

ASTRO-PHYSICS GTO KEYPAD Version 4.15

Plus Supplemental Information for Customers Outside of North America

03-24-08 Version 4.15

- **Eastern Longitudes** The accuracy of eastern longitude values that are sent to the mount has been improved by including minutes in the calculation. We are unable to add seconds into the calculation at this time, due to memory space limitations in the keypad.
- **Eastern Time Zones When Polling the Mount** The 3=Get Time/Loc FrMnt command (how you “poll” the mount) now returns correct time zone values for people in eastern longitudes using the GTOCP3 control box. (GTOCP1 & 2 control boxes already returned the correct time zone values in version 4.12 and continue to do so in version 4.15)
- **Shipping Notice** Because these changes only applied to eastern longitudes, a small number of keypads with v.4.12 were shipped to US addresses after the date referenced above.

Starting in March, 2008, Astro-Physics customers will begin receiving GTO keypads that have been programmed with a new version of our keypad firmware. This new keypad version – v.4.15 - addresses some of the issues that have faced customers in eastern time zones. Other issues pertaining to southern latitudes were addressed in the latest ROM chip version in the GTOCP3 control box: the “Q” chip. (Only people using their mounts in the southern hemisphere need the “Q” ROM chip.) In terms of operation, version 4.15 is identical to version 4.12, and the manual included with the keypad is, in fact, the v.4.12 Keypad Manual. This supplemental document will explain the differences, as well as the limitations and remaining issues with this new firmware. We anticipate that all remaining issues will be resolved in the next major firmware release which will be v.4.20.

Some of the discussion below may not make sense to new users of the Astro-Physics GoTo Servo System who are not already familiar with keypad operations. We have therefore included references to the pages of the v.4.12 manual where the related operations are explained in detail. If you are new to our system, it is suggested that you read the entire “Getting Started” section of the manual before worrying about any of the details below.

Issues that are discussed below:

- Slightly inaccurate eastern longitude values were being sent to the mount.
- Polling the Mount (3=Get Time/Loc FrMnt command) returned incorrect GMT offset values
 - General issue resolution
 - Special problems with time zone zero and west longitudes
 - Issue with time zone 12 East and Daylight Savings Time
- Longitude limit for people near 180° East Longitude
- Dealing with the International Date Line and fractional time zones

Eastern Longitude Values (see pp. 14-16) Keypad v.4.15 will give the mount a more accurate value for your eastern longitude than v.4.12. The servo only accepts longitude values as west values, so the keypad must convert your eastern longitude to a western value by subtracting it from 360 degrees. In v.4.12 and all previous versions, only the degrees were subtracted while the minutes and seconds were ignored. This could result in up to almost a 2 degree error in the longitude in the servo. V.4.15 now also takes the minutes into account by subtracting from 359° 60'. There was not sufficient memory space to also account for the seconds without a major re-allocation of the code, so the full fix will be accomplished in v.4.20. For this version, it is recommended that you round your longitude to the nearest minute, and enter zeros in the

“seconds” field when entering your location data. With v.4.15, the mount will not receive any “seconds” data from the keypad at all. This ONLY applies to eastern longitudes. Latitudes and western longitudes can be entered normally. DO NOT try to enter your eastern longitude as a western longitude by doing the arithmetic yourself. (Actually, the keypad won’t let you.) To correctly calculate the sidereal time, both the keypad and the mount must know whether you are east or west of the Prime Meridian. The error you would introduce by trying to “trick” the mount is considerably larger than the 30 arc second maximum error in longitude that you would have by rounding to the nearest minute. External software like PulseGuide can initialize the mount with the full eastern longitude including seconds.

Incorrect GMT Offsets When Polling the Mount from the Keypad (see p. 44) Keypad v.4.15 addresses a bug with the 3=Get Time/Loc FrMnt command in the 2=Setup => 1=Locations & Time menu. Earlier versions of the keypad firmware did not return the correct value for the GMT offset from the mount when polled from the keypad in eastern time zones. This problem only occurred with GTOCP3 control boxes because they return negative numbers for eastern offsets whereas the older GTOCP1 & 2 returned text for the negative values. In all cases, the correct values were being sent to the mount’s servo, and all other mount functions relating to the GMT offset were handled correctly. Version 4.15 will now return the correct values for all time zones except for the special cases below.

Western Longitudes at Time Zone Zero (see p. 44) There is one major issue that remains when using the 3=Get Time/Loc FrMnt command: Customers in western longitudes who are in time zone 0 cannot poll the mount and get the correct offset when daylight savings time is in effect. This will affect customers in Great Britain, Portugal and West Africa. The keypad sends the correct information to the mount servo, but it cannot retrieve it correctly at this juncture, because it wants to apply the “west” standard to the “01” that is returned from the mount. This erroneously puts the offset as one hour behind GMT instead of one hour ahead of GMT. Customers affected by this bug have two options until version 4.20 is released: 1. Do not use the 3=Get Time/Loc FrMnt command when daylight savings is in effect, or 2. Keep your keypad, computer etc. on standard time so that the system’s time always equals GMT.

Eastern Longitudes and Time Zone 12 There is an additional minor remaining issue with the 3=Get Time/Loc FrMnt command, but it should be of no consequence to anyone that we are aware of. If you happen to be in time zone 12 east and observe daylight savings time giving an offset to GMT of local time – 13 hours, AND you are using a GTOCP1 or 2, you cannot use this command. Again, all data sent to the mount is fine; you just can’t have the keypad poll the mount for your time and location data.

Eastern Longitude Limit (see pp. 14-16) The last issue will only affect people in the Fiji Islands and in far north-eastern Siberia. Because of the longitude issue outlined above, an eastern longitude above 178° 59’ 00” should not be used. At this time, we know of no one who is affected.

The International Date Line The region on either side of the International Date Line has the potential to pose some problems. First of all, the IDL is not a straight line at exactly 180° from the Prime Meridian. There are Pacific Islands (Tonga, parts of Fiji, Chatham etc.) whose longitudes would be measured as West, but who are in an eastern time zone. Likewise, many of the western Aleutians are actually in eastern longitudes, but have western time zones. The keypad will not allow a time zone greater than 12 or a longitude higher than 180° either east or west. Fortunately, we again know of no customers in these locations, but you never know... This is where we would have to trick the system.

Let’s say you have taken your Mach1GTO on a South Pacific Dream Vacation in Tonga at 175° 08’ West Longitude, but at 13 hours east time zone. (Thank goodness there’s no DST in Tonga!) Since you want to begin with some solar observing you decide to use the Daytime Polar Alignment Routine which requires accurate time, date and location information to be successful. (The mount

must know the exact LST to know the RA and Dec values for the Park Positions. See pp. 23-28) The key to successfully tricking your mount is to remember that your DATE must be backed up by one day if in a western longitude with an eastern time zone, and it must advance by one day if in an eastern longitude with a western time zone. For my Tonga example, let's assume it is Feb. 15th, and local time is 3:15pm (15:15:00). You already entered the correct longitude of 175° 08' 15" W and the correct latitude of 21° 10' 47" S and then entered the time zone as 24 – 13 = 11 hours west. (The keypad will assign the west time zone because the longitude is west.) You check the GMT by pressing the 4=Time/LST button and see that it correctly reads 02:15:00. The problem is that your mount will be calculating LST one day off amounting to about +4 minutes of LST error or about 1° off (west) in your Daytime Polar Alignment Routine. To correct this, just set your keypad's date back to Feb. 14th, wish everyone Happy Valentines Day once again, and proceed with polar aligning and observing.

Fractional Time Zones There is no provision in the keypad firmware at this time for fractional time zones as are found in Central Australia, Iran, Afghanistan, India, Nepal and several other locations. To get proper function from your keypad, you will have to adjust the keypad's clock to a time value that does not match the clock on your wall. The important thing is that the keypad calculates the correct GMT.