

Seagate Info

APS System Database Migration and Clustering

Overview

This technical paper discusses the requirements and procedures necessary to ensure a proper migration of the Seagate Info APS system database, specifically,

- What are the requirements and steps needed to migrate the Info APS system database from the default Microsoft Access to one of the supported SQL-type databases?
- How is a clustered Info APS database created?

This document also outlines what is required before Info APS database migration is attempted; the steps involved in completing Info APS database migration; the steps required after Info APS database migration is completed; how to diagnose a problem with Info APS database migration, and the steps to install and cluster additional Info APS computers.

Three additional appendices discuss issues with specific SQL-type databases, general Info APS migration hints, and a specific Seagate Info (SI) 7 upgrade issue to be aware of before performing an Info APS database migration.

Contents

REQUIREMENTS BEFORE MIGRATING AN INFO APS DATABASE.....	2
INFO APS SYSTEM DATABASE MIGRATION STEPS	3
STEPS AFTER THE INFO APS DATABASE MIGRATION IS COMPLETE.....	6
HOW TO DIAGNOSE A PROBLEM WITH INFO APS DATABASE MIGRATION	7
STEPS TO INSTALL AND CLUSTER ADDITIONAL INFO APS COMPUTERS.....	7
APPENDIX A: DATABASE-SPECIFIC REQUIREMENTS FOR THE INFO APS	9
ORACLE (Upgrading an Oracle Info APS System Database).....	9
Microsoft SQL Server.....	10
Informix.....	10
APPENDIX B: GENERAL INFO APS DATABASE MIGRATION HINTS	11
APPENDIX C: SEAGATE INFO 7 SPECIFIC CHANGES\ISSUES	12
CONTACTING CRYSTAL DECISIONS FOR TECHNICAL SUPPORT	13

Requirements BEFORE Migrating an Info APS Database

There are two advantages to porting the Info APS system database to a supported SQL-type database. The first is that it allows for the implementation of Info APS clustering to enforce fault tolerance for the Info APS computers. The second is that SQL-type databases are better for handling a growing Info APS database as it is recommended that the database not be allowed to grow beyond 20 Meg if it is stored in Microsoft Access.

1. It is recommended that the Info APS be installed to a Microsoft Windows NT Server computer. The reason for this is that NT Server allows for unlimited user connections when creating directory shares. NT 4.0 Workstation is not recommended, as it is limited to 10 user connections only.
2. Only the following SQL-type databases are supported for storing the Info APS system database: Microsoft SQL Server, Oracle, Sybase System 10.x\11.x, and Informix.
3. It is recommended that you do **NOT** install the Info APS component to a computer that also stores the database server (i.e. DBMS), as both applications will compete for memory resources on the computer. Also, do **NOT** install an Info APS on a Primary Domain Controller (PDC) or a Backup Domain Controller (BDC).
4. Select a client\server SQL-type database to store the Info APS system database information (Microsoft SQL Server, Oracle, Sybase System 10.x\11.x, or Informix).
5. Create a database within the selected SQL DBMS Server and create a database user account that has **FULL** Administrative rights to the database. For example, you can name the database: *CINFO_SQL*.
6. Ensure that there is sufficient tempdb space on the SQL DBMS Server (at least 25% of the largest database).

NOTE	The tempdb should be made as large as possible, at least 25% of the largest database. If the database server computer has more than 64MB of RAM and is not running an Info APS, it is recommended that you use available RAM for the tempdb to increase performance.
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7. Install and configure the appropriate 32-bit database client on any computer that the Info APS is or will be installed to.
8. Ensure that you are logged on to NT using a DOMAIN user account (and NOT a local user account). This DOMAIN user account should be part of the local Administrators group. [This domain user account should be the same one that will eventually be used to run the SI server components as NT services.]

If the Info APS has already been installed and is using the default Microsoft Access database, complete the following BEFORE attempting to migrate the Info APS system database:

9. Info APS clustering for Oracle, Sybase 10\11, and Informix is **ONLY** supported using the Intersolv or MERANT ODBC drivers that ship with SI. These are: CR Oracle7, CR Oracle8, CR Sybase System 10, CR Informix, CR Informix7, and CR Informix9. APS clustering for Microsoft SQL Server is only supported using the SQL Server ODBC driver, *Sqldr32.dll*. This ODBC driver also ships with SI.

NOTE	The specific version of the Intersolv\MERANT ODBC drivers supplied and supported for the Info APS database will depend on the version of SI you are installing. For example, Oracle 8i
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	is not supported for the Info APS database until SI version 7.0.2.200 and requires the CR Oracle8 driver, Cror815.dll, and Oracle 8.1.6 client. Please check the product documentation, the Crystal Decisions web site or contact Technical Support to confirm that you are using a supported driver and database version. Using an unsupported driver could result in unrecoverable Info APS database corruption.
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10. In the ODBC Administrator, create an ODBC System data source (System DSN) that uses the correct ODBC driver, server, database, and user information.
11. First, test connectivity natively to the database client using one of the native connectivity tools that comes with the database client. If you are using an Oracle database client, run the "SQL Plus" program from the Oracle program group. If using a Microsoft SQL Server database client, run the "ISQL_W" program from the Microsoft SQL Server program group. If using a Sybase 10\11 database client, run the "WISQ32" program from the Sybase program group. (If you do not see "WISQ32" in the Sybase program group, run Wisql32.exe from the Sybase\Bin directory.) Alternatively, for Sybase 11.1.1 database clients, run the "SQL Advantage" program. If running an Informix database client, run the "ILogin 32 Demo" program from the Informix program group.

If you cannot connect natively in your database client connection tool, you will NOT be able to proceed. Please contact your Database Administrator to resolve this problem.

12. Test ODBC connectivity to the ODBC System DSN created in step 10. This can be done by using an ODBC connectivity tool, such as our Sqlcon32.exe, which can be downloaded from the Crystal Decisions web site at:
<http://support.crystaldecisions.com/communityCS/FilesAndUpdates/sqlcon32.zip>

Follow the Readme.txt instructions, which are included. [This utility also exists on the SI 7 CD in the Tools\Sqlconn\X86 directory.]

If you cannot connect via ODBC to the defined ODBC System DSN, you will NOT be able to proceed. Please contact your Database Administrator to resolve this problem.

NOTE 1	The Info APS computers in an Info APS Cluster MUST reside in the same network segment. They CANNOT be located across a router or WAN connection.
NOTE 2	The Info APS computers in an Info APS Cluster MUST communicate via TCP/IP and as such, the computers must be properly configured to use TCP/IP. In the Info Configuration Manager, Sentinel tab, TCP/IP must be selected.

Info APS System Database Migration Steps

Now, you are ready to proceed with performing a migration of the Info APS system database to a clustered SQL-type database.

NOTE	The use of third party migration tools, such as DTS, is not supported by Crystal Decisions Technical Support. If issues arise while migrating the database using such a tool please contact the tool vendor.
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13. If the SI components are being run as processes or applications, make certain to shut down each, including the Info APS and Info Sentinel. Also, NO applications should be running during the migration.

If the SI components are being run as NT services, make certain to stop all SI services, including the Info APS and Info Sentinel.

14. **Make certain that the Info APS system database is properly backed up by the Database Administrator before proceeding. Crystal Decisions does not assume responsibility if an improper backup or no backup was completed of the Info APS system database, which then leads to an unsuccessful restore.**

Point the Info APS data source to a working Info APS system database:

15. In SI 6 and 7, launch the 'Info Configuration Manager' from the Seagate Info program group. (If using SI 5, launch the 'Crystal Info Config' from the Crystal Info 5.0 program group.)

- a.) Click the 'APS' tab. For the Info APS data source, ensure that the data source listed actually points to a valid working Info APS system database (that is what you want to actually migrate to a SQL-type database). If yes, proceed to step 16. If not, continue with step 15.
- b.) Click the 'Specify' button.
- c.) In the 'Info APS Database Setup' dialog, click 'Select a data source'.
- d.) The following appears in the 'CITemp Warning' dialog:

"The APS may contain temporary files that represent operations that have not been updated in the database. We recommend you verify that the C:\CINFO\WINNT\CITemp directory is empty before selecting a data source. Continue with selecting a data source?"

Do not respond to the dialog. Instead, using Windows Explorer, ensure that the CITemp directory is in fact empty. Then, click 'OK' on the 'CITemp Warning' dialog to proceed.

- e.) The following appears in the 'New Data Source' dialog:

"Please select a new data source. Supported database servers include: Microsoft Access, Microsoft SQL Server, Oracle, Sybase and Informix. APS Clustering is not supported for MS Access."

Click 'OK'.

- f.) In the 'Select Data Source' dialog, click the 'Machine Data Source' tab and choose the ODBC System DSN that points to the Info APS system database, which is a valid Info APS system database which contains the current information. Click 'OK'.
- g.) Finally, you will be returned back to the original 'Info Configuration Manager' dialog. On the 'APS' tab, the 'APS Data Source' should now be pointing to the new ODBC System DSN that is pointing to a valid Info APS system database that contains the Info APS system database tables. Also, if the Info APS is properly clustered, it will say:

"APS belongs to cluster <clustername>".

Click 'OK'.

Migrate the Info APS system database:

NOTE	If at any point you have difficulties during the following procedure, please contact Crystal Decisions Technical Support for assistance. For contact information, go to the Contacting Crystal Decisions for Technical Support section of this document.
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16. In SI versions 6 and 7, launch the 'Info Configuration Manager' from the Seagate Info program group. (If using SI 5, launch the 'Crystal Info Config' from the Crystal Info 5.0 program group.)

- a.) Click the 'APS' tab. For the 'APS Data Source', ensure that the data source listed actually points to a valid working Info APS system database (that is what you want to actually migrate to a SQL-type database).
- b.) Click 'Specify'.
- c.) In the 'Info APS Database Setup' dialog, click "Data Source Expert".
- d.) The following appears in the 'Transfer Contents' dialog:

"Do you wish to copy the contents of your previously installed Seagate Info system database (e.g. users/group lists) to your new Seagate Info system database?"

Click 'YES'.

- e.) The following appears in the 'CITemp Warning' dialog:

"The APS may contain temporary files that represent operations that have not been updated in the database. We recommend you verify that the C:\CINFO\WINNT\CITemp directory is empty before selecting a data source. Continue with selecting a data source?"

Do not respond to the dialog. Instead, using Windows Explorer, ensure that the CITemp directory is in fact empty. Then, click 'OK' on the 'CITemp Warning' dialog to proceed.

- f.) The following appears in the 'New Data Source' dialog:

"Please select a new data source. Supported database servers include: Microsoft Access, Microsoft SQL Server, Oracle, Sybase and Informix. APS Clustering is not supported for MS Access."

Click 'OK'.

- g.) In the 'Select Data Source' dialog, switch to the 'Machine Data Source' tab and choose the ODBC System DSN that was created in step 9 for the SQL-type database that you plan to use. Click 'OK'.

- h.) A database logon dialog will appear. Enter the user name and password for the user account that has FULL Administrative rights to the database [which was created in step 5].
- i.) An hourglass will then display (which indicates that the Info tables are currently being written to the SQL-type database chosen).
- j.) The following will appear in a 'Cluster Database' dialog:

"An APS can run standalone or as a member of an APS Cluster. All APS computers in an APS Cluster share the same database. Would you like to enable this APS database to use Clustering? If you choose to run as a cluster, you must provide an APS Cluster name. Enable database for Clustering?"

Enter a 'Cluster Name' and then click 'YES' (if you choose to cluster).

- k.) The following will appear in the 'Data Source Expert' dialog:

"Remember to change the Owner APS List on each Info Server computer."

Click 'OK'.

- l.) The following will appear in the 'Info Configuration Manager' dialog:

"Remember to change the Owner APS List on each Info Server computer."

Click 'OK'.

- m.) Finally, you will be returned to the original 'Info Configuration Manager' dialog. On the 'APS' tab, the 'APS Data Source' should now be pointing to the new ODBC System DSN that was used to migrate the Info APS system database. Also, if the Info APS is properly clustered, it will indicate: "APS belongs to cluster <clustername>"
- n.) Click the 'Info Server' tab. Note that the clustername (for example, @clustername) has been added to the 'Owner APS List' field. [NOTE: This must be added manually to each Info Server computer.] Click 'OK'.

Steps After the Info APS Database Migration is Complete

17. Launch the Info APS from the Seagate Info program group.

- a.) The Info Sentinel will be started and a 'Please Wait' dialog will appear that says: *"Announcing Join (ClusterName) Cluster for 1 times", "Announcing Join (ClusterName) Cluster for 2 times",* etc. until the Runtime Image table is loaded into memory and the Info APS has started successfully.
- b.) Both the Info Sentinel and Info APS icons should now appear on the NT task bar or task tray.
- c.) Launch the Info Desktop from the Seagate Info program group. When connecting for the first time to a new Info APS cluster, you must enter the name of the Info APS (same as before) for the 'APS Name'. After this is done, on subsequent connection attempts the Info Desktop will recognize the Info APS cluster name. Since the Info APS is a clustered

database, thereafter you should enter @clustername for the 'APS Name'. The Info APS cluster will determine which Info APS cluster member to connect to.

How to Diagnose a Problem with Info APS Database Migration

During the Info APS system database migration, a Dbutil.log file is created in the \Cinfo\X86 directory. [For versions prior to SI 6.0.2.2, the Dbutil.log will be created in the \Cinfo\Winnt directory. For new installs of SI 7 (not upgraded from an older version) the Dbutil.log will be created in the \Program Files\Seagate Software\SI\X86 directory.]

The log contains the SQL commands that were executed during the Info APS system database migration and is a good source of information to help in isolating where problems may have occurred. For example, if a table could not be created or dropped it could be due to insufficient account privileges on the database server.

Steps to Install and Cluster Additional Info APS Computers

1. It is recommended that the Info APS be installed to a Microsoft Windows NT Server computer. The reason for this is that NT Server allows for unlimited user connections when creating directory shares. NT 4.0 Workstation should NOT be used, as it is limited to 10 user connections only.
2. It is recommended that you do **NOT** install the Info APS component to a computer that also stores the database server (i.e. DBMS), as both applications will compete for memory resources on the computer. Also, do **NOT** install an Info APS on a Primary Domain Controller (PDC) or a Backup Domain Controller (BDC).
3. Install and configure the appropriate 32-bit database client on any computer that the Info APS is or will be installed to.
4. Ensure that you are logged on to NT using a DOMAIN user account (and NOT a local user account). This DOMAIN user account should be part of the local Administrators group. [This domain user account should be the same one that will eventually be used to run the SI server components as NT services.]
5. Info APS clustering for Oracle, Sybase 10\11, and Informix is **ONLY** supported using the Intersolv or MERANT ODBC drivers that ship with SI. These are: CR Oracle7, CR Oracle8, CR Sybase System 10, CR Informix, CR Informix7, and CR Informix9. APS clustering for Microsoft SQL Server is only supported using the SQL Server ODBC driver, *Sqldr32.dll*. This ODBC driver also ships with SI.
6. Perform the ODBC connectivity tests to the ODBC System DSN that will be used for Info APS clustering. The System DSN should point to the SAME database server and SAME database name of the data source configured on the other members of the Info APS cluster.

If you cannot connect via ODBC to the defined ODBC System DSN, you will NOT be able to proceed. Please contact your Database Administrator to resolve this problem.

7. Install SI. Choose to install or create the default Info APS system database (Cinfo.mdb) when the 'Info APS Database Setup' dialog appears.
8. Near the end of the install, the 'Info Configuration Manager' dialog will appear.

- a.) Click the 'APS' tab, and then click 'Specify'.
- b.) In the 'Info APS Database Setup' dialog, click "Join an existing APS Cluster".
- c.) The following will appear in the 'CITemp Warning' dialog:

"The APS may contain temporary files that represent operations that have not been updated in the database. We recommend you verify that the C:\CINFO\WINNT\CITemp directory is empty before selecting a data source. Continue with selecting a data source?"

Do not respond to the dialog. Instead, using Windows Explorer, ensure that the CITemp directory is in fact empty. Then, click 'OK' on the 'CITemp Warning' dialog to proceed.

- d.) The following will appear in the 'New Data Source' dialog:

"Please select a new data source. Supported database servers include: Microsoft Access, Microsoft SQL Server, Oracle, Sybase and Informix. APS Clustering is not supported for MS Access."

Click 'OK'.

- e.) In the 'Select Data Source' dialog, click the 'Machine Data Source' tab and choose the ODBC System DSN that was created previously for the SQL-type database that you plan to use. Click 'OK'
- f.) A database logon dialog appears. Enter the SAME user name and password as used on the first Info APS computer that has FULL Administrative rights to the Info APS database and which was created above in the section 'Requirements Before Doing APS Migration' (step 5).
- g.) The following will appear in the 'Join Allowed Cluster' dialog:

"This database is for the use of APS cluster <clustername>. Do you want to join the cluster? Join cluster?"

Click 'YES'.

- h.) The following will appear in the 'Info Configuration Manager' dialog:

"Remember to change the Owner APS List on each Info Server computer."

Click 'OK'. [This means that each Info APS that is added to the Info APS cluster needs to be added to the 'Owner APS List' field of every Info Server computer via the Info Configuration Manager, Info Server tab.]

- i.) Finally, you will be returned to the original 'Info Configuration Manager' dialog. On the Info APS tab the 'APS Data Source' should now be pointing to the new ODBC System DSN that points to the Info APS system database. If the Info APS is properly clustered, it will indicate: *"APS belongs to cluster <clustername>"*
- j.) Click the 'Info Server' tab. You will notice that the clustername (i.e. @clustername) has been added to the 'Owner APS List' field. [NOTE: Each Info APS must be manually added to the 'Owner APS List' field on each Info Server computer.] Click 'OK'.

9. Go to the first Info APS computer and start the Info APS.
 - a.) When the Info APS has started, launch the Info Administrator from the Seagate Info program group.
 - b.) Click the 'Options' tab, and then click 'Clustering Options'.
 - c.) Add each Info APS computer name that will be a member of the Info APS cluster.
 - d.) Click 'OK', and then click 'Accept'.
 - e.) Now each Info APS computer should be able to properly start in the Info APS cluster.

NOTE

Do NOT start all of the Info APS computers at the same time. Wait until each has fully loaded into memory before proceeding to start the next Info APS in the cluster.

APPENDIX A: Database-Specific Requirements for the Info APS

ORACLE (Upgrading an Oracle Info APS System Database)

1. Back up the Info APS system database before starting the database migration.
2. If there is more than one Info APS system database on the Oracle server, make certain that the Oracle account you are using is **NOT** a database administrator account that can see tables from other schemas. Create an Oracle user account that contains only the CONNECT and RESOURCE roles, and use the Info Configuration Manager to log on to an ODBC data source that uses that account. For example, suppose you have a database schema for the user "SI70" that contains a valid SI 7.x database, and another SI 7.x database under the schema "SI70-Backup". Then, the Oracle account that you use to access "SI70" **must not** be able to see the tables under "SI70-Backup". **Otherwise, database migration will simply not work.** [The Info APS system database should be placed in its own schema.]
3. When asked to transfer the contents of your existing Info APS system database to the new database, click 'Yes'. When asked to select the new data source for the version 7 database (or whichever version of SI you are using), select **your existing Info APS system data source**. Selecting a different data source that uses a different Oracle user account--and therefore, a different database schema--**will not work**.
4. SI 7 will NOT migrate objects from an Info APS system database created with the Cror7xx.dll driver to the Cror813.dll driver. Users upgrading their Info APS system database to Oracle version 8 or later must continue to use the Cror7xx.dll driver. The Cror813.DLL driver is not supported for use with the Info APS system database.
5. If you need to install the Oracle client or server components after you have installed SI, you must first make a copy of the P2sodbc.dll in the \Winnt\System32 directory before you begin installing the Oracle software. After you have finished installing the Oracle components, you must then replace the copy of the P2sodbc.dll that Oracle installs in the \Winnt\System32 directory with the one you made a copy of before you began the process. [It is recommended that the Oracle client be installed prior to the migration.]
6. If the following error is encountered during the Info APS migration to Oracle,

"Failed in moving contents from one data source to another. Your existing data source contains bad data. The bad data was ignored during migration"

review the steps below.

- a.) Make certain that a previously established ODBC System DSN using the CR Oracle7 ODBC driver is being used. In addition, ensure that you can connect to the data source via an ODBC connectivity tool.
- b.) The above error message may indicate a restriction of disk space for the database user account on the database server. [In Oracle this is set with the Quota clause, of the CREATE USER and ALTER USER statements.]

For example: The command, "ALTER USER WILMA QUOTA 10M ON SYSTEM" will limit user "WILMA" to 10MB of space for her tables in the database.

As the Info APS system database contains 40 tables, you must either:

- Increase the table space allowed in Oracle
- OR
- Grant unlimited space with the Oracle UNLIMITED TABLESPACE privilege
- c.) The database account should have full account privileges to the Oracle database. This includes the ability to create new tables and to drop tables.

Microsoft SQL Server

1. Create a database exclusively for use with SI.
2. When creating the Microsoft SQL Server ODBC System DSN in the ODBC Administrator, make certain that the option 'Generate Stored Procedure for Prepared Statement' is not selected. This will prevent unnecessary statements from being sent to the transaction log of the SQL Server.
3. In the SQL Server database properties, select the option 'Truncate Log on Checkpoint'. This will ensure that the transaction log does not become full, which would prevent the database server from executing SQL statements to\from the database.

Informix

Creating an Info APS system database on an Informix server is ONLY supported using the Intersolv or MERANT Informix drivers that ship with SI versions 5, 6, 7 and 7.5. These drivers are named in the format of Crinfxxx.dll where "xxx" is the version number, for example Crinf709.dll. Other Informix Intersolv or MERANT drivers CANNOT be used for the Info APS system database.

APPENDIX B: General Info APS Database Migration Hints

The information that follows can be found in the `Release6.doc` in the `Docs` directory of the SI 6 CDs or in the `Release.doc` or `Release.rtf` in the root directory of the SI 7 CDs.

- In the Info Configuration Manager, if the "Create default data source" and "Select a new data source" option dialogs appear, it usually means that the Data Source Expert thinks you have no existing data source. However, if you do have an existing Info APS data source set (and the name is displayed in the 'APS' tab of the 'Info Configuration Manager'), then this might indicate that the Data Source Expert is **unable to connect to your existing data source**. This could be due to a database client error. Use another tool such as MSQuery to verify that you can connect to the database and view the tables using your database user account.
- If an ODBC error occurs during migration, it could be that the database is out of space. Check the DBMS to make certain that enough space is allocated.
- In the Info Configuration Manager, if you click 'Specify...' in the Info APS tab, and then click 'Select Data Source' to point to a pre-SI 7.0 Info APS cluster database, you will be warned that you must use the Data Source Expert to migrate to the SI version 7 format before starting your Info APS. You will then be asked whether you want to join the cluster. You must click 'Yes' in order for the Info APS to be pointed to the data source. This same procedure must be followed whether using SI 7, as in the above example, or SI 6.
- If you point to a valid Info APS system database that is the same version as the Data Source Expert in the Info Configuration Manager, it will simply point your Info APS to that database. If you want to overwrite the version 7 database (or whatever version you are using of SI), simply drop the SI tables in your version 7 database (or other version of SI) before the database migration.
- In the Info Configuration Manager on each Info APS computer, the Info Sentinel **MUST** have the TCP/IP protocol selected.

APPENDIX C: Seagate Info 7 Specific Changes\Issues

NOTE	With SI version 7, one significant change to the Info APS system database is the enforcement of unique records in the tables. In SI 7.0.2.0 and later, unique indexing is being enforced to prevent duplicate records from occurring in the Info APS system database. In previous versions, the Info APS system database was not designed this way and thus allowed duplicate records to occur.
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Therefore, if duplicate records do exist in the Info APS system database (particularly the CI_RUNTIMEIMAGE, CI_USERS, and CI_SECRIGHTS tables) prior to migrating the Info APS system database to version 7, you will encounter the following error message during the Info APS system database migration to SI 7:

"Failed in moving contents from one data source to another. Your existing data source contains bad data. The bad data was ignored during migration".

The Dbutil.log should be examined. The log will indicate on which table the Info APS system database migration failed and the specific SQL_ERROR\ODBC error for the encountered issue. This will indicate if the issue is the result of trying to create a unique index on a table with duplicates where the indexed field is not unique.

This is an issue that you may encounter when upgrading the Info APS system database and has been tracked. The SI Track ID is: 13264. This track describes a requirement or ability of the Info APS database migration code to be able to detect duplicates before performing the actual migration and then eliminate the duplicates in the tables on which the Info APS system database migration wishes to create unique indexes. That way, this will be handled automatically behind the scenes.

This issue has been corrected in SI 7.0.2.100 Maintenance Release 1. The workaround for SI 7.0.2.0 users is to open the Cidbdef.ini file located in the \X86 directory on the Info APS computer (SI 7 computer) and make the following setting changes:

```
[INDEX:CI_RUNTIMEIMAGE.IndRUNTIMEIMAGE1]
```

change from **Unique=1** to **Unique=0**

```
[INDEX:CI_SECRIGHTS.IndSECRIGHTS1]
```

change from **Unique=1** to **Unique=0**

```
[INDEX:CI_USERS.IndUSERS1]
```

change from **Unique=1** to **Unique=0**

After this change to Cidbdef.ini has been completed, save the file then restore a copy of the older Info APS system database and redo the migration again.

NOTE	<p>To detect if the above issue will apply to your current Info APS system database; before performing the actual Info APS system database migration, query the database (in particular the CI_RUNTIMEIMAGE table) for duplicates to see if the change to the Cidbdef.ini needs to be made or not.</p> <p>The syntax for this in Microsoft SQL Server is:</p> <pre>select ci_prcid, count(ci_prcid) from ci_runtimeimage group by ci_prcid having count(ci_prcid) > 1</pre>
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Contacting Crystal Decisions for Technical Support

We recommend that you refer to the product documentation and that you visit our Technical Support web site for more resources.

Self-serve Support:

<http://support.crystaldecisions.com/>

Email Support:

<http://support.crystaldecisions.com/support/answers.asp>

Telephone Support:

<http://www.crystaldecisions.com/contact/support.asp>