Radio Frequency Measured Data Transmit

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Abstract- **Target of this work is realization *a* small, easy to handle, modular and lightweight system for wireless collection of a different measurements signals. It consists of several measurement modules, a signal conditioning stage, a wireless link-layer and a master control station. The whole system can be operated as stand-alone as well as PC controlled.**

Key words: **transceiver, wireless collection, wireless link-layer PC control station**

I. INTRODUCTION

The network in between the measuring modules and the base station is realized as a bi-directional multi-point, single master RF-link, operating in the LPD-frequency range (868MHz) on a single channel. The structure of the network is fully dynamic and in operation re-configurable.
The configuration process of the RF-network is fully automatic in conjunction with the control program, running on the PC.
The initialisation process and the required communication in between the master and the module's give the possibility to control the network dynamically. It is therefore necessary to initialise a slave module to a dedicated master.
The slave modules have addresses, for example AA for a firs and AB for a second. The master sends address and control word and expects a slave's answer. The measurements modules are realized at base MSP430F147 micro controller that controls TRF6900 Single-Chip RF Transceiver.
It is possible to transmit 8- 12- and 16-bit wide data from the measuring modules over the RF-link. The maximum sampling rate on one channel is 250Hz, the total sampling rates of all modules operating in the network is limited to 750Hz. As a result, the maximum total byte-rate is lower than 14400Bytes/sec. So at least 30% of the bandwidth can be reserved for administrative purpose.
The basic concept of the data transmission should be packet oriented data sequencing. As a result the output data have to be restored to give them the original time relationship and to ensure the time-sequenced data fields given to the PC-application. The total delay to the system has to be less then 100ms. The data stream to the PC (logical protocol) has to result in several data fields with equidistant time samples separated for each channel. A ring buffer including timestamps to ensure time relationship reconstruction by the application program should manage the data transmission to the application program.

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The configuration has to be managed by the program in conjunction with the base station. The channel selection by the master has to be managed by a collision detection algorithm to ensure the usage of the channel with the minimum radio strength signal.

II. SLAVE MODULES REALISATION

The hardware design of the slave module, consisting of:

1) The processor MSP430F147
2) The RF link realized by the TRF6900

The TRF6900 has three line programming interface, Data, Clock and Strobe, which is used for programming of the four frequency and control registers. Then there are two lines for the transmitted and received data. RXDATA delivers the received; TXDATA is the line, which is connected to the base band output signal. On the Lock detect line the TRF6900 signalises, that the PLL has locked to the selected frequency. This means, it is ready for transmission or reception, as far as the settings for the modules are correct. The two control lines Standby and Mode are used to switch the TRF6900 very fast to standby on the one hand, and to enable fast switching between the two reprogrammed modes (Mode 0 and mode 1).

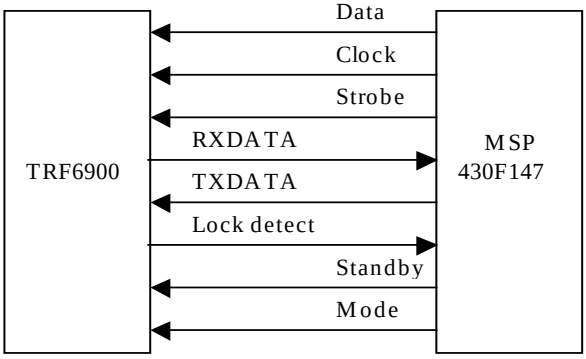

Fig. 1.Interface TRF6900-micrpcontroller

The 12-bit A/D converter is used for measure. There are eight analogue channels for measuring of temperature, pressure, humidity, pulse etc. The necessary firmware is included in the controller to fulfil the requirements of the network layer.
The main routines are explained in Figure 2.

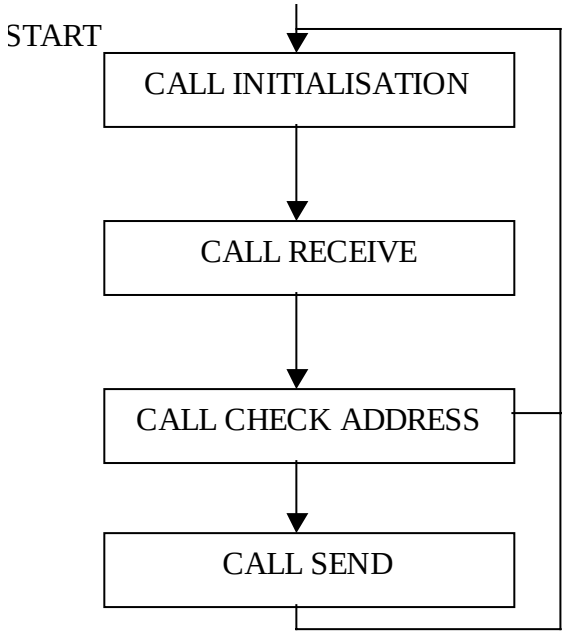

Fig. 2. Main firmware preocedure

The purpose of the initialisation routine is to configure the ports, modules and Basic Clock System for the RF-link. Also the programming routines, used to program the four Words of the TRF6900. This prepares the TRF6900 for data reception, and enables fast switching from receive to transmit mode.
The RECEIVE routine using RF_reception. It switches the TRF6900 from reception in learn mode to reception in hold mode.
The routine CHECK ADDRESS checking the slave address and making decision. If address is correct, go to SEND routine, if address is not correct go to START.
The SEND routine sends data to TRF6900.

III. MASTER MODUL REALISATION

The hardware of the master module consisting of:

1) The processor MSP430F147
2) The RF link realized by the TRF6900.
3) The RS232 communication between the master module and PC
4) The processor CY7C64013 for USB further communications.

Master program has the role to administer multiple instances of slave programs. Name the new slave as you wish, just do not use spaces. Set slave address and give it an instruction. Set argument and priority. Click OK to accept changes. Set the comm port, baud rate, parity and timeout interval, open the port and press start. Master will start sending sequences of data to the selected serial port in the following way: The sequence for the first slave in the list is sent. Master then waits for the reply from the slave. The reply should be in the form

AABBBBCCCCC

Where AA is the address of the slave, BBBB is the instruction that slave sent to indicate a correct decoding, and CCCCC is the result of executed instruction on the slave side. If the reply doesn't come within a specified timeout, master claims the slave unavailable. It then sends instruction to the second slave. Each slave has its own history window where one can see results of executed instructions. After the master program has been started and setup, one should start the slave program.

Press the "Add" button to add a new slave. Select the new slave by double clicking it. Properties window appear.

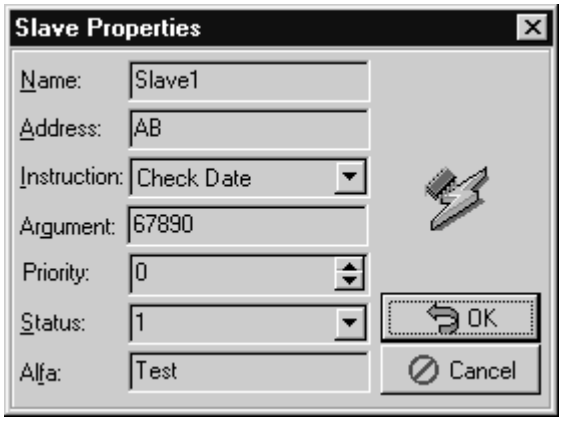

Fig. 3 Slave properties settings

IV. CONCLUSION

In this moment the interface between a master module and PC are realised by a standard RS232 protocol. The target goal is to use the well-known Cypress controller CY7C64013 with USB interface to the PC. The whole configuration and the data pre-processing should be managed by a special DLL prepared for the high level data processing. Further more also a stand alone base station with local data storage will be connected by internet to one big Internet based control, monitoring and operation system.

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