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Towards the Integration of Object-Oriented Constructs within Structured Query Language (SQL)

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TOWARDS THE INTEGRATION OF OBJECT-ORIENTED CONSTRUCTS WITHIN STRUCTURED QUERY LANGUAGE (SQL)

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ABSTRACT

This paper explores the possibility of coupling SQL with a semantic data model. For this study, the primary objective was to build a working prototype of a program that allows a database designer to define data objects and their respective interrelationships using the Object-oriented Semantic Association Model (OSAM*).

The prototype isolates from the designer the low level commands (i.e., CREATE TABLE, CREATE INDEX) which comprise the SQL data definition language (DDL). Once the objects are defined by the designer, the prototype generates the relational database table definitions without the designer having to directly use the SQL DDL.

Chapter 1

INTRODUCTION

Of the myriad of applications in which computers have been employed, perhaps none is so pervasive as the database. Since the advent of computers, an ever-growing body of work has been compiled with regard to database management in both industrial and academic circles. Not surprisingly, a considerable amount of controversy has never been far behind. Today, the whole question of current and future trends in database management is one that is hotly debated--particularly in the area of relational database technology.

The fundamental concepts of the relational model were first documented in the early 1970s [Codd70]. A few years later, the original Structured Query Language (SQL) was formally presented as a language for the defining and manipulating of a relational database [Cham74]. Since that time, SQL driven relational databases have evolved into a de facto standard and have been widely accepted in the industry. Even so, SQL driven databases have been heavily criticized for their inability to adequately represent more complex relationships [Codd79]. For this reason, other database methodologies continue to be researched.

One such methodology that is especially prominent in the literature is that of semantic data modelling. Semantic data modelling grew out of the need to more easily depict data abstractions that more closely resembled real world objects. The first published semantic model appeared in the mid-1970s [Abri74]. This and other early papers on the subject presented semantic models as strictly a high level tool for initial schema design, rather than as a full fledged database management system (DBMS). Some of these earlier models include the Entity-Relationship (ER) model [Chen76], the Functional Data Model (FDM) [Kers76], and the Semantic Database Model (SDM) [Hamm81]. Progressively, these semantic data models became more refined and the scope extended to incorporate a database structure. In recent years, a renewed interest in semantic data models has been kindled in part by the heightened industry awareness of object-oriented techniques. Modern semantic models, such as the Object-oriented Semantic Association Model (OSAM*) [Su88], and the IRIS model [Derr85], are testimony to this interest.

There is an immediate problem, however, with semantic models coupled with databases in that they are neither standard nor accepted within the industry. Most do make use of a DBMS that is relational, though these databases frequently exhibit nonstandard features. In addition, many of these model driven databases have their own special languages that

do not conform to the SQL standard. This lack of compatibility with what is now a standard will undoubtedly slow the acceptance of such models, however good, by industry.

This is not to say that the SQL driven relational database is the best way to accommodate objects and abstract data types. Rather it is to say that, for better or worse, SQL is a standard and will likely continue to be for quite some time. It may be that SQL just cannot be made to efficiently manage the complex objects that are addressed by these semantic data models. However, if some of the ideas that have been put forth in these semantic models can somehow be incorporated into SQL, the industry would be in a much better position to put to work the research that has been done thus far.

Curiously enough, there appears to be little in the way of literature that pursues the idea of taking SQL as it now stands and adding to it some object-oriented capabilities. With the notable exception of the IRIS model, no other major semantic data models even consider SQL a going concern, preferring instead to specify their own languages. What the literature does provide though, is a good solid framework upon which an object-oriented SQL extension can be built.

There is little doubt that the representing of objects within a SQL driven relational database will have its problems--primarily because relational databases were never designed with that in mind. In some instances, these object-oriented "extensions" may turn out to be very superficial changes to SQL. Nevertheless, the idea is well worth considering for the aforementioned reasons.

Chapter 2

THE PROJECT

For this study, the primary objective was to build a working prototype of a program that allows a database designer to define data objects and their respective interrelationships using a high level, object-oriented semantic model. For the purposes of this study, an object can be defined as follows:

> Objects are abstract or atomic entities which correspond to things in the application environment being represented in the database, and may be at various levels of abstraction and of various modalities (media). [McLe91]

The prototype would seek to hide from the designer the low level commands (i.e., CREATE TABLE, CREATE INDEX) which comprise the SQL data definition language (DDL). Once the objects are defined by the user, the prototype would have the ability to generate the relational database table definitions without the designer having to directly use the SQL DDL.

2.1 Selecting a Semantic Data Model

Rather than define a semantic model expressly for this project, an existing semantic model--the Object-oriented Semantic Association Model (OSAM*)--was selected as the

basis for the prototype. OSAM* was selected because it is one of the foremost object-oriented models in the literature as well as one of the most accessible. The prototype encompasses only the fundamental principles of OSAM*, as laid out by Su [Su88]. These principles as they relate to the project are outlined briefly here:

As with many popular semantic models, OSAM* makes heavy use of graphical depictions of objects and their inter-relationships. In OSAM*, these depictions are referred to as semantic (S-)diagrams (see Figure 1) that consist of a series of nodes which are linked together by lines. Each node represents an object class.

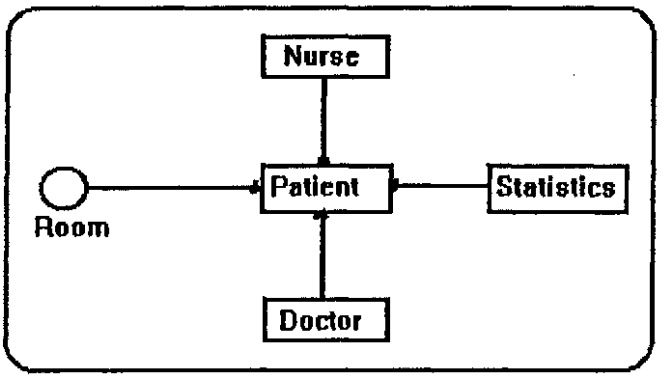


Figure 1: A Simple S-Diagram

In OSAM*, there are two major classes of objects, one of which is the domain (D-)class. According to Su:

> A D-class specifies a domain of permissible values over which attributes of other classes can be defined. [Su88]

A D-class object can represent a kind of data type, such as a string, number, or boolean, or may represent an actual set of values. In the context of an S-diagram, domains are depicted as circles that may be connected to other objects which have attributes dependent upon that domain.

The other object class in OSAM* is the entity (E-)class of objects. According to Su:

> An E-class represents a set of objects that correspond to entities in an application domain. [Su88]

Every instance of an E-class is defined and identified by a set of attributes. These attributes, in turn, may be inherited by other E-classes, and mapped to values in a predefined D-class.

In addition to these two classes, there are five semantic associations for these object classes in OSAM* that are discussed in [Su88]. These five associations derive their definitions from the different interrelationships allowed among E-classes and D-classes and are represented within the S-diagram as the lines that link the nodes together.

From the start, the prototype was envisioned as providing a graphical representation of OSAM* objects based on the OSAM* S-diagram. Because of the emphasis on the graphical aspects of OSAM*, it seemed logical that the prototype would be most

effective if it were built to run within a graphical user interface (GUI). Here again, because the focus of the project was not the GUI itself, an existing GUI would be selected and the prototype built to run within it rather than building a GUI as part of the prototype. With ease of use in mind, the prototype would be made to work in a way that would be consistent with other programs that run under the GUI, adhering as much as possible to any existing standards within the GUI.

2.2 Selection of tools for development

In selecting the host GUI to be used in the project, the primary consideration was industry acceptance. Since the idea was to build a prototype with the industry in mind, the host GUI had to be something of an industry standard. The second major criterion was the physical availability of the GUI and the software required for applications development. In the end, the Microsoft® Windows™ 3.1 GUI (hereinafter referred to as "Windows") was chosen.

With respect to the developer tool to be used to build the prototype, ease of learning and ease of use were the two major criteria. As with any other GUI, Windows has its share of low level programming concerns such as memory allocation, resource compilation, and message handling which must ordinarily be addressed by a programmer using a

traditional language like C, or Pascal. Since these Windows specifics can be difficult to master, attention was focused on those packages which isolate the developer from the lower levels of Windows programming. Strongest consideration was given to those packages that offered an Integrated Development Environment (IDE) within Windows so that the user could actually develop, compile, run, and debug the code from within Windows. Of the packages that were evaluated, Gupta Technologies® SQLWindows™ package (hereinafter referred to as "SQLWindows") was finally selected. In addition to meeting the aforementioned requirements, the package also comes with a single user SQL database that runs under Windows, and an entire suite of SQL functions for accessing the database.

Of course, the very strength of SQLWindows would also prove to be its major weakness. Since the package does isolate you somewhat from the lower level Windows functions, it is not always easy to employ lower level Windows calls from within your code when you need them. Secondly, the product is meant to be used for designing database applications--which this prototype is not. Specifically, it was noticed that the actual graphical capabilities afforded by the package were extremely limited. There are no SQLWindows functions for dynamically drawing lines, boxes, or circles on the basis of any kind of a coordinate system. The other major limitation was the lack of internal data structures

toward working with a SQL database, it is assumed that all complex data structures are somehow represented and managed within the database. Only the single dimensional array is native to SQLWindows. Advanced data structures such as multi-dimensional arrays, link lists, binary trees, and pointers are not supported. This fact was of much greater concern than the lack of graphical capability, because the primary focus of the prototype was not graphics--but affording a means of generating SQL from a semantic model depicted in part by graphics. If the intent was to build a commercially viable product, the typical abilities of panning, zooming, and printing graphics would have to be present; but for the purposes of the prototype, nominal graphics capabilities were required.

2.3 Understanding OSAM*

Once the development platform was determined, the underlying issues and design for the prototype could be finalized. The two most important considerations in designing an OSAM* based tool of this nature are: 1) how an OSAM* defined schema is to be translated into an SQL database, and 2) how this schema is to be presented to the end user.

With respect to the first item, it is submitted that the basic structures found in any given OSAM* schema can be represented in a SQL database using standard SQL tables and

views. Elements of OSAM* that cannot readily be accommodated by SQL can be captured by the prototype and, at the user's option, stored in a special SQL table as metadata to be referenced and updated by the programmer(s) throughout the development life cycle.

To better understand how these tables are derived, consider a typical OSAM* s-diagram. In OSAM*, there are two basic classes of objects that can be modeled. The first class is the Entity, or E-Class. Entities are represented in an s-diagram as a rectangle and can reference any other element within the OSAM* model as attributes of itself. The way a particular entity references another element is known as its semantic association. The five different semantic associations defined in OSAM* are generalization, aggregation, interaction, composition, and cross product which are denoted in an S-diagram by the letters G,A,I,C, and X respectively.

The other OSAM* class is the Domain, or D-Class. Domains are depicted in an s-diagram as a circle and may either be defined as simple or composite. Simple domains usually are defined in terms of elementary data types, such as DATE, INTEGER, or CHAR. They may consist of a finite set of values, or a range of values. They may not make reference to any other entities or domains defined in the model. Composite domains are defined in terms of other classes and

are usually composed of two or more simple domains, though other entities may also be referenced within the model.

Starting with the OSAM* s-diagram, the first step was to identify those aspects of OSAM* which either corresponded directly with existing SQL structures, or could be easily made to do so. In so doing, several less obvious structures within OSAM* were uncovered. Much of the semantic model lends itself very nicely to SQL with some minor modifications. The following represents a summary of the OSAM* structures, or objects, that are implemented in the prototype:

- Simple domains as defined in OSAM* are depicted in SQL as elementary data types. There is no good way to represent some of the OSAM* simple domain structures, such as the incorporation of functions (i.e. COMPUTE) or restrictions on number or date fields into a SQL data type, so these aspects of OSAM* were left as part of the SQL metadata structure.

- OSAM* composite domains are represented in SQL as a simple lookup table. By definition, a composite domain usually is a finite group of values with which other OSAM* objects may be associated. Domains can inherit attributes only from other domains. Objects associated

with composite domains inherit any attributes used to identify the domain as part of the object.

- OSAM* regular entities are represented in SQL as a regular data table, complete with indexes and primary keys. In OSAM*, regular entities can provide attributes to other regular entities with which they are associated. Domains may be inherited by regular entities.

- Composite entities are represented via SQL views. In OSAM*, a composite entity consists of summary attributes derived from a dynamic group of objects. Within OSAM*, composite entities may be nested to any level (a composite of multiple composite entities can be created), but within the prototype only one level of composites is permitted. Composite entities, by definition, are derived from the regular entities with which they are associated, and may have no attributes of their own.

- Like composite entities, cross product entities are defined via summary attributes from other objects, and also take the form of a SQL view. However, cross product entities may have attributes of their own which determine the means by which summary data is broken out. Cross product entities get their attributes from one or more predefined domains with which they are associated. When a regular entity is associated with a cross product

entity, all domains inherited by the cross product entity are passed on to the regular entity.

Chapter 3

DESIGNING THE USER INTERFACE

Once the correspondence between these OSAM* objects and SQL structures was defined, the next step was to design the user interface. Of primary concern when designing the overall presentation of an OSAM* s-diagram was determining those aspects of the semantic model that would be represented graphically.

3.1 OSAM* Concerns

As is the case with most semantic models, the primary difficulty encountered when working with OSAM* is in depicting a given logical database schema graphically. In all but the simplest systems, graphical representations quickly become unmanageable and an alternative means of documenting the database design becomes necessary.

Instead of trying to keep up with all levels of detail within a given database schema, it was decided that the user be provided a high level depiction of the entire system in which only the major system entities would be shown. From here, the user would be given the option to create or remove high level entities from the diagram and associate them with one another via connecting lines. Also, the prototype had

to allow the user to be able to place or move (cut and paste) objects on the screen. It was also desired that the prototype support some simple rerouting logic as objects were placed on the screen.

Because of the limited graphics capabilities of SQLWindows, programming the graphical portions of the prototype was something of a challenge. To an end user, the prototype had to be able to draw boxes, circles, and lines much in the way that an OSAM* s-diagram would appear. Unfortunately, there are no functions internal to SQLWindows that allow a programmer to do this. In SQLWindows, lines must be hard-coded objects defined within a top level window and are generally used to give an aesthetic touch to the interface. Lines cannot be programmed to respond to mouse clicks or any other user actions. They cannot be generated dynamically unless the program accesses special graphics functions in the Windows API. Microsoft does manufacture a Windows Software Development Kit (SDK) for the purpose of using the API functions; but at the time, this was unavailable.

Eventually, special functions were written to keep track of the window handle assigned to each line. A window handle is an internal identifier which is assigned to any given Windows object at the time that object is created. Given a window handle, SQLWindows does have functions that allow a programmer the ability to hide and show windows, thus

creating the illusion that the line is "drawn." The logic that dictates which lines are drawn is hard coded based on which OSAM* objects on a screen are associated with one another. However, since each line is its own Windows object, too many lines defined on a given top level window can affect the performance of the program. For every OSAM* object depicted on a screen, a whole set of lines had to be hard coded to allow that object to be "associated" with any other object on that screen. This served to be the primary limitation as to how many OSAM* objects could be depicted on a screen. To accommodate 10 OSAM* objects on the screen, 62 separate lines were required.

Boxes and circles were somewhat easier to implement. Like the lines, all the boxes and circles had to be predefined objects on the top level window. Boxes were represented by data fields (which are rectangular by default) and circles were represented by picture fields, which are used for displaying bitmaps on a window. Fortunately, SQLWindows has a considerably richer set of functions for manipulating data and picture fields. Data fields are used to display numbers or text and can interpret and take actions on a Windows SetFocus message, which is received whenever the user tabs into the data field or clicks on it with a mouse. Picture fields can also intercept a mouse click or double click.

3.2 SQL Concerns

With respect to SQL, the principle design issue was determining the extent to which the user would be isolated from SQL itself. Ideally, the semantic model on the screen would be as complete a schema as would be needed to generate a complete set of SQL statements, but as with most semantic data models, OSAM* was not designed around SQL. OSAM* is best at modeling the overall relationships between objects which roughly translate to relationships between tables in SQL. However there are certain aspects of SQL, such as the length of a character field within a table, which cannot be practically designated on a traditional OSAM* s-diagram. At some point, then, the user would have to be required to key in all of the detail necessary for SQL; so the original intent was for the prototype to isolate the user from as much of the SQL syntax as possible and provide an easy means for entering the required SQL details. The prototype could then generate the SQL for the s-diagram, and write the finished SQL to a file.

Another major concern regarding SQL was the question of referential integrity. Until relatively recently, the concept of referential integrity (rules that guarantee the validity and accuracy of tables which are reliant upon other tables within the database) was the exclusive domain of relational database theory since few, if any, commercially

available databases actually supported it. As of this writing, there are several vendors that offer databases that provide referential integrity. For its part, SQL has always had the PRIMARY KEY and FOREIGN KEY constructs for defining referential integrity among its tables, but there are still a number of databases that, while they profess to be SQL databases, do not recognize these clauses. Since it was a primary objective that this prototype be useful across any SQL database, it was felt that it should be able to generate PRIMARY KEY and FOREIGN KEY clauses at the user's option.

Finally, there was the question of the SQL syntax itself as it tends to vary from database to database. Many vendors offer enhancements to SQL in their products which are not ANSI SQL compliant. For this reason, it was decided that the prototype would generate ANSI SQL only, on the assumption that most SQL databases should support at least the ANSI standard.

Chapter 4

IMPLEMENTING THE OSAM* DESIGNER

4.1 The Workspace: Showing the s-diagram

It was desired that the prototype's main window present the user with an overall workspace within which the user would construct a likeness of an OSAM* s-diagram (see Figure 2). The workspace is limited in the number of objects that could be viewed on any one screen, but the user has the ability to scroll horizontally and vertically around the workspace. For the purposes of the prototype, the number of screens allowed is limited to 324 arranged in an 18x18 matrix; such that from the center of the workspace, the user may go 9 screens in any direction. At all times, the user is able to see their relative position within the entire workspace via screen coordinates displayed at the lower right hand corner of the workspace. Screen (0,0) denotes the center of the workspace, whereas screens having horizontal or vertical coordinates of 9 or -9 denote the boundaries of the workspace. These screens hold up to 10 objects apiece, but are also designed to partially overlap one another when scrolling such that any individual screen can only hold five distinct objects on average. In all, well over 1500 objects

can be accommodated within any one s-diagram, where a single object usually corresponds to a SQL table.

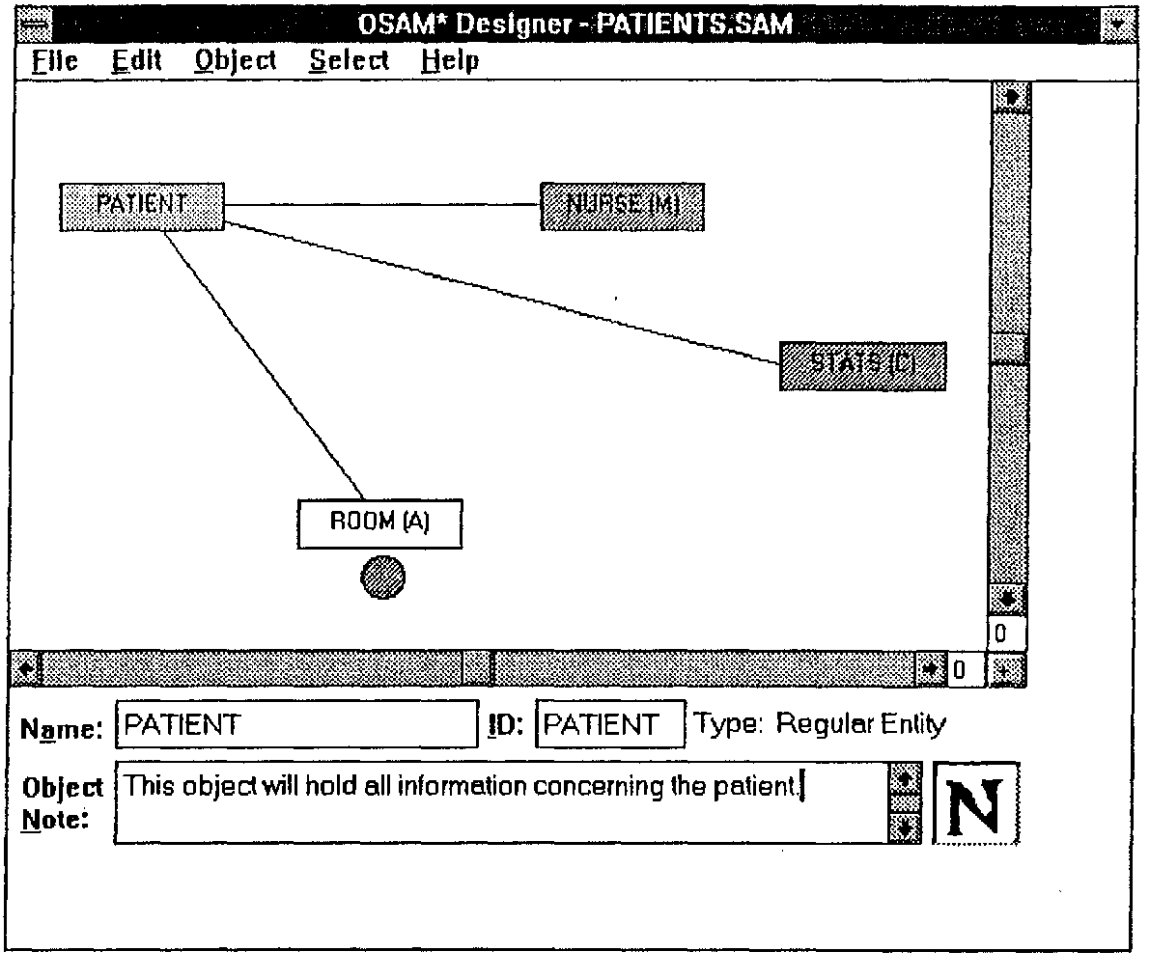


Figure 2: Main Window

Key to maneuvering around the workspace and working with objects is the concept of object focus--the idea that at any given time within the workspace, a single object has focus and only that object may be worked with. In the prototype, the user is able to set focus to any object visible on the screen via the keyboard or the mouse. An object with focus is depicted in the workspace as yellow instead of the

normal, light blue color for all other objects. In addition to the coloring, data identifying the object with focus is displayed in the lower part of the main screen. This is important because the object which has focus does not necessarily have to be visible on the screen because focus on a given object is not lost as the user scrolls around the workspace.

4.1.1 Representing of OSAM* Objects

Upon starting the program, the user begins in the center of an empty workspace. At this point, the user is only allowed to create objects (unless the user opts to load a previously saved s-diagram file). To add an object, the user would pull down the "Object" menu (see Figure 3), and select the "Create..." option. The prototype then presents the Add Object dialog box (see Figure 4) which prompts the user for an Object ID, name, type, notes, and a location.

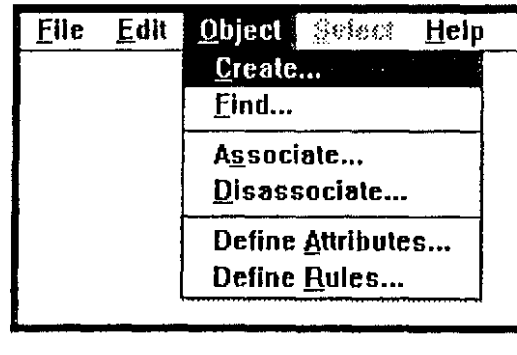


Figure 3: Object Menu

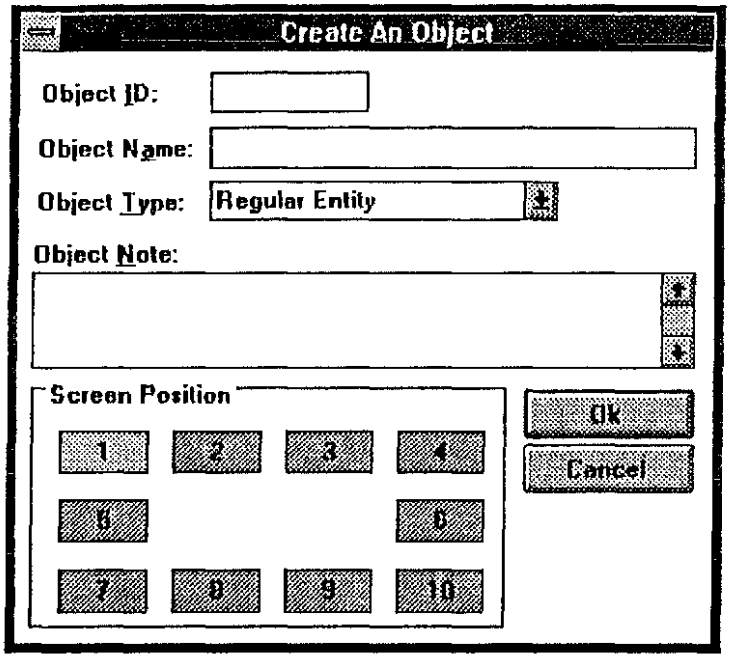


Figure 4: Create An Object Dialog

In OSAM*, every object is assigned an Object ID, or OID, which uniquely identifies that object from all others within the s-diagram. It is unclear whether the OID as defined in [Su88] is supposed to be a number, or if it can be a label. Within the prototype, the OID is defined as an alphanumeric field that can be up to 7 characters long. The OID here serves the same purpose as within OSAM*, as the user will refer to the OID whenever working with that object. It is the OID which actually labels the object within the workspace, and identifies the object in all the Windows dialog boxes, or dialogs. At the time an OID is entered, the prototype verifies that it is a unique identifier and that it is not a SQL reserved word. (A list of SQL reserved

words is read in from a file and stored in an array when the program first starts.)

Since an OSAM* object usually corresponds to a SQL table, the prototype requires a name for any object created. The sole purpose of the name is to provide a name for the SQL table at the time the SQL statements are actually generated. There is nothing wrong with using the OID as the table name; and, the table name will default to the OID when an object is first created. However, the OID is limited to 7 characters whereas a SQL table name can be up to 18 characters long. It is important to note that summary entities do not result in SQL tables being created, and so the object names for these objects have no function. However, the prototype still requires that an object name be provided as a further means of identifying the object. Like the OID, the name must be unique from all other names, and must not be a SQL reserved word.

When an object is first created, it must be defined as a certain type, of which there are four kinds in the prototype: regular entities, composite domains, composite entities, and cross product entities. To assign a specific type to the new object, the user selects the desired type from a drop down list box. The object type dictates the kinds of attributes an object may have and the kind of associations that can be made with it. It is the only

object parameter that cannot be changed once the object is created; an object accidentally created with the wrong object type must be deleted and reentered.

The prototype also allows the user to attach a note which may be up to 254 characters long to any object. It is not required for any object. The note itself serves no purpose within the prototype itself, but may be stored as a remark in the SYSTABLES table when the user builds the SQL.

Finally the user must indicate an object location when adding an object. The location specifies where the object is to be drawn on the screen. The user may select any location on the visible screen that is not currently occupied by another object; and is not allowed to create objects at all on screens that are full. Once the object is defined, it is immediately placed in the workspace. In OSAM*, the s-diagram depicts any entity as a rectangle and any domain as a circle, and it was initially planned that the prototype should do the same thing. Within the prototype, however, it was not immediately clear how to create a circle that could contain a label (the OID) with SQLWindows. As a result, an entity in the workspace is represented by a light blue rectangle; whereas the domain is shown as a gray rectangle with a small, light blue circle either above or below it. As focus is set to an entity, the

rectangle turns yellow; with domains, the rectangle remains gray and the circle turns yellow.

Once added, objects within the workspace may be associated with one another. To associate an object with another object, the user would pull down the "Object" menu, and select the "Associate..." option. At that time, the object which currently has focus becomes the host object and the prototype then presents the user with the Associate Object dialog box (see Figure 5). The Associate Object dialog presents the user with a drop down list of the different object types that may be associated with the host object. If the host object is a composite domain, it may be associated with regular entities, cross product entities, or other domains; otherwise it may only be associated with regular entities. When the user selects a given object type to be associated with the host, the prototype lists all objects of that type that are not already associated with the host object in a separate list box from which the user may select the object that is to be associated with the host. Whatever object the user selects from this list becomes the dependent object.

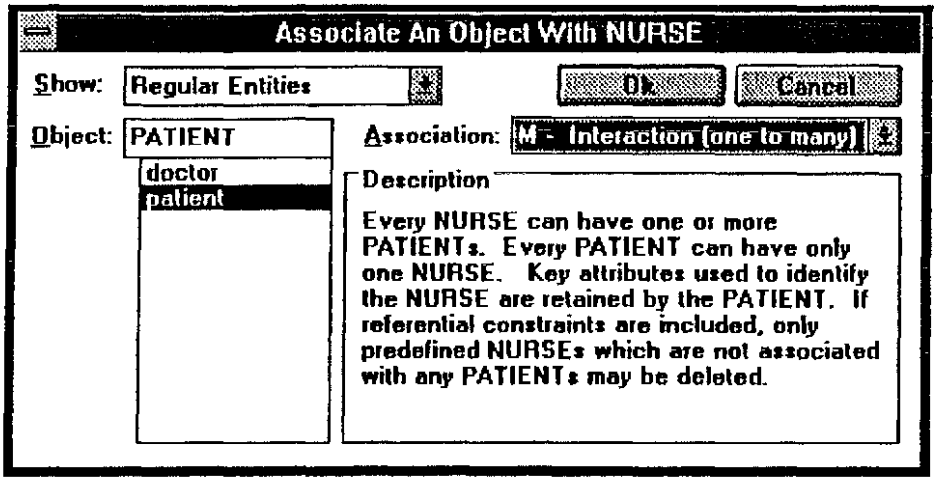


Figure 5: Associate An Object Dialog

At this point, the user must select the type of association that will exist between the host and the designated dependent object from another drop down list box. Like the object types list, the allowable types of association are dependent on the type of the host object; as well as that of the selected object. At any point when the user has designated an object and has selected the type of association, the prototype presents the user with a brief description of the association that they are about to create. This way, when the user wishes to associate the object DOCTOR with the host object STAFF, the user will see "The DOCTOR is a kind of STAFF..." rather than having to know what a generalization (or "G") relation is. Note that the user is not given the option to specify a G-relation which states that "the STAFF is a kind of DOCTOR..." because the STAFF is the host object, and the DOCTOR is the dependent object. If the converse is desired, then the user

would be required to first set focus to DOCTOR and then associate it with STAFF.

The user may undo any association made by selecting the "Disassociate" option under the Object menu; at which point, the prototype displays the Disassociate Object Dialog (see Figure 6). This dialog presents the user with a drop down list of all objects dependent upon the object with focus. When the user selects a given object in the drop down list, the asociation type and description fields are refreshed to indicate the kind of association that is about to be undone.

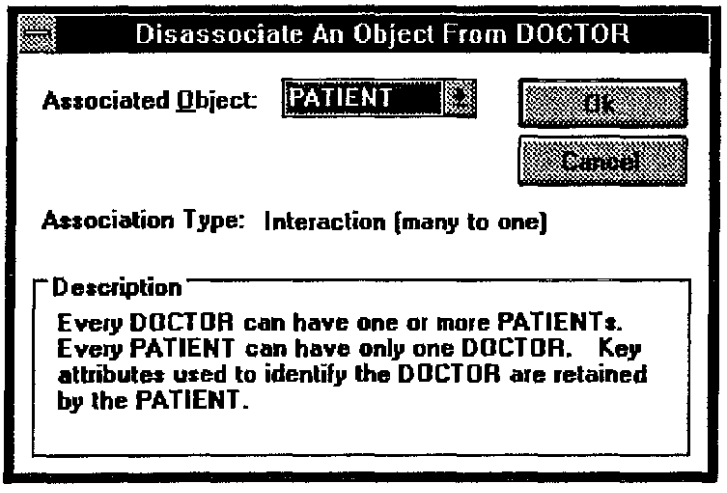


Figure 6: Disassociate An Object Dialog

In OSAM*, as with many other semantic data models, associations between objects are depicted by connecting the two objects with a directional line or arrow, where the object to which the arrow is pointing is the dependent object. Next to the line would appear a symbol (i.e., "G"

for Generalization, "A" for Aggregation) denoting the kind of association. This posed two major hurdles for the prototype. First, how would the prototype represent relationships between two objects that were not physically located on the same screen. Since there was no way to pan out, a user would not be able to make out such a relationship connected by a line without having to scroll through several screens. Should the lines cross with other lines that span multiple screens, it is likely that a user could be confused. Add to this the fact that the prototype has a refresh rate of between two and three seconds as one pages through screens, and this quickly becomes an infeasible solution.

It was eventually decided that there would be two ways to graphically depict a relationship dependent upon the proximity of the associated objects. If the associated objects were on the same screen, the prototype would connect the two with a line just as would be done in OSAM*. However, associations between objects on different screens would be represented not by lines, but by color. Bearing in mind that at any one time a single object would always have focus, all objects associated with the object having focus that were not on the same screen would be shaded green, rather than blue. The user would not need to see the focus object on the screen because the focus object's OID and other information are always displayed at the bottom of the

main screen, so the user always knows which object has focus. However, this solution still didn't solve the screen problem, as the user would still have to page through the screens looking for green objects. To keep screen scrolling to a minimum, a "Find..." option was added to "Object" menu that provided the user with a Find Object dialog (see Figure 7). From here, the user would be able to list all objects of a given type, or objects associated with the focus object--then jump directly to the screen having a particular object.

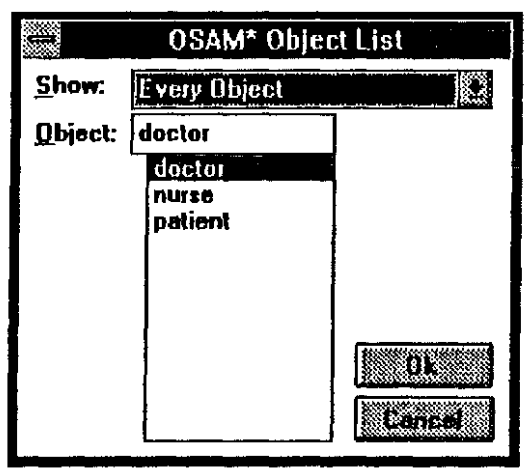


Figure 7: Find An Object Dialog

The second major issue with the OSAM* association was with the arrows that indicated the direction of the association. Given the amount of code required just to show lines on the screen, it was clear that showing arrows would not be feasible; and lines couldn't be used at all for associated objects on different screens anyway. What was finally done

was to use the symbol denoting the kind of association as directional indicators--rather than an arrow. Whenever an object received focus, all other objects associated with that object would have the appropriate association symbol (i.e., "G", "A") appear to the right of the OID. If the associated object was dependent on the object with focus, then the symbol would appear in lowercase. Conversely, if the object with focus was dependent upon the associated object, then the symbol would be capitalized. The symbols themselves would appear only on objects associated with the object with focus, and would disappear (or be refreshed) whenever the focus changed.

Once the logic for the drawing of lines, boxes, and circles was tested, the next major hurdle was the representation of the workspace. It had been decided that the workspace should let the user scroll in any direction; and that the scroll would be partial such that a portion of the previous screen would appear on an adjoining screen. This was the first of many instances where having only single dimensional arrays made for a challenge.

The scrolling logic would not have been so bad were it not for the partial scrolling; but the partial scrolling was viewed as necessary not only for the user to keep their bearings, but also to allow multiple views of any given object so that an object can visually be associated with

more objects. Otherwise, the user would only be able to see an object on one screen, and could at most visually associate that object with nine others. With the partial scroll, the user would be able to see side objects on two screens and corner objects on four, thus allowing the user to view up to 36 different associations (see Figure 8).

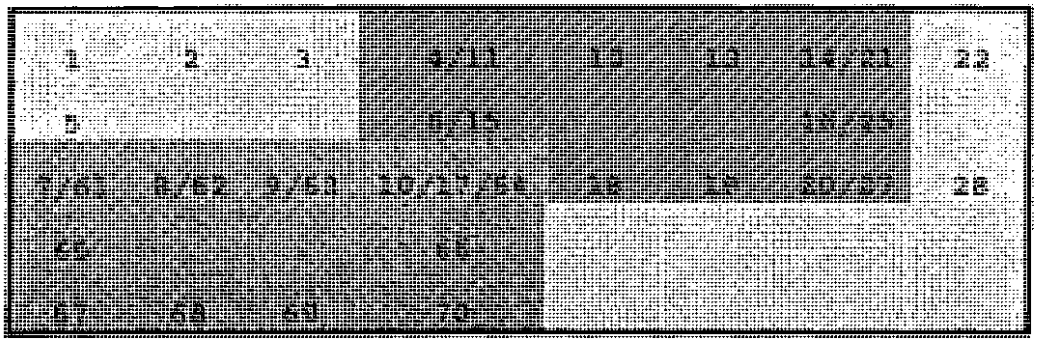


Figure 8: Workspace "Cells"

A special array is defined in which each array element represented a single location, or cell, in the workspace. Starting from the upper left hand corner screen, each of the screen cells would be assigned a sequential number. These numbers could then be assigned to objects and the program would be able to determine the location of any given object on the screen based on that number. Without the partial scroll, it would have been easy to key the first 10 objects on the first screen as the first 10 elements of the array, the 10 objects on the next screen as elements 11 through 20, and so on. Every object then would be tied to a single location in the workspace. At the time a user created or

moved an object, the program would need only calculate the address of the cell, based on the screen coordinates and the cell's own location on the screen, and store that number with the object. However, partial scrolling resulted in the placing of the same object on two or four screens and a means for keeping up with multiple addresses per object had to be designed.

The cell array was used to hold object numbers that would be generated sequentially starting at 1 and assigned to objects as objects were created. Within the program, these object numbers would serve to identify the location of a given object's OID, name, type, and description--each of which would be held in their own global arrays. Therefore cells 10,17, and 64 might contain the object number 23; in which case OID(23) would hold the object's OID.

Once the cell array was in place, the logic for maintaining the array had to be designed. Looking at Figure 8, if the user added an object and associated it with position 6, the program would have to be smart enough to figure out that position 15 would have to be updated to contain that same object. To accommodate this, the prototype has to calculate the affected positions on other screens based on a position that has been changed or added to. For example, if an object is added to the sixth position on any screen, the program adds 9 to the corresponding array element's address

to come up with the address of the affected element (or cell) and set that cell to the same object unless the screen is on the right-hand border of the workspace, in which case no other cells are changed.

After the partial scroll had been designed and built, the next hurdle was in handling the associations. Unlike the OID, name, and other object parameters captured at the time the object was added, a single object can, and typically will, have multiple relationships with other objects. However, the amount of information that needs to be carried by any one association is minimal. All that is really needed is the number of the associated object, the type of association (i.e., generalization, aggregation), and the direction of the association. It was decided that it was needless to create separate structures for each of these pieces of information, and so the two were combined into a single global array. What any given element in the array would hold would be a comma separated string that contained special delimiters for object numbers, and delimiters for associations. The result was an association array in which there could only be one array element per object (just like OID and name) but that each element could be parsed out into multiple relationships for that object. The direction of the association did not need to be stored separately at all because it would be derived based on the association being capitalized or in lowercase. Once these associations were

working in conjunction with the objects and lines being drawn on the screen, the bulk of the OSAM* s-diagram was completed.

4.2 Accommodating SQL in the prototype

The prototype was now to the point where there was little more that could be represented within OSAM*, and designs for the capture and upkeep of SQL data had to be planned. It was clear at this point that the SQL data, or object attributes, would have to be stored in a separate structure than that of the OID, associations, and the other object parameters; but that these attributes would somehow have to be referenced by the object itself. In addition, this structure had to be completely dynamic, allowing the user to add, delete, or change individual attributes. Finally, the structure would have to hold enough information about the attribute to construct a SQL table with it. It would also have to hold any information concerning the creation of primary keys and indices in SQL.

4.2.1 Representation of OSAM* attributes

There was no question that this structure would eventually become implemented as an array, or more likely, a series of arrays. The problem was with the need for quick access. It would have been fairly simple to have done a brute force traversal of an array holding the object numbers looking for just those attributes having a given object number until reaching the end of the array; but in a large OSAM* definition with hundreds of tables, this method might not be acceptable.

What finally had to be done for performance purposes was to emulate a series of link lists using an array. An element within the array that marked the start of a particular link list for some object would have its address stored as a parameter of the object itself. Objects having no attributes, or objects just created would have this address set to zero. Each of the individual attributes stored for that object would also store a pointer that the program could use to jump directly to the next attribute, and so on until the next pointer came up with a sentinel value (-1). Given a particular object, the program could then retrieve the object parameter that pointed to the start of the link list, jump to that element, and start traversing the list. Naturally, as attributes were added and deleted from objects, the program would have to clean up the links.

The link list worked fine for just representing those attributes that were defined under a given object; but how would the structure be able to handle attributes inherited from objects associated with a given object? Referring back to a previous example, if DOCTOR is a kind of STAFF, and every STAFF is identified by the attribute LICENSE, then every DOCTOR must have a LICENSE. The problem is that LICENSE is defined under the STAFF, not the DOCTOR. Somehow, then, this structure had to be equipped to handle inherited attributes.

The first approach taken to handle inherited attributes called for maintaining an image of every object in the system, with each image being its own link list in the attributes structure. Therefore, if there were twelve different objects that were a kind of STAFF, then the attribute LICENSE would be duplicated in twelve different lists. It was felt that it would be easier to traverse the OSAM* structure for any one object and reconstruct its attribute list at the time that changes were made, rather than construct all objects based on the associations and their own attributes at the time that the SQL was generated.

There is no easy way to solve the problem of inherited attributes; but maintaining an image of every object never worked quite right from the start, and ultimately had to be

abandoned. The most difficult problem arose when tracking attributes across dependent objects. For example, unless an association between two objects is defined as a generalization (or G-relation), only key attributes are inherited by any dependent objects. So, if a user changed the key of an object, all of the keys inherited on through the s-diagram would have to be changed as well. For their part, G-relations are even more complex because they can go as deep as the user desires, and the attributes defined in each object involved have to trickle all the way down to all objects associated directly or indirectly. For instance, an INTERN may be defined as a kind of DOCTOR, in which case INTERN would inherit all the attributes from both DOCTOR and STAFF.

The other major consideration with tracking attributes is handling the case where the user creates a duplicate attribute. One of the many rules in SQL is that, for any one table, no two columns defined for that table may share the same name. Otherwise, SQL would not know which column is being referred to when a database transaction is being performed on that table. The prototype has to be able to reliably loop through all associated dependent objects of a given object, as well as the given object itself, and verify that this attribute is not duplicated. For example if INTERN had an attribute called SPECIALTY, then the user

would not be able to enter SPECIALTY in either DOCTOR or STAFF.

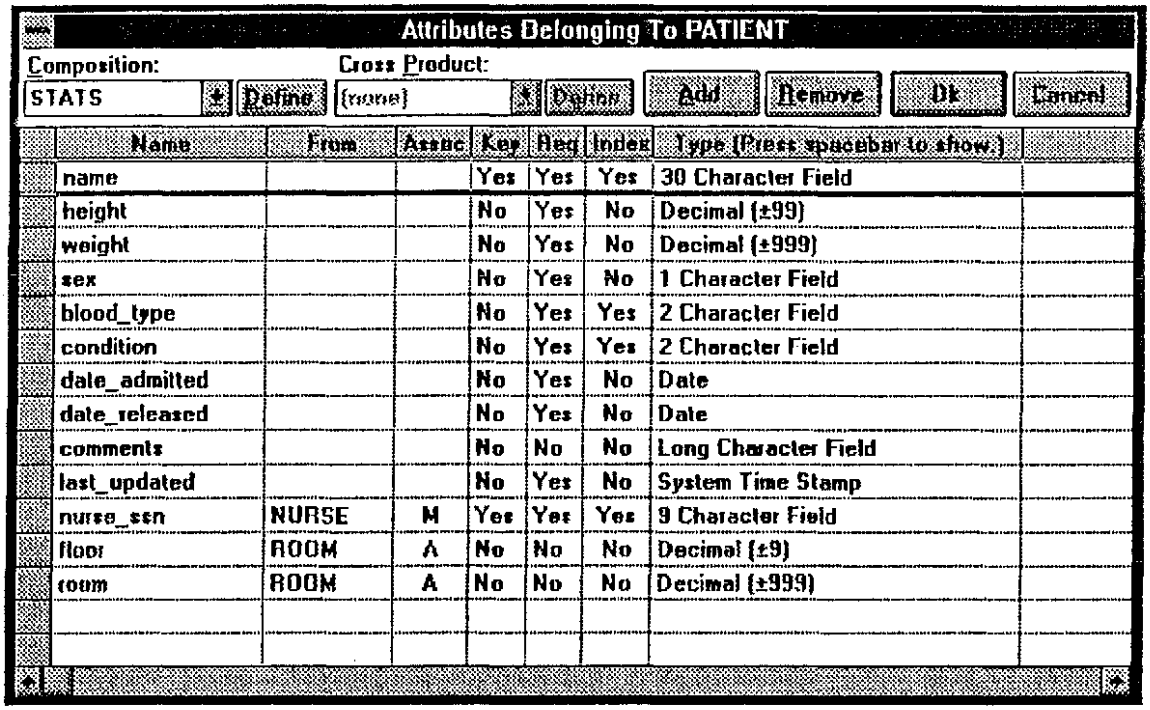
Duplicate attributes can also be encountered when the user creates associations. Had the user entered in the SPECIALTY attribute for both DOCTOR and INTERN prior to creating a G-relation between the two objects, it would be the responsibility of the prototype to catch the duplicate SPECIALTY attribute that would result in INTERN at the time the G-relation is created. Akin to this problem is dealing with OSAM* associations that are altogether invalid. A good example of this is when the user attempts to create an association that results in a loop (i.e., an INTERN is a kind of DOCTOR is a kind of STAFF is a kind of INTERN). This is clearly an invalid association; but if this associative loop is created prior to any attributes being keyed in, the logic which checks for duplicates would not catch it.

As it turned out, the underlying logic that would have to be built to handle any of these duplication errors was completely dependent upon the ability to reliably traverse the OSAM* definition in real time. Once it was determined that this piece was an absolute, it became unnecessary to maintain separate attribute lists for each object. Special functions were written that would return a list of ancestor objects (objects from which a given object inherited

attributes) or dependent attributes (objects dependent upon a given object for attributes). For associations, special functions called IsAncestor() and IsDependent() were written so that objects either directly or indirectly associated with the host object would not be brought up in the Associate Object dialog.

While all of this design and coding transpired, the user interface for keying in all of the SQL details gradually took shape. The finished Object Attributes dialog (see Figure 9) presented the user with a large table window, in which each row in the table window represented an object attribute. In the window, the user can see all attributes defined for that object shown in black, and all inherited attributes from associations with other objects in green. The dialog allows the user to freely change or remove any attribute shown in black. Since objects shown in green are inherited, they cannot be changed and cannot be removed without destroying the association that caused the attributes to be inherited in the first place. Finally if an object, through association, requires attributes from another object which have not yet been defined for that other object, an "(undefined)" entry is shown in red in the table window. To correct this problem, the user must either define attributes for the other object, or disassociate the two objects entirely. If this is not corrected, the

prototype will produce an error message when the user attempts to generate SQL for the object.



Name	From	Assoc	Key	Req	Index	Type (Press spacebar to show.)
name			Yes	Yes	Yes	30 Character Field
height			No	Yes	No	Decimal (±99)
weight			No	Yes	No	Decimal (±999)
sex			No	Yes	No	1 Character Field
blood_type			No	Yes	Yes	2 Character Field
condition			No	Yes	Yes	2 Character Field
date_admitted			No	Yes	No	Date
date_released			No	Yes	No	Date
comments			No	No	No	Long Character Field
last_updated			No	Yes	No	System Time Stamp
nurse_ssn	NURSE	M	Yes	Yes	Yes	9 Character Field
floor	ROOM	A	No	No	No	Decimal (±9)
room	ROOM	A	No	No	No	Decimal (±999)

Figure 9: Object Attributes Dialog

When a new attribute is added to an object, the user must provide all the details necessary to properly define a SQL table and any indices. In essence, object attributes correspond directly to a SQL column definition within a table. In designing the interface of the Object Attributes dialog, the primary objective was to isolate the user as much as possible from SQL syntax. Also, since a large number of attributes can be defined for any given object, efforts were made to minimize the number of keystrokes necessary to actually enter all SQL details for any one

defined in the prototype in about 10 keystrokes after the attribute is given a name which may be up to 18 characters long. The following information is captured for any attribute entered.

- Name: Every attribute must have a name. The attribute name is ported directly into SQL as the name of the corresponding SQL column. Names may be up to 18 characters long.

- Key: denotes whether an attribute is used to identify an object instance. In SQL, key attributes will translate into unique indices and primary keys.

- Required: denotes whether a value must be assigned an attribute in every instance of an object. In SQL, required attributes will become columns defined as NOT NULL. Key attributes are always required.

- Indexed: denotes whether an attribute should be indexed for purposes of data retrieval. In SQL, required attributes will translate into regular indices. Key attributes are always indexed.

- Type: represents the data type of an attribute (i.e., character, number, date). In SQL, a data type must always be defined with a column at the time a table is

always be defined with a column at the time a table is created. Allowable types from which the user may choose may be displayed when the user moves the cursor to the "Type" column, and presses the spacebar.

- Description: a short description of the attribute as it relates to the parent object. It is stored as a remark within the SYSCOLUMNS table, and is an optional field.

In addition to these basic attribute definitions, summary attributes may be defined for individual compositions or cross products. Recall that compositions and cross products take the form of special entities, called summary entities, which may be associated with any regular entities. When such an association is made, summary information can then be defined for that summary entity based on numeric attributes defined for the regular entity. To define a composition or cross product for a regular entity, the user is provided with two drop down list boxes on the Object Attributes dialog which contain all composite and cross product entities to which the object is associated. When the user selects one or the other, a list of all numeric attributes defined for that object is presented in the Summary Attributes dialog (see Figure 10). Next to each attribute are the four standard aggregate functions supported in ANSI SQL: Lowest (MIN), Highest (MAX), Average (AVG), and Total (SUM). The user may then go through each of the numeric

attributes and selectively enable or disable each of these functions. When the user has defined each of the summary attributes within the entity, the prototype saves the composite or cross product definition as part of the overall entity.

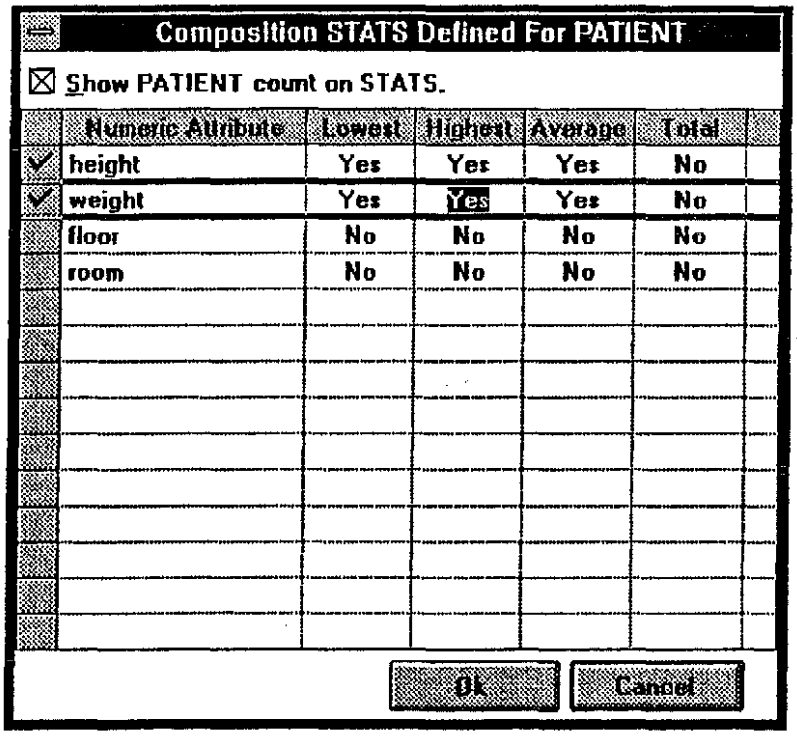


Figure 10: Summary Attributes Dialog

Once the user has finished defining the attributes for any one object, the prototype then begins a series of error sequences to validate that no attribute names are duplicated. It was found that the easiest way to do this was to actually retain a snapshot of the object as it was immediately prior to its attributes being changed. At that time, all changes made to the attributes are saved to the

object or a name that conflicts with the list of SQL reserved words, are trapped without creating a snapshot.

The first thing that happens at the time attribute changes are saved is that all objects which are dependent upon the changed object, their respective associations, and the level of removal are read into separate arrays. The level of removal is dictated by the number of dependents that constitute an actual association. For example, DOCTOR is only one level removed from STAFF; whereas INTERN is two levels removed since INTERN is dependent upon DOCTOR for its association with STAFF. At that point, each of the dependents' attributes are traversed separately with the new definition to ensure that no conflicting names occur in any of the objects. In the event that a duplicate is found, the user is alerted to the problem and is given the option to fix the duplicate, or discard all changes just made. The former option results in the Object Attributes being brought up with the just saved changes; whereas the latter results in the snapshot being restored. Though fairly involved, this was viewed as being a much simpler approach as opposed to waiting to create the SQL definitions and, at that point, checking the entire OSAM* definition.

In addition to being able to tie attributes to an object, the user is also given the ability to add rules to regular attributes by selecting "Define Rules" under the Object

In addition to being able to tie attributes to an object, the user is also given the ability to add rules to regular attributes by selecting "Define Rules" under the Object menu. Rules are basically high level comments that may be captured for each object that detail any steps that may have to be taken as an object's corresponding data table is accessed within the SQL database. There are three different kinds of rules supported in the prototype: insert rules, update rules, and delete rules (see Figure 11). At the time a SQL script is generated, the user has the ability to include these rules into a special rules table on the database. This table can then be accessed by the programmer through the course of development.

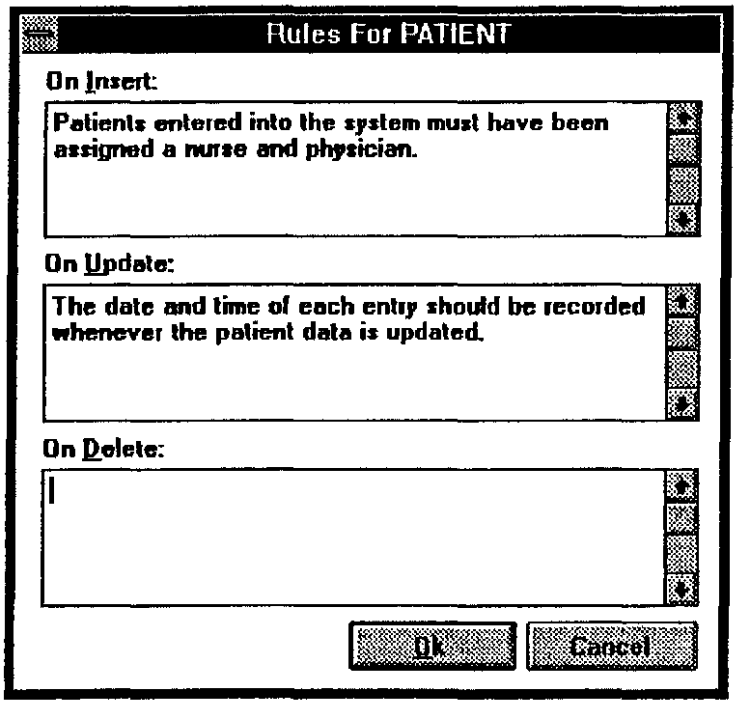


Figure 11: Object Rules Dialog

4.3 Considerations for Microsoft Windows

In an effort to make the prototype comply with Windows standards, the overall menu structure that is presented on the main window closely follows that of a typical Windows program. The leftmost menu is the File menu (see Figure 12), with which the user may create, open, or save OSAM* files.

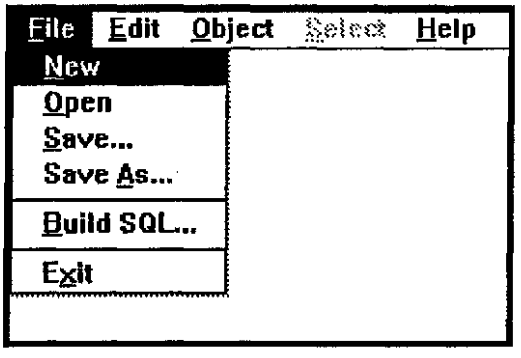


Figure 12: File Menu

The file options themselves all make use of the Windows 3.1 common file dialogs so that the procedures for opening or saving a file are identical to that of other Windows programs. When opening a file, the user has the ability to search for and open OSAM* files having an extension of ".sam" or generated SQL files having an extension of ".sql" (see Figure 13). Finally, the Build SQL and Exit option appears under the File menu.

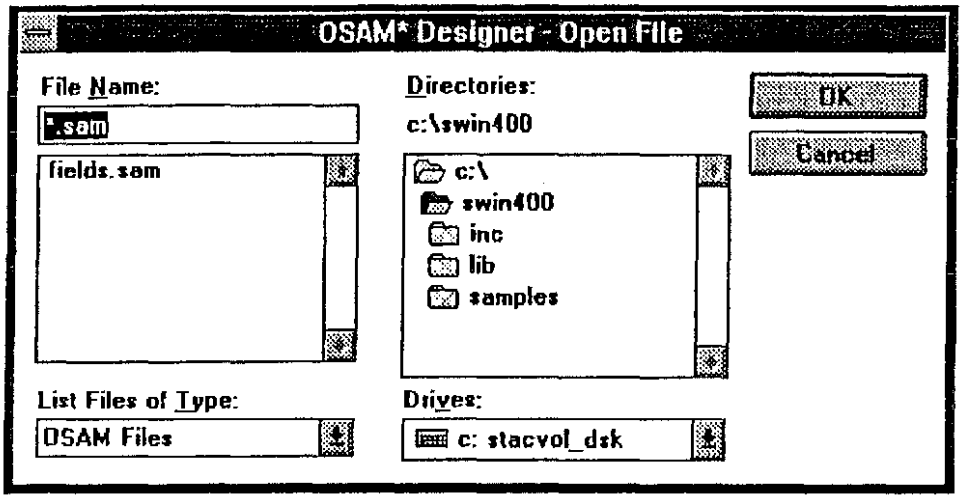


Figure 13: Open File Common Dialog

Following the File menu is the Edit menu (see Figure 14), which provides the user with the ability to Cut, Copy, Paste, and Clear objects from the screen. Like the File menu, it was intended that this menu would follow the Windows standard Edit menu as closely as possible; but a number of instances arose where this was not feasible for the purposes of the prototype.

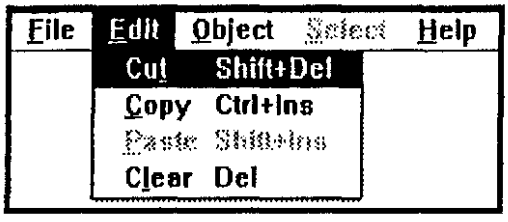


Figure 14: Edit Menu

In Windows, the cut and paste functions are usually used together such that the user will generally cut, or remove, data from the screen and immediately paste it elsewhere--whether the data is a value in a spreadsheet, a phrase in a

text document, or a bitmap. What Windows will do when a user cuts is place the cut data into a behind-the-scenes program called the Clipboard. Later, when the user does a paste, the information currently residing in the Clipboard is pasted wherever the user specifies if those data are compatible with where it is being pasted. The issue here is that data, once cut, does not have to be pasted. Cutting data effectively acts as a delete until such time as the cut data are pasted back into the application. If the user never pastes the data, or overwrites the information in the Clipboard with a subsequent cut, then the cut data are gone.

However, one just doesn't cut an object from an s-diagram as one would a word or phrase from a document; because of the interdependencies involved with that object. The sheer logic that would need to be in place for a program to be able to accurately restore an s-diagram after an object was cut (deleted) and subsequent changes were made went far beyond the original intentions for the prototype; and as such, had to be compromised. In the prototype, performing a cut implies that the user will do a paste. The prototype enforces this by disabling every other menu option for objects once an object is cut except the paste option. This greatly simplifies the underlying logic because now the prototype need never delete a cut object; it just stores the object and any of its attributes in temporary variables

within the application until it is pasted back into the workspace. As such, the Clipboard is not used at all.

Like the cut and paste operations, the copy operation also had to be modified somewhat to accommodate the rules of OSAM*. In a typical Windows application, a copy implies that an exact copy of the entire data structure has been placed in the Clipboard for pasting. In the context of OSAM*, an exact copy of any given object would technically mean that the object's OID, name, description, attributes, and associations with other objects would all have to be copied. This will not work for two reasons. First, both the OID and name for an object must be unique for that object; so creating a brand new object with the exact parameters would violate the integrity of the s-diagram. An even more difficult scenario arises with respect to the associations. If an object is exactly copied, then all of the attributes defined for and inherited by that object must become part of the new object. In addition to this, the new object would also have all the dependents that the original object had--and each of these dependents will be inheriting the exact same attributes again. Clearly, these duplicate attributes cannot be allowed.

As a result of this, the OSAM* prototype does not make an exact copy of an object when the user invokes the copy option. The only things that are copied are the base

attributes for that object, and the object type. No associations are carried over at all; so all inherited attributes in the original are not reflected in the copy. At the time the copied object is pasted back into the workspace, the prototype prompts the user for a new OID, name, and description.

Finally, the Edit menu allows the user the clear option, which is used to delete an object from the workspace entirely. Usually, a Windows application will provide a clear option coupled with an undo option--in case the user did not mean to clear data from the application. As stated before, however, the ability to totally delete and subsequently restore an object is beyond the scope of the prototype; so the undo option is not supported. Instead, upon selecting clear, the user is warned that they are about to permanently delete the object which has focus, and are given the opportunity at that time to cancel their action.

A Help menu (see Figure 15) and a simple help file has also been included in the prototype to make use of the complete Windows 3.1 help engine. For the purposes of demonstration, however, the prototype will call the Microsoft help file which explains how to use the help engine. At the bottom of the Help menu is a menu item that calls the About dialog, which serves to identify the prototype.

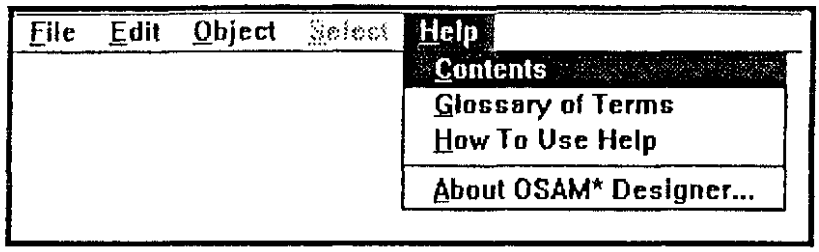


Figure 15: Help Menu

4.4 Generation of SQL from OSAM*

Once the user has completed entering the objects, their individual attributes and associations with other objects, they may build a SQL file. To invoke this function, the user may select "Build SQL..." under the File menu. The prototype will then present the user with a Build SQL dialog (see Figure 16), which provides the user with a number of options for generating the file. A list of these follows:

- Text Format: The finished SQL file will be a readable text file, and this option allows the user to specify the format in which the SQL commands will be written to the file. Choices here are: 1) Uppercase SQL commands only, 2) Uppercase object definitions only, 3) Proper (first letter of each word is capitalized, all other letters lowercase), 4) Uppercase, and 5) Lowercase.

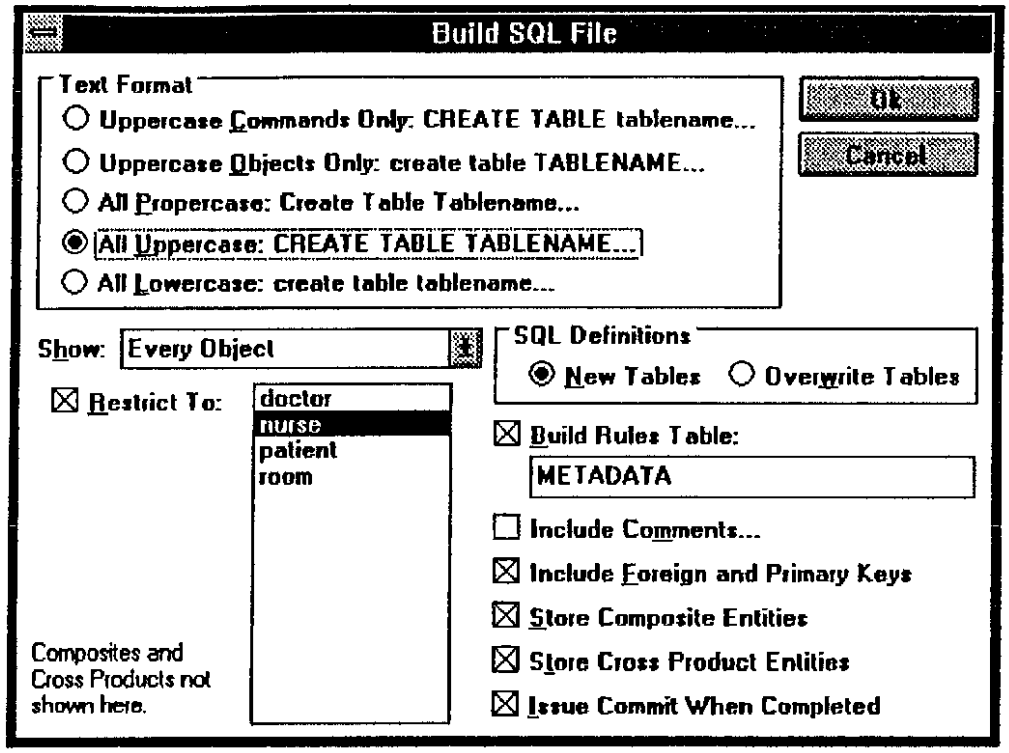


Figure 16: Build SQL Dialog

- Object List: Allows the user to limit the SQL build to specific objects instead of generating SQL for everything in the s-diagram.

- Overwrite SQL: The user may specify whether the SQL definition will assume new tables, or that the tables have already been defined and need to be overwritten. In the event the latter is selected, the prototype will automatically create "DROP TABLE" statements preceding the "CREATE TABLE" statement.

- Build Rules Table: The user may provide a name for a table which will contain all rules defined by object within the s-diagram.

- Include Comments: Notes and rules entered for each object are displayed as comments throughout the SQL file.

- Referential Integrity: If the SQL database for which the generated file is intended supports referential integrity, the prototype will generate PRIMARY KEY and FOREIGN KEY definitions within the file.

- Store Composite/Cross Product Entities: If the user wants to represent summary entites in the SQL database as views, the prototype will generate CREATE VIEW statements for composite and/or cross product entities within the SQL file.

- Issue a Commit: At the time a SQL definition is created on a database, the definitions themselves are committed, or permanently saved, to the database. Otherwise, the user may opt to rollback, which will cause the database to "undo" these transactions, and restore the database to a previous state. Issuing a commit at the end of the file may save the user from having to manually commit the SQL tables just created from the generated file.

When the user has specified these options on the Build SQL Dialog and continues, the Windows 3.1 Common File Dialog will pop up and allow the user to enter a name to which the generated file will be saved. When a valid file name is entered, the prototype proceeds to generate the SQL file. Each non-summary object included in the build first has its table definition (CREATE TABLE statement) generated. At this point, there are two possible errors which may occur. The first error occurs when the object being tested has no attributes, in which case the build process simply skips the object entirely. The second error results when the object is dependent upon another object for attributes which have not yet been defined in the other object. In this case, the build process will generate an incomplete SQL statement based on the information that is there. Both errors will result in an error message being printed to the SQL file, and the build process will continue. Following the object table definition, any indices required by the SQL table are then written to the SQL file. Finally, each summary definition for that object has a corresponding CREATE VIEW statement generated. Once all object definitions have been created, the build will then create a series of ALTER table...FOREIGN KEY statements to account for referential integrity (if the user has opted to include these statements in the SQL file.) When finished, the prototype automatically brings the SQL file up for viewing in the Microsoft Notepad (see Figure 17).

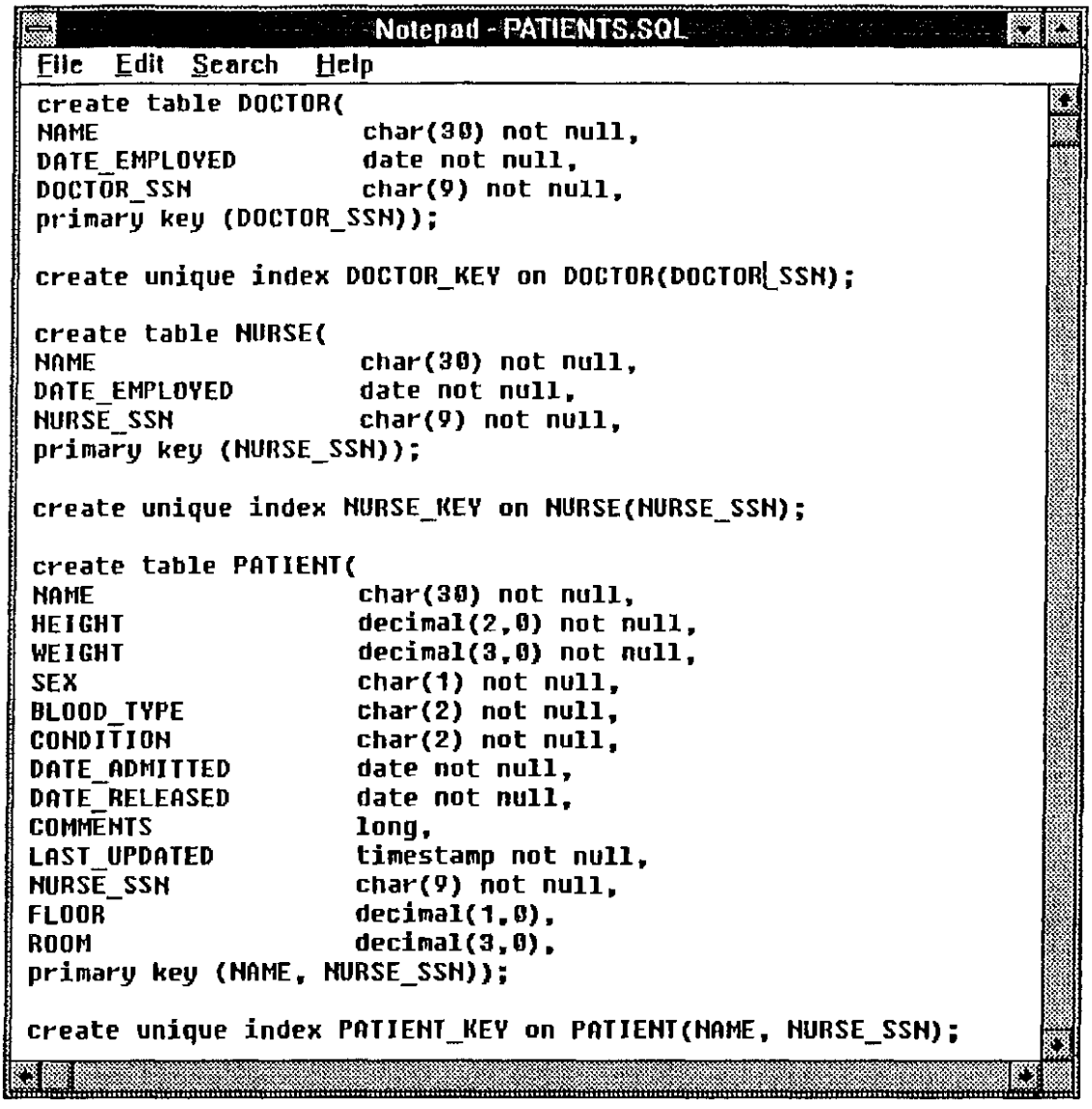


Figure 17: Microsoft Notepad w/ SQL File

4.5 Results of the Project

The finished prototype represents the culmination of the project. It demonstrates that a given semantic data model can be incorporated into a program that allows a user familiar with the model to use it to design SQL databases. Specifically, the prototype allows a user who knows nothing

about SQL to generate error-free SQL scripts that are 100% compatible with the database engine against which the generated scripts were tested. Several scripts, including the example cited within this document, were successfully imported into SQLBase 5.0.0, a relational database engine from Gupta Technologies, Inc. The s-diagrams created with the prototype from which these scripts were created addressed all major aspects of the OSAM* model. Together, they encompassed regular entities, composite domains, and summary entities; as well as the five types of OSAM* associations: generalization, aggregation, interaction, composition, and cross products. From these files, SQLBase 5.0.0 was able to create tables for regular entities and domains, views for summary entities, place remarks on generated tables and columns, and create primary and foreign keys on the defined tables based entirely on the semantic model created by the user.

The prototype was also successful in providing the designer a means of maintaining a database schema via a semantic data model rather than having to modify the SQL directly. Any schema built using the prototype can be saved to file and changed at any time. This ability to save and update a schema would serve as an invaluable tool during the early stages of database development. Instead of having to work directly with the SQL statements, the designer need only make changes to the current OSAM* schema, and regenerate a

new SQL script that reflects these changes. Of course, were a developer interested in changing a database definition once the database were actually in production, then the original database would have to be converted to accommodate these changes. If the change were minor enough, a developer in a production environment would probably prefer to make use of the ALTER TABLE statement in SQL and change the database directly. On the other hand, if a major restructuring of one or more tables was to occur, a developer would very likely have to export the data from the affected tables into a flat file. At that point, the developer could go back to the original s-diagram, make the required changes, create the new database schema, and then convert the original data to fit the new schema.

Chapter 5

FUTURE AREAS OF STUDY

The whole task of integrating a complex semantic data model like OSAM* with SQL such that each can make full use of the features of the other is far too broad a scope for this project; and, from the start, this prototype was designed and built with that understanding. What follows are some issues which are prospects for future study.

5.1 Evaluation of Design Techniques

While it was verified that the prototype worked as it was supposed to, tests involving end users working with the finished prototype were not extensive. To fully evaluate the program, it would be necessary to subject the prototype to rigorous testing to at least two categories of database designers--those that know SQL and those who do not, and record and analyze the feedback given by each one of the subjects.

5.2 Improving the Graphical User Interface

There are a number of areas concerning the prototype relating to how it works in the Microsoft Windows environment. In the prototype, the user is allowed to view up to 10 objects at a time on a screen. The program supports printing of an s-diagram one screen at a time, and generated SQL files may be printed from the Microsoft Notepad. In the future, the prototype could be further enhanced by adding options for panning, zooming, and printing the entire workspace.

The edit functions within the prototype could be made to operate in a way which is more consistent with that of other Windows applications. With respect to the cut operation, the prototype requires the user to either paste a cut object, or undo the cut itself. In many Windows applications, it is assumed that a cut object has been deleted from the workspace unless the user pastes it back. One possible enhancement to the existing prototype would be to alter the cut and paste logic so that it could work in this way. To do this, the prototype would have to be able to use an image of the s-diagram prior to when an object is cut or any data required to reconstruct that image, as well as a current view of the s-diagram as it exists after the object is cut. This concept of a before and after image could also be employed in the event the user deletes an

object, and later wishes to undo the delete. Currently, the prototype informs the user that an undo delete is not possible and allows them the opportunity to cancel the delete action.

5.3 Possible Enhancements to SQL

There are some aspects of OSAM* that simply cannot be handled by current implementations of SQL. The OSAM* simple domain, for instance, is far more complex a structure than is its SQL counterpart--the elementary data type. In addition to being able to represent a data type such as CHAR, or DATE, the simple domain may also ascribe certain attributes to that type. For example, any simple domain can be defined as having a specific range of valid values (i.e., between 0 and 60, between 1/1/1980 and 1/1/1990, or must be alphabetic). In SQL, there is no concept of a range. For data of type DECIMAL or type CHAR, SQL does allow the size of the column to be defined, but no control is afforded the user for specifying the content of a column. Simple domains may also be defined as a mathematical expression and in terms of rules, procedures, and functions. In SQL, any such significance attached to a column must be handled programatically.

Similarly, the definition of a SQL table doesn't quite measure up to that of an OSAM* object. OSAM* allows any

object to have its own set of rules and procedures, which dictate how the object behaves. The prototype approaches this concept by allowing the user to define insert, update, and delete rules for a given object, but these "rules" are simply comments about the object. They are included within the prototype to provide the designer with the ability to record some notes on how each object will work within the database. Then there is the question of inheritance. Within OSAM*, when an object inherits from another, it may inherit not only attributes, but also any rules and procedures such that the dependent object behaves in the same manner as its ancestor. In SQL, there is no such thing as inheritance. Columns defined in a given SQL table cannot be defined in terms of another column in another table. Each is its own entity; and, with the notable exception of declaring primary and foreign keys, do not interact with one another. Within the prototype, when an object inherits an attribute from another, this translates into a distinct SQL column being generated for the dependent object's corresponding table which bears the same name, length, and data type as its forbear. Certainly, if SQL were to be made fully compatible with the structures proposed within OSAM*, provisions for rule based logic and inheritance would have to be incorporated into SQL.

5.4 Other Issues

Of course, the prototype does bring up some questions not addressed by this study. There is little doubt that a similar prototype could be built to interface almost any semantic data model with SQL. But which is best? Surely, if the industry was to embrace the semantic data model as a design tool, a standard model would have to be decided upon. For the purposes of this study, OSAM* proved to be an excellent semantic data model on which to build the prototype. This is not to say that OSAM* would necessarily be the only candidate for a standard; but there are certain unique aspects of this model, such as its object-oriented approach, that might be desirable in a standard model. Perhaps the solution lies in a hybrid model which borrows from several prominent models in the literature. Such questions as these are left to further research.

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APPENDIX A

OSAM* Designer Code Listing

```
Application Description:
    OSAM* Designer -- This program enables a user who is familiar with the OSAM* Model to
    create and maintain an OSAM* s-diagram complete with regular entities, summary entities,
    and composite domains.  When an s-diagram is completed, the program will take the
    OSAM* definition and generate SQL code to emulate the OSAM* structures.  The program
    features a rudimentary graphical interface, and a complete set of File I/O utilities for
    creating and modifying OSAM* and SQL files.  This program requires the SQLWindows
    runtime libraries available from Gupta Technologies, Inc. and Microsoft Windows 3.1
    or higher.

    Author:  Paul F. Rabuck
    Date:    August 1, 1992

    This software is submitted to the University of North Florida College of Computer and
    Information Sciences in partial fulfillment of the requirements for the degree of
    Master of Science in Computer and Information Sciences.
  Outline Version - 3.0.A
  Design-time Settings
    Outline Window State: Maximized
    Outline Window Location and Size
      Left:  4.763"
      Top:  0.031"
      Width:  5.263"
      Height: 5.094"
    Options Box Location
      Visible? No
      Left:  4.9"
      Top:  0.594"
    Tool Palette Location
      Visible? No
      Left:  6.8"
      Top:  2.25"
    Fully Qualified External References? No
  Included Objects
    |
    | winmenus.apl consists of a set of Windows functions for manipulating Windows menu objects.
        It includes the USER.EXE library.
    |
    File Include: winmenus.apl
    |
    | winfiles.apl consists of a set of Windows functions for using the Windows 3.1 File Common Dialogs.
        It includes the SWCOMMON.DLL library.
    |
    File Include: winfiles.apl
  Global Declarations
    Window Defaults
      Form Window
        Font Name: System Default
        Font Size: System Default
        Font Enhancement: System Default
        Text Color: System Default
        Background Color: System Default
      Dialog Box
        Font Name: MS Sans Serif
        Font Size: 8
        Font Enhancement: Bold
        Text Color: System Default
        Background Color: System Default
      Top Level Table Window
        Font Name: System Default
        Font Size: System Default
        Font Enhancement: System Default
```

Text Color: System Default
Background Color: System Default
Data Field
Font Name: Use Parent
Font Size: Use Parent
Font Enhancement: Use Parent
Text Color: Use Parent
Background Color: Use Parent
Multiline Field
Font Name: Use Parent
Font Size: Use Parent
Font Enhancement: Use Parent
Text Color: Use Parent
Background Color: Use Parent
Background Text
Font Name: Use Parent
Font Size: Use Parent
Font Enhancement: Use Parent
Text Color: Use Parent
Background Color: Use Parent
Pushbutton
Font Name: Use Parent
Font Size: Use Parent
Font Enhancement: Use Parent
Radio Button
Font Name: Use Parent
Font Size: Use Parent
Font Enhancement: Use Parent
Text Color: Use Parent
Background Color: Use Parent
Check Box
Font Name: Use Parent
Font Size: Use Parent
Font Enhancement: Use Parent
Text Color: Use Parent
Background Color: Use Parent
Group Box
Font Name: Use Parent
Font Size: Use Parent
Font Enhancement: Use Parent
Text Color: Use Parent
Background Color: Use Parent
Child Table Window
Font Name: Use Parent
Font Size: Use Parent
Font Enhancement: Use Parent
Text Color: Use Parent
Background Color: Use Parent
List Box
Font Name: Use Parent
Font Size: Use Parent
Font Enhancement: Use Parent
Text Color: Use Parent
Background Color: Use Parent
Combo Box
Font Name: Use Parent
Font Size: Use Parent
Font Enhancement: Use Parent
Text Color: Use Parent
Background Color: Use Parent
Line
Line Color: Use Parent
Frame
Border Color: Use Parent
Background Color: Use Parent
Picture
Border Color: Use Parent
Background Color: Use Parent
Formats

```
  Number: 0%
  Number: #0
  Number: #,##0.00
  Number: $#,##0.00;($#,##0.00)
  Date/Time: hh:mm:ss AMPM
  Date/Time: M/d/yy
  Date/Time: MM-dd-yy
  Date/Time: dd-MMM-yyyy
  Date/Time: MMM d, yyyy
  Date/Time: MMM d, yyyy hh:mm AMPM
  Date/Time: MMMM d, yyyy hh:mm AMPM
External Functions
Constants
  System
  User
    String: APPNAME = "OSAM* Designer"
    ! Windows System Commands
    Number: WM_CHAR          = 0x0102
    ! User Defined Messages
    Number: MSG_Created = SAM_User + 1
    Number: MSG_Gray = SAM_User + 2
    Number: MSG_Hide = SAM_User + 3
    Number: MSG_Show = SAM_User + 4
    Number: MSG_DrawLine = SAM_User + 5
    Number: MSG_Reset = SAM_User + 6
    Number: MSG_Copy = SAM_User + 7
    Number: MSG_Delete = SAM_User + 8
    Number: MSG_Check = SAM_User + 9
    Number: MSG_Change = SAM_User + 10
    Number: MSG_Disable = SAM_User + 11
    Number: MSG_HideLine = SAM_User + 12
    Number: MSG_ShowLine = SAM_User + 13
    Number: MSG_Redraw = SAM_User + 14
    Number: MSG_Load = SAM_User + 15
    Number: MSG_Highlight = SAM_User + 16
    ! OSAM Line Constants
    Number: LN_6To10c = 61
    Number: LN_7To9c = 60
    Number: LN_2To4c = 59
    Number: LN_1To3c = 58
    Number: LN_1To7c = 57
    Number: LN_4To10c = 56
    Number: LN_7To10c = 55
    Number: LN_1To4c = 54
    Number: LN_1To2 = 53
    Number: LN_1To3a = 52
    Number: LN_1To3b = 51
    Number: LN_1To4a = 50
    Number: LN_1To4b = 49
    Number: LN_1To5 = 48
    Number: LN_1To6 = 47
    Number: LN_1To7a = 46
    Number: LN_1To7b = 45
    Number: LN_1To8 = 44
    Number: LN_1To9 = 43
    Number: LN_1To10 = 42
    Number: LN_2To3 = 41
    Number: LN_2To4a = 40
    Number: LN_2To4b = 39
    Number: LN_2To5 = 38
    Number: LN_2To6 = 37
    Number: LN_2To7 = 36
    Number: LN_2To8 = 35
    Number: LN_2To9 = 34
    Number: LN_2To10 = 33
    Number: LN_3To4 = 32
    Number: LN_3To5 = 31
    Number: LN_3To6 = 30
    Number: LN_3To7 = 29
```

```
Number: LN_3To8 = 28
Number: LN_3To9 = 27
Number: LN_3To10 = 26
Number: LN_4To5 = 25
Number: LN_4To6 = 24
Number: LN_4To7 = 23
Number: LN_4To8 = 22
Number: LN_4To9 = 21
Number: LN_4To10a = 20
Number: LN_4To10b = 19
Number: LN_5To6 = 18
Number: LN_5To7 = 17
Number: LN_5To8 = 16
Number: LN_5To9 = 15
Number: LN_5To10 = 14
Number: LN_6To7 = 13
Number: LN_6To8 = 12
Number: LN_6To9 = 11
Number: LN_6To10 = 10
Number: LN_7To8 = 9
Number: LN_7To9a = 8
Number: LN_7To9b = 7
Number: LN_7To10a = 6
Number: LN_7To10b = 5
Number: LN_8To9 = 4
Number: LN_8To10a = 3
Number: LN_8To10b = 2
Number: LN_9To10 = 1
Number: MAXLINES = 62
!
! MAX_SCROLL must be an even number.  MAX_SCROLL determines the size of the
    total workspace presented to the user.  (ie. a MAX_SCROLL of 6 will result in a
    screen matrix with x and y coordinates ranging from -3 to 3 (6/2)).  Since the maximum
    allowable lengths of df_nHBar and df_nVBar are preset to 2, these lengths may have
    to be modified to accommodate MAX_SCROLL if it is set above 18 (x and y ranges =
    -9 to 9).
Number: MAX_SCROLL = 18
!
String: NULL = ''
String: TAB = '	'
String: SPACE = ' '
String: DEL = '-'
Number: ALL = 0
Number: ENTITY_Regular = 1
Number: DOMAIN = 2
Number: ENTITY_CrossProduct  = 3
Number: ENTITY_Composite = 4
Number: CUT = 1
Number: COPY = 2
Number: DELETE = 6
Number: DEPENDENT_UPON = 5
Number: DEPENDENT_ON_BY = 6
Number: ACTIVE = 0
String: CIRCLE_ON = 'ciryello.bmp'
String: CIRCLE_OFF = 'circyan.bmp'
String: CIRCLE_CONNECTED = 'cirgreen.bmp'
String: SPACES = '                                                  '
! SQL Column Types
String: TYPE_CHOICES = 'CVLIENMRFOATY'
Number: CHAR = 0
Number: VARCHAR = 1
Number: LONG = 2
Number: INTEGER = 3
Number: DECIMAL = 4
Number: NUMBER = 5
Number: SMALLINT = 6
Number: REAL = 7
Number: FLOAT = 8
Number: DOUBLE = 9
```

```
        Number: DATE = 10
        Number: TIME = 11
        Number: TIMESTAMP = 12
        ! Floating Menu Constants
        Number: MENU_MAXLENGTH  = 50
        Number: SELECT_MENU             = 3
        !
        String: REF_WARNING1 = 'The following statements will not work on SQL engines which do not support referential
integrity.'
        String: REF_WARNING2 = 'All tables referenced below and their corresponding unique indexes must be created prior
to these statements being executed, or these statements will not work.'
    Variables
      ! Global Booleans
      !
      Boolean: bGloAddObject
      Boolean: bGloBuildSQL
      Boolean: bGloChanged
      Boolean: bGloDetailOK
      Boolean: bGloDupeCheck
      Boolean: bGloInitialized
      Boolean: bGloItemsVisible
      Boolean: bGloOverwrite
      Boolean: bGloReferential
      Boolean: bGloUpperCommands
      Boolean: bGloStoreComposites
      Boolean: bGloStoreCrossProducts
      !
      ! Global Numbers
      !
      Number: nGloAbsPos
      Number: nGloCompNumber
      Number: nGloCount
      Number: nGloDetailObject
      Number: nGloEditPos
      Number: nGloErrorFound
      Number: nGloForeignCount
      Number: nGloNextPos
      Number: nGloObjFunction
      Number: nGloResetPos
      Number: nGloScreen
      Number: nGloScreenPos
      !
      ! SQL File Arrays/Variables
      !
      String: strGloRegularIndex[*]
      String: strGloSQLTableDef[*]
      String: strGloSQLForeignDef[*]
      String: strGloStoredComposites[*]
      String: strGloStoredCrossProducts[*]
      String: strGloUniqueIndex
      String: strGloUniqueColumns
      !
      ! File Strings
      !
      String: strGloDefPath
      String: strGloFilePath
      String: strGloFileName
      !
      ! Miscellaneous Strings
      !
      String: strGloCSV
      String: strGloDupeAttr
      String: strGloErrorMessage
      String: strGloSQLReservedWord[*]
      !
      ! Screen "Cells"
      !
      Number: nGloCell[*]
      !
```

```
    ! Object Arrays
    !
    String: strGloO_ID[*]
    String: strGloObjName[*]
    String: strGloObjDesc[*]
    Number: nGloObjType[*]
    Number: nGloObjCell[*]
    Number: nGloObjHBar[*]
    Number: nGloObjVBar[*]
    Number: nGloObjAttrPtr[*]
    Long String: strGloObjAssociations[*]
    Long String: strGloObjCRel[*]
    Long String: strGloObjXRel[*]
    Long String: strGloObjInsert[*]
    Long String: strGloObjUpdate[*]
    Long String: strGloObjDelete[*]
    !
    ! Related Objects Arrays
    !
    Number: nGloRelated[*]
    Number: nGloRelatedType[*]
    Number: nGloRelatedLevel[*]
    String: strGloObjRelation[*]
    !
    ! Detail Item Arrays
    !
    String: strGloAttrName[*]
    Boolean: bGloAttrKey[*]
    Boolean: bGloAttrRequired[*]
    Boolean: bGloAttrIndexed[*]
    Number: nGloAttrType[*]
    Number: nGloAttrLength[*]
    Number: nGloAttrScale[*]
    Number: nGloAttrStatus[*]
    Number: nGloAttrNextPtr[*]
    String: strGloAttrComments[*]
    Long String: strGloAttrRules[*]
    String: strGloAttrCRel[*]
    String: strGloAttrXRel[*]
    !
    ! Detail Item Copy
    !
    String: strGloAttrCopyName[*]
    Boolean: bGloAttrCopyKey[*]
    Boolean: bGloAttrCopyRequired[*]
    Boolean: bGloAttrCopyIndexed[*]
    Number: nGloAttrCopyType[*]
    Number: nGloAttrCopyLength[*]
    Number: nGloAttrCopyScale[*]
    String: strGloAttrCopyComments[*]
    String: strGloAttrCopyCRel[*]
    String: strGloAttrCopyXRel[*]
    Long String: strGloAttrCopyRules[*]
    !
    ! Global Window Handles
    !
    Window Handle: hWndGloDetailTable
    Window Handle: hWndGloMenuBar
    Window Handle: hWndGloSubMenu
    Window Handle: hWndGloWait
    !
    ! Included Strings (from winfiles.apl)
    !
  Internal Functions
    Function: AddAssociations
      Description: Creates an association between two objects.  The associations for any object are stored in
          the global strGloObjAssociations[*] array as a CSV.  This function updates the
          strGloObjAssociation array and posts a message to the workspace to redraw itself.
      Returns
```

```
    Parameters
      Number: nAddObj
    Local variables
      String: strAddObj
      String: strObjectID
      Number: nObjLoc
      String: strObjLoc
      String: strInverseAssoc
    Actions
      Call SalNumberToStr(nAddObj,0,strAddObj)
      Set strGloCSV = strGloObjAssociations[nAddObj]
      While SalStrLength(strGloCSV) > 1
        Set strObjectID = ReadCSV()
        Call SalStrRight(strObjectID,1,strInverseAssoc)
        If strInverseAssoc > 'Z'
          Call SalStrUpper(strInverseAssoc,strInverseAssoc)
        Else
          Call SalStrLower(strInverseAssoc,strInverseAssoc)
        Call SalStrLeft(strObjectID,SalStrScan(strObjectID,':'),strObjLoc)
        Call SalStrLop(strObjLoc)
        Set nObjLoc = SalStrToNumber(strObjLoc)
        Set strGloObjAssociations[nObjLoc] = strGloObjAssociations[nObjLoc]||'#'||strAddObj||':'||strInverseAssoc||','
      Call SalPostMsg(frmObjMgr.pbOrigin,MSG_Redraw,0,0)
  Function: AppendSettingsToType
    Description: Retrieves the SQL length and scale parameters for a given attribute and produces
        a more readable display of the attribute type in the case of CHARs, VARCHARs or DECIMALs.
    Returns
    Parameters
    Local variables
      String: strLength
    Actions
      If colType = 'Character Field' or colType = 'Variable Length Field'
        Call SalNumberToStr(nLength,0,strLength)
        If colType = 'Character Field'
          Set colType = strLength||SPACE||colType
        Else
          Set colType = strLength||' char. '||colType
        Set colScale = -1
      If colType = 'Decimal'
        Set strLength = NULL
        While nLength > 0
          If strLength = '999' or strLength = '999,999' or
              strLength = '999,999,999' or strLength = '999,999,999,999'
            Set strLength = ','||strLength
          Set strLength = '9'||strLength
          Set nLength = nLength-1
        If nScale > 0
          If strLength = NULL
            Set strLength = '0.'
          Else
            Set strLength = strLength||'.'
          While nScale > 0
            Set strLength = strLength||'9'
            Set nScale = nScale -1
        Set colType = colType||' (±'||strLength||')'
  Function: BuildSQLFile
    Description: Coordinates the creation of a SQL file after the user has selected the desired options on the
        Build SQL Dialog box, and has entered a file name.
    Returns
    Parameters
      String: strFileName
      Window Handle: hWndList
    Local variables
      File Handle: hFile
      Number: nMaxCount
      Number: nColCount
      Number: nListCount
      Number: nLine
      String: strLine
```

```
  String: strObjParm[5]
  String: strObject
  String: strOverwrite
  String: strTable
  String: strErrors
Actions
  Set nGloErrorFound = 0
  If SalFileOpen(hFile,strFileName,OF_Create|OF_Write)
    Call SalWaitCursor(TRUE)
    Set bGloBuildSQL = TRUE
    Set strMessage = 'Building SQL File: '||strFileName||'...'
    If cbInclude
      Call SalFilePutStr(hFile,dfDelimiter||SPACE||APPNAME)
      Call SalFilePutStr(hFile,dfDelimiter||' Copyright © 1992 by Paul F. Rabuck')
      Call SalFilePutStr(hFile,dfDelimiter)
      Call SalFilePutStr(hFile,NULL)
    If cbRules
      If rbOverwrite
        If bGloUpperCommands
          Call SalStrLower(dfRulesTable,strGloSQLTableDef[0])
          Set strGloSQLTableDef[0] = 'DROP TABLE '||strGloSQLTableDef[0]||';'
        Else
          Set strGloSQLTableDef[0] = 'drop table '||dfRulesTable||';'
        Set strGloSQLTableDef[1] = NULL
        Call WriteSQLToFile(hFile,strGloSQLTableDef,rbProper,rbUpper,rbLower,FALSE,FALSE)
      If bGloUpperCommands
        Call SalStrLower(dfRulesTable,strGloSQLTableDef[0])
        Set strGloSQLTableDef[0] = 'CREATE TABLE '||strGloSQLTableDef[0]||'('
        Set strGloSQLTableDef[1] = 'tbname          CHAR(18) NOT NULL,'
        Set strGloSQLTableDef[2] = 'on_insert       CHAR(254),'
        Set strGloSQLTableDef[3] = 'on_update        CHAR(254),'
        Set strGloSQLTableDef[4] = 'on_delete       CHAR(254));'
      Else
        Set strGloSQLTableDef[0] = 'create table '||dfRulesTable||'('
        Set strGloSQLTableDef[1] = 'TBNAME          char(18) not null,'
        Set strGloSQLTableDef[2] = 'ON_INSERT        char(254),'
        Set strGloSQLTableDef[3] = 'ON_UPDATE        char(254),'
        Set strGloSQLTableDef[4] = 'ON_DELETE        char(254));'
      Set strGloSQLTableDef[5] = NULL
    Call WriteSQLToFile(hFile,strGloSQLTableDef,rbProper,rbUpper,rbLower,FALSE,FALSE)
    Set nListCount = 0
    Set nGloForeignCount = 0
    Set nMaxCount = SalListQueryCount(hWndList)
    While nListCount < nMaxCount
      If not cbRestrict or SalListQueryState(hWndList,nListCount)
        Call SalListQueryText(hWndList,nListCount,strObject)
        Call SalStrTokenize(strObject,TAB,TAB,strObjParm)
        Set nGloDetailObject = SalStrToNumber(strObjParm[1])
        If cbInclude
          Call SalFilePutStr(hFile,dfDelimiter||' SQL Definition for: '||strGloObjName[nGloDetailObject])
          Call SalFilePutStr(hFile,dfDelimiter||' ----------------------------')
          Call WordWrap(hFile,strGloObjDesc[nGloDetailObject],dfDelimiter,' NOTES:     ',FALSE)
          Call WordWrap(hFile,strGloObjInsert[nGloDetailObject],dfDelimiter,' ON INSERT: ',FALSE)
          Call WordWrap(hFile,strGloObjUpdate[nGloDetailObject],dfDelimiter,' ON UPDATE: ',FALSE)
          Call WordWrap(hFile,strGloObjDelete[nGloDetailObject],dfDelimiter,' ON DELETE: ',FALSE)
          Call SalFilePutStr(hFile,dfDelimiter)
          Call SalFilePutStr(hFile,NULL)
        If cbRules and
            (strGloObjDesc[nGloDetailObject] != NULL or
            strGloObjInsert[nGloDetailObject] != NULL or
            strGloObjUpdate[nGloDetailObject] != NULL or
            strGloObjDelete[nGloDetailObject] != NULL)
          If bGloUpperCommands
            Call SalStrLower(dfRulesTeble,strLine)
            Set strLine = 'INSERT INTO '||strLine||' VALUES('
          Else
            Set strLine = 'insert into '||dfRulesTable||' values('
          If rbProper
            Call SalStrProper(strLine,strLine)
```

```
                    If rbUpper
                      Call SalStrUpper(strLine,strLine)
                    If rbLower
                      Call SalStrLower(strLine,strLine)
                    Call SalFilePutStr(hFile,strLine)
                    Call SalFilePutStr(hFile,'\"'||strGloObjName[nGloDetailObject]||'\",')
                    Call WordWrap(hFile,'\"'||strGloObjInsert[nGloDetailObject]||'\",',NULL,NULL,FALSE)
                    Call WordWrap(hFile,'\"'||strGloObjUpdate[nGloDetailObject]||'\",',NULL,NULL,FALSE)
                    Call WordWrap(hFile,'\"'||strGloObjDelete[nGloDetailObject]||'\");',NULL,NULL,FALSE)
                    Call SalFilePutStr(hFile,NULL)
                  If rbOverwrite
                    If bGloUpperCommands
                      Call SalStrLower(strGloObjName[nGloDetailObject],strOverwrite)
                      Set strOverwrite = 'DROP TABLE '||strOverwrite||';'
                    Else
                      Set strOverwrite = 'drop table '||strGloObjName[nGloDetailObject]||';'
                    If rbProper
                      Call SalStrProper(strOverwrite,strOverwrite)
                    If rbUpper
                      Call SalStrUpper(strOverwrite,strOverwrite)
                    If rbLower
                      Call SalStrLower(strOverwrite,strOverwrite)
                    Call SalFilePutStr(hFile,strOverwrite)
                    Call SalFilePutStr(hFile,NULL)
                  Call SalModalDialog(dlgDetails,hWndForm)
                  If strGloSQLTableDef[0] = NULL
                    Call WordWrap(hFile,
                      'No Attributes Exist For '||strGloO_ID[nGloDetailObject]||'...Table '||strGloObjName[nGloDetailObject]||'
could not be created.',
                      dfDelimiter,' ERROR: ',FALSE)
                    Set nGloErrorFound = nGloErrorFound + 1
                    Call SalFilePutStr(hFile,dfDelimiter)
                    Call SalFilePutStr(hFile,NULL)
                  Else
                    Call WriteSQLToFile(hFile,strGloSQLTableDef,rbProper,rbUpper,rbLower,FALSE,FALSE)
                    If rbProper
                      Call SalStrProper(strGloUniqueIndex,strGloUniqueIndex)
                    If rbUpper
                      Call SalStrUpper(strGloUniqueIndex,strGloUniqueIndex)
                    If rbLower
                      Call SalStrLower(strGloUniqueIndex,strGloUniqueIndex)
                    Call WordWrap(hFile,strGloUniqueIndex,NULL,NULL,rbObjects)
                    If strGloUniqueIndex != NULL
                      Call SalFilePutStr(hFile,NULL)
                    Set strGloUniqueIndex = NULL
                    Call WriteSQLToFile(hFile,strGloRegularIndex,rbProper,rbUpper,rbLower,rbObjects,TRUE)
                    If cbStoreComposites
                      Call WriteSQLToFile(hFile,strGloStoredComposites,rbProper,rbUpper,rbLower,rbObjects,TRUE)
                    If cbStoreCrossProducts
                      Call WriteSQLToFile(hFile,strGloStoredCrossProducts,rbProper,rbUpper,rbLower,rbObjects,TRUE)
                Set nListCount = nListCount + 1
              If nGloForeignCount > 0
                If cbInclude
                  Call SalFilePutStr(hFile,dfDelimiter||' SQL Foreign Key Definitions')
                  Call SalFilePutStr(hFile,dfDelimiter||' ----------')
                  Call WordWrap(hFile,REF_WARNING1,dfDelimiter,' WARNING: ',FALSE)
                  Call WordWrap(hFile,REF_WARNING2,dfDelimiter,'          ',FALSE)
                  Call SalFilePutStr(hFile,dfDelimiter)
                  Call SalFilePutStr(hFile,NULL)
                Call WriteSQLToFile(hFile,strGloSQLForeignDef,rbProper,rbUpper,rbLower,rbObjects,TRUE)
              If cbCommit
                If rbCommands or rbUpper
                  Call SalFilePutStr(hFile,'COMMIT;')
                If rbObjects or rbLower
                  Call SalFilePutStr(hFile,'commit;')
                If rbProper
                  Call SalFilePutStr(hFile,'Commit;')
              Call SalFileClose(hFile)
              Set strMessage = NULL
```

```
      Set bGloBuildSQL = FALSE
      If nGloErrorFound > 0
        Call SalNumberToStr(nGloErrorFound,0,strErrors)
        Call SalMessageBox(strErrors||' Error(s) were found...please check the SQL file for errors.',APPNAME,
            MB_Ok|MB_IconExclamation)
      Call SalLoadApp('notepad',strFileName)
      Call SalWaitCursor(FALSE)
  Function: CopyDetails
    Description: Copies the attributes for a given object to temporary variables for later retrieval (used when
        doing an edit/copy, or when the program checks for duplicates.)
    Returns
      Boolean:
    Parameters
      Number: nObjectID
      Boolean: bTempCopy
    Local variables
      Number: nNextPtr
      Number: nCopyCount
    Actions
      If nGloObjAttrPtr[nObjectID] = 0
        Set strGloAttrCopyName[0] = NULL
        Return TRUE
      Else
        Set nCopyCount = 0
        Set nNextPtr = nGloObjAttrPtr[nObjectID]
        While nNextPtr != -1
          Set strGloAttrCopyName[nCopyCount] = strGloAttrName[nNextPtr]
          Set bGloAttrCopyKey[nCopyCount] = bGloAttrKey[nNextPtr]
          Set bGloAttrCopyRequired[nCopyCount] = bGloAttrRequired[nNextPtr]
          Set bGloAttrCopyIndexed[nCopyCount] = bGloAttrIndexed[nNextPtr]
          Set nGloAttrCopyType[nCopyCount] = nGloAttrType[nNextPtr]
          Set nGloAttrCopyLength[nCopyCount] = nGloAttrLength[nNextPtr]
          Set nGloAttrCopyScale[nCopyCount] = nGloAttrScale[nNextPtr]
          Set strGloAttrCopyComments[nCopyCount] = strGloAttrComments[nNextPtr]
          If bTempCopy
            Set strGloAttrCopyCRel[nCopyCount] = strGloAttrCRel[nNextPtr]
            Set strGloAttrCopyXRel[nCopyCount] = strGloAttrXRel[nNextPtr]
            Set nGloObjFunction = DELETE
          Set nNextPtr = nGloAttrNextPtr[nNextPtr]
          Set nCopyCount = nCopyCount+1
        Return TRUE
  Function: CopyObject
    Description: Copies the definition and associations for a given object to temporary variables for
        later retrieval (used when doing an edit/copy.)
    Returns
    Parameters
      Number: nCopyFrom
      Number: nCopyTo
    Local variables
    Actions
      Set strGloO_ID[nCopyTo] = strGloO_ID[nCopyFrom]
      Set strGloObjName[nCopyTo] = strGloObjName[nCopyFrom]
      Set strGloObjDesc[nCopyTo] = strGloObjDesc[nCopyFrom]
      Set nGloObjType[nCopyTo] = nGloObjType[nCopyFrom]
      Set nGloObjCell[nCopyTo] = nGloObjCell[nCopyFrom]
      Set nGloObjHBar[nCopyTo] = nGloObjHBar[nCopyFrom]
      Set nGloObjVBar[nCopyTo] = nGloObjVBar[nCopyFrom]
      Set nGloObjAttrPtr[nCopyTo] = nGloObjAttrPtr[nCopyFrom]
      Set strGloObjAssociations[nCopyTo] = strGloObjAssociations[nCopyFrom]
      Set strGloObjInsert[nCopyTo] = strGloObjInsert[nCopyFrom]
      Set strGloObjUpdate[nCopyTo] = strGloObjUpdate[nCopyFrom]
      Set strGloObjDelete[nCopyTo] = strGloObjDelete[nCopyFrom]
      If nCopyTo > 0
        Call AddAssociations(nCopyTo)
  Function: CreateIndexes
    Description: Generates the SQL "Create Index..." statements for a given object and stores them to
        a temporary array.  Called from the BuildSQLFile() function through the Details dialog.
    Returns
      Boolean:
```

```
    Parameters
    Local variables
      String: strIndexName
      String: strTableName
      Number: nRegCount
      String: strRegCount
    Actions
      Set strGloUniqueIndex = NULL
      Set strGloUniqueColumns = NULL
      Set nAttributeTblRow = TBL_MinRow
      Set nRegCount = 0
      Call SalStrLower(strGloO_ID[nGloDetailObject],strIndexName)
      Call SalStrLower(strGloObjName[nGloDetailObject],strTableName)
      While SalTblFindNextRow(hWndForm,nAttributeTblRow,0,0)
        Call SalTblSetContext(hWndForm,nAttributeTblRow)
        If colIndexed = 'Yes'
          If colKey = 'Yes'
            If strGloUniqueIndex != NULL
              Set strGloUniqueIndex = strGloUniqueIndex||', '
            Set strGloUniqueIndex = strGloUniqueIndex||colName
          Else
            Call SalNumberToStr(nRegCount+1,0,strRegCount)
            Set strGloRegularIndex[nRegCount] =
                'CREATE INDEX '||strIndexName||'_index_'||strRegCount||' ON '||strTableName||'('||colName||');'
            Set nRegCount = nRegCount + 1
      Set strGloRegularIndex[nRegCount] = NULL
      If strGloUniqueIndex != NULL
        Set strGloUniqueColumns = strGloUniqueIndex
        Set strGloUniqueIndex =
            'CREATE UNIQUE INDEX '||strIndexName||'_key ON '||strTableName||'('||strGloUniqueIndex||');'
      Return TRUE
  Function: CreateStoredSQL
    Description: Generates the SQL "Store...Select" statements for a given object (to represent summary
        objects) and stores them to a temporary array.  Called from the BuildSQLFile() function
        through the Details dialog.
    Returns
      Boolean:
    Parameters
      Number: nEntityType
    Local variables
      String: strComposition
      String: strTable
      String: strTableName
      String: strName
      String: strCompDef
      String: strCompNumber
      Number: nDetailTblRow
      Number: nCompCount
    Actions
      Set nGloCompNumber = 0
      Set nCompCount = 0
      While nGloRelated[nGloCompNumber] != -1
        If nGloRelatedType[nGloCompNumber] = nEntityType
          Call SalNumberToStr(nGloRelated[nGloCompNumber],0,strCompNumber)
          If nEntityType = ENTITY_Composite
            Set strCompDef = strGloObjCRel[nGloDetailObject]
            Set strTable = strGloO_ID[nGloRelated[nGloCompNumber]]||'_of_'||strGloO_ID[nGloDetailObject]||'('
          Else
            Set strCompDef = strGloObjXRel[nGloDetailObject]
            Set strTable = strGloO_ID[nGloDetailObject]||'_by_'||strGloO_ID[nGloRelated[nGloCompNumber]]||'('
          If SalStrScan(strCompDef,strCompNumber) != -1
            Set strComposition = 'COUNT(*), '
            Set strTable = strTable||strGloO_ID[nGloDetailObject]||'_count, '
          Set nDetailTblRow = TBL_MinRow
          While SalTblFindNextRow(hWndGloDetailTable,nDetailTblRow,0,0)
            Call SalTblSetContext(hWndGloDetailTable,nDetailTblRow)
            If colItemType > 2 and colItemType < 10
              Set strName = hWndGloDetailTable.colName
              If nEntityType = ENTITY_Composite
```

```
                Set strCompDef = hWndGloDetailTable.colCRel
              Else
                Set strCompDef = hWndGloDetailTable.colXRel
              If SalStrScan(strCompDef,'#'||strCompNumber) != -1
                Call
SalStrMid(strCompDef,SalStrScan(strCompDef,'#'||strCompNumber),SalStrLength(strCompNumber)+7,strCompDef)
              Else
                Set strCompDef = NULL
              If SalStrScan(strCompDef,'L') != -1
                Set strComposition = strComposition||'MIN('||strName||'), '
                Set strTable = strTable||strName||'_N, '
              If SalStrScan(strCompDef,'H') != -1
                Set strComposition = strComposition||'MAX('||strName||'), '
                Set strTable = strTable||strName||'_X, '
              If SalStrScan(strCompDef,'A') != -1
                Set strComposition = strComposition||'AVG('||strName||'), '
                Set strTable = strTable||strName||'_A, '
              If SalStrScan(strCompDef,'T') != -1
                Set strComposition = strComposition||'SUM('||strName||'), '
                Set strTable = strTable||strName||'_S, '
            If strComposition != NULL
              Call SalStrLeft(strComposition,SalStrLength(strComposition)-2,strComposition)
              Call SalStrLeft(strTable,SalStrLength(strTable)-2,strTable)
              Set strTable = strTable||')'
              Call SalStrLower(strTable,strTable)
              Call SalStrLower(strGloObjName[nGloDetailObject],strTableName)
              If nEntityType = ENTITY_Composite
                If bGloOverwrite
                  Set strGloStoredComposites[nCompCount] = 'ERASE '||strTable||';'
                  Set strGloStoredComposites[nCompCount+1] = SPACE
                  Set nCompCount = nCompCount + 2
                Set strComposition =
                    'CREATE VIEW '||strTable||' AS SELECT '||strComposition||' FROM '||strTableName||';'
              Else
                If bGloOverwrite
                  Set strGloStoredCrossProducts[nCompCount] = 'ERASE '||strTable||';'
                  Set strGloStoredCrossProducts[nCompCount+1] = SPACE
                  Set nCompCount = nCompCount + 2
                Set strComposition =
                    'CREATE VIEW '||strTable||' AS SELECT '||strComposition||' FROM '||strTableName||
                    ' GROUP BY '||RetrieveCrossProductAttributes(nGloRelated[nGloCompNumber])||';'
              If nEntityType = ENTITY_Composite
                Set strGloStoredComposites[nCompCount] = strComposition
              Else
                Set strGloStoredCrossProducts[nCompCount] = strComposition
              Set nCompCount = nCompCount + 1
          Set nGloCompNumber = nGloCompNumber + 1
        If nEntityType = ENTITY_Composite
          Set strGloStoredComposites[nCompCount] = NULL
        Else
          Set strGloStoredCrossProducts[nCompCount] = NULL
        Return TRUE
      Function: CreateTable
        Description: Generates the SQL "Create Table..." and "Comment On..." statements for a given object
            and stores them to a temporary array. Called from the BuildSQLFile() function through
            the Details dialog.
        Returns
          Boolean:
        Parameters
          Number: nTable
        Local variables
          String: strSQL
          String: strTable
          Number: nColCount
          String: strType
          String: strName
          String: strLength
          String: strScale
          String: strComment[*]
```

```
Actions
  Set nAttributeTblRow = TBL_MinRow
  Set strTable = strGloObjName[nTable]
  Set nColCount = 1
  While SalTblFindNextRow(hWndForm,nAttributeTblRow,0,0)
    Call SalTblSetContext(hWndForm,nAttributeTblRow)
    If strSQL != NULL
      Set strSQL = strSQL||', '
      Set strGloSQLTableDef[nColCount] = strSQL
      Set strSQL = NULL
      Set nColCount = nColCount + 1
    Call SalStrLeft(colName||SPACES,20,strName)
    If not bGloUpperCommands
      Call SalStrUpper(strName,strName)
    Set strSQL = strSQL||strName
    Select Case colItemType
      Case CHAR
        Call SalNumberToStr(colLength,0,strLength)
        Set strType = ' CHAR('||strLength||')'
        Break
      Case VARCHAR
        Call SalNumberToStr(colLength,0,strLength)
        Set strType = ' VARCHAR('||strLength||')'
        Break
      Case LONG
        Set strType = ' LONG'
        Break
      Case INTEGER
        Set strType = ' INTEGER'
        Break
      Case DECIMAL
        Call SalNumberToStr(colLength,0,strLength)
        Call SalNumberToStr(colScale,0,strScale)
        Set strType = ' DECIMAL('||strLength||','||strScale||')'
        Break
      Case NUMBER
        Set strType = ' NUMBER'
        Break
      Case SMALLINT
        Set strType = ' SMALLINT'
        Break
      Case REAL
        Set strType = ' REAL'
        Break
      Case FLOAT
        Set strType = ' FLOAT'
        Break
      Case DOUBLE
        Set strType = ' DOUBLE'
        Break
      Case DATE
        Set strType = ' DATE'
        Break
      Case TIME
        Set strType = ' TIME'
        Break
      Case TIMESTAMP
        Set strType = ' TIMESTAMP'
        Break
    If not bGloUpperCommands
      Call SalStrLower(strType,strType)
    Set strSQL = strSQL||strType
    If colRequired = 'Yes'
      If bGloUpperCommands
        Set strSQL = strSQL||' NOT NULL'
      Else
        Set strSQL = strSQL||' not null'
  If strSQL != NULL
    If bGloUpperCommands
```

```
            Call SalStrLower(strTable,strTable)
            Set strGloSQLTableDef[0] = 'CREATE TABLE '||strTable||'('
          Else
            Call SalStrUpper(strTable,strTable)
            Set strGloSQLTableDef[0] = 'create table '||strTable||'('
          If strGloUniqueColumns = NULL or not cbReferential
            Set strGloSQLTableDef[nColCount] = strSQL||');'
          Else
            Set strGloSQLTableDef[nColCount] = strSQL||','
            Set nColCount = nColCount + 1
            If bGloUpperCommands
              Call SalStrLower(strGloUniqueColumns,strGloUniqueColumns)
              Set strGloSQLTableDef[nColCount] = 'PRIMARY KEY ('||strGloUniqueColumns||'));'
            Else
              Call SalStrUpper(strGloUniqueColumns,strGloUniqueColumns)
              Set strGloSQLTableDef[nColCount] = 'primary key ('||strGloUniqueColumns||'));'
          Set strGloSQLTableDef[nColCount+1] = 'COMMENT'
          Set nColCount = nColCount + 1
          Call SalStrTrim(strGloObjDesc[nTable],strGloObjDesc[nTable])
          If strGloObjDesc[nTable] != NULL and SalStrLength(strGloObjDesc[nTable]) > 1
            If bGloUpperCommands
              Set strGloSQLTableDef[nColCount+1] = 'COMMENT ON TABLE '||strTable||' IS \"||strGloObjDesc[nTable]
            Else
              Call SalStrUpper(colName,strName)
              Set strGloSQLTableDef[nColCount+1] = 'comment on table '||strTable||' is \"||strGloObjDesc[nTable]
            Set nColCount = nColCount + 1
          Set nAttributeTblRow = TBL_MinRow
          While SalTblFindNextRow(hWndForm,nAttributeTblRow,0,0)
            Call SalTblSetContext(hWndForm,nAttributeTblRow)
            If not SalIsNull(colComments)
              If bGloUpperCommands
                Call SalStrLower(colName,strName)
                Set strGloSQLTableDef[nColCount+1] = 'COMMENT ON COLUMN '||strTable||'.'||strName||' IS
\"||colComments
              Else
                Call SalStrUpper(colName,strName)
                Set strGloSQLTableDef[nColCount+1] = 'comment on column '||strTable||'.'||strName||' is \"||colComments
              Set nColCount = nColCount + 1
          Set strGloSQLTableDef[nColCount+1] = NULL
          If bGloReferential
            Call CreateForeignKeys(strTable)
        Else
          Set strGloSQLTableDef[0] = NULL
        Return TRUE
    Function: CreateForeignKeys
      Description: Generates the SQL "Alter Table...Foreign Key" statements for a given object when the
          user selects referential integrity in the Build SQL options and stores it to a temporary array.
          Called from the BuildSQLFile() function through the Details dialog.
      Returns
        Boolean:
      Parameters
        String: strTable
      Local variables
        String: strSQL
        String: strName
        String: strFrom
        String: strAssocType
        Number: nColCount
        String: strTableName
      Actions
        Set strSQL = NULL
        Set nColCount = nGloForeignCount+1
        Set nAttributeTblRow = TBL_MinRow
        While SalTblFindNextRow(hWndForm,nAttributeTblRow,0,0)
          Call SalTblSetContext(hWndForm,nAttributeTblRow)
          If colFrom != NULL and colAssocType != 'G'
            If strSQL != NULL
              Set strSQL = strSQL||', '
              Set strGloSQLForeignDef[nColCount] = strSQL
```

```
        Set strSQL = NULL
        Set nColCount = nColCount + 1
      Set strFrom = colFrom
      Set strTableName = colTableName
      Set strAssocType = colAssocType
      Call SalStrLower(colFrom,colFrom)
      Set strSQL = 'FOREIGN KEY '||colFrom||' ('
      While colFrom = strFrom and colFrom != NULL
        Call SalStrLower(colName,colName)
        Set strSQL = strSQL||colName||','
        If SalTblFindNextRow(hWndForm,nAttributeTblRow,0,0)
          Call SalTblSetContext(hWndForm,nAttributeTblRow)
        Else
          Set colFrom = NULL
      Call SalStrLeft(strSQL,SalStrLength(strSQL)-1,strSQL)
      Set nAttributeTblRow = nAttributeTblRow - 1
      Call SalStrLower(strTableName,strTableName)
      If strAssocType = 'A'
        Set strSQL = strSQL||') REFERENCES '||strTableName||' ON DELETE SET NULL'
      Else
        Set strSQL = strSQL||') REFERENCES '||strTableName||' ON DELETE RESTRICT'
    If nColCount > nGloForeignCount+1
      Set strGloSQLForeignDef[nColCount] = strSQL||';'
      Call SalStrLower(strTable,strTable)
      Set strGloSQLForeignDef[nGloForeignCount] = 'ALTER TABLE '||strTable
      Set strGloSQLForeignDef[nColCount+1] = SPACE
      Set strGloSQLForeignDef[nColCount+2] = NULL
      Set nGloForeignCount = nColCount + 2
    Return TRUE
Function: DeleteAssociations
  Description: Removes an association between two objects.  The associations for any object are stored in
      the global strGloObjAssociations[*] array as a CSV.  This function updates the
      strGloObjAssociation array and posts a message to the workspace to refresh itself.
  Returns
  Parameters
    Number: nDelObj
    Boolean: bRefresh
  Local variables
    String: strDelObj
    String: strObjectID
    Number: nObjLoc
    String: strObjLoc
  Actions
    Call SalNumberToStr(nDelObj,0,strDelObj)
    Set strGloCSV = strGloObjAssociations[nDelObj]
    While SalStrLength(strGloCSV) > 1
      Set strObjectID = ReadCSV()
      Call SalStrLeft(strObjectID,SalStrScan(strObjectID,':'),strObjLoc)
      Call SalStrLop(strObjLoc)
      Set nObjLoc = SalStrToNumber(strObjLoc)
      Call SalStrReplace(strGloObjAssociations[nObjLoc],
          SalStrScan(strGloObjAssociations[nObjLoc],'#'||strDelObj),
          SalStrLength(strDelObj)+4,NULL,strGloObjAssociations[nObjLoc])
    Set strGloObjAssociations[nDelObj] = NULL
    If bRefresh
      Call RefreshLabels()
Function: DeleteObject
  Description: Removes the definition and associations for a given object and posts a message
      to the workspace to redraw itself.  Performed on an edit/cut, or an edit/clear.
  Returns
  Parameters
    Number: nDelete
  Local variables
  Actions
    Call DeleteAssociations(nDelete,TRUE)
    Set strGloO_ID[nDelete] = NULL
    Set strGloObjName[nDelete] = NULL
    Set strGloObjDesc[nDelete] = NULL
    Set nGloObjType[nDelete] = DELETE
```

```
        Set nGloObjCell[nDelete] = 0
        Set nGloObjHBar[nDelete] = -1
        Set nGloObjVBar[nDelete] = -1
        Set nGloObjAttrPtr[nDelete] = 0
        Set nGloCell[nGloAbsPos] = 0
        Set strGloObjInsert[nDelete] = NULL
        Set strGloObjUpdate[nDelete] = NULL
        Set strGloObjDelete[nDelete] = NULL
        Call SalSendMsgToChildren(hWndForm,MSG_Disable,0,0)
        Set wParam = SalNumberMod(nGloAbsPos,10)
        If wParam = 0
          Set wParam = 10
        Call SalSendMsgToChildren(hWndForm,MSG_HideLine,wParam,0)
        Call SalSendMsgToChildren(hWndForm,MSG_Disable,0,0)
        Call SalSendMsg(hWndDF[nGloScreenPos],MSG_Delete,0,0)
        Call SalSendMsg(hWndDF[nGloScreenPos],MSG_Hide,0,0)
        Call Redraw()
    Function: FileContinue
      Description: Prompts the user to save any changes made to their s-diagram before continuing.
          Performed on file/new or file/open.
      Returns
        Boolean:
      Parameters
      Local variables
        Number: nSaveResponse
        String: strCapFile
      Actions
        If bGloChanged
          If strGloFileName = NULL
            Set nSaveResponse = SalMessageBox('Save Changes To File?',
                APPNAME,MB_YesNoCancel|MB_IconQuestion)
          Else
            Call SalStrUpper(strGloFileName,strCapFile)
            Set nSaveResponse = SalMessageBox('Save Changes To '||strCapFile||'?',
                APPNAME,MB_YesNoCancel|MB_IconQuestion)
          If nSaveResponse = IDYES
            Call ResetFileNames(strGloFileName,strGloFilePath,'sam')
            If strGloFilePath = NULL
              Call SalStrLeft(strGloFileName,SalStrScan(strGloFileName,'.'),strGloFileName)
              Set strGloFileName = strGloFileName||'.sam'
              If DlgSaveAs(hWndForm,strGloDefPath,APPNAME||' - Save File','sam','OSAM
Files~*.sam~',OFN_PATHMUSTEXIST|OFN_HIDEREADONLY|OFN_OVERWRITEPROMPT,strGloFilePath,strGloFileNam
e)
                Call SaveOSAMFile(strGloFilePath)
              Else
                Return FALSE
            Else
              Call SaveOSAMFile(strGloFilePath)
          If nSaveResponse = IDCANCEL
            Return FALSE
        Return TRUE
    Function: FileNew
      Description: Initializes all workspace and attribute arrays and posts a message to pbOrigin to
          return the workspace to screen (0,0).  Performed on file/new when the user wishes
          to start a brand new s-diagram.
      Returns
        Boolean:
      Parameters
        Boolean: bRedraw
      Local variables
        Number: nDeleteCell
        Number: nMaxCell
        Number: nDelObject
      Actions
        If not bGloInitialized or bGloChanged
          If FileContinue()
            Call SalWaitCursor(TRUE)
            Set strMessage = 'Initializing Workspace...'
            Set nGloObjFunction = DELETE
```

```
        Set nDelObject = 1
        While nGloObjType[nDelObject] != 0
          Call DeleteAssociations(nDelObject,FALSE)
          Set strGloO_ID[nDelObject] = NULL
          Set strGloObjName[nDelObject] = NULL
          Set strGloObjDesc[nDelObject] = NULL
          Set nGloObjType[nDelObject] = DELETE
          Set nGloObjCell[nDelObject] = 0
          Set nGloObjAttrPtr[nDelObject] = 0
          Set strGloObjInsert[nDelObject] = NULL
          Set strGloObjUpdate[nDelObject] = NULL
          Set strGloObjDelete[nDelObject] = NULL
          Set nDelObject = nDelObject + 1
        Set nDeleteCell = 0
        Set nMaxCell = (SalNumberPower(MAX_SCROLL+1,2)+MAX_SCROLL)*10
        While nDeleteCell < nMaxCell
          Set nGloCell[nDeleteCell] = 0
          Set nDeleteCell = nDeleteCell + 1
        Set bEntityFocus = FALSE
        Set bGloChanged = FALSE
        Set bGloInitialized = TRUE
        Call SalWaitCursor(FALSE)
        If bRedraw
          Call SalSetWindowText(hWndForm,APPNAME||' - (untitled)')
          Call Redraw()
        Call SalSendMsgToChildren(hWndForm,MSG_Disable,0,0)
        Set bStartApp = TRUE
        Call SalSendMsg(pbOrigin,SAM_Click,0,0)
        Return TRUE
      Else
        Return FALSE
    Else
      Return TRUE
Function: FlipCase
  Description: Called depending on the Text Format options select on the Build SQL Dialog, called by
      the WordWrap() and WriteSQLToFile() functions.
  Returns
    String:
  Parameters
    String: strText
  Local variables
    Number: nWordCount
    String: strWord[*]
    String: strWordCheck
    Number: nTokens
  Actions
    Set nTokens = SalStrTokenize(strText,SPACE,SPACE,strWord)
    Set strText = NULL
    Set nWordCount = 0
    While nWordCount < nTokens
      Call SalStrUpper(strWord[nWordCount],strWordCheck)
      If strWordCheck = strWord[nWordCount]
        Call SalStrLower(strWordCheck,strWordCheck)
      Set strText = strText||SPACE||strWordCheck
      Set nWordCount = nWordCount + 1
    Call SalStrLop(strText)
    Return strText
Function: GetAllRelatedObjects
  Description: Lists data concerning either ancestor or dependent objects for a given object into four
      separate receive arrays depending upon the bDependent boolean (if FALSE, ancestors...
      if TRUE, dependents) regardless of how many levels the dependency is removed from
      the given object.
  Returns
  Parameters
    Number: nObject
    Boolean: bDependent
    Receive Number: nRelated[*]
    Receive Number: nRelatedLevel[*]
    Receive Number: nRelatedType[*]
```

```
    Receive String: strObjRelation[*]
  Local variables
    Number: nStart
    Number: nLevelStart
    String: strBaseRelation
  Actions
    Set nRelated[0] = nObject
    Set nRelatedLevel[0] = 0
    Set nRelated[1] = -1
    Set nGloCount = 0
    Set nStart = 1
    Set nLevelStart = 1
    While nRelated[nGloCount] != -1
      Set nStart = GetDirectlyRelatedObjects(nRelated[nGloCount],nStart,bDependent,
          strObjRelation[nGloCount],nRelated,nRelatedType,strObjRelation)
      While nLevelStart != nStart
        Set nRelatedLevel[nLevelStart] = nRelatedLevel[nGloCount]+1
        Set nLevelStart = nLevelStart+1
      Set nGloCount = nGloCount + 1
Function: GetDirectlyRelatedObjects
  Description: Lists data concerning either ancestor or dependent objects for a given object into four
      separate receive arrays depending upon the bDependent boolean (if FALSE, ancestors...
      if TRUE, dependents) only if the related objects are directly associated (or one level
      removed) from the given object.
  Returns
    Number:
  Parameters
    Number: nObject
    Number: nStart
    Boolean: bDependent
    String: strBaseRelation
    Receive Number: nRelated[*]
    Receive Number: nRelatedType[*]
    Receive String: strObjRelation[*]
  Local variables
    String: strObjectID
    String: strObjLoc
  Actions
    Set strGloCSV = strGloObjAssociations[nObject]
    While SalStrLength(strGloCSV) > 1
      Set strObjectID = ReadCSV()
      Call SalStrLeft(strObjectID,SalStrScan(strObjectID,':'),strObjLoc)
      Call SalStrLop(strObjLoc)
      Set nRelated[nStart] = SalStrToNumber(strObjLoc)
      Set nRelatedType[nStart] = nGloObjType[nRelated[nStart]]
      Call SalStrRight(strObjectID,1,strObjRelation[nStart])
      If (bDependent and strObjRelation[nStart] > 'Z')
          or (not bDependent and strObjRelation[nStart] < 'Z')
        If not bDependent
          If strBaseRelation = 'A'  or
              ((strBaseRelation = 'O' or strBaseRelation = 'M' or strBaseRelation = 'X') and
               strObjRelation[nStart] != 'A')
            Set strObjRelation[nStart] = strBaseRelation
        Set nStart = nStart + 1
    Set nRelated[nStart] = -1
    Return nStart
Function: GetNextAttributePtr
  Description: Returns a starting point for a new link list of object attributes.
  Returns
    Number:
  Parameters
  Local variables
    Number: nAttrCount
  Actions
    Set nAttrCount = 1
    While nGloAttrNextPtr[nAttrCount] != 0
      Set nAttrCount = nAttrCount+1
    Set nGloAttrNextPtr[nAttrCount] = -1
    Return nAttrCount
```

```
Function: GetTypeSpecifics
  Description: Determines whether an attribute type (ie CHAR, DATE) requires length and scale and
      calls a dialog box for the user to enter one or both fields if required by SQL.
  Returns
  Parameters
  Local variables
  Actions
    If colType != 'Decimal' and
        colType != 'Character Field' and
        colType != 'Variable Length Field'
      Call SalClearField(colLength)
      Call SalClearField(colScale)
    Else
      If not bSpecificsDialog
        If SalIsNull(colLength)
          Set colLength = -1
          Set colScale = -1
        If colScale = -1
          Set nLength = colLength
        Else
          Set nLength = colLength-colScale
        Set nScale = colScale
        If SalModalDialog(dlgTypeSpecifics,dlgDetails)
          Set colScale = nScale
          If nScale = -1
            Set nScale = 0
          Set colLength = nLength+nScale
        Else
          If nLength = -1
            Call SalClearField(colType)
            Return FALSE
        Call AppendSettingsToType()
Function: HideEntity
  Description: Hides an object displayed in the workspace.
  Returns
  Parameters
    Window Handle: hWndDomain
  Local variables
  Actions
    Call SalHideWindow(hWndItem)
    Call SalHideWindow(hWndDomain)
Function: IsAlphaNumeric
  Description: Determines whether or not a given string consists entirely of alphanumeric characters.
      Return TRUE if the string is alphanumeric, FALSE otherwise.  Will also replace spaces
      in the string with an underscore.
  Returns
    Boolean:
  Parameters
    Receive String: strName
  Local variables
    String: strNameCheck
    Number: nChar
  Actions
    Call ReplaceChar(strName,SPACE,'_')
    Set strNameCheck = strName
    While strNameCheck != NULL
      Set nChar = SalStrLop(strNameCheck)
      If (nChar > 47 and nChar < 58) or
          (nChar > 64 and nChar < 91) or
          (nChar > 96 and nChar < 123) or
          nChar = 95
      Else
        Call SalMessageBox('This entry must be alphanumeric.',APPNAME,MB_Ok|MB_IconAsterisk)
        Return FALSE
    Return IsNotReserved(strName)
Function: IsAncestor
  Description: Determines whether one object is the ancestor of the other.
  Returns
    Boolean:
```

```
    Parameters
      Number: nAssociate
      Number: nObject
    Local variables
      Boolean: bAncestor
    Actions
      Set bAncestor = FALSE
      Call GetAllRelatedObjects(nObject,FALSE,
          nGloRelated,nGloRelatedLevel,nGloRelatedType,strGloObjRelation)
      Set nGloCount = 1
      While nGloRelated[nGloCount] != -1
        If nGloRelated[nGloCount] = nAssociate
          Set bAncestor = TRUE
        Set nGloCount = nGloCount + 1
      Return bAncestor
  Function: IsDependent
    Description: Determines whether one object is dependent upon the other.
    Returns
      Boolean:
    Parameters
      Number: nAssociate
      Number: nObject
    Local variables
      Boolean: bDependent
    Actions
      Set bDependent = FALSE
      Call GetAllRelatedObjects(nObject,TRUE,
          nGloRelated,nGloRelatedLevel,nGloRelatedType,strGloObjRelation)
      Set nGloCount = 1
      While nGloRelated[nGloCount] != -1
        If nGloRelated[nGloCount] = nAssociate
          Set bDependent = TRUE
        Set nGloCount = nGloCount + 1
      Return bDependent
  Function: IsNotReserved
    Description: Determines whether a given string is on the list of SQL reserved words (read in at the start
        of the program into strGloSQLReservedWords[*] from the file "RESERVE.SQL". Return
        TRUE if the string is not on the list, FALSE otherwise.
    Returns
      Boolean:
    Parameters
      String: strWord
    Local variables
      Number: nReserveCount
    Actions
      Set nReserveCount = 0
      Call SalStrLower(strWord,strWord)
      While strGloSQLReservedWord[nReserveCount] != NULL
        If strGloSQLReservedWord[nReserveCount] = strWord
          Call SalMessageBox(""||strWord||"" is a SQL reserved word.  Please change your entry.',APPNAME,
              MB_Ok|MB_IconAsterisk)
          Return FALSE
        Else
          Set nReserveCount = nReserveCount + 1
      Return TRUE
  Function: KillFocusColor
    Description: Changes the color of an object which has just lost focus so that it no longer appears
        to have focus.
    Returns
    Parameters
      Number: nColorBkgd
      Number: nColorText
    Local variables
      String: strEntityName
    Actions
      Call SalColorSet(hWndItem,COLOR_IndexWindow,nColorBkgd)
      Call SalColorSet(hWndItem,COLOR_IndexWindowText,nColorText)
  Function: LoadHandles
    Description: Loops through a window looking for a particular object type and records a handle
```

```
        for each object of that type to a given array.
      Returns
      Parameters
        Window Handle: hWndCurrent
        Window Handle: hWndArray[60]
        Number: nType
      Local variables
        Window Handle: hWndChild
      Actions
        Set hWndChild = SalGetFirstChild(hWndCurrent,nType)
        Set nGloCount = 0
        Loop
          If hWndChild = hWndNULL
            Break
          Else
            Call SalHideWindow(hWndChild)
            Set hWndArray[nGloCount] = hWndChild
            Set hWndChild = SalGetNextChild(hWndChild,nType)
            Set nGloCount = nGloCount + 1
    Function: NoDetailErrors
      Description: Loops through the Object Attributes table window on dlgDetails and validates that each
        entered attribute has no errors.  Returns TRUE if no errors are found, FALSE otherwise.
      Returns
        Boolean:
      Parameters
      Local variables
        Number: nNameCount
        String: strCurrentName
        Number: nKeyResponse
      Actions
        Set nAttributeTblRow = TBL_MinRow
        While SalTblFindNextRow(hWndForm,nAttributeTblRow,0,0)
          Call SalTblSetContext(hWndForm,nAttributeTblRow)
          If SalIsNull(colFrom)
            If SalIsNull(colName)
              Set colName = '(unnamed)'
              Call SalTblSetFocusCell(hWndForm,nAttributeTblRow,colName,-1,-1)
              Call SalTblKillEdit(hWndForm)
              Call SalMessageBox('Please provide a name for this attribute.',
                  APPNAME,MB_Ok|MB_IconAsterisk)
              Call SalClearField(colName)
              Call SalTblSetFocusCell(hWndForm,nAttributeTblRow,colName,-1,-1)
              Return FALSE
            Else
              If nAttributeTblRow > 0
                Set strCurrentName = colName
                Set nNameCount = 0
                While nNameCount < nAttributeTblRow
                  Call SalTblSetContext(hWndForm,nNameCount)
                  If colName = strCurrentName
                    Call SalMessageBox('Duplicate Attribute Found.  Please Make Sure That Each Attribute for
'||frmObjMgr.strO_ID||' has a unique name.',
                        APPNAME,MB_Ok|MB_IconAsterisk)
                    Call SalTblSetFocusCell(hWndForm,nAttributeTblRow,colName,-1,-1)
                    Return FALSE
                  Else
                    Set nNameCount = nNameCount+1
                Call SalTblSetContext(hWndForm,nAttributeTblRow)
              If SalIsNull(colKey)
                Set nKeyResponse = SalMessageBox('Is the '||colName||' a key attribute? (ie. is the '||colName||' used to identify
a given '||frmObjMgr.strO_ID||')',
                    APPNAME,MB_YesNoCancel|MB_IconQuestion|MB_DefButton2)
                If nKeyResponse = IDYES
                  Set colKey = 'Yes'
                  Set colRequired = 'Yes'
                  Set colIndexed = 'Yes'
                If nKeyResponse = IDNO
                  Set colKey = 'No'
                If nKeyResponse = IDCANCEL
```

```
                Call SalTblSetFocusCell(hWndForm,nAttributeTblRow,colKey,-1,-1)
                Return FALSE
            If SalIsNull(colRequired)
              Set nKeyResponse = SalMessageBox('Is the '||colName||' a required attribute? (ie. must a '||colName||' be
provided for every '||frmObjMgr.strO_ID||')',
                APPNAME,MB_YesNoCancel|MB_IconQuestion|MB_DefButton2)
              If nKeyResponse = IDYES
                Set colRequired = 'Yes'
              If nKeyResponse = IDNO
                Set colRequired = 'No'
              If nKeyResponse = IDCANCEL
                Call SalTblSetFocusCell(hWndForm,nAttributeTblRow,colRequired,-1,-1)
                Return FALSE
            If SalIsNull(colIndexed)
              Set nKeyResponse = SalMessageBox('Should the '||colName||' be an indexed attribute? (ie. are
'||frmObjMgr.strO_ID||' data going to be retrieved, reported or queried by '||colName||')',
                APPNAME,MB_YesNoCencel|MB_IconQuestion|MB_DefButton2)
              If nKeyResponse = IDYES
                Set colIndexed = 'Yes'
              If nKeyResponse = IDNO
                Set colIndexed = 'No'
              If nKeyResponse = IDCANCEL
                Call SalTblSetFocusCell(hWndForm,nAttributeTblRow,colIndexed,-1,-1)
                Return FALSE
            If SalIsNull(colType)
              Call SalMessageBox('Please provide an attribute type for '||colName||'.',
                APPNAME,MB_Ok|MB_IconAsterisk)
              Call SalTblSetFocusCell(hWndForm,nAttributeTblRow,colType,-1,-1)
              Call SalSendMsg(dlgDetails,MSG_Show,0,0)
              Call SalPostMsg(colType,MSG_Reset,0,0)
              Return FALSE
          Return TRUE
        Function: NoDuplicateDependentAttributes
          Description: Coordinates the process of verifying that no attributes belonging to a given object are
              duplicated in any dependents.
          Returns
            Boolean:
          Parameters
            Number: nObject
            String: strAssociationType
          Local variables
            Number: nDupeCount
            Number: nDupeRelated[*]
            Number: nDupeRelatedDummy[*]
            String: strDupeRelatedDummy[*]
          Actions
            Call SalWaitCursor(TRUE)
            Set strMessage = 'Checking for duplicate attributes...'
            Set bGloDupeCheck = TRUE
            Call GetAllRelatedObjects(nObject,TRUE,
                nDupeRelated,nDupeRelatedDummy,nDupeRelatedDummy,strDupeRelatedDummy)
            Set strGloObjRelation[0] =  strAssociationType
            Set nDupeCount = 0
            While nDupeRelated[nDupeCount] != -1
              Set nGloDetailObject = nDupeRelated[nDupeCount]
              If not SalModalDialog(dlgDetails,hWndForm)
                If bGloDetailOK
                  Call SalMessageBox(strAssocID||' may not be associated with '||frmObjMgr.strO_ID||' because the
"'||strGloDupeAttr||'" attribute belonging to '||strGloO_ID[nGloDetailObject]||' would be duplicated.',
                    APPNAME,MB_Ok|MB_IconAsterisk)
                Set bGloDupeCheck = FALSE
                Call SalWaitCursor(FALSE)
                Return FALSE
              Set nDupeCount = nDupeCount + 1
            Set bGloDupeCheck = FALSE
            Set strMessage = NULL
            Call SalWaitCursor(FALSE)
            Return TRUE
        Function: NoDuplicateDependents
```

```
  Description: Verifies that associations for a given object do not result in duplicate dependents
  Returns
    Boolean:
  Parameters
    Number: nObject
    Receive String: strDuplicates
  Local variables
    Boolean: bNoDuplicate
    Number: nDupeCount
  Actions
    Set bNoDuplicate = TRUE
    Call GetAllRelatedObjects(nObject,TRUE,
        nGloRelated,nGloRelatedLevel,nGloRelatedType,strGloObjRelation)
    Set nGloCount = 1
    Set strDuplicates = NULL
    While nGloRelated[nGloCount] != -1
      Set nDupeCount = nGloCount + 1
      While nGloRelated[nDupeCount] != -1
        If nGloRelated[nGloCount] = nGloRelated[nDupeCount]
          Set bNoDuplicate = FALSE
          Set strDuplicates = strDuplicates||', '||strGloO_ID[nGloRelated[nGloCount]]
        Set nDupeCount = nDupeCount + 1
      Set nGloCount = nGloCount + 1
    If not bNoDuplicate
      Call SalStrLop(strDuplicates)
      Call SalStrLop(strDuplicates)
    Return bNoDuplicate
Function: NoDuplicateErrors
  Description: Verifies that no attributes for a given object (currently listed in the dlgDetails window) are
      duplicates of one another.
  Returns
    Boolean:
  Parameters
  Local variables
    Number: nNameCount
    String: strCurrentName
    Number: nKeyResponse
  Actions
    Set nAttributeTblRow = TBL_MinRow
    While SalTblFindNextRow(hWndForm,nAttributeTblRow,0,0)
      Call SalTblSetContext(hWndForm,nAttributeTblRow)
      If nAttributeTblRow > 0
        Set strCurrentName = colName
        Set nNameCount = 0
        While nNameCount < nAttributeTblRow
          Call SalTblSetContext(hWndForm,nNameCount)
          If colName = strCurrentName and colName != '(undefined)'
            Set strGloDupeAttr = colName
            Return FALSE
          Else
            Set nNameCount = nNameCount+1
        Call SalTblSetContext(hWndForm,nAttributeTblRow)
    Return TRUE
Function: NoErrorsFound
  Description: Sends a MSG_Check message to all children of hWndForm (the top level window that
      currently has focus) for purposes of error checking.  If an error is found, the message is
      displayed in a message box, and FALSE is returned; otherwise TRUE is returned.
  Returns
    Boolean:
  Parameters
  Local variables
  Actions
    Set strGloErrorMessage = NULL
    Call SalSendMsgToChildren(hWndForm,MSG_Check,0,0)
    If strGloErrorMessage != NULL
      Call SalMessageBox(strGloErrorMessage,APPNAME,MB_Ok|MB_IconAsterisk)
      Return FALSE
    Else
      Return TRUE
```

```
Function: OpenOSAMFile
  Description: Reads a ".sam" file into the object and attribute arrays and returns the user to screen (0,0)
  Returns
  Parameters
    String: strFileName
  Local variables
    Number: nCount
    Number: nPos
    Number: nFldCount
    Long String: strField[20]
    String: strObject
    File Handle: hFile
  Actions
    Call SalWaitCursor(TRUE)
    Set strMessage = 'Reading OSAM* File:  '||strFileName||'...'
    If SalFileOpen(hFile,strFileName,OF_Read)
      Call SalFileGetStr(hFile,strObject,5000)
      While strObject != DEL
        Call SalStrTokenize(strObject,DEL,DEL,strField)
        Set nCount = SalStrToNumber(strField[0])
        Set strGloO_ID[nCount] = strField[1]
        Set strGloObjName[nCount] = strField[2]
        Set strGloObjDesc[nCount] = strField[3]
        Set nGloObjCell[nCount] = SalStrToNumber(strField[4])
        Set nGloObjType[nCount] = SalStrToNumber(strField[5])
        Set nGloObjHBar[nCount] = SalStrToNumber(strField[6])
        Set nGloObjVBar[nCount] = SalStrToNumber(strField[7])
        Set nGloObjAttrPtr[nCount] = SalStrToNumber(strField[8])
        Set strGloObjAssociations[nCount] = strField[9]
        Set strGloObjCRel[nCount] = strField[10]
        Set strGloObjXRel[nCount] = strField[11]
        Set strGloObjInsert[nCount] = strField[12]
        Set strGloObjUpdate[nCount] = strField[13]
        Set strGloObjDelete[nCount] = strField[14]
        Set nFldCount = 0
        While nFldCount < 15
          Set strField[nFldCount] = NULL
          Set nFldCount = nFldCount + 1
        If strGloObjDesc[nCount] = SPACE
          Set strGloObjDesc[nCount] = NULL
        If strGloObjAssociations[nCount] = SPACE
          Set strGloObjAssociations[nCount] = NULL
        If strGloObjCRel[nCount] = SPACE
          Set strGloObjCRel[nCount] = NULL
        If strGloObjXRel[nCount] = SPACE
          Set strGloObjXRel[nCount] = NULL
        If strGloObjInsert[nCount] = SPACE
          Set strGloObjInsert[nCount] = NULL
        If strGloObjUpdate[nCount] = SPACE
          Set strGloObjUpdate[nCount] = NULL
        If strGloObjDelete[nCount] = SPACE
          Set strGloObjDelete[nCount] = NULL
        Set nGloNextPos = nCount
        Set nGloAbsPos = nGloObjCell[nCount]
        Set nGloCell[nGloAbsPos] = nCount
        Set nHBar = nGloObjHBar[nCount]
        Set nVBar = nGloObjVBar[nCount]
        Set nPos = SalNumberMod(nGloAbsPos,10)
        If nPos = 0
          Set nPos = 10
        Call SalSendMsg(frmObjMgr.hWndDF[nPos],MSG_Copy,0,0)
        Call SalFileGetStr(hFile,strObject,5000)
      Call SalFileGetStr(hFile,strObject,5000)
      While strObject != DEL
        Call SalStrTokenize(strObject,DEL,DEL,strField)
        Set nCount = SalStrToNumber(strField[0])
        Set strGloAttrName[nCount] = strField[1]
        Set bGloAttrKey[nCount] = SalStrToNumber(strField[2])
        Set bGloAttrRequired[nCount] = SalStrToNumber(strField[3])
```

```
        Set bGloAttrIndexed[nCount] = SalStrToNumber(strField[4])
        Set nGloAttrType[nCount] = SalStrToNumber(strField[5])
        Set nGloAttrLength[nCount] = SalStrToNumber(strField[6])
        Set nGloAttrScale[nCount] = SalStrToNumber(strField[7])
        Set nGloAttrStatus[nCount] = SalStrToNumber(strField[8])
        Set nGloAttrNextPtr[nCount] = SalStrToNumber(strField[9])
        Set strGloAttrComments[nCount] = strField[10]
        Set strGloAttrRules[nCount] = strField[11]
        Set strGloAttrCRel[nCount] = strField[12]
        Set strGloAttrXRel[nCount] = strField[13]
        If strGloAttrName[nCount] = SPACE
          Set strGloAttrName[nCount] = NULL
        If strGloAttrComments[nCount] = SPACE
          Set strGloAttrComments[nCount] = NULL
        If strGloAttrRules[nCount] = SPACE
          Set strGloAttrRules[nCount] = NULL
        If strGloAttrCRel[nCount] = SPACE
          Set strGloAttrCRel[nCount] = NULL
        If strGloAttrXRel[nCount] = SPACE
          Set strGloAttrXRel[nCount] = NULL
        Call SalFileGetStr(hFile,strObject,5000)
      Call SalFileClose(hFile)
      Set bGloChanged = FALSE
      Call SalPostMsg(pbOrigin,SAM_Click,0,0)
      Call SalSetWindowText(hWndForm,APPNAME||' - '||strGloFileName)
      Set bGloInitialized = FALSE
    Set strMessage = NULL
    Call SalWaitCursor(FALSE)
Function: ReadCSV
  Description: Strips off and returns the first element of global strGloCSV.
  Returns
    String:
  Parameters
  Local variables
    Number: nOffset
    Number: nLength
    Number: nQuote
    String: sTemp
  Actions
    Set nLength = SalStrLength(strGloCSV)
    Set nOffset = SalStrScan(strGloCSV,',')
    Call SalStrLeft(strGloCSV,nOffset,sTemp)
    Call SalStrRight(strGloCSV,nLength-nOffset-1,strGloCSV)
    Return sTemp
Function: ReadReservedWords
  Description: Reads a list of SQL reserved words from the RESERVE.SQL file.
  Returns
  Parameters
  Local variables
    File Handle: hFile
  Actions
    Call SalWaitCursor(TRUE)
    Set nGloCount = 0
    If SalFileOpen(hFile,'RESERVE.SQL',OF_Read)
      While SalFileGetStr(hFile,strGloSQLReservedWord[nGloCount],100)
        Call SalStrLower(strGloSQLReservedWord[nGloCount],strGloSQLReservedWord[nGloCount])
        Set nGloCount = nGloCount + 1
      Call SalFileClose(hFile)
    Set strGloSQLReservedWord[nGloCount] = NULL
    Call SalWaitCursor(FALSE)
Function: Redraw
  Description: Coordinates the repainting of the workspace when the user has made a change to it.
  Returns
  Parameters
  Local variables
  Actions
    Call SalWaitCursor(TRUE)
    Set strMessage = 'Redrawing Workspace...'
    Set nGloEditPos = 0
```

```
    Set bEntityFocus = FALSE
    Set nGloResetPos = nGloScreen*10
    Set nGloCount = 1
    While nGloCount < MAXLINES+1
      Call SalHideWindow(frmObjMgr.hWndLine[nGloCount])
      Set nGloCount = nGloCount + 1
    Call SalSendMsgToChildren(hWndForm,MSG_Hide,0,0)
    Call SalSendMsgToChildren(hWndForm,MSG_Reset,0,0)
    Call SalSendMsgToChildren(hWndForm,MSG_Gray,0,0)
    Call SalSendMsgToChildren(hWndForm,MSG_Show,0,0)
    Call ShowLines()
    Call RefreshSelectMenu()
    Set strMessage = NULL
    Call SalWaitCursor(FALSE)
Function: ResetEntity
  Description: Resets the regular colors--cyan or gray (for domains) on all visible objects.
  Returns
  Parameters
  Local variables
  Actions
    Set nGloResetPos = nGloResetPos+1
    If strGloO_ID[nGloCell[nGloResetPos]] != NULL and nGloCell[nGloResetPos] != 0
      Call SalSetWindowText(hWndItem,strGloO_ID[nGloCell[nGloResetPos]])
      If nGloObjType[nGloCell[nGloResetPos]] = DOMAIN
        Call SalColorSet(hWndItem,COLOR_IndexWindow,COLOR_Gray)
      Else
        Call SalColorSet(hWndItem,COLOR_IndexWindow,COLOR_Cyan)
    Else
      Call SalClearField(hWndItem)
Function: ResetFileNames
  Description: resets buffers for file names (for use with the Common File Dialogs)
  Returns
  Parameters
    Receive String: strFile
    Receive String: strPath
    String: strExtension
  Local variables
  Actions
    Call SalStrSetBufferLength(strFile,256)
    Call SalStrSetBufferLength(strPath,256)
    Call SalStrLeft(strGloFileName,SalStrScan(strGloFileName,'.'),strGloFileName)
    Set strGloFileName = strGloFileName||'.'||strExtension
    Call SalStrLeft(strGloFilePath,SalStrScan(strGloFilePath,'.'),strGloFilePath)
    If strGloFilePath = NULL
      Set strGloFilePath = '*.'||strExtension
    Else
      Set strGloFilePath = strGloFilePath||'.'||strExtension
    If strGloFileName != NULL
      Call SalStrLeft(strGloDefPath,SalStrLength(strGloDefPath)-(SalStrLength(strFile)+1),strGloDefPath)
    Else
      Set strGloDefPath = '\\'
Function: RefreshLabels
  Description: Updates the labels which are visible on the workspace to reflect each object's association
      (if any) with the object with focus.
  Returns
    Number:
  Parameters
  Local variables
    String: strConnectPos
    Number: nConnect1
    Number: nConnect2
    Number: nPos1
    Number: nPos2
    Number: nMaxPos
    Number: nScanPos
    Boolean: bNotCurrent
    String: strAssocType
  Actions
    Set nMaxPos = (nGloScreen*10)+10
```

```
    Set nPos1 = (nGloScreen*10)+1
    While nPos1 <= nMaxPos
      Set nConnect1 = SalNumberMod(nPos1,10)
      If nConnect1= 0
        Set nConnect1 = 10
      Call SalNumberToStr(nGloCell[nPos1],0,strConnectPos)
      Set nScanPos =
          SalStrScan(strGloObjAssociations[nGloCell[nGloAbsPos]],'#'||strConnectPos)
      If nScanPos != -1
        Set strAssocType = SPACE
        While strAssocType < 'A'
          Call SalStrMid(strGloObjAssociations[nGloCell[nGloAbsPos]],nScanPos,1,strAssocType)
          Set nScanPos = nScanPos+1
        Call SalSetWindowText(hWndDF[nConnect1],strGloO_ID[nGloCell[nPos1]]||' ('||strAssocType||')')
      Else
        Call SalSetWindowText(hWndDF[nConnect1],strGloO_ID[nGloCell[nPos1]])
        If nGloAbsPos != nPos1
          If nGloObjType[nGloCell[nPos1]] != DOMAIN
            Call SalColorSet(frmObjMgr,hWndDF[nConnect1],COLOR_IndexWindow,COLOR_Cyan)
          Else
            Call SalPicSetFile(hWndDom[10-nConnect1],CIRCLE_OFF)
      Set nPos1 = nPos1+1
Function: RefreshSelectMenu
  Description: Updates the select menu to reflect the objects currently visible on the screen.
  Returns
  Parameters
  Local variables
    Number: nMenuCount
    Number: nPos
    Number: nOffset
    String: strMenuItem
  Actions
    Set nPos = (nGloScreen*10)+1
    Set nMenuCount = 0
    Set nOffset = 0
    Set bGloItemsVisible = FALSE
    While nMenuCount < 10
      If nMenuCount = 4
        Set nOffset = 1
      If nMenuCount = 6
        Set nOffset = 2
      If nMenuCount = 9
        Set strMenuItem = '1&0 - '
      Else
        Call SalNumberToStr(nMenuCount+1,0,strMenuItem)
        Set strMenuItem = ' &'||strMenuItem||' - '
      If nGloCell[nPos+nMenuCount] > 0
        Set strMenuItem = strMenuItem||strGloO_ID[nGloCell[nPos+nMenuCount]]
        Set bGloItemsVisible = TRUE
      Call SalStrProper(strMenuItem,strMenuItem)
      Call ChangeMenu( hWndGloSubMenu, nMenuCount+nOffset, strMenuItem,
            GetMenuItemID( hWndGloSubMenu, nMenuCount+nOffset ),
            MF_ByPosition | MF_String | MF_Change )
      Set nMenuCount = nMenuCount + 1
    Call SalDrawMenuBar(frmObjMgr)
Function: ReplaceChar
  Description: scans a string and replaces a given character with a second character.
  Returns
  Parameters
    Receive String: strName
    String: strChar
    String: strReplacement
  Local variables
  Actions
    While SalStrScan(strName,strChar) != -1
      Call SalStrReplace(strName,SalStrScan(strName,strChar),1,strReplacement,strName)
Function: RestoreDetails
  Description: copies object attributes held in temporary variables to a given object's attribute link list.
  Returns
```

```
    Boolean:
  Parameters
    Number: nObjectID
  Local variables
    Number: nNextPtr
    Number: nLastPtr
    Number: nCopyCount
  Actions
    If nGloObjAttrPtr[nObjectID] = 0
      Return TRUE
    Else
      Set nCopyCount = 0
      Set nNextPtr = nGloObjAttrPtr[nObjectID]
      While nNextPtr != -1 and strGloAttrCopyName[nCopyCount] != NULL
        Set strGloAttrName[nNextPtr] = strGloAttrCopyName[nCopyCount]
        Set bGloAttrKey[nNextPtr] = bGloAttrCopyKey[nCopyCount]
        Set bGloAttrRequired[nNextPtr] = bGloAttrCopyRequired[nCopyCount]
        Set bGloAttrIndexed[nNextPtr] = bGloAttrCopyIndexed[nCopyCount]
        Set nGloAttrType[nNextPtr] = nGloAttrCopyType[nCopyCount]
        Set nGloAttrLength[nNextPtr] = nGloAttrCopyLength[nCopyCount]
        Set nGloAttrScale[nNextPtr] = nGloAttrCopyScale[nCopyCount]
        Set strGloAttrComments[nNextPtr] = strGloAttrCopyComments[nCopyCount]
        Set strGloAttrCRel[nNextPtr] = strGloAttrCopyCRel[nCopyCount]
        Set strGloAttrXRel[nNextPtr] = strGloAttrCopyXRel[nCopyCount]
        Set nCopyCount = nCopyCount+1
        If nGloAttrNextPtr[nNextPtr] = -1
          Set nGloAttrNextPtr[nNextPtr] = GetNextAttributePtr()
        Set nLastPtr = nNextPtr
        Set nNextPtr = nGloAttrNextPtr[nNextPtr]
      If nNextPtr != -1
        Set nGloAttrNextPtr[nLastPtr] = -1
        Set nGloAttrNextPtr[nNextPtr] = 0
      Return TRUE
Function: RetrieveCrossProductAttributes
  Description: Generates the SQL "group by" fields when building SQL stored statements .
  Returns
    String:
  Parameters
    Number: nObject
  Local variables
    Number: nNextPtr
    Boolean: bAttributeFound
    Number: nRelated[*]
    Number: nLevel[*]
    Number: nType[*]
    String: strRelation[*]
    Number: nCount
    String: strCrossProduct
  Actions
    Set strCrossProduct = NULL
    Call GetAllRelatedObjects(nObject,FALSE,nRelated,nLevel,nType,strRelation)
    Set nCount = 1
    While nRelated[nCount] != -1
      Call SalStrUpper(strRelation[nCount],strRelation[nCount])
      If strRelation[nCount] = 'X'
        Set strRelation[nCount] = 'A'
      If nGloObjAttrPtr[nRelated[nCount]] != 0
        Set nNextPtr = nGloObjAttrPtr[nRelated[nCount]]
        While nNextPtr != -1
          If nGloAttrStatus[nNextPtr] = ACTIVE and bGloAttrKey[nNextPtr]
            Set strCrossProduct = strCrossProduct||strGloAttrName[nNextPtr]||', '
          Set nNextPtr = nGloAttrNextPtr[nNextPtr]
      Set nCount = nCount + 1
    If strCrossProduct != NULL
      Call SalStrLeft(strCrossProduct,SalStrLength(strCrossProduct)-2,strCrossProduct)
    Return strCrossProduct
Function: RetrieveObjectAttributes
  Description: Populates the dlgDetail table with the attributes belonging to a given object.
  Returns
```

```
  Boolean:
Parameters
  Number: nObject
  Number: nRelLevel
  String: strAssocType
Local variables
  Number: nNextPtr
  Number: nNewRow
  String: strOrigAssocType
  Boolean: bAttributeFound
Actions
  Call SalStrUpper(strAssocType,strAssocType)
  Set strOrigAssocType = strAssocType
  If strAssocType = 'X'
    Set strAssocType = 'A'
  If nGloObjAttrPtr[nObject] = 0 or
      (nRelLevel > 1and strAssocType != 'G' and strOrigAssocType != 'X')
    Set bAttributeFound = FALSE
  Else
    Set nNextPtr = nGloObjAttrPtr[nObject]
    Set bAttributeFound = FALSE
    While nNextPtr != -1
      If nGloAttrStatus[nNextPtr] = ACTIVE and
          ((bGloAttrKey[nNextPtr] and (nRelLevel = 1 or strOrigAssocType = 'X'))
           or nObject = nGloDetailObject or strAssocType = 'G')
        Set bAttributeFound = TRUE
        Set nNewRow = SalTblInsertRow( hWndForm, TBL_MaxRow )
        Call SalTblSetContext(hWndForm,nNewRow )
        Call SalTblSetRowFlags(hWndForm,nNewRow,ROW_New,FALSE)
        Set colName = strGloAttrName[nNextPtr]
        If nObject != nGloDetailObject
          Set colFrom = strGloO_ID[nObject]
          Set colTableName = strGloObjName[nObject]
          Set colAssocType = strAssocType
          Call SalColorSet(colName,COLOR_IndexCellText,COLOR_DarkGreen)
          Call SalColorSet(colFrom,COLOR_IndexCellText,COLOR_DarkGreen)
          Call SalColorSet(colAssocType,COLOR_IndexCellText,COLOR_DarkGreen)
          Call SalColorSet(colKey,COLOR_IndexCellText,COLOR_DarkGreen)
          Call SalColorSet(colRequired,COLOR_IndexCellText,COLOR_DarkGreen)
          Call SalColorSet(colIndexed,COLOR_IndexCellText,COLOR_DarkGreen)
          Call SalColorSet(colType,COLOR_IndexCellText,COLOR_DarkGreen)
          Call SalColorSet(colComments,COLOR_IndexCellText,COLOR_DarkGreen)
        Else
          If not bGloDetailOK and colName = strGloDupeAttr
            Call SalTblSetFocusCell(hWndForm,nNewRow,colName,-1,-1)
        If bGloAttrKey[nNextPtr] and (nObject = nGloDetailObject or strAssocType != 'A')
          Set colKey = 'Yes'
        Else
          Set colKey = 'No'
        If bGloAttrRequired[nNextPtr] and (nObject = nGloDetailObject or strAssocType != 'A')
          Set colRequired = 'Yes'
        Else
          Set colRequired = 'No'
        If bGloAttrIndexed[nNextPtr] and (nObject = nGloDetailObject or strAssocType != 'A')
          Set colIndexed = 'Yes'
        Else
          Set colIndexed = 'No'
        Set colItemType = nGloAttrType[nNextPtr]
        Set colComments = strGloAttrComments[nNextPtr]
        Set colCRel = strGloAttrCRel[nNextPtr]
        Set colXRel = strGloAttrXRel[nNextPtr]
        Call SalStrReplace(strColType[colItemType],SalStrScan(strColType[colItemType],'&'),
            1,NULL,colType)
        Call SalStrMid(TYPE_CHOICES,colItemType,1,strCheck)
        Set colLength = nGloAttrLength[nNextPtr]
        Set colScale = nGloAttrScale[nNextPtr]
        Set nScale = colScale
        If nScale = -1
          Set nScale = 0
```

```
            Set nLength = colLength-nScale
            Call AppendSettingsToType()
          Set nNextPtr = nGloAttrNextPtr[nNextPtr]
      If not bAttributeFound and (nRelLevel =1 or strAssocType = 'G')
          and nObject != nGloDetailObject
        Set nNewRow = SalTblInsertRow( hWndForm, TBL_MaxRow )
        Call SalTblSetContext(hWndForm,nNewRow )
        Call SalTblSetRowFlags(hWndForm,nNewRow,ROW_New,FALSE)
        Call SalColorSet(colName,COLOR_IndexCellText,COLOR_Red)
        Call SalColorSet(colFrom,COLOR_IndexCellText,COLOR_Red)
        Call SalColorSet(colAssocType,COLOR_IndexCellText,COLOR_Red)
        Set colName = '(undefined)'
        Set colFrom = strGloO_ID[nObject]
        Set colAssocType = strAssocType
        Set colKey = NULL
        Set colRequired = NULL
        Set colIndexed = NULL
        Set colType = NULL
      Return bAttributeFound
  Function: SaveDetails
    Description: writes the base attributes (attributes not inherited from other objects) for a given object to that
        object's attribute link list.
    Returns
      Boolean:
    Parameters
    Local variables
      Number: nNextPtr
      Number: nLastPtr
    Actions
      If nGloObjAttrPtr[nGloCell[nGloAbsPos]] = 0
        Set nGloObjAttrPtr[nGloCell[nGloAbsPos]] = GetNextAttributePtr()
      Set nNextPtr = nGloObjAttrPtr[nGloCell[nGloAbsPos]]
      Set nAttributeTblRow = TBL_MinRow
      While SalTblFindNextRow(hWndForm,nAttributeTblRow,0,0)
        Call SalTblSetContext(hWndForm,nAttributeTblRow)
        If colFrom = NULL
          Set strGloAttrName[nNextPtr] = colName
          If colKey = 'Yes'
            Set bGloAttrKey[nNextPtr] = TRUE
          Else
            Set bGloAttrKey[nNextPtr] = FALSE
          If colRequired = 'Yes'
            Set bGloAttrRequired[nNextPtr] = TRUE
          Else
            Set bGloAttrRequired[nNextPtr] = FALSE
          If colIndexed = 'Yes'
            Set bGloAttrIndexed[nNextPtr] = TRUE
          Else
            Set bGloAttrIndexed[nNextPtr] = FALSE
          Set nGloAttrStatus[nNextPtr] = ACTIVE
          Set nGloAttrType[nNextPtr] = colItemType
          Set nGloAttrLength[nNextPtr] = colLength
          Set nGloAttrScale[nNextPtr] = colScale
          Set strGloAttrComments[nNextPtr] = colComments
          Set strGloAttrCRel[nNextPtr] = colCRel
          Set strGloAttrXRel[nNextPtr] = colXRel
          If nGloAttrNextPtr[nNextPtr] = -1
            Set nGloAttrNextPtr[nNextPtr] = GetNextAttributePtr()
          Set nLastPtr = nNextPtr
          Set nNextPtr = nGloAttrNextPtr[nNextPtr]
      If nNextPtr != -1
        Set nGloAttrNextPtr[nLastPtr] = -1
        Set nGloAttrNextPtr[nNextPtr] = 0
      Return TRUE
  Function: SaveOSAMFile
    Description: writes object and attribute arrays to a ".sam" file.
    Returns
    Parameters
      String: strFileName
```

```
Local variables
  String: strCount
  String: strObjCell
  String: strObjType
  String: strObjHBar
  String: strObjVBar
  String: strObjAttrPtr
  File Handle: hFile
  String: strAttrKey
  String: strAttrRequired
  String: strAttrIndexed
  String: strAttrType
  String: strAttrLength
  String: strAttrScale
  String: strAttrStatus
  String: strAttrNextPtr
  Number: nNextPtr
  String: strNext
Actions
  Call SalSendMsgToChildren(hWndForm,SAM_FieldEdit,0,0)
  If SalFileOpen(hFile,strFileName,OF_Create|OF_Write)
    Call SalWaitCursor(TRUE)
    Set strMessage = 'Saving Workspace to OSAM* File: '||strFileName||'...'
    Set nGloCount = 1
    While nGloObjType[nGloCount] != 0
      If nGloObjType[nGloCount] != DELETE
        Call SalNumberToStr(nGloCount,0,strCount)
        Call SalNumberToStr(nGloObjCell[nGloCount],0,strObjCell)
        Call SalNumberToStr(nGloObjType[nGloCount],0,strObjType)
        Call SalNumberToStr(nGloObjHBar[nGloCount],0,strObjHBar)
        Call SalNumberToStr(nGloObjVBar[nGloCount],0,strObjVBar)
        Call SalNumberToStr(nGloObjAttrPtr[nGloCount],0,strObjAttrPtr)
        If strGloObjDesc[nGloCount] = NULL
          Set strGloObjDesc[nGloCount] = SPACE
        If strGloObjAssociations[nGloCount] = NULL
          Set strGloObjAssociations[nGloCount] = SPACE
        If strGloObjCRel[nGloCount] = NULL
          Set strGloObjCRel[nGloCount] = SPACE
        If strGloObjXRel[nGloCount] = NULL
          Set strGloObjXRel[nGloCount] = SPACE
        If strGloObjInsert[nGloCount] = NULL
          Set strGloObjInsert[nGloCount] = SPACE
        If strGloObjUpdate[nGloCount] = NULL
          Set strGloObjUpdate[nGloCount] = SPACE
        If strGloObjDelete[nGloCount] = NULL
          Set strGloObjDelete[nGloCount] = SPACE
        Call SalFilePutStr(hFile,
            strCount||DEL||strGloO_ID[nGloCount]||DEL||strGloObjName[nGloCount]||DEL||
            strGloObjDesc[nGloCount]||DEL||strObjCell||DEL||strObjType||DEL||strObjHBar||DEL||
            strObjVBar||DEL||strObjAttrPtr||DEL||strGloObjAssociations[nGloCount]||DEL||
            strGloObjCRel[nGloCount]||DEL||strGloObjXRel[nGloCount]||DEL||strGloObjInsert[nGloCount]||
            DEL||strGloObjUpdate[nGloCount]||DEL||strGloObjDelete[nGloCount])
      Set nGloCount = nGloCount + 1
    Call SalFilePutStr(hFile,DEL)
    Set nGloCount = 1
    While nGloObjType[nGloCount] != 0
      If nGloObjType[nGloCount] != DELETE
        If nGloObjAttrPtr[nGloCount] != 0
          Set nNextPtr = nGloObjAttrPtr[nGloCount]
          While nNextPtr != -1
            Call SalNumberToStr(nNextPtr,0,strNext)
            Call SalNumberToStr(bGloAttrKey[nNextPtr],0,strAttrKey)
            Call SalNumberToStr(bGloAttrRequired[nNextPtr],0,strAttrRequired)
            Call SalNumberToStr(bGloAttrIndexed[nNextPtr],0,strAttrIndexed)
            Call SalNumberToStr(nGloAttrType[nNextPtr],0,strAttrType)
            Call SalNumberToStr(nGloAttrLength[nNextPtr],0,strAttrLength)
            Call SalNumberToStr(nGloAttrScale[nNextPtr],0,strAttrScale)
            Call SalNumberToStr(nGloAttrStatus[nNextPtr],0,strAttrStatus)
            Call SalNumberToStr(nGloAttrNextPtr[nNextPtr],0,strAttrNextPtr)
```

```
            If strGloAttrName[nNextPtr] = NULL
              Set strGloAttrName[nNextPtr] = SPACE
            If strGloAttrComments[nNextPtr] = NULL
              Set strGloAttrComments[nNextPtr] = SPACE
            If strGloAttrRules[nNextPtr] = NULL
              Set strGloAttrRules[nNextPtr] = SPACE
            If strGloAttrCRel[nNextPtr] = NULL
              Set strGloAttrCRel[nNextPtr] = SPACE
            If strGloAttrXRel[nNextPtr] = NULL
              Set strGloAttrXRel[nNextPtr] = SPACE
            If strAttrLength = NULL
              Set strAttrLength = '0'
            If strAttrScale = NULL
              Set strAttrScale = '0'
            Call SalFilePutStr(hFile,
                strNext||DEL||strGloAttrName[nNextPtr]||DEL||strAttrKey||DEL||
                strAttrRequired||DEL||strAttrIndexed||DEL||
                strAttrType||DEL||strAttrLength||DEL||strAttrScale||DEL||strAttrStatus||
                DEL||strAttrNextPtr||DEL||strGloAttrComments[nNextPtr]||DEL||
                strGloAttrRules[nNextPtr]||DEL||strGloAttrCRel[nNextPtr]||DEL||
                strGloAttrXRel[nNextPtr])
            Set nNextPtr = nGloAttrNextPtr[nNextPtr]
        Set nGloCount = nGloCount + 1
      Call SalFilePutStr(hFile,DEL)
      Call SalSetWindowText(hWndForm,APPNAME||' - '||strGloFileName)
      Call SalFileClose(hFile)
      Set bGloChanged = FALSE
      Set strMessage = NULL
      Call SalWaitCursor(FALSE)
Function: SetDomainGray
  Description: Repaints a domain when that domain loses focus.
  Returns
  Parameters
    Window Handle: hWndDomain
  Local variables
  Actions
    If SalColorGet(hWndItem,COLOR_IndexWindow) != COLOR_Gray
      Call KillFocusColor(COLOR_Cyan,COLOR_Black)
    Else
      Call SalPicSetFile(hWndDomain,CIRCLE_OFF)
Function: SetEntityFocus
  Description: Repaints an object visible on the screen when that object gets focus.
  Returns
  Parameters
    Number: nEntity
    Window Handle: hWndDomain
  Local variables
  Actions
    Set nGloScreenPos = nEntity
    Set bEntityFocus = TRUE
    Set nGloAbsPos = (nGloScreen*10)+nGloScreenPos
    Call RefreshLabels()
    If SalColorGet(hWndItem,COLOR_IndexWindow) != COLOR_Gray
      Call SetFocusColor(COLOR_Yellow,COLOR_Black)
    Else
      Call SetFocusColor(COLOR_Gray,COLOR_Black)
      Call SalPicSetFile(hWndDomain,CIRCLE_ON)
Function: SetFocusColor
  Description: Repaints a data field a certain foreground and background and sends a gray message
      to all children of the form.
  Returns
  Parameters
    Number: nColorBkgd
    Number: nColorText
  Local variables
    String: strEntityName
  Actions
    Call SalSendMsgToChildren(hWndForm,MSG_Gray,0,0)
    Call SalColorSet(hWndItem,COLOR_IndexWindow,nColorBkgd)
```

```
      Call SalColorSet(hWndItem,COLOR_IndexWindowText,nColorText)
  Function: SetPositionBlack
    Description: Blacks out an object position for placing an object on the workspace if that position is
        already taken by another object. (called from dlgAddDialog)
    Returns
    Parameters
    Local variables
    Actions
      If SalColorGet(hWndItem,COLOR_IndexWindow) = COLOR_Yellow
        Call KillFocusColor(COLOR_Cyan,COLOR_Black)
  Function: SetPositionFocus
    Description: Determines which object position has been selected for placing an object on the workspace
        (called from dlgAddDialog)
    Returns
      Number:
    Parameters
    Local variables
      String: strPos
    Actions
      Call SetFocusColor(COLOR_Yellow,COLOR_Black)
      Call SalGetWindowText(hWndItem,strPos,2)
      Return SalStrToNumber(strPos)
  Function: SetPositionValue
    Description: Populates a given position field (hWndItem) with a given number (1..10). Returns
        TRUE if the position is available, FALSE otherwise.
    Returns
      Boolean:
    Parameters
      Number: nPos
      Boolean: bPositionFilled
    Local variables
      String: strPos
    Actions
      If SalIsWindowVisible(frmObjMgr.hWndDF[nPos]) = bPositionFilled
        Call SalColorSet(hWndItem,COLOR_IndexWindow,COLOR_Black)
        Call SalDisableWindow(hWndItem)
        Return FALSE
      Else
        Call SalNumberToStr(nPos,0,strPos)
        Call SalSetWindowText(hWndItem,strPos)
        Return TRUE
  Function: ShowDomain
    Description: shows the corresponding object circle (representing a domain) for given screen position
        if that object is a domain.
    Returns
    Parameters
      Window Handle: hWndDomain
    Local variables
      String: strText
    Actions
      If not SalIsNull(hWndItem)
        Call SalShowWindow(hWndItem)
        If SalColorGet(hWndItem,COLOR_IndexWindow) = COLOR_Gray
          Call SalShowWindow(hWndDomain)
      Call SalGetWindowText(hWndItem,strText,8)
      If strText = frmObjMgr.strO_ID
        Call SalPostMsg(hWndItem,SAM_SetFocus,0,0)
  Function: ShowLines
    Description: loops through the objects currently visible in the workspace and coordinates the redrawing
        of lines and association (directional) labels.
    Returns
      Number:
    Parameters
    Local variables
      String: strConnectPos
      Number: nConnect1
      Number: nConnect2
      Number: nPos1
      Number: nPos2
```

```
    Number: nMaxPos
    Number: nScanPos
    Boolean: bNotCurrent
    String: strAssocType
  Actions
    Set nMaxPos = (nGloScreen*10)+10
    Set bNotCurrent = FALSE
    If SalNumberTruncate(nGloAbsPos/10,8,0) != nGloScreen
        and nGloAbsPos != nMaxPos
      Set bNotCurrent = TRUE
    Set nPos1 = (nGloScreen*10)+1
    While nPos1 <= nMaxPos
      Call SalNumberToStr(nGloCell[nPos1],0,strConnectPos)
      Set nConnect1 = SalNumberMod(nPos1,10)
      If nConnect1= 0
        Set nConnect1 = 10
      Set nPos2 = nPos1+1
      While nPos2 <= nMaxPos
        Set nScanPos =
            SalStrScan(strGloObjAssociations[nGloCell[nPos2]],'#'||strConnectPos)
        If nGloCell[nPos2] > 0 and nScanPos != -1
          Set nConnect2 = SalNumberMod(nPos2,10)
          If nConnect2 = 0
            Set nConnect2 = 10
          Call SalSendMsg(frmObjMgr.hWndDF[nConnect1],MSG_ShowLine,nConnect2,0)
          If nPos1 = nGloAbsPos
            Set strAssocType = SPACE
            While strAssocType < 'A'
              Call SalStrMid(strGloObjAssociations[nGloCell[nPos2]],nScanPos,1,strAssocType)
              Set nScanPos = nScanPos+1
            If strAssocType > 'Z'
              Call SalStrUpper(strAssocType,strAssocType)
            Else
              Call SalStrLower(strAssocType,strAssocType)
            Call SalSetWindowText(hWndDF[nConnect2],strGloO_ID[nGloCell[nPos2]]||' ('||strAssocType||')')
        Set nPos2 = nPos2+1
      Set nScanPos =
          SalStrScan(strGloObjAssociations[nGloCell[nGloAbsPos]],'#'||strConnectPos)
      If bNotCurrent and nScanPos != -1
        Set strAssocType = SPACE
        While strAssocType < 'A'
          Call SalStrMid(strGloObjAssociations[nGloCell[nGloAbsPos]],nScanPos,1,strAssocType)
          Set nScanPos = nScanPos+1
        Call SalSetWindowText(hWndDF[nConnect1],strGloO_ID[nGloCell[nPos1]]||' ('||strAssocType||')')
        If nGloObjType[nGloCell[nPos1]] != DOMAIN
          Call SalColorSet(frmObjMgr.hWndDF[nConnect1],COLOR_IndexWindow,COLOR_Green)
        Else
          Call SalPicSetFile(hWndDom[10-nConnect1],CIRCLE_CONNECTED)
      Set nPos1 = nPos1+1
Function: WordWrap
  Description: Wraps comments or error messages being written to an SQL file.
  Returns
  Parameters
    File Handle: hFile
    String: strText
    String: strDelimiter
    String: strHeader
    Boolean: bFlip
  Local variables
    String: strLine
    String: strChar
    String: strWord[*]
    Number: nWord
  Actions
    If bFlip
      Set strText = FlipCase(strText)
    Call SalStrTrim(strText,strText)
    Call SalStrTokenize(strText,SPACE,SPACE,strWord)
    Set nWord = 0
```

```
    Set strLine = strHeader
    Call SalStrRepeat(SPACE,SalStrLength(strHeader),strHeader)
    While strWord[nWord] != NULL
      While (SalStrLength(strLine)+SalStrLength(strWord[nWord]) < 85) and strWord[nWord] != NULL
        Set strLine = strLine||SPACE||strWord[nWord]
        Set nWord = nWord + 1
      If strDelimiter = NULL
        Call SalStrLop(strLine)
      Call SalFilePutStr(hFile,strDelimiter||strLine)
      Set strLine = strHeader
Function: WriteSQLToFile
  Description: writes SQL (generated by other functions) from temporary variables to the SQL file.
  Returns
  Parameters
    File Handle: hFile
    Receive String: strText[*]
    Boolean: bProper
    Boolean: bUpper
    Boolean: bLower
    Boolean: bObjects
    Boolean: bWordWrap
  Local variables
    Number: nBegin
    Number: nWordCount
    String: strWord[*]
    Number: nTokens
    Boolean: bUndefined
    Boolean: bComments
    String: strComment[5]
  Actions
    Set bUndefined = FALSE
    Set bComments = FALSE
    While strText[nBegin] != NULL
      If strText[nBegin] = 'COMMENT'
        Set bComments = TRUE
        Set bWordWrap = TRUE
      Else
        If SalStrScan(strText[nBegin],'(undefined)') != -1
          Set bUndefined = TRUE
        Else
          If SalStrScan(strText[nBegin],' )') = -1
            If bComments
              Call SalStrTokenize(strText[nBegin],'\',"\",strComment)
              Set strText[nBegin] = strComment[0]
            If rbProper
              Call SalStrProper(strText[nBegin],strText[nBegin])
            If bObjects and strText[nBegin] != SPACE
              Set strText[nBegin] = FlipCase(strText[nBegin])
            If rbUpper
              Call SalStrUpper(strText[nBegin],strText[nBegin])
            If rbLower
              Call SalStrLower(strText[nBegin],strText[nBegin])
            If bComments
              Call SalFilePutStr(hFile,'')
              Set strText[nBegin] = strText[nBegin]||'\'||strComment[1]||'\;'
            If bWordWrap and strText[nBegin] != SPACE
              Call WordWrap(hFile,strText[nBegin],NULL,NULL,FALSE)
            Else
              If SalStrScan(strText[nBegin],' KEY ') = -1
                Call SalFilePutStr(hFile,strText[nBegin])
              Else
                Call WordWrap(hFile,strText[nBegin],NULL,NULL,FALSE)
      Set strText[nBegin] = NULL
      Set nBegin = nBegin + 1
    If nBegin > 0
      Call SalFilePutStr(hFile,NULL)
    If bUndefined
      Call WordWrap(hFile,
```

```
                'Undefined Attributes Were Inherited From '||strGloO_ID[nGloDetailObject]||'...Table
'||strGloObjName[nGloDetailObject]||' is incomplete.',
                dfDelimiter,' ERROR: ',FALSE)
            Set nGloErrorFound = nGloErrorFound + 1
            Call SalFilePutStr(hFile,dfDelimiter)
            Call SalFilePutStr(hFile,NULL)
    Application Actions
      On SAM_AppStartup
        Set hWndGloWait = SalCreateWindow(dlgWait,hWndForm)
        Call ReadReservedWords()
  Form Window: frmObjMgr
    Title: OSAM* Designer - (untitled)
    Icon File: osam.ico
    Display Settings
      Visible at Design time? No
      Automatically Created at Runtime? Yes
      Initial State: Normal
      Maximizable? No
      Minimizable? Yes
      System Menu? Yes
      Resizable? No
      Window Location and Size
        Left:  0.0"
        Top:  0.0"
        Width:  7.0"
        Height: 4.948"
      Form Size
        Width:  Default
        Height: Default
        Number of Pages: Dynamic
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Gray
    Menu
      Popup Menu: &File
        Enabled when: bGloDetailOK
        Menu Item: &New
          Keyboard Accelerator: (none)
          Menu Settings
            Enabled when:
            Checked when:
          Menu Actions
            Call FileNew(TRUE)
        Menu Item: &Open
          Keyboard Accelerator: (none)
          Menu Settings
            Enabled when:
            Checked when:
          Menu Actions
            Call ResetFileNames(strGloFileName,strGloFilePath,'sam')
            If DlgOpenFile(hWndForm,strGloDefPath,APPNAME||' - Open File','sam','OSAM Files~*.sam~SQL
Files~*.SQL~',OFN_PATHMUSTEXIST|OFN_FILEMUSTEXIST|OFN_HIDEREADONLY,strGloFilePath,strGloFileName)
              If SalStrScan(strGloFileName,'.SAM') > -1
                If FileNew(FALSE)
                  Call OpenOSAMFile(strGloFilePath)
              Else
                Call SalLoadApp('notepad.exe',strGloFilePath)
        Menu Item: &Save...
          Keyboard Accelerator: (none)
          Menu Settings
            Enabled when:
            Checked when:
          Menu Actions
            Call ResetFileNames(strGloFileName,strGloFilePath,'sam')
            If strGloFilePath = NULL
```

```
            If DlgSaveAs(hWndForm,strGloDefPath,APPNAME||' - Save File','sam','OSAM
Files~*.sam~',OFN_PATHMUSTEXIST|OFN_HIDEREADONLY|OFN_OVERWRITEPROMPT,strGloFilePath,strGloFileNam
e)
              Call SaveOSAMFile(strGloFilePath)
          Else
            Call SalStrLeft(strGloFilePath,SalStrScan(strGloFilePath,'.'),strGloFilePath)
            Set strGloFilePath = strGloFilePath||'.sam'
            Call SaveOSAMFile(strGloFilePath)
      Menu Item: Save &As...
        Keyboard Accelerator: (none)
        Menu Settings
          Enabled when:
          Checked when:
        Menu Actions
          Call ResetFileNames(strGloFileName,strGloFilePath,'sam')
          If DlgSaveAs(hWndForm,strGloDefPath,APPNAME||' - Save File','sam','OSAM
Files~*.sam~',OFN_PATHMUSTEXIST|OFN_HIDEREADONLY|OFN_OVERWRITEPROMPT,strGloFilePath,strGloFileNam
e)
            Call SaveOSAMFile(strGloFilePath)
      Menu Separator
      Menu Item: &Build SQL...
        Keyboard Accelerator: (none)
        Menu Settings
          Enabled when:
          Checked when:
        Menu Actions
          Call SalModalDialog(dlgBuildSQL,hWndForm)
      Menu Separator
      Menu Item: E&xit
        Keyboard Accelerator: (none)
        Menu Settings
          Enabled when:
          Checked when:
        Menu Actions
          Call SalSendMsg(hWndForm,SAM_Close,0,0)
    Popup Menu: &Edit
      Enabled when: bGloDetailOK
      Menu Item: Cu&t
        Keyboard Accelerator: Shift+Del
        Menu Settings
          Enabled when: bEntityFocus and nGloObjFunction != CUT
          Checked when:
        Menu Actions
          Set nGloObjFunction = CUT
          Set bEntityFocus = FALSE
          Call CopyObject(nGloCell[nGloAbsPos],0)
          Set nGloEditPos = nGloAbsPos
          Call DeleteObject(nGloCell[nGloAbsPos])
          Set bGloChanged = TRUE
      Menu Item: &Copy
        Keyboard Accelerator: Ctrl+Ins
        Menu Settings
          Enabled when: bEntityFocus and nGloObjFunction != CUT
          Checked when:
        Menu Actions
          Set nGloObjFunction = COPY
          Set nGloEditPos = 0
          Call CopyObject(nGloCell[nGloAbsPos],0)
      Menu Item: &Paste
        Keyboard Accelerator: Shift+Ins
        Menu Settings
          Enabled when: nGloObjFunction != DELETE
          Checked when:
        Menu Actions
          Call SalModalDialog(dlgAddObject,hWndForm)
      Menu Item: C&lear
        Keyboard Accelerator: Del
        Menu Settings
          Enabled when: bEntityFocus and nGloObjFunction != CUT
```

```
        Checked when:
      Menu Actions
        If SalMessageBox('You are about to delete the '||strGloO_ID[nGloCell[nGloAbsPos]]||' object and all associations
involving the '||strGloO_ID[nGloCell[nGloAbsPos]]||' object.  Once deleted, an object may not be recovered.  Are you sure you
want to continue?',
            APPNAME,MB_YesNo|MB_IconExclamation|MB_DefButton2) = IDYES
          Set bEntityFocus = FALSE
          Set nGloObjFunction = DELETE
          Set nGloEditPos = nGloAbsPos
          Call DeleteObject(nGloCell[nGloAbsPos])
          Set bGloChanged = TRUE
    Popup Menu: &Object
      Enabled when: bGloDetailOK
      Menu Item: &Create...
        Keyboard Accelerator: (none)
        Menu Settings
          Enabled when: nGloObjFunction != CUT
          Checked when:
        Menu Actions
          Set bGloAddObject = TRUE
          Call SalModalDialog(dlgAddObject,hWndForm)
      Menu Item: &Find...
        Keyboard Accelerator: (none)
        Menu Settings
          Enabled when:
          Checked when:
        Menu Actions
          Call SalModalDialog(dlgFindObject,hWndForm)
      Menu Separator
      Menu Item: A&ssociate...
        Keyboard Accelerator: (none)
        Menu Settings
          Enabled when: bEntityFocus and nGloObjFunction != CUT
          Checked when:
        Menu Actions
          Call SalModalDialog(dlgAssociateRegular,hWndForm)
      Menu Item: &Disassociate...
        Keyboard Accelerator: (none)
        Menu Settings
          Enabled when: bEntityFocus and nGloObjFunction != CUT
          Checked when:
        Menu Actions
          Call SalModalDialog(dlgDisassociate,hWndForm)
      Menu Separator
      Menu Item: Define &Attributes...
        Keyboard Accelerator: (none)
        Menu Settings
          Enabled when: bEntityFocus and nGloObjFunction != CUT
          Checked when:
        Menu Actions
          If nGloObjType[nGloCell[nGloAbsPos]] = ENTITY_Composite or
              nGloObjType[nGloCell[nGloAbsPos]] = ENTITY_CrossProduct
            Call SalMessageBox('The '||frmObjMgr.strO_ID||' entity is defined via the regular entities associated with it.',
                APPNAME,MB_Ok|MB_IconAsterisk)
          Else
            Set nGloDetailObject = nGloCell[nGloAbsPos]
            Set bGloDetailOK = TRUE
            Loop
              If SalModalDialog(dlgDetails,hWndForm)
                Set bGloDetailOK = SalModalDialog(dlgDetailCheck,hWndForm)
              If bGloDetailOK
                Break
      Menu Item: Define &Rules...
        Keyboard Accelerator: (none)
        Menu Settings
          Enabled when: bEntityFocus and nGloObjFunction != CUT
          Checked when:
        Menu Actions
          If nGloObjType[nGloCell[nGloAbsPos]] = ENTITY_Regular
```

```
        If SalModalDialog(dlgRules,hWndForm)
          Set bGloChanged = TRUE
      Else
        Call SalMessageBox('Rules may only be defined for regular entities.',
          APPNAME,MB_Ok|MB_IconAsterisk)
Popup Menu: &Select
  Enabled when: bGloItemsVisible and bGloDetailOK
  Menu Item: 1
    Keyboard Accelerator: (none)
    Menu Settings
      Enabled when: SalIsWindowVisible(strEntity1)
      Checked when:
    Menu Actions
      Call SalSetFocus(strEntity1)
  Menu Item: 2
    Keyboard Accelerator: (none)
    Menu Settings
      Enabled when: SalIsWindowVisible(strEntity2)
      Checked when:
    Menu Actions
      Call SalSetFocus(strEntity2)
  Menu Item: 3
    Keyboard Accelerator: (none)
    Menu Settings
      Enabled when: SalIsWindowVisible(strEntity3)
      Checked when:
    Menu Actions
      Call SalSetFocus(strEntity3)
  Menu Item: 4
    Keyboard Accelerator: (none)
    Menu Settings
      Enabled when: SalIsWindowVisible(strEntity4)
      Checked when:
    Menu Actions
      Call SalSetFocus(strEntity4)
  Menu Separator
  Menu Item: 5
    Keyboard Accelerator: (none)
    Menu Settings
      Enabled when: SalIsWindowVisible(strEntity5)
      Checked when:
    Menu Actions
      Call SalSetFocus(strEntity5)
  Menu Item: 6
    Keyboard Accelerator: (none)
    Menu Settings
      Enabled when: SalIsWindowVisible(strEntity6)
      Checked when:
    Menu Actions
      Call SalSetFocus(strEntity6)
  Menu Separator
  Menu Item: 7
    Keyboard Accelerator: (none)
    Menu Settings
      Enabled when: SalIsWindowVisible(strEntity7)
      Checked when:
    Menu Actions
      Call SalSetFocus(strEntity7)
  Menu Item: 8
    Keyboard Accelerator: (none)
    Menu Settings
      Enabled when: SalIsWindowVisible(strEntity8)
      Checked when:
    Menu Actions
      Call SalSetFocus(strEntity8)
  Menu Item: 9
    Keyboard Accelerator: (none)
    Menu Settings
      Enabled when: SalIsWindowVisible(strEntity9)
```

```
        Checked when:
      Menu Actions
        Call SalSetFocus(strEntity9)
    Menu Item: 10
      Keyboard Accelerator: (none)
      Menu Settings
        Enabled when: SalIsWindowVisible(strEntity10)
        Checked when:
      Menu Actions
        Call SalSetFocus(strEntity10)
    Menu Separator
    Menu Item: &Print Screen
      Keyboard Accelerator: (none)
      Menu Settings
        Enabled when:
        Checked when:
      Menu Actions
        Call SalWaitCursor(TRUE)
        Call SalPrtPrintForm(hWndForm)
        Call SalWaitCursor(FALSE)
  Popup Menu: &Help
    Enabled when:
    Menu Item: &Contents
      Keyboard Accelerator: (none)
      Menu Settings
        Enabled when:
        Checked when:
      Menu Actions
        Call SalWinHelp(hWndForm,'osamhelp.hlp',HELP_Context,1,NULL)
    Menu Item: &Glossary of Terms
      Keyboard Accelerator: (none)
      Menu Settings
        Enabled when:
        Checked when:
      Menu Actions
        Call SalWinHelp(hWndForm,'osamhelp.hlp',HELP_Context,14,NULL)
    Menu Item: &How To Use Help
      Keyboard Accelerator: (none)
      Menu Settings
        Enabled when:
        Checked when:
      Menu Actions
        Call SalWinHelp(hWndForm,'winhelp.hlp',HELP_HelpOnHelp,0,NULL)
    Menu Separator
    Menu Item: &About OSAM* Designer...
      Keyboard Accelerator: (none)
      Menu Settings
        Enabled when:
        Checked when:
      Menu Actions
        Call SalModalDialog(dlgAbout,hWndForm)
Contents
  ! Entities
  Data Field: strExtra
    Data
      Maximum Data Length: Default
      Data Type: String
      Editable? No
    Display Settings
      Window Location and Size
        Left:  Default
        Top:  Default
        Width:  0.25"
        Height: 0.25"
      Visible? No
      Border? Yes
      Justify: Left
      Format: Unformatted
      Country: Default
```

```
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
  Message Actions
Data Field: strEntity1
  Data
    Maximum Data Length: Default
    Data Type: String
    Editable? Yes
  Display Settings
    Window Location and Size
      Left:  0.288"
      Top:  0.531"
      Width:  1.025"
      Height: 0.26"
    Visible? Yes
    Border? Yes
    Justify: Center
    Format: Unformatted
    Country: Default
    Font Name: MS Sans Serif
    Font Size: 8
    Font Enhancement: Default
    Text Color: Default
    Background Color: Cyan
  Message Actions
    On SAM_SetFocus
      Call SetEntityFocus(1,dom1)
    On WM_CHAR
      Return FALSE
    On MSG_Gray
      Call SetDomainGray(dom1)
    On MSG_DrawLine
      If SalNumberTruncate(nGloAbsPos/10,8,0) = nGloScreen or
          nGloAbsPos = (nGloScreen*10)+10
        Call SalSendMsg(hWndItem,MSG_ShowLine,wParam,0)
      Else
        Call SalColorSet(hWndItem,COLOR_IndexWindow,COLOR_Green)
    On MSG_ShowLine
      Set nTo = wParam
      If nTo > 1
        If nTo = 2
          Call SalShowWindow(hWndLine[LN_1To2])
        If nTo = 3
          If SalIsWindowVisible(strEntity2)
            Call SalShowWindow(hWndLine[LN_1To3a])
            Call SalShowWindow(hWndLine[LN_1To3b])
            Call SalShowWindow(hWndLine[LN_1To3c])
          Else
            Call SalShowWindow(hWndLine[LN_1To2])
            Call SalShowWindow(hWndLine[LN_2To3])
        If nTo = 4
          If SalIsWindowVisible(strEntity2) or SalIsWindowVisible(strEntity3)
            Call SalShowWindow(hWndLine[LN_1To4a])
            Call SalShowWindow(hWndLine[LN_1To4b])
            Call SalShowWindow(hWndLine[LN_1To4c])
          Else
            Call SalShowWindow(hWndLine[LN_1To2])
            Call SalShowWindow(hWndLine[LN_2To3])
            Call SalShowWindow(hWndLine[LN_3To4])
        If nTo = 5
          Call SalShowWindow(hWndLine[LN_1To5])
        If nTo = 6
          Call SalShowWindow(hWndLine[LN_1To6])
        If nTo = 7
          If SalIsWindowVisible(strEntity5)
            Call SalShowWindow(hWndLine[LN_1To7a])
```

```
        Call SalShowWindow(hWndLine[LN_1To7b])
        Call SalShowWindow(hWndLine[LN_1To7c])
      Else
        Call SalShowWindow(hWndLine[LN_1To5])
        Call SalShowWindow(hWndLine[LN_5To7])
    If nTo = 8
      Call SalShowWindow(hWndLine[LN_1To8])
    If nTo = 9
      Call SalShowWindow(hWndLine[LN_1To9])
    If nTo = 10
      Call SalShowWindow(hWndLine[LN_1To10])
On MSG_HideLine
  If SalNumberTruncate(nGloAbsPos/10,8,0) = nGloScreen or
     nGloAbsPos = (nGloScreen*10)+10
    Set nTo = wParam
    If nTo = 2
      Call SalHideWindow(hWndLine[LN_1To2])
      Return TRUE
    If nTo = 3
      If SalIsWindowVisible(strEntity2)
        Call SalHideWindow(hWndLine[LN_1To3a])
        Call SalHideWindow(hWndLine[LN_1To3b])
        Call SalHideWindow(hWndLine[LN_1To3c])
      Else
        Call SalHideWindow(hWndLine[LN_1To2])
        Call SalHideWindow(hWndLine[LN_2To3])
      Return TRUE
    If nTo = 4
      If SalIsWindowVisible(strEntity2) or SalIsWindowVisible(strEntity3)
        Call SalHideWindow(hWndLine[LN_1To4a])
        Call SalHideWindow(hWndLine[LN_1To4b])
        Call SalHideWindow(hWndLine[LN_1To4c])
      Else
        Call SalHideWindow(hWndLine[LN_1To2])
        Call SalHideWindow(hWndLine[LN_2To3])
        Call SalHideWindow(hWndLine[LN_3To4])
      Return TRUE
    If nTo = 5
      Call SalHideWindow(hWndLine[LN_1To5])
      Return TRUE
    If nTo = 6
      Call SalHideWindow(hWndLine[LN_1To6])
      Return TRUE
    If nTo = 7
      If SalIsWindowVisible(strEntity5)
        Call SalHideWindow(hWndLine[LN_1To7a])
        Call SalHideWindow(hWndLine[LN_1To7b])
        Call SalHideWindow(hWndLine[LN_1To7c])
      Else
        Call SalHideWindow(hWndLine[LN_1To5])
        Call SalHideWindow(hWndLine[LN_5To7])
      Return TRUE
    If nTo = 8
      Call SalHideWindow(hWndLine[LN_1To8])
      Return TRUE
    If nTo = 9
      Call SalHideWindow(hWndLine[LN_1To9])
      Return TRUE
    If nTo = 10
      Call SalHideWindow(hWndLine[LN_1To10])
      Return TRUE
  Else
    Call SalColorSet(hWndItem,COLOR_IndexWindow,COLOR_Cyan)
On MSG_Hide
  Call HideEntity(dom1)
  Set strScreenObject[1] = NULL
On MSG_Show
  Call ShowDomain(dom1)
  Call SalGetWindowText(hWndItem,strScreenObject[1],12)
```

```
    On MSG_Change
      Call SalGetWindowText(hWndItem,strEntityText,8)
      If strEntityText = strGloO_ID[nGloCell[nGloAbsPos]]
        Call SalSetWindowText(hWndItem,strO_ID)
    On MSG_Reset
      Call ResetEntity()
    On MSG_Copy
      If nVBar > 0
        Set nGloCell[nGloAbsPos-(MAX_SCROLL*10+4)] = nGloNextPos
      If nHBar  > 0
        Set nGloCell[nGloAbsPos-7] = nGloNextPos
      If nHBar  > 0 and nVBar > 0
        Set nGloCell[nGloAbsPos-(MAX_SCROLL*10+11)] = nGloNextPos
    On MSG_Delete
      If nVBar > 0
        Set nGloCell[nGloAbsPos-(MAX_SCROLL*10+4)] = 0
      If nHBar  > 0
        Set nGloCell[nGloAbsPos-7] = 0
      If nHBar  > 1 and nVBar > 0
        Set nGloCell[nGloAbsPos-(MAX_SCROLL*10+11)] = 0
Data Field: strEntity2
  Data
    Maximum Data Length: Default
    Data Type: String
    Editable? Yes
  Display Settings
    Window Location and Size
      Left:  1.788"
      Top:  0.531"
      Width:  1.025"
      Height: 0.26"
    Visible? Yes
    Border? Yes
    Justify: Center
    Format: Unformatted
    Country: Default
    Font Name: MS Sans Serif
    Font Size: 8
    Font Enhancement: Default
    Text Color: Default
    Background Color: Cyan
  Message Actions
    On MSG_DrawLine
      If SalNumberTruncate(nGloAbsPos/10,8,0) = nGloScreen
          or nGloAbsPos = (nGloScreen*10)+10
        Call SalSendMsg(hWndItem,MSG_ShowLine,wParam,0)
      Else
        Call SalColorSet(hWndItem,COLOR_IndexWindow,COLOR_Green)
    On MSG_ShowLine
      Set nTo = wParam
      If nTo > 2
        If nTo = 3
          Call SalShowWindow(hWndLine[LN_2To3])
        If nTo = 4
          If SalIsWindowVisible(strEntity3)
            Call SalShowWindow(hWndLine[LN_2To4a])
            Call SalShowWindow(hWndLine[LN_2To4b])
            Call SalShowWindow(hWndLine[LN_2To4c])
          Else
            Call SalShowWindow(hWndLine[LN_2To3])
            Call SalShowWindow(hWndLine[LN_3To4])
        If nTo = 5
          Call SalShowWindow(hWndLine[LN_2To5])
        If nTo = 6
          Call SalShowWindow(hWndLine[LN_2To6])
        If nTo = 7
          Call SalShowWindow(hWndLine[LN_2To7])
        If nTo = 8
          Call SalShowWindow(hWndLine[LN_2To8])
```

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        If nTo = 9
          Call SalShowWindow(hWndLine[LN_2To9])
        If nTo = 10
          Call SalShowWindow(hWndLine[LN_2To10])
    On MSG_HideLine
      If SalNumberTruncate(nGloAbsPos/10,8,0) = nGloScreen
          or nGloAbsPos = (nGloScreen*10)+10
        Set nTo = wParam
        If nTo = 1
          Call SalHideWindow(hWndLine[LN_1To2])
          Return TRUE
        If nTo = 3
          Call SalHideWindow(hWndLine[LN_2To3])
          Return TRUE
        If nTo = 4
          If SalIsWindowVisible(strEntity3)
            Call SalHideWindow(hWndLine[LN_2To4a])
            Call SalHideWindow(hWndLine[LN_2To4b])
            Call SalHideWindow(hWndLine[LN_2To4c])
          Else
            Call SalHideWindow(hWndLine[LN_2To3])
            Call SalHideWindow(hWndLine[LN_3To4])
          Return TRUE
        If nTo = 5
          Call SalHideWindow(hWndLine[LN_2To5])
          Return TRUE
        If nTo = 6
          Call SalHideWindow(hWndLine[LN_2To6])
          Return TRUE
        If nTo = 7
          Call SalHideWindow(hWndLine[LN_2To7])
          Return TRUE
        If nTo = 8
          Call SalHideWindow(hWndLine[LN_2To8])
          Return TRUE
        If nTo = 9
          Call SalHideWindow(hWndLine[LN_2To9])
          Return TRUE
        If nTo = 10
          Call SalHideWindow(hWndLine[LN_2To10])
          Return TRUE
      Else
        Call SalColorSet(hWndItem,COLOR_IndexWindow,COLOR_Cyan)
    On WM_CHAR
      Return FALSE
    On SAM_SetFocus
      Call SetEntityFocus(2,dom2)
    On MSG_Gray
      Call SetDomainGray(dom2)
    On MSG_Hide
      Call HideEntity(dom2)
      Set strScreenObject[2] = NULL
    On MSG_Show
      Call ShowDomain(dom2)
      Call SalGetWindowText(hWndItem,strScreenObject[2],12)
    On MSG_Change
      Call SalGetWindowText(hWndItem,strEntityText,8)
      If strEntityText = strGloO_ID[nGloCell[nGloAbsPos]]
        Call SalSetWindowText(hWndItem,strO_ID)
    On MSG_Reset
      Call ResetEntity()
    On MSG_Copy
      If nVBar > 0
        Set nGloCell[nGloAbsPos-(MAX_SCROLL*10+4)] = nGloNextPos
    On MSG_Delete
      If nVBar > 0
        Set nGloCell[nGloAbsPos-(MAX_SCROLL*10+4)] = 0
Data Field: strEntity3
  Data
```

```
    Maximum Data Length: Default
    Data Type: String
    Editable? Yes
  Display Settings
    Window Location and Size
      Left:  3.288"
      Top:  0.531"
      Width:  1.025"
      Height: 0.26"
    Visible? Yes
    Border? Yes
    Justify: Center
    Format: Unformatted
    Country: Default
    Font Name: MS Sans Serif
    Font Size: 8
    Font Enhancement: Default
    Text Color: Default
    Background Color: Cyan
  Message Actions
    On MSG_DrawLine
      If SalNumberTruncate(nGloAbsPos/10,8,0) = nGloScreen
          or nGloAbsPos = (nGloScreen*10)+10
        Call SalSendMsg(hWndItem,MSG_ShowLine,wParam,0)
      Else
        Call SalColorSet(hWndItem,COLOR_IndexWindow,COLOR_Green)
    On MSG_ShowLine
      Set nTo = wParam
      If nTo > 3
        If nTo = 4
          Call SalShowWindow(hWndLine[LN_3To4])
        If nTo = 5
          Call SalShowWindow(hWndLine[LN_3To5])
        If nTo = 6
          Call SalShowWindow(hWndLine[LN_3To6])
        If nTo = 7
          Call SalShowWindow(hWndLine[LN_3To7])
        If nTo = 8
          Call SalShowWindow(hWndLine[LN_3To8])
        If nTo = 9
          Call SalShowWindow(hWndLine[LN_3To9])
        If nTo = 10
          Call SalShowWindow(hWndLine[LN_3To10])
    On MSG_HideLine
      If SalNumberTruncate(nGloAbsPos/10,8,0) = nGloScreen
          or nGloAbsPos = (nGloScreen*10)+10
        Set nTo = wParam
        If nTo = 1
          If SalIsWindowVisible(strEntity2)
            Call SalHideWindow(hWndLine[LN_1To3a])
            Call SalHideWindow(hWndLine[LN_1To3b])
            Call SalHideWindow(hWndLine[LN_1To3c])
          Else
            Call SalHideWindow(hWndLine[LN_1To2])
            Call SalHideWindow(hWndLine[LN_2To3])
          Return TRUE
        If nTo = 2
          Call SalHideWindow(hWndLine[LN_2To3])
          Return TRUE
        If nTo = 4
          Call SalHideWindow(hWndLine[LN_3To4])
          Return TRUE
        If nTo = 5
          Call SalHideWindow(hWndLine[LN_3To5])
          Return TRUE
        If nTo = 6
          Call SalHideWindow(hWndLine[LN_3To6])
          Return TRUE
        If nTo = 7
```

```
            Call SalHideWindow(hWndLine[LN_3To7])
            Return TRUE
          If nTo = 8
            Call SalHideWindow(hWndLine[LN_3To8])
            Return TRUE
          If nTo = 9
            Call SalHideWindow(hWndLine[LN_3To9])
            Return TRUE
          If nTo = 10
            Call SalHideWindow(hWndLine[LN_3To10])
            Return TRUE
        Else
          Call SalColorSet(hWndItem,COLOR_IndexWindow,COLOR_Cyan)
      On WM_CHAR
        Return FALSE
      On SAM_SetFocus
        Call SetEntityFocus(3,dom3)
      On MSG_Gray
        Call SetDomainGray(dom3)
      On MSG_Hide
        Call HideEntity(dom3)
        Set strScreenObject[3] = NULL
      On MSG_Show
        Call ShowDomain(dom3)
        Call SalGetWindowText(hWndItem,strScreenObject[3],12)
      On MSG_Change
        Call SalGetWindowText(hWndItem,strEntityText,8)
        If strEntityText = strGloO_ID[nGloCell[nGloAbsPos]]
          Call SalSetWindowText(hWndItem,strO_ID)
      On MSG_Reset
        Call ResetEntity()
      On MSG_Copy
        If nVBar > 0
          Set nGloCell[nGloAbsPos-(MAX_SCROLL*10+4)] = nGloNextPos
      On MSG_Delete
        If nVBar > 0
          Set nGloCell[nGloAbsPos-(MAX_SCROLL*10+4)] = 0
Data Field: strEntity4
  Data
    Maximum Data Length: Default
    Data Type: String
    Editable? Yes
  Display Settings
    Window Location and Size
      Left:  4.788"
      Top:  0.531"
      Width:  1.025"
      Height: 0.26"
    Visible? Yes
    Border? Yes
    Justify: Center
    Format: Unformatted
    Country: Default
    Font Name: MS Sans Serif
    Font Size: 8
    Font Enhancement: Default
    Text Color: Default
    Background Color: Cyan
  Message Actions
    On MSG_DrawLine
      If SalNumberTruncate(nGloAbsPos/10,8,0) = nGloScreen
          or nGloAbsPos = (nGloScreen*10)+10
        Call SalSendMsg(hWndItem,MSG_ShowLine,wParam,0)
      Else
        Call SalColorSet(hWndItem,COLOR_IndexWindow,COLOR_Green)
    On MSG_ShowLine
      Set nTo = wParam
      If nTo > 4
        If nTo = 5
```

```
      Call SalShowWindow(hWndLine[LN_4To5])
    If nTo = 6
      Call SalShowWindow(hWndLine[LN_4To6])
    If nTo = 7
      Call SalShowWindow(hWndLine[LN_4To7])
    If nTo = 8
      Call SalShowWindow(hWndLine[LN_4To8])
    If nTo = 9
      Call SalShowWindow(hWndLine[LN_4To9])
    If nTo = 10
      If SalIsWindowVisible(strEntity6)
        Call SalShowWindow(hWndLine[LN_4To10a])
        Call SalShowWindow(hWndLine[LN_4To10b])
        Call SalShowWindow(hWndLine[LN_4To10c])
      Else
        Call SalShowWindow(hWndLine[LN_4To6])
        Call SalShowWindow(hWndLine[LN_6To10])
On MSG_HideLine
  If SalNumberTruncate(nGloAbsPos/10,8,0) = nGloScreen
      or nGloAbsPos = (nGloScreen*10)+10
    Set nTo = wParam
    If nTo = 1
      If SalIsWindowVisible(strEntity2) or SalIsWindowVisible(strEntity3)
        Call SalHideWindow(hWndLine[LN_1To4a])
        Call SalHideWindow(hWndLine[LN_1To4b])
        Call SalHideWindow(hWndLine[LN_1To4c])
      Else
        Call SalHideWindow(hWndLine[LN_1To2])
        Call SalHideWindow(hWndLine[LN_2To3])
        Call SalHideWindow(hWndLine[LN_3To4])
      Return TRUE
    If nTo = 2
      If SalIsWindowVisible(strEntity3)
        Call SalHideWindow(hWndLine[LN_2To4a])
        Call SalHideWindow(hWndLine[LN_2To4b])
        Call SalHideWindow(hWndLine[LN_2To4c])
      Else
        Call SalHideWindow(hWndLine[LN_2To3])
        Call SalHideWindow(hWndLine[LN_3To4])
      Return TRUE
    If nTo = 3
      Call SalHideWindow(hWndLine[LN_3To4])
      Return TRUE
    If nTo = 5
      Call SalHideWindow(hWndLine[LN_4To5])
      Return TRUE
    If nTo = 6
      Call SalHideWindow(hWndLine[LN_4To6])
      Return TRUE
    If nTo = 7
      Call SalHideWindow(hWndLine[LN_4To7])
      Return TRUE
    If nTo = 8
      Call SalHideWindow(hWndLine[LN_4To8])
      Return TRUE
    If nTo = 9
      Call SalHideWindow(hWndLine[LN_4To9])
      Return TRUE
    If nTo = 10
      If SalIsWindowVisible(strEntity6)
        Call SalHideWindow(hWndLine[LN_4To10a])
        Call SalHideWindow(hWndLine[LN_4To10b])
        Call SalHideWindow(hWndLine[LN_4To10c])
      Else
        Call SalHideWindow(hWndLine[LN_4To6])
        Call SalHideWindow(hWndLine[LN_6To10])
      Return TRUE
  Else
    Call SalColorSet(hWndItem,COLOR_IndexWindow,COLOR_Cyan)
```

```
    On WM_CHAR
      Return FALSE
    On SAM_SetFocus
      Call SetEntityFocus(4,dom4)
    On MSG_Gray
      Call SetDomainGray(dom4)
    On MSG_Hide
      Call HideEntity(dom4)
      Set strScreenObject[4] = NULL
    On MSG_Show
      Call ShowDomain(dom4)
      Call SalGetWindowText(hWndItem,strScreenObject[4],12)
    On MSG_Change
      Call SalGetWindowText(hWndItem,strEntityText,8)
      If strEntityText = strGloO_ID[nGloCell[nGloAbsPos]]
        Call SalSetWindowText(hWndItem,strO_ID)
    On MSG_Reset
      Call ResetEntity()
    On MSG_Copy
      If nVBar > 0
        Set nGloCell[nGloAbsPos-(MAX_SCROLL*10+4)] = nGloNextPos
      If nHBar < MAX_SCROLL
        Set nGloCell[nGloAbsPos+7] = nGloNextPos
      If nHBar  < MAX_SCROLL and nVBar > 0
        Set nGloCell[nGloAbsPos-(MAX_SCROLL*10-3)] = nGloNextPos
    On MSG_Delete
      If nVBar > 0
        Set nGloCell[nGloAbsPos-(MAX_SCROLL*10+4)] = 0
      If nHBar < MAX_SCROLL
        Set nGloCell[nGloAbsPos+7] = 0
      If nHBar  < MAX_SCROLL and nVBar > 0
        Set nGloCell[nGloAbsPos-(MAX_SCROLL*10-3)] = 0
Data Field: strEntity5
  Data
    Maximum Data Length: Default
    Data Type: String
    Editable? Yes
  Display Settings
    Window Location and Size
      Left:  0.288"
      Top:  1.365"
      Width:  1.025"
      Height: 0.271"
    Visible? Yes
    Border? Yes
    Justify: Center
    Format: Unformatted
    Country: Default
    Font Name: MS Sans Serif
    Font Size: 8
    Font Enhancement: Default
    Text Color: Default
    Background Color: Cyan
  Message Actions
    On MSG_DrawLine
      If SalNumberTruncate(nGloAbsPos/10,8,0) = nGloScreen
          or nGloAbsPos = (nGloScreen*10)+10
        Call SalSendMsg(hWndItem,MSG_ShowLine,wParam,0)
      Else
        Call SalColorSet(hWndItem,COLOR_IndexWindow,COLOR_Green)
    On MSG_ShowLine
      Set nTo = wParam
      If nTo > 5
        If nTo = 6
          Call SalShowWindow(hWndLine[LN_5To6])
        If nTo = 7
          Call SalShowWindow(hWndLine[LN_5To7])
        If nTo = 8
          Call SalShowWindow(hWndLine[LN_5To8])
```

```
        If nTo = 9
          Call SalShowWindow(hWndLine[LN_5To9])
        If nTo = 10
          Call SalShowWindow(hWndLine[LN_5To10])
    On MSG_HideLine
      If SalNumberTruncate(nGloAbsPos/10,8,0) = nGloScreen
          or nGloAbsPos = (nGloScreen*10)+10
        Set nTo = wParam
        If nTo = 1
          Call SalHideWindow(hWndLine[LN_1To5])
          Return TRUE
        If nTo = 2
          Call SalHideWindow(hWndLine[LN_2To5])
          Return TRUE
        If nTo = 3
          Call SalHideWindow(hWndLine[LN_3To5])
          Return TRUE
        If nTo = 4
          Call SalHideWindow(hWndLine[LN_4To5])
          Return TRUE
        If nTo = 6
          Call SalHideWindow(hWndLine[LN_5To6])
          Return TRUE
        If nTo = 7
          Call SalHideWindow(hWndLine[LN_5To7])
          Return TRUE
        If nTo = 8
          Call SalHideWindow(hWndLine[LN_5To8])
          Return TRUE
        If nTo = 9
          Call SalHideWindow(hWndLine[LN_5To9])
          Return TRUE
        If nTo = 10
          Call SalHideWindow(hWndLine[LN_5To10])
          Return TRUE
      Else
        Call SalColorSet(hWndItem,COLOR_IndexWindow,COLOR_Cyan)
    On WM_CHAR
      Return FALSE
    On SAM_SetFocus
      Call SetEntityFocus(5,dom5)
    On MSG_Gray
      Call SetDomainGray(dom5)
    On MSG_Hide
      Call HideEntity(dom5)
      Set strScreenObject[5] = NULL
    On MSG_Show
      Call ShowDomain(dom5)
      Call SalGetWindowText(hWndItem,strScreenObject[5],12)
    On MSG_Change
      Call SalGetWindowText(hWndItem,strEntityText,8)
      If strEntityText = strGloO_ID[nGloCell[nGloAbsPos]]
        Call SalSetWindowText(hWndItem,strO_ID)
    On MSG_Reset
      Call ResetEntity()
    On MSG_Copy
      If nHBar > 0
        Set nGloCell[nGloAbsPos-9] = nGloNextPos
    On MSG_Delete
      If nHBar > 0
        Set nGloCell[nGloAbsPos-9] = 0
Data Field: strEntity6
  Data
    Maximum Data Length: Default
    Data Type: String
    Editable? Yes
  Display Settings
    Window Location and Size
      Left:  4.788"
```

```
    Top:  1.365"
    Width:  1.025"
    Height: 0.26"
  Visible? Yes
  Border? Yes
  Justify: Center
  Format: Unformatted
  Country: Default
  Font Name: MS Sans Serif
  Font Size: 8
  Font Enhancement: Default
  Text Color: Default
  Background Color: Cyan
Message Actions
  On MSG_DrawLine
    If SalNumberTruncate(nGloAbsPos/10,8,0) = nGloScreen
        or nGloAbsPos = (nGloScreen*10)+10
      Call SalSendMsg(hWndItem,MSG_ShowLine,wParam,0)
    Else
      Call SalColorSet(hWndItem,COLOR_IndexWindow,COLOR_Green)
  On MSG_ShowLine
    Set nTo = wParam
    If nTo > 6
      If nTo = 7
        Call SalShowWindow(hWndLine[LN_6To7])
      If nTo = 8
        Call SalShowWindow(hWndLine[LN_6To8])
      If nTo = 9
        Call SalShowWindow(hWndLine[LN_6To9])
      If nTo = 10
        Call SalShowWindow(hWndLine[LN_6To10])
  On MSG_HideLine
    If SalNumberTruncate(nGloAbsPos/10,8,0) = nGloScreen
        or nGloAbsPos = (nGloScreen*10)+10
      Set nTo = wParam
      If nTo = 1
        Call SalHideWindow(hWndLine[LN_1To6])
        Return TRUE
      If nTo = 2
        Call SalHideWindow(hWndLine[LN_2To6])
        Return TRUE
      If nTo = 3
        Call SalHideWindow(hWndLine[LN_3To6])
        Return TRUE
      If nTo = 4
        Call SalHideWindow(hWndLine[LN_4To6])
        Return TRUE
      If nTo = 5
        Call SalHideWindow(hWndLine[LN_5To6])
        Return TRUE
      If nTo = 7
        Call SalHideWindow(hWndLine[LN_6To7])
        Return TRUE
      If nTo = 8
        Call SalHideWindow(hWndLine[LN_6To8])
        Return TRUE
      If nTo = 9
        Call SalHideWindow(hWndLine[LN_6To9])
        Return TRUE
      If nTo = 10
        Call SalHideWindow(hWndLine[LN_6To10])
        Return TRUE
    Else
      Call SalColorSet(hWndItem,COLOR_IndexWindow,COLOR_Cyan)
  On WM_CHAR
    Return FALSE
  On SAM_SetFocus
    Call SetEntityFocus(6,dom6)
  On MSG_Gray
```

```
        Call SetDomainGray(dom6)
      On MSG_Hide
        Call HideEntity(dom6)
        Set strScreenObject[6] = NULL
      On MSG_Show
        Call ShowDomain(dom6)
        Call SalGetWindowText(hWndItem,strScreenObject[6],12)
      On MSG_Change
        Call SalGetWindowText(hWndItem,strEntityText,8)
        If strEntityText = strGloO_ID[nGloCell[nGloAbsPos]]
          Call SalSetWindowText(hWndItem,strO_ID)
      On MSG_Reset
        Call ResetEntity()
      On MSG_Copy
        If nHBar  < MAX_SCROLL
          Set nGloCell[nGloAbsPos+9] = nGloNextPos
      On MSG_Delete
        If nHBar  < MAX_SCROLL
          Set nGloCell[nGloAbsPos+9] = 0
Data Field: strEntity7
  Data
    Maximum Data Length: Default
    Data Type: String
    Editable? Yes
  Display Settings
    Window Location and Size
      Left:  0.288"
      Top:  2.198"
      Width:  1.025"
      Height: 0.26"
    Visible? Yes
    Border? Yes
    Justify: Center
    Format: Unformatted
    Country: Default
    Font Name: MS Sans Serif
    Font Size: 8
    Font Enhancement: Default
    Text Color: Default
    Background Color: Cyan
  Message Actions
    On MSG_DrawLine
      If SalNumberTruncate(nGloAbsPos/10,8,0) = nGloScreen
          or nGloAbsPos = (nGloScreen*10)+10
        Call SalSendMsg(hWndItem,MSG_ShowLine,wParam,0)
      Else
        Call SalColorSet(hWndItem,COLOR_IndexWindow,COLOR_Green)
    On MSG_ShowLine
      Set nTo = wParam
      If nTo > 7
        If nTo = 8
          Call SalShowWindow(hWndLine[LN_7To8])
        If nTo = 9
          If SalIsWindowVisible(strEntity8)
            Call SalShowWindow(hWndLine[LN_7To9a])
            Call SalShowWindow(hWndLine[LN_7To9b])
            Call SalShowWindow(hWndLine[LN_7To9c])
          Else
            Call SalShowWindow(hWndLine[LN_7To8])
            Call SalShowWindow(hWndLine[LN_8To9])
        If nTo = 10
          If SalIsWindowVisible(strEntity8) or SalIsWindowVisible(strEntity9)
            Call SalShowWindow(hWndLine[LN_7To10a])
            Call SalShowWindow(hWndLine[LN_7To10b])
            Call SalShowWindow(hWndLine[LN_7To10c])
          Else
            Call SalShowWindow(hWndLine[LN_7To8])
            Call SalShowWindow(hWndLine[LN_8To9])
            Call SalShowWindow(hWndLine[LN_9To10])
```

```
On MSG_HideLine
  If SalNumberTruncate(nGloAbsPos/10,8,0) = nGloScreen
      or nGloAbsPos = (nGloScreen*10)+10
    Set nTo = wParam
    If nTo = 1
      Call SalHideWindow(hWndLine[LN_1To7a])
      Call SalHideWindow(hWndLine[LN_1To7b])
      Call SalHideWindow(hWndLine[LN_1To7c])
      Return TRUE
    If nTo = 2
      Call SalHideWindow(hWndLine[LN_2To7])
      Return TRUE
    If nTo = 3
      Call SalHideWindow(hWndLine[LN_3To7])
      Return TRUE
    If nTo = 4
      Call SalHideWindow(hWndLine[LN_4To7])
      Return TRUE
    If nTo = 5
      Call SalHideWindow(hWndLine[LN_5To7])
      Return TRUE
    If nTo = 6
      Call SalHideWindow(hWndLine[LN_6To7])
      Return TRUE
    If nTo = 8
      Call SalHideWindow(hWndLine[LN_7To8])
      Return TRUE
    If nTo = 9
      If SalIsWindowVisible(strEntity8)
        Call SalHideWindow(hWndLine[LN_7To9a])
        Call SalHideWindow(hWndLine[LN_7To9b])
        Call SalHideWindow(hWndLine[LN_7To9c])
      Else
        Call SalHideWindow(hWndLine[LN_7To8])
        Call SalHideWindow(hWndLine[LN_8To9])
      Return TRUE
    If nTo = 10
      If SalIsWindowVisible(strEntity8) or SalIsWindowVisible(strEntity9)
        Call SalHideWindow(hWndLine[LN_7To10a])
        Call SalHideWindow(hWndLine[LN_7To10b])
        Call SalHideWindow(hWndLine[LN_7To10c])
      Else
        Call SalHideWindow(hWndLine[LN_7To8])
        Call SalHideWindow(hWndLine[LN_8To9])
        Call SalHideWindow(hWndLine[LN_9To10])
      Return TRUE
  Else
    Call SalColorSet(hWndItem,COLOR_IndexWindow,COLOR_Cyan)
On WM_CHAR
  Return FALSE
On SAM_SetFocus
  Call SetEntityFocus(7,dom7)
On MSG_Gray
  Call SetDomainGray(dom7)
On MSG_Hide
  Call HideEntity(dom7)
  Set strScreenObject[7] = NULL
On MSG_Show
  Call ShowDomain(dom7)
  Call SalGetWindowText(hWndItem,strScreenObject[7],12)
On MSG_Change
  Call SalGetWindowText(hWndItem,strEntityText,8)
  If strEntityText = strGloO_ID[nGloCell[nGloAbsPos]]
    Call SalSetWindowText(hWndItem,strO_ID)
On MSG_Reset
  Call ResetEntity()
On MSG_Copy
  If nVBar < MAX_SCROLL
    Set nGloCell[nGloAbsPos+(MAX_SCROLL*10+4)] = nGloNextPos
```

```
      If nHBar  > 0
        Set nGloCell[nGloAbsPos-7] = nGloNextPos
      If nHBar  > 0 and nVBar < MAX_SCROLL
        Set nGloCell[nGloAbsPos+(MAX_SCROLL*10-3)] = nGloNextPos
    On MSG_Delete
      If nVBar < MAX_SCROLL
        Set nGloCell[nGloAbsPos+(MAX_SCROLL*10+4)] = 0
      If nHBar  > 0
        Set nGloCell[nGloAbsPos-7] = 0
      If nHBar  > 0 and nVBar < MAX_SCROLL
        Set nGloCell[nGloAbsPos+(MAX_SCROLL*10+4)] = 0
Data Field: strEntity8
  Data
    Maximum Data Length: Default
    Data Type: String
    Editable? Yes
  Display Settings
    Window Location and Size
      Left:  1.788"
      Top:  2.198"
      Width:  1.025"
      Height: 0.26"
    Visible? Yes
    Border? Yes
    Justify: Center
    Format: Unformatted
    Country: Default
    Font Name: MS Sans Serif
    Font Size: 8
    Font Enhancement: Default
    Text Color: Default
    Background Color: Cyan
  Message Actions
    On MSG_DrawLine
      If SalNumberTruncate(nGloAbsPos/10,8,0) = nGloScreen
          or nGloAbsPos = (nGloScreen*10)+10
        Call SalSendMsg(hWndItem,MSG_ShowLine,wParam,0)
      Else
        Call SalColorSet(hWndItem,COLOR_IndexWindow,COLOR_Green)
    On MSG_ShowLine
      Set nTo = wParam
      If nTo > 8
        If nTo = 9
          Call SalShowWindow(hWndLine[LN_8To9])
        If nTo = 10
          If SalIsWindowVisible(strEntity9)
            Call SalShowWindow(hWndLine[LN_8To10a])
            Call SalShowWindow(hWndLine[LN_8To10b])
            Call SalShowWindow(hWndLine[LN_8To10c])
          Else
            Call SalShowWindow(hWndLine[LN_8To9])
            Call SalShowWindow(hWndLine[LN_9To10])
    On MSG_HideLine
      If SalNumberTruncate(nGloAbsPos/10,8,0) = nGloScreen
          or nGloAbsPos = (nGloScreen*10)+10
        Set nTo = wParam
        If nTo = 1
          Call SalHideWindow(hWndLine[LN_1To8])
          Return TRUE
        If nTo = 2
          Call SalHideWindow(hWndLine[LN_2To8])
          Return TRUE
        If nTo = 3
          Call SalHideWindow(hWndLine[LN_3To8])
          Return TRUE
        If nTo = 4
          Call SalHideWindow(hWndLine[LN_4To8])
          Return TRUE
        If nTo = 5
```

```
            Call SalHideWindow(hWndLine[LN_5To8])
            Return TRUE
          If nTo = 6
            Call SalHideWindow(hWndLine[LN_6To8])
            Return TRUE
          If nTo = 7
            Call SalHideWindow(hWndLine[LN_7To8])
            Return TRUE
          If nTo = 9
            Call SalHideWindow(hWndLine[LN_8To9])
            Return TRUE
          If nTo = 10
            If SalIsWindowVisible(strEntity9)
              Call SalHideWindow(hWndLine[LN_8To10a])
              Call SalHideWindow(hWndLine[LN_8To10b])
              Call SalHideWindow(hWndLine[LN_8To10c])
            Else
              Call SalHideWindow(hWndLine[LN_8To9])
              Call SalHideWindow(hWndLine[LN_9To10])
            Return TRUE
        Else
          Call SalColorSet(hWndItem,COLOR_IndexWindow,COLOR_Cyan)
      On WM_CHAR
        Return FALSE
      On SAM_SetFocus
        Call SetEntityFocus(8,dom8)
      On MSG_Gray
        Call SetDomainGray(dom8)
      On MSG_Hide
        Call HideEntity(dom8)
        Set strScreenObject[8] = NULL
      On MSG_Show
        Call ShowDomain(dom8)
        Call SalGetWindowText(hWndItem,strScreenObject[8],12)
      On MSG_Change
        Call SalGetWindowText(hWndItem,strEntityText,8)
        If strEntityText = strGloO_ID[nGloCell[nGloAbsPos]]
          Call SalSetWindowText(hWndItem,strO_ID)
      On MSG_Reset
        Call ResetEntity()
      On MSG_Copy
        If nVBar < MAX_SCROLL
          Set nGloCell[nGloAbsPos+(MAX_SCROLL*10+4)] = nGloNextPos
      On MSG_Delete
        If nVBar < MAX_SCROLL
          Set nGloCell[nGloAbsPos+(MAX_SCROLL*10+4)] = 0
Data Field: strEntity9
  Data
    Maximum Data Length: Default
    Data Type: String
    Editable? Yes
  Display Settings
    Window Location and Size
      Left:  3.288"
      Top:  2.198"
      Width:  1.025"
      Height: 0.26"
    Visible? Yes
    Border? Yes
    Justify: Center
    Format: Unformatted
    Country: Default
    Font Name: MS Sans Serif
    Font Size: 8
    Font Enhancement: Default
    Text Color: Default
    Background Color: Cyan
  Message Actions
    On MSG_DrawLine
```

```
  If SalNumberTruncate(nGloAbsPos/10,8,0) = nGloScreen
      or nGloAbsPos = (nGloScreen*10)+10
    Call SalSendMsg(hWndItem,MSG_ShowLine,wParam,0)
  Else
    Call SalColorSet(hWndItem,COLOR_IndexWindow,COLOR_Green)
On MSG_ShowLine
  Set nTo = wParam
  If nTo = 10
    Call SalShowWindow(hWndLine[LN_9To10])
On MSG_HideLine
  If SalNumberTruncate(nGloAbsPos/10,8,0) = nGloScreen
      or nGloAbsPos = (nGloScreen*10)+10
    Set nTo = wParam
    If nTo = 1
      Call SalHideWindow(hWndLine[LN_1To9])
      Return TRUE
    If nTo = 2
      Call SalHideWindow(hWndLine[LN_2To9])
      Return TRUE
    If nTo = 3
      Call SalHideWindow(hWndLine[LN_3To9])
      Return TRUE
    If nTo = 4
      Call SalHideWindow(hWndLine[LN_4To9])
      Return TRUE
    If nTo = 5
      Call SalHideWindow(hWndLine[LN_5To9])
      Return TRUE
    If nTo = 6
      Call SalHideWindow(hWndLine[LN_6To9])
      Return TRUE
    If nTo = 7
      If SalIsWindowVisible(strEntity8)
        Call SalHideWindow(hWndLine[LN_7To9a])
        Call SalHideWindow(hWndLine[LN_7To9b])
        Call SalHideWindow(hWndLine[LN_7To9c])
      Else
        Call SalHideWindow(hWndLine[LN_7To8])
        Call SalHideWindow(hWndLine[LN_8To9])
      Return TRUE
    If nTo = 8
      Call SalHideWindow(hWndLine[LN_8To9])
      Return TRUE
    If nTo = 10
      Call SalHideWindow(hWndLine[LN_9To10])
      Return TRUE
  Else
    Call SalColorSet(hWndItem,COLOR_IndexWindow,COLOR_Cyan)
On WM_CHAR
  Return FALSE
On SAM_SetFocus
  Call SetEntityFocus(9,dom9)
On MSG_Gray
  Call SetDomainGray(dom9)
On MSG_Hide
  Call HideEntity(dom9)
  Set strScreenObject[9] = NULL
On MSG_Show
  Call ShowDomain(dom9)
  Call SalGetWindowText(hWndItem,strScreenObject[9],12)
On MSG_Change
  Call SalGetWindowText(hWndItem,strEntityText,8)
  If strEntityText = strGloO_ID[nGloCell[nGloAbsPos]]
    Call SalSetWindowText(hWndItem,strO_ID)
On MSG_Reset
  Call ResetEntity()
On MSG_Copy
  If nVBar < MAX_SCROLL
    Set nGloCell[nGloAbsPos+(MAX_SCROLL*10+4)] = nGloNextPos
```

```
    On MSG_Delete
      If nVBar < MAX_SCROLL
        Set nGloCell[nGloAbsPos+(MAX_SCROLL*10+4)] = 0
Data Field: strEntity10
  Data
    Maximum Data Length: Default
    Data Type: String
    Editable? Yes
  Display Settings
    Window Location and Size
      Left:  4.788"
      Top:  2.198"
      Width:  1.025"
      Height: 0.26"
    Visible? Yes
    Border? Yes
    Justify: Center
    Format: Unformatted
    Country: Default
    Font Name: MS Sans Serif
    Font Size: 8
    Font Enhancement: Default
    Text Color: Default
    Background Color: Cyan
  Message Actions
    On WM_CHAR
      Return FALSE
    On MSG_DrawLine
      If SalNumberTruncate(nGloAbsPos/10,8,0) = nGloScreen
          or nGloAbsPos = (nGloScreen*10)+10
        Else
          Call SalColorSet(hWndItem,COLOR_IndexWindow,COLOR_Green)
    On SAM_SetFocus
      Call SetEntityFocus(10,dom10)
    On MSG_Gray
      Call SetDomainGray(dom10)
    On MSG_Hide
      Call HideEntity(dom10)
      Set strScreenObject[10] = NULL
    On MSG_Show
      Call ShowDomain(dom10)
      Call SalGetWindowText(hWndItem,strScreenObject[10],12)
    On MSG_Change
      Call SalGetWindowText(hWndItem,strEntityText,8)
      If strEntityText = strGloO_ID[nGloCell[nGloAbsPos]]
        Call SalSetWindowText(hWndItem,strO_ID)
    On MSG_Reset
      Call ResetEntity()
    On MSG_Copy
      If nVBar < MAX_SCROLL
        Set nGloCell[nGloAbsPos+(MAX_SCROLL*10+4)] = nGloNextPos
      If nHBar  < MAX_SCROLL
        Set nGloCell[nGloAbsPos+7] = nGloNextPos
      If nHBar  < MAX_SCROLL and nVBar < MAX_SCROLL
        Set nGloCell[nGloAbsPos+(MAX_SCROLL*10+11)] = nGloNextPos
    On MSG_Delete
      If nVBar < MAX_SCROLL
        Set nGloCell[nGloAbsPos+(MAX_SCROLL*10+4)] = 0
      If nHBar  < MAX_SCROLL
        Set nGloCell[nGloAbsPos+7] = 0
      If nHBar  < MAX_SCROLL and nVBar < MAX_SCROLL
        Set nGloCell[nGloAbsPos+(MAX_SCROLL*10+11)] = 0
    On MSG_HideLine
      If SalNumberTruncate(nGloAbsPos/10,8,0) = nGloScreen
          or nGloAbsPos = (nGloScreen*10)+10
        Set nTo = wParam
        If nTo = 1
          Call SalHideWindow(hWndLine[LN_1To10])
          Return TRUE
```

```
        If nTo = 2
          Call SalHideWindow(hWndLine[LN_2To10])
          Return TRUE
        If nTo = 3
          Call SalHideWindow(hWndLine[LN_3To10])
          Return TRUE
        If nTo = 4
          If SalIsWindowVisible(strEntity6)
            Call SalHideWindow(hWndLine[LN_4To10a])
            Call SalHideWindow(hWndLine[LN_4To10b])
            Call SalHideWindow(hWndLine[LN_4To10c])
          Else
            Call SalHideWindow(hWndLine[LN_4To6])
            Call SalHideWindow(hWndLine[LN_6To10])
          Return TRUE
        If nTo = 5
          Call SalHideWindow(hWndLine[LN_5To10])
          Return TRUE
        If nTo = 6
          Call SalHideWindow(hWndLine[LN_6To10])
          Return TRUE
        If nTo = 7
          If SalIsWindowVisible(strEntity8) or SalIsWindowVisible(strEntity9)
            Call SalHideWindow(hWndLine[LN_7To10a])
            Call SalHideWindow(hWndLine[LN_7To10b])
            Call SalHideWindow(hWndLine[LN_7To10c])
          Else
            Call SalHideWindow(hWndLine[LN_7To8])
            Call SalHideWindow(hWndLine[LN_8To9])
            Call SalHideWindow(hWndLine[LN_9To10])
          Return TRUE
        If nTo = 8
          If SalIsWindowVisible(strEntity9)
            Call SalHideWindow(hWndLine[LN_8To10a])
            Call SalHideWindow(hWndLine[LN_8To10b])
            Call SalHideWindow(hWndLine[LN_8To10c])
          Else
            Call SalHideWindow(hWndLine[LN_8To9])
            Call SalHideWindow(hWndLine[LN_9To10])
          Return TRUE
        If nTo = 9
          Call SalHideWindow(hWndLine[LN_9To10])
          Return TRUE
      Else
        Call SalColorSet(hWndItem,COLOR_IndexWindow,COLOR_Cyan)
}
Horizontal Scroll Bar: hBar
  Window Location and Size
    Left:  0.0"
    Top:  2.979"
    Width:  5.638"
    Height: 0.198"
  Visible? Yes
  Message Actions
    On SAM_Create
      Call SalScrollSetRange(hWndItem,0,MAX_SCROLL,1,1)
    On SAM_SetFocus
      Set bEntityFocus = FALSE
    On SAM_ScrollBar
      If wParam != SB_ThumbTrack
        Call SalScrollGetPos(hWndItem,nHBar)
        Set df_nHBar = nHBar-MAX_SCROLL/2
        Set nGloScreen = (nVBar*(MAX_SCROLL+1))+nHBar
        If nGloScreen != nPriorScreen
          Set nPriorScreen = nGloScreen
          Call SalPostMsg(pbOrigin,MSG_Redraw,0,0)
Data Field: df_nHBar
  Data
    Maximum Data Length: 2
```

```
      Data Type: Number
      Editable? Yes
    Display Settings
      Window Location and Size
        Left:  5.825"
        Top:  2.979"
        Width:  0.25"
        Height: 0.198"
      Visible? Yes
      Border? Yes
      Justify: Left
      Format: Uppercase
      Country: Default
      Font Name: MS Sans Serif
      Font Size: 8
      Font Enhancement: Default
      Text Color: Default
      Background Color: White
    Message Actions
      On SAM_SetFocus
        Set bEntityFocus = FALSE
      On SAM_FieldEdit
        If SalIsNull(hWndItem)
          Call SalScrollGetPos(hBar,nHBar)
          Set df_nHBar = nHBar-MAX_SCROLL/2
        If df_nHBar < -MAX_SCROLL/2
          Set df_nHBar = -MAX_SCROLL/2
        If df_nHBar > MAX_SCROLL/2
          Set df_nHBar = MAX_SCROLL/2
        Set nHBar = df_nHBar+MAX_SCROLL/2
        Call SalScrollSetPos(hBar,nHBar)
        Set nGloScreen = (nVBar*(MAX_SCROLL+1))+nHBar
        If nGloScreen != nPriorScreen
          Set nPriorScreen = nGloScreen
          Call SalPostMsg(pbOrigin,MSG_Redraw,0,0)
      On WM_CHAR
        If wParam = 46
          Return FALSE
Vertical Scroll Bar: vBar
  Window Location and Size
    Left:  6.075"
    Top:  -0.01"
    Width:  0.25"
    Height: 2.813"
  Visible? Yes
  Message Actions
    On SAM_Create
      Call SalScrollSetRange(hWndItem,0,MAX_SCROLL,1,1)
    On SAM_SetFocus
      Set bEntityFocus = FALSE
    On SAM_ScrollBar
      If wParam != SB_ThumbTrack
        Call SalScrollGetPos(hWndItem,nVBar)
        Set df_nVBar = nVBar-MAX_SCROLL/2
        Set nGloScreen = (nVBar*(MAX_SCROLL+1))+nHBar
        If nGloScreen != nPriorScreen
          Set nPriorScreen = nGloScreen
          Call SalPostMsg(pbOrigin,MSG_Redraw,0,0)
Data Field: df_nVBar
  Data
    Maximum Data Length: 2
    Data Type: Number
    Editable? Yes
  Display Settings
    Window Location and Size
      Left:  6.075"
      Top:  2.792"
      Width:  0.25"
      Height: 0.198"
```

```
    Visible? Yes
    Border? Yes
    Justify: Left
    Format: Uppercase
    Country: Default
    Font Name: MS Sans Serif
    Font Size: 8
    Font Enhancement: Default
    Text Color: Default
    Background Color: White
  Message Actions
    On SAM_SetFocus
      Set bEntityFocus = FALSE
    On SAM_FieldEdit
      If SalIsNull(hWndItem)
        Call SalScrollGetPos(vBar,nVBar)
        Set df_nVBar = nVBar-MAX_SCROLL/2
      If df_nVBar < -MAX_SCROLL/2
        Set df_nVBar = -MAX_SCROLL/2
      If df_nVBar > MAX_SCROLL/2
        Set df_nVBar = MAX_SCROLL/2
      Set nVBar = df_nVBar+MAX_SCROLL/2
      Call SalScrollSetPos(vBar,nVBar)
      Set nGloScreen = (nVBar*(MAX_SCROLL+1))+nHBar
      If nGloScreen != nPriorScreen
        Set nPriorScreen = nGloScreen
        Call SalPostMsg(pbOrigin,MSG_Redraw,0,0)
    On WM_CHAR
      If wParam = 46
        Return FALSE
Pushbutton: pbOrigin
  Title: &+
  Window Location and Size
    Left:  6.075"
    Top:  2.99"
    Width:  0.245"
    Height: 0.19"
  Visible? Yes
  Keyboard Accelerator: (none)
  Font Name: Arial
  Font Size: 9
  Font Enhancement: Default
  Message Actions
    On SAM_Create
      Call SalPostMsg(hWndItem,SAM_Click,0,0)
    On MSG_Redraw
      Call Redraw()
    On SAM_Click
      !
      ! Reset the workspace to screen(0,0)
      !
      Set df_nHBar = 0
      Set df_nVBar = 0
      Set nHBar = df_nHBar+MAX_SCROLL/2
      Set nVBar = df_nVBar+MAX_SCROLL/2
      Call SalScrollSetPos(hBar,nHBar)
      Call SalScrollSetPos(vBar,nVBar)
      Set nGloScreen = (nVBar*(MAX_SCROLL+1))+nHBar
      Set nPriorScreen = nGloScreen
      If not bStartApp
        Call SalPostMsg(hWndItem,MSG_Redraw,0,0)
      Else
        Set bStartApp = FALSE
! Extra Join Lines
Line
  Coordinates
    Begin X:  3.388"
    Begin Y:  2.823"
    End X:  4.188"
```

```
    End Y: 2.823"
  Visible? Yes
  Line Thickness: 1
  Line Color: Default
Line
  Coordinates
    Begin X: 1.9"
    Begin Y: 2.823"
    End X: 2.7"
    End Y: 2.823"
  Visible? Yes
  Line Thickness: 1
  Line Color: Default
Line
  Coordinates
    Begin X: 3.37"
    Begin Y: 0.156"
    End X: 4.175"
    End Y: 0.156"
  Visible? Yes
  Line Thickness: 1
  Line Color: Default
Line
  Coordinates
    Begin X: 1.975"
    Begin Y: 0.156"
    End X: 2.7"
    End Y: 0.156"
  Visible? Yes
  Line Thickness: 1
  Line Color: Default
Line
  Coordinates
    Begin X: 0.088"
    Begin Y: 0.656"
    End X: 0.688"
    End Y: 0.656"
  Visible? Yes
  Line Thickness: 1
  Line Color: Default
Line
  Coordinates
    Begin X: 5.388"
    Begin Y: 0.656"
    End X: 6.0"
    End Y: 0.656"
  Visible? Yes
  Line Thickness: 1
  Line Color: Default
Line
  Coordinates
    Begin X: 1.088"
    Begin Y: 2.906"
    End X: 4.988"
    End Y: 2.906"
  Visible? Yes
  Line Thickness: 1
  Line Color: Default
Line
  Coordinates
    Begin X: 1.088"
    Begin Y: 0.073"
    End X: 5.075"
    End Y: 0.073"
  Visible? Yes
  Line Thickness: 1
  Line Color: Default
! Lines From Entity 1 (Top To Bottom, Left To Right) = 12
Line
```

Coordinates
Begin X: 1.313"
Begin Y: 0.646"
End X: 1.813"
End Y: 0.646"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 0.963"
Begin Y: 0.656"
End X: 1.988"
End Y: 0.146"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 2.713"
Begin Y: 0.156"
End X: 3.6"
End Y: 0.667"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 1.088"
Begin Y: 0.573"
End X: 1.088"
End Y: 0.073"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 5.088"
Begin Y: 0.656"
End X: 5.088"
End Y: 0.073"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 0.688"
Begin Y: 1.573"
End X: 0.688"
End Y: 0.74"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 1.075"
Begin Y: 0.688"
End X: 4.975"
End Y: 1.521"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 0.088"
Begin Y: 0.656"
End X: 0.088"
End Y: 2.323"
Visible? Yes

Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 0.088"
Begin Y: 2.323"
End X: 0.588"
End Y: 2.323"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 0.888"
Begin Y: 0.74"
End X: 2.388"
End Y: 2.406"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 0.988"
Begin Y: 0.74"
End X: 3.688"
End Y: 2.323"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 1.238"
Begin Y: 0.75"
End X: 5.238"
End Y: 2.333"
Visible? Yes
Line Thickness: 1
Line Color: Default
| Lines From Entity 2 (Top To Bottom, Left To Right) = 9
Line
Coordinates
Begin X: 1.813"
Begin Y: 0.646"
End X: 3.288"
End Y: 0.646"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 2.4"
Begin Y: 0.656"
End X: 3.413"
End Y: 0.146"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 4.175"
Begin Y: 0.156"
End X: 5.013"
End Y: 0.625"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 0.688"

Begin Y: 1.49"
End X: 1.888"
End Y: 0.656"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 2.588"
Begin Y: 0.656"
End X: 5.488"
End Y: 1.573"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 0.788"
Begin Y: 2.24"
End X: 2.188"
End Y: 0.74"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 2.288"
Begin Y: 0.74"
End X: 2.288"
End Y: 2.406"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 2.388"
Begin Y: 0.656"
End X: 3.788"
End Y: 2.323"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 2.588"
Begin Y: 0.656"
End X: 5.288"
End Y: 2.323"
Visible? Yes
Line Thickness: 1
Line Color: Default
| Lines From Entity 3 (Top To Bottom, Left To Right) = 7
Line
Coordinates
Begin X: 3.288"
Begin Y: 0.646"
End X: 4.788"
End Y: 0.646"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 0.638"
Begin Y: 1.531"
End X: 3.338"
End Y: 0.698"
Visible? Yes
Line Thickness: 1

Line Color: Default
Line
Coordinates
Begin X: 4.188"
Begin Y: 0.656"
End X: 5.288"
End Y: 1.406"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 0.788"
Begin Y: 2.323"
End X: 3.388"
End Y: 0.74"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 2.188"
Begin Y: 2.406"
End X: 3.688"
End Y: 0.74"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 3.788"
Begin Y: 0.74"
End X: 3.788"
End Y: 2.406"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 3.888"
Begin Y: 0.74"
End X: 5.388"
End Y: 2.406"
Visible? Yes
Line Thickness: 1
Line Color: Default
! Lines From Entity 4 (Top To Bottom, Left To Right) = 7
Line
Coordinates
Begin X: 1.238"
Begin Y: 1.448"
End X: 5.438"
End Y: 0.615"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 5.388"
Begin Y: 0.74"
End X: 5.388"
End Y: 1.573"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 0.588"
Begin Y: 2.406"

End X: 5.388"
End Y: 0.573"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 2.288"
Begin Y: 2.406"
End X: 4.988"
End Y: 0.74"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 3.788"
Begin Y: 2.406"
End X: 5.088"
End Y: 0.74"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 5.988"
Begin Y: 0.656"
End X: 5.988"
End Y: 2.323"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 5.588"
Begin Y: 2.323"
End X: 5.988"
End Y: 2.323"
Visible? Yes
Line Thickness: 1
Line Color: Default
) Lines From Entity 5 (Top To Bottom, Left To Right) = 5
Line
Coordinates
Begin X: 1.186"
Begin Y: 1.521"
End X: 4.888"
End Y: 1.521"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 0.688"
Begin Y: 1.573"
End X: 0.688"
End Y: 2.323"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 0.788"
Begin Y: 1.573"
End X: 1.688"
End Y: 2.24"
Visible? Yes
Line Thickness: 1
Line Color: Default

Line
  Coordinates
    Begin X: 0.888"
    Begin Y: 1.573"
    End X: 3.288"
    End Y: 2.24"
  Visible? Yes
  Line Thickness: 1
  Line Color: Default
Line
  Coordinates
    Begin X: 1.088"
    Begin Y: 1.573"
    End X: 4.988"
    End Y: 2.24"
  Visible? Yes
  Line Thickness: 1
  Line Color: Default
! Lines From Entity 6 (Top To Bottom, Left To Right) = 4
Line
  Coordinates
    Begin X: 0.588"
    Begin Y: 2.313"
    End X: 4.988"
    End Y: 1.563"
  Visible? Yes
  Line Thickness: 1
  Line Color: Default
Line
  Coordinates
    Begin X: 2.688"
    Begin Y: 2.24"
    End X: 5.188"
    End Y: 1.573"
  Visible? Yes
  Line Thickness: 1
  Line Color: Default
Line
  Coordinates
    Begin X: 4.188"
    Begin Y: 2.24"
    End X: 5.288"
    End Y: 1.573"
  Visible? Yes
  Line Thickness: 1
  Line Color: Default
Line
  Coordinates
    Begin X: 5.388"
    Begin Y: 1.573"
    End X: 5.388"
    End Y: 2.323"
  Visible? Yes
  Line Thickness: 1
  Line Color: Default
! Lines For Entity 7 = 5
Line
  Coordinates
    Begin X: 1.288"
    Begin Y: 2.323"
    End X: 1.788"
    End Y: 2.323"
  Visible? Yes
  Line Thickness: 1
  Line Color: Default
Line
  Coordinates
    Begin X: 1.088"
    Begin Y: 2.417"

End X: 1.9"
End Y: 2.823"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 2.688"
Begin Y: 2.823"
End X: 3.5"
End Y: 2.396"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 1.088"
Begin Y: 2.406"
End X: 1.088"
End Y: 2.906"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 4.988"
Begin Y: 2.406"
End X: 4.988"
End Y: 2.906"
Visible? Yes
Line Thickness: 1
Line Color: Default
I Lines For Entity 8 = 3
Line
Coordinates
Begin X: 1.788"
Begin Y: 2.323"
End X: 3.288"
End Y: 2.323"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 2.513"
Begin Y: 2.406"
End X: 3.4"
End Y: 2.823"
Visible? Yes
Line Thickness: 1
Line Color: Default
Line
Coordinates
Begin X: 4.175"
Begin Y: 2.823"
End X: 5.0"
End Y: 2.406"
Visible? Yes
Line Thickness: 1
Line Color: Default
I Lines For Entity 9 = 1
Line
Coordinates
Begin X: 3.288"
Begin Y: 2.323"
End X: 4.788"
End Y: 2.323"
Visible? Yes
Line Thickness: 1

```
    Line Color: Default
  | Extra Line (First Child)
  Line
    Coordinates
      Begin X: 0.588"
      Begin Y: 2.656"
      End X: 0.988"
      End Y: 2.656"
    Visible? Yes
    Line Thickness: 1
    Line Color: Default
  | Total Of 62 Lines
  | Domains
  Frame
    Window Location and Size
      Left: 5.75"
      Top: 3.55"
      Width: 0.543"
      Height: 0.44"
    Visible? Yes
    Corners: Square
    Border Style: Drop-Shadow
    Border Thickness: 2
    Border Color: Default
    Background Color: Default
  Picture: picUNFLogo
    Window Location and Size
      Left: 5.793"
      Top: 3.574"
      Width: 0.457"
      Height: 0.405"
    Visible? Yes
    File Name: unflogo.bmp
    Storage: Internal
    Fit: Scale
    Scaling
      Width: 100
      Height: 100
    Corners: Square
    Border Style: No Border
    Border Thickness: 1
    Tile To Parent? No
    Border Color: Default
    Background Color: Default
    Message Actions
      On SAM_Click
        Call SalModalDialog(dlgAbout,hWndForm)
  Picture: dom1
    Window Location and Size
      Left: 0.688"
      Top: 0.24"
      Width: 0.275"
      Height: 0.229"
    Visible? Yes
    File Name: circyan.bmp
    Storage: Internal
    Fit: Size to Fit
    Scaling
      Width: 100
      Height: 100
    Corners: Square
    Border Style: No Border
    Border Thickness: 1
    Tile To Parent? No
    Border Color: Black
    Background Color: Default
    Message Actions
      On SAM_Click
        Call SalSetFocus(strEntity1)
```

```
Picture: dom2
  Window Location and Size
    Left:  2.188"
    Top:  0.24"
    Width:  0.275"
    Height: 0.229"
  Visible? Yes
  File Name: circyan.bmp
  Storage: Internal
  Fit: Size to Fit
  Scaling
    Width:  100
    Height:  100
  Corners: Square
  Border Style: No Border
  Border Thickness: 1
  Tile To Parent? No
  Border Color: Black
  Background Color: Default
  Message Actions
    On SAM_Click
      Call SalSetFocus(strEntity2)
Picture: dom3
  Window Location and Size
    Left:  3.688"
    Top:  0.24"
    Width:  0.275"
    Height: 0.229"
  Visible? Yes
  File Name: circyan.bmp
  Storage: Internal
  Fit: Size to Fit
  Scaling
    Width:  100
    Height:  100
  Corners: Square
  Border Style: No Border
  Border Thickness: 1
  Tile To Parent? No
  Border Color: Black
  Background Color: Default
  Message Actions
    On SAM_Click
      Call SalSetFocus(strEntity3)
Picture: dom4
  Window Location and Size
    Left:  5.188"
    Top:  0.24"
    Width:  0.275"
    Height: 0.229"
  Visible? Yes
  File Name: circyan.bmp
  Storage: Internal
  Fit: Size to Fit
  Scaling
    Width:  100
    Height:  100
  Corners: Square
  Border Style: No Border
  Border Thickness: 1
  Tile To Parent? No
  Border Color: Black
  Background Color: Default
  Message Actions
    On SAM_Click
      Call SalSetFocus(strEntity4)
Picture: dom5
  Window Location and Size
    Left:  0.588"
```

```
    Top:  1.083"
    Width:  0.275"
    Height: 0.219"
  Visible? Yes
  File Name: circyan.bmp
  Storage: Internal
  Fit: Size to Fit
  Scaling
    Width:  100
    Height:  100
  Corners: Square
  Border Style: No Border
  Border Thickness: 1
  Tile To Parent? No
  Border Color: Black
  Background Color: Default
  Message Actions
    On SAM_Click
      Call SalSetFocus(strEntity5)
Picture: dom6
  Window Location and Size
    Left:  5.288"
    Top:  1.073"
    Width:  0.275"
    Height: 0.229"
  Visible? Yes
  File Name: circyan.bmp
  Storage: Internal
  Fit: Size to Fit
  Scaling
    Width:  100
    Height:  100
  Corners: Square
  Border Style: No Border
  Border Thickness: 1
  Tile To Parent? No
  Border Color: Black
  Background Color: Default
  Message Actions
    On SAM_Click
      Call SalSetFocus(strEntity6)
Picture: dom7
  Window Location and Size
    Left:  0.588"
    Top:  2.49"
    Width:  0.275"
    Height: 0.229"
  Visible? Yes
  File Name: circyan.bmp
  Storage: Internal
  Fit: Size to Fit
  Scaling
    Width:  100
    Height:  100
  Corners: Square
  Border Style: No Border
  Border Thickness: 1
  Tile To Parent? No
  Border Color: Black
  Background Color: Default
  Message Actions
    On SAM_Click
      Call SalSetFocus(strEntity7)
Picture: dom8
  Window Location and Size
    Left:  2.188"
    Top:  2.49"
    Width:  0.275"
    Height: 0.229"
```

```
    Visible? Yes
    File Name: circyan.bmp
    Storage: Internal
    Fit: Size to Fit
    Scaling
      Width: 100
      Height: 100
    Corners: Square
    Border Style: No Border
    Border Thickness: 1
    Tile To Parent? No
    Border Color: Black
    Background Color: Default
    Message Actions
      On SAM_Click
        Call SalSetFocus(strEntity8)
  Picture: dom9
    Window Location and Size
      Left:  3.688"
      Top:  2.49"
      Width: 0.275"
      Height: 0.229"
    Visible? Yes
    File Name: circyan.bmp
    Storage: Internal
    Fit: Size to Fit
    Scaling
      Width: 100
      Height: 100
    Corners: Square
    Border Style: No Border
    Border Thickness: 1
    Tile To Parent? No
    Border Color: Black
    Background Color: Default
    Message Actions
      On SAM_Click
        Call SalSetFocus(strEntity9)
  Picture: dom10
    Window Location and Size
      Left:  5.188"
      Top:  2.5"
      Width: 0.275"
      Height: 0.219"
    Visible? Yes
    File Name: circyan.bmp
    Storage: Internal
    Fit: Size to Fit
    Scaling
      Width: 100
      Height: 100
    Corners: Square
    Border Style: No Border
    Border Thickness: 1
    Tile To Parent? No
    Border Color: Black
    Background Color: Default
    Message Actions
      On SAM_Click
        Call SalSetFocus(strEntity10)
  Background Text: N&ame:
    Window Location and Size
      Left:  0.075"
      Top:  3.302"
      Width: 0.588"
      Height: 0.167"
    Visible? Yes
    Justify: Left
    Font Name: Default
```

```
  Font Size: Default
  Font Enhancement: Default
  Text Color: Default
  Background Color: Default
Data Field: strName
  Data
    Maximum Data Length: 18
    Data Type: String
    Editable? Yes
  Display Settings
    Window Location and Size
      Left:  0.675"
      Top:  3.24"
      Width:  2.25"
      Height: 0.25"
    Visible? Yes
    Border? Yes
    Justify: Left
    Format: Uppercase
    Country: Default
    Font Name: MS Sans Serif
    Font Size: 10
    Font Enhancement: Default
    Text Color: Default
    Background Color: White
  Message Actions
    On MSG_Gray
      Set strName = strGloObjName[nGloCell[nGloAbsPos]]
      If bEntityFocus
        Call SalEnableWindow(hWndItem)
      Else
        Call SalDisableWindow(hWndItem)
    On SAM_SetFocus
      Set bEntityFocus = FALSE
    On SAM_FieldEdit
      !
      ! Verify that the name is not used by any other object
      !
      If SalStrTrim(strName,strName) > 0 and strName != SPACE
          and strName != strGloObjName[nGloCell[nGloAbsPos]] and IsAlphaNumeric(strName)
        Call SalWaitCursor(TRUE)
        Set nGloCount = 1
        While nGloObjType[nGloCount] != 0
          If strName = strGloObjName[nGloCount]
            Call SalMessageBox('This Name Has Been Used.  Please Create A New Name.',
                APPNAME,MB_Ok|MB_IconAsterisk)
            Call SalSetFocus(strName)
            Call SalWaitCursor(FALSE)
            Return FALSE
          Set nGloCount = nGloCount + 1
        Set strGloObjName[nGloCell[nGloAbsPos]] = strName
        Set nGloCount = SalNumberMod(nGloAbsPos,10)
        If nGloCount = 0
          Set nGloCount = 10
        Call SalWaitCursor(FALSE)
      Else
        Set strName = strGloObjName[nGloCell[nGloAbsPos]]
    On MSG_Disable
      Call SalDisableWindow(hWndItem)
      Call SalClearField(hWndItem)
    On SAM_Validate
      If IsAlphaNumeric(strName)
        Set bGloDetailOK = TRUE
        Call SalDrawMenuBar(frmObjMgr)
        Call SalPostMsg(hWndItem,SAM_FieldEdit,0,0)
        Return VALIDATE_Ok
      Else
        Set bGloDetailOK = FALSE
        Call SalDrawMenuBar(frmObjMgr)
```

```
        Return VALIDATE_Cancel
Background Text: &ID:
  Window Location and Size
    Left:  2.988"
    Top:  3.281"
    Width:  0.263"
    Height: 0.167"
  Visible? Yes
  Justify: Left
  Font Name: Default
  Font Size: Default
  Font Enhancement: Default
  Text Color: Default
  Background Color: Default
Data Field: strO_ID
  Data
    Maximum Data Length: 7
    Data Type: String
    Editable? Yes
  Display Settings
    Window Location and Size
      Left:  3.288"
      Top:  3.24"
      Width:  0.938"
      Height: 0.25"
    Visible? Yes
    Border? Yes
    Justify: Left
    Format: Uppercase
    Country: Default
    Font Name: MS Sans Serif
    Font Size: 10
    Font Enhancement: Default
    Text Color: Default
    Background Color: White
  Message Actions
    On MSG_Gray
      Set strO_ID = strGloO_ID[nGloCell[nGloAbsPos]]
      If bEntityFocus
        Call SalEnableWindow(hWndItem)
      Else
        Call SalDisableWindow(hWndItem)
    On SAM_SetFocus
      Set bEntityFocus = FALSE
    On SAM_FieldEdit
      !
      ! Verify that the name entered is not used by any other object
      !
      If SalStrTrim(strO_ID,strO_ID) > 0 and strO_ID != SPACE
          and strO_ID != strGloO_ID[nGloCell[nGloAbsPos]] and IsAlphaNumeric(strO_ID)
        Call SalWaitCursor(TRUE)
        Set nGloCount = 1
        While nGloObjType[nGloCount] != 0
          If strO_ID = strGloO_ID[nGloCount]
            Call SalMessageBox('This ID Has Been Used.  Please Create A New ID.',
                APPNAME,MB_Ok|MB_IconAsterisk)
            Call SalSetFocus(strO_ID)
            Call SalWaitCursor(FALSE)
            Return FALSE
          Set nGloCount = nGloCount + 1
        Set strGloO_ID[nGloCell[nGloAbsPos]] = strO_ID
        Set nGloCount = SalNumberMod(nGloAbsPos,10)
        If nGloCount = 0
          Set nGloCount = 10
        Call SalSetWindowText(hWndDF[nGloCount],strO_ID)
        Call SalWaitCursor(FALSE)
      Else
        Set strO_ID = strGloO_ID[nGloCell[nGloAbsPos]]
    On SAM_Validate
```

```
        If IsAlphaNumeric(strO_ID)
          Set bGloDetailOK = TRUE
          Call SalDrawMenuBar(frmObjMgr)
          Call SalPostMsg(hWndItem,SAM_FieldEdit,0,0)
          Return VALIDATE_Ok
        Else
          Set bGloDetailOK = FALSE
          Call SalDrawMenuBar(frmObjMgr)
          Return VALIDATE_Cancel
      On MSG_Disable
        Call SalDisableWindow(hWndItem)
        Call SalClearField(hWndItem)
  Data Field: strType
    Data
      Maximum Data Length: 35
      Data Type: String
      Editable? No
    Display Settings
      Window Location and Size
        Left:  4.275"
        Top:  3.271"
        Width:  2.125"
        Height: 0.25"
      Visible? Yes
      Border? No
      Justify: Left
      Format: Unformatted
      Country: Default
      Font Name: MS Sans Serif
      Font Size: 10
      Font Enhancement: Default
      Text Color: Black
      Background Color: Default
    Message Actions
      On MSG_Gray
        Select Case nGloObjType[nGloCell[nGloAbsPos]]
          Case ENTITY_Regular
            Set strType = 'Type:  Regular Entity'
            Break
          Case ENTITY_Composite
            Set strType = 'Type:  Composite Entity'
            Break
          Case ENTITY_CrossProduct
            Set strType = 'Type:  Cross Product Entity'
            Break
          Case DOMAIN
            Set strType = 'Type:  Composite Domain'
            Break
          Default
            Set strType = NULL
  Background Text: Object &Note:
    Window Location and Size
      Left:  0.088"
      Top:  3.604"
      Width:  0.588"
      Height: 0.385"
    Visible? Yes
    Justify: Left
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
  Multiline Field: strDescription
    Data
      Maximum Data Length: 254
      String Type: String
      Editable? Yes
    Display Settings
```

```
        Border? Yes
        Word Wrap? Yes
        Vertical Scroll? Yes
        Window Location and Size
          Left:  0.675"
          Top:  3.552"
          Width:  5.013"
          Height: 0.438"
        Visible? Yes
        Font Name: MS Sans Serif
        Font Size: 10
        Font Enhancement: Default
        Text Color: Default
        Background Color: White
      Message Actions
        On SAM_SetFocus
          Set bEntityFocus = FALSE
        On MSG_Gray
          Set strDescription = strGloObjDesc[nGloCell[nGloAbsPos]]
          If bEntityFocus
            Call SalEnableWindow(hWndItem)
          Else
            Call SalDisableWindow(hWndItem)
        On SAM_FieldEdit
          Call ReplaceChar(strDescription,DEL,SPACE)
          Call ReplaceChar(strDescription,"\","")
          If SalStrTrim(strDescription,strDescription) > 0 and strDescription != SPACE
              and strDescription != strGloObjDesc[nGloCell[nGloAbsPos]]
            Set strGloObjDesc[nGloCell[nGloAbsPos]] = strDescription
            Set nGloCount = SalNumberMod(nGloAbsPos,10)
            If nGloCount = 0
              Set nGloCount = 10
          Else
            Set strDescription = strGloObjDesc[nGloCell[nGloAbsPos]]
        On MSG_Disable
          Call SalDisableWindow(hWndItem)
          Call SalClearField(hWndItem)
        On SAM_Validate
          Call SalPostMsg(hWndItem,SAM_FieldEdit,0,0)
          Return VALIDATE_Ok
    Data Field: strMessage
      Data
        Maximum Data Length: Default
        Data Type: String
        Editable? No
      Display Settings
        Window Location and Size
          Left:  0.18"
          Top:  4.05"
          Width:  5.0"
          Height: 0.25"
        Visible? Yes
        Border? No
        Justify: Left
        Format: Unformatted
        Country: Default
        Font Name: MS Sans Serif
        Font Size: 8
        Font Enhancement: None
        Text Color: Default
        Background Color: Default
      Message Actions
Window Variables
  Boolean: bEntityFocus
  Boolean: bStartApp
  Number: nHBar
  Number: nPriorScreen
  Number: nTemp
  Number: nTo
```

```
  Number: nVBar
  String: strDevice
  String: strDriver
  String: strEntityText
  String: strPort
  String: strScreenObject[15]
  |
  | Window handle Arrays
  |
  Window Handle: hWndDF[30]
  Window Handle: hWndDom[15]
  Window Handle: hWndLine[65]
Message Actions
  On SAM_Create
    Call SalWaitCursor(TRUE)
    |
    | get and save a window handle to the Form's menu bar
    |
    Set hWndGloMenuBar = GetMenu( hWndForm )
    Set hWndGloSubMenu = GetSubMenu( hWndGloMenuBar, SELECT_MENU )
    |
    | Load handles for data fields, pictures, and lines.  Show certain fields, and initialize startup variables.
    |
    Set bStartApp = TRUE
    Call SalHideWindow(hWndForm)
    Call LoadHandles(hWndForm,hWndLine,TYPE_Line)
    Call LoadHandles(hWndForm,hWndDF,TYPE_DataField)
    Call LoadHandles(hWndForm,hWndDom,TYPE_Picture)
    Set hWndDom[10] = hWndNULL
    Call SalShowWindow(strO_ID)
    Call SalShowWindow(strName)
    Call SalShowWindow(strType)
    Call SalShowWindow(strMessage)
    Call SalShowWindow(picUNFLogo)
    Call SalShowWindow(df_nHBar)
    Call SalShowWindow(df_nVBar)
    Call SalSendMsgToChildren(hWndForm,MSG_Hide,0,0)
    Call SalSendMsgToChildren(hWndForm,MSG_Disable,0,0)
    Set nGloCount = 1
    While nGloCount < 11
      Set nGloCount = nGloCount + 1
    Set nGloScreen = 0
    Set nGloObjFunction = DELETE
    Set bGloChanged = FALSE
    Set bGloDetailOK = TRUE
    Set bGloInitialized = TRUE
    Call SalPostMsg(hWndForm,MSG_Created,0,0)
  On MSG_Created
    |
    | Refresh Select Menu, show main window, and open OSAM* file if one has been provided.
    |
    Set bEntityFocus = FALSE
    Call SalShowWindow(hWndForm)
    Call RefreshSelectMenu()
    Call SalDestroyWindow(hWndGloWait)
    Call SalWaitCursor(FALSE)
    If strArgArray[1] != NULL
      Call SalStrRight(strArgArray[1],4,strGloFileName)
      Call SalStrUpper(strGloFileName,strGloFileName)
      If strGloFileName = '.SAM'
        Set strGloFileName = strArgArray[1]
        Call OpenOSAMFile(strGloFileName)
      Else
        Call SalMessageBox(strArgArray[1]||' is not a valid OSAM* file.',APPNAME,MB_Ok)
        Set strGloFileName = NULL
  On SAM_Close
    |
    | end the program
    |
```

```
      If not FileContinue()
        Return FALSE
Dialog Box: dlgAbout
  Title: About OSAM* Designer
  Display Settings
    Visible at Design time? No
    Type of Dialog: Modal
    Window Location and Size
      Left:  0.45"
      Top:  0.177"
      Width:  5.243"
      Height: 3.988"
    Absolute Screen Location? Yes
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Gray
  Contents
    Frame
      Window Location and Size
        Left:  0.186"
        Top:  0.143"
        Width:  0.543"
        Height: 0.44"
      Visible? Yes
      Corners: Square
      Border Style: Drop-Shadow
      Border Thickness: 2
      Border Color: Default
      Background Color: Default
    Picture: picUNFLogo
      Window Location and Size
        Left:  0.229"
        Top:  0.167"
        Width:  0.457"
        Height: 0.405"
      Visible? Yes
      File Name: unflogo.bmp
      Storage: Internal
      Fit: Scale
      Scaling
        Width:  100
        Height:  100
      Corners: Square
      Border Style: No Border
      Border Thickness: 1
      Tile To Parent? No
      Border Color: Default
      Background Color: Default
      Message Actions
    Pushbutton: pbOk
      Title: Ok
      Window Location and Size
        Left:  4.029"
        Top:  0.155"
        Width:  0.957"
        Height: 0.25"
      Visible? Yes
      Keyboard Accelerator: Enter
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Message Actions
        On SAM_Click
          Call SalEndDialog(hWndForm,TRUE)
    Pushbutton: pbCancel
      Title: Ok
      Window Location and Size
```

```
      Left:  4.029"
      Top:  0.155"
      Width:  0.957"
      Height: 0.25"
    Visible? No
    Keyboard Accelerator: Esc
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Message Actions
      On SAM_Click
        Call SalEndDialog(hWndForm,TRUE)
  Background Text: OSAM* Designer
    Window Location and Size
      Left:  0.8"
      Top:  0.179"
      Width:  2.829"
      Height: 0.19"
    Visible? Yes
    Justify: Left
    Font Name: MS Sans Serif
    Font Size: 10
    Font Enhancement: Bold
    Text Color: Default
    Background Color: Default
  Background Text: Copyright © 1992 by Paul F. Rabuck
    Window Location and Size
      Left:  0.814"
      Top:  0.429"
      Width:  3.057"
      Height: 0.167"
    Visible? Yes
    Justify: Left
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
  Background Text: With Special Thanks to:
    Window Location and Size
      Left:  0.2"
      Top:  0.679"
      Width:  2.729"
      Height: 0.167"
    Visible? Yes
    Justify: Left
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
  Background Text: Dr. Susan R. Wallace, Thesis Advisor and Committee Chairman
    Window Location and Size
      Left:  0.371"
      Top:  0.917"
      Width:  3.486"
      Height: 0.381"
    Visible? Yes
    Justify: Left
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
  Background Text: and the Thesis Committee:
    Window Location and Size
      Left:  0.2"
      Top:  1.333"
      Width:  2.443"
```

Height: 0.167"
Visible? Yes
Justify: Left
Font Name: Default
Font Size: Default
Font Enhancement: Default
Text Color: Default
Background Color: Default
Background Text: Dr. Judith Solano
Window Location and Size
Left: 0.386"
Top: 1.571"
Width: 1.614"
Height: 0.167"
Visible? Yes
Justify: Left
Font Name: Default
Font Size: Default
Font Enhancement: Default
Text Color: Default
Background Color: Default
Background Text: Dr. F. Layne Wallace
Window Location and Size
Left: 0.386"
Top: 1.738"
Width: 1.843"
Height: 0.167"
Visible? Yes
Justify: Left
Font Name: Default
Font Size: Default
Font Enhancement: Default
Text Color: Default
Background Color: Default
Line
Coordinates
Begin X: 0.614"
Begin Y: 2.012"
End X: 4.514"
End Y: 2.012"
Visible? Yes
Line Thickness: 2
Line Color: Default
Multiline Field: mlSubmit
Data
Maximum Data Length: Default
String Type: String
Editable? No
Display Settings
Border? No
Word Wrap? Yes
Vertical Scroll? No
Window Location and Size
Left: 0.2"
Top: 2.107"
Width: 4.714"
Height: 0.702"
Visible? Yes
Font Name: MS Sans Serif
Font Size: 8
Font Enhancement: None
Text Color: Default
Background Color: Default
Message Actions
On SAM_Create
Set mlSubmit = 'This software is submitted to the University of North Florida College of Computer and Infomation Sciences In partial fulfillment of the requirements for the degree of Master of Science in Computer and Information Sciences.'
On SAM_SetFocus
Call SafSetFocus(pbOk)

```
      Multiline Field: mlPortions
        Data
          Maximum Data Length: Default
          String Type: String
          Editable? No
        Display Settings
          Border? No
          Word Wrap? Yes
          Vertical Scroll? No
          Window Location and Size
            Left:  0.2"
            Top:  2.833"
            Width:  4.771"
            Height: 0.75"
          Visible? Yes
          Font Name: MS Sans Serif
          Font Size: 8
          Font Enhancement: None
          Text Color: Default
          Background Color: Default
        Message Actions
          On SAM_Create
            Set mlPortions = 'The ideas presented within this software and the term "OSAM*" are based on prior work
conducted by Dr. Stanley Y. W. Su at the Database Systems Research and Development Center, University of Florida.'
          On SAM_SetFocus
            Call SalSetFocus(pbOk)
    Window Variables
    Message Actions
      !
      ! OSAM* Designer About Box
      !
      On SAM_Create
        Call SalWaitCursor(TRUE)
        Call SalSendMsg(hWndForm,MSG_Created,0,0)
      On MSG_Created
        Call SalWaitCursor(FALSE)
      On SAM_Close
        Call SalEndDialog(hWndForm,TRUE)
  Dialog Box: dlgAddObject
    Title: Create An Object
    Display Settings
      Visible at Design time? No
      Type of Dialog: Modal
      Window Location and Size
        Left:  1.95"
        Top:  0.25"
        Width:  5.071"
        Height: 3.893"
      Absolute Screen Location? Yes
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Default
    Contents
      Background Text: Object &ID:
        Window Location and Size
          Left:  0.143"
          Top:  0.167"
          Width:  0.986"
          Height: 0.167"
        Visible? Yes
        Justify: Left
        Font Name: Default
        Font Size: Default
        Font Enhancement: Default
        Text Color: Default
        Background Color: Default
      Data Field: strO_ID
```

```
    Data
      Maximum Data Length: 7
      Data Type: String
      Editable? Yes
    Display Settings
      Window Location and Size
        Left:  1.343"
        Top:  0.119"
        Width:  1.129"
        Height: 0.25"
      Visible? Yes
      Border? Yes
      Justify: Left
      Format: Uppercase
      Country: Default
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Default
    Message Actions
      On MSG_Check
        If strGloErrorMessage = NULL
          If SalStrTrim(strO_ID,strO_ID) = 0 or strO_ID = SPACE
            Set strGloErrorMessage = 'An Object ID Must Be Provided.'
            Call SalSetFocus(hWndItem)
      On SAM_FieldEdit
        If SalIsNull(strName)
          Set strName = strO_ID
      On SAM_Validate
        If IsAlphaNumeric(strO_ID)
          Return VALIDATE_Ok
        Else
          Return VALIDATE_Cancel
  Background Text: Object N&ame:
    Window Location and Size
      Left:  0.129"
      Top:  0.5"
      Width:  1.157"
      Height: 0.167"
    Visible? Yes
    Justify: Left
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
  Data Field: strName
    Data
      Maximum Data Length: 18
      Data Type: String
      Editable? Yes
    Display Settings
      Window Location and Size
        Left:  1.343"
        Top:  0.452"
        Width:  3.457"
        Height: 0.25"
      Visible? Yes
      Border? Yes
      Justify: Left
      Format: Uppercase
      Country: Default
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Default
    Message Actions
```

```
      On MSG_Check
        If strGloErrorMessage = NULL
          If SalStrTrim(strName,strName) = 0 or strName = SPACE
            Set strGloErrorMessage = 'An Object Name Must Be Provided.'
            Call SalSetFocus(hWndItem)
      On SAM_Validate
        If IsAlphaNumeric(strName)
          Return VALIDATE_Ok
        Else
          Return VALIDATE_Cancel
  Background Text: Object &Type:
    Window Location and Size
      Left:  0.129"
      Top:  0.821"
      Width:  1.143"
      Height: 0.167"
    Visible? Yes
    Justify: Left
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
  Combo Box: strObjType
    Window Location and Size
      Left:  1.343"
      Top:  0.774"
      Width:  2.486"
      Height: 1.024"
    Visible? Yes
    Editable? No
    String Type: String
    Maximum Data Length: Default
    Sorted? No
    Always Show List? No
    Vertical Scroll? Yes
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
    List Initialization
      Text: Regular Entity
      Text: Composite Domain
      Text: Cross Product Entity
      Text: Composite Entity
    Message Actions
      On SAM_Create
        Call SalListSetSelect(hWndItem,0)
  Background Text: Object &Note:
    Window Location and Size
      Left:  0.1"
      Top:  1.131"
      Width:  1.129"
      Height: 0.167"
    Visible? Yes
    Justify: Left
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
  Multiline Field: strDescription
    Data
      Maximum Data Length: 254
      String Type: String
      Editable? Yes
    Display Settings
      Border? Yes
```

```
      Word Wrap? Yes
      Vertical Scroll? Yes
      Window Location and Size
        Left:  0.1"
        Top:  1.321"
        Width:  4.7"
        Height: 0.583"
      Visible? Yes
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Default
    Message Actions
      On SAM_Validate
        Call ReplaceChar(strDescription,DEL,SPACE)
        Call ReplaceChar(strDescription,"\","")
        Return VALIDATE_Ok
  Group Box: Screen Position
    Window Location and Size
      Left:  0.1"
      Top:  1.94"
      Width:  3.371"
      Height: 1.512"
    Visible? Yes
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
  Data Field: scrpos1
    Data
      Maximum Data Length: Default
      Data Type: String
      Editable? Yes
    Display Settings
      Window Location and Size
        Left:  0.3"
        Top:  2.274"
        Width:  0.629"
        Height: 0.262"
      Visible? Yes
      Border? Yes
      Justify: Center
      Format: Unformatted
      Country: Default
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Cyan
    Message Actions
      On WM_CHAR
        Return FALSE
      On SAM_Create
        If SetPositionValue(1,TRUE)
          Set bOpenPositions =TRUE
          Set nPos = SetPositionFocus()
      On SAM_SetFocus
        Set nPos = SetPositionFocus()
      On MSG_Gray
        Call SetPositionBlack()
  Data Field: scrpos2
    Data
      Maximum Data Length: Default
      Data Type: String
      Editable? Yes
    Display Settings
      Window Location and Size
```

```
        Left:  1.1"
        Top:  2.274"
        Width:  0.629"
        Height: 0.262"
      Visible? Yes
      Border? Yes
      Justify: Center
      Format: Unformatted
      Country: Default
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Cyan
    Message Actions
      On WM_CHAR
        Return FALSE
      On SAM_Create
        If SetPosItionValue(2,TRUE)
          If not bOpenPositions
            Set nPos = SetPositionFocus()
          Set bOpenPositions =TRUE
      On SAM_SetFocus
        Set nPos = SetPositionFocus()
      On MSG_Gray
        Call SetPositionBlack()
  Data Field: scrpos3
    Data
      Maximum Data Length: Default
      Data Type: String
      Editable? Yes
    Display Settings
      Window Location and Size
        Left:  1.9"
        Top:  2.274"
        Width:  0.629"
        Height: 0.262"
      Visible? Yes
      Border? Yes
      Justify: Center
      Format: Unformatted
      Country: Default
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Cyan
    Message Actions
      On WM_CHAR
        Return FALSE
      On SAM_Create
        If SetPositionValue(3,TRUE)
          If not bOpenPositions
            Set nPos = SetPositionFocus()
          Set bOpenPositions =TRUE
      On SAM_SetFocus
        Set nPos = SetPositionFocus()
      On MSG_Gray
        Call SetPositionBlack()
  Data Field: scrpos4
    Data
      Maximum Data Length: Default
      Data Type: String
      Editable? Yes
    Display Settings
      Window Location and Size
        Left:  2.7"
        Top:  2.274"
        Width:  0.629"
```

```
      Height: 0.262"
    Visible? Yes
    Border? Yes
    Justify: Center
    Format: Unformatted
    Country: Default
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Cyan
  Message Actions
    On WM_CHAR
      Return FALSE
    On SAM_Create
      If SetPositionValue(4,TRUE)
        If not bOpenPositions
          Set nPos = SetPositionFocus()
        Set bOpenPositions =TRUE
    On SAM_SetFocus
      Set nPos = SetPositionFocus()
    On MSG_Gray
      Call SetPositionBlack()
Data Field: scrpos5
  Data
    Maximum Data Length: Default
    Data Type: String
    Editable? Yes
  Display Settings
    Window Location and Size
      Left:  0.3"
      Top:  2.69"
      Width:  0.629"
      Height: 0.262"
    Visible? Yes
    Border? Yes
    Justify: Center
    Format: Unformatted
    Country: Default
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Cyan
  Message Actions
    On WM_CHAR
      Return FALSE
    On SAM_Create
      If SetPositionValue(5,TRUE)
        If not bOpenPositions
          Set nPos = SetPositionFocus()
        Set bOpenPositions =TRUE
    On SAM_SetFocus
      Set nPos = SetPositionFocus()
    On MSG_Gray
      Call SetPositionBlack()
Data Field: scrpos6
  Data
    Maximum Date Length: Default
    Data Type: String
    Editable? Yes
  Display Settings
    Window Location and Size
      Left:  2.7"
      Top:  2.69"
      Width:  0.629"
      Height: 0.262"
    Visible? Yes
    Border? Yes
```

```
      Justify: Center
      Format: Unformatted
      Country: Default
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Cyan
    Message Actions
      On WM_CHAR
        Return FALSE
      On SAM_Create
        If SetPositionValue(6,TRUE)
          If not bOpenPositions
            Set nPos = SetPositionFocus()
          Set bOpenPositions =TRUE
      On SAM_SetFocus
        Set nPos = SetPositionFocus()
      On MSG_Gray
        Call SetPositionBlack()
  Data Field: scrpos7
    Data
      Maximum Data Length: Default
      Data Type: String
      Editable? Yes
    Display Settings
      Window Location and Size
        Left:  0.3"
        Top:  3.107"
        Width:  0.629"
        Height: 0.262"
      Visible? Yes
      Border? Yes
      Justify: Center
      Format: Unformatted
      Country: Default
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Cyan
    Message Actions
      On WM_CHAR
        Return FALSE
      On SAM_Create
        If SetPositionValue(7,TRUE)
          If not bOpenPositions
            Set nPos = SetPositionFocus()
          Set bOpenPositions =TRUE
      On SAM_SetFocus
        Set nPos = SetPositionFocus()
      On MSG_Gray
        Call SetPositionBlack()
  Data Field: scrpos8
    Data
      Maximum Data Length: Default
      Data Type: String
      Editable? Yes
    Display Settings
      Window Location and Size
        Left:  1.1"
        Top:  3.107"
        Width:  0.629"
        Height: 0.262"
      Visible? Yes
      Border? Yes
      Justify: Center
      Format: Unformatted
      Country: Default
```

```
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Cyan
    Message Actions
      On WM_CHAR
        Return FALSE
      On SAM_Create
        If SetPositionValue(8,TRUE)
          If not bOpenPositions
            Set nPos = SetPositionFocus()
          Set bOpenPositions =TRUE
      On SAM_SetFocus
        Set nPos = SetPositionFocus()
      On MSG_Gray
        Call SetPositionBlack()
Data Field: scrpos9
  Data
    Maximum Data Length: Default
    Data Type: String
    Editable? Yes
  Display Settings
    Window Location and Size
      Left:  1.9"
      Top:  3.107"
      Width:  0.629"
      Height: 0.262"
    Visible? Yes
    Border? Yes
    Justify: Center
    Format: Unformatted
    Country: Default
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Cyan
  Message Actions
    On WM_CHAR
      Return FALSE
    On SAM_Create
      If SetPositionValue(9,TRUE)
        If not bOpenPositions
          Set nPos = SetPositionFocus()
        Set bOpenPositions =TRUE
    On SAM_SetFocus
      Set nPos = SetPositionFocus()
    On MSG_Gray
      Call SetPositionBlack()
Data Field: scrpos10
  Data
    Maximum Data Length: Default
    Data Type: String
    Editable? Yes
  Display Settings
    Window Location and Size
      Left:  2.7"
      Top:  3.107"
      Width:  0.629"
      Height: 0.262"
    Visible? Yes
    Border? Yes
    Justify: Center
    Format: Unformatted
    Country: Default
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
```

```
    Text Color: Default
    Background Color: Cyan
  Message Actions
    On WM_CHAR
      Return FALSE
    On SAM_Create
      If SetPositionValue(10,TRUE)
        If not bOpenPositions
          Set nPos = SetPositionFocus()
        Set bOpenPositions =TRUE
    On SAM_SetFocus
      Set nPos = SetPositionFocus()
    On MSG_Gray
      Call SetPositionBlack()
Pushbutton: pbOk
  Title: Ok
  Window Location and Size
    Left:  3.6"
    Top:  2.024"
    Width:  1.2"
    Height: 0.298"
  Visible? Yes
  Keyboard Accelerator: Enter
  Font Name: Default
  Font Size: Default
  Font Enhancement: Default
  Message Actions
    On SAM_Click
      !
      ! Verify that there are no errors with the entered object, and update the global object arrays to
          hold the entry.
      !
      If NoErrorsFound()
        Call SalWaitCursor(TRUE)
        Set nGloCount = 1
        Set nGloNextPos = 0
        While nGloObjType[nGloCount] != 0
          If strName = strGloObjName[nGloCount]
            Call SalMessageBox('This Name Has Been Used.  Please Create A New Name.',
                APPNAME,MB_Ok|MB_IconAsterisk)
            Call SalSetFocus(strName)
            Call SalWaitCursor(FALSE)
            Return FALSE
          If strO_ID = strGloO_ID[nGloCount]
            Call SalMessageBox('This ID Has Been Used.  Please Create A New ID.',
                APPNAME,MB_Ok|MB_IconAsterisk)
            Call SalSetFocus(strO_ID)
            Call SalWaitCursor(FALSE)
            Return FALSE
          If nGloObjType[nGloCount] = DELETE and nGloNextPos = 0
            Set nGloNextPos = nGloCount
          Set nGloCount = nGloCount + 1
        Set nGloScreenPos = nPos
        Set nGloAbsPos = (nGloScreen*10)+nPos
        Set nGloEditPos = 0
        If nGloNextPos = 0
          Set nGloNextPos = nGloCount
        Set strGloObjName[nGloNextPos] = strName
        Set strGloO_ID[nGloNextPos] = strO_ID
        Set strGloObjDesc[nGloNextPos] = strDescription
        Set nGloObjType[nGloNextPos] = SalListQuerySelection(strObjType)+1
        Set nGloObjCell[nGloNextPos] = nGloAbsPos
        Set nGloObjHBar[nGloNextPos] = nHBar
        Set nGloObjVBar[nGloNextPos] = nVBar
        Set nGloObjAttrPtr[nGloNextPos] = 0
        Set nGloCell[nGloAbsPos] = nGloNextPos
        If not bGloAddObject
          If nGloObjFunction = CUT
            Set strGloObjAssociations[nGloNextPos] = strGloObjAssociations[0]
```

```
            Set strGloObjCRel[nGloNextPos] = strGloObjCRel[0]
            Set strGloObjXRel[nGloNextPos] = strGloObjXRel[0]
            Call AddAssociations(nGloNextPos)
            Set nGloObjAttrPtr[nGloNextPos] =  nGloObjAttrPtr[0]
          If nGloObjFunction = COPY
            Call CopyDetails(0,FALSE)
            Set nGloObjAttrPtr[nGloNextPos] = GetNextAttributePtr()
            Call RestoreDetails(nGloNextPos)
          Set strGloObjInsert[nGloNextPos] = strGloObjInsert[0]
          Set strGloObjUpdate[nGloNextPos] = strGloObjUpdate[0]
          Set strGloObjDelete[nGloNextPos] = strGloObjDelete[0]
        Call SalSetWindowText(frmObjMgr.hWndDF[nPos],strGloO_ID[nGloNextPos])
        If nGloObjType[nGloNextPos] = DOMAIN
          Call SalColorSet(frmObjMgr.hWndDF[nPos],COLOR_IndexWindow,COLOR_Gray)
        Else
          Call SalColorSet(frmObjMgr.hWndDF[nPos],COLOR_IndexWindow,COLOR_Cyan)
        Call SalSendMsg(frmObjMgr.hWndDF[nPos],MSG_Copy,0,0)
        Call SalSendMsg(frmObjMgr.hWndDF[nPos],MSG_Show,0,0)
        Call SalPostMsg(hWndDF[nPos],SAM_SetFocus,0,0)
        Call Redraw()
        Call SalWaitCursor(FALSE)
        Set bGloAddObject = FALSE
        Set bGloChanged = TRUE
        Set nGloObjFunction = DELETE
        Call SalEndDialog(hWndForm,TRUE)
  Pushbutton: pbCancel
    Title: Cancel
    Window Location and Size
      Left:  3.6"
      Top:  2.357"
      Width:  1.2"
      Height: 0.298"
    Visible? Yes
    Keyboard Accelerator: Esc
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Message Actions
      On SAM_Click
        Set bGloAddObject = FALSE
        Call SalEndDialog(hWndForm,FALSE)
Window Variables
  Boolean: bOpenPositions
  Number: nPos
  Number: nRelObj
  String: strRelation
  String: strRelObj
Message Actions
  On SAM_Create
    Call SalWaitCursor(TRUE)
    Set bOpenPositions = FALSE
    Call SalHideWindow(hWndForm)
    Call SalPostMsg(hWndForm,MSG_Created,0,0)
  On MSG_Created
    Call SalWaitCursor(FALSE)
    !
    ! Initialize settings on Create Object dialog, verify that there is room on the workspace for adding an object.
    !
    If bOpenPositions
      If not bGloAddObject
        Call SalDisableWindow(strObjType)
        If nGloObjFunction = CUT
          Set strO_ID = strGloO_ID[0]
          Set strName = strGloObjName[0]
          Call SalDisableWindow(strO_ID)
          Call SalDisableWindow(strName)
          Call SalDisableWindow(strDescription)
          Call SalSetWindowText(hWndForm,'Paste An Object')
        If nGloObjFunction = COPY
```

```
            Call SalSetWindowText(hWndForm,'Copy '||strGloO_ID[0]||' To:')
          Set strDescription = strGloObjDesc[0]
          Call SalListSetSelect(strObjType,nGloObjType[0]-1)
        Call SalShowWindow(hWndForm)
      Else
        Call SalMessageBox('This Screen Is Full.  Please Scroll To Another Screen On Which Fewer Than 10 Objects Are
Depicted.',
            APPNAME,MB_Ok|MB_IconAsterisk)
        Call SalEndDialog(hWndForm,FALSE)
    On SAM_Close
      Call SalSendMsg(pbCancel,SAM_Click,0,0)
  Dialog Box: dlgAssociateRegular
    Title: Associate An Object
    Display Settings
      Visible at Design time? No
      Type of Dialog: Modal
      Window Location and Size
        Left:  0.188"
        Top:  1.052"
        Width:  6.586"
        Height: 2.833"
      Absolute Screen Location? Yes
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Default
    Contents
      Background Text: &Show:
        Window Location and Size
          Left:  0.114"
          Top:  0.107"
          Width:  0.543"
          Height: 0.167"
        Visible? Yes
        Justify: Left
        Font Name: Default
        Font Size: Default
        Font Enhancement: Default
        Text Color: Default
        Background Color: Default
      Combo Box: strObjType
        Window Location and Size
          Left:  0.757"
          Top:  0.083"
          Width:  2.271"
          Height: 1.179"
        Visible? Yes
        Editable? No
        String Type: String
        Maximum Data Length: Default
        Sorted? No
        Always Show List? No
        Vertical Scroll? Yes
        Font Name: Default
        Font Size: Default
        Font Enhancement: Default
        Text Color: Default
        Background Color: Default
        List Initialization
        Message Actions
          On SAM_Create
            If nGloObjType[nGloCell[nGloAbsPos]] = DOMAIN
              Call SalListAdd(hWndItem,'Regular Entities')
              Call SalListAdd(hWndItem,'Cross Product Entities')
              Call SalListAdd(hWndItem,'Composite Domains')
            Else
              Call SalListAdd(hWndItem,'Regular Entities')
            Call SalListSetSelect(hWndItem,0)
```

```
      On SAM_Click
        Call SalSendMsg(lbObject,MSG_Load,0,0)
  Background Text: &Object:
    Window Location and Size
      Left:  0.1"
      Top:  0.417"
      Width: 0.629"
      Height: 0.167"
    Visible? Yes
    Justify: Left
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
  Data Field: strAssocID
    Data
      Maximum Data Length: Default
      Data Type: String
      Editable? No
    Display Settings
      Window Location and Size
        Left:  0.757"
        Top:  0.393"
        Width: 1.486"
        Height: 0.25"
      Visible? Yes
      Border? Yes
      Justify: Left
      Format: Unformatted
      Country: Default
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Default
    Message Actions
List Box: lbObject
  Window Location and Size
    Left:  0.871"
    Top:  0.631"
    Width: 1.371"
    Height: 1.726"
  Visible? Yes
  Multiple selection? No
  Sorted? Yes
  Vertical Scroll? Yes
  Font Name: Default
  Font Size: Default
  Font Enhancement: Default
  Text Color: Default
  Background Color: Default
  List Initialization
  Message Actions
    On SAM_Create
      Call SalPostMsg(hWndItem,MSG_Load,0,0)
    On MSG_Load
      Call SalListClear(hWndItem)
      Set strAssocID = NULL
      If strObjType = 'Regular Entities'
        Set nObjType = ENTITY_Regular
      If strObjType = 'Composite Domains'
        Set nObjType = DOMAIN
      If strObjType = 'Cross Product Entities'
        Set nObjType = ENTITY_CrossProduct
      If strObjType = 'Composite Entities'
        Set nObjType = ENTITY_Composite
      Set nListCount = 1
      |
```

```
        ! Retrieve unassociated objects ONLY and place into combo box.
        !
        Call SalNumberToStr(nGloCell[nGloAbsPos],0,strObjLoc)
        Call SalWaitCursor(FALSE)
        While nGloObjType[nListCount] != 0
          If SalStrScan(strGloObjAssociations[nListCount],'#'||strObjLoc) = -1
            If strGloO_ID[nListCount] != frmObjMgr.strO_ID and
                strGloO_ID[nListCount] != NULL and nGloObjType[nListCount] = nObjType
              If not IsDependent(nListCount,nGloCell[nGloAbsPos]) and
                  not IsAncestor(nListCount,nGloCell[nGloAbsPos])
                Call SalNumberToStr(nListCount,0,strListCount)
                Call SalStrLower(strGloO_ID[nListCount]||SPACES||strListCount,strListCount)
                Call SalListAdd(hWndItem,strListCount)
          Set nListCount = nListCount + 1
        If SalListQueryCount(hWndItem) = 0
          Call SalDisableWindow(hWndItem)
          Call SalDisableWindow(cbAssociationType)
          Set cbAssociationType = NULL
          Set mlAssociation1 = NULL
          Set strAssocID = '(none)'
        Else
          Call SalEnableWindow(hWndItem)
          Call SalPostMsg(cbAssociationType,MSG_Load,0,0)
      On SAM_Click
        Call SalListQueryText(hWndItem,SalListQuerySelection(hWndItem),strObjectID)
        Call SalStrRight(strObjectID,8,strListCount)
        Call SalStrLeft(strObjectID,8,strObjectID)
        Call SalStrTrim(strObjectID,strObjectID)
        Call SalStrTrim(strListCount,strListCount)
        Set nListCount = SalStrToNumber(strListCount)
        Call SalStrUpper(strObjectID,strObjectID)
        Set strAssocID = strObjectID
        Call SalSendMsg(cbAssociationType,SAM_Click,0,0)
Background Text: &Association:
  Window Location and Size
    Left:  2.471"
    Top:  0.417"
    Width:  1.043"
    Height: 0.167"
  Visible? Yes
  Justify: Left
  Font Name: Default
  Font Size: Default
  Font Enhancement: Default
  Text Color: Default
  Background Color: Default
Combo Box: cbAssociationType
  Window Location and Size
    Left:  3.529"
    Top:  0.381"
    Width:  2.771"
    Height: 1.024"
  Visible? Yes
  Editable? No
  String Type: String
  Maximum Data Length: Default
  Sorted? Yes
  Always Show List? No
  Vertical Scroll? Yes
  Font Name: Default
  Font Size: Default
  Font Enhancement: Default
  Text Color: Default
  Background Color: Default
  List Initialization
  Message Actions
    On SAM_Click
      If not SalIsNull(strAssocID)
        Call SalStrLeft(cbAssociationType,1,strAssocType)
```

```
            If strAssocType = 'G'
              Set mlAssociation1 = 'A(n) '||strObjectID||' is a kind of '||frmObjMgr.strO_ID||'.  All attributes belonging to the
'||frmObjMgr.strO_ID||' are inherited by the '||strObjectID||'.'
              Set mlAssociation1 = mlAssociation1||'  If referential constraints are included, only predefined
'||frmObjMgr.strO_ID||'s which are not associated with any '||strObjectID||'s may be deleted.'
            If strAssocType = 'A'
              Set mlAssociation1 = 'Every instance of a(n) '||strObjectID||' can be associated with a predefined
'||frmObjMgr.strO_ID||'.  Key attributes used to identify the '||frmObjMgr.strO_ID||' are retained by the '||strObjectID||'.'
              Set mlAssociation1 = mlAssociation1||'  If referential constraints are included, any '||strObjectID||'s having a
predefined '||frmObjMgr.strO_ID||' will have their '||frmObjMgr.strO_ID||' nullified if that '||frmObjMgr.strO_ID||' is deleted.'
            If strAssocType = 'O'
              Set mlAssociation1 = 'Every '||frmObjMgr.strO_ID||' can have only one '||strObjectID||'.  Every '||strObjectID||'
can have only one '||frmObjMgr.strO_ID||'.  Key attributes used to identify the '||frmObjMgr.strO_ID||' are retained by the
'||strObjectID||'.'
              Set mlAssociation1 = mlAssociation1||'  If referential constraints are included, only predefined
'||frmObjMgr.strO_ID||'s which are not associated with any '||strObjectID||'s may be deleted.'
            If strAssocType = 'M'
              Set mlAssociation1 = 'Every '||frmObjMgr.strO_ID||' can have one or more '||strObjectID||'s.  Every
'||strObjectID||' can have only one '||frmObjMgr.strO_ID||'.  Key attributes used to identify the '||frmObjMgr.strO_ID||' are
retained by the '||strObjectID||'.'
              Set mlAssociation1 = mlAssociation1||'  If referential constraints are included, only predefined
'||frmObjMgr.strO_ID||'s which are not associated with any '||strObjectID||'s may be deleted.'
            If strAssocType = 'X'
              Set mlAssociation1 = 'The '||strObjectID||' is partially defined by the '||frmObjMgr.strO_ID||'.  Key attributes used
to identify the '||frmObjMgr.strO_ID||' are retained as part of the '||strObjectID||'.  Numeric attributes belonging to '||strObjectID||'
can be summarized by '||frmObjMgr.strO_ID||'.'
            If strAssocType = 'C'
              Set mlAssociation1 = 'The '||frmObjMgr.strO_ID||' is partially defined by the set of all '||strObjectID||'s.  Selected
attributes of all '||strObjectID||'s are summarized into '||frmObjMgr.strO_ID||'.'
          On MSG_Load
            Call SalClearField(hWndItem)
            Call SalListClear(hWndItem)
            Set mlAssociation1 = NULL
            If nObjType = ENTITY_Composite
              Call SalListInsert(hWndItem,-1,'C - Composition')
            If nObjType = ENTITY_CrossProduct
              Call SalListInsert(hWndItem,-1,'X - Cross Product')
            If nObjType != ENTITY_CrossProduct and
               nObjType != ENTITY_Composite
              If nGloObjType[nGloCell[nGloAbsPos]] = DOMAIN
                Call SalListInsert(hWndItem,-1,'G - Generalization')
                Call SalListInsert(hWndItem,-1,'A - Aggregation')
              If nGloObjType[nGloCell[nGloAbsPos]] = ENTITY_CrossProduct
                Call SalListInsert(hWndItem,-1,'X - Cross Product')
              If nGloObjType[nGloCell[nGloAbsPos]] = ENTITY_Composite
                Call SalListInsert(hWndItem,-1,'C - Composition')
              If nGloObjType[nGloCell[nGloAbsPos]] = ENTITY_Regular
                If nObjType != DOMAIN
                  Call SalListInsert(hWndItem,-1,'G - Generalization')
                  Call SalListInsert(hWndItem,-1,'A - Aggregation')
                  Call SalListInsert(hWndItem,-1,'O -  Interaction (one to one)')
                  Call SalListInsert(hWndItem,-1,'M -  Interaction (one to many)')
            If SalListQueryCount(hWndItem) = 1
              Call SalListSetSelect(hWndItem,0)
              Call SalDisableWindow(hWndItem)
            Else
              Call SalEnableWindow(hWndItem)
      Group Box: Description
        Window Location and Size
          Left:  2.329"
          Top:  0.655"
          Width:  3.971"
          Height: 1.702"
        Visible? Yes
        Font Name: Default
        Font Size: Default
        Font Enhancement: Default
        Text Color: Default
        Background Color: Default
```

```
      Multiline Field: mlAssociation1
        Data
          Maximum Data Length: Default
          String Type: String
          Editable? No
        Display Settings
          Border? No
          Word Wrap? Yes
          Vertical Scroll? No
          Window Location and Size
            Left:  2.457"
            Top:  0.94"
            Width:  3.7"
            Height: 1.298"
          Visible? Yes
          Font Name: Default
          Font Size: Default
          Font Enhancement: Default
          Text Color: Default
          Background Color: Default
        Message Actions
          On SAM_SetFocus
            Call SalSetFocus(pbOk)
      Pushbutton: pbOk
        Title: Ok
        Window Location and Size
          Left:  3.857"
          Top:  0.071"
          Width:  1.186"
          Height: 0.25"
        Visible? Yes
        Keyboard Accelerator: Enter
        Font Name: Default
        Font Size: Default
        Font Enhancement: Default
        Message Actions
          On SAM_Click
            |
            ! Check For An Incomplete Association Entry
            |
            If SalIsNull(strAssocID)
              Call SalMessageBox('Please Select An Object From The Object List.',
                  APPNAME,MB_Ok|MB_IconAsterisk)
              Call SalSetFocus(lbObject)
              Return FALSE
            If strAssocID = '(none)'
              Call SalMessageBox('There are no other defined '||strObjType||' to associate with
'||frmObjMgr.strO_ID||'.',APPNAME,
                  MB_Ok|MB_IconAsterisk)
              Call SalSetFocus(strObjType)
              Return FALSE
            If SalIsNull(cbAssociationType)
              Call SalMessageBox('Please Select An Association Type.',
                  APPNAME,MB_Ok|MB_IconAsterisk)
              Call SalSetFocus(cbAssociationType)
              Return FALSE
            |
            ! Update the strGloObjAssociations[*] for both objects
            |
            Set strAncestorAssociations = strGloObjAssociations[nGloCell[nGloAbsPos]]
            Set strDependentAssociations = strGloObjAssociations[nListCount]
            Call SalStrLower(strAssocType,strAssocType)
            Set strGloObjAssociations[nGloCell[nGloAbsPos]] =
                strGloObjAssociations[nGloCell[nGloAbsPos]]||'#'||strListCount||':'||strAssocType||','
            Call SalStrUpper(strAssocType,strAssocType)
            Call SalNumberToStr(nGloCell[nGloAbsPos],0,strObjLoc)
            Set strGloObjAssociations[nListCount] = strGloObjAssociations[nListCount]||'#'||strObjLoc||':'||strAssocType||','
            |
            ! Verify that the association is valid (no duplicate errors.)
```

```
            !
            If NoDuplicateDependents(nGloCell[nGloAbsPos],strDupes)
              Call SalHideWindow(hWndForm)
              If NoDuplicateDependentAttributes(nGloCell[nGloAbsPos],strAssocType)
                Set nGloCount = 1
                While nGloCount < 11
                  If nGloCell[(nGloScreen*10)+nGloCount] = nListCount
                    Set nRelPos = SalNumberMod(nGloAbsPos,10)
                    If nRelPos = 0
                      Set nRelPos = 10
                    If nRelPos < nGloCount
                      Call SalSendMsg(frmObjMgr.hWndDF[nRelPos],MSG_DrawLine,nGloCount,0)
                    Else
                      Call SalSendMsg(frmObjMgr.hWndDF[nGloCount],MSG_DrawLine,nRelPos,0)
                    Set nGloCount = 11
                  Else
                    Set nGloCount = nGloCount + 1
                !
                ! Repaint the workspace to reflect the new association.
                !
                Call RefreshLabels()
                Set bGloChanged = TRUE
                Call SalEndDialog(hWndForm,TRUE)
              Else
                !
                ! Upon finding an error, restore associations to what they were prior to entry.
                !
                Set strGloObjAssociations[nGloCell[nGloAbsPos]] = strAncestorAssociations
                Set strGloObjAssociations[nListCount] = strDependentAssociations
                Call SalEndDialog(hWndForm,FALSE)
            Else
              Set strGloObjAssociations[nGloCell[nGloAbsPos]] = strAncestorAssociations
              !
              ! Upon finding an error, restore associations to what they were prior to entry.
              !
              Set strGloObjAssociations[nListCount] = strDependentAssociations
              Call SalMessageBox(frmObjMgr.strO_ID||' may not be associated with '||strAssocID||' because the following
dependent objects would have duplicate attributes:  '||strDupes,
                  APPNAME,MB_Ok|MB_IconAsterisk)
      Pushbutton: pbCancel
        Title: Cancel
        Window Location and Size
          Left:  5.114"
          Top:  0.071"
          Width:  1.186"
          Height: 0.25"
        Visible? Yes
        Keyboard Accelerator: Esc
        Font Name: Default
        Font Size: Default
        Font Enhancement: Default
        Message Actions
          On SAM_Click
            Call SalEndDialog(hWndForm,FALSE)
    Window Variables
      Boolean: bCreated
      Boolean: bObjectFound
      Boolean: bRelated
      Number: nDummy[*]
      Number: nFocusOrigPos
      Number: nListCount
      Number: nObjAncestor[*]
      Number: nObjDependent[*]
      Number: nObjType
      Number: nRelPos
      String: strAncestorAssociations
      String: strAssocType
      String: strDependentAssociations
      String: strDummy[*]
```

```
      String: strDupes
      String: strListCount
      String: strObjLoc
      String: strObjectID
      String: strRelation
    Message Actions
      On SAM_Create
        Call SalWaitCursor(TRUE)
        Call SalSetWindowText(hWndForm,'Associate An Object With '||frmObjMgr.strO_ID)
        Set bCreated = FALSE
      On MSG_Created
        If not bObjectFound
          Call SalEndDialog(hWndForm,FALSE)
        Else
          Call SalSendMsg(lbObject,SAM_Click,0,0)
        Call SalShowWindow(hWndForm)
      On SAM_Close
        Call SalSendMsg(pbCancel,SAM_Click,0,0)
Dialog Box: dlgBuildSQL
  Title: Build SQL File
  Display Settings
    Visible at Design time? No
    Type of Dialog: Modal
    Window Location and Size
      Left:  0.563"
      Top:  0.635"
      Width:  7.043"
      Height: 4.44"
    Absolute Screen Location? Yes
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
  Contents
    Group Box: Text Format
      Window Location and Size
        Left:  0.114"
        Top:  0.071"
        Width:  5.3"
        Height: 1.476"
      Visible? Yes
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Default
    Radio Button: rbCommands
      Title: Uppercase &Commands Only: CREATE TABLE tablename...
      Window Location and Size
        Left:  0.286"
        Top:  0.262"
        Width:  4.971"
        Height: 0.25"
      Visible? Yes
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Default
      Message Actions
    Radio Button: rbObjects
      Title: Uppercase &Objects Only: create table TABLENAME...
      Window Location and Size
        Left:  0.286"
        Top:  0.524"
        Width:  4.9"
        Height: 0.25"
      Visible? Yes
```

Font Name: Default
Font Size: Default
Font Enhancement: Default
Text Color: Default
Background Color: Default
Message Actions
Radio Button: rbProper
Title: All &Propercase: Create Table Tablename...
Window Location and Size
Left: 0.286"
Top: 0.762"
Width: 4.2"
Height: 0.25"
Visible? Yes
Font Name: Default
Font Size: Default
Font Enhancement: Default
Text Color: Default
Background Color: Default
Message Actions
Radio Button: rbUpper
Title: All &Uppercase: CREATE TABLE TABLENAME...
Window Location and Size
Left: 0.286"
Top: 1.012"
Width: 4.614"
Height: 0.25"
Visible? Yes
Font Name: Default
Font Size: Default
Font Enhancement: Default
Text Color: Default
Background Color: Default
Message Actions
Radio Button: rbLower
Title: All &Lowercase: create table tablename...
Window Location and Size
Left: 0.286"
Top: 1.25"
Width: 4.414"
Height: 0.25"
Visible? Yes
Font Name: Default
Font Size: Default
Font Enhancement: Default
Text Color: Default
Background Color: Default
Message Actions
Background Text: S&how:
Window Location and Size
Left: 0.114"
Top: 1.702"
Width: 0.557"
Height: 0.167"
Visible? Yes
Justify: Left
Font Name: Default
Font Size: Default
Font Enhancement: Default
Text Color: Default
Background Color: Default
Combo Box: strObjType
Window Location and Size
Left: 0.714"
Top: 1.667"
Width: 2.586"
Height: 1.488"
Visible? Yes
Editable? No

```
    String Type: String
    Maximum Data Length: Default
    Sorted? No
    Always Show List? No
    Vertical Scroll? Yes
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
    List Initialization
      Text: Every Object
      Text: Regular Entities
      Text: Simple Domains
    Message Actions
      On SAM_Create
        Call SalListSetSelect(hWndItem,ALL)
        Call SalListInsert(hWndItem,-1,'Dependent Upon '||frmObjMgr.strO_ID)
        Call SalListInsert(hWndItem,-1,'Depended on by '||frmObjMgr.strO_ID)
        Call SalSendMsg(lbObjects,MSG_Load,0,0)
        If nObjType = ALL
          Call SalShowWindow(hWndForm)
      On SAM_Click
        Set cbRestrict = FALSE
        Call SalSendMsg(cbRestrict,SAM_Click,0,0)
        Call SalSendMsg(lbObjects,MSG_Load,0,0)
  Check Box: cbRestrict
    Title: &Restrict...
    Window Location and Size
      Left:  0.229"
      Top:  1.964"
      Width:  1.271"
      Height: 0.25"
    Visible? Yes
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
    Message Actions
      On SAM_Click
        If cbRestrict
          Call SalShowWindow(lbObjects)
          Call SalSetWindowText(hWndItem,'&Restrict To:')
          If SalListQuerySelection(strObjType) = 0
            Set mlRestrict = 'Composites and Cross Products not shown here.'
          Else
            Set mlRestrict = NULL
        Else
          Call SalHideWindow(lbObjects)
          Call SalSetWindowText(hWndItem,'&Restrict...')
          Set mlRestrict = NULL
  List Box: lbObjects
    Window Location and Size
      Left:  1.657"
      Top:  1.988"
      Width:  1.429"
      Height: 2.036"
    Visible? Yes
    Multiple selection? Yes
    Sorted? Yes
    Vertical Scroll? Yes
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
    List Initialization
    Message Actions
```

```
    On MSG_Load
      Call SalWaitCursor(TRUE)
      Set nObjType = SalListQuerySelection(strObjType)
      If nObjType > 2
        Set nObjType = nObjType + 2
      Call SalListClear(hWndItem)
      !
      ! Show objects of a certain type (if not a summary attribute.)
      !
      If nObjType < DEPENDENT_UPON
        Set nGloCount = 1
        While nGloObjType[nGloCount] != 0
          If nGloObjCell[nGloCount] != 0
            If nObjType = ALL or nGloObjType[nGloCount] = nObjType
              If nGloObjType[nGloCount] != ENTITY_Composite and
                 nGloObjType[nGloCount] != ENTITY_CrossProduct
                Call SalNumberToStr(nGloCount,0,strObject)
                Set strObject = strGloO_ID[nGloCount]||TAB||strObject
                Call SalStrLower(strObject,strObject)
                Call SalListAdd(hWndItem,strObject)
          Set nGloCount = nGloCount + 1
      Else
        If nObjType = DEPENDENT_ON_BY
          Call GetAllRelatedObjects(nGloCell[nGloAbsPos],FALSE,
               nGloRelated,nGloRelatedLevel,nGloRelatedType,strGloObjRelation)
        Else
          Call GetAllRelatedObjects(nGloCell[nGloAbsPos],TRUE,
               nGloRelated,nGloRelatedLevel,nGloRelatedType,strGloObjRelation)
        Call SalListClear(hWndItem)
        Set nGloCount = 1
        While nGloRelated[nGloCount] != -1
          Call SalNumberToStr(nGloRelated[nGloCount],0,strObject)
          If nGloRelatedType[nGloCount] != ENTITY_Composite and
             nGloRelatedType[nGloCount] != ENTITY_CrossProduct
            Set strObject = strGloO_ID[nGloRelated[nGloCount]]||TAB||strObject
            Call SalStrLower(strObject,strObject)
            Call SalListAdd(hWndItem,strObject)
          Set nGloCount = nGloCount + 1
      Call SalWaitCursor(FALSE)
      Call SalListRedraw(hWndItem,TRUE)
      If SalListQueryCount(hWndItem) = 0
        If nObjType = ALL
          Call SalMessageBox('No Objects Have Been Created.',APPNAME,MB_Ok|MB_IconAsterisk)
          Set nObjType = -1
          Call SalPostMsg(pbCancel,SAM_Click,0,0)
          Return FALSE
      Call SalHideWindow(hWndItem)
    On SAM_DoubleClick
      Call SalSendMsg(pbOk,SAM_Click,0,0)
    On SAM_Click
      Call SalListQueryText(lbObjects,SalListQuerySelection(lbObjects),strObject)
      Call SalStrTokenize(strObject,TAB,TAB,strObjParm)
      Call SalWaitCursor(FALSE)
Group Box: SQL Definitions
  Window Location and Size
    Left:  3.386"
    Top:  1.595"
    Width:  3.414"
    Height: 0.524"
  Visible? Yes
  Font Name: Default
  Font Size: Default
  Font Enhancement: Default
  Text Color: Default
  Background Color: Default
Radio Button: rbNew
  Title: &New Tables
  Window Location and Size
    Left:  3.629"
```

```
      Top:  1.81"
      Width:  1.371"
      Height: 0.25"
    Visible? Yes
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
    Message Actions
  Radio Button: rbOverwrite
    Title: Over&write Tables
    Window Location and Size
      Left:  5.043"
      Top:  1.81"
      Width:  1.643"
      Height: 0.25"
    Visible? Yes
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
    Message Actions
  Check Box: cbRules
    Title: &Build Rules Table...
    Window Location and Size
      Left:  3.386"
      Top:  2.167"
      Width:  2.043"
      Height: 0.25"
    Visible? Yes
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
    Message Actions
      On SAM_Click
        If cbRules
          Call SalShowWindow(dfRulesTable)
          Call SalSetWindowText(hWndItem,'&Build Rules Table:')
          Call SalSetFocus(dfRulesTable)
        Else
          Call SalHideWindow(dfRulesTable)
          Call SalSetWindowText(hWndItem,'&Build Rules Table...')
Data Field: dfRulesTable
  Data
    Maximum Data Length: 18
    Data Type: String
    Editable? Yes
  Display Settings
    Window Location and Size
      Left:  3.643"
      Top:  2.429"
      Width:  3.143"
      Height: 0.25"
    Visible? Yes
    Border? Yes
    Justify: Left
    Format: Uppercase
    Country: Default
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
  Message Actions
    On SAM_Create
```

```
        Call SalHideWindow(hWndItem)
      On SAM_KillFocus
        If SalIsNull(hWndItem)
          Set cbRules = FALSE
          Call SalSendMsg(cbRules,SAM_Click,0,0)
      On SAM_Validate
        !
        ! Verify that an alphanumeric rules table has been declared.
        !
        If SalIsNull(hWndItem)
          Set cbRules = FALSE
          Call SalSendMsg(cbRules,SAM_Click,0,0)
          Return VALIDATE_Ok
        If IsAlphaNumeric(dfRulesTable)
          If SalStrTrim(dfRulesTable,dfRulesTable) > 0 and dfRulesTable != SPACE
            Call SalWaitCursor(TRUE)
            Set nGloCount = 1
            While nGloObjType[nGloCount] != 0
              If dfRulesTable = strGloObjName[nGloCount]
                Call SalMessageBox('This Name Has Been Used.  Please Create A New Name.',
                    APPNAME,MB_Ok|MB_IconAsterisk)
                Call SalWaitCursor(FALSE)
                Return VALIDATE_Cancel
              Set nGloCount = nGloCount + 1
            Call SalWaitCursor(FALSE)
          Return VALIDATE_Ok
        Else
          Return VALIDATE_Cancel
  Check Box: cbInclude
    Title: Include Co&mments...
    Window Location and Size
      Left:  3.386"
      Top:  2.726"
      Width:  2.871"
      Height: 0.25"
    Visible? Yes
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
    Message Actions
      On SAM_Click
        If cbInclude
          Call SalShowWindow(dfDelimiter)
          Call SalSetWindowText(hWndItem,'Include Co&mments delimited by:')
        Else
          Call SalHideWindow(dfDelimiter)
          Call SalSetWindowText(hWndItem,'&Include Comments...')
Data Field: dfDelimiter
  Data
    Maximum Data Length: 3
    Data Type: String
    Editable? Yes
  Display Settings
    Window Location and Size
      Left:  6.329"
      Top:  2.738"
      Width:  0.471"
      Height: 0.25"
    Visible? Yes
    Border? Yes
    Justify: Left
    Format: Unformatted
    Country: Default
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
```

```
      Background Color: Default
    Message Actions
      On SAM_Create
        Call SalHideWindow(hWndItem)
        Set dfDelimiter = ';'
  Check Box: cbReferential
    Title: Include &Foreign and Primary Keys
    Window Location and Size
      Left:  3.386"
      Top:  2.988"
      Width:  3.043"
      Height: 0.25"
    Visible? Yes
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
    Message Actions
      On SAM_Click
        Set bGloReferential = cbReferential
      On SAM_Create
        Set cbReferential = TRUE
        Set bGloReferential = cbReferential
  Check Box: cbStoreComposites
    Title: &Store Composite Entities
    Window Location and Size
      Left:  3.386"
      Top:  3.25"
      Width:  3.1"
      Height: 0.25"
    Visible? Yes
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
    Message Actions
      On SAM_Create
        Set cbStoreComposites = TRUE
  Check Box: cbStoreCrossProducts
    Title: S&tore Cross Product Entities
    Window Location and Size
      Left:  3.386"
      Top:  3.512"
      Width:  2.757"
      Height: 0.25"
    Visible? Yes
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
    Message Actions
      On SAM_Create
        Set cbStoreCrossProducts = TRUE
  Check Box: cbCommit
    Title: &Issue Commit When Completed
    Window Location and Size
      Left:  3.386"
      Top:  3.774"
      Width:  3.186"
      Height: 0.25"
    Visible? Yes
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
```

```
        Message Actions
          On SAM_Create
            Set cbCommit = TRUE
      Pushbutton: pbOk
        Title: Ok
        Window Location and Size
          Left:  5.529"
          Top:  0.143"
          Width:  1.271"
          Height: 0.274"
        Visible? Yes
        Keyboard Accelerator: Enter
        Font Name: Default
        Font Size: Default
        Font Enhancement: Default
        Message Actions
          On SAM_Click
            |
            | Prompt the user for a SQL file name.
            |
            Call ResetFileNames(strGloFileName,strGloFilePath,'sql')
            Call SalStrLeft(strGloFilePath,SalStrScan(strGloFilePath,'.'),strGloFilePath)
            Set strGloFilePath = strGloFilePath||'.sql'
            Call SalStrLeft(strGloFileName,SalStrScan(strGloFileName,'.'),strGloFileName)
            Set strGloFileName = strGloFileName||'.sql'
            If DlgSaveAs(hWndForm,strGloDefPath,APPNAME||' - Build SQL File','sql','SQL
Files~*.sql~',OFN_PATHMUSTEXIST|OFN_HIDEREADONLY|OFN_OVERWRITEPROMPT,strGloFilePath,strGloFileName
)
              |
              | If a file name has been provided, hide window and call BuildSQLFile()
              |
              Call SalHideWindow(hWndForm)
              Set bGloUpperCommands = rbCommands
              Set bGloOverwrite = rbOverwrite
              Set bGloStoreComposites = cbStoreComposites
              Set bGloStoreCrossProducts = cbStoreCrossProducts
              Call BuildSQLFile(strGloFilePath,lbObjects)
              Call SalEndDialog(hWndForm,TRUE)
            Call SalStrLeft(strGloFilePath,SalStrScan(strGloFilePath,'.'),strGloFilePath)
            Set strGloFilePath = strGloFilePath||'.sam'
            Call SalStrLeft(strGloFileName,SalStrScan(strGloFileName,'.'),strGloFileName)
            Set strGloFileName = strGloFileName||'.sam'
      Pushbutton: pbCancel
        Title: Cancel
        Window Location and Size
          Left:  5.529"
          Top:  0.476"
          Width:  1.271"
          Height: 0.274"
        Visible? Yes
        Keyboard Accelerator: Esc
        Font Name: Default
        Font Size: Default
        Font Enhancement: Defeult
        Message Actions
          On SAM_Click
            Call SalEndDialog(hWndForm,FALSE)
      Multiline Field: mlRestrict
        Data
          Maximum Data Length: Default
          String Type: String
          Editable? No
        Display Settings
          Border? No
          Word Wrap? Yes
          Vertical Scroll? No
          Window Location and Size
            Left:  0.1"
            Top:  3.512"
```

```
            Width:  1.457"
            Height: 0.512"
          Visible? Yes
          Font Name: Default
          Font Size: Default
          Font Enhancement: None
          Text Color: Default
          Background Color: Default
        Message Actions
    Window Variables
      Number: nObjType
      String: strBuildFile
      String: strDirection
      String: strObject
      String: strObjParm[*]
    Message Actions
      On SAM_Create
        Call SalWaitCursor(TRUE)
        Call SalHideWindow(hWndForm)
      On SAM_Close
        Call SalEndDialog(hWndForm,FALSE)
  Dialog Box: dlgDetailCheck
    Title:
    Display Settings
      Visible at Design time? No
      Type of Dialog: Modal
      Window Location and Size
        Left:  3.588"
        Top:   1.896"
        Width:  3.586"
        Height: 0.94"
      Absolute Screen Location? Yes
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Default
    Contents
    Window Variables
    Message Actions
      On SAM_Create
        !
        ! The user never sees this window.
        !
        Call SalHideWindow(hWndForm)
        Call SalPostMsg(hWndForm,MSG_Created,0,0)
      On MSG_Created
        !
        ! After hiding itself, dlgDetailCheck creates a dlgDetails dialog, which also hides itself, for each object.  As
            instances of dlgDetails are created, they are traversed for duplicates.  After traversing each object, this
            loop terminates, and dlgDetailCheck destroys itself and returns TRUE.  If a duplicate is found, a message
            is displayed and dlgDetailChecks returns FALSE.
        !
        Set bGloDetailOK = FALSE
        If NoDuplicateDependentAttributes(nGloCell[nGloAbsPos],'G')
          Set bGloChanged = TRUE
          Call SalEndDialog(hWndForm,TRUE)
        Else
          If SalMessageBox(
              frmObjMgr.strO_ID||' cannot be saved as is because the '"||strGloDupeAttr||'" attribute in
'||strGloO_ID[nGloDetailObject]||' would be duplicated.  If this is not corrected, changes just made to '||frmObjMgr.strO_ID||'
will be lost.  Do you wish to correct the changes?'
              ,APPNAME,MB_YesNo|MB_IconQuestion) = IDYES
            Set nGloDetailObject = nGloCell[nGloAbsPos]
            Call SalEndDialog(hWndForm,FALSE)
          Else
            Call RestoreDetails(nGloCell[nGloAbsPos])
            Call SalEndDialog(hWndForm,TRUE)
  Dialog Box: dlgDetails
```

```
Title:
Display Settings
  Visible at Design time? No
  Type of Dialog: Modal
  Window Location and Size
    Left:  0.163"
    Top:  0.479"
    Width:  8.8"
    Height: 4.464"
  Absolute Screen Location? Yes
  Font Name: Default
  Font Size: Default
  Font Enhancement: Default
  Text Color: Default
  Background Color: Default
Contents
  Table Window: tblDetails
    Title:
    Icon File:
    Display Settings
      Visible at Design time? Yes
      Automatically Created at Runtime? Yes
      Initial State: Normal
      Maximizable? No
      Minimizable? No
      System Menu? No
      Resizable? No
      Window Location and Size
        Left:  0.0"
        Top:  0.5"
        Width:  8.657"
        Height: 3.631"
      Visible? Yes
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Default
    Memory Settings
      Maximum Rows in Memory: Default
      Discardable? Yes
    Menu
    Contents
      Column: colName
        Title: Name
        Visible? Yes
        Editable? Yes
        Maximum Data Length: 16
        Data Type: String
        Justify: Left
        Width:  1.629"
        Format: Lowercase
        Country: Default
        Message Actions
          On MSG_Highlight
            Call SalTblSetFocusCell(hWndForm,nAttributeTblRow,hWndItem,-1,-1)
          On SAM_SetFocus
            Set hWndColFocus = hWndItem
          On SAM_Validate
            If IsAlphaNumeric(colName)
              Return VALIDATE_Ok
            Else
              Return VALIDATE_Cancel
      Column: colFrom
        Title: From
        Visible? Yes
        Editable? No
        Maximum Data Length: Default
        Data Type: String
```

```
    Justify: Left
    Width:  1.0"
    Format: Unformatted
    Country: Default
    Message Actions
  Column: colTableName
    Title: Table
    Visible? No
    Editable? No
    Maximum Data Length: Default
    Data Type: String
    Justify: Left
    Width:  1.0"
    Format: Unformatted
    Country: Default
    Message Actions
  Column: colAssocType
    Title: Assoc
    Visible? Yes
    Editable? No
    Maximum Data Length: Default
    Data Type: String
    Justify: Center
    Width:  0.586"
    Format: Unformatted
    Country: Default
    Message Actions
  Column: colKey
    Title: Key
    Visible? Yes
    Editable? Yes
    Maximum Data Length: 3
    Data Type: String
    Justify: Left
    Width:  0.457"
    Format: Unformatted
    Country: Default
    Message Actions
      On SAM_AnyEdit
        If not SalIsNull(hWndItem)
          If colKey = 'Y' or colKey = 'y'
            Set colKey = 'Yes'
            Set colRequired = 'Yes'
            Set colIndexed = 'Yes'
            Return TRUE
          If colKey = 'N' or colKey = 'n'
            Set colKey = 'No'
            Return TRUE
          Call SalClearField(hWndItem)
      On SAM_KillFocus
        If colKey = 'Yes' and SalIsNull(colType)
          Call SalPostMsg(colType,SAM_SetFocus,0,0)
          Call SalPostMsg(colType,MSG_Highlight,0,0)
      On MSG_Highlight
        Call SalTblSetFocusCell(hWndForm,nAttributeTblRow,hWndItem,-1,-1)
      On SAM_SetFocus
        Set hWndColFocus = hWndItem
  Column: colRequired
    Title: Req
    Visible? Yes
    Editable? Yes
    Maximum Data Length: 3
    Data Type: String
    Justify: Left
    Width:  0.443"
    Format: Unformatted
    Country: Default
    Message Actions
      On SAM_AnyEdit
```

```
        If not SalIsNull(hWndItem)
          If colRequired = 'Y' or colRequired = 'y' or colKey = 'Yes'
            Set colRequired = 'Yes'
            Return TRUE
          If colRequired = 'N' or colRequired = 'n'
            Set colRequired = 'No'
            Return TRUE
          Call SalClearField(hWndItem)
      On MSG_Highlight
        Call SalTblSetFocusCell(hWndForm,nAttributeTblRow,hWndItem,-1,-1)
      On SAM_SetFocus
        Set hWndColFocus = hWndItem
  Column: colIndexed
    Title: Index
    Visible? Yes
    Editable? Yes
    Maximum Data Length: 3
    Data Type: String
    Justify: Center
    Width:  0.529"
    Format: Unformatted
    Country: Default
    Message Actions
      On SAM_AnyEdit
        If not SalIsNull(hWndItem)
          If colIndexed = 'Y' or colIndexed = 'y' or colKey = 'Yes'
            Set colIndexed = 'Yes'
            Return TRUE
          If colIndexed = 'N' or colIndexed = 'n'
            Set colIndexed = 'No'
            Return TRUE
          Call SalClearField(hWndItem)
      On MSG_Highlight
        Call SalTblSetFocusCell(hWndForm,nAttributeTblRow,hWndItem,-1,-1)
      On SAM_SetFocus
        Set hWndColFocus = hWndItem
  Column: colType
    Title: Type (Press spacebar to show.)
    Visible? Yes
    Editable? Yes
    Maximum Data Length: 50
    Data Type: String
    Justify: Left
    Width:  2.857"
    Format: Unformatted
    Country: Default
    Message Actions
      On SAM_AnyEdit
        If not SalIsNull(hWndItem)
          Call SalStrUpper(colType,strCheck)
          Call SalStrRight(strCheck,1,strCheck)
          Set nCheck = SalStrScan(TYPE_CHOICES,strCheck)
          If nCheck != -1
            Call SalStrReplace(strColType[nCheck],SalStrScan(strColType[nCheck],'&'),1,NULL,
                colType)
            Set colItemType = nCheck
          Else
            Call SalClearField(hWndItem)
            Call SalSendMsg(dlgDetails,MSG_Show,0,0)
        Call SalPostMsg(hWndItem,MSG_Reset,0,0)
      On MSG_Highlight
        Call SalTblSetFocusCell(hWndForm,nAttributeTblRow,hWndItem,-1,-1)
      On SAM_SetFocus
        Set hWndColFocus = hWndItem
      On MSG_Reset
        Call GetTypeSpecifics()
  Column: colComments
    Title: Field Description
    Visible? Yes
```

```
  Editable? Yes
  Maximum Data Length: 254
  Data Type: String
  Justify: Left
  Width:  4.729"
  Format: Unformatted
  Country: Default
  Message Actions
    On SAM_SetFocus
      Set hWndColFocus = hWndItem
    On MSG_Highlight
      Call SalTblSetFocusCell(hWndForm,nAttributeTblRow,hWndItem,-1,-1)
    On SAM_Validate
      Call ReplaceChar(colComments,"\","")
Column: colCRel
  Title: C-Relation
  Visible? No
  Editable? Yes
  Maximum Data Length: 254
  Data Type: String
  Justify: Left
  Width:  4.729"
  Format: Unformatted
  Country: Default
  Message Actions
    On SAM_SetFocus
      Set hWndColFocus = hWndItem
    On MSG_Highlight
      Call SalTblSetFocusCell(hWndForm,nAttributeTblRow,hWndItem,-1,-1)
Column: colXRel
  Title: X-Relation
  Visible? No
  Editable? Yes
  Maximum Data Length: 254
  Data Type: String
  Justify: Left
  Width:  4.729"
  Format: Unformatted
  Country: Default
  Message Actions
    On SAM_SetFocus
      Set hWndColFocus = hWndItem
    On MSG_Highlight
      Call SalTblSetFocusCell(hWndForm,nAttributeTblRow,hWndItem,-1,-1)
Column: colLength
  Title: Length
  Visible? No
  Editable? Yes
  Maximum Data Length: 3
  Data Type: Number
  Justify: Right
  Width:  0.7"
  Format: Unformatted
  Country: Default
  Message Actions
Column: colScale
  Title: Scale
  Visible? No
  Editable? Yes
  Maximum Data Length: 2
  Data Type: Number
  Justify: Right
  Width:  0.7"
  Format: Unformatted
  Country: Default
  Message Actions
Column: colItemType
  Title:
  Visible? No
```

```
    Editable? No
    Maximum Data Length: Default
    Data Type: Number
    Justify: Left
    Width: 1.2"
    Format: Unformatted
    Country: Default
    Message Actions
Window Variables
  Boolean: bAttributes
Message Actions
  On SAM_Create
    !
    ! Create Elementary Data Type Menu
    !
    Set hWndGloDetailTable = hWndItem
    Set strColType[0] = '&Character Field'
    Set strColType[1] = '&Variable Length Field'
    Set strColType[2] = '&Long Character Field'
    Set strColType[3] = '&Integer'
    Set strColType[4] = 'D&ecimal'
    Set strColType[5] = '&Number'
    Set strColType[6] = 'S&mall Integer'
    Set strColType[7] = '&Real'
    Set strColType[8] = '&Floating Point Number'
    Set strColType[9] = 'D&ouble Precision Number'
    Set strColType[10] = 'D&ate'
    Set strColType[11] = '&Time'
    Set strColType[12] = 'S&ystem Time Stamp'
    Call SalSetWindowText(hWndForm,'Attributes For '||frmObjMgr.strO_ID)
    ! get and save a window handle to the Form's menu bar
    Set hWndMenuBar = GetMenu( hWndForm )
    !
    ! set the string's length for the GetMenuString() call
    !
    Call SalStrSetBufferLength( sMenuName, MENU_MAXLENGTH )
    !
    ! Initialize the floating popup menu - use the space bar, while positioned
        in the table window "Type" column, to display the popup menu
    ! set bFloating = TRUE when Floating popup is displayed
    !
    Set bFloating = FALSE
    !
    ! create a Floating Popup menu for the Form Window
    !
    Set hWndFloating = CreatePopupMenu()
    !
    ! add some menu items
    !
    Set nGloCount = 0
    While nGloCount < 13
      If strColType[nGloCount] = '&Integer' or strColType[nGloCount] = 'D&ate'
        ! add a menu separator
        Call AppendMenu( hWndFloating, MF_Separator, 0, NULL )
      Call AppendMenu( hWndFloating, MF_Enabled, nGloCount,
            strColType[nGloCount] )
      Set nGloCount = nGloCount+1
  On SAM_Click
    If lParam != nAttributeTblRow
      Call SalTblSetRowFlags(hWndForm,nAttributeTblRow,ROW_Selected,FALSE)
      Set nAttributeTblRow = lParam
    If SalIsNull(colFrom)
      !
      ! If the table row is not inherited, it may be edited--highlight the appropriate column.
      !
      Call SalSendMsg(hWndColFocus,MSG_Highlight,0,0)
      Call SalEnableWindow(pbDelete)
    Else
      !
```

```
            ! Do not allow row to be edited or deleted.
            !
            Call SalTblKillEdit(tblDetails)
            Call SalDisableWindow(pbDelete)
          On MSG_Check
            !
            ! If attributes have been changed, check the table window for any errors with the attributes
                as they relate to one another.
            !
            If bDetailsChanged or not bGloDetailOK
              If NoDetailErrors()
                If bGloDetailOK
                  Call CopyDetails(nGloDetailObject,TRUE)
                If SaveDetails()
                  Call SalEndDialog(hWndDialog,TRUE)
            Else
              Call SalEndDialog(hWndDialog,FALSE)
          On MSG_Load
            !
            ! Fetch all object attributes into the Details table window.
            !
            Call GetAllRelatedObjects(nGloDetailObject,FALSE,
                nGloRelated,nGloRelatedLevel,nGloRelatedType,strGloObjRelation)
            Set bAttributes = FALSE
            Set nGloCount = 0
            While nGloRelated[nGloCount] != -1
              If nGloRelatedType[nGloCount] != ENTITY_CrossProduct and
                  nGloRelatedType[nGloCount] != ENTITY_Composite
                If
RetrieveObjectAttributes(nGloRelated[nGloCount],nGloRelatedLevel[nGloCount],strGloObjRelation[nGloCount])
                  Set bAttributes = TRUE
              Set nGloCount = nGloCount + 1
            Call SalSendMsg(cmbCompositions,MSG_Load,0,0)
            Call SalSendMsg(cmbCrossProducts,MSG_Load,0,0)
            If not bAttributes
              Call SalSetWindowText(hWndDialog,'Attributes Belonging To '||frmObjMgr.strO_ID||' - (none)')
              Call SalDisableWindow(pbDelete)
              Call SalDisableWindow(pbCompositions)
              Call SalDisableWindow(pbCrossProducts)
            !
            ! If checking for duplicates, dlgDetails does not show itself.  Instead, it traverses the attributes within
                itself looking for errors.  If an error is found, it returns FALSE; otherwise, it returns TRUE.)
            !
            If bGloDupeCheck
              If NoDuplicateErrors()
                Call SalEndDialog(hWndDialog,TRUE)
              Else
                Call SalEndDialog(hWndDialog,FALSE)
            Else
              !
              ! If an SQL file is being built, dlgDetails does not show itself.  Instead, it traverses the attributes within
                  itself to create indices, tables, and stored SQL statements, and returns TRUE.  Otherwise, it shows
                  itself to the user for editing.)
              !
              If bGloBuildSQL
                Call CreateIndexes()
                Call CreateTable(nGloDetailObject)
                If bGloStoreComposites
                  Call CreateStoredSQL(ENTITY_Composite)
                If bGloStoreCrossProducts
                  Call CreateStoredSQL(ENTITY_CrossProduct)
                Call SalEndDialog(hWndDialog,TRUE)
              Else
                Call SalShowWindow(hWndDialog)
                Call SalWaitCursor(FALSE)
        On SAM_AnyEdit
          Set bDetailsChanged = TRUE
    Background Text: &Composition:
      Window Location and Size
```

```
      Left:  0.057"
      Top:  0.024"
      Width:  1.286"
      Height: 0.167"
    Visible? Yes
    Justify: Left
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
  Combo Box: cmbCompositions
    Window Location and Size
      Left:  0.043"
      Top:  0.202"
      Width:  1.614"
      Height: 1.798"
    Visible? Yes
    Editable? No
    String Type: String
    Maximum Data Length: Default
    Sorted? Yes
    Always Show List? No
    Vertical Scroll? Yes
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
    List Initialization
    Message Actions
      On MSG_Load
        !
        ! Combo box populates itself with all composite entities associated with the object.
        !
        Set nListCount = 0
        While nGloRelated[nListCount] != -1
          If nGloRelatedType[nListCount] = ENTITY_Composite
            Call SalNumberToStr(nListCount,0,strObjLoc)
            Call SalListAdd(hWndItem,strGloO_ID[nGloRelated[nListCount]]||SPACES||strObjLoc)
          Set nListCount = nListCount + 1
        If SalListQueryCount(hWndItem) = 0
          If nGloObjType[nGloDetailObject] = ENTITY_Regular
            Call SalListAdd(hWndItem,'(none)')
          Else
            Call SalListAdd(hWndItem,'(n/a)')
          Call SalColorSet(hWndItem,COLOR_IndexWindowText,COLOR_DarkGray)
          Call SalDisableWindow(hWndItem)
          Call SalDisableWindow(pbCompositions)
        Call SalListSetSelect(hWndItem,0)
        Call SalSendMsg(hWndItem,SAM_Click,0,0)
      On SAM_Click
        Call SalListQueryText(hWndItem,SalListQuerySelection(hWndItem),strCompObjectID)
        Call SalStrRight(strCompObjectID,8,strListCount)
        Call SalStrLeft(strCompObjectID,8,strCompObjectID)
        Call SalStrTrim(strCompObjectID,strCompObjectID)
        Call SalStrTrim(strListCount,strListCount)
        Set nListCount = SalStrToNumber(strListCount)
  Pushbutton: pbCompositions
    Title: &Define
    Window Location and Size
      Left:  1.686"
      Top:  0.202"
      Width:  0.7"
      Height: 0.238"
    Visible? Yes
    Keyboard Accelerator: (none)
    Font Name: Default
    Font Size: Default
```

```
    Font Enhancement: Default
    Message Actions
      On SAM_Click
        Call SalSendMsg(cmbCompositions,SAM_Click,0,0)
        Set nGloCompNumber = nListCount
        If SalModalDialog(dlgSummaryDetails,hWndForm)
          Set bDetailsChanged = TRUE
  Background Text: Cross &Product:
    Window Location and Size
      Left:  2.457"
      Top:  0.024"
      Width:  1.286"
      Height: 0.167"
    Visible? Yes
    Justify: Left
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
  Combo Box: cmbCrossProducts
    Window Location and Size
      Left:  2.443"
      Top:  0.202"
      Width:  1.614"
      Height: 1.798"
    Visible? Yes
    Editable? No
    String Type: String
    Maximum Data Length: Default
    Sorted? Yes
    Always Show List? No
    Vertical Scroll? Yes
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
    List Initialization
    Message Actions
      On MSG_Load
        !
        ! Combo box populates itself with all cross product entities associated with the object.
        !
        Set nListCount = 0
        While nGloRelated[nListCount] != -1
          If nGloRelatedType[nListCount] = ENTITY_CrossProduct
            Call SalNumberToStr(nListCount,0,strObjLoc)
            Call SalListAdd(hWndItem,strGloO_ID[nGloRelated[nListCount]]||SPACES||strObjLoc)
          Set nListCount = nListCount + 1
        If SalListQueryCount(hWndItem) = 0
          If nGloObjType[nGloDetailObject] = ENTITY_Regular
            Call SalListAdd(hWndItem,'(none)')
          Else
            Call SalListAdd(hWndItem,'(n/a)')
          Call SalColorSet(hWndItem,COLOR_IndexWindowText,COLOR_DarkGray)
          Call SalDisableWindow(hWndItem)
          Call SalDisableWindow(pbCrossProducts)
        Call SalListSetSelect(hWndItem,0)
        Call SalSendMsg(hWndItem,SAM_Click,0,0)
      On SAM_Click
        Call SalListQueryText(hWndItem,SalListQuerySelection(hWndItem),strCompObjectID)
        Call SalStrRight(strCompObjectID,8,strListCount)
        Call SalStrLeft(strCompObjectID,8,strCompObjectID)
        Call SalStrTrim(strCompObjectID,strCompObjectID)
        Call SalStrTrim(strListCount,strListCount)
        Set nListCount = SalStrToNumber(strListCount)
Pushbutton: pbCrossProducts
  Title: D&efine
```

```
    Window Location and Size
      Left:  4.086"
      Top:  0.202"
      Width:  0.7"
      Height: 0.238"
    Visible? Yes
    Keyboard Accelerator: (none)
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Message Actions
      On SAM_Click
        Call SalSendMsg(cmbCrossProducts,SAM_Click,0,0)
        Set nGloCompNumber = nListCount
        If SalModalDialog(dlgSummaryDetails,hWndForm)
          Set bDetailsChanged = TRUE
  Pushbutton: pbAdd
    Title: &Add
    Window Location and Size
      Left:  4.857"
      Top:  0.143"
      Width:  0.9"
      Height: 0.298"
    Visible? Yes
    Keyboard Accelerator: (none)
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Message Actions
      On SAM_Click
        !
        ! Adds a new row to the dlgDetails table so the user may key in a new attribute.
        !
        Set nAttributeTblRow = SalTblInsertRow( tblDetails, TBL_MaxRow )
        Call SalTblSetFocusRow(tblDetails,nAttributeTblRow )
        Call SalTblSetContext(tblDetails,nAttributeTblRow )
        Call SalTblSetFocusCell(tblDetails,nAttributeTblRow,colName,-1,-1)
        Call SalSetWindowText(hWndForm,'Attributes Belonging To '||frmObjMgr.strO_ID)
        Call SalEnableWindow(pbDelete)
        If cmbCompositions != '(none)'
          Call SalEnableWindow(pbCompositions)
        If cmbCrossProducts != '(none)'
          Call SalEnableWindow(pbCrossProducts)
        Set bDetailsChanged = TRUE
  Pushbutton: pbDelete
    Title: &Remove
    Window Location and Size
      Left:  5.8"
      Top:  0.143"
      Width:  0.9"
      Height: 0.298"
    Visible? Yes
    Keyboard Accelerator: (none)
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Message Actions
      On SAM_Click
        !
        ! Removes an attribute from an object.
        !
        Call SalTblKillEdit(tblDetails)
        If SalIsNull(colName)
          Set colName = '(unnamed)'
        If SalMessageBox('Are you sure you want to remove the '||colName||' attribute from '||frmObjMgr.strO_ID||'?',
            APPNAME,MB_YesNo|MB_IconQuestion|MB_DefButton2) = IDYES
          Call SalTblDeleteRow(tblDetails,nAttributeTblRow,TBL_NoAdjust)
          Set bDetailsChanged = TRUE
          Call SalTblSetContext(tblDetails,nAttributeTblRow)
```

```
            If colName = NULL
              Set nAttributeTblRow = nAttributeTblRow - 1
            Call SalTblSetContext(tblDetails,nAttributeTblRow)
            Call SalTblSetFocusRow(tblDetails,nAttributeTblRow)
            If colFrom != NULL
              Call SalDisableWindow(pbDelete)
            If not SalTblAnyRows(tblDetails,0,0)
              Call SalSetWindowText(hWndDialog,'Attributes Belonging To '||frmObjMgr.strO_ID||' - (none)')
              Call SalDisableWindow(pbDelete)
              Call SalDisableWindow(pbCompositions)
              Call SalDisableWindow(pbCrossProducts)
          Else
            If colName = '(unnamed)'
              Call SalClearField(colName)
            Call SalTblSetFocusCell(tblDetails,nAttributeTblRow,colName,-1,-1)
            If colName = NULL
              Set nAttributeTblRow = nAttributeTblRow - 1
    Pushbutton: pbOk
      Title: Ok
      Window Location and Size
        Left:  6.771"
        Top:  0.143"
        Width:  0.9"
        Height: 0.298"
      Visible? Yes
      Keyboard Accelerator: Enter
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Message Actions
        On SAM_Click
          Call SalSendMsg(tblDetails,MSG_Check,0,0)
    Pushbutton: pbCancel
      Title: Cancel
      Window Location and Size
        Left:  7.714"
        Top:  0.143"
        Width:  0.9"
        Height: 0.298"
      Visible? Yes
      Keyboard Accelerator: Esc
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Message Actions
        On SAM_Click
          If not bGloDetailOK
            Call RestoreDetails(nGloCell[nGloAbsPos])
            Set bGloDetailOK = TRUE
          Call SalEndDialog(hWndDialog,FALSE)
        On SAM_KillFocus
          Call SalPostMsg(tblDetails,colName,MSG_Highlight,0,0)
  Window Variables
    Boolean: bSpecificsDialog
    Number: nAttributeTblRow
    Number: nCheck
    Number: nLength
    Number: nListCount
    Number: nScale
    String: strCheck
    String: strColType[15]
    String: strCompObjectID
    String: strListCount
    String: strObjLoc
    Window Handle: hWndColFocus
    Window Handle: hWndDialog
    ! Floating Menu Variables
    Number: nMenuID
    String: sMenuName
```

```
    Window Handle: hWndMenuBar
    Window Handle: hWndSubMenu
    Window Handle: hWndSystemMenu
    Window Handle: hWndSystemSubMenu
    !
    ! for the floating popup menu
    Boolean: bFloating
    Boolean: bDetailsChanged
    Window Handle: hWndFloating
  Message Actions
    On SAM_Create
      Call SalWaitCursor(TRUE)
      Call SalHideWindow(hWndForm)
      Set bDetailsChanged = FALSE
      Set hWndDialog = hWndForm
      Call SalSetWindowText(hWndForm,'Attributes Belonging To '||strGloO_ID[nGloDetailObject])
      Call SalPostMsg(tblDetails,MSG_Load,0,0)
    On WM_COMMAND
      If bFloating
        If wParam > -1 and wParam < 13
          Call SalStrReplace(strColType[wParam],SalStrScan(strColType[wParam],'&'),
              1,NULL,tblDetails.colType)
          Call SalStrMid(TYPE_CHOICES,wParam,1,strCheck)
          Set tblDetails.colItemType = wParam
        Set bFloating = FALSE
    On MSG_Show
      Set bFloating = TRUE
      Call ClientToScreen( hWndForm, lParam )
      Call TrackPopupMenu( hWndFloating, 0, SalNumberLow( lParam ),
            SalNumberHigh( lParam ), 0, hWndItem, NULL )
      ! WM_COMMAND's wParam is the menu item chosen when bFloating = TRUE
    On SAM_Close
      Call SalSendMsg(pbCancel,SAM_Click,0,0)
Dialog Box: dlgDisassociate
  Title: Delete An Association
  Display Settings
    Visible at Design time? No
    Type of Dialog: Modal
    Window Location and Size
      Left: 0.625"
      Top: 0.625"
      Width: 5.086"
      Height: 2.857"
    Absolute Screen Location? Yes
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
  Contents
    Background Text: Associated &Object:
      Window Location and Size
        Left: 0.186"
        Top: 0.202"
        Width: 1.629"
        Height: 0.167"
      Visible? Yes
      Justify: Left
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Default
    Combo Box: cbObject
      Window Location and Size
        Left: 1.888"
        Top: 0.156"
        Width: 1.4"
        Height: 1.927"
```

```
Visible? Yes
Editable? No
String Type: String
Maximum Data Length: Default
Sorted? Yes
Always Show List? No
Vertical Scroll? Yes
Font Name: Default
Font Size: Default
Font Enhancement: Default
Text Color: Default
Background Color: Default
List Initialization
Message Actions
  On SAM_Create
    |
    | Combo box populates itself with all entities dependent upon the object.
    |
    Set strGloCSV = strGloObjAssociations[nGloCell[nGloAbsPos]]
    Set nListCount = 0
    While SalStrLength(strGloCSV) > 1
      Set strObjectID = ReadCSV()
      Call SalStrLeft(strObjectID,SalStrScan(strObjectID,':'),strObjLoc)
      Call SalStrLop(strObjLoc)
      Set nObjLoc = SalStrToNumber(strObjLoc)
      Set strLocList[nListCount] = strObjLoc
      Call SalStrRight(strObjectID,1,strObjRel[nListCount])
      If strObjRel[nListCount] > 'Z'
        Call SalNumberToStr(nListCount,0,strListCount)
        Set strObjectID = strGloO_ID[nObjLoc]
        Call SalListAdd(cbObject,strObjectID||SPACES||strListCount)
        Set nListCount = nListCount + 1
    Call SalPostMsg(hWndForm,MSG_Created,0,0)
  On SAM_Click
    |
    | Association type is determined and a simple description of the relationship is diplayed.
    |
    Set strObjectID = cbObject
    Call SalStrLeft(strObjectID,8,strObjectID)
    Call SalStrTrim(strObjectID,strObjectID)
    Set strListCount = cbObject
    Call SalStrRight(strListCount,8,strListCount)
    Call SalStrTrim(strListCount,strListCount)
    Set nListCount = SalStrToNumber(strListCount)
    Set nObjLoc = SalStrToNumber(strLocList[nListCount])
    Set strAssocType = strObjRel[nListCount]
    If strAssocType = 'g'
      Set strAssociationType = 'Generalization'
      Set mlAssociation = 'A(n) '||strObjectID||' is a kind of '||frmObjMgr.strO_ID||'.  All attributes belonging to the
'||frmObjMgr.strO_ID||' are inherited by the '||strObjectID||'.'
    If strAssocType = 'a'
      Set strAssociationType = 'Aggregation'
      Set mlAssociation = 'Every instance of a(n) '||strObjectID||' can be associated with a predefined
'||frmObjMgr.strO_ID||'.  Key attributes used to identify the '||frmObjMgr.strO_ID||' are retained by the '||strObjectID||'.'
    If strAssocType = 'o'
      Set strAssociationType = 'Interaction (one to one)'
      Set mlAssociation = 'Every '||frmObjMgr.strO_ID||' can have only one '||strObjectID||'.  Every '||strObjectID||' can
have only one '||frmObjMgr.strO_ID||'.  Key attributes used to identify the '||frmObjMgr.strO_ID||' are retained by the
'||strObjectID||'.'
    If strAssocType = 'm'
      Set strAssociationType = 'Interaction (many to one)'
      Set mlAssociation = 'Every '||frmObjMgr.strO_ID||' can have one or more '||strObjectID||'s.  Every '||strObjectID||'
can have only one '||frmObjMgr.strO_ID||'.  Key attributes used to identify the '||frmObjMgr.strO_ID||' are retained by the
'||strObjectID||'.'
    If strAssocType = 'c'
      Set strAssociationType = 'Composition'
      Set mlAssociation = 'The '||frmObjMgr.strO_ID||' is partially defined by the set of all '||strObjectID||'s.  Selected
attributes of all '||strObjectID||'s are summarized into '||frmObjMgr.strO_ID||'.'
    If strAssocType = 'x'
```

Set strAssociationType = 'Cross Product'
Set mlAssociation = 'The '||strObjectID||' is partially defined by the '||frmObjMgr.strO_ID||'. Key attributes used to identify the '||frmObjMgr.strO_ID||' are retained as part of the '||strObjectID||'. Numeric attributes belonging to '||strObjectID||' can be summarized by '||frmObjMgr.strO_ID||'.'
Background Text: Association Type:
Window Location and Size
Left: 0.186"
Top: 0.917"
Width: 1.529"
Height: 0.167"
Visible? Yes
Justify: Left
Font Name: Default
Font Size: Default
Font Enhancement: Default
Text Color: Default
Background Color: Default
Data Field: strAssociationType
Data
Maximum Data Length: Default
Data Type: String
Editable? No
Display Settings
Window Location and Size
Left: 1.757"
Top: 0.929"
Width: 3.029"
Height: 0.25"
Visible? Yes
Border? No
Justify: Left
Format: Unformatted
Country: Default
Font Name: Default
Font Size: Default
Font Enhancement: Default
Text Color: Default
Background Color: Default
Message Actions
Multiline Field: mlAssociation
Data
Maximum Data Length: Default
String Type: String
Editable? No
Display Settings
Border? No
Word Wrap? Yes
Vertical Scroll? No
Window Location and Size
Left: 0.3"
Top: 1.536"
Width: 4.343"
Height: 0.762"
Visible? Yes
Font Name: Default
Font Size: Default
Font Enhancement: Default
Text Color: Default
Background Color: Default
Message Actions
Pushbutton: pbOk
Title: Ok
Window Location and Size
Left: 3.588"
Top: 0.156"
Width: 1.2"
Height: 0.292"
Visible? Yes
Keyboard Accelerator: Enter

```
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Message Actions
      On SAM_Click
        !
        ! Association is deleted from the strGloObjectAssociations[*] array, and the workspace is refreshed.
        !
        Call SalWaitCursor(TRUE)
        Set strGloCSV = strGloObjAssociations[nGloCell[nGloAbsPos]]
        Call SalStrReplace(strGloCSV,SalStrScan(strGloCSV,'#'||strLocList[nListCount]),
            SalStrLength(strLocList[nListCount])+4,NULL,strGloCSV)
        Set strGloObjAssociations[nGloCell[nGloAbsPos]] = strGloCSV
        Set strGloCSV = strGloObjAssociations[nObjLoc]
        Call SalNumberToStr(nGloCell[nGloAbsPos],0,strObjLoc)
        Call SalStrReplace(strGloCSV,SalStrScan(strGloCSV,'#'||strObjLoc),
            SalStrLength(strObjLoc)+4,NULL,strGloCSV)
        Set strGloObjAssociations[nObjLoc] = strGloCSV
        Set nGloCount = 1
        While nGloCount < 11
          If nGloCell[(nGloScreen*10)+nGloCount] = nObjLoc
            Set nRelPos = SalNumberMod(nGloAbsPos,10)
            If nRelPos = 0
              Set nRelPos = 10
            If nRelPos < nGloCount
              Call SalSendMsg(frmObjMgr.hWndDF[nRelPos],MSG_HideLine,nGloCount,0)
            Else
              Call SalSendMsg(frmObjMgr.hWndDF[nGloCount],MSG_HideLine,nRelPos,0)
            Set nGloCount = 11
          Else
            Set nGloCount = nGloCount + 1
        Call RefreshLabels()
        Call SalWaitCursor(FALSE)
        Set bGloChanged = TRUE
        Call SalEndDialog(hWndForm,TRUE)
  Pushbutton: pbCancel
    Title: Cancel
    Window Location and Size
      Left:  3.586"
      Top:  0.5"
      Width:  1.2"
      Height: 0.298"
    Visible? Yes
    Keyboard Accelerator: Esc
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Message Actions
      On SAM_Click
        Call SalEndDialog(hWndForm,FALSE)
  Group Box: Description
    Window Location and Size
      Left:  0.129"
      Top:  1.286"
      Width:  4.686"
      Height: 1.131"
    Visible? Yes
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
Window Variables
  Number: nListCount
  String: strListCount
  Number: nObjLoc
  String: strObjLoc
  String: strLocList[*]
  String: strObjRel[*]
```

```
      String: strObjectID
      String: strAssocType
      Number: nRelPos
    Message Actions
      On SAM_Create
        Call SalWaitCursor(TRUE)
        Call SalHideWindow(hWndForm)
        Call SalSetWindowText(hWndForm,'Disassociate An Object From '||frmObjMgr.strO_ID)
      On MSG_Created
        Call SalWaitCursor(FALSE)
        !
        ! If there exist no objects to associate with the object having focus, this window displays a message,
            and does not show.
        !
        If not SalListSetSelect(cbObject,0)
          Call SalMessageBox('There are no high level objects dependent upon '||frmObjMgr.strO_ID||' to
disassociate.',APPNAME,
              MB_Ok|MB_IconAsterisk)
          Call SalEndDialog(hWndForm,FALSE)
        Else
          Call SalSendMsg(cbObject,SAM_Click,0,0)
          Call SalShowWindow(hWndForm)
      On SAM_Close
        Call SalSendMsg(pbCancel,SAM_Click,0,0)
  Dialog Box: dlgFindObject
    Title: OSAM* Object List
    Display Settings
      Visible at Design time? No
      Type of Dialog: Modal
      Window Location and Size
        Left:  1.125"
        Top:  0.75"
        Width:  3.657"
        Height: 2.714"
      Absolute Screen Location? Yes
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Default
    Contents
      Background Text: &Show:
        Window Location and Size
          Left:  0.1"
          Top:  0.071"
          Width:  0.614"
          Height: 0.167"
        Visible? Yes
        Justify: Left
        Font Name: Default
        Font Size: Default
        Font Enhancement: Default
        Text Color: Default
        Background Color: Default
      Combo Box: strObjType
        Window Location and Size
          Left:  0.786"
          Top:  0.06"
          Width:  2.586"
          Height: 1.488"
        Visible? Yes
        Editable? No
        String Type: String
        Maximum Data Length: Default
        Sorted? No
        Always Show List? No
        Vertical Scroll? Yes
        Font Name: Default
        Font Size: Default
```

```
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
    List Initialization
      Text: Every Object
      Text: Regular Entities
      Text: Simple Domains
      Text: Cross Product Entities
      Text: Composite Entities
    Message Actions
      On SAM_Create
        Call SalListSetSelect(hWndItem,ALL)
        Call SalListInsert(hWndItem,-1,'Dependent Upon '||frmObjMgr.strO_ID)
        Call SalListInsert(hWndItem,-1,'Depended on by '||frmObjMgr.strO_ID)
        Call SalSendMsg(lbObjects,MSG_Load,0,0)
        If nObjType = ALL
          Call SalShowWindow(hWndForm)
      On SAM_Click
        Call SalPostMsg(lbObjects,MSG_Load,0,0)
  Background Text: &Object:
    Window Location and Size
      Left:  0.1"
      Top:  0.357"
      Width:  0.643"
      Height: 0.167"
    Visible? Yes
    Justify: Left
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
  Data Field: strTargetID
    Data
      Maximum Data Length: Default
      Data Type: String
      Editable? No
    Display Settings
      Window Location and Size
        Left:  0.786"
        Top:  0.321"
        Width:  1.471"
        Height: 0.25"
      Visible? Yes
      Border? Yes
      Justify: Left
      Format: Unformatted
      Country: Default
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Default
    Message Actions
List Box: lbObjects
  Window Location and Size
    Left:  0.9"
    Top:  0.56"
    Width:  1.357"
    Height: 1.726"
  Visible? Yes
  Multiple selection? No
  Sorted? Yes
  Vertical Scroll? Yes
  Font Name: Default
  Font Size: Default
  Font Enhancement: Default
  Text Color: Default
  Background Color: Default
```

```
    List Initialization
    Message Actions
      On MSG_Load
        |
        | Lists all objects of a certain type in the combo box.
        |
        Call SalWaitCursor(TRUE)
        Set nObjType = SalListQuerySelection(strObjType)
        Call SalListClear(hWndItem)
        Call SalListRedraw(hWndItem,FALSE)
        If nObjType < DEPENDENT_UPON
          Set nGloCount = 1
          While nGloObjType[nGloCount] != 0
            If nGloObjCell[nGloCount] != 0
              If nObjType = ALL or nGloObjType[nGloCount] = nObjType
                Call SalNumberToStr(nGloCount,0,strObject)
                Set strObject = strGloO_ID[nGloCount]||TAB||strObject
                Call SalStrLower(strObject,strObject)
                Call SalListAdd(hWndItem,strObject)
            Set nGloCount = nGloCount + 1
        Else
          If nObjType = DEPENDENT_ON_BY
            Call GetAllRelatedObjects(nGloCell[nGloAbsPos],FALSE,
                nGloRelated,nGloRelatedLevel,nGloRelatedType,strGloObjRelation)
          Else
            Call GetAllRelatedObjects(nGloCell[nGloAbsPos],TRUE,
                nGloRelated,nGloRelatedLevel,nGloRelatedType,strGloObjRelation)
          Call SalListClear(hWndItem)
          Set nGloCount = 1
          While nGloRelated[nGloCount] != -1
            Call SalNumberToStr(nGloRelated[nGloCount],0,strObject)
            Call SalStrLower(strGloO_ID[nGloRelated[nGloCount]]||TAB||strObject,strObject)
            Call SalListAdd(hWndItem,strObject)
            Set nGloCount = nGloCount + 1
        Call SalWaitCursor(FALSE)
        Call SalListRedraw(hWndItem,TRUE)
        Call SalInvalidateWindow(hWndItem)
        If SalListQueryCount(hWndItem) = 0
          If nObjType = ALL
            Call SalMessageBox('No Objects Have Been Created.',APPNAME,MB_Ok|MB_IconAsterisk)
            Set nObjType = -1
            Call SalPostMsg(pbCancel,SAM_Click,0,0)
            Return FALSE
          Set strTargetID = '(none)'
        Else
          Call SalListSetSelect(hWndItem,0)
          Call SalSendMsg(hWndItem,SAM_Click,0,0)
      On SAM_DoubleClick
        Call SalSendMsg(pbOk,SAM_Click,0,0)
      On SAM_Click
        Call SalListQueryText(lbObjects,SalListQuerySelection(lbObjects),strObject)
        Call SalStrTokenize(strObject,TAB,TAB,strObjParm)
        Set strTargetID = strObjParm[0]
        Call SalWaitCursor(FALSE)
Pushbutton: pbFind
  Title: &Find
  Window Location and Size
    Left:  2.543"
    Top:   0.714"
    Width:  0.514"
    Height: 0.238"
  Visible? No
  Keyboard Accelerator: (none)
  Font Name: Default
  Font Size: Default
  Font Enhancement: Default
  Message Actions
    On SAM_Click
      Call SalSendMsg(lbObjects,MSG_Load,0,0)
```

```
  Pushbutton: pbOk
    Title: Ok
    Window Location and Size
      Left:  2.414"
      Top:  1.69"
      Width:  0.986"
      Height: 0.274"
    Visible? Yes
    Keyboard Accelerator: (none)
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Message Actions
      On SAM_Click
        |
        | Verifies that an object has been selected for finding.
        |
        If SalIsNull(strTargetID)
          Call SalMessageBox('Please Select An Object From The Object List.',
              APPNAME,MB_Ok|MB_IconAsterisk)
          Call SalSetFocus(lbObjects)
          Return FALSE
        If strTargetID = '(none)'
          Call SalMessageBox('There are no other objects which are '||strObjType||'.',APPNAME,
              MB_Ok|MB_IconAsterisk)
          Call SalSetFocus(strObjType)
          Return FALSE
        |
        | Finds object in workspace, and repaints workspace to show object.
        |
        Set nGloCount = SalStrToNumber(strObjParm[1])
        Set nHBar = nGloObjHBar[nGloCount]
        Set nVBar = nGloObjVBar[nGloCount]
        Set df_nHBar = nHBar-MAX_SCROLL/2
        Set df_nVBar = nVBar-MAX_SCROLL/2
        Call SalScrollSetPos(hBar,nHBar)
        Call SalScrollSetPos(vBar,nVBar)
        Set nGloAbsPos = nGloObjCell[nGloCount]
        Set nGloScreen = (nVBar*(MAX_SCROLL+1))+nHBar
        Call SalPostMsg(frmObjMgr.pbOrigin,MSG_Redraw,0,0)
        Call SalEndDialog(hWndForm,TRUE)
  Pushbutton: pbCancel
    Title: Cancel
    Window Location and Size
      Left:  2.414"
      Top:  2.012"
      Width:  1.0"
      Height: 0.274"
    Visible? Yes
    Keyboard Accelerator: (none)
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Message Actions
      On SAM_Click
        Call SalEndDialog(hWndForm,FALSE)
Window Variables
  Number: nObjType
  String: strDirection
  String: strObject
  String: strObjParm[*]
Message Actions
  On SAM_Create
    Call SalWaitCursor(TRUE)
    Call SalHideWindow(hWndForm)
  On SAM_Destroy
    Call SalWaitCursor(FALSE)
  On SAM_Close
    Call SalSendMsg(pbCancel,SAM_Click,0,0)
```

```
Dialog Box: dlgRules
  Title:
  Display Settings
    Visible at Design time? No
    Type of Dialog: Modal
    Window Location and Size
      Left:  0.638"
      Top:  0.625"
      Width:  5.129"
      Height: 4.095"
    Absolute Screen Location? Yes
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
  Contents
    Background Text: On &Insert:
      Window Location and Size
        Left:  0.186"
        Top:  0.083"
        Width:  0.886"
        Height: 0.167"
      Visible? Yes
      Justify: Left
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Default
    Multiline Field: mlInsert
      Data
        Maximum Data Length: 254
        String Type: String
        Editable? Yes
      Display Settings
        Border? Yes
        Word Wrap? Yes
        Vertical Scroll? Yes
        Window Location and Size
          Left:  0.186"
          Top:  0.286"
          Width:  4.657"
          Height: 0.81"
        Visible? Yes
        Font Name: Default
        Font Size: Default
        Font Enhancement: Default
        Text Color: Default
        Background Color: Default
      Message Actions
        On SAM_Create
          Set mlInsert = strGloObjInsert[nGloCell[nGloAbsPos]]
        On SAM_Validate
          Call ReplaceChar(mlInsert,DEL,SPACE)
          Call ReplaceChar(mlInsert,"\","")
          Return VALIDATE_Ok
    Background Text: On &Update:
      Window Location and Size
        Left:  0.186"
        Top:  1.167"
        Width:  1.029"
        Height: 0.167"
      Visible? Yes
      Justify: Left
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
```

```
    Background Color: Default
  Multiline Field: mlUpdate
    Data
      Maximum Data Length: 254
      String Type: String
      Editable? Yes
    Display Settings
      Border? Yes
      Word Wrap? Yes
      Vertical Scroll? Yes
      Window Location and Size
        Left:  0.186"
        Top:  1.369"
        Width:  4.657"
        Height: 0.81"
      Visible? Yes
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Default
    Message Actions
      On SAM_Create
        Set mlUpdate = strGloObjUpdate[nGloCell[nGloAbsPos]]
      On SAM_Validate
        Call ReplaceChar(mlUpdate,DEL,SPACE)
        Call ReplaceChar(mlUpdate,'\',"")
        Return VALIDATE_Ok
  Background Text: On &Delete:
    Window Location and Size
      Left:  0.186"
      Top:  2.25"
      Width:  0.886"
      Height: 0.167"
    Visible? Yes
    Justify: Left
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
  Multiline Field: mlDelete
    Data
      Maximum Data Length: 254
      String Type: String
      Editable? Yes
    Display Settings
      Border? Yes
      Word Wrap? Yes
      Vertical Scroll? Yes
      Window Location and Size
        Left:  0.186"
        Top:  2.452"
        Width:  4.657"
        Height: 0.81"
      Visible? Yes
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Default
    Message Actions
      On SAM_Create
        Set mlDelete = strGloObjDelete[nGloCell[nGloAbsPos]]
      On SAM_Validate
        Call ReplaceChar(mlDelete,DEL,SPACE)
        Call ReplaceChar(mlDelete,'\',"")
        Return VALIDATE_Ok
  Pushbutton: pbOk
```

```
      Title: &Ok
      Window Location and Size
        Left:  2.371"
        Top:  3.345"
        Width:  1.2"
        Height: 0.298"
      Visible? Yes
      Keyboard Accelerator: Enter
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Message Actions
        On SAM_Click
          Set strGloObjInsert[nGloCell[nGloAbsPos]] = mlInsert
          Set strGloObjUpdate[nGloCell[nGloAbsPos]] = mlUpdate
          Set strGloObjDelete[nGloCell[nGloAbsPos]] = mlDelete
          Call SalEndDialog(hWndForm,TRUE)
    Pushbutton: pbCancel
      Title: Cancel
      Window Location and Size
        Left:  3.643"
        Top:  3.345"
        Width:  1.2"
        Height: 0.298"
      Visible? Yes
      Keyboard Accelerator: Esc
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Message Actions
        On SAM_Click
          Call SalEndDialog(hWndForm,FALSE)
  Window Variables
  Message Actions
    On SAM_Create
      !
      ! Accepts insert, update, and delete rules for a given object.
      !
      Call SalSetWindowText(hWndForm,'Rules For '||frmObjMgr.strO_ID)
    On SAM_Close
      Call SalSendMsg(pbCancel,SAM_Click,0,0)
Dialog Box: dlgSummaryDetails
  Title:
  Display Settings
    Visible at Design time? No
    Type of Dialog: Modal
    Window Location and Size
      Left:  0.85"
      Top:  0.656"
      Width:  5.557"
      Height: 4.31"
    Absolute Screen Location? Yes
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
  Contents
    Check Box: cbCounts
      Title:
      Window Location and Size
        Left:  0.057"
        Top:  0.048"
        Width:  5.071"
        Height: 0.25"
      Visible? Yes
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
```

```
    Text Color: Default
    Background Color: Default
    Message Actions
      On SAM_Create
        If nGloRelatedType[nGloCompNumber] = ENTITY_Composite
          Call SalSetWindowText(hWndItem,'&Show '||frmObjMgr.strO_ID||' count on
'||strGloO_ID[nGloRelated[nGloCompNumber]]||'.')
        Else
          Call SalSetWindowText(hWndItem,'&Show '||frmObjMgr.strO_ID||' counts broken out by
'||strGloO_ID[nGloRelated[nGloCompNumber]]||'.')
  Table Window: tblSummaryDetails
    Title:
    Icon File:
    Display Settings
      Visible at Design time? Yes
      Automatically Created at Runtime? Yes
      Initial State: Normal
      Maximizable? No
      Minimizable? No
      System Menu? No
      Resizable? No
      Window Location and Size
        Left:  0.0"
        Top:  0.333"
        Width:  5.414"
        Height: 3.226"
      Visible? Yes
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Default
    Memory Settings
      Maximum Rows in Memory: Default
      Discardable? Yes
    Menu
    Contents
      Column: colCompValue
        Title: Numeric Attribute
        Visible? Yes
        Editable? No
        Maximum Data Length: 18
        Data Type: String
        Justify: Left
        Width:  1.729"
        Format: Unformatted
        Country: Default
        Message Actions
          On MSG_Highlight
            Call SalTblSetFocusCell(hWndForm,nAttrSummaryTblRow,hWndItem,-1,-1)
      Column: colCompItemType
        Title: Type
        Visible? No
        Editable? No
        Maximum Data Length: 50
        Data Type: Number
        Justify: Left
        Width:  2.857"
        Format: Unformatted
        Country: Default
        Message Actions
      Column: colCompTblRow
        Title:
        Visible? No
        Editable? Yes
        Maximum Data Length: Default
        Data Type: Number
        Justify: Left
        Width:  1.2"
```

```
    Format: Unformatted
    Country: Default
    Message Actions
  Column: colLowest
    Title: Lowest
    Visible? Yes
    Editable? Yes
    Maximum Data Length: Default
    Data Type: String
    Justify: Center
    Width:  0.785"
    Format: Unformatted
    Country: Default
    Message Actions
      On SAM_Create
        Set hWndSummaryFocus = hWndItem
      On SAM_AnyEdit
        If not SalIsNull(hWndItem)
          If colLowest = 'Y' or colLowest = 'y'
            Set colLowest = 'Yes'
            Return TRUE
          If colLowest = 'N' or colLowest = 'n'
            Set colLowest = 'No'
            Return TRUE
          Call SalClearField(hWndItem)
      On SAM_KillFocus
        If SalIsNull(hWndItem)
          Call SalSetWindowText(hWndItem,'No')
      On MSG_Highlight
        Call SalTblSetFocusCell(hWndForm,nAttrSummaryTblRow,hWndItem,-1,-1)
      On SAM_SetFocus
        Set hWndSummaryFocus = hWndItem
  Column: colHighest
    Title: Highest
    Visible? Yes
    Editable? Yes
    Maximum Data Length: Default
    Data Type: String
    Justify: Center
    Width:  0.786"
    Format: Unformatted
    Country: Default
    Message Actions
      On SAM_AnyEdit
        If not SalIsNull(hWndItem)
          If colHighest = 'Y' or colHighest = 'y'
            Set colHighest = 'Yes'
            Return TRUE
          If colHighest = 'N' or colHighest = 'n'
            Set colHighest = 'No'
            Return TRUE
          Call SalClearField(hWndItem)
      On MSG_Highlight
        Call SalTblSetFocusCell(hWndForm,nAttrSummaryTblRow,hWndItem,-1,-1)
      On SAM_KillFocus
        If SalIsNull(hWndItem)
          Call SalSetWindowText(hWndItem,'No')
      On SAM_SetFocus
        Set hWndSummaryFocus = hWndItem
  Column: colAverage
    Title: Average
    Visible? Yes
    Editable? Yes
    Maximum Data Length: Default
    Data Type: String
    Justify: Center
    Width:  0.786"
    Format: Unformatted
    Country: Default
```

```
    Message Actions
      On SAM_AnyEdit
        If not SalIsNull(hWndItem)
          If colAverage = 'Y' or colAverage = 'y'
            Set colAverage = 'Yes'
            Return TRUE
          If colAverage = 'N' or colAverage = 'n'
            Set colAverage = 'No'
            Return TRUE
          Call SalClearField(hWndItem)
      On MSG_Highlight
        Call SalTblSetFocusCell(hWndForm,nAttrSummaryTblRow,hWndItem,-1,-1)
      On SAM_KillFocus
        If SalIsNull(hWndItem)
          Call SalSetWindowText(hWndItem,'No')
      On SAM_SetFocus
        Set hWndSummaryFocus = hWndItem
  Column: colTotal
    Title: Total
    Visible? Yes
    Editable? Yes
    Maximum Data Length: Default
    Data Type: String
    Justify: Center
    Width:  0.786"
    Format: Unformatted
    Country: Default
    Message Actions
      On SAM_AnyEdit
        If not SalIsNull(hWndItem)
          If colTotal = 'Y' or colTotal = 'y'
            Set colTotal = 'Yes'
            Return TRUE
          If colTotal = 'N' or colTotal = 'n'
            Set colTotal = 'No'
            Return TRUE
          Call SalClearField(hWndItem)
      On MSG_Highlight
        Call SalTblSetFocusCell(hWndForm,nAttrSummaryTblRow,hWndItem,-1,-1)
      On SAM_KillFocus
        If SalIsNull(hWndItem)
          Call SalSetWindowText(hWndItem,'No')
      On SAM_SetFocus
        Set hWndSummaryFocus = hWndItem
Window Variables
Message Actions
  On SAM_Click
    If lParam != nAttrSummaryTblRow
      Call SalTblSetRowFlags(hWndForm,nAttrSummaryTblRow,ROW_Selected,FALSE)
      Set nAttrSummaryTblRow = lParam
    Call SalSendMsg(hWndSummaryFocus,MSG_Highlight,0,0)
  On SAM_EndCellTab
    Call SalPostMsg(colLowest,MSG_Highlight,0,0)
  On MSG_Load
    !
    ! Populates the summary attributes table with all numeric attributes, and their summary settings
        (from colCRel or colXRel in the dlgDetails attribute table.)
    !
    Call SalNumberToStr(nGloRelated[nGloCompNumber],0,strCompNumber)
    If nGloRelatedType[nGloCompNumber] = ENTITY_CrossProduct
      Set strCompDef = strGloObjXRel[nGloDetailObject]
    Else
      Set strCompDef = strGloObjCRel[nGloDetailObject]
    If SalStrScan(strCompDef,strCompNumber) != -1
      Set cbCounts = TRUE
    Else
      Set cbCounts = FALSE
    Set bCompAttributes = FALSE
    Set nDetailTblRow = TBL_MinRow
```

```
        While SalTblFindNextRow(hWndGloDetailTable,nDetailTblRow,0,0)
          Call SalTblSetContext(hWndGloDetailTable,nDetailTblRow)
          If colItemType > 2 and colItemType < 10 and colFrom = NULL
            Set nAttrSummaryTblRow = SalTblInsertRow(hWndForm,TBL_MaxRow)
            Call SalTblSetContext(hWndForm,nAttrSummaryTblRow)
            Call SalTblSetRowFlags(hWndForm,nAttrSummaryTblRow,ROW_New,FALSE)
            Set colCompTblRow = nDetailTblRow
            Set colCompValue = hWndGloDetailTable.colName
            Set colCompItemType = hWndGloDetailTable.colItemType
            If nGloRelatedType[nGloCompNumber] = ENTITY_CrossProduct
              Set strCompDef = hWndGloDetailTable.colXRel
            Else
              Set strCompDef = hWndGloDetailTable.colCRel
            If SalStrScan(strCompDef,'#'||strCompNumber) != -1
              Call
SalStrMid(strCompDef,SalStrScan(strCompDef,'#'||strCompNumber),SalStrLength(strCompNumber)+7,strCompDef)
            Else
              Set strCompDef = NULL
            If SalStrScan(strCompDef,'L') != -1
              Set colLowest = 'Yes'
            Else
              Set colLowest = 'No'
            If SalStrScan(strCompDef,'H') != -1
              Set colHighest = 'Yes'
            Else
              Set colHighest = 'No'
            If SalStrScan(strCompDef,'A') != -1
              Set colAverage = 'Yes'
            Else
              Set colAverage = 'No'
            If SalStrScan(strCompDef,'T') != -1
              Set colTotal = 'Yes'
            Else
              Set colTotal = 'No'
            Set bCompAttributes = TRUE
        Call SalWaitCursor(FALSE)
        If bCompAttributes
          Call SalSendMsg(hWndForm,SAM_Click,0,0)
        Else
          Call SalMessageBox('No numeric attributes have been defined for '||frmObjMgr.strO_ID||'.',
            APPNAME,MB_Ok|MB_IconAsterisk)
      On MSG_Check
        !
        ! Updates the dlgDetails attribute summary column (colCRel or colXRel) to reflect changes made
          to summaries.
        !
        Set nAttrSummaryTblRow = TBL_MinRow
        While SalTblFindNextRow(hWndForm,nAttrSummaryTblRow,0,0)
          Call SalTblSetContext(hWndForm,nAttrSummaryTblRow)
          Call SalTblSetContext(hWndGloDetailTable,colCompTblRow)
          If nGloRelatedType[nGloCompNumber] = ENTITY_CrossProduct
            Set strCompDef = hWndGloDetailTable.colXRel
          Else
            Set strCompDef = hWndGloDetailTable.colCRel
          If SalStrScan(strCompDef,'#'||strCompNumber) != -1
            Call SalStrReplace(strCompDef,
                SalStrScan(strCompDef,'#'||strCompNumber),
                SalStrLength(strCompNumber)+8,NULL,strCompDef)
          Call SalStrRight(strCompDef,1,strComma)
          If strComma != ','
            Set strCompDef = strCompDef||','
          Set strCompDef = strCompDef||'#'||strCompNumber||':'
          If colLowest = 'Yes'
            Set strCompDef = strCompDef||'L'
          Else
            Set strCompDef = strCompDef||'-'
          If colHighest = 'Yes'
            Set strCompDef = strCompDef||'H'
          Else
```

```
            Set strCompDef = strCompDef||'-'
          If colAverage = 'Yes'
            Set strCompDef = strCompDef||'A'
          Else
            Set strCompDef = strCompDef||'-'
          If colTotal = 'Yes'
            Set strCompDef = strCompDef||'T'
          Else
            Set strCompDef = strCompDef||'-'
          Set strCompDef = strCompDef||'-'
          If nGloRelatedType[nGloCompNumber] = ENTITY_CrossProduct
            Set hWndGloDetailTable.colXRel = strCompDef
          Else
            Set hWndGloDetailTable.colCRel = strCompDef
        If nGloRelatedType[nGloCompNumber] = ENTITY_CrossProduct
          Set strCompDef = strGloObjXRel[nGloDetailObject]
        Else
          Set strCompDef = strGloObjCRel[nGloDetailObject]
        If SalStrScan(strCompDef,strCompNumber) != -1
          Call SalStrReplace(strCompDef,
              SalStrScan(strCompDef,strCompNumber),
              SalStrLength(strCompNumber)+1,NULL,strCompDef)
        If cbCounts
          If strCompDef != NULL
            Set strCompDef = strCompDef||','
          Set strCompDef = strCompDef||strCompNumber
        If nGloRelatedType[nGloCompNumber] = ENTITY_CrossProduct
          Set strGloObjXRel[nGloDetailObject] = strCompDef
        Else
          Set strGloObjCRel[nGloDetailObject] = strCompDef
    Pushbutton: pbOk
      Title: Ok
      Window Location and Size
        Left:  2.657"
        Top:  3.619"
        Width:  1.229"
        Height: 0.298"
      Visible? Yes
      Keyboard Accelerator: Enter
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Message Actions
        On SAM_Click
          Call SslSendMsg(tblSummaryDetails,MSG_Check,0,0)
          Call SalEndDialog(hWndForm,TRUE)
    Pushbutton: pbCancel
      Title: Cancel
      Window Location and Size
        Left:  3.957"
        Top:  3.619"
        Width:  1.229"
        Height: 0.298"
      Visible? Yes
      Keyboard Accelerator: Enter
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Message Actions
        On SAM_Click
          Call SalEndDialog(hWndForm,FALSE)
Window Variables
  Boolean: bCompAttributes
  Number: nAttrSummaryTblRow
  Number: nDetailTblRow
  Number: nListCount
  Number: nSettings
  String: strComma
  String: strCompDef
```

```
      String: strCompNumber
      String: strCompObjectID
      String: strCountDef
      String: strObject
      String: strObjList[5]
      String: strObjLoc
      Window Handle: hWndSummaryFocus
    Message Actions
      On SAM_Create
        Call SalWaitCursor(TRUE)
        If nGloRelatedType[nGloCompNumber] = ENTITY_Composite
          Call SalSetWindowText(hWndForm,'Composition '||strGloO_ID[nGloRelated[nGloCompNumber]]||' Defined For
'||frmObjMgr.strO_ID)
        Else
          Call SalSetWindowText(hWndForm,'Cross Product '||strGloO_ID[nGloRelated[nGloCompNumber]]||' Defined For
'||frmObjMgr.strO_ID)
        Call SalPostMsg(tblSummaryDetails,MSG_Load,0,0)
        Call SalPostMsg(tblSummaryDetails,MSG_Created,0,0)
      On SAM_Close
        Call SalSendMsg(pbCancel,SAM_Click,0,0)
  Dialog Box: dlgTypeSpecifics
    Title: Type Specifics
    Display Settings
      Visible at Design time? No
      Type of Dialog: Modal
      Window Location and Size
        Left:  0.625"
        Top:  0.625"
        Width:  6.8"
        Height: 1.25"
      Absolute Screen Location? Yes
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Default
    Contents
      Data Field: dfDescription1
        Data
          Maximum Data Length: Default
          Data Type: String
          Editable? No
        Display Settings
          Window Location and Size
            Left:  0.186"
            Top:  0.19"
            Width:  4.429"
            Height: 0.25"
          Visible? Yes
          Border? No
          Justify: Left
          Format: Unformatted
          Country: Default
          Font Name: Default
          Font Size: Default
          Font Enhancement: Default
          Text Color: Default
          Background Color: Default
        Message Actions
      Data Field: dfDescription2
        Data
          Maximum Data Length: Default
          Data Type: String
          Editable? No
        Display Settings
          Window Location and Size
            Left:  0.186"
            Top:  0.524"
            Width:  4.429"
```

Height: 0.25"
Visible? Yes
Border? No
Justify: Left
Format: Unformatted
Country: Default
Font Name: Default
Font Size: Default
Font Enhancement: Default
Text Color: Default
Background Color: Default
Message Actions
Data Field: dfLength
Data
Maximum Data Length: 3
Data Type: Number
Editable? Yes
Display Settings
Window Location and Size
Left: 4.686"
Top: 0.155"
Width: 0.429"
Height: 0.25"
Visible? Yes
Border? Yes
Justify: Right
Format: Unformatted
Country: Default
Font Name: Default
Font Size: Default
Font Enhancement: Default
Text Color: Default
Background Color: Default
Message Actions
Data Field: dfScale
Data
Maximum Data Length: 2
Data Type: Number
Editable? Yes
Display Settings
Window Location and Size
Left: 4.686"
Top: 0.488"
Width: 0.429"
Height: 0.25"
Visible? No
Border? Yes
Justify: Right
Format: Unformatted
Country: Default
Font Name: Default
Font Size: Default
Font Enhancement: Default
Text Color: Default
Background Color: Default
Message Actions
Pushbutton: pbOk
Title: Ok
Window Location and Size
Left: 5.286"
Top: 0.155"
Width: 1.2"
Height: 0.298"
Visible? Yes
Keyboard Accelerator: Enter
Font Name: Default
Font Size: Default
Font Enhancement: Default
Message Actions

```
        On SAM_Click
          |
          | Verifies that an attribute's length and scale (in the case of dEcimals) has been declared properly.
          !
          If dlgDetails.strCheck = 'E'
            If dfLength < 0 or dfLength > 15
              Call SalMessageBox('Number of positions left of the decimal must be between 0 and 15.',
                  APPNAME,MB_Ok|MB_IconAsterisk)
              Call SalSetFocus(dfLength)
              Return FALSE
            If dfScale < 0 or dfScale > 15-dfLength
              Call SalNumberToStr(15-dfLength,0,strLength)
              Call SalMessageBox('Both of these numbers added may not exceed 15.  Number of positions right of the
decimal must be between 0 and '||strLength||'.',
                  APPNAME,MB_Ok|MB_IconAsterisk)
              Call SalSetFocus(dfScale)
              Return FALSE
            If dfLength = 0 and dfScale = 0
              Call SalMessageBox('At least one of these values must be greater than 0.',
                  APPNAME,MB_Ok|MB_IconAsterisk)
              Call SalSetFocus(dfLength)
              Return FALSE
          Else
            If dfLength < 1 or dfLength > 254
              Call SalMessageBox('Length for a character field must be between 1 and 254.',
                  APPNAME,MB_Ok|MB_IconAsterisk)
              Call SalSetFocus(dfLength)
              Return FALSE
          Set dlgDetails.nLength = dfLength
          Set dlgDetails.nScale = dfScale
          Call SalEndDialog(hWndForm,TRUE)
      Pushbutton: pbCancel
        Title: Cancel
        Window Location and Size
          Left:  5.286"
          Top:  0.488"
          Width:  1.2"
          Height: 0.298"
        Visible? Yes
        Keyboard Accelerator: Esc
        Font Name: Default
        Font Size: Default
        Font Enhancement: Default
        Message Actions
          On SAM_Click
            Call SalEndDialog(hWndForm,FALSE)
    Window Variables
      String: strLength
    Message Actions
      On SAM_Create
        |
        | Show length and scale (in the case of dEcimal) fields for user to enter.
        !
        If dlgDetails.strCheck = 'C' or dlgDetails.strCheck = 'V'
          Set dfDescription1 = 'Maximum Number Of Characters In Character Field:'
          If dlgDetails.nScale > -1 or dlgDetails.nLength = -1
            Set dfLength = 0
            Set dlgDetails.nLength = -1
          Else
            Set dfLength = dlgDetails.nLength
          Call SalSetWindowText(hWndForm,'Parameters For Character Fields')
        Else
          Set dfDescription1 = 'Maximum Number Of Positions Left Of The Decimal:'
          Set dfDescription2 = 'Maximum Number Of Positions Right Of The Decimal:'
          If dlgDetails.nScale = -1
            Set dfLength = 0
            Set dfScale = 0
            Set dlgDetails.nLength = -1
          Else
```

```
            Set dfLength = dlgDetails.nLength
            Set dfScale = dlgDetails.nScale
          Call SalSetMaxDataLength(dfLength,2)
          Call SalShowWindow(dfScale)
          Call SalSetWindowText(hWndForm,'Parameters For Decimal Fields')
        Set dlgDetails.bSpecificsDialog = TRUE
      On SAM_Destroy
        Set dlgDetails.bSpecificsDialog = FALSE
      On SAM_Close
        Call SalSendMsg(pbCancel,SAM_Click,0,0)
Dialog Box: dlgWait
  Title: OSAM* Designer
  Display Settings
    Visible at Design time? No
    Type of Dialog: Modeless
    Window Location and Size
      Left:  0.625"
      Top:  0.625"
      Width:  4.157"
      Height: 0.905"
    Absolute Screen Location? Yes
    Font Name: Default
    Font Size: Default
    Font Enhancement: Default
    Text Color: Default
    Background Color: Default
  Contents
    Background Text: Loading OSAM* Designer...Please Wait.
      Window Location and Size
        Left:  0.757"
        Top:  0.214"
        Width:  3.357"
        Height: 0.167"
      Visible? Yes
      Justify: Left
      Font Name: Default
      Font Size: Default
      Font Enhancement: Default
      Text Color: Default
      Background Color: Default
    Picture: picIcon
      Window Location and Size
        Left:  0.1"
        Top:  0.083"
        Width:  0.571"
        Height: 0.464"
      Visible? Yes
      File Name: osam.ico
      Storage: Internal
      Fit: Size for Best Fit
      Scaling
        Width:  100
        Height:  100
      Corners: Square
      Border Style: Solid
      Border Thickness: 1
      Tile To Parent? No
      Border Color: Default
      Background Color: Default
      Message Actions
Window Variables
Message Actions
  On SAM_Close
    !
    ! Display wait box while OSAM* Designer loads.
    !
    Return FALSE
```

VITA

Paul Francis Rabuck earned his Bachelor of Science degree from the University of North Florida in May of 1989; and expects to receive his Master of Science degree in Computer and Information Sciences from the University of North Florida in December of 1992. Dr. Susan R. Wallace is serving as Mr. Rabuck's thesis advisor.

Mr. Rabuck is a cofounder of Noe & Associates, a local software company specializing in client-server applications on PC LANs employing Microsoft Windows as a front-end. He is currently working in Columbia, South Carolina as a consultant with Noe & Associates for Strategic Data Systems, Inc., a company which specializes in property and casualty insurance computer systems. Prior to founding Noe & Associates, Mr. Rabuck worked for three years at American Surety and Casualty, a Jacksonville based insurance company, where he designed and implemented their current claims system.

Mr. Rabuck continues to work with GUIs and hopes to start working with the imaging and multimedia technologies as they relate to the user interface. His interests include music, swimming, and writing.