

Appendix)

Monitor & Control Specifications for FSK Communications Interface

Rev. 3.0

June 14 2013

1. FSK Communications Specifications

(1) Transmitter

- a. Frequency 650 kHz +/-5%
- b. FSK deviation +/- 60 kHz Nominal (+60 kHz mark)
- c. Deviation tolerance +/- 50 kHz minimum ; +/-70 kHz maximum
- d. Output Level -5 to -15 dBm
- e. Output impedance 50 Ohm
- f. Start Tone 710 kHz
- g. Start Tone Time 10 ms minimum

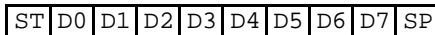
(2) Receiver

- a. Locking range +/- 32.5 kHz
- b. Input impedance 50 Ohm
- c. Input Sensitivity -15 dBm

(3) Transmission Protocol

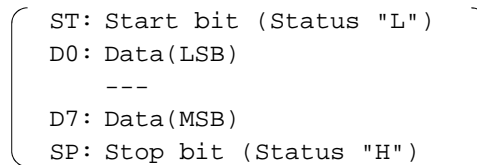
- a. Operation Mode Legacy-Binary
- b. Transfer Rate 9600 bit/s
- c. Data Format 1 start bit, 8 data bits, 1 stop bit

No Parity



← Transmit

(The least significant bit (LSB) is sent first.)



- d. Maximum Response Time 50 ms
- e. Message Rate 1 every 20 ms

2. Packet Format

(1) Byte Configuration

- a. Data Packet Length 7 Bytes
- b. Byte Configuration

Byte	Command (IDU to BUC)	Response (BUC to IDU)
1st	BUC Address (*1)	BUC Address (*2)
2nd	Command	Data Byte 1
3rd	Data Byte 1	Data Byte 2
4th	Data Byte 2	Data Byte 3
5th	Data Byte 3	Data Byte 4
6th	Data Byte 4	Data Byte 5
7th	Check Sum (*3)	Check Sum (*3)

- *1: Initial setting of a BUC address is 0x01.
- *2: Responder address is shifted left by 4 bits.
- *3: Algebraic sum of bytes 1 through 6.
Spare bytes are always filled with 0xAA (10101010).

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3. Command & Response Message Structure

The last state of the BUC condition is stored to inside memory, so when the BUC is re-turned DC power on again, the state is reproduced last condition.

(1) Command Message Structure (IDU to BUC)

a. Request Status 1

Byte	Name	Description	Value
1	Address	Address of BUC	0x01 (to 0x0F)
2	Command	Request Status 1	0x01
3	Data Byte 1	Not used	0xAA
4	Data Byte 2	Not used	0xAA
5	Data Byte 3	Not used	0xAA
6	Data Byte 4	Not used	0xAA
7	Checksum	Algebraic sum of bytes 1 - 6	

b. Set Transmit On/Off State

Byte	Name	Description	Value
1	Address	Address of BUC	0x01 (to 0x0F)
2	Command	Tx On/Off	0x02
3	Data Byte 1	Tx Control	Off:0x00/On:0x01
4	Data Byte 2	Not used	0xAA
5	Data Byte 3	Not used	0xAA
6	Data Byte 4	Not used	0xAA
7	Checksum	Algebraic sum of bytes 1 - 6	

c. Change BUC Address (N/A)

Byte	Name	Description	Value
1	Address	Address of BUC	0x01 (to 0x0F)
2	Command	Change Address	0x03
3	Data Byte 1	New Address	0x01 to 0x0F
4	Data Byte 2	Not used	0xAA
5	Data Byte 3	Not used	0xAA
6	Data Byte 4	Not used	0xAA
7	Checksum	Algebraic sum of bytes 1 - 6	

This command is not applicabe (N/A) in this version.

d. Set Carrier Frequency (N/A)

Byte	Name	Description	Value
1	Address	Address of BUC	0x01 (to 0x0F)
2	Command	Set Carrier Frequency	0x04
3	Data Byte 1	Carrier Frequency	MSbyte
4	Data Byte 2	Carrier Frequency	LSbyte
5	Data Byte 3	Not used	0xAA
6	Data Byte 4	Not used	0xAA
7	Checksum	Algebraic sum of bytes 1 - 6	

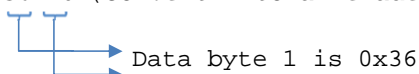
This command is not applicabe (N/A) in this version.

Data Field Definition

Carrier Frequency	Unsigned integer in MHz
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ex).

14000 MHz : 36 B0 (Convert into a hexadecimal number)



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e. Set Attenuator

Byte	Name	Description	Value
1	Address	Address of BUC	0x01 (to 0x0F)
2	Command	Set Attenuator	0x05
3	Data Byte 1	Attenuator Selection 1 or 2	Att.1 0x01 Att.2 0x02 *1
4	Data Byte 2	Setting Att. in 10dB digit	0x00 or 0x01 *2
5	Data Byte 3	Setting Att. in 1dB digit	0x00 to 0x09 *2
6	Data Byte 4	Setting Att. bit in 0.5dB digit	0x00 or 0x05 *2
7	Checksum	Algebraic sum of bytes 1 - 6	

*1 Att.1 is available, Att.2 is not available.

*2 Dynamic range and step size of the step attenuator: 15.5dB in 0.5dB step

ex) 12.5dB : Data byte 2 is 0x01
 Data byte 3 is 0x02
 Data byte 4 is 0x05

f. Request Status 2

Byte	Name	Description	Value
1	Address	Address of BUC	0x01 (to 0x0F)
2	Command	Request Status 2	0x06
3	Data Byte 1	Attenuator Selection 1 or 2	Att.1 0x01 Att.2 0x02
4	Data Byte 2	Not used	0xAA
5	Data Byte 3	Not used	0xAA
6	Data Byte 4	Not used	0xAA
7	Checksum	Algebraic sum of bytes 1 - 6	

(2) Response Message Structure (BUC to IDU)

a. Request Status 1

Byte	Name	Description	Value
1	Address	Address of BUC shifted left by 4	0x10 (to 0xF0)
2	Level Byte 1	MSbyte of Tx Output Power	*1
3	Level Byte 2	LSbyte of Tx Output Power	*1
4	Temperature	Temperature in deg. C	*2
5	Status Byte 1	Bit 0: Temperature Out-of-Range	1:Fail , 0:Normal
		Bit 1: PLL Out-of-Lock	1:Fail , 0:Normal
		Bit 2: Checksum Error	1:Error , 0:Normal
		Bit 3: Tx Status	1:Tx On , 0:Tx Off
		Bits 4 thru 7: BUC Power Class	0x1 to 0xA *3
6	Status Byte 2	Bits 0 - 3: Not used	Fixed 0xA
		Bits 4 - 7: Software Version	0x0 to 0xF
7	Checksum	Algebraic sum of bytes 1 - 6	

*1 Data Field Definition

Output power is the number which changed hexadecimal data into the decimal number and was divided by 100.

ex).

Output Power Data	Output Power
Data byte 1 is 0x10	} 0x1036 → +41.50 dBm
Data byte 2 is 0x36	

*2 Data Field Definition

Temperature data is -128 deg.C to +127 deg.C in two's complement.
 (1 deg.C step).

ex).

When BUC Temperature is -40C, Temperature data is

*3 BUC Power Class

Value	0x1	0x2	0x3	0x4	0x5	0x6	0x7	0x8	0x9	0xA
Power	2W	4W	5W	8W	10W	16W	20W	25W	40W	60W

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b. Set Transmit

Byte	Name	Description	Value
1	Address	Address of BUC shifted left by 4	0x10 (to 0xF0)
2	Command	Tx On/Off	0x02
3	Data Byte 1	Tx Control	Off:0x00/On:0x01
4	Data Byte 2	Not used	0xAA
5	Data Byte 3	Not used	0xAA
6	Data Byte 4	Not used	0xAA
7	Checksum	Algebraic sum of bytes 1 - 6	

c. Change BUC Address (N/A)

Byte	Name	Description	Value
1	Address	Address of BUC shifted left by 4	0x10 (to 0xF0)
2	Command	Change Address	0x03
3	Data Byte 1	New Address	0x01 to 0x0F
4	Data Byte 2	Not used	0xAA
5	Data Byte 3	Not used	0xAA
6	Data Byte 4	Not used	0xAA
7	Checksum	Algebraic sum of bytes 1 - 6	

This command is not applicable (N/A) in this version.

d. Set Carrier Frequency (N/A)

Byte	Name	Description	Value
1	Address	Address of BUC shifted left by 4	0x10 (to 0xF0)
2	Command	Set Carrier Frequency	0x04
3	Data Byte 1	Carrier Frequency	MSbyte
4	Data Byte 2	Carrier Frequency	LSbyte
5	Data Byte 3	Not used	0xAA
6	Data Byte 4	Not used	0xAA
7	Checksum	Algebraic sum of bytes 1 - 6	

This command is not applicable (N/A) in this version.

e. Set Attenuator

Byte	Name	Description	Value
1	Address	Address of BUC shifted left by 4	0x10 (to 0xF0)
2	Command	Set Attenuator	0x05
3	Data Byte 1	Attenuator Selection 1or 2	Att.1 0x01 Att.2 0x02
4	Data Byte 2	Set Att. bit in 10 dB digit	0x00 or 0x01
5	Data Byte 3	Set Att. bit in 1 dB digit	0x00 to 0x09
6	Data Byte 4	Set Att. bit in 0.5 dB digit	0x00 or 0x05
7	Checksum	Algebraic sum of bytes 1 - 6	

f. Request Status 2

Byte	Name	Description	Value
1	Address	Address of BUC	0x10 (to 0xF0)
2	Command	Request Status 2	0x08
3	Data Byte 1	Attenuator Selection 1or 2	Att.1 0x01 Att.2 0x02
4	Data Byte 2	Set Att. bit in 10 dB digit	0x00 or 0x01
5	Data Byte 3	Set Att. bit in 1 dB digit	0x00 to 0x09
6	Data Byte 4	Set Att. bit in 0.5 dB digit	0x00 or 0x05
7	Checksum	Algebraic sum of bytes 1 - 6	