The Efficiency Analysis of the Three-link Switching Field of the Digital Switching System EWSD

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Abstract – **This work has an educational and research character and aims to analyze the efficiency of the three-link SN switching field structure of the modern digital switching system EWSD according to the defined efficiency criterias of the switching systems.**

Keywords – **Digital switching field, Criteria of the efficiency, Time module, Equivalent switching point.**

I. INTRODUCTION

A lot of digital automatic telephone station (ATS), either of the state or the foreign production, are introduced in the telephone networks of Ukraine. This will gradually lead to the complete digitalization of all kinds of information networks.

Considering the widespread introduction of the digital ATS and their diversity, the question of the determination of the digital PBX efficiency, which is mainly determined by the efficiency of the switching fields and control system, becomes relevant.

There is almost no analysis on the digital ATS efficiency in the technical literature, so the question of the efficiency evaluation of the individual components of ATS and its efficiency as a whole becomes relevant.

It is conventional to evaluate the efficiency of the structures of the digital switching fields in terms of their economic feasibility, which, in switching systems, is determined by the number of equivalent switching points (P eq.) [1].

II. DIGITAL SWITCHING FIELD SN

Digital switching field of the EWSD system is used to switch the speech paths, semipermanent connections between the processors of the LTG blocks and a coordination processor CP.

Fully accessible switching field of the digital EWSD system, being developed on a modular principle, has a small internal blockage and, depending on the number of linear groups (LTG), may be used at the stations of all types and capacities. The version of EWSD V.15 uses the switching fields of the following types: SN, SN (B) and SN (D) [2, 4]. The SN (B) functions fully correspond to the SN switching field functions, however in the SN (B) each module of TSG includes not just four but eight LTG functional blocks. SN and SN (B) switching fields of the 63LTG have T-S-T structure, and SN and SN (B) switching fields of the 126, 252, 504 LTG - have the T-S-S-S-T structure.

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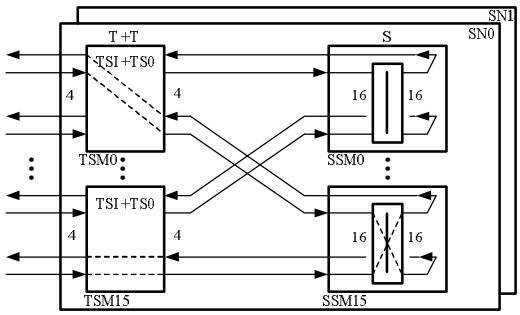
SN and SN (B) switching fields, depending on the capacity, contain from 1 to 8 switching groups. Each group can be connected to 64 external input and output PCM - lines with the speed of 8192 Kbit/s. Coordination processor CP is connected to the switching group through the message buffer MBU: LTG with the help of the 0th PCM line.

The structure of the three-link SN switching field of 63 LTG is provided in pic. 1.



Pic. 1 Structure of the three-link SN switching field of 63 LTG

Small telephone stations have the switching field SN: 63LTG with the structure of T-S-T:

- one degree of the time switching, input (TSI);
- one degree of the spatial switching (SS);
- one degree of the time switching, output (TSO).

Table I

Technical data of the SN switching field of different capacity

Capacity SN	15LTG	63LTG	126LTG	252LTG	504LTG
Number of LTG	15	63	126	252	504
Structure	TST	TST	TSST	TSST	TSST
Capacity, Erl	750	3150	6300	12600	25200
Number of SL for RS	7500	30000	60000	120000	240000
Number of SL for RTS	1800	7500	15000	30000	60000

In the report there is provided the efficiency analysis of the switching fields of the EWSD Digital Switching System that has a wide and future-oriented spectrum of applications.

The ground was given for the choice of the most powerful criteria of the efficiency, that is economic feasibility, which can be evaluated in switching fields (SF) by the value of a

single channel. It was shown that it is convenient to express the cost of the single digital channel T_{1K} in relative units through the number of equivalent switching points (eq.s.p.) needed to actualize this channel;

30 structures of switching fields were selected and constructed for the analysis, the main condition for the construction of which was the use of the standard time and space modules of the EWSD system. The analysis of the single-link, three-link, fife-link SF structures of five capacities ([16 × 16], [64 × 64], [128 × 128], [256 × 256] [512 × 512] linear groups LTG) was conducted with the use of two time modules T1 and T2 of the capacity of 512 and 1024 digital channels with the speed of 64 kbit/s and two spatial modules of the capacity of (16 × 16),

(8 × 15) LTG;

The efficiency was calculated (cost of the single digital channel in eq.s.p.) for all built SFs [3];

Results of the calculations shown in table 2.

Table 2

Efficiency indicators of the three-link TST SF

i - number of the switching field	1	2	3	4	5
Capacity SF, (LTG)	[16×16] (i=1)	[64×64] (i=2)	[128×128] (i=3)	[256×256] (i=4)	[512×512] (i=5)
Capacity SF, channels	(2048×2048)	(8192×8192)	(16384×16384)	(32768×32768)	(65536×65536)
K mod(3d,1), mod.	4	16	32	64	128
K mod(3d,2), mod.	2	8	16	32	64
P 3d,1, eq.s.p.	1034,24	4137	8273,9	16547	33096
P 3d,2, eq.s.p.	1075	43	8601,6	17203	34406

As a result of the received data analysis it was shown that:

- single-link SFs of small capacity are the most efficient, however their structure requires custom, as for the EWSD, solutions during the construction.

- three-link SFs are efficient at low and medium capacity. Although the efficiency of three-link SFs at the cost of 1 digital channel remains unchanged at any capacity, at high capacity the use of the three-link SFs is inefficient due to the deterioration of the switching quality (the internal blockage emerges);

- fife-link SFs are effectively built only at high capacity of the switching fields. In this case fife-link SFs are ten times cheaper than the single-link SFs and 1.5 times more expensive than the three-link SFs, but their quality is much better than previous one's;

- the capacity of the time modules T1 and T2 greatly affects the efficiency only in single-link SFs, the efficiency in these SFs increases in 1,6-2 times with the increase in capacity of modules T in 2 times. With the use of T1 or T2 in two-link and fife-link SF the effectiveness varies to 1-5%;

III. Conclusion

Medium and small telephone stations with a capacity SN: 63LTG and SN:15LTG have three leading switching fields with T-S-T structure, at high capacity (SN:504LTG, SN:252LTG, SN:126LTG) switching field has five leading structure T-S-S-S-T.

The construction of any SF used only two time switching modules TS (with capacity of 512 channels and 1024 channels) and three spatial switching modules SSM (SM8/15, SM15/8, SM16) (with capacity (8x15), (15x8), (16x16) of inlet/outlet linear groups LTG.

The results of the work that are covered in the report allow us to analyze the efficiency of the SF and other digital switching systems.

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