

Appendix for Tx5xx manuals

Software development kit for Tx5xx devices family

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1. Web pages design

1.1 Introduction

Tx5xx family sensors (devices) enable to design user's own web pages to display readings from the sensor. To successfully make of user's web pages you need these files: **web2cob.exe**, **mimetype.ini**, **jsgraphics1.js**. Contact manufacturer for obtaining this files. To upload web files to probe is the tftp client needed (included in Windows XP).

Pages are created in HTML code. Insert `<% %>` tag to your HTML code if you need show some measured values from the device (actual temperature, history graphs, etc.). If web browser send web page request to the device, devices web server load this page from a memory and insert requested values. Create HTML pages in any text editor and upload to the device – see *chapter 1.4*.

Address of www pages is http://device_IP_address/page.html. If your home page is named **index.html**, enter only IP address of the device.

1.2 Tx5xx tags

Insert tag (from the table below), if you need display some value generated by the device. If tag isn't supported device insert blank text. For history graphs is necessary include javascript file **jsgraphics1.js**. Devices Tx5xx supports following tags:

General tags:

Tag	Description	Example of generated text
<code><%srn%></code>	device serial number	07940140
<code><%name%></code>	device name/description	TRh-Sensor+relay
<code><%rfr%></code>	web pages refresh interval	60
<code><%fw%></code>	firmware version	04.01 / 1-5-2.01
<code><%ttbl%></code>	show table with time stamps for history table	<p>If device is synchronized by the SNTP server:</p> <pre><table border="0"> <tr><td>24.11.2008 14:04:28</td></tr> <tr><td>24.11.2008 14:03:28</td></tr> </table></pre> <p>But If device isn't synchronized, values are generated by the javascript.</p> <pre><table border="0"> <script type="text/javascript"> <!-- var datum=new Date(); var c = 0; var datum1=0; var minuty=0; for(c=1;c<=100;c++) { datum1=new Date(datum-((-43+60*(c+1))*1000)); minuty=((datum1.getMinutes())<10)? "0": "")+datum1.getMinutes(); document.write('<tr><td>' + datum1.getDate()+'. '+ (datum1.getMonth()+1)+'.' + datum1.getHours()+':'+minuty + '</td></tr>'); }</pre>

Tag	Description	Example of generated text
		<pre> } //--> </script> </table> </pre>
<%tstr%>	history storage interval	60
<%time%>	shown actual device time	<p>If device is synchronized by the SNTP server: 24.11.2008 14:13:57</p> <p>But If device isn't synchronized, value is generated by the javascript. Local PC time: <pre> <script type="text/javascript"> <!-- var d = new Date();document.write(d.toLocaleString()); //--> </script> </pre> </p>

Tags for RSS feed:

Tag	Description	Example of generated text
<%rstm%>	time for RSS feed	<p>If device is synchronized by the SNTP server: 24.11.2008 14:13:57</p> <p>But If device isn't synchronized: -----</p>
<%rss%>	IP address for RSS feed. Separately configurable external IP address (gateway with port 80 forward). If RSS IP address isn't set, this tag returns device IP address.	192.168.1.1
<%tmpa%> <%rha%> <%dpa%> <%pra%>	for guid element generating. If new alarm occurred, this tag generates new random value. By the guid element RSS reader identifies a "new article".	<pre> <%tmpa%> tmpa_12345678 <%rha%> rha_12345678 <%dpa%> dpa_12345678 <%pra%> pra_12345678 </pre>
<%tmpg%> <%rhg%> <%dpg%> <%prg%>	guid element for identifying measured value change	<pre> <%tmpg%> tmpg_12345678 <%rhg%> rhg_12345678 <%dpg%> dpg_12345678 <%prg%> prg_12345678 </pre>

Temperature tags:

Tag	Description	Example of generated text
<%tmp%>	actual measured temperature	23.2
<%atmp%>	temperature alarm state	lo or no or hi
<%gtmp%>	temperature history graph, it is necessary include jsgraphics1.js file	
<%ttmp%>	temperature history table	<pre> <table border="0"> <tr><td>23.2</td></tr> <tr><td>24.0</td></tr> </table> </pre>
<%htmp%>	temperature alarm upper limit	300.0
<%ltmp%>	temperature alarm lower limit	-200.0
<%tmph%>	temperature alarm hysteresis	1.0
<%dtmp%>	temperature alarm time delay	30
<%unt1%>	temperature unit	°C or °F

Relative humidity tags – RH:

Tag	Description	Example of generated text
<%rh%>	actual measured relative humidity	37.2
<%arh%>	RH alarm state	lo or no or hi
<%grh%>	relative humidity history graph, include jsgraphics1.js file is necessary	
<%trh%>	relative humidity history table	<pre><table border="0"> <tr><td>37.2</td></tr> <tr><td>37.1</td></tr> .. </table></pre>
<%hrh%>	relative humidity alarm upper limit	100.0
<%lrrh%>	relative humidity lower upper limit	0.0
<%rrhh%>	RH alarm hysteresis	1.0
<%drh%>	RH alarm time delay	30
<%unt2%>	relative humidity unit	%RH

Computed value unit tags – CV:

Tag	Description	Example of generated text
<%dp%>	actual computed value	0.5
<%adp%>	CV alarm state	lo or no or hi
<%gdp%>	computed value history graph, include jsgraphics1.js file is necessary	
<%tdp%>	CV history table (100 values from history)	<pre><table border="0"> <tr><td>0.5</td></tr> <tr><td>0.4</td></tr> .. </table></pre>
<%hdp%>	CV alarm upper limit	25.0
<%ldp%>	CV alarm lower limit	5.0
<%dph%>	CV alarm hysteresis	1.0
<%ddp%>	CV alarm time delay	30
<%unt3%>	web unit for CV (html)	g/m³, etc.
<%un3%>	text unit for CV	g/m^3, etc.
<%dscr%>	computed value description	Absolute humidity, etc.

Tags for atmospheric pressure:

Tag	Description	Example of generated text
<%pr%>	actual atmospheric pressure	1005.2
<%apr%>	atmospheric pressure alarm state	lo or no or hi
<%gpr%>	atmospheric pressure history graph, include jsgraphics1.js file is necessary	
<%tpr%>	atmospheric pressure history table	<pre><table border="0"> <tr><td>1005.2</td></tr> <tr><td>1005.1</td></tr> .. </table></pre>
<%hpr%>	atmospheric pressure alarm upper limit	1013.0
<%lpr%>	atmospheric pressure alarm lower limit	1000.0
<%prh%>	atmospheric pressure alarm hysteresis	1.0
<%dpr%>	atmospheric pressure alarm time delay	30
<%unt4%>	web unit for atmospheric pressure	inH₂>0, etc.
<%un4%>	text unit for atmospheric pressure	inH2O, etc.

1.3 Examples

1.3.1 Web pages

Following code shows a simple web page example. This page shows only information about measured temperature.

Web page example:

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN">
<html>
  <head>
    <meta http-equiv="refresh" content="<%rfr%>">
    <meta http-equiv="content-type" content="text/html; charset=windows-1250">
    <style>
      <!--
        body{font-family: verdana, arial, helvetica, sans-serif; font-size: 76%;
          color: #000; background-color: #fff;}
        h1{font-size: 2.0em; font-weight: normal;margin-top: 0.5em;
          margin-bottom: 0.2em;}
        .cervene {color: red}
        .modre {color: #0000FF}
      <!-->
    </style>
    <script src="jsgraphics1.js"></script>
  </head>

  <body>
    <h1>Current temperature: <%tmp%>
      <%unt1%></h1>
    (<%time%>)
    <h1>Temperature history:</h1>
    <%unt1%>
    <div style="position:absolute;top:120px;left:30px;"><%gtmp%></div>

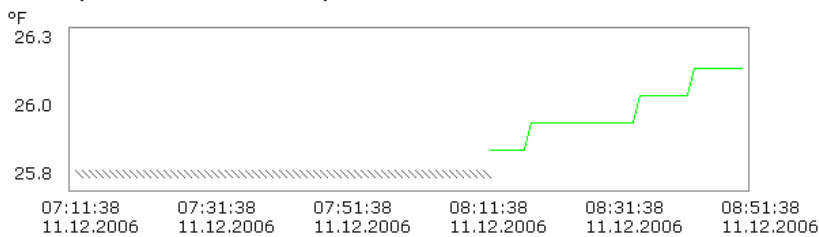
    <div style="position:absolute;top:280px;">
      <h1>Temperature settings:</h1>
      <table>
        <tr>
          <td>Alarm:</td><td><%atmp%></td>
        </tr>
        <tr>
          <td>upper limit:</td><td class="cervene"><%htmp%>
            <%unt1%></td>
          </tr>
        <tr>
          <td>lower limit:</td><td class="modre"><%ltmp%>
            <%unt1%></td>
          </tr>
        <tr>
          <td>hysteresis:</td><td><%tmp%>
            <%unt1%></td>
          </tr>
        <tr>
          <td>time delay:</td><td><%dtmp%> s</td>
          </tr>
        <tr>
          <td>Storage interval:</td><td><%tstr%> s</td>
          </tr>
        </table>
        <br>
      </div>
    </body>
  </html>
```

Web pages generated by the example html code:

Current temperature: 26.2 °F

(11.12.2006 08:50:51)

Temperature history:



Temperature settings:

Alarm: no
upper limit: 300.0 °F
lower limit: -200.0 °F
hysteresis: 1.0 °F
time delay: 30 s
Storage interval: 60 s

1.3.2 RSS feed

Device provide information about actual measured values and alarm via RSS feed. For RSS XML files are reserved two files - **rss1.xml** and **rss2.xml**. Device support RSS feed via RSS 2.0 version. Please visit <http://cyber.law.harvard.edu/rss/rss.html> for more information about RSS 2.0. Device is tested with following RSS readers: Opera 9.60, Firefox 3, Internet Explorer 7.

XML file example for channel with information about temperature alarm state (file **rss2.xml**):

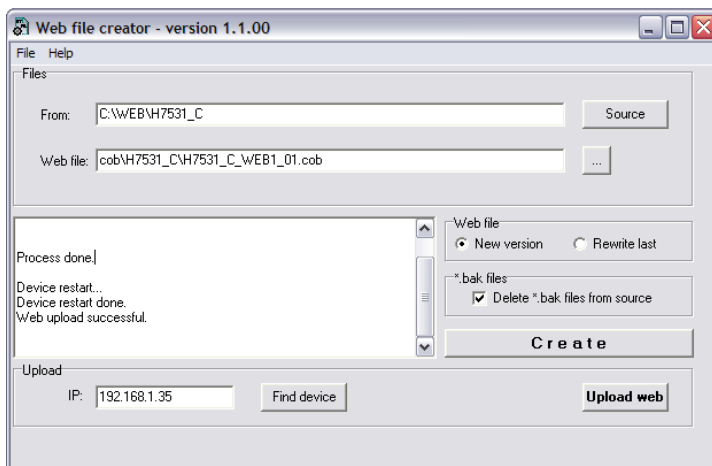
```
<?xml version="1.0" encoding="windows-1250"?>
<rss version="2.0" xmlns:atom="http://www.w3.org/2005/Atom">
  <channel>
    <atom:link href="http://<%rss%>/rss2.xml" rel="self" type="application/rss+xml" />
    <title><%name%> alarms</title>
    <link>http://<%rss%>/</link>
    <description>Serial No:&#160;<%srn%></description>
    <language>en</language>
    <ttl>5</ttl>
    <image>
      <title>Comet system company</title>
      <width>80</width>
      <height>45</height>
      <link>http://www.cometsystem.cz</link>
      <url>http://<%rss%>/logol.gif</url>
    </image>
    <item>
      <title>Temperature alarm:&#160;<%atmp%></title>
      <link>http://<%rss%>/temp.html</link>
      <description>Current temperature:&#160;<%tmp%>
        <%until%>, &#160;
        time:&#160;<%rstm%></description>
      <guid isPermaLink="false"><%tmpa%></guid>
    </item>
  </channel>
</rss>
```


1.4 Web compilation and pages upload

For upload web pages to the device, use WebFileCreator software. This software is available on the manufactures web pages. Save pages intended to be uploaded to the device to one directory (best way is create subdirectory at WebFileCreator's directory). In case history graph is required to display, it is necessary to add file `jsgraphics1.js` to the directory with `www` pages. For the correct function of a SOAP messages sending is the `soap` file required (eventually `soap.conf` file).

Web pages upload process:

1. Unpack file `www.zip` to a directory `C:\WEB`
2. New web pages copy to a WebCreatr's subdirectory (e.g. `C:\WEB\T7511_C`)
3. Run software `C:\WEB\WebFileCreator.exe`



4. Insert path to the new web pages to a `From` field (`C:\WEB\T7511_C`)
5. Press `Create` button. Now software compile web pages to a `cob` file.
6. Insert device IP address (field `IP` or use button `Find device`). Then press `Upload web` button. Software now uploads new web pages to your device. This will take approx. 30 sec. For web upload is necessary opened UDP port 69 for TFTP data transfer.

1.5 Supplement

1.5.1 Reserved file names

Device web server has some reserved file names (this names aren't for free use).

File name	Descriptions
index.html	Main web page. If you insert only IP address this file is shown.
.htm	File with html. Web tags <% %> you can use with *.htm and *.html files.
soap	SOAP file. If a SOAP message is sended, this file is processed. This file is for SOAP protocol mandatory.
soap.conf	Configurations file for HTTP SOAPaction header.
jsgraphics1.js	Javascript file is necessary for history graphs.
rss1.xml	Files for RSS feed.
rss2.xml	
export.csv	Virtual files for export history to a CSV files.
export_comma.csv	
diag	Virtual file for device diagnostic (http://IP_address/diag).

1.5.2 Restrictions

- Every <% %> tag must be placed in new line in source code.
- Tags <% %> can be used only in a ***.htm** and ***.html** files.
- Respect reserved file names.
- For history graphs is **jsgraphics1.js** file necessary.
- Maximal size of one HTML file is 64kB.
- Maximal size of web pages is 256kB (summary of all files)
- Capacity of device web server is limited. The larger size of www pages, the lower number of simultaneous accesses is enabled. Small web pages without many graphics and images are recommended. Using frames is not recommended. For text and graphic use **css** inside HTML file.

1.6 Web server statistic and error messages

Device provides some basic information about web server function. To web browser insert http://device_IP_address/diag (e.g.: <http://192.168.1.213/diag>). Following items describing device web server:

WWW

```
WWW req cnt: 55
RSS req cnt: 11
File index.html: ok
File rss1.xml: ok
File rss2.xml: ok
```

Items description:

Item	Description
WWW req cnt	Number of HTTP requests to a web server. Every file or image is counted.
RSS req cnt	Number of requests to RSS XML file.
File index.html	File exist test (only file name check, file content is not verified) ok file exists not found file is not present on web pages
File rss1.xml	
File rss1.xml	

Web server warning messages:

Not found (The requested URL /test was not found on this server.)

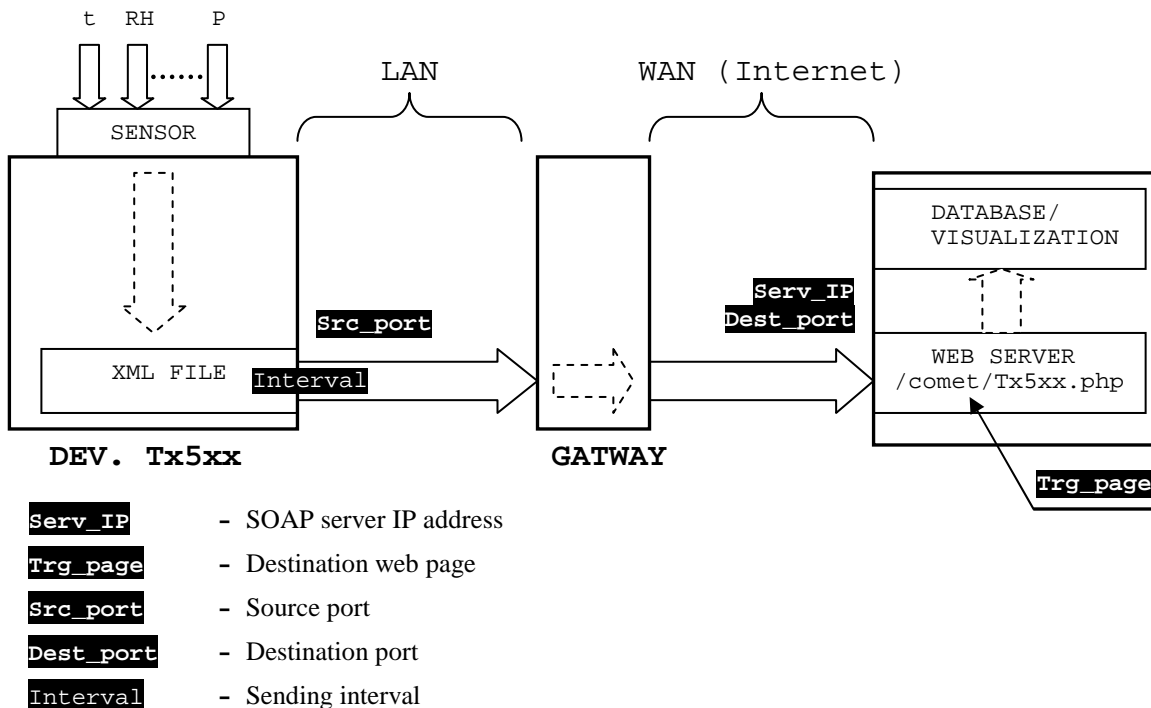
ACCESS DENIED!!! (Telnet config.)

ACCESS DENIED!!! (Server disabled.)

2. SOAP protocol

2.1 Introduction

SOAP serves for sending measured data to a HTTP server. With the aid of this protocol data are sent as a XML document (SOAP message). The advantage of this protocol is that sent data aren't binary and for this reason SOAP messages are allowed through firewalls. For more information about SOAP please visit: <http://www.w3.org/TR/soap/>. This device supports only SOAP 1.1.



2.2 Device configuration

For right SOAP message sending to the remote server is necessary setup some device parameters:

Parameter	Description	Example/Conf. dialog label
SOAP protocol enable	SOAP messages sending enable.	SOAP enable: Y
SOAP server IP address	IP address of the SOAP server. This server implements SOAP service for SOAP messages „catching“. If SOAP server isn't at the local network it is necessary setup network gateway also (gateway IP address).	SOAP server IP address: 192.168.1.1
Target web pages	Target to the SOAP file/service for messages reception.	Target web page: http://192.168.1.1/comet/Tx5xx.php
Source port	Device source port. Never set this port to 80, because it cause to conflict with internal web server.	Source port: 8080
Destination port	Destination port for SOAP message delivery. This port is mainly comforted to 80, if standard web server is used (Apache+PHP, IIS).	Destination port: 80

Parameter	Description	Example/Conf. dialog label
Sending interval	Sending interval for SOAP messages. Configuring this value less then 10 sec is prohibited.	Sending interval: 60 s

2.3 Standard SOAP message from Tx5xx device

Tx5xx device standard SOAP message:

```
<?xml version="1.0" encoding="utf-8"?>
<soap:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema">
  <soap:Body>
    <InsertTx5xxSample xmlns="http://cometsystem.cz/schemas/soapTx5xx_v2.xsd">
      <passKey>07940140</passKey>
      <device>4656</device>
      <temp>25.4</temp>
      <relHum>41.7</relHum>
      <compQuant>8.9</compQuant>
      <pressure>994.5</pressure>
      <alarms>lo,no,hi,hi</alarms>
      <compType>Dew point</compType>
      <tempU>C</tempU>
      <pressureU>hPa</pressureU>
      <timer>30</timer>
    </InsertTx5xxSample>
  </soap:Body>
</soap:Envelope>
```

Element		Description		
<soap:Envelope>		Specifies that the XML document is a SOAP message. It is defined by the SOAP protocol.		
<soap:Body>		Everything what is nested in this element is a SOAP message data. It is defined by the SOAP protocol.		
<InsertTx5xxSample>		<p>It is needed to have running HTTP server for accepting SOAP messages. For example it can be Microsoft IIS or Apache HTTP server. There have to be installed a web service for processing data from the message on this server. For example ASP.NET or PHP can be used for creating the web service. This service must include a method of the same name as this element (thus InsertTx5xxSample). Descendants of the element InsertTx5xxSample (nested elements passKey, device, etc.) must correspond to parameters of the method.</p> <p>The attribute xmlns defines a namespace for elements of the SOAP message. For namespace name was chosen the URI referring to the XSD schema which describes this SOAP message. This schema only defines the structure of the XML document which represents the SOAP message. It is in no manner related to the sending and accepting functionality.</p>		
	<passKey>	Contains the device serial number (an eight digit whole number).		
	<device>	Device type identification number (code).		
		Device	Code [DEC]	Code [HEX]
		T0510	4144	0x1030
		T3510	4145	0x1031
		T3511	4107	0x100B
		T4531	4106	0x100A
		T7510	4146	0x1032
		T7511	4129	0x1021
		H0530	4656	0x1230
		H4531	4657	0x1231
		H0530	4658	0x1232
		H3531	4659	0x1233

Element		Description		
		H7530	4660	0x1234
		H7531	4661	0x1235
		H3531R	4673	0x1241
		H4531R	4674	0x1242
		H7531R	4675	0x1243
	<temp>	Contains the value of temperature (a number whose decimal part is separated by a dot). In case of device failure it can contain value 9999 . This applies to all elements containing a value (relHum , compQuant and pressure).		
	<relHum>	Contains the value of relative humidity. If the device doesn't support this quantity, the element is set to n/a . This also applies to elements compQuant and pressure .		
	<compQuant>	Contains the value of computed quantity.		
	<pressure>	Contains the value of atmospheric pressure. Error value: -9999 .		
	<alarms>	Temperature, relative humidity, computed value and atmospheric pressure alarm state. Format: tm,rh,cv,pr , where: tm temperature alarm rh relative humidity alarm cv computed value alarm pr atmospheric pressure alarm and alarm values: no no alarm or measured value is not supported by the device hi upper limit alarm lo lower limit alarm example: lo,no,hi,no (lower temperature alarm, no relative humidity alarm, computed value upper limit, no atmospheric pressure alarm)		
	<compType>	Computed value type: Absolute humidity, Specific humidity, Mixing proportion, Specific enthalpy, Dew point		
	<tempU>	Temperature unit (and dew point). Values: C – temperature unit is °C. F – temperature unit is °F.		
	<pressureU>	Atmospheric pressure unit. Values: hPa, PSI, inHg, mBar, oz/in^2, mmHg, inH2O, kPa .		
	<timer>	SOAP sending interval (sec).		

2.4 Changing a SOAP message structure

It is possible to write your own XML document which represents the SOAP message. You can create it in whatever text editor. Enter proper tag according to tables below to the place where you want to insert any of data field provided by the device. Finally save the file with the name `soap` and add it to the directory with web pages. Maximal size of this file is 900B. Its upload to the device is part of web pages upload. Tags for SOAP messages for Tx5xx devices:

Tag	Description	Example	Stand.
<code><%srn%></code>	Serial number of the device.	07940140	✓
<code><%time%></code>	Writes a time. It is either synchronized with a SNTP server (format: dd.mm.yyyy hh:mm:ss) or simply a number of seconds elapsed from enabling the device (format: Local: <NumberOfSeconds> /1000)	30.10.2008 11:38:45	
<code><%type%></code>	Device type.	T7511	
<code><%kind%></code>	Device type identification number.	4661	✓
<code><%tmr%></code>	SOAP sending interval (sec).	30	✓
<code><%ala%></code>	Temperature, relative humidity, computed value and atmospheric pressure alarm status.	no,no,lo,hi	✓
<code><%c1%></code>	Actual temperature.	35.8	✓
<code><%c2%></code>	Actual relative humidity.	30.0	✓
<code><%c3%></code>	Actual computed value (depend on configuration).	5.1	✓
<code><%c4%></code>	Actual atmospheric pressure.	993.5	✓
<code><%dscr%></code>	Computed value type.	Dew point	✓
<code><%c1u%></code>	Temperature unit type.	C	✓
<code><%c2u%></code>	Relative humidity unit type.	%RH	
<code><%c3u%></code>	Computed value unit type.	C	
<code><%c4u%></code>	Atmospheric pressure unit type.	hPa	✓

Simple XML file example (information about temperature and relative humidity):

```
<?xml version="1.0" encoding="utf-8"?>
  <soap:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema">
    <soap:Body>
      <InsertTx5xxSample xmlns="http://cometsystem.cz/schemas/soapTx5xx_v2.xsd">
        <temp><%c1%></temp>
        <relHum><%c2%></relHum>
      </InsertTx5xxSample>
    </soap:Body>
  </soap:Envelope>
```

Edit file `soap.conf`, if `SOAPAction` header change is necessary.

2.5 SOAP diagnostic

Tx5xx device provides this ways for SOAP diagnostic:

- SNMP Trap and Syslog message sending if SOAP communication error occurs
- Diagnostic via web pages

2.5.1 Diagnostic via SNMP Traps and Syslog

Device sends SNMP Traps (Syslog messages), if SNMP or Syslog is properly configured.

Trap	Text Trap/Syslog	Description
1/5	SOAP Halted. Hostname error	Tag Target web page is wrong configured. Target web page isn't selected or less then 5 characters.
1/4	SOAP delivery error	SOPA message delivery error. Message probably wasn't delivery. HTTP server returns wrong response code. Please check your destination target (Target web page) and your SOAP function on the HTTP server.
1/3	SOAP connection error	Connection error to the server. Communication with SOAP server isn't possible (IP address or port is unreachable). Please check SOAP server IP address and destination port.

2.5.2 Diagnostic via web pages

Device provides SOAP diagnostic via web. Insert to the web browser http://device_IP_address/diag (e.g.: <http://192.168.1.213/diag>). Following items describes SOAP diagnostic:

SOAP

```
Cnt (req/ok): 0/0
Err. cnt (sock/req1/req2): 0/0/0
Last code (req1/req2): 9999/9999
File SOAP: ok
```

Item	Description	
Cnt. (req/ok)	SOAP messages counter. First number describes number of SOAP requests and second identifying number of successfully messages sends. Success is signalized when message is correctly deliver to the SOAP server. If SOAP message is delivered to the server, but SOAP service is wrong, this counter probably shows success. Device check only HTTP response header. XML feedback file isn't checked.	
Err. cnt (sock/req1/req2)	SOAP error request counter, where: sock number or TCP connection error. This item is incremented when SOAP server is inaccessible. req1 number of 100-continue request errors. This value is incremented if TCP connection with server is possible, but server not accepts data (it isn't HTTP server, etc.) req2 number of wrong requests for XML data transfer. This item is incremented if server returns some wrong HTTP response code (wrong SOAP service, etc.).	
Last code (req1/req2)	Last SOAP request return codes: Last code (req1/req2): code1,code2	
	code1 (return code to 100-continue request)	
	Code	Description
	9999	Device SOAP service is disabled or no SOAP request yet.
	8888	Parameter Target web page is wrong configured. This parameter must be longer then 5 characters.

Item	Description
	7777 Opening TCP connection.
	-1 Timeout. Server timeout during 800 ms.
	0 TCP connection established, but no HTTP/1.1/n header.
	100 Right response code.
	other See: http://www.w3.org/Protocols/rfc2616/rfc2616-sec10.html
	kod2 (return code to the XML data)
	9999 Device SOAP service is disabled or no SOAP request yet.
	8888 Parameter Target web page is wrong configured. This parameter must be longer then 5 characters.
	7777 TCP connection opening or timeout or no HTTP/1.1/n header inside the response.
	200 Right response code.
	500 Internal server error (wrong SOAP service, etc.).
	other See: http://www.w3.org/Protocols/rfc2616/rfc2616-sec10.html
File SOAP	SOAP file exist test (only file name check, file content is not verified) ok file exists not found file is not present on web pages

Diagnostic example, if all is right:

SOAP

Cnt (req/ok): 10/10	10/10 requests was delivered
Err. cnt(sock/req1/req2):0/0/0	error counters shows zeros, that is also right
Last code (req1/req2):100/200	req1 code 100 a req2 code 200
File SOAP: ok	file SOAP was found at web pages area

2.6 PHP example for SOAP service

This chapter describes a simple PHP service for SOAP messages from Tx5xx family devices. Example uses Apache (2.2.10) web server and PHP (5.2.6). It is necessary install and enable SOAP extension for PHP. Example catch SOAP message from the device and store values to the hard disk. For more information about SOAP services and PHP see: <http://php.net/soap>.

```
<?
function InsertTx5xxSample($passKey, $device, $temp, $relHum, $compQuant, $pressure,
    $alarms, $compType, $tempU, $pressureU, $timer) {

    $data = "Time: ".StrFTime("%y/%m/%d %H:%M:%S", Time()).", Temp: ".$temp.
        ", RH: ".$relHum.", CV: ".$compQuant.", Pressure: ".$pressure."\n";
    $file_write = FOpen("soap.log", "a");
    FWrite($file_write, $data);
    FClose($file_write);
}

$server = new SoapServer(null, array('uri' => "http://test-uri/"));
$server->addFunction('InsertTx5xxSample');
$server->handle();
?>
```

3. E-mail – protocol SMTP

Tx5xx device can send an e-mail if measured value alarm occurred. For e-mail sending is used SMTP protocol.

3.1 Supported authentication protocols

Device uses for sending an e-mail SMTP protocol (TCP port 25). Device supports SMTP server with and without authentication – see:

Auth type	Description	Supported
without auth	SMTP server login without authentication. Use this option if local SMTP server without authentication is available.	✓
AUTH LOGIN	Base on base64 authentication algorithm. Use two commands for password and user name transitions.	✓
AUTH PLAIN	Authentication via base64 . Use one command for send password and user name.	
CRAM-MD5	Encrypted login process.	
SSL	Encrypted communication between clients and the SMTP server.	

3.2 SMTP protocol configuration

This table describes SMTP protocol configuration parameters:

Parameter	Description	Example/Conf. dialog label
Enable SMTP protocol	Enabling of sending warning e-mails after alarm activation.	E-mail Sending Enable: Y
IP address of SMTP server	IP address of SMTP server. If SMTP server isn't at the local network it is necessary setup network gateway also (gateway IP address).	IP address of SMTP server: 192.186.1.2
Shot e-mail?	Device send e-mail message without alarm configuration, if you choice this option (Y).	Short e-mail: Y
Sensor e-mail address	Sensor e-mail address is sensor@IP , if you choice default sender. But if default sender isn't selected, you can setup own sensor e-mail address. It is perhaps necessary setup sensor e-mail address, if SMTP auth is enabled (probably same text as SMTP auth user). For more information please connect your internet provider.	Default mailfrom address: Y Sensor e-mail address: sensor@mynet.com
SMTP auth	Please insert SMTP auth user and SMTP auth password if you select SMTP authentication (Y).	SMTP authentication: Y SMTP auth user: sensor@mynet.com SMTP auth password: psw
E-mail address of receiver	3x address for mail e-mail delivery	

3.3 E-mail examples

Standard e-mail:

Action: Testing message

Actual values:

Temperature: 23.1 °C
Relative humidity: 49.4 %
Dew point: 12.0 °C
Pressure: 407.0 inH2O

Alarm settings:

Temperature: Upper Limit: 300.0 °C, Lower Limit: -200.0 °C, Hysteresis: 1.0 °C, Alarm Delay: 30 s

Relative Humidity: Upper Limit: 100.0 %RH, Lower Limit: 0.0 %RH, Hysteresis: 1.0 %RH, Alarm Delay: 30 s

Dew point: Upper Limit: 80.0 °C, Lower Limit: -50.0 °C, Hysteresis: 1.0 °C, Alarm Delay: 30 s

Pressure: Upper Limit: 1100.0 inH2O, Lower Limit: 600.0 inH2O, Hysteresis: 1.0 inH2O, Alarm Delay: 30 s

For actual info visit local sensor: <http://192.168.1.47> . Have a nice day.

Short e-mail:

Action: Testing message

Actual values:

Temperature: 23.1 °C
Relative humidity: 49.4 %
Dew point: 12.0 °C
Pressure: 407.1 inH2O

For actual info visit local sensor: <http://192.168.1.47> . Have a nice day.

3.4 Diagnostic

Tx5xx device provides this ways for SMTP diagnostic:

- SNMP Trap and Syslog message sending if e-mail sending error occurs
- Diagnostic via web pages

3.4.1 SNMP Trap a Syslog error messages

If e-mail sending error courses, device sends following messages:

Trap	Text Trap/Syslog	Description
1/6	EMAIL send error 1	SMTP server connection error. SMTP server is unreadable (check SMTP server IP address and port - 25). E-mail wasn't send.
1/7	EMAIL send error 2	SMTP server login error. SMTP server isn't supported or wrong server type (some server on port 25, but probably it isn't SMTP server). This message is also shown if SMTP server active refuse connection. E-mail wasn't send.
1/8	EMAIL send error 3,4	Some error during communication occurs. This message is also send if SMTP auth is unsuccessfully. E-mail wasn't probably sent.

3.4.2 Diagnostic via web pages

Device provides SMTP diagnostic via web. To web browser insert http://device_IP_address/diag (e.g.: <http://192.168.1.213/diag>). Following items describes SMTP diagnostic:

Email

Last email: 9999: Unknown.
Cnt (req/ok): 0/0
Err. cnt (sock/helo/auth/some): 0/0/0/0

Items description:

Item	Description
Last email	Return code from last e-mail send, where: X: Unknown. – Unknown status or no e-mail request yet. 0: Last e-mail sent successfully. – E-mail was right delivered to the SMTP server. 1: Last e-mail wasn't send. SMTP server not responding. – Isn't possible connect to the SMTP server now. Please check SMTP server IP address (eventually network gateway address). 2: Last e-mail wasn't send. Wrong welcome response. – SMTP server sends wrong welcome code. Server refuse transaction or device not supports this SMTP server. 3: Last e-mail probably wasn't send. Wrong response code. – Some error during e-mail sending. E-mail wasn't probably sent. 4: Last e-mail probably wasn't send. SMTP Auth fail. – SMTP auth error (wrong password or user name, etc.). E-mail wasn't probably sent.
Cnt (req/ok)	E-mail requests and successfully sent counter.
Err. cnt (sock/helo/auth/some)	E-mail error counters: sock – number or SMTP server connection errors (code nr. 1) helo – number or connection establishment errors (code nr. 2) auth – number or SMTP auth errors (code nr. 4) some – number or SMTP communication errors (code nr. 3)

4. Syslog protocol

Device can send warning and error messages via Syslog protocol (using UDP protocol on port 514). Syslog message is also send if measured value alarm occurred. Device sends following Syslog messages:

Syslog message	Description
<00001> Device restart	Ethernet interface restart
<00002> Alarm Temperature High/Low	Measured value alarm occurred
<00002> Alarm Humidity High/Low	
<00002> Alarm Dew point High/Low	
<00002> Alarm Pressure High/Low	
<00004> SOAP Halted. Hostname error	SOAP sending error
<00004> SOAP delivery error	
<00004> SOAP connection error	
<00004> Email send error 3,4	E-mail sending error message
<00004> Email send error 2	
<00004> Email send error 1	
<00004> Settings changed	Device configuration was changed via Modbus or SNMP
<00004> Firmware uploaded	New firmware was uploaded
<00004> NTP connection error	Time synchronization error with SNTP server
<00006> Testing message	Testing Syslog message
<00006> Clearing Temperature Alarm	Alarm clearing message
<00006> Clearing Humidity Alarm	
<00006> Clearing Dew point Alarm	
<00006> Clearing Pressure Alarm	

5. SNMP protocol

By the SNMP protocol is possible read values from the device. For right OID (Object identifier) assignment is a MIB table necessary. MIB tables are available at the manufactures web pages. Device supports only SNMP version 1. In case of alarm activation, warning message (a SNMP Trap) can be sent to specified addresses. SNMP Trap can be send to the 3 independent IP address. Traps description:

Trap	Description
0/0	Ethernet interface restart
1/0	Testing SNMP Trap
1/1	Time synchronization error with SNTP server
1/2	New firmware was uploaded
1/3	SOAP sending error message
1/4	
1/5	
1/6	E-mail sending error message
1/7	
1/8	
1/9	Device configuration was changed via Modbus or SNMP
6/3	Measured value (temperature, relative humidity, computed value, pressure) alarm occurred/clearing

6. Modbus protocol

It is possible read actual measured values via Modbus TCP protocol. For data transport is used TCP protocol on port 502. Port configuration is allowed. For more information about Modbus address see device instruction manual. Maximal number of client transaction is set to 1. The Modbus address of the device is always set to 1. Multiple parallel request sending is prohibited (you can send requests only one after another, requesting site must wait for response deliver before new request sending). Some important information about Modbus protocol you can find at: <http://www.modbus.org/specs.php>.

Request actual temperature readings (address 0x30H, word count: 1).

```
[- Transmission Control Protocol, Src Port: 3787 (3787), Dst Port: 502 (502), Seq: 0, Ack: 0, Len: 12
  Source port: 3787 (3787)
  Destination port: 502 (502)
  Sequence number: 0 (relative sequence number)
  [Next sequence number: 12 (relative sequence number)]
  Acknowledgement number: 0 (relative ack number)
  Header length: 20 bytes
  [+ Flags: 0x18 (PSH, ACK)
  window size: 65535
  [+ Checksum: 0x3be7 [correct]
[- Modbus/TCP
  transaction identifier: 0
  protocol identifier: 0
  length: 6
  unit identifier: 1
  [- Modbus
    function 3: Read multiple registers
    reference number: 48
    word count: 1

0000  00 20 4a b0 0a cd 00 40 ca 85 9b 08 08 00 45 00  . J....@ .....E.
0010  00 34 54 7d 40 00 80 06 21 f6 c0 a8 01 84 c0 a8  .4T}@... !.....
0020  01 7c 0e cb 01 f6 ef 7e 6d 1a a2 93 de 60 50 18  .|. ....~ m....`P.
0030  ff ff 3b e7 00 00 00 00 00 00 06 01 03 00 30    .;....0
0040  00 01                                             ..
```

Response from the device (value 0x20H 0xf2H = 754DEC, = temperature 75,4 °F).

```
[- Transmission Control Protocol, Src Port: 502 (502), Dst Port: 3787 (3787), Seq: 0, Ack: 12, Len: 11
  Source port: 502 (502)
  Destination port: 3787 (3787)
  Sequence number: 0 (relative sequence number)
  [Next sequence number: 11 (relative sequence number)]
  Acknowledgement number: 12 (relative ack number)
  Header length: 20 bytes
  [+ Flags: 0x18 (PSH, ACK)
  window size: 255
  [+ Checksum: 0x470c [correct]
[- Modbus/TCP
  transaction identifier: 0
  protocol identifier: 0
  length: 5
  unit identifier: 1
  [- Modbus
    function 3: Read multiple registers
    byte count: 2
    Data

0000  00 40 ca 85 9b 08 00 20 4a b0 0a cd 08 00 45 00  .@..... J.....E.
0010  00 33 30 c8 40 00 40 06 85 ac c0 a8 01 7c c0 a8  .30.@.@. ....|..
0020  01 84 01 f6 0e cb a2 93 de 60 ef 7e 6d 26 50 18  . ....~m&P.
0030  00 ff 47 0c 00 00 00 00 00 00 05 01 03 02 02  ..G....
0040  r2
```

7. Time synchronization via NTP protocol

The device allows time synchronization with SNTP server. If SNTP servers IP address is right configured, device after restart synchronize time with this server. Then device ask for actual time once a day. Also is necessary setup **UTC time shift**.

Time synchronization interval is set to 8 hours. Maximal time jitter between NTP synchronizations is 30 sec.

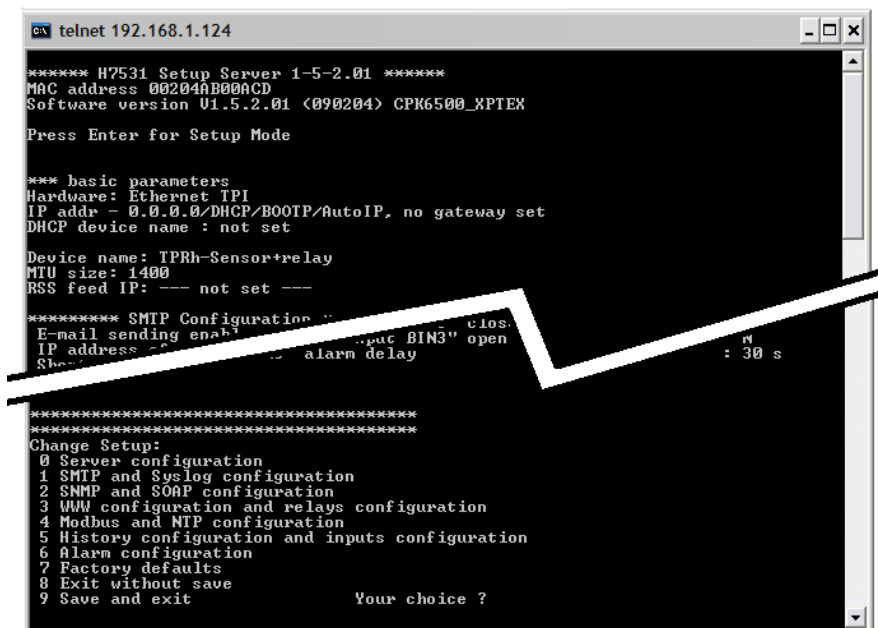
8. Device configuration via Telnet protocol

Setting is performed by means of Telnet, or TSensor program. In this document only settings through the Telnet will be described. Access to the setup can be protected by a password. If items in the Telnet are not confirmed within 5 minutes, the Telnet is ended and the device is restarted. Modified values will not be saved. Use the **save and exit** selection to store new values.

During setting of a value in the Setup it is not guaranteed the device works with correctly adjusted values. Correct values are set upon leaving the Telnet. Through the Telnet isn't possible set all device features (display settings, pressure units, etc.) accessible. Complete device configuration you can setup by the TSensor software.

8.1 Basic introduce

Device has a telnet setup on port 9999. For connection to the Telnet setup use command: **telnet <IP address> 9999** (e.g. **telnet 192.168.1.213 9999**).



```
telnet 192.168.1.124

***** H7531 Setup Server 1-5-2.01 *****
MAC address 00204AB00ACD
Software version U1.5.2.01 (090204) CPK6500_XPTEX

Press Enter for Setup Mode

*** basic parameters
Hardware: Ethernet TPI
IP addr - 0.0.0.0/DHCP/BOOTP/AutoIP, no gateway set
DHCP device name : not set

Device name: TPRh-Sensor+relay
MTU size: 1400
RSS feed IP: --- not set ---

***** SMTP Configuration *****
E-mail sending enable: yes
IP address: 0.0.0.0
SMTP port: 25
SMTP timeout: 30 s

***** Change Setup: *****
0 Server configuration
1 SMTP and Syslog configuration
2 SNMP and SOAP configuration
3 WWW configuration and relays configuration
4 Modbus and NTP configuration
5 History configuration and inputs configuration
6 Alarm configuration
7 Factory defaults
8 Exit without save
9 Save and exit

Your choice ?
```

Principle of entering a value in the Setup:

Telnet items are set by means of the command line. Enter any part of the Telnet by pressing keys 0-9 followed by the **Enter** key. The Telnet always prints the current value. If you do not want to change the value, go to the next item by pressing the **Enter** key. The best way to enter a blank string (e.g. as e-mail address) is to press a **space bar**, then erase it by the **backspace** and press **Enter**.

Contact your network administrator to get the correct values of the IP , mask, gateway. Entering incorrect values can cause the device be not found in the network or other complications!

8.2 Telnet items

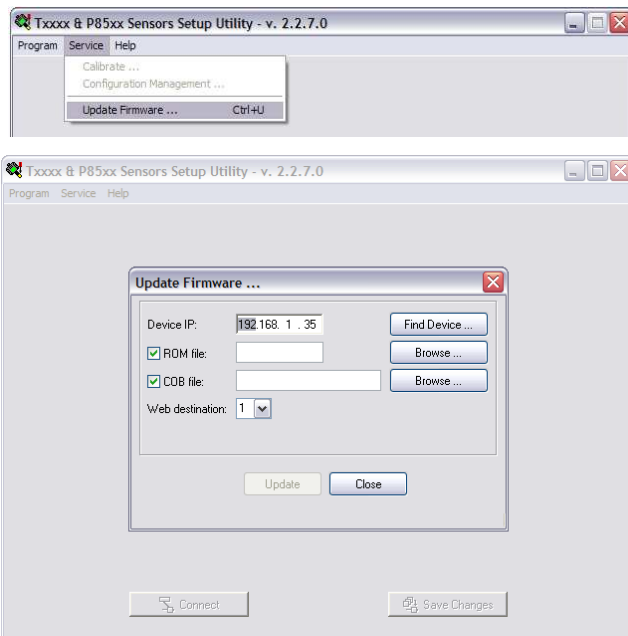
Items	Description								
\- 0 Server configuration									
\- IP Address	Setting IP address of the device. Code in brackets shows the current value. By pressing the Enter key the original setting will stay unchanged. Set the IP address to 0.0.0.0, device IP address is obtain by the DHCP server.								
\- Set Gateway IP Address	Setting of the internet gateway (or gateway between LANs). The value need not be entered if the device will operate only in a local network.								
\- Netmask	Setting of the network mask of your network. 0 means the standard preset value. Example: <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Mask</th><th>No. of bits</th></tr> </thead> <tbody> <tr> <td>255.255.255.252</td><td>2</td></tr> <tr> <td>255.255.255.0</td><td>8</td></tr> <tr> <td>255.128.0.0</td><td>23</td></tr> </tbody> </table>	Mask	No. of bits	255.255.255.252	2	255.255.255.0	8	255.128.0.0	23
Mask	No. of bits								
255.255.255.252	2								
255.255.255.0	8								
255.128.0.0	23								
\- Change telnet config Password - Y	If you press key Y, telnet ask you for a new password.								
\-Enter new Password	Enter a new password for device configuration (max. 4 characters).								
\- Device name	The description of the device. This description is displayed on WWW pages and in subjects of sent e-mails. Its maximum length is 63 characters.								
\- MTU size	Maximal packet size. Default setting is 1400, range is from 512 to 1400. If you have some troubles with connection, try reducing the MTU size.								
\- RSS feed IP	IP address for RSS feed. Setting address to 0.0.0.0, RSS use device IP address.								
\- 1 SMTP and Syslog config									
\- E-mail Sending Enable	Enabling of sending warning e-mails after alarm activation. If N is left, no e-mails will be sent to the specified address.								
\- IP address of SMTP server	Setting of an IP of the SMTP server. Correct setting is required for the device to be able to send e-mails.								
\- Short e-mail	Sending e-mails without information about limits configuration.								
\- Default mailfrom address - N	Press Y for default e-mail sender address (sensor@[sensor's IP address]), N for user defined e-mail sender address.								
\- Change mailfrom address - Y	Press Y for user-defined e-mails sender address.								
\- Enter a new mailfrom address	Enter a new sender e-mail address (30 chars max.).								
\- SMTP authentication	Press Y for enable SMTP auth.								
\- SMTP auth user	Enter user name for SMTP authentication. Max. 29 chars.								
\- SMTP auth password	Enter password for SMTP authentication. Max. 14 chars.								
\- E-mail address of rec1	E-mail address of warning e-mail recipients. Maximal address length is 55 characters.								
\- E-mail address of rec2									
\- E-mail address of rec3									
\- Send test e-mail?	In case of confirmation a test e-mail is sent to the specified address.								
\- SysLog enable	Enable sending Syslog messages.								
\- SysLog server IP address	Syslog server IP address.								
\- Send SysLog message?	Send testing Syslog message.								
\- 2 SNMP and SOAP config									
\- SNMP Traps Enable	Enabling/disabling of sending SNMP traps.								
\- SNMP community name for read	Setting of the password for access to SNMP MIB tables. Max. 12 chars.								
\- SNMP community name for write	Setting of the password for write to SNMP MIB table of the device. Max. 12 chars.								
\- Trap IP address 1	The IP address of recipients of SNMP traps.								
\- Trap IP address 2									
\- Trap IP address 3									

Items	Description
\- Send test trap?	Sends a test trap of type 1/0 to the specified IP address.
\- SOAP enable	Enable SOAP protocol.
\- Send SOAP if alarm occurs	Is some alarm occurs (temperature, RH, relays, inputs, etc.) SOAP message is send. This message is posted out of the SOAP interval.
\- SOAP server IP address	IP address of SOAP server.
\- Target web page	Path to web page (without http://), where the device send the message. Maximum length 100 characters.
\- Source port	Device's source port. Never set to 80!
\- Destination port	SOAP server destination port.
\- Sending interval	SOAP sending interval.
\- 3 WWW configuration	
\- WWW Enable	Enables the display of www pages.
\- Web Refresh time	Intervals for automatic page refresh (update of measured values). Range 10-65535 sec.
\- 4 Modbus and NTP configuration	
\- Modbus Enable	Enable access to the device via Modbus protocol.
\- Set port	Set Modbus communication port.
\- Time synchronization Enable	Enable time synchronization with SNTP server.
\- IP address of NTP server	SNTP server IP address.
\- UTC time shift	Time shift (in minutes) between device place and UTC (GMT) time. Summer time is not supported.
\- 5 History configuration	
\- History Storage Time	Storing interval for logging to the history.
\- 6 Alarm configuration	
\- xxx upper limit	Alarm configuration (upper and lower limits, hysteresis and time delays).
\- xxx lower limit	
\- xxx hysteresis	
\- xxx alarm delay	
\- 7 Factory defaults	This operation restore factory configuration. IP address and subnet mask will stay unchanged.
\- 8 Exit without save	Telnet quit, without save or device restart.
\- 9 Save and exit	Saves modifications to the memory and resets the device.

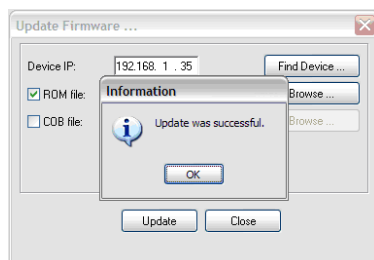
9. Ethernet firmware update

Customer can update Ethernet firmware if new version is available. For firmware update is necessary TSensor software. Use only firmware designed to this device. Firmware updates procedure:

1. Download new firmware from manufactures web pages, install latest TSensor software. Unpack downloaded archive with firmware.
2. Turn on device and connect Ethernet connector.
3. Run TSensor with parameter **/service** (e.g. **C:\Program files\Cometloggers\TSensor\TSensor.exe /service**)
4. Open menu for firmware update. Insert device IP address and enter new firmware (**ROM file**) and new web pages (**COB file**) if necessary. Press button **update**.



5. Please wait while new firmware is uploading. This operation takes approx. one minute. After successfully upload, will be shown following message.



10. Communication ports

Following table contain Tx5xx ports list.

Port		Device is Client/ server	Service/Protocol	Change port nr.	Notice
Destin.	Source				
TCP/80		server	Embedded WWW server		
TCP/502		server	Protocol Modbus TCP	✓	
TCP/25		client	SMTP		Protocol for E-mail sending
TCP/80	TCP/8080	client	SOAP	✓	Active sensing via TCP/HTTP
UDP/514	UDP/514	client	Syslog protocol		Active sensing via UDP/Syslog
UDP/161		server	SNMP v1		
UDP/162	UDP/162	client	SNMP – Trap		Active sensing via UDP/SNMP – Trap
TCP/9999		server	Telnet		Protocol for device configuration
UDP/123	UDP/123	client	SNTP		Synchronization with time server
UDP/30718		server	Configuration protocol		Lantronix & Comet UDP configuration command set
UDP/69		server	New firmware upload		New firmware upload via TFTP
ICMP/echo		server	Ping response		Ping can't be deactivated.

11. Document revision table

Following table describe changes between Ethernet firmware versions.

Date	Document revision	Web and firmware version
to 10.06.2009	IE-SNC-T_x5xx-apx-04	1.5.1.07/3.00 or older
11.06.2009	IE-SNC-T_x5xx-apx-05	1.5.2.04/4.01