

Using Microsoft Access to Explore the PRIME Database

Introduction

The CD-ROM includes two copies of the database in different variants of the Microsoft JET database format. Also included is a copy of the Microsoft Access 7.0 run-time edition software, which may be freely distributed by anyone holding an Access 7.0 Developers' Edition licence, provided it is accompanied by an Access database.

The database files may be found in the DBJET directory of the PRIME CD-ROM. In this directory there are three full copies named PRIME00.MDB (JET 4.0), PRIME97.MDB (JET 3.5) and PRIMEV7.MDB (JET 3.0), together with a compressed empty database (WORK.MD_) that is used by the BODC Database Explorer software.

The Access and JET variants are discussed more fully in the next section, but the following summary table of which file to use with which software may prove helpful.

<i>Access2000</i>	PRIME00.MDB
<i>Access97</i>	PRIME97.MDB
<i>Access 7.0</i>	PRIMEV7.MDB
BODC Database Explorer	PRIMEV7.MDB
Run-time Access	PRIMEV7.MDB

Access Versions

At the time of writing, five versions of Microsoft Access have been released. The first of these, version 1.0, was current for a very short period of time and was not widely adopted.

This was replaced by Access 2.0, which was the main version used with *Windows 3.n*. Neither of these versions of Access may be used with any of the JET databases on the CD-ROM.

Each version of Access has its own version of the JET database format associated with it thus:

<i>Access 7.0</i>	JET 3.0	<i>Access97</i>	JET 3.5	<i>Access2000</i>	JET 4.0
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Each of these formats is different and there is only limited compatibility between the versions. Obviously, earlier versions of Access cannot be expected to read later versions of the format. However, it would seem reasonable to expect later versions of the software to read earlier versions of the data, but this is not the case for data on CD-ROM. Any attempt to open a read-only Access database will fail unless there is an exact match between the software and data versions. Hence the inclusion of the data in multiple formats.

It is perfectly possible for users to take copies of any of the database files onto their hard disk. Once there, either the data content or structure may be changed, providing a full version of the *Access* program is available. However, remember to clear the read-only attribute using *Windows Explorer*. Please note that the fields in the database forms are not write-protected, so anything typed into a form will change the database contents.

Access Objects

When a database is opened using *Access*, a dialog box is usually presented offering a choice of the objects available. However, the *PRIME* database has been set up so that the only object that is visible is the switchboard form. To see the full database press the *F11* key.

There are six types of object: tables, queries, forms, reports, macros and modules. Users of the *JET* database on the CD-ROM need only be concerned about the first three of these. The type of object required is selected by clicking one of the tabs on the side or top (depending on *Access* version) of the dialog, which presents a list of the available objects of that type. The desired object is simply highlighted by clicking on it and then opened by clicking on the 'Open' button. Alternatively, double clicking on an object will open it.

Table objects, as their name suggests, are the actual tables of data that make up the relational database. Opening a table object provides a listing of the table contents as a data grid. The tables may also be opened in design mode, which allows their detailed structure to be seen or, providing a full version of *Access* is installed, modified.

Within the data grid, the fields and records visible may be adjusted by using the horizontal and vertical scroll-bar controls. Any subset of rows and columns may be highlighted by dragging the mouse cursor over them and then transferred to other applications via the clipboard. However, as individual tables from a relational database are rarely self-contained, this may be of limited value.

Query objects, or 'views' as they are known in other relational database systems, may be thought of as additional table objects, which combine several base tables together, filter their contents or sort the data into a specified order. Their main reason for being is to underpin form objects. However, users may find them convenient for exporting some types of data into other applications. Like table objects, opening a query object causes its contents to be listed in the form of a data grid. Alternatively, the query may be opened in design mode, which provides a clear indication of the fields, source tables, sort keys and filter criteria that comprise the query. For those averse to GUI displays, the query may also be viewed as a native SQL statement.

The most important object type for those wishing to interrogate the database is the form object. The forms provide an interface to data from several tables combined in such a way that the user is provided with all the information necessary to make use of the data. Forms may be used to simply step through data records or display data as a data grid. However, when used in conjunction with *Access* 'find' and 'filter' tools, the forms provide a powerful and flexible mechanism for searching the database.

Using Access Forms

When an Access form is opened, the information is presented in a 'form view', which looks like this:

14C Data

Event: 200290 Gear: BOTTLE Cruise: VLD137
Start: 03/07/93 04:15:00 End: 03/07/93 04:45:00 Originator's reference: 310
Latitude: 49.333 Latitude variation: Site:
Longitude: -12.5 Longitude variation: Water Depth: 1220

Water Collection Information

Experiment: V1C004 Type: IS Microplankton: >5 um
Start: 03/07/93 05:00:00 Duration (hr): 24 Nanoplankton: 2-5 um
Comment: Picoplankton: 0.2-2 um

Incubation Information

Microplankton Uptake: 189.21 Nanoplankton Uptake: 69.3 Picoplankton Uptake: 182.37
Integration Depth (m): 40 Total Uptake: 440.88

Integrated 14C Uptake (mg C/m2/incubation duration)

Experiment	Inc Depth	Coll Depth	Rel Light	Abs Light	Microplankton	SD Microplankton	Nanoplankton	SD Nanoplankton
V1C004	1	1			4.443	0.565	1.888	
V1C004	5	5			5.087	0.6	1.86	
V1C004	10	10			5.985	0.766	2.36	
V1C004	15	15			4.279	2.254	2.998	
V1C004	20	20			3.075	0.392	0.832	

Record: 1 of 9
Record: 4 of 33

The information presented is from a single database record, in this case a ^{14}C incubation experiment. The header information is displayed in discrete labelled boxes. In addition, there is a second embedded form that displays the data from child records (the individual sample bottles involved in the experiment) owned by the experiment record.

The record displayed may be changed using the 'video' control in the bottom left-hand corner of the window to step one record forwards, one record backwards or to jump directly to the first or last record.

For a form such as this to be of practical use there are two things that the user needs to be able to do. First, the user must be able to find the record or records of interest. Secondly, the user must be able to get the information from those records into another application such as a spreadsheet. One method for locating the record or records of interest is to use the video controls to single step through the records until a record of interest is encountered. This is a perfectly satisfactory method for forms containing up to 100 records. However, many of the forms contain a significantly larger number of records and so more powerful tools are required.

The first tool provided by Access is the 'find' tool that may be found in the 'Edit' pull-down menu or invoked using the button on the toolbar with the binocular icon. This tool can be used to search for a given string in either a single field (selected by clicking in the appropriate form box) or all fields. It is particularly useful for finding related records in other forms by searching for the BODC Event Number.

The most powerful tool provided by Access is the form filter. This allows the creation of a copy of the current form that contains a user-specified subset of records. The filter criteria are best

specified through the 'Filter by Form' option from the menu obtained by right clicking on the form background. Simply enter selection criteria in one or more fields, right click on the background again and choose 'Apply Filter/Sort' to obtain a copy of the form containing the desired subset of the data. A rudimentary knowledge of SQL helps in setting the criteria, but the program is far from pedantic about syntax and usually accepts the obvious (e.g. =50, >50 or <50).

Tips. To select data values within a range use the syntax 'between value and value'.

To match a string, enter the full string.

To match parts of a string enter a string including wild cards. The Access wild cards are '.' for a single character and '*' for any number of characters.

Having identified a record of interest in an Access form, the next problem to address is how to get the information from that record into another application such as *Excel*. The best way of doing this is to copy the data over the Windows clipboard. Click on 'Select Record' in the 'Edit' menu followed by 'Copy'. The record, including column names based on table field names, may then be pasted into *Excel*.

Providing the form doesn't contain a sub-form, that's all there is to it. However, most of the forms present in the PRIME database include sub-forms. The data from these must be copied over in a separate operation. Select the sub-form data by clicking on the small box in its top left-hand corner. Then, simply click 'Copy' in the 'Edit' menu and paste the data into a convenient empty cell in the *Excel* spreadsheet.

This section has presented a very brief digest on how to use the forms included in the PRIME database. Access is both intuitive to use and includes extensive documentation. The more one learns about the program, the more one can get out of it. By all means use this section as a starting point but please do not regard it as an exclusive alternative to the documentation provided by Microsoft.

PRIME Database Forms

A number of forms have been created to allow the contents of individual tables or groups of tables to be viewed conveniently. At first sight, the list of forms might look daunting. However, nearly half of the forms in the list are sub-forms embedded in other forms and the user may safely ignore these. To make them easy to recognise, these forms include the word 'Datacycles' in their name.

The forms for net and water bottle data the forms included have limited functionality because each parameter is listed sequentially, rather than in spreadsheet grid format. The latter presentation would be much more useful but is impossible to produce using simple Access forms, because the data tables contain a 3-field primary key to reflect the real world where different people may well measure the same thing on the same sample. The BODC Database Explorer was primarily written to circumvent this problem and may be used instead. However, there are many tables in the database that are most effectively interrogated using a form interface.

The PRIME Database Switchboard provides access to the following 13 forms on two pages:

Page 1 Forms

CTD Data
SeaSoar Data
Water Bottle Data
Net Data
Cruises
Events
Parameter Dictionary

Page 2 Forms

Multisizer Data
Secchi Disk data
Fatty Acid Data
Argos Buoy Data
Weather Observations
¹⁵N Production Data

Bug Fix. The forms in the PRIME database have been built on a computer with *Windows* large fonts selected for the screen display. Due to a bug in some versions of *Access*, viewing the forms on a system with small fonts selected causes some of the form field labels to be truncated. If this problem is encountered, it may be rectified in seconds by converting to a large font display.

Forms on Switchboard Page 1

Page 1 of the PRIME Database Switchboard offers the following forms:

CTD Data

This form provides access to all the CTD profiles held in the database. The header information (date/time, position, etc.) is in the main body of the form with the profile data included as a sub-form. Filtering this form to focus the data displayed is advisable as it contains a lot of records.

SeaSoar Data

This form provides access to the data from the PRIME cruise SeaSoar survey. The data are held in the database as 'pseudo-CTD' profiles, where each column of gridded data is considered as if it were a CTD profile. The appearance of the form is very similar to that used for CTD data.

Water Bottle Data

This table presents water sample data. Each record displayed by the form represents a sample collection event. Consequently, all depths sampled by a CTD rosette are included as one record. The embedded sub-form displays the profile for each parameter measured sequentially because of the cross-tabulation constraints imposed by Access. This is adequate for either a quick look at the data or if a small number of parameters are of interest. However, it is cumbersome if a significant number of parameters are required. If a grid format with several parameters in each row is required, then use the BODC Database Explorer software to retrieve the data.

Note that data values have to be displayed to the maximum precision of the database. Consequently, the number of decimal places shown for a parameter does not necessarily reflect the accuracy of that parameter.

Net Data

This table presents net haul sample data from the PRIME cruise, OWS INDIA and the FRS over wintering zooplankton cruise. Each record displayed by the form represents a sample collection event. The embedded sub-form displays the profile for each parameter measured sequentially. This may be found useful if the profile for a single parameter is required. The rows for the parameter of interest may be highlighted by drawing the mouse cursor over them and then copied to another application. If a spreadsheet format with several parameters in each row is required, then use the Database Explorer software.

Note that data values have to be displayed to the maximum precision of the database. Consequently, the number of decimal places shown for a parameter does not necessarily reflect the accuracy of that parameter.

Cruises

This form presents information from table CRSINDX for every mnemonic included in the cruise field of the EVENT table.

Events

This form provides access to the information held on data events. The form is divided into four sections. The top two sections display information common to all events and their associated cruise. The lower sections provide information specific to point events or traverse events. One or other of these will be blank, depending upon the type of event currently selected. Note that this includes position for entries concerned with the Mesocosm Experiment. Browsing this form can quickly provide an overview of the scope of the oceanographic measurements held in the database.

Parameter Dictionary

This form provides the definitions of the BODC parameter codes, which are used extensively in the PRIME database. Its primary purpose is to allow the meaning of a parameter code to be obtained. If using a form that includes a parameter code, it may be convenient to also have the Parameter Dictionary form open at the same time. Codes are most conveniently located by using the 'Find' tool on the 'Parameter Code' box.

Forms on Switchboard Page 2

Multisizer Data

This form presents size spectra from nearly 200 Mesocosm Experiment samples, each of which contains particle abundance, surface area and volume data for 244 size classes.

Secchi Disk data

This form presents over 450 Secchi disk deployments collected by the ships occupying the OWS INDIA site from 1970 to 1975.

Fatty Acid Data

This form presents concentration and carbon stable isotope data for a wide range of fatty acid species from samples taken during the Mesocosm Experiment and the PRIME cruise.

Argos Buoy Data

This form provides access to the tracks of the drogued buoys released into the SF₆ patch during the PRIME cruise.

Weather Observations

This form presents 6-hourly synoptic meteorological data from Bergen Airport for the duration of the PRIME mesocosm experiment.

¹⁵N Production Data

This form presents data from ¹⁵N incubation experiments. The data included here are from long-term experiments where it is inappropriate to normalise the data in terms of uptake per hour.

The form contains five sections. The top section displays information on where, when and how the water used in the experiment was collected. Below this are sections presenting information on the incubation conditions and the size fraction definitions. The fourth section displays column integrated uptake data. The fifth section is a sub-form that presents the uptake rates for the individual samples incubated during the experiment.