Interface Control Document

Telescope M3 Assembly

THIRTY METER TELESCOPE

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Telescope M3 Assembly

The primary role of the M3A assembly is to manage the associated HCD, to validate all commands and maintain a state machine.The assembly will also ensure the correct ordering of commands if needed. Assembly provides a constant stream of demands to the subsystem. These demands will be used by the subsystem only when instructed to do so as part of a tracking move.Unless explicitly told to follow the subsystem will ignore this demand stream.

Subsyatem	Name	Prefix	Type	WBS ID
TCS	M3Assembly	TCS.TC.M3A	Assembly	tmt.tel.cont.tcs.m3

Items Published by M3Assembly

Events Published by M3Assembly

Events: currentPosition

This assembly publishes the current positional information for the M3 axes.

Min Rate	Max Rate	Archive
40.0 Hz	40.0 Hz	no

Attributes for currentPosition

Name	Description	Type	Units
inposition	This is the conjunction of tilt_inposition and rotate_inposition	boolean	
tiltpos	This is the Axis position as reported to the tilt position servo loop	double	deg
tiltposdemand	This is the Tilt position demand value to the M3CON	double	deg
tiltposerror	This is the Axis position error as calculated by the tilt position servo loop	double	deg
tiltinposition	This is True if tilt servo is correctly tracking the demand	boolean	
rotatepos	This is the Axis position as reported to the rotation position servo loop	double	deg
rotateposdemand	This is the Rotataion position demand value to the M3CON	double	deg
rotateposerror	This is the Axis position error as calculated by the rotation position servo loop	double	deg
rotateinposition	This is True if rotation servo is correctly tracking the demand	boolean	
encoderlatchtime	This is the time at which the encoders were latched	double	
tilterrcnt	This is 0 if no issues with tilt demands, increments otherwise	integer	counter
rotateerrcnt	This is 0 if no issues with rotation demands, increments otherwise	integer	counter
time	This is the time at which the event data was sampled	double	

Events: M3CSDriveStatus

This event describes current drive status of M3CS component

Archive
no

Attributes for M3CSDriveStatus

Name	Description	Type
processing	This is True if M3 is processing a command.	boolean
lifecyclestate	This is the Current Lifecycle State of M3	enum: (READY, LOADED, INITIALIZED, RUNNING)
tiltstate	This is the Current tilt state of M3.	enum: (Good, Ill, Bad)
rotationstate	This is the Current rotation state of M3	enum: (Good, Ill, Bad)
tdiagenabled	This is True when diagnostics are enabled	boolean
servoteston	This Indicates if servo testing is in progress. Only one axis can be changed to the Servo Testing state at a time.	boolean
time	This is the time at which the event data was sampled	double

Events: M3CSControlsDiagnostics

This event describes M3CS control Diagnostics

Archive
no

Attributes for M3CSControlsDiagnostics

Name	Description	Type
M3s_inposition	This is Conjunction of tilt_inposition and rotate_inposition	array[10] of boolean
tilt_inposition	This is True if tilt servo is correctly tracking the demand	array[10] of boolean
rotate_inposition	This is True if rotation servo is correctly tracking the demand	array[10] of boolean
tilt_drive_currents	This is tilt drive currents as measured at the axis servo amplifier(s)	array[10] of float
rotate_drive_currents	This is rotation drive currents as measured at the axis servo amplifier(s)	array[10] of float
tilt_pos	This is Axis position as reported to the tilt position servo loop	array[10] of double
rotate_pos	This is Axis position as reported to the rotation position servo loop	array[10] of double
tilt_pos_demand	This is tilt position demand value to the M3CON	array[10] of double
rotate_pos_demand	This is rotation position demand value to the M3CON	array[10] of double
tilt_pos_error	This is Axis position error as calculated by the tilt position servo loop	array[10] of double
rotate_pos_error	This is Axis position error as calculated by the rotation position servo loop	array[10] of double
tilt_velocity	This is Azimuth axis velocity as reported by the tilt velocity loop	array[10] of double
rotate_velocity	This is Elevation axis velocity as reported by the rotation velocity loop	array[10] of double
tilt_velocity_demand	This is Axis velocity demand as received by the tilt velocity servo loop	array[10] of double
rotate_velocity_demand	This is Axis velocity demand as received by the rotation velocity servo loop	array[10] of double
tilt_velocity_error	This is Axis velocity error as calculated by the tilt velocity servo loop	array[10] of double
rotate_velocity_error	This is Axis velocity error as calculated by the rotation velocity servo loop	array[10] of double
tilt_acceleration	This is Tilt acceleration as determined by the tilt servo system	array[10] of double
rotate_acceleration	This is Rotation acceleration as determined by the rotation servo system	array[10] of double
tilt_torque_demand	This is tilt torque demand(s) as sent to the azimuth servo amplifier(s)	array[10] of double
rotate_torque_demand	This is Rotation torque demand(s) as sent to the rotation servo amplifier(s)	array[10] of double
tilt_encoder_positions	This is Array of the n raw tilt encoder read head positions. Specific format is TBD.	array[10] of integer
rotate_encoder_positions	This is Array of the n raw rotation read head positions. Specific format is TBD.	array[10] of integer
encoder_latching_time	This is Time the encoders were latched	array[10] of double
time	This is the time at which the event data was sampled	double

Events: M3CSHEALTH

This event describes M3CS Health

Archive
no

Attributes for M3CSHEALTH

Name	Description	Type
Health	This is overall M3S health.	enum: (Good, Ill, Bad, INTERLOCKED, UNKNOWN)
Reason	This is the Health Message	string
time	This is the Time of Health Event Publishing	double

Alarms published by M3Assembly

Name	Description	Severity	Archive
M3InBadStatus	M3A Assembly will be configured to generate an alarm in case M3 is in ILL or BAD status	minor	true

Items Subscribed to by M3Assembly

M3 Assembly processes events received and sends it to M3CS subsystem.

Events Subscribed to by M3Assembly

Subsystem	Component	Name	Required Rate	Max Rate	Usage
TCS	PointingKernelAssembly	m3demandpositions	40.0	40.0	M3 assembly refines position demands and send it to M3CS subsystem

Commands for M3Assembly

TCS M3 Assembly commands.

Configuration: Initialize

Requirements:

Ask M3CS to initialize

Arguments:

n/a

Configuration: Reboot

Requirements:

Ask M3CS to reboot

Arguments:

n/a

Configuration: Shutdown

Requirements:

Ask M3CS to shutdown

Arguments:

n/a

Configuration: axis

Requirements:

This command turns drive power on or off for one or more axes.

Arguments:

Name	Description	Type	Required
operation	This will be used to turn drive power on or off.	enum: (On, Off)	yes
axes	This is the axes for which we want to turn Drive Off or On.	enum: (TILT, ROTATION, BOTH)	yes

Configuration: bearingSweep

Requirements:

This command in sweep through each axis full range of motion to distribute lubricant in the bearing.

Arguments:

Name	Description	Type	Units	Required
axes	This is the axes for which we want Bearing Sweep Operation to be performed	enum: (TILT, ROTATION, BOTH)		no
rotation	This is the rotation angle for Bearing Sweep operation. Its value can be in range ±181 which is TBC	double	deg	no
tilt	This is the tilt angle for Bearing Sweep operation. Its value range is TBD.	double	deg	no

Configuration: cancelProcessing

Requirements:

This command will help in cancelling a command which is currently being processed and mark update assembly so that it will be ready to accept a new command

Arguments:

n/a

Configuration: datum

Requirements:

This command will datum the encoders for the specified axis

Arguments:

Name	Description	Type	Required
axes	This is the axes for which needs to be datumed	enum: (TILT, ROTATION, BOTH)	yes

Configuration: lock

Requirements:

This command will Move M3 to the requested lock positions

Arguments:

Name	Description	Type	Units	Required
operation	This parameter will help in locking and Unlocking.	enum: (On, Off)		yes
axes	This is the axes which we want to lock or unlock.	enum: (TILT, ROTATION, BOTH)		yes
rotation	This is rotation angle to which operator wants M3 to lock to. Its value can be 0°, 90°, 180° or 270°.	double	deg	yes
tilt	This is tilt angle to which operator wants M3 to lock to. Its value can be 45°	double	deg	yes

Configuration: move

Requirements:

This command will be used to move M3 to the desired Rotation and Tilt angle.

Arguments:

Name	Description	Type	Units	Required
operation	This will be used to move M3 to specific Rotation and Tilt angle.	enum: (On, Off)		yes
rotation	This is the rotation angle at which M3 needs to be moved.	double	deg	yes
tilt	This is the tilt angle at which M3 needs to be moved.	double	deg	yes

Configuration: Track

Requirements:

This command will be used to mark M3 in Track mode or get it out of track mode. When this command is executed M3 moves to the requested Rotation and Tilt positions. Once M3 reaches the required coordinates, it will then start following Position Demands being published by TCSpk.

Arguments:

Name	Description	Type	Units	Required
operation	This will be used to mark M3 in Track Mode or get it out of track mode	enum: (On, Off)		yes
rotation	This is the rotation angle at which M3 needs to be moved.	double	deg	yes
tilt	This is the tilt angle at which M3 needs to be moved	double	deg	yes

Configuration: Park

Requirements:

This command will be used to park M3 once observation is over. M3 will move to default Rotation and Tilt position being defined in Assembly Configuration.

Arguments:

n/a

Configuration: ReadConfiguration

Requirements:

This command shall be used to read active in memory configuration of M3. This command is effective only if M3 is in running state else the configuration is rejected.

Arguments:

n/a

Configuration: Servo

Requirements:

This command will turn the servo off for the requested axis. If the configuration is accepted HCD will send Servo off command to M3 for the requested axis. The configuration is rejected if M3 is not in running state.

Arguments:

Name	Description	Type	Required
axes	This is the axes for which the command needs to be executed.	enum: (TILT, ROTATION, BOTH)	yes

Configuration: Log

Requirements:

This command will help in starting and stopping diagnostic event data publishing.

Arguments:

Name	Description	Type	Required
enable	This will start (Value = On) or Stop (Value = Off) diagnostic event data.	enum: (On, Off)	yes

Configurations Sent to Other Components

Name	Component	Subsystem
Initialize	M3HCD	TCS
Reboot	M3HCD	TCS
Shutdown	M3HCD	TCS
AxisOn	M3HCD	TCS
AxisOff	M3HCD	TCS
BearingSweep	M3HCD	TCS
CancelProcessing	M3HCD	TCS
Datum	M3HCD	TCS
LockPosition	M3HCD	TCS
PointDemand	M3HCD	TCS
Follow	M3HCD	TCS
Point	M3HCD	TCS
ReadConfiguration	M3HCD	TCS
ServoOff	M3HCD	TCS
StartLogging	M3HCD	TCS
StopLogging	M3HCD	TCS