

TDbf 7.0 Manual

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1 Introduction

TDbf is an open source native data access component for Object Pascal. This includes support for Delphi, C++ Builder, Kylix and Free Pascal. It allows you to create very compact database programs which don't need any special installer programs. The database engine code is compiled right into your executable. It has the following features:

- Works without the Borland Database Engine.
- Allows the use of all dBASE
- native types (including character, numeric, logical, date, and memo). See `TableLevel`.
- Memo files are supported, both text and binary so you can use fields with no size limit.
- File format 100% compatible with dBASE III+ or dBASE IV or dBASE for Windows.
- Support for Clipper and Visual FoxPro tables.
- Restructuring existing tables to drop, add or modify a current table structure while retaining table data.
- Multi-user access through BDE compatible locking. Only 1 user can lock a particular record for writing, but multiple users can read the record.
- Index support available for fast sorting, searching and ranging of big tables. Indexes supported include NDX and MDX index files.
- Expression parser for both indexes and filters.
- OS dependant multi-codepage and multi-locale support. This allows you to read and write tables in different ANSI codepages than your OS and to specify a sort order better suited for your language or locale. Currently, this is not yet supported on the Linux OS. Unicode is not supported by the dBASE standard.

2 Class structure

2.1 TDbf

File: Dbf.pas

The TDbf class is the main class, and the main interface for most programmers. You open/close dBase files, add/select/remove indexes with this class. It stores the current record number, the selected index, etc. TDbf is a TDataSet-descendant and therefore the usual delphi data-aware controls like TDBEdit, TDBNavigator, TDBGrid, etc. can be used.

2.2 TDbfFile

File: Dbf_DbfFile.pas

This class handles the dbf file itself, it remembers what index files are open, and updates them when needed and provides an interface to lock records. The split TDbf/TDbfFile was originally to share open dbf files, so more TDbf components can open the same file at the same time. However, this has multi-user problems, and now each TDbf component opens it's own TDbfFile.

2.3 TDbfFieldDef

File: Dbf_Fields.pas

TDbfFieldDef is an enhanced version of TFieldDef, handling native field types to VCL field types conversion and dbase fields specific features. One problem of VCL TFieldDefs is their inability to store the size and precision of float fields. To use this ability you need to create a set of TDbfFieldDefs instead.

3 File types

- .dbf A dBase or FoxPro file. Contains the data of all fixed size fields. Records are fixed size.
- .dbt A memo file. Memo contents are variable in size, and the memo field in the .dbf contains a pointer to a block number in the memo file which contains the actual memo data.
- .ndx An index file. Contains one index, and is created and referenced in tdbf using it's filename and extension. For example:
`Dbf1.AddIndex('index1.ndx', 'field1', []);` creates and opens an index file named "index1.ndx". This index file can be closed by calling `Dbf1.CloseIndexFile('index1.ndx');`. If you close the dbf file without closing the index files, they are automatically closed. Note that they are not automatically opened next time the dbf is opened again. For the index to be maintained, it must be opened after the tdbf is opened by calling `Dbf1.OpenIndexFile('index1.ndx');`.
- .mdx A Multiple Index file. Essentially a collection of several NDX files in one. Each dbf file can have one accompanying .mdx file, if the dbf file is named file.dbf, the mdx file is named file.mdx. Indexes are created automatically in the accompanying mdx file if you name them without the extension .ndx; example: `Dbf1.AddIndex('index1', 'field1', []);`. Note that if an .mdx file is present, it's automatically opened and maintained, you don't need to call `OpenIndexFile` for it.

4 Expressions

Expressions are used in indexes and in filters. When adding an index with `AddIndex`, you need to supply an index expression. When you want to apply a filter, you need to supply a filter expression in the `Filter` property. Functions and operators are case insensitive.

For index expressions, you must take care that if the result is a string, that then it's length is not longer than 100 characters. Use the `SUBSTR` function to get the first X characters, if it's too long. Example:

```
Dbf1.AddIndex('INDEX1', 'DTOS (DATEFIELD)+SUBSTR (LONGFIELD,1,10)+SUBSTR (LONGFIELD2,1,20)', []);
```

Supported operators:

+ Concatenate two strings, or add two numbers

– Subtract two numbers

* Multiply two numbers

/ Divide two numbers

= Compare two strings, numbers or booleans for equality

<> Compare two strings, numbers or booleans for inequality

< Return iff first argument smaller than second argument

<= Return iff first argument smaller than or equal to second argument > Return iff first argument greater than second argument

>= Return iff first argument greater than or equal to second argument

NOT Negate the boolean argument to the right

AND Returns true iff first and second boolean argument are true OR Returns true iff first or second boolean argument is true

Supported functions:

ABS (*expN*)

Returns the absolute value of the specified number, *expN*.

ASC (*expC*)

Returns the ASCII value of the specified character, *expC*.

CEIL (*expN*)

Returns the nearest integer that is greater than or equal to the specified number, *expN*. This is the same as CEILING () .

CEILING (*expN*)

Returns the nearest integer that is greater than or equal to the specified number, *expN*. This is the same as CEIL () .

CHR (*expN*)

Returns the characters with the specified ASCII value, *expN*.

CDOW (*expD*)

Returns the name of the day of the week for the specified date, `expD`.

`DATE ()`

Returns the current date.

`DAY (expD)`

Returns day part of the specified date, `expD`.

`DTOS (expD)`

Converts the specified date, `expD`, to a string with representation *YYYYMMDD*

`EMPTY (exp)`

Returns `True` if and only if the expression, `Exp`, is empty.

`IIF (expL, exp1, exp2)`

If `expL` is `True`, returns `exp1`.

If `expL` is `False`, returns `exp2`.

`LEFT (expC, expN)`

Returns the specified number of characters, `expN`, from the beginning of the specified string, `expC`.

`LEN (expC)`

Returns the length of the specified string, `expC`, in characters.

`LTRIM (expC)`

Removes leading spaces from the specified string, `expC`.

`MONTH (expD)`

Returns the month part of the specified date, `expD`.

`PROPER (expC)`

Returns the proper (mixed) case equivalent of the specified string `expC`.

`RECNO ()`

Returns the current record number.

`RIGHT (expC, expN)`

Returns the specified number of characters, `expN`, from the end of the specified string, `expC`.

`ROUND (expN1 [, expN2])`

Rounds the specified number, expN1, to the number of digits specified by expN2. If expN2 is not specified, rounds to the nearest integer.

`RTRIM (expC)`

Removes trailing spaces from the specified string, expC.

`SOUNDEX`

`STR (num [, size, precision])`

Converts a number num to a string with optional size and precision.

num is number to convert to string.

size the total number of characters to output

precision is the number of digits to the right of the decimal point

`SUBSTR (expC, index [, count])`

Extracts a sub-string from string expC from position index and length count.

`UPPER (expC)`

Returns the upper case equivalent of specified string, expC.

`LOWER (expC)`

Returns the lower case equivalent of the specified string, expC.

`TRIM (expC)`

Removes leading and trailing spaces from the specified string, expC.

`VAL (expC)`

Converts the specified string, expC, to a number.

`YEAR (expD)`

Returns the year part of the specified date, expD.

5 FAQ

5.1 Does TDbf support images?

TDbf does support images. You need to make a table with $\text{TableLevel} \geq 4$ to be able to do that. That's because the Memo needs to use level 4 (= binary) encoding. So set `tablelevel` to at least 4, make some fields, make a BLOB field (`ftGraphic`, whatever) and `CreateTable`. Attach a `TDBImage` to it, and it should work.

Another solution is attaching a `TDBRichEdit` to a memo field and pasting an image in it.

5.2 Why do deleted records not show up when using ixPrimary indexes?

When a record is deleted, it's key is deleted immediately from `ixPrimary` indexes, to prevent key violations when you want to insert another record with the same key. As the record is not in the index, it is not "visited", and therefore does not show up.

5.3 How can I make an index on a TDateTime field?

Use an expression index and the `DTOS` function:

```
Dbf1.AddIndex('INDEX1', 'DTOS(FIELD1)', []);
```

where `FIELD1` is the `ftDateTime` field and `INDEX1` the name of the index.

5.4 How can I sort the display of the records differently?

You need to add an index that sorts the records in the order you want. See for an example the previous question. Next, you need to "select" the index to be used to sort the records. This is done using:

```
Dbf1.IndexName := 'INDEX1';
```

where `INDEX1` is the name of the index you created using `AddIndex`.

The index can be deselected by selecting the empty name index:

```
Dbf1.IndexName := '';
```

Note that you can create multiple indexes by calling `AddIndex` multiple times, but you can select only one index at a time.

5.5 Why does RecordCount return too many records?

When no index is active, the `RecordCount` property returns the total number of records in the table including deleted ones. When an index is active, it returns a number based upon internal index tree, usually very large. `RecordCount` is made for speed, and has the sequential property, so `TDBGrid` can approximately

show using its scrollbar the position of the current record in the range.

If you need exact number of active records, use the `ExactRecordCount` function, which is very slow (it reads all records from beginning to end).

5.6 How to know if a record is currently being edited by another user?

Just try to edit the record using `Dbf1.Edit`; and when a record “lock” is in place, meaning another user is editing the record, an exception will be fired.

5.7 How to handle different character sets and locale sorting?

When creating the table, you determine in what character set and sorting locale the data is stored and sorted. Make sure you are using `tablelevel ≥ 4`. In `DbfLang.pas` you will find a list of all possible character set / locale combinations. Choose an appropriate one and before creating the table set it, for example hex 22, hungarian locale, charset 852:

```
Dbf1.LanguageID := DbfLangId_HUN_852;
```

...

```
Dbf1.CreateTableEx(...);
```

The `LanguageID` and `CodePage` can also be queried of any opened table.

5.8 How to undelete records?

When records are `Deleted`, they are just marked as being deleted. To undelete them, set `ShowDeleted` to true, navigate to the record you want to undelete, and call `Undelete`.

5.9 How can I restructure a table?

To restructure a table, create a new `TDbfFieldDefs` collection with the new structure of the table, and pass that to `RestructureTable`. The `CopyFrom` property determines the index of the field to copy data from. Note that when using `TDbfFieldDefs.Assign` to copy the structure of the fields, the `CopyFrom` fields are assigned automatically, if you have Delphi 5 (or BCB 5) or higher. A `CopyFrom` property with value -1 indicates a new field.

See also `RestructureTable`, section 6.36.

6 Methods

6.1 AddIndex

```
{$ifdef DELPHI_5} procedure AddIndex(const AIndexName, Fields: String; Options: TIndexOptions; const
```

```
DescFields: String='');
{$else} procedure AddIndex(const AIndexName, Fields: String; Options: TIndexOptions);
{$endif}
```

Name is the name of the new index. Name must contain an index name with length shorter than or equal to 10.

Fields is a AnsiString value containing the field or an expression on which the new index will be based.

Options is a set of attributes for the index. The Options parameter may contain any one, multiple, or none of the TIndexOptions constants: ixPrimary, ixUnique, ixDescending, ixCaseInsensitive, and ixExpression.

- ixPrimary specifies a distinct unique index. An exception will be thrown when you try to insert 2 equal keys.
- ixUnique specifies an unique index. Duplicate key entries will be ignored.
- ixDescending specifies reverse sorting order.
- ixCaseInsensitive is not used.
- ixExpression need not be given; it is autodetected when the Fields parameter is parsed.

6.2 BatchMove

```
procedure TDbf.BatchMove(DataSet: TDataSet; FileName: string; DateTimeAsString: Boolean; Level: Integer;
Mode: TDbfBatchMode; Options: TDbfBatchOptions; FieldMappings: TStrings);
```

This function performs a batch operation on the dataset using DataSet as the source dataset.

Mode can be bmAppend or bmCopy, other modes are not currently supported. When mode is bmAppend, records from the source dataset are appended to the existing dataset. When mode is bmCopy, records in the source dataset are copied to a new dataset, in the same way as the CopyFrom method.

When Mode is bmCopy, FileName is the complete (including path and extension) filename of the new table and Level is the TableLevel of the new table.

DateTimeAsString is defined in the CopyFrom documentation and the OnCopyDateTimeAsString event is called as defined in the CopyFrom documentation.

Options is used to request optional features. Use the boUsePhysicalfieldNo option if you want the default field mapping to be determined by physical field number (first source field is copied to the first destination field, second source field is copied to the second destination field, etc.) instead of by field name.

If FieldMappings is not nil, it overrides the default field mappings. Each line is used to map a source field name to a destination field and is equal to the source field name, an = and the destination field name concatenated.

This is similar to the BDE TTable.BatchMove method.

6.3 *CancelRange*

```
procedure CancelRange;
```

{From Borland Help} Call CancelRange to remove a range currently applied to a table. Canceling a range reenables access to all records in the dataset.

6.4 *CheckDbfFieldDefs*

```
procedure CheckDbfFieldDefs (DbfFieldDefs: TDbfFieldDefs);
```

Checks if you used invalid field types in your TDbfFieldDef definitions taking into account the current TableLevel. When using TableLevel smaller than 7, not all types are possible.

6.5 *ClearCalcFields*

```
procedure ClearCalcFields (Buffer: PChar); override;
```

An internal method.

6.6 *CloseIndexFile*

```
procedure CloseIndexFile(const AIndexName: string);
```

An opened indexfile by OpenIndexFile, or by settings Indexes property, can be closed by calling CloseIndexFile. The particular index will not be maintained any longer.

6.7 *CompactIndexFile*

```
procedure CompactIndexFile(const AIndexFile: string);
```

CompactIndexFile is alike RepageIndexFile, the argument is compatible, and it also tries to reduce the index file size. However it will do this better, but slower, than RepageIndexFile. It compacts the index file so that it uses the minimum amount needed for the index, while usual AddIndex/RepageIndexFile leaves gaps in the index tree. Note that, when you start inserting or modifying keys after calling this function, the index file will slowly start to grow again to usual size.

6.8 *CompareBookmarks*

```
function CompareBookmarks (Bookmark1, Bookmark2: TBookmark): Integer; override;
```

{From Borland Help} Call CompareBookmarks to determine if two bookmarks are identical or not. Bookmark1 and Bookmark2 are the bookmarks to compare.

If the bookmarks differ, CompareBookmarks returns 1. If the Bookmarks are identical, or both bookmarks are NULL, CompareBookmarks returns 0.

6.9 CompareKeys

```
function TDbf.CompareKeys(Key1, Key2: PAnsiChar): Integer;
```

This function assumes that Key1 and Key2 are index keys for the current index, which was specified using the IndexName property.

This compares the two index keys. The result is 0 if the keys are equal, negative if Key1 is less than Key2 or positive if Key1 is more than Key2.

6.10 CopyFrom

```
procedure CopyFrom(DataSet: TDataSet; FileName: string; DateTimeAsString: Boolean; Level: Integer);
```

Use this procedure to copy the contents of a given DataSet into a new TDbf table. DataSet is the TDataSet you want to copy from, FileName is the complete (including path and extension) filename of the new table. DateTimeAsString determines whether datetime fields should be converted to string fields in the target table. This is especially useful if you want to use TDbf to create mailing sources for a text processor for example. If this parameter is set True an event OnCopyDateTimeAsString is triggered where you can override the default datetime-to-string conversion which is based on your current local settings. Level determines the TableLevel of the target table.

In order to convert prior TDbf version 6.0 datetime values into a BDE compatible format use this procedure as follows: drop two instances of TDbf on a form, set DateTimeHandling of TDbf1 to dtDateTime and connect it with the existing table. Make sure TDbf2 is set to dtBDETimeStamp and call CopyFrom with DataSet = TDbf1 and DateTimeAsString = False. You can then replace the old table with the new one and use TDbf in dtBDETimeStamp mode in your application.

6.11 CreateBlobStream

```
function CreateBlobStream(Field: TField; Mode: TBlobStreamMode): TStream; override; {virtual}
```

{From Borland Help} Call CreateBlobStream to obtain a stream for reading data from or writing data to a binary large object (BLOB) field. The Field parameter must specify a TBlobField component from the Fields property array. The Mode parameter specifies whether the stream will be used for reading, writing, or updating the contents of the field.

Blob streams are created in a specific mode for a specific field on a specific record. Applications should create a new blob stream every time the record in the dataset changes rather than reusing an existing blob stream.

6.12 CreateTable

```
procedure CreateTable;
```

Call CreateTable at runtime to create a table using this datasets current definitions. If the table already exists, CreateTable overwrites the tables structure and data.

If the FieldDefs property contains values, these values are used to create field definitions. Otherwise the Fields property is used. One or both of these properties must contain values in order to create a database table.

If the Indexes property contain values, these values are used to create indexes on the table.

See also CreateTableEx.

6.13 *CreateTableEx*

```
procedure CreateTableEx(DbffieldDefs: TDbffieldDefs);
```

Call CreateTableEx to create a table using given field definitions. These dbf field definitions give more power, as you can specify precision for numeric fields, for example.

6.14 *DeleteIndex*

```
procedure DeleteIndex(const AIndexName: string);
```

AIndexName specifies an index to remove.

- If this index is contained in the accompanying MDX file, it will be removed there.
- In the case of an NDX file, it will be closed, detached, then removed from disk.

6.15 *DeleteMdxFile*

```
procedure DeleteMdxFile;
```

This deletes the MDX index file and detaches it (ie. clears the MDX flag in the DBF header).

6.16 *EmptyTable*

```
procedure EmptyTable;
```

The EmptyTable method deletes all records from the table. It retains the current field and index structure.

6.17 *EndExclusive*

```
procedure EndExclusive;
```

If you are done operating in exclusive mode, call EndExclusive to return to the previous mode.

6.18 *ExtractKey*

```
procedure ExtractKey(KeyBuffer: PChar);
```

KeyBuffer: you need to provide a buffer of length 100 characters minimal.

If an index is selected, the function will extract the key from the current record's buffer and copy it into KeyBuffer.

6.19 *GetFieldData*

```
function GetFieldData(Field: TField; Buffer: Pointer): Boolean; override;
```

{From Borland Help} Most applications do not need to call GetFieldData. TField objects call this method to implement their GetData method.

The Field or FieldNo parameter indicates the field whose data should be fetched. Field specifies the component itself, while FieldNo indicates its field number. The Buffer parameter is a memory buffer with sufficient space to accept the value of the field as it exists in the database (unformatted and untranslated). NativeFormat indicates whether the dataset fetches the field in C++Builders native format for the field type. When NativeFormat is false, the dataset must convert the field value to the native type. This allows the field to handle data from different types of datasets (ADO-based, BDE-based, and so on) in a uniform manner.

GetFieldData returns a value that indicates whether the data was successfully fetched.

GetFieldData returns true if the buffer is successfully filled with the fields data, and false if the data could not be fetched.

6.20 *GetAllIndexFiles*

```
procedure GetAllIndexFiles(Strings: TStrings);
```

Returns all *.ndx in the directory of the dbf file, ie. which are possible candidates to open with OpenIndexFile.

6.21 *GetFileNames*

```
procedure GetFileNames(Strings: TStrings; Files: TDbfFileNames); {  
$ifdef SUPPORT_DEFAULT_PARAMS} overload; {$endif}  
  
{$ifdef SUPPORT_DEFAULT_PARAMS}  
  
function GetFileNames(Files: TDbfFileNames = [dfDbf] ): string; overload; {$else} function  
GetFileNamesString(Files: TDbfFileNames (* = [dfDbf] *)) :  
string;  
{$endif}
```

Provide a TStrings instance, and the function will fill it with the currently opened filenames.

TDbfFileNames specifies what files to report:

- dfDbf: The main dbf filename

- dfMemo: The memo filename if any
- dfIndex: Any open index files

6.22 ***GetIndexNames***

```
procedure GetIndexNames(Strings: TStrings);
```

Strings specifies a list which upon return contains a list of all indexes. Entries in this list can be used to set the property IndexName.

6.23 ***GotoCommon***

```
function TDbf.GotoCommon(SearchKeyType: TSearchKeyType): Boolean;
```

This function assumes that you selected a particular index, using the IndexName property, put the dataset into dsSetKey mode using the SetKey method and populated the key buffer.

The key buffer is used to generate a key to search for in the active index. The result of the search is the same as if SearchKey were called with this key.

6.24 ***GotoKey***

```
function TDbf.GotoKey: Boolean;
```

This function is equivalent to the GotoCommon function with the SearchType parameter set to stEqual.

This is similar to the BDE TTable.GotoKey method.

6.25 ***GotoNearest***

```
procedure TDbf.GotoNearest;
```

This function is equivalent to the GotoCommon function with the SearchType parameter set to stGreaterEqual.

This is similar to the BDE TTable.GotoNearest method.

6.26 ***InitFieldDefsFromFields***

```
{ $ifndef DELPHI_5 }  
procedure InitFieldDefsFromFields;  
{ $endif }
```

InitFieldDefsFromFields is an internal method used in various functions, CreateTable for example. It creates field definitions for a given set of Fields. This

function is only needed for

Delphi 4 and older, because in Delphi 5 and later, this function is implemented in TDataSet.

6.27 *IsDeleted*

```
function IsDeleted: Boolean;
```

Call IsDeleted to check if the current record is marked as deleted. This can only be true if the property ShowDeleted is true.

6.28 *Locate*

```
function Locate(const KeyFields: string; const KeyValues: Variant; Options: TLocateOptions): Boolean;  
override;
```

Call Locate to search a dataset for a specific record and position the cursor on it.

KeyFields is a string containing a semicolon-delimited list of field names on which to search.

KeyValues is a variant array containing the values to match in the key fields. If KeyFields lists a single field, KeyValues specifies the value for that field on the desired record. To specify multiple search values, pass a variant array as KeyValues.

Options is a set that optionally specifies additional search latitude when searching on string fields. If Options contains the loCaseInsensitive setting, then Locate ignores case when matching fields. If Options contains the loPartialKey setting, then Locate allows partial-string matching on strings in KeyValues. If Options is an empty set, or if the KeyFields property does not include any string fields, Options is ignored.

Locate returns true if it finds a matching record, and makes that record the current one. Otherwise Locate returns false.

If you enter one keyfield to search on, and it matches an open index, then it will use that index to do the search. In that case, Options will be ignored, as if you specified loPartialKey.

6.29 *LocateRecord*

```
function LocateRecord(const KeyFields: string; const KeyValues: Variant; Options: TLocateOptions;  
bSyncCursor: Boolean): Boolean;
```

This is an internal method that does the actual work for the Locate functions.

6.30 *LockTable*

```
function LockTable(const Wait: Boolean): Boolean;
```

Call LockTable to lock the whole table. Wait specifies whether the component should wait to actually get to lock, or fail if the lock cannot be applied.

The difference between LockTable and Exclusive mode is that in Exclusive mode, others cannot open the file anymore, except when ReadOnly is true, but when LockTable is called, they can still open the file in read write mode. When LockTable has succeeded others cannot alter records, because all attempts to lock an individual record will fail.

6.31 *OpenIndexFile*

```
procedure OpenIndexFile(IndexFile: string);
```

Call OpenIndexFile to attach IndexFile, a secondary, non-maintained index file, for example an NDX file, to the DBF file. While the index file is attached, it will be maintained.

6.32 *PackTable*

```
procedure PackTable;
```

Call PackTable to actually remove records marked for deletion. When records are deleted, they are just marked. When PackTable is called, these records will be physically removed. As is, it will call RestructureTable with a nil pointer for DbfFieldDefs, and true for Pack.

6.33 *PrepareKey*

```
function PrepareKey(Buffer: Pointer; BufferType: TExpressionType): PChar;
```

This function converts a key from a given type into the internal type. This is useful for numeric indexes: a pointer to an integer or int64, with BufferType etInteger or etInt64, will return the same key in BCD format. The result can then be used in a call to SearchKeyPChar.

Note: the result is a temporary buffer, which is invalidated by the next call to a tdbf method!

6.34 *RegenerateIndexes*

```
procedure RegenerateIndexes;
```

Clears all attached indexes, then recreates them from scratch.

6.35 *RepageIndexFile*

```
procedure RepageIndexFile(const AIndexFile: string);
```

When the size of an index file is watched, it can be noticed that the size will not decrease when an index is removed. This functions will “repage” the given index file to attempt to reduce it’s size. Enter an empty string to repage the accompanying MDX file of the table. The effect of RepageIndexFile and recreating all indexes in the index file is about the same, however, RepageIndexFile will be much quicker. RepageIndexFile can be thought of as a “PackTable” for a given index file. NOTE: you need enough memory for this operation because a temporary index file will be created in memory and then written to disk.

6.36 *RestructureTable*

```
procedure RestructureTable (DbfFieldDefs: TDbfFieldDefs; Pack: Boolean);
```

Call RestructureTable to change the field structure of the current table.

DbfFieldDefs allows you to specify the new structure. Each fielddef contains a property CopyFrom, which is the index of field from which to copy information. Fields with index that are not mentioned in any DbfFieldDef's CopyFrom, will be dropped. If you Assign to copy a table's DbfFieldDefs to a new list for modification, then the CopyFrom property of the new list's fielddefs will be automatically assigned, except for Delphi 3 users. So Delphi 3 users beware, specify CopyFrom property correctly to prevent fields from getting dropped without you wanting it!

If DbfFieldDefs is assigned, the table is restructured and it keeps a copy of the current files.

If DbfFieldDefs is not assigned, the structure remains the same and it deletes the current files.

Pack specifies whether to pack the table, that is, to remove records marked for deletion.

See RestructureTable2.

Example

```
NewFieldDefs: TDbfFieldDefs; NewFieldDef: TDbfFieldDef; Dbf1: TDbf;
// create new field list
NewFieldDefs := TDbfFieldDefs.Create(Self);
// assign current list
NewFieldDefs.Assign(Dbf1.DbfFieldDefs);
// assume first field is string, 20 wide, make larger to 40
NewFieldDefs.Items[0].Size := 40;
// rename second field to 'RENAMED'
NewFieldDefs.Items[1].FieldName := 'RENAMED';
// add a float field
NewFieldDef := NewFieldDefs.AddFieldDef;
NewFieldDef.FieldName := 'NEW_FLOAT';
NewFieldDef.FieldType := ftFloat;
NewFieldDef.Size := 10;
```

```

NewFieldDef.Precision := 3;
// restructure table and pack
Dbf1.Restructure(NewFieldDefs, true);
// restructure table and not pack
//Dbf1.Restructure(NewFieldDefs, false);
// free mem
NewFieldDefs.Free;

```

6.37 *RestructureTable2*

```
procedure RestructureTable2(DbffieldDefs: TDbffieldDefs; Pack, DeleteFiles: Boolean);
```

Call RestructureTable to change the field structure of the current table.

This is similar to RestructureTable, except that the DeleteFiles parameter controls whether to keep a copy of the current files (False) or delete them (True).

See RestructureTable.

6.38 *Resync*

```
procedure Resync(Mode: TResyncMode); override;
```

TDbf supports disabling of resync calls. See property DisableResyncOnPost.

6.39 *SearchKey*

```
function SearchKey(Key: Variant; SearchType: TSearchKeyType): Boolean;
```

```
function SearchKeyPChar(Key: PChar; SearchType: TSearchKeyType): Boolean;
```

This function assumes you selected a particular index, using the IndexName property.

Key specifies the value to search for in the active index. You can specify the key as a variant type, or pass a native buffer using the SearchKeyPChar function. In the native case, pass a buffer according to the following rules based on index and key type:

- String index: a pointer to the first character of a null-terminated character array.
- MDX, numeric: a pointer to a buffer containing a BCD, a binary coded decimal in dBase format.
- NDX, numeric: a pointer to a double.

SearchType is one of the following:

- stEqual searches exactly Key. Returns false if no key matches.
- stGreaterEqual searches exactly Key or, if not found, the record which key is greater. Returns false if end of file is found.
- stGreater searches the first record which key is greater than specified Key. Returns false if end of file is found.

When false is returned as result, the cursor is not moved.

6.40 *SetKey*

```
procedure TDbf.SetKey;
```

This puts the dataset in dsSetKey state and clears the key buffer. Setting field values will populate the key buffer which will then be used to search when calling the GotoKey, GotoNearest or GotoCommon method.

This is similar to the BDE TTable.SetKey method.

6.41 *SetRange*

```
procedure SetRange(LowRange: Variant; HighRange: Variant); procedure SetRangePChar(LowRange: PChar;  
HighRange: PChar);
```

This function assumes you selected a particular index, using the IndexName property. The function applies a range to the current dataset. LowRange specifies the lower bound and HighRange specifies the upper bound. For the parameter formatting of the SetRangePChar function, see SearchKeyPChar.

6.42 *Translate*

```
{ $ifdef DELPHI_4 }  
function Translate(Src, Dest: PChar; ToOem: Boolean): Integer; override; {virtual}  
{ $else }  
procedure Translate(Src, Dest: PChar; ToOem: Boolean); override; { virtual }  
{ $endif }
```

The data stored in a DBF file is written in a specific codepage, the “OEM” codepage. Windows uses the “ANSI” codepage to display data. This function translates between these codepages.

Specifying true for ToOem translates from Windows to DBF. Specifying false for ToOem translates from DBF to Windows.

6.43 *TryExclusive*

```
procedure TryExclusive;
```

Requires Active to be true. Call TryExclusive to try to get exclusive access to the open file, without having to call Close, set Exclusive to true and reopening. The property Exclusive will be properly updated to reflect the new status. Investigate the Exclusive property if this attempt was successful.

6.44 *Undelete*

```
procedure Undelete;
```

Call Undelete to unmark the current record as deleted.

6.45 *UnlockTable*

```
procedure UnlockTable;
```

When the table was locked with LockTable, call UnlockTable to unlock the table.

6.46 *UpdateIndexDefs*

```
procedure UpdateIndexDefs; override;
```

An internal method that calls update on the fielddefs, which in turn causes both the field and index definitions to be read from the dbase and index files.

6.47 *Zap*

```
procedure Zap;
```

An alias for EmptyTable.

7 Properties

7.1 *AbsolutePath*

```
property AbsolutePath: string read FAbsolutePath;
```

The absolute path for the current table. See FilePathFull.

7.2 BeforeAutoCreate

```
property BeforeAutoCreate: TBeforeAutoCreateEvent read FBeforeAutoCreate write FBeforeAutoCreate;
```

When a table does not exist, OpenMode is omAutoCreate and Open is called, this event will be fired. Implement BeforeAutoCreate to prevent the automatic creation of the table.

7.3 CodePage

```
property CodePage: Cardinal read GetCodePage;
```

Examine CodePage to determine the codepage the dbase data is stored in.

7.4 DateTimeHandling

```
property DateTimeHandling: TDateTimeHandling read FDateTimeHandling write FDateTimeHandling default dtBDETimeStamp;
```

Prior to version 6.0 TDbf used to store values in '@' (ftDateTime) fields as Delphi type TDateTime. To be compatible with the BDE, however, datetimes need to be stored as BDE type TimeStamp (which is milliseconds elapsed since 01/01/0001 plus one day). To provide backward compatibility you can use this property to determine whether TDbf will read and write datetime values as TDateTime or as BDE TimeStamp. Default now is dtBDETimeStamp but in order to read values in existing TDbf tables you need to choose dtDateTime. If you want to convert your data to be BDE compatible have a look at the new procedure CopyFrom.

7.5 DbfFieldDefs

```
property DbfFieldDefs: TDbfFieldDefs read GetDbfFieldDefs;
```

DbfFieldDefs lists the field definitions for a dataset, alike the TDataSet.FieldDefs, except that TDbfFieldDefs are better suitable for dbase tables. It includes information for native field types, and precision for numeric fields for example. See TDbfFieldDefs.

To access fields and field values in a dataset, use the Fields and FieldValues properties, and the FieldByName method.

7.6 DbfFile

```
property DbfFile: TDbfFile read FDbfFile;
```

An internally used property to retrieve access to the more lower level access functions. Application users should have no need to use this property.

7.7 DisableResyncOnPost

```
property DisableResyncOnPost: Boolean read FDisableResyncOnPost write FDisableResyncOnPost;
```

When a record is posted, TDataSet fetches all records in the “neighbourhood” of the current record. The property DisableResyncOnPost controls this behaviour. It can possibly increase speed if you’re adding a block of records. See also TDataSet::DisableControls.

7.8 ExactRecordCount

```
property ExactRecordCount: Integer read GetExactRecordCount;
```

Examine ExactRecordCount to determine the exact number of records in the current dataset. This takes into account deleted, filtered and indexed records. This is in contrast to RecordCount, which will always give a rough upper bound estimate. Note that this property needs to scan the complete dataset to find the number of records that are active, while RecordCount is just a simple calculation.

7.9 Exclusive

```
property Exclusive: Boolean read FExclusive write FExclusive default false;
```

Use Exclusive to prevent other instances from accessing a table while it is open in this instance. Before opening the table, set Exclusive to true. A table must be closed before changing the Exclusive property.

When Exclusive is true, then when the instance successfully opens the table, no other instance can access it. If the table for which the instance has requested exclusive access is already in use by another instance, an exception is thrown. To handle such exceptions, wrap the code that opens the table in a try..except/finally block. See also TryExclusive.

7.10 FilePath

```
property FilePath: string read FRelativePath write SetFilePath;
```

Examine FilePath to determine the user set file path of the current table. It can be relative to the current directory or an absolute path. See FilePathFull.

7.11 FilePathFull

```
property FilePathFull: string read FAbsolutePath write SetFilePath stored false;
```

Examine FilePathFull to determine the absolute path for the current table. It will always read the absolute path, whether a relative or absolute path was given in FilePath. Mostly used in the design time IDE, where you can set FilePath a relative path, then examine FilePathFull where the file is going to be opened or created.

7.12 Filter

```
property Filter: string read FFilter write SetFilterText;
```

The Filter property specifies a condition for a record to be displayed. Records not matching the condition are not displayed, they are skipped. Set the Filtered

property to true to activate the filter. Note that the OnFilterRecord event, see section 7.33, also excludes records from view, namely those for which you set Accept to false within the event handler.

7.13 *IndexDefs*

```
property IndexDefs: TDbfIndexDefs read FIndexDefs write SetDbfIndexDefs;
```

IndexDefs is a collection of index definitions, each of which describes an available index for the table. Define the index definitions of a table before calling CreateTable or creating a table at design time.

Ordinarily, an application accesses or specifies indexes at runtime through the IndexName and IndexFieldNames properties.

If IndexDefs is updated or manually edited, the StoreDefs property becomes true.

The index definitions in IndexDefs may not always reflect the current indexes available for a table. Before examining IndexDefs, call its Update method to refresh the list.

7.14 *Indexes*

```
property Indexes: TDbfIndexDefs read FIndexDefs write SetDbfIndexDefs stored false;
```

This property is deprecated in favour of the IndexDefs property, and may be removed in the future.

7.15 *IndexFieldNames*

```
property IndexFieldNames: string read GetIndexFieldNames write SetIndexFieldNames;
```

Use IndexFieldNames as an alternative method of specifying the index to use for a table. In IndexFieldNames, specify the name of each column to use as an index for a table. You can also specify an expression of an existing index. The column name specified in IndexFieldNames must already be indexed.

The IndexFieldNames and IndexName properties are mutually exclusive. Setting one clears the other.

7.16 *IndexName*

```
property IndexName: string read GetIndexName write SetIndexName;
```

Use IndexName to specify an alternative index for a table. If IndexName is empty, a table's sort order is based on its physical record order.

If IndexName contains a valid index name, then that index determines the sort order of records. The index name supplied to the IndexName property must either reside in the table's master index file, or in another index file already specified in the Indexes property or opened with OpenIndexFile.

IndexFieldNames and IndexName are mutually exclusive. Setting one clears the other.

7.17 *LanguageID*

property LanguageID: Integer read GetLanguageID write SetLanguageID;

Examine LanguageID to determine the codepage, locale combination the table is using. See Dbf Lang.pas to decipher the information. Set it before calling CreateTable to specify a codepage/locale combination for a table.

7.18 *LanguageStr*

property LanguageStr: String read GetLanguageStr;

Examine LanguageStr to read codepage, locale information for level 7 dbase tables.

7.19 *MasterFields*

property MasterFields: string read GetMasterFields write SetMasterFields;

Use MasterFields after setting the MasterSource property to specify the names of one or more fields to use in establishing a detail-master relationship between this table and the one specified in MasterSource.

MasterFields is a string containing one or more field names in the master table. Separate field names with semicolons.

Each time the current record in the master table changes, the new values in those fields are used to select corresponding records in this table for display.

7.20 *MasterSource*

property MasterSource: TDataSource read GetDataSource write SetDataSource;

Use MasterSource to specify the name of the data source component whose DataSet property identifies a dataset to use as a master table in establishing a detail-master relationship between this table and another one. The specified DataSource's DataSet must be another TDbf table.

At design time choose an available data source from the MasterSource property's drop-down list in the Object Inspector.

After setting the MasterSource property, specify which fields to use in the master table by setting the MasterFields property. At runtime each time the current record in the master table changes, the new values in those fields are used to select corresponding records in this table for display.

7.21 *OnCompareRecord*

property OnCompareRecord: TNotifyEvent read FOnCompareRecord write FOnCompareRecord;

This event is not used.

7.22 *OnCopyDateTimeAsString*

```
property OnCopyDateTimeAsString: TConvertFieldEvent read  
FOnCopyDateTimeAsString write FOnCopyDateTimeAsString;
```

Write an OnCopyDateTimeAsString event to provide a custom formatting of DateTime fields into string fields. See the CopyFrom procedure.

7.23 *OnFilterRecord*

```
TFilterRecordEvent = procedure(DataSet: TDataSet; var Accept: Boolean) of object;  
property OnFilterRecord: TFilterRecordEvent read FOnFilterRecord write SetOnFilterRecord;
```

If the Filtered property is true, this event is called for each record to determine whether it should be viewed, or should be skipped. If you set the Accept parameter to true, the record is viewed, if you set it to false, the record is skipped. See also the Filter property, section

7.15.

7.24 *OnIndexMissing*

```
property OnIndexMissing: TDbfIndexMissingEvent read FOnIndexMissing write FOnIndexMissing;
```

Write an OnIndexMissing event to inhibit the action taken when a table specifies that it had an index attached, but it is gone. The default is to break the link, but you can refuse to open the table.

7.25 *OnIndexInvalid*

```
TDbfIndexInvalidEvent = procedure(Sender: TObject; var Handled, DeleteLink: Boolean) of object;  
property OnIndexInvalid: TDbfIndexInvalidEvent read FOnIndexInvalid write FonIndexInvalid;
```

This event is called when an index is found to be invalid when opening a table with an MDX index file.

To continue without raising an exception, set Handled to True.

To detach the index file (ie. clear the MDX flag in the DBF header), set DeleteLink to True.

To delete and detach the index file, call the DeleteMdxFile method.

7.26 *OnLanguageWarning*

```
property OnLanguageWarning: TLanguageWarningEvent read FOnLanguageWarning write FOnLanguageWarning;
```

Write an OnLanguageWarning event to inhibit the action taken when a table's data is stored in a specific codepage, but this OS can not translate the data for

viewing into it's ANSI codepage. You can specify a readonly mode, or edit nonetheless.

7.27 *OnLocaleError*

```
property OnLocaleError: TDbfLocaleErrorEvent read FOnLocaleError write FOnLocaleError;
```

Write an OnLocaleError event to inhibit the action taken when index data is stored in a specific order, but this OS does not have the capability to sort records according to this sort order. You can try to read or even alter the index nonetheless, but the index can be easily corrupted if you do not know exactly what you are doing.

7.28 *OnProgress*

```
TPagedFileProgressEvent = procedure(Sender: TObject; Position, Max: Integer; var Aborted: Boolean; Msg: string) of object;
```

```
property OnProgress: TPagedFileProgressEvent read FOnProgress write FOnProgress;
```

The OnProgress event is called whenever progress is made during any of the following long-running operations.

- AddIndex
- BatchMove
- CopyFrom
- RegenerateIndexes
- RestructureTable
- PackTable

Position is the completeness of the current step in the range 0 to Max.

Msg is a message providing more details about the current step.

To abort the operation, set Aborted to True.

7.29 *OnTranslate*

```
property OnTranslate: TTranslateEvent read FOnTranslate write FOnTranslate;
```

Write an OnTranslate event to provide custom translating of the table's data into the OS "ANSI" codepage.

7.30 *OpenMode*

```
property OpenMode: TDbfOpenMode read FOpenMode write FOpenMode default omNormal;
```

OpenMode specifies what to do if a table does not exist by this name and Active is set to true, or Open is called.

- omNormal fails the open action if the file does not exist.
- omAutoCreate creates a new table as if CreateTable is called, and opens it.
- omTemporary is not used.

7.31 *PhysicalRecNo*

```
property PhysicalRecNo: Integer read GetPhysicalRecNo write SetPhysicalRecNo;
```

Examine PhysicalRecNo to determine the physical record number for the current record. It can be set to position the cursor on that record. The difference to RecNo is that reading RecNo returns the sequential record number which is the same if no indexes are active, but could be different if there is an index active.

7.32 *ReadOnly*

```
property ReadOnly: Boolean read FReadOnly write FReadonly default false;
```

ReadOnly specifies to open the file in read only mode. If it is true, the table's data can not be altered. You can open a table in read only mode although it is already open in exclusive mode.

7.33 *ShowDeleted*

```
property ShowDeleted: Boolean read FShowDeleted write SetShowDeleted default false;
```

ShowDeleted specifies whether or not to show the records marked for deletion. Use the IsDeleted function to determine if the current record is marked for deletion.

7.34 *Storage*

```
property Storage: TDbfStorage read FStorage write FStorage default stoFile;
```

This property specifies what kind of storage type is used: file or memory. If it is stoFile, you need to specify a FilePath and TableName where to open or create the file. When it is stoMemory, you need to specify a UserStream, which is then used as backend storage.

7.35 *StoreDefs*

```
property StoreDefs: Boolean read FStoreDefs write FStoreDefs default False;
```

If StoreDefs is true, the table's index and field definitions are stored with the data module or form. Setting StoreDefs to true makes the CreateTable method into a one-step procedure that creates fields, indexes, and validity checks at runtime.

StoreDefs is false by default. It becomes true whenever FieldDefs or Indexes is updated or edited manually; to prevent edited (or imported) definitions from being stored, reset StoreDefs to false.

7.36 *TableLevel*

```
property TableLevel: Integer read FTableLevel write SetTableLevel;
```

Examine TableLevel to find the current table level. Set TableLevel to specify the table level for to be created tables. The Active property must be false to be able to set TableLevel. These are the possible levels:

- 3: dBase III+ compatible.
- 4: dBase IV compatible. The only difference to dBase III+ is the current codepage, locale. dBase III+ uses no translation for the codepage and a binary sort order for the indexes.
- 7: Visual dBase VII. Not all features are supported, but these give an summary:
 - More field types: datetime, 32 bit integers, 64 bit doubles.
 - Default values for fields. This info can be found via the DbfFieldDef.HasDefault and DefaultBuf properties.
 - Min and Max values for fields are NOT supported, but can be read.
 - Referential integrity is NOT supported.
- 25: FoxPro compatible. The native field types are a bit different, but very comparable to dBase IV. CDX indexes are not supported.

7.37 *TableName*

```
property TableName: string read FTableName write SetTableName;
```

Use TableName to specify the file name of the database table this component encapsulates. You can specify a full filepath with filename, in which case the filepath part split and stored in the FilePath property.

To set TableName, the Active property must be false.

7.38 *UserStream*

```
property UserStream: TStream read FUserStream write FUserStream;
```

Use UserStream to specify a memory stream to be used for opening/creating a table. See also the Storage property.

7.39 Version

property Version: string read GetVersion write SetVersion stored false;

Examine Version to find the version of the TDbf component.

8 dBASE Reference

8.1 Key Types

The following are the possible combinations of level, key type and secondary key type in an index file:

| Level | Key Type | Secondary Key Type | Length | Null Value | Basic Type | Endianness | Sign Bit Reversed | Description | Comparison |
|-------|---------------|-----------------------------|----------|-------------------------------------|---------------------------------|---------------|-------------------|----------------------------|----------------------------|
| 3 | C (Character) | 0x00 (Character) | (varies) | 20 20... | String | n/a | n/a | String | Binary comparison |
| 4 | C (Character) | 0x00 (Character or Numeric) | (varies) | 20 20... | String | n/a | n/a | String | Depends on language driver |
| 7 | C (Character) | 0x00 (Character or Numeric) | (varies) | 20 20... or 00 00... | String | n/a | n/a | String | Depends on language driver |
| 3 | N (Numeric) | 0x01 (Numeric or Date) | 8 | 00 00 00 00 00 00 00 00 | Double precision floating point | Little endian | no | Null value is same as zero | Floating point arithmetic |
| 4 | N (Numeric) | 0x00 (Character or Numeric) | 12 | 34 01 00 00 00 00 00 00 00 00 00 00 | Binary Coded Decimal | n/a | n/a | Null value is same as zero | Floating point arithmetic |

| | | | | | | | | | |
|---|-------------------|-----------------------------|---|-------------------------|---------------------------------|---------------|-----|---|---------------------------|
| 3 | D (Date) | 0x01 (Date) | 8 | 7D C3 94 25 AD 49 B2 54 | Double precision floating point | Little endian | no | Julian Date, TDateTime + 2,415,019; null value is 10100 + 2,415,019 | Floating point arithmetic |
| 7 | @ (Date/Time) | 0x00 (Character or Numeric) | 8 | 00 00 00 00 00 00 00 00 | Double precision floating point | Big endian | yes | Same as DBF file; number of milliseconds since 1/1/0001 at midnight | Binary comparison |
| 7 | O (Double) | 0x00 (Character or Numeric) | 8 | 00 00 00 00 00 00 00 00 | Double precision floating point | Big endian | yes | Same as DBF file | Binary comparison |
| 7 | I (Integer) | 0x00 (Character or Numeric) | 4 | 00 00 00 00 | 32-bit signed Integer | Big endian | yes | Same as DBF file | Binary comparison |
| 7 | + (AutoIncrement) | 0x00 (Character or Numeric) | 4 | 00 00 00 00 | 32-bit signed Integer | Big endian | yes | Same as DBF file | Binary comparison |

8.2 File Locking Protocol

File locking is used with the .DBF file to control access to records and the file. The protocol is based on the behaviour of the BDE. There are 1,000,000,002 bytes of a dBASE file that are used to implement the lock protocol. A portion of the file beyond the physical file size can be locked.

- Offset 4,026,531,839 (0xEFFFFFFF) is used for file locking and will be referred to as f_2 .
- Offset 4,026,531,838 (0xEFFFFFFE) is used for file locking and will be referred to as f_1 .
- The 1 billion bytes starting at offset 3,026,541,838 (0xB46535FE) are used for record locking.
 - Offset 4,026,531,837 (0xEFFFFFFD) represents record number 1, and will be referred to as r_1 .
 - Offset 4,026,531,836 (0xEFFFFFFC) represents record number 2, and will be referred to as r_2 .
 - Offset 4,026,531,835 (0xEFFFFFFB) represents record number 3, and will be referred to as r_3 .
 - ...
 - Offset 3,026,541,839 (0xB46535FF) represents record number 999,999,999, and will be referred to as $r_{999999999}$.
 - Offset 3,026,541,838 (0xB46535FE) represents record number 1,000,000,000, and will be referred to as $r_{1000000000}$ or r_{\max} .

Note that this effectively limits the number of records to 1 billion, as there is no offset representing a larger record number, and effectively limits the size of a dBASE file to 3,026,541,838 bytes (about 2.89 GB), otherwise locking would interfere with writing.

When locking record number n for editing:

- Lock f_1
- Lock r_n
- Unlock f_1

When inserting record n :

- Lock f_1
- Lock f_2 (wait)
- Lock r_n
- Unlock f_1
- Unlock r_n
- Unlock f_2

When unlocking record number n after editing or inserting:

- Unlock r_n

When locking the table:

- Lock $f_1 - f_2$
- Lock $r_{\max} \dots r_1$
- Unlock $r_{\max} \dots r_1$

When unlocking the table:

- Unlock $f_1 - f_2$

8.3 References

Here are some other good references to information about dBASE and FoxPro.

- dBase .DBF File Structure – http://www.dbase.com/Knowledgebase/INT/db7_file_fmt.htm
- Visual dBASE 5.7 Language Reference – <http://www.dbase.com/manuals/57LanguageReference.zip>
- Visual dBASE 7.5 Language Reference – <http://www.dbase.com/manuals/75LanguageReference.zip>
- BDE Limits – http://www.dbase.com/help/BDE_Limits/IDH_BDE_LIMITS.htm
- XBase File Format Description (Clickety Click Software) – <http://www.clicketyclick.dk/databases/xbase/format/index.html>
- File Structures (Microsoft) – [http://msdn.microsoft.com/en-us/library/aa695883\(v=VS.71\).aspx](http://msdn.microsoft.com/en-us/library/aa695883(v=VS.71).aspx)
- Visual FoxPro Index Files (Microsoft) – [http://msdn.microsoft.com/en-us/library/xb5dh76z\(VS.80\).aspx](http://msdn.microsoft.com/en-us/library/xb5dh76z(VS.80).aspx)
- Table File Structure (Visual FoxPro Wiki) – <http://fox.wikis.com/wc.dll?Wiki~TableFileStructure>
- The History of FoxPro – <http://www.foxprohistory.org/>