SOFTLINK
SW & HW Solutions

WIRELESS COMMUNICATION SYSTEM
WM868

SW description and configuration
of wireless sensors

WM868-TI
WM868-THI

Contents

Introduction

Modules **WM868-TI** is a wireless thermometer for interior (indoor) usage. The module **WM868-THI** is intended for the measurement of indoor air temperature and humidity. The modules have to be operated in co-operation either with any GateWay type of module (WM868-RFU, WM868-RFE, WM868-RFG), or with the data collection unit (modules WM868-SJ-xx).

NOTE: processing of humidity value is currently not supported by WM868-SJ-RK/R4/U data collection units.

Module configuration

Module can be configured locally (via configuration port), or from remote computer (via IP-network) with using of configuration program (MiniColl, Analyzer) which sends commands with using of special management protocol.

Local configuration is carried out via connected PC with any terminal program. For example, Windows 2000/XP/Vista operating system goes with Hyperterminal program.

Serial port parameters:

- 9600 bauds
- none parity
- 8 data bits
- 1 STOP bit

After switching the system on with a PC connected there appears on the screen of the terminal program this following notification:

```
sysmon – System monitor,  Version 1.0
Copyright (c) 2001, Petr Volny *MSoft*
Compiled at Apr 18 2008, 07:29:25
sysmon>#
```

If this message wouldn't display on the screen it is possible to push ENTER key and after each keystroke there should appear the system prompt with a command input:

```
sysmon>
```

This statement means that the system is in gear and ready to accept the commands.

Enter the commands in the shape of text lines ending by ENTER key. It is possible to edit the line before ending the line by „Backspace"key which always erases the last character.

General form of commands is:

```
command parameter ...
```

In which the number of parameters and their meanings differ according to the command.

The module has system and configuration parameters. We use only configuration parameters for usual configuration. For the module diagnostics we use the system commands (parameters).

Note: The configuration parameters always begin with slash (/)

For the listing of configuration commands and their parameters enter the command slash question mark '/?'

```
sysmon>/?
/W                 write configuration into the FLASH
/x                 RESET station
/m  address        set Master's address
/g  group          set group (multicast address)
/h  count          set hop count
/f [e] [m]         set flags (e-range extender, m-master)
/P  patable        set PA table value
/c  number         set RF channel 0..12
/l  timeslots      set # of timeslots in RF network
/t  timeout        set timeslot timeout in ms
/I address         ping another station
/T test_timeout    set test timeout in ms
/E flag            run test flag (0-Off, 1-On)
/D flag            debug flag (0-Off, 1-On)
/s time            sending time (50 ms)
/a time            ADC measure time (50 ms)
sysmon>
```

For the listing of configuration parameters and their current values enter the command slash:

```
sysmon>/
--------- CONFIGURATION ---------
Configuration is NOT WRITTEN into the FLASH !!!
Address        : 0xFFFFFFAA
Master address: 0x010000FF
Group          : 0
Flags          :
PA table       : C2
--------- RF --------------------
Channel        : 0
Timeslot       : 20 ms
# of timeslots: 10
Hop Count      : 3
Test tout  : 1000 ms
Run test       : 0
DEBUG          : 0
** MEASUREMENT
Sending time  : 2400
ADC measure   : 1200
repeat         : 3
repeat timeout: 6
RX timeout     : 8
Temper. Guart : +0 - +600
sysmon>
```

Operating and stored configuration

The module contains two configurations:

1. operating configuration
2. stored configuration

Once the system is switched on it copies the stored configuration into the operating configuration and goes on working in operating mode.

The user changes the parameters always in operating configuration.

After setting up the operating configuration it is necessary to transfer it into the stored configuration by '/W' command:

```
sysmon>/W
sysmon>
```

It is possible to find out if the stored configuration is identical with the operating configuration by listing of the configuration by entering the slash '/' command.

If both configurations are identical the following statement **would not** appear:

```
Configuration is NOT WRITTEN into the FLASH !!!
```

In the head of the listing there is a statement saying weather the displayed configuration is written into the internal FLASH memory of the module. If the above mentioned statement is missing the current operation configuration agrees with that one which is written in the FLASH memory.

Some of the parameters of the operating configuration are not accepted immediately therefore it is necessary to restart the module.

To restart the module use the command '/x' :

```
sysmon>/x
```

ATTENTION! Before restarting the module it is necessary to save the configuration by '/W' command.

Parameters of the radio part of the module

These parameters are related to the radio frequency part of the module operating in 868MHz bandwidth and they are also related to the communications protocol SLRF which is used for the access to a public volume – radio frequency.

Module address

The module address is a unique 32-bit number. This address is determined by the module's manufacturer and is not changeable by the user. The address of the module is displayed in the listing of the configuration in the form of a hexadecimal number in the line:

```
Address      : 0xFFFFFFAA
```

Group address

The group address is a number from interval 0 to 65535. The group address is used for creation of virtual data buses. This means that all modules forming one virtual (wireless) data bus must have this same address. The group address is displayed in the configuration listing in this line:

```
Group        : 0
```

The group address is set up by '/g number' command, for example:

```
sysmon>/g 12
sysmon>/
```

Master bus address

This address determinates the virtual master data bus and it is displayed this way:

```
Master address: 0x010000FF
```

Master bus address setting is '/m address', for example:

```
sysmon>/m 0xffffa143
sysmon>
```

Characters **0x** go before the address which is a format convention for hexadecimal numbers writing.

In the application of wireless thermometer/hygrometer the only GateWay type of module (WM868-RFU, WM868-RFE, WM868-RFG) or data collector module (WM868-SJ-xx) can be configured as the master of virtual bus.

Bit flags

The bit flags influence the module behavior within the wireless net. Currently there are two flags implemented:

- '**e**', the module works as a repeater, range extender
- '**m**' the module is a virtual master data bus

Set up the bit flags by '/f ...' command which is followed by the characters identifying particular flags, for example:

```
sysmon>/f e m
```

This command causes that the module behaves as a repeater and a master of a virtual data bus at the same time.

ATTENTION!, while entering this command there must always be all bit flags that need to be set up. If we wish to erase flags then we enter:

```
sysmon>/f
```

WARNING!! Wireless thermometer module cannot be a master of the virtual bus. As the module is not permanently "on-line", also the repeater functionality has no real sense. In the current software application of the wireless thermometer the 'e' and 'm' flags have no meaning and they should not be used.

Transmission power set up (PATABLE)

The command serves for the module's transmission power set up. A standard value is C2 (conforms to a maximum transmitting power) which is displayed in the configuration listing in the line:

```
PA table      : C2
```

In case it is required to degrade the transmitting power it is possible to set-up the power to lower value according to the original datasheet of transceiver chip producer (TI CC1101 Data Sheet). The command for changing of this value is:

```
sysmon>/P 0xc3
```

The command effects the module only after its restart.

WARNING!! This command fundamentally influences the module's behavior so we strongly recommend to use this only by the purpose-trained person and/or for service purposes.

Operating channel

The systems WM868 make it possible to operate on 3 frequency channels without mutual interaction. The module operates always in one of those 3 channels and the modules working in other channels are invisible for the first one.

Current channel setting is displayed in the configuration listing as:

```
Channel        : 0
```

Command for the channel set up:

```
sysmon>/c 2
```

Number of the channel must be from the interval 0 to 2.
This command has an effect only after the restart of the module.

Timeslot timeout

This parameter determinates one timeslot's timeout, in milliseconds. Current value can be found in the configuration listing in the line:

```
Timeslot       : 20 ms
```

Command for timeslot's timeout set up is:

```
sysmon>/l 50
```

the parameter specifies timeslot's time out in milliseconds.

Number of timeslots

This parameter determines the number of timeslots that the module uses. Current value can be found in the configuration listing in the line:

```
# of timeslots: 10
```

Command for the number of timeslots set up is:

```
sysmon>/t 5
```

the parameter here is the number of timeslots.

Maximum hop counts

The parameter determines a maximum hop count of one packet through repeaters in a wireless net. Current hop count value is listed in the configuration listing in the line:

```
Hop Count      : 3
```

Command for the maximum hop count set up:

```
sysmon>/h 10
```

The parameter determines the number of hop count which is limited for the interval 0 to 15.

Temperature/humidity measurement parameters

These parameters setup frequency of temperature/humidity measurement and frequency of sending messages with the current temperature value to GateWay or data collecting unit. That is why the parameters have secondary influence on the module's power consumption and the lifetime of batteries.

Setting up the interval of data sending

This parameter serves for the module's data sending interval set up. In the interval which is set-up by this parameter the module sends data to the collector unit. The parameter means the time in 50 millisecond intervals so that one second is expressed by value 20. If we can send the value of temperature every 10 minutes the parameter "sending time" should be:

*10 * 60 * 20 = 12000*

Current setting is listed in the line:

```
Sending time: 24000
```

Command for the setting of the parameter is:

```
sysmon>/s 12000
```

The parameter here is the interval of sending data with measured temperature/humidity.

A/D time interval set up

This parameter serves for the set up of a time interval of the A/D converter measuring temperature/humidity and battery voltage.

The parameter means time in 50 millisecond intervals so that one second is expressed by value 20. Current setting is listed in the line:

```
ADC measure  : 1200
```

Command for the setting of the parameter is:

```
sysmon>/a 1400
```

The parameter here is the interval of measurement of the processor temperature and battery voltage. If we want to measure the battery voltage and the processor temperature every 2 minutes the parameter "ADC measurement" should be:

*2 * 60 * 20 = 2400*

WARNING!! This command fundamentally influences the power consumption of the module so we strongly recommend to use this only by the purpose-trained person and/or for service purposes.

WARNING! The minimum time interval of temperature and humidity measurement for WM868-THI module is 10 seconds. Do not set up parameter ADC measure to value less than 12000.

Number of repetition set up

After transmitting of the message the module awaits a confirmation message from the GateWay or data collection module. If it doesn't happen until the end of repeating timeout, the module repeats the message. This parameter sets up the number of repetition of the message.

Current setting is listed in the line:

```
repeat      : 3
```

Command for the number of repetition set up is:

```
sysmon>/R 5
```

The parameter here is the number of repetition of the message.

WARNING!! This command fundamentally influences the power consumption of the module.

Repeating timeout set up

During the transmission the module awaits the confirmation from the GateWay or data collection module. If it doesn't happen the module repeats the message and remains waiting for its message confirmation. This parameter sets up the repeating timeout while waiting for the confirmation. The parameter means time in 50 millisecond intervals.

Current setting is listed in the line:

```
repeat timeout: 6
```

Command for the repeating timeout set up is:

```
sysmon>/A 8
```

the parameter here is the timeout until the confirmation of the message is expected. If we can set up the timeout for repeating messages to 250 milliseconds the parameter "repeat timeout" should be:

250 / 50 = 5

WARNING!! This command fundamentally influences the power consumption of the module so we strongly recommend to use this only by the purpose-trained person and/or for service purposes.

Temperature thresholds set up

The module is able to compare the current temperature towards the upper and lower bound setting (i.e. maximum and minimum thresholds). If the temperature exceeds the threshold the module immediately sends the alarm message.

Current setting of the temperature thresholds is listed in the line:

```
Temper. Guart : +0 - +600
```

The first parameter (+0) means the lower threshold (minimum), the second parameter (+600) means the upper threshold (maximum). The temperature is setting in tenths of degree Celsius.

Command for the setting of the lower threshold (minimum) is:

```
sysmon>/L -25
```

Command for the setting of the upper threshold (maximum) is:

```
sysmon>/H 800
```

The lower threshold is set up to -2,5 °C. The upper threshold is set up to +80 °C.

Setting up real time

The module maintains real time. The set up can be done by a special radio message or by the following command:

```
siab41>/r hour minute second day month year
```

for example:

```
siab41>/r 9 11 30 1 9 2008
```

sets the time to 09:11:30 and the date to 1st September, 2008.

Testing parameters

This group of parameters is determined for the testing mode of the module. Typically, these parameters are not stored in the internal FLASH memory.

DEBUG mode

When switching this mode on, we get detailed listings of the module internal processes. After you restart the module, this mode stays switched **off**. Command for setting of this parameter is:

```
sysmon>/D 1
sysmon>/D 0
```

Here the first command switches the debug mode on and the second command switches the debug mode off.

WARNING!, switching this parameter on may cause a lower processor power of the module and therefore causes a bit higher data loss

Test transmission

After switching this mode on, the module transmits a test message in regular intervals to another module whose address is listed in the configuration as „**Master bus address**". Set up the message interval by command:

```
sysmon>/T 1000
```

Here the parameter defines the period of the test message in milliseconds.

Switching on/off of the test mode is carried out by command:

```
sysmon>/E 1
sysmon>/E 0
```

The first command switches the test transmission on and the second command switches the test mode off.

ATTENTION!, don't set up the parameter T on the value lower than 50 otherwise there is a thread of cache memories thrashing!

Useful information

Examples of using WACO components including examples of configuration can be found in "Examples of Utilization" appendix of the manual. General description and features of the WACO system including the examples of its usage can also be found on the producer's web site:

http://www.softlink.cz/produkty/telemetrie-dalkove-rizeni/waco/popis.html?lang=en

Information about technical parameters of modules, control and adjusting elements and instructions for installation and operation can be found in "HW description and operation" manual:

WM868-TI/THI - HW description and device operation

In above mentioned manual you will find also safety and environmental instructions and conditions for guarantee and repairs. The manuals are available at www.softlink.cz

WM868-TI modules are logically connected to the WACO GateWays (WM868-RFU, WM868-RFE, WM868-RFG) or data collection modules (WM868-SJ-xx) which are designed for collection of data from pulse/analog modules WM868-SI/SA, wireless thermometers WM868-TI/TE and similar modules.

The principles of inter-working among the WM868-TI/THI modules and WACO GateWays are more precisely specified in the particular WACO GateWay manuals:

Module WM868-RFE (WACO Ethernet GateWay) - SW description and configuration
Module WM868-RFU (WACO USB GateWay) - SW description and configuration
Module WM868-RFG (WACO GSM GateWay) - SW description and configuration

The principles of inter-working among the modules including examples of configuration of WM868-SJ, WM868-TI/THI/TE and WM868-SI/SA formations are more precisely specified in data collector unit configuration manual:

Module WM868-SJ-xx ("Data Collection Unit") - SW description and configuration

If you need any additional information about wireless communication system WACO do not hesitate to contact us:

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