What is a Database?

- A database is simply a collection of organized information, usually as a set of related lists of similar entries. The data is often organized so that it is easily accessible.
- The following are examples of databases that we use often:
  - address book
  - dictionary
  - telephone book

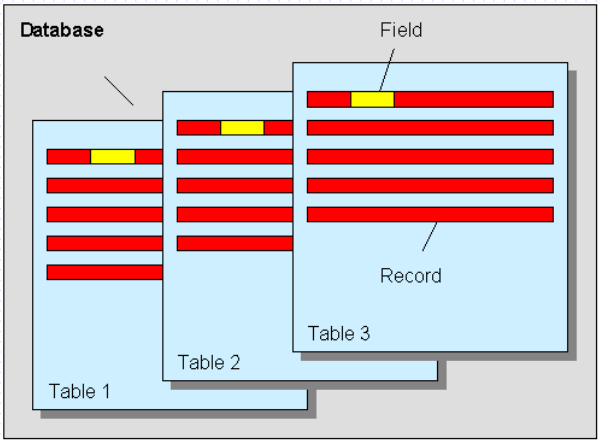
Who uses Databases?

- Large databases are used all around the world:
  - Police
    - criminal records
  - Department of motor vehicles
    - driving history
    - driving records
  - Banks
    - all customers and their transactions
  - Government
    - statistics
    - election information
    - tax records :(

Databases Basics

- A database consists of a number of interrelated tables.
- Each table has a number of records which are used to represent real world objects.
  - For example, the police may have a record for each criminal that has ever been arrested (i.e., the "rap"-sheet)
- Each record has a number of fields which are data items used to specify a characteristic of the record.
- Examples of fields are:
  - name
  - employee number
  - address
  - prior convictions etc…

Example



Primary Keys

- Each record in a table MUST be uniquely identified by a particular value in one of its fields.
- In other words, different records in a table always have unique values for this field.
- This field is called the primary key of the table.
- A person's name may be enough to uniquely identify this person, but then again, many people can have the same name.
- Sometimes, we chose to assign unique numbers to people in order to uniquely identify them (e.g., employee number, social insurance number, student number etc…)

Composite Keys

- Sometimes, we may also use more than one field to identify a record in a table.
- In this case, a set of keys are used.
- This set of keys altogether is call a composite key.

Structures of Tables

- The specification of fields of the records in a table is called the structure of the table.
- The structure specifies the type (or kind of data) for each field of each record.
- Different types of fields are treated differently when they are entered, displayed, or used. Examples of types are:
  - integer
  - currency
  - real number
  - time
  - date

Databases Management Systems

- A Database Management System, or DBMS, is a computer application that allows you to work with databases on a computer.
- A database management system allows you to easily…
  - Create/Delete tables
  - Modify tables: (e.g., adding, deleting, editing and rearranging records, changing the table structure)
  - Retrieve data from a table or a number of tables: (e.g., finding and displaying an individual record, answering queries (i.e., displaying specified field of records that satisfy a set of specified conditions)
  - Create reports: (e.g., create formatted output of a list of specified fields of records that satisfy a set of specified conditions)

RDBMS

- A database management system is a Relational Database Management System (RDBMS) if different tables are related to each other by common fields, so that information from several tables can be combined.
- For example, police detectives may cross reference phone records or driving records to make a connection or relationship between two or more criminals.

Operations on Databases

- There are 3 basic things that you do with a DBMS:
  - Design: You must first create the database by defining the tables which specifies what is to be stored.
  - Data Entry: Once the tables have been created, someone has to enter ALL the data (i.e., information)
  - Queries: Once we have the database with data entered, we can then ask questions (also known as Queries) about the data.

The Video Store Example

- We will go through an example – to build a database for a video store.
- We'll have 3 tables in our database:
  - A video table;
  - A customer table; and
  - A rental table

The Video Table

- **Video ID** (primary key)
- Title
- Price
- Quantity
- Category

The Video Table

Video ID	Title	Price	Quantity	Category
3445	Rumble in the Bronx	$3	4	Action
5644	Halloween	$4	6	Horror
3566	The Matrix	$4	10	Action
6576	The Nutty Professor	$3	4	Comedy
2395	Gone With the Wind	$2	1	Musical
7440	Toy Story	$2	15	Adventure
8354	The Holy Grail	$2	1	Comedy
1298	My Best Friends Wedding	$4	8	Drama

The Customer Table

- **Membership Number** (primary key)
- Name
- Address
- Phone Number

The Customer Table

Member #	Name	Address	Phone #
J4234	Rob Banks	Hollywood, California	555-1224
L4523	Ben Dover	New York, New York	555-2335

The Rental Table

- **Membership Number** (composite key)
- **Video ID** (composite key)
- Date Rented
- Date Due
- Returned Yet?

The Rental Table

Member #	Video ID	Date Rented	Date Due	Returned
J4234	7440	11/4/2003	11/5/2003	No
J4234	8354	11/4/2003	11/5/2003	No
L4523	1998	11/1/2003	11/3/2003	Yes

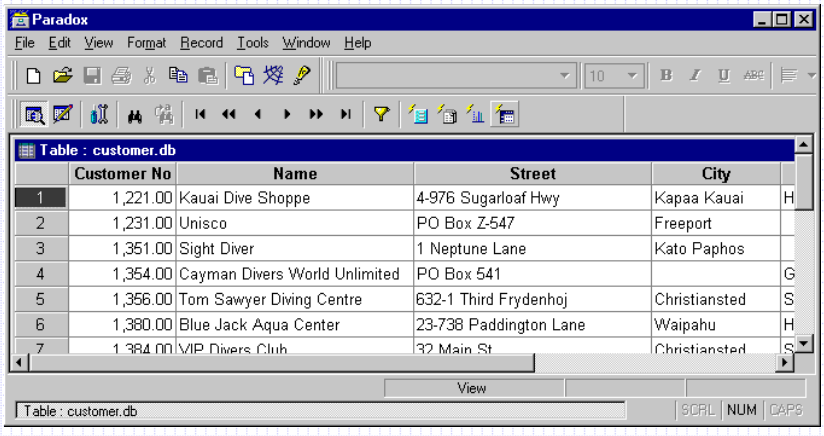
Introduction to Paradox

- Accessing Paradox:
  - Choose from the start menu: Programs - Corel - WordPerfect Office 2000 - Paradox 9. (Note that these directories may differ depending on how the software was installed).

The Paradox Window

- When Paradox starts, you see the Paradox window and the desktop. The Paradox window has the components common to most window applications:
  - Title bar - shows “Paradox 7” and the name of the file that you are working on.
  - Menu bar - with menus File, Edit, View, Window, and Help.
  - Tool bar - with shortcut button to be addressed later. The shortcut buttons will change according to the type of the work that your are currently doing on the desktop.
  - Status bar - at the bottom of the window showing the current status of the application.

The Paradox Window



Working Directory

- **Always set the working directory at the beginning of a Paradox session!**
- To set the working directory, select Working Directory… from the File menu to open a dialog box.
- You may enter a new name (other than the default Work) to be an alias of the working directory.
- Next time, you may key in the alias to access this directory instead of type the full path name.

Project Viewer

- There is a Project Viewer window in Paradox that allows you to view certain files of different types such as Tables, Forms, Queries etc…
- It is essentially a custom file browser. Within it you can select the working directory as well, by clicking on the … button in its toolbar.
- If the Project Viewer window is not open, select Project viewer from the Tool menu to open it.

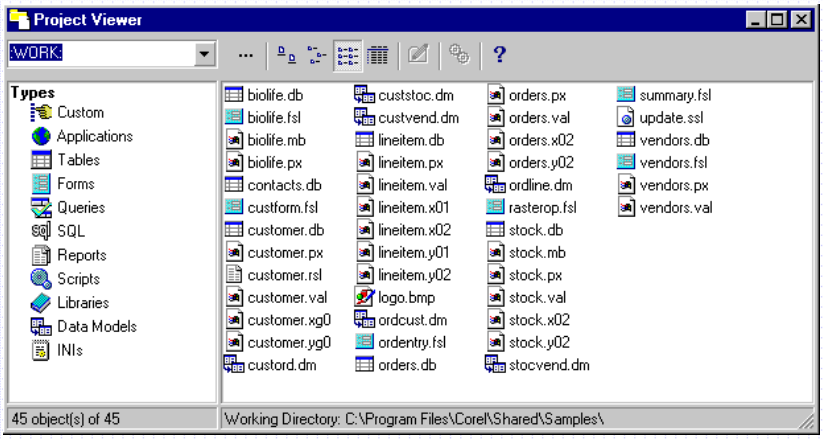
Project Viewer

- In the Project Viewer window, you have to set the working directory first.
- If the working directory is not set properly, your file may be saved to a default directory that you are not aware of, so that you cannot find your file next time you want to open it.
- In Paradox, you may have files as tables, queries, form, or reports.
- These are referred to as Paradox Objects.

Project Viewer

- The Project Viewer has two panels
  - the left panel shows a number of categories of objects
  - the right panel shows the files in the category that you have in your working directory.
- You may open a file by double clicking on the file name.

Project Viewer



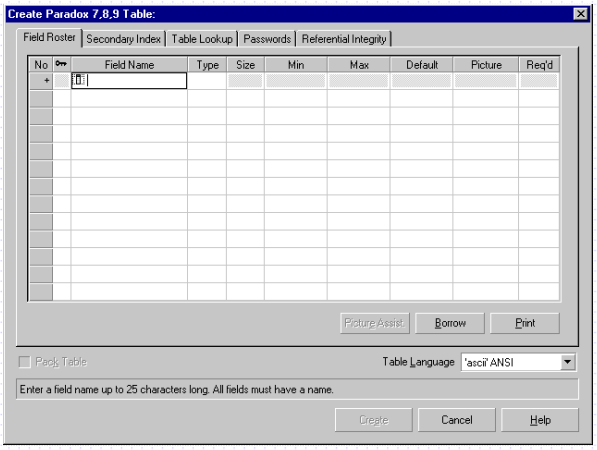
Getting Help and Exiting

- Help
  - The help system is accessed by the help menu.
  - Paradox also has a context sensitive help system.
  - Move the mouse pointer to a component on the screen, and press F1. A help window related to the component appears.
- Closing file and exiting Paradox:
  - At the end of a session, use the menu sequence File-Close to close the open files and File-Exit to quit Paradox.

Creating Tables

- To create a new table, right click Tables in the left panel of the Project Viewer.
- Then choose New… From the New Table dialog box, choose Blank.
- From the Table Type dialog box, choose the format of the file, usually Paradox 7,8,9. Then the "Create Paradox 7,8,9 Table:" dialog box opens …

Creating Tables



Defining the Structure of a Table

- The "Create Paradox 7,8,9 Table:" dialog box contains everything you need to set up a table.
- It has five tabbed pages: Field Roster, Secondary Index, Table Lookup, Passwords, and Referential Integrity.
- By default, the Field Roster page shows first.
- At the bottom of the field roster, there is an area displaying instructions. You may to refer to this whenever you get stuck and are unsure what to do.

Defining the Structure of a Table

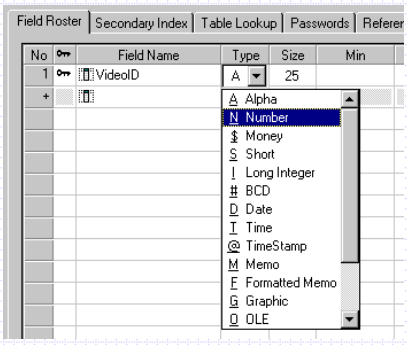
- The first column in the Field Roster is the order number of the fields, which is added automatically by Paradox.
- The second column holds a symbol to indicate whether this field is a key of the record.
  - The key field(s) must be the first field(s) in the table.
  - To indicate that a field is a key field (or to remove the key symbol from a field), click the box in the second column or press the space bar.

Defining the Structure of a Table

- The third column holds the Field Name of the fields:
  - the names can be up to 25 characters in length
  - duplicate field names are not allowed in the same table
  - spaces can be used but not as the first character
  - almost any characters can be used except [ ], ( ), { }, and a single $.
- The fourth column is the Type of a field.
  - Paradox data entries may have a number of different types.
  - When the Type column of a field is highlighted, a list of all possible types appears.

Common Field Types

- Alpha - any combinations of characters up to 255 long.
- Number - decimal numbers
- Money - shows a dollar sign
- Short - small integers
- Long Integer- large integers
- Date - a date
- Time - a time
- Memo - a long text paragraph
- Formatted Memo - memo with format
- Graphic - any object or image that can be pasted from the Windows Clipboard.
- Logical - true or false, yes or no, etc…



Defining the Structure of a Table

- The fifth column is the Size of the field.
  - The size is the maximum number of characters to be displayed.
  - The size of a field with type alpha or memo must be specified.
  - For a field of type formatted memo and graphic the size is optional.
  - The size of a field with the other types are predetermined, so you don't get to set the size (e.g., Money, Date…)

Defining the Structure of a Table

- The Max and Min columns in the Field Roster can be used to give the field a minimum value and/or a maximum value.
  - This is very useful, since it provides a kind of error checking when the user enters data.
  - For example if the maximum price of a video is $5 then we can set the maximum to 5 and this will prevent the data entry person from entering anything greater than 5. Sometimes for example, someone may hit the 4 key as well as the 5 key and so numbers like $45, $54, $44, $55 may be entered accidentally.
  - By setting the maximum, this is prevented.

Defining the Structure of a Table

- The Default column in the Field Roster can be used to give the field a default value.
  - The default value is the value that appears in the field when the user creates a new record.
  - It is useful since it can speed up the data entry process.
  - For example, if most movies at a video store are Action movies, we can set the default category to be Action.
  - Then when typing in movie information, whenever we enter an Action movie, we don't have to set this field since it will already be set to Action. It saves time.
  - However, we still have to change this value for movies such as comedies or dramas…

Defining the Structure of a Table

- The picture of a field is a predefined format for the data to be entered in this field.
  - The picture column in the Field Roster is used to specify the format of a field.
  - Basically, we get to specify exactly what is expected in terms of letters, digits and special characters from the data to be entered.
  - This specification forms a kind of "template" which the data being entered must match.
  - If the data entered to a field violates the picture's template, it will not be accepted.

Picture Codes

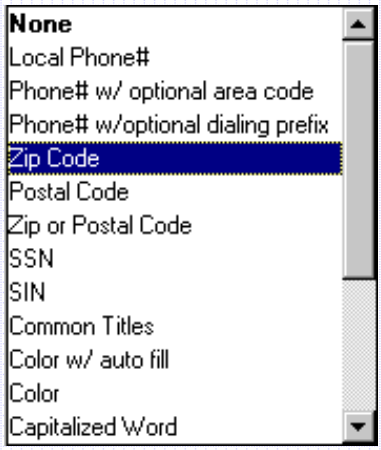
- # a digit
- ? a letter
- & a letter, converted to upper case
- @ Any character
- ! Any character; if it is a letter, converted to upper case
- * the character that follows can be repeated for any number of times or a specified number of times
- ; indicates that the character that follows is just an ordinary character but not a picture symbol
- [ ] characters included are optional
- { , } characters included are acceptable

Examples

- [(###)]###-#### phone number with optional area code
- &#& #&# post code
- Yes, No This field has only two possible values: “Yes”, or “No”
- &*@ Start with a character (converted to uppercase) then followed by any number of any characters.
- ;&## An ampersand followed by two digits
- {+,-}*#[.]*# Start with either + or -, followed by a number of digits, with optionally a dot somewhere.

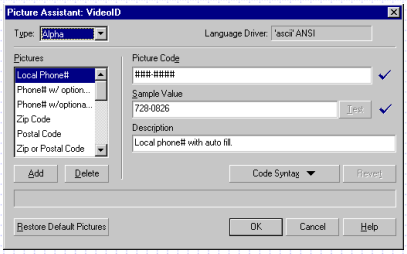
Predefined Pictures

- You may select from a predefined set of picture types by clicking in the cell under the picture column.



Make Your Own Pictures

- You may also make your own picture type by selecting Picture Assistant from this list which will bring up a dialog box.
- You may add or delete pictures from the list and define your own type of picture to be used as often as you wish.



Defining the Structure of a Table

- The last column in the Field Roster is the Req'd column.
- Here, you can "check off" any fields that are required to be entered during the data entry process.
- Thus, when someone is entering the data, if there is no value for this field, Paradox will not allow the record to be saved.

Example – Defining the Video Table

Field Roster | Secondary Index | Table Lookup | Passwords | Referential Integrity

No	Field Name	Type	Size	Min	Max	Default	Picture	Req'd
1	Video ID	I		0	9999			☐
2	Title	A	40					☐
3	Price	$		2	5	3		☐
4	Quantity	S		1	100	1		☐
5	Category	A	3				Category	☐
+								

Picture Assist. | Borrow | Print

Restructuring the Tables

- Once you have completed a table, you can still make changes.
- To change the structure of a table, select table in the left panel of the Project Viewer, and right click the table name on the right panel of Project Viewer.
- In the pop up menu, choose Restructure. Then the create table dialog box appears.
- You may add, delete, or modify the fields, and save it again.

Restructure Button

- There is also a Restructure button in the tool bar.
- Select a table and click on this button, you will see the "create paradox 7,8,9 table dialog box". Then you may change the structure of the table.
  - To correct errors in a field definition, make sure that the cell with the mistake is highlighted. Click where you want to start correcting. Then use backspace or Delete key to erase the error and type in the correction.
  - To delete a field, make the field highlighted, and press Ctrl-Delete.
  - To insert a field, click the number of the field after the new field. Press the Insert key. Type in the new field in the blank row.
  - To change the order of fields, click the number of a field and drag it to a new position.

Saving a Table Structure

- After the fields of a table are defined, click the Create button.
- Then a Save Table As dialog box appears. This dialog box shows the folders in your working directory.
- You may select a folder (otherwise, your table will be saved directly under the working directory).
- You should also specify a name of the table.
- The default extension of a Paradox 7 table is ".db".
- Then you may move to a blank table immediately to enter the data by checking the Display Table option in the save-as dialog box.

Data Entry

- A table has two different modes: The Edit mode and the View mode.
  - You can switch back and forth between view and edit mode through the use of the two buttons (view) and (edit).
  - You may also press F9 to toggle between these two modes.
  - The current mode is indicated in the status bar.
- In the edit mode, the status bar also indicates "locked". This means that the table is "under construction", so that no other user can change it at the same time.

Data Entry

- In a blank table, the first column of the first record is highlighted.
- After a value is entered into a cell, press Tab (or Enter, or use the right arrow key) to move to the next cell in the same column.
- After values are entered into all cells in a row, the first column of the next row is highlighted.
- If a field in a record is the same as the previous record, you may use the key combination Ctrl-D to enter.

Changing Records

- If any mistake is made, you may use the arrow keys to move the highlighted cell to where you want to correct. Then you may enter the correct data to overwrite the mistake.
- Or, double click it or press F2 to have an insertion point. In this way, you may correct a part of it without having to re-type the entire entry.
- If an entire record is to be deleted, use Ctrl-Delete.
- To change the display format of an entry, right click on the entry, then choose Properties-Format.

Insert Records

- To insert a record to the end of a table, click the last field of the last record, and press Enter.
- You may also use the Record menu to do insertion and deletion.

Example

- Now let's create the video tables of the Video store example. The data are as follows:

Video ID	Title	Price	Quantity	Category
3445	Rumble in the Bronx	$3	4	Action
5644	Halloween	$4	6	Horror
3566	The Matrix	$4	10	Action
6576	The Nutty Professor	$3	4	Comedy
2395	Gone With the Wind	$2	1	Musical
7440	Toy Story	$2	15	Adventure
8354	The Holy Grail	$2	1	Comedy
1298	My Best Friends Wedding	$4	8	Drama

Dynamic Record Updating

- The table is saved automatically when the data is entered.
- This is called dynamic record updating and the big advantage is that if something bad happens (such as the power goes out), we do not lose our data records that we spent a long time entering.
- After all records are entered, click the Edit Data button again to exit the edit mode.

Records in the Tables

- The records in a table are arranged automatically in an increasing order of the key.
- The first column of the table is the record number of the records.
- As you see, they are added by Paradox automatically.
- We can create the customer table and the rental table of the video store in the same way.
- The following slide show the completed Video Table.

Example – Video Table

Table : video.db

	Video ID	Title	Price	Quantity	Category
1	1298	My Best Freind's Wedding	$4.00	8	DRA
2	2395	Gone With the Wind	$2.00	1	DRA
3	3445	Rumble in the Bronx	$3.00	4	ACT
4	3566	The Game	$4.00	10	DRA
5	5644	Super Cop	$4.00	6	ACT
6	6576	The Nutty Professor	$3.00	4	COM
7	7440	Halloween	$2.00	1	HOR
8	8354	The Holy Grail	$2.00	1	COM
9					

Referential Integrity

- The Referential Integrity check is used to ensure the consistency among different tables.
- That is, when entering data into the database, it can help catch errors.
  - For example, when filling in data for the rental table, it is important to make sure that the VideoID as well as the MemberID are both valid IDs.
  - If a mistake is made, this could cause significant problems.

Referential Integrity

- We cannot check here to make sure that the proper VideoID or MemberID was entered, but we can at least catch situations in which an impossible VideoID or Member ID has been entered.
- We can check to make sure that there is a member with the given ID in the Member table and also to make sure that there is a Video with the given ID in the Video table.

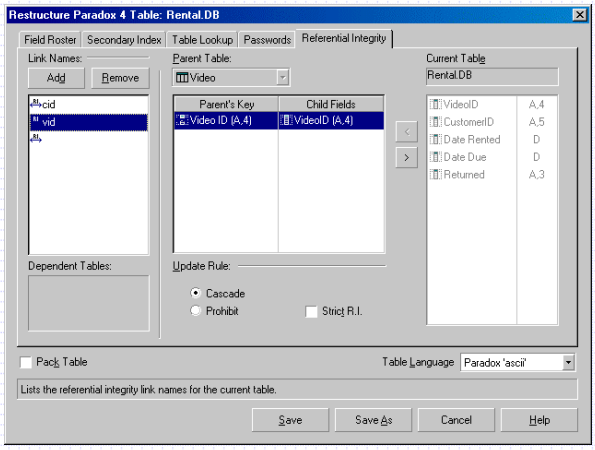
Foreign Fields

- A table (the child table) may have a field which is also a field of another table (the parent table).
- Such a field is called a foreign field.
- A foreign field must exist in the parent table. Otherwise, it will not be accepted.
- We will assume for our example that the Rental table is the child table and the parent tables are the Video and Customer tables.

Defining Foreign Fields

- To define the referential integrity, open the child table. Click on restructuring button to open the Create Paradox 7,8,9 Table dialog box… then click on the Referential Integrity tab.

Defining Foreign Fields



Creating Referential Integrity Links

- Click Add button, and enter a name of the referential integrity link in the list below the add button (e.g., above we have two links, “cid” and “vid”).
- Choose the parent table from the Parent Table drop down list. The parent table should pertain to the table that is to be used to match the key. For example, to match the CustomerID in the rental table to the CustomerID of the Customer table, the parent table would be the Customer table.
- Select the field in the parent table that we are trying to match to.

Creating Referential Integrity Links

- From the Current Table field list on the right, select the field that matches the field that you’ve chosen from the parent table.
- Click the topmost arrow button (i.e., the one that looks like a < sign). This will transfer the field to the Child Fields list
- Set the Update Rule: by selecting the appropriate radio button.
  - This specifies what Paradox should do if a violation occurs.
  - If Prohibited is selected, then the value in the parent table cannot be changed if there is a match in the child table.
  - If Cascade is selected, any change made to the parent table will cause the same change to the matched field of the child table.

Example

- In our Video Store Example, we may link the CustomerID and the VideoID fields of the rental table to the same fields in the Video table and the Customer table.
- See what happens if a new record is entered in the rental table that violates the referential integrity conditions.
- Also see what happens if the VideoID field of a record in the Video table changes.

Additional Formatting

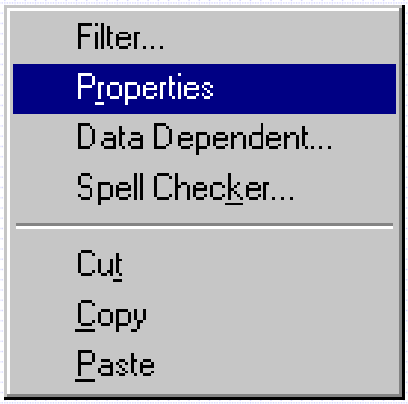
- You may change the format of a table using these two options:
  - Column Width
  - Other Formatting

Changing Column Width

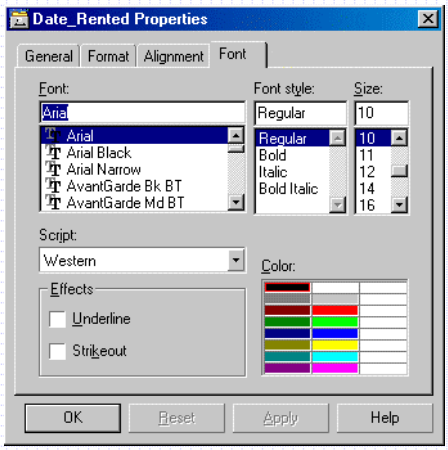
- You may use direct manipulation to change the column width or change the order of the columns.
- When the mouse pointer moves to the boundary of a field, it becomes a horizontal arrow pointing towards both directions. By dragging the mouse pointer, you may change the width of a field.
- When the mouse moves to the field names in the first row of the table, it changes its shape indicating you may change the order of the columns.
- To move a column to the right of another column, drag the header of the former over the header of the latter.

Other Formatting

- The Object Inspector is a pop up menu activated when you right click at a part of the table.
- Choose the **Properties** command from the menu, you have a dialog box to set up the format of the object.



Object Properties



Reports

- A report is a formatted table of data retrieved from a database, which can be printed and kept as a permanent copy.
- Paradox provides a Report Expert to create a report with a customized format.
- To activate the Report Expert, choose Experts… from Tools menu, then activate Report Expert.
- Following the instructions in a sequence of windows, you may create a report with nice format.

Reports

- Another way to create a report is to choose Report from New option of the File menu, then click Blank.
- An easier way to create a simple report is to use QuickReport.
  - This simple report shows all records in a table and includes a header, with the current date, the table name, and the page number.
  - To create a quick report, select a table, then click the Quick Report button .

Forms

- A form is a special window that display one record at a time.
- When a record has many fields, the table view may not be able to show all fields on a screen.
- In the form view, each field is shown line by line, so that you may see more fields, or all fields, on a single screen.
- The Quick Form option in Tools-Quick Design can be used to create a simple form.

Form Expert

- To customized the format of a form, you may use the Form Expert. To activate the Form Expert, choose Expert button in Tools menu, then choose Form Expert.
- The Expert will prompt you to choose from a number of formats.
- You will be able to display only selected fields, and design the layout of the form.
- Different people using the database may have different purposes.
- You can design different forms for a table for different needs.

Other Way to Create Forms

- You may also create a new form from the menu sequence File-New-Form.

What are Queries?

- Once a database has been created and data has been entered into it, we want to be able to get this information back out again.
- A query is the question (or command) that we send to the database in order to select and view the data that we want to see.
- For instance, when the police pull you car over to the side of the road, they ask their database for any information about you and/or your car.

Queries

- A query is used as a way to retrieve and display a list of selected fields from selected records that satisfy some condition.
- The selection criteria are specified by a query image.
- After the query image is defined, you may run the query to get the results.
- The result of running a query is an answer table, which is a list of the selected fields from the selected records.

Creating Queries

- To start creating a query, do one of the following:
  - Select Query… from the New option in the File menu, or
  - right click on Queries in the Project Viewer and then select New.
- Then a dialog box gives you a list of tables. Double click on the name of table (or tables) for which you want to create a query. Then a query image window of this table(s) appears.

Query Image Window

Run Query Button

- The query image window shows all fields in this table.
- Complete the definition of the query image and click on the Run Query Button in the tool bar.
- Paradox creates an answer table for this query.

Creating Query Images

- There are two steps in creating a query image:
  - Selecting fields to be displayed
  - Selecting records to be displayed

Selecting Field to Be Displayed

- Under the name of every field, there is a check box.
- Checking a box means that this field will be displayed in the answer.
- The leftmost check box is used to select all fields. If it is checked, then all fields will be displayed.

Types of Checks

- For each field checkbox, there are four kinds of checks which can be used.
- If you right-click on the checkbox, you will see the different checks that can be used.
- A simple left click in a check box puts a plain check in the check box.

Types of Checks

- A plain check displays only unique values of the field and sorted in an ascending order.
- A check plus displays all records, including duplicates, in the order of the records in the table.
- A check descending displays is the same as the plain check but the unique values are sorted in a descending order.
- A group check displays a group of records (we do not cover this in this course).

Examples

- The following slides show the results when applying different checkmarks on the Video table:
  - Select price with plain check
  - Select price with check descending
  - Select price with check plus
  - Select category with plain check
  - Select category with check plus
  - Select title and category with plain check

Select Price With Plain Check

	Price
1	$1.00
2	$2.00
3	$3.00
4	$4.00
5	$5.00
6	$6.00

Select Price With Check Descending

	Price
1	$6.00
2	$5.00
3	$4.00
4	$3.00
5	$2.00
6	$1.00

Select Price With Check Plus

	Price
1	$4.00
2	$3.00
3	$3.00
4	$2.00
5	$2.00
6	$5.00
7	$4.00
8	$5.00
9	$2.00
10	$5.00
11	$3.00
12	$2.00
13	$3.00
14	$3.00
15	$2.00
16	$1.00
17	$3.00
18	$3.00
19	$4.00
20	$6.00
21	$2.00

Select Category With Plain Check

	Category
1	ACT
2	ADV
3	CLA
4	COM
5	DRA
6	HOR
7	SCI

Select Category With Check Plus

	Category
1	ACT
2	ACT
3	ACT
4	COM
5	COM
6	SCI
7	DRA
8	ADV
9	CLA
10	DRA
11	ADV
12	HOR
13	SCI
14	SCI
15	SCI
16	HOR
17	HOR
18	ACT
19	ADV
20	COM
21	HOR
22	ACT

Select Title & Category With Plain Check

	Title	Category
1	95.101 - The Beast	HOR
2	A Time to Kill	DRA
3	Forest Gump	DRA
4	Friday the 13th	HOR
5	Halloween	HOR
6	Nightmare on Elm St.	HOR
7	Raiders of the Lost Ark	ADV
8	Return of the JEDI	SCI
9	Return of the Pink Panther	COM
10	Robocop	ACT
11	Robocop 2	ACT
12	Rumble in the Bronx	ACT
13	Slapshot	ACT
14	Small Soldiers	ADV
15	Something About Mary	COM
16	Star Wars	SCI
17	Starship Troopers	SCI
18	The Empire Strikes Back	SCI
19	The Pink Panther Strikes Again	COM
20	The Terminator	ACT
21	Toy Story	ADV
22	Wizard of Oz	CLA

Selecting Records to Display

- We may also select records to be displayed by using the selection condition in a query image dialog box.
- Under the name of the fields, right to the check box, we may enter the selection conditions.
- Next slide shows a list of movies in a video store table that are used in our examples

Video Table

	Video ID	Title	Price	Quantity	Category
1	893	Return of the Pink Panther	$2.00	1	COM
2	1298	My Best Freind's Wedding	$4.00	8	DRA
3	2395	Gone With the Wind	$2.00	1	DRA
4	2677	Who Am I ?	$2.50	1	ACT
5	3445	Rumble in the Bronx	$3.50	4	ACT
6	3566	The Game	$4.00	10	DRA
7	4417	95.101 Sure is Fun		1	HOR
8	4444	Operation Condor	$3.00	4	ACT
9	5261	The Firm	$2.75	1	DRA
10	5644	Super Cop	$4.00	6	ACT
11	5673	The Pink Panther	$2.50	1	COM
12	6576	The Nutty Professor	$3.00	4	COM
13	7221	The Matrix		2	SCI
14	7440	Halloween	$2.75	1	HOR
15	7444	Saving Ryan's Privates	$3.00	4	DRA
16	8354	The Holy Grail	$2.00	1	COM
17	9442	Pretty in Pink	$3.00	2	COM

Selecting Records to Display

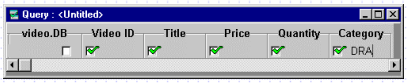
- A selection condition can be specified in one of the following ways:
  - Using fixed values
  - Using operators
  - Using speical operators
  - Pattern matching
  - Using compound selection conditions

Using Fixed Values:

- Type in an exact value to be searched for or to be ignored.

Example

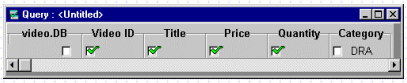
- Problem: List all Drama movies, showing all fields
- Solution: Check all fields. Put in condition DRA in Category field.



	Video ID	Title	Price	Quantity	Category
1	1298	My Best Freind's Wedding	$4.00	8	DRA
2	2395	Gone With the Wind	$2.00	1	DRA
3	3566	The Game	$4.00	10	DRA
4	5261	The Firm	$2.75	1	DRA

Example

- Problem: List all Drama movies, showing all fields except category
- Solution: Check all fields except Category. Put in condition DRA in Category field.



	Video ID	Title	Price	Quantity
1	1298	My Best Freind's Wedding	$4.00	8
2	2395	Gone With the Wind	$2.00	1
3	3566	The Game	$4.00	10
4	5261	The Firm	$2.75	1
5	7444	Saving Ryan's Privates	$3.00	4

Using Operators

- Use >, <, >=, <=, or = to specify the range of the values of this field.

Example

- Problem: List all movies which cost at most $3.00, showing all fields
- Solution: Check all fields. Put in condition <= 3 in Price field.

Result

	Video ID	Title	Price	Quantity	Category
1	893	Return of the Pink Panther	$2.00	1	COM
2	2395	Gone With the Wind	$2.00	1	DRA
3	2677	Who Am I ?	$2.50	1	ACT
4	4417	95.101 Sure is Fun		1	HOR
5	4444	Operation Condor	$3.00	4	ACT
6	5261	The Firm	$2.75	1	DRA
7	5673	The Pink Panther	$2.50	1	COM
8	6576	The Nutty Professor	$3.00	4	COM
9	7221	The Matrix		2	SCI
10	7440	Halloween	$2.75	1	HOR
11	7444	Saving Ryan's Privates	$3.00	4	DRA
12	8354	The Holy Grail	$2.00	1	COM
13	9442	Pretty in Pink	$3.00	2	COM

Example

- Problem: List all movies which cost at least $3.00, showing only title, price and category
- Solution: Check Title, Price and Category fields. Put in condition >= 3 in Price field.

Result

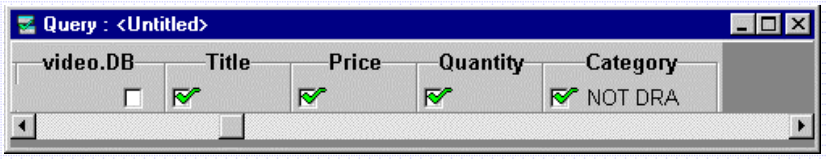
	Title	Price	Category
1	My Best Freind's Wedding	$4.00	DRA
2	Operation Condor	$3.00	ACT
3	Pretty in Pink	$3.00	COM
4	Rumble in the Bronx	$3.50	ACT
5	Saving Ryan's Privates	$3.00	DRA
6	Super Cop	$4.00	ACT
7	The Game	$4.00	DRA
8	The Nutty Professor	$3.00	COM

Using Special Operators

- Not condition (displays records that do not satisfy the condition)
- Blank (displays records that does not have a value in this field)
- Today (displays the record with this date field has today's date).

Example

- Problem: List all non-Drama movies, showing all fields
- Solution: Check all fields. Put in condition NOT DRA in Category field.

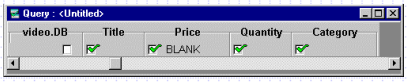


Result

	Video ID	Title	Price	Quantity	Category
1	893	Return of the Pink Panther	$2.00	1	COM
2	2677	Who Am I ?	$2.50	1	ACT
3	3445	Rumble in the Bronx	$3.50	4	ACT
4	4417	95.101 Sure is Fun		1	HOR
5	4444	Operation Condor	$3.00	4	ACT
6	5644	Super Cop	$4.00	6	ACT
7	5673	The Pink Panther	$2.50	1	COM
8	6576	The Nutty Professor	$3.00	4	COM
9	7221	The Matrix		2	SCI
10	7440	Halloween	$2.75	1	HOR
11	8354	The Holy Grail	$2.00	1	COM
12	9442	Pretty in Pink	$3.00	2	COM

Example

- Problem: List all videos whose price has not yet been determined, showing all fields except price
- Solution: Check all fields except price. Put in condition BLANK in Price field.



	Video ID	Title	Quantity	Category
1	4417	95.101 Sure is Fun	1	HOR
2	7221	The Matrix	2	SCI

Pattern Matching

- Use wild cards @ and .. to display records that match the specified pattern.
  - @ matches any single character
  - .. matches any sequence of character including spaces.
- Examples:
  - w.. matches Wind, window, win a game.
  - W@@@n matches Women, woman.
  - ..t@ matches private, Pasta, due date.
  - ..the.. matches phrases with “the”
  - ..in..the.. matches phrases with “in” before “the”
  - T@m.. matches phrases that start with a ‘t’ followed by any character, and then an ‘a’, with anything else afterwards

Pattern Matching

- Patterns are case insensitive.
- You may also use LIKE to find all records with similar to a given value of a field.

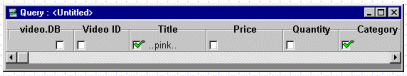
Example

- Problem: List all movies whose title starts with “The”, showing only the title
- Solution: Check Title field. Put in condition The.. in Title field.

	Title
1	The Firm
2	The Game
3	The Holy Grail
4	The Matrix
5	The Nutty Professor
6	The Pink Panther

Example

- Problem: List all movies whose title has pink in it, showing only the title and category
- Solution: Check Title and Category fields. Put in condition "..pink.." in Title field.



	Title	Category
1	Pretty in Pink	COM
2	Return of the Pink Panther	COM
3	The Pink Panther	COM

Use Compound Selection Conditions

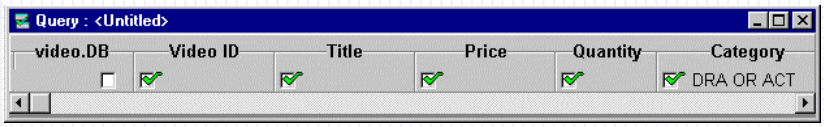
- You may use two or more conditions in a field separated by comma(s) to display the records that satisfy all these conditions.
- The comma is called the "and" operator here.

Use Compound Selection Conditions

- Now suppose that you want display records that satisfy one condition or another condition. This is done in one of two ways:
  - If these two conditions are for the same field, just use OR to connect the conditions.
  - If these conditions are for different fields, use the down arrow button to create the second line of the query image. Then the records that satisfy the condition in the first row or the condition in the second row will be displayed.
    - If you have multiple lines in a query, it is important to make sure that the same boxes are checked in all lines. If two lines have different boxes check, an error message will appear.

Example

- Problem: List all Drama and Action movies, showing all fields
- Solution: Check all fields. Put in condition DRA OR ACT in Category field.

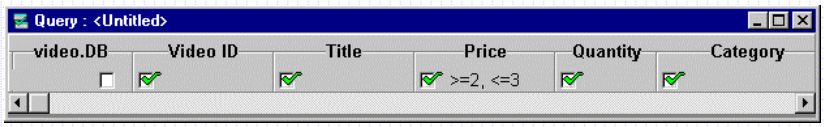


Result

	Video ID	Title	Price	Quantity	Category
1	1298	My Best Freind's Wedding	$4.00	8	DRA
2	2395	Gone With the Wind	$2.00	1	DRA
3	2677	Who Am I ?	$2.50	1	ACT
4	3445	Rumble in the Bronx	$3.50	4	ACT
5	3566	The Game	$4.00	10	DRA
6	4444	Operation Condor	$3.00	4	ACT
7	5261	The Firm	$2.75	1	DRA
8	5644	Super Cop	$4.00	6	ACT
9	7444	Saving Ryan's Privates	$3.00	4	DRA

Example

- Problem: List all movies with price between $2 and $3, showing all fields
- Solution: Check all fields. Put in condition >=2, <=3 in Price field.

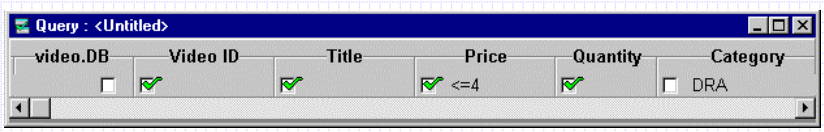


Result

	Video ID	Title	Price	Quantity	Category
1	893	Return of the Pink Panther	$2.00	1	COM
2	2395	Gone With the Wind	$2.00	1	DRA
3	2677	Who Am I ?	$2.50	1	ACT
4	4444	Operation Condor	$3.00	4	ACT
5	5261	The Firm	$2.75	1	DRA
6	5673	The Pink Panther	$2.50	1	COM
7	6576	The Nutty Professor	$3.00	4	COM
8	7440	Halloween	$2.75	1	HOR
9	7444	Saving Ryan's Privates	$3.00	4	DRA
10	8354	The Holy Grail	$2.00	1	COM
11	9442	Pretty in Pink	$3.00	2	COM

Example

- Problem: List all Drama movies with price under $4, showing all fields except category
- Solution: Check all fields except Category. Put in condition <4 in Price field and DRA in Category.

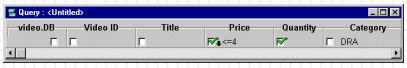


Result

	Video ID	Title	Price	Quantity
1	1298	My Best Freind's Wedding	$4.00	8
2	2395	Gone With the Wind	$2.00	1
3	3566	The Game	$4.00	10
4	5261	The Firm	$2.75	1
5	7444	Saving Ryan's Privates	$3.00	4

Example

- Problem: List all Drama movies with price under $4, showing only price and quantity fields in decreasing order of price
- Solution: Check all fields except Video ID, Title and Category. Use the check descending in the Price field. Put in condition <4 in Price field and DRA in Category.



	Price	Quantity
1	$4.00	8
2	$4.00	10
3	$3.00	4
4	$2.75	1
5	$2.00	1

Example

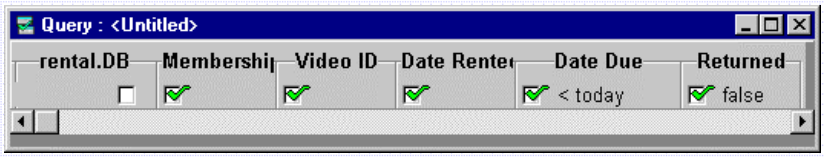
- Problem: List all movies with either the price under $3, or category of action, showing all fields
- Solution: Check all fields. Put in condition <3 in Price field. Create a second line by hitting down arrow. Put in condition ACT in Category.

Result

	Video ID	Title	Price	Quantity	Category
1	893	Return of the Pink Panther	$2.00	1	COM
2	2395	Gone With the Wind	$2.00	1	DRA
3	2677	Who Am I ?	$2.50	1	ACT
4	3445	Rumble in the Bronx	$3.50	4	ACT
5	4417	95.101 Sure is Fun		1	HOR
6	4444	Operation Condor	$3.00	4	ACT
7	5261	The Firm	$2.75	1	DRA
8	5644	Super Cop	$4.00	6	ACT
9	5673	The Pink Panther	$2.50	1	COM
10	7221	The Matrix		2	SCI
11	7440	Halloween	$2.75	1	HOR
12	8354	The Holy Grail	$2.00	1	COM

Example

- Problem: List all movies in the rental table that are overdue and not yet returned, showing all fields
- Solution: Check all fields. Put in condition false in Returned field. Put in condition < today in DateDue field.



Result

	Membership ID	Video ID	Date Rented	Date Due	Returned
1	A9098	3566	11/22/99	11/23/99	False
2	J1234	3566	11/4/98	11/6/98	False
3	J1234	5644	11/5/98	11/10/98	False
4	L4523	3566	11/1/98	11/5/98	False

Create Query with Multiple Tables

- Sometimes it is necessary to use more than one table to answer a query.
  - For example, we may want to know which customers in Ottawa have not returned movies yet.
- We will see how to do this, but we must first discuss what an example element is.

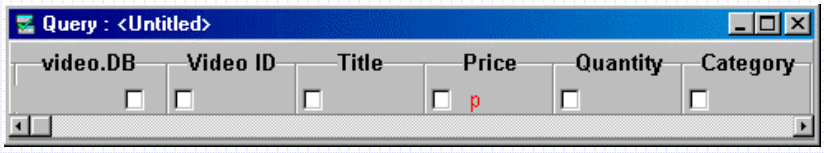
Example Elements

- An example element is a label which is given to a field that can be used to define common fields in different tables or perform calculations.
- Example elements consist of letters or digits, but not space or special characters (punctuation marks or %, &, etc).
- To give a field an example element (i.e. a special label), do the following:
  - select the field in the query window,
  - press F5, then
  - enter the example element label (you can pick any name but try to pick a name that is not a field name).

Example Elements

- To end entering an example element
  - press spacebar, or
  - enter any special (non alpha-numeric) character, or
  - press F5.
- Example elements appear in red.
- Always make sure the example elements are in red when joining tables or defining calculations, otherwise you have done something wrong.
- The image on the next slide shows an example element called “p” which was made for the price field

Example Elements



Example Elements

- Now that we have this example element for the price, anytime we want to do a calculation with the price for a particular record, we just use the example element name "p".
  - For example, a calculation of a video's price with PST and GST can be specified as: p* 1.15

Joining Tables

- Paradox is a relational database management system, so we should be able to relate data in different tables.
- As it turns out, in Paradox, data in different tables can be combined by their common fields to form this relation.

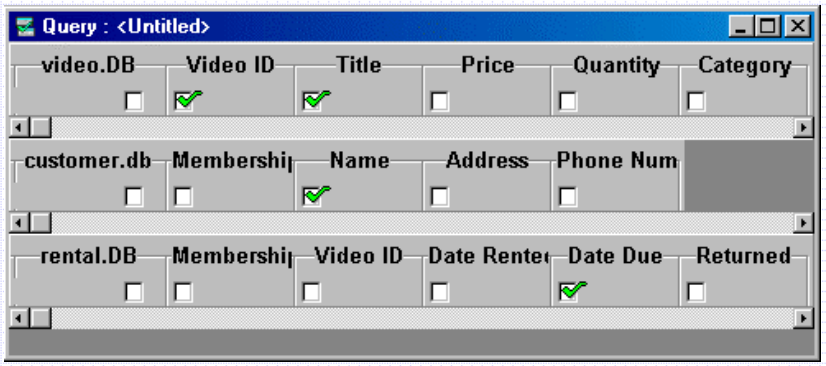
Common Fields

- Common fields in different tables may have different names, such as the student number field in one table may called ID in another table
- Different fields may also have the same name, such as both the customer ID number and the video ID number may be called ID,
- We have to tell paradox which fields we are going to use as “common fields”.
- If two fields in different tables have the same example element, then they are recognized by Paradox as the common field of these two tables.

Using Multiple Tables

- Suppose we want to create a query that uses data in more than one table.
- The first step is to create a query window with the image of all necessary tables. This is done as follows:
  - Open the query window as usual with the first table.
  - Click the Add Table button on the toolbar, and select the second table. Then, in the query window, you have the image of both the first and the second table.
  - Repeat this step, you may add as many tables to the a query window as needed.

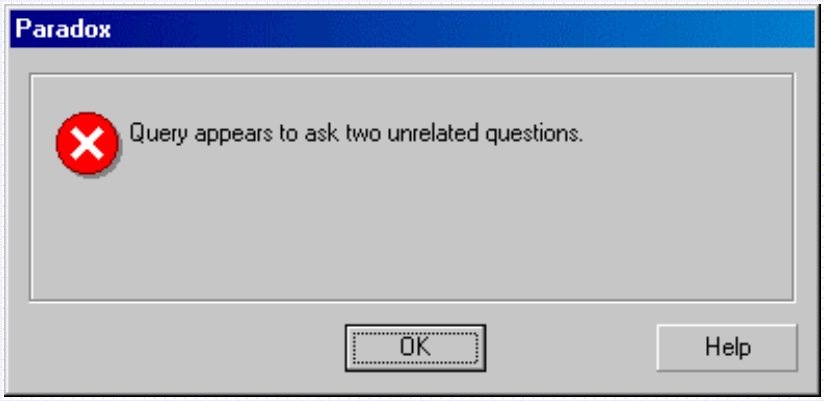
Example



Using Multiple Tables

- The next step is to define joins to indicate "common fields" by example elements.
- This provides the "magical" link between the tables.
- If you do not do this step, or do it improperly, you get an error box as shown in the next slide.

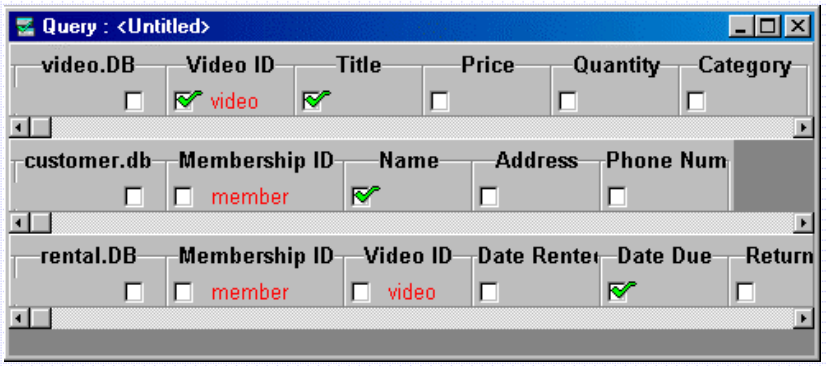
Error



Linking Two Tables

- To link two tables with their common fields, enter an example element in one field in the query image of a table, and enter the same example element in the query image of the common field in the other table.
- For example, we made two example elements: one for the videoID and the other for the memberID.
- Note that you can chose any name whatsoever for these example elements. However, you must make sure that the two corresponding to the same field have the same name.
- Also, make sure that they appear RED, or you did something wrong.

Linking Two Tables



Seeing the Results

- Now these tables are all joined together and you can run the query.
- The result is shown on the next slide.
- Notice that by joining these tables, the result of the query is that we have data extracted from 3 different tables and this data is presented in a final table of answers (i.e., the answer table for the query).

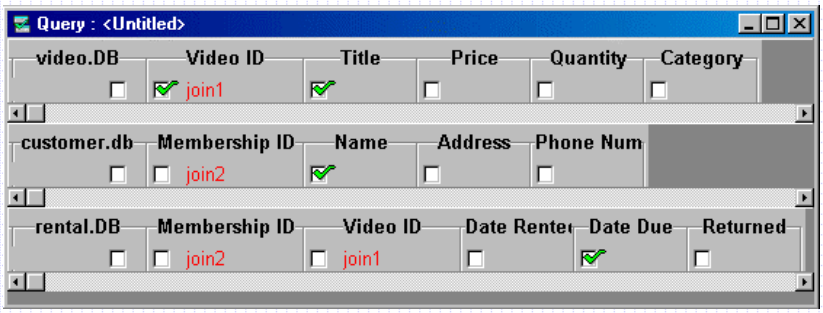
Result

	Video ID	Title	Name	Date Due
1	1298	My Best Freind's Wedding	Rob Banks	11/22/99
2	3566	The Game	Ben Dover	11/23/99
3	3566	The Game	Hugh Jass	11/5/98
4	3566	The Game	Phil MeUp	11/6/98
5	5644	Super Cop	Phil MeUp	11/10/98

Automatic Joins

- We can have Paradox automatically join the tables for us.
- It names these joins as join1, join2, etc.
- To do this, press the Join Tables button in toolbar.
- This will put Paradox in Example mode. You can see the word joining in the status bar.
- Move the pointer to the query image, it changes the shape. Click the fields to the right of the check box that you want to link in the query images of two tables.
- Repeat this step. You may define as many joining pairs as needed.

Example



Automatic Joins

- The result of running the query will be the same as if we entered the example elements manually.
- Keep in mind that this method of "joining" merely creates the example elements for you with some "automatic" naming convention.
- It is not a "magical" function :).

Queries With Multiple Tables

- When tables are linked together by example elements, we may create queries using data in all these tables.
- The same as single table queries, check boxes are used to select fields to display and selection conditions are used to select records to display.
- In the following slides, we will see examples of creating queries using two or three tables in our Video Store example.

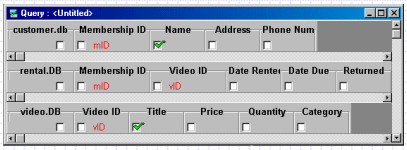
Example

- Problem: Display the membership ID and names of customers who have rented a video.
- Solution: Create a query for the Customer table. Add the Rental table to the query image. Check the MembershipID and Name fields of the customer table. Join the two tables with a commonly named example element (mID) (Note: we don't check off MembershipID in both tables, otherwise we get it displayed twice)

	Membership ID	Name
1	A9098	Ben Dover
2	J1234	Phil MeUp
3	L4523	Hugh Jass
4	R7557	Rob Banks

Example

- Problem: Display the titles of videos that a customer has rented along with the name of the customer.
- Solution: Create a query for the Video table. Add the Rental table AND Customer table to the query image. Check the Name in the Customer table and the Title field of the Video table. Join the Customer and Rental tables with a commonly named example element (mID). Join the Video and Rental tables with a commonly named example element (vID).

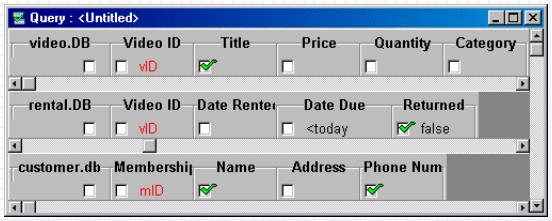


	Name	Title
1	Ben Dover	The Game
2	Hugh Jass	The Game
3	Phil MeUp	Super Cop
4	Phil MeUp	The Game
5	Rob Banks	My Best Freind's Wedding

Example

- Problem: Display the member name and telephone number of the customers who have overdue movies.
- Solution: Create a query for the Video table. Add the Rental table AND Customer table to the query image. Check the Name and Phone Number fields of the Customer table and the Title of the Video table. Type in < today in the Date Due field. Type in false in the Returned field. Join the Customer and Rental tables with a commonly named example element (e.g., mID) Join the Video and Rental tables with a commonly named example element (e.g., vID)

Query and Result

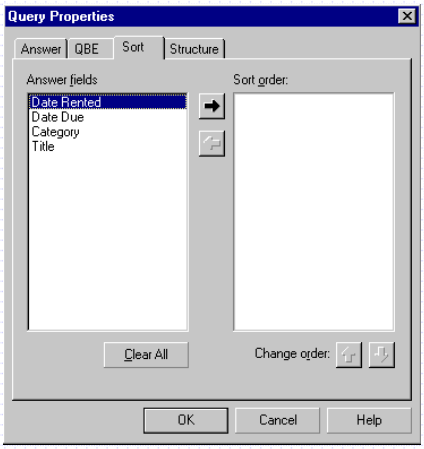


	Title	Name	Phone Number
1	Super Cop	Phil MeUp	123-4567
2	The Game	Ben Dover	830-2784
3	The Game	Hugh Jass	555-2335
4	The Game	Phil MeUp	123-4567

Editing the Answer Table

- You may use Drag and Drop to change the order of the fields in an answer table, or change the column width of fields.
- To sort the answer table before it is run do one of the following:
  - Click the Sort button from the toolbar (when in Query mode); or
  - Click the Properties button from the toolbar (when in Query mode); or
  - Select Properties… from the Query menu on the menu bar.
- The dialog box on the next slide will appear. Select the Sort tab.

Query Properties



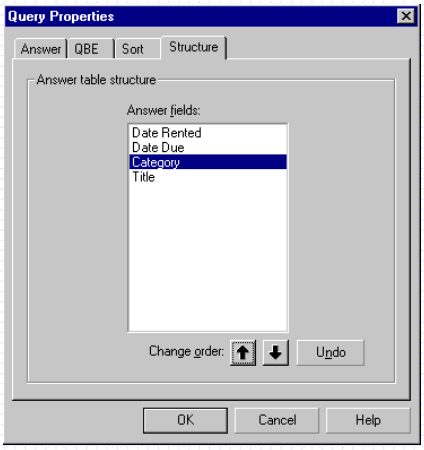
Sorting Answer Table

- Here, select the Answer fields (in the left list) in the order that you want to sort by and then move them one by one onto the Sort Order (rightmost) list by clicking the black arrow button. Click OK when done.

Changing Column Order

- You may also specify the order (column-wise) that the results come back in by selecting the Structure tab of this dialog box.
- Once again, you can select items from the Answer fields list and move them up and down by clicking on the black arrow buttons to change their order. The topmost items will be the leftmost columns of the answer table.
- Another way of sorting is to do it manually after the query answer table is returned, by dragging the boundaries at the top of the fields in the answer table. The cursor will change to a kind of box shape.

Changing Column Order



Saving a Query

- Activate the query window and choose the Save command in File menu.
- In the dialog box, specify a name for the query, and click SAVE.
- After a query is saved, you can use it the next time.
- If the database is modified, the answer table will be created according to the modified data.

Calculation in Queries

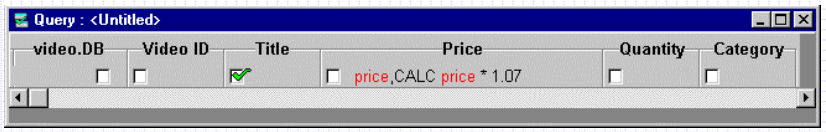
- Paradox can compute information from the data in tables by performing calculations.
  - For instance, in a table we have a field called price. We may include in the answer table of a query a new field that displays price + 7% tax.
- To perform a calculation, an expression with operator CALC is entered in a field (any field can be used).
- When computed, these calculations appear in a new column in the answer table.

Using Fields in Calculation

- If the value of a field is used in a calculation, the field has to be represented by an example element.
- Usually, any field that needs to be used in a calculation is first given a label (example element) and then a comma is used if more needs to be written in that field (see the example later).
- When entering expression, always remember to press F5 before entering each example element.

Example

- Run a query that will show the titles of all videos and their price (with 7% tax added).
- Note that the price is an example element and shows up in red. This is IMPORTANT. If it is not shown in red, it won't work. Here is the outcome:

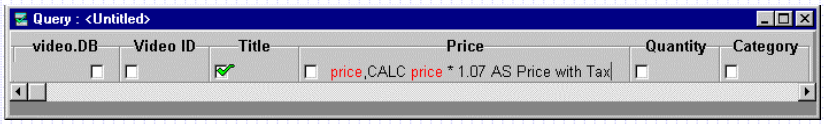


Result

	Title	Price * 1.07
1	95.101 Sure is Fun	$0.00
2	Gone With the Wind	$2.14
3	Halloween	$2.94
4	My Best Freind's Wedding	$4.28
5	Operation Condor	$3.21
6	Pretty in Pink	$3.21
7	Return of the Pink Panther	$2.14
8	Rumble in the Bronx	$3.75
9	Saving Ryan's Privates	$3.21
10	Super Cop	$4.28
11	The Firm	$2.94
12	The Game	$4.28
13	The Holy Grail	$2.14
14	The Matrix	$0.00
15	The Nutty Professor	$3.21
16	The Pink Panther	$2.68
17	Who Am I ?	$2.68

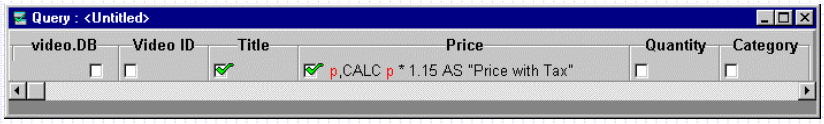
Example

- Note that a new column is created for the answer. Also note the Heading for the new column created. It is Price * 1.07. We can rename this heading by using the AS keyword. To pick a new name to be assigned to the new field, use “AS new_name” after the expression.



Example

- Problem: Calculate the price of each video with 15% tax, display the title original price and price with tax.
- Solution: Do query on Video table. Check fields Title and Price. Put this into the price field: p,CALC p * 1.15 AS “Price with Tax”
- Note that p is an example element for the price.

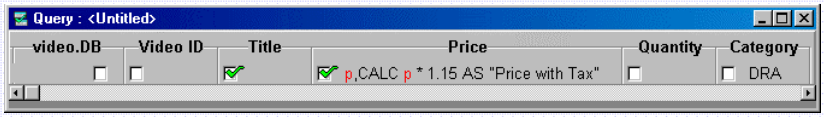


Result

	Title	Price	Price with Tax
1	95.101 Sure is Fun		$0.00
2	Gone With the Wind	$2.00	$2.30
3	Halloween	$2.75	$3.16
4	My Best Freind's Wedding	$4.00	$4.60
5	Operation Condor	$3.00	$3.45
6	Pretty in Pink	$3.00	$3.45
7	Return of the Pink Panther	$2.00	$2.30
8	Rumble in the Bronx	$3.50	$4.03
9	Saving Ryan's Privates	$3.00	$3.45
10	Super Cop	$4.00	$4.60
11	The Firm	$2.75	$3.16
12	The Game	$4.00	$4.60
13	The Holy Grail	$2.00	$2.30
14	The Matrix		$0.00
15	The Nutty Professor	$3.00	$3.45
16	The Pink Panther	$2.50	$2.88
17	Who Am I ?	$2.50	$2.88

Example

- Problem: Calculate the price including tax for all Drama videos, display title and price with tax.
- Solution: Do query on Video table. Check fields Title and Price. Enter condition DRA in Category field. Put in this into the Price field: p,CALC p * 1.15 AS “Price with Tax”

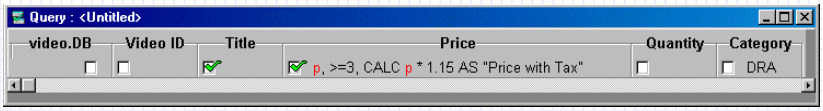


Result

	Title	Price	Price with Tax
1	Gone With the Wind	$2.00	$2.30
2	My Best Freind's Wedding	$4.00	$4.60
3	Saving Ryan's Privates	$3.00	$3.45
4	The Firm	$2.75	$3.16
5	The Game	$4.00	$4.60

Example

- Problem: Calculate the price including tax for all Drama videos whose original price is at least $3, display title, original price and price with tax.
- Solution: Do query on Video table. Check fields Title and Price. Enter condition DRA in Category field. Put in this into the Price field: p, >=3, CALC p * 1.15 AS “Price with Tax”
- Note that p is an example element for the price.

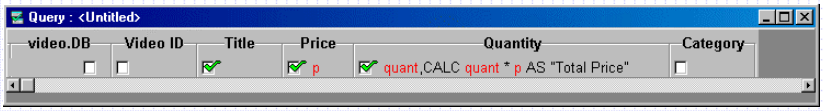


Result

	Title	Price	Price with Tax
1	My Best Freind's Wedding	$4.00	$4.60
2	Saving Ryan's Privates	$3.00	$3.45
3	The Game	$4.00	$4.60

Example

- Problem: Calculate the total price to rent all copies of a particular video. Display the title, quantity, original price, and total price.
- Solution: Do query on Video table. Check fields Title, Quantity and Price. Put in this formula into the Quantity field quant,CALC quant * p AS “Total Price”
- Note that p is an example element for the price and quant is an example for the quantity.



Result

	Title	Price	Quantity	Total Price
1	95.101 Sure is Fun		1	$0.00
2	Gone With the Wind	$2.00	1	$2.00
3	Halloween	$2.75	1	$2.75
4	My Best Freind's Wedding	$4.00	8	$32.00
5	Operation Condor	$3.00	4	$12.00
6	Pretty in Pink	$3.00	2	$6.00
7	Return of the Pink Panther	$2.00	1	$2.00
8	Rumble in the Bronx	$3.50	4	$14.00
9	Saving Ryan's Privates	$3.00	4	$12.00
10	Super Cop	$4.00	6	$24.00
11	The Firm	$2.75	1	$2.75
12	The Game	$4.00	10	$40.00
13	The Holy Grail	$2.00	1	$2.00
14	The Matrix		2	$0.00
15	The Nutty Professor	$3.00	4	$12.00
16	The Pink Panther	$2.50	1	$2.50
17	Who Am I ?	$2.50	1	$2.50

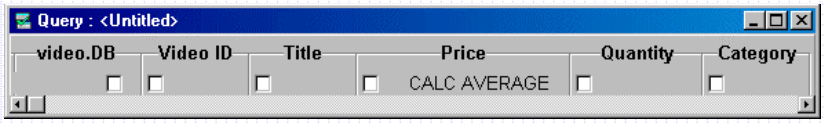
Summary Operators

- Paradox has some common operators (called summary operators), which are pretty much like @ functions in Quattro Pro.
- Summary operators are used to find a single value calculated from all values of a field in each row of the answer table.
- There is a total of six summary functions:
  - AVERAGE Average value of all records in a group.
  - COUNT The number of unique records in a group of records.
  - COUNT ALL The number of records in a group including duplicates.
  - MIN Minimum value of the field
  - MAX Maximum value of the field
  - SUM The total value of the field

Example

- Problem: Calculate the average cost to rent a video, display the average.
- Solution: Formula CALC AVERAGE in Price field.
- No field should be checked off !!!!!

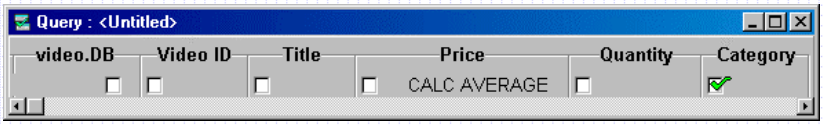
	Average of Price
1	$2.93



Example

- Problem: Calculate the average cost to rent a video for each category, display category and average.
- Solution: Formula CALC AVERAGE in Price field. Check field Category.

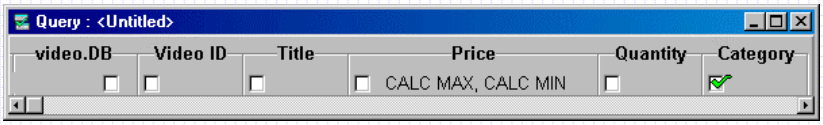
	Category	Average of Price
1	ACT	$3.25
2	COM	$2.50
3	DRA	$3.15
4	HOR	$2.75
5	SCI	



Example

- Problem: Calculate the maximum and minimum cost to rent a video for each category, display category, maximum and minimum.
- Solution: Formula CALC MAX, CALC MIN in Price field. Check off Category field.

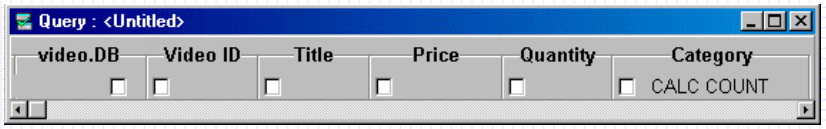
	Category	Max of Price	Min of Price
1	ACT	$4.00	$2.50
2	COM	$3.00	$2.00
3	DRA	$4.00	$2.00
4	HOR	$2.75	$2.75
5	SCI		



Example

- Problem: Calculate the number of categories.
- Solution: Formula CALC COUNT in field Category. Do not check any field.

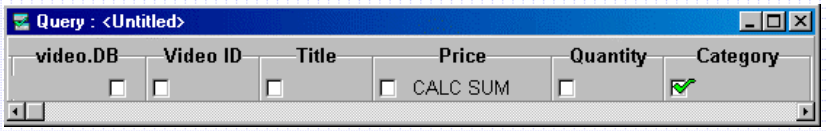
	Count of Category
1	5.00



Example

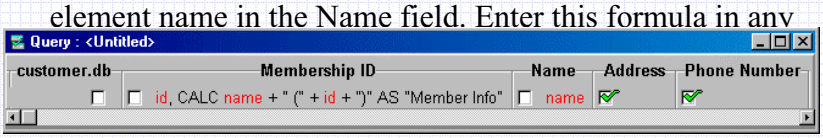
- Problem: Calculate the total price to rent all videos in each category, display category and the total.
- Solution: Formula CALC SUM in field Price. Check field Category.

	Category	Sum of Price
1	ACT	$13.00
2	COM	$12.50
3	DRA	$15.75
4	HOR	$2.75
5	SCI	



Example

- Problem: Display the membership ID and the name of a customer in one column of the answer table in the format Name_of_Customer (membership ID) as well as the address and telephone number of the customer.
- Solution: Paradox also has an operator '+' to concatenate strings, i.e., field values of type A. We enter the example element id in the Membership ID field, and example element name in the Name field. Enter this formula in any



Result

	Address	Phone Number	Member Info
1	1234 Queen St., Ottawa	123-4567	Phil MeUp (J1234)
2	666 Devils Road, Orleans	830-2784	Ben Dover (A9098)
3	78 Maple St., Ottawa	782-3465	Rob Banks (R7557)
4	8 Oak Road, Kanata	555-2335	Hugh Jass (L4523)
5	90 Oak Cres.		Rod Stewart (Y7834)

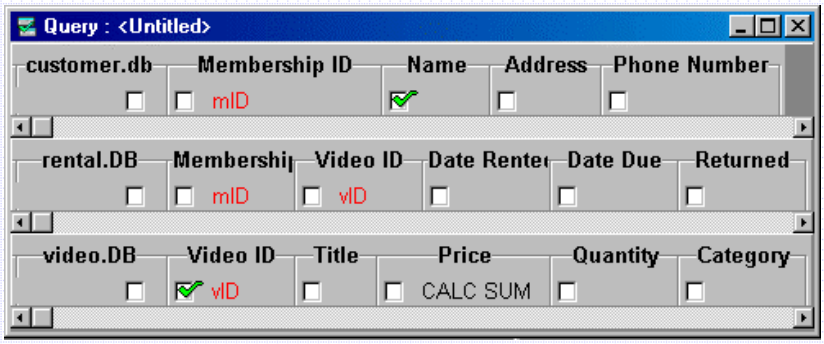
Using CALC with Multiple Tables

- Calculation may also be done in the same way with data in different tables.
- For instance, if we want to calculate the total amount for each customer paid for their video rentals, we have to use the Price field in the Video table and the Video ID in the Rental table, and the Name field in the Customer table.

Example

- Problem: Calculate the total amount that each customer paid for their video rentals, showing the customer name and total rentals.
- Solution: Open a query on all 3 tables and link them appropriately with example elements. Check off the Name field. Enter CALC SUM in the Price field.

Query Image



Result

	Name	Sum of Price
1	Ben Dover	$4.00
2	Hugh Jass	$4.00
3	Phil MeUp	$8.00
4	Rob Banks	$4.00