Ninthway
Radio
Network
Technology

Programming the Ninthway Transceiver Module (NTM)	

Command set	SENT_destination address_string*LF* (no sensor address is sent)
	SENF_string*LF* (sensor address is sent, no destination address)
Serial Protocol	RMOT_destination address_command_command_...command*LF*
Programming codes	CRGP_grnr_destination address_payload data*LF*
n= number	HSCD=n*LF* or HSCD?*LF* program/ask house code
LF = line feed	SNSR=n*LF* or SNSR?*LF* program/ask sensor number
B= bit number 0 – 7	GTNR=n*FL* or GTNR*?LF* program/ask gateway number
X = 0 or 1	MTMR=n*LF* or MTMR?*LF* program/ask status timing in 10 s steps
_ = mandatory space	ASNR=n*LF* or ASNR?*LF* program/ask alarm element address
	TEST=n*LF* n =1 start test; n = 0 stop test
	FUNC=n*LF* or FUNC?*LF* program/ask transceiver function
	0: basic; 1: alarm; 2: Repeater; 3: Gateway etc.
	POWR=n*LF* or POWR?*LF* program/ask transmission power index
	VERS?*LF* ask version
	BTLM=n*LF* or BTLM? program/ask low bat limit in dV
	VOLT?*LF* ask supply voltage level in dV
	FLG1=B_X*LF* or FLG1? see I^2C register 0
	FLG2=B_X*LF* or FLG2? see I^2C register 14
	I2CD=n*LF* or I2CD?*LF* Program/ask I2C extender address
	I2CW=*nF* or I2CW?*LF* Program/ask I2C extender register width
	MEAS device reports RSSI level every 2.5 s

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I2C registers

Register range	Description
0 - 15	NTM-command registers
16 - 31	API-command registers including result registers
128 - 230	Transmission frame registers

NTM basic parameters

Register	description	default
0	Flags1 (FLG1)	0x00
0:0	Wake flag	0 (awake)
0:1	I2C or UART	0 (UART)
0:2	Synchronised operation	0 (no sync)
0:3	Use sensor or destination address	0 (sensor address)
0:4	Beacon	0 (no beacon)
0:5	Receive/Transmit mode	0 (transmit)
0:6	Remote	0 (local)
0:7	Restart transceiver	0 (1 = restart, will default to 0 after restart)
1	Network ID high byte	255
2	Network ID low byte	255
3	Device id upper byte	16
4	Device id lower byte	255
5	Alarm group	0
6	Gateway number	255
7	Destination address upper byte	255
8	Destination address lower byte	0
9	Supply voltage low level	40 dV
10	Transmission power	3 dBm
11	Status report period	5 min
12	Extension I2C address	0
13	I2C address width 0 = 8 bit, 1 = 16 bit	0
14	Flags2 (FLG2)	0x01

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14:0	Reserved for future use	0
14:1	Transfer Acknowledgement	0 (no)
14:2	PAN coordinator	0 (no)
14:3	DIG1 control 1 = input, 0 = output	1 (input)
14:4	DIG2 control 1= input, 0 = output	1 (input)
14.5	Gateway	0
14.6	Transceiver handles Data/Audio	1 (Data)
14.7	Repeater	0 (no)
15	API service number	0 (basic mode)

NTM API parameters

Register	Description	Remarks
16	API par1	255
17	API par2	255
18	API par3	255
19	API par4	255
20	API par5	255
21	API par6	255
22	API par7	255
23	API par1	255
24	API par9	255
25	API par10	255
26	API par11	255
27	API par12	255
28	API par13	255
29	API par14	255
30	API par15	255
31	API par16	255

Description of the programmers	The function mode of the NTM is determined by a set of parameters.
	The mode is either set via the IIC register by the application controller or via a UART connection. Most of the time this is done after production of the application.

Programming the Ninthway Transceiver Module (NTM)

However, in the field every transceiver is expected to have a sensor and an actor address as well as a network id as specified in the datasheet of the NTM.

For setting these parameters the NTMComm program is available to download from www.ninthway.eu site or a program like HyperTerminal can be used.
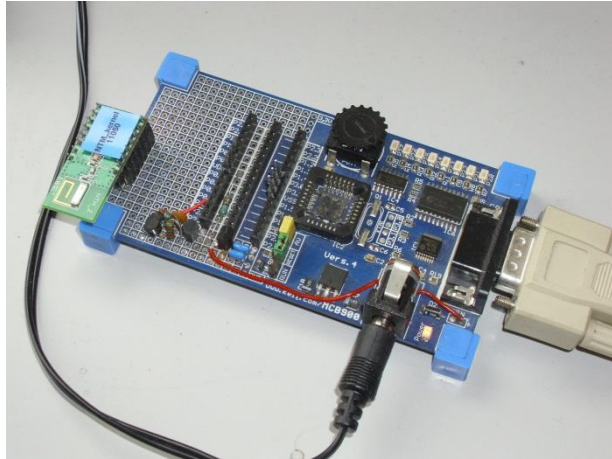

Ninthway NTM programming station for wireless programming of NTMs in application connected to a PC via USB.

These parameters can either be set via a wired link to the NTM or wireless link, using a second NTM wired to the programming device, like a gateway, Ninthway programmer or a self-prepared device like i.e. an adapted Keil MCB900 test board.

Programming the Ninthway Transceiver Module (NTM)	
	  Or one of the sockets on a gateway with serial conversion module

Programming parameters into the NTM

Be sure the INT/PROG pin on the NTM is grounded.

At start-up NTMComm searches for the right com port. Pressing the REFRESH button will load the existing parameter values from the connected NTM.

A message to a receiver can be send by filling in the remote address and message fields and press SEND.

Fill in the parameters and confirm with enter or tab.

The filled in data is immediately transferred to the NTM.

Parameters can be obtained from NTM by pressing REFRESH.

Select flags window

Awake keeps the NTM active at cost of battery life

Select output channel for received data. Either UART or I²C.

If I²C is chosen, the I²C destination address should be filled in and width of the I²C register addressing.
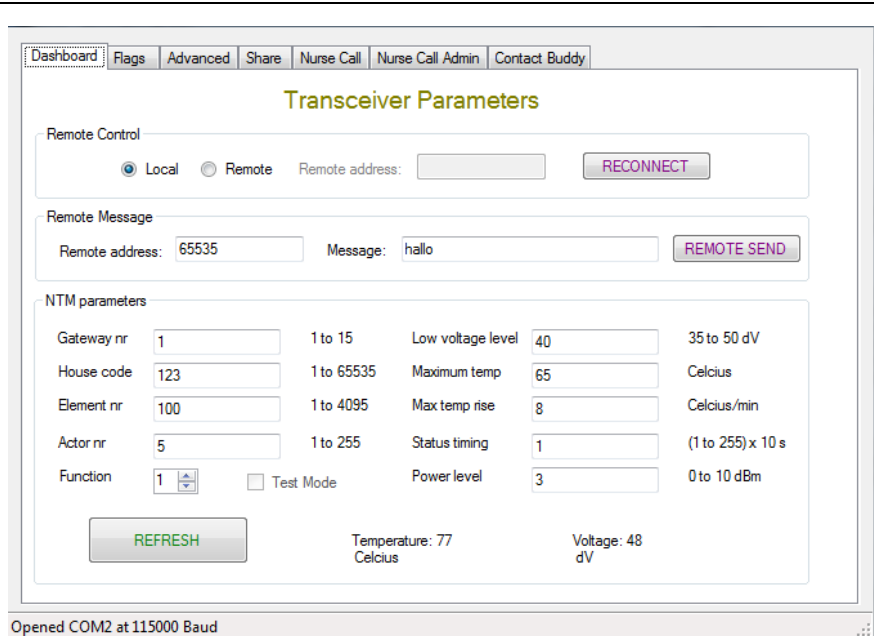
The address is specified as an 8 bit byte using the 7 upper bits. The LSB is use as R/W flag. So I²C addresses are always even.

Gateway is chosen if the NTM is a repeater function with gateway facility.
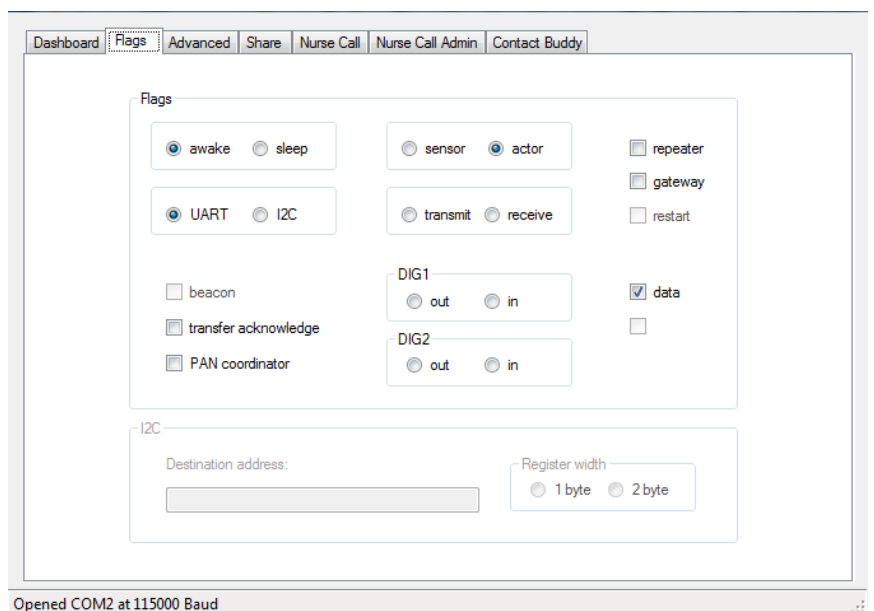
Is the device used in a sensor of actor application?

Actor application requires a synchronized operation with a beacon transmitter like a repeater station.

Address match should be chosen.

NTMComm parameter window

NTMComm flags window

At start up flags are already set in accordance with the requirement for the chosen operational mode.

Choose PAN coordinator if the device is used as a repeater or receiver in a control unit.

Programming complete!

Remote programming of a device

Selecting the remote radio button lets happen everything exactly the same but on a wirelessly connected NTM indicated by the Remote address window.

It is not necessary to have the program jumper placed on the remote device.

Advanced control is available at the Advanced tab.

The com port can be chosen, as protocol parameters. NTM communication will only work with default values.

The auto connect can be switched off to control the serial link with the NTM by hand by using Open and Close buttons.

The StringBuilder window can be used to prepare command strings as specified in this application note and send them to the NTM by tapping the Send button.

Using a program like
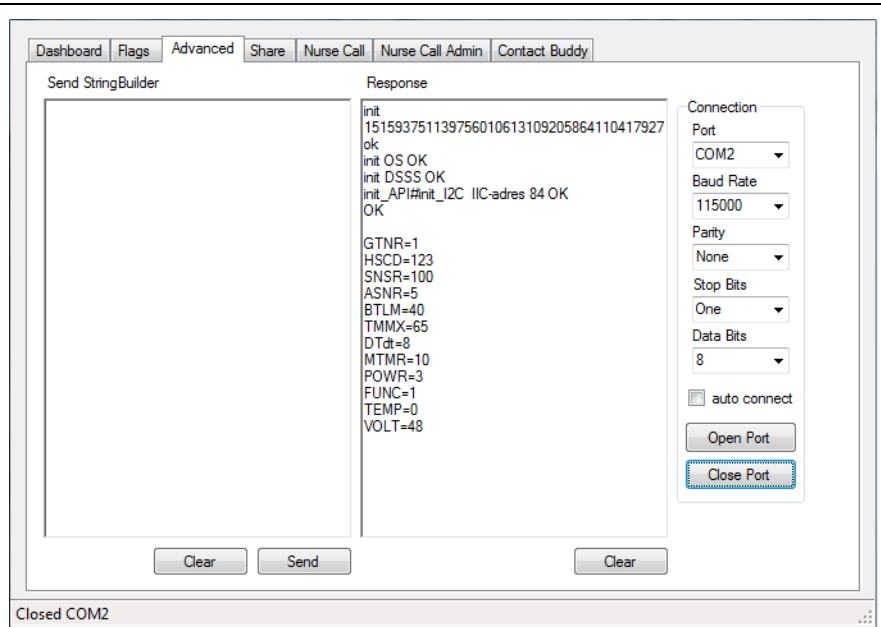
NTMComm Advanced window

After establishing contact by choosing the right com port and baud rate, commands (in CAPITALS!) can be given.

Wrong command strings are ignored. Commands can be typed on separate lines or consecutively on one line.
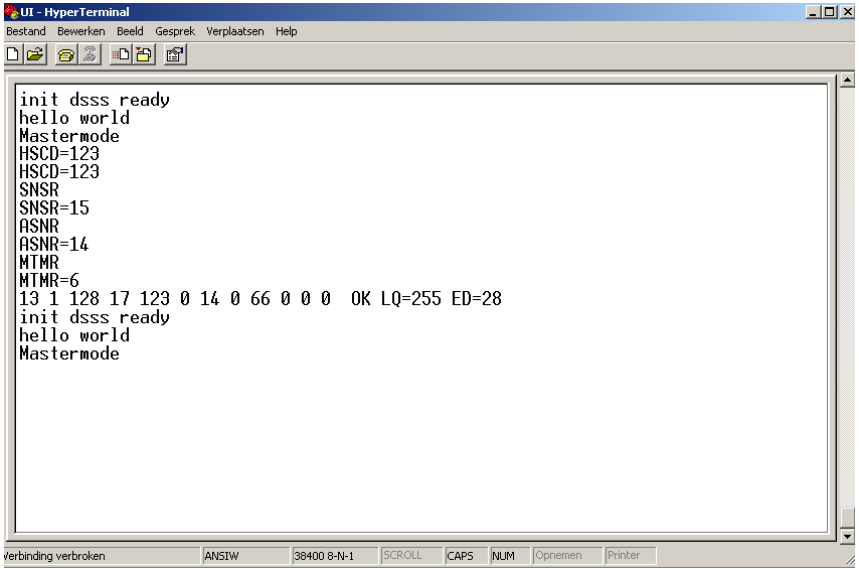
> HSCD(enter)
> MTMR(enter)

Or   HSCD?MTMR?SNSR=456 ASNR=456 VERS?(enter)

Notice the space behind a number character string.

HyperTerminal	

	UI - HyperTerminal
	Bestand Bewerken Beeld Gesprek Verplaatsen Help
	
	`init dsss ready`
	`hello world`
	`Mastermode`
	`HSCD=123`
	`HSCD=123`
	`SNSR`
	`SNSR=15`
	`ASNR`
	`ASNR=14`
	`MTMR`
	`MTMR=6`
	`13 1 128 17 123 0 14 0 66 0 0 0  OK LQ=255 ED=28`
	`init dsss ready`
	`hello world`
	`Mastermode`
	
	Verbinding verbroken ANSIW 38400 8-N-1 SCROLL CAPS NUM Opnemen Printer

Start-up strings	After power up, the NTM sends strings to the UART like:
	init 151647277 1397560106 1310922864 4110417926 ok primary initiation of device with its unique device number *init OS OK :* operating system started *init DSSS OK :* transceiver successfully initiated *init_SAPI OK:* mode 0 initiation routine executed *1L :* first status message broadcasted with L(BT) protocol *DN:* program pin grounded (program mode) *2L:* second status message If the device starts up in another mode, the init SAPI is replaced by a similar string indicating the used mode. This might include status reports on the initiation of I2C or VORN/SPI peripherals. Every time a frame is transmitted, this is reported via de UART bus by its frame number followed by an indicator for the used protocol. L for LTB, C for CSMA.

| Single pin I/O | **Using SCL and SDA for I^{2}C.**
Flags1:1 or register 0:1 should be set to 1. "FLG1=1 1".
SCL and SDA should be tied to V+ in accordance with I^{2}C specifications.
Registers 12 and 13 must contain the I^{2}C address and register width.
The address is specified as an 8 bit byte using the 7 upper bits. The LSB is use as R/W flag. So *I^{2}C addresses are always even.*

Using SCL and SDA as DIG1 and DIG2.
FLG1:1 or register 0:1 should be set to 0. "FLG1=1 0".
Set input/output function of both pins via UART command "FLG2=3 X" and "FLG2=4 X". X= 1 pin is input, X= 0 pin is output. |

	Pins used as output are in open collector mode (max sink current 20 mA per pin).
	To be able to activate the output(s) the NTM needs to be either in Awake mode (FLG1=0 1) or Sleep with Sync mode ("FLG1=0 0" & "FLG1=3 1").
	Synchronisation needs to be set up in combination with a beacon transmitter (repeater station).
	Using ANL as analogue input.
	Voltage input signal 0 – 3 V. (Internal programmable gain amplifier can be configured on request).
	Remote programming the NTM
Remote programming	Remote programming is a basic functionality of the NTM and can be performed in any NTM mode.
	Remote programming is either done via a Ninthway programming station ()in mode 0 state, a gateway (in mode 3 state) or an NTM application hardwired to a PC.
	There are two ways to set parameters in a remote NTM:
	• Use remote option on the dashboard of NTMComm • Use the RMOT command
	Place the active NTM application near the programmer
	Remote via the NTMComm dashboard

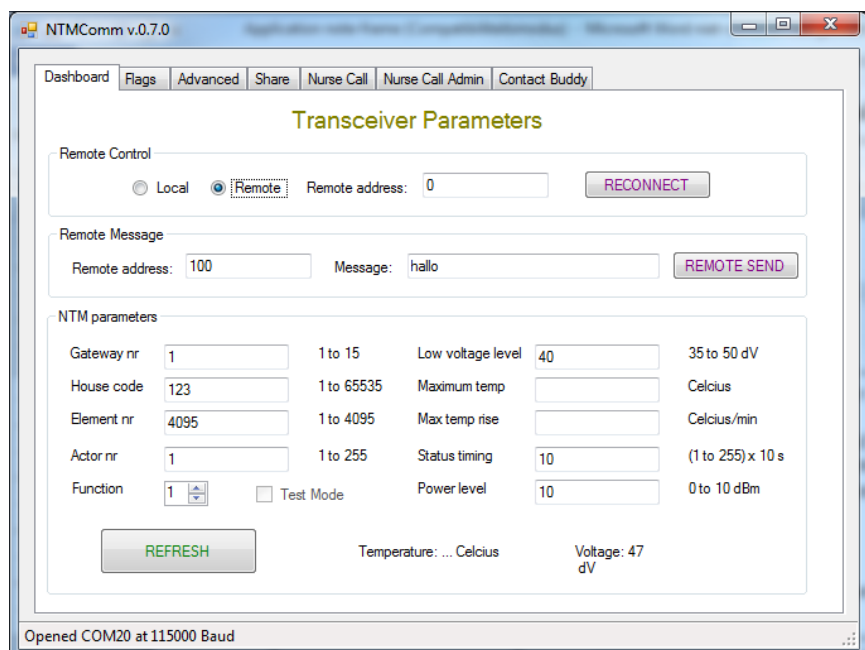| Remote programming via dashboard	By pushing the radiobutton 'Remote' and filling in the proper device address of the remote NTM, all data on the dashboard will be exchanged with the remote NTM. This is only true when the remote NTM has the same: - Gateway number (default 1) - House code (default 65535) To program a new NTM remotely, the local NTM needs to be programmed with the default gateway and house code. After changing either parameters, the local parameters need to be adapted to the same value one by one before sending a new command to the remote NTM. The dashboard allows setting of the most common parameters. Other parameters and application dependent parameters can we controlled with the RMOT and CGRP command. Syntax: RMOT_Element-nr_ Command_ Command … *LF* This sends one or more command strings to element nr. The example here under asks for the software version from device 100 The local NTM is a gateway station linked to the PC

Example of remote programming
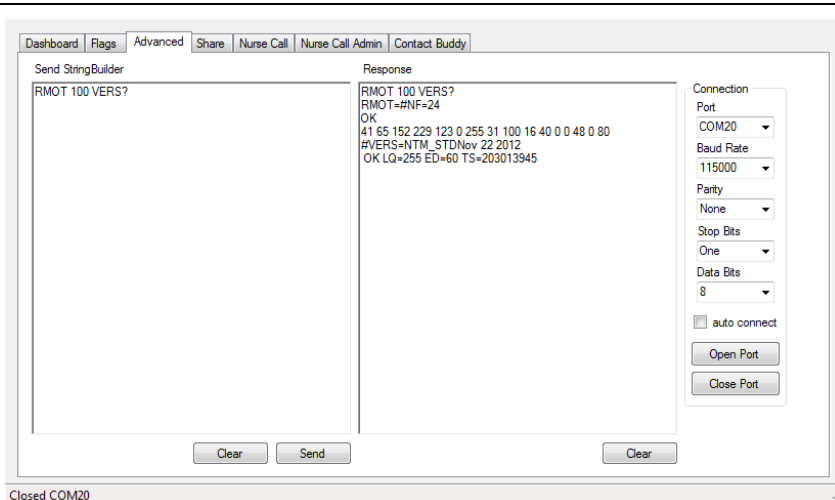
On the left the string builder with the remote command

On the right the response from the local and remote NTM

The local NTM echoes the command RMOT followed by some information from the gateway about the length of the stored frame. The parser in de gateway NTM confirms the execution of the command with OK.

A gateway stores commands in a buffer and transmits them right after the broadcast of the beacon signal. (The beacon signal will tell the targetted device that it will need to stay awake to be able to receive the command frame).

The remote NTM echoes a frame with the requested information in its payload: #VERS= NTM_STD….

Keep in mind that the RMOT command intrinsically applies gateway number and house code of the local device. If they do not match those in the remote NTM, you will get no response from the remote NTM.

The remote command is a so called mac command and is intended to control transceiver and application parameters.

Data intended to be handed over to a remote application is send with the

SENT(o) or SENF(rom) command. The first requires a device number of the remote NTM. The second one is a broadcast to any device in the network.

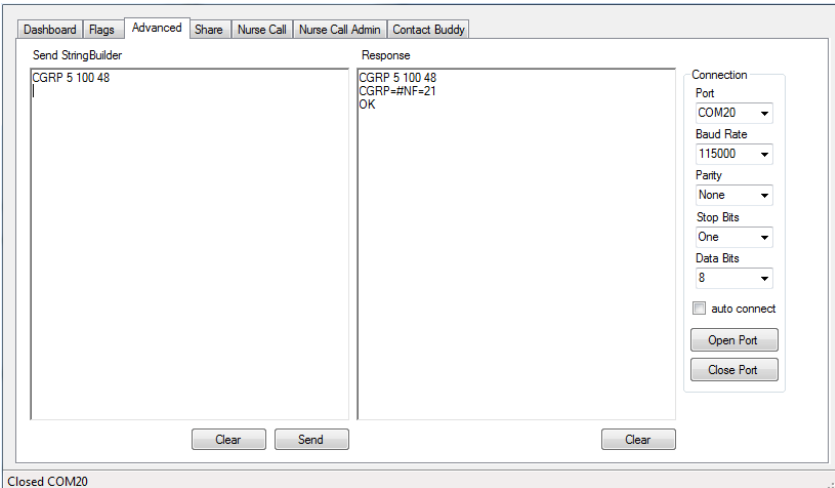*N.B. SENT commands are not relayed by a repeater.*

To overcome this problem the command CGRP is provided. This is also a mac command. Mac commands are transmitted by both NTMs on the gateway or repeater.

Syntax:

 CRGP_Actor-nr_Element-nr_ data…LF

Example:

Example of group command control	 In this case the number 48 is the setting for the output expander on the universal interface for fire alarm devices powering the sensor connected to it. The local NTM echoes the command in the usual way. There is no response from the receiving NTM in this case. That depends on the application program. This command can be used to either address a group of devices indicated by the Actor number or individually by the Element number. A receiving element having the proper actor number or element number will process the data in the payload. The form of data in the payload is completely determined by the application program.
Additional documentation	Datasheet NTM_3 Datasheet NTM Repeater/gateway Application note_2 Ninthway high secure radio network Application note_3 Third party software for the NTM_3