Testing Data Radio Modem with Serial Port Tool V1.20

This document demonstrates how to test the communication of data radio modem with tool Advanced Serial Port Monitor from AGG Software and USB board. DORJI provides two types of USB-to-TTL converter boards which can be used to test the most of DORJI's radio modem modules.

USB Type	Description	Pin-to-Pin compatible Modules
DAC02-3	3V USB-to-TTL	DRF1212D10, DRF4463D20-A1, DRF5150S
DAC02-5	5V USB-to-TTL	DRF7020D13,DRF7020D20,DRF7020D27,DRF4463D20-A2, DRF4432D20, DRF4432S, DRF1278DM
DAC03	5V USB-to-TTL	DRF4432D20I-M1/M2

Table 1: Compatible USB Boards for Data Radio Modem

1. USB BOARD DEFINITIONS

Pin	Name	Description
1	GND	Ground(0V)
2	VCC	DAC02-3: 3.3V DAC02-5: 5V
3	---	
4	RXD	Actually it is the TXD pin of USB Chip on DAC02 so it should connect RXD pin of data radio modems
5	TXD	It is the RXD pin of USB Chip on DAC02 so it should connect TXD pin of data radio modems
6	---	
7	---	

Table 2: USB Board DAC02

Pin	Name	Description
1	VCC	+5V
2	GND	Ground(0V)
3	TXD	It is the RXD pin of USB Chip on DAC03 so it should connect TXD pin of data radio modems
4	RXD	Actually it is the TXD pin of USB Chip on DAC03 so it should connect RXD pin of data radio modems
5	SET	There is a jumper between SET pin and GND which is controlled by the black cap on the board.
6	---	

Table 3: USB Board DAC03

If it is the first time for the users to use the USB board, the corresponding USB driver should

be installed in advance.

For DAC02 Board: http://www.dorji.com/pro/tool/USB_Driver.rar

For DAC03 Board: http://www.dorji.com/pro/tool/DACx3_USB_Driver.rar

2. CONFIGURING DATA RADIO MODEM WITH DRF TOOL

All of the data radio modems in the table can be configured with new parameters through the DRF Tool provided by DORJI. The table 4 below shows the data radio modems with corresponding DRF Tool.

DRF Tool Name	Supported Modules
DRF7020 series	DRF7020D13, DRF7020D20, DRF7020D27
DRF1212/44xx series	DRF1212D10-A/S1, DRF4432D20, DRF4463D20
DRF5150 series	DRF5150S, DRF4432S
DRF4432D20I series	DRF4432D20I-M1/M2, DRF4432D20I-L1/L2
DRF1278D series	DRF1278DM

Table 4: DRF Tool vs Data Radio Modems

For the first three types of DRF tools, they only can recognize the COM port number no more than 10. If the USB board occupies COM port larger than 10, please change it to a smaller one. What's more if the three types of DRF tool run in Windows Vista /7, please right click the tool and run it as administrator. We will use DRF7020 series tool to configure the DRF7020D13 module as an example.

If the USB driver for DAC02 is installed correctly, we will insert the DRF020D13 into the DAC02 directly (Both of two boards have the first pin as GND) and connect them to the computer.

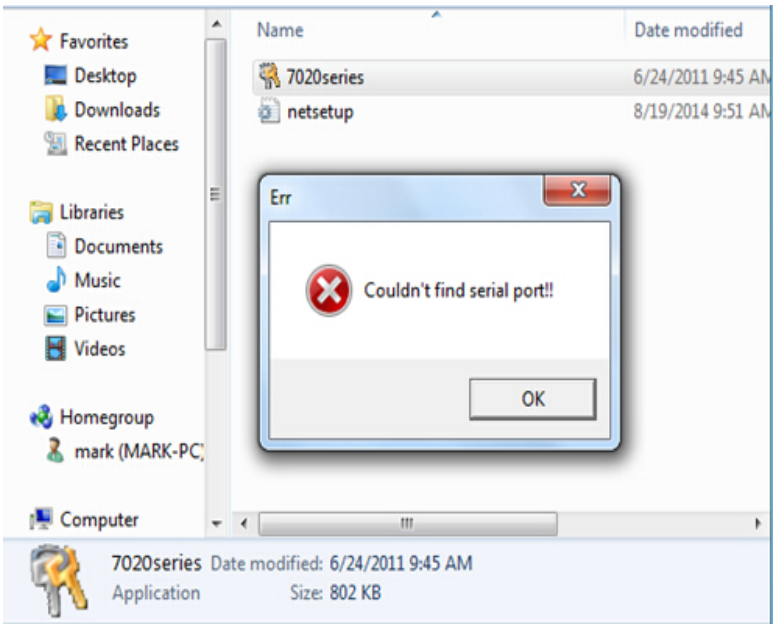

Figure 1: Run the DRF Tool by Left-click

If users run the tool by left-click, the pop-up window (Figure 1) will prompt you that the tool can't run correctly. Users need to click ok and close the tool and then run it as administrator by right-click (Figure 2).

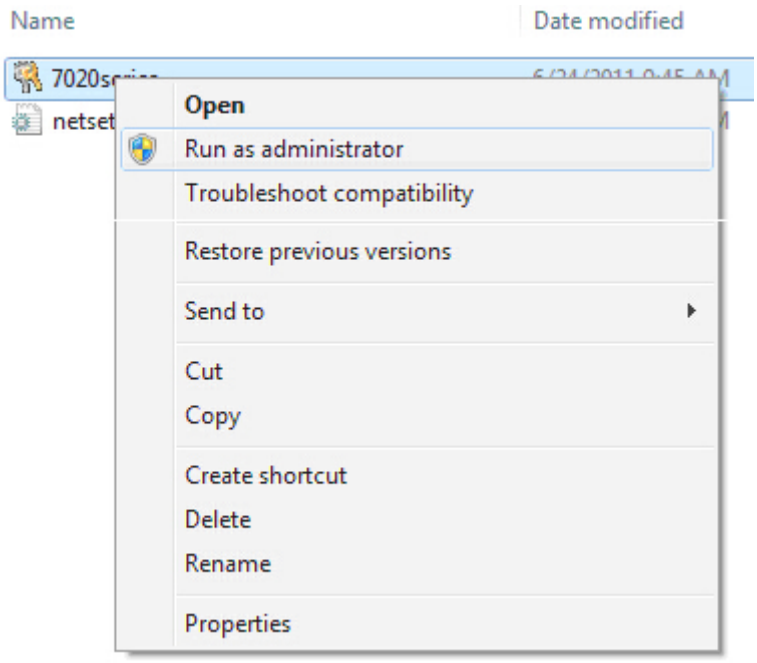

Figure 2: Run the DRF Tool by Right-click

The tool will be opened correctly (Figure 3) and users can Read / Write the modules with new parameters now.

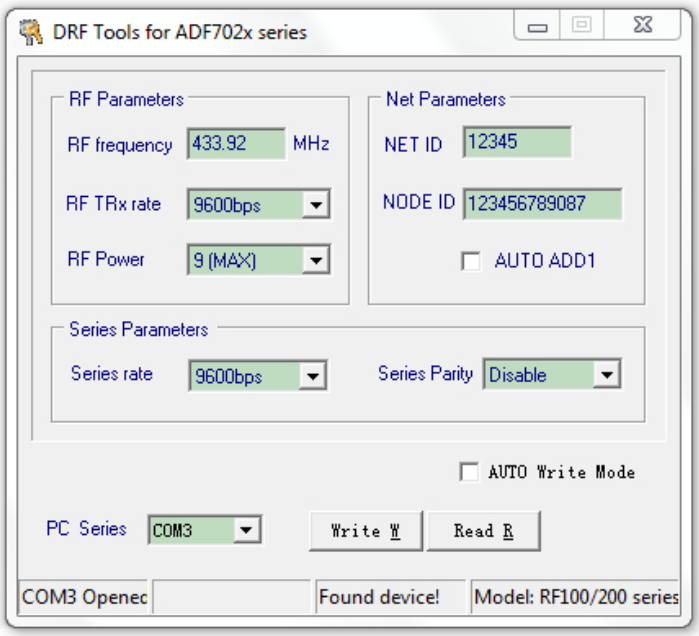

Figure 3: DRF Tool is Run Successfully

Anyway it will be very troublesome for users to run the tool by right-click as administrator

role so we change the privilege level of the tool by right-click the tool and choose the Properties (Figure 2). In the new pop-up window, we click the option [Run this program as an administrator] in Privilege Level area. Now we can run the tool directly by left-click permanently.

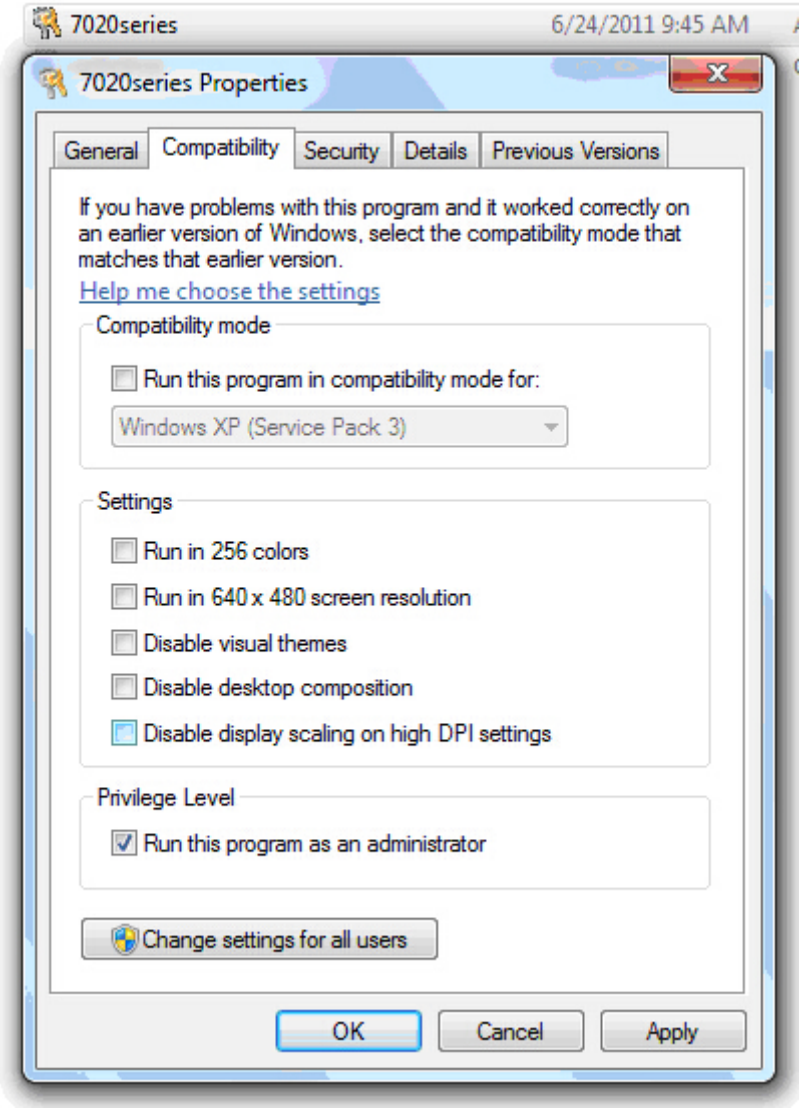

Figure 4: Privilege Level for DRF Tool

The procedure described above is applicable for the first three types of DRF Tools in the table 3 and related data radio modems.

DRF7020D20 and DRF7020D27 modules are compatible with DRF7020D13 in firmware. In hardware DRF7020D20 has the same pin sequence and pin function as DRF7020D13 so the connection with USB board is the same as DRF7020D13. As to DRF7020D27, it has one interface (RS232/RS485) more than DRF7020D13 except TTL interface but it doesn't affect to use DAC02 to configure the DRF7020D27 by the same way as DRF7020D13. If we use DAC02 board to configure the module, we only need to match the GND pin of DRF7020D27

and the GND pin of DAC02 and then insert the pin header of DAC02 into the socket of DRF7020D27; then run the tool to configure the module as the way mentioned above.

3. COMMUNICATING WITH THE SERIAL PORT TOOL

This section we will use the serial tool Advanced Serial Port Monitor from AGG Software as an example to test the communications between data radio modems of the same type.

3.1. DRF7020D13, DRF020D20 and DRF7020D27

The three types of modules use the same firmware so they are compatible in communication and differ in pin sequence, power level and dimensions. Here we will use the pin definitions of DRF7020D13 as an example.

PIN	Name	Function	Description
1	GND	Ground	Ground (0V)
2	VCC	Power	Power supply
3	EN	Input	Enable pin (>1.6V);
4	RXD	Input	UART input, TTL level
5	TXD	Output	UART output, TTL level
6	AUX	Output	Data In/Out indication
7	SET	Input	Parameter setting pin

Table 5: DRF7020D13 Pin Definitions

From the description of datasheet we can know that the module enters into configuration mode when the EN is connected to Logic high and SET is connected to Logic Low. If users still use DAC02 board (or other USB board from other companies), we can connect the EN pin to VCC and SET pin to GND. After the DRF7020D13 with DAC02 are connected to computer, we can run the serial tool.

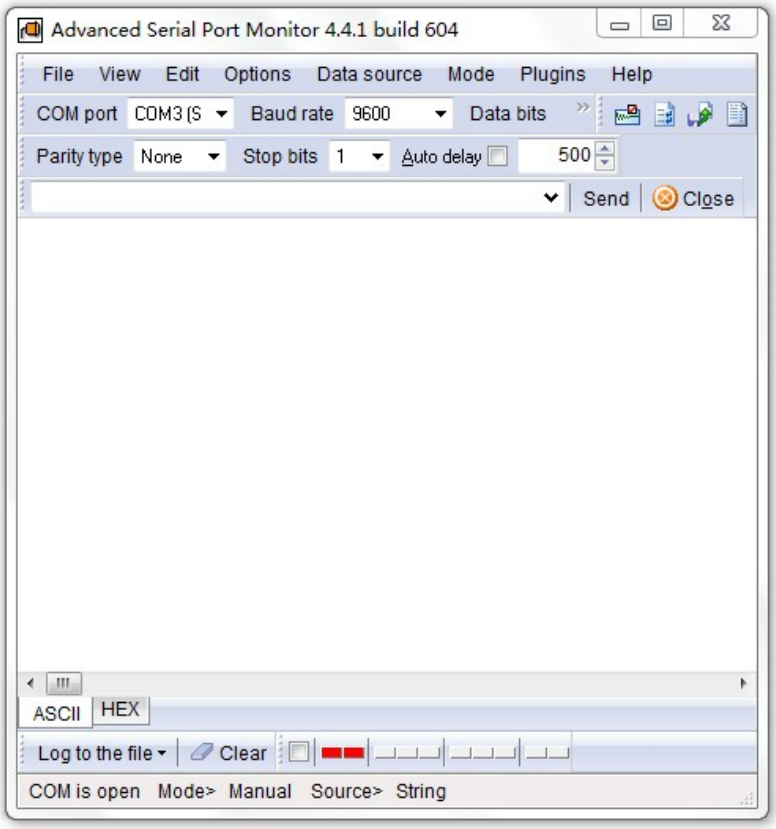

Figure 5: Advanced Serial Port Monitor

In configuration mode, the DRF7020D13 communicates with the host (microcontroller or PC) at the fixed data format (9600 bps and no parity check) so we make corresponding selection in the serial tool (Figure 5).

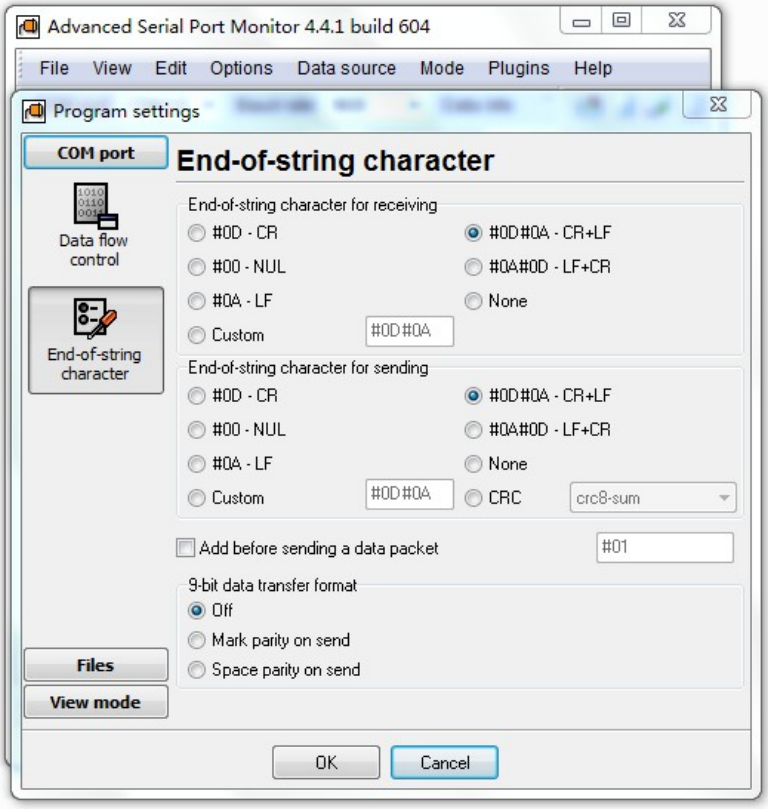

Figure 6: End-of-string Character

Now we can input the read command and press the ENTER key, the module will respond with default parameters which are showed in the tool.

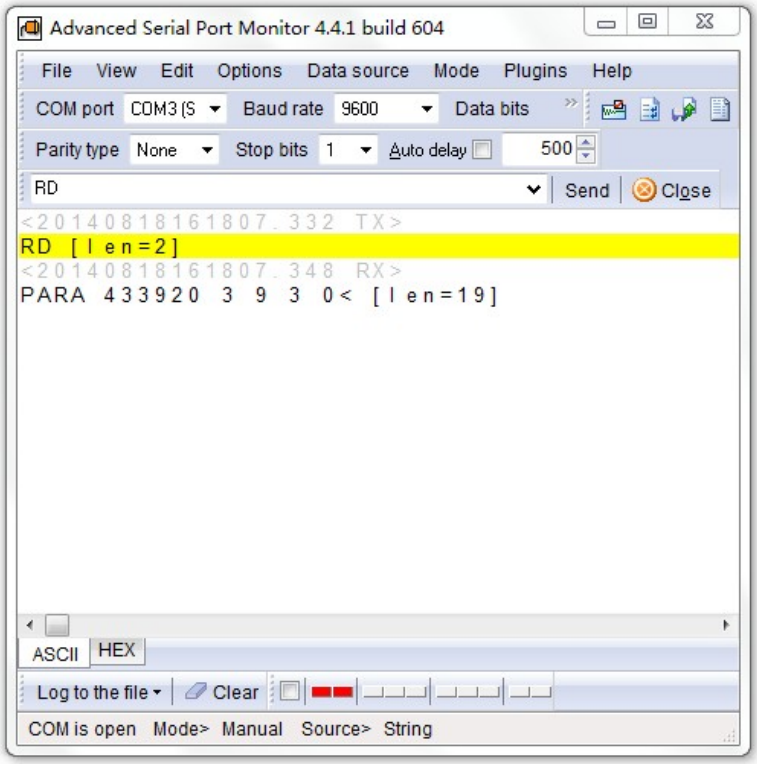

Figure 7: Read Command with Returned Parameters in ASCII

The commands of DRF7020D13 are ASCII codes in HEX format. We can click the HEX at the left-bottom of the serial tool to check corresponding HEX codes.

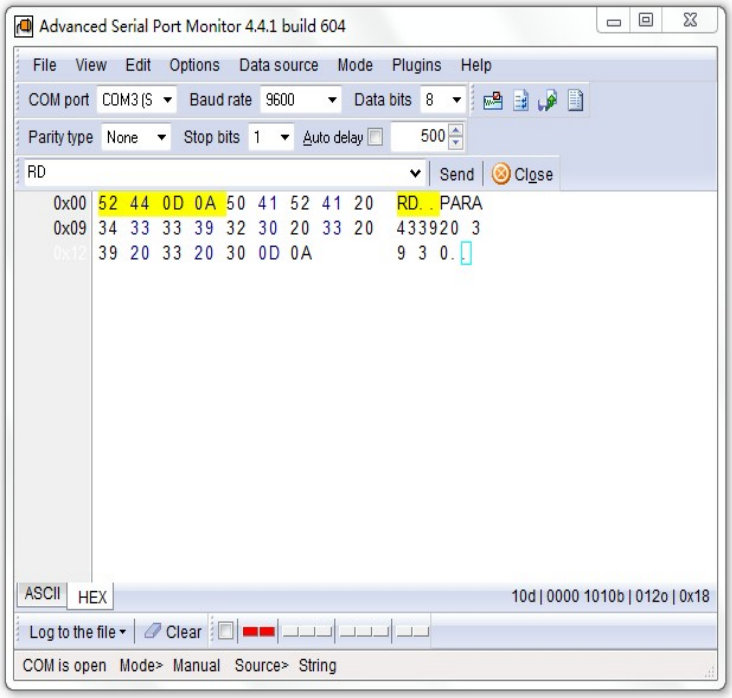

Figure 8: Read Command with Returned Parameters in HEX

The HEX codes are the data which microcontrollers use to configure the modules. Now we switch to the ASCII panel and input Write command (WR 433920 3 9 3 0).

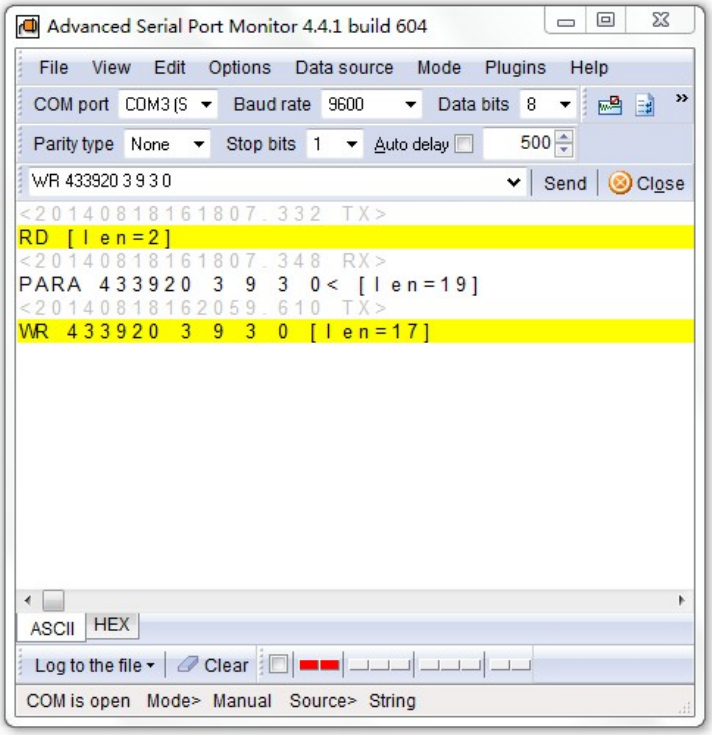

Figure 9: Write Command of DRF7020D13

Anyway the tool doesn't give any response after executing the command. We check the datasheet of DRF7020D13 and can find that [Please note that users only can send command once when the SET pin is configured to low. If users want to revise the parameters after a successful setting, users must configure SET pin to high and then set it into low in order to reconfigure the module.] so users need to pull out the board and insert it into the PC back to reset the module and then input Write command.

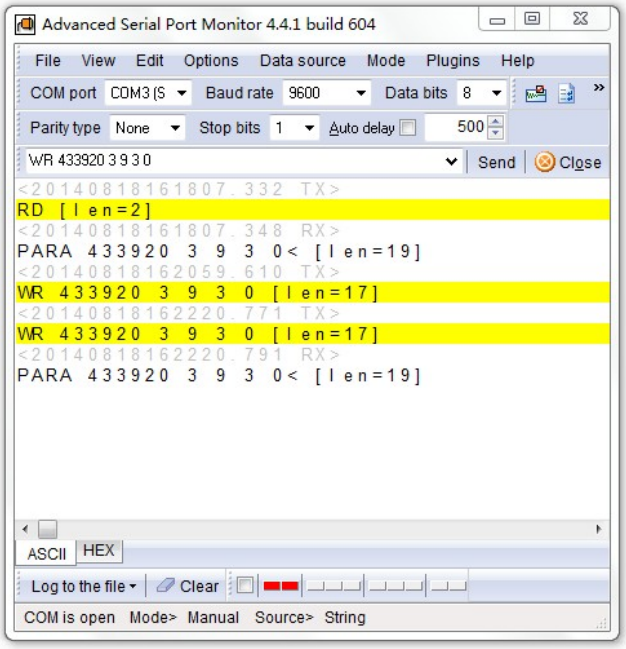

Figure 10: Write Command with Returned Parameters in ASCII

The tool shows the parameters are written correctly and we can switch to the HEX panel to check the responding HEX codes which can be used by microcontroller to configure the modules.

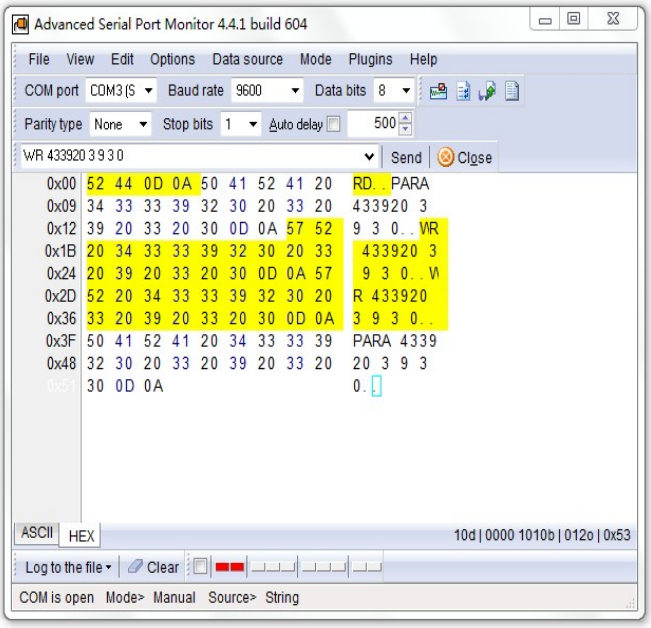

Figure 11: Write Command with Returned Parameters in HEX

After practicing the use of AT commands, we can test the communication between two DRF7020D13 modules with serial tool. In normal work mode, the SET pin should be connected to logic high. Therefore, we should disconnect the SET pin from GND and make it floated but the EN pin should still connect to logic high.

3.2. DRF1278DM

In this section we will still use the DAC02 board to test the DRF1278DM modules. The 3rd pin of DRF1278DM should be connected to GND if it is configured with PC tool or microcontroller. Therefore we can solder a wire between 1st pin and 3rd pin on the back of DAC02 board to make the module enter into configuration mode. Here we take the newest version (V2.7) of DRF1278DM as example to demonstrate the communication and setting of the modules

PIN	DIP-A	Function	Description
1	GND	Ground	Ground (0V)
2	VCC	Power	Power supply
3	EN	Input	Enable pin, Low effective
4	RXD	Input	RXD: UART input, TTL level
5	TXD	Output	TXD: UART output, TTL level
6	AUX	Output	Data indication pin for waking up module
7	SET	Input	Fast mode control, effective under central/node mode

Table 6: DRF1278DM Pin functions

3.2.1 Configuring the modules

Assuming the USB driver for DAC02 is installed correctly. We insert the module into DAC02 board, connect them to computer and then run the configuration tool. The corresponding COM will show in the interface.

DRF1278DM		DAC02	
1	GND	1	GND
2	VCC	2	VCC
3	GND	3	---
4	RXD	4	TXD
5	TXD	5	RXD
6	---	6	---
7	---	7	---

Table 7: DRF1278DM Pin Connection with DAC02 in Configuration Mode

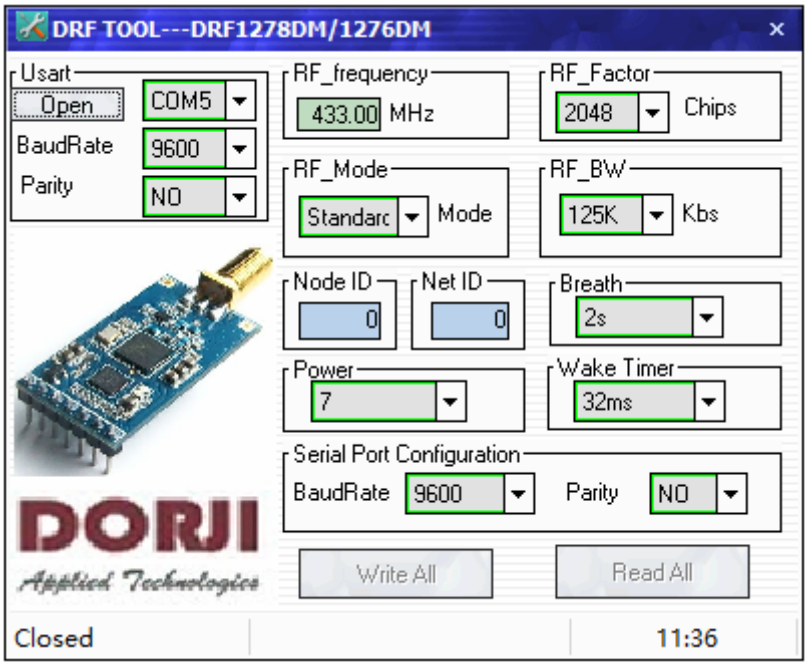

Figure 12: Configuration Tool for Lora Modem

We can click the OPEN button to activate the COM port and now can click Read All button to read the default parameters.

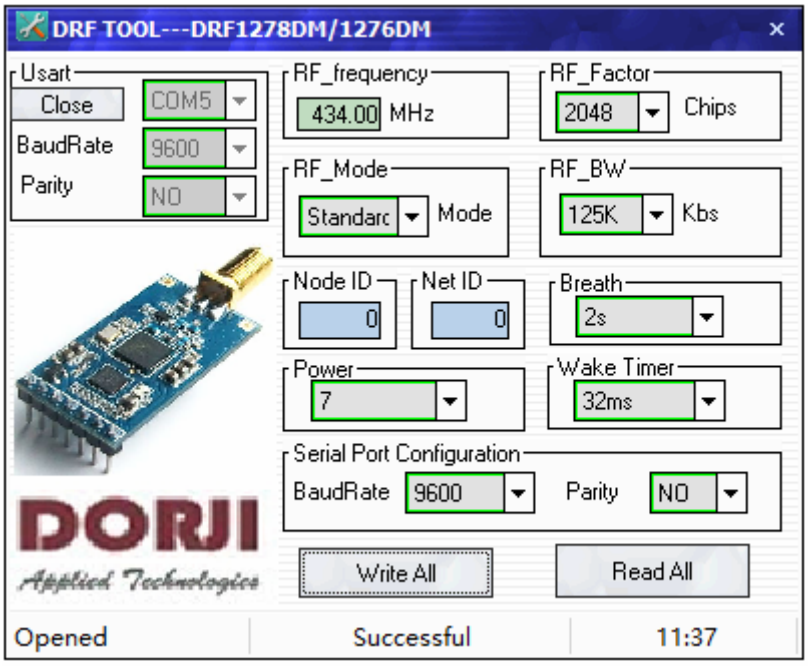

Figure 13: Configuration Tool for Lora Modem

Users also can change the default parameters and click Write All to write the new parameters into the modules.

In order to understand the commands better, we can use Advanced Serial Port Monitor to test the commands. We still keep the modules connecting to the computer, close DRF Tool and

run the Advanced Serial Port Tool.

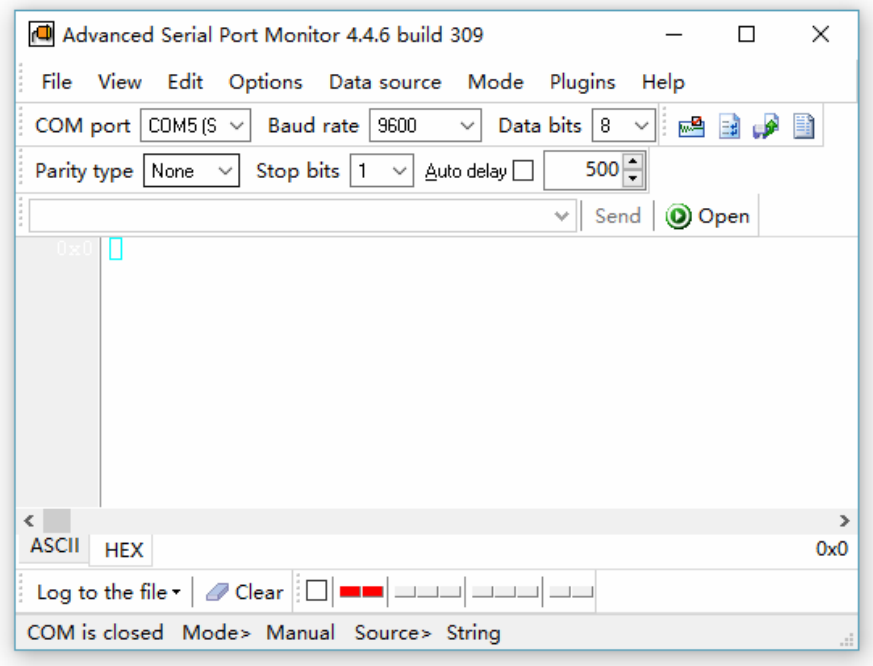

Figure 14: Configuring DRF1278DM with Serial Port Tool

Because the AT commands are in Hex format, we need to adjust the parameters of the serial tool to assure the successful configuration. Click the Options from the menu and choose Parse #xx Hex codes.

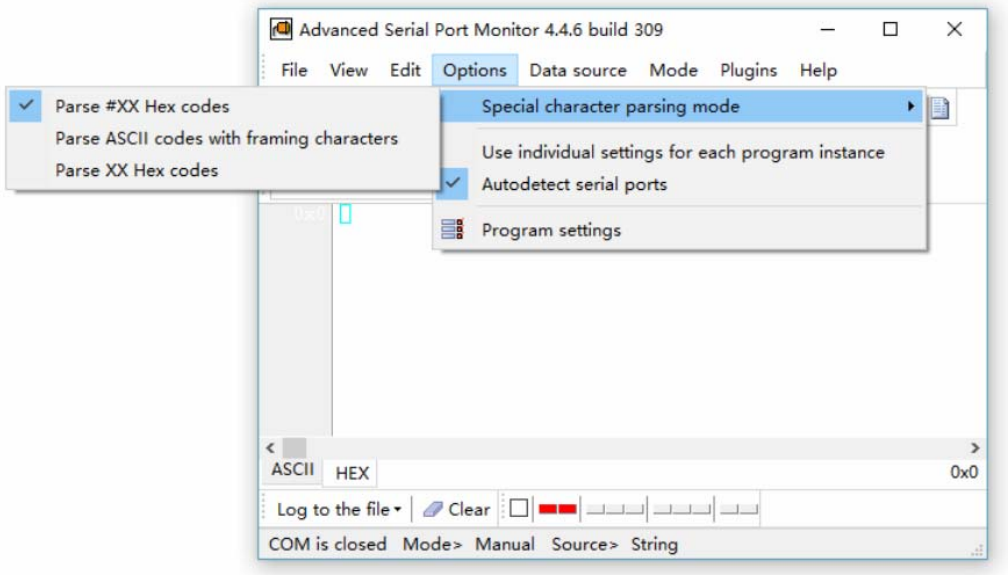

Figure 15: Send/Receive Hex data in Serial Port Tool

Then we make right-click on the display area and choose Data view from the pop-up menu.

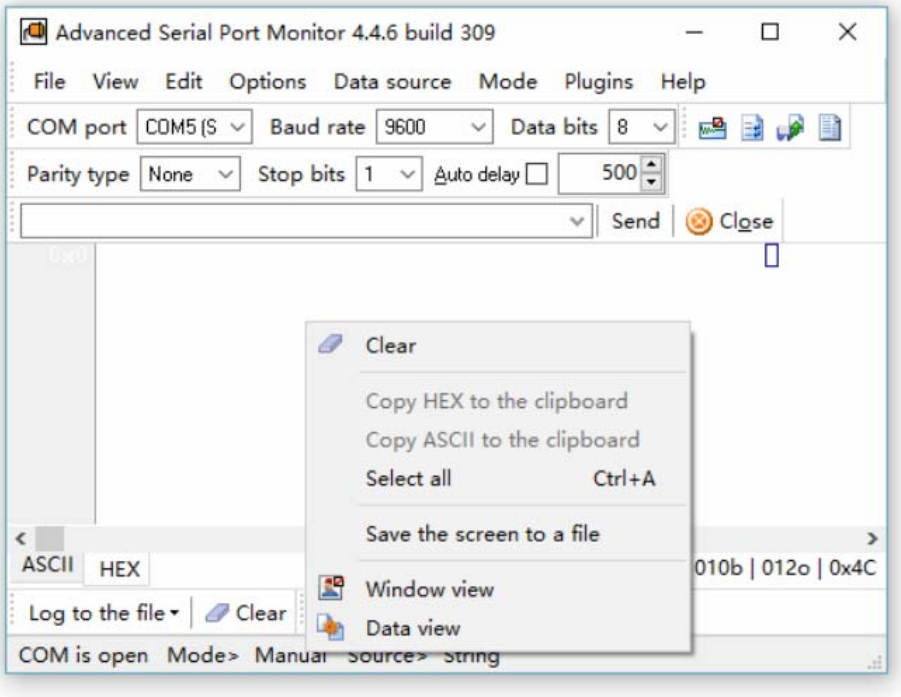

Figure 16: Data View of Serial Tool

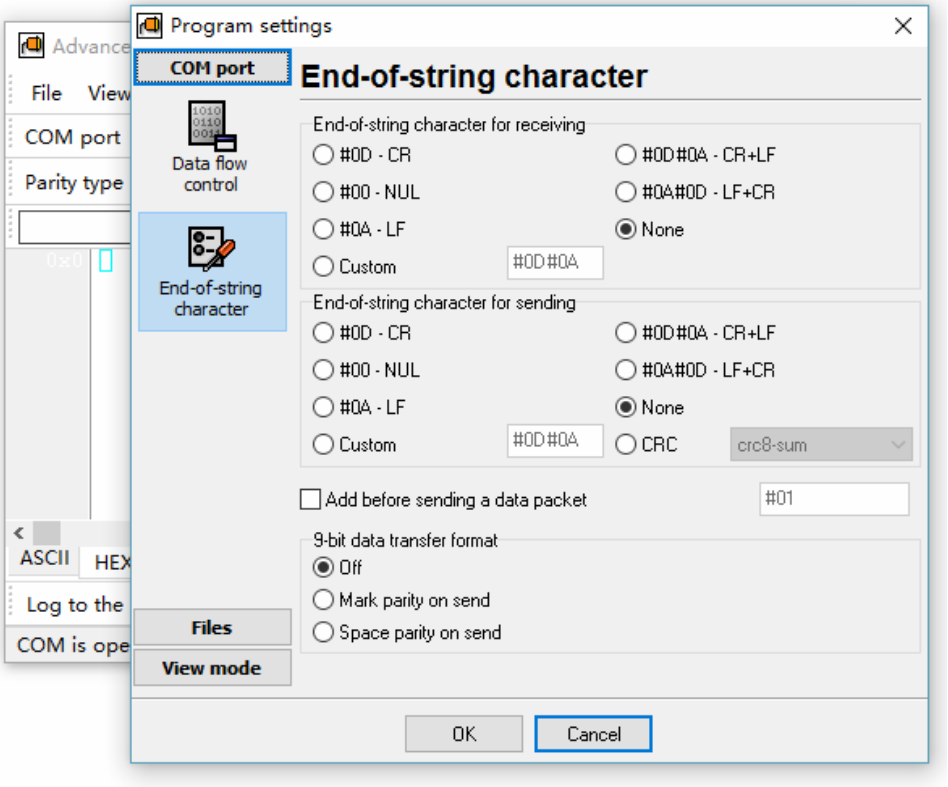

Figure 17: End-of-string character in COM port

We set the End-of-string character for receiving/ for sending to None in COM port and then open View mode to set the Data view as below:

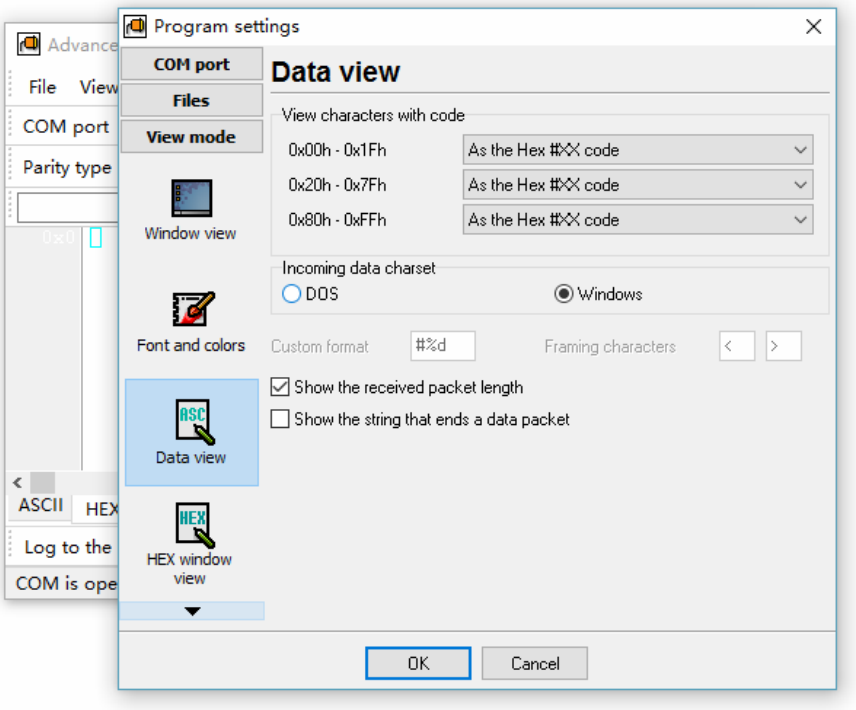

Figure 18: Data view setting in Data view

Now we can use read command to test the results. For version 2.0, we added breath parameter so the data length (LEN) in command is 13 bytes (AF AF 00 00 AF 80 02 **0D** 00 00 00 00 00 00 00 00 00 00 00 00 9C 0D 0A). In figure 15, we choose Parse #xx Hex codes so we need to add prefix # on each byte of Hex data (#AF#AF#00#00#AF#80#02#0D#00#00#00#00#00#00#00#00#00#00#00#00#9C#0D#0A) and input them into the text input area and click send.

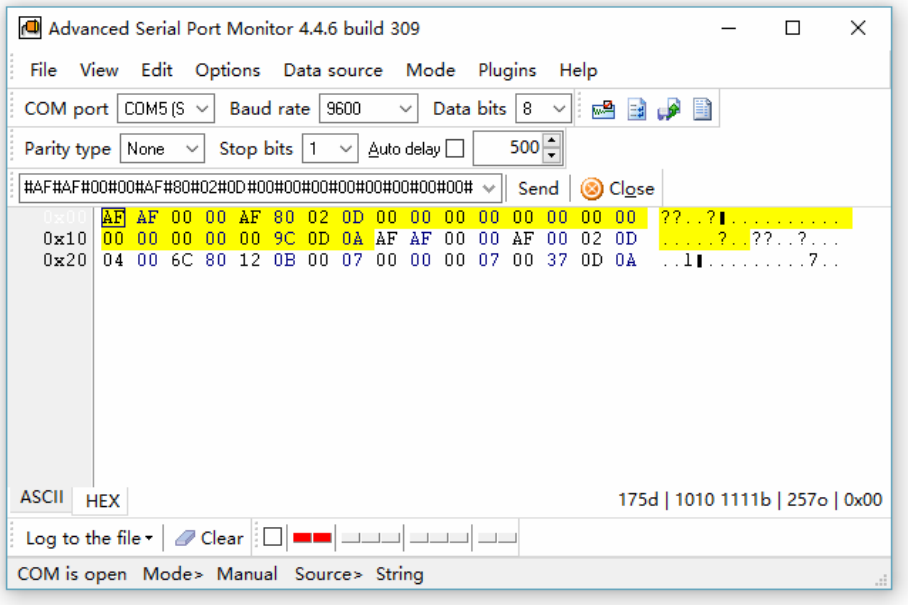

Figure 18: Response of Read Command in Hex Interface

The Hex interface shows the response after sending Read command. We also can switch to ASCII interface to see the data more concise.

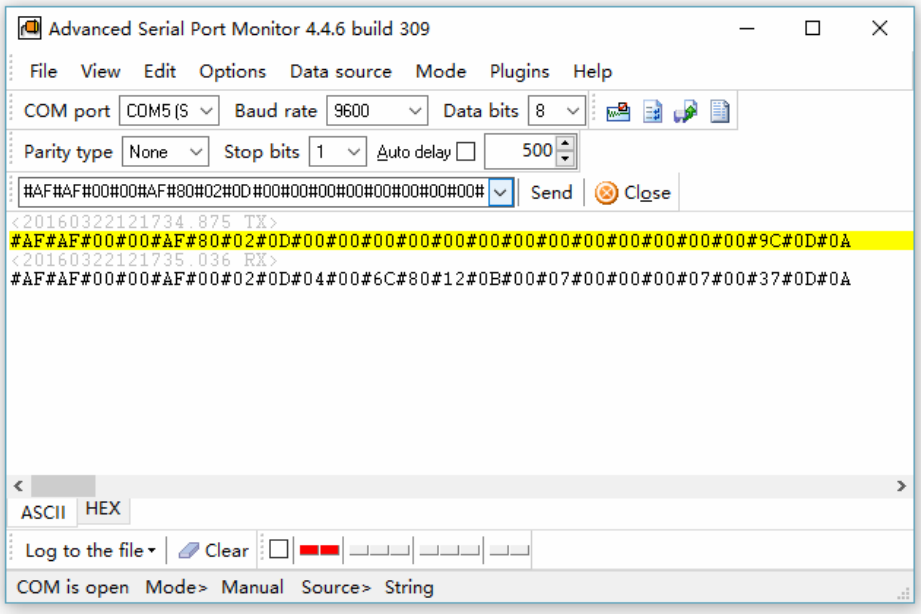

Figure 19: Response of Read Command in ASCII Interface

From above testing we can see that the version 2.7 module still can use the same read command parameters in version 2.0 in order to keep compatibility. We introduce the waker timer parameter in Version 2.7 so the data length in Read command is 14 bytes(AF AF 00 00 AF 80 02 **0E** 00 00 00 00 00 00 00 00 00 00 00 00 00 9D 0D 0A). We input the command (#AF#AF#00#00#AF#80#02#0E#00#00#00#00#00#00#00#00#00#00#00#00#00#9D#0D#0A) to read out the full 14 bytes parameters.

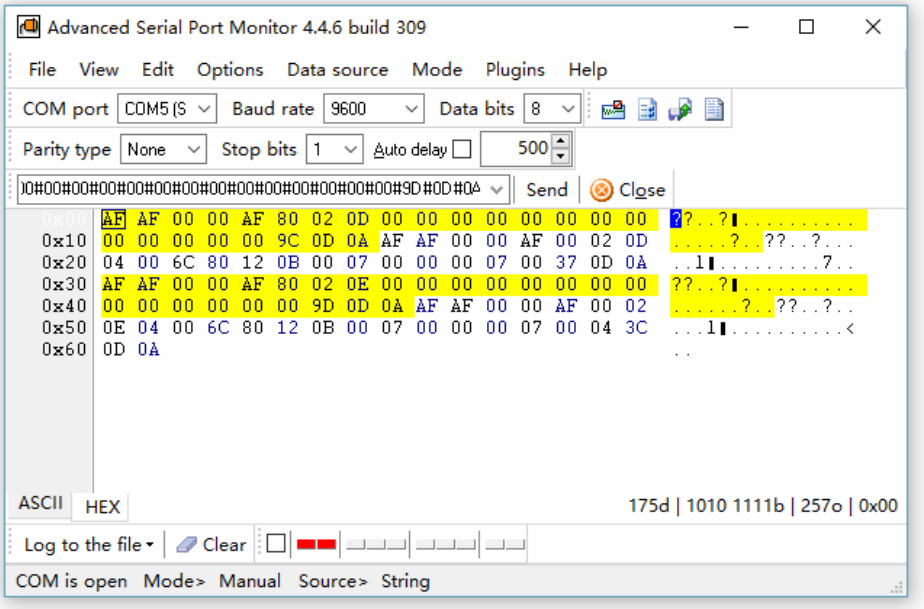

Figure 20: 14 Bytes Data of Read Command in Version 2.7

3.2.2 Testing the communication of DRF1278DM modules

Last section we shows how to configure the parameters of DRF1278DM modules with DRF Tool and Advanced Serial Port Monitor. We also can use the default parameters of DRF1278DM to test the communication between two modules. In standard or configuration mode, the EN pin should be connected to logic low. By default the modules are set to standard mode.

DRF1278DM		DAC02	
1	GND	1	GND
2	VCC	2	VCC
3	GND	3	---
4	RXD	4	TXD
5	TXD	5	RXD
6	---	6	---
7	---	7	---

Table 7: DRF1278DM Pin Connection with DAC02 in Standard Mode

When modules with USB boards are connected to computer, we can open two Advanced Serial Port Monitor windows to test the communication.

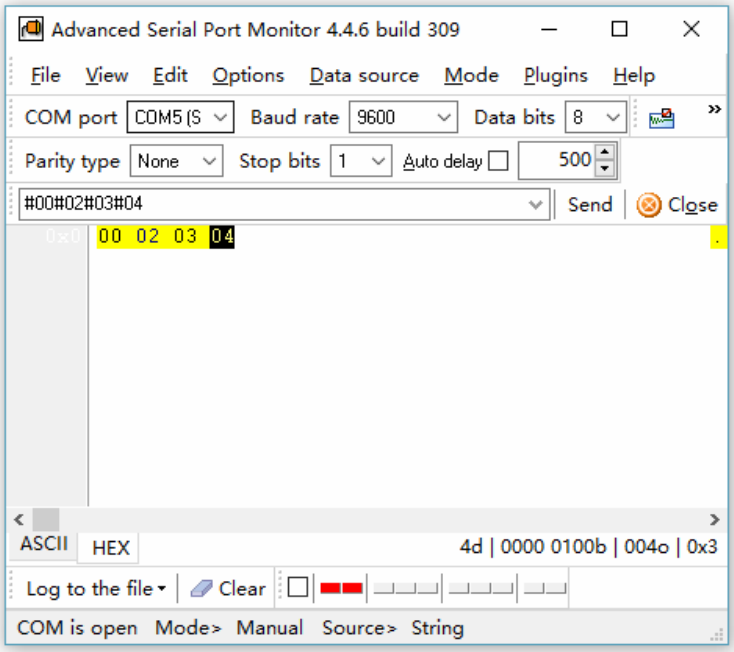

Figure 21: Module A on COM 5 Sends Data

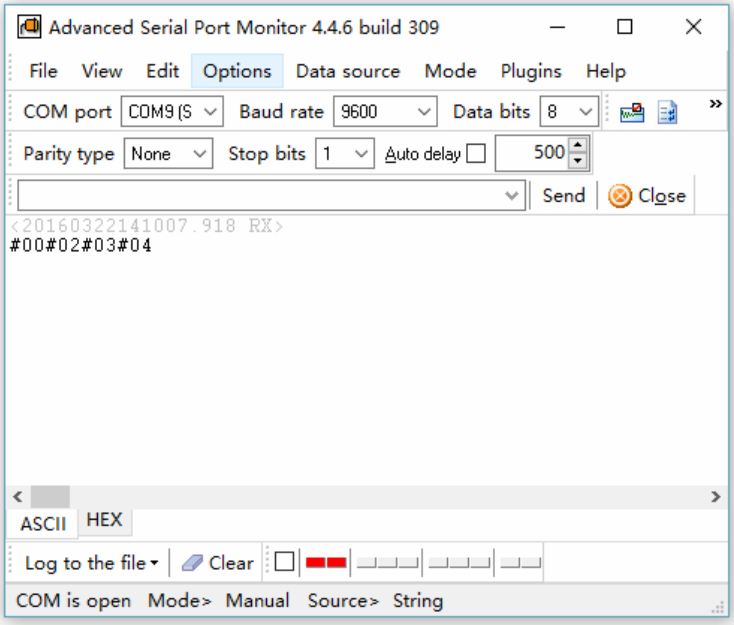

Figure 22: Module B on COM 9 Receives Data

If users want to send ASCII characters and show them directly, we need to change the Data view in View mode and select As the same character in 0x20h – 0x7Fh.

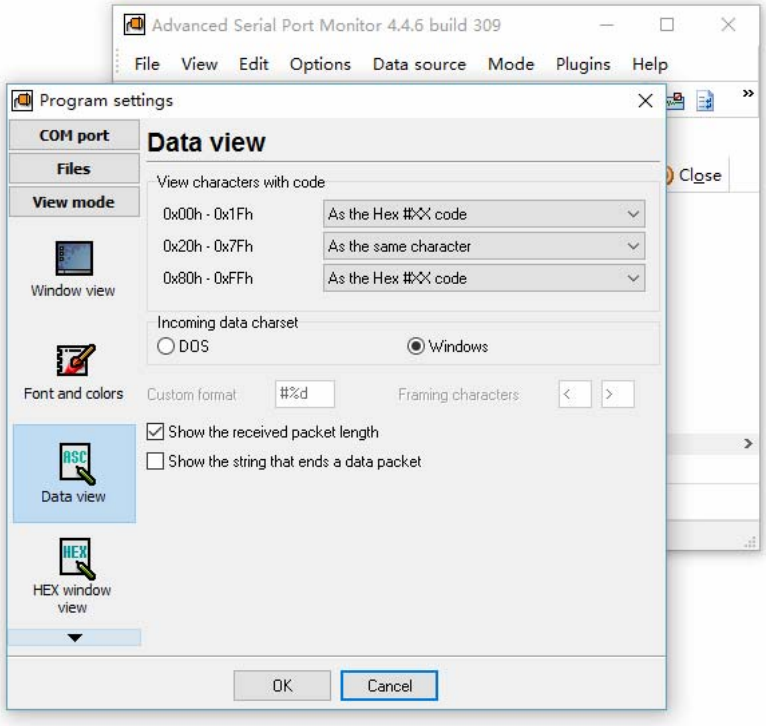

Figure 23: Changing Data View to Show ASCII

Now we send character string from Module A and the Module B receives it and shows the

same string in the display area. Please note we need to choose ASCII interface to see the ASCII string directly. 

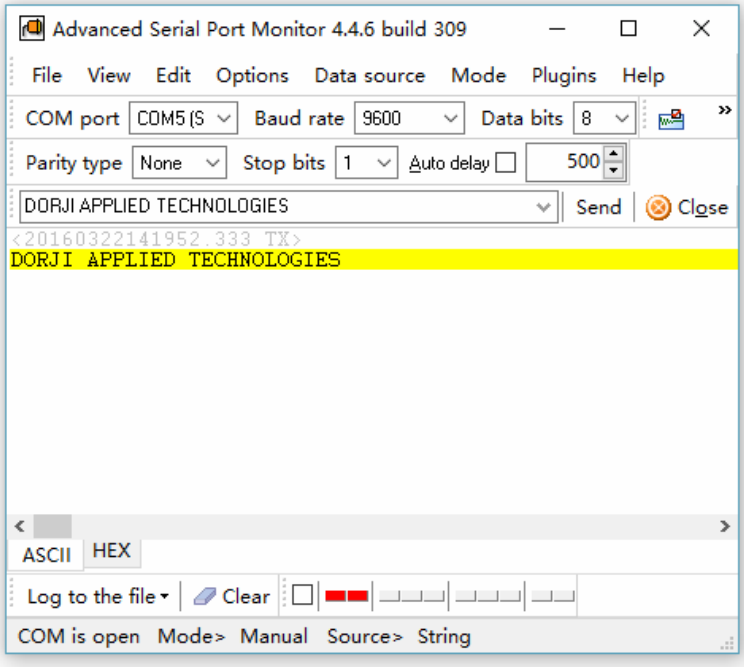

Figure 24: Module A in COM 5 sends ASCII String

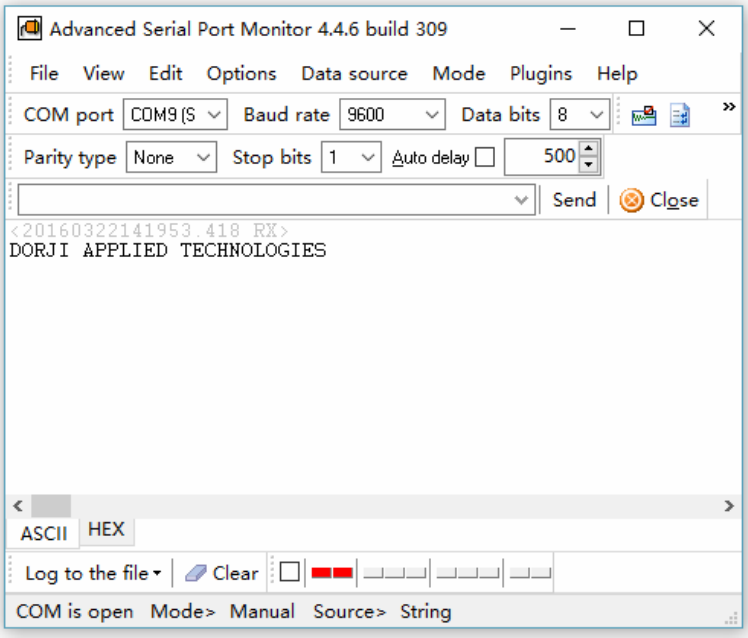

Figure 25: Module B Receives ASCII String and Shows it in ASCII Interface

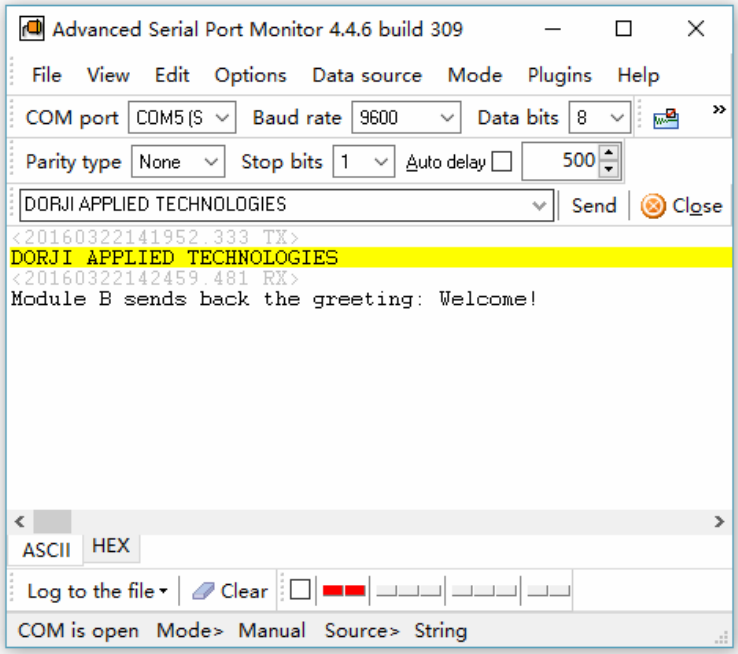

Figure 26: Module A in COM 5 Receives Feedback from Module B

Now we are on the journey to test the star network function. Firstly we should configure one module to central mode and another module to node mode by DRF tool or serial port tool.

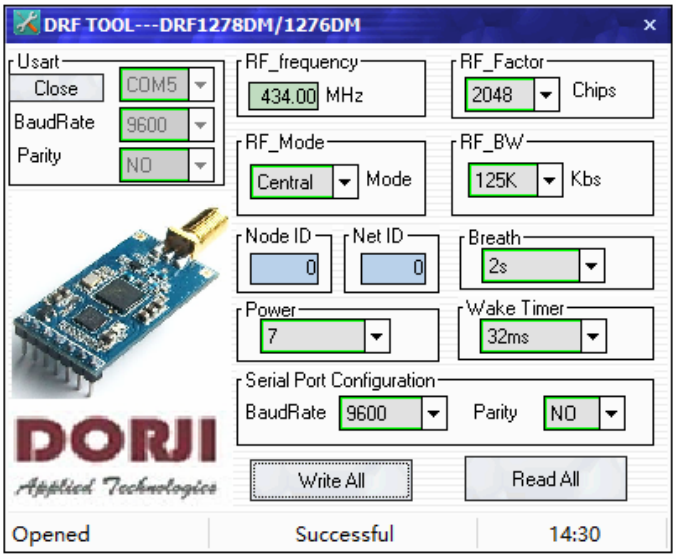

Figure 27: Configuring Module A to Central Mode

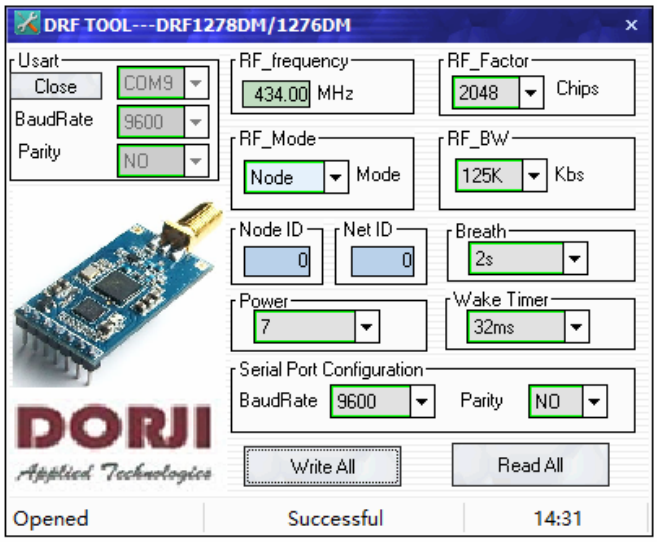

Figure 28: Configuring Module B to Node Mode

Now we should connect the modules to DAC02 board with correct logic levels to test the star networking function. The EN pin of central module is connected to logic low as in standard mode and the EN of node module connects to logic high or keep it floated.

Central Module		DAC02	
1	GND	1	GND
2	VCC	2	VCC
3	GND	3	---
4	RXD	4	TXD
5	TXD	5	RXD
6	---	6	---
7	---	7	---
Node Module		DAC02	
1	GND	1	GND
2	VCC	2	VCC
3	---	3	---
4	RXD	4	TXD
5	TXD	5	RXD
6	---	6	---
7	---	7	---

Table 8: Pin Connections in Central/node Mode

Now we still open two Advanced Serial Port Monitor windows just like we do in standard mode and still set the Data view in View mode as figure 23. For central module, the first two bytes of data package should be the node ID of targeted node module. Now the central module in COM 5 sends data #00#01abc, the node module should be supposed to receive the

data (abc) but it displays #00#01abc. The reason is that when the node ID of node module is set to 0, it will receive all of the data from central module and not filter the node ID.

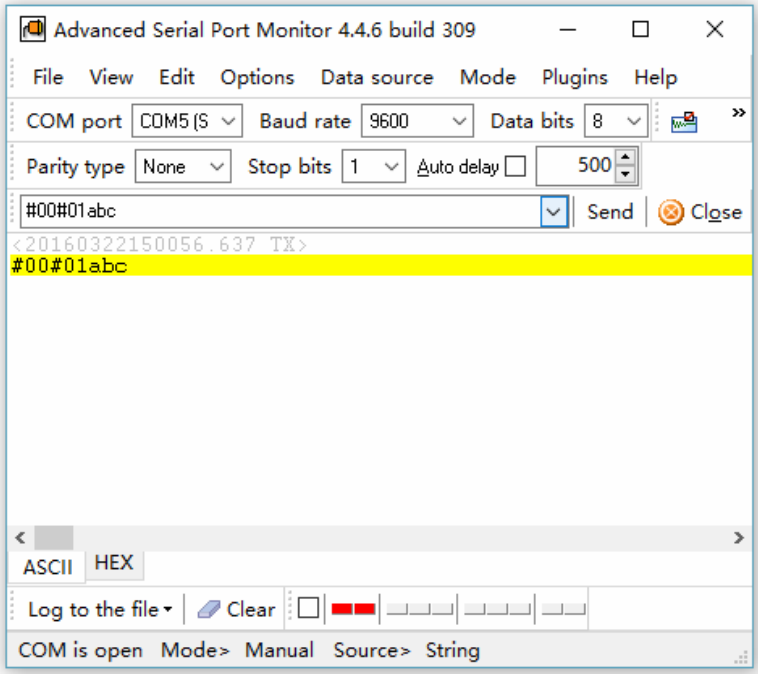

Figure 29: Central Module Sends Data

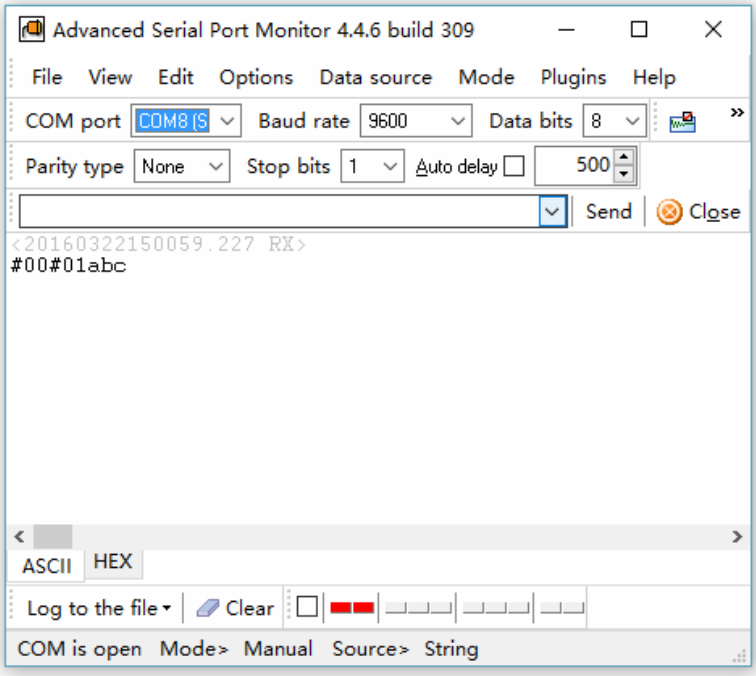

Figure 30: Node Module Receives Data

Now we set the node ID of the node module to 1 (0x00 0x01) through tool (**The EN pin of module must be logic level whenever configuring the module**).

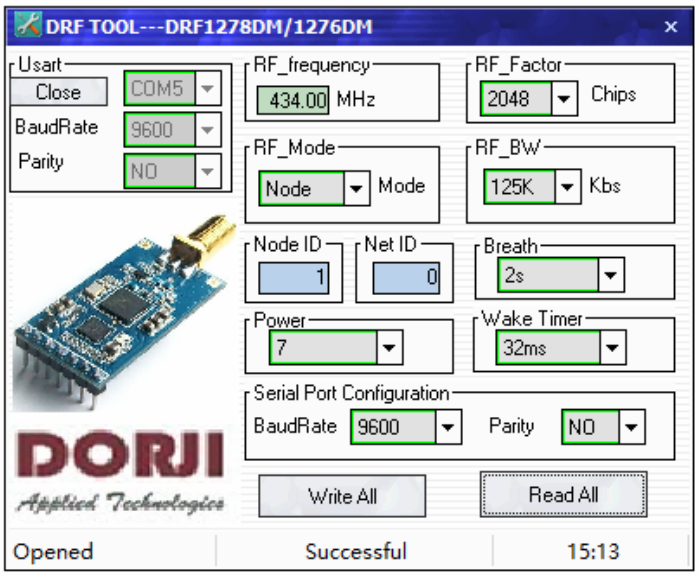

Figure 31: Changing the Node ID of the Node Module

We now send the same data through central module. The node module with ID (0x00 0x01 in Hex) will receive the data (abc) and filter the node ID automatically. If central module sends data #00#02abc, the node module will receive nothing because the node ID in the data package is not the same as its own.

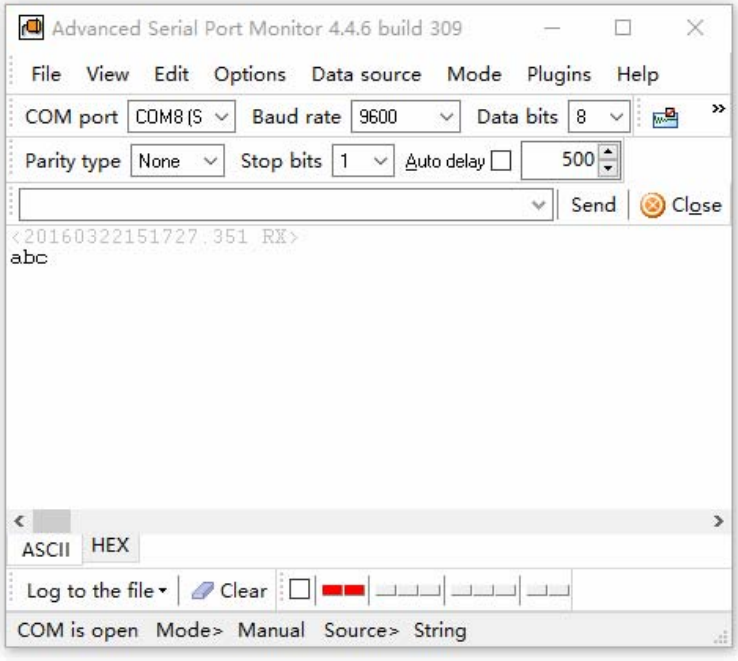

Figure 32: Changing the Node ID to 1 (0x00 0x01)

When the SET pin of node/central is connected to logic high or floated, the node module only enables wireless monitor and disable the UART interface (serial port). Therefore if the node module wants to send data to central module, it needs to set the EN pin to logic low to enable the UART interface to receive the data from the host (MCU or computer). We connect the EN pin of node module to GND, close the serial port

tool and reopen it. The node module then sends the data (abc) out. The central module in COM 5 receives the data correctly. The data package from the node module doesn't need to contain any node ID. The central module will receive all the data from the node modules with the same NetID.

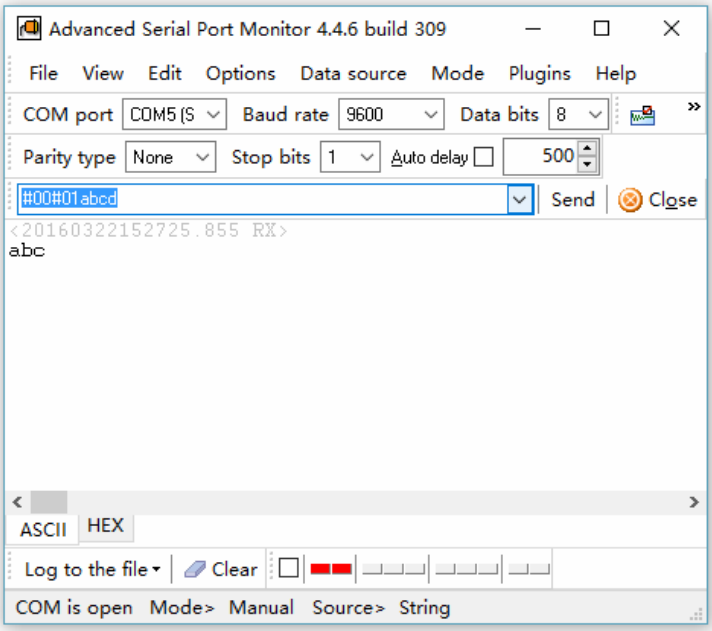

Figure 33: The Central Module with the Same NetID Receives the Data

This section shows how to use USB board to test the DRF1278DM through computer. In most applications, the modules are connected to MCU so the EN, AUX and SET pin can be controlled through I/O pins of MCU to realize more flexible communication.

Dorji Applied Technologies
A division of ***Dorji Industrial Group Co., Ltd***

Add.: Xinchenhuayuan 2, Dalangnanlu, Longhua, Baoan district, Shenzhen, China 518109
Tel: 0086-755-28156122
Email: sales@dorji.com
Web: http://www.dorji.com