EASYCOM Server

Easycom server

Easycom server is a Software engine running on IBM i – AS/400.

It is compliant with all the Easycom connectors and drivers for many development tools:

WinDev & WebDev	PHP
Delphi	.NET
OLE DB	NodeJS

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 V5R2 to V7R6.
- TCP/IP protocol

Client

- Protocol TCP/IP
- All Windows OS supported by Microsoft.

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

Install 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.

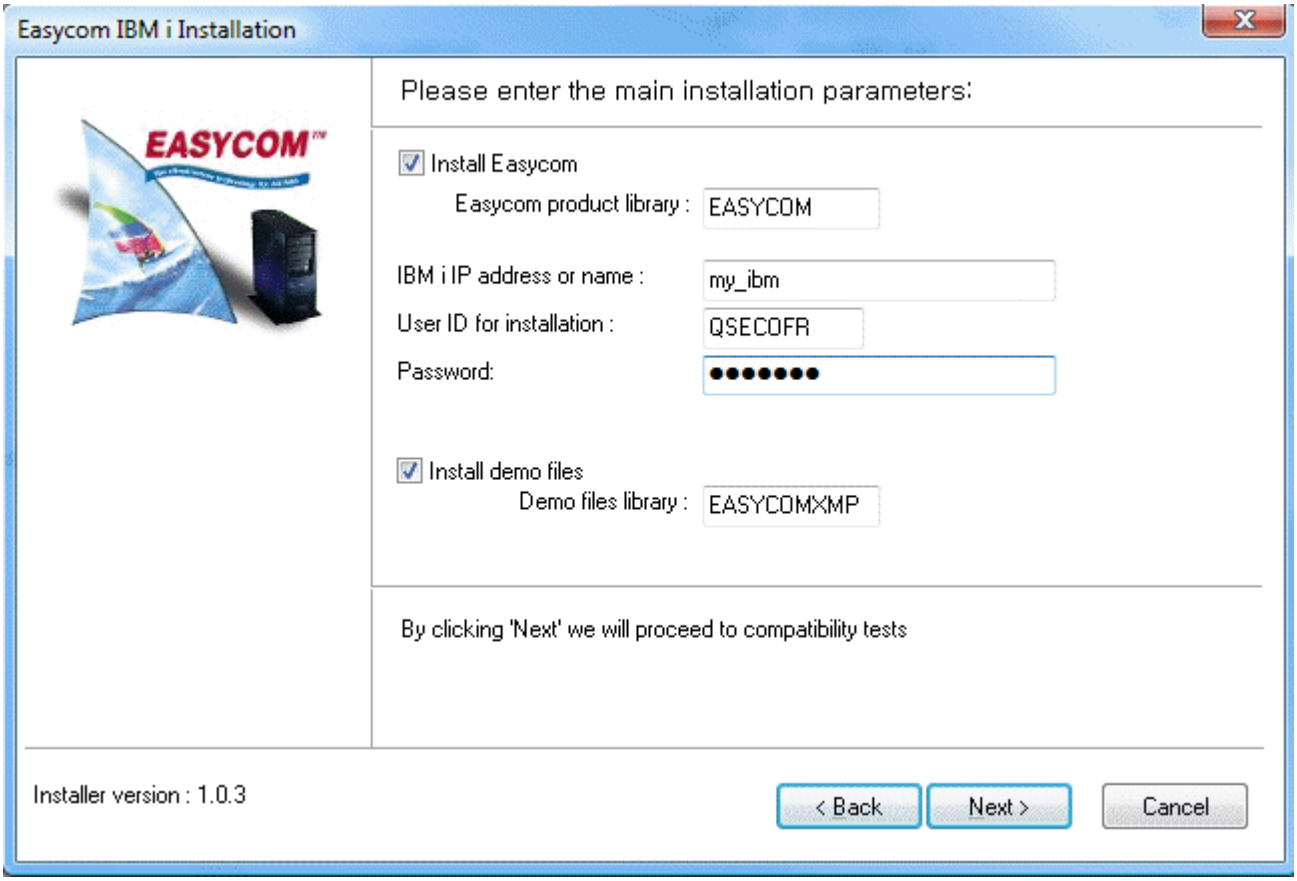
Prerequisites - TCP/IP and FTP

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.



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.

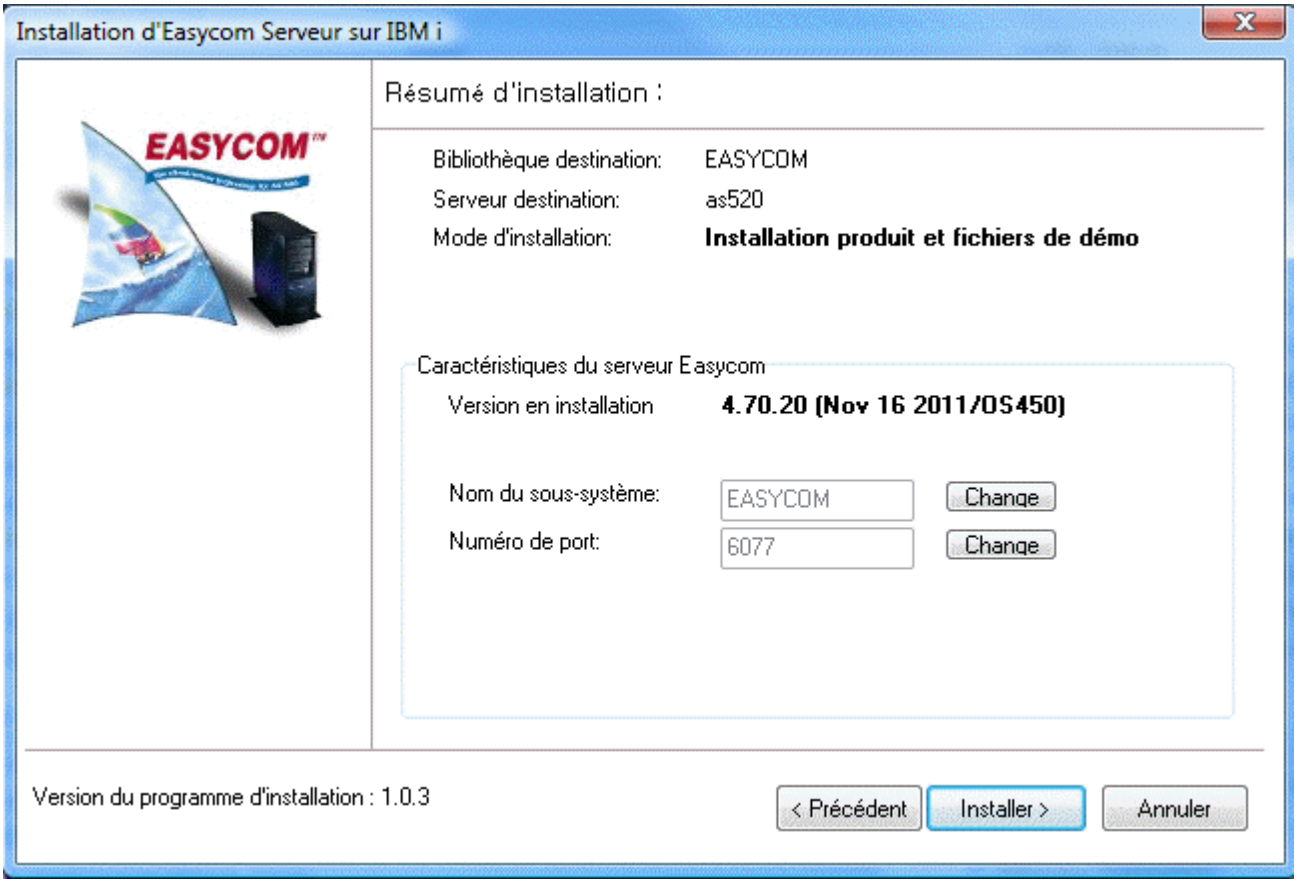
In the future, you need to rename this server library, or copy it, you will need to run CFGEACSBS command, using the new library name, in order to link the objects together in the new library.

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. EACINSTALL command is 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 license is registered.
EACSESSION	*FILE	Modified when the user license 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 CFGEACSBS 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

Easycom 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 Easycom 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 SBSD(EASYCOM/EASYCOM) PGM(EASYCOM/EASYCOM) INLJOBS(10) JOB(EASYCOMPJ) JOBD(EASYCOM/EACJOBD) CLS(EASYCOM/EACCLS)

CFGEACSBS SBS(EASYCOM) MODE(*PJ) PJSTART(*YES)

To return to backward configuration, stop the subsystem, remove PJ definition using RMVPJE, and then run again CFGEACSBS with **PJSTART(*NO)**.

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 *JOBD, 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 EACJOBD 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.

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 ADDLIBLE, RMVLIBLE 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 CFGEACSBS.

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

ADDLIBLE EASYCOM2

CFGEACSBS 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.

EIM Installation on IBM i

EIM Installation on AS/400 consists of the following steps:

- Create a domain in EIM
- Add the domain in the domain management
- Create a source user registry definition in EIM.
- Create a user identifier in EIM.
- Create a target association in EIM for the user identifier.
- Create a source association in EIM for the user identifier.
- Test the connection to the EIM domain controller
- Configure the EIM Identity Token Connection Factory

All required information can be found here:
https://www.ibm.com/docs/en/was/9.0.5?topic=eim-configuring

Once it works with Client Access you can setup Easycom.

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

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 an 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:

```
STREACD PORT(*JOBD) 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 EACLOG002 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

CFGEACAUTH 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 CFGEACEIM 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 certicates'
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 EACJOBD 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:

- EACJOBD, if it exists,
- The JOBD associated to the user profile that is authenticated, if EACJOBD is not present.
- The JOBD 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 **EACJOBD** 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 (*JOBD) 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)

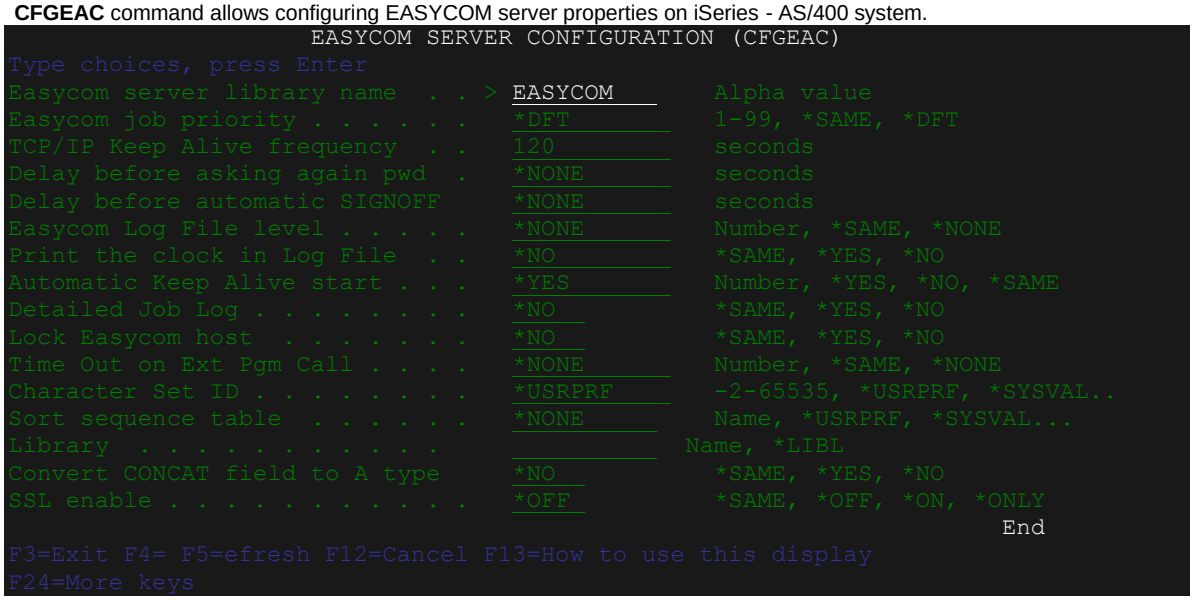
CHGOBJOWN OBJ(EASYCOM/EASYCOMD) OBJTYPE(*PGM) NEWOWN(QSECOFR)

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 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 JOBD job priority setting. If set to 0, JOBD determines job priority. JOBD used with EASYCOM is EACJOBD.

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 (EACJOBD).

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)

OBSOLETE: use CFGEACSBS

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 : SBSD, JOBD, JOBQ, CLS.

Object name	Object type	Description
EASYCOM (default)	*SBSD	Subsystem in which service is running, and client jobs are submitted.
EACJOBD	*JOBD	Descriptions for client jobs.
EACJOBQ	*JOBQ	Client job queue.
EACCLS	*CLS	Class for client jobs.
EASYCOMD	*JOBD	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 LIBL (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/EACJOBD)
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 *JOBD, and see message queue EACMSGQ in Easycom library:

DSPMSG EACMSGQ

CFGEACSBS (Configure Easycom Subsystem)

This command configures the EASYCOM subsystem, and the way Client jobs are started in the subsystem.

EASYCOM Subsystem name (SBS)

Enter the name of the Easycom subsystem to configure, and its library name.

Server Job Default Start Mode (MODE)

How Easycom Client jobs are started in the subsystem when Client connects.

Possible values are:

***SAME**: Do not change actual mode.

***BCH**: On Client connection, a new batch job is submitted.

***BCI**: On Client connection, a new batch immediate job is started.

Connection time is shorter using *BCI mode.

***PJ**: On Client connection, Easycom tries to connect to a pre-started job.

If no pre-start job is available, a BCI is started.

Easycom service port number (PORT)

The TCP/IP port number you want to allocate to the Easycom host server.

If you want to run multiple Easycom servers on the same IBM i machine, you need to allocate a different port number to each one.

Possible values are:

***SAME**: Do not change actual port setting.

***DFT**: If a service easycom exists in the service table, the port number associated with that service will be used.

See system command WRKSRVTBLE to manage the service table.

If service Easycom doesn't exist, the default port number 6077 is used.

Number: A port number to allocate to the new Easycom host server.

Server Job Description (JOBD)

Description used when Easycom jobs are submitted, when MODE is set to *BCH.

Possible values are:

***SAME**: Do not change actual JOBD setting.

***DFT**: Use Default EACJOBD Job description.

***USRPRF**: Use Job Description from user profile.

JobD Name: Set the name and library of the Job Description to use when Easycom jobs are submitted.

Initial Prestart Jobs Number (INLJOBS)

Specifies the initial number of prestart jobs that are started when the subsystem is started.

Possible values are:

***SAME**: Do not change actual setting.

***NONE**: Do not start prestart jobs when subsystem is started.

1-9999 : Specify the number of prestart jobs that are started when the subsystem is started.

Prestart Jobs Threshold (THRESHOLD)

Specifies when additional prestart jobs are started.

When the pool of available jobs is reduced below this number, more jobs are started and added to the available pool.

Possible values are:

***SAME**: Do not change actual setting.

1-9999 : Specify the minimum number of prestart jobs that must be available before additional prestart jobs are started.

Additional Prestart Jobs (ADLJOBS)

Specifies the additional number of prestart jobs that are started when the number of prestart jobs drops below the value specified on the Threshold parameter.

Possible values are:

***SAME**: Do not change actual setting.

1-9999 : Specify the number of additional prestart jobs to start.

Prestart Jobs User Profile (PJUSER)

Specifies the name of the user profile under which the prestart job is initiated

Possible values are:

***SAME**: Do not change actual setting.

QUSER: The IBM-supplied QUSER user profile is used.

name: Specify the name of the user profile used for the prestart job.

Name of Prestart Jobs (PJJOB)

Specifies the name of the prestart job that is started.

Possible values are:

***SAME**: Do not change actual setting.

name : Specify the name of the prestart job.

Prestart Job JOBD (PJJOBD)

Specifies the qualified name of the job description used for the prestart job.

Possible values are:

***SAME**: Do not change actual setting.

***DFT**: Default job description EACJOBD is used to start prestart jobs.

name: Specify the name of the job description being used for this prestart job, and its library name.

Start Prestart Jobs with Sbs (PJSTART)

Specifies whether the prestart jobs should be started at the time the subsystem is started.

Possible values are:

***SAME**: Do not change actual setting.

***YES** : The prestart jobs are started at the time the subsystem is started.

***NO** : The prestart jobs are not started at the time the subsystem is started.

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.

*JOBD : 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 * JOBD. 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 CFGEACSBS command.

Comments:

TCP/IP must be on when EASYCOMD is submitted.

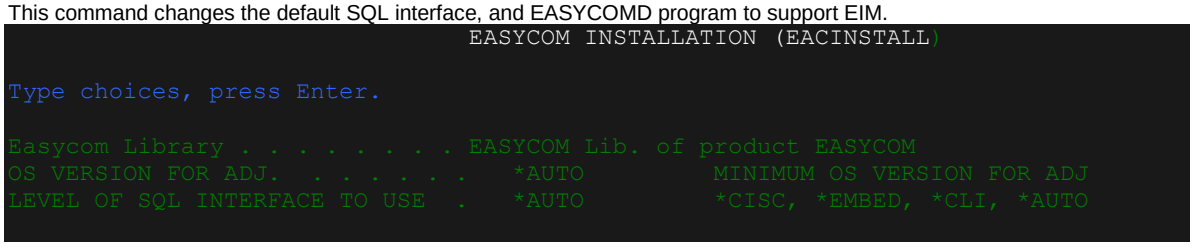
If EASYCOMD is not started, check EASYCOMD *JOBD, and see message queue EACMSGQ in Easycom library:

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.



You can change the default SQL INTERFACE from *CLI to *EMBED. This will use the embedded SQL interface in replacement of *CLI.

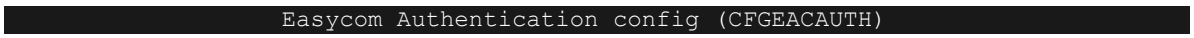
The *CLI interface is more powerful, but using *EMBED can help solving issues that are encountered by *CLI interface. The *CISC interface is obsolete, and is no longer included in latest versions of Easycom.

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.



```
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 is '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)

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 ares:

- 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' is 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 CFGEACEIM) 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_ROTH 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)

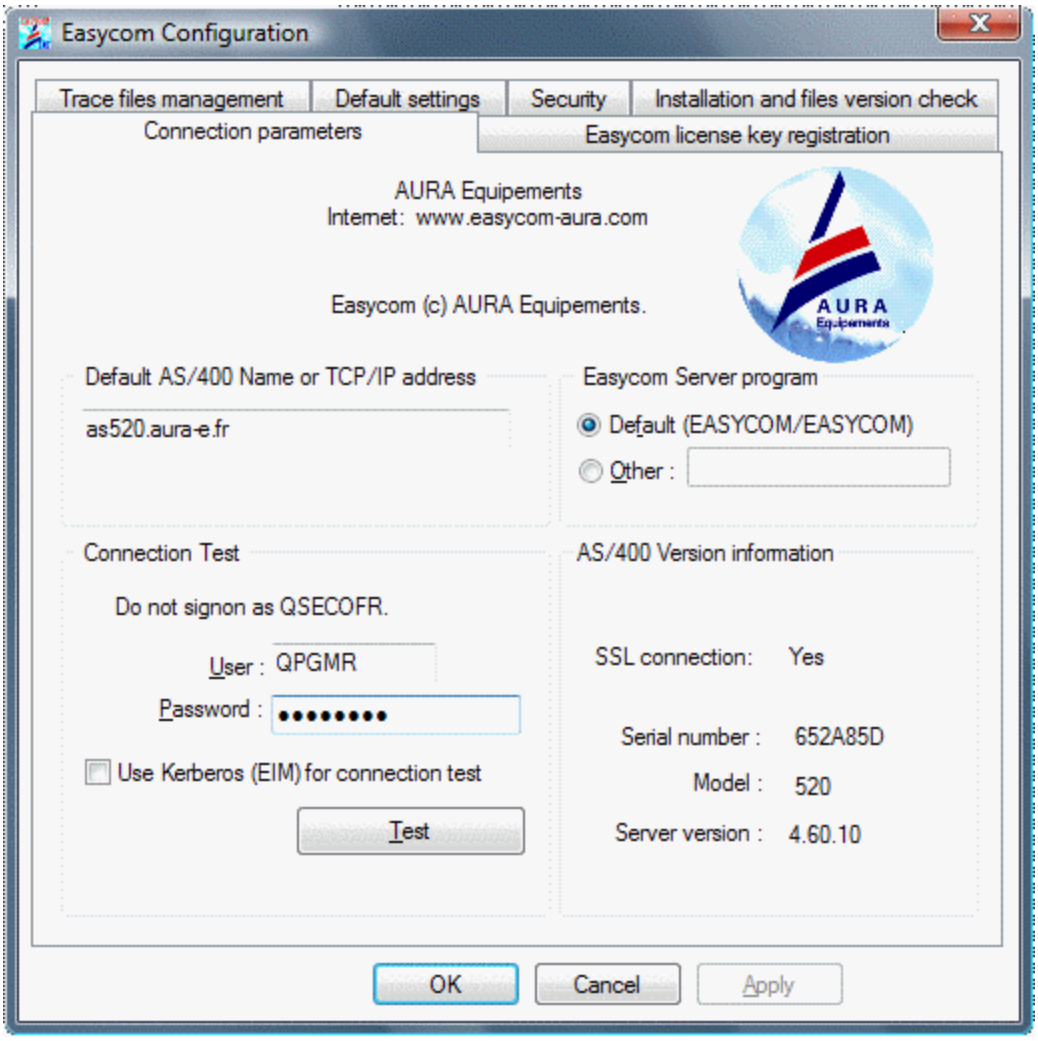
- **Other**

  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.



Click on **"Test"** button.

If connection is successful, AS/400 version information's are displayed, as for example:

Serial number : 650643C

Model : 520

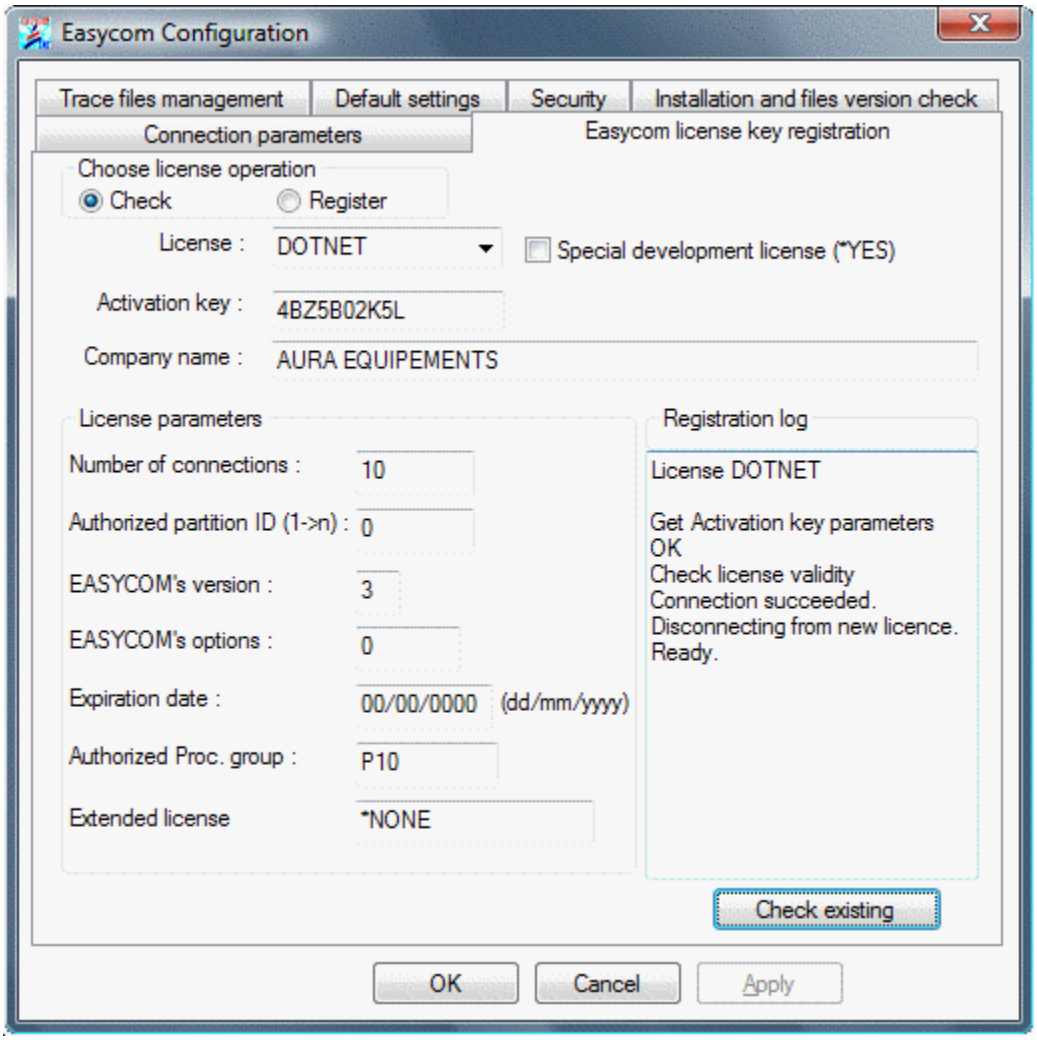
Server version: 4.60.10

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.



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).

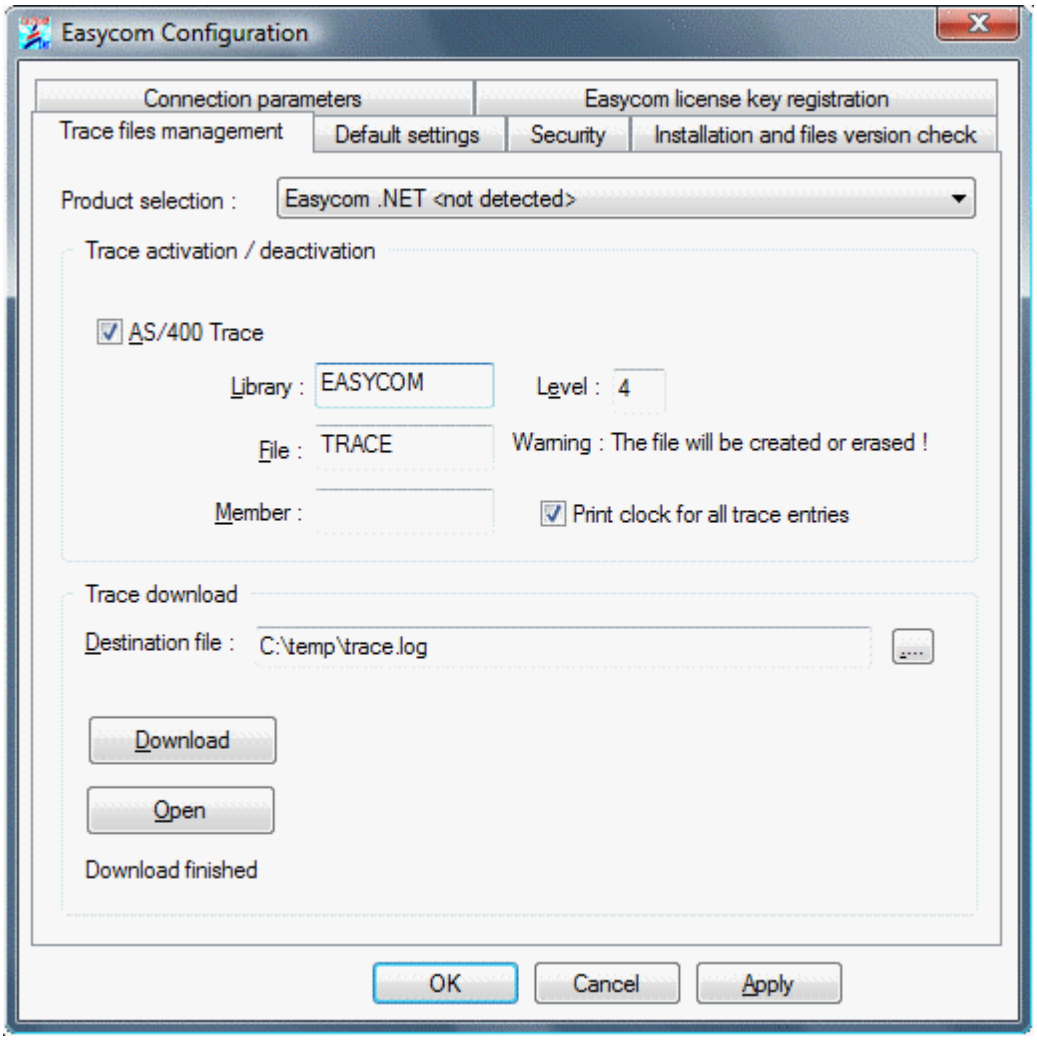
Press **'Register'** button to submit the registration process to the iSeries. After integrity check it will store it into the iSeries and test the connection on that license.

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 :**

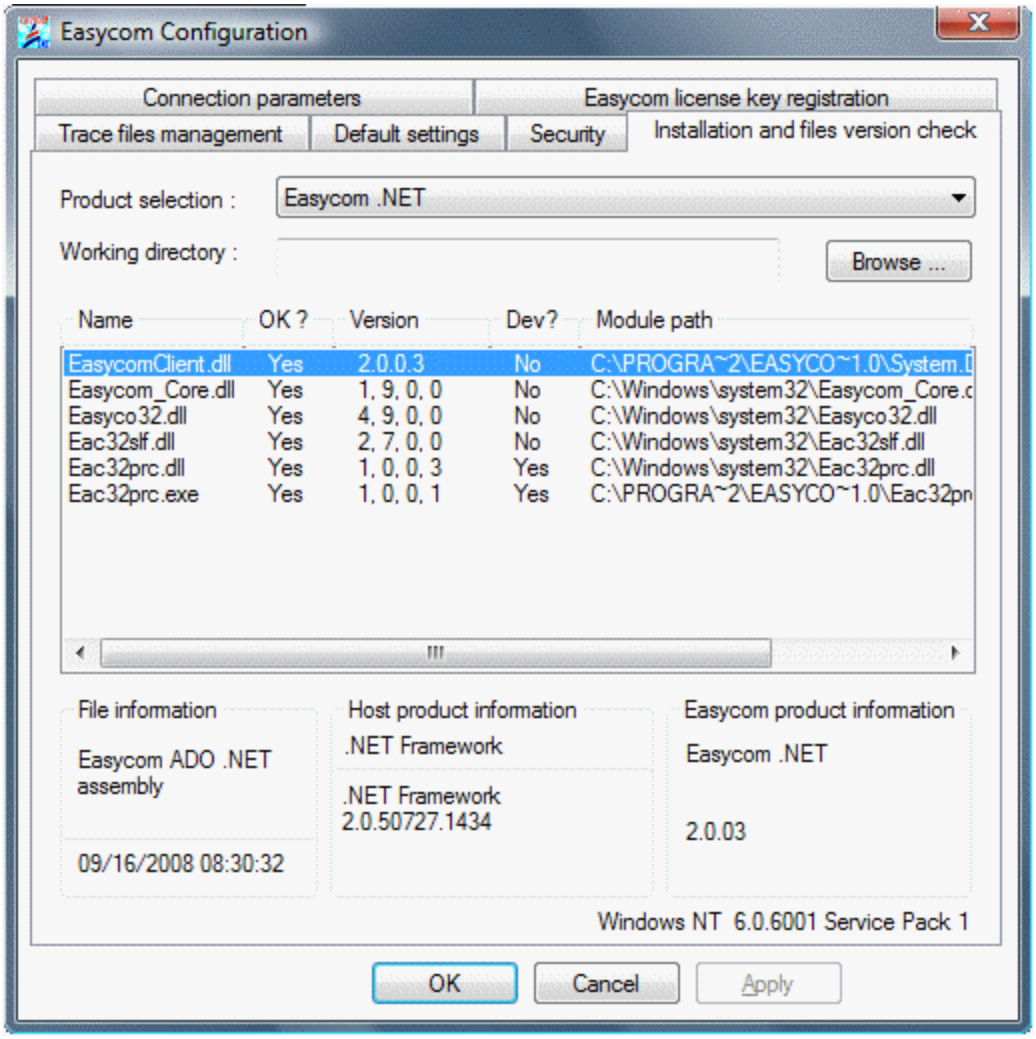
PC file should be specified, it will be generated by filling the entry box or choosing the file in the tree structure using the **"browse"** button.

NB : An user name and password must be specified on "Connection parameters" bookmark.

- **To download :**

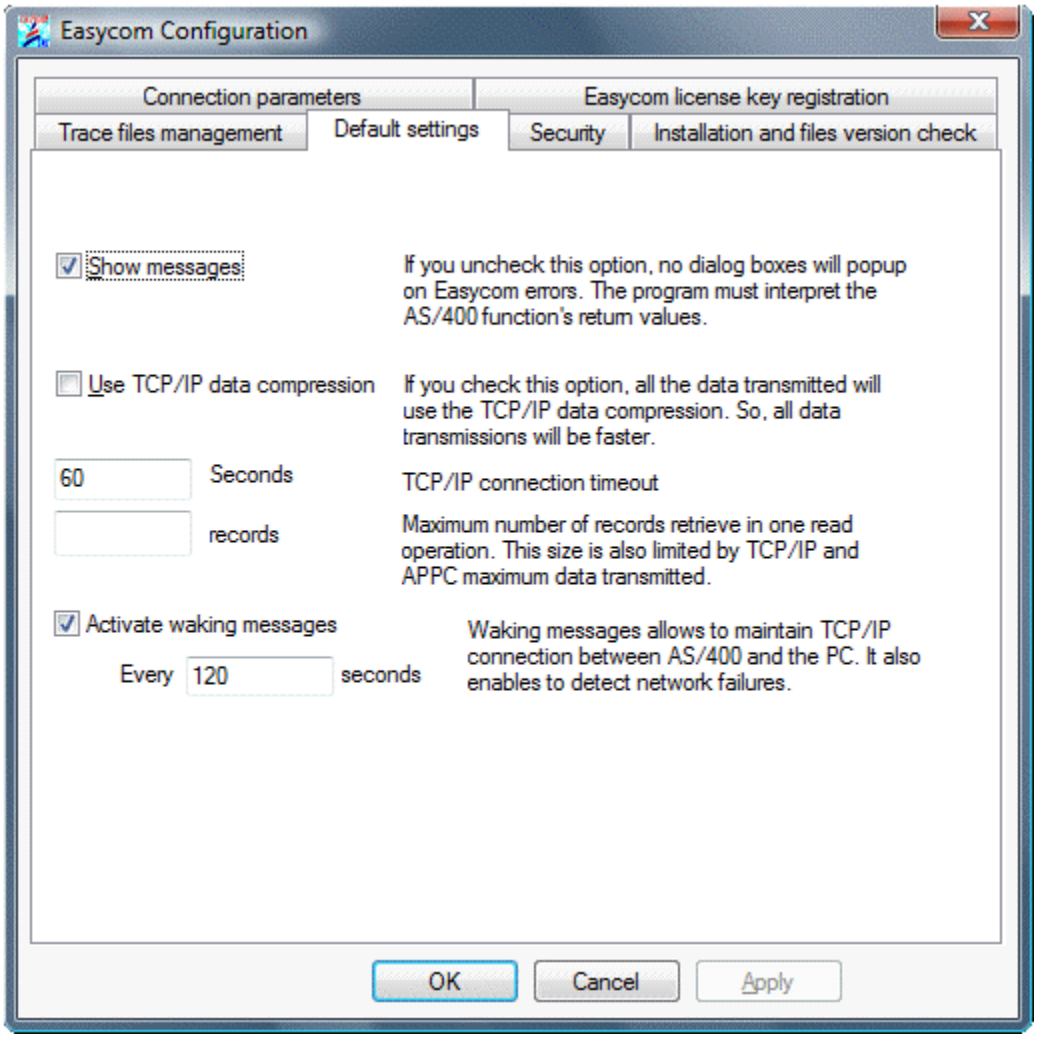
Click on **"Downloading"** to recover the trace.

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

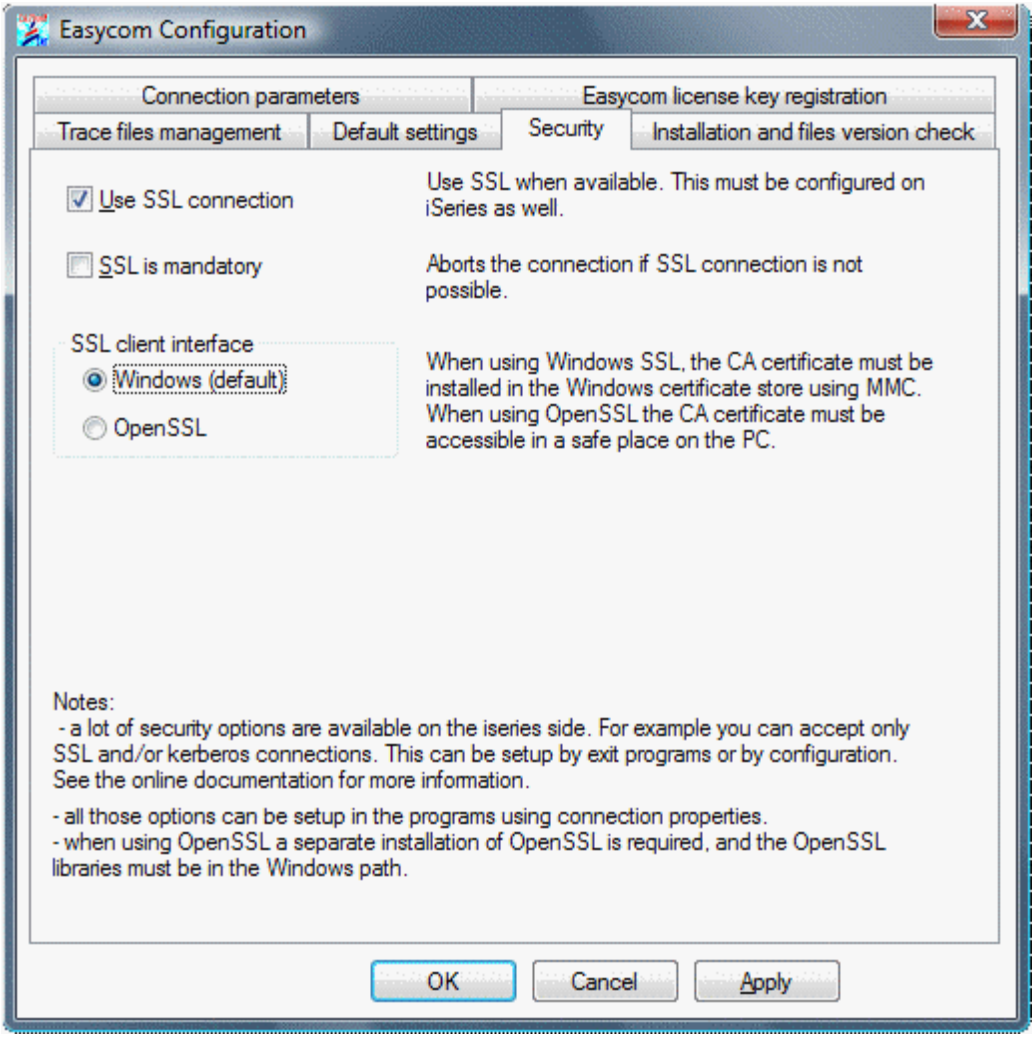
With this option maximum recordings number read in a block can be set. Default value is 32, and its limit is set by the block size parameter.

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-lick 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

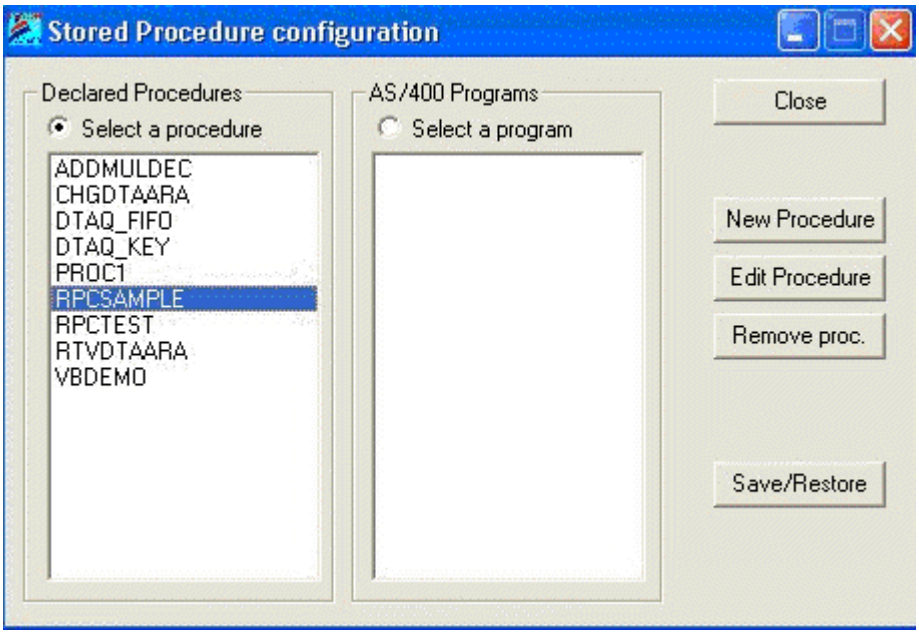
AS/400 native program description

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.

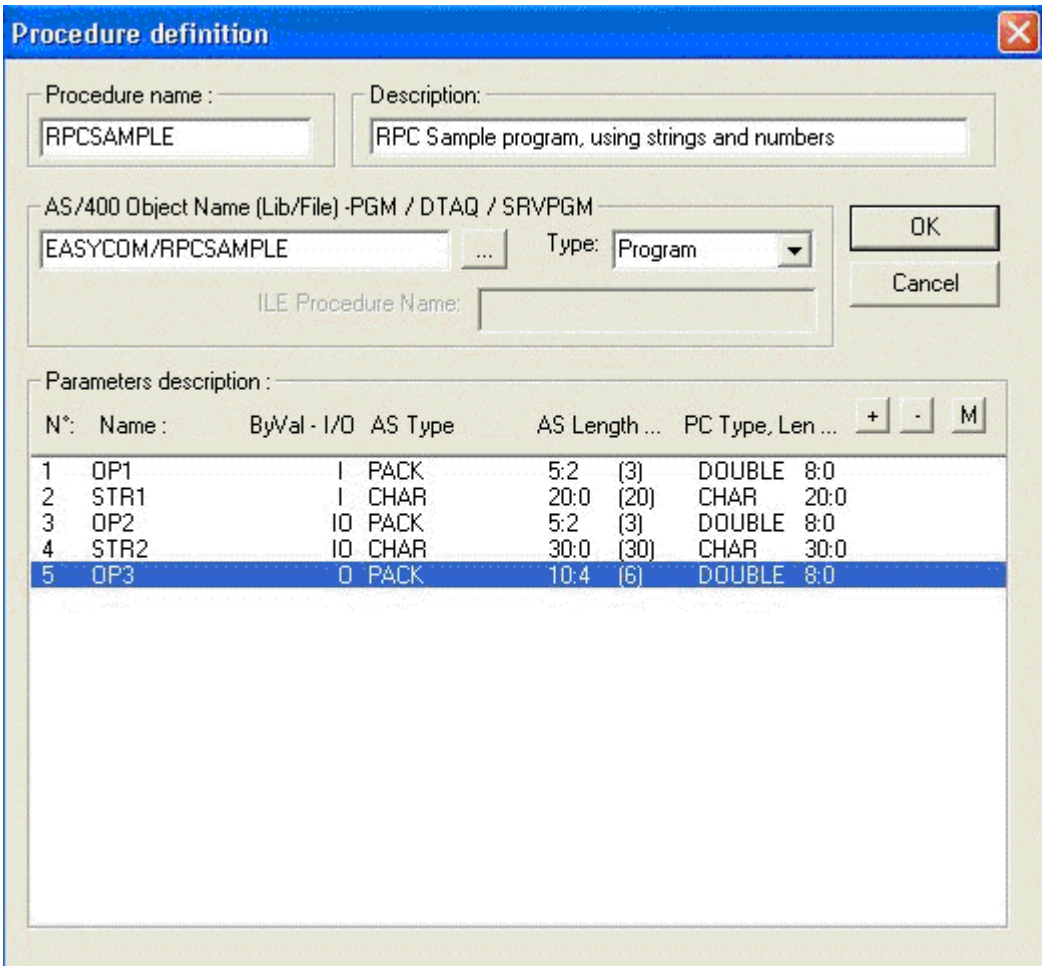
A native AS/400 program (CL, RPG, COBOL, C etc.) is associated to the procedure.

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.



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.

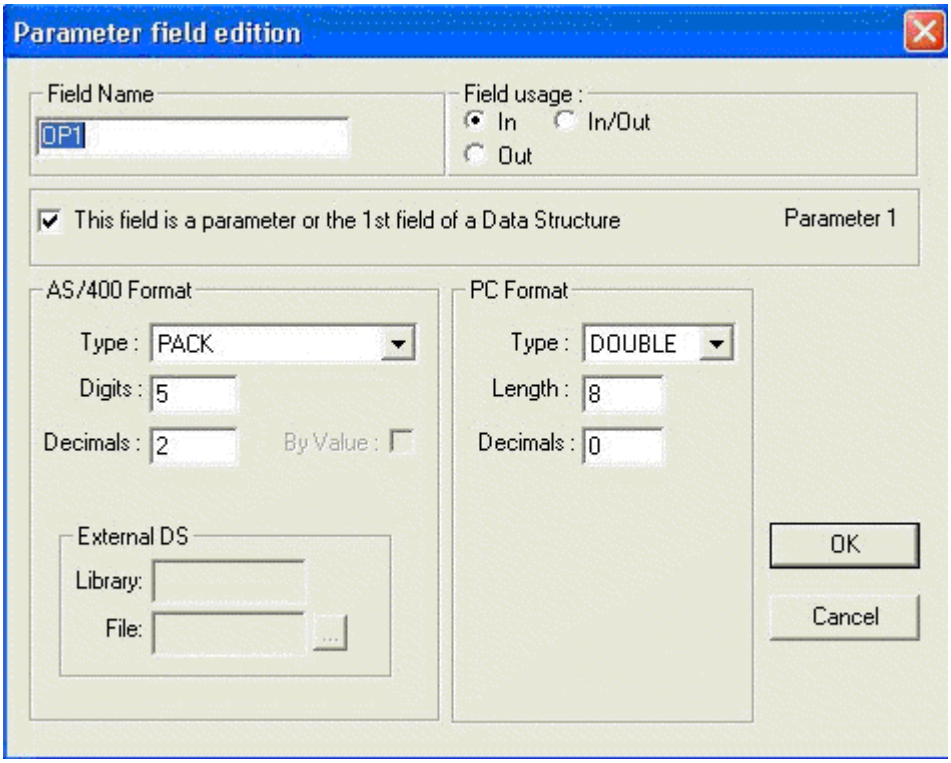
If a calling parameter of the program is a structure (DS : Data Structure), each field of the DS has to be described individually.

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.

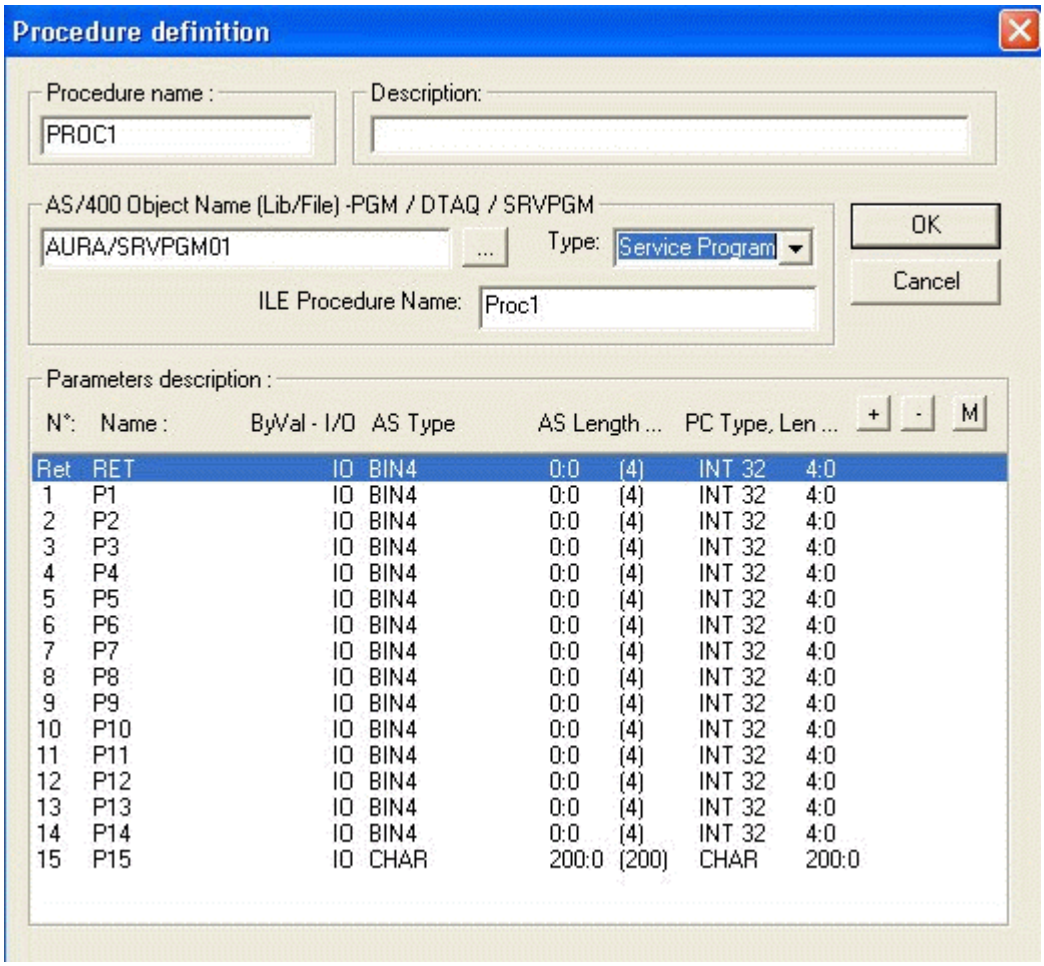
It must be "Service Program" type.

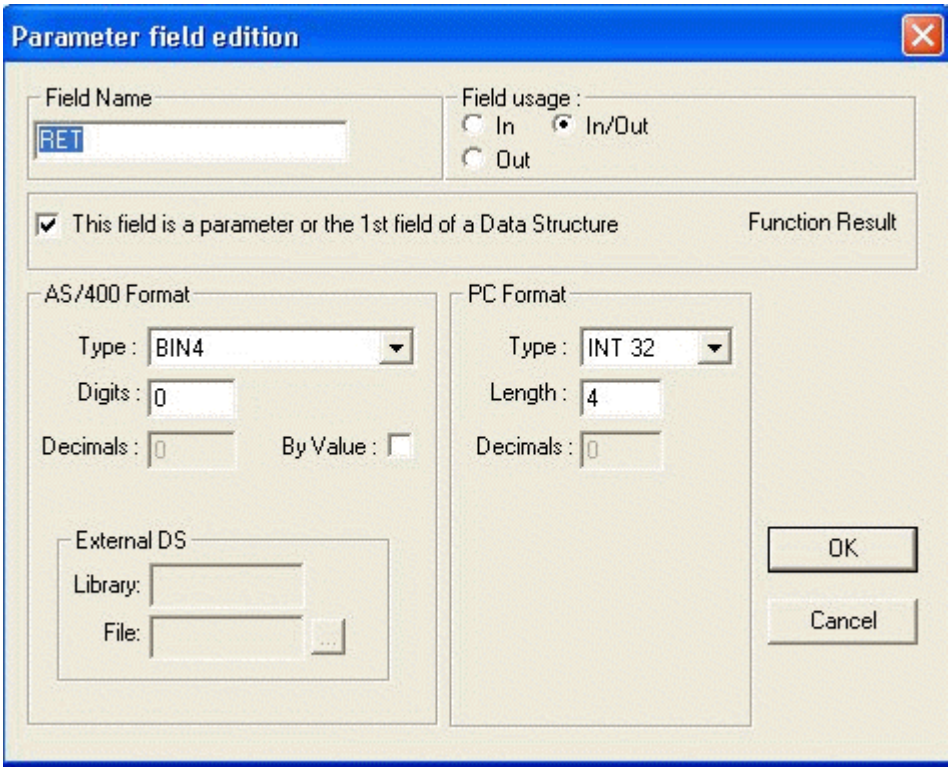
The first described parameter is the procedure returned value.

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.





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 :	supporteasycom@easycom-aura.com	AURA Equipements
		108, Rue de la Boëtie
Tél. :	33 (0) 1 56 81 28 70	75008 Paris
		FRANCE
Fax :	33 (0) 1 56 81 90 22	
Internet :	http://www.easycom-aura.com/	

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/

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 56 81 28 70

Fax : + 33 (0) 1 56 81 90 22

eMail : supporteasycom@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 spended 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, KET_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 is 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: ○ 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 CFGEACEIM 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 CFGEACEIM 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.

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 CFGEACSBS 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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