

Connecting the FS2 System to the PC

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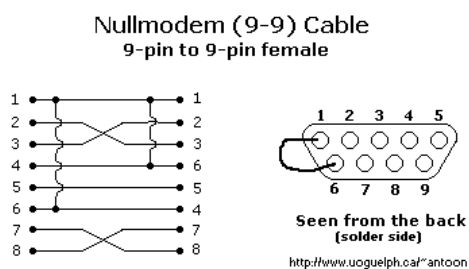
Abstract

The FS2 active pointing & tracking system that now pilots the main telescope in the GAS observatory has solved a large amount of problems risen as the old pointing routine, usually done by eye, was difficult and sometimes quite annoying as the light-polluted sky does not allow us to distinguish faint objects even through a finder. After having used the wire-remote command control for a while we decided to pilot the telescope through a PC, this largely simplifies the pointing routine and gives a support for our explaining it to the public. The FS2-PC connection required some modifications on the hardware, this paper illustrates both this changes and the use of the PC for the pointing & tracking routine.

The GAS observatory main telescope is provided with a 130 mm diameter achromatic refracting telescope and a 130 mm diameter Newtonian reflecting telescope, both with a focal of $f = 1700$ mm, mounted on a common fork structure. Until few years ago, the celestial objects searching was done by eye through the finder, the only aid was the object tracking by a rpm-adjustable RA movement. The electric parts and components were dated 1974, year of the opening of the structure. From this the decision to improve the system installing an FS2 active pointing & tracking system, purchased from *Astrotech* (www.astrotech.it). The old DC current AR motor was replaced with a new stepper one, and all the obsolete electronic part eliminated, with the installation of a new stepper motor on DEC and a new DEC transmission gear provided

by *Franco Bellincioni* (www.bellincioni.it). After a few tests using the wire-remote controls, the decision of connecting the FS2 system to a PC in order to control the telescope through a planetarium software. The system used was an old computer, with the *Microsoft*[®] *Windows 98* OS, *Sky Charts* software (also known as *Carts du Ciel*) and many others software in order to control the *Starlight*[®] *MX-7C* CCD camera too.

The FS2 system can be piloted by PC through a RS232 (serial) female port present on the power supply box, like the one usually found on a PC motherboard. As the port located on the PC motherboard is a female one too, a so-called 'null-modem' cable is needed, which has a male RS232 connector on both sides. The scheme of such a kind of cable is showed in Figure1. Sometimes the pins

**Signal Description**

1 Carrier Detect	5 System Ground
2 Receive Data	6 Data Set Ready
3 Transmit Data	7 Request to Send
4 Data Terminal Ready	8 Clear to Send

Pins 6 & 1 are wired together to simulate 'on-line' status. This Nullmodem configuration is also for gameply like Westwood's Command & Conquerer "Tiberian Sun".

Figure 1: Null-modem 9-9 scheme

order is flipped horizontally, so the numbers printed on the port should be checked accurately with the aid of a tester. After having connected the FS2 system to the PC, the Sky Charts software was not able to detect it, even changing the serial port settings in the configuration window of the software.

After posting a question on forum.astrofili.org, the pin order of one of the two connectors of the null-modem cable were changed, in particular pins 2 and 3 were exchanged (the ones for the transmission and the reception of the data). This change was implemented by cutting one of the two connector and testing the continuity of each wire inside the cable with the pins of the remaining connector. One should found a wires scheme like the one shown in Figure1. After purchasing a new female connector (available in a common electronic components shop) the wires of the cable must be knit with the same order of the remaining connector, obtaining the scheme showed in Figure2. Beyond these wires also the shield and not covered wire must be knit to the metal of the new connector. After having knit the new connector, the system is ready to be connected to the FS2 and to be tested.

Always using the LX200 protocol, open the telescope control panel in *Sky Charts* software and, after having pointed and centered an object manually with the FS2 system command device (*RefObj*

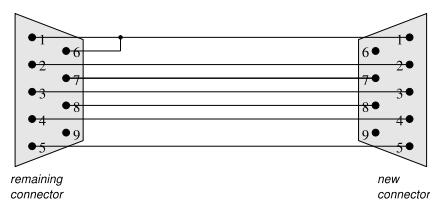


Figure 2: New connection

function), switch the **CONNECT** button on the panel and the green light will confirm the connection. Thus try to switch the four cardinal point buttons, one will see the telescope moving on both axis.

Different moving speeds and options can be tested, each useful for different duties. For example:

- **Slew:** to move the telescope with the four buttons described above.
- **Find:** to select an object on the map and point it directly.
- **Centering:** to center the object in the ocular field of view.
- **Guide:** to track an object precisely.

Every time the system has to be switched off, it is better first to push the **DISCONNECT** button on the control panel of the telescope in *Sky Chart*, then to switch off the FS2 system and at last the PC. Not doing so a potential damage in the FS2 system may occur.

References

- [1] *FS2 System Manual*