Biclops Installation Instructions (Revl)

Congratulations on your purchase of a TRACLabs Biclops system. Please take a moment to review the packing list, verify package content and visually inspect the contents for damage. Before mounting a load on Biclops, it is prudent to ensure proper operation of the equipment, as described in the following section.

1. Biclops Wiring

All the electronics required to control Biclops are housed internally. Consequently, Biclops requires only two connections to operate: power and communication. These connections are show in Figure 1, with the 4-pin power connector on the left under the power switch and power LED, and the 6-pin communication connector on the right.

Power is supplied through a 4-pin Switchcraft EN3 weather-tight connector (P/N EN3P4M) and mates with a Switchcraft EN3C4F. Power supplied through this connection is nominally 24VDC at .5A max, but the voltage can range from 9-35V. The optional power supply (P/N PS) comes prewired with the necessary connector. For custom power supply connections, pin 1 is connected to ground and pin 2 is power. First, ensure that the power switch is in the off (down) position, and then attach the power plug from the supply to the power receptacle on Biclops by aligning the pins and securing the connection with the locking ring.

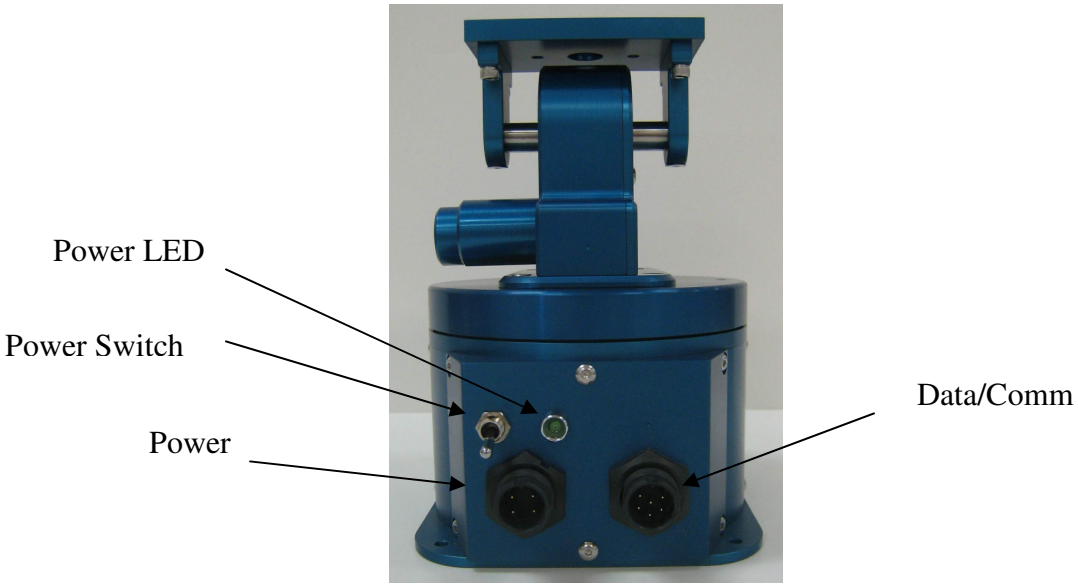

Figure 1 Biclops PT-M rear view, showing connectors

Communication with the Biclops controller occurs through another weather tight 8-pin connector, Switchcraft P/N EN3P8M. Depending on the option ordered, a mating cable provides either RS232 or USB 2.0 full speed. The other end of this external cable terminates in the appropriate PC-relative connector: either a female DB9 connector or a USB-A plug. Just plug the weather tight connector into Biclops and the other end into the appropriate adapter on the PC.

There is also an option to route cables internally through Biclops for the customers load. This connection comes into Biclops just above the communication connector on the back of the unit and exits at the back of the tilt axis. Since this is a custom option, the

pinout is not presented in this document, but the design uses a Hirose HR10A connector. Please refer to supporting documentation provided with your Biclops shipment.

Power your Biclops unit by flipping the power switch to the on (up) position. A properly functioning unit will have its green LED illuminated.

2. Running Demo Software

Biclops control occurs as a series of 16-bit binary instructions through a serial connection to a computer. To assist the user in getting their application operational as quickly as possible, TRACLabs provides a C++ API. To illustrate the use of the API and allow the user to easily control Biclops without any programming, Biclops comes equipped with a couple of demonstration applications.

The Biclops API is available to customers through the TRACLabs website subversion repository at https://www.traclabs.com/svn/motion, https://www.traclabs.com/svn/portablePosix, and https://www.traclabs.com/svn/Biclops. If you do not have subversion capability on your Microsoft Windows-based PC, we recommend that you use Tortoise SVN, which can be found at http://tortoisesvn.tigris.org/. The motion project provides the API for communicating with the embedded controller, while the Biclops project contains a Biclops-specific API, all of the demo applications, and all supporting documentation. The portablePosix project provides a platform-independent API to posix calls and is only necessary for MS Windows users. Access to the repositories is restricted and requires a login and password, which is available by sending email to bwolfe@traclabs.com.

The simplest API usage is demonstrated in BiclopsBareBones.cpp. This application's only function is to establish communication with Biclops, execute a homing sequence, and then exercise the axes with a couple of short moves. This application has the minimal sequence of API calls necessary to begin controlling Biclops and is platform-independent.

A more elaborate demo application is found in the BiclopsDemo executable. This application is a GUI using Microsoft Windows Visual C++-based graphics library calls. As such, it will not run on any other OS without significant modification. The purpose of this demo is to give access to more of the API methods and demonstrate their use within a GUI.

To use this demo, select the configuration file that describes the Biclops communication port characteristics and control parameters (for RevI this should be BiclopsRevI.cfg), and then click on the (Re)connect button. Once communication is established, you can initialize Biclops by asking it to go through its homing sequence. Select the axes you want to control using the enabled check boxes in the "Commands" region and then click on the "Do Homing" button. Homing progress is displayed in the status window. It will indicate success when homing completes and current position information will be displayed in the "ACTUAL" status table along with default commanded velocities, accelerations and gains.

To move Biclops you may enter new values in the Pos/Vel/Acc rows for each axis or, more simply, by just clicking on the "Move Axes" button. This action brings up a

separate window in which you can left click to drag the pan and tilt axis anywhere within its motion limits dynamically. This window may be resized to get finer control of the individual axes. Actual position is shown in the status box. You may also modify the gains for each axis by typing in the desired values and then clicking on the appropriate SET button below each column.

The figure below shows a snapshot of the BiclopsDemo GUI. Note that the source code is provided for not only the demo applications but also for the API itself. This allows the customer to customize the interface without restriction as long as the low level communication protocol is adhered to. Please refer to the Programmers Manual and source code for further detail.

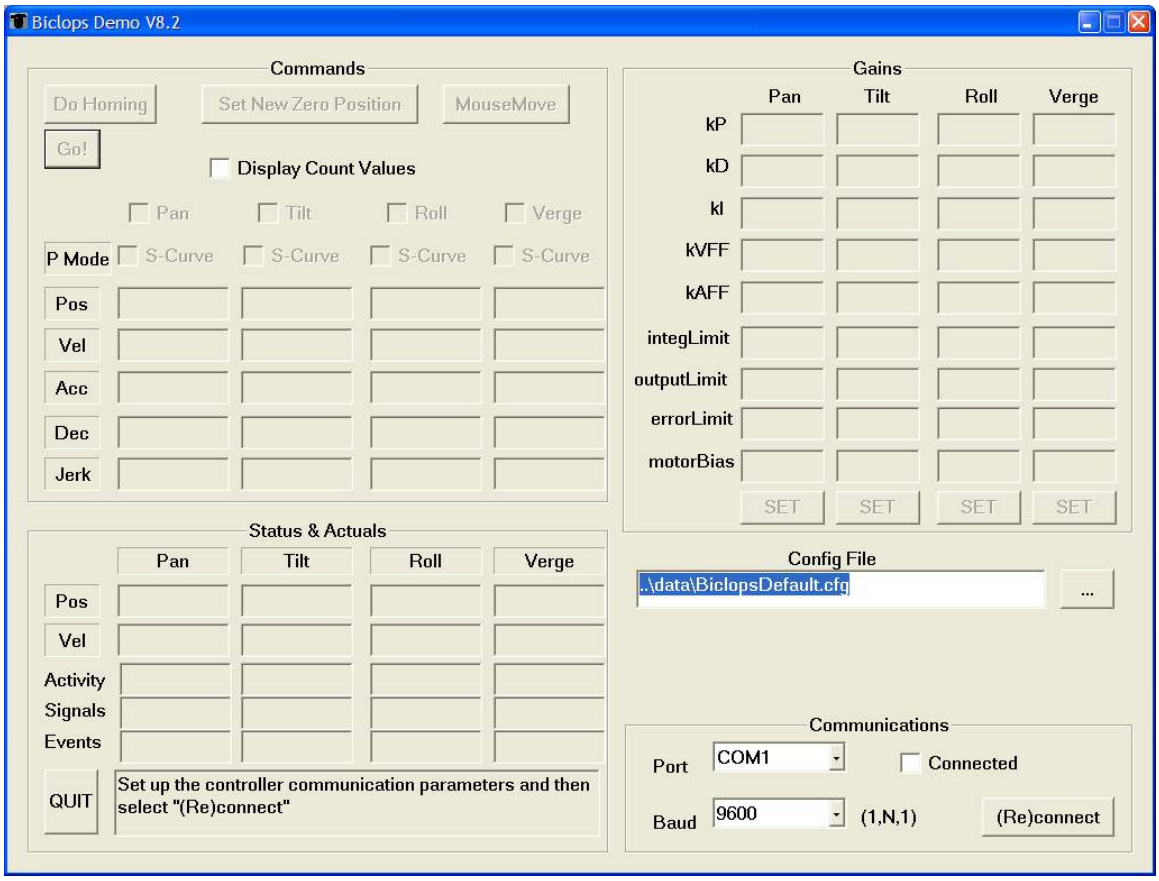

Figure 6 BiclopsDemo screen capture

3. Axis Calibration

Due to calibration inaccuracies during the manufacturing process, the user should calibrate each Biclops for the best pointing accuracy. A one-time calibration procedure may be run by the user, as described in section 4.1 of the Biclops Users Manual.

4. Mounting Loads

Biclops comes equipped with two different mounting surfaces: a monocular mount (standard model PT-M), and an optional multi-sensor stereo mount (option -S). The monocular mount is intended for single loads located along the pan center, whereas the

stereo mount is an extended version of the monocular mount with additional mounting locations for multiple load pairs. Figure 2 and Figure 3 show the hole patterns for the –M and –S mounts, respectively.

Loads may be mounted in any configuration as long as that configuration does not exceed load ratings. Ideally, loads should be balanced about the pan and tilt rotation axes. For pan, this means having the load mass roughly balanced between left and right side of center. For tilt, a balanced load is a little more challenging given that the load mount is directly above the tilt actuator, so for loads mounted in the center, balance about tilt is not possible without a counterbalance. However, for stereo loads, it is possible to mount the loads below the mounting bar, putting the load close to the tilt axis of rotation.

The mounting bars have multiple mounting locations to support the standard ¼-20 camera mount, including an alignment pin to help align the load to the mounting plate. These mounting holes are in the center (-M and –S mounts), and at 4-, 5-,6-, and 7-inch centers (-S mount only). Biclops is shipped with special low profile screws (one for –M, two for –S) that fit within the ¼-20 counterbore of each mount location. The alignment pin hole accommodates a 3/16” 4-40 socket cap screw (provided in screw kit) for aligning cameras that offer an alignment pin feature, such as video cameras. The head of the screw acts as the alignment pin.

Special consideration is needed for the central mount location. Due to the tilt axis drive mechanism, direct access to the mounting screw is restricted. It is therefore necessary to remove the mount plate from Biclops to attach a load. The mount plate may be easily removed by unscrewing the 4 #6-32 socket cap screws holding the mounting plate to the tilt mounting ears using a 7/64” hex wrench. After the load is attached to the plate, the entire assembly can be reattached to the tilt axis using those same 4 screws. This process does not adversely affect mechanism alignment or precision.

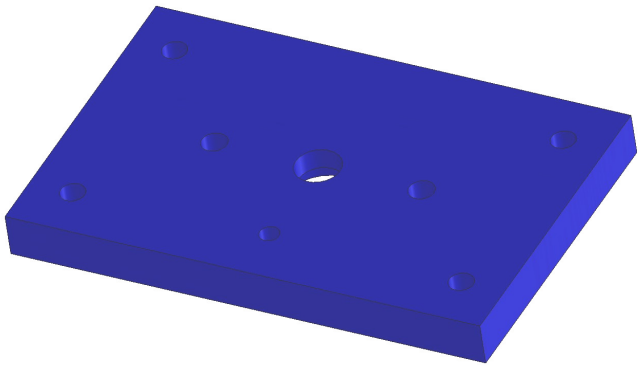

Figure 2 Monocular (-M) mount, top view

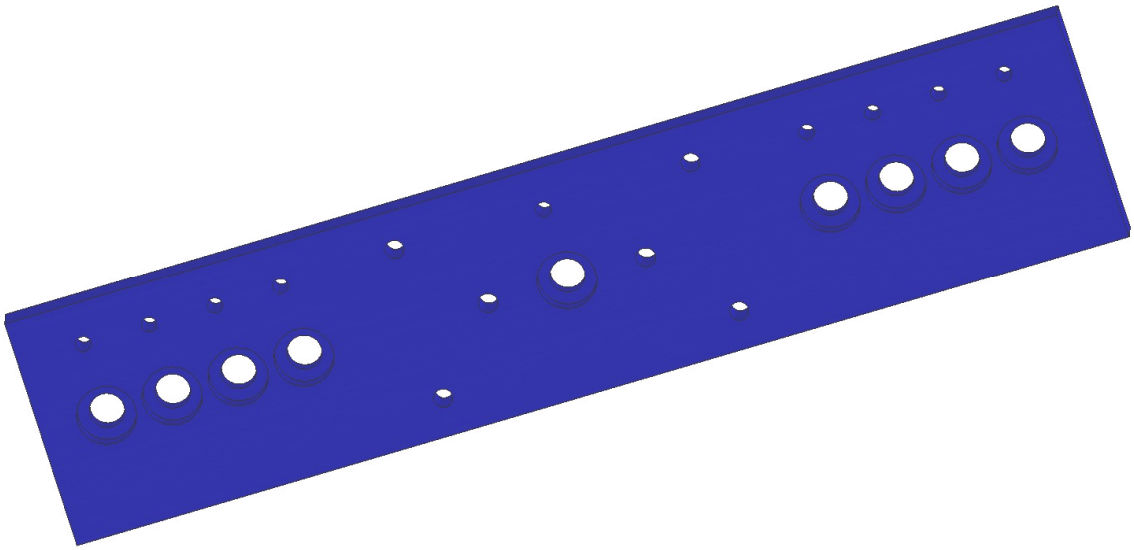

Figure 3 Stereo/wide (-S) mount, bottom view

Figure 4 Biclops PT-M, front view

Mounting bar orientation is somewhat restricted by Biclops but is otherwise arbitrary. By default, Biclops is shipped with the monocular mount attached, having the ¼-20 screwhead countersink on the underside with the alignment pin facing forward. Other than rotating the mount bar 180 degrees to place the alignment pin towards the back, this is the only logical configuration due to the space restrictions beneath the mount bar. However, the stereo mount has more flexibility since all of the additional mount locations do not interfere with the Biclops mechanism. Therefore, the stereo bar may be mounted upside down as well as backwards to accommodate loads hanging below the bar instead of above the bar as is required by the monocular bar.

Please note that the Biclops is shipped with the tilt axis range of motion limited to ±60°, which ensures that the load mounting plane does not intersect any other mechanical features on Biclops. Full range of motion (±90°) is possible by replacing the 6-32x3/8" screw on the left side of the tilt axis (as view from the front) with a shorter 6-32x3/16" screw (provided). With the greater tilt range, the user must ensure that the load does not interfere with tilt motion or damage to the load is possible.

5. Mounting Biclops

Proper mounting of Biclops is recommended to ensure that the base does not move during axis rotation, especially with high axis acceleration or unbalanced loads. The Biclops base includes a mounting flange with four 0.144" (3.65mm) through holes on 3.25" (82.55mm) centers. These holes are suitable for screws up to #6 (M3.5) size. Alternately, there is a ¼-20 x ¼" deep threaded hole in the center of the base for mounting to a tripod. Biclops is shipped with a threaded nylon plug in this hole. When using this center hole, the screw **must not** go deeper than ¼" or the internal circuitry will be damaged and is not covered under warranty.