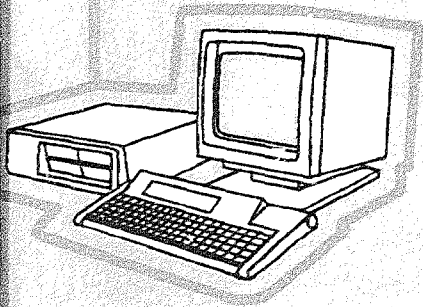


COMPUTER
MANUAL
SERIES

No.1

MicroPRIS User's Guide

A VERSION OF THE
POWER REACTOR INFORMATION SYSTEM (PRIS)
FOR PC USERS



COMPUTER MANUAL SERIES No.1

MicroPRIS USER'S GUIDE

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FOREWORD

Since the very beginning of commercial operation of nuclear power plants, the nuclear power industry worldwide has accumulated more than 5600 reactor years of experience. The IAEA has been collecting operating experience data for nuclear power plants since 1970 which were computerized in 1980.

In parallel with the on-line system, the IAEA has announced a new service - MicroPRIS, which is a PC version of PRIS data published on diskette in a form readily accessible by standard commercially available personal computer packages. The product is a result of a project which started in the middle of 1989 on the basis of a research contract signed between the IAEA and the Nuclear Information Centre of the Czechoslovak Atomic Energy Commission.

The aim of this publication is to provide the users of the PC version of PRIS data with description of the subset of the full PRIS database contained in MicroPRIS (release 1990), description of files and file structures, field descriptions and definitions, extraction and selection guide and with the method of calculation of a number of important performance indicators used by the IAEA.

EDITORIAL NOTE

In preparing this material for the press, staff of the International Atomic Energy Agency have mounted and paginated the original manuscripts and given some attention to presentation.

The views expressed do not necessarily reflect those of the governments of the Member States or organizations under whose auspices the manuscripts were produced.

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1. INTRODUCTION

1.1 MicroPRIS philosophy

MicroPRIS is a new service of the IAEA Power Reactor Information System (PRIS) for the Member States of the IAEA. MicroPRIS makes the IAEA database on nuclear power plants and their operating experience available to Member States on computer diskettes in a form readily accessible by standard commercially available personal computer packages.

MicroPRIS is not the only way for Member States to access the PRIS database. In 1989 the PRIS database was made available on-line for direct access via the telephone system. While this on-line access has been successfully implemented, the access to the mainframe database management system where PRIS resides involves the learning of a computer language (Natural). Further, connections on-line can involve expensive telephone connect charges.

Consequently the IAEA decided to offer, in parallel with the on-line system, a service for use on personal computers. MicroPRIS consists of a set of PC diskettes containing a subset of the full PRIS database and a selection and conversion program to enable the selection of all or part of the data and convert it into either spreadsheet format (Lotus 1-2-3) or a standard PC database format (dBase III format).

The intention is that the user of MicroPRIS can use either spreadsheet or PC database tools to further manipulate the data. Using tools with which the user is already familiar will obviate the otherwise necessary process of learning a new computer language. Likewise using a local PC should be cheaper than investing in computer links with the mainframe computer in Vienna.

1.2 Coverage of MicroPRIS

MicroPRIS does not contain the full set of data contained in PRIS.

- Firstly, PRIS contains calculated fields. An example of a calculated field would be the annual load factor of a nuclear power plant. Calculated fields are present in PRIS as a convenience for

the on-line users but they all can be derived from other fields in the database record. For MicroPRIS the user will be expected to perform these calculations himself. Elimination of calculated fields reduce the size of the MicroPRIS files considerably and therefore reduces the number of diskettes needed to contain MicroPRIS.

- Secondly, MicroPRIS does not contain monthly production data. In the experience of the IAEA in over 10 years of using the PRIS database, monthly production values are seldom used. Including monthly data in MicroPRIS would increase the storage requirements over tenfold. Should monthly data be required in the future by the users of MicroPRIS, then the IAEA will reconsider the matter.

- Some of the design parameters of nuclear power plants have not been included in the MicroPRIS version. This is a decision taken for the first issues of MicroPRIS only. The design data fields are currently under review by the IAEA both as to quality of the data and also with a view to including more fields. When this review is complete, then these fields will be added to MicroPRIS.

Although MicroPRIS does contain less than its 'parent' mainframe database, the IAEA feels that fields included are those that will be of most use to the Member States. MicroPRIS will be reviewed regularly in the light of the comments and requirements of the Member States, and will be expanded should the need arise.

2. DESCRIPTION OF FILES AND FIELDS

2.1 The STATUS file

The file contains current general information on all nuclear reactors in operation, under construction or shut down. The information includes the reactor name, the country of location, reactor status (operational, under construction or shut down), reactor type, net electrical power, plant operator, and dates of construction start, first criticality, grid connection, commercial operation, and shutdown.

The file consists of the following 14 fields:

Country	alphanumeric, 2 characters long; contains the ISO code for the country where the reactor is located. From the CODE file the user can obtain either the code for a particular country, or the country name corresponding to a particular code, or preferably a whole list of the codes and the corresponding country names.
Reactor Code	alphanumeric, up to 4 characters long; contains the reference code assigned by the country of the reactor; the code is unique within the country.
Unit Code	alphanumeric; contains a unit code for stations with multiple reactors. It is used for some UK and USSR reactors and will be 'A' for the first reactor unit, 'B' for the second, etc.
Station Name	alphanumeric; contains the name of the reactor station.

Reactor Status alphanumeric, 1 character long; contains a code for the state the reactor is in, i.e., whether it is under construction, operating, or shut down. The codes are 'C' for 'under construction', 'O' for 'operational' and 'S' for shut down.

Reactor Type alphanumeric; contains a code for the reactor type in agreement with the usual classification of power reactors (e.g., 'FBR' for 'fast breeder reactor'). From the CODE file the user can obtain either the code for a particular reactor type, or the reactor type corresponding to a particular code, or preferably a whole list of the codes and their meanings.

Net Capacity numeric; records the maximum net electrical capacity of the reactor, being the maximum power it can supply. It is measured at the unit outlet terminals, i.e., after deducting the power taken by unit auxiliaries and the losses in transformers. It is given in MW(e).

Operator alphanumeric; contains a code for the organization operating the reactor. From the CODE file the user can obtain either the code for a particular operator, or the name of the operator corresponding to a particular code, or preferably a whole list of the operator codes together with the corresponding names of the organizations.

NSSS Supplier alphanumeric; contains a code for the organization that had supplied the nuclear steam supply system. From the CODE file the user can obtain either the code for a particular NSSS supplier, or the name of the supplier corresponding to a particular code,

or preferably a whole list of the NSSS supplier codes together with the corresponding names of the organizations.

The following four fields are alphanumeric and contain dates in the form YYYYMMDD where YYYY is the year, MM the month number (01 to 12) and DD the number of the day. When the day is unknown, the number is set to 00 (for example, 19790500). When also the month is unknown, the form is YYYY0000 (for example, 19810000).

Construction S[tart] contains the date at which construction of the reactor was started, as defined by the first major placing of concrete, usually for the base mat of the reactor building.

First Critical[ity] contains the date when the reactor first went critical.

Grid Connectio[n] contains the date when the reactor was (or will be, for reactors under construction) first connected to the electrical grid for supply of power.

Commercial Ope[ration] contains the date when the reactor was (or will be, for reactors under construction) handed over by the contractor to the owner and declared officially in commercial operation.

Shut Down for reactors already shut down contains the date when the reactor was officially declared shut down by the owner and taken out of operation permanently. Contains a zero for all other reactors.

2.2 The PRODUCTION file

The file contains basic information on the reactor (reactor status, type, net capacity and country of location), annual data on energy produced, planned energy loss, unplanned energy loss due to reasons internal to the plant or

external to the plant, the time the reactor was connected to the grid, the energy the reactor would have produced had it operated the whole year at full capacity, and also the total energy produced throughout the lifetime of the reactor.

The file consists of the following 15 fields:

Country	alphanumeric, 2 characters long; contains the ISO code for the country where the reactor is located. From the CODE file the user can obtain either the code for a particular country, or the country name corresponding to a particular code, or preferably a whole list of the codes and the corresponding country names.
Reactor Code	alphanumeric, up to 4 characters long; contains the reference code assigned by the country of the reactor; the code is unique within the country.
Unit Code	alphanumeric; contains a unit code for stations with multiple reactors. It is used for some UK and USSR reactors and will be 'A' for the first reactor unit, 'B' for the second, etc.
Year	alphanumeric, has the form YYYY (e.g., 1988) and specifies the year for which the energy production data apply.
Net Capacity	numeric; records the maximum net electrical capacity of the reactor, being the maximum power it can supply. It is measured at the unit outlet terminals, i.e., after deducting the power taken by unit auxiliaries and the losses in transformers. It is given in MW(e).

On-line Time	numeric; records the total number of hours in the year during which the reactor operated with breakers closed to the station bus.
Reference Peri[od]	numeric; for reactors which had been connected to the grid before the referenced year gives the total number of hours in the year (being 8784 for leap years and 8760 for other years); for reactors connected to the grid during the referenced year, the number of hours counted from the date of grid connection to the end of the year. This does not apply for some British reactors which report to PRIS on a different system (where each month is exactly 4 or 5 weeks long).
Energy Product[ion]	numeric; records the total net energy produced during the year as measured at the unit outlet terminals, and is given in GW(e)•h.
Planned Energy [Loss]	numeric; records the energy loss during the year due to planned unavailability (e.g., for refuelling or planned maintenance work); it is given in GW(e)•h.
Unplanned Ener[gy Loss]	numeric; records the energy loss during the year caused by unplanned unavailability due to causes in the plant; it is given in GW(e)•h.
External Energ[y Loss]	numeric; records the energy loss during the year caused by unplanned unavailability due to causes external to the plant; it is given in GW(e)•h.
Maximum Energy	numeric; contains calculated data: records the product of the numeric contents of fields Net Capacity and Reference Period; it is given in GW(e)•h. It is equal to the net energy the reactor would have produced had it operated for the whole reference period at maximum electrical capacity.

Lifetime Energy[Production]	numeric; records the total energy produced throughout the lifetime of the reactor to the end of the referenced year. It is given in GW(e)*h.
Reactor Status	alphanumeric, 1 character long; contains a code for the state the reactor is in, i.e., whether it is still operating or shut down. The codes are 'O' for 'operational' and 'S' for shut down. It refers to the current year.
Reactor Type	alphanumeric; contains a code for the reactor type in agreement with the usual classification of power reactors (e.g., 'FBR' for 'fast breeder reactor'). From the CODE file the user can obtain either the code for a particular reactor type, or the reactor type corresponding to a particular code, or preferably a whole list of the codes and their meanings.

2.3 The OUTAGE file

The file contains information on reported significant outages/unavailabilities. A significant outage is a power reduction resulting in a loss of energy corresponding to at least 10 hours continuous operation at maximum reactor capacity. When reported to the IAEA, however, smaller outages are also included. Stored in the file are some basic reactor data (reactor type, reactor status, country of location) and information on the starting date of the outage, on the type and extent of the outage (planned or unplanned, full or partial), on the cause of the outage and the plant system involved, the duration of the outage, and the energy lost; a short description of the outage is also given.

The file consists of the following 15 fields:

Country	alphanumeric, 2 characters long; contains the ISO code for the country where the reactor is located. From the CODE file the user can
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obtain either the code for a particular country, or the country name corresponding to a particular code, or preferably a whole list of the codes and the corresponding country names.

Reactor Code

alphanumeric, up to 4 characters long; contains the reference code assigned by the country of the reactor; the code is unique within the country.

Unit Code

alphanumeric; contains a unit code for stations with multiple reactors. It is used for some UK and USSR reactors and will be 'A' for the first reactor unit, 'B' for the second, etc.

Year

alphanumeric, has the form YYYY (e.g., 1988) and specifies the year of occurrence of the reactor outage.

Reactor Status

alphanumeric, 1 character long; contains a code for the state the reactor is in, i.e., whether it is still operating or shut down. The codes are 'O' for 'operational' and 'S' for shut down. It refers to the current year.

Reactor Type

alphanumeric; contains a code for the reactor type in agreement with the usual classification of power reactors (e.g., 'FBR' for 'fast breeder reactor'). From the CODE file the user can obtain either the code for a particular reactor type, or the reactor type corresponding to a particular code, or preferably a whole list of the codes and their meanings.

Outage Number numeric; contains the serial number assigned to an outage of a particular reactor in a particular year. Special use is made of the value zero which indicates that the outage is the first in the year but is a continuation of an outage from the previous year, and of the value 999 which indicates that the outage is the last in the year and that it continues in the next year.

Outage Date alphanumeric, has the form YYMMDD (e.g., '850512' for May 12, 1985) and contains the date when the outage started. If the date is unknown then the field will contain a zero. For an outage which is a continuation of an outage from the previous year (and for which therefore a zero is stored in field Outage Sequence), the date is set to YY0101.

Outage Type alphanumeric; contains a code specifying the type of the outage, i.e., whether the outage was

- planned, e.g., scheduled at least 1-3 months in advance, generally for refuelling or for annual maintenance work - in that case the code for the type is 'P'; or
- unplanned and caused by some equipment failure or other reason connected with the plant itself - the code for the type is then 'U'; or
- unplanned and due to some cause not attributable to the plant - the code for the type is then 'X'.

Outage Extent alphanumeric; contains a code for whether the outage was full or partial. The outage is considered full when net power is reduced to zero percent (it involves a shutdown of the reactor) and is coded with the letter 'F'.

The outage is considered partial when the available capacity is lower than the maximum net capacity, and the letter 'P' is used to code it.

Outage Cause

alphanumeric; contains a one-letter code characterizing the reason for the outage (e.g., equipment failure, operator error, refuelling, etc.). From the CODE file the user can obtain either the code for a particular outage cause, or the outage cause corresponding to a particular code, or preferably a whole list of the codes and their meaning.

Outage System

alphanumeric; for those outages which can be related to a particular reactor system (this will be the case for equipment failures, inspections, maintenance work, repairs, testing of components), contains a two-digit code for the reactor system involved. From the CODE file the user can obtain either the code for a particular reactor system, or the reactor system corresponding to a particular code, or preferably a whole list of the codes and the reactor systems.

Duration

numeric; records the duration of the outage in hours.

Energy Loss

numeric; records the amount of energy lost because of the outage. It is given in GW(e)·h.

Outage Descrip[tion]

alphanumeric; contains the first 240 characters of the verbal description (or the whole description, if it is shorter) of the outage as it is recorded in PRIS.

2.4 The CODE file

Country	alphanumeric, 2 characters long; contains the ISO code for the country the full name of which is given in field Full Form.
Reactor Status	alphanumeric, 1 character long; contains the code for the reactor state whose full specification is stored in field Full Form.
Reactor Type	alphanumeric; contains the code for reactor type (in agreement with the usual classification of power reactors) whose full specification is given in field Full Form.
Operator	alphanumeric; contains the code for the organization (operating the reactor) whose full name is given in field Full Form.
NSSS Supplier	alphanumeric; contains the code for the organization (a supplier of nuclear steam supply systems) whose full name is given in field Full Form.
Outage Type	alphanumeric; contains the code for the type of outage which is specified in field Full Form.
Outage Extent	alphanumeric; contains the code for the outage extent which is specified in field Full Form.
Outage Cause	alphanumeric; contains the code for the outage cause specified in field Full Form.
Outage System	alphanumeric; contains the code for the reactor system (to which an outage can be related) specified in field Full Form.

Full Form

alphanumeric; contains the full name corresponding to, meaning of, or specification for the code given in one of the preceding fields.

2.5 The ANNUAL file

Country

alphanumeric, 2 characters long; contains the ISO code for the country for which the values of annual production and capacity are given. From the CODE file the user can obtain either the code for a particular country, or the country name corresponding to a particular code, or a whole list of the codes and the corresponding country names.

Year

alphanumeric, has the form YYYY (e.g., 1988) and specifies the year for which the values of annual production and capacity are given.

Nuclear Prod[uction]

numeric; records the total net annual energy produced in the country by nuclear reactors, and is given in GW(e)•h.

Nuclear Cap[acity]

numeric; records the total net electrical capacity of nuclear reactors in the country, being the maximum power that can be produced in the country by nuclear reactors. It is given in MW(e).

Total Prod[uction]

numeric; records the total net annual energy produced in the country by all kinds of power generation facilities, and is given in GW(e)•h.

Total Cap[acity]

numeric; records the total net electrical capacity of power generation facilities in the country, being the maximum power that can be produced in the country by all kinds of power generation facilities. It is given in MW(e).

3. HOW TO USE THE MicroPRIS PROGRAM

3.1 Minimum requirements

- IBM PC-XT or AT or IBM PS/2 or compatible PC running MS DOS 3.0 or higher
- Hard disk with at least 5 MB of free space
- One 5 1/4" high density (1.2 MB) diskette drive or one 3 1/2" low density (720 kB) diskette drive for 1990 release

3.2 Installing MicroPRIS

- i. Decide what disk and what directories you want to use for the MicroPRIS files. (C:\MPRIS\IN\ is the default for both input and output files. If you prefer to have a separate directory for output files, you have to create it before running MicroPRIS.)
- ii. Make sure there is at least 5 MB of free space available on the selected disk.
- iii. Insert DISK 1 into the diskette drive.
- iv. Make this drive the DOS current drive (in most cases this means typing a: at the DOS prompt and pressing ENTER).
- v. Type INSTALL and press ENTER.
- vi. Follow the instructions you see on the screen, answer the questions and specify your preferences when prompted to do so. (In editing the entries you may use, if need be, the CURSOR keys and the DEL, BACKSPACE, HOME and END keys; with the INS key you can toggle between the Overwrite and Insert modes, Overwrite being the default.)
- vii. To change at any later time the drives and directories for the input and output data files and the extension for files containing spreadsheets, go to the drive and directory with the MicroPRIS system files, type INSTALL, press ENTER and answer the questions you will see on the screen.

3.3 Starting MicroPRIS

- i. Change the DOS current drive and directory to the drive and directory specified by you during installation for the MicroPRIS system files.
- ii. Type MPRIS and press the ENTER key; you will be provided with the MicroPRIS File Selection Menu.

3.4 The MicroPRIS file selection menu

The screen looks like a form containing fields you have to fill in. For some of the fields the program prompts you with a default entry, for other fields a pop-up menu will offer you a choice.

- i. The first two fields specify the drive and directory containing the PRIS data files serving as input for the MicroPRIS selection/conversion program; the second two fields specify the drive and directory where the data files resulting from the selection and conversion process will be stored. The default entries presented to you correspond to the information provided by you during installation.

To confirm the content of all four fields simply press the ESC key. To confirm an individual entry, press the ENTER key; to make changes, type over the entry using, if need be, the CURSOR RIGHT and CURSOR LEFT keys and the DEL and the BACKSPACE keys (with the INS key you can toggle between the Overwrite and Insert modes, Overwrite being the default); confirm the changed entry by pressing ENTER. (As long as you have not confirmed all four fields with ESC or the last field with ENTER, you can go back to the first field by pressing HOME.)

- ii. Having done with the first four fields (either by pressing ESC or by using the ENTER key four times), a two-line menu pops up offering you the choice between two output formats: the file of PRIS data the MicroPRIS program will create for you, can either have the format of a LOTUS spreadsheet or that of a dBASE-type data base. Use the CURSOR DOWN or CURSOR UP key to alternately highlight the two formats; confirm the highlighted selection by pressing ENTER.

- iii. Another menu pops up offering the choice of five PRIS data files serving as a source for the selection/conversion process. Use again the CURSOR DOWN or CURSOR UP key to select a file; confirm the highlighted selection with the ENTER key.
- iv. In case you have selected the Outage file, another menu will pop up offering you the choice of the starting country, i.e., you will have to specify the only or the first by alphabetical order ISO code of the country or countries to which the data pertain you are interested in. (This is to speed up the selection of data: the Outage file being split up into a number of subfiles, the MicroPRIS program will know which subfiles it is unnecessary to go through.)

Use again the CURSOR DOWN or CURSOR UP key to select the starting country ISO code; confirm the highlighted selection with the ENTER key.

- v. A window appears suggesting a name (default) for the output file which will be the result of the selection and conversion performed by MicroPRIS. You may either accept this name by pressing ENTER or change it by overwriting, using, if need be, also the CURSOR RIGHT, CURSOR LEFT, DEL and BACKSPACE keys, and the ENTER key to end the editing. An appropriate extension will automatically be added to the file name by the program: in case you have chosen the dBASE format it will be .DBF; in case you have chosen the spreadsheet format, it will be that extension which you had specified during installation (.WKS, .WK1, .WR1, etc.).
- vi. Now you have made all selections for the File Selection Menu. MicroPRIS asks whether the selections are OK; press Y for YES or N for NO. In case of NO you will have to go through all the fields of the File Selection Menu once again.
- vii. If your answer is YES, MicroPRIS will at first check whether in the directory for output files, a file already exists with the name you have just selected for output (this will be the case if you have accepted the default entry for the second time for the same source file). If no such file exists you will be shown another screen, the Field Selection Menu. If such a file exists a warning message will

appear and you will have to decide whether you don't object to overwriting the existing file (you will press Y) or whether you don't want the existing file to be overwritten (press N).

If your answer is Y, the existing file will be overwritten and the Field Selection Menu will appear. If it is N, the MicroPRIS program will stop and you will be put back to DOS.

3.5 The MicroPRIS field selection menu

The screen with the Field Selection Menu is divided into two parts, the upper and the lower halves. To specify the conditions for selecting PRIS data (prior to converting them into a data file whose format you have specified on the previous screen), you will fill in one or several (up to 8) lines in the lower half of the screen. The upper half you will use for setting up these lines and for specifying which data fields you are interested in.

On the top line of the screen 6 functions are offered to you by a horizontal menu; on the bottom line a hint is given of how to make your choice: use the CURSOR RIGHT or CURSOR LEFT key to highlight and the ENTER key (or the CURSOR DOWN key) to confirm your selection.

Both Condition and Selection will lead to a pop-up menu listing the names of all fields contained in the PRIS file you have chosen from the File Selection Menu (on the previous screen). The field names obtained through Condition you will use in combination with actual field values to set up selection criteria, those obtained through Selection to specify the fields required. You may simply visualize the difference: think of the PRIS file as consisting of a set of individual records, e.g., one for a particular reactor, or one for a particular year of operation of a particular reactor, or one for a particular outage of a particular reactor, etc.; then in the first instance (CONDITION), the field names are used to determine which records are to be selected (in dependence on the values of these fields), and in the second (SELECTION), which fields of these records are to be included in the output file.

- i. You will usually start with CONDITION: press ENTER or CURSOR DOWN with CONDITION highlighted. (If CONDITION is not highlighted use the CURSOR LEFT or CURSOR RIGHT to highlight it.) A window appears

prompting you to specify the three or four entries which will make up line number 1 in the lower half of the screen; the cursor blinks at the position of the first entry. The bottom line of the screen again suggests possible actions: press ENTER to make a selection of an entry, to type an entry or to edit an entry already filled in; use the PgDn or PgUp key to change the number of the line to which the window and its contents pertain (there are 8 lines available); use the DEL key to delete the contents of both the window and the corresponding line; and use the ESC key to 'close' the window and go back to the horizontal menu on the top line of the screen.

Of the four entries in the window you will have to type only the entry for Value; the other three entries you will select from the menu that will pop up for a particular entry when you press ENTER with the cursor at the position of that entry. (The cursor can be moved from one entry to another using the CURSOR DOWN or CURSOR UP key; after an entry has been filled in the cursor will move to the next one.)

SELECTION from the menus for Field name, Operator and And/Or is performed in the usual way. At first highlight the required entry using the CURSOR DOWN or CURSOR UP key. (Note that in the menu for Field name not all names can be seen at the same time.) Then confirm the selection with ENTER. The entry will appear both in the window and on the relevant line in the lower part of the screen. You can later change the entry by simply making another selection. Note that the menu for And/Or consists of three lines, the third one being blank; you can use this blank entry to delete an AND or OR operator previously put in.

To make or edit an entry for Value, press ENTER with the cursor next to Value, then start typing (you may also use the CURSOR LEFT, CURSOR RIGHT, DEL and BACKSPACE keys); finish typing with ENTER. With the INS key you can toggle between the Overwrite and the Insert mode (Overwrite is the default). Only digits will be accepted if the name of a numeric field or of a field containing a date has been entered in Field name.

For hints on how to specify values in some particular selection criteria, see part 3.6.

The three entries for Field name, Operator and Value put on one line in the lower part of the screen (by means of the window) form an elementary selection criterion. Often you will need several such elementary selection criteria connected with Boolean operators **and** and/or **or**. (For the moment, forget the necessary parentheses.) Thus, for any line which will not be the only one or the last one, you have to make an And/Or entry (i.e., select either **AND** or **OR**). After having finished one line, use the PgDn key (with the window still open) to go to the next one.

After having finished all the lines you need, either 'close' the window for Condition by pressing ESC and make another selection from the horizontal menu at the top of the screen, or use directly the CURSOR RIGHT or CURSOR LEFT key for the same purpose.

N.B. It is not absolutely necessary to specify a selection criterion. The MicroPRIS selection/conversion program will work also without any criterion; in that case it will simply take to the output file all data from the fields specified by means of Selection (and these specify you must!), and this from the whole input file without making any distinction (i.e., from all 'records' mentioned above). This might result, of course, in an inconveniently large output file, and would probably not be what you wanted.

- ii. Being familiar with the way queries for searching data bases are usually constructed using fairly simple rules of Boolean algebra, you will have noticed that one important feature has so far not been mentioned: the placing, if need be, of parentheses to 'nest' what we called elementary selection criteria. If you need to add parentheses to the set of criteria you have prepared in the previous step, select Nest from the horizontal menu (CURSOR RIGHT or LEFT, ENTER or CURSOR DOWN).

A window will appear; the cursor there can take one of four positions, and you can switch between them with the CURSOR DOWN and CURSOR UP keys (and with some others). You will use the upper two to place a parenthesis, the lower two to remove an already placed one. Press the key for one of the digits 1,...,8 with the cursor next to 'Left:', and a left parenthesis will be placed or removed at

the left of the entry for Field name, this on the line with the number you have just typed; similarly, pressing a digit with the cursor next to 'Right:' will place or remove a parenthesis at the right of the entry for Value on the corresponding line.

To quit this feature, again either 'close' the window by pressing ESC and make another selection from the horizontal menu at the top of the screen, or use directly the CURSOR RIGHT or CURSOR LEFT key for the same purpose.

- iii. The next choice in the horizontal menu is SELECTION, and this one you must use in all cases: the MicroPRIS selection/conversion program will not run without your specifying the fields of the input file from which data are to be taken to the output file. Highlight it and press ENTER or CURSOR DOWN.

A menu will pop up containing the names of all fields contained in the PRIS file you have chosen from the File Selection Menu (they are the same as for Field name under Condition). There are two ways of selecting from this menu:

- (a) Highlight the name of the field you want to select (using CURSOR DOWN or CURSOR UP) and press ENTER. An 'S' mark will appear next to the name, indicating the field which has been selected. To 'unselect' a name already selected, press ENTER once more (with that name highlighted).
- (b) To select all fields at once, press Alt-S; all names will get the 'S' mark irrespective of which name is highlighted. You may 'unselect' some of them in the way described under (a). To 'unselect' at once all fields currently selected, press Alt-U.

Quit in the same manner as was described for CONDITION and NEST.

- iv. Next in the horizontal menu is PREV. SCREEN. Highlighting it and pressing ENTER or CURSOR DOWN will cancel everything you have entered and specified on the current screen (the Field Selection Menu) and will put you back to the File Selection Menu (the previous screen). This may be convenient in case you have changed your mind (about the PRIS file to use, the format of output, etc.); you need not quit MicroPRIS and start it again.

- v. The next choice in the horizontal menu is QUIT. You will use this one if you want to quit MicroPRIS without running the selection/conversion program. It will put you back to DOS. (And you will get no output, i.e., no output file will appear in the directory specified during installation for output data files.)

- vi. Last in the horizontal menu is RUN. Highlighting it and pressing ENTER or CURSOR DOWN will get the MicroPRIS selection/conversion program running (unless you made a formal mistake in setting up the selection criteria under Condition, or did select no fields under Selection; in that case you will get a warning message and will have to correct your specifications).

Up to the moment of selecting RUN, you can change anything you have selected or specified on the two screens.

When you select RUN, the selection/conversion program starts running and a message to this effect appears. Above the window with the message a two-color bar is shown and a moving boundary indicates the progress of the program.

As soon as the program run is finished the two-color bar disappears and the message is changed to 'DONE'. Pressing any key will bring you back to DOS. In the directory specified during installation as the directory for the output files you will find the file resulting from the selection/conversion.

If you are using the Outage file (which is split up into a number of subfiles), the program will process each subfile separately. When processing of a particular subfile is finished you are given the possibility either to stop processing (by pressing the 'S' key) or to let the next subfile to be processed (by pressing any other key). It is reasonable to stop the program when you are sure no more input subfiles need to be processed to reach all data you are interested in.

3.6 Specifying field values in selection criteria

As already explained, in every selection criterion set up in the Field Selection Menu you have to enter a value; with this value the actual values of the fields in the PRIS file are compared by the program and the result is used to decide which 'records' to select. In the criteria, 6 arithmetic operators may be used. For numeric fields the meaning of the operators is obvious; to understand how comparison will proceed with alphanumeric fields, the following has to be born in mind:

- (a) each character is assigned its ASCII value;
- (b) the comparison of values proceeds character by character.

Examples: As a consequence of (a), 'I' is less than 'R' and '3' is less than 'A'.

As a consequence of (b), '1000' is less than '9'! (This you should not forget when using, e.g., field Unit Code which mainly contains digits but is alphanumeric.)

When using fields which contain values of physical quantities (Net Capacity, Energy Loss, etc.), do not forget to use the correct units when specifying numerical values, i.e., those which are used in the PRIS data files - see the definitions of the fields.

There are special rules for entering dates into selection criteria:

- (a) values for the fields Construction Start, First Criticality, Grid Connection, Commercial Operation, Shut Down in file STATUS you have to write in the format YYYY, i.e., the year only;
- (b) the value for field Outage Date in file OUTAGE you have to write in the format YY, i.e., again the year only.

You have to enter a special value in the selection criterion when using the CODE file to obtain a list of codes of some sort. When you want to get a list of codes used in a particular field, you want the selection/conversion program to retrieve those 'records' for which this particular field is not empty. All encoded fields being alphanumeric, this means that the value of the field should not be blank. Thus, in the selection criterion you will use operator '#' (not equal to) and a blank value. To enter a blank value into

Value in the window used to specify selection criteria, with the cursor next to Value simply press the ENTER key twice. Both in the window and on the line in the lower part of the screen the blank value will appear as " ".

Example: to get a list of ISO codes for countries, the selection criterion should be written as

Country # " "

3.7 Reports of MicroPRIS operations

To provide you with recorded information on the selection criteria you used and on the fields you wanted to have selected and some other useful information, for each output file MicroPRIS creates a report of the selection/conversion operation and stores it in the same directory as the output file (the directory specified during installation). This report is given the same filename as the output file, the extension being .RPW for output files in the spreadsheet format and .RPD for those in dBASE format. As these reports are plain text files, you may see their content with any editor etc. you are used to.

3.8 Quitting MicroPRIS

To quit MicroPRIS and go back to DOS:

- i. with the File Selection Menu on the screen, press Ctrl-C;
- ii. with the Field Selection Menu on the screen and the selection/conversion program not yet running, either select Quit from the horizontal menu at the top of the screen or press Ctrl-C;
- iii. with the selection/conversion program running, press Ctrl-C. The outcome, however, will depend on your current MS-DOS configuration: with **break** set to **off** the program will not stop, only the final creation of the output file and the record will be aborted; with **break** set to **on** the program will be stopped (not immediately, though) with no output file and record;

iv. with the run of the selection/conversion program finished, press any key.

N.B. In some situations you might prefer not to go back to DOS each time a particular selection/conversion is finished (you would like to perform a series of selections). In such a case use the batch file `pris.bat` provided for you, i.e., instead of typing `MPRIS`, type `PRIS` to start MicroPRIS. In each instance you would normally from the MicroPRIS program be put back to DOS, you will then be given the possibility of starting MicroPRIS again. Just answer the questions and follow the instructions on the screen.

Appendix A

CALCULATION OF SOME PERFORMANCE INDICATORS USED BY THE IAEA

MicroPRIS contains only 'raw' data values. Analysis of this data is usually carried out by calculating one or more performance indicators. The definitions below show the method of calculation of a number of important performance indicators used by the IAEA.

Maximum Net Energy (E_m)

$$E_m(\text{MW}(e)\cdot\text{h}) = P_n \cdot T$$

where

$$\begin{aligned} P_n &= \text{maximum net electrical capacity (MW}(e)) \\ T &= \text{reference period (h)} \end{aligned}$$

Energy Unavailability Factor (EUF)

$$\text{EUF}(\%) = \frac{EL}{E_m} \times 100$$

where

$$\begin{aligned} EL &= \text{energy loss during the specified period (MW}(e)\cdot\text{h)} \\ E_m &= \text{energy that could have been produced during the same period} \\ &\quad \text{by the maximum capacity (MW}(e)\cdot\text{h)} \end{aligned}$$

Planned Energy Unavailability Factor (PUF)

$$\text{PUF}(\%) = \frac{ELP}{E_m} \times 100$$

where

$$\begin{aligned} ELP &= \text{energy loss planned during the specified period (MW}(e)\cdot\text{h)} \\ E_m &= \text{energy that could have been produced during the same period} \\ &\quad \text{by the maximum capacity (MW}(e)\cdot\text{h)} \end{aligned}$$

Unplanned Energy Unavailability Factor (UUF)

$$\text{UUF}(\%) = \frac{ELU}{E_m} \times 100$$

where

$$\begin{aligned} ELU &= \text{energy loss unplanned during the specific period due to} \\ &\quad \text{causes in the plant (MW}(e)\cdot\text{h)} \\ E_m &= \text{energy that could have been produced during the same period} \\ &\quad \text{by the maximum capacity (MW}(e)\cdot\text{h)} \end{aligned}$$

Unplanned External Energy Unavailability Factor (XUF)

$$XUF(\%) = \frac{ELX}{E_m} \times 100$$

where

- ELX = energy loss unplanned during the specified period due to causes external to the plant (MW(e)•h)
E_m = energy that could have been produced during the same period by the maximum capacity (MW(e)•h)

Energy Availability Factor (EAF)

$$EAF(\%) = 100 - EUF$$

where

- EUF = energy unavailability factor (%)
EUF = PUF + UUF + XUF

Load Factor (LF)

$$LF(\%) = \frac{E}{E_m} \times 100$$

where

- E = net energy produced during the specified period (MW(e)•h)
E_m = energy that could have been produced during the same period by the maximum capacity (MW(e)•h)

Operation Factor (OF)

$$OF(\%) = \frac{t}{T} \times 100$$

where

- t = number of hours on-line (h)
T = number of hours in the reference period (h)

Reactor Age = full calendar commercial years

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