User's Manual Computerized
(Model CFS-Pro, CFS-R)

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User's Manual

for the

Astro-Smart

(Model CFS-Pro or CFS-R)

Contents

A. Overview

The CFS-PRO can be setup with your home observatory or field setup for trouble-free operation controlled standalone or by the user supplied computer interface.

The **Computerized Focus Smart Controller Pro(Model: CFS-PRO or CFS-R)** are an economical yet superior Automation solution made available to the amateur or professional Astronomer. The **Computerized Focus Smart Controller Pro (Model: CFS-PRO or CFS-R)** are designed to be used with most make or model focuser motor or with various supplied stepper motor drives provided by Astro-Smart for your observatory or field setup. Shown below is typical setup for generic telescope focuser as standalone unit or from remote computer using the **CFS-PRO**.

B. Features

The **Computerized Focus Smart Controller Pro (Model: CFS-PRO or CFS-R) by Asto-smart** has

the following innovative and unique features:

1. *Worry Free Warranty Program For Life Of Product Sale.*

2. *Standalone and or USB Computerized Focuser Control Software Solution GUI.*

3. *ASCOM Driver Support Tested With MAXIM_DL, FocusMax, StarryNight, Sequence Generator Pro, Nebulosity, and Sky X*

4. *Wireless remote control interface options available. Bluetooth, IR or ISM*

5. *Data Logging Capability with Parameter Setting Flash Storage And Retrieval.*

6. *Temperature Focus Compensation Function with temperature resolution to 0.025 degC.*

7. *Focuser Step Modes: Full, Half, 1/4,1/8,1/16 and 1/32*

8. *Various Stepper Motor Support including Astro-Smart, Technical Innovations Robo Motor Feather Touch, JMI, Pegasus and MoonLite for 2.5", 3" or 3.5" focusers.*

9. *Various Stepper Motor Speeds Supported. Slow, Medium and Fast.*

10. *8 Line OLED Display On CFS-PRO Only*

11. *Manual Control of Focus Using IN and OUT buttons with LED activation Indicators. On CFS-PRO Only.*

12. *Free Firmware Updates For Life Of Product Sale.*

13. *Input Requirements: 12VDC – 3Amps.*

14. *Overvoltage, Overcurrent and Reverse current Protection.*

15. *High quality design employs multi-layer PCB form factor and only the best quality components with conformal coatings for outdoor use.*

16. *Price point set below development cost for such a system while providing more features*

17. *Generic L Bracket Telescope Mounting Plate By Astro-Smart. Custom Dimensions and Custom Bracket Types such as Pulley Systems Available upon request.*

The Astro-Smart Computerized SQM Pro (CFS-PRO or CFS-R) was designed with the same Astro-Smart USER-Friendly design philosophy as all our other products:
 - Usable
 - Serviceable
 - Elegant
 - Reliable
 - Build with burn in time testing before ship.
 ... USER-Friendly

C. Contents Of Box

1. CD with **CFS-PRO** SW, ASCOM Driver, manual and video tutorials.

2. **CFS-PRO** or **CFS-R** Controller Module.

3. One USB interface Cable.

4. 12VDC/2 Amp AC/DC power Supply.

D. Design Features

The Astro-Smart integrated Differential Dew
Heater Module, **CFS-PRO, CFS-R** , has these
innovative and unique features:

- High quality components and construction utilizing multi-layer board designs with conformal coatings to aid in corrosion prevention in the elements.
- Astro-Smart uses only the best quality components and engineering practices in design, construction and fabrication.
- It can keep optical surfaces free of moisture in many different circumstances. CFS-PRO, CFS-R Front Panel And Connector Diagram:

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E. CFS-PRO, CFS-R Front Panel And Connector Diagram

➢ **Computerized Observatory Pro** Configuration . See Figures below.
CFS-PRO and CFS-R Overview Model (2017).

Focuser Pos =05000
MaxSteps   =10000
Step Mode   =Full
StepSize(u) =23.40
Motor Speed =Slow
Coil Power =OFF
Reverse Dir =OFF
Temperature =79.700 F

8 line OLED Display

Power On

Power In

8 Line OLED

Computerized Focus Smart Pro
Model: CFS-Pro

USB

USB Interface

Motor Out Connection

IN/OUT Focus With LED Indicators

www.astro-smart.com

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An online video demo of operation can be found on our website at :

http://www.astro-smart.com/index.php?p=1_49_Video-Overviews

F. PC StandAlone And ASCOM Remote User Interface Summary

Your CFS-PRO, CFS-R can be monitored or controlled from your computer or interfaced via ASCOM. Just connect the serial to USB cable and in the device manager of your operating system, you must know what port is used when connected. The settings will be automatic and the host PC install program provided will list all available serial ports to connect. You just pick the correct one. A video tutorial is listed in the support page of our website to go thru the basic operations of this feature. Some basic features are listed below.

Shown below is the standard Focus Smart Controller Pro interface.
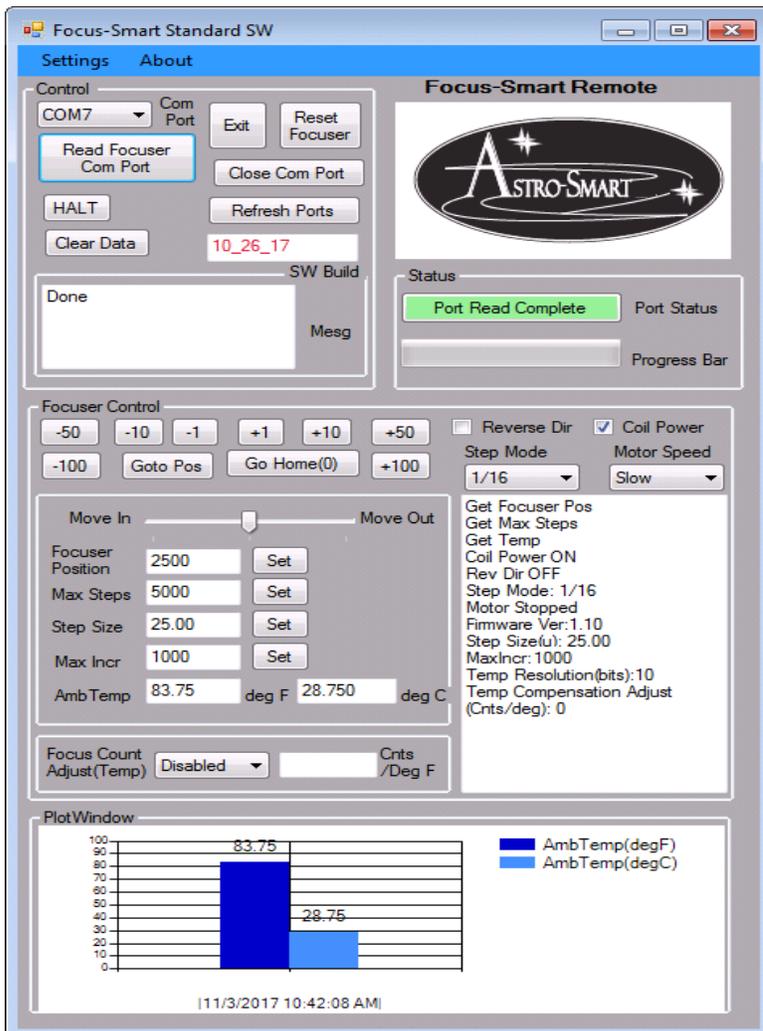
The PC SW remote interface snap shot main screen is shown to the left. Its a USB-Serial connection to the CFS-PRO, CFS-R tested across multiple PC operating system platforms.

As part of the CFS-PRO, CFS-R package, new CFS-PRO, CFS-R purchases will get the standard PC SW remote platform and ASCOM Drivers for free.

Focus-Smart Standard SW

Settings   About

Save Default Settings to Flash And Log File
Save Focuser Settings To Flash And Log File
Focuser Presets   ▶   Configure Presets

Smart Remote

Com Port   Close Com Port
HALT   Refresh Ports
Clear Data   10_26_17

SW Build

Done

Mesg

Status
Port Read Complete   Port Status

Progress Bar

Focuser Control

-50	-10	-1	+1	+10	+50
-100	Goto Pos	Go Home(0)	+100		

☐ Reverse Dir   ☑ Coil Power
Step Mode   Motor Speed
1/16 ▼   Slow ▼

Move In ———|——— Move Out

Focuser Position	2500	Set
Max Steps	5000	Set
Step Size	25.00	Set
Max Incr	1000	Set
AmbTemp	83.75	deg F	28.750	deg C

Get Focuser Pos
Get Max Steps
Get Temp
Coil Power ON
Rev Dir OFF
Step Mode: 1/16
Motor Stopped
Firmware Ver:1.10
Step Size(u): 25.00
MaxIncr: 1000
Temp Resolution(bits):10
Temp Compensation Adjust
(Cnts/deg): 0

Focus Count Adjust(Temp)   Disabled ▼   ___ Cnts/Deg F

Plot Window

■ AmbTemp(degF)
■ AmbTemp(degC)

|11/3/2017 10:42:08 AM|

Configure Focus Smart Presets

Preset Label	Focus Position		
TAK F8 Focus	5000	Save Preset 1	GOTO
TAK F4 Focus	3500	Save Preset 2	GOTO
		Save Preset 3	GOTO
		Save Preset 4	GOTO

Clear Presets   Exit

Message Box

On the Settings tab, the user can perform the following:

1. Save and recall upto 4 focuser presets.
2. Save Defaults Focuser Settings to EEPROM Flash and to Log File.
3. Save Current Focuser Settings to EEPROM Flash and to Log File.

About Focus_Smart_Standard_SW

Astro-Smart CFS-PRO Software
Version: 2.0
Copyright: Dale DiDomenico 2017-2055
Company Name: Astro-Smart LLC

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OK

CFS-PRO, CFS-R GUI Features.

1. Focus Control Group.
    a. **Focuser Position** (Current focuser position wishing to Get or Set.) Example edit textbox from 5010 to 6000 and press the Set button to reset focuser to this position. This does not move the focuser, just sets to new value.
    b. **1-100 plus or minus buttons** to move focuser quickly when close to focus.
    c. **Snap Jog Control**. Jog the focuser in and out by grabbing the center pointer and dragging left(In) or right(Out) with mouse click and then release for the total amount of time you want the focuser to move.
    d. **Goto Pos**. When wanting to move focuser to new position, Enter the new position in the focuser position textbox say "6000" and then press the Goto Pos button for the focuser to move to that position.
    e. **Go Home(0)**. Moves the focuser to position "0" Zero.
    f. **Reverse Direction checkbox**. Check when reverse direction desired.
    g. **Coil Power checkbox**. Check when you want the motor power to coils ON. Want this on when focusing so you don't slip on focus with load.
    h. **Halt**. You can always cancel a move with this button if so desired.
    i. **Step Mode Dropdown**. Select Full, half,1/4,1/8,1/16,1/32 as desired. Refer to stepper motor using for your application. Example. If using a Astro-Smart M1 stepper, a full step mode produces 200 counts per revolution. A step mode of 1/32 produces 6400 steps(200*32) per revolution if selected.
    j. **Motor Speed Dropdown**. Select Slow, Medium or Fast Speeds for Motor.
    k. **Maximum Steps**. Is the maximum step limit of your focuser set by user. Set or Get Maximum Step settings. The higher your step mode should equate to a larger Maximum Step size to obtain the full travel capability of your telescope focuser typically 1-5 full 360 deg rotations of your focuser shaft. Examples in section G.
    l. **Step Size.** Is the amount of radial travel on your telescope focuser moves within 1 step or the resolution for each motor count as the result from 1 **Step Time**. We will define **Step Size CFZ** as the number of steps tailored to your optical CFZ with at least 10-15 steps within your CFZ. **Step Size and Step Size CFZ** are determined by your Optical Fstop and stepper motor configuration. See Section G.
    m. **Max Incr.** Is the maximum amount step increment that can be used on a focuser move. Example. If focuser position is set at 5000 and a move to 10000 is desired, a Max incr of 1000 would limit the focuser to jump no more than 1000 counts at a time before reaching the destination position. Default Max Step size is 1000 counts.
    n. **Focus Temp Adjust**. Add the focus counts per deg of temperature change here when selecting the Enabled drop down beside this feature. This data should be collected based on your optical train and location, so, if you find for every 1 deg change in ambient temperature, your focus changes by 15 counts then you would enter this value in this textbox and select the enabled pull down to enable temperature compensation for focus.
    o. **Read Focuser Com Port button**. This queries the focuser for all data in GUI.
    p. **Settings Tab: Save And Log Settings.** This option saves in flash current or default GUI settings and Logs to a data file on your computer. Stored in c:\Focus Smart Pro Data. The Data is stored in .csv and .log file as shown below.

```
Focus_Smart_Pro_Data_20171103105725118.log - Notepad

File   Edit   Format   View   Help

Focus Smart Focuser Settinsgs
11-03-2017-10-57

Firmware Version: 1.10
Temperature(F,C): 83.75, 28.750
Temp Sensor Resolution(Bits): 10
Focuser Position: 2500
Max Steps: 5000
Max Incr: 1000
Step Mode: 1/16
Step Size(u): 25.00
Reverse Dirction: OFF
Coil Power Applied: ON
Motor Speed: Slow
Temperture Compensation: Disabled
Focuser Count Compensataion Per Deg Of Rotation: 0
Preset1-> TAK F8 Focus: 5000
Preset2-> TAK F4 Focus: 3500
Preset3-> :
Preset4-> :
EEPROM Flash Settings And Data Saved:
```

q.   **Refresh Ports button**. This refreshes all com port connections while GUI is active.
r.   **Exit button**. Closes Application.
s.   **Close Com Port**. This closes com port but allows GUI to still be active. Pressing button in item n opens the com port again and reads the focuser data.
t.   **Clear Data**. Clears data on GUI.

To set the proper midpoint focus position, Max Step Size and pick the best motor for your optical configuration using Astro-Smart's CFS-PRO, CFS-R, you must perform the following.

1. Determine the maximum drawl of your focuser tube on your telescope in mm. Using these measurements, we set the min and max travel boundaries minus ¼" to be used with your CFS-PRO.

2. Determine your optical load, amount of travel(mm) for your focuser within 1 revolution of your focuser shaft, CFZ of your optical path and desired step size within your CFZ called step size CFZ. See Section G.

3. Set your (max step, focus position to mid point of max step and your measured Step Size in microns(ex...20.5))using section G as guidance. Then use MAXIM_DL or a similar Focusmax run to find focus to verify settings.

The simplicity of operation can be seen in the following these steps below.

CFS-PRO, CFS-R Installation and Working Test Scenario:

1. Install the CFS-PRO SW on your computer (Win XP, Win 7 or Win 8, 10). This program was developed under .Net 4.5 and Win 7 PRO.
2. Install the supplied ASCOM driver package on your computer (Win XP, 7 8, 10).
3. Plug in the Power Supply Input.
4. Attach the motor cable assembly to the CSF-PRO and telescope focuser mount.
5. Connect to USB cable provided by Astro-Smart to CFS-Pro and computer.
6. Switch Power ON/OFF button to "ON".
7. Run the CFS-PRO software, then run the device manager on your PC OS to determine which port the CFS-PRO is attached to. This program was developed under .Net 4.5 and Win 7 PRO. It has been tested on XP and Win 10. If compatibility issues occur but should not be likely, set program to run as administrator and or set to Win 7 compatibility. You can also use the troubleshoot compatibility settings to set automatic to your OS.
8. While in CFS-PRO PC interface, select the serial port CFS-PRO is attached to from the Com Port drop down menu on top left of application.
9. Press the "Read Focuser Com Port" button and the progress bar will turn green then grey when complete and the data fields and textbox messaging data will populate from focuser.
10. If you get something like the data above in the GUI SW figure, you are connected to your focuser.
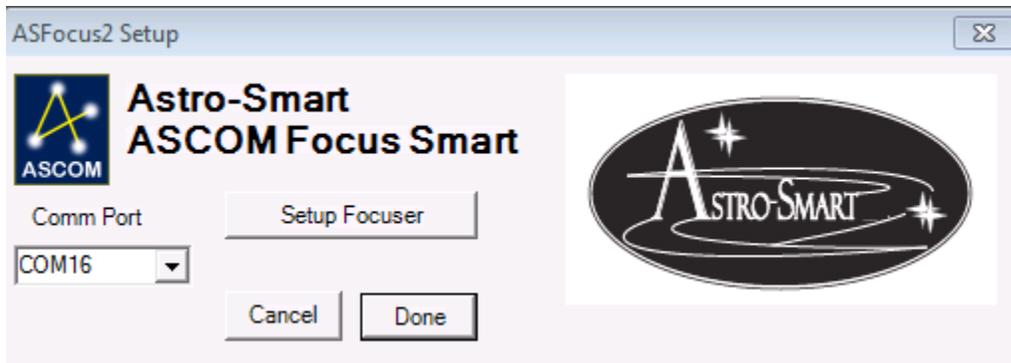
ASCOM Example Using MAXIM DL.

1. Start MAXIM_DL.
2. Open Observatory Control Window Setup Tab.
3. Select Focuser 1 or 2 Options and Choose the following ASCOM driver.
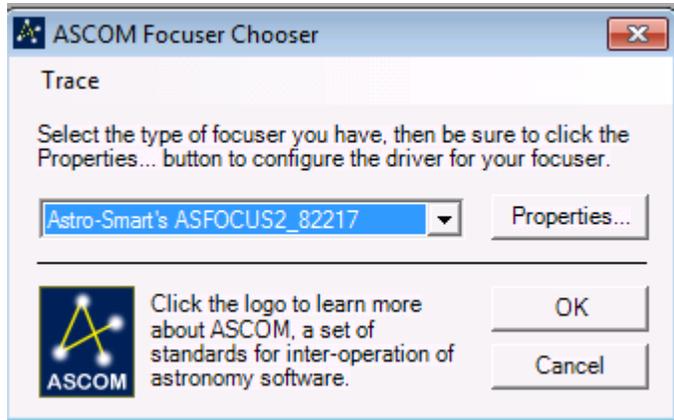
4. Select Properties…

5. At this point you have a few choices, either select the com port and click done which will launch you in the MAXIM_DL application Or You can enter the Setup Mode.

6. Case 1: Ready to Enter MAXIM_DL. Here you then press Connect and then navigate to the Observatory Control Focus Menu, select the focuser you chose either 1 or 2 and the focus data will update and be ready to use in MAXIM_DL as shown below.
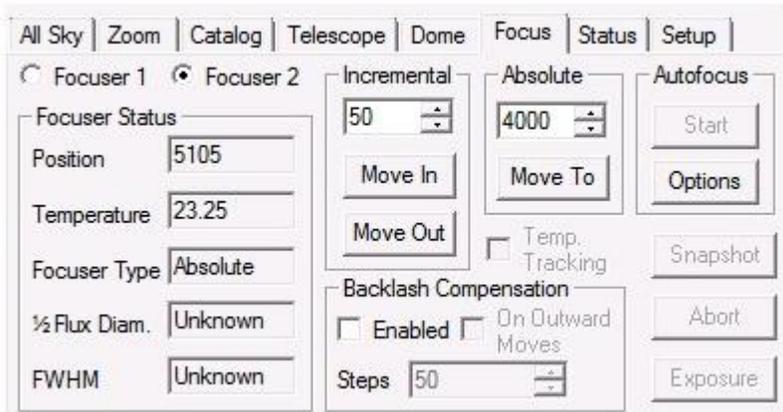
7. Case 2: Enter Setup Mode. Here you can change settings on the focuser before you enter MAXIM_DL. Here you then press Setup Focuser and the Focus Smart Controller Pro interface is invoked as shown below. Use this interface as described above connecting with com port, changing any settings, closing port and then Exit the application when all settings are set to your liking. This will return you to MAXIM_DL where you can select the com port and click Done and proceed as in step 5. Refer to section F above and G below in setting your step size in microns, your max steps and your mid point focus position before running ASCOM or the application. These settings are crucial to your particular optical configuration and is the users responsibility to set these correctly to avoid damage to your focuser.

8. Other examples can be seen by demonstration on our website to browse support pages, video tutorials for this product and others. Such as Sequence Generator Pro.
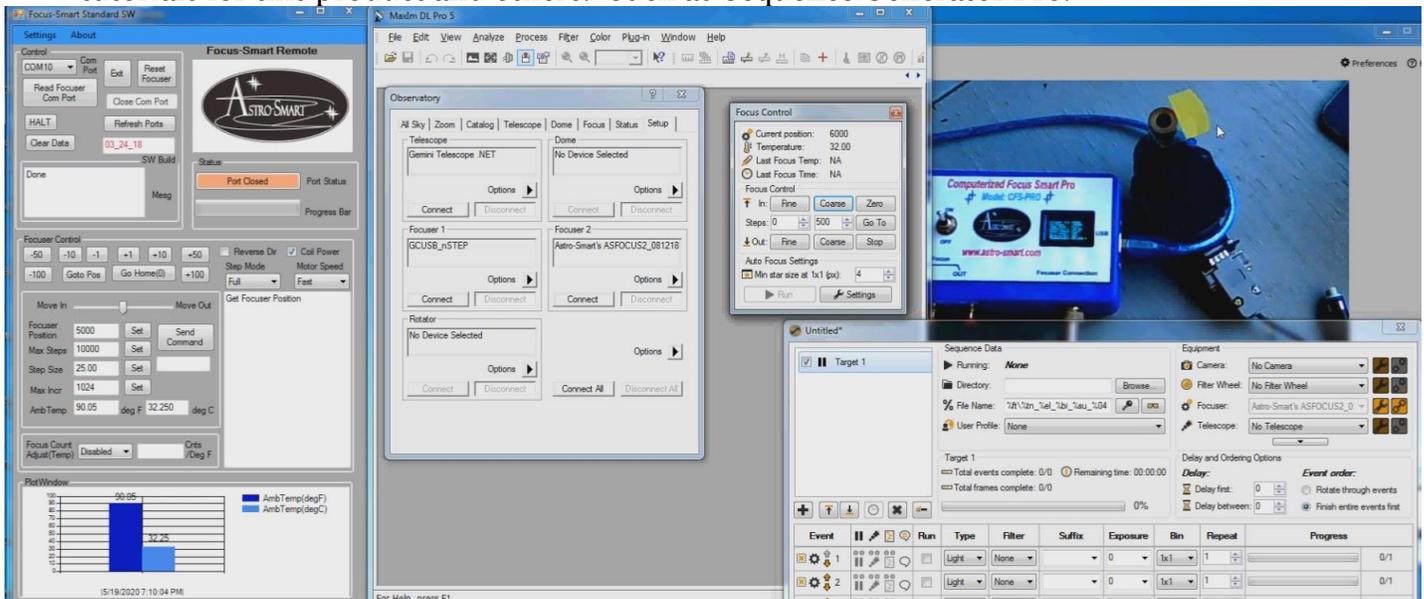
9. Enhancements to the software will be made based on user input on a continual basis and can be uploaded from our site for your convenience.

   http://www.astro-smart.com/index.php?p=1_49_Video-Overviews

G. Motor Configuration And Setting Options:

The following tables represents the recommended motor configurations based on your optical mount load including couplers, cameras, rotators, OAG's, etc for your CFS-PRO, CFS-R.

Chart below shows various motor, step mode and holding torque configurations. This spreadsheet can be made available for modification of your particular configuration.

Configurations	CFS-Pro Step Settings	Resultant # Of Steps per 360 deg Shaft Rotation	FSTOP Configuration Of Tak 106ED with 1.6X Extender	TaK FSQ 106 ED Focuser Draw Tube Max Extension(mm)	CFZ	SSR(microns) inside CFZ for 10 distinct steps.	SST(microns) Measured Step Size Of Telescope Focuser Configuration (Tak 106 ED)	# Of Steps In SST With Chosen CFZ Configuration	Holding Torque Power(lbs-in) using 0.3 inch(8mm) radial shaft	Recommended Projected Step Size Count For Max Travel Of Focuser -10%	Recommended Configuration
Astro-Smart M1	Full	400	8	30	141	14	59	2	14.94	426	NO
	8	3200	8	30	141	14	7	20	10.8	3402	YES
	32	12800	8	30	141	14	2	71	8.4	13607	YES
Astro-Smart M2	Full	200	8	30	141	14	117	1	17.5	213	NO
	8	1600	8	30	141	14	15	9	12.67	1701	YES
	16	3200	8	30	141	14	7	20	11.2	3402	YES
	32	6400	8	30	141	14	4	35	9.85	6804	YES
Astro-Smart M3	Full	1028	8	30	141	14	23	6	58.97	1093	NO
	4	4112	8	30	141	14	6	24	53.24	4372	YES
	8	8224	8	30	141	14	3	47	42.62	8743	YES
	32	32896	8	30	141	14	0.71	199	33.18	34969	YES
Astro-Smart M4	Full	5370	8	30	141	14	4	35	90.64	5709	YES
	Half	10740	8	30	141	14	2	71	81.83	11417	YES
	8	42960	8	30	141	14	0.55	256	65.51	45667	YES
	32	171840	8	30	141	14	0.14	1007	51	182665	YES
Robo Motor /MoonLite	Full	3600	8	30	141	14	7	20	21.04	3827	YES
	8	28800	8	30	141	14	0.81	174	15.22	30615	YES
	32	115200	8	30	141	14	0.2	705	11.85	122457	YES

Chart below shows CFZ, Max Step Size and Step Size CFZ configurations using a TAK-FSQ-106ED. ==In this example, the STEP SIZE measured was 23.42 mm and must be set in the CFS-PRO GUI or ASCOM as used in this chart example below.==

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Configurations	Steps Per 360 deg's In Full Step Mode	CFS-Pro Step Settings	Resultant # Of Steps per 360 deg Shaft Rotation	Holding Torque Power(lbs-in) using 1 inch(25.4 mm) radial shaft	Holding Torque Power(lbs-in) using 0.394 inch(10mm) radial shaft	Holding Torque Power(lbs-in) using 0.3 inch(8mm) radial shaft	Holding Torque Power(lbs-in) using 0.28 inch(7mm) radial shaft	Holding Torque Power(lbs-in) using 0.24 inch(6mm) radial shaft
Astro-Smart M1	400	Full	400	4.48	11.37	14.94	16	18.67
	400	8	3200	3.81	8.22	10.8	11.57	13.5
	400	32	12800	3.36	6.4	8.4	9	10.5
Astro-Smart M2	200	Full	200	5.25	13.32	17.5	18.75	21.88
	200	8	1600	4.47	9.64	12.67	13.57	15.84
	200	16	3200	4.2	8.53	11.2	12	14.88
	200	32	6400	3.94	7.5	9.85	10.56	12.32
Astro-Smart M3	1028	Full	1028	17.69	44.88	58.97	63.18	73.71
	1028	4	4112	16.81	40.52	53.24	57.04	66.54
	1028	8	8224	15.04	32.44	42.62	45.66	53.27
	1028	32	32896	13.27	25.25	33.18	35.55	41.47
Astro-Smart M4	5370	Full	5370	27.19	68.98	90.64	97.11	113.3
	5370	Half	10740	25.84	62.28	81.83	87.68	102.29
	5370	8	42960	23.12	49.86	65.51	70.19	81.89
	5370	32	171840	20.4	38.82	51	54.65	63.75
Robo Motor /MoonLite	3600	Full	3600	6.31	16.01	21.04	22.54	26.3
	3600	8	28800	5.37	11.58	15.22	16.31	19.02
	3600	32	115200	4.74	9.02	11.85	12.7	14.82

H.   Motor Output Connection Details:

The following list below shows the supported focuser motors for the CFS-PRO, CFS-R. For each configuration, a Wire harness assembly in 12 foot length(custom lengths available) is pre-fabricated with a aviation style bezel ring keyed screw on connector. Custom configurations can be made at user request for other motor configurations. Email me directly at dale@astro-smart.com for these requests.

Astro-Smart Motors M1 through M4
Technical Innovations Robo Motors
Moonlite Motors
Rigel Motors
Pegasus Motors
MotoFocus JMI Motors
Optec Motors

I. Accessories

Optional accessory that Astro-Smart offers is various Stepper Motor Assemblies For your Focus Smart product as outlined in Section G and various Stepper Motor Brackets and Couplers for Focuser shaft mounting.
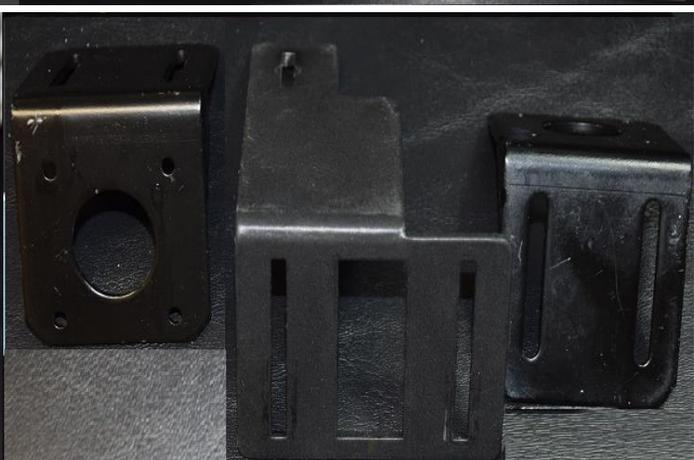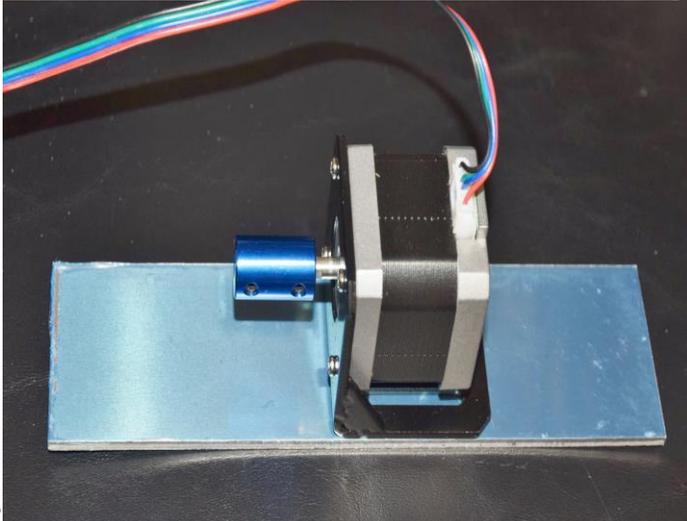
2

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Life Time Warranty

All products are guaranteed to the original purchaser to be free from defects in material and workmanship for the life of the product from the date of original purchase. Simply put, once you buy a Astro-Smart product we make sure it works for as long as you keep the product for free upgrades of software and firmware for the product. Warranty coverage excludes normal wear and tear, or damage caused by improper installation, any modification, abuse, misuse, improper maintenance, and unauthorized repairs or modifications to the original product. Shipper is responsible for proper packaging, shipping and insurance on applicable upgrades or repair items. . Upon receipt of returned product, Astro-Smart will assess the item/s to determine if they comply with the conditions of our warranty. Astro-Smart is not responsible for damage caused by the freight carrier, i.e.: USPS, UPS, FED EX, etc., to our product. A claim to repair or replace the product must be initiated by the recipient. In no event shall Astro-Smart be liable for any claim for incidental or consequential damage arising out of or in connection, manufacture, delivery or use of any product offered on this website or by information received by US mail, E-mail, data files or fax.

Return Policy

Merchandise must be returned in new (mint) condition within 30 days of receipt for exchange/refund which may be subject to 20% restocking charge (Shipper is responsible for proper packaging, shipping, and insurance.). We must receive the returned merchandise within 30 days of the date you received it. All items must be in new (mint) condition and fully functional. Returned items cannot show evidence of use or wear, dirt, or blemishes of any kind. Merchandise must be returned in its original packaging and should include all supplied materials, instructions, original accessories, hardware, and any CD software disks provided. Software purchases via email or download since released are non-refundable. Astro-Smart is not responsible for lost or damaged packages. Return shipping costs are the responsibility of the customer. Any returned items must be in "as new" condition. We ask that you open and inspect your order upon receipt. No insurance or damage claims will be accepted more than 3 days after delivery. All customers MUST email Astro-Smart before returning products for warranty or repair to get an RMA# (Return Merchandise Authorization).

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