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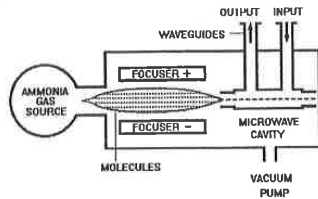
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Mars Global Surveyor

Mars Global Surveyor A spacecraft that is to go into orbit around Mars and use a battery of six instruments to scan the planet's surface for a full Martian year (about two earth years), seeking evidence of past or present water and life forms.

Mars Pathfinder Lander A spacecraft that will fly directly to Mars and land on its surface to transmit images of the Martian terrain with a color TV camera. It will monitor the Martian weather and deploy a small roving unit that will explore the terrain and sample rocks and soil.

maser [microwave amplification by stimulated emission] A microwave amplifier that amplifies by stimulating atoms or molecules to an unstable higher energy level. A microwave input signal interacts with the atoms or molecules to stimulate the emission of excess energy at the same frequency and phase as the stimulating wave, thus providing coherent amplification at a wavelength determined by the dimensions of the cavity or resonant structure. The application of external energy required for amplification or oscillation is called *pumping*. The radiated energy greatly exceeds the energy level of the pumping signal. There are three types: *gas*, *solid state*, and *traveling wave*. Ammonia atoms or molecules are the parametric material in beam-type gas maser oscillators. Solid-state masers depend on the electrons of parametric atoms or molecules. There are two- and three-level solid-state masers. Masers can function as low-noise preamplifiers for very weak signals in radio astronomy or long-distance radar, and as time and frequency standards. The stimulated emission principles of the maser apply in the visible light and infrared regions, where the equivalent device is the *laser*.



Maser that uses ammonia as its parametric material.

mask 1. A transparent (glass or quartz) plate covered with opaque patterns that define the size and shape of integrated-circuit elements at one level of fabrication. Examples include wells, emitters, gates, drains, and channels. Selected areas of a *photoresist*-coated wafer are exposed to ultraviolet light to define the areas to be etched. Opaque mask areas can be formed from deposited chrome, iron oxide, or silicon. As many as 20 successively registered masks might be used to make an IC. 2. A transparent (glass or plastic) plate with opaque emulsion forming a stencil for defining conductors, pads, ground planes, and contacts in printed-circuit board manufacture. Light passing through the mask exposes the pattern onto a photoresist-coated circuit board. Exposed photoresist is chemically removed, and the pattern that remains defines the copper-clad areas to be removed by acid etch. See *lithographic*.

masking 1. The amount the threshold of audibility of a sound is raised by the presence of another sound. The unit

customarily used is the decibel. It is also called audio masking and aural masking. 2. A programmed procedure for eliminating radar coverage in areas where such transmissions can be useful to the enemy for navigation purposes, by weakening the beam in those directions, or by using additional transmitters on the same frequency at suitable sites to interfere with homing. 3. Applying a covering or coating on a semiconductor surface to provide a masked area for selective deposition or etching. 4. The use of tones, noise, music, or other sounds to hide or mask a clear signal for secrecy purposes. The masking signal must be available at the receiving terminal for subtraction, leaving the desired signal.

mask programming A factory method for custom finishing semiconductor read-only memories (ROM), by applying one or more metallized film layers by mask-and-etch processing with a custom mask. By contrast, *field-programmable ROMs* such as a PROM, EPROM, EEPROM, and flash are field-programmed with special equipment that organizes the memory cells by selective voltage application.

mask-programmed read-only memory [ROM] A read-only memory in which a mask produces the metallized interconnection pattern corresponding to the desired permanently stored program or data.

mass The quantity of matter in a body. Mass is a measure of inertia and determines resistance to acceleration independently of gravitational force, whereas weight is the force exerted by a body under the influence of gravity at a particular location.

mass conversion factor *Atomic mass conversion factor*.

mass-energy equation The equation developed by Albert Einstein for interconversion of mass and energy, written as $E = mc^2$, where E is the energy in ergs, m is mass in grams, and c is the velocity of light in centimeters per second.

mass memory A large-capacity magnetic memory disk or memory system consisting of multiple parallel Winchester-style hard disks for mainframe computers or supercomputers.

mass migration Metallic erosion that occurs when a high current density is passed through a conductor that has a small cross-sectional area, such as the conductors in integrated circuits.

mass spectrograph A mass spectrometer that provides a permanent record of the mass spectrum lines of a material on a photographic plate.

mass spectrometer A spectrometer that analyzes a substance in terms of the ratios of mass to charge of its components. A gas or a compound in the vapor state is bombarded by electrons, and the resulting ions are accelerated and separated according to their mass-to-charge ratios, in the most common type, combined electric and magnetic fields deflect the ions of the substance and focus each type in turn on an output electrode for detection and measurement. In another type, sorting of ions is based on the time of flight of the ions through a drift tube during acceleration by electric fields.

mass storage *Mass memory*.

mast A vertical metal pole that acts as an antenna or antenna support.

master 1. The negative metal counterpart of a disk recording, produced by electroforming as one step in the production of phonograph records. 2. *Master station*.