OSCILLOQUARTZ
A COMPANY OF THE SWATCH GROUP

Application Note

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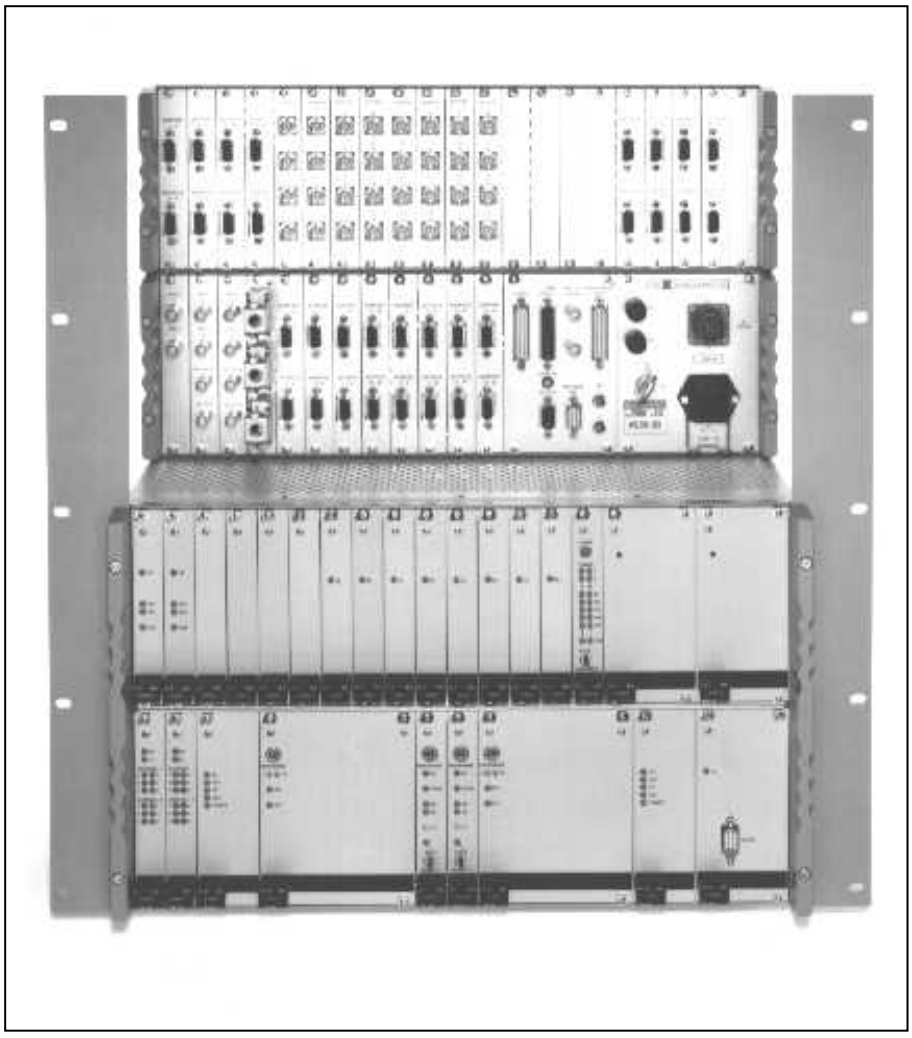
OSA 5548B SASE & SSM Inter-working with SDH Equipment



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1. INTRODUCTION

The OSA 5548B SASE (Release r2.2) includes provisions for enhanced 2Mbit/s interfaces with Synchronisation Status Message (SSM) detection and generation. The SSMs are used in SDH networks to indicate the synchronisation quality carried by the aggregate STM-N signals. Currently defined SSMs and quality levels are shown in table 1.

SSM CODE	INDICATION	QUALITY LEVEL
0010	PRC (G.811)	1 (highest)
0100	SSU-A (G.812 Type I or V)	2
1000	SSU-B (G.812 Type VI)	3
1011	SEC (G.813 Option 1)	4
1111	Do not use (DNU)	6

Table 1: SSM and quality level indications

2. SASE INPUT SELECTION WITH AND WITHOUT SSM

2.1 Inputs without SSM

If the 2Mbit/s synchronisation signals applied to the SASE do not have valid SSM codes, then the SASE would select a synchronisation input according to the user programmable input selection priority table. The default values of the input selection priority table are shown in table 2.

INPUT	DEFAULT PRIORITY	SELECTION CHOICE
1	1	First
2	2	Second
3	3	Third
4	4	Fourth
5	5	Fifth
6	6	Sixth

Table 2: Default input priority values

The flow diagram of the priority table input selection algorithm is shown in figure 1.

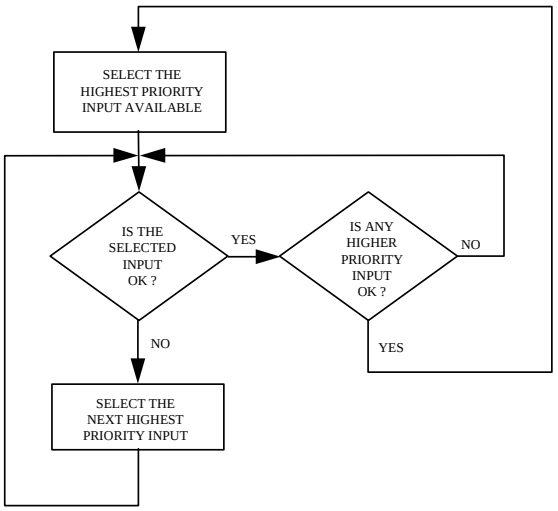

Fig 1: Priority table input selection algorithm

2.2 Inputs with SSM

If the 2 Mbit/s synchronisation inputs have valid SSMBs then the input selection algorithm of the SASE is programmed to figure 2.

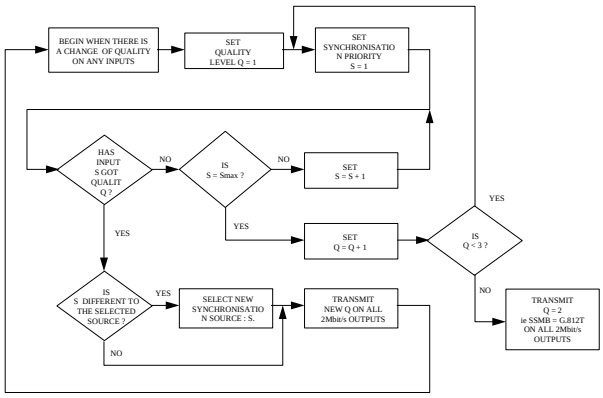

Fig 2: SSMB input selection algorithm

Essentially, the SASE performs the following in the SSM input selection mode:

a) Always select the synchronisation inputs with the highest quality.
b) If more than one synchronisation input has the same quality, then select the synchronisation inputs with the highest priority.
c) If more than one synchronisation input has the same quality and the same priority then the result depends on the previous selected input.
d) For a selected input with SSU-A quality or better, the SASE transfers the input SSMB to all the outputs.
e) If all the inputs were below SSU-A quality then the SASE would enter hold-over/free-

run mode. The output SSM codes are then set to SSU-A {the quality of the high stability clock (HSC) in the SASE}.

Note 1: When the selected synchronisation input switches from PRC to below SSU-A quality, the SASE would holdover its outputs within the G.811 MTIE mask for some time. The SASE would hold SSM = PRC until the output timing quality falls to SSU.

Note 2: The SSM input selection algorithm is currently being refined for SDH equipment clocks in the new Draft ITU-T Rec. G.781. For SASEs the algorithm is not standardized. The algorithm for Oscilloquartz SASEs is derived from Draft ITU-T Rec. G.781.

3. SASE AND SDH NETWORK ELEMENT INTER WORKING

3.1 First generation SDH

In general, the first generation (current) SDH Network Elements (NEs) have not implemented the SSM algorithm on the 2Mbit/s synchronisation interface, and they cannot easily be upgraded either. Therefore in these networks, the SASE would only be operating in the priority table input selection mode as described in section 2.1.

3.2 Second generation SDH

The second generation SDH NEs, expected by 1999, will include the SSM algorithm on the 2Mbit/s synchronisation, as well as on the STM-N aggregate and tributary interfaces. The input selection algorithm of the SASE can then be switched/upgraded to the SSM selection mode as described in section 2.2.

4. APPLICATION OF THE SASE

4.1 Filtering of the STM-N signal

If the number of consecutive NEs in a long synchronisation chain is beyond twenty, then SASEs are required to break the chain to shorter ones, as shown in figures 3 & 4. In this application, the SASE transfers and switches the SSM information as described in section 2.2.

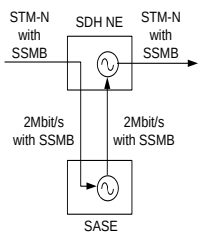

Fig 3: SASE & NE inter working

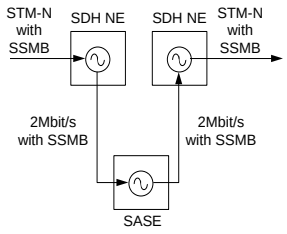

Fig 4: SASE & NEs inter working

If the SSM information between the SASE and the NEs is lost, e.g. in first generation SDH or the interface is 2 MHz, then the NE may assume that the output from the SASE is SSM = PRC. However, when the SASE enters holdover, its output is still valid and therefore the NE would still output SSM = PRC. If required, the false SSM may be changed by the SDH network management system.

4.2 SASE as gateway slave clocks

In general, the SDH synchronisation networks are partitioned into hierarchical layers. To ensure that failures in the server synchronisation layer do not propagate to the client layers, SASEs should be placed at the synchronisation gateways between the server and client networks, as shown in figure 5. The SSMs are used for the protection of inter and intra network (ring shown in figure 5) synchronisation. In this application, the SASE transfers and switches the SSM information as described in section 2.2.

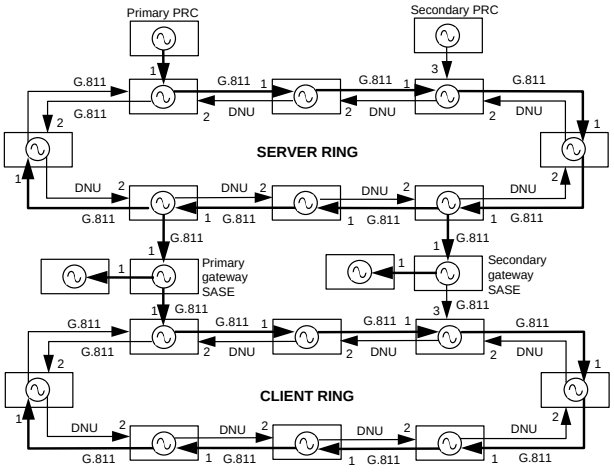

Fig 5 : SASEs used as gateway slave clocks