

## CELESTRON GT HAND-CONTROLLER INFORMATION

Here are some information on the internals of the GT hand-controller which was shipped together with my NexStar114GT:

It is powered from the base unit in the telescope and receives from there +12V. In the GT controller a voltage regulator stabilizes the used voltage to +5V.

The 6 pin cable to the base unit has the same colour coding as the HC hand-controller:

1 white	ground
2 black	data input from base unit to PIC17C752
3 blue	ground
4 green	data output from PIC17C752 to base unit
5 yellow	ground
6 red	+12V (supply voltage from base unit to GT hand-controller)

The multilayer PCB has the following identifiers:  
CEL NH0010A, ED V4270, C4256108 and CTIHC Rev. G, 94V0

Beside the voltage regulator IC there are 8 other ICs inside:

2x 74HC373D  
1x DS275  
1x 24LC64  
1x 74HC164D  
1x PIC 17C752-16/L  
2x AT27C010 (90JI)

### 74HC373D

Octal 3-State Non-Inverting Transparent Latch The device inputs are compatible with standard CMOS outputs. These latches appear transparent to data (i.e., the outputs change asynchronously) when Latch Enable is high. When Latch Enable goes low, data meeting the setup and hold time becomes latched. The Output Enable input does not affect the state of the latches, but when Output Enable is high, all device outputs are forced to the high-impedance state. Thus, data may be latched even when the outputs are not enabled. It is in a 20 pin SOIC package.

### 74HC164D

The MC74HC164 is an 8bit, serial input to parallel output shift register. Two serial data inputs, A1 and A2, are provided so that one input may be used as a data enable. Data is entered on each rising edge of the clock. The active low asynchronous Reset overrides the Clock and Serial Data inputs. Operating Voltage Range: 2 to 6 V. Low input current of only 1uA. It is in a 14 pin SOIC package.

### DS275S

DS275 is a RS232 transceiver chip from Dallas Semiconductors (see further details in the file "what's inside the HC hand-controller). It is in an 9 pin SOIC package.

### 24LC64

This IC from Microchip is housed in an 8pin SOIC package. It is a 8K x 8 (64K bit) Serial Electrically Erasable PROM (serial EEPROM). It has a 2-wire serial interface bus which is I2C compatible. Functional address lines allow up to eight devices on the same bus, for up to 512 KBit address space. The guaranteed data retention is more than 200 years (this should be enough for even the longest star parties).

### PIC 17C752-16/L

PIC17C752 is a high-performance 8-bit CMOS EPROM microcontroller with 10-bit A/D. It contains 8Kx16 (words) of program memory and 678x8 (bytes) of data memory. It includes Brown-Out-Reset (BOR), Power-On-Reset (POR), multiple timer/counters, PWM outputs and 3 serial ports. The synchronous Serial Port can be configured as either a 3-wire Serial Peripheral Interface (SPI(tm)) or the 2-wire Inter-Integrated Circuit (I2C) bus. This device also features 2 Universal Synchronous Asynchronous Receiver Transmitter (USART) which are also known as a Serial Communications Interface (SCI). It has 50 I/O pins with 25mA source/sink

per I/O. Many of them are used to control the 19 LEDs of the GT controller and as inputs from the 19 keys (buttons) of the GT hand-controller. The PIC17C752-16L is in a 68pin PLCC package and soldered directly to the PCB. A crystal of 16MHZ is used to generate the clock for this microcontroller (The extension (-16/L) specifies the microcontroller to run up to 16 MHz and in the temperature range 0°C...70°C). Maybe the industrial version would help to reduce the problems at low temperature !? However most likely the display is limiting the speed.

My microcontroller has a label: CELP003, 08/28/2000.

AT27C010 (90JI)

The ATMEL AT27C010(L) is a low-power, high-performance 1,048,576-bit one-time programmable read only memory (OTP EPROM) organized as 128K by 8 bits. They require only one 5V power supply in normal read mode operation. Any byte can be accessed in less than 90 ns (extension 90), eliminating the need for speed reducing WAIT states on high-performance microprocessor systems. The extension JI means it is suited for the industrial temperature range (-40°C...+85°C).

The 2 EPROMs are not soldered to the PCB but are in removable sockets.

The 2 labels say: CELP001, 08 31 00, CTIHC01L, C7WZ and CELP002, 09/11/00, CTIHC01H, C7YP

The RS232 input and output signals (from and to the PC) are provided by the GT hand-controller and not directly by the base unit. Between the PIC17C752 and the RS232 jack the signal is routed through the IC DS275, which acts as a level converter (TTL/CMOS to RS232 and reverse).

No warranty that these data are complete / correct. Please take care when experimenting with the hardware.

Any questions and comments are appreciated.

Kind regards

Matthias

Email: [DD1US@AMSAT.ORG](mailto:DD1US@AMSAT.ORG)

Homepage: <http://www.dd1us.de>