

Hubble Facts

National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, Maryland 20771



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Hubble Space Telescope Servicing Mission 3A **FINE GUIDANCE SENSOR**

The Fine Guidance Sensor (FGS) is an optical sensor used on the Hubble Space Telescope to provide pointing information for the spacecraft and also as a scientific instrument for astrometric science.

A FGS consists of a large structure housing a collection of mirrors, lenses, servos, prisms, beam-splitters and photomultiplier tubes.

There are three fine guidance sensors on Hubble located at 90-degree intervals around the circumference of the telescope. Two FGSs are used to point the telescope at an astronomical target and hold that target in the scientific instrument's field of view. The third FGS can then be used as a scientific instrument for astrometry.

Pointing Control

The fine guidance sensors are one of the sensors used by Hubble's pointing control system to

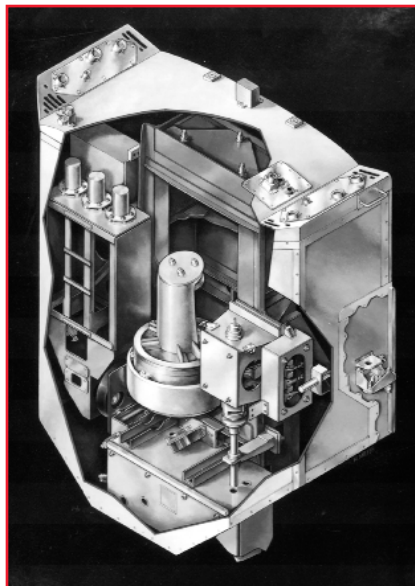
point the telescope at a target with an accuracy of 0.01 arcsec. What is an arcsec? An arcsec is the width of a paperclip wire viewed from the distance of two football fields. With this fine precision, the guidance sensors lock on to a star and then measure any apparent motion to an accuracy of 0.0028 arcsec. This gives Hubble the ability to remain pointed at that target with no more than 0.007 arcsec of deviation over long periods of time. This level of stability and precision is comparable to being able to hold a laser beam focused on a dime that is 200 miles away (the distance from Washington D.C. to New York City).

Astrometry Science

Astrometry is the science that deals with the determination of precise positions and motions of stars. The FGS's can provide star positions that are about 10 times more precise than those observed from a ground based telescope.

When used for astrometric science the fine guidance sensors will let Hubble:

- Search for a wobble in the motion of nearby stars that could indicate the presence of a planetary companion.
- Determine if certain stars really are double stars.
- Measure the angular diameter of stars, galaxies and other celestial objects.



*Cutaway view of a Fine
Guidance Sensor.*

- Refine the positions, distances and energy output of stars.
- Help determine the true distance scale for the universe.

Servicing

During the Hubble Servicing Mission 3A, astronauts will exchange a FGS with a refurbished unit that has an enhanced on-orbit alignment capability.

The refurbished FGS on SM3A is the same unit that was returned from Servicing Mission 2. The FGS returned from SM3A will be refurbished and upgraded for re-use on Hubble's 4th Servicing Mission.

The astrometry science program is managed through the Space Telescope Science Institute, Baltimore, Md., and is open to scientists throughout the world in the same manner as all other Hubble science.

The Hubble Space Telescope operations and servicing are the responsibility of NASA's Goddard Space Flight Center, Greenbelt, Md.

FGS PHYSICAL CHARACTERISTICS

Size	5.5 x 4 x 2 feet
Weight	478 pounds
Power	19 Watts

FOR ADDITIONAL INFORMATION CONTACT

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