

Diagnosing a Motor Stall

(Amber or Yellow Light on the GTOCPx Control Box)

The following document is from a post to the Yahoo ap-gto users group in June of 2010. The plan is to take the text and adapt it as a general purpose document along with some illustrations and graphics for greater clarity. However, since the subject is of great importance, and time to further develop such a document is limited, we decided to add the post "as is" to our Technical Support section until such a time as a final version can be prepared. As you read, please understand that this was prepared in response to a specific situation for a specific customer. This document also assumes that you have already considered the text in the Troubleshooting section of the manual.

For those of you new to this topic, let me preface this rather long post. We have a situation where a remotely operated 900GTO mount is going into safe mode or "motor stall" condition. The GTOCP3 control box is showing the yellow (or amber) LED on its panel. This is on a system that has been operating well for a couple years, and is well balanced. The owner and his remote observatory are in Spain, and the observatory is 300 miles from the owner's home, so we want to diagnose the problem as quickly and accurately as possible.

The yellow light indicates that the servo has gone into "safe mode." This is normally caused by a motor stall from an out-of-balance system, but basically any condition in the servo that causes a difference between what the servo feedback loop expects and what it receives will cause the servo to go into safe mode and shut down all power to the motors. Unplugging one motor or the other will not help you to diagnose the problem. The servo will detect the missing motor (because it is not getting the expected feedback from that motor's servo loop) and give you the yellow light, as it should. Here are the steps I would undertake if I got the yellow light on my system.

1. First, we check the power and all the cables and connections. You have checked your supply and even tried another one. That is good, but have you also checked the power cable to the mount and especially the power cable connection on the GTOCP3 control box? Make sure that the center pin in the receptacle has been spread enough to make good contact with the inside walls of the locking plug. Check the plugs and receptacles for corrosion as well.

If everything here is good, we need to find out whether the problem is in the GTOCP3 servo control box, in the Y-cable, or in one of the two axes.

2. Power up the mount with the keypad. Proceed to the main menu if auto connect is no. If autoconnect is yes, you will already be there. Does the yellow light appear right away, within a few seconds? If so, we know that the mount cannot track in RA. Using the "8" button, set the tracking rate to stop. Now, press the N or S button. Did the declination move? Did the yellow light turn back to red? If the dec did not move, and the light remained yellow, then neither axis is functioning, and we probably have a problem in the servo control box (GTOCP3) or Y cable. You can check the Y-cable with help from the following document:
http://www.astro-physics.com/tech_support/mounts/servo/900-1200-GYC-diagram-2.pdf Since neither axis worked, concentrate especially on the ground leads of the Y-cable.

If the cable is fine, you can go no further at this point and will need to contact us for a Return Authorization for the GTOCP3.

On the other hand, if the declination moves and the light turns to red, proceed to step 3. That result would tell us that the declination side of the servo system is functional. If you want to be absolutely sure, slew around a bit in declination with the N and S buttons at a couple different rates. If the dec is working properly, and you leave tracking rate at STOP, and you do not mistakenly press the E or W button, the light should stay red and the dec should move as instructed.

3. Now remove the cover from the gearbox end of the RA motor / gearbox. It has 6 small screws – use the 5/64” hex wrench from your set. There is a gear that obviously would need to be the first one if you were removing the spur gears. Remove just that one gear by unscrewing the shoulder bolt that is its axle. Power up the mount and proceed to the main menu. Press the “8” button to set the tracking rate back to sidereal. Does the motor start to turn or does the light turn to yellow? If the motor turns, and the light stays red, press the E or W button at 600x to be sure that the motor seems to run as it should. If all is OK, then we need to check the RA gear mesh. The easiest thing to do here is to grab the spur gear on the end of the worm shaft and turn it with your fingers. It should feel like it is turning in thick cream. It should not spin freely, but it should not be difficult to turn either. Re-mesh the gears as instructed on the website. http://www.astro-physics.com/tech_support/mounts/900gto/900backlash.htm
This should solve the problem. Reassemble everything and try it out.

However, if the motor did not turn and the light turned yellow, we know that there is a problem somewhere in the RA side of the servo system. Proceed to step 4 below.

4. Remove the GTOCP3 from its place on the back of the mount. It is held on by two small set screws just below the cable connections. Now, with the servo control box removed, you can connect the short RA leg of the Y-cable to the declination axis, and connect the long declination leg to the RA axis. You are essentially reversing the axes. Make sure you are prepared to kill the power if needed, and then power up the mount with the keypad attached, but do not issue any goto slews, or push the direction buttons yet. If auto connect is set to yes, you will go to the main menu. If autoconnect is set to no, proceed in the normal fashion to get to the main menu. Make sure the keypad is set to sidereal tracking. The dec (thinking it is the RA) should start tracking. Do you get the yellow light? If yes, then we probably have a problem in the servo control box or in the Y-cable. The Y-cable can be tested with help from the document linked above. Remember that ALL of the required connections must be good – motor power, ground, and both encoder channels for each axis! If the problem is in the control box, it will need to be returned to Astro-Physics. Please contact us for a return authorization.

If you do not get a yellow light, try the E or W button on the keypad at a button rate of 600x. Remember that the axes are reversed. Does the dec slew when you press the E/W buttons, or do you get the yellow light? If you did not get the yellow light earlier, then you should not get one here either, but I would check it at the faster rate anyway. In this way we have tested the RA side of the servo control box and Y-cable using the dec motor gearbox that we confirmed was working in step #2. Proceed to step 5.

5. If you did not get a yellow light in step #4, try the N or S buttons. Having made it this far, I would expect that this would cause the yellow light to reappear. If the yellow light appears, release the N or S button and reset the servo by pressing the E or W button for a moment. Now try the N or S again just to be sure. If the yellow light reappears, we will know that the problem must lie in the RA motor gearbox because we have eliminated the other possibilities.

Once we have identified the problem component(s) we can proceed with a repair of just that part, and you won't need to send the entire mount. If the problem is in a motor / gearbox, simply remove the two UNPAINTED screws that hold the motor / gearbox on to the bracket, and remove the motor / gearbox. CAUTION! Remove your instrument before removing the motor / gearbox! Once the worm gear is disengaged, the axis will swing freely! Bring the faulty component home and contact us for the return authorization number. I'm sorry I couldn't get this to you sooner.

HH
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