

Echologger EA400 Quick start guide

■ Switch On/Off & Mode changing

- Switch on the device using a magnet switch provided. Place the magnet 5cm below the front end of the device for 1~2 seconds.



Fig1. Position of Magnet sensor

- Red LED starts to blink, in 10 second intervals (now Transmit Mode)
- In Transmit Mode, the red LED also blinks as acoustic signals emit. Blinking in 10 second intervals continues in between.
- Change the mode to Communication Mode by placing the magnet on the same place for 1~2 seconds for changing to Communication Mode.
 - Green LED blinks every 0.5 second. (Communication Mode without USB cable)
 - When connected to PC via a USB cable, Green LED is on
- Switch off the device by placing the magnet for approximately 5 seconds.
 - 'ACTIVATE' button does the same as the magnet switch. (To access the button, open the cap)



Fig2. In side the device

- ① MICRO SD : Slot for an SD card.
- ② ACTIVATE: Button changing modes or power on/off.
- ③ USB : USB connection to. PC
- ④ Battery connector
- ⑤ Battery holder cap.

- The cap can be opened with a metal rod(chopstick or screwdriver). Put in the hole and unscrew it.



Fig3. How to open cap / Place of O-sealing ring



When closing the cap, a great care has to be taken not to get any sand particles or dirt be trapped on the O-sealing ring. Otherwise water can be leaked in. It is recommend that silicone grease should applied on it for maintenance.

- Modes

Mode	Activation (Using Magnet or Button)	LED	USB	Blinking interval	Note
Transmit	1~2 sec. from any mode	 Red	Unplugged	10 sec	Device is on (hibernating)
				Depend on period & interval settings	When Transmitting
Waiting	1~2 sec. from transmit mode	 green	Plugged	0.25 sec	No SD card
			Unplugged	0.5 sec	Not connected to PC
Communication	USB plugged		Plugged	0 sec	Communication
Error	-	 Both	Unplugged	1 second	No SD card / memory full
Off	5~6 sec. from any mode	None	-	-	-

- Place the magnet switch or press ACTIVATE button, then it toggles between transmit and communication mode.

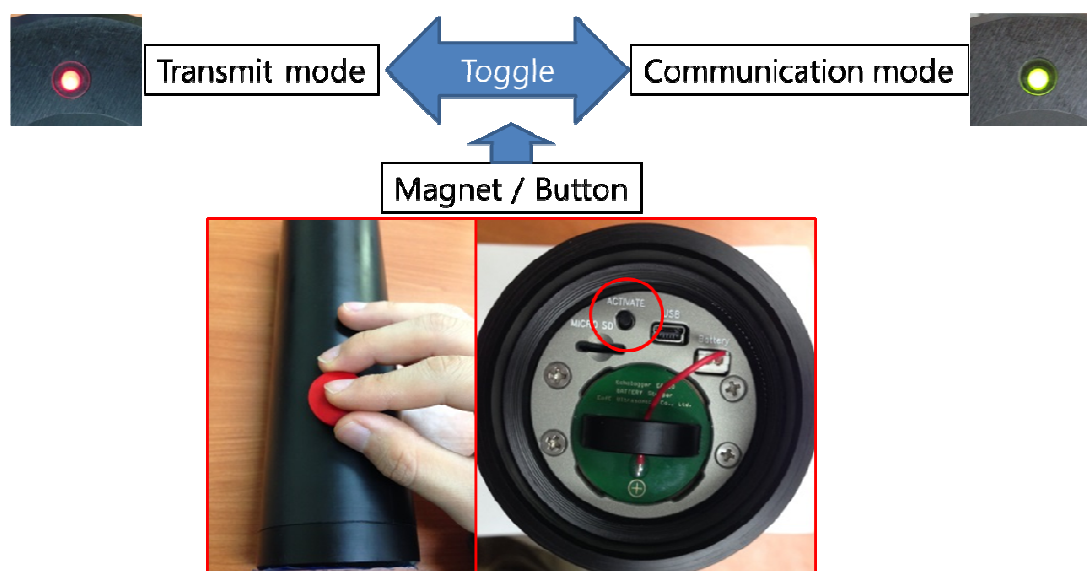


Fig4. Schematic of mode changes

- Changing batteries



Fig5. Procedure of changing batteries

■ Setting parameters in EA400ControlProgram.exe

- Run EA400ControlProgram. (Battery should be disconnected at this stage)

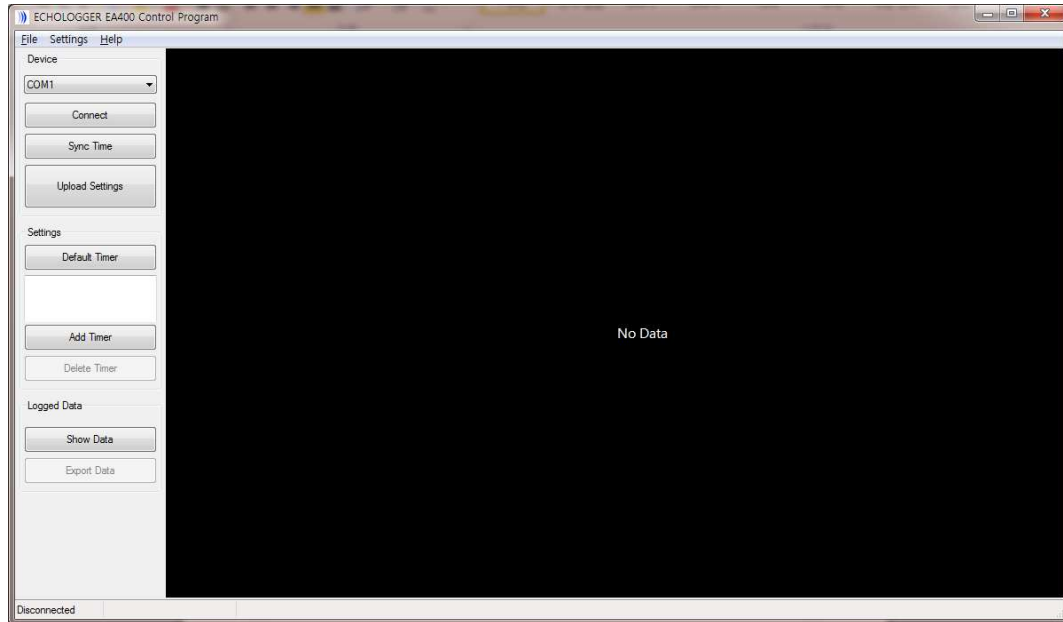


Fig6. GUI

- Connect EA400 to PC with a USB cable provided.
- Correct COM port can be found in Control Panel > Hardware and Sound > Devices and Printers. (Windows 7)

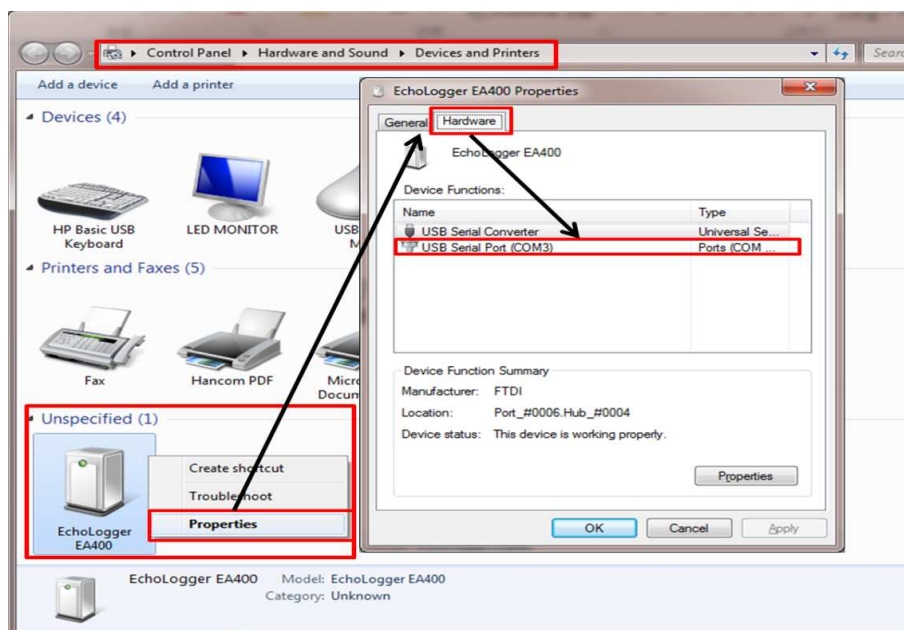


Fig7. Procedure for check COM port number

- Choose a correct data port and click 'Connect' button.

- If EA400 connected with a PC then a new COM Port appear on the list. (When unplugged it will disappear)
- 'Device info' dialog will appear when Connect is successful (Device is in Communication mode)

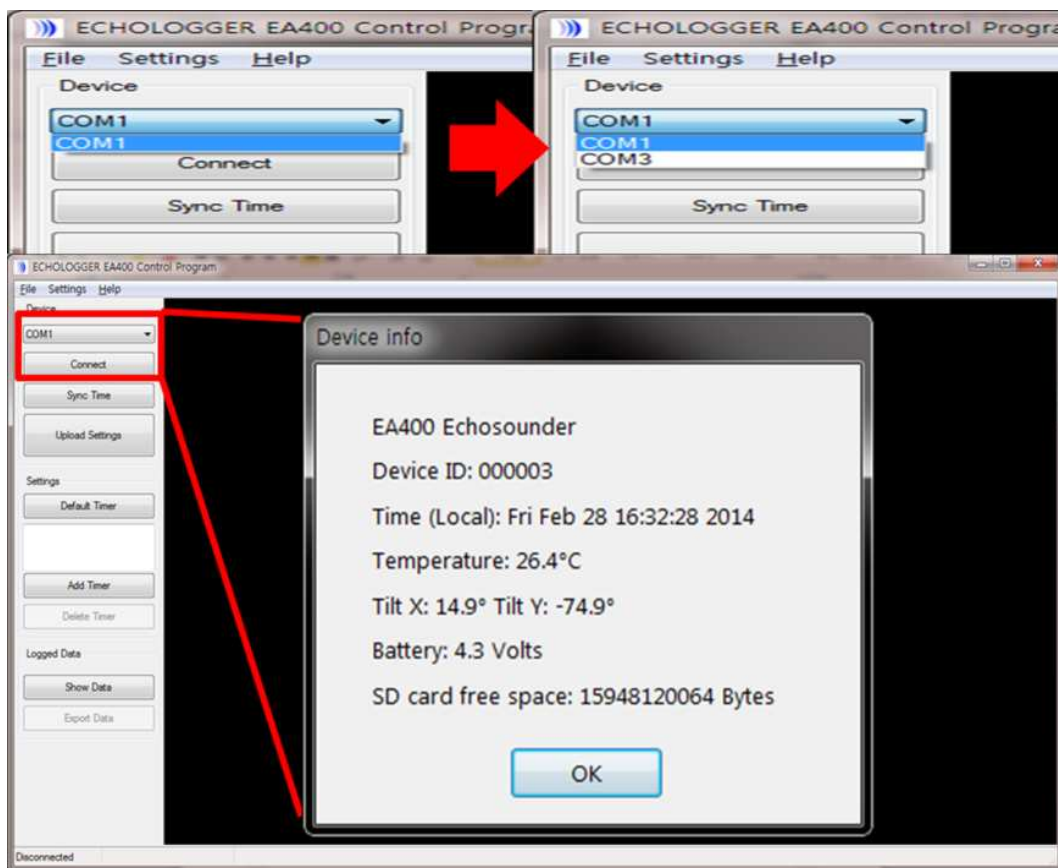


Fig8. Connect to device

- Synchronization in time

1. Synchronize the time of your PC and internet server first.

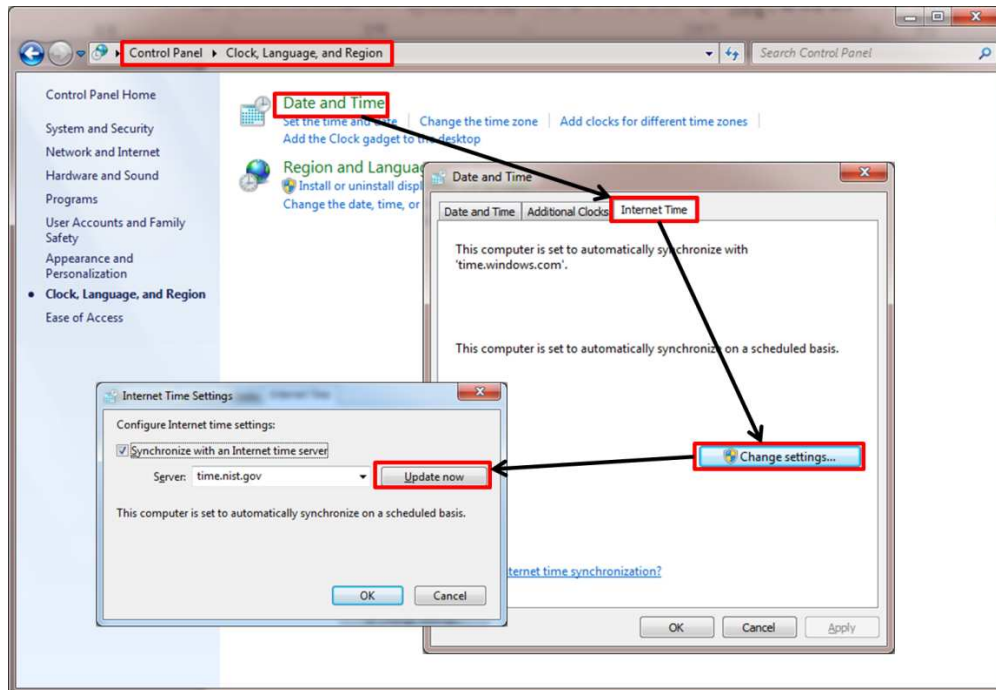


Fig9. Set time with internet server

2. Synchronize time between the PC and EA400 at a UTC time.

- Press buttons ; Sync Time – Sync

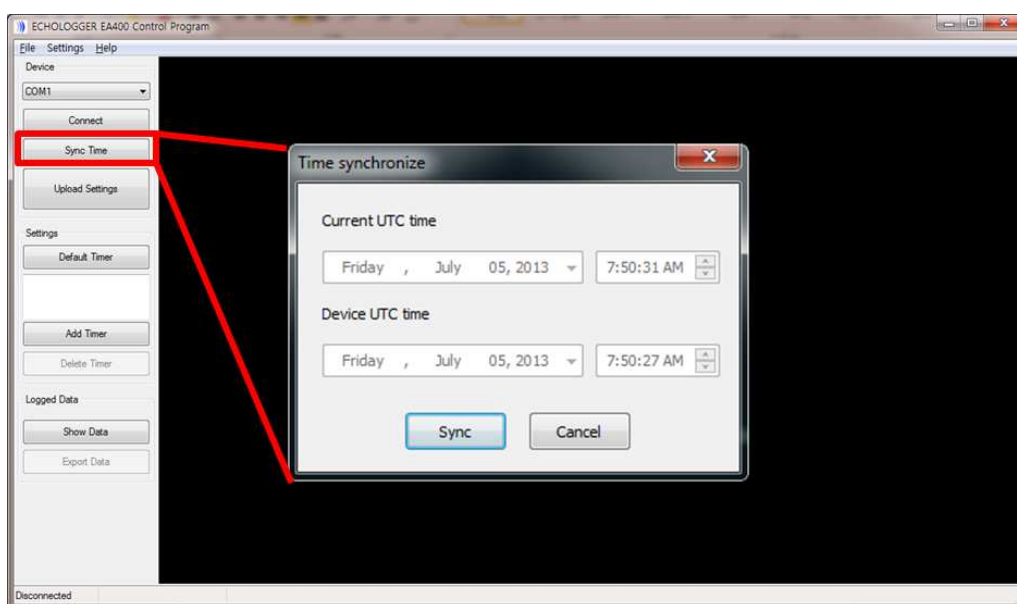


Fig10. Synchronize time PC with device

■ Parameter settings

- Two timer modes are available: Continuous (default timer) & Added Timers
- 'Add Timer' is booking a future measurement plan. (Can book up to 32 timers)

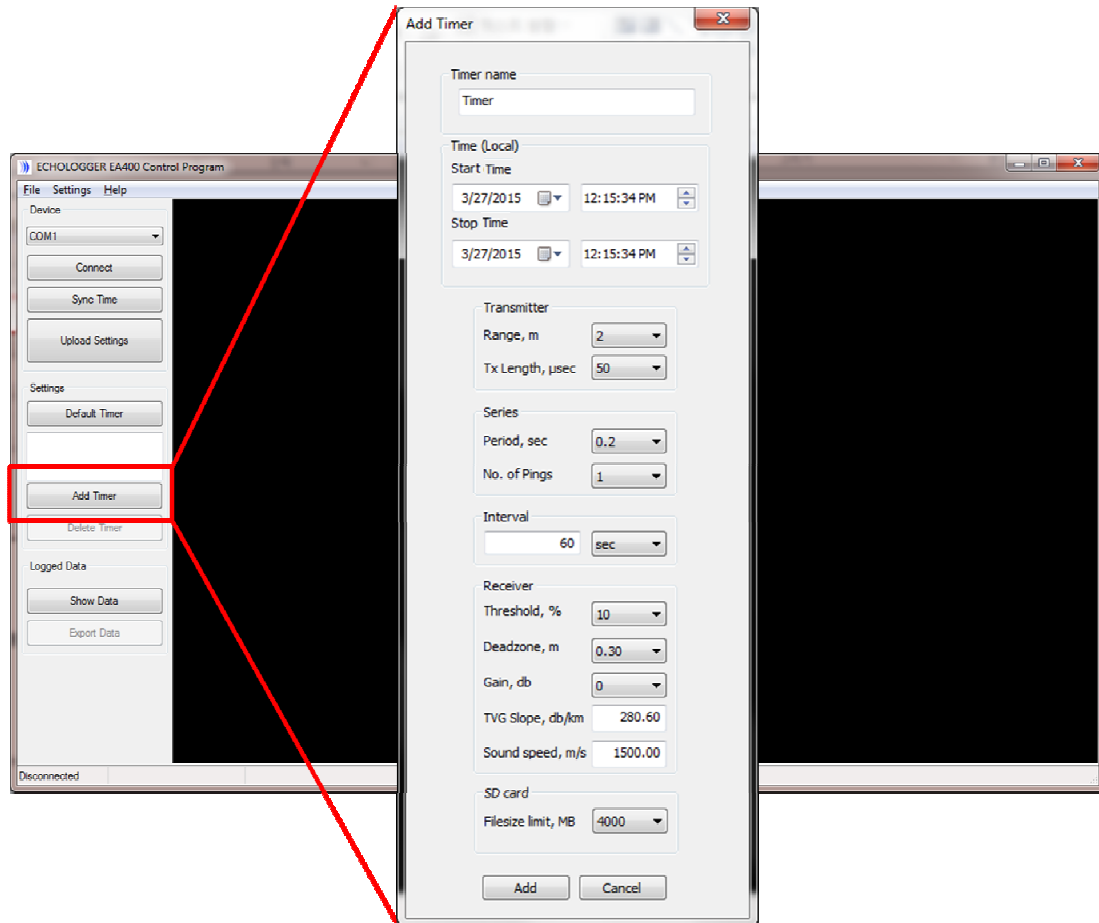


Fig11. Add Timer window

- Parameter can be set-up differently at each added Timer

1. Timer name
: Name of the timer. (Maximum 31 characters.)
2. Start time and Stop time
: Schedule to start and stop measurement.
3. Range
: Maximum range of measurement.

4. Tx Length

: Pulse length in microseconds.

5. Period

: Time between each pulse in series.

6. No. of Pings

: Number of pulses in a series.

7. Interval

: Interval between series.

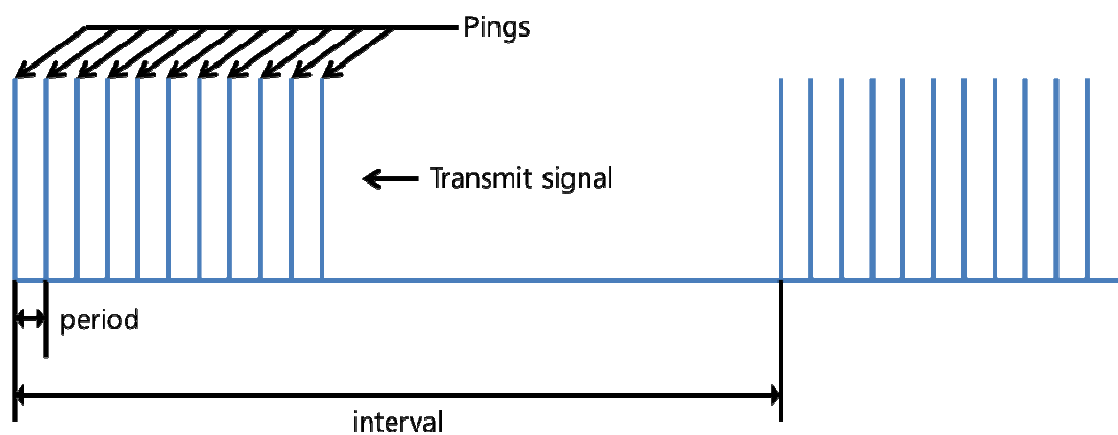


Fig12. Meaning of parameters in transmit signal

8. Threshold

: Threshold for altitude calculation.

9. Dead zone

: Near field zone where measurement is not possible.

10. Gain

: Gain of the receiver.

11. TVG Slope

: TVG(Time variant gain) is distance-related gain.

12. Sound speed

: User can define speed of sound in the water.

13. File size limit

: Maximum data size for each timer.

※ TVG slope could make echo signal without attenuation.

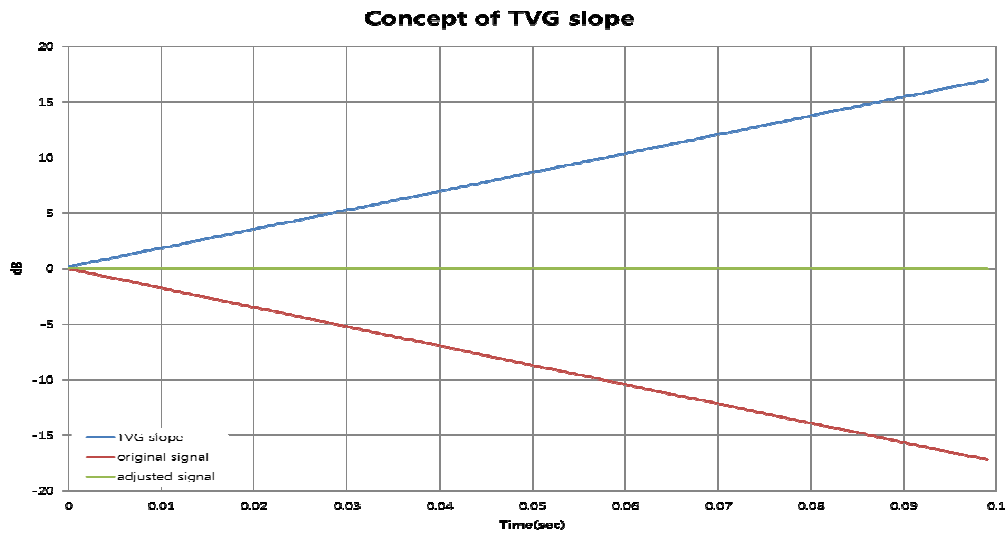


Fig13. Concept of TVG slope

- 'Default Timer' means EA400 works continuously straightaway when started. Simply set up other parameters after choosing Default Timer.

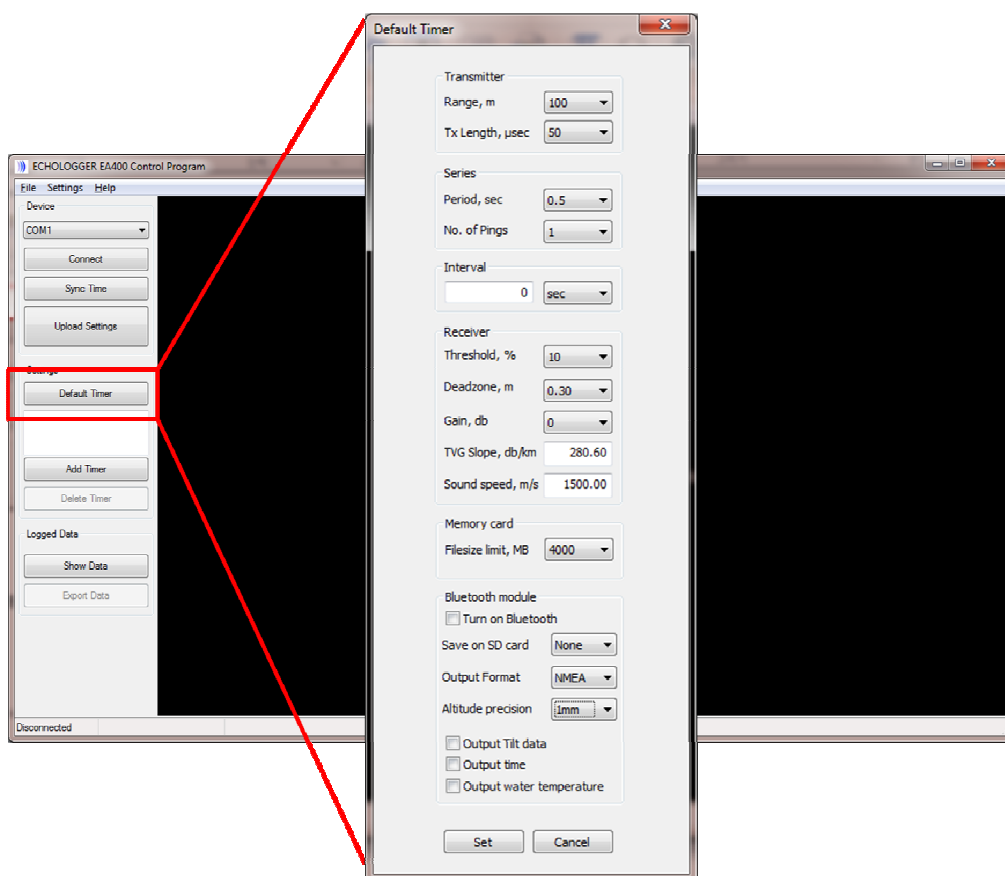


Fig14. Default timer window

- EA400 can be used a wireless real time device by setting Bluetooth parameters. (Only at 'Default Timer')

1. Turn on Bluetooth

: Turn on Bluetooth module.

2. Save on SD card

: Save the data to SD card.

3. Output format

: Choose a data format of saved data.

4. Altitude precision

: Set resolution of data.

5. Output Tilt data

: Include tilt data the device on the data set.

6. Output time

: Include recorded time on the data set.

7. Output water temperature

: Include water temperature on the data set.

※ Recorded NMEA tilt data according to the device orientation. (See below)

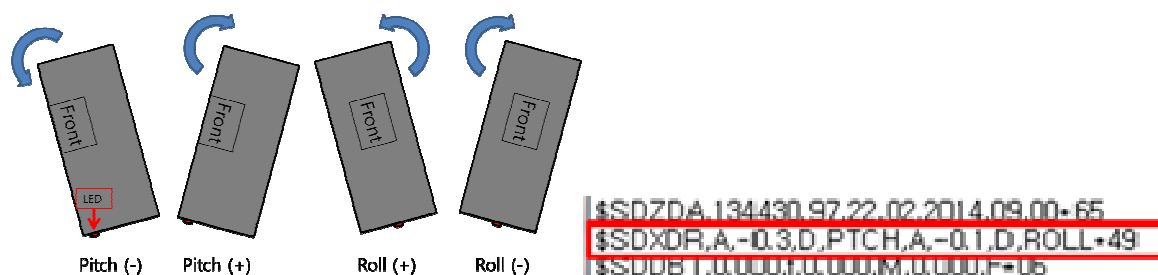


Fig15. Direction of pitch & roll

- Click 'Upload Settings' and select "Default timer" or "Added timers". Selected timer(s) will be uploaded to the device.

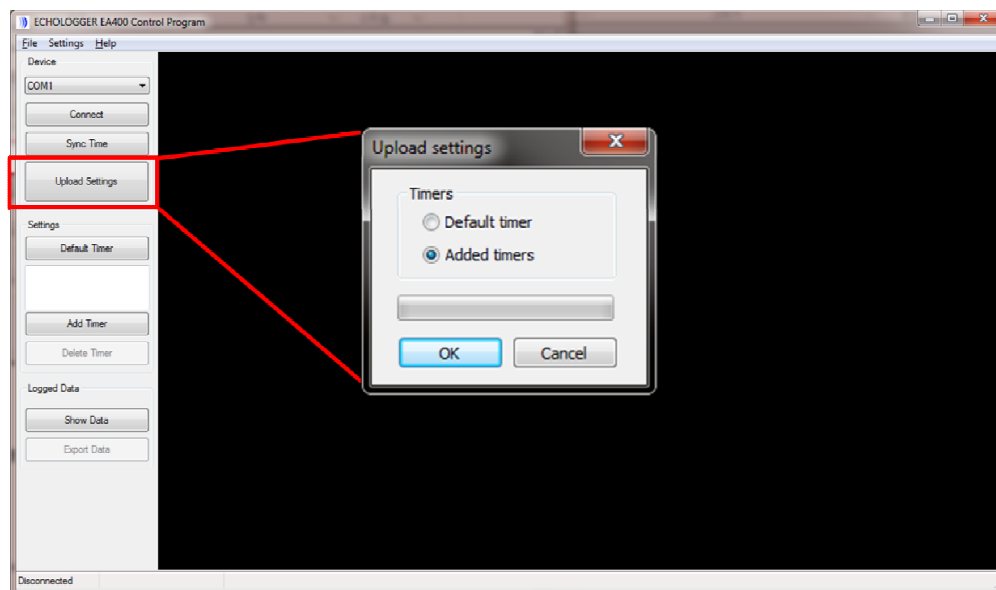


Fig16. Upload settings window

- Now, setting parameters is done. (Still Communication Mode)
- Change to Transmit Mode (or Switch off for now and Switch on later before deployment)
- Deploy the device.



IMPORTANT : DO NOT TURN OFF BEFORE THE DEVICE IS DEPLOYED. (EA400 must be transmit mode when deployed. Turn off means Turn-off, and will not wake up on your timer setting)

■ Real time wireless communication using Bluetooth

- Run EA400ControlProgram.
- EA400 in communication mode with USB connection.
- Set parameters including Bluetooth parameters. (Only at 'Default Timer')

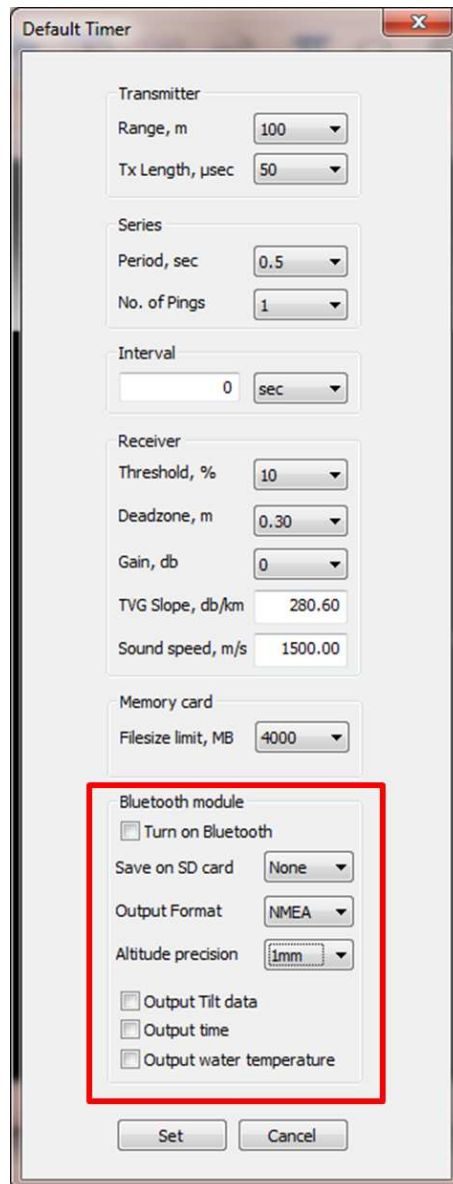


Fig17. Bluetooth parameters

- Upload Default Timer settings.
- Unplug USB and change into Transmit Mode. (Blue LED blinking)

- Pairing PC with EA400 by Bluetooth.

※ Procedure for pairing devices via Bluetooth communication. (Pairing code : 'BTWIN')



Fig18. Check blue LED is blinking

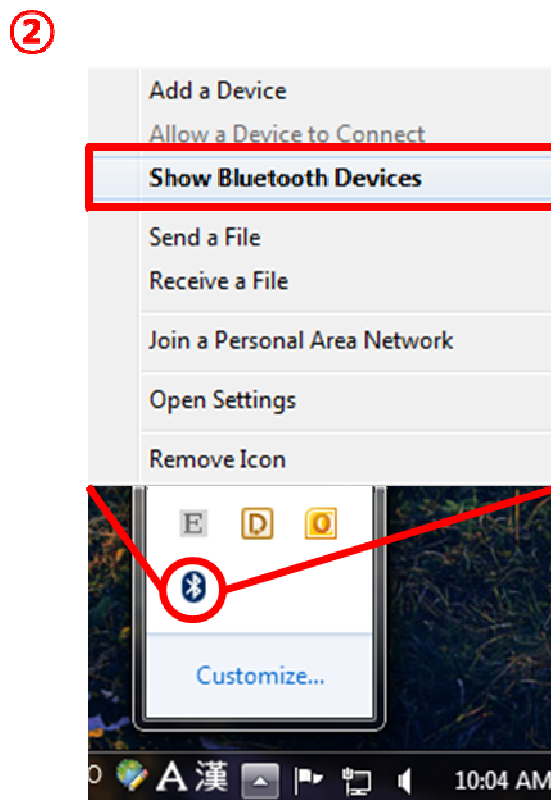


Fig19. Open Bluetooth device window

③

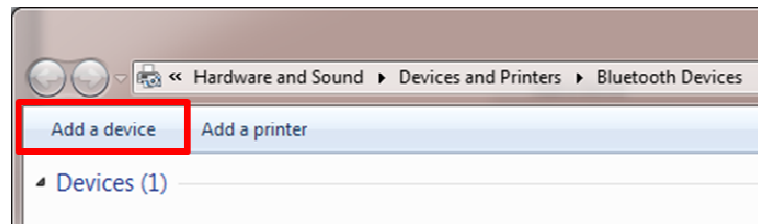


Fig20. Click 'Add a device' button

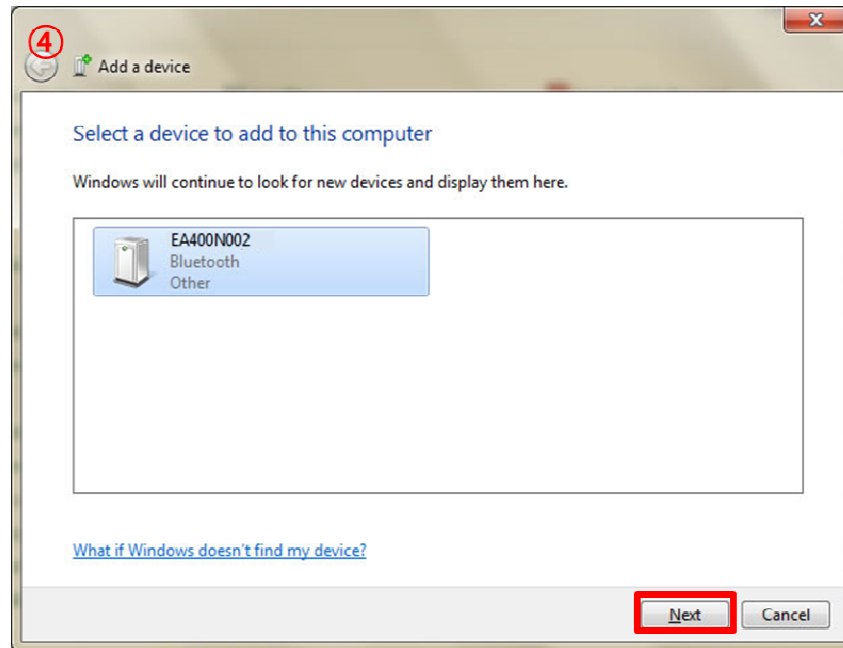


Fig21. Click 'Next' when device detected.

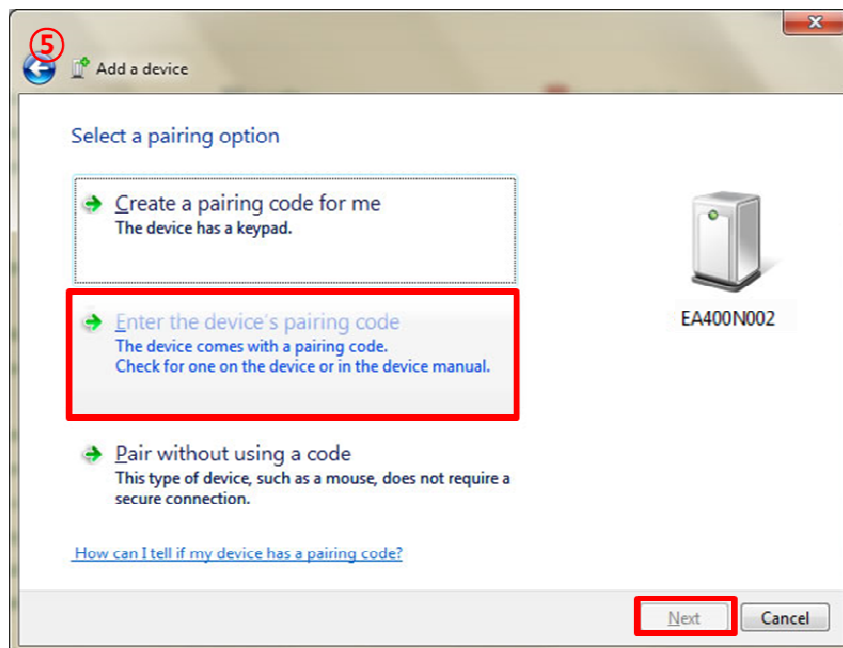


Fig22. Select pairing code option

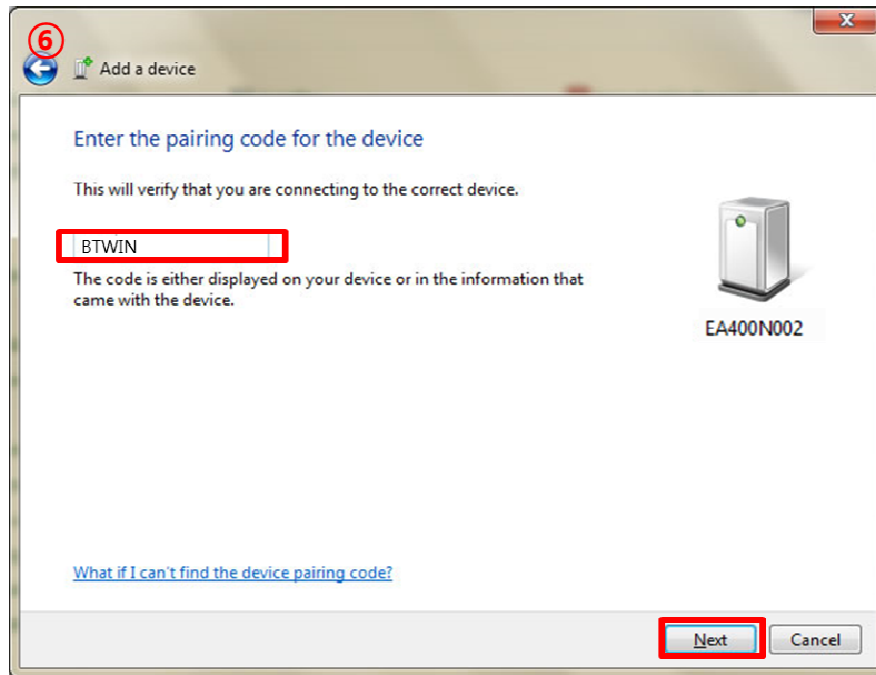


Fig23. Type pairing code 'BTWIN'

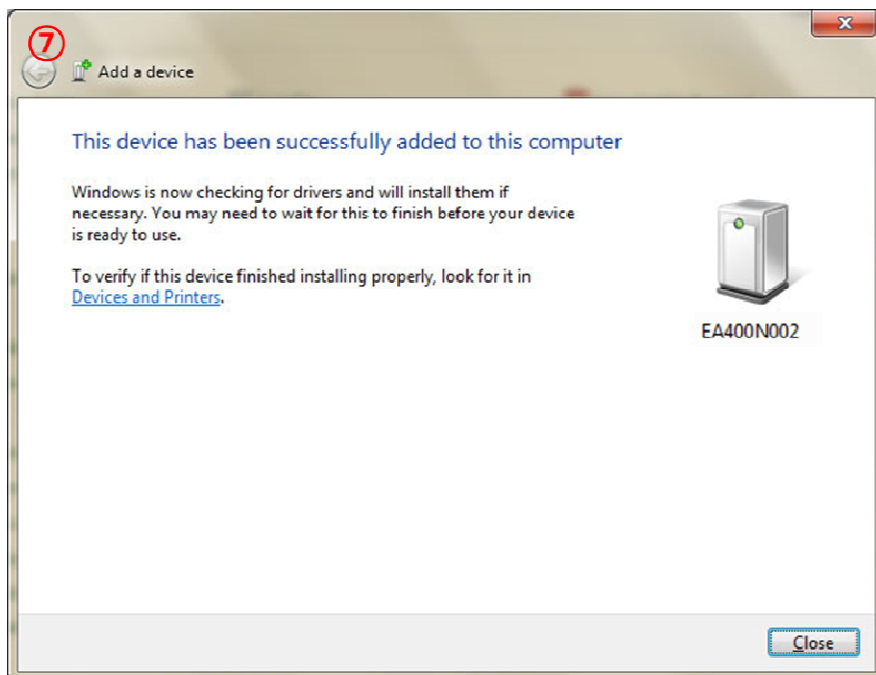


Fig24. Pairing complete

- Run Echosounder/Altimeter Control program provided.
- Set correct EA400 serial port and connect in this program. (GPS module can be connected together. (Optional))
- Output Mode should be 'Altimeter NMEA'.

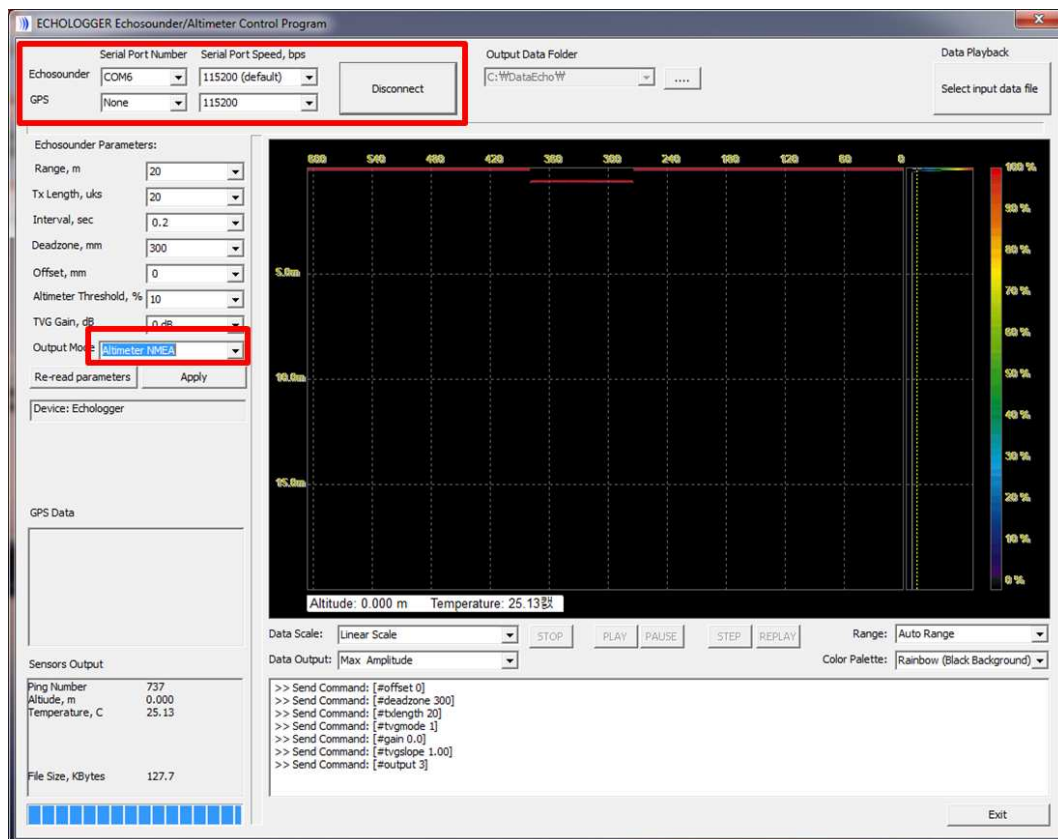


Fig25. Real time monitoring

- Life time (battery) estimation. (Depending on range and data save mode)

Life time (hours)	Data save	Bluetooth	Range(meters)			
			10	20	50	100
	No	On	468	348	283	217
	Yes		326	288	200	157
		Off	535	500	384	217

※ Test condition : No. of pings 1 / Period 0.5 / interval 0



IMPORTANT : Bluetooth will disconnect, if device fully submerged.

■ Retrieving data

- Take out micro SD card from EA400 and put it into a USB card reader
- Connect the USB card reader into a PC and click 'Show Data' to choose data to be retrieved. (Saved data is in Binary format)

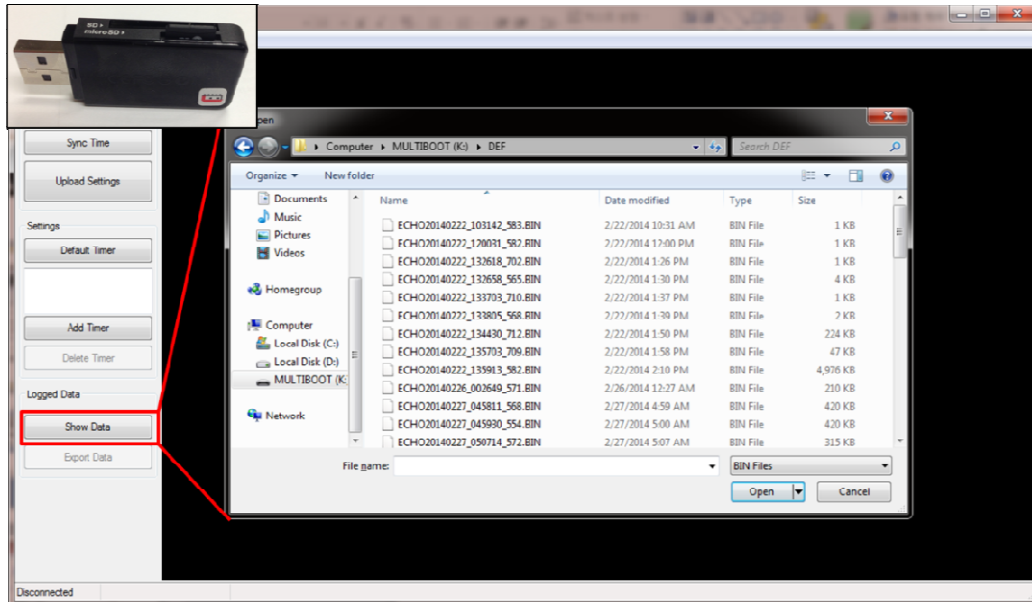


Fig26. USB card reader / Show data window

- Selected BIN file is played back on the screen.
- By placing the mouse on the picture, detailed information on the spot where the mouse is displayed.

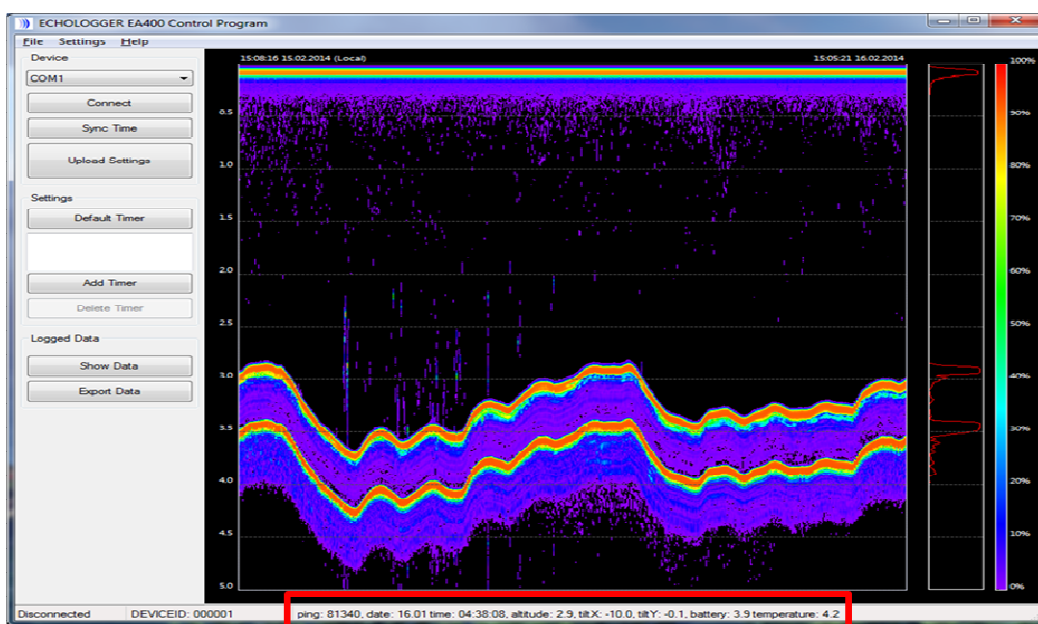


Fig27. Displayed data & informations

- Dragging mouse on figure window could move the displayed data.
- To zoom in/out, use the scroll wheel of mouse.
- 'Export Data' changes binary data to ASCII format in Echosounder format(Echologger EU/ECT/ECS400 compatible) or NMEA format or AA400 compatible format.)

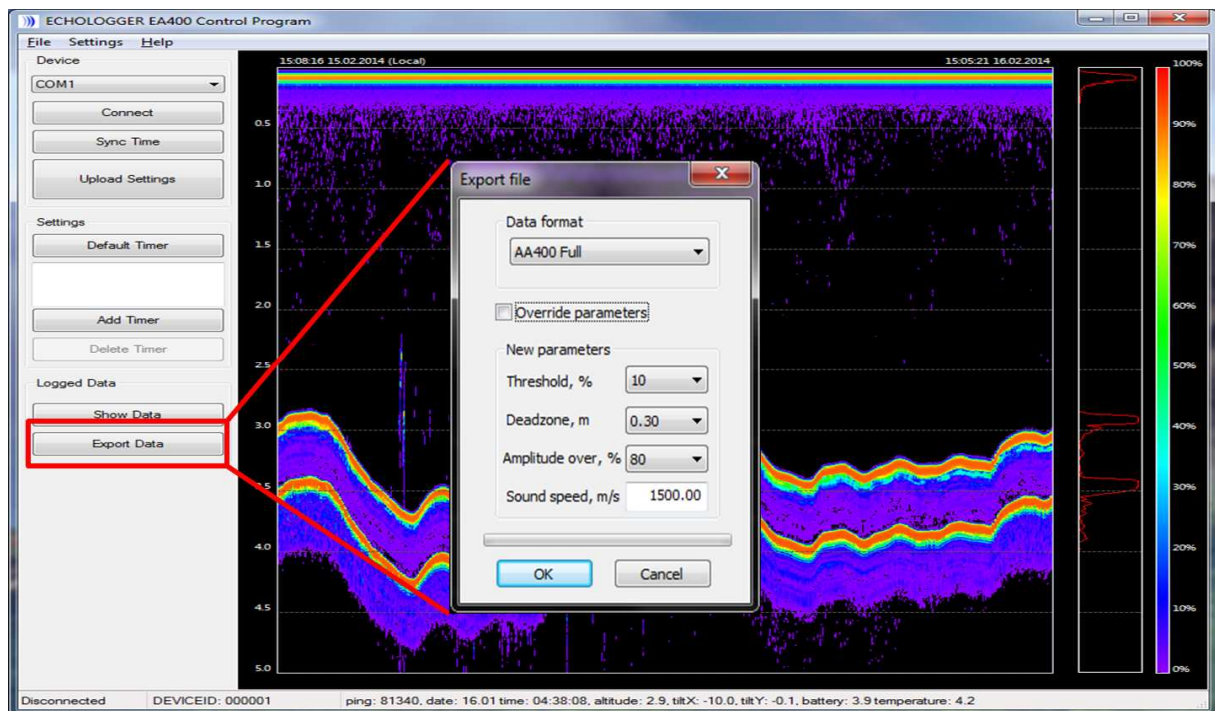


Fig28. Export data window

- New parameters can be applied choosing 'Override parameters'.

- Export data format

```

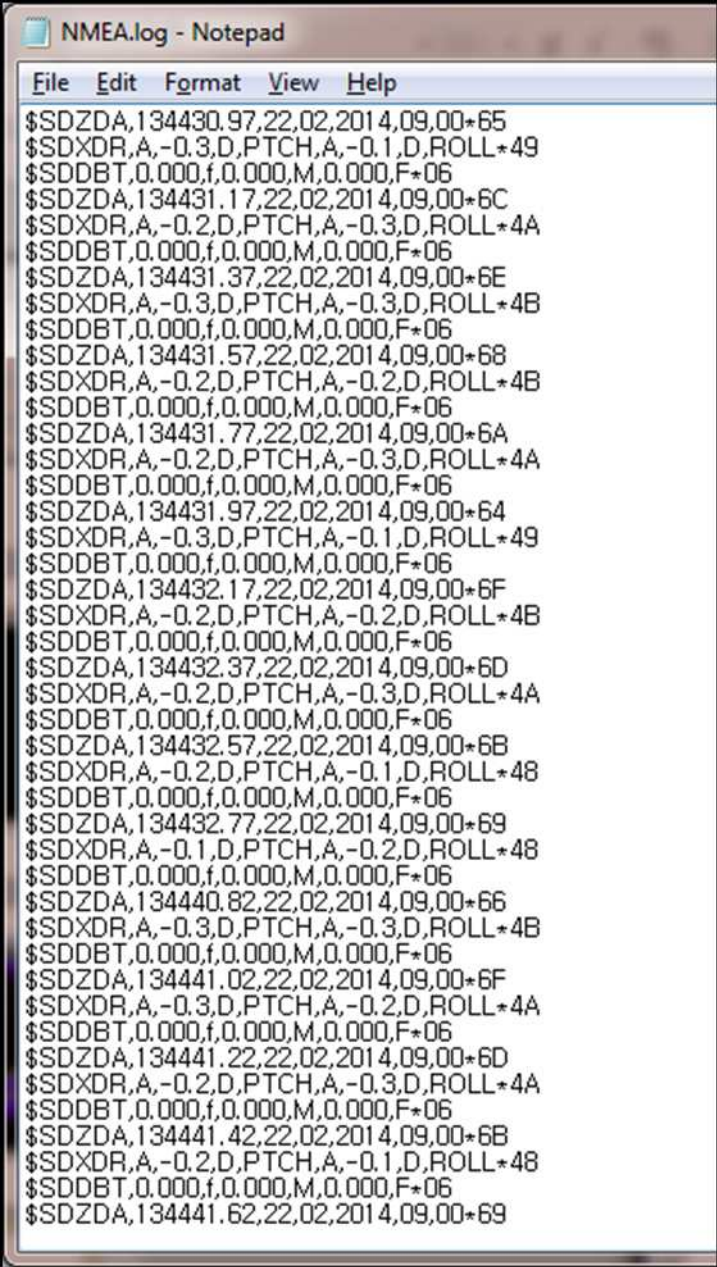
Echosounder mode + NMEA.LOG - Notepad
File Edit Format View Help
#DeviceID 000000 EA400 USB/SDCard + Alfat Type
#TimeLocal 20140222 22:44:30.97
#TimeUTC 20140222 13:44:30.97
#Ping 1
#Ping num in series 1
#Altitude,m 0.000
#Temperature, 21.68
#NSamples 272
#Resolution,m 0.0075
#SoundSpeed,mps 1500.00
#-----Parameters-----
#Tx_Frequency,Hz 450000
#Range,m 2.0
#Pulse period,sec 0.20
#Pulses in series,num 10
#Interval between series,sec 10
#Threshold,% 10
#Offset,m 0.000
#Deadzone,m 0.300
#PulseLength,uks 50
#TVG_Gain,dB +0.000
#TVG_Slope,dB/km 280.6
#TVG_Mode 1
#OutputMode 2
#Pitch,deg -0.300
#Roll,deg -0.100

$SDZDA,134430.97,22,02,2014,09,00+65
$SDXDR,A,-0.3,D,PTCH,A,-0.1,D,ROLL*49
$SDBT,0.000,f,0.000,M,0.000,F*06

##DataStart
0
0
4
22
60
124
241
394
517
604
656

```

Fig29. Echosounder format(backscatter along the full water column)



```
$SDZDA,134430.97,22,02,2014,09,00*65
$SDXDR,A,-0.3,D,PTCH,A,-0.1,D,ROLL*49
$SDDBT,0.000,f,0.000,M,0.000,F*06
$SDZDA,134431.17,22,02,2014,09,00*6C
$SDXDR,A,-0.2,D,PTCH,A,-0.3,D,ROLL*4A
$SDDBT,0.000,f,0.000,M,0.000,F*06
$SDZDA,134431.37,22,02,2014,09,00*6E
$SDXDR,A,-0.3,D,PTCH,A,-0.3,D,ROLL*4B
$SDDBT,0.000,f,0.000,M,0.000,F*06
$SDZDA,134431.57,22,02,2014,09,00*68
$SDXDR,A,-0.2,D,PTCH,A,-0.2,D,ROLL*4B
$SDDBT,0.000,f,0.000,M,0.000,F*06
$SDZDA,134431.77,22,02,2014,09,00*6A
$SDXDR,A,-0.2,D,PTCH,A,-0.3,D,ROLL*4A
$SDDBT,0.000,f,0.000,M,0.000,F*06
$SDZDA,134431.97,22,02,2014,09,00*64
$SDXDR,A,-0.3,D,PTCH,A,-0.1,D,ROLL*49
$SDDBT,0.000,f,0.000,M,0.000,F*06
$SDZDA,134432.17,22,02,2014,09,00*6F
$SDXDR,A,-0.2,D,PTCH,A,-0.2,D,ROLL*4B
$SDDBT,0.000,f,0.000,M,0.000,F*06
$SDZDA,134432.37,22,02,2014,09,00*6D
$SDXDR,A,-0.2,D,PTCH,A,-0.3,D,ROLL*4A
$SDDBT,0.000,f,0.000,M,0.000,F*06
$SDZDA,134432.57,22,02,2014,09,00*6B
$SDXDR,A,-0.2,D,PTCH,A,-0.1,D,ROLL*48
$SDDBT,0.000,f,0.000,M,0.000,F*06
$SDZDA,134432.77,22,02,2014,09,00*69
$SDXDR,A,-0.1,D,PTCH,A,-0.2,D,ROLL*48
$SDDBT,0.000,f,0.000,M,0.000,F*06
$SDZDA,134440.82,22,02,2014,09,00*66
$SDXDR,A,-0.3,D,PTCH,A,-0.3,D,ROLL*4B
$SDDBT,0.000,f,0.000,M,0.000,F*06
$SDZDA,134441.02,22,02,2014,09,00*6F
$SDXDR,A,-0.3,D,PTCH,A,-0.2,D,ROLL*4A
$SDDBT,0.000,f,0.000,M,0.000,F*06
$SDZDA,134441.22,22,02,2014,09,00*6D
$SDXDR,A,-0.2,D,PTCH,A,-0.3,D,ROLL*4A
$SDDBT,0.000,f,0.000,M,0.000,F*06
$SDZDA,134441.42,22,02,2014,09,00*6B
$SDXDR,A,-0.2,D,PTCH,A,-0.1,D,ROLL*48
$SDDBT,0.000,f,0.000,M,0.000,F*06
$SDZDA,134441.62,22,02,2014,09,00*69
```

Fig30. NMEA data format

test1.log - Notepad									
File Edit Format View Help									
[Date Time,Ping,Altitude [mm],Temperature [Celsius],Battery [mV],Amplitude Raw[%FS], Amplitude>15%,									
Median15, Average Value, NSeries, Interval									
20140917 12:23:11.119,	1,	548.2,	25.31,	4660,	13,	548.2,	0.0,	0.0,	0.0 N:1 Interval: 5.0
20140917 12:23:11.519,	2,	407.5,	25.31,	4660,	15,	407.5,	407.5,	0.0,	
20140917 12:23:11.719,	3,	322.5,	25.31,	4666,	9,	322.5,	0.0,	0.0,	
20140917 12:23:11.919,	4,	181.2,	25.40,	4660,	20,	181.2,	181.2,	0.0,	
20140917 12:23:12.119,	5,	289.3,	25.31,	4660,	55,	289.3,	289.3,	0.0,	
20140917 12:23:12.319,	6,	1129.6,	25.31,	4660,	10,	1129.6,	0.0,	0.0,	
20140917 12:23:12.519,	7,	768.2,	25.40,	4647,	18,	768.2,	768.2,	0.0,	
20140917 12:23:12.919,	8,	98.2,	25.31,	4660,	17,	98.2,	98.2,	0.0,	
20140917 12:23:13.119,	9,	537.3,	25.31,	4666,	44,	537.3,	537.3,	0.0,	
20140917 12:23:13.319,	10,	0.0,	25.40,	4660,	25,	0.0,	0.0,	0.0,	
20140917 12:23:13.519,	11,	0.0,	25.31,	4660,	32,	0.0,	0.0,	0.0,	
20140917 12:23:13.719,	12,	0.0,	25.31,	4660,	13,	0.0,	0.0,	0.0,	
20140917 12:23:13.919,	13,	747.1,	25.31,	4660,	37,	747.1,	747.1,	0.0,	
20140917 12:23:14.119,	14,	1235.6,	25.31,	4654,	13,	1235.5,	0.0,	0.0,	
20140917 12:23:14.319,	15,	0.0,	25.31,	4654,	25,	0.0,	0.0,	0.0,	
20140917 12:23:14.519,	16,	0.0,	25.40,	4660,	12,	0.0,	0.0,	0.0,	
20140917 12:23:14.719,	17,	314.5,	25.31,	4654,	11,	314.5,	0.0,	0.0,	
20140917 12:23:14.919,	18,	167.2,	25.31,	4660,	34,	167.2,	167.2,	0.0,	
20140917 12:23:15.119,	19,	615.3,	25.31,	4660,	64,	615.3,	615.3,	0.0,	
20140917 12:23:15.319,	20,	1268.5,	25.31,	4660,	15,	1268.5,	1268.5,	0.0,	
20140917 12:23:15.519,	21,	218.1,	25.31,	4666,	15,	218.1,	218.1,	98.2,	
20140917 12:23:15.719,	22,	286.6,	25.40,	4666,	28,	286.6,	286.6,	98.2,	
20140917 12:23:15.919,	23,	0.0,	25.31,	4666,	62,	0.0,	0.0,	0.0,	
20140917 12:23:16.119,	24,	482.3,	25.31,	4641,	50,	482.3,	482.3,	0.0,	
20140917 12:23:16.319,	25,	317.5,	25.31,	4654,	30,	317.5,	317.5,	167.2,	
20140917 12:23:16.719,	26,	328.1,	25.31,	4660,	17,	328.1,	328.1,	218.1,	
20140917 12:23:16.919,	27,	288.4,	25.31,	4660,	9,	288.4,	0.0,	218.1,	
20140917 12:23:17.119,	28,	255.0,	25.31,	4660,	45,	255.0,	255.0,	218.1,	
20140917 12:23:17.319,	29,	268.2,	25.31,	4666,	12,	268.2,	0.0,	218.1,	
20140917 12:23:17.519,	30,	403.8,	25.31,	4654,	43,	403.8,	403.8,	255.0,	
20140917 12:23:18.119,	31,	1048.1,	25.31,	4660,	60,	1048.0,	1048.0,	286.6,	
20140917 12:23:18.319,	32,	333.6,	25.31,	4660,	39,	333.6,	333.6,	317.5,	
20140917 12:23:18.519,	33,	0.0,	25.31,	4666,	8,	0.0,	0.0,	317.5,	
20140917 12:23:18.719,	34,	668.1,	25.31,	4666,	28,	668.1,	668.1,	317.5,	
20140917 12:23:18.919,	35,	360.6,	25.31,	4666,	14,	360.6,	0.0,	286.6,	
20140917 12:23:19.119,	36,	305.2,	25.31,	4654,	15,	305.2,	305.2,	305.2,	
20140917 12:23:19.719,	37,	399.4,	25.31,	4673,	11,	399.4,	0.0,	305.2,	
20140917 12:23:19.919,	38,	278.0,	25.31,	4666,	57,	278.0,	278.0,	305.2,	
20140917 12:23:20.119,	39,	246.6,	25.31,	4666,	41,	246.6,	246.6,	278.0,	
20140917 12:23:20.319,	40,	818.0,	25.31,	4666,	54,	818.0,	818.0,	278.0,	
20140917 12:23:20.519,	41,	705.5,	25.31,	4666,	11,	705.5,	0.0,	255.0,	

Fig31. AA400 compatible format

■ Binary file format

- Format of the file, produced by the EA400 is shown on below.

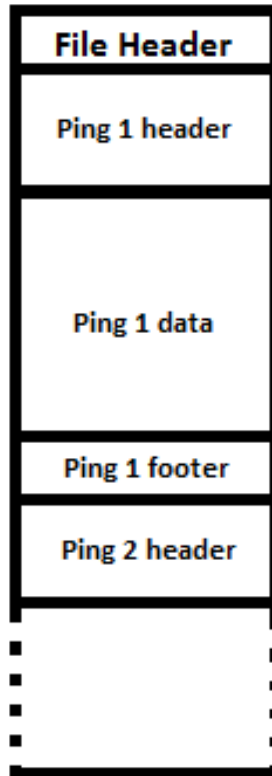


Fig32. Output file format

- File header structure (C-language)

```
struct _timer_settings
{
    unsigned long dwSize ;
    int id ;
    char szName[32] ;
    unsigned long startdate ;
    unsigned long stopdate ;
    int is_newfile ;
    int range ;
    int txlength ;
    float pings_interval ;
    int pings_num ;
    int period ;
    int threshold ;
}
```

```

float deadzone ;
float gain ;
float tvg_slope ;
float soundspeed ;
float offset ;
int sampling_freq ;
int serialnumber ;
int reserved1[6] ;
};

```

- This file header contains the timer settings, which user set when programming timers.

- Ping header

```

struct _echoheader
{
    unsigned long    magic ;
    unsigned long    version ;
    unsigned long    nping ;
    unsigned long    nsamples ;
    unsigned long    time ;
    unsigned short    time_ctc ;
    unsigned short    reserved1 ;
    unsigned long    seriesping ;
    int              reserved[9] ;
};

```

- Ping data contains 10bit ADC data values (0~1023)

```

unsigned short echosamples[] ;

```

- Ping footer

```
struct _echofooter
{
    unsigned long version ;
    unsigned long nping ;
    unsigned long nsamples ;
    float         water_temperature ;
    float         battery_voltage ;
    float         altitude ;
    float         tilt_x ;
    float         tilt_y ;
    int           reserved[8] ;
};
```

■ Known issue

1. Minimum Interval between pulses in series is depending on range and should be corrected when user set timer settings.

Range (Meter)	Minimum interval (Second)	Samples	Data size (Bytes)	Time (hours) for 4GB file (1pps rate)
1	0.1	144	544	2194
1.5	0.1	208	672	1776
2	0.1	272	800	1492
3	0.1	400	1056	1130
5	0.1	672	1600	746
10	0.2	1344	2944	406
15	0.2	2000	4256	281
20	0.2	2672	5600	214
30	0.2	4000	8256	145
40	0.2	5344	10944	110
50	0.3	6672	13600	88
60	0.5	8000	16256	74
70	0.5	9344	18944	63
80	0.5	10672	21600	56
90	0.5	12000	24256	50
100	0.5	13344	26944	45



IMPORTANT : EA400 data acquisition is maximum 4GB per each file. Please consider when use long-term and/or long range data.

2. Serial port speed can only be 115200baud speed for now
3. If device driver doesn't installing on PC then visit below website and install manually.

<http://www.ftdichip.com/Drivers/VCP.htm> (or direct link below.)

<http://www.ftdichip.com/Drivers/CDM/CDM%20v2.12.00%20WHQL%20Certified.exe>