V12 Database Engine™

for Macromedia Director®

Regular Edition

Version 3.0

User Manual

(99/06/16)

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Introduction

Welcome to V12 Database Engine (V12-DBE), the most powerful and user-friendly cross-platform database management Xtra for Macromedia Director and Macromedia Authorware .

V12-DBE for Director

V12-DBE was originally designed in 1996 to be used specifically with Director. It extends Director's features and helps you speed up the development of your multimedia titles. You will discover many benefits in using V12-DBE to create interactive applications such as electronic catalogs, storybooks, kiosks, training material, sales material, games, and more. You will be using it as a back-end to your multimedia projects to efficiently manage text, numeric data, dates, images, sound clips as well as any type of media that Director can store in its members.

V12 Database Engine enables you to provide advanced functionality to your end-users while bringing down your development and maintenance costs.

V12-DBE is very flexible and scalable. It can be used in a wide range of applications; from simple projects where Lingo Lists and FileIO have become difficult to manage, to true database-driven applications.

V12-DBE for Director is available in *Light* and *Regular* editions. V12-DBE *Light Edition* can be used with Director 6.x and later and supports Windows 95, 98, NT, and PowerMac. V12-DBE *Regular Edition* runs with Director 5.x and later, and supports Windows 3.x, 95, and 98, NT, Mac68K and PowerMac.

Lingo programmers can work through more complex projects by taking advantage of V12-DBE *Regular Edition's* rich and flexible Lingo interface to fully script both the authoring and runtime tasks. If you are new to Lingo you may want to begin with V12-DBE *Light Edition* to create more simple projects. Both *Regular* and *Light Editions* are fully compatible with each other. You can start using V12-DBE *Light Edition*, and later easily upgrade to V12-DBE *Regular Edition*.

If you are looking for a fast and easy way to integrate V12-DBE into your multimedia projects, you may be interested in using the V12-DBE Tool and V12-DBE Behaviors Library, both freely available at http://www.integration.qc.ca.

An *Online Companion* is also available for V12-DBE. It enables the management of V12 databases through the Internet. You can learn more about it at http://www.integration.qc.ca, in the Products section.

V12-DBE for Authorware

V12-DBE is easy to use with Authorware (version 4.x and later). It allows you to enter, store, and retrieve data, using Auhthorware as a multimedia front-end. V12-DBE enables you to easily create multimedia applications whose content is managed separately from Authorware thus speeding up development cycle, last-minute changes and content updating. It also provides Authorware with a simple way to store and retrieve specific pieces of information, which is very useful for common data management tasks such as multiple user tracking and score management.

The V12-DBE Tool used with Authorware will help you quickly implement the most common V12-DBE's powerful functions such as database creation, viewing, editing, importing, exporting, and more. The V12-DBE Tool is available FREE on our web site at http://www.integration.qc.ca

About This Manual

If you are familiar with other database management systems, you will find V12-DBE very easy to use. If you are only vaguely familiar with database management, the First Steps Manual will guide you, step-by-step, through the basics required to implement simple database management in your multimedia projects.

This manual provides you with a brief overview on how to use V12-DBE, by illustrating the main development stages involved through a practical example: the Portfolio. You will be guided from step one, which consists in modeling your database, up to the final results in a Director movie. The Portfolio example is also extended in the Manual's Appendix, where you will learn how to add a media field in the project in order to display images in the Portfolio.

This manual is organized to help you get the information you need efficiently. The first two sections deal with basics concerning Xtras (Using Xtras) and databases (*Database Basics*). The third section leads you through explanations on how to use V12-DBE in greater detail (*Using V12-DBE*). You will learn how to prepare data, create the database and import data. The following sections will show you how to use the methods available to you in V12-DBE.

The next sections cover the integration of V12-DBE with Macromedia Director —here you can get a sense of how V12-DBE can be helpful to your projects. The Appendices deal with very specific issues such as capacities and limitations, errors, end-user delivery, portability, etc.

Where to Start

Before browsing through this User Manual, we recommend that you look at the *First Steps*. The First Steps contains an introductory tutorial, example scripts, and sample projects to help you get started with V12-DBE and Lingo in a few short steps. You may also benefit from browsing through the Sampler and the Mini-Sample movies. All available for free on INM's web site at http://www.integration.qc.ca/downloads.

Please make sure you understand V12 Database Engine's license agreement before proceeding. The full license agreement is at the end of this user manual, in Appendix 2: License Agreement. Answers to commonly asked questioned can be found in the licensing FAQ section in Appendix 1: :Licensing FAQs.

System Requirements for Running V12-DBE

Macintosh Version

Mac68K or PowerMac with System 7.1 or later and 1 Mb of free disk-space. On the Macintosh, V12-DBE (and any other Xtra) will share the same memory partition as Macromedia Director.

For simple database applications, you do not need to change the memory partition allocated to Director or for projectors generated by Director. For more advanced development, you may need to increase the memory partition. In either cases, try to establish the minimum equipment requirements of your project as conservatively as possible.

Windows Version

Any PC running Windows 3.1, 95, Windows 98 or Windows NT that is capable of running Macromedia Director plus 1 Mb of free disk-space. The amount of memory allocated to an application cannot be configured on Windows. This means that an application can "borrow" as much memory as needed from the Operating System. It also means that Windows shows unpredictable behaviors when it is short of memory. Try to establish the minimum equipment requirements of your project as conservatively as possible.

Macromedia Director

Macromedia Director version 5.0 or later is required.

Do I really need to master Lingo to use V12-DBE?

How comfortable do you need to be with Lingo to use V12-DBE efficiently? The answer varies according to the complexity of your projects.

Simple projects require no knowledge of Lingo at all. If your project uses a single database and shows one record at a time on Director's stage, chances are that you can implement it using the *V12-DBE Behaviors Library* only. No Lingo required.

For more advanced projects, V12 Database Engine's comprehensive Lingo interface requires very little knowledge of Lingo and provides as much guidance as possible when programming, such as checking the number of parameters, the types of the parameters, etc.

In a nutshell, the Lingo basics you need to acquire before delving into V12-DBE are
- Local and global variables,
- Control structures (`if` statements, `repeat` loops, etc.),
- Handlers
- Object instances (this is covered in detail later in the Using Xtras section of this manual)

You're Not Alone!

Whether you are looking for a quick answer or in-depth information you may find the following resources to be very helpful.

V12-L Distribution List

On the V12L List you will find developers at every level of expertise, and in every area of multimedia. This friendly group is the perfect place to bounce ideas around with other V12 developers. Sign up at http://www.integration.qc.ca/V12L

FAQs

INM's FAQs discusses many of the questions that are frequently asked by V12 developers. Please check http://www.integration.qc.ca/products/v12director/faqs/

Other Online Resources

Macromedia's web site at http://www.macromedia.com/support, is also a possible source of information. It contains, amongst other things, directions on how to subscribe to Macromedia's support Newsgroups (the NNTP server is "forums.marcomedia.com").

You may want to check alternate Internet resources such as Director-online-User Group (*http://www.director-online.com*), UpdateStage (*http://www.updatestage.com*), Maricopa (*http://www.mcli.dist.maricopa.edu/director*), and the Lingo User Journal (*http://www.penworks.com*).

Customer Support and Developer Assistance

If you need additional assistance, INM's experienced team will be happy to help.

Customer support is available from 9:00 am to 5:00 pm EST, Monday through Friday by email to support@integration.qc.ca or by phone at (514) 871-1333 (choose menu selection6). Priority will be given to registered V12-DBE users. Customer suport covers:

- Helping to understand V12-DBE, clarify specifications.
- Supplying sample scripts.
- Providing useful tips.

Where Customer Support stops, Developer Assistance begins. If you are familiar enough with V12-DBE, but want to take your project to a more sophisticated level, Developer Assistance is for you. Our team of programmers can help you discover easier ways to take advantage of databases in your multimedia projects. Here are just some of the services we offer:

- Project design, data structure analysis, planning
- Technical assistance (guidance/advice) throughout the various steps of your project
- Troubleshooting and debugging your scripts
- Optimization (how to obtain superior performance)
- Assistance with other Xtras, custom development of Xtras

Typographic Conventions

Important terms, such as the names of methods, are in **bold**.

```
    Sample code is indented and printed in a courier font.
```

Note: Special annotations and tips are enclosed in boxes like this one.

Although the sample scripts throughout this manual contain both upper and lower case characters, V12-DBE is *not* case sensitive. This applies to the methods names, the parameters as well as to the actual data.

Welcome to V12 Database Engine

Welcome to V12-DBE, the most powerful and user-friendly cross-platform database management Xtra for Macromedia Director™ (version 5.x and later) on Macintosh and Windows.

If you are familiar with other database management systems, you will find V12-DBE very easy to use. If you are only vaguely familiar with database management systems, the next few sections will give you an overview of what you need to know to help you get started with V12-DBE.

Installing V12-DBE

The name of this Xtra is *V12-DBE for Director.XTR* on the Macintosh, *V12-DBE for Director.X32* on Windows 9x/NT and *V12DBE-D.x16* on Window 3.x.

To install the V12-DBE Xtra in your authoring environment:

- Make sure that Director is closed.
- Move the V12-DBE Xtra to the Xtras folder located in the same folder as Director.
- Start Director.

To confirm that V12-DBE is properly installed, check the Xtras menu in Director. You should see "V12-DBE for Director" in the Xtras menu.

V12-DBE comes with an on-line help to assist you in the development of your projects. It is an unprotected Director movie that can be accessed by selecting the Xtras>V12-DBE for Director >Help menu. To install it, Move *V12Help.DIR* and *V12Help.V12* to the Director folder.

Note	*V12Help.DIR* is itself a project that relies on dynamic data management thanks to V12-DBE. A single Director movie – *V12Help.DIR* – is used as a screen layout template and pulls content out of a V12 database depending on users requests. Replacing the *V12Help.V12* database behind this movie by another one makes an entirely new content available to the users.

What's New in Version 3.0?

V12 databases versions 2.x and 3.0 are fully compatible to each other. Databases created with V12-DBE version 2.x can be used as is with V12-DBE version 3.0.

- Multiple users can simultaneously access V12 databases over a Local-Area Network. See Appendix 4: Multi-user Access (if you need to make a V12 database available to multiples users through a TCP/IP network, check V12-DBE's Online Companion).

- On Win9x/NT, MS Access databases, MS FoxPro files, MS Excel workbooks and MS SQL Server data sources can be used as templates to create new V12 database and as sources of data to import records from through ODBC drivers. See Scripting the Database Creation and Importing Data with mImport.

- Text files can be easily imported from FileMaker Pro, MS Access and MS Excel thanks to the new `mImport` file method and its `TextQualifier` property. `mImportFile` is still supported for the purpose of backward compatibility. However, it will be progressively phased out. See Importing Data with mImport.

- Lingo lists and property lists can be easily imported to V12 databases with the `mImport` method. One can easily convert a project that has become hard to manage with Lingo lists to one that takes advantage of V12-DBE. Also, it makes it possible to import XML documents to V12 databases (through Macromedia's XML parser). See Importing Data with mImport.

- Partial Selections: `mSelect` optionally returns a limited number of records in the selection. This is convenient when users can express queries that match very large numbers of records. See Partial Selections in Step 5: Implementing the User Interface.

- `mFind` allows the setting of the current record within the selection based on a value (as opposed to `mGo`, which requires a record number). mFind in Step 5: Implementing the User Interface.

- `mGetUnique` retrieves unique values of the field that determines selection's order. It is convenient to populate a pop-up menu or a scrolling list with all the possible search values on a given field. See Reading Unique Values of a Field in Step 5: Implementing the User Interface.

- `mBuild` accepts an additional parameter, "online", and can create V12 databases that are compatible to the V12-DBE Online Companion. See Step 3c: Building the Database.

- `mOrderBy` can now properly sort on any field, whether indexed or not. See Sorting a Selection (mOrderBy) in Step 5: Implementing the User Interface.

- Table, field and index identifiers must begin with an alphabetic character and must be followed by up to 31 alphanumeric characters. Unlike former versions of V12-DBE they cannot contain spaces or punctuation marks.

- V12-DBE is now a Shockwave-Safe Xtra. It properly runs with Shockwave document ran off a CD-ROM, or any local medium. However, it cannot be automatically downloaded from a Shockwave movie.

Version History

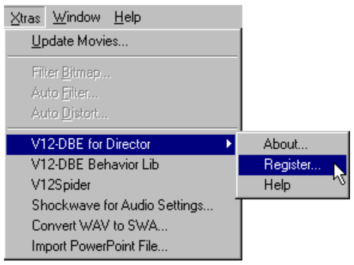
V12 Database Engine version 1.0 was released in 1996 as both an Xobject and Xtra for Macromedia Director 4 and 5. It was essentially meant to serve as an advanced data management system for Director titles with elaborate user interfaces delivered on CD-ROM, such as games and virtual workshops.

V12 Database Engine Xtra version 2.0 was released in early 1998. It focused on making database technology easier to learn an use by Director users. It added features that better suit projects such as electronic catalogs, electronic books, template-based movies, etc. Some of these features are: full-text indexing, simplified database creation , data binding, styled text management, a behaviors library, etc.

How to register your V12-DBE license

Evaluation copies of V12 Database Engine are available on Integration New Media's web site (http://www.integration.qc.ca) along with full documentation and sample movies. You can download those files and start developing your project without purchasing a V12-DBE license.

The evaluation copy of V12-DBE is not limited in any way: it only displays a splash screen upon startup. To get rid of the splash screen, you must purchase a V12-DBE license (or as many as required by the V12-DBE license agreement). Such a license is granted to you as a registration number that you enter in Director's Xtra > V12-DBE for Director > Register… menu item.



Once your copy of V12-DBE is licensed, all new databases you create are automatically stamped as legal and do not show a splash screen. Existing databases are also stamped as legal as soon as they are opened by the registered V12-DBE.

Note	Existing V12 database *must* be opened once in ReadWrite or Shared ReadWrite mode to be stamped as legal. If you open them in ReadOnly mode or from a CD-ROM, they cannot be legalized and the splash screen will continue to appear on computers that do not have the license file. V12-DBE returns a warning when opening unstamped databases in such circumstances.

Files Needed to Use V12-DBE

Only one file is required for the "Runtime" version (also called "end-user" version) of V12-DBE. The name of this file is *V12-DBE for Director.XTR* on the Macintosh and *V12-DBE for Director.X32* on Windows 9x/NT and *V12DBE-D.x16* on Window 3.11.

The “Development” version requires an additional file – the license file - located in the *System:Preferences* folder of your Macintosh, or the *Windows\System* folder of your PC. This encoded file is generated by V12-DBE upon the registration of your license number.

Although the “Runtime” version of V12-DBE can be distributed freely in as many copies as you wish, you *cannot* distribute your license file. See Appendix 1: :Licensing FAQs and Appendix 2: License Agreement.

Using Xtras

This section deals with Xtras and how they are used in Macromedia Director. The V12-DBE Xtra is used as an example throughout the manual. You will be introduced to the basic steps involved in using V12-DBE successfully before you actually begin to work with V12-DBE.

This appendix covers:

- What is an Xtra
- Making an Xtra available to Director
- Creating a Lingo Xtra instance
- Verifying whether the instance was successfully created
- Using the Lingo Xtra instance
- Freeing the Lingo Xtra instance

What is an Xtra?

Xtras are components (alternatively know as add-ons, or plug-ins) that add new features to Macromedia Director. Many of Director's own functions are implemented as Xtras.

Macromedia Director supports five types of Xtras:

- Lingo Xtras add new Lingo commands and functions to Director. They must be delivered to the end-users along with your project. To list all available Lingo Xtras, type "ShowXlib" in Director's Message Window. To find out what methods are provided by a Lingo Xtra, type "put mMessageList(Xtra "<the Xtra's name>")" in the message window.

- Tool Xtras extend Director's features at authoring time. They appear in Director's Xtra menu.

- Transition Xtras add new transitions to Director's own transitions set. They only appear in Director's Modify > Frame > Transition window.

- Asset Xtras enable you to create members of new types and place them on Director's stage. They appear in Director's Insert menu.

- MIX Xtras are translation modules that enable you to import/export foreign media such as WAV, MP3 files, etc.

Xtras for Windows 9x/NT must have a .X32 file extension, as in "V12-DBE for Director.X32". Xtras for the Macintosh generally have the an .XTR extension. The file extension *.X16 is reserved for Xtras for Windows 3.1.

The V12-DBE Xtra

The brief description of V12 Database Engine is that it is a Lingo Xtra.

The more accurate description is that it actually contains two Lingo Xtras and one Tool Xtra:

- a Lingo Xtra named *V12dbe*, which basically represents a database file
- a Lingo Xtra named *V12table*, which represents the table within the database file (see Database Basics for the definition of *table*)
- a Tool Xtra that enables you to access V12-DBE's on-line help and to register your V12-DBE license.

Making an Xtra Available to Director

Xtras are designed to be opened automatically by Director (in authoring mode) or by your Projector (in runtime mode, also called *playback* mode). The Xtras must be placed in the **Xtras** folder, located either in Director's folder or the same folder as your Projector. This feature is supported on both Macintosh and Windows.

Creating an Xtra Instance

This step creates an Xtra instance of your database and stores its reference in a global variable (`gDB`) for future use. It uses the `New` method of the database Xtra.

Example:
```
set gDB = New(Xtra"V12dbe", the pathname&"myBase.V12", "Create",
   "myPassword")
```

Checking if *New* Was Successful

You should always ensure that the Xtra was created successfully immediately after calling `New`. `New` can fail for many reasons, such as a lack of free memory or as a result of misplaced files.

Example:
```
if NOT ObjectP(gDB) then alert "Could not create Xtra instance"
```

Note:	This is a generic approach and works with all Xtras. In V12-DBE, the preferred way to check for errors is the `V12Status()` method. See Errors and Defensive Programming in this manual.

Using the Xtra Instance

Once the preliminary steps have been executed, you can start using the Xtra instance of your database for creating tables, fields and indexes, or for using an existing database. **Methods** of the Xtra need to be called to perform these operations. By convention, V12-DBE method names begin with the letter `m` such as `mGetfield` and `mSelect` (with a few exceptions such as `New`, `V12Error` and `V12status`). `New` and `mMessageList` are compulsory methods and all Xtras support them.

Note:	In order to learn which methods are supported by an Xtra, use the Xtra's built-in documentation. See Basic Documentation below.

This example shows the structure of the database referred to by `gDB` in the message window:

```
    put mDumpStructure(gDB)
```

Closing an Xtra

When the Xtra instance has completed its function and is no longer required, close it by setting the variable that refers to it to *0*. Closing an Xtra performs mandatory housekeeping tasks and closes unneeded files. It also frees the memory occupied by the Xtra. All Xtra instances created with `New` must be ultimately set to *0* once they are no longer needed.

Example:

```
    set gDB = 0
```

Note:	If a V12dbe Xtra instance is not properly set to *0*, the file it refers to remains open and cannot be re-opened unless the computer is restarted. In some cases, it can even become corrupted.

Checking for Available Xtras

You can learn which Xtras are available to Director by typing the following in the Message Window:

```
    ShowXlib
```

If V12-DBE is installed, you should see V12dbe and V12table listed in `ShowXlib`'s output, as well as all other available Lingo Xtras. Note that this technique applies to Lingo Xtras only.

Dealing with Pathnames

The `New` method in V12dbe requires that you specify the name of the V12-DBE file you want to create or open. If only a file name is specified, the file is assumed to be located in the same folder as Director or the Projector.

Example

```
    set gDB = New(Xtra"V12dbe", "myBase.V12", "Create", "myPassword")
```

assumes that "myBase.V12" is in the same folder as Director or the Projector. This is strictly equivalent to:

```
    set gDB = New(Xtra"V12dbe", the applicationPath & "myBase.V12",
       "Create", "myPassword")
```

Most of the time, however, placing the database file in the same folder as the *movie* that uses it is more convenient. Use `the pathname` Lingo function to get the current movie's folder. Example:

```
    set gDB = New(Xtra"V12dbe", the pathname & "myBase.V12", "Create",
       "myPassword")
```

Passing Parameters to Xtras

As in any programming language (including Lingo), functions, commands and methods require a certain number of parameters. For example, in Lingo, the `Go to frame` command expects one parameter: the destination frame identifier. Likewise, the `getAt` function expects two parameters: *list* and *position*.

While the two aforementioned examples require exactly one and two parameters respectively, some commands and functions offer more flexibility by accepting optional parameters. For example, in Lingo, the `Beep` command requires one parameter: the number of beeps. However, if that parameter is omitted, Lingo assumes that one beep is required.

Xtras offer the same mechanism: some methods require an exact number of parameters (*fixed number of parameters*), others assume default values if parameters are omitted (*variable number of parameters*). Each of these methods can be easily identified in the Xtras built-in documentation explained below (see Basic Documentation).

Basic Documentation

In Director, Xtras contain a built-in mechanism that provides documentation for Lingo developers. In the Message Window, type:

```
    put mMessageList(Xtra "V12dbe")
```

in the Message Window, where Xtra "V12dbe" is the name of the Xtra library, not of an Xtra instance.

The above command returns the following Xtra description:

```
    -- "Xtra V12dbe
    -- part of V12 Database Engine
    -- ©Integration New Media, Inc. 1995-1999
    -- Please check the on-line help in the Xtras/V12-DBE menu
    new object me, string databasename, string openmode, *
    mBuild object me, *
    mCloneDatabase object me, string databasename
    mCreateField object me, string tablename, string fieldname, *
    mCreateFullIndex object me, string tablename, string fieldname, *
    mCreateIndex object me, string tablename, string indexname, string
       isunique, string fieldname, string order, *
    mCreateTable object me, string tablename
    mCustom object me, *
    mDeleteTable object me, string tablename
    mDumpStructure object me, *
    mEditDBStructure object me
    + mError object xtraRef, *
    + mFixDatabase object xtraRef, string databasename, string
       newdatabasename
    mGetPropertyNames object me, *
    mGetProperty object me, string property
    mGetRef object me
    mPackDatabase object me, string newdatabasename
    mReadDBStructure object me, string inputtype, string source, *
    mRenameField object me, string tablename, string oldfieldname,
       string newfieldname
    mSetPassword object me, string oldpassword, string newpassword
    mSetProperty object me, string property, string value
    + mStatus object xtraRef
    mUpdateDBStructure object me
    * V12Error *
    * V12ErrorReset
    * V12Status
    + mXtraVersion object xtraRef
```

Methods that expect a fixed number of parameters are those for which each parameter is listed. Methods that accept a variable number of parameters are those followed by a *.

Following are a few explanations:

```
    mEditDBStructure object me
```

means that the `mEditDBStructure` method requires exactly one parameter: the database instance.

```
    mSetProperty object me, string property, string value
```

means that `mSetProperty` requires three parameters: the database instance, the property (a string) and the value of the property (a string).

```
    mDumpStructure object me, *
```

means that `mDumpStructure` requires at least one parameter, and possibly more (indicated by the asterisk). You must refer to the documentation of this method to know what additional parameters are accepted.

```
    + mStatus object xtraRef
```

the leading "+" sign means that `mStatus` is a static method - a method that can be used with a database instance (i.e. `mStatus(gDB)`) and a database library instance (i.e. `mStatus(Xtra "V12dbe")`). Static methods are seldom used in V12-DBE.

```
    * V12Status
```

the leading "*" means that `V12status` is a global method - a method that can be used at any time, regardless of Xtra instances. It is only required that the Xtra be present when that function is called.

Note:	In addition to its built-in documentation, V12-DBE offers detailed on-line help accessible from the **Xtras>V12-DBE for Director >Help** menu in Director.

Using Xtras with Shockwave

V12-DBE can be used with Director movies delivered in Shockwave format (a.k.a. "shocked" movies) on local media (e.g. CD-ROM, hard disk, etc.). This form of distribution is interesting for users who need to view content locally, on their own computer, and eventually connect to the World Wide Web by clicking on hyperlinks.

In this case, the Shockwave movies you deliver must playback on the end-user's computer in a web browser (Microsoft Internet Explorer or a Netscape browser) using a playback engine installed in the System folder.

Note	If you plan to deploy Shockwave movies over the Internet or require that Shockwave movies access a V12 database located on a server on the Internet, you must either use the V12-DBE Online Companion, or devise a way to bring the V12 database to the local hard disk before opening it and using it. The V12 Database Engine Xtra can only open files that are available locally or on mounted volumes.

Shockwave movies, like projectors, need to handle two files: the V12-DBE Xtra and your V12 database. These files must be placed in a location on the end-user's computer depending on which browser is used, as explained below.

When using Netscape

The Xtra file must be placed into the Shockwave Plug-In folder located in Netscape's Plug-Ins folder. This folder's name is:

- \windows\shockwave\xtras\ on Microsoft Windows
- System folder:Extensions:Macromedia:Shockwave:Xtras on Macintosh

The database file (filename.V12) must be placed in the same folder as Netscape. If the Shocked movie is used locally (that is, not downloaded by the user from the Web), the V12 database file can also be placed in the same folder as the Shockwave movie.

When Using Internet Explorer

The Xtra file must be placed into the Shockwave Plug-In folder.

- \windows\shockwave\xtras\ on Microsoft Windows
- System Folder:Extensions:Macromedia:Shockwave:Xtras: on Macintosh

The V12 database file must be placed in the same folder as the shocked movie.

Database Basics

Overview

If your understanding of what a database is and does is unclear, we recommend that you read this section. The following sections deal with database basics:

- what is a database,
- records, fields and tables,
- indexes and full-text indexes,
- flat and relational databases,
- field types,
- selection, current record, and search criteria.

What is a Database?

A database is a collection of information that can be structured and sorted. A telephone book is an example of a hardcopy database, and government statistical records are examples of electronic databases. Database management programs such as V12-DBE provide many advantages over hardcopy databases. Unlike using a telephone directory that sorts data in alphabetical order, database software allows you to change the way you sort and view information. Moreover, you can find, modify and update information quickly and easily.

Records, Fields and Tables

An entry in a database is called a **record**.

Each record consists of pieces of information called **fields**.

All records are stored in a **table**.

For example, data entry in an address book typically consists of seven pieces of information called `fields`: last name, first name, street address, city, state, zip code and phone number. All the information relevant to one person makes up one `record`. The collected records make up the `table` and are contained in a `database` file. Entries below are typical of those found in an address book:

This is a **table**:

Last Name	First Name	Address	City	State	Zip	Phone	--- These are **fields**
Jordan	Ann	6772 Toyon Court	San Mateo	CA	94403	349-5353	--- This is the 1st **record**
Brown	Charles	30 Saxony Ave.	San Francisco	CA	94115	421-9963	--- ...the 2nd **record**
Pintado	Jack	22 Hoover Ave.	Bowie	MD	20712	731-5134	--- ...the 3rd **record**
Van Damme	Lucie	87 Main St.	Richmond	VA	23233	315-3545	--- ... etc

Peppermint	Patty	127 Big St.	Lebanon	MO	92023	462-6267

> **Note**: Some database management systems refer to fields as columns and to records as lines or rows. In V12-DBE, the terms remain `fields` and `records`.

Indexes

In a telephone directory, information is indexed by last name - a typical way to search for a telephone number. There are directories which index information by order of phone number or address, but any such directory sorts information in only one specific predetermined order.

V12-DBE allows you to determine how you want to sort information by defining one or more **indexes** in a table. When a field is indexed, V12-DBE creates an internal list that can be used to sort and search quickly the data it contains. Non-indexed fields can also be searched and sorted, but at a slower speed.

In this example, the address book entries are listed according to an index of the first name field and sorted in ascending order (A to Z), thus appearing in alphabetical order by first name.

Last Name	First Name	Address	City	State	Zip	Phone
Jordan	Ann	6772 Toyon Court	San Mateo	CA	94403	349-5353
Brown	Charles	30 Saxony Ave.	San Francisco	CA	94115	421-9963
Pintado	Jack	22 Hoover Ave.	Bowie	MD	20712	731-5134
Van Damme	Lucie	87 Main St.	Richmond	VA	23233	315-3545
Peppermint	Patty	127 Big St.	Lebanon	MO	92023	462-6267

Compound Indexes

A *compound index* — or *complex index* —organizes entries composed of two or more fields, as opposed to simple indexes — or indexes, for short — which organize single-field entries. Compound indexes are useful to determine the sorting order of records when some fields contain identical values.

In the following example, three records share the same last names (Cartman). Indexing the field `LastName` alone would certainly force Last Names to be properly ordered. But this would not determine the order in which the Cartmans are sorted.

Last Name	First Name	City	State	Zip
Cartman	Wendy	San Mateo	CA	94403
Brown	Charles	San Francisco	CA	94115
Pintado	Jack	Bowie	MD	20712
Cartman	Lucy	Richmond	VA	23233
Cartman	Eric	Lebanon	MO	92023

If you want your records sorted by Last Name, and by First Name in case of identical Last Names, you define a compound index on the fields `LastName` and `FirstName`. The sorted result would then be:

Last Name	First Name	City	State	Zip
Brown	Charles	San Francisco	CA	94115
Cartman	Eric	Lebanon	MO	92023
Cartman	Lucy	Richmond	VA	23233
Cartman	Wendy	San Mateo	CA	94403
Pintado	Jack	Bowie	MD	20712

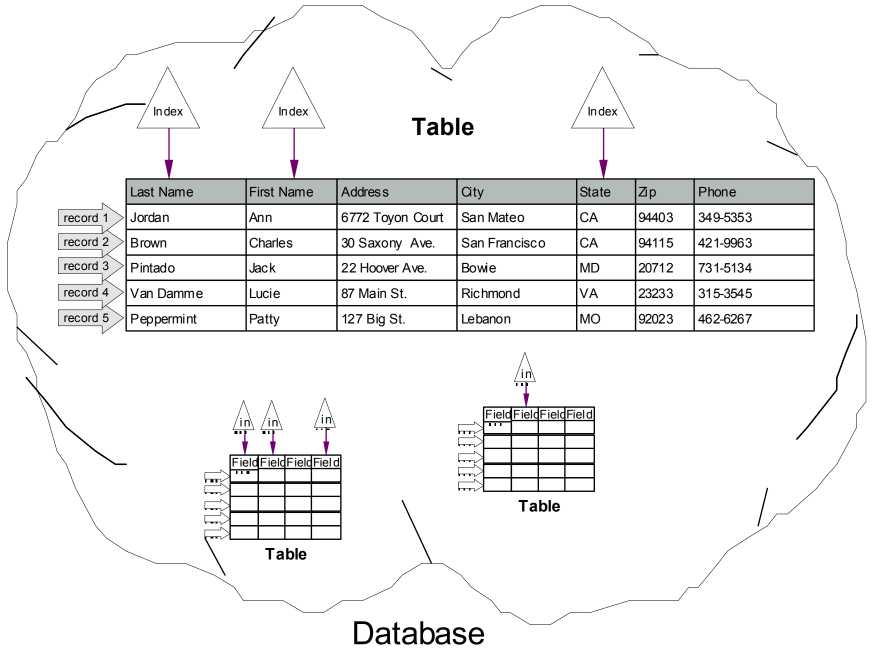
If you want them sorted by Last Name, and then by State in case of identical Last Names you define a compound index on the fields `LastName` and `State`. The sorted result would then be:

Last Name	First Name	City	State	Zip
Brown	Charles	San Francisco	CA	94115
Cartman	Wendy	San Mateo	CA	94403
Cartman	Eric	Lebanon	MO	92023
Cartman	Lucy	Richmond	VA	23233
Pintado	Jack	Bowie	MD	20712

Up to twelve fields can be declared in a single compound index in V12 Database Engine.

Database

A table, its fields and the indexes defined are stored in a **database**. A database can contain one or more such tables.



Last Name	First Name	Address	City	State	Zip	Phone
Jordan	Ann	6772 Toyon Court	San Mateo	CA	94403	349-5353
Brown	Charles	30 Saxony Ave.	San Francisco	CA	94115	421-9963
Pintado	Jack	22 Hoover Ave.	Bowie	MD	20712	731-5134
Van Damme	Lucie	87 Main St.	Richmond	VA	23233	315-3545
Peppermint	Patty	127 Big St.	Lebanon	MO	92023	462-6267

Full-text Indexing

Defining an index on a field allows for quick sorting and searching *of the first few characters* of a field. In some applications – typically when fields contain extensive information – you need to search for words that appear *anywhere* in a field efficiently.

This is where you need to define a full-text index, or **full-index** for short, on that field. A full-index is an index defined on every single word of a field.

Last Name	First Name	Publication Title
Jordan	Ann	Soups and Salads for Dummies
Brown	Charles	The Hunchback of the Empire State Building
Pintado	Jack	Bounds on Branching Programs
Van Damme	Lucie	Natural and Artificial Intelligence
Peppermint	Patty	Mastering Soups in 32767 Easy Lessons

In this example, looking for the word "Soup" in the Publication Title field requires a full-index for optimal search performance. If no index is defined on the Publication Title field, the same result can be achieved, but with a slower performance. If a regular index is defined on the Publication Title field, publications that start with the word "Soup" can be quickly located, but publications that contain that word require more time. Full-indexes apply only to fields of type `string`, including those which contain styled text (see Field Types, International Support and Managing Styled Text).

Note: Each index takes up disk space so it is not recommended that all fields be indexed. Full-indexes require much more space than regular indexes. Indexed fields should be limited to those likely to be searched and sorted most often.

For optimal full-text search efficiency, some level of control is required on the way it is performed. For example, indexing trivial words such as "and", "or", "the", etc. (or equivalent words that appear frequently in your application's language) is useless as most records would contain one or more occurrences of those words.

Likewise, some applications or languages require that digits be full-indexed whereas others would prefer to ignore them. V12-DBE enables you to fine-tune the behavior of the full-indexes by allowing for the definition of **Stop Words** (words that must be ignored), **Delimiters** (characters that delimit word boundaries) and **MinWordLength** (the size of the shortest word that must be considered for full-indexing).

Flat and Relational Databases

A flat database usually consists of one table. In flat database management systems such as FileMaker Pro, the terms table and database are interchangeable.

A relational database presents a more sophisticated use of information. In relational database management systems, two or more tables are contained in the database. Therefore, you can store as many tables as you wish in a single database file and each table could have one or more indexes. Tables can be linked so that information can be shared, saving you the trouble of copying the same information into several locations and in the maintenance of duplicate information. This is important if there are relationships between the various pieces of information. Though tables can be linked or related to other tables in a flat database management system, manipulation is cumbersome and changes made in one record are not automatically updated in other(s).

For example, if you want to add information to the entries contained in the address book in our first example, such as the company address and phone number, one way to do this would be to add them to the table:

Last Name	First Name	Address	City	State	Zip	Phone	Company	Phone
Jordan	Ann	6772 Toyon Court	San Mateo	CA	94403	349-5353	Rocco & Co.	526-2342
Brown	Charles	30 Saxony Ave.	San Francisco	CA	94115	421-9963	National Laundry	982-9400
Pintado	Jack	22 Hoover Ave.	Bowie	MD	20712	731-5134	Rocco & Co.	526-2342
Van Damme	Lucie	87 Main St.	Richmond	VA	23233	315-3545	Presto Cleaning	751-5290
Peppermint	Patty	127 Big St.	Lebanon	MO	92023	462-6267	Presto Cleaning	751-5290

However, adding this information might lead to the duplicate of information given that some people might be working for the same company. To prevent duplication and to save on disk space and time required to update, you could create a new table containing only the business information. For example, the new table could be called: Companies. Each record of that new table would have a unique ID number, *Company Ref*, that would also be used in the first table.

The database now contains two related tables, each having a field containing the common information, named “Company Ref”:

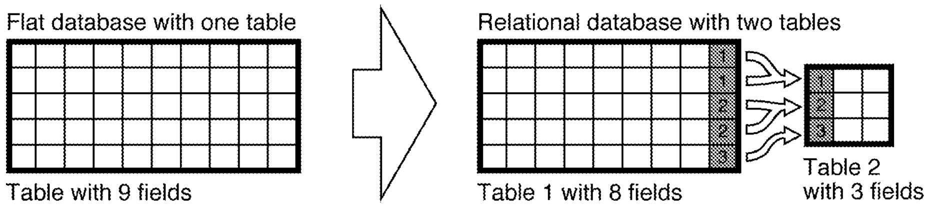
Table 1 containing information about the each person:

Last Name	First Name	Address	City	State	Zip	Phone	**Company Ref**
Jordan	Ann	6772 Toyon Court	San Mateo	CA	94403	349-5353	**RO**
Brown	Charles	30 Saxony Ave.	San Francisco	CA	94115	421-9963	**NA**
Pintado	Jack	22 Hoover Ave.	Bowie	MD	20712	731-5134	**RO**
Van Damme	Lucie	87 Main St.	Richmond	VA	23233	315-3545	**PR**
Peppermint	Patty	127 Big St.	Lebanon	MO	92023	462-6267	**PR**

Table 2 containing information about the companies:

Company ref	Company	Phone
NA	National Laundry	982-9400
PR	Presto Cleaning	751-5290
RO	Rocco & Co.	526-2342

The two databases could also be compared as follows:



The relational database is smaller because it avoids useless data duplication. In order to retrieve full information about any given individual in your address book, you would perform a search in your first table, retrieve the company reference, and then perform a search in the second table. The flat model may be easier to manage when retrieving data given that only one search is required, however it tends to consume valuable disk space.

Note	Relational Database Management Systems (RDBMS) are usually programmed with SQL (System Query Language), which has the ability to automatically resolve relations between related tables. Although V12 Database Engine can store multiple tables per database, it relies on Lingo scripts to resolve relations. It cannot automatically such resolve relations.

Field Types

For optimal data sorting and searching, you can specify the kind of information to be stored in each field. In V12-DBE, fields can be designated to contain strings**,** integers**,** floating**-**point numbers**,** dates, pictures, sounds, palettes, etc. A field would then be of type **string**, **integer**, **float**, **date**, or **media**. Fields of type Media can accommodate any media that can be stored in a cast member except for Film Loops and QuickTime movies. See Appendix 3: Capacities and Limits at the end of this manual for a formal definition of each field type.

For example, if you wanted to organize a contest where each person listed in your address book is collecting points, you would need to keep track of the number of points accumulated by each person. Therefore, you would update your address book to include a new field: *number of points*. Since you would want to search and sort this new field quickly, you need to define an index. This new field could be one of two types: string or integer.

If you define the new field as type string, you might end up with the following listing when the table is sorted by ascending order of points:

Jordan	Ann	1
Brown	Charles	12
Peppermint	Patty	127
Pintado	Jack	6
Van Damme	Lucie	64

This order occurs because the string "12" is alphabetically lower than the string "6" given that the ASCII code for "1" is 49 which is smaller than the ASCII code for "6", 54. To sort the list in the expected ascending order, you must define the field number of points to be of type integer to get the following result:

Jordan	Ann	1
Pintado	Jack	6
Brown	Charles	12
Van Damme	Lucie	64
Peppermint	Patty	127

Typecasting

Typecasting (or *casting*, for short) is the process of converting a piece of data from one type to another. This is a common mechanism to most programming languages, including Lingo.

For example, the integer *234* can be casted to the string "234". Conversely, the string "3.1416" can be casted to the float *3.1416*.

Typecasting can be performed explicitly in Lingo using the `Integer`, `String` and `Float` functions (i.e., `String(234)` returns the string "234") or automatically (i.e., `12&34` returns the string "1234").

V12-DBE has the same ability as Lingo to typecast data when it is required by the context. However, some borderline conditions can lead to ambiguous results such as trying to store the value " 123" in a field of type `Integer` (note the leading space).

You must always make sure that the data supplied to V12-DBE does not contain spurious characters, otherwise typecasting will not be performed properly.

International Support

Although the 26 basic letters of the roman alphabet sort in the same order in all roman languages, the position of accented characters (also called *mutated characters*) varies from one language to another. For example, the letter **ä** sorts as a regular **a** in German whereas it sorts after **z** in Swedish. Likewise, in Spanish, **ch** sorts after **cz** and **ll** sorts after **lz.**

V12-DBE's default `string` was designed to satisfy as many languages as possible. It can sort and search texts in English, French, Italian, Dutch, German, Norwegian, etc. See Appendix 16: String and Custom String Types in the appendices of this manual for a detailed description of `string`'s behavior.

V12-DBE also offers the option of defining fields of type `Swedish`, `Spanish`, `Hebrew`, etc. that index and sort data in a way that is compliant with these languages. See Appendix 16: String and Custom String Types for an exhaustive list and description of those behaviors called *custom string types*.

The Regular Edition of V12-DBE allows for the creation of custom string types having each a sort/search description table defined by you. Therefore, you can define your own string type for any language supported by single-byte characters, including Klingon.

Note: Everything that applies to the type `string` also applies to custom string types. Throughout this manual, the term `string` is used to designate both the default V12-DBE string and custom string types.

Selection, Current Record, Search Criteria

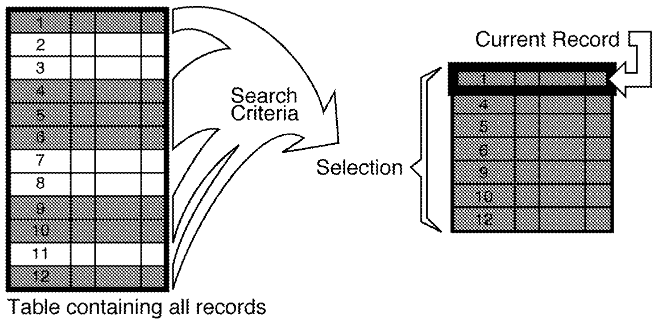
The selection is the set of records currently available in the table. When a table is opened the selection contains all the records of the table. If you search through a table after having defined search criteria, the resulting set of records that satisfy the search is the new selection. When a selection is first defined, the current record is the first record of that selection.

- If exactly one record satisfies the search criteria, the selection contains only the record which automatically becomes the current record.

- If two or more records satisfy the search criteria, the selection is the set of those records and the first record of the selection becomes the current record.

- If no record satisfies the search criteria, then the selection is empty and the current record is undefined. Any attempt to read or write in a field will result in an error.

The following figure illustrates the idea of searching a table for records satisfying a certain criteria. The result is placed in a selection, the first record of which becomes the current record.



All operations on any fields (such as reading and writing data) are done on the current record. Therefore, before performing these operations, you must designate the record on which you wish to work as the current record by selecting it, and by using methods such as `mGoFirst`, `mGoLast`, `mGoNext`, `mGoPrevious` and `mGo`.

At any given time, with the possible exception of no record satisfying the criteria, there is a current record. All record operations apply to the current record and do not apply to any other record. You can read the content of a field in the current record, modify its content or delete the entire record. The current record is changed when you move from one record to the next in the selection.

Besides sorting a table through indexes, you can find information based on search criteria. You can define simple search criteria, also called **simple queries**, such as:

- First name is Jack
- State is California
- Number of points is less than 30
- Last name begins with P

Or you can define **complex search criteria**, also called Boolean queries using and/or, such as:

- First name is Jack **or** Last name begins with P
- State is California **and** Number of points is less than 30
- State is California **and** Number of points is less than 30 **and** Last name contains "pe"

Note	Database Management Systems that use SQL as their programming language can define search criteria such as: *(Dish is soup or appetizer) and (Main Ingredient is celery or eggplant or pumpkin)*. V12 Database Engine does not support this alternation of ANDs and ORs. See Appendix 9: Advanced Boolean Searches for possible workarounds.

Using V12-DBE

Overview

This section covers the main steps in using V12-DBE. If you have looked at the *First Steps* manuals, you should already be familiar with these five steps.

V12-DBE Basics

V12-DBE is a powerful database management engine, composed of two Xtras libraries: a **database** Xtra named "V12dbe" and a **table** Xtra named "V12table". The database Xtra is used to create a new database or to open an existing database in a given mode (read only, read/write or create). The table Xtra is used to manage the content of the table in your database.

The Main Steps

If you read through the *First Steps* manual, a typical step-by-step use of V12-DBE was outlined. The individual steps to using V12-DBE are explored in greater details in this section.

Step 1 **Deciding on a data model**: Before you create your database, decide which fields are needed, the type of those fields, how they should be grouped in the tables and which fields should be indexed. This is a design effort that does not require a special tool (with the possible exception of a word processor to help you edit your ideas). If your original data is managed in FileMaker Pro, MS Access, or a similar database management product, that database's model is probably the best starting point for your V12 database model.

Step 2 **Preparing the data**: If your original data is managed in FileMaker Pro, MS Access, or a similar database management product, in step 2, you make sure that your data is properly entered and that it is in a format readable by V12 Database Engine (Text file, DBF file or one of V12-DBE's ODBC-compliant formats).

Step 3 **Creating a V12-DBE database**: Use the V12-DBE Tool to create the V12 database you designed at Step 1. Alternatively, you can use the database Xtra's (i.e. Xtra *V12dbe*'s) methods to write an automated database creation script in Lingo.

Step 4 **Importing data into a V12-DBE database**: Use the V12-DBE Tool to import the Text or DBF file exported at Step 2. Alternatively, you can write Lingo scripts to automate the process of importing data into your V12-DBE databases.

Step 5 **Implementing the user interface**: This step consists of the development of data search, retrieval and modification routines at runtime either as Behaviors attached to the various Director sprites, or as Lingo handlers in Director script members. Sample movies provided in the V12-DBE package or on Integration New Media's web site (http://www.integration.qc.ca) can be used to inspire the development of your projects.

Each of the aforementioned steps is discussed in subsequent sections. Since V12-DBE offers more than one way to attain a goal, the simplest approach is explained first, then alternate and more powerful or versatile approaches are discussed.

Step 1: Deciding on a Data Model

Before creating a database file, you need to decide how you want to organize your data. If your original data is managed in FileMaker Pro, MS Access, or a similar database management product, that database's model is probably the best starting point for your V12 database model. The questions you need to address are :

- which fields are required and what are their respective types?
- which fields should be indexed for quick searching and sorting?
- how many tables are required to group the fields?
- are there any relationships between the various tables?

In the stationary catalog example below, only one table is needed. It is called "Articles". The seven fields you need are :

- Field "ItemName" of type String
- Field "Category" of type String
- Field "Description" of type String
- Field "Price" of type Float
- Field "CatalogNumber" of type Integer
- Field "Photo" of type Media
- Field "Date" of type Date

Since only the fields "ItemName", "Price" and "CatalogNumber" will be searchable, only them are indexed.

Defining Identifiers

Tables, field and indexes are given names called **identifiers**, and V12-DBE makes reference to them by use of these identifiers. An identifier must start with a low-ASCII alphabetic character (a..z, A..Z) and can be followed by any combination of alphanumeric characters (0..9, a..z, A..Z, à, é, ö, …). The maximum length for an identifier is 32 characters. No two fields or indexes of a table can have the same name.

V12-DBE is not case-sensitive. That is, upper-cases and lower-cases are identical. The following identifiers are considered identical in V12-DBE: "articles", "ARTICLES", "Articles", "aRtICleS".

Step 2: Preparing the Data

Step 2 is relevant only if your original data is managed in FileMaker Pro, 4th Dimension, DBase or any other database management system that has the ability to export TEXT or DBF files.

If you plan to use an ODBC driver to import your data from MS Access, MS FoxPro, MS Excel or MS SQL Server, or if the records must be keyed-in by the user, skip to Step 3.

In brief, Step 2 consists in making sure that your original data is properly structured and in exporting it as Text or DBF files. Those files are then imported to V12 databases at Step 4: Importing Data into a V12-DBE Database.

TEXT File Formats

Text files are the most popular data interchange file formats. Usually, *TAB-delimited* Text files are used to exchange data between database management systems.

A typical TAB-delimited file is in the following format:

```
    Field_A1 TAB Field_A2 TAB Field_A3 TAB ... TAB Field_An CR
    Field_B1 TAB Field_B2 TAB Field_B3 TAB ... TAB Field_Bn CR
    Field_C1 TAB Field_C2 TAB Field_C3 TAB ... TAB Field_Cn CR
```

where `Field_A1, Field_A2,` etc. designate the actual data in those fields. `TAB` is the ASCII character 9, indicating the end of a field.

On the Mac, `CR` is the ASCII character 13, indicating the end of a record. On Windows, `CR` is the ASCII character 13 followed by the ASCII character 10 (Line Feed). Since V12-DBE always ignores Line Feed characters, you need not worry about exceptional cases between the Mac and Windows with respect to Record Delimiters.

Generally, using the V12-DBE Tool or the `mImport` method to import a text file into a V12-DBE database is a straightforward process, unless your fields contain `TAB` or `CR` characters. In such cases, V12-DBE confuses the real delimiter with the legitimate content of your field. See Dealing with Delimiters Ambiguity below.

Field Descriptors

V12-DBE requires a special type of Delimited Text file format. The file's first line must contain **field descriptors**, or the names of the fields into which the data that follow must be imported. This file format is sometimes referred to as **mail merge format**. Following is an example of such a file:

Name	Price	CatNumber
Ruler	1.99	1431

Labels	1.19	1743
Tags	6.19	…

You can easily have FileMaker Pro and MS Access export those field names before exporting the records data as follows:

- In FileMaker Pro, choose File > Import/Export > Export Records and select "Merge (*.MER)" in the Save as Type menu. As a side effect, FileMaker Pro exports your data with quotation marks surrounding each field and a comma as field separator. Your file can easily be imported to the V12 database with quotation marks as Text Qualifiers (Text Qualifiers below) and commas as field delimiters (see Custom Delimiters below).

- In MS Access, choose File > Save As/Export, to an external file or database. Then, select Text Files in the Save as Type menu. Click Export. Make sure that Delimited is selected and click Next. Click "Include Field Names in First Row".

Dealing with Delimiters Ambiguity

Most of the time, `TAB`s are used to delimit fields in a Text file, and `CR`s to delimit records. If your fields contain `TAB`s or `CR`s as part of their actual data, the legitimate content of your fields would be confused with those delimiters once exported in a text file. There is more than one way to deal with this problem. Choose the one — or combination — that best fit your project's needs in the list below.

Virtual Carriage Returns

Some database management systems (e.g., FileMaker Pro) export a special character other than ASCII #13 instead of the `CR`s that appear in your fields. For example, FileMaker Pro exports ASCII #11 (Vertical Tab) instead of ASCII #13. Those characters are called *Virtual Carriage Returns* or *VirtualCR* for short.

V12 Database Engine can recognize those characters and convert them to real Carriage Returns (ASCII #13) once they are imported. See Step 4: Importing Data into a V12-DBE Database / Importing Data with mImport and VirtualCR / Properties of Databases.

Text Qualifiers

A *text qualifier* is special character used to begin and end each Text field. In most database management systems, the quotation mark (") is the default text qualifier. Its main purpose is to group a field's content between two identical marks so to enable the occurrence of field and record delimiters without the risk of confusion.

Example:

"Name" , "Description" *CR*
"Hat" , "high-quality, excellent fabric, available in:*CR*Red*CR*Green*CR*Blue"
"Shoe", "this, description, field, contains, commas, and, Carriage*CR*Returns"

Text qualifiers are automatically placed in text files exported from MS Access, FileMaker Pro (Mail Merge format) and MS Excel (only for fields that contain commas).

Text files containing Text Qualifiers are easily imported to V12 databases by setting the `mImport` method's `TextQualifier` property to the right character. See Step 4: Importing Data into a V12-DBE Database / Importing Data with mImport.

Custom Delimiters

Another way to avoid delimiter ambiguity is to choose delimiters other than `TAB` and `CR`. Some database management systems allow you to select appropriate delimiters before exporting a TEXT file (e.g., 4th Dimension). Some others allow only the selection of a custom field delimiter and always use `CR`s as records delimiters (e.g., MS Access). FileMaker Pro and MS Excel do not allow for any customization.

V12-DBE's `mImport` method assumes, by default, that the field and record delimiters are `TAB` and `CR`. However, other delimiters can be specified. See Step 4: Importing Data into a V12-DBE Database / Importing Data with mImport.

Note	Since V12-DBE always ignores Line Feed characters, (ASCII Character 10), those cannot be used as field or record delimiters.

Calculated Fields

If your database management system does not support alternative delimiters you can nonetheless force it to export your own delimiters by creating an additional field and setting it as the result of the concatenation of all the other fields with the desired delimiter in between each two fields. Then, export only the new field in a text file.

Processing the Exported Text File

If the database management system used to store your data is not flexible enough, or if the data themselves are not properly structured, you can export them in a text file and use Third Party tools to search and replace sequences — or patterns — of characters .

Below is a non-exhaustive list of helpful tools:

- BBEdit for MacOS from Bare Bones Software (www.barebones.com). For MacOS.
- TextPad from Helios Software Solutions (www.textpad.com). For Windows.
- UltraEdit from IDM Computer Solutions (www.ultraedit.com). For Windows.
- MS Excel from Microsoft Corp. (www.microsoft.com). For MacOS and Windows.

BBEdit, TextPad and UltraEdit feature GREPs (General Regular Expression Parsers) which are very convenient to structure unstructured data.

Character Sets

Character sets are not standard across operating systems and file formats. For example, the letter "é" is the 233rd on Windows, whereas it is the 142nd on Macintosh and the 130th on MS-DOS.

Although all three operating systems use the ASCII characters set, only low-ASCII characters (i.e., those below #127) are common to the many variants of the ASCII set. Therefore, the rest of this topic is of interest to you only if your deal with high-ASCII characters (such as **å, æ, ß, ê, ï, ø, ž, ‰, §, ¥,** etc.)

V12-DBE's `CharacterSet` property can be set to translate Windows, Macintosh or MS-DOS character sets when importing or exporting Text or DBF files. Optionally, `mImport` accepts the `CharacterSet` property to use only once to import a single file (as opposed to the `CharacterSet` property which permanently affects `mImport`, `mImportFile` and `mExportSelection`, or until it is set to another value). Step 4: Importing Data into a V12-DBE Database / Importing Data with mImport.

MS Word documents, V12 databases as well as many other proprietary file formats are cross-platform compatible. You should not worry about this portability issue if your data contains only low-ASCII characters (e.g. English alphabet).

Dealing with Dates

Although V12-DBE can output dates in highly customizable formats, it requires that they be input in a single unambiguous format called the *raw* format: YYYY/MM/DD.

- YYYY: year in 4 digits (e.g., *1901*, *1997*, *2002*)
- MM: month in 1 or 2 digits (e.g., *01* or *1* for January)
- DD: day in 1 or 2 digits (e.g., *04* or *4* for the 4th day of the month)

The separator between the three chunks of values can be any non-numeric character, although slash (`/`), hyphen (`-`) and period (`.`) are most commonly used.

Any date that needs to be imported in a V12-DBE fields of type `date` needs to be in this raw format. This rules applies to the V12-DBE Tool as well as to V12-DBE's Lingo methods that accept dates as input parameters (e.g., `mImportFile`, `mSetField` and `mSetCriteria`).

Note	If you omit to initialize a field of type date in a new record, or try to store an invalid date in it, it is automatically set to 1900/01/01 (January 1st, 1900).

DBF File Formats

V12 Database Engine can import DBF files two ways:

- on both MacOS and Windows, it can read DBF files of type Dbase III, Dbase IV, Dbase V, FoxPro 2.0, FoxPro 2.5, FoxPro 2.6, FoxPro 3.0 and FoxPro 5.0.

- on Windows 9x/NT only, DBF files can be exported through the FoxPro ODBC driver.

You may want to export your data as DBF files, if that format is supported by your database management system.

DBF is an old file format. It was enhanced over the years but most common applications still use the popular Dbase III format whose features are common to all other DBF file variants. Limitations include:

- Field names are limited to ten characters, all in upper case,

- The number of fields per DBF file is limited to 128,

- Records are of fixed length, determined upon the creation of the DBF file,

- There is more than one way to deal with high-ASCII characters (accented characters) with DBF files. This depends on the operating system and application used to manage the DBF file,

- Indexes are saved in separate files with extensions such as IDX, MDX, NDX or CDX (depends on the managing application),

- DBF files cannot be password-protected. However, some applications protect DBF files by encrypting/decrypting them,

- Character fields (roughly, the equivalent of V12-DBE's `string` fields) are limited to 255 characters. Any text longer than 255 characters, must be stored in separate files called DBT files and referred to by Memo fields,

- Media (either Binary or Text) are stored in external DBT files pointed to by Memo fields in the DBF file. Media fields are limited to 32K of size.

Various flavors of the DBF file format were introduced over the years, such as DBase IV, DBase V, FoxPro 2.0, FoxPro 2.5, FoxPro 2.6, FoxPro 3.0 and FoxPro 5.0. They all include DBase III's features as core specifications and add new data types or extend certain limits. See mReadDBstructure from a DBF File for more details.

Note	Years ago, DBF files were convenient given that they contained less variants than TEXT files. However, since the introduction of Windows and the popularization of DBF to other Operating Systems, DBF files contain many categories and have become difficult to manage. V12-DBE's preferred file importing format is Text.

In summary, the exact structure and limitations of your DBF files largely depend on how your database management system deals with them.

Field Buffer Size

Prior to creating your database structures, you need to determine the size of the largest chunk of data for each field of type `string` or `media` in your database. This helps you optimize the size of the buffers needed to manage V12-DBE's internal data structures for each of those fields.

If you are confident that your `string`s will not exceed 256 bytes, or your `media` 64K, you do not need to worry about the buffer size. Default buffers are set to 256 bytes for `string`s and to 64K for `media`.

Note: Database management systems that use a fixed-length record format (such as the DBF file format) use this maximum value to allocate data space on disk. Consequently, that amount of space is lost for each record of the database regardless of the actual data stored in it.

V12 Database Engine uses a variable-length record format. This means that it uses the exact amount of space needed for the storage of a record on disk, with no space loss at all. The Field Buffer Size is used only to allocate buffer sizes in RAM while transferring data between Director and the V12 database files.

Step 3: Creating a Database

At Step 3, you formalize the database you designed at Step 1: Deciding on a Data Model into a **database descriptor**. Then, you provide that descriptor to the V12-DBE Tool (if you choose to use the V12-DBE Tool), or to V12-DBE's `mReadDBstructure` method (if you decided to script the database creation process).

If you use the V12-DBE Tool, just read through the next two sections (Database Descriptors and Using the V12-DBE Tool) and skip to Step 4: Importing Data into a V12-DBE Database. If you wish to script the database creation process, read through Scripting the Database Creation as well.

The V12-DBE Tool is a convenient point-and-click environment for small projects. Scripting the database creation process with Lingo requires a little more effort upfront but may end up saving you a lot of time, if you need to experiment with your database structure or data before committing to a final form. It enables you to automate the database creation process.

Database Descriptors

Following is the format of text (and literal) database descriptors required by both the V12-DBE Tool and the `mReadDBstructure` method. It is used to build a database structure from scratch.

If you build your V12 databases from other databases (e.g., MS Access, MS Excel, etc.), you can directly skip to Scripting the Database Creation.

The desired V12-DBE database structure is stored in a text file (or Director member) called the database descriptor in the following format.

```
[TABLE]
NameOfTable
[FIELDS]
FieldName1 FieldType1 IndexType1
FieldName2 FieldType2 IndexType2
FieldName3 FieldType3 BufferSize3 IndexType3
etc.
[END]
```

The `[TABLE]` tag is be followed by one parameter: the name of the table. This is an identifier (see Defining Identifiers).

The `[FIELDS]` tag is followed by as many lines as you need to define fields in the above defined table. The syntax of each line is as follows (see Database Basics for a thorough explanation of these concepts):

- `FieldName`: the name given to the field to be created. This is an identifier (see Defining Identifiers),

- `FieldType`: `string` , `integer`, `float`, `date`, `media` or a custom string type (see Field Types),

- `BufferSize`: the amount of RAM to allocate for the internal management of the field's content. This parameter is relevant only for fields of type `string` and `media`. If omitted, fields of type `string` are created with a default buffer size of 255 characters and fields of type `media` are created with a default buffer size of 64K. See Field Buffer Size in Step 2: Preparing the Data.

- `IndexType`: the word "indexed" if the field must be indexed, or the word "full-indexed" if the field must be full-indexed, or nothing if no indexing is required. If you need to both index and full-index a field, see Defining Both an Index and a Full-index on a Field.

Note: If you try to store a text longer than the size of the buffer allocated for a field type `string`, V12-DBE signals a warning and stores the truncated text into the field. `Media` that are larger than the maximum buffer size of a fields are not stored at all.

`[END]` indicates the end of the descriptor. It is a mandatory tag.

In each line of the descriptor file, tokens (i.e. field name, index name, value, etc.) must be separated by one or multiple Tabs and/or space characters.

Note: A convenient way to build a descriptor file for a database containing a large number of tables, fields or indexes is to type it in a spreadsheet thus taking advantage of advanced editing functions. The result can then be saved to a TAB-delimited file or Copy/Pasted to a Director field for processing by `mReadDBStructure`.

Example:
```
[TABLE]
Recipes
[FIELDS]
NameOfRecipe string indexed
Calories integer indexed
CookingTime integer
TextOfRecipe string 5000 full-indexed
Photo media 300000
[END]
```

Note: A valid database needs exactly one table, at least one field and at least one index.

Defining Both an Index and a Full-index on a Field

In exceptional cases, you would need to define both an index and a full-index on a field. Since the `IndexType` parameter defined above can represent only one of "indexed" or "full-indexed", you would need to set it to "indexed" and define the full-index separately under an additional tag named [FULL-INDEXES].

The [FULL-INDEXES] tag must follow the [FIELDS] section and must be followed by a list of fields to be full-indexed, one per line.

Example:
```
[TABLE]
Recipes
[FIELDS]
NameOfRecipe string indexed
Calories integer indexed
CookingTime integer
TextOfRecipe string 5000 indexed
Photo media 300000
[FULL-INDEXES]
TextOfRecipe
[END]
```

Alternate Syntax for Creating Indexes

Database descriptors support an alternate syntax to create indexes. The [INDEXES] tag can be used right after the fields definitions to explicitly name and define the desired indexes.

This alternate syntax is used by mDumpStructure for clarity (see Viewing the Structure of a Database).

This database descriptor example is equivalent to the one above:
```
[TABLE]
Recipes
[FIELDS]
NameOfRecipe string
Calories integer
CookingTime integer
TextOfRecipe string 5000
Photo media 300000
[INDEXES]
NameOfRecipeNdx duplicate NameOfRecipe ascending
CaloriesNdx duplicate Calories ascending
TextOfRecipeNdx duplicate TextOfRecipe ascending
[FULL-INDEXES]
TextOfRecipe
[END]
```

Defining Compound Indexes

Compound indexes are indexes defined on two or more fields (see Database Basics/Compound Indexes). Compound indexes can be defined after the [INDEXES] tag, as in:
```
[TABLE]
Students
[FIELDS]
LastName string
FirstName string
Age integer
[INDEXES]
CompoundNdx duplicate LastName ascending FirstName ascending
```

```
[END]
```

The general syntax of a compound index definition is

```
[INDEXES]
Indx1 UniqueOrDup [FieldName AscOrDesc]1..10
```

where:

- `Indx1` is the name of the compound index
- `UniqueOrDup` is either "unique" or "duplicate", depending upon whether or not you allow duplicate entries for that index
- `FieldName` is the name of a field defined under the `[FIELDS]` tag
- `AscOrDesc` is "ascending" if you want that field sorted low-to-high, or "descending" otherwise.

Up to ten `FieldName AscOrDesc` couples can be defined for a single compound index.

Adding Comments to Database Descriptors

Database descriptors can also contain comments in much the same way Lingo scripts do. In Lingo, comments are preceded by double hyphens ("`--`") and must be followed by a `CARRIAGE_RETURN`. In database descriptors, comments must be preceded by `(*` and be followed by `*)`. They can include any sequences of characters, including `CARRIAGE_RETURN`s.

Example:

```
(*
   description of the Mega-Cookbook recipes table version 1.1
   by Bill Gatezky, 14-Feb-97
   This is a valid comment despite the fact that it contains
   Carriage Returns
*)
[TABLE]
Recipes
(* this is also a valid comment *)
[FIELDS]
NameOfRecipe string indexed
...
[END]
```

The comment opening tag for database descriptors must be followed by a blank character such as a space, tab or `CARRIAGE_RETURN`. Likewise, a comment closing tag must be preceded by a blank character. Thus,

```
(*invalid comment: will generate an error*)
```

is an invalid comment, whereas

```
(* valid comment *)
```

is valid.

Using the V12-DBE Tool

To create a V12 database using the V12-DBE Tool:

1. Choose File > New…

2. Fill out the Database Descriptor field according to the syntax described in Database Descriptors,

3. Provide a name, and optionally a password, for your new V12 database,

4. Click the Create button

Instead of filling out the Database Descriptor field manually in the V12-DBE Tool, you can edit it in a text file and load that text file to the Tool's Database Descriptor field. You can also directly read the structure of a DBF file, or of another V12 database into the Tool's Database Descriptor field.

For more information, see the V12-DBE Tool's *User Manual.*

Scripting the Database Creation

Automating the creation a V12 database through Lingo with V12-DBE consists in three steps:

- Creating an Xtra instance of the database with `New`
- Defining its structure with `mReadDBstructure`
- Building the database with `mBuild`

The general form of a database creation Lingo handler is:

```
on CreateDatabase
   set gDB = New(Xtra "V12dbe", FileName, "create", Password)
   CheckV12Error()
   mReadDBStructure(gDB, InputType, other params)
   CheckV12Error()
   mBuild(gDB)
   CheckV12Error()
   set gDB=0
end CreateDatabase
```

where

- `FileName` is the full pathname of the V12 database to create

- `Password` is the password to protect `FileName`

- `InputType` is one of "Text", "Literal", "DBF", "V12", "FoxPro", "Access", "Excel" or "SQL Server".

- *other params* are one or more parameters depending on the selected InputType.

See CheckV12Error in Errors and Defensive Programming for a definition of the CheckV12Error() handler used throughout this section.

Step 3a: Creating a Database Xtra Instance

Use the New method to create a database Xtra instance.

Syntax:
```
    set gDB = New(Xtra "V12dbe", Name, "create", Password)
```

The parameters you provide are:

- Name: the name of the new database file, including its path if needed (see Dealing with Pathnames in Using Xtras).

- "Create" or the Mode: the mode in which the Xtra instance is defined. In this case, the mode is Create (create a new database file). Other possible modes are ReadOnly, ReadWrite and Shared ReadWrite. See Opening an Existing Database.

- Password: the password is required if you wish to protect your database against tampering and/or data theft. You can lock the database with a password, but make sure to record it in a safe place. If you forget it, you will not be able to open your database again.

Example:
```
    set gDB = New(Xtra "V12dbe", "Catalog.V12", "Create", "top secret")
```

Note	For a number of reasons, the creation of an Xtra instance can fail (insufficient memory, invalid file path, etc.) Always make sure that your database instance is valid by checking V12Error (see Errors and Defensive Programming) or ObjectP (see Checking if *New* Was Successful in Using Xtras) before pursuing the database creation process.

Step 3b: Defining the Database Structure

The next method, after successfully creating a database Xtra instance, is to call mReadDBstructure to read in the database structure you designed at Step 1: Deciding on a Data Model.

mReadDBstructure requires one the following inputs:

- a database descriptor as defined in Database Descriptors above. Such as descriptor is supplied either as a text file or as a literal (i.e. a Director field or variable),

- a DBF file (DBase) which serves as a table template,
- a V12 database which serves as a database template,
- a directory containing one or more MS FoxPro files which serve collectively as a database template (Windows-32 only, requires the FoxPro ODBC driver),
- a MS Access database which serves as a database template (Windows-32 only, requires the Access ODBC driver),
- a MS Excel workbook which serves as a database template (Windows-32 only, requires the Excel ODBC driver),
- a MS SQL Server data source which serves as a database template (Windows-32 only, requires the MS SQL Server ODBC driver).

It is always a good practice to check the value returned by `V12Error()` or `V12Status()` after calling `mReadDBstructure` (see Errors and Defensive Programming) to find out if an error occurred. You may also call `mDumpStructure` right after calling `mReadDBstructure` to check the actual database structure V12-DBE will build once `mBuild` is called.

Database structure translation rules from the above ODBC-compliant databases to V12 Databases vary according to the specific ODBC driver installed on your computer.

mReadDBstructure from a Text File

To read a database descriptor into V12-DBE, use the following Lingo statement:

```
    mReadDBStructure(gDB, "TEXT", File_Pathname)
```

Assuming that the name of the database descriptor's filename is "Def.txt", the following Lingo code creates a new V12-DBE database file named "Catalog.V12" and structures it as described in "Def.txt".

```
    on CreateDatabase
       set gDB = New(Xtra "V12dbe",  the pathname&"Catalog.V12",
       "create", "top secret")
       CheckV12Error()
       mReadDBStructure(gDB, "TEXT", the pathname & "Def.txt")
       CheckV12Error()
       mBuild(gDB)
       CheckV12Error()
       set gDB=0
    end CreateDatabase
```

mReadDBstructure from a Literal

A literal is either a Director member of type *Field* or a Lingo variable that actually contains the database descriptor (as opposed to containing the pathname of the descriptor Text file). Building a database from a literal description is very similar to the building it from a text file. The literal must contain the database descriptor as defined in Database Descriptors. The Lingo script to build the database is:

```
    mReadDBStructure(gDB, "LITERAL", Variable_or_Field_Name)
```

For example, assume that the Director member of type Field and named "descriptor" contains a database descriptor, the following example creates a V12-DBE database compliant to that description.

```
on CreateDatabase
   set gDB = New(Xtra "V12dbe", the pathname&"Catalog.V12",
   "create", "top secret")
   CheckV12Error()
   mReadDBStructure(gDB, "LITERAL", field "Descriptor")
   CheckV12Error()
   mBuild(gDB)
   CheckV12Error()
   set gDB=0
end CreateDatabase
```

mReadDBstructure from a DBF File

A DBF file alone represents a flat file, thus a single V12-DBE table. A DBF file can be used as a template for a V12-DBE table in much the same way as a text file or literal can. The name of the created V12-DBE table is identical to the DBF filename without the ".DBF" extension. The syntax is:

```
mReadDBStructure(gDB, "DBF", File_Pathname)
```

For a DBF file to be used as a complete and valid V12-DBE table descriptor, at least one index must be defined. If that index is defined by an IDX or NDX file located in the same folder as the DBF file, `mReadDBstructure` detects its presence and automatically defines an index for that field in the current table.

Tip	V12-DBE does not check the validity of that index, therefore you can fool it to create an index for a field named "MyField" by creating an empty file named "MyField.IDX" in the same folder as your DBF file.

The following rules apply to the translation of DBF file structures:

DBF field type	Translated to V12 field type	Notes
Character	String	Buffer size = size of field in DBF file
Integer	Integer	
Numeric with no digit after fixed point	Integer	
Numeric with one or more digits after fixed point	Float	
Float	Float	
Double	Float	
Currency	Float	On Windows 3.1 and Mac68K, acceptable values are in the range -2^k to 2^k-1, where k = 31

		minus the number of decimal places.
Date	Date	
DateTime	Date	Data cannot be converted from fields of type DateTime. Only the default date (1900/01/01) is imported.
Logical	Integer	FALSE values are translated to *0*s, TRUE values to *1*s and undefined values (represented by "?" in the DBF file) to *-1*s
Media	String	Buffer size = 32K
General	Ignored	
Character-Binary	Ignored	
Memo-Binary	Ignored	

Memo fields are those typically used to store text longer than 255 characters. Memo fields can also store binary data of arbitrary formats: those *cannot* be imported in V12-DBE databases. When importing data from a DBF file that contains Memo fields, the corresponding DBT files are automatically processed by V12-DBE.

The following example uses the file VIDEO.DBF as a template to build a table named "video" in the V12-DBE database named "VideoStore.V12". The structure of the file VIDEO.DBF is as follows:

Field	**Type**	**Width**
TITLE	Character	30
DESCRIPT	Memo	10
RATING	Character	4
TYPE	Character	10
DATE_ARRIV	Date	8
AVAILABLE	Logical	1
TIMES_RENT	Numeric	5
NUM_SOLD	Numeric	5

Two index files named TITLE.IDX and TYPE.IDX are available in the same folder as VIDEO.DBF.

The Lingo script is as follows:

```
on CreateDatabase
   set gDB = New(Xtra "V12dbe",  the pathname&"VideoStore.V12",
   "create", "")
   CheckV12Error()
   mReadDBStructure(gDB, "DBF", the pathname & "Video.DBF")
   CheckV12Error()
   mBuild(gDB)
   CheckV12Error()
   put mDumpStructure(gDB)
   set gDB=0
end CreateDatabase
```

The resulting V12-DBE database can be verified immediately with `mDumpStructure` (see Viewing the Structure of a Database). The following is a sample output from `mDumpStructure`:

```
    [TABLE]
    Video
    [FIELDS]
    TITLE String 30
    DESCRIPT String 30000
    RATING String 4
    TYPE String 10
    DATE_ARRIV Date
    AVAILABLE Integer
    TIMES_RENT Integer
    NUM_SOLD Integer
    [INDEXES]
    TitleNdx duplicate TITLE ascending (* Default Index *)
    TypeNdx duplicate TYPE ascending
    [END]
```

`mReadDBStructure` reads the *structure* of a DBF file, not its content. To import the content of a DBF file, see Importing from a DBF File.

mReadDBstructure from V12-DBE

Any V12-DBE database can be used as a template for the creation of a new V12-DBE database, provided you know the password to unlock it. The syntax is as follows:

```
    mReadDBStructure(gDB, "V12", FileName, Password)
```

The following example uses the database "Catalog.V12" as a template for a new database named "Specials.V12".

```
    on CreateDatabase
       set gDB = New(Xtra "V12dbe", the pathname&"Specials.V12",
       "create", "MyNewPassword")
       CheckV12Error()
       mReadDBStructure(gDB, "V12", the pathname&"Catalog.V12", "top
       secret")
       CheckV12Error()
       mBuild(gDB)
       CheckV12Error()
       set gDB=0
    end CreateDatabase
```

`mReadDBStructure` reads the *structure* of a V12-DBE file, not its content. To import the content of a V12-DBE file, see Importing from V12-DBE and Adding Records to a Database.

mReadDBstructure from FoxPro (Win-32 Only)

A FoxPro database is a directory containing a collection of DBF files along with their index files. A directory containing one or more MS FoxPro files can be collectively used as a database template to a V12 database. The FoxPro ODBC driver is required to perform this operation. The names of your FoxPro files and their field names must be valid V2-DBE identifiers (see Defining Identifiers in Step 1: Deciding on a Data Model).

Syntax:

```
    mReadDBStructure(gDB, "FoxPro", DirectoryPath)
```

where `DirectoryPath` is the path to a directory — not a file. Thus, it must necessarily end with a "\".

The following rules apply to the translation of FoxPro databases to V12 databases:

FoxPro field type	Translated to V12 field type	Notes
Character	String	Buffer size is the size of the field in the DBF file
Integer	Float	
Numeric	Float	
Float	Float	
Double	Float	
Currency	Float	
Date	Date	
DateTime	Date	Data cannot be converted from fields of type DateTime. Only the default date (1900/01/01) is imported.
Logical	Integer	
Memo	String	Buffer size = 32K
General	String	Buffer size is the size of the field in the DBF file
Character-Binary	String	Buffer size is 32K
Memo-Binary	String	Buffer size is 32K

FoxPro indexes are translated to V12-DBE indexes with unique values.

Example:
```
    on CreateDatabase
       set gDB = New(Xtra "V12dbe", the pathname&"myDB.V12", "create",
       "secret")
       CheckV12Error()
       mReadDBStructure(gDB, "FoxPro", the pathname&"FoxDB\")
       CheckV12Error()
       mBuild(gDB)
       CheckV12Error()
       set gDB=0
    end CreateDatabase
```

`mReadDBStructure` reads the *structure* of a FoxPro database, not its content. To import the content of a database, see Importing from MS FoxPro (Win-32 only).

mReadDBstructure from MS Access (Win-32 Only)

MS Access databases can be used as templates to V12 databases. Like V12-DBE, MS Access can store multiple tables per database. `mReadDBstructure` imports all such tables to V12-DBE. The MS Access ODBC driver is required to perform this operation.

The names of the tables and fields of your MS Access file must be valid V2-DBE identifiers (see Defining Identifiers in Step 1: Deciding on a Data Model).

Syntax:
```
    mReadDBStructure(gDB, "Access", FileName, Username, Password)
```

where

- `FileName` is the path to the *.MDB file,
- `Username` is a valid user name to access the MDB file, or EMPTY if the MDB file is not protected,
- `Password` is Username's matching password, or EMPTY if the MDB file is not protected.

The following rules apply to the translation of MS Access file structures to V12 databases:

MS Access field type	Translated to V12 field type	Notes
Text	String	Buffer size is same as Access field size
Number (byte)	Integer	
Number (integer)	Integer	
Number (long integer)	Integer	
Number (single)	Float	
Number (double)	Float	
Number (replication ID)	Ignored	
Currency	Integer	
Date / Time	Ignored	
Autonumber	Integer	
Yes/No	Integer	
OLE Object	Ignored	
HyperLink	String	URL imported as text

Memo-Binary	Ignored	Buffer size is 32K

MS Access unique and duplicate indexes are properly converted to unique and duplicate V12-DBE indexes with ascending field values.

`mReadDBStructure` reads the *structure* of a MS Access database, not its content. To import the content of a database, see Importing from MS Access (Win-32 only).

mReadDBstructure from MS Excel (Win-32 Only)

MS Excel workbooks can be used as templates to V12 databases. MS Excel workbooks can contain one or more worksheets, with each worksheet corresponding to a V12 table and each column to a V12 field. The resulting V12 database contains as many tables as there are worksheets in the Excel file. The MS Excel ODBC driver is required to perform this operation.

The names of the worksheets and columns of your MS Excel file must be valid V2-DBE identifiers (see Defining Identifiers in Step 1: Deciding on a Data Model).

The types of the field defined in the new V12 database depend on the format of the corresponding MS Excel columns. To change the format of a entire column in MS Excel, select it by clicking in its heading, choose Format > Cells… and select the Number tab. It may be necessary to Save As… your workbook with a new name to force MS Excel to commit to the new column's format (depends on version of Excel).

The following rules apply to the translation of MS Excel file structures to V12 databases:

MS Excel field type	Translated to V12 field type	Notes
General	Float	
Number	Float	
Currency	Integer	
Accounting	Integer	
Date	Ignored	Convert to text first if importing to V12-DBE is needed
Time	Ignored	Convert to text first if importing to V12-DBE is needed
Percentage	Float	
Fraction	Float	
Scientific	Float	
Text	String	Buffer size = 255 bytes
Special	Float	

Custom	Float	

MS Excel cannot define indexes on its fields, when reading an Excel workbook, V12-DBE automatically indexes the leftmost field of each worksheet.

Syntax:
```
    mReadDBStructure(gDB, "Excel", FileName)
```

where `FileName` is the path to the *.XLS file.

`mReadDBStructure` reads the *structure* of a MS Excel database, not its content. To import the content of a database, see Importing from MS Excel (Win-32 only).

mReadDBstructure from MS SQL Server (Win-32 Only)

A MS SQL Server version 6 or 7 data source can be used as a template to a V12 database. In contrast to MS Access, MS FoxPro and MS Excel files, `mReadDBstructure` requires a DSN (Data Source Name) to be supplied instead of a pathname. The MS SQL Server ODBC driver is required to perform this operation.

The following rules apply to the translation of MS SQL Server data sources to V12 databases:

MS SQL Server field type	Translated to V12 field type	Notes
Binary	Ignored	
Bit	Integer	
Char	String	Buffer size is same as MS SQL Server field size
DateTime	Ignored	
Decimal	Float	
Float	Float	
Image	String	Buffer size = 32K. Data cannot be imported from Image fields.
Int	Integer	
Money	Float	
Numeric	Integer	
Real	Float	
SmallDateSize	Ignored	
SmallInt	Integer	
SmallMoney	Float	
SysName	String	Buffer size is same as MS SQL

		Server field size
Text	String	Buffer size = 32K
TimeStamp	Ignored	
TinyInt	Integer	
VarBinary	String	Buffer size is same as MS SQL Server field size
VarChar	String	Buffer size is same as MS SQL Server field size

Syntax:
```
    mReadDBStructure(gDB, "SQLserver", DSN, Username, Password)
```

- where `DSN` is the name of a valid User DSN, System DSN or File DSN (see Window's Control Panel)
- `Username` is a valid user name to access the DSN,
- `Password` is Username's matching password.

`mReadDBStructure` reads the *structure* of a MS SQL Server data source, not its content. To import the content of the data source, see Importing from MS SQL (Win-32 only).

Step 3c: Building the Database

Once the database structure is read by `mReadDBstructure`, whether from a text file, a DBF file or otherwise, build the database by calling `mBuild`. `mBuild` checks if the database is well defined and creates the file on your disk.

Syntax:
```
    mBuild(gDB)
```

`mBuild` optionally accepts a second parameter, "online", that makes the created file compatible to the V12-DBE Online companion. In this case, two additional fields, named `_uID` and `_timeStamp` are created for V12-DBE Online to manage internally. Both fields are hidden and do not appear in `mDumpStructure`'s result.

Syntax:
```
    mBuild(gDB, "online")
```

Note: A valid database needs exactly one table, at least one field and at least one index.

Example:
```
    mBuild(gDB)
    -- since mBuild does a lot of validations, checking for
       errors/warnings is HIGHLY recommended
    if V12Status() then Alert "mBuild failed with error code" &
       V12Error()
```

Once the database file is built, the database instance remains valid and data can be immediately imported into the file. It is as if the database was opened in ReadWrite mode.

Note:	For `mBuild` to create a licensed database (that is, one that does not display a Demo dialog when opened), a V12-DBE license file must be present on your Mac or PC. Since the V12-DBE license file cannot be delivered to the end-user, `mBuild` cannot be used to create new databases at runtime. If your application requires to create new databases at runtime, usee `mCloneDatabase (see` Cloning a Database`)`.

Viewing the Structure of a Database

You can view the structure of a database with `mDumpStructure`.

Syntax:
```
mDumpStructure(gDB)
```

Example:
```
put mDumpStructure(gDB) into field "myDBstructure"
```

The above example places the structure of the database referred by `gDB` in the member named "myDBstructure".
```
(*
    Structure of file 'HardDisk:myDatabase.V12'
    created on Thu Apr 29 15:55:07 1999,
    last modified on Tue May 11 15:31:53 1999,
    file format version = V12,3.0.0,Multi-User
*)

[TABLE]
Articles

[FIELDS]
name string 256
category string 256
price Float
catalognumber Integer
description string 600

[INDEXES]
nameNdx duplicate name ascending     (* Default index *)
categoryNdx duplicate category ascending
priceNdx duplicate price ascending
cat#Ndx unique catalognumber ascending
catNameNdx duplicate category ascending name descending

[FULL-INDEXES]
description

[END]"
```

Note that the date/hour of the last modification mentioned in the header of the above output is provided by the Operating System. Therefore, it reflects the date/hour at which the V12 database was *closed* regardless of when the *modification* occurred.

This output is fully compatible with the database descriptors discussed in *Database Descriptors* and thus, can be used as is with `mReadDBstructure`.

Step 4: Importing Data into a V12-DBE Database

In Step 3: Creating a Database, you created a properly structured (although empty) V12 database. Step 4 explains how to import the data prepared at Step 2: Preparing the Data into your V12 database.

You can import data into a V12 database through one of the two following methods:

- using the V12-DBE Tool. This is a convenient point-and-click environment for small projects.

- using V12-DBE's `mImport` method in a Lingo handler. This approach is efficient when you need to experiment with your database structure or data before committing to a final form. However, it requires a bit more up front effort to write/adapt Lingo handlers than simply using the V12-DBE Tool.

Note `mImport` was introduced with V12-DBE version 3.0. It replaces the former `mImportFile` method. `mImportFile` is still supported in V12-DBE version 3.0. However, it will be phased out in future versions.

Using the V12-DBE Tool

To import data using the V12-DBE Tool:

1. Choose File > Open… to open the V12 database you want to import data to. A newly created V12 database automatically opens and data can be immediately imported to it.

2. Choose File > Import Text File… or File > Import DBF File…

3. Browse through your disk to locate the Text or DBF file to import. Click OK.

If the source data is in more than one file, you can successively import them by repeating the above steps.

For more information, see the V12-DBE Tool's *User Manual.*

Scripting the Data Importing

`mImport` imports data to a V12-DBE table both at authoring time (i.e., in Director's development environment) and at runtime (i.e., from a Projector or Shockwave movie).

`mImport` is very flexible and can be adapted to a large number of situations. It can import data from:

- a Text file
- a literal value, such as a string, a Director member, etc.
- a DBF file
- a V12 database
- a Lingo list or Lingo property list
- a MS Access database through an ODBC driver (Win-32 only)
- a FoxPro file through an ODBC driver (Win-32 only)
- a MS Excel file through an ODBC driver (Win-32 only)
- a MS SQL data source through an ODBC driver (Win-32 only)

Data type translation rules from the above ODBC-compliant databases to V12 Databases vary according to the specific ODBC driver installed on your computer.

The general form of a table importing script is:

```
-- create a V12dbe instance
set gDB = New(Xtra"V12dbe", database_filename, mode, password)
CheckV12Error()
-- create a V12table instance
set gTable = New(Xtra "V12table", mGetRef(gDB), TableName)
CheckV12Error()
-- import data
mImport(gTable, InputType, InputSource, other params)
CheckV12Error()
-- free the V12table and V12dbe instances
set gTable = 0
set gDB = 0
```

As for any V12table method, valid instances of V12dbe and V12table must exist before the method is invoked. This is explained in details in Creating Instances.

`mImport`'s syntax varies significantly according to the selected input source. This is explained in details in Importing Data with mImport below.

Setting Xtra instances to *0* when they are no longer needed is mandatory, as explained in Closing an Xtra, so to make sure that the imported data is secured on hard disk.

`CheckV12Error` is a generic error management handler explained in Errors and Defensive Programming.

Note	Previous versions of V12-DBE could import only Text and DBF files via `mImportFile`. `mImportFile` is still supported for backward compatibility reasons. It will be progressively phased out in future versions of V12-DBE.

Importing Data with mImport

The general syntax for `mImport` is:

```
mImport(gTable, InputType, InputSource, other params)
```

where:

- `InputType` is one of "Text", "DBF", "literal", "list", "propertyList", "V12", "Access", "FoxPro", "Excel" or "SQLserver".

- `InputSource` is the data to import or a reference to the data to import. It varies according to the selected `InputType`.

- *`other params`* are parameters that depend upon the selected `InputType`. For example, if `InputType` is "text", *`other params`* is an optional property list that specifies the source text file's field delimiter, record delimiter, etc. If `InputType` is "Access", *`other params`* are the user name, password and table to import. The details are explained below.

Importing from a TEXT File

The imported text file must begin with a field descriptor line. A field descriptor is a sample record that contains the names of the fields in which subsequent data must be imported (see Field Descriptors in Step 2: Preparing the Data). These fields can be listed in any order. Some of them can be omitted.

Syntax:
```
    mImport(gTable, "TEXT", FileName [, Options])
```

where `FileName` is the pathname of the text file to import, and `Options` is an optional Lingo Property list containing the following properties:

`#field_delimiter` determines which character is used to delimit fields in the text file. The default character is TAB (ASCII #9).

`#record_delimiter` determines which character is used to delimit records in the text file. The default character is RETURN (ASCII #13). If the Text file contains Carriage Returns (ASCII #13) followed by Line Feeds (ASCII #10) as records delimiters, Line Feeds are automatically ignored.

`#character_set` is one of "Mac-Standard", "Windows-ANSI" or "MS-DOS". It determines which character set the Text file is encoded in. Usually, Text files exported on MacOS are encoded in the Mac-Standard character set, and Text files exported on Windows are encoded in the Windows-ANSI character set. See Character Sets in Step 2: Preparing the Data. The default character set is the one defined by the `CharacterSet` property (see CharacterSet in Properties of Databases).

`#virtual_CR` determines which character is used as a Virtual Carriage Return, and thus must be converted to ASCII #13 after importing (see Virtual Carriage Returns in Step 2: Preparing the Data). The default character is the one defined by the `VirtualCR` property, which is usually ASCII #11 (see VirtualCR in Properties of Databases).

`#text_qualifier` determines which character is used to begin and end each Text field. Those qualifiers delimit the field so to allow it to contain special characters, including those used as field and record delimiters. Text qualifiers are removed after importing the file. See Text Qualifiers in Step 2: Preparing the Data. The default text qualifier is QUOTE

For example, the following instruction imports the Text file "myTextData.txt" located in the same folder as the current movie into `gTable` with all the default options (field delimiter = TAB, records delimiter = RETURN, Character set = the current operating system's, virtual CR = ASCII #11, Text Qualifier = QUOTE).

```
mImport(gTable, "TEXT", the pathname & "myTextData.txt")
```

This second example imports the Text file "myFile.txt" which uses "%" as field delimiter and "\" as record delimiter.

```
mImport(gTable, "TEXT", the pathname & "myTextData.txt",
   [#field_delimiter:"%", #record_delimiter:"\"] )
```

Importing from a Literal

Sometimes, you need to process data with Lingo before importing it in a V12-DBE table. A convenient place to store such data is a Director member of type Field. `mImport` allows to import the content of such a field through the following syntax:

```
mImport(gTable, "LITERAL", DirMemberName_or_variable, [, Options])
```

where `DirMemberName_or_variable` is an expression of type Text, such as

```
Field "myData"
the text of member "yada yada"
"Field-1,Field-2,Field-3" &RETURN& "12,14,16"&RETURN& "54,12,89"
```

and `Options` is a property list identical to the one used for importing Text files (see Importing from a TEXT File above).

Following is an example of a Director field containing data to split into V12-DBE fields and records (assume the name of the field is "Discounts"):

Level-1,Level-2,Level-3
12,14,16
45,58,72
33,56,68
224,301,451

The following instruction imports the above Director field to `gTable`:

```
mImportFile(gTable, "LITERAL", field "Discounts", ",", RETURN)
```

Importing from a DBF File

Importing a DBF file is similar to importing text files, except that you cannot specify a subset of fields to import: all the fields in the DBF file must be imported. The field names of the DBF file must match those in the destination V12-DBE table. Non-matching field names are ignored during the importing process and a warning is reported by `V12Error` (see Errors and Defensive Programming).

Syntax:

```
mImport(gTable, "DBF", FileName [, Options])
```

where `FileName` is the pathname of the DBF file to import, and `Options` is an optional Lingo Property list containing the following property:

> `#character_set` is one of "Mac-Standard", "Windows-ANSI" or "MS-DOS". It determines which character set the DBF file is encoded in. Most systems automatically encode DBF file in the MS-DOS character set. See Character Sets in Step 2: Preparing the Data. The default character set the one defined by the `CharacterSet` property (see CharacterSet in Properties of Databases). It is normally "Windows-ANSI" on the Windows version of V12-DBE and "Mac-Standard" on the Macintosh version of V12-DBE.

Note	DBF is an antiquated file format. It is always assumed to be encoded in the MS-DOS character set. When importing a DBF files, make sure to assign the right Character Set. See CharacterSet in Properties of Databases.

Example:
```
    mImport(gTable, "DBF", the pathname&"Pier1-Import.DBF",
       [#character_set:"MS-DOS"])
```

If a field in the destination table has the same name as a field in the source DBF file, but is of a different type, `mImport` tries to typecast the data to match the destination field type. When importing data from a DBF file that contains Memo fields, the corresponding DBT files are automatically processed and imported by V12-DBE. See Dealing with Dates and mReadDBstructure from a DBF File for more details on DBF files and data importing rules.

Importing from V12-DBE

Data can be imported from one V12 table into another. The name of the source table need not necessarily match the name of the destination table. However, field names must match. Non-matching field names are ignored. If the source and destination tables have different indexes, the destination table's indexes are used.

Syntax:
```
    mImportFile(gTable, "V12", FileName, password, TableName)
```

where `FileName` is the pathname of the V12 database to import from, `password` is the password to unlock it and `TableName` is the name of the table to import.

Example:
```
    mImportFile(gTable, "V12", the pathname&"Catalog.V12", "top secret",
       "articles")
```

If two fields have the same name but are of different types when importing data from a V12-DBE database, `mImport` tries to typecast the data fields.

Importing from a Lingo List or Property List

Lingo list, or a Lingo Property List can easily be imported to V12 tables through mImport. This is very convenient for the conversion of projects that use Lingo lists to manage data and that have become difficult to debug and maintain.

It is also convenient to import XML documents into V12 tables, through Macromedia's XML Xtra.

Syntax:
```
    mImport(gTable, "List", theList)
    mImport(gTable, "PropertyList", thePropertyList)
```

where:

- theList is a Lingo list of lists. The first element is a list containing the names of the V12 fields to which subsequent items must be imported, in the right order. If the first item of the list contains field names that are not present in the current V12 table, the corresponding data is ignored.

- thePropertyList is a Lingo list of property lists, where properties have the same names as the V12 fields into which the corresponding data must be imported.

Examples of valid Lingo lists:

```
    [ ["LastName", "FirstName", "Age"],  ["Cartman", "Eric", 8],
       ["Testaburger", "Wendy", 9], ["Einstein", "Albert", 75]  ]


    [ ["CatalogNumber"],  [8724], [9825], [1745] ]
```

Examples of valid Property lists:

```
    [ [#LastName:"Cartman", #FirstName:"Eric", #Age:8 ],
      [#FirstName:"Wendy", #LastName:"Testaburger", #Age:9 ]
      [#LastName:"Einstein", #FirstName:"Albert"] ]


    [ [#CatalogNumber:8724], [#CatalogNumber:9825],
      [#CatalogNumber:1745] ]
```

Importing XML to V12-DBE

You can import an XML document to a V12 table using Macromedia's XML parser Xtra (delivered with Director 7). This is a two-step process:

1 Convert the XML document to a Lingo property list using the XML parser. Example (the XML string xmlString below is convert to xmlPropList)
```
      parserObj = new (xtra "xmlparser")
      node = parseString(parserObj, xmlString)
      error = getError(parserObj)
      if voidP(error) then
           xmlPropList = makeList(parserObj)
      else
           alert "Sorry, there was an error"&&error
      end if
```

2 Import the resulting property list to your V12 table. Example

```
mImport(gT, "PropertyList", xmlPropList)
```

Importing from MS Access (Win-32 only)

MS Access (*.MDB) files can be imported to V12 databases, one table at a time. A MS Access ODBC driver must be present but no DSN (Data Source Name) is required.

Syntax:

```
mImport(gTable, "Access", FileName, UserName, Password, TableName)
```

where

- `FileName` is the path to the source *.MDB file,
- `Username` is a valid user name to access the MDB file, or EMPTY if the MDB file is not protected,
- `Password` is Username's matching password, or EMPTY if the MDB file is not protected.
- `TableName` is the name of the table to import.

Converting an MS Access database into a V12 database is a two-step process: First, create the V12 database (see mReadDBstructure from MS Access (Win-32 Only)). Then, import data to each of its tables with `mImport`, as explained above.

Generally, MS Access databases are encoded in the Windows ANSI character set. Thus, you must make sure that the `CharacterSet` Property is properly set to "Windows-ANSI" before importing the data. ("Windows-ANSI" is the default setting for the `CharacterSet` property. See CharacterSet in Properties of Databases).

Importing from MS FoxPro (Win-32 only)

Fox Pro (*.DBF) files can be imported to V12 tables provided a MS FoxPro ODBC driver is present on your PC. No DSN (Data Source Name) is required.

Syntax:

```
mImport(gTable, "FoxPro", FileName)
```

where `FileName` is the path to the source *.DBF file. Always make sure to set V12-DBE's CharacterSet property to the encoding that matches your DBF file's (see CharacterSet in Properties of Databases).

Example:

```
mImport(gTable, "Excel", the pahtname&"Results.XLS", TableName)
```

Converting a FoxPro database into a V12 database is a two-step process: First, create the V12 database (see mReadDBstructure from FoxPro (Win-32 Only)). Then, import data to each of its tables with `mImport`, as explained above.

Importing from MS Excel (Win-32 only)

MS Excel workbooks (*.XLS) can be imported to V12 databases, one table at a time, through a PC's ODBC driver. No DSN (Data Source Name) is required.

Syntax:
```
    mImport(gTable, "Excel", FileName, TableName)
```

where:

- `FileName` is the path to the source *.XLS file. It is assumed to be encoded in the Windows ANSI character set (default encoding on Windows).

- `TableName` is the name of the table to import.

Example:
```
    mImport(gTable, "Excel", the pahtname&"Results.XLS")
```

Protected MS Excel workbooks cannot be imported

Converting a MS Excel workbook into a V12 database is a two-step process: First, create the V12 database (see Importing from MS Excel (Win-32 only)). Then, import data to each of its tables with `mImport`, as explained above.

Importing from MS SQL (Win-32 only)

MS SQL Server data sources can be imported to V12 databases, one table at a time, through a PC's ODBC driver and a valid DSN (Data Source Name). Data sources can be created through Window's ODBC Data Sources Control Panel which is accessible from Start > Settings > Control Panel menu.

Syntax:
```
    mImport(gTable, "SQLserver", DSN, Username, Password, TableName)
```

where:

- `DSN` is a valid Data Source Name.

- `Username` is a valid user name to access the SQL Server.

- `Password` is Username's matching password.

- `TableName` is the name of the table to import.

Example:
```
    mImport(gTable, "SQLserver", "InventoryDSN", "Admin", "XBF48",
       "Products")
```

Converting an MS SQL Server data source into a V12 database is a two-step process: First, create the V12 database (see mReadDBstructure from MS SQL Server (Win-32 Only)). Then, import data to each of its tables with `mImport`, as explained above.

Importing Media into a V12 database

Although V12-DBE databases can store different types of media (anything that can be stored in a Director member, except Film Loops and QuickTime movies), there is an alternative to storing media directly in V12.

Instead of storing media in V12-DBE files, they can be stored in a Director member. In addition, these members' names or numbers can be stored in V12-DBE tables. This may be convenient if your original media is already located in Director members - it yields faster access times given that it avoids useless memory allocations/re-allocations in transferring data between Director and V12-DBE.

However, storing media directly in V12-DBE databases has its advantages. Your data becomes completely independent of your Director projector and it may be easier to update.

You can import media to V12-DBE fields of type `media`, one at a time, using the V12-DBE Tool (see the V12-DBE Tool's User Manual).

You can also automate and customize the media importing process through Lingo scripting. Assume your database contains one table and five fields:

- Field `ItemName` of type `String`,
- Field `Description` of type `String`,
- Field `Price` of type `Float`,
- Field `CatalogNumber` of type `Integer`,
- Field `Photo` of type `Media`.

In addition, assume that the first four fields are in a TAB-delimited format named "Data.txt", and that all photos (5th field) are in PICT format. Each photo is located in the same folder as "Data.txt" with each image file bearing the catalog number of the item with which it corresponds.

The following example illustrates how to import the text file in a V12-DBE database, and then how to review each imported record in order to import the corresponding image file.

Example:
```
    -- some database creation preliminaries here
    -- this is a purely academic example: no error trapping is performed
    set gDB = New(Xtra "V12dbe", the pathname&"Catalog.V12",
       "ReadWrite", "top secret")
    set gTable = New(Xtra "V12table", mGetRef(gDB), "Articles")

    -- import the text data
    mImport(gTable, "TEXT", the pathname&"Data.txt")
```

```
-- loop on each record and import the matching image
repeat with i = 1 to mSelectCount(gTable)

   -- record i becomes the current record
   mGo(gTable, i)

   -- get the photo's filename and import it in a member
   set catNbr = mGetField(gTable, "catalogNumber")
   set the filename of member "DummyMember" to (the pathname&catNbr)

   -- assign the photo to the appropriate V12-DBE field
   mEditRecord(gTable)
   mSetMedia(gTable, "photo", member "DummyMember")
   mUpdateRecord(gTable)
end repeat

set gTable = 0 -- close the table instance
set gDB = 0 -- close the database instance
```

The `mAddRecord`, `mSetField`, `mGetField` and `mUpdateRecord` methods are explained in greater detail *Using a V12-DBE Database*.

Step 5: Implementing the User Interface

Steps 1 through 4 (Step 1: Deciding on a Data Model through Step 4: Importing Data into a V12-DBE Database) explain how to design, build and import data into a V12-DBE database.

This section discusses the elements needed to manage your V12-DBE database at runtime.

Tip	If you chose to script the database creation and importing processes, once the database file is ready, you do not need those Lingo scripts any longer. Moreover, they do not necessarily need to be delivered to the end-user. However, for your convenience, you may want to keep all the scripts related to your project in a single Director movie.

Using the V12-DBE Behaviors Library

The fastest and easiest way to implement V12-DBE into your project's user interface is to use the V12-DBE Behaviors Library. See the *First Steps* manual and the *V12-DBE Behaviors Library* manual for an overview of V12-DBE Behaviors.

However, the V12-DBE Behaviors Library enables you to implement a subset of V12-DBE's functionality. If the V12-DBE Behaviors Library cannot satisfy the requirements of your project, you probably need to use V12-DBE's Lingo interface.

Using Lingo

As for any V12-DBE method, a valid V12dbe or V12table Xtra instance (depending on which Xtra the method belongs to) must exist before the method is invoked. Generally, you create instances of V12dbe and V12table `on StartMovie`, store their references in global variables and use those instances throughout your project.

Likewise, `on StopMovie`, you set those global variables to 0 thus disposing of the Xtra instances and closing the V12 database file.

The creation of such Xtra instances is often referred to as Opening a Database and Opening a Table. Disposing the Xtra instances is often referred to as Closing the Database and Closing the Table instances.

Opening and Closing Databases and Tables

Opening an Existing Database

Use the `New(Xtra "V12dbe"…)` method to open an existing V12 database. If your V12 database is not created yet, see Step 3: Creating a Database to learn how to create it.

Syntax:
```
    set gDB = New(Xtra"V12dbe", database_filename, mode, password)
```

Opening a database means creating a `V12dbe` Xtra instance with the following parameters:

- `database_Filename`: the name if the database file. This is usually a filename preceded by the lingo function `the pathname &` to indicate that the file is located in the same folder as the current movie (see Dealing with Pathnames in Using Xtras).

- `mode`: the mode in which the Xtra instance is opened. To allow for modifications to the database, open it in "Shared ReadWrite" or "ReadWrite" mode. If you open your database in "Shared ReadWrite" mode, up to 128 users can access your database simultaneously (see Appendix 4: Multi-user Access). If you open it in "ReadWrite" mode, only one user at a time can access your database. If you do not allow modifications to your database, open it in "ReadOnly" mode.

- `password`: the password. If you do not use the correct password, the database cannot be opened.

Example:
```
    set gDB = New(Xtra "V12dbe", the pathname & "Catalog.V12",
       "ReadWrite", "top secret")
```

Always make sure that the `New` method succeeded by checking the validity of the returned reference with `ObjectP`. Example:
```
    set gDB = New(Xtra"V12dbe", the pathname & "Catalog.V12",
       "ReadWrite", "top secret")
    if NOT (ObjectP(gDB)) then alert "New V12dbe failed"
```

Opening a Table

Records belong to tables. Creating new records, reading the contents of records, and searching and sorting records are operations that are performed on tables. Prior to performing any of these operations, you must create a table Xtra instance

Syntax:
```
    set gTable = New(Xtra "V12table", mGetRef(gDB), TableName)
```

To create a table Xtra instance, use the `New` method with the following parameters:

- `gDB`: the database Xtra instance to which the current table belongs

- `TableName`: the name of the table to open

Example:
```
    set gTable = New(Xtra "V12table", mGetRef(gDB), "Articles")
```

`mGetRef` is a standard Xtra method that returns the exact reference of an Xtra instance.

Always make sure that the New method succeeded by checking the validity of the returned reference with `ObjectP`. Example:
```
    set gTable = New(Xtra "V12table", mGetRef(gDB), "Articles")
    if NOT (ObjectP(gTable)) then alert "New V12table failed"
```

Following is a complete example of a script that would run `on startMovie:`
```
    on StartMovie
       global gDB, gTable
       set gDB = New(Xtra "V12dbe", the pathname&"Catalog.V12",
       "ReadWrite", "pwd")
       CheckV12Error()
       set gTable = New(Xtra "V12table", mGetRef(gDB), "Articles")
       CheckV12Error()
       …
    end StartMovie
```

Closing a Table

To close a table, set the variable that refers to it to 0. Example:
```
    set gTable = 0
```

Closing a Database

To close a V12 database, set the variable that refers to it to 0. Example:
```
    set gDB = 0
```

Always make sure to dispose of all V12table instances before you dispose of the V12dbe instance that contains them.

Following is a complete example of a script that would run `on StopMovie`:
```
    on StopMovie
       global gDB, gTable
       set gTable = 0
       set gDB = 0
    end StopMovie
```

Selection and Current Record

To read or write data to a record, set it as the current **record**. The current record concept is strongly related to the concept of **selection**. Both concepts are fundamental to this section. See Database Basics earlier in this manual for more details.

At any time, the selection is sorted according to one of its fields. You can enforce that sorting order with `mOrderBy` (see Sorting a Selection (mOrderBy)). Otherwise, the selection's sorting order would be defined by the index chosen by V12-DBE for its last search. The field that determines the selection's sorting order is called the **master field**.

Selection at startup

When a table is first opened, its selection is the entire content of that table sorted by the field that is indexed by the default index. The first record of that selection – which is also the first record of the table – is the current record. The default index is the first index that was defined for the table in the database descriptor. You can use `mDumpStructure` to verify which of the table's index is the default index (see Viewing the Structure of a Database).

You never need to explicitly manage indexes in V12-DBE. The best index is always chosen by V12-DBE to perform a search. See Appendix 12: Optimization Using Indexes for advanced index management.

Selecting All the Records of a Table

Call `mSelectAll` at any time to set the selection to the whole table..

Syntax:
```
    mSelectAll(gTable)
```

To force a specific sort order, call `mOrderBy` before calling `mSelectAll`

Example:
```
    mOrderBy(gTable, "price", "ascending")
    mSelectAll(gTable)
```

This example sets the selection to the whole table as referred by `gTable`, in ascending order of prices (least to most expensive). The field "price" must be indexed for `mSelectAll` to work efficiently. Otherwise, it would be very slow.

Browsing a Selection

Browsing a selection means changing the position of the current record. The following methods enable you to change the current record in a selection (to set the current record to various values related to a given selection).

mGetPosition

`mGetPosition` checks the position of the current record in a table and returns an integer between one and the total number of records in the selection.

Example:
```
    set currRec = mGetPosition(gTable) -- returns the current record's
       position in the Message Window
    put "the current record is:" & currRec
```

mGoNext

`mGoNext` sets the current record to the record following the current record.

Example:
```
    mGoNext(gTable)
```

Suppose that the current record is the tenth item in the selection. After calling `mGoNext`, the current record becomes the eleventh. If the selection contains only ten records, the current record does not change and a warning is reported by V12-DBE (see Errors and Defensive Programming).

mGoPrevious

`mGoPrevious` sets the current record to the record preceding the current record.

Example:
```
    mGoPrevious(gTable)
```

Suppose that the current record is the tenth item in the selection. Upon calling `mGoPrevious,` the current record becomes the ninth. If the current record is the first record of the selection, upon calling `mGoPrevious` the current record does not change and a warning is reported by V12-DBE (see Errors and Defensive Programming).

mGoFirst

`mGoFirst` sets the current record to the first record of the selection.

Example:
```
    mGoFirst(gTable)
```

`mGoLast` sets the current record to the last record of the selection.

Example:
```
    mGoLast(gTable)
```

mGo

`mGo` takes one integer parameter (call it *n*) and sets the current record to the *n*th item of the selection.

Example:
```
    mGo(gTable, 11)
```

This example sets the current record to the eleventh record of the selection. If no such record exists, `mGo` signals a warning.

mFind

mFind sets the current record to one, in the selection, whose Master Field equals or starts with the keyword provided in parameter (see definition of Mater Field in Selection and Current Record).

mFind is a great complement to mGo which can set the current record only based on its position in the selection.

The syntax is:
```
    mFind(gTable, "First", Keyword)
    mFind(gTable, "Next")
    mFind(gTable, "Previous")
```

where Keyword is the value to look for in the Master Field. If the Master Field is of type String, the matching record's content must *start with* Keyword. If it is of type Integer, Float or Date, it must *equal* Keyword

Use the first form (with the "First" parameter), if you want the new current record to be the first one of the selection that matches Keyword

Use the second form (with the "Next" parameter) if you want it to be the next record in the selection according to the present current record. Use the third form ("Previous") if you want it to be the previous record in the selection according to the present current record.

If, for example, you run the following script
```
    mSetCriteria(gT, "Age", ">", 30)
    mOrderBy(gT, "LastName")
    mSelect(gT)
```

and get the following selection:

FirstName	LastName	Age
Marie	Curie	39
Albert	Einstein	75
Kurt	Gödel	36
Mona	Karp	53
Joe	Karp	31
Richard	Karp	62
Eric	Kartman	31
Marshall	McLuhan	48
John	Von Neumann	51
Claude	Shannon	33
Alan	Turing	36

The selection's Master Field is "LastName". Thus, a call to mFind would automatically look for values in this field. For example:
```
    mFind(gT, "First", "Kar") -- current rec becomes Mona Karp's
    mFind(gT, "Next") -- current rec becomes Joe Karp's
    mFind(gT, "Next") -- current rec becomes Richard Karp's
    mFind(gT, "Next") -- current rec becomes Eric Kartman's
    mFind(gT, "Next") -- current rec remains Eric Kartman's
    mFind(gT, "Previous") -- current rec becomes Richard Karp's
```

mFind can be used to quickly locate one occurrence of a keyword in a selection where many duplicate values exist, as opposed to mSetCriteria and mSelect which find all occurrences but need more time.

Note	Because mFind uses the selection's Master Field, it is advised that you call mOrderBy with the appropriate field before calling mSelect and mFind. (see Searching Data with mSetCriteria). If you don't call mOrderBy, mFind sets the current record based on the Master Field chosen by default by V12-DBE, which is either the one indexed by the default index (if the table was just opened), or the one indexed by the best index chosen by V12-DBE during the last search.

Reading Data From a Database

In order to read or write the content of a record, you must first set it as the current record. Setting the appropriate current record is accomplished by use of the mGoNext, mGoPrevious, mGoFirst, mGoLast and mGo methods (see Browsing a Selection).

Reading Fields of Type String, Integer, Float and Date

Once the current record is properly set, mGetField retrieves the data from a specific field. mGetField retrieves data from all field types except Media.

Syntax:
```
    set var = mGetField(gTable, fieldName[, dataFormat])
```

Example:
```
    set cost = mGetField(gTable, "price")
```

This example stores the content of the price field from the current record in the variable cost. You do not need to specify the type of field you are reading. The Lingo variable is automatically set to the appropriate type after a successful call to mGetField (see Typecasting in Database Basics).

Example:
```
    set cost = mGetField(gTable, "price", "9,999.99")
```

This example retrieves the formatted content of the price field to the cost variable. The formatting is according to the pattern "9,999.99". That is, if the field price contains the value 1245.5, the string "1,245.50" is returned by mGetField. Note that the result of a formatted value is always a string.

Data formatting applies to mGetField the same way it does to mDataFormat. If two distinct formatting patterns are applied to a field with the mGetField option and mDataFormat, the mGetField option overrides mDataFormat. See Data Formatting for a complete explanation on formatting patterns.

Note	mGetField retrieves only unformatted text. If you store styled text to a V12 record, you can retrieve the text without the styles with mGetField and the styled text with mGetMedia. See Managing Styled Text.

Reading one or more Entire Records

mGetSelection allows for the retrieval of one or more fields in one or more records of the selection. The result is one of the followings:

- a string where fields are delimited by TABs and records by CARRIAGE_RETURNs (the default delimiters), or by any other custom delimiters you specify.
- a Lingo list of lists, where each sub-list represents a record and each item of each sub-list is the data contained in the corresponding field
- a Lingo list of property lists, where each sub-list represents a record and each item is a property/value pair: the property is the name of the field and the value is the data contained in it.

mGetSelection is powerful and flexible. It's behavior depends on the syntax used to call it. The syntax for mGetSelection to return a result of type String is:

```
    mGetSelection(gTable ["Literal" [, From [, #recs [, FieldDelimiter
       [, RecordDelimiter [, FieldNames ]* ]]]]])
```

The syntax for mGetSelection to return a lingo list is:

```
    mGetSelection(gTable ["List" [, From [, #recs [, FieldNames ]* ]]])
```

The syntax for mGetSelection to return a lingo property list is:

```
    mGetSelection(gTable ["PropertyList" [, From [, #recs [, FieldNames
       ]* ]]])
```

where:

- gTable is the instance of the table from which records must be retrieved (mandatory parameter),
- From is the number of the first record to retrieve data from. It is optional. The default value is 1.
- #recs is the number of records to retrieve starting from record number From. It is optional. The default value is the number of records between From and the end of the selection plus 1 (convenient to retrieve all the records of a selection starting from record number From).
- FieldDelimiter is the character to use as the field delimiter. It is optional. The default field delimiter is a TAB.
- RecordDelimiter is the character to use as the record delimiter. It is optional. The default field delimiter is a CARRIAGE_RETURN.
- FieldNames are the names of the fields to retrieve, in the specified order. If the field names are omitted, mGetSelection returns the contents of all the fields of gTable, in their order of creation. Fields of type Media are ignored by mGetSelection.

Besides gTable, all other parameters are optional. However, if a parameter is present, all its preceding ones must also be present. For example, if #recs is present, result_format and From must also be present.

mGetField requires that you set the current record to the record you need to retrieve data from. mGetSelection does not.

The examples below show various ways of using mGetSelection. All examples assume that the table gTable contains 3 fields ("name", "price" and "number", declared in that order when creating the table), and that the selection contains 6 records.

Reading the Entire Selection

This example retrieves the entire content of each record of the selection with TABs as field delimiters and CARRIAGE_RETURNs (CRs) as record delimiters. Fields are sorted in their order of creation. The records' sort order is the one defined by the selection.

```
    set x = mGetSelection(gTable)
```

sets the variable x to the following string:

```
    Batteries   TAB   9.20   TAB   6780   CR
    Floppies    TAB   1.89   TAB   9401   CR
    Labels      TAB   1.19   TAB   1743   CR
    Pencils     TAB   5.55   TAB   6251   CR
    Ruler       TAB   1.99   TAB   1431   CR
    Tags        TAB   6.19   TAB   7519   CR
```

Reading a Range of Records in a String variable

This example retrieves the content of 3 successive records in the selection starting with record #2, with TABs as field delimiters and CARRIAGE_RETURNs (CRs) as record delimiters..

```
    set x = mGetSelection(gTable, "LITERAL", 2, 3)
```

sets the variable x to the following string:

```
    Floppies    TAB   1.89   TAB   9401   CR
    Labels      TAB   1.19   TAB   1743   CR
    Pencils     TAB   5.55   TAB   6251   CR
```

Reading a Range of Records in a Lingo List

This is identical to the previous example, except that the result is returned in a Lingo list:

```
    set x = mGetSelection(gTable, "LIST", 2, 3)
```

sets the variable x to the following list:

```
    [ ["Floppies", 1.89, 9401], ["Labels", 1.19, 1743], ["Pencils",
       5.55, 6251] ]
```

Reading a Range of Records in a Property List

Same as the two previous examples, except that the result is returned in a Lingo property list:

```
    set x = mGetSelection(gTable, "PropertyList", 2, 3)
```

sets the variable `x` to the following list:

```
    [ [#name:"Floppies", #price:1.89, #number:9401], [#name:"Labels",
       #price:1.19, #number:1743], [#name:"Pencils",  #price:5.55,
       #number:6251] ]
```

Reading the Entire Content of the Current Record

This example retrieves the entire content of the current record in a single call to V12-DBE.

```
    set x = mGetSelection(gTable, "LITERAL", mGetPosition(gTable), 1)
```

sets the variable `x` to the following string:

Batteries ***TAB*** 9.20 ***TAB*** 6780 ***CR***

The "List" and "ProperyList" would respectively return:

```
    [ ["Batteries", 9.20, 6780] ]
```

and

```
    [ [#name:"Batteries", #price:9.20, #number:6780] ]
```

Reading a Record without Setting it as the Current Record

This example retrieves the content of record #4 without setting it as the current record.

```
    set x = mGetSelection(gTable, "LITERAL", 4, 1)
```

sets the variable `x` to the following string:

Pencils ***TAB*** 5.55 ***TAB*** 6251 ***CR***

The "List" and "ProperyList" would respectively return:

```
    [ ["Pencils", 5.55, 6251] ]
```

and

```
    [ [#name:"Pencils",  #price:5.55, #number:6251] ]
```

Reading the Entire Selection with Special Delimiters

This example retrieves the entire content of each record of the selection with commas (",") as field delimiters and slashes ("/") as record delimiters.

```
    set x = mGetSelection(gTable, "LITERAL", 1, mSelectCount(gTable),
       "," , "/" )
```

sets the variable `x` to the following string:

Batteries , 9.20 , 6780 / Floppies , 1.89 , 9401 / Labels , 1.19 , 1743 / Pencils , 5.55 , 6251 / Ruler , 1.99 , 1431 / Tags , 6.19 , 7519 /

Reading Selected Fields in a Selection

This example retrieves the content of a single field ("name") for all the records of the selection. Note that the `TAB` parameter is unused in the result, but it should nonetheless be present.

```
    set x = mGetSelection(gTable, "LITERAL", 1, mSelectCount(gTable),
       TAB , RETURN, "name" )
```

sets the variable `x` to the following string:

```
    Batteries  CR
    Floppies   CR
    Labels     CR
    Pencils    CR
    Ruler      CR
    Tags       CR
```

The syntax for the Lingo List result would be:

```
    set x = mGetSelection(gTable, "List", 1, mSelectCount(gTable),
       "name" )
```

and the result would be

```
    [["Batteries"],["Floppies"],["Labels"],["Pencils"],["Ruler"],
       ["Tags"]]
```

Note This is a list where each element is itself a single element list.

The syntax for the Property List result would be:

```
    set x = mGetSelection(gTable, "PropertyList", 1,
       mSelectCount(gTable), "name" )
```

and the result would be

```
    [[#name:"Batteries"],[#name:"Flsoppies"],[#name:"Labels"],
       [#name:"Pencils"],[#name:"Ruler"],[#name:"Tags"]]
```

Reading Records with a Determined Order of Fields

This example retrieves the content of all the records of the selection with `TAB`s as field delimiters and `CARRIAGE_RETURNs` (`CR`s) as record delimiters, with fields ordered in the sequence "number", "name", "price".

```
    set x = mGetSelection(gTable, "LITERAL", 1, mSelectCount(gTable),
       TAB, RETURN, "number", "name", "price")
```

sets the variable `x` to the following string:

```
    6780   TAB   Batteries  TAB   9.20   CR
    9401   TAB   Floppies   TAB   1.89   CR
    1743   TAB   Labels     TAB   1.19   CR
    6251   TAB   Pencils    TAB   5.55   CR
    1431   TAB   Ruler      TAB   1.99   CR
    7519   TAB   Tags       TAB   6.19   CR
```

The syntax for the Lingo List result would be:

```
    set x = mGetSelection(gTable, "List", 1, mSelectCount(gTable),
       "number", "name", "price")
```

and the result would be
```
    [ [6780, "Batteries", 9.20], [9401, "Floppies", 1.89], [1743,
       "Labels", 1.19], [6251, "Pencils", 5.55], [1431, "Ruler", 1.99],
       [7519, "Tags", 6.19] ]
```

The syntax for the Property List result would be:
```
    set x = mGetSelection(gTable, "PropertyList", 1,
       mSelectCount(gTable), "number", "name", "price")
```

and the result would be
```
    [ [#number:6780, #name:"Batteries", #price:9.20], [#number:9401,
       #name:"Floppies", #price:1.89], [#number:1743, #name:"Labels",
       #price:1.19], [#number:6251, #name:"Pencils", #price:5.55],
       [#number:1431, #name:"Ruler", #price:1.99], [#number:7519,
       #name:"Tags", #price:6.19] ]
```

Although, this latter request would not be of much interest because property lists are parsed by property names, not item positions.

Reading Unique Values of a Field

`mGetUnique` returns unique values of the Master Field in a string or a Lingo list (See Selection and Current Record above for a definition of Master Field).

Syntax:
```
    set a = mGetUnique(gTable, "literal")
    set b = mGetUnique(gTable, "list")
```

`mGetUnique` is very convenient to populate a user interface element (such as scrolling list or pull-down menu) with search values that are relevant only for a specific database and context.

Example: In a clothing catalog, you want to display only the available colors for a specific category and size of product (e.g., T-shirt and XXL). You run the following script:
```
    mSetCriteria(gTable, "category", "=", "T-shirt")
    mSetCriteria(gTable, "and", "size", "=", "XXL")
    mOrderBy(gTable, "color")
    mSelect(gTable)
    put mGetUnique(gTable, "literal") into field "ScrollList"
```

This script retrieves unique values of the "color" field (which is the Master Field) to the field "ScrollList". Assuming that your selection contains 30 records (10 with Color = "Red", 10 with Color = "Green" and 10 with Color = "Blue"), the above script puts the string
```
    Blue
    Green
    Red
```
in field "ScrollList".

Running the following script:
```
    mSetCriteria(gTable, "category", "=", "T-shirt")
    mSetCriteria(gTable, "and", "size", "=", "XXL")
    mOrderBy(gTable, "color")
    mSelect(gTable)
    put mGetUnique(gTable, "list") into field "ScrollList"
```

would return the list

```
[ "Blue", "Green", "Red" ]
```

Note	Because it uses the selection's Master Field, it is recommended that you call `mOrderBy` with the appropriate field before calling `mSelect` and `mGetUnique`. If you don't call `mOrderBy`, `mGetUnique` returns unique values from the Master Field chosen by default by V12-DBE, which is either the one indexed by the default index (if the table was just opened), or the one indexed by the best index chosen by V12-DBE for the last selection. See Selection and Current Record above.

Data Formatting

`mDataFormat` assigns a display pattern to a field so that all data read from that field are formatted according to that pattern. All V12-DBE methods that read data from a formatted field are affected. These include `mGetField` and `mGetSelection`.

Syntax:
```
    mDataFormat(gTable, FieldName, Pattern)
```

The following example forces all data retrieved from the field `price` to be formatted with 3 integral digits and 2 decimal places.

Example:
```
    mDataFormat(gTable, "price", "999.99")
```

`mDataFormat` can be applied to fields of type `float`, `integer` and `date`. `Media` and `string` fields cannot be formatted.

To reset the formatting of a pattern to its original value, call `mDataFormat` with an empty string.

Example:
```
    mDataFormat(gTable, "price", "")
```

Formatting Integers and floats

Valid patterns for fields of type `integer` and `float` contain the following:

- `9` designates a digit at that position (possibly 0),
- `#` designates a digit or a space at that position,
- `.` (period) designates the decimal point,
- any other character literally.

The following example forces the output of the field `ratio` to 2 integral digits, 2 decimal places and a trailing "%" sign:

```
    mDataFormat(gTable, "ratio", "99.99%")
    put mGetField(gTable, "ratio")
```

If the value in field `ratio` is 34.567, the displayed string is "34.57%".

The pattern "`###9999`" forces the output of an integer field to be formatted within no less than four digits and with three leading spaces if necessary. Thus:

```
    4           is formatted as    "   0004"
    123         is formatted as    "   0123"
    314159      is formatted as    " 314159"
    3141592     is formatted as    "3141592"
    31415926    is formatted as    "#######"
```

The last formatting in the above example fails because an eight-digit integer does not fit in a seven-digit pattern.

The pattern "(999) 999-9999" is convenient for formatting phone numbers stored as integers. For example:

```
    mDataFormat(gTable, "phone", "(999) 999-9999")
    put mGetField(gTable, "phone")
    -- returns something formatted as "(514) 871-1333"
```

Formatting Dates

Valid patterns for fields of type `date` are combinations of:

- `D` for days,
- `M` for months,
- `Y` for years,
- any other character literally.

The following example formats the date in the "Year-Month-Day" numerical format:

```
    mDataFormat(gTable, "TheDate", "YY-MM-DD")
    put mGetField(gTable, "TheDate")
```

Assume the content of field `TheDate` for the current record is Jan 5th, 95 - the returned string is "95-01-05".

`D`s, `M`s and `Y`s can be combined in the following way:

To format	Use this sequence
Days as 1-31	D
Days as 01-31	DD
Weekdays as Sun-Sat	DDD
Weekdays as Sunday-Saturday	DDDD
Months as 1-12	M
Months as 01-12	MM
Months as Jan-Dec	MMM
Months as January-December	MMMM
Years as 00-99	Y or YY
Years as 1900-9999	YYY or YYYY

Examples:

The pattern	**Formats 5 January 1995 as**
D	5
DDDD	Thursday
MM	01
DD-MM	05-01
MMM DD, YY	Jan 05, 95
On D MMMM, YYYY	On 5 January, 1995
'Weekday='DDDD; 'Month=' MMMM	Weekday=Thursday; Month=January

In this last example, apostrophes around 'Weekday' and 'Month' are mandatory, otherwise the "d" in *Weekday* and the "m" in *Month* would interfere with the pattern itself. To specify real apostrophes within date patterns, use two consecutive apostrophes.

When a table is first opened, the default format of all its Date fields is set to "YYYY/MM/DD".

By default, the names for the months in V12-DBE are (`MMMM`)
```
    January, February, March, April, May, June, July, August, September,
       October, November, December
```

The short names for the months are (`MMM`)
```
    Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec
```

The names for the weekdays are (`DDDD`)
```
    Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday
```

The short names of the weekdays are (`DDD`)
```
    Sun, Mon, Tue, Wed, Thu, Fri, Sat
```

All of these names can be replaced by custom names through the properties of the database (see Properties of Databases).

Note: If a formatting pattern is assigned to a field, all values retrieved from that field become strings (see Typecasting in Database Basics).

Reading Fields of Type Media

`mGetMedia` retrieves data from fields of type `media` and stores them directly in the designated Director member.

Syntax:
```
    mGetMedia(gTable, fieldName, DirMember)
```

Example:
```
    mGetMedia(gTable, "photo", member "PhotoMember")
```

This example stores the content of the field "photo" from the current record into the member named "PhotoMember" in Director's internal castlib. If more than one castlib is used in a project, `mGetMedia` can also retrieve media to any castlib through the following syntax:

Example:
```
    mGetMedia(gTable, "photo", member 28 of castlib "album")
```

Adding Records to a Database

To add a new record to a V12-DBE table, use `mAddRecord`. Calls to `mAddRecord` must be balanced by `mUpdateRecord`.

In the following example, a new record is created for the item "goggles" and its price is set to $158.99:
```
    mAddRecord(gTable)
    mSetField(gTable, "ItemName", "Goggles")
    mSetField(gTable, "Price", 158.99)
    mUpdateRecord(gTable)
```

If `mUpdateRecord` is not called, the record created with `mAddRecord` is not saved to the database. After calling `mUpdateRecord`, the record is created and kept in a cache: it is not immediately written to disk. Thus, if the computer crashes or a power failure occurs, the database file on disk may become corrupt. To secure the newly added records onto the hard disk, close the database and open it again (see Opening and Closing Databases and Tables).

New records are always added to the end of the selection regardless of the criteria used to form the selection.

Note	Only `mSetField` and `mSetMedia` can be called after `mAddRecord` and before `mUpdateRecord`. Calling any other method aborts the new record adding process and sets the current record to the previous current record. Thus, if you started to add a record and wish to abort the operation, simply call `mGetField` instead of calling `mUpdateRecord`.

Updating Data in a Database

Writing data is very similar to reading data. Writing data is accomplished with `mSetField`. Prior to updating a field, you must set the current record, and your intentions must be indicated in V12-DBE with `mEditRecord`. Once this is completed, V12-DBE will update your database with `mUpdateRecord`.

After calling `mUpdateRecord`, the modified record is kept in a cache: it is not immediately written to disk. Thus, if the computer crashes or a power failure occurs, the database file on disk may become corrupt. To secure the updated record onto the hard disk, close the database and open it again (see Opening and Closing Databases and Tables)

Writing to Fields of Type Integer, Float and String

In the following example, the name of the current record is changed to "funnel" and its price to $2.95:

```
    mEditRecord(gTable)
    mSetField(gTable, "name", "funnel")
    mSetField(gTable, "price", 2.95)
    mSetField(gTable, "CatalogNumber", 1234)
    mUpdateRecord(gTable)
```

Like `mAddRecord`, every call to `mEditRecord` must be balanced with a call to `mUpdateRecord`. Calls to `mSetField` will result in an error if not preceded by `mEditRecord`.

If an error occurs when updating a record (e.g. Duplicate Key error in a given field), none of the preceding calls to `mSetField` are taken into consideration.

When writing to a field whose type is not the same as the supplied parameter, V12-DBE tries to cast the parameter to the appropriate type and to interpret it as accurately as possible (see Typecasting).

Example

```
    mSetField(gTable, "price", "3.14") -- stores the value 3.14
    mSetField(gTable, "price", "xyz") -- stores the value 0.00
    mSetField(gTable, "name", 1234) -- stores the string "1234"
```

Note: Updating the content of a field that has a full-index may take more time than equivalent fields without full-indexes.

Writing to Fields of Type Date

Writing to a field of type Date is similar to writing to field of type Integer, Float or String, except that V12-DBE requires the date to be supplied in Raw format (YYYY/MM/DD).

Example

```
    mSetField(gTable, "BirthDate", "1993/02/22") -- is valid
    mSetField(gTable, "BirthDate", "02/22/1993") -- is not valid
```

Storing the current date in Raw format may be difficult as Lingo's `the Date` function returns the current date in the Control Panel settings of the computer it is running on. In this case, use `mGetProperty(gDB, "CurrentDate")` to retrieve the current date in Raw format (see CurrentDate in Properties of Databases).

Writing to Fields of Type Media

To write any media type, call:

```
    mSetMedia(gTable, MediaField, DirMember)
```

The following example copies the content of member "Yeti" of castlib "photo_album" to the field `photo:`

```
    mEditRecord(gTable)
    mSetMedia(gTable, "photo", member "Yeti" of Castlib "photo_album")
```

```
mUpdateRecord(gTable)
```

Note:	Only `mSetField` and `mSetMedia` can be called after `mEditRecord` and before `mUpdateRecord`. Calling any other method aborts the new record adding process and sets the current record to the previous current record. Thus, if you started editing a record and wish to abort the operation, simply call `mGetField` instead of calling `mUpdateRecord`.

Deleting a Record

Call `mDeleteRecord` to delete the current record.

Syntax:
```
mDeleteRecord(gTable_instance)
```

Example:
```
mDeleteRecord(gTable)
```

After calling `mDeleteRecord`, the record which follows the record being deleted becomes the new current record. If no record follows the deleted record, the preceding record becomes the new current record. If no record precedes the deleted record, the selection is then empty and the current record is not defined.

Deleting All the Records of a Selection

Call `mSelDelete` to delete all the records of a selection at once.

Syntax:
```
mSelDelete(gTable)
```

After `mSelDelete` has been completed, the selection is empty and the current record is undefined.

Note:	Use this method with caution. There is no way to *undelete* records in V12-DBE. As a general rule, avoid giving direct access of this method to the end-user through your user interface.

Data Binding

Throughout this section, the term *field* is used to designate a V12-DBE field, and *member* to designate a Director member.

`mBindField` establishes a live link between a field and a member. Once bound, the member automatically displays and updates the content of its associated field, for the current record.

Syntax:
```
    mBindField(table_instance, V12FieldName, DirMember)
```

Example:
```
    mBindField(gTable, "price", member "thePrice")
    mBindField(gTable, "age", member "AgeOfStudent" of Castlib
       "External-two")
```

`mUnBindField` performs the opposite function - it breaks the link between a member and whatever field with which the link is bound.

Syntax:
```
    mUnBindField(gTable, DirMember)
```

Example:
```
    mUnBindField(gTable, member "thePrice")
```

`mBindField` spares you multiple calls to `mGetField` and `mSetField` every time the current record changes. It performs a complete read/write binding between the member and its associated field. Every time the current record changes, V12-DBE *updates* the field with the Director member content, goes to the new current record and then *refreshes* the Director member with the new field's content.

Data displayed in the bound members comply to the formatting pattern supplied to `mDataFormat`, if such a pattern is specified.

At any given time, a maximum of one field can be bound to a Director member. However, a single field can be bound to several members and they can all display the bound field's content from the current record. This may lead to ambiguous results if two or more of these members are edited and need to be saved in the associated field. When updating such data, V12-DBE always gives precedence to the last bound member.

If a V12-DBE field of type `string` is bound to a Director member of another type, the type of the Director field is forced to the type imposed by the binding (that is, `string`): its contents will be replaced.

Fields of all types can be bound to Director members, including fields of type Media. If a V12-DBE field is bound to a member such as a check box or radio button, the member is checked if the field contains a non-zero value.

It is not necessary to call `mUnBindField` before you free a table (setting its instance to zero). Once free, all bindings pertaining to the fields of a table are automatically revoked.

Binding Types

V12-DBE offers the possibility of controlling when the binding features are applied, (i.e. refreshing the screen and updating the database information). It is defined as either “Full” or “Safe” binding, and set with the `bindingType` parameter.

When the `bindingType` is not specified, it is automatically set to "`Fullbinding`".

Full Binding

For projects that usually require simple browsing and viewing of information, the binding is a “Full” binding. This means that information is displayed and updated automatically to and from the V12 database.

```
    mBindField(gTable, V12FieldName, DirMember, "FullBinding")
```

Safe Binding (for advanced users)

For large projects (i.e. a large number of bound members, many of which can be used without being on the stage), or in cases where increased control over content updates or screen refreshment is required, note the following syntax variation in which you specify a "safe" binding.

```
    mBindField(gTable, V12FieldName, DirMember, "SafeBinding")
```

The "SafeBinding" parameter instructs V12-DBE to wait for calls to `mRefreshBoundFields` and `mUpdateBoundFields` to refresh the member content, or to update the field content.

To explicitly trigger a field→member refresh, call:

```
    mRefreshBoundFields(gTable) -- updates the display in Director
```

which forces the retrieval of content from V12-DBE and refreshes the display for the bound member, and for all bound members simultaneously.

If you wish to refresh only selected bound fields, use:

```
    mRefreshBoundFields(gTable, "f1", "f2", "f3")
```

which refreshes the members associated with fields `f1`, `f2` and `f3` only, as long as they are already bound by `mBindField`.

Explicitly triggering member→ field updates uses `mUpdateBoundFields` in much the same way as. `mUpdateBoundFields` forces the writing of Director members content into their bound V12-DBE fields.

```
    mUpdateBoundFields(gTable)
```

or for a partial update of selected bound fields:

```
    mUpdateBoundFields (gTable, "f1", "f2", "f3")
```

Automatic Generation of Members and Auto-binding

When starting a new project, you need to create Director members for each V12-DBE field you need to represent on the stage, name them in an appropriate way, and write the script to retrieve and store data for each member (or use `mBindField`). For convenience, you may want to have these members created and named automatically, and then bound automatically to matching fields. This is accomplished with `mGenerateMembers` and `mAutoBinding`.

mGenerateMembers

`mGenerateMembers` is usually used immediately after the creation of a database to generate members that correspond to the created fields.

Syntax:
```
    mGenerateMembers(table_instance, fromMember)
```

This instruction creates as many members as there are fields in `table_instance`, starting the creation process from member `fromMember`. The members are of types compatible with the V12-DBE field they were generated from. Fields of type `String`, `Integer`, `Float` and `Date` generate members of type "field" in Director. Fields of type `Media` generate members of type Bitmap. That would change to Sound, Palette, or any other member type depending on the exact content retrieved by `mGetMedia`.

For example, assume `gTable` refers to a table named `articles` containing the fields: `ItemName` of type `String`, `Description` of type `String`, `Price` of type `Float`, `Catalog number` of type `Integer` and `Photo` of type `Media`:
```
    mGenerateMembers(gTable, member 22)
```

creates five members in the internal castlib starting from member 22. If all members 22 - 26 are empty upon calling `mGenerateMembers`, members 22, 23, 24, 25 and 26 are created.

If any of the members 22 - 26 are not empty upon calling `mGenerateMembers`, the members are skipped. In the above example, suppose that members 24 and 26 already existed, `mGenerateMembers` would have then created members 22, 23, 25, 27 and 28.

`mGenerateMembers` can also generate members in any castlib other than the default Director "internal" castlib as follows:
```
    mGenerateMembers(gTable, member "bird" of castlib "album")
```

The newly created members are named after the table from which they were generated, followed by the V12-DBE field name they represent, with a comma in-between. In the above example, the newly created members are named "Articles,ItemName", "Articles,Description", "Articles,Price", "Articles,Catalog number" and "Articles,Photo".

This naming scheme enables you to get each piece of information as follows: for a given auto-generated member (say member 25), `item 1 of the name of member 25` returns the name of the table from which it is generated and `item 2 of the name of member 25` returns the name of the field from which it is generated.

mAutoBinding

`mAutoBinding` tries to bind V12-DBE fields to Director members automatically based on the naming convention described above (e.g., "`TableName`,`FieldName`").

Syntax:
```
    mAutoBinding(table_instance, castLib)
```

This operation tries to bind each field of `table_instance` to a member of `castLib`. If more than one member is eligible to be bound, the one with the smallest number is bound and the others are ignored.

For example, if `gTable` refers to a table named `articles` containing the fields: `ItemName`, `Description`, `Price`, `Catalog number` and `Photo,` and if the Director movie's `internal` cast contains members named "Articles,ItemName", "Articles,Description", "Articles,Price", "Articles,ItemName" and "Articles,Photo" (possibly obtained by calling `mGenerateMembers`):
```
    mAutoBinding(gTable, "internal")
```

performs the following binding operations

V12-DBE field	↔	Director member
ItemName	↔	Articles,ItemName
Description	↔	Articles,Description
Price	↔	Articles,Price
Catalog number	↔	Articles,Catalog number
Photo	↔	Articles,Photo

As does `mBindField`, `mAutoBinding` accepts the parameter `SafeBinding` to establish a binding link between fields and members where data updating and refreshing operations must be explicitly triggered with `mUpdateBoundFields` and `mRefreshBoundFields`.

Syntax:
```
    mAutoBinding(gTable, "Cast", "SafeBinding")
```

Searching Data with mSetCriteria

When searching data, you often need to isolate a specific group of records that satisfy a common condition in a table. These conditions are called **search criteria** and the subset of isolated records is the **selection** (see Database Basics for an explanation of selections and current records). `mSetCriteria` is the method used to specify search criteria, followed by `mSelect` to trigger the search process.

Syntax:
```
    mSetCriteria(gTable, FieldName, operator, Value)
    mSelect(gTable)
```

Simple Search Criteria

A search criterion has at least three characteristics:

- `FieldName`: this is a valid field name in the table instance,
- `operator`: this is a comparison keyword. Valid operators are `=`, `<`, `<=`, `>`, `>=`, `<>`, `starts`, `contains`, `wordStarts` and `wordEquals`.
- `value`: this is the value to which the field contents must be compared to, in order to be selected.

The following example selects all items that are cheaper that $12.

```
mSetCriteria(gTable, "price", "<", 12)
mSelect(gTable)
```

Upon completion of `mSelect`, the resulting selection contains the set of records that satisfy the defined criteria. In the above example, all records that contain a `price` field with a value that is strictly smaller than *12* are selected. In addition, the selection is sorted with an increasing order of prices given that a search with a defined ascending index was performed on that field.

The current record is the first record of that selection. In our example, it is the least expensive item.

If you want the selection sorted in an order other than the one proposed by `mSelect`, you can do so by calling `mOrderBy` right before calling `mSelect`. However, keep in mind that this may cost some additional processing time.

Values provided to `mSetCriteria` need to be in the same type as `FieldName`. As discussed in Database Basics / Typecasting, V12-DBE tries to automatically typecast `value` to the proper type. Borderline conditions such as criteria containing extra spaces, carriage returns or other unwanted characters must be avoided.

Example:

```
mSetCriteria(gTable, "price", "<", "100")
```

is strictly equivalent to

```
mSetCriteria(gTable, "price", "<", 100.00)
```

but beware of the unpredictable results of

```
mSetCriteria(gTable, "price", "<", "..100.00..")
```

Operations on fields of type `Date` require that Value be supplied in Raw format (see Step 2: Preparing the Data / Dealing with Dates). The following example locates all records where field `theDate` contains a date occurring before May 21st, 1997.

```
mSetCriteria(gTable, "theDate", "<", "1997/05/21")
```

Sorting a Selection (mOrderBy)

You can define a sort order on a selection by calling the `mOrderBy` method prior to calling `mSelect`. Specify the sorting order (whether `ascending` or `descending`) and the field upon which the sort is performed.

Example:
```
    mSetCriteria(gTable, "ItemName", "contains", "hat")
    mOrderBy(gTable, "price", "descending")
    mSelect(gTable)
```

The above example selects all hats in `gTable` and returns a selection sorted by a descending order of prices (most expensive to least expensive).

If `mOrderBy` is not called before calling `mSelect`, the sort order of the selection depends on the index used to perform the search. That index is automatically chosen by V12-DBE to optimize the search time. See Appendix 12: Optimization Using Indexes.

Operators

The following is a list of valid operators and their meanings. Although comparisons of `integer`s, `float`s and `date`s are straightforward, comparing strings and custom string types depends on how those comparison rules are defined (see Appendix 16: String and Custom String Types). Media fields cannot be compared.

Equal (=)

The "=" operator is used to locate data that exactly match the specified value.

Example:
```
    mSetCriteria(gTable, "price", "=", 3.14)
```

specifies a search for items that cost exactly $3.14 .

Example:
```
    mSetCriteria(gTable, "ItemName", "=", "hat")
```

specifies a search for items named "hat". Items named "hats" or "hatchet" will not be selected. Since V12-DBE does not differentiate upper case and lower case characters, items named "HAT" or "Hat" will be selected.

Not Equal (<>)

The "<>" operator has the opposite effect of the "=" operator. It is used to locate data that are different than the specified value.

Example:
```
    mSetCriteria(gTable, "price", "<>", 9.99)
```

specifies a search for all items except those that cost $9.99.

Less than (<)

The "<" operator is used to locate data that are strictly smaller that the specified value.

Example:
```
    mSetCriteria(gTable, "price", "<", 10)
```

specifies a search for items that cost less than $10. Items that cost exactly $10 are not selected.

Example:
```
    mSetCriteria(gTable, "ItemName", "<", "hat")
```

specifies an alphabetical search for items with names that precede the letter “h” in "hat". This includes "cap", "bonnet" but excludes "hat".

Less or equal (<=)

The "<=" operator is used to locate data that are smaller or equal to the specified value.

Example:
```
    mSetCriteria(gTable, "price", "<=", 10)
```

specifies a search for items that cost no more than $10.

Example:
```
    mSetCriteria(gTable, "ItemName", "<=", "hat")
```

specifies an alphabetical search for items with names that precede equal “h” in "hat". This includes "cap", "bonnet" and "hat".

Greater than (>)

The ">" operator is used to locate data that are strictly larger than the specified value.

Example:
```
    mSetCriteria(gTable, "CatalogNumber", ">", 1000)
```

specifies a search for items with catalog numbers larger than 1000. Catalog number 1000 will *not* be selected.

Example:
```
    mSetCriteria(gTable, "birth date", ">", "1961/12/31")
```

specifies a search for records with a "birth date" field occurring *after* Dec 31st, 1961, (excluding that date). The earliest birth date in the selection should be Jan 1st, 1962 or later.

Greater or equal (>=)

The ">=" operator is used to locate data that are larger or equal to the specified value.

Example:
```
    mSetCriteria(gTable, "CatalogNumber", ">=", 1000)
```

specifies a search for items with catalog numbers larger or equal to 1000. Catalog number 1000 *will* be selected.

Example:
```
    mSetCriteria(gTable, "birth date", ">=", "1961/12/31")
```

specifies a search for records with a "birth date" field occurring *on* or *after* Dec 31st, 1961. Therefore, the earliest birth date in the selection may be Dec 31st, 1961.

Starts

The "starts" operator can be used with fields of type `string` only (including custom string types). It locates records that start with a given sub-string in the specified field.

Example:
```
    mSetCriteria(gTable, "description", "starts", "hat")
```

sets items for selection with descriptions such as "Hat with two propellers" and "Hatchet for heavy-duty applications".

If an index is defined on the field `description`, the search process is very fast. If not, the search takes more time but can be performed nonetheless.

Contains

The "contains" operator can be used with fields of type `string` only (including custom string types). It locates records that contain a given sub-string in the specified field.

Example:
```
    mSetCriteria(gTable, "description", "contains", "hammer")
```

sets records for selection containing descriptions such as "the greatest hammer in the world" and "casing for hammers of all sizes".

Searches using the "contains" operator are inherently sequential. They cannot take advantage of any index definition and can be very slow.

WordStarts

The "wordStarts" operator can be used only with fields of type `string` (including custom string types) with defined full-indexes. It locates records that contain words that fully or partially match the value specified to `mSetCriteria`.

Example:
```
    mSetCriteria(gTable, "description", "wordStarts", "ham")
```

sets records for selection containing descriptions such as "Gigantic hamburger with fries" and "The greatest hammer in the world". It does not find records containing descriptions such as "Champion" or "Gotham City" because the words in these records don't *start* with the sub-string "ham".

Note	Although words such as "hamburger" and "hammer" can be quickly found by the above query, the word "ham" will never be found because it is shorter than the minimum word length set for full-indexing.

Since "wordStarts" operates on full-indexes, searching is performed very quickly.

WordEquals

The "wordEquals" operator can be used only with fields of type `string` with defined full-indexes. It locates records that contain words that fully match the value specified to `mSetCriteria`.

Example:
```
    mSetCriteria(gTable, "description", "wordEquals", "form")
```

sets records for selection containing descriptions such as "claim form". Records containing words such as "forms" or "formalism" would not be selected.

Since "wordEquals" operates on full-indexes, searching is performed very quickly.

Note	Words shorter than the minimum word length set for full-indexing cannot be looked for with the "WordEquals" operator. In such cases, you must use the "WordStarts" operator instead.

Difference Between Contains and WordStarts

Why should you bother using the slow "Contains" operator if "wordStarts" does the job faster?

Because "wordStarts" requires that a full-index be defined on a field. Full-indexes allow for quick searches, but require more disk space and more time when updating data.

Another reason is that "wordStarts" can only search for *words* that match or begin with a given string. For example, if the description field of a certain record contains the text "Dark chocolate with hazelnuts":
```
    mSetCriteria(gTable, "description", "contains", "cola")
```

would locate that record ("chocolate" contains the sub-string "cola"), whereas
```
    mSetCriteria(gTable, "description", "wordStarts", "cola")
```

would not. This is because no word in the description field *starts* with the string "cola".

Complex search criteria

mSetCriteria can also be called with four parameters. The additional parameter is the Boolean operator "AND" or "OR". It is added to the second call to mSetCriteria and inserted before the field to be searched.

Example:
```
    mSetCriteria(gTable, "name", "contains", "hat")
    mSetCriteria(gTable, "and", "price", "<=", 50)
    mSelect(gTable)
```

The above example selects all hats up to $50.00 in the table referred to by gTable.

The first call to mSetCriteria should use three parameters, and it can be chained with as many four-parameter calls as needed to specify your query. Using mSetCriteria with three parameters will reset and ignore the preceding search criteria.

Another example, using the Boolean "OR" operator is:
```
    mSetCriteria(gTable, "name", "contains", "hat")
    mSetCriteria(gTable, "or", "name", "contains", "helmet")
    mSetCriteria(gTable, "or", "name", "contains", "cap")
    mSelect(gTable)
```

It selects all records whose "name" fields contain either "hat" or "helmet" or "cap".

Note	Complex searches that use the OR operator are always slower than those that use the AND operator. This is true with V12 Database Engine as well as most other database management systems.

Complex criteria are very powerful but can be tricky to use. The following example illustrates complex criteria.
```
    mSetCriteria(gTable, "name", "=", "hat")
    mSetCriteria(gTable, "or", "name", "=", "helmet")
    mSetCriteria(gTable, "and", "price", "<=", 50)
    mSelect(gTable)
```

This section of script selects all hats priced under $50.00 and all helmets under $50.00. This is very different from:
```
    mSetCriteria(gTable, "name", "=", "hat")
    mSetCriteria(gTable, "and", "price", "<=", 50)
    mSetCriteria(gTable, "or", "name", "=", "helmet")
    mSelect(gTable)
```

where the selection consists of all hats under $50.00 and all helmets listed at any price.

To illustrate the semantic difference between the two requests, we could express the first as:
```
    (name = "hat" or name = "helmet") and price <= 50
```

whereas the second could be written as:

```
(name = "hat" and price <= 50) or name = "helmet"
```

Note The current version of V12-DBE does *not* have the ability to perform searches such as

```
name = "hat" or (name="helmet" and price<=50)
```

(note the parentheses).
The first two criteria are always grouped first and the third criteria is added to the result. See Appendix 9: Advanced Boolean Searches for possible workarounds.

Partial Selections

The selection process can be time-consuming if a large number of records match the criteria you specify. The worst case scenario is when all the records of a table match the specified criteria. This can handicap your project if you have no control over that the queries the end-user can express.

To speed up the selection process, you can limit the number of records V12-DBE places in the selection with the following syntax of `mSelect`.

```
mSelect(gTable, from, #recs)
```

Example:

```
mSetCriteria(gT, "LastName", "=", "Smith")
mSelect(gT, 1, 100)
```

The above example returns up to a maximum of 100 records in the selection, regardless of the total number of Smith in the database. If less than 100 Smith exist, all of them would be selected.

To retrieve the next 100 records that contain "Smith" in the "LastName" field, call:

```
mSelect(gT, 101, 100)
```

Note Partial selections also work with complex searches, but not *all* of them. They are only accepted for complex searches that *do not* use full-text indexes (i.e., `WordStarts` or `WordEquals`).

Checking the Size of a Selection

It is sometimes useful to know the number of items localized in a selection. This is the purpose of the `mSelectCount` method.

Example:

```
mSetCriteria(gTable, "name", "=", "hat")
mSelect(gTable)
set selSize = mSelectCount(gTable)
```

In this example, the number of records in the selection (the number of items named "hat") is stored in `selSize`.

Managing Styled Text

Director 5 and 6 feature cast members of type **Text** (also called of type Rich Text, RTF, or `#richText`). Unlike members of type **Field**, members of type Text keep all the formatting styles assigned to their content (including fonts, colors, margins, etc.) and can be anti-aliased. In Director 5 and 6, members of type Text cannot be edited at runtime. This is because members of type Text have two components: a content component (the actual unformatted text) and an image component (the bitmap that represents the formatted content). At runtime, only the image component of Text members is available and therefore these members behave exactly like Bitmaps.

Director 7 introduced a new member of type Text (or `#text`) that can by styled and edited both at authoring time and runtime.

V12 Database Engine manages both Director 5/6 and Director 7 Text members through fields of type String, Integer, Float and Date. Both types of Text members are split in two parts: the text of the member is stored in the V12 field itself. The media component — whether bitmap or binary representation of styled text — is stored in a hidden field of type Media. The text component is used to searching and sorting, whereas the media component is used for storage and retrieval.

Any V12-DBE field of type `integer`, `float`, `date` or `string` can be used to store a text member through the following syntax:

```
    mSetField(gTable, fieldName, member)
```

For example, assume that `gTable` contains a field of type `string` named "Banner" and that member 28 is a Text member containing the anti-aliased text "The Tiger in your Engine",

```
    mSetField(gTable, "banner", member 28)
```

stores the styled Text member 28 in the field "Banner". Technically, the string "The Tiger in your Engine" is stored in the field "Banner" and the media component of the Text member is stored in an hidden Media field.

To retrieve styled text, call `mGetMedia` as follows:

```
    mGetMedia(gTable, "Banner", member "myBanner")
```

This instruction retrieves the banner image from the V12-DBE database and places it in the member named "myBanner". Note that the V12-DBE field "Banner" mentioned above is of type `string` and not `media`.

Alternatively, you can retrieve the content (the individual characters) of the data contained in the field "Banner" as follows:

```
    set aText = mGetfield(gTable, "Banner")
    -- assigns "The Tiger in your Engine" to aText
```

If, for some reason, your script does the following:

```
    mSetField(gTable, "banner", member 28)
    mSetField(gTable, "banner", the text of member 28)
```

the second call to `mSetField` would replace the content of the field "Banner" with the unformatted text contained in member 28. This would replace any image associated with that specific record/field by an empty image. A subsequent call to `mGetMedia` would then return the placeholder.

Note	By opening a Director 5 or 6 movie in Director 7, old Text members are automatically converted to new Text members. However, Director 5 or 6 styled texts that are stored in V12 databases cannot be converted to Director 7 text members. To you need to convert such V12 fields into Director 7-compatible members, first export them to Director 5/6 Castlibs, convert the Castlibs to Director 7 and then store them back to V12-DBE. A utility movie called "Media Converter" and available from http://www.integration.qc.ca performs this conversion.

Searching and Sorting Styled Text Fields

As a result of this technique, it is possible to search and sort fields that contain styled text based on the content component of the fields. Since the fields used to store styled text are of type `string`, `integer`, `float` or `date`, operations such as indexing, sorting, searching, etc. all remain valid.

Errors and Defensive Programming

Effective error management is key to any reliable script or program. If you choose to implement the user interface of your project with the V12-DBE Behaviors Library, you automatically take advantage of this Library's efficient built-in error management. You just need to make sure that the appropriate check boxes are checked when dragging/dropping behaviors.

V12-DBE's Lingo interface provides methods that allow you to keep a close check on your programming. Use the global functions `V12Status()` and `V12Error()`, to confirm each step of database creation and handling.

As well, Director has two interesting tools to help you detect your Lingo scripting errors: the **Watcher** and the **Debugger**, both available in the Windows menu. V12-DBE's error detecting functions, the Watcher and the Debugger can be used together to efficiently debug your scripts.

Checking the Status of the Last Method Called

Call `V12Status()` after each call to V12-DBE methods (both V12dbe and V12table methods) to check its outcome. `V12Status()` returns *0* if no error occurred during the execution of that method. Otherwise, it returns a non-zero error code.

Example:
```
    set aPrice = mGetField(gTable, "price")
    set errCode = V12Status()
    if errCode <> 0 then
       Alert("Mayday! Mayday! mGetField returned error code" && errCode)
    end if
```

If `V12Status()` returns a non-zero result, you can call `V12Error()` to get the details of the error. When called with no parameters, as in `V12Error()` this global function returns a plain-English explanation of the outcome of the last called method. If an error occurred in that last call to V12-DBE, `V12Error()` provides a detailed contextual report on it.

Example:
```
    set aPrice = mGetField(gTable, "price")
    set errCode = V12Status()
    if errCode <> 0 then
       Alert ( V12Error() )
    end if
```

When called with a parameter, as in `V12Error(errCode)`, this function returns the generic explanation of the code `errCode` regardless of the last called V12-DBE method.

Example:
```
    put V12Error(-600)
```

returns:

```
    -- "Table '%s' does not exist"
```

As shown in this last example, `V12Error()` sometimes returns strings which contain placeholders for context specific information, such as %s or %ld. This is because the returned message is a generic explanation of the error code -600. When called without parameter, `V12Error()` returns a contextual explanation with the actual non-existing table name instead of %s.

CheckV12Error

The `CheckV12Error()` Lingo handler is often used throughout this manual and in sample projects. It is a generic error handling routine that centralizes all the error management logic is a single handler. That way, it can more easily be adapted from one project to the other, or from a *debugging* mode to a *delivery* mode (e.g. the debugging mode would display alerts, whereas the delivery mode would write an error log to an external file with the FileIO Xtra).

```
on CheckV12Error
   if V12Status() then
      alert V12Error()
      return TRUE
   end if
   return FALSE
end CheckV12Error
```

Errors and Warnings

Typically, two types of faults can occur in using V12-DBE:

- **Errors** which lead to major problems that require that you stop the execution of your script.

- **Warnings** which happen while executing certain instructions partially or in borderline conditions, that you need to be aware of.

An example of an error is *File not found*, when trying to import data. When a file is not found, it does not make sense to continue the importing operation until the problem is solved.

An example of a warning is *No previous record*, when trying to go to the previous record from the first record of the selection. In such a case, the current record remains valid (although unchanged).

`V12Status()` returns negative codes for errors and positive codes for warnings. Often, the term *error* is used to designate faults of both types (i.e. errors and warnings).

Note: Usually, you call `V12Status()` to get an error or warning code, then `V12Error()` to get a full explanation of that error or warning.

Lingo Syntax Errors

When a scripting error occurs (e.g. Lingo syntax error), Macromedia Director displays an error message and aborts the execution of the current handler. This can be annoying in cases where local database and table instance variables are defined in your handler.

Example

```
on doSomethingCritical
   set gDB = New(Xtra "V12dbe", the pathname&"catalog.V12",
   "ReadWrite", "top top top")
   set gTable = New(Xtra "V12table", mGetRef(gDB), "Articles")
   -- other Lingo statements
   -- with a syntax error somewhere which
   -- causes the handler to abort
   set gTable = 0
   set gDB = 0
end doSomethingCritical
```

In this example, a Lingo error is detected and the database remains open. If the database was opened in `ReadWrite` mode and changes were made, the database file might become corrupted.

You can prevent this problem by declaring the instance variables as global variables.

Example:

```
on doSomethingCritical
   global gDB, gTable
   set gDB = New(Xtra "V12dbe", the pathname&"catalog.V12",
   "ReadWrite", "top top top")
   set gTable = New(Xtra "V12table", mGetRef(gDB), "Articles")
   -- other Lingo statements
   -- with a syntax error somewhere which causes the handler to
   abort
   set gTable = 0
   set gDB = 0
end doSomethingCritical
```

When a Lingo syntax error is detected and the handler aborts, you can still type

```
set gTable = 0
set gDB = 0
```

in the Message Window to close your database file.

Additional V12-DBE Methods

Exporting Data

mExportSelection allows exporting of data from a V12-DBE table to TEXT or DBF files (DBase III). Only the selected records are exported (i.e. those in the selection). To export a complete table, make sure it is entirely selected first (see Selection and Selecting All the Records of a Table).

Exporting in TEXT Format

The syntax for exporting all the fields of a table's selection is:

```
    mExportSelection(table_instance, "TEXT", FileName)
```

The above instruction exports all the fields of the selection to the file named FileName. The field and record delimiters are TAB and CARRIAGE_RETURN respectively.

To specify custom field and record delimiters, use:

```
    mExportSelection(table_instance, "TEXT", FileName, FldDelimiter,
       RecDelimiter)
```

Example:

```
    mExportSelection(gTable, "TEXT", "Output.txt", "~", "%")
```

This example exports the selection in a text file named "Output.txt" with the field delimiter "~" and the record delimiter "%".

mExportSelection can also export only selected fields in the following way:

```
    mExportSelection(table_instance, "TEXT", FileName, FldDelimiter,
       RecDelimiter, Field1, Field2, ...)
```

Example:

```
    mExportSelection(gTable, "TEXT", "Data.TXT", TAB, RETURN,
       "ItemName", "catalog number", "price")
```

This example exports the selection in a text file named "Data.TXT" with TAB and RETURN delimiters. The only exported fields are ItemName, catalog number and price, in that order.

The first line in the exported file contains the names of the exported fields separated by the selected field delimiter. The resulting text file is in the character set of the current Operating System (this is relevant only if accented characters are present in the exported data).

mExportSelection takes the format patterns specified in mDataFormat into account. The sorting order of the exported records is identical to the one set on the selection. Media fields are ignored during the exporting process.

Exporting in DBF Format

The parameters for exporting DBF files are identical to those of exporting text, without the field and record delimiters.

Example:
```
    mExportSelection(gTable, "DBF", "Goliath.DBF")
    -- exports all fields of gTable
```

Or:
```
    mExportSelection(gTable, "DBF", "Goliath.DBF", "ItemName", "catalog
       number", "price")
    -- exports only fields ItemName, catalog number and price.
```

The following rules apply when exporting to a DBF file format

- String fields are exported to fields of type Character, if the buffer size of the string field is declared to be no larger than 255 characters. Otherwise, they are exported to field of type Memo.
- Integer fields are exported to fields of type Numeric.
- Float fields are exported to fields of type Numeric with 10 digits after the fixed point.
- Date fields are exported to fields of type Date.
- Media fields are ignored.

Note	Although V12-DBE can read all kinds of DBF file variants, it exports data only in the popular DBase III format. This is mainly because DBase III is universally read by all DBF-compliant systems whereas other more recent formats are not.

Cloning a Database

Cloning a database makes a copy of an existing database file, with all the table, field and index definitions but with none of the data. This is similar to creating a database file from a template rather than starting a new project. Contrary to creating a database with mReadDBstructure (which requires a V12-DBE license to create legal V12-DBE databases) this method can be used at runtime.

Syntax:

```
    mCloneDatabase(db_instance, new_pathname)
```

Example
```
    mCloneDatabase(gDB, the pathname & "myClonedFile.V12")
```

In this example, a new database file named "Cloned.V12" is created using the same tables, fields and index definitions, as well as the same password as the database file designated by the global variable `gDB`. This implies that the original database file, designated by the variable `gDB`, must have been opened with the appropriate password prior to proceeding with the cloning.

An alternate syntax for cloning databases is also supported for the purpose of backward compatibility. It is similar to creating a new instance of an existing database, and it uses the `New` method.

Syntax:
```
    cloned_db_instance = New(Xtra "V12dbe", new_pathname, "clone",
       mGetRef(main_db_instance))
```

where `new_pathname` is the pathname of the database file to be created and `main_db_instance` is the database instance that serves as a model for the clone.

Example:
```
    set gClone= New(Xtra "V12dbe", "myClone.V12", "clone", mGetRef(gDB))
```

In this example, the new Xtra instance `gClone` refers to the file "myClone.V12".

Freeing up Disk Space (packing)

Most database management systems, including V12-DBE, do not reclaim the space freed by deleted records, for the sake of performance. Consequently, as records are created and deleted, the size of the database grows continuously. `mPackDatabase` can be used periodically to reclaim lost bytes.

Syntax:
```
    mPackDatabase(database_instance, NewFilePathName)
```

Example:
```
    mPackDatabase(gDB, the pathname & "Packed_DB.V12")
    mPackDatabase(gDB, "LAN/Shared/Projects/Barney/KidsStuff.V12")
```

The first example compresses `gDB` into a new file named `Packed_DB.V12` located in the same folder as the current Director movie. The second example compresses `gDB` into a new file named `KidsStuff.V12` located on a different volume (removable media, LAN, etc.)

At the end of the operation, `database_instance` stays valid (referring to the non-packed database) and `NewFilePathName` is a new file that can be opened with V12-DBE.

If you just need to compress your current database without creating a new file, you can do so by compressing it into a new temporary database, deleting your initial database and renaming the temporary database to your initial database's name. `FileXtra`, a free Xtra delivered with recent versions of Director (also available for download at http://www.littleplanet.com/kent/kent.html), comes in handy as shown below:

```
-- let fName be your V12 database's name
-- first make sure to set all table instance to 0
mPackDatabase(gDB, the pathname&"temp.V12")
if CheckV12Error() then exit -- don't continue if pack failed
DeleteFile(the pathname&fName)
RenameFile(the pathname&"temp.V12", the pathname&fName)
```

Fixing Corrupted Database Files

Databases may become corrupt if a power failure or system crash occurs while updating records. Therefore, V12-DBE is unable to reopen the database and returns an explicit error code when trying to create a database instance.

Some of these corrupt databases can be fixed with `mFixDatabase`. The syntax for `mFixDatabase` is:

```
mFixDatabase(Xtra "V12dbe", pathname, new_pathname)
```

`pathname` is the name of the database to fix and `new_pathname` is the name of the fixed database, which may reside on a different volume.

`mFixDatabase` is a static method (its first parameter is the Xtra library itself, not on an instance of V12dbe). In the following example:

```
mFixDatabase(Xtra "V12dbe", "Crash.V12", "Recovered.V12")
```

`mFixDatabase` tries to read data from "Crash.V12" and saves the data to "Recovered.V12".

Note: `mFixDatabase` attempts to save a corrupted file as much as possible, but there is no guarantee on the result. `mFixDatabase` essentially attempts to rebuild the indexes of a damaged V12-DBE file, but if the file's headers or data clusters are damaged, chances are that the recovery process will fail.

Progress Indicators

V12 Database Engine can display a progress indicator to the user when performing time-consuming tasks such as `mImportFile`, `mExportFile`, `mGetSelection`, `mSelect`, `mSelDelete`, `mFixDatabase` and `mPackDatabase`. Such a progress indicator can optionally feature a Cancel button to enable users to interrupt the current task. You can also replace the standard V12-DBE progress bar by any custom progress indicator you provide via Director and Lingo.

Note	`mSelect` preceded by `mSetCriteria` with simple or complex criteria enables the display of a single progress indicator for the selection task, except if the criteria contain `wordStarts` or `wordEquals` operators. In that case, as many progress indicators as criteria are displayed.

To activate the progress indicator, set the `ProgressIndicator` property to `With_Cancel`, `Without_Cancel` or `UserDefined`. To deactivate it, set it to `None`.

Options of the ProgressIndicator property

With_Cancel

V12-DBE displays its own progress bar when performing one of the above mentioned tasks. The user can click on the Cancel button to abort it. You can set the `ProgressIndicator.Message` property to whatever message you wish to display in the upper part of the progress window. If you set the `ProgressIndicator.Message` property to an empty string, V12-DBE displays its own context-dependant message.

Without_Cancel

`Without_Cancel`: V12-DBE displays its own progress bar when performing one of the above mentioned tasks. No "Cancel" button is shown and the current task cannot be interrupted. You can set the `ProgressIndicator.Message` property to whatever message you wish to display in the upper part of the progress window. If you set the `ProgressIndicator.Message` property to an empty string, V12-DBE displays its own context-dependant message.

UserDefined

V12-DBE does not display a progress bar of its own. Instead, it calls three Lingo handlers that *must* be defined in your movie: `V12BeginProgress`, `V12Progress` and `V12EndProgress`. See

User Defined Progress Indicators below.

None

No Progress Indicator is shown and no callbacks are performed to Lingo handlers (default value).

See also Properties of Databases / ProgressIndicator.

User Defined Progress Indicators

If you wish to display your own progress indicator to the user, you must set the `ProgressIndicator` property to `UserDefined` and define three Lingo handlers in your movie: `V12BeginProgress`, `V12Progress` and `V12EndProgress`.

- The `V12BeginProgress` handler is called when the task starts, to allow you to initialize or open whatever progress indicator you want to show. One parameter is supplied to `V12BeginProgress`: it is either 100 (which is the upper bound that is eventually reached by the first parameter at the end of the operation), or -1 if no such upper bound is known up front.

- The `V12Progress` handler is repetitively called as long as the task is performed. Two parameters are supplied to `V12Progress`. The first parameter is the actual progress made so far and thus increases at every call. The second one is either 100 (which is the upper bound that is eventually reached by the first parameter at the end of the operation), or -1 if no such upper bound is known up front. `V12Progress` must return FALSE to keep V12-DBE performing the current task or TRUE to abort it. See example below.

- The `V12EndProgress` handler is called at the end of the task, to allow you to cleanup or close your progress indicator.

Note	In V12-DBE 2.1, only `mSelect` calls `V12BeginProgress` and `V12EndProgress` with an upper bound of -1. All the other methods (i.e., `mImportFile`, `mExportFile`, `mSelDelete, mFixDatabase` and `mPackDatabase`) pass an upper bound parameter of 100.

Example: spinning a custom cursor

If you want to spin a custom cursor while V12-DBE is performing time-consuming tasks, you need to define the following three handlers:

```
on V12BeginProgress
   -- this is an empty handler. Spinning a cursor does not
   -- require intialization.
end V12BeginProgress

on V12Progress prog, limit
   -- rotate cursor cast members. limit is ignored because spinning
   -- a cursor does not need to reach an upper bound.
   -- cast 27=first of series 4 cursors, cast 31=mask (empty)
      cursor [27 + (prog mod 4), 31]
      return FALSE
end V12Progress

on V12EndProgress
      cursor -1  -- restore pointer cursor
end V12EndProgress
```

In this example, `V12BeginProgress` is an empty handler, but it must be present. `V12Progress` only uses the `prog` parameter because it indefinitely rotates among four cursors (which are one-bit depth members defined in members 27, 28, 29 and 30). V12EndProgress is responsible of restoring the standard pointer cursor.

The "Progress" Mini-Sampler (available on http://www.integration.qc.ca) demonstrates other uses of progress indicators, including user-defined ones.

Checking the Xtra's Version

At authoring time, you check the V12-DBE Xtra's version by opening its Get Info window in the MacOS Finder, or by checking its Properties in Windows' Explorer.

Both at authoring time and runtime, you can call mXtraVersion to retrieve the version of the Xtra. Example:

```
    set v = mXtraVersion(xtra "v12dbe")
    put v -- puts "V12,3.0.0,Multi-User" in message window
    if (char 1 of item 2 of v) <> 3 then Alert "not version 3"
```

Changing a Password

You can change the password assigned to a database by using the mSetPassword method. The new password can be an empty string. The syntax is as follows:

```
    mSetPassword(gDB, oldPassword, newPassword)
```

Example:

```
    mSetPassword(gDB, "houdini", "ali baba")
```

Properties of Databases

V12-DBE databases contain generic properties that provide for technical information on the current V12-DBE environment (such as the number of available indexes and the state of the active debugger) and allow for the control of the V12-DBE environment (such as custom string types and custom weekday names).

mSetProperty and mGetProperty are used to assign and read these generic database properties. Certain properties can only be read, not written (i.e. the number of available indexes) while others can be read and written (i.e. custom string types)

Certain properties are *persistent* (i.e. saved to the database and recovered when the database is reopened), others are not.

The syntax for mGetProperty is:

```
    set val = mGetProperty(gDB, PropertyName)
```

The syntax for `mSetProperty` is:

```
mSetProperty(gDB, PropertyName, Value)
```

`PropertyName` is a valid identifier (see Appendix 3: Capacities and Limits for the definition of a valid identifier).

`Value` is always a string, even if `PropertyName` refers to a number. For example, the `MaxLoggedErrors` property accepts a number (e.g. 35) but the parameter supplied to `mSetProperty` must be a string (e.g. "35").

Note: `Value` is limited to 4096 characters.

`mSetProperty` can be used to define a new property or to change an existing one. Using `mSetProperty` with a value of EMPTY deletes that property. Properties pertaining to Strings (see The String Property below) cannot be deleted.

Note: `mSetProperty` is a *very* powerful tool. If you are unsure about what you're doing, always work on a copy of your original database.

Valid `PropertyName`s and `Value`s are listed below. Both parameters must be of type String. Both are case insensitive (hence "resources", "Resources" and "RESOURCES" are all three equivalent).

You can retrieve the list of all the properties of a database by calling `mGetPropertyNames`, as in

```
set props = mGetPropertyNames(gDB)
```

Note: V12-DBE properties can only be accessed by the `mSetProperty` and `mGetProperty` methods. They are totally unrelated to Windows 9x/NT file properties.

Predefined Properties

ProgressIndicator

Read-Write, persistent. Valid values are "None", "With_Cancel", "Without_Cancel", "UserDefined". Default value is "None".

```
set x = mGetProperty(gDB, "ProgressIndicator")
mSetProperty(gDB, "ProgressIndicator", "With_Cancel")
```

Enables V12-DBE to show a progress indicator while performing time-consuming tasks, or calls back Lingo handlers to enable custom progress indicator implementations. See Progress Indicators.

ProgressIndicator.Message

Read-Write, persistent.

```
set msg = mGetProperty(gDB, "ProgressIndicator.Message")
```

```
    mSetProperty(gDB, "ProgressIndicator.Message", "Exporting records.
       Please be patient…")
```

This property sets the text that must be displayed in the upper part of V12-DBE's progress window. If you set it to an empty string, V12-DBE displays a message that depends on the current operation. See Progress Indicators.

VirtualCR

Read-Write, persistent. Valid values: any ASCII character.

When importing or exporting data, convert Carriage Returns (ASCII #13) to this ASCII character. This is convenient to avoid the confusion of real Carriage Returns with Record Delimiters. This property can be overridden by a specific VirtualCR character passed as parameter to `mImport`.

```
    set c = mGetProperty(gDB, "VirtualCR")
    put CharToNum(c) – show ASCII number in message window
    --
    mSetProperty(gDB, "VirtualCR", NumToChar(10)) -- define ASCII
       character #10 as virtual CR
```

See Step 2: Preparing the Data / Virtual Carriage Returns.

CharacterSet

Read-Write, persistent. Valid values: "Windows-ANSI", "Mac-Standard", "MS-DOS". Default: "Windows-ANSI" on the Windows version of V12-DBE and "Mac-Standard" on the Macintosh version of V12-DBE. This property affects all of V12-DBE's import and export functions. It can be overridden by a specific character set passed as parameter to `mImport`.

Translates imported and exported files (whether Text or DBF) with the "Windows-ANSI", "Mac-Standard" or "MS-DOS" character set tables.

```
    mSetProperty(gDB, "CharacterSet", "Mac-Standard")
```

See Step 2: Preparing the Data / Character Sets..

Resources

Read-only, non-persistent.

```
    put mGetProperty(gDB, "resources")
```

Returns information on the number of available indexes and the index used by the last call to `mSelect`.

Example:

```
    -- Number of indexes used: 6
    -- Current index in table 'articles': 'nameNdx', using field 'name'
```

V12-DBE resources should not be confused with the MacOS resources (those normally edited with ResEdit) - they are completely unrelated.

CurrentDate

Read-only, non-persistent.

`mGetProperty` returns the current date in V12-DBE's raw format (YYYY/MM/DD) regardless of the Control Panel settings of the Mac or PC.

Example
```
    set aDate = mGetProperty (gDB, "CurrentDate")
    put aDate
    -- "1999/12/31"
```

Verbose

Read/write, non-persistent. Valid values are "on" and "off".

When Verbose is set to "on", V12-DBE constantly displays a detailed feedback on the tasks it is performing in Director's Message Window,

Example:
```
    mSetProperty(gDB, "verbose", "on")
    mGetProperty(gDB, "verbose")
```

Avoid setting both the Verbose and the ErrorLog properties to "on" at the same time, otherwise Director's Message Window will be quickly loaded with lengthy error logs at every call to V12-DBE.

Months

Read/write, persistent. Valid values: any 12 word string.

The Month property contains the names of the months used by `mDataFormat` to format dates (the `MMMM` pattern in `mDataFormat`). The `Value` parameter is any 12-word string. Words must be separated by spaces. Names of months that contain spaces themselves must be enclosed between apostrophes.

Example:
```
    mSetProperty (gDB, "Months", "Gennaio Febbraio Marzo Aprile Maggio
       Giugno Luglio Agosto Settembre Ottobre Novembre Dicembre")
```

ShortMonths

Read/write, persistent. Valid values: any 12 word string.

The ShortMonth property contains the short names of the months used by `mDataFormat` to format dates (the `MMM` pattern in `mDataFormat`). The `Value` parameter is any 12-word string. Words must be separated by spaces. Short names of months that contain spaces themselves must be enclosed between apostrophes.

Example:

```
    mSetProperty (gDB, "ShortMonths", "Jan Fév Mar Avr Mai Juin Juil
       Août Sep Oct Nov Déc")
```

Weekdays

Read/write, persistent. Valid values: any 12 word string.

The Weekdays property contains the names of the weekdays used by `mDataFormat` to format dates (the `DDDD` pattern in `mDataFormat`). The `Value` parameter is any 12-word string. Words must be separated by spaces. Names of weekdays that contain spaces themselves must be enclosed between apostrophes.

Example
```
    mSetProperty (gDB, "Weekdays", "Montag Dienstag Mittwoch Donnerstag
       Freitag Samstag Sonntag")
```

ShortWeekdays

Read/write, persistent. Valid values: any 12 word string.

The ShortWeekdays property contains the short names of the weekdays used by `mDataFormat` to format dates (the `DDD` pattern in `mDataFormat`). The `Value` parameter is any 12-word string. Words must be separated by spaces. Short names of weekdays that contain spaces themselves must be enclosed between apostrophes.

Example
```
    mSetProperty (gDB, "ShortWeekdays", "Lun Mar Mie Jue Vie Sab Dom")
```

ErrorLog

Read/write, persistent. Valid values: "on" and "off". Default value: "off".

When the `ErrorLog` property is set to "off", V12-DBE's error log and status code are reset before each call to a V12-DBE method.

When `ErrorLog` is set to "on", error messages are cumulated in an error log as V12-DBE methods are called. Likewise, the status code is set to reflect the most recent error/warning code according to the following rule:

- `V12Status()` reflects the code of the most recent error,
- If no error occurred, `V12Status()` reflects the code of the most recent warning,
- If no warning was reported, `V12Status()` signals a success.

Syntax:
```
    mSetProperty(database_instance, "ErrorLog", on_or_off)
```

Example:
```
    mSetProperty(gDB, "ErrorLog", "on")
```

When `ErrorLog` is "on", the error log and status code can be explicitly cleared by calling the global function `V12ErrorReset`. Resetting the `ErrorLog` property to "on" or "off" also clears the error log and status code.

When `ErrorLog` is "on", the maximum number of messages allowed for logging can be adjusted with the `MaxLoggedErrors` property.

Avoid setting both the Verbose and the ErrorLog properties to "on" at the same time, otherwise Director's Message Window will be quickly loaded with lengthy error logs at every call to V12-DBE.

MaxLoggedErrors

Read/write, persistent. Valid values: any integer between 1 and 1000. Default value: 32.

When the `ErrorLog` property is set to "on", the maximum number of messages that can be cumulated can be set with the `MaxLoggedErrors` property.

Syntax:
```
    mSetProperty(database_instance, "MaxLoggedErrors", Max)
```

As V12-DBE's methods are called, error messages cumulate in an error log and can be retrieved at any time with the `V12Error()` function.

The V12-DBE error log and status code can be explicitly cleared by calling the global function `V12ErrorReset`.

Example:
```
    mSetProperty(gDB, "MaxLoggedErrors", "100")
    The above example sets the maximum number of messages allowed for
       cumulation to 100. Note that the last parameter is "100" (a
       string), not 100 (an integer).
```

SharedRWcount

Read only, non-persistent. Returns the number of users currently using the database in Shared ReadWrite mode.

Example:
```
    set nbUsers = mGetProperty(gDB, "SharedRWcount")
```

DBversion

Read only, non-persistent. Returns the version of the V12-DBE Xtra used to create the database.

Example:
```
    set v = mGetProperty(gDB, "DBversion")
    put v
```

The above example puts "V12,3.0.0,Multi-User" in the message window.

The String Property

The String property is covered in a separate section because other sub-properties (`Delimiters`, `StopWords` and `MinWordLength`) depend on it. Properties below must be modified before fields of the corresponding string types are created in the database.

String.*Language*

Read/write, persistent. Valid values: any valid search/sort table (see Appendix 16: String and Custom String Types)

The String property defines or modifies custom string types (i.e. string fields that obey to particular searching and sorting rules). To define a new string type, or modify an existing one, you append its name to "String.". The chosen name must be a valid identifier and cannot contain periods (".").

Example:
```
    mSetProperty (gDB, "String.Klingon", field "CompTable")
```

In this example, field "CompTable" contains the search/sort descriptor for Klingon as defined in Appendix 16: String and Custom String Types. Once this property is defined, you can use the type "Klingon" to define new fields with `mCreateField` or `mReadDBstructure`. You also need to define this property first before modifying other string properties such as `Delimiters`, `StopWords` and `MinWordLength`.

To modify the sort order of the default string, just omit the *Language* identifier:
```
    mSetProperty (gDB, "String", field "NewCompTable")
```

String.*Language*.Delimiters

Read/write, persistent. Valid values: any valid delimiters descriptor.

Delimiters defines, for an existing string type, the list of characters that are acceptable as word delimiters for full-text indexing. By default, word delimiters for the predefined types are all non-alphanumeric characters (everything except 0-9, A-Z, a-z and accented characters).

Example:
```
    mSetProperty (gDB, "String.Spanish.Delimiters",
       "!?@$%?&*()[]^®{}£¢§¨¶≤≥°=+-,./\|")
```

In the above example, the punctuation characters indicated as the `Value` parameter are considered as delimiters.

If you need to specify the double-quote as part of the delimiters, either use the Lingo constant QUOTE, or place the delimiters in a Director member of type Field and use that field as a `Value` parameter as follows :

```
mSetProperty(gDB, "String.Spanish.Delimiters", field "myDelimiters")
```

All non-printing characters such as TAB, Space, CTRL+J, etc. (i.e. characters lower than ASCII 32) are always considered as delimiters.

To modify the delimiters of the default string, just omit the *Language* identifier:

```
mSetProperty(gDB, "String.Delimiters", field "newDelimiters")
```

String.*Language*.MinWordLength

Read/write, persistent. Valid values: an integer in the range 1..100 passed as a String parameter.

MinWordLength determines the size of the shortest word that must be considered for full-indexing. All words shorter than MinWordLength are ignored and hence refused by the mSetCriteria method when used with the operator "WordEquals".

Example:

```
mSetProperty (gDB, "String.Spanish.MinWordLength", "3")
```

Note that the `Value` parameter is "3" (with quotation marks). This is because mSetProperty expects a `Value` parameter of type String only. The following is also a valid formulation:

```
mSetProperty(gDB, "String.Spanish.MinWordLength", String(3) )
```

To modify the `MinWordLength` of the default string, just omit the *Language* identifier:

```
mSetProperty(gDB, "String.MinWordLength", "2")
```

The default value for MinWordLength is 4.

String.*Language*.StopWords

Read/write, persistent. Valid values: a string no longer than 32K.

StopWords allows for the definition of a list of words that must be ignored in the full-indexing process. The `Value` parameter is a string containing the stop words in any order separated by spaces, TAB or Carriage Returns).

Example:

```
mSetProperty (gDB, "String.Spanish.StopWords", "in on the a")
```

To modify the stop words list of the default string, just omit the *Language* identifier:

```
mSetProperty(gDB, "String.StopWords","a the on for in by as")
```

By default, the StopWords property is empty. A typical list of stop words in English is:

```
a by in the an for is this and from it to are had not was as have
of with at he on which be her or you but his that
```

Note	Remember that at most 4096 characters can be stored in properties.

Custom Properties (Advanced Users)

Advanced users may want to define their own properties and make them persistent to a database. This is a convenient way to store preferences in your database and it eliminates the trouble of having to create a table that includes only one record.

For example, if you need to save the frame last visited by the user prior to leaving your application (possibly to bring him/her back to that same frame next time):

```
on StopMovie
   global gDB
   mSetProperty(gDB, "LastVisited", string(the frame))
   -- Typcasting to string is mandatory here.
   -- Some other housekeeping tasks...
end StopMovie
```

The startup handler of your movie would contain the following:

```
on StartMovie
   global gDB
   -- create database instance, etc.
   set LastVisit = integer(mGetProperty(gDB, "LastVisited"))
   if (LastVisit)>0) then go to frame LastVisit
   -- other housekeeping tasks...
end StartMovie
```

Custom properties are always read/write and persistent.

Appendix 1: :Licensing FAQs

We invite you to carefully read and agree to the terms and conditions of the license before using V12 Database Engine. For your information, the following answers the most frequent questions on our licensing policy. The full licensing agreement follows these FAQs.

Q: Do I have to pay royalties, or a per-project fee, for using V12 Database Engine?

A: No. Integration New Media's one-time licensing fee enables you to use V12-DBE royalty-free Once you own a V12-DBE license, you can use it for as many projects as you wish.

Q: What do Authoring time and Runtime mean in the context of V12-DBE?

A: You use V12-DBE at authoring time if the V12-DBE Xtra is present in Director's or Authorware's Xtras folder when developing a project that requires it. Writing scripts that call the V12-DBE Xtra and creating/modifying database structures (a.k.a. database schema) are authoring time tasks. You use V12-DBE at runtime if the V12-DBE Xtra is present in a playback executable's Xtras folder (a Director projector or Authorware runtime).

Q: A business associate of mine is interested in evaluating V12-DBE. What am I entitled to give him/her for the purpose of evaluation?

A: You can give away the V12-DBE Xtra, its manuals and other related files in as many copies as you wish, *except* for the license file (*.LIC) and the V12-DBE registration number. Better yet, refer your business associate to http://www.integration.qc.ca for free downloads of V12-DBE and related files.

Q: During the development of my project, I need to have the V12-DBE Xtra in my Director / Authorware's Xtras folder. When I deliver it to end-users, I still need to place the V12-DBE Xtra in the Xtras folder. Can't the end-user simply hijack my V12-DBE license?

A: No. The V12-DBE Xtra works as a development tool and enables you to create new database structures only if it detects a license file in your System folder. Otherwise, it works as a playback (a.k.a runtime) tool for reading, writing and searching data. Your license number is encrypted in the V12 database you deliver. Thus, no one can hijack it.

Q: Can I deliver a project that uses V12-DBE and that would be used by two or more users simultaneously?

A: You can distribute any product or program containing V12-DBE Xtra to be used at runtime.

Q: I am working as a consultant for a client who will distribute (or sell, or give away) the project I am developing. Who needs a V12-DBE license?

A: Both you and your client need a license for V12-DBE. The only other alternative is for you to permanently transfer your V12-DBE license to your client. Integration New Media must be notified of such permanent transfers. If you decide to transfer you license, you must make sure not to keep a copy of the registration number and the license file. At all time, a V12-DBE license file can be installed only on a single computer.

Q: We are two employees of the same company working on a project involving V12-DBE. Both of us need to create database structures and/or write scripts to call V12-DBE methods. Do we both need V12-DBE licenses?

A: Yes. You need two separate V12-DBE licenses, unless you share the same computer. A V12-DBE license file can be installed on only one computer at a time.

Q: I am working on a project involving V12-DBE, however I never need to create or modify database structures, neither do I write or modify V12-DBE related scripts. Do I need a V12-DBE license.

A: No. If you only need to view or modify the content (add/delete records) of a V12-DBE database, no license is required. If your project requires you to create or modify a V12-DBE database structure (a.k.a adding/deleting tables), or if you need to write V12-DBE-related scripts, then you must have a V12-DBE license.

Q: I developed a software tool that uses V12-DBE and I want to make it available to colleagues and associates for use at authoring time. Must they also have V12-DBE licenses?

A: Yes. Users of software that use V12-DBE in an authoring environment must have V12-DBE licenses.

Q: As a student, am I entitled to an educational license of V12-DBE?

A: Yes, but you must conform to specific conditions. To obtain an educational license of V12-DBE, you agree to use V12-DBE only for educational purposes. Educational means that V12-DBE is intended for use by students and faculty of educational institutions only for non-commercial projects.

Q: What are my obligations as V12-DBE license holder?

A: In your project, you must mention "Portions of code are Copyright (c)1995-99 Integration New Media, Inc." next to your own copyright notice. You must also place the "Powered by V12" logo on the packaging of your product *or* within your product (in the Credits section, About box or equivalent location). The "Powered by V12" logo is available on the V12-DBE CD-ROM and on Integration New Media's web site (http://www.integration.qc.ca).

Appendix 2: License Agreement

PLEASE READ THIS LICENSE AGREEMENT CAREFULLY BEFORE USING V12 DATABASE ENGINE. BY USING V12 DATABASE ENGINE, YOU AGREE TO BECOME BOUND BY THE TERMS OF THIS LICENSE AGREEMENT.

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(e) The Software contains a license file (.LIC) which is subject to the restrictions set forth above and may not be distributed by you in any way. However, Integration grants you a royalty-free right to reproduce and distribute the files named "V12-DBE for Director.XTR", "V12-DBE for Director.X32" and "V12DBE-D.X16" (collectively, "Runtime Kit") provided that (i) you distribute the Runtime Kit only in conjunction with and as part of your own Products; (ii) own a license for the specific Version of the Software that contains the Runtime Kit; (iii) agree to indemnify, hold harmless and defend Integration from and against any claims or lawsuits, including attorney's fees, that arise or result from the use or distribution of your Products with the Runtime Kit.

(f) Any third party who may distribute or otherwise make available a product containing the V12-DBE Runtime Kit must purchase its own V12-DBE license.

(g) Any third party who will use the V12-DBE Runtime Kit in an authoring environment must purchase his own V12-DBE license.

2. Restrictions. The Software contains trade secrets in its human perceivable form and, to protect them, you may not MODIFY, TRANSLATE, REVERSE ENGINEER, REVERSE ASSEMBLE, DECOMPILE, DISASSEMBLE OR OTHERWISE REDUCE THE SOFTWARE TO ANY HUMAN PERCEIVABLE FORM. YOU MAY NOT MODIFY, ADAPT, TRANSLATE, RENT, LEASE, LOAN OR CREATE DERIVATIVE WORKS BASED UPON THE SOFTWARE OR ANY PART THEREOF.

3. Copyright notices. You may not alter or change Integration's copyright notices as contained in V12-DBE. You must include (a) a copyright notice, in direct proximity to your own copyright notice, in substantially the following form "Portions of code are Copyright (c)1995-99 Integration New Media, Inc."; and (b) place the "Powered by V12" logo on the packaging of your Products; or (c) place the "Powered by V12" logo within your Products in the credits section.

4. Acceptance. V12-DBE shall be deemed accepted by you upon delivery unless you provide Integration, within two (2) weeks therein, with a written description of any bona fide defects in material or workmanship.

5. Termination. This Agreement is effective until terminated. This Agreement will terminate immediately without notice from Integration or judicial resolution if you fail to comply with any provision of this Agreement. Upon such termination you must destroy the Software, all accompanying written materials and all copies thereof, and Sections 7 and 8 will survive any termination.

6. Limited Warranty. Integration warrants for a period of ninety (90) days from your date of purchase (as evidenced by a copy of your receipt) that the media on which the Software is recorded will be free from defects in materials and workmanship under normal use and the Software will perform substantially in accordance with the manual. Integration's entire liability and your sole and exclusive remedy for any breach of the foregoing limited warranty will be, at Integration's option, replacement of the disk, refund of the purchase price or repair or replacement of the Software.

7. Limitation of Remedies and Damages. In no event will Integration, its parent or subsidiaries or any of the licensers, directors, officers, employees or affiliates of any of the foregoing be liable to you for any consequential, incidental, indirect or special damages whatsoever (including, without limitation, damages for loss of profits, business interruption, loss of business information and the like), whether foreseeable or not, arising out of the use of or inability to use the Software or accompanying written materials, regardless of the basis of the claim and even if Integration or an Integration representative has been advised of the possibility of such damage. Integration's liability to you for direct damages for any cause whatsoever, and regardless of the form of the action, will be limited to the greater of US $350.00 or the money paid for the Software that caused the damages.

THIS LIMITATION WILL NOT APPLY IN CASE OF PERSONAL INJURY ONLY WHERE AND TO THE EXTENT THAT APPLICABLE LAW REQUIRES SUCH LIABILITY. BECAUSE SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES, THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

8. General. This Agreement will be construed under the laws of the Province of Quebec, except for that body of law dealing with conflicts of law. If any provision of this Agreement shall be held by a court of competent jurisdiction to be contrary to law, that provision will be enforced to the maximum extent permissible, and the remaining provisions of this Agreement will remain in full force and effect.

9. The parties acknowledge having requested and being satisfied that this Agreement and its accessories be drawn in English. Les parties reconnaissent avoir demandé que cette entente et ses documents connexes soient rédigés en anglais et s'en déclarent satisfaits.

The following trademarks are used throughout this manual: Director and Xtra are trademarks of Macromedia, Inc., FileMaker Pro is a trademark of Claris corp., Windows, Access and MS Excel are trademarks of Microsoft corp., Macintosh is a trademark of Apple corp., 4th Dimension is a trademark of ACI, Photoshop is a trademark of Adobe Systems Inc.

Appendix 3: Capacities and Limits

- The size of a V12-DBE database file is limited by disk space.
- The number of database instances and table instances is limited by RAM. Up to 128 instances of single database can be opened by 128 different executables (Director applications, Shockwave movies or Projectors) in `Shared ReadWrite` mode. Each executable is entitled to only one database instance of a given database (although, you may create as many instances of *distinct* databases as you wish in a single executable). Multiple instances of a table can be created on a single computer.
- Databases that contain media fields are not compatible between version 6 and version 7 of Director. They must be used with the version of Director they were created with.
- A maximum of 128 indexes can be defined on a V12-DBE database. Each index can operate on up 12 fields.
- Since each table requires at least one index, the maximum number of tables in a V12-DBE database is also 128.
- A valid V12-DBE database contains at least one field and one index.
- Up to 100 criteria can be chained with sequences of `mSetCriteria` separated by Boolean operators.
- All records are of variable length. Fields of type `media` are limited to 1Mb. Fields of type `string` are limited to 64K (Note: Director Field members are limited to 32K).
- The range of the type `Integer` is -2^{31} to $2^{31}-1$ (*-2147483648* to *2147483647*).
- The range of the type Float is ±*1.79769313486232E+308* to ±*2.22507385850720E-308.*
- Any date later than January 1st, 1600 can be compared, retrieved and stored to fields of type Date. However, date formatting is limited to the range Jan 1st 1904 through Dec 31st 2037.
- No two fields or indexes can have the same name in the same table. However, two fields or two indexes might have the same name in different tables.
- Fields of type `media` can hold any type of media that can be stored in a Director member, except Film Loops and QuickTime movies.
- Up to 32 custom string types can be defined.

- DBF files of type DBase III, DBase IV, DBase V, FoxPro 2.0, FoxPro 2.5, FoxPro 2.6, FoxPro 3.0 and FoxPro 5.0 can be imported, exported and used as templates for the definition of V12 databases. Fields of type DateTime are not supported. The following DBF data types are ignored: General, Character-Binary, Memo-Binary.

- On Win9x/NT, MS Access databases, MS FoxPro files, MS Excel workbooks and MS SQL Server data sources can be used as templates to create new V12 database and as sources of data to import records from through ODBC drivers. The exact database translation/data importing rules varies among ODBC drivers and versions of ODBC drivers.

- Identifiers (names of fields, tables and indexes) are limited to 32 characters. They must start with a low-ASCII alphabetic character (a..z, A..Z) and can be followed by any alphanumeric character (0..9, a..z, A..Z, à, é, ö). Keywords such as `NOT`, `AND`, `OR`, `String`, `Integer`, `Float`, `Date` or `Media` are not suitable for use as identifiers.

- When indexing fields of type String, up to the 200 first characters of each string are actually entered in the index. The remaining characters are ignored.

- Full-indexes are built with words not exceeding 31 characters. Words longer than 31 characters are truncated to 31 characters for the purpose of indexing (this does not affect the actual data).

- New database structures cannot be created at runtime without the presence of a V12-DBE license file (actually, they can, but they will be non-licensed V12 databases). They can only be cloned from existing databases.

Appendix 4: Multi-user Access

V12-DBE allows for multi-user access to its databases. This means that a V12-DBE file can be shared by many users provided the V12-DBE file is available to them on a mounted volume.

An icon on the desktop represents a mounted volume on the Macintosh computer. You can mount such a volume by selecting it in the Chooser, in the Apple menu.

On windows 9x/NT a mounted volume is either a volume that is mapped to a drive letter or a volume or partition accessible in the Network Neighborhood.

On Windows 3.1, a mounted volume is a network drive.

Opening a file in *Shared ReadWrite* Mode

To open a V12 database in a multi-user environment, create a V12dbe Xtra instance in "Shared ReadWrite" mode. Syntax:

```
    Set gDB = New(Xtra "V12dbe", "FilePathname", "Shared ReadWrite",
       "MyPassword")
```

MacOS example:

```
    new(Xtra "V12dbe", "MyNetworkDrive:Data:Catalog.V12", "Shared
       ReadWrite", "password")
```

Windows 9x/NT/3.1 example (F is a mapped volume):

```
    new(Xtra "V12dbe", "F:\Data\Catalog.V12", "Shared ReadWrite",
       "password")
```

Windows 9x/NT example:

```
    new(Xtra "V12dbe", "//BigServer/Data/Catalog.V12", "Shared
       ReadWrite", "password")
```

At most 128 users can open a V12-DBE file in `Shared ReadWrite` mode.

Note:	If a user opens a database in "Shared ReadWrite" mode, any attempt to open it in an exclusive mode (ReadWrite or ReadOnly) will fail. If the database is open in "Shared ReadWrite", other users can also open it "Shared ReadWrite" mode. If the database is open in an exclusive mode ("ReadWrite" or "ReadOnly"), it cannot be opened by any other user.

Modifying a Shared Database

If you plan on allowing users to modifying the content of your shared database, note the following rules:

- V12-DBE uses a record locking technique which means that if a user is editing the current record after a `mEditRecord`, then no other user can call `mUpdateRecord` until that user is finished. Any other call to `mEditRecord` would fail because the record would be locked. Both `V12Error()` and `V12Status()` would report such failures.

- Any attempt to retrieve the content of a locked record using `mExportFile`, `mGetSelection` etc…, will return a warning and cancel the action.

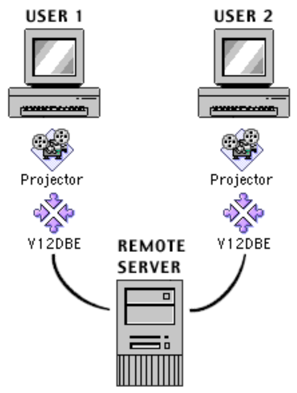
- If many users proceed to making modifications on the same table simultaneously, synchronization problems may arise between the actual content of the table and the selection as reflected in the users' V12table instances. Such instances must be "refreshed" by invoking `mSelect()`. To detect whether a table was modified by another user, call `mNeedSelect()` at any time. `mNeedSelect()` returns TRUE if records were added, deleted or modified since the current instance last called `mSelect()`. In some cases, it is a good idea to check for `mNeedSelect()` on idle and refresh the displayed records when signaled to do so.
  Example:
```
on idle
   if mNeedSelect(gTable) then
        mSelect(gTable)
        -- do wathever necessary to refresh the display
        end if
end idle
```

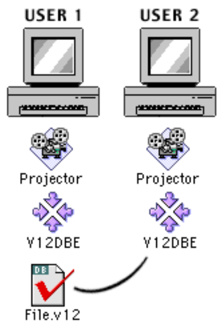
Counting the number of Users

The `sharedRWcount` property is ReadOnly and non persistent. It returns the number of users currently sharing the V12-DBE database file in `Shared ReadWrite` mode.

Syntax:
```
mGetProperty(gDB, "sharedRWcount")
```

Possible Configurations



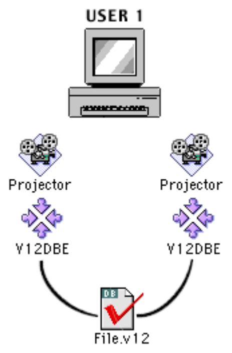


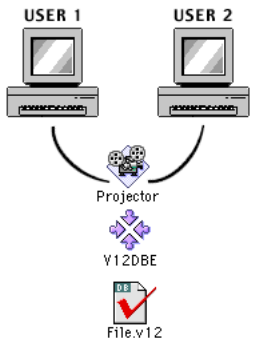
Scenario 1:

User 1 and User 2 access the same V12 database on a Remote Server. This is the typical multi-user access configuration.

Scenario 2:

User 2 accesses the same V12 database file as User 1, on User 1's computer. User 1 and User 2 use separate instances of the projector and V12-DBE Xtra.





Scenario 3:

User 1 with two distinct Projectors, each with its own copy of the V12-DBE Xtra share a single V12 database. NOTE: for the Mac version to properly run in this scenario, File Sharing must be set and the V12 database must be in a shared folder.

Scenario 4:

User 1 and User 2 share the same projector, V12-DBE Xtra, and V12-DBE database file

(this scenario requires a locked projector file on a Windows computer).

Appendix 5: Multiple Instances of a Table

In some applications, it is useful to create more than one Xtra instance for a given table. The advantage of such a duplication is to keep several selections and several current records for the same table.

Example

```
    set gTable1 = New(Xtra "V12table", mGetRef(gDB), "articles")
    set gTable2 = New(Xtra "V12table", mGetRef(gDB), "articles")
    mOrdreBy(gTable1, "price")
    mOrdreBy(gTable2, "name")
    mSelectAll(gTable1)
    mSelectAll(gTable2)
```

This example defines two table instances (`gTable1` and `gTable2`) for the table `articles`. The selection in `gTable1` is sorted by order of price, whereas in `gTable2` it is sorted by order of name.

Note: 1. The multiple instance definition technique is sometimes convenient for Read-Only databases but can lead to inconsistencies when used in Read/Write mode. This happens particularly when editing a current record which is also the current record of the other instance.

2. Each table instance takes up RAM.

Appendix 6: Delivering to the End User

V12-DBE is designed in a way that minimizes any last minute changes needed before delivery to the end-user. Unlike other database management systems where you need to swap the development version of certain files with the runtime versions, no swapping is required with V12-DBE.

You deliver the Xtra file *V12-DBE for Director.XTR* and/or *V12-DBE for Director.X32* and/or *V12-DBE for Director.X16*. For an Xtra to be available to a Director projector, you must to place it in a folder named "Xtras" located in the same folder as the projector itself. Alternately, with Director 7, you can package the required Xtras into your Director projector by including them in the Modify > Movie > Xtras window.

As stated in the licensing agreement, you DO NOT deliver the license file "V12-30.LIC", which is in the System:Preferences folder of your Macintosh, or the Windows\System folder of your PC.

Note	Although V12-DBE works fine with Shockwave movies, you cannot have it automatically downloaded via the net from a Shockwave movie.

Testing for end-users

It is always a good idea to thoroughly test the product before delivering it to the end-user. Tests must be performed on computers with configurations very similar to those of end-users. However, if you need to perform end-user tests on the computer that contains the V12-DBE license, you can reproduce an end-user environment by proceeding as follows:

- Make sure Director or a Director Projector is not running,
- Open the System:Preferences folder of your Macintosh, or the (Windows\System folder) of your PC,
- Move the V12*.LIC file out of that folder to the destination of your choice, except of course, the trash can or the recycle bin,
- Open your project either with a Projector or Macromedia Director and perform the tests.
- Once the tests are completed, close the Projector or Macromedia Director and put the license file back in its original folder.

Note	DO NOT attempt to rename or tamper with the license file. If you do, you may need to re-register V12-DBE.

Appendix 7: Portability Issues

Some files are cross-platform compatible and others are not. As a general rule, everything that can be executed is not cross-platform compatible. Applications, DLLs, Xtras, EXE files are all executable and include the following:

- Macromedia Director
- Projectors generated by Macromedia Director
- the V12-DBE Xtras

Everything that is a static document is cross-platform compatible. This includes:

- Director movies (either protected or not)
- V12-DBE databases

The following figure identifies which files are specific to Macintosh or Windows, and which files are compatible to both Macintosh and Windows.

Windows only	Macintosh and Windows	Macintosh only
Director for Windows		Director for Macintosh
	Director movies (.DIR, .DXR) Shockwave movies (.DCR)	
Projector for Windows		Projector for Macintosh
V12-DBE Xtras for Windows		V12-DBE Xtras for Macintosh
	V12-DBE databases	

Appendix 8: Data Updating and Sort Orders

Updating a field that is used in the current index can yield a potentially unwanted – although consistent – behavior. For example, imagine a database that has the following structure:

```
[TABLE]
MyFavoriteThings
[FIELDS]
Preference integer indexed
Thing string
[END]
```

it contains the following 10 records:

Preference	Thing
27	Raindrop on roses
35	Whiskers on kittens
50	Bright copper kettles
54	Warm woolen mittens
60	Round paper packages tied up with strings
75	Cream-colored ponies
87	Crisp apple strudels
92	Door bells and sleigh bells
95	Schnitzels with noodles
100	Wild geese that fly with the moon on their wings

The table is currently sorted by order of Preference, using that field's index and the current record is the first record (*27-Raindrop on roses*).

Any modification to the `Thing` field does not affect the order of the selection. However, modifying the `Preference` field would automatically cause the table to be resorted with respect to the current index's sort order.

For example, modifying the value `27` above for `90` would instantly update the selection to the following order, with the current record pointing to the 7th record.

Preference	Thing
35	Whiskers on kittens
50	Bright copper kettles
54	Warm woolen mittens
60	Round paper packages tied up with strings
75	Cream-colored ponies
80	Crisp apple strudels
90	Raindrop on roses
92	Door bells and sleigh bells
95	Schnitzels with noodles
100	Wild geese that fly with the moon on their wings

This "repositioning" occurs right after calling `mUpdateRecord`.

This behavior may seem even stranger when the V12-DBE Behaviors are used. In that case, if the current record is #1, the value `27` is changed to `90` and the user clicks on the Next button (theoretically to view record #2: 35-*Whiskers on kittens*), the record *50-Bright copper kettles* is displayed. This is because the `mGoNext` method called by the Next button updates record #1 thus relocating it as record #7, and then goes to the new record #2 which is *50-Bright copper kettles*.

To avoid this behavior, you must prohibit the modification of fields used in the current index. Or better yet, create an additional indexed field that can be used as an internal ID. This is how many database engines work internally.

Note Selections defined by calls to `mSetCriteria`/`mSelect` are not affected by this symptom.

Appendix 9: Advanced Boolean Searches

Two or more search criteria can be chained in a single query with V12 Database Engine, as in:

```
    mSetCriteria(gT, "DishType", "=", "soup")
    mSetCriteria(gT, "AND", "TimeToPrepare", "<=", 20)
    mSelect(gT)
```

or

```
    mSetCriteria(gT, "Ingredients", "WordStarts", "celery")
    mSetCriteria(gT, "OR", "Ingredients", "WordStarts", "pumpkin")
    mSetCriteria(gT, "OR", "Ingredients", "WordStarts", "carrot")
    mSetCriteria(gT, "OR", "Ingredients", "WordStarts", "eggs")
    mSelect(gT)
```

You can also mix ANDs and ORs, as follows:

```
    mSetCriteria(gT, "DishType", "=", "soup")
    mSetCriteria(gT, "OR", "DishType", "=", "appetizer")
    mSetCriteria(gT, "AND", "TimeToPrepare", "<=", 30)
    mSelect(gT)
```

The above query finds all soups and appetizers that require less than 30 minutes of preparation time. This is not equivalent to:

```
    mSetCriteria(gT, "TimeToPrepare", "<=", 30)
    mSetCriteria(gT, "AND", "DishType", "=", "soup")
    mSetCriteria(gT, "OR", "DishType", "=", "appetizer")
    mSelect(gT)
```

which finds all soups that require less than 30 minutes of preparation time and all appetizers regardless of the time required to prepare them. Thus, the order in which criteria are expressed to V12-DBE is important.

However, V12-DBE cannot handle four criteria or more with alternating ANDs and ORs. For example, the query "*(Dish is soup or* appetizer*) and (Main Ingredient is celery or eggplant)*" cannot be directly expressed to V12-DBE.

Following are three techniques to workaround this limitation. Many others can be easily derived from those techniques, but they all require some Lingo programming.

Workaround #1: Merging Selections

This technique requires to act on two V12table instances of the same table and to merge the resulting selections.

Define a separate table instance of the same V12 table for each set of query your are performing. For example:

```
    set gT1 = new (Xtra "v12Table, mgetRef(gBD), "Recipes")
    set gT2 = new (Xtra "v12Table, mgetRef(gBD), "Recipes")
```

Run your segments of query on each table instance:

```
    -- first on gT1
    mSetCriteria(gT1, "DishType", "=", "soup")
    mSetCriteria(gT1, "OR", "DishType", "=", "appetizer")
    mOrderBy(gT1, "RecipeID") -- sort by a uniquely indexed field
    mSelect(gT1)
    -- on gT2
    mSetCriteria(gT2, "ingredient", "WordEquals", "celery")
    mSetCriteria(gT2, "OR", "ingredient", "WordEquals", "eggplant")
    mOrderBy(gT2, "RecipeID") -- sort by the same field as gT1 above
    mSelect(gT2)
```

You end up with `gT1` and `gT2` referencing two separate selections, both ordered by `RecipeID`. You can run a small Lingo loop to intersect them:

```
    set field "result" = EMPTY -- Dir member. Can also be a Lingo list
    repeat while not V12Error() -- by "Next" on last rec of gT1 or gT2
      set s1 = (mGetField(gT1, "RecipeID")
      set s2 = (mGetField(gT2, "RecipeID")
      if  (s1 = s2) then
        put mGetField(gT1, "RecipeName")&RETURN after field "result"
          mGoNext(gT1)
          mGoNext(gT2)
        else if (s1 < s2) then
          mGoNext(gT1)
        else
          mGoNext(gT2)
        end if
      end repeat
```

This Lingo loop performs an AND (intersection) between two selections. It can easily be modified to perform an OR (union).

If you need to run your query with 3, 4, 5,... sets of criteria, just modify the above Lingo loop to operate on 3, 4, 5,... V12table instances.

Workaround #2: Marking Records

This technique may be faster if the number of records satisfying the search criteria is large, but it works only if your database is on a writeable volume (ie, not on CD-ROM).

In this case, you work with a single `gTable` instance. In your database structure, for that table, define an additional indexed field of type Integer named "Marker". Initially, this field contains 0s for all records.

Then, run the "*(Dish is soup or* appetizer*) and (Main Ingredient is celery or eggplant)*" query in two rounds:

```
    mSetCriteria(gTable, "DishType", "=", "soup")
    mSetCriteria(gTable, "OR", "DishType", "=", "appetizer")
    mSelect(gtable)
```

Then, mark all found records:

```
    repeat with i = 1 to mSelectCount(gtable)
      mEditRecord(gtable)
      mSetField(gtable, "marker", 1)
      mUpdateRecord(gtable)
    end repeat
```

Now, run the second part of the query:

```
    mSetCriteria(gTable, "ingredient", "WordEquals", "celery")
    mSetCriteria(gTable, "OR", "ingredient", "WordEquals", "eggplant")
    mSetCriteria(gTable,"and","marker","=", 1)
    mSelect(gtable)
```

If there is a third part to you query, mark your selection with a 2 in the "Marker" field, and keep on going. For best performance, the first query must be the most restrictive, that is, the one that yields the least results.

At the end, restore the marked fields to 0 so to prepare them for another query.

Workaround #3: Field Concatenation

The field concatenation technique works for queries that use ANDs at the lowest level, and ORs a the higher level, such as:
(Origin is Italian AND Dish is appetizer) or (Origin is French AND Dish is soup)

Furthermore, all of your search criteria — with the possible exception of the last one — must use the "`=`" operators. The last operator can be either "`=`" or "`starts`".

This technique requires some preparation at the database design step. Such a preparation is sometimes called *data preconditioning*.

When designing your database, you plan for additional fields that would hold the concatenated result of the lowest level queries. For example, in the above example you would create an additional field named `OriginType` that would hold the concatenation of `DishOrigin` and `DishType`. That field would contain values such as

```
    "Italian Asparagus al dente"
    "Italian Prociutto e melone"
    "French Soupe à l'oignon"
    "Italian Melanzane del re"
    "French Bouillon de merguez au miel"
```

At runtime, to perform a user query such as
(Origin is Org1 AND Dish is Type1) or (Origin is Org2 AND Dish is Type2)

you run the script

```
    mSetCriteria(gTable, "OriginType", "=", Org1 & Type1)
    mSetCriteria(gTable, "OR", "OriginType", "=", Org2 & Type2)
    mSelect(gTable)
```

Appendix 10: Handling Double-Byte Content

V12 Database Engine is 100% compliant to single-byte languages. It can properly index, sort and search strings of any single-byte language in addition to allowing for the definition of custom sort and search orders. However, V12-DBE contains the following limitations with respect to double-byte languages.

Storing and Retrieving Data

Double-byte strings can be successfully stored and retrieved from V12 fields of type String. The calls to V12-DBE are identical to those used for single-byte strings (see Step 5: Implementing the User Interface).

To store a double-byte string:

```
    mEditRecord(gTable)
    mSetField(gTable, "name", aName) -- a Name is double-byte
    mUpdateRecord(gTable)
```

To retrieve a double-byte string:

```
    set aName = mGetField(gTable, "name")
```

You can also store and retrieve styled double-byte strings with calls to

```
    mSetField(gTable, "name", member 5 of castlib "V12stuff")
    mGetField(gTable, "name", member 5 of castlib "V12stuff")
```

See Managing Styled Text for details on the storage and retrieval of styled text.

Indexing, Searching and Sorting Data

The indexes of V12 Database Engine version 3.0 are not designed to handle double-byte strings. This implies the following limitations on the queries that can be expressed for searching (see Searching Data with mSetCriteria).

- the `Equal` and `<>` operators works properly, as with single-byte languages.
- the `Starts` operator can fail in certain circumstances, such as when an odd number of bytes is searched with `mSetCriteria`.
- the `Contains` operator finds all records that match the specified criteria, but can also find additional records that don't (Remember: the `contains` operator does not take advantage of indexes. It is therefore slow).
- the `>`, `<`, `>=`, `<=` operators will fail most of the time. They would work properly only in exceptional cases where the sort order of each stored double-byte string happens to match the numeric (i.e. single-byte) ordering of that string.

- `WordEquals` and `WordStarts` cannot be used because, unlike single-byte languages, delimiting words in double-byte languages require language-specific dictionaries.

Work Around

A convenient and easy way to work around the above limitations is to manage double-byte strings as if they were media. That is, only use them for the purpose of storage and retrieval, and use additional fields of type Integer or single-byte String to store codes that would determine the searching behavior and sorting order of the corresponding double-byte strings. Either fields of type String or Media can be used to store such double-byte strings.

Appendix 11: Printing From V12-DBE

There are three popular ways to print from Director movies:

- Directly print Director's stage with the `PrintFrom` Lingo command. This is very easy to implement and does not require an additional Xtra. However, it simply prints Director's stage and thus prints at 75 or so dots-per-inch.
- Use the mPrint Xtra (see http://www.mediashoppe.com). mPrint is easy to use and features an advanced page design tool. However, it only runs on Windows 9x/NT.
- Use the PrintOMatic Xtra (see http://www.printomatic.com). PrintOMatic is available for MacOS, Windows 3.11 and Windows 9x/NT. However, it doesn't have an interactive page design tool: page layouts must be scripted in Lingo.

mPrint and V12 Database Engine

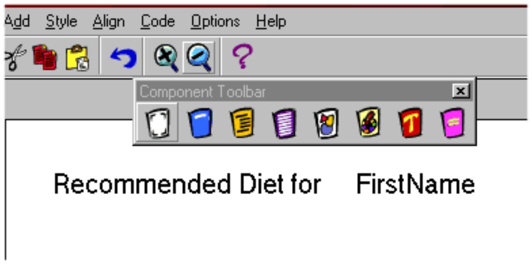
The main steps to print a report with mPrint are:

1. Use the mPrint designer to layout your reports.
2. Save your report (a *.MPF file) on your hard disk.
3. Choose Code > Generate > Director Lingo (F7) to have mPrint Designer generate the Lingo script needed for printing.
4. Copy and paste the printing script in a Director handler.
5. Replace variable references (typically designated by the `"--value--"` strings) by actual calls to V12-DBE
6. Print your report.

At step 6, you can optionally preview your report instead of printing it by replacing the call to `tMsPrintReport()` by `tMsPreviewReport()`

Example #1: printing a specific field in a record

For example, to print the content of selected fields of a record first design as report similar to this:



"Recommend Diet for" is a mPrint Text object. "FirstName" is a mPrint variable.

In mPrint Designer, choose Code > Generate > Director Lingo. You get the following script:

```
    tMsRegisterMPrint("mp-xxxxxxxxxx")
    tMsCreateReport(the pathname&"myReport.mpf")
    tMsBeginRegion("MainRegion")
         tMsSetVariable("FirstName","--value--")
    tMsEndRegion()
    tMsPrintReport()
    tMsFreeReport()
```

Copy this script into your Lingo handler and replace

```
         tMsSetVariable("FirstName","--value--")
```

by

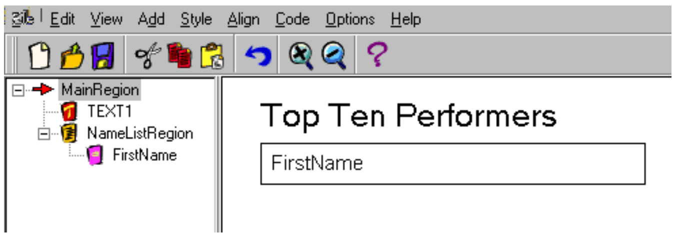
```
         tMsSetVariable("FirstName", mGetField(gT, "FirstName"))
```

Your report is ready for printing.

Example #2: printing multiple records from a V12-DBE selection

This example shows how to print the first ten records of a V12-DBE selection with mPrint. Printing any other number of records, or the entire selection, is similar.

First define a Repeat Region with the mPrint Designer.



"Top Ten Performers" is a mPrint Text object named TEXT1. "FirstName" is a mPrint variable. The rectangle enclosing "FirstName" is a Repeat Region named "NameListRegion".

In mPrint Designer, choose Code > Generate > Director Lingo. You get the following script:

```
tMsRegisterMPrint("mp-xxxxxxxxxx")
tMsCreateReport(the pathname&"NameList.mpf")
tMsBeginRegion("MainRegion")
     repeat with i=1 to "--loop count--"
     tMsBeginRegion("NameListRegion")
          tMsSetVariable("FirstName","--value--")
     tMsEndRegion()
     end Repeat
tMsEndRegion()
tMsPrintReport()
tMsFreeReport()
```

Change this script to obtain the following (changes are in bold):

```
tMsRegisterMPrint("mp-xxxxxxxxxx")
tMsCreateReport(the pathname&"NameList.mpf")
tMsBeginRegion("MainRegion")
     repeat with i=1 to 10
     tMsBeginRegion("NameListRegion")
          mGo(gT, i)
          tMsSetVariable("FirstName", mGetField(gT, "FirstName"))
     tMsEndRegion()
     end Repeat
tMsEndRegion()
tMsPrintReport()
tMsFreeReport()
```

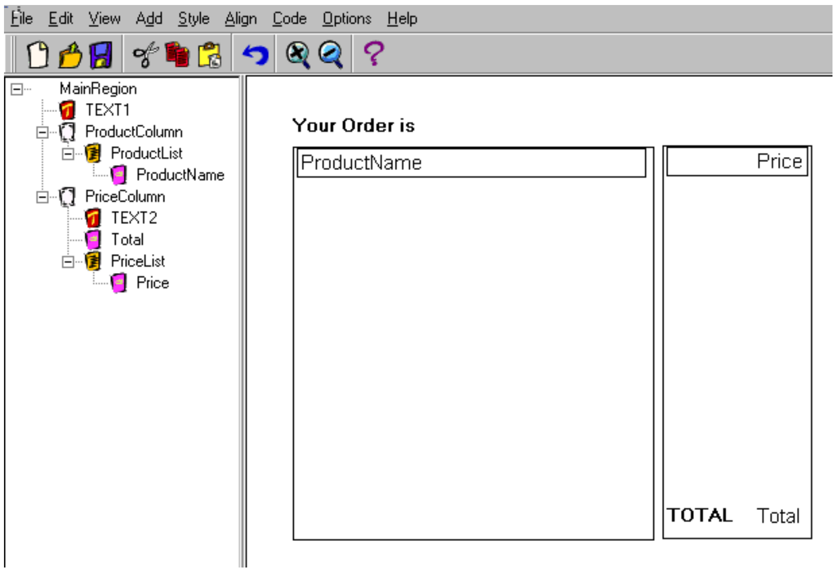
Your report is ready for printing.

Example #3: printing multiple columns

This example shows how to print two columns on a mPrint report: the left column is a list of products. The right column in a list of prices matching each product of the left column. The right column is right-aligned.

This example also shows how to print a sum at the bottom of a column. This technique can be easily extended to print a product, mean, standard deviation, etc.

In mPrint Designer, draw two Regions. In each region, create a Repeat Region: one for each column. In the left region Repeat Region, create a variable named ProductName. In the right region Repeat Region, create a variable named Price. Open the Properties of the Price variable, and choose Alignment: Right. Finally, in the PriceColumn Region but outside of the PriceList Repeat Region, create a variable named Total.



In mPrint Designer, choose Code > Generate > Director Lingo. You obtain the following script:

```
tMsRegisterMPrint("mp-xxxxxxxxxx")
tMsCreateReport(the pathname&"TwoCols.mpf")
tMsBeginRegion("MainRegion")
     tMsBeginRegion("ProductColumn")
          repeat with i=1 to "--loop count--"
          tMsBeginRegion("ProductList")
               tMsSetVariable("ProductName","--value--")
          tMsEndRegion()
          end Repeat
     tMsEndRegion()
     tMsBeginRegion("PriceColumn")
          tMsSetVariable("Total","--value--")
          repeat with j=1 to "--loop count--"
          tMsBeginRegion("PriceList")
               tMsSetVariable("Price","--value--")
          tMsEndRegion()
          end Repeat
     tMsEndRegion()
tMsEndRegion()
tMsPrintReport()
tMsFreeReport()
```

Change this script to obtain the following (changes are in bold):

```
set n = mGetSelection(gT)
set totalPrice = 0 -- local var to sum up product prices
tMsRegisterMPrint("mp-xxxxxxxxxx")
tMsCreateReport(the pathname&"TwoCols.mpf")
tMsBeginRegion("MainRegion")
     tMsBeginRegion("ProductColumn")
          repeat with i=1 to n
          tMsBeginRegion("ProductList")
               mGo(gT, i)
               tMsSetVariable("ProductName", mGetField(gT, "pName"))
          tMsEndRegion()
          end Repeat
     tMsEndRegion()
     tMsBeginRegion("PriceColumn")
          repeat with j=1 to n
          tMsBeginRegion("PriceList")
               tMsSetVariable("Price", mGetField(gT, "price"))
               set totalPrice = totalPrice + mGetField(gT, "price")
```

```
            tMsEndRegion()
            end Repeat
            **tMsSetVariable("Total", totalPrice)**
        tMsEndRegion()
    tMsEndRegion()
    tMsPrintReport()
    tMsFreeReport()
```

Note that the statement that prints "Total" was moved to *after* the repeat loop.

PrintOMatic and V12 Database Engine

First, initialize PrintOMatic as you normally would, and print the required titles, texts, tables, etc. A typical PrintOMatic initialization script is:

```
      global doc
      set doc = new(xtra "PrintOMatic")
      newPage doc -- add a new page
```

Then, if you want to print the content of a specific V12-DBE field at the current coordinates location of PrintOMatic, call V12-DBE's `mGetField` method followed by PrintOMatic's `append` method. Example:

```
    set x = mGetField(gT, "FirstName")
    append doc, x, FALSE
```

If you want to print an entire selection, call `mGetField` in a loop (`mGetSelection` cannot be of much help). Example:

```
    repeat with i = 1 to mSelectCount(gT)
       set prod = mGetField(gT, "FirstName")
       append doc, prod & RETURN, FALSE
    end repeat
```

If you want to compute a function (e.g., number of items, sum, average, product, mean, standard deviation, etc.), initialize a Lingo variable and keep updating it in your loop. Example: to compute the average price of all the products in a selection:

```
    set n = mSelectCount(gT)
    set total = 0
    repeat with i = 1 to n
       set prc = mGetField(gT, "price")
       append doc, prc & RETURN, FALSE
       set total = total + prc
    end repeat
    append doc, "Total=" & total & REUTRN, FALSE
    append doc, "Average=" & total/n & REUTRN, FALSE
```

To print multiple columns with PrintOMatic, you must first create frames in your document. For example, to print a list of products along with their corresponding prices (prices must obviously right-adjust), you would write a script similar to the following:

```
    on PrintProdAndPrice
      set doc = new(xtra "PrintOMatic")
      newPage doc -- add a new page

      -- products frame is 200 pixels wide, 600 pixels tall
      newFrame doc, Rect(0,0,200,600), FALSE
      repeat with i = 1 to mSelectCount(gT)
        mGo(gT, i)
        set prod = mGetField(gT, "prodName")
        append doc, prod & RETURN, FALSE
      end repeat

      -- prices frame is 50 pixels wide, 600 pixels tall
```

```
  newFrame doc, Rect(200,0,250,600), FALSE
  setTextJust doc, "right" -- right-align column
  repeat with i = 1 to to mSelectCount(gT)
    mGo(gT, i)
    set price = mGetField(gT, "prodName")
    append doc, price & RETURN, FALSE
  end repeat

  printPreview doc -- or, to print: print doc
  set doc=0
end PrintProdAndPrice
```

It is very convenient, with PrintOMatic, to first preview your page before printing it. To preview a page, call

```
printPreview doc
```

To print a document, call

```
print doc
```

Note	The reports printed by the above PrintOMatic sample scripts are not visually identical to the ones illustrated in the mPrint section. You need to add a few page layout and font styling scripts to match those illustrations.

Appendix 12: Optimization Using Indexes

Two methods in V12-DBE take advantage of database indexes: `mOrderBy` and `mSelect`.

`mSelect` chooses the index that delivers the fastest search time based on the database structure. It does an excellent job most of the time. However, it can be fooled in some extreme cases where the actual data in the database is not uniform. In such cases, you can optimize your queries to further improve searching time.

`mOrderBy` indifferently uses any one index defined for the field it sorts (if more than one such index is defined). There is no performance handicap in using one index or another. However, at any time, only one index can be used by V12-DBE. Thus, if you call `mOrderBy` and `mSelect` in a single query, V12-DBE uses the best index it can to build the selection, and then sorts the selection without relying on indexes[1].

`mSelect` chooses its best index based on the following algorithm. Assume that your query is :

```
    (Field1 = A)  AND (Field2 starts B)  AND (Field3 < C)
```

V12-DBE first checks if `Field1` is the first segment of an index (i.e., a simple index is defined for it, or it is the first field of a compound index). If such an index exists, it is automatically considered to be the best index for the query. Otherwise, V12-DBE checks if `Field2` is the first segment of an index. If so, that index is the best index for the query. Otherwise, V12-DBE attempts to apply the same logic to Field3. If none of `Field1`, `Field2` and `Field3` is indexed, or appears in the first segment of a compound index, the table's default index is used.

Note	This logic does not apply to OR operators. AND operators further refine a selection, whereas OR operators constantly add new data to them. This is also why queries with ORs are slower than those with ANDs.

The index chosen by `mSelect` determines the selection's default sorting. Thus, if `Field1` is not indexed and `Field2`'s index is chosen, the following script yields a selection sorted by `Field2`:

```
    mSetCriteria(gT, "Field1", "=", A)
    mSetCriteria(gT, "AND", "Field2", "starts", B)
    mSetCriteria(gT, "AND", "Field3", "<", C)
    mSelect(gT)
```

[1] Actually, V12-DBE *can* use two or more indexes for a single search. However, for the purpose of combined search and sort operations, using an index for sorting would require more CPU effort than actually sorting the selection with Quicksort. Quicksort is the most efficient sorting algorithm known to date.

Further assume that `Field2` contains a lot of duplicate values, the sub-sorting order of the duplicate records would be determined by the chosen index's second segment, or the order in which records are input if the chosen index is not compound.

As a result, you can control the sorting order of your selection without calling `mOrderBy`.

Example: consider the following address book table

```
    [TABLE]
    Addresses
    [FIELDS]
    LastName string
    FirstName string
    YearOfBirth integer
    [INDEXES]
    LastNameNdx duplicate LastName ascending
    FirstNameNdx duplicate FirstName ascending
```

The following query uses the index `LastNameNdx`. It delivers a selection sorted by `LastName` and then by order of input. Since all the last names in the selection would be identical ("Smith"), the selection's sorting order would be the order in which records were added to the database.

```
    mSetCriteria(gT, "LastName", "=", "Smith")
    mSelect(gT)
```

If you need to sort all the Smiths in your table by order of First Name, run the following script:

```
    mSetCriteria(gT, "LastName", "=", "Smith")
    mOrderBy(gT, "FirstName")
    mSelect(gT)
```

You can optimize this script by slightly modifying your database structure as follows:

```
    [TABLE]
    Addresses
    [FIELDS]
    LastName string
    FirstName string
    YearOfBirth integer
    [INDEXES]
    LastNameNdx duplicate LastName ascending FirstName ascending
    FirstNameNdx duplicate FirstName ascending
```

By adding `FirstName` to the `LastNameNdx` index, your initial script:

```
    mSetCriteria(gT, "LastName", "=", "Smith")
    mSelect(gT)
```

yields a selection sorted by `FirstName`.

You can further optimize your queries by imposing a specific index for your search, if more than one index fits the *best index* criteria.

Assume, for example, that your table contains two compound indexes: one for `LastName`/`FirstName` and one for `LastName`/`YearOfBirth`:

```
    [TABLE]
    Addresses
    [FIELDS]
    LastName string
    FirstName string
    YearOfBirth integer
    [INDEXES]
    LastFirstNdx duplicate LastName ascending FirstName ascending
    LastBirthNdx duplicate LastName ascending YearOfBirth ascending
    FirstNameNdx duplicate FirstName ascending
```

The query:

```
    mSetCriteria(gT, "LastName", "=", "Smith")
    mSelect(gT)
```

automatically chooses `LastFirstNdx` as its best index, thus delivering a selection sorted by `LastName` and then `FirstName`. If you need your selection sorted by `LastName` and then `YearOfBirth`, run the following script:

```
    mSetCriteria(gT, "LastName", "=", "Smith")
    mSetCriteria(gT, "AND", "YearOfBirth", ">", 0) -- bogus criterion
    mSelect(gT)
```

The criterion (`YearOfBirth > 0`) does not affect your selection in any way (since any data stored in this field is always greater than 0). However, its presence forces V12-DBE to use the `LastBirthNdx` index thus resulting in a selection sorted by `YearOfBirth`.

Appendix 13: Resolving Relations

A relational database stores data in two or more tables and establishes links between records[2].

For example, if you are tracking students scores, you would have two tables: one to identify students, and one to log tests results. Following is a typical relational database structure for student tracking:

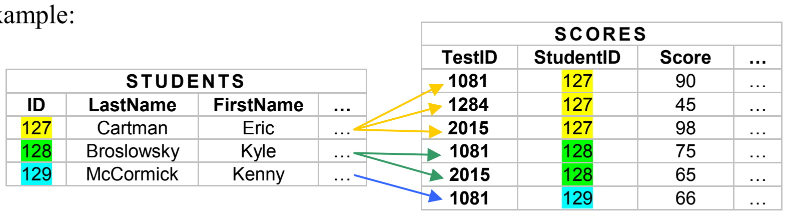
```
[TABLE]
Students

[FIELDS]
ID integer indexed
LastName string indexed
FirstName string
Email string
Faculty string

[TABLE]
Scores

[FIELDS]
StudentID integer indexed
TestID integer indexed
Score integer indexed
TimeSpent integer
```

Table `Students` and `Scores` are related to each other through their respective `ID` and `StudentID` fields. A shorthand notation to express this is:

$$Students :: ID \xrightarrow{1-N} Scores :: StudentID$$

`1-N` means that many records in the `Scores` table can be related to a single record in the `Students` table, and that to each record in the `Scores` table is related to exactly one record in the `Students` table. This is called a **One-To-Many** relation.

Example:



STUDENTS			
ID	**LastName**	**FirstName**	**…**
127	Cartman	Eric	…
128	Broslowsky	Kyle	…
129	McCormick	Kenny	…

SCORES			
TestID	**StudentID**	**Score**	**…**
1081	127	90	…
1284	127	45	…
2015	127	98	…
1081	128	75	…
2015	128	65	…
1081	129	66	…

If you look at the relation the other way around, that is starting from the `Scores` table, you get a `N-1`, or **Many-to-One** relation noted:

$$Scores :: StudentID \xrightarrow{N-1} Students :: ID$$

[2] In exceptional cases, relations can be established from a table's records onto records of the same table.

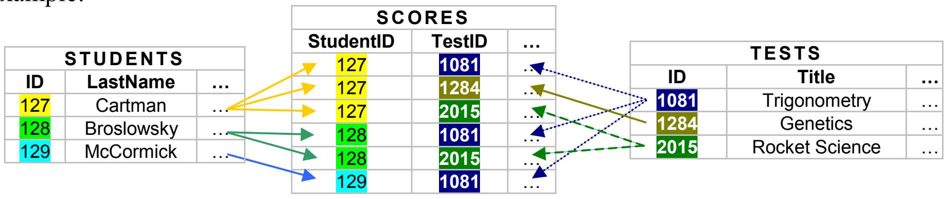
Assume that we add a `Tests` table to the database to store the description of each test.

```
[TABLE]
Tests

[FIELDS]
ID integer indexed
Title string indexed
Topic string indexed
Author string
CreationDate date
LastUpdateDate date
```

Field `TestID` of table `Scores` refers to field `ID` of table `Tests`. This is another Many-to-One relation:

$$Scores :: TestID \overset{N-1}{\longrightarrow} Tests :: ID$$

Example:



STUDENTS

ID	LastName	...
127	Cartman	...
128	Broslowsky	...
129	McCormick	...

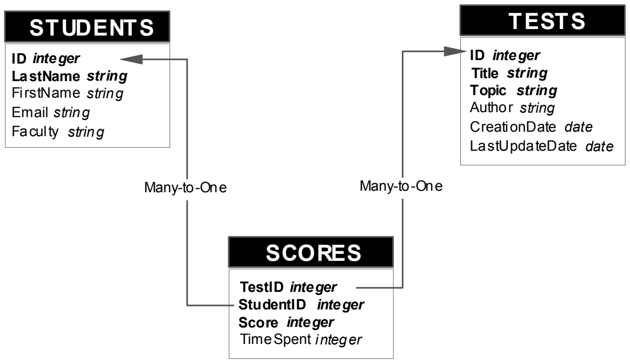
SCORES

StudentID	TestID	...
127	1081	...
127	1284	...
127	2015	...
128	1081	...
128	2015	...
129	1081	...

TESTS

ID	Title	...
1081	Trigonometry	...
1284	Genetics	...
2015	Rocket Science	...

The structure of the overall database now contains three tables and can be represented by the following **Entity-Relation Diagram**.



Tables `Students` and `Tests` are said to be in a **Many-to-Many** relation.

In this example, we were lucky enough to have a `Scores` tables that naturally links `Students` and `Tests`, but in many cases, creating a Many-to-Many relation is not obvious: you often need to create a fake table that only contains the IDs of both sides' entities. Such a table is called an Associative Table: It's sole purpose is to put other tables in relation with each other.

V12 Database Engine does not contain a language that automatically resolve relations between tables. Instead, it relies on Lingo to do so.

Resolving a One-to-Many Relation

In the above example, resolving a One-to-Many relation from the `Students` table is something like "given a Student's last name, select all the records in table `Scores` that a related to it". The following script performs this operation:

```
-- first locate record of student who's last name is LName
mSetCriteria(gTStudents, "LastName", "=", LName)
mSelect(gTStudents)
-- get student's ID
sID = mGetField(gTStudents, "ID")
-- look for score records where StudentID is sID
mSetCriteria(gTScores, "StudentID", "=", sID)
mOrderBy(gTScores, "Score") -- sorting is optional
mSelect(gTScores)
```

At the end of this script, `gTScores'`selection contains `LName's` scores sorted lowest to highest.

Example: if `LName` was assigned the string "Cartman" in the above example, after the execution of the above script, table `gTScores`' selection would contain:

SCORES			
TestID	**StudentID**	**Score**	**…**
1284	127	45	…
1081	127	90	…
2015	127	98	…

Resolving a Many-to-One Relation

Resolving a Many-to-One relation would be something like "given a score record, which student does it belong to?". The script that answers this question is:

```
-- first get sID of Score record
sID = mGetField(gTScores, "StudentID")
mSetCriteria(gTStudents, "ID", "=", sID)
mSelect(gTStudents)
```

At the end of this script, `gTStudents`' current record is the one `gTScores`'s current record is related to.

Example: if the current record in table `gTScores` was

1081	128	75	…

the corresponding record in table `gStudents` would be

128	Broslowsky	Kyle	…

Another more complex Many-to-One relation resolving question would be "list the last names of all the students who scored 75 or higher at test number 1081". It can be answered by the following script:

```
-- first locate all Scores records that match criteria
mSetCriteria(gTScores, "TestID", "=", 1081)
mSetCriteria(gTScores, "AND", "Score", ">=", 75)
mSelect(gTScores)
-- loop through all Student Ids and append them to member "result"
put EMPTY into field "result"
repeat with i = 1 to mSelectCount(gTScores)
   mGo(gTScores, i)
   sID = mGetField(gTScores, "StudentID")
```

```
    mSetCriteria(gTStudents, "ID", "=", sID)
    mSelect(gTStudents)
    put mGetField(gTStudents, "LastName")&RETURN after field "result"
end repeat
```

Example: if we run this script on the above example, we would get:

```
Cartman
Broslowsky
```

This script lists the last names of all the students that match the specified criteria in a Director member, in contrast to the previous script which leaves them in a V12-DBE selection. Although a V12-DBE selection can be easily dumped to a Director field, the opposite is not true.

Thus, if you need to further manage the list of last names created above, you must set the current record to the one that matches a specific last name's and then perform the required operation. This is sometimes called the *lazy approach*, whereby a piece of data is accessed only when it is needed (as opposed to processing data before it is actually needed, which may yield faster results, but at a higher pre-processing overhead). V12-DBE's high-speed data search and retrieval routines enable you to implement the lazy approach without handicap of performance.

Resolving a Many-to-Many Relation

Resolving Many-to-Many relations is much more complex than resolving other types of relations. Even powerful query languages such as SQL cannot perform this operation in a simple way.

A typical Many-to-Many relation resolving question in the above example would be "list the last names of all the students who took Mrs. Crabtree's tests". Assuming that table `Tests` possibly contains zero, one or more tests authored by Mrs. Crabtree, we would run the following script:

```
-- find all students who took one of Mrs.Crabtree's tests
-- first locate all Tests authored by Mrs Crabtree
mSetCriteria(gTests, "Author", "=", "Crabtree")
mSelect(gTests)
put EMPTY into field "result"
-- loop through each test created by Mrs.Crabtree
repeat with i = 1 to mSelectCount(gTests)
  mGo(gTests, i)
  set tID = mGetField(gTests, "ID")
  mSetCriteria(gTScores, "testID", "=", tID)
  mSelect(gTScores)
  -- loop through student IDs and retrieve name
  repeat with j = 1 to mSelectCount(gTScores)
    mGo(gTScores, j)
    mSetCriteria(gTstudents, "ID", "=", )
    mSelect(gTstudents)
      put mGetField(gTStudents, "LastName")&RETURN after ¬
            field "result"
   end repeat
end repeat
```

For example, assuming that Mrs. Crabtree is the author of both the Trigonometry and the Rocket Science courses, running this script on the above example would yield the following result:

```
Cartman
Broslowsky
```

```
McCormick
Broslowsky
```

A shortcoming of this script is it's inability to sort the results, or to remove duplicates from the results. A possible work around this limitation consists in creating an additional field named `Marker` in table `Students` and, instead of immediately listing all last names in field "result", setting the `Marker` field of found records to 1. At the end, just find all marked records in table `Students`. Of course, this requires the database to be on a writeable volume.

```
-- find all students who took one of Mrs.Crabtree's tests
-- and list their last names in alphabetic order, without duplicates
-- first locate all Tests authored by Mrs Crabtree
mSetCriteria(gTests, "Author", "=", "Crabtree")
mSelect(gTests)
put EMPTY into field "result"
-- loop through each test created by Mrs.Crabtree
repeat with i = 1 to mSelectCount(gTests)
  mGo(gTests, i)
  set tID = mGetField(gTests, "ID")
  mSetCriteria(gTScores, "testID", "=", tID)
  mSelect(gTScores)
  -- loop through student IDs and retrieve name
  repeat with j = 1 to mSelectCount(gTScores)
    mGo(gTScores, j)
    set sID = mGetField(gTScores, "StudentID")
    mSetCriteria(gTstudents, "ID", "=", )
    mSelect(gTstudents)
   -- mark the found record
    mEditRecord(gTstudents)
    mSetField(gTstudents, "Marker", 1)
    mUpdateRecord(gTstudents)
  end repeat
end repeat
-- once all records are marked, select them all
mSetCriteria(gTstudents, "Marker", "=", 1)
mOrderBy(gTstudents, "LastName")
mSelect(gTstudents)
put mGetField(gTstudents, "literal") into field "results"
-- DO NOT forget to restore Markers to 0 to prepare
-- for next search
```

In the above example, this modified script would yield the result:

```
Broslowsky
Cartman
McCormick
```

Appendix 14: Modifying a Database Structure

Once a V12 database is created, modifying its structure is not an easy task. Because V12-DBE files are optimized both for speed and file size, only a limited number of modifications are allowed to an existing database. For example, to add a field to an existing table, you must first create a new table, create all fields and indexes in it including your new field, import all your records to the new table and finally delete the old table.

The methods used to modify an existing V12 database are (see details in Methods References):

```
mEditDBStructure
mUpdateDBStructure
mCreateField
mCreateFullIndex
mCreateIndex
mCreateTable
mDeleteTable
mRenameField
```

Modifying an existing database's structure is a tedious task and can be easily worked around as follows:

1. Dump the structure of your initial database (see Viewing the Structure of a Database).

2. Modify the returned database descriptor.

3. Create a new V12 database based on the modified descriptor.

4. Import the content of each table to the new V12 database (see Importing from V12-DBE).

The above steps can be executed either through Lingo handlers, or using the V12-DBE Tool.

Appendix 15: Data Encryption

Though V12 Databases are password-protected and as such can not be readily opened by other V12-DBE users, they are not *encrypted*. This means that a hacker using the right tools (e.g., a hexadecimal editor) can open a V12 database and view its content. In more exceptional cases, s/he can modify data in it, although this is very hard to accomplish without corrupting the database.

This applies to V12-DBE as well as FileMaker Pro, MS Access and many other database management systems.

To protect you V12 database from illegal viewing and/or tampering, you can use simple techniques such as giving it a system file's name or making it invisible to the Mac Finder or Windows Explorer.

If you really need to encrypt your data, you can use a third party Xtras (see http://www.macromedia.com/software/xtras/director) or use your own Lingo encryption handler. In either case, you will *not* be able to index encrypted strings. Searching and sorting encrypted indexed strings would not work properly. Encrypted fields must rely on other non-encrypted fields for searching and sorting.

The following Lingo handlers enable the encryption and decryption of strings based on a variation of the One-Time Pad algorithm. One-Time Pad is very easy to program, however it is only moderately secure, especially if a hacker is entitled to generate large amounts of original/encrypted message pairs.

```
global gEncryptKey

on initCrypt
  -- change this encryption key to the string of your choice.
  -- The longer the string, the stronger your encryption algorithm.
  set gEncryptKey = "thisisthesecretkey."
end initCrypt

on encrypt str
  set res = ""
  -- avoid redundant calls: compute lengths in advance
  set keyLength = length (gEncryptKey)
  set strLength = length (str)
  repeat with i = 1 to strLength
    set keyIdx = i mod keyLength
    set tmp = numToChar ((charToNum (char i of str) + charToNum ¬
             (char keyIdx of gEncryptKey)) mod 256)
    -- check if resulting string contains 0.
    -- if so, Director would trucate the string.
    if (tmp = numToChar (0)) then
      -- the escape code for a 00 char is 0102
      set tmp = numToChar (1) & numToChar (2)
    -- encode 01 as well to differentiate from encoded "0"s
    else if (tmp = numToChar (1)) then
      set tmp = tmp & tmp -- the escape code for a 01 char is 0101
    end if

    set res = res & tmp
  end repeat
  return res
end encrypt
```

```
on decrypt str
  set res = ""
  -- first clean up escape codes
  set str = cleanEscape (str)
  set keyLength = length (gEncryptKey)
  set strLength = length (str)
  repeat with i = 1 to strLength
    set keyIdx = i mod keyLength
    set res = res & numToChar ((charToNum (char i of str) - ¬
              charToNum (char keyIdx of gEncryptKey) + 256) mod 256)
  end repeat
  return res
end decrypt

on cleanEscape str
  -- just replace every instance of 0101 by 01, and 0102 by 00
  set res = ""
  set strLength = length (str)
  repeat with i = 1 to strLength
    if (charToNum (char i of str) = 1) then
      if (charToNum (char i + 1 of str) = 2) then
        set res  = res & numToChar (0)
      else if (charToNum (char i + 1 of str) = 1) then
        set res = res & numToChar (1)
      end if
      set i = i + 1
    else
      set res = res & char i of str
    end if
  end repeat
  return res
end cleanEscape
```

To use the above handlers, first assign the encryption key of your choice to the global variable `gEncryptKey`. Then, at startup, call `initCrypt` (e.g., `on StartMovie`). To store an encrypted string to a V12 table, call:

```
mSetField(gT, "Account", encrypt(secretData) )
```

To retrieve an encrypted string from a V12 table, call:

```
set x = decrypt (mGetField(gT, "Account", encrypt(secretData) )
```

You can further enhance the strength of your encryption by creating an additional field in your table for the encryption key — as opposed to using the same global `gEncryptKey` for all fields and records. Thus, each record would be encrypted with a different key, making it harder to hackers to crack your algorithm.

If you want to encrypt dates, floats or integers, convert them to strings first.

Appendix 16: String and Custom String Types

V12-DBE enables you to develop applications containing different types of strings such as English, German, Swedish and Spanish. Basically, each V12-DBE table can contain any combination of those string types.

String comparisons depend on how special characters are defined in their corresponding languages. For example, the letters **a** and **ä** may be considered identical in some languages but different in others. This behavior is determined by the *sorting and searching rules* attached to each type of string.

V12-DBE's default and custom String types' sorting and searching rules are defined by the following tables where equivalent characters are listed on the same line separated by one or more spaces and strict precedence is indicated by characters on successive lines. For example:

```
j J
k K
l L
```

means that:

- `K` sorts after `J` and before `L`,
- `j` and `J` are equivalent (likewise, `k` and `K` are equivalent, and `l` and `L` are equivalent too)

Characters omitted from a sorting and searching rules table are considered to sort *after* those listed in the table, except for Control characters (such as Carriage Return, Horizontal Tab, Vertical Tab, etc.) which are considered to sort *before* those listed in the table.

The default string

The default `string` type has predefined rules that accommodate a large number of languages (English, French, German, Italian, Dutch, Portuguese, Norwegian, etc.).

(If the tables below are not properly formatted in the HTML version of this manual, please refer to the PDF version)

Its sorting and searching rules table is:

1.	' ‘ ’	39.	1
2.	" « » “ ”	40.	2
3.	! ¡	41.	3
4.	? ¿	42.	4
5.	.	43.	5
6.	,	44.	6
7.	:	45.	7
8.	;	46.	8
9.	…	47.	9
10.	#	48.	a à á â ã ä A À Á Â Ã Ä
11.	$	49.	b B

12. ¢
13. £
14. ¥
15. % ‰
16. °
17. |
18. † ‡
19. [ ]
20. { }
21. ( )
22. < >
23. *
24. +
25. -
26. /
27. \
28. =
29. ~
30. ¬ - – —
31. §
32. µ
33. &
34. @
35. ©
36. ƒ
37. ®
38. 0

50. c ç C Ç
51. d D
52. e è é ê ë E È É Ê Ë
53. f F
54. g G
55. h H
56. i ì í î ï I Ì Í Î Ï
57. j J
58. k K
59. l L
60. m M
61. n ñ N Ñ
62. o ò ó ô õ ö œ O Ò Ó Ô Õ Ö Œ
63. p P
64. q Q
65. r R
66. s ß S
67. t T
68. u ù ú û ü U Ù Ú Û Ü
69. v V
70. w W
71. x X
72. y ÿ Y Ÿ
73. z Z
74. æ Æ
75. ø Ø
76. å Å

Predefined Custom String Types

Along with the standard `string` type, V12-DBE contains a number of predefined custom string types. They include `Swedish, Spanish` and `Hebrew`.

Searching and Sorting rules for Strings of Type *Swedish*

(If the tables below are not properly formatted in the HTML version of this manual, please refer to the PDF version)

1.	' ‘ ’	77.	2
2.	" « » “ ”	78.	3
3.	! ¡	79.	4
4.	? ¿	80.	5
5.	.	81.	6
6.	,	82.	7
7.	:	83.	8
8.	;	40.	9
9.	…	41.	a à á â ã A À Á Â Ã
10.	#	42.	b B
11.	$	43.	c ç C Ç
12.	¢	44.	d D
13.	£	45.	e è é ê ë E È É Ê Ë
14.	¥	46.	f F
15.	% ‰	47.	g G
16.	°	48.	h H
17.	|	49.	i ì í î ï I Ì Í Î Ï
18.	† ‡	50.	j J
19.	[ ]	51.	k K
20.	{ }	52.	l L
21.	( )	53.	m M
22.	< >	54.	n ñ N Ñ
23.	*	55.	o ò ó ô õ œ O Ò Ó Ô Õ Œ
24.	+	56.	p P
25.	-	57.	q Q
26.	/	58.	r R
27.	\	59.	s ß S
28.	=	60.	t T
29.	~	61.	u ù ú û ü U Ù Ú Û Ü
30.	¬ - – —	62.	v V
31.	§	63.	w W
32.	µ	64.	x X
33.	&	65.	y ÿ Y Ÿ
34.	@	66.	z Z
35.	©	67.	æ Æ
36.	ƒ	68.	ø Ø
37.	®	69.	å Å
38.	0	70.	ä Ä
39.	1	71.	ö Ö

Searching and Sorting rules for Strings of Type *Spanish*

(If the tables below are not properly formatted in the HTML version of this manual, please refer to the PDF version)

1. ' ‘ ’
2. " « » “ ”
3. ! ¡
4. ? ¿
5. .
6. ,
7. :
8. ;
9. …
10. #
11. $
12. ¢
13. £
14. ¥
15. % ‰
16. °
17. |
18. † ‡
19. [ ]
20. { }
21. ( )
22. < >
23. *
24. +
25. -
26. /
27. \
28. =
29. ~
30. ¬ - – —
31. §
32. µ
33. &
34. @
35. ©
36. ƒ
37. ®
38. 0
39. 1
40. 2
41. 3
42. 4
43. 5
44. 6
45. 7
46. 8
47. 9
48. a à á â ã ä A À Á Â Ã Ä
49. b B
50. c ç C Ç
51. d D
52. e è é ê ë E È É Ê Ë
53. f F
54. g G
55. h H
56. i ì í î ï I Ì Í Î Ï
57. j J
58. k K
59. l L
60. m M
61. n N
62. ñ Ñ
63. o ò ó ô õ ö œ O Ò Ó Ô Õ Ö Œ
64. p P
65. q Q
66. r R
67. s ß S
68. t T
69. u ù ú û ü U Ù Ú Û Ü
70. v V
71. w W
72. x X
73. y ÿ Y Ÿ
74. z Z
75. æ Æ
76. ø Ø
77. å Å

Searching and Sorting rules for Strings of Type *Hebrew*

(If the tables below are not properly formatted in the HTML version of this manual, please refer to the PDF version)

`(requires a hebrew font such as "Web Hebrew")`

1.	' ’ ‘		50.	í î	(mem)
2.	" « » ” “		51.	ï ð	(nun)
3.	! ¡		52.	ñ	(samech)
4.	? ¿		53.	ò	(ain)
5.	.		54.	ó ô	(phe)
6.	,		55.	õ ö	(sadi)
7.	:		56.	÷	(koph)
8.	;		57.	ø	(resch)
9.	…		58.	ù	(sin)
10.	#		59.	ú	(tau)
11.	$		60.	0	
12.	¢		61.	1	
13.	£		62.	2	
14.	¥		63.	3	
15.	% ‰		64.	4	
16.	°		65.	5	
17.	|		66.	6	
18.	† ‡		67.	7	
19.	[ ]		68.	8	
20.	{ }		69.	9	
21.	( )		70.	a A À Á Â Ã Ä	
22.	< >		71.	b B	
23.	*		72.	c C Ç	
24.	+		73.	d D	
25.	-		74.	e E È É Ê Ë	
26.	/		75.	f F	
27.	\		76.	g G	
28.	=		77.	h H	
29.	~		78.	i I Ì Í Î Ï	
30.	- – ¬		79.	j J	
31.	§		80.	k K	
32.	µ		81.	l L	
33.	&		82.	m M	
34.	@		83.	n N Ñ	
35.	©		84.	o O Ò Ó Ô Õ Ö	
36.	ƒ		85.	p P	
37.	®		86.	q Q	
38.	à	(aleph)	87.	r R	
39.	á	(beth)	88.	s ß S	
40.	â	(ghimel)	89.	t T	
41.	ã	(daleth)	90.	u û ü U Ù Ú Û Ü	
42.	ä	(he)	91.	v V	
43.	å	(vau)	92.	w W	
44.	æ	(zain)	93.	x X	
45.	ç	(heth)	94.	y ÿ Y Ÿ	
46.	è	(teth)	95.	z Z	
47.	é	(iod)	96.	Æ	
48.	ê ë	(caph)	97.	Ø	
49.	ì	(lamed)	98.	Å	

User-definable Custom String Types

In addition to V12-DBE's predefined string types, you can define your own string types with `mSetProperty`. Up to 32 custom types can be defined, including the ones already predefined in V12-DBE.

To define your own sorting and searching rules, build a table similar to the ones listed above in a Director member of type Field. Equivalent characters are listed on a single line, whereas precedence is indicated by successive lines.

Then, call `mSetProperty` with the keyword "String." (note the period after String) followed by the name of the custom string type.

For example, if your sorting and searching rules are defined in a Director field named "Klingon-Sort-Order" and if the new custom string type is "Klingon", the following statement defines the new custom type:

```
    mSetProperty(gDB, "String.Klingon", field "Klingon-Sort-Order")
```

From then on, the type `String.Klingon` can be used in `mCreateField` and `mReadDBstructure` to define new fields.

Appendix 17: Chatacter sets

Windows-ANSI Character Set

(If the tables below are not properly formatted in the HTML version of this manual, please refer to the PDF version)

32		70	F	108	l	146	’	184	¸	222	Þ
33	!	71	G	109	m	147	“	185	¹	223	ß
34	"	72	H	110	n	148	”	186	º	224	à
35	#	73	I	111	o	149	•	187	»	225	á
36	$	74	J	112	p	150	–	188	¼	226	â
37	%	75	K	113	q	151	—	189	½	227	ã
38	&	76	L	114	r	152	˜	190	¾	228	ä
39	'	77	M	115	s	153	™	191	¿	229	å
40	(	78	N	116	t	154	š	192	À	230	æ
41	)	79	O	117	u	155	›	193	Á	231	ç
42	*	80	P	118	v	156	œ	194	Â	232	è
43	+	81	Q	119	w	157	□	195	Ã	233	é
44	,	82	R	120	x	158	□	196	Ä	234	ê
45	-	83	S	121	y	159	Ÿ	197	Å	235	ë
46	.	84	T	122	z	160		198	Æ	236	ì
47	/	85	U	123	{	161	¡	199	Ç	237	í
48	0	86	V	124	|	162	¢	200	È	238	î
49	1	87	W	125	}	163	£	201	É	239	ï
50	2	88	X	126	~	164	¤	202	Ê	240	ð
51	3	89	Y	127	□	165	¥	203	Ë	241	ñ
52	4	90	Z	128	□	166	¦	204	Ì	242	ò
53	5	91	[	129	□	167	§	205	Í	243	ó
54	6	92	\	130	‚	168	¨	206	Î	244	ô
55	7	93	]	131	ƒ	169	©	207	Ï	245	õ
56	8	94	^	132	„	170	ª	208	Ð	246	ö
57	9	95	_	133	…	171	«	209	Ñ	247	÷
58	:	96	`	134	†	172	¬	210	Ò	248	ø
59	;	97	a	135	‡	173	-	211	Ó	249	ù
60	<	98	b	136	ˆ	174	®	212	Ô	250	ú
61	=	99	c	137	‰	175	¯	213	Õ	251	û
62	>	100	d	138	Š	176	°	214	Ö	252	ü
63	?	101	e	139	‹	177	±	215	×	253	ý
64	@	102	f	140	Œ	178	²	216	Ø	254	þ
65	A	103	g	141	□	179	³	217	Ù	255	ÿ
66	B	104	h	142	□	180	´	218	Ú		
67	C	105	i	143	□	181	µ	219	Û		
68	D	106	j	144	□	182	¶	220	Ü		
69	E	107	k	145	‘	183	·	221	Ý		

Mac-Standard Character Set

(If the tables below are not properly formatted in the HTML version of this manual, please refer to the PDF version)

32		70	F	108	l	146	í	184	Þ	222	□
33	!	71	G	109	m	147	ì	185	þ	223	□
34	"	72	H	110	n	148	î	186	Š	224	‡
35	#	73	I	111	o	149	ï	187	ª	225	·
36	$	74	J	112	p	150	ñ	188	º	226	‚
37	%	75	K	113	q	151	ó	189	ý	227	„
38	&	76	L	114	r	152	ò	190	æ	228	‰
39	'	77	M	115	s	153	ô	191	ø	229	Â
40	(	78	N	116	t	154	ö	192	¿	230	Ê
41	)	79	O	117	u	155	õ	193	¡	231	Á
42	*	80	P	118	v	156	ú	194	¬	232	Ë
43	+	81	Q	119	w	157	ù	195	¯	233	È
44	,	82	R	120	x	158	û	196	ƒ	234	Í
45	-	83	S	121	y	159	ü	197	¼	235	Î
46	.	84	T	122	z	160	†	198	Đ	236	Ï
47	/	85	U	123	{	161	°	199	«	237	Ì
48	0	86	V	124	|	162	¢	200	»	238	Ó
49	1	87	W	125	}	163	£	201	…	239	Ô
50	2	88	X	126	~	164	§	202		240	□
51	3	89	Y	127	□	165	•	203	À	241	Ò
52	4	90	Z	128	Ä	166	¶	204	Ã	242	Ú
53	5	91	[	129	Å	167	ß	205	Õ	243	Û
54	6	92	\	130	Ç	168	®	206	Œ	244	Ù
55	7	93	]	131	É	169	©	207	œ	245	¦
56	8	94	^	132	Ñ	170	™	208	-	246	ˆ
57	9	95	_	133	Ö	171	´	209	—	247	˜
58	:	96	`	134	Ü	172	¨	210	“	248	–
59	;	97	a	135	á	173	□	211	”	249	š
60	<	98	b	136	à	174	Æ	212	‘	250	²
61	=	99	c	137	â	175	Ø	213	’	251	¾
62	>	100	d	138	ä	176	□	214	÷	252	¸
63	?	101	e	139	ã	177	±	215	×	253	½
64	@	102	f	140	å	178	□	216	ÿ	254	³
65	A	103	g	141	ç	179	□	217	Ÿ	255	¹
66	B	104	h	142	é	180	¥	218	□		
67	C	105	i	143	è	181	µ	219	¤		
68	D	106	j	144	ê	182	ð	220	‹		
69	E	107	k	145	ë	183	Ý	221	›		

MS-DOS Character Set

(If the tables below are not properly formatted in the HTML version of this manual, please refer to the PDF version)

32		70	F	108	l	146	Æ	184	©	222	Ì
33	!	71	G	109	m	147	ô	185	¦	223	_
34	"	72	H	110	n	148	ö	186	¦	224	Ó
35	#	73	I	111	o	149	ò	187	+	225	ß
36	$	74	J	112	p	150	û	188	+	226	Ô
37	%	75	K	113	q	151	ù	189	¢	227	Ò
38	&	76	L	114	r	152	ÿ	190	¥	228	õ
39	'	77	M	115	s	153	Ö	191	+	229	Õ
40	(	78	N	116	t	154	Ü	192	+	230	µ
41	)	79	O	117	u	155	ø	193	-	231	þ
42	*	80	P	118	v	156	£	194	-	232	Þ
43	+	81	Q	119	w	157	Ø	195	+	233	Ú
44	,	82	R	120	x	158	×	196	-	234	Û
45	-	83	S	121	y	159	ƒ	197	+	235	Ù
46	.	84	T	122	z	160	á	198	ã	236	ý
47	/	85	U	123	{	161	í	199	Ã	237	Ý
48	0	86	V	124	|	162	ó	200	+	238	¯
49	1	87	W	125	}	163	ú	201	+	239	´
50	2	88	X	126	~	164	ñ	202	-	240	-
51	3	89	Y	127	□	165	Ñ	203	-	241	±
52	4	90	Z	128	Ç	166	ª	204	¦	242	_
53	5	91	[	129	ü	167	º	205	-	243	¾
54	6	92	\	130	é	168	¿	206	+	244	¶
55	7	93	]	131	â	169	®	207	¤	245	§
56	8	94	^	132	ä	170	¬	208	ð	246	÷
57	9	95	_	133	à	171	½	209	Ð	247	¸
58	:	96	`	134	å	172	¼	210	Ê	248	°
59	;	97	a	135	ç	173	¡	211	Ë	249	¨
60	<	98	b	136	ê	174	«	212	È	250	·
61	=	99	c	137	ë	175	»	213	i	251	¹
62	>	100	d	138	è	176	_	214	Í	252	³
63	?	101	e	139	ï	177	_	215	Î	253	²
64	@	102	f	140	î	178	_	216	Ï	254	_
65	A	103	g	141	ì	179	¦	217	+	255	
66	B	104	h	142	Ä	180	¦	218	+		
67	C	105	i	143	Å	181	Á	219	_		
68	D	106	j	144	É	182	Â	220	_		
69	E	107	k	145	æ	183	À	221	¦		

Appendix 18: V12-DBE methods (by category)

Appendix 18 IS NOT UPDATED FOR VERSION YET

Note: Database structuring methods require a V12-DBE license to be present.

Initialization

new (V12dbe)
new (V12Table)

Retrieving Data

mGetField (V12Table)
mGetMedia (V12Table)
mGetSelection (V12Table)
mGetUnique (V12Table)
mDataFormat (V12Table)

Modifying Data

mAddRecord (V12Table)
mDeleteRecord (V12Table)
mEditRecord (V12Table)
mSelDelete (V12Table)
mSetField (V12Table)
mSetMedia (V12Table)
mUpdateRecord (V12Table)

Browsing through Data

mFind (V12Table)
mGetPosition (V12Table)
mSelectCount (V12Table)
mGo (V12Table)
mGoFirst (V12Table)
mGoLast (V12Table)
mGoNext (V12Table)
mGoPrevious (V12Table)

Searching and Sorting

mOrderBy (V12Table)
mSelect (V12Table)
mSelectAll (V12Table)
mSetCriteria (V12Table)
mSetIndex (V12Table)

Importing Data

mImport (V12Table)
mImportFile (V12Table)

Error Management

V12Error (Global)
V12status (Global)

Database Structures

mReadDBStructure (V12dbe)
mBuild (V12dbe)
mDumpStructure (V12dbe)

Database Utilities

mGetProperty (V12dbe)
mSetProperty (V12dbe)
mSetPassword (V12dbe)

Special Methods

mCustom (V12dbe)
mCustom (V12Table)

Appendix 19: V12-DBE methods (alphabetical)

NOTE: Appendix 19 IS NOT UPDATED FOR VERSION 3 YET

mAddRecord (V12Table)

Syntax

```
mAddRecord(gTable)
```

Parameters

(none)

Description

Adds a new record to the table and sets it as the current record. Calls to mAddRecord are generally followed by calls to mSetField and must end with a call to mUpdateRecord.

Example

```
-- add a record to gTable, put data in fields "name" and "price" and updates the
record:
mAddRecord(gTable)
mSetField(gTable, "field1_string", "funnel")
mSetField(gTable, "field2_float", 2.95)
mUpdateRecord(gTable)
```

See Also

`mEditRecord, mSetField, mUpdateRecord`

mBuild (V12dbe)

Syntax

```
mBuild (gDB)
```

Parameters

(none)

Description

Create the database structure defined by mReadDBstructure and writes it to a disk file. After successfully calling mBuild, the database remains open in ReadWrite mode. Data can be immediately imported to it.

Example

```
-- Reads the database definition contained in a text file:
set gDB = New(Xtra "V12dbe", "myBase", "Create", "very secret password")
mReadDBStructure(gDB, the pathname & "DatabaseDef.txt")
set mBuild(gDB)
```

See Also

`new, mReadDBstructure.`

mCustom (V12dbe)

Syntax

```
mCustom(gDB)
```

Parameters

(none)

Description

Undocumented generic method for project-specific implementations.
Contact Integration New Media, Inc. for specific implementations.

mCustom   (V12Table)

Syntax

```
mCustom(gTable)
```

Parameters

(none)

Description

Undocumented generic method for project-specific implementations.
Contact Integration New Media, Inc.for specific implementations.

mDataFormat (V12Table)

Syntax

```
mDataFormat(gTable, fieldName, format)
```

Parameters

fielName = name of field to which format must be applied.
format = format applied to the content of fieldName.

Description

Associate a formatting pattern to the data retrieved from fieldName. Data formats can be applied to fields of type Float, Integer and Date. If the retrieved data is longer then the formatting pattern, V12 returns the corresponding number of "#": 56.78 would be returned as "#.##" if the format was set to "9.99".

Example

```
mDataFormat(gTable,"date","dd/mm/yy")
-- characters can be added before the data such as:
-- 56.78 is formated to "00056.78":
mDataFormat(gTable, "price", "99999.99")
-- 56.78 is formated to "56.78$":
mDataFormat(gTable, "price", "99.99$")
-- 56.78 is formated to " 56.87":
mDataFormat(gTable, "price", "###.99")
```

See Also

`mGetField, mGetSelection`

---

mDeleteRecord (V12Table)

Syntax

```
mDeleteRecord(gTable)
```

Parameters

(none)

Description

Delete the current record. After calling mDeleteRecord, the record following the current record becomes the new current record. If no record follows the deleted record, the preceding record becomes the new current record. If no record precedes the deleted record, the current record is not defined.

Example

```
mDeleteRecord(gTable)
```

See Also

`mAddRecord, mEditRecord`

---

mDumpStructure (V12dbe)

Syntax

```
mDumpStructure(gDB)
```

Parameters

(none)

Description

Retrieve information on a database structure. Very convenient for debugging.

Example

```
put mDumpStructure(gDB)
put mDumpStructure(gDB) into field "dummy"
```

---

mEditRecord (V12Table)

Syntax

```
mEditRecord(gTable)
```

Parameters

(none)

Description
Enable the modification of the current record. A normal record modification sequence consists of a call to mEditRecord, a sequence of calls to mSetField and a call to mUpdateRecord.

Example
```
mEditRecord(gTable)
mSetField(gTable, "name", "funnel")
mSetField(gTable, "price", 2.95)
mUpdateRecord(gTable)
```

See Also
`mAddRecord, mSetField, mUpdateRecord`

mFind (V12Table)
```
-- alternative to mGo
```

mGetField (V12Table)

Syntax
```
mGetField(gTable, fieldName [, dataFormat])
```

Parameters
fieldName = name of the field to read.
dataFormat = patten for Integer, Float and Date formatting.

Description
Retrieve the content of field FieldName for the current record. If dataFormat is specified, the retrieved data is formatted accordingly. Otherwise, if a formatting pattern is assigned to FieldName with mDataFormat, that format is taken into account. mGetField's dataFormat parameter overrides mDataFormat's setting.

Example
```
set name = mGetField(gTable, "theName")
set date = mGetField(gTable, "theDate", "YY-MM-DD")
```

See Also
`mDataFormat, mGetSelection, mGetMedia, mSetField`

mGetMedia (V12Table)

Syntax
```
mGetMedia(gTable, fieldName, Member)
```

Parameters
fieldName = name of the field from which media is retrieved.
member = cast member in which media is stored.

Description
Replace the content of cast member Member with the media contained in the fieldName field of the current record.

Example
```
-- get the media from field "photo" and
-- store in the cast named "thePhotoCast" in castlib 1:
mGetMedia(gTable, "photo", Member "thePhotoCast")
-- or:
mGetMedia(gTable, "photo", member "thePhotoCast" of castlib 1)
```

See Also
`mDataFormat, mGetSelection, mGetField, mSetMedia`

---

mGetPosition (V12Table)

Syntax
`mGetPosition(gTable)`

Parameters
(none)

Description
Return the position of the current record in the selection.

Example
```
put mGetPosition(gTable)
```

See Also
`mGo, mGoPrevious, mGoNext, mGoFirst, mGoLast, mSelectCount`

---

mGetPropertyNames
```
-- introduced with V12 3.0. Return names of properties.
```

---

mGetProperty (V12dbe)

Syntax
`mGetProperty(gDB, Prop)`

Parameters
Prop = "virtualCR" | "characterSet" | "resources" | "currentDate" | "weekDays" | "shortWeekDays" | "months" | "shortMonths".

Description
Retrieve the value of the property Prop.

Example
```
put mGetProperty(gDB, "characterSet")
-- return: "Windows-ANSI"
```

```
put mGetProperty(gDB, "months")
-- return: "January February March April May June July
-- August September October November"
```

See Also

```
mSetProperty
```

mGetSelection (V12Table)

Syntax

```
mGetSelection(gTable, [outputType [, From [, #recs [, FieldDelimiter] [,
RecordDelimiter] [, FieldNames ]* ]]]]])
```

Parameters

outputType = “LITERAL” | “LIST” | “PROPERTYLIST”
From = number of first record to retrieve (default = position of current record)
#recs = number of records to retrieve (default value is Size of selection - From +1)
FieldDelimiter = delimiter between fieldsn (default = Tab, for “LITERAL” only)
RecordDelimiter = delimiter between record (default = Return, for “LITERAL” only))
FieldNames = any number of field names

Description

Retrieve one or more fields in one or more records of the selection. Optionally, you can specify custom field and record delimiters (with the “Literal” option only. Delimiters are not supported by the “List” and “PropertyList” options). If fieldNames are omitted, all fields are returned. Otherwise, only the specified field are returned. “LITERAL” returns a string. “LIST” returns a Lingo list. “PROPERTYLIST” returns a Lingo property list.

Example

```
set x = mGetSelection(gTable)
set x = mGetSelection(gTable, "LITERAL", mGetPosition(gTable), 1)
set x = mGetSelection(gTable, "LITERAL", 1, mSelectCount(gTable), TAB, RETURN,
"number", "name", "price")
```

Notes

Use mError to discover whether mGetField has succeeded, mGetField is the only method that follows this rule.

See Also

```
mGetField, mSetField, mDataFormat
```

mGetUnique (V12Table)

```
-- similar to mGetSelection. Operates on Master Field only. Returns unique
values.
```

mGo (V12Table)

Syntax

```
mGo(gTable, toPosition)
```

Parameters
toPosition = index of a record in the selection.

Description
Set the current record to the toPosition nth record of the selection.

Example
```
-- set the current record to the 45th of the selection.
mGo(gTable, 45)
```

See Also
`mGoFirst, mGoLast, mGoNext, mGoPrevious and mGetPosition`

---

mGoFirst (V12Table)

Syntax
```
mGoFirst(gTable)
```

Parameters
(none)

Description
Set the current record to the first record of the selection.

Example
```
mGoFirst(gTable)
```

See Also
`mGoLast, mGoPrevious, mGoNext, mGo and mGetPosition`

---

mGoLast (V12Table)

Syntax
```
mGoLast(gTable)
```

Parameters
(none)

Description
Set the current record to the last record of the selection.

Example
```
mGoLast(gTable)
```

See Also
`mGoFirst, mGoPrevious, mGoNext, mGo and mGetPosition`

mGoNext (V12Table)

Syntax

`mGoNext(gTable)`

Parameters

(none)

Description

Set the current record to the record following the actual current record in the selection.

Example

`mGoNext(gTable)`

See Also

`mGoFirst, mGoLast, mGoPrevious, mGo and mGetPosition`

mGoPrevious (V12Table)

Syntax

`mGoPrevious(gTable)`

Parameters

(none)

Description

Set the current record to the record preceding the actual current record in the selection.

Example

`mGoPrevious(gTable)`

See Also

`mGoFirst, mGoLast, mGoNext, mGo and mGetPosition`

mImport (V12Table)

`-- New method: import from Text, DBF, ODBC drivers`

mImportFile (V12Table)

Syntax

`mImportFile(gTable, inputType, inputData [, fieldDelimiter [, recordDelimiter]])`

Parameters

inputType = type of the file to import: “LITERAL” | “TEXT” | “V12” | “DBF”.
inputData = pathname of file to import.
fieldDelimiter and recordDelimiter = single-character delimiters.

password = the password (for V12 files importing).
tableName = an identifier (for V12 files importing).

Description
Import the data from the specified source. Syntax varies according to inputType. See manual.

Example
```
-- import from within Director:
mImportFile(gTable, "LITERAL", field "data")
-- Default delemiters: TAB and RETURN:
mImportFile(gTable, "LITERAL", field "data", TAB, RETURN)
-- import from a TEXT file:
mImportFile(gTable, "TEXT", "data.txt", TAB, RETURN)
-- import from a V12 database file
-- you need to specify the password, put "" if there is
-- none, and specify from which table the data is taken
-- from:
mImportFile(gTable, "V12", the pathname & "data.v12", "password", "table")
-- import from a DBF database file:
mImportFile(gTable, "DBF", the pathname & "data.DBF")
```

Notes
During the importation of data from a V12 database, if two fields bear the same name but are of different types, try type casting.
The index of the files from which you are importing the data are not taken into consideration. Only the indexes of the host files are brought up-to-date.

See Also
`mEditRecord, mUpdateRecord`

mOrderBy (V12Table)

Syntax
```
mOrderBy(gTable, fieldName [, SortOrder])
```

Parameters
fieldName = name of field to use as the sorting key.
SortOrder = “ascending” | “descending”, Default = “ascending”

Description
Sort the selection according to field fieldName.This method is normally called just before the mSelect method is used.
NOTE: when mOrderBy is used before mSelectAll, fieldName must be indexed.

Example
```
mOrderBy(gTable, "lastName") -- ascending by default.
mSelect(gTable)

mOrderBy(gTable, "lastName", "ascending")
mSelect(gTable)

mOrderBy(gTable, "lastName", "descending")
mSelect(gTable)
```

See Also

```
mSelectAll, mSelect, mSetIndex
```

mReadDBStructure (V12dbe)

Syntax

```
mReadDBStructure(gDB, inputType, inputData,[password])
-- accepts importing from ODBC drivers
```

Parameters

inputType = "LITERAL" | "TEXT" | "V12" | "DBF"
inputData = database descriptor expression (if inputType = "LITERAL") or pathname of template file (otherwise)
password is releavnt only if inputType = "V12".

Description

Create a new database or modify an existing one. mReadDBstructure can read a definition from a string, field or variable (LITERAL), from a text file (TEXT), from another V12 database file or from a DBF file (DBF).
The size of the database descriptor is limited to 32K.

Example

```
-- read a definition from a Director field member:
mReadDBStructure(gDB,"LITERAL",field "definition")
-- read a definition from a TEXT file:
mReadDBStructure(gDB,"TEXT", the pathname & "definition.txt")
-- read a definition from a V12 database file:
mReadDBStructure(gDB,"V12", the pathname & "definition.v12", "top secret")
-- read a definition from a DBF database file:
mReadDBStructure(gDB,"DBF", the pathname & "definition.dbf")
```

See Also

```
new, mBuild
```

mSelDelete (V12Table)

Syntax

```
mSelDelete(gTable)
```

Parameters

(none)

Description

Delete all the records of a selection. At the end of the operation, the selection is empty.

Example

```
-- the following will delete the current selection:
mSelDelete(gTable)
```

See Also

```
mDeleteRecord
```

mSelect (V12Table)

Syntax

```
mSelect(gTable)
-- accepts partial selections
```

Parameters

(none)

Description

Trigger the selection process. This is required after calls to mSetIndex, mSetCriteria and/or mOrderBy. If no record satisfies the search criteria, mSelect returns an empty selection and sets the current record to an undefined value.

Example

```
-- select all records of the table and sort them by order of catalog number:
mSetIndex(gTable, "CatNumberNdx")
mSelect(gTable)
 -- select all items that cost at least $20,
 -- and at most $40:
mSetCriteria(gTable, "price", ">=", 20)
mSetCriteria(gTable, "and", "price", "<=", 40)
mSelect(gTable)
 -- select all items that cost at most $40
 -- and sort them by alphabetic order:
mSetCriteria(gTable, "price", "<=", 40)
mOrderBy(gTable, "name")
mSelect(gTable)
```

See Also

`mSetIndex, mSetCriteria, mOrderBy`

mSelectAll (V12Table)

Syntax

```
mSelectAll(gTable)
```

Parameters

(none)

Description

Select all the records of a table. The sorting order for the selection is the same as the most recently chosen index unless it is preceded by mOrderby. That index is either explicitely chosen by you (mSetIndex) or automatically chosen by mSetCriteria and/or mOrderBy.

Example

```
mOrderby(gT,"price")
mSelectAll(gTable)
```

See Also

`mOrderby`

mSelectCount (V12Table)

Syntax

```
mSelectCount(gTable)
```

Parameters

(none)

Description

Return the number of records in the selection. If the selection is empty, this method returns 0.

Example

```
put mSelectCount(gTable) into field "TotalHits"
```

See Also

```
mGetPosition
```

mSetCriteria (V12Table)

Syntax

```
mSetCriteria(gTable, [boolOp,] fieldName, operator, value)
```

Parameters

boolOp = “and” | “or”
fieldName = fieldin which value must be searched.
Operator = "=" | "<>" | "<" | ">" | "<=" | ">=" | "starts" | "contains" | "wordEquals" | "wordStarts"
value is value to look for.

Description

Specify a search criteria. A call or sequence of calls to mSetCriteria must be followed by a call to mSelect to trigger the search process. If more than one criterion is used, subsequent criteria must use the boolean operator “and” or “or”.

Example

```
-- finds all cases where the field "muffin"
-- contains "chocolate"
mSetCriteria(gTable, "muffin", "wordEquals", "chocolate")
-- This instruction combines a full text search
-- in two fields with an ordinary search
mSetCriteria(gTable, "muffin", "wordEquals", "chocolate")
mSetCriteria(gTable, "or", "donut","containsWord", "chocolate")
mSetCriteria(gTable, "and", "name", "starts", "Shlomo")
mOrderBy(gTable, "price")--selection doesn't apply to full Index
mSelect(gTable)
```

See Also

```
mSelect, mOrderBy
```

mSetField (V12Table)

Syntax

```
mSetField(gTable, fieldName, value)
```

Parameters

fieldName = name of the field who's content is modified
 in the current record.
value = value to assign to the field fieldName of the current record.

Description

Set the content of field fieldName, of the current record, to value. If value is not of the same type as fieldName, V12-DBE casts it to the appropriate type. If fieldName is a date, value must be a valid date in V12-DBE's raw format (YYYY/MM/DD). Calls to mSetField must be preceded by a call to mEditRecord or to mAddRecord, and must be followed by a call to mUpdateRecord.

Example

```
-- editing an existing record:
mEditRecord(gTable)
mSetField(gTable, "description", field "myDescription")
mSetField(gTable, "height", integer(field "height"))
mUpdateRecord(gTable)
-- adding a new record to the table gTable:
mAddRecord(gTable)
mSetField(gTable, "name", "hot dog")
mSetField(gTable, "length", 2)
mSetField(gTable, "price", 1.95)
mUpdateRecord(gTable)
```

See Also

```
mGetField, mSetMedia, mGetMedia, mEditRecord, mUpdateRecord
```

mSetIndex (V12Table)

Syntax

```
mSetIndex(gTable, indexName)
```

Parameters

indexName = name of the index to set as current index

Description

Set the index indexName as the current index.
A call to mSetIndex must be followed by a call to mSelect.
It is useless to call mSetIndex before setting search criteria as mSetCriteria selects the most appropriate index for a given query.
mSetIndex is seldom used. It is still supported only for the purpose of backwarding compatiblity.

Example

```
-- select all records of the table and sort them by order of price:
mSetIndex(gTable, "priceNdx")
mSelect(gTable)
```

See Also

`mSelectAll, mOrderBy`

mSetMedia (V12Table)

Syntax

```
mSetMedia(gTable, fieldName, Member)
```

Parameters

fieldName = name of the field in which media is to be stored.
Member = cast member from which media is retrieved.

Description

Replace the content of the field FieldName of the current record with the cast member Member.

Example

```
-- get the media from the cast named "thePhotoCast".
-- in cast 1 and store it in the field "photo",
-- of the current record:
mSetMedia(gTable, "photo", member "thePhotoCast")
-- or
mSetMedia(gTable, "photo", member "thePhotoCast" of CastLib "internal")
```

See Also

`mSetField, mGetMedia`

mSetPassword (V12dbe)

Syntax

```
mSetPassword(gDB, oldPassword, newPassword)
```

Parameters

oldPassword = current password.
newPassword = new password.

Description

Change the current password (oldPassword) to a new one (newPassword). Either oldPassword and/or newPassword can be empty strings.

Example

```
-- change the password "very secret" to "even more secret":
mSetPassword(gDB, "very secret", "even more secret")
-- change from an empty password to "my new password":
mSetPassword(gDB, "", "my new password")
```

mSetProperty (V12dbe)

Syntax

```
mSetProperty(gDB, prop, value)
```

Parameters

Prop = "virtualCR" | "characterSet" | "weekDays" | "shortWeekDays" | "months" | "shortMonths".

Description

Set an existing property Prop to value, or create a new property named Prop and assigns value to it. Special rules apply to properties that start with “string.” (see manual)

Example

```
-- turn on the verbose property:
mSetProperty (gDB, "months", "January February March April May June July August
September October November December")
mSetProperty (gDB, "string.MinWordLength", String(5) )

Note: See user manual for additional information.
```

See Also

```
mGetProperty
```

mUpdateRecord (V12Table)

Syntax

```
mUpdateRecord(gTable)
```

Parameters

(none)

Description

Save modifications of the current record to the database file. A call to mUpdateRecord must be preceded by a call to mEditRecord or mAddRecord.

Example

```
mEditRecord(gTable)
mSetField(gTable, "name", field "name")
mUpdateRecord(gTable)
```

See Also

```
mEditRecord, mAddRecord, mSetField
```

new (V12dbe)

Syntax

```
new(Xtra "V12dbe", databaseName, openMode, password)
-- now accepts "Shared ReadWrite" mode
```

Parameters
databaseName = name of the database file to create, clone or open. This can be a partial or full pathname to that file.
openMode is the mode in which the database will be opened. Valid values are "create", "readWrite", "readOnly" and "clone".

If openMode is "create", the third parameter is a password and it is stored in the database file for later reference.
If openMode is "readOnly" or "readWrite", the third parameter is a password and it is checked against the one provided with "create".

Description
Create a database Xtra instance and returns a reference to it. Usually, that reference is assigned to a global variable and used throughout the Lingo script to refer to that database.
If openMode is "create" and new database file is created. Table, field and index definitions must follow. That process must be terminated by a call to mBuild.
If openMode is "readOnly", data can be read but not be written to the database.
If openMode is "readWrite", data can be read and written to the database.

Example
```
-- create a new database named "myBase"
-- and lock it with password "very secret":
set gDB = New(Xtra "V12dbe", "myBase", "Create", "very secret")
-- open an existing database file named
-- "myBase" in Read-Only mode:
-- (i.e. the database cannot be modified).
set gDB = New(Xtra "V12dbe", "myBase", "ReadOnly", "very secret")
-- open an existing database (FirstDB.v12) and
-- clone it in the directory of the current movie:
set gDB1 = New(Xtra "V12dbe", "KrazyCD:DataFiles:FirstDB.v12", "ReadOnly", "top
secret")
```

new (V12Table)

Syntax
```
new(Xtra "V12table", mGetRef(gDB), tableName)
```

Parameters
gDB = reference to the database object that contains tableName.
tableName = name of table to open.

Description
Create a table Xtra instance and opens the table
tableName. new returns a reference to that Xtra instance, which is normally assigned to a global variable for later reference.

Example
```
set gDB = New(Xtra "V12dbe", "myBase", "ReadOnly", "Exclusive", "very secret")
set gTable = New(Xtra "V12dbe", gDB, "MegaTable")
```

See Also
```
new (v12dbe)
```

V12Error (Global)

Syntax

```
  V12Error()
```

Parameters

err = an integer (optional parameter)

Description

If you call v12Error without the Err parameter and right after calling a V12 method, it returns an accurate and contextual description of the result. When called with the Err parameter, a generic explanation of that error code is provided. V12Error() is global method: it is an alternate syntax to mError.

Example

```
set errMsg = V12Error()
set errMsg = V12Error(-30000)
```

See Also

`V12status`

V12status (Global)

Syntax

```
 V12Status()
```

Parameters

(none)

Description

Return the result code of the last V12-DBE method called. A return code of 0 means no error occurred. A positive code signals a warning. A negative call signals an error.
Call V12Error to get a complete explanation of the problem(s) that occurred in the last method.

Example

```
mSetCriteria(gTable,"name","=","buzzlightyear")
if V12Status() then Alert V12Error()
```

See Also

`V12Error`

XtraVersion(Global)

```
-- Return version of Xtra.
```

Appendix 20: Error Codes

This section lists error codes and their descriptions. Two kinds of errors may be returned: warnings and errors.

Errors

-1	Selection empty
-2	Not initialized properly
-3	Internal error
-4	Bad global area
-5	Disk read error
-6	Disk Write Error
-7	Header Read Error
-8	Header Write Error
-9	The file does not exist or is already opened
-10	Not closed properly
-11	No Space
-12	File already exists
-13	Not created properly
-14	Incomplete Data
-15	Bad Header
-16	Bad Node
-17	Bad Split Entry
-18	File Not Open
-19	File Not Closed
-20	No Root Node
-21	No Current
-22	Bad Index Number
-23	Bad data length
-24	Bad reference type
-25	Bad field reference
-26	Bad field pointer
-27	Bad field handle
-28	Bad field type
-29	Bad Sequence type
-30	Bad key length
-31	Bad key type
-32	Bad Duplicate type
-33	Buffer overflow
-34	Bad file specification
-35	Bad minimum extend
-36	Over demo limit
-37	File seek
-38	Log record number not used
-39	Double lock current info
-40	Double unlock current info
-41	Entry has bad data length
-42	Bad segment number
-44	Memory allocation error
-45	Data checksum error
-46	Data definition checksum error
-47	Unable to open database. The maximum of users as been reached
-48	Bad build key
-49	Duplicate key
-50	Invalid number of buffers
-51	Key too big
-52	Too many segments
-53	Bad lock current info
-81	Bad load shared library
-82	Function not loaded
-83	Function not found
-101	File locked
-102	File mode error
-103	Not enough memory or not multiuser OS
-104	Not locked
-105	Current record locked by other user
-106	Locked by self
-107	Reset error
-108	Clear schema error
-109	Bad clear byte
-110	Bad set byte
-111	Current Record already locked
-201	Bad select position number
-202	Bad field number
-203	Bad select type
-204	Bad select Op
-205	User abort
-206	Bad key number
-207	Different select types
-520	Invalid open mode
-530	Invalid parameter
-540	Bad edit mode
-550	Unknown error
-560	Invalid identifier. Valid identifiers must have at least one character
-570	Invalid identifier. First character must be alphabetic
-580	Invalid character(s) in identifier
-590	Invalid identifier length. Valid identifiers have at most 32 characters
-600	Table '%s' does not exist
-610	Field '%s' does not exist in table '%s'
-620	Field '%s' of type '%s' of table '%s' is of a type that cannot be full-indexed
-630	Invalid field type
-640	Invalid parameter. The parameter must be a valid V12base component
-650	Invalid parameter. The parameter must be a valid V12table component
-660	The database used by the table is not opened
-1010	Bad table instance. Check current instance
-1030	Too many records
-1050	Invalid object
-1060	Invalid database structure
-1070	Memory allocation error
-1080	Field does not exist

-1090	Unable to read structure from database
-1100	Structure not initialized properly
-1110	Corrupted DBF file
-1120	Field does not exist. Please contact tech support
-1130	Cannot modify table
-1140	Invalid database structure. Please contact tech support
-1150	Invalid identifier
-1160	Cannot create text file. Maybe the file already exists
-1170	Cannot create DBF file. Maybe the file already exists
-1180	Cannot create DBT file. Maybe the file already exists
-1250	Field does not exist
-1260	Invalid field data. Please contact tech support
-1270	Invalid field type
-1280	Invalid field size in table
-1290	No table defined
-1330	Unable to set password
-1370	Duplicate key
-1380	Unable to create or modify a database on a locked file/volume
-1400	Database not initialized properly. Please contact tech support
-1410	Unable to pack database. File name already exists
-1420	Table already in use. Set all instances of a table to zero
-1430	MOA error in V12-DBE. Please contact Tech Support
-1440	Cannot set a void value
-1460	Cannot bind multiple fields with the same member name
-1480	Item not found in table. Please contact tech support
-1500	Current record locked by other user
-1530	Cannot open database. This database structure is not supported by the current version of V12
-1810	Low-level engine not initialized
-1820	Wrong number of parameters
-1830	Invalid file name
-1840	Invalid open mode. Valid modes are Create, ReadWrite, ReadOnly and Clone
-1841	'%s' is an invalid open mode. Valid modes are Create, ReadWrite, ReadOnly and Clone
-1850	V12-DBE instance was not opened properly
-1860	Corrupted variables. Reboot the computer
-1870	Invalid pathname
-1880	File already exists
-1890	Error at file creation
-1900	Error while writing header files
-1910	File does not exist or is already open
-1920	Not enough disk space
-1930	Wrong password
-1940	Cannot get password. Please contact tech support
-1960	Invalid password. Check if the password is not VOID
-2210	Invalid object
-2410	Unable to edit database structure. Database must be opened in ReadWrite mode
-2810	Unable to update database structure. Database must be opened in ReadWrite mode
-2820	Not in database structure edition mode. Call mEditDBstructure before modifying database structure
-3010	Wrong number of parameters
-3020	Invalid pathname
-3030	Empty pathname
-3210	Wrong number of parameters
-3220	Invalid descriptor type. Valid types are Text, Literal, V12 and DBF
-3230	Invalid database descriptor. Check descriptor's syntax
-3240	Unable to locate/decode password
-3250	Unable to read database structure
-3260	Field '%s' of table '%s' has an invalid index order. Valid orders are Ascending and Descending
-3270	Missing '(*' or '*)'
-3280	Unable to open TEXT file. Make sure the file is in the specified path and not used by another application
-3290	Unable to open V12 file. Make sure the file is in the specified path and not used by another application
-3300	Unable to open DBF file. Make sure the file is in the specified path and not used by another application
-3310	Unable to modify database structure. Call mEditDBstructure first
-3320	Empty file name
-3330	Missing [END] tag in database descriptor
-3340	Missing field name in table '%s'
-3350	Field '%s' of type Media cannot be indexed
-3360	Missing [TABLE] tag in database descriptor
-3370	Missing table name in database descriptor
-3380	Invalid field name in table '%s'
-3390	Field '%s' already exists in table '%s'

-3400	Field '%s' of type '%s' of table '%s' is of a type that cannot be full-indexed
-3410	Invalid field type in table '%s'
-3420	Maximum number of indexes reached. The maximum is %ld
-3430	Index '%s' already exists in table '%s'
-3440	Invalid index type in index '%s' of table '%s'
-3450	Missing field name for index '%s' in table '%s'
-3460	Field '%s' set in index '%s' of table '%s' does not exist
-3470	Missing order for index '%s' of table '%s'. Valid orders are Ascending and Descending
-3480	Invalid field name. '%s' is a reserved word
-3490	Field '%s' of table '%s' has an invalid field type
-3500	Invalid descriptor type. Valid types are Literal, Text, DBF or V12
-3510	Empty database descriptor
-3520	Table '%s' already exists
-3530	Field '%s' does not exist in table '%s'
-3540	Unable to edit database structure. Database must be opened in Create or ReadWrite mode
-3550	Not in database structure edition mode. Call mEditDBstructure first
-3570	Invalid DBF file format
-3580	Buffer size not required for fields of type '%s'
-3590	Invalid field size in table '%s'
-3600	First character of table '%s' must be alphabetic
-3610	Unable to modify database structure. Database must be opened in Create or ReadWrite mode
-3810	Wrong number of parameters
-3820	Invalid table name
-3830	Table '%s' already exists
-3840	Unable to create new table. Call mEditDBstructure before creating new tables
-3850	Empty table name
-3860	Unable to edit database structure. Open database in Create or ReadWrite mode
-3870	Table '%s' contains invalid characters
-3880	First character of table '%s' must be alphabetic
-3890	Table '%s' has an invalid identifier length. Valid identifiers have at most 32 characters
-3900	Cannot create table '%s'. The maximum number of table(s) is '%ld'
-4010	Wrong number of parameters
-4020	Invalid table name
-4030	Invalid field name
-4040	Invalid field type
-4050	Invalid buffer size
-4060	Table '%s' does not exist
-4070	Database structure not created properly
-4080	Field '%s' already exists in table '%s'
-4090	Unable to create new field. Call mEditDBstructure and mCreateTable before creating new fields
-4100	Empty table name
-4110	Empty field name
-4120	Invalid buffer size. Buffer size must be greater than zero
-4140	Buffer size not required for fields of type '%s'
-4160	Unable to use '%s' as a field name. This is a reserved word
-4170	Invalid index type. Valid index types are indexed and full-indexed
-4180	Unable to edit structure of table '%s'. Table already built
-4190	Unable to edit database structure. Open database in Create or ReadWrite mode
-4200	Field '%s' of table '%s' contains invalid characters
-4210	First character of field '%s' in table '%s' must be alphabetic
-4220	Field '%s' of table '%s' has an invalid identifier length. Valid identifiers have at most 32 characters
-4230	Field '%s' of table '%s' cannot be indexed. It must have at most 29 characters to be indexed
-4240	Cannot create field '%s'. The maximum number of field(s) is '%ld'
-4510	Wrong number of parameters
-4520	Table '%s' does not exist
-4530	Field '%s' does not exist in table '%s'
-4540	Database structure not created properly
-4550	Invalid table name
-4560	Invalid field name
-4570	Invalid index name
-4580	Invalid index type. Valid types are Duplicate and Unique
-4590	Invalid index order. Valid orders are Ascending and Descending
-4591	'%s' is an invalid index order. Valid orders are Ascending and Descending
-4600	Unable to create index. Call mEditDBstructure, then create new tables and new fields before creating new indexes

-4610	Maximum number of indexes reached. The maximum is %ld
-4620	Empty table name
-4630	Empty index name
-4640	Empty field name
-4650	Empty index type. Valid types are Unique and Duplicate
-4660	Empty index order. Valid orders are Ascending and Descending
-4670	Field '%s' already used in index '%s' of table '%s'
-4680	Unable to edit database structure. Database must be opened in Create or ReadWrite mode
-4690	Field '%s' of type Media specified in table '%s' cannot be indexed
-4700	Unable to edit structure of table '%s'. Table already built
-4710	Cannot create compound index '%s'. Limited to '%ld' field(s) per index
-4910	Unable to delete table. Database must be opened in Create or ReadWrite mode
-4920	Unable to edit database structure. Call mEditDBstructure first
-4930	Table '%s' does not exist
-4940	Unable to open table
-4950	Empty table name
-4960	Table already in use. Set all instances of a table to zero before deleting it
-4970	Cannot delete table. Database must be opened in Create or ReadWrite mode
-5110	Database structure not created properly
-5120	Missing index. Table '%s' must contain at least one index
-5130	Unable to edit database structure
-5140	Unable to modify database structure. Use mEditDBStructure and mUpdateDBStructure to change a database structure
-5150	Unable to build database. Database must be opened in Create or ReadWrite mode
-5160	Unable to update database structure. At least one index per table is required
-5170	Unable to build database structure. At least one index per table is required
-5410	Wrong number of parameters
-5420	Invalid password. Password should not exceed 32 characters
-5430	Invalid character(s) in password
-5440	Wrong password. '%s' does not match with the current password
-5450	Unable to write to database. Database must be opened in ReadWrite mode
-5610	Wrong number of parameters
-5620	Database structure not created properly
-5630	Invalid output format. Please consult the manual to get a description of the different output formats
-5640	Table '%s' does not exist
-5650	Field '%s' does not exist in table '%s'
-5660	Can only get size information on fields of type Media or String
-5670	Invalid table name
-5680	Invalid field name
-5690	Empty table name
-5700	Empty field name
-5810	Property does not exist
-5820	Invalid property
-5830	Missing apostrophe. A sub-string was left open-ended
-5840	Unable to write to database. Database must be opened in ReadWrite mode
-5850	Cannot delete or set the property value to blank
-5860	Cannot modify the property value
-5870	Cannot change verbose value. Invalid verbose type
-5880	Cannot set week days. Invalid number of days
-5890	Cannot set months. Invalid number of months
-5900	Cannot modify property. The string type associated does not exist
-5910	Cannot modify property. The string type associated is already used
-5920	Cannot modify MinWordLength property. This property must be greater than 0 and smaller than 100
-5930	Cannot define new string type. String type names cannot contains periods (dots)
-5940	Cannot set property name. Too many characters
-5950	Cannot set new string type. The maximum number of custom string types is reached
-5960	Invalid log value. Must be set to 'on' or 'off'
-5970	Invalid maximum value. Must be a number between 1 and 1000
-5980	Invalid progress indicator value. Must benone, with_cancel, without_cancel or userdefined
-5990	Invalid Character Set value. Must beDos-US, Mac-Standard, Windows-ANSI or Default
-6010	Property does not exist

-6110	Memory allocation error
-6120	Wrong number of parameters
-6130	V12base instance not properly opened
-6140	Invalid table name
-6150	Missing table definition in database. At least one table must be defined in a V12 database
-6160	No such table in database
-6170	Failed to open table. Database file not open.
-6180	Table was defined but not written to database
-6190	Table not found
-6200	Invalid object
-6210	Empty table name
-6220	Cannot create table instance. Only one table instance can be created
-6410	Wrong number of parameters
-6420	Invalid export type
-6430	Invalid pathname
-6440	Invalid field delimiter
-6450	Invalid record delimiter
-6460	Invalid field name
-6470	Field '%s' does not exist
-6480	Invalid record delimiter length
-6490	Invalid field delimiter length
-6810	Wrong number of parameters
-6820	Wrong number of parameters
-6830	Wrong number of parameters
-6840	Parameter #2 should be either a valid pathname or a valid source type (Literal, Text, DBF or V12)
-6850	Invalid pathname
-6860	Invalid record delimiter
-6870	Invalid field delimiter
-6880	Invalid import type. Must be Literal, Text, DBF or V12
-6890	Import error
-6900	Unable to open DBF file. Check pathname
-6910	Unable to open TEXT file. Check pathname
-6920	Empty file name
-6931	Field %ld does not exist
-6940	Empty table name
-6950	Database not properly initialized
-6970	Invalid DBF file format
-6980	Field and record delimiters must be different
-6990	Unable to import data. Database must be opened in ReadWrite mode
-7050	Cannot use line feed (LF) as field delimiter
-7070	Duplicate key occurred at line '%ld'
-7210	Selection empty. No current record
-7410	Selection empty. No current record
-7620	Selection empty. No current record
-7820	Selection empty. No current record
-8410	Index '%s' does not exist
-8420	Invalid index name
-8430	Empty index name
-8610	Wrong number of parameters
-8620	Invalid field name
-8630	Invalid operator
-8640	Invalid field type
-8650	Invalid operator
-8660	Invalid operator
-8670	Field does not exist
-8680	No memory available
-8690	Empty field name
-8700	Operator not allowed for this type of field
-8710	Field '%s' is not full-indexed
-8720	Field '%s' does not exist
-8730	Word length is smaller than the minimum of indexed words (%ld)
-8740	Cannot specify boolean operator in first criteria
-8750	String must have at least one character
-8760	Maximum number of criteria reached
-9010	Wrong number of parameters
-9020	Field '%s' does not exist
-9030	Invalid index order
-9050	Empty index name
-9410	Selection empty. No current record
-9420	Outside of selection range
-9610	Unable to delete selection. Database must be opened in ReadWrite mode
-9620	Unable to delete record #%ld. This record is locked by another user
-9810	Invalid result
-9820	Selection empty
-10010	Field does not exist
-10020	Invalid field name
-10030	Empty field name
-10040	Field '%s' does not exist
-10050	Cannot get field when selection is empty
-10060	Wrong number of parameters
-10410	Invalid value. Please contact tech support
-10440	Parameter incompatible with type of destination field
-10450	Invalid field name
-10460	Unable to modify data. Call mEditRecord first
-10470	Media exceeds buffer size declared upon database creation
-10480	Empty field name
-10490	'%s' is an invalid date
-10500	Field '%s' does not exist
-10810	Wrong number of parameters
-10820	Empty media field
-10830	Empty field name
-10840	Field '%s' does not exist
-10850	CastLib %ld does not exist
-10860	Unable to find member '%s'
-10870	The parameter must be a (cast) member

-10880	Cannot get field when selection is empty
-11010	Wrong number of parameters
-11020	Cast member empty
-11030	Invalid field name
-11040	Empty field name
-11050	Empty media field
-11060	Field '%s' does not exist
-11070	Unable to modify data. Call mEditRecord first
-11080	Unable to import this kind of media
-11710	Unable to edit record. Database must be opened in ReadWrite mode
-11730	Selection empty. No current record
-11910	Cannot write data. Call mEditRecord first
-11920	Duplicate key '%s'. Check the following field(s) %s
-12130	Unable to delete record. Database must be opened in ReadWrite mode
-12140	Selection empty. No current record
-12710	Wrong number of parameters
-12730	Cast '%s' does not exist
-12731	Cast %ld does not exist
-12740	Cast member %s does not exist
-12741	Cast member %ld does not exist
-12750	Invalid member identifier
-13010	Wrong number of parameters
-13025	Field '%s' is not bound. Call mBindField first
-13030	Cast '%s' does not exist
-13035	Cast %ld does not exist
-13045	Cast member %s %ld does not exist
-13050	Field '%s' does not exist
-13410	Wrong number of parameters
-13420	Invalid member identifier
-13610	Wrong number of parameters
-13630	Unable to find Field '%s'
-13640	Cast '%s' does not exist
-13650	Cast %ld does not exist
-13660	Cast member '%s' does not exist
-13670	Cast member %ld does not exist
-13680	Unable to update record. Database must be opened in ReadWrite mode
-14010	Wrong number of parameters
-14020	Field '%s' does not exist
-14030	Cast %ld does not exist
-14040	Cast member %s does not exist
-14041	Cast member %ld does not exist
-14050	Wrong number of parameters. Please consult the manual
-14060	You must specify a CastLib
-14070	Cast member '%s' not found
-14080	Invalid CastLib identifier
-14410	Wrong number of parameters
-14420	Field '%s' does not exist
-14430	Invalid parameter. Third parameter cannot be of type String
-14440	Invalid member identifier
-14450	Invalid parameter 3, attempt to get the binding type
-14460	Cannot bind field. The member '%ld' is already bound
-14810	Wrong number of parameters
-14850	Database structure not created properly
-14860	Invalid table name
-14870	Invalid field name
-14890	Field '%s' does not exist in table '%s'
-14910	Unable to create full-index. Call mEditDBstructure first
-14920	Empty table name
-14930	Empty field name
-14940	Field '%s' of type '%s' specified in table '%s' cannot be full-indexed
-14950	Unable to edit database structure. Database must be opened in Create or ReadWrite mode
-14960	Unable to edit structure of table '%s'. Table already built
-15210	Conflicting Add/Edit mode. Call mUpdateRecord before creating a new record
-15230	Unable to add record. Database must be opened in ReadWrite mode
-15610	Wrong number of parameters
-15620	Only fields type Integer, Float, and Date can be formatted
-15630	Invalid data format
-15650	Missing apostrophe. A sub-string was left open-ended
-15660	Too may periods (.) in format specifier. At most one period is allowed
-15670	Empty field name
-15680	Cannot set field format. 200 is the maximum format length
-15810	Wrong number of parameters
-15820	Invalid output format. Please consult the manual to get a description of the different output formats
-15830	Error number required
-16010	Wrong number of parameters
-16020	Invalid pathname
-16030	Empty pathname
-16040	Invalid new pathname
-16050	Empty new pathname
-16410	Wrong number of parameters
-16420	Invalid table name
-16430	Empty table name
-16440	Invalid old field name
-16450	Empty new field name
-16460	Cannot rename field. Database must be opened in Create or ReadWrite mode

-16470	Table '%s' does not exist
-16480	Field '%s' does not exist in table '%s'
-16490	Unable to rename field '%s' of table '%s'. Table already built
-16500	Unable to modify database structure. Call mEditDBstructure first
-16510	Cannot rename field. Field '%s' already exist in table '%s'
-16810	Field '%s' does not exist
-16820	Invalid output format. Please consult the manual to get a description of the different output formats
-16830	Invalid start position. Must be a number greater than zero (0) and smaller than the number of records in the selection
-16840	Invalid number of records to read. Must be a number greater than zero and smaller than the number of records in the selection
-16850	Invalid field delimiter
-16860	Invalid record delimiter
-16870	Invalid field name

Warnings

1390	File is opened in ReadOnly mode. Check if medium or file is read only
1450	Cannot update bound fields. Not in ReadWrite mode
1470	No field match. No data copied
1510	File is opened in ReadOnly mode. Can't open in Shared Readonly mode
1520	File is opened in ReadWrite mode. Can't open in Shared Readwrite mode
1950	Old database version. It was opened in ReadOnly mode
1970	This database is still in demo mode. To legalize it, please open it once in ReadWrite mode
2420	Already in database structure edition mode. Call mUpdateDBstructure before calling mEditDBstructure again
3620	Unsupported dbf field type
4130	Fields of type media cannot be indexed
4150	Fields of type '%s' cannot be full-indexed
6500	Unable to export binary field type. Field '%s' not exported in DBF file
6510	Field '%s' has been truncated to ten characters
6520	Selection empty. No current record
6530	Field '%s' of type Media cannot be export
6930	Field '%s' does not exist
6960	'%s' is an invalid date. Default date has been set
7000	Field '%s' at line '%ld' is longer than the '%ld' allocated for it and was truncated
7010	Too many field delimiters at line '%ld'. The extra data was ignored
7020	Missing field delimiter(s) at line '%ld'. Some fields were set to default data
7030	Field '%s' is defined of type media in your database. Use mSetMedia to store data in it
7040	The field '%ld' of your definition has been truncated. Exceed the maximum number of characters for a field (32)
7060	DBF field '%s' of type '%s' does not match the V12 type '%s'
7080	Unsupported dbf field type
7610	Unable to select records beyond end of selection. %ld record(s) in selection
7810	Unable to select records preceding first record of selection
10070	Current record is edited by another user. Data could change
11720	mEditRecord already called. Call mUpdateRecord prior to calling mEditRecord again
12120	No current record
12760	Cannot generate a member beyond the size of the castLib
14970	Field '%s' is already full-indexed in table '%s'
15220	Already in database structure addition mode
16880	Selection empty. No current record
16890	Field '%s' of type Media cannot be retrieved with mGetSelection

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