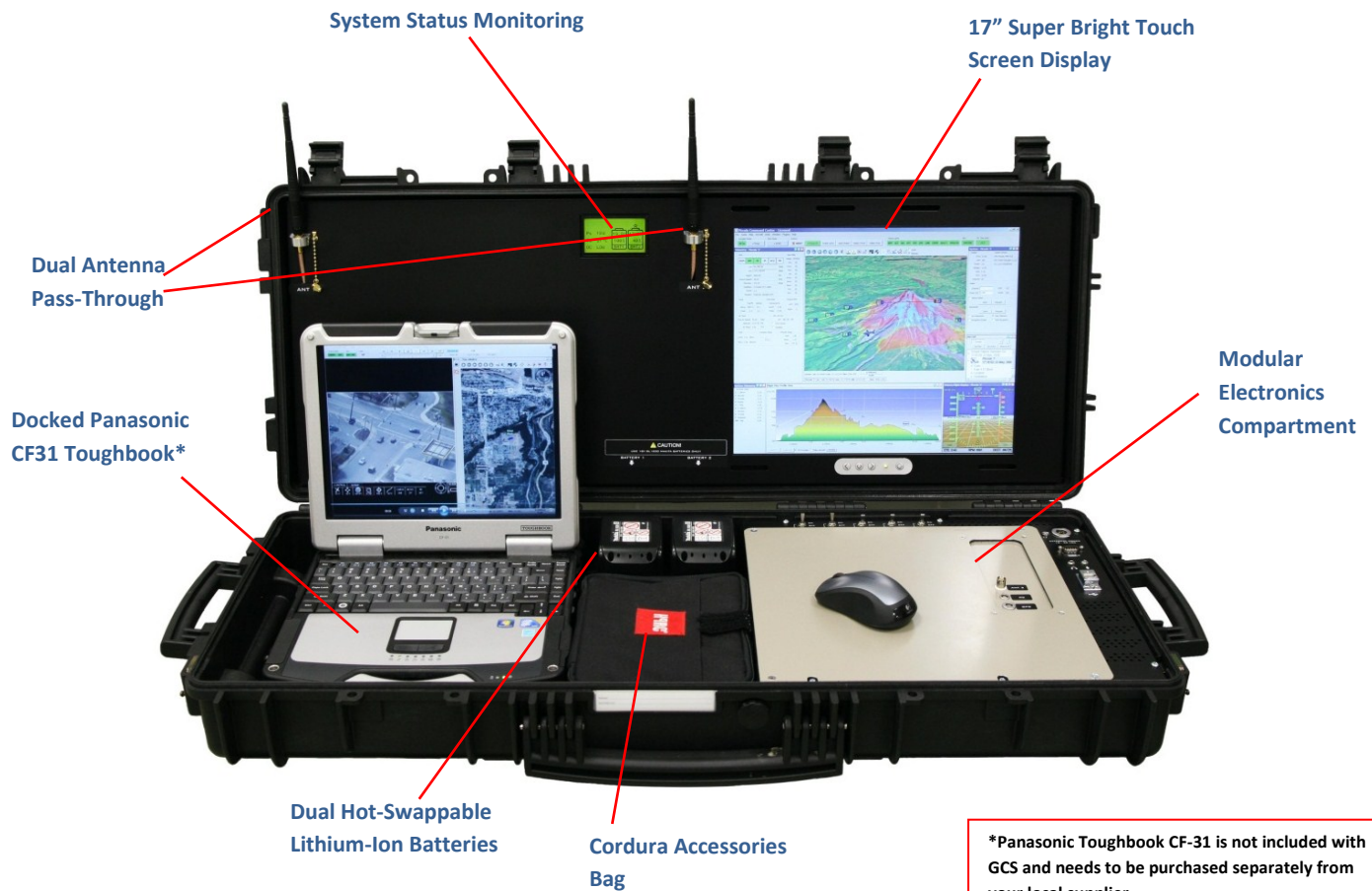# Portable Ground Control Station

## A Universal Off-the Shelf Solution
## Datasheet V2.1

## System Overview

UAV Factory's off-the-shelf portable Ground Control Station (GCS) is a flexible and universal solution for controlling unmanned vehicles and payloads. By using a unique, modular electronics compartment (MEC), application specific hardware can be quickly installed. This flexibility allows the GCS to be configured to control unmanned aircraft vehicles (UAV), ground robots, bomb disposal robots, remotely operated vehicles (ROV) and other robotic devices.  The GCS can also be configured to control and monitor measurement and sensing equipment.

Based on Panasonic's field proven CF-31 Toughbook, the GCS has additional 17'' sunlight readable touch screen display, advanced power distribution system with hot-swappable dual batteries and status monitoring features. The GCS is housed in a military grade rugged lightweight case which makes it ideal for use in harsh environments.

System Status Monitoring

17" Super Bright Touch Screen Display

Dual Antenna Pass-Through

Modular Electronics Compartment

Docked Panasonic CF31 Toughbook*

Dual Hot-Swappable Lithium-Ion Batteries

Cordura Accessories Bag

*Panasonic Toughbook CF-31 is not included with GCS and needs to be purchased separately from your local supplier

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# Key Features

The GCS can be configured for many different applications by using the modular electronics compartment. The modular electronics compartment contains a comprehensive set of connections which allows the user to install application specific hardware such as autopilot hardware, video receivers, data storage and recording devices and data links. The connection ports are routed directly from the electronics compartment to the docked Panasonic CF-31. This makes all hardware installation essentially plug and play.

With the capability to be powered from 10-32 VDC, the GCS can be used anytime, anywhere. Dual hot-swappable Lithium batteries up to 2 hours on a single battery set. Batteries can be hot-swapped without restarting the GCS, allowing for extended operation time.

The integrated power distribution system provides two 12 VDC, 50 W power outputs for use with equipment in the electronics compartment and external devices that are used in conjunction with GCS. Sensitive electronic equipment is protected by built in power safety features including over-voltage protection, over-current protection, reverse polarity protection and battery over-discharge protection.

The GCS is housed in a military-grade transportation case for maximum protection. A removable Cordura accessories bag makes it convenient to carry small components and accessories such as a joystick, mouse, wiring, antennas, external GPS antenna.

- Universal off-the-shelf ground control station
- Based on fully ruggedized Panasonic CF-31 Toughbook
- Integrated Toughbook docking station
- User dedicated modular electronics compartment with threaded mounting base
- Two, 50 W stabilized 12 V power outputs for electronics compartment
- A comprehensive set of connections: 2 serial (RS-232), 5 USB, 2 Ethernet, 1 video in, 1 VGA in (optional), 1 Microphone in, 1 Audio out, PCMCIA slot, HDMI
- Super bright 17" and 13" touch screen displays
- 10-32 VDC input range
- Hot-swappable dual lithium batteries
- Intuitive power monitoring display (battery status, input voltage, internal temperature, power consumption)
- Over-voltage, over-current, reverse polarity, battery over-discharge protection
- User-serviceable fuses
- Removable Cordura bag for accessories
- Carry handles, wheels and shoulder strap for convenient transportation
- Ruggedized and lightweight design

# Specifications

| Mechanical Specifications | |
|---|---|
| Dimensions | 1000 x 420 x 170 mm |
| Weight (excl. Panasonic Toughbook CF-31) | 18.9 kg |
| Environmental protection | IP66 when closed |
| Operating temperature | 0 to + 60 °C   (-20 to +60 °C with optional LCD heater) |
| Electronics compartment dimensions | 320 x 270 x 80 mm |
| Mounting base | M4 threaded mounting grid, 45 mm pitch, aluminum mount kit included |
| Accessory bag internal dimensions | 220 x 160 x 70 mm |
| Case features | Rugged plastic case, side handles, carry handle, wheels, pressure purge valve, shoulder strap (optional) |
| Computer mounting | Docking |
| **Electrical Specifications** | |
| DC input | 10 – 32 VDC<br>Over-voltage protection, reverse polarity protection |
| Battery type | Lithium Ion |
| Battery Capacity | 108 Wh |
| Battery Operation time | 2 hours (typical) |
| Connections (all routed to Panasonic CF-31) | 2 serial (RS-232), 5 USB, 2 Ethernet, 1 Composite Video in (IMPERX video device needed), 1 VGA in (optional), 1 Microphone in, 1 Audio out, PCMCIA slot, HDMI |
| DC power output 1 | 12V 5A fused, 50 W |
| DC power output 2 | 12V 5A fused, 50 W |
| Antenna pass-through | Two 50 Ohm antenna pass-through to upper lid<br>SMA-RP termination, RG 142 |
| **Computer Specifications (not included with GCS)** | |
| Model | Panasonic Toughbook CF-31 ( all specifications as per manufacturer datasheets) |
| Durability | MIL-STD-810G & IP65 certified (6' drop) |
| Display Type | 13.1" XGA touch screen LED 1024x768 |
| Brightness | 1100 nits |
| **17" Display Specifications** | |
| Display Type | 17 " TFT 1280 x 1024 (SXGA)<br>Optional touch screen |
| Brightness | 1600 nits |
| Signal source | Selectable between Panasonic Toughbook and external VGA input ( Optional) |

# Modular Electronics Compartment

The modular electronics compartment (Figure 1) allows application specific hardware to be quickly installed. Using the built-in M4 mounting grid and included standard mounting kit most device enclosures can be quickly and easily installed (Figure 5). Circuit boards can be installed onto the base of the electronics compartment using standoffs.

The MEC is protected by a removable lid. The lid has an additional configurable connection panel as shown in Figure 2. This connection panel is used for routing additional connections or switches from equipment installed in the MEC. The GCS comes with three blank connection panels and can be further machined to accommodate additional connectors and switches.

Two SMA-RP terminated antenna pass-through cables can be used to connect the SMA-RP antennas in the upper lid to hardware devices located in the modular electronics compartment (Figure 1). Alternatively, antenna connectors can be located on the connection panel as shown in Figure 2. If omni-directional antennas are used, it is convenient to use the integrated antenna pass-through. If the antennas need to be routed outside the GCS, such as to an antenna mast or tracking antenna, it is more convenient to use the antenna connections directly on the connection panel.
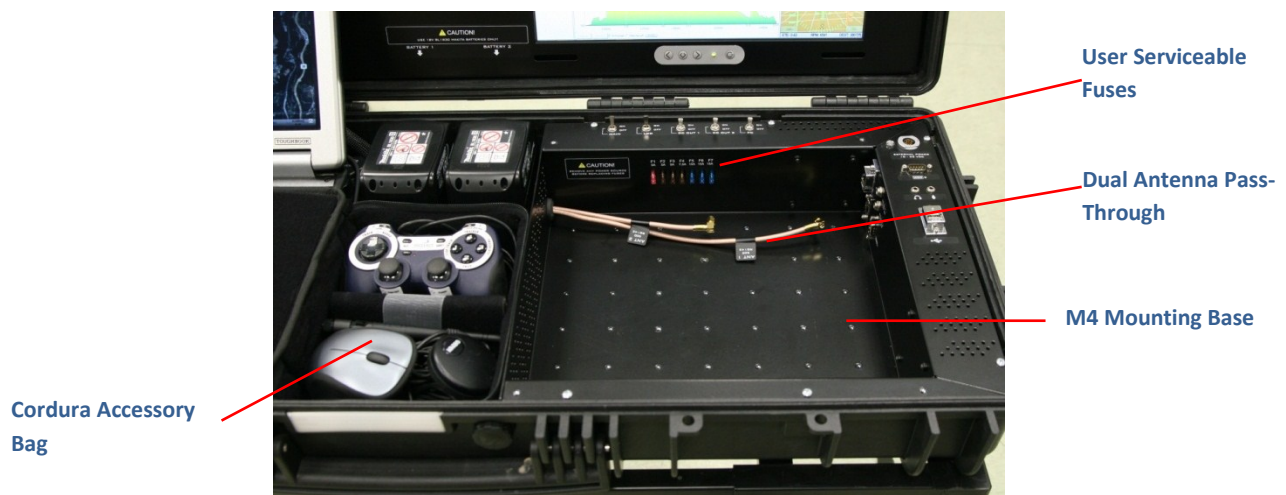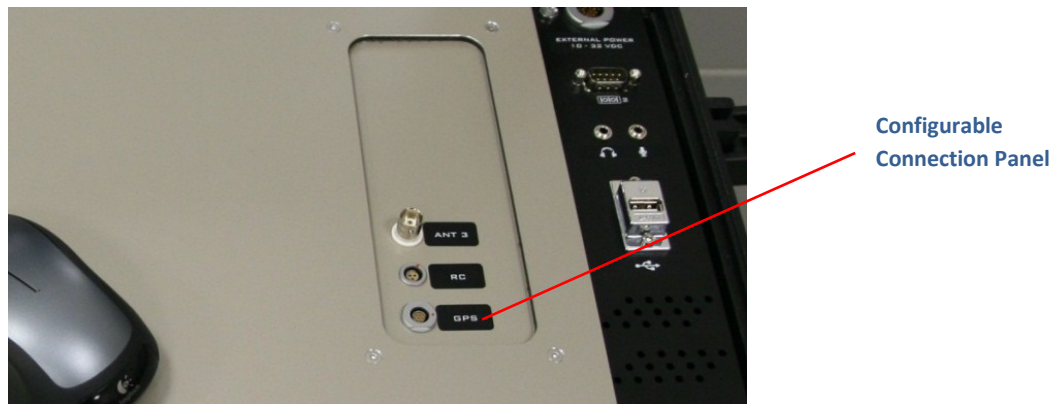


**Figure 1 Layout of the modular electronic compartment.**



**Figure 2 Electronics compartment lid and user-configurable connection panel.**

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# Electrical Connections

There are two groups of electrical connections in the GCS (Figure 3). Group 1 is for external connections and features one serial (RS-232) port, one microphone in, one Audio out and one USB. An optional VGA input for the 17" display can be factory installed. This option allows users to switch between a VGA input and the Panasonic Toughbook.

Group 2 is located in MEC and used for connecting additional application specific hardware to the GCS and features one USB, one serial (RS-232), one Ethernet and one Composite Video. Please note that for capturing composite video on the Panasonic CF-31, the IMPERX VCE-PRO capture device is needed.

Two 50 Watt, regulated 12 Volt power outputs are located in the MEC and can be used for powering additional hardware. The switch panel and fuses (Figure 4) control the DC Power Output 1 and DC Power Output 2 inside the MEC. The PC on/off switch can be used to charge the Panasonic Toughbook from the GCS power system. If this switch is off, the Panasonic Toughbook will use its internal batteries.
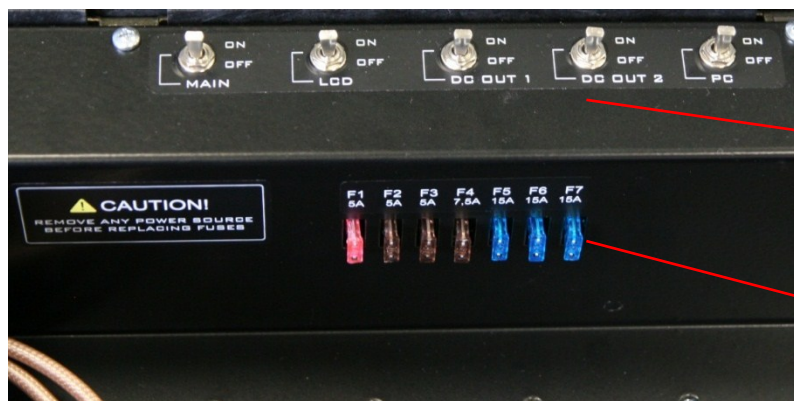
**Group 2 Connections:**
**Ethernet**
**USB**
**Serial (RS-232)**
**Composite Video-in**
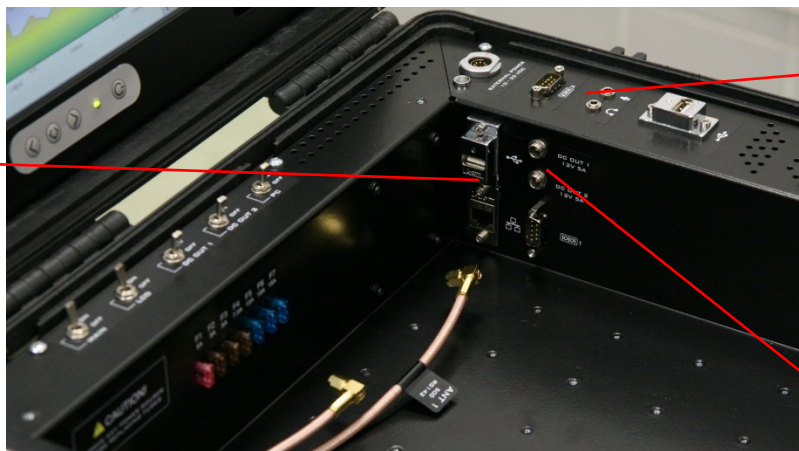
**Group 1 Connections:**
**Power Input**
**RS232 (COM1)**
**USB**
**Headphones**
**Microphone**
**VGA (optional)**

**DC Power Output 1**
**DC Power Output 2**

**Figure 3 Connections in the modular electronics compartment.**

**Switch panel**

**Fuses**

**Figure 4 GCS switch panel and user-serviceable fuses.**

# Installing Equipment in the Modular Electronics Compartment

A variety of electronic devices can be installed inside the modular electronics compartment using the threaded M4 mounting grid and provided adjustable mounts (Figure 5). Adjustable mounts can hold any rectangular enclosure that will fit within the compartment. A Velcro strap can be used to quickly fasten hardware to the base. Cable ties may also be used.

An example of hardware installed for controlling an unmanned aerial vehicle (UAV) is shown in Figure 6. For this particular application a COFDM diversity digital video receiver was installed in the modular electronics compartment and connected to the two antenna pass-through cables. The video output from the digital video receiver is connected to the Ethernet port and is fed directly to the Panasonic Toughbook. The video is displayed on the 17" display. The power supply for the video receiver is connected to the 12V Power Output 1. Also shown, is a ground station device used for communicating between the UAV and the GCS. The device is connected to the Panasonic Toughbook through a serial RS-232 port and is powered from the Power Output 2. The device requires an additional connection with an external GPS antenna, as well as a connection to the radio control transmitter (all of these connections are routed to connection panel as shown in Figure 2). All accessories necessary for this setup such as joystick, antennas and GPS receiver are stored in Cordura bag (Figure 1).
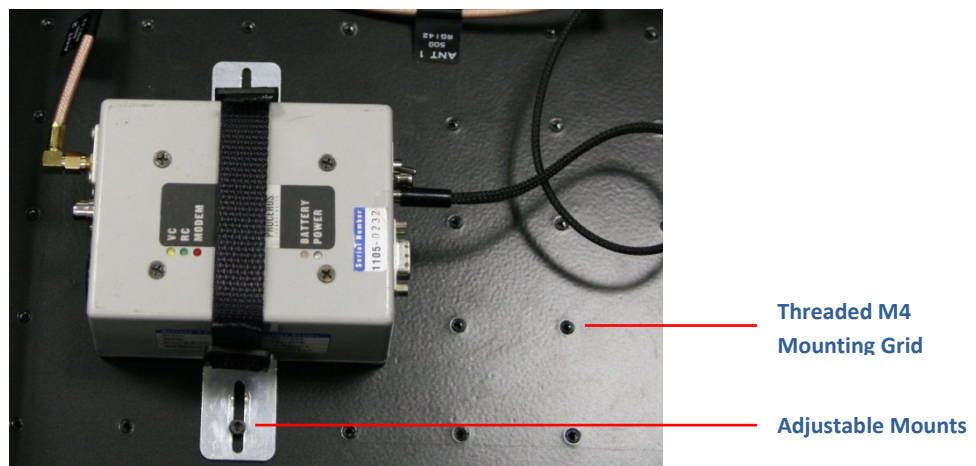


**Threaded M4 Mounting Grid**

**Adjustable Mounts**

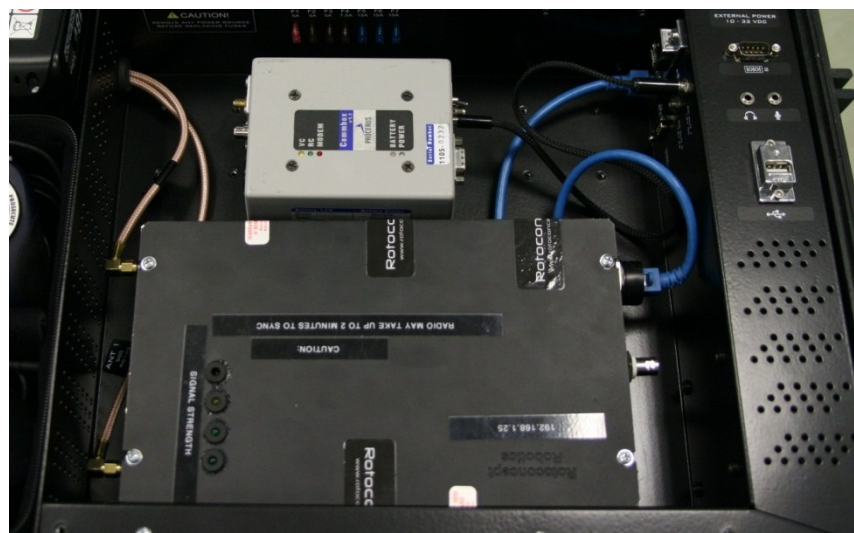Figure 5 mounting of hardware using the provided aluminum mounts.



Figure 6 Example of hardware installation for an unmanned aircraft vehicle.

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# Accessories

| Accessories |
| --- |
| AC/DC adapter 110 - 240 VAC to 24 VDC 200 W complete with push-pull connector |
| Power supply cable with push-pull connector, unterminated, 12 AWG, 5 m |
| GCS foldable stand |
| Shoulder strap |



**Figure 7 GCS with optional foldable stand.**



**Figure 8 GCS with optional shoulder strap.**