

NR500 Series Industrial Cellular VPN Router

Application Note 041

Modbus Slave

Version:V1.0.1Date:May 2020Status:Confidential





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1. Introduction

1.1 Overview

This document contains information regarding the configuration and use of Modbus Slave.

This guide has been written for use by technically competent personnel with a good understanding of the communications technologies used in the product, and of the requirements for their specific application.

1.2 Compatibility

This application note applies to: **Models Shown:** NR500 series. **Firmware Version:** V1.1.2(3be6e5a) or newer **Other Compatible Models:** None

1.3 Version

Updates between document versions are cumulative. Therefore, the latest document will include all the content of previous versions.

Release Date	Doc. Version	Firmware Version	Change Description	
2019/07/18	V1.0.0	V1.1.0(ddcaac4)	First released	
2020/05/13	V1.0.1	V1.1.2(3be6e5a)	Register Table changed	

1.4 Corrections

Appreciate for corrections or rectifications to this application note, and if any request for new application notes please email to: **support@navigateworx.com**



2. Topology



- 1. NR500 router runs as Modbus Slave with static public IP address with SIM card.
- 2. Modbus Master connect to NR500 router (Modbus Slave) via TCP connection.
- 3. Modbus Master read the statue of Digital IO and control DO.

Note: For this Application Note will run the software "Modbus Poll" to simulate Modbus Master.



3. Digital IO Register Table

Index	ltem	Function	Write Function	Address (Decimal)	Quantity	Value
1	Digital Input 1	02 Input Status	NULL	13800	1	0 - Low 1 - High
2	Digital Input 2	02 Input Status	NULL	13801	1	0 - Low 1 - High
3	Digital Output 1	01 Coil Status	05/15	13802	1	0 - Low 1 - High
4	Digital Output 1	01 Coil Status	05/15	13803	1	1 - Pulse
5	Digital Output 2	01 Coil Status	05/15	13804	1	0 - Low 1 - High
6	Digital Output 2	01 Coil Status	05/15	13805	1	1 - Pulse
7	DO1 Pulse Width	03 Holding Registers	06/16	13806	1	Default:500(ms) range:1~1000
8	DO2 Pulse Width	03 Holding Registers	06/16	13807	1	Default:500(ms) range:1~1000

Example: Read DI Status (DI1 High Level)

Master	Transaction	Protocol id	Data	Slave id	Function	Address	Quantity
	id		length		code		
Tx	01 90	00 00	00 06	01	02	35 E8	00 01

Slave	Transaction	Protocol id	Data	Slave id	Function	Byte length	Value
	id		length		code		
Rx	01 90	00 00	00 04	01	02	01	01

Example: Read Two Register Values (DI1 and DI2 High Level)

Master	Transaction	Protocol id	Data	Slave id	Function	Address	Quantity
	id		length		code		
Tx	01 91	00 00	00 06	01	02	35 E8	00 02

Slave	Transaction	Protocol id	Data	Slave id	Function	Byte length	Value
	id		length		code		
Rx	01 91	00 00	00 04	01	02	01	03



Example: Read DO Status (DO1 Output Low Level)

Master	Transaction	Protocol id	Data	Slave id	Function	Address	Quantity
	id		length		code		
Tx	04 81	00 00	00 06	01	01	35 EA	00 01

Slave	Transaction	Protocol id	Data	Slave id	Function	Byte length	Value
	id		length		code		
Rx	04 81	00 00	00 04	01	01	01	00

Example: Control DO1 Output High Level

Master	Transaction	Protocol id	Data	Slave id	Function	Address	Value
	id		length		code		
Tx	07 29	00 00	00 06	01	05	35 EA	FF 00

Slave	Transaction	Protocol id	Data	Slave id	Function	Address	Value
	id		length		code		
Rx	07 29	00 00	00 06	01	05	35 EA	FF 00

Example: Control DO1 Output Low Level

Master	Transaction	Protocol id	Data	Slave id	Function	Address	Value
	id		length		code		
Tx	07 30	00 00	00 06	01	05	35 EA	00 00

Slave	Transaction	Protocol id	Data	Slave id	Function	Address	Value
	id		length		code		
Rx	07 30	00 00	00 06	01	05	35 EA	00 00

Example: Control DO1 Output Pulse

Master	Transaction	Protocol id	Data	Slave id	Function	Address	Value
	id		length		code		
Tx 07 31		00 00	00 06	01	05	35 EB	FF 00

Slave	Transaction	Protocol id	Data	Slave id	Function	Address	Value
	id		length		code		
Rx	07 31	00 00	00 06	01	05	35 EB	FF 00

Example: Modify the width of the output pulse -- 500ms (The current output is Pulse to modify the width)

Master	Transaction	Protocol id	Data	Slave id	Function	Address	Value
	id		length		code		
Tx	07 2C	00 00	00 06	01	06	35 EE	01 F4



Slave	Transaction	Protocol id	Data	Slave id	Function	Address	Value
	id		length		code		
Rx	07 2C	00 00	00 06	01	06	35 EE	01 F4

4. Configuration

4.1 NR500 Pro Configuration

1. Go to Application>Modbus Slave, enable Modbus Slave feature like below:

Overview Status	Modbus Slave			
Link Management General S	Settings			
Industrial Interface		Enable 🗹		
Network		Protocol TCP/IP •		
Applications DDNS SMS		Slave ID 1 Local IP		
Schedule Reboot Modbus Slave				
VPN				
Maintenance			Save	Apply

2. Click Save>Apply.



5. Testing.

5.1 Read Digital Input Status

1. Run software "Modbus Poll" to connect to NR500 (Modbus Slave), like below: (Path: Connection>Connect)

📲 Modbus Poll - Mbpoll1			- 🗆 X
File Edit Connection Setup	Functions Display View Window Help		
🗅 🖻 🖬 🎒 🗙 📑 🖳	Connection Setup	X	
Mbpoll1 Tx = 5923: Err = 0: ID = 1: No connection Alias	Connection Modbus TCP/IP ~ Serial Settings COM1 ~	OK Cancel Mode	
	9600 Baud V 8 Data bits V	RTU ASCI Response Timeout [1000 [ms]	
4 5 5	Even Panty 1 Stop Bit Remote Modbus Server	Delay Between Polls 10 [ms]	
7 8 9	IP Address or Node Name 192.168.111.199 Server Port Connect Timeout 502 3000 [ms]	 ✓ ✓ ✓ ✓ ✓ 	
		C IF VO	

(Path: Setup>Read/Write Definition)

📆 Modbus Poll - Mbpoll1		- 🗆 X						
le Edit Connection Setup Functions Display View Window Help								
D 📽 🖬 🚭 🗙 🛅 🗏 🎰	∏ 05 06 15 16 17 22 23 TC 🖳 🦹 💦							
💬 Mbpoll1	Read/Write Definition X							
Tx = 5923: Err = 0: ID = 1: F = 0	Slave ID: 1 OK							
Alias 13	Function: 02 Read Discrete Inputs (1x) V Cancel							
0	Address: 13800 Protocol address. E.g. 10011 -> 10							
1	Quantity: 1							
2	Scan Rate: 1000 [ms] Apply							
3	Disable							
4	Read/Write Disabled							
5	Disable on error Read/write Unce							
6	View Rows							
7	● 10 ○ 20 ○ 50 ○ 100 ○ Fit to Quantity							
8	Hide Alias Columns PLC Addresses (Base 1)							
9	Address in Cell Enron/Daniel Mode							
<u> </u>								



2. Send the command to read the status of DI1: (Path: Functions>Test Center)

월 Modbus Poll - Mbpoll1							
File Edit Connection Setup Functions Display View Window Help							
) 🖻 🛛	- @ X		. 05 06 15 16 22 23 101 🤋 🌾			
	📴 Mbp	oll1			×		
	Tx = 13	43: Err = 0:	ID = 1: F = 0	02: SR = 1000ms			
		Alias	13800				
	0		1				
	1						
	2						
	3			Test Center X			
	4			Enter hex number separated by "," "." or space			
	6			01 90 00 00 00 06 01 02 35 E8 00 01			
	7						
	8			Open list Save list Add to list Send Exit			
	9			Add Check CRC CLRC Copy			
				000-Tx:01 90 00 00 00 06 01 02 35 E8 00 01 001-Rx:01 90 00 00 00 04 01 02 01 01			

The reply Value is "01", DI1 status is "High". Test successfully. Note: The meaning of "Tx" and "Rx" command, please refer to "Digital IO Register

Table".

5.2 Read Digital Output Status

1. Set the Function Code to "01", Address is "13802" and Quantity is "1": (Path: Setup>Read/Write Definition)



웹 Modbus Poll - Mbpoll1		- 🗆 🗙
File Edit Connection Setup Fur	ctions Display View Window Help	
D 🖻 🖬 🚳 🗙 🗂 🖳 👜 .	几 05 06 15 16 17 22 23 TC 🖗 🤋 🎀	
Mbpoli1	Read/Write Definition X	
Alias 130	Function: 01 Read Coils (0x) Cancel Address: 13802 Protocol address. E.g. 11 -> 10	
0 1 2	Quantity: 1 Scan Rate: 1000 [ms] Apply	
3 4	Disable Read/Write Disabled Disable on error Read/Write Once	
5	View Rows ● 10 20 50 100 Fit to Quantity	
8 9	Hide Alias Columns PLC Addresses (Base 1) Address in Cell Enron/Daniel Mode	

2. Send the command to read the status of DI1: (Path: Functions>Test Center)

ť,	Modbus Poll -	- Mbpoll1 —		\times
Fil	e Edit Conne	ection Setup Functions Display View Window Help		
C) 🖻 🖥 🚭	🗙 🛅 🗒 🚊 Л. 05 06 15 16 17 22 23 ТС 🛛 🖓 🦹		
	Mbpoll1	Test Center X		23
T	× = 5923: Err	Enter hex numbers separated by "," "," or space		
h		04 81 00 00 06 01 01 35 EA 00 01	-	_
ľ	0	Open list Save list Clear Add to list Send Exit Copy		
	1	Add Check CRC LRC		
	2	000-Tx:04 81 00 00 06 01 01 35 EA 00 01		
	3	001-Rx:04 81 00 00 04 01 01 01 00		
	4			
	5			
	6			
	7			
	8			
	9			

The reply Value is "00", DO1 status is "Low". Test successfully.

Note: The meaning of "Tx" and "Rx" command, please refer to "Digital IO Register Table".



5.3 Control Digital Output

Go to Functions>05: Write Single Coils, to change the DO statue from "0" to "1".

웹 Modbus Poll - Mbpoll1		- 🗆 ×							
File Edit Connection Setup Functions	Display View Window Help								
🗅 📽 🖬 🎒 🗙 🛅 🖳 🚊 Л. 05	06 15 16 17 22 23 TC 🖳 🧣 🎀								
Tx = 5923: Err = 0: ID = 1: F = 01: SR = 1	Write Single Coil X								
Alias 13800	Slave ID: 1 Send								
0	Address: 13802 Cancel								
2 0									
3	Response ok								
5									
6	O 5: Write single coil T5: Write smylliple coil								
8									
9									

Go to Application>Modbus Slave>DO Status, the DO Logic Level change to High:

Stat	tus M	odbus Slave		
Modbus Slave Status				
		Er	nable	True
		Pro	tocol	TCP Server
		Connection S	tatus	Connected
DI Status				
Index	Logic Leve	21		
1	High			
2	High			
DO Status				
Index	Logic Leve	el Pulse Width		
1 2	High Low]		

Test successfully.