

- * **I/O errors** - The system automatically retries failed I/O operations to recover from transient errors and marginal media conditions. Disk I/O errors are retried using the hardware recovery mechanisms. Optionally, the system validates disk I/O transfers with read-check and write-check functions. If an I/O request cannot be completed, all data that was correctly transferred is returned to the initiator.

The system logs all processor errors, all operating system errors detected through internal consistency checks, all double-bit memory errors (and a summary of corrected single-bit errors), and all I/O errors. The log can be printed or examined interactively to locate failed and troublesome components.

If the effects of an unrecoverable error cannot be limited to a process, the system shuts down and restarts without operator intervention by bootstrapping a fresh copy of VAX/VMS from the system disk (although the user can inhibit the automatic restart feature). Whenever the system fails, a dump of physical memory is taken; the dump includes the contents of the processor registers. Additionally, an entry is made in the error log indicating the hardware and software states of the machine at failure. A utility that can access system data structures symbolically is provided for analyzing dumps.

On a power failure, the system shuts down automatically. On power restoration, the system restarts automatically and resumes processing at the point of interruption if the system has a time-of-day clock and a memory battery back-up unit, and if the contents of memory are still valid. The system restarts devices and communications lines. All I/O operations in progress, including magnetic tape, are restarted. On request, programs can be notified of power restoration. An optional battery operated hardware clock resets the date and time of day when the system restarts. If the system does not have a battery back-up unit, or if the memory contents are not valid on power restoration, the system will perform a cold start (reboot).

If for any reason the system disk does not come back on line after power failure within a specific time after the CPU regains power the system shuts down.

Diagnostics can be run on individual devices during normal system operation. The system need not be shut down and run stand-alone in order to format disks, to position disk and tape heads, and to diagnose hardware faults on device drives.

Certain critical components can operate in degraded mode. For example, the memory cache can be disabled. The system places a component in degraded mode when errors pass a threshold.