

uSherpa Binary Protocol

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Input Packets

General Packet format

Byte #	1	2	3	n	4+n
Description	Start of packet 0x24 \$	Packet length (total bytes including predefined)	Packet type	Data (Defined by packet type)	CRC

Packet type

Description	Value	Data length (bytes)
NULL	0x00	0
RESERVED	0x01	n
System Info	0x02	2
Pin function (setup)	0x04	2
Pin control	0x05	2
PWM function (setup)	0x06	3
PWM control	0x07	3
External Interrupt function (setup)	0x0A	2
RESET	0xFF	0

Pin function (setup)

Byte	Description
1	Pin number (0x PORT PIN, i.e. P2.3 -> 0x23)
2	Pin function

Description	Byte 2 value
Set pin as input float	0x00
Set pin as input pull-up	0x01
Set pin as input pull-down	0x02
Set pin as output	0x03
Set pin as analog in	0x04
Set pin as PWM	0x05

Pin control

Byte	Description
1	Pin number
2	Pin value

Description	Byte 2 value
Clear pin	0x00
Set pin	0x01
Toggle pin	0x02
Digital pin read	0x03
Analog pin read	0x04
Pulse length read (PWM read)	0x05

PWM function (setup)

Byte	Description
1	Pin number

2	PWM period LSB
3	PWM period MSB

Description	Byte 2+3 value
PWM period in ms	0x0000 - 0xFFFF

PWM control

Byte	Description
1	Pin number
2	PWM duty cycle

Description	Byte 2 value
PWM duty cycle	0x00 - 0xFF 0x00 = 0%, 0xFF = 100%

CRC

Simple CRC is calculated by adding up bytes 2 to n (all bytes btw. package start and CRC). In C code this would look something like this:

```
unsigned char *pkt;          // pointer to whole package
unsigned char  crc = 0;      // resulting 1 byte CRC

for(int i = 1; i < pkt[1] - 1; i++) crc += pkt[i];
```

Return Packets

General Packet format

Byte #	1	2	3	n	4+n
Description	Start of packet 0x2B +	Packet length (total bytes including predefined)	Packet type	Data (Defined by packet type)	CRC

Packet type

Description	Value	Data length (bytes)
NULL	0x00	0
STATUS / ERROR	0x01	1
System Info	0x02	2
Digital pin read	0x03	2
Analog pin read	0x04	3
Pulse length read	0x05	3
RESET	0xFF	0

System info

Byte #	1	2	3
Description	Board-Type	MCU-Type	Firmware revision

Board-Type

Description	Byte 1 value
Unknown	0x00
TI Launchpad	0x01

MCU-Type

Description	Byte 2 value
Unknown	0x00
TI MSP430G2553	0x01

STATUS / ERROR

Status type	Value
Unknown	0x00
ACK	0x01
Bad CRC / Malformed packet	0x02
Invalid packet type	0x03
Invalid data	0x04
Invalid pin command	0x05

Digital pin read

Byte	Description
1	Pin number
2	Pin value

Description	Byte 2 value
Pin low	0x00
Pin high	0x01

Analog pin read

Byte	Description
1	Pin number
2	Analog value LSB
3	Analog value MSB

CRC

see CRC for *Input Packages*

Example Packages

Read System Info

Send system info request packet to MCU

0x24	0x04	0x02		0x06
Start of packet	Packet length	Packet type	Data	CRC
\$	4 Bytes	System Info	Empty	

Result packet received from MCU **on Success**

0x2B	0x07	0x02	0x01 0x01 0x01	0x0C
Start of packet	Packet length	Packet type	Data	CRC
+	7 Bytes	System Info	[0] Board-Type [1] MCU-Type [2] Firmware Rev.	

Digital output

Configure pin as output

Send pin function output to MCU

0x24	0x06	0x04	0x14 0x03	0x21
Start of packet	Packet length	Packet type	Data	CRC
\$	6 Bytes	Pin function (setup)	[0] Pin P1.4 [1] Set pin as output	

Result received from MCU **on Success**

0x2B	0x05	0x01	0x01	0x07
Start of packet	Packet length	Packet type	Data	CRC
+	5 Bytes	STATUS / ERROR	[0] ACK	

Set output pin to HIGH

Send pin control HIGH to MCU

0x24	0x06	0x05	0x14 0x01	0x20
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Start of packet \$	Packet length 6 Bytes	Packet type Pin control	Data [0] Pin P1.4 [1] Set to HIGH	CRC
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Result received from MCU **on Success**

0x2B	0x05	0x01	0x01	0x07
Start of packet +	Packet length 5 Bytes	Packet type STATUS / ERROR	Data [0] ACK	CRC

Digital input

Configure pin as input with pull-down enabled

Send pin function input pull-down to MCU

0x24	0x06	0x04	0x15 0x02	0x21
Start of packet \$	Packet length 6 Bytes	Packet type Pin function (setup)	Data [0] Pin P1.5 [1] Set pin input with pull-down enabled	CRC

Result received from MCU **on Success**

0x2B	0x05	0x01	0x01	0x07
Start of packet +	Packet length 5 Bytes	Packet type STATUS / ERROR	Data [0] ACK	CRC

Read input state

Send pin control read to MCU

0x24	0x06	0x05	0x15 0x03	0x23
Start of packet \$	Packet length 6 Bytes	Packet type Pin control	Data [0] Pin P1.5 [1] Digital pin read	CRC

Result received from MCU **on Success**

0x2B	0x06	0x03	0x15 0x01	0x1F
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Start of packet +	Packet length <i>6 Bytes</i>	Packet type <i>Digital pin read</i>	Data <i>[0] Pin P1.5 [1] Pin state is HIGH</i>	CRC
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Analog input

Configure pin as analog input

Send pin function analog input to MCU

0x24	0x06	0x04	0x20 0x04	0x2E
Start of packet \$	Packet length <i>6 Bytes</i>	Packet type <i>Pin function (setup)</i>	Data <i>[0] Pin P2.0 [1] Set pin analog input</i>	CRC

Result received from MCU **on Success**

0x2B	0x05	0x01	0x01	0x07
Start of packet +	Packet length <i>5 Bytes</i>	Packet type <i>STATUS / ERROR</i>	Data <i>[0] ACK</i>	CRC

Read input state

Send pin control read to MCU

0x24	0x06	0x05	0x20 0x04	0x2F
Start of packet \$	Packet length <i>6 Bytes</i>	Packet type <i>Pin control</i>	Data <i>[0] Pin P2.0 [1] Analog pin read</i>	CRC

Result received from MCU **on Success**

0x2B	0x07	0x04	0x20 0x00 0xAB	0xD6
Start of packet +	Packet length <i>7 Bytes</i>	Packet type <i>Analog pin read</i>	Data <i>[0] Pin P2.0 [1] LSB of ADC sample [2] MSB of ADC sample</i>	CRC

Using PWM

Configure pin as PWM

Send pin function PWM to MCU

0x24	0x06	0x04	0x21 0x05	0x30
Start of packet \$	Packet length 6 Bytes	Packet type Pin function (setup)	Data [0] Pin P2.1 [1] Set pin as output	CRC

Result received from MCU **on Success**

0x2B	0x05	0x01	0x01	0x07
Start of packet +	Packet length 5 Bytes	Packet type STATUS / ERROR	Data [0] ACK	CRC

Setup PWM

Send PWM function (setup) to MCU

0x24	0x07	0x06	0x21 0x00 0x14	0x42
Start of packet \$	Packet length 7 Bytes	Packet type PWM function (setup)	Data [0] Pin P2.1 [1] Period in ms LSB [2] Period in ms MSB (20ms)	CRC

Result received from MCU **on Success**

0x2B	0x05	0x01	0x01	0x07
Start of packet +	Packet length 5 Bytes	Packet type STATUS / ERROR	Data [0] ACK	CRC

Change duty cycle

Send PWM control to MCU

0x24	0x06	0x07	0x21 0x13	0x41
Start of packet \$	Packet length 6 Bytes	Packet type PWM control	Data [0] Pin P2.1 [1] duty cycle (7.5% ~ 1.5ms)*	CRC

*) Period is set to 20ms
1.5ms is 7.5% of 20ms

100% duty cycle equals 0xFF (255)
Thus, 1% equals 2.55, and 7.5% equals 19.125 (~0x13)

Result received from MCU **on Success**

0x2B	0x05	0x01	0x01	0x07
Start of packet +	Packet length <i>5 Bytes</i>	Packet type <i>STATUS / ERROR</i>	Data <i>[0] ACK</i>	CRC