Operation Manual

Slip and Rates

Anexx to TSW200E1's Operating Manual

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1. Introduction

The synchronism concept is important in a telecommunications network. This network is composed by several interconnected switches. Each one of them have a clock that determines the links transmission rate. In a E1 link, the information is organized and transmissed in frames with several timeslots, using PCM modulation. The frames alignment is done by identifying the begin of a frame on the received bits. Once found this alignment, the other timeslots are identified comparing to the frame begin. In order to not lose alignment, the switches must be synchronized, that is, they must work with the same clock.

Figure 1 shows the connection between switches A and B. A transmit a PCM beam to switch B. Received data are put into a buffer and removed to be processed by switch B. The switch A writing rate, in the buffer, is *fa* bits/s and switch B reading rate is *fb* bits/s. If *fa* is different from *fb,* that is, writing and reading rates are different, there will be moments when buffer will be filled or empty. If *fa* > *fb,* writing is faster than removing bytes from the buffer, Overflow happens. If *fa* < *fb,* bytes are removed from buffer faster than they are put there, Underflow happens. Both situation result in ***slip***. In the case of Overflow, some bytes will be lost because buffer is already filled. In the case of Underflow, some bytes will be repeated because the same information will be read twice.

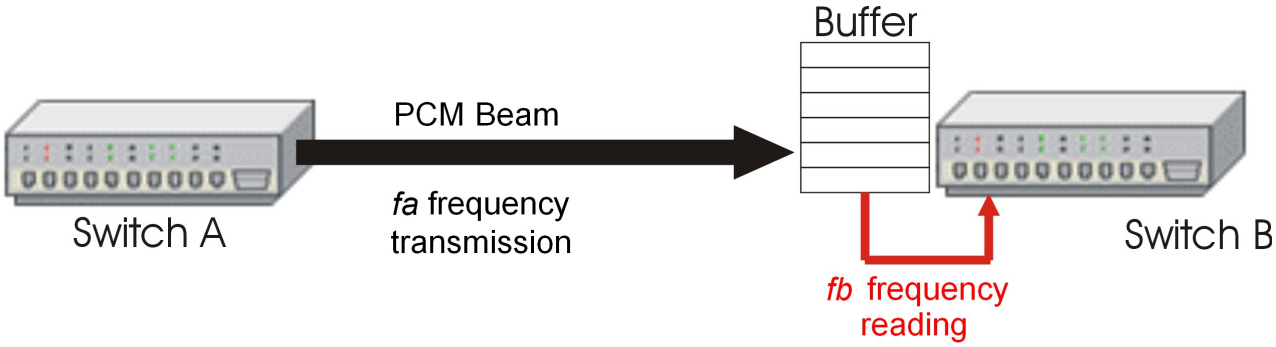

Figure 1

Implementation of communication using buffers, like the figure above, is done to minimize slip occurrence. In a system like this, jitter occurrence is normal. If the system did not have a reception buffer, the jitter would provoque loss or bit repetition (slip). The buffer is applied to compensate that phenomenum. It stores the arriving information and the receptor gets less susceptible to transmissor's clock little variations. In the PCM case, buffers are dimensioned to 2 frames, what means that 256 clock slips are necessary to generate an error in the system. When this happens, there is a frame slip and the frame alignment will be lose.

2. Slip and Rates[1] Tests on TSW200E1

Slip and Rates modules were developed to monitor the syncronism of a E1 link.

In Slip module, the synchronism between them are verified by detecting slips. If two signals with different clocks are measured, there will be slip occurrence and the rate slip by second will tell the difference between the two clocks, in Hz.

In Rates module, the two signals rate is measured, in bps, and is presented on screen.

To test, TSW200E1 may be connected as terminal, replacing a switch, or as monitor in the middle of a communication. Figures 2 e 3 show the two connection possibilities.

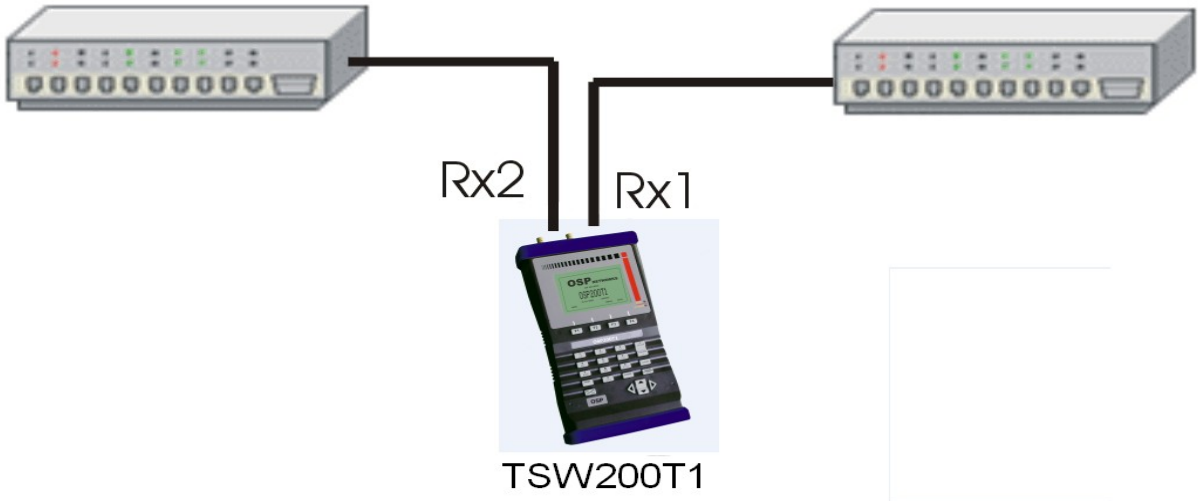

Figure 2: TSW200E1 connected as terminal.

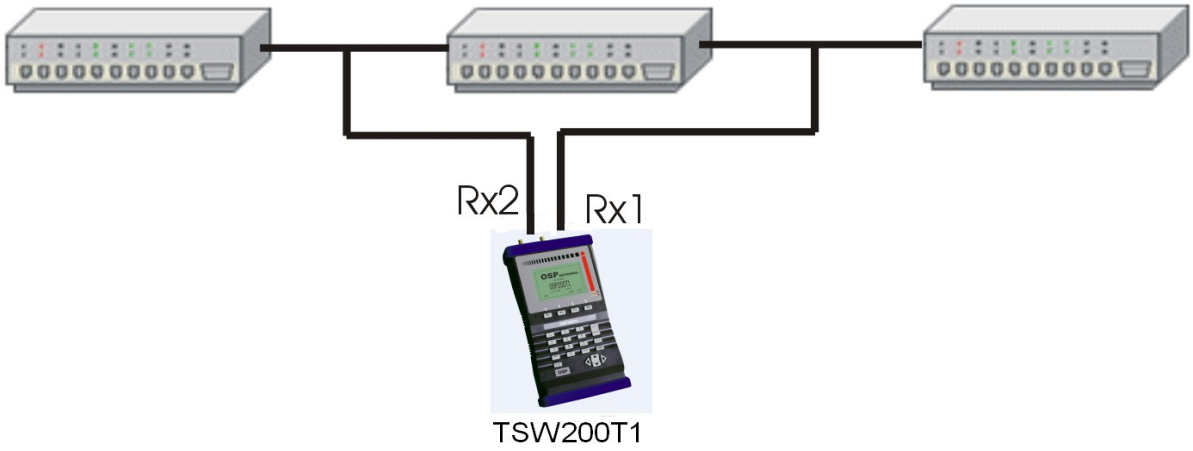

Figure 3: TSW200E1 connected as monitor (high impedance - Hi-Z).

1 The Rates Module can only be installed in hardwares type I or newer.

3. Test Configuration

The equipment configuration to do the test is done by choosing only 2 parameters.

- **Termination**: Allows the user to choose the used cable termination: 75 Ohms Unbal, 120 Ohms Bal, High-Z Unbal or High-Z Bal.
- **Line Code**: Allows the user to choose the line code: HDB3 and AMI.

Figure 4 shows Module Slip configuration screen. Termination choice depends on the way TSW200E1 is connected to the communication link. It may be connected as terminal ou may be insert into the communication mean (monitor), this last case must have high impedance (Hi-Z).

Parameters selection is done by pressing ← and → keys with the cursor pointing to the desired line. F2 key returns to module screen.

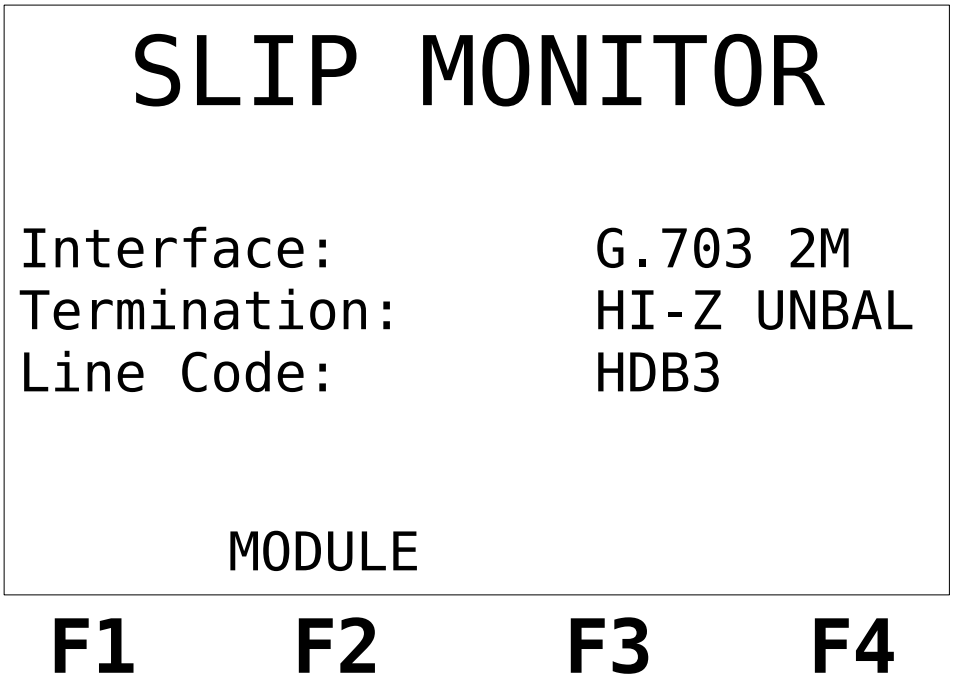

Figure 4: Module Slip configuration screen.

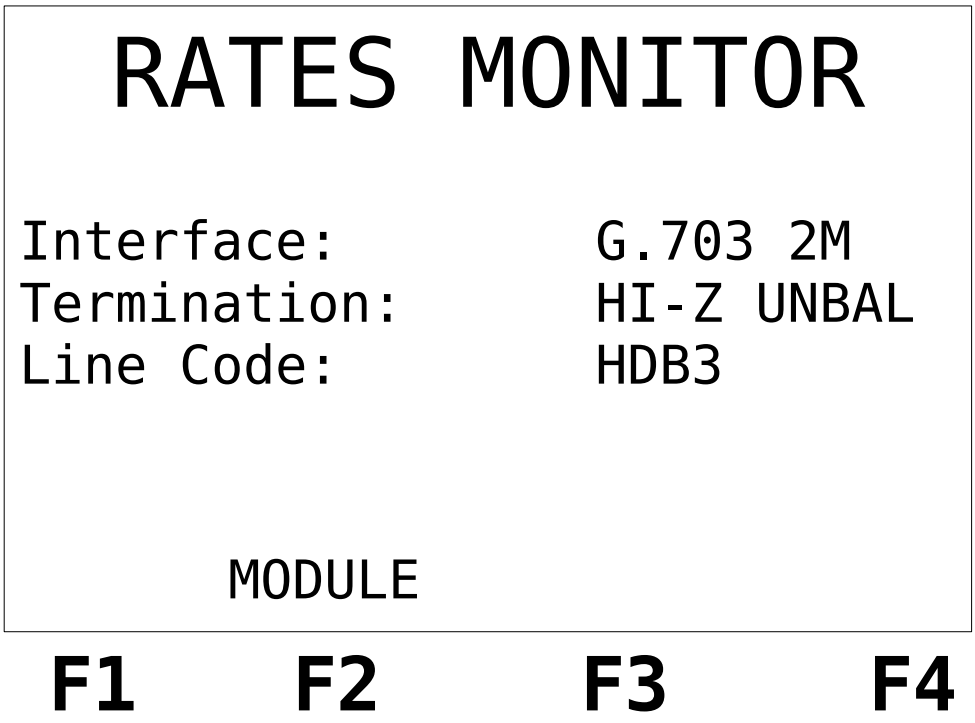

Figure 5: Rates module configuration screen.

4. Test Realization

Once configured, the test may be initiated by pressing START/STOP key.

In slip module, results are shown in 3 different screens. To navigate between them, use F1(BACK) or F4 (NEXT) keys. In Rates module, only one screen are shown.

Screens with several measures done by TSW200E1 are the next figures.

First screen, (Figure 6) shows results related to clock slips.

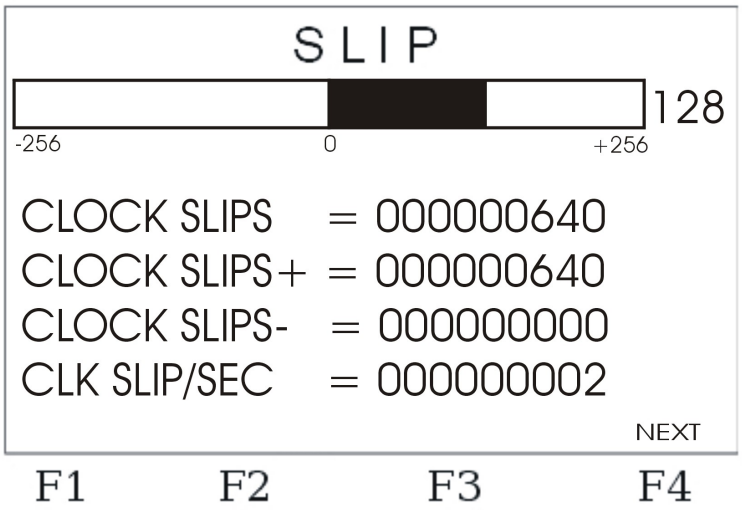

Figure 6

- **Clock slip position**: Through a bar that shows direction and a 256 counter. The bar to right direction means RX1 clock is bigger than RX2. The bar to left direction means the opposite.
- **Clock slips**: Presents slip total, adding both directions.
- **Clock slip +**: Slip total caused by RX1 bigger than RX2.
- **Clock slip -**: Slip total caused by RX1 smaller than RX2.
- **Clock slip/sec**: Last second occurred Slip total.

Second screen, (Figure 7), present results related to frame slips.

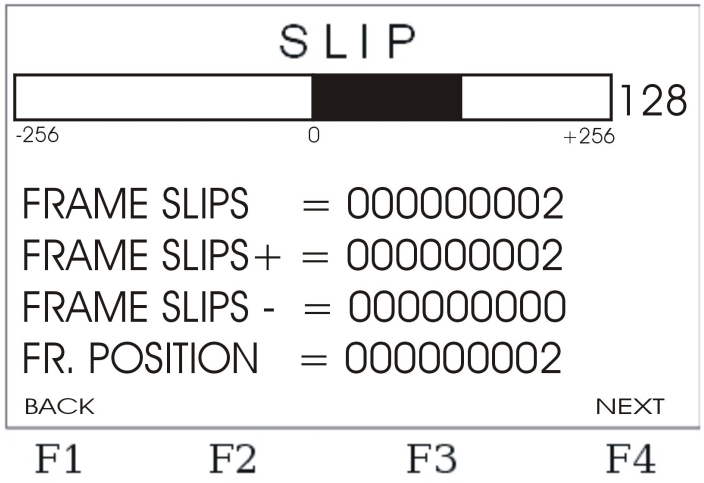

Figure 7

- **Frame slips**: Frame slips total, adding both directions.
- **Frame slip +**: Total of frame slips caused by RX1 bigger than RX2 when clock slip position pass 256, to right direction.
- **Frame slip -**: Total of frame slips caused by RX1 smaller than RX2 when clock slip position pass 256, to left direction.
- **Frame position**: Difference between frame slip+ and frame slip-.

Third screen (Figure 8) shows test time information.

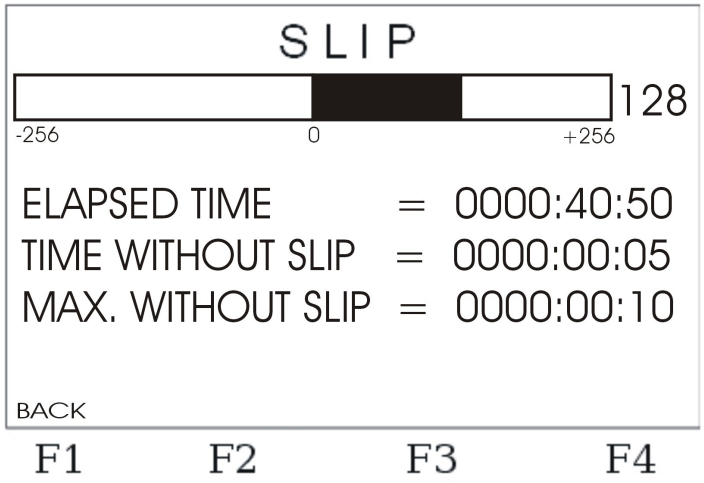

Figure 8

- **Elapsed Time**: Presents test time in the form [HHHH]:[MM]:[SS]
- **Time Without Slip**: Shows time without a slip occurrence. Each slip reset this counting. Shown in the form [HHHH]:[MM]:[SS].
- **Max. Without Slip**: Shows maximum time without a slip occurrence. Shown in the form [HHHH]:[MM]:[SS].

Next figure is Rates module screen (Figure 9) and shows the comparison between the two signals rates.

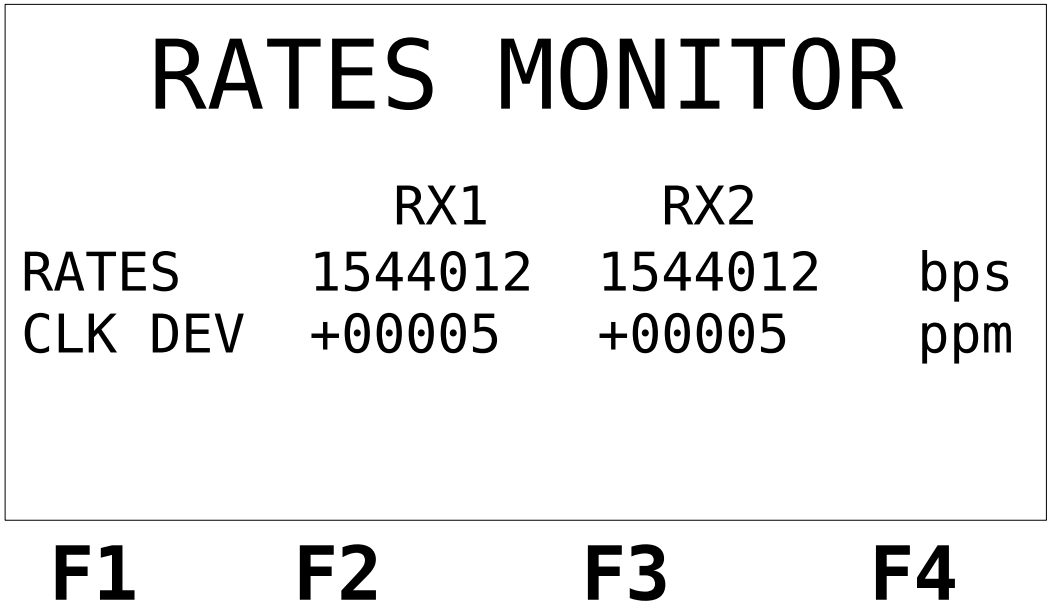

Figure 9

- **Rates**: Clock rates of each signal, in bps.
- **Clk Dev**: O desvio, in ppm (parts per million), of measured signal sinal medido em relação a 2048000 bps.

Test may be ended by pressing START/STOP key.