

## External Interface for Heinrichs Weikamp Dive-Computers with hwOS (OSTC3, OSTC cR, OSTC 2 and OSTC Plus)

See <http://www.heinrichsweikamp.com/?id=335>

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### hwOS Computers with USB:

The USB interface is equipped with an USB Chip (FT232) from FTDI. You can get Windows/Linux drivers from here: <http://www.ftdichip.com/Drivers/VCP.htm> (current Version is 2.08.24)

With Linux Kernel >2.6.9, these drivers are included in the Kernel.

In most cases, with Windows7 or Windows 8, these drivers will install automatically.

After installation a virtual COM port can be found in your windows hardware control panel.

You can change the COM port number there if required.

### hwOS Computers with Bluetooth:

The uses Bluetooth chipset creates a virtual COM port, with Bluetooth 4.0 (LE) the device is compatible to "Stollman's Terminal IO Profile". See <http://www.stollmann.de/de/software/bluetooth-bluetooth-low-energy/terminal-io-profile.html>

### Software

The data rate is 115200 Baud, 8 Databits, 1 Stopbit, no parity, (115200, N, 8, 1)

16 and 24bit Values are transmitted in little Endian format (LOW:HIGH or (LOW:HIGH:UPPER)

### Transfer protocol

Transfer is bi-directional and is initiated from the PC software by sending a command byte to the OSTC

- A command echo is send for every command
- Wait for answers/error bytes before starting new command!
- Keep COM port open until all transfers are done.
- After 120 seconds idle time the OSTC exits the COM mode – [it's recommended to use a timeout lower then 120seconds and exit the COM mode from the PC application before the OSTC does \(See Command 0xFF for details\)](#).
- Right button will abort COM mode when in idle loop.
- OSTC sends a 0x4D if it's ready for a new command.

### Starting the communications with the OSTC:

- [Open COM Port]
- Enter Download mode: 0xBB
- Answer from OSTC:
- 0xBB (Command Echo)
- 0x4D -> OSTC will show "Download mode enabled"

Type	Command	Input	Output (w/o command echo and Ready/Done byte)	Ready/Done.
Start communication	0xBB	N	N	0x4D
Hardware + features	0x60	N	Data (5)	0x4D
Send headers	0x61	N	Data (65536)	0x4D
Send compact headers	0x6D	N	Data (4096)	0x4D
Set clock & date	0x62	Data (6)	N	0x4D

Custom text	0x63	Data (60)	N	0x4D
Get dive profile	0x66	Data (1)	(Data n)	0x4D
Version/Identity	0x69	N	Data (64)	0x4D
Display text	0x6E	Data (16)	N	0x4D
Get hardware descriptor	0x6A	N	Data (1)	0x4D
Reset all settings	0x78	N	N	0x4D
Write setting	0x77	See "Read/Write Settings"		0x4D
Read setting	0x72	See "Read/Write Settings"		0x4D
Exit communication	0xFF	N	N	N

**command 0x60 („`“): hardware descriptor + feature descriptor**

Output OSTC: 0x60 (command echo)

Output OSTC: Hardware descriptor High byte (always 00 at the moment)

Output OSTC: Hardware descriptor Low byte (see table 0x6A)

Output OSTC: Feature descriptor High byte (always 00 at the moment)

Output OSTC: Feature descriptor Low byte (see table below)

Output OSTC: Model descriptor byte (see table below)

Output OSTC: Final 0x4D

**Resulting feature bytes:**

OSTC Model by hw descriptor	Feature Low byte (HEX)	Feature
hwOS Sport	0x02	Rec/Nitrox
standard / all	0x00	standard

**Resulting model byte:**

Specific OSTC Model	Model descriptor byte (HEX)
<unknown>	0x00
OSTC Sport	0x51

**command 0x61 („a“): download all 256 dive headers from the OSTC**

Output OSTC:

- 0x61 (Command Echo)

The complete TOC (Table of Contents) memory block will be send, no matter how many dives are stored. One TOC entry is the header of one dive stored in the OSTC's memory.

**The Header does not contain the detailed profile for the dive.**

The total of 256 headers (256 dives, max. in the OSTC Dive-Computer) will be send. No matter if all 256 dives are in the memory already used. Unused headers consists of 0xFF's only and must be ignored in the software.

Header size is 256byte/dive → A total of 65536Bytes will be transferred.

**Download starts with dive #0 and ends with dive #255. Depending on how many dives made with the OSTC yet, this list is not sorted to the date and/or time of the dives. Sort by using date/time information from the header! Keep number (0-255) in your list, it's needed to get the dive profile for a particular dive. See command "f" for details.**

### Header details:

Byte Number	Length	Description	Data	Comment
0	2	Dive Header start	0xFA, 0xFA	For internal use
2	3	Internal pointer to the begin of the profile data	24bit Address	For internal use
5	3	Internal pointer to the end of the profile data	24bit Address	For internal use
8	1	Logbook-Profile version	8bit Version	Currently only 0x23 or 0x24
9	3	Length of profile data for this dive	24bit Length	Useful for parsing profile
12	3	Date of Dive at end (or start!) (YYMMDD)	3Byte Date	Year is 20xx, <a href="#">See Note 11</a>
15	2	Time at end (or start!) of Dive (HHMM)	2Byte Time	<a href="#">See Note 11</a>
17	2	Max. Depth in centimetres ( <b>Includes salinity offset!</b> )	16bit Depth	See Note 1
19	3	Divetime (MMMMSS)	24bit Divetime	2Bytes Min, 1Byte Sec.
22	2	Min. Water temperature in 0.1°C	16bit Temp	Signed 16Bit
24	2	Surface air pressure before dive in mbar	16bit Pressure	30min before dive
26	2	Desaturation time after the dive in minutes	16bit Minutes	
28	4	Gas/Dil 1 (%O2, %He, Change Depth in m, Type)	4Byte Gas data	See Note 2,3
32	4	Gas/Dil 2 (%O2, %He, Change Depth in m, Type)	4Byte Gas data	See Note 2,3
36	4	Gas/Dil 3 (%O2, %He, Change Depth in m, Type)	4Byte Gas data	See Note 2,3
40	4	Gas/Dil 4 (%O2, %He, Change Depth in m, Type)	4Byte Gas data	See Note 2,3
44	4	Gas/Dil 5 (%O2, %He, Change Depth in m, Type)	4Byte Gas data	See Note 2,3
48	2	Firmware Version xx.yy	2Byte Version	
50	2	Battery voltage in mV after the dive	16bit Voltage	
52	1	Sampling rate in Seconds	1Byte	Also stored in profile section
53	2	CNS at beginning of dive in %	16bit CNS	
55	1	GF at beginning of dive in %	1Byte GF	
56	1	GF at end of dive in %	1Byte GF	
57	2	Configured logbook offset in the OSTC	16Bit Offset	
59	1	Battery Information	1Byte	TBD
60	2	Setpoint 1 (Setpoint in cbar, Change depth in m)	2Byte SP Data	1 cbar = 0.01bar
62	2	Setpoint 2 (Setpoint in cbar, Change depth in m)	2Byte SP Data	
64	2	Setpoint 3 (Setpoint in cbar, Change depth in m)	2Byte SP Data	
66	2	Setpoint 4 (Setpoint in cbar, Change depth in m)	2Byte SP Data	
68	2	Setpoint 5 (Setpoint in cbar, Change depth in m)	2Byte SP Data	
70	1	Salinity Setting	1Byte Salinity	See Note 5
71	2	Max. CNS in %	16bit CNS	
73	2	Average depth in mbar	16bit Depth	See Note 1
75	2	Total dive time in seconds (incl. shallow parts)	16bit Seconds	See Note 6
77	1	If GF deco model was used : GF_lo [%]	1Byte Deco model info	

Byte Number	Length	Description	Data	Comment
		else: Saturation multiplier [%]		
78	1	If GF deco model was used : GF_hi [%] else: Desaturation multiplier [%]	1Byte Deco model info	
79	1	Deco model used for this dive	1Byte Model	0= ZH-L16, 1= ZH-L16-GF
80	2	Dive number (Internal total dive counter)	16bit Number	See Note 7
82	1	Dive mode used for this dive	1Byte Mode	See Note 8
83	16	N2 compartment desaturation time in min.	16Bytes	See Note 9
99	64	N2 compartments at end of dive in mbar	64Bytes	16*4Byte (Float), See Note 9
163	16	He compartment desaturation time in min.	16Bytes	See Note 9
179	64	He compartments at end of dive in mbar	64Bytes	16*4Byte (Float), See Note 9
243	1	Last decompression stop in m	1Byte Depth	User-Set value
244	1	Assumed distance to shown stop in 10cm	1Byte	Safety-margin parameter
245	2	hwHUD battery value at end of dive in mV	16bit Voltage	Zero when no HUD present
247	1	hwHUD last status	1Byte Status	See Note 10
248	6	Battery gauge registers at end of dive in $1 \cdot 10^{-9} \text{As}$	48bit Battery	Only for 3,6V Battery
254	2	Dive Header end	0xFB, 0xFB	

Note 1: Depth in centimetres (With salinity and gravitational acceleration already included)

Note 2: "First Gas" always has change depth = 0m, [List contains OC Gases for OC and Diluents for CC](#)

Note 3: Gas Types: 0=Disabled, 1=First, 2= Travel, 3= Deco, Diluent Type: 0=Disabled, 1=First, 2=Normal

Note 4: bit0-3: Divisor, 0=never, 1=every Sample, 2=every 2nd Sample, ...bit4-7: Information size (0-15)

Note 5: 0-5 [%]

Note 6: very shallow (<1m) parts of the dive are not counted in the divetime (Byte 19-21)

Note 7: [This number is increased by one with every dive made and the number stored here is the number of total dives at the time this dive was made. It's not related to the TOC entry.](#)

Note 8: 0= OC, 1= CC, 2= Gauge, 3= Apnea

Note 9: Compartment assignment according to *Bühlmann, Albert: Tauchmedizin; 4. Auflage [2002]*, values after dive

Note 10: bit0=1:HUD connection ok, bit1=1:HUD is calibrated, bit2=1:HUD Battery is low (<3000mV), bit3=1:Sensor 1 active, bit4=1:Sensor 2 active, bit5=1:Sensor 3 active, bit6=1:HUD calibrated through external interface (DR5/DRx), bit7=1:HUD received (valid) data through RS232 input from DR5/DRx

Note 11: With profile version 0x24 or later, hwOS stores the START of the dive, not the END as before

[Note: OSTC sends a 0x4D after transferring all headers successfully.](#)

## Profile Details

The profile for each dive has a variable length.

**First, a small header with the information divisors is send.**

### Small Header

Byte Number	Length	Description	Data	Comment
0	3	Length of profile data for this dive	24bit Length	<a href="#">Useful for parsing profile</a>
3	1	Sampling rate in Seconds	1Byte	Also stored in header section
4	1	Number of Divisors in this dive ( $n=7$ )	1Byte	Each divisor has 3 Bytes, See Note 1
5 ( $1*3+2$ )	3	Sampling Divisor Temperature	3Byte	See Note 2
8 ( $2*3+2$ )	3	Sampling Divisor Deco/NDL Status	3Byte	See Note 2
11 ( $3*3+2$ )	3	Sampling Divisor Gradient Factor	3Byte	See Note 2
14 ( $4*3+2$ )	3	Sampling Divisor ppO2 Sensors	3Byte	See Note 2
17 ( $5*3+2$ )	3	Sampling Divisor Decoplan	3Byte	See Note 2
20 ( $6*3+2$ )	3	Sampling Divisor CNS profile	3Byte	See Note 2
23 ( $n*3+2$ )	3	Sampling Divisor Tank data	3Byte	See Note 2
$(n+1)*3+2$ )		Future Profile versions may have more divisors		

Note 1: Inspect each divisor (0=no Divisors, 1=One Divisor, etc.)

Note 2: Each divisor: Byte0= Type, Byte1=Length, Byte2=Divisor

Type=0: Temperature

Type=1: Deco/NDL Status

Type=2: Gradient Factor

Type=3: ppO2 Sensors

Type=4: Decoplan

Type=5: CNS

Type=6: Tank Data

**Now, the actual dive profile is send.**

Byte ( $n*3+5$ ) to Byte #“Length of profile data for this dive”:

Depth in mbar (LOW:HIGH, not including salinity offset), **ProfileFlagByte**, [extended Information](#)

...

2 Byte:

0xFD 0xFD (Profile and dive end)

**ProfileFlagByte:**

bit0-6: amount of additional bytes after the ProfileFlagByte (0-127)

bit7: **EventByte Flag** (At least one Event Byte is available)

**EventByte:**

bit0-3: Alarm type

0=No Alarm

1=SLOW

2=Deco Stop missed

3=unused

- 4=ppO Low Warning
- 5=ppO High Warning
- 6=Manual Marker
- 7=Low Battery

Bit4: Manual Gas Set („GasX”)

Bit5: Gas Change (Gas1-5 or Dil 1-5, called “Gas 6”-”Gas10” in the menu)

Bit6: SetPoint Change (cbar)

Bit7: Another Eventbyte is available

**EventByte 2 (Only included if Bit7 of Eventbyte 1 = 1)**

Bit0: Switched to bailout

Bit1-6: unused (yet)

Bit7: Another Eventbyte is available...

**Events and Extended Information** will be stored strictly in the following order (future extensions will append at the end of the list for compatibility reasons!):

**Events:**

- EventByte (s)
- ManualGasSet: new values for Gas 6 (2 bytes: byte1=O2%, byte2=He%)
- Gas Change (1 byte: current Gas#)
- SetPoint Change (1Byte: new SetPoint in cbar)
- Bailout: new values for bailout gas (2 bytes: byte1=O2%, byte2=He%)

**Extended Information:**

Type	Length	Data	Standard Divisor	Comment
Temperature	2	16bit short signed in 0.1°C	6	
Deco/NDL Status	2	Byte1:=0 if within NDL, if in deco mode: depth of 1st stop Byte2: NDL in minutes or length of first stop in minutes)	6	
GF Value	1	1Byte GF in %	12	
PpO2-Sensors	9	Per Sensor three bytes. Byte0: Sensor ppO2 (in 0.01bar) Byte1-2: 16bit Sensor Voltage in 0.1mV steps	2	Divisor=0 in OC dives
Deco Plan	15	Last 15 stops in minutes	12	Make sure to take care of header Byte243, which can be 3, 4, 5 or 6m
CNS value	2	16bit CNS value in %	12	
Tank Data	2	Active gas tank pressure in 0.1bar	15	** Fehlerhafter Ausdruck **

For calculation of the available information the following rules apply:

- First sample# is 1
- if divisor == 0 the information will never appear
- dataAvailable = (sample# modulo divisor) == 0

**Sampling rate can vary between dives! Always use sample rate from Dive Header.**

Profile memory is a „first-in first-out” memory, so older dives will be overwritten when there is no free space left.

Profile for dives, where no profile information is available, will be two bytes: 0xFD 0xFD

### Examples:

Assume the following configuration:

Divisor Temperature=3

Divisor Deco/NDL Status=1

Divisor Gradient Factor=0

Divisor ppO2 Sensors=0

Divisor Decoplan=0

Divisor CNS=0

Divisor Tank Data=0

Sample 1:

0x64 0x00 0x02 0x00 0xA0

Depth = 1m

ProfileFlagByte = 2 bytes will follow, No Event

Deco/NDL = NDL 160 minutes

Sample 2:

0xC8 0x00 0x02 0x00 0xA0

Depth = 2m

ProfileFlagByte = 2 bytes will follow, No Event

Deco/NDL = NDL 160 minutes

Sample 3:

0x2C 0x01 0x04 0x32 0x00 0x00 0xA0

Depth = 3m

ProfileFlagByte = 4 bytes will follow, No Event

Temperature = 5°C

Deco/NDL = NDL 160 minutes

Sample 4:

0x5E 0x01 0x84 0x21 0x02 0x00 0x9f

Depth = 3.5m

ProfileFlagByte = 4 bytes will follow, Event available (bit7=1)

EventByte = Alarm SLOW, Stored Gas Change

GasChange = Gas#2

Deco/NDL = NDL 159 minutes

...

## Other Commands

### command 0x62 („b“): Sync clock and date with PC

Output OSTC: 0x62 (command echo)

Now, 6 bytes must be send to the OSTC

Byte1: Hours

Byte2: Minutes

Byte3: Seconds

Byte4: Month

Byte5: Day

Byte6: Year (20xx)

All bytes will be checked for plausibility and the clock is set at once. After a timeout of about 30ms, the transmission will be aborted

Note: OSTC sends a 0x4D after setting the clock successfully

### command 0x63 („c“): Send the custom text (up to 60 bytes)

Output OSTC: 0x63 (command echo)

Now, up to 60 bytes must be send to the OSTC

Byte 1-60: Custom text string shown when in surface mode (NULL terminated, last byte =0x00)

After a timeout of about 30ms, the transmission will be aborted and the text saved.

Note: OSTC sends a 0x4D after the text is saved.

### command 0x66 („f“): Download one dive (incl. profile data)

Output OSTC: 0x66 (command echo)

Now, 1 byte must be send to the OSTC

Byte1: Number of dive to download (0-255)

This number is the internal TOC number in which the OSTC has stored this dive.

Now, the OSTC sends the header (256bytes) + the profile (Ending with 0xFD 0xFD).

Note: Header bytes 8-10 contain the profile length in bytes including final 0xFD 0xFD

Depending on the dive length and profile details you can expect about 3Bytes/second divetime (e.g. 21,6kByte for a one-hour dive).

Note: OSTC sends a 0x4D after the dive was transmitted

### command 0x69 („i“): Download OSTC identity

Output OSTC: 0x69 (command echo)

Output OSTC: serial number (low:high)

Output OSTC: firmware version (x.y)

Output OSTC: Custom text (60 chars) Note: Custom Text is NULL terminated, but here all 60bytes are send.

Output OSTC: Final 0x4D

### command 0x6A („j“): Download OSTC hardware descriptor byte

Output OSTC: 0x6A (command echo)

Output OSTC: Hardware descriptor byte

Output OSTC: 0x4D

Bit 0	OSTC has rechargeable battery with battery management chip
Bit 1	OSTC has an ambient sensor
Bit 2	OSTC has analog inputs and S8 digital
Bit 3	OSTC has an digital optical input
Bit 4	OSTC has a BLE module
Bit 5	OSTC has receiver for tank pressure sensors
Bit 6	Unused (=0)



Bit 7	Unused (=0)
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### Resulting hardware byte:

OSTC Model	Resulting hardware bytes (HEX)
OSTC 3	0x0A
OSTC 3+	0x1A or 0x13
OSTC cR	0x05 or 0x07
OSTC Sport	0x12 or 0x13
OSTC 2	0x11, 0x13 or 0x1B
OSTC 2 TR	0x33

Note: OSTC with old firmware (without the 0x6A command) will respond a 0x4D only.

Since different units may result in the same hardware byte, it's recommended only to distinguish between [hwOS Sport](#) and [hwOS Tech](#). Parsing of all data or settings is identical for every unit with hwOS Sport and every unit with hwOS Tech. Use the **command 0x60 („“): hardware descriptor + feature descriptor** to check for hwOS Sport or hwOS Tech version. Contact Matthias for details: [mh@heinrichsweikamp.com](mailto:mh@heinrichsweikamp.com)

### command 0x6E („n“): Display up to 16 characters in the COM mode

Output OSTC: 0x6E (command echo)

Now, up to 16 bytes must be send to the OSTC

Byte 1-16: String to show in COM mode

Note: This is useful for debugging and showing some status (e.g.: “Reading Dives”) before actually downloading data (Which may take up to 2minutes for a full memory download).

Text can be updated as often as required whenever the COM mode is in the idle state waiting for commands. As all other commands, this will also reset the timeout.

Note: OSTC sends a 0x4D after displaying the new text

### command 0x6D („m“): Download all 256 “Compact headers” from the OSTC

Output OSTC: 0x6D (command echo)

The complete list of “Compact headers” will be send, no matter how many dives are stored.

The Compact header contains basic informations about the dive. With it's small amount of data the use of this command is recommended to determine which dive needs to be downloaded. Especially when downloading from Bluetooth LE enabled OSTC's.

The total of 256 compact headers (256 dives, max. in the OSTC Dive-Computer) will be send. No matter if all 256 dives are in the memory already used. Unused headers consists of 0xFF's only and must be ignored in the software. Header size is 16byte/dive → A total of 4096Bytes will be transferred.

Download starts with dive #0 and ends with dive #255. Depending on how many dives made with the OSTC yet, this list is not sorted to the date and/or time of the dives. Sort by using date/time information from the compact header! Keep number (0-255) in your list, it's needed to get the dive profile for a particular dive. See command “f” for details.

### Compact header details:

Byte Number	Length	Description	Data	Comment
0	3	Length of profile data for this dive	24bit Length	Useful for parsing profile
3	3	Date of Dive at end (or start!) (YYMMDD)	3Byte Date	Year is 20xx, See Note 3
6	2	Time at end (or start!) of Dive (HHMM)	2Byte Time	See Note 3
8	2	Max. Depth in mbar (Includes salinity offset!)	16bit Depth	See Note 1

Byte Number	Length	Description	Data	Comment
10	3	Divetime (MMMMSS)	24bit Divetime	2Bytes Min, 1Byte Sec.
13	2	Total dive number	16bit Number	See Note 2
15	1	Logbook-Profile version	8bit Version	Only in 1.92 or later (Older firmwares send 0xFF instead)

Note 1: Depth in meters = Depth in mbar\* $g_0/1000$  ( $g_0=9,80665\text{m/s}^2$ )

Note 2: This number is increased by one with every dive made and the number stored here is the number of total dives at the time this dive was made. It's not related to the TOC entry.

Note 3: With profile version 0x24 or later, hwOS stores the START of the dive, not the END as before

Note: OSTC sends a 0x4D after transferring all compact headers successfully.

**command 0xFF: Exit COM mode**

Output OSTC: 0xFF (command echo)

The OSTC displays "Exited" for two seconds and powers-down the COM chip.

**Command 0x77 and 0x72: Read/Write Settings:**

1. Byte (Read/Write)

**Write: 0x77 („w“)**

+2...5 Bytes Data

OSTC will send 0x4D when all bytes have been received

**Read: 0x72 („r“)**

+1 Byte Data

OSTC will send 1...4 Bytes information + 0x4D

Output OSTC: 1 Byte (command echo)

2. Byte	3. Byte	4. Byte	5. Byte	6. Byte
Gas1: 0x10	%O2	%He	Type (Note 1)	Change Depth [m]
Gas2: 0x11	%O2	%He	Type (Note 1)	Change Depth [m]
Gas3: 0x12	%O2	%He	Type (Note 1)	Change Depth [m]
Gas4: 0x13	%O2	%He	Type (Note 1)	Change Depth [m]
Gas5: 0x14	%O2	%He	Type (Note 1)	Change Depth [m]
Dil1: 0x15	%O2	%He	Type (Note 2)	Change Depth [m]
Dil2: 0x16	%O2	%He	Type (Note 2)	Change Depth [m]
Dil3: 0x17	%O2	%He	Type (Note 2)	Change Depth [m]
Dil4: 0x18	%O2	%He	Type (Note 2)	Change Depth [m]
Dil5: 0x19	%O2	%He	Type (Note 2)	Change Depth [m]
SP1: 0x1A	Setpoint [cbar]	Change Depth [m]		
SP2: 0x1B	Setpoint [cbar]	Change Depth [m]		
SP3: 0x1C	Setpoint [cbar]	Change Depth [m]		
SP4: 0x1D	Setpoint [cbar]	Change Depth [m]		
SP5: 0x1E	Setpoint [cbar]	Change Depth [m]		
CCR mode: 0x1F	0=Fixed SP, 1=Sensor, 2=Auto SP			
Dive mode: 0x20	0=OC, 1=CC, 2=Gauge, 3=Apnea			
Deco type: 0x21	0=ZH-L16, 1=ZH-L16-GF			
ppO2 max (Bottom/Travel Gases): 0x22	ppO2 max [cbar]			
ppO2 min: 0x23	ppO2 min [cbar]			
Future TTS: 0x24	FTTS [min]			
GF_low: 0x25	GF_low [%]			
GF_high: 0x26	GF_high [%]			
aGF_low: 0x27	aGF_low [%]			
aGF_high: 0x28	aGF_high [%]			
aGF selectable: 0x29	0=aGF disabled, 1=aGF can be selected underwater			

Saturation: 0x2A	Saturation [%] for Non-GF Deco mode			
Desaturation: 0x2B	Desaturation [%] for Non-GF Deco mode			
Last deco: 0x2C	Last Stop [m]			
Brightness: 0x2D	0=Eco, 1=Medium, 2=Full			
Units: 0x2E	0=m/°C, 1=ft/°F			
Sampling rate: 0x2F	0=2s, 1=10s			
Salinity: 0x30	0-4 [%]			
Dive mode colour: 0x31	0=Standard, 1=Red, 2=Green, 3=Blue			
Language: 0x32	0=EN, 1=DE, 2=FR, 3=IT			
Date format: 0x33	0=MMDDYY, 1=DDMMYY, 2=YYMMDD			
Compass gain: 0x34	(Note 3)			
Pressure sensor offset: 0x35	In mbar (Note 4)			
Show a safety stop: 0x36	0=No, 1=Yes			
Set calibration gas: 0x37	%O2			
0x38	Command not used anymore			
Flip screen: 0x39	0=normal, 1=180° flipped			
Left button sensitivity: 0x3A (Note 5)	20-100 [%]			
Right button sensitivity: 0x3B (Note 5)	20-100 [%]			
Bottom Gas consumption: 0x3C	5-50 [l/min]			
Decompression Gas consumption: 0x3D	5-50 [l/min]			
MOD Warning: 0x3E	0=No, 1=Yes			
Dynamic ascend rate: 0x3F	0= Fixed to 10m/min, 1=variable speed			
Graphical speed indicator: 0x40	0=No, 1=Yes			
Always show ppO2: 0x41	0=No, 1=Yes			
Temperature sensor offset: 0x42	In 0.1°C (Note 4)			
SafetyStop Length: 0x43	60-240 [s]			
SafetyStop Start Depth: 0x44	21-61[cbar] (2,1-6,1m)			
SafetyStop End Depth: 0x45	19-39 [cbar] (1,9-3,9m)			
SafetyStop Reset Depth: 0x46	81-151 [cbar] (8,1-15,1m)			
Conservatism: 0x47(Note 6)	"-2"==0 .. "+2"==4 "GF"==5			
Divemode Timeout: 0x48	1-20 [min]			
Button polarity: 0x49	0xFF (Both normal), 0x00			

	(Both inverted), 0x01 (Left inverted only), 0x02 (Right inverted only) – used in production only			
PSCR Drop [%]: 0x4A	0 ... 15%			
PSCR Lung Ratio [1/x]: 0x4B	5..20 (1/5... 1/20)			
ppO2 max (Deco Gases): 0x4C	ppO2 max [cbar]			
CCR/pSCR min ppO2: 0x4D	ppO2 min [cbar]			
Tank size tank 1: 0x4E	Tank size [l]			
Tank size tank 2: 0x4F	Tank size [l]			
Tank size tank 3: 0x50	Tank size [l]			
Tank size tank 4: 0x51	Tank size [l]			
Tank size tank 5: 0x52	Tank size [l]			
Tank pressure budget tank 1: 0x53	Tank pressure budget [bar]			
Tank pressure budget tank 2: 0x54	Tank pressure budget [bar]			
Tank pressure budget tank 3: 0x55	Tank pressure budget [bar]			
Tank pressure budget tank 4: 0x56	Tank pressure budget [bar]			
Tank pressure budget tank 5: 0x57	Tank pressure budget [bar]			
CCR max ppO2 limiter: 0x58	O2% max in loop [%]			
Setpoint for simulator: 0x59	Setpoint # 1-5			
Compute gas needs for bailout case: 0x5A	0=No, 1=Yes			
Use aGF for simulator: 0x5B	0=No, 1=Yes			
Waiting time: 0x5C	0=no-fly, 1=1000m, 2=2000m, 3=3000m			
Isobaric counter diffusion warning: 0x5D	0=No, 1=Yes			
Saturation: 0x5E	Saturation [%] for GF Deco mode			
Desaturation: 0x5F	Desaturation [%] for GF Deco mode			
Logbook Offset: 0x60	LOW Byte	HIGH Byte		

Note 1: 0=Disabled, 1=First, 2=Travel, 3=Deco

Note 2: 0=Disabled, 1=First, 2=Normal

Note 3: 0=230LSB/Gauss, 1=330LSB/Gauss, 2=390LSB/Gauss, 3=440LSB/Gauss, 4=660LSB/Gauss, 5=820LSB/Gauss, 6=1090LSB/Gauss, 7=1370LSB/Gauss (See HMC5883L Datasheet, Page 13, for details). It's recommended not to adjust the compass gain externally.

Note 4: signed int8 (two's complement), values between +/-20 are valid

Note 5: Only for devices with piezo-electric buttons, lower values mean higher sensitivity

Note 6: hwOS Sport only

Note: OSTC sends a 0x4D after read or write of one setting.

Note: Use command 0x6E („,n“): *Display up to 16 characters in the COM mode* to display some feedback on the OSTC screen when updating settings.

#### **Example 1: Set Gas 3 to TX18/40 (First Gas)**

Command: 0x77 (Write)

Output OSTC: 0x77 (command echo)

Command: 0x12, d'17', d'40', 0x01, 0x00 (Gas3, O2=17, He=40, Type=1, Change Depth=0)

Output OSTC: 0x4D (Command done)

#### **Example 2: Set Gas 5 to TX50/10 (Deco Gas, 21m)**

Command: 0x77 (Write)

Output OSTC: 0x77 (command echo)

Command: 0x14, d'50', d'10', 0x03, d'21' (Gas5, O2=50, He=10, Type=3, Change Depth=21)

Output OSTC: 0x4D (Command done)

#### **Example 3: Set OSTC to CCR Mode with Fixed Setpoints**

Command: 0x77 (Write)

Output OSTC: 0x77 (command echo)

Command: 0x20, 0x01 (Dive mode=1)

Output OSTC: 0x4D (Command done)

Command: 0x77 (Write)

Output OSTC: 0x77 (command echo)

Command: 0x1F, 0x00 (CCR Mode=0)

Output OSTC: 0x4D (Command done)

As soon as **command 1** is done (0x4D from OSTC) the **next command** can be started.

#### **command 0x78 („,x“): Reset all settings**

Output OSTC: 0x78 (command echo)

Output OSTC: Final 0x4D