

Hardware-in-The Loop Flight Motion Simulator
Model HD7747
Three Axis Flight Motion Simulator
Two Axis Target Motion Simulator



Description

The Series HD7747 Flight Motion Simulator (FMS) is a precision 3-Axis Missile Flight Motion Simulator together with a 2-Axis Target Motion Simulator (TMS). The system is designed for high dynamic missile test. The HD7747 provides a comprehensive platform for Hardware-in-the-Loop (HWIL) simulation of guided missiles, munitions and other systems.

The 3-Axis FMS is configured with a horizontal outer (pitch) axis, a middle (yaw) axis, which is orthogonal to the outer axis and an inner (roll) axis supported by the middle axis gimbal. The inner axis is the payload mounting area.

The inner axis has continuous angular freedom and is driven by a high torque brushless AC motor. The middle and outer axes have limited angular motion and are driven by hydraulic actuators. A hard-anodized aluminum tabletop on the roll axis serves as the payload mounting surface. Optionally, a bearing ring may be attached to the middle axis to support the UUT during high dynamic motion.

The 2-Axis TMS is configured with an outer elevation axis which supports the inner azimuth axis. The missile target is mounted to the azimuth gimbal at the large payload mounting area.

Construction materials used are treated for long term dimensional stability. The stiffness of the system is such that orthogonality of the axes and bearing wobbles are maintained, virtually independent of axis rate or position. Protective coatings are used to prevent corrosion and outer surfaces are painted.

The real time digital controller, ACUTROL® Model ACT3000 controls the table. The controller has a colour, touch sensitive operator interface flat panel display and scalable analog input/output interfaces. Programmable Event Pulses can be used for calibration and synchronization with external computers or test equipment. Typically, the standard digital interface Ethernet (TCP/IP) and IEEE-488 are supplemented with a real time computer interface. SCRAMNet and VMIC

reflective memory interfaces are the preferred standard in the HWIL test environment.

Modes of Operation

<ul style="list-style-type: none"> Rate – absolute and relative: 0.0001degs/s resolution 	<ul style="list-style-type: none"> Absolute Positioning: 0.00001 deg. resolution 	<ul style="list-style-type: none"> Track Mode – for real time simulation of complex motion profiles
<ul style="list-style-type: none"> Synthesis mode – Sinusoidal motion, command amplitude and frequency 	<ul style="list-style-type: none"> Local or remote control via touch sensitive operator panel or digital interface 	<ul style="list-style-type: none"> Analog readout and command with 16 bit resolution

Performance Specification FMS

	ROLL	YAW	PITCH
	Inner	Middle	Outer
Design Features			
Actuator	AC-torquer	Dual vane hydraulic	Single vane hydraulic
Position Transducer	Inductosyn	Inductosyn	Inductosyn
Electrical Access to UUT	sliprings	twist cable	twist cable
Axis Intersection Within Sphere Of	1 mm radius		
UUT			
Table top (UUT interface)	650 mm dia.		
Payload Max	650 mm dia. X 600 mm high		
Payload, Mass	70 kg, nominal		
Payload, Inertia	1 kgm ² roll; 5 kgm ² pitch & yaw		
UUT Interface To Axis Intersection	500 mm with additional 100mm optional insertable		
Slipring and Facility Possibilities To UUT	Power Rings, 20A 415VAC; Signal Rings, 2A 150VDC; coaxial video; Mil 1553; RF or GPS rotary joint; gas coolant joint		
Specification			
Angular Freedom, Nominal	continuous	>+/-60 deg	>+/-120 deg
Angular Freedom, Servo Controlled	continuous	+/-55 deg	+90 to -135
Position Accuracy	+/-0.04deg	+/-0.04deg	+/-0.04deg
Position Repeatability	+/-0.003deg	+/-0.003deg	+/-0.003deg
Rate, Peak	+/-400 deg/s	+/-200 deg/s	+/-200 deg/s
Rate, Minimum	0.003 deg/s	0.003 deg/s	0.003 deg/s
Rate, Accuracy	0.10%	0.10%	0.10%
Acceleration Peak With Load	7000 deg/s ²	7000 deg/s ²	7000 deg/s ²
Dynamic Performance			
+/-30deg/s with frequency 30Hz	less than 90deg phase loss and within +/-3db amplitude		
+/- 30deg/s with frequency 1 Hz	less than 2deg phase shift and within +/-1db amplitude change		
Bandwidth -3db, nominal (tolerance +/-5Hz)	40Hz	30Hz	30Hz

Performance Specification TMS

	AZIMUTH	ELEVATION
	inner	outer
Design Features		
Actuator	dual vane hydraulic	dual vane hydraulic
Position Transducer	Inductosyn	Inductosyn
Axis Intersection Within Sphere Of	1 mm radius	
Payload Interface To Axis Intersection	1155 mm	
Payload Interface	396mm OD / 350 mm ID	
Payload Details		
Payload Mass	50 kg nominal	
Payload Inertia	<=70 kqm ² in relation to axis	
Specifications		
Angular Freedom, Nominal	>+/-45 deg	>+/-60 deg
Angular Freedom, Servo Controlled	+/- 45deg	+/-55 deg
Position Accuracy	+/-0.04deg	+/-0.04deg
Position repeatability	+/-0.003deg	+/-0.003deg
Rate, Peak	+/-80 deg/s	+/-80 deg/s
Rate, Minimum	0.003 deg/s	0.003 deg/s
Rate, Accuracy	0.10%	0.10%
Acceleration Peak With Load	1200 deq/s ²	1200 deq/s ²
Dynamic Response		
Bandwidth -3db	8Hz	8Hz

- Options:
- SCRAMNet or VMIC
 - Non standard sliprings
 - Special UUT adapters
 - Custom offsets UUT to Axis intersection
 - Custom performance parameters

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