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SUPPLEMENT TO THE PROPOSAL FOR AN EJECTION MAINTENANCE ASSISTANT SYSTEM (E.M.A.S.)

H. Kugler

Although none of the major statements of the above mentioned proposal has changed, some supplements to it become necessary due to:

a) the fact that the FAK comes into play
b) the work invested in structuring of the future multi-computer system of the PS.

In addition, a more detailed description of the system as well as the computer configuration which will be commanded is given.

Tasks of an E.M.A.S.

The tasks of an E.M.A.S. are again briefly summarized here: The insufficiency of the protection of ejection hardware by simple interlock actions is evident, so the maintenance system will achieve a steady surveillance (in time intervals of 100 ms) of all parameters being essential for any operation of septa, kickers and their power supplies.

Surveillance means parameter memorization, checks, diagnostics and control of components of the system in the case of slow deteriotation

of quality to allow optimal system performance, to give alarm to the operator in the MCR in case of malfunctioning which cannot automatically be eliminated by the E.M.A.S.

Improvements of the operation (as well as fast running-in of repaired or new components) of this hardware ensemble depend strongly on the possibility to study parameter behaviors systematically. The E.M.A.S. will allow to run the necessary programs simultaneously to the steady surveillance, at times only defined by the maintenance staff.

The following timing scheme will give an idea of simultaneous handling of protection, maintenance and controls (ref. fig. 1). During the scan interval of 100 ms the computer will run (after the input of all parameters from the DTS into computer store (1)) a fixed surveillance program (2) concerning the most critical parameters which must be treated every 100 ms. After this it will check the M-pulse (3) at which the scan took place and run a second part of surveillance procedure (4), the rest of the time is foreseen for special programs and controls (MCR) (5).

FAK Controls, Protection and Maintenance

During the phase of implantation of the FAK into the PS it will become part of the ejection hardware. Therefore the following tasks to guarantee optimal operation, protections and maintenance have to be governed by the future system. This set of tasks was established by an intensive cooperation of SR's FAK and Ejection Section.

1. PFN-voltage surveillance and memorization per PS-cycle.
2. Surveillance and memorization of faulty thyratron shots for MAIN- as well as DUMP-switches per PS-cycle in correlation to shot modus.
3. Surveillance and memorization of short pulses in the magnet per module correlated to the M-train.

4. Calculations of kick strength per ejection zone.
5. Early warnings due to malfunctions measured and pre-diagnosed (e.g. thyratron jitter out of $\pm$ 5 ns range).
6. Setting of kicker moduls (voltages, timing, e.g. setting number of bunches to be ejected). with simultaneous system surveillance.
7. Surveillance and control of slowly changing parameters (e.g.: system cooling, SF_6-household).
8. Optimization of kicker modules to fit PS ejection cycle.
9. Fully (PS) independent runs of tests and maintenance programs.
10. Surveillance of interlock status.

Some Remarks on the Future PS Multi-Computer-System

The future structure of the PS multi-computer system for controls and other tasks will consist of a "core" like the IBM 1800 and several "intelligent peripherals" where low-level detailed control tasks are handled in the peripherals. The proposed E.M.A.S. will take this structure into account. The timing scheme (fig. 1) shows that during (5) the system works as peripheral for controls.

Taking into consideration the development of the DTS and the future structure of the PS computer system leads to the E.M.A.S. system given in fig. 2.

The construction of the power-supply current monitor as well as command boxes to control the hardware components was finished at the end of last year.

Extensions to implant 10 further data-inputs and controls (e.g. for FAK) are under design.

Conclusions

The present situation is as follows:

1. Our project is in complete accordance with the PS improvement plans [1,2,3,5].
2. It can treat all tasks (control as well as maintenance),
3. It is in a very advanced state (the PDP 11 can be implanted in the already existing data transmission system (DTS) within one year .
4. The future design and construction of FAK controls not being in coincidence with a computer oriented system can only be avoided if a straight forward construction of the E.M.A.S. is guaranteed.
5. The straight forward development is further stressed by the work-load distribution of the next years (the future work-load of the SR Group can easily be extracted from [4]).

References:

1. O. Barbalat : The PS Machine Development Program CERN/MPS/DL 71-10
2. H. van der Beken, Ch. Serre : Minutes of a Meeting of Discussions on Structures of Multi-Computer Systems and Computer Selections. MPS/CO; 4.10.71
3. H. Kugler, W. Remmer, U. Tallgren : Choice of a Standardized Mini-Computer for the PS Department. MPS/CO; 17.11.71
4. G. Plass : A Survey of PS Utilization in the Forthcoming Years. MPS/SR/Note 70-21.
5. J.H.B. Madsen : Minutes of a Meeting of 11.1.1972, Report on the Future PS Control System (in preparation).

Fig. 1: Timing scheme of E.M.A.S.

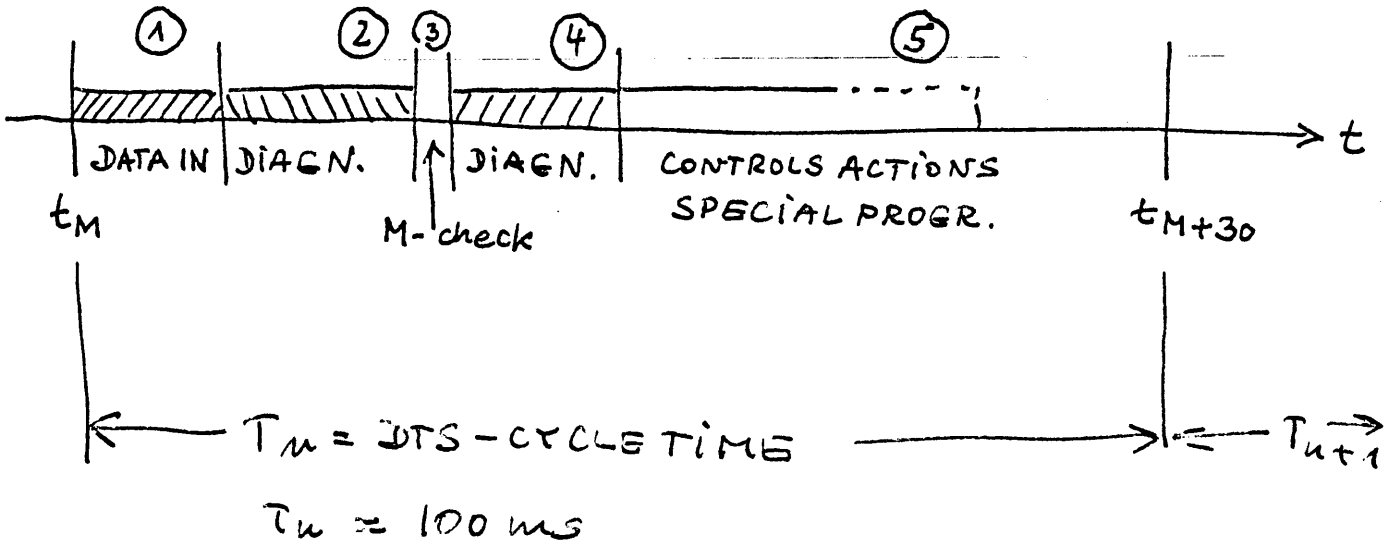
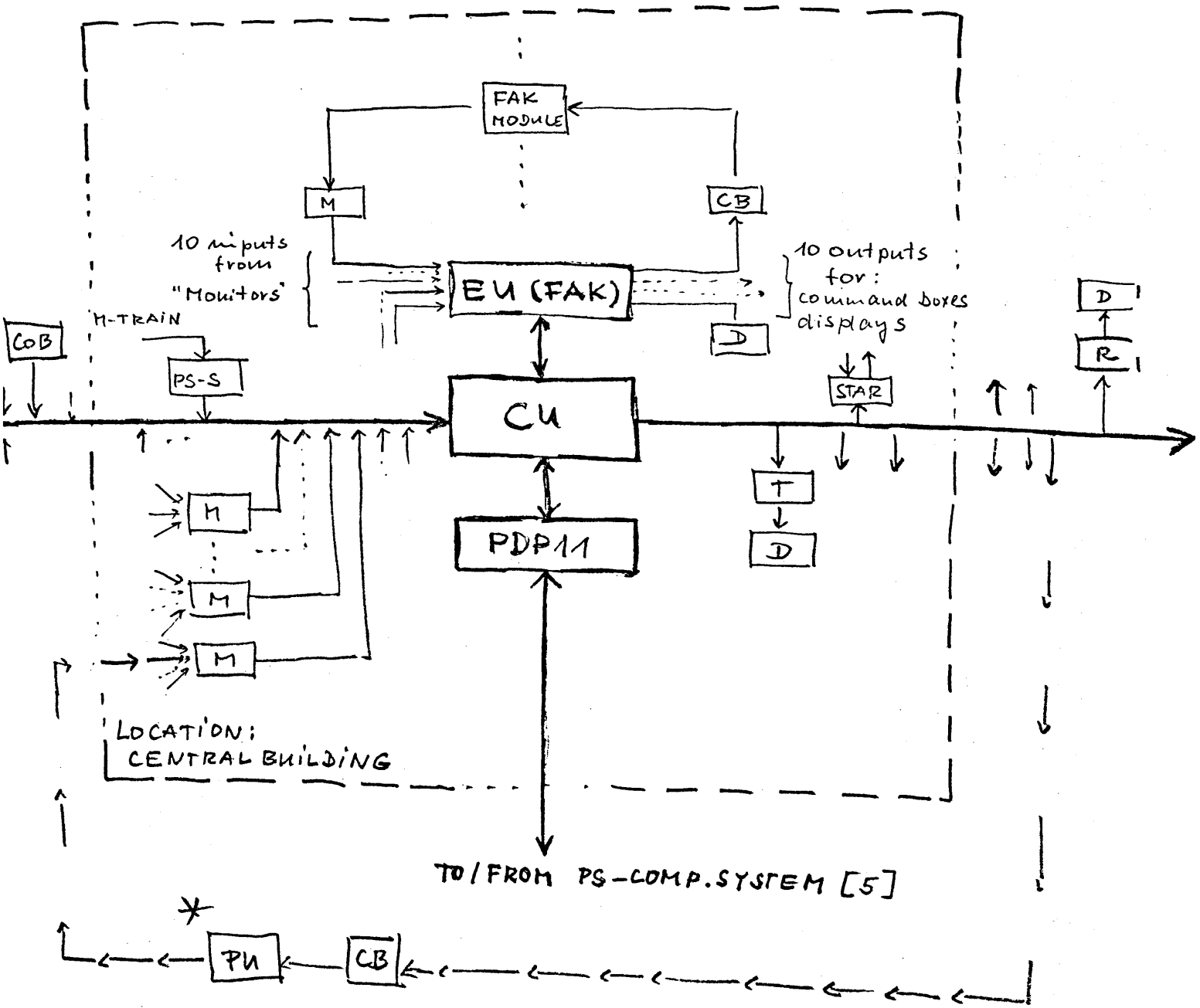


Fig. 2: Structure of the system



CU	:	Central Unit DTS
T	:	Transmitter
R	:	Receiver
D	:	Display
M	:	Monitor
CB	:	Command Box
CoB	:	Control Box
PS-S	:	PS-Synchronizer
EU	:	Extension Unit
PU	:	Physical Unit (e.g. septa, power supplies)
*	:	Example for a closed loop

Comparison of PDP 11/20 and 11/45

One of the following PDP 11 configurations is needed:

PDP 11/20	CU + 4 K Memory (950 ns) + LA 30 Decwriter + Power Supply + Cabinet	62.547
	4 K Memory (950 ns)	16.100
	Memory Protection	27.600
	Extended Arithmetic Unit	8.280
	Programmable Realtime Clock	2.760
	Reader + Puncher PC 11 + Transfo H 722	18.400
	Extension Mounting Box	1.840
	Power Supply	2.760
	Unibus Connector Modules	396
	Interface Blank	396
	Unibus Cable	880
	Unibus Cable	396
		142.355
		14.236 (-10%)
		128.119
PDP 11/45	CU + LA 30 Decwriter + Power Supply + Cabinet	69.447
	8 K Memory (850 ns)	26.220
	Memory Protection	17.940
	Programmable Realtime Clock	2.760
	Reader + Puncher PC 11 + Transfo H. 722	18.400
	Interface Blank	396
	Unibus Connector Modules	396
	Unibus Cable	880
	Unibus Cable	396
		136.835
		13.683 (-10%)
		123.152

Comparing the prices and taking into account the higher speed, and flexibility the PDP 11/45 is considered to be the better choice.