

### Summary

Application Note  
AP0110 (v2.0) February 28, 2008

This application note describes the weather station demonstration project. The demo shows one or more weather stations that each track wind direction, wind speed and temperature.

The weather information is always available on the LCD of the weather station. In addition, history information can be made visible on a VGA monitor and a computer can be connected to the system which can be used to monitor the current weather conditions using an Internet browser.

The weather station is available in several versions:

1. Internet enabled version for either direct connection through RS232 or modem connections.
2. GSM HTTP enabled version.
3. CAN network based version with HTML interface using a router.

The RS232 and GSM versions can have a VGA screen attached.

In addition to the usual setup (host PC with Altium Designer and a NanoBoard), you will need:

- A 1:1 serial cable with 1 x male and 1 x female connector (RS232\_HTTP\_Enabled version)
- A null modem cable with two male connectors and two Siemens MC45 Terminals or equivalent (GSM\_HTTP\_Enabled version)
- CAN network cable (if you want to demonstrate the CAN setup).
- A second NanoBoard (if you want to use the CAN network setup) – more if you want to demonstrate CAN's multi-drop capabilities.
- An anemometer (Davis 7911) for each weather station.

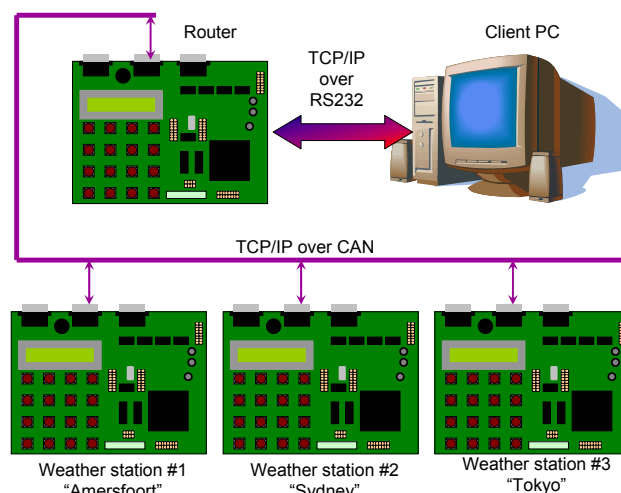


Figure 1. CAN network setup

### PC Configuration for RS232 and CAN

For the demonstration you will need a PC with the following software installed:

- Operating system: Windows 2000 or Windows XP
- Altium Designer
- Internet Explorer version 5.5 or later (check the "about" box in IE)
- DirectX 8.01 or later (check by running **dxdiag** from **Start » Run**)

*Note: these minimum requirements are based on formal information provided by Microsoft and others. If something does not work as it should, try upgrading individual components to their latest versions.*

In order to browse to the NanoBoard, you need to connect the board to the PC using a 1:1 serial cable.

#### Configure a COM Port with a Null Modem

First, you need to configure a COM port with a null modem as follows (directions are based on Windows XP. For Windows 2000, the steps to follow should be similar):

1. Open the Windows Control Panel (**Start » Settings » Control panel**) and select **Phone and Modem Options**.
2. Click on the **Modems** tab and click **Add**.

## Weather Station Example

3. In the hardware wizard that appears, select **Don't detect my modem; I will select it from a list** and click **Next >**. It may take a while before the wizard continues.
4. Select **(Standard modem Types)** from the Manufacturer panel, select **Communications cable between two computers** from the Models panel and click **Next >**.
5. Select the serial port that you want to use to connect to the NanoBoard (e.g. COM1). This may take a while. Click **Finish** when it is enabled.
6. Click **OK** to close the *Phone and Modem Options* dialog.

## Make a Direct Cable Connection

Second, you need to setup a direct cable connection and tell the host to use this connection to carry TCP/IP:

1. Select **Start » Settings » Network Connections » New Connection Wizard**.
2. On the first screen is some useless information. Just click the **Next >** button.
3. Select **Set up an advanced connection** and click **Next >**.
4. Select **Connect directly to another computer** and click **Next >**.
5. Select **Guest** and click **Next >**.
6. Type the name you want to give to this connection (e.g. "NanoBoard") and click **Next >**.
7. From the drop-down menu, select **Communications cable between two computers (COM1)** and click **Next >**.
8. Adjust the **Connection availability** setting to your preference and click **Next >**.
9. Click **Finish**.
10. Usually, the system will assume you want to connect to the system immediately and it will open a connection window. If that does not happen, select the newly created connection from the **Start » Settings » Network Connections** list.
11. Click the **Properties** button.
12. On the **General** tab, select **Communications cable between two computers (COM1)** and click **Configure**.
13. Set the **Maximum speed (bps)** to 57600 baud, enable hardware flow control and disable modem error control and modem compression. Click **OK**.
14. Click on the **Networking** tab. Make sure the type of connection is set to "PPP" and disable all support for Microsoft Networks (usually **File and Printer Sharing** and **Client** setup). Click **OK**.

That's it. All other options keep their default settings.

## PC Configuration for GSM

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For the GSM\_HTTP\_Enabled version you need to connect a Siemens MC45 Terminal (or equivalent) to your PC and install the modem.

## Board Configuration

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The NanoBoards must be configured as follows:

- Oscillation frequency = 44.236800 MHz.
- Set all Vcc references to 3.3V

Further more, on the NanoBoards that are to be used as weather stations, you should:

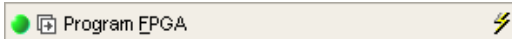
- Connect thermistor KED102CY between GND and AN1. Add a 2.7 k $\Omega$  resistor between AN1 and Vcc
- Connect anemometer 7911:
- Pulse output to User I/O1, pin 2
- 10 k $\Omega$  pull-up resistor between pulse output and Vcc
- Wiper of direction output to AN0
- Vcc of direction output to Vcc
- GND of direction output to GND

## Loading the Software

### Configuring the FPGA

The FPGA needs to be configured as usual. Simply hook up the NanoBoard to your PC and open the workspace:

1. Start Altium Designer
2. Open a new workspace by selecting **File » New » Design Workspace**.
3. Select **Project » Add Existing Project**. The *Choose Project to Open* dialog appears.
4. Open a weather station FPGA project file. For example, choose the file `RS232_HTTP_Enabled.PrjFpg` and click **Open**.
5. Open the Devices view by selecting **View » Devices**.
6. Click on the **Run Stages up to and including Download** part (⚙️) on the **Program FPGA** button.

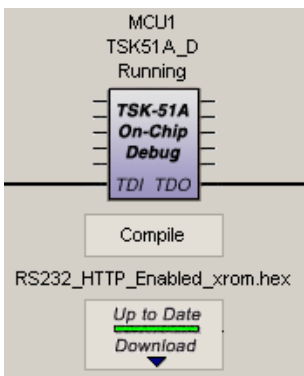


The software should now run all steps and finally program the FPGA.

### Uploading the Software

Now you can upload the software.

1. In the **Devices** window click on the **Compile** button.



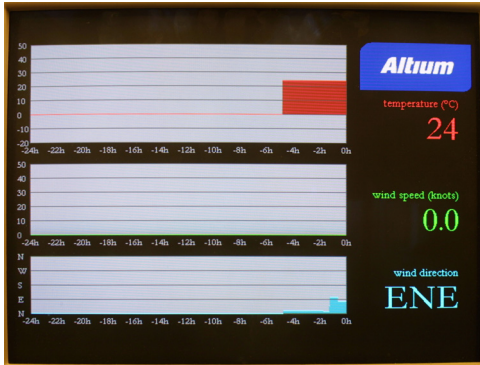
2. Click on the **Up to Date Download** button.
3. Right-click on the **TSK-51A On-Chip Debug** symbol and select **Reset**.
4. Right-click on the **TSK-51A On-Chip Debug** symbol and select **Continue**.

### Loading the Data

If you set up direct cable connection on your PC and connected the NanoBoard to your PC through its RS232 channel, you should now be able to contact the web server on the NanoBoard by starting the serial TCP/IP connection, then start your browser and surf to <http://weatherdemo.test/index.html>.

## Weather Station Versions

The weather station demo has an internet enabled version, a GSM version and a CAN networked version. The internet enabled RS232 version and GSM version can have a VGA screen attached. Simply connect a VGA cable to the corresponding connector on the NanoBoard. The VGA screen continuously shows histograms indicating temperature, wind speed and wind direction. The current values are displayed on the LCD as well.



You can use the upper four keys of the keypad on the NanoBoard to modify the way things are displayed on the LCD as follows:

Key 0: Default settings: knots, compass quarters, °C

Key 1: Cycle wind speed between knots, m/s, km/h and MPH

Key 2: Choose wind direction between degrees and compass quarters

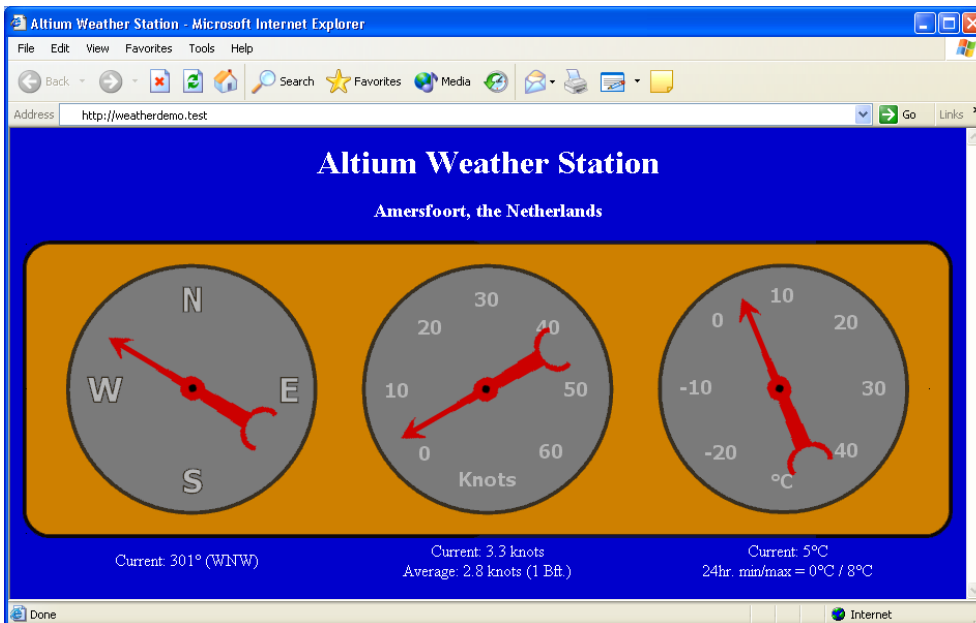
Key 3: Switches temperature between °C and °F

You can start calibration by using the bottom right key marked 'F'.

### Internet Enabled

The Internet enabled version is located in the \Examples\Reference Designs\Weather Station\RS232\_HTTP\_Enabled folder of the installation. In order to connect to the weather station, you need to connect a PC running Internet Explorer version 5.5 or newer through its serial port.

When hardware and software are loaded and running, the browser should display a simple dashboard with three dials, all indicating the current weather parameters.



### GSM Enabled

The GSM enabled version is located in the \Examples\Reference Designs\Weather Station\GSM\_HTTP\_Enabled folder of the installation. You will need a null modem cable and two Siemens MC45 Terminals or equivalent.

CAN Networked

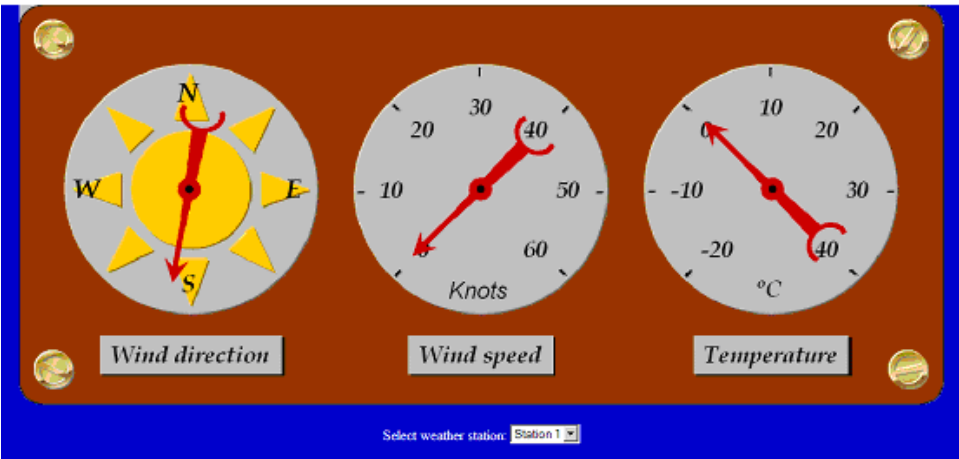
The CAN networked version requires at least two NanoBoards. The first NanoBoard functions as a router / fileserver / media converter and the second board functions as a remote weather station. Both boards should be connected through the CAN interface.

Flash the board you want to use as router / fileserver with the project found in the \Examples\Reference Designs\Weather Station\ CAN\_RS232\_Router folder of the installation. This board should be hooked up to your PC using a serial cable. When done, the HTML files must be FTP-ed to this board. The Html subdirectory for this project contains the necessary files and a batch file called ftp\_upload.bat.

The other board(s) is/are to be used as weather station. Connect them to the router through the CAN interface. The hardware configuration and software is stored in the sub-folder \Examples\Reference Designs\Weather Station\ CAN\_HTTP\_Enabled of the installation.

On each NanoBoard you have to set the station number (address) of the weather station. Use the 'F' key to open the calibration menu. In the **Setup** select **Address** and choose a number. Set a different address for each NanoBoard.

When everything has been connected correctly and started, you should be able to surf to the router using your Internet Explorer browser. You will see a semi-wooden dashboard with three dials indicating the weather on the first weather station. A drop-down box is provided to switch to other weather stations that should be connected to the same CAN network.



Revision History

Date	Version No.	Revision
20-Jan-2004	1.0	New product release
28-Feb-2008	2.0	Updated for Altium Designer Summer 08

Software, hardware, documentation and related materials:

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