INSTITUTE OF HYDROLOGY

GROUNDWATER SECTION

Programs for the acquisition of groundwater data
using the Epson HX-20 portable computer

version 5

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INTRODUCTION

   The software is designed to run on the Epson HX-20 portable
computer. It allows the user to input hydrogeological data through
the computer's keyboard and store the data on microcassettes. All
data entries require verification before the data is accepted. Data
can be retrieved from the microcassettes and listed on the
microprinter. Several options are available to allow the user to
select the data that is printed. Additional facilities are available
to enable data to be transferred from the HX-20 microcassettes to
other micro, mini or mainframe computers.

   A basic knowledge of the HX-20 is necessary to operate this
software and you should read the HX-20 manual before proceeding
further.

MICROCASSETTES AND DATA TYPES

   The microcassettes are divided into two types; program cassettes
and data cassettes. It is not possible to mix the two types i.e.
programs must not be written or read from data cassettes or vice
versa. Program cassettes are marked by a red dot. The types of data
that can be handled are:

        Site location and construction details

        Borehole lithological logs

        Water level time series

        Water quality time series

        Pumping test readings

        Omissions and errors in data

WARNING once data has been put on a microcassette it cannot be
altered.

   Amendments, omissions or notes of errors can be stored on a
microcassette and there is a facility for producing copies of data
microcassettes on audio cassettes as a safety precaution or for data
to be sent back to the Institute.

FILENAMES

The full name of a file consists of 12 characters. The first eight are the name; the ninth is . and the remaining three are called the qualifier. The qualifier is used to signify the type of data on a file i.e.:

SIT   -   site directory
MAS   -   recognised lithological terms
LIT   -   lithological logs
WLV   -   water levels
WQL   -   water quality
PTS   -   pumping tests
ADD   -   errors and omissions

Filenames are automatically generated by the system when data is input.

When replying to a request by a program for a filename you need not give the . and qualifier but you must give eight characters for the filename; so give additional spaces after the other characters to make it a total of eight.

PROGRAMS

The following programs are supplied on the program cassette:

approx. tape count	filename	size in bytes
0	DATABASE	504
89	SITE-DIR	9185
839	LITH-LOG	7533
1397	WAT-LVL	5363
1775	WAT-QLTY	5914
2169	PUMP-TST	8004
2642	ADDENDUM	4076
2889	BACKUP	4298

Their functions are:

DATABASE	to select the appropriate program for the data type
SITE-DIR	to input and output borehole locations and construction details
LITH-LOG	to input and output borehole lithological logs
WAT-LVL	to input and output water level time series
WAT-QLTY	to input and output water quality series i.e. readings of temperature, eH, conductivity and pH
PUMP-TST	to input and output water levels observed during constant rate and step pumping tests
ADDENDUM	to input omissions or corrections to data on other cassettes
BACKUP	to produce copies of data cassettes on audio cassettes

The programs are designed to be as user-friendly as possible, within the constraints imposed by the computer. Data entry and decisions are made in response to prompts and are in free format. Some of the programs are fairly large and others have large areas reserved for data, hence it is advisable to only hold one program at a time in the HX-20.

Sites are identified by their station number, which should be 8 characters or less. Whilst entering data, if a value is unknown then, if the data would have been a numeral, enter zero and press RETURN. Otherwise merely press RETURN.

If you want to know the contents of a cassette then insert it in the microcassette drive and make sure the HX-20 is in Basic. Wind the cassette back to the beginning, then type FILES and press RETURN. This will list all the files on the cassette. As this is a rather tedious operation, it can be stopped once you have the information you require by pressing the BREAK key.

DATA PROGRAMS

The programs for the different data types in this software package have essentially the same structure. After selecting the data type you will encounter a menu which allows three options, to input data, output selected data to the microprinter or to stop the program. Other sections of the programs normally return to this menu.

The procedure for running the data programs is:

1. switch on the HX-20 using the switch on the right hand side,
2. press 2
3. put the program cassette into the microcassette drive with side A uppermost and the bare tape towards you
4. make sure the cassette is wound back to the beginning. Type RUN"DATABASE" and press RETURN
5. Reply to the prompts from the computer with the appropriate answer for the choice or enter the data requested, pressing RETURN after typing in the data.
6. After you have terminated the program by pressing S in reply to a prompt, if you aren't going to run another program, remember to switch off.

STATION DETAILS

This option is used to enter basic details about the location and construction of a borehole. The information it can handle is:

    Station number
    Site location
    Grid reference
    Surface datum elevation
    Depth to struck water
    Date of construction
    Contractor's name
    Total depth drilled
    Drilled diameters and depths
    Casing type
    Casing diameters and depths
    Screen diameters and depths
    Pump type
    Pump capacity
    Pump intake depth
    Borehole yield
    Drawdown

If the output option is chosen, several possible combinations are possible. Either a full or a summary listing will be given. If the full listing is chosen all details for a station are listed but if a summary listing is asked for then only the station number and grid references are given. It is possible to list all the stations on either the cassette or in a given file. Otherwise it is possible to list only a given station. If this option is chosen you will be asked if you know the filename where the station is stored, this is to save search time. If you do not know the filename the program will search the entire cassette.

Depths and elevations should be in metres, diameters in millimetres and pumping rates etc. in m^3/day.

LITHOLOGICAL LOGS

This option is designed to allow lithological logs to be stored
on cassettes. When a data cassette is used by this program for the
first time you will be asked to define a series of lithological terms,
up to 25, and a series of colours, up to 15. Obviously it is
important to define all the terms you are likely to want. The terms
defined should consist of one or two words.

When entering lithological logs you will be asked to give the
station number. There are two ways of entering the depths to the top
and bottoms of the layers. The first method is to enter the depths to
the top and bottoms of the layers. In the second method only the
depth to the bottom of the layer need be entered but in this case the
layers must be entered in order, starting from the surface and working
downwards, as the computer will assume that the bottom of the previous
layer is the top of the current layer.

For each layer you will be asked to give, firstly a lithological
term and secondly a colour. These must be one of the terms entered
when the cassette was first used. The program compares the lithology
or colour you have entered with the defined terms and, if it does not
find a match you will be asked to enter the term again. After
entering the lithological term and colour you will be presented with
the opportunity to add a comment. This facility allows additional
lithological or hydrogeological information to be entered. You can
enter several words but the total length of the comment should not
exceed 80 characters. This comment is stored on the cassette but it
is not listed on the microprinter.

If the output option is selected it is possible to list the
lithological logs for all the stations, either on the cassette or on a
given file, or only a selected station. It is also possible to select
only those logs in which a given lithological term and/or colour
appear. For example you could ask for all the logs with gravel on the
cassette or all the logs with yellow clay on a file.

WATER LEVELS

This option allows readings of depth to water and the date of the measurement for a borehole site to be stored on microcassette. After entering the station number you will be able to enter as many readings as you have.

The output option allows the water levels for all stations or a given station on a given file or on the whole cassette to be listed. If a listing of a single station is requested then the readings will be sorted into date order before they are listed. Thus it is possible to list all the readings for a given station ready for plotting as a hydrograph.

WATER QUALITY

This option allows readings of conductivity, temperature, eH, pH and the date of the measurement to be stored on microcassette. After entering the station number you will be able to enter as many readings as you have.

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station on a given file or on the whole cassette to be listed. If a
listing of a single station is requested then the readings will be
sorted into date order before they are listed.

PUMPING TESTS

This option allows data obtained from a pumping test to be stored on microcassettes. The information that can be entered is:

        Station number of the observation borehole
        Date the test was started
        If a step test then the number of steps
        Station number of the pumped borehole
        Depth to rest water level
        Datum elevation
        Pumping rate(s)
        Duration of pumping rate(s)

The readings are then entered as the time after the start of the test or step, in minutes, and the depth to water. Although not essential, it is best to enter the readings in order, starting from the first taken after the test was started. After all the readings have been entered they are listed on the microprinter and can then be edited. Readings can be changed or deleted and readings that were omitted can be inserted.

The output allows the selection of an individual station or all the stations on a file or all stations on the cassette. The output gives the drawdown as well as the depth to water, provided a rest water level was given when the data was entered.

Times are in minutes, pumping rates in m^3/day and depths in metres.

AMENDMENTS AND OMISSIONS

This option allows notes of omissions or errors in data stored on the other data cassettes to stored on a microcassette. After giving the station number you will be asked to give a single sentence defining the information. On the output these comments are listed on the microprinter and can be selected as all stations on a cassette or a file or those comments for a specific station.

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The readings are then entered as the time after the start of the test or step, in minutes, and the depth to water. Although not essential, it is best to enter the readings in order, starting from the first taken after the test was started. After all the readings have been entered they are listed on the microprinter and can then be edited. Readings can be changed or deleted and readings that were omitted can be inserted.

The output allows the selection of an individual station or all the stations on a file or all stations on the cassette. The output gives the drawdown as well as the depth to water, provided a rest water level was given when the data was entered.

Times are in minutes, pumping rates in m^3/day and depths in metres.

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BACKUP

This program allows a copy of either all the data on a cassette or a file to be copied on to an audio cassette using a conventional cassette recorder. The program supplies all the necessary prompts and it is only necessary to ensure that the cassette recorder is connected to the HX-20 using the lead numbered 702. If the cassette recorder has a remote facility the HX-20 will operate the motor automatically. If not you will have to switch the motor on and off when the HX-20 tells you to.