



WS800 Wireless Microphone System

## Serial Protocol Definition

# ClearOne WS800 Serial Protocol Definition

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This document defines the serial commands available for control and monitoring of ClearOne WS8x receivers. The serial commands may be sent using either USB or RS232 connections.

## Port Setup

The USB port on the ClearOne receiver uses a RS232 to USB driver on the PC, so it appears as a COM port on the computer. The settings for the communications are:

- Baud Rate: 115200
- Data Bits: 8
- Stop Bits: 1
- Parity: None
- IE 115200, 8, N, 1

## Available Commands

1. Read system status (Audio level, Diversity status, TX Battery level, TX Battery run time hours, TX PAD, TX Low cut, TX Power switch mode, TX Button Mode, Conference/Stage mode)
2. RF Channel change
3. Main output volume change
4. Headphone output volume change
5. Mute audio
6. Read System information
7. Headphone output volume change
8. Set transmitter parameters (PAD, Low Cut, RF Power Level, Channel, Power switch mode, Button Lock, Button Mode, Conference/Stage mode)
9. Set transmitter name
10. Antenna phantom power on/off
11. Set headphone mode (balanced/unbalanced)
12. Load preset
13. Save preset
14. Read preset names
15. Set GPIO configuration

## Serial Protocol Definition

All communications start with a command sent from the PC to the ClearOne receiver. The general format for a packet is:

- 0xFD : Start byte
- 0xd : Device address (0-7)
- 0xs : Slot address (0-7)
- 0xC : Command code
- 0xd : Number of data bytes that follow
- 0xd0 : Data byte 0
- : Data byte n-2
- : Data byte n-1
- 0xdn : Data byte n
- 0xFE : End byte

The “0x” prefix indicates a hex value follows. (Don’t actually send the 0x characters). In other words, for the 0xFD, the actual value that is sent is 253, which is FD in hex.

For example, the string the PC sends to request the status is:

0xFD	0x0	0x0	0x1	0x0	0xFE
Start	Device	Slot	Cmd	Num	End
byte	addr	addr	code	data	byte
				bytes	

Since there are no data bytes, the end byte appears directly after the data byte count.

## 1. Read System Status Command

The PC sends the Read Status request to the ClearOne Receiver and the receiver returns the string defined below.

- The command retrieves 4 channels (slots) of status info at a time.
- To get status of channels 0-3, use 0 for the slot value.
- To get status of channels 4-7, use 4 for the slot value.
- Each channel's info uses 14 bytes, so all 4 channels use a total of 56 data bytes. Bytes 6 through 19 are the block of data for the first channel, bytes 20 through 33 are for the second channel, etc.

**Bytes 10, 11, and 18 are bit-mapped. The bits are defined as follows:**

### BYTE 10:

- Bit 7: diversity status (0=Ant A, 1=Ant B)
- Bits 6-5: TX status (0=Off, 1=On, 2=Mute)
- Bits 4-3: Battery Type (0=NIMH, 1=Alkaline)
- Bit 1: Antenna A RF clipping indicator
- Bit 0: Antenna B RF clipping indicator

### BYTE 18:

- Bit 5-4: Button Mode (0=Toggle on/off, 1=Push to talk, 2=Push to mute)
- Bit 3-2: Model (0=Beltpack, 1=Handheld, 2=Podium, 3=Tabletop)
- Bit 1: Logic Mute (1=Enabled)
- Bit 0: TX Button Lock

### BYTE 11:

- Bit 7: AES Encryption on/off
- Bit 6: Conference mode or stage mode (1=Conf mode)
- Bits 5-4: Power switch mode (0=On/Off, 1=On/Mute, 2=On/On)
- Bits 3-2: TX RF Power (0=1 mW, 1=10 mW, 2=25 mW, 3=50 mW)
- Bit 1: Low Cut
- Bit 0: Pad

### The PC sends:

- |        |           |        |         |
|--------|-----------|--------|---------|
| • 0xFD | startbyte | • 1    | command |
| • 0    | device    | • 0    | data #  |
| • 0    | slot      | • 0xFE | endbyte |

### The ClearOne receiver returns:

<u>byte</u>	<u>Receiver Returns:</u>			
1	0xFD startbyte	29	x	HP output level 2
2	0 device	30	x	BER MSB
3	0 slot	31	x	BER LSB
4	1 command	32	x	TXLock /logic mut/Model/btnmd
5	58 data bytes	33	x	reserved
6	x RSSI1a	34	x	RSSI1a
7	x RSSI1b	35	x	RSSI1b
8	x Audio Level 1	36	x	AUDIO3
9	x RF Channel 1	37	x	CHAN3
10	x diversity/TX status/battery type/	38	x	diversity/TX status/battery type/
11	x AES/conf/swmod/txpwr/lc/pad	39	x	AES/conf/swmod/txpwr/lc/pad
12	x tx run hours1	40	x	tx run hours3
13	x BAT1	41	x	BAT3
14	x main output level 1	42	x	main output level 3
15	x HP output level 1	43	x	HP output level 3
16	x BER MSB	44	x	BER MSB
17	x BER LSB	45	x	BER LSB
18	x TXLock /logic mut/Model/btnmd	46	x	TXLock /logic mut/Model/btnmd
19	x reserved	47	x	reserved
20	x RSSI1a	48	x	RSSI1a
21	x RSSI1b	49	x	RSSI1b
22	x AUDIO2	50	x	AUDIO4
23	x CHAN2	51	x	CHAN4
24	x diversity/TX status/battery type/	52	x	diversity/TX status/battery type/
25	x AES/conf/swmod/txpwr/lc/pad	53	x	AES/conf/swmod/txpwr/lc/pad
26	x tx run hours2	54	x	tx run hours4
27	x BAT2	55	x	BAT4
28	x main output level 2	56	x	main output level 4
		57	x	HP output level 4

byte	Receiver Returns:				
58	x	BER MSB	61	x	reserved
59	x	BER LSB	62	x	mainmutebits/hpmute bits
60	x	TXLock /logic mut/Model/btnmd	63	0xFE	endbyte

## 2. RF Channel Change Command

The PC sends the RF Channel Change command for the selected slot. The chanval is indexed starting at 0, so to set a slot to RF channel 1, send a chanval of 0.

### The PC sends

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>• 0xFD startbyte</li> <li>• 0 device</li> <li>• 0 slot</li> <li>• 2 command</li> </ul> | <ul style="list-style-type: none"> <li>• 1 data #</li> <li>• chanval data</li> <li>• 0xFE endbyte</li> </ul> |
|---|--|

## 3. Main Output Volume Change Command

The PC sends the desired value for the analog output volume level. The range is 0 (off) to 100 (Full Scale). The steps are 0.5 dB.

### The PC sends

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>• 0xFD startbyte</li> <li>• 0 device</li> <li>• 0 slot</li> <li>• 3 command</li> </ul> | <ul style="list-style-type: none"> <li>• 1 data #</li> <li>• volume data</li> <li>• 0xFE endbyte</li> </ul> |
|---|---|

## 4. Headphone Volume Change Command

The PC sends the desired value for the analog output volume level. The range is 0 (off) to 100 (Full Scale). The steps are 0.5 dB.

### The PC sends

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>• 0xFD startbyte</li> <li>• 0 device</li> <li>• 0 slot</li> <li>• 11 command</li> </ul> | <ul style="list-style-type: none"> <li>• 1 data #</li> <li>• volume data</li> <li>• 0xFE endbyte</li> </ul> |
|--|---|

## 5. Mute Audio Command

The PC sends the desired mute state (0=NOT muted, 1=muted) for the selected slot.

### The PC sends

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>• 0xFD startbyte</li> <li>• dev num device</li> <li>• 0 slot</li> <li>• 4 command</li> </ul> | <ul style="list-style-type: none"> <li>• 1 data #</li> <li>• 0 or 1 on/off</li> <li>• 0xFE endbyte</li> </ul> |
|---|---|

## 6. Read System Information Command

This command retrieves information about the receiver such as the serial number, data code, model, # channels, # of receivers, Firmware version, PCB version, and total run time hours.

### The PC sends

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>• 0xFD startbyte</li> <li>• dev num device</li> <li>• 0 channel</li> </ul> | <ul style="list-style-type: none"> <li>• 5 command</li> <li>• 0 data #</li> <li>• 0xFE endbyte</li> </ul> |
|---|---|

### The Receiver responds:

byte	drf Replies:				
1	0xFD	startbyte	9	x	DRF serial number LSB
2	0	device	10	x	model
3	0	channel	11	x	DRF FW Ver
4	5	command	12	x	DRF #1 mfg year/month
5	24	data bytes	13	x	reserved
6	x	#DRF in network	14	x	DRF #1 mfg day
7	x	DRF serial number MSB	15	x	DRF Tot Hours MSB
8	x	DRF serial number midB	16	x	DRF Tot Hours midB

### The Receiver responds:

<u>byte</u>	<u>drf Replies:</u>				
17	x	DRF Tot Hours LSB	24	x	MasterSlave slot 6
18	x	MasterSlave slot 0	25	x	MasterSlave slot 7
19	x	MasterSlave slot 1	26	x	DRF1PCB REV
20	x	MasterSlave slot 2	27	x	DRF2PCB REV
21	x	MasterSlave slot 3	28	x	DRF3PCB REV
22	x	MasterSlave slot 4	29	x	DRF4PCB REV
23	x	MasterSlave slot 5	30	0xFE	end byte

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## 7. Set Transmitter Parameters Command

This sets all of the syncable transmitter parameters. Once this is sent, syncing the transmitter to the receiver card via IR will transfer the values to the transmitter.

The values are contained in 2 bit mapped bytes, Telem1 and Telem 2, defined below:

### Telem1:

- Bit 7: AES on/off
- Bit 6: Conf mode/stage mode (0=conf mode)
- Bits 5-4: Power switch mode: (0 = on/off, 1 = on/mute, 2 = on/on)
- Bits 3-2: TX Power level (0=1 mW, 1=10 mW, 2=25 mW, 3=50 mW)
- Bit 1: Low cut
- Bit 0: Pad

### Telem2:

- Bit 5: Logic Mute enable (1=logic mute enabled, muting will trigger a GPIO but not mute audio output)
- Bits 4-3: Button Mode for podium/tabletop TX(0=Toggle on/off, 1=Push to talk, 2=push to mute)
- Bit 2: TX Button lock
- Bits 1-0: Battery Type (0=NiMh, 1 = alkaline)

<u>byte#</u>	<u>PC Sends:</u>				
1	0xFD	startbyte	5	2	data #
2	0	device	6		Telem1
3	0	channel	7		Telem2
4	21	command	8	0xFE	endbyte

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## 8. Set Transmitter Name Command

This command sends up to 10 characters (letters and numbers only) for the name value displayed on the selected transmitter OLED display and on the receiver card OLED display.

The transmitter must be IR synced to update the name value after this command is sent.

<u>byte#</u>	<u>PC Sends:</u>				
1	0xFD	startbyte	10		name byte 4
2		dev num device	11		name byte 5
3	0	slot #	12		name byte 6
4	9	command	13		name byte 7
5	12	data #	14		name byte 8
6		name byte 0	15		name byte 9
7		name byte 1	16		reserved
8		name byte 2	17		reserved
9		name byte 3	18	0xFE	endbyte

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## 9. Antenna Phantom Power On/Off Command

This turns on or off the antenna jack 3.3V phantom power for powering active antennas, like the ones ClearOne provides.

<u>byte#</u>	<u>PC Sends:</u>				
1	0xFD	startbyte	5	1	data #
2		dev num device	6		on/off 0=off,1=on
3	0	slot	7		0xFE endbyte
4	29	command			

## 10. Set Headphone Mode Command

The headphone output jack on the front panel can operate in 2 modes. In the normal headphone mode, the tip and ring of the TRS jack are in-phase signals for monitoring with headphones. In balanced mode, the tip and ring are 180 degrees out of phase. This mode is for connecting the jack to the input of a mixer or other balanced input. If the headphone jack is in normal headphone mode, there will be no sound if it is connected to a balance input since the + and – signals will be the same. If the jack is in balanced mode and it is monitored with headphones, the left and right ears will be out of phase and it will sound a bit weird.

<u>byte#</u>	<u>PC Sends:</u>				
1	0xFD	startbyte	5	1	data #
2	dev num	device	6	0 or 1	0=HP mode, 1=balanced mode
3	0	slot #	7	0xFE	endbyte
4	30	command			

## 11. Load Preset Command

This preset loads the selected preset from eeprom into the current settings.

<u>byte#</u>	<u>PC Sends:</u>				
1	0xFD	startbyte	5	1	data #
2	dev num	device	6		Preset #
3	0	slot	7	0xFE	endbyte
4	21	command			

## 12. Save Preset Command

This saves the current settings to a selected user preset. It also allows a 10 character preset name to be saved with the preset. This name is displayed in the ClearOne GUI in the list of available presets. Presets 1-3 are factory presets and can not be overwritten. Presets 4-8 are user presets and can be written.

The name characters should be sent in ASCII format.

<u>byte#</u>	<u>PC Sends:</u>				
1	0xFD	startbyte			
2	0	device	10		name byte 3
3	0	channel	11		name byte 4
4	22	command	12		name byte 5
5	11	data #	13		name byte 6
6		preset number	14		name byte 7
7		name byte 0	15		name byte 8
8		name byte 1	16		name byte 9
9		name byte 2	17	0xFE	endbyte

## 13. Read Preset Names

This command retrieves the preset names for the 8 presets. It loads either the first 4 names or the second 4 names, depending on the value of the slot parameter. The names are 10 characters long, and the values are returned in ASCII format. The name characters should be sent in ASCII format.

<u>byte#</u>	<u>PC Sends:</u>				
1	0xFD	startbyte	4	31	command
2	0	device	5	0	data #
3	0	slot (0 for 0-4, 4 for 5-8)	6	0xFE	endbyte

### The Receiver responds:

<u>byte</u>	<u>drf Replies:</u>				
1	FD	startbyte	10		preset 1 name char 5
2	0	device	11		preset 1 name char 6
3	0	channel	12		preset 1 name char 7
4	31	command	13		preset 1 name char 8
5	40	data bytes	14		preset 1 name char 9
6		preset 1 name char 1	15		preset 1 name char 10
7		preset 1 name char 2	16		preset 2 name char 1
8		preset 1 name char 3	17		preset 2 name char 2
9		preset 1 name char 4	18		preset 2 name char 3

### The Receiver responds:

<u>byte</u>	<u>drf Replies:</u>		
19	preset 2 name char 4	33	preset 3 name char 8
20	preset 2 name char 5	34	preset 3 name char 9
21	preset 2 name char 6	35	preset 3 name char 10
22	preset 2 name char 7	36	preset 4 name char 1
23	preset 2 name char 8	37	preset 4 name char 2
24	preset 2 name char 9	38	preset 4 name char 3
25	preset 2 name char 10	39	preset 4 name char 4
26	preset 3 name char 1	40	preset 4 name char 5
27	preset 3 name char 2	41	preset 4 name char 6
28	preset 3 name char 3	42	preset 4 name char 7
29	preset 3 name char 4	43	preset 4 name char 8
30	preset 3 name char 5	44	preset 4 name char 9
31	preset 3 name char 6	45	preset 4 name char 10
32	preset 3 name char 7	46	FE end byte

## 14. Set GPIO Configuration Command

This command configures the GPIO for the DB25 connector on the back of the receiver. Each GPIO pin can be either an input, an output, or disabled. When configured as an output, it is floating/high impedance when not asserted and driven low when asserted. When configured as an input, driving it low asserts it. In addition, pins 2 and 3 are shared with the RS232 function. When configured as RS232, these pins are only used for TX and RX and unavailable for GPIO.

Byte 31 determines if pins 2 and 3 are GPIO pins or RS232 pins. Setting it to 0 enables RS232, setting it to 1 enables GPIO on these pins. In the command structure, each pin has a byte associated with it to configure it.

- BITS 6-5: pin function (0 = mute, 1 = low battery; 2,3 reserved)
- BITS 4-2: slot (0-7). This determines which receiver slot is associated with the pin.
- BIT 1: input or output. (0 = input, 1 = output)
- BIT 0: enable or disable. (0 = disabled, 1 = enabled)

<u>byte#</u>	<u>PC Sends:</u>		
1	0xFD startbyte	18	pin13
2	0 device	19	pin14
3	0 channel	20	pin15
4	25 command	21	pin16
5	26 data #	22	pin17
6	pin1	23	pin18
7	pin2	24	pin19
8	pin3	25	pin20
9	pin4	26	pin21
10	pin5	27	pin22
11	pin6	28	pin23
12	pin7	29	pin24
13	pin8	30	pin25
14	pin9	31	RS232OFF
15	pin10	32	0xFE endbyte
16	pin11		
17	pin12		