

# 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: <u>http://www.dorji.com/pro/tool/USB\_Driver.rar</u> For DAC03 Board: <u>http://www.dorji.com/pro/tool/DACx3\_USB\_Driver.rar</u>

## 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).

Name		Date modified
<table-of-contents> 7020sı</table-of-contents>	Open Run as administrator Troubleshoot compatibility Restore previous versions	6 /24 /2011 0.45 AM
	Send to Cut Copy	Þ
	Create shortcut Delete Rename Properties	

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.

RF Tools for ADF702x series	
RF Parameters	Net Parameters
RF frequency 433.92 MHz	NET ID 12345
RF TRx rate 9600bps 💌	NODE ID 123456789087
RF Power 9 (MAX)	AUTO ADD1
Series Parameters	
Series rate 9600bps 💌	Series Parity Disable 💌
	🗖 AUTO Write Mode
PC Series COM3 💌 Wri	ite <u>W</u> Read <u>R</u>
COM3 Opened Four	nd device! Model: RF100/200 series

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.

n 7020series	6/24/2011 9:45 AM
R 7020series Properties	
General Compatibility Security Details Prev	vious Versions
If you have problems with this program and it wo an earlier version of Windows, select the compa matches that earlier version.	
Help me choose the settings	
Compatibility mode	
Run this program in compatibility mode for Windows XP (Service Pack 3)	r:
Settings	
Run in 256 colors	
Run in 640 x 480 screen resolution	
Disable visual themes	
Disable desktop composition	
Disable display scaling on high DPI settin	gs
Privilege Level	
Run this program as an administrator	
Change settings for all users	
OK Canc	el Apply

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.



							. 0	a 23	
Advance	d Serial Por	t Monitor 4	4.1 DUI	la 604					
File Vie	w Edit C	options D	ata sour	ce M	ode F	Plugins	Help		
COM port	COM3 (S 🔻	Baud rate	9600	•	Data b	its »	<b>2</b>	ا 🎣 🕯	
Parity type	None 🔻	Stop bits	1 🔻 (	<u>A</u> uto del	ay 🗖	500	÷		
						* s	end   🤇	Close	3
<	v								F.
ASCII HE		i m			1				
	file 🕶 🛛 🖉 C								
COM is ope	n Mode≻ I	Manual So	urce> S	String					at

#### 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).



-	erial Port Monitor 4.4.1 bui Edit Options Data sour							
Program set	ttings	X						
COM port	End-of-string c	haracter						
1010 0110	End-of-string character for I	receiving						
Data flow	🔘 #0D - CR	#0D#0A - CR+LF						
control	🔘 #00 - NUL	#0A#0D - LF+CR						
0-h	🔵 #0A - LF	None						
ē-2	Custom 🖡	\$0D#0A						
End-of-string character	End-of-string character for sending							
	🖉 🔘 #0D - CR	#0D#0A - CR+LF						
	🔘 #00 - NUL	🗇 #0A#0D - LF+CR						
	💿 #0A - LF	None						
	Custom ‡	tOD #0A O CRC crc8-sum -						
	🔲 Add before sending a dat	a packet #01						
	9-bit data transfer format Off							
	Mark parity on send							
Files	Space parity on send							
View mode								
	OK	Cancel						

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.

File       View       Edit       Options       Data source       Mode       Plugins       Help         COM port       CDM3 (S • Baud rate       9600 • Data bits       >       Definition       Definition <td< th=""></td<>
Parity type       None       Stop bits       1       ▲ duto delay       500 €         RD       ✓       Send       Send       Send       Send         <20140818161807.332
RD     ✓     Send     ⊗ Close       <20140818161807.332
<pre>&lt;20140818161807.332 TX&gt; RD [len=2] &lt;20140818161807.348 RX&gt;</pre>
RD [len=2] <20140818161807.348 RX>
<20140818161807.348 RX>
PARA 433920 3 9 3 0< [len=19]
ASCIL HEX
Log to the file + @ Clear
COM is open Mode> Manual Source> String

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.

🖪 Advance				1 1						_ 0	X
File Vie	ew Edit	Ор	tions	Data s	ource	e M	lode	Plugins Help			
COM port	COM3 (S	•	Baud	rate 96	00	•	Data	bits 8 🔻 🔜 📑	P 🗎		
Parity type	None	• 8	Stop bi	ts 1	▼ <u>A</u>	uto de	lay 📃	500 🌩			
RD								✓ Send Send Send Send Send Send Send Send	se		
0x00	52 44	0 D	0A S	5 <mark>0 4</mark> 1	52	41	20	RD PARA			
0x09	34 33	33	39 3	32 30	20	33	20	433920 3			
	39 20	33	20 3	30 OD	0A			930.			
ASCII HE	EX							10d	0000 1	1010b 012	o   0x18
Log to the	file - Z	Cle	ar 🗐	]==							
COM is ope	en Mode	e> Ma	anual	Source	> Str	ring					
o o in to ope	an mour	- me	anadr	Coaroo	ou	9					

#### 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).

Advanced Serial Port Monitor 4.4.1 build 604
File View Edit Options Data source Mode Plugins Help
COM port COM3 (S 🔻 Baud rate 9600 🔹 Data bits 8 👻 🛁 🎽
Parity type None 🔻 Stop bits 1 💌 Auto delay 🔲 500 🛬
WR 433920 3 9 3 0 V Send Olose
<20140818161807.332 TX>
RD [len=2] <20140818161807.348 RX>
PARA 433920 3 9 3 0 < [len=19]
<20140818162059.610 TX>
WR 433920 3 9 3 0 [len=17]
ASCIL HEX
Log to the file - Clear
COM is open Mode> Manual Source> String

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.

File Viev	w Edit (	Options Da	ata source	Mode PI	ugins He	elp
COM port	COM3 (S 🔻	Baud rate	9600 -	Data bit	s 8 🔻	🛁 📑 🕺
Parity type	None 🔻	Stop bits	1 🝷 Auto	delay 📃	500 🌲	
WR 433920	3930				✓ Send	Olose
201408	318161	807.331	2 TX>			
ND [len						
201408	318161	807.341	8 RX>			
PARA 43	33920	3 9 3 (	) < [len	= 19]		
201408		059.610				
VR 4339			len = 17	]		
201408			1 TX>			
VR 4339			len = 17			
201408			1 RX>			
PARA 43	33920	3 9 3 (	) < [len	= 19]		
	v					,
ASCII HE	^					
Log to the t	file - AC	lear			1	

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.

File Vie		Edit		tions		ata s	02213	_	ode	Plugir		lelp					
COM port	CON	43 (S	•	Baud	d rate	960	00	•	Data	bits 8	•		🔒 😫				
Parity type	No	ne	• :	Stop I	bits	1	A	ito de	lay 📃	5	00 🊔						
VR 433920	393	30								¥	Sen	d   🥝	) Cl <u>o</u> se				
0x00	52	44	0 D	0A	50	41	52	41	20	RD.	PAF	AS					
0x09	34	33	33	39	32	30	20	33	20	433	920	3					
0x12	39	20	33	20	30	0 D	0 A 0	57	52	93							
0x1B	20	34	33	33	39	32	30	20	33		3920	-					
0x24	20	39	20	33	20	30	0 D	0 A 0	57		30.						
0x2D	52	20	34	33	33	39	32	30	20		3392						
0x36	33	20	39	20	33	20	30	0 D	0 A 0		3 0						
0x3F	50	41	52	41	20	34	33	33	39	PAR							
0x48	32	30	20	33	20	39	20	33	20	20	39	3					
	30	0 D	0 A							0.							
SCII HE	EX												10d 0	000 1	010b	0120	Oxe
_og to the	file	10	Cla	or il	- 10				1 1 1								

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  $3^{rd}$  pin of DRF1278DM should be connected to GND if it is configured with PC tool or microcontroller. Therefore we can solder a wire between  $1^{st}$  pin and  $3^{rd}$  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.

Ι	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



ADW1014

K DRF TOOLDRF127	8DM/1276DM ×
Usart Open COM5 V	RF_frequency     RF_Factor       433.00 MHz     2048 ▼
BaudRate 9600 ▼ Parity NO ▼	RF_Mode     RF_BW       Standarc ▼ Mode     125K ▼ Kbs
	Node ID Net ID Breath
No. of the second secon	Power 7 ✓ Serial Port Configuration
DORJI	BaudRate 9600 - Parity NO -
Applied Technologies Closed	11:36

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.

K DRF TOOLDRF127	8DM/1276DM	x=
Usart Close COM5 - BaudRate 9600 -	RF_frequency 434.00 MHz	RF_Factor
Parity NO V	RF_Mode	RF_BW
	Node ID Net ID	Breath 2s
A CONTRACTOR	Power 7 ▼ 7 Serial Port Configuration -	Wake Timer
DORJI	BaudRate 9600 -	Parity NO 🔻
Applied Technologies	Write All	Read All
Opened	Successful	11:37

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.

Advanced Serial Port Monitor 4.4.6 build 309	_		×
File View Edit Options Data source Mode Plugins	Help		
COM port COM5 (S 🗸 Baud rate 9600 🗸 Data bits 8	~	🖹 🏓	
Parity type None  V Stop bits 1  Auto delay  500			
▼ Send	00	Dpen	
0×0			
<			>
ASCII HEX			0x0
Log to the file - Clear			
COM is closed Mode> Manual Source> String			

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.

			vanced Seria View Edit	-		tor 4.4.6 build Data source		Plugins	— Help	×
~	Parse #XX Hex codes Parse ASCII codes with f Parse XX Hex codes	raming c	haracters	~	Use	cial character p individual settin odetect serial p	ngs for e		am insta	
		0.20			Prog	gram settings				
		< ASCII	HEX							0x0
		Log to	the file •		-	al Source> S				

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.



COM port COM5 (S V Ba		ata source Mode Plugi te 9600 v Data bits			🖹 🎜	
Parity type None 🗸 Stop	o bits	1 V Auto delay 5	500 <del>•</del>			
		~	Send	0 C	lose	
0x0						
	0	Clear				
	0	Clear Copy HEX to the clipboar	rd			
	0					
	0	Copy HEX to the clipboar Copy ASCII to the clipboar				
c	0	Copy HEX to the clipboar Copy ASCII to the clipboar	ard			
ASCII HEX	0	Copy HEX to the clipboar Copy ASCII to the clipboar Select all Ct	ard	010	Ь   012о	0x4

### Figure 16: Data View of Serial Tool

Advance	付 Program sett	tings				×
File View	COM port	End-of-string	charad	ter		
COM port	1010 0110 0011	End-of-string character	for receiving	() #0D #0A -	CB1E	
Parity type	Data flow control	○ #00 · NUL		○ #0A#0D -		
0x0	<b>-</b>	#QA - LF Custom	#0D#0A	None		
	End-of-string character	End-of-string character	for sending	() #0D#0A -	CR+LF	
		○ #00 - NUL		○ #0A#0D ·	LF+CR	
		🔾 #0A - LF		None		
		◯ Custom	#0D#0A		crc8-sum	$\sim$
		Add before sending a	data packet		#01	
< ASCII HEX		●9-bit data transfer forma ● Off	ıt			
Log to the		O Mark parity on send				
COM is ope	Files	O Space parity on sen	d			
	View mode					
		ОК	Can	cel		

### 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:



Advance	៧ Program set	tings		×
File View	COM port	Data view		
	Files	View characters with cod	le	
COM port	View mode	0x00h - 0x1Fh	As the Hex #XX code	~
Parity type	Berley and	0x20h - 0x7Fh	As the Hex #XX code	$\sim$
	Window view	0x80h - 0xFFh	As the Hex #XX code	~
	Z	Incoming data charset ODOS	Windows	
	Font and colors	Custom format #%d	Framing characters	< >
<	ASC Data view	Show the received pac	-	
ASCII HEX Log to the COM is ope	HEX window view			
	•			
		OK	Cancel	

Figure 18: Data view setting in Data view

Advanced Serial Port Monitor 4.4.6 build 309	_		×			
File View Edit Options Data source Mode Plugins Help						
COM port COM5 (S 🗸 Baud rate 9600 🗸 Data bits 8 🗸 🛤 📄 🍻						
Parity type None 🗸 Stop bits 1 🗸 Auto delay 🗌 500 ᆍ						
#AF#AF#00#00#AF#80#02#0D#00#00#00#00#00#00#00#00# ~ Send 0 Close						
0x10 <mark>00 00 00 00 00 9C 0D 0A</mark> AFAF 00 00 AF 00 02 0D	? .	??? 				
ASCII HEX 175d   10	010 11	11 <mark>b  </mark> 257o	0x00			
Log to the file -   // Clear						
COM is open Mode> Manual Source> String						

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.

🖪 Advanced Serial Port Monitor 4.4.6 build 309 — 🗆	×
File View Edit Options Data source Mode Plugins Help	
COM port C0M5 (S 🗸 Baud rate 9600 🗸 Data bits 8 🗸 📾 📑 🧬 🗎	
Parity type None 🗸 Stop bits 1 🗸 Auto delay 🗌 500 🗭	
#AF#AF#00#00#AF#80#02#0D#00#00#00#00#00#00#00#00#00#00# Send Since	
<pre>&lt;20160322121734.875 TX&gt; #AF#AF#00#00#AF#80#02#0D#00#00#00#00#00#00#00#00#00#00#00#00#</pre>	
<20160322121735.036 RX> #AF#AF#00#00#AF#00#02#0D#04#00#6C#80#12#0B#00#07#00#00#00#00#07#00#37#0D#0A	
< ASCIL HEX	>
Log to the file - O Clear	
COM is open Mode> Manual Source> String	

Figure 19: Response of Read Command in ASCII Interface

៧ Advan	iced	Ser	ial P	ort I	Moni	itor 4	4.4.6	bui	ld 30	9									_		×
File Vi	ew	Ed	it (	Opti	ons	Da	ata s	ouro	e	Mod	de	Plu	gins	H	elp						
COM po	rt 🛛	сома	5 (S	~	Bauc	l rat	e 9	600	`	- [	Data	bits	8	$\sim$		1	ø	ľ			
Parity typ	Parity type None V Stop bits 1 V Auto delay 500																				
)0#00#00#	00#0	00#0	0#00	#00#	00#0	00#00	)#00	#00#	00#9	D#0[	0#04	~	Se	nd	8	Cl <u>o</u> se	•				
0x10 0x20 0x30 0x40 0x50 0x60	AF 00 04 AF 00 0E 0D	AF 00 AF 00 04 04	00 6C 00 00 00	00 80 00 00 6C	AF 00 12 AF 00 80	80 9C 0B 80 00 12	02 0D 00 9D 0B	0D 0A 07 0E 0D 00	00 AF 00 00 0A 07	00 AF 00 AF 00	00 00 00 AF 00	00 00 07 00 00 00	00 AF 00 00 00 07	00 00 37 00 AF 00	00 02 0D 00 00 04	00 0D 0A 00 02 3C	••• ••• ?? •••		? <sup>.</sup>  ∎ . ? .	??.  <mark></mark> ??	
ASCII HEX 175d   1010 1111b   257o   0x00																					
Log to the file -   🖉 Clear																					
COM is o	pen	M	ode>	M	anua	al S	our	ce>	Stri	ng											



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.

Γ	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.

🖪 Advanced Serial Port Monitor 4.4.6 build 309 - 🗆 🗙					
<u>F</u> ile <u>V</u> iew <u>E</u> dit <u>Options</u> <u>D</u> ata source <u>M</u> ode <u>P</u> lugins <u>H</u> elp					
COM port COM5 (S 🗸 Baud rate 9600 🗸 Data bits 8 🗸 🛤 🎽					
Parity type None 🗸 Stop bits 1 🗸 Auto delay 🗌 500 🖡					
#00#02#03#04 V Send Send Send					
0x0 <mark>00 02 03 04</mark>					
< >					
ASCII HEX 4d   0000 0100b   004o   0x3					
Log to the file - Clear					
COM is open Mode> Manual Source> String					

Figure 21: Module A on COM 5 Sends Data



	_						
Advanced Serial Port Monitor 4.4.6 build 309 -	×						
File View Edit Options Data source Mode Plugins Help							
COM port COM9 (S 🗸 Baud rate 9600 🗸 Data bits 8 🗸 🛤 📑	»						
Parity type None 🗸 Stop bits 1 🗸 Auto delay 🗌 500 🐳							
Send 😣 Cl <u>o</u> se							
<20160322141007.918 RX> #00#02#03#04							
< ASCII HEX	>						
ASCIT							
Log to the file •   🥒 Clear							
COM is open Mode> Manual Source> String							

#### 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.

COM port	Data view			
Files	View characters v	with cod	e	) Close
View mode	0x00h - 0x1Fh		As the Hex #XX code V	
8-17-1	0x20h - 0x7Fh		As the same character $\sim$	
Window view	0x80h - 0xFFh		As the Hex #XX code V	
37	Incoming data ch	arset	Windows	
Font and colors	Custom format	#%d	Framing characters < >	
ASC Data view	Show the receiv		ket length ds a data packet	
HEX	1			-

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. ASCII HEX

Advanced Serial Port Monitor 4.4.6 build 309	-		×		
File View Edit Options Data source Mode	Plugins	Help			
COM port C0M5 (S $\checkmark$ Baud rate 9600 $\checkmark$ Data	bits 8	~	»		
Parity type None  V Stop bits 1  V Auto delay	500	•			
DORJI APPLIED TECHNOLOGIES	<ul> <li>✓ Ser</li> </ul>	nd 🔕	Cl <u>o</u> se		
<20160322141952.333 TX>					
DORJI APPLIED TECHNOLOGIES					
<			>		
ASCII HEX					
Log to the file -   @ Clear					
COM is open Mode> Manual Source> String					

Figure 24: Module A in COM 5 sends ASCII String

Advanced Serial Port Monitor 4.4.6 build 309 - 🗆 >	<
File View Edit Options Data source Mode Plugins Help	
COM port COM9 (S 🗸 Baud rate 9600 🗸 Data bits 8 🗸 🛁 📑	»
Parity type None V Stop bits 1 V Auto delay 500	
<pre>&lt;20160322141953_418_RX&gt; DORJI APPLIED TECHNOLOGIES</pre>	
ASCII HEX	>
Log to the file - Olear	
COM is open Mode> Manual Source> String	:

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



Advanced Serial Port Monitor 4.4.6 build 309 - 🗆 🗙						
File View Edit Options Data source Mode Plugins Help						
COM port COM5 (S 🗸 Baud rate 9600 🗸 Data bits 8 🗸 🛁 🎽						
Parity type None V Stop bits 1 V Auto delay 500						
DORJI APPLIED TECHNOLOGIES  V Send Send October						
<20160322141952.333 TX>						
DORJI APPLIED TECHNOLOGIES						
<20160322142459.481 RX>						
Module B sends back the greeting: Welcome!						
< >						
ASCII HEX						
Log to the file - Clear						
COM is open Mode> Manual Source> String						

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.

K DRF TOOLDRF127	8DM/1276DM	×
Usart Close COM5 - BaudRate 9600 -	RF_frequency 434.00 MHz	RF_Factor
Parity NO -	RF_Mode	RF_BW
	Node ID Net ID	Breath 2s V
and the	Power 7 ▼ 7 Serial Port Configuration −	Wake Timer 32ms ▼
DORJI	BaudRate 9600 -	Parity NO -
Applied Technologies	Write All	Read All
Opened	Successful	14:30

Figure 27: Configuring Module A to Central Mode



K DRF TOOLDRF127	78DM/1276DM	x = x
Usart Close COM9 ¥ BaudRate 9600 ¥ Parity NO ¥	RF_frequency 434.00 MHz RF_Mode Node V Mode	RF_Factor 2048   Chips RF_BW 125K   Kbs
	Node ID Net ID	Breath 2s Wake Timer 32ms
DORJI Applied Technologies	BaudRate 9600 V	Parity NO - Read All
Opened	Successful	14:31

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
1			
6		6	

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.

Advanced Serial Port Monitor 4.4.6 build 309 - 🗆 🗙
File View Edit Options Data source Mode Plugins Help
COM port COM5 (S 🗸 Baud rate 9600 🗸 Data bits 8 🗸 👼 🎇
Parity type None  V Stop bits 1  V Auto delay  500
#00#01abc Send Send
<pre>&lt;20160322150056.637 TX&gt; #00#01abc</pre>
*00*01abc
< >
ASCII HEX
Log to the file -   I Clear
COM is open Mode> Manual Source> String

Figure 29: Central Module Sends Data

Advanced Serial Port Monitor 4.4.6 build 309 -	<
File View Edit Options Data source Mode Plugins Help	
COM port COMB(S ~ Baud rate 9600 ~ Data bits 8 ~	»
Parity type None 🗸 Stop bits 1 🗸 Auto delay 🗌 500 룾	
Send 🕺 Cl	<u>o</u> se
<20160322150059.227 RX> #00#01abc	
ASCII HEX	>
Log to the file - Clear	
COM is open Mode> Manual Source> String	

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).



K DRF TOOLDRF1	278DM/1276DM	×
Usart Close COM5 <del>-</del> BaudRate 9600 <del>-</del> Parity NO <del>-</del>	434.00 MHz	RF_Factor 2048 ▼ Chips RF_BW 125K ▼ Kbs
DORJ	Forial Port Configuration BaudRate 9600	Breath 2s Wake Timer 32ms V Parity NO V
Applied Technologic	1.2.2. 4.0	Read All
Opened	Successful	15:13

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.

COM port	COMOL	5 - Da	ud rate	9600	~ [	Data bit	is 8 ~	· 🔜
Parity type	None	~ Stop	bits 1	~ <u>A</u>	uto delay		500 🗘	
						~	Send	0 Clos
20160322	151727	, JUL RA	13. V					
	2151727	. 551 14						
	2151727							
20160322 bc	(151727		a /					
	(151727	. 551 14	£. 7					
	(151727							
	(15172)							
	(151727		Carl					
	2151727		i de					
	2151727							

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.

Advanced Serial Port Monitor 4.4.6 build 309 - 🗆 🗙
File View Edit Options Data source Mode Plugins Help
COM port COM5 (S 🗸 Baud rate 9600 🗸 Data bits 8 🗸 🛤 🎽
Parity type None  V Stop bits 1  Auto delay  500
#00#01abcd
<20160322152725.855 RX> abc
<>
ASCII HEX
Log to the file - Olear
COM is open Mode> Manual Source> String

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.

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