TCF-S Control

Overview

The **TCF-S Control** program has been designed for use with the Optec TCF-S series Temperature Compensating Focusers.

This help document provides instruction and assistance in using this standalone Windows program. Optec has also developed an ASCOM driver for use with other ASCOM compliant software. Visit the Optec download page to obtain the latest TCF-S ASCOM driver. Drivers for Linux based software are being developed and will also be available from the Optec download page as they are available. The effort is called the Instrument-Neutral-Distributed-Interface or INDI for short. Visit the INDI page and check under Device Support for more information.

This Help document is organized into the following chapters:

*Optec, Inc. makes no warranties either expressed or implied about **TCF-S Control** software.*

Please note: These help files are sometimes updated. The latest version can always be found online at:
http://www.optecinc.com/astronomy/software/docs/tcf-s_control/TCF-S_Control.htm

Chapter 1: Installation

Thank you for installing the **TCF-S Control** program. **TCF-S Control** is a stand-alone Windows program designed for testing, setting parameters, and operating the Optec TCF-S line of Temperature Compensating Focusers. The latest version of this program will communicate with and control the following focuser models:

- **TCF-S**
- **TCF-Si**
- **TCF-S3**
- **TCF-S3i**

You can learn more about the TCF-S focusers by visiting the Optec web page located at:
http://www.optecinc.com/astronomy/tcf-s.htm

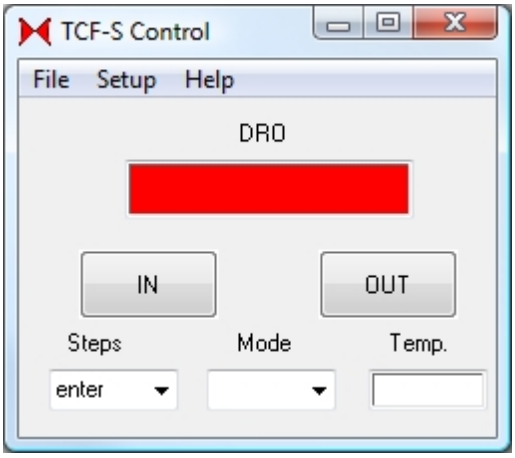
Check the Optec, Inc. web site often to download the most current version of **TCF-S Control** or to download the ASCOM

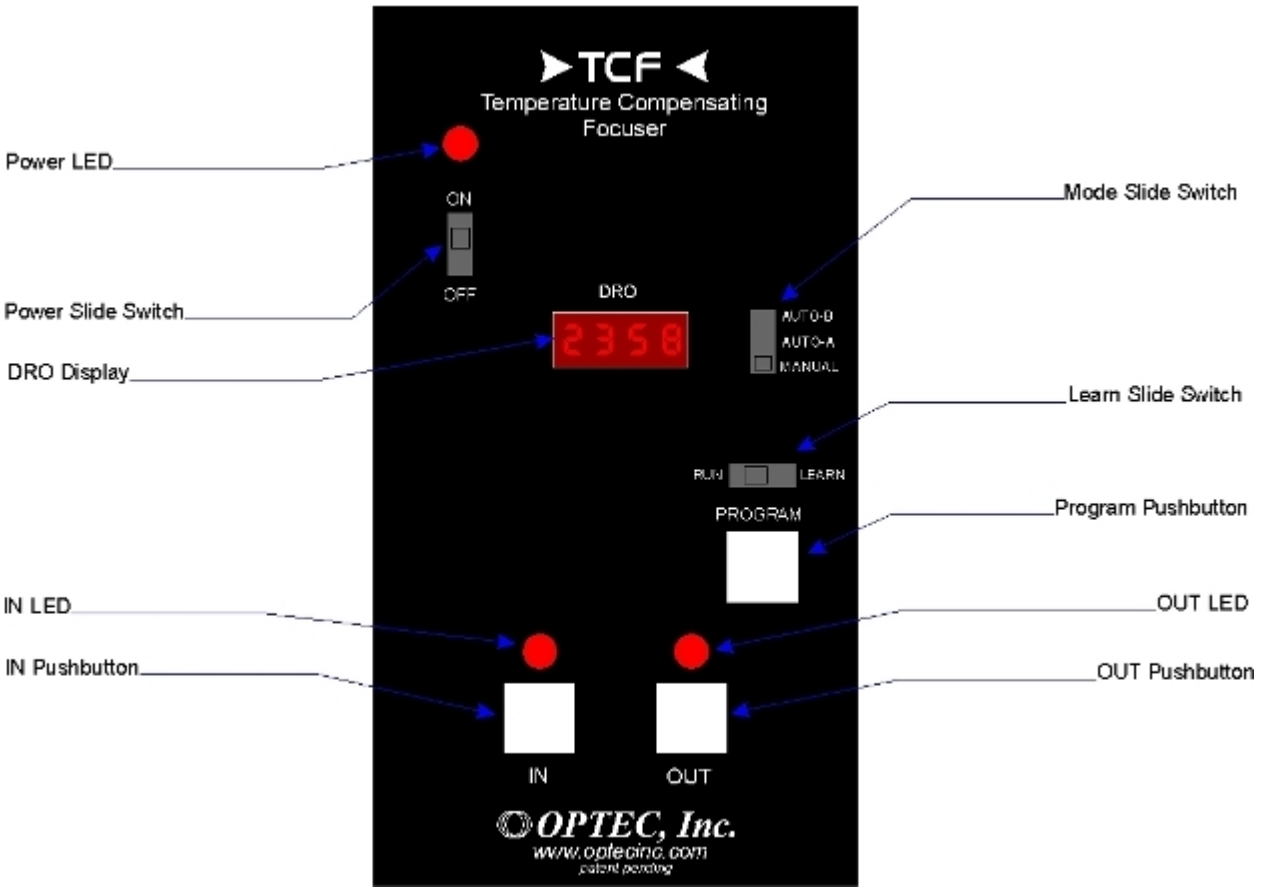
standard driver or Linux drivers (soon to be released).

The **TCF-S Control** program is written in Liberty Basic version 4.03. For more information about this basic compiler visit the Liberty Basic Home Page located at www.libertybasic.com. We have included the source code for any focuser users interested in programming in this easy-to-learn language. The source code is titled **TCF-S.BAS** and can be compiled with Liberty Basic version 4.03 or higher.

This help file was written for **TCF-S Control** version 1.40. This version will operate with full functionality using the **TCF-S** and **TCF-S3** having firmware version 2.40 or higher or **TCF-Si** and **TCF-S3i** firmware version 3.00 or higher. Older firmware versions will work with focusers having earlier firmware versions but with some loss of function.

A pdf copy of this help file can be found by visiting the Optec website. Click here to download the current pdf version for this help file.





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Requirements

The **TCF-S Control** program will run on any Windows based computer from WIN 95 through Windows 7. The program uses very little of the system resources and should not interfere with any other operating programs. Neither printer nor graphic functions are used by **TCF-S Control**. It is necessary that the computer have an available COM port for communication with the TCF-S focuser.. Only comm ports numbered from 1 to 19 are recognized by this software. If the computer has no native comm ports, a USB-to-Serial port converter adapter may be used. Optec offers stock no. 17690, a USB-to-Serial converter known to work well with Optec devices. Any FTDI based converter should work equally well.

The connection from the TCF-S, TCF-Si, TCF-S3, or TCF-S3i Temperature Compensating Focuser to the PC requires a modular 6-wire cable with the appropriate 9-pin DB9 (serial port) and 6-pin RJ-12 connectors. Optec can supply this cable in any length along with stock no. 17695, our modular to DB9 converter for the modular Reverse cables. Users wishing to fabricate their own cables are referred to Appendix A of the TCF-S Technical Manual.

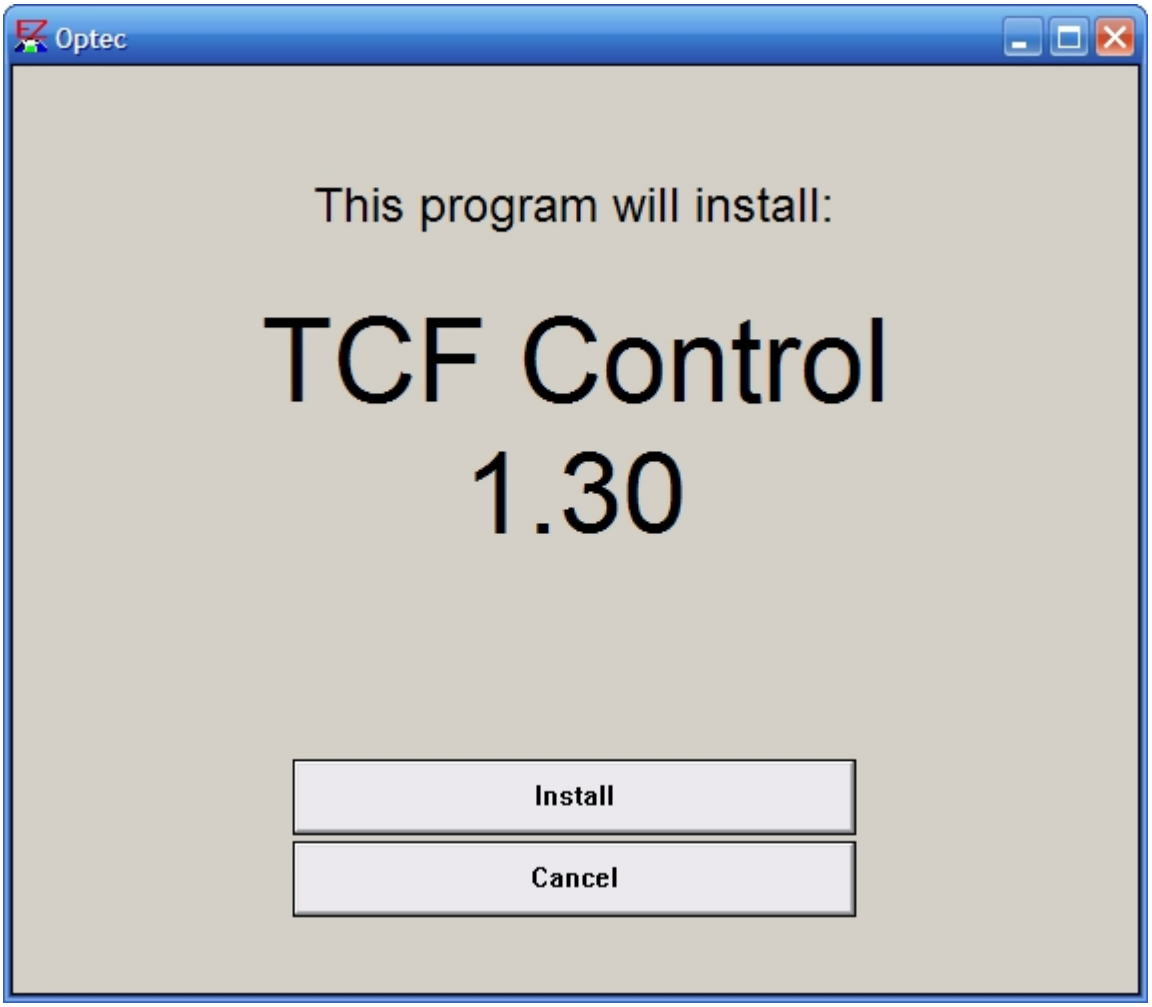
The program automatically sets the communications port settings to operate at 19.2K baud. At this data rate, the cable length should to be 100-ft (30m) or less and of good quality. Erratic operation may be due to communication errors when the serial connections are not secure.

Of course, a Optec TCF-S focuser is also required. The TCF-S focuser should be turned on with the temperature probe connected when attempting to "Connect" to the device within **TCF-S Control** software.

Installing

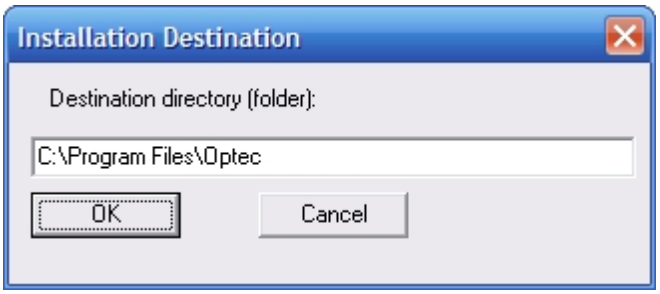
- **Installing the Software**

  The self extracting setup program is called **`Setup_TCF-S_Vx,xx.EXE`** *(Vx,xx is the version number)* and is less than 2Mb in size. This program contains all of the necessary files to run **TCF-S Control** on any Windows based computer. Double clicking or opening this program will launch the installation handler which will create the necessary folders, extract and the copy files to their proper location. A few inputs are necessary from the user with regards to acceptance of the license and warranty terms and location of the folder containing the files. The very latest version of this program can always be downloaded directly from the Optec website at:
  http://www.optecinc.com/astronomy/downloads.htm



- **Location of Files**

The default location for the program files including the data files is in the ***Program Files*** folder under ***Optec***. The use can specify any other location for the files during the installation.



- **The Start Menu**

Click the Windows ***Start*** button, then ***All Programs*** to locate the ***TCF-S Control*** folder. You will find shortcuts within this folder for:

TCF-S.exe - the executable program
Uninstall.exe - the uninstaller
Readme.txt - a list of revisions or changes
TCF-S. Control.chm - this compiled help file
www.optecinc.com - Optec's internet website

Right click the TCF-S.exe to create a shortcut on the desktop if you wish.

- **The Program Files**

TCF-S.exe is a run time engine that interprets and runs the tokenized file TCF-S.tkn. Both program MUST HAVE THE

SAME NAME and be in the same folder in order to run. You can change the name but both must have the same filename. The actual code that makes TCF-S work is contained in TCF-S.tkn.

TCF-S.bas. is the source code in text format. You need the Liberty Basic program to compile this code. However, the techniques and sub-routines used in the basic code could be used to write operating programs in other languages. Good luck.

TCFparms.txt contains the necessary configuration variables. These can be modified within TCF-S.exe. This file must also be in the same folder.

TCF-S_Control.chm is this complied help file you are viewing.

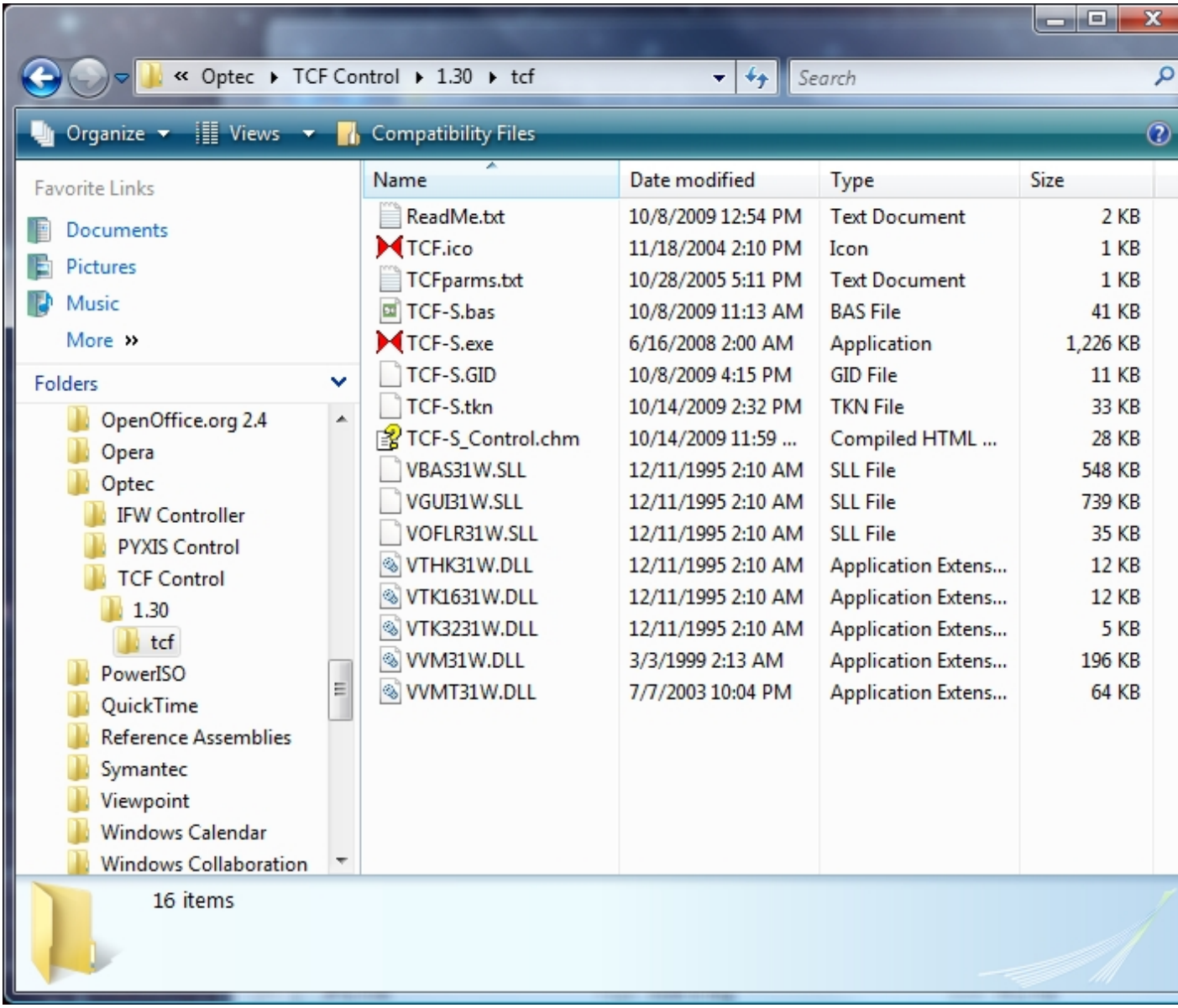
Hidden DLL & SLL Files

Eight DLL and SLL files are also copied to the Optec folder. Normally, these files would be hidden and not visible when viewing the file contents. They could be left in the Optec folder or moved to the Window System folder if the user desires. However, the uninstaller will not find these files if they are moved and they would have to be deleted manually. These filese are also used by other Optec control programs.

These required files are listed below:

```
Vbas31w.sll
Vgui31w.sll
Voflr31w.sll
Vthk31w.dll
Vtk1631w.dll
Vtk3231w.dll
Vvm31w.dll
Vvmt31w.dll
```

Below is a screen shot of the Optec TCF-S folder displaying the complete required files which are created during the installation process.

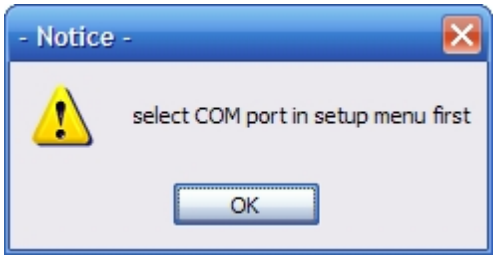


Starting

- **First Time**

  Navigate through the ***Start, All Programs, Optec, TCF-S Control*** folders to locate the **TCF-S Control** shortcut.

  Double click on the **TCF-S Control** shortcut  to start the program. On the first run of the program you MUST set the COM port.

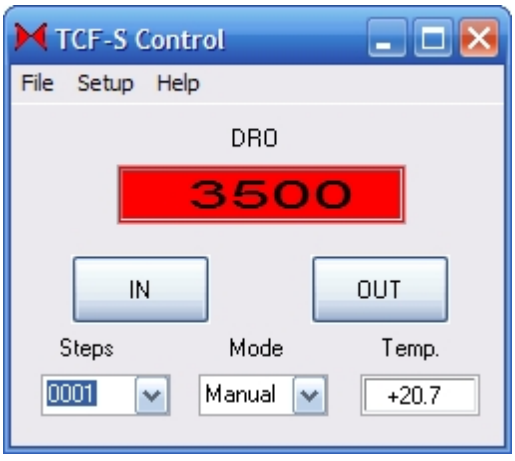


The TCF-S interface window will appear.

Click on **Setup** and then on **Select COM Port**. Select the appropriate the COM number. A list of port options from COM1 to COM19 will appear. If you choose the wrong COM port number, you will see an error message pop up indicating that the COM number is in error. If this happens, select another number and try again. The Device Manager within your computer's control panel may be helpful in finding and selection an available COM port, especially if a USB-to-Serial converter is used. See Determining COM Port for help.

Tip: Not all USB-to-Serial converter works the same. Some of these devices are not compatible with Optec software. If you fail to connect with your USB-to-Serial converter, call Optec. We have both single and 4-port models which are compatible.

- Click on **File** and then click on **Connect**. You should see in the **DRO** display window the current position if the serial link is successful. If not successful, the error message not connected - try again will appear. It may take a few seconds for the connection to happen and a few more before the fault error message appears. Be patient. If no connection can be made, check cable, COM port number and the other usual sources for trouble.



Tip: The TCF-S must complete it's homing routine at startup before you can attempt to connect in software.

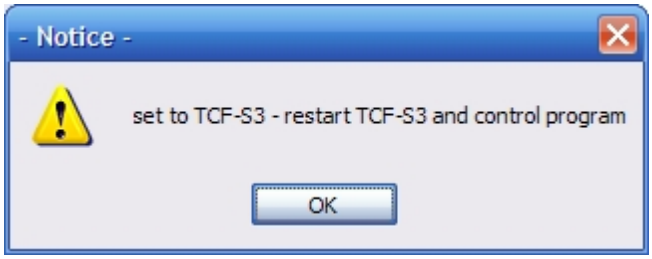
Once the TCF-S is linked to the PC, operation of the three buttons IN, OUT and PROGRAM on the TCF-S and TCF-S3 hand controllers are disabled and the instruments will not accept commands other than from the PC. In other words, while connected to the TCF-S Control software, all device controls are passed through to the PC. The Hand Control Box functions are disabled during software control.

NOTE: When using the Remote IN/OUT Keypad (Optec stock #17680), you MUST disconnect from software before "hot-swapping" the Remote Keypad with the temperature probe. **TCF-S Control** will display an ER=1 error and the Remote Keypad will not function. Select File - Disconnect to use the Remote Keypad.

Tip: The Temp. display in TCF-S Control will read approximated -53.1 while the Remote Keypad is connected to the focuser.

NOTE: You will NOT successfully Connect while the Remote IN/OUT Keypad is connected to the focuser. You MUST remove the Remote Keypad and re-install the temperature probe.

- **Select TCF-S or TCF-S3** under the **Setup** file option to properly configure the **TCF-S Control** program and hand control box firmware for the focuser model to be used. This option does two things: it sets the TCFparms.txt file to load the correct parameters upon next run and also pushes the model type to the EEPROM onboard the TCF-S series circuit board. The primary difference between the **TCF-S** or **TCF-Si** and the **TCF-S3** or **TCF-S3i** focuser models is the number of steps and step resolution. The 2-inch model **TCF-S** and **TCF-Si** focuser have 7000 steps for 0.6" of travel while the larger 3-inch **TCF-S3** and **TCF-S3i** models have 10,000 steps and a full 1.0" of travel. The model affects the center position as well so it is important that the model be set once when first installing the **TCF-S Control** program. Select the proper model using **Setup - Select TCF-S or TCF-S3**. A notification message will appear and the TCF-S hand controller will need to re-booted (BOOT will appear on the hand control DRO).



After re-booting both the TCF-S hand controller and the TCF-S Control software, the model type will be displayed in the top bar of the program and the Center location will be adjusted accordingly (5000 for the **TCF-S3** or **TCF-S3i** and 3500 for the **TCF-S** or **TCF-Si** models).

Tip: This process need only be completed one time. The firmware is automatically set from the factory for the correct model. Alternatively, the TCFparms.txt file can be edited to indicate to the TCF-S Control program which model focuser is to be connected. Review TCFparms.txt under Operation for additional information.

- **Disconnecting**

Click on **File** and then on **Disconnect** to put the TCF-S back in operation for manual pushbutton entry or to use the Remote IN/OUT Keypad.

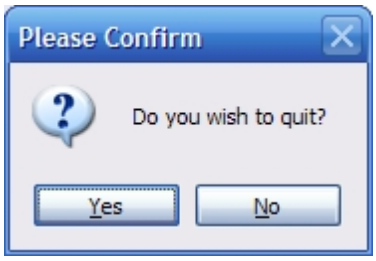
Exiting the Program

To prevent receiving an error message from Windows about failing to close the COM port, it is advisable that the serial connection port be disconnected by exiting the program under the **File** menu by selecting **Quit** or by clicking on the "close" X icon on the right corner of the window. Other program quits may cause an error.

NOTE: **TCF-S Control** holds exclusive control of the assigned COM port when connected. Disconnecting to pass control to another program such as FocusMax is permitted while leaving the program window open.

If the program is terminated before disconnecting from the TCF-S as described above, the TCF-S series focuser will remain in the serial loop. The instrument would have to be turned off to end the serial loop. If the TCF-S is still in the serial loop, the **TCF-S Control** program can be restarted and the link reestablished by selecting **Connect** again under the **File** menu option.

Finally, you must confirm your intention to Quit or exit the program.



Chapter 2: Operation

- Setup Variables - Options under the **Setup** menu.
- Mode - Options under **Mode** selection box.
- TCFparms.txt - Program parameters for operating **TCF-S Control** program.
- Learn Temp Coefficients - provides step-by-step instructions for determining temperature coefficents.

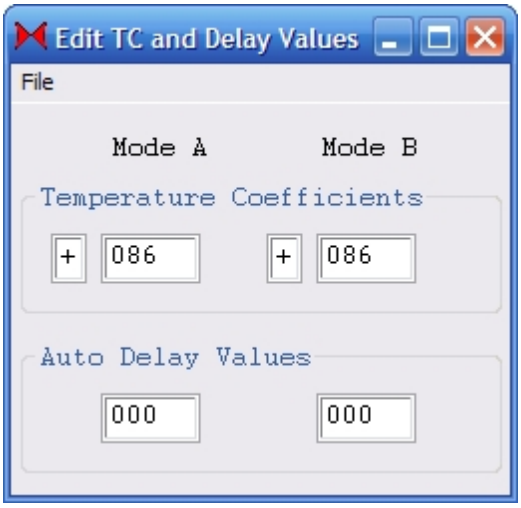
Under the **Setup** menu, some of the operating variables may be configured.

- **Select COM Port**

  This option allows the user to set the COM port to be used with the TCF-S focuser. Communication ports and USB-to-Serial converter port assignments from COM1 through COM19 are allowed.

- **Edit Temperature and Delay Values**

  Temperature Coefficients: Normally, the temperature coefficients to run the temperature compensation Modes AUTO A or AUTO B are preset in manual mode using the Program button on the TCF-S hand control box. However, if the numbers are lost or need to be entered manually, this can be done using the **Edit Temperature and Delay Values** option dialog box. Type into the text box the coefficient for the mode, **Mode A** or **Mode B**. Use a maximum of three digits. The default factory value for each mode is + 086, which is the temperature coefficient for the 10" Meade Schmidt Cassegrain Telescope used in the Optec observatory. The coefficient value is the number of steps the focuser must move for every 1 degree centigrade temperature change to keep the image in focus. With firmware version 2.32 and above, the sign of the temperature coefficient can be change from positive (+) to negative (-). Normally, the sign is positive (+) for most telescopes including the popular SCT and Newtonians. However, some the Takahashi refractors have a negative temperature coefficient.



Auto Delay Values: When operating in auto mode, the cycle time is approximately 1-second for the TCF-S to measure the temperature and then make a step change if necessary. Normally, this is sufficient for most CCD applications to track temperature. However, some users have suggested that there should be an option to lengthen the cycle time. Entering a number into the appropriate textbox will allow the user to lengthen the cycle time by units of 0.01 seconds. The input is much the same as with Edit Temp. Coefficients. The delay values for either AUTO A or AUTO B may be changed. For example, entering a value of 100 in the **Mode A** Auto Delay textbox will make the cycle time for AUTO A equal to 2-seconds. The maximum value of *nnn* is 999 or 9.99 seconds. The default value is 0.

Tip: These changes are not stored in the control program or the TCF-S firmware. Once the TCF-S is powered down the default value of 0 (1-second cycle time) is restored and used again.

- **Learn Temperature Coefficients**

With the hand control box, the temperature coefficients can be found manually using the LEARN procedure as described in the ***TCF-S Technical Manual***. The **Setup - Learn Temperature Coefficients** option allows the coefficient to be found while in serial connection mode. The start position and temperature and the end position and temperature can be recorded during an observational period and the resulting coefficient saved to either MODE A or MODE B memory locations. The same basic procedure as described in the manual is to be followed with a suggested minimum 5 degree C temperature difference to be achieved before calculating the coefficient. Originally conceived for use with the **TCF-Si** and **TCF-S3i** focusers which lack the Program and In/Out buttons, this procedure works equally well with any TCF-S focuser for determining temperature coefficients. See Learn Temperature Coefficients for step-by-step instructions.

- **DRO**

The control box for the TCF-S displays the focuser position in steps units which are equal to a measured displacement of 0.00216 *(0.002455 for TCF-S3)* millimeters. The default mode for the **TCF-S Control** program is to show the position in step units. However, the position can be displayed in units of millimeters if selected with this control. Thus, the center position of 3500 *(5000 for TCF-S3*) steps is displayed as 7.556 (*12.275 for TCF-S3)* millimeters. The user can switch from steps to millimeters at any time using the **Setup - DRO** selector box.

*Tip: The number entered in the **Steps** combo box to change position manually is still in units of steps and not millimeters.*

- **Disable/Enable Temperature Probe**

When the temperature control features of the TCF-S are not needed or there is a malfunction with the temperature probe, you can disable the **TCF-S Control** software use of temperature data with this selection. In the case of a temperature probe malfunction that results in an ER=1 code, clicking on the **Disable** selection will allow the control software to operate without locking up. When the TCF-S is first turned on, there may be an ER=1 displayed on the **DRO** for a few seconds but the unit will operate normally in the manual mode. Of course, the AUTO A or AUTO B modes cannot be initiated by the control software.

- **Change LED/Display Brightness**

The 5th generation hand control boards of the **TCF-S** and **TCF-S3** model focusers have a which can be varied in brightness or turned off with this setup option. The **TCF-Si** and **TCF-S3i** model focusers have a single Power LED

which can either be turned on or off with this option, but not varied in brightness. At the current time, the LED in the control box cannot be adjusted but will have this feature in a future upgrade of the circuit board.

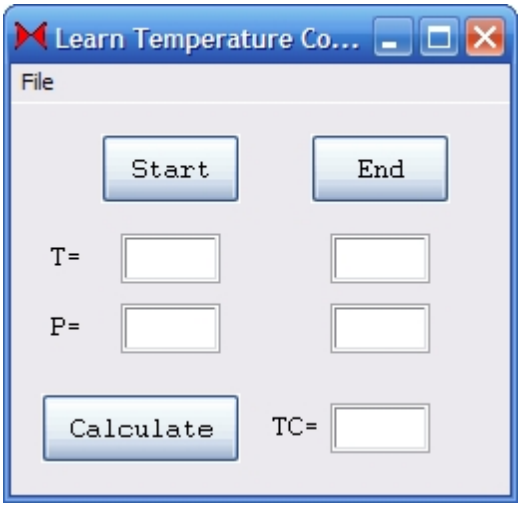
- **Select TCF-S or TCF-S3**

  The TCF-S is the original 2" ID focuser and the TCF-S3 is the 3" ID focuser. Both focuser units operate the same except the TCF-S3 has a total of 1" of travel and a maximum of 9999 steps. This compares to the TCF-S which has 0.6" of travel and 7000 maximum steps. It is necessary to select the model type that is used with this control program so that the focuser firmware in the control box is set accordingly. In addition, the conversion to millimeters for the DRO will not be accurate if the wrong model is selected

Learn Temp Coefficients

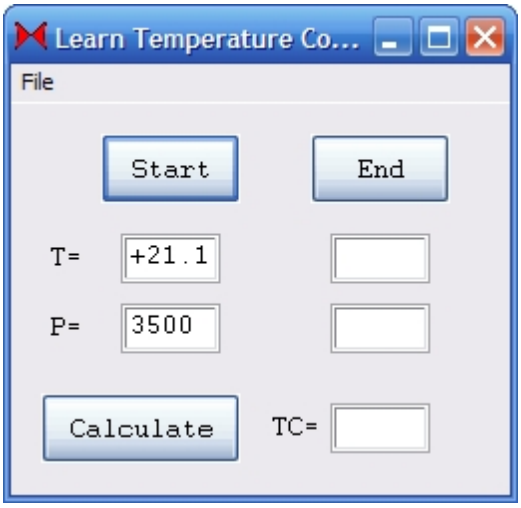
Optec

Under the **Setup** menu, the user can perform a "Learn" operation to determine new temperature coefficients. Begin by selecting **Setup - Learn Temperature Coefficients**. The Learn Temperature Coefficient dialog box appears.



- **Learn Temperature Coefficients** dialog allows the user to calculate new temperature coefficients easily and without interrupting a night's observing session. The user is free to initiate a Learn session, disconnect from the **TCF-S Control** program to run second program such as **FocusMax** to obtain optimal focus, allow for a sufficient temperature differential, and then return to the program to complete the Learn session. Newly calculated temperature coefficients can be saved to either Auto A or Auto B modes or discarded altogether.

- **Start** - clicking the Start button grabs the current temperature and position values from the TCF-S focuser. First find an optimal focus, then click the **Start** button. This initiates the Learn sequence.



Next, leave the **Learn Temperature Coefficients** dialog box open and select File - Disconnect from the main **TCF-S Control** program window.

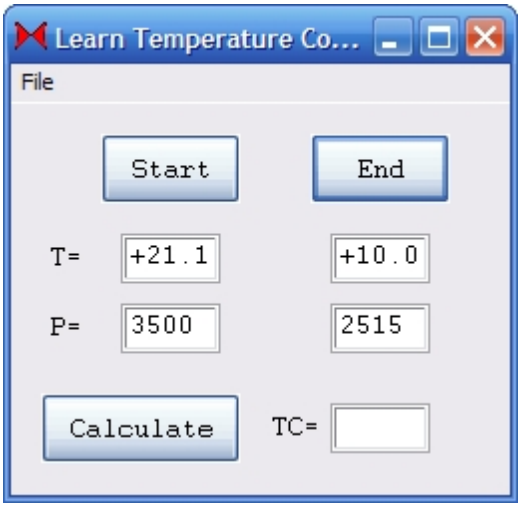
Tip: you can minimize the two windows to make more room available on your desktop.

Now, use **FocusMax** or any other focus optimizing software throughout your observing session and wait for a 5-degree (Celsius) or greater temperature drop before retuning to the **TCF-S Control** program.

NOTE: **FocusMax** is freeware developed by Larry Weber and Steve Brady. Visit the **FocusMax** website at http://users.bsdwebsolutions.com/~larryweber/
to download the latest version and full documentation.

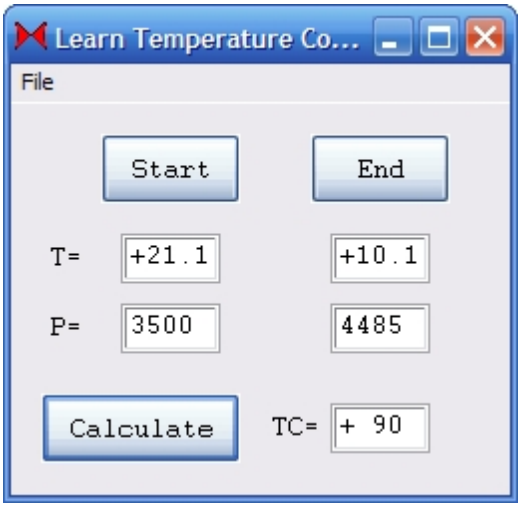
NOTE: These procedures work equally well with **Software Bisque's @Focus** algorithm included in **TheSky** software. Visit the **Software Bisque** website at: http://www.bisque.com/.

- **End** - Once a sufficient temperature differential has been acheived (typically at least 5-degrees C), the second data point can be obtained by re-connecting to the **TCF-S** focuser (**File - Connect**). Click the **End** button to record the new temperature and position values.



Tip: You will receive a prompt warning you if the temperature differential is less than 5-degrees. You may choose to accept these values or continue until the temperature changes sufficient and re-click the End button with more favorable temperature and position values.

- **Calculate** - Finally, click the **Calculate** button to determine the new temperature coefficient.

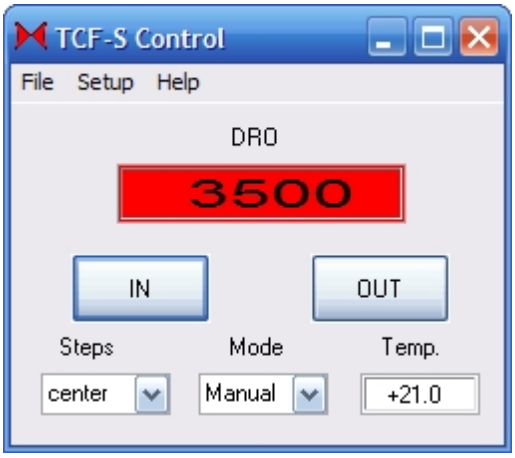


Click **File - Save TC to Mode A** or **Mode B** to save the new temperature coefficient to the focuser EEPROM. You will see the following dialog box confirming the save operation.

*Tip: You can always check the currently saved values by selecting **Setup - Edit Temperature and Delay Values** in the main **TCF-S Control** program window.*

Mode

At the bottom center of the **TCF-S Control** window is a pull-down selector box titled **Mode**. Use this box to place the TCF-S focuser into either of the temperature compensation modes, **Auto A** or **Auto B**, or to place the focuser in a low-power **Sleep** mode. This is also the place to **Wake** the focuser from the low-power mode.

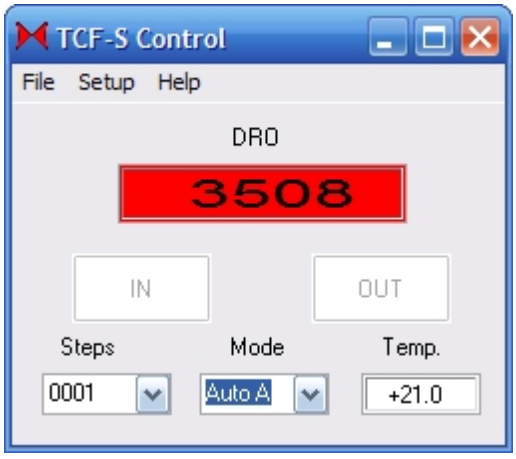


- **Manual**

  When this mode is selected, the IN and OUT pushbuttons control the position of the focuser. Select the number of steps to move by pulling down the Steps combo box and pick a number. If the Enter selection is picked, a custom value for steps can be entered. That value is then displayed in the steps list and will remain there until the program is terminated.

- **Auto A or Auto B**

  Select either of these two controls to start automatic temperature tracking for the TCF-S. All other controls are disabled with the exception of Manual which ends the automatic mode and returns the TCF-S to manual mode.



- **Sleep**

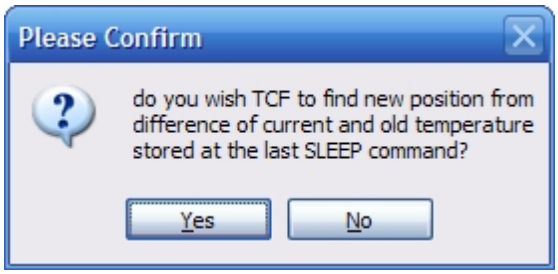
  Instead of turning power off to the TCF-S, the unit can be put to sleep by selecting this control. Power is turned off to the display and drive motor only. The current temperature and position are also stored in the EEPROM contained within the TCF-S. Power can then be removed from the units at this point if desired. See the Wake control.

Tip: Since no power is applied to the drive motor, make sure that the telescope is stored in a horizontal position so that the focuser does not loose position due to the weight of the camera.

Tip: After an observing session, the new focus for the next night can be found automatically only if the unit is put into the Sleep mode first before power is removed.

- **Wake**

  Once the Wake control is picked, the unit is powered up and the user has the option to find the new current position based on the current temperature or return to normal manual operation



Tip: If the user selects finding a new position based on the current temperature, a computer bell sound is heard when the focuser has reached the new position.

TCFparms.txt

The `TCFparms.txt` text file holds some the operating variables and is located in the program directory *(i.e. C:\Program Files\Optec\TCF Control\1.30\tcf)*. These values can be changed by using **TCF-S Control** as described on the previous pages or by using a simple text editor such as Notepad.exe. However, entering non-printable ASCII values or mixing up the order of the variables could cause the program to crash. Thus, it is suggested that these variables be changed only within **TCF-S Control**.

The following list the default values and their proper order:

0	com port number	*The zero value instructs the TCF-S control program to ask for your COM port number before proceeding. Otherwise, this value will be the number of the COM port set in Setup-Select COM Port; default is 0.*

0	display steps in the DRO	*Change to 1 to display millimeters in the DRO; default is 0.*
0	flag for enabling or disabling use of temperature probe	*0 = enabled, 1= disabled; default is 0.*
1	flag for determining focuser model type	*1 = TCF-S, 3 = TCF-S3; default is 1.*

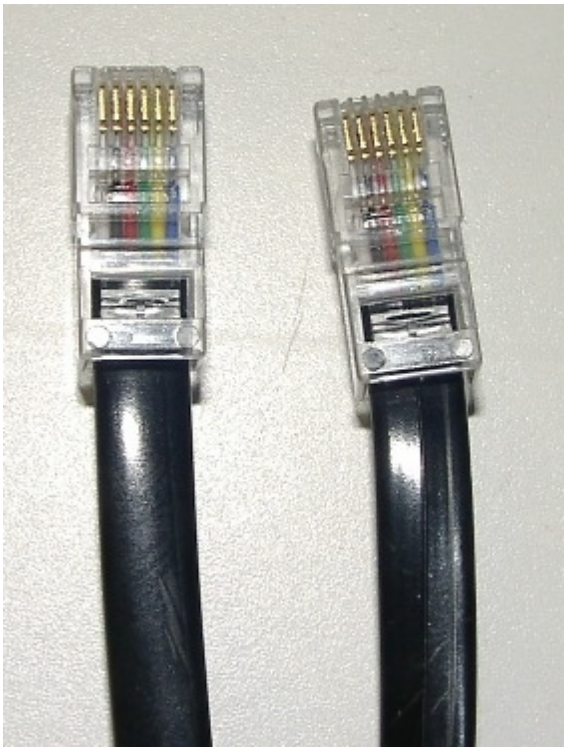
Chapter 3: FAQ & Troubleshooting

- Connect Errors - Most commons solutions to connection errors.
- Determining COM Port - Checking the Device Manager for assigned COM port.
- Error Codes - Focuser generated error codes.
- Page cannot be displayed - Windows Help engine error.

Connect Errors

Connect Errors - the most common connection errors occur due to faulty or intemittent connections. If you receive a "**Error connecting to TCF**" error, check the following possible problem sources.

- Check the COM port assignment of your USB-to-Serial converter as described under **Determining COM Port**.
- Check that the PC Serial Port connector, if not purchased from Optec, is wired correctly.
- Check the flat Reverse cable. You easily check that each end of the RJ12 connectors are wired straight through. That is, Pin 1 on one connector should be connected to Pin 1 on the opposite connector. When looking at the Reverse cable connector ends, the wire colors should appear identical as shown below.



- Check that the RJ12 connectors are properly inserted into the TCF-S focuser control box and the PC Serial Port Converter.

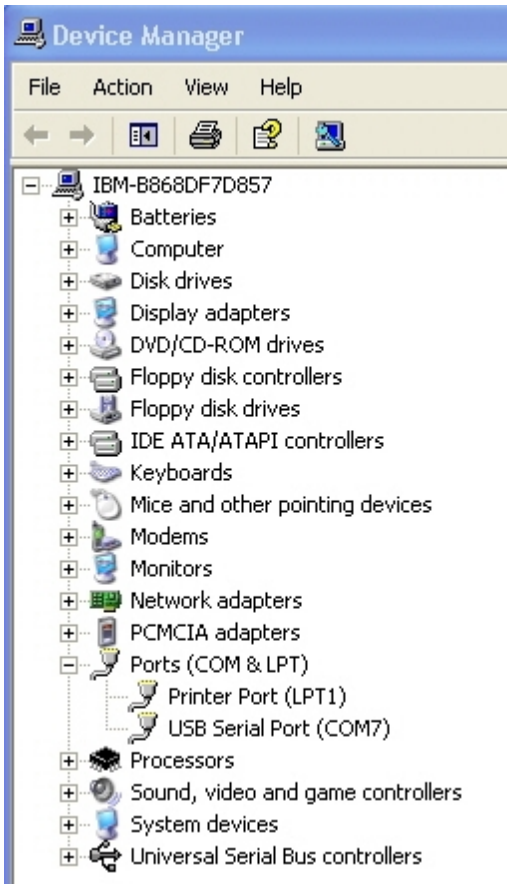
Determining COM Port

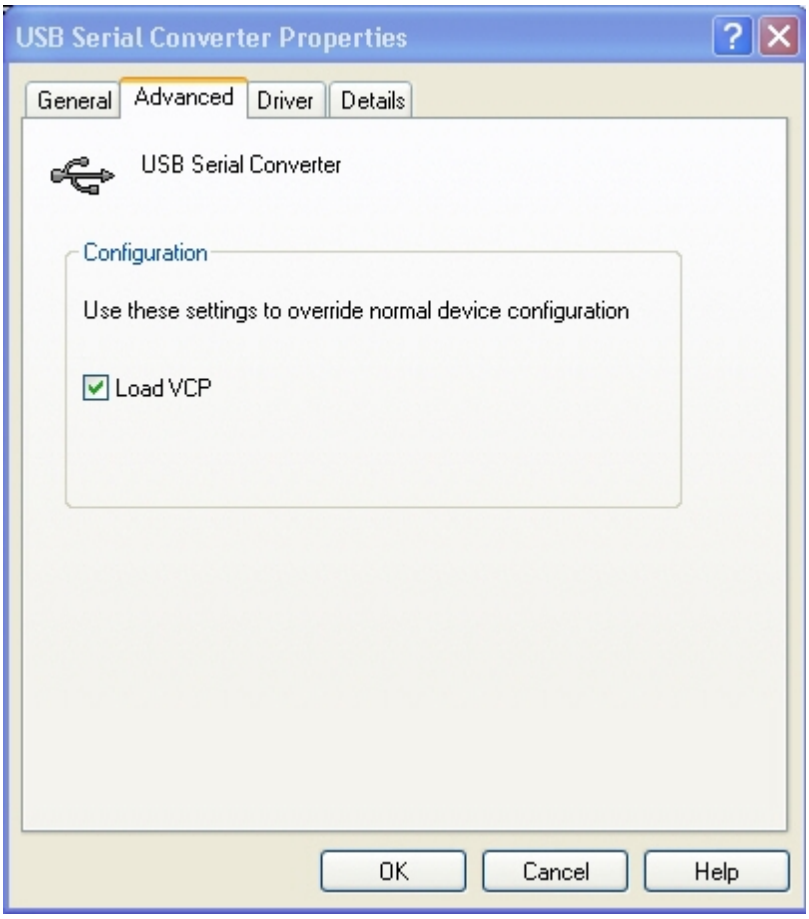
One of the first problems encountered when using the USB-to-Serial port converters is trying to determine which COM port is assigned.

- **COM Port Assignments**

The instructions below provide the easiest way to set up the USB-to-Serial port converter. To display the Device Manager in Windows, click Control Panel, or right-click on the My Computer icon and select Manage. Select Device Manager under System Tools.

Follow the instructions at right below.





1. Before plugging your new converter into your computer, make sure that any existing old drivers for the FTDI chips set have been removed. Do this by going to the Add/Remove Programs in the Control Panel and find any listing of "FTDI drivers" and remove it. If you have any older USB-to-Serial Converters using the FTDI chip set, you can remove them now.

2. From the Optec Install disk or from the Optec web site at: or from clicking on the FTDI 2.02.04 driver link above, download and run the executable setup program. This setup program is for Windows operating systems: Win2000, XP and VISTA. You will not see any message if the program loads successfully.

3. After running the setup program, you can now plug in one of your FTDI chip set USB-to-Serial converters. To find the COM number that was selected for each USB-to-Serial converter, go to your Device Manager (PATH: My Computer - Control Panel - Systems - Hardware) and check to see the COM port number listed under Ports (COM & LPT). See the diagram on the left which has COM7 selected for the USB-to-Serial Converter. You can then plug your other converters in one at a time to see which COM number have been selected for those.

4. **IMPORTANT NEW INFORMATION**: There have been some recent changes with the firmware installed in the USB-to-Serial converters that Optec supplies after July 2007 that may require an additional computer setting to be modified. If you do not see the COM port number in the Device Manger screen as above, but do see messages that indicated that the USB-to-Serial converter is installed and ready, then the VCP (Virtual COM Port) box must be checked. Examine the second image at the left and see that no COM port number has been selected. Open the line item "Universal Serial Bus controllers" and select properties for the"USB Serial Converter" line item. Select the "Advanced" tab as shown in the third image at the left and check the "Load VCP" box. Unplug the USB-to-Serial converter and then plug it back in. You should see the COM port number appear under Ports as described in

	paragraph 3. This will effect all converters that are connected.

Error Codes

The TCF-S focusers communicate with **TCF-S Control** through an ascii command set as described in the TCF-S Technical Manual. The TCF-S firmware and protocol display error codes for common problems that might occur at the hardware level. **TCF-S Control** will handle most of these errors and display a suitable message, but occasionally you may see one of the error codes below:

- **ER=1** Temperature probe not connected or not working.
  This is the most common fault and can usually be traced to a missing temperature probe or faulty wiring. Check the temperature probe connection first. Also check the Control cable connection at the TCF hand control.

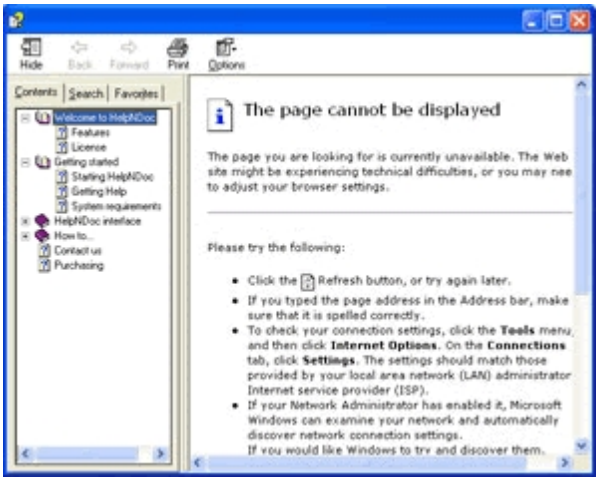
  Note: If using the Remote IN/OUT Keypad (Optec stock #17680) the software will throw an error. Though the Remote Keypad is "hot-swappable" it is advised that you Disconnect from **TCF-S Control** software before using it.

  SPECIAL NOTE: If the PC serial control cable is inadvertently plugged into the RJ-45 connector of the TCF-S hand control box (the left-most connector) pins 1 and 8 may be pushed down and fail to make a proper contact. Pin 1 is the ground pin for the temperature probe. If this connection fails intermittently, an **ER=1** error code will result. If you are experiencing intermittent connection problems, examine the pins of the RJ-45 connector using a good light and magnifier. Check all the pins are lined up evenly. If not, use a pair of tweezers to bend pins 1 and 8 upward and back in line.

- **ER=2** New calculated position when unit turned on in AUTO-A or AUTO-B exceeds limits.
  Try re-centering the focuser and adjusting the telescope's coarse focus. This error should never be passed to the **TCF-S Control** software. If it is displayed, check that the slide switches are in the "Manual/PC"

- **ER=3** EEPROM failed read/write test on boot up.
  Contact Optec is this error condition occurs repeatedly.

Page cannot be displayed



Symptoms

Microsoft's HTML Help Viewer is showing an error page saying either that:

- "The action has been canceled"
- "The page cannot be displayed"

Solutions

- Make sure your help file is not accessed from a network path or via a mapped networked drive. Try to copy the file locally and launch it again;
- Make sure your help file isn't in a path with symbols such as "#" (sharp). Once again, try to copy it locally before launching it;
- In some cases, you can have access to an "unblock" button in the properties page of the help file. Right click on the file then go to its properties and click the "unblock" button. This button is not available in all systems though.

Chapter 4: Other Resources

There are many resources on the internet to help you use the TCF-S focuser. Visit the Optec website first.

If unable to connect to the internet, or with any other questions at all, please feel free to contact Optec Support by telephone at:

- Optec Support: 616-897-9351

http://www.optecinc.com/astronomy/software/docs/tcf-s_control/files/SetupVariables.html