

**Phantom 300  
Remotely Operated Vehicle  
User's Guide**



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## **Table of Contents**

INTRODUCTION .....	3
VEHICLE DESCRIPTION .....	3
BASIC SHIPBOARD REQUIREMENTS .....	4
CAMERAS AND LIGHTS .....	4
Color Video .....	4
Monochrome Low Light Camera.....	5
Dual Red Laser Scaling Device.....	5
Lights.....	5
TOPSIDE VIDEO CONSOLE EQUIPMENT .....	6
Horita GPT-50 Video Titler.....	6
Panasonic AG-DV1000 Mini DV Video Cassette Recorder .....	6
Panasonic BT-M1950Y Color Video Monitor.....	6
TETHER MANAGEMENT AND PENETRATIONS .....	7
Vessel at Anchor.....	7
ROV Free Swimming with Tether Marked by Surface Buoy .....	8
ROV Towed Using Down Weight.....	8
ROV Free Swimming Using Down Weight .....	9
TYPICAL WORK DAY .....	9
RESULTS AND DELIVERABLES .....	10
DAY RATE CHARGES .....	10
PHANTOM 300 LOAD LIST .....	10

## INTRODUCTION

This remotely operated vehicle guide is designed to provide guidelines for the use of UNCW Undersea Vehicle Program's Phantom 300 ROV System. Following these guidelines will ensure the safe performance of ROV research operations for the equipment and personnel involved. This guide is to be used for mission planning and implementation in conjunction with direct consultation with the UNCW/UVP office. Every effort shall be made to complete the scientific task proposed by the Principal Investigator without placing the vehicle in jeopardy. In order to do this, all scientific requirements shall be thoroughly discussed and planned with the Principal Investigator to maximize efficiency and the successful completion of the mission objectives. Ultimate responsibility for vehicle and personnel safety rests with the ROV supervisor/operator. Therefore, it is the supervisor/operator's responsibility and duty to refuse to commit the ROV if conditions are unsafe, unfavorable, or they would be violating the conditions of their training or the regulations of the UNCW/UVP ROV Operations and Procedures Manual.

## VEHICLE DESCRIPTION

The Phantom 300 is a small, mobile, easy to operate remotely operated vehicle (ROV) that can reach depths to 100 meters. This lightweight system can be deployed by one operator and is designed as an underwater platform for color video documentation. The basic configuration of the ROV provides color video with a laser scaling device, and vehicle heading and vehicle depth information on the operations console. The Phantom 300 can carry small, self-contained instruments, such as a CT Logger.

Basic characteristics of the vehicle are as follow:

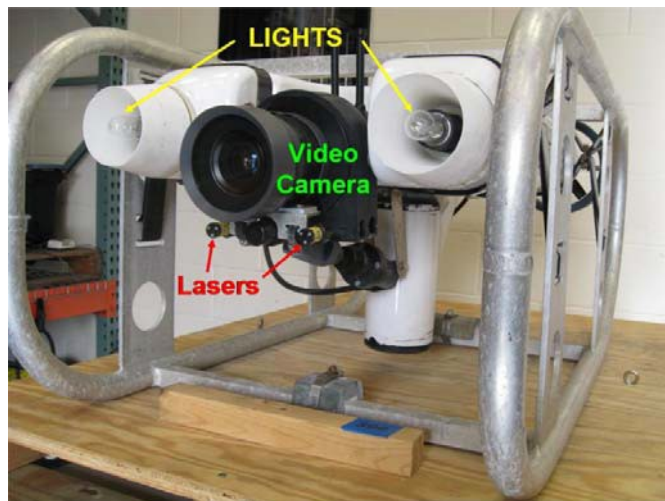
Height	18 in.	46 cm
Length	38 in.	96.5 cm
Width	20 in.	51 cm
Weight	48 lb	22 kg
Payload	~10 lb	4.5 kg
Depth rating	350 ft	106 m
Cable length	400 ft	122 m
Power requirement	2 KVA (requires dedicated 110VAC/15 amp circuit breaker)	
Horizontal speed	1 kt.	
Thrusters	Three 1/12 HP motors providing 12 lb forward thrust/6 lbs vertical thrust.	
Console	Slab style with joystick/dial control for thrusters, LCD readout for depth and heading.	

## BASIC SHIPBOARD REQUIREMENTS

1. The Phantom 300 requires a dedicated 110VAC/15 amp circuit for main power. The Video Console containing the digital video recorder and monitor, requires clean 110VAC/15 amp breaker from standard wall receptacle.
2. The Control Console and Video Console require counter space approximately 2' deep by 5' wide by 3' high in an environmentally controlled environment with seats for the operator and scientific observers.
3. The ROV, umbilical, and down weight require about 8' x 8' of outside deck space.
4. The ROV requires a J-frame or A-frame with a block and winch with wire rope or synthetic line capable of safely deploying 500 pounds. A crane or davit can also be used.
5. Mounting the DGPS antenna requires a railing or vertical pole with an unobstructed view of the sky within a 50-foot cable run of the ROV Video Console.
6. A four inch diameter wire pass from the outside deck area into the interior space where the ROV Consoles are located is required for ROV umbilical and DGPS antenna cable.
7. Vessel must supply standard VHF radio communications between the bridge, winch/crane operator, ROV pilot, and ROV deck crew. Communications must be maintained at all times during ROV operations.



ROV Control Console and Video Console.



Phantom 300 Video Camera, Lights, and lasers.

## PHANTOM 300 CAMERAS AND LIGHTS

**Color Video** – A Sony high resolution, single-chip color camera with auto iris, 12:1 zoom, and auto/manual focus provides video documentation during ROV operations. The video signal is routed from the ROV console to the Horita GPT-50 Video Titler, then to the Panasonic Mini-DV Cassette Recorder (one hour recording time), then to a JVC 13" color monitor. This ensures that if you are seeing the video and overlay information on the monitor, that it is being correctly routed through the video recording equipment. **This does not ensure that the video recording equipment is recording.** The Horita Video Titler can display a title for each tape and real-time data on a video overlay. An omnidirectional microphone is available for audio annotation onto the recording media by the scientists.

The Sony NTSC camera format specifications are:

- Image Sensor 1/3" IT CCD
- Pixels/effective pixels 410 x 380
- Picture Elements 768 (H) x 484 (V)
- Horizontal Resolution (Center) >460 TV Lines
- Vertical Resolution (Center) >350 TV Lines
- Lens 12X zoom, auto focus, f1.8 to f2.7
- Diagonal Angle of view in air Wide angle: 117°, Tele: 10°
- Diagonal Angle of view in water Wide angle: 79°, Tele: 7.4°
- Minimum Illumination 2 LUX (F1.8)
- Signal to Noise Ratio >48 dB
- White Balance TTL Auto tracking

**Monochrome Low Light Camera** – A Simrad Osprey OE1323 Silicon Intensifier Target (SIT) black and white video camera can be put on the ROV in place of the Sony color video camera. An example of the capability of this camera was noted in extremely clear water off Bermuda where excellent video images out to 50 meters were acquired in ambient light at 700 feet sea water. This camera is particularly good for searches because it has a wider field of view than the SONY color video camera. It is important to note that this is a low-light camera, and not a no-light camera. In other words, it does not provide an image at night (even with the moon at full) without artificial illumination. Camera specifications include:

- Image Sensor Silicon Intensifier Target RCA 4804/H/P2
- Horizontal Resolution (Center) 600 TV Lines
- Lens Comutar V615, f1.5, 5.5mm
- Focus Fixed 150 mm (6") to ∞
- Diagonal Angle of view in water 110°
- Minimum Illumination  $5 \times 10^{-4}$  LUX (tube faceplate)
- Signal to Noise Ratio 34 dB (with CCIR pass filter)
- Grey Scale Resolution 10 shades

**Dual Red Laser Scaling Device** – The Phantom 300 has a Tritech Micro Laser Scaling System with a separation of 10 cm. The output power is <2.4 mW. The lasers are mounted directly under the video camera and the beams are usually in the video unless the ROV is very close to the object or the camera is zoomed in. The laser scaling device is powered by one CR2 3volt Photo Lithium Battery, which has duration of up to 8 hours.

**Lights** – Two 150-watt quartz-halogen lights are mounted in the front end caps and provide illumination for the color video camera.



**Panasonic Monitor**

**Horita Video Titler**

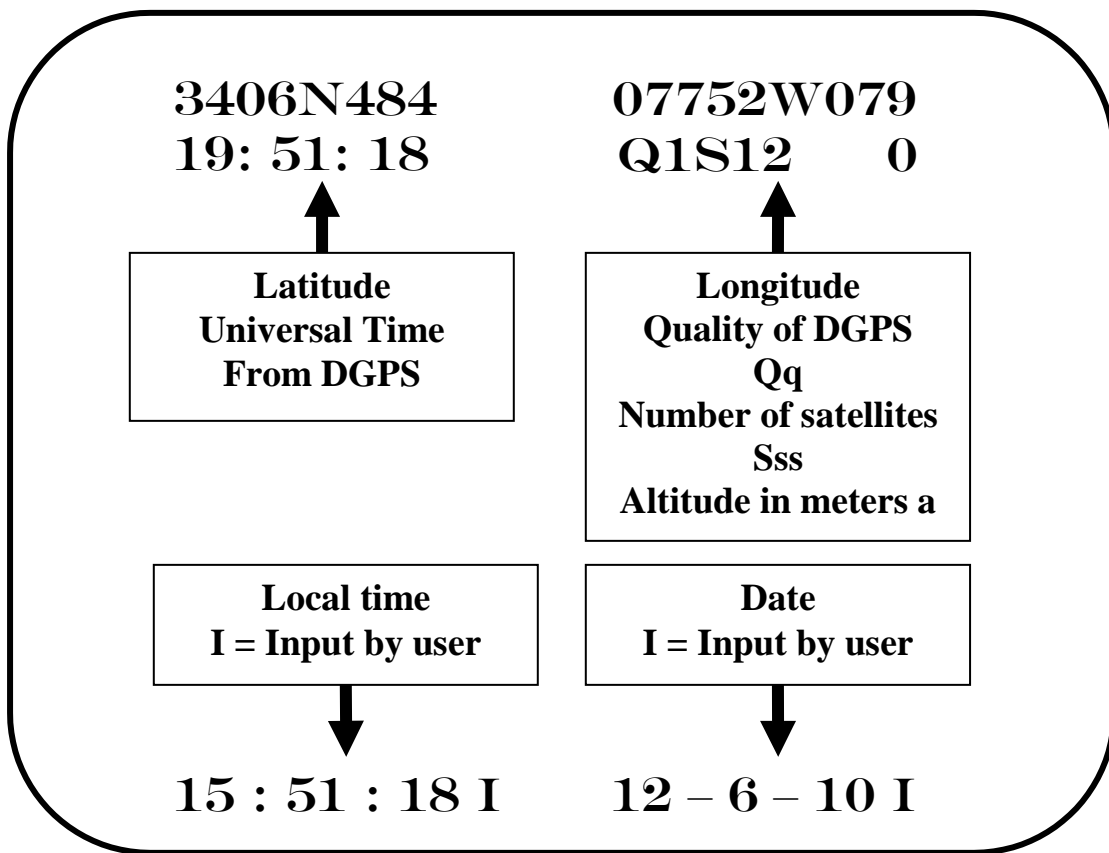
**Panasonic Mini-DV  
Cassette Recorder**

**Microphone**

#### **TOPSIDE VIDEO CONSOLE EQUIPMENT:**

**Horita GPT-50 GPS Video Titler** has two modes: a Manual Title Mode for creating a title leader on each tape, and a Data Screen Mode for recording and displaying real-time data on the video. The data screen may be customized to display data such as Date, Time and GPS Position of the ship, and DGPS quality. Various user selectable options are available for both modes. See sample data screen below.

- **Panasonic AG-DV1000 Mini-DV Video Cassette Recorder** records up to 1 hour of video on Mini DV tape cassettes. Scientists must supply Mini-DV tapes.
- **Panasonic BT-M1950Y Color Video Monitor** is a 19" (diagonal) video monitor, which displays the video from the color video camera on the ROV.
- **A Realistic Microphone/Mixer** can be used by the scientist/observer to provide real-time narration on the audio track of the video cassette tape.

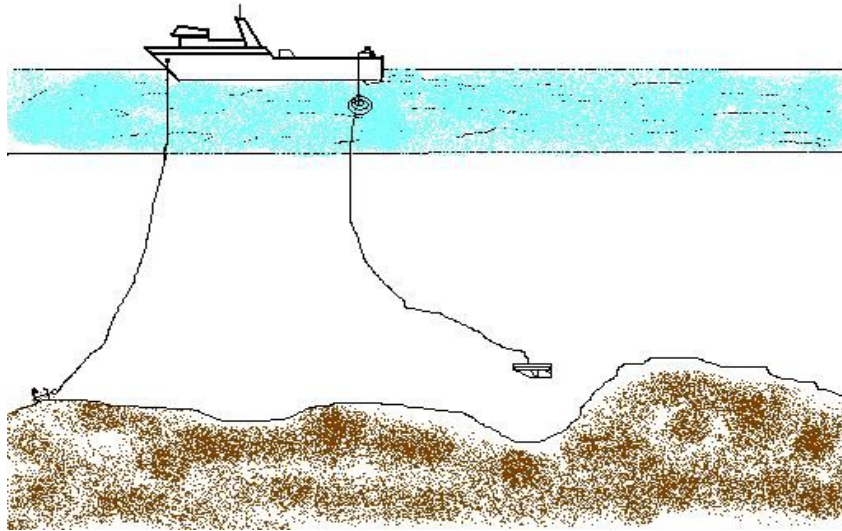


**Sample Horita Data Screen. User may select other formats.**

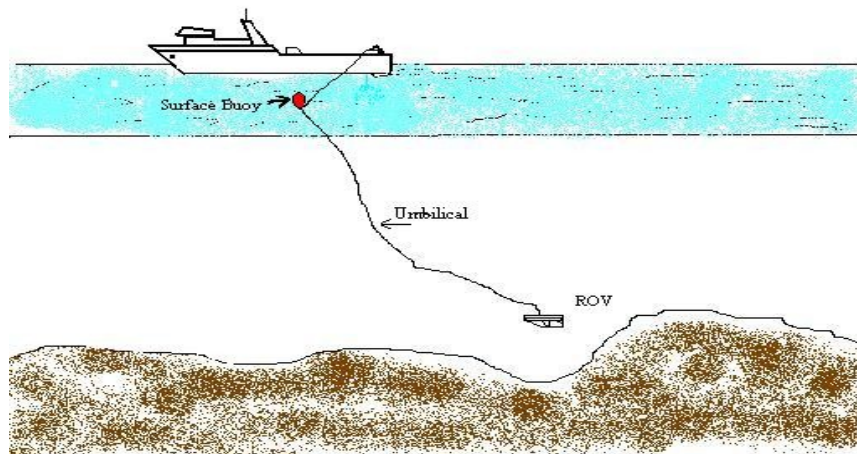
## **TETHER MANAGEMENT AND PENETRATIONS**

Different operating modes and tether management techniques are used to ensure the best possibility of a successful ROV dive. Current strength, bottom type, and science objectives will require different techniques of tether management. Some of the most common and successful techniques of tether management are discussed below. The tether shall **always** be tended with communications set up between the tender, operator, support vessel's bridge, and crane or winch operator. Penetrations into large, natural enclosures will be considered only after a thorough external visual inspection. As a rule, penetrations into wrecks or areas that limit maneuverability shall not be performed. No penetrations will be permitted during live-boat operations.

**Vessel at Anchor** – The ROV is free swimming on bottom or mid water from a vessel which is at anchor. The ROV is neutrally buoyant and cable is paid out by tender on an as needed basis. Tether is coded so the amount paid out is known. This mode of operation is the safest type of deployment for the ROV for two main reasons; 1) The vessel wheels are not under power thus are not turning, and 2) The vessel is in a relatively stationary position so the ROV will not be dragged into any structure.

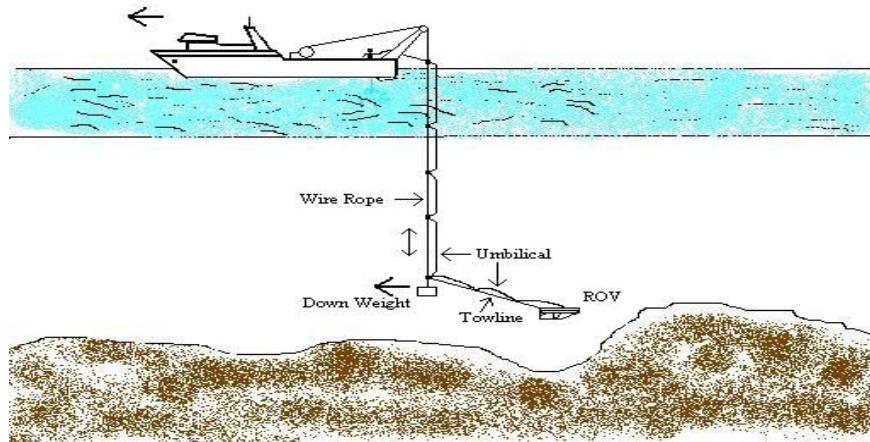


**ROV Free Swimming With Tether Marked by Surface Buoy** – The ROV is free swimming from a vessel which is not at anchor, but ROV is marked with a surface buoy attached to the tether. The ROV is deployed with the vessel adrift and out of gear. When the ROV reaches the desired working depth a large Norwegian buoy is affixed to the tether and placed overboard along with additional tether. With the buoy clear of the vessel and in sight of the bridge the vessel is free to maneuver in order to follow the buoy. Maneuvers must be coordinated with the tender.

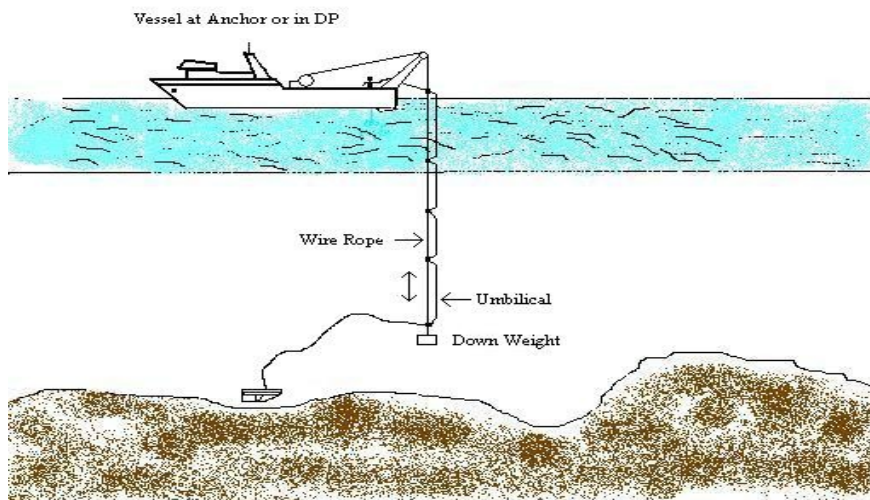


**ROV Towed Using Down Weight** – The ROV is towed by a bridle attached to a down weight and is deployed from a vessel not at anchor. The ROV is attached to the down weight by the bridle which is approximately 70 feet in length. The tether is attached to the tow bridle so that no strain is placed on the tether. With the vessel adrift the ROV/tow bridle are paid out until the end of the bridle is reached. The bridle is then shackled to a down weight, which is then lowered into the water on a wire rope by A-frame. The tether is clipped to the wire rope every 50 feet such that no tension is placed on the tether. When the down weight is at a depth of 50 feet, the vessel is can make necessary maneuvers coordinated with the tender. This mode of operation requires constant vigilance due to the vessel being underway and the chance of hangs present in the tow path. Pre-dive coordination and dive planning are, therefore, very important. This technique is very useful for long transects.





**ROV Free Swimming Using Down Weight** – The ROV is free swimming from a vessel not at anchor. The tether is attached to a down weight with 100 feet of free tether between the ROV and the down weight. With the vessel adrift, the ROV is placed in the water and motors away until the 100 foot mark is reached. The tether is then shackled to the down weight, which is lowered into the water on a wire rope by A-frame. This gives the ROV a 100 foot working radius from the down weight. The tether is clipped to the static line roughly every 50 feet such that no tension is placed on the tether. After the down weight is at a depth of 50 feet, the vessel is free to make necessary maneuvers coordinated with the ROV operator. This mode of operation works best with vessels that have dynamic positioning capability or can hold station without a visual reference in the water.



## TYPICAL WORK DAY

ROV operations require the full concentration of the operator at all times. In order to maintain ROV operations at peak performance, operators should perform no more than a maximum of four continuous hours of dive time. Dive operations should then be terminated or operators will be rotated. After a one hour break, the original operator can return for another four hour period of vehicle operations. ROV operations can be performed during the day or night, but each operator shall be given the opportunity to acquire at least eight hours of continuous sleep per day. Normal work hours for personnel engaged in ROV

operations should not exceed twelve hours during any twenty-four hour period. A typical work day will consist of 12 hours of ROV activities. This includes pre-dive vehicle preparations (0.5 hours), the ROV operations window (10 hours including breaks for meals, etc), and post-dive activities (1.5 hours) such as post-dive checks and securing the ROV and deck gear, labeling tapes, processing data, and logging. Hours of operations are flexible depending on mission circumstances.

## **RESULTS AND DELIVERABLES**

At the end of each ROV mission, the Principal Investigator or Chief Scientist will receive all original video recording media (DVD's). A metadata file and this manual will also be provided.

## **DAY RATE CHARGES**

**ROV Operational** charge is **\$1000/day** with one ROV pilot/technician. The operational day rate shall be charged for any day of operations in which an ROV dive is made. Training of scientist operators prior to the mission is required if leasing the ROV alone.

No day rate will be charged under the following circumstances:

- ROV and associated equipment failure.
- Any delay or suspension of ROV operations resulting from an error in judgment or negligence on the part of the ROV support crew.

A standby rate of \$900/day will be charged for the following:

- Each day of travel to/from port of embarkation/debarkation. For planning purposes, budget one travel day for every 600 miles of distance between Wilmington, NC and ports of embarkation/debarkation.
- Each day the ROV staff and asset is on location (in port) or aboard the vessel (in port, in transit or on station) and dive operations do not take place.

The following will be billed on an individual basis:

- All travel involved with the mission will be charged at cost.
- Excess shipping charges, when they occur, will be charged at cost.
- Additional support personnel beyond one staff member that may be requested by the chief scientist (e.g., additional staff members may be requested to increase the hours of operation, or contracting staff members with specialized skills to augment novel sampling equipment).

## **PHANTOM 300 LOAD LIST**

The table on the following page lists the equipment provided with the Phantom 300 System as well as scientist-supplied gear.

Phantom 300 ROV User's Guide

QTY	Check	ITEM	QTY	Check	ITEM
<b>Phantom 300 ROV System</b>			<b>Deck Box</b>		
1		Phantom 300 ROV	1		Recovery Hook
1		400' Tether	1		Quick Release Line
1		ROV Console & cord in case	1		Strain Relief Line
1		Video Console	1		Poly-pro bridle
1		<b>Gray Box</b>	Misc.		Cable Ties
1		<b>Tool Box</b>	10		Loops w/brass clips
1		Trim Weight Bag	10		Loops of 1/8" line
1		Square Recovery Pole	1		Dykes
1		Norwegian Buoy	1		Pliers
1		Down Weight	1		Screwdriver
			1		Electrical Tape

<b>Gray Box</b>	
1	ROV Manual
1	Isolation Transformer
Misc	Spare Video Cables
1	Extension Cord
1	<b>Deck Box</b>
1	<b>Spares Box</b>

<b>Spares Box</b>	
Misc.	Spare O-rings
Misc	Spare Fuses
1	Spare Bulb
1	Bulb Replacement Tool
1	Vertran End Cap Puller
2	Spare Shaft Zincs
Misc.	Spare Strap Hardware

<b>Tool Box</b>	
Misc.	Tools
Box	Q-Tips
1	Electrical Cleaner Spray
1	Silicone Lubricant Spray
1	Parker O-Lube Tube
1	Electrical Tape
1	Duct Tape
Misc.	1/8" nylon tie-down line
Misc.	Cable ties (small)
Misc.	Cable ties (medium)
Misc.	Cable ties (large)

<b>Scientist Provided Supplies</b>	
	<b>Blank Mini DV Tapes</b>
	<b>Spare battery for lasers</b>
	Power Strips
	Extension cords
	Gloves