

**WEB browsing, data file access and full remote
control over the LabView program reading the old
H-maser operating parameters**

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Abstract

Integrating old hardware into new data acquisition software is very often difficult for the presence of non-standard interfaces and awkward in retrieving the past documentation.

EFOS4 and EFOS5, the almost 20 years old H-masers, used in our VLBI stations of Medicina and Noto as atomic frequency references, were not designed for any interface with the outside world.

In 1989 we designed a dedicated interface [1] utilizing a MAT card (the standard Serial to Parallel circuit that controls all the MarkIII-IV modules). This was suitable for being called from the RS-232 serial port of an APPLEII computer, located locally or remotely, via Modem and telephone lines.

A failure in the Apple and the need to get the result data in a machine readable format on the local network has triggered the decision to use a new PC and then to write new software for this task.

This report describes the LabView programs that can read the 32 operating parameters of the H-maser and save the results, on a daily basis, in a read-only file, shared with the outside.

The front panel of the master program “Hmaser.vi”, can be accessed by any web browser (only IE allows the automatic update of the display), then from any location worldwide.

We have taken also this occasion to test almost all the remote control possibilities offered by LabView to run, abort and modify the code from another PC, located anywhere.

In the actual case, the PC physically interfaced to the H-Maser is at the VLBI station in Medicina, while the controlling PC is within the Institute headquarters in downtown Bologna. Real time parameters, like the Starting Time, that sets the start of the query to the H-Maser, can be uploaded in real time both locally and remotely. The permission to modify the program is limited to a known list of remote users.

Description

The limited interest of this task does not justify a detailed description of this project. We report here only the main diagram of the hardware, the hard copy of the front panels and of the diagrams (Graphic software codes) of the programs that make possible all that.

We will be pleased to give all details to the interested people via phone or E-mail (ambrosini@ira.bo.cnr.it).

Figure 1 reports the special electronics designed to interface the Data and Clock lines (top right), that drive the display unit of the H-maser to the MAT (bottom right). It is made of the following modules: Serial to Parallel conversion, channel selection, high and low limits for the alarm, various

LED displays and the selection of the RS-232 control lines (Modem or PC). Of course this last feature is superseded by the network capability of the PC now connected to the local Intranet.

The following pages show the front panel and the diagrams of the main reading program *Hmaser.vi*, running in the PC at the VLBI station.

The panel updates every second the *Current Time* as read from the internal clock. By the way, because that PC runs also TCA32plus, locked to the GPS time, it is also guaranteed its synchronization.

The *Start Time* instead displays the time when the next reading of the H-maser will be performed.

This quantity can either be set locally or remotely by a remote program like “*HmaserSetStartTime.vi*”, via a DataSocket connection. This means that the programmed reading is made every day at that time. The results are stored in the file location reported at the bottom of the panel.

This feature has been very useful during the development stage of the code (most of it done remotely) and as a real time diagnosis tool, in case of a failure of the H-maser. We recommend to strictly follow the string data format: HH MM SS <Enter> (from the numeric keyboard). Any difference will give a “False” result in the test for the Start Time and then the H-maser query will not be performed.

Remember also that for the 20 seconds of the H-maser reading, the current time display is not updated. If this happens, you can be sure that the program is working correctly and a new reading is underway.

Only the local operator can see the two top data indicators of the front panel, while the 32 channels are scanned: they are not visible on the web.

In the first sequence frame (0) of *Hmaser.vi*, a while loop looks for a match between the current and start time, in the second frame (1) the serial interface of the PC is opened and configured, then the MAT is synchronized.

From the third frame (2) to the fifth (4) and their subframes, the MAT protocol is followed. This is cumbersome and is not described here. It may sufficient to remind few rules. It is compulsory to reset the “turn around timer” in order to allow some delay due to the very low speed of the old H-maser internal serial connection. For every operating parameter to be monitored, it is needed to select a channel, update the user lines, pass the control to the user and finally read the data.

The reason for having two scanning loops comes from the fact that channel 8 and 9, for every decade, has to be skipped away.

Finally the PC serial port is released in frame (5) and results saved on disk in (6). LabView offers also the possibility to FTP the file or to send E-mail attachments to a list of recipients (implemented later if really needed).

Find now all the diagrams (except False cases, for the sake of brevity) of *Hmaser.vi*, and “*HmaserSetStartTime.vi*”.

Connector Pane

Read
H-maser

Front Panel

Medicina VLBI station

H-Maser data of year and day <yyddd>

109	81	38	69
30	81	25	32
109	50	98	101
1	66	25	100
30	49	106	100
91	76	14	101
56	9	108	100
56	48	14	102

Current Time

Start Time

STOP

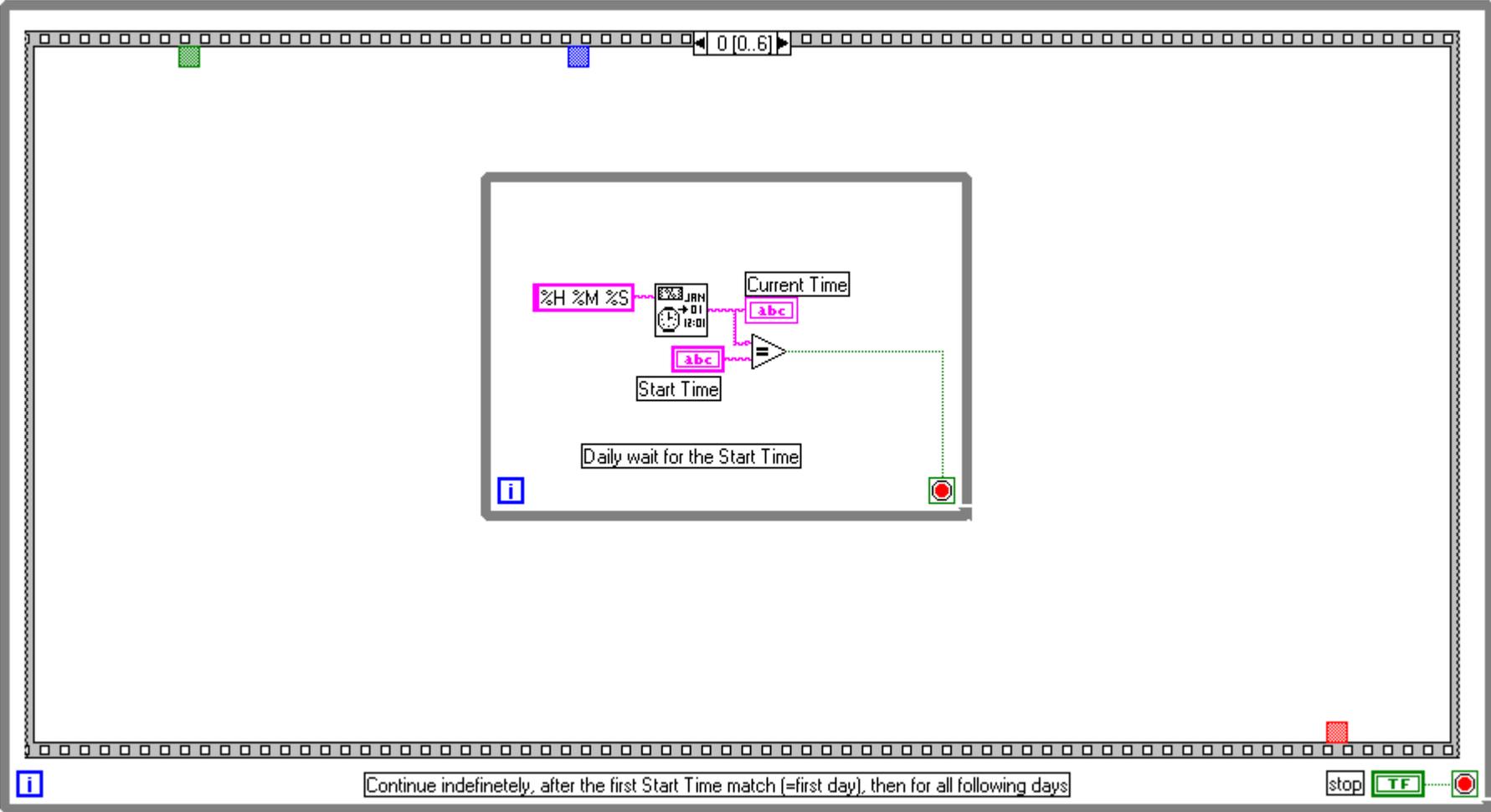
File saved in: D:\Hmaser\MEDmaser<yyddd>.txt

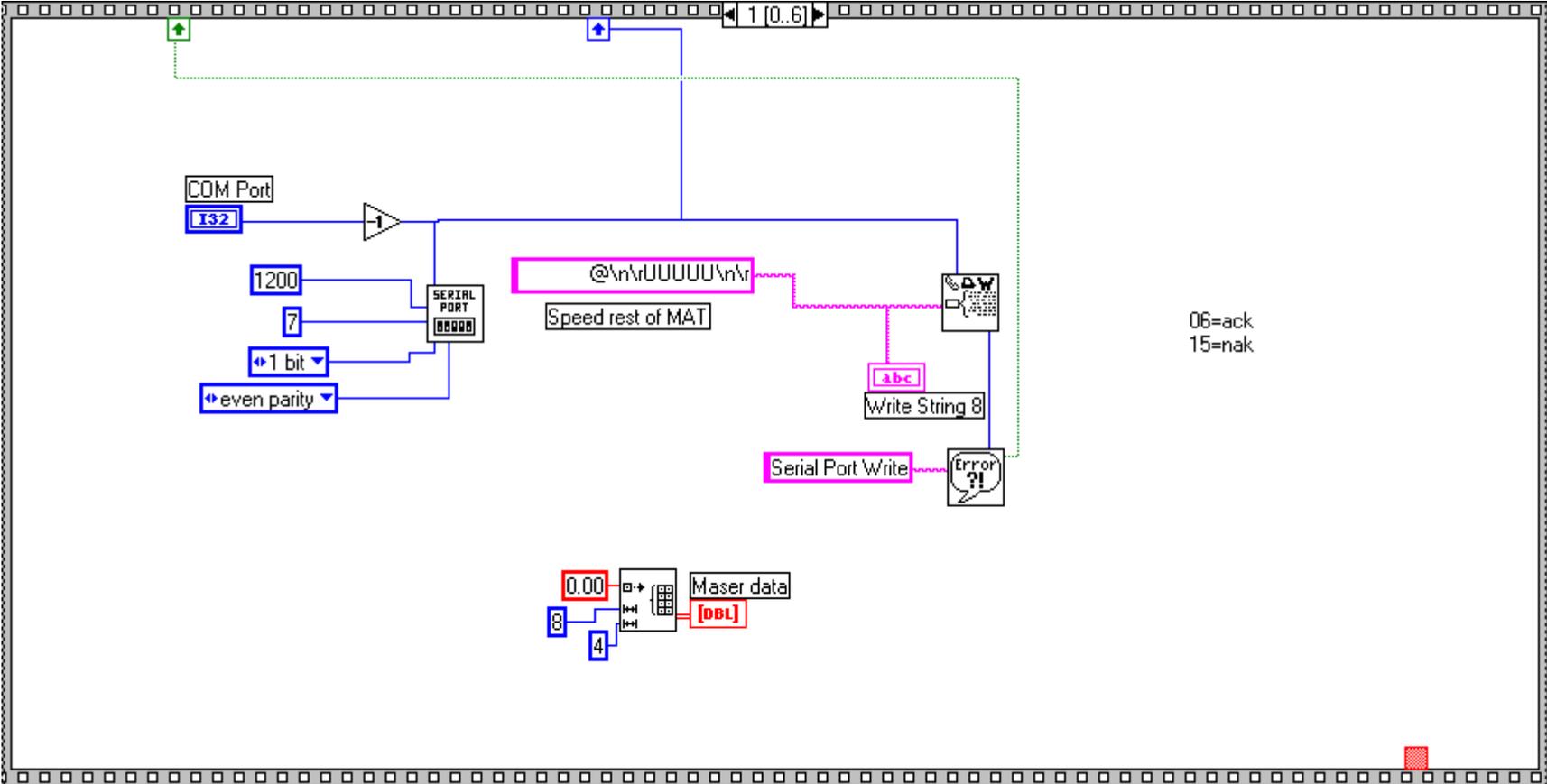
HMaser.vi

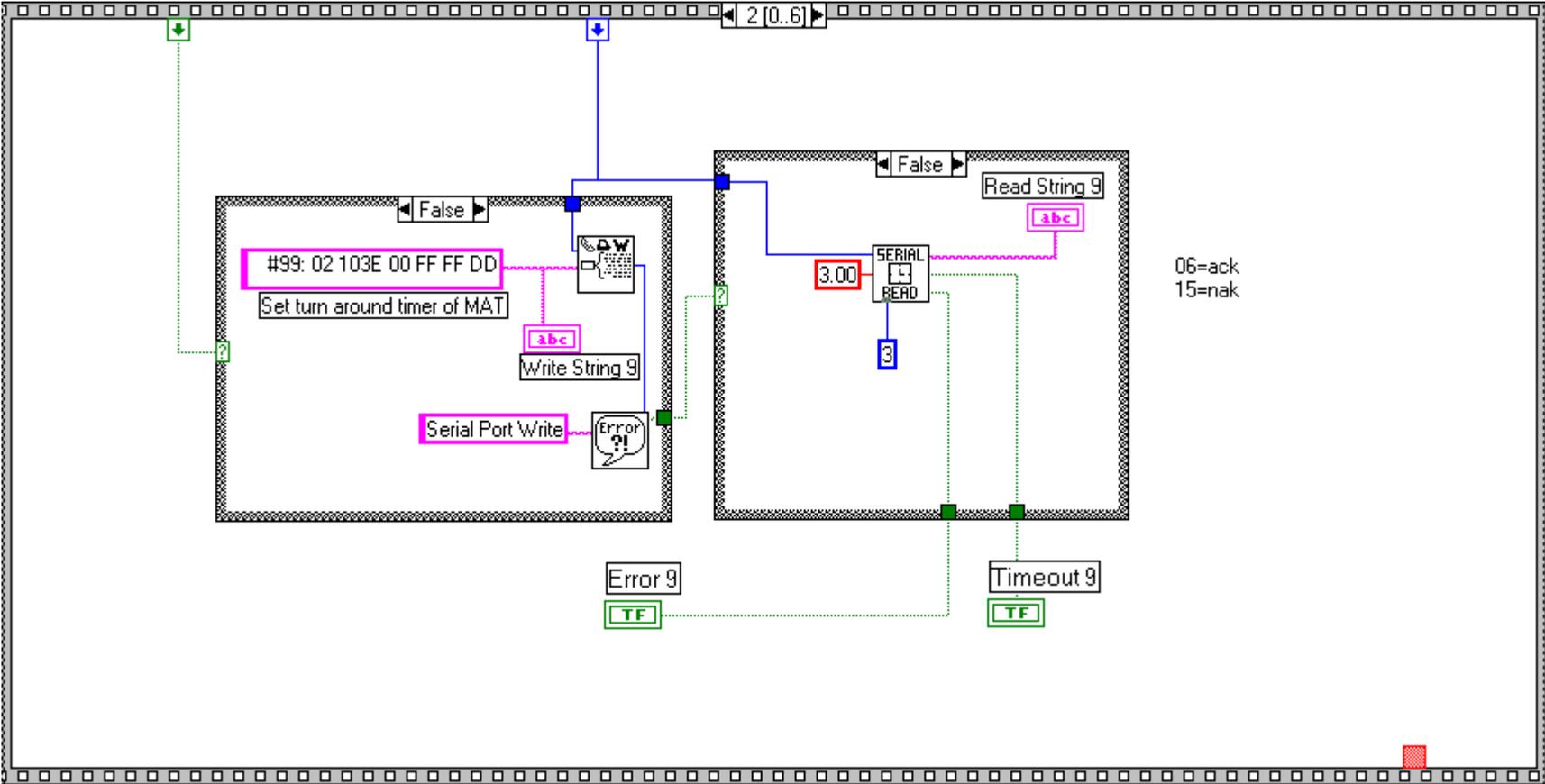
The 32 operating parameters of the H-maser atomic frequency standard are acquired every day, at Start Time.

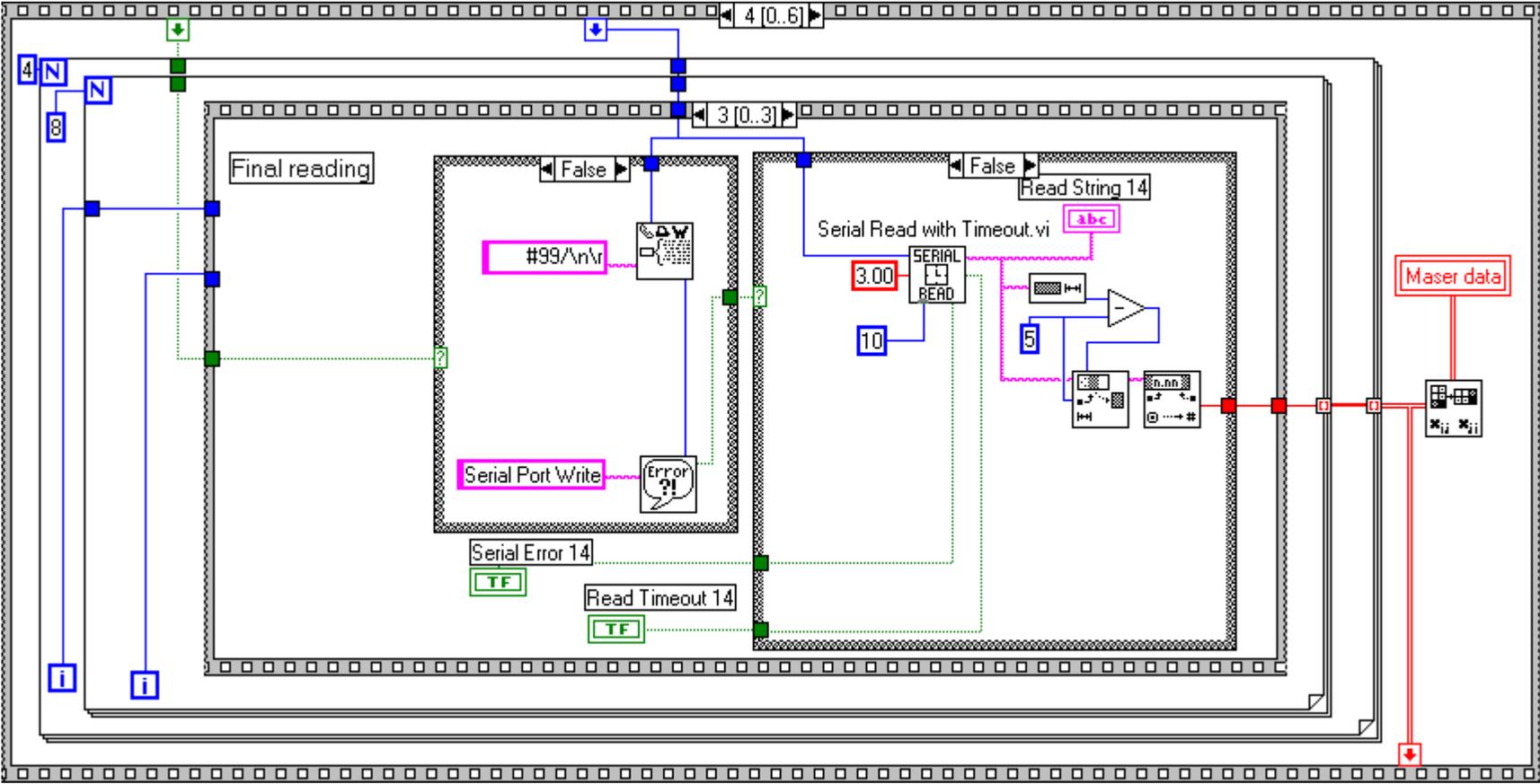
The Serial Communication VI performs bidirectional communication with a port. It initializes the port, writes a string to the port, and performs a read with timeout. The Read with Timeout VI will wait until the requested bytes are available or the time limit is up, whichever comes first.

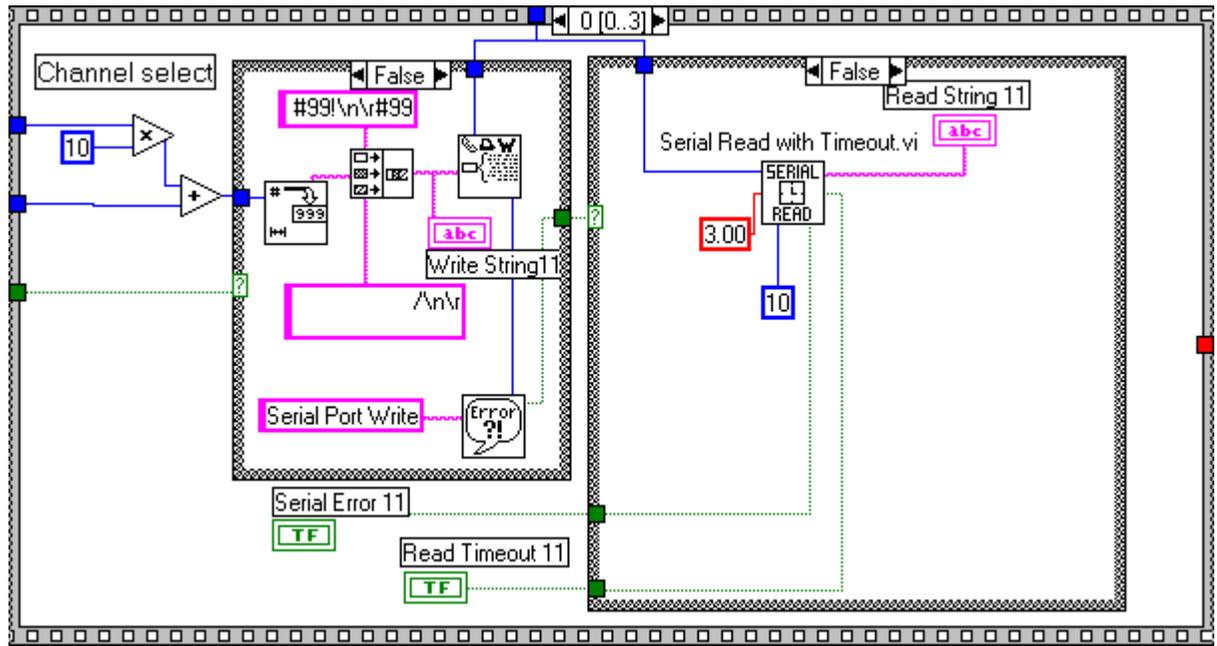
Block Diagram

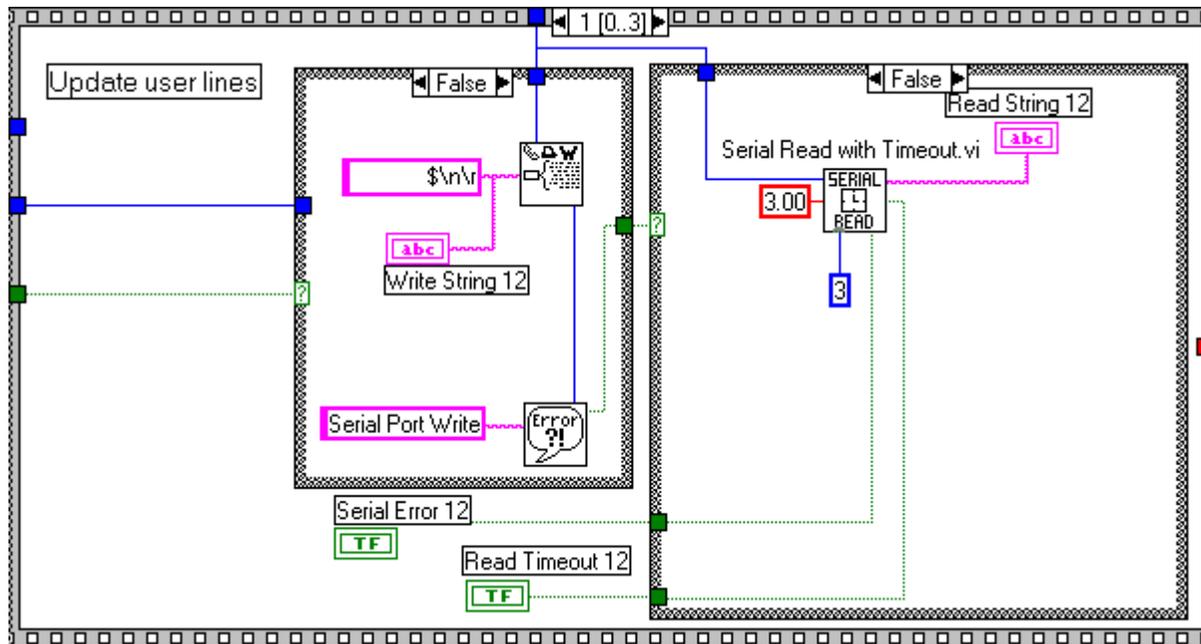


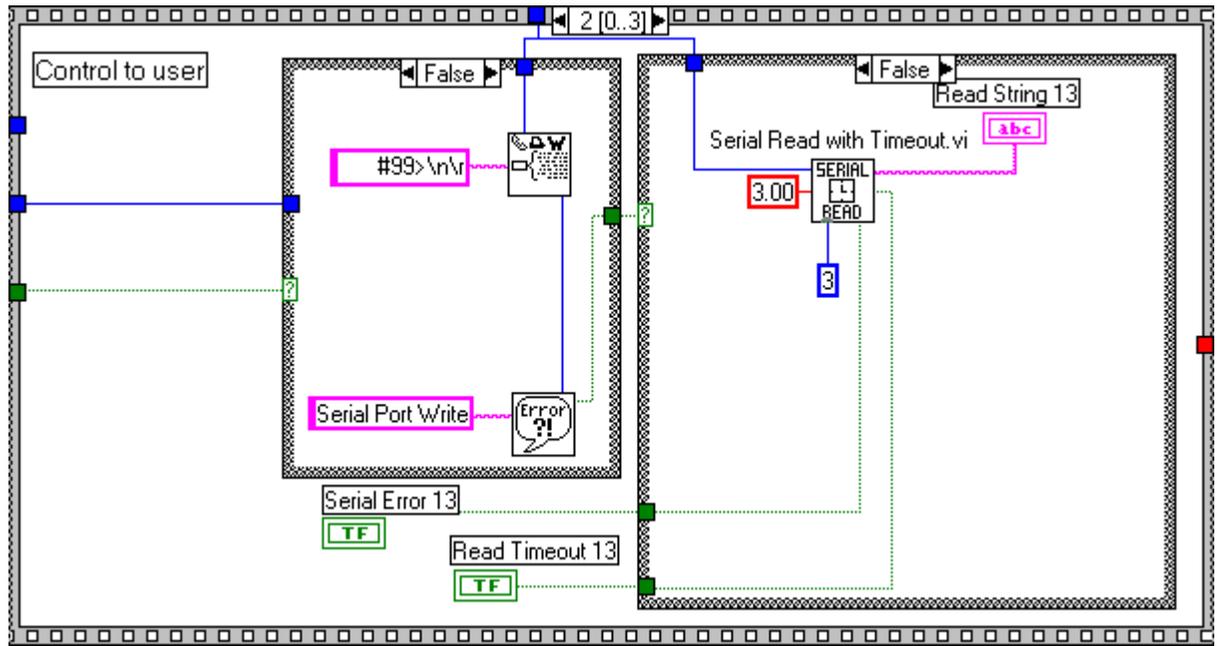


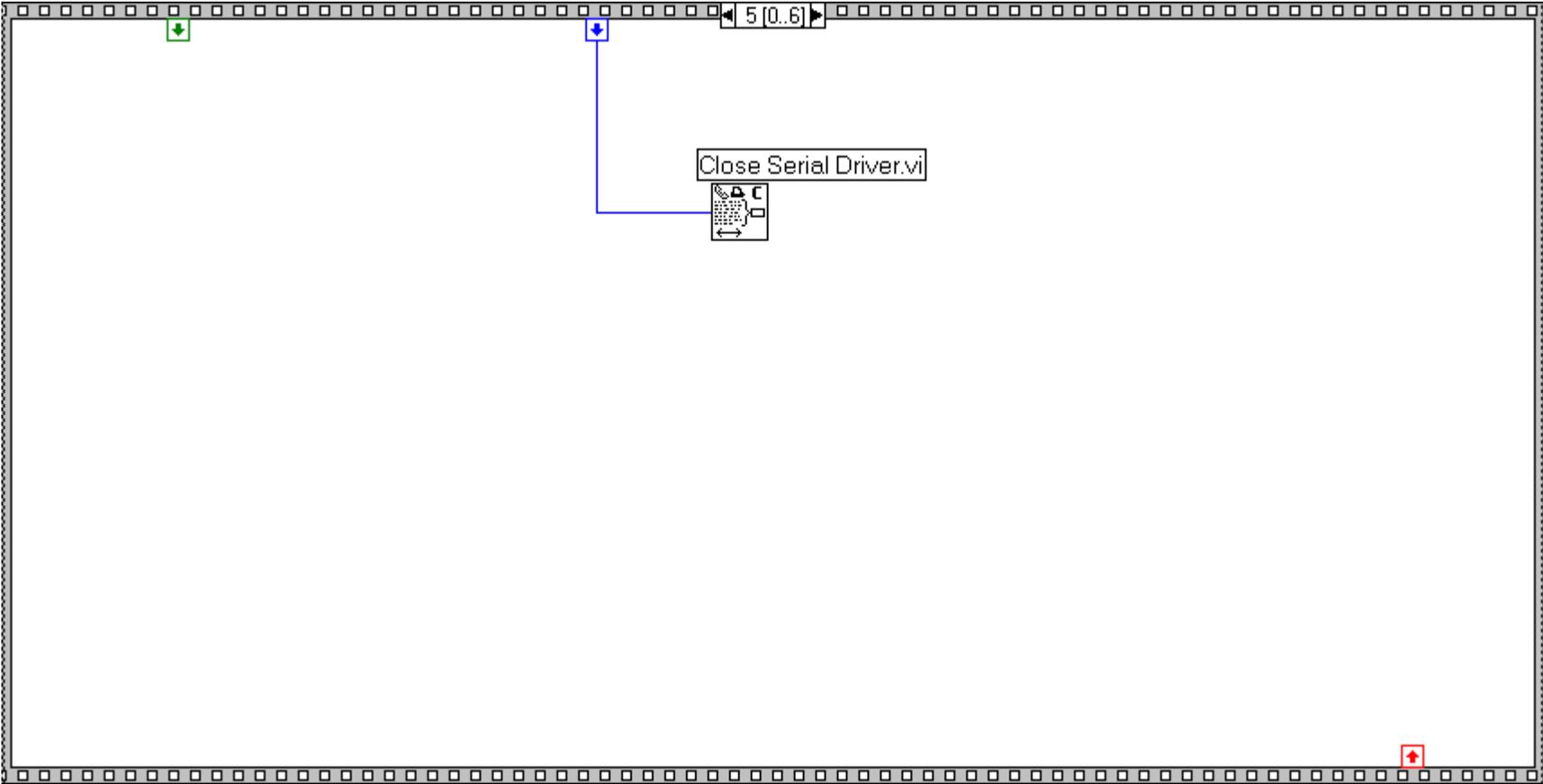


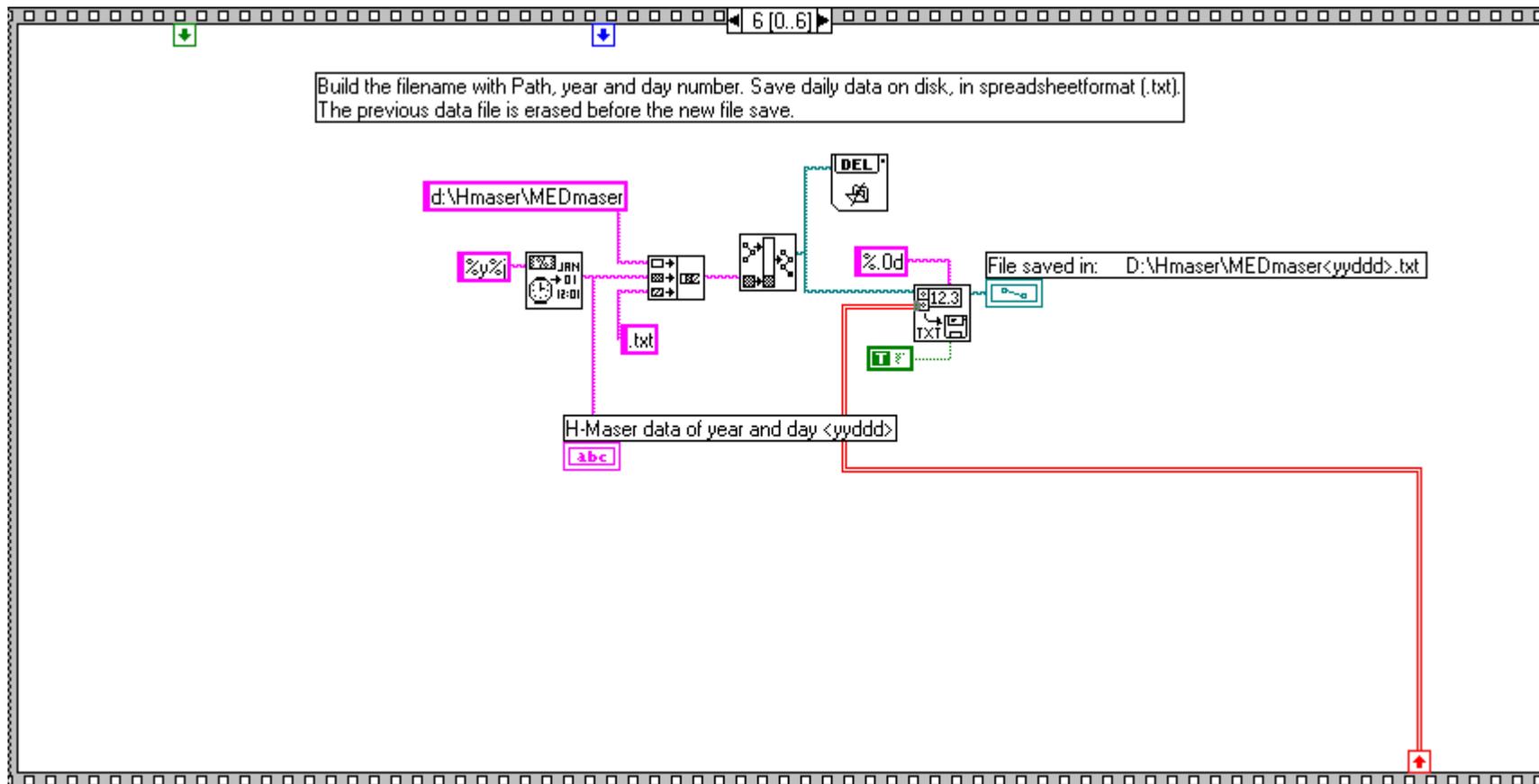






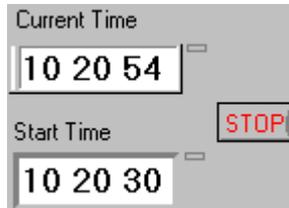




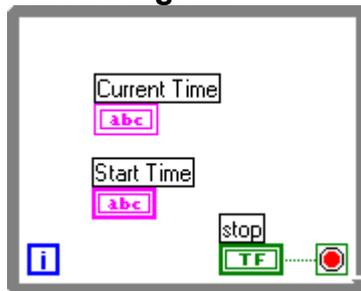


HMaserSetStartTime.vi

Front Panel



Block Diagram



Conclusions

The LabView environment is very powerful in particular here, where we want to deliver the operating parameters to different users like the VLBI operator, as a real time check, or the maintenance people for systematic controls.

The integration with the old hardware has been successful.

Now any upgrade seems much easier, like a cumulative check of all the operating parameters against a “confidence table” and then giving an OK, of the passed test. The possibility of sending daily E-mail messages will be used only if really needed.

The front panel is accessible via any web browser at the following addresses:

<http://labtf.ira.bo.cnr.it/.snap?hmaser.vi>

<http://labtf.ira.bo.cnr.it/.monitor?hmaser.vi>

the second automatically refresh the display, but it works only with Internet Explorer.

Important Note:

- strictly follow the String format of Start Time
- remember to activate the *DataSocket server*, in the appropriate machine, before launching these programs, if you want the full remote control.

References

- [1] R. Ambrosini, M. Roma, “Il sistema di controllo remoto della stazione T&F per uso VLBI”, Rapporto Interno IRA CNR, n. 120/89.