M3 x M3.5 PCB Stand-Off	Brass CZ112
11	1	VAL-PCB-003	903259	Power Pod PCB	PCB Material
12	3	VAL-PCB-004	903106	VALOR USP Carrier	PCB Material
13	1	VAL-PCB-006		10A Motor Driver	-
14	1	VAL-PCB-007		4 Port Mini Ethernet Switch	PCB Material
15	3	VAL-USP-0001	903179	VALOR USP	PCB Material
16	10	VAL-400-5504	903211	Vicor Power Brick	-
17	1	VAL-400-0005		H.V. Pass Through Puck	-
18	1	VAL-400-0007		Vacuum Port Assembly	-
19	1	VAL-600-5000	903414	Hawke Cable Gland	Brass CZ112
20	1	VAL-600-5003	903149	A Shell Straight Connector	Stainless Steel 316
21	3	VAL-600-5006	903122	5/8-18 Blanking Plug	Stainless Steel 316
22	6	VAL-600-5007	903144	A Shell 90 Degree Connector	Stainless Steel 316
23	1	VAL-600-5015	903415	Adaptor 3/4NPT (M) - M25 (F)	Brass CZ112
24	2	VAL-600-5016	903147	W Shell Connector	-
25	2	VAL-600-5017		Adaptor 5/8-18 (M) - 7/16-20 (F)	Stainless Steel 316
26	1	VAL-600-5101	903349	Cable Penetrator with Size B Connector	Silicon
27	1	VAL-600-0001	903467	VALOR Fibre Cable	-
28	4	VAL-950-0030	903421	Socket Head Countersunk Screw M6 x 80	Stainless Steel A4-70
29	4	VAL-950-0008	903215	M6 Nyloc Nut	Stainless Steel A4-70
30	4	VAL-950-0014	903300	M6 Washer	Stainless Steel A4-70
31	2	VAL-950-0029		Socket Head Countersunk Screw M4 x 22	Stainless Steel A4-70
32	14	VAL-950-0024	903301	Socket Head Countersunk Screw M4 x 20	Stainless Steel A4-70
33	46	VAL-950-0031	903303	Socket Head Button Screw M3 x 12	Stainless Steel A4-70
34	44	VAL-950-0044		Socket Head Cap Screw M3 x 5	Stainless Steel A4-70
35	6	VAL-950-0033	903422	M3 Spring washer	Stainless Steel A4-70
36	10	VAL-950-0034	903423	M3 Washer	Stainless Steel A4-70
37	1	VAL-950-5000	903417	Hollow Hex Plug 1/8 BSPP	Stainless Steel 316
38	1	VAL-950-5001	903418	Hollow Hex Plug 1/4 BSPP	Stainless Steel 316
39	1	VAL-950-5002	903419	3/4"NPT Flush Hex Plug	Stainless Steel 316
40	1	VAL-950-5003	903420	1/2"NPT Flush Hex Plug	Stainless Steel 316

NOTES:-

1. APPLY AQUA-LUBE OR EQUIVALENT TO ALL MATING FACES/THREADED FASTENERS
2. APPLY LOCTITE 243 (BLUE) TO SPECIFIED THREAD FACES ONLY
3. APPLY SLIP-WAX OR EQUIVALENT TO ALL O-RINGS
4. SEE FOLLOWING SHEETS FOR BUILD/ASSEMBLY PROCEDURE

REV	DATE	ECR	DESCRIPTION	BY	CHK	APP
1	24/06/2019	N/A	ISSUED FOR PRODUCTION	ABL		

RECORD OF REVISIONS

MATERIAL: SEE B.O.M.

SURFACE FINISH: -

U.S.O. TOLERANCES TO BE (DIMENSIONS ARE IN mm)

DECIMALS: X. = ± 1.0, .X = ± 0.5

ANGLES : = ± 0°30'

PAINT/SPECIAL FINISH SPEC: -

WT AIR 11.242 kg (E)

WT WATER 4.682 kg (E)

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SCALE (U.S.O.) 1:3

ORIG. SIZE A3

PROJECT VALOR ROV

TITLE POWER POD ASSEMBLY

ASSEMBLY DRAWING

Sheet 1 of 5

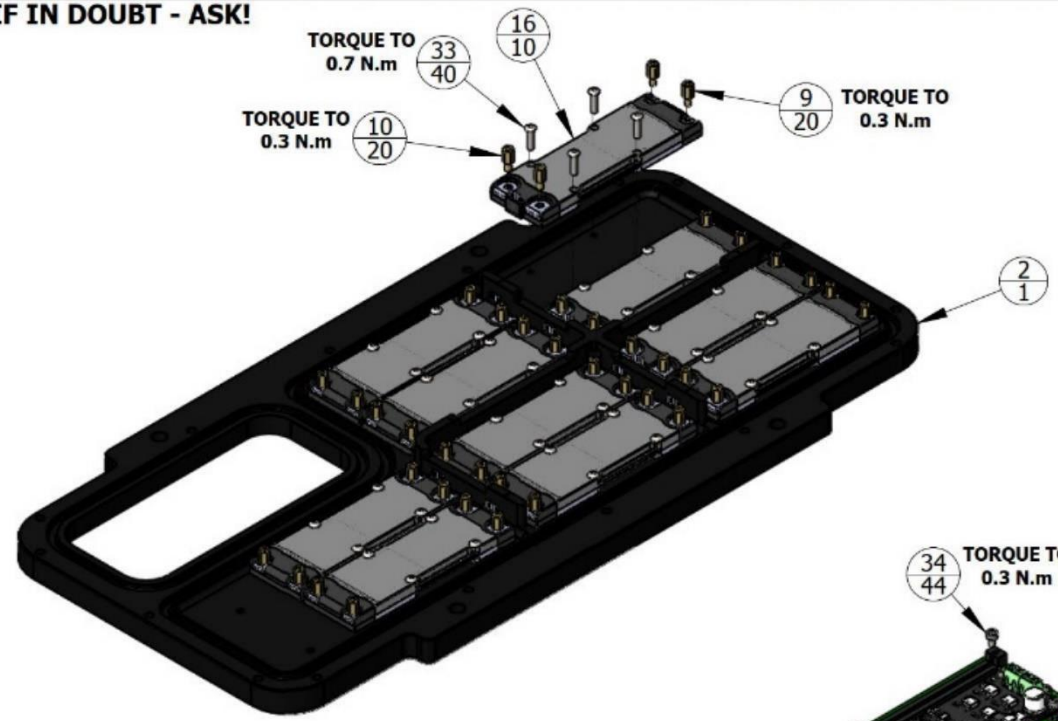
DOC. No. VAL-400-0002

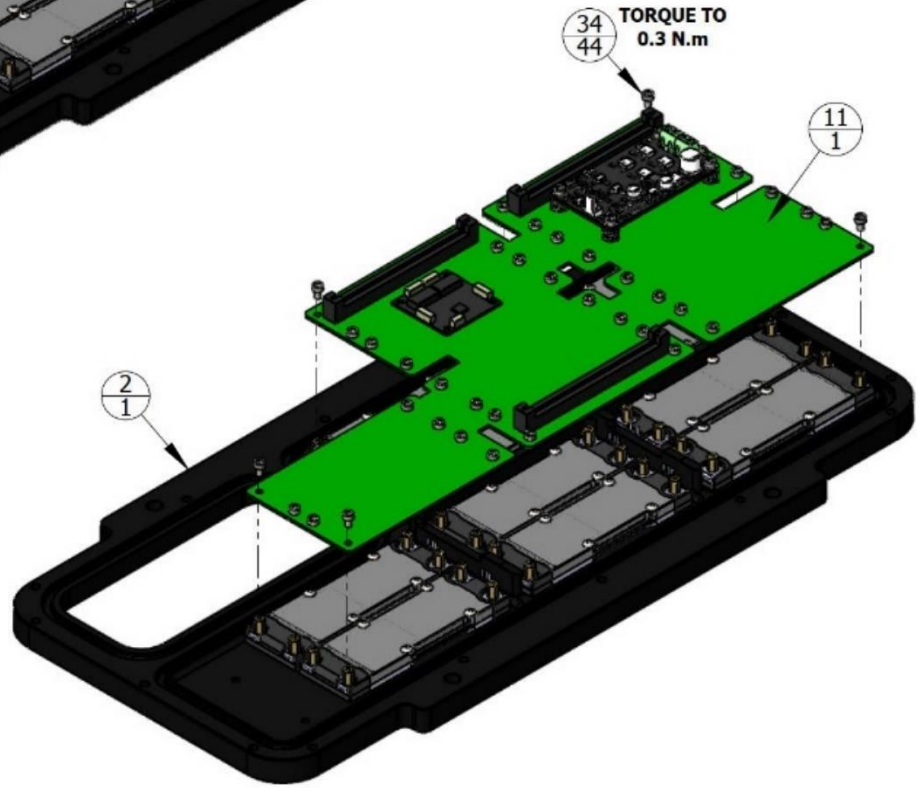
REV 1

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THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!





ASSEMBLY PROCEDURE:-

1. **MOUNT 10-OFF VICOR BRICKS (VAL-400-5504) TO THE POWER POD BASE (VAL-400-5003) SECURING WITH 4-OFF M3 X 12 SOCKET HEAD BUTTON SCREWS (VAL-950-0031) TORQUE TO 0.7N.m.**
2. **FIT 2-OFF STAND-OFFS (VAL-400-6000) TO THE HIGH VOLTAGE +VE & -VE TERMINALS OF THE VICOR BRICK (VAL-400-5504) TORQUE TO 0.3N.m.**
3. **FIT 2-OFF STAND-OFFS (VAL-400-6001) TO THE LOW VOLTAGE +VE & -VE TERMINALS OF THE VICOR BRICK (VAL-400-5504) TORQUE TO 0.3N.m.**
4. **REPEAT STEPS 2 & 3 UNTILL ALL 10 VICOR BRICKS ARE POPULATED WITH STAND-OFFS.**
5. **LOCATE THE POWER POD PCB (VAL-PCB-0003) ONTO THE INSTALLED STAND-OFFS & SECURE IN PLACE WITH 40-OFF M3 X 5 SOCKET HEAD CAP SCREWS (VAL-950-0044) TORQUE TO 0.3N.m.**

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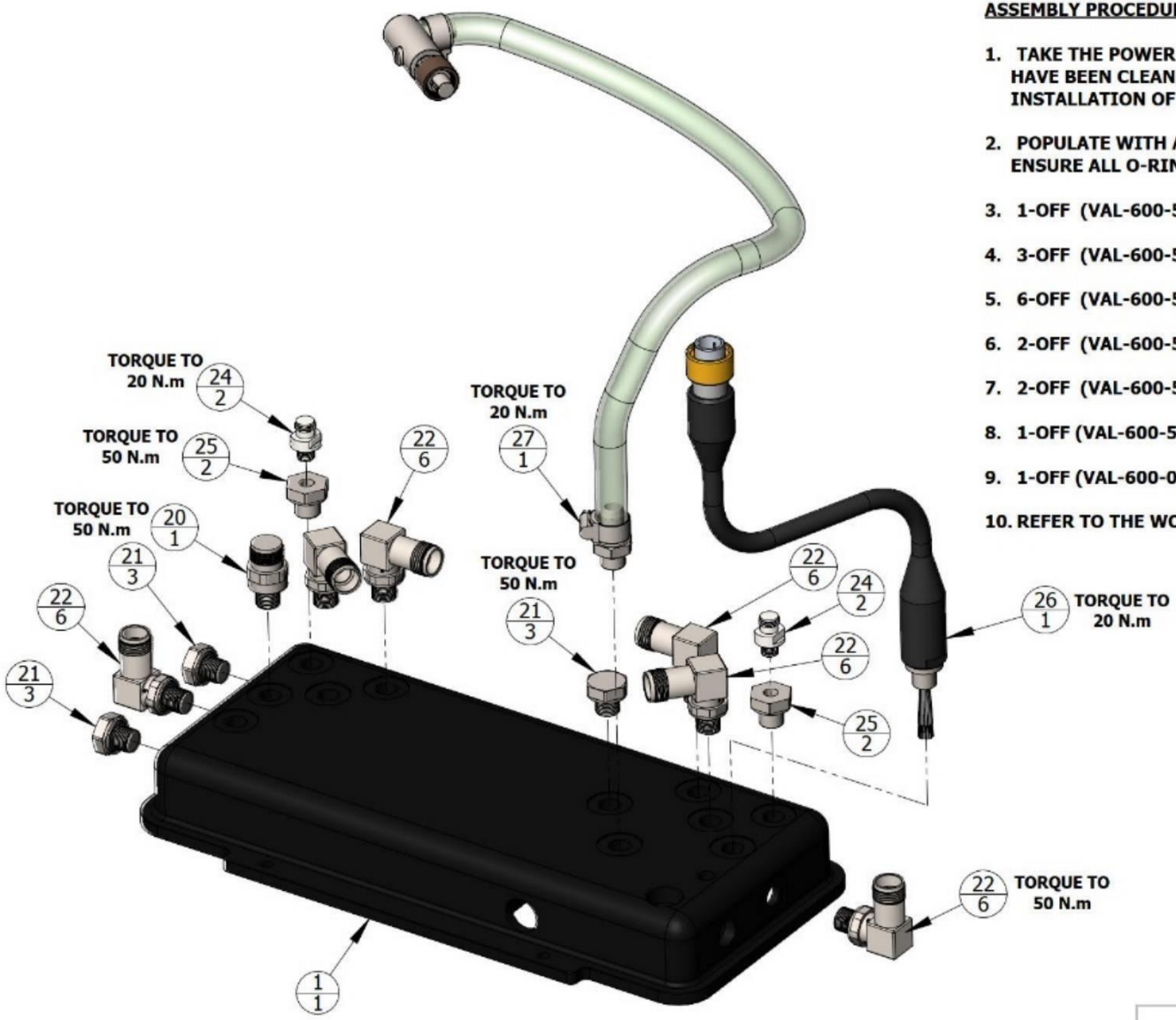
PROJECT	VALOR ROV
TITLE	POWER POD ASSEMBLY
	ASSEMBLY DRAWING
Sheet	2 of 5
DOC. No.	VAL-400-0002
REV	1

WT AIR	WT WATER	SCALE (U.S.O.)	ORIG. SIZE
11.242 kg (E)	4.682 kg (E)	1:2.5	A3

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ASSEMBLY PROCEDURE (cont):-

1. **TAKE THE POWER POD ENCLOSURE (VAL-400-5002) & ENSURE ALL SPOT FACES HAVE BEEN CLEANED & ARE FREE FROM ANY CONTAMINATION BEFORE COMMENCING INSTALLATION OF THE BULKHEADS.**
2. **POPULATE WITH ALL NECESSARY BULKHEADS IN THE ARRANGEMENT SHOWN. ENSURE ALL O-RINGS ARE PRESENT, FREE FROM CONTAMINATION & LUBRICATED.**
3. **1-OFF (VAL-600-5003) IS TO BE TORQUED TO 50N.m.**
4. **3-OFF (VAL-600-5006) ARE TO BE TORQUED TO 50N.m.**
5. **6-OFF (VAL-600-5007) ARE TO BE TORQUED TO 50N.m.**
6. **2-OFF (VAL-600-5016) ARE TO BE TORQUED TO 20N.m**
7. **2-OFF (VAL-600-5017) ARE TO BE TORQUED TO 50N.m**
8. **1-OFF (VAL-600-5101) IS TO BE TORQUED TO 20N.m.**
9. **1-OFF (VAL-600-001) IS TO BE TORQUED TO 20N.m.**
10. **REFER TO THE WORK INSTRUCTION FOR CORRECT BULKHEAD CABLE LENGTHS.**

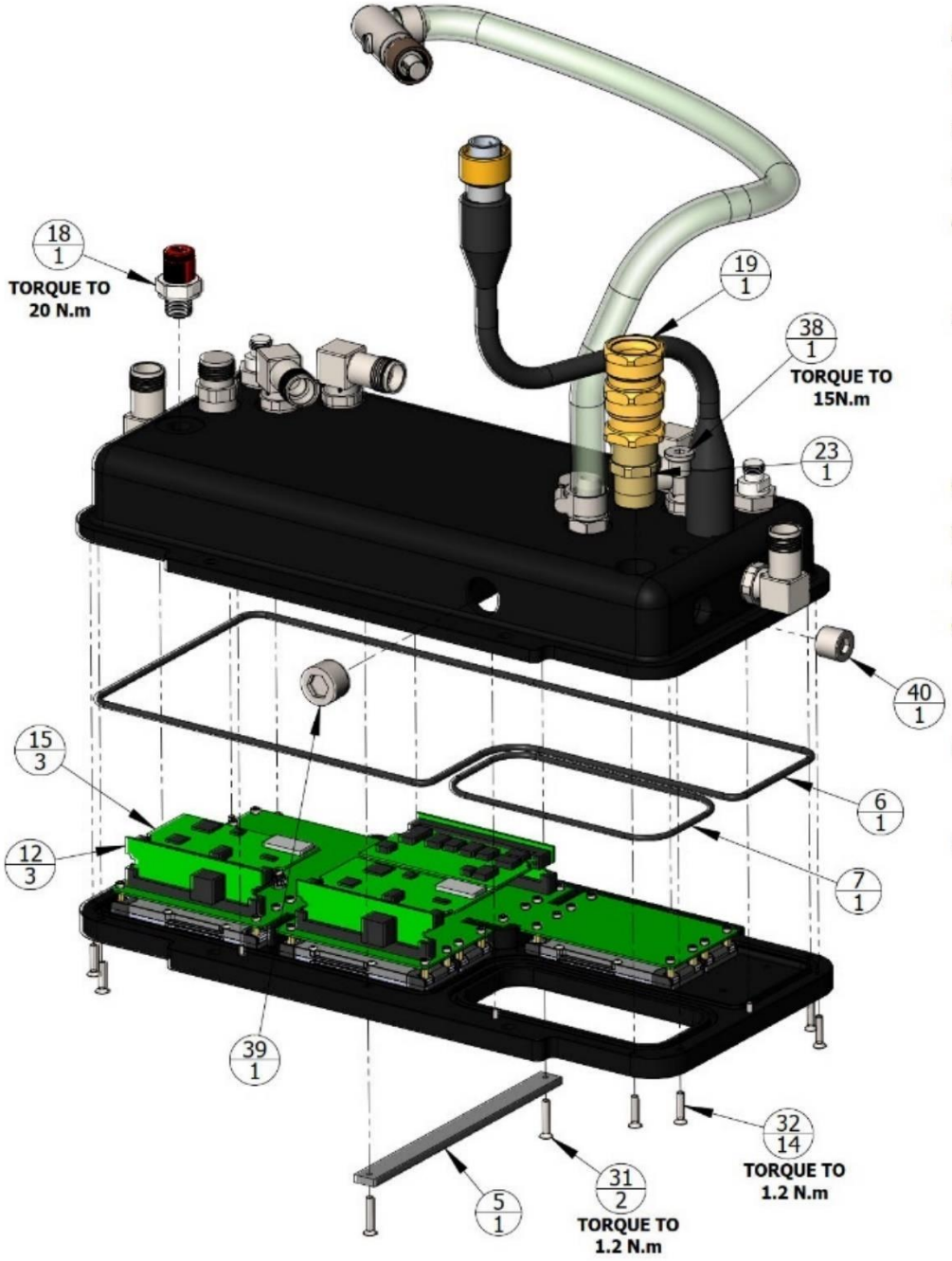
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PROJECT	VALOR ROV
TITLE	POWER POD ASSEMBLY
	ASSEMBLY DRAWING
Sheet	3 of 5
WT AIR	11.242 kg (E)
WT WATER	4.682 kg (E)
SCALE (U.S.O.)	1:3
ORIG. SIZE	A3
DOC. No.	VAL-400-0002
REV	1

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ASSEMBLY PROCEDURE (cont):-

1. INSTALL 3-OFF USP CARRIERS (VAL-PCB-0004) INTO THE POWER POD PCB (VAL-PCB-0003).
2. INSTALL 3-OFF USP'S (VAL-USP-0001) INTO THE USP CARRIERS (VAL-PCB-0004).
3. INSTALL THE VACUUM PORT ASSEMBLY (VAL-400-0007) AND TORQUE TO 20N.m.
4. CABLE GLAND (VAL-600-5000) & M25 ADAPTER (VAL-600-5015) SHOULD BE FASTENED TOGETHER PRIOR TO INSTALLATION INTO THE POWER POD ENCLOSURE (VAL-400-5002). FITTINGS SHOULD BE TORQUED TOGETHER TO 30N.m.
5. ONCE TOGETHER INSTALL THE JOINED ASSEMBLY INTO THE POWER POD ENCLOSURE, THE FOLLOWING ASSEMBLY GUIDANCE FOR NPT THREADS SHOULD BE FOLLOWED. ALL NPT THREADS SHOULD BE COVERED IN PTFE TAPE OR SUITABLE THREAD SEALANT BEFORE INSERTION, CONNECTIONS SHOULD BE MADE UP FINGER/SPANNER TIGHT INITIALLY. THEN THEY SHOULD BE ENGAGED A FURTHER 3 FULL TURNS PAST THIS TO ENSURE FULL ENGAGEMENT. TORQUE WRENCHES/SPANNERS SHOULD NEVER BE USED ON NPT THREADS.
6. INSTALL 1-OFF 3/4"NPT FLUSH FITTING (VAL-950-5002) FOLLOWING THE ABOVE GUIDELINES.
7. INSTALL 1-OFF 1/2"NPT FLUSH FITTING (VAL-950-5003) FOLLOWING THE ABOVE GUIDELINES.
8. INSTALL 1-OFF 1/4"BSPP PLUG (VAL-950-5001) AND TORQUE TO 15N.m.
9. ENSURE O-RING GROOVES IN THE POWER POD LID (VAL-400-5002) ARE FREE FROM CONTAMINATION, CLEAN IF NECESSARY & INSERT BOTH POWER POD O-RINGS INTO THE GROOVES (VAL-400-5013) & (VAL400-5014) ENSURING THEY ARE FREE FROM CONTAMINATION AND FULLY LUBRICATED.
10. CAREFULLY GUIDE THE POWER POD ENCLOSURE (VAL-400-5002) OVER THE PCB ASSEMBLY TAKING EXTREME CARE TO ROUTE ALL WIRING AWAY FROM THE INTERNAL RIBS & TO AVOID INTERFERENCE WITH THE USP MODULES. ALIGN WITH THE POWER POD BASE.
11. INSTALL ALL OF THE M4 SOCKET HEAD CONTERSUNK SCREWS (VAL-950-0024) & (VAL-950-0029) ENSURING THE ANODE (VAL-400-5008) IS IN PLACE AND TORQUE ALL FASTENERS TO 1.2N.m.

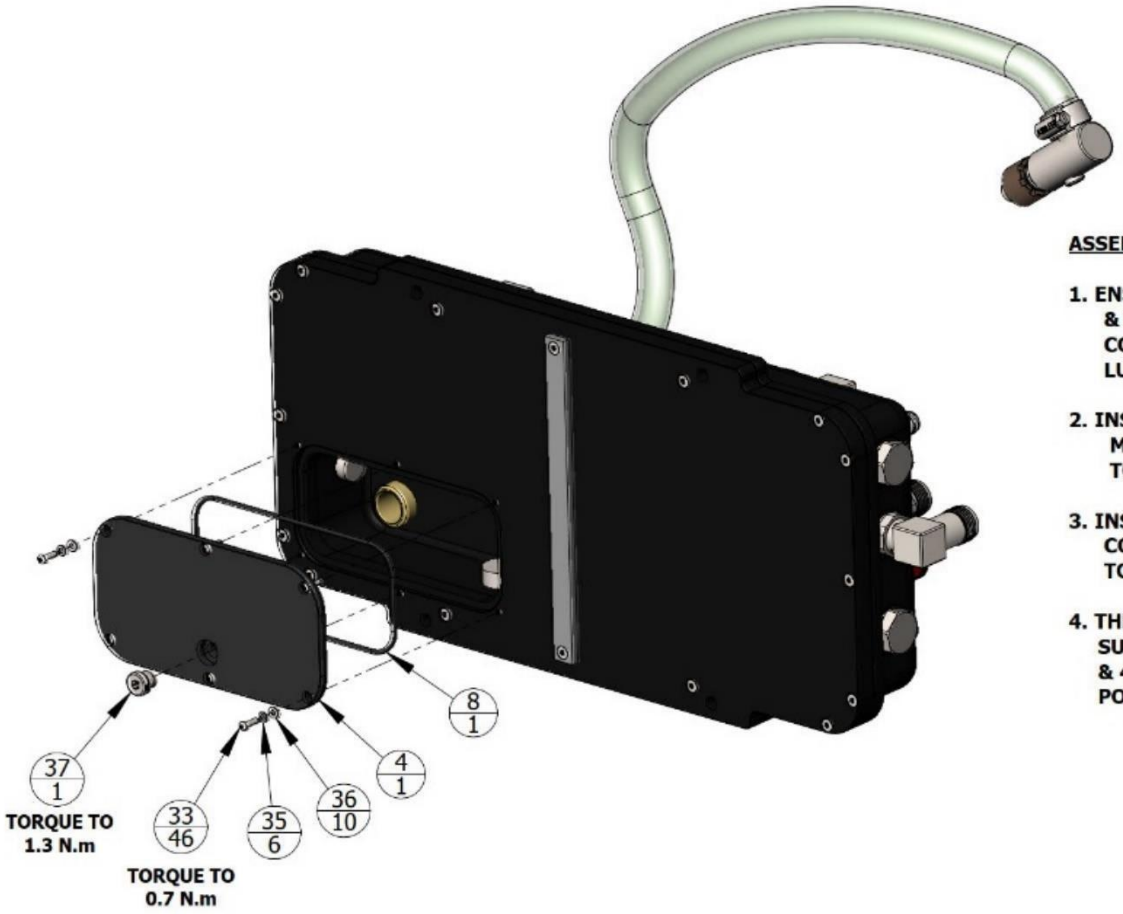
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PROJECT	VALOR ROV
TITLE	POWER POD ASSEMBLY
	ASSEMBLY DRAWING
Sheet	4 of 5
DOC. No.	VAL-400-0002
REV	1
WT AIR	11.242 kg (E)
WT WATER	4.682 kg (E)
SCALE (U.S.O.)	1:3
ORIG. SIZE	A3

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THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!



ASSEMBLY PROCEDURE (cont):-

1. **ENSURE THE O-RING GROOVE ON THE JUNCTION BOX COVER (VAL-400-5005) IS CLEAN & FREE FROM CONTAMINATION, CLEAN IF NECESSARY & INSTALL THE JUNCTION BOX COVER O-RING (VAL-400-5015) ENSURING IT IS FREE OF CONTAMINATION AND FULL LUBRICATED.**

2. **INSTALL 6-OFF M3 X 12 SOCKET HEAD BUTTON SCREWS (VAL-950-0031) WITH 6-OFF M3 WASHERS (VAL-950-0034) & 6-OFF M3 SPRING WASHERS (VAL-950-0033) & TORQUE TO 0.7N.m.**

3. **INSTALL THE 1/8"BSPP DRAIN PLUG ENSURING THE SEAL IS PRESENT, FREE FROM CONTAMINATION & LUBRICATED. TORQUE TO 1.3N.m, TAKE EXTRA CARE TO NOT OVER TORQUE AS THREAD STRIPPING CAN OCCUR.**

4. **THE POWER POD BASE COVER (VAL-400-5004) & 4-OFF M6 X 80 SOCKET HEAD COUNTER SUNK SCREWS (VAL-950-0030) ALONG WITH THE 4-OFF M6 WASHERS (VAL-950-0014) & 4-OFF M6 NYLOC NUTS (VAL-950-0008) ARE UTILISED WHEN MOUNTING THE POWER POD ASSEMBLY TO THE VEHICLE, SEE DRAWING VAL-100-0001 FOR THE INSTALLATION.**

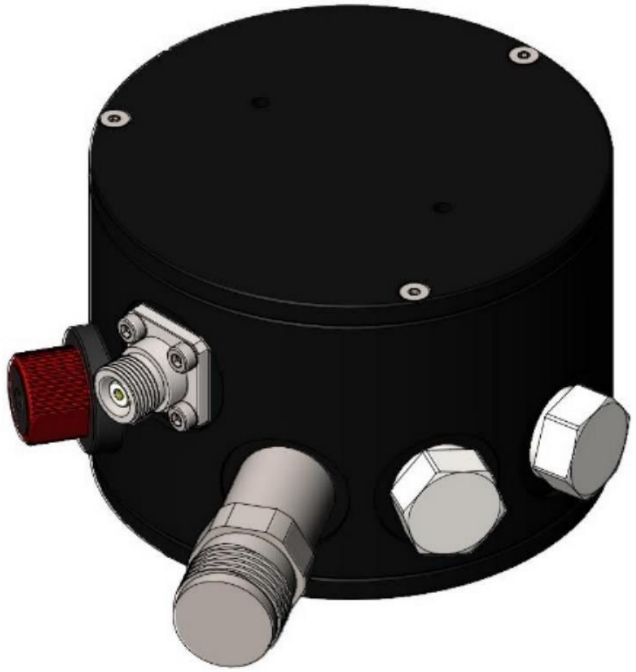
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PROJECT	VALOR ROV
TITLE	POWER POD ASSEMBLY
	ASSEMBLY DRAWING
Sheet	5 of 5
WT AIR	11.242 kg (E)
WT WATER	4.682 kg (E)
SCALE (U.S.O.)	1:3
ORIG. SIZE	A3
DOC. No.	VAL-400-0002
REV	1

THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF SEATRONICS LTD. ANY REPRODUCTION IN PART OR WHOLE WITHOUT THE WRITTEN PERMISSION OF SEATRONICS LTD IS PROHIBITED

THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!



ITEM NO.	QTY.	PART NUMBER	Bulk #	DESCRIPTION	Material
1	1	VAL-400-5010	903313	I.N.S. Pod Housing	Aluminium 6082-T6
2	2	VAL-400-5011	903314	I.N.S. Pod End	Aluminium 6082-T6
3	1	VAL-400-5018	903406	I.N.S.Pod Spacer	Acetal
4	4	VAL-400-5021		I.N.S. Pod O-ring 82.22I/D x 2.62	Nitrile 70 IRHD
5	1	VAL-400-5012		I.N.S. Pod O-Ring 13.94 I/D x 2.62	Nitrile 70 IRHD
6	1	VAL-900-0004	903014	Spatial Unit	-
7	1	VAL-400-5505	903284	300m Depth Sensor	6061 Alloy
8	1	VAL-400-5506	903410	Arduino UNO	PCB Material
9	1	VAL-400-5507	903408	I2C level Converter	PCB Material
10	1	VAL-400-5508	903411	3W DC-DC Converter	Nylon 6/10
11	1	VAL-400-5509	903409	Transceiver Breakout Board	Material <not specified>
12	2	VAL-600-5011	903238	7/16-20 Blanking Plug	Stainless Steel 316
13	1	VAL-600-5012	903319	12M A Shell Connector - 7/16-20UNF	Stainless Steel 316
14	1	VAL-600-5102	903092	Poseidon BulkHead Connector	-
15	1	VAL-600-5106	903188	ODU to 9D Connector	-
16	2	VAL-950-0028	903405	Socket Head Countersunk Screw M4 x 18	Stainless Steel A4-70
17	6	VAL-950-0038	903404	Socket Head Countersunk Screw M3 x 10	Stainless Steel A4-70
18	4	VAL-950-0044	903407	Socket Head Cap Screw M3 x 5	Stainless Steel A4-70

NOTES:-

1. APPLY AQUA-LUBE OR EQUIVALENT TO ALL MATING FACES/THREADED FASTENERS.
2. APPLY LOCTITE 243 (BLUE) TO SPECIFIED THREAD FACES.
3. APPLY SLIP-WAX OR EQUIVALENT TO ALL O-RINGS.
4. SEE SHEET 2 FOR ASSEMBLY INSTRUCTION.

REV	DATE	ECR	DESCRIPTION	BY	CHK	APP
1	28/06/2019	N/A	ISSUED FOR PRODUCTION	ABL		

RECORD OF REVISIONS

MATERIAL: SEE B.O.M.

SURFACE FINISH: -

U.S.O. TOLERANCES TO BE (DIMENSIONS ARE IN mm)

DECIMALS: X. = ± 1.0
.X = ± 0.5

ANGLES : = ± 0°30'

PAINT/SPECIAL FINISH SPEC: -

WT AIR 0.932 kg (E)

WT WATER 0.625 kg (E)

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SCALE (U.S.O.) 1:1

ORIG. SIZE A3

PROJECT VALOR ROV

TITLE I.N.S. POD ASSEMBLY

ASSEMBLY DRAWING

Sheet 1 of 2

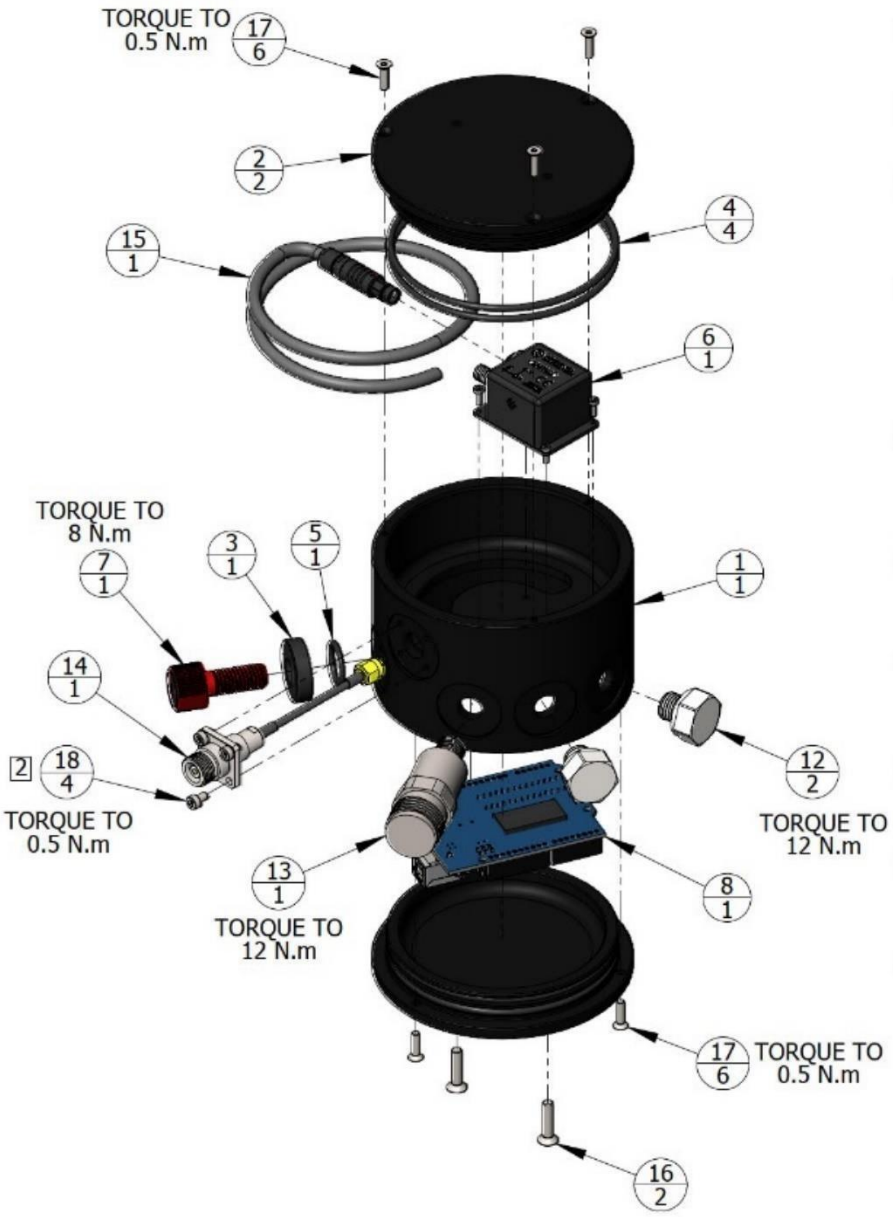
DOC. No. VAL-400-0003

REV 1

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THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!



ASSEMBLY PROCEDURE:-

1. **THOROUGHLY CLEAN THE I.N.S. POD HOUSING (VAL-400-5010) TO REMOVE ANY RESIDUAL DEBRIS FROM THE MACHINING PROCESS, PAYING PARTICULAR ATTENTION TO ALL SPOTFACES.**
2. **INSTALL 1-OFF SPATIAL UNIT (VAL-900-0004), SECURING WITH THE SUPPLIED M2 x 6 SOCKET HEAD CAP SCREWS.**
3. **CONNECT 1-OFF ODU TO 9D CABLE (VAL-600-5106) TO THE SPATIAL UNIT (VAL-900-0004) & COIL PASSING THROUGH THE INTERNAL SLOT. REFER TO THE DEPTH POD INSTRUCTIONS FOR WIRING TO THE ARDUINO UNO (VAL-400-5506).**
4. **INSTALL 1-OFF DEPTH SENSOR (VAL-400-5505) WITH 1-OFF POD SPACER (VAL-400-5018) & 1-OFF O-RING INTO THE POD HOUSING (VAL-400-5010). ENSURING THAT BOTH O-RINGS ARE FREE FROM CONTAMINATION & FULLY LUBRICATED. TORQUE TO 8N.m. COIL THE DEPTH SENSOR WIRES THROUGH THE INTERNAL SLOT. REFER TO THE DEPTH POD INSTRUCTIONS FOR WIRING TO THE ARDUINO UNO (VAL-400-5506).**
5. **INSTALL 1-OFF POSEIDON BULKHEAD CONNECTOR (VAL-600-5102), ENSURING THE O-RING IS PRESENT & FULLY LUBRICATED FIT WITH 4-OFF M3 x 5 SOCKETHEAD CAP SCREWS. TORQUE TO 0.5N.m. & SECURE WITH LOCTITE 243. COIL CABLE INTERNALLY & CONNECT TO THE SPATIAL UNIT (VAL-900-0004).**
6. **INSTALL 1-OFF A SHELL CONNECTOR (VAL-600-5012), ENSURING THE O-RING IS PRESENT & FULLY LUBRICATED. FOR WIRING TO THE ARDUINO UNO (VAL-400-5506) PLEASE REFER TO THE DEPTH POD INSTRUCTION. TORQUE TO 12N.m.**
7. **THE I2C LEVEL CONVERTER (VAL-400-5507), 3W DC-DC CONVERTER (VAL-400-5508) & TRANSCEIVER BREAK OUT BOARD ARE TO BE INSTALLED ONTO THE ARDUINO UNO (VAL-400-5506) PLEASE REFER TO THE DEPTH POD INSTRUCTIONS FOR INSTALLTION & WIRING.**
8. **THOROUGHLY CLEAN BOTH I.N.S. POD ENDS (VAL-400-5011) PAYING PARTICULAR ATTENTION TO THE O-RING GROOVES. INSTALL 2-OFF O-RINGS (VAL-400-5021) TO EACH POD END ENSURING THEY FREE FROM CONTAMINATION & FULLY LUBRICATED.**
9. **INSERT BOTH POD ENDS (VAL-400-5011) INTO THE POD HOUSING (VAL-400-5010) ENSURING THAT THE ALIGNMENT GROOVES IN ALL CORRESPOND. SECURE IN PLACE WITH 6-OFF M3 x 10 SOCKET HEAD COUNTERSUNK SCREWS (VAL-950-0038). TORQUE TO 0.5N.m.**
10. **INSTALL 2-OFF BLANKING PLUGS (VAL-600-5011) & TORQUE TO 12N.m. THE 2-OFF M4 x 18 SOCKET HEAD COUNTERSUNK SCREWS (VAL-950-0028) ARE TO BE UTILSED FOR INSTALLING TO THE VEHICLE FRAME, REFER TO DRAWING VAL-100-0001.**

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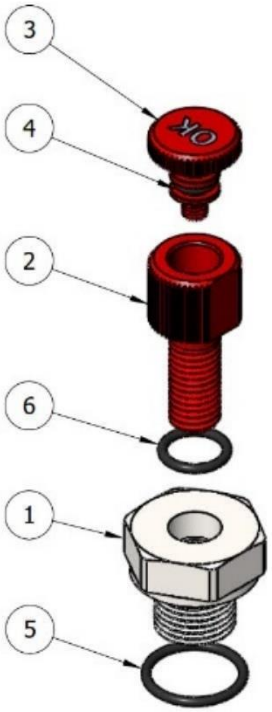
PROJECT	VALOR ROV
TITLE	I.N.S. POD ASSEMBLY
	ASSEMBLY DRAWING
Sheet	2 of 2
WT AIR	0.932 kg (E)
WT WATER	0.625 kg (E)
SCALE (U.S.O.)	1:2
ORIG. SIZE	A3
DOC. No.	VAL-400-0003
REV	1

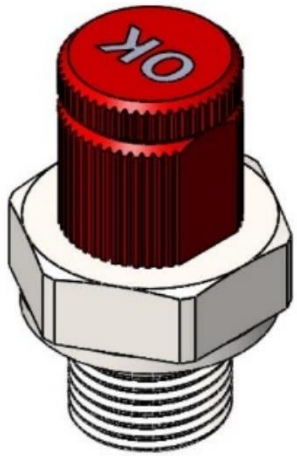
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THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	VAL-400-5028	Vacuum Port Plug	1
2	VAL-400-5510	Vent Plug Enclosure	1
3	VAL-400-5511	Vent Plug	1
4	VAL-400-5029	Vent Plug O-Ring 6.0I/D x 2.0	2
5	VAL-400-5030	Vacuum Port Plug O-ring	1
6	VAL-400-5031	Vent Plug Enclosure O-Ring 10.82I/D x 1.78	1





NOTES:-

1, APPLY AQUA-LUBE OR EQUIVALENT TO ALL MATING FACES/THREADED FASTENERS

2, APPLY LOCTITE 243 (BLUE) TO SPECIFIED THREAD FACES

3, APPLY SLIP-WAX OR EQUIVALENT TO ALL O-RINGS

REV	DATE	E.C.R.	DESCRIPTION	BY	CHK	APP
1	07/06/2021	N/A	ISSUED FOR PRODUCTION	ABL	JNE	DOW

RECORD OF REVISIONS

MATERIAL: SEE B.O.M.

SURFACE FINISH: -

U.S.O. TOLERANCES TO BE (DIMENSIONS ARE IN mm)

DECIMALS: X. = ± 1.0
.X = ± 0.5

ANGLES : = ± 0°30'

PAINT/SPECIAL FINISH SPEC: -

WT AIR 0.062 kg (E)

WT WATER 0.062 kg (E)

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SCALE (U.S.O.) 1:1

ORIG. SIZE A3

PROJECT VALOR ROV

TITLE

VACUUM PORT ASSEMBLY

ASSEMBLY DRAWING

Sheet 1 of 1

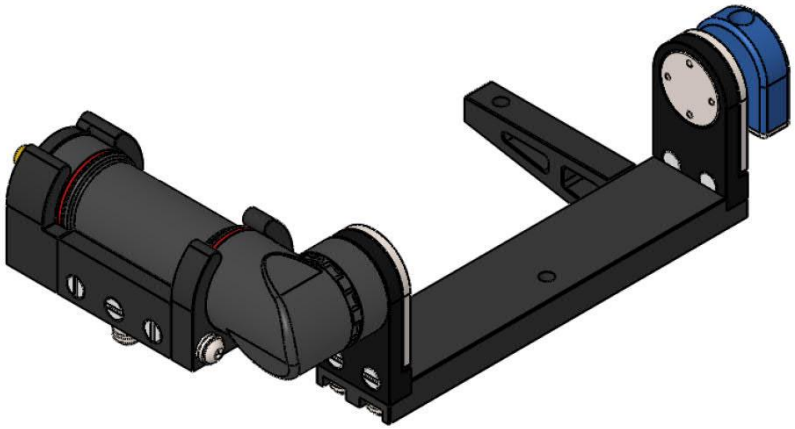
DOC. No. VAL-400-0007

REV 1

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THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!



ITEM NO.	QTY.	Bulk #	PART NUMBER	DESCRIPTION	MATERIAL
1	1	903625	VAL-900-0010	Blueprint Lab RA-1400 Rotator	-
2	1	903737	VAL-700-5005	Blueprint RA-1400 Saddle	Acetal
3	1	903738	VAL-700-5006	Blueprint RA-1400 End Support	Acetal
4	2	903739	VAL-700-5007	Tilt Yoke Arm	Acetal
5	2	903740	VAL-700-5008	Tilt Yoke Arm Stiffening Plate	Stainless Steel 316
6	1	903741	VAL-700-5009	Tilt Yoke	Acetal
7	1	903742	VAL-700-5010	Tilt Support Shaft	Stainless Steel 316
8	2	903743	VAL-700-5011	Tilt Unit Yoke Arm Brace	Acetal
9	1	903744	VAL-700-5012	Blueprint RA-1400 Front Support	Acetal
10	1	903376	VAL-100-5023	Tilt Unit Pivot Support	Aluminium 6082-T6
11	1	903736	VAL-100-5048	Tilt Unit Pivot Support Spacer	Stainless Steel 316
12	2	903019	VAL-100-5010	Barrel Nut M6x10x20	Stainless Steel 316
13	6	903307	VAL-100-5019	Barrel Nut M6x10x15	Stainless Steel 316
14	4	903727	VAL-100-5036	Barrel Nut M6x10x12	Stainless Steel 316
15	2	903519	VAL-950-0043	Socket Head Button Screw M6 x 35	Stainless Steel A4-70
16	2	903494	VAL-950-0062	Socket Head Button Screw M6 x 25	Stainless Steel A4-70
17	8	903754	VAL-950-0092	Socket Head Button Screw M6 x 16	Stainless Steel A4-70
18	12	903164	VAL-950-0007	M6 Spring washer	Stainless Steel A4-70
19	12	903300	VAL-950-0014	M6 Washer	Stainless Steel A4-70
20	4	903753	VAL-950-0091	Socket Head Countersunk Screw M3 x 16	Stainless Steel A4-70
21	4	903755	VAL-950-0094	Socket Head Countersunk Screw M3 x 12	Stainless Steel A4-70
22	4	903669	VAL-950-0041	Socket Head Button Screw M3 x 6	Stainless Steel A4-70
23	4	903423	VAL-950-0034	M3 Washer	Stainless Steel A4-70
24	4	903422	VAL-950-0033	M3 Spring Washer	Stainless Steel A4-70

NOTES:-

1, APPLY AQUA-LUBE OR EQUIVALENT TO ALL MATING FACES/THREADED FASTENERS

2, APPLY LOCTITE 243 (BLUE) TO SPECIFIED THREAD FACES

3, APPLY SLIP-WAX OR EQUIVALENT TO ALL O-RINGS

REV	DATE	E.C.R.	DESCRIPTION	BY	CHK	APP
1	19/07/2021	N/A	ISSUED FOR PRODUCTION	ABL	JNE	DOW

RECORD OF REVISIONS

MATERIAL: SEE B.O.M.

SURFACE FINISH: -

U.S.O. TOLERANCES TO BE (DIMENSIONS ARE IN mm)

DECIMALS: X. = ± 1.0
.X = ± 0.5

ANGLES : = ± 0°30'

PAINT/SPECIAL FINISH SPEC: -

WT AIR 1.13 kg (E)

WT WATER 0.617 kg (E)

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SCALE (U.S.O.) 1:2

ORIG. SIZE A3

PROJECT VALOR ROV

TITLE

TILT UNIT ASSEMBLY RA-1400

ASSEMBLY DRAWING

Sheet 1 of 2

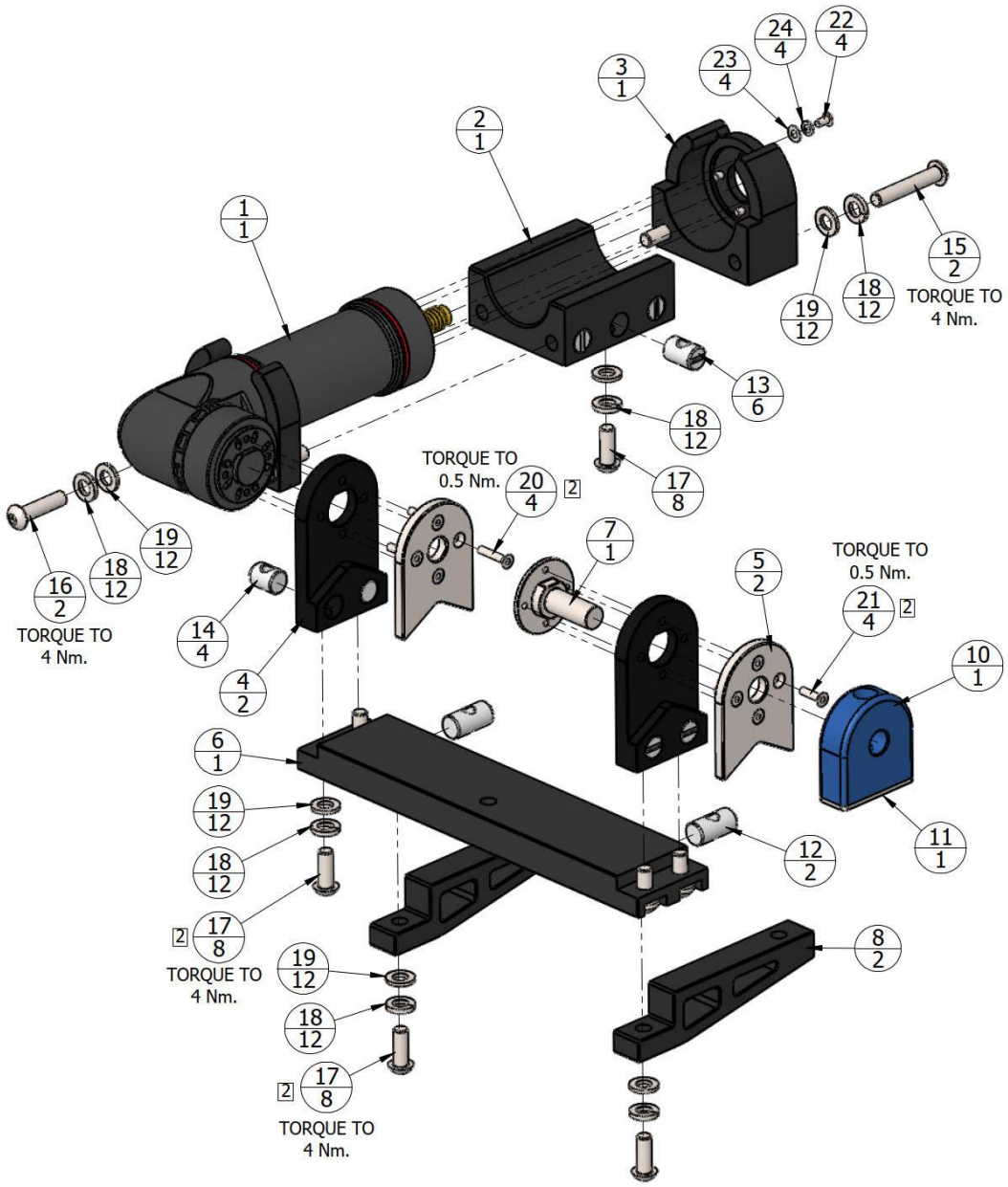
DOC. No. VAL-700-0002

REV 1

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THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!



ASSEMBLY PROCEDURE

1. SLIDE THE FRONT SUPPORT (VAL-700-5012) OVER THE BODY OF THE ROTATOR UNIT (VAL-900-0010) TO THE POSITION SHOWN OPPOSITE. INSERT THE 2-OFF M6 x 25 SOCKET HEAD BUTTON SCREWS (VAL-950-0062) WITH ACCOMPANYING M6 WASHERS (VAL-950-0014) & M6 SPRING WASHERS (VAL-950-0007)

2. INSERT 2-OFF M6x10x15 BARREL NUTS (VAL-100-5019) IN THE CORRESPONDING HOLES OF THE ROTATOR SADDLE (VAL-700-5005) ENSURING THE M6 THREAD ALIGNS WITH THE FORWARD FACING HOLES. SEAT THE SADDLE (VAL-100-5005) BELOW THE ROTATOR UNIT (VAL-900-0010). THREAD THE 2-OFF M6 x 25 SOCKET HEAD BUTTON SCREWS (VAL-950-0062) INTO THE BARREL NUTS (VAL-100-5019) & TORQUE TO 4 Nm.

3. INSERT 2-OFF M6x10x15 BARREL NUTS (VAL-100-5019) IN THE HOLES TO THE REAR OF THE ROTATOR SADDLE (VAL-700-5005) ENSURING THE M6 THREAD ALIGNS WITH THE REARWARD FACING HOLES. GUIDE THE ROTATOR END SUPPORT (VAL-700-5006) OVER THE REAR OF THE ROTATOR UNIT (VAL-900-0010). INSERT THE 2-OFF M6 x 35 SOCKET HEAD BUTTON SCREWS (VAL-950-0043) WITH ACCOMPANYING M6 WASHERS & M6 SPRING WASHERS (VAL-950-0014 & VAL-950-0007) & TORQUE TO 4 Nm.

4. INSERT 4-OFF M3 x 6 SOCKET HEAD BUTTON SCREWS (VAL-950-0041) WITH THE ACCOMPANYING M3 WASHERS (VAL-950-0034) & M3 SPRING WASHERS (VAL-950-0033) INTO THE THREADED HOLES TO THE REAR OF THE ROTATOR UNIT (VAL-900-0010) & TORQUE TO 0.5 Nm. GUIDE 1-OFF TILT YOKE ARM (VAL-700-5007) OVER THE OUTPUT SHAFT OF THE ROTATOR UNIT (VAL-900-0010) ALONG WITH 1-OFF YOKE ARM STIFFENING PLATE (VAL-700-5008) & SECURE IN PLACE WITH THE 4-OFF M3 X 16 SOCKET HEAD COUNTERSUNK SCREWS (VAL-950-0091) USING LOCTITE 243 & TORQUE TO 0.5 Nm.

5. GUIDE THE TILT SUPPORT SHAFT (VAL-700-5010) THROUGH THE OTHER TILT YOKE ARM (VAL-700-5007), GUIDE THE YOKE ARM STIFFENING PLATE (VAL-700-5008) OVER THE TILT SUPPORT SHAFT (VAL-700-5010) & SECURE IN PLACE WITH THE 4-OFF M3 x 12 SOCKET HEAD COUNTERSUNK SCREWS (VAL-950-0094) USING LOCTITE 243 & TORQUE TO 0.5 Nm.

6. INSERT THE 2-OFF M6x10x20 BARREL NUTS (VAL-100-5010) INTO THE TILT YOKE (VAL-700-5009) ENSURING THE M6 THREADS ALIGN WITH THE THROUGH HOLES. GUIDE 2-OFF M6 X 16 SOCKET HEAD BUTTON SCREWS (VAL-950-0092) WITH ACCOMPANYING M6 WASHER & M6 SPRING WASHERS (VAL-950-0014 & VAL-950-0007) THROUGH THE 2-OFF YOKE ARM BRACES (VAL-700-5011) THREAD INTO THE 2-OFF BARREL NUTS (VAL-100-5010) USING LOCTITE 243 & TORQUE TO 4 Nm.

7. INSERT 4-OFF M6x10x12 BARREL NUTS (VAL-100-5036) INTO THE TILT YOKE ARMS (VAL-700-5007) ENSURING THE M6 THREAD ALIGNS WITH THE THROUGH HOLES. GUIDE 4-OFF M6 X 16 SOCKET HEAD BUTTON SCREWS (VAL-950-0092) THROUGH THE TILT YOKE (VAL-700-5009) WITH ACCOMPANYING M6 WASHER & M6 SPRING WASHER (VAL-950-0014 & VAL-950-0007) THREAD INTO THE M6x10x12 BARREL NUTS USING LOCTITE 243 & TORQUE TO 4 Nm.

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PROJECT: VALOR ROV

TITLE: TILT UNIT ASSEMBLY RA-1400

ASSEMBLY DRAWING | Sheet 2 of 2

WT AIR	WT WATER	SCALE (U.S.O.)	ORIG. SIZE	DOC. No.	REV
1.13 kg (E)	0.617 kg (E)	1:2	A3	VAL-700-0002	1

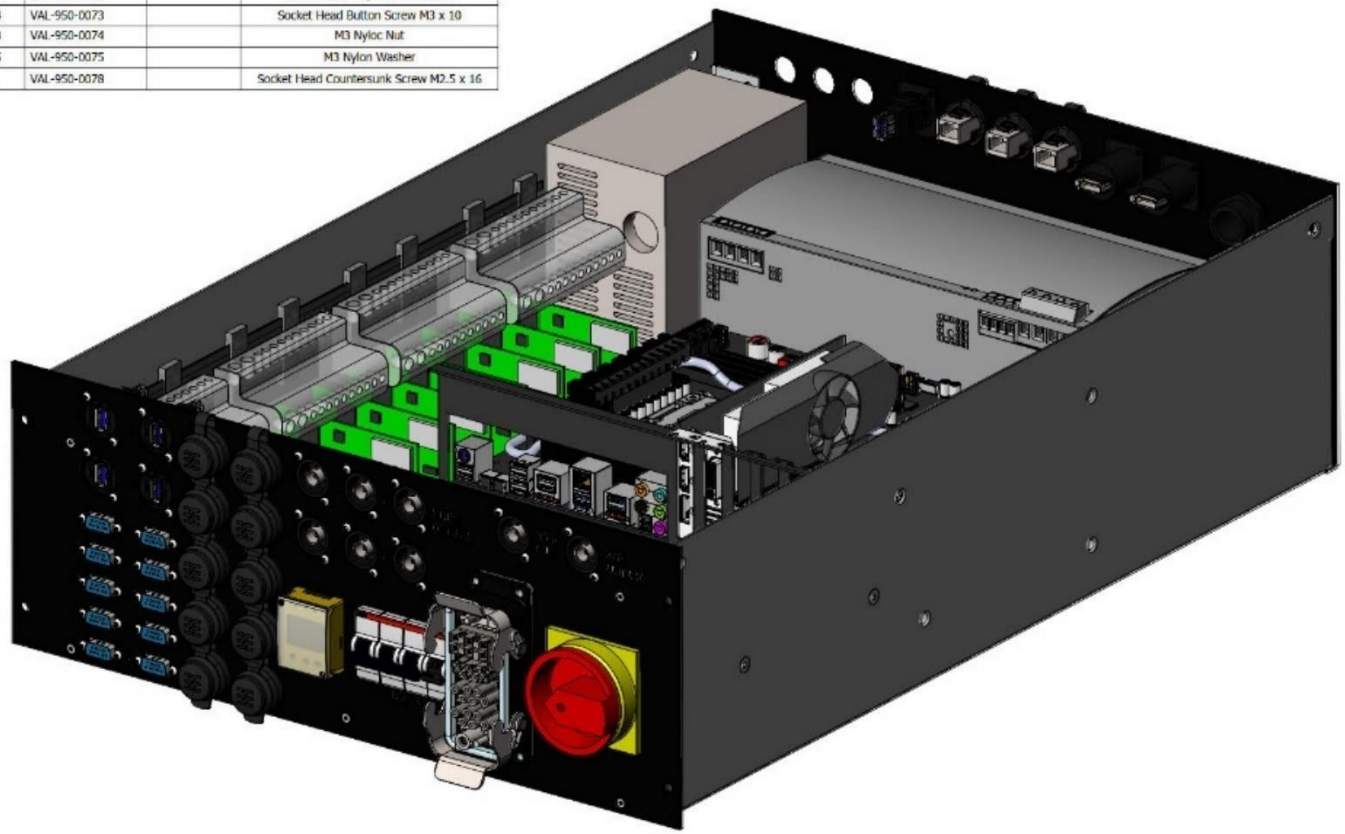
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THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!

ITEM NO.	QTY.	PART NUMBER	Bulk #	DESCRIPTION
1	1	VAL-500-5000	903436	S.C.U. Chassis
2	1	VAL-500-5002	903196	S.C.U. Front Panel (10 User)
3	1	VAL-500-5003	903279	S.C.U. Rear Panel
4	1	VAL-PCB-005	903177	10G Ethernet Switch
5	1	VAL-PCB-005-HS	-	Switch Heatsink (Part of VAL-PCB-0005)
6	10	VAL-PCB-008	903106	U.S.P. Carrier PCBA
7	1	VAL-PCB-010	903178	10G Ethernet Switch Carrier Board
8	10	VAL-USP-0001	903179	VALOR USP
9	1	VAL-500-5500	903212	System PC
10	1	VAL-500-5501	903437	Intel Ethernet Network Adapter
11	1	VAL-500-5502	903439	Gigabyte GTX 1050TI Graphics Card
12	1	VAL-500-5503	903195	ATX System PC Chassis
13	1	VAL-500-5504	903194	System PC PSU
14	1	VAL-500-5505	903193	ABB CP-T 48v/20.0 PSU
15	2	VAL-500-5506	903021	Bender LIM
16	1	VAL-500-5507	903203	48v Contactor
17	1	VAL-500-5508	903051	3 Pole 20A M.C.B.
18	1	VAL-500-5509	903052	12-60V ac/dc Shunt Release
19	1	VAL-500-5510	903050	3 Pole Rotary Isolator Switch
20	2	VAL-500-5511	903433	30A Rail Mounted Fuse Holder
21	2	VAL-500-5512	903434	Fused DIN Rail terminal
22	1	VAL-500-5513	903086	CWDM Module
23	1	VAL-500-5514	903448	HAN DD Module
24	1	VAL-500-5515	903441	HAN M Base Panel 2 Levers
25	1	VAL-500-5516	903443	Han M Protection Cover
26	1	VAL-500-5517	903442	HAN Hinged Frame
27	1	VAL-500-5518	903450	HAN LC Module-F
28	2	VAL-500-5519	903445	Han E Protected Module, Crimp Female
29	13	VAL-500-5520	903201	RJ45 Panel Mount Connector
30	10	VAL-500-5521	903197	9 Way IDC D-sub Connector
31	8	VAL-500-5522	903198	BNC Panel Mount
32	5	VAL-500-5523	903199	USB 3.0 A-A Panel Mount Connector
33	2	VAL-500-5524	903202	HDMI Panel Mount Connector
34	2	VAL-500-5525	903398	Fibre Reel
35	3	VAL-500-5526		M25 Cable Gland
36	1	VAL-500-5527	903276	2 Way DIN Earth Block 10 AWG
37	1	VAL-500-5528	903277	2 Way DIN Earth Block 6 AWG
38	4	VAL-500-5529	903430	12 Way Commoning Block
39	1	VAL-500-5530	903077	10G CWDM SFP+ Tnx Module 1550nm
40	1	VAL-500-5531	903079	10G CWDM SFP+ Tnx Module 1590nm
41	1	VAL-500-5532		Composite Codec SFP Coax Dual
42	1	VAL-500-5533		OSA5401 Sync Plug with GPS
43	5	VAL-500-5540	903431	DIN Rail
44	1	VAL-500-5541	903438	75mm x 75mm Bracket
45	3	VAL-500-5542	903278	System PC PSU Mounting Bracket

ITEM NO.	QTY.	PART NUMBER	Bulk #	DESCRIPTION
46	5	VAL-500-5544		M4 x 50mm Stand-off
47	46	VAL-500-5543	903266	M3 x 20 Female Stand-offs
48	1	DIN 7991		Socket Head Countersunk Screw M5 x 25
49	10	VAL-950-0071	903555	Socket Head Countersunk Screw M5 x 10
50	10	VAL-950-0052		M5 Nyloc Nut
51	11	VAL-950-0042		M5 Form A Flat washer
52	6	VAL-950-0065		Socket Head Cap Screw M4 x 12
53	6	VAL-950-0076		Socket Head Countersunk Screw M4 x 10
54	2	VAL-950-0077		M4 Nyloc Nut
55	3	VAL-950-0050		M4 Form A Flat Washer
56	55	VAL-950-0038	903404	Socket Head Countersunk Screw M3 x 10
57	45	VAL-950-0039		Socket Head Cap Screw M3 x 10
58	44	VAL-950-0073		Socket Head Button Screw M3 x 10
59	43	VAL-950-0074		M3 Nyloc Nut
60	45	VAL-950-0075		M3 Nylon Washer
61	5	VAL-950-0078		Socket Head Countersunk Screw M2.5 x 16



NOTES:-

1, APPLY AQUA-LUBE OR EQUIVALENT TO ALL MATING FACES/THREADED FASTENERS

2, APPLY LOCTITE 243 (BLUE) TO SPECIFIED THREAD FACES

3, APPLY SLIP-WAX OR EQUIVALENT TO ALL O-RINGS

REV	DATE	ECR	DESCRIPTION	BY	CHK	APP
1	24/06/2020	N/A	ISSUED FOR PRODUCTION	ABL	JNE	DOW

RECORD OF REVISIONS

MATERIAL: SEE B.O.M.

SURFACE FINISH: -

U.S.O. TOLERANCES TO BE (DIMENSIONS ARE IN mm)

DECIMALS: X. = ± 1.0, .X = ± 0.5

ANGLES : = ± 0°30'

PAINT/SPECIAL FINISH SPEC: -

WT AIR 21.872 kg (E)

WT WATER 11.622 kg (E)

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Denmore Industrial Estate, Bridge of Don
Aberdeen, AB23 8JW
United Kingdom
Phone: +44 (0)1224 853100 (24 hour)
e-mail: aberdeen@seatronics-group.com

SCALE (U.S.O.) 1:3

ORIG. SIZE A3

PROJECT VALOR ROV

TITLE S.C.U. ASSEMBLY

ASSEMBLY DRAWING

Sheet 1 of 5

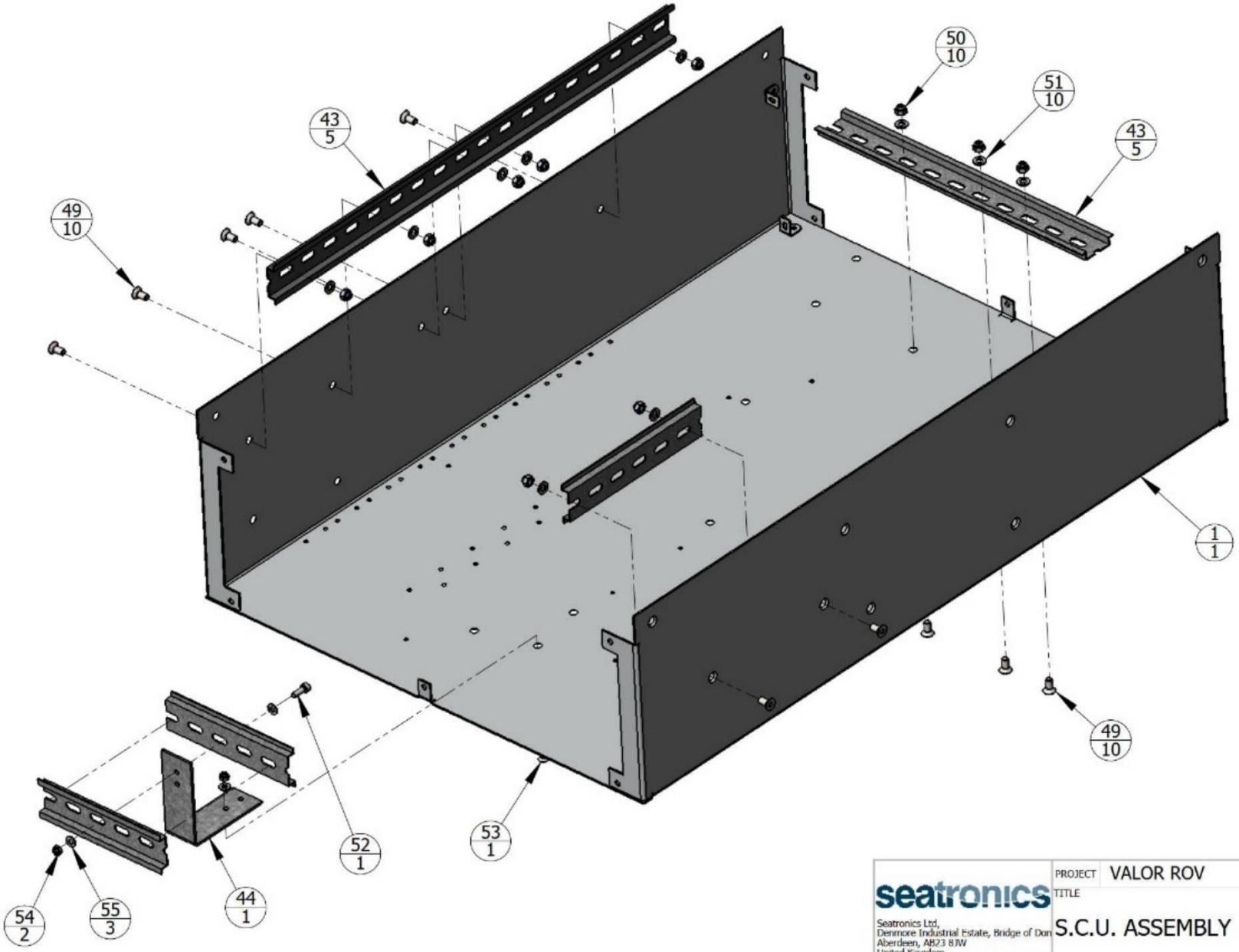
DOC. No. VAL-500-0001

REV 1

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THIRD ANGLE PROJECTION

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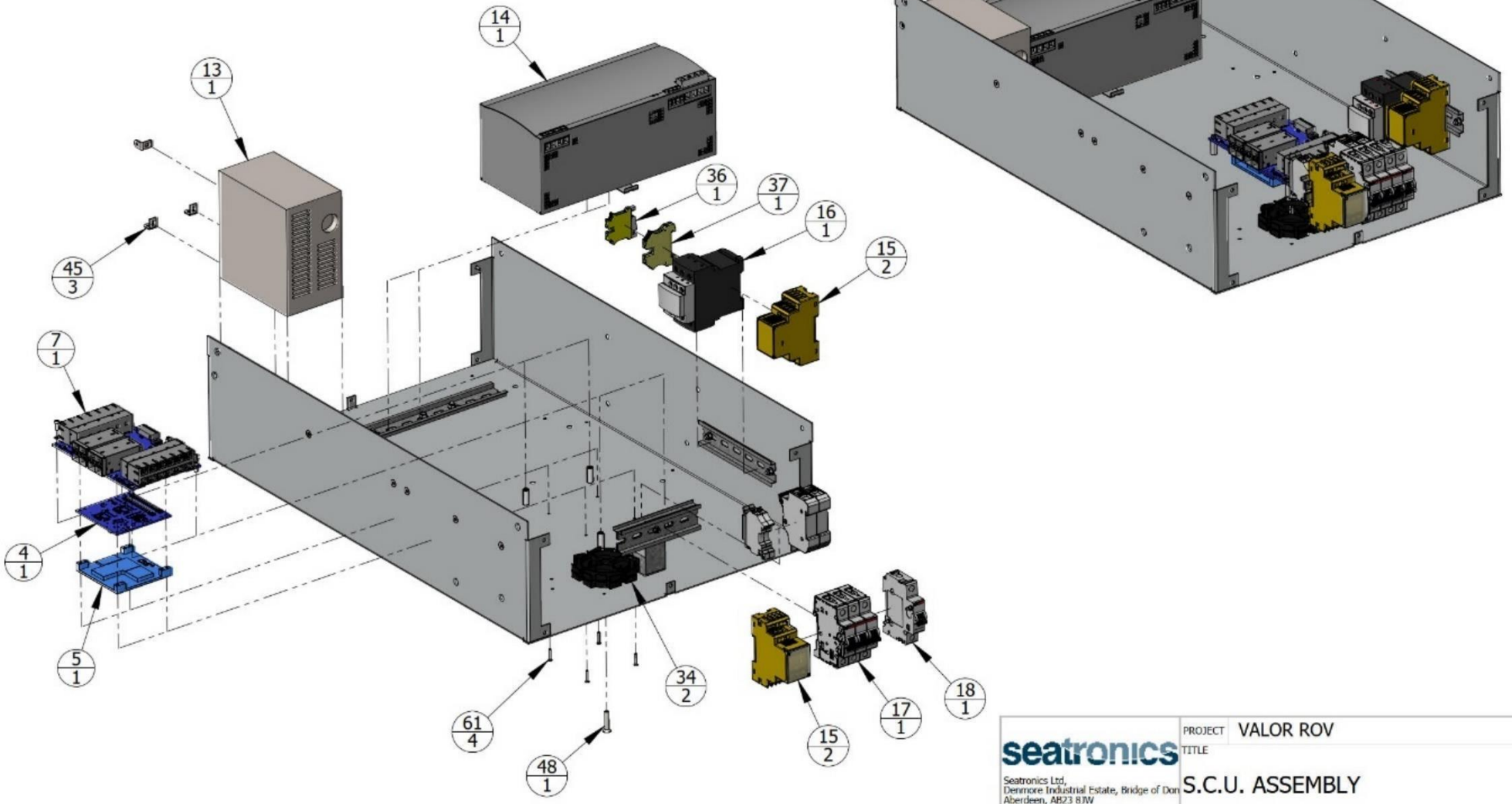
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e-mail: aberdeen@seatronics-group.com

PROJECT	VALOR ROV
TITLE	S.C.U. ASSEMBLY
	ASSEMBLY DRAWING
Sheet	2 of 5
WT AIR	21.872 kg (E)
WT WATER	11.622 kg (E)
SCALE (U.S.O.)	1:3
ORIG. SIZE	A3
DOC. No.	VAL-500-0001
REV	1

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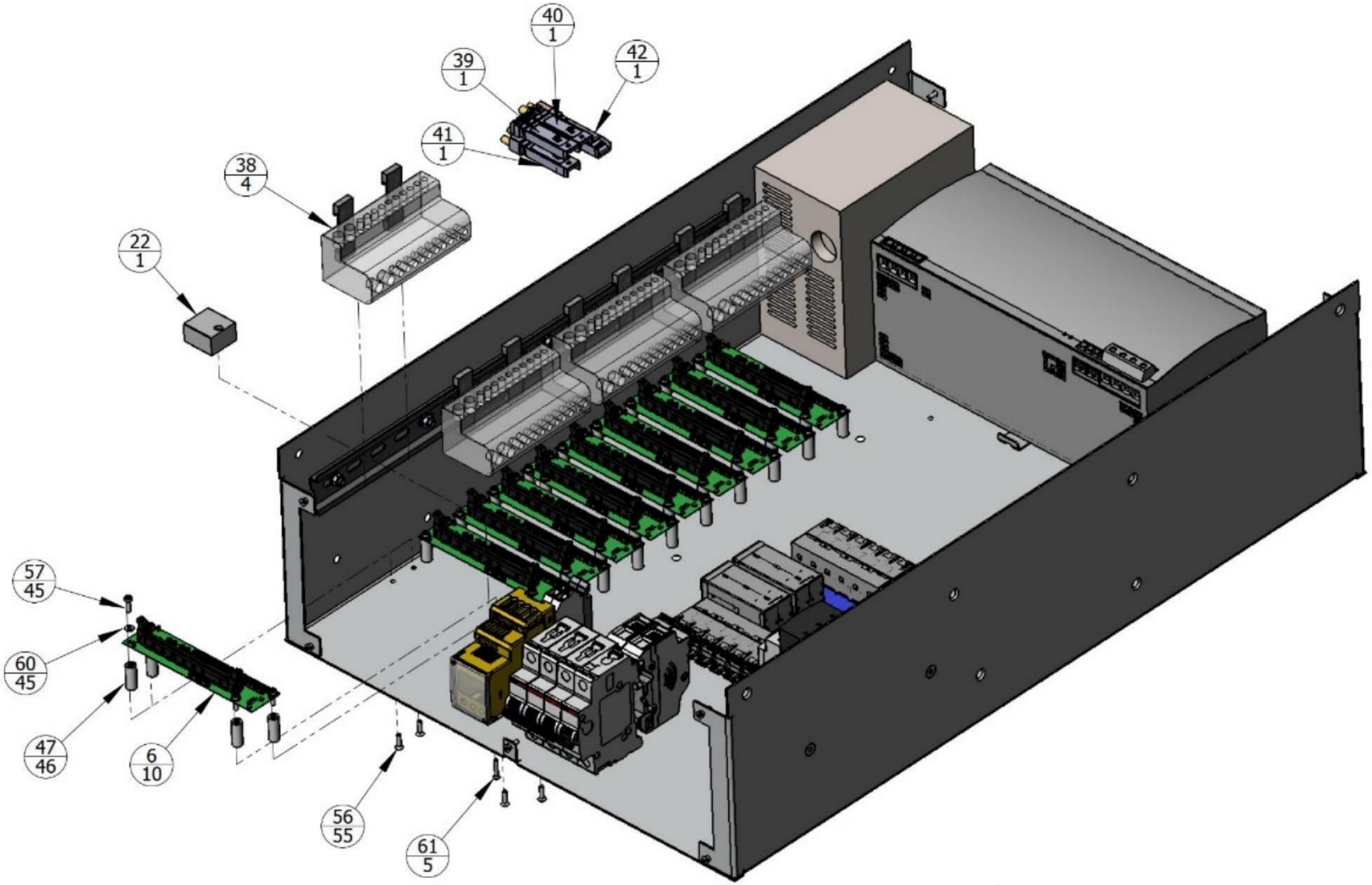
PROJECT	VALOR ROV
TITLE	S.C.U. ASSEMBLY
ASSEMBLY DRAWING	Sheet 3 of 5
DOC. No.	VAL-500-0001
REV	1

WT AIR	WT WATER	SCALE (U.S.O.)	ORIG. SIZE
21.872 kg (E)	11.622 kg (E)	1:5	A3

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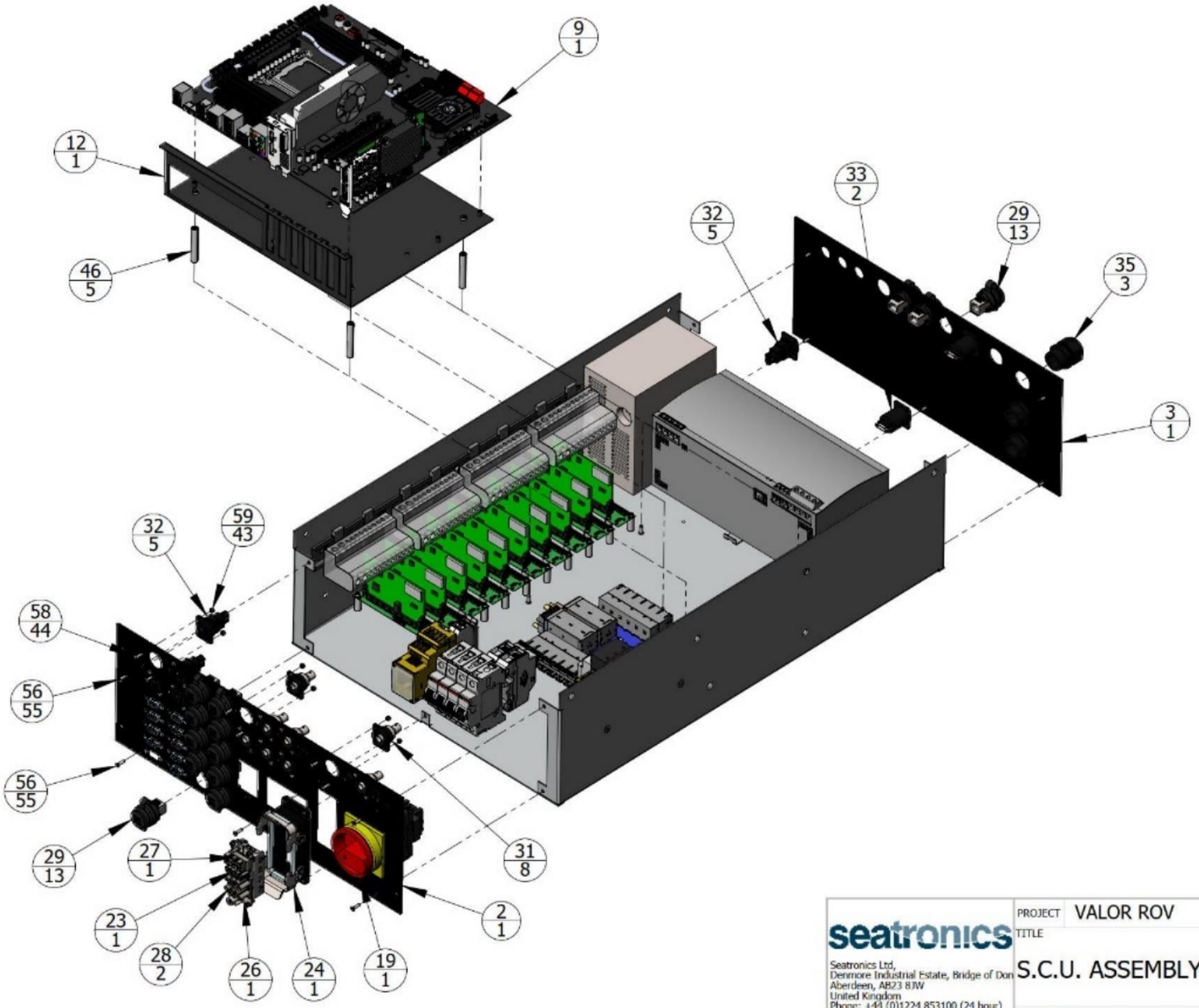
PROJECT	VALOR ROV
TITLE	S.C.U. ASSEMBLY
ASSEMBLY DRAWING	Sheet 4 of 5

WT AIR	WT WATER	SCALE (U.S.O.)	ORIG. SIZE	DOC. No.	REV
21.872 kg (E)	11.622 kg (E)	1:3	A3	VAL-500-0001	1

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PROJECT	VALOR ROV
TITLE	S.C.U. ASSEMBLY
	ASSEMBLY DRAWING
Sheet	5 of 5
DOC. No.	VAL-500-0001
REV	1

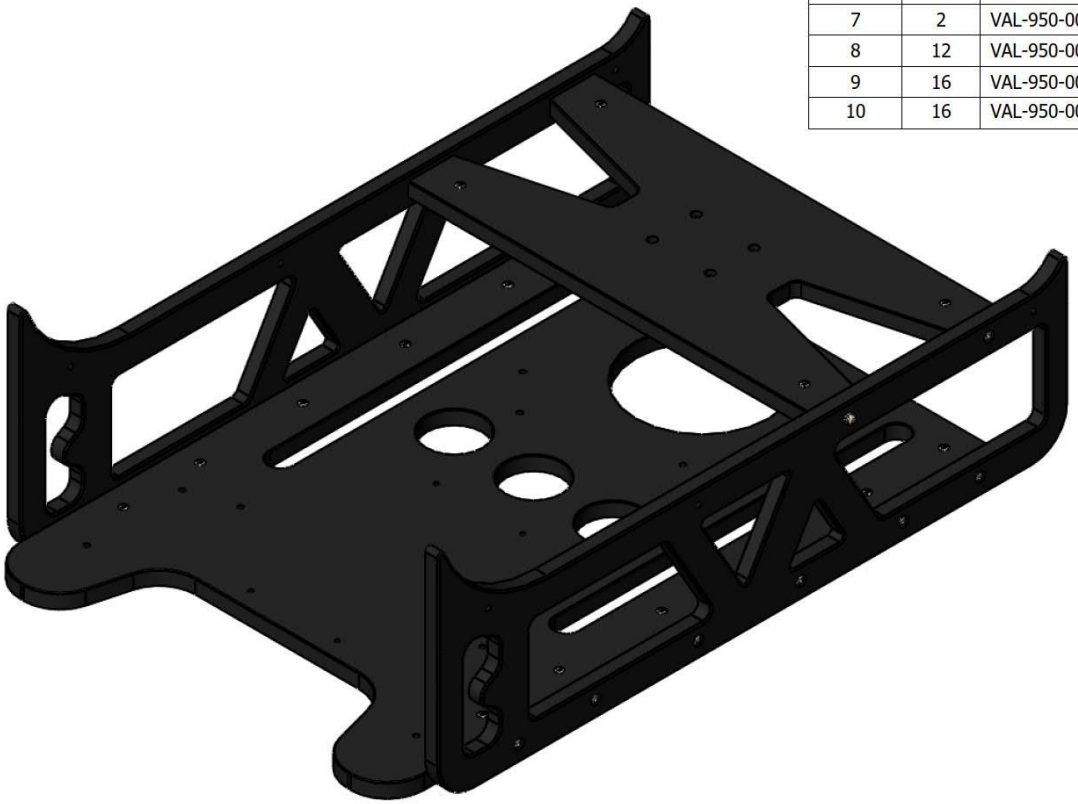
WT AIR	WT WATER	SCALE (U.S.O.)	ORIG. SIZE
21.872 kg (E)	11.622 kg (E)	1:5	A3

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ITEM NO.	QTY.	PART NUMBER	Bulk #	DESCRIPTION	Material
1	1	VAL-150-5037	903517	Standard Skid Base	UHMWPE 1000
2	1	VAL-150-5005_01	903351.01	STD Skid PORT Side Frame Rev2	UHMWPE 1000
3	1	VAL-150-5006_01	903352.01	STD Skid STBD Side Frame Rev2	UHMWPE 1000
4	1	VAL-150-5014	903354	DVL Mount/Cross Brace	UHMWPE 1000
5	16	VAL-100-5010	903019	Barrel Nut M6x10x20	Stainless Steel 316
6	2	VAL-950-0083	903678	Socket Head Button Screw M6 x 70	Stainless Steel A4-70
7	2	VAL-950-0005	903261	Socket Head Button Screw M6 x 65	Stainless Steel A4-70
8	12	VAL-950-0004	903292	Socket Head Button Screw M6 x 55	Stainless Steel A4-70
9	16	VAL-950-0014	903300	M6 Washer	Stainless Steel A4-70
10	16	VAL-950-0007	903164	M6 Spring washer	Stainless Steel A4-70



NOTES:-

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2, APPLY LOCTITE 243 (BLUE) TO SPECIFIED THREAD FACES

3, APPLY SLIP-WAX OR EQUIVALENT TO ALL O-RINGS

REV	DATE	E.C.R.	DESCRIPTION	BY	CHK	APP
1	16/08/2021	N/A	ISSUED FOR PRODUCTION	ABL	JNE	DOW

RECORD OF REVISIONS

MATERIAL: SEE B.O.M.

SURFACE FINISH: -

U.S.O. TOLERANCES TO BE (DIMENSIONS ARE IN mm)

DECIMALS: X. = ± 1.0
.X = ± 0.5

ANGLES : = ± 0°30'

PAINT/SPECIAL FINISH SPEC: -

WT AIR 12.588 kg (E)

WT WATER -0.84 kg (E)

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SCALE (U.S.O.) 1:5

ORIG. SIZE A3

PROJECT VALOR ROV

TITLE STANDARD SKID

ASSEMBLY DRAWING

Sheet 1 of 2

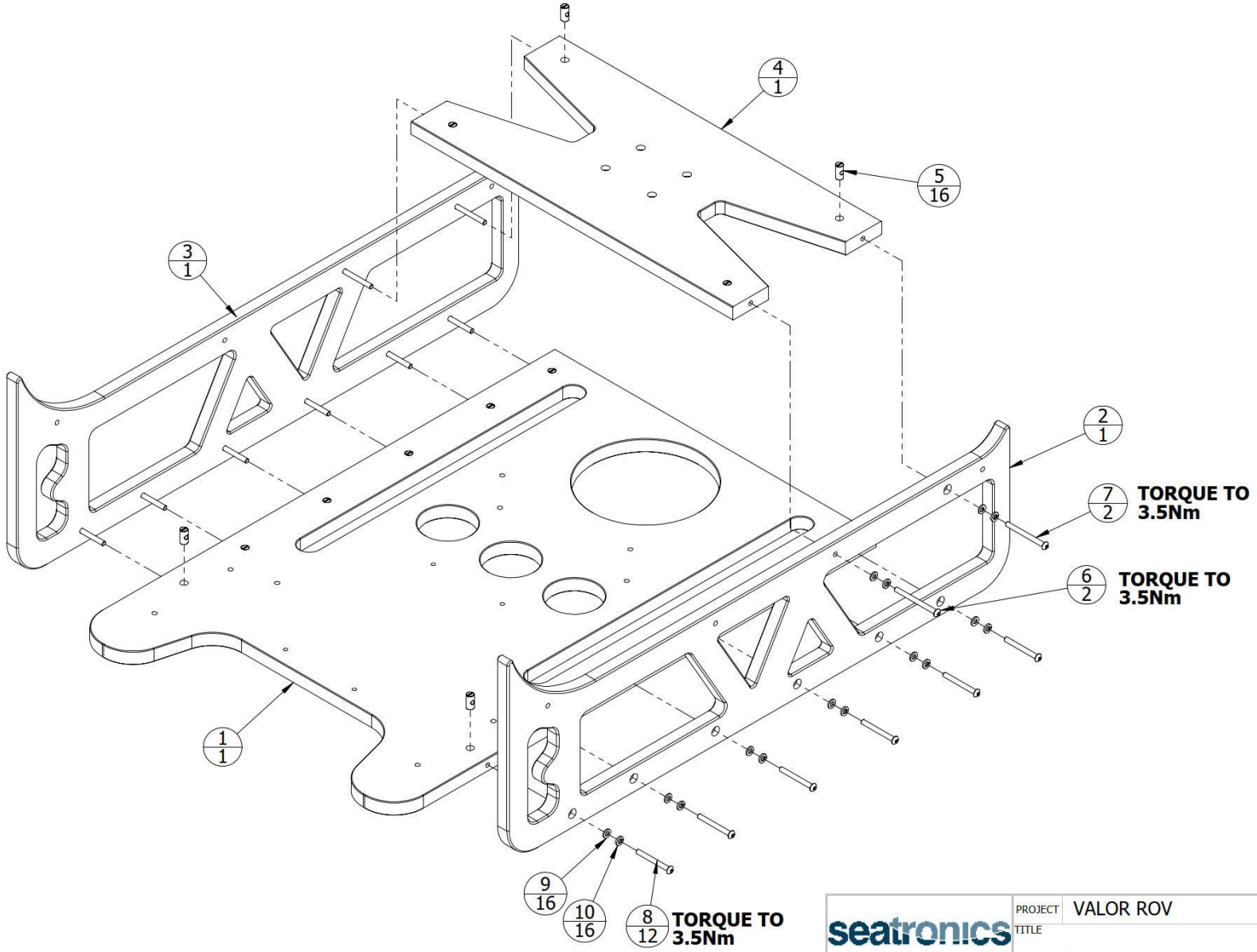
DOC. No. VAL-150-0006

REV 1

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PROJECT	VALOR ROV
TITLE	STANDARD SKID
ASSEMBLY DRAWING	Sheet 2 of 2

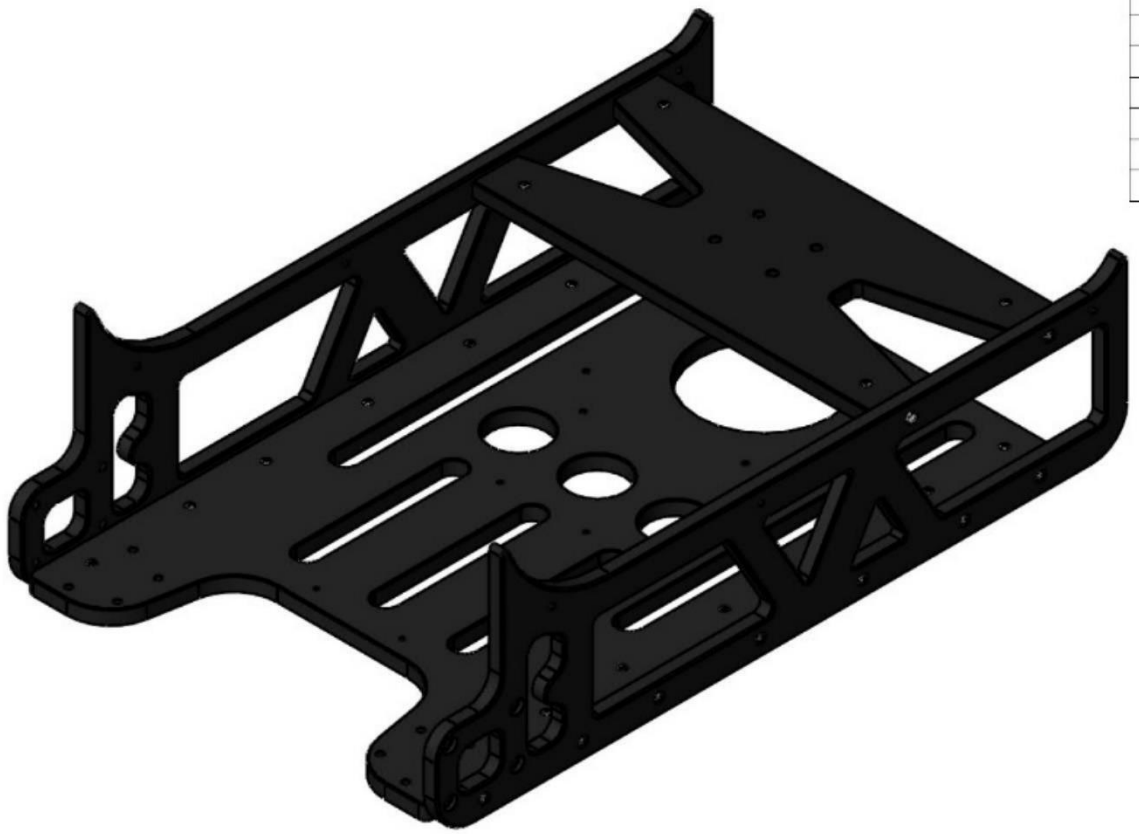
WT AIR	WT WATER	SCALE (U.S.O.)	ORIG. SIZE	DOC. No.	REV
12.588 kg (E)	-0.84 kg (E)	1:5	A3	VAL-150-0006	1

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ITEM NO.	PART NUMBER	Bulk #	DESCRIPTION	QTY.
1	VAL-150-5061	903653	Manipulator Skid Base	1
2	VAL-150-5062	903654	Manip Skid PORT Side Frame	1
3	VAL-150-5063	903655	Manip Skid STBD Side Frame	1
4	VAL-150-5014	903354	DVL Mount/Cross Brace	1
5	VAL-100-5010	903019	Cross Dowel M6x10x20	18
6	VAL-950-0083	903678	Socket Head Button Screw M6 x 70	2
7	VAL-950-0005	903261	Socket Head Button Screw M6 x 65	2
8	VAL-950-0004	903292	Socket Head Button Screw M6 x 55	14
9	VAL-950-0014	903300	M6 Washer	18
10	VAL-950-0007	903164	M6 Spring washer	18



NOTES:-

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2, APPLY LOCTITE 243 (BLUE) TO SPECIFIED THREAD FACES

3, APPLY SLIP-WAX OR EQUIVALENT TO ALL O-RINGS

REV	DATE	E.C.R.	DESCRIPTION	BY	CHK	APP
1	14/05/2021	N/A	ISSUED FOR PRODUCTION	ABL	JNE	DOW

RECORD OF REVISIONS

MATERIAL: SEE B.O.M.

SURFACE FINISH: -

U.S.O. TOLERANCES TO BE (DIMENSIONS ARE IN mm)

DECIMALS: X. = ± 1.0
.X = ± 0.5

ANGLES : = ± 0°30'

PAINT/SPECIAL FINISH SPEC: -

WT AIR 12.791 kg (E)

WT WATER -0.739 kg (E)

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SCALE (U.S.O.) 1:5

ORIG. SIZE A3

PROJECT VALOR ROV

TITLE MANIPULATOR SKID

ASSEMBLY DRAWING

Sheet 1 of 2

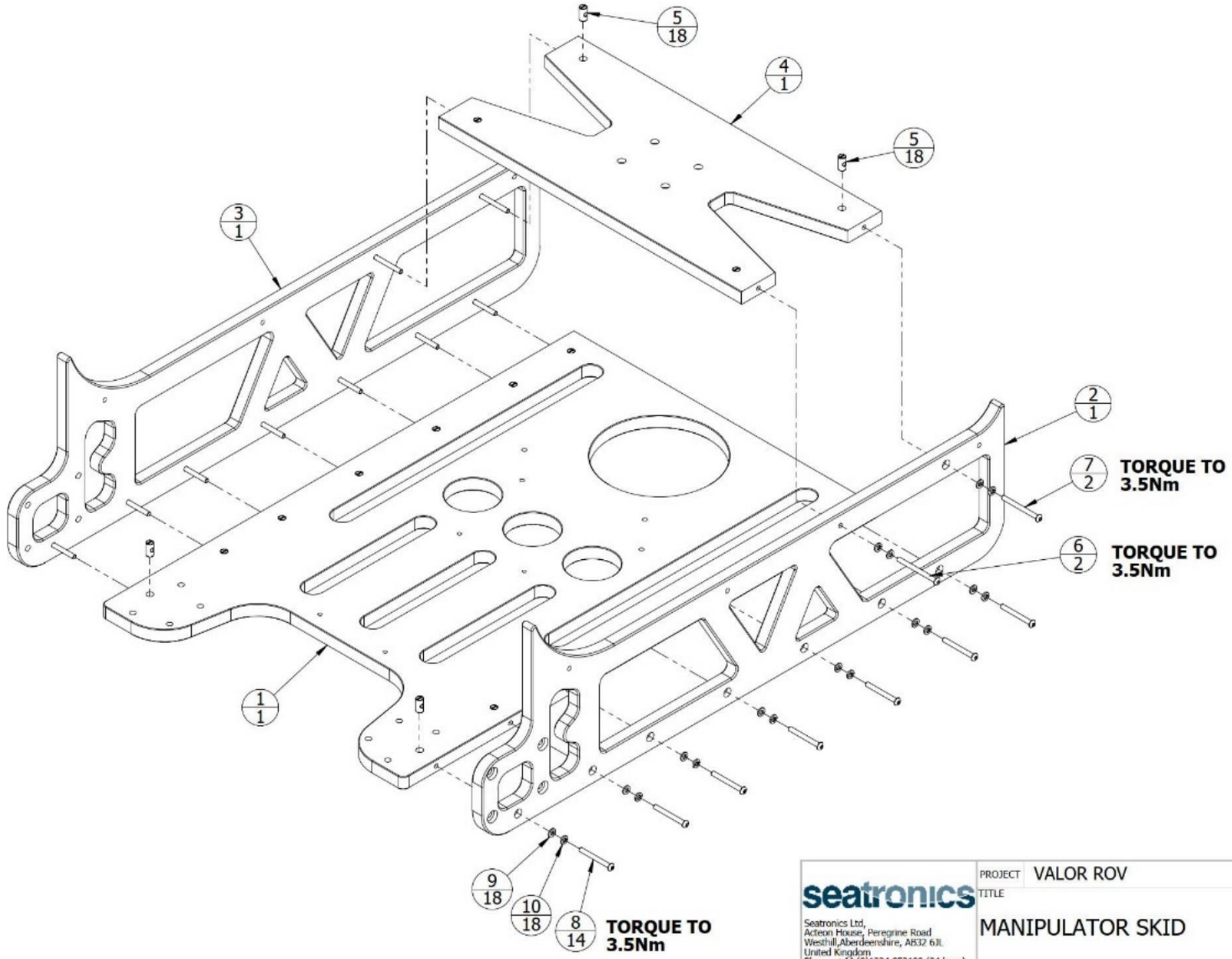
DOC. No. VAL-150-0008

REV 1

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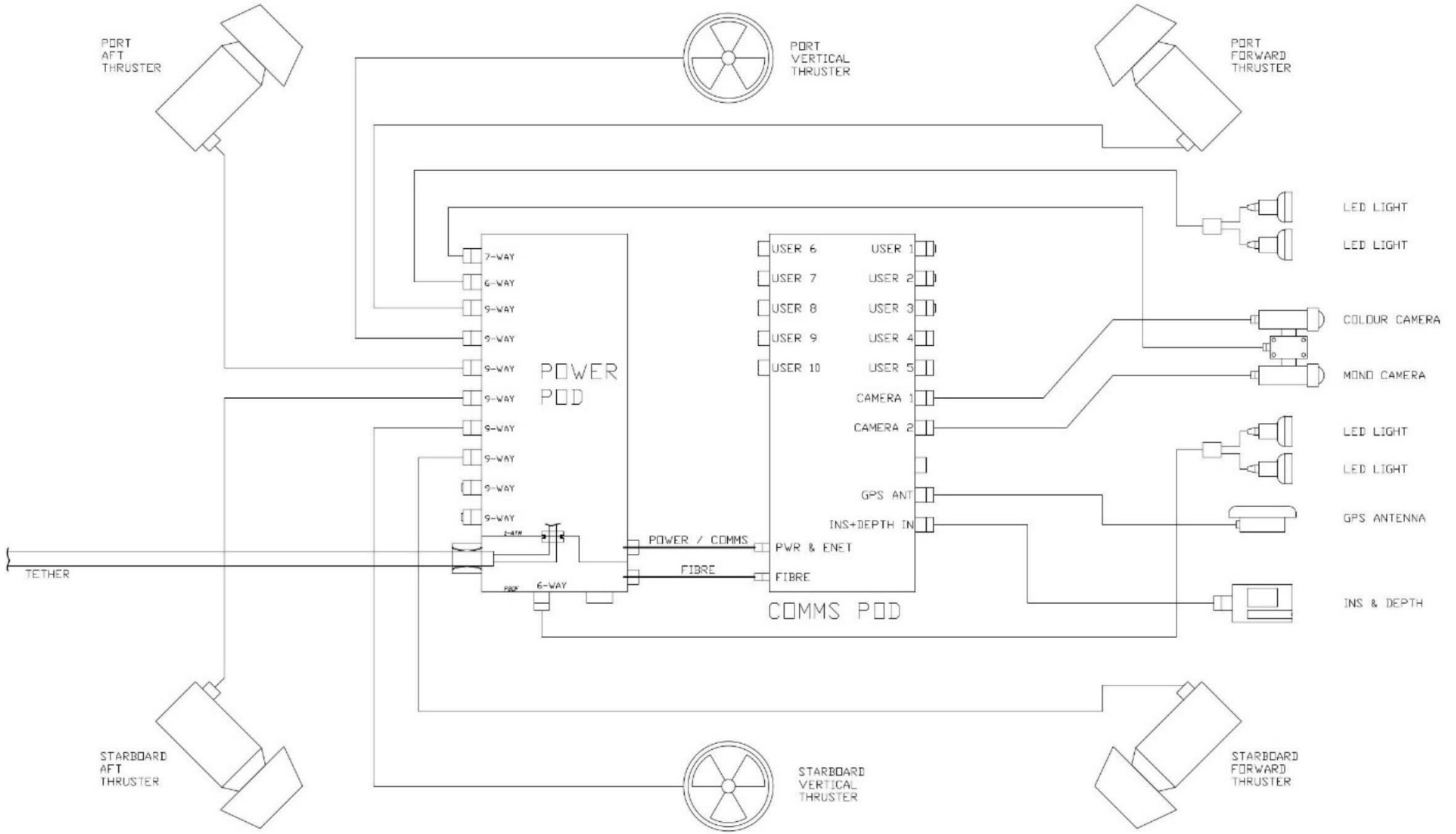
PROJECT	VALOR ROV
TITLE	MANIPULATOR SKID
	ASSEMBLY DRAWING
Sheet	2 of 2
DOC. No.	VAL-150-0008
REV	1
SCALE (U.S.O.)	1:5
ORIG. SIZE	A3
WT AIR	12.791 kg (E)
WT WATER	-0.739 kg (E)

9.2 Electrical Drawings

Drawing No.	Drawing Title
System	
VAL-800-0009	Vehicle Layout
VAL-800-0004	System Wiring Diagram
ROV	
VAL-400-5400	Comm's Pod Layout
VAL-400-5401	Comm's Pod Wiring Schematic
VAL-400-5402	Power Pod Layout Schematic
VAL-400-5403	Power Pod Wiring Schematic
VAL-500-5400	SCU Schematic Drawing
VAL-400-5107	VALOR Dual LED Lamp Assembly
VAL-400-5109	VALOR User Port to GigE Camera
VAL-400-5120	VALOR Power Pod Fibre Hose Assy
VAL-400-5300	VALOR Long Line Schematic
VAL-PCB-001-SCH	Comm's/Controls PCB Schematic
VAL-PCB-001-LAS	Comm's/Controls PCB Layout
VAL-PCB-USP-001-SCH	U.S.P. Schematic
VAL- PCB-USP-001-LAS	U.S.P. Board Layout
VAL-PCB-003-SCH	Power Pod Termination PCB Schematic
VAL-PCB-003-LAS	Power Pod Termination PCB Layout

REF ST-A3-ACAD TEMPLATE REV 1

IF IN DOUBT, ASK, DO NOT SCALE



NOTES:
1. REFER TO POWER POD LAYOUT SCHEMATIC AND WIRING SCHEMATIC FOR SPECIFIC POWER POD DETAILS.
2. REFERE TO COMMS POD LAYOUT SCHEMATIC AND WIRING SCHEMATIC FOR SPECIFIC COMMS POD CONFIGURATION..

REV	DRWN	CHKD	APRD	DATE	DESCRIPTION
A	-	-	-	-	FOR COMMENT ONLY

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ISSUE A

TITLE: VALOR ROV LAYOUT SCHEMATIC

SIZE: A3

PROJECT: VALOR ROV

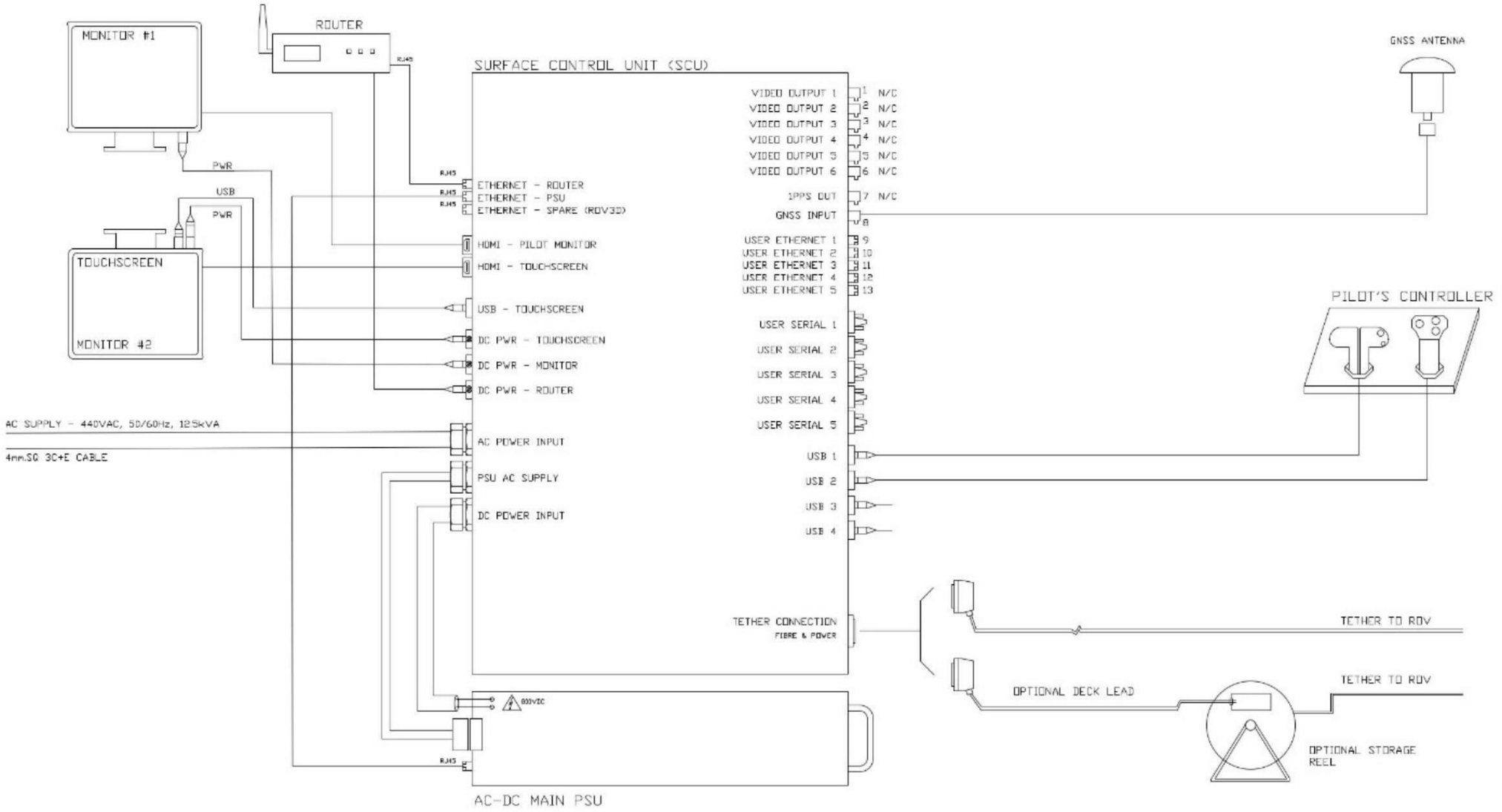
DWG. NO.: VAL-800-0009

FILE NO : VAL-800-0009.DWG

SHEET 1 OF 1

REF ST-A3-ACAD TEMPLATE REV 1

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NOTES:
1.

REV	DRWN	CHKD	APRD	DATE	DESCRIPTION
1	BDW	JNC	DDW	5/19/2021	INITIAL RELEASE
A	BDW	-	-	01/07/2019	NOT RELEASED - INFORMATION ONLY

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ISSUE 1

TITLE: VALOR SCU HOOKUP DIAGRAM

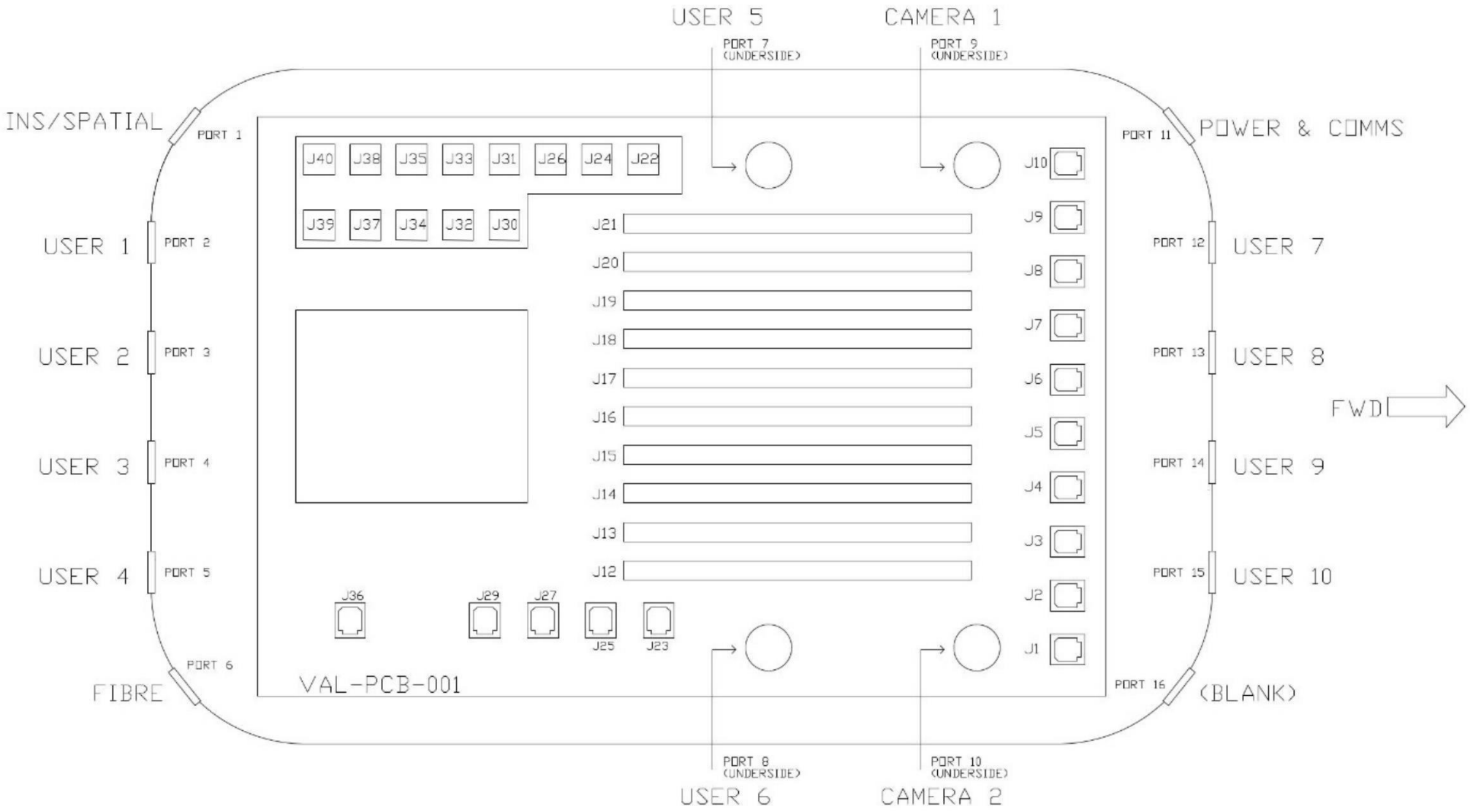
SIZE	PROJECT	DWG. NO.
A3	VALOR	VAL-800-0004

FILE NO : VAL-800-0004

SHEET 1 OF 1

REF ST-A3-ACAD TEMPLATE REV 1

IF IN DOUBT, ASK, DO NOT SCALE



NOTES:
1.

REV	DRWN	CHKD	APRD	DATE	DESCRIPTION
1	JNE	DDW	JNE	16/01/2020	INITIAL RELEASE

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ISSUE 1

TITLE: VALOR COMMS POD LAYOUT SCHEMATIC

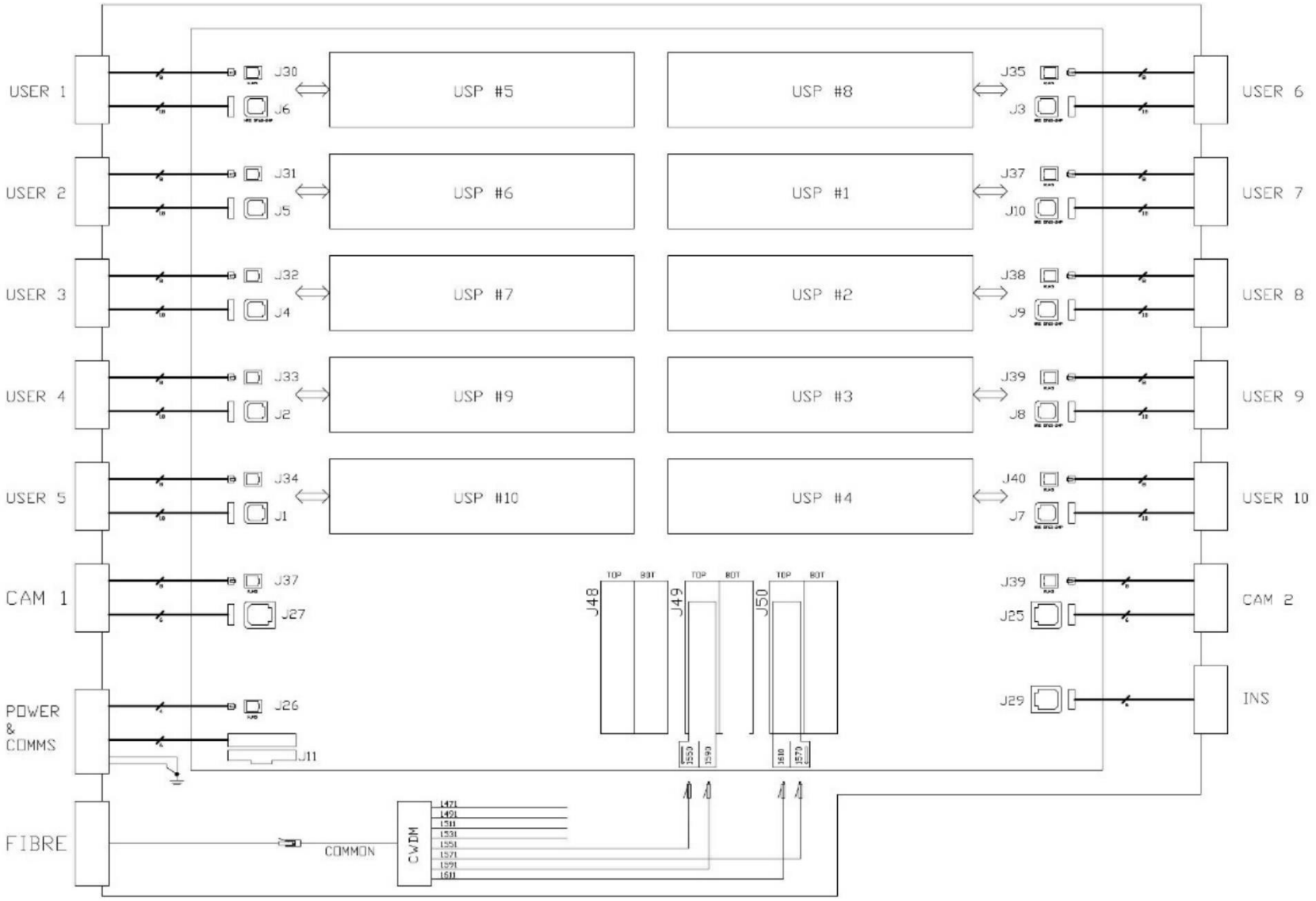
SIZE	PROJECT	DWG. NO.
A3	VALOR ROV	VAL-400-5400

FILE NO : VAL-400-5400.DWG

SHEET 1 OF 1

REF ST-A3-ACAD TEMPLATE REV 1

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REV	DRWN	CHKD	APRD	DATE	DESCRIPTION
1	JNE	DDW	JNE	16/01/2020	INITIAL RELEASE

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ISSUE 1

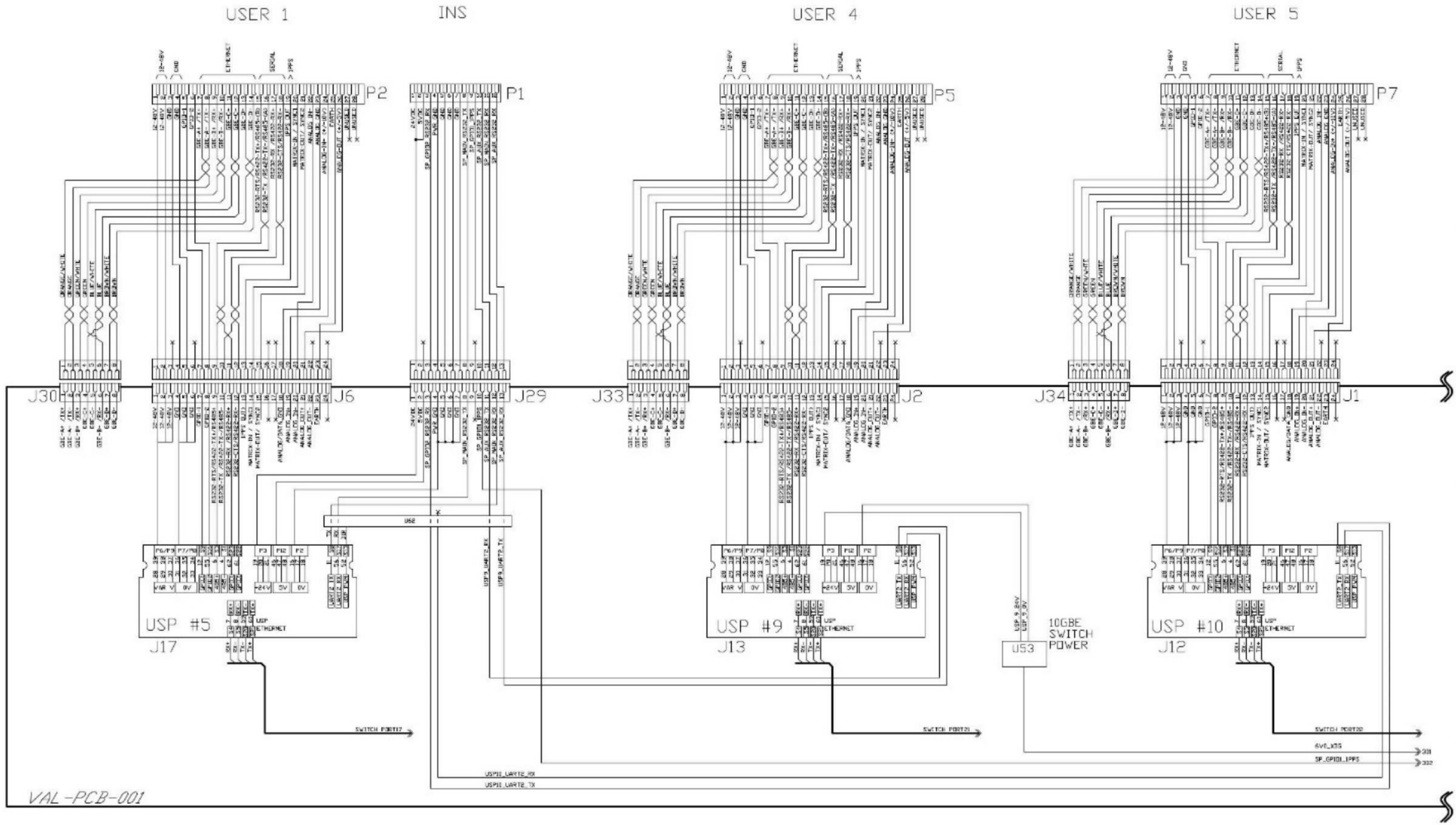
TITLE: COMMS POD WIRING SCHEMATIC

SIZE: A3 | PROJECT: VALOR ROV | DWG. NO. VAL-400-5401

FILE NO : VAL-400-5401.DWG | SHEET 1 OF 6

REF ST-A3-ACAD TEMPLATE REV 1

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NOTE:
1. ALL USER PORTS ARE WIRED IDENTICALLY.
2. ALL CAMERA PORTS ARE WIRED IDENTICALLY.

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ISSUE 1

TITLE: COMMS POD WIRING SCHEMATIC

SIZE: A3

PROJECT: VALOR ROV

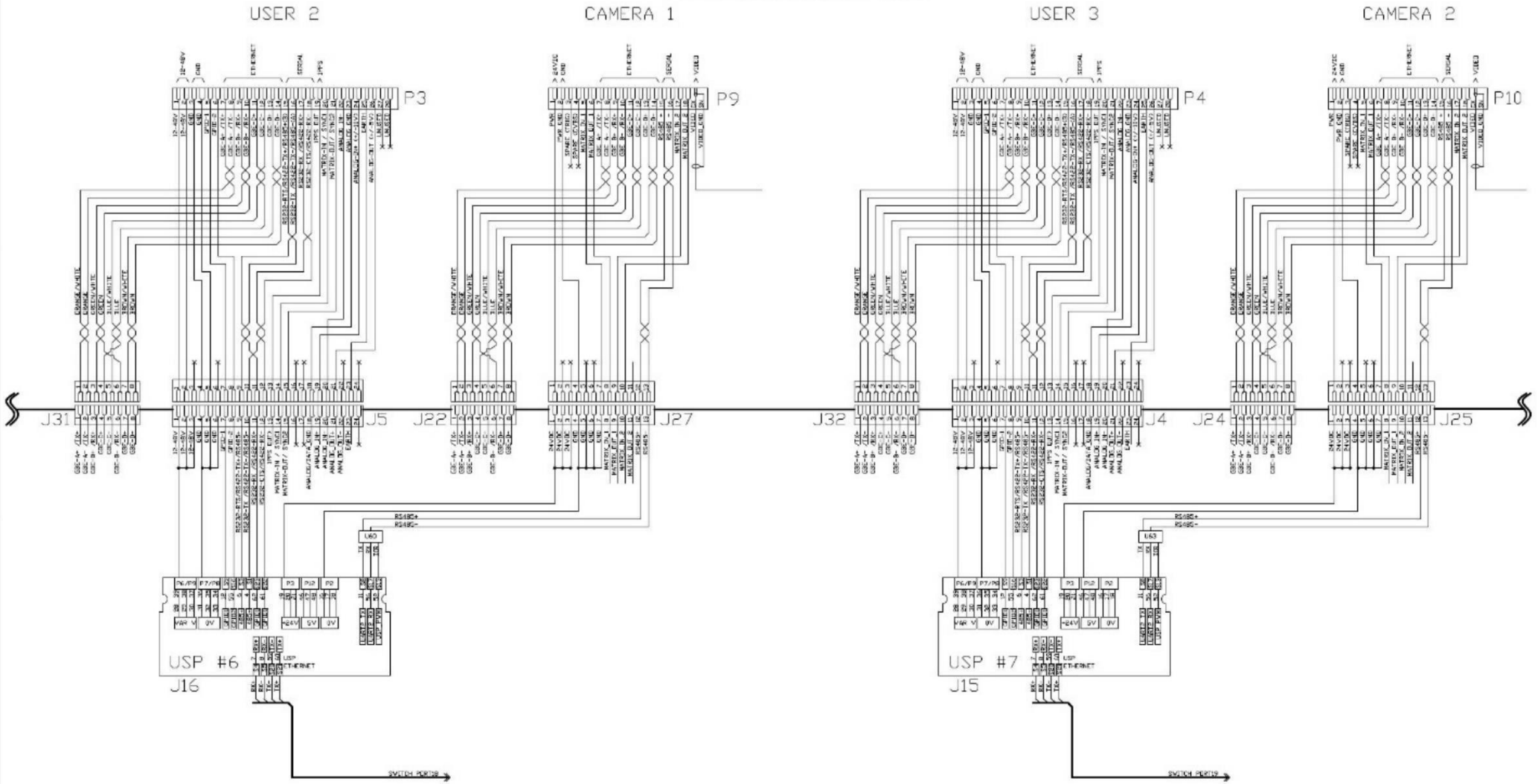
DWG. NO. VAL-400-5401

FILE NO : VAL-400-5401.DWG

SHEET 2 OF 6

REF ST-A3-ACAD TEMPLATE REV 1

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NOTE:
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ISSUE 1

TITLE: COMMS POD WIRING SCHEMATIC

SIZE: A3

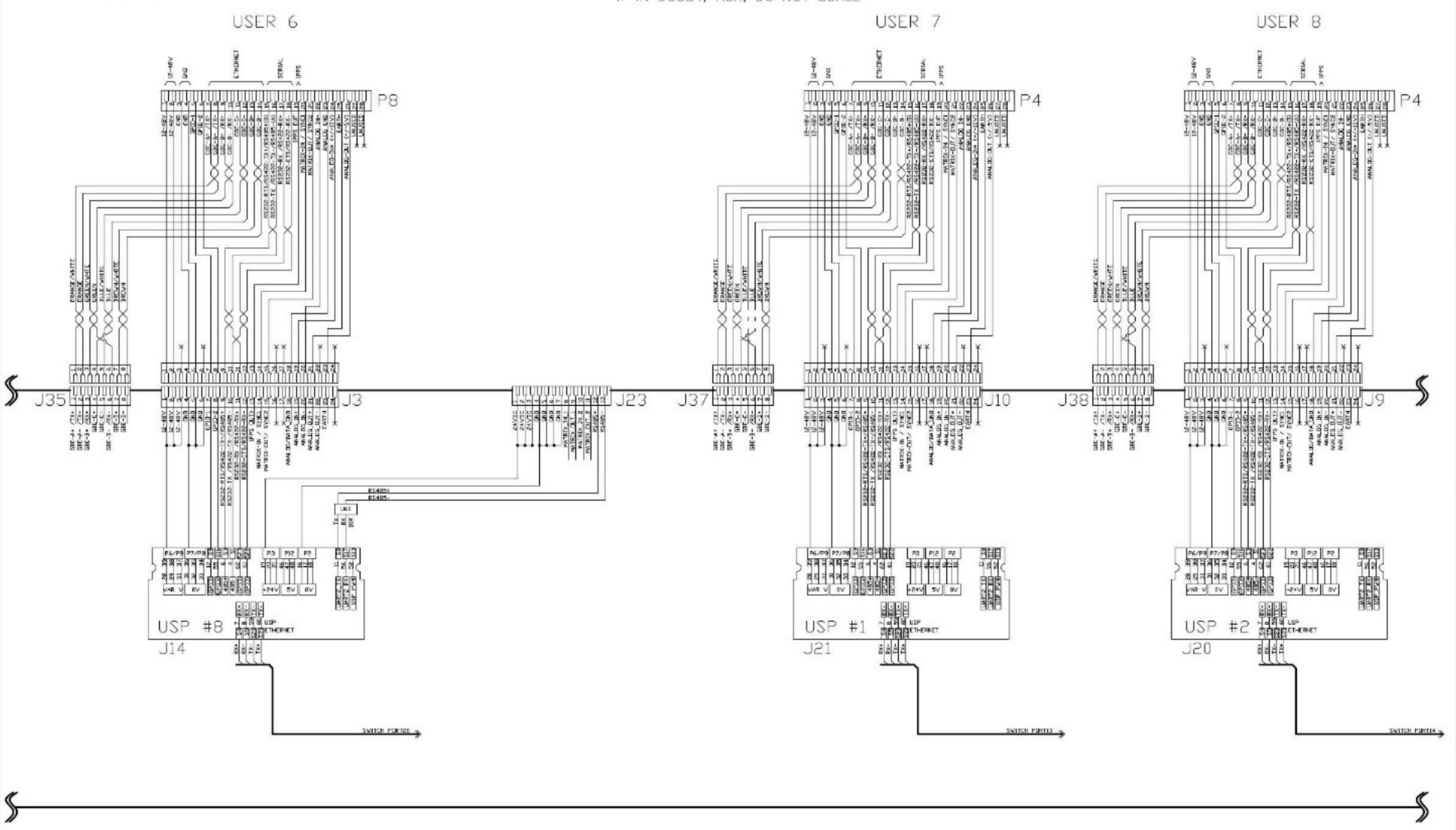
PROJECT: VALOR ROV

DWG. NO. VAL-400-5401

FILE NO : VAL-400-5401.DWG

REF ST-A3-ACAD TEMPLATE REV 1

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NOTE:
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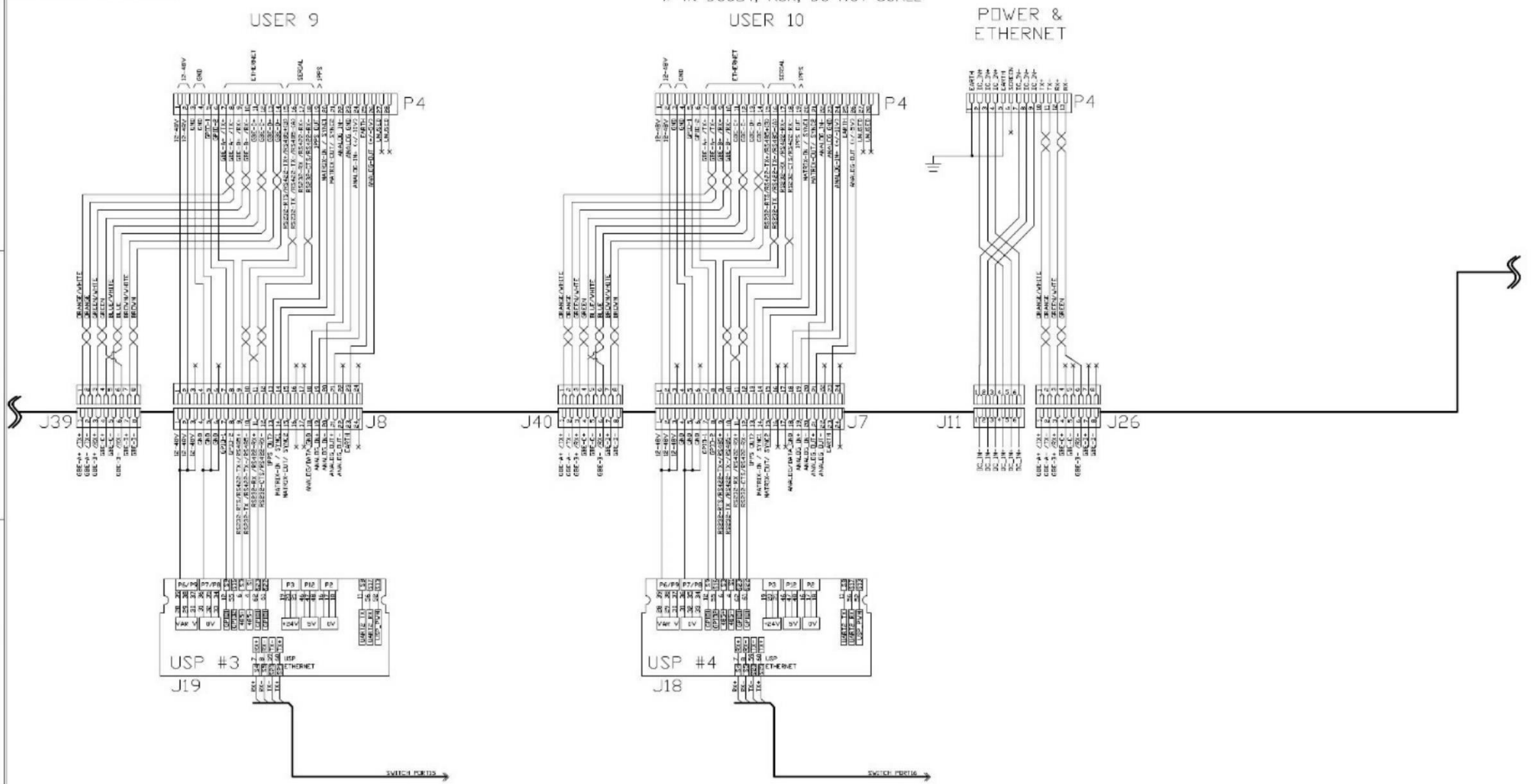
TITLE: COMMS POD WIRING SCHEMATIC

SIZE: A3 | PROJECT: VALOR ROV | DWG. NO. VAL-400-5401

FILE NO : VAL-400-5401.DWG | SHEET 4 OF 6

REF ST-A3-ACAD TEMPLATE REV 1

IF IN DOUBT, ASK, DO NOT SCALE



NOTE:
1. ALL USER PORTS ARE WIRED IDENTICALLY.
2. ALL CAMERA PORTS ARE WIRED IDENTICALLY.

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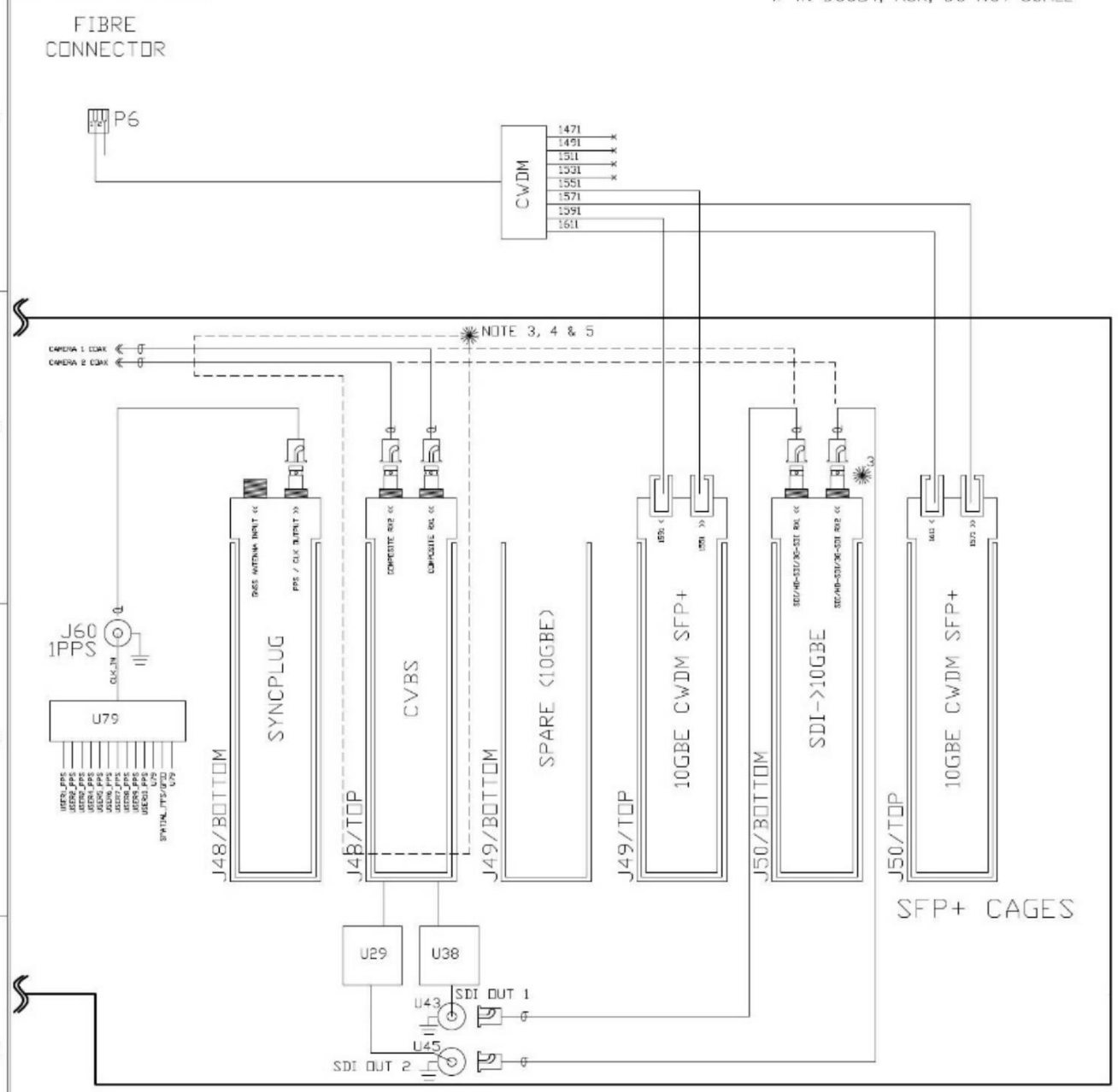
TITLE: COMMS POD WIRING SCHEMATIC

SIZE: A3 | PROJECT: VALOR ROV | DWG. NO. VAL-400-5401

FILE NO : VAL-400-5401.DWG | SHEET 5 OF 6

REF ST-A3-ACAD TEMPLATE REV 1

IF IN DOUBT, ASK, DO NOT SCALE



NOTE:

1. ALL USER PORTS ARE WIRED IDENTICALLY.
2. ALL CAMERA PORTS ARE WIRED IDENTICALLY.
3. OPTIONAL MODULE. MAY NOT BE FITTED.
4. IF USING COMPOSITE (CVBS) CAMERAS, THEY MUST BE CONNECTED TO THE DEDICATED CAMERA PORT(S). ALSO THE CVBS-SFP MODULE MUST BE FITTED TO J48/TOP (AND THE CAMERA PORT COAX CONNECTION MADE TO IT).
5. IF USING HD CAMERAS (DIGITAL OUTPUT) THEN A DEDICATED CAMERA PORT MUST BE USED AND THE COAX LINE CONNECTED T
6. A STANDARD VALOR (5-PORT) SYSTEM WILL ONLY HAVE USER PORTS 1 TO 5 FITTED AND CORRESPONDING USP MODULES 5, 6, 7, 9 AND 10.
7. A ELITE (10-PORT) SYSTEM WILL HAVE ALL USP MODULES AND USER BULKHEADS FITTED.
8. AS STANDARD, VALOR HAS GIG-E CAMERAS FITTED. THESE CAN USE ANY 1GB ETHERNET CONNECTION (E.G. CAMERA PORT OR USER PORT).

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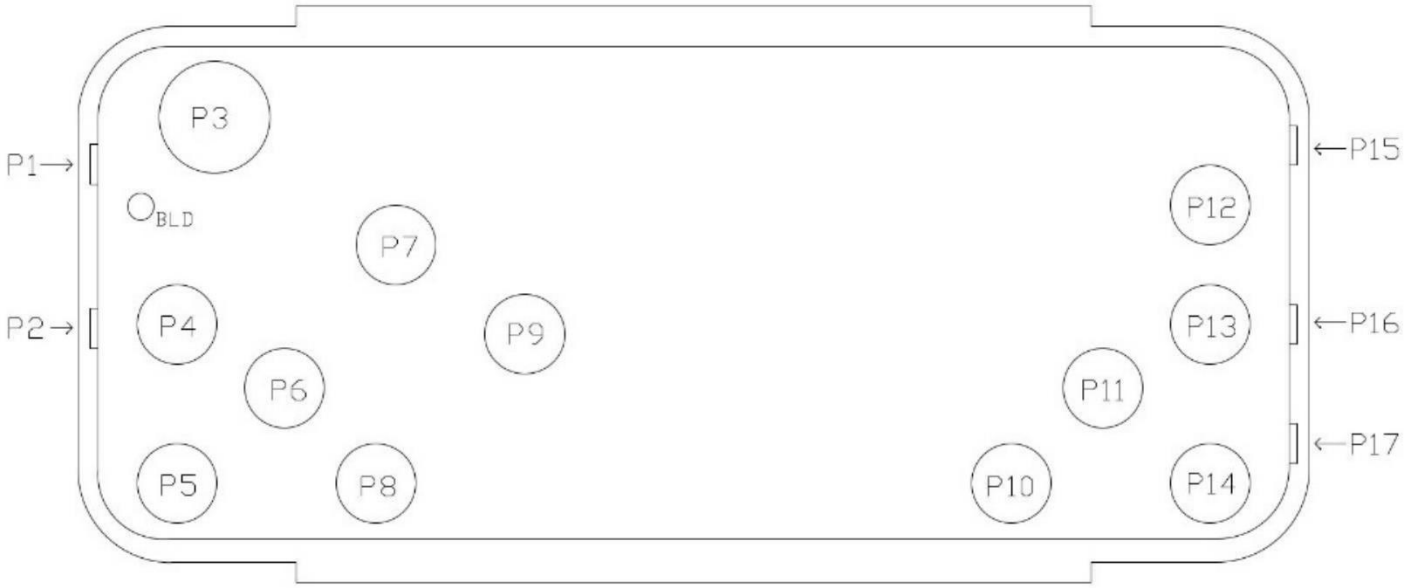
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ISSUE 1

TITLE: COMMS POD WIRING SCHEMATIC

SIZE: A3 | PROJECT: VALOR ROV | DWG. NO. VAL-400-5401

FILE NO : VAL-400-5401.DWG | SHEET 6 OF 6



CONNECTOR DESIGNATION

PORT #	FUNCTION	SIZE	CONNECTOR
1	BLANK (AUX PWR)	1/2" NPT	VAL-950-5003
2	PORT VERT	5/8"-18 UNF	BRA09F090022LPT10
3	TETHER IN	3/4" NPT	VAL-600-5000
4	COMMS AND POWER	5/8"-18 UNF	VAL-600-5101
5	LIGHTS 2	5/8"-18 UNF	VAL-600-5017 (ADAPTER) VAL-600-5016
6	PORT FORWARD	5/8"-18 UNF	BRA09F090022LPT10
7	FIBRE	5/8"-18 UNF	MC1569
8	PORT AFT	5/8"-18 UNF	BRA09F090022LPT10
9	BLANK	5/8"-18 UNF	MC1569

PORT #	FUNCTION	SIZE	CONNECTOR
10	STBD AFT	5/8"-18 UNF	BRA09F090022LPT10
11	STBD FWD	5/8"-18 UNF	BRA09F090022LPT10
12	VACUUM PORT	5/8"-18 UNF	VAL-400-0007
13	TILT	5/8"-18 UNF	BRA07F09002208
14	LIGHTS 1	5/8"-18 UNF	VAL-600-5017 (ADAPTER) VAL-600-5016
15	BLANK	5/8"-18 UNF	MC1569
16	STBD VERT	5/8"-18 UNF	BRA09F090022LPT10
17	BLANK	5/8"-18 UNF	MC1569

REV	DRWN	CHKD	APRD	DATE	DESCRIPTION
1	BDW	JNE	ABL	18/11/2019	INITIAL RELEASE FOR PRODUCTION

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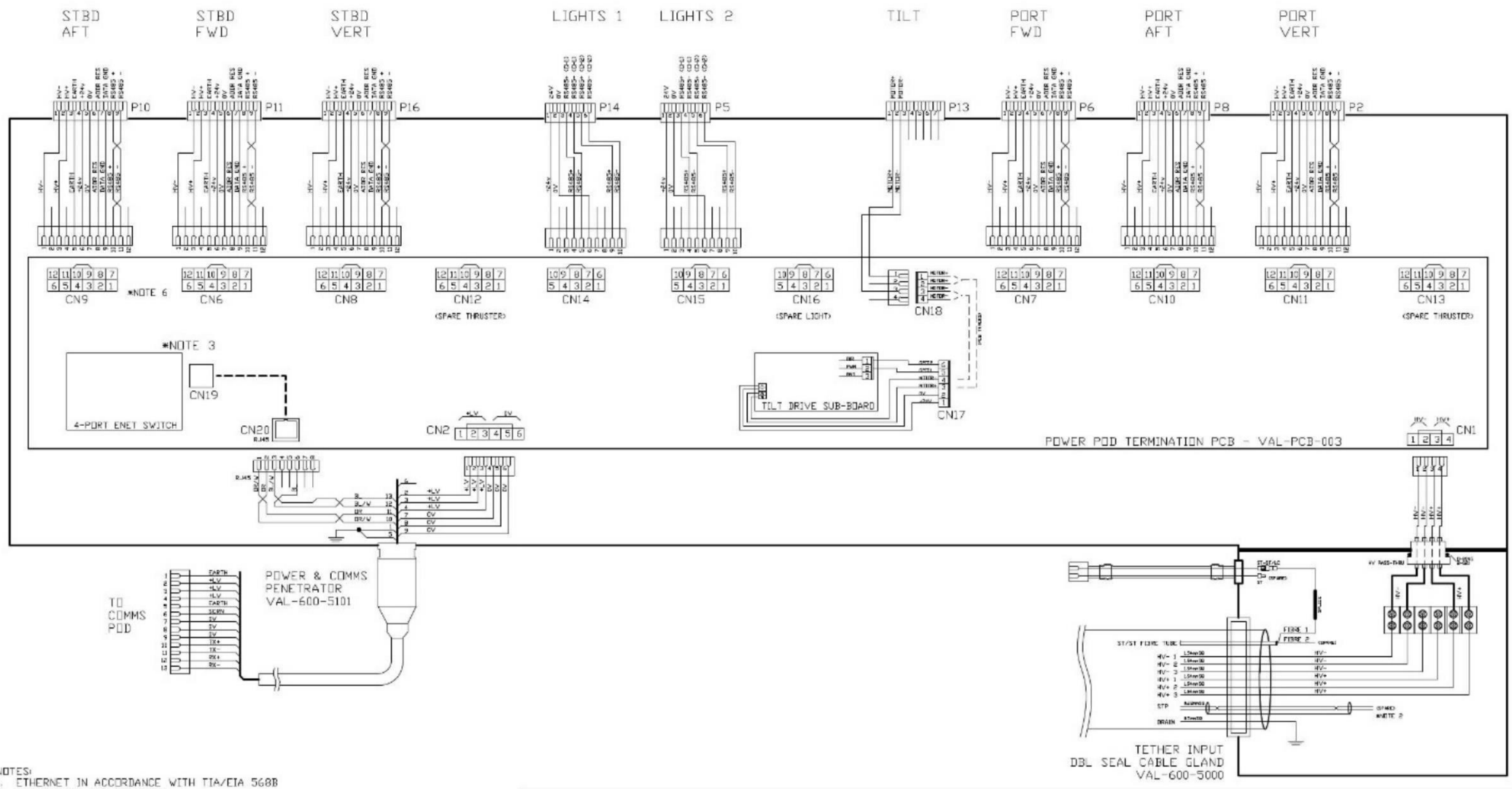
TITLE: POWER POD LAYOUT SCHEMATIC

SIZE: A3 | PROJECT: VALOR | DWG. NO. VAL-400-5402

FILE NO: VAL-400-5402.DWG | SHEET 1 OF 1

REF ST-A3-ACAD TEMPLATE REV 1

IF IN DOUBT, ASK, DO NOT SCALE



NOTES:
1. ETHERNET IN ACCORDANCE WITH TIA/EIA 568B
2. HEATSHRINK AND TIE BACK.
3. SEE SHEET 2 FOR ETHERNET HEADER PIN-OUT
4. PRE WIRED CONNECTOR TAILS ARE PROVIDED WITH THE BOARD. ALTERNATIVELY USE RS: 125-0734 FOR ENET AND RS: 125-0724 FOR POWER CONNECTIONS.
5. SEE SHEET 2 FOR USP FUNCTION MAPPING.
6. THRUSTER AND LIGHT CONNECTOR PINOUTS ARE SHOWN AS REAR (CRIMP) SIDE VIEW OF HEADER PLUG.

REV	DRWN	CHKD	APRD	DATE	DESCRIPTION
1	BDW	DSM	BDW	21/02/2020	FIRST RELEASE

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ISSUE A

TITLE: POWER POD LAYOUT AND WIRING SCHEMATIC

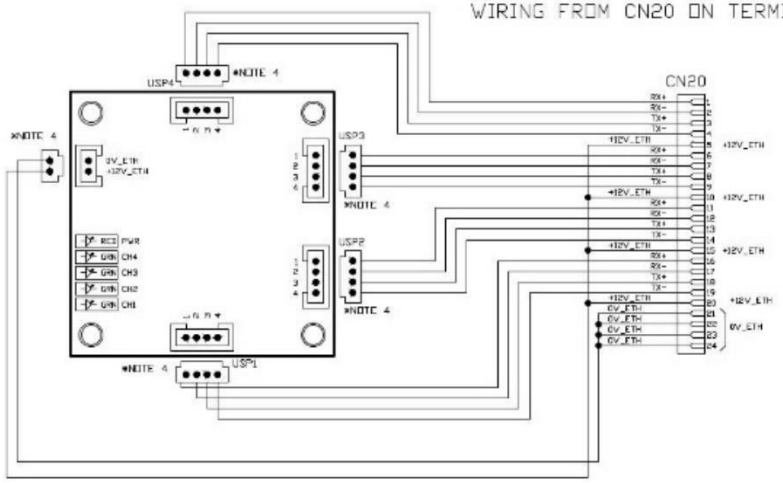
SIZE: A3 | PROJECT: VALOR | DWG. NO.: VAL-400-5403

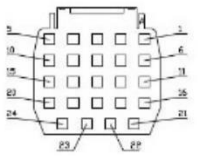
FILE NO: VAL-400-5403.DWG | SHEET 1 OF 2

REF ST-A3-ACAD TEMPLATE REV 1

IF IN DOUBT, ASK, DO NOT SCALE

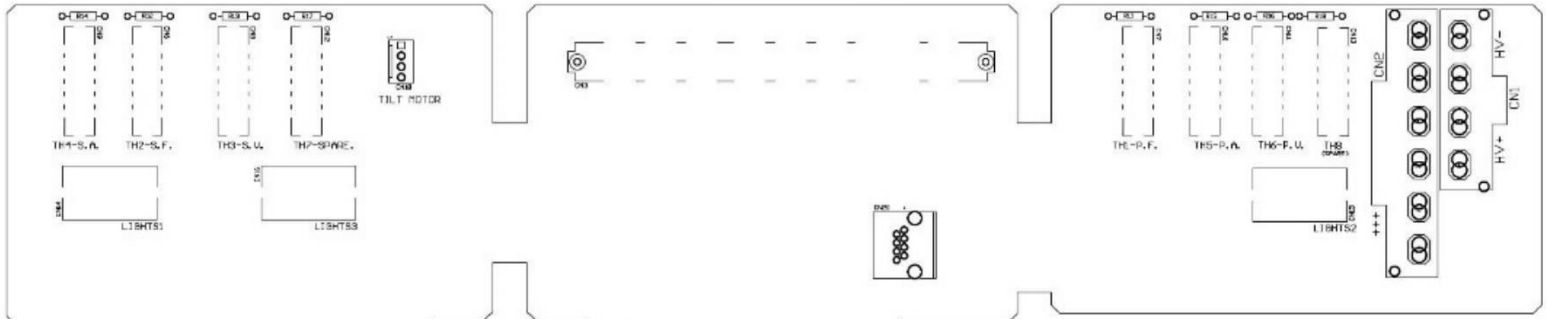
WIRING FROM CN20 ON TERMINATION BOARD TO ETHERNET SWITCH

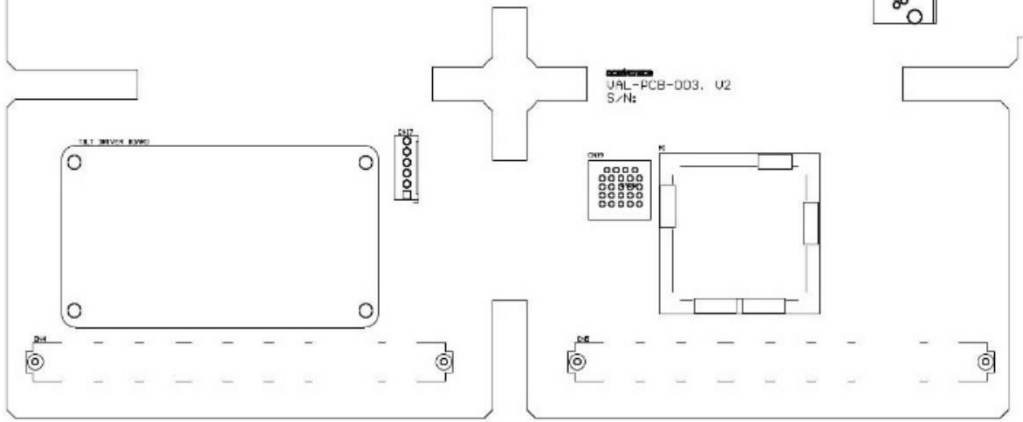




REAR (CRIMP) SIDE VIEW OF MATING SOCKET
(MATES TO CN20)
PART REF:
HRS DF62B-24S-2.2C (SOCKET)
HRS DF62-22SC (CRIMPS)

USP #1
ADDRESS 18





USP #1
VARIABLE VOUT - LIGHTS #3 SUPPLY (SET AT +24VDC)
FIXED VOUT - THRUSTERS LV SUPPLY (+24VDC)
SERIAL CHANNEL 1 - THRUSTERS (RS485 / 57k6 BAUD)
SERIAL CHANNEL 2 - SPARE
GPIO 1 - NOT USED
GPIO 2 - LIGHTS #3 RS485 TERMINATION

USP #2
VARIABLE VOUT - LIGHTS #2 SUPPLY (SET AT 24VDC)
FIXED VOUT - LIGHTS #1 SUPPLY (+24VDC)
SERIAL CHANNEL 1 - LIGHTS #1 (RS485 / 9600 BAUD)
SERIAL CHANNEL 2 - SPARE
GPIO 1 - NOT USED
GPIO 2 - NOT USED

USP #3
VARIABLE VOUT - TILT DRIVER SUPPLY
FIXED VOUT - SPARE
SERIAL CHANNEL 1 - LIGHTS #2 (RS485 / 9600 BAUD)
SERIAL CHANNEL 2 - LIGHTS #3 (RS485 / 9600 BAUD)
GPIO 1 - TILT SPEED
GPIO 2 - TILT DIRECTION

USP #2
ADDRESS 38

USP #3
ADDRESS 28

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ISSUE: A

TITLE: POWER POD LAYOUT AND WIRING SCHEMATIC

SIZE: A3

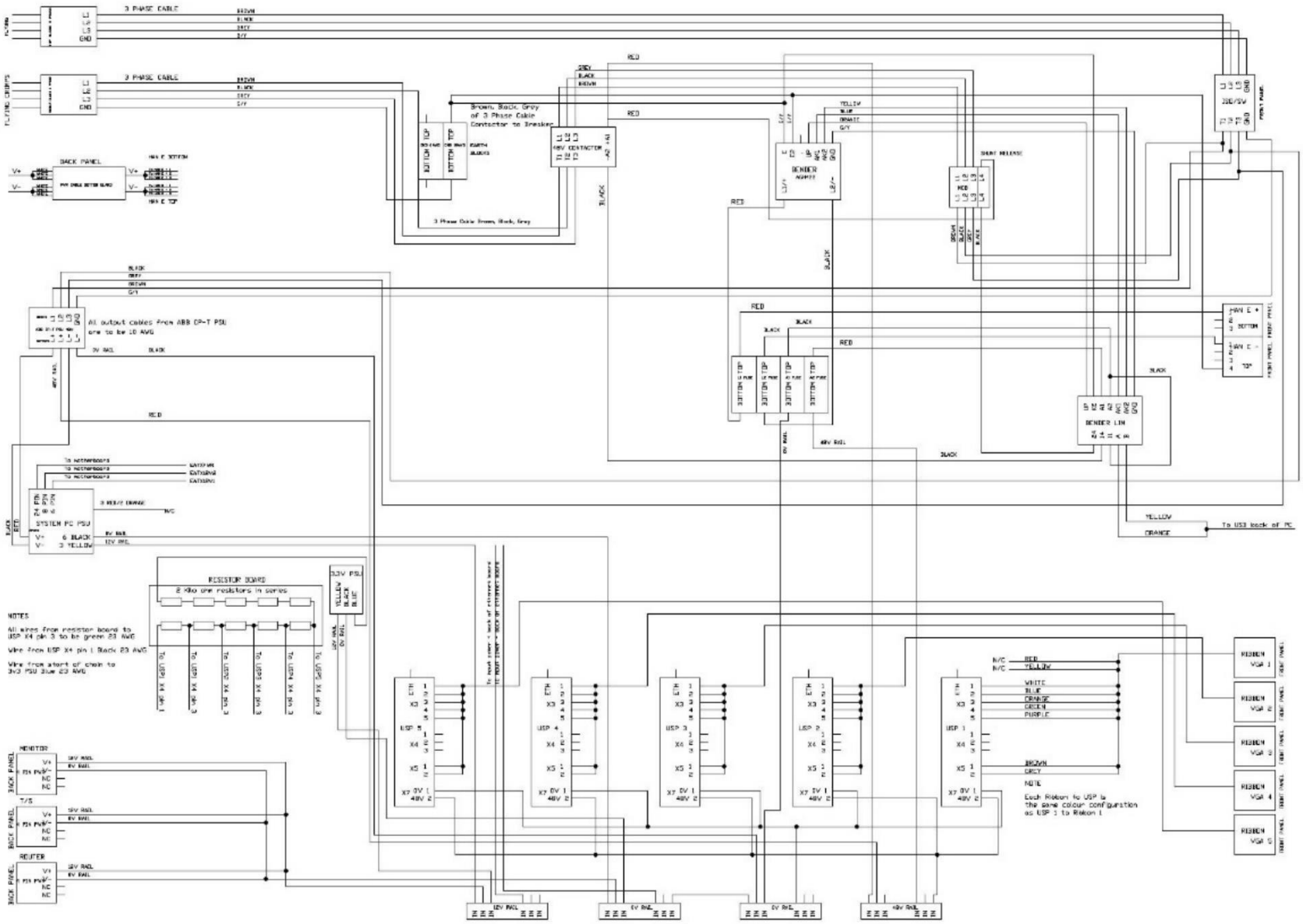
PROJECT: VALOR ROV

DWG. NO.: VAL-400-5403

FILE NO : VAL-400-5403

REF ST-A3-ACAD TEMPLATE REV 1
TARGET 11 SCALE BOUNDARY.

IF IN DOUBT, ASK, DO NOT SCALE



REV	DRWN	CHKD	APRD	DATE	DESCRIPTION
1	JNE	DDW	JNE	01/06/2021	INITIAL RELEASE FOR COMMENT

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ISSUE 1

TITLE: SCU ELECTRONICS WIRING SCHEMATIC

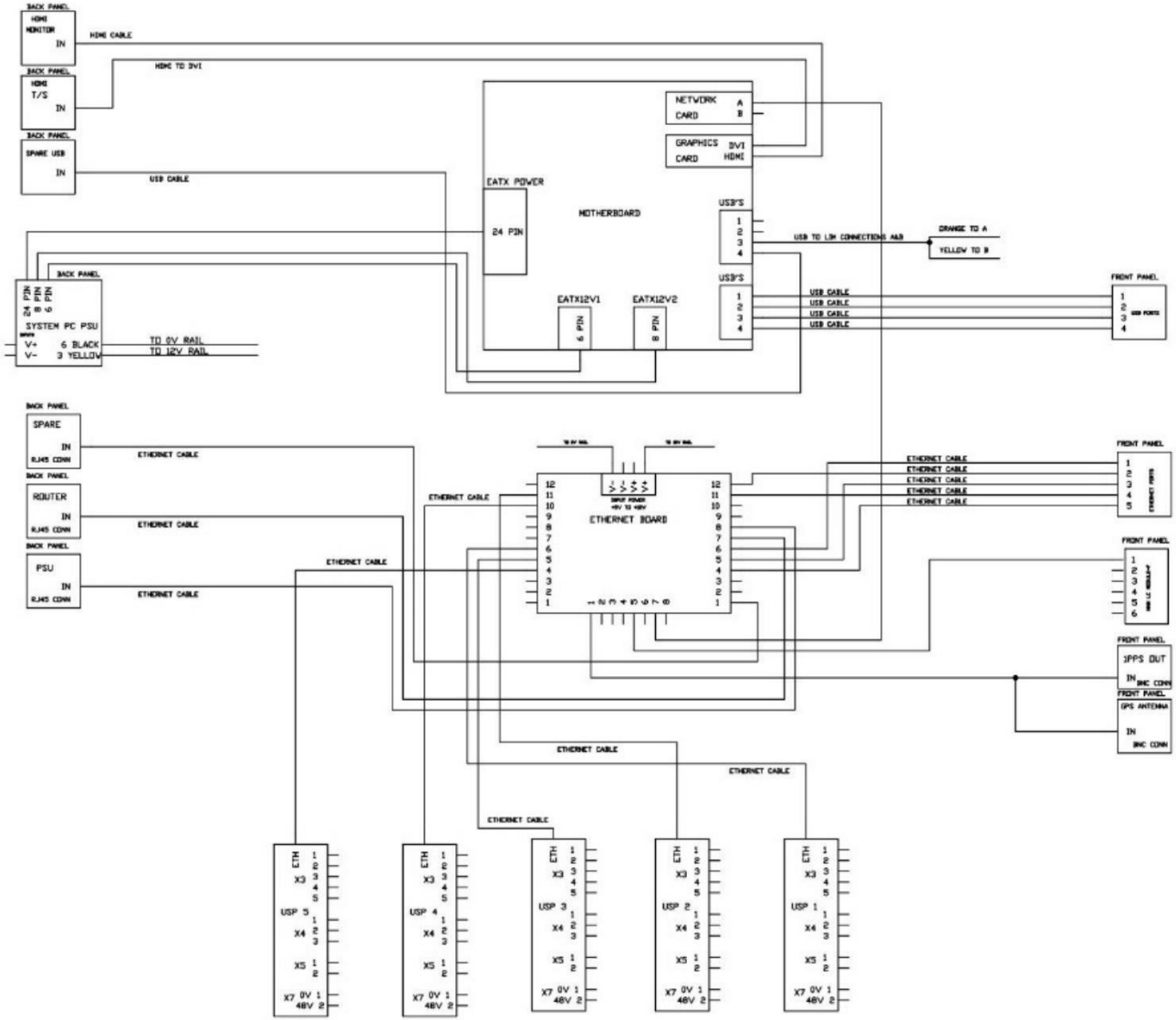
SIZE	PROJECT	DWG. NO.
A3	VALOR ROV	VAL-500-5400

FILE NO : VAL-500-5400.DWG

SHEET 1 OF 2

REF ST-A3-ACAD TEMPLATE REV 1

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REV	DRWN	CHKD	APRD	DATE	DESCRIPTION
1	JNE	DDW	JNE	01/06/2021	INITIAL RELEASE FOR COMMENT

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ISSUE 1

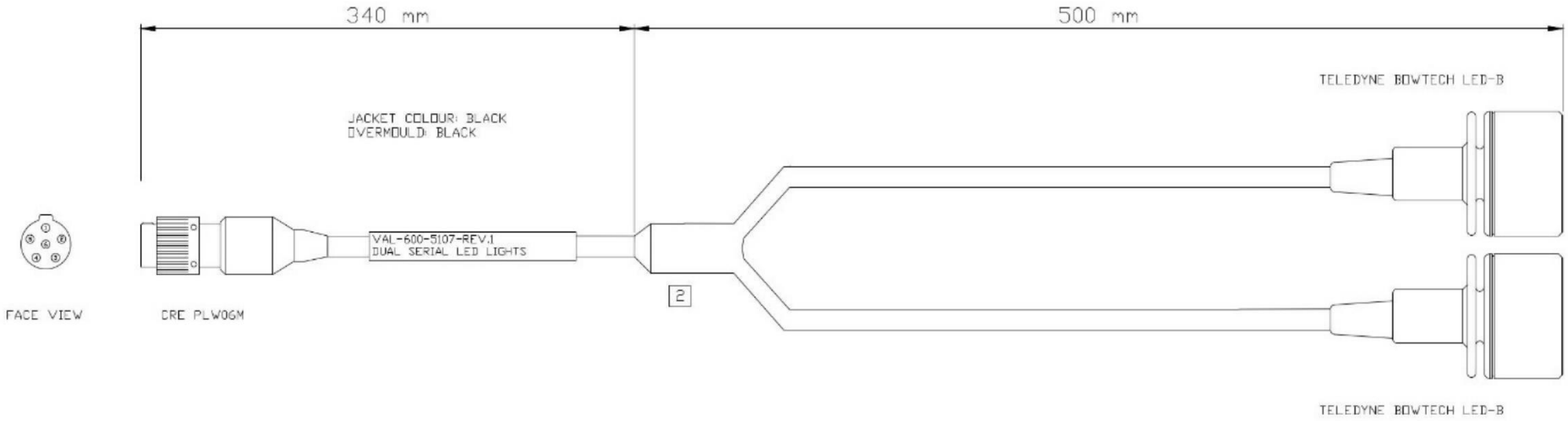
TITLE: SCU ELECTRONICS WIRING SCHEMATIC

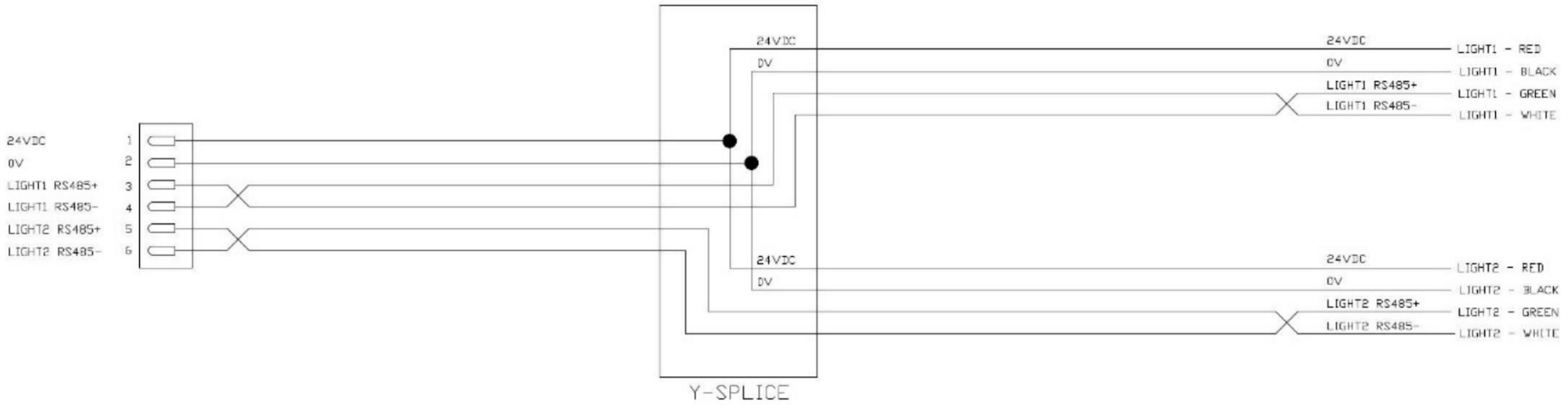
SIZE	PROJECT	DWG. NO.
A3	VALOR ROV	VAL-500-5400

FILE NO : VAL-500-5400.DWG

REF ST-A3-ACAD TEMPLATE REV 1

IF IN DOUBT, ASK, DO NOT SCALE





NOTES:
1. OVERALL CABLE ASSEMBLY SHOULD BE RATED FOR 1000MSW OPERATION MINIMUM
2. JACKET COLOUR: BLACK
   OVERMOULDING: BLACK

REV	DRWN	CHKD	APRD	DATE	DESCRIPTION
1	JNE	DDW	JNE	16/01/2020	INITIAL RELEASE

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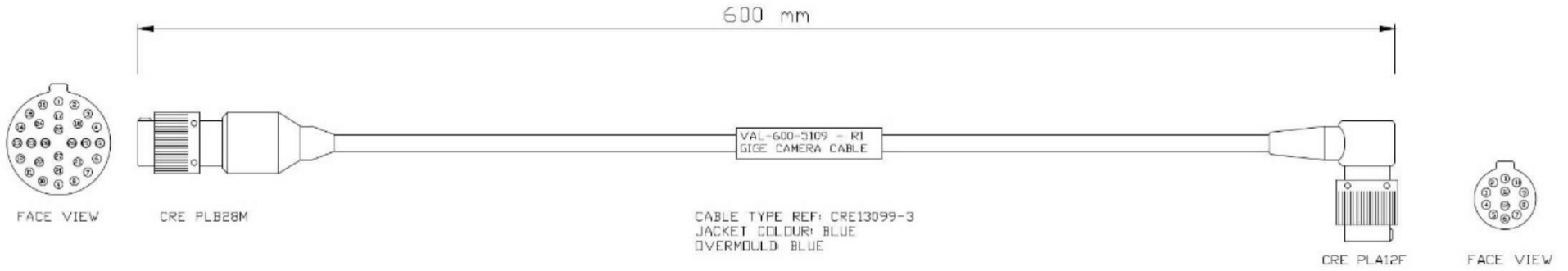
TITLE: VALOR DUAL LED LIGHTS CABLE ASSEMBLY

SIZE: A3 | PROJECT: VALOR ROV | DWG. NO.: VAL-600-5107

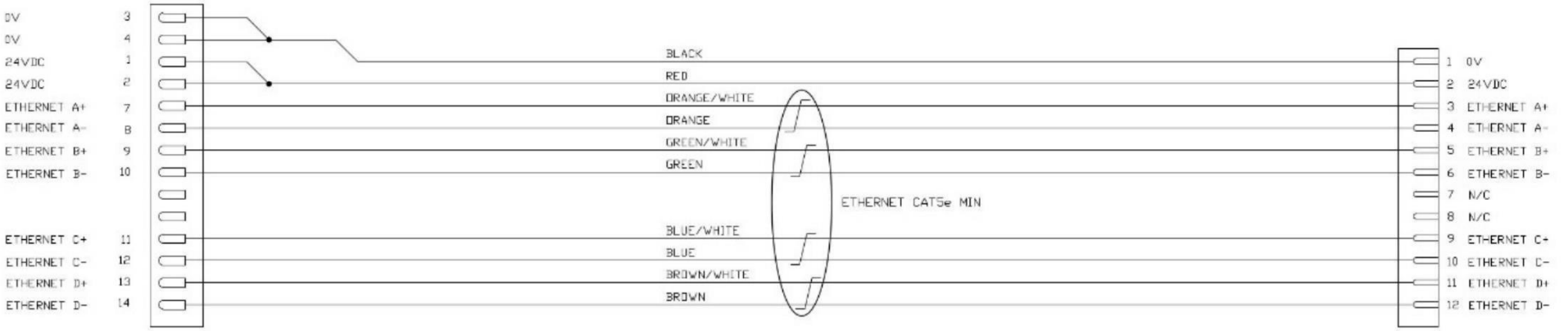
FILE NO : VAL-600-5107.DWG | SHEET 1 OF 1

REF ST-A3-ACAD TEMPLATE REV 1

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PLEASE NOTE THAT PINS ARE NOT IN NUMERICAL ORDER



UNLISTED PIN NUMBERS = N/C

NOTES:
1. ETHERNET CABLING SHOULD BE CAT6 OR CAT5e MINIMUM.
2. MAINTAIN THE TWIST IN THE ETHERNET PAIRS AS MUCH AS POSSIBLE
3. OVERALL CABLE ASSEMBLY SHOULD BE RATED FOR 1000MSW OPERATION MINIMUM

REV	DRWN	CHKD	APRD	DATE	DESCRIPTION
1	BDW	JNE	BDW	02/12/2018	INITIAL RELEASE (XFRD FROM VAL-CAB-00034)

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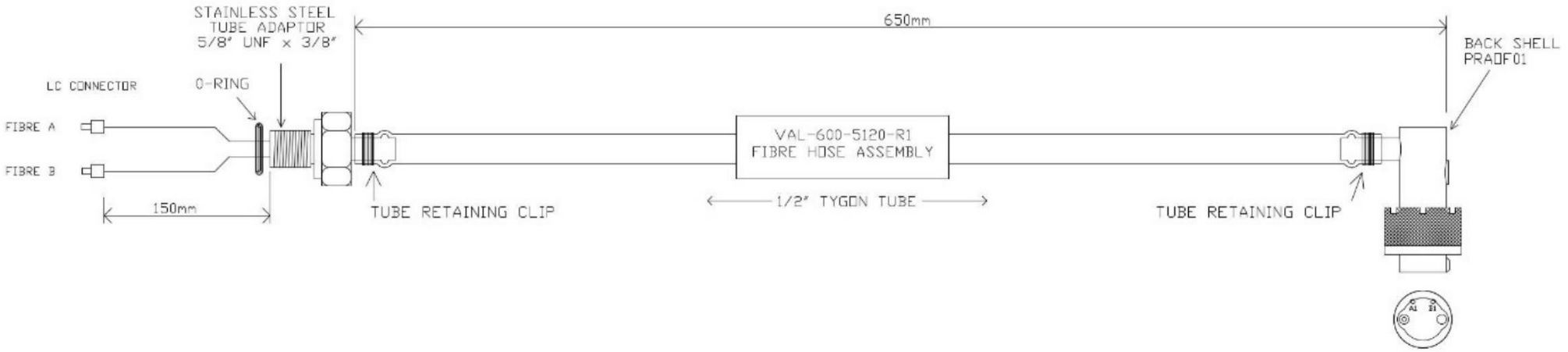
TITLE: VALOR USER PORT TO TELEDYNE GigE CAMERA CABLE

SIZE: A3 | PROJECT: VALOR ROV | DWG. NO.: VAL-600-5109

FILE NO : VAL-600-5109.DWG | SHEET 1 OF 1

REF ST-A3-ACAD TEMPLATE REV 1

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REV	DRWN	CHKD	APRD	DATE	DESCRIPTION
1	DDW	JNE	DDW	21/05/2020	INITIAL RELEASE FOR PRODUCTION

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ISSUE 1

TITLE: VALOR FIBRE HOSE ASSEMBLY POWER POD TO COMMS POD

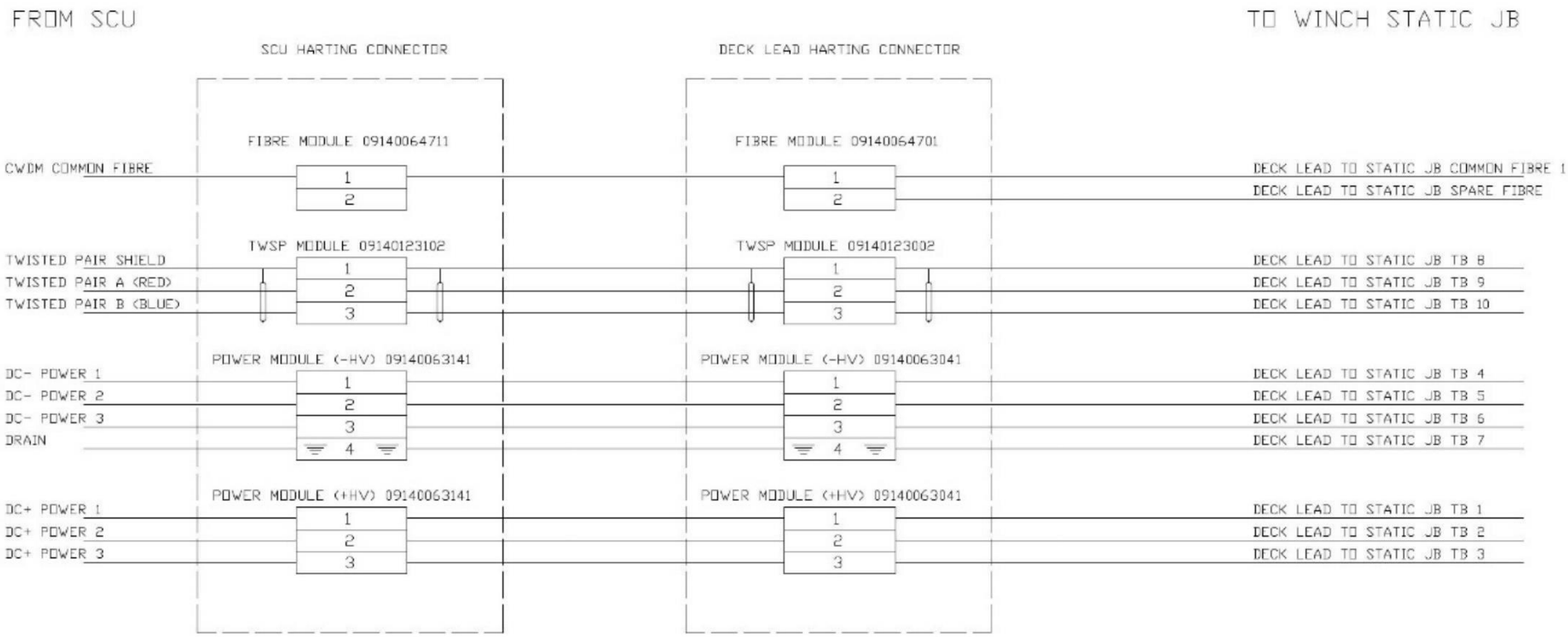
SIZE	PROJECT	DWG. NO.
A3	VALOR	VAL-600-5120

FILE NO : VAL-600-5120.DWG

SHEET 1 OF 1

REF ST-A3-ACAD TEMPLATE REV 1

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REV	DRWN	CHKD	APRD	DATE	DESCRIPTION
2	DDW	JNE	DDW	3/15/2021	ECR-862 (SHEET 3 CHANGES AND TITLE BLOCK)
1	DDW	JNE	DDW	02/03/2021	FIRST RELEASE

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ISSUE 2

TITLE: VALOR SYSTEM LONG LINE DRAWING – SCU TERMINATION

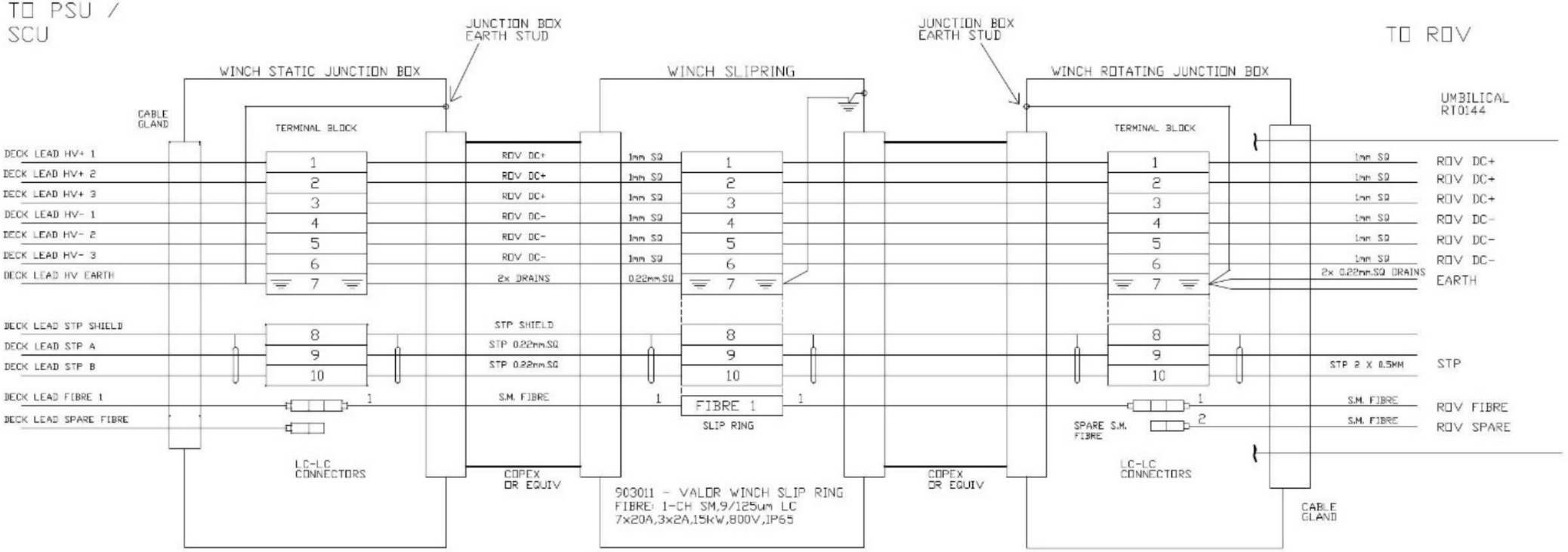
SIZE	PROJECT	DWG. NO.
A3	VALOR ROV	VAL-500-5300

FILE NO: VAL-500-5300.DWG

SHEET 1 OF 3

REF ST-A3-ACAD TEMPLATE REV 1

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NOTES:

1. TERMINALS 1-7 - MUST BE RATED TO 1000VDC OPERATION.
2. TERMINALS 8-10 = 300V TERMINAL

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ISSUE 2

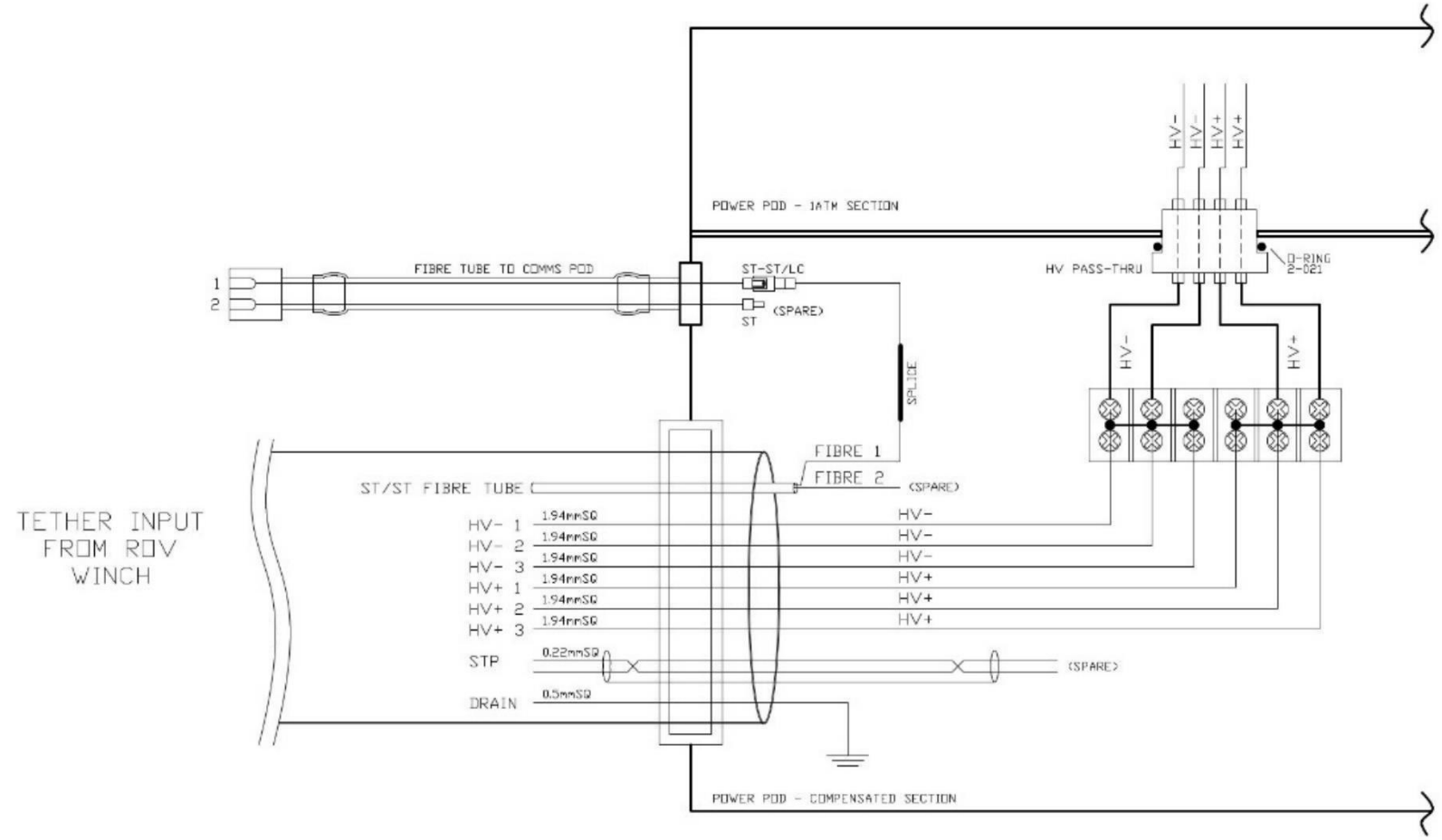
TITLE: VALOR SYSTEM LONG LINE DRAWING - WINCH SCHEMATIC

SIZE	PROJECT	DWG. NO.
A3	VALOR ROV	VAL-500-5300

FILE NO : VAL-500-5300.DWG

REF ST-A3-ACAD TEMPLATE REV 1

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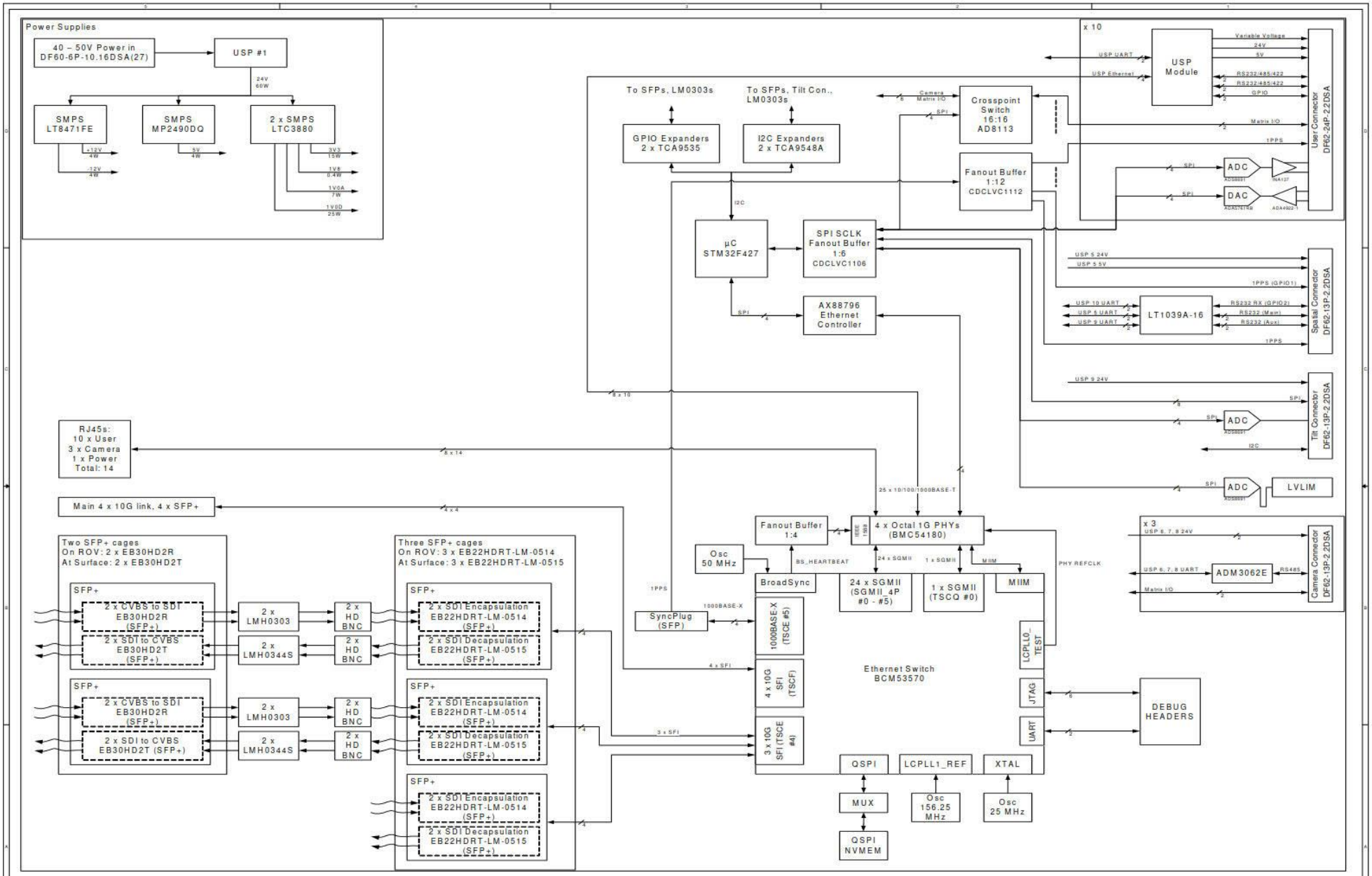
ISSUE 2

TITLE: VALOR SYSTEM LONG LINE DRAWING – POWER POD TERMINATION

SIZE	PROJECT	DWG. NO.
A3	VALOR ROV	VAL-500-5300

FILE NO : VAL-500-5300.DWG

SHEET 3 OF 3

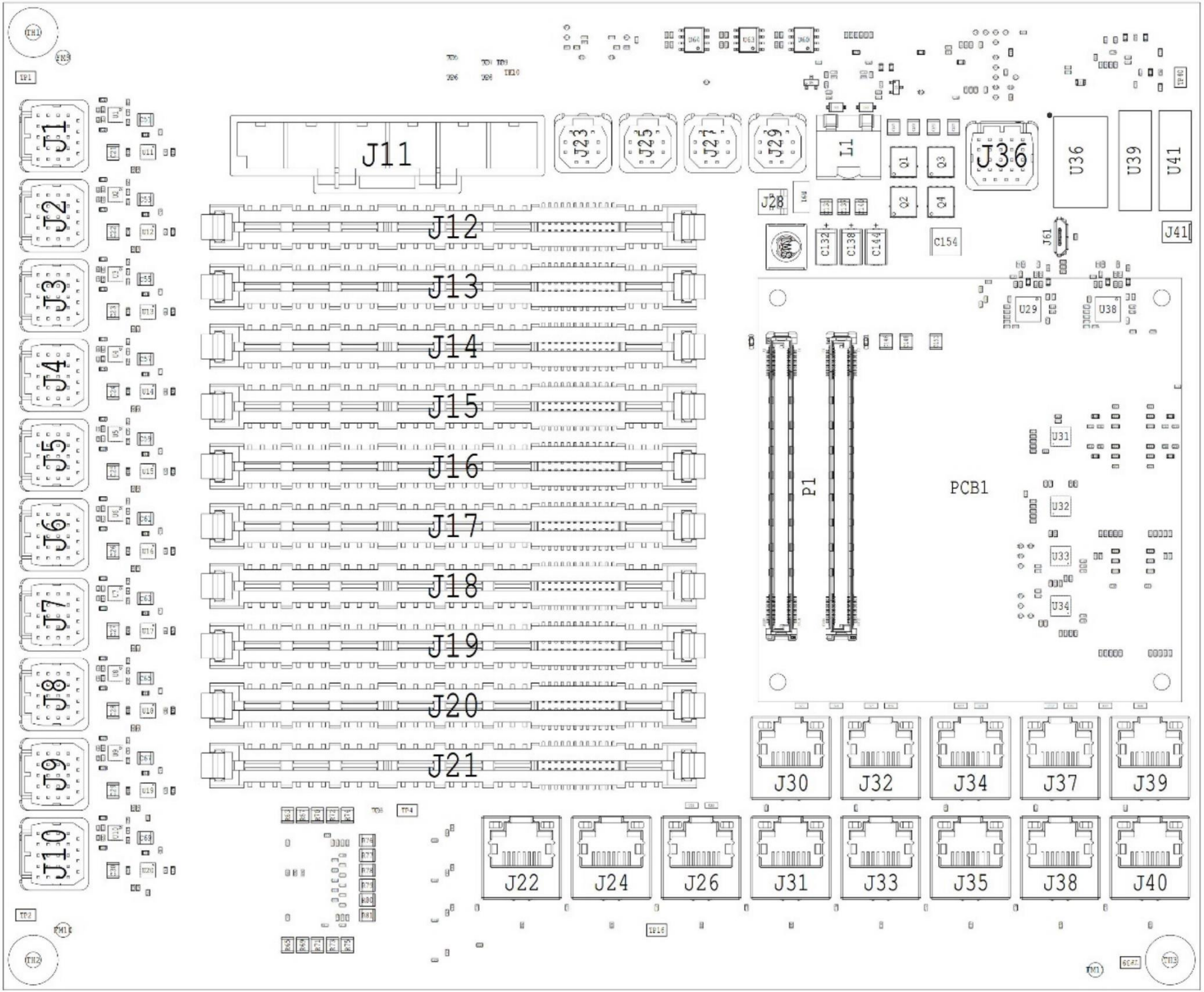


NOTES:

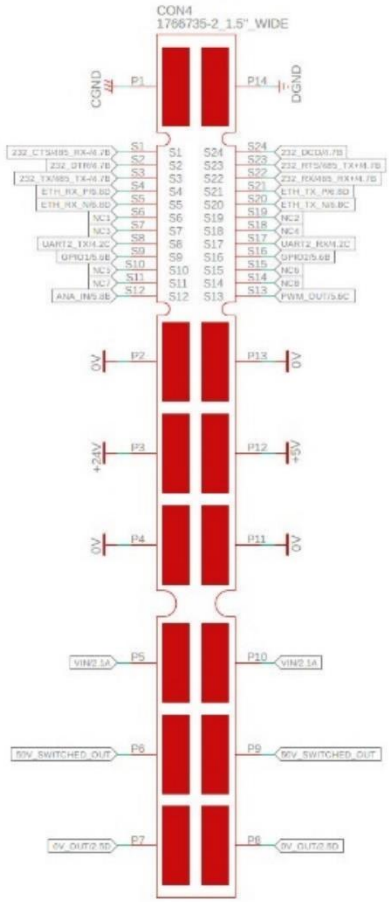
All resistors are 0402, 1%, 63mW unless otherwise stated

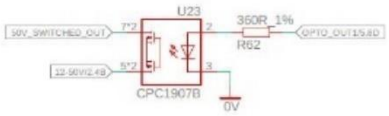
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File	VALOR Control Board		
Size	A2	Rev	2
Date	Tuesday, January 14, 2020	Sheet	1 of 25


J1
J2
J3
J4
J5
J6
J7
J8
J9
J10
J11
J12
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L1
Q1
Q2
Q3
Q4
U36
U39
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J61

External Connections

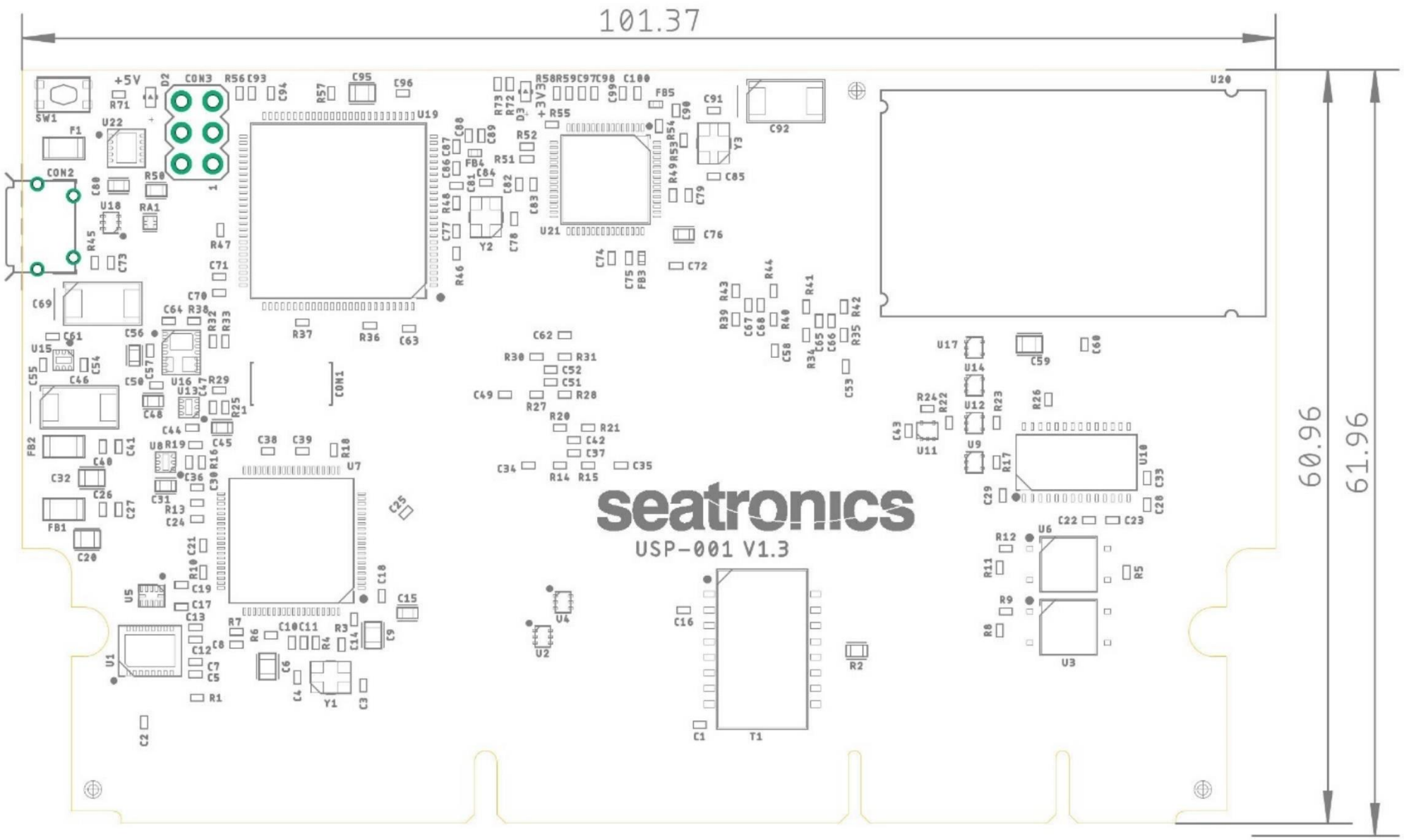


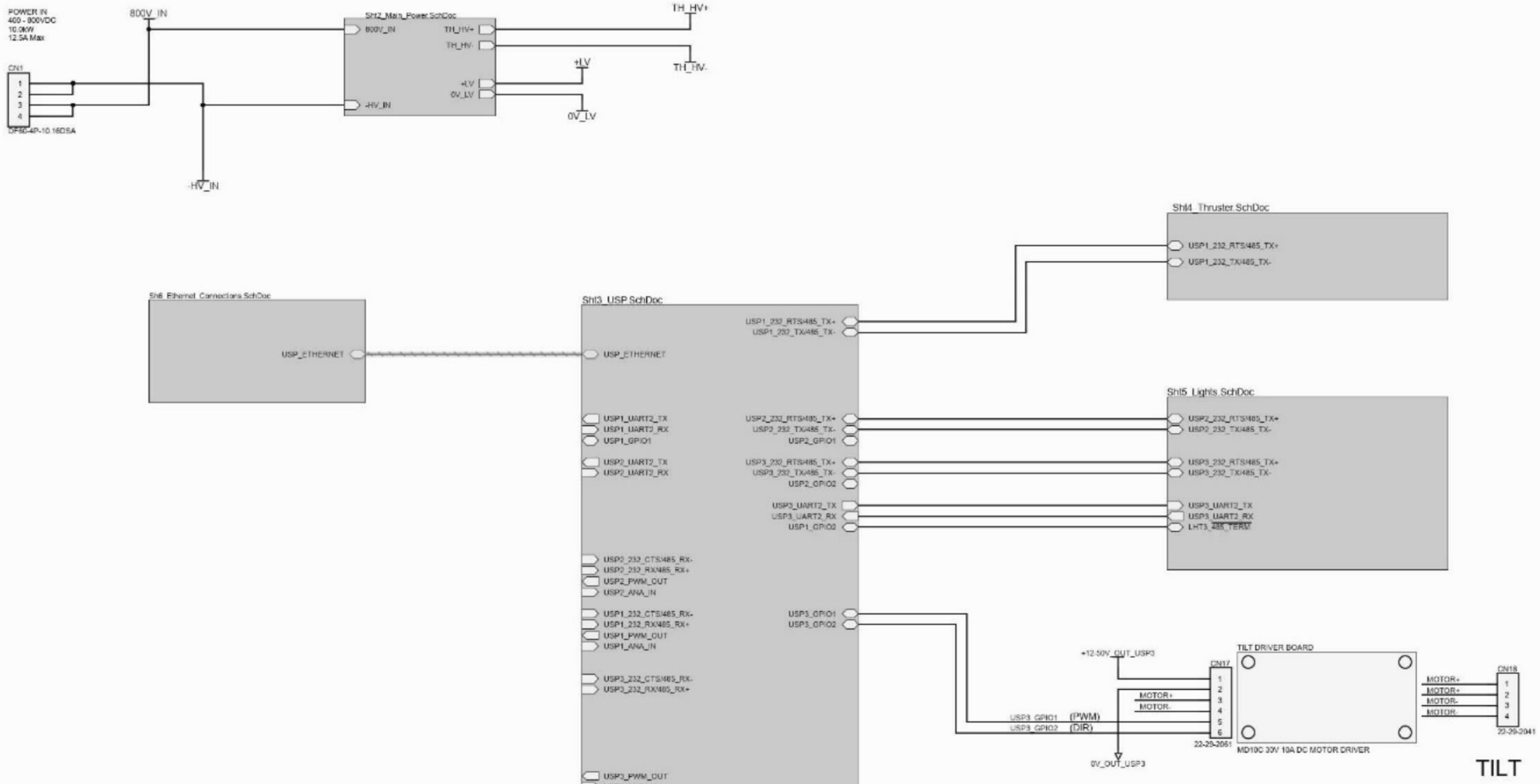


PCB FEATURE
LAYER-CHECK-6

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Seatronics Ltd Acteon House Peregrine Road, Westhill Aberdeenshire G81 4HT	VALOR usp-001-V1.3 11/01/2021 01:58 Sheet: 1/6


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USP-001 V1.3

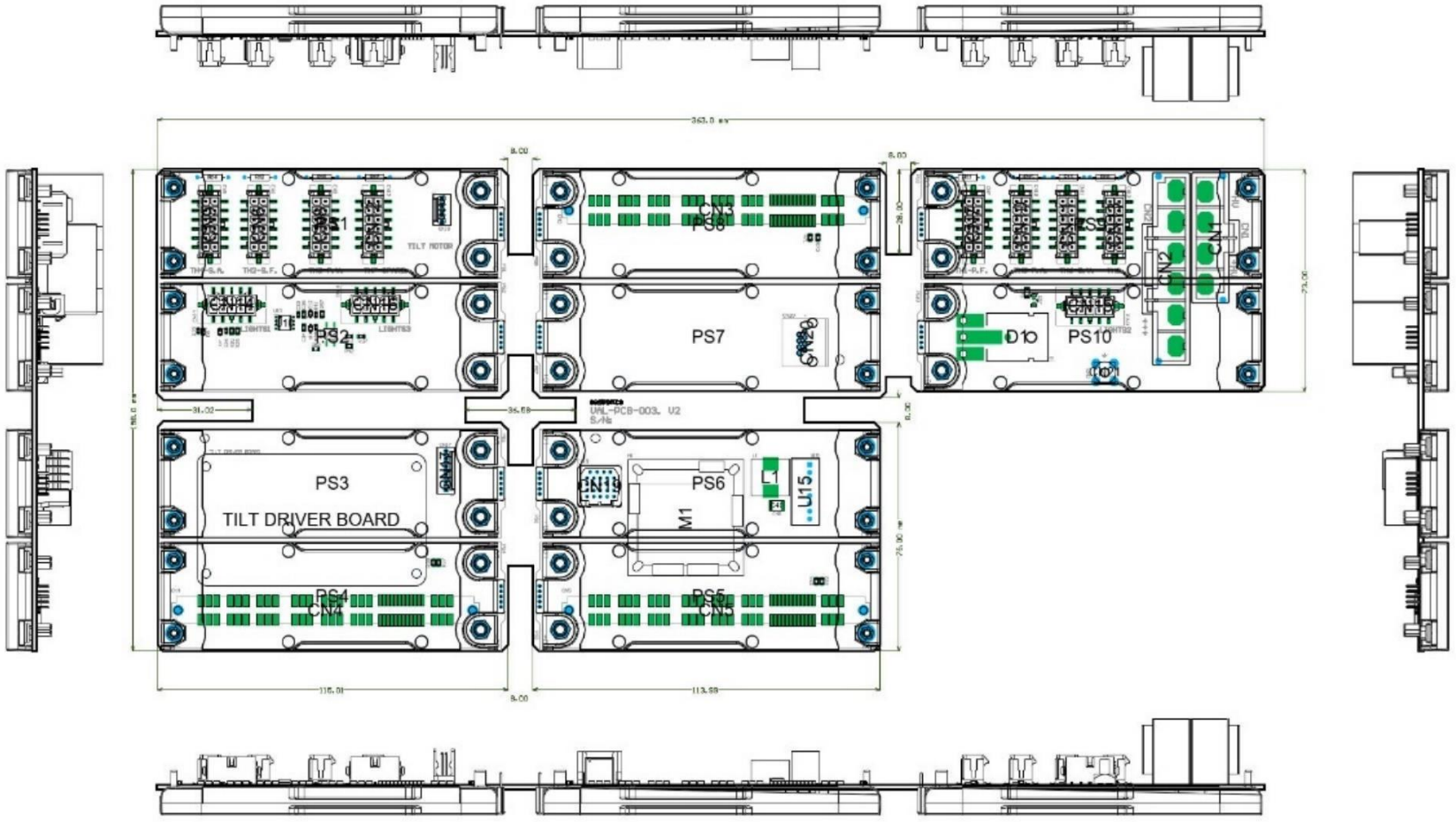


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REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVED



PART NO: =PCB_PART_NUMBER

APPROVALS	DATE
ENGINEER:	
DESIGNER: DOW	04/09/2019
CHECKER:	

Reference Documents	
SOM DOC:	VAL-PCB-003-SOM
ASSY DOC:	
SCH DOC:	VAL-PCB-003-SCH
PCB DOC:	

NEXT ASSY	USED ON
APPLICATION	

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TITLE: Power Pod Termination PCB Layout Drawing

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A3	VAL-PCB-003-AAS	2

SCALE: | FILE NAME: | SHEET: 1 OF 1