



QMirror/DB™ Version 9.3.3

Installation and Users Guide

**Real-time data replication
between IBM System i (AS400s DB2)
and MS SQL Server, MySQL, PostgreSQL,
Azure SQL Database, Google Cloud SQL,
Oracle, LUW DB2, MaxDB, MariaDB, Tiberio**

The Twentieth Edition (December 2024)

This edition applies to the licensed program QMirror/DB version 9.3.3 and to all subsequent releases until otherwise indicated in the new editions. Make sure you are using the proper edition for the level of the product.

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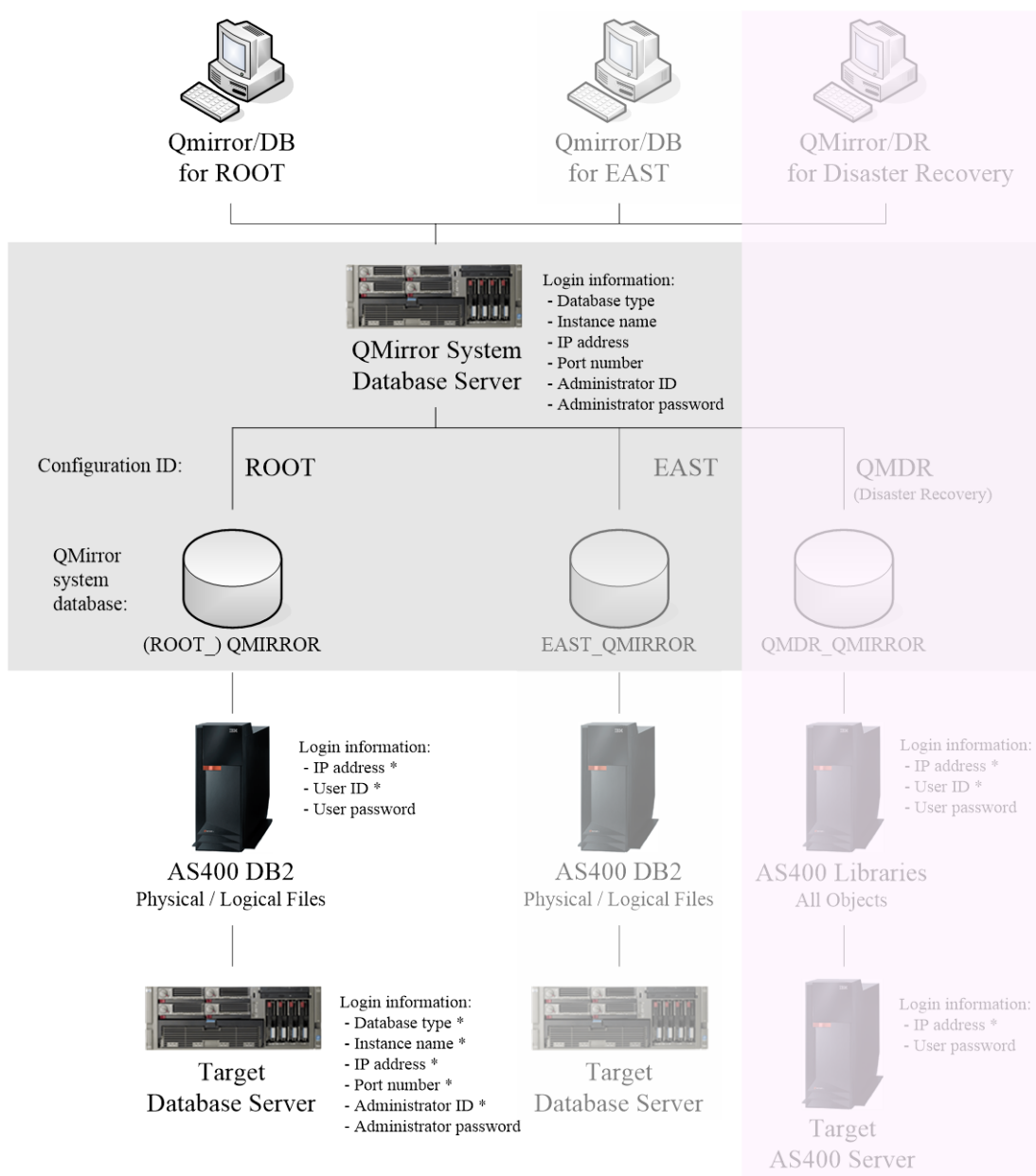
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(000) QMirror/DB system structure



QMirror/DB is designed to replicate data from single / multiple AS400 servers to single / multiple PC databases / AS400 servers:

- QMirror/DB instances could be executed on a single or multiple PC servers.
- AS400 servers could be the same one or different.
- Target PC database servers could be the same one as QMirror/DB system database server or different.

(Notes: All data with '*' will be saved in the system configuration file.)

(010) How to implement QMirror/DB?

The QMirror/DB implementation consists of three parts and takes a few minutes to complete.

Part 1: Configure PC database

Part 2: Configure AS400

Part 3: Configure QMirror/DB (download *Configuration Data Sheet*)

Go to [\(020\) Quick start](#)

(020) Quick start

The steps to quick start QMirror/DB:

Install QMirror/DB –

1. Install PC database
2. Create an AS400 user profile for QMirror/DB
3. Install QMirror/DB
4. Configure QMirror/DB
5. Performance check (command option P)
6. Build up table list from AS400 physical files
(command option 4)
(Note: The empty physical files on the AS400 will not be processed by the trial version.)
7. Start AS400 journaling (command option 8)

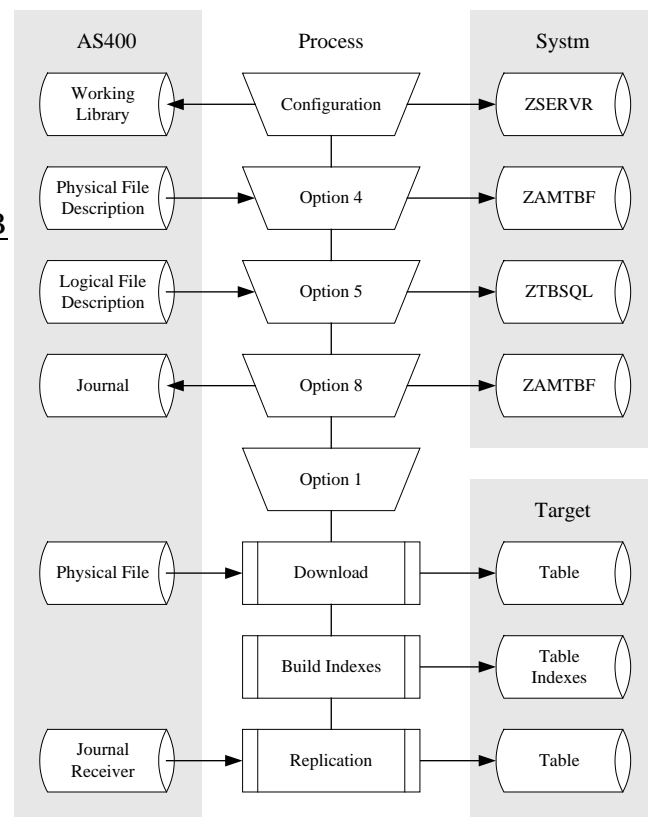
Execute QMirror/DB –

1. Start a new instance (command option 1)
2. Log monitoring (command option L)
3. Status monitoring (command option S)

Add more AS400 physical files into QMirror/DB table list –

1. End current instance (command option 2)
2. Add more AS400 physical files into QMirror/DB table list (command option 4)
(Note: The empty physical files on the AS400 will not be processed by the trial version.)
3. Start AS400 journaling (command option 8)
4. Start a new instance (command option 1)
5. Log monitoring (command option L)
6. Status monitoring (command option S)

Go to (100) Do you have PC database installed?



(100) Do you have PC database installed?

1. No. I do not have any PC database installed.

Go to [\(110\) Download and install PC database](#)

2. Yes. I have Oracle database installed.

Go to [\(130\) Check existing databases](#)

3. Yes. I have MS SQL Server installed.

Go to [\(130\) Check existing databases](#)

4. Yes. I have MaxDB database installed.

Go to [\(130\) Check existing databases](#)

5. Yes. I have MySQL or MariaDB database installed.

Go to [\(130\) Check existing databases](#)

6. Yes. I have PostgreSQL database installed.

Increase max_connections, shared_buffers and kernel.shmmax by changing postgresql.conf

Go to [\(130\) Check existing databases](#)

7. Yes. I have Azure SQL Database with 50 DTUs or above.

Make sure you are using Azure SQL Database, not Azure SQL managed instance

Go to [\(130\) Check existing databases](#)

8. Yes. I have LUW DB2 database installed.

Go to [\(130\) Check existing databases](#)

9. Yes. I have Tibero database installed.

Go to [\(130\) Check existing databases](#)

10. Yes. I have other PC database installed.

Tell us which PC database you are using. We shall do our best to fulfill your requirement. Please send your mail to customer.support@qmirror.com

(110) Download and install PC database

MySQL or MS SQL Server database are recommended to use. You can download one of them from its website and install it on your PC server.

QMirror connects your PC database by IP address. Make sure your PC database can be connected by TCP/IP.

Go to [\(130\) Check existing databases](#)

(130) Check existing databases

QMirror/DB will use the following databases in your existing PC database instance:

1. System database – QMIRROR

There should be no database named 'QMIRROR' before installing QMirror/DB.

2. User databases - named as AS400 library

QMirror/DB assigns table name as AS400 physical file name in these databases.

Go to (200) Create an AS400 user profile for QMirror/DB

(200) Create an AS400 user profile for QMirror/DB

1. To create an AS400 user profile 'QMIRROR', enter command:
 CRTUSRPRF USRPRF(QMIRROR) PASSWORD(xxxxxxxx) USRCLS(*USER)
 SPCAUT(*ALLOBJ *JOBCTL) PWDEXPITV(*NOMAX)
2. Or use any existing user profile which owns SPCAUT(*ALLOBJ *JOBCTL) authority.
3. The user profile has to have authority to execute following commands:
 ADDRPLYE, CHGJOB, CHGJRN, CPYF, CRTDTAATA, CRTJRN, CRTJRNRCV,
CRTLIB ^(Notes), CRTMSGQ, DLTDTAARA, DLTF, DLTJRNRCV, ENDJRNPF, SNDJRNE,
 STRJRNPF.
4. If you are using non-ASCII character set, the AS400 user profile CCSID for QMirror/DB should not be 65535.
5. If QMirror/DB is running, you have to reboot QMirror/DB after you changed the password of AS400 user profile for QMirror/DB.

(Notes: QMirror/DB uses a default working library named 'QMIRROR' on AS400 server. If the user profile you are using does not have authority to execute command CRTLIB, please create library 'QMIRROR' before starting QMirror/DB.)

Go to [\(210\) Check AS400 configuration](#)

(210) Check AS400 configuration

Normally, QMirror/DB should be running well under common AS400 configuration. If you have a slow download speed, you will need to check and tune your AS400 configuration.

Please refer to the following paragraphs to check with your AS400 configuration. Watch the QMirror/DB performance status and tune accordingly.

1. Use command `DSPUSRPRF QUSER` to verify that the user's status is `*ENABLED`.
 2. Use command `STRHOSTSVR *ALL` to start the optimized host server daemons.
 3. Amend `QZDASOINIT/QUSER` PJ jobs back to normal priority.
 - a) `QZDASOINIT` run priority based on `QSYS/QPWFSEVER *CLS`
 - b) Default value = 20
 - c) Use command `CHGCLS CLS(QPWFSEVER) RUNPTY(20)`
 - d) Restart `QSERVER` subsystem
 4. Use command


```
CHGPJE SBSD(QSYSWRK) PGM(QSQSRVR) MAXJOBS(*NOMAX)
```

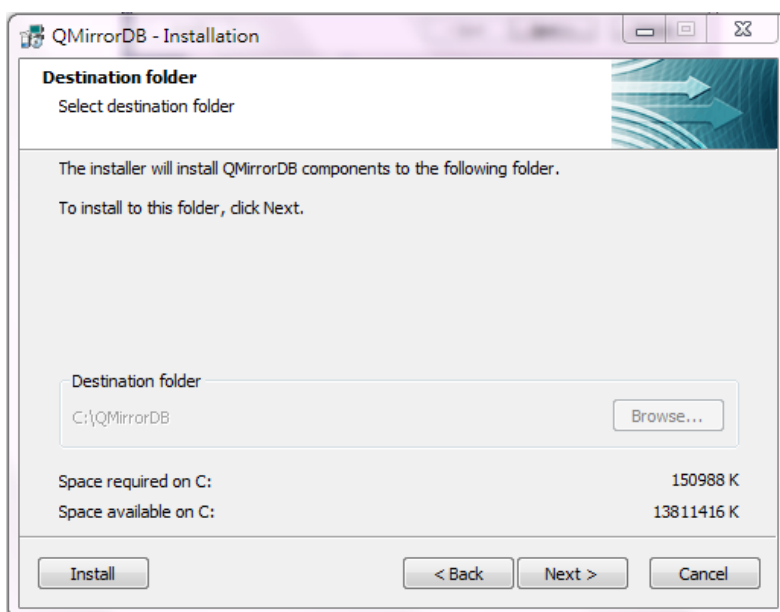
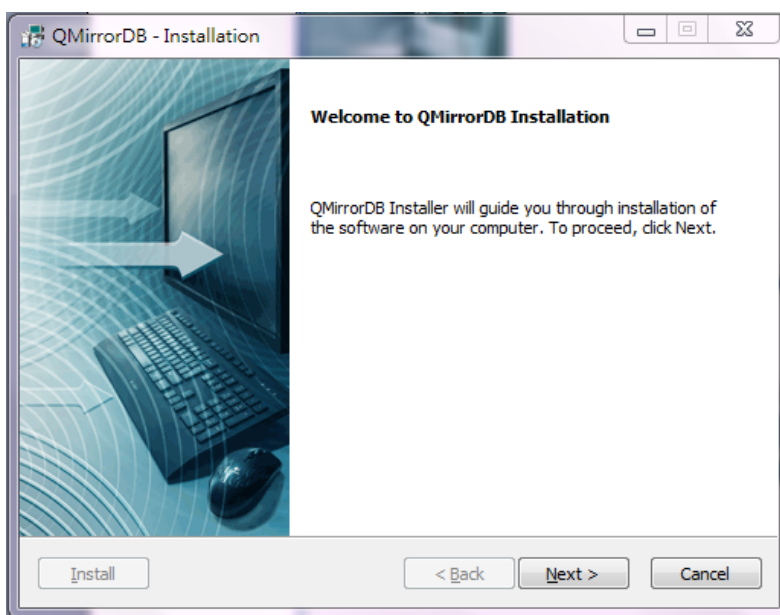
 to set SQL maximum number of jobs to `*NOMAX`. You might refer to http://publib.boulder.ibm.com/infocenter/wasinfo/v6r1/index.jsp?topic=/com.ibm.websphere.base.iseries.doc/info/series/ae/tins_is_cfgsql.html
- Notes: For OS400 V3, use command
- ```
CHGPJE SBSD(QSYSWRK) PGM(QIWS/QZRCSRVS) MAXJOBS(*NOMAX)
```
5. Tune AS400 server for Java SQL Database access. Please refer to <http://archive.midrange.com/java400-l/200210/msg00036.html>
  6. QMirror/DB requires these AS400 ports to connect to AS400:
    - Non-SSL - 446, 449, 8470, 8471, 8472, 8473, 8474, 8475, 8476
    - SSL – 448, 449, 9470, 9471, 9472, 9473, 9474, 9475, 9476
  7. For AS400 SSL, import the AS400 certificate using JRE 1.8 keytool to generate a keystore named `QMirror.ks`. Then, put it into directory `C:\QMirrorDB`.

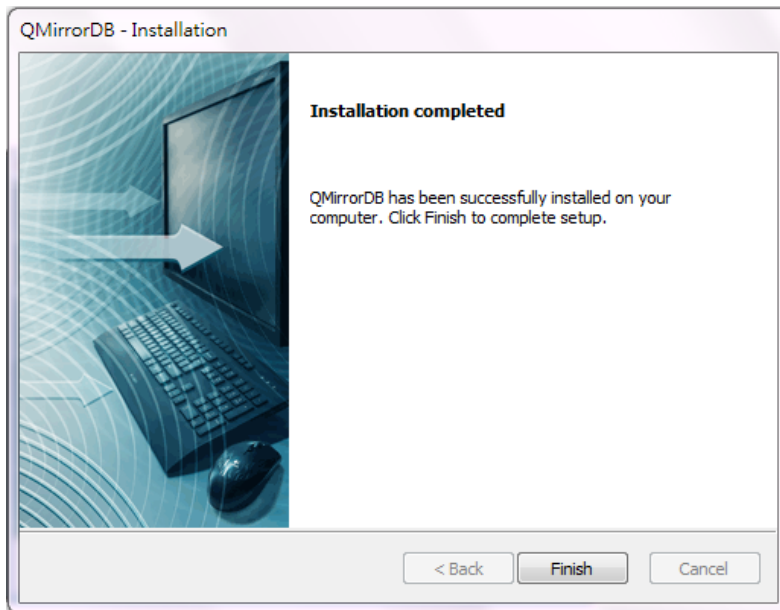
Go to [\(300\) Install QMirror/DB](#)

## (300) Install QMirror/DB

Since QMirror/DB demands tiny system resources, we recommend you to install it on the same PC server with database server. For remote download/replication processing, place QMirror/DB server at the AS400 site is better than at the PC databases site.

1. Download QMirror\_DB\_nnn.zip from <http://www.qmirror.com/download>
2. Uninstall earlier QMirror/DB version from Windows program menu list
3. Unzip, execute QMirror\_DB\_nnn.exe, and follow the instructions





4. A program menu 'QMirror DB' will be created on Windows
5. There is no need to drop any table on existing PC databases of earlier version
6. Execute QMirror/DB from program menu list
7. Or execute QMirror/DB on a Windows command prompt with administrative privileges, e.g. `c:\QMirrorDB\qmirror.bat`

Go to [\(330\) Configure QMirror/DB](#)

## (310) Install QMirror/DB on Linux

You can install QMirror/DB on Linux with WINE installed. WINE is a compatibility layer capable of running Windows applications on Linux. Please refer to <https://www.winehq.org/> for more details.

To enable QMirror dashboard, you need to install an HTTP server on Linux. Some hints here to set up Apache server.

```
<VirtualHost *:80>
 ServerAdmin admin@qmirrordb
 ServerName qmirrordb
 ServerAlias www.qmirrordb.com
 DocumentRoot /home/ubuntu/.wine/drive_c/QMirrorDB
 ErrorLog \${APACHE_LOG_DIR}/error.log
 CustomLog \${APACHE_LOG_DIR}/access.log combined
</VirtualHost>

<Directory /home/ubuntu/.wine/drive_c/QMirrorDB/>
 Options Indexes FollowSymLinks
 AllowOverride None
 Require all granted
</Directory>
```

Go to [\(330\) Configure QMirror/DB](#)

### (330) Configure QMirror/DB

1. Prepare data for configuration

*[https://www.qmirror.com/qmirror-download/QMirrorDB\\_Configuration\\_Data\\_Sheet.txt](https://www.qmirror.com/qmirror-download/QMirrorDB_Configuration_Data_Sheet.txt)*

2. Start configuration by **c:\QMirrorDB\qmirror.bat**
3. Accept the terms of the license agreement

```
Do you accept the terms of the license agreement? (y/N/q) y
```

4. AS400 IP Address or Hostname
5. AS400 User ID
6. QMirror Working Library (default is 'QMIRROR')  
p.s. QMirror saves work files in working library
7. Select Target Database Server
8. Target Database Instance Name
9. Target Database IP Address or Hostname
10. Target Database Connection Port
11. Target Database Administrator ID
12. Target Database Prefix
13. Target Database Character Data Type
14. Target Database Natural Number Data Type
15. Enter QMirror/DB License Key
16. Select AS400 Character Set

```
AS400 Conversion Character Set: (1-ASCII 2-DBCS/Unicode 3-Others)
```

17. Set Default CCSID if the AS400 Character Set is not ASCII
18. Apply AS400 Alternative Field Name
19. Message handling

```
Email Messages: (N-None S-Suspended E-Suspended and Error W-Suspended, Error and
Warning) e
Email Message for Suspended and Error (y/N/q) y

Email Address: (E.g. webmaster@qmirror.com, john@abc.com) admin@qmirror.com
Email Address is admin@qmirror.com (y/N/q) y

Sending a test mail to admin@qmirror.com ...
The test mail was sent successfully.
```

20. Configuration Description

Go to (340) Build up table list from AS400 physical files



### (340) Build up table list from AS400 physical files

(Note: The empty physical files on the AS400 will not be processed by the trial version.)

To build up table list from AS400 physical files, take command option 4 to enter AS400 library name and physical file name.

```

Buildup table list from AS400 physical files -
Enter AS400 library name: libr1
Enter AS400 physical file name (*ALL/generic name/name): *all
Omit empty files? (Y/n) y
Buildup table list from AS400 physical files LIBR1/*ALL (y/N/q) y

20xx/xx/xx 11:39:51 Buildup table list from AS400 physical files LIBR1/*ALL
20xx/xx/xx 11:39:51 This may take minutes ...
20xx/xx/xx 11:40:08 Adding: LIBR1/FCOA(FCOA) - Chart of Account
20xx/xx/xx 11:40:08 Adding: LIBR1/FJVTX(FJVTX) - Journal voucher
20xx/xx/xx 11:40:08 Adding: LIBR1/FPCTL(FPCTL) - Period controlling
20xx/xx/xx 11:40:08 Adding: LIBR1/FPLF(FPLF) - Posting log file
20xx/xx/xx 11:40:08 Adding: LIBR1/FBALSH(FBALSH) - Balance sheets
20xx/xx/xx 11:40:08 Adding: LIBR1/FINCST(FINCST) - Income statements
20xx/xx/xx 11:40:09 End of buildup table list from AS400.

20xx/xx/xx 11:40:09 Buildup indexes from AS400 logical files in library LIBR1
20xx/xx/xx 11:40:09 This may take minutes ...
20xx/xx/xx 11:40:11 LIBR1.FCOA; CREATE INDEX LF_FCOA1 ON LIBR1.FCOA (FC01)
20xx/xx/xx 11:40:11 LIBR1.FCOA; CREATE INDEX LF_FCOA2 ON LIBR1.FCOA (FC12)
20xx/xx/xx 11:40:11 LIBR1.FPCTL; CREATE INDEX LF_FPCTL1 ON LIBR1.FPCTL (FPYM)
20xx/xx/xx 11:40:11 End of buildup indexes from AS400 logical files.

Buildup table list from AS400 physical files -
Enter AS400 library name: (LIBR1/q) libr2
Enter AS400 physical file name (*ALL/generic name/name): fap*
Omit empty files? (Y/n) y
Buildup table list from AS400 physical files LIBR2/FAP* (y/N/q) y

20xx/xx/xx 11:40:21 Buildup table list from AS400 physical files LIBR2/FAP*
20xx/xx/xx 11:40:21 This may take minutes ...
20xx/xx/xx 11:40:33 Adding: LIBR2/FAPCTL(FAPCTL) - A/P controlling
20xx/xx/xx 11:40:33 Adding: LIBR2/FAPTX(FAPTX) - A/P transactions
20xx/xx/xx 11:40:34 End of buildup table list from AS400.

20xx/xx/xx 11:40:34 Buildup indexes from AS400 logical files in library LIBR2
20xx/xx/xx 11:40:34 This may take minutes ...
20xx/xx/xx 11:40:35 LIBR2.FAPTX; CREATE INDEX LF_FAPTX1 ON LIBR2.FAPTX (FA01)
20xx/xx/xx 11:40:35 End of buildup indexes from AS400 logical files.

Buildup table list from AS400 physical files -
Enter AS400 library name: (LIBR2/q) q

```

The table list will be kept in the system table QMIRROR.ZAMTBF. Please refer to [\(A10\) AS400 table master \(ZAMTBF\)](#).

If you want to rearrange the download sequence, tune the field TBPRTY in the system table QMIRROR.ZAMTBF.

QMirror/DB takes the index keys out of the AS400 logical fields related to the new selected physical files and inserts them into system table QMIRROR.ZTBSQL to build up indexes on the target PC database.

To activate specified indexes, set the column ZQSTS to ‘ ’ in the system table QMIRROR.ZTBSQL. To omit the specified indexes, set the column ZQSTS to ‘X’ in the system table QMIRROR.ZTBSQL.

For data replication performance consideration, the indexes on the target PC database only build up when the delay is below 60 seconds.

Go to (350) Build up indexes from AS400 logical files

### (350) Build up indexes from AS400 logical files

If you have logical files on the AS400 and want to build up indexes on the target PC database from these logical files, take command option 5. QMirror/DB takes the index keys out of the AS400 logical fields and inserts them into system table QMIRROR.ZTBSQL to build up indexes. Only the tables in the system table QMIRROR.ZAMTBF will be affected.

View definitions on the AS400 are also imported into system table QMIRROR.ZTBSQL. Since the view creation syntax is different between AS400 and PC databases, you can modify the statements in column ZTBSQL.ZQSQL to adopt the SQL syntax on the target database.

```
Buildup indexes from AS400 logical files -
Enter AS400 library name: (LIBR1/q) libr1
Buildup indexes from AS400 logical files in library LIBR1 (y/N/q) y

20xx/xx/xx 11:41:05 Buildup indexes from AS400 logical files in library LIBR1
20xx/xx/xx 11:41:05 This may take minutes ...
20xx/xx/xx 11:41:14 LIBR1.FCOA; CREATE INDEX LF_FCOA2 ON LIBR1.FCOA1 (FC02)
20xx/xx/xx 11:41:14 LIBR1.FCOA; CREATE INDEX LF_FCOA2 ON LIBR1.FCOA2 (FC22)
20xx/xx/xx 11:41:14 End of buildup indexes from AS400 logical files.

Buildup indexes from AS400 logical files -
Enter AS400 library name: (LIBR1/q) q
```

To activate specified indexes, set the column ZQSTS to ‘’ in the system table QMIRROR.ZTBSQL. To omit the specified indexes, set the column ZQSTS to ‘X’ in the system table QMIRROR.ZTBSQL.

For data replication performance consideration, the indexes on the target PC database only build up when the delay is below 60 seconds.

Go to [\(360\) Start / End AS400 journaling by QMirror/DB](#)

## **(360) Start / End AS400 journaling by QMirror/DB**

QMirror/DB uses AS400 journal to do data replication. You can let QMirror/DB setup AS400 journaling for you. When you run QMirror/DB command option 8 – ‘Start / End AS400 journaling’, QMirror/DB will keep message queue (MSGQ), journal receivers (JRNRCV) and journal (JRN) into library ‘QMIRROR’. If command option 8 is not shown on the menu, you might need to first quit the current instance by taking command option 2.

The size of each journal receiver created by QMirror/DB is 200MB. QMirror/DB keeps the last ten journal receivers and deletes the earlier ones at every 7 a.m. If you'd like to maintain journal receivers by yourself, set field ZMJRCV to -1 in the system table QMIRROR.ZJMASF.

(Notes: For multiple configurations, QMirror/DB does not delete journal receivers.)

The easiest way is to let QMirror/DB handle AS400 journaling for you. If you choose to build up AS400 journaling yourself, QMirror/DB will use that journal if it exists. Note that you should retain these journal receivers for at least one day before deleting them. The maximum number of receivers on the AS400 is 2045 receivers. If you get a CPF7053 error message, delete the oldest receivers until the receiver directory contains 2045 or fewer receiver entries.

(Notes: For OS400 V5 and above, check journal caching for all of your own journals with AS400 command WRKJRNA. Set field ZJRCHE in the system table QMIRROR.ZSERVR to ‘N’ if all the journals cache status are \*NO. This may increase replication performance.)

To omit some specified tables from journal QMIRROR/JRN, set field TBREPL to ‘N’ in the system table QMIRROR.ZAMTBF.

Attention, never start journaling for any object in working library ‘QMIRROR’.

Go to [\(370\) Download journaled physical files without replication](#)

## **(370) Download journaled physical files without replication**

You can download journaled AS400 physical files without replication by setting the table as non-journaled, To do this, set column TBREPL to 'N', TBJLIB and TBJNAM to blank in QMirror/DB system table ZAMTBF.

E.g. UPDATE QMIRROR.ZAMTBF  
SET TBREPL='N',TBJLIB='',TBJNAM=""  
WHERE TBLIB='LIBR1' AND TBOBJ='FILEA' AND TBMBR='FILEA'

Go to [\(380\) Upgrade QMirror/DB](#)

## **(380) Upgrade QMirror/DB**

Upgrade QMirror/DB is easy. All existing data on the target PC database are safe. No re-configuration is needed.

1. Stop QMirror/DB by taking Ctrl-C or command option 2
2. Uninstall QMirror/DB from Windows server by `c:\QMirrorDB\uninstall.exe`
3. Uninstall QMirror/DB service by `c:\QMirrorDBService\uninstall.exe`
4. Download the latest version of QMirror/DB from [www.qmirror.com/download](http://www.qmirror.com/download)
5. Install QMirror/DB
6. Install QMirror/DB service
7. Start QMirror/DB instance ROOT by `c:\QMirrorDB\run_qmirror.bat`
8. Start QMirror/DB other instances by `c:\QMirrorDB\run_qmirror_xxxx.bat`
9. Or, start QMirror/DB Service by launching 'Services' from the Windows 'Control Panel / Administrative Tools'

Go to (390) Uninstall QMirror/DB

### **(390) Uninstall QMirror/DB**

First, run QMirror/DB command option 8 – ‘Start / End AS400 journaling’ to end AS400 journaling which was started by QMirror/DB.

Second, delete AS400 library ‘QMIRROR’ which was created by QMirror/DB.

Third, clean QMirror/DB system database and library databases on the PC database server.

The last one, uninstall QMirror/DB from the Windows program menu list or execute c:\QMirrorDB\uninstall.exe

Go to (400) Normal running QMirror/DB

## (400) Normal running QMirror/DB

Start QMirror/DB instance ROOT by `c:\QMirrorDB\run_qmirror.bat` or start QMirror DB other instances by `c:\QMirrorDB\run_qmirror_xxxx.bat` on a Windows command prompt.

To execute a QMirror/DB instance, take command option 1 - 'Start instance xxxx'.

```

QMirror/DB x.x.x (released in 20xx/xx) command list (xxxx):
 1 - Start instance xxxx
 3 - Re-configuration
 4 - Build up table list from AS400 physical files
 5 - Build up indexes from AS400 logical files
 7 - Re-download selected tables
 8 - Start / End AS400 journaling
 E - Build up views from AS400 views
 K - Change license key
 P - Performance check
 U - Uninstall QMirror/DB
 Q - Quit
Your option is (1/3/4/5/7/8/e/k/p/u/Q) 1

```

Now as QMirror/DB starts to download and replicate data from AS400 into the target database, the table name on the target database will be <library.file\_member>. If the member name were identical to the file name, the target database table name would be <library.file>.

A faster way to execute QMirror/DB is to use batch programs. Batch programs named 'run\_qmirror.bat' for instance ROOT and 'run\_qmirror\_xxxx.bat' for other instances are auto-created in the QMirror/DB directory. Follow the instruction in the batch programs to preset all the parameters needed by QMirror/DB. You can get all the encrypted data from QMirror/DB console displayed under the interactive mode.

(Notes: QMirror/DB keeps the last workable run\_qmirror.bat into run\_qmirror.bat.ba2, or run\_qmirror\_xxxx.bat into run\_qmirror\_xxxx.bat.ba2 automatically, so there is no need to re-edit run\_qmirror.bat or run\_qmirror\_xxxx.bat again after upgrading QMirror/DB.)

Windows 10 has a new feature 'Quick Edit Mode', which halts the application process when users click on a Window command prompt. This new feature may halt QMirror. Please refer to *Why is my command prompt freezing on Windows 10?*

Go to [\(410\) Get QMirror/DB running log and status](#)



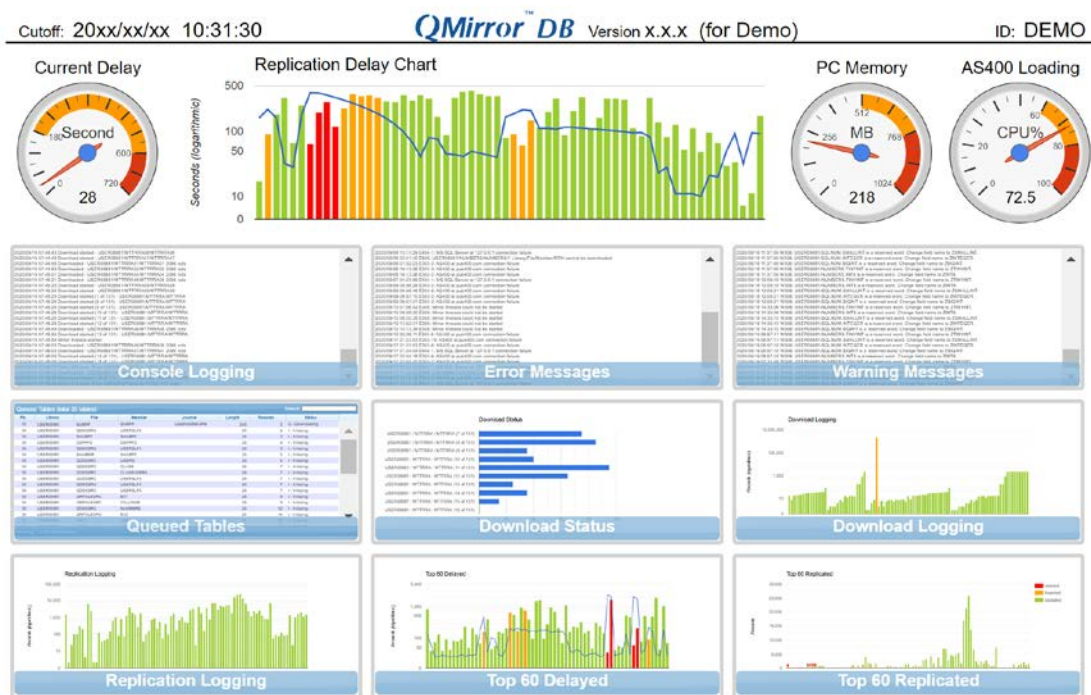
## (410) Get QMirror/DB running log and status

The current states of QMirror/DB are kept in the system table QMIRROR.ZJBSTS. Please refer to (A50) Job log file (ZJBLOG) / Job status file (ZJBSTS) for table structure and field comments.

Administrator may monitor the running log and status of QMirror/DB on any PC at any location with the following three methods.

Method 1 - Use a web browser to monitor QMirror/DB status:

Opening 'QMirror Dashboard' from the Windows program menu list, you will get a display similar to the one below.



Steps to setup QMirror Dashboard:

1. Turn on Internet Information Services (IIS) on Windows  
<https://www.betterhostreview.com/turn-on-iis-windows-10.html>
2. Open Internet Information Services (IIS) Manager
3. Remove Sites 'Default Web Site'
4. Add Sites 'QMirror'
  - 4.1 Site Name – 'QMirror'
  - 4.2 Physical Path – 'C:\QMirrorDB'
  - 4.3 Binding Type - http
  - 4.4 Binding IP Address - All Unassigned
  - 4.5 Binding Port – 80

5. For PCs in the intranet - by <http://IP address/dashboard.html>
6. If the web server port 80 is blocked, open Windows firewall for HTTP  
*[http://www.supergeotek.com/SGS10.0\\_ENG\\_HTML/firewallsetup.htm](http://www.supergeotek.com/SGS10.0_ENG_HTML/firewallsetup.htm)*
7. Input configuration ID
8. Double click navigators to enlarge a particular chart
9. Double click the chart to return to the navigators
10. Click the configuration ID at upper-right corner to show status report

Steps to setup SSL QMirror Dashboard:

1. Open Internet Information Services (IIS) Manager
2. Remove Sites 'Default Web Site'
3. Create personal Self-Signed Certificate 'QMirror'
4. Add Website 'QMirror\_https'
  - 4.1 Site Name – 'QMirror\_https'
  - 4.2 Physical Path – 'C:\QMirrorDB'
  - 4.3 Binding Type - https
  - 4.4 Binding IP Address - All Unassigned
  - 4.5 Binding Port - 443
  - 4.6 Select SSL certificate - QMirror
5. For PCs in the intranet - by <https://IP address/dashboard.html>
6. If the web server port 443 is blocked, open Windows firewall for HTTPS  
*[http://www.supergeotek.com/SGS10.0\\_ENG\\_HTML/firewallsetup.htm](http://www.supergeotek.com/SGS10.0_ENG_HTML/firewallsetup.htm)*
7. Input configuration ID
8. Double click navigators to enlarge a particular chart
9. Double click the chart to return to the navigators
10. Click the configuration ID at upper-right corner to show status report

Method 2 - Monitor QMirror by QMirror/DB command: (not recommended)

1. To monitor QMirror/DB running log and status, the operators need to have the 'SELECT' privilege on the following tables:
  - QMIRROR.ZSERVR
  - xxxx\_QMIRROR.ZAMTBF
  - xxxx\_QMIRROR.JBSTS
  - xxxx\_QMIRROR.ZPCLOG2
 'xxxx\_' is the configuration ID for Multiple AS400s / PC databases configurations.
2. Execute QMirror/DB on a Windows command prompt. Take command option L - 'Log Monitoring'.
3. Execute QMirror/DB on a Windows command prompt. Take command option S - 'Status Monitoring'.
4. The monitor displays are refreshed every five seconds. For security reason, the only way to stop a monitoring display is to use Ctrl-C.

Method 3 - Review QMirror status by database SQL queries: (not recommended)

1. Open PC database SQL studio
2. Log in as database administrator
3. Execute SQL statement

E.g. 

```
SELECT ZJTYPE,ZJJBID,ZJRPTM,ZJACTN,ZJLIB,
 ZJOBJ,ZJTIME,ZJRCDS,ZJRMK
FROM QMIRROR.ZJBSTS
ORDER BY ZJTYPE,ZJJBID
```

4. Action description:

CUTOFF - Cutoff date / time of data replication, memory used  
CURRENT DELAY - Current delay by seconds, time period  
AVERAGE DELAY - Average delay by seconds, time period  
MINIMUM DELAY - Minimum delay by seconds, time point  
MAXIMUM DELAY - Maximum delay by seconds, time point

Go to [\(420\) Get QMirror/DB status log](#)

## (420) Get QMirror/DB status log

There are four kinds of status logs kept in the system table QMIRROR.ZJBLOG. Please refer to [\(A50\) Job log file \(ZJBLOG\) / Job status file \(ZJBSTS\)](#) for table structure and field comments.

1. Delay status log
2. Download status log
3. SQL status log
4. Recovery status log

When you set configuration, you can choose to keep or omit these logs. Through QMIRROR.ZJBLOG, you can do tracking or other things that you want to do.

For example, use following SQL to get mirror status per day:

```
SELECT ZJRPDT AS AS400_DATE,
SUM(ZJRCDS) AS TOTAL_RCDS,
MAX(ZJTIME) AS MAX_DELAY,
AVG(ZJTIME) AS AVG_DELAY,
COUNT(*) AS CYCLES,
AVG(ZJRCDS) AS AVG_RCDS
FROM QMIRROR.ZJBLOG
WHERE ZJTYPE=' ' AND ZJRCDS>0 AND ZJBSTS=' '
GROUP BY ZJRPDT
```

QMirror/DB purges its own log tables at the end of each month. Entries in log tables QMIRROR.ZPCLOG, QMIRROR.ZJBLOG, and QMIRROR.ZJMLOG, that are created earlier than the first date of the last month will be purged.

Go to [\(430\) Re-download specified AS400 physical files manually](#)

## (430) Re-download specified AS400 physical files manually

You can re-download non-journaled or omit journaled physical files manually. Please refer to [\(370\) Download journaled physical files without replication](#). To re-download specified AS400 physical files manually, you can change the download flag TBDWFG to 'A' in the system table QMIRROR.ZAMTBF for full table download. Or change TBDWFG to 'Y' for 'Selected Download'. Please refer to [\(580\) Selected download](#) if needed.

### 1. Download immediately

E.g. UPDATE QMIRROR.ZAMTBF  
 SET TBDWFG='A',TBNDT=0,TBNDTM=0,TBSTS=' '  
 WHERE TBLIB='LIBR1' AND TBOBJ='FILEA' AND TBMBR='FILEA'

### 2. Download on a specified date

E.g. UPDATE QMIRROR.ZAMTBF  
 SET TBDWFG='A',TBNDT=20101231,TBNDTM=135959  
 WHERE TBLIB='LIBR1' AND TBOBJ='FILEB' AND TBMBR='FILEB'

### 3. Download scheduling

Use scheduling code TBDSCH and next download time TBNDTM to setup download scheduling. QMirror/DB will do a 'Selected Download' if it was specified.

Reboot QMirror/DB instance is needed after you changed download schedule.

Daily – Set TBDSCH to 9999

E.g. UPDATE QMIRROR.ZAMTBF SET  
 TBREPL='N',TBDSCH=9999,TBNDTM=001000  
 WHERE TBLIB='LIBR1' AND TBOBJ='FILEC' AND TBMBR='FILEC'

Weekly – Set TBDSCH from 9990 to 9996, 9990 means Sunday

E.g. UPDATE QMIRROR.ZAMTBF SET  
 TBREPL='N',TBDSCH=9990,TBNDTM=001000  
 WHERE TBLIB='LIBR1' AND TBOBJ='FILED' AND TBMBR='FILED'

Monthly – Set TBDSCH from 9901 to 9931, 9901 means 1<sup>st</sup> of month

E.g. UPDATE QMIRROR.ZAMTBF SET  
 TBREPL='N',TBDSCH=9901,TBNDTM=001000  
 WHERE TBLIB='LIBR1' AND TBOBJ='FILEE' AND TBMBR='FILEE'

Yearly – Set TBDSCH from 0101 to 1231, 0101 means January 1<sup>st</sup>

E.g. UPDATE QMIRROR.ZAMTBF SET  
 TBREPL='N',TBDSCH=0101,TBNDTM=001000  
 WHERE TBLIB='LIBR1' AND TBOBJ='FILEF' AND TBMBR='FILEF'

Go to [\(440\) Normal ending QMirror/DB](#)

## (440) End QMirror/DB

Execute QMirror/DB on a Windows command prompt and take command option 2 - 'End current instance'.

```
QMirror/DB x.x.x (released in 20xx/xx) command list (xxxx):
1 - Start instance xxxx
2 - End instance xxxx
5 - Build up indexes from AS400 logical files
K - Change license key
L - Log monitoring
S - Status monitoring
Q - Quit
```

Or, you can take Ctrl-C to terminate QMirror/DB immediately.

Go to [\(450\) Add more AS400 physical files into QMirror/DB table list](#)

## **(450) Add more AS400 physical files into QMirror/DB table list**

(Note: The empty physical files on the AS400 will not be processed by the trial version.)

Step 1. Execute QMirror/DB on a Windows command prompt

Step 2. Take command option 2 to end the current instance if running

Step 3. Take command option 4 to add tables from AS400 physical files

No need to worry about duplications. All existing selected physical files in QMIRROR.ZAMTBF would not be affected.

Step 4. Take command option 8 to add tables into AS400 journaling

No need to worry about duplications. Only one journal can be started for each physical file on AS400.

Step 5. Take command option 1 to start instance

Go to (460) Remove tables from QMirror/DB table list

## **(460) Remove tables from QMirror/DB table list**

If you want to remove a specified table from QMirror/DB table list, you can change download flag TBDWFG to 'D' in the system table QMIRROR.ZAMTBF.

E.g. UPDATE QMIRROR.ZAMTBF  
SET TBDWFG='D'  
WHERE TBLIB='LIBR1' AND TBOBJ='FILEA' AND TBMBR='FILEA'

QMirror/DB will drop the tables which TBDWFG is 'D'; end journaling and delete the record in ZAMTBF.

Go to (470) Data verification between AS400 and the target database



## **(470) Data verification between AS400 and the target database**

QMirror/DB offers a fast and low-impact data verification feature between the AS400 and the target database.

This function begins by comparing record counts on both systems, deleting any extra records and downloading missing ones. In cases where data inconsistency occurs due to field definition issues on the AS400, which can lead to replication failures, QMirror will display the details of the first missing record to assist in problem diagnosis.

If you want to verify a specified AS400 table at once, set the verification flag TBVRFY to 'A' in the system table QMIRROR.ZAMTBF, or set the verification flag TBVRFY to 'X' to omit that specified AS400 tables.

For the updated tables, QMirror/DB sets their TBVRFY to 'U' and starts data verification at every midnight and completes in the early morning.

Go to [\(480\) Large object \(LOB\) processing](#)

## **(480) Large object (LOB) processing**

A large object (LOB) is a string data type with a size ranging from 0 bytes to 2 GB. For example, audio, video, drawing, mixed text and graphic, and image.

For performance consideration, QMirror downloads and replicates large object fields as empty strings. If you want to download and replicate large object fields to the PC databases, set large object processing TBLOB from 'N' to 'Y' in the system table QMIRROR.ZAMTBF. Then, re-download the table by setting TBDWFG to 'A'.

Go to [\(490\) Learn QMirror/DB table status](#)

## (490) Learn QMirror/DB table status

Table status is kept in field TBDWFG, QMIRROR.ZAMTBF.

- 'A' - Waiting for a full table download  
(The table will be dropped before downloading)
- 'B' - Journal backlog processing
- 'D' - To be removed
- 'G' - Downloading
- 'H' - Hooking resources
- 'I' - Initiating for download
- 'Q' - Running SQL QMIRROR.ZTBSQL statements
- 'R' - Downloaded, ready to mirror
- 'X' - Excluded from QMirror/DB
- 'Y' - Waiting for a full table download or 'Selected Download' if specified  
(The table will be cleared dropped before downloading)
- 'Z' - Downloaded and start mirroring, ready to use

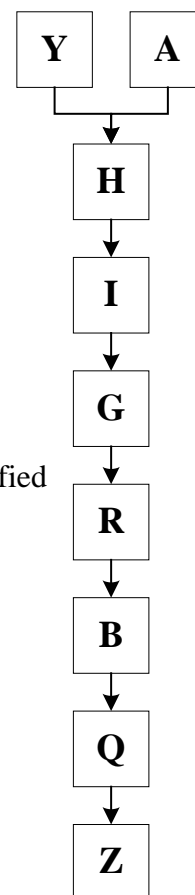
For examples:

1. To know which tables are not yet ready for use  

```
SELECT * FROM QMIRROR.ZAMTBF
WHERE TBDWFG<>'Z' AND TBDWFG<>'X'
```
2. To know which tables are excluded from QMirror/DB  

```
SELECT * FROM QMIRROR.ZAMTBF WHERE TBDWFG='X'
```

Download Flow



## (520) Create extra indexes in the target database

You should create sufficient indexes to get better query performance. The index creation could be defined in the system table QMIRROR.ZTBSQL.

Unique keys of physical file will be kept in field QMIRROR.ZAMTBF.TBUNIQ.

QMirror/DB will insert a record into system table QMIRROR.ZTBSQL to build up index by pulling index keys off of the AS400 physical file with ZQSEQ=99998 after the table was downloaded.

QMirror/DB will insert a records into system table QMIRROR.ZTBSQL to build up indexes by pulling index keys off of the AS400 logical files with ZQSEQ=99999 when you take command option 5 to build up indexes from AS400 logical files.

You can create additional indexes by manually inserting records into system table QMIRROR.ZTBSQL. ZQSEQ set to 9999x, such as 99999 or 99998, is reserved by QMirror.

Example for Oracle, MySQL, PostgreSQL, and MaxDB:

```
INSERT INTO QMIRROR.ZTBSQL (ZQNDX,ZQBOA,ZQKEY,ZQSEQ,ZQSOL)
VALUES(101,'A','LIBRARY1.FILEA;',1,
'CREATE INDEX FILEA01 ON LIBRARY1.FILEA (FIELD1,FIELD2);')
```

Example for MS SQL Server:

```
INSERT INTO QMIRROR.ZTBSQL (ZQNDX,ZQBOA,ZQKEY,ZQSEQ,ZQSOL)
VALUES(101,'A','LIBRARY1..FILEA;',1,
'USE LIBRARY1;CREATE INDEX FILEA01 ON FILEA (FIELD1,FIELD2);')
```

(Notes: Too many indexes on PC databases may slow down QMirror replication performance.)

Refer to [\(A90\) SQL statement master \(ZTBSQL\)](#)

## (525) Dynamic table selection

QMirror/DB supports dynamic table selection, which downloads and replicates tables after around 10 minutes they are created on the AS400.

(Note: The empty physical files on the AS400 will not be processed by the trial version.)

E.g. A daily transaction file named TRNyymmdd is created in library INVLIB on AS400 every morning. To let QMirror/DB download and replicate it, insert a record into system table ZAMTBS manually.

```
INSERT INTO QMIRROR.ZAMTBS (TBLIB,TBGEN,ATOJRN,LFLIB)
VALUES('INVLIB','TRN*','Y','INVLIB')
```

Refer to [\(A17\) Dynamic selection master \(ZAMTBS\)](#)

## (530) Define extended fields in the target database

QMirror/DB uses system table QMIRROR.ZEXFLD to add extended fields in the replicated tables. Insert records into QMIRROR.ZEXFLD to define extended fields, and QMirror/DB will maintain these fields for you. Please refer to [\(A30\) Extended fields master \(ZEXFLD\)](#) for table structure and field comments.

After maintaining QMIRROR.ZEXFLD, you need to re-download the files which you updated. Please refer to [\(430\) Re-download specified AS400 table manually](#).

### 1. System-maintained extended fields

System-maintained extended fields are calculated fields in the replicated tables. You can define the formula into field EXFUNC. The formula could be a simple function, stored function, or a complex stored procedure. QMirror/DB will update the contents in the extended fields according to EXFUNC when records are inserted or changed.

E.g. INSERT INTO QMIRROR.ZEXFLD  
 (EXLIB,EXFILE,EXFLDE,EXFLDT,EXFUNC,EXFTXT)  
 VALUES('LIBR1','FILEA','AMTEXT','CHAR(200)',  
 'MYFUNC(BILLAMT)','Convert amount to text')  
 (Notes: MYFUNC is a stored function defined by user)

### 2. User-maintained extended fields

A table with user-maintained extended fields must have unique keys described in the field QMIRROR.ZAMTBF.TBUNIQ. QMirror/DB extracts unique keys from AS400 physical file or logical files and inserts them into TBUNIQ. If there is no unique key, manually enter the unique keys in TBUNIQ. Be aware that if the physical file has been moved to another library, all data in user-maintained extended fields in your tables will be lost.

E.g. INSERT INTO QMIRROR.ZEXFLD  
 (EXLIB,EXFILE,EXFLDE,EXFLDT,EXFTXT)  
 VALUES('LIBR1','FILEA','PASSWD','CHAR(20)',  
 'Password for Web users')

## (535) Data encryption in the target database

Case study -

When an employee master file on the AS400 contains sensitive data, you can encrypt it in the target database.

Library - EMPLIBR

Physical file – EMPMASTER

Data fields –

F1 – Employee ID

F2 – Social security number (character)

F3 – Salary (decimal)

Target database – MS SQL Server

-- Create database key

USE EMPLIBR;

CREATE MASTER KEY EMPMASTERION BY PASSWORD = 'pwd123';

-- Create self signed certificate

USE EMPLIBR;

CREATE CERTIFICATE Certificate1

EMPMASTERION BY PASSWORD = 'pwd246'

WITH SUBJECT = 'Protection';

-- Define two extended fields in the target database, refer to [\(530\) Define extended fields in the target database](#)

USE QMIRROR;

INSERT INTO ZEXFLD (EXLIB,EXFILE,EXFLDE,EXFLDT,EXFUNC,EXFTXT)

VALUES('EMPLIBR','EMPMASER','F2\_ENCRYPTED','VARBINARY(MAX)',',','Encrypted F2');

INSERT INTO ZEXFLD (EXLIB,EXFILE,EXFLDE,EXFLDT,EXFUNC,EXFTXT)

VALUES('EMPLIBR','EMPMASER','F3\_ENCRYPTED','VARBINARY(MAX)',',','Encrypted F3');

-- Create a trigger by inserting records into ZTBSQL, refer to [\(520\) Create extra indexes in the target database](#)

USE QMIRROR;

INSERT INTO ZTBSQL (ZQNDX,ZQBOA,ZQKEY,ZQSEQ,ZQSQL)

VALUES(1,'B','EMPLIBR..EMPMASER;',100,'USE EMPLIBR;');

INSERT INTO ZTBSQL (ZQNDX,ZQBOA,ZQKEY,ZQSEQ,ZQSQL)

VALUES(2,'B','EMPLIBR..EMPMASER;',100,'DROP TRIGGER IF EXISTS ENCRYPT\_TRIGGER;');

INSERT INTO ZTBSQL (ZQNDX,ZQBOA,ZQKEY,ZQSEQ,ZQSQL)

VALUES(3,'B','EMPLIBR..EMPMASER;',100,

CREATE TRIGGER ENCRYPT\_TRIGGER ON EMPMASTER

AFTER INSERT,UPDATE AS

BEGIN

UPDATE T

SET F2\_ENCRYPTED = EncryptByCert(Cert\_ID('Certificate1'), T.F2), T.F2=NULL,

F3\_ENCRYPTED = EncryptByCert(Cert\_ID('Certificate1'), CONVERT(VARCHAR(20), T.F3)), T.F3=NULL

FROM EMPMASTER AS T

INNER JOIN inserted AS i

ON i.RRN400 = T.RRN400;

END);

-- Select physical file EMPLIBR/EMPMASER by taking QMirror command option 4

-- Start journal physical file by taking QMirror command option 8

-- Start QMirror and wait EMPLIBR/EMPMASER to be downloaded

-- Reading decrypted data by certification

USE EMPLIBR;

SELECT F1,

F2,CONVERT(VARCHAR(MAX), DecryptByCert(Cert\_ID('Certificate1'), F2\_ENCRYPTED, N'pwd246')) AS F2\_E,

F3,CONVERT(VARCHAR(MAX), DecryptByCert(Cert\_ID('Certificate1'), F3\_ENCRYPTED, N'pwd246')) AS F3\_E

FROM EMPMASTER;

## (540) Define hidden fields in the target database

If you have some fields on AS400 files that are sensitive to share with users who are using the PC database, you can hide them up in the target database. For example, salary. It is approached by system table QMIRROR.ZHDFLD. Please refer to [\(A40\) Hidden fields master \(ZHDFLD\)](#) for table structure and field comments.

Insert records into QMIRROR.ZHDFLD for specified library / file / field of AS400 before downloading files. QMirror/DB won't replicate the fields defined in ZHDFLD.

If you are applying AS400 alternative filed name, use AS400 original filed name to edit QMIRROR.ZHDFLD.

E.g. 

```
INSERT INTO QMIRROR.ZHDFLD (HDLIB,HDFILE,HDFLDE)
VALUES('LIBR1','FILEA','FIELDC')
```

After maintaining QMIRROR.ZHDFLD, you need to re-download the files which you updated. Please refer to [\(430\) Re-download specified AS400 table manually](#).



## (550) Multiple AS400s / PC database servers configurations

QMirror/DB supports replication from multiple AS400 servers to multiple PC database servers. You can use it to consolidate data from multiple AS400s for analytics or analysis. Or, split data from a single AS400 to multiple PC databases for widely applications.

Every configuration has a unique ID in QMirror/DB. The first configuration ID is named as 'ROOT'. Take command option 3 - 'Re-configuration' to add new configurations into QMirror/DB.

The PC database name in QMirror/DB for secondary configurations will be put a prefix before AS400 library name. For example, if the second configuration ID is 'EAST', then the PC database name will be:

System database - EAST\_QMIRROR

Library LIBA - EAST\_LIBA (default, could be changed at configuration)

## (560) Data migration from AS400 to PC databases

QMirror/DB provides you a simple way to migrate data from AS400 to PC databases.

Live data migration steps -

1. Install and configure QMirror/DB
2. Select tables from AS400 libraries/PFs by taking command option 4  
(Note: The empty physical files on the AS400 will not be processed by the trial version.)
3. Start journaling all tables by taking command option 8
4. Start QMirror/DB to download and replicate tables by taking command option 1  
(QMirror/DB downloads all tables and replicates data from AS400 to PC databases in real-time)

Once PC databases go production

5. Stop QMirror by taking Ctrl-C or command option 2
6. Stop journaling all tables by taking command option 8. QMirror/DB removes extra columns, RRN400, TBUPDT, and TBUPTM from tables
7. Migration completed

Static data migration steps -

1. Install and configure QMirror/DB
2. Select tables from AS400 libraries/PFs by taking command option 4  
(Note: The empty physical files on the AS400 will not be processed by the trial version.)
3. Stop tables replication by SQL statement  
`UPDATE QMIRROR.ZAMTBF SET TBREPL='N',TBJLIB='',TBJNAM=''`
4. Start QMirror/DB to download tables by taking command option 1  
(QMirror/DB downloads all tables from AS400 to PC databases)

Once tables download completed

5. Stop QMirror by taking Ctrl-C or command option 2
6. Migration completed

## (570) Install QMirror/DB as a Windows Service

Notice:

1. QMirror/DB Service must be installed after QMirror/DB.
2. QMirror/DB Service must be installed on the same PC server which has QMirror/DB installed.
3. QMirror/DB Service xxxx.ini will be reset when QMirror/DB instance xxxx start up.

To install QMirror/DB as a Windows Service:

1. Download QMirror\_DB\_nns.zip from <http://www.qmirror.com>
2. Uninstall the earlier QMirror/DB Service from the Windows program menu list
3. Unzip, execute QMirror\_DB\_nns.exe, and follow the instructions
4. A program menu 'QMirror DB Service' will be created on Windows
5. It is no need to drop any table on the existing PC databases of the earlier version
6. Edit the preset parameters as needed in ROOT.ini in c:\QMirrorDBService  
(Notes: QMirror/DB Service keeps the last workable ROOT.ini into ROOT.ini.ba2 automatically, so there is no need to re-edit ROOT.ini again after upgrading QMirror/DB Service.)
7. Start QMirror/DB Service by launching 'Services' from the Windows 'Control Panel / Administrative Tools'
8. Refer to [\(410\) Get QMirror/DB running log and status](#)

For multiple configurations, create a new QMirror/DB Service as below:

1. Copy ROOT.ini to a new file, e.g. EAST.ini
2. Edit the preset parameters as needed in EAST.ini  
(Notes: QMirror/DB keeps the last workable EAST.ini into EAST.ini.ba2 automatically, so there is no need to re-edit EAST.ini again after upgrading QMirror/DB.)
3. To create an extra QMirror/DB Service:  

```
sc create QMirrorEAST binpath= "c:\QMirrorDBService\qmirrorDBs.exe EAST.ini" start= auto displayname= "QMirrorDB EAST"
```

 (a space is required between equal '=' and double quote '"')
4. To remove an extra QMirror/DB Service:  

```
sc delete QMirrorEAST
```

## (580) Selected download

A partial download of non-jouaned files can be accomplished by QMirror/DB through SQL WHERE clause definition in ZAMTBF.TBSQLW. A new table on the target database <library.file\_member\_SELECTED> will be created with selected records according to the SQL WHERE clause defined in ZAMTBF.TBSQLW.

### Case study

Jack is the QMirror/DB administrator of company ABC who uses MySQL as the target database. A large file SALES/DAILY on AS400 keeps the daily sales report by product. The date of sales is written in field SALES\_DATE. A daily statistic procedure on AS400 will be starts at 00:30 a.m. and completes before 2:00 a.m. He wishes QMirror/DB to download the new records from yesterday after the daily procedure is done and then merge it into the main table.

Following are what Jack should do for the QMirror/DB setting.

1. Take command option 4 to include physical file SALES/DAILY into ZAMTBF
2. Set file SALES/DAILY as a non-replication file:  
`ZAMTBF.TBREPL = 'N'`
3. Set ZAMTBF.TBJLIB and ZAMTBF.TBJNAM to blank if it is a jouraned file and the journal file is not QMIRROR/JRN
4. Set download schedule at 2:00am daily:  
`ZAMTBF.TBDSCH = 9999, TBNDTM = 020000`
5. Set selected download SQL WHERE clause according to AS400 SQL syntax:  
`ZAMTBF.TBSQLW = 'SALES_DATE = CURDATE() - 1 DAY'`
6. Add a record in ZTBSQL to tell QMirror/DB to delete duplicated records and merge it into table SALES.DAILY after the daily download from AS400 according to MySQL SQL syntax:  
`INSERT INTO QMIRROR.ZTBSQL (ZQNDX,ZOBOA,ZQKEY,ZOSEQ,ZOSQL)  
VALUES(101,'A','SALES.DAILY_SELECTED;',100,  
'DELETE FROM SALES.DAILY WHERE SALES_DATE = CURRENT_DATE -  
INTERVAL "1 DAY"; INSERT INTO SALES.DAILY(SELECT * FROM  
SALES.DAILY_SELECTED);')`
7. Start QMirror/DB
8. QMirror/DB will download full table of SALES.DAILY for the first time

## (585) Define mapping table in the PC database

(Note 1: An additional license is required to enable QMirror/DB mapping functions.)

(Note 2: QMirror/DB upload function does not support multiple split mapped tables.)

Normally, QMirror/DB replicates AS400 physical files to target database with same naming rules.

|                      |   |                                                             |
|----------------------|---|-------------------------------------------------------------|
| Target database name | = | AS400 library name                                          |
| Target table name    | = | AS400 physical file name<br>AS400 physical file member name |
| Target column name   | = | AS400 field name                                            |

You can use QMirror/DB system tables, ZAMTBM and ZWHFLM, to define your own naming rules. Up to nine split mapping tables can be defined for one AS400 physical file member by unique non-zero number in ZAMTBM.MAPSEQ.

|                     |               |    |               |
|---------------------|---------------|----|---------------|
| AS400 library name: | ZAMTBM.TBLIB  | => | ZAMTBM.MAPLIB |
| AS400 PF name:      | ZAMTBM.TBOBJ  | => | ZAMTBM.MAPOBJ |
|                     | ZAMTBM.TBMBR  |    |               |
| AS400 field name:   | ZWHFLD.WHFLDI | => | ZWHFLD.MAPFLD |

Refer to [\(A15\) Mapped table master \(ZAMTBM\)](#)  
[\(A125\) Mapped filed master \(ZWHFLM\)](#)

## (590) Upload data from PC database to AS400

(Notes: An additional license is required to enable QMirror/DB upload functions.)

QMirror/DB provides a convenient and safe method for writing data back to the AS400 server from then PC database based on transactional management.

Only defined upload fields will be written back to the AS400 server and these fields will be restricted to download from the AS400 server to the PC database during the replication. That means you should not update the fields on the AS400 which are defined as the upload fields in the system table QMIRROR.ZUPFLD.

A CL program UPCLIB/UPCPGM will be called right after the upload succeeded. Refer to [\(A100\) Upload controller \(ZUPCTL\)](#)

To write data back to the AS400 server from the PC database:

1. The table must be journaled and well downloaded to the PC database
2. Define upload fields in the system table QMIRROR.ZUPFLD  
 Use SQL command for rapid insertion:  

```
INSERT INTO QMIRROR.ZUPFLD (UPLIB,UPFILE,UPFLDI,UPFTXT)
SELECT WHLIB,WHFILE,WHFLDI,WHFTXT FROM QMIRROR.ZWHFLD
WHERE WHLIB='LIBR1' AND WHFILE='FILEA'
```

 Refer to [\(A120\) Upload fields master \(ZUPFLD\)](#)
3. Maintain upload fields' value on PC database by PC applications
4. Request QMirror/DB to write data back based on transaction by inserting changed records into system table QMIRROR.ZUPDTL  

```
INSERT INTO QMIRROR.ZUPDTL
(UPTMST,UPTRXN,UPLIB,UPOBJ,UPMBR,UPCODE,UPRRN)
VALUES(<current timestamp>,'POCFM','LIBR1','FILEA','FILEA','U',425);
```

 Refer to [\(A110\) Upload transaction detail \(ZUPDTL\)](#)
5. Insert transaction controller into system table QMIRROR.ZUPCTL to start upload  

```
INSERT INTO QMIRROR.ZUPCTL (UPTMST,UPTRXN,UPCLIB,UPCPGM,UPRMRK)
VALUES(<current timestamp>,'POCFM','LIBR1','POPGM2','PO Confirmation')
```

 Refer to [\(A100\) Upload controller \(ZUPCTL\)](#)
6. Check upload return code
  - 0000 - Success
  - 0001 - Fields definition error in ZUPFLD
  - 0002 - Record missing on PC database
  - 0003 - Record missing on AS400 server
  - 0004 - Record insertion error
  - 0005 - Record updating error
  - 0006 - Table not journaled or well downloaded
  - 0008 - CL program failure
  - 9999 - Unknown error

**(A10) AS400 table master (ZAMTBF)**

| Field name | Key | Data type    | Description                                                                                                                                                       |
|------------|-----|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| =====      | === | =====        | =====                                                                                                                                                             |
| TBLIB      | K   | CHAR(10)     | AS400 library name                                                                                                                                                |
| TBOBJ      | K   | CHAR(10)     | AS400 file name                                                                                                                                                   |
| TBMBR      | K   | CHAR(10)     | AS400 member name                                                                                                                                                 |
| TBFMT      |     | CHAR(10)     | Record format                                                                                                                                                     |
| TBREPL     |     | CHAR(1)      | To be replicated                                                                                                                                                  |
| TBJLIB     |     | CHAR(10)     | Journal library                                                                                                                                                   |
| TBJNAM     |     | CHAR(10)     | Journal name                                                                                                                                                      |
| TBFLDN     |     | NUMBER(5,0)  | Number of fields                                                                                                                                                  |
| TBRLEN     |     | NUMBER(5,0)  | Record length                                                                                                                                                     |
| TBTXT      |     | CHAR(50)     | AS400 file text                                                                                                                                                   |
| TBDWFG     |     | CHAR(1)      | Download flag<br>Refer to <a href="#">(490) Learn QMirror/DB table status</a>                                                                                     |
| TBPRTY     |     | NUMBER(2,0)  | Download priority                                                                                                                                                 |
| TBLOB      |     | CHAR(1)      | Large object (LOB) processing<br>Refer to <a href="#">(480) Large object (LOB) processing</a>                                                                     |
| TBMAXR     |     | NUMBER(10,0) | Total records                                                                                                                                                     |
| TBDLTR     |     | NUMBER(10,0) | Deleted records                                                                                                                                                   |
| TBDSCH     |     | NUMBER(4,0)  | Download schedule code<br>Refer to <a href="#">(430) Re-download AS400 table manually</a>                                                                         |
| TBSQLW     |     | TEXT         | Selected download SQL WHERE clause<br>Refer to <a href="#">(580) Selected download</a>                                                                            |
| TBNDDT     |     | NUMBER(8,0)  | Next download date                                                                                                                                                |
| TBNDTM     |     | NUMBER(6,0)  | Next download time                                                                                                                                                |
| TBDWDT     |     | NUMBER(8,0)  | Last download date                                                                                                                                                |
| TBDWTM     |     | NUMBER(6,0)  | Last download time                                                                                                                                                |
| TBSTS      |     | CHAR(1)      | Table status<br>'E' - Error occurred for this table                                                                                                               |
| TBVRFY     |     | CHAR(1)      | Verification flag                                                                                                                                                 |
| TBLIAS     |     | CHAR(1)      | Override alternative field name configuration<br>'Y' - Apply alternative field name<br>'N' - Not apply alternative field name<br>blank - By configuration setting |
| TBVRDT     |     | NUMBER(8,0)  | Last verification date                                                                                                                                            |
| TBVRTM     |     | NUMBER(6,0)  | Last verification time                                                                                                                                            |
| TBRMRK     |     | CHAR(128)    | Remark                                                                                                                                                            |

## (A15) Mapped table master (ZAMTBM)

| Field name | Key | Data type   | Description                  |
|------------|-----|-------------|------------------------------|
| =====      | === | =====       | =====                        |
| MAPLIB     | K   | CHAR(64)    | Mapped database name         |
| MAPSMA     | K   | CHAR(64)    | Mapped schema for SQL server |
| MAPOBJ     | K   | CHAR(64)    | Mapped table name            |
| TBLIB      |     | CHAR(10)    | AS400 library name           |
| TBOBJ      |     | CHAR(10)    | AS400 file name              |
| TBMBR      |     | CHAR(10)    | AS400 member name            |
| MAPSEQ     |     | NUMBER(1,0) | Mapped sequence              |

Refer to [\(585\) Define mapping table on PC database](#)



**(A17) Dynamic selection master (ZAMTBS)**

| <b>Field name</b> | <b>Key</b> | <b>Data type</b> | <b>Description</b>                 |
|-------------------|------------|------------------|------------------------------------|
| =====             | ===        | =====            | =====                              |
| TBLIB             | K          | CHAR(10)         | AS400 library name                 |
| TBGEN             | K          | CHAR(10)         | Generic physical file name         |
| ATOJRN            |            | CHAR(1)          | Auto start journal                 |
| LFLIB             |            | CHAR(10)         | Logical files located library name |

Refer to [\(525\) Dynamic table selection](#)

**(A30) Extended fields master (ZEXFLD)**

| <b>Field name</b> | <b>Key</b> | <b>Data type</b> | <b>Description</b>                                                 |
|-------------------|------------|------------------|--------------------------------------------------------------------|
| =====             | ===        | =====            | =====                                                              |
| EXLIB             | K          | CHAR(10)         | AS400 library name                                                 |
| EXFILE            | K          | CHAR(10)         | AS400 file name                                                    |
| EXFLDE            | K          | CHAR(30)         | Extended field name                                                |
| EXRESV            |            | CHAR(1)          | Reserved                                                           |
| EXFLDT            |            | CHAR(32)         | Extended field data type                                           |
| EXFUNC            |            | CHAR(500)        | Extended field function statement<br>blank - User maintained field |
| EXFTXT            |            | CHAR(50)         | Extended field comment                                             |
| EXSTS             |            | CHAR(1)          | Status of execution                                                |

Refer to (530) Define extended fields in the target database

**(A40) Hidden fields master (ZHDFLD)**

| <b>Field name</b> | <b>Key</b> | <b>Data type</b> | <b>Description</b> |
|-------------------|------------|------------------|--------------------|
| =====             | ===        | =====            | =====              |
| HDLIB             | K          | CHAR(10)         | AS400 library name |
| HDFILE            | K          | CHAR(10)         | AS400 file name    |
| HDFLDE            | K          | CHAR(15)         | Hidden field name  |

Refer to (540) Define hidden fields in the target database

**(A50) Job log file (ZJBLOG) / Job status file (ZJBSTS)**

| <b>Field name</b> | <b>Key</b> | <b>Data type</b> | <b>Description</b>                                                                                                             |
|-------------------|------------|------------------|--------------------------------------------------------------------------------------------------------------------------------|
| =====             | ===        | =====            | =====                                                                                                                          |
| ZJTYPE            |            | CHAR(1)          | Log type<br>blank - Delay status<br>'D' - Download status<br>'E' - Error occurred<br>'R' - Recovery status<br>'S' - SQL status |
| ZJJBID            |            | NUMBER(3,0)      | Job ID                                                                                                                         |
| ZJRPDT            |            | NUMBER(8,0)      | Reporting date                                                                                                                 |
| ZJRPTM            |            | NUMBER(6,0)      | Reporting time                                                                                                                 |
| ZJACTN            |            | CHAR(30)         | Action description                                                                                                             |
| ZJLIB             |            | CHAR(10)         | AS400 library name                                                                                                             |
| ZJOBJ             |            | CHAR(10)         | AS400 file name                                                                                                                |
| ZJMBR             |            | CHAR(10)         | AS400 member name                                                                                                              |
| ZJDATE            |            | NUMBER(8,0)      | Journal date                                                                                                                   |
| ZJTIME            |            | NUMBER(6,0)      | Journal time                                                                                                                   |
| ZJRCDS            |            | NUMBER(10,0)     | Journal records                                                                                                                |
| ZJBSTS            |            | CHAR(1)          | Status code<br>blank - Normal delay<br>'S' - Starting delay                                                                    |
| ZJRMRK            |            | CHAR(128)        | Remark                                                                                                                         |

Refer to [\(420\) Get QMirror/DB status log](#)

**(A60) Journal master (ZJMASF)**

| <b>Field name</b> | <b>Key</b> | <b>Data type</b> | <b>Description</b>                   |
|-------------------|------------|------------------|--------------------------------------|
| =====             | ===        | =====            | =====                                |
| ZMJLIB            | K          | CHAR(10)         | Journal library                      |
| ZMJNAM            | K          | CHAR(10)         | Journal name                         |
| ZMJRHD            |            | CHAR(10)         | Journal receiver header              |
| ZMJNDX            |            | NUMBER(3,0)      | Journal index                        |
| ZMCRCV            |            | CHAR(10)         | Current journal receiver             |
| ZMCSEQ            |            | NUMBER(10,0)     | Current sequence number              |
| ZMJRCV            |            | NUMBER(4,0)      | No. of last deleted journal receiver |
| ZMRMRK            |            | CHAR(128)        | Remark                               |

**(A65) Journal count log (ZJMLOG)**

| <b>Field name</b> | <b>Key</b> | <b>Data type</b> | <b>Description</b> |
|-------------------|------------|------------------|--------------------|
| =====             | ===        | =====            | =====              |
| ZJMRDT            |            | NUMBER(8,0)      | Date replicated    |
| ZJMRHR            |            | NUMBER(6,0)      | Hour replicated    |
| ZJLIB             |            | CHAR(10)         | AS400 library name |
| ZJOBJ             |            | CHAR(10)         | AS400 file name    |
| ZJMBR             |            | CHAR(10)         | AS400 member name  |
| ZJINS             |            | NUMBER(10,0)     | Records inserted   |
| ZJUPD             |            | NUMBER(10,0)     | Records updated    |
| ZJDEL             |            | NUMBER(10,0)     | Records deleted    |

**(A70) System log file (ZPCLOG / ZPCLOG2)**

| <b>Field name</b> | <b>Key</b> | <b>Data type</b> | <b>Description</b> |
|-------------------|------------|------------------|--------------------|
| =====             | ===        | =====            | =====              |
| ZPLGDT            |            | NUMBER(8,0)      | Logging date       |
| ZPLGTM            |            | NUMBER(6,0)      | Logging time       |
| ZPLSEQ            |            | NUMBER(3,0)      | Sequence number    |
| ZPLOGS            |            | TEXT             | QMirror/DB log     |

**(A80) System control file (ZSERVR)**

| <b>Field name</b> | <b>Key</b> | <b>Data type</b> | <b>Description</b>                                                                                                   |
|-------------------|------------|------------------|----------------------------------------------------------------------------------------------------------------------|
| =====             | ===        | =====            | =====                                                                                                                |
| ZVERNO            |            | CHAR(10)         | QMirror/DB version number                                                                                            |
| ZSVRID            |            | CHAR(4)          | Configuration ID<br>'ROOT' – Primary configuration<br>Refer to <u>(550) Multiple AS400s / PCs configurations</u>     |
| ZPTYPE            |            | NUMBER(1,0)      | Target database type                                                                                                 |
| ZPINST            |            | CHAR(30)         | Target database instance name                                                                                        |
| ZPTPIP            |            | CHAR(30)         | Target database IP address                                                                                           |
| ZPPORT            |            | CHAR(10)         | Target database connection port                                                                                      |
| ZPUSER            |            | CHAR(30)         | Target database user ID                                                                                              |
| ZPPRFX            |            | CHAR(4)          | Target database prefix                                                                                               |
| ZATPIP            |            | CHAR(30)         | AS400 IP address                                                                                                     |
| ZAUSER            |            | CHAR(10)         | AS400 user name                                                                                                      |
| ZSLKEY            |            | CHAR(31)         | QMirror/DB license key                                                                                               |
| ZACHAR            |            | CHAR(10)         | Database character set                                                                                               |
| ZCCSID            |            | CHAR(5)          | DBCS/Unicode default CCSID                                                                                           |
| ZAJBPR            |            | NUMBER(2,0)      | AS400 job priority                                                                                                   |
| ZXDLJB            |            | NUMBER(2,0)      | Maximum download threads                                                                                             |
| ZMSIZE            |            | NUMBER(5,0)      | Optimum mirror block size                                                                                            |
| ZJBLOG            |            | CHAR(10)         | Log flags                                                                                                            |
| ZMLMSG            |            | CHAR(1)          | Email option<br>'N' - None<br>'S' – Suspend message only<br>'E' - Error messages<br>'W' - Error and warning messages |
| ZMHOST            |            | CHAR(64)         | Email SMTP host                                                                                                      |
| ZMADDR            |            | CHAR(128)        | Email address                                                                                                        |
| ZMRDLN            |            | NUMBER(5,0)      | Maximum record length                                                                                                |
| ZJMRDT            |            | NUMBER(8,0)      | Replication cutoff date                                                                                              |
| ZJMRTM            |            | NUMBER(6,0)      | Replication cutoff time                                                                                              |
| ZJRCHE            |            | CHAR(1)          | Journal caching                                                                                                      |
| ZALIAS            |            | CHAR(1)          | Use AS400 alternative field name                                                                                     |
| ZDESC             |            | CHAR(50)         | Configuration description                                                                                            |



**(A90) SQL statement master (ZTBSQL)**

| Field name | Key | Data type   | Description                                                                                                                                                                           |
|------------|-----|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| =====      | === | =====       | =====                                                                                                                                                                                 |
| ZQNDX      | K   | NUMBER(9,0) | Record index                                                                                                                                                                          |
| ZQBOA      |     | CHAR(1)     | C/B/A-before or after table creation<br>'A' - Execute AFTER the table is downloaded<br>'B' - Execute BEFORE the table starts downloading<br>'C' - Execute before the table is CREATED |
| ZQKEY      |     | TEXT        | Binding table list, separates by semicolon                                                                                                                                            |
| ZQSEQ      |     | NUMBER(9,0) | Sequence of execution<br>99998 - Index buildup from AS400 physical file<br>99999 - Indexes buildup from AS400 logical files                                                           |
| ZQSQL      |     | TEXT        | SQL statement                                                                                                                                                                         |
| ZQSTS      |     | CHAR(1)     | Status of execution<br>'A' - Newly added by selection<br>'E' - Failed to execute SQL statement in ZQSQL<br>'X' - Omitted<br>'Z' - Success to execute SQL statement in ZQSQL           |
| ZQPDT      |     | NUMBER(8,0) | Execution date                                                                                                                                                                        |
| ZQPTM      |     | NUMBER(6,0) | Execute time                                                                                                                                                                          |

Refer to (520) Create index in the target database

## (A100) Upload controller (ZUPCTL)

| Field name | Key | Data type   | Description                                                                                |
|------------|-----|-------------|--------------------------------------------------------------------------------------------|
| =====      | === | =====       | =====                                                                                      |
| UPTMST     | K   | CHAR(26)    | Transaction timestamp<br>e.g. CURRENT_TIMESTAMP for MS SQL Server<br>e.g. NOW(3) for MySQL |
| UPCLIB     | K   | CHAR(10)    | CL PGM library                                                                             |
| UPCPGM     | K   | CHAR(250)   | CL program<br>Will be called right after upload successes                                  |
| UPTRXN     | K   | CHAR(10)    | Transaction code                                                                           |
| UPRMRK     |     | CHAR(64)    | User remark                                                                                |
| UPRTN      |     | CHAR(4)     | Return code                                                                                |
| UPUDAT     |     | NUMBER(8,0) | Upload date                                                                                |
| UPUTIM     |     | NUMBER(8,0) | Upload time                                                                                |

Refer to (590) Upload data from PC database to AS400

## (A110) Upload transaction detail (ZUPDTL)

| Field name | Key | Data type    | Description                                                                                |
|------------|-----|--------------|--------------------------------------------------------------------------------------------|
| =====      | === | =====        | =====                                                                                      |
| UPTMST     | K   | CHAR(26)     | Transaction timestamp<br>e.g. CURRENT_TIMESTAMP for MS SQL Server<br>e.g. NOW(3) for MySQL |
| UPTRXN     | K   | CHAR(10)     | Transaction code                                                                           |
| UPLIB      | K   | CHAR(10)     | AS400 library name                                                                         |
| UPOBJ      | K   | CHAR(10)     | AS400 file name                                                                            |
| UPMBR      | K   | CHAR(10)     | AS400 member name                                                                          |
| UPCODE     | K   | CHAR(1)      | Upload code (I/U/D)                                                                        |
| UPRRN      | K   | NUMBER(10,0) | AS400 relative record number<br>For insertion, use negative unique number                  |
| UPRMRK     |     | CHAR(64)     | User remark                                                                                |
| UPRTN      |     | CHAR(4)      | Return code                                                                                |
| UPUDAT     |     | NUMBER(8,0)  | Upload date                                                                                |
| UPUTIM     |     | NUMBER(8,0)  | Upload time                                                                                |

Refer to (590) Upload data from PC database to AS400

**(A120) Upload fields master (ZUPFLD)**

| <b>Field name</b> | <b>Key</b> | <b>Data type</b> | <b>Description</b> |
|-------------------|------------|------------------|--------------------|
| =====             | ===        | =====            | =====              |
| UPLIB             | K          | CHAR(10)         | AS400 library name |
| UPFILE            | K          | CHAR(10)         | AS400 file name    |
| UPFLDI            | K          | CHAR(10)         | AS400 field name   |
| UPTXT             |            | CHAR(50)         | Field text         |
| UPFRMK            |            | CHAR(64)         | User remark        |

Refer to (590) Upload data from PC database to AS400

## (A125) Mapped field master (ZWHFLM)

| Field name | Key | Data type | Description                  |
|------------|-----|-----------|------------------------------|
| =====      | === | =====     | =====                        |
| MAPLIB     | K   | CHAR(64)  | Mapped database name         |
| MAPSMA     | K   | CHAR(64)  | Mapped schema for SQL server |
| MAPOBJ     | K   | CHAR(64)  | Mapped table name            |
| MAPFLD     | K   | CHAR(64)  | Mapped field name            |
| WHFLDI     |     | CHAR(10)  | AS400 field name             |

Refer to [\(585\) Define mapping table on PC database](#)

## **(B10) Error messages**

- E001: AS400 user <user> does not have the authority to execute QMirror/DB
- E002: Table list is empty. Please build up table list from AS400 physical files
- E101: QMirror/DB license is expired or incorrect
- E102: QMirror/DB license is expired
- E103: Configuration failure
- E104: A serious problem occurred. Please drop QMIRROR database  
in <PC database type> and re-start QMirror/DB
- E105: Re-download setting failure
- E106: Configuration ID <id> is incorrect
- E107: Time Synchronization error
- E201: Configuration ID <id> in the system table <database.table> is missing
- E203: QMirror/DB already started
- E204: Failed to start QMirror/DB
- E205: Target database <database> at <IP address> does not exist
- E301: AS400 at <IP address> is not running
- E302: AS400 user password is incorrect
- E303: AS400 connection failure
- E304: <journal work file> cannot be created or has been locked
- E305: Mirror threads could not be started
- E401: <PC database type> at <IP address> is not running  
or instance <instance> does not exist or installation is incorrect
- E402: <PC database type> <user ID> password is incorrect or connection refused
- E403: <PC database type> <user ID> cannot log in
- E404: <PC database type> connection failure
- E405: Failed to end the existing instance <instance>
- E406: Failed to create <PC database> on <PC database type> at <IP address>
- E501: SQL failure - <SQL statement>
- E502: <database.table> failure - <SQL statement>
- E503: System table <database.table> has error at <database.table> field <field>
- E504: System table <database.table> has errors at <database.table> fields unknown
- E505: <library/file/member> Library/File/Member download error occurred
- E506: <library/file/member/rnn> Library/File/Member/RRN cannot be <event>
- E507: Failed to upload data to AS400 with error code <error code>
- E508: Journal events lost - <journal name> at <date/time>

## (B20) Warning messages

- W101: QMirror/DB configuration terminated
- W103: QMirror/DB license will be expired at the end of this month
- W104: QMirror/DB command terminated
- W301: No table is journaling. Mirror threads disabled
- W302: Index list is empty. Try to build up indexes ...
- W303: AS400 at <IP address> is not running. Will re-connect <n> minutes later.
- W304: AS400 field value dumping (<offset>) <library/file/member/RRN>
- W305: Failed to build up the replication path. Re-starting QMirror/DB
- W306: <library/file.field> is a reserved word. Change field name to <field>
- W307: Cannot access AS400 journal <library/journal> properly. Reboot is required.
- W308: AS400 journal <library/journal> does not exist or read error
- W309: Re-download <library/file/member>
- W310: Physical file member <library.file\_member> has been deleted
- W311: Physical file member <library.file\_member> has been moved to  
           <new library.new file\_new member>
- W312: Physical file member <library.file\_member> has been renamed to  
           <new library.new file\_new member>
- W313: <library/file/member/rn.field> has different field definition. Set as  
           <default value>
- W314: Replication error - <library/file/member/rn>
- W315: <library/file/member> verification record not match
- W316: It could be a lock on the <server type>
- W317: Slow replication speed <library/file/member>
- W318: <library/file/member> primay key changed
- W402: <PC database type> at <IP address> is not running  
           Will re-connect <n> minutes later.
- W403: <database.table> is locked
- W404: <database.table> cannot be dropped. Will try again later.
- W405: <database.table> cannot be renamed. Will try again later.
- W406: <library/file/member/rn> Library/File/Member/RRN cannot be mirrored
- W407: ZTBSQL statement failure