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Letter Of Volatility
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LabJack T4, T4-OEM

Following is an overview of the memory spaces available on the T4. Access methods are described for firmware 1.0027.

All volatile memory is cleared by any reboot. In the specific case of removing/losing power supply voltage, it takes about 1 millisecond after losing the power supply for the T4 supply voltage to drop below the brown-out voltage, so power supply loss of 1 millisecond or more will result in a reboot when the power supply returns.

Memory Areas:

Bold items are memory areas designed to allow the user to store non-volatile information.

- Data memory, 128 kilobytes SRAM (volatile).
  - Statically assigned variables.
  - Heap.
  - User RAM. Read and write access through modbus.
- Program memory, 524 kilobytes Flash (non-volatile). The program memory is code-protected to prevent general reading through the programming interface.
  - Main firmware image. Written by the Bootstrap.
  - Bootstrap image. Loaded during factory setup.
- Flash, 4MB (non-volatile). Used for storing:
  - **User Area** (includes web pages). Read and write access through modbus. Also read by the HTTP server. Data is cleared 4k Bytes at a time using the Flash Erase command.
  - **Lua scripts**. The script that is saved in RAM is copied to flash memory when requested. The saved script can be read through modbus. Cleared by saving a blank or inconsequential script.
  - Reserved Area:
    - Backup Firmware Image. Read and write access through modbus. Also read by the Bootstrap.

- Emergency Recovery Firmware Image. Read and write access through modbus. Also read by the Bootstrap.
- Calibration Constants. Read and write access through modbus.
- Upgrade Log. Read and write access through modbus. Also read and written to by the Bootstrap.
- **Startup Settings**. IO Config and _Default registers as described in Section 24 of the T7 Datasheet. Cleared by writing IO_CONFIG_SET_DEFAULT_TO_FACTORY=1 and IO_CONFIG_SET_CURRENT_TO_FACTORY =1, and by writing default or junk values to all _DEFAULT registers.
- Device information such as SN, MAC, and Device. Read and write access through modbus.
- Information and checksums for all stored firmware images. Read and write access through modbus. Also read by the Bootstrap.

Clear All User Memory:

1A. To clear non-volatile user memory, the bold items above are cleared as described above. For a T4, clear the following:

- Lua Scripts
- Flash User Area
- Flash Startup Settings

As of firmware 1.0020 there is a register CLEAR_USER_MEMORY. Writing a value of 0x5317052E to this register will clear the 3 areas of non-volatile memory above.

2. To clear all volatile memory power-down or reboot the device.

Note that this clearing procedure clears *all memory designed for user access*, not *all memory*. If all memory was cleared, including things like calibration and firmware, the device would be unusable. Of particular note is that the Flash Reserved Area is not an area that an end user will write to during routine operation, but this area is writeable and readable through the Modbus interface. Some areas of the Reserved Area contain factory stored information critical to the basic operation of the device, and thus those areas are not cleared by the clearing procedure described here. It is possible that someone with malicious intentions could do modbus writes to store information in the Reserved Area for later retrieval after clearing.