

BTC-40 Pan and Tilt Gimbal



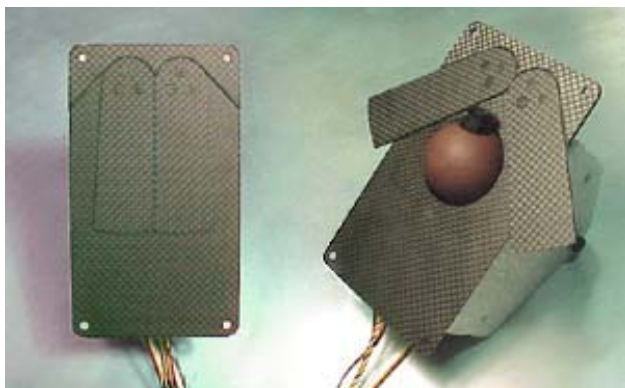
Procerus partner, Brandebury Tool, is the maker of the BTC-40 Pan and Tilt Gimbal (www.microuav.com).

FEATURES

- Fully Retractable System (non-retract version also available)
- Pan and Tilt Camera (400 and 90 degrees respectively)
- Field changeable lenses - standard 4mm focal length
- Pulse Width Modulation (PWM) control of servos
- Supports OnPoint™ Targeting with Virtual Cockpit™
- Image Stabilization through OnPoint™
- Light Weight: 65 grams (Including camera)
- Dimensions: 2.125" x 1.5" x 3.5"
- Ball Diameter: 40mm (3.5")
- Pan: 400 degrees max. @ 0.72 sec / 360°
- Tilt: 90 degrees max. @ 0.18 sec / 90°

APPLICATIONS

- Persistent Imaging of an Area or Target
- Image Based Target Localization and Navigation
- Search and Rescue
- Aerial Surveillance and Reconnaissance



BTC-40 R Retractable Gimbal with optional beetle-wing bay doors.

DESCRIPTION

The BTC-40 Micro Ball Turret Gimbal, made by Brandebury Tool, is a lightweight, full-featured, retractable, pan-and-tilt gimbal that is specifically designed for imaging onboard small UAVs. The BTC-40 features a rigid and ultra light composite chassis coupled with a novel movement that keeps inertia low and results in fast and smooth action. Aiming can be done manually or by a GPS directed autopilot referencing the attitude and altitude of the aircraft allowing the camera to point to any designated GPS location and stay there if desired. With standard servo pulse code operation the Ball Turret Camera is easy to install with "plug and play" simplicity. The structure is built from a combination of carbon fiber composite and G-10 fiberglass components. The polymer ball and camera mount are suspended by a machined aluminum yoke that rotates on two sealed ball bearings for smooth movement. Custom mounting brackets are available for your installation.

The **BTC-40 R** is fully retractable and does not require additional skids for protection. Optionally, the system utilizes a pair of "Beetle Wing" doors that function as skid plates and are articulated on high impact mounts. The retracting mechanism has an over-center lock in the up position and is fabricated from carbon fiber and machined polymers. The system allows bare lens operation without distortion from a clear dome cover.

The BTC-40 is fully compatible with the Procerus Virtual Cockpit™ ground control software and OnPoint™ Targeting software, making "Click N' Fly" operation easy while providing powerful mission planning, monitoring, and in-flight adjustment. This makes the BTC-40 ideal for all surveillance and reconnaissance applications. And at 65 grams, the BTC-40 is ideally suited to small UAVs.

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HIGH-RESOLUTION DAYLIGHT CAMERA

- Format: NTSC / PAL
- 1/4" Inter-line type color CCD Image sensor
- Field changeable lenses - standard 4mm focal length
- Operating Voltage of 5V DC current consumption of 160mA
- **High resolution: 752(H) x 582(V)**
- 0.9 Lux max
- S/N ratio: better than 45 dB
- Electronic Iris: 1/50sec – 1/100 sec
- Auto white balance
- Gamma: 0.45
- Operating temp of -5C - +45C



HIGH-RESOLUTION LOW-LIGHT CAMERA

- Format: NTSC / PAL
- NTSC 1/3" - 2:1 Inter lace CCD Image sensor
- Operating Voltage of 12V DC (+-10%)
- Current consumption of 100mA
- **High resolution: 795(H) x 596(V)**
- **0.0003 Lux max**
- S/N ratio: better than 45 dB
- Auto Shutter: 1/50sec – 1/100,000 sec
- Operating temp of -10C - +50C



ABSOLUTE MAXIMUM RATINGS

Input Supply Voltage (Servos)..... 0V to 6.0V
 Operating Temperature Range-5°C to 45°C
 Storage Temperature Range.....-5°C to 45°C
 Humidity5% to 95%, no condensing

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 the 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.

OPERATING CHARACTERISTICS

Parameter	Conditions	Min	Typ	Max	Units
Day-light Camera Input Voltage			5		V
Low-light Camer Input Voltage		10.8	12	13.2	V
Servo Input Voltage (Each)		4.8	5.0	6.0	V
Dimensions			2.125" x 1.5" x 3.5"		inches
Weight			65		grams

DESCRIPTION OF APPLICATIONS FOR BTC-40 GIMBAL

Smart Loiters

Using the BTC-40 Gimballed camera the user can center an object / target in their field of view and click "loiter now". The Kestrel will geo-locate the target and place a loiter point at that location and direct the UAV to it. The Kestrel then calculates the optimal radius and eccentricity to keep the object in the center of the FOV. If a gimbal is present, the autopilot will stabilize the camera and keep the gimbal pointed at the target.

GPS Targeting

Using Virtual Cockpit™, users can instruct the autopilot to "Target Gimbal Here" on the map. A cross hair is placed on the target and the gimbal remains locked on. Click-n-drag the cross hair to new targets as desired. The gimbal follows and locks on independent of flight path. Terrain elevation data is utilized for greater accuracy. The gimbal can also be used to geo-locate objects with a single click.

OnPoint™ Target Localization

Vision-based target localization using OnPoint™ Targeting allows the user to obtain GPS coordinates of desired ground targets to within 5m or less. Terrain Elevation Data is utilized

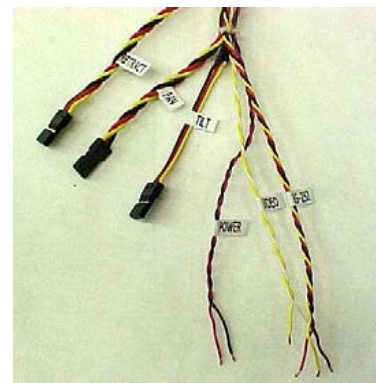
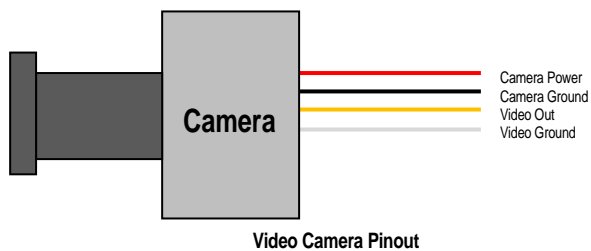
to maximize accuracy. Users can click in the video on a desired target and the autopilot will fly the UAV to the object and loiter about it - within 1 revolution GPS coordinates will be given to within 3- 5m accuracy. If the target moves, OnPoint uses a sophisticated computer vision based tracking technique to keep the target centered in the video. The user can also click on the moving target and the UAV will follow, providing GPS coordinates as it does so.

Gimbal Features in Procerus Virtual Cockpit™

- Terrain Elevation Data is used for gimbal pointing accuracy.
- Gimbal Mode status displayed in Artificial Horizon.
- Gimbal position indicators on-screen.
- "Flashlight" view displays image frustum on map to aid user.
- Gimbal multi-point calibration and configuration screen.
- Smooth panning with hand controller.
- Control, Retract, or Change gimbal mode with gamepad.
- Click-n-drag crosshair – gimbal follows and locks on target.
- Autopilot optimized gimbal loiters. (point click - Kestrel computes radius)

PORT FUNCTIONS

The following section describes the pin assignments for each port type. The Pan, Tilt, and Retract servo cables plug directly into the Kestrel Servo Expansion Board as Gimbal Azimuth, Gimbal Elevation, and Gimbal Retract (Ch6) respectively. The digital servos used in the BTC-40 require 4.8-6.0V DC. The Daylight Camera can be powered with any regulated 5VDC power source. The Low-Light Camera can be powered with an unregulated 10.8 – 13.2 VDC power source. The camera video should be connected to any NTSC composite video transmitter.



Wiring for the BTC-40 Gimbal

INSTALLATION NOTES

- Be careful not to jam the tilt servo against the stops when setting up the throws.
- The retract servo must be carefully adjusted to be "over-center locked" without being jammed against the stop in the full up position.
- The aluminum yoke is a press fit – do not force. Do not back drive the servos.
- You must ensure proper lens position prior to extension/retraction to avoid striking the base plate opening.
- Camera ball is lowered to the hemisphere line with the ball being centered in base plate opening.
- Be sure not to restrict the motion of the camera harness wire exiting the chassis as it is on a return spring and needs to retract approximately 1 inch.
- Adjust the focus by rotating the lens, it seats on a rubber washer. Unscrew to remove and be careful when installing as the threads are very fine.

RELATED PARTS

Part Number	Manufacturer	Description	Comments
ZHR-3	JST Sales Amer.	3 pin JST connector housing. Used w/ servo ports.	CONN HOUSING ZH 3POS 1.5MM
SZH-003T-P0.5	JST Sales Amer.	Terminal crimp for JST connector.	CONN TERM FEMALE 28-32AWG TIN