

# TCF-S

## Temperature Compensating Focuser Serial Interface Protocol

*(Valid for TCF-S PIC versions 2.40, 3.11 and 4.11)*

To communicate with the TCF-S controller firmware through the serial interface, first connect using the FM MODE command at 19200 baud, 8N1 protocol. Note that the published commands are given first below. The actual parsed commands are provided below in parenthesis - “x” denotes any character, “n” denotes a variable with definitions provided in column 2. For example, the FM MODE command will establish the serial connection, but the “MODE” characters are actually disregarded.

All commands MUST include six character strings. All responses are followed by the LF/CR ASCII characters. Refer to Section 5.0 in the TCF-S Technical Manual for additional details.

| SYNTAX                            | <u>Variable Definitions</u>  | <u>Function</u>   | Serial Return |
|-----------------------------------|--|---|---------------|
| <b>FM MODE</b><br><b>(FMxxxx)</b> | <i>none</i>  | <i>Establish serial connection or check to confirm serial connection.</i>   | <b>!</b>      |
| <b>FAMODE</b><br><b>(FAxxxx)</b>  | <i>none</i>  | <i>Select Auto-A temperature compensation mode. Issue FM MODE to exit this mode. Telemetry (position and temperature) information will be sent along serial link if FQUIET flag = 0.</i>  | <b>A</b>      |
| <b>FBMODE</b><br><b>(FBxxxx)</b>  | <i>none</i>  | <i>Select Auto-B temperature compensation mode. Issue FM MODE to exit this mode. Telemetry (position and temperature) information will be sent along serial link if FQUIET flag = 0.</i>  | <b>B</b>      |
| <b>FCENTR</b><br><b>(FCxxxx)</b>  | <i>none</i>  | <i>Move focuser to Center position [3500 for TCF-S and TCF-Si, 5000 for TCF-S3 and TCF-S3i]</i>   | <b>CENTER</b> |
| <b>FDAnnn</b><br><b>FDBnnn</b>    | <i>nnn = the time in units of 0.01 seconds to delay when in the serial Auto -A or Auto-B mode. Default is 000.</i> | <i>The minimum or default delay between steps is 1.0 seconds. A value of 100 for nnn will increase the total delay to 2.0 seconds. Default delay of 000 is restored after power is turned off. Does not apply to manual Auto-A or B modes, only to serial connection A and B modes.</i> | <b>DONE</b>   |
| <b>FExxxxn</b>                    | <i>where n = 1 or 3</i>  | <i>Change TCF device type for TCF-S (n=1) or TCF-S3 (n=3). A controller reboot or power cycle is required after issuing this command.</i>   | <b>DONE</b>   |

| <u>SYNTAX</u>                    | <u>Variable Definitions</u>  | <u>Function</u>  | <u>Serial Return</u> |
|----------------------------------|--|--|----------------------|
| <b>FFMODE</b><br><b>(FFxxxx)</b> | <i>none</i>  | <i>Free focuser from serial mode and return to RUN mode. No effect on TCF-Si and TCF-S3i models which only operate in serial mode.</i>   | <b>END</b>           |
| <b>FHOME</b><br><b>(FHxxxx)</b>  | <i>none</i>  | <i>Once the TCF-S is put to SLEEP in order to save current position and temperature values, a new position based on a different temperature can be achieved with this command. This is similar to turning off the unit when in RUN mode (no PC) with the switch in Auto-A or B and then turning the TCF-S back on at a different time.</i> | <b>DONE</b>          |
| <b>Flnnnn</b>                    | <i>where nnnn = number of steps to move,<br/>[valid input: 0000 to 9999]</i> | <i>Move focuser IN by nnnn steps, [absolute position value decreases] Focuser will stop moving at 0000 if move exceeds number of "IN" steps available.</i>   | *                    |
| <b>FJxxxn</b>                    | <i>n = 0, 1, 2, 3 where 0=off, 1=low, 2=med, 3=high</i>                      | <i>Set LED display brightness.</i>   | <b>LED=n</b>         |
| <b>Fjxxxx</b>                    | <i>None</i>  | <i>Read current display brightness value where n=0=off, 1=low, 2=med, 3=high.</i>  | <b>LED=n</b>         |
| <b>FKxxxn</b>                    | <i>n = 0 or 1 where 0 = disabled, 1= enabled.</i>                            | <i>Set or read current backlash flag. Send n=0 to disable, n=1 to enable, or any other character to read.</i>  | <b>BKL=n</b>         |
| <b>FLAnnn</b><br><b>FLBnnn</b>   | <i>where nnn = TC (temperature coefficient) for Auto-A or Auto-B mode.</i>   | <i>Set focuser temperature coefficient for Auto-A or Auto-B. A typical TC temperature coefficient or slope for a 10" SCT at f/10 should be about 086. This is the factory loaded value.</i>  | <b>DONE</b>          |
| <b>FOnnnn</b>                    | <i>where nnnn = number of steps to move,<br/>[valid input: 0000 to 9999]</i> | <i>Move focuser OUT by nnnn steps, [absolute position value increases] Focuser will stop moving at 7000 (TCF-S/TCF-Si) or 9999 (TCF-S3 or TCF-S3i) if move exceeds number of "OUT" steps available.</i>  | *                    |
| <b>FPOSRO</b><br><b>(FPxxxx)</b> | <i>none</i>  | <i>Read current focuser position.</i>  | <b>P=nnnn</b>        |

| <u>SYNTAX</u>              | <u>Variable Definitions</u>  | <u>Function</u>  | <u>Serial Return</u>  |
|----------------------------|--|--|---|
| <b>FQxxxn</b>              | Set <i>FQUIET</i> Flag where <i>n</i> = 0 (Telemetry on) or 1 (Telemetry off).<br>Default is <i>n</i> = 0. | Current position and temperature data can be sent to the PC after every auto loop cycle if enabled, <i>n</i> = 0. When <i>n</i> = 1, no telemetry data is sent.  | <b>DONE</b>   |
| <b>FREADA<br/>(FRxxxA)</b> | <i>none</i>  | Read focuser TC temperature coefficient for Auto-A or Auto-B mode. TC value is 3-digits, 000 to 999. Represents number of steps per degree Celsius the focuser will move to compensate. Direction is opposite the natural movement of the telescope focus and set by FZAxxn or FZBxxn command below. | <b>A=0nnn</b>   |
| <b>FREADB<br/>(FRxxxB)</b> |  |  | <b>B=0nnn</b>   |
| <b>FSLEEP<br/>(FSxxxx)</b> | <i>none</i>  | Put focuser in low power mode and store current position and temperature. The unit can be powered off in this state.   | <b>ZZZ</b>  |
| <b>FTMPRO<br/>(FTxxxx)</b> | <i>none</i>  | Read current focuser temperature. Response is the current temperature in Celsius including sign ( <i>z</i> = + or -)   | <b>T=znn.n</b>  |
| <b>FtxxxA<br/>FtxxxB</b>   | <i>None</i>  | Read TC sign for A or B mode, response includes<br><i>n</i> =0 is a positive value (default) and <i>n</i> =1 is a negative value. See FZXxxn commands below.   | <b>A=n<br/>B=n</b>  |
| <b>FVxxxx</b>              | <i>none</i>  | Read version number and model type. Response includes firmware version (first three digits) and model type, <i>n</i> =1 indicates TCF-S/TCF-Si and <i>n</i> =3 indicates TCF-S3/TCF-S3i. (i.e. 3.11.3 indicates TCF-S3i running firmware version 3.11)   | <b>v.vv.n</b><br><br><b>where</b><br><b>v.vv = version,</b><br><b>n = model type.</b> |
| <b>FWAKUP<br/>(FWxxxx)</b> | <i>none</i>  | Re-establish full power mode. Use this command to wake focuser from Sleep mode (FSLEEP above).   | <b>WAKE</b>   |
| <b>FWCxxx</b>              | <i>none</i>  | Check to see if focuser is sleeping, but do not wake. See FSLEEP above.  |   |
| <b>FYxxxn</b>              | <i>n</i> = 0 or 1<br>1=disable, 0=enable   | Disables temperature reading for manual mode (TCF-S and TCF-S3 only), set <i>n</i> =1 to disable, <i>n</i> =0 to enable temperature read in manual mode.   | <b>DONE</b>   |

| <u>SYNTAX</u>                  | <u>Variable Definitions</u>  | <u>Function</u>   | <u>Serial Return</u> |
|--------------------------------|--|---|----------------------|
| <b>FZAxxn</b><br><b>FZBxxn</b> | $n = 0$ or $1$ ,<br>default is $0$ (normal OTA),<br>$1 =$ reverse direction. | <i>Load and store temperature compensation (TC) sign or direction. Most telescopes use a positive TC where focal point moves away from OTA with dropping temperatures. Certain telescopes such as the Takahashi TOA130 are non-typical and the focus position is drawn inward with dropping temperatures.</i> | <b>DONE</b>          |