

1 LDT Software Simulation Environment

An LDT software simulation environment exists so operators can train and practice using LDT Software. This system is also used by the software development group, therefore operators must coordinate with them before logging in for training. Please email Georgi Mandushev (gmand@lowell.edu), with subject line 'Operator training', and specify your requested time block for using the system. Once approved, the operator can use Windows Remote Desktop or VNC to connect (from within the observatory firewall) or via VPN/VNC if outside of Lowell Observatory.

The various components of the LDT Software Simulation Environment run on two PC computers: **NYSA** and **LO-DCTSIM**, and one Mac computer: **DCT-SIM1**. The networking and credentials information for those machines is listed below:

IP address	Computer name	User name	Password	VNC password
10.10.130.29	lo-dctsim.lowell.edu	dctoperator	dcttest	testcon
10.10.100.38	nysa.lowell.edu	dctoperator	dctsim	dctsimcon
10.10.50.13	dct-sim1.lowell.edu	observer	dct-sim1sim1	dctsim1con

The TCS Simulator and the MCB reside on **NYSA**; the remaining LabVIEW applications (AOS, OCS, TXS, TRI, SimulateM1M2, M1S/M2S) reside on **LO-DCTSIM**. Those two computers simulate the operation of the LDT control computers (not all of them!).

The Mac computer simulates to a certain degree the operation of **DCT-TO1** in the LDT control room. On **DCT-SIM1** one can run CAT and the Observer Target List tool, just as on **DCT-TO1**. As long as the TCS Simulator and the MCB are running locally (on Mars Hill), one can send targets to the TCS Simulator via either the CAT or the OTL tool for training and software testing purposes. With **DCT-SIM1**, **NYSA** and **LO-DCTSIM**, the setup resembles the LDT control room environment.

The TCS Simulator environment also allows one to send commands to the TCS via the ActiveMQ broker on **tanagra.lowell.edu**, and to receive messages from the various topics that ActiveMQ subscribes to. This is very useful for testing new (or existing) observer-side applications and their communications with the TCS.

Procedure for starting and running the TCS Simulator:

Two applications are needed to run the TCS Simulator: the TCS simulator itself, and the MCU (Mount Control Unit) simulator. They both reside on **NYSA**. The MCU Simulator allows for somewhat-realistic operation of the TCS in this simulation environment. The MCU simulator must be running on NYSA in order to use the TCS Simulator. The TCS application is not really a simulator – it is exactly the same application that runs at the LDT, except that it doesn't use the hardware timing card. However, we will call it a "simulator" to distinguish it from the TCS that runs at the LDT.

1. Login to **NYSA** (nysa.lowell.edu) either via RDC or via VNC.
2. From the desktop shortcut (or from the Start Menu), start the MCU Simulator (current version is 1.9).
3. From the desktop shortcut (or from the Start Menu), start the TCS (current version is 1.9). Please note that the MCU Simulator version must match the version of the TCS that will be used.
4. Click on the Startup button to start the TCS Simulator. Click on Main Display to show the TCS operator display

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Procedure for starting and running the MCB, and for ActiveMQ testing:

1. Remote in to **NYSA** and start the MCU Simulator, and then the TCS
2. From the desktop shortcut (or from the Start Menu), start the Data Listener Manager
3. From the desktop shortcut (or from the Start Menu), start the MCB Controller and the MCB View.
4. **VERY IMPORTANT:** the ActiveMQ broker is hosted on **tanagra.lowell.edu**. Please do not change the host name in MCB under any circumstances!
5. Now one can send commands to the TCS from an application (or directly from the ActiveMQ web page via properly formatted XML packets), and listen to the appropriate ActiveMQ topics to receive status messages from the TCS.

Other LDT applications:

All other applications (M1S/M2S, AOS, TXS and OCS) reside on **LO-DCTSIM**. With these simulators/applications and the corresponding data listeners and controllers running, the user can operate the following software components:

- M1S
- M2S
- AOS
- TXS
- OCS
- WS

The simulation environment provides the Data Listeners, Controllers, and Views for these components in the same manner that the OCS and AOS computers at the LDT provide them. See the software user manuals for these systems for instructions on starting and operating these applications.

The TCS and the other simulators use the actual weather data from the LDT weather station. So the WS (Weather Station) simulator usually does not have to run. However, if the TCS or other simulators indicate bad health because of high humidity or similar conditions, one can run the WS simulator (on **LO-DCTSIM**) and set manually the temperature, humidity and atmospheric pressure.

Procedure for starting and running M1S, M2S, AOS, OCS:

1. Start the M1_M2 Simulator (on **LO-DCTSIM**) and the MCU Simulator (on **NYSA**). If asked about the Shared Variables host, enter 10.10.130.29 or **lo-dctsim.lowell.edu**
2. Start the Data Listener Manager and check the boxes for the data listeners for the applications that you want to use
3. Start the application(s) that you want to use

See below for a screenshot of the OCS simulator view.

Worth noting:

- Several sub-systems in the OCS display are in Off State. Simulators for these systems do not exist, therefore controls and indicators related to these systems may not be available, or appear to update.
- The AOS simulators do not currently provide 'settled' signals, therefore these indicators will never illuminate.
- The AOS simulators do not currently provide tilt-tip-piston readings, therefore the position graphs will not update.
- The weather data and mount temperature readings shown are from the LDT site (not simulated).
- The TCS will appear to "jump" to new targets because the Mount Control Simulator immediately applies target demand as the current position status (*i.e.* there is no slewing).

OCS (Observatory Control System)

File Tools Help

Application Control

Disable

Apply To:

AOS ☒

CCS ☐

DCS ☐

ECS ☐

TCS ☐

TXS ☒

Pointing

Detailed State

TXS: TCSOLInPositionState

Times

UT 2013 Mar 12 23:36: LST 03:33:35

M1 Cover [Control](#)

Cover State: Open

Position Status [Tracking Control](#) [Target Configuration](#)

Name: jupiter

	Demand	Actual
Equinox: 2000	04h 29m 47.27s	+021° 21' 57.7"
Diff Rates: +0.000s/s +0.000"/s	04h 29m 47.17s	+021° 21' 57.7"
RA/Dec:		
Tracking: On	Az/El: +133° 37' 59.5"	+071° 48' 19.9"
	+133° 38' 02.9"	+071° 48' 20.7"
Rot Track: Target	Rot Ang: 219.8°	219.8

Airmass: 1.1
HA: 00h 56m 13s E
Sky Ang: 0.0°
Par Ang: -39.7°

Enclosure [Azimuth](#) [Shutter](#)

[Tracking Control](#)

Active Optics

Settled Status

M1F M1L M1P M2P M2V

Detailed State

AOS: UnlockedOpenLoopState [Position Control](#) [Mode Control](#)

Calibration

[Flat Screen](#)

Environment

Ventilation

[Mezzanine Doors](#) [Fans](#)

SW NW NE SE Mount Stair

☐ ☐ ☐ ☐ ☐ ☐

[Dome Doors](#)

1 2 3 4 5 6 7

Not Yet Implemented

Weather

Air Temp	11.5 Cdeg
Dew Point	0.0 Cdeg
Relative Humidity	26.6 %
Avg Wind Speed	2.6 m/s
Wind Direction	66.5 deg

Flat Field Screen Lamps

HB: AtSetpointState

LB: RampingToSetpoint

Mount Temperature

Average: 8.8 Cdeg

Summary State

OCS: E CCS: O

AOS: E M1S: E M1P: E M1L: E

M1FA: E M1FB: E M1FC: E

M1FD: E M1FE: E M1FF: E

M2S: E M2P: E M2V: E

DCS: O DAS: O DSS: O

TXS: E TCS: E

ECS: O WRS: E MTS: E CLS: O

VCM: O

Detailed State

OCS: EnabledState

Weather Warning

Weather Shutdown Warning Inactive

Detailed State

DCS: AzimuthNotReadyState

DAS: AtGeneralPositionState

DSS: