Consort
Hertenstraat 56/9 +32 (0)14 411279
B-2300 Turnhout +32 (0)14 429179
Belgium support@consort.be

C60xx Digital communication

Table of contents

Consort

Hertenstraat 56/9 +32 (0)14 411279
B-2300 Turnhout +32 (0)14 429179
Belgium support@consort.be

1. Introduction

The new range of electrochemical instrumentation C60xx from **Consort** has been completely redesigned and is significantly improved compared to his predecessors. The digital communication allows more direct commands to be able to read faster and more accurate.

2. Digital ports

The devices have now a USB port. The USB driver can be downloaded from our website http://www.consort.be, section *Downloads>Software*.

After installing the USB driver, the instrument will appear, when connected, as a serial COMx port. Set the communication software to use this port. The default serial communication settings are 19200 baud, 8 data bits, 1 stop bit, No parity.

The device allows a baud rate up to 115200 bps which might be interesting especially for transferring a large data table to the computer.

3. Command protocol to send

Commands are sent according to the next protocol:

'>' + Command + Data + Checksum + CR + LF

With:

'>'	Start of command protocol.
Command	Single byte. A specific character invoking a special action or requesting information from the device.
Data	Additional binary information to complete the command. This is not always required. See the *command table* when data is required.
Checksum	Single byte, the lowest binary byte of the sum of the previous bytes which have already been sent starting from '>'. *The checksum is not required for simple commands which don't require additional data* (see *command table*).
CR+LF	Carriage return + Linefeed or ASC(13)+ASC(10). To indicate the termination of the command. *These 2 bytes are not required for the receipt of the command and may be omitted.* They might be interesting for use in terminal windows.

- The single quote signs are only to indicate it is a character, the quote signs are not to be sent to the device.
- The + signs are to not to be sent either unless when placed between quotes.
- The function ASC() indicates the character with the ASCII value given between the brackets, ought to be used.

Hertenstraat 56/9 ☎ +32 (0)14 411279
B-2300 Turnhout 🖷 +32 (0)14 429179
Belgium support@consort.be

4. Command protocol to receive

Responses to the command are sent by the device follow the next protocol:

'<' + Command (+ Size + Data) + Checksum + CR + LF

With:

'<'	Start of response. Note the opposite direction of the character, compared to the protocol to send.
Command	Single byte. The command for which is being responded.
Size	Binary single byte value. The amount of data bytes to follow. The size is only returned when data is following. See the ***command table*** when size and data will follow.
Data	The requested information. This information can be ascii coded or binary. See the ***command table*** when and which data will follow.
Checksum	Single byte. The lowest byte of the binary sum of the previous bytes which have already been sent starting from '<'.
CR+LF	Carriage return + LineFeed, or ASC(13)+ASC(10), to indicate the termination of the response.
()	Size and data are not always returned! See the ***command table*** when and which data will follow.

Consort
Hertenstraat 56/9 +32 (0)14 411279
B-2300 Turnhout +32 (0)14 429179
Belgium support@consort.be

5. Command table

Command	Additional data bytes	Returned data bytes	Purpose	See
'?'			Request to print last measurement in ASCII format	Print measurement
'-'			Disable user keyboard	Keyboard
'+'			Enable user keyboard	Keyboard
'B'	1		Simulation of key	Key simulation
'S'		yes	Request the settings from the device	Settings
'M'	1	yes	Request measurement as binary information	Request Measurement
'F'	1		Change measurement on display	Display output
'G'		yes	Return the GLP report from the current focused measurement	GLP report
'D'	4		Modify the data logger settings	Parameters Data log
'L'		yes	Requests complete Data table in ASCII format	Data table text
'l'	8	yes	Requests Data information in binary format	Data table binary
'Y'		yes	Read date and time from device	Read Date/time
'y'	6		Set date and time from device	Set Date/time
'(' and ')'			Start and stop dumping of display text	Start/Stop Display dump
'I'	1	yes	Request specific device information	Device Information
'U'	2	yes	Read specific user table	Read User table
'u'	65		Store user table	Store User table
'R'	4		Resets/Restarts the device	Reset

Hertenstraat 56/9 +32 (0)14 411279
B-2300 Turnhout +32 (0)14 429179
Belgium support@consort.be

6. Command specifications + examples

6.1 Conventions

- The examples are written in the coloured fixed pitch font `Courier`.
- The blue coloured text in the example highlights the text sent by the computer (see Command protocol to send).
- The magenta coloured text highlights the answer received from the device (see Command protocol to receive).
- Green text highlights additional comments or clarifications which are not sent or received.
- The examples are either given in ASCII text or as binary codes, hexadecimally written. The ASCII coded examples don't always show the additional code for the checksum, carriage return and linefeed. Character with an ASCII code less than 0x20 (' ') are displayed as an underscore '_'.

6.2 Print Measurements

Send the command '?' to request the last measurements.
e.g.

```
>?
<?{
31/05/10 15:00:18 7.215 pH   18.2 °C
```

6.3 Keyboard

With the commands '-' and '+', it is possible to disable and enable the keyboard so the user cannot interact while the software communicates. This way the software can control the device completely. The keyboard is automatically re-enabled when the device restarts.
e.g.

```
>-
<-i /* the keyboard is now disabled */
>+
<+g /* the keyboard is now enabled */
```

6.4 Key Simulation

With the commands 'B' and an additional code (see table below), it is possible to simulate the keyboard. As soon as a 'B' command has been received, the keyboard will be automatically disabled and should be enabled again with the '+' command when required.

Table Key codes:

Code (binary!)	*Key*
0	UP (arrow)
1	OK
2	DOWN (arrow)
3	STORE
4	CAL
5	HOLD
6	MODE

e.g.

```
3E 42 00 80 0D 0A      /* '>B'+CHR(0)+CS+CR+LF :  Simulate up arrow */
3C 42 7E 0D 0A         /* Device answer, command is accepted */
                       /* the keyboard is now disabled !! */
```

Hertenstraat 56/9 ☎ +32 (0)14 411279
B-2300 Turnhout 🖷 +32 (0)14 429179
Belgium support@consort.be

6.5 Request Settings

The command 'S' returns the binary settings of the device.

e.g.
```
3E 53 91 0D 0A
3C 53 1F 03 E8 05 0F 01 0B 01 40 00 00 00 00 05 2E E0 04 43 04 43 04 3B 00 00 00 00 07 00 00 0A 00 01
0  1  2  3  4  5  6  7  8  9  10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33
EC 0D 0A
34 35 36 : byte number offsets)
```

Data record structure

Byte 0, 1: 3C 53
'<S' = start of answer from device

Byte 2: 1F
number of bytes to follow, excluding checksum + termination code CR+LF,
here *31* bytes.

Byte 3, 4: 03 E8
Temperature reference for conductivity measurements.
= *1000* for **25°C**
= *896* for **20°C**

Byte 5: 05
Display Contrast setting, a number between 0 and 9.

Byte 6: 0F
Irrelevant information.

Byte 7: 01
Language setting. 0 = English, 1 = Dutch, 2 = French, 3 = German

Byte 8: 0B
Measurement setting. Here it is 11 (model C6030) which is the setting for measuring the air pressure in hPa.

Byte 9: 01
Measurement resolution settings.

Byte 10, 11, 12, 13: 40 00 00 00
32 bits Password settings. The highest bit (32^{nd}) indicates the password is enabled. The other information will always be zeroed.

Byte 14, 15: 00 05
Data log settings:
- Highest bit (16^{th}) = the data logger is enabled when 1.
- Second highest bit (15^{th}) = memory rotation or continuous data registration.
- Remaining lower *14* bits: Time interval in seconds

Byte 16, 17:
Data log settings: irrelevant information

Hertenstraat 56/9 +32 (0)14 411279
B-2300 Turnhout +32 (0)14 429179
Belgium support@consort.be

Byte 18, 19:
Data log settings: Number of logged data points

Byte 20, 21, 22, 23, 24:
Data log settings: irrelevant information

Byte 25, 26, 27, 28, 29, 30: `00 00 00 07 00 00`
Digital output settings:
- Byte 27+28 is the baudrate index. The value is between 0 and 7 where 0 indicates the lowest baudrate and 7 the highest one.
- Byte 29+30 returns the printer time interval in seconds.

Byte 31: `0A`
Shutdown timer value in minutes when battery powered. Disabled when 0.

Byte 32: `00`
Shutdown timer value in minutes when DC powered. Disabled when 0.

Byte 33: `01`
Enable display background light when DC powered.

Byte 34: `EC`
lowest byte of Checksum of preceding data bytes

Byte 35, 36:
CR + LF, End of data block

6.6 Request measurement

The command to print the measurements (using '?') returns ASCII coded measurement values. This requires more time for the sending and can only be used during the regular measurement mode. To request the measurement during the calibration or to reduce communication time, use the command 'M'+0x00. The device will return all measurement and status information as binary data.

e.g. Request the measurement

```
3E 4D 00 8B 0D 0A /* send the request */
3C 4D 13 00 80 01 01 2C 00 59 CD 2B 00 01 1A 3A 00 03 D0 90 04 51 A8 0D 0A /* returned data */
0  1  2  3  4  5  6  7  8  9  10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 : byte offsets)
```

Data record structure

Byte 0 + 1 = '<M':
start of answer from device

Byte 2: `13`
number of bytes follow, excluding checksum + CR+LF,
here 19 bytes.

Hertenstraat 56/9 ☎ +32 (0)14 411279
B-2300 Turnhout 🖷 +32 (0)14 429179
Belgium support@consort.be

Byte 3+4: 00 80
16 bit information with measurement status of which:
- bit 14: temperature out of range, when 1
- bit 13: temperature probe connected, when 1
- bit 11: measurement out of range, when 1
- bit 7: measurement is found to be stable, when 1

Byte 5: 01
Type of measurement. This will depend on the device model. Here is measurement with number 1 the pH measurement (see Set Measurement).

Byte 6, 7, 8, 9, 10:
Internal information, not of use

Byte 11: 2B
Output format of measurement.
See the table Measurement formats to find here the value 0x2B (= 43 decimal) corresponds with the format of '0.01 pH'.

Byte 12, 13, 14, 15: 00 01 1A 3A
32 bits with measurement data where the value 10000 corresponds to the unit 1. In this example, the hex value 00 01 1A 3A corresponds with 72250. Using the format from byte 11, this example returns the value of '7.22 pH'.

Byte 16, 17, 18, 19: 00 03 D0 90
32 bits with temperature measurement where the value 10000 corresponds to the unit 1. Here is the temperature 00 03 D0 90 corresponding to 250000 or 25,0°C.

Byte 20, 21: ***Not for the model C6010 (without Dissolved Oxygen Measurements)***
16 Bits with air pressure measurement. This value is valid only when measuring Oxygen or the air pressure, it is not correct when measuring the other parameters.

Byte 23: lowest byte of Checksum of preceding data bytes

Byte 24, 25: CR + LF, End of data block

6.7 Set Measurement

The device has several measurements which are normally selected by the user manually from the measurement menu. These can be chosen directly via the communication port using the 'F' command. The measurement is selected with a binary number which depends on the device model.

C6010: pH = 1, mV = 2, °C =3, S/cm = 4, Ohm.cm = 5, TDS = 6, SAL = 7.
C6020: pH = 1, mV = 2, °C =3, S/cm = 4, Ohm.cm = 5, TDS = 6, SAL = 7, O2 = 8, %O2 = 9, hPa = 10.
C6030: pH = 1, Ion = 2, mV = 3, °C =4, S/cm = 5, Ohm.cm = 6, TDS = 7, SAL = 8, O2 = 9, %O2 = 10, hPa = 11.

e.g. To set the milliVolt measurement in a C6010 device:
3E 46 02 86 0D 0A
3C 46 82 0D 0A

e.g. To set the °C measurement for the C6030 model:
3E 46 04 88 0D 0A
3C 46 82 0D 0A

Hertenstraat 56/9 ☎ +32 (0)14 411279
B-2300 Turnhout 🖷 +32 (0)14 429179
Belgium 📠 support@consort.be

6.8 Request GLP report

Request the GLP report from the current measurement. This is the same as selecting manually GLP>SEND REPORT from the calibration menu.

e.g.
```
>G
****     GLP     ****
Toestel    : C6030
Versie     : 1.0
Serial nr  : 100852
Input      : pH

CALIBRATION
Date       : 30/11/2011
Time       : 16:37:07
Eo         : 0 mV
Buffer 1   : 4.00pH
  mV       : 152.5
  øC       : 25.0
  min:sec  : 00:28
Buffer 2   : 7.00pH
  mV       :-11.2
  øC       : 25.0
  min:sec  : 00:13

1.2 pHo      : 6.80pH
    Slope    : 92.2%

PREVIOUS
>1.2 pHo     : 6.81pH
>    Slope   : 100.0%
```

6.9 Set Parameters Data log

The command 'D' allows to adjust the data log parameters while measuring. Four additional bytes (32 bits) are required:

- Highest bit: enable data log function
- 2nd highest bit: log continuously when 1. The oldest data can be overwritten.
- The next 14 bits is the Interval of time in seconds, max 14400 = 4 hours.
- The next bit is irrelevant
- The lowest 15 bits is the maximum number of data points to log. The device is technically limited to 12000 points.

e.g. Enable the data log function, have the values logged at an interval of 15 seconds and let it end when 10000 values have been logged.

```
3E 44 80 0F 27 10 48
3C 44 80 0D 0A
```

Enable the data log function, have the values logged at an interval of 1 minute and keep only the last 60 values in memory.

```
3E 44 C0 3C 00 3C BA
3C 44 80 0D 0A
```

Mind that these settings remain valid only as long as the measurement mode has not been canceled due to entering the settings or a calibration. The number of data points to log will then be reset to its maximum. Therefore it is advised to resend the settings when returning in measurement mode.
It is not really advised to log data continuously when less then 12000 points need to be logged. This leads to mixed time points in the data table.

Consort
Hertenstraat 56/9 +32 (0)14 411279
B-2300 Turnhout +32 (0)14 429179
Belgium support@consort.be

6.10 Request Data table as text

The command 'L' is the same as manually selecting DATA>PROCESS>SEND from the SETTINGS menu. It is required to use this command during a measurement display screen. This can be achieved by sending a Set Measurement command first.

e.g.

```
>L
<L^
LOG.00001       01/12/11        14:20:09        7.18    pH      25.0    °C      TIMER
LOG.00002       01/12/11        14:20:11        7.18    pH      25.0    °C      TIMER
LOG.00003       01/12/11        14:20:13        7.18    pH      25.0    °C      TIMER
LOG.00004       01/12/11        14:20:15        7.18    pH      25.0    °C      TIMER
LOG.00005       01/12/11        14:20:17        7.18    pH      25.0    °C      TIMER
LOG.00006       01/12/11        14:20:19        7.18    pH      25.0    °C      TIMER
LOG.00007       01/12/11        14:20:21        7.18    pH      25.0    °C      TIMER
LOG.00008       01/12/11        14:20:23        7.18    pH      25.0    °C      TIMER
LOG.00009       01/12/11        14:20:25        7.18    pH      25.0    °C      TIMER
LOG.00010       01/12/11        14:20:27        7.18    pH      25.0    °C      TIMER
LOG.00011       01/12/11        14:20:29        7.18    pH      25.0    °C      TIMER
LOG.00012       01/12/11        14:20:31        7.18    pH      25.0    °C      TIMER
LOG.00013       01/12/11        14:20:35        7.18    pH      25.0    °C      TIMER
LOG.00014       01/12/11        14:20:37        7.18    pH      25.0    °C      TIMER
LOG.00015       01/12/11        14:20:39        7.18    pH      25.0    °C      TIMER
LOG.00016       01/12/11        14:20:41        7.18    pH      25.0    °C      TIMER
LOG.00017       01/12/11        14:20:43        7.18    pH      25.0    °C      TIMER
LOG.00018       01/12/11        14:20:45        7.18    pH      25.0    °C      TIMER
LOG.00019       01/12/11        14:20:47        7.18    pH      25.0    °C      TIMER
```

6.11 Request Data table as binary data

The command 'l' allows to read the data table as binary information. This is much faster than the 'L' command but requires the receiver program to decode the information.

Additional required information are:

- a 4 byte long number, the start record number,
- a 4 byte long number, the number of records to send.

The device will first return the number of records which will be actually returned. This number can be different from the requested number depending on the amount of available records starting from the given start record number.

e.g. Read the first 20 data records, starting from 0

```
3E 6C 0 0 0 0 0 0 14 BE 0D 0A              ' The request
3C 6C 0 0 0 14 BC D A         ' the 4 byte number of records (here 20) which will be returned
3C 6C A 1C A 1 2C B C5 9 B AB 0 94 D A      ' first record at address 0,
3C 6C A 1C A 1 2C B C5 B B AB 0 96 D A      ' address 1, record 2
3C 6C A 1C A 1 2C B C5 D B AB 0 98 D A      ' address 2, record 3
3C 6C A 1C A 1 2C B C5 F B AB 0 9A D A      ' address 3, record 4
3C 6C A 1C A 1 2C B C5 11 B AB 0 9C D A     ' address 4, record 5
3C 6C A 1C 9 1 2C B C5 13 B AB 0 9D D A     ' and so on …
… … …
3C 6C A 1C 9 1 2C B C5 2F B AB 0 B9 D A     ' address 18, record 19
3C 6C A 1C 9 1 2C B C5 31 B AB 0 BB D A     ' address 19, record 20
```

Consort
Hertenstraat 56/9 +32 (0)14 411279
B-2300 Turnhout +32 (0)14 429179
Belgium support@consort.be

Data record structure

The returned information from a data record contains 10 bytes with the following information. Here's a description with the data from the first record as example: `1C 0A 01 2C 0B C5 09 0B AB 00` or binary written:

- First 2 bytes = The measured value.
  - `1C 0A` or *7178*: This value needs to be multiplied with the 'Data value multiplicator', which can be found in the measurement format table, to obtain a 32 bit measurement value based on 10000 as unit value. The required measurement format can be retrieved from the lower 6 bits from the 9th data byte.

- The next 2 bytes contain the measured temperature:
  - In the example: `01 2C` or *300*. This value has an offset of the minimal temperature (*-5,0*°C) and needs to be multiplied with the 'Data value multiplicator' for °C, which can be found in the measurement format table, to obtain a 32 bit measurement value based on *10000* as unit value. The resulting °C value is *(300-50)*1000 = 250000* or *25,0*°C.

- The 5th Byte contains the 'out of range flag' and the lowest 2 digits of the year.
  - The highest bit is 1 when the value or the temperature is out of range
    In the example: `0`, No out of range measurements.
  - The lowest seven bits is a number for 0 to 99, indicating the last 2 digits of the year
    In the example: `0B`, year 11 (lowest 2 digits from 2011).

- The 6th , 7th , 8th and 9th byte (32 bits, starting from *b31* down to *b0*) contain the date/time information and the measurement format range.
  In the example, this information is binary: `1100 0101 0000 1001 0000 1011 1010 1011`
  - b31 →b28: 4 bits with the Month (0..12), in example `1100` = *12*, the month December
  - b27 →b22: 6 bits with the Minutes (0..59), in example `0101 00` = *20*
  - b21 →b16: 6 bits with the Seconds (0..59), in example `00 1001` = *9*
  - b15 →b11: 5 bits with the date (day of the month, 0..31), in example `0000 1` = *1*
  - b10 →b6: 5 bits with the hour (0..23), in example `011 10` = *14*
  - b5 →b0: 6 bits with the measurement format table index, in example `10 1011` = *43* or the range *0.01 pH*.

- The 10th byte returns additional information which has the following values:
  - *0* The data is recorded due to the timer
  - *1* The data is recorded due to pressing the STORE button
  - 2 The data is recorded due to pressing the HOLD button

The recorded data from the example is *7.18 pH, 25.0°C* on the *1st of December, 2011* at *14:20:09*. The value is recorded due to the timer.

Hertenstraat 56/9 +32 (0)14 411279
B-2300 Turnhout +32 (0)14 429179
Belgium support@consort.be

6.12 Read Date/time

e.g. Send the 'Y' command to return the date and time

```
3E 59 97 0D 0A
3C 59 6 A B F 11 C 1D F9 D A
```

Returned information (hexadecimal):

- `3C 59 6` First 3 bytes = start of answer + number of data bytes to follow.
- `A B F` Next 3 bytes form the date in the order Year (10), month (11) and date (15).
- `11 C 1D` Next 3 bytes form the time in the order hour (17), minutes (12) and seconds (29).
- `F9 D A` Last 3 bytes with checksum and closing codes.

The current date and time here is: 15 November (20)10, 17:12:29.

6.13 Set Date/time

e.g. Send the 'y' command +data to set the date and time to 15 Nov 10, 17:30:00

```
3E 79 A B F 11 1E 0 A 0D 0A   ' '>y' + year + month + date + hour + minutes + seconds + CS + cr + lf
3C 79 B5 D A
```

6.14 Start/Stop Display dump

When sending the command '(' the device starts to send all data written to the display, also to the serial port. The dumping will be stopped when sending the closing bracket command ')'.
Each string sent to the display will be terminated with a CR+LF combination on the serial port.

e.g. Start the dump during the pH measurement:

```
>(                          ' start the dump
<(d__                       ' __ are CR+LF combinations
17:03:28__30/11/11__
17:03:28__30/11/11__  4.00__pH__     __  25.0__øC__
17:03:29__30/11/11__  4.00__pH__     __  25.0__øC__
Æ__17:03:29__30/11/11__  4.00__pH__     __  25.0__øC__
17:03:30__30/11/11__  4.00__pH__     __  25.0__øC__
Æ__17:03:30__30/11/11__  4.00__pH__     __  25.0__øC__
17:03:31__30/11/11__  4.00__pH__     __  25.0__øC__
>)                          ' stop the dump
<)e__
```

Mind that special characters such as the battery symbols are given in the internal font code which is similar to the ASCII table, besides these special characters. Mind that characters with an ASCII code less then a space (0x20) are given as underscore '_'.

Hertenstraat 56/9 ☎ +32 (0)14 411279
B-2300 Turnhout 🖷 +32 (0)14 429179
Belgium support@consort.be

6.15 Device Information

Using the command 'I' with extra byte, it is possible to request some device specific information.

Byte	*Returned information*
0	Device model
1	Version
2	Serial number
3	Battery Voltage

e.g. Request model:

```
3E 49 00 87 0D 0A
3C 49 05 43 36 30 33 30 96 0D 0A     /* '<I'+nr of data bytes+'C6030'+Checksum+CR+LF */
```

Request version:

```
3E 49 01 88 0D 0A
3C 49 04 20 31 2E 30 38 0D 0A        /* '<I'+nr of data bytes+' 1.0'+Checksum+CR+LF */
```

6.16 Read User table

There are 5 pH tables and 3 Conductivity tables available in these devices. It is possible to read these user tables using the command 'U' added with the *table number - 1* and the *table type (0x00 = pH, 0x01 = EC)*. More explanation is given in the following examples.

e.g. Read pH user table nr. 2

```
3E 55 01 00 94 0D 0A  /* '>U'+0x01+0x00+Checksum+CR+LF = Read pH table 2 (BUF2)*/
3C 55 41              /* start of answer '<U' + 65 data bytes to follow                          */
42 55 46 32 00 00     /* 6 bytes: 5 characters with name('BUF2') + 0x00 as end of string         */
00 00 C3 50 00 09 27 C0 /* 10 bytes: 4 bytes as minimum and 4 bytes as maximum temperature,
                           (here 50000 (00 00 C3 50) and 600000 (00 09 27 00), or 5,0 and 60°C   */
0B                    /* 1 byte as size of table -1: 0B=11 => 12 values of 4 bytes each,         */
02                    /* 1 byte with irrelevant information, NOT USED                            */
00 00 71 A8 00 00 00 00 00 00 00 00 00 00 00 00 /* 12 table values (4 bytes each)starting from 5
<----0----> <----1----> <----2----> <----3----> /  to 60°C. The value at 25°C (group 4)is         */
00 00 71 A8 00 00 00 00 00 00 71 A8 00 00 00 00 /* obligatory. Values equal to 0 are not used !
<----4----> <----5----> <----6----> <----7----> /  The representation of the values is in         */
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 /* combination with the measurement format byte
<----8----> <----9----> <----10---> <----11---> /  (=last table byte = 2B)                       */
2B                    /* Format of the table values = '0,01 pH' (see Measurement formats)        */
67 0D 0A              /* checksum + CR +LF */
```

e.g. Read Conductivity (EC) user table nr. 1

```
3E 55 00 01 94 0D 0A  /* '>U'+0x00+0x01+Checksum+CR+LF = Read EC table 1 (STD1)                  */
3C 55 41              /* start of answer '<I' + 65 data bytes to follow                          */
53 54 44 31 00 00     /* 6 bytes: 5 characters with name ('STD1') + 0x00 as end of string        */
00 00 C3 50 00 05 57 30 /* 8 bytes: 4 bytes as minimum and 4 bytes as maximum temperature,
                           (here 50000 (00 00 C3 50) and 350000 (00 05 57 30), or 5,0 and 35°C
                            (see Measurement formats)                                           */
06                    /* 1 byte as size of table-1: 06 => 7 values of 4 bytes each               */
02                    /* 1 byte with irrelevant information, NOT USED                            */
00 00 00 00 00 9B A3 C0 00 AF 04 B0 00 C3 01 E0 /* 12 table values (4 bytes each)starting from 5
<----0----> <----1----> <----2----> <----3----> /  to 35°C. The value at 25°C is obligatory. The */
00 D7 9B 50 00 EC D1 00 00 00 00 00 00 00 00 00 /* last 5 table values (marked X) are not used
<----4----> <----5----> <----6----> <----X----> /  but are required.                             */
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 /*
<----X----> <----X----> <----X----> <----X----> /                                               */
07                    /* Format of the table values = '1 µS/cm' (see Measurement formats)        */
20 0D 0A              /* checksum + CR +LF */
```

Hertenstraat 56/9 +32 (0)14 411279
B-2300 Turnhout +32 (0)14 429179
Belgium support@consort.be

6.17 Store User table

It is also possible to store your user tables with the 'u' command. It is however required to follow the next procedure:

1. Set the device in the SETTINGS menu mode using the key MODE command.
2. Send the Device Information command code with the code 0xC7.
3. Send the Device Information command code with the code 0x63.
4. Send the table number, table type and the table information in the same format as one can read them with the 'U' command (mind the capital size or lower case of the command codes!). This tables format requires :
   (see examples in Read User Table)
   - 6 bytes for the table name,
   - 10 bytes with table information,
   - 48 bytes with table values, also required for EC for which the last 20 bytes are irrelevant !
   - 1 byte with the measurement format of the table values (Important for EC!)

e.g. Store the table 0,01 M KCl as EC table nr 3

```
3E 46 00 84 0D 0A     /* Step1: '>B'+ 0x06 = command to get into the SETTINGS menu (When in
                                                                        measurement mode ! */
3C 46 82 0D 0A        /* device confirmation */
3E 49 C7 4E 0D 0A     /* Step2: '>I'+ 0xC7 = First step of unlock code */
3C 49 85 0D 0A        /* device confirmation */
3E 49 63 EA 0D 0A     /* Step3: '>I'+ 0x63 = Second step of unlock code */
3C 49 85 0D 0A        /* device confirmation */
3E 75 02 01           /* Step4: '>u'+ 0x02 (= table number 3)+ 0x01 (=EC table) */
53 54 44 31 00 00 00 00 C3 50 00 05 57 30 06 02 /* table name + min/max°C+ ... */
00 88 B8 00 00 9B A3 C0 00 AF 04 B0 00 C3 01 E0 /* first 4 values  */
00 D7 9B 50 00 EC D1 00 00 00 00 00 00 00 00 00 /* next 4 values   */
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 /* last 4 values   */
07                                              /* Measurement format */
44 0D 0A              /* checksum + CR + LF  */
3C 75 B1 0D 0A        /* device confirmation */
```

Mind that all these table elements (name, min/max, values, format, irrelevant values/bytes, ...) are required but only the 12 values and the measurement format for conductivity tables will be stored. The measurement format cannot be changed for pH tables. The names, min/max temperature, number of table values... cannot be changed.

There is no control on the 12 table values or the measurement format when writing the table. The incorrectness of these are solely the responsibility of the user.

6.18 Restart the device

Send the Command '>R' followed by 'ESET'+Checksum to restart the device. There will be no answer given.

e.g.

```
3E 52 45 53 45 54 C1 0D 0A /* 'RESET' + Checksum + CR + LF */
                           /* The device restarts without any answer ! */
```

Hertenstraat 56/9 ☎ +32 (0)14 411279
B-2300 Turnhout +32 (0)14 429179
Belgium support@consort.be

7. Measurement formats

The measurements returned as 32 bit numbers are based on the integer 10000 as unit value. The returned format number indicates which value is represented according to the following table. The values should rounded against the given format.

e.g. 1. The measured 32 bit value is *86932*, the given format number is *43* which is 0,01 pH according to the table. This value represents the measurement of *8,69 pH*.

2. The measured 32 bit value is *1006325*, the given format number is *9* which is 0,1 mS/cm according to the table. This value represents the measurement of *100,6 mS/cm*.

Code	*Format*	*Unit*	*Data value Multiplicator*	*Measurement*
0	0.1	mV	1000	Redox Potential
1	1	mV	1000	Redox Potential
2	0.1	$\%O_2$	100	Dissolved Oxygen, saturation in water
3	1	$\%O_2$	100	Dissolved Oxygen, saturation in water
4	0.001	µS/cm	10	Conductivity
5	0.01	µS/cm	100	Conductivity
6	0.1	µS/cm	1000	Conductivity
7	1	µS/cm	10000	Conductivity
8	0.01	mS/cm	100	Conductivity
9	0.1	mS/cm	1000	Conductivity
10	1	mS/cm	10000	Conductivity
11	0.001	mg/l	10	TDS (Total Dissolved Solids)
12	0.01	mg/l	100	TDS (Total Dissolved Solids)
13	0.1	mg/l	1000	TDS (Total Dissolved Solids)
14	1	mg/l	10000	TDS (Total Dissolved Solids)
15	0.01	g/l	100	TDS (Total Dissolved Solids)
16	0.1	g/l	1000	TDS (Total Dissolved Solids)
17	1	g/l	10000	TDS (Total Dissolved Solids)
18	0.1	MΩ.cm	1000	Resistivity
19	0.01	MΩ.cm	100	Resistivity
20	1	KΩ.cm	10000	Resistivity
21	0.1	KΩ.cm	1000	Resistivity
22	0.01	KΩ.cm	100	Resistivity
23	1	Ω.cm	10000	Resistivity
24	0.1	Ω.cm	1000	Resistivity
25	0.1	SAL	100	Salinity
26	0.01	ng/l	100	Ion
27	0.1	ng/l	1000	Ion
28	1	ng/l	10000	Ion

Consort
Hertenstraat 56/9 +32 (0)14 411279
B-2300 Turnhout +32 (0)14 429179
Belgium support@consort.be

Code	*Format*	*Unit*	*Data value Multiplicator*	*Measurement*
29	0.01	µg/l	100	Ion
30	0.1	µg/l	1000	Ion
31	1	µg/l	10000	Ion
32	0.01	mg/l	100	Ion
33	0.1	mg/l	1000	Ion
34	1	mg/l	10000	Ion
35	0.01	g/l	100	Ion
36	0.1	g/l	1000	Ion
37	1	g/l	10000	Ion
38	0.1	°C	1000	Temperature in degrees Celsius
41	1	hPa	n.a.	Air Pressure
42	0.001	pH	10	pH
43	0.01	pH	10	pH
44	0.1	pH	10	pH
45	0.01	ppm O_2	100	Dissolved Oxygen in ppm (=mg/l)
46	0.1	ppm O_2	100	Dissolved Oxygen in ppm (=mg/l)
50	0.1	%	100	General unit in percentage
51	1	%	100	General unit in percentage
53	0.1	mVH	1000	Redox Potential, Normal Hydrogen Electrode reference
54	1	mVH	1000	Redox Potential, Normal Hydrogen Electrode reference
55	0.01	rH_2	100	rH_2, Hydrogen Potential
56	0.1	rH_2	100	rH_2, Hydrogen Potential
57	0.001	µW	10	Power in microWatts, quantification of Vincent
58	0.01	µW	100	Power in microWatts, quantification of Vincent
59	0.1	µW	1000	Power in microWatts, quantification of Vincent
60	1	µW	10000	Power in microWatts, quantification of Vincent
61	1	µW	10000	Power in microWatts, quantification of Vincent
62	1	µW	10000	Power in microWatts, quantification of Vincent
63	1	µW	10000	Power in microWatts, quantification of Vincent