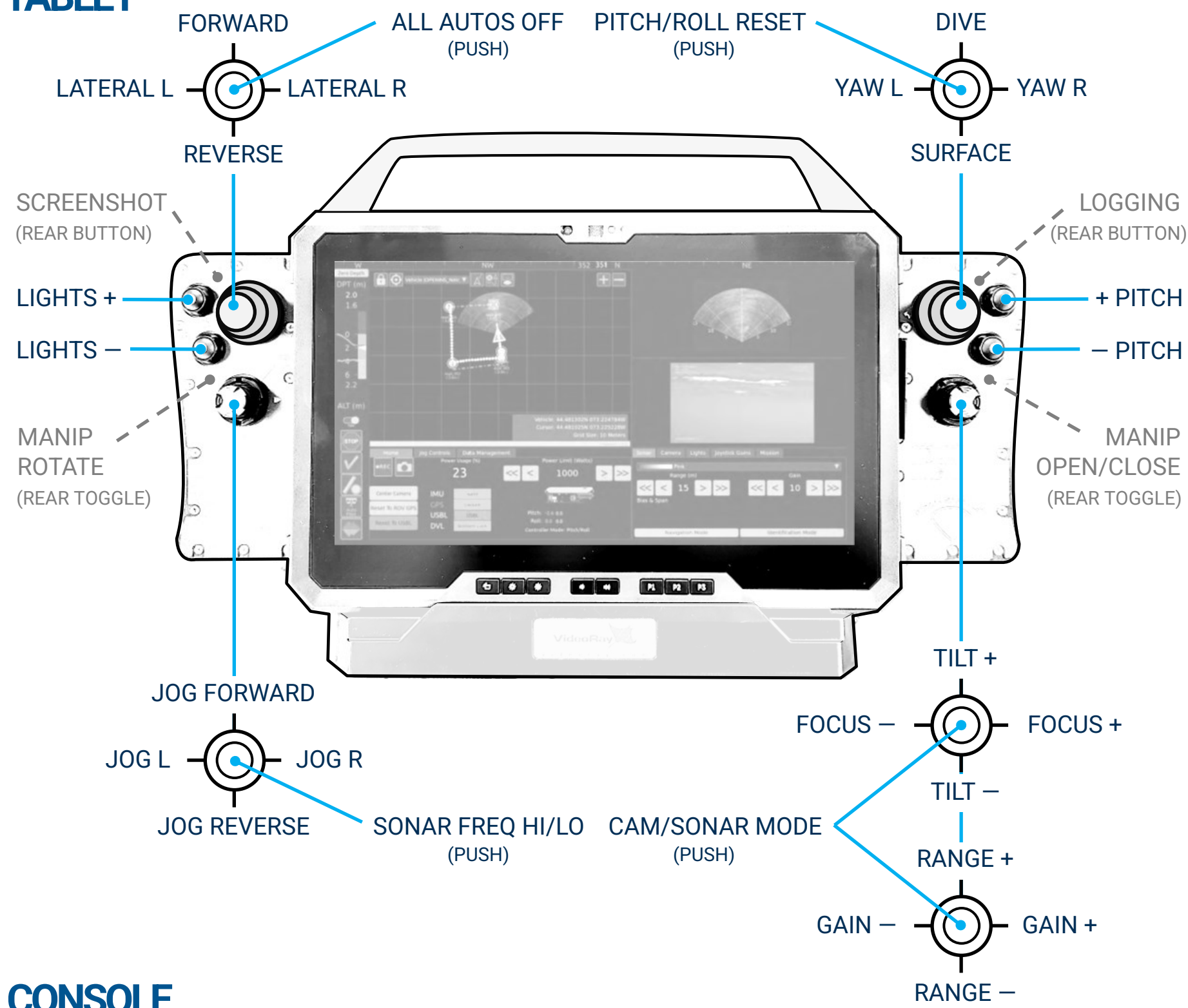
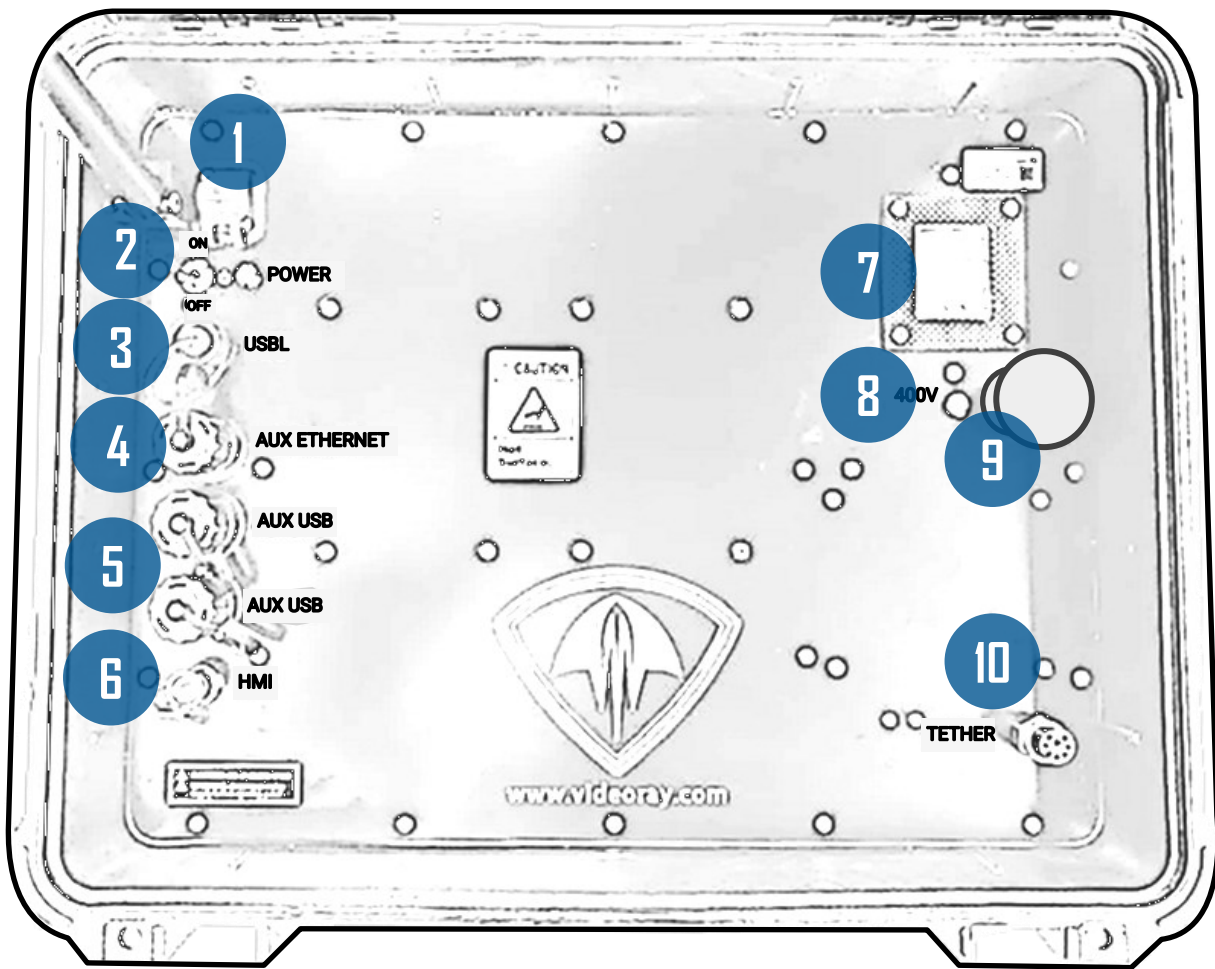


TABLET



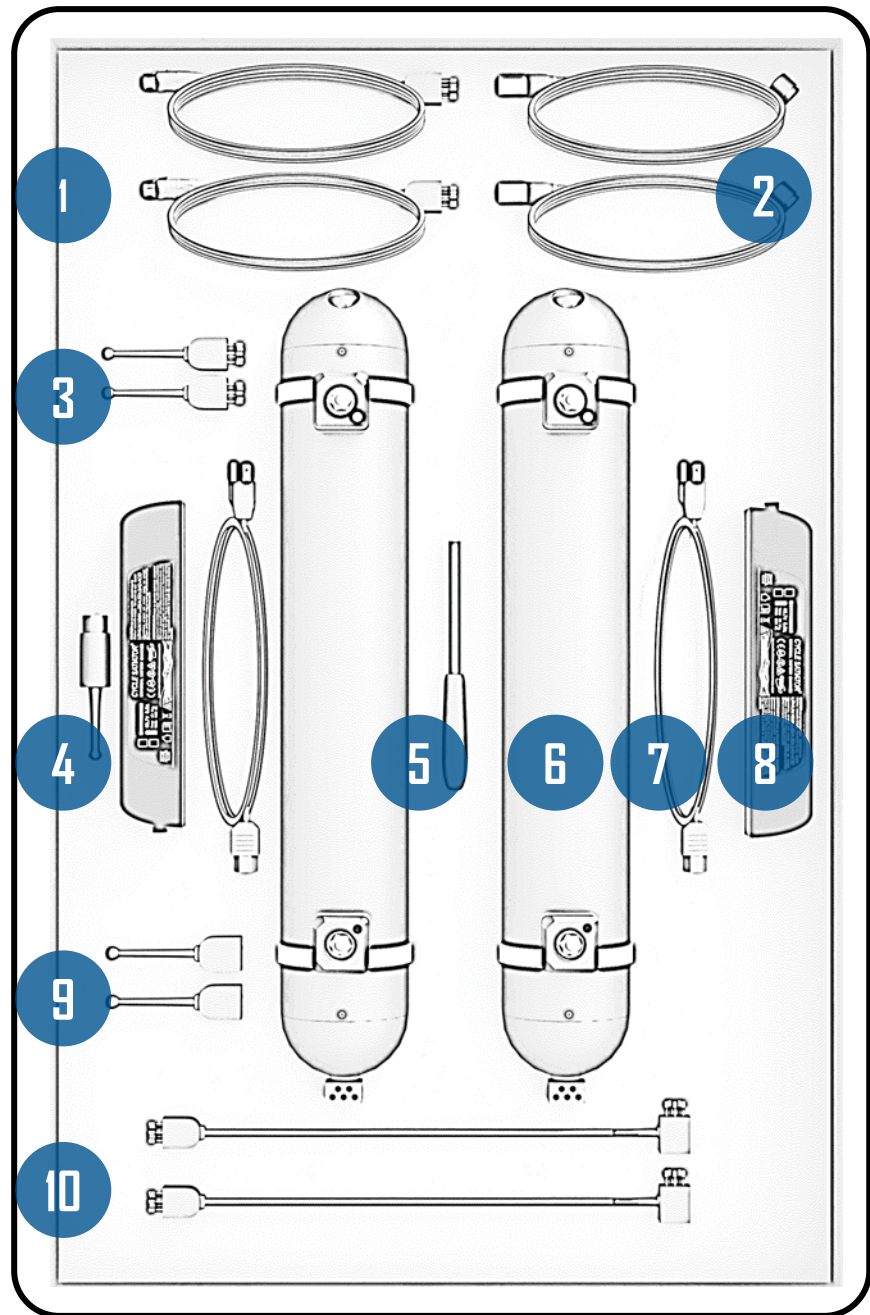
CONSOLE

- 1 A/C Power Cord Port
- 2 Console Power Switch
- 3 USBL Topside Beacon Port
- 4 Ethernet Port
- 5 USB Port (2)
- 6 Fischer Cable to Tablet Port
- 7 Line Insulation Monitor (LIM)
- 8 Active 400V Indicator
- 9 ROV Power Main
- 10 Tether 8-pin Port



LI-ION SUBSEA BATTERIES

- 1 XLR to 5-Pin Male Charging Cable (2)
- 2 Charger Port to XLR Charging Cable (2)
- 3 5-Pin Male Dummy Plug (2)
- 4 8-Pin Tether Dummy Plug w/ Cap
- 5 Power Wand
- 6 Li-Ion Subsea Battery (2)
- 7 Charger A/C Power Cord (2)
- 8 Battery Charger (2)
- 9 5-Pin Female Dummy Plug (2)
- 10 5-Pin F/M to 5-Pin Male Power Cable (2)



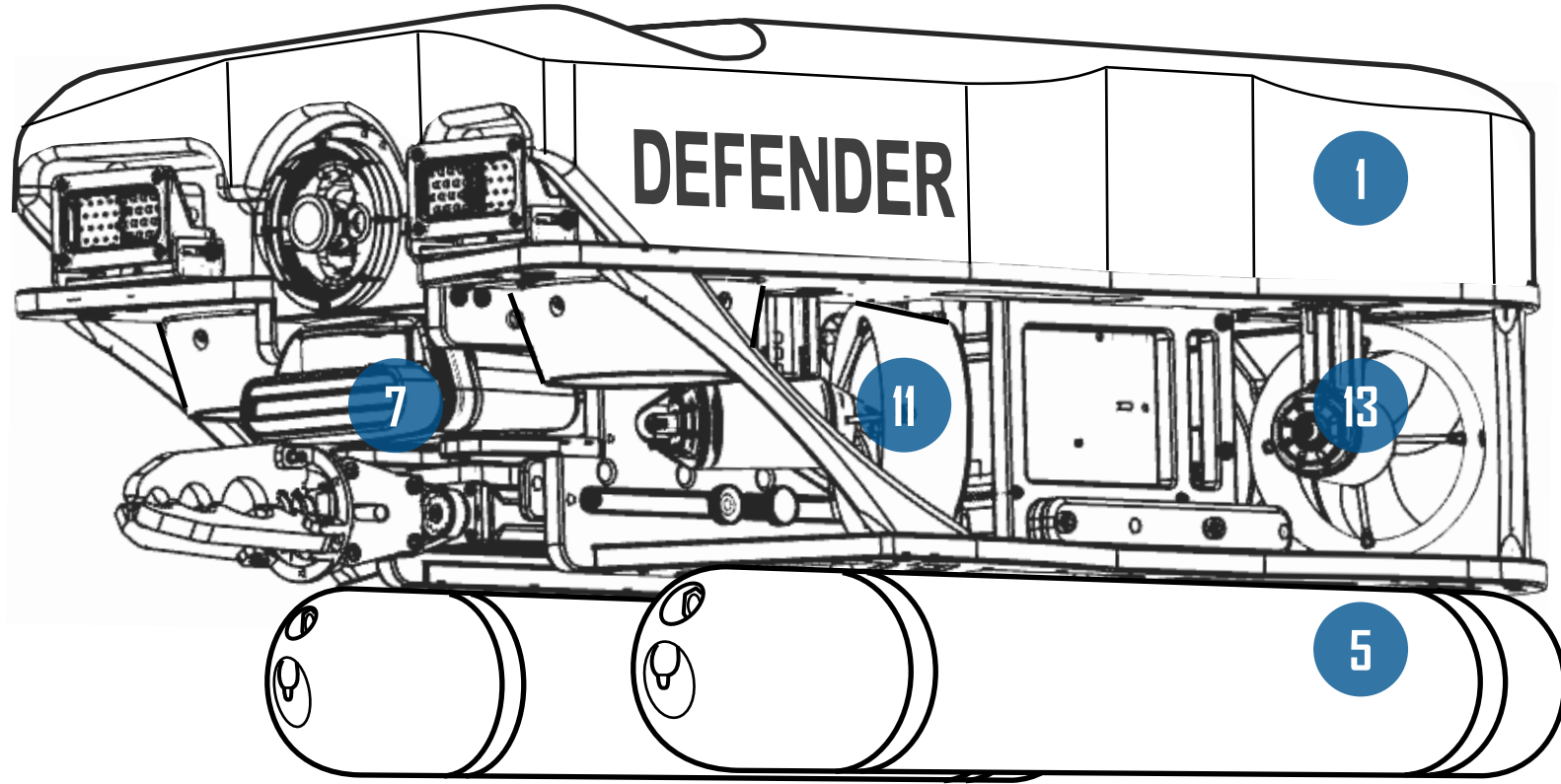
videoray.com/resources/
support@videoray.com
+1 610-458-3000, Opt. 1



QUICK
GUIDE



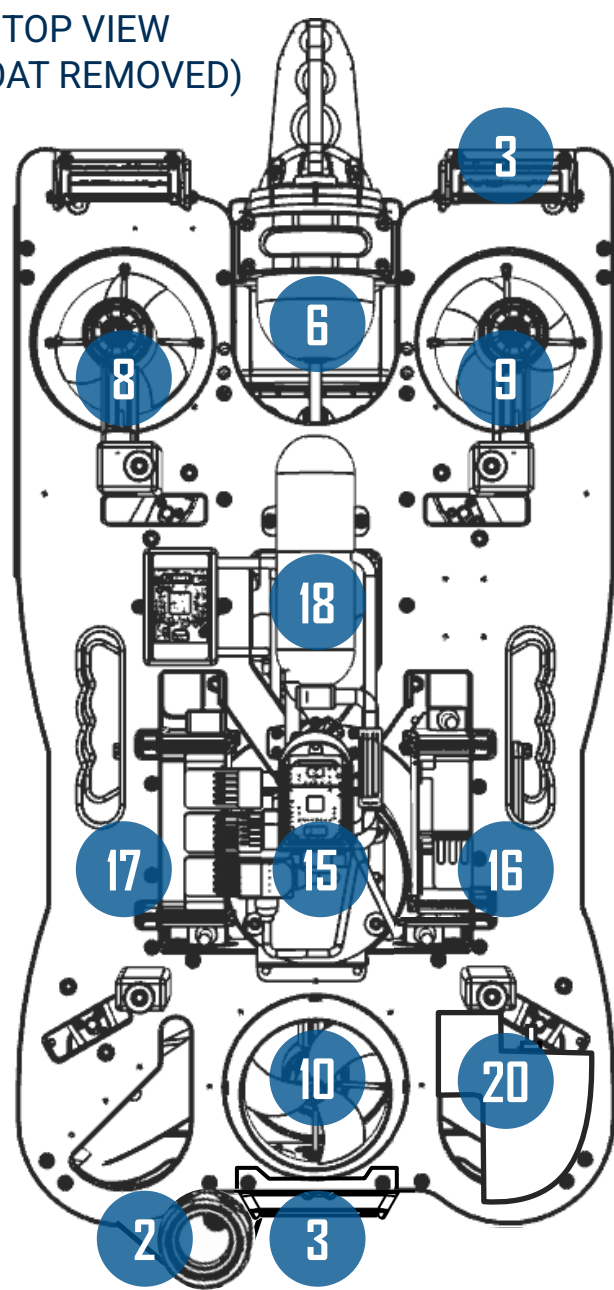
Mission Specialist
Defender Deep Water System



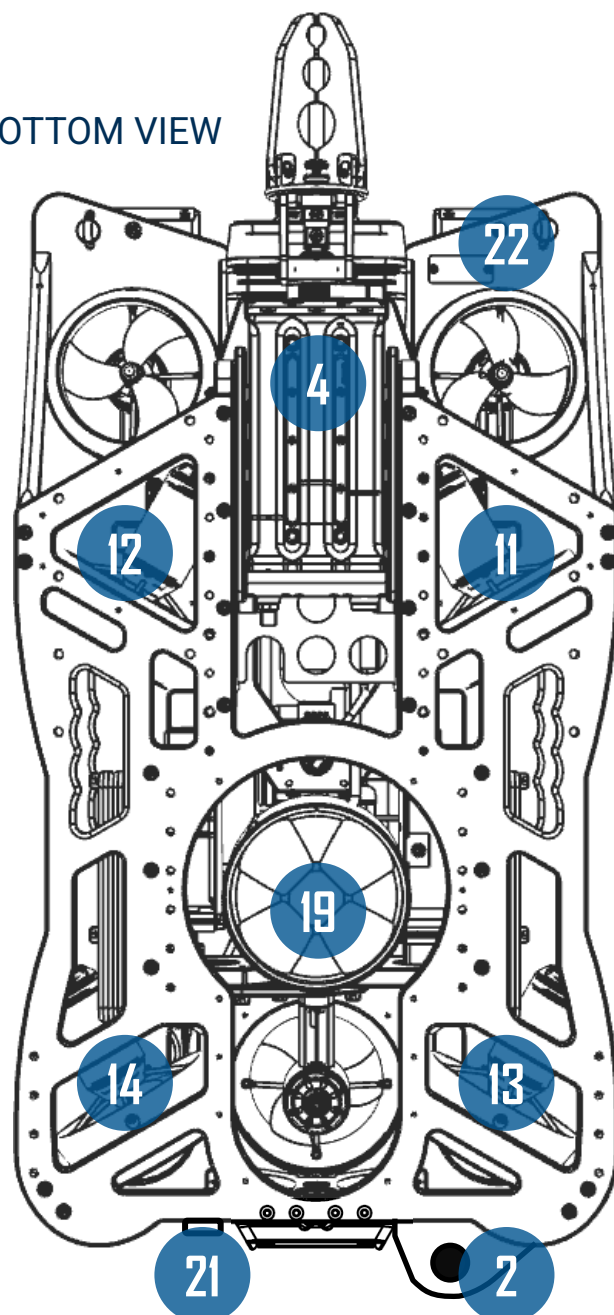
DEFENDER DEEP WATER SYSTEM

- 1 Deep Float Block *part number 71028*
- 2 USBL X110 Beacon *part number 72430*
- 3 LED Lighting Modules *part number 70023*
- 4 Rotating Manipulator *part number 70824*
- 5 Li-Ion Subsea Battery *part number 73502*
NiMH Subsea Battery *part number 73501*
- 6 HD Camera Module *part number 70044*
- 7 MT750d Sonar *part number 72346*
- 8 Port Vertical Thruster *part number 70503*
- 9 Starboard Vertical Thruster *part number 70503*
- 10 Rear Vertical Thruster *part number 70503*
- 11 Port Forward Thruster *part number 70503*
- 12 Starboard Forward Thruster *part number 70503*
- 13 Port Rear Thruster *part number 70503*
- 14 Starboard Rear Thruster *part number 70503*
- 15 Submersible GPS Module *part number 70809*
- 16 Power Module *part number 70160*
- 17 Communications Module *part number 70191*
- 18 AHRS Module *part number 70273*
- 19 Navigation DVL *part number 72363*
- 20 Subside Fiber Optic Modem *part number 72700*
- 21 Rear Auxiliary Camera *part number 73234*
- 22 Serial Number Plate *part number 71094*

TOP VIEW
(FLOAT REMOVED)



BOTTOM VIEW



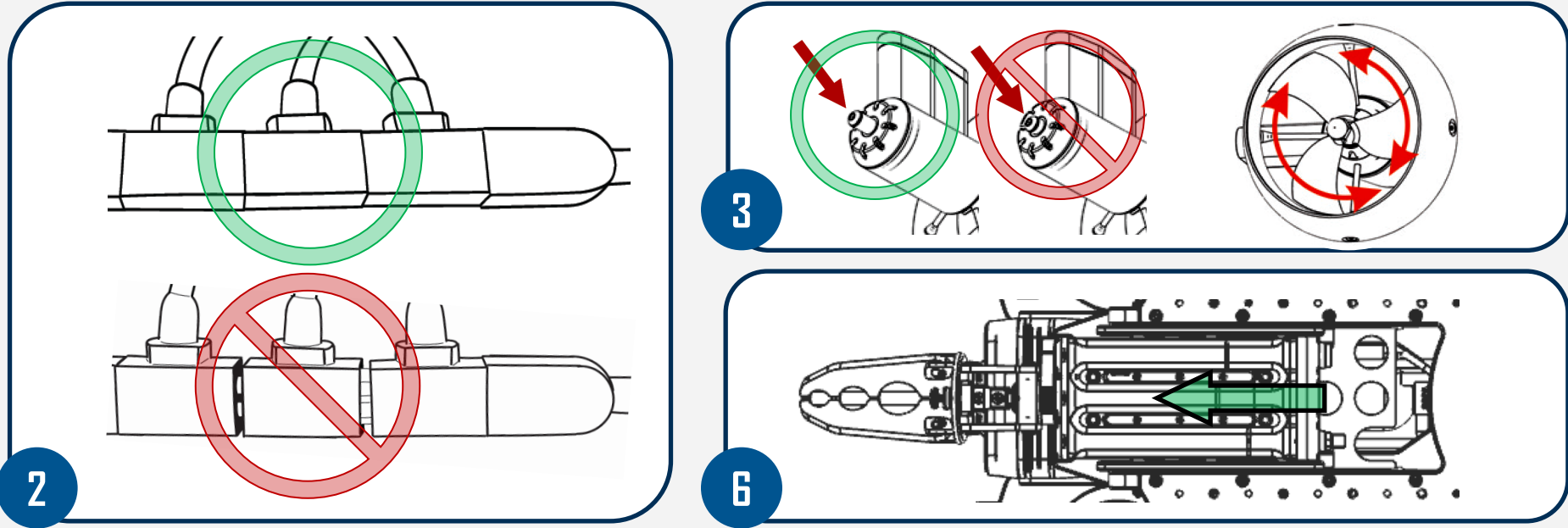
Deep Water System 1km Configuration

- | | |
|-----------------------|--------------------------------------|
| Defender Submersible | Dual Frequency FL Sonar |
| Navigation Package | Li-Ion or NiMH Subsea Batteries |
| USBL Positioning | 1.5 km Range Fiber Optic Tether |
| Dual Axis Manipulator | Expeditionary Splashproof Controller |

Pre-Dive Operations

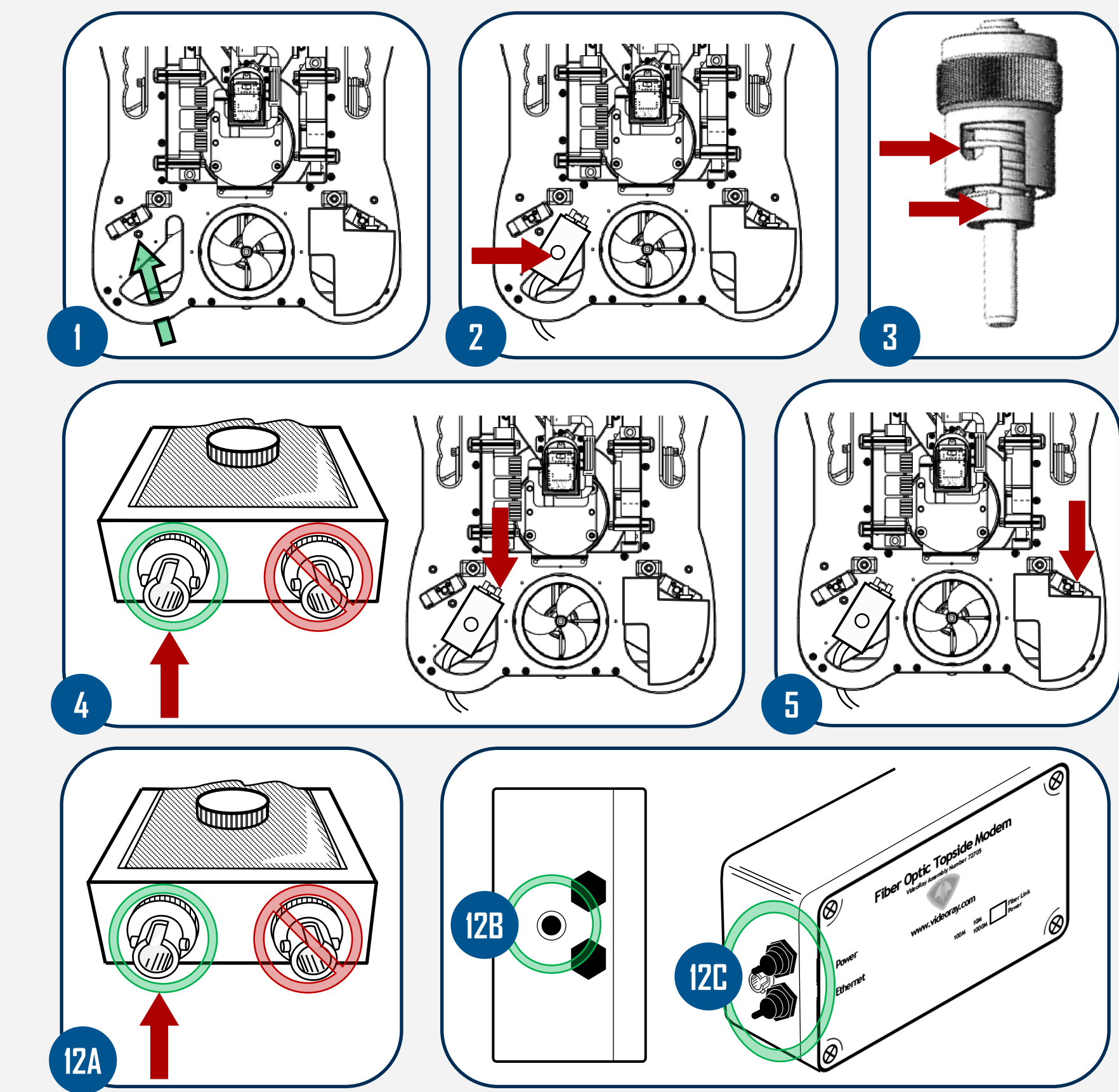
VISUAL INSPECTION

- 1. Confirm all mission equipment is on scene
- 2. Remove the float block and inspect connections
- 3. Check thruster tell tales and that propellers spin freely
- 4. Check camera dome for moisture or damage
- 5. Ensure manipulator is securely mounted and extended
- 6. Mount the Defender's USBL X110 beacon securely to the aft mounting plate
- 7. Ensure subsea batteries are labeled with unique numbers (1 and 2) or have unique Node IDs (32 and 33)
- 8. Mount batteries under the frame with 5-pin ports aft; turn camlocks clockwise to lock in place



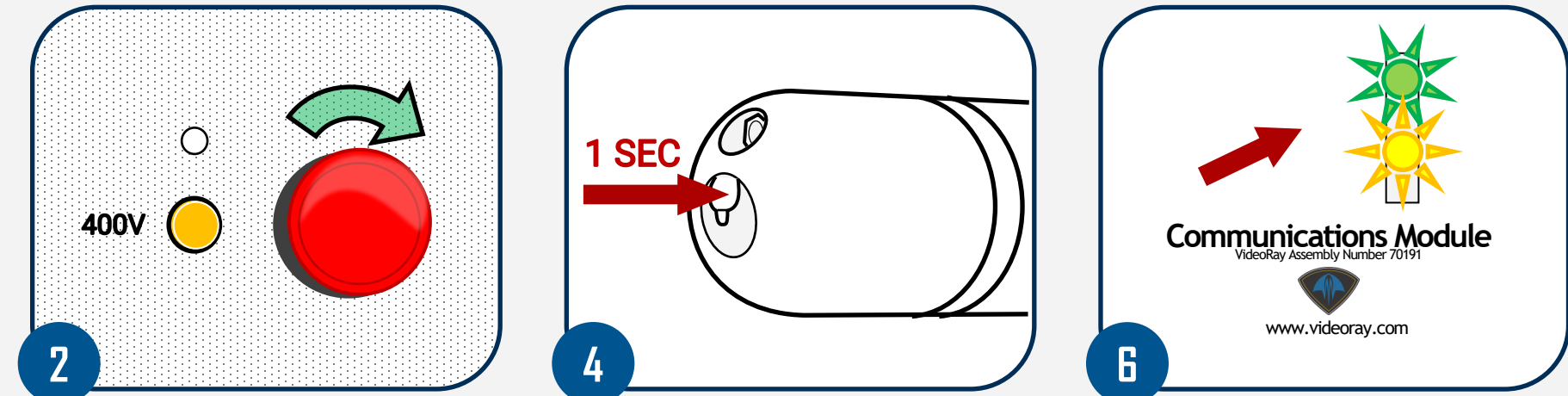
MAKE CONNECTIONS

- 1. Feed the tether's subside termination block upward through the port aft opening of the Defender frame
- 2. Push the tether termination block into the mounting plate rearward and secure with the thumb screw
- 3. Remove caps from one fiber optic patch cable and generously lubricate both ends with supplied fiber optic lubricant; take note of twist lock coupling and the locating sleeve of the ST Type connectors
- 4. Carefully align and connect one end of the patch cable to the Channel 1 port of the tether termination block
- 5. Carefully align and connect the opposite end to the submersible fiber optic modem port on starboard side
- 6. Route and secure any excess fiber optic patch cable slack
- 7. Connect the strain relief and test all angles to prove NO tension is on the subside tether
- 8. Using silicone, lubricate and connect the Beacon-to-9-pin cable to the Defender's USBL X110 beacon
- 9. Lubricate and link the other end of the cable into the 9-pin chain at Port 6 of the Communications module
- 10. Connect port and starboard 5-pin power cables to the corresponding port and starboard subsea batteries
- 11. Replace the float block and extend the GPS mast
- 12. When using bagged or loose fiber optic tether :
 - A. Carefully align and connect a patch cable to the Channel 1 port of the tether's topside termination block
 - B. Carefully align and connect the opposite end of the patch cable to the topside modem's ST port
 - C. Connect the topside modem cables to the console's AUX USB and AUX ETHERNET ports
 - D. Secure the topside termination block at the console, ensure there is NO strain on fiber optic connections
- 13. When using the Fiber Optic Tether Reel, connect the standard tether from the reel to console's 8-pin whip
- 14. Take note of Fischer cable connector labels and connect the tablet to the console's HMI port
- 15. Connect the topside GPS puck and keyboard to the console's AUX USB port
- 16. Connect USBL topside cable to the console's USBL port and X150 beacon; deploy 1+ m depth
- 17. Connect the console to the GFCI and power source



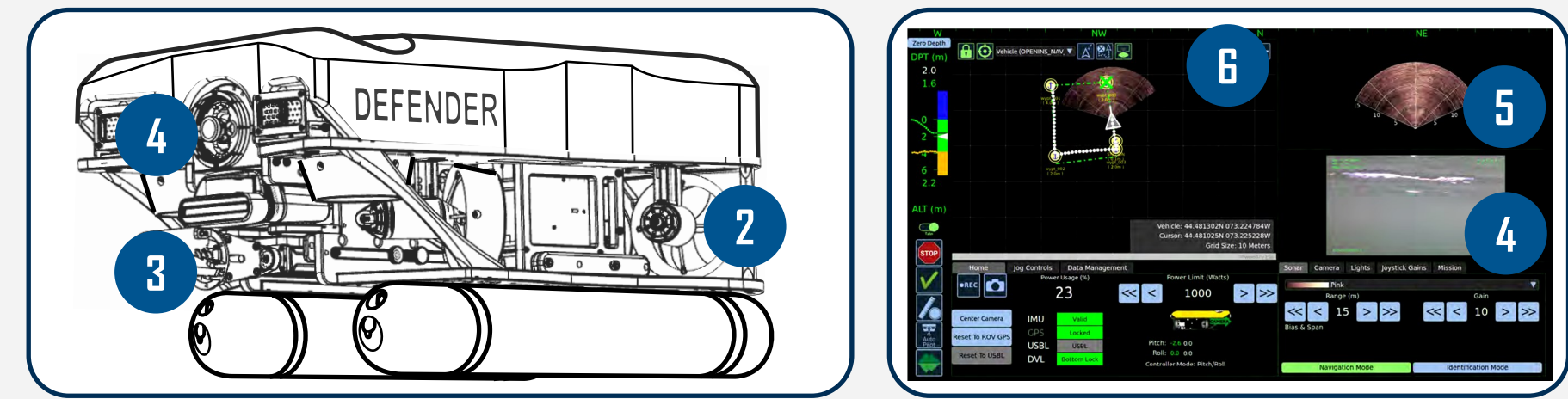
POWER UP

- 1. Power on the console using the toggle switch
- 2. If using the Fiber Optic Tether Reel, rotate the red Power Mains clockwise to send power to topside modem
- 3. Power on the tablet
- 4. Insert the power wand into the forward center port of either battery (NOT both) for approx. one second
- 5. Listen for two audible tones from each battery
- 6. After several seconds, verify power by checking the status LEDs on the Power and Comms modules



FUNCTION TEST

- 1. Double-click the EOD Icon on the desktop to open the Greensea software
- 2. Momentarily test thrusters (horizontal/vertical in all directions) and LED functions (on/bright/dim/off)
- 3. Check manipulator operation (open/close, rotation)
- 4. Verify video feed imagery, camera tilt, and picture-in-picture (PIP) functions
- 5. Verify sonar feed is displayed
- 6. Check that compass ribbon is responsive and accurate



LAUNCH

- 1. Deploy the Defender and check ballast / trim— optimum buoyancy is just at the surface and level
- 2. Zero the depth while on the surface
- 3. Reset to GPS when position for the Defender is acquired and displayed in the Map View
- 4. Enable Auto controls (heading, depth/altitude, pitch, roll, dynamic positioning)
- 5. Dive 1-2 m and verify positioning in the Map View and sensor status in the Flight View Home tab



Subsea Battery Operation

Piloting the Defender will have minor variations when subsea batteries are installed. The recommended considerations are as follows:

Once the Defender is launched, immediately check and adjust ballast so that the top of the float block hovers just at the waterline.

With the batteries mounted below the frame, be cognizant of the Defender's deeper draft. Increase your minimum altitude from the bottom when navigating to avoid inadvertent grounding.

Lithium (Li-Ion) batteries can operate at the default power setting of 1,000 watts or to the maximum power setting if more power is needed or desired.

When using Nickel Metal Hydride (NiMH) batteries, it is recommended to reduce the Defender power setting to 700 watts via the *Home* tab in the Flight View menu. This power setting will extend the flight time of the Defender with little effect on navigation and accessories.

During extended periods of use, the batteries may experience excessive power drain resulting in insufficient power for continued normal use. In addition to on-screen battery meters indicating low levels, signs and symptoms of insufficient power will become apparent on the monitor of the tablet, to include freezing of the video feed, the ribbon compass going dark, or the video feed going dark. If this occurs, safe recovery of the Defender should now be the priority of the pilot.

Recommended actions are as follows:

- a. Disable Auto controls to reset the Defender's attitude and reduce power consumption
- b. Turn off lights
- c. Reduce power setting to 500 watts via the Flight View *Home* tab
- d. Navigate back to the deployment site (or surface for tether-pull recovery) and recover the Defender using proper procedures

Post-Dive Operations

- 1. Maintain communication between pilot/tether handler
- 2. Disable all Auto Pilot controls and Dynamic Positioning
- 3. Recover via the tether or Defender frame
- 4. Open quick-release manip jaw partially for removal
- 5. Power off the subsea batteries by inserting the power wand into the forward center port of each battery for approx. one second
- 6. Listen for a single audible tone from each battery and confirm no status LEDs blinking on the Power and Communications Modules
- 7. Shut off Defender Power Mains and console
- 8. Stop video logging and exit Greensea software via the  flyout menu and confirm exit
- 9. Power off the tablet via the side power button and confirm power off
- 10. Disconnect all system connections and replace protective caps/covers
- 11. Remove float block, rinse and soak Defender and USBL beacons with fresh water
- 12. Rinse deployed tether and tether termination block
- 13. Conduct a thorough post-dive inspection of the system and allow to dry completely
- 14. Inspect and use provided kit to clean all connectors and ports of the fiber optic connections
- 15. Follow SOP for charging Subsea Batteries
- 16. Follow SOP for mission file data