

Introduction



EASYCOM For WinDev is available since WinDev Version 4.

PC Soft and AURA Equipments are partnering since the first release of EASYCOM For WinDev, to provide a complete set of drivers and tools to access AS/400 databases, programs and objects, natively, from WinDev applications.

Easycom For WinDev 19, Easycom For WebDev 19 and Easycom For WinDev 19 Mobile are the latest enhancement of this product range.

This documentation is common to WinDev, WebDev and WinDev mobile environments.

You can find some specific features for [WebDev](#) and [WinDev Mobile](#).

EASYCOM For WinDev provides a global access to AS/400 resources :

- [Native Access](#) to DB2/400 files, using standard WLanguage and Hyper File functions. ([HReadFirst](#), etc...)
- [SQL Access](#) using standard WLanguage SQL functions, such as [HExecuteQuery](#),
- [Simple Commands](#) or [Commands with Result Values](#) calls.
- [Native Programs and Data Queues Access](#).

WinDev applications can be ported from Hyper File environment to AS/400 and vice versa.

Installation

System requirement

EASYCOM is a Client/Server middleware. It is made of :

- A **Server engine** to be installed on System I – AS/400
- **Client connectors and drivers** to be installed on Windows, Linux or Unix workstations and servers.

Requirements :

Server

- All AS/400 series B and further
- All OS/400 version from V3R7 to V6R1. Minimum of V4R5 is recommended.
- TCP/IP protocol

Client

- PC with Pentium (x86) processor minimum
- Protocol TCP/IP
- Operating system : Windows 95, Windows 98, Windows NT 4.0 (SP3), Windows 2000, Windows XP, Windows Vista.

QSECOFR profile is required to install server on AS/400.

Installing Easycom For WinDev for development

Easycom installation procedure runs on a Windows workstation.

It is launched from the product CD-Rom, or from the downloaded installation procedure.

Installation package contains also the [installation procedure for the Server part](#) of EASYCOM.

If option is checked, Server installation will be launched by the client installation. Server needs to be installed only once. When you install Easycom on additional workstations, uncheck the option, or quit the installation process when it shows the server installation screen.

The installation process creates a sub-directory in "Program Files" directory.

- "Program Files\EASYCOM\WinDevnn".

It also creates a samples folder, and copy connectors and drivers files to WinDev and WebDev directories.

Default location of the native access connectors is: C:\WinDev 19\Programmes

Compatibility with previous WinDev and WebDev versions.

Installing Easycom For WinDev 19 has no effect in WinDev 16, 15, 14, 12, 11, 10, 9, 8, 7.5 and 5.5 existing installations.

Connectors and drivers files have different names.

Utility programs are located in different sub-directories in "Program Files"

Installing Easycom Server

EASYCOM Server installation procedure is launched from a Windows workstation, connected to the AS/400 via TCP/IP.

It uses FTP to upload objects on the system.

The Easycom Server installation procedure is a Windows executable file. It is embedded in the Easycom connectors installation, and automatically launched the first time you install a client connector on a Windows workstation or server.

Server has to be installed only once. If you run an Easycom connector installation again on a Windows station, you need to uncheck "Install AS/400 server" option, or leave the installation procedure when the Server installation wizard is shown.

EASYCOM server consists in a set of objects (programs, commands and files) collected into one single library, named 'EASYCOM' (default).

It is possible to change this default library name or to [install multiple EASYCOM servers](#). In the following, library name will be referred to as EASYCOM.

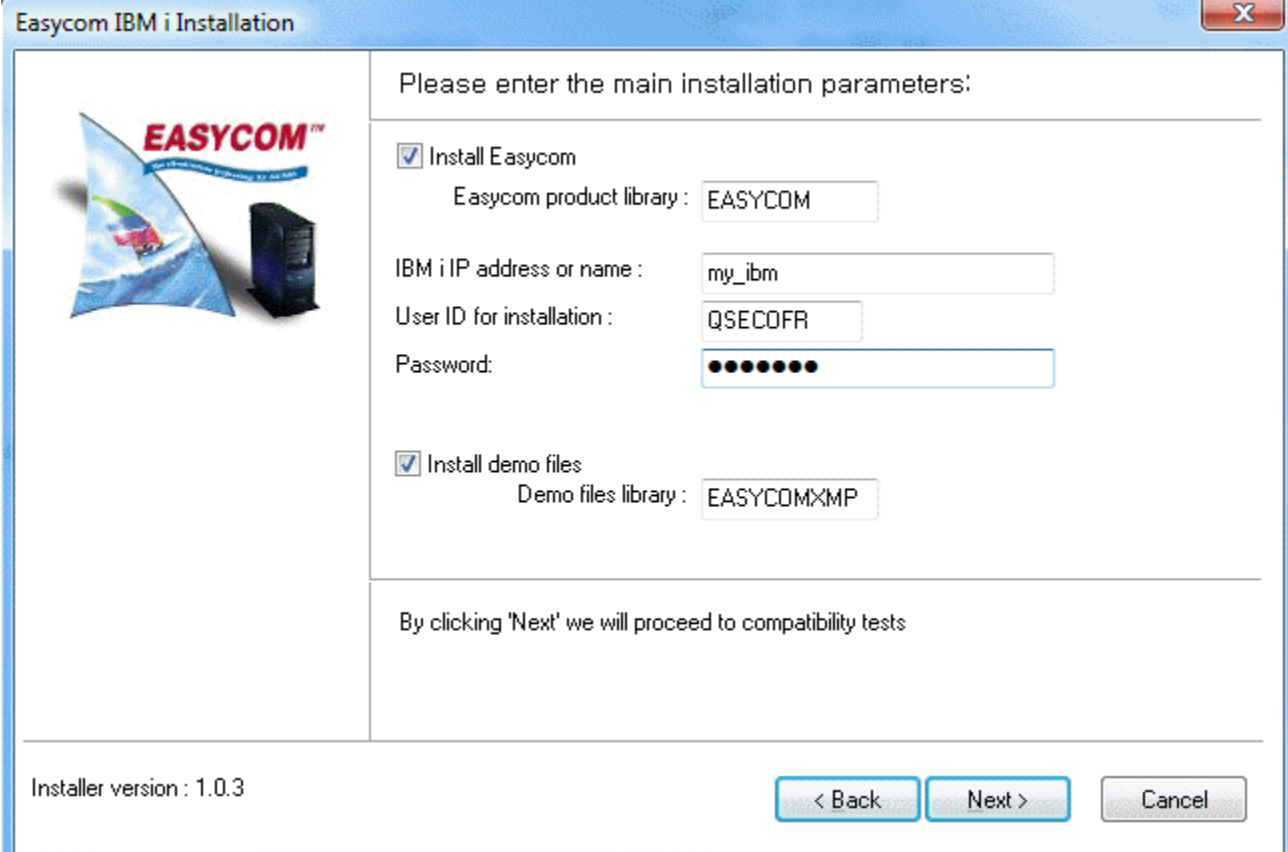
Prerequisites - TCP/IP and FTP

TCP/IP must be installed, configured and running on the AS/400 (see the CFGTCP and STRTCP AS/400 commands for more details).

FTP is required for Easycom installation process. Once installed, it is no longer need for the EASYCOM normal operation.

The AS/400 FTP service can be started if needed using STRTCPSVR SERVER (*FTP) command.

QSECOFR profile is recommended: *SECADM and *ALLOBJ special authorities are needed for proper installation.



The image shows a Windows-style installation window titled "Easycom IBM i Installation". On the left is a logo for "EASYCOM" with a sailboat and a server tower. The main area is titled "Please enter the main installation parameters:". It contains two checked checkboxes: "Install Easycom" and "Install demo files". Below "Install Easycom" is a text field for "Easycom product library" containing "EASYCOM". Below "Install demo files" is a text field for "Demo files library" containing "EASYCOMXMP". There are also text fields for "IBM i IP address or name" (containing "my_ibm"), "User ID for installation" (containing "QSECOFR"), and "Password" (represented by dots). At the bottom, it says "By clicking 'Next' we will proceed to compatibility tests". The footer shows "Installer version : 1.0.3" and three buttons: "< Back", "Next >", and "Cancel".

Easycom IBM i Installation

Please enter the main installation parameters:

☒ Install Easycom
Easycom product library : EASYCOM

IBM i IP address or name : my_ibm

User ID for installation : QSECOFR

Password:

☒ Install demo files
Demo files library : EASYCOMXMP

By clicking 'Next' we will proceed to compatibility tests

Installer version : 1.0.3

< Back Next > Cancel

Confirm Destination Library Name

Default name is EASYCOM.

We suggest to keep the default name as it is, unless you have to [install multiple Easycom servers](#) on the same machine, or you want to test a new version without updating the existing one.

The library will be created if it doesn't already exist.

If the library already exists, a backup copy will be created in library EAC_BACKUP.

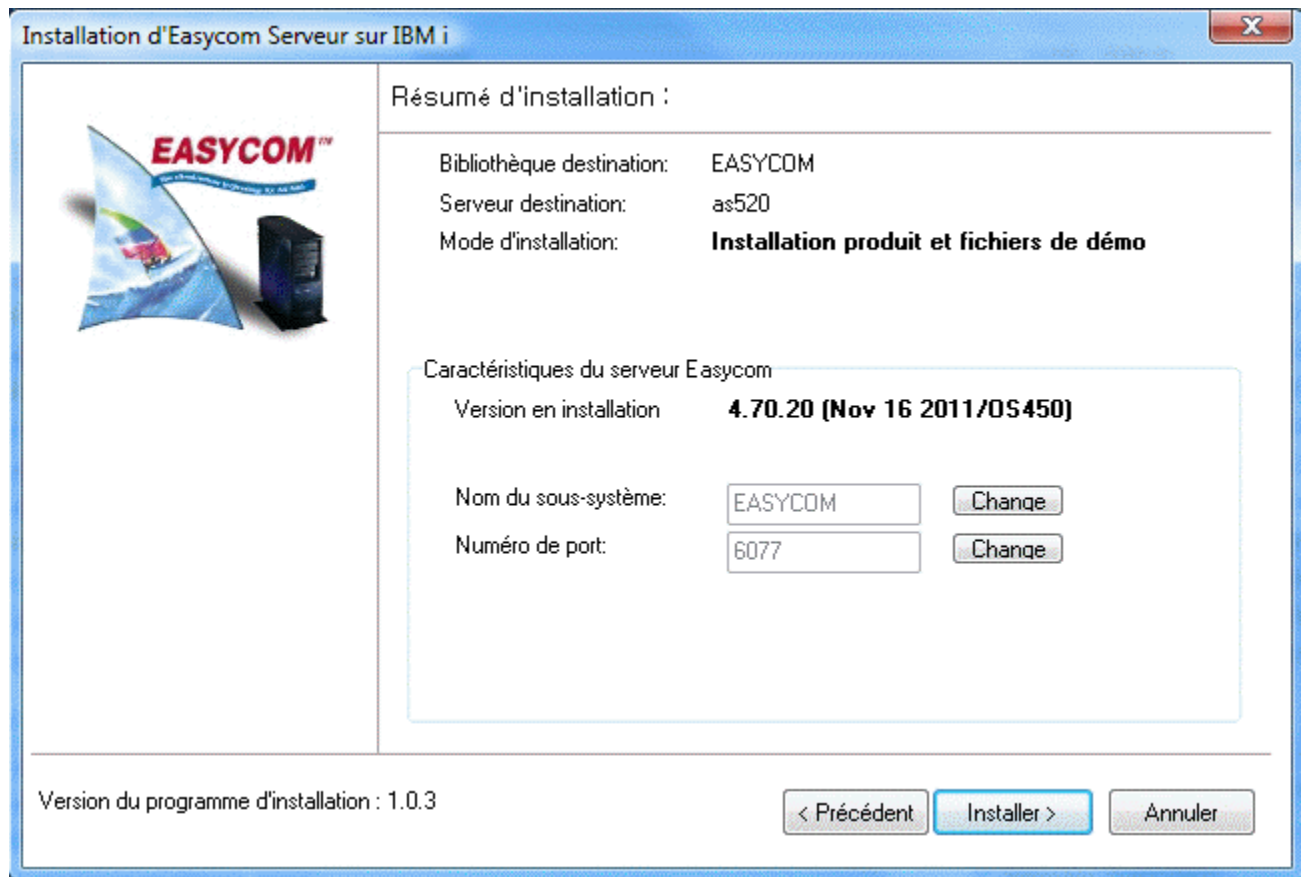
In the future, you need to rename this server library, or copy it, you will need to run [CFGEACTCP](#) command, using the new library name, in order to link the objects together in the new library.

Testing the initial configuration and compatibility

The installation is first performing a routine test: if the OS/400 is compatible with the installation, if a previous version is present, ...

During the test, nothing is installed on the AS/400 (you even can cancel the process during the test)

Then it shows the following confirmation screen (here in case of a new installation):



It confirms the destination library, and if it is a new installation (for product and demo libraries), or an update. If it is an update, it shows the actual version number.

This step allows to change the current (or default) subsystem name and port values.

Installing the demonstration files

For the first EASYCOM installation on AS/400, the demonstration files allows to run the test and demonstration programs installed on the client workstation within development environment.

Give the AS/400 name or IP address AS/400 on which the software will be installed.

Enter a user name and password to proceed with the installation

It is not recommended to use any other user than QSECOFR.

Some EASYCOM library objects are configured to be owned by QSECOFR.

The EASYCOMD (*PGM) object has to be run under QSECOFR permissions.

If QSECOFR is not used for installing the server, the auto-configuration may not be completed, and the first start-ups may be difficult.

EASYCOM Subsystem.

When installation is completed, **Easycom subsystem is started**.

This subsystem must remain active to accept client connections. See your system administrator to have the [subsystem started at IPL](#).

Operations performed on AS/400

Creation of an EASYCOM library and restoration of some objects in this library. [CFGEACTCP](#) and [EACINSTALL](#) commands are automatically run by the installation process.

Operations performed on PC

Creation of an \EASYCOM folder and specific subfolders and copy of various files.

Shortcuts created in Windows Start menu

Help on Easycom For WinDev/WebDev 19

Direct access to online help.

RPC – DTAQ Configuration

Tool to describe native programs to call from WinDev applications, and data queues.

See : Describing native AS/400 programs

See : [Calling Service Program procedures](#)

Easycom Configuration

This configuration tool includes several features :

- License activation,
- Default connection configuration.
- Connection check.
- Trace file configuration
- Optimization
- Single Sign on configuration.
- Installation and Version check.

Examples

Browses the Easycom For WinDev Samples directory.

This directory contains several WinDev sample projects using Easycom with WinDev.

AS/400 File Export

Utility to export database files from a WinDev analysis, to AS/400 file system.

Easycom Server installation

This shortcut is present only if you asked for Easycom Server Installation from your PC.

Using this shortcut, you can retry a server installation without launching again the full Install package.

Easycom For WinDev Updates web page

Go to this URL to get information about the current Easycom For WinDev updates.

Deploying WinDev applications

Installation of the client part of Easycom will be done by the WinDev deployment process.

When you create the deployment procedure for your application with WinDev IDE, AS/400 native access DLL (**eac1900as.dll**) is always selected in the list of mandatory DLLs, as soon as an AS/400 file is used in the project, or an Easycom function is called.

We suggest to use this standard WinDev mechanism to install Easycom client for your application deployments.

So, you don't have to run Easycom installation procedure on users workstations.

Alternatively, you can also copy DLL file **eac1900as.dll** into Windows directory. If more than one application is using Easycom, all the applications will use the same DLL, and future updates of Easycom Client DLL will be easier.

Only file **eac1900as.dll** is mandatory.

Easycom.ini : Local configuration file

Easycom.ini file contains several setting (Cache size, Default system name, ...).

You can copy it from your development environment to the user workstations, or you can include it in your application deployment procedure.

Installing an additional EASYCOM server

An Easycom Server has the following properties :

- A library with all the objects (Default name = EASYCOM)

- A Subsystem (Default name = EASYCOM)
- A TCP Port (Default = 6077)

To setup an additional server on a System, you need to install EASYCOM in a new library. The subsystem name must be unique, and a new unique port number must be assigned.

Proceed with the installation of Easycom server, from a Windows workstation.

Give a new unique name to the library in the installation wizard (Example EASYCOM2).

Once the library is installed, you need to create the new subsystem and assign a port number, by running command CFGEACTCP.

Example: To install an additional Easycom server, in library EASYCOM2, subsystem EASYCOM2, port 6078, run the following commands:

```
ADDLIB EASYCOM2
CFGEACTCP LIB(EASYCOM2) SBS(EASYCOM2) PORT(6078)
```

On the client workstations, you need to configure Easycom client, or applications, to connect to the right Easycom server.

Add the port number at the end of the name or address of the AS/400 to connect to, separated by a colon (:).

Example:

```
SYSTEMAS:6078
192.168.0.10:6078
```

You need to change this value with "Easycom configuration" utility, if the system is the default one, or in the connection properties of your application.

Updating and uninstalling Easycom

Before to update or uninstall Easycom For WinDev, you need to end WinDev or WebDev development tool, and all WinDev applications running on your system.

Before to update or uninstall Easycom server on your AS/400, disconnect all the users, and stop Easycom subsystem.

Updating Easycom For WinDev

You can get the latest Easycom For WinDev installation pack from URL : <http://www.easycom-aura.com/windev.asp>

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You download an executable file to run on your PC.

The installation pack includes also Easycom Server. To update Easycom server on AS/400, you don't need to uninstall it before.

Uninstalling Easycom For WinDev

To uninstall the client side of Easycom For WinDev, use Windows Configuration panel, Add and Suppress programs menu.

To uninstall the server part on AS/400 you just have to delete Easycom library :

- Stop Easycom subsystem : ENDSBS EASYCOM OPTION(*IMMED)
- Delete Easycom Library.

Easycom Licenses

To run Easycom For WinDev on your AS/400, you have to purchase a user license.

You have got "Yellow Registration Cards" with your WinDev package. Fill up these Yellow cards, and send it back to AURA Equipments, you will receive activation keys for your system.

You need different activation keys for development and deployment.

User License is valid for one partition on one single AS/400 system, and for a limited number of simultaneous sessions, unless you have got a license for unlimited number of sessions.

Warning : One single application can open multiple connections to one AS/400 system. Each connection is counted as a session by the licensing system.

You need different licenses for **WinDev** and **WebDev** development.

Deployment license allows to run **WinDev** and **WebDev** applications on one single AS/400 system.

To develop and deploy **WinDev Mobile** application, you need to subscribe and additional contract.

When you **change your AS/400 system**, Easycom licenses are moved to your new system for free if you have subscribe a maintenance contract.

Development

Connections

A connection is defined in the analysis, or, dynamically defined in a program, using `HDescribeConnection` statement.

A connection defined in the analyses is automatically open, while a file that belongs to the connection is open for the first time.

It can also be explicitly open with `HOpenConnection` statement.

Server name or address, User ID and Password are sets :

- In the connection description in the analysis,
- Or during `HDescribeConnection` call,
- Or on `HOpenConnection` call,
- Or in easycom.ini, file.

Sign in can be automated by using [Single Sign On](#).

Long passwords are supported

Association between files and connections is made in the Analysis, when the connection is defined in the analysis, or using `HChangeConnection` statement.

Each connection is an active [JOB](#) in Easycom subsystem on AS/400.

If you have got a user license having limited concurrent sessions, take care when using `HChangeConnection`. Don't open too many connections in the same application.

An AS/400 file can be declared out of the analysis by using `HDeclareExternal` statement.

When a connection is closed with `HCloseConnection`. all files pen in the connection are closed.

Connection parameters :

In the parameter list passed to `HDescribeConnection`, and `HOpenConnection` :

- <Data Source> is the name or IP address of the AS/400 system.
- <Database> is always an empty string "".
- <OLE DB Provider or Native Access> is always `hNativeAccessAS400`.

Example

```
MyConnection is a Connection
MyConnection..User = "me"
MyConnection..Password = "dontknow"
MyConnection..Server = "MY_SYSTEM"
MyConnection..Provider = hNativeAccessAS400
```

```
MyConnection..Access = hOReadWrite
MyConnection..ExtendedInfo = "<EASYCOM>" + CRLF + "JOBNAME=" + CRLF + "</EASYCOM>"

HOpenConnection(MyConnection)
```

Extended info

Connection Level Properties

Connection properties are :

- Sets in the extended info of a connection description, in the analysis,
- Passed to function HOpenConnection , separated by CRLF,
- Set in a Connection type variable, separated by CRLF.

Easycom Properties start by literal "<EASYCOM>", and ends with "</EASYCOM>".

Example

```
HOpenConnection("USER", "PASSWD", "", "MyServer",
hNativeAccessAS400, hOReadWrite,
"<EASYCOM>" + CRLF + "JOBNAME=" + CRLF + "INITLIBL=" + CRLF + "</EASYCOM>")
```

Properties	Values & Description
AUTOJOURNAL	TRUE / FALSE During file description import, property "Journaled" is set to value "true" at file level. in the analysis. File will be journalized when open.
CODEPAGEFILE	Set the codepage file to use to convert to and from EBCDIC character set. Example: CODEPAGEFILE=
CONNECTION TIMEOUT	Delay in seconds before returning an error, if connection fail.
COMMAND TIMEOUT	Maximum Delay in seconds when waiting for an answer from the AS/400 system on a read operation for example.
DATETYPE	Set the AS/400 default data type for Date fields. See AS/400 Native Data Types for the possible values.
TIMETYPE	Set the AS/400 default data type for Time fields. See AS/400 Native Data Types for the possible values.
DRVOPTIMISTIC	When set to TRUE, every record update (HModify) <ul style="list-style-type: none"> • Locks the record, • Reads data, • Write new data if no change were made by another job since record was read.
DUPPATH	Set this property to TRUE, to authorize Easycom to duplicate open paths when a filter with conditions is applied on a key, while the file is already filtered on the same key in another HyperFile Context.
EIM_LOOKUP_INFO	This is the lookup information to use when performing an EIM connection. That EIM connection can come from a certificate authentication (SSL) or from a Kerberos authentication. This Lookup information is used to resolve ambiguous mappings: from one authentication it can go to different OS/400 users depending on the lookup information value. See EIM configuration for more details.
EXTRAIDX	Allows Easycom to use composite key as index on the first field of the composite key. The column witch is the first field of the composite key

	will become a sort criteria in a Table control, and the magnifier icon will be displayed.
FIELDNAMES_MUST_MATCH	<p>0 / 1</p> <p>When = 1 fieldnames must be identical both on iseries and in the analysis (if not the HOpen fails with an error message)</p> <p>When = 0 the fieldnames may be different but must be in the same physical order.</p>
FORCELIBL	<p>0 / 1</p> <p>When set to 1, library names presents in extended info, at file or field level, will be ignored.</p> <p>All files will be searched in the LIBL, even if it is qualified.</p>
HFMAXKEY	When the highest character in the AS/400 is not FF(hexa), you need to give it by property HFMAXKEY, in order to handle correctly HValMax .
IGNORE_EMPTY_EXTINFO	If no extended info is given for a file, Easycom will assume that the AS/400 physical file name is equal to the the WinDev file name, logical file name are equal to the key field names in the analysis.
IMPORT_DFT	<p>0 / 1</p> <p>When=1 the iseries default values are imported into the analysis.</p>
IMPORT_SELOMIT	<p>By default, Easycom does not use logical files with omissions or selections, as indexes.</p> <p>By setting this property to 1, you allow Easycom to consider all logical files as indexes during file description import.</p> <p>Warning! Logical files with selections or omissions do not contain all the data from the physical files !</p>
INITLIBL	List the library names you want to add on top of the library list. Library names are separated by a semicolon (;). Example: INITLIBL=
LITERALCASE	Controls the way file and field names are built. See Controlling Character Case for file and field names .
JOBNAME	Name to set to the client job on AS/400. Default job name is the workstation name.
LEADINGSPACES	WinDev 5.5 compatibility. When this option is set to True, all character field values are padded with blanks, up to the size of the database field on AS/400, on read operations.
ONLYSHORTFILEDNAMES	<p>0 / 1</p> <p>When a file description is imported, only short field names are used when this property is set.</p>
PGMNAME	This option defines what is the EASYCOM program name. Default is EASYCOM. Example of value: EASYCOMT/EASYCOM.
SQLNAMING	<p>SYS / SQL</p> <p>With value SYS, character slash (/) is used to separate library and file names.</p> <p>With value SQL, a point (.) is used.</p>
SHOWDIALOGS	<p>0 / 1</p> <p>Disable / Enable Easycom dialog boxes.</p> <p>It is important to disable dialog boxes for web applications, or for applications running on servers.</p> <p>When dialog boxes are disabled, in case of error, error message is sent to the application without any intermediate message box.</p>
SSL	True/False/Mandatory/ <u>Undefined</u>

	Forces SSL mode. If true, the SSL connection will be attempted. If mandatory SSL connection will be attempted, and if the connection could not use SSL, it is aborted.
SSLINTF	<u>Windows</u> /OpenSSL SSL interface to use.
SSLCAFILE	In OpenSSL, the CA file to verify server certificate.
SSLCAPATH	In OpenSSL, the CA path in which searching for authority certificates. This is to verify the server certificate.
TCP_VERSION	This option is used to force the TCP/IP version. By default the tcp/ip version is automatically selected from the DNS. Possible values are 4 for IPv4 or 6 for IPv6.
USER_CERT_FILE	Client certificate file. This is for client certificate authentication, when OpenSSL is used. The certificate file must be in PEM format. When using Windows interface the option is not needed: the certificate is automatically selected.
USER_CERT_PKEY_FILE	Client certificate private key file. This is the file path for the OpenSSL private key file. When using Windows interface the option is not needed: the certificate and private key is automatically selected.
USER_CERT_PASSPHRASE	Passphrase to be able to read the private key file. This is used in OpenSSL only.
STRICTIDENTICAL	<u>0</u> /1 When a identical search is performed, use strict behaviour. This uses really full key equal search (not greater equal), and the current position is unchanged in case of record not found condition
SQLFULLPRECISION	<u>0</u> / 1 When this property is set to 1, long decimal values resulting from SQL functions are converted to character string, when the precision exceed the precision of WinDev "currency" data type.
SQLHPOS	<u>0</u> / 1 When true, the table with direct link to data (file or query) generates more actions on the iseries to reflect intuitive behaviour (mostly scrollbar position)
SQLIDX	When set to True, this options allows to use any column of an SQL result set like an index. The user will be able to change the order of the records displayed in a table. This option can affect the performances; Use it carefully.
SQLLIVE	Possible values are: 0 (default) : It is not possible to update a record from an SQL result set. 1 : Only files having "SQLUPDATABLE=1" extended info, can be updated out of an SQL result set. 3 : All files can be updates out of an SQL result set, except files having "SQLUPDATABLE=0" extended info. Field level extended info "SQLUPDATABLE=0" can also be set to deny modification of field values. Note: All the field names must appear in the "SELECT statement". You cannot use *.
TCPIP_FATAL	<u>0</u> / 1 By default, TCP/IP error is fatal, end stop the application. By setting this property to 0, you can manage TCP/IP errors, and for example, restart your application in case of error.
TIMEOUTNOTIF	<u>TRUE</u> / FALSE WinDev Mobile only. When an execution time is suppose to be long because

	Wi-Fi connection was lost, a message is shown to the user, when this property is set to TRUE.
UNLOCK	This option is connected Easycom "Program Level Security" Exit program. It sets the password value to pass to EACP003 Exit program to unlock Easycom server, and authorize databases and program access.
USER_CERT_FILE	Client certificate file. This is for client certificate authentication, when OpenSSL is used. The certificate file must be in PEM format. When using Windows interface the option is not needed: the certificate is automatically selected.
USER_CERT_PKEY_FILE	Client certificate private key file. This is the file path for the OpenSSL private key file. When using Windows interface the option is not needed: the certificate and private key is automatically selected.
USER_CERT_PASSPHRASE	Passphrase to be able to read the private key file. This is used in OpenSSL only.

File Level Properties

Properties	Values & Description
MAIN	Set the main AS/400 file name associated with the WinDev file. File name can be qualified with a library name: <ul style="list-style-type: none"> LIBRARY/FILE Or without library name, to use *LIBL (Preferred): <ul style="list-style-type: none"> FILE A member name can be specified after the file name: <ul style="list-style-type: none"> MYFILE(MEMBER_A)
JOURNALED	Tell Easycom that the file is journalized, and must be opened under commitment control. This property is automatically set when file description is imported. See also AUTOJOURNAL connection level property.
PFSYSNAME	File short name, when file has a long name.
SQLUPDATABLE	See SQLLIVE connection property.
DATETYPE	Set the AS/400 default data type for Date fields. See AS/400 Native Data Types for the possible values.
TIMETYPE	Set the AS/400 default data type for Time fields. See AS/400 Native Data Types for the possible values.

SQLUPDATABLE

Pour pouvoir modifier le résultat d'une [requête SQL](#), les infos étendues de la Connection doivent contenir l'option SQLLIVE avec une valeur de 1 ou 3.

Si SQLLIVE=1, les fichiers qui peuvent être modifiés doivent contenir l'option SQLUPDATABLE=

Si SQLLIVE=3, tous les fichiers sont modifiables par défaut mais il est possible d'exclure un fichier particulier (empêcher toute mise à jour depuis une requête), avec l'option SQLUPDATABLE à 0.

DATETYPE / TIMETYPE

Cette option associe tous les champs date et heure du fichier à un autre type de format pour un formatage automatique de requête en mode [HRequêteDéfaut](#). Elle peut également être définie au niveau de la Connection (voir détail) ou au niveau de la rubrique par l'option NATIVETYPE (voir ci-dessous).

Field Level Properties

Properties	Values & Description
LF	Logical File name for a key field. File name can be qualified with a library name: <ul style="list-style-type: none">LIBRARY/LFILE Or without library name, to use *LIBL (Preferred): <ul style="list-style-type: none">LFILE
SYSNAME	Short field name, when the field has a long name, and when the field is not a multi member key field.
LFSYSNAME	File short name, when logical file has a long name.
SQLUPDATABLE	See SQLLIVE connection property.
NATIVETYPE	This property is automatically set for some data types, when file description is imported. It tells the system what is the original data type in the DDS. See AS/400 Native Data Types for the possible values.

LF

Chemin d'accès du fichier logique correspondant à une clé.

LF=Nom de la Bibliothèque/Nom court du Fichier Logique

SYSNAME

Nom court (système) pour une rubrique non clé, clé unique et clé avec doublon

SYSNAME=Nom court de la rubrique (10 caractères maxi)

LFSYSNAME

Nom court (système) pour le fichier logique associé à une rubrique clé composée

LFSYSNAME=Nom court du Fichier Logique (10 caractères maxi)

SQLUPDATABLE

Pour pouvoir modifier le résultat d'une requête SQL, les infos étendues de la Connection doivent contenir l'option SQLLIVE avec une valeur de 1 ou 3.

Si SQLLIVE=1, les fichiers qui peuvent être modifiés doivent contenir l'option SQLUPDATABLE=

Si SQLLIVE=3, tous les fichiers sont modifiables à moins de contenir SQLUPDATABLE=

Dans ces deux cas, toutes les rubriques sont modifiables par défaut mais il est possible d'exclure certaines rubriques avec l'option SQLUPDATABLE à 0 dans les infos étendues de la rubrique.

NATIVETYPE

Cette option est automatiquement insérée à l'importation lorsqu'un champ de type Date ou Heure a été associé à un autre format. Voir les valeurs possibles dans l'option DATETYPE/TIMETYPE des infos étendues de la Connection.

Par Exemple si un champ de type Date est associé à une zone CHAR (sur 8 caractères) on aura :

NATIVETYPE=

Controlling character case for file and field names

Property **LITERALCASE** in Connection Extended info, controls the way file and field names are imported (Lowercase / Uppercase).

By default, imported file names are in lower case.

You can control file naming using the following rules with LITERALCASE property:

Value	Description
A	UPPERCASE

a	Lowercase
#nx	Next n characters are in x case (A for upper, a for lower) Example : #3A – Next 3 characters are uppercase.
*x	x case is applied until the end of the name
[Go to end of name, and change direction (Backward).
]	Go to beginning of name, and change direction (Forward).
<	change direction (Backward).
>	change direction (Forward).

Examples :

A*a	Only First character is upper case.
#3A#3a*A	Position 1 to 3 are Uppercase, Next 3 characters are lowercase, then, next characters are uppercase.
#3A[#3A	First 3 characters are uppercase, Last 3 characters are uppercase too, middle is lowercase.

This property must be set in the connection extended info before file import.

Example : Set all file names to uppercase :

```
<EASYCOM>
LITERALCASE=
</EASYCOM>
```

AS/400 Native Data Types

When a date or time is stored in DB2/400 database in character or numeric format (Not in original Date or Time data type), Easycom needs to know how to convert a date or time constant value given in SQL queries, into the right data type for the AS/400.

Properties NATIVETYPE, DATETYPE and TIMETYPE in extended info can have the following values, depending on the field data type on AS/400 :

Value	AS/400 data type
0	Character
1	Integer 16 bits (2 bytes)
2	Integer 32 bits (4 bytes)
3	Float simple precision (4 bytes)
4	Float Double precision (8 bytes)
6	Packed decimal
7	Zoned
8	Date
9	Time
10	Time Stamp
13	Integer 64 bits (8 bytes)

When file description is imported, Field level property **NATIVETYPE** is set to the native data type on AS/400.

In the following example, the field is packed decimal on AS/400:

```
<EASYCOM>
NATIVETYPE=
</EASYCOM>
```

In this example, the field contains a date value (YYYYMMDD) stored as a packed decimal. You need to change the WinDev data type to "Date" in the Analysis. Easycom will convert WinDev dates To/From Packed decimal.

When NATIVETYPE is not set , properties **DATETYPE** and **TIMETYPE** in the file or connection extended info, tells the system how date and time values are stored in the database.

Accessing AS/400 data

WebDev Special : updating records.

In a **WebDev** project, if your application updates AS/400 files using **HModify**, you need to:

- Either, explicitly lock the record before to update it,
- Or, follow the rules described here after:

If you don't explicitly lock records before update with **HModify**, you need to customize the management of lock errors with:

```
HOnError ("*", hErrLock, "OnLockError")
```

Insert this statement in the project initialization, after opening the connection

```
HOpenConnection(MyConnection)  
HOnError ("*", hErrLock, "OnLockError")
```

The minimum source for the procedure is :

```
// global Procedure  
PROCEDURE OnLockError ()  
    RETURN opCancel  
END
```

When a record update is requested while the record is not locked, WebDev will lock the record and check if it was changed, only if an error procedure exists for lock errors. Otherwise, WebDev will not try to lock the record, and the AS/400 system will fail.

Using dynamically HF and/or AS/400 files

To dynamically choose at run time, what database manage a file (HyperFile or AS/400), you have to use functions:

HOpenConnection, **HDescribeConnection**, **HChangeConnection**, **HDeclareExtern**.

Import file descriptions from AS/400.

If files are initially in HyperFile format, export them to AS/400, then, import them.

Keep files in « AS/400

Keep AS/400 files in « AS400 » type in the analysis, even if they are mostly used in HyperFile mode;

Extended info are visible only when the file has an AS/400 type.

For that, you just have to keep the files attached to a connection in the analysis.

At run time, use function **HDescribeConnection** to describe an HyperFile connection, and change the connection with **HChangeConnection** for all the files that need to be handled in HF mode.

SQL Query « test » will also be possible, because it runs the « project initialization code ». You just have to run **HChangeConnection** in the Project initialization Code. Function **OnTestMode()** can be used to know if we are running a test or an application.

Note:

In this case, connection defined in the analysis is only used to import file descriptions, edit SQL queries, ...

You cannot use "LiveData" when your application change dynamically the connections.

Import File Descriptions (DDS)

Import DDS

To create file descriptions in the analysis for AS/400 files, import the Data Description Specifications (DDS) from the System I – AS/400 database.

From menu "**Structure of Files**", select "**Import Description of Files / Tables**".

Choose "**AS/400**" as data source, and select "**Access data in current format**" to just get the file description, and be connected to the real data on DB2/400.

If a connection description already exists, you can use it, or create a new one.

If you have to create a new connection description, choose "**Native AS/400 Access**" mode when selecting the data source.

If you need some special connection properties, such as a different LIBL, you can create a connection description and set extended info, before to import file descriptions.

Library where files are searched for.

Default value is *USRLIBL to import descriptions of files located in the current user LIBL.

You can change this default value, and type a library name.

When file description is imported, if the file is located in the LIBL, file name will be not qualified in the "Main" property of the file extended info. (MAIN=

If the file is not in the LIBL, a dialog box asks you if you want to qualify the file name (keep library name in the path: LIBRARY/FILE), or remove it.

If you don't qualify the file name, you will need to change the LIBL at run time, by changing the [INITLIBL connection property](#), or by changing dynamically the LIBL at run time with [AsExec](#) statement.

Physical and Logical files.

When a physical file is imported, each dependant logical file having an access path will be considered as an index on the file.

Warning ! Logical files with selection or omission are not handle as indexes, except by setting [IMPORT SELOMIT connection property](#) to True.

You can manually add new indexes to the file, linked to logical files having selections or omissions.

When a logical file is imported, the resulting file has one single index: itself.

File names

You can control the letter case in file and field names with connection property [LITERALCASE](#)

Take care of not using WinDev reserved keywords.

Program and Data Queues.

When Selecting Tables to Import, at the end of the file list displayed, you can see the program and data queues described and available on your system. They are prefixed by ***PGM/** and ***DTAQ/**.

See [Programs](#) (*RPC) and [Data Queue](#) (*DTAQ).

Constraints:

Referential constraint are imported as Links between tables.

Primary key constraint is imported as Unique Key.

Import and Export data

AS400 To HyperFile

To import DB2/400 data into HyperFile database,

- Go to menu **"Structure of Files"** in the Data Model Editor,
- Select **"Import Description of Files / Tables"**.
- Choose **"AS/400"** as data source,
- Select **"Convert data to Hyper File Classic or Hyper File Client/Server"**

Hyperfile To AS400

To export Hyper File data to DB2/400, use the DDS Builder tool.

You can access this tool using the Windows **Start** menu – **Easycom For WinDev 19**,

Or, from the Data Model Editor, Menu **"Structure of Files"** – **"Synchronize and AS/400 – iSeries"**.

DDS Builder tool doesn't synchronize the data; It can copies a whole Hyper File table to a DB2/400 table.

Native Access

Introduction

AS/400 Native Access allows to access DB2/400 files using standard HyperFile W Language functions from WinDev, WinDev Mobile and WebDev.

SQL access is also supported by Easycom For WinDev, using standard SQL statements from WLanguage.

AS/400 files are attached to AS/400 connections in the analysis.

File description can be imported from DB2/400.

Files can be created on DB2/400, using the description set in the analysis.

WDMAP utility is compliant with AS/400 files.

WinDev Report editor also supports DB2/400 files.

AS/400 Specific Features

Support of some WinDev or HyperFile features can be different on AS/400 system.

Files and Fields naming.

AS/400 has many restrictions in files and fields naming WinDev doesn't have.

- Accentuated characters are not supported.
- Blank character is not allowed in long names.
- Length of a long name is limited.

Easycom support long names for files and fields. Long names on AS/400 are created by SQL, or they are the DDS Alias for the fields.

By setting Connection property LITERALCASE, you can manage some naming rules for WinDev names.

When file description is exported to AS/400 using the DDS Builder, Easycom converts WinDev names into AS/400 compliant names.

Record numbers.

On AS/400 a record number is not a "stable" value. Relative Record Numbers can be changed by a Physical File reorganization.

Caution when using [HRead](#) statement.

Crossed records.

Crossed records do not exist on AS/400. [HCross](#) statement is not supported.

Record lock.

AS/400 locks only one record at a time, per open file, per job.

When a record is locked on a file, previous record locked on the same open file, by the same job, is unlocked.

Function [HUnlockRecNum](#) Unlocks the latest record locked for the open file, whatever is the value of current record.

When a lock is requested on a record already locked by another job, the system waits for a delay before to return an error. This delay (WAITRCD) can be changed by CHGPF command on AS/400, or it can be overridden with OVRDBF command called with AExec.

File locking is supported by Easycom For WinDev.

Transactions and Journals.

Hyper File journaling doesn't apply to AS/400 files. AS/400 has its own journal system.

Functions **HchangeLogDir**, **HsetLog**, **HhistoryModification**, **HlogInfo**, **HlogRecreate**, **HlogRestart**, **HlogStop**, **HRegenerateFile**, **Hpost** are not supported by Easycom For WinDev.

See [Journals and transaction](#).

Blobs

When file description is imported, LOB fields are imported as HyperFile memo fields.

File must be journalized, and you need to manage transactions.

When a HyperFile file having memo fields is exported, Easycom creates an additional file on AS/400 to store memos. The name of this additional file is equal to the physical file name, prefixed by 2 underscore characters (__).

SQL limitations:

Query on a Query is not supported.

Filter on a query is not supported.

Special limitations on HyperFile functions.

HCreation	Not supported
HCreationIfNotFound	File is opened, but not created if it doesn't exist.
HWrite	
HCross	Not supported
HFree	Not supported
HChangeLogDir	Hyper File journaling doesn't apply to AS/400 files
HChangeName	Not supported
HSetPosition	Not supported
HDescribeFile	Temporary file cannot be created on AS/400.
HDescribeItem	Temporary file cannot be created on AS/400.
HhistoryModification	Hyper File journaling doesn't apply to AS/400 files
HlogInfo	Hyper File journaling doesn't apply to AS/400 files
HlogRestart	Hyper File journaling doesn't apply to AS/400 files
HlogStop	Hyper File journaling doesn't apply to AS/400 files
Hpost	Hyper File journaling doesn't apply to AS/400 files
HRegenerateFile	Hyper File journaling doesn't apply to AS/400 files
HSecurity	Security is always active on AS/400
HsetLog	Hyper File journaling doesn't apply to AS/400 files
HVersion	Returns always 0

Data types translations

An AS/400 data type is by default translated into a HF when importing a file description, or when executing an SQL query or using HDeclareExternal.

Default data type mapping can be manually changed by changing a item data type after DDS import, or by setting the field extended info before to export description to AS/400.

DDS type	SQL type	Condition	HF type
A (character)	CHAR		Text
A OPTION(VARYING) (variable length)	VARCHAR		Text
G + CCSID 13488 (Unicode)	GRAPHIC CCSID(13488)		Text Unicode (version 12 and up only)
G + CCSID 13488 + OPTION(VARYING) (Unicode variable length)	VARGRAPHIC CCSID(13488)		Text Unicode (version 12 and up only)
P (Packed decimal) or Z (Zoned)	DECIMAL or NUMERIC	Integer, <= 4 digits	2 bytes signed integer
		Integer, <=9 digits	4 bytes signed integer
		Integer, <=19 digits	8 bytes signed integer
		<= 15 digits	8 bytes Real
		<= 17 integer digits, and less than 6 decimal digits.	Currency
		<= 38 digits or SQL with	Numeric (version 12

		SQLFULLPRECISION property set.	and up only)
		Others	Text
L	DATE		Date
T	TIME		Time (HHMMSS)
Z	TIMESTAMP		Date and Time
B4 (Short Integer)	SMALLINT		2 bytes signed integer
B9 (Long Integer)	INT		4 bytes signed integer
B19 (Integer 64 bits)	BIGINT		8 bytes signed integer
F	FLOAT		Real 8 bytes
F double precision	DOUBLE		Real 8 bytes
H	BINARY		Binary string
H	VARBINARY		Binary string
N/A	CLOB		Memo text
N/A	BLOB		Other Binary Memo
N/A	DBCLOB + CCSID 13488		Memo Unicode

Note :

Easycom maintains initial HyperFile data types when a file is exported to AS/400 and imported again. Original data type is stored in the field description.

When a file is imported, Field Extended info can contain NATIVETYPE property, to memorize the original AS/400 data type.

Record Seek

Logical Files.

When you use function `HReadSeek(File, Key_Field, value)`, the logical file associated with the key is open and used. Its name is in the field level extended info, in the file description in the analysis.

Also, when `HFilter` is processed, the logical file matching the filter definition is used. If a selection condition is set for the filter, an OPNQRYP is applied to the logical file.

Record seek on a query.

Warning : `HReadSeek` on a non indexed column of a query will read all the records to find out the right one. This process can be long, and the result could be inconsistent if the column is not sorted.

Option SQLIDX in extended info allows to dynamically create indexes on query columns.

Composite keys :

Seek on a composite key acts on AS/400 files exactly like on Hyper File files.

You have to build the key value using function `hBuildKeyValue` or pass each value using an array: [value1, value 2, value3...].

Special values `HValMin` and `HValMax` .are also compliant with AS/400 files.

If a sort sequence is defined for the file or for the job, and if the highest character is not FF (Hexa) for this sort sequence, you need to set extended info HFMAYHEY.

Clés composées réduites

Il est possible de supprimer des rubriques **à la fin** de la description de la clé composée, la recherche sur cette clé utilisera alors les champs restants. Mais il est plus simple de ne passer que les premiers Parameters en complétant les bornes par HValMin et HValMax.

Filters

Independent HyperFile contexts.

A file can be used in more than one window with « Independent HyperFile Context » option.
An open data path is used for each context.

File can have a filter with selection conditions applied on the same key, in each context. In this case, DUPPATH property must be set in the file Extended info.

Simple filters.

A simple filter (with no selection conditions) uses the logical file associated with the key, to navigate into the defined range of key values.

Filters with selection conditions.

This filter uses OPNQRYF feature on AS/400.

Filters on composite keys.

To build the composite key value, use function `HBUILDKEYVALUE`.

Use constant keywords `hMinVal` and `hMaxVal` to complete key values.

Following example filters all customers having name beginning with "Dupond" :

```
HFilter(Clients, Name,  
HBUILDKEYVALUE(Clients, Name, "Dupond")+hMinVal, ...  
HBUILDKEYVALUE(Clients, Name, "Dupond")+hMaxVal)
```

Séquence de tri

Attention, si la rubrique utilise une séquence de tri dans laquelle le dernier caractère n'est pas le code "FF", voir l'option HFMXKEY des infos étendues de la Connection.

Record Locking

AS/400 can lock only one record per open data path.

This means that, when a record lock is requested on a file by a WinDev program, the previous record locked applied to the same file, by the same program, is released. Except when using independent contexts, or inside a transaction.

Locking the whole file is possible.

When using independent HyperFile contexts, set connection property DUPPATH, to have one open data path per file and per context, and allow each context to have its record lock.

Delay and retries.

When a program requests a record lock, if the record is already locked, the system waits during a delay before returning an error, in case of the record become available.

This delay can be changed on the system with CHGPF command, or overridden with OVRDBF command called with `ASExec` function, before file open.

Example:

```
ASExec ("OVRDBF FILE (SP_CUST) WAITRCD (*IMMED) OVRSCOPE (*JOB) ")
```

If the record lock fails, WinDev tries again. The number of retries is set by `H.NbRetry` WinDev keyword.

Warning : Each retry includes the system delay.

Record modification.

`HModify` Needs to lock the record before changing its value.

If record wasn't locked previously by an explicit "Read and lock", WinDev will read and lock the record, compare its actual value with the value it had last time current program read it.

If value was changed (by another user), WinDev showup a dialog box, and ask the user what to do.

With WebDev, this dialog box is not showed, and an error is raised. You will have to manage this error case with `HOnError`, or you can set DRVOPTIMISTIC Connection property in Extended info.

Constraints and integrity

Integrity check is processed, as it is for HyperFile files, with [HErrorIntegrity](#) after record update, delete or insert.

Function [HSetIntegrity](#) doesn't allow to deactivate AS/400 constraints.

File export.

Only links of type 0,n -> 1,1 are exported during File creation on AS/400.

You will be prompted to change Links of type 1,0 -> 1,1.

Other links are not exported.

File description import.

Referential constraint are imported as links of type 0,n -> 1,1.

Additional links can be define in the analysis after file description import, without creating the constraint on AS/400. Those links will be handled by WinDev, and could generate low performances.

Journals and Transactions

On AS/400, transactions management uses journals and journal receivers.

- Create a journal receiver : CRTJRNRCV
- Create a journal : CRTJRN
- Start file journalization : STRJRNPF

When the file is created by Easycom For WinDev, from its definition in the Analysis, all these operations are automatically done.

In native mode, you cannot use [HTransactionStart](#). Use [SQLTransaction](#).

All files to be included in transactions must have JOURNALED property set in Extended info:

```
<EASYCOM>
JOURNALED=
</EASYCOM>
```

All imported files have this property set.

Connection property AUTOJOURNAL puts all the files in transaction mode.

Transaction is cancelled in case of error, or in case the program ends abnormally.

It is preferable to open the files inside a transaction.

When transaction are used in a program, it is preferable to not do any insert, update or delete operation out of a transaction.

Start a new transaction : [SQLTransaction\(SQLStart\)](#)

Validate the transaction (COMMIT) : [SQLTransaction\(sqlCommit\)](#)

Cancel transaction (ROLLBACK) : [SQLTransaction\(sqlRollback\)](#)

Isolation Level

Default isolation level used by Easycom For Windev is equivalent to the following command :

```
STRCMTCTL LCKLVL (*CHG) .
```

Every record read for update (for a file opened under commitment control) is locked. If a record is changed, added, or deleted, that record remains locked until the transaction is committed or rolled back. Records that are accessed for update operations but are released without being changed are unlocked.

By calling STRCMTCTL with [ASExec](#) function, you can change this default.

Performances

The most important things involved in Client/Server performances are :

- The number of network access.

- The volume of data moved over the network.

Configuration and easycom.ini

Use Easycom Configuration. Utility, « Optimisation » tab, to set properties.

If the configuration utility is not installed on the workstation, you can edit "EASYCOM.INI" file.

Cache size :

You can set the maximum size (in bytes) for the network buffer.

The maximum number of records read at a time is also set by this Optimisation screen.

Easycom will move bloc of records over the network, without exceeding those two maximum values.

In EASYCOM.INI files, these entries are set by:

```
[BUFFERS]
records=
size=
```

Warning ! A cache too large can also reduce performances.

These two properties can also be set by [ASProperty](#) function call.

TCP/IP Compression:

Compressing data over TCP/IP can reduce the volume of data, and increase performances when the network is slow.

On a high speed network, this property isn't very useful.

```
[TCP]
Compression=
```

SQLIDX

Property SQLIDX in Extended info can be deactivated to reduce the number of SQL statements executed on the AS/400.

ASProperty

Function [ASProperty](#) sets the cache size for each file.

File open

When a file is open by WinDev, Easycom open on the AS/400 the file pointed to by MAIN entry in the extended info. Usually, this file is a physical file. If this file doesn't have an index, maybe it will never be used by the application.

To reduce the number of open file on the system, you can set the MAIN entry in the extended info to the most used logical file.

Lists and combos

If your application is using a lot of lists and combos filled from files that are rarely updated, use tables, or copy those files to local HyperFile files, and synchronise the contains.

File tables with links.

If a window displays a file with links, WinDev will run a « Read by key » for each linked field in each record in the table.

This will result in a large number of access to the AS/400, and the cache will not be used, because WinDev reads one record at a time.

To optimise this feature, we suggest two ways:

- Use SELECT statement with INNER JOIN clause.
- Create a logical join file on AS/400, import it in the analysis, and use it to fill up the table

Filters

Filters with selection are processed by OPNQRYF. Ranges use access paths on logical files, and are faster.

It can be useful to create new logical files on AS/400 to optimise WinDev filters.

Record locking

Try to lock the records while you are reading it, when they are supposed to be updated.

So that, Easycom will not have to read it again, to lock it and check if it was changed since the last read.

HCreateVue

Function [HCreateVue](#) with condition reads the whole file, and WinDev checks the selection condition on the PC.

So, before running [HCreateVue](#), use function [HFilter](#) with the same selection condition. Easycom will apply an OPNQRYF on the file, and reduce the number of records to read.

Memos

Memos are stored in separated files. When WinDev reads a record, it reads all the fields, including memos.

If your application is not using the memos, deactivate the memos with function [HGèreMémo](#).

```
<Résultat> = HGèreMémo([<Nom du fichier>, [<Nom de la rubrique>,]]  
<Mode de gestion>)
```

Avec [hMémoOui](#) pour activer et [hMémoNon](#) pour désactiver.

Warning ! This function must be called while the file is closed to take effect. Close the file before to call [HGèreMémo](#).

Blob

When WinDev reads a record, it gets all the fields, including memos and blobs.

If your application access files with blobs, and doesn't use them, it can be preferable to use SQL queries where blobs are not selected.

Or, you can create a logical file based on the physical file, without blob fields, and import it as a main file in the analysis.

AS/400 Libraries and Files

Libraries

It is preferable to always use the user LIBL.

If the file is in the LIBL when its description is imported, the file name is not prefixed with the library name; File name is not qualified in the file Extended info.

In this case, the file must be also in the user LIBL at application run time.

You can use [AsExec](#) function to change the LIBL at run time.

```
AsExec("ADDLIBL my_library"),  
AsExec("RMVLIBL a_library")
```

The LIBL can be different for each user category. So that, a developer can have a test LIBL, and test his application without going to production data.

If you qualify the file names in the Extended info, library name will be hard coded in the analysis.

When a file is not in the user LIBL, you have to qualify file name in SQL queries, and use

[HQueryWithoutCorrection](#) mode

User LIBL description.

When the connection is open, the user LIBL for an Easycom job contains ::

- Libraries added by INITLIBL connection property, if set.
- Libraries from the user JOBD.
- Libraries from EACJOB Job description, if it exists.
- Library EASYCOM.

(See also [Default LIBL](#))

Then the application can change the LIBL at run time with [AsExec](#) ("ADDLIBL ...

LIBL changes with [ADDLIBL](#) do not affect files already open.

OVRDBF

Using OVRDBF, you can set the library where the file is open.

Don't forget to override also logical files !

```
ASExec ("OVRDBF FILE(FILE1) TOFILE(LIBR2/FILE2) MBR(MEMBRE)
OVRSCOPE (*JOB) ")
```

Libraries and SQL queries with *hQueryDefault* mode.

Only file name is used in a SQL query.

So, it is easier to have the file in LIBL.

If the file is not in the LIBL, you can dynamically change the current library before to execute a query, with [ASExec](#).

```
ASExec ("CHGCURLIB MYLIB")
HExecuteQuery(REQ_Requext3, hQueryDefault)
```

Physical and Logical Files

On AS/400, Data are stored in physical files (PF). A physical file can have one index.

Logical Files (LF) are based on Physical Files.

They point to PF data, They can point to multiple physical files (Multi formats, Join files)

LF can have record selections and omissions.

They can have column selections or expressions.

They can be an access path (Index) to the data.

Physical Files:

When a Physical File description is imported into the Analysis by Easycom, the following rules apply:

- The physical file is the MAIN file.
- If the Physical Files has an index, it is imported also as Index.
- Some dependant Logical Files are **not** imported as indexes
 - LF with selection or Omission
 - LF with field selections
 - Multi format LF,
 - Join Logical Files.
- Other Logical Files having an access path are imported as indexes.

AS/400 file names appears in the file extended info, or field extended info for the indexes.

Logical Files:

A Logical File omitted by the import process can be manually added as an index, in the analysis.

Set the field as an Index in the file description, and add the following in the field extended info:

```
<EASYCOM>
LF=
</EASYCOM>
```

Be careful: All logical files do not point the whole data ! Check the selection rules.

A logical file can be imported as a MAIN file. The file will have only one index: Itself.

Join Files:

A join file point to more than one physical file. It cannot be an index to the data.

To use it, import its description as a main file.

Overrides

From your application, you can override a database file before to open it, with function [ASExec](#) ..

Don't forget **OVRSCOPE (*JOB)** in **OVRDBF** command:

```
ASExec ("OVRDBF FILE(FILE1) . . . OVRSCOPE (*JOB) ")
```

Join Files

A join file is a logical file based on multiple physical files.

It join together records from different files. It is like a permanent SQL SELECT view.

When the join can be resolved with existing indexes on physical files, the join file doesn't spend any disk space and time.

So, it can be interesting to create join files, and use it with WinDev in file tables with linked fields. Instead of reading by key for each linked field, WinDev will get all the field values in a logical record.

A Join File can be accessed in Read Only mode.

Logical Files with OMIT or SELECT

Logical Files with omissions or selections are not considered as indexes by Easycom For WinDev.

Date are filtered by omission or selection conditions applied on the file itself.

They are not automatically imported as indexes, but you can manually add them as indexes, as far as you are sure that all the data needed by your application is pointed to by the logical file.

To do that, created the index in the file definition in the analysis, and update the field extended info:

```
<EASYCOM>
LF=
</EASYCOM>
```

You can also import those logical files as main file. A file is then created in the analysis, with one single index: itself.

Using HDeclareExternal, you can also use those logical file, without importing the definition into the analysis.

DDM Files

A DDM File (DDMF) is a link from the local AS/400 system, to a file on a remote system.

You cannot import a DDMF in the analysis.

You can use a DDMF with HDeclareExternal function.

Multi Format Files

A Multi Format logical file is based on multiple physical files.

All the records do not have the same description (format). WinDev can handle only one format per file.

When a Multi Format file is open, its first format is used by default.

To override this, you can change the file name in the extended info, by adding:

*FORMAT=

After the file name:

Example:

```
<EASYCOM>
MAIN=MYLIB/CUSTFILE *RFORMAT=format2
</EASYCOM>
```

System 36 Files

If the System 36 file has an IDDU (Interactive Data Definition Utility), it can be accessed like any AS/400 file.

If the file doesn't have a description, you need to proceed as follow:

- Create an empty AS/400 file having the record description the 36 file should have.
- At the end of the 36 file name, add the extension : *FMT=

Example :

```
<EASYCOM>
MAIN=LIB36/MY36F *FMT=
</EASYCOM>
```

In the example above :

- MY36F is a file with no description.
- FIC36_DESC is an empty AS/400 file, created with the description MY36F should have

SQL

Creating Queries

SQL Queries can be created using the wizard, or, manually input in a character string.

Mode constant *hModifyFile* can be set when executing a query, if property SQLLIVE is set in connection level extended info (Value 1 or 3).

In this case, files involved in the query are updated when the query result is modified.

By default, additional queries are prepared to be able to change records order in tables, and allow the use of magnifiers in tables. This feature can be disabled with property SQLIDX in connection extended info.

Area fields cannot be used with SQL queries.

Filters on queries are not supported.

Queries and transactions

AS/400 SQL queries can be processed inside transaction.

Use regular WinDev transaction functions:

```
sStmt is string
MyQuery is Data Source
SQLTransaction (sqlStart, MyConnection)
sStmt="UPDATE SP_CUST SET Firstname='Jean' WHERE CUST_ID='C-01'"
HExecuteSQLQuery (myQuery, MyConnection, hQueryDefault, sStmt)
SQLTransaction (sqlRollBack, MyConnection)
```

Using mode HQueryDefault

Mode *hQueryDefault* is used when files involved in the query are in the analysis, and when the statement doesn't contain any SQL/400 proprietary keyword or function, such as a library name.

If the files are not in the LIBL, use function *ASExec* to add the library in the LIBL, or to change the current library:

Example:

```
ASExec ("CHGCURLIB MYLIBRARY")
HExecuteQuery (Query3, hQueryDefault)
```

Using mode HQueryWithoutCorrection

When *hQueryWithoutCorrection* mode is used, the SQL statement is sent directly to SQL/400 without being interpreted or changed by WinDev SQL engine.

You must use this mode when the statement contains some syntax or keywords WinDev doesn't know.

hQueryDefault

Connection is automatically identified, using the files involved in the query.

Replace all PC Soft proprietary operator
(Example : ']=')

Date and time constant are translated into SQL/400 format.

Decimal point is adjusted for decimal constant, depending on the system language.

Alias names are replaced by original column names in the Where, Order by and Group by clauses.

hQueryWithoutCorrection

Connection must be given when calling *HExecuteSQLQuery*.

No replacement is done. You need to type SQL/400 compliant syntax.

No format translation. You need to type data and time values in SQL/400 syntax..

You need to use the right decimal point for you system.

No replacement. Use only original database column names.

When a query without correction contains parameters ({Param}), don't forget to include quotes characters when setting string parameter values.

```
REQ_Example2.Param1=" "+CUST_NAME+" "
```

Date and Time as parameter values.

With mode *hQueryDefault* date and time values are automatically translated from WinDev to AS/400 format.

```
dToday is Date
```

```
HExecuteQuery (REQ_3, hQueryDefault, dToday)
```

When the value is hard coded, it must be in 8 digits format (YYYYMMDD).

```
HExecuteQuery (REQ_3, hQueryDefault, "20080125")
```

See connection extended info DATETYPE and TIMETYPE for information about handling date and time values stored in different data types on AS/400.

With mode *hQueryWithoutCorrection* date and time values must be given in ***ISO** format.

Time : HH:MM:SS,

Dates : YYYY-MM-DD,

Example

```
HExecuteQuery (MyQuery, MyConnect,  
hQueryWithoutCorrection, "00:00:03")
```

```
HExecuteQuery (MyQuery, MyConnect,  
hQueryWithoutCorrection, "1970-07-01")
```

Prepared Queries

HExecuteSQLQuery

This function executes a query created with the wizard, or a statement given as a character string.

Syntax with connection parameter must be used when files used in the SQL statement are not in the analysis, or, if *hQueryWithoutCorrection* is used.

hQueryWithoutCorrection must be used if the SQL statement contains library names, or some SQL/400 proprietary keywords.

HPrepareSQLQuery

This function declares the query on the database server, to optimize data access.

The query is prepared, but not executed. No data is retrieved at this point.

This function optimizes data access in case of multiple execution of a query, with different parameters.

The query is then executed with function *HExecuteQuery*, after setting parameter values if needed.

To free resources used by the prepared query, use function *HCancelDeclaration*.

Warning : Some files on AS/400 can remain open. This is a normal behaviour. The AS/400 system optimizes open access paths.

Queries calling stored procedures, and returning multiple result sets are not supported.

Parameters

Parameters name in the statement must be prefixed by a colon (:).

```
//Prepare SQL Query for multiple executions  
HPrepareSQLQuery ( Insert , connection ,  
hQueryWithoutCorrection... ,  
"INSERT INTO employees VALUES (:name, :firstname, :age )" )  
...  
//Set param values; Execute  
Insert.name = EmpName  
Insert.firstname = EmpFirstName  
Insert.age = EmpAge  
HExecuteQuery (Insert)
```

W-Language Functions for AS/400

ASRtvCall

Call an AS/400 command having return values (Retrieve commands).

Syntax

```
bResult = ASRtvCall ( Command [,Connection])
```

French keyword : [ASAppelRtv](#)

Parameters

bResult

Boolean ; True if the command ran successfully, False if it failed.

Command

Character string ; Contain the OS/400 command to execute.

Connection [optional]

Connection to the AS/400.

Description

Most of the commands that can be called using this function are the "retrieve" commands (**RTV***) and "receive" commands (**RCV***).

You can create your own commands returning result values (CRTCMD).

Commands can return one or more results.

Example: RTVJOBA can return multiple attributes of the current job.

```
RTVJOBA USER(&USER) CURLIB(&CURLIB) OUTQ(&OUTQ)
```

Some result variables need to be declared when calling the command.

For it, the command string is prefixed with the variable declarations, separated by semicolons, in the form:

VARIABLE=

VARIABLE is the variable name.

Type can be:

- DEC(n,p) For Decimal type;.
n = number of digits, including decimal digits.
d = number of decimal digits.
- CHAR(n) For Character; .
n = number pf characters.

Examples :

```
CmdLine ="CCSID=DEC(5 0);RTVJOBA JOB(&JOB) USER(&USER) USRLIB(&USRLIB) SYSLIB(&SYSLIB)  
CCSID(&CCSID) CURLIB(&CURL)"
```

```
CmdLine =" DATA=CHAR(100);RTVDTAARA DTAARA(MYDTAARA (*N 100)) RTNVAR(&DATA)"
```

You get the result value of a variable with function [ASRtvResult](#).

You need to get and check value of internal result variable **RC** to know if the command ran successfully.

See example.

ASRtvResult

This function is used after [AsRtvCall](#) function call.

It retrieve the values for the result variables after a command call.

Syntax

```
sResult = ASRtvResult(Variable[,Connection])
```

In French : [ASResultatRtv](#)

Parameters

sResult

Result value (String).

Variable

Name of the variable from what we retrieve the result value.

Connection (optional)

Connection to AS/400.

Description

ASRtvResult retrieves the value of a result variable, after a command call issued with function [ASRtvCall](#).

RC is an internal result variable.

If the command call fails, variable RC contains the CPF error code, otherwise, it contains "0".

So, check RC value before to retrieve any other variable results.

Example

Retrieve job attributes.

CmdLine is a string

```
CmdLine = "RTVJOBA USER(&USER) USRLIB(&USRLIB) SYSLIB(&SYSLIB) CURLIB(&CURL)"
```

```
ASRtvCall(CmdLine)
```

sResult is a string

```
sResult = ASRtvResult ("RC")
```

```
IF sResult = "0" THEN
```

```
    sUser=ASRtvResult("user")
```

```
    sUserlib= ASRtvResult ("usrlib")
```

```
    sSyslib= ASRtvResult ("syslib")
```

```
    sCurl= ASRtvResult ("curl")
```

```
END
```

Retrieve system serial number.

bRet is a boolean

Result is a string

var1 is a string

CmdLine is a string

```
CmdLine = "RTVSYSVAL SYSVAL(QSRLNBR) RTNVAR(&VAR1)"
```

```
bRet = ASRtvCall (CmdLine)
```

sResult is a string

```
sResult = ASRtvResult ("RC")
```

```
IF sResult = "0" THEN
```

```
    Result = ASRtvResult ("VAR1")
```

```
    Info("AS/400 serial number = " + Result)
```

```
END
```

ASErrorHelp and ASErrorData

These functions return extended information about AS/400 error message.

ASErrorHelp returns the complete formatted error message.

ASErrorData returns the parameter data To know the position and length of the message data, see commands DSPMSGD or WRKMSGF on AS/400.

Information returned completes information returned by [ErrorInfo](#) et [HErrorInfo](#),
See [Errors management](#).

Syntax

```
sResult = ASErrorHelp([Connection])  
sResult = ASErrorData(Position, Length [,Connection])
```

In French : [ASErrorAide](#) et [ASErrorDonnee](#)

Parameters

sResult

Character string : Result information.

Position

Integer : Offset in the message data to retrieve.

Length

Integer : Length of the data to retrieve.

Connection (optional)

Connection to AS/400.

Example

Retrieve message text and message data on a constraint error.

```
s1 is strings  
constr_name is string  
constr_parmfil, constr_parmlib is string  
constr_fil, constr_lib is string  
  
s1 = HErrorInfo(hErrMessage)  
IF ExtractString(s1, 6, CR) = "Message: CPF503A" THEN  
  // Nom de la contrainte  
  constr_name = NoSpace(ASErrorData(176, 258))  
  constr_parmfil = NoSpace(ASErrorData(448, 10))  
  constr_parmlib = NoSpace(ASErrorData(458, 10))  
  constr_fil = NoSpace(ASErrorData(10, 10))  
  constr_lib = NoSpace(ASErrorData(20, 10))  
  Info("Error on constraint: "+constr_name+CR+"Parent File:  
"+constr_parmlib+"/"+constr_parmfil+CR+"File: "+constr_lib+"/"+constr_fil)  
  
END  
Info("AS/400 Error: " +Middle(ExtractString(s1, 7, CR),14)+CR+"Help: "+CR+  
ASErrorHelp())
```

AsExec

Execute an OS/400 command.

If the commands returns result values, use function [ASRtvCall](#) .

To call a program, and retrieve modified parameters, use [ASRunRPC](#).

Syntax

```
bResult = ASExec(Command [, Connection])
```

Parameters

bResult

Boolean ; True if the command ran successfully, False if it failed.

Command

Character string ; Contain the OS/400 command to execute.

Connection [optional]

Connection to the AS/400.

Description

This function can execute any command that doesn't open a terminal screen on AS/400.

It is useful to change job attributes, library list, or call programs that do not return result values.

Examples

```
// Send a message to "QPGMR"
ASExec("SNDMSG MSG('Hello') TOUSR(QPGMR) ")

// Change current library
ASExec("CHGCURLIB PROD2005")

// Add a library in LIBL
ASExec("ADDLIB DEVLIBR")

// Call a program
ASExec("CALL PGM(MYPROG) PARM('00213')")

// Create a journal receiver, start journalization.

sCmd is a string
sCmd="CRTJRNRCV JRNRCV(EASYCOM/TMPRCV)"
IF NOT ASExec(sCmd) THEN
  IF ExtractString(ErrorInfo(),2,CR)="CPF7010" THEN Info("Receiver already exists") ELSE
  Info(ErrorInfo)
ELSE

sCmd="CRTJRN JRN(EASYCOM/TMPJRN) JRNRCV(EASYCOM/TMPRCV)"
IF NOT ASExec(sCmd) THEN
  IF ExtractString (ErrorInfo(),2,CR)="CPF7015" TEHN Info("Receiver already contains this journal") ELSE Info(ErrorInfo)
END

sCmd="STRJRNPF FILE(EASYCOM/SP_CUST) JRN(EASYCOM/TMPJRN)"
IF NOT ASExec(sCmd) THEN
  IF ExtractString (ErrorInfo(),2,CR)="CPF7030" THEN Info("File already journalized") ELSE
  Info(ErrorInfo)
END

// Display a file description to a QTEMP file, and read it.

gdsOutput is Data Source
ASExec("DSPFD FILE(EASYCOM/SP_CUST) TYPE(*MBR) OUTPUT(*OUTFILE) OUTFILE(QTEMP/OUTPUT)")
HDeclareExternal ("QTEMP/OUTPUT",gdsOutput,MyConnection)
HReadFirst(gdsOutput)

...

ASExec ("DLTF FILE(QTEMP/OUTPUT)")
```

ASProperty

This functions defines properties on a file or on a datasource :

- Activation of the alias name and path (only on a file),
- Selection of the member name (only for a file).
- Cursor and cache options (for a file or a datasource),

This function allows backward compatibility with alias files (WinDev 5.5 backward compatibility)

Syntax

```
bResult = ASProperty(FileName, Property, Value [, Connection])
```

In french : [ASPropriété](#)

Parameters

bResult

Boolean. True if success, False if failed..

FileName

Character string e

Name of the file in the analysis for what a property is to be changed. This is the WinDev name, not the AS/400 name !

If FileName is an empty string, the property will be changed for the connection, and so, for all the AS/400 files attached to the connection.

Property

Character string.

<i>Property</i>	<i>Value-Type</i>	<i>Value description</i>
MEMBER	String	<p>Name of the file member to use.</p> <p>If the file has multiple members, the first i=one is open by default.</p> <p>File must be open after calling ASProperty.</p> <p>The member name can also be set by the extended info :</p> <p>MAIN=</p>
ALIASEPATH	String	<p>Path where the Alias file is located (*.AS)</p> <p>The alias files were used with WinDev 5.5. It is recommended to use extended info with WinDev 12.</p>
ONLYALIAS	Boolean	<p>Ignore extended info for the file, and use the Alias file, like i twas used with WinDev 5.5.</p>
CACHESIZE	Integer	<p>Maximum Number of records read.in one shot into the record cache.</p>
FORWARDONLY	Boolean	<p>Set the cursor non scrollable, for better performances.</p> <p>The file can be read forward only.</p>
CACHEDINSERT	Boolean	<p>When set to true, Records are kept in a cache before to be inserted into the file.</p> <p>This property must be used carefully, while function HInsert will not insert the records in real time.</p> <p>Records are physically inserted when Easycom cache is full, or when you set again this property to False.</p> <p>You must set this property to False when the last record is inserted, in order to flush the cache, and write the data to the file.</p>
FORCELIBL	Boolean	<p>Set to True to ignore library names in file extended info.</p>
CONNECTION TIMEOUT	Integer	<p>Set the connection time out. After the delay, the connection fails if AS/400 doesn't respond.</p>
COMMAND TIMEOUT	Integer	<p>Set the maximum delay to way for an answer from the AS/400. After this delay, WinDev will consider that the connection is down.</p>

Value

New value for the property.

Connection (optional)

Connection to AS/400

Fichier d'alias

Le fichier d'alias était utilisé en WinDev 5.5 pour identifier les fichiers AS/400. C'est un fichier texte qui se trouve dans le répertoire où devrait se trouver son équivalent HyperFile.

```
[NOM_DU_FICHER]
$FILE=BIBLIO/FICHER ou FICHER
CLE1=
CLE2=
...
$JNAL=TRUE // si le fichier est journalisé
$READONLY=TRUE // ouverture en lecture seule
```

\$FILE correspond désormais au MAIN des infos étendues du fichier.

Les logiques associés aux clé sont dans les infos étendues des rubriques (LFSYSNAME).

\$JNAL correspond à l'option JOURNALED des infos étendues du fichier.

\$READONLY correspond au mode d'ouverture de la Connection ([HOuvreConnection](#)).

Exemples

Utiliser les fichiers d'alias

```
Résultat est un Boolean

// Indique dans quel répertoire trouver tous les fichiers d'alias
Résultat=ASPropriete("", "ALIAPATH", "C:\Program Files\Projet")

// ignorer les infos étendues, avant l'ouverture du fichier
Résultat=ASPropriete("", "ONLYALIAS", "VRAI")
```

Cache et curseur

'Doper' les performances de lecture "brute" de données provenant d'un [HExecuteRequeteSQL](#).

```
// Il faut exécuter la requête avant d'utiliser ASPROPRIETE
HExécuteRequête(MaRequete)
//Cache de 1000 enregistrements
ASPropriete(MaRequete, "CACHESIZE", "1000")
ASPropriete(MaRequete, "FORWARDONLY", "1")
```

Le gain de performance peut théoriquement atteindre 50% sur la partie "lecture" du résultat.

AsRunRPC

Calls an AS/400 program or procedure, with parameters exchange.

You cannot use **AsRunRPC** to call a program with no parameter. Use **AsExec**.

Syntax

```
bResult = ASRunRPC(ProgramName)
```

Parameters

bResult

Boolean ; True if the command ran successfully, False if it failed.

ProgramName

Character string – Program Name ; It is also the name of the file imported in the analysis.

Note : This function uses always the connection associated with the file in the analysis.

Detaill

Using this function, WinDev program can call any AS/400 program or procedure, with parameter passing. Value of parameters changed by the called program can be retrieved by WinDev program.

AS/400 Program or procedure must be described using [RPC-DTAQ Description utility](#), and imported in the analysis.

Before to call the program with AsRunRPC, input and input/output parameters must be initialised.

After program call, output, and input/output parameters are updated. You can retrieve values like you retrieve database field values.

Notes

On AS/400, program is executed in the job associated to the connection.

See [EASYCOM Jobs](#).

If you have to call a program, without retrieving modified parameter values, you can use AsExec() function to run CALL command.

```
ASExecC ("CALL PGM(MyProgram) PARM('My param 1' 'My Param 2')")
```

A maximum execution time can be set for program calls. See EASYCOM Server configuration.

ASPgmCall

ASPgmCall is an alternate solution to ASRunRPC.

The is the same purpose : calling native programs, using different method.

First of all, importing the program's description in the analysis is not needed.

The description can reside :

- in PCML syntax, inside your program
- or : in PCML syntax, in an IFS file on your system
- or : in the program's description, made using the RPC/DTAQ setup tool.

The input/output values are directly managed using the ASPpgmCall function call, one by one or using a structure variable datatype.

Syntax

```
bResult = ASPgmCall(ProgramDescription, ProgramName [,
Connection], Param1 [, Param2 [, Param3, ...] ])
```

Parameters**bResult**

Boolean : True if function succeed, False otherwise.

ProgramDescription

Character string :

- When the program to call was described using [RPC-DTAQ Description utility](#), this parameter has the form : ***PGM/NAME**. where NAME is the name of the description given in RPC/DTAQ Configuration tool.
- When the program is described in **PCML** syntax in a file, this parameter contains an **IFS Path**.
- When the program is described in **PCML** syntax in the WinDev program, this parameter contains the **PCML description** itself.

ProgramName

Character string : Real name (and library if needed) of the native program to call (LIB/NAME).

This parameter can be an empty string if the program name to call is the one given by the PCML description, or if *PGM/NAME is used for the program description.

Connection [optional]

Connection to AS/400.

Param1, Param2 , ...

Variables or values for each parameter expected by the native program.

Description

In the following example, AS/400 program was described in the RPC-DTAQ configuration tool.

Program expects 5 parameters, mapped to WinDev variables OP1, STR1, OP2, STR2, OP3.

```
IF NOT ASPgmCall ("*PGM/RPCSAMPLE", "", connect1, OP1, STR1, OP2, STR2, OP3)
THEN
  Error (ErrorInfo (errFullDetails) )
END
```

For the following example, program description is stored on IFS file "/tmp/rpcsample.pcml", in PCML format.

```
IF NOT ASPgmCall ("/tmp/rpcsample.pcml", "", cnx, OP1, STR1, OP2, STR2, OP3)
THEN
  Error (ErrorInfo (errFullDetails) )
END
```

PCML description can be created by AS/400 ILE compilers.

Example with RPG ILE compiler:

CRT RPGMOD ... PGMINFO(*PCML) INFOSTMF('/tmp/rpcsample.pcml')

PCML syntax looks like this :

```
<pcml version=
<!-- PCML source for calling "RPCSAMPLE" program -->
<!-- Program "RPCSAMPLE" and its parameter list -->

<program name="RPCSAMPLE" path=

<data name="Op1" type="packed" length="5" precision="2" usage=
<data name="Str1" type="char" length="20" usage=
<data name="Op2" type="packed" length="5" precision="2" usage=
<data name="Str2" type="char" length="30" usage=
<data name="Op3" type="packed" length="10" precision="4" usage=

</program>

</pcml>
```

Parameters passed to the program or procedure can be mapped to a WinDev structure.

```
STStrpcsample is structure
  rOp1 is real
  sStr1 is string on 20
  sOp2 is string
  sStr2 is string on 30
  rOp3 is real
END
stRpcSample is STStrpcsample

stRpcSample:rOp1 = OP1
stRpcSample:sStr1 = STR1
stRpcSample:sOp2 = OP2
stRpcSample:sStr2 = STR2

IF NOT ASPgmCall ("*PGM/RPCSAMPLE", "", cnx, stRpcSample) THEN
  Error (ErrorInfo (errFullDetails) )
```

END

ASProcedureCall

ASProcedureCall is for calling ILE procedures of a service program (an alternative of ASRunRPC).

The usage is similar to ASPgmCall, with only difference of an additional parameter for the procedure name.

Syntax

```
bResult = ASProcedureCall(ProcedureDescription,  
ServiceProgramName, ProcedureName [, Connection], Param1 [,  
Param2 [, Param3, ...] ])
```

ASUser

With this function, the program gives to the current connection the authority of another user.

With this function, the real user who sign on, uses his user profile and password to connect, using function [HOpenConnection](#). Then, the connection job adopts the authority of another user known by the program only.

See also EACTCP003 exit program to secure access to Easycom server.

Syntax

```
bResult = ASUser(New_Profile, Password [, Connection])
```

In french : [ASUser](#)

Parameters

bResult

Boolean : True if function succeed, and job is running under new user authority.

New_Profile

User profile : The connection job will adopt the user authority.

Password

Password for the new user profile.

Connection [optional]

Connection to AS/400

Example

```
HOpenConnection(MyConnecton, User, Pwd, "AS400", hNativeAccessAS400,  
hOReadWrite, "")
```

...

```
ASUser(SuperID, SuperPWD)
```

User and Pwd are typed by the real user. They validate the user login on the system.

By providing SuperID and SuperPWD with function ASUser(), the program increases the authority of the job on the database. Even is the real user has no authority on the data, the application will be able to access files.

ASChangePasswd

Change the password for the current user.

Syntax

```
bResult = ASChangePasswd (OldPassword, NewPassword, Connection)
```

Parameter

bResult

Boolean – True if the command is successful.

OldPassword

Old password for the current user.

NewPassword

New password for the current user.

Connection

Connection – name of the connection

ASJobList

liste jobs of an as400 system

Syntaxe

```
bResult = ASJobList (ASJobCollection, JobName, User, JobNumber, Type,
Status, Connection)
```

Parameters**bResult**

Boolean – true if the command was successful.

ASJobCollection

ASJobCollection variable which will contain the list of ASJob

JobName

Filter using a job name, special values allowed are *CURRENT, *ALL. *ALL is used per default.

User

Filter using the name of the user which created the job, special values allowed are *CURRENT, *ALL. *CURRENT is used per default.

JobNumber

Filter using the job number, special values allowed *, *INT. * is used per default.

Type

Filter using job type, special values allowed are *, A, B, I, M, R, S, W, X. * is used per default.

Status

Filter using the status of the job, special values are *ACTIVE, *JOBQ, *OUTQ, *ALL. Per default, *ACTIVE is used.

Connection

Connection – name of the Connection

Example

listJob is a ASJobCollection

```
//per default behaviour, list all the active jobs for the current user
IF NOT ASJobList(listJob,""," ", ""," ", " ", MaConnection1)
  Error(ErrorInfo())
END
```

An ASJobCollection contains a certain number of ASJob objects; those objects have the following properties:

Propriété	Description
Job_name	Job name used
Job_user_name	User name used
Job_number	Job number used
Job_internal_id	Internal job identifier
Job_status	Status
Job_type	Job type

Job_subtype	Job subtype
Job_info_status	Job information status
Job_act_job_sts	Active job status
Job_alw_multi_threads	Allow multiple threads
Job_act_endjob_sts	Active job status for jobs ending
Job_brkmsg	Break message handling
Job_cancel_key	Cancel key
Job_ccsid	Coded character set ID
Job_cntryid	Country or region ID
Job_cpu_time	Processing unit time used, if less than 2,147,483,647 milliseconds
Job_usrprf	Current user profile
Job_completion_sts	Completion status
Job_pool_id	Current system pool identifier
Job_char_id_ctrl	Character identifier control
Job_process_unit_time	Processing unit time used - total for the job
Job_process_unit_time_db	Processing unit time used for database - total for the job
Job_datetime_active	Date and time job became active
Job_datetime_in	Date and time job entered system
Job_datetime_sched	Date and time job is scheduled to run
Job_datetime_jobq	Date and time job was put on this job queue
Job_datfmt	Date format
Job_datsep	Date separator
Job_dbcs_cap	DBCS-capable
Job_ddm_handle	DDM conversation handling
Job_dftwait	Default wait
Job_devrcyacn	Device recovery action
Job_devname	Device name
Job_dftccsid	Default coded character set identifier
Job_decfmt	Decimal format
Job_datetime_end	Date and time job ended
Job_endsev	End severity
Job_endsts	End status
Job_exitkey	Exit key
Job_func_name	Function name
Job_func_type	Function type
Job_signed_job	Signed-on job
Job_grpprfname	Group profile name
Job_grpprfname_sup	Group profile name - supplemental
Job_inqmsgsrply	Inquiry message reply
Job_account_code	Job accounting code
Job_date	Job date
Job_desc_name	Job description name - qualified
Job_queue_name	Job queue name - qualified
Job_queue_pty	Job queue priority

Job_switches	Job switches
Job_jobmsgqfl	Job message queue full action
Job_jobmsgq_size	Job message queue maximum size
Job_usrid	Job user identity
Job_usrid_setting	Job user identity setting
Job_end_reason	Job end reason
Job_log_pending	Job log pending
Job_type_enhanced	Job type - enhanced
Job_langid	Language ID
Job_loglvl	Logging level
Job_logclpgm	Logging of CL programs
Job_logsev	Logging severity
Job_logtext	Logging text
Job_mode_name	Mode name
Job_max_proc_unit_time	Maximum processing unit time
Job_max_tmp_stg_k	Maximum temporary storage in kilobytes
Job_max_threads	Maximum threads
Job_max_tmp_stg_m	Maximum temporary storage in megabytes
Job_mem_pool_name	Memory pool name
Job_msgrpl	Message reply
Job_interactive_trs	Number of interactive transactions
Job_db_lckwait	Number of database lock waits
Job_mch_lckw	Number of internal machine lock waits
Job_nondb_lckw	Number of nondatabase lock waits
Job_aux_ioreq	Number of auxiliary I/O requests
Job_outq_name	Output queue name - qualified
Job_outq_pty	Output queue priority
Job_prttext	Print text
Job_prtdevname	Printer device name
Job_purge	Purge
Job_prd_retcode	Product return code
Job_prog_retcode	Program return code
Job_pending_sgnset	Pending signal set
Job_process_id	Process ID number
Job_response_time	Response time total
Job_runpty	Run priority (job)
Job_routing_data	Routing data
Job_strseq	Sort sequence table - qualified
Job_sts_msghdl	Status message handling
Job_sts_jobq	Status of job on the job queue
Job_sbmjob	Submitter's job name - qualified
Job_sbmsgq	Submitter's message queue name - qualified
Job_sbsd	Subsystem description name - qualified
Job_syspoolid	System pool identifier
Job_spclenv	Special environment

Job_sgnblk_mask	Signal blocking mask
Job_sgnsts	Signal status
Job_svrtype	Server type
Job_splfile_action	Spooled file action
Job_timsep	Time separator
Job_timeslice	Time slice
Job_timeslice_end	Time-slice end pool
Job_tmpstgk	Temporary storage used in kilobytes
Job_time_db_lckw	Time spent on database lock waits
Job_time_mch_lckw	Time spent on internal machine lock waits
Job_time_nondb_lckw	Time spent on nondatabase lock waits
Job_threadcnt	Thread count

ASJobLogList

List the objects of a job log AS/400.

Syntaxe

```
bResult = ASJobLogList(ASJobLogCollection, JobName, User, JobNumber,
NumberOfMessages, Direction, Connection)
```

Parameters

bResult

Boolean – true if the command was successful.

ASJobLogCollection

ASJobLogCollection variable which will contains the results.

JobName

Filter using the name of the job, special values allowed : *, *INT. Per default * is used.

User

Name of the user, or leave empty when the JobName used is a special value * or *INT.

JobNumber

Number of a specific job or leave empty when the JobName used is a special value * or *INT.

NumberOfMessages

Maximum number of messages to be returned.

Direction

Reading directions, you have to user *NEXT or *PRV. Per default *NEXT is used.

Connection

Connection – name of Connection

Example

`listJobLog` is a `ASJobLogCollection`

```
//Per default behaviour, list all the job logs
IF NOT ASJobLogList(listJobLog,""," ", " ", " ", " ", MaConnection1)
  Error(ErrorInfo())
END
```

ASObjectList

List all the objects of an AS400 library.

Syntaxe

```
bResult = ASObjetsList(ASObjectCollection, Library, Name, Type, Connection)
```

Parameters

bResult

Boolean – true if the command was successful.

ASObjectCollection

ASObjectCollection variable which will contain the results.

Library

Filter using a Library name, special values allowed are *ALL, *ALLUSR, *CURLIB, *LIBL, *USRLIBL. Per default, *LIBL is used.

Name

Filter using the name of the object, special values allowed are *ALL, *ALLUSR, *IBM. Per default, *ALL is used.

Type

Filter using the type of object, special value allowed : *ALL. Per default, *ALL is used.

Connection

Connection – name of Connection

Example

listJob is a ASObjectCollection

```
//per default behaviour, list all objects in *LIBL.  
IF NOT ASObjetsList(listJob,""," ", " "," ", " ", MaConnection1)  
  Errorrr(ErrorrrInfo())  
END
```

IFS functions

ASfLoadText - ASfLoadBinary

Those functions are for loading a whole IFS file into a WinDev variable.

Syntax

```
sData = ASfLoadText(FileName [,Connection])  
sData = ASfLoadBinary(FileName [,Connection])
```

Parameters

FileName

Strings which contains the IFS file path

Connection (optional)

Connection to AS/400.

Detail

ASfLoadText/Binary functions are reading the complete file into a variable. The difference between the two functions is that ASfLoadText is performing conversion, but ASfLoadBinary isn't.

Example


```

bufImg is Buffer
bufImg = ASfLoadBinary("/images/smt3.jpg")

IF bufImg="" THEN
  Info(ErrorInfo())
ELSE
  IMG_Image1 = bufImg
END

```

ASfCreate

Opens an IFS file in creation mode. (ASfOpen also allows this using the mode parameter)

Syntax

```
<result> = ASfCreate(FileNAme [,mode] [,Connection])
```

Parameters

<result>: integer

Number of the opened file (handle). This value must be given to other functions: ASfClose, ASfRead, ASfWrite and so on.

Result is -1 in case of error

<mode>: optional integer

[Creation mode](#) of the file

The default value is: [ASfoCreate](#)+[ASfoTruncate](#)+[ASfoWrite](#)+[ASfoModeU_RW](#)+[ASfoModeG_RW](#)

Connection (optional)

Connection to AS/400.

Example

```

nres =
ASfCreate("/text/unicode_text_to_create.txt",ASfoUnicode+ASfoTruncate)
IF nres = -1 THEN
  Error(ErrorInfo())
RETURN
END

```

ASfWrite

Write into an IFS file

Syntax 1

```
<Result> = ASfWrite(<open_id>, <data1>, <Length>)
```

Syntax 2

ASfWriteLine

Writes a line in an IFS File (writes the text and a new line character).

Syntax

```
<Result> = ASfWriteLine(<open_id>, <text> [,<length>])
```

Parameters

<result>: integer

Number of actually written characters. -1 in case of error.

<open_id>: integer

Value provided by ASfCreate or ASfOpen

<text>: ANSI or Unicode string

Text to write.

<length>

Number of characters to write. Is useful if a 0 character is present in the string.

ASfClose

This closes the IFS file. The pending data (if any) is written at this time.

Syntax

```
<Result> = ASfClose(<open_id>)
```

Parameters

<result>: boolean

False in case of error.

<open_id>: integer

Value provided by ASfCreate or ASfOpen

ASfRead

Reads in an IFS file.

Syntax 1 (recommended)

```
<Result1> = ASfRead(<open_id>, <length>, <data>)
```

Syntax 2

```
<Result2> = ASfRead(<open_id>, <length>)
```

Parameters

<Result1>: integer

Number of bytes or characters actually read.

<Result2>: Buffer

Result data

<open_id>: integer

Value provided by ASfCreate or ASfOpen

<data>: buffer or string (allocated).

Data space for receiving result

<length>: integer

Number of bytes or characters to read

The syntax 1 is better because it translates the data into the provided datatype (from or to Unicode if necessary), whenever the open mode.

The number given for <length> and of the result is the "natural" length, which will be:

For syntax 1:

- a number of bytes if the the 3rd parameter datatype is binary or text
- a number of characters if the 3rd parameter datatype is Unicode

For syntax 2:

- a number of bytes if the open mode is binary or text
- a number of Unicode characters if the open mode is Unicode

Example

This example is downloading a *SAVF file into a local directory, from MY_LIB/SAVF to c:\temp\mysavf.savf.

```
nHdl, cnt is int
```

```

buf is Buffer
nLocalFile is int

nHdl = ASfOpen("/QSYS.LIB/MY_LIB.LIB/MYSAVF.FILE", ASfoBinary)
IF nHdl = -1 THEN
    Error(ErrorInfo())
    RETURN
END

nLocalFile = fOpen("c:\temp\mysavf.savf", foWrite+foCreate)
IF nLocalFile = -1 THEN
    Error(ErrorInfo())
    RETURN
END

cnt = ASfRead(nHdl, 65000, buf)
WHILE cnt <> 0
    fWrite(nLocalFile, buf, cnt)
    cnt = ASfRead(nHdl, 65000, buf)
END

fClose(nLocalFile)
ASfClose(nHdl)

```

ASfReadLine

Reads a text line in an IFS file.

Syntax

```
<Result> = ASfReadLine(<open_id>)
```

Parameters

<result>: Ansi or Unicode string

The read line. The datatype depends on the open mode.

<open_id>: integer

Value provided by ASfCreate or ASfOpen

ASfOpen

Opens an IFS file, and returns an handle to use it with other functions: ASfRead, ASfReadLine, ...

Syntax

```
<result> = ASfOpen(FileNAme [,mode] [,Connection])
```

Parameters

<result>: integer

Number of the opened file (handle). This value must be given to other functions: ASfClose, ASfRead, ASfWrite and so on.

Result is -1 in case of error

<mode>: optional integer

[Open mode](#) of the file

The default value is: *ASfoRead*

Connection (optional)

Connection to AS/400.

Example

```

nHdl = ASfOpen("/textes/text_to_read.txt", ASfoUnicode)
IF nHdl = -1 THEN
    Error(ErrorInfo())
    RETURN

```

END

ASfSaveText/ASfSaveBinary

Those functions are for writing a whole IFS file directly from a string or a buffer.

Syntax

```
<result> = ASfSaveText(FileName, data [,mode] [,Connection])  
<result> = ASfSaveBinary(FileName, data [,mode] [,Connection])
```

Parameters

Result: Boolean

Is false in case of error.

FileName

Strings which contains the IFS file path

Data : Ansi or Unicode string, or buffer

Variable which contain all the data to put in the file

Mode : optional integer

[Creation mode](#) of the file

The default value is:

[ASfoCreate](#)+[ASfoTruncate](#)+[ASfoWrite](#)+[ASfoModeU_RW](#)+[ASfoModeG_RW](#)

Connection (optional)

Connection to AS/400.

Example

`bufImg` is Buffer

```
IF NOT ASfSaveText("/images/new_image.jpg", bufImg, MyConnection) THEN  
  Info(ErrorInfo())  
END
```

Mode for ASfOpen, ASfCreate, ASfSaveText/Binary

This mode values is used to specify how to open or create an IFS file using ASfOpen, ASfCreate, ASfSaveText/Binary.

This mode is a combination (i.e. a sum) of the following constants:

- Open kind

[ASfoAdd](#) : add data from end of the existing file

[ASfoTruncate](#) truncates the file

[ASfoCreate](#) creates the file, which must not exist before

[ASfoCreateIfNotExist](#) creates the file if does not exist before, use existing file otherwise

- Usage

[ASfoWrite](#) write access

[ASfoRead](#) read access

[ASfoReadWrite](#) read and write access

[ASfoBinary](#) binary : no conversion

[ASfoUnicode](#) file is storing Unicode data

- Locking

[ASfoReadLock](#) read locking

[ASfoWriteLock](#) write locking

- Rights . This is unix-like rights: read (r), write (w), execute(x) for user(u), group(g) and other(o). This are the same symbolic which are used by the Unix chmod command.

When creating a file the object's owner will always be the current user.

CHGAUT command allows adjusting user rights. CHGOWN allows changing object's owner.

ASfoModeU_R the object's owner has read access
ASfoModeU_W the object's owner has write access
ASfoModeU_X the object's owner has execution access
ASfoModeU_RW = *ASfoModeU_R*+*ASfoModeU_W*
ASfoModeU_RX = *ASfoModeU_R*+*ASfoModeU_X*
ASfoModeU_RWX = *ASfoModeU_RW*+*ASfoModeU_X*
ASfoModeG_R the object's group has read access
ASfoModeG_W the object's group has write access
ASfoModeG_X the object's group has execution access
ASfoModeG_RW = *ASfoModeG_R*+*ASfoModeG_W*
ASfoModeG_RX = *ASfoModeG_R*+*ASfoModeG_X*
ASfoModeG_RWX = *ASfoModeG_RW*+*ASfoModeG_X*
ASfoModeO_R other users have read access
ASfoModeO_W other users have write access
ASfoModeO_X other users have execution access
ASfoDroitsO_RW = *ASfoModeO_R*+*ASfoModeO_W*
ASfoDroitsO_RX = *ASfoModeO_R*+*ASfoModeO_X*
ASfoDroitsO_RWX = *ASfoDroitsO_RW*+*ASfoModeO_X*
ASfoModeA_R = *ASfoModeU_R*+*ASfoModeG_R*+*ASfoModeO_R*
ASfoModeA_W = *ASfoModeU_W*+*ASfoModeG_W*+*ASfoModeO_W*
ASfoModeA_X = *ASfoModeU_X*+*ASfoModeG_X*+*ASfoModeO_X*
ASfoModeA_RWX = *ASfoModeA_R*+*ASfoModeA_W*+*ASfoModeA_X*

Profil Management

ASUserList

List all the AS400 profiles.

Syntaxe

```
bResult = ASUserList(ASUsrPrfCollection, Connection)
```

bResult

Boolean – True if successful, False otherwise.

ASUsrPrfCollection

A variable of ASUsrPrfCollection type, which will be filled with the result. It is a collection of ASUsrPrf objects.

Connection

String – name of the Connection

Example

```
profilList is ASUsrPrfCollection
myProfil is ASUsrPrf
nb is integer

HOpenConnection(AS400)
ASUserList(profilListe, AS400)

nb = profilList.CollectionASUsrPrf..Occurrence
FOR indice= 1 A nb
    myProfil = profilList.CollectionASUsrPrf[indice]
    TableauAjoute(gtabObjet, myProfil)
FIN
TableAffiche(TABLE_GtabObjet)
```

ASCreateProfil

Create a new AS400 profile

Syntaxe

```
bResult = ASCreateProfil(ProfileName,Password, Description,  
[Source Profile],Connection)
```

bResult

Boolean – True if the command was successful, false otherwise.

NomProfil

String – Name of the new AS400 profile

Mot de passe

String – Password for the new profile

Description

String – Description of the profile.

Profil Source

String – Name of the profile to copy settings from, this is an optional parameter. .

Connection

String – Name of the connection

ASModifyProfil

Modify an AS400 profile

Syntaxe

```
bResult = ASModifyProfil(ProfileName,Field,Value,Connection)
```

bResult

Boolean - True if the command was successful, false otherwise.

ProfileName

String – Name of the AS400 profile to modify

Field

String – Field of the profile to modify, it can be one of the following values :

PASSWORD,PWDEXP,STATUS,USRCLS,ASTLVL,CURLIB,INLPGM,INLMNU,LMTCPB,TEXT,SPCAUT,SPCENV,
DSPSGNINF,PWDEXPITV,LCLPWDMGT,LMTDEVSSN,KBDBUF,MAXSTG,PTYLMT,JOBD,GRPPRF,OWNER,G
RPAUT,GRPAUTTY, SUPGRPPRF,ACGCDE,DOCPWD,MSGQ,DLVRY,SEV,PRTDEV,OUTQ,ATNPGM,SRTSEQ
,LANGID,CNTRYID,CCSID,CHRIDCTL,SETJOBATR,LOCALE,USROPT,UID,GID,HOMEDIR,EIMASSOC.

Value

String – New value for the field

Connection

String – Name of the Connection

ASDeleteProfil

Delete an AS400 profile

Syntaxe

```
bResult = ASDeleteProfil(NomProfil,Connection)
```

bResult

Boolean - True if the command was successful, false otherwise.

NomProfil

String – Name of the AS400 profile to delete

Connection

String – Name of the Connection

ASCheckPassword

Check if the password given as a parameter is correct.

Syntaxe

```
bResult = ASCheckPassword(ProfileName, Password, [CCSID], Connection)
```

bResult

Boolean – True if the password is correct, false otherwise.

ProfileName

String – Name of the AS400 profile

Password

String – Password to check.

CCSID

Integer – Optional parameter, CCSID of the password if different of the system's one.

Connection

String – Name of the Connection

ASCheckAuthority

Check if an AS400 profile has a given authority on an object.

Syntaxe

```
bResult =  
ASCheckAuthority(ProfileName, Object, Library, ObjectType, Authority  
, Connection)
```

bResult

Boolean – True if the profile has the requested authority, false otherwise.

ProfileName

Chaine de caractères – Le nom du profil AS400

Object

String – Name of the object on which we're checking the authority.

Library

String – Library of the object.

ObjectType

String – Type of the object

Droit

String – Authority to check, the following values are allowed:

*EXCLUDE,*ALL,*CHANGE,*USE,*AUTLMGT,OBJALTER,*OBJOPR,*OBJMGT,*OBJEXIST,*OBJREF,*READ,*ADD,*UPD,*DLT,*EXECUTE

Connection

String – Name of the Connection

DataQueue / UserSpace functions

ASDataQueueSend

Writes into a dataqueue (keyed or non keyed), with description enclosed in the WinDev program.

Syntax

```
result = ASDDataQueueSend(DataQueueDesc, DataQueueName [, Connection], data  
[, key])
```

bResult

boolean – true if success, false in case of failure

DataQueueDesc

Multiline string which contains the PCML source corresponding to the data and key (see above example)

The syntax is the same syntax which is used for [ASPgmCall](#)

DataQueueName

String representing the dataqueue name.

Connection (optional)

Connection to AS/400.

Data

Variable or values corresponding to data to send

Key (optional)

String for the key value

Example

```
sdq_pcm1 is string =
<pcm1 version="1.0">
<program name="TESTDQ" >
<data name="data" type="char" length="200" usage="input"/>
<data name="key" type="char" length="10" usage=
</program>
</pcm1>
]
```

```
IF NOT ASDataQueueSend(sdq_pcml, "*LIBL/DTAQ_KEY", cnxConnection,
sData, sKey) THEN
    Error("Write failed")
END
```

ASDataQueueReceive

Receives data from a dataqueue, for a non-keyed dataqueue.

Syntax

```
result = ASDataQueueReceive (DataQueueDesc, DataQueueName , timeout,
bRemove, [ , Connection], Param1 [ , Param2, ... ] )
```

bResult

boolean – true if success, false in case of failure

DataQueueDesc

Multiline string which contains the PCML source corresponding to the data and key (see above example)

The syntax is the same syntax which is used for [ASPqmcCall](#)

DataQueueName

String representing the dataqueue name.

Timeout

Timeout value in case of no data at the moment of the call. 0 for immediate answer.

Remove

Tell to remove or just read the dataqueue value.

Param1, Param2, ...

Data to receive the value

Connection (optional)

Connection to AS/400.

Example

```
sdq_pcml is string =
<pcml version="1.0">
<program name="TESTDQ" >
<data name="data" type="char" length="50" usage="input"/>
</program>
</pcml>
]

IF NOT ASDataQueueReceive(sdq_pcml, "*LIBL/DTAQ_FIFO", 2, True ,
cnxConnection, data_read) THEN
Info("Data Queue vide!")
END
```

ASKeyDataQueueReceive

Receives data from a dataqueue, using the specified key.

Syntax

```
result = ASKeyDataQueueReceive (DataQueueDesc, DataQueueName , operation,
timeout, bRemove, [, Connection], Data, key )
```

bResult

boolean – true if success, false in case of failure

DataQueueDesc

Multiline string which contains the PCML source corresponding to the data and key (see above example)

The syntax is the same syntax which is used for [ASPgmCall](#)

DataQueueName

String representing the dataqueue name.

Operation

Key operation. Possible values are:

EQ: equal, NE: not equal, LE : <=, LT : <, GE : >=, GT : >.

Timeout

Timeout value in case of no data at the moment of the call. 0 for immediate answer.

Remove

Tell to remove or just read the dataqueue value.

Data

Data to receive the value

Key

The actual key for the data (useful when not using Operation=

Connection (optional)

Connection to AS/400.

Example

```
sdq_pcml is string =
<pcml version="1.0">
<program name="TESTDQ" >
<data name="data" type="char" length="200" usage="input"/>
<data name="key" type="char" length="10" usage=
</program>
</pcml>
]
```

```

IF NOT ASKeyDataQueueReceive(sdg_pcml, "*LIBL/DTAQ_KEY", "EQ", 2, True
,cnxConnection, data_read, key2) THEN
    Info("Empty data queue!")
END

```

ASUserSpaceRead

Reads structured or simple information from a userspace.

Syntax

```

result = ASUserSpaceRead(UserSpaceDesc, UserSpaceName, Offset [,
Connection], param1 [,Param 2 [, Param3, ... ] ] )

```

bResult

boolean – true if success, false in case of failure

UserSpaceDesc

Multiline string which contains the PCML source corresponding to the data in the userspace at the specified offset

The syntax is the same syntax which is used for [ASPgmCall](#)

UserSpaceName

String representing the userspace name.

Connection (optional)

Connection to AS/400.

Offset

Offset in the userspace

Param1, Param2, ...

Data matched to the described structure. Can be a structure (one parameters) or single value(s).

Example

```

sus_pcml is string =
    <pcml version="1.0">
    <program name="US_TEST" >
    <data name="data" type="char" length="45" usage="input"/>
    </program>
    </pcml>
]

IF NOT ASUserSpaceRead(sus_pcml, "MY_LIB/MY_US", 1, res)
    Error(ErrorInfo())
END

```

ASUserSpaceWrite

Writes structured or simple information into a userspace.

Syntax

```

result = ASUserSpaceWrite(UserSpaceDesc, UserSpaceName, Offset [,
Connection], param1 [,Param 2 [, Param3, ... ] ] )

```

bResult

boolean – true if success, false in case of failure

UserSpaceDesc

Multiline string which contains the PCML source corresponding to the data in the userspace at the specified offset

The syntax is the same syntax which is used for [ASPgmCall](#)

UserSpaceName

String representing the userspace name.

Connection (optional)

Connection to AS/400.

Offset

Offset in the userspace

Param1, Parm2, ...

Data matched to the described structure. Can be a structure (one parameters) or single value(s).

Example

```

str is string

sus_pcml is string =
<pcml version="1.0">
<program name="TESTUS" >
<data name="data" type="char" length="45" usage="input"/>
</program>
</pcml>
]

str="uspc test"

IF NOT ASUserSpaceWrite(sus_pcml, "MY_LIB/MY_US", 1, str)
  Error(ErrorInfo())
END

```

Spool functions**ASCreateSpool**

Creates a binary spool file on the AS/400, from a windows printer file. This allows printing a report to the AS/400 spools.

Syntax

```

bResult = ASCreateSpool(prn_FileName, Connection, options [,
user_data, user_name, user_text [, copies, spoolname [,
output_queue, output priority, form_type]]] )

```

c

Options

Basic options for the spool file. The possible valeurs are a combination of the following constants::

ASsplHold : for creating the spool file in hold state.

ASsplSave : for a spool file which will be saved after being printed.

User_data (10 caracters)

User data: a short identifier for the spool item. Also known as user reference. This is used to easily retrieve the spool after creation.

User_name

Name of the user which will own the spool. Possible values are:

Name of a user

*CURRENT (by default) -> current user

User_text (100 caracters)

User text. Holds a customized description.

copies

Number of copies to be printed

spoolname (10 caractères)

name of the spool file to create

Output_Queue

Name of the outq. Possible values are:

Name of an OUTQ (*LIBL/OUTQ, or OUTQ)

*JOB (by default)

Output_priority

Output priority. Possible values:

1-9

*JOB (by default)

Form_type (10 characters)

Form type: possible values are: *STD or any string.

Example

```
// redirects the REPORT_Report1 print into a prn file
iDestination(iFile, fTempPath()+"impr.prn")
iPrintReport(REPORT_Report1)

// example 1
IF NOT ASCreateSpool(fTempPath()+"impr.prn", cnxConnection,0, "QPGMR",
"DOC0099", "Invoice XYZ") THEN
  Error(ErrorInfo(errFullDetails))
END
// example 2
IF NOT ASCreateSpool(fTempPath()+"impr.prn",
cnxConnection,ASsplHold+ASSplSave, "*CURRENT", "DOC0099", "Invoice
XYZ",2, "MYSPool", "PRT_EAC", 1, "FRM01") THEN
  Error(ErrorInfo(errFullDetails))
END
```

ASGetSpool

Reads an AS/400 spool file into a local PCL or text document.

Syntax

```
bResult = ASGetSpool(local_FileName, Connection , SpoolName [, job [,
spl_number [, spl_format [, paper_size [, supprLF ]]]]] )
```

bResult

boolean – true if success, false in case of failure

local_FileName

PC file which will be created by ASGetSpool.

Connection

Connection to AS/400.

SpoolName

Name of the spool file. Possible values: *LAST or a name

Job

Job identity. Possible value is * for current job, or nnn/USER/JOBNAME.

Spl_number

Number of the spool. Possible values are:

- from 0 to 9999999: spool number
- ASSplOnly (*ONLY)
- ASSplLast (*LAST)

Spl_format

Format of the result. Possible values are:

- ASSplTxt: text format
- ASSplPCL: PCL format

Paper_size

Paper size. Possible values are:

*NONE *MFRTYPMDL *LETTER *LEGAL *EXECUTIVE *A3 *A4 *A5 *B4 *B5 *CONT80 *CONT132

supprLF (boolean)

Remove the last page jump (by default : false)

Example

```
IF NOT ASGetSpool("c:\temp\spl_test_wd.spl", cnxConnection,
"QPJOBLOG", "108755/SMITH/PRTXJK", 1, ASsplPCL, "", False) THEN
  Error(ErrorInfo(errFullDetails))
END
```

ASSpoolList

Liste the AS400 spool files

Syntaxe

```
bResult = ASSpoolList(CollectionOfASSpool, User, OutQ, UserDataKey,
JobName, jobNumber, Connection)
```

bResult

Boolean- True if the command succeeded false otherwise.

CollectionOfASSpool

AsSpoolCollection variable, it will be filled with the list of spool.

User

Name of the user who created the job.

OutQ

Name of the out queue containing the spool file.

UserDataKey

User Data Key for the spool file.

JobName

Name of the job which created the spool file.

JobNumberI

Number of the job which created the spool file.

Connection

Connection name of the AS400 Connection

Example

listSpool is ASSpoolCollection

//look for all the spool files

```
IF NOT ASSpoolList(listSpool, "", "", "", "", "", MyConnection)
  Error(ErrorInfo())
END
```

Trace Management Functions**ASSetTrace**

Active la trace AS400

Syntaxe

```
bResult = ASSetTrace(ActiveTrace, TraceFile, TraceLvl, TimeStamp,
Connection)
```

bResult

Boolean- True if the command is successful.

ActiveTrace

Boolean, if true, enable tracing, if false disable it.

TraceFile

Name of the trace file, it has to be in the following format: LIBRARY/FILE.

TraceLvl

Level of detail for the trace, has to be in between 1 and 4, 4 providing the highest level of details.

Timestamp

Boolean, if true, each line of the trace will be timestamp

Connection

Connection – name of the AS400 Connection

Example

```
//activate trace
IF NOT ASSETTrace(True,"EASYCOM/TRACE",4, True, MyConnection)
  Error(ErrorInfo())
FIN
```

ASIfTraceActive

Check if the trace is activated.

Syntaxe

```
bResult = ASSiTraceActive (Connection)
```

bResult

Boolean- True if the trace is activated.

Connection

Connection – name of the AS400 Connection

ASGetTraceLib

Retrieve the name of the library used for trace.

Syntaxe

```
bResult = ASGetTraceLib(Connection)
```

bResult

String – Name of the library used for the trace

Connection

Connection – name of the AS400 Connection

ASGetTraceFic

Retrieve the name of the file used for trace.

Syntaxe

```
bResult = ASGetTraceFic (Connection)
```

bResult

String – Name of the file used for the trace.

Connection

Connection – name of the AS400 Connection

ASGetTraceLvl

Retrieve the current level of detail for trace.

Syntaxe

```
bResult = ASGetTraceLvl (Connection)
```

bResult

Int – Level of detail used for the trace

Connection

Connection – name of the AS400 Connection

Job Management Functions

ASChangeJobName

Customize the « function » field displayed in the WRKACTJOB listing for the Easycom sub-system corresponding to the connection.

Syntaxe

```
bResult = ASChangeJobName (NewName, Connection)
```

bResult

Int – -1 in case of Error, 0 otherwise

NewName

Name which will be displayed in the WRKACTJOB results on as400

Connection

Connection – name of the AS400 Connection

ASSubmitBIC

Submit a Batch Immediat job (BCI)

Syntaxe

```
bResult = ASSubmitBIC (ProgName, Library, User, Data, Multi-Thread,  
CurrLIBL, Connection)
```

bResult

ANSI String– ID of the job if it started correctly, otherwise, it's an empty string.

ProgName

Name of the AS400 program name to start

Library

Library of the AS400 program

User

Name of the user to be used to start the job

Data

Data to be passed on to the job.

Multi-thread

Boolean– if true authorize use of multi-thread in the job.

CurrLIBL

Boolean–if true, keep the current LIBL for the job execution.

Connection

Connection – name of the AS400 Connection

ASSubmitPJ

Submit a pre-start job (PJ)

Syntaxe

```
bResult = ASSbmPJ(Program, User, Data, SBS, Connection)
```

bResult

ANSI String– ID of the job if it started correctly, otherwise, it's an empty string.

Program

Name of the AS400 program name to start

User

Name of the user to be used to start the job

Data

Data to be passed on to the job.

SBS

Name of the subsystem containing the pre-start job.

Connection

Connection – name of the AS400 Connection

ASJobStatus

Permet d'obtenir le Status d'un JobName lancé en BIC ou PJ

Syntaxe

```
bResult = ASJobStatus(JobID, Connection)
```

bResult

String – Status of the job

JobID

Job Id as return by ASSubmitBIC ou ASSubmitPJ

Connection

Connection – name of the AS400 Connection

Debug and error management

Errors management

Errors are mainly managed by the WinDev functions :

`HError, HErrorDuplicates, HErrorInfo, HErrorIntegrity, HErrorLock, HErrorModification, HErrorPassword, HErrorStatusModification`

WRKACTJOB

Using AS/400 command WRKACTJOB, you can see the job properties for the connection, and get some additional information on errors :

- Job log,
- Open files,
- Locked files and records,

Traces

By generating a Trace File on Easycom server, you can see native error messages raised by the system.

CPF messages

Functions [ASErrorHelp](#) and [ASErrorData](#) return the native AS/400 error message (CPFxxxx).

ErrorInfo et HErrorInfo

[hError](#) returns the last code WinDev raised.

Error code **73001** is returned in case of AS/400 native access error. Use [ErrorInfo](#) or [hErrorInfo](#) to get details, with [hErrNative](#) or [hErrNativeMessage](#) parameters.

Easycom Trace File

Trace file enables EASYCOM carried out operations to be displayed on client or server side. AS/400 EASYCOM server processes elementary requests applied to tables or procedures.

It receives a process request from the network, and returns a response.

The requests and responses are recorded in a trace file, it can be used as basis to analyze data flow between client and server.

Lines starting with << indicates client request.

Lines starting with >> indicates AS/400's answer.

```
<<EACopen(EASYCOM/SP_CUST,4194309,-1) ʘ Requête.
9 Fields, 0 key fields
EAC_NO_CVT - mode=
>>Ret=1; Err=0; Msg=; Int=0 ʘ Réponse.
```

In AS/400 trace, if time option was selected, all requests and responses are time in hh:mm:ss.ms format.

```
<<15:48:45.566: EACread(1,p(2275),91,34144281,(null),0,p(100))
```

In response, data "Clk=x" indicates AS/400 CPU time spend to process the request.

```
.
>>15:48:45.574: Clk=8, Len=619; Ret=5; Err=0; Msg=; Int=
```

Trace file header (common to all sessions)

This trace file part is always the same for all EASYCOM sessions.

Time is : 03/27/2000 - 17:22:10

Easycom Server Version is : 4.5712, Link is TCP/IP

Client licence is : D\$WINDEV10 , Easycom Library is : EASYCOM

JobName=ALBATROS, User=QPGMR , QCCSID=297 Heart Beat freq :10

Easycom Log File TRACE/SR, level 1

```
-----
>>Ret=1; Err=0; Msg=; Int=0
```

```
<<RTV_AS_VER(p(4))
```

```
>>Ret=4; Err=0; Msg=; Int=0
```

<<WriteTableEBCDI(49 42 4D 43 43 53 49 44 20 30 20 31 32 35 32 00 00 00 00 00 ... (256))

Build Table from CCSID:0 to 1252

open IBMCCSID01252, IBMCCSID000000000100

<<WriteTableASCII(49 42 4D 43 43 53 49 44 20 31 32 35 32 20 30 00 00 00 00 00 ... (256))

Build Table from CCSID:1252 to 0

open IBMCCSID00000, IBMCCSID012520000100

<<ReadTableASCII(p(256))

>>Ret=0; Err=0; Msg=; Int=

<<ReadTableEBCDIC(p(256))

>>Ret=0; Err=0; Msg=; Int=0

<<EACSqlDeclare(2A 45 41 43 20 43 56 54 20 4E 4F 00 ,12)

Statement:*EAC CVT NO

>>Ret=1; Err=0; Msg=; Int=0

<<EACSqlBegin()

>>Ret=0; Err=0; Msg=; Int=0

Physical file opening trace

<<EACOpen(EASYCOM/SP_CUST,4194309,-1)

9 Fields, 0 key fields

EAC_NO_CVT - mode=rr+

>>Ret=1; Err=0; Msg=; Int=

<<EACgetdesc(1,p(65000),65000,939786240,(null))

>>Ret=9; Err=0; Msg=; Int=

Logical file opening trace

<<EACOpen(EASYCOM/SP_CUST_UN,4194309,-1)

LF with 1 Data Members, 1 Record Formats

9 Fields, 1 key fields

EAC_NO_CVT - mode=rr+

>>Ret=2; Err=0; Msg=; Int=

<<EACgetdesc(2,p(65000),65000,939786240,(null))

>>Ret=9; Err=0; Msg=; Int=

File records reading trace

<<EACread(2,p(816),102,34144264,(null),0,p(32))

VERB=_EAC_NEXT LOCK=OFF RECS=8 FILE=EASYCOM/SP_CUST_UN

RRN=2 RRN=4 RRN=5 RRN=6 RRN=7 RRN=8 RRN=9 RRN=10

>>Ret=8; Err=0; Msg=; Int=0

Read operation type is indicated by « VERB=

Where xxxx may be :

FIRST, NEXT, PREV, LAST, KEY_EQ, KEY_GE, KEY_GT, ...

"**LOCK=**" indicates if operation is carried out with or without record locks.

"**RECS=**" indicates maximum records number requested for the response.

This number is directly linked to "Records= data" in the "Easycom.ini" file "Buffers section" on client PC.

"**RRN=**" indicates the records read number.

In response, "Ret=n" indicates the records number actually returned, to the read request.

If the read operation fails because of an input/output error, the message is stored in the trace, and the records actually read are returned.

```
<<EACread(2,p(3570),102,34144291,(null),0,p(140))
```

```
VERB=_EAC_NEXT LOCK=OFF RECS=35 FILE=EASYCOM/SP_CUST_UN
```

```
RRN=11 RRN=12 RRN=13 RRN=14 RRN=15 RRN=16 RRN=17 RRN=18 RRN=19 RRN=20 RRN=54 +...
```

```
... RRN=55 RRN=56
```

```
**SIGIO** Msg:CPF5001
```

```
>>Ret=13; Err=5001; Msg=CPF5001; Int=0
```

In this example, 35 records are requested, but only 13 are available until file end.

To obtain the detailed error message, use DSPMSGD command.

SQL request opening trace

```
<<EACopen(SELECT * from SP_CUST where LASTNAME>'M',4194309,-1)
```

```
Statement : SELECT * from SP_CUST where LASTNAME>'M'
```

```
Cursor 0
```

```
>>Ret=2; Err=0; Msg=; Int=
```

```
<<EACgetdesc(2,p(65000),65000,939786240,(null))
```

```
>>Ret=9; Err=0; Msg=; Int=
```

Common error messages

Connection error 10060 (274C Hexa) : Connection Time out

The called TCP/IP address does not exist on the network.

AS/400's TCP/IP address or name must be checked.

If an AS/400 machine name is used, check that it is properly referenced on DNS servers.

Connection error 10061 (274D Hexa) : Connection Refused

IP address or name of AS/400 must be checked.

EASYCOM system proper launch on AS/400 must be checked.

Subsystem must be launched with command :

STRSBS EASYCOM/EASYCOM

If the subsystem was started, check if EASYCOMD job runs.

If not, it must be started with the command :

STREACD EASYCOM

Or, subsystem must be stopped restarted.

Connection must be tested using EASYCOM configuration or administration tool.

If the EASYCOMD job can't be started, messages that EASYCOM generate have to be checked using the commands :

DSPMSG EASYCOM/EACMSGQ or **DSPPFM EASYCOM/LOGFILE**

Default EASYCOM port number is 6077.

If this number is already used, use [CFGEACTCP](#) to configure another port, and change [client configuration](#) to select the port number.

Connection error 11001 (2AF9 Hexa) : Host not found

On TCP/IP network AS/400 can be identified with its name at DNS level or host file. This error occurs when this name is used as IP address in connection parameters and is not found and associated with the right IP address.

AS/400 name, host file, DNS servers, must be checked or an IP address in xxx.xxx.xxx.xxx format must be used.

Where is the Hosts file located ?

Usually in C:\WINDOWS\system32\drivers\etc repertory.

This file contains IP addresses relation to host names. Each entry must set on his proper line. The IP address must be placed in the first column, followed by the related host name. The IP address and the host name must separated with one space at least.

Moreover, comments can be inserted on their proper lines or after computer name. They are indicated with '#' symbol.

Example :

```
194.206.10.1 main.as # main AS/400 server
194.206.10.2 test.as # AS/400 test server
194.206.10.100 serveur.info1
194.206.10.101 poste_x
....
```

DNS Server

Allows checking a DNS server address in connection network Internet (TCP/IP) Protocol properties.

Easycom Dll not found

- In the WinDev Program directory for a development configuration.
- In the application directory for a deployment,
- Or in any directory present in the PATH, for deployment.

You have no free Connection on EASYCOM Serveur

This error message is raised when you reach the maximum number of simultaneous session authorized by your Easycom [license](#).

Each session is a job in EASYCOM sub system. With WRKACTJOB command, you can check the number of job running, and who is using Easycom.

Warning ! One single application can open multiple connection.

Error codes

Easycom For WinDev errors summary

WinDev functions [HErrorInfo](#) () and [HErrorInfo](#) ([hErrNativeMessage](#)) return a detailed error message where you can see an "Error Category".

	Category	Description
SQL	1	SQL native error.
SIGNAL	2	Signal Error. example CPF9810 : Library not found.
MULTIREC	3	Error while writing cached records.
APPC	4	APPC error (No longer used)
INTERNAL	5	Easycom internal error.
TCPIP	6	TCP/IP error (connection, ...)
UNKNOWN	7	General error.
EACWD	8	Specific Easycom For WinDev Error.

Category 1 - SQL Error

See IBM documentation about DB2/UDB database for more details.

Category 2 - Signal (CPF...)

Use function [ASErrorHelp](#) or [ASErrorData](#) to get more information about the signal message.

With AS/400 command WRKACTJOB, you can manage the Easycom job, and see the job log, where you can find more details.

Easycom Trace file can also help you in getting more information.

Category 3 - Error writing cached records

This error can raise only if you set CACHEDINSERT to true, with function [ASProperty](#)

Category 5 - Internal

Error code	Description
257	You may not open another file then specified for the demonstration
258	License key is not valid. Please do DSPMSG QSYSOPR to have full details if needed (which kind of license is required)
260	License key expired. Please do DSPMSG QSYSOPR to have full details if needed (which kind of license is required)
261	No free connection. The number of allowed simultaneous connection was reached, and this new connection is not allowed.
263	License key not found. There is no license for the product currently used. Please do DSPMSG QSYSOPR to have full details if needed (which kind of license is required)
275	There is no license for this option. An option of the product is required but not found. DSPMSG QSYSOPR can contain more information if needed.
1	Parameter error. There was an invalid request sent to Easycom. This can be caused by unexpected usage of Easycom, a bug in the application or a bug in the Easycom upper stack (specific part to a product, like Delphi, WinDev, PHP, ...)
2	Memory allocation error. This is usually caused by incorrect size during memory allocation on the server. The possible reasons are: unexpected usage of Easycom, a bug in the application or a bug in the Easycom upper stack (specific part to a product, like Delphi, WinDev, PHP, ...)
3	File not opened. Attempt on a non-opened file. This is probably an application or easycom bug.
522	Cannot convert a NULL parameter. Problem during iSeries <-> client conversion on a NULL value.

527	Problem during ALCOBJ action. ALCOBJ was requested but failed
528	Failed to create an object. An object creation attempt failed.
529	Timeout on pgm call. A timeout was defined for a pgm call (using CFGEAC or by client application), and this timeout was reached. The program call was cancelled, with possible non closed context. Restarting the connection is recommended.
530	Procedure not found. A procedure call was requested, but the procedure was not found in the service program

Category 6 -TCP/IP Errors

Negative error codes mean an Easycom protocol error during TCP/IP connection, and positive ones mean native TCP/IP errors.

Native codes (positive) change depending on the client platform (Windows, Linux, AIX, iSeries, ...).

All errors come with a local error text, and most of the time with a specific error text coming from the iSeries.

Here are negative codes:

Error code	Description
-1	Error while submitting the job. SBMJOB made by the EASYCOMD job failed. Additional error text coming from iSeries will be provided with this error. The EASYCOMD job history should contain all information on that failure.
-2	Security not valid. This error can occur if wrong user, password, password disabled, etc. The detailed reason is specified as text.
-4	submitted job did not answer, or failed to initialize data queues The most common reason for this is that the job failed to run. It was submitted, but ended before beginning to communicate with the client. This is usually caused by wrong user's jobd. The full reason can be found in the QZEJOBLOG OUTQ of the system. To see it, do the following commands: <ul style="list-style-type: none"> ○ WRKOUTQ OUTQ(QEZJOBLOG) ○ Type F18 (to go at the end), and then F11. ○ There should be a line with the station name, with the corresponding user, date and time. ○ Type 5 on it to see the errors.
-5	Password is expired. If the client program 'catches' this error, it can perform a custom password change dialog box, and send the password with the new connection request. The password send by the application will have the following form in this case: oldpassword@newpassword
-6	Internal reject 1. Unexpected error, caused by a bug in EASYCOMD. Please contact help support. Restarting EASYCOM subsystem is recommended.
-7	Failed to init the library list. Errors occurred when installing the libraries that are defined in the user's jobd. You can consult the QEZJOBLOG outq for more information (see error -4)
-8	SSO error. SSO profile is expired (re-signoon required), or not supported by EASYCOMD.
-9	The server cannot accept Kerberos tickets. EIM SSO is not configured, or the EASYCOMD LDAP connection failed. Do DSPMSG EASYCOM/EACMSGQ to see if there are Kerberos-related messages. Check that you see 'Eim=
-10	Timeout on read. Communication error: the read request timed out. The connection was probably broken.
-11	Logon cancelled. This error occurs when message boxes are enabled and when the user clicks on 'cancel'.
-12	Connection broken. The connection was broken by peer.
-13	Kerberos negotiation protocol failure. There was an unexpected Kerberos error when connecting. Check EIM configuration, and check if the same user is working using IBM Client Access in EIM mode.
-14	Kerberos error on client. The client failed to generate a ticket to send to the server. Additional text should explain the reason.
-15	Kerberos error on server. The server did not recognize the ticket or failed to grant it.
-16	OS/400 incompatible version. The OS/400 version is not compatible with the current request.
-17	Unexpected error while submitting (state unknown). Unexpected error probably caused by a bug. Please contact help support.
-18	Kerberos authentication out of hours. See CFGEACSSO to setup the valid hours for Kerberos authentication.
-19	Out of hours by exit program. The EACLOG001 exit program returned that the login is not valid at this time.

-20	Denied by exit program. The EACLOG001 exit program return that the login is denied
-21	Not processed by exit program. The EACLOG001 exit program returned that the login is invalid.
-22	Kerberos authentication is not supported by the server. See that CFGEACSSO enabled *EIM mode and that EASYCOMD started properly (DSPMSG EASYCOM/EACMSGQ).
-23	Kerberos authentication is mandatory. The Easycom server was configured to accept only Kerberos authentication, but a regular login was attempted.
-24	Failed to use the target library. The library specified by the target program property (Program= in easycom.ini, in section [general]) was not usable, because nonexistent or other reason.
-25	Awake on private job failed. The application attempted awaking a job that was registered by the setting, but it fails. A new connection is required. Note: this error currently can appear only with Easycom For PHP.
-26	SSL required on this server. The SSL negotiation was not setup or failed, but is required on the server. This can be marked as required using the EACTCPP01 exit program or using CFGEAC command.
-27	SSL server error. The SSL negotiation failed because the server detected an error. There are probably some information in the EACMSGQ message queue (type DSPMSG EASYCOM/EACMSGQ on a terminal)
-28	SSL negotiation was made, but a failure is detected while passing the connection to the Easycom job.
-29	SSL client error. The SSL negotiation failed because of an error on the client. More additional information is provided in the error message text.
-30	SSL sequence error. The SSL negotiation sequence was detected as invalid
-31	SSL protocol error. An SSL error is detected during SSL handshake.
-32	SSL error: SSL not supported on the platform
-33	EIM was mandatory for login
-34	SSL authentication is mandatory
-35	SSL authentication error (bad certificate, expired, ...)
-36	EIM error
-37	No valid authentication provided. This means that all kind of accepted authentication methods failed.

Here are most common TCP/IP error codes:

Windows error code	AS/400 error code	Description
10061	ECONNREFUSED 3425	Connection refused. No connection could be made because the target machine actively refused it. This usually results from trying to connect to a service that is inactive on the foreign host - i.e. one with no server application running.
10060	ETIMEDOUT 3447	Connection timed out. A connection attempt failed because the connected party did not properly respond after a period of time, or established connection failed because connected host has failed to respond.
11001	HOST_NOT_FOUND 5 (host error category)	Host not found. No such host is known. The name is not an official hostname or alias, or it cannot be found in the database(s) being queried. This error may also be returned for protocol and service queries, and means the specified name could not be found in the relevant database.
10053	ECONNABORTED 3424	Connection aborted. An established connection was aborted by the software in your host machine, possibly due to a data transmission timeout or protocol error.
10064	EHOSTDOWN 3428	Host is down. A socket operation failed because the destination host was down. A socket operation encountered a dead host. Networking activity on the local host has not been initiated. These conditions are more likely to be indicated by the error WSAETIMEDOUT.
10050	ENETDOWN 3433	Network is down. A socket operation encountered a dead network. This could indicate a serious failure of the network system (i.e. the protocol stack that the WinSock DLL runs over), the network interface, or the local network itself.

The localized error text is available at runtime and can be shown by the application or Easycom dialog boxes.

NB: most connection problem are caused by routers or firewalls installed on the client stations, or on the network.
Easycom is using one TCP/IP connection by default on tcp port 6077.

Category 8 - Easycom For WinDev Errors

Migrating from previous WinDev versions.

Migrating Windev 5.5 applications

Warning : To migrate a WinDev 5.5 project, you first need to migrate it to WinDev 7.5.

Alias files used with WinDev 5.5 (*.AS) are still supported by Easycom For WinDev 19, but they are usually replaced by extended info.

Non supported functions

Obsolete function	Replaced by
ASError	HErrorInfo , Extended by ASErrorHelp et ASErrorData
ASConnect	HOpenConnection
ASDisconnect	HCloseConnection
ASSource, ASReadAlias ASWriteAlias	File extended info.
ASSQLImmed	HExecuteQuery

Function Return values

All the functions return booleans (True / False), except [ASErrorHelp](#) and [ASErrorData](#) .
Alias Files.

File extended info replace Alias Files.

You can still use Alias files by setting ONLYALIAS option in extended info, or with [ASProperty](#) function.

Migrating from WinDev 7, 8, 9, 10, 11, 12, 14

WinDev 19 migrates automatically from older versions.

Easycom has a unique DLL for each WinDev version (eac750as.dll, eac800as.dll, ... eac1900as.dll).
So, different versions can be installed on the same system.

Easycom server must be updated to be compliant with latest WinDev versions.

Newest Easycom server versions are compatible with ancient WinDev versions.

Migrating from WinDev 7, 8, 9, 10, 11

WinDev 19 migrates automatically from older versions.

Easycom has a unique DLL for each WinDev version (eac750as.dll, eac800as.dll, ... eac1900as.dll).
So, different versions can be installed on the same system.

Easycom server must be updated to be compliant with latest WinDev versions.

Newest Easycom server versions are compatible with ancient WinDev versions.

Programs and Data Queues

Introduction

AS/400 native programs and procedures can be called from WinDev programs using functions [ASRunRPC](#) , or [ASPgmCall](#)

If you use **ASRunRPC** to call AS/400 native programs or procedure, you need to describe program parameters with [RPC/DTAQ Configuration Tool](#)., and import the description into the analysis, like a file, using ***PGM** as library name.

Data Queues are handled like database files from WinDev programs. A file exists in the analysis for each data queue to access.

Data Queues also must be described with [RPC/DTAQ Configuration Tool](#)., and then imported into the analysis, by using ***DTAQ** as library name.

Descriptions for Programs and Data Queues are stored on your AS/400 system in files **YPROCHDR** and **YPROCPARMS**, located in the Easycom Job LIBL. (Default is EASYCOM library).

[RPC/DTAQ Configuration Tool](#). allows you to export and import descriptions to help porting description from one AS/400 to another one.

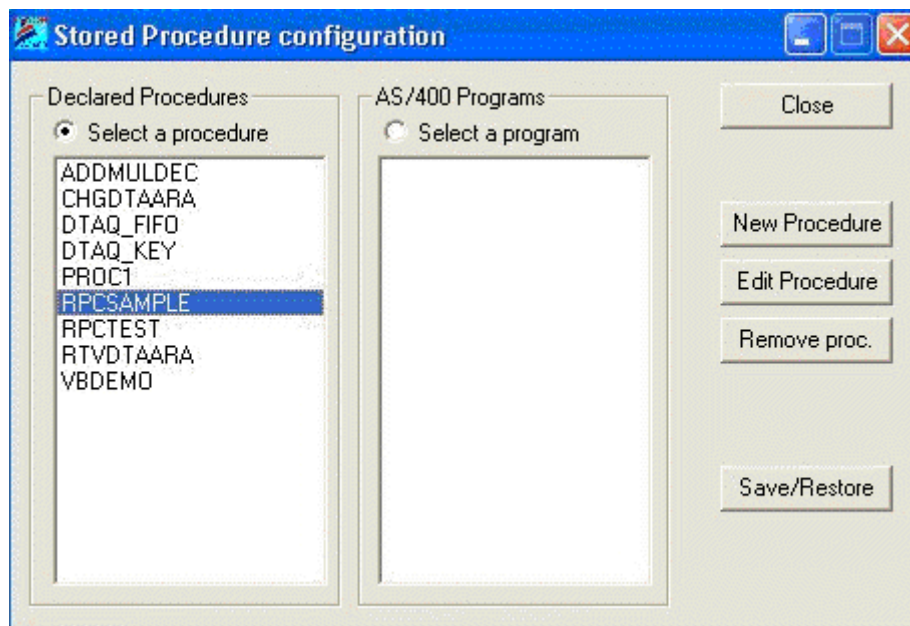
AS/400 Native Programs Description

EASYCOM enables AS/400 native programs calling, CL or RPG programs or stored procedures.

To perform this, EASYCOM needs these programs description stored on AS/400 in YPROCHDR and YPROCPARMS files in EASYCOM library.

Programs description and data queues are built by DTAQ-RPC constructor. The basic principle is to specify all parameters, types and uses (input, output, input/output) required to call the program.

The first screen displays the existing procedures (stored on AS/400) and enables to create, modify or deleted them. The descriptions can be saved in a PC text file in view of a later transfer to another AS/400.



A new name is assigned to the procedure. It does not need to match with the associated program name.

A native AS/400 program (CL, RPG, COBOL, C etc.) is associated to the procedure.

The library may be omitted, or replaced by *LIBL.

The description is a free text, which will be seen when client workstations browse through the procedures.

Each program calling type and size parameters are described.

Each parameter may be considered as a database table field.

Procedure definition

Procedure name : Description:

AS/400 Object Name (Lib/File) -PGM / DTAQ / SRVPGM
 ... Type:

ILE Procedure Name:

OK
Cancel

Parameters description :

N°:	Name :	ByVal	I/O	AS Type	AS Length ...	PC Type, Len ...	+	-	M
1	OP1		I	PACK	5:2 (3)	DOUBLE 8:0			
2	STR1		I	CHAR	20:0 (20)	CHAR 20:0			
3	OP2		IO	PACK	5:2 (3)	DOUBLE 8:0			
4	STR2		IO	CHAR	30:0 (30)	CHAR 30:0			
5	OP3		O	PACK	10:4 (6)	DOUBLE 8:0			

Each parameter can be considered as a field in a database table.

It therefore has a name, by which it can be referred to by the application.

Parameters designed to provide values for the called program are considered as input parameters (IN).

Parameters designed to receive a value on returning from the call are considered as output parameters (OUT).

Parameters that are modified by the program are both input and output (IN/OUT) parameters.

By default, all the parameters in an AS/400 program are both input and output. The logic of the program can change this property.

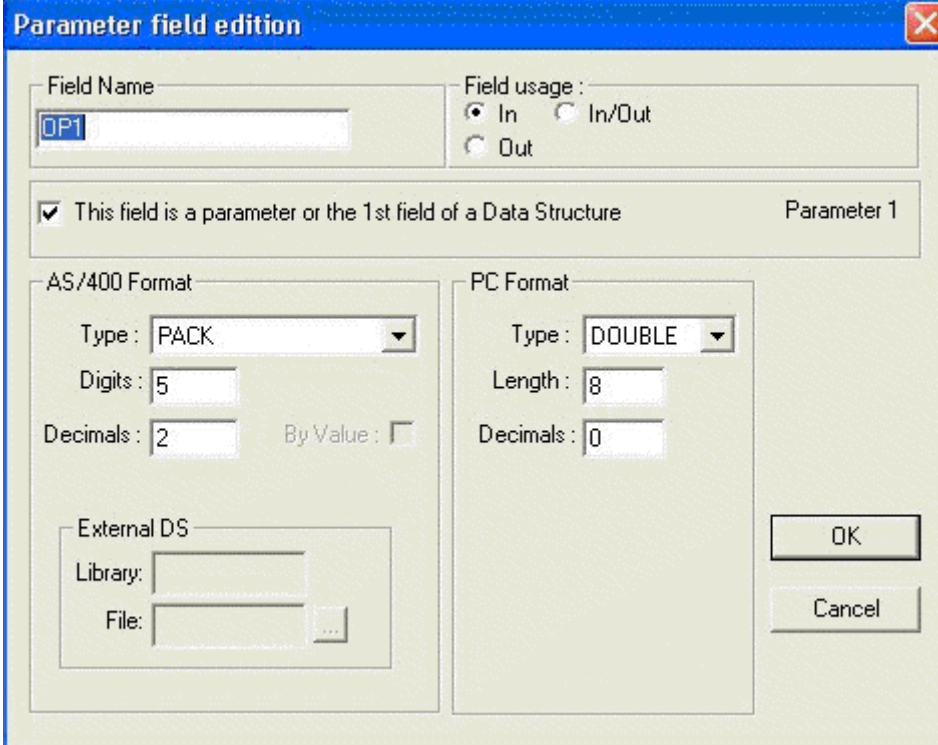
If a calling parameter of the program is a structure (DS : Data Structure), each field of the DS has to be described individually.

For the first field only, the box to be ticked is : This field is a parameter or the 1st Field.

The type of parameter expected by the AS/400 program must be specified exactly :

CHAR : Character data type.
 BIN2 : 16-bit numeric data type.
 BIN4 : 32-bit numeric data type.
 PACK : Condensed numeric data type (DECIMAL).
 This is the format in which CL handles numerical data (CL *DEC type).
 ZONED : Extended numeric data type (NUMERIC).
 DATE : AS/400 date in the yyyy-mm-dd format.
 TIME : Time in hh:mm:ss format.
 FLOAT : Numeric value in single-precision floating point.

DOUBLE : Numeric value in double-precision floating point.
TIMESTP : Elapsed time field.
GRAPHIC : Character type data, not to be converted.
EXTERNAL DS : A structure described by an external data structure, i.e. a physical file.



The image shows a Windows-style dialog box titled "Parameter field edition" with a red close button in the top right corner. The dialog is divided into several sections. At the top, there is a "Field Name" text box containing "OP1" and a "Field usage" section with three radio buttons: "In" (selected), "In/Out", and "Out". Below this is a checkbox labeled "This field is a parameter or the 1st field of a Data Structure" which is checked, and a label "Parameter 1" to its right. The main body of the dialog is split into two columns. The left column is for "AS/400 Format" and contains a "Type" dropdown menu set to "PACK", a "Digits" text box with "5", a "Decimals" text box with "2", and a "By Value" checkbox which is unchecked. Below these is an "External DS" section with "Library:" and "File:" text boxes. The right column is for "PC Format" and contains a "Type" dropdown menu set to "DOUBLE", a "Length" text box with "8", and a "Decimals" text box with "0". At the bottom right of the dialog are "OK" and "Cancel" buttons.

Calling ILE Procedures

The ILE procedure must be described, as a program (Type *PGM).

The AS/400 object in "AS/400 Object Name" field must be *SRVPGM type.
It must be "Service Program" type.

The first described parameter is the procedure returned value.
Only returned values type "Integer 32 bits" are accepted.

Then, the parameters are described, as for a OPM program.

16 parameters maximum are accepted for the procedure, plus returned value.

Procedure definition

Procedure name : PROC1

Description:

AS/400 Object Name (Lib/File) -PGM / DTAQ / SRVPGM
 AURA/SRVPGM01 ... Type: Service Program

ILE Procedure Name: Proc1

OK
Cancel

Parameters description :

N°	Name :	ByVal - I/O	AS Type	AS Length ...	PC Type, Len ...	+	-	M
Ret	RET		IO BIN4	0:0 (4)	INT 32 4:0			
1	P1		IO BIN4	0:0 (4)	INT 32 4:0			
2	P2		IO BIN4	0:0 (4)	INT 32 4:0			
3	P3		IO BIN4	0:0 (4)	INT 32 4:0			
4	P4		IO BIN4	0:0 (4)	INT 32 4:0			
5	P5		IO BIN4	0:0 (4)	INT 32 4:0			
6	P6		IO BIN4	0:0 (4)	INT 32 4:0			
7	P7		IO BIN4	0:0 (4)	INT 32 4:0			
8	P8		IO BIN4	0:0 (4)	INT 32 4:0			
9	P9		IO BIN4	0:0 (4)	INT 32 4:0			
10	P10		IO BIN4	0:0 (4)	INT 32 4:0			
11	P11		IO BIN4	0:0 (4)	INT 32 4:0			
12	P12		IO BIN4	0:0 (4)	INT 32 4:0			
13	P13		IO BIN4	0:0 (4)	INT 32 4:0			
14	P14		IO BIN4	0:0 (4)	INT 32 4:0			
15	P15		IO CHAR	200:0 (200)	CHAR 200:0			

Parameter field edition

Field Name: RET

Field usage :
☐ In ☒ In/Out ☐ Out

☒ This field is a parameter or the 1st field of a Data Structure Function Result

AS/400 Format
 Type: BIN4
 Digits: 0
 Decimals: 0 By Value: ☐

PC Format
 Type: INT 32
 Length: 4
 Decimals: 0

External DS
 Library:
 File:

OK
Cancel

For each parameter, option "By Value" has been added.

This option is valid only for parameters type "32 Bits integer".

When checked, this option indicates that the procedure receives this parameter in value, and not in address.

Moving procedures and DTAQ descriptions between AS/400

When a developer works on an AS/400, he creates procedures and data queues which will subsequently have to be used on another AS/400, these procedures descriptions and data queues have to be transferred to the other AS/400.

Descriptions are stored in three files : YPROCHDR, YPROCPARMS and YPROCPGM. They are stored in AS/400 EASYCOM library (default). They can also be placed in another library. In this case they will be searched in connected profile LIBLE.

If two AS/400s are connected, the above three files can obviously be transferred directly from one to the other.

Otherwise, the DTAQ-RPC manufacturer offers a facility to import/export descriptions from or to text files, that means that the necessary descriptions can be saved on the developer's workstation and then restored on the client's.

Using DATA QUEUES

Accessing a Data queue with Easycom For WinDev, is like accessing a database file.

- Use `HAdd()`. Function to add a new entry to a data queue.
- Use `hRead HReadNext()`. Or `HReadSeek()`. To read a data queue entry.

Data queues can be created with different sequence:

- ***FIFO**, for First In – First Out,
- ***LIFO**, for Last In – First Out,
- ***KEYED**, where each entry is indexed by a key value.

Data queue entries must be described using [RPC - DTAQ configuration tool](#) , then imported into the analysis, like a database table.

Adding an entry to the data queue.

Whatever is the sequence of the data queue, an entry is added with function `HAdd`

Only data field needs to be updated.

Example :

```
// Add entry to DataQueue
DTAQ_FIFO.DATA = data
HAdd(DTAQ_FIFO)
```

Reading from a FIFO or LIFO data queue

Read the data queue entry with function `HReadSeek`.

```
HReadSeek(DTAQ_FIFO, TIMEOUT, "000000")
```

When TIMEOUT key field is 0, the system returns immediately the value, or set `HOut` to `True` is the data queue is empty.

Set TIMEOUT key value to a number of seconds to wait before to exit with `HOut = True`.

Example:

```
WaitStrg is string
```

```
WaitStrg = timeout
HReadSeek(DTAQ_FIFO, TIMEOUT, WaitStrg)
IF HOut = True THEN
    Info("DataQueue is empty !")
ELSE
    // Value is here
```

```
data_lue=DTAQ_FIFO.DATA
END
```

Reading from a KEYED data queue

The « Virtual key » of a keyed data queue is composed as follow :

- TIMEOUT field: Number of seconds to wait before returning with `HOut = True`
- FILER: must be blank.
- ORDER: a 2 character field containing the comparison operator (EQ, NE, GT, GE, LT, LE).
- Key value to search for.

ORDER field has the following meaning :

EQ	=	Equal to
NE	<>	Non equal to
GT	>=	Greater than
GE	>	Greater or Equal
LT	<	Less than
LE	<=	Less or Equal

Example

```
// Writing to keyed data queue.
DTAQ_KEY.DATA=data
DTAQ_KEY.KEY= key
HAdd(DTAQ_KEY)
```

```
KeyVal is string
// Reading from keyed data queue
KeyVal=HBuildKeyValue(DTAQ_KEY,DTAQ_KEY,timeout,"","EQ",key2)
HReadSeekFirst(DTAQ_KEY,DTAQ_KEY,KeyVal)
IF HOut THEN
  Info("DataQueue is empty !")
ELSE
  EntryValue=DTAQ_KEY.DATA
END
```

Using DATA AREAS

Use [AsExec](#) function to change a data area value.

Use [ASRtvCall](#) and [ASRtvResult](#) functions to retrieve a Data Area value.

Example :

```
eacret is int
CmdLine is string
RetVal is string

// Connect to AS/400
IF NOT
HOpenConnection("MyConnection",user,pwd,ipadress,hNativeAccessAS400,hOReadWrit
e,"") THEN
  Info(HErrorInfo())
END

// Write to DATAARA
CmdLine="chgdataara dtaara(easycom/dtaara) value("Hello World")"
```



```

IF NOT ASExec(CmdLine) THEN
    Info(ErrorInfo())
END

// Retreive DTAARA value
CmdLine = "rtvdtara dtaara(easycom/dtaara *ALL) rtnvar(&var1)"
eacret = ASRtvCall(CmdLine)
IF NOT eacret THEN
    Info(ErrorInfo())
END

// Lecture du Result
RetVal = ASRtvResult("var1")
IF NOT RetVal = "0" THEN
    Info("New DTAARA value is : " + RetVal)
ELSE
    Info("L'appel a échoué")
END
HCloseConnection("MyConnection")

```

5250 Emulator

ActiveX 5250

When you purchase a maintenance contract for Easycom For WinDev, you also get a link to download a 5250 emulator extension.

This extension is made of an ActiveX you can use from WinDev programs.

With the 5250 ActiveX, you can :

- Open interactive session from your WinDev programs,
- Automate keyboard input,
- Retrieve screen contain,
- Showup the screen,

The programmer's guide is included in the installation package.

Application Deployment

Deploying WinDev applications

Installation of the client part of Easycom will be done by the WinDev deployment process.

When you create the deployment procedure for your application with WinDev IDE, AS/400 native access DLL (**eac1900as.dll**) is always selected in the list of mandatory DLLs, as soon as an AS/400 file is used in the project, or an Easycom function is called.

We suggest to use this standard WinDev mechanism to install Easycom client for your application deployments.

So, you don't have to run Easycom installation procedure on users workstations.

Alternatively, you can also copy DLL file **eac1900as.dll** into Windows directory. If more than one application is using Easycom, all the applications will use the same DLL, and future updates of Easycom Client DLL will be easier.

Only file **eac1900as.dll** is mandatory.

Easycom.ini : Local configuration file

Easycom.ini file contains several setting (Cache size, Default system name, ...).

You can copy it from your development environment to the user workstations, or you can include it in your application deployment procedure.

Deploying on another AS/400 Server

Easycom server must be installed on the deployment system.

Run the same [installation procedure](#) you used to install your development system.

Deployment license must be registered. You need an activation key.

Programs and Data Queues descriptions

If your application is deployed on another AS/400, and if it uses program calls or Data Queues I/O, you need to port the descriptions from your development system to the deployment one.

Descriptions are stored in files YPROCHDR and YPROCPARMS in Easycom Library (by default).

Library where YPROCHDR and YPROCPARMS might have been changed with the "[RPC-DTAQ configuration](#)" utility.

You can copy those two files from the development system to the deployment.

Or, you can use the "[RPC-DTAQ configuration](#)" utility to save descriptions and restore them on the target system.

WebDev and WinDev Mobile

WebDev Deployment

On a WebDev server, Easycom dialog boxes and message boxes are disabled.

So, you have to manage connections and all errors from your program.

Prestarts jobs

To speedup connection time, [Prestarts jobs](#) are recommended.

Record Locking

When a record is modified by your application, while it was already modified by another user, WebDev cannot open a dialog box to ask the user to confirm the update.

So, you need to manage record locking errors from your application.

See [WebDev Special Record Locking](#).

Option DRVOPTIMISTIC connection extended info can also be used.

Installation

Before to deploy WebDev application using Easycom, it is recommended to proceed with the full installation of Easycom Client, on the WebDev server.

WinDev Mobile Deployment

To install a WinDev 19 Mobile application, you can :

- Directly copy executable files from Windows directory to your mobile system.
- Use the installation tool ran on a Windows PC connected to the mobile system.

Deployment

Only DLL file **eac1900as.dll** is part of Easycom For WinDev Mobile.

This DLL file is dependent on the processor. On the PC, it is located in one of the following directories:

- C:\WinDev Mobile 19\Programmes\Framework\ARM
- C:\WinDev Mobile 19\Programmes\Framework\ARM4T

Most of mobile systems are based on ARM processor.

WinDev 19 Mobile copies the right DLL to directory "**Windows\PC SOFTWD19.0**" on the Mobile system.

Data types conversion and formats

ASCII and EBCDIC Sort sequences

By default, File sort sequence is based on EBCDIC character sets.

- EBCDIC sequence is : Lowercases – Uppercases - Digits.

- ASCII sequence is : Digits – Uppercases – Lowercases.

To get an "ASCII Like" sequence with AS/400 files, you need to specify the right Sort Sequence when creating access paths on AS/400.

Example

```
CRTLF FILE(EASYCOM/SP_CUST_CU) SRTSEQ(*LANGIDSHR)
```

SRTSEQ(*LANGIDSHR) is a sort sequence in what, digits are at the beginning of the sequence, lowercases and uppercases characters are mixed.

Fields and Formats

Dates

If NULL is allowed for a date field, a "blank" value will be considered as a null.

Otherwise, a blank value is converted to "01.01.0001" when writing, and "01.01.0001" is converted to blank when reading.

See DATETYPE and TIMETYPE connection extended info for more details.

On SQL queries, when [HQueryWithoutCorrection](#) is used, ***ISO** format must be used: YYYY-MM-DD (2005-12-25) ; HH:MM:SS (17:59:59) .

Memos and BLOB

Imported files :

A BLOB field on the imported AS/400 file is considered as a memo.

Caution : A file with BLOB fields must be journalized.

Exporting Files :

When files are exported to AS/400, an additional file is created for each file having memo fields.

The name of this additional file is made of the first 8 characters of the main file name, prefixed by 2 underscore characters (__).

In the main file, memo field is replaced by a numeric field containing the memo ID.

Memo files are automatically managed by Easycom when the main file is accessed in native mode.

When the file is managed with SQL, you only get the memo ID. You need to manage the memo file to get the memo value.

When your WinDev program doesn't need memo values, it is recommended to disable memo management with [HSetMemo](#) function.

UNICODE

UNICODE is supported by Easycom since version 4.58.56 .

When using SQL queries, if a "Unicod literal value" is given in a statement for a UNICOD field, then, the CCSID for the Easycom job on AS/400 must support Unicod (1147, 13488, ...).

You can set default CCSID for all Easycom jobs with **CFGEAC** command on AS/400.

Or, you can dynamically change CCSID job with :

```
ASExec ("CHGJOB CCSID( ... ) ")
```

CCSID

AS/400 system converts database data to and from job CCSID (Coded Character Set Identifier), except when CCSID is 65535.

Then, Easycom converts data to and from PC Code Page.

Easycom job default CCSID is equal to the User CCSID, as defined in the user profile.

You can change this default with CFGEAC command, or by call "CHGJOB" command from your WinDev program with AsExec function.

Codepage

Easycom identifies automatically how to convert data between the job CCSID, and the Windows code page.

You can change the default by giving a conversion table.

Install "Easycom International Pack" to get conversion tables (*.CPG files).

Each file in the pack provides conversion rules between an EBCDIC CCSID and an ASCII character set.

Example : E037ANSI.CPG = Conversion between EBCDIC 37 and ANSI ASCII.

You can change the conversion table for all Easycom connections, using "**Easycom.ini**" file.

```
[GENERAL]
```

```
ConvTable=c:\Program Files\Easycom\WinDev10\E037ANSI.cpg
```

To change conversion table for one connection only, change the connection extended info in the analysis.

```
<EASYCOM>
```

```
CODEPAGEFILE=c:\Program Files\Easycom\WinDev10\E037ANSI.cpg
```

```
</EASYCOM>
```

Dates

If NULL is allowed for a date field, a "blank" value will be considered as a null.

Otherwise, a blank value is converted to "01.01.0001" when writing, and "01.01.0001" is converted to blank when reading.

See DATETYPE and TIMETYPE connection extended info for more details.

On SQL queries, when [HQueryWithoutCorrection](#) is used, ***ISO** format must be used: YYYY-MM-DD (2005-12-25) ; HH:MM:SS (17:59:59) .

Memos and Blobs

Imported files :

A BLOB field on the imported AS/400 file is considered as a memo.

Caution : A file with BLOB fields must be journalized.

Exporting Files :

When files are exported to AS/400, an additional file is created for each file having memo fields.

The name of this additional file is made of the first 8 characters of the main file name, prefixed by 2 underscore characters (__).

In the main file, memo field is replaced by a numeric field containing the memo ID.

Memo files are automatically managed by Easycom when the main file is accessed in native mode.

When the file is managed with SQL, you only get the memo ID. You need to manage the memo file to get the memo value.

When your WinDev program doesn't need memo values, it is recommended to disable memo management with [HSetMemo](#) function.

Unicode

UNICODE is supported by Easycom since version 4.58.56 .

When using SQL queries, if a "Unicod literal value" is given in a statement for a UNICOD field, then, the CCSID for the Easycom job on AS/400 must support Unicod (1147, 13488, ...).

You can set default CCSID for all Easycom jobs with **CFGEAC** command on AS/400.

Or, you can dynamically change CCSID job with :

```
ASExec ("CHGJOB CCSID( ... )")
```

CCSID

AS/400 system converts database data to and from job CCSID (Coded Character Set Identifier), except when CCSID is 65535.

Then, Easycom converts data to and from PC Code Page.

Easycom job default CCSID is equal to the User CCSID, as defined in the user profile.

You can change this default with CFGEAC command, or by call "CHGJOB" command from your WinDev program with ASExec function.

CODEPAGE

Easycom identifies automatically how to convert data between the job CCSID, and the Windows code page.

You can change the default by giving a conversion table.

Install "Easycom International Pack" to get conversion tables (*.CPG files).

Each file in the pack provides conversion rules between an EBCDIC CCSID and an ASCII character set.

Example : E037ANSI.CPG = Conversion between EBCDIC 37 and ANSI ASCII.

You can change the conversion table for all Easycom connections, using "**Easycom.ini**" file.

```
[GENERAL]
```

```
ConvTable=c:\Program Files\Easycom\WinDev10\E037ANSI.cpg
```

To change conversion table for one connection only, change the connection extended info in the analysis.

```
<EASYCOM>
```

```
CODEPAGEFILE=c:\Program Files\Easycom\WinDev10\E037ANSI.cpg
```

```
</EASYCOM>
```

Data types equivalences

An AS/400 data type is by default translated into a HF when importing a file description, or when executing an SQL query or using HDeclareExternal.

Default data type mapping can be manually changed by changing a item data type after DDS import, or by setting the field extended info before to export description to AS/400.

DDS type	SQL type	Condition	HF type
A (character)	CHAR		Text
A OPTION(VARYING) (variable length)	VARCHAR		Text
G + CCSID 13488 (Unicode)	GRAPHIC CCSID(13488)		Text Unicode (version 12 and up only)
G + CCSID 13488 + OPTION(VARYING) (Unicode variable length)	VARGRAPHIC CCSID(13488)		Text Unicode (version 12 and up only)
P (Packed decimal) or Z (Zoned)	DECIMAL or NUMERIC	Integer, <= 4 digits	2 bytes signed integer
		Integer, <=9 digits	4 bytes signed

			integer
		Integer, <=19 digits	8 bytes signed integer
		<= 15 digits	8 bytes Real
		<= 17 integer digits, and less than 6 decimal digits.	Currency
		<= 38 digits or SQL with SQLFULLPRECISION property set.	Numeric (version 12 and up only)
		Others	Text
L	DATE		Date
T	TIME		Time (HHMMSS)
Z	TIMESTAMP		Date and Time
B4 (Short Integer)	SMALLINT		2 bytes signed integer
B9 (Long Integer)	INT		4 bytes signed integer
B19 (Integer 64 bits)	BIGINT		8 bytes signed integer
F	FLOAT		Real 8 bytes
F double precision	DOUBLE		Real 8 bytes
H	BINARY		Binary string
H	VARBINARY		Binary string
N/A	CLOB		Memo text
N/A	BLOB		Other Binary Memo
N/A	DBCLOB + CCSID 13488		Memo Unicode

Note :

Easycom maintains initial HyperFile data types when a file is exported to AS/400 and imported again. Original data type is stored in the field description.

When a file is imported, Field Extended info can contain NATIVETYPE property, to memorize the original AS/400 data type.

EASYCOM Server

Easycom server

Easycom server is a Software engine running on System I – AS/400.

It is compliant with all the Easycom connectors and drivers for many development tools:

WinDev & WebDev	PHP
Delphi	.NET
Java	OLE DB

This is the core of Easycom technology.

Basically, when installed, configured and running, Easycom is a TCP/IP service running in a subsystem. It is listening on a TCP Port, waiting for client connections.

Easycom Client modules are running on Windows, Windows Mobile, PASE, AIX, Linux, and many other platforms.

Easycom technology is owned by Aura Equipements company, France.

Installing and configuring EASYCOM

System requirements

EASYCOM is a Client/Server middleware. It is made of :

- A **Server engine** to be installed on System I – AS/400
- **Client connectors and drivers** to be installed on Windows, Linux or Unix workstations and servers.

Requirements :

Server

- All AS/400 series B and further
- All OS/400 version from V3R7 to V6R1. Minimum of V4R5 is recommended.
- TCP/IP protocol

Client

- PC with Pentium (x86) processor minimum
- Protocol TCP/IP
- Operating system : Windows 95, Windows 98, Windows NT 4.0 (SP3), Windows 2000, Windows XP, Windows Vista.

QSECOFR profile is required to install server on AS/400.

Installing EASYCOM server

EASYCOM Server installation procedure is launched from a Windows workstation, connected to the AS/400 via TCP/IP.

It uses FTP to upload objects on the system.

The Easycom Server installation procedure is a Windows executable file. It is embedded in the Easycom connectors installation, and automatically launched the first time you install a client connector on a Windows workstation or server.

Server has to be installed only once. If you run an Easycom connector installation again on a Windows station, you need to uncheck "Install AS/400 server" option, or leave the installation procedure when the Server installation wizard is shown.

EASYCOM server consists in a set of objects (programs, commands and files) collected into one single library, named '**EASYCOM**' (default).

It is possible to change this default library name or to [install multiple EASYCOM servers](#). In the following, library name will be referred to as EASYCOM.

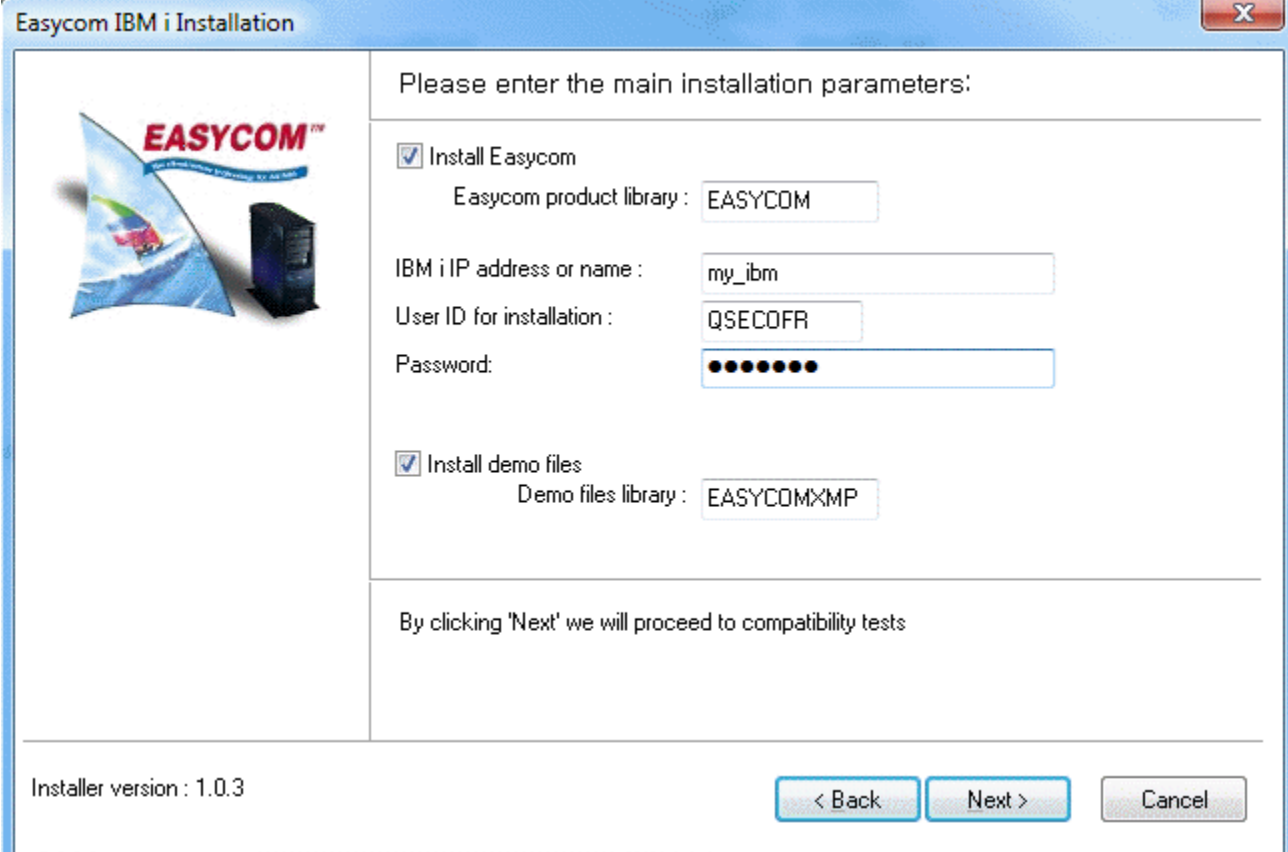
Prerequisites - TCP/IP and FTP

TCP/IP must be installed, configured and running on the AS/400 (see the CFGTCP and STRTCP AS/400 commands for more details).

FTP is required for Easycom installation process. Once installed, it is no longer need for the EASYCOM normal operation.

The AS/400 FTP service can be started if needed using STRTCPSVR SERVER (*FTP) command.

QSECOFR profile is recommended: *SECADM and *ALLOBJ special authorities are needed for proper installation.



The image shows a Windows-style installation window titled "Easycom IBM i Installation". On the left is a logo for "EASYCOM" with a sailboat and a server tower. The main area is titled "Please enter the main installation parameters:". It contains two checked checkboxes: "Install Easycom" and "Install demo files". Below "Install Easycom" is a text field for "Easycom product library" containing "EASYCOM". Below "Install demo files" is a text field for "Demo files library" containing "EASYCOMXMP". There are also text fields for "IBM i IP address or name" (containing "my_ibm"), "User ID for installation" (containing "QSECOFR"), and "Password" (represented by dots). At the bottom, it says "By clicking 'Next' we will proceed to compatibility tests". The footer shows "Installer version : 1.0.3" and three buttons: "< Back", "Next >", and "Cancel".

Easycom IBM i Installation

Please enter the main installation parameters:

☒ Install Easycom
Easycom product library : EASYCOM

IBM i IP address or name : my_ibm

User ID for installation : QSECOFR

Password:

☒ Install demo files
Demo files library : EASYCOMXMP

By clicking 'Next' we will proceed to compatibility tests

Installer version : 1.0.3

< Back Next > Cancel

Confirm Destination Library Name

Default name is EASYCOM.

We suggest to keep the default name as it is, unless you have to [install multiple Easycom servers](#) on the same machine, or you want to test a new version without updating the existing one.

The library will be created if it doesn't already exist.

If the library already exists, a backup copy will be created in library EAC_BACKUP.

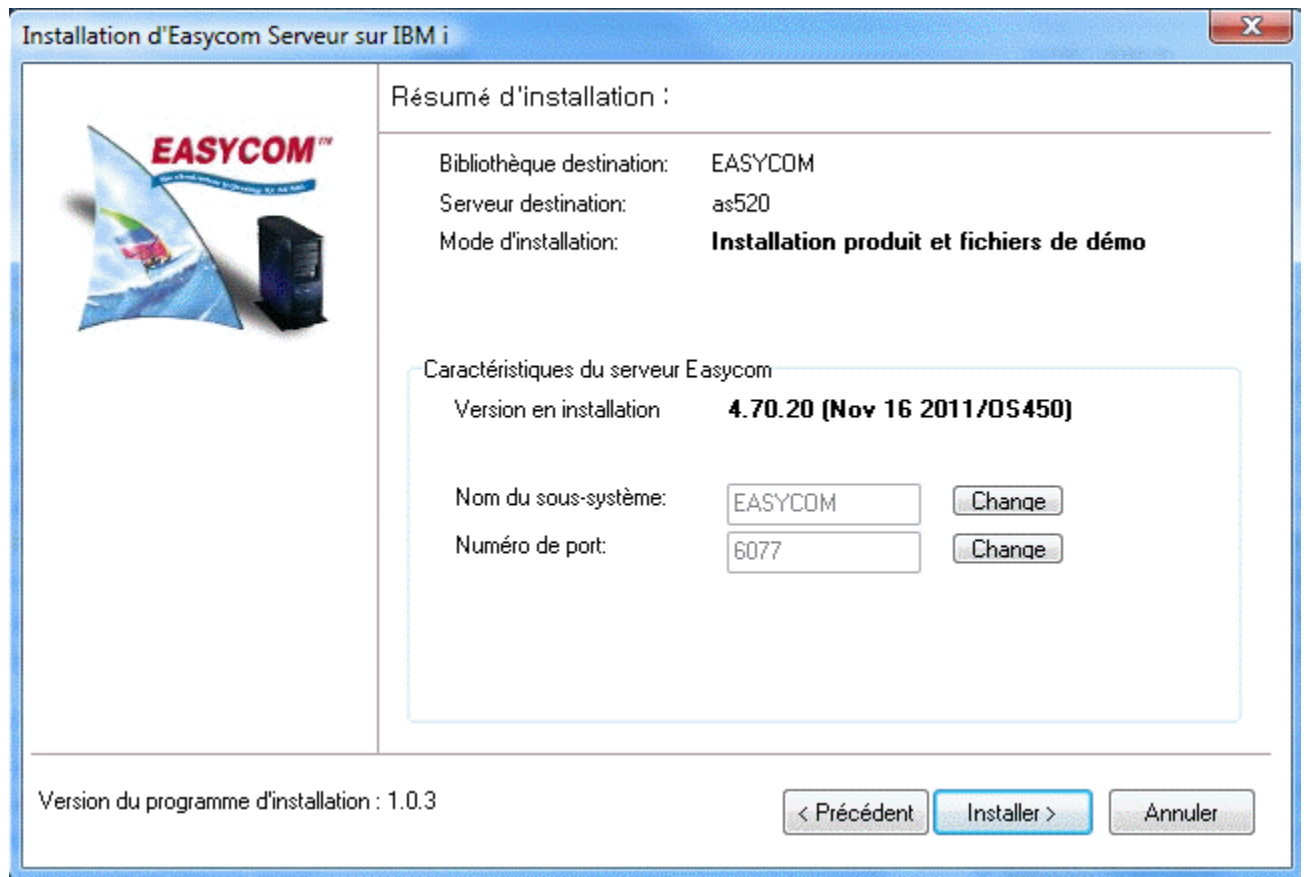
In the future, you need to rename this server library, or copy it, you will need to run [CFGEACTCP](#) command, using the new library name, in order to link the objects together in the new library.

Testing the initial configuration and compatibility

The installation is first performing a routine test: if the OS/400 is compatible with the installation, if a previous version is present, ...

During the test, nothing is installed on the AS/400 (you even can cancel the process during the test)

Then it shows the following confirmation screen (here in case of a new installation):



It confirms the destination library, and if it is a new installation (for product and demo libraries), or an update. If it is an update, it shows the actual version number.

This step allows to change the current (or default) subsystem name and port values.

Installing the demonstration files

For the first EASYCOM installation on AS/400, the demonstration files allows to run the test and demonstration programs installed on the client workstation within development environment.

Give the AS/400 name or IP address AS/400 on which the software will be installed.

Enter a user name and password to proceed with the installation

It is not recommended to use any other user than QSECOFR.

Some EASYCOM library objects are configured to be owned by QSECOFR.

The EASYCOMD (*PGM) object has to be run under QSECOFR permissions.

If QSECOFR is not used for installing the server, the auto-configuration may not be completed, and the first start-ups may be difficult.

EASYCOM Subsystem.

When installation is completed, **Easycom subsystem is started**.

This subsystem must remain active to accept client connections. See your system administrator to have the [subsystem started at IPL](#).

Operations performed on AS/400

Creation of an EASYCOM library and restoration of some objects in this library. [CFGEACTCP](#) and [EACINSTALL](#) commands are automatically run by the installation process.

Operations performed on PC

Creation of an \EASYCOM folder and specific subfolders and copy of various files.

EASYCOM behavior

EASYCOM Server configuration files

AS/400 EASYCOM library contains all EASYCOM objects.

When the server is launched the first time a single additional object is created : EASYCOM object, *FILE type in QGPL library.

An EASYCOM library entry is automatically added to the on line libraries list (ADDLIBLE) for each job started on client workstations. Therefore, no explicit addition to the 'users' JOBD is required.

The following objects may be modified in the EASYCOM library

AURA	*FILE	Modified when the user licence is registered.
EACSESSION	*FILE	Modified when the user licence is registered.
YPROCHDR	*FILE	Modified by adding native AS/400 program description to be called by client applications. This file can be moved to another library listed in the jobs LIBL.
YPROCPARMS	*FILE	Modified when AS/400 native programs calling parameters are described. This file can be moved to another library listed in the jobs LIBL.
CFGEAC	*DTAARA	Holds parameters setup by CFGEAC command
CFGEACSSO	*DTAARA	Holds parameters setup by CFGEACSSO command
EASYCOM	*SBSD	Updated when CFGEACTCP is used
EAC_EIM	*USRSPC	Holds parameters setup by CFGEACSSO command in *EIM mode.

If the AS/400 EASYCOM server is updated, these objects are eventually upgraded to new format, but the settings are kept except for EASYCOM subsystem.

IPv6 connectivity

Easycm is fully compatible with IPv6 networking.

There is no special configuration to do to allow IPv6 connections. The only requirement is using a minimum version for EASYCOMD, EASYCOM programs, and the OS/400 version:

- EASYCOM program must be 4.60.10 or above
- EASYCOMD program must be 3.0.3 or above
- OS/400 version must be V5R3 or above

To have full IPv6 connection the Easycm client must also be compatible with IPv6. You need to check the documentation for each client products.

This is recommended to use a name instead of an IP address. However, this is possible to specify an ip address in IPv6 syntax, like follows :

2001:db8::1428:57ab

or

[2001:db8::1428:57ab] :6077

with 6077 as a port number.

You can check whenever the connection was made in IPV6 or not using the NETSTAT command of the OS/400.

You also can see it in the log file (generated by CFGEAC command or by the client application).

Remarks:

- The IP address will appear in the IPv6 syntax in all exit programs
- The IP version is available in two new exit programs: EACTCPP01 and EACLOG002
- Connections in V6 and V4 are both accepted by default. You can use EACLOG002 to deny connections if needed.

Pre-start jobs

"Pre-start" jobs, anticipate job starting, and speedup EASYCOM connection. Its use is particularly well suited if applications are frequently connected and disconnected (i.e. Web applications).

Advantages:

- Faster connection Start (quasi instantaneous connection).
- Possible to initialize a custom environment before the connection is started (however the username is not known at this stage).

Disadvantages:

- The jobname is equal to the name that was chosen in the ADDPJE command, cannot be changed during the connection.
- The effective user is not visible in WRKACTJOB displayed list except on V5R4 and above. Effective user can be known with WRKACTJOB option 5, and option 1 (job status).

Here is the required commands to setup prestart jobs for Easycom (this will end all active connections) :

ENDSBS SBS(EASYCOM) OPTION(*IMMED)

**ADDPJE SBS(D(EASYCOM/EASYCOM) PGM(EASYCOM/EASYCOM) INLJOBS(10) JOB(EASYCOMPJ)
JOB(D(EASYCOM/EACJOB) CLS(EASYCOM/EACCLS)**

CFGEACTCP LIB(EASYCOM) PJ(*ON)

To return to backward configuration, stop the subsystem, remove PJ definition using RMVPJE, and then run again CFGEACTCP set to *OFF.

IPL process

EASYCOM subsystem must be active to accept client connections.
EASYCOMD job must be active in the subsystem.

See your system administrator to start EASYCOM subsystem during the IPL of your system.
One way to have EASYCOM started at IPL, is by changing QSTRUP program in QSYS library.
Retrieve the source of this program
RTVCLSRC QSYS/QSTRUP ...
Change the source, by adding command "STRSBS EASYCOM/EASYCOM" after TCP/IP is started.
And compile :
CRTCLPGM ...

TCP/IP must be on when Easycom subsystem is started !

Starting Easycom subsystem, automatically starts EASYCOMD job.
If EASYCOMD is not started, check EASYCOMD *JOB, and see message queue EACMSGQ in Easycom library:
DSPMSG EACMSGQ

Default LIBL

Easycom Client job is started with an initial library list in the following order :

- Libraries from System library list.
- Libraries resulting from EACJOB job description, if it exists.
- Libraries resulting from the Job Description assigned to the user.
- Easycom library, if it is not already in one of the above lists.

Default LIBL for EACJOB job description is *NONE, as defined by command CFGEACTCP.

Warning ! The initial LIBL was changed with EASYCOM Server **version 4.58.80**

Client application can change the initial LIBL for its Easycom job.
It uses remote command function API to run ADDLIBL, RMVLIBL or CHGLIBL.

Default CCSID, SRTSEQ

The default behavior of Easycom is using the default CCSID of the system. It is possible to give other values of use the values of the user profile using the [CFGEAC](#) command.

Timeout on call program

Using CFGEAC program allows configuring a maximum execution time (timeout) for a program call.

When the program execution is lasting above configured time, the program call is simply cancelled, and an error is reported to the client.

Warning: when the timeout condition is met, some files and/or resources allocated by the called program may not be released, and never will, until the Easycom job is ended.

Protecting access to EASYCOM

EASYCOM takes care of security at user level: an EASYCOM program can be used on an AS/400 after user name and password validation on the system. The processes carried out by the program will be executed under the user identity. All AS/400 permissions of that user will be applied.

All AS/400 rights will be applied.

Each connection opened requires a valid profile and password, or a Kerberos ticket if this kind of connection is allowed and configured.

Advanced security settings is available using the following Easycom Exit Programs:

- [EACP003](#) : authorizes a program according to a complementary password (independent of the profile). This allows locking the easycom server for only a set of applications and/or developers.
- [EACTCP003](#) and [EACTCP002](#) : controls the client settings like IP address, changes effective user or performs specific job submission.
- [EACTCPP01](#): controls security just before validating the login (avoids login exchange if the client is denied from this IP address or protocol).
- [EACLOG002](#): controls security just after the login as been validated by Easycom
- [EACSSO001](#) : controls Easycom Single Sign-On system.

Installing an additional EASYCOM server

An Easycom Server has the following properties :

- A library with all the objects (Default name = EASYCOM)
- A Subsystem (Default name = EASYCOM)
- A TCP Port (Default = 6077)

To setup an additional server on a System, you need to install EASYCOM in a new library. The subsystem name must be unique, and a new unique port number must be assigned.

Proceed with the installation of Easycom server, from a Windows workstation.

Give a new unique name to the library in the installation wizard (Example EASYCOM2).

Once the library is installed, you need to create the new subsystem and assign a port number, by running command CFGEACTCP.

Example: To install an additional Easycom server, in library EASYCOM2, subsystem EASYCOM2, port 6078, run the following commands:

```
ADDLIB EASYCOM2
```

```
CFGEACTCP LIB(EASYCOM2) SBS(EASYCOM2) PORT(6078)
```

On the client workstations, you need to configure Easycom client, or applications, to connect to the right Easycom server.

Add the port number at the end of the name or address of the AS/400 to connect to, separated by a colon (:).

Example:

```
SYSTEMAS:6078
```

```
192.168.0.10:6078
```

You need to change this value with "Easycom configuration" utility, if the system is the default one, or in the connection properties of your application.

Single sign on - EIM

What is EIM ?

The Single Sign On (SSO) in the EIM mode is the implementation of the IBM Single sign-on system.

The main idea is that there is one unique credential management server, Kerberos. When the user is connecting to its station the Kerberos server gives him a **ticket**. When EIM is used during connection that **ticket** is used in place of user/password. This ticket is validated by the Kerberos server (from the iSeries job), and a corresponding OS/400 user is given from the ticket username (the windows login).

So the user password is not used anymore, and best security is to put "**NONE" to the password. This way the user **must** use a Kerberos authentication to connect to the system.

See also

[EIM Installation on AS/400](#)

[EIM with Easycom](#)

[EIM common problems](#)

EIM Installation on AS/400

EIM Installation on AS/400 consists on the following steps:

install EIM installation prerequisites for AS/400

- configure the Network Authentication Service using iSeries Navigator
- export the 'keytab' to the network Kerberos system (usually the Microsoft Windows server domain controller).
- configure OS/400 users EIM using IBM iSeries Navigator.
- test using a Client Access connection (for example terminal emulator), by selecting the "Use Kerberos principal name (no prompt)" in the connection properties.

Once it works with Client Access you can setup in Easycom using the [CFGEACSSQ](#) command.

All required information can be found on the iSeries Information Center:

<http://publib.boulder.ibm.com/infocenter/iseries/v5r4/index.jsp>

EIM installation documentation can be found under: Network / Network Security / Enterprise Identity Mapping (EIM). We suggest reading at least the following pages:

- Planning For Enterprise Identity Mapping / Enterprise Identity Mapping for i5/OS / EIM installation prerequisites for AS/400
- Enterprise Identity Mapping concepts
- Configuring Enterprise Identity Mapping / Creating and joining a new local domain (this the most common situation).

Here are typical steps:

Configure Network Authentication Service

Use System i Navigator and go to "Security/Network Authentication Service". Then click on "Configure Network Authentication Service".

The suggestions here are in case of a Windows Domain Controller.

You will need to choose a Kerberos Realm. If you have an Active Directory server, you will enter the domain name here. KDC is the Kerberos Domain Controller.

The wizard prompts which service is to put to the keytab entry. You need to select at least "i5/OS Kerberos Authentication".

The wizard generates a batch file to be executed on the KDC. Warning! The password is included in **clear text** in this batch file! You need to store it in a secure location.

After having executed the batch file you will get a user named "myiseries_1_krbsvr400". You need to ensure that the "Use DES encryption for this account" is checked.

Configure EIM

Use System i Navigator and go to "Network/Enterprise Identity Mapping". Then click on "Configure system for EIM".

You will see a wizard:

(in this scenario we will create a standalone EIM domain)

- Select "Create and join a new domain".

- Select "On the local Directory server". If you choose this you need to define an administrator password for the local directory server. To setup the password, go to "Network/Servers/TCP/IP", and select "IBM Tivoli Directory Server for i5/OS".
- If you did not configure all keytabs, you will be prompt to "finish" the Network Authentication Service". You can bypass this step.
- Then enter the Directory server credentials, and validate the creation of the Domain. You can choose any name for the domain.

Add a new mapping and test it

- Go to "Network"/"Enterprise Identity Mapping"/"Domain Management"/"<your domain>"/"Identifiers", and click "Add a new identifier".
- Choose a identifier name (usually the username). Then add the association entries, typically a source and a target entry (source is Kerberos, target is i5/OS). Configure your own user for the next tests.
- Test the mapping using the "Test an EIM mapping" option
- Test the mapping using System i Access emulator (click "Properties" on the server, and choose "User Kerberos principal name, no prompting" in the User ID signon information combobox).

This should connect directly to the user you have configured.

See also

[EIM with Easycom](#)

[EIM common problems](#)

EIM with Easycom

In order to use EIM with Easycom we need to do the following:

1. Install and configure it in the AS/400 and the domain controller.
2. Grant the TCP user to access the keytab file. QTCP is the user for EASYCOMD job.

```
CHGAUT
OBJ ('/QIBM/UserData/OS400/NetworkAuthentication/keytab/krb5.keytab')
USER (QTCP) DTAAUT (*R)
```

3. Enable the Kerberos authentication:

```
CFGEACAUTH LIB (EASYCOM) KERBAUTH (*ON)
```

Note: Instead of Kerberos authentication you also can use client certificate authentication, with certificates registered in the EIM database.

4. Configure Easycom to use EIM on the server,

```
CFGEACEIM LIB (EASYCOM) ACTIVE (*YES) EIM_LDAPU (administrator)
EIM_LDAPPW (xxx)
```
5. Optionally define an exit program [EACLOG002](#)
6. Update applications to use EIM by using *KERBAUTH special value for the login.

EIM implementation on client is very simple. All you need is to specify "**KERBAUTH" special value for the user id, and a recent client DLL. The password have no importance (can be blank or any value).

There are special TCP/IP error codes (negative) for different Kerberos errors (ticket expired, ...), with corresponding native error text (coming from i5 or from client).

For testing you can type *KERBAUTH in place of the username, and leave a blank password. After this, you can put that special value in your client/server programs.

See also

[EIM Installation on AS/400](#)

[EIM common problems](#)

[CFGEACSSO - EIM Mode](#)

EIM common problems

Domain names must match

The domain name that is configured with iSeries navigator must match the domain name of the machine.

If not, you will get an error on the client like: *"the specified target is not known or inaccessible"* (with tcp/ip error code -14)

Here is how to check it:

Step 1: to know what the real domain name is, do the following using a command prompt on the **client machine**:

Enter "nslookup", then type the name of the iseries, like follows:

```
Default server : domain_controller.domain-name.com
Address: 194.206.160.4

> my_iseries
Server : domain_controller.domain-name.com
Address: 194.206.160.4

Name : my_iseries.domain-name.com
Address: 194.206.160.112
```

So here the correct domain name is **domain-name.com**

Step 2: check that exported keytab contains the correct domain name.

Do do this, use iseries navigator, and go to "security", and then "Network authentication service". Right-click and select "Manage keytab". Click on the "Details" button.

You should see a line with:

Principal Type: i5/OS

Principal Name: krbsvr400/my_iseries.domain-name.com@DOMAIN-NAME.COM

Where DOMAIN-NAME.COM is your i5/OS realm.

If this is not correct, you need to modify configuration and re-export keytab, or you need to check your DNS to have matching domain names.

b. DES encryption must be enabled on the DC accounts created from keytab.

If not, you will get an error *"Encryption or checksum type is not supported."*

To enable it, you need to connect to the domain controller machine, and run the Active Directory application. Then, select "Users", and choose a user named:

my_iseries_1_krbsvr400

(There also can be others: my_iseries_2_krbsvr400, ...)

On the properties of that user, choose "Account", and check "use DES encryption".

c. Error on connect: "Not authorized to access key table".

The keytab file must be accessible from the i5/OS account that is used for EASYCOMD, typically QTCP.

You need to know the location of the keytab file. iseries navigator, and go to "security", and then "Network authentication service". Right-click and select "Manage keytab". Follow the wizard until the last step (you can cancel it if you already done the wizard). The keytab file path is specified in that window.

The typical location is:

/QIBM/UserData/OS400/NetworkAuthentication/keytab/krb5.keytab

To grant access to QTCP you need to do the following command:

```
CHGAUT OBJ('/QIBM/UserData/OS400/NetworkAuthentication/keytab/krb5.keytab')
USER(QTCP) DTAAUT(*R)
```

d. The time of all machines must be synchronized.

If you get errors like *'ticket not yet valid'* or *'ticket is expired'*, this is probably due to wrong time synchronization.

Check QTIMZON and QTIME system values using WRKSYSVAL. Also check the time clock and time zone for the domain controller and end-users machines.

See also

[EIM Installation on AS/400](#)

[EIM with Easycom](#)

SSL

SSL connection - prerequisites

Easycom connection can use SSL encryption.

The main prerequisites for using this feature are:

- EASYCOM version must be 4.60.10 or above
- EASYCOMD version must be 3.0.3 or above
- OS/400 version must be V5R3 or above, with i5/OS Host Servers (57xx-SS1 Option 12), Qshell Interpreter (57xx-SS1 Option 30)
- An application ID named 'EASYCOM' must be created in the OS/400, using DCM. A certificate must be assigned to the application.
- System i™ Access for Windows® (57xx-XE1)
- The Easycom server must allow SSL connections using CFGEAC
- The client must support SSL and have the certificate of authority (CA) installed (the CA from which is issued the certificate assigned to the 'Easycom' application).

SSL client support depends on the product versions and on the platforms that are used. You need to check the documentation of the client products.

SSL connection - server configuration

To enable SSL in Easycom you need to create an **application** and assign a **certificate to it**. The application ID must be equal to Easycom. The certificate must have been issued by a CA that will be accepted by the client.

To create the application you will need to use the **Digital Certificate Manager (DCM)** of the AS/400.

Exactly the same configuration is required to enable SSL connection with Telnet (apart for client part).

Here are the required steps for the server configuration:

- First, connect to the DCM using a web browser, with **http://my_iseries:2001** and then click on "Digital Certificate manager" (a tip says that it is for creating and managing digital certificates).

If this doesn't work you will need to enable it using iSeries navigator.

- Then, click on "**Select a Certificate Store**", and select "***SYSTEM**", then click "**continue**". This will prompt you to enter the password for the certificate store.
- Then select "**manage applications**" on the left menu and click on "**Add application**". Then select "**Server**", and click "**continue**".

Enter "**EASYCOM**" for the application ID. This is the key that will be used by Easycom. Enter a description and validate.

- Now we need to **assign a certificate to the application**. This is a required step: the certificate is used to ensure that the server can be trusted and also for encryption. There are two options for it:
 1. You can generate the certificate using the AS/400 CA (Certificate of Authority). In this case the CA certificate will need to be installed on the client (first, export the CA certificate using the export menu).
 2. You can request a certificate from a trust 3rd party CA. In this case you will need to import it into the *SYSTEM certificate store using the "import" menu.

To assign the certificate, click on "**Manage Application**", and then "**Update certificate assignment**". Choose "**Server**", and click "**continue**". You will see the current assignment ("*none assigned*") for the application.

Select the 'Easycom' entry that you have created and click on '**Update Certificate Assignment**'. Select the appropriate certificate, and click on 'Assign New Certificate'.

Now click on "**Validate**": this will check that the certificate is valid for the system.

-
- Finally, configure Easycom server to use SSL using [CFGEAC](#):

```
CHGCURLIB EASYCOM
```

```
CFGEAC LIB(EASYCOM) SSL(*ON)
```

- Then you need to restart EASYCOMD with the following command:

```
BTREACD PORT(*JOBID) RESTART(*YES)
```

- then try a connection from a client using SSL. You can use the [Easycom Configuration](#) tool for that.
- You can check the options using the following command:

```
DSPMSG EASYCOM/EACMSGQ
```

This will show:

```
EASYCOMD:Starting from library EASYCOM, Version 3.00.03, (Nov 10 2008
11:15:49/OS530) .
EASYCOMD:EASYCOM - (c)AURA Equipments - http://www.easycom-aura.com
----- Lib=
;Pwd=SSL support
EASYCOMD:Configuration used for Library EASYCOM is Dq=
SSL=On
```

In case of problem, the errors will appear here. Note: this does not ensure that the connection is actually in SSL, but only that SSL will be accepted.

To know if SSL is used during a connection, use [FACLOG002](#) exit program. You usually also can check it in the client application.

[Easycom Configuration](#) tool is showing SSL status on the connection test page.

To check it for an active job, look at the call stack of the job. To do this, use WRKACTJOB command, then option 5, and then option 11. If you see "SSL_Read" in the stack, this means that the connection is using SSL.

SSL connection - client certificate

Easycom can accept client certificates for two purposes:

- Additional security of the network. The server can give access only to clients that have a valid certificate.
- Use the client certificate to assign the OS/400 user to use. The client certificate subject can be use to define the OS/400 username, or the EIM database can be used for this.

The client certificate must be valid for the AS/400. The certificate is considered valid if it is issued by one of the CA (Certificate Authority) that are installed on the AS/400, in the *SYSTEM certificate store.

So the certificate can be issued by the AS/400; in this case the CA is the Local CA.

Create a X.509 registry in EIM, and configure LDAP location (optional)

This step is required if you want to use the EIM database to map the certificate to the OS/400 user.

In this case the supplied username must be "**SSL".

Using system i access, go to "Network"/"Enterprise Identity Mapping"/"Domain Management"/"your domain>"/"User Registries", and click "Add a new system registry".

Choose a name, and "X.509" registry type.

Under "configuration", select properties, and select the X.509 registry just created.

Now we need configuring the LDAP location for the *SYSTEM store. This will make the user certificates creation process linked to the EIM.

Use Digital Certificate manager. Connection is at: http://my_iseries:2001. Select "Digital Certificate Manager" (on V6R1 select "i5/OS management" and then "Internet configuration" first. Logon as QSECOFR when prompted).

Select "Manage LDAP location", and enter:

LDAP server: fully defined host name : my_series.mydomain.com

Directory distinguished name (DN): dc=

Use Secure Sockets Layer (SSL): No

Port Number: 389

Login distinguished name (DN): cn=

Password: xxxx (password for LDAP used by EIM).

Create a user certificate

Go to https://my_iseries:2010/QIBM/ICSS/Cert/Admin/qycucm1.ndm/main0 using the user login for which you want to create the certificate.

Then select "Create Certificate". The login name will be the user under you connected to the web site.

Then click on "install certificate". This will install the certificate into the web browser. Then you can export it into a portable format if needed.
If you created the X.509 registry and specified the LDAP location the DCM configuration, the EIM settings is automatically updated. Note: an EIM mapping MUST exist for this user before doing this (with an i5/OS target equal to that user).

Install the user certificate on your local store

Use the web browser to transfer the user certificate locally.

Enable the Easycom server part

CHGCURLIB EASYCOM

[CFGGEACAUTH](#) LIB(EASYCOM) SSL(*ON) SSLAUTH(*ON) SSLROLE(*EIM)

Use "SSLROLE(*EIM)" if you use a X.509 registry or *SUBJECT if you use the certificate Distinguish name for username.

EIM must be configured with CFGGEACEIM as well.

You can try connections with "**SSL" userprofile and no password if EIM is activated, or with a regular user and password if not.

Now type DSPMSG EASYCOM/EACMSGQ. You should see:

```
EASYCOMD:Starting from library EASYCOM, Version 3.00.05, (Jun 23 2009
16:29:38/OS530).
EASYCOMD:Eim connection OK - X.509 registry is 'p520 certificates'
EASYCOMD:EASYCOM - (c)AURA Equipments -
http://www.easycom-aura.com
=====
EASYCOMD-V.3.00.05(EASYCOM/EASYCOMD); Lib=EASYCOM; PJ=off; SSO=off;
Eim=On; Pwd=2; Port=6077; IPv6; SSL
EASYCOMD:Configuration used for Library EASYCOM is Dq=EASYCOM, Vers=
KerbAuth=Off, SSL=On, SSLAuth=On *EIM
```

This shows the the X.509 (certificates) registry is detected, and named 'p520 certificates'.

This also confirms SSL capability for EASYCOMD.

This also shows (from first connection attempt) that the EASYCOM library is with SSL activated, and SSL authentication activated with *EIM role.

If there is a problem with authentication a message will appear here.

EASYCOM jobs on AS/400

EASYCOM jobs on AS/400

When a client application connects to Easycom Server on System I – AS/400, an Easycom Client job is submitted in Easycom Subsystem.

This job run under the authority of the connected user. It can "adopt the authority" of another user on request of the client application.

If exit program EACTCP003 exists in Easycom library, it can submit the client job according to its own rules and descriptions.

If job description EACJOB exists in Easycom library, the job is submitted according to it. Otherwise, it is submitted according to the Users job description.

In any case, user initial library list will be added to the Easycom Client job.

Priority of Easycom Client job is defined by class object EACCLS in Easycom library. This priority can be adjusted with CHGCLS command.

System can use [prestarts jobs](#).

Jobs creation and properties

The job alternatively can be created by the safety program EACTCP003 (see below),

If EACTCP003 does not exist or the job does not start, it is created according to:

- EACJOB, if it exists,
- The JOB associated to the user profile that is authenticated, if EACJOB is not present.
- The JOB associated to the user profile that is authenticated for the LIBL management (see [Default LIBL](#))

EASYCOM on AS/400 works using a subsystem and a demon. That daemon handles the connection requests from client applications. When the application is launched, and a connection established with AS/400, a job is created on AS/400. There is an active job for each connected client application, using the appropriate authority and user rights. Each application can have its own file openings, locks, current positions, and transactions in progress.

EASYCOM job priority

Jobs are stored in EASYCOM subsystem. It uses **EACJOB**D for its description and **EACCLS** for its priority class. Subsystem priority class can be modified with CHGCLS command.

EASYCOMD authority

EASYCOMD (*PGM) is submitted in Easycom subsystem according to EASYCOMD (*JOB) Job description.

EASYCOMD program has special authorities. Those authorities are necessary to handle security features and submit jobs (or work with prestart jobs) for other users.

To have those features EASYCOMD program is owned by QSECOFR, as '*OWNER' user profile and is using 'adopt authority'. By default EASYCOMD job is submitted under QTCP but using QSECOFR user rights because of those properties.

If EASYCOMD has wrong properties you can restore them with the following commands:

```
CHGPGM PGM(EASYCOM/EASYCOMD) USRPRF(*OWNER) USEADPAUT(*YES)
```

```
CHGOBJOWN OBJ(EASYCOM/EASYCOMD) OBJTYPE(*PGM) NEWOWN(QSECOFR)
```

```
GRTOBJAUT OBJ(EASYCOM/EASYCOMD) OBJTYPE(*PGM) USER(QTCP) AUT(*USE)
```

EASYCOM Server configuration commands

CFGEAC (Configure Easycom)

CFGEAC command allows configuring EASYCOM server properties on iSeries - AS/400 system.

```

EASYCOM SERVER CONFIGURATION (CFGEAC)
Type choices, press Enter
Easycom server library name . . . > EASYCOM          Alpha value
Easycom job priority . . . . . *DFT                1-99, *SAME, *DFT
TCP/IP Keep Alive frequency . . 120                seconds
Delay before asking again pwd . *NONE             seconds
Delay before automatic SIGNOFF  *NONE             seconds
Easycom Log File level . . . . *NONE             Number, *SAME, *NONE
Print the clock in Log File . . *NO              *SAME, *YES, *NO
Automatic Keep Alive start . . . *YES             Number, *YES, *NO, *SAME
Detailed Job Log . . . . . *NO              *SAME, *YES, *NO
Lock Easycom host . . . . . *NO              *SAME, *YES, *NO
Time Out on Ext Pgm Call . . . . *NONE          Number, *SAME, *NONE
Character Set ID . . . . . *USRPRF             -2-
65535, *USRPRF, *SYSVAL..
Sort sequence table . . . . . *NONE             Name, *USRPRF, *SYSVAL...
Library . . . . . Name, *LIBL
Convert CONCAT field to A type  *NO              *SAME, *YES, *NO
SSL enable . . . . . *OFF              *SAME, *OFF, *ON, *ONLY
End
F3=Exit F4= F5=efresh F12=Cancel F13=How to use this display
F24=More keys

```

EASYCOM server library name (LIB)

Enter the library name in which the EASYCOM server is installed.

EASYCOM server job priority (PTY)

This parameter is used to override JOB D job priority setting. If set to 0, JOB D determines job priority. JOB D used with EASYCOM is EACJOB D.

TCP/IP Keep Alive frequency (TCPTOUT)

This parameter is used to set the 'keep alive' interval value. Default value is 120 seconds. When 'keep alive' is on, a TCP/IP message is sent from PC to AS/400 every n seconds. This is useful to keep a remote line up,

and to have automatic shutdown of jobs that are no longer linked to a client application, even in case of client crash.

If the AS/400 EASYCOM job does not receive the message in n+10 seconds, it automatically shut downs.

These TCP/IP messages are only sent when the communication is idle for that delay.

This value can be set to 0 to disable it. This is useful when debugging, as some debuggers avoids Easycom to send the TCP/IP message when the process is stopped.

This parameter can also be set using 'Easycom configuration' tool on the PC.

Delay before asking again pwd (RESIGN)

This parameter is used to make end-user sign-on again after a given idle time. (Default is disabled).

Not currently supported.

Delay before automatic SIGNOFF (CONNECTION)

This parameter is used to close a connection after a given idle time.

EASYCOM Log File level (LOGLEV)

Use this to enable an AS/400 log file. Valid values are 1 to 4.

It will create a EASYCOM/LOGFILE(MEMBER) file, EASYCOM is the Easycom installation library, MEMBER is Easycom job name.

Be careful with that :

- Log file member is always cleared when a new connection is made
 - If two jobs with same job's name are run, the second cannot have log file and will be locked for 1 minute at start-up.

Print clock in Log File (LOGCLOCK)

Allows getting time information in log file: command processing starting and ending time, CPU consuming.

Automatic Keep Alive start (HBEAT)

If this value is *YES, the 'keep alive' message (see above) will be generated unless the PC is configured to refuse it.

If this value is *NO, 'keep alive' will not start unless the PC is configured to enable it.

Detailed Job Log (JOBLOG)

This option is used to run an automatic job login. This can be changed with Easycom JOBD (EACJOBDD).

Lock EASYCOM host (LOCKED)

Easycom is default locked if this option is used. This means that the Easycom connection is accepted, but no file neither program access will work until the 'unlock' password arrives. See our documentation about EACP003 entry program for more information.

Time Out on Ext Pgm Call (PGMTOUT)

Defines a timeout for program execution. This avoids program call taking too much time. When the timeout is reached, the call will abort and Easycom will return an error.

Character Set ID (CCSID)

Indicates character set used which EASYCOM. Default character set is *HEX (65535).

A good idea can be to set it up to *USRPRF.

Sort Sequence table (SRTSEQ)

Indicates the sort file to be used for comparison and sorting. Possible values are those suitable for SRTSEQ parameter in the system CHGJOB command. *LANGIDUNQ is a value that allows "natural" sorting for the current CCSID. However, there is a need to be careful to have the indexes or logical files with a compatible sort sequence.

Convert fields CONCAT to type A (CONCATF)

Indicates if CONCAT operations resulting fields must always be considered as alphanumeric type fields. Possible values are :

*YES : CONCAT result fields will be processed as a single alphanumeric type field.

*NO : CONCAT result fields keep their original type.

SSL enable (SSL)

Specifies how SSL encryption can be used with Easycom.
Use DSPMSG EACMSGQ to know if SSL init worked.

Note: Modifying this option requires EASYCOMD job restart. You can perform it using STRSBS/ENDSBS system commands or the STREACD command.

Possible values are:

*YES: Both SSL encrypted and clear connections are accepted.

*NO: SSL is not used on this library. SSL connection attempts will fail.

*ONLY: SSL usage is mandatory. The connection will fail if the client does not support SSL, or if SSL negotiation failed.

CFGEACTCP (Configure Easycom TCP/IP)

This command is automatically called when automatic installation is performed.

It creates the subsystem and all the related objects, and it sets the TCP/IP port number used by Easycom service.

Objects created : SBS, JOB, JOBQ, CLS.

Object name	Object type	Description
EASYCOM (default)	*SBS	Subsystem in which service is running, and client jobs are submitted.
EACJOB	*JOB	Descriptions for client jobs.
EACJOBQ	*JOBQ	Client job queue.
EACCLS	*CLS	Class for client jobs.
EASYCOMD	*JOB	Job description for the EASYCOMD job, which must always be active in the subsystem.

Note: this command creates the required objects to have a subsystem running, and starts it. But it **doesn't store any of the parameters**.

EASYCOM library (LIB)

Enter EASYCOM server objects library name, where new sub-system will be created, with all related objects.

If the objects already exist in the library, they will be replaced.

System library in LIB (SYSLIB)

This parameter is no used.

EASYCOM sub-system name (SBS)

Enter the subsystem name to be created in the library.

The subsystem name must be unique on the system. If you have more than one Easycom Server running on the system, each server must have its own library and subsystem. See [Installing an additional Easycom Server](#).

When the subsystem will be active, job associated with each connection will run in this subsystem.

EASYCOM service port (PORT)

Enter the TCP port number to be assigned to the EASYCOM server. If multiple EASYCOM servers will run on the same machine, a different port number must be assigned to each one.

Possible values are :

***DFT** : If a service named easycom exists in the port services table, the associated port will be used. See WRKSRVTBLE system command to manage the services table. If Easycom service does not exist, **default port 6077** is used.

Number : port number to be allocated to new EASYCOM server.

If port number is changed, it has to be changed in the client configuration, using "Easycom configuration utility", or by changing the connection properties in your client application.

When a non default port number is configured, port number must be added at the end of the server name or address in the client application, separated by a colon (:).

Example: my_server:6090

Authorize pre started jobs (PJ)

Possible values are :

***OFF** : "Prestart" jobs are not used when client session requires a connection, even if they are configured in the subsystem.

***ON / *AUTO** : To use pre-started jobs on the subsystem, if they are configured and active.

This option only authorize Easycom to use pre started jobs at connection time, if they are active.

You need to configure the pre started jobs manually (available on V4R4 and above).

To configure pre started jobs, after running CFGEACTCP command, you need to proceed as Follow:

Stop EASYCOM subsystem.

Example: ENSSBS EASYCOM *IMMED

Run ADDPJE command.

Example:

```
ADDPJE SBSD (EASYCOM/EASYCOM)
PGM (EASYCOM/EASYCOM)
USER (QUSER) INLJOBS (4)
JOB (PJEASYCOM) JOBD (EASYCOM/EACJOB)
CLS (EASYCOM/EACCLS)
```

Start subsystem again:

STRSBS EASYCOM/EASYCOM

Comments:

Command CFGEACTCP starts the Easycom subsystem.

TCP/IP must be on when subsystem is started !

Starting Easycom subsystem, automatically starts EASYCOMD job.

If EASYCOMD is not started, check EASYCOMD *JOB, and see message queue EACMSGQ in Easycom library:

DSPMSG EACMSGQ

STREACD (EASYCOM service start)

STREACD command starts EASYCOM service. EASYCOMD program is started in the subsystem to allow connection of clients stations.

Remark: this command **doesn't store any of the parameters**.

EASYCOM Library(LIB)

Enter EASYCOM server library name, where subsystem description was created.

EASYCOM service port (PORT)

Enter the TCP port number assigned to EASYCOM server. If several EASYCOM servers will run on the same machine, a different port number must be assigned to each one. Possible values are :

***DFT** : If a service named Easycom exists on the port services table, the associated will be used. See WRKSRVTBLE system command to manage the services table. If Easycom service does not exist, **default port 6077** is used.

***JOB** : The service is started according to EASYCOMD job description in the library.

Number : Port number to be allocated to new EASYCOM server.

Authorised pre-starts jobs (Pre-starts jobs - PJ)

This parameter is used only if PORT parameter is different from * JOB. Use pre-starts jobs in the subsystem.

Possible values are :

***OFF** (default) : "Pre-start" jobs are not used when client session requires a connection, even if they are configured in the subsystem.

***ON / *AUTO** : To use pre-started jobs on the subsystem if those are configured and active.

EASYCOMD restart (RESTART)

Stop and Start again EASYCOMD job if it is already running in the subsystem. Possible values are :

*NO : If EASYCOMD job is already active, it remains unchanged.

*YES : If EASYCOMD is running, it is stopped, then re-started with new parameters.

EASYCOM subsystem must be active.

EASYCOMD job (demon) runs permanently in the EASYCOM subsystem. It starts automatically when subsystem is started.

EASYCOMD uses TCP/IP port 6077 (default) to accept connection requests from client stations.

If a safety system or another application prohibits using this port, it can be modified with CFGEACTCP command.

Comments:

TCP/IP must be on when EASYCOMD is submitted.

If EASYCOMD is not started, check EASYCOMD *JOBID, and see message queue EACMSGQ in Easycom library:
DSPMSG EACMSGQ

EACINSTALL (Easycom Install)

This command is the final setup command. This command updates Easycom objects to have the best possible match according to the current running OS/400 release.

This command changes the default SQL interface, and EASYCOMD program to support EIM.

```
EASYCOM INSTALLATION (EACINSTALL)

Type choices, press Enter.

Easycom Library . . . . . EASYCOM Lib. of product EASYCOM
OS VERSION FOR ADJ. . . . . *AUTO          MINIMUM OS VERSION FOR ADJ
LEVEL OF SQL INTERFACE TO USE . . *AUTO          *CISC, *EMBED, *CLI, *AUTO
```

You can change the default SQL INTERFACE from *CLI to *EMBED. This will use the embedded SQL interface in replacement of *CLI.

The *CLI interface is more powerful, but using *EMBED can help solving issues that are encountered by *CLI interface. The *CISC interface is obsolete, and is no longer included in latest versions of Easycom.

The *EMBED interface limitations are: cannot use LOB fields, or SQL procedures. However, in some cases it is fastest than CLI.

In fact, the *EMBED is the old - historical – interface, and *CLI is the one. Only the *CLI interface will have future improvements.

CFGEACAUTH

This command configures the authentication methods and security options which are valid with Easycom.

```
Easycom Authentication config (CFGEACAUTH)

Type choices, press Enter.

Easycom server library name. . > EASYCOM Alpha value
Use SSL encryption . . . . . *OFF          *SAME, *OFF, *ON, *ONLY
Use SSL authentication . . . . . *OFF          *SAME, *OFF, *ON, *ONLY
SSL authentication role . . . . . *SAME
Use Kerberos authentication . . *ON          *SAME, *OFF, *ON, *ONLY
```

Use SSL encryption

This option defines if the SSL encryption is supported, or mandatory. Possible values are:

*OFF: SSL is not used by the Easycom server.

*ON: SSL is used if requested by the client

*ONLY: SSL must be used. The connection will be rejected if the client doesn't support SSL or if the SSL negotiation fails.

Use SSL authentication

This option defines if SSL authentication is enabled. This option is valid if 'Use SSL encryption' is activated. Possible values are:

*OFF: SSL authentication is not accepted.

*ON: SSL authentication is valid. A valid certificate must be provided by the client.

*ONLY: SSL authentication is mandatory. A valid certificate must be provided by the client. This SSL authentication can validate the OS/400 user or can only act as an additional security option (see 'SSL authentication role').

SSL authentication role

This option defines how the SSL authentication will imply an OS/400 user. Possible values are:

*NONE: the SSL authentication won't define an OS/400 user. The client certificate will be checked by Easycom, but not used to define the OS/400 User. OS/400 User and password, or Kerberos authentication must be provided as well.

*EIM: Easycom will search if the client certificate is found in the EIM database. If yes, the EIM will define which user to use. In this case EIM configuration must be valid.

*SUBJECT: the certificate subject is equal to the OS/400 username. In this case the EIM configuration is not necessary. The SSL client certificate will be use for the whole authentication process.

Use Kerberos authentication

This option defines if the Kerberos authentication is valid. The EIM configuration must be valid to be able to map the Kerberos authentication (typically Windows credentials) to an OS/400 user.

CFGEACEIM

This command is designed to configure the EIM connection for Easycom. It replaces the CFGEACSSO command, which is now obsolete.

The EIM system is used to define an OS/400 user from another authentication.

EIM can be seek the OS/400 user from different sources :

- from the Kerberos authentication. This allows single signon (SSO)
- from SSL client certificate authentication

The [CFGEACAUTH](#) command defines which kind of authentication are valid.

```
Easycom EIM Configuration (CFGEACEIM)

Type choices, press Enter.

Easycom server library name . . . > EASYCOM Valeur alpha
Use EIM in Easycom . . . . . *YES          *YES, *NO, *SAME
EIM valid from . . . . . *NONE           HHMM =
EIM valid to . . . . . *NONE           HHMM =
LDAP user for EIM . . . . . 'administrator'

LDAP password for EIM . . . . .

EIM logon is mandatory . . . . . *NO          *YES, *NO
LDAP dn for EIM . . . . .
LDAP service spn . . . . .
```

Use EIM in EASYCOM

This is the main option for enable EIM on Easycom or not. Must be *YES to enable the other options.

SSO authorized from / SSO authorized to

EIM 'opening hours'. EIM connections are forbidden outside of those hours.

LDAP user for EIM

Local LDAP user. This user name is required during a connection attempt, to retrieve the "OS/400" user name associated to the "Windows" user name.

This local user name is the name used when configuring EIM with iSeries Navigator (when selecting NetWork/EIM Domain Mapping/Domain Management/<yourDomain>).

You need to only put the username, not "cn=

LDAP password for EIM

This is the password for the local LDAP connection.

EIM logon is mandatory

Configures EASYCOM to deny all non-EIM connections (with username/password).

LDAP dn for EIM

This is a alternate way for giving LDAP logon name, allowing specific syntax. So this is valid only if user is left blank. A typical value is:

cn=

LDAP service spn

This allows a specific service principal name. If *DFT is specified, Easycom calculates it using "krbsvr400" and the system name.

Example of valid values (with systemi5 name for the system, testdomain.com for the domain and TESTDOMAIN.COM for the realm):

krbsvr400/systemi5

krbsvr400/systemi5@TESTDOMAIN.COM

krbsvr400/systemi5.testdomain.com@TESTDOMAIN.COM (default if *DFT is specified)

CFGEACSSO (Single Sign On)

CFGEACSSO (Single Sign On)

There are two different Single sign-on modes : the Easycom and the EIM system. The choice between those two modes is done with the CFGEACSSO command.

CFGEACSSO - EIM Mode

The EIM mode is only supported from V5R3 OS/400 version. It requires to [configure OS/400 components from the IBM iSeries Navigator software](#).

From a terminal session, under QSECOFR user profile, run command :

CFGEACSSO <F4>

Set 'Active Single Sign On' option to ***EIM**, and fill up the LDAP user name and password.

When validating this command, the EASYCOMD job will restart automatically if there are new changes to apply (this will work only if working with the default port number; otherwise you will need to restart EASYCOMD using STREACD or restart the subsystem).

The settings are stored in the EAC_EIM *USRSPC object, with exclusive use for the user that first used the CFGEACSSO command with *EIM mode. **So it is recommended to always use this command with the QSECOFR user profile.**

```
EASYCOM S.S.O. CONFIGURATION (CFGEACSSO)

Type choices, press Enter.

Easycom server library name . . . > EASYCOM
Activate Single Sign On . . . . . > *EIM          *YES, *NO, *EIM, *SAME
SSO authorized from . . . . . *NONE             HHMM =
SSO authorized to . . . . . *NONE             HHMM =
LDAP user for EIM . . . . .
LDAP password for EIM . . . . .

EIM logon is mandatory . . . . . *NO *YES, *NO
LDAP dn for EIM . . . . . *DFT
LDAP service spn . . . . . *DFT
```

SSO authorized from / SSO authorized to

Single Sign-on 'opening hours'. EIM connections are forbidden outside of those hours.

LDAP user for EIM

Local LDAP user. This user name is required during a connection attempt, to retrieve the "OS/400" user name associated to the "Windows" user name.

This local user name is the name used when configuring EIM with iSeries Navigator (when selecting NetWork/EIM Domain Mapping/Domain Management/<yourDomain>).

You need to only put the username, not "cn=

LDAP password for EIM

This is the password for the local LDAP connection.

EIM is mandatory

Configures EASYCOM to deny all non-EIM connections (with username/password).

LDAP dn for EIM

This is an alternate way for giving LDAP logon name, allowing specific syntax. So this is valid only if user is left blank. A typical value is:

cn=

LDAP service spn

This allows a specific service principal name. If *DFT is specified, Easycom calculates it using "krbsvr400" and the system name.

Example of valid values (with systemi5 name for the system, testdomain.com for the domain and TESTDOMAIN.COM for the realm):

krbsvr400/systemi5

krbsvr400/systemi5@TESTDOMAIN.COM

krbsvr400/systemi5.testdomain.com@TESTDOMAIN.COM (default if *DFT is specified)

See also

[EIM Installation on AS/400](#)

[EIM with Easycom](#)

CFGEACSSO - Easycom Mode

This mode is supported on all versions of i5/OS. It doesn't require any change in the i5/OS system settings. In the easycom mode, it memorizes the first validated connection, with possible restrictions. The 'first' connection can be a regular connection or the **windows login**, but needs to install a special configuration on each client (a network driver). In this case opening session information are automatically transmitted. Windows network and AS400 management must be compatible on users and their password level and Single Sign On with administrator rights activated client side.

Choose '*YES' in the 'Activate Single Sign On' option.

Server side Single Sign-On configuration : **CFGEACSSO** command

```
EASYCOM S.S.O. CONFIGURATION (CFGEACSSO)
```

Type choices, press Enter.

```
Easycom server library name . . > EASYCOM Alpha value
```

```
Activate Single Sign On . . . . > *YES *YES, *NO, *EIM, *SAME
```

```
Validity of Sign On (Seconds) . *NODELAY seconds, *NODELAY
```

```
SSO authorized from . . . . . *NONE HHMM = Hour Minutes
```

```
SSO authorized to . . . . . *NONE HHMM = Hour Minutes
```

```
Reset actual connected users . . *NO *YES, *NO
```

```
EASYCOM service port number . . *DFT Number, *DFT
```

Parameters and options :

Validity of Sign On (Seconds)

Single signature validity duration.

Signature is memorized during 7200 seconds (two hours) after first connection, beyond this the user will have to be signed again.

SSO authorized from / SSO authorized to

Single Sign-On active time duration.

Connections are not prohibited but memorization is inactive.

Reset actual connected users

Disconnects and reinitializes SSO procedure connected users.

EASYCOM service port number

EASYCOM service port.

If EASYCOM is installed in several libraries and operates in different subsystems, corresponding port has to be specified.

Exit Programs

Exit Programs

[EASYCOM](#) offers many programs called « Exit Programs ».

Those kind of programs follow a given specification and must be implemented by the administrator of the AS/400, allowing a most advanced control and security of easycom connections and usage.

Some of them must be written in some configuration cases like the exit programs related to [Single Sign On](#) or to the Easycom lock ([Lock EASYCOM Host](#)).

Others are related to a specific configuration but are not mandatory, like with [Prestarts Jobs](#) use.

The others are not mandatory and are designed to have better security and control.

Sample sources are provided in **EACSYSSRC** source file in Easycom library.

Easycom startup

Starting Client Job - EACSTART

If a program named EACSTART exists in the job libraries list (LIBL), it is called each time EASYCOM client job is submitted.

It is particularly useful to set properties or perform maintenance actions.

This program is called when the user is known. It can still modify attributes or parameters but cannot cancel the job, except by hardly killing it.

EACTCP003 is to be preferred to control user rights and eventually cancel the job.

Prestart job initialization - EACPJINI

If Pre-starts Jobs are activated in EASYCOM server configuration and if EACPJINI program exists in the job library list, it is called each time Pre-start Job is started by the system.

EACPJINI offers the possibility to define job properties when the job is created. At that time the connected user is unknown.

EACTCP002 will be called at connection time.

SQL initialization - EACSQLINI

This exit program is called when Easycom is using the SQL interface for the first time in the job (between SQL initialization and actual SQL usage, like SQL query prepare)

If using pre-start jobs, it is called **before the connection is made (SQL is initialized at this moment to reduce the connection delay)**, during the pre-start process; otherwise it is called when the SQL for the first time (so it is never called if SQL is not used by the application).

This exit program can be used to check the environment at this point.

Logon and access security

Connection control - EACTCPP01

This exit program is designed to control the connection before any authentication. This can deny connection before any password or ticket exchange is made.

This can also be used to control whenever the connection must or can be made using SSL.

```
PGM PARM(&LIB &TPNAME &RMTADDR &IPVERSION +
&SSLASK &SSLCNF &VALID)
  DCL VAR(&LIB) TYPE(*CHAR) LEN(10)
  DCL VAR(&TPNAME) TYPE(*CHAR) LEN(30)
  DCL VAR(&RMTADDR) TYPE(*CHAR) LEN(50)
  DCL VAR(&IPVERSION) TYPE(*CHAR) LEN(1)
  DCL VAR(&SSLASK) TYPE(*CHAR) LEN(1)
  DCL VAR(&SSLCNF) TYPE(*CHAR) LEN(1)
  DCL VAR(&VALID) TYPE(*CHAR) LEN(10)
```

&LIB is the library that when the Easycom program is. Usually Easycom.

&TPNAME is the name of the Easycom program. By default this is Easycom.

&RMTADDR is the TCP/IP address of the connection request. This can be in IPV4 or IPV6 form depending on &IPVERSION value.

&IPVERSION is equal to 4 or 6 depending on the IP version currently in use for the connection (if the AS/400 supports it, Easycom will accept both protocols by default)

&SSLASK informs if the client will try to negotiate an SSL connection. Possible values are:

- 'Y': the client supports SSL, and if the server accepts it, the connection will be made using SSL. In other words, the connection will maybe use SSL.

- 'N': the client is not supporting SSL or doesn't asked to use it. In other words, the connection won't use SSL in any case.

&SSLCNF informs if the SERVER will or supports SSL. Possible values are:

- 0: the server won't use SSL at all (even if supported)

- 1: the server may use SSL if SSLASK=Y. If SSL negotiation fails, the connection will remain valid.

- 3: the server will use SSL. If SSLASK=N or if the SSL negotiation fails, the connection will be aborted.

&VALID is used to tell EASYCOMD to grant or deny the connection. Possible values are:

- *YES: the connection process can continue

- *DENY: the connection is aborted immediately. An error message will be prompted on the client.

Note: only **&SSLCNF** and **&VALID** can be modified by the exit program.

Logon control - EACLOG002

EACLOG002 is an exit program for general authentication process.

This program is called **after** the authentication made by Easycom.

This exit program is called on all authentication situations (normal, SSO, and EIM).

It can be used to audit the Easycom usage and/or deny connections from custom criteria.

EACLOG001 is the previous version of EACLOG002; it won't be called if EACLOG002 is implemented.

EACLOG002 has only two more parameters for IP version and SSL condition.

The prototype is:

```
PGM PARM(&LOGTYPE &RC &LOGUSER &LOGDOMAIN &USER
```

```
&IPADDR &STATION &IPVERSION &SSL)
```

```
DCL VAR(&LOGTYPE) TYPE(*CHAR) LEN(10)
```

```
DCL VAR(&RC) TYPE(*CHAR) LEN(10)
```

```
DCL VAR(&LOGUSER) TYPE(*CHAR) LEN(130)
```

```
DCL VAR(&LOGDOMAIN) TYPE(*CHAR) LEN(130)
```

```
DCL VAR(&USER) TYPE(*CHAR) LEN(10)
```

```
DCL VAR(&IPADDR) TYPE(*CHAR) LEN(130)
```

```
DCL VAR(&STATION) TYPE(*CHAR) LEN(130)
```

```
DCL VAR(&IPVERSION) TYPE(*CHAR) LEN(1)
```

```
DCL VAR(&SSL) TYPE(*CHAR) LEN(1)
```

&LOGTYPE is input, and tells which logon is being processed. The possible values are:

*STD: this is a standard login/password logon (&LOGUSER and &LOGDOMAIN are not available)

*EIM: this is an EIM logon. No password is available. &LOGUSER, &LOGDOMAIN and &USER are applicable.

*SSO: this is an Easycom kind SSO. All fields are available.

&RC is the result of the command. This can be used to deny the user or indicate that the OS/400 user was changed.

The possible values are:

*OK: the logon remains granted

*CHG: the &USER parameter is changed by the exit program. Note: the &USER user will not have a password validation.

*OUTOURS: the logon is rejected because of hours of work.

*DENY: the logon is denied.

&LOGUSER is the Windows user name. This is filled only in *EIM or *SSO mode for &LOGTYPE.

&LOGDOMAIN is the Windows domain. This is filled only in *EIM or *SSO mode for &LOGTYPE.

&USER is the OS/400 user. This is the OS/400 user under which the Easycom job will run.

&IPADDR is the IP address of the client connection. This can be used to filter access or for auditing.

&STATION is a string that represents the station of the client connection. This can be the real machine name (the name that corresponds to the IP address) or the Terminal name, if the connection is made thru an RDP connection.

&IPVERSION is equal to 4 or 6 depending on the TCP/IP network version used for connection. (IPv4 or IPv6)

&SSL is equal to 'Y' if the connection is using SSL and 'N' if not. SSL negotiation is already made at this time.

Security by restriction - EACTCP003

This exit program is designed for limiting EASYCOM use of to a user and/or a PC group.

If EACTCP003 program exists in EASYCOMD library list, it will be called at each connection attempt, excepted if EASYCOM is configured to use pre-starts Jobs (in this case [EACTCP002](#) can be used).

This program can allow or deny the connection from the client application.

If connection is accepted, it can submit by itself the client job or let Easycomd doing it.

&JOBNAME variable is used to determine what is decided:

- *YES to accept the connection, but submit the job in the exit program.
- *NO to refuse the connection
- Any value to let easycomd submit the job with that name.

Note: the initial value is equal to the jobname that is calculated during the connection, usually the name of the client pc if it is possible to use it as a jobname (or the jobname decided by the client application).

Program specification :

PGM PARM(&TPPGM &TPLIB &USER &EAC_PARM1 + &EAC_PARM2 &RMT_ADR &JOBNAME)

DCL VAR(&TPPGM) TYPE(*CHAR) LEN(10)

DCL VAR(&TPLIB) TYPE(*CHAR) LEN(10)

DCL VAR(&USER) TYPE(*CHAR) LEN(10)

DCL VAR(&EAC_PARM1) TYPE(*CHAR) LEN(30)

DCL VAR(&EAC_PARM2) TYPE(*CHAR) LEN(30)

DCL VAR(&RMT_ADR) TYPE(*CHAR) LEN(50)

DCL VAR(&JOBNAME) TYPE(*CHAR) LEN(10)

Parameters :

TPPGM : Target Program Name

TPLIB : Library containing TPPGM program.

Parameters TPPGM and TPLIB will be used by the EACTCP003 program if it submits the client job by itself.

USER : User name

New client connection user name (can be used to limit access to a user group).

EAC_PARM1 : Parameter 1 of TPPGM program

First parameter to pass to target program (TPPGM) if EACTCP003 submits the client job by itself.

EAC_PARM2 : Parameter 2 of TPPGM program

Second parameter to pass to target program (TPPGM) if EACTCP003 submits the client job by itself.

RMT_ADR : TCP/IP client address

TCP/IP client address (may concern a workstations set).

JOBNAME : SBMJOB job name (Input / Output).

Name of the job to be activated in EASYCOM subsystem. Default name is the client station name.

On return, set JOBNAME parameter to :

*NO, to refuse the connection.

*YES, if EACTCP003 has submitted the client job by itself.

A name, or leave it unchanged, to accept the connection and let Easycom submit the client job.

Comments:

This exit program can be use to check the validity of the user id or tcp/ip address.

It can also submit the job under the authority of a user different from the one requesting the connection.

Or, it can also submit another program, different from TPPGM, in order to setup some environment properties before calling TPPGM.

Prestart job control - EACTCP002

EACTCP002 works the same way as as [EACTCP003](#) when Pre-starts Jobs are activated.

Since the job is already initialized, EACTCP002 does not create it but allows or refuses its start. It also permits controls or treatments prior initialization.

Note: this exit program is also called when not using prestart jobs.

'Program Level' Security - EACP003

In addition to basic safety, **programs level** safety can be used.

Only programs validated by data processing department can be used on AS/400.

Unauthorized EASYCOM programs may be connected to AS/400, but will be unable to make any operation (file opening, program calling or other).

Authorized program will send a special password to EASYCOM. A data processing department AS/400 program returns information telling if password is accepted. This password can be similar, for example, to EASYCOM program coding.

To activate this mechanism :

If '**Lock EASYCOM host**' entry is set to *YES in CFGEAC, no file can be opened, no program can be called, no command can be sent to AS/400 by EASYCOM, until the client application frees it sending a password to it.

This option requires writing an EACP003 script. This script must be located in EASYCOM job LIBL.

Warning, if option is activated and script does not exist, EASYCOM will remain locked and no job can be created.

Here is this script layout :

```
PGM PARM(&PASSW &RESULT)
```

```
DCL VAR(&PASSW) TYPE(*CHAR) LEN(100)
```

```
DCL VAR(&RESULT) TYPE(*CHAR) LEN(10)
```

```
...
```

```
/* IF PASSW HAS THE RIGHT VALUE */
```

```
CHGVAR VAR(&RESULT) VALUES(*YES)
```

```
...
```

```
/* IF PASSW DOES NOT HAVE THE RIGHT VALUE */
```

```
CHGVAR VAR(&RESULT) VALUES(*NO)
```

It receives a single entry parameter (&PASSW applicative password different from profile password). It returns &RESULT parameter.

- *YES value authorizes job starting and process to continue.

- *NO value locks the job.

Easycom mode single signon - EACSSO001

It's the Exit Program associated to Single Sign-On activation in easycom mode. This is not called in EIM mode.

Note: this is recommended to use the EIM mode single signon instead of the Easycom mode.

When Single Sign-on is configured and activated (see [CFG EACSSO](#)) and if program EACSSO001 exists in the job libraries list, it runs with various events:

- before memorizing a signature (simple connection or Windows session)
- when recording (simple connection or Windows session)

then with each connection request.

Parameters

EASYCOM calls the program, transfers various parameters to it and turns over.

&OP - Operation : program call origin

**BEFORE and *WINBEFORE*

Before memorizing simple or session signature, the program can :

- modify user name and/or password
- authorize or refuse memorizing

**SIGNON and *WINSIGNON*

Signature memorizing, the program :

- can't modify user or password any more,
- can authorize or refuse memorizing

**REQUEST*

Requires connection, the program :

- cannot modify user or password any more,
- can erase storage and force user to be signed again.

&RC - Return

*OK : accepts signature

*DENY : refuses signature

*EXPIRED : signature validity period is exceeded

*OUTHOURS : request out of authorized hours,

*CHG : user change

&USER / &USERLEN - user name length

&PWD / &PWDLEN - password length

&SOTIME – Time in HHMMSS format

&SODATE - Date in CYYMMDD format

&IDADR - IP client address

&STATION - workstation (different from &computer if TSE is used)

&COMPUTER – computer name

&LOGDOMAIN – Windows domain

&LOGUSER – Windows user

The fat variables (except &OP) can be modified with &RC program (to authorize or refuse signature or connection, change user, expiration or out of authorized domains), &USER and &PWD for a user change.

See EASYCOM library EACSSO001 file for an example and more detailed specifications.

Objects and programs security

EACSOPEN - File open, SQL queries

EACSOPEN exit program is called, if it exists in the client job LIBL, each time a file open is requested by the client job, or a SQL statement is prepared or immediately executed.

The exit program can refuse the file operation, or it can change file name or SQL statement.

See source example in EACSYSSRC file, Easycom library.

EACSRCMD - Remote command

EACSRCMD exit program is called, if it exists in client job LIBL, each time a command is submitted by the client application, with Easycom function API.

Exit program can refuse execution of the command, or it can replace the command before returning.

See source example in EACSYSSRC file, Easycom library.

EACSCALL - Program Call

Exit Program EACSCALL will be called, if it exists in the client job library list, each time an external program or procedure is called by the client application, using Easycom API.

This exit program can refuse the program or procedure call by the client application.

It can also change the program name, library name or procedure name on return, so that the client application will call another program.

See source example in EACSYSSRC file, Easycom library.

EACSIFS - IFS access

This exit program is called on each IFS file open.

The parameters are the file path and open mode. The open mode is a numeric value that is a combination of the following constants (hexadecimal):

- _EAC_IFSOPEN_READ=1 read access
- _EAC_IFSOPEN_WRITE=2 write access
- _EAC_IFSOPEN_CREAT=4 file will be created if not exist
- _EAC_IFSOPEN_EXCL=8 file must not exist before open (create is mandatory)
- _EAC_IFSOPEN_TRUNC=10 truncate file
- _EAC_IFSOPEN_APPEND=20 append file
- _EAC_IFSOPEN_BINARY=40 binary mode
- _EAC_IFSOPEN_BIGFILE=80 big file. Allows to open > 2Gb files

Create mode:

- _EAC_IFSMODE_RUSR 400 user can read (u+r)
- _EAC_IFSMODE_WUSR 800 user can write (u+w)
- _EAC_IFSMODE_XUSR 1000 user can execute (u+x)
- _EAC_IFSMODE_RGRP 2000 group can read (g+r)
- _EAC_IFSMODE_WGRP 4000 group can write (g+w)
- _EAC_IFSMODE_XGRP 8000 group can execute (g+x)
- _EAC_IFSMODE_OTH 10000 others can read (o+r)
- _EAC_IFSMODE_WOTH 20000 others can write (o+w)
- _EAC_IFSMODE_XOTH 40000 others can execute (o+x)

Share mode:

- _EAC_IFSSHARE_RDONLY 100 0000 read only share
- _EAC_IFSSHARE_WRONLY 200 0000 write only share
- _EAC_IFSSHARE_NONE 400 0000 no share (exclusive)
- _EAC_IFSSHARE_RDWR 300 0000 read/write share

If you need to test the open mode, you need to use a bitwise AND with the flag to test, and see if the result is equal to that flag.

Note: the exit program can only deny or accept the file open.

A source sample is available in the EACSYSSRC file in EASYCOM library.

EASYCOM Client Configuration

EASYCOM Configuration

This is the PC side centralized management tool for EASYCOM native access. The server part configuration is executed from a terminal or an emulator. All options are stored in easycom.ini file on Windows.

Unix versions (AIX, Linux or other) use the /etc/easycom.conf file, with the same syntax.

This configuration file can be general (in Windows directory, C:\WINDOWS) or be specific to an application (in the executable directory).

Using this file is optional for deployment. This is used only for convenience, allowing to avoid having connection parameters managed by the application program itself.

This tool contains the following tabs :

- Connection parameters
- EASYCOM Activation key
- Trace file
- Default settings
- Security
- Checking installation and versions

Connection parameters

AS/400 name or IP address

Machine name or TCP/IP address for the AS/400 is entered here.

Use of a name implies a DNS configuration or hosts file.

The **port number** can be specified with ":portnum", for example: iseries:6078 to have 6078 port number.

The **easycom** service name is used to setup the default port; and if no service is defined, the 6077 port number will be used.

EASYCOM Server

• Default (EASYCOM/EASYCOM)

Use the default server program : (EASYCOM/EASYCOM)

• Other

Select the server program to be activated (LIBRARY/PROGRAM) during connection. The server program is an AS/400 program started by the router or started by EASYCOMD job.

If no library is given, the library where EASYCOMD is running will be used.

Connection test

These options are used only for connection test and are not saved in the configuration file.

Easycom Configuration

Trace files management | **Default settings** | Security | Installation and files version check

Connection parameters | Easycom license key registration

AURA Equipements
Internet: www.easycom-aura.com

Easycom (c) AURA Equipements.

Default AS/400 Name or TCP/IP address
as520.aura-e.fr

Easycom Server program
☒ Default (EASYCOM/EASYCOM)
☐ Other :

Connection Test
Do not signon as QSECOFR.
 User : QPGMR
 Password :

☐ Use Kerberos (EIM) for connection test

Test

AS/400 Version information

SSL connection: Yes

Serial number : 652A85D
Model : 520
Server version : 4.60.10

OK Cancel Apply

Click on **"Test"** button.

If connection is successful, AS/400 version information's are displayed, as for example:

Serial number : 650643C

Model : 520

Server version: 4.60.10

If SSL connection was setup this will show if the connection was actually in SSL.

If Kerberos connection was selected the actual OS/400 username will be shown in the information box.

Easycom license key registration

Activation key is provided by AURA Equipements. If this is a purchased product, the registration card will be claimed to obtain the activation key. For evaluation process, the activation key is automatically send after having downloaded the product.

Easycom Configuration

Trace files management | **Default settings** | Security | Installation and files version check

Connection parameters | Easycom license key registration

Choose license operation
☒ Check ☐ Register

License : DOTNET ☐ Special development license (*YES)

Activation key : 4BZ5B02K5L

Company name : AURA EQUIPEMENTS

License parameters

Number of connections : 10

Authorized partition ID (1->n) : 0

EASYCOM's version : 3

EASYCOM's options : 0

Expiration date : 00/00/0000 (dd/mm/yyyy)

Authorized Proc. group : P10

Extended license : *NONE

Registration log

License DOTNET

Get Activation key parameters
 OK
 Check license validity
 Connection succeeded.
 Disconnecting from new licence.
 Ready.

Check existing

OK Cancel Apply

Below information must be exactly the same as on the form received from AURA (Equivalent to EASYREG command).

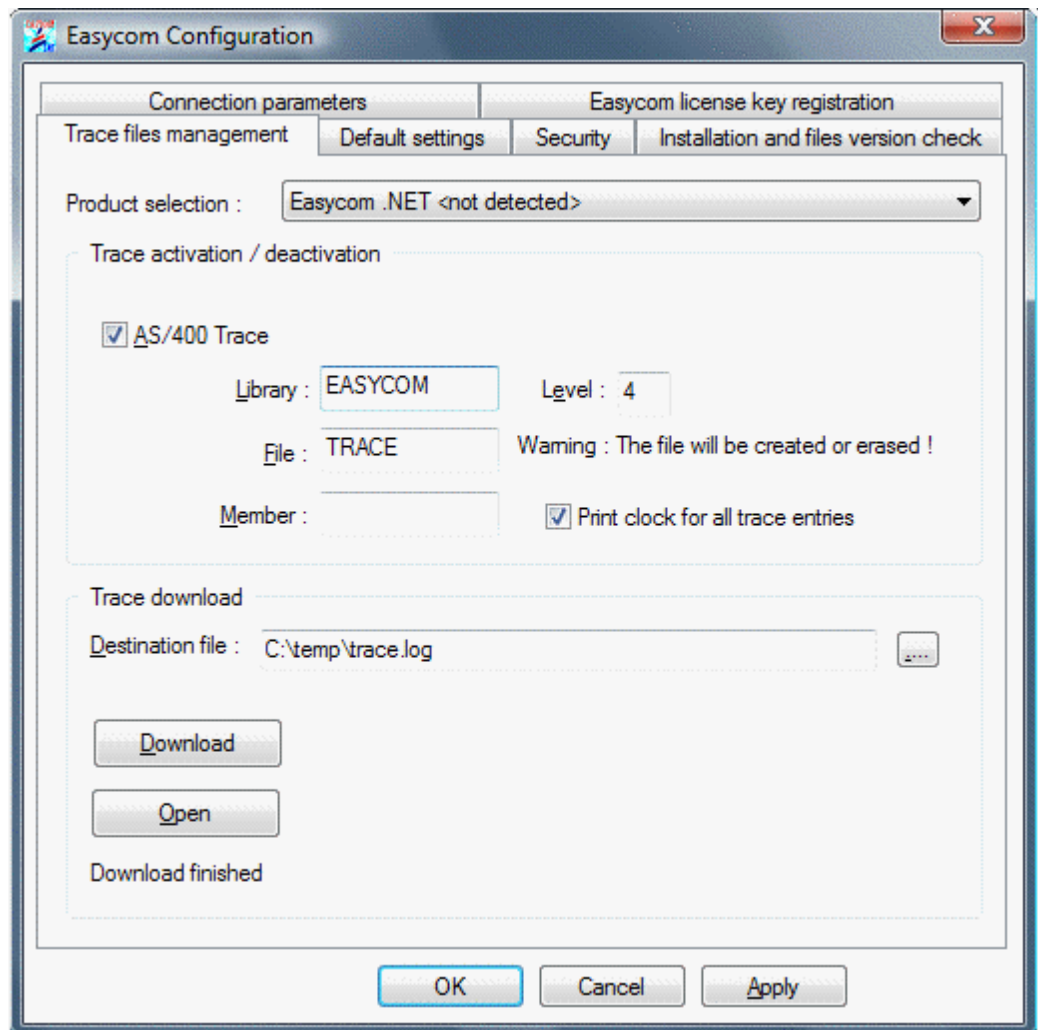
- **License** : Enter licence.
- **Special development licence** : Select this option for development licence.
- **Only used in development** : Select this option for a development licence which will never be used by an application.
- **Activation key** : Enter key (10 characters).
- **Compagny name** : Enter compagny name.
- **Number of connections** : Enter Connection(s) number.
- **Authorized partition ID** : 0 (default)
- **EASYCOM's version** : 3 (default).
- **EASYCOM's option** : 0 (default).
- **Expiration date** : Enter key the end date, in dd/mm/yyyy format
- **Authorized Proc. Group** : * (default).
- **Extended license** : *NONE (default).

Press '**Register**' button to submit the registration process to the iSeries. After integrity check it will store it into the iSeries and test the connection on that license.

Trace file management

In the event of an error or to audit EASYCOM operations, it is interesting to keep traces of what program performs. AS/400 trace mode is devoted to this job.

Traces mode reduced performances significantly, it must be strictly reserved for analysis purpose.



Trace Activation / Deactivation

- **AS/400 trace :**

Select "AS/400 Trace" to activate or deactivate the EASYCOM generated trace on AS/400.

- **Library :**

Use of AS/400 trace, requires to specify at least an AS/400 library and file names.

Warning, library name must be one with writing rights opened.

- **File :**

The file will be created if it does not exist and deleted later. Commands to AS/400 can detailed if suitable.

- **Level :**

Low detail level is 1 (default value), highest is 9. Trace level 4 is usually sufficient. At this level, all fields values sent or received are detailed.

- **Operation time printing :**

Operation time printing gives an idea of elapsed time between each request. Level 1 is enough in this case.

- **Member :**

Optional option.

Trace download

To download AS/400 generated trace, information related to AS/400 trace access is required. If AS/400 trace is already active, this information is already available.

- **Destination file :**

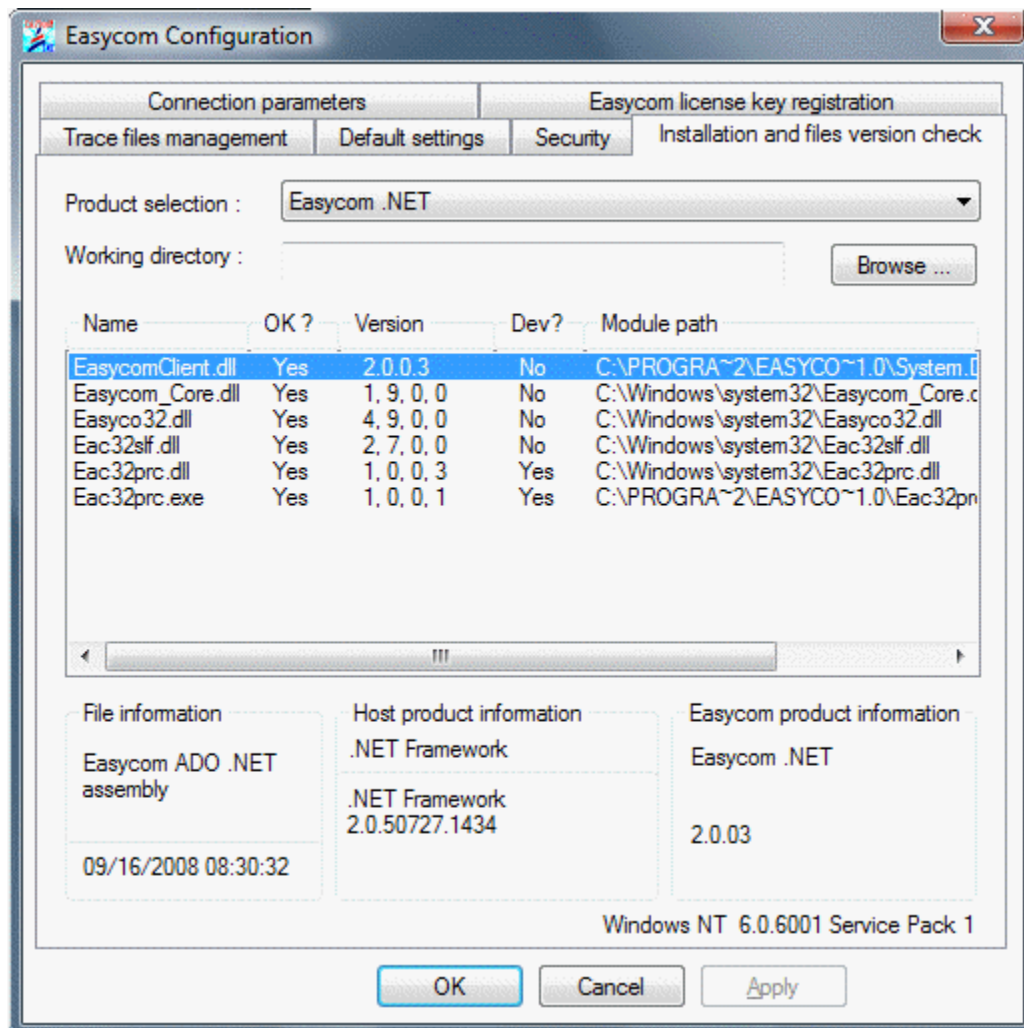
PC file should be specified, it will be generated by filling the entry box or choosing the file in the tree structure using the "browse" button.

NB : An user name and password must be specified on "Connection parameters" bookmark.

- **To download :**

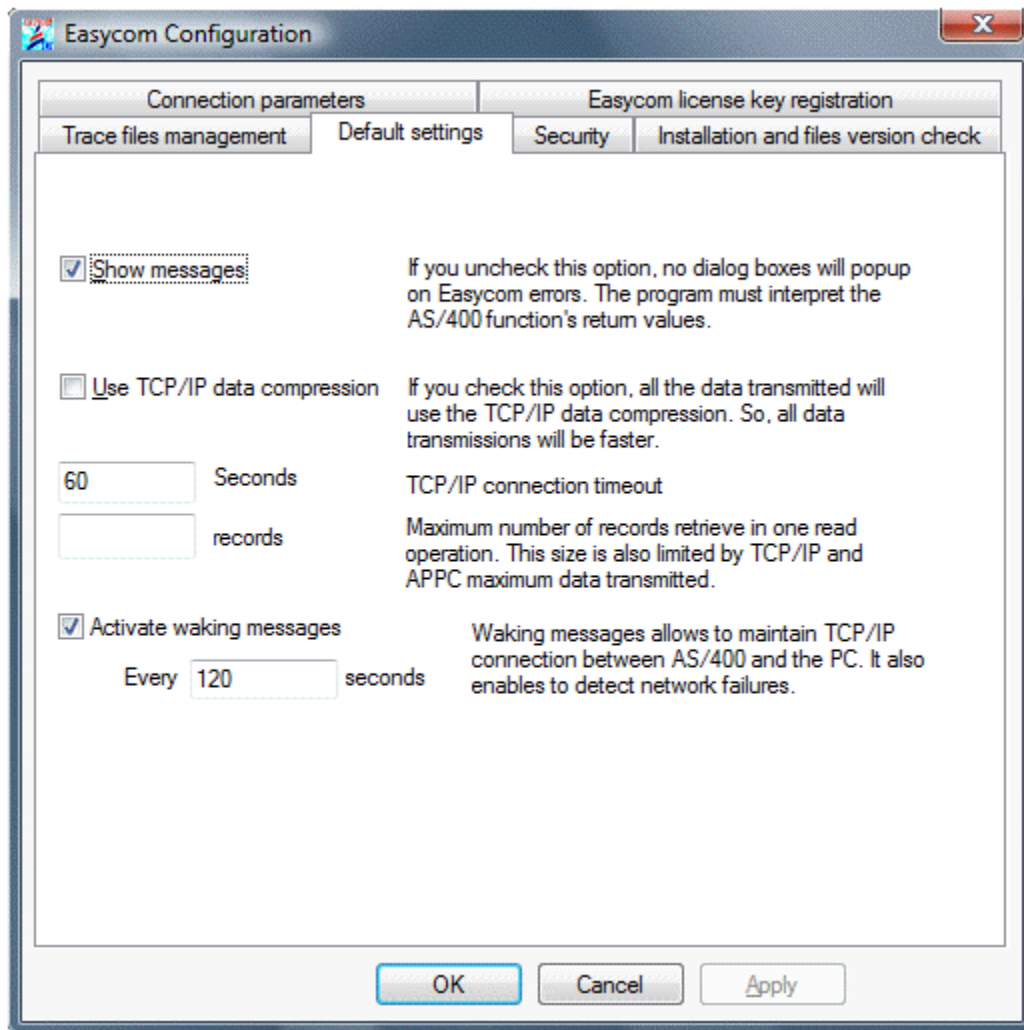
Click on "**Downloading**" to recover the trace.

Installation and checking modules versions (dlls)



Easycom default settings

This part allows setting EASYCOM parameters in order to optimize network access times and reduce exchanges between AS/400 and application.



Messages display

If this option is unchecked, no dialog box will be displayed in case of EASYCOM error. Then, program will interpret the functions returned values in all cases (example : password error). This option is recommended with a PC program server type (Web or any program operating automatically).

TCP/IP data compression

This option allows to use data compression in order to reduce exchanged volumes between AS/400 and PC.

TCP/IP connection maximum timeout

Default : 60 seconds.

Timeout = "": Default value 60s

Timeout = 0 : no timeout

Retrieved recordings maximum number

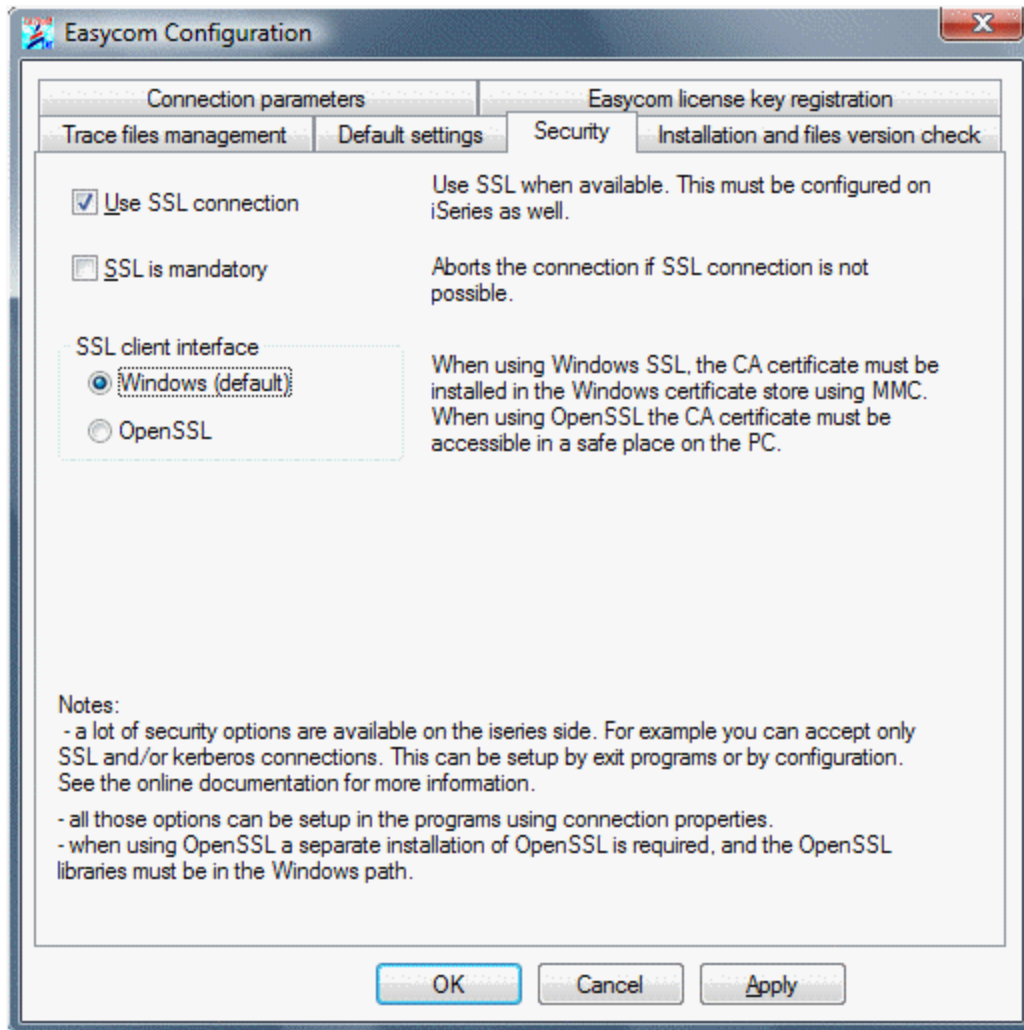
With this option maximum recordings number read in a block can be set. Default value is 32, and its limit is set by the block size parameter.

Activating Keep Alive messages

In the case of sustained applications uses without data exchanged, TCP/IP may close AS/400 to PC communication. To avoid that, regular intervals messages can be sent on established connection. That also allows an EASYCOM job automatic termination in case of PC prolonged silence.

Easycom security

This tab is for SSL default connectivity options. SSL connection settings can also be setup inside the client application.



If SSL is activated, SSL connection will be attempted. If the SSL negotiation fails or not supported by the server or client the connection will continue without SSL (not encrypted).

If SSL is activated and mandatory, the client will successfully connect only if SSL negotiation succeeds.

Notes:

- if the client part is not up to date, the option may be ignored, and connection succeed without SSL
- if client part is up to date, but not server part, the connection will be aborted.
- The connection test tab shows if the connection test was successfully using SSL (yes, no or N/A for not supported on client). If this test succeeds, this does not mean that the application will use SSL, because client part is specific for each product (Delphi, WinDev, PHP ...).

This configuration screen shows two different interfaces:

- Windows (default). Use the Microsoft Windows integrated interface. You may be need to install the certificate of the CA (certificate Authority) that issued the certificate of the SSL Easycom server ([see SSL connection - server configuration](#)).

To do this, use mmc (Microsoft Management console), and add the certificate store plugin into it. You can do this by clicking "start", "Run", and type "certmgr.msc" then enter. Then right-click on "Trusted Root Certification Authorities", then select "All Tasks", and the "Import". You need then to select the file that is containing the certificate.

- OpenSSL. Use OpenSSL interface. In this case the OpenSSL libraries must be available on the PC. You also need to have the CA certificate available. You can give the certificate path or name using Easycom configuration tool (or inside the application).

Easycom.ini

The easycom.ini file contains parameters and comprehensive options (installation, optimization, trace, etc...) set including EASYCOM Configuration utility chosen parameters.

Several easycom.ini are possible. In this case it will be looked for first in the application repertory, then in the Windows repertory and finally in other path.

Example : Easycom.ini file

```
[INSTALL]
PCdir=C:\PROGRAM FILES\Easycom

[GENERAL]
Network=
Msg=1 //Option 'Display messages'
NoWait=
QryOptimize=
Location=194.206.165.100 //AS/400 name or IP address

[TCP]
COMPRESSION=
Timeout=5 //TCP/IP connection maximum time

[Buffers]
Record=9 //recordings maximum Number
//retrieved in a reading operation
Size=8000 //data maximum size in byte
//sent between AS/400 and PC
TimeOut=30 //data refreshing time
```

Native programs an Data Queues

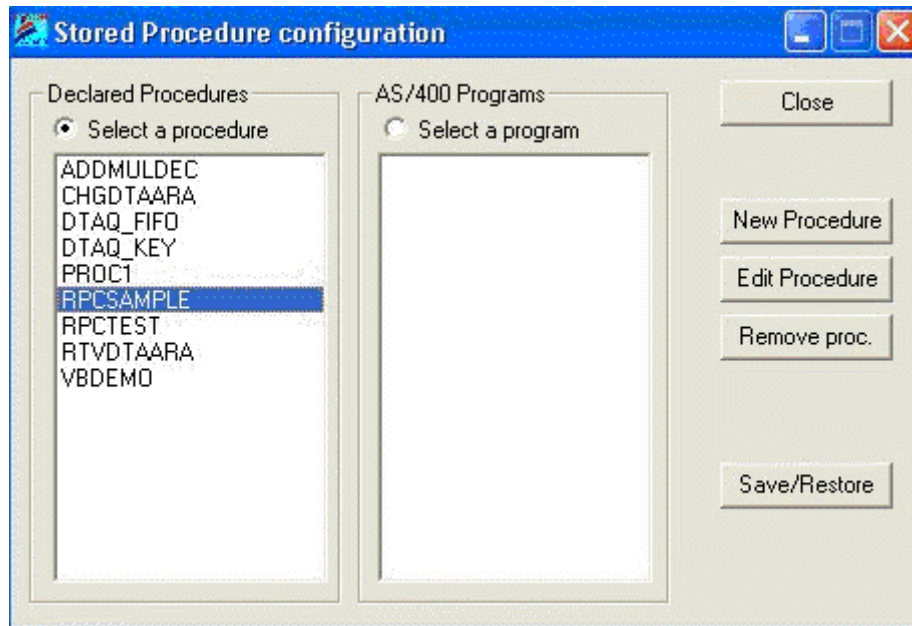
AS/400 native program description

EASYCOM enables AS/400 native programs calling, CL or RPG programs or stored procedures.

To perform this, EASYCOM needs these programs description stored on AS/400 in YPROCHDR and YPROCPARMS files in EASYCOM library.

Programs description and data queues are built by DTAQ-RPC constructor. The basic principle is to specify all parameters, types and uses (input, output, input/output) required to call the program.

The first screen displays the existing procedures (stored on AS/400) and enables to create, modify or deleted them. The descriptions can be saved in a PC text file in view of a later transfer to another AS/400.



A new name is assigned to the procedure. It does not need to match with the associated program name.

A native AS/400 program (CL, RPG, COBOL, C etc.) is associated to the procedure.

The library may be omitted, or replaced by *LIBL.

The description is a free text, which will be seen when client workstations browse through the procedures.

Each program calling type and size parameters are described.

Each parameter may be considered as a database table field.

Procedure definition

Procedure name : Description:

AS/400 Object Name (Lib/File) -PGM / DTAQ / SRVPGM
 ... Type:

ILE Procedure Name:

OK
Cancel

Parameters description :

N°:	Name :	ByVal	I/O	AS Type	AS Length ...	PC Type, Len ...	+	-	M
1	OP1		I	PACK	5:2 (3)	DOUBLE 8:0			
2	STR1		I	CHAR	20:0 (20)	CHAR 20:0			
3	OP2		IO	PACK	5:2 (3)	DOUBLE 8:0			
4	STR2		IO	CHAR	30:0 (30)	CHAR 30:0			
5	OP3		O	PACK	10:4 (6)	DOUBLE 8:0			

Each parameter can be considered as a field in a database table.

It therefore has a name, by which it can be referred to by the application.

Parameters designed to provide values for the called program are considered as input parameters (IN).

Parameters designed to receive a value on returning from the call are considered as output parameters (OUT).

Parameters that are modified by the program are both input and output (IN/OUT) parameters.

By default, all the parameters in an AS/400 program are both input and output. The logic of the program can change this property.

If a calling parameter of the program is a structure (DS : Data Structure), each field of the DS has to be described individually.

For the first field only, the box to be ticked is : This field is a parameter or the 1st Field.

The type of parameter expected by the AS/400 program must be specified exactly :

CHAR : Character data type.
 BIN2 : 16-bit numeric data type.
 BIN4 : 32-bit numeric data type.
 PACK : Condensed numeric data type (DECIMAL).
 This is the format in which CL handles numerical data (CL *DEC type).
 ZONED : Extended numeric data type (NUMERIC).
 DATE : AS/400 date in the yyyy-mm-dd format.
 TIME : Time in hh:mm:ss format.
 FLOAT : Numeric value in single-precision floating point.

DOUBLE : Numeric value in double-precision floating point.
TIMESTP : Elapsed time field.
GRAPHIC : Character type data, not to be converted.
EXTERNAL DS : A structure described by an external data structure, i.e. a physical file.

Migrating procedures and DTAQ from AS/400 to another

When a developer works on an AS/400, he creates procedures and data queues which will subsequently have to be used on another AS/400, these procedures descriptions and data queues have to be transferred to the other AS/400.

Descriptions are stored in three files : YPROCHDR, YPROCPARMS and YPROCPGM. They are stored in AS/400 EASYCOM library (default). They can also be placed in another library. In this case they will be searched in connected profile LIBLE.

If two AS/400s are connected, the above three files can obviously be transferred directly from one to the other.

Otherwise, the DTAQ-RPC manufacturer offers a facility to import/export descriptions from or to text files, that means that the necessary descriptions can be saved on the developer's workstation and then restored on the client's.

Calling a ILE procedure

The ILE procedure must be described, as a program (Type *PGM).

The AS/400 object in "AS/400 Object Name" field must be *SRVPGM type.

It must be "Service Program" type.

The first described parameter is the procedure returned value.

Only returned values type "Integer 32 bits" are accepted.

Then, the parameters are described, as for a OPM program.

16 parameters maximum are accepted for the procedure, plus returned value.

Procedure definition

Procedure name : PROC1

Description:

AS/400 Object Name (Lib/File) -PGM / DTAQ / SRVPGM
 AURA/SRVPGM01 ... Type: Service Program

ILE Procedure Name: Proc1

OK
Cancel

Parameters description :

N°	Name :	ByVal - I/O	AS Type	AS Length ...	PC Type, Len ...	+	-	M
Ret	RET		IO BIN4	0:0 (4)	INT 32 4:0			
1	P1		IO BIN4	0:0 (4)	INT 32 4:0			
2	P2		IO BIN4	0:0 (4)	INT 32 4:0			
3	P3		IO BIN4	0:0 (4)	INT 32 4:0			
4	P4		IO BIN4	0:0 (4)	INT 32 4:0			
5	P5		IO BIN4	0:0 (4)	INT 32 4:0			
6	P6		IO BIN4	0:0 (4)	INT 32 4:0			
7	P7		IO BIN4	0:0 (4)	INT 32 4:0			
8	P8		IO BIN4	0:0 (4)	INT 32 4:0			
9	P9		IO BIN4	0:0 (4)	INT 32 4:0			
10	P10		IO BIN4	0:0 (4)	INT 32 4:0			
11	P11		IO BIN4	0:0 (4)	INT 32 4:0			
12	P12		IO BIN4	0:0 (4)	INT 32 4:0			
13	P13		IO BIN4	0:0 (4)	INT 32 4:0			
14	P14		IO BIN4	0:0 (4)	INT 32 4:0			
15	P15		IO CHAR	200:0 (200)	CHAR 200:0			

Parameter field edition

Field Name: RET

Field usage :
☐ In ☒ In/Out ☐ Out

☒ This field is a parameter or the 1st field of a Data Structure Function Result

AS/400 Format
 Type: BIN4
 Digits: 0
 Decimals: 0 By Value: ☐

PC Format
 Type: INT 32
 Length: 4
 Decimals: 0

External DS
 Library:
 File:

OK
Cancel

For each parameter, option "By Value" has been added.

This option is valid only for parameters type "32 Bits integer".

When checked, this option indicates that the procedure receives this parameter in value, and not in address.

Troubleshooting

How to diagnose errors

In case of [connectivity errors](#), there are several ways to search:

- in the EASYCOMD job history. To see it, do WRKACTJOB, then option 5 on EASYCOMD, then option 10 (job's history), and type F10. Type F1 on the suspicious messages to get more information.
- In the EACMSGQ messages. To see it, enter DSPMSG EASYCOM/EACMSGQ.
- In the QSYSOPR messages. To see it enter DSPMSG QSYSOPR. Unexpected, failures or licensing messages will appear here.
- In the QEZJOBLOG OutQ. A spool file is generated in this outq if Easycom failed to start properly (error -4 on the client), or if the easycom job unexpectedly stops.

To see the spool file, do the following commands:

- WRKOUTQ OUTQ(QEZJOBLOG)
- Type F18 (to go at the end), and then F11.
- There should be a line with the station name, with the corresponding user, date and time.

Type 5 on then entry to display the spool. It contains information, warning and error messages of the job.

- In the LOGFILE file, LOGFILE member in the EASYCOM library. This file will contain all TCP/IP failures, with OS/400 errors codes. To see that file, use: DSPPFM EASYCOM/LOGFILE MBR(LOGFILE)

This file can be downloaded using FTP or [Easycom configuration](#) client on Windows.

In case of errors during processing, an Easycom logfile can be useful. It can be setup using [CFGEAC](#) or [Easycom configuration](#). The contents of this file can help to understand what is performed on the server, see parameters, additional error messages, ...

The Easycom job history can also help a lot. To see it, use WRKACTJOB, option 5, then 10 and type F10.

If the Easycom job stops too quickly to see a job history, use JOBLOG(*YES) in [CFGEAC](#) command to setup EASYCOM to always have an spool generated in QEZJOBLOG (see above to consult it).

If the Easycom job aborts unexpectedly there should be a spool file in QEZJOBLOG (see above).

If the EASYCOM or the EASYCOMD job fails in a loop, try to see what is involved in the call stack. It is available by using WRKACTJOB, then option 5, then option 11.

In case of licensing errors, do DSPMSG QSYSOPR if the information provided on the client is not sufficient.

How to contact our Technical Support ?

Contact EASYCOM technical support.

E-Mail : tech@easycom-aura.com

Tél. : 33 (0)1 69 07 01 45

Fax : 33 (0)1 64 46 29 06

Internet : <http://www.easycom-aura.com/>

AURA Equipements
Z.A. de Courtaboeuf
10, Avenue du Québec
BP 519
91946 LES ULIS CEDEX
FRANCE

On line form

You can send an online request to the technical support using the form available from the site :
<http://www.easycom-aura.com/fr/formulaire.asp>

Important before contacting us ...

For quick and efficient answers from our technical support to your queries, you are kindly requested to prepare your call as follow :

- Complete and return EASYCOM registration card (AURA EQUIPEMENTS yellow card).
- Enter the product activation key on AS/400.
- Perform several tests to define the original problem.
- Identify EASYCOM version.
- **Check that your Premium Assistance contract is valid.**
- Make a note of the local or network hardware and software configuration, and the PC's configuration where the problem had occurred.
- Make a note of all recent configuration modifications.
- Make a note of the different tested operations and displayed error messages.
- Consult FAQ (in the help on line).
-

If you have not found solution, can contact us :

Phone : +33 (0) 1 69 07 01 45

Fax : + 33 (0) 1 64 46 29 06

Mail : tech@easycom-aura.com

Maintenance agreement

AURA Equipements offers several technical support levels.

On request, we will provide you with the best commercial offer matching your needs.

For general or commercial information, contact : info@easycom-aura.com.

AS/400 trace file

EASYCOM trace file activating

Use EASYCOM Configuration utility, trace files management bookmark. Library and traces file name to be created, its detail level (from 1 to 9, level 1 is basic, level 9 is the most detailed) can be set.

Option "Time print" allows having a timestamp in front of each operation line.

This trace can be retrieved on PC from the same screen as a text file.

This trace can also be activated from a terminal with CFGEAC command.

Easycom log file

Trace file enables EASYCOM carried out operations to be displayed on client or server side. AS/400 EASYCOM server processes elementary requests applied to tables or procedures.

It receives a process request from the network, and returns a response.

The requests and responses are recorded in a trace file, it can be used as basis to analyze data flow between client and server.

Lines starting with << indicates client request.
Lines starting with >> indicates AS/400's answer.

```
<<EACopen(EASYCOM/SP_CUST,4194309,-1)  ß  Requête.  
9 Fields, 0 key fields  
EAC_NO_CVT - mode=  
>>Ret=1; Err=0; Msg=; Int=0  ß  Réponse.
```

In AS/400 trace, if time option was selected, all requests and responses are time in hh:mm:ss.ms format.
<<15:48:45.566: EACread(1,p(2275),91,34144281,(null),0,p(100))

In response, data "Clk=x" indicates AS/400 CPU time spend to process the request.

```
>>15:48:45.574: Clk=8, Len=619; Ret=5; Err=0; Msg=; Int=
```

Trace file header (common to all sessions)

This trace file part is always the same for all EASYCOM sessions.

Time is : 03/27/2000 - 17:22:10

Easycom Server Version is : 4.5712, Link is TCP/IP

Client licence is : D\$WINDEV10 , Easycom Library is : EASYCOM

JobName=ALBATROS, User=QPGMR , QCCSID=297 Heart Beat freq :10

Easycom Log File TRACE/SR, level 1

>>Ret=1; Err=0; Msg=; Int=0

<<RTV_AS_VER(p(4))

>>Ret=4; Err=0; Msg=; Int=0

<<WriteTableEBCDI(49 42 4D 43 43 53 49 44 20 30 20 31 32 35 32 00 00 00 00 00 ... (256))

Build Table from CCSID:0 to 1252

open IBMCCSID01252, IBMCCSID000000000100

<<WriteTableASCII(49 42 4D 43 43 53 49 44 20 31 32 35 32 20 30 00 00 00 00 00 ... (256))

Build Table from CCSID:1252 to 0

open IBMCCSID00000, IBMCCSID012520000100

<<ReadTableASCII(p(256))

>>Ret=0; Err=0; Msg=; Int=

<<ReadTableEBCDIC(p(256))

>>Ret=0; Err=0; Msg=; Int=0

<<EACSqlDeclare(2A 45 41 43 20 43 56 54 20 4E 4F 00 ,12)

Statement:*EAC CVT NO

>>Ret=1; Err=0; Msg=; Int=0

<<EACSqlBegin()

>>Ret=0; Err=0; Msg=; Int=0

Physical file opening trace

```
<<EACopen(EASYCOM/SP_CUST,4194309,-1)
 9 Fields, 0 key fields
EAC_NO_CVT - mode=rr+
>>Ret=1; Err=0; Msg=; Int=
<<EACgetdesc(1,p(65000),65000,939786240,(null))
>>Ret=9; Err=0; Msg=; Int=
```

Logical file opening trace

```
<<EACopen(EASYCOM/SP_CUST_UN,4194309,-1)
LF with 1 Data Members, 1 Record Formats
 9 Fields, 1 key fields
EAC_NO_CVT - mode=rr+
>>Ret=2; Err=0; Msg=; Int=
<<EACgetdesc(2,p(65000),65000,939786240,(null))
>>Ret=9; Err=0; Msg=; Int=
```

File records reading trace

<<EACread(2,p(816),102,34144264,(null),0,p(32))

VERB=_EAC_NEXT LOCK=OFF RECS=8 FILE=EASYCOM/SP_CUST_UN

RRN=2 RRN=4 RRN=5 RRN=6 RRN=7 RRN=8 RRN=9 RRN=10

>>Ret=8; Err=0; Msg=; Int=0

Read operation type is indicated by « VERB=

Where xxxx may be :

FIRST, NEXT, PREV, LAST, KEY_EQ, KEY_GE, KEY_GT, ...

"**LOCK=**" indicates if operation is carried out with or without record locks.

"**RECS=**" indicates maximum records number requested for the response.

This number is directly linked to "Records= data" in the "Easycom.ini" file "Buffers section" on client PC.

"**RRN=**" indicates the records read number.

In response, "Ret=n" indicates the records number actually returned, to the read request.

If the read operation fails because of an input/output error, the message is stored in the trace, and the records actually read are returned.

<<EACread(2,p(3570),102,34144291,(null),0,p(140))

VERB=_EAC_NEXT LOCK=OFF RECS=35 FILE=EASYCOM/SP_CUST_UN

RRN=11 RRN=12 RRN=13 RRN=14 RRN=15 RRN=16 RRN=17 RRN=18 RRN=19 RRN=20 RRN=54 +...

... RRN=55 RRN=56

SIGIO Msg:CPF5001

>>Ret=13; Err=5001; Msg=CPF5001; Int=0

In this example, 35 records are requested, but only 13 are available until file end.

To obtain the detailed error message, use DSPMSGD command.

SQL request opening trace

```
<<EACopen(SELECT * from SP_CUST where LASTNAME>'M',4194309,-1)
Statement : SELECT * from SP_CUST where LASTNAME>'M'
Cursor 0
>>Ret=2; Err=0; Msg=; Int=
<<EACgetdesc(2,p(65000),65000,939786240,(null))
>>Ret=9; Err=0; Msg=; Int=
```

Error codes

TCP/IP Errors

Negative error codes mean an Easycom protocol error during TCP/IP connection, and positive ones mean native TCP/IP errors.

Native codes (positive) change depending on the client platform (Windows, Linux, AIX, iSeries, ...).

All errors come with a local error text, and most of the time with a specific error text coming from the iSeries.

Here are negative codes:

Error code	Description
-1	Error while submitting the job. SBMJOB made by the EASYCOMD job failed. Additional error text coming from iSeries will be provided with this error. The EASYCOMD job history should contain all information on that failure.
-2	Security not valid. This error can occur if wrong user, password, password disabled, etc. The detailed reason is specified as text.
-4	submitted job did not answer, or failed to initialize data queues The most common reason for this is that the job failed to run. It was submitted, but ended before beginning to communicate with the client. This is usually caused by wrong user's jobd. The full reason can be found in the QZEJOBLOG OUTQ of the system. To see it, do the following commands: <ul style="list-style-type: none">○ WRKOUTQ OUTQ(QEZJOBLOG)○ Type F18 (to go at the end), and then F11.○ There should be a line with the station name, with the corresponding user, date and time.○ Type 5 on it to see the errors.
-5	Password is expired. If the client program 'catches' this error, it can perform a custom password change dialog box, and send the password with the new connection request. The password send by the application will have the following form in this case: oldpassword@newpassword
-6	Internal reject 1. Unexpected error, caused by a bug in EASYCOMD. Please contact help support. Restarting EASYCOM subsystem is recommended.
-7	Failed to init the library list. Errors occurred when installing the libraries that are defined in the user's jobd. You can consult the QEZJOBLOG outq for more information (see error -4)
-8	SSO error. SSO profile is expired (re-signoon required), or not supported by EASYCOMD.

-9	The server cannot accept Kerberos tickets. EIM SSO is not configured, or the EASYCOMD LDAP connection failed. Do DSPMSG EASYCOM/EACMSGQ to see if there are Kerberos-related messages. Check that you see 'Eim=
-10	Timeout on read. Communication error: the read request timed out. The connection was probably broken.
-11	Logon cancelled. This error occurs when message boxes are enabled and when the user clicks on 'cancel'.
-12	Connection broken. The connection was broken by peer.
-13	Kerberos negotiation protocol failure. There was an unexpected Kerberos error when connecting. Check EIM configuration, and check if the same user is working using IBM Client Access in EIM mode.
-14	Kerberos error on client. The client failed to generate a ticket to send to the server. Additional text should explain the reason.
-15	Kerberos error on server. The server did not recognize the ticket or failed to grant it.
-16	OS/400 incompatible version. The OS/400 version is not compatible with the current request.
-17	Unexpected error while submitting (state unknown). Unexpected error probably caused by a bug. Please contact help support.
-18	Kerberos authentication out of hours. See CFGEACSSO to setup the valid hours for Kerberos authentication.
-19	Out of hours by exit program. The EACLOG001 exit program returned that the login is not valid at this time.
-20	Denied by exit program. The EACLOG001 exit program return that the login is denied
-21	Not processed by exit program. The EACLOG001 exit program returned that the login is invalid.
-22	Kerberos authentication is not supported by the server. See that CFGEACSSO enabled *EIM mode and that EASYCOMD started properly (DSPMSG EASYCOM/EACMSGQ).
-23	Kerberos authentication is mandatory. The Easycom server was configured to accept only Kerberos authentication, but a regular login was attempted.
-24	Failed to use the target library. The library specified by the target program property (Program= in easycom.ini, in section [general]) was not usable, because nonexistent or other reason.
-25	Awake on private job failed. The application attempted awaking a job that was registered by the setting, but it fails. A new connection is required. Note: this error currently can appear only with Easycom For PHP.
-26	SSL required on this server. The SSL negotiation was not setup or failed, but is required on the server. This can be marked as required using the FACTCPP01 exit program or using CFGEAC command.
-27	SSL server error. The SSL negotiation failed because the server detected an error. There are probably some information in the EACMSGQ message queue (type DSPMSG EASYCOM/EACMSGQ on a terminal)
-28	SSL negotiation was made, but a failure is detected while passing the connection to the Easycom job.
-29	SSL client error. The SSL negotiation failed because of an error on the client. More additional information is provided in the error message text.
-30	SSL sequence error. The SSL negotiation sequence was detected as invalid
-31	SSL protocol error. An SSL error is detected during SSL handshake.
-32	SSL error: SSL not supported on the platform
-33	EIM was mandatory for login
-34	SSL authentication is mandatory
-35	SSL authentication error (bad certificate, expired, ...)
-36	EIM error
-37	No valid authentication provided. This means that all kind of accepted authentication methods failed.

Here are most common TCP/IP error codes:

Windows error code	AS/400 error code	Description
10061	ECONNREFUSED 3425	Connection refused. No connection could be made because the target machine actively refused it. This usually results from trying to connect to a service that is inactive on the foreign host - i.e. one with no server application running.
10060	ETIMEDOUT 3447	Connection timed out. A connection attempt failed because the connected party did not properly respond after a period of time, or established connection failed because connected host has failed to

		respond.
11001	HOST_NOT_FOUND 5 (host error category)	Host not found. No such host is known. The name is not an official hostname or alias, or it cannot be found in the database(s) being queried. This error may also be returned for protocol and service queries, and means the specified name could not be found in the relevant database.
10053	ECONNABORTED 3424	Connection aborted. An established connection was aborted by the software in your host machine, possibly due to a data transmission timeout or protocol error.
10064	EHOSTDOWN 3428	Host is down. A socket operation failed because the destination host was down. A socket operation encountered a dead host. Networking activity on the local host has not been initiated. These conditions are more likely to be indicated by the error WSAETIMEDOUT.
10050	ENETDOWN 3433	Network is down. A socket operation encountered a dead network. This could indicate a serious failure of the network system (i.e. the protocol stack that the WinSock DLL runs over), the network interface, or the local network itself.

The localized error text is available at runtime and can be shown by the application or Easycom dialog boxes.

NB: most connection problem are caused by routers or firewalls installed on the client stations, or on the network.

Easycom is using one TCP/IP connection by default on tcp port 6077.

Internal Errors

Error code	Description
257	You may not open another file then specified for the demonstration
258	License key is not valid. Please do DSPMSG QSYSOPR to have full details if needed (which kind of license is required)
260	License key expired. Please do DSPMSG QSYSOPR to have full details if needed (which kind of license is required)
261	No free connection. The number of allowed simultaneous connection was reached, and this new connection is not allowed.
263	License key not found. There is no license for the product currently used. Please do DSPMSG QSYSOPR to have full details if needed (which kind of license is required)
275	There is no license for this option. An option of the product is required but not found. DSPMSG QSYSOPR can contain more information if needed.
1	Parameter error. There was an invalid request sent to Easycom. This can be caused by unexpected usage of Easycom, a bug in the application or a bug in the Easycom upper stack (specific part to a product, like Delphi, WinDev, PHP, ...)
2	Memory allocation error. This is usually caused by incorrect size during memory allocation on the server. The possible reasons are: unexpected usage of Easycom, a bug in the application or a bug in the Easycom upper stack (specific part to a product, like Delphi, WinDev, PHP, ...)
3	File not opened. Attempt on a non-opened file. This is probably an application or easycom bug.
522	Cannot convert a NULL parameter. Problem during iSeries <-> client conversion on a NULL value.
527	Problem during ALCOBJ action. ALCOBJ was requested but failed
528	Failed to create an object. An object creation attempt failed.
529	Timeout on pgm call. A timeout was defined for a pgm call (using CFGEAC or by client application), and this timeout was reached. The program call was cancelled, with possible non closed context. Restarting the connection is recommended.
530	Procedure not found. A procedure call was requested, but the procedure was not found in the service program

Error 10060 (3447 in Unix) : Connection Timed out

The called TCP/IP address does not exist on the network.

AS/400's TCP/IP address or name must be checked.

If an AS/400 machine name is used, check that it is properly referenced on DNS servers.

Error 10061 (3425 in Unix) : Connection Refused

IP address or name of AS/400 must be checked.

EASYCOM system proper launch on AS/400 must be checked.

Subsystem must be launched with command :

STRSBS EASYCOM/EASYCOM

If the subsystem was started, check if EASYCOMD job runs.

If not, it must be started with the command :

STREACD EASYCOM

Or, subsystem must be stopped restarted.

Connection must be tested using EASYCOM configuration or administration tool.

If the EASYCOMD job can't be started, messages that EASYCOM generate have to be checked using the commands :

DSPMSG EASYCOM/EACMSGQ or **DSPPFM EASYCOM/LOGFILE**

Default EASYCOM port number is 6077.

If this number is already used, use [CFGEACTCP](#) to configure another port, and change [client configuration](#) to select the port number.

Error 11001 : (Host error 5 in Unix) Host not found

On TCP/IP network AS/400 can be identified with its name at DNS level or host file. This error occurs when this name is used as IP address in connection parameters and is not found and associated with the right IP address.

AS/400 name, host file, DNS servers, must be checked or an IP address in xxx.xxx.xxx.xxx format must be used.

Where is the Hosts file located ?

Usually in C:\WINDOWS\system32\drivers\etc repertory.

This file contains IP addresses relation to host names. Each entry must set on his proper line. The IP address must be placed in the first column, followed by the related host name. The IP address and the host name must separated with one space at least.

Moreover, comments can be inserted on their proper lines or after computer name. They are indicated with '#' symbol.

Example :

194.206.10.1 main.as # main AS/400 server

194.206.10.2 test.as # AS/400 test server

194.206.10.100 serveur.info1

194.206.10.101 poste_x

....

DNS Server

Allows checking a DNS server address in connection network Internet (TCP/IP) Protocol properties.

Product licensing

Registration card

To get your product activation key and take advantage of the warranty, please complete and return EASYCOM registration card (AURA EQUIPEMENTS yellow card).

Moving licenses to new hardware

If you change your iSeries, the activation key(s) that you have will no longer be valid for the new machine.

Every license is granted for a specific company and a specific iSeries. To make this change, print out, complete and return to us the following form :

http://www.easycom-aura.com/doccom/attestchange_vf.pdf

When you have installed and tested the new iSeries machine, you need to uninstall EASYCOM from the old iSeries.

What needs to be uninstalled on the old iSeries ?

You need to delete the EASYCOM library by the following commands:

```
ENDSBS EASYCOM *IMMED
```

```
DLTLIB EASYCOM
```

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