USER'S GUIDE

Axle Load Calculation software
With Horizontal & Vertical C.G. Calculation
For Heavy Trucks

CIE-TECH INC.

Tel: (450) 923-1458   Fax: (450) 923-2077

5990 Auteuil Ave., Brossard (QC), Canada, J4Z 1N2
Email: info@loadxpert.com   web: www.loadxpert.com

Registered Trademarks

- IBM is a registered trademark of International Business Machines, Inc.
- Microsoft is a registered trademark of Microsoft Corporation.
- All other brands and product names mentioned in this manual are trademarks or registered trademarks of their respective holders.

LICENSE AGREEMENT AND LIMITED WARRANTY

READ THIS AGREEMENT CAREFULLY BEFORE OPENING THE SEALED DISK PACKAGE. By opening the sealed disk package, you indicate your acceptance of these terms.

This is a legal agreement between you, the end user, and CIE-TECH Inc. By opening the sealed disk package, you are agreeing to be bound by the terms of this agreement. If you do not agree to the terms of this agreement, promptly return, within 30 days following purchase, the unopened disk package and all accompanying materials for a full refund.

COPYRIGHT

The *Load Xpert* software and other related and optional software **("SOFTWARE"),** and the documentation is owned by CIE-TECH Inc. The software is protected by both Canada's copyright and trademark laws and international copyright treaty provisions. **CIE-TECH Inc. grants you the right to use a single copy of the "SOFTWARE"**.You may not translate, decompile, disassemble or reverse engineer the software.

LIMITED WARRANTY

CIE-TECH Inc. warrants the physical CD and documentation of the "SOFTWARE" to be free of defects in materials and workmanship for a period of thirty (30) days from the date of purchase. In the event of notification within the Limited Warranty period of defects in materials or workmanship, CIE-TECH Inc. will replace at no charge the defective CD or documentation. The remedy for breach of this Limited Warranty shall be limited to replacement of physical CD and documentation and shall not include or extend to any claim for or right to recover any other damages, including but not limited to, loss of profit, data, or use of the "SOFTWARE", or special, incidental, or consequential damages or other similar claims, even if CIE-TECH Inc. has been specifically advised of the possibility of such damages.

The client recognizes that the "SOFTWARE", although sophisticated, remains an estimation software only. CIE-TECH Inc. specifically disclaims all other warranties, express or implied, including but not limited to implied warranties of merchantability and fitness for a particular purpose with respect to defects in the diskettes and documentation. In no event shall CIE-TECH Inc. be liable for any loss of profit, data or time or any commercial damage, including but not limited to, special, incidental, direct or indirect, consequential or other damages.

The "SOFTWARE" should only be used by knowledgeable personnel with extensive heavy vehicle experience. The determination of the software user's qualifications is the obligation of the Licensee of the "SOFTWARE" under the aforesaid License Agreement.

CIE-TECH Inc. does not guarantee the accuracy and/or usefulness of the results or solutions of any analysis obtained with the "SOFTWARE". Confirming the accuracy and/or usefulness of all the results obtained with the "SOFTWARE", is the responsibility of the Licensee or user.

This agreement is governed by the laws applicable in the province of Quebec, Canada.

<u>**WARNING**</u>

This software can give ESTIMATED results only. The purpose of this software is to give quick estimated results to help in the early stages of decision. The results of this software should not be used to make any final decision. The accuracy of the estimated results given by this software depends totally on the validity of the inputs from the user.

This software is not intended to replace experienced and knowledgeable personnel. It should be used by qualified personnel with extensive heavy vehicle experience who are able to interpret correctly the results of the software. Accurate computer simulation or field tests should be conducted whenever critical decisions have to be made.

READ CAREFULLY THE ENTIRE ON-LINE USER'S MANUAL BEFORE USING THE SOFTWARE, ESPECIALLY THE TOPIC ON SOFTWARE LIMITATIONS.

READERS ARE CAUTIONED THAT THE USE AND INTERPRETATION OF THE DATA, MATERIAL AND FINDINGS CONTAINED HEREIN IS DONE AT THEIR OWN RISK.

OVERVIEW

Load Xpert is an easy-to-use software tool to estimate axle load distribution of most types of heavy vehicles. The software package can be used in a wide range of applications including trailer design, verification of compliance with size and weight regulations (e.g.: U.S. Bridge Formula), payload positioning, and as a tool for owner operators, truck/trailer dealers and sales personnel.

Load Xpert permits the user to define the vehicle's configuration in an extremely simple manner. The user-friendly graphical interface provides all the options necessary to configure most types of heavy vehicles. Axle load distribution is carried out and displayed in real-time. The software allows the user to move an axle group, the fifth wheel or payloads with a mouse and see the axle loads updated in real-time.

Load Xpert has been packaged with relevant features for the need of major user groups in trucking industry and they are:

- Truck and trailer manufacturers, dealers, repair shops, training schools, leasing companies, municipalities, utilities, etc.

- Heavy Haul operations with jeep dollies, drop deck trailers, booster axles, etc. It can print Permit Application including vehicle, load and routing information.

The ***Load Xpert*** installation includes ***LX-CAD. LX-CAD*** is a small standalone drawing software which allows the user to draw the desired look of a unit, load or accessory. The new look created are saved in a Look File that can be read by ***Load Xpert***.

SYSTEM REQUIREMENT

Load Xpert requires the following hardware and software:

- A personal computer with a 486 or higher processor running Microsoft Windows 95, 98, ME, NT4, 2000, XP, 2003 or Vista
- 256 MB of memory
- Hard disk space required: 30 MB
- 1024x768 or higher resolution monitor
- A compatible mouse or pointing device
- A CD-ROM drive

INSTALLATION

IMPORTANT: Connect the HASP key only after the installation is completed

Insert the CD in the drive and the software installation will be done automatically.

Or

1. Place the *Load Xpert CD* in the CD-ROM drive
2. From the Start button, choose Run
3. Type D:\setup.exe (or replace D: by your CD drive letter) and press OK
4. Follow the on-screen instructions.

NOTE: You need administrator privileges to install the software

STANDALONE INSTALLATION (BLUE or USB HASP KEY)

Version 7 of **Load Xpert** is copy protected. You will be able to install the software on any number of computers, however, it will run ONLY on the computer with the BLUE HASP key plugged in the parallel port. **To run the software on another computer you MUST move the HASP key to the new computer.**

NETWORK SERVER INSTALLATION (RED HASP KEY)

Version 7 of **Load Xpert** can work in a network environment. You need to perform the Network Server installation on one computer on the network. The Red Hasp Key has to be connected to that computer. It doesn't need to be your network server. This will allow other workstation on your network to run the software without having a Hasp Key physically connected.   Each license that you purchase will allow you to run simultaneously on one more workstation.

NETWORK WORKSTATION INSTALLATION (NO KEY)

Version 7 of **Load Xpert** can work in a network environment. Once you have performed the Network Server installation, you can perform the Network Workstation install on all the workstations in your network that will be used with the **Load Xpert** software. If you do not want to install the software locally, you can still install from the workstation on the network server by overwriting the previous Network Server install. This will copy all the proper DLL's needed by the software and create the shortcuts in the Start menu. You do not need to have a key connected to the workstation. However, you will be able to run the software only if the number of **Load Xpert** running on your network is less than the number of licenses you have purchased. You will be able to use **Load Xpert** from a workstation only if you have done a Network Server Install on a computer accessible on your network.

If you have any problem, please contact CIE-TECH Inc. at (450) 923-1458.

UNINSTALLING THE SOFTWARE

The **Load Xpert**™ software can be uninstalled with the standard Windows Add/Remove Programs from the Control Panel. This will delete program files only. The data files will not be deleted.

UPGRADING FROM EARLIER VERSIONS

If you are upgrading **Load Xpert**™ from version 3.0, you need to update all your configuration files (.CFG) and your database files (.DBU, .DBS, .DBA and .DBP) to version 4.

A utility software called CONVERT4.EXE is available that will automatically upgrade all your configuration and database files. Just execute this program and all configuration and database files in the current directory will be upgraded automatically.

If you are upgrading from other earlier versions (version 1.0 or 2.0), you must run TO3.EXE first to upgrade your files to version 3.0 and then run CONVERT4.EXE.

USER'S MANUAL

This version of **Load Xpert**™ features a context-sensitive help system. By pressing the *F1* key or invoking the HELP command from any menu or dialog box, **Load Xpert**™ will display the page of the on-line user's manual related to the command you are currently executing. From there you can navigate to any related topics or go to the content page to access any topics of the on-line user's manual.

Except for this "Getting Started" manual, all information about **Load Xpert**™ is included in the on-line user's manual and is not available in printed form.

USING *Load Xpert* ™

You can run a simple **Load Xpert**™ session by following these instructions:

1. Press the Data Module (yellow) button. This will allow you to create & save in the database your individual units (tractor, trailer, etc.)

2. Press STEP1: Select Vehicle button, to assemble a vehicle from the units saved in your database.

3. Press STEP2: Add Load button. This command will permit you to add loads to your vehicle. You can repeat this command to add several loads. Once a load is added, you can click on any particular load with the mouse and move it to a new position.

4. Click the "U.S. interstate bridge formula" button and select "Check". This command will verify if your vehicle is complying with the U.S. interstate bridge formula.

5. From the File menu, select "Print". This command will permit you to print several pages of information about your vehicle.

6. From the File menu, select "Save". This command will permit you to save your vehicle. Next time you run the software, you will be able to retrieve any saved vehicle using the "Open" command from the File menu.

7. Press F1 at any time to display the on-line user's manual.

FILE EXTENSIONS

Load Xpert needs and creates many different types of files. The following list shows some file extensions that are used by the software and their type:

File extension	File type
.CFG	Vehicle configuration files
.DBU	Unit database files
.DBS	Axle group database files
.DBP	Product database
.DBL	Load database files
.DBT	Load pattern database files
.DBA	Accessory database files
.DBB	Body database files
.LOK	Look files for units (**LX-CAD** option only)
.LLK	Look files for loads and accessories

MAIN GRAPHICAL DISPLAY

The main graphical display is the focal point of the software which shows a scaled drawing of the complete vehicle. It contains all commands you need to configure your vehicle and also some additional information about the current vehicle. The software will return to this screen after every command.

Each axle group is identified in the drawing by an ID number located just under the axle group. This ID number has to be used whenever you are working with any specific axle group. These ID numbers will automatically change whenever an axle group is added or removed from a unit. Because of this, you must always refer to the graphical display to know the ID number currently attributed to a specific axle. The load carried by each axle group is displayed underneath the ID number. The axle load is similar to what would be observed on a weigh scale for the loaded and connected vehicle. All axle groups of a unit that are linked together with load equalization are displayed in red.

The loads, accessories and compartments on the vehicle are also displayed on the screen with ID numbers. An ID number is preceded by a letter: **L for load, A for accessory and C for compartment**.

ORDER OF OPERATIONS

When configuring a vehicle, you must note that the order of operation can affect the results of various calculations.

When you change the position or the weight of an axle group, the horizontal position of the centre of gravity of the unit is recalculated. This is done to take into consideration the influence of the weight of the axle group. In practice, this means that the horizontal position of the centre of gravity that you enter applies to the current axle disposition and weights. Moving an axle group or changing its weight will affect this value. **Therefore, you should position your axle groups and specify their weights before entering the horizontal position of the centre of gravity.**
When you add an axle group to a unit, the weight of the axle is added to the weight of the unit and the position of the centre of gravity is recalculated. In practice, this means that the weight and the position of the centre of gravity of the unit you enter apply only to the number of axle groups currently on the unit.

When you replace an axle group, the weight of the unit is changed to reflect the weight difference between the old and the new axle groups. If there is a weight difference, the center of gravity position will also be recalculated.

As a general rule, any value that you enter applies only to the current vehicle. Changing parameters such as weight and axle group position will result in the recalculation of the value you have entered.

The bare unit weight and its centre of gravity are not affected (or recalculated) when moving, adding, replacing or deleting axle groups.

MOUSE-ACTIVATED COMMANDS

Several commands can be activated directly by clicking or double clicking the mouse on certain vehicle components. Most of these commands can be canceled by pressing the *ESC* key.

Action	**Corresponding command**
Single click on an axle group	Move the selected axle group
Single click on a load	Move the selected load
Single click on an accessory	Move the selected accessory
Single click on a compartment	Edit product in all compartments of that unit
Single click on a fifth wheel	Change the fifth wheel offset
Ctrl + single click on a fifth wheel	Change the pintle hook offset
Single click with right mouse button on a portion of the vehicle	Toggle between Normal and Enlarge view of the vehicle
Single click with right mouse button when entering dimension	Allows to enter dimension in ft-in.
Double click on an axle group	Edit the selected axle group
Double click on a load	Edit the selected load
Double click on an accessory	Edit the selected accessory
Double click on a compartment	Edit all compartments of that unit
Double click on a fifth wheel	Edit the dimensions of the unit on which the fifth wheel is mounted

In addition to these commands, you can also move or delete a group of loads/accessories. You must first enclose inside a window all the loads or accessories that you want to move or delete. To do that, first click and hold the mouse on the upper-left corner on your selection window, then move the mouse (still holding down the mouse button) to the lower-right corner and

release the mouse button. At this point, you can move the group of loads/accessories, or delete it by pressing the *DEL* key. You can also cancel the operation by pressing the *ESC* key.

MOVE LOAD/ACCESSORY/AXLE GROUP/FIFTH WHEEL/PINTLE HOOK

Loads, accessories, axle groups, fifth wheels and pintle hooks can be moved using the mouse. Simply click the mouse directly on the "object" you want to move, drag it to the new position using the mouse or the arrow keys, and click the mouse or press *Enter* to accept the new position. You can press *ESC* at anytime to cancel the operation. For pintle hook only, you need to press the Ctrl key before clicking on the pintle hook.

NOTE - During this operation, the position of the "object" is updated and displayed as you move it. The axle loads are also calculated and shown in real-time.

ENTERING DATA IN FEET INSTEAD OF INCHES

Dimensions can be entered in feet instead of inches. Simply right-click the mouse in the field and a pop-up dialog box will appear for entering data in feet-inches.

REQUIRED DATA

When entering data in *Load Xpert™*, the required data is the data needed to perform basic axle load calculations. Other calculations (e.g.: payload analysis, center of gravity, etc.) will require additional data to be entered. Some calculations results may not be available if you do not enter the corresponding data needed.

DEFAULT VALUES

To ease the work of entering the data, *Load Xpert™* contains default values for most data. These values are given for your convenience only and should NEVER be used as accurate values. You MUST replace these default values with your own real measured values.

HOW TO USE THE SOFTWARE

The **Load Xpert**™ (Job-File) software is tailored to answer the needs of intermediate and final stage truck/equipment manufacturers to design vehicles that will carry the maximum payload without violating weight laws.

1 - The first step is to define the "BASE VEHICLE" weight and dimensions. The "BASE VEHICLE" is your original vehicle without any of the work you're planning to perform (e.g.: adding a body, moving or adding axles, adding accessories, etc.). For example, if you are planning to add a lift axle to a chassis, your "BASE VEHICLE" will be the chassis without the lift axle. To create you "BASE VEHICLE", simply click the NEW button a follow the wizard.

Once your "BASE VEHICLE" is completed, you can still modify it using the VEHICLE/EDIT function

2 - The second step is to modify your vehicle: you can add a body (only if your "BASE VEHICLE" is a chassis), add or move axle groups, add loads, add accessories and add a hitch load. The ADD/EDIT/DEL menu contains all the functions to help you modify your vehicle.

3 - The third step is to view the results. The results available are: Payload Analysis, Maximum Payload, Center of Gravity and U.S. Bridge Formula

PAYLOAD ANALYSIS

This can be calculated only if the Gross Vehicle Weight Ratings (GVWR) and all the Gross Axle Weight Ratings (GAWR) have been entered

The payload analysis calculates the maximum payload that can be carried by the vehicle to meet both the vehicle's GVWR and the GAWRs.

MAXIMUM PAYLOAD

This can be calculated only if the Desired Gross Vehicle Weight and all the Desired Gross Axle Weights have been entered

The maximum payload calculates the maximum payload (and its position) that can be carried by the vehicle without violating the desired weights. The GVWR and the

---

GAWRs are also considered if they have been entered by the user. Typically, the desired loads would be the weight laws of a State or Province.

4 – The last step is to print the results. Use the print button to print and/or preview all the pages that can be printed.

TECHNICAL SUPPORT

Technical support is available to registered users **with valid Service Contract only**. If you encounter any problem, please refer to the user's manual before calling technical support. Please note that technical support is limited to the use of the *Load Xpert*™ software.

CIE-TECH Inc.
5990 Auteuil Ave.
Brossard, QC, Canada
J4Z 1N2
Tel.: (450) 923-1458
Fax: (450) 923-2077
Email: info@loadxpert.com

LIMITATIONS OF *Load Xpert* ™

Load Xpert™ is based on theoretical calculations. Frame deflection is not accounted for in the calculations. Because of that, axle loads calculated may differ from exact (measured) axle loads. It is strongly recommended to validate the results of the software with a weigh scale when starting to use the software in order to know how precise the software's results are. The accuracy of the results are dependent on the accuracy of the information supplied by the user.

READERS ARE CAUTIONED THAT THE USE AND INTERPRETATION OF THE DATA, MATERIAL AND FINDINGS CONTAINED IN THIS SOFTWARE AND USER'S MANUAL ARE DONE AT THEIR OWN RISK.

User Manual for LX-CAD

CHAPTER 1: INTRODUCTION

OVERVIEW

LX-CAD is a simple drawing software that permits the user to modify the appearance (or the look) of vehicles, loads and accessories displayed and printed by *Load Xpert™*.

Using *LX-CAD*, you can draw your own vehicles (tractors, trucks and trailers), loads and accessories, and save them in a look file. This file can later be used by *Load Xpert™* to display vehicles, loads and accessories with custom looks instead of the standard looks.

LX-CAD will permit you to draw your look using line, arc and circle primitives. You can also save frequently used objects as blocks. Blocks can be inserted in any drawing. *LX-CAD* can also import DXF files. This will permit you to use parts of your already existing CAD drawings (e.g. AutoCad, Cadkey, etc.) directly with *LX-CAD*.

INSTALLATION

The *LX-CAD* software package includes this user's manual, and a disk. The software installation is done automatically with *Load Xpert™*.

FILE EXTENSIONS

LX-CAD needs and creates many different types of file. The following list shows some file extensions that are used by the software and their type.

File extension	File type
.CFG	Vehicle configuration files
.LOK	*LX-CAD* vehicle look files
.LLK	*LX-CAD* load and accessory look files
.BLK	*LX-CAD* blocks
.DXF	Drawing exchange file.

HOW TO USE *LX-CAD*

LX-CAD is a drawing software that permits you to modify the appearance (or look) of vehicles (trucks, tractors, trailers, pups, etc.), loads and accessories used in *Load Xpert*™. For vehicles, you can modify only the look of the body. Axle groups along with their sub-frames will still be displayed as usual by *Load Xpert*™.

ORDER OF OPERATIONS

LX-CAD and *Load Xpert*™ are two software packages designed to work in conjunction. However, operations have to be performed in a specific order.

Modifying the look of a vehicle unit involves the following steps:

1. CREATING THE UNIT

- Run *Load Xpert*™.
- Create and save the unit you want to modify in a configuration file. All important dimensions (cab length, axle setback, overall length, axle positions, etc.) for tractor, straight truck and pup trailer units, must absolutely be set to the final desired value. For trailers, the various dimensions (except the bumper length), even if not set to the desired value, can be modified in *Load Xpert*™. However, for best results, dimensions should be set relatively close to the intended final dimensions. The bumper length should be set to zero in *Load Xpert*™ (see section 2.1.2). Then draw the desired bumper length in *LX-CAD*.

2. DRAWING THE UNIT LOOK

- Run *LX-CAD.*
- Retrieve the configuration file created with *Load Xpert*™ and select the desired unit. *LX-CAD* will display the standard unit in the background (light color) as a reference. We strongly suggest that you draw the desired look without modifying the important dimensions in the background reference. Axle groups and articulation members will be drawn in black to indicate that they can not be erased and will automatically be part of your custom look drawing.
- Draw the unit look using primitives (line, arc, circle) , blocks and DXF files. Once again, use the background unit as a reference for your overall dimensions.
- Save your look drawing in a look file.

---

3. MODIFYING THE UNIT LOOK

- Run **Load Xpert™**.
- Create or retrieve a unit for which you want to modify the look .
- Using the EDIT CUSTOM LOOK, UNIT command, select the desired look file created with **LX-CAD**. The unit will now be displayed using the look you have created. To reset the look of the unit to the standard look, use the EDIT RESET LOOK, UNIT command in **Load Xpert™**. Note that for trailers only, the look file can be proportionally stretched along its length (if necessary) to the desired length without redrawing the trailer in **LX-CAD**. However, for tractors, straight trucks and pup trailers, the look file should NOT be stretched in order to avoid disproportional display. For these cases, you should make sure that the look file was created in **LX-CAD** to the desired dimension (see section 2.1.2 for more information).

Modifying the look of a load or accessory involves the following steps:

1. DRAWING THE LOAD OR ACCESSORY LOOK

- Run **LX-CAD.**
- Select the Create NewLoad command from the File menu and enter the overall dimensions of the load or accessory to be drawn.
- Draw the look using primitives (line, arc, circle) , blocks and DXF files. Use the background frame as a reference for your overall dimensions.
- Save your look drawing in a look file.

2. MODIFYING THE LOAD OR ACCESSORY LOOK

- Run **Load Xpert™**.
- Using the EDIT CUSTOM LOOK, LOAD or ACCESSORY command, select the desired look file created with **LX-CAD**. The load or accessory will now be displayed using the look you have created. To reset the look of the load or accessory to the standard look, use the EDIT RESET LOOK, LOAD or ACCESSORY command in **Load Xpert™**. The look will be scaled to fit the length and the height of the load that you have selected. This may change the look aspect ratio if you have selected a load with a different aspect ratio that the look.

UNIT DIMENSIONS

The important thing to keep in mind to successfully modify the look of a unit is that you must keep certain dimensions of your look drawing to be the same as the dimensions of the background reference unit. Failure to do this will result in mismatched dimensions that will affect dimensional lines in *Load Xpert*™and on the printouts. For example, if you retrieve a 48-foot trailer in *LX-CAD* and draw a 45-foot unit, the dimensions will be mismatched. Therefore, *Load Xpert*™will display your 45-foot trailer but will show the length as 48 feet and the dimensional lines will not be aligned properly, especially on the printouts.

To help you draw your look in *LX-CAD* with the important dimensions, the standard unit is displayed as a reference in the background (light color). When drawing the look of your unit, you should use this background outline as a reference to help you achieve the correct dimensions. Axle groups and articulations are displayed in black (and not in light color) to indicate that they are part of your look. They can not be erased and will be automatically included in your custom look drawing. All dimensional lines displayed by *Load Xpert*™ will be aligned with the background reference outline. You can not and should not draw yourself any axle group or articulation connection. *Load Xpert*™ can not recognize axle groups that were drawn in *LX-CAD* and will not be able to perform axle load calculations for those axles.

The important dimensions that should not be changed in the look drawing of *LX-CAD* are listed below:

Tractor: Cab length, front axle setback and sleeper length (if present).
Straight truck: Cab length, front axle setback, box length (body) and box height (body).
Trailer: Length and height of box.
Pup trailer: Length and height of box, and length of drawbar.

STRETCHING RULES

TRAILERS:

When you are modifying the look of a trailer unit, **Load Xpert**™ is capable of stretching (proportionally) the desired look to fit the dimensions of the current unit. The stretching is done along the length of the vehicle only and the height is not adjusted in any way. You can use the EDIT UNIT DIMENSIONS command of **Load Xpert**™ to change the trailer dimensions and the look will be automatically stretched (proportionally along the length) to fit the new dimensions.

TRACTORS, STRAIGHT TRUCKS AND PUP TRAILERS:

Load Xpert™ is NOT capable of stretching tractor, straight truck and pup trailer looks to fit the dimensions of the current unit. Therefore, when you modify the look of a unit, you must select a look file that was created with the same important dimensions (see list below for important dimensions) as the current unit. Also, you should not use the EDIT UNIT DIMENSIONS command on a unit with a modified look to change any of these important dimensions. Mismatched dimensions between the look file and the unit will result in improper alignment of dimensional lines. For example, if you want to modify the look of two pup trailers with different lengths, you need to draw both of them in **LX-CAD**. You can not simply use the EDIT UNIT DIMENSIONS command to modify the length of the pup trailer. The following dimensions must be identical for both the background reference unit and the look file:

Tractor: Cab length, front axle setback and sleeper length (if present).

Straight truck: Cab length, front axle setback, box (body) length and height.

Pup trailer: Length and height of box, and length of drawbar.

MAIN GRAPHICAL DISPLAY

The main graphical display (Fig. 1) of the **LX-CAD** software contains all the menus you need to draw your unit. The software will return to this screen after every command. This is the focal point of the software.
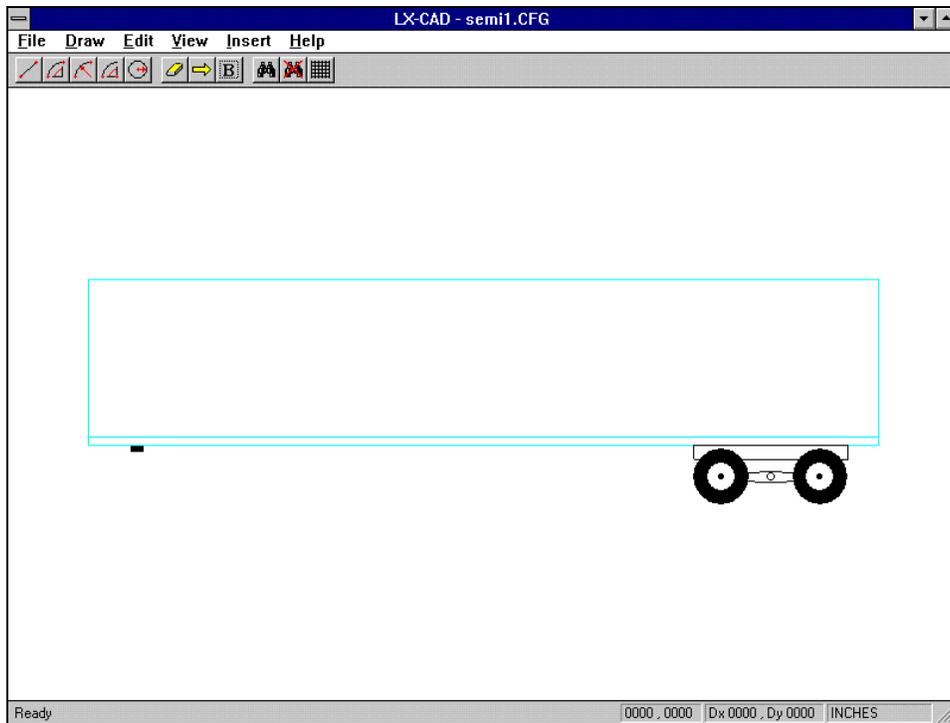

Figure 1: MAIN Graphical display of LX-CAD

The main menu of the **LX-CAD** software is the horizontal menu at the top of the screen. It contains all the commands that you can use to draw a vehicle, load or accessory.

The main part of the screen is occupied by the graphic window. This window contains the look of the standard reference unit, load, or accessory as the background in light color. The unit, load or accessory look drawn using **LX-CAD** will appear in the foreground in black. Axle groups and articulations are automatically drawn in the foreground and are part of your unit look.

The bottom part of the screen is the status bar. This section will provide you information and instructions to complete operations. The right side of the status bar will be used during certain operations to display the coordinates of the cursor location. The cursor location can be displayed in three different forms:

1. **3,6 |**   Cursor at position (3,6)
2. **3,6 | Dx 2, Dy 1**   Cursor at position (3,6), offset by (2,1) from base point
3. **3,6 | Ang. 74⁰**   Cursor at position (3,6), at an angle of 74 degrees from base point

The cursor position is always given in the current unit system. Position (3,6) indicates that the cursor is 3 inches (or centimeter) to the right and 6 inches (or centimeter) above the origin.

The current unit system is displayed in the lower-right corner of the main graphical display.

BASIC CONCEPTS

LX-CAD is a simple drawing software. It follows some of the same basic concepts used in any standard CAD softwares such as AutoCAD and Cadkey.

The graphic window is used to represent the drawing of your vehicle. Whenever you are performing a drawing operation, the cursor will change to a crosshair cursor. The crosshair cursor will move in a specific increment specified by the snap setting. The snap setting is user-defined. For example, if the snap is set to 2 inches, it will not be possible to move the cursor to the position (1,1). The snap setting defines an imaginary grid with its origin at (0,0) to which the cursor is "attached". The cursor can only move to grid point positions. The grid points are automatically displayed by *LX-CAD* whenever possible. The crosshair cursor can be moved using the arrow keys instead of the mouse for greater precision. Angular measurements are all made in a counterclockwise direction from horizontal axis.

The unit drawing is composed of three types of primitives: lines, arcs and circles. A group of primitives can be saved as blocks. Blocks are a convenient way of creating high-level objects that are frequently used in unit drawing.

SELECTION MECHANISM

Several operations (erase, move, block, etc.) will require you to select entities on which you want the operation to be performed. Selection is done by clicking on the entities or defining a window that include all desired primitives: click and hold the left mouse button on the first corner of the window, move to the mouse to the second corner of the window and release the mouse button. Only primitives completely inside a window will be selected. All primitives that are selected are displayed in dotted red. You can unselect a primitive by selecting it again.

THE OPEN VEHICLE COMMAND

The OPEN VEHICLE command permits the user to retrieve a reference unit in *LX-CAD*. The unit will be displayed in the background (light color) as a reference for subsequent drawing operations.

THE OPEN VEHICLE LOOK COMMAND

The OPEN LOOK command is used to retrieve a the drawing of unit previously saved in a look file. Retrieving a look will discard the current vehicle.

THE NEW LOAD LOOK COMMAND

The NEW LOAD LOOK command is used to create a new load or accessory look. You will need to specify the overall dimensions of the load or accessory you are planning to draw.

THE OPEN LOAD LOOK COMMAND

The OPEN LOAD LOOK command is used to retrieve a drawing previously saved in a look file. Retrieving a look will discard the current look.

THE SAVE LOOK COMMAND

The SAVE command is used to save the drawing in a look file. If the drawing does not have a name yet, the SAVE LOOK AS command will be used instead.

THE SAVE LOOK AS COMMAND

The SAVE AS command is used to save the drawing in a look file under a different name. You will be prompted for a file name. If the file already exists, you will have the option of replacing the existing file or canceling the save operation. All drawings that are stored in look files can be retrieved using the OPEN LOOK command. All unit look files have a .LOK extension. All load and accessory look files have a .LLK extension.

THE UNIT SYSTEM COMMAND

The UNIT SYSTEM command is used to change the unit system used in the software. Two different unit systems are available: inches and centimeters. The unit system currently in use is displayed on the right side of the main menu.

THE EXIT COMMAND

The EXIT command is used to quit the *LX-CAD* software. The EXIT command will not save the current drawing. You have to use the SAVE LOOK command to save the current drawing BEFORE exiting.

THE LINE COMMAND

The LINE command is used to draw a line primitive (Fig. 2). You are first prompted to enter the start point of the line. You can move the cursor to the desired point with the mouse or the arrow keys and click the mouse left button or press enter to accept the point. You must then enter the end point of the line using the same method. Once entered, the end point automatically becomes the start point of another line segment. You can create several connecting lines by successively entering end points of your line segments. You can abort the operation by clicking the right mouse button or by pressing the ESC key.
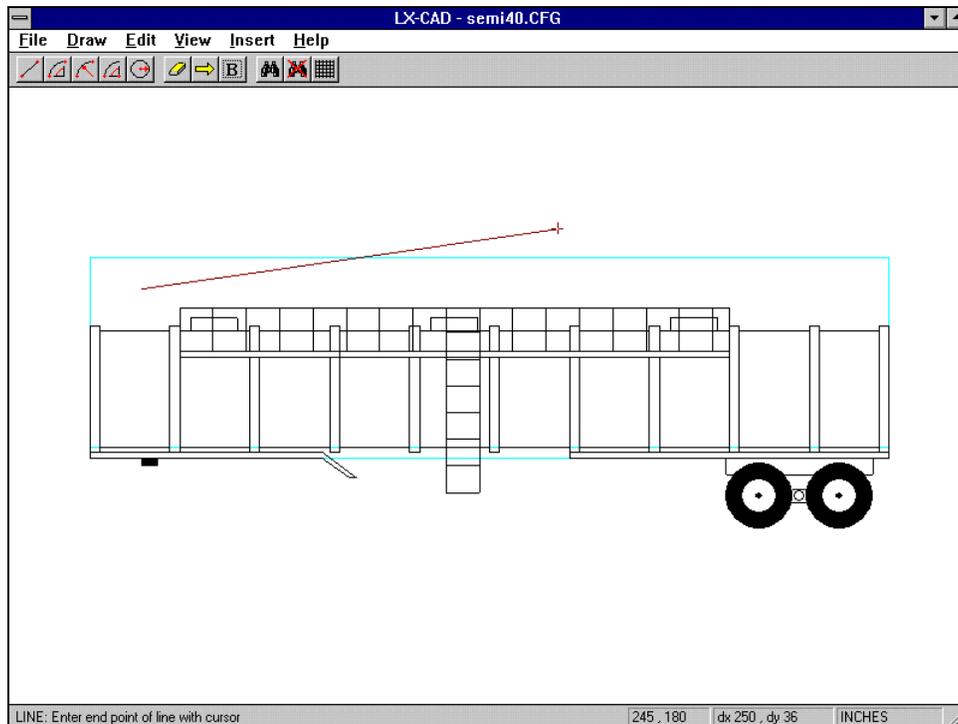
Figure 2: Drawing a line.

THE ARC COMMAND

The ARC command is used to draw an arc primitive (Fig. 3). Three options are available to describe the arc: 1) start point, end point and angle covered; 2) start point, end point and radius; 3) start point, centre point and angle covered. You are first prompted to enter the start point of the arc. You can move the cursor to the desired point with the mouse or the arrow keys and click the mouse left button or press enter to accept the point. You must then enter the end point or the centre point of the arc using the same method. Finally, you can enter the angle covered by the arc or the radius of the arc. Note that an arc is always defined counterclockwise from its start point. Also, options 1 and 2 do not permit you to create arcs that are covering more than 180 degrees. You can abort the operation by clicking the right mouse button or by pressing the ESC key.
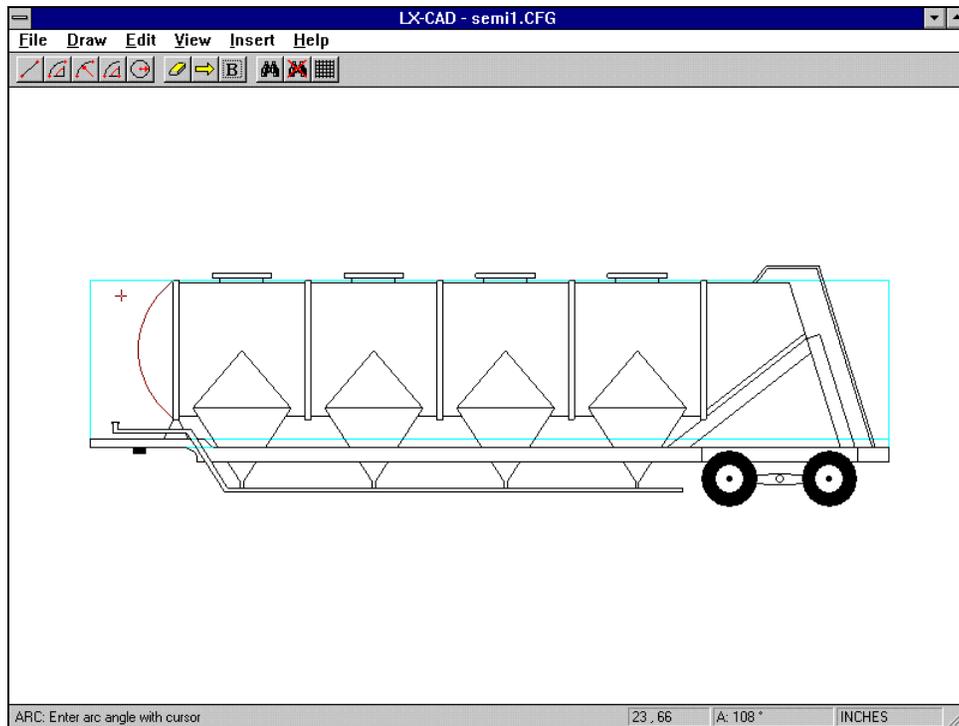
Figure 3: Drawing an arc.

THE CIRCLE COMMAND

The CIRCLE command is used to draw a circle primitive (Fig. 4). You are first prompted to enter the centre point of the circle. You can move the cursor to the desired point with the mouse or the arrow keys and click the mouse left button or press enter to accept the point. You must then define the radius of the circle by picking a point along it's circumference. You can abort the operation by clicking the right mouse button or by pressing the ESC key.
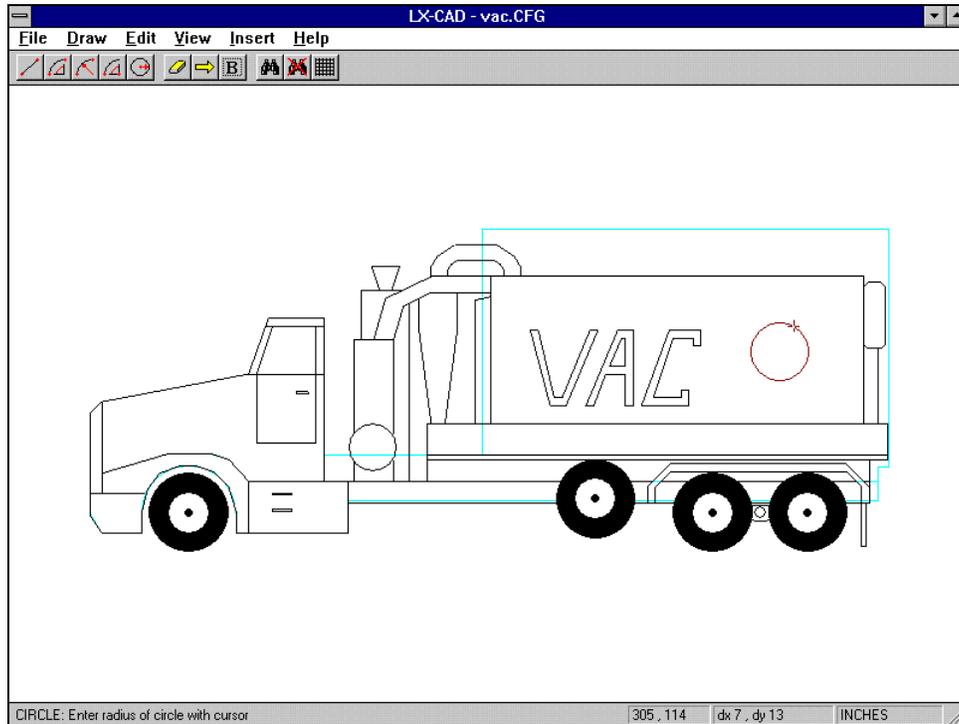
Figure 4: Drawing a circle.

THE ERASE COMMAND

The ERASE command is used to erase one ore more entities (lines, arcs and circles). First select all the entities to be erased (see section 2.4). Then, using the ERASE command, all selected entities will be erased definitively.

THE MOVE COMMAND

The MOVE command is used to move entities from one point to another. First select all entities to be moved (see section 2.4) and invoke the MOVE command. You will need to enter the base point and its new position where it needs to be moved. All selected entities will be moved by the distance between the base point and the new point.

THE BLOCK COMMAND

The BLOCK command is used to save many entities as one block. For example, you could draw and save a ladder as a block. First select all entities (see section 2.4) that are part of the block and invoke the BLOCK command. Then, enter the insertion point for the block. The insertion point of the block will be placed at the insertion point selected with the mouse when inserting a saved block. The insertion point should be chosen to facilitate accurate insertion of the block in a drawing. Finally, you can save the block and give it a representative name for easy retrieval.

THE UNSELECT ALL COMMAND

The UNSELECT ALL command permit you to unselect all selected entities.

THE ZOOM ALL COMMAND

The ZOOM ALL command is used to restore the original complete view of the vehicle.

THE ZOOM WINDOW COMMAND

The ZOOM WINDOW command is used to enlarge a section of the drawing. The portion of the drawing contained in the window will be enlarged. You can use the ZOOM WINDOW command several times to enlarge a very small portion of the drawing.

THE ZOOM PREVIOUS COMMAND

The ZOOM PREVIOUS command permits you to restore the previous view or zoom.

THE PAN COMMAND

The PAN command permits you to translate or slide your drawing in any direction without affecting the zoom setting. You must select the base point and the new

point for the panning operation. After the command is completed, the base point will be located on the screen at the position of the new point before the operation .

THE SET SNAP COMMAND

The SET SNAP command permits you to change the snap increment. The snap increment is used to define the grid that the cursor is "attached" to. The cursor can only move to grid points. This permits you to improve the accuracy of drawing operations. The minimum value for the snap is 1 (inch or centimeter). The grid defined by the snap is automatically displayed whenever possible.

THE INSERT DXF COMMAND

The INSERT DXF command is used to insert a DXF file in the drawing. DXF files are similar to block files except that they were created using a commercial CAD software (e.g. AutoCAD, Cadkey, etc.). DXF is a standard format for exchange of drawing information between different CAD softwares.

To use the INSERT DXF command, you must first draw part of your vehicle using a commercial CAD software and save it as a DXF file. This file can then be inserted in **LX-CAD** using the INSERT DXF command. When drawing using a commercial CAD software, you must use only lines, arcs and circles because **LX-CAD** does not support any other types of primitives. Also, the unit system must be set to one unit equals one inch and all lines, arcs and circles must be on layer 0.

When inserting the DXF file, you can select an insertion point with the mouse. Note that the insertion point of the DXF file is automatically set to the origin (0,0) of the CAD drawing.

THE INSERT BLOCK COMMAND

The INSERT BLOCK command is used to insert a block that was saved with the BLOCK command. You need to select the block to be inserted and its insertion point. The insertion point you enter will coincide with the insertion point of the block.