

A.7: Prototype serial communication analyzer for Indus control system

The supervisory control systems of the synchrotron radiation sources Indus-1 and Indus-2 have interface to various sub-systems distributed over a large area. Communication with remotely located field controllers takes place over RS485 differential serialbus. Profibus, an industry standard communication protocol is implemented to interact with these field controllers. Performance of serial bus communication has vital role in monitoring and control of synchrotron beam parameters for reliable and uninterrupted delivery of beam to beam-line users.

A prototype serial communication analyzer system is developed which detects the communication errors at protocol and signal level. This system continuously monitors the data over these serial buses, which are transmitted in the form of electrical voltages at maximum 1Mbps, records and validates them in real-time.

This system consists of a high-speed data-acquisition system (Figure A.7.1), which captures and stores the actual voltage levels of RS485 serial bus at 10 MSPS with 12-bit resolution (Figure A.7.2) and stores an event of ~6.4 ms data. Salient features include two-channel high bandwidth analog front-end, configurable analog-input voltage up to ±12 V, single-ended or differential mode analog inputs, sampling @ 10 MSPS with 12-bit resolution, 64K × 16 high speed static RAM. A software module for signature based analysis is developed which measures and records the time profile of various transmission packets (telegrams) with a time resolution of 1 μs

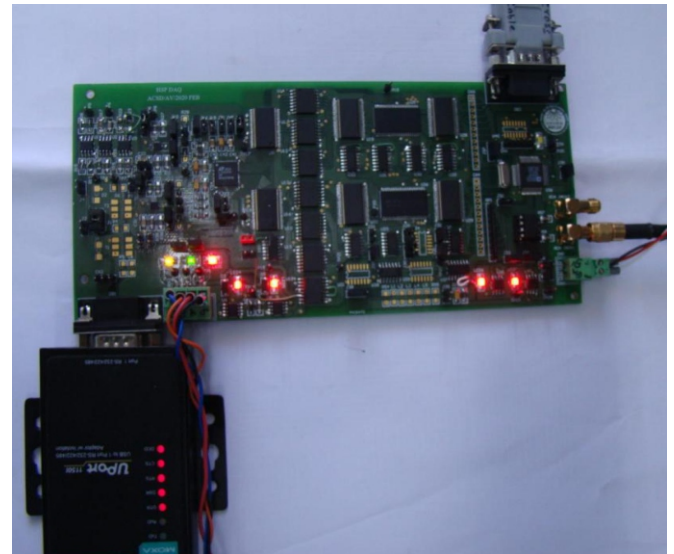


Fig.A.7.1: The 10 MBPS data acquisition board.

(Figure A.7.3) using event based handshaking with the high-speed data-acquisition system. The software can identify and classify the type of communication errors like start delimiter error, frame length error, framechecksum error, parity error, etc. Retrieval of digitized data of RS485 line voltage signals is done in synchronism with the configurable event generated by signature based analyses module. This system can be configured for the analysis of standard as well as for the custom made protocol.

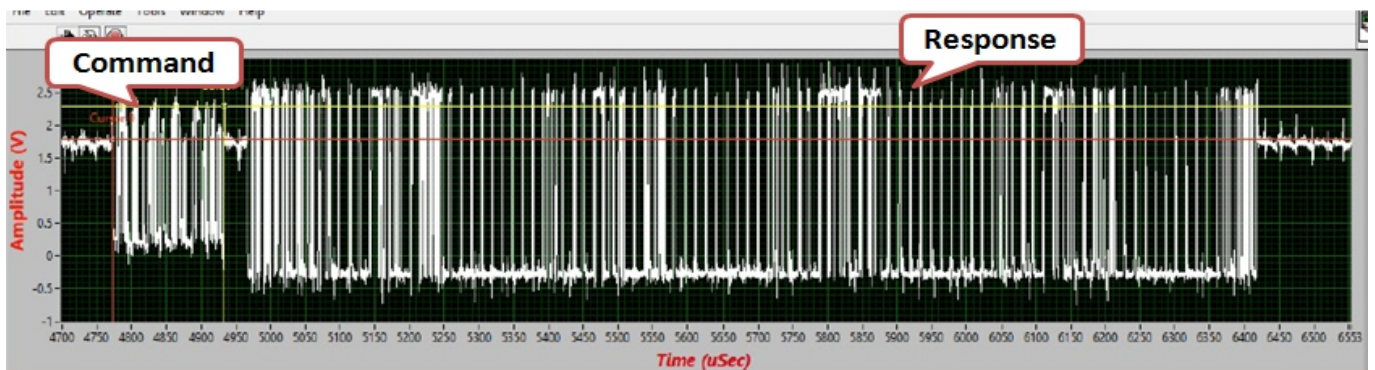


Fig. A.7.2: The captured electrical voltages of command- response telegram being probed.

	Type	Frame Start time(s)	Frame End time (s)	Pkt Comm time(s)	Inter Frame interval (s)	Destination	Source /	DSAP	SSAP	Data Length	Parity Error	Error	Status
FRAME#1	CMD	13.550999	13.551562	0.000563	0.000000	1	0	255	128	32	0	0	OK
FRAME#2	CMD	13.551749	13.552312	0.000563	0.000187	2	0	255	128	32	0	0	OK
FRAME#3	CMD	13.552499	13.553062	0.000563	0.000187	3	0	255	128	32	0	0	OK
FRAME#4	CMD	13.553249	13.553811	0.000562	0.000187	4	0	255	128	32	0	0	OK
FRAME#5	CMD	13.553998	13.554560	0.000562	0.000187	5	0	255	128	32	0	0	OK
FRAME#6	CMD	24.417908	24.417924	0.000015	10.863348	5	0	255	128	32	0	128	SD Error
FRAME#7	CMD	24.754157	24.754719	0.000562	0.336233	1	0	255	128	32	0	0	OK
FRAME#8	CMD	24.754907	24.755469	0.000563	0.000187	2	0	255	128	32	0	0	OK
FRAME#9	CMD	25.314503	25.315053	0.000550	0.559034	1	0	255	128	32	0	64	CHK SUM

Fig. A.7.3: Signature based packet analysis of communication protocol.

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