SBE 37-SMP-ODO (SDI-12) MicroCAT Reference Sheet

(see SBE 37-SMP-ODO MicroCAT User's Manual for complete details)

Sampling Modes

- **Polled sampling** – On command, run pump, take one sample, and send data to computer. Alternatively, command MicroCAT to transmit last sample in memory while sampling autonomously.
- **Autonomous sampling** (*not compatible with SDI-12 deployments.*) – At pre-programmed intervals, wake up, run pump, sample, store data in FLASH memory, and go to sleep. Data can also be transmitted real-time for RS-232 deployments.

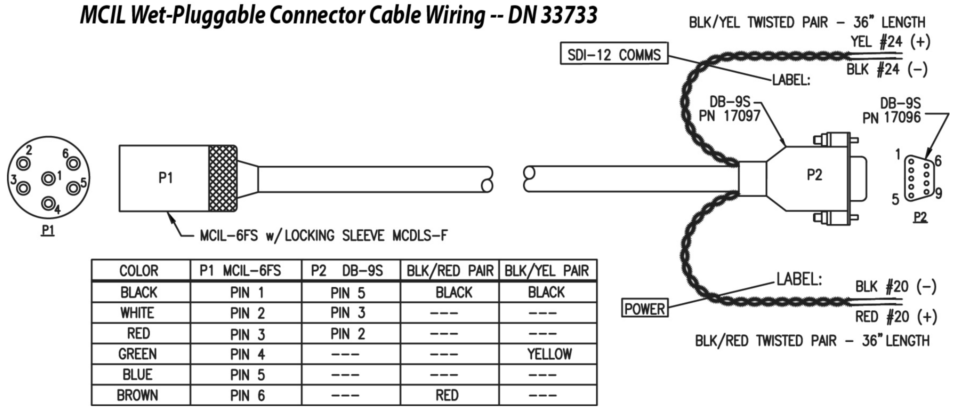
Setup

1. Install AA lithium cells (Note: **ODO MicroCATs use a battery pack with a yellow cover plate**):
   A. *Remove connector end cap*: Wipe dry housing/end cap seam. Remove 2 cap screws, twist end cap counterclockwise, and pull out. Disconnect Molex connecting to battery pack. Wipe dry O-ring mating surfaces with lint-free cloth.
   B. *Remove battery pack, install cells*: Loosen captured screw in battery pack cover. Use handle to lift pack out of housing. Keep handle upright. Unscrew cover plate. Roll 2 O-rings on side of pack out of grooves. Insert cells, and roll 2 O-rings back into grooves. Align pin on cover plate PCB with post hole, keep handle upright, and screw cover plate onto battery pack.
   C. *Reinstall battery pack and connector end cap*: Align D-shaped opening and pins on shaft. Lower battery pack into housing; push gently to mate. Tighten captured screw to secure battery pack in housing. Remove water from O-rings and mating surfaces with lint-free cloth. Inspect O-rings and mating surfaces for dirt, nicks, and cuts. Clean as necessary. Apply light coat of O-ring lubricant to O-ring and mating surfaces. Plug Molex connector together. Fit end cap into housing. Reinstall 2 cap screws.
2. Install supplied RS-232 data I/O cable on MicroCAT and connect to computer serial port.
3. Double click on SeatermV2.exe. SeatermV2 opens; in Instruments menu, select *SBE 37 RS232*. Seaterm232 opens.
4. In Seaterm232's Communications menu, select Configure. Select Comm port and baud rate (factory set to 9600), and click OK.
5. Seaterm232 connects to MicroCAT, and sends **GetHD**.
6. Program MicroCAT for intended deployment (see other side of this sheet for *Command Instructions and List*):
   A. Ensure all data has been uploaded, and then send **InitLogging** to make entire memory available for recording. If **InitLogging** is not sent, data will be stored after last recorded sample.
   B. Set date and time **(DateTime=**), and establish logging parameters.
   C. **For SDI-12 deployments:**
      - Set address (**SetAddress=** via RS-232, or aAb! via SDI-12) for SDI-12 communications (0-9, a-z, A-Z).
      - Program controller to send periodic requests to run pump and sample (aM!, aMC!, aC!, or aCC! store data in MicroCAT FLASH memory; aM1!, aMC1!, aC1!, or aCC1! do not store data in FLASH memory), and then transmit sample (aD0!, aD1!, etc.).
   D. Set other parameters as desired.
   E. **For RS-232 deployments:** If you will be sampling autonomously, use one of following sequences to start logging:
      - **StartNow** to start logging now, taking a sample every **SampleInterval=** seconds.
      - **StartDateTime=** and **StartLater** to start logging at specified date and time, sampling every **SampleInterval=** seconds.

Deployment

1. Wiring – Install cable (not supplied) between MicroCAT and controller. Install locking sleeve on MicroCAT.
2. Mount MicroCAT **with connector at bottom for proper operation – see manual for details.**

MCIL Wet-Pluggable Connector Cable Wiring -- DN 33733



COLOR	P1 MCIL-6FS	P2 DB-9S	BLK/RED PAIR	BLK/YEL PAIR
BLACK	PIN 1	PIN 5	BLACK	BLACK
WHITE	PIN 2	PIN 3	---	---
RED	PIN 3	PIN 2	---	---
GREEN	PIN 4	---	---	YELLOW
BLUE	PIN 5	---	---	---
BROWN	PIN 6	---	RED	---

Data Upload

1. Connect RS-232 data I/O cable from MicroCAT to computer.
2. Double click on SeatermV2.exe. SeatermV2 opens; in Instruments menu, select *SBE 37 RS232*. Seaterm232 opens.
3. In Seaterm232's Communications menu, select Configure. Select Comm port and baud rate, and click OK.
4. Seaterm232 connects to MicroCAT, and sends **GetHD**.
5. If sampling autonomously (logging), command MicroCAT to stop logging by sending **Stop**.
6. If desired, reset baud to increase upload speed (**BaudRate=**). After first entry, MicroCAT changes to new baud, then waits for command to be sent again at new baud (In Seaterm232's Communications menu, select *Configure*. In dialog box, select new baud and click OK. Then retype command.). If it does not receive command again at new baud, it reverts to previous baud.
7. Click Upload menu to upload stored data.
8. Seaterm232 prompts you to run SBE Data Processing to convert uploaded .hex file to .cnv file for use by other modules in data processing software. Process file and review data to ensure all data has been uploaded.

RS-232 Command Instructions and List

- Input commands in upper or lower case letters and register commands by pressing Enter key.
- If in quiescent (sleep) state, re-establish communications by clicking Connect in Communications menu or pressing Enter key.
- If a new command is not received within 2 minutes after completion of a command, MicroCAT returns to quiescent (sleep) state.
- MicroCAT sends an error message if invalid command is entered.

Shown below are commands used most commonly in field. See Manual for complete listing and detailed descriptions.

Category	Command	Description
Status	**GetCD**	Get and display configuration data.
	GetSD	Get and display status data.
	GetCC	Get and display calibration coefficients.
	GetEC	Get and display event counter data (use **ResetEC** to resent event counter).
	GetHD	Get and display hardware data.
	Help	Display list of currently available commands.
	DS	Get and display status.
	DC	Get and display calibration coefficients.
General Setup	**DateTime=x**	**x= mmddyyyyhhmmss** (real-time clock month, day, year, hour, minute, second).
	BaudRate=x	**x=** baud for **RS-232** communication (4800, 9600, 19200, 38400, 57600, 115200). ***Default 9600.*** *Note: 1200 baud is used for SDI-12 communication, and is independent of baud set for RS-232 communication.*
	ReferencePressure=x	**x** = reference pressure (decibars) (used when MicroCAT has no pressure sensor).
	QS	Place MicroCAT in quiescent (sleep) state. Logging and memory retention not affected.
RS-232 Setup	**OutputExecutedTag=x**	**x=Y**: Output XML Executed and Executing tags for **RS-232** communications. **x=N**: Do not.
	TxRealTime=x	**x=Y**: Output real-time **RS-232** data while sampling autonomously. **x=N**: Do not.
SDI-12 Setup	**SetAddress=x**	**x=** address (0-9, a-z, A-Z) for **SDI-12**.
	SetSDI12Flag=x	**x=** out-of-range value (-9999999 to +9999999; must include + or -) for **SDI-12** (**OutputFormat=3**). ***Default +9999999***.
Pump Setup	**MinCondFreq=**	**x=** minimum conductivity frequency (Hz) to enable pump turn-on for sampling.
	AdaptivePumpControl=x	**x=Y**: Use *Adaptive Pump Control*. **x=N**: Run pump for [**OxTau20** * **OxNTau**] before each sample.
	OxNTau=x	**x=** pump time multiplier. Range 1 – 100; ***default*** *7*.
	PumpOn	Turn pump on, for testing.
	PumpOff	Turn pump off, if turned on with **PumpOn**.
DO Sensor Setup	**Send63=command**	Command MicroCAT to send **command** to SBE 63 DO sensor and receive response. See SBE 63 manual for command list. Following SBE 63 setup required: **SetEcho=1**, **SetFormat=1**, **SetAvg=1 to 16** (recommended value is **2**), **SetAutoRun=0**.
Memory Setup	**InitLogging**	Initialize logging to make entire memory available for recording.
	SampleNumber=x	**x=** sample number for last sample in memory. **SampleNumber=0** equivalent to **InitLogging**.
Output Format Setup	**OutputFormat=x**	**x=0**: Output raw decimal data. **x=2**: Output converted decimal data, XML format. **x=1**: Output converted decimal data. **x=3**: Output converted decimal data, SDI-12 format.
	SetTempUnits=x	**x=0**: Temperature output °C, ITS-90. **x=1**: °F, ITS-90.
	SetCondUnits=x	**x=0**: Conductivity output S/m. **x=1**: mS/cm. **x=2**: µS/cm.
	SetPressUnits=x	**x=0**: Pressure output decibars. **x=1**: psi (gauge).
	SetOxUnits=x	**x=0**: Dissolved oxygen output ml/L. **x=1**: mg/L.
	OutputTemp=x	**x=Y**: Output temperature (units defined by **SetTempUnits=**). **x=N**: do not.
	OutputCond=x	**x=Y**: Output conductivity (units defined by **SetCondUnits=**). **x=N**: do not.
	OutputPress=x	**x=Y**: Output pressure (units defined by **SetPressUnits=**). **x=N**: do not.
	OutputOx=x	**x=Y**: Output dissolved oxygen (units defined by **SetOxUnits=**). **x=N**: do not.
	OutputSal=x	**x=Y**: Output salinity (psu). **x=N**: do not.
	OutputSV=x	**x=Y**: Output sound velocity (m/sec). **x=N**: do not.
	OutputSC=x	**x=Y**: Output specific conductivity (units defined by **SetCondUnits=**). **x=N**: do not.
	UseSCDefault=x	**x=0**: Use **SetSCA=** value. **x=1**: Use default (0.020) thermal coefficient (specific conductivity calculation).
	SetSCA=x	*Only applicable if* ***UseSCDefault=0***. **x=** thermal coefficient (specific conductivity calculation).
	TxSampleNum=x	**x=Y**: Output sample number with each polled sample. **x=N**: do not.
	SetCoastal=x	**x=0**: Set units to °C, S/m, dbar, ml/L; enable T, C, P, DO output. **x=1**: Set units to °C, µS/cm, psi, mg/L; enable T, P, DO, specific conductivity output.
Autonomous Sampling (Logging)	**SampleInterval=x**	**x=** interval between samples (10-21600 sec).
	StartNow	Start logging now.
	StartDateTime=x	**x= mmddyyyyhhmmss** (delayed logging start month, day, year, hour, minute, second).
	StartLater	Start logging at delayed start time.
	Stop	Stop logging or waiting to start logging. Press Enter before sending **Stop**. Must send **Stop** before uploading data.
Polled Sampling	**TS**	Do not pump. Take sample, store data in buffer, output data.
	TSR	Do not pump. Take sample, store data in buffer, output data in raw decimal format.
	TPS	Run pump, take sample, store data in buffer, output data.
	TPSH	Run pump, take sample, store data in buffer, do not output data.
	TPSS	Run pump, take sample, store data in buffer and in FLASH memory, output data.
	TSN:x	Do not pump. Take **x** samples, output data.
	TPSN:x	Run pump continuously while taking **x** samples and outputting data.
	T63	Do not pump. Take sample from SBE 63, output oxygen data in format set by **SetFormat=** *in SBE 63*.
	SL	Output last sample stored in buffer.
	SLTP	Output last sample stored in buffer, then run pump, take new sample, and store data in buffer.
Data Upload	**GetSamples:b,e**	Upload scan **b** to **e**; format defined by **OutputFormat=**. Send **Stop** before sending.
	DDb,e	Upload scan **b** to **e**; converted decimal format (**OutputFormat=1**). Send **Stop** before sending.
Calibration Coefficients		*See manual.*

SDI-12 Standard Commands

Note: Responses to Start Measurement commands include:

- a = SDI-12 address
- ttt = maximum amount of time (sec) until data is ready
- n (1digit, for M commands) **or**
  nn (2 digits, for C [Concurrent] commands) =
  number of parameters in data string (can include T, C, P, DO, salinity, sound velocity, specific conductivity, sample number; dependent on which outputs are enabled)

Command	**Response**	**Description**
Break	None; initiate search for valid mark.	12 millisec spacing on line - Wake all MicroCATs on line. Note: '!' command termination and <CR><LF> do not apply.
a!	a <CR><LF>	Check that MicroCAT 'a' is responding.

aI!	Allccccccccmmmmmmmv.vnnnnnoooooooo<CR><LF>
	where
	ll = SDI-12 version compatibility (13 = 1.3)
	cccccccc = vendor ID ('Sea-Bird')
	mmmmmm = Instrument ID ('37SMP-')
	v.v = MicroCAT firmware version ('2.3')
	nnnnn = MicroCAT serial number
	oooooooo= up to 8 characters, designation of optional sensors (P if pressure installed, O if oxygen installed)
	*Example string when 37-SMP-ODO's SDI-12 address is 0, serial number is 037***12345,** *and* **pressure sensor is installed***:*
	`013Sea-Bird37SMP-2.312345PO`
		Identify instrument.
		Notes:
		• Serial number is last 5 characters of serial number (037xxxxx).
		• Firmware version in aI! response is limited to number of digits shown. Use aXV! (see SDI-12 Extended Commands list) to get full firmware version. For example, for firmware version 2.3.0, aI! will return '2.3', while aXV! will return '2.3.0'.

?!	a<CR><LF>	Get MicroCAT's SDI-12 address; valid only if just 1 MicroCAT online.
aAb!	b<CR><LF>	Change MicroCAT's SDI-12 address from 'a' to 'b'.
aM!	atttn<CR><LF> *(followed by)* a<CR><LF> *(when data is ready)*	Start Measurement **TPSS** (run pump, store data in memory) - Send **TPSS** to MicroCAT (run pump, take sample, store data in buffer, store data in MicroCAT's FLASH memory for later upload). Hold results in MicroCAT buffer until another sample taken. Service request issued when data ready.
aMC!	Same as aM!	Start Measurement **TPSS** - Same as aM!, but response in buffer includes 3character checksum before <CR><LF>.
aC!	atttnn<CR><LF>	Start Measurement **TPSS** - Same as aM!, but service request (a<CF><LF>) not sent.
aCC!	Same as aC!	Start Measurement **TPSS** - Same as aC!, but response in buffer includes 3character checksum before <CR><LF>.
aM1!	atttn<CR><LF> *(followed by)* a<CR><LF> *(when data is ready)*	Start Measurement **TPS** (run pump, do not store data in memory) - Send **TPS** to MicroCAT (run pump, take sample, store data in buffer). Hold results in MicroCAT buffer until another sample taken. Service request issued when data ready.
aMC1!	Same as aM1!	Start Measurement **TPS** - Same as aM1!, but results in buffer includes 3-character checksum before <CR><LF>.
aC1!	atttnn<CR><LF>	Start Measurement **TPS** - Same as aM1!, but service request (a<CF><LF>) not sent.
aCC1!	Same as aC1!	Start Measurement **TPS** - Same as aC1!, but results in buffer includes 3character checksum before <CR><LF>.
aM2!	atttn<CR><LF> *(followed by)* a<CR><LF> *(when data is ready)*	Start Measurement **TS** (do not run pump or store data in memory) - Send **TS** to MicroCAT (**do not run pump**; take sample, store data in buffer). Hold results in MicroCAT buffer until another sample taken. Service request issued when data ready.
aMC2!	Same as aM2!	Start Measurement **TS** - Same as aM2!, but response in buffer includes 3-character checksum before <CR><LF>.
aC2!	atttnn<CR><LF>	Start Measurement **TS** - Same as aM2!, but service request (a<CF><LF>) not sent.
aCC2!	Same as aC2!	Start Measurement **TS** - Same as aC2!, but response in buffer includes 3-character checksum before <CR><LF>.
aD0!	a<*values*><*CRC*><CR><LF> *where* <values> = parameters in data string (can include T, C, P, DO, salinity, sound velocity, specific conductivity, sample number; dependent on which outputs are enabled). CRC is sent if Start Measurement command included CRC request (aMC!, aMC1!, aCC!, aCC1!, etc.)	Send data from MicroCAT buffer. If string is too long, additional commands (aD1!, aD2!, etc.) required to retrieve remaining data. Number of characters in values plus CRC string is limited to 75 for Concurrent data (sampling command string includes 'C'), or 35 for non-Concurrent data (sampling command string includes 'M').

SDI-12 Extended Commands

Note: For all extended commands with an argument (x): If the argument is omitted, the response provides the current setting.

Command	Response	Description
aXV!	aversion&date<CR><LF>	Get full firmware version string (firmware version and firmware date).
aXPx!	ax <CR><LF>	Send **PumpOn (1)** or **PumpOff (0)**. Turn pump on to test or remove sediment; **runs continuously, drawing current**.
aXMCFx!	ax<CR><LF>	Send **MinCondFreq=x**. Minimum conductivity frequency (Hz) to enable pump turn-on, to prevent pump from running in air. Configuration Sheet lists frequency output at 0 conductivity. Typical **MinCondFreq** values: salt water & estuarine: (0 conductivity frequency + 500). fresh water: (0 conductivity frequency + 5).
aXMRx!	xx<CR><LF> *where* xx is current sample number Note: must send aXMR0! twice. Response to first command shows current sample number. Response to second command shows that current sample number has been reset to 0, indicating that memory has been reset.	Send **InitLogging** when **x=0**. **After all data has been uploaded**, initialize logging before starting to sample again to make entire memory available for recording. If not initialized, data will be stored after last recorded sample. MicroCAT requires this command to be sent twice, to prevent accidental reset of memory.
aXUTx!	ax<CR><LF>	Send **SetTempUnits=x**. **x=0**: Temperature output °C, ITS-90. **x=1**: °F, ITS-90.
aXUCx!	ax<CR><LF>	Send **SetCondUnits=x**. **x=0**: Conductivity output S/m. **x=1**: mS/cm. **x=2**: µS/cm.
aXUPx!	ax<CR><LF>	Send **SetPressUnits=x**. **x=0**: Pressure output decibars. **x=1**: psi (gauge).
aXUOx!	ax<CR><LF>	Send **SetOxUnits=x**. **x=0**: Oxygen output ml/L. **x=1**: mg/L.
aXOxxxxxxxx!	axxxxxxxxx<CR><LF> *where* xxxxxxxx=enable (1) / disable (0) status for each output parameter (in order: temperature, conductivity, pressure, oxygen, salinity, sound velocity, specific conductivity, sample number) *Example (enable T, C, P, O, salinity):* `a11111000` *Example (enable T, C, O, salinity; no pressure installed):* `a11x11000`	Send **OutputTemp=x**, **OutputCond=x**, **OutputPress=x**, **OutputOx=x**, **OutputSal=x**, **OutputSV=x**, **OutputSC=x**, **TxSampleNum=x**. **x=0**: Disable output. **x=1**: Enable output.
aXUR!	a<CR><LF>	Send **SetCoastal=1**. Reset units to °C, µS/cm, psi, mg/L; enable output of temperature, pressure, oxygen, and specific conductivity (disable other outputs).