

Ground Control Station



FEATURES

- RC Transmitter Link for Direct Control and Preliminary Flights.
- Wireless Modems: Maxstream 9Xtend; Microhard Nano; Freewave MM2; Aerocomm AC4868, AC4424
- GPS Support:
 - UTC Time with Pulse Synchronization for Millisecond Accuracy
 - UTC Time Stamping of Telemetry
 - Ground Station Position Reference
 - Convoy Support
- Video Overlay of UAV State Information (Optional). Latitude, Longitude, Altitude, Airspeed, Battery Voltage, UTC Date & Time, etc.
- Uninterruptible Power Supply (UPS) Charges Internal Battery
- Over Two Hour Operation Using Internal Battery
- Small Rugged Metal Case: (4.7 x 3.7 x 2.1 inches)

APPLICATION

- Communication Data Control Link for Kestrel™ Autopilot
- Ground Station GPS Interface
- Multiple UAV Operations
- RC Transmitter Link for Pilot in-the-Loop Control

DESCRIPTION

The Commbox™ v1.1 is the heart of the ground station communications hardware. The Commbox ground control station provides a wireless data link between the Virtual Cockpit™ and one or more Kestrel™ autopilots. The Commbox provides ground station GPS information to the ground station computer and sends RC transmitter stick information to the UAV for pilot in-the-loop control. An NTSC/PAL video signal can be passed through the Commbox to overlay UAV state information, such as GPS location, airspeed, altitude, battery voltage, etc.

➤ Kestrel and Virtual Cockpit are trademarks of Procerus Technologies.

TYPICAL APPLICATION

Figure 1 demonstrates typical application of the Commbox v1.1. This includes use of a ground station GPS, video overlay of UAV status, and use of an RC transmitter for pilot in-the-loop control.

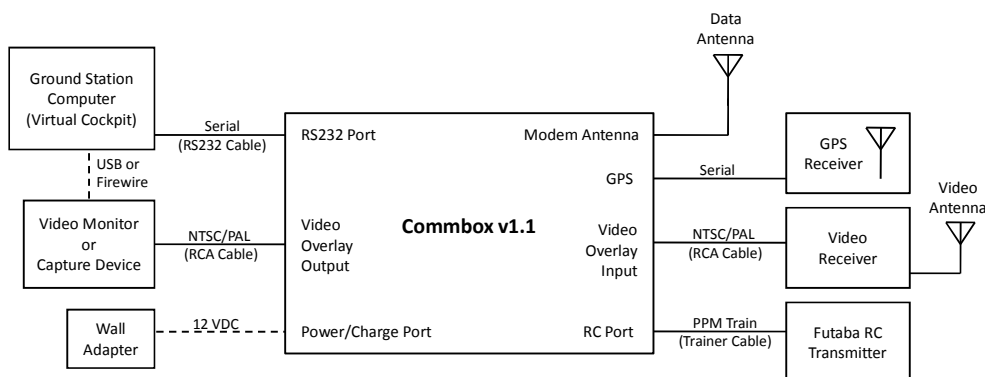


Figure 1 - Typical Use of the Commbox v1.1.

Commbot v1.1

ABSOLUTE MAXIMUM RATINGS

Input Supply Voltage.....	14V
Input Supply Voltage (Commbot v1.1.2 and later).....	24V**
Operating Temperature Range.....	-40°C to 80°C
Storage Temperature Range	-40°C to 125°C
Humidity	5% to 95%, no condensing

** Contact Procerus Technologies to verify that your Commbot v1.1.2 can support 18V - 24V input voltage.

Stresses above those listed under the Absolute Maximum Ratings may cause permanent damage to this device. This is a stress rating only; functional operation of this device at these or any other conditions above those indicated in the operational section of this specification are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

Parameter	Conditions	Min	Typ	Max	Units
Power	Charger OFF		4.2		W
	Charger ON		8.0	9.2	W
Charge Port					
Input Voltage		9	12	14	V
Input Voltage (v1.1.2 and later)**	(VAR3 & VAR4 must be changed)	9		24	V
Current Draw	@12V, Maxstream modem	420	670	770	mA
Internal Battery (8 Cell NiMH)					
Nominal Voltage			9.6	12	V
Capacity			2500		mAhr
Battery Port Input Voltage				12	V
Battery Port Current Draw	@12V, Maxstream modem	150	350	500	mA
Startup Time			4		Sec

PHYSICAL CHARACTERISTICS

Parameter	Conditions	Typ	Units
Dimensions	Metal Case Outsides	4.69" x 3.69" x 2.06"	Inches
Weight		23.8	Oz.
		674	Grams

PORT DESCRIPTIONS

This section contains figures and descriptions of ports on the Commbot.

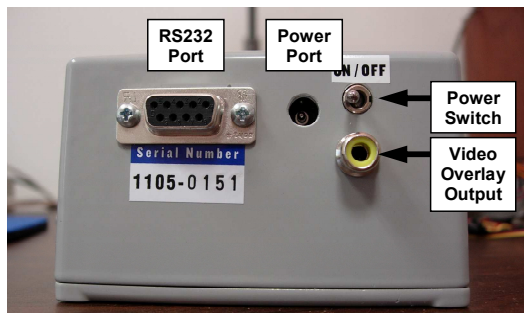


Figure 2 – Power Switch Side Ports

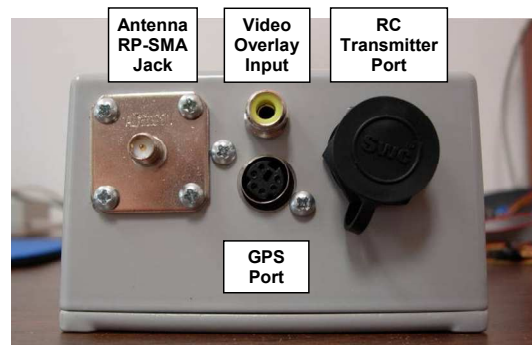


Figure 3 - Antenna Side Ports

Antenna RP-SMA Jack: Connection point for the wireless modem antenna. The jack is a male reverse polarity SMA (RP-SMA) connector. Mating antennas should use a female RP-SMA connector.

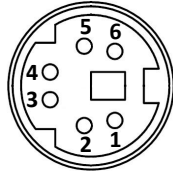
Power Port: This port powers and charges the Commbot. Use any standard 12 VDC P-5 tip wall adapter that is rated at or above 500 mA. The polarity should be center positive.

Power Switch: The power switch disables the wireless modem, stops communication with any UAV, and disconnects the internal battery as a supply.

GPS Port: This port is configured for use with the Garmin roof mount GPS supplied by Procerus Technologies. The GPS Port is configured to read NMEA sentences “GPGGA” and “GPRMC” over asynchronous serial data at 4800 baud and either RS232 or inverted TTL levels.

Pin	Description
1	GND
2	PWR (5V @ <400mA)
3	Tx (SERD)
4	Rx (SERD)
5	CMD (PF0)
6	Time Sync Pulse (PE4)

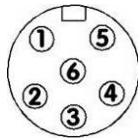
Table 1 - GPS Port Pin Assignments



RC Transmitter Port: An RC transmitter connected to this port with the cable supplied by Procerus Technologies is used for pilot in-the-loop control. Any Futaba radio with 7 or more channels should be used.

Pin	Description
3	Signal In
6	GND

Table 2 - RC Port Pin Assignments



RS232 Port: This port provides a serial connection to the ground station computer (Virtual Cockpit). This serial port communicates at 115,200 baud asynchronous serial data,

using RS232 signal levels. The RS232 port is also used to update the Commbox firmware (refer to the Updating Firmware Guide for details).

Video Overlay Input/ Output: These ports are used to overlay UAV state information onto video onto an NTSC video feed. The video source, such as a video receiver, is connected to the input and a monitor is connected to the output. The UAV state information reflects the selected UAV agent in the Virtual Cockpit, or by default agent 1032. Use standard RCA video connector.

GPIO Port: This port supports general purpose I/O logic applications. Video receiver channel changing can be enabled using this port by selecting the “Enable Video Channel Ability” option on the Commbox settings window of the Virtual Cockpit. The GPIO lines are configured as open-drain for the Video Channel Ability, (i.e. floating high and driven low). The video channel is set by the Video Channel flash parameter. This parameter can be manually changed or automatically by specifying the agent video channel in the Edit Agent List and then enabling the “Match Video Channel with Selected Agent” Commbox setting. The GPIO Port is available on Commbox hardware version 1.1.2 and later.

Pin	Description
1	GND
2-5	GPIO

Table 3 – GPIO Pin Assignments

LED STATUS DISPLAY

Commbox status information is provided through the top LED lights. This section describes these LEDs.

Battery LED: Provides the state of the battery as follows:

Color	Description
Amber	Charging
Green	Charged / OK
Green/Red Flashing	Low Battery
Red Flashing	Critically Low Battery
Red	No Battery

Table 4 - Battery LED Description

Modem LED: Indicates data received from a UAV.

Power LED: Indicates if the Commbox power switch is ON. This LED flashes indicating data transfer during firmware update.

RC LED: Indicates valid RC transmitter stick positions read through RC Port and transmitted to selected UAV.

VC LED: Indicates data received from Virtual Cockpit (VC).

Commbox Ground Control Station

RELATED PARTS

Part Number	Manufacturer	Description	Comments
RCTRAIN3	Procerus	12' Trainer Cable	Connects RC Transmitter to Commbox RC Port
	Procerus / Garmin	Ground Station GPS	Provides UTC Time Synchronization
AK131-2-R	Assman Electric	CABLE DB9M-DB9F 2M	RS232 Cable. Connects Commbox to Computer.
T991-P5P-ND	CUI Inc.	TRANSFORMER 12VDC 1.25A P-5 PLUG	Power/Charging Wall Adapter
EN3C6M	Switchcraft Inc.	CONN PLUG WEATHERTIGHT 6POS MALE	Connector for RC Trainer Cable
MD-60	CUI Inc.	CONN MINI-DIN 6 PIN MALE	Connector for GPS Cord
S161AH-915R	Nearson	Right Angle RP-SMA plug reverse polarity	900 MHz, 2.5dBi, Whip Antenna
S467AH-915S	Nearson	Swivel RP-SMA plug reverse polarity	900 MHz, 2.0dBi, Whip Antenna
HG2403MGU-RSP	Hyper Link Technology	Mag Mount, 900MHz, 3dBi, 10' cable, RP-SMA	900 MHz Magnetic Roof Mount Antenna for Commbox
HG908P-RSP	Hyper Link Technology	900 MHz 8 dBi Flat Patch Antenna RP-SMA	900 MHz Directional Long-Range Antenna