THE DESIGN OF THE GIER ALGOL COMPILER

PART I

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Abstract.

The report gives a full description of the design of an ALGOL 60 system for the GIER, a machine having 1024 words of cores and 12800 words on drum. An introductory section gives the historical perspective of the design and the principal characteristics of the machine. The second section discusses the problems of the running ALGOL program: storage allocation and addressing of variables, program references, procedure calls, and the automatic administration of transfers of program segments from the drum to the core store.

The second part of the report will describe the translator, and the performance of the system.

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1. Introduction.

GIER ALGOL is an ALGOL compiler written for the medium size computer GIER manufactured by Regnecentralen, Copenhagen.

The compiler was first distributed in a slightly restricted form in September 1962. A final version was distributed in February 1963. By
this time it had become the dominating programming language for the machine in most of the installations.

The language of GIER ALGOL is ALGOL 60 except for the omission of integers as labels, arrays called by value, and own arrays. Input and output (including transfers of variables between the magnetic drum and the core store) are controlled by means of standard procedures. A full description of the language is given in the published manual (Ref. 2).

In the following the design of the system and compiler is discussed in some detail. Some information on the performance is also given. Since the purpose is to give a clear picture of the over-all design the discussion is not confined to the points where the system deviates from designs described elsewhere in the literature.

2. Background of the project.

2.1. Historical notes.

The GIER ALGOL design has been influenced by a variety of other projects. To put the description in its proper perspective it is helpful to give a brief historical account of the development of our ideas during the years 1959 to 1961.

Our first exposure to compiler techniques came from Professors F. L. Bauer and K. Samelson of the University of Mainz, Germany, the leaders of the ALCOR group. In June 1959 P. Mondrup and W. Heise of Regnekcentralen spent a few days at Mainz and had the opportunity of studying the sequential techniques developed there (Ref. 9). These techniques were adapted to our machine DASK by P. Mondrup and form the main frame of the DASK ALGOL compiler completed in late 1961.

In the meantime we became increasingly aware of the problems inherent in the ALGOL procedure concept and of the incompleteness of the description of procedures given in the Zürich ALGOL report (ALGOL 58). We raised this problem within the ALCOR group in December 1959, but were disappointed to find that the other members of this group did not seem prepared to take a common stand in the problem. Fortunately the problem was cleared in ALGOL 60 and during the time which followed we developed the scheme for handling the ALGOL 60 name concept which was used in DASK ALGOL (Ref. 3).

In March 1960 we opened an active personal contact with Prof. A. van Wijngaarden, Dr. E. W. Dijkstra, and Mr. J. A. Zonneveld of the Stichting Mathematical Center of Amsterdam, Netherlands, who came to spend a few days of informal discussions with us. These discussions showed that both groups independently had arrived at the same conclu-