Technical Information

BER Measurement SFL-K17

Option for TV Test Transmitter SFL

Bit error rate (BER) can be measured at different points on set-top boxes for digital television.
A BER instrument must be able to accept and evaluate data in serial or parallel form or as the payload of an MPEG2 transport stream.

This is no problem with TV Test Transmitter SFL and its BER measurement option:
while the necessary signals are generated at the right places in the signal flow, BER is measured at the same time.

To perform BER measurements you do not have to buy highly specialized add-ons any longer. BER Measurement SFL-K17 is a favourably priced SW-option for TV Test Transmitter SFL.

Features

- Integrated BER measurement
- Serial and parallel inputs
- Input data rate up to 63/80 Mbit/s
- 2^{15}-1 and 2^{23}-1 sequences

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General

The bit error rate measurement function is independent of other SFL settings. The current bit error rate is continuously displayed. Messages regarding the BER measurement are displayed in the header field of the display.

Serial and parallel inputs are available.

The serial input is used for measuring the BER after demappers. Two BNC connectors for clock and data are provided on the rear panel of SFL.

The parallel transport stream input TS PARALLEL at the rear panel can either be used as transport stream input or as parallel input for bit error rate measurements (LVDS level) in standard transport streams. Switchover is effected via software.

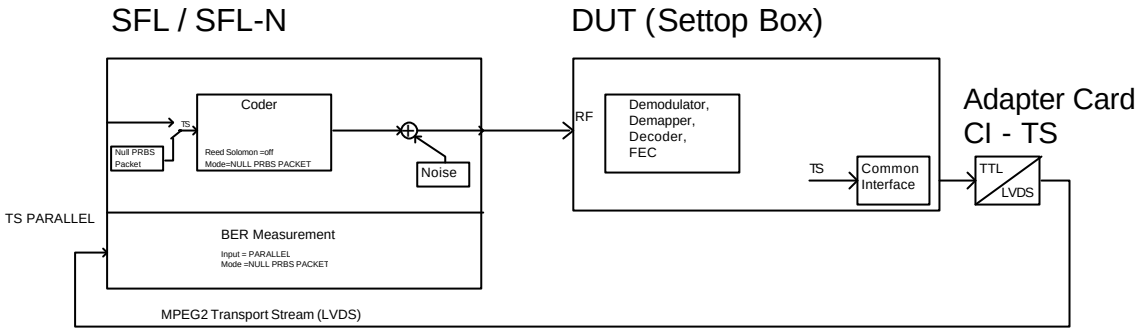
Menu

- The bit error rate measurement can be switched on and off.
- As long as the bit error rate measurement is active, the BER is displayed all the time.
- Selection can be made between the serial input (BNC connector, TTL level) and the parallel input (Sub-D connector, LVDS level).
- The BER mode for the two inputs can be configured.
- The user can select whether a PRBS 2^{23} -1 or a PRBS 2^{15} -1 is to be evaluated.

Application Examples :

Application 1: Measuring BER Before Reed-Solomon Decoder

Test setup for determining the bit error rate before the Reed-Solomon decoder for a set-top box by means of an adapter card for the common interface:



SFL setting: I/Q-Coder
Mode = NULL PRBS PACKET
Special: Reed-Solomon = OFF

SFL setting: Utilities/Setup
PRBS Sequence = 2^{23} -1

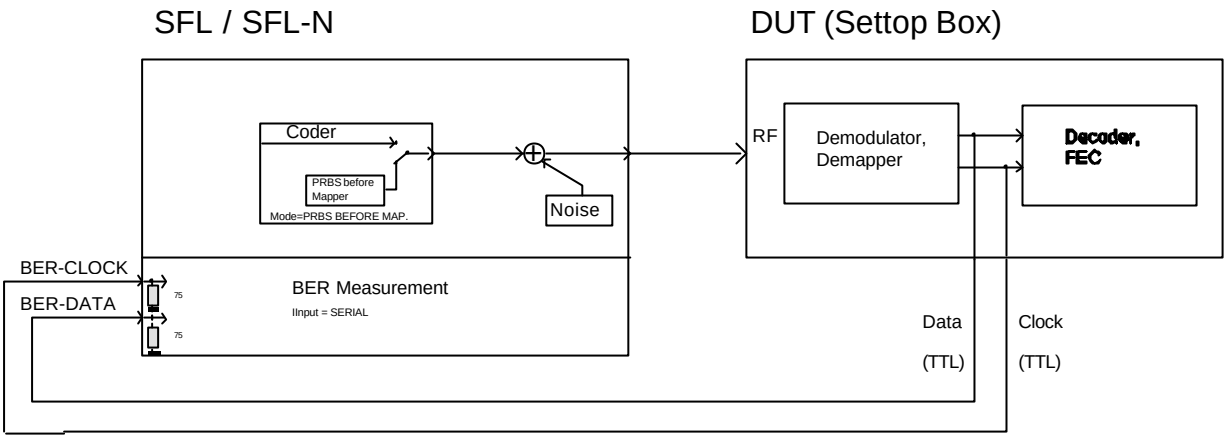
SFL setting: BER
BER = ON
BER INPUT = PARALLEL
MODE = NULL PRBS PACKET
BER PRBS SEQUENCE = 2^{23} -1

The data - in this case NULL PRBS PACKET (null packet whose payload consists of PRBS bytes) – are transmitted in the normal way. The channel coding is complete, only the Reed-Solomon encoder is switched off.
The Reed-Solomon decoder in the receiver (DUT) thus recognizes more than 8 seemingly erroneous bytes (which it could correct). It sets an error flag and lets the transport stream pass in unchanged form. The bit error rate can thus be measured in a simple way before the Reed-Solomon decoder.
With a set-top box, the transport stream is available at the common interface (TTL level). An adapter card converts the TTL signals into LVDS signals. These signals are applied to the BER measuring device via the parallel input. In the BER measuring device, the header (4 bytes) is removed by setting NULL PRBS PACKET. The 184-byte payload comprises the PRBS which is evaluated to determine the bit error rate.
The measurement before the Reed-Solomon decoder is important as the latter is highly efficient and yields an output error rate of 1E-11 (QEF – quasi error free) at an input error rate of 2E-4.
Slight changes of the input error rate in this range result in very strong changes of the output bit error rate. The measurement results are very susceptible to inaccuracies of the interference source, e.g. the noise power in the measurement of C/N versus BER. Moreover, the measurement time largely increases with small bit error rates, e.g. after the Reed-Solomon decoder (data rate 100 Mbit/s BER 1E-11, 1000 error events for a statistical accuracy of more than 10% -> measuring time approx. 11 days (to measure an error, the average time is about 16 minutes)).

Higher bit error rates are measured before the Reed-Solomon decoder. This reduces the measurement time. Moreover, the C/N versus BER curves are much flatter. Therefore inaccuracies of the interference source have less impact on the BER.

Application 2: BER Measurement After Demapper

Test setup for determining the bit error rate after the demapper with a set-top box.



SFL setting: I/Q-Coder
Mode = PRBS BEFORE MAPPER

SFL setting: Utilities/Setup
PRBS Sequence = 2^{23} -1

SFL setting: BER
BER = ON
BER INPUT = SERIAL
CLOCK = NORMAL (also INVERTED, if possible)
DATA = NORMAL
BER PRBS SEQUENCE = 2^{23} -1

The mapper generates a PRBS in the coder which is transmitted instead of data.
Interference can be generated in the subsequent transmission path, i.e. by adding Gaussian distributed white noise and/or fading. The receiver demodulates the signal. After the demapper, clock and data are available in serial form. These are then fed into the serial input of the bit error rate measuring device (TTL level, high impedance) and are evaluated there.

Specifications

BER Measurement	option SFL-K17
Characteristics	integrated BER measurement
Input data rate	max. 63 Mbit/s serial 80 Mit/s parallel
PRBS sequences	2^{15}-1, 2^{23}-1 to ITU-T Rec. O.151
Input	
Serial	BER DATA / BER CLOCK
Input impedance	high impedance
Input level	TTL
Connectors	BNC female
Clock, data	normal, inverted
BER mode	
PRBS	2^{15}-1, 2^{23}-1 to ITU-T Rec. O.151
Parallel	TS PARALLEL
Characteristics	meet EN50083-9
Input impedance	100 Ω
Input level	100 mV to 2 V, LVDS
Connector	25-pin female, shielded
BER mode	
PRBS, PRBS INVERTED	2^{15}-1, 2^{23}-1 to ITU-T Rec. O.151
NULL PRBS PACKET	evaluation of all payloads as PRBS*
PID FILTER FOR PRBS PACKET	evaluation of all payloads with PID 1FFFhex as PRBS **

*Evaluation of a standard transport stream. The four header bytes are removed and the 184 bytes of all payloads are evaluated as a PRBS. This corresponds to the NULL PRBS PACKET mode of the SFL.

** Evaluation of a standard transport stream. The PID filter selects null packets with PID=1FFFhex. Only the payloads of these packets are evaluated as PRBS. This corresponds to the ASI or SPI mode of the SFL, where NULL PRBS PACKETS are used for stuffing.

Ordering Information

BER Measurement (SW Option)	SFL-K17	2084.5682.02

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