



X10 RF codes

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2. X10 RF formats

2.1. X10 standard - bit definitions

```
Byte 1      bit 7 6 5 4 3 2 1 0
              H H H H 0 | 0 0
              A 0 1 1 0 |
              B 0 1 1 1   L-- bit4 of Unit number
              C 0 1 0 0
              D 0 1 0 1
              E 1 0 0 0
              F 1 0 0 1
              G 1 0 1 0
              H 1 0 1 1
              I 1 1 1 0
              J 1 1 1 1
              K 1 1 0 0
              L 1 1 0 1
              M 0 0 0 0
              N 0 0 0 1
              O 0 0 1 0
              P 0 0 1 1
              H H H H = House code
```

Byte 2 is complement of Byte 1

```
Byte 3      bit 7 6 5 4 3 2 1 0
              | | | | | 0 0 0
              | | | | L----- bit1 of Unit number
              | | | L----- bit0 of Unit number
              | | L----- 1=Off command, 0=On command
              | L----- bit2 of Unit number
              L----- 1=Dim or Bright
```

With a Dim, Bright, All Units On or All Units Off command (bit7=1), the unit numbers are not used.

The last On or Off command indicates which unit will dim or bright.

```
Dim           = 0x98
Bright        = 0x88
All Lights On = 0x90
All Lights Off= 0x80
```

To assemble the unit number:

(Byte 1 bit 2, Byte 3 bit 6, bit 3, bit 4) + 1

Byte 4 is complement of Byte 3

NOTE: in 32 bits, standard X10 mode the bytes are transmitted as:

```
Received order      Byte 1  Byte 2  Byte 3  Byte 4
Bytes changed of position Byte 3  Byte 4  Byte 1  Byte 2
Bits are changed 7-0 to 0-7 for all 4 bytes
```

2.2. X10 security format

Byte 1 is device address

Byte 2 lower nibble is complement of Byte 1, upper nibble is Byte 1

Byte 3 is the message code

Byte 4 is complement of Byte 3

Byte 5 is a random number (additional address code to Byte 1)

Byte 6 bit 7 is even parity bit of Byte 5

Byte 3 message codes are:

X10	Rec.	command	SH624	KR10	DS10	DS90	MS10	MS20	MS90	DM10	SD90	Digimax
0x00	0x00	ALERT (max delay)			X	X						
0x80	0x01	ALERT (bat low, max)			X							
0x20	0x04	ALERT			X	X					X	
0xA0	0x05	ALERT (battery low)			X						X	
0x01	0x80	NORMAL (max delay)			X	X						
0x81	0x81	NORMAL (bat low,max)			X							
0x21	0x84	NORMAL			X	X					X	
0xA1	0x85	NORMAL(battery low)			X						X	
0x02	0x40	ALERT+Tamper (max delay)				X						
0x22	0x44	ALERT+Tamper				X						
0x03	0xC0	NORMAL+Tamper (max delay)				X						
0x23	0xC4	NORMAL+Tamper				X						
0x30	0x0C	ALERT					X	X	X			
0x31	0x8C	NORMAL					X	X	X			
0x04	0x20	Dark sensor						X				
0x32	0x4C	ALERT+Tamper							X			
0x33	0xCC	NORMAL+Tamper							X			
0x04	0x02	ARM AWAY (max)	X									
0x41	0x82	DISARM	X									
0x42	0x42	Lights On	X									
0x43	0xC2	Lights Off	X									
0x44	0x22	PANIC	X									
0x50	0x0A	ARM HOME (max)	X									
0x60	0x06	ARM AWAY (min)	X	X								
0x61	0x86	DISARM		X								
0x62	0x46	Light On		X								
0x63	0xC6	Light Off		X								
0x64	0x26	PANIC		X							X	
0x70	0x0E	ARM HOME (min)	X									
0xC0	0x03	PANIC	X									
0x38	0x1C	Temp =< Set										X
0xD4	0x2B	Temp > Set										X
0x07	0xE0	MOTION								X		
0x0F	0xF0	DARKNESS DETECTED								X		
0x1F	0xF8	LIGHT DETECTED								X		

NOTE: in 32 bits, standard X10 mode the bytes are transmitted as:

Received order Byte 1 Byte 2 Byte 3 Byte 4

Bytes changed of position Byte 3 Byte 4 Byte 1 Byte 2

Bits are changed 7-0 to 0-7 for all 4 bytes

2.3. RFXSensor

Message examples:

```
01F11607 RFXSensor Temperature sensor addr:01F1 ACRF addr:1 Temperature = 22 deg.  
00F01384 RFXSensor Temperature sensor addr:00F0 ACRF addr:0 Temperature = 19.5 deg.  
FF0F8118 RFXSensor Device addr:FF0F ACRF addr:FF Error: No 1-Wire device connected
```

The format is:

Message length 32 bits (decimal)

- 1st address byte.
- 2nd address byte.
This is byte 1 with the complement of the upper nibble (bit 7-4).
- 1 byte measured temperature /humidity etc in hex if byte 4-bit 4 is 0
info or error code present if byte 4-bit 4 is 1
info codes:
 - 01 = sensor addresses incremented
 - 02 = Low Voltage detected (not yet implemented)error codes:
 - 81 = no 1-wire device connected
 - 82 = 1-Wire ROM CRC error
 - 83 = 1-Wire device connected is not a DS1820
 - 84 = no end of read signal received from 1-Wire device
 - 85 = 1-Wire scratchpad CRC error
- Temperature + sensor type / info-error flag / parity
3 bits sensor type:
 - 000 = temperature sensor (MSB = 0.5 degrees bit off)
 - 100 = temperature sensor (MSB = 0.5 degrees bit on)
 - 001 = RFU (humidity sensor)
 - 010 = RFU (pressure sensor)
 - 011 = RFU
 - 101 = RFU
 - 110 = RFU
 - 111 = RFU1 bit = info-error flag
4bits parity, complement of:
 - byte 1 bit 7654 + byte 1 bit 3210 + byte 2 bit 7654 + byte 2 bit 3210+
 - byte 3 bit 7654 + byte 3 bit 3210 + byte 4 bit 7654

Byte 1 is 1st byte of sensor address
Byte 2 is 2nd byte of sensor address
Byte 3 measured temperature / humidity etc. or error/info code
Byte 4 bit7 = 0.5 degrees bit if a temperature sensor, bit 7-5 is the sensor type,
bit 4 is error flag, bit 3-0 is 4 bits parity

2.4. Digimax:

Message example:

2C 186B 14 15 16 5 Digimax addr:186B Temp<Set Temp:21 Set:22 bits=44

The format is:

Message length 44 bytes (decimal)

1. 2 bytes address.
This is really a 16 bits address and the 2nd byte is not a complement of the 1st byte.
Addresses I have seen are AC93, 455C, 186B
2. 4 bits status
 - a. xx00 device has no set temperature (set temp always 0x00)
 - b. xx01 demand for heat
 - c. xx10 no demand for heat
 - d. xx11 initializing
3. 4 bits parity over address and status
Formula to calculate the 4 bits parity is:
complement (addr1 bit 7 6 5 4 + addr1 bit 3 2 1 0 + addr2 bit 7 6 5 4 + addr2 bit 3 2 1 0 + status bit 7 6 5 4)
4. 1 byte measured temperature in hex
5. 1 byte
 - bit 7 : ?
 - bit 6 : 0 = heating mode, 1 = cooling mode
 - bit 5-0: set temperature in hex
6. 4 bits parity over measured temperature and set temperature.
Formula to calculate the 4 bits parity is:
complement (temp bit 7 6 5 4 + temp bit 3 2 1 0 + set bit 7 6 5 4 + set bit 3 2 1 0)

Byte 1 is 1st byte device address

Byte 2 is 2nd byte device address

Byte 3 bit 7-4 is the status

Bit 3-0 4 bits parity

Byte 4 measured temp

Byte 5 heating/cooling mode and set temp

Byte 6 bit 7-4 4 bits parity.

2.5. X10 PC Remote format

Byte 1 is &HEE

Byte 2 is complement of Byte 1

Byte 3 is the message code

Byte 4 is complement of Byte 3

Byte 3 message codes are:

	shift	command
0xD4		PC
0x02		0
0x82	0xD1	1 (shift MP3)
0x42	0xD2	2 (shift DVD)
0xC2	0xD3	3 (shift CD)
0x22	0xD4	4
0xA2	0xD5	5
0x62		6
0xE2		7
0x12		8
0x92		9
0xC0		CH-
0x40		CH+
0xE0		VOL-
0x60		VOL+
0xA0		MUTE
0x3A		INFO
0x38		REW
0xB8		FF
0xB0		PLAY
0x72		PAUSE
0x70		STOP
0xB6		MENU
0xFF		REC
0xC9		EXIT
0xD8	0xD9	TEXT
0xF2	0xD7	TELETEXT
0xBA		A+B
0x52	0xD6	ENT

NOTE: in 32 bits, standard X10 mode the bytes are transmitted as:

Received order Byte 1 Byte 2 Byte 3 Byte 4
Bytes changed of position Byte 3 Byte 4 Byte 1 Byte 2
Bits are changed 7-0 to 0-7 for all 4 bytes

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