

# ABSTRACT

**ABSTRACT** provides an integrated set of cross-referencing, documentation, and programming tools for AS/400 and iSeries systems. ABSTRACT analyzes your applications and builds a “where-used” cross-reference of system objects and procedures. It tracks object and field usage, relationships between objects, file analysis and other important reference information. Graphical flowcharting is also available to help you document and analyze your applications. All this information is available to you at a mouse click. Pop-up menus allow you to edit source, view object usage, recreate file relationships or initiate a number of other options.

ABSTRACT may be used from three different user interfaces:

1. WebSphere Development Studio
2. iSeries Navigator
3. 5250 Host (green screen)

All versions of ABSTRACT use the same cross-reference database resident on the iSeries or AS/400, and all versions are included in the license fee.

ABSTRACT simplifies iSeries and AS/400 development tasks and will help you be more productive, whether you're maintaining existing applications or developing new ones. Everything you need is integrated into one consistent, easy to use interface. You'll be able to use ABSTRACT as your primary development environment from the start of your work day until the end.

The image displays two screenshots of the ABSTRACT software interface. The top screenshot, titled 'Object where used', shows a table with columns for Library, Type, Attribute, Usage, and Text. The table lists various objects and their usage, such as 'CUSTMAST' being used in 'Pld E-3' for 'Customer Number'. The bottom screenshot, titled 'Object references', shows a hierarchical flowchart of system objects and their relationships, including objects like 'CUSTMAST', 'CUSTCOPY', 'CUSTLIST', 'CUSTPRO', 'CUSTSTRT', 'CUSTSTRT', and 'CUSTQUERT'.

Library	Type	Attribute	Usage	Text
CUSTMAST	FILE	Pld E-3		Customer Number
CUSTMAST	FILE	PF		SECUREL Guide
CUSTCOPY	PGM	RPG	Out	MANUAL
CUSTLIST	PGM	RPG	Imp	MHC(CUSTLIST) Sec
CUSTPRO	PGM	RPG	Imp	Filter customer
CUSTSTRT	PGM	RPG	Out	MHC(CUSTSTRT) Sec
CUSTMAST	FILE	PF		SECUREL Guide
CUSTQUERT	QRYDFM	QRY	Imp	Query using CUSTMAST in QDHEAD to get cust. MHC(CUSTQUERT) Sec

With a click of a mouse, ABSTRACT shows “where-used” information for fields or system objects.

ABSTRACT generates flowcharts in both standard and Visio format.

## Summary of ABSTRACT features:

**Cross-Reference Database** - Contains object relationship information about your applications. The cross-reference database is easy to maintain and update using ABSTRACT's intuitive menus and options.

**Object Relations** - Different object reference and 'where-used' scenarios are easy to display and interpret. This information is based both on real-time information and on data loaded into the cross-reference files.

**Flowcharts** - Graphical flowcharting is included as a standard feature within the Object Relations function. Visio users have the ability of generating flowcharts in that format.

**File Analysis** - Provides information about database, display and printer files, including external and internal file layouts, database relations and member definitions.

**Recreate Database Relations** - Recreates all affected objects after changes are made to a physical file record layout and/or programs are modified.

**Exception Reports** - Show potential problems with your applications or ABSTRACT cross-reference data.

**Find String** - Searches source and message files for occurrences of one or more specified strings.

**Edit Objects** - Interfaces with IBM's Code/400 or a compatible 3rd-party editing tool.

**E-mail (includes Esend)** - ABSTRACT includes the base version of ASC's **Esend** product which provides report and file distribution by e-mail and FTP.

**ABSTRACT Conversion Utility (ACU)** - ACU is an add-on product consisting of two modules: Impact Analysis and Conversion. The Impact Analysis module allows you to nominate fields for expansion or a more detailed impact analysis. The Conversion module provides automated source code conversion for field expansion projects.



ABSTRACT includes plug-ins to WebSphere Development Studio and iSeries Navigator (the iSeries Navigator interface is shown above). Pop-up menus in both plug-ins let you edit source, recreate objects, generate flowcharts or initiate other development tasks.

## Cross-Reference Database

ABSTRACT analyzes your applications and builds a “where-used” cross-reference of system objects. It tracks object and field usage, relationships between objects, file analysis and other important reference information.

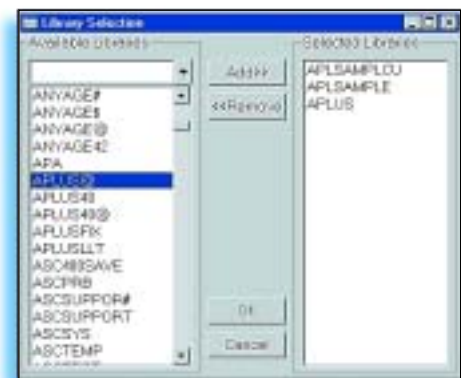
ABSTRACT makes it easy to keep the cross-reference information for several application sets independent, using different **data sets**. Whether you want to make a distinction between “production” and “development” applications, or to segregate the documentation for each application into different databases, ABSTRACT can accomplish your objective by allowing you to specify a data set name when the initialization request is made.

Information in the various data sets will remain independent throughout the analysis, reporting, and development phases of ABSTRACT use.

The **Library Selection** window (right), as its name suggests, allows you to specify the libraries to load into the ABSTRACT cross-reference. This window displays all the libraries on your iSeries in the left-hand column. All you need to do is double-click a library name or use the **Add>** button to include a library in the selection list, displayed in the right column. You also have the option to load only specific object types or objects into the cross-reference.



The Defaults window allows you to specify the active data set along with a number of additional job submission parameters.



### The following object types may be included in the ABSTRACT cross-reference:

- Files
- Fields
- Programs
- Copybooks
- Source Files
- Job Descriptions
- Subsystem Definitions
- ILE Objects
- Query/400 and QMQUERY Objects
- CA-PRMS Menu Definitions
- Subroutines
- Formats
- User Profiles
- Commands
- Menus
- Members
- SEQUEL and SQL Objects
- OpCenter Scheduler Job Definitions
- ROBOT Job Schedule Definitions
- Procedures
- RPG-to-Java Procedures

### When the initialization process is complete, the cross-reference database will contain the following information:

- Database structure
- Physical/logical relationships
- Format definitions
- Field definitions
- Flow of control
- Program-program transfers among CL and HLL programs/modules
- User profile initial program
- Command processing program (CPP) access
- Menu access to programs and commands
- Subsystem routing entry programs
- Trigger programs
- Data flow
- File object manipulations
- Program-file relationships
- Program-field relationships
- Database use by SEQUEL views
- Database use by OS/400 query definitions
- Object usage
- Command parameter references within programs
- Command parameter references within job descriptions (user profile, queues, etc.)
- Repository Information
- Binding directories
- Service programs
- FMTDTA
- Overrides / Stored Procedures

## Object Relations

ABSTRACT provides two major cross-referencing functions:

**Object references** – Objects “used by” a selected object

**Object usage** – Object “where used”

Object reference and usage information are presented on displays using a hierarchical approach, similar to other iSeries Navigator and WebSphere displays. The object relation displays provide you with a true object-action mechanism of working with the various elements of your software applications.

An **Object Usage** display shows wherever a selected object is used. The example at the left shows the usage for a physical file named CUSTMAST. There are two primary branches for the CUSTMAST file. The first branch shows all

Object	Library	Type	Attributes	Usage	Text	Extended
CUSTMAST		FILE	RF		SEQUEL Outfile	Lib(*LIBL)
CUSTMAST	APLSAMP	MODULE		ExternalFS		Seq(*PF)PFCSeq(*S)Seq(*T)
CUSTNDCHGE	APLSAMP	PGM	CLP	INTRDP		
CUSTCOPY	APLSAMP	PGM	RPG	inpOut		
CUSTLIST	APLSAMP	PGM	RPG	inp	File summary	
CUSTTRFL	APLSAMP	PGM	RPG	inp		
CUSTTRFDT	APLSAMP	PGM	RPG	Updt		
CUSTMAST	APLSAMP	FILE	RF		SEQUEL Outfile	
CUSTMAST	APLSAMP	FILE	RF		SEQUEL Outfile	Lib(*LIBL)
CUSTNDCHGE	APLSAMP	PGM	CLP	INTRDP		TRFILEAPLSAMP/CU
CUSTMAST1	APLSAMP	FILE	LF		Customer Master File	
CUSTMAST1	APLSAMP	FILE	LF		Customer Master File Seq. by Account Date	
CUSTM03	APLSAMP	FILE	LF		Customer Master File	
CUSTMAST	APLSAMP	QRYDFN	QRY	Query	Query joining CUSTMAST to (CUSTHEAD) to get what	

usage within the library list of the user profile that submitted the initialization process, as indicated by the value **Lib(\*LIBL)** in the **Extended** column. The second branch shows usage only within the APLSAMPLE library, which was the only library actually loaded into the cross-reference during the initialization process.

In addition, “where-used” information may be displayed at different levels:

- **Field Where Used** displays show where a selected field is used.
- **File Group Usage** displays show usage information for a physical file and its related logical files.
- **Field Group Usage** displays, similar to File Group Usage, show usage information for a physical file and its related logical files, only at a more detailed field level.

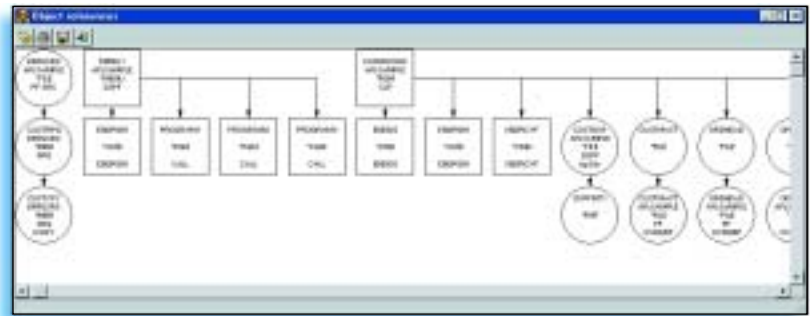
Object	Library	Type	Attributes	Usage	Text	Extended
CUSTCOPY	APLSAMP	PGM	RPG			
CUSTMAST		FILE	RF	inpOut	SEQUEL Outfile	Lib(*LIBL)
CUSTMAST		PGM				
AMTDU	CUSTMAST	FIL	Rcd 11.2	Out	Outstanding A/R Balance	Subr(120 126)
CADD1	CUSTMAST	FIL	Dir 25	Out	Customer Address Line 1	Subr(30 54)
CADD2	CUSTMAST	FIL	Dir 25	Out	Customer Address Line 2	Subr(55 79)
CADD3	CUSTMAST	FIL	Dir 16	Out	Customer Address Line 3	Subr(80 95)
CNAME	CUSTMAST	FIL	Dir 25	Out	Customer Name	Subr(5 25)
CPHON	CUSTMAST	FIL	Rcd 16.0	Out	Phone Number	Subr(108 112)
CHUM	CUSTMAST	FIL	Rcd 3.0	Out	Credit Limit in Dollars	Subr(118 120)
CSTTE	CUSTMAST	FIL	Dir 2	Out	Customer State	Subr(96 97)
CTYPE	CUSTMAST	FIL	Dir 2	Out	Customer Type	Subr(114 115)
CUSNO	CUSTMAST	FIL	Rcd 8.0	Out	Customer Number	Subr(1 4)
CCPC	CUSTMAST	FIL	Dir 10	Out	Customer Zip Code	Subr(90 107)
DFW4H	CUSTMAST	FIL	Dir 2	Out	Default Warehouse	Subr(164 165)
H24B	CUSTMAST	FIL	Rcd 3.0	Out	Highest A/R Balance	Subr(132 136)
H24C	CUSTMAST	FIL	Rcd 3.2	Out	Work to Date Limit	Subr(148 152)
OPDPS	CUSTMAST	FIL	Rcd 3.2	Out	Total Open Orders in Dollars	Subr(127 131)
PLC0H	CUSTMAST	FIL	Rcd 11.2	Out	Last Payment Amount	Subr(127 142)
PLC0MY	CUSTMAST	FIL	Rcd 8.0	Out		Subr(139 173)
PLC0Y	CUSTMAST	FIL	2nd 2.0	Out	Last Payment Date Day	Subr(145 146)
PLC0J	CUSTMAST	FIL	Rcd 5.0	Out	Last Payment Date J2J	Subr(158 163)
PLC0Y	CUSTMAST	FIL	Rcd 8.0	Out	Last Payment Date MEY	Subr(168 169)
PLC0M	CUSTMAST	FIL	2nd 2.0	Out	Last Payment Date Month	Subr(143 144)
PLC0Y	CUSTMAST	FIL	2nd 8.0	Out	Last Payment Date YMD	Subr(174 175)

**Object reference** displays show the objects used by a selected object. The window at the left shows the files and fields used by an RPG program named CUSTCOPY. Note that field usage within the program (input/output) is also identified.

# Flowcharts

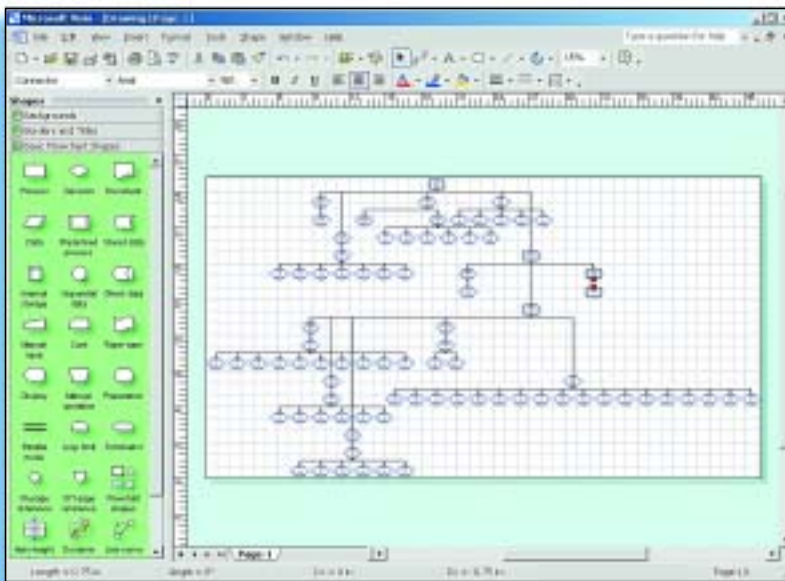
## Job Stream Flowcharts

ABSTRACT includes a standard job stream flowcharting function in both the WebSphere Development Studio and iSeries Navigator plug-ins that generates flowcharts showing the relationship between objects in a graphical format (right). Flowcharts may be edited by the user to incorporate planned changes or enhancements to the application.



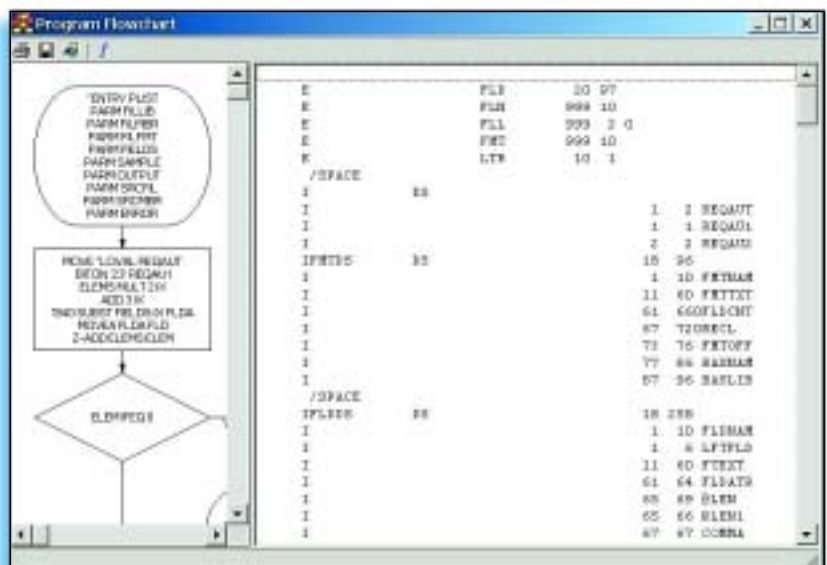
## Visio Support

Alternately, ABSTRACT will generate job stream flowcharts in MS-Visio format for users of that tool. (Visio must be purchased separately.)



## Program Source Flowcharts

The WebSphere plug-in also contains a program source flowcharting function that analyzes logic within RPG programs.



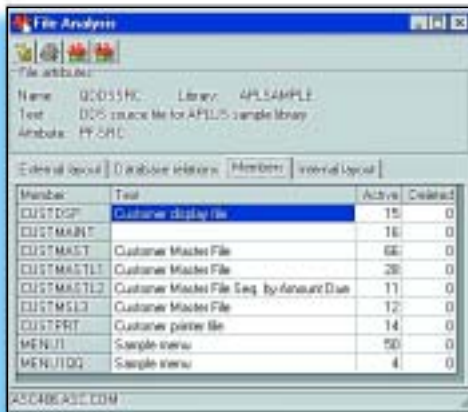
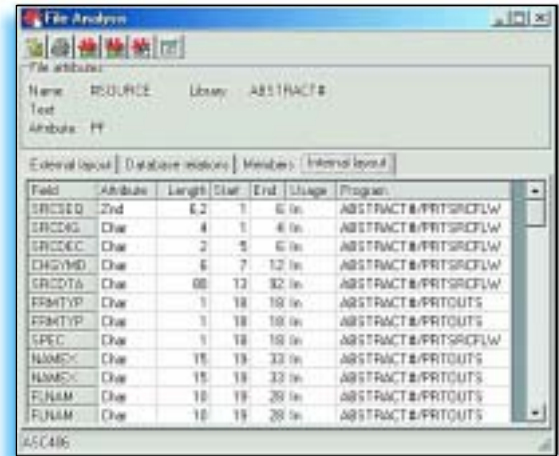
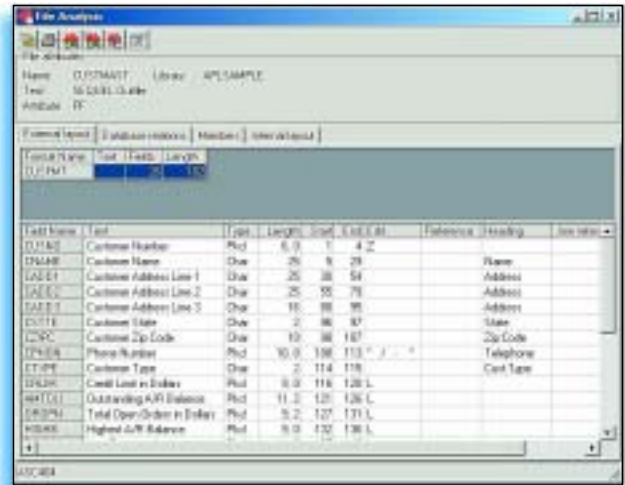
## File Analysis

ABSTRACT's **File Analysis** option shows information about a selected file through a tabbed interface.

### External and Internal Record Layouts

The **External Layout** tab shows the external definition of the record format. If the file has more than one format, you may click on the name of the format for which you want to see information. Each field in the format will be shown in positional order along with its attributes, length and text, if any. You may right-click on a field name to show options available for that field.

When available, the **Internal Layout** tab provides information about your application's use and definition of program described files. If programs in your application use record or field definitions that are different from the external definitions in the database, ABSTRACT will acquire and store the program descriptions in its database. The program which provides the description is shown in the display, and its use of the field is also indicated.

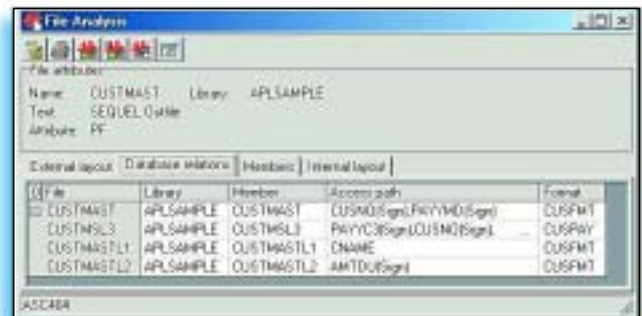


### Member Information

The **Members** tab shows information for each database file member (this option is not available for device files). For each member, a count of active and deleted records is shown, as well as member text.

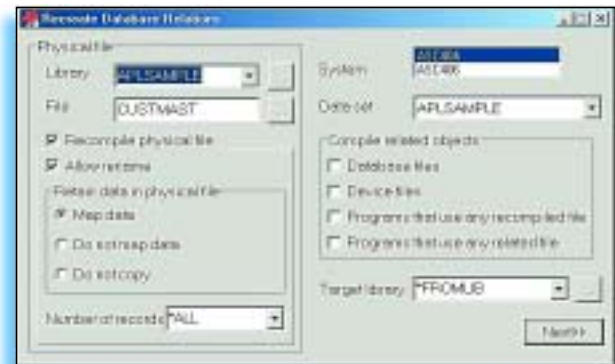
### Database Relations

The **Database Relations** tab depicts database structure and access path information. Use it to determine the relationships among the physical and logical database files in your application. This example lists the database structure in which the CUSTMAST file participates. Each member of the physical files in the structure is represented at the leftmost position of the file name column. Logical file members that are built on the physical file member are listed underneath it and indented to the right. Access path information is listed to the right of the file and member name.



## Recreate Database Relations

The **Recreate Database Relations** option will greatly reduce the time and effort required to recreate all affected system objects when changes have been made to a program or a physical file record layout. It automates many of the file changes that CHGPF can not do, like source changes in logical files. This option does not rely on cross-reference information. Current database structure, file attributes and other information is analyzed when the option is run.



The recreate database relations option performs the following steps *automatically*:

- Renames the current physical file to preserve its data
- Creates the new physical file in using the current file attributes
- Creates all logical files built on the “old” physical into QTEMP
- Adds members to the newly created physical
- Adds members to the newly created logicals, preserving original DTAMBRs structure
- Copies data from “old” physical file to new file
- Deletes logical files from “old” physical file
- Deletes “old” physical
- Moves the new logicals from QTEMP to their original library(s)

## Exception Reports

The Exception Reports option allows you to create reports that describe potential problems with your application or ABSTRACT cross-reference data. It is recommended to run the report and resolve conflicts before a library is loaded into the cross-reference to ensure correct source for the programs is analyzed and to avoid having to re-run the cross-reference load process. Exception reports may contain the following information:

**Orphaned objects** - Objects in an application library that are not referenced by any object loaded into the ABSTRACT cross-reference database. Presumably, if it is not referenced, it is not used by your application.

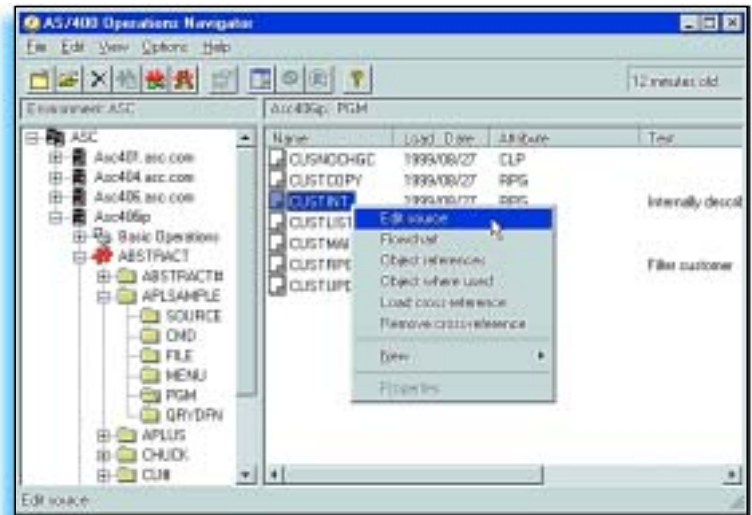
**Undocumented objects** - Objects in an application library that have never been loaded into the ABSTRACT cross-reference database, or that haven't been loaded since a given date.

**Object-source conflicts** - Objects in your application library with service (compile-time) information that references a source member that cannot be located on your system, or that references a source member changed since the object was created.

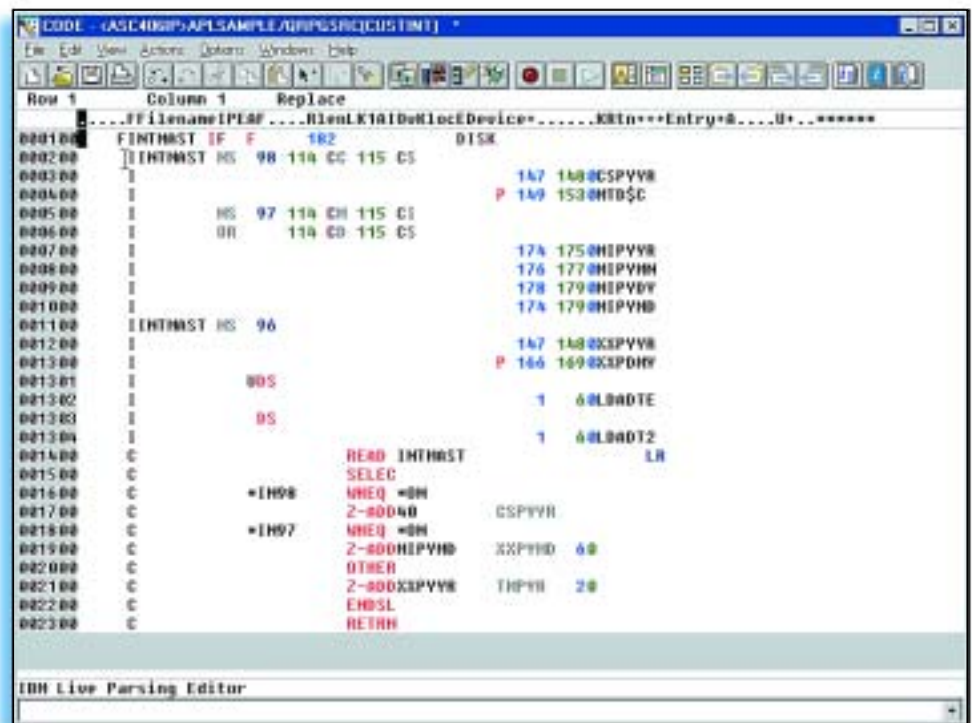
**Unused objects** - Application objects that have never been used, or haven't been used since a given date. The OS/400 operating system updates an object's last used date whenever it is used.

## Edit Source

You can right-click on an object shown within an ABSTRACT window, then take the Edit Source option to start an edit session in IBM's Code/400 product (bottom of this page) or another compatible 3rd-party editing tool.



Code/400 Edit Screen Example





## Host Interface

ABSTRACT includes three different user interfaces - two graphical interfaces for WebSphere Development Studio and iSeries Navigator, and a “green screen” interface. All versions of ABSTRACT use the same cross-reference database resident on the AS/400 or iSeries and offer similar functionality.

The host interface appears similar to IBM's Programming Development Manager (PDM). ABSTRACT takes the PDM concept a lot further, however, with:

- More powerful options
- An integrated cross-reference
- Enhanced display station capabilities

ABSTRACT puts all development tasks and utilities just a keystroke or two away in a consistent, easy-to-use interface. The cross-reference locates all required system objects and the ABSTRACT options execute whatever you need to accomplish. All tasks may be done very quickly, saving you significant amounts of time.

ABSTRACT's real power is in the integration of its cross-reference directory with its options. The host interface lets you complete virtually all development tasks from a single screen. PDM-like option codes let you select an object from the cross-reference display and use options to edit, recompile, ...or do whatever else you want. You'll no longer have to navigate through multiple utilities and screens to get your job done. You'll spend a lot less time and get a lot more done with ABSTRACT.

- Standard options are predefined for most development activities.
- Custom option codes can be defined and saved in personal option libraries.
- PDM options can be converted automatically.
- Function key options can also be defined.
- Option codes can be 3 characters in length to provide better descriptions and more options (PDM allows only 2 characters).
- Multiple commands can be defined within each option code (up to 1,000 characters are available for each option).
- Powerful substitution parameter capabilities reduce transactions and provide closer integration to called programs.
- Generic options can be driven by both object type and object attribute.
- An option file window can be pulled up at any display. Options can quickly be reviewed, created, or modified without leaving the development environment.

You can also run ABSTRACT operations through its menus, at the command line, or called from other programs using a Callable Action Bar or a “Where Used” API. ABSTRACT can be used in conjunction with most of the change management products in the iSeries and AS/400 market.

## E-Mail / FTP Report Distribution

ABSTRACT contains the base functions of ASC's Esend e-mail and FTP report distribution product.

Esend provides a convenient method of automatically e-mailing iSeries spooled files and PC files on the IFS in a variety of formats. It can also FTP iSeries database files or IFS files to other servers. In addition to file transfer, Esend is also useful as means for backing up or archiving output queues. Esend provides a series of intuitive, easy-to-use menu options to facilitate its use. Default settings tailor many aspects of e-mail to individual user requirements, including the following:

**E-mail Attachments** - Supports up to 300 attachments per message with a maximum message size of 16 Mb.

Attachment contents may optionally be embedded within the message body. If you wanted to include graphics and other formatting with a spooled file, you could merge HTML headers and footers before and after a spooled file report in the body of an email.

**Spooled files** - Sends spooled files to another iSeries server in standard spooled file format. Spooled files may also be converted to HTML, RTE, TXT or PDF for deployment on a company's website or for other external distribution requirements.

**Database files** - Sends iSeries file data in binary mode to remote iSeries systems to preserve packed data. (The target file must already exist on the remote system).

**Distribution Lists** - E-mail and FTP address lists can be predefined in external physical file members to facilitate broadcast delivery.

**Intuitive Menu Options** - Esend provides a series of intuitive, easy-to-use menu options to facilitate its use.

**Customization** - Default settings tailor many aspects of e-mail to individual user requirements. E-mail messages may include 'date sent' and up to 6 lines of signature text.

**Advanced Function Printing (AFP) and Form Overlay Support** - Esend provides the ability to work with AFP spooled files - including conversion of AFP to PDF format. Esend also support Form Overlays.

## ABSTRACT Conversion Utility

ABSTRACT Conversion Utility (ACU) is an add-on to the base ABSTRACT product that addresses some additional needs encountered in some RPG development projects.

ACU's **Impact Analysis** module provides a more granular level of **source manipulation of database fields**. For example, it shows how specific fields are manipulated within programs (such as in work fields or data structures) and are then passed as variables to external programs.

The **Conversion** module is designed to automate many of the most time-consuming tasks related to **field expansion** projects. Specifically, the Conversion module will:

- Generate a member-level impact analysis
- Expand database fields within affected objects
- Convert data
- Recreate object relationships

The Impact Analysis and Conversion modules are described in more detail, below.

### Impact Analysis

ACU's **Impact Analysis** module provides on-line inquiries and reports that show the scope and impact of necessary changes. Impact analysis information includes high-level summary statistics, project costing estimates and details on each line of source (CMD, DDS, RPG, RPG ILE and CL) that needs to be changed. The Impact Analysis module can be licensed separately or is included within the complete product.

After identifying database fields, you'll be able to submit a menu option that generates an impact analysis. The impact analysis uses the cross-reference database, package defaults and conversion attributes specified for each field to determine the scope and impact of necessary changes. It also rigorously analyzes source code to identify all program-defined work fields that also need to be expanded.

When the impact analysis is complete, you can print impact analysis reports or review the impact analysis information on-line. Three general classifications of reports and inquiries are available:

- Field/Members Where Used
- Member/Fields Used
- Project Costing

Project cost estimates for programmer resource requirements and programmer costs are based upon impact analysis data and user-defined costing factors. These estimates reflect the cost of completing the conversion effort without the assistance of ACU.

## Conversion

The automated conversion process is where ACU really pays for itself. It eliminates weeks and even months of manual effort. You can initiate a batch job from an ACU screen that completes the conversion for you.

The **Conversion** module automatically converts existing source code. It expands field references when converting applications, while new source members are created based on existing source and the conversion attributes you have selected. You have the flexibility to expand each field using either global or field-specific conversion attributes. When the conversion steps are complete, ACU will automatically create new files, rebuild file relationships and recompile programs. Data from existing databases will be converted to new formats as necessary.

During the conversion process, changes are not made to your existing source members, but to members copied by either ACU or your change management system. ACU converts RPG, ILE RPG, CL, DDS, internally-described record layouts, and command definitions. After the automated conversion step is complete you can review all changes before you recompile members. ACU inserts a "CU" (or your choice of characters) in positions 3 and 4 of every line of converted source so you can easily track what changes are made. You can also set an optional default to comment-out and retain original lines of source for a good "before and after" view of what was changed.

ACU automates and simplifies the otherwise time-consuming tasks of recreating file relationships, recompiling affected programs and converting data. This option lets you submit a batch request that will complete all these tasks at once. You also have the ability to partition the effort into multiple requests as your needs dictate.

ACU recreates physical files and all associated logical files. It also recreates any database or device files that reference converted files via the REF or REFFLD keywords. All current data is preserved, along with file attributes, physical/logical structure and journaling. Files are generally compiled into a new library, leaving the original library unchanged. Programs that are dependent upon the converted files are also recompiled. If an error is encountered while a file is being compiled, built-in error recovery restores the physical and logical files to the original status.

