

Object: **SW OF SENSOR and ENCODER FOR ASTRONOMICAL TELESCOPE**  
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Name: **SW PROJECT OF SENSOR - ENCODER FOR ASTRONOMICAL TELESCOPE**

## 1. SOFTWARE SENSOR MODULE TELESCOPE

The tenet listed in introduction of those WEB pages oblige the authors to publish mature programmes not only in HEX code, but we introduce it also in comment source code:

- 1.1. Programme **SNIMAC** of sensor - in source code for MCU **AT90S1200** (after request)
- 1.2. Programme **SNIMAC** of sensor - in HEX code for MCU **AT90S1200**
- 1.3. Programme **CITAC** of encoder - in source code for MCU **AT89C2051** (after request)
- 1.4. Programme **CITAC** of encoder - in HEX code for MCU **AT89C2051**

The programmes named above are freely dilated and they are identified for amateurish utilize.

Contingent commercial and industrial utilize must be certified by previous agreement of the author of the programme by convention.

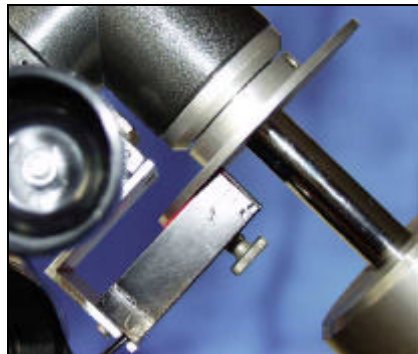
Pertinent changes in programme must be consulted with the author, who arranges in the event of their justification the edition and publication of the new version.

### 1.5. PLACING IRC AND IRC-M

The public made programmes are corresponding the placing of IRC resp. IRC-M in face of axes of the telescope according to following photographs



**Fig.1.a.** (jpg) on the left: IRC rotary



**Fig.1.b** (jpg) on the right: IRC-M linear

For DOWNLOAD it is ready version: CITAC-26 and SNIM-31 of programmes for IRC and IRC-M idem.

In case of interests and needs we public other preparing and commented versions in source code that is solving f.ex. cases of mechanical transmission between axes of the telescope and the sensor.

## 2. DOWNLOAD

The parcel of programmes under the name [irc-sw-web.zip](#) includes programmes:

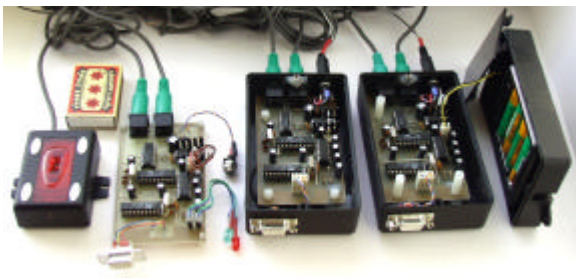
[CITAC-26.hex](#) for MCU AT89C2051

[SNIM-31.hex](#) for MCU AT90S1200 – for the mechanical transmission 1:1 of the shaft

Electrical diagram (168 kB pcx) of the sensor module telescope under the name NAVIGATOR-1 is published together with specification card of used parts and a drawing unilateral printed circuit in document NAVIGATOR-1.doc

## 3. REALIZATION - DIAGRAM - PRINTED CIRCUIT

The module sensor of the astronomical telescope was realized like pilot under the name NAVIGATOR-1:



**Fig. 2.** (jpg) Encoder **NAVIGATOR-1**

The criteria of simplicity, easy construction, availability of parts and small financial heftiness were thoroughly applied.

### 3.1. SCHEMATIC DIAGRAM of module NAVIGATOR-1

Document **NAVIGATOR-1.doc** (1,3 MB) includes:

- [SCHEMATIC DIAGRAM](#) of module NAVIGATOR-1,
- [SCHEDULE OF PARTS](#) including prices,
- DRAWING of PC for unilateral printed circuit NAVIGATOR-1,
- description of sensor incremental optical IRC-M from mouse PC, with a view to make up for sensor incremental mechanical rotating IRC,
- rich picture documentation ..

### 3.2 TESTS A RESULTS ACHIEVED by TESTING the PROTOTYPE

Modulus NAVIGATOR-1 wiht encoder Ra and Dec / IRC, IRC-M was tested in three programmatic configuration:

- INSTRUCTION of [PROTOCOL OURANOS](#) engaged over communication terminal PC (COMit, TELIX ..)
- by the programm [OURANOS UTILITY](#) v 1.3.5 was certified the mail functionality of the modulus and IRC
- In software [SKY CHARTS](#) version 2.71 were fulfilled working tests.

In all cases modulus NAVIGATOR-1 obliged the supposed requirements and worked without defects. It is however very difficult to tempt the kvantification of achieved results, because they depend on many adjacent technical circumstances.

Detachedly in laboratory conditions was timed and it is possible to bring in parameter of reading speed pulse from IRC, which is up to > 50 kHz (in certain circumstances till 90 kHz).

This value allows us use IRC with more than 20000 guideline /speed without safe losses at sudden changes of telescope position.

We did not mention any slippage in funds coordinate axes RA and Dec neither in environment SkyCharts v. 2.71, nor at reading graduation sensor in SW OURANOS.

#### **4. LIST OF ABBREVIATIONS**

IRC	-	Incremental rotary sensor
IRC-M	-	Incremental linear sensor extracted from optical mice for PC
RS	-	electronic control system
SW	-	software, (solving ... )
HW	-	peripheral equipment, (solving ... )

**RETURN**