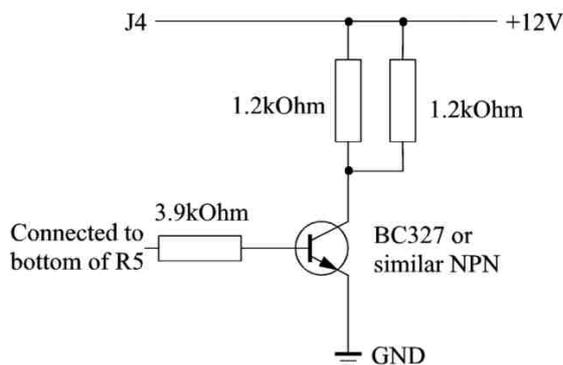


Heating of the hand-controller of the NexStar N5i/N8i/N8GPS/N11GPS

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It is entirely possible that Celestron will change circuitry inside the hand control at any time. If your hand control appears different in anyway from the pictures in these instructions, do not proceed unless you have the proper background in electronics.

All NexStar models suffer from problems using the hand-controller at low temperatures. Different solutions have been discussed in the NexStar Yahoo Group, one of them is heating of the hand-controller display internally. The following pictures show how to modify the hand-controller to heat it with approx. 240mW. The same power was formerly also used in the hand-controller of a NexStar N5 and has proved to be sufficient.



We use 3 resistors (3.9kOhm, 1.2kOhm, 1.2kOhm) and a BC327 or similar Silicon-NPN transistor. The transistor is used in a common emitter circuit with the 3.9kOhm resistor in front of its base and the two 1.2kOhm resistors connected in parallel forming the load between the collector of the NPN transistor and the 12 Volt supply. The dissipated power in those 2 resistors provides the heat for the display. The transistor is switched on and off by the same signal used to switch the backlight of the display on and off. This signal can be tapped at the existing 1kOhm resistor R5. Thus the heating can be switched on and off using the software of the hand controller (together with the light of the display).



Hand-controller front side still closed



Hand controller rear side, the 6 screws like the one in the upper left corner have to be removed to open the hand-controller



Hand-controller opened and back removed. Now the PCB can be taken out of the housing without having to remove any other screws. However, to split the PCB from the display the connector of the flex-cable has to be opened and the flex-cable pulled out. Furthermore the clamp for the fibres has to be pulled off the LED. These fibres guide the light from the LED to the back of the LCD-display.



PCB taken out, component side up



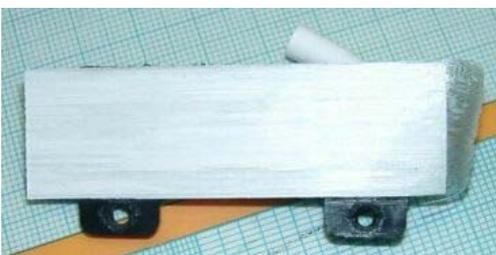
PCB taken out, keypad side up



The display is still in the hand-controller, the flex-cable is pulled out of its connector and the clamp for the backlight optical fibre cable is pulled off the LED (marked by the 2 arrows). Next the 2 screws fixing the black plastic holder for the display have to be removed.



Here the black plastic holder with the backlight optical fibre cable is removed. The small black rectangle marked with the arrow is a chip-on-glass display controller.

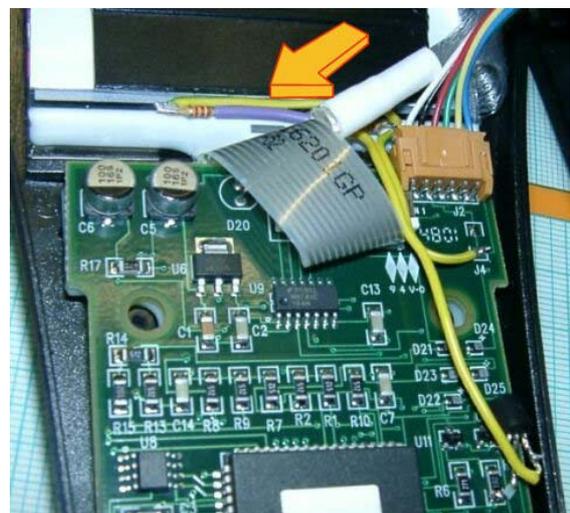


This is the front side of the plastic holder showing the backlight optical fibre cable guiding the light from the LED on the PCB to the LCD-display

Now the modification to the electronic of the PCB can be done and the 2 resistors can be glued on the backside of the LCD-display (close to the display controller).



The 3.9kOhm SMD-resistor (marked with the arrow) is soldered to the lower pad of the 1kOhm resistor R5. The other side of the 3.9kOhm resistor is soldered to the base pin of the NPN transistor. The emitter of the NPN is soldered to ground, which is the lower right pin of transistor U10. Finally a wire (here yellow) is soldered to the collector of the NPN transistor. This wire goes to the resistors on the backside of the display. Another wire is soldered to the pads J4 which is the +12V supply of the hand-controller. Also this wire goes to the resistors at the back of the display.



The wires of the 2 resistors are isolated (purple insulation) to avoid a short circuit with the display controller.



The resistors have been glued to the back of the display using “superglue” (Cyanacrylat) and then the display and its holder have been reassembled. Also the connections of the flex-board and the optical fibre cable are reassembled.



Modified hand-controller before back part of the casing is reattached

It is entirely possible that Celestron will change circuitry inside the hand control at any time. If your hand control appears different in any way from the pictures in these instructions, do not proceed unless you have the proper background in electronics. I cannot give any guarantee for the modifications nor held responsible for any damage.

Further modifications including a simpler design with permanent heating using only two 2 resistors can be found on my webpage <http://www.dd1us.de>

Many thanks to Mike Swanson, Dan Hupp and Frank Dilatush for reviewing these instructions and giving me helpful hints for improvements.

Questions and comments are always welcome. Please send them to dd1us@amsat.org.

Kind regards

Matthias