MEASURING SYSTEM WITH FIBER-OPTICAL INTERFACE

E.V. Bykov, S.V. Tararyshkin, BINP, Novosibirsk, Russia

Abstract

The device represents a two channel ADC with the measurement range of 0-3 Volts. The ADC is connected to PC through fiber-optical interface; this allows using the device for measuring parameters under high voltage. In the report, the measuring system realization and its main parameters are demonstrated.

INTRODUCTION

In BINP Siberian Branch of the Russian Academy of Science, works are constantly conducted where the high voltage is used (~100 kV), thus often there is a necessity to receive the information from the devices, which are being under such voltage. In this connection, it was offered to develop a measuring system, which should satisfy the following parameters:

- Reliable isolation between measuring modules and operating computer.
- 2 channels ADC in each module with a possibility of deactivating one of them.
- ADC measurement rate on each channel in a continuous mode should be ~1 KSPS.
- CAN for connection to PC.
- Compact design of the measuring module

THE SYSTEM BLOCK DIAGRAM

The block diagram of measuring system is shown in Figure 1. Communication of a computer with the system is carried out through CAN BUS. The system consists of the measuring modules which can be in the of high voltage area, and splitter of CAN bus (it is conventional CAN Hub). CAN Hub has a fiber-optical connection with modules that provides reliable isolation of a high voltage from potential of the ground.

One measuring system can have up to 8 measuring modules, thus the system is quite efficient with their any quantity ranging from 1 up to 8.

A power of each of modules is realized independently, in parallel to a power of each of the measured devices, which are being under high voltage.

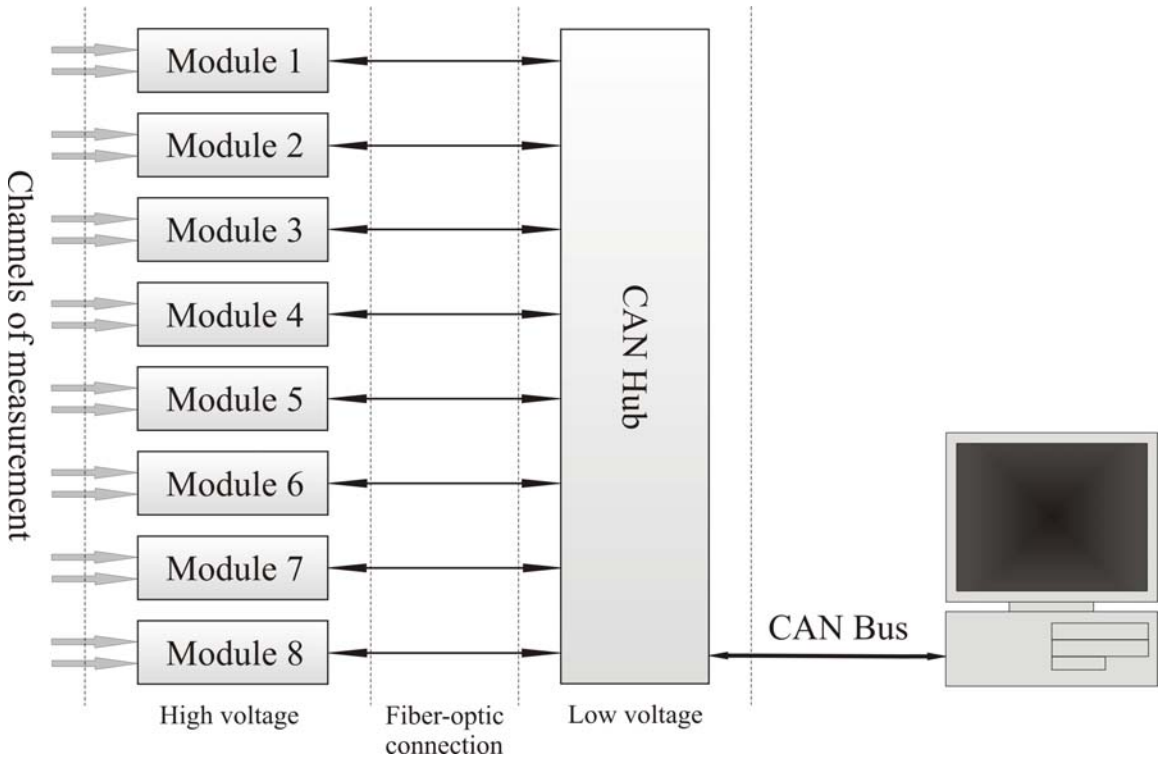

Figure 1: Measuring system with fiber-optical interface

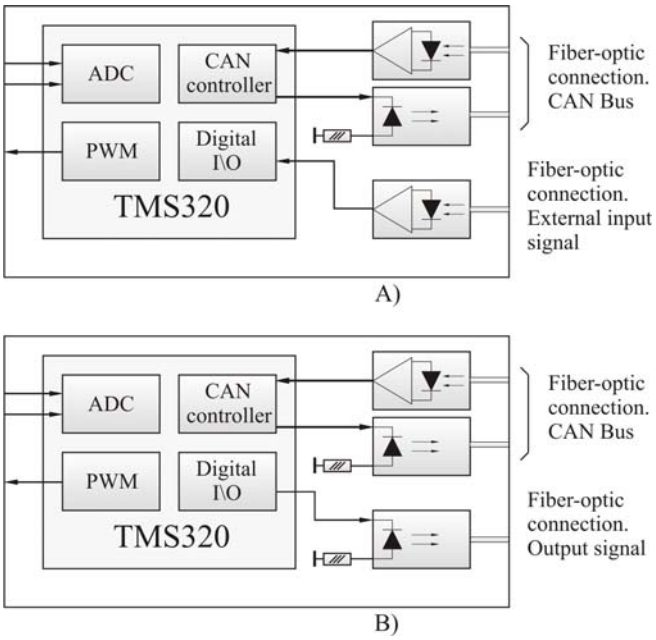

Figure 2: Measuring module. A) Module with signal of external start. B) Module with feedback

THE MODULE BLOCK DIAGRAM

Two variants of measuring modules are shown in Figure 2. Modules have PWM output and two analog inputs for measurement of an analog signal. Each module in any of variants has three optical channels, two of which are intended for communication on CAN BUS, and other:

A) Input signal. It can be used for the real time synchronization.

B) Output signal. It can be used as a real time loopback

The central unit of the module is the processor of the TMS320 family which comprises a CAN controller, a 12-bit ADC and a PWM generator, and provides the interaction between these units. Also, the processor has the internal memories: 32 kb RAM and 128 kb FLASH.

Some ADC parameters are given in table 1.

Table 1: ADC parameters

digit capacity	12 bit
Maximal rate	12.5 MSPS
Range of measurements	From 0V to 3V
Own noise ADC (% from the aperture)	0.2

TEST RESULTS

Rate ADC

The maximal rate of data transmission on CAN Bus makes ~76000 bytes per second or otherwise ~38000 values ADC. Accordingly, if the system has one measuring module in a continuous mode of measurement rate ADC should not exceed 38 KSPS. If in system some modules their total speed ADC should not exceed ~38 KSPS.

If the continuous mode of data transmission is not required and it is necessary to measure only a signal of the certain duration, it is possible to take advantage of that processor TMS320 has internal memory which is capable to contain 10000 values ADC. In this case, the rate ADC depends on duration of a measured signal. For example, 10000 points turn out for rate ADC 12,5 MSPS at measurement of a signal by duration of 800 micro seconds. At the same time, it is necessary to consider that on CAN bus 10000 values will be transferred about ~0,4 seconds. After this time, it is possible to start the following cycle of measurement.

A Power of the Module

The power supply parameters of the module are given in table 2.

Table 2: Power supply

Voltage supply (Volt)	5
Power consumption of the module (Watt)	2.5