



Using the MagAlpha Serial Interface Advanced Features

Application Note

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TABLE OF CONTENTS

INTRODUCTION 3

PARITY BIT (SPI AND SSI)..... 3

CONCATENATED READ/WRITE REGISTERS (SPI ONLY)..... 4

READ ANGLE WITH SSI USING SPI HOST 6

INTRODUCTION

This MagAlpha serial interface has some advanced features that are not listed in the datasheets. This application note explains what they are and how to use them.

PARITY BIT (SPI AND SSI)

This parity bit, or check bit, is a bit added to a string of binary code to ensure that the total number of 1 in the string is even (see Table 1). Parity bits are used as error detecting code.

The MagAlpha transmits the parity bit at the 17th clock edge.

Table 1: Parity Bit Behavior Overview 16-Bits Angle Value

16-Bits Angle Value	Number of Bits Set to "1"	16-Bits Angle Value + 1-Bit Parity Check
0000000000000000	0	0000000000000000 0
1000110001100010	6	1000110001100010 0
1000110001100011	7	1000110001100011 1
0101110100000000	5	0101110100000000 1

Figure 1 through Figure 4 show SPI and SSI frames with and without parity bits.

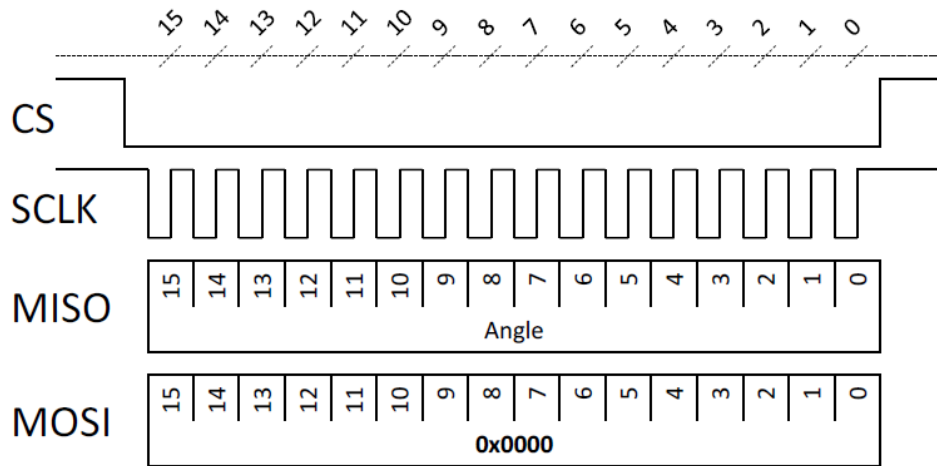


Figure 1: SPI Frame without Parity Bit

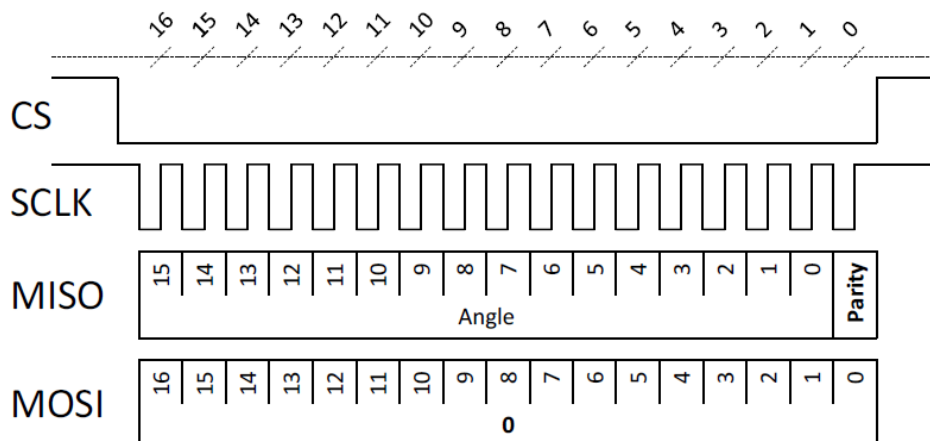


Figure 2: SPI Frame with Parity Bit

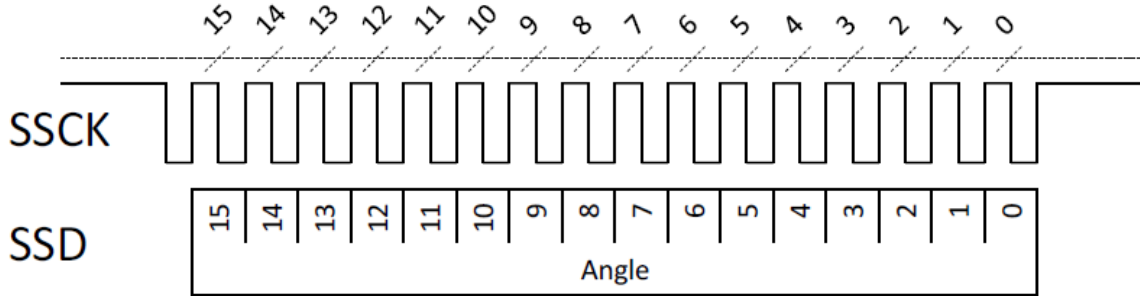


Figure 3: SSI Frame without Parity Bit

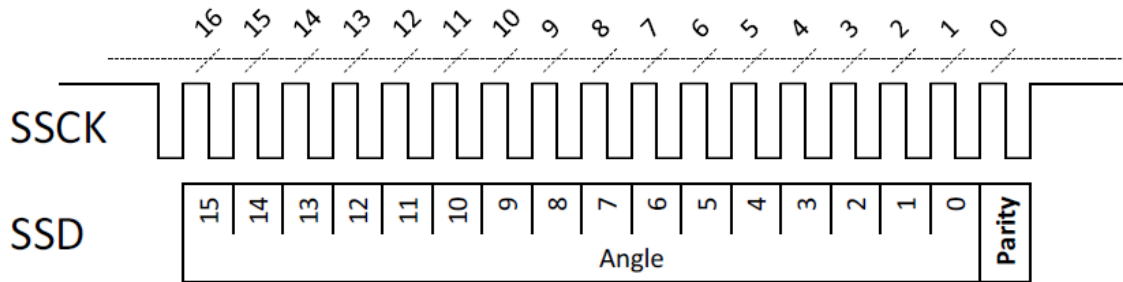


Figure 4: SSI Frame with Parity Bit

CONCATENATED READ/WRITE REGISTERS (SPI ONLY)

It is possible to concatenate multiple read or write register commands together to save time. To concatenate read/write frames together, simply send the next read/write command while reading the previous register value.

The last SPI frame of the sequence must send 0x0000 to the MagAlpha to set the sensor in angle readback mode (see Figure 5). If this is not done, the next read angle operation will return a register value instead of an angle.

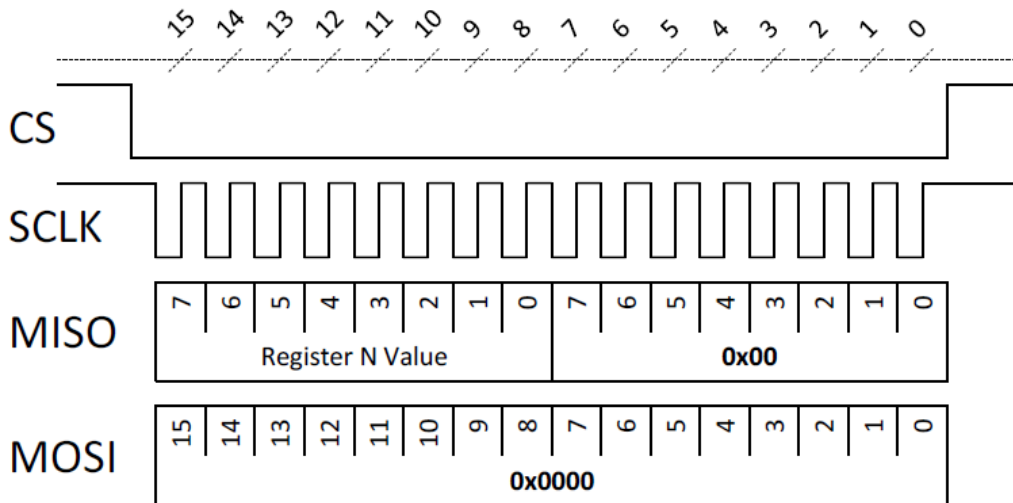


Figure 5: SPI Last Concatenated Frame of the Sequence Must Send 0x0000 Value to the Sensor

Figure 6 to Figure 9 show the difference between the standard read/write commands and the concatenated commands for both SPI and SSI protocols.

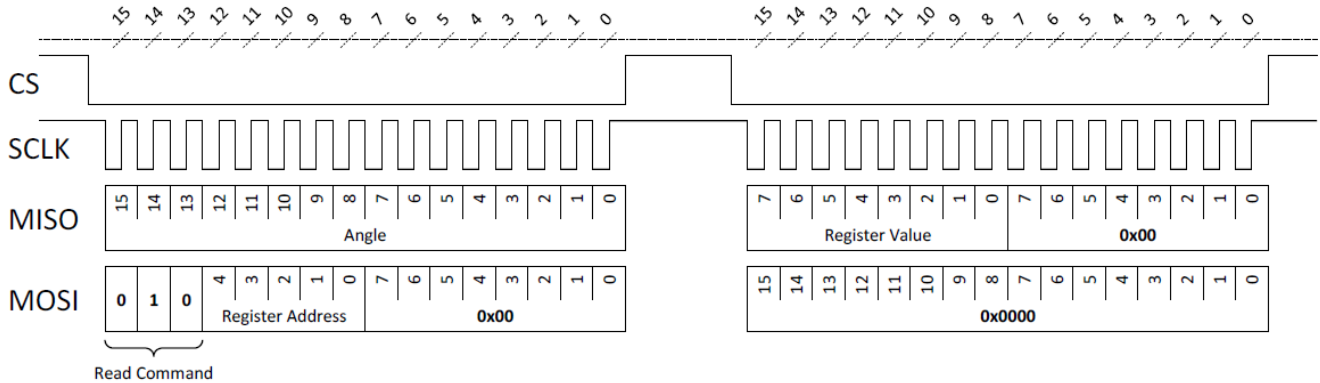


Figure 6: SPI Standard Read Command

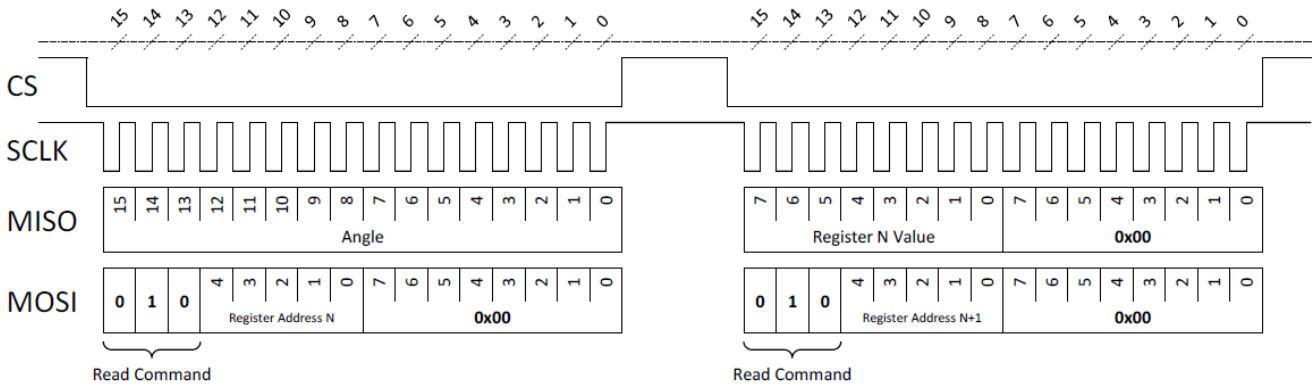


Figure 7: SPI Concatenated Read Commands

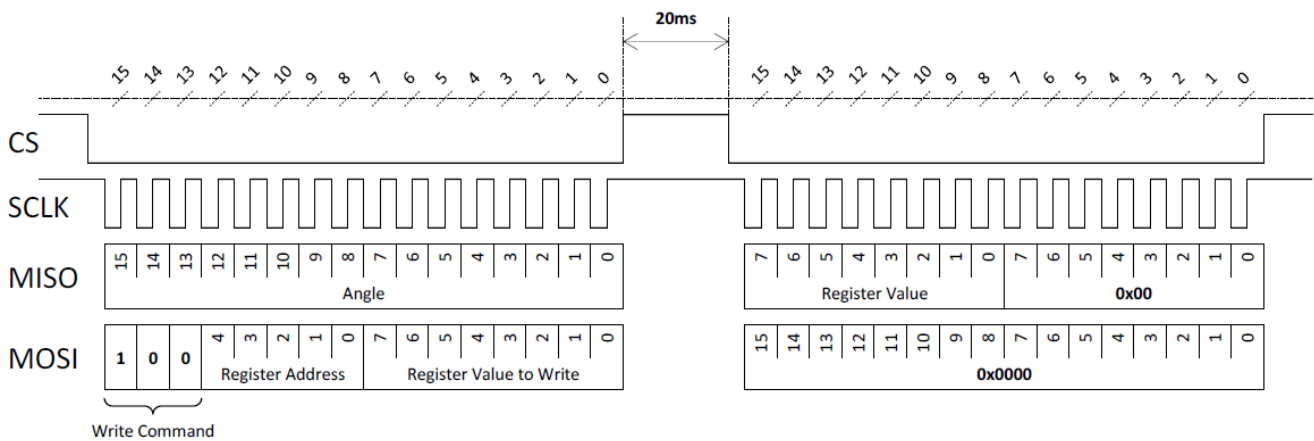


Figure 8: SPI Standard Write Command

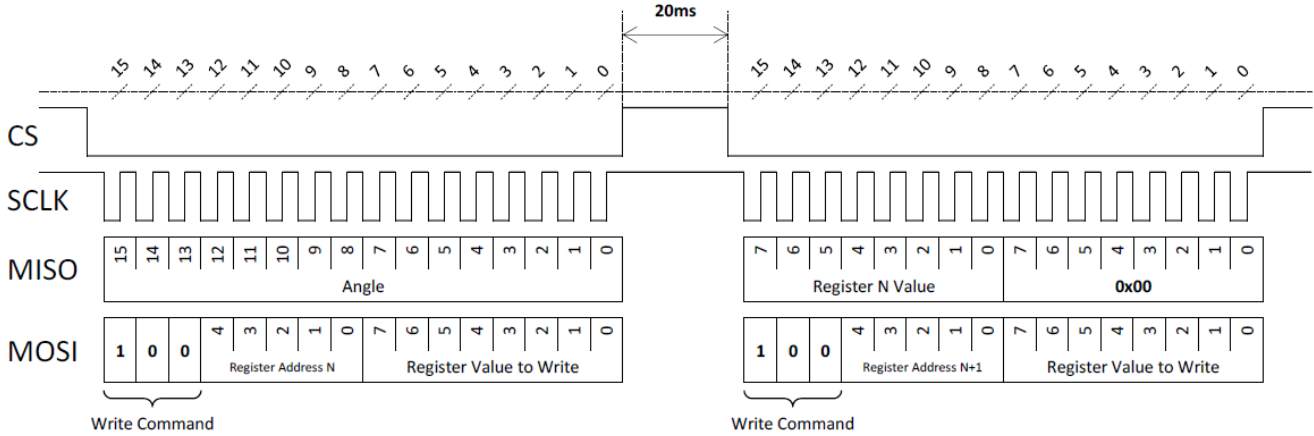


Figure 9: SPI Concatenated Write Commands

READ ANGLE WITH SSI USING SPI HOST

It is possible to emulate an SSI host by using an SPI interface in Mode 2 (CPOL 1, CPHA 0) (see Table 2 and Table 3).

Please note that not all SPI Mode 2 will work out of the box. Some MCUs propagate the MSB bit with the CS falling edge instead of with the first clock rising edge and therefore do not add an extra clock to the SPI frame. In this case, it is required to add an extra clock count manually to read the correct number of bits (17 clock count to read a 16-bit angle) (see Figure 10).

If adding an extra bit at the beginning of the frame, do not forget to mask out the MSB bit (see the pseudo code below).

```
angle = spi17bitsOutputValue & 0x0FF;
```

Table 2: SSI SPI Signal Mapping

	SPI	SSI
Clock	SCLK	SSCK
Data from the sensor to the host	MISO	SSD

Table 3: SSI Emulation with SPI Mode 2

	SPI Mode 2	SSI
Clock idle state	High	High
Data propagation edge	Rising edge	Rising edge
Data capture edge	Falling edge	Falling edge

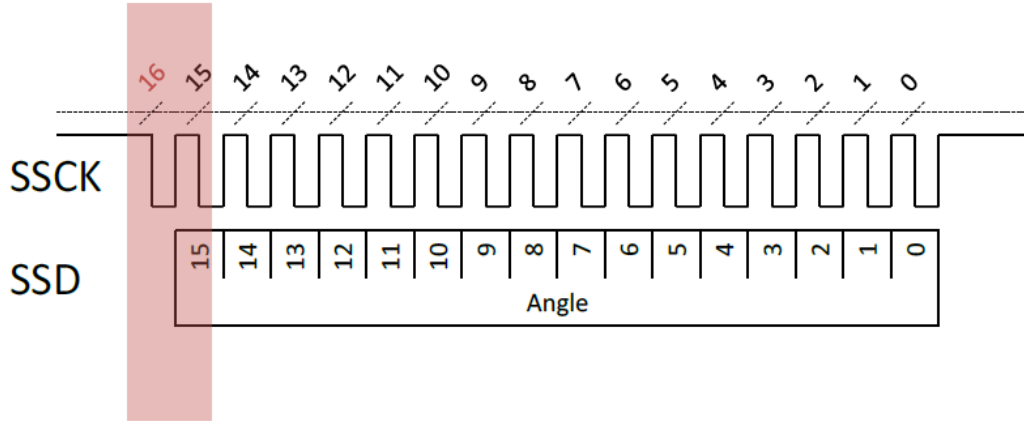


Figure 10: Possible Clock Count Issue with SSI Emulation