

Model-20 Frequently Asked Questions

1. What are the differences between the Model 20 and the Model 20 Servo?

Answer: The most obvious difference is that the Model 20 Servo is driven by servomotors instead of step motors. This has a couple of implications for the customer. First, while the stepper system operates “open loop” and positions the payload by counting motor steps, the servo system operates “closed loop” and positions the payload by monitoring the position as indicated by encoders on the motor shaft. This enables the gimbal to operate at a higher speed and with better positional resolution.

In addition, the Model 20 Servo comes with a dual payload shelf as part of its standard configuration, and has a stiffened internal structure for better performance.

2. What is the accuracy of the Model 20 Stepper?

Answer: Positions read on a Model 20 Stepper without encoders are based on the motor step counts from the “home” position, which is 0 degrees Azimuth, 0 degrees Elevation. In theory, the position accuracy is one step count, or 36.35 arc-seconds. In practice, because of compliance in the drive system and mechanical structure, one or more motor steps may be “lost” depending upon the payload mass and configuration and not result in any real movement of the payload. It would be safe to assume the gimbal should position the payload to within 0.1 degrees or better.

3. How do the encoders help the Stepper system?

Answer: The encoder option for the step motor system provides a position feedback on the output shaft of the gimbal that will allow the user to compensate for missed steps or payload deflections that cannot be seen at the motor. In applications requiring a high degree of pointing accuracy, use of the encoders is desirable.

We also have software for the step motor controller that uses the encoder data in a quasi-closed loop fashion. After moving the commanded number of steps, the software checks the encoder position and then moves additional steps to correct the output.

4. What is the pointing accuracy of the servo model?

Answer: The servo system includes an encoder on the motor shaft and operates with a closed-loop controller. The positional resolution is 0.004 degrees in output space. The pointing accuracy issues are similar to that of the stepper system. Measured positioning accuracy is better than 0.01 degrees based on the

encoder signal, but structural compliance issues would be transparent to the encoder.

If necessary, we can put encoders on the output shafts of the servo system and use these encoders in place of the encoder on the motor.

5. I can operate on 12V or 24V. Which is better? Do I need to specify?

Answer: The servo electronics operate only at 24 Volts DC. The stepper electronics can operate with an input voltage of either 12 or 24 Volts DC. The higher voltage is preferred for heavier payloads or higher torsional loads. You need to specify which operating voltage is desired when you order.

6. How do I communicate with the gimbal?

Answer: We provide a serial interface and GUI for use on a PC to control the gimbal using our electronics. This is adequate for many users. We also support joysticks, and provide the command message format for users who want to integrate the gimbal commands into their programs.

7. Since I have my own computer, I might want to bypass your processor. Can this be done, and what are the pros and cons?

Answer: It can be done. We have customers who started out using our electronics and then transitioned to their own controller. We also have customers who buy our drives for integration with their own motors and controls. The biggest advantage is that you can customize the software to your application and eliminate the overhead of passing position commands to our controller. You will also have more flexibility in customizing the control algorithms if you have all of the inputs and outputs available to you.

Nearly all of the drawbacks that our customers have seen involve driving the gimbal against the stops at the limits of travel and breaking things. This situation usually occurs during initial integration of the software and during loop tuning as you are working out the bugs in your software.

Normally, our electronics are mounted in the elevation housing of the gimbal, and with the exception of power and serial communications all of the wiring is internal to the gimbal. If your long-term intent is to use your computer in place of our electronics, we can supply the electronics in a stand-alone box with a cable connection to the gimbal. We will provide a drawing of the cable pin-out so that you can build an interface cable between your computer I/O and the gimbal.

Please understand that our warranty is limited to gimbals operated using our electronics and software. Gimbals sold without electronics or gimbals converted to third-party electronics do not carry a warranty against damage caused by your controls.

8. I need to mount everything on an optical bench, which has 1/4-20 holes in a 1-inch grid. Can it be delivered ready to mount? Do I need to worry about any cable lengths?

Answer: We can provide an interface plate that will connect to the gimbal base and to the bolt pattern on the optical bench.

Using our electronics at the gimbal, cable lengths are not an issue until you reach the limit of your serial communications link.

9. Have you ever tried to operate the gimbals using batteries?

Answer: That should not be a problem as long as the batteries can deliver 3A continuous power at the input voltage of the gimbal. Our customers typically use a DC power supply instead of batteries, but as long as the current is available we know of no reason why the batteries should not work.

We do recommend that the battery be rated for 24 Volts and not 12 Volts so that if the voltage drops over time it will still be sufficient to power the electronics. If your application limits you to 12 Volt batteries, the Model 20 Stepper can be configured for 12 Volt operation.

10. What is the allowed range of motion in Azimuth and Elevation?

Answer: The standard range of motion is as follows:

AZ: +/-180 degrees, EL: +95, -35 degrees

We can provide some factory customization to reduce the range of motion in elevation if necessary. The bolt pattern between the payload shelf and the elevation shaft is designed to allow the customer to change the orientation of the payload shelf in order to change the range of motion in elevation.

11. I need to center my payload on the intersection of the Azimuth and Elevation axes. Can this be done on a Model-20?

Answer: Yes. The offset bracket option moves the elevation drive to one side so that the payload can be centered on both axes. If this is a requirement, please send us dimensioned drawings of your payload so that we can determine which offset bracket will meet your needs.

If none of our existing offset brackets will solve your problem, we would be happy to discuss designing a custom bracket for you.

12. My application requires a joystick interface. How would that work?

Answer: The Model-20 Stepper can be operated with a PC joystick using a software package called JDEMO that is included with each gimbal.

Our servo board set supports an "Industrial Mouse" type joystick as a stand-alone control wired directly to the gimbal. It does not directly support a PC style joystick, but you can write your own software to interface a PC joystick

through a computer using the current control boards and the protocol information in the User's Manual.

13. If I use the industrial mouse with the Servo gimbal, how far from the gimbal can I get and still have the mouse work?

Answer: The maximum distance is a total of 106 feet (32.3 meters). This includes the 6-foot cable supplied with the mouse.

14. I have a Stepper system with encoders. What is actually returned by the "Return the Current Azimuth and Elevation Position" command?

Answer: This command returns a position that is calculated based upon motor steps. In order to get encoder position, you need to send a different command. The User's Manual also includes documentation on the encoder commands. The encoder commands return a four-byte position for each axis.

15. What are the time accuracy or update rates of the positions returned by the gimbal?

Answer: Positions are read when the position request is received by the gimbal electronics. Details on how to calculate the data latency for the Model 20 Stepper communications are provided in the User's Manual.

We have measured the data latency on the Model 20 Servo electronics at 115,000 baud, and the latency of the position data is approximately 1 millisecond.

16. Why is the power rating low? We have seen smaller gimbals using stepper motors, but with a higher power rating.

Answer: The lower friction of the Roto-Lok drive and high drive ratio on the Model 20 gimbal allow us to position a payload with very small power consumption.

17. Is there any particular limitation with the RS-232 cable? We assume the connection can be run up to 5 meters.

Answer: The standard rules for cable distance on RS-232 communications apply. A five-meter cable should not be a problem. Depending upon the baud rate and number of commands being sent, some customers have had problems with time lags due to the volume of data being transmitted.

18. Once I select RS-422 or RS-232, can it be changed back to the other if I change computers?

Answer: Where there is a need to switch between the communication formats, we would recommend that the gimbal be delivered with RS-232 communications. The customer can purchase commercially available converters that can be installed on their incoming data line to convert from RS-422 to RS-232 when necessary.

19. Does the Model 20 come with an Ethernet interface?

Answer: No. We don't support Ethernet communications.

20. We would like to use the standard unit on a vehicle, moving off-road. Do we need to install a shock absorber or vibration filter?

Answer: We recommend the High Capacity option and stiffened structure to help with the vibration problem. Previous customers have set the mounting plate of the High Capacity bearing level with the roof of the vehicle and allowed the azimuth drive to hang down into the vehicle to lower the profile. Anything that can be done to isolate for shock and vibration may be useful.

For some customers with off-road vehicle applications, we have designed and built custom yokes to provide better support for the payload.

21. We are considering using the High Capacity Pan Bearing. Does the height increase?

Answer: The overall height of the Model 20 with the High Capacity Bearing Option increases by 1.332 inches.

22. Is it possible to send a speed signal to control the Model-20 Servo unit?

Answer: The standard gimbal software supports a rate control loop, but the standard gimbal is not equipped with a rate instrument. The software calculates the rate every millisecond based upon the change in position. This rate calculation has a margin of error of +/- 0.8 deg/second for rates above 20 degrees per second.

Depending upon the application, we can integrate a rate instrument into the gimbal.

23. Do you have experience relating to your pan & tilt units installed on a ship or in a coastal environment?

Answer: We have customers who use the Model 20 in coastal and shipboard environments. The current "standard" configuration of the Model 20 has evolved to address some of the unique problems of the coastal environment. The outer covers are now a corrosion resistant white powder coat, the data and power wiring passes through a weatherproof connector, and the elevation housing is better sealed against rain and spray.

We can recommend additional changes depending on the details of the specific application.

24. Are the gimbals submersible? Do they meet the requirements for explosion-proof operation?

Answer: The answer to both questions is no – for off-the-shelf versions of the Model 20. We would be happy to look at specific application requirements and develop a customized solution.

25. Can you ship the Model 20 anywhere in the world? Is an export license required?

Answer: We can ship to any country that is not the subject of a trade embargo by the United States Government. Under most circumstances, no export licenses are required for Model 20 gimbals, but we are required to keep records of the end users and end-user applications for gimbals shipped to foreign countries. We cannot ship to persons or entities that have been denied export privileges by the United States Government.