XHC WHB03 & WHB04 INTERNALS

Characteristics:

model	description	driver	initially for
WHB03 	wireless mpg	HID DEVICE VID: 0x10CE PID: 0xEB6E	NC Studio
WHB04 	wireless mpg	HID DEVICE VID: 0x10CE PID: 0xEB70	Mach 3

Power saving:

If you use wireless model of this device you need to know what each device will go sleep mode after 30 seconds if no button was pressed.

HID structure:

Device has two reports IDs one of it (Report ID: 0x04) used as expected through writing to USB Endpoint 0x81, another one (Report ID: 0x06) used to HOST->DEVICE communication, but we do not have OUT endpoint in our USB Device Descriptor for it, it was first tricky place, device used HID SET_REPORT request and transfer data via 7 bytes chunks. Take a closer look for these reports.

Report ID: 0x04 DEVICE->HOST (6 bytes)

offset	size (bytes)	name	description
0x00	1	ID	report id (0x04)
0x01	1	BUTTON 1	button key code
0x02	1	BUTTON 2	button key code
0x03	1	WHEEL MODE	axes for wheel and etc
0x04	1	WHEEL	signed value of wheel speed, sign - direction
0x05	1	XORED DAY	current day XORed with button 1 key code

ID - it is our report ID according to HID report information.
BUTTON 1,2 – if we push da button we see our key codes in this fields. We can push TWO buttons simultaneously.
WHEEL MODE

value	HB03	HB04
0x00	off state	off state
0x11	X direction for hand-wheel	X direction for hand-wheel
0x12	Y direction for hand-wheel	Y direction for hand-wheel
0x13	Z direction for hand-wheel	Z direction for hand-wheel
0x15	adjust Spindle speed	A direction for hand-wheel

0x14	adjust Feedrate speed	adjust Spindle speed
0x18	adjust Processing speed	adjust Processing speed

WHEEL – it is direction and speed of wheel, when we spin the wheel to CW dir it will be positive from 1 to 10 (this value based on current spin speed) and when spin wheel to CCW value be negative from -1 to -10 (based on spin speed too)
XORED DAY - very interesting value, it is a crypted DAY OF THE MONTH this value settable with HID Set Feature and used as key for simple XOR crypt what used for very easy protection of they protocol and solved easily (XORED DAY) XOR (BUTTON 1).

Report ID: 0x06 HOST->DEVICE (8 bytes)

offset	size (bytes)	name	description
0x00	1	ID	report id (0x06)
0x01	7	PAYLOAD CHUNK	chunk of output data report

ID - it is our report ID according to HID report information.
PAYLOAD CHUNK – it is chunk of our payload, if we need to send data not aligned to 7 bytes we need to pad it for 7 bytes.

Payloads data:
HB03 (31 bytes)

offset	size (bytes)	name	description
0x00	2	MAGIC	0xFDFE used to detect start sequences
0x02	1	DAY	day of the month
0x03	2	WC_X_INT	X workspace position integer
0x05	1	WC_X_FRAC	X workspace position fractional
0x06	2	WC_Y_INT	Y workspace position integer
0x08	1	WC_Y_FRAC	Y workspace position fractional
0x09	2	WC_Z_INT	Z workspace position integer
0x0B	1	WC_Z_FRAC	Z workspace position fractional
0x0C	2	MC_X_INT	X machine position integer
0x0E	1	MC_X_FRAC	X machine position fractional
0x0F	2	MC_Y_INT	Y machine position integer
0x11	1	MC_Y_FRAC	Y machine position fractional
0x12	2	MC_Z_INT	Z machine position integer
0x14	1	MC_Z_FRAC	Z machine position fractional
0x15	2	FEEDRATE OVR	feedrare override value
0x17	2	SPINDLE SPEED OVR	spindle speed override value
0x19	2	FEEDRATE	feedrate value
0x1B	2	SPINDLE SPEED	spindle speed value
0x1D	1	STEP MUL	step multiplier for hand-wheel
0x1E	1	STATE	notify user for something

HB04 (37 bytes)

offset	size (bytes)	name	description
0x00	2	MAGIC	0xFDFE used to detect start sequences
0x02	1	DAY	day of the month
0x03	2	WC_X_INT	X workspace position integer
0x05	2	WC_X_FRAC	X workspace position fractional
0x07	2	WC_Y_INT	Y workspace position integer
0x09	2	WC_Y_FRAC	Y workspace position fractional
0x0B	2	WC_Z_INT	Z workspace position integer
0x0D	2	WC_Z_FRAC	Z workspace position fractional
0x0F	2	MC_X_INT	X machine position integer
0x11	2	MC_X_FRAC	X machine position fractional
0x13	2	MC_Y_INT	Y machine position integer
0x15	2	MC_Y_FRAC	Y machine position fractional
0x17	2	MC_Z_INT	Z machine position integer
0x19	2	MC_Z_FRAC	Z machine position fractional
0x1B	2	FEEDRATE OVR	feedrare override value
0x1D	2	SPINDLE SPEED OVR	spindle speed override value
0x1F	2	FEEDRATE	feedrate value
0x21	2	SPINDLE SPEED	spindle speed value
0x23	1	STEP MUL	step multiplier for hand-wheel
0x24	1	STATE	notify user for something

MAGIC - magic value indicate what it is a first packet sequence and it is always **0xFDFE**
DAY - day of the month, it will read back as XORED DAY (see before)
***_*C_INT** - it is integer part of position without sign.
Example:

value	result
135.17	135
-77.89	77

***_*C_FRAC** – has 8bit for HB03 and 16bit for HB04 it is simple when you look to display max frac part for HB03 it is .99 and for HB04 it is .9999 this value also have a SIGN bit if value is negative you must set most significant bit to 1, else drop it.
Example:

value	device	result
-117.33	HB03	33 OR 0x80
-220.334	HB04	3340 OR 0x8000

FEEDRATE OVR – display our feedrate override value

SPINDLE SPEED OVR - display our speed override value
FEEDRATE - current feedrate
SPINDLE SPEED - current speed
STEP MUL - it is step multiplier for our hand-wheel. If we change it in software we can show this value to user. It divided into two part low and hi nibble.

Low nibble	
value	**description**
0x00	0*1x
0x01	1*1x
0x02	5*1x
0x03	10*1x
0x04	20*1x
0x05	30*1x
0x06	40*1x
0x07	50*1x
0x08	100*1x
0x09	500*1x
0x0A	1000*1x

Hi nibble	
value	**description**
0x10	back to origin
0x20	floating on the knife(?)
0x50	back to mechanical origin
0x60	fine adjustment

STATE - this is state value, used to notify user of state of our machine or if you need something from user.

value	description
0x01	run state blink
0x02	pause state blink
0x40 (0x80)	flash yes/no leds (HB03 only ?)

Changelog:
09/01/2014 – initial release