

# **TMT P2 Prototype Actuator Draft Test Plan**

Mark Colavita, James Moore  
Jet Propulsion Laboratory, California Institute of Technology

Mark Sirota  
Thirty Meter Telescope Corporation

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## **1. Background**

A limited set of simple functional tests will be completed by the supplier prior to shipment of the “Prototype Actuators”. These are intended to address basic functionality prior to beginning performance testing to be carried out by TMT.

This is a draft of the “M1CS Prototype Actuator Test Procedure”. In the near term this draft procedure is intended to communicate the level of complexity required to test the Prototype Actuators so as to provide a basis for an estimate of the cost associated with Prototype Actuator testing. Based on TMT’s experience with functional testing of the Prototype Actuators, it should take less than 2 hours per actuator assuming all test equipment is available and no major problems are found.

## **2. Test equipment**

- Encoder interface adapter (MicroE Systems ATMII5000-S-US SmartPrecision Alignment Tool)
- Stepper motor driver/indexer (Applied Motion Products Model Si2035 or similar)
- Audio signal generator
- Laptop computer with serial port adapter

## **3. Functional tests**

### 3a. Test for range of travel and force

The stepper motor offloader specified for the prototype actuator is a direct drive device. As long as it’s not driven at very high speeds, it will stall safely at both ends of travel.

Connect the motor to the stepper motor driver, and configure the driver. Driver settings: 10,000 steps/rev, 0.5 A per phase, 1 rps default speed, 1 rpss default acceleration.

Drive the motor at 1 rps to retract the offloader until the motor stalls. Stop the motor. Measure:

- a) Extension of the actuator output shaft.
- b) Extension of the offloader.
- c) Using a spring gauge, measure the maximum pull force at the actuator output shaft before the four-bar linkage moves.

Drive the motor at 1 rps to extend the offloader until the motor stalls. Stop the motor. Measure:

- d) Extension of the actuator output shaft.
- e) Extension of the offloader.

- f) Using a spring gauge, measure the maximum push force at the actuator output before the four-bar linkage moves.

### 3b Test for encoder operation

(This test can be done in parallel with preceding test).

Connect the encoder to the encoder interface adapter, connect the adapter to a laptop computer, and run the encoder diagnostic software. Move the offloader over its range of travel as above. Measure:

- g) Encoder measurement with offloader retracted.
- h) Encoder measurement with offloader extended.
- i) Confirm a “green” signal strength over the full range of travel.

### 3c Test for voice coil operation.

Drive the motor at low speed to put the offloader approximately mid-range, so that the four-bar linkage is free to move and in the center of its range. Connect the voice coil to an audio signal generator. Set the amplitude at the voice coil leads to TBD V at 0.5 Hz. Measure:

- j) Encoder peak-to-peak value.

Move the offloader so that the voice coil is 3 mm from max retraction. Measure:

- k) Encoder peak-to-peak value.

Move the offloader so that the voice coil is 3 mm from max extension. Measure:

- l) Encoder peak-to-peak value.