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COMMENTS ON THE CHANGE-OVER OF THE PS COMPUTER STRUCTURE

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The structure of the future PS computer system has to simplify and improve the PS process control and operation. In this statement lies the only justification for the whole computerization project.

In the following we describe the scheme of a system structure to be aimed at and a possible way of changeover into this direction.

Some trends in the computer control of the PS are obvious. On one hand the whole PS process is split into many subprocesses and the tasks are delegated software- and hardwarewise. On the other hand, the subprocesses have to be efficiently coordinated, supervised and optimized by a computer director. This leads to a simple hierarchic structure (Fig. 1) as also proposed for the 300 GeV project.

Each subprocess is connected to its own real time processor (RTP) via a relevant data transmission system (STAR, DTS, etc.). The main tasks at the RTP level are hardware control, processing of data, generation of warning keywords and other messages and management of man-subprocess interfacing via local displays. The RTP's are interconnected with each other and with the supervisor level computer(s) (SVC) by a link system through which commands and data of general interest are transferred as well as special messages and core loads (e.g. complete software programs). This LINK system could have a "DALTON" like structure[1)] or a layout as proposed by J. Cuperus[2)]. It is, however, a link between computers only and not a link between computers and their real-time processes. Versus the high level SVC, the RTP's act like filters which keep back all information necessary only at the subprocess level, unless specifically requested. Then the SVC(s) has mainly to deal with extracts of information and can efficiently concentrate on the tasks of overall PS program organization, link and message switching control, active control of subprocesses, diagnostic and generation of general warnings.

The changeover from the present situation to such a structure could conform to the following steps and phases (Fig. 2,3):

Step 1 : The LINAC part of the existing STAR is separated from the IBM 1800 and implanted into the LINAC computer, IBM 1800 and PDP 11/45 (LINAC) communicate via LINK. A switch between the existing STAR and the new LINAC STAR master could facilitate tests during the changeover period.

During the first stage, the measurement computer (MC) should serve for program development only. The PS and BOOSTER processes stay in the IBM 1800 (via STAR). The major part of the ejection will be treated by the Ejection Computer via DTS.

In a later stage the MC should take over beam diagnostic data handling and other tasks[3)]. Then it should be directly connected to the appropriate processes via a separate data transmission system (e.g. MINI STAR).

Step 2 : In the second phase, the LINK control and other supervisor tasks could be handled by one or more separate computers. Subprocesses like RF, timing, PS power, PS beam diagnostics are delegated to separate RTP's. The BOOSTER process can remain in the IBM 1800 or be delegated to another RTP.

Step 1 immediately requires a heavy effort in hard- and software work and implies therefore a certain risk. A well planned concentrated effort would be required in order to manage the switch-over.

Due to this constraint, a solution was launched by E. Asseo[1)], where STAR will be cut as a whole block from the IBM 1800 and directly connected to the "DALTON" interface system. STAR would be simultaneously accessible from the LINAC computer, the IBM 1800 and the MC. Then, from our point of view, one has the choice between two alternatives :

A. This system represents only an intermediate solution ending up later in a structure similar to the one we described above. This means :

1. A lot of hardware work is nevertheless necessary to cut STAR from the IBM 1800 and to hang it onto "DALTON".

2. An eventual redistribution of STAR connected subprocesses onto separate RTP's involves all the painful hardware manipulations necessary in case of an immediate separation and shifts the troubles only to a later stage.

3. During the period of this type of changeover, the software development always has to follow two lines :

   a) for a system with processes accessed via STAR and "DALTON",

   b) for a system with processes stepwise delegated to their appropriate RTP's.

   This implies a constant software work load on the SVC and RTP level.

4. Data fluxes of communication (filtered information) <u>and</u> real-time information (subprocess oriented) are superimposed in the switching matrix until the final stage is reached.

B. The proposed "DALTON" system is already the final solution. For the future, the major part of the whole PS process will be directly connected to the switching matrix via STAR. Here objections are made for the following reasons :

1. One has always to live with the mixture of communication and real-time data and hence with a complex software in the message switching computer, especially in view of additional RTP's in the future.

2. The risk of faulty "over-writing" of information from an RTP to a not appropriate real-time process is considerably higher than in a clear hierarchic structure.

3. With increasing numbers of RTP's the danger of slowing down the real-time data flux is growing.

4. Each implantation of a new computer asks for modification of a good deal of the system software.

5. If new subprocesses like timing have to be added, it must be decided whether to feed the additional real-time data directly into the corresponding RTP or to transfer them by STAR via the switching matrix. In the first case, a RTP might have to get its real-time data through more than one data channel (e. g. "DALTON" linked STAR and RTP linked STAR or another data transmission system) hence, seen from the RTP, the data transfer structure is "inhomogeneous".

   The second case contradicts the trend of delegation of tasks and restricts the future use of more efficient commercial data transmission systems.

Conclusions

This note could serve as a basis for future discussions. The type of final structure proposed here can fulfill subprocess real-time tasks optimally as well as it simplifies the overall system organization. It seems that these requirements cannot be satisfied to the same degree by the solution discussed up to now in the PS Controls Committee. As an intermediate configuration during the change-over period, the latter concept may render more difficult the development in direction of a healthy definite PS multicomputer structure.

References

1. Structure Multicoordinateur au PS, E. Asséo, MPS/CO Electronique 72-6.

2. An alternative proposal for the PS process control computer link. J.H. Cupérus, CERN/PS/FES/73-1.

3. Commentary on Project "The Expansion of the PS Control System", J.H.B. Madsen, MPS/CO-Note 72-42.

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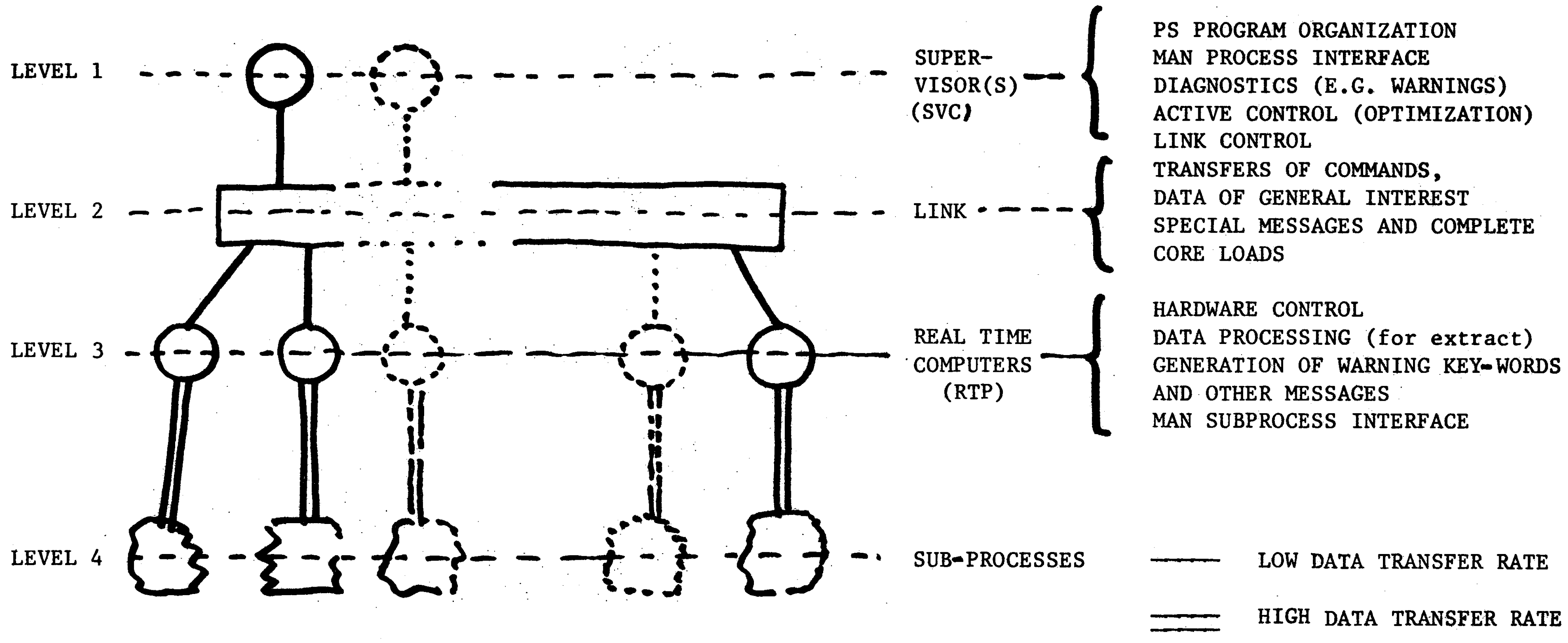
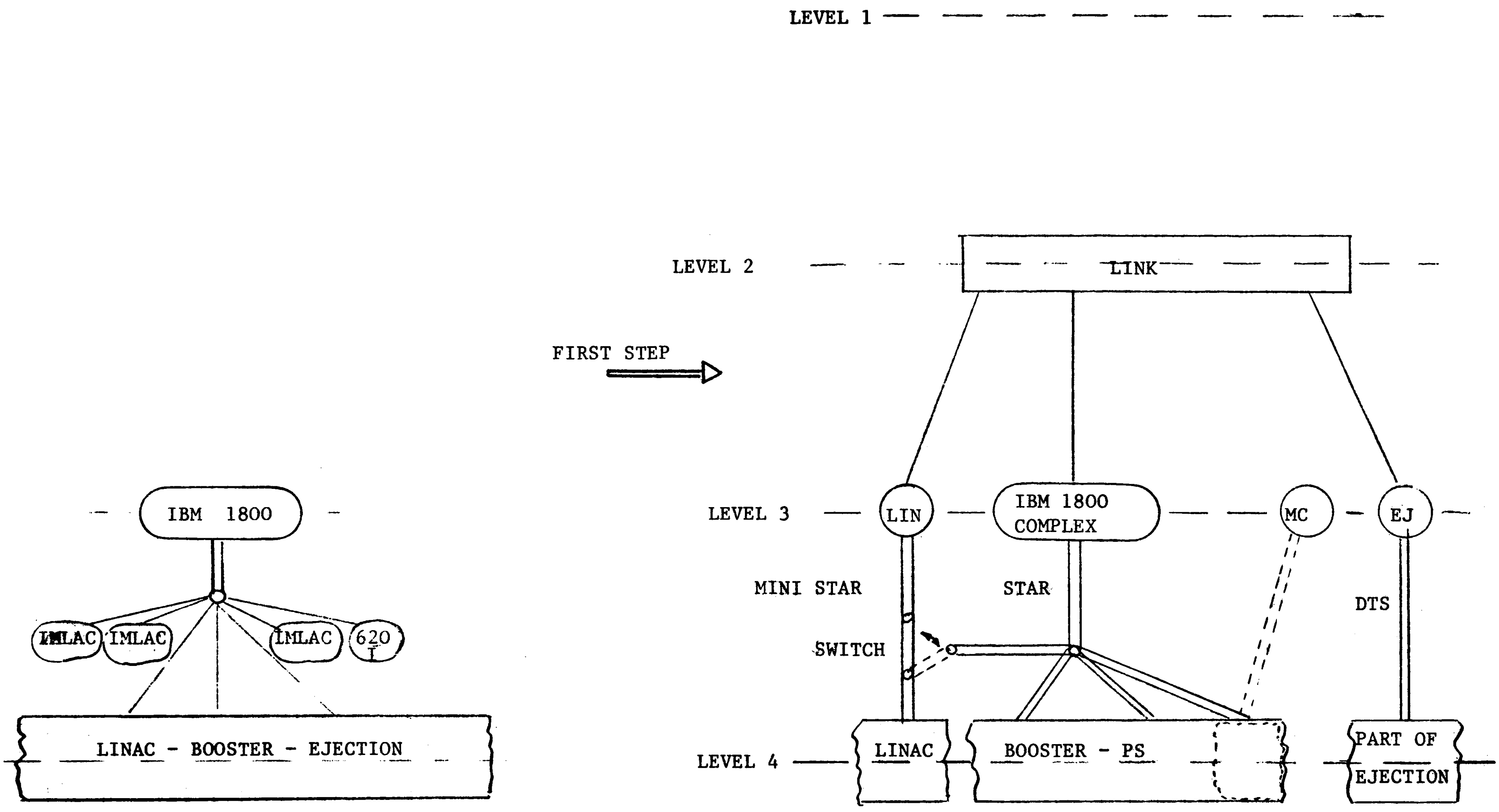


Fig. 1 : Hierarchic Structure in a Multi Computer System



PRESENT STATE

NEXT STATE

FIG. 2 FIRST STEP OF CHANGE-OVER

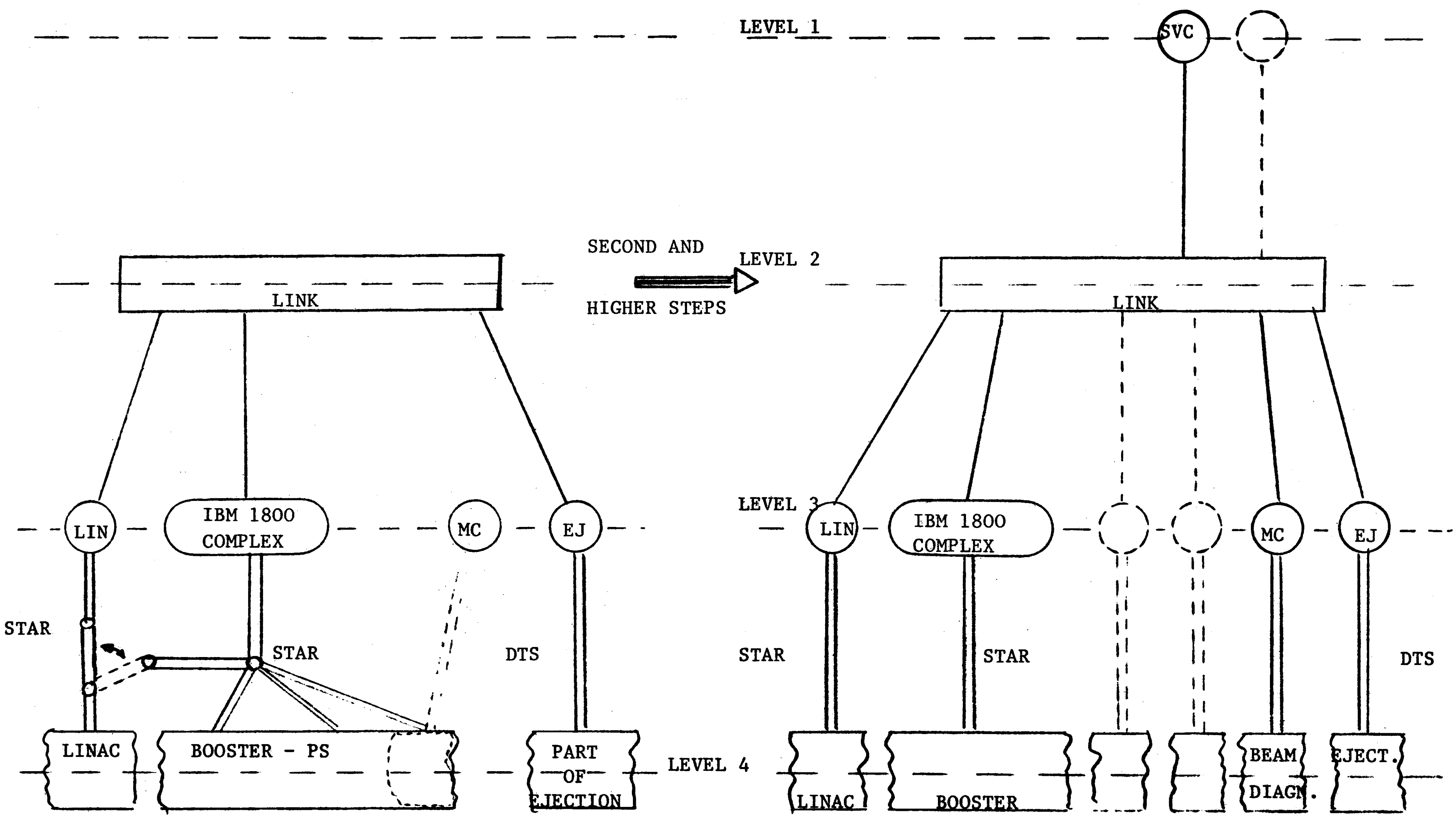


FIG. 3 : SECOND AND HIGHER STEPS OF CHANGEOVER