

SERCOS Protocol Analyzer

Takahisa Sakuma

Shin Nagata

Yoshiaki Kobayashi

1. Introduction

Since 1996, our company has been developing the system adopting SERCOS interface and producing components, and developing the SERCOS products, an international standard.

We have so far been commercializing a group of SERCOS products, such as a controller “S-MAC PC”, an objected-oriented full-software motion control language “AML” along with servo drivers with SERCOS I/F, such as “PV2W”, “PQ” Type R, “PQ” Type M, “PE-W” and “PZ-W”, in addition a SERCOS I/O unit “SRU10D”. This time we have developed the SERCOS analyzer, which analyzes the SERCOS interface protocol in order to facilitate the defect analysis on SERCOS systems and to reduce the start-up time of the SERCOS product. This SERCOS protocol analyzer is introduced in this document.

2. SERCOS Protocol Analyzer

2.1 Basic Configuration

Fig.1 shows a basic system configuration used this SERCOS protocol analyzer. A basic configuration consists of the target unit and the host analyzer software that controls the unit. Fig.2 shows the target unit.

With the SERCOS protocol analyzer software, the user analyze the real-time SERCOS communication data displayed on the screen of his/her pc, while the software is communicating with its target unit via RS-232C.

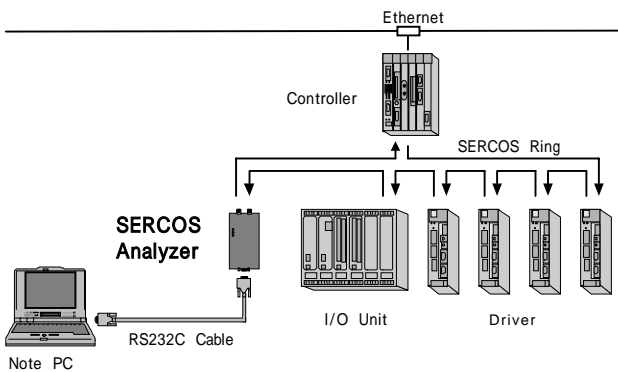


Fig.1 Basic Configuration of SERCOS Protocol Analyzer



Fig.2 Target Unit

2.2 Internal Configuration of Target Unit

Fig.3 shows the internal configuration of the target unit. This unit consists of an ASIC “SERCON816” which controls the SERCOS communication, a RAM (memory) to trace the communication data, a D/A converter to monitor the communication data with the oscilloscope, FPGA which manages SERCOS communication time and the transition of the external inputs, and a CPU to transmit the temporarily stored data in the RAM toward the management PC.

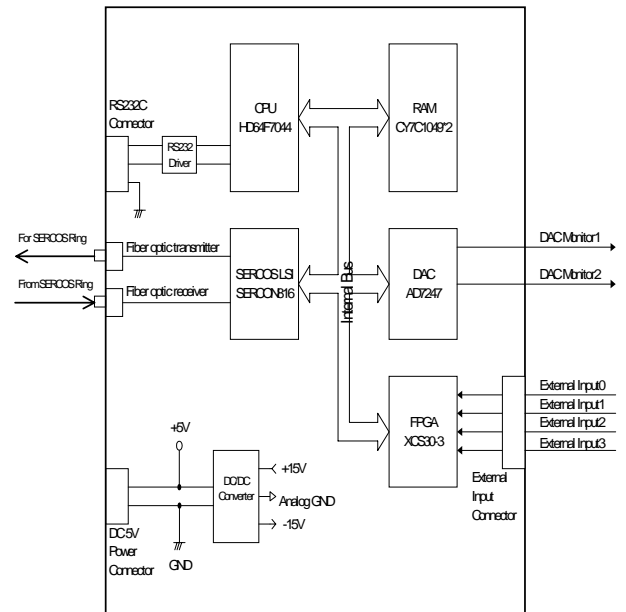


Fig.3 Internal Configuration of SERCOS Analyzer

2.3 Features

The main features of the SERCOS analyzer are as follows.

(1) Compact Size

The Target unit is compact and lightweight so it is ideal for field use. (W70×H138×D25) In addition, a RS232C interface is ready for connecting to PC to realize the general-purpose use.

(2) SERCOS baud rate and communication cycle

The SERCOS baud rate can be selected from 2, 4, 8, and 16MHz at the time of starting the software.

Moreover, the SERCOS cycle can be selected from 1msec or 2msec.

(3) Optical communication transmit level

The intensity of optical transmitting is selectable from 1 to 6 16MHz at the time of starting the software.

(4) Real-Time Monitoring

The cyclic data of axes, such as AT (Amplifier Telegram) and MDT (Mater Data Telegram), configured to monitor at starting the software can be checked for the command and feedback data by real-time monitoring.

(5) Manual tracing command

The communication data of an axis selected at the time of starting the software can be traced at a random timing. The traced data is displayed after it is uploaded into the personal computer. The total of the traced data can be displayed at one try is about 400 samplings of SERCOS communication cycle.

(6) Automatic tracing command with trigger conditions

Various kinds of trigger events can be set as trigger conditions, including SERCOS phase information, status data, control data, cyclic data, the transition of external inputs. When any trigger events meet the trigger conditions defined, the tracing data will be automatically displayed on the screen after completing the uploading process to the pc. The traced data can be displayed at one try is about 400 samplings of the SERCOS communication and the trigger point can be selected manually, 100 samples 200 samples or 300 samples. Additionally displayed traced data can be saved on PC as a text file with naming.

(7) External Trigger Input

The target unit has four external inputs, which can be used to set the trigger conditions. As a result, the data which relates to events other than the SERCOS communication can be traced as well

(8) DAC Monitor Function

The Target unit has a D/A converter to output SERCOS cyclic data including position command values or position feedback values. By connecting the unit to an oscilloscope or a data logger, the user can monitor the waveform of these data on the screen.

2.4 Basic Specification

Table 1 shows a basic specification of the SERCOS protocol analyzer.

Table 1 Basic Specification

Item	Specification
Protocol	IEC61491(SERCOS)compatible
Data Transfer Speed	Selectable from 2M, 4M, 8M and 16Mbps
Host Interface	RS232C interface (9600bps)
Monitoring Software	OS : Windows NT, Windows 98(95) (English, Japanese)
Features	Real time monitoring, Automatic tracing command with trigger conditions, and Dumping and Saving function
Power Supply	DC4.75 ~ 5.25V
Temperature Range for Use	0 ~ 55
Accessory	A pair of SERCOS optical fiber cable
Option	DC adopter (for +5V power supply) Power supply cable

Note: The slave axis that can be analyzed at one try is up to one axis selected at starting the monitoring software.

Note: The SERCOS communication cycle is only 1msec or 2msec.

3. Outline of SERCOS Protocol Analyzer Software Operation

The outline of the SERCOS protocol analyzer software operation is explained next.

1) Start of Tool

After the tool is installed, click "SERCOS Analyzer.EXE" in the installation folder. The main window of this tool appears as shown in figure 4.

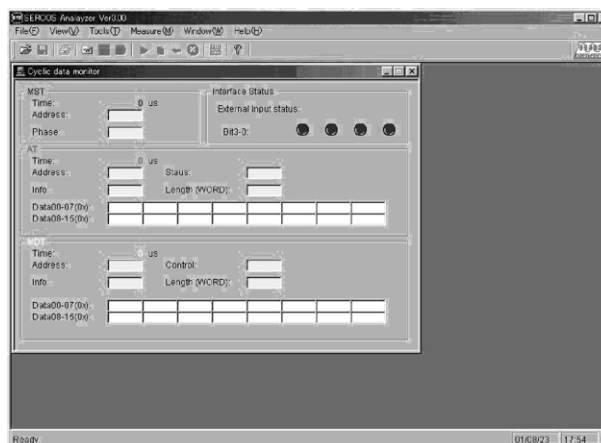


Fig.4 Main screen

2) Configuration

Select "Configure Analyzer" under the Tools menu and set an address of the axis, the SERCOS communication baud rate, and the optical communication transmit level.

3) Start of Master Device

Start up the SERCOS system including the SERCOS master and SERCOS slave devices.

4) Setting of Trigger Condition

Select "Trigger Setting" under the Tools menu and set different kinds of trigger events. Fig.5 shows the trigger setting screen.

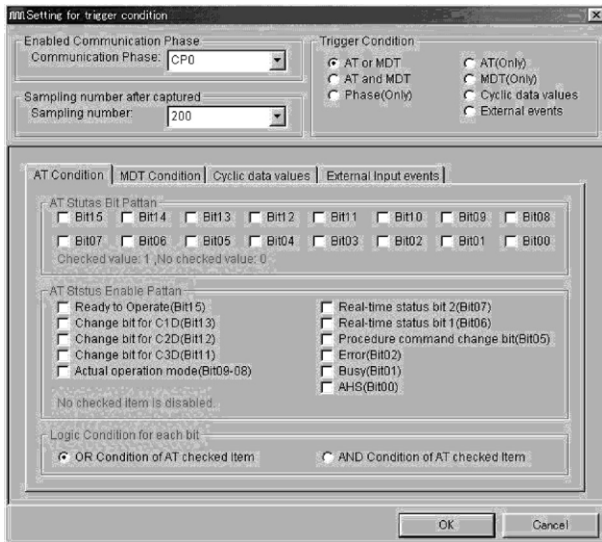


Fig.5 Trigger condition setting screen

5) Beginning of Analysis

Selecting "Start" under the Measure menu will start analyzing. When any trigger events set as the trigger conditions occur, a message is displayed on the screen of pc, then the user comes to know some trigger event has occurred. After that, the data uploading process to pc starts automatically, then the detailed data is to be displayed on the screen.

Fig.6 shows the display screen of the SERCOS communication protocol.

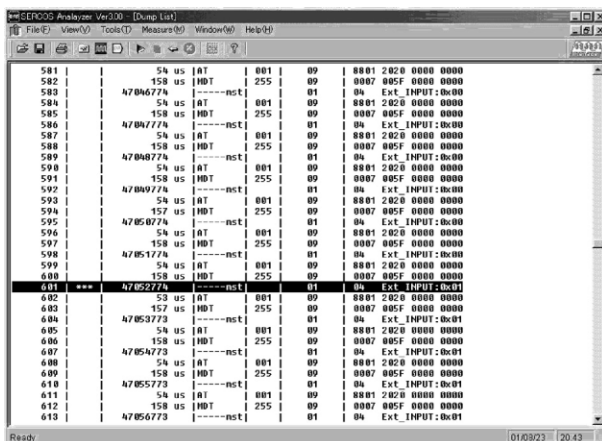


Fig.6 Display screen of the SERCOS communication protocol

6) Saving of Traced Data

The displayed traced data can be named and saved on the PC as a text file.

4. Application Example

The following is the application of remote maintenance in which a SERCOS protocol analyzer is used. There is a problem in how to acquire necessary information by remote maintenance. We were concerned that preparing analog I/O or digital I/O and wiring to connect for data acquisition would bring about a great increase in the cost of equipment and time. The SERCOS analyzer, on the other hand, was used inserting in a SERCOS Ring. No special wiring is needed except the use of an external input trigger, which resulted in a remarkable reduction in wiring. Individual data that flows in a SERCOS Ring such as drivers and I/O can be selected and monitored though the system configuration of the SERCOS analyzer is concise. Additionally, this placed no requirements on other equipment. This time, we would like to introduce the usage of a remote maintenance tool utilizing the features of this SERCOS analyzer.

Range of Remote Maintenance

The SERCOS analyzer is structured on the assumption of operating it face to face meaning: it is necessary that a operator specify an axis he/she wants to acquire, analyze the meaning of the bit row of the acquired axis data, and take the required action for it. The only exception is when the trigger condition is validated, the event is voluntarily started. Therefore, the range of remote maintenance becomes the following.

- The event of voluntary trigger condition from the SERCOS analyzer is validated is the only factor monitored by remote maintenance.
- The analysis and setting of data are handled with Remote Monitoring and Remote Handling.
- The target unit of the SERCOS analyzer is left as is and Configuration & Monitor Tool Software support remote starting RS232C.
- Sending a warning mail at the event of when trigger condition validated. Data is analyzed and set by remote access with the PPP connection.

Fig.7 shows the example of applying remote maintenance.

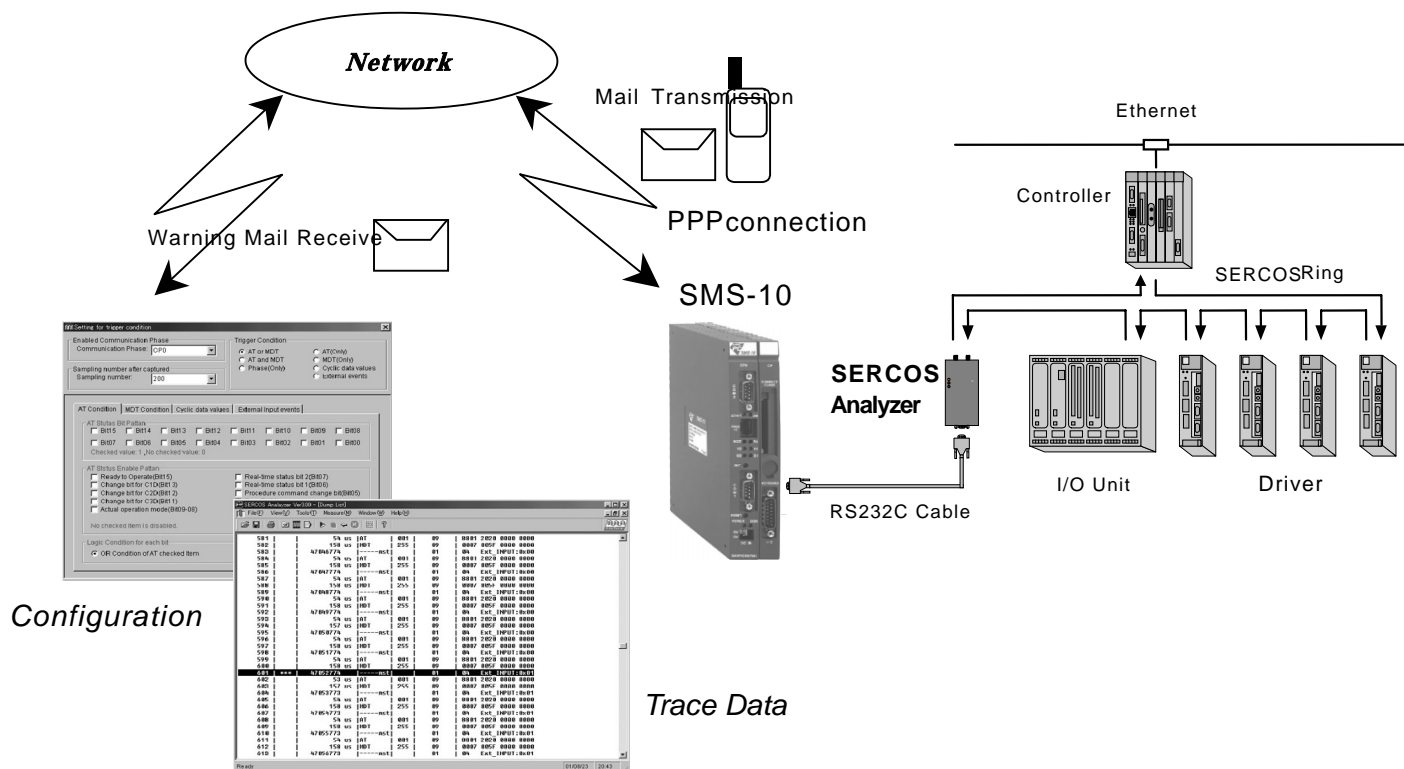


Fig.7 Example of Applying Remote Maintenance

5. Conclusion

The SERCOS protocol analyzer including an application example was introduced above. The network in the field of motion control is surely becoming widespread its range of the application expands. We will continuously make an effort for enhancements of these peripheral tool and the improvements of ease of use in the future.

We would be most pleased if this tool helps create the solutions to problems that can occur in the use of the network.

*SERCOS is the abbreviation of SERIAL Realtime COMMUNICATIONS System

References

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SANYO DENKI Technical Report No.7, pp.28-36(1999-5)
IGS : 「 SERCOS interface I/O-Functions 」



Yoshiaki Kobayashi

Joined company in 1981
Control Systems Division
Worked on design and development of S-MAC components



Shin Nagata

Joined company in 1983
Control Systems Division, 1st Solution Dept.
Worked on design and development of S-MAC components



Takahisa Sakuma

Joined company in 1991
Control Systems Division, Solution Dept.
Worked on design and development of S-MAC components