ALE Peripherals MMIO Manual

MIDI Synthesizer

Address	Size	Description
`base`	`byte`	Storing *ch* ≥ *0* triggers the synthesizer to start playing a MIDI note in the channel *ch*.
`base + 2`	`short`	Instrument ID
`base + 4`	`byte`	Note
`base + 5`	`byte`	Note velocity
`base + 6`	`short`	Note duration

Self Driving Car

Address	Size	Description
base+0x00	byte	Storing “1” triggers the GPS device to start reading the coordinates and rotation of the car. The register is set to 0 when the reading is completed.
base+0x01	byte	Storing “1” triggers the Line Camera device to capture an image. The register is set to 0 when the capture is completed.
base+0x02	byte	Storing “1” triggers the Ultrasonic Sensor device to measure the distance in front of the car. The register is set to 0 when the measurement is completed.
base+0x04	word	Stores the Euler angle X of the car rotation at the moment of the last reading by the GPS.
base+0x08	word	Stores the Euler angle Y of the car rotation at the moment of the last reading by the GPS.
base+0x0C	word	Stores the Euler angle Z of the car rotation at the moment of the last reading by the GPS.
base+0x10	word	Stores the X-axis of the car position at the moment of the last reading by the GPS.
base+0x14	word	Stores the Y-axis of the car position at the moment of the last reading by the GPS.
base+0x18	word	Stores the Z-axis of the car position at the moment of the last reading by the GPS.
base+0x1C	word	Stores the distance (in centimeters) between the Ultrasonic sensor and the nearest obstacle. Returns -1 if there’s no obstacle within 20m.
base+0x20	byte	Sets the steering wheel direction. Negative values indicate steering to the left, positive values indicate steering to the right.
base+0x21	byte	Sets the engine direction. 1: forward. 0: off -1: backward.
base+0x22	byte	Sets the hand break. (1 = enabled)
base+0x24	256-byte array	Stores the image captured by the Line Camera. Each byte represents the luminance of a pixel.

General Purpose Timer

`base+0x00`	`byte`	Storing “1” triggers the GPT device to start reading the current system time. The register is set to 0 when the reading is completed.
`base+0x04`	`word`	Stores the time (in milliseconds) at the moment of the last reading by the GPT.
`base+0x08`	`word`	Storing *v > 0* programs the GPT to generate an external interruption after *v* milliseconds. It also sets this register to 0 after *v* milliseconds (immediately before generating the interruption).

Serial Port (dev version)

The serial port is connected to the terminal (stdout and stdin).

base+0x00	byte	Storing “1” triggers the serial port to write (to the stdout) the byte stored at base+0x01. The register is set to 0 when writing is completed.
base+0x01	byte	Byte to be written.
base+0x02	byte	Storing “1” triggers the serial port to read (from the stdin) a byte and store it at base+0x03. The register is set to 0 when reading is completed.
base+0x03	byte	Byte read. Null when stdin is empty.

Canvas (dev version)

base+0x00	byte	Storing “1” triggers the canvas to write an array of up to 504 bytes representing up to 126 pixels to the screen. The register is set to 0 when writing is completed.
base+0x02	half	Array size (in bytes).
base+0x04	word	The initial position to write the array on the canvas. The canvas is represented as a 512x512x4-byte one-dimensional array representing 512x512 pixels.
base+0x08 to base+0x200	word	504-byte array representing up to 126 pixels. Each pixel takes 4 bytes, one byte for each value: Red, Green, Blue, and Alpha (in this order).