Serial communication with GS311 series of sensors

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Introduction

This application note describes how to communicate with the 8-pin GS311 series of sensors with a simple protocol. This protocol provides users a cost-effective method to communicate with the sensor through a RS-232 or RS-485 half-duplex serial communication link. Commands are available to read sensor real-time measurement/status, calibrate sensors and do sensors self-test.

Hardware Interfacing

The following pins are provided to build a serial data link between an GS311 series sensor (with –C option) with a monitor hardware, which can be a PC or a MPU. These are TTL level RS-232 signals, so a level converter is required to communicate with the RS-232 or RS-485 standard device, like a PC.

Table 1: Pins for Serial Communication

Pin	Color	Function
6	Blue	Communication TX output
7	Brown	Communication RX input
8	Green	RS-485 direction output

The serial port is configured as following and it cannot be changed:

Table 2: Serial Communication Setup

Baud rate	19200
Parity	No
Data bits	8
Stop bits	1
Flow control	No

Communication Format

Through the RS-232 or RS-485, the sensor can be visited with commands. The sensor sends back one or multiple response to the terminal to indicate that the command succeeds. Each command or response consists of an ID, data, and a checksum (Table 3). All the commands/responses are hex value.

Table 3: Command/Response Format

No.	Length (BYTE)	Name	Explanation
1	1	ID	Command/Response ID
2	0 or any number	Data	Command/Response data
3	1	Checksum	Checksum for ID and Data

Each command is identified by an ID and there is only one type of response to each command. The command, which is sent from the monitor to the sensor, begins with 0x50, while the response, which is from sensor to the monitor, begins with 0xA0. The next command can be sent only after the response of the current command is received.

The checksum is computed by adding all the data and ID fields together. Each command has a fixed length. If there is no data, the checksum should be equal to the ID.

Definition

X/Y sample:	The raw ADC value minus the offset. It is between –2047 to +2047and big-endian.
X/Y offset:	The raw ADC value. It is used to compute the sample value. It is between 0 to 4095 and big-endian.
LED Status:	The bit 7 to bit 4 is the status of left, right, rear and front LED; the bit 3 to bit 0 is the current threshold value (0-7). Table 4 gives the value with the threshold angle.
Sequential Number:	An auto-increased number, from 0 to 255.
Version Strings:	A few ASCII strings about the version of current firmware, total 29 bytes.
Reset String:	Every time the sensor resets, it sends a string “Init ADuC814 Done.” via the serial port.
Reserved IDs:	All the ID values other than that listed in the Commands and Response section are reserved.

Table 4: Threshold Angle

Threshold Value	Threshold Angle (°)
0	5
1	10
2	15
3	20
4	25
5	30
6	35
7	40

Commands and Response

START_READ: Request the sensor to send the samples to the monitor. The samples are sent one by one, till the monitor sends an STOP_READ command to stop it. Other commands except the STOP_READ cannot be accepted after the START_READ is issued.

No.	Command	Response
1	0x50	0xa0
2		X sample
3		
4		Y sample
5		
6		LED Status
7		Sequential number

STOP_READ: Stop sending the samples

No.	Command	Response
1	0x51	0xa1

SET_OFFSET: Set the offset

No.	Command	Response
1	0x52	0xa2
2	X offset	
3		
4	Y offset	
5		

GET_OFFSET: Read the offset to monitor

No.	Command	Response
1	0x53	0xa3
2		X offset
3		
4		Y offset
5		

RESET_OFFSET: Set the current sensor position as the 0. 12 samples are averaged as the current offsets, and they are sent to the monitor with the response.

No.	Command	Response
1	0x54	0xa4
2		X offset
3		
4		Y offset
5		

GET_ECHO: Return all the bytes in command

No.	Command	Response
1	0x56	0xa6
2	Echo BYTE 1	Echo BYTE 1
3	Echo BYTE 2	Echo BYTE 2
4	Echo BYTE 3	Echo BYTE 3
5	Echo BYTE 4	Echo BYTE 4

GET_VERSION: Return current software version

No.	Command	Response
1	0x57	0xa7
2 – 30		Version Strings.

START_SELFTEST: Set the sensor in self-test status, which give a voltage offset to the X and Y ADC channels. The X sample or Y sample increase about 86 each.

No.	Command	Response
1	0x59	0xa9

STOP_SELFTEST: Set the sensor to leave the self-test status

No.	Command	Response
1	0x5a	0xaa

Examples

Monitor sends (HEX)	**Monitor received (HEX)**	**Instructions**
50 50		Start transfer the samples
	a0 00 00 00 00 06 01 a7	The first sample, X sample=0, Y sample=0, no LED is ON, the threshold is 35°
	a0 ff fe 00 00 06 02 a5	The second sample, X sample= -1, Y sample=0, no LED is ON, the threshold is 35°
51 51		Stop the sending
	a1 a1	OK
53 53		Get the offset
	a3 07 b3 07 bc 20	OK, X offset is 1971 and the Y offset is 1980
52 08 34 07 85 1a		Set the X offset=2100 and Y offset=1925
	a2 a2	OK

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