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WinTICS-24 Version 2.0 and PFITS—An Integrated Telescope/CCD Control Interface

R. Lee Hawkins

Whitin Observatory, Wellesley College

David Berger and Ian Hoffman

Foggy Bottom Observatory, Colgate University

Abstract. WinTICS-24 Version 2.0 is a telescope control system interface and observing assistant, that provides the ability to control a telescope and guide-acquire module, along with a suite of utilities to assist observers. PFITS is a suite of scripts for taking data in PMIS, with the ability to construct very comprehensive FITS headers by using data supplied to PFITS from WinTICS-24.

1. History

WinTICS is an evolution TICS-24, an integrated telescope control system (TCS) written by Hawkins & Ratcliff (1993) for the Macintosh in HyperCard. While sharing the general design philosophy of TICS-24, WinTICS is much more flexible and extensible.

2. User Interface and Communications

The WinTICS user interface is a windowing interface written in Microsoft Visual Basic for Windows 95/NT. While mimicking somewhat the DFM Engineering TCS screen layout, WinTICS adds to the DFM TCS commands to give a more complete observer interface. Controls are grouped by function, and color is used to indicate normal (green), caution (yellow), or abnormal (red) telescope and instrument conditions. All site-specific settings are configurable by the observer. All observer input is checked for range validity, and whether the target position is closer than an observer-set limit to the Sun and/or Moon. Additionally, WinTICS contains a complete hypertext help system describing every window and control. WinTICS communicates with the remote TCS by sending ASCII commands over a serial port. Although originally developed for DFM TCS, WinTICS could easily be adapted to any other TCS that accepts ASCII commands over a serial port, simply by changing the appropriate commands and rebuilding the package. Each set of controls will be described below. The main WinTICS window is shown in Figure 1.

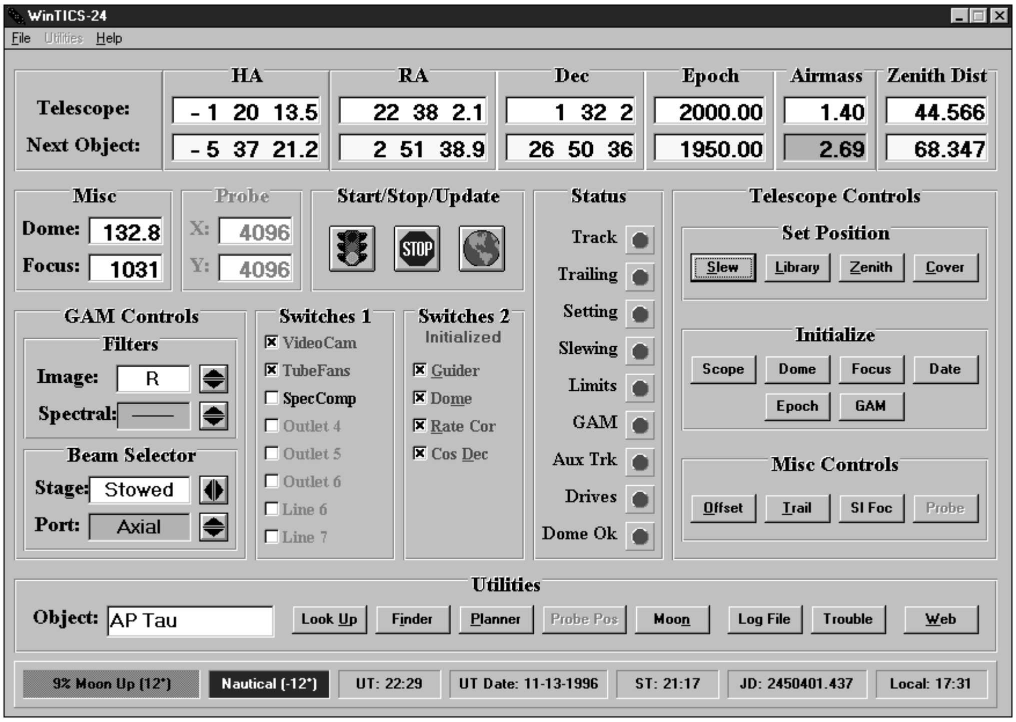

Figure 1. The WinTICS-24 Main Window.

3. Position Readouts

WinTICS communicates with the native telescope TCS to get and display the following position information for both the current telescope position and the next object: Hour Angle, Right Ascension, Declination, Epoch, Airmass, and Zenith Distance. In addition to the coordinates of the telescope, WinTICS also displays the focus position in ADUs, the dome position in degrees, and the X-Y position of the Guide-Acquire Module (GAM) guide probe.

4. Telescope and GAM Control and Status

On the right side of the main WinTICS window are controls for movement and initialization of the telescope. These controls are as follows: Set Position: Controls for slewing the telescope to coordinates, library object by number, the zenith, and the cover position for removal/replacement of the telescope covers. Initialize: Controls for initializing the telescope, dome, and focus positions, setting the date/time and epoch of precession, and moving the GAM filters and mirrors to known positions. Misc. Controls: Controls for offsetting the telescope in RA and Dec, trailing a star along the spectrograph slit, moving to a given focus position, and moving the GAM guide probe to a new X-Y position. The Switches 2 box contains check boxes to turn the Guider flag, dome, rate correction (first derivative of the pointing model), and cosine of the declination for guide rate on/off. Additionally, this box contains messages that tell the observer whether the remote TCS is initialized or not. The Status box contains "virtual LEDs" that display the status of various telescope modes: Tracking, Trailing, Setting, Slewing, Limits, GAM, Aux Track, Drives, and Dome OK. In the Start/Stop/Update box are three buttons, two of which are applicable here. The green traffic light starts a slew, and the red Stop sign cancels an enabled slew. On the middle left of the main WinTICS window are controls for the GAM: Filters: Position of the axial and south port filter wheels. Beam Selector: Stage: The position of the stage that carries the beam selector mirror. In the stowed position, the beam goes through the axial port and imaging filter to a CCD. In the On-Beam position, the beam is directed to either the north, south, east, or west radial ports by a 45° flat mirror. Port: The radial port to which the beam is being directed. Switches 1 gives the status of 8 digital I/O lines on the GAM controller. Six of these are in turn connected to solid state relays which switch outlets on and off.

5. Observing Utilities and Time Status Bar

Perhaps the most useful part of WinTICS is the observing utilities, found in the Utilities box along the bottom of the main WinTICS window. From left to right, these are: Object: The name of an object to look up in the WinTICS object database. If the object is found, then the coordinates are automatically sent to the remote TCS and a slew is enabled. If the object is not found, a window is brought up that allows the observer to add the object to the WinTICS object database, then slew to the object. Look Up: Look up the object given in the Object box. Finder: Bring up a finder chart centered on the current telescope coordinates from the Guide CD ROM, with a box the size of the CCD field of view overlaid on the chart. Planner: Bring up an eclipsing binary star time of minimum prediction for the object given in the Object box (Downey & Hawkins 1995). Probe Pos: Move the guide probe to the predefined position for the the object given in the Object box. Moon: Brings up a graphical view of the phase of the Moon, accurate to a day or so (Craig 1993). Log File: Brings up a window to make an entry into an observing log file to be filled out by the observer, detailing the observers, program, and comments. Trouble: Brings up a window to enter problems into a trouble log file. Web: Brings up a window that communicates via DDE with a Web browser to display frequently accessed Web pages (e.g., weather forecasts and images). In addition to these options, there is a button on the Time Preferences tab which dials the Naval Observatory and resets the PC's internal clock (Craig 1993). (See also NTP support, below.) Below the Utilities section on the WinTICS main screen is a status bar that displays the position of the Sun and Moon, along with the time in various formats. The backgrounds of these fields change color depending on whether the Moon/Sun is up/down and the twilight type (civil, nautical, or astronomical). The fields are updated once per minute, and the times are accurate to ± 1 minute. From left to right, they are: Moon: Percent illumination of the Moon, Moon up/down, and altitude of the Moon in degrees. Sun: Sun up/down or twilight type and the altitude of the Sun in degrees. Times: The current time is displayed in the following formats: UT, UT Date, ST, JD, and Local. All these times except Local come from TCS. Local comes from the WinTICS computer system clock. In turn, the WinTICS computer system clock can be updated via the Network

Time Protocol by supplying the hostname of an NTP server and enabling NTP updates on the Time Preferences tab.

6. Coordinate/Status File

Each time the telescope coordinates are updated or a filter is changed, WinTICS writes a log file entry containing the telescope coordinates, filter positions, and status of the telescope and switches. These are written as FITS format keywords, which can then be read by a CCD control program such as PMIS (Remington 1995) to be merged into the image header for the current observation. This file essentially allows WinTICS to act as the "glue" between the telescope TCS and the data acquisition system. The author and a series of students have written a suite of scripts for PMIS called PFITS (Berger & Hawkins 1995; Hoffman & Hawkins 1996) that greatly simplifies and automates data taking, including incorporating the FITS keywords written by WinTICS into the image headers.

7. Conclusions

When compared to the typical native telescope control system, WinTICS provides an observer interface that is more easily and quickly understood at a glance. In addition, its incorporation of various utilities for observation planning and execution makes WinTICS much more powerful than most vendor-supplied TCSs. Anyone interested in receiving more information on WinTICS should contact the author at lhawkins@wellesley.edu, or have a look at the WinTICS homepage.[1]

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[1]http://www.astro.wellesley.edu/lhawkins/tics/ticsIntro.html