CSO Telescope Control System Network Interface for eSMA

Hiroshige Yoshida
Caltech Submillimeter Observatory

May 25, 2012

1 Introduction

This document briefly describes the Caltech Submillimeter Observatory (CSO) Telescope Control System (TCS) Network Interface for the extended Submillimeter Array (eSMA).

Commands have initially been implemented according to the following specification documents:

- Nick Rees & Russell Kackley, "Description of the JAC Telescope Control System serial line interface," PTCS TCS/UN/004, August 4, 2003
- Mark Bentum, "eSMA SOFTWARE INTERFACE," Version 0.3, August 10, 2005

then updated to implement new commands specified in:

- Nick Rees, Russell Kackley, & Firmin Oliveira, "Description of the JAC Telescope Control System serial l PTCS TCS/UN/004, November 15, 2005

Instead of duplicating details already given in the above documents, only the differences between the specifications and the CSO implementations will be discussed in the following sections.

2 General Descriptions

2.1 Network Interface Specification

The CSO TCS Network Interface server will be started by opening a TCP connection to host 128.171.xxx.xxx of port xxxxx. Communications between the server and clients are line-oriented. As specified in the "Description of the JAC Telescope Control System serial line interface," each line is delimited by a carriage return code (ASCII 0x0d).

2.2 Status Value

The CSO TCS Network Interface commands always return one of the following status values as the first item in a response line. The values 0—3 have been adopted from JAC's existing serial line interface code. The values 4—6 are CSO-extensions. Some of newly added commands, specified in PTCS TCS/UN/004, November 15, 2005, have a conflicting status value convention (1 for success and 0 for otherwise). This issue must be resolved in a future update.

- SUCCESS (0) — Indicates that the CSO TCS has successfully received all the commands sent by the CSO TCS Network Interface server. This does not necessarily mean the commands have successfully been executed nor completed.
- NOREPLY (1) — Indicates communication error between the CSO TCS Network Interface server and various CSO telescope control subsystems.
- BADREPLY (2) — Indicates that a value returned by the CSO TCS is invalid (e.g., $EL \leq 0$ for the airmass computation).
- BADLINE (3) — Indicates that an input line is malformed (e.g., misspelled command name, wrong number of arguments, wrong argument type).
- NOTIMPLEMENTED (4) — Indicates that requested feature is not implemented although it should be available for the CSO telescope.
- NOTAPPLICABLE (5) — Indicates that requested feature is not applicable to the CSO telescope (thus not available).
- INTERNALERROR (6) — Indicates that an unexpected event was occurred within the CSO TCS Network Interface server software.

2.3 Coordinate System

Unless noted otherwise, the following coordinate systems are supported: MOUNT, OBS, AZEL, HADEC, APP, GAL, B*nnnn*, J*nnnn*, ICRF, ICRS and PLANET. ICRF and ICRS are equivalent to J2000. In some cases, MOUNT, OBS and AZEL coordinates are treated as if they are interchangable.

2.4 Guide Telescope

A guide telescope is not yet operational.

3 Command Descriptions

3.1 AOFFSET

- Not implemented.

3.2 GET_AIRMASS

- Telescope (mount) zenith distance is used to compute airmass.
- Plane parallel approximation.

3.3 GET_DEMAND

3.4 GET_GUIDING

- Always returns FALSE.

3.5 GET_IMAGE_SCALE

- Not implemented.

3.6 GET_OBSERVATORY

3.7 GET_OFFSETS

- "Mapping" offsets are returned as demand values.

3.8 GET_STATE

- Time, airmass and telescope coordinates are obtained sequentially.
- TT is returned in place of TDB.
- State number is always zero.
- Telescope (mount) zenith distance is used to compute airmass.
- Plane parallel approximation for airmass.

3.9 GET_TEL_BASE

- Target coordinates, offset by "Field" offsets, are returned.

3.10 GET_TIME

- TT is returned in place of TDB.

3.11 NOD

- Not implemented.

3.12 OFFSET

- "Mapping" offsets are used.
- AZEL and OBS coordinates are treated like MOUNT coordinates.

3.13 SET_BASE_HERE

- "Mapping" offsets are copied to "Field" offsets, then "mapping" offsets are zeroed.
- AZEL and OBS coordinates are treated like MOUNT coordinates.

3.14 SET_GUIDING

- Fails if argument is TRUE.

3.15 SET_TARGET

3.16 SET_SLEW

- Only the combination of MAIN virtual telescope and NEXT target is supported.
- Only SHORTEST_SLEW option is implemented.
- HADEC coordinate system is not supported.

3.17 TOFFSET

- Not applicable.

3.18 XOFFSET

- Not applicable.

3.19 CHECK_SDFOCUS

- Not implemented.

3.20 CHECK_SDPOINT

- Not implemented.

3.21 GET_LOAD

- Receiver name argument is ignored.
- Ambient temperature is returned as hot load temperature and cold load temperature.

3.22 GET_RECEIVER_STATUS

- Receiver name argument is ignored.
- Mixer bias voltage and mixer current are not available (zeroes are returned).

3.23 SD_FOCUS

- Not implemented.

3.24 SD_POINTING

- Not implemented.

3.25 SET_LOAD

- Receiver name argument is ignored.
- Cold load is not available.

3.26 SET_POLARIZER

- Polarizer name argument is ignored.
- Active Cassegrain instrument rotator is set to a given position angle.

3.27 SET_RECEIVER

- Receiver name argument is ignored.
- Line name is constructed using LO frequency.
- Doppler tracking is turned off by setting (topocentric) radial velocity to zero.

3.28 GET_ONSOURCE

- Status of the CSO acquired flag is returned as tracking status.

A Revision History

- 1.0 (September 18, 2006) — Initial release based on "Description of the JAC Telescope Control System se (Nick Rees & Russell Kackley 2003) and "eSMA SOFTWARE INTERFACE, Version 0.3 (10 August 200 (Mark Bentum 2005).
- 1.1 (October 9, 2006) — Updated for "Description of the JAC Telescope Control System serial line interf (Nick Rees, Russell Kackley, & Firmin Oliveira 2005).