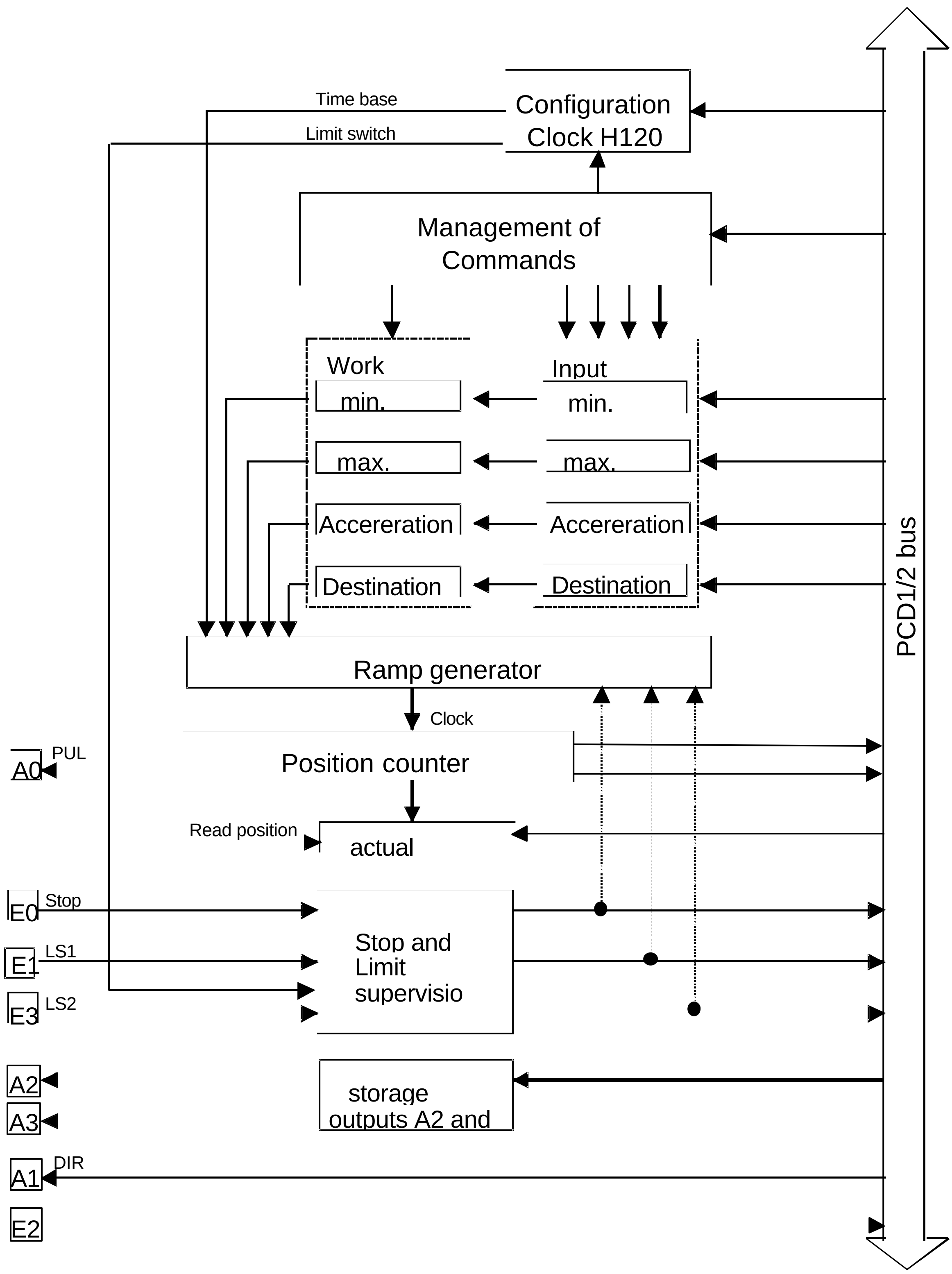
5. Functional Description

5.1 Block diagram of the module



5.2 Module description

Successful operation of a stepper motor requires the definition of 4 parameters:

- Start/stop frequency, i.e. the frequency with which a stepper motor can be started and stopped directly without losing steps
- Maximum frequency at which the stepper motor can be accelerated to run under all conditions
- Optimum acceleration at which to change from minimum to maximum frequency and back again.
- Number of steps to be executed in a travel

The first three parameters are motor or system-specific, i.e. they are defined once and then are not usually modified again. The fourth parameter, the number of steps to be executed, depends on the task and must be continuously revised by the user program.

The first three parameters are loaded during initialisation of the module and can also be changed individually if needed. The number of steps are normally loaded by the user program just before pulse output.

During initial configuration the time base is defined. A choice is possible between these ranges:

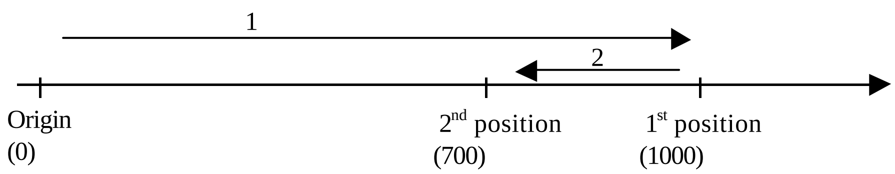
9.54 ... 2441 Hz, 19.08 ... 4883 Hz,
38.15 ... 9765 Hz or 76.30 ... 19'531 Hz

When the destination position is reached, a flag is set. Querying this flag controls the sequential processing of the user program.

It is also possible to interrupt a pulse string and then continue the interrupted movement concluding it without loss of steps according to the specification. However, this must be planned for in the user program.

The PCD2.H210 module works exclusively with relative position control. The path to reach the destination is always loaded (number of pulse) and then you need also to specify which way the movement has to be done (DIR).
E.g. in the following motion:

1) Load the path to destination 1000 (pulses) and set the output ‘A1’(DIR =1) to go in the right way. Then when the first position is reached.
2) Load the second path way 1000-700 = **300** (pulses) and invert the output ‘A1’(DIR = 0) .



Current position, i.e. internal counter status, can be read at any time.

The "absolute" position operation can also be done, but the use of FC is needed. Those FC will calculate the relative motion for the controller.For those FC see chapter 8.

Input "E0" (emergency stop) can be used to stop motion abruptly (without a braking ramp). Afterwards values must be redefined and motion re-initialized.

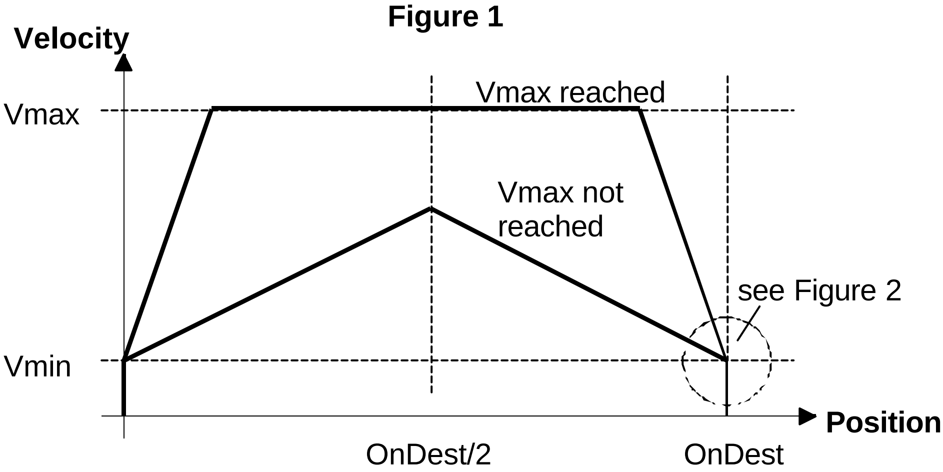
Apart from the emergency stop input (E 0) there are 3 other inputs (E1 - E3) available. 'E1' and 'E3' can be configured either as general purpose digital inputs, or as limit switches (LS1 and LS2. 'E2' is configured as a general purpose digital input.

Limit switches "LS1" and "LS2" and the emergency stop are normally closed and supply +24V to the inputs. Please note that smoothed DC voltage must be used (see technical data) because the input circuits have been designed for stops to happen without a delay, i.e. with stepping accuracy (time constant of input filter < 1 ms). If these inputs are not configured for limit or stop the behaviour is the same as for "normal" inputs.

LEDs always show the voltage at the relevant input.

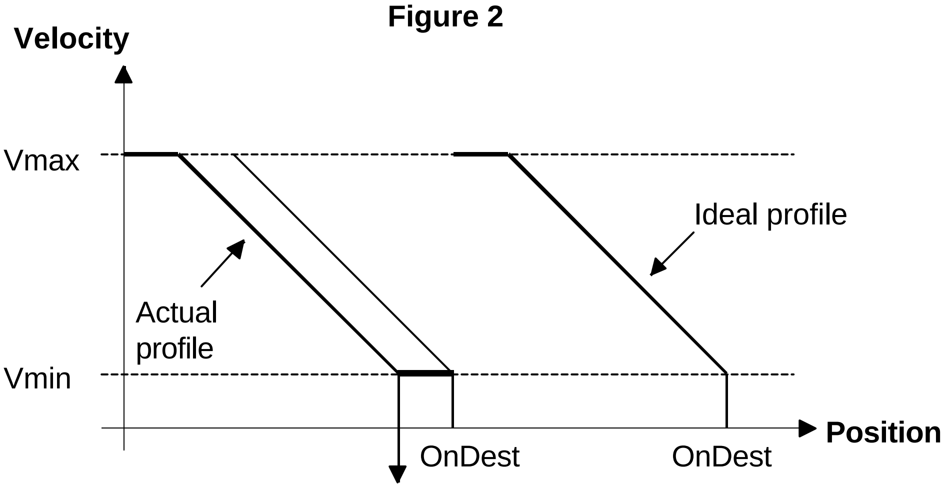
5.3 Additional information: frequency profile

Figure 1



Number of steps for acceleration = Number of steps for braking

Figure 2



Motion completed with some steps at Vmin

The equation shown below determines the maximum time for completion of a movement.

$$\text{max. time} = \frac{\text{Vmax}}{\text{Vmin}} \times \text{Tacc}$$

where:

Vmax = maximum velocity attained during movement
Vmin = minimum programmed velocity (start-stop frequency)
Tacc = acceleration time: n * 250 µs $(1 \leq n \leq 255)$

Please note: The formula shown corresponds to the worst case. Small modifications to parameters Vmax, Vmin and Tacc can optimize motion and completion time.

