ROHDE&SCHWARZ

SOUND AND TV BROADCASTING DIVISION

APPLICATION NOTE

Synchronization of the Datarate of TV TEST TRANSMITTER SFQ with an External Clock

Products:

TV TEST TRANSMITTER   *SFQ*

7MGAN16E

Synchronization of the Datarate of
TV TEST TRANSMITTER SFQ
with an External Clock

The datarate of MPEG2 Transport Stream Packets within the SFQ may be defined in several modes:
1. The internal PRBS or NULL TS PACKETs are the data source and define the clock- and symbol rate. The internal free running VCO in this case is used for clock generation. But „Free Running" of course means not very high precision in Clock frequency.
2.An external MPEG2 Data Stream - like the DVG MPEG2 Data - synchronises via the MPEG2 data input „TS PARALLEL" all the clock generation of the SFQ. Data rate and symbol rate are as precise as the connected signal.
3. The option INPUT INTERFACE defines with its crystal controlled oscillator the data rate and symbol rate of the internal generated PRBS und NULL TS PACKETEs.

But sometimes neither a MPEG2 Data Stream nor the INPUT INTERFACE is available. In spite of this fact the SFQ should generate and guarantee very precise specified data rates respectively symbol rates for the internal PRBS and NULL TS PACKETs.
The solution is the synchronization of the SFQ with an external sinewave generator with the corresponding precision. Such generators normally are always available within labs, service centers a.s.o. Generators of such kind from R&S are for example all members of the SMX family, AFG and AFGU, ADS a.s.o.

What is to do?

At first you have to look at the SFQ's firmware version. It must be 1.04 or higher. The firmware with this version number will be available in September 97.

Secondly an adapter cable according to the following design, to be connected to the TS PARALLEL input at the rear of the SFQ, is necessary:
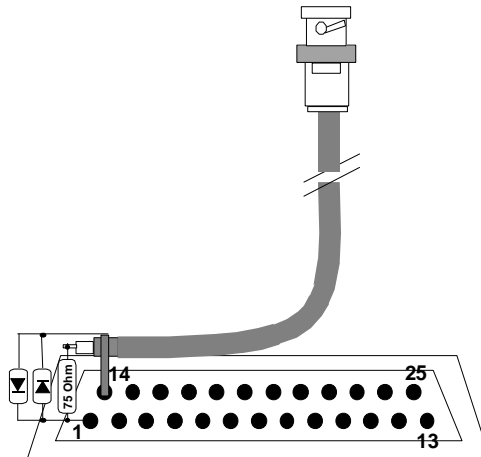
View from Soldering Pins

Via the Coax-Cable with BNC connector the synchronization signal is fed into the adapter. The outer conductor is soldered to pin 14 of the 25 pin connnector, whilst the inner conductor is connected to pin 1 using an additional 75 Ω protection resistor. Two antiparallel rectifiers (1N4448 or similar Si rectifiers) are connected between pin 1 and pin 14 and prevent a too high input voltage.
The corresponding hand guard offers the needed pull-relief for the adapter.
Into the clock input pin 1 (pin 14 is defined as the corresponding ground) of the TS PARALLEL Interface a sinewave signal of the signal generator now may be fed in. The actual 8 bit wide MPEG2 TS Data is not present.

Thirdly you should calculate the frequency to be adjusted at the signal generator for a desired TS data rate. Within one clock cycle of the frequency f_C the TS PARALLEL Interface inputs one Byte of MPEG2 TS Data. But the data rate f_C is expressed in bit/s. Therefore the frequency to be adjusted is calculated as:

$$f_{Generator} = f_C / 8.$$

For simulating the often used TS Cable Data Rate of 38.152941 Mbit/s a frequency of $f_{Generator} = 4.7691176$ MHz is to be adjusted. (Here the exact values are used, the normal accuracy is 38.15 Mbit/s.)

Fourthly the recommended amplitude of the fed in sinewave should be defined. Because the antiparallel rectifiers are limiting the signal to ca. ± 0.7 V, the amplitude should be in the range 1.4 V $< U_{SS} <$ 3 V. A DC offset must not be present.

What further SFQ settings are important?

After the SFQ has genlocked to the incomming clock, in the field „I/Q CODER" of the status line in the SFQ display appears the indication FRMERR (Frame Error). This means, that at the TS PARALLEL Interface the clock is present but MPEG2 TS Data is invalid respectively not packetized additionally no SYNC BYTE is provided. After the synchronization via measuring the DATA RATE within the menue I/Q CODER and taking over the value using the softkey F3 ACCEPT is done, you may select NULL TS PACKETs as substitution data. The SFQ now generates and modulates

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either in QAM or QPSK TS packets with a valid synchronization byte 47 hex with a data rate defined by the sinewave generator.

Block diagram

SMG, SMH ...
SMT, SME...

75 Ohm

2 x Si rectifiers

adapter

SFQ

**QAM/QPSK modulated
NULL TS PACKETs**