

## Ground Control Station (GCS)

Flight operations with Insitu UAS are generally in two classes: those handled either by stationary or transportable ground control stations (GCS and TGCS). The non-moving GCS (a fixed unit that is stationary) is the most common for land-based operations. The moving TGCS is used for sea-based operations, and for land-based operations that require mobility (in a vehicle, such as a HMMWV).

The involvement of the TGCS varies; ship-based operations might require the TGCS to have full control (including launch and retrieval), while a land-based TGCS might only be used for part of a mission (i.e. no launch and retrieval) using omni antennas. GCS software includes operator interfaces for preflight checks, operating, flying, monitoring multiple aircraft on independent missions, and simulating flight operations to facilitate training and mission planning. A standard PC, running the Microsoft Windows operating system, is connected to an Interface Computer (If/C) that provides interconnection and control logic between the operator's control station and other GCS components.



The components and operations of each GCS vary depending on the project. The equipment, layout, and procedures are established by the commanding unit in charge, and training is provided on a project-by-project basis. Use the latest approved checklists for GCS Assembly, Startup, and Shutdown. The checklists are found:

- On Insitu's Extranet.
- In the *Pocket Handbook*.



The Transportable Ground Control Station (TGCS) and the Ground Control Station (GCS) use essentially the same setup procedure for installing and connecting the cables.

## Ground Control Station Hardware

### Layout – Arranging peripherals

(cont.)

The following diagram shows a typical arrangement for a right-handed operator.



### Layout – Connecting peripherals

The following diagram details which USB hub each peripheral utilizes. The speakers and video recorder (both from the I-MUSE computer) do not use a USB hub.

- 1 On ObjectTracker (Rack 2) USB hub, connect keyboard, mouse, fighter stick, and Nostromo pad.
- 2 On the I-MUSE (Rack 1) USB hub, connect the keyboard and four-button expert mouse.



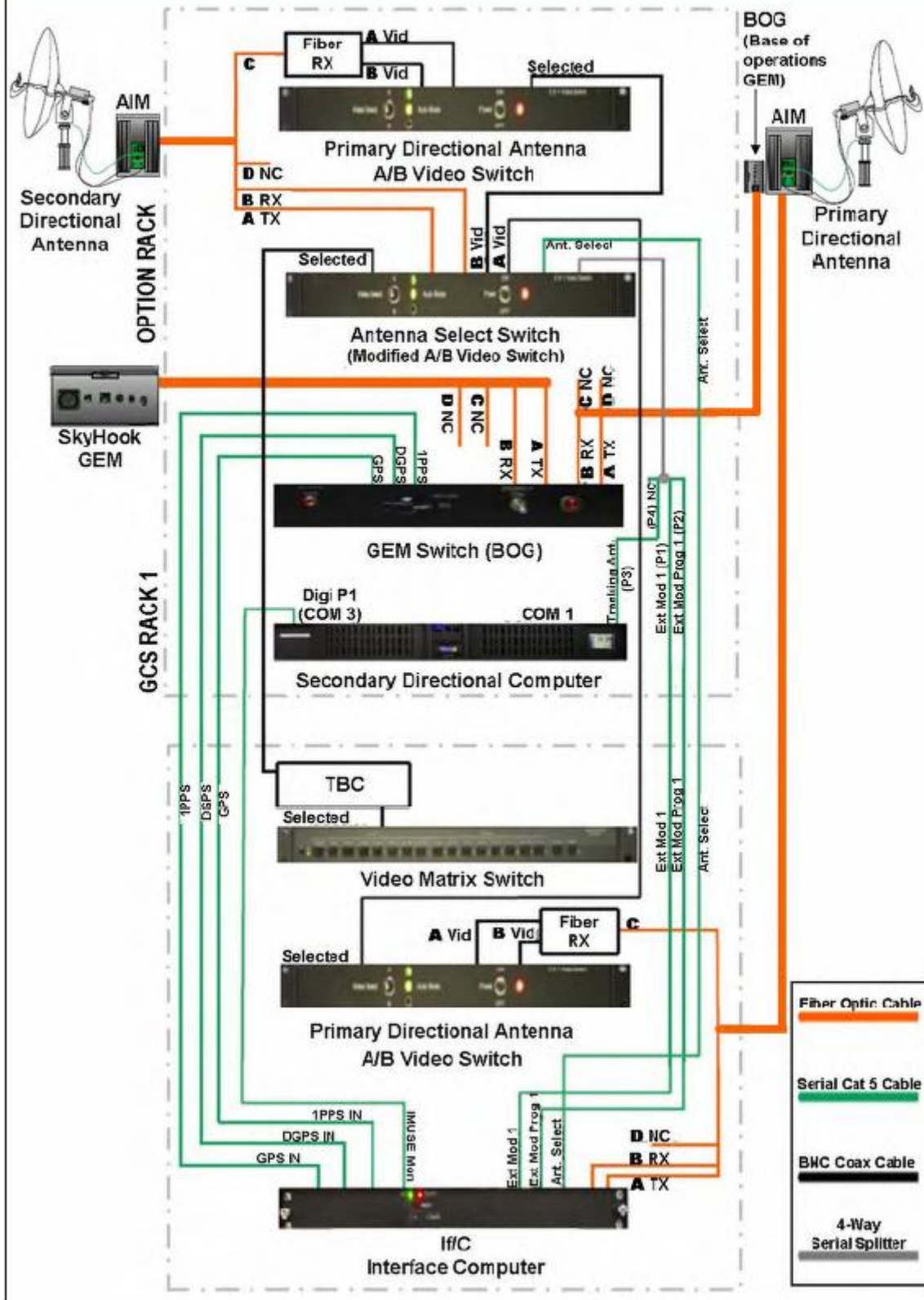
**CAUTION:** If a peripheral requires power, use the supplied power strip so it will continue to function if there is a power outage. Remember, the battery unit supplies 20+ minutes of reserve power for the complete system.





# Ground Control Station Hardware

## Layout – Dual directional antenna option

(cont.)





Ground Control Station Hardware	
Antennas (cont.)	
Accessories	<p>The case labeled "Antenna Accessories" contains the following items:</p> <ul style="list-style-type: none"> <li>▪ Wind/dust skirts for each antenna tripod. These can be wrapped around the tripod after setup in order to minimize wind load, dust incursion, and solar heating of the RF electronics cases.</li> <li>▪ Spare antenna actuator cable and test umbilical. The test umbilical can be used to command the antenna actuator from a laptop computer using the manufacturer's standard user interface.</li> <li>▪ Fiber optic power meter (for testing the fiber connections). The power output of a fiber optic transmitter can be measured and compared to the power at the other end of the cable. Losses should be less than 10 dB.</li> </ul>
Directional antenna setup	<div> <div>  <p><b>Tools:</b></p> <ul style="list-style-type: none"> <li>▪ Socket wrench or crescent wrench for 5/16-inch and 7/16-inch</li> <li>▪ Allen wrench for 1/4-inch bolts</li> <li>▪ Level</li> <li>▪ Hand-held GPS receiver</li> <li>▪ Azimuth calculation S/W (Excel spreadsheet)</li> </ul> </div> <div>  <p><b>Parts / Materials:</b></p> <ul style="list-style-type: none"> <li>▪ Cable ties</li> </ul> </div> </div> <p>Each parabolic dish antenna should be set up with its tripod level and its pan/tilt motor drive facing a known location – preferably in the general direction of operations.</p> <p><b>Note:</b> The command trailer should be behind the antenna. The SkyHook should not be behind the antenna.</p> <p>If using two antennae, they should be separated by a distance of 100 feet (30.5 m) to ensure that they do not create a potential for mutual blockage.</p> <p>Use the following procedures to set up each antenna.</p> <ol style="list-style-type: none"> <li>1 Pick a suitable location that offers an unobstructed view to the horizon in all directions, such as a small rise or rooftop. Consideration should be given to cable runs. Ideally, sites should be selected such that heavy vehicle traffic over the cables is minimized. <ul style="list-style-type: none"> <li>▪ If an unobstructed site is not available, find a location with minimum obstructions.</li> <li>▪ Blockage from the other antenna or ground vehicles is not a concern if they are more than 100 feet (30.5 m) away. Ideally, select a location away from a road or parking area where a vehicle could block the antenna.</li> </ul> </li> </ol> 