

4D v11 SQL Maintenance and Security Center

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Technical Note 07-43

Abstract

The Maintenance and Security Center (MSC) in 4D v11 SQL is a new interface that is designed to repair, maintain, and provide information about the structure and data files. The MSC is available in all 4D developer and deployment applications. It is divided up into the following sections:

- Information
- Activity Analysis
- Verify
- Backup
- Compact
- Rollback
- Restore
- Repair

This Technical Note covers each of these sections.

Documentation

Documentation on the new MSC in 4D v11 SQL can be found at:

<http://www.4d.com/docs/4DDOCUS.HTM>

In addition, the upgrade manual contains some information and can be found at:

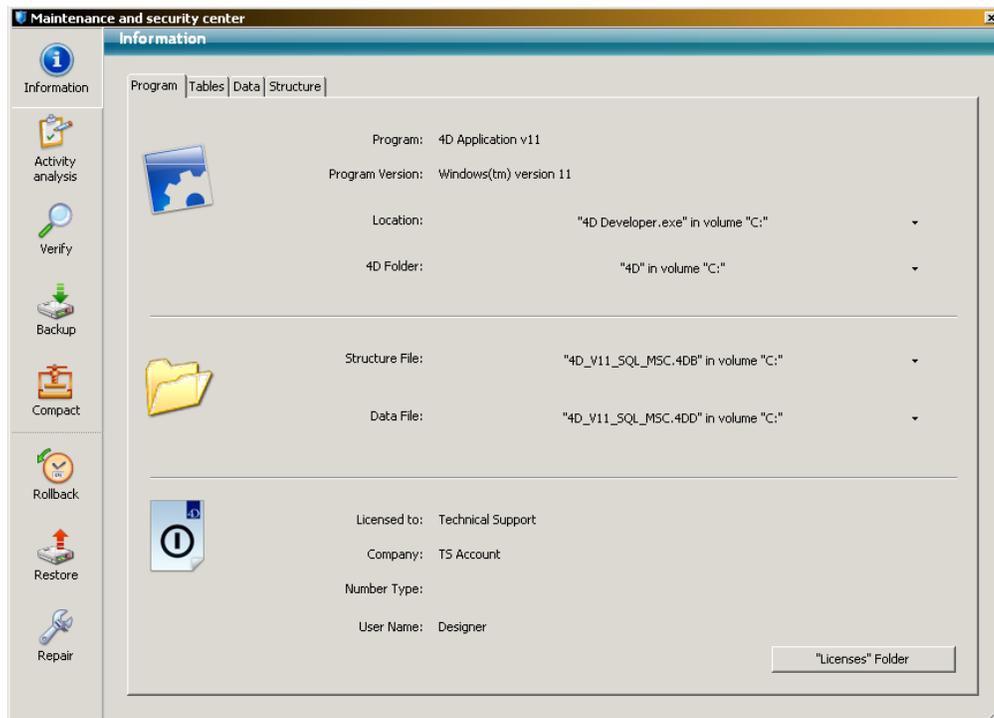
<http://www.4d.com/support/documentation.html>

MSC

The MSC is a collection of environments from previous versions of 4D. It contains pieces of the following:

- "About" dialog box – almost completely replaced.
- Open database dialog box – not completely replaced, but contains functionality from the Open database dialog box.
- Backup features – shows backup preferences and allows for a manual backup.
- 4D Tools application – replaces 4D Tools.

Since the 4D Tools functionality is in the MSC there is no 4D Tools product for 4D V11 SQL. Below is a screenshot of the MSC.



The MSC

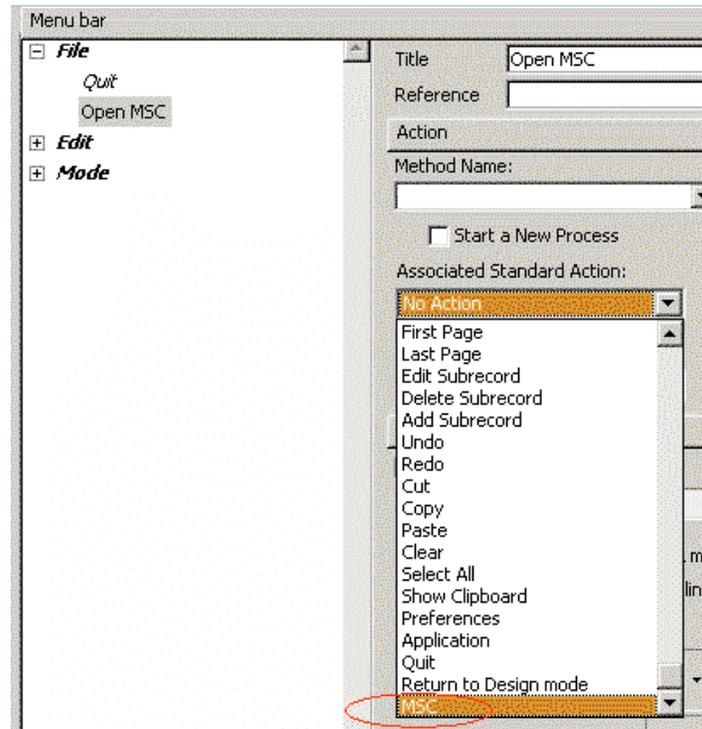
Options for Invoking the MSC

When the MSC is invoked, it enters into one of two modes, standard or maintenance. This section describes the different ways to open the MSC in these modes.

Standard Mode

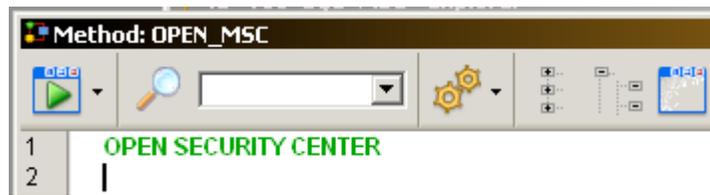
When using standard mode, the database is opened normally, meaning that it is still possible to access the Design and Application environment. Use standard mode when **NO** maintenance options need to be performed, but rather only when information is needed about the structure and data file. The only MSC sections or pages available in standard mode are Information, Activity Analysis, Verify, Backup and Restore. Trying to perform operations from the Compact, Rollback, or Repair sections will result in 4D prompting to change to maintenance mode.

In addition, the MSC can be opened in standard mode from the Help Menu, MSC Toolbar button (only available in Design mode), and from a custom menu by assigning the "Open MSC" standard action to a menu item or by using the **OPEN SECURITY CENTER** command.



Open MSC using a standard action, tied to a menu item

The screenshot above shows the MSC standard action being associated to the “Open MSC” menu item. Selecting this menu item in the Application environment will display the MSC.



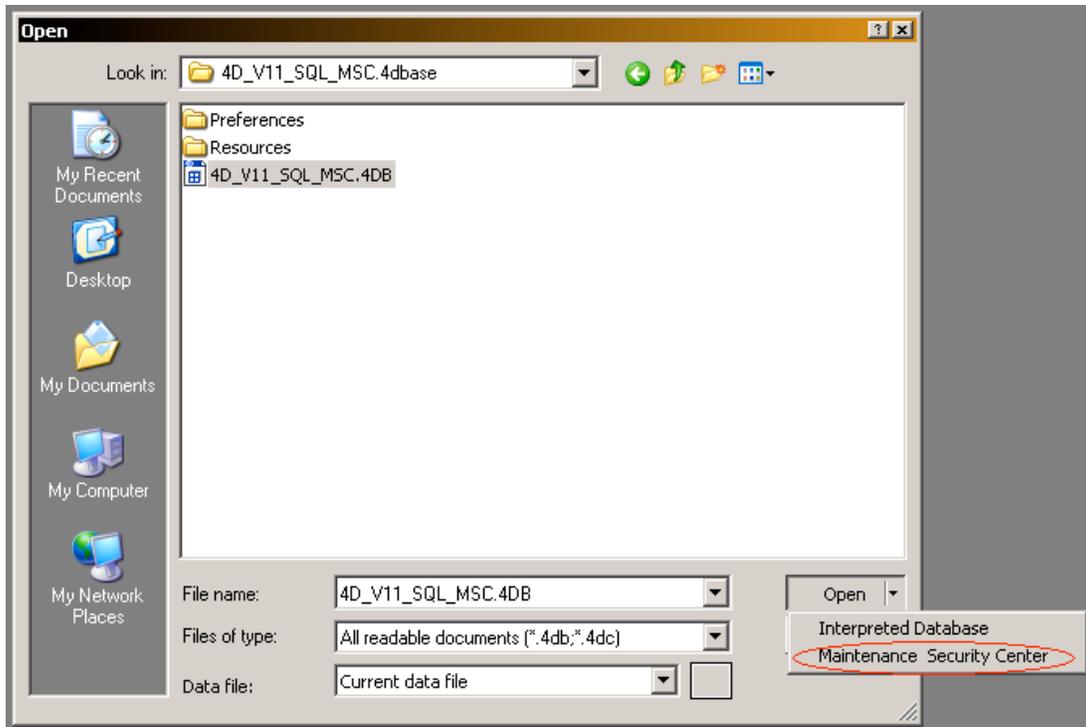
Open MSC using 4D code

The above picture displays the **OPEN SECURITY CENTER** command used in a method. When this command executes, it displays the MSC window.

Note: Some functions will be disabled in the MSC window due to the access rights of the user.

Maintenance Mode

Use maintenance mode when performing database operations such as compact, repair, rollbacks, restore. The structure and/or data file may be opened in this mode in two possible ways. The first is from the operating system’s open dialog box. The second is to use the MSC button from the toolbar within the Design environment. Below is a screenshot of both options.

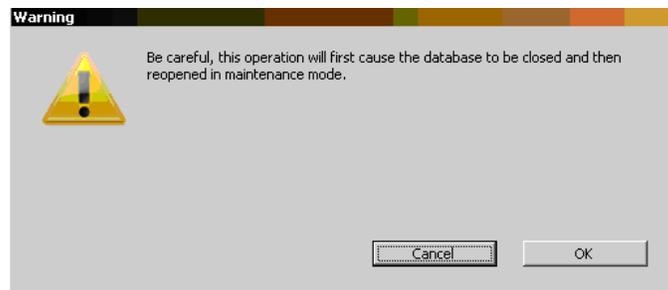


Open MSC using the open dialog on a Windows machine



Open MSC using the MSC toolbar button

In maintenance mode, only the MSC functionality is available to be performed on the structure and data file. In addition, there is no access to the Design and Application environment. When the structure file and/or data file are damaged the maintenance mode will be automatically invoked. Also, it is possible to enter maintenance mode when in standard mode. For example, trying to execute operations from the compact, repair, rollbacks, or restore in standard mode will display the following warning below.



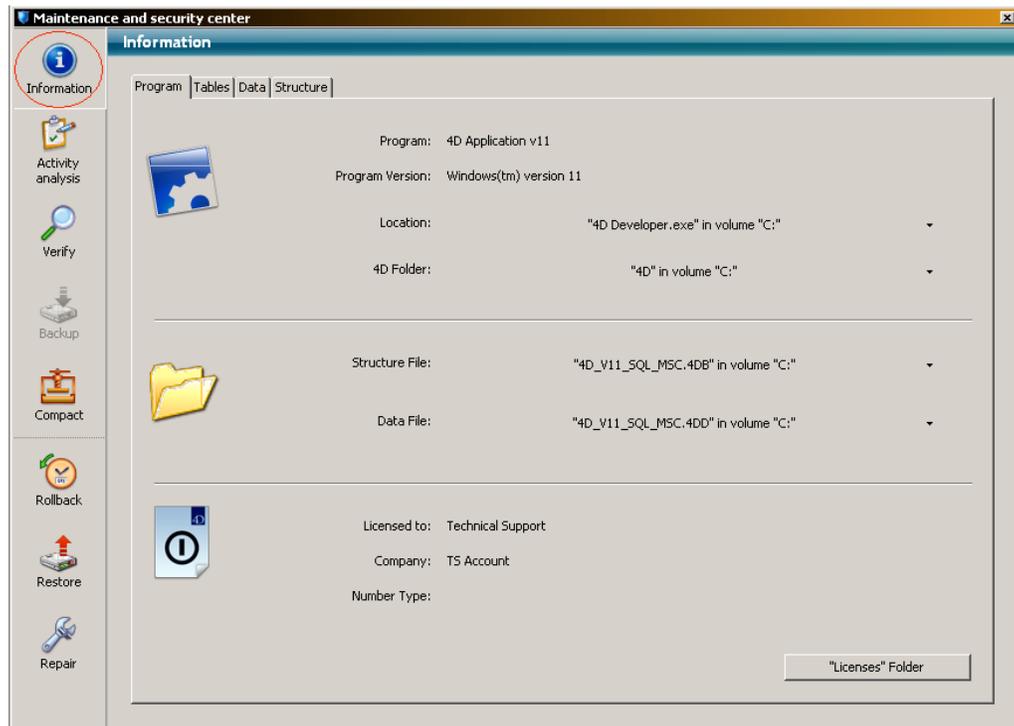
Selecting OK from this prompt will change MSC into maintenance mode.

Note: The compacting, repairing, rollback and restore functions can only be accessed by the Administrator or Designer users.

What makes up the MSC?

This section will provide information about each page in the MSC.

Information Page



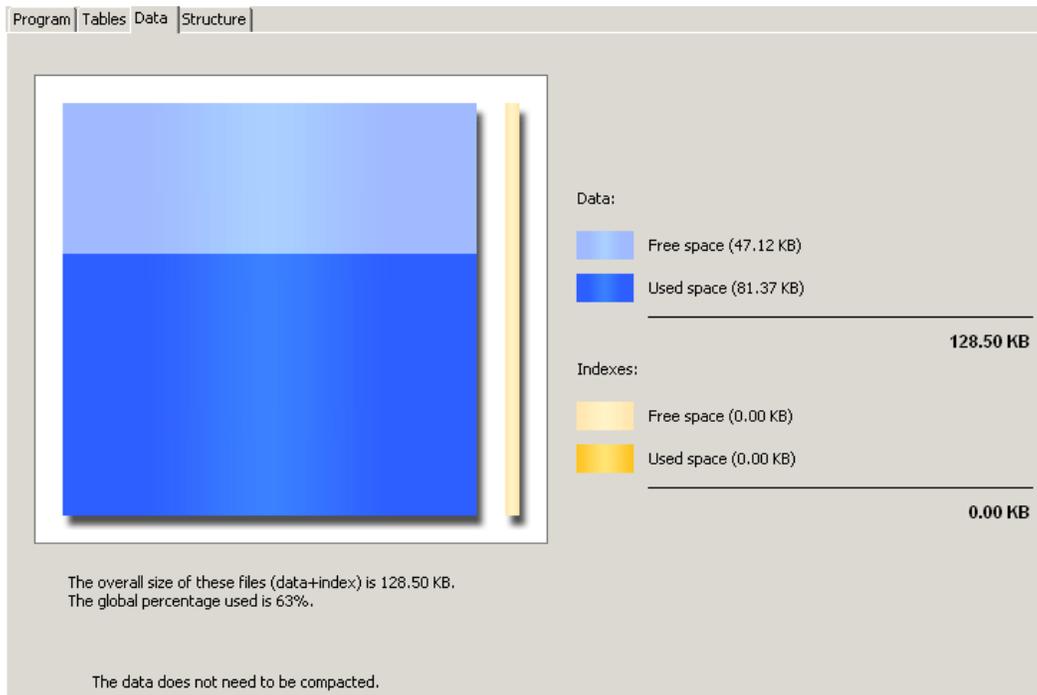
The Information Page

The Information page in the MSC provides information about the 4D environment, structure and data files. The *Program* and *Tables* tabs provide the same information found in previous versions of 4D's About box. The *Data* and *Structure* tabs provide graphical information about the sizing of the structure and data files. When necessary, warning icons will be displayed to provide notification that either the structure and/or data files are in need of maintenance. The *Data* and *Structure* tabs are not accessible when in maintenance mode, only in standard mode. The *Structure* tab is only available from inside 4D Developer and 4D Server.



A graphical representation of the Structure files sizing

The screenshot above shows how the space in a structure file might be represented in terms of free, used and total space. The dark green color is used to represent the amount of used space, while a light green color is used to represent the amount of free space in the structure file. In regards to the structure index, the dark orange color is used to represent the amount of used space, while a light orange color is used to represent the amount of free space.



A graphical representation of the Data files sizing

The screenshot above shows another graphical representation of used space versus free space, but it refers to the data file. The dark blue color is used to represent the amount of used space, while a light blue color is used to represent the amount of free space within the data file. Also the dark orange color is used to represent the amount of used space, while a light orange color is used to represent the amount of free space for data file indexes.

Activity Analysis Page

The list below shows all the performed operations recorded in the log file since the last backup.

Operation#	Action	Table	Record/BLOB	Process	Size	Date	Hour	User
0	Closing of Dat...					2007-11-07	15:43:45	
1	Opening of D...					2007-11-07	15:44:54	
2	Creation of a ...			5		2007-11-07	15:45:11	00000000000...
3	Addition	Companies	0	5	36	2007-11-07	15:45:11	
4	Addition	Companies	1	5	42	2007-11-07	15:45:18	
5	Addition	Companies	2	5	42	2007-11-07	15:45:24	
6	Deletion	Companies	2	5		2007-11-07	15:45:34	
7	Opening of D...					2007-11-07	16:21:27	
8	Closing of Dat...					2007-11-07	16:21:44	
9	Opening of D...					2007-11-08	07:42:32	

Right click in column headers to display specific fields.

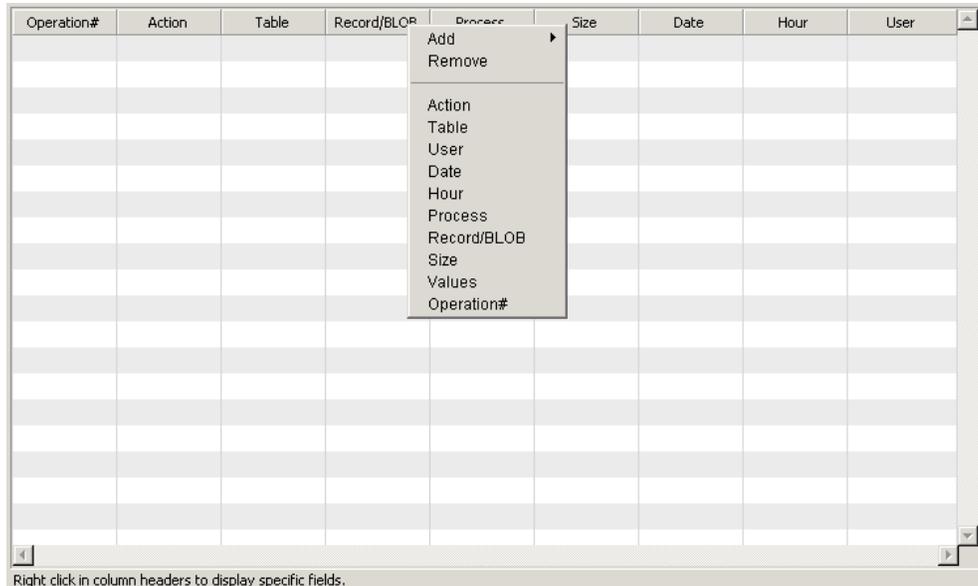
Buttons: Analyse, Browse..., Export...

The Activity Analysis Page

The Activity Analysis page is used to display all of the operations found in the log file. This is useful as now it is possible to easily view what operations have occurred in the database and can be used to audit the database activity. With the Action column displayed, the following types of actions are recorded:

- Closing of Data file
- Opening of Data file
- Addition
- Deletion
- Modification

In addition, the list is flexible enough to specifically display certain fields. In order to choose which fields to add or remove, simply right click on the header of each column to display a contextual menu displaying several items to choose from.



Contextual menu allowing adding or removing fields

The page also contains some buttons:

Analyze: Displays the contents of the current log file (datafilename.journal). For instance, if a log file from a different database is currently being viewed, clicking this button will display the log file currently opened by 4D.

Browse: Allows opening of another log file for the database. It is possible to open log files from other 4D v11 SQL databases.

Export: Allows exporting the contents of the Activity Analysis window to a text file. Below is an example of what the exported text file might look like.

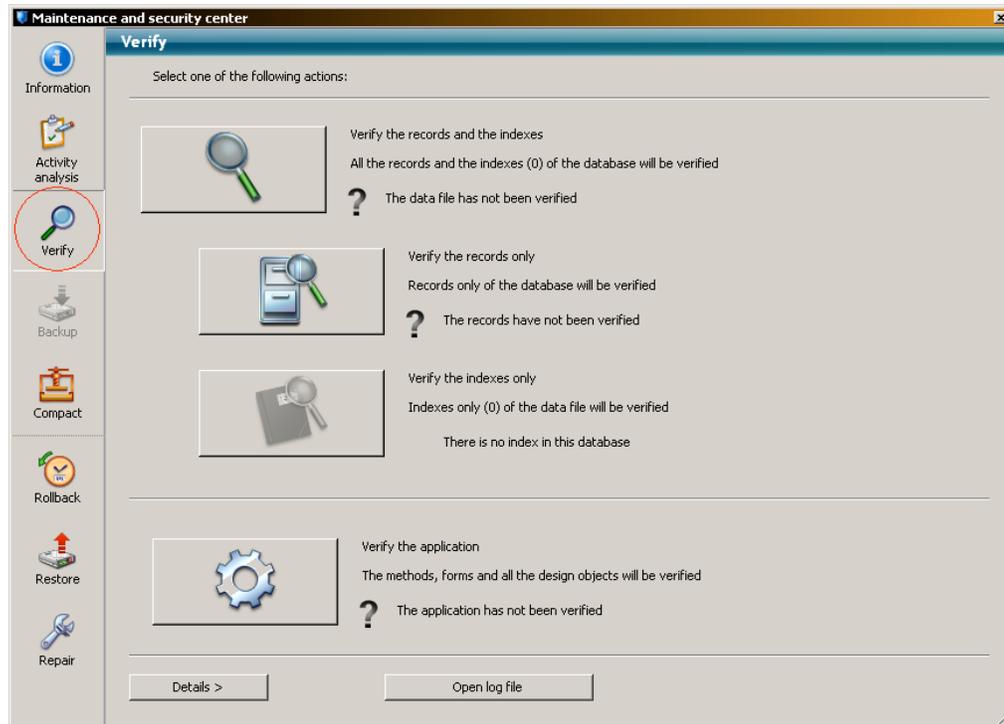
```

Operation#;Action;Table;Record/BLOB;Process;Size;Date;Hour;User
0;Closing of Data File;;;;2007-11-07;15:43:45;
1;Opening of Data File;;;;2007-11-07;15:44:54;
2;Creation of a Context;;;5;;2007-11-07;15:45:11;00000000000000000000000000000000
3;Addition;Companies;0;5;36;2007-11-07;15:45:11;
4;Addition;Companies;1;5;42;2007-11-07;15:45:18;
5;Addition;Companies;2;5;42;2007-11-07;15:45:24;
6;Deletion;Companies;2;5;;2007-11-07;15:45:34;
7;Opening of Data File;;;;2007-11-07;16:21:27;
8;Closing of Data File;;;;2007-11-07;16:21:44;
9;Opening of Data File;;;;2007-11-08;07:42:32;
10;Creation of a Context;;;46;;2007-11-08;08:02:09;00000000000000000000000000000000
11;Addition;Customers;0;46;54;2007-11-08;08:02:09;
12;Addition;Customers;2;46;48;2007-11-08;08:02:09;
13;Addition;Customers;3;46;48;2007-11-08;08:02:09;
14;Addition;Customers;4;46;48;2007-11-08;08:02:09;

```

Activity Analysis Export example

Verify Page



The Verify Page

The Verify page is used to check the integrity of the structure and data file which includes indexes, methods, forms, etc. If there is suspicion of data loss or integrity, use the Verify area to check the structure and data file for damage. If repairs are necessary, using the Repair page is advised. There are 4 options in the Verify page that can be used. All verification options produce an XML based log file that can be viewed. The following options are available:

- **Verify the records and the indexes**
Records and Indexes will both be verified.
- **Verify the records only**
Records only will be verified
- **Verify the indexes only**
Indexes only will be verified
- **Verify the application**
Database objects are verified (tables, methods, forms, etc). Records and Indexes are NOT verified.

The Verify page allows an XML log file to be generated. Upon using the Open Log File button the XML file is automatically converted from XML to HTML and rendered

in the default web browser. The resulting window is an HTML representation of the Log file for easy viewing. The HTML version is useful as it is much easier to read and understand than trying to traverse an XML file.

Below is an example.

4D_V11_SQL_MSC

Operation:	Verify
Structure file:	C:\Documents and Settings\Jason Slack\ACI-US\My Documents\4D Inc\Technical Notes\4D MSC\4D_V11_SQL_MSC.4dbase\4D_V11_SQL_MSC.4DB
Data file:	
OS:	Windows XP (5.1)
Started on:	2007-11-07T14:02:13+-7:00
Ended on:	2007-11-07T14:02:15+-7:00

[Show all / Hide all](#)
 [Show errors / Hide errors](#)
 [Show warnings / Hide warnings](#)

1. Opening the database in maintenance mode [OK]
2. Verify the internal database of the structure [OK]
3. Initialization of the resources for the verify operation [OK]
4. Check Database Methods [OK]
5. Check Trigger Methods [OK]
6. Check Project Methods [OK]
7. Check Project Forms [OK]
8. Check Table Forms [OK]
9. Check User and Group information [OK]
10. Check the folders of the Explorer [OK]
11. Check Orphan Methods [OK]

Rendered HTML version of the verify log file

The Verify page allows selectively choosing which tables as well as if records and indexes are verified for the selected tables by using the Details button located in the Verify page. This is a time saving approach versus always verifying everything in its entirety. Below is a screenshot.

	Tables	Action	Status
▼	<input checked="" type="checkbox"/> Customers	Verify all	?
	<input checked="" type="checkbox"/> Records	(101 record(s))	?
▼	<input checked="" type="checkbox"/> Invoices	Verify all	?
	<input checked="" type="checkbox"/> Records	(100 record(s))	?
▼	<input checked="" type="checkbox"/> Products	Verify all	?
	<input checked="" type="checkbox"/> Records	(100 record(s))	?
▼	<input checked="" type="checkbox"/> BackOrders	Verify all	?
	<input checked="" type="checkbox"/> Records	(100 record(s))	?
▼	<input checked="" type="checkbox"/> Companies	Verify all	?
	<input checked="" type="checkbox"/> Records	(102 record(s))	?

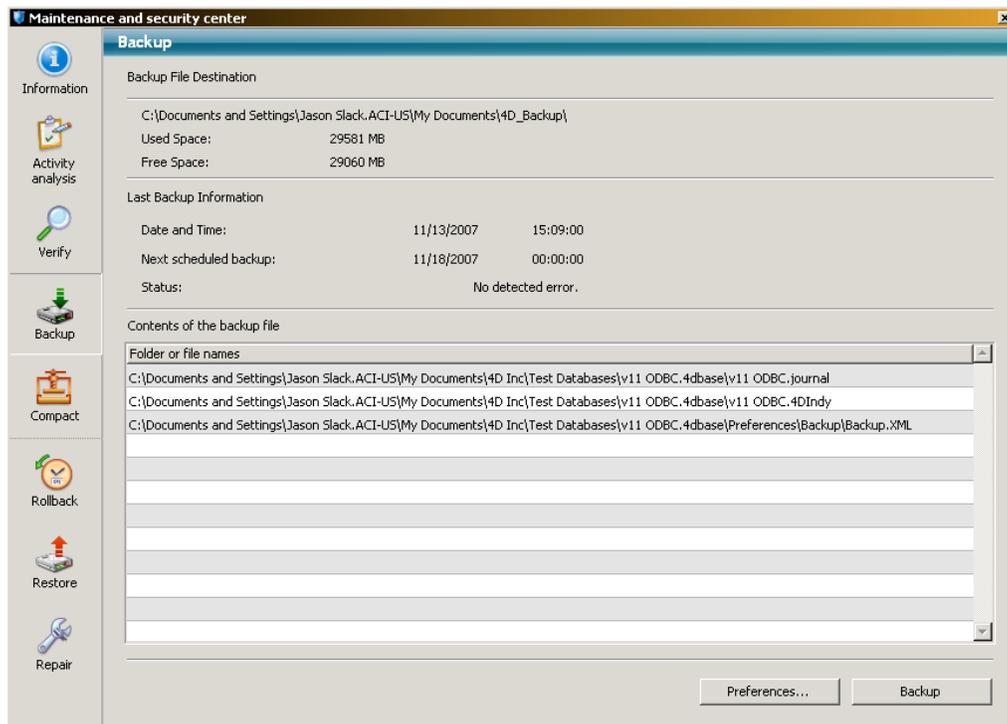
Selectively verifying tables, records and indexes

Here is an example of what the resulting log file might look like:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes" ?>
<verifylog operation="Verify" name="4D_V11_SQL_MSC" structure="C:\Documents and Settings\Jason
Slack.ACI-US\My Documents\4D Inc\Technical Notes\4D
MSC\4D_V11_SQL_MSC.4dbase\4D_V11_SQL_MSC.4DB" data="" os="Windows XP (5.1)">
<start_timer time="2007-11-07T14:02:13+-7:00" />
<step title="Opening the database in maintenance mode" />
- <step title="Verify the internal database of the structure">
  <step title="Check bit tables for segment 1" />
  <step title="Check bit tables for segment 65" />
  <step title="Checking auto sequence number definitions" />
  <step title="Checking chained list of deleted auto sequence number definitions" />
  <step title="Checking data table definitions" />
  <step title="Checking chained list of deleted table definitions" />
  <step title="Checking index definitions" />
  <step title="Checking chained list of deleted index definitions" />
- <step title="Load data tables">
  <step title="Checking data table headers" />
  <step title="Checking chained list of deleted data table headers" />
</step>
<step title="Checking BLOBs in table Resources" />
<step title="Checking list of deleted BLOBs in table Resources" />
<step title="Checking records in table Resources" />
<step title="Checking list of deleted records in table Resources" />
<step title="Checking index page addresses on B-tree Index 0 on kind (TYPE only)" />
<step title="Checking list of deleted index pages on B-tree Index 0 on kind (TYPE only)" />
<step title="Checking index pages on B-tree Index 0 on kind (TYPE only)" />
<step title="Checking index page addresses on B-tree Index 1 on stamp (stamp)" />
<step title="Checking list of deleted index pages on B-tree Index 1 on stamp (stamp)" />
<step title="Checking index pages on B-tree Index 1 on stamp (stamp)" />
<step title="Checking index page addresses on B-tree Index 2 on kind , id (TYPE and ID)" />
<step title="Checking list of deleted index pages on B-tree Index 2 on kind , id (TYPE and ID)" />
<step title="Checking index pages on B-tree Index 2 on kind , id (TYPE and ID)" />
</step>
</verifylog>
```

Sample Log file from Verify process

Backup Page



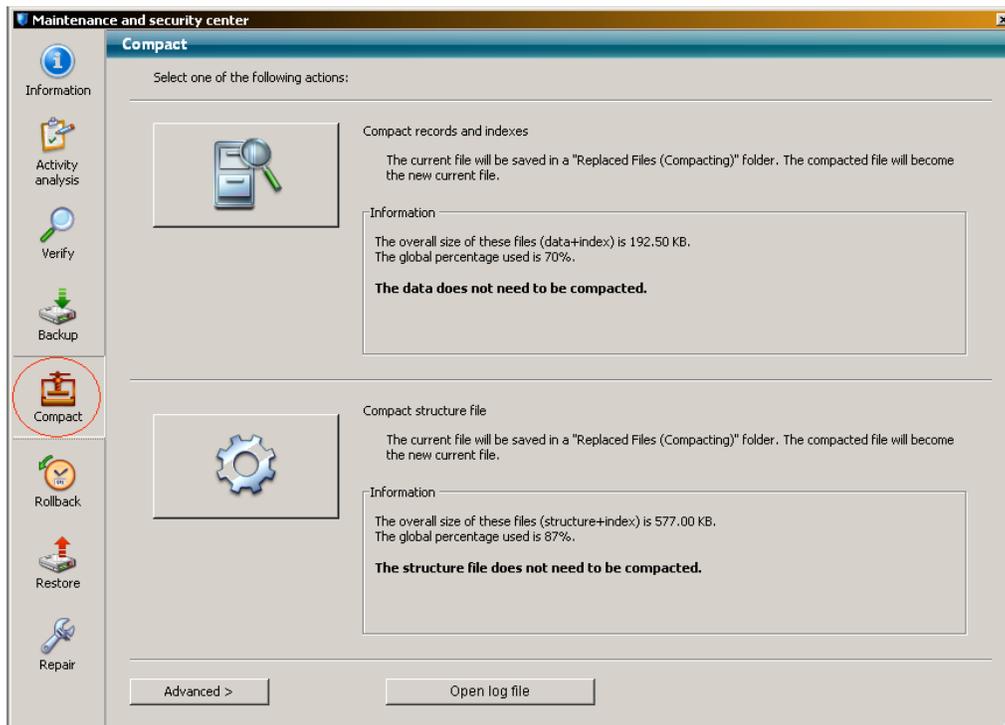
The Backup Page

Backing up the data is one of the most important tasks in a database, thus making sure constant backups are occurring without any error is critical. Using this page will help troubleshoot any backup issues that may occur. The page is also used to view the backup preferences as well as start a manual backup. It also displays the current free space and used space of the hard drive of the machine, which helps determine if old archives may need to be moved or deleted. In addition, the page also displays information about the last backup and the files that are included during each backup execution.

Note: The backup area is to view Backup preferences only. Modification of these preferences is not allowed. If modifications are necessary, use the Preferences button to open the backup Preferences inside of the 4D Preferences window.

Note: In 4D v11 SQL, the backup destination must be "local" to the machine where 4D is running on. It is no longer possible to backup to a network location.

Compact Page



The Compact Page

The Compact page is used to access the Structure and Data file compacting options.

The Structure and Data file can become "fragmented" or develop "holes" from deleting records as well as database objects such as forms, tables, methods, etc. This results in empty, unused space. 4D will attempt to re-use empty space when possible, but since data sizes vary, it is not always possible. The ratio of size of the data file and the actual space used is known as the "occupation rate". Low

occupation rates lead to database performance issues. Compacting reduces the empty space as well as organizes data and optimizes database performance. Compacting is only available in maintenance mode. When compacting, 4D copies the original files and puts them in a folder named "Replaced Files (Compacting)". When the compact is finished the original files are automatically replaced with the compacted files and the database is ready to be used again. Before the compact is started, here is a typical structure and data file:

 4D_V11_SQL_MSC.4DB	449 KB	Structure File	11/8/2007 2:57 PM
 4D_V11_SQL_MSC.4DD	257 KB	4D Data File	11/8/2007 2:57 PM

Start with a typical structure and data file

After compacting, the end result is a replaced folder that contains the original files.

 Replaced Files (Compacting) 2007-11-08 14-5...	File Folder	11/8/2007 2:57 PM
----------------------------------------------------------------------------------------------------------------------------------	-------------	-------------------

During compacting a Replaced Files folder is created

The original files are then copied back to the parent folder.

 4D_V11_SQL_MSC.4DB	449 KB	Structure File	11/8/2007 3:01 PM
 4D_V11_SQL_MSC.4DD	257 KB	4D Data File	11/8/2007 3:01 PM

After compacting the original files are replaced with the compacted files

Each Compact operation generates an XML based log file (named `databasename_compact_log`). This log can be viewed by using the Open Log File button. Below is an example of what the log file might look like.

4D_V11_SQL_MSC

Operation:	Compact
Structure file:	C:\Documents and Settings\Jason Slack.ACI-US\My Documents\4D Inc\Technical Notes\4D MSC\4D_V11_SQL_MSC.4dbase\4D_V11_SQL_MSC.4DB
Data file:	C:\Documents and Settings\Jason Slack.ACI-US\My Documents\4D Inc\Technical Notes\4D MSC\4D_V11_SQL_MSC.4dbase\4D_V11_SQL_MSC.4DD
OS:	Windows XP (5.1)
Started on:	2007-11-07T14:02:19+-7:00
Ended on:	2007-11-07T14:02:20+-7:00

[Show all / Hide all](#) [Show errors / Hide errors](#) [Show warnings / Hide warnings](#)

1. Opening the database in maintenance mode [OK]

2. Compact [OK]

- Checking auto sequence number definitions [OK]
- Load data tables [OK]
 - Checking data table headers [OK]
- Checking BLOBs in table Resources [OK]
- Checking records in table Resources [OK]
- Checking index definitions [OK]
 - Checking index page addresses on B-tree Index 0 on kind (TYPE only) [OK]
 - Checking list of deleted index pages on B-tree Index 0 on kind (TYPE only) [OK]
 - Checking index pages on B-tree Index 0 on kind (TYPE only) [OK]
 - Checking index page addresses on B-tree Index 1 on stamp (stamp) [OK]
 - Checking list of deleted index pages on B-tree Index 1 on stamp (stamp) [OK]
 - Checking index pages on B-tree Index 1 on stamp (stamp) [OK]
 - Checking index page addresses on B-tree Index 2 on kind , id (TYPE and ID) [OK]
 - Checking list of deleted index pages on B-tree Index 2 on kind , id (TYPE and ID) [OK]
 - Checking index pages on B-tree Index 2 on kind , id (TYPE and ID) [OK]
- Checking auto sequence number definitions [OK]

Compact Page HTML Log file

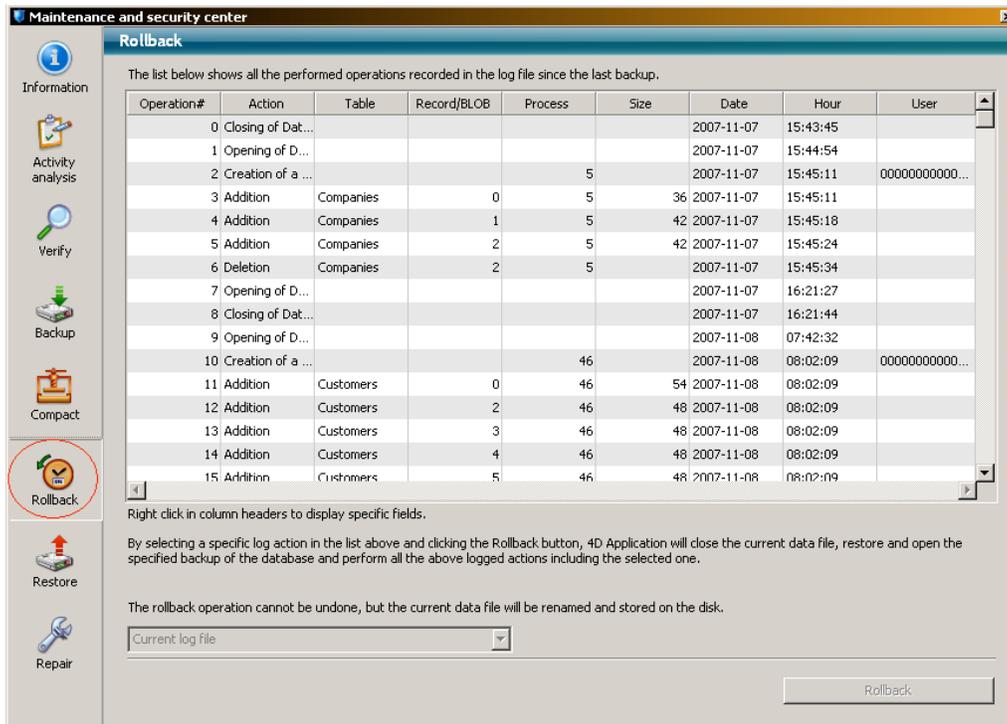
Note: It is important to realize that each compacting operation will create a “replaced Files (Compacting)” folder. This can significantly increase the size of the database folder. Clean out unnecessary files as needed.

The Compact page also contains an Advanced button that provides more functionality. The Compact page advanced options can be used to compact data files other than the current data file and/or disable automatic operations implemented in standard mode (duplication and replacement of original file). Below is a screenshot of the Compact page advanced features.



Compact Page advanced options

Rollback Page



The Rollback Page

The Rollback page allows access to the operations carried out in the database, based upon what is found in the log file. A ".journal" extension is appended to log files in 4D v11 SQL (the file type was .4DL in previous versions). This page is similar to the Activity Analysis page as it shows a list of operations that have been performed on the database. The rollback page is different in that it allows certain operations to be undone. For instance, if a record was deleted, it is possible with this feature to undo that deletion and continue on as if that deletion never occurred. In addition, this feature might help clear up any confusion of accidentally deleted records, questions about what records have been accessed and by whom. Essentially it is possible to audit the database activity.

Note: Rollback feature is not available if the log file is enabled. The MSC will display the rollback button icon as disabled.

To rollback an operation simply select the operation that needs to be rolled back and click the Rollback button.

9	Deletion	Table_1	0	5		2007-11-06	15:33:51	
---	----------	---------	---	---	--	------------	----------	--

Delete Operation that can be rolled back

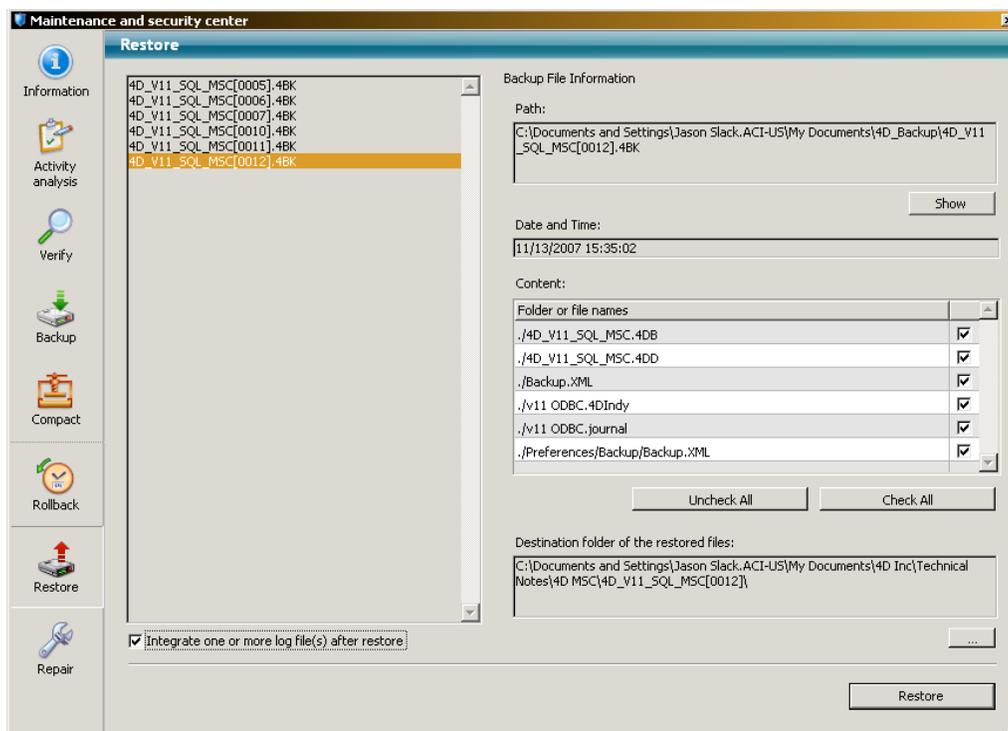
In order to rollback, 4D automatically closes and re-opens the database in maintenance mode. As explained in the "Maintenance Mode" section, a warning is displayed to confirm the operation.

After confirming the shift to maintenance mode, 4D will automatically rollback the operation that was selected. During the Rollback, a few files are created in the databases parent folder.

 rollback.tmp	File Folder	11/8/2007 3:10 PM
 4D_V11_SQL_MSC 2007-11-08 15h10m05.4DD	257 KB 4D Data File	11/8/2007 3:10 PM
 4D_V11_SQL_MSC 2007-11-08 15h10m06.journal	1 KB JOURNAL File	11/8/2007 3:10 PM

Files created during Rollback operation

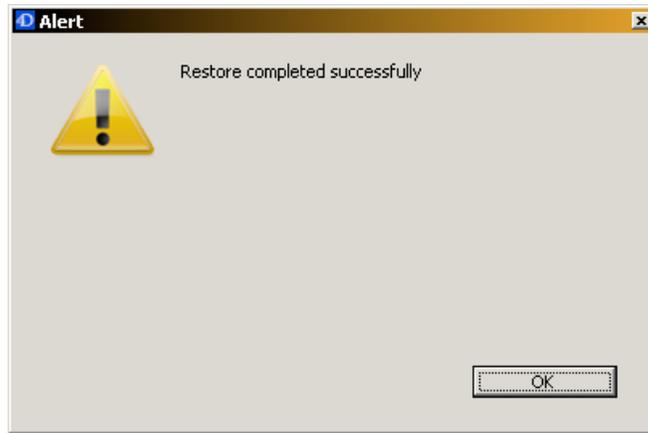
Restore Page



The Restore Page

The Restore page is used to view and restore critical database backups. Backups are listed and upon clicking a specific backup, the pertinent information is shown. These include: Path, Date/Time, Content of the backup, and Restoration location details. The Restore page provides the option to selectively restore files if needed.

Use the Restore button at the bottom of the page to perform the task. When the restore is completed a dialog appears confirming the restoration has been completed. Below is a screenshot.



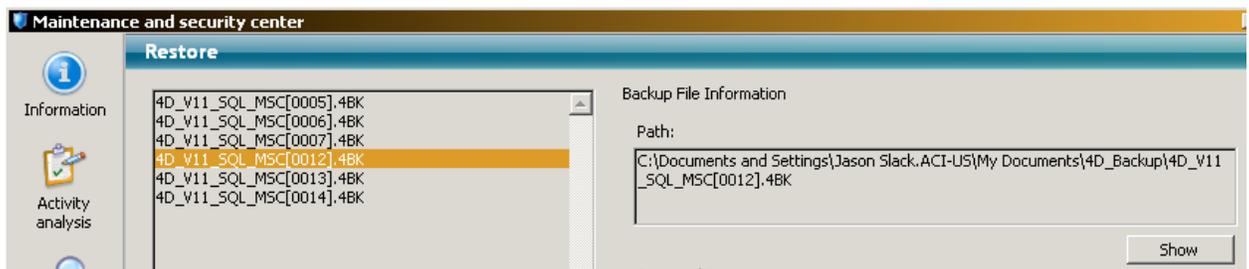
A successful restore

The 'Integrate one or more log file(s) after restore' option (shown in the picture above at the bottom left corner) can be used to successively integrate several log file backups into the database. This means it is possible to recover a data file even when the last database backup files are missing.

For example a backup is executed 5 days during the week. A power outage occurs on the last day of the week causing the data file to be corrupted and unusable. To make matters worse, the backups from Thursday and Wednesday are also corrupted. Therefore, the last usable backup was done on Tuesday. In order to bring this data up to speed, log files from Wednesday, Thursday, and Friday need to be integrated into the restored data from Tuesday.

Use the Restore area to perform this task. Here is an example:

1. Select the starting backup point.



2. Click Restore button.
3. In the Open File dialog select the log files to integrate. The corresponding log file is always numbered one behind the backup file. Below are the log file backups (.4BL) with the corresponding backup files (.4BK).

 4D_V11_SQL_MSC[0012].4BK	204 KB	4BK File	11/13/2007 3:35 PM
 4D_V11_SQL_MSC[0012].4BL	1 KB	4BL File	11/13/2007 4:05 PM
 4D_V11_SQL_MSC[0013].4BK	204 KB	4BK File	11/13/2007 4:05 PM
 4D_V11_SQL_MSC[0013].4BL	1 KB	4BL File	11/13/2007 4:10 PM
 4D_V11_SQL_MSC[0014].4BK	204 KB	4BK File	11/13/2007 4:10 PM

Available backups

If needing to restore 4D_v11_SQL_MSC[0012].4BL integrate log files in sequential order by selecting 4D_v11_SQL_MSC[0012].4BL, 4D_v11_SQL_MSC[0013].4BL and 4D_v11_SQL_MSC[0014].4BL.

The end result is a new, restored version of the database in a folder named 4D_V11_SQL_MSC[0012] (same name as the backup that was restored). Also corresponding integration folders are created for each log file that was integrated (in the above example the folder would be named 4D_V11_SQL_MSC[0012].integrate).

 4D_V11_SQL_MSC[0012].integrate	File Folder	11/13/2007 5:04 PM
 4D_V11_SQL_MSC[0013].integrate	File Folder	11/13/2007 5:04 PM

Integration folders generated

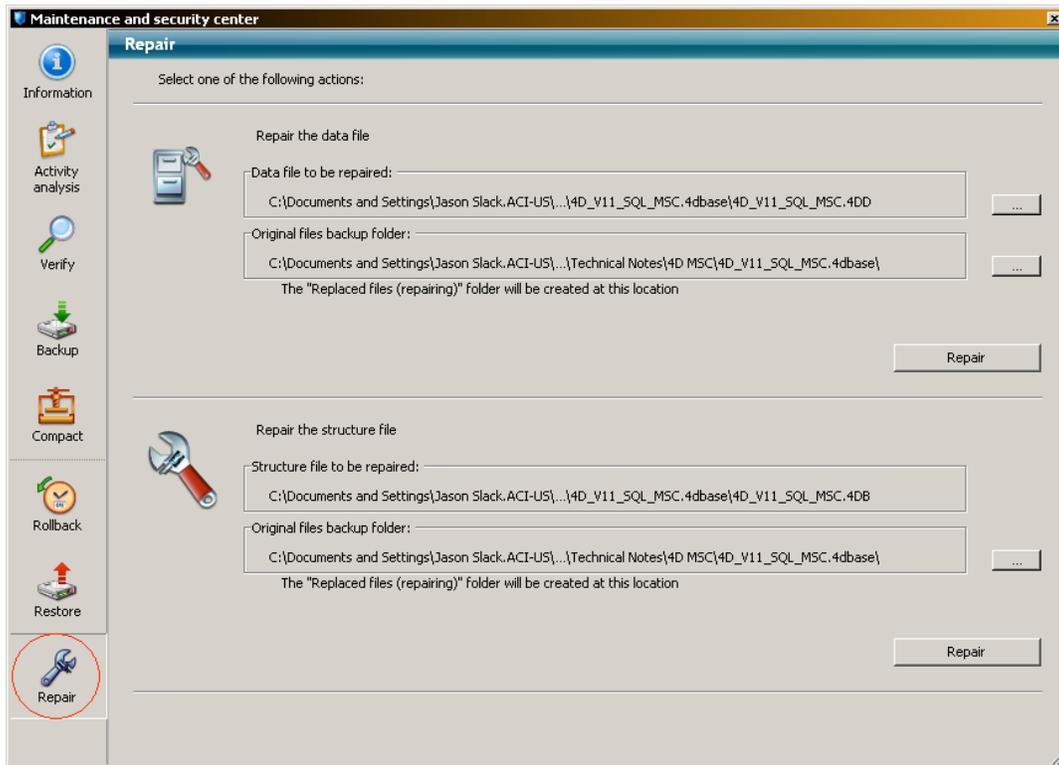
 4D_V11_SQL_MSC 2007-11-13 17h04m50.journal	1 KB	JOURNAL File	11/13/2007 5:04 PM
 4D_V11_SQL_MSC.journal	1 KB	JOURNAL File	11/13/2007 5:04 PM

Integration folders contents

Above is a screen shot of a typical integration folder after a restore. It contains the journal file that was integrated as well as a backup of the same file for safe keeping.

Once finished, the resulting files in 4D_V11_SQL_MSC[0012] folder are able to be used. The data file will be up to date and contains all of the data from the restore point plus the data from the log files that were integrated.

Repair Page



The Repair Page

The Repair page is used to repair the structure and data file when necessary. For instance if the application is currently suffering from a crash, it would be wise to repair the structure and data file.

When executing a repair, a message will be prompted explaining that the database will be opened in maintenance mode, if it is not already. When opened in maintenance mode the repair operation is performed and completed. The resulting parent folder contains:

 4D_V11_SQL_MSC.4DB	449 KB	Structure File	11/8/2007 3:30 PM
 4D_V11_SQL_MSC.4DD	257 KB	4D Data File	11/8/2007 3:30 PM
 Replaced Files (Repairing) 2007-11-08 15-29-59		File Folder	11/8/2007 3:30 PM

Repair files generated

A log file is also generated and can be viewed by using the Open Log File button. The log file might look something like:

4D_V11_SQL_MSC

Operation:	Repair
Structure file:	C:\Documents and Settings\Jason Slack\ACI-US\My Documents\4D Inc\Technical Notes\4D MSC\4D_V11_SQL_MSC.4dbase\4D_V11_SQL_MSC.4DB
Data file:	C:\Documents and Settings\Jason Slack\ACI-US\My Documents\4D Inc\Technical Notes\4D MSC\4D_V11_SQL_MSC.4dbase\4D_V11_SQL_MSC.4DD
OS:	Windows XP (5.1)
Started on:	2007-11-08T15:30:00+7:00
Ended on:	2007-11-08T15:30:01+7:00

[Show all](#) / [Hide all](#) [Show errors](#) / [Hide errors](#) [Show warnings](#) / [Hide warnings](#)

1. Opening the database in maintenance mode [OK]

2. Repair [OK]

- Checking auto sequence number definitions [OK]
- Load data tables [OK]
 - Checking data table headers [OK]
- Checking BLOBs in table Resources [OK]
- Checking records in table Resources [OK]
- Checking auto sequence number definitions [OK]
- Checking data table definitions [OK]
- Checking data table definitions [OK]
- Load data tables [OK]
 - Checking data table headers [OK]
- Checking BLOBs in table Customers [OK]
- Checking records in table Customers [OK]
- Checking BLOBs in table Invoices [OK]
- Checking records in table Invoices [OK]
- Checking BLOBs in table Products [OK]
- Checking records in table Products [OK]

Example HTML Log File

As with compacting, the application folder is significantly increased with each repair that is performed as a copy of the original files is saved.

Conclusion

The MSC is the “one stop” shop for keeping a database and its components in good working order. It is quick and easy to get the information needed as well as perform verification and repair items on the database.