

# Mark 5 Newsletter

MIT Haystack Observatory

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Issue #2

The Mark 5 Newsletter is issued from time to time to keep users informed regarding features, plans, problems, solutions and workarounds. All back issues of the Mark 5 Newsletter are available at the Mark 5 web site at [www.haystack.edu/mark5](http://www.haystack.edu/mark5). We invite input from anyone on subjects we should discuss or questions that need answers; please send them to [mark5@haystack.mit.edu](mailto:mark5@haystack.mit.edu).

## Version identification of Mark 5A software, firmware and command set

The *'DTS-id?'* query returns the currently installed versions of Mark 5A firmware and hardware. A typical response to the *'DTS-id?'* query might be:

```
!DTS_id? 0 : Mark5A : 2003y183d10h : 1 : mark5-01 : 1 : 1 : 2.5x : 0xb8 : 0x19 ;
```

where (in order)

- '0' – response code (e.g. normal response)
- 'Mark5A' – identifies system type
- '2003y183d10h' – Mark5A software date code
- '1' – media type (1=disk)
- 'mark5-01' – system name or serial number
- '1' - #input ports (really applicable only to VSI-H system)
- '1' - #output ports (really applicable only to VSI-H system)
- '2.5x' – command-set revision level ('x' indicates that some as-yet-undocumented extensions to revision 2.5 are in this version)
- 0xb8 – revision level of Xilinx code installed in Input section of Mark 5A I/O board (corresponds to Xilinx configuration files ibaxb8.\* on Mark 5 web site)
- 0x19 – revision level of Xilinx code installed in Output section of Mark 5A I/O board (corresponds to Xilinx configuration files obax19.\* on Mark 5 web site)

The latest versions of Mark 5A software and firmware are always available on the 'downloads' page of the Mark 5 website.

## New feature – Start/stop disk playback at specified scan times

Mark 5A version 2.6 adds a new feature that allows playback from a recorded scan to start and stop at any specified times within the scan. The playback start and stop times (or playback duration) are specified by additional parameters in the *'scan\_set'* command and apply to the commands *'scan\_play'*, *'disk2net'* and *'disk2file'*. This capability is useful, for example, to select a small portion of a scan to be sent via e-VLBI for test correlation, or to start playback at the correlator at a particular scan time. See the *'Mark 5A command set'* document at the Mark 5 web site (<http://www.haystack.edu/mark5>) for details.

## More on Disk-Conditioning

The *'SSErase'* program has been enhanced for efficient standalone disk conditioning. Invoked by *'SSErase -c 1'*, up to two disk modules can be conditioned *simultaneously*. The utility requires only two passes through the target disks and operates much faster than using standard

Mark 5A commands. In addition, disk-performance statistics are collected during the conditioning process and printed at the end of each conditioning run. To make best use of the statistics, compare the statistics from the individual disks in the same pack to see if one (or more) stand out as poor performers.

The *SSErase* program has also been modified to check for write protection on a disk module (set by a *protect=on* command to *Mark5A*); if the module is write protected, user confirmation is required before *SSErase* will actually erase or condition the module.

### Monitor/control interface from Beppe Maccaferri

Beppe Maccaferri of Medicina has written a beautiful and useful Mark 5A monitor/control interface for the Mark 5A. Dubbed 'vMk5', we think it is particularly useful as a Mark 5A monitor during normal data-recording activities at a station. vMk5 is written in TCL/TK interpreted language, so a TCL/TK interpreter must be present; TCL/TK interpreters are available for both Linux and Windows environment. The program is compatible with TCL/TK v.8.3 and later. A screen shot of vMk5 in monitor mode is shown in Figure 1. Contact Beppe at [g.maccaferri@ira.cnr.it](mailto:g.maccaferri@ira.cnr.it) for further details.

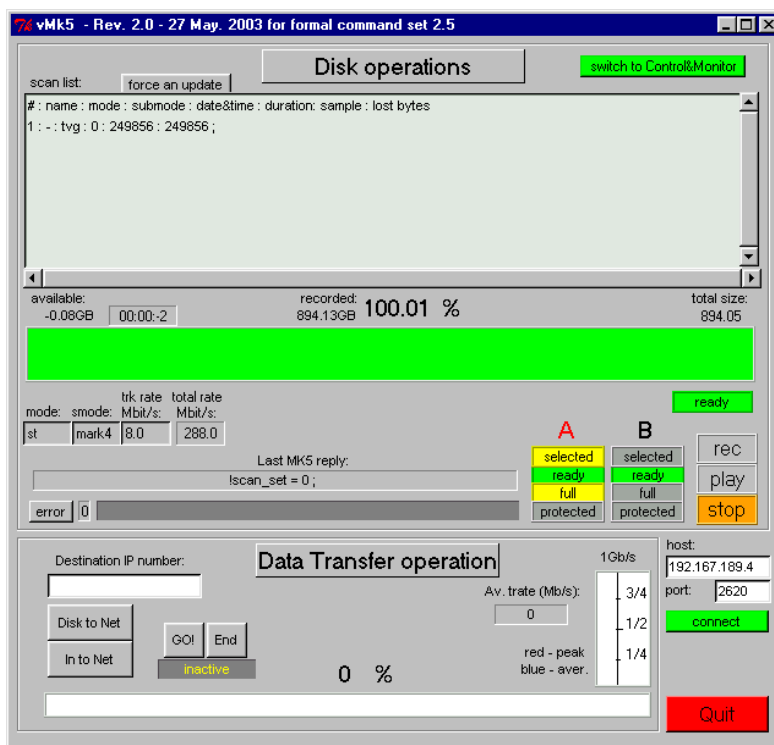


Figure 1: Screen shot of Beppe Maccaferri's Mark 5A monitor/control interface

### Some Mark 5A boards have wrong oscillator value

A mistake in the parts lists prepared by Haystack Observatory for Conduant Corp has led to a few Conduant-manufactured Mark 5A I/O boards with the wrong value oscillator being installed. The oscillator value should be 100 MHz; in the affected boards, a 110 MHz oscillator was installed. The only effect of this error will be that playback will be 10% faster than it should be; recording of VLBI data is unaffected. We believe only three boards were affected, which have been subsequently corrected, but if your Mark 5A was manufactured by Conduant and you

suspect this problem, please send a note to [mark5@haystack.mit.edu](mailto:mark5@haystack.mit.edu) and we will assist you as necessary.

### **Terminator boards recommended on Mark 5A output connectors**

At Haystack we have observed that unterminated output ECL signals on the Mark 5A I/O Panel sometimes tend to create sufficient cross-talk to somewhat elevate observed error rates on an attached Mark 4 decoder even though the data on the disk are perfectly good. This is only a problem at stations where the four Mark 5A output connectors are not used. To solve this problem, we have fabricated small terminator PCB boards that can be attached to these connectors. If you need some of these terminator boards for your system, please drop us an e-mail at [mark5@haystack.mit.edu](mailto:mark5@haystack.mit.edu) and we will be glad to send some to you.

### **Hitachi/IBM announces 250GB disks**

Hitachi Global Storage Technologies, which purchased the IBM disk division some months ago, has just announced the Deskstar 7K250 250GB disk; this unit uses the ramp load/unload technology that appears to be more durable than Contact Start-Stop method used by some other manufacturers. The unit is expected to be available in August 2003 at an estimated \$325/unit. Additional information available at <http://www.hgst.com/hdd/desk/7k250.html>.

### **High-processing efficiency for mm-VLBI experiment**

A 4-station mm-VLBI experiment using only Mark 5A recording systems at data rates to 1024 Mbps has been processed on the Mark 4 correlator at Haystack Observatory in 'faster than real-time'. The 66-hour experiment, consisting of ~360 scans (actual recording time of ~42 hours) was processed in just 54 hours, including the re-processing of 4 scans due to problems unrelated to the Mark 5A. Prior experience of processing similar experiments on tape has always taken at least 50% longer under the best of conditions. The difference is primarily due to three factors: 1) very fast synchronization of the Mark 5A systems compared to tape, 2) fast random access to observations and 3) high playback quality, resulting in no re-processing due to playback problems.

We expect that other correlators will begin to see similar results when processing data from experiments exclusively using disk-based Mark 5A recording systems

### **UT1 results from Kashima-Westford observations in <24 hours**

On Saturday June 28 at UTC 012:59:00 colleagues at Kashima and Haystack Observatories completed the process of estimating UT1-TAI from VLBI data less than 24 hours after the start of data acquisition. Data were collected at Kashima on the K5 system and at Westford on the Mark 5A system. The first fringes were detected 53 minutes after the completion of the 2-hour experiment. Approximately 83GB of data were transferred between the two sites in under 3 hours at a maximum sustained rate of 107 Mbps. After some initial difficulties, correlation was completed at the Haystack Mark 4 correlator 15 hours after the start of the experiment and UT1 analysis was completed at NASA/GSFC ~7 hours later, for a total turnaround time of ~22 hours.

With improved coordination and a little practice, we believe that future experiments should easily reduce the total time from the start of data-taking to final UT1 results in less than 8 hours; further experiments are planned.

## **Guidelines for Handling 8-pack Disk Modules**

Because disks are complex precision mechanical devices, some care needs to be exercised when handling Mark 5 disk modules. Three guidelines should be kept in mind:

Handle Mark 5 disk modules only on ‘soft’ surfaces to minimize shock: Even a thin pad will help to minimize shock. Setting a Mark 5 module down onto a hard surface can cause surprisingly large shocks since it is forced to stop its motion almost instantaneously. At correlators, all storage shelving should be similarly protected with some sort of padding; at Haystack we use thin conductive carpeting.

Beware of static electricity: Though the Mark 5 disk modules pretty much surround the individual disks with metal and prevent direct contact with the disk connectors, care must still be exercised to not create excessive static build-up that could, for example, create a spark when a module is inserted into a Mark 5 chassis. Simple precautions such as touching the Mark 5 chassis before inserting the disk module will greatly aid in reducing the risk of static discharge. Observing these precautions is particularly important in dry environments.

Use shipping covers when transporting: The module shipping covers completely cover the exposed disks and connectors, protecting them both electrically and mechanically. In addition, the shipping covers help to prevent potential prying eyes from seeing what is inside, somewhat reducing the vulnerability to theft. Please use them.

### **Coordination of VSN Owner ID’s**

Each Mark 5 disk module is identified with an 8-character VSN of the form XXX-nnnn or XXXX-nnn, where ‘XXX’ or ‘XXXX’ are owner ID’s and ‘nnn/nnnn’ is the serial number within that owner’s inventory; the embedded ‘-’ distinguishes the Mark 5 VSN from that of tapes. Jon Romney of the VLBA has agreed to coordinate the assignment of VSN owner IDs. If you purchase disks and want to establish an owner-ID for your disk modules, please contact Jon at [jromney@nrao.edu](mailto:jromney@nrao.edu) to ensure that no one else has already chosen this owner ID. You can also contact Nancy Vandenberg ([nrv@gemini.gsfc.nasa.gov](mailto:nrv@gemini.gsfc.nasa.gov)), who has agreed to coordinate with Jon.

### **Rack ID must be EVEN when using with Mark 4 formatter**

Each Mark 3 or Mark 4 DAS rack is assigned a ‘rack ID’ by jumpering on one of the connectors which mates to the Mark 3 or Mark 4 formatter. When recording data in ‘parity-stripped’ mode (‘mode=mark4:xx’), *the rack-ID must be an even number*; in fact the Mark 5A will refuse to record in Mark 4 parity-strip mode unless the rack ID is even.

The reason for this requirement is a little obscure, but let us try to explain. In the Mark 3/Mark 4 track format, the rack-ID field is contained in the byte just preceding the track-frame sync word. When parity is stripped, the sync word becomes ‘ffffff’; an odd-numbered rack-ID adds at least one additional ‘1’ immediately before the sync word, considerably complicating the job of reconstructing proper synchronization on playback. It would be possible for the Mark 5A to *force* the bit immediately prior to the sync word to be a ‘0’, but that would invalidate the CRC character embedded in the Mark 4 header and force it to be recomputed on the fly (different for every track). It is simply much easier to ensure that the rack-ID is an even number.

Forcing the rack ID to an even number is a simple procedure involving grounding one pin on the relevant Mark 4 DAS connector. Contact Dan Smythe ([dsmythe@haystack.mit.edu](mailto:dsmythe@haystack.mit.edu)) for instructions.