Guiding a Dobson Skywatcher telescope with STELLARIUM on a mobile device and/or on a PC using wi-fi and no cable.

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1. Objectives:

Although it is quite possible to just use the telescope with his hand control, what I did in the first few months, I see 3 basic reasons using Stellarium:

- The available objects available limitation in the telescope DB. The telescope's native database (Synscan DB) contains more than 40,000 objects, but with limitations on accessible catalogues. The use of a software allow to exceed these limits:
    - The deep sky is limited to Messier, NGC, IC and Caldwell while many others are referenced in a software such as Stellarium.
    - The SAO catalog is limited to magnitude less than 8
    - Too few variables are referenced.

- An advantageous alternative to using the hand control:
    - Use of the virtual hand control (mobile and/or PC) with the same functionality but increased readability and the ability to encode without repeated pushes of the arrow keys.

- A solution to avoid unavailability of the hand control.
    - Indeed, in the event of a hand control failure, the Synscan Pro application on mobile or PC takes over. This gives time to make a warranty exchange, to obtain one after an order or simply to avoid a shortage of this component. The shortage of components could lead retailers to provide future Dobson Skywatcher without hand control. The required software (on mobile and/or tablet):

Required in all cases because it is this software that establishes the Wi-Fi connection with the Skywatcher and provides 3 essential functions:

1) Replaces the hand control to point objects contained in the Skywatcher DB with the exception of the SAO Catalog of stars (see the remark (exclamation mark below)
2) Guide the telescope to any object whose coordinates are provided by Stellarium to it.
3) Used to center the object with the eyepiece once the object is pointed.

SynScan Pro allows you to point planets, the Moon, the Sun, objects from the deep sky, bright stars and some double stars. However, if the hand control can point stars from the SAO catalog limited to magnitude +- 7.8), this is not the case for SynScan or SynScan pro which does not contain an SAO catalog.

Therefore, SynScan is not suitable for pointing objects that are occulted, satellites, variable star fields or objects from other catalogues. **This is why a planetarium software is appreciated** in addition to SynScan Pro.

2. Softwares tested :

I am using Stellarium on my laptop with SynScan Pro on my mobile phone 100% successfully. It allows me to point objects and asterisms from deep sky catalogs not available in the Telescope DB, and especially to point directly variable stars that I wanted to follow rather than pointing to a SAO star often away from the desired field.

3. Wi-fi :

All the planetarium software only need Wi-Fi to work. No need for the cable that connects the telescope to the PC. My 254mm contains a built-in Wi-Fi module. For those who do not have it, just order it (available in multiple websites)

4) Devices to use to manage the telescope

3 possibilities to use the telescope:

a) just use it with the (physical) hand control. Point and manage the telescope movements with the hand control.

b) Stellarium on the PC and Synscan Pro on the mobile phone. This configuration allows you to point the instrument indifferently from Stellarium hand control or directly from the mobile phone. When pointed to the selected object, you can use the mobile phone to center the object correctly.

c) Both Stellarium and Synscan on a tablet. Point with the planetarium and manage the telescope movements from the tablet.

5) Notes and Advices

- **With the latest release of Sysnscan, it is possible to use Synscan on the PC and Synscan on a mobile phone by using a new funtion: PMSHARING in the utility menu.**
  see the tuto on Youtube: https://www.youtube.com/watch?v=wtjjaSxrAL8
- **Never connect the physical hand control when using Synscan on mobile phone or tablet**
- The telescope is to be parked using Synscan on the Tablet or Mobile phone.
- Using Synscan Pro and Stellarium doesn't change the pointing accuracy of the telescope. In other words, placing the object in the center remains manual (use of the direction buttons).

Reminder: when using a PC (that's what I am doing), you use Synscan Pro on your mobile phone to use the direction keys when you stand at the eyepiece to center the pointed object.

6) Download and install Synscan Pro

The latest release of Synscan is not available from Google play so you may download it from the following link: https://synscan.en.aptoide.com/app

7) Connect Synscan to the Wi-fi on the mobile phone or tablet

Fig 1

1) Switch on the telescope
2) Connect the mobile phone to the telescope Wi-Fi "Synscan_xxxx"
3) Load Synscan on the mobile phone
4) Connect to the Wi-Fi of the telescope by pressing "Connect" on picture. Synscan will automatically find the Wi-Fi of the telescope

NB: nothing else to do on the mobile phone nor on the tablet – all data is loaded from the integrated GPS

That's all for Synscan - This is the default Synscan configuration:

8. Stellarium

Stellarium can work directly with Synscan App driver (without the Ascom driver) but **In any case the best way is to use the Ascom driver**

8.1. Ascom platform

All planetarium softwares can guide any mount using the ASCOM platform and the driver corresponding to the mount. It is therefore necessary to proceed as follows:

8.1 Install the latest ASCOM platform: https://ascom-standards.org/Downloads/Index.htm

8.2 Then install the Ascom driver for Synscan:
https://www.skywatcher.com/download/software/ascom-driver/

From there on, Stellarium, Ciel, C2A and others can address Synscan to guide the telescope.

Launch Stellarium and click the left side menu key (Fig 1 - Red arrow on the left image) or press “F2” to open the software configuration menu.

In the configuration module (Fig 2), click on "Plugins" (1), then select "Telescope control" (2) then check "load at startup" (3) !!! which requires Stellarium to reboot before step (4) and so after reboot, "configure" (4)

Fig 1

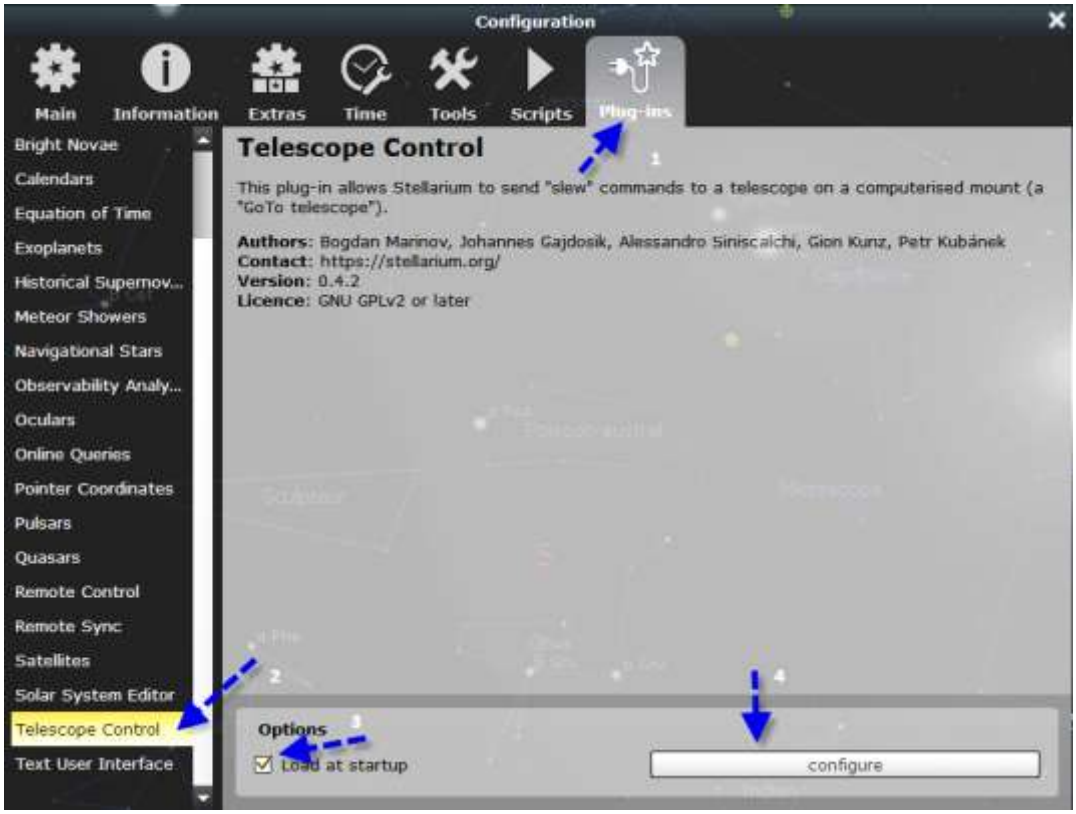


Fig 2

After clicking on “Configure”, create a telescope by clicking on the icon shown by the red arrow (Fig 3).

Fig 3

Choose Ascom (Fig 4 - red arrow)
Give a name to the telescope (Blue arrow)
Click on “Select one Ascom telescope” (Green arrow)
You get the Fig 5 menu

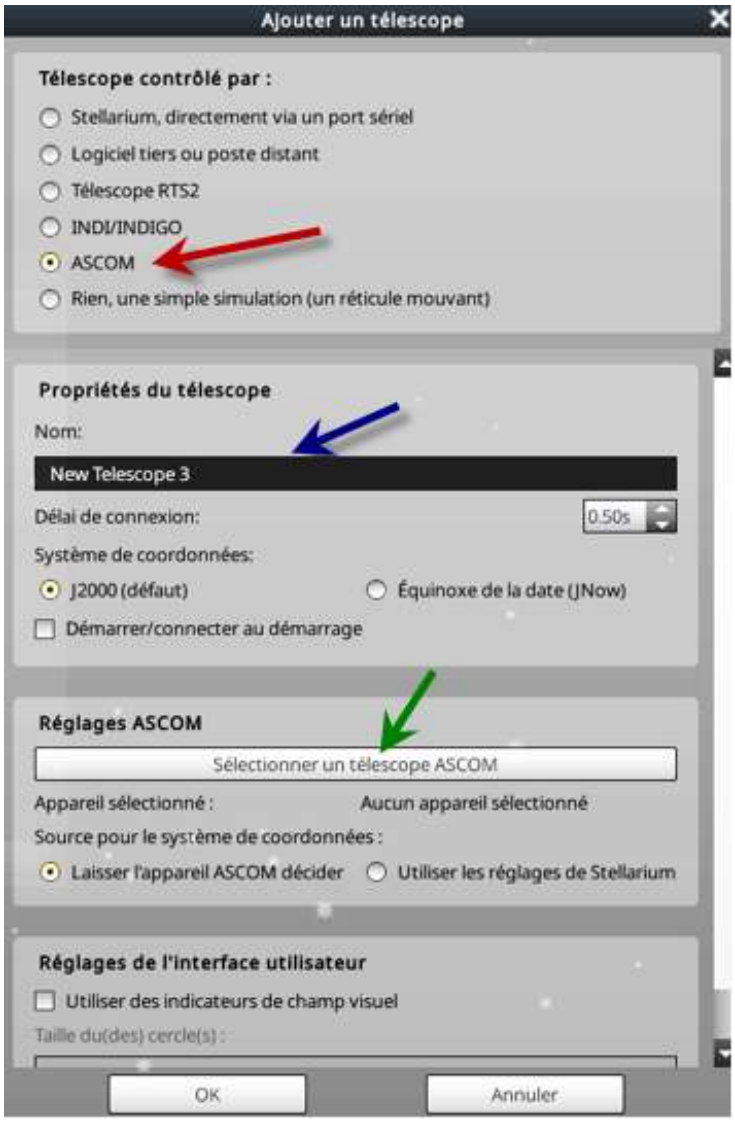


Fig 4

(Fig 5) Choose “Synscan app driver” and then “Properties” and you get the Fig 6 menu

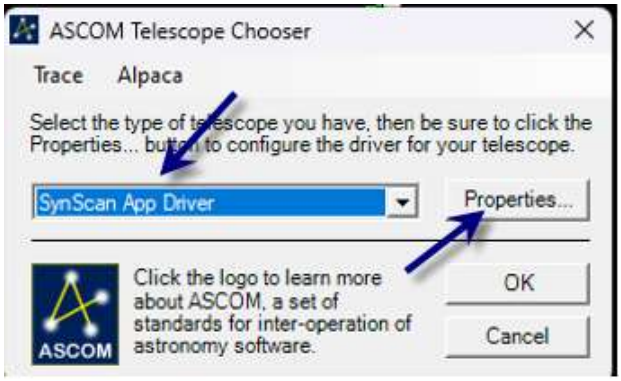


Fig 5

(Fig 6) All data is correct without changement.

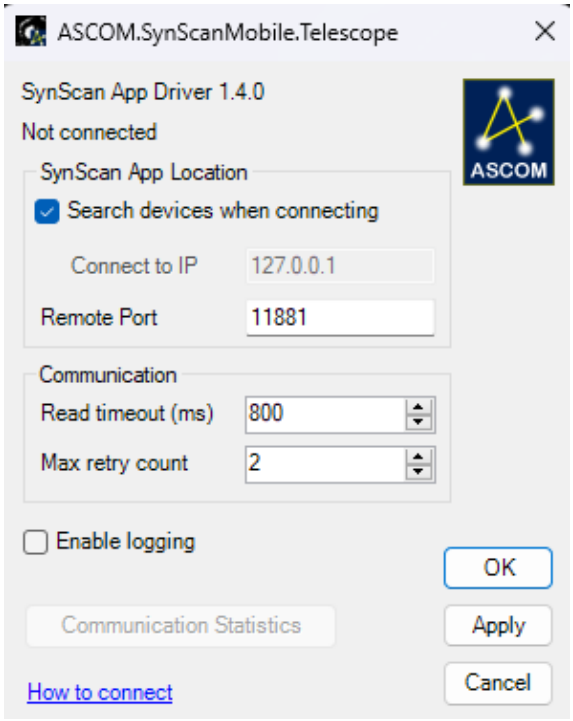


Fig 6

You are now ready to work with Stellarium on a PC and Synscan on your mobile phone to manage your Dobson SkyWatcher.

7.2. Telescope configuration using Stellarium and Synscan on the same tablet

Connect your tablet to you telescope Wi-Fi ("Synscan_xxxx")
Launch Stellarium and click the left side menu key (Fig 1 - Red arrow on the left image) or press “F2” to open the software configuration menu.

In the configuration module (Fig 2), click on "Plugins" (1), then select "Telescope control" (2) then check "load at startup" (3) !!! which requires Stellarium to reboot before step (4) and so after reboot, "configure" (4)

Fig 1

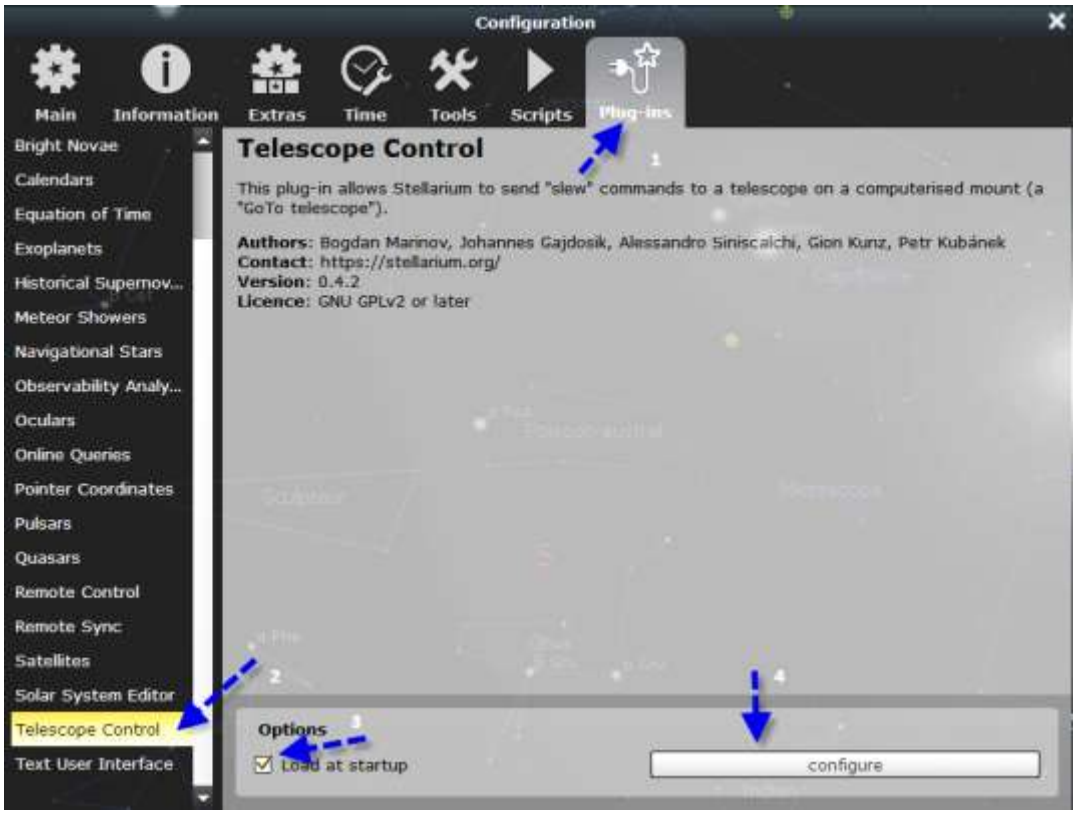


Fig 2

After clicking on “Configure”, create a telescope by clicking on the icon shown by the red arrow (Fig 2).
Add the telescope by clicking on the icon shown by the red arrow (Fig 3).

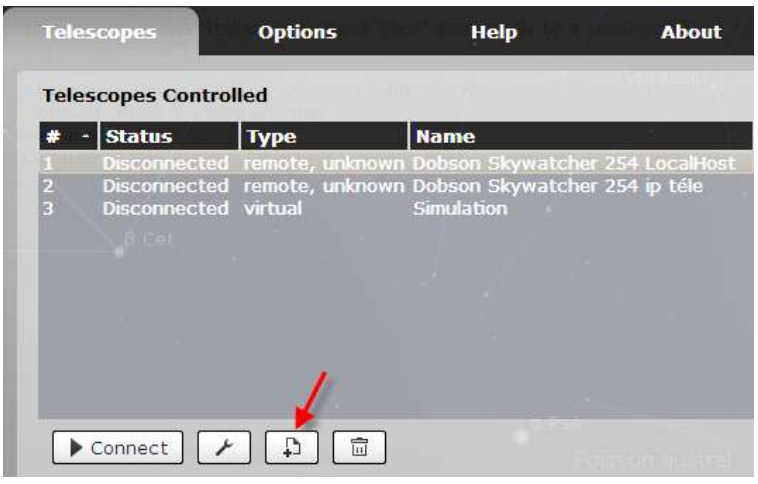


Fig 3

(Fig 4) Choose “External software or remote computer”
Give a name to the configuration
Choose “localhost” or IP address 127.0.0.1 (it is the same)
TCP port on 10001 (to be checked)

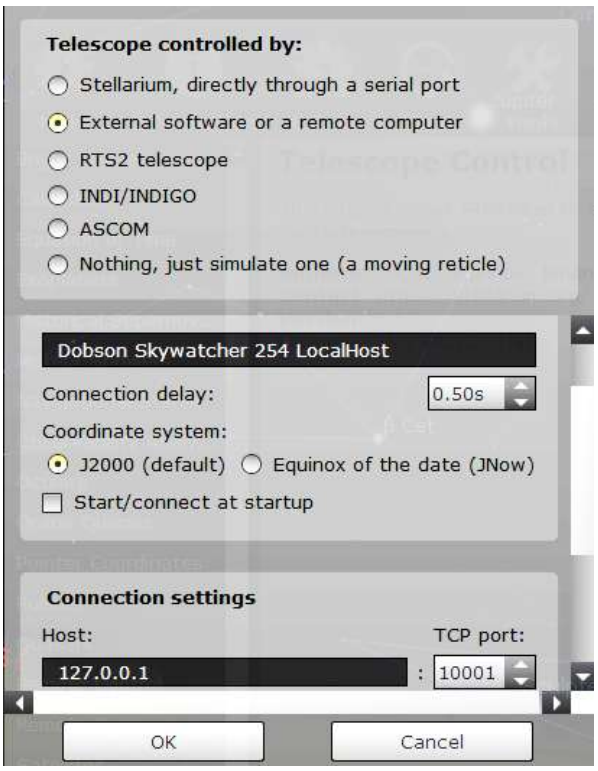


Fig 4

7.3 starting the observation night

a) Switch on the telescope
b) Connect the mobile phone to the telescope Wi-fi, Start Synscan app and connect (chapter 7)
c) Start Stellarium
d) Click on the little telescope in the below menu bar (red arrow) to connect Stellarium to the telescope

Fig 1

Select the telescope you want to guide (yellow highlighted) and click on “Connect” (red arrow); once connected, you are ready.

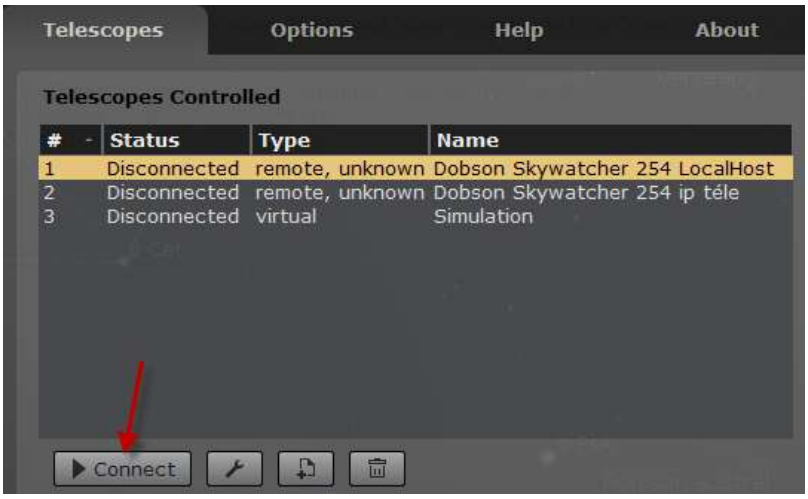


Fig 2

7.4. Pointing to an object

First make a search for an object by pressing (F3). Type the name of the object and when found, center it (Tab key). Then click on the little telescope (Fig 2 – red arrow) on the below menu bar to open the control menu.

Fig 3

Then ask Stellarium to send the coordinates to Synscan who will guide the Telescope to the selected object (Fig 4).
!!! In Synscan settings, be sure to set the max height to 90° up and 0° down to avoid having the telescope to avoid damaging the telescope if the object is outside these values.

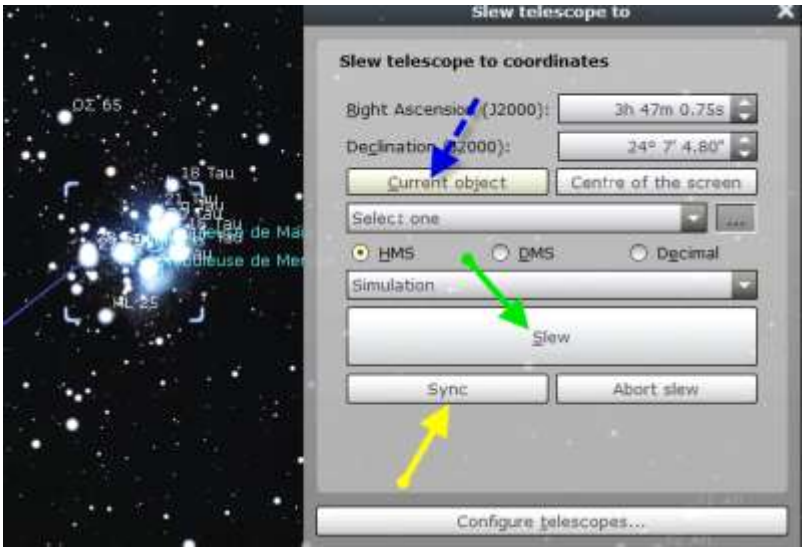


Fig 4

- Click on“current object” to indicate that the selected object is to be pointed (blue arrow).
- Click on “Slew” to start the guide (green arrow)
- **Center the objet in the ocular.**
- correct the position of the object in Stellarium by clicking the “SYNC” button (+- equivalent to POE correction – orange arrow)

The position and movements of the telescope are visible on the Stellarium display.

8. Additional info by Benoît

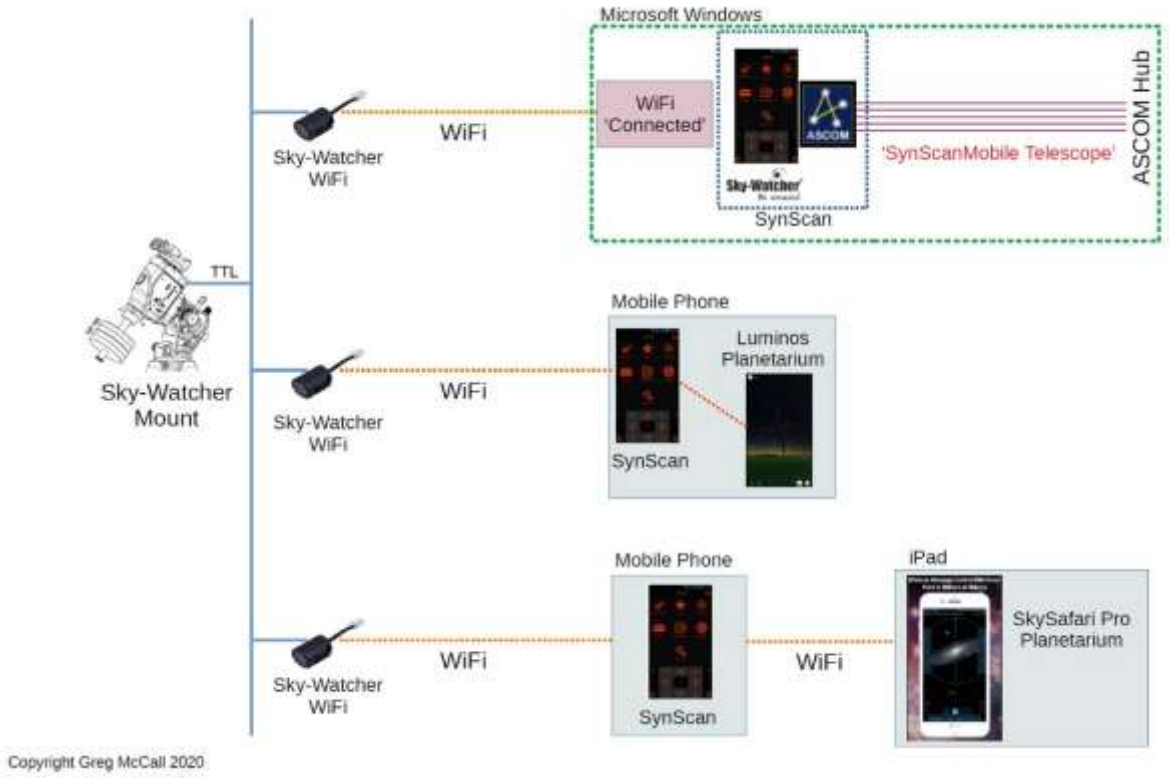
If we want to generalize, we can say that all the frames made in China at Synta (Skywatcher of course, but also Bresser, Meade, some Celestron products, and more...) are controlled at the base by serial controls that the AD and DEC motor controller receives via the RJ45 connector on which the Synscan racket is normally plugged.

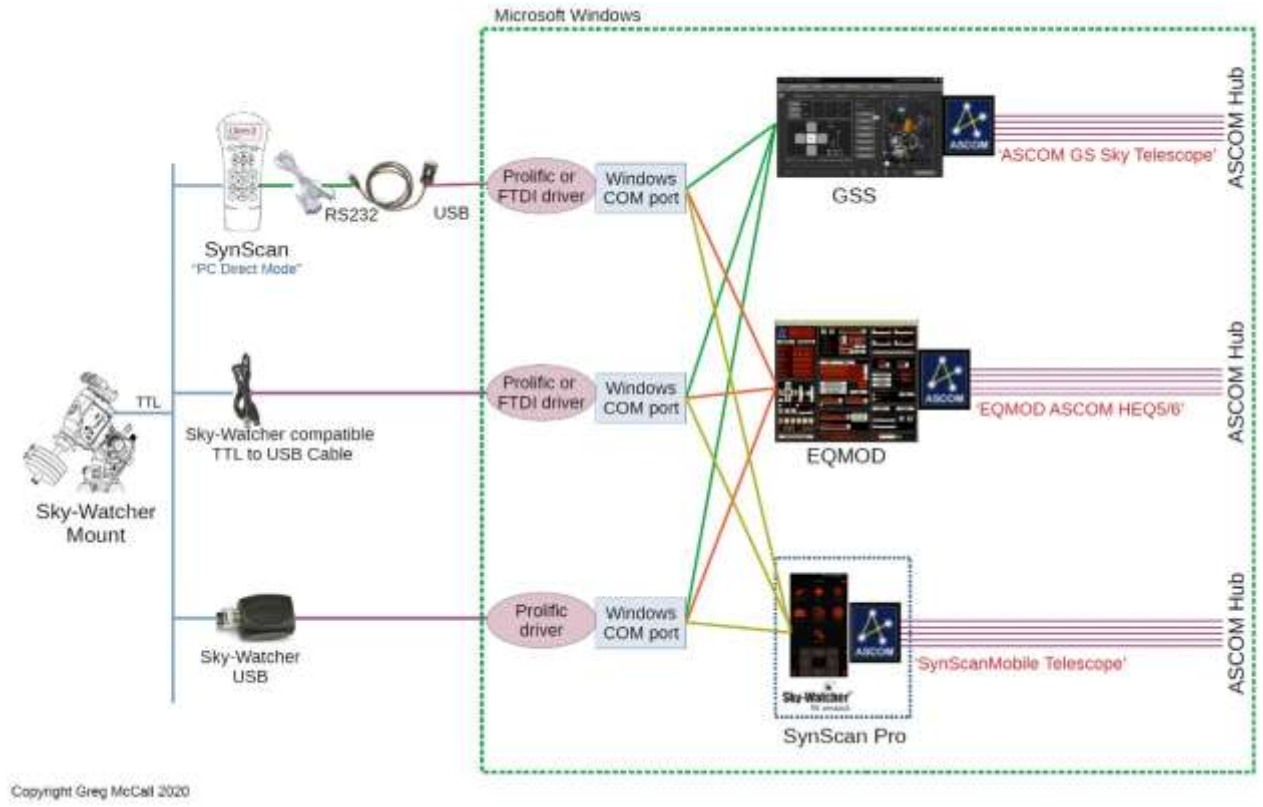
The problem with this connector is that it is not usable directly by connecting it to the serial port of a computer - it is even something to avoid under penalty of damage on the mount - because it uses a command syntax specific to Synta, and above all it is not a serial port to the RS232 standard but a TTL port that works with 3.3 or 5 V logical voltages directly usable by the mount microprocessor, and much lower than those of an RS232 port. It is also less robust and more sensitive to interference, which is why the connection cable supplied with the racquet is equipped with ferrite filters and its length is limited.

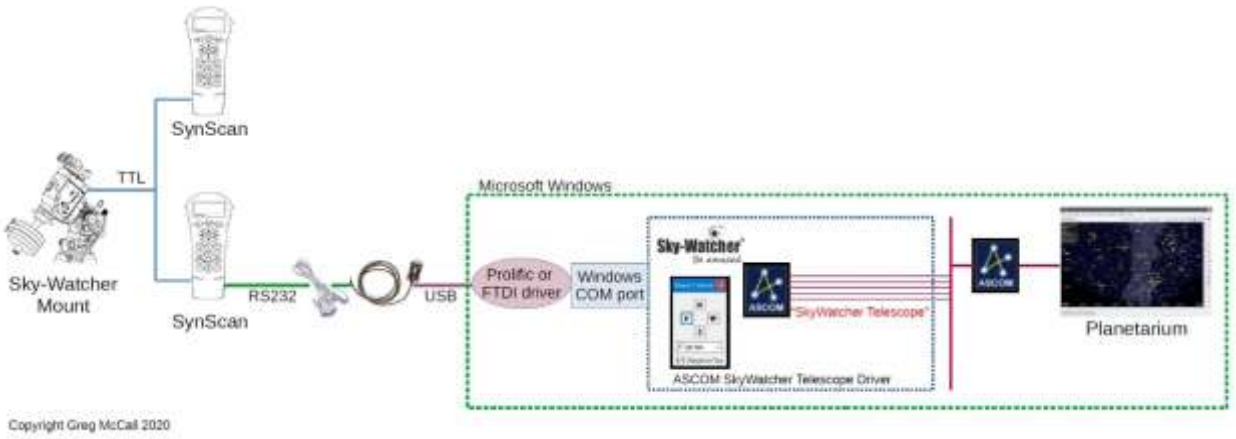
In short, if you want to use something other than the racquet, you need a physical interface: a special RS232 cable to TTL, or a small dedicated module that generates a WI-FI access point to TTL, to be connected instead of the racquet (it is also possible to keep the racket, which is equipped with a real RS232 or USB port from the V4, and to use it as a physical interface using the «PC Direct» mode, but it is unanimously not recommended because apparently it does not work very well), and a logical interface: the Synscan Pro application, or an EqMod or GSS alternative. The role of the logical interface application is to convert ASCOM external controls, one of the standardized protocols in astronomy to make «talk» between them equipment of all kinds (frames, focusers, cupolas, filter wheels, etc.) Controls can be operated by the mount via its TTL "racket" port.

This software is only able to move the mount and interpret the ASCOM commands: if you want to make «go to» without racket, you must use an additional «planetarium» type software which integrates an ASCOM client compatible with Synscan Pro or one of its alternatives. This is where Carte du Ciel, C2A, Stellarium, SkySafari etc...

Here are the different possible configurations:







These illustrations come from an English site that explains all this very clearly:

[Sky-Watcher_Mount_connection_options (astrophotosite.com)]

Robert WI-FI module is integrated into the frame since Skywatcher applied this excellent idea on its latest products, but the general principle remains the same.

The software interface (Synscan Pro, etc.) and the planetarium software can run on different machines or on the same machine (PC, smartphone, tablet, etc.).

In the case of different machines, it is necessary that both communicate in IP via Wi-Fi or a network link by cable, correctly configuring the access points and IP addresses and choosing the configuration of the planetarium that is compatible with Synscan (=the correct version of the ASCOM client), as explained very clearly above in this document with Stellarium.

If both applications run on the same PC or smartphone (or Mac, or iPhone, etc.), they must speak to each other via a special IP address standardized as being an internal address to a machine (= "internal loopback"): 127.0.0.1

I have an observatory away from my house, so I have chosen Synscan Pro and SkySafari. In my small observatory I wanted to limit as much as possible the use of a PC, fragile element and especially energy-consuming, this last point is particularly critical in my case since my observatory operates exclusively on a battery charged by a solar panel.

In the observatory I use a small and cheap Android tablet and a small router, both only dedicated to this use and powered autonomously by their battery with a capacity much higher than a full night. In nomadic mode it is my smartphone that does the trick. Obviously, the PC becomes essential once I have to use the camera for example!

9. Conclusion :

Once the telescope connected to Synscan and any compliant planetarium, the possibilities are infinite.

- You can point to any object
- You can download the different databases you need: Asteroids, Comets, more Star Databases (See the planetarium guide to learn how to do it).
- You can reverse the sky view to match what you see in the eyepeace
- You can prepare at home a list of the objects you want to observe or follow so that you do not need to search during the night
- And many more

I hope this document will help.

Great job developers, many thank's for that work you are sharing !