FALCOM
WIRELESS COMMUNICATIONS GMBH

BIOS Communication version 1.4 or later

Application Notes

For STEPPII-55/56 & STEPPII-55/56-LT

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1 INTRODUCTION

1.1 Features

- Bidirectional three wire communication
- Watchdog functionality
- Can be used to:
  - ✓ query states (ACCU voltage, poor battery voltage etc..)
  - ✓ send commands (reset GPS, enable/disable GSM voltage etc..)
    - ♦ receive command responses
  - ✓ enter sleep modes (configurable wakeup sources)

1.2 Restrictions

- Before sending or receiving BIOS data, communication must be set up properly. Please, see section 2 "Detection" for further details.
- Sleep mode command won't be responded (because STEPPII is sleeping right now after issuing this command)
- In case "RING" (or SMS) is set as only wakeup source, STEPPII needs sufficient GSM coverage in order to receive a Call or SMS. The device cannot return from sleep mode if there is no sufficient GSM signal strength.
  - ✓ Therefore it is recommended to combine a "RING" wakeup with a "TIMER" always.

Important:

- ☝ Do not start STEPPII-LT with internal battery only.
  - ♦ The purpose of the internal battery is to act as backup battery in case of an external power loss only. It is strongly not recommended to use this battery as only power source when starting.
  - ♦ GSM hardware reset is not possible in this mode.

2 DETECTION

This procedure is necessary to detect BIOS version 1.x and to enable the associated features (configurable wakeup sources for sleep mode etc.).

Before this detection, no communication is possible between STEPPII and the microcontroller.

For BIOS detection only GPIO10 is required.

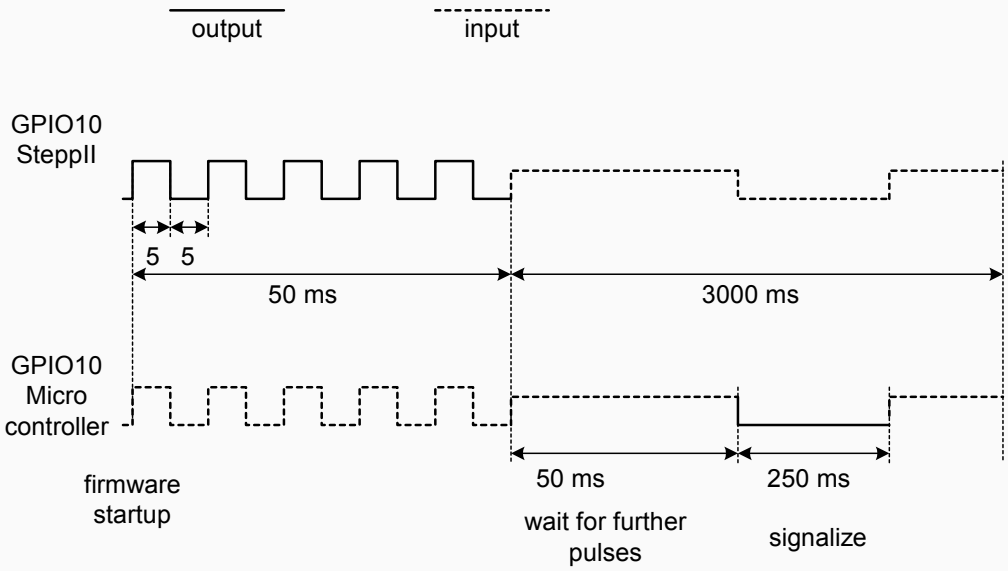
2.1 Steps of detection

After firmware startup, GPIO10 is configured as output and performs 5 pulses (using a pulse width of 5ms; the time between pulses is also 5ms).

After these pulses, GPIO10 is configured as input for the next three seconds.

At this time, the internal microcontroller must hold down the line for approximately 250 ms in order to signalize version 1.x (its ability to communicate with STEPPII)

If GPIO10 isn't hold down, firmware will detect the old BIOS version, which supports only IGN sleep and watchdog.



2.2 Watchdog detection

To prevent a watchdog reset, pin DO (for more detail see chapter 3 "Communication") must be toggled at least once each 2 minutes.

This is usually done between 2 commands (the commands itself also cause the pin DO to toggle – but it is recommended also to toggle every once and a while between 2 commands in order to prevent a watchdog reset).

3 COMMUNICATION

This chapter describes how to transfer data between STEPPII and the internal microcontroller.

Three GPIO's are used for communication – "clock", "data in" and "data out".

GPIO	Name	Function	STEPPII	Micro controller
10	CLK	STEEPPII Clock	Output	Input
0	DI	STEPPII Data IN	Input	Output
1	DO	STEPPII Data OUT	Output	Input
OUT	**Name**	**Function**	**STEPPII**	**Micro controller**
5	SYNC	STEPPII Byte SYNC	Output	Input

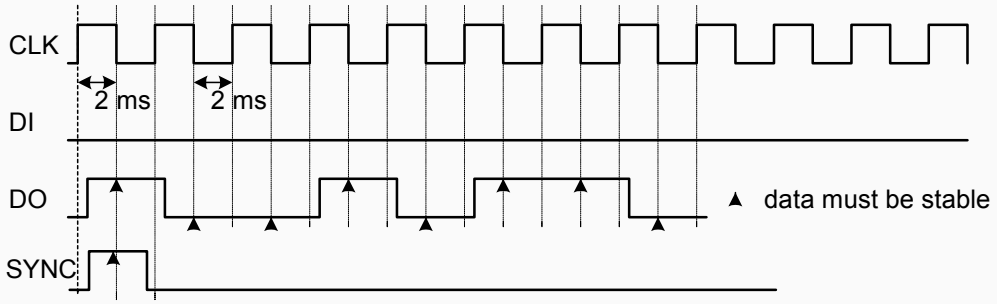
Data transfer happens synchronously – which means, whenever one byte data is sent to microcontroller, one byte is also read back as answer.

SYNC is used to mark the first bit of a byte in order to maintain synchronisation.

3.1 Sending data to microcontroller

When STEPPII sends commands to microcontroller, the expected answer must be always 0x00 (as shown in the following example).

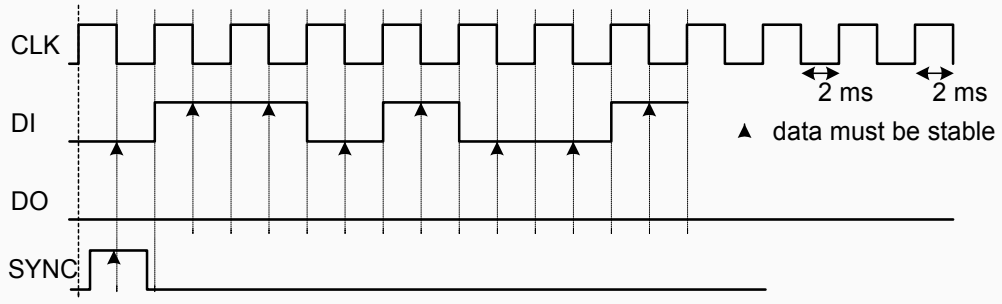
In case the answer byte doesn't contain a 0x00, a communication error will be detected.



Example: sending 0x96 to Micro controller

3.2 Receiving data from microcontroller

When STEPPII receives data from microcontroller, 0x00 will be sent as "command data" In case the command byte doesn't contain a 0x00, the microcontroller will interrupt its answer mode and switches to command mode.



Example: receiving 0x69 from Micro controller

4 COMMANDS

After each command, a few answer bytes will be read. The number of bytes being read depends on the command itself.

4.1 Version

It reads out complete version information.

Cmd	**1 Byte**	v	
Answer	**5 Byte**	<major>.<minor><devicetype><HwRev>	
		<major>,<minor>	Number from 0-9
		<devicetype>	'i' for STEPPII-LT 'e' for STEPPII
		<HwRev>	G - ... for hardware revisions
		Example	***1.2iG***

4.2 Sleep Mode

It enters sleep mode and defines wakeup conditions.

Cmd	**3 Byte**	s<condition_flag><timeout>	
		<condition_flag>	Bit 7: 0x80 - IGN Shutdown Bit 6: 0x40 - Ring Shutdown Bit 5: 0x20 - Sleep Timer Bit 4: 0x10 - External Power Shutdown (to detect low bat)
		<timeout>	Binary value (required only if Sleep Timer flag is set inside <condition_flag>) This value specifies the sleep time multiplied with 10 minutes. (i.e. a value of 0x0A means 10*10 minutes= 1h,40 minutes sleep duration)
Answer	-	No answer is required here – the command is executed immidiately and SteppII falls asleep	

4.3 Wakeup reason

It returns wakeup condition, which caused the wakeup.

Cmd	**1 Byte**	u	
Answer	**3 bytes**	'>'<condition_flag>	
		<condition_flag>	Bit 7: 0x80 - IGN Shutdown Bit 6: 0x40 - Ring Shutdown Bit 5: 0x20 - Sleep Timer Bit 4: 0x10 - External Power Shutdown (to detect low bat) - **currently not provided.**

4.4 Battery state

It returns the complete battery state (voltage plus low power detection flag).

Cmd	**1 Byte**	b	
Answer	**3 bytes**	'>'<bat_flags><voltage>	
		<bat_flags>	Bit7: 0x80 - set if low power is detected (low power shutdown will be entered in this case)
		<voltage>	Binary value from 0x00 to 0xFF. **Calculation:** <voltage>= <bat_voltage>*255 / 4.5 <bat_voltage> - is the true battery voltage in volts. (this value may not exeed 4.5V).

4.5 GSM

It enables or disables GSM.

> Note that this command is available only if an external power source has been applied (Therefore it is not recommended to start SteppII-LT only with its internal battery).

Cmd	**(2 Byte)**	`g<enable>`	
		<enable>	'1' Enables GSM voltage '0' Disables GSM voltage
Answer	**3 bytes**	`">OK"` **OR** `">ER"`	

4.6 Internal accu

It uses internal ACCU always or automatically (ACCU usage can be controlled with the external "accu pin" – pulling it to GND or leaving it open).

Cmd	**(2 Byte)**	`a<always>`	
		<always>	'1' Uses internal accu always. '0' Uses ACCU depending on whether external accu pin is pulled to GND or not.
Answer	**3 bytes**	`">OK"` **OR** `">ER"`	

4.7 GPS reset

It performs a complete system reset by turning off and on GPS voltage.

Cmd	**1 Byte**	`r`
Answer	**-**	No answer is given because the firmware resets immediately after sending this command.