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A package for paper-tape reader and punch

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ABSTRACT. A software package programme, developed for paper-tape reader and punch, translates messages from ITA No. 2 Code to EBCDIC (Extended Binary Coded Decimal Interchange Code). The code used by the system IBM 360/44, sorts out and edits the message and introduces any missing groups or deletes superfluous groups. It also takes care of adjusting the blanks and the size of the groups so as to bring each message into a standard format. Incomplete groups, wherever, cannot be properly determined, are filled with slashes, and finally, the messages in EBCDIC adjusted to standard WMO format are written on magnetic tape.

The second programme for the paper-tape punch is a reverse process wherein the messages in EBCDIC are translated into ITA No. 2 paper-tape code. Necessary control characters are introduced as the message warrants.

1. Introduction

National as well as International Meteorological messages are exchanged the world over on telecommunication network in the ITA No. 2 code, a 5-unit code and received on paper-tape. The Scientific Computer IBM 360 Model 44 installed at Meteorological Office, New Delhi has been provided with a fast paper-tape reader as well as a paper-tape punch for the exchange of all the Meteorological messages. This necessitated developing of a software package specially for meteorological environment. The meteorological messages read from the paper-tape are converted into EBCDIC and suitably processed for the purpose of machine analysis and prognosis of the weather charts. The results of the machine analysis and the forecasts which are now in EBCDIC, are converted into ITA No. 2 code for transmission to various national and international Meteorological Centres over T/P circuits.

In this paper, we have presented two main programmes which carry out the above job. In Section I of the first programme the messages from the paper tape are translated from ITA No. 2 code to EBCDIC. In the second section, these messages are sorted out and only the selected ones are accepted and edited by introducing the missing groups, if any. Section III of the programme takes care of adjusting the blanks and sizes of various groups. It then scans the whole message and organises it into a standard format. Incomplete groups, wherever cannot be properly determined are filled up with slashes. The messages in EBCDIC adjusted to the standard World Meteorological Organisation (WMO) format are then written on magnetic tape.

The second programme is with regard to the paper-tape punch. It is a reverse process in which the computer output in EBCDIC is translated into ITA No. 2 paper tape code. The programme takes care of the introduction of control signals like carriage return, line feed and letter shift or figure shift as required. To economise the length of the tape, lines completely blank as also the contiguous blanks coming in the end of a line are eliminated. In the following sections, we shall discuss certain salient features of these programmes.

2. Details of the programme

2.1. *First Programme*

We present the flow chart of the first programme in Fig. 1(a-c) which brings out its broad aspects in three different sections :

2.1.1. *Section I* (Fig. 1 a) — This part of the programme basically translates the messages from ITA No. 2 code into EBCDIC. For this purpose we have organised two tables which have one to one correspondence for the two codes. The first table is for the alphabets and the other for the numerals and special characters. Control characters (in the ITA No. 2 code) indicating letter shift and figure shift are utilized for the selection of the table; whereas characters line feed and carriage return are utilized for the purpose of grouping the various logical records of 72 characters each, corresponding to every line feed. However, all these control signals as well as non-convertable characters such as 'bell' etc. are either eliminated or translated into 'blanks' in the EBCDIC. Further to facilitate the future processing of the

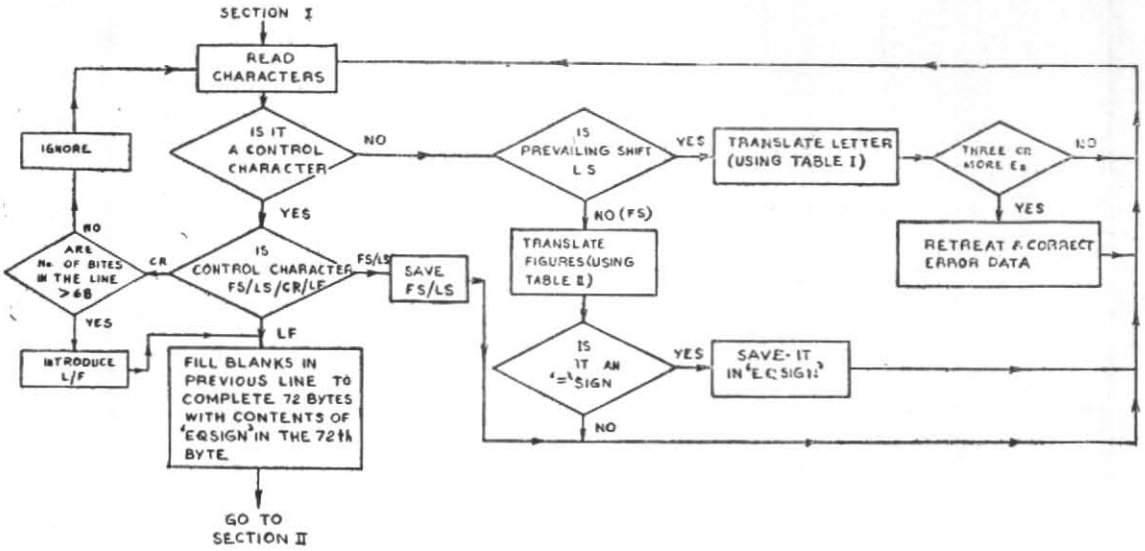

Fig. 1(a). Section I

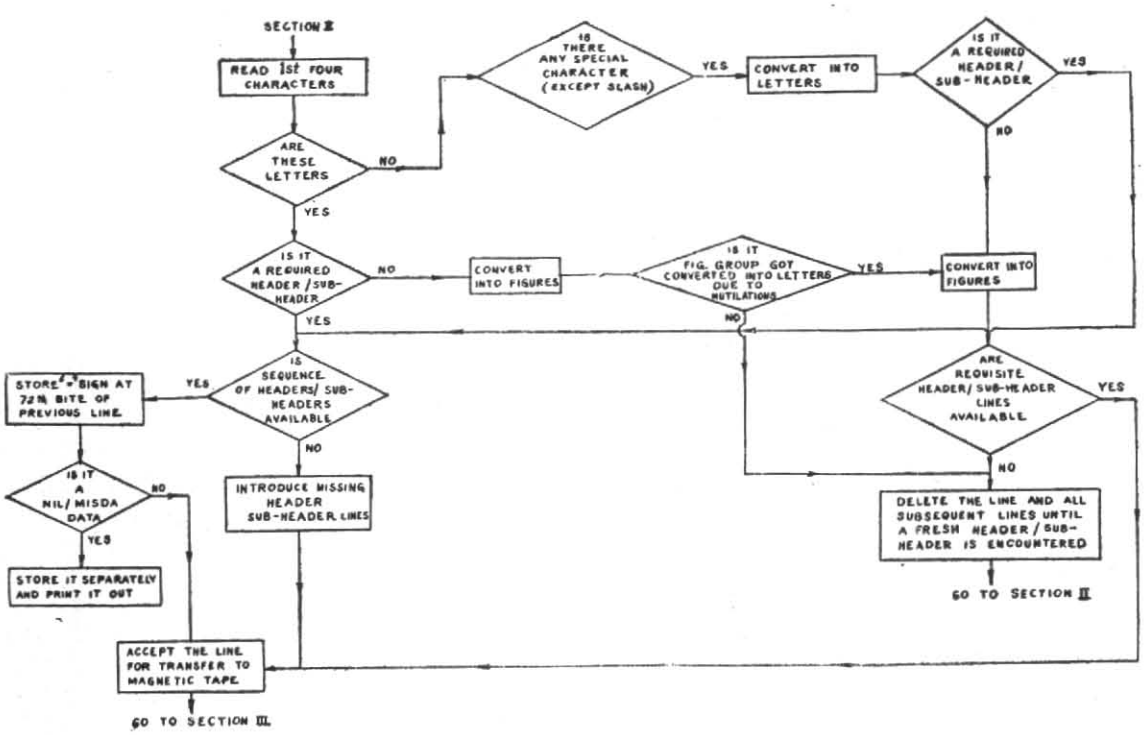

Fig. 1(b). Section II

data, as soon as a line feed is encountered or introduced as warranted by the carriage return, the previous line is filled with requisite number of 'blanks' so as to make a logical record of 72 characters inclusive of the last byte which is filled with an '=' sign for the purpose of identification, if this be the end of an individual message. In case an '=' sign is encountered anywhere in the message, it is saved and brought on to the 72th byte. As will be clear from the following paragraphs, we are making fixed length blocks of 360 bytes each, to be written on the magnetic tape.

With experience it is noticed that sometimes while the message is being transmitted, the operator realising the wrong transmission of a group, adopts the practice of correcting it by an indicator group, EEE (with 'blanks' in between) followed by the correct group. Sometimes, through oversight or otherwise more than three Es are encountered with no 'blanks' or more than one blank in between. The programme, therefore, provides for erasing the Es (in all such cases) as well as the preceding erroneous group and then replacing the same with correct data which follows.

2.1.2. *Section II* (Fig. 1 b) — This section of the programme checks the first 4 characters out of the logical record of 72 organised in Section I, in order to recognise the various identification headers. In the meteorological telecommunication procedure for global exchange there is a systematic follow up of various headings such as Synop code, Pilot code, Temp. code etc. The sequence of the header and sub-headers are different for different meteorological messages and have been properly taken care of. Thus in case the first of the four characters is an alphabet, it compares the headings to various indicator groups such as ZCZC, or any sub-header, *viz.*, SM, US, UP etc. In case the header or any sub-header or even the end of message group (*i.e.*, NNNN) is missing in full or part of it, but the contents of the message testify and warrant its presence, it is created at the appropriate position to complete the required sequence. Part of the subsidiary group headings (MM, XX, PP, TT etc.) if missing but with the sub-headers and head-line conforming to it, is also created to complete it.

Special care has been taken to retrieve any header-line which due to mutilation might have got converted into figures or *vice-versa*, by reconverting it into its possible original form, and then accepting or rejecting the same as the message warrants. Letters occurring within a message

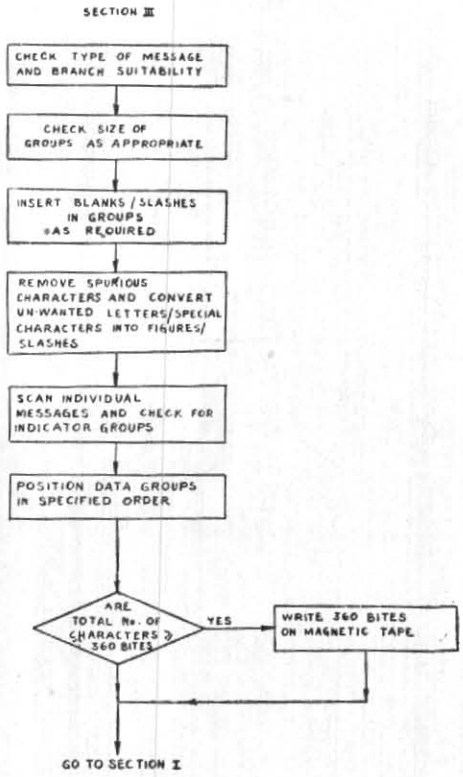

Fig. 1(c). Section III

in unwanted locations due to mutilations are also converted into figures or slashes.

If the 'header' and 'sub-header' tests made in Section II do not react favourably for acceptance, the whole line (including the four characters under test) and all subsequent lines are deleted straightaway (*i.e.*, without even their conversion into EBCDIC so as to save time) till a fresh header or sub-header is encountered when the control jumps to Section I. Provision has also been made to collect separately the NIL or MISDA data and print it out without writing it on magnetic tape.

2.1.3. *Section III* — In this section the size of various groups is adjusted to the standard format (*see* Saxena *et al.* on pp. 302-308 of this issue). Due insertion of blanks is done between the groups, if wanting, and superfluous blanks if existing, are deleted. Incomplete groups are made up by inserting slashes. The lines thus get standardised to the WMO format (Fig. 1c).

Here, the data is also thoroughly checked for various standard indicator figures within a message say 99,88,77 (or the pressure level indicator figures like 85,70 etc.) to be available in appropriate sequence and locations (or close to it due to possible mutilations) and then stored along with the

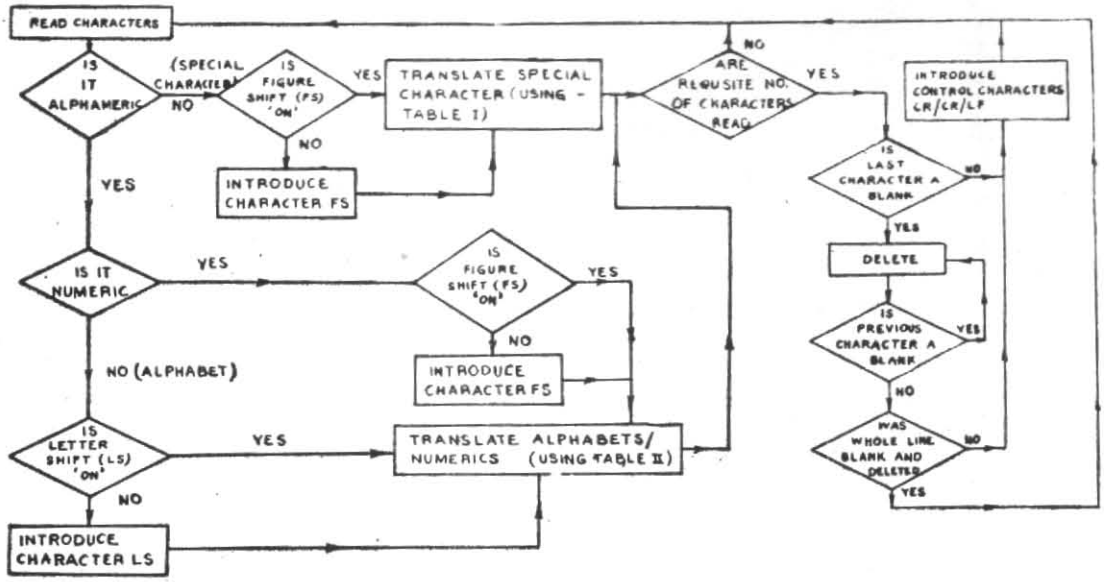

Fig. 2

attached groups into predetermined specific locations of the message, for convenience in subsequent processing of the data. Any gross mutilations are discarded here. The final output is grouped into 5 logical records of 72 characters each, thus making fixed length blocks of 360 bytes, which are written on the magnetic tape. These messages, now duly sorted and edited in the specific predetermined format, are ready for processing for machine analysis.

2.2. *Second Programme*

In Fig. 2 we present the flow chart for the second programme which has the capability of translating the output product of system 360/44 into Standard ITA No. 2 code. Similar to the first programme, but in the reverse fashion, we have set-up two tables of equivalences; the only difference being that, here one table is the equivalence of all the alphabets and numerals, whereas, the other table is for special characters only. Various control signals required for proper T/P transmission, *viz.*, carriage return, line feed, letter shift and figure shift are introduced as and when required.

Here again, like the first programme, provision has been made to translate the non-convertible EBCDIC characters, if any, into 'blanks' for the ITA No. 2 code. Provision has also been kept to delete any completely blank line if existed in the input, and also all the contiguous blanks coming in the end of a line, to avoid wastage of the paper tape.

3. Remarks

The programmes which are written in 360 assembler language under 44 PS have been tested on real time basis and are put on routine operational use.

Though this software package has been designed specifically for the meteorological users, it is of a general nature, lucid and simple and can be used in any paper-tape environment with some modifications.

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