

**SENKO CO., LTD.**

# **4-20mA Transmitter Digital Communication Manual**



## **Calibration**

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## 1. Transmitter

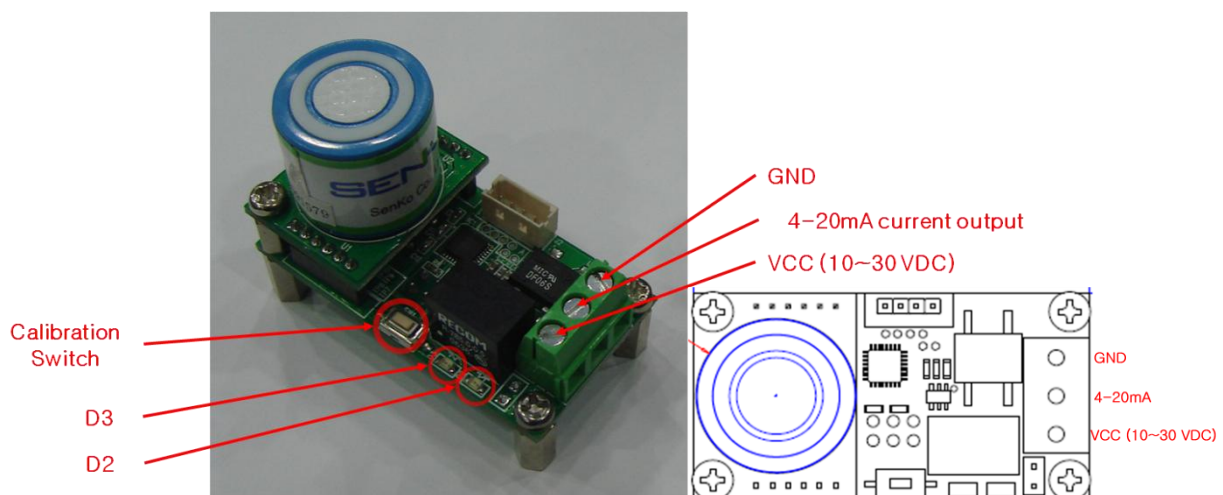
When this transmitter connects to the power, it works after 1 time blinking of D2 and 5 times blinking of D3. This 6 times of LED blinking is normal function for reading stored data. If this D3 LED blinks continuously, the transmitter should be repaired.

There are 2 Calibration function; Fresh air calibration, Standard Gas Calibration.

- Fresh air Calibration should be performed at the environment of fresh air
- Standard Gas Calibration should calibrate with the gas that has concentration of calibration gas.

## 2. Calibration and Connecting cable

**Caution : In case of standard gas calibration, before you push calibration button, you should keep sensor contacting calibration gas more than 1 minute for stable sensor reading.**



### Oxygen gas sensor calibration:

#### - Span calibration(air calibration) :

- ① If you Push calibration button more than 2 seconds, D3 LED turns on.
- ② If you push the button more than 2 seconds once more, span calibration start with D3 LED blinks.
- ③ After calibration completed, D3 & D2 LED turns on together and turns off.

#### - Zero calibration(0% oxygen standard gas calibration) :

- ① If you Push calibration button more than 2 seconds, D3 LED turns on.
- ② If you push the button twice within 1 second, D2 LED turns on.
- ③ If you push the button more than 2 seconds, Zero calibration start with D2

LED blinks.

- ④ After calibration completed, D3 & D2 LED turns on together and turns off.

### **Toxic(or %LEL) gas sensor calibration:**

#### **- Zero calibration(air calibration)**

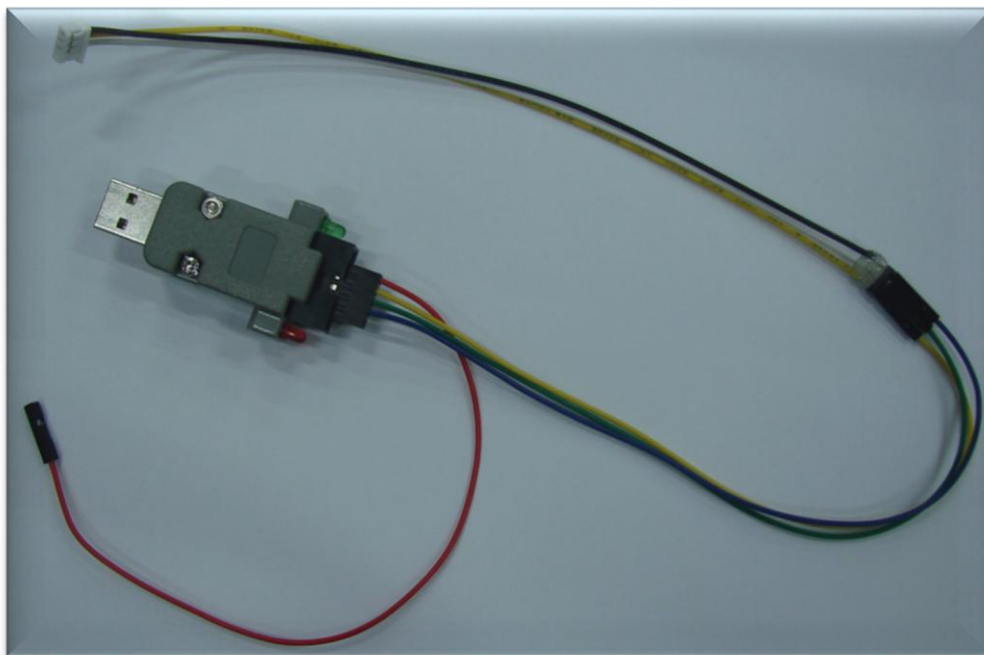
- ① If you Push calibration button more than 2 seconds, D3 LED turns on.
- ② If you push the button more than 2 seconds once more, span calibration start with D3 LED blinks.
- ③ After calibration completed, D3 & D2 LED turns on together and turns off.

#### **- Span calibration(standard gas calibration) :**

- ① If you Push calibration button more than 2 seconds, D3 LED turns on.
- ② If you push the button twice within 1 second, D2 LED turns on.
- ③ If you push the button more than 2 seconds, Zero calibration start with D2 LED blinks.
- ④ After calibration completed, D3 & D2 LED turns on together and turns off.

## 3. Connector for data transfer to PC

In order to transfer data to PC, PC connector shown below and drivers are needed



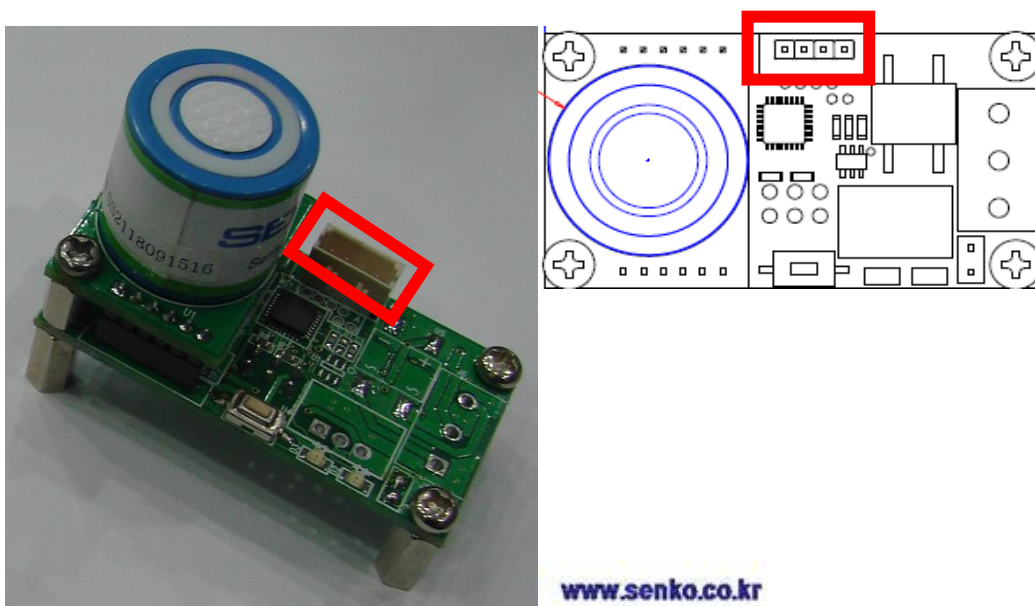
## 4. USB-232TTL Installation

- ① Connect USB-232TTL equipment to USB Port.
- ② Right-Click "My Computer" icon and choose "Properties" .
- ③ Select "Hardware" tap on the top of the window and click "Device Manager".
- ④ Right-click the "USB Serial Port" which shows a yellow '?' sign and select "Update driver".
- ⑤ When a "hardware update wizard" pop up, select "No, not this time" and click "Next".
- ⑥ Select "install from a link or specific location(Advanced)" and click "Next".
- ⑦ Select "Search for the best driver in these locations" and check "Include this location in the search".
- ⑧ Click "Browse" , In the Locate File dialog box that appears next, navigate to the folder that you extracted as part of the driver download and click "Next".
- ⑨ Driver installation completed and USB Serial Port(COMx) in the Device Manager - PORT(COM and LTP) will be shown.

\* COMx is depends on the computer. PORT is determined like COM4 or COM5.

## 5. Connecting to PC

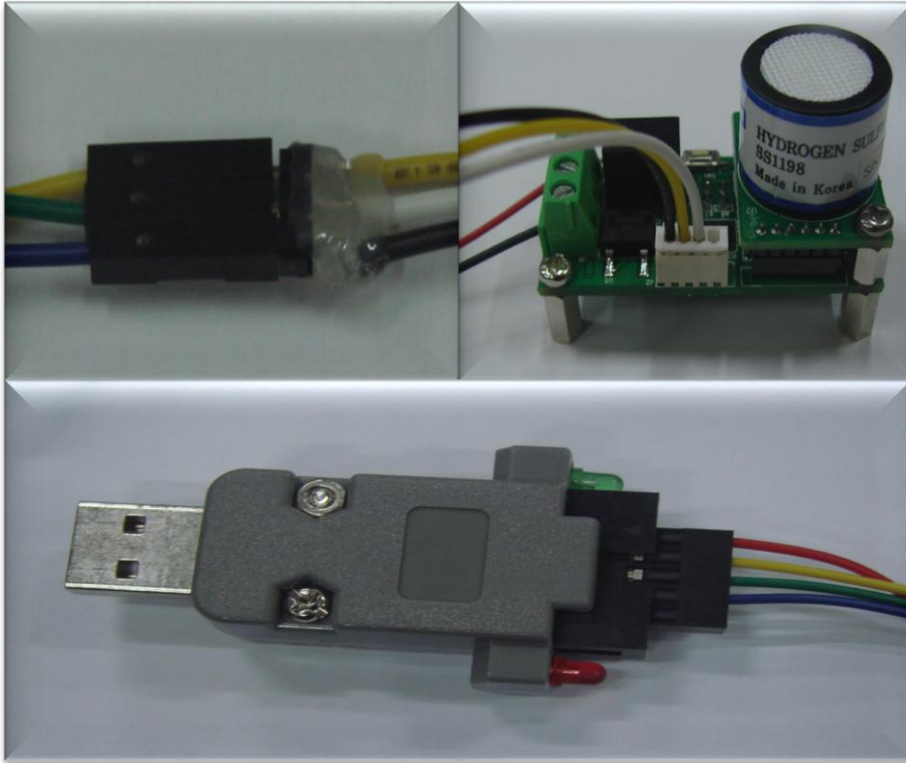
Connect enclosed connector to MOLEX marked below.



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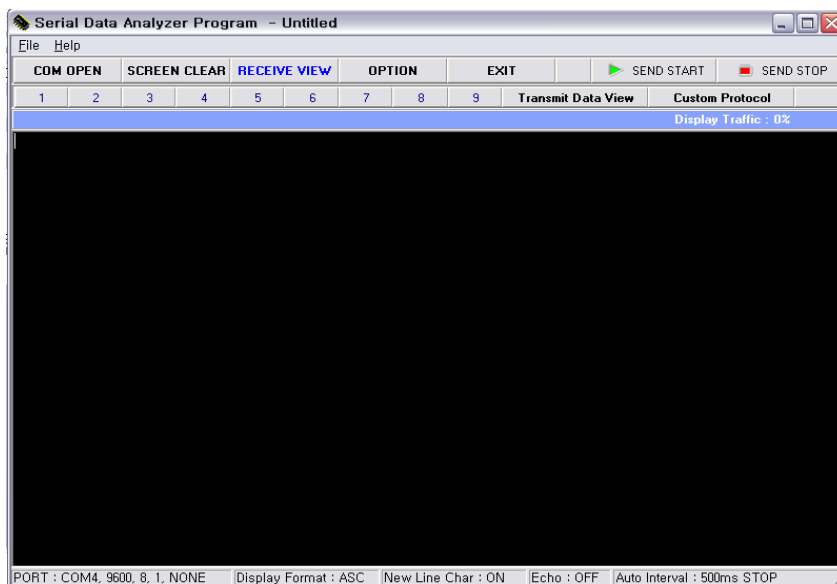
## 6. Connecting PC and Transmitter via USB\_232TTL



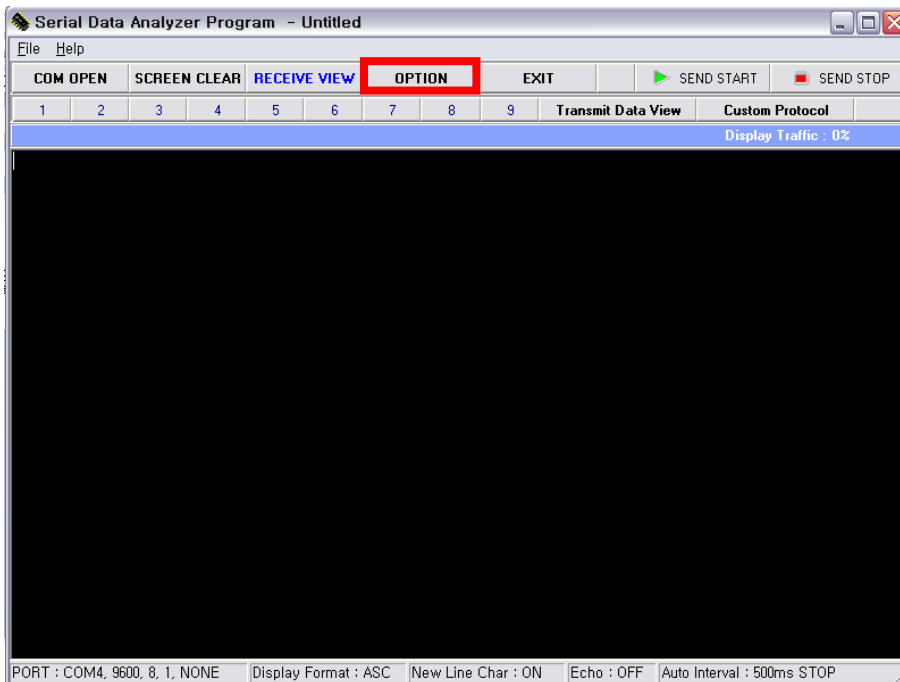
## 7. Run Serial Data Analyzer Program

To see measurement of module on PC,

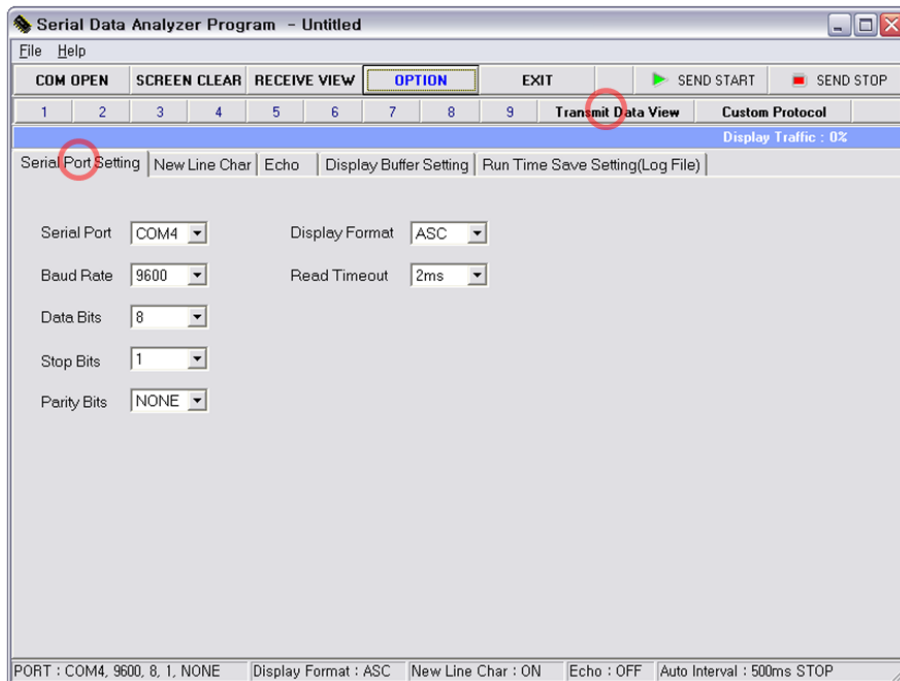
- ① Run "[Pcom.exe](#)" in attached file.



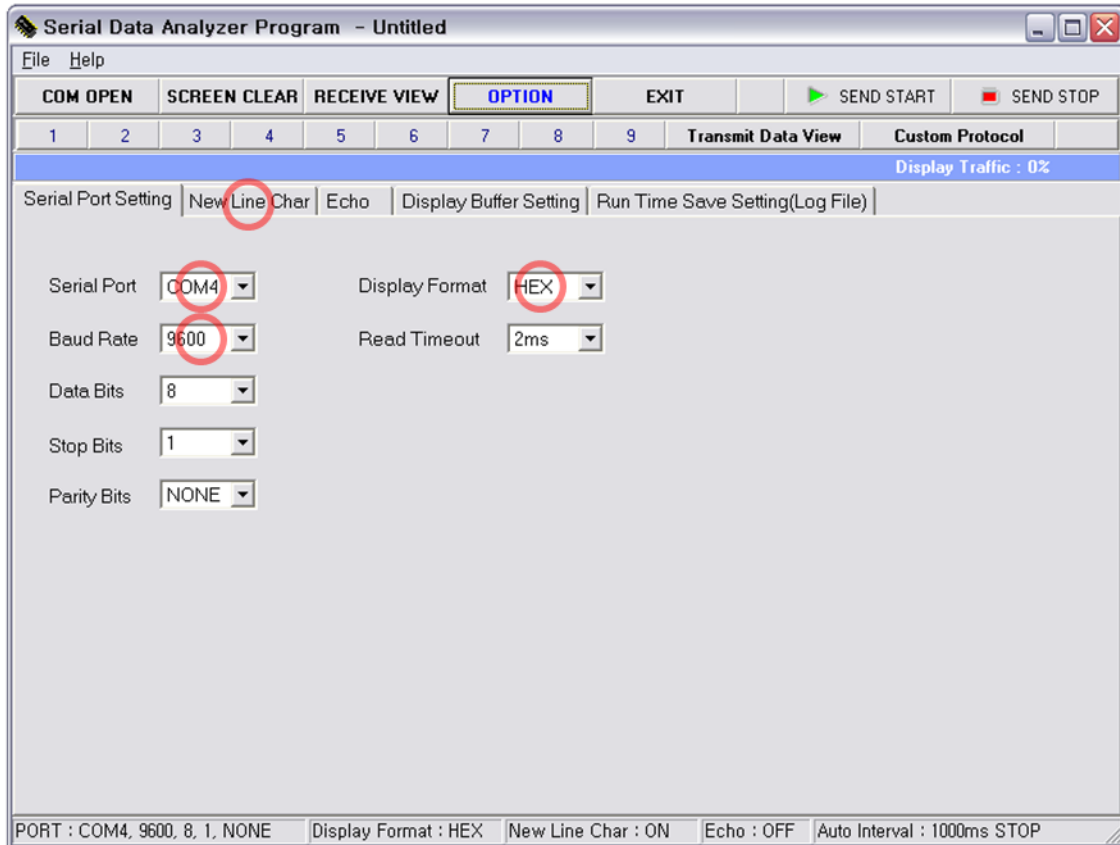
- ② Click "OPTION" button when Serial Data Analyzer program is pop up.



**You can see the windows shown below**



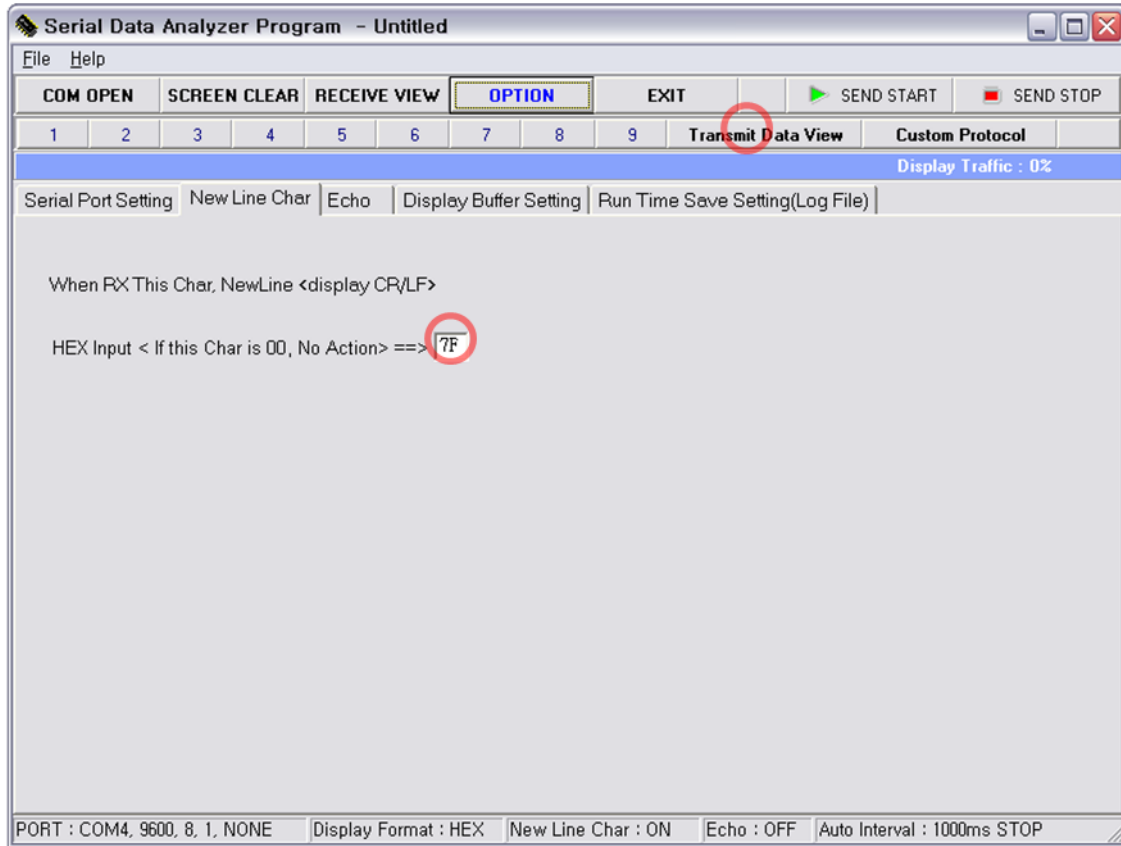
- ③ Go to "Serial Port Setting",  
Change \*"Serial Port" to "PC port" which is USB-232TTL connected.  
(Shown picture below is random value)  
Change "Baud Rate" to "9600",and "Display Format" to "HEX"



\* To see user's Serial Port,  
Right click [My Computer](#) Icon and click [Properties](#).  
Select [Hardware](#) tap on the top of the window and click [Device Manager](#).  
There is USB Serial Port when click [PORT\(COM and LTP\)](#) and you can see COMx in the parenthesis next of it.  
For example, Choose Serial Port [COM4](#) if value in Device Manager is [COM4](#) and choose [COM5](#) if value is [COM5](#).

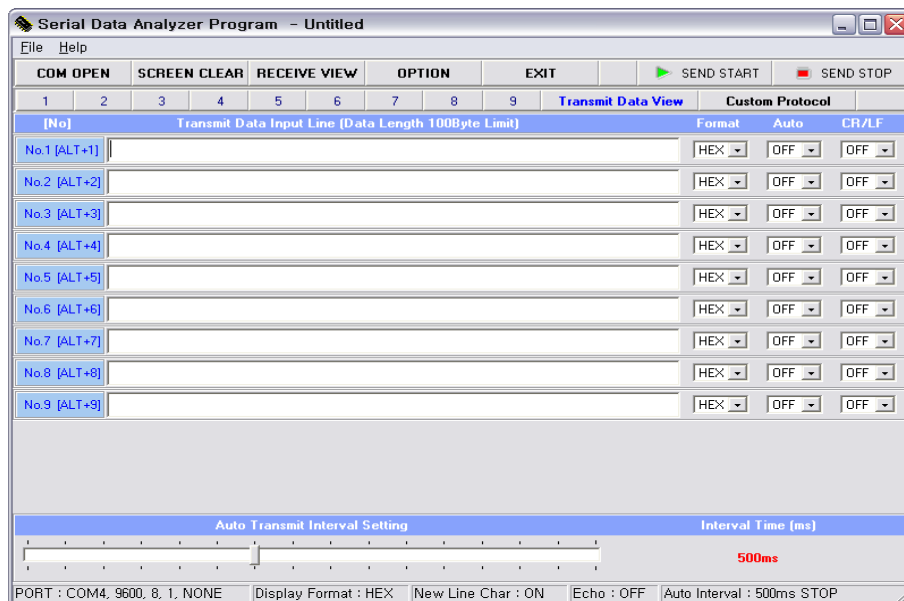


- ④ Change value "00" to "7F" in "HEX Input" box as shown below.



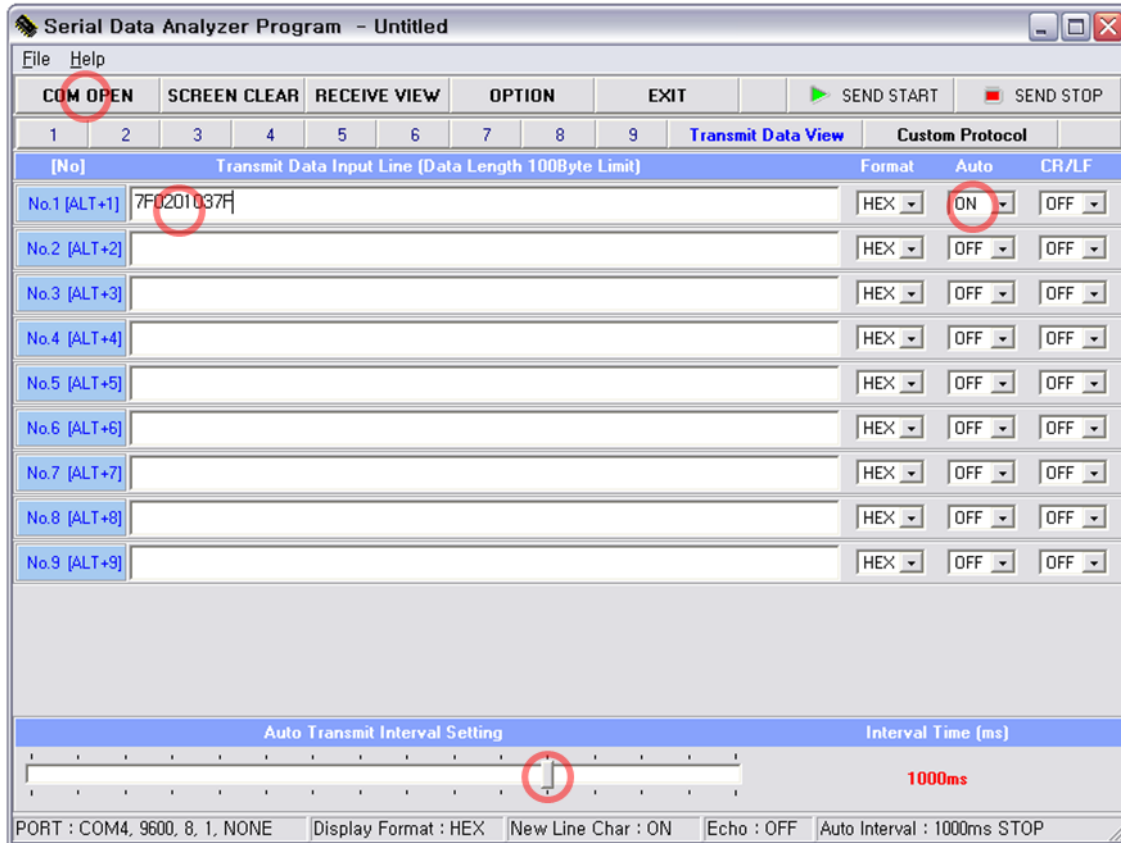
- ⑤ Click "Transmit Data View" after "HEX Input" Setting change.

**You can see the windows shown below**





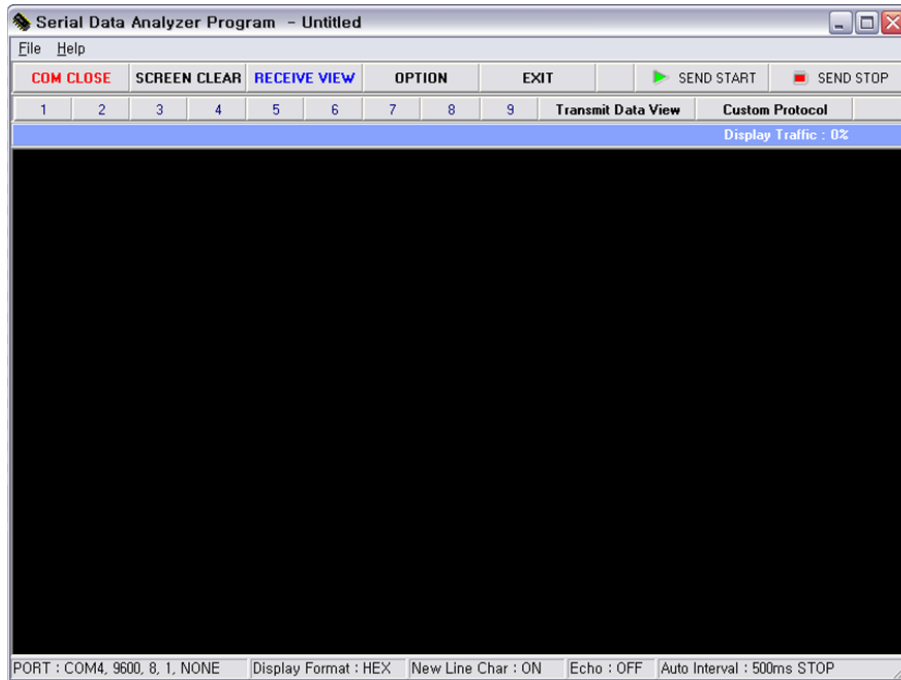
- ⑥ Put "7F0201037F" in No.1 box and change "Auto" to "on".  
Drag scroll until "Interval Time" shows "1000ms" (\*example) on the bottom of the windows.



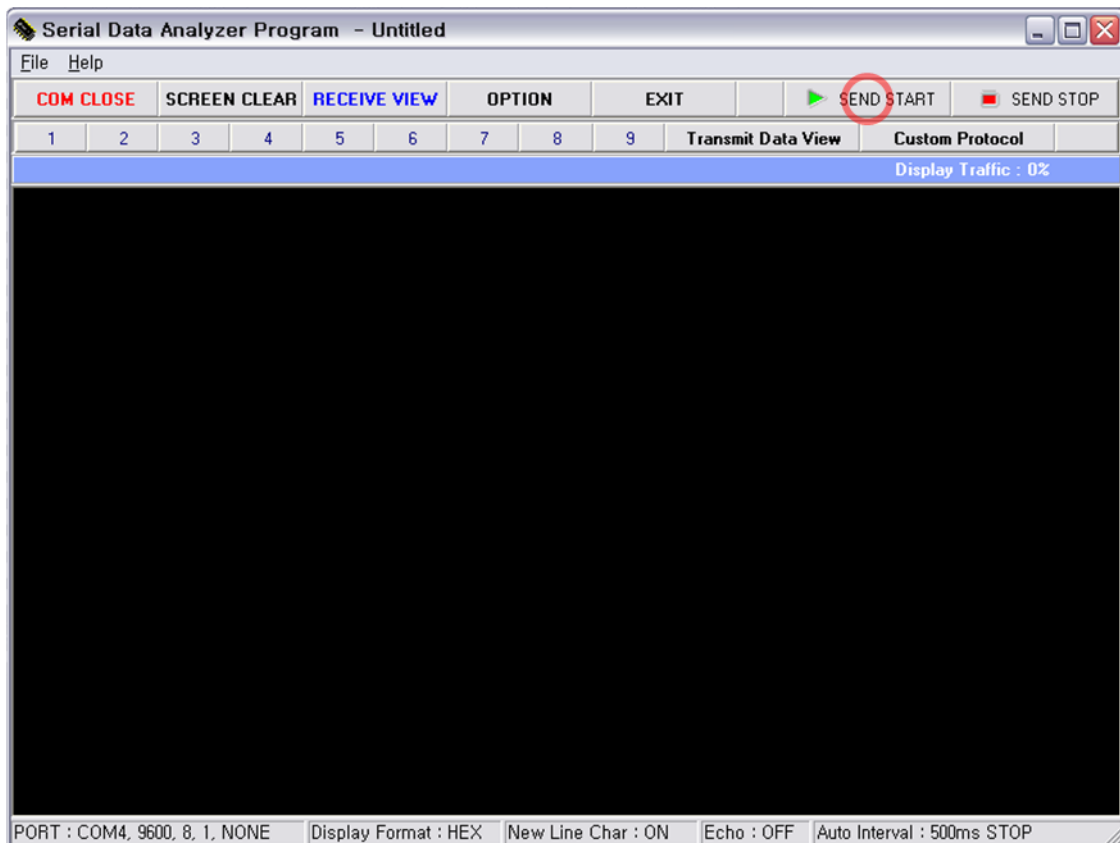
\* "1000ms" means show measurement once every 1 second.  
This Interval Time is user-programmable from 20ms to 5000ms.

- ⑦ Click "COM OPEN" after "Transmit Data View" Setting change.

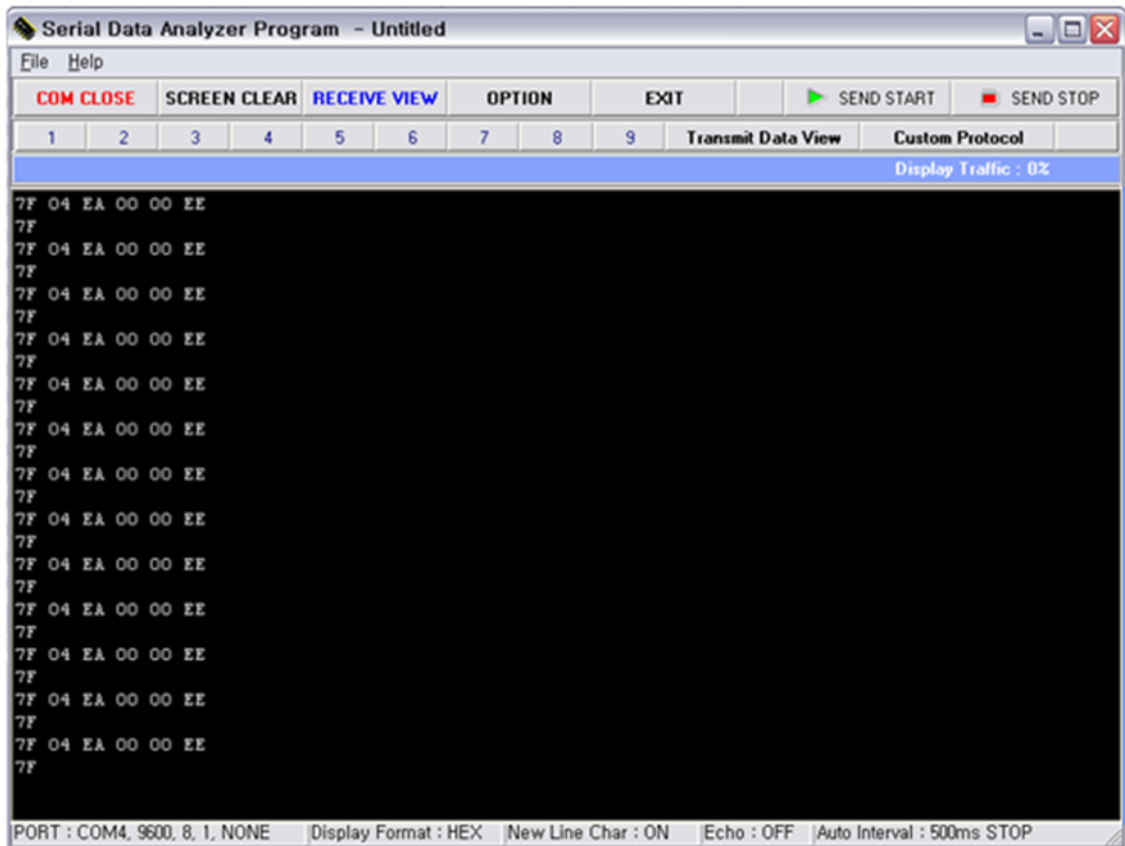
You can see the windows shown below



⑧ Click "SEND START" button as marked below.



- ⑨ Measurement will be displayed on screen as shown below.  
Measurement display is updating according to setting time that set up in “Auto Transmit Interval Setting”.



## 8. Protocol

### • Data command

START 0x7F	LENGTH 0x02	CMD 0x01	CRC 0x03	END 0x7F
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**LENGTH** : Total number of byte from LENGTH to CMD.

**CMD** : 0x01, Zero Calibration→ 0x02, SPAN Calibration→ 0x03

**CRC** : xor from LENGTH to CMD

### • Data Response

START 1Byte	LENGTH 1Byte	DEST 1Byte	DATA 2Byte	CRC 1Byte	END 1Byte
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**START** : start frame → 0x7F

**LENGTH** : Total number of byte from LENGTH to Data

**DEST** : sensor id → 0xEF (in case of OXYGEN)

**DATA** : sensor data ( low | high)

**CRC** : xor from LENGTH to CMD

**END** : end frame → 0x7F

### • Calibration Response

START 1Byte	LENGTH 1Byte	RES 1Byte	CRC 1Byte	END 1Byte
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**LENGTH** : Total number of byte from LENGTH to RES

**RES** : Zero Calibration Response → 0x05  
Span Calibration Response → 0x07

**CRC** : xor from LENGTH to RES

## 9. Calculate concentration

• Data Response

START 1Byte	LENGTH 1Byte	DEST 1Byte	DATA 2Byte	CRC 1Byte	END 1Byte
----------------	-----------------	---------------	---------------	--------------	--------------

1. In Data Response shown above, Data 2 bytes is in the order of Low byte and High byte.
2. Unit of Oxygen is "%", others are ppm.
3. To get calculated concentration of gas, Convert (high byte/low byte) to decimal number.
4. Divide the value that calculated from no.1 with the value that eliminate decimal point of resolution(10 multiplier).

For example; O<sub>2</sub>

1. If data response is 0xD1 0x00, it becomes decimal number of 209.
2. Oxygen's resolution is 0.1%, 10 multiplier value that eliminate decimal point is 10.
3. Concentration is  $209/10 = 20.9$

For example; O<sub>3</sub>

1. If data response is 0x62 0x00, it becomes decimal number of 98.
2. Resolution of ozone is 0.02ppm, 10 multiplier value that eliminate decimal point is 100.
3. Concentration is  $98/100 = 0.98\text{ppm}$ .