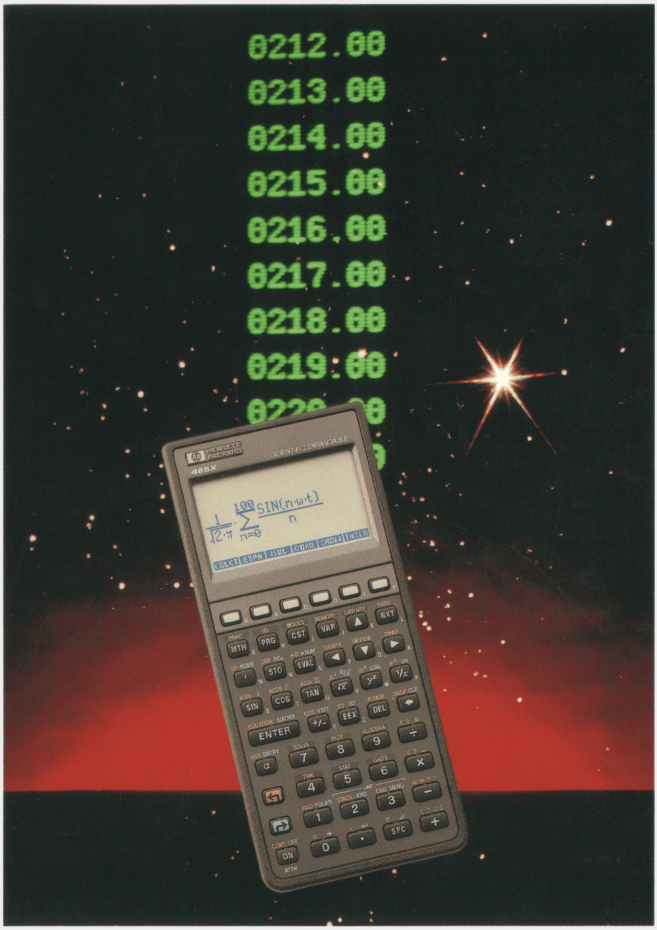
The HP 48 Database



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Contents

Getting Started

The HP 48 Database is an HP 48 program that has been designed to simplify the entry, formatting, and storage of collections of data within the HP 48.

Five files are on the disk provided with this manual:

`README`	Read this file to find the current version of the HP 48 Database and any update information.
`DB48LIB`	The HP 48 Database library.
`MUSIC`	A sample database.
`BIKEPRTS`	A sample database.
`REPAIRS`	A sample database.
`NAMES`	A sample database.

Installing the Database

The HP 48 Database has been implemented as a library object with library ID #876d. To install the HP 48 Database, perform the following:

- Download the file `DB48LIB` to the HP 48 in binary mode.
- Recall the library to the stack from the variable `DB48LIB`.
- Purge the variable `DB48LIB`, leaving the library object in level 1 of the stack.
- Store the library object in a port, such as port 0. For example, when the library object is in level 1 of the stack, execute `0 STO`.
- Turn the calculator off, then on again. The calculator will update the system configuration to recognize the new library. The database library automatically attaches itself to the HOME directory.

To display the Database commands, press [↰][LIBRARY] DB48L:

```
{ HOME }
4:
3:
2:
1:
DB48 DBSIZ RCLRE INSRE DELRE DBVER
```

The command DB48 starts the database, and DBVER displays the version of the software:

```
HP 48 Database
VERSION A
COPYRIGHT © JAMES DONNELLY 1992
ALL RIGHTS RESERVED

DB48 DBSIZ RCLRE INSRE DELRE DBVER
```

The other commands are used to add or delete records to an existing database, and are described in the section *Programmatic Access*.

Removing the Database

To remove the database library, switch to the HOME directory, enter :0:876 (where 0 refers to the port in which the library is stored), duplicate the entry, and execute DETACH and then PURGE. The HP 48 display will flicker briefly as the library is purged.

A Quick Tour

To get a quick introduction to DB48, download the file MUSIC into the HP 48.

Display the contents of MUSIC by pressing [↰][LIBRARY] DB48L DB48. If there's more than one database name in the display, move the highlight arrow (on the left side of the display) using [▼] until the arrow points to MUSIC. Now press OPEN to view the first record:

```
BROWSING 1 OF 16
→Title: DARK SIDE OF ...
 Artist: PINK FLOYD
 Category: Rock
 Medium: LP
 Copies: 1

ADD | DEL | GOTO |  |  | INDX
```

The MUSIC database is organized in the classic database sense - with *records* of information about various recordings, where each item of information is stored in a *field*. All records in the database are structured in the same manner.

The display now shows the first record in the database. The highlight arrow points to the first field in the record. To move between fields press [▼] or [▲]. The arrows in the upper left corner of the display indicate additional fields above and below the display. To move between records press [◀] or [▶]. The arrows in the upper right corner of the display indicate additional records.

To replace the contents of a field, press [α], type in the new information, and press [ENTER]. You may also press [←] to begin editing at the end of the existing data.

When the database has been opened, the following menu keys are available:

ADD	Adds a new record to the database after the currently displayed record.
DEL	Deletes the current record.
GOTO	Prompts for a record number to move to.
PREV NEXT	These menu keys are displayed only when an option field is highlighted, and may be used to change the displayed option.
INDX	Displays an index view across all records.
↓ [NXT] ↑	
FIND	Displays the menu keys for searching for data.
SLCT	Displays the menu for selecting a subset of records from the current set. This menu also contains keys for sorting, statistics printing, and reporting.
FONT	Toggles the font size between the medium and small fonts.
→STK	Copies the current record to the stack as a list.
UNDO	Restores the original data for the highlighted field (as long as you view the current record).
EXIT	Closes the database and returns to the database catalog. You may also press [ATTN].

Now that you've had a quick tour, read on to learn about all the details!

Overview of the Database

A database in the HP 48 is implemented as a classic "flat-file" database, with information stored in a Library Data object. There is no limit (other than available memory) to the number of databases that you may create in your HP 48.

A great deal of power is available to you as you design a database to store your information. For instance, you can define pre-determined or common responses to questions, perform calculations on the data in a record, or even use the data in one field to extract information from another database.

The data is organized into one or more *records,* where each record is composed of one or more *fields*. In the MUSIC database, each database record consists of data about a particular musical recording. Title, Artist, and Medium are examples of fields in the MUSIC database.

All records in the database are structured in the same manner as the first record, so once you have defined your field layout, you're ready to add information to your database.

If you wish to add or delete a field, you may do so at any time.

There are eight field types:

Number

A number field may contain any valid real number that the HP 48 can represent. The display of the number will always be displayed in STD format. The default value for a number field is 0.

Text

A text field may contain any sequence of characters. The default value for a text field is an empty string ("").

Time

A time field is basically numeric, but when a value is entered, the value will be checked to ensure HH.MMSS format. The default value for a time field is the system time at the time the field is created or a new record is created.

Date

A date field is basically numeric, but when a value is entered, the value will be checked to ensure MM/DD/YY format (or DD.MM.YY if flag -42 is set). The default value for a date field is the system date at the time the field is created or a new record is created.

Lookup

A lookup field copies a value from another database based on a search using data from another field in the current database. The default value for a lookup field is 0 for returned numeric data or "" (null string) for returned text data.

Text Option & Number Option

An option field presents a pre-programmed set of options which may be selected with special menu keys PREV and NEXT, which appear only for option fields. The default value for an option field is the first available option.

Calculation

A calculation field performs a calculation using a stored equation which uses number fields as variables. The default value for a calculation field is 0.

All eight field types store data as text or numbers. The differences in the types have the following three traits:

- Optional type checking for data that is entered into the field.
- Whether a change in the field triggers a file lookup or calculation.
- Whether the field type affects searching and sorting. (In the case of the Date type, the comparison is made with the DDAYS function instead of −.)

Defining a Database

This section describes the procedures used to create, select, and open a database. The subsequent sections describe the methods that are available for entering and accessing data.

Starting DB48

Press [↰][LIBRARY] DB48L DB48 to start the database. The names of all databases in the current directory will be displayed in the *database catalog*:

```
    HP 48 Database
→MUSIC
 REPAIRS
 BIKEPRTS
 NAMES

OPEN FLDS NEW INFO FONT QUIT
```

In the display above, there are several databases available to choose from. To perform any operation, select the database you wish to work with by pressing [▼] or [▲] and then pressing a menu key. The menu keys perform the following:

OPEN — Opens the database and displays the first record. An initial check is performed to validate lookup and calculation field definitions, and prepare calculation formulas for faster interactive performance later on. You may also open the highlighted database by pressing [ENTER].

FLDS — Displays the field catalog which allows you to add or delete fields across all records in the database.

NEW — Creates a new database.

INFO — Displays the number of records in the database, the number of fields in the database definition, and the size (in bytes) of the database.

FONT Switches font sizes. The default font is the medium font, which can show six fields in the display. The small font can show eight fields, but the characters are harder to read and there is no distinction between upper and lower case letters.

QUIT Exits the application (you may also press [ATTN]).

Creating A New Database

When the catalog of databases is displayed, press NEW to create a new database:

```
Database name?
←

OPEN | FLDS | NEW | INFO | FONT | QUIT
```

Type the name of the new database, and press [ENTER]. You will now enter the standard procedure for adding a new field to a database. The section *The Field Catalog* below describes how to manage fields in an existing database.

Note: Database names and field names must follow the standard HP 48 naming convention for variables. For details on variable and file naming conventions, see the chapter *Naming Conventions*.

Adding A New Field

When you add a field to a database, you will first be prompted for the name of the field:

```
  Define First Field

Enter field name:
←
```

Type the name of the first field, and press [ENTER]. Field names may contain letters, digits, and most characters. Field names must not:

- Start with a digit.
- Contain object delimiters or the characters + − * / ^ ∫ = < > ≤ ≥ ≠ § ! , @ or a space.
- Duplicate a built-in command name or reserved word.

You will now see the *field type catalog*, from which you specify the field type:

```
  Choose field type:
→NUMBER
 TEXT
 TIME
 DATE
 LOOKUP
 TEXT OPTIONS
 NUMBER OPTIONS
 CALCULATION
                    EXIT
```

Use the [▼] and [▲] keys to select the field type that you want, then press [ENTER]. If the field type that you have selected is either number, text, time, or date, the field catalog will now be shown and you can skip ahead to the section *The Field Catalog*. The lookup, option, and calculation field types require additional information, as described below.

The Bicycle Parts Example

To illustrate the use of lookup, option, and calculation fields, we'll need a couple of sample databases. Suppose you have a database BIKEPRTS containing information about bicycle parts. This database has the following fields:

BIKEPRTS

Field Name	Field Type
StockNum	Number
Description	Text
Price	Number
QtyInStk	Number

Suppose that the BIKEPRTS has the following records:

Rec#	StockNo.	Description	Price	QtyInStk
1	1000	Frame	85.50	5
2	1001	Handlebar	14.95	7
3	1002	Steel Wheel	6.95	8
4	1003	Alloy Wheel	15.70	10
5	1004	Chain	12.55	10
...	...	...	...	...

Now suppose that you're designing a new database which will record parts which have been used in repairs. This database, named REPAIRS, will have the following fields:

REPAIRS

Field Name	Field Type
StockNo.	Number
NumUsed	Number
UnitPrice	Lookup (Number)
Discount	Number Option
TotalPrice	Calculation

The field UnitPrice is a lookup field, and shows the price of a part that has been found in the BIKEPRTS database based on the field StockNo.. The field TotalPrice is a calculation field which shows NumUsed multiplied by UnitPrice and discounted by Discount.

Lookup Fields

A lookup field is used to copy information from another database into the current database. For example, REPAIRS looks up the unit price from the BIKEPRTS database. It does so by performing the following procedure:

> *If the value of* StockNo. *in* REPAIRS *matches the value of* StockNum *in* BIKEPRTS, *get the corresponding value from* UnitPrice *in* BIKEPRTS *and place it in* UnitPrice *in* REPAIRS.

In addition to the name for the lookup field, five additional pieces of information are required to specify a lookup field:

- the local comparison field
- the remote database
- the remote comparison field
- the remote return field
- the default value

The next few paragraphs explain each piece and show how they are used in the bicycle example.

The Local Comparison Field. The local comparison field is the field in the current database that you use for comparisons with data in the remote database.

```
   Local comparison:
→StockNo.: Number
 NumUsed: Number
```

In the example above, the local comparison field is StockNo.. The data in this field is entered by the user. Select the local comparison field by moving the highlight arrow to the desired field and pressing [ENTER]. If there is only one field in the database when you add a lookup field, that field will be assumed to be the desired local comparison field and a prompt to that effect will be displayed for a few seconds.

The Remote Database. The database in which you will search for information.

```
   Remote database:
 MUSIC
→BIKEPRTS
 NAMES
```

In the example above, the remote database is BIKEPRTS. Select the remote database by moving the highlight arrow to the desired database and pressing [ENTER]. If there is only one other database in the current directory, that database will be assumed to be the remote database and a prompt to that effect will be displayed for a few seconds.

The Remote Comparison Field. The remote comparison field is the field in the remote database with which data from the source field will be compared.

```
 Remote comparison:
→StockNum: Number
 Description: Text
 Price: Number
 QtyInStk: Number

                EXIT
```

Select the remote comparison field by moving the highlight arrow to the desired field and pressing [ENTER]. In the example above, this field is StockNum.

The Remote Return Field. The remote return field is the field in the remote database whose data will be copied into the current database.

```
   Remote return:
 StockNum: Number
 Description: Text
→Price: Number
 QtyInStk: Number

                EXIT
```

Select the remote return field by moving the highlight arrow to the desired field and pressing [ENTER]. In the bicycle example, the remote return field is Price.

Note: There's no requirement that the remote return field and the field that's being defined have the same name - they are the same in the bike parts example to clarify the way that lookup fields work.

The Default Value. If a lookup fails, a default value must be supplied.

```
Enter default value:
←
                    EXIT
```

The default value type must match the field type of the remote return field. For instance, if the remote return field is a number type, the default value must be a number, and cannot be a text string. In our bicycle example, the default is zero, since it's not reasonable to charge for a non-existent part.

As mentioned before the data in all fields (regardless of their type in the database) are eventually stored as numbers or strings. This means that regardless of the nature of the remote return field in the remote database, if a number comes back from the remote database, the newly specified lookup field may be used as part of a calculation formula.

Option Fields

An option field definition contains a series of predefined values. An option field may store either number or text values, thus the *number option* and *text option* field types. An option field is most useful when the data for the field will be drawn from a reasonably small set of values. In the bicycle example the field `Discount` indicates the discount a customer gets when buying bicycle parts. If there are three standard discounts, such as 0, 10, and 25%, it might be easier to store the discounts in an option field than to remember and then type standard discount values.

When you specify an option field, you are prompted for the first value and subsequently use an *option catalog* to enter the remaining values.

```
   Number Options

Enter first option:
←
```

Enter the first option (which will be the default value), and press [ENTER]. The option catalog will now be displayed:

```
      Edit Options
→0
INS ADD DEL      FONT DONE
```

The menu keys in the option catalog do the following:

INS Insert a new option before the highlighted option.

ADD Add a new option after the highlighted option.

DEL Delete the highlighted option.

FONT Toggle the font size.

DONE Store the field definition and go to the field catalog.

When there is more than one option, you may move the highlight arrow with the [▼] and [▲] keys.

The options may be changed later, using the EDIT menu key in the field catalog.

When the database has been opened and you have highlighted an option field, the fourth and fifth menu keys will display PREV and NEXT as shown below:

```
BROWSING 1 OF 1
StockNo.: 1001
NumUsed: 1
UnitPrice: 14.95
→Discount: 0
TotalPrice: 14.95

ADD | DEL | GOTO | PREV | NEXT | INDX
```

Press these menu keys to switch between the stored options. You may still press [α] or [←] to edit the selection if the options available are not sufficient.

Calculation Fields

A calculation field definition stores a formula based on numeric field names and operators. When you specify a calculation field, there must be at least one numeric field in the database. After you have selected the calculation field type, you are prompted to enter the formula:

```
Enter formula:
←

STOC | NUMU | UNITP | DISCO |
```

The menu keys are typing aids which represent the numeric fields in the database. (There must be at least one numeric field.) If there are more than six numeric fields, press [NXT] to view the next row of menu keys. The syntax is limited to real numbers, numeric fields, parentheses (( )), and the operators +, −, *, /, and ^. To enter a left parenthesis, press [↰] [()]. To enter a right parenthesis, press [↱] [()] (or [▶] if you're used to using the Equation Writer). After you press [ENTER] the equation is verified.

The Field Catalog

The field catalog allows you to view and change the fields in a database. To access the field catalog, begin from the database catalog by highlighting the database whose fields are of interest, then press FLDS to view the fields. In the example below, the fields for the sample database REPAIRS are shown:

```
  Field Definitions
→STOCKNO.: NUMBER
 NUMUSED: NUMBER
 UNITPRICE: LOOKUP (NUMBER)
 DISCOUNT: NUMBER OPTIONS
 TOTALPRICE: CALCULATION

 INS | ADD | DEL |     |     | EXIT
```

The menu keys in the field catalog do the following:

INS — Inserts a new field before the highlighted field.

ADD — Adds a new field after the highlighted field.

DEL — Deletes the highlighted field. A confirmation prompt will ask if you *really* want to delete the field.

SHOW — Displays the specification for a lookup field or a calculation field.

EDIT — Appears only when an option or calculation field is highlighted. For option fields, the option catalog will be displayed again, and you may add, delete, or edit the options in the field specification. For calculation fields, the formula may be edited using the same technique used to enter the original formula.

EXIT — Returns to the database catalog (you may also press [ATTN]).

↓ [NXT] ↑

FONT — Toggles the font size.

Using a Database

To open a database, start the program DB48, and press [▼] or [▲] to highlight the desired database in the database catalog and press either OPEN or [ENTER]. When a database is opened, the following actions take place:

- Lookup specifications are validated to ensure that a successful lookup action can be performed. If anything is missing, such as the remote database, or a specified field in either the current database or the remote database, a warning will be issued and no lookups will be attempted.

- Calculation formulas will be validated to ensure that fields referenced in each formula are present, and that they are still numeric. In addition, the HP 48 system flags -20, -21, and -22 will be set to guard against underflow, overflow, or infinite result exceptions. These flags will be restored to their original settings when the database is closed.

- The first record is displayed, and the highlight is positioned at the first field:

```
▼     BROWSING 1 OF 16     ▶
→Name: JAMES DONNELLY
 Company: ARMSTRONG P...
 Addr: 3135 NW ASHWOO...
 City: CORVALLIS
 State: OR
 Zip: 97330
ADD | DEL | GOTO |  |  | INDX
```

If present, the arrows in the upper-left corner of the display indicate that more fields are present in the record. The arrows in the upper-right corner of the display indicate more records either before or after the current record. The message in the top-center, BROWSING 1 OF NN, shows which record number you're viewing, and reminds you that all the records are available. The word BROWSING will change to the phrase <FIND> or <SELECT> if you have chosen either FIND or SLCT.

Menu Keys for Browsing

When the database has been opened, the following menu keys are available:

ADD — Adds a new record to the database after the currently displayed record. Default values will be assigned to each field. The default values are listed under *Field Types*.

DEL — Deletes the current record. A confirmation prompt will ask if you *really* want to delete the record.

GOTO — Prompts for a record number to move to.

PREV
NEXT — These menu keys are displayed only when an option field is highlighted, and may be used to change the displayed option.

INDX — Displays an index view across all records.

↓ [NXT] ↑

FIND — Displays the menu keys for searching through the database. See the section *Finding Data*.

SLCT — Displays the menu for selecting a subset of records from the current set. This menu contains keys for sorting, statistics printing, and reporting. See the section *Selecting Records*.

FONT — Toggles the font size between the medium and small fonts.

→STK — Copies the current record to the stack as a list.

UNDO — Restores the original data for the highlighted field (as long as you view the current record). When you move away from the current record, the new data is stored, and UNDO will no longer have any effect.

EXIT — Closes the database and returns to the database catalog. You may also press [ATTN].

Active Keys

The following keys are active when the database has been opened:

Record Movement Keys

[◀] [▶] Moves to the previous or next record.

[↱] [◀] Moves to the first record.

[↱] [▶] Moves to the last record.

Field Movement Keys

[▲] [▼] Moves the the previous or next field.

[↰] [▲] Moves to the top field in the display, then to the previous page of fields.

[↰] [▼] Moves to the bottom field in the display, then the next page of fields.

[↱] [▲] Moves to the first field in the record.

[↱] [▼] Moves to the last field in the record.

Editing Keys

The following keys may be used to edit the contents of a field:

[α] Clears the field and allows entering new data.

[←] Edits the current contents of the field, starting at the right end of the data.

[0] - [9] [.] [+/-] Clears the field and starts a new value beginning with the key that was pressed. [+/-] enters a minus sign.

When either [α], [←], or a digit have been pressed to begin an edit line, the HP 48 alpha mode is locked on. While the field is being edited, the following keys are active:

[ENTER] Validates and stores the new data. If data is being entered into a new record, the field highlight will move to the next field.

[←] Erases the last character in the line.

[ATTN] Cancels the entry, leaving the field's contents unaltered.

[↰] Hold down the left shift to enter a lower case character.

[α] Toggles alpha entry mode. The behavior of the alpha lock respects the setting of HP 48 system flag -60.

[↰] [TIME] Enters the current system time into a time field or the current system date into a date field. Alpha mode must be unlocked.

Automatic highlight movement will continue until [ENTER] is pressed on the last field, another menu is displayed, or another record is displayed.

Other Keys

[NXT] Displays the next row of menu keys.

[ATTN] Closes the database and returns to the database catalog.

Displaying the Index View

The index view provides an overview of the currently selected records by displaying one record per line in the display. For instance, to display an index view of bicycle part names, select the Description field and press INDX:

```
↓Description:
→Frame
 Handlebar
 Steel Wheel
 Alloy Wheel
 Chain
 Seat
GOTO                EXIT
```

When the index view is displayed, the following arrow keys are active:

[▲][▼] Moves the the previous or next record.

[↰][▲] Moves to the top line of the display, then the previous page.

[↰][▼] Moves to the bottom line of the display, then to the next page.

[↱][▲] Moves to the first record.

[↱][▼] Moves to the last record.

To return to the record that you were viewing before selecting the index view, press either EXIT or [ATTN]. To return to the detail view for the highlighted record, press GOTO or [ENTER].

Finding a Specific Data Item

If you wish to find a record containing a particular value, press the FIND menu key to select the *find menu*.

When the find menu is active, the top line of the display reads <FIND>. You may still use the [◀] and [▶] keys to move between records, and the [α] and [←] keys to edit the data in fields.

The menu keys are different for number or text fields, and are updated to reflect the currently highlighted field type:

Number Find Menu

```
<FIND> 1 OF 12 ▶
 StockNum: 1000
 Description: Frame
→Price: 85.5
 QtyInStk: 5

 =  #  <  <=  >=  >
```

Text Find Menu

```
<FIND> 1 OF 12 ▶
 StockNum: 1000
→Description: Frame
 Price: 85.5
 QtyInStk: 5

 =  #  ==
```

In both the number and text find menus, press [NXT] to display a second page of menu keys:

```
<FIND> 1 OF 12 ▶
 StockNum: 1000
→Description: Frame
 Price: 85.5
 QtyInStk: 5

                FONT ⇒STK UNDO EXIT
```

The UNDO menu key behaves the same as when you're browsing records. The EXIT menu key (and the [ATTN] key) return to the browse menu.

The left two keys appear as PREV and NEXT if the current field is an option type field.

The next sections describe each find menu in further detail.

Number Find Menu

```
<FIND> 1 OF 12
StockNum: 1000
Description: Frame
Price: 85.5
→QtyInStk: 5

=  #  <  <=  >=  >
```

To find a record whose value has a certain characteristic when compared to a sample value that you enter, press the menu key for the comparison operator first, then enter the sample value. For instance, to find the next record with a numeric value greater than 4, press > , then enter 4:

```
<FIND> 1 OF 12
StockNum: 1000
Description: Frame
Price: 85.5
4←

=  #  <  <=  >=  >
```

After you press [ENTER], the search will begin at the next record, proceed to the last record in the database, start at the first record and proceed to the record previous to the current record. If the search fails, a beep will sound.

The comparison operators are:

=	Equal
#	Not equal
<	Less than
<=	Less than or equal to
>=	Greater than or equal to
>	Greater than

Text Find Menu

```
▼      BROWSING 1 OF 16      ▶
→Name: JAMES DONNELLY
 Company: ARMSTRONG P...
 Addr: 3135 NW ASHWOO...
 City: CORVALLIS
 State: OR
 Zip: 97330
ADD | DEL | GOTO |  |  | INDX
```

The text find menu works the same way as the number find menu: press the menu key for the comparison operator first, then enter the sample value. For instance, to find the next record with a string value containing "SMITH", press = , then enter SMITH:

```
      <FIND> 1 OF 16      ▶
SMITH←
 Company: ARMSTRONG P...
 Addr: 3135 NW ASHWOO...
 City: CORVALLIS
 State: OR
 Zip: 97330
 =  |  #  |  ==  |  |  |
```

After you press [ENTER], the search will begin at the next record, proceed to the last record in the database, start at the first record and proceed to the record previous to the current record. If the search fails, a beep will sound.

All string comparison are *case insensitive*, so "Smith" will match "SMITH". The comparison operators are:

= Sample value contained within the record's field value. For instance, if you were looking for all names containing "SMITH", using = would find records with names Joe Smith, Harvey Smithson, Mike Blacksmith, etc.

Sample value is not contained within the record's field value.

== Exact match. If you enter 'Joe Smith", a record containing Joe Smithson would be overlooked.

Selecting Subsets of the Data

The *selection menu* offers you the chance to select a subset of the records in your database, sort the selected records, perform statistical summaries on number fields, and produce reports to a printer, a variable in user memory, or a data file on a host computer. You may also display an *index view* of the selected records. When you're browsing through the database, press the SLCT menu key (on the second page of menu keys) to display the *selection menu*.

When the selection menu is active, the top line of the display reads <SELECT>. You may still use the [◀] and [▶] keys to move between records, and the [α] and [←] keys to edit the data in fields. The UNDO menu key works the same way as in other menus, and the EXIT menu key (or the [ATTN] key) returns to the browsing menu with all records available.

The menu keys are different for number or text fields, and are updated to reflect the currently highlighted field type.

The first page of the selection menus are the same as the find menus:

Number Selection Menu

```
<SELECT> 1 OF 12
→StockNum: 1000
 Description: Frame
 Price: 85.5
 QtyInStk: 5
=  #  <  <=  >=  >
```

Text Selection Menu

```
<SELECT> 1 OF 12
 StockNum: 1000
→Description: Frame
 Price: 85.5
 QtyInStk: 5
=  #  ==
```

Note: When you press the SLCT menu key for the first time, an *index array* is created in temporary memory. There must be enough free memory to create this index array, which occupies approximately 15 bytes per record. It is possible to have enough free memory to run the database program but not enough memory to build the index array.

When you select a group of records, the next selection request will scan only the currently selected records. To reselect all the records in the database, press ALL.

Press [NXT] to view the additional pages in the selection menu:

ALL	INDX	FONT	→STK	UNDO	EXIT
SRT↑	SRT↓	GOTO	PREV	NEXT	EXIT
RPRT	→VAR	CLΣ	Σ+	ΣSEL	ΣSUM

The menu keys →STK, UNDO, PREV, NEXT work the same way as they do in the browse menu.

The menu keys PRINT and RPRT are described in detail in *Generating Reports*.

Press EXIT or [ATTN] to return to the browse menu.

Number Select Menu

To select records whose values have a certain characteristic when compared to a sample value that you enter, press the menu key for the comparison operator first, then enter the sample value. For instance, to select records with values greater than 4, press > , then enter 4:

```
<SELECT> 1 OF 12
StockNum: 1000
Description: Frame
Price: 85.5
4←

=  #  <  <=  >=  >
```

After you press [ENTER], all currently selected records will be searched for values that meet your comparison criterion. If the search fails, a beep will sound.

The comparison operators are:

=	Equal
#	Not equal
<	Less than
<=	Less than or equal to
>=	Greater than or equal to
>	Greater than

Going back to our BIKEPRTS example, suppose you wish to find the records the describe parts that are out of stock and expensive to order. Your definition of expensive parts is any part whose price is greater than $50. To select the parts that are out of stock, move the highlight to the field QtyInStk, press SLCT = [0][ENTER]. Then move the highlight to Price and press > [5][0][ENTER]. Now you have selected the records of interest.

Text Select Menu

The text selection menu works the same way as the number selection menu: press the menu key for the comparison operator first, then enter the sample value. For instance, to select records with a value containing "SMITH", press = , then enter SMITH:

```
<SELECT> 1 OF 16
SMITH←
 Company: ARMSTRONG P...
 Addr: 3135 NW ASHWOO...
 City: CORVALLIS
 State: OR
 Zip: 97330
 =  #  ==
```

After you press [ENTER], all currently selected records will be searched for values that meet your comparison criterion. If the search fails, a beep will sound.

All string comparison are *case insensitive*, so "Smith" will match "SMITH".

The comparison operators are:

= Sample value contained within the record's field value. For instance, if you were looking for all names containing "SMITH", using = would find records with names Joe Smith, Harvey Smithson, Mike Blacksmith, etc.

Sample value is not contained within the record's field value.

= = Exact match. If you enter "Joe Smith", a record containing Joe Smithson would be overlooked.

Sorting Selected Records

The menu keys SRT↓ and SRT↑ are used to sort the selected records in decending order or ascending order, respectively. To sort the selected records, highlight the field to be used for the sort comparisons, then press either SRT↓ or SRT↑. The sort process is for display and export only - it does not alter the actual data records.

Summary Statistics

Summary statistics may be calculated for numeric fields with the summary statistics menu keys in the numeric selection menu. The statistics are calculated using the array ΣDAT in the same manner as the statistics functions that are built into the HP 48.

Note: There is an additional memory requirement here: you must have 8 bytes of free memory for each value being added to ΣDAT. Also, you may need to clear the existing ΣDAT before selecting new values.

The menu keys have the following definitions:

CLΣ	Purges any existing ΣDAT.
Σ+	Adds the single value from the highlighted field in the current record to ΣDAT.
ΣSEL	Adds the values from the highlighted field from all selected records to ΣDAT.
ΣSUM	Displays summary statistics for ΣDAT.

The summary statistics presented by ΣSUM are:

n	The number of rows in ΣDAT.
Sum	The sum of the samples.
Min	The minimum value.
Mean	The mean (average).
Max	The maximum value.
Sdev	The standard deviation (sample).
Var	The variance (sample).

Generating Reports

When the select menu is displayed, there are four ways to extract information from the database while it is open. Data may be placed on the stack or in a variable, printed, or exported to another computer.

Placing a Record on the Stack

Press →STK to return the currently displayed record to the stack. The record will be returned as a list. The first item in the list corresponds to the first field in the record.

```
{ HOME }
3:
2:
1: { "TOMMY" "THE WHO"
   "Rock" "LP" 2 }
DB48 DBSIZ RCLRE INSRE DELRE OBVER
```

Storing Selected Records in a Variable

To extract the data and save it in a variable, press →VAR. The resulting variable will contain a list of lists, where each list corresponds to a single record. You will be prompted for the name of a variable in which to store the data:

```
Variable name?
←
RPRT →VAR
```

For details on variable and file naming conventions, see the chapter *Naming Conventions*.

Printing the Selected Records

Press RPRT PRINT to print the selected records to the current printer device. Printer output is directed to the infrared printer if flag -34 is clear, or the serial port if flag -34 is set. Printing operations will be controlled by the parameters set in the variable PRTPAR, which should be established before opening the database.

```
Record 1
StockNum: 1000
Description: Frame
Price: 85.5
QtyInStk: 5

Record 2
StockNum: 1001
Description: Handlebar
Price: 14.95
QtyInStk: 7

Record 3
StockNum: 1002
Description: Steel Wheel
Price: 6.95
QtyInStk: 8

Record 4
StockNum: 1003
Description: Alloy Wheel
Price: 15.7
QtyInStk: 10
```

Exporting Data to Another Computer

Press RPRT I/O to send the selected records to a Kermit server. The I/O parameters (baud rate, translate code, etc.) should be set before opening the database. You will be prompted for a file name on the server:

```
Remote file name?
←
                    I/O
```

The data will be sent as comma-separated values in ASCII text. Each field is separated by a comma, and each record is on a separate line. For instance, data from a phone list with three fields Name, Company, and Phone would look like this:

```
John Alexander,Motorola,800-555-2374
Janet Principal,Acme Fireworks,555-0282
Bill Friendly,Friendly Dodge,555-3983
Amy Grant,Music City,555-2389
Frederic Vogel,MegaGlobal,555-6595
```

Naming Conventions

HP 48 variable names and MS-DOS file names allow different sets of characters. This can create some problems when files are transferred between the two systems.

HP 48 Variable Names

Variable names may contain letters, digits, and most characters. Variable names must not:

- Start with a digit.
- Contain object delimiters or the characters + − * / ^ ∫ = < > ≤ ≥ ≠ δ ! , @ or a space.
- Duplicate a built-in command name or reserved word.

MS-DOS File Names

File names may contain up to eight characters, followed by an optional period and extension containing up to three characters. File names must not:

- Use a period except to separate the extension.
- Exceed eight characters in the name or three characters in the extension.
- Contain the characters . " / \ < > + , : = ; or a space.
- Contain .BAT, .COM, or .EXE extensions, which are reserved for DOS executable files.

Macintosh File Names

File names may contain up to 255 printable characters, excluding the colon (:).

Programmatic Access

Four commands are provided to facilitate programmatic access to a database. In all these commands, the first record is record number 1.

DBSIZE 'name' —> number_of_records

Returns the database size (number of records).

RCLREC 'name' record_number —> { data }

Gets a record from the database. The data from the specified record will be returned as a list. The first field's data will be returned as the first item in the list, the second field's data returned as the second item in the list, etc.

ADDREC 'name' record_number { data } —>

Adds a record to the database after the specified record number. The data to be added to the database must be supplied in a list. Each item will be checked for validity. Lookup items will be checked only for text/number consistency. Calculation items must be numeric.

To insert a record at the beginning of the database, specify 0 for the record number.

DELREC 'name' record_number —>

Deletes a record from the database. To delete the first record in the database, specify 1 for the record number.

DBVER Displays the copyright message and version of the software.

Messages

This chapter lists the error or warning messages that may be generated by the database.

0/1 Remote Fields

When a lookup field is being defined, the remote database must have at least two fields: one for the remote comparison and one for the remote return value.

Can't Edit Calculation

The result of a calculation can't be edited.

Data Type Conflict

The remote comparison field you have selected has a different type than the local comparison.

Existing Database

You can't give the name of an existing database to a new database.

Insufficient Memory

The memory of the HP 48 is too full to continue.

Invalid Date

The date that has been entered does not correspond to the current date format setting (MM/DD/YY or DD.MM.YY, if flag -42 is set).

Invalid Name

Names must follow the HP 48 variable naming convention. See the chapter *Naming Conventions*.

Invalid Object

The data entered into a field is not recognizable as a standard number or text object.

Invalid Return Type

The remote return field in the remote database no longer has the same type as when the lookup field was first defined.

Invalid Time

Times in the HP 48 must be real numbers in HH.MMSS format.

Invalid Σ Data

The HP 48 variable ΣDAT has data that gives a statistics calculation error, or the variable ΣPAR specifies conditions (such as columns that don't exist) that don't match ΣDAT.

Kermit Error

An error, broken connection, or [ATTN] keystroke interrupted data transfer.

Mismatched Lkp Type

The local comparison field in a lookup field definition has a different data type from the remote comparison field in the remote database.

Missing Calc Src Field

A field used in a calculation formula is no longer in the database.

Missing Loc Comp. Fld

The local comparison field in a specified in a lookup field definition is no longer in the database.

Missing Rmt Comp. Fld

The remote comparison field specified in a lookup field definition is no longer in the remote database.

Missing Rmt Rtn Field

The remote return field specified in a lookup field definition is no longer in the remote database.

Must Be A Number

Data entered into a number field must be numeric.

Must Have 1 Option

Option fields must have at least one entry.

Must Have 1 Record

You cannot delete the only record in the database.

Name In Use

The name that was entered for a new database is already present in the HP 48 VAR menu.

No Fields

The database has no fields defined.

No Number Fields

There are no number fields in the database. Calculation fields work only with number fields and constants.

No Records Selected

None of the records in the database met the selection criteria.

No Remote Database

There are no other databases in the VAR menu for a lookup field definition to reference.

The HP 48 Database

The HP 48 Database is a compact, sophisticated, general purpose flat-file database engine designed for the HP 48. Major features of the database are:

- Easy-to-learn user interface for database design, simple data entry, and rapid data access.
- Eight data types: Number, Text, Time, Date, Text Options, Number Options, Lookup, and Calculation.
- Index and detail views of data records.
- Searching and sorting.
- Selection of subsets of data records.
- Printing to infrared or serial printers.
- Exporting data as comma-separated text to databases or spreadsheets on other computers.
- Exporting data to the stack or user variables.
- Interactive or programmatic access to data records.
- Efficient machine-language design for fast data entry and rapid data retrieval.

The HP 48 Database is an indispensable tool for anyone who needs to use the HP 48 to collect and organize information.

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