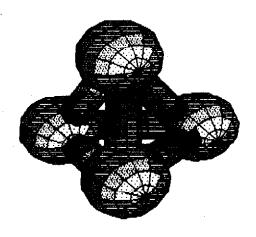
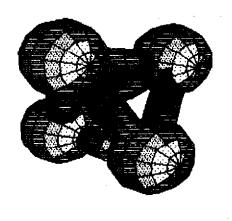
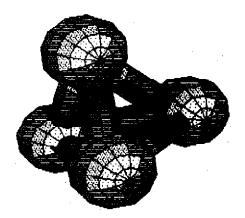
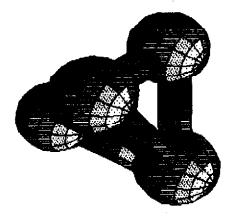
# McCann Software Presents The Geometer's Apprentice

3D CRD color, light and magic for the TI-99/4R and Geneve computers.









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The Geometer's Apprentice (TGA) is distributed on "flippie" diskettes. A flippie is like a 33 LP record in the sense that there are programs on both sides of the diskette. In this case the 99/4A version is on the other.

Loading TGA (99/4A version)

1. From TI Editor Assembler: Choose 3. Load and Run. Type DSK1.TGA<enter>. The disk drive will run and the TGA Title Screen will appear. TGA must load from disk drive 1.

2. From TI Extended BASIC: Put the TGA disk in the diskette drive and choose the Extended BASIC option, TGA will autoload. NOTE: The Extended BASIC cartridge is notorious for having dirty contacts causing improper loading. Cleaning these contacts with a soft swab and rubbing alcohol may help.

Loading TGA (Geneve Version)
TGA uses all memory and may not run with menu programs or other
programs which attempt to reside in memory with it. For easiest use
make a separate MDOS diskette with the MDOC, GPL, Editor/Assembler and
all the files from the Geneve side of the TGA diskette. Finally the
following AUTOEXEC in V1.08 of MDOS and later works well:

ECHO OFF TIMODE A:GPL DSK1.RA

Once you have the Editor/Assembler (E/A) loaded in the Geneve follow instruction number 1. above to load the Geneve version of TGA. Special note: Using MDOS V1 01 and GPL .99 will allow more memory for objects since MDOS was smaller in that version.

Printer Information:

The proper file name for parallel printers is PIO.CR or PIO.CR.LF. Our experience with TPA and other programs indicate that some printers have a dip switch that performs an automatic linefeed after each line of print is sent. In order to do graphics this switch should be set so that no automatic linefeed is done (see your printer manual). In order to use TGA with the TI-99/4A Impact Printer you must set the dip switch for 8 wire graphics. The instructions are on page 51 of the owner's manual. The proper filename for the TI-99/4A impact Printer is R523Z.BA=xxxx.CR.DA=8, where xxxx is the baud rate chosen in the printer dip switches.

Copying the Program Diskette:

McCann Software believes that your software investment should be protected. For that reason we do not copy protect our software. You are encouraged to make a back-up copy. Caution: The names of programs in the Geneve and 99/4A versions are the same but the programs are not. Do not copy both versions onto one diskette or attempt to change the program names. Please do not make any other copies as this is in violation of our copyright and in violation of Federal law.

NOTE: TI-99/4A, TI-99/4A Impact Printer, TI Extended Basic, TI-Writer and TI-Editor/Assembler are trademarks of Texas Instruments Inc. TI-Artist copyright by Inscebot Inc. Geneve and MDOS are trademarks of MYARC Inc. Draw N Plot copyright by Quality-99 Software.

Getting Started with TGA (99/4A version)

Please follow these instructions step by step. They will give you the basic idea of the TGA system. elipses around a key name such as <fctn> or <enter> or around a <filename> or a series of commands the command, key or filename do not include the elipses just what is enclosed within. Please make a back-up copy of your TGA disk before proceeding and use the backup.

- Load the TGA 99/4A version from your backup copy of the TGA disk. When you see <Type TGA--Press Enter> please type TGA in caps and 2. enter
- 3. When the TGA CAD main menu appears press (D) for Directory.
  4. You will be asked (Please enter drive number). With your TGA disk in drive one press <1><enter>.
- When the directory manager appears use  $\langle fctn \rangle \langle X \rangle$  or  $\langle fctn \rangle \langle E \rangle$  keys to move the cursor next to the (GLOBE O) filename. Press
- You will notice that your cursor has returned to the main menu and the
- filename <DSK1.GLOBE\_O> has moved to the Objfile <filename> field. Press (L) for Load\_obj.
- When the drive stops running press (E) for Edit. You are now at the Object Editing Menu.
- 8. Press (B) to Blank the Graphics Screen.
  9. Press (W) for Wire The gord CALCHIATI
- Press (W) for Wire. The word CALCULATING will appear followed by a blank screen on which a wire frame of the (GLOBE 0) object will be
- Press any key to return to the Object Editing Menu. Besides Wire 10. frame there are three other renderings of the same object: Faces, Color Faces shows only the visible faces of the object. Color ows each visible face shaded according to where the light strikes it and the chosen shading palette. Solid shows the shaded faces with a highlighted outline. To see each of these in turn, press (B) for Blank then <F> for Faces; <B> for Blank then <S> for Solid; <B> for Blank and then (C) for Color. Pressing any key returns you to the menu.
- 11. Variables are available to change the apparent size, attitude or light source of the object. Press V to enter the Variable Editing Menu. Use the <fctn><E> and <fctn><X> keys to move the cursor into the Xaspect and Yaspect fields. Change the values to 0800 in each field. Use (fctn)(9) to get back to the Object Editing Menu. Go back to step 8 above and do steps 8 and 9 again. You can see the apparent change in cise of the object caused by your change in Xaspect and Yaspect.
- 12. To create a new object press (N) for New New will erase the vertex data from the object memory and enter the vertex editing screen which is an axis and a cursor. Move the cursor using <fctn><E> and <fctn><X> and the <enter> key to make a cross section of vertices and lines similar to the diagram on the next page. First move the cursor toward the top of the screen and press (enter) creating a vertex then move clockwise to the next vertex. When you press enter a vertex is If you don't like the place you put the last vertex you may remove it with <fctn><1>. When you have an approximation of the diagram press (fctn)(9). Return to step 8 above and see what the created object looks like. The variables and shading palette are not crased when you pressed (N) for New
- Pressing (T) for Toggle will flip from the menu to the picture screen.
- 14. Pressing (P) for Palette will allow you to edit the shading

When the Palette editing screen comes up, you may press enter to jump into the block editor. The cursor keys (fctn) and (S), (D), (E) or (X) will move you around the blocks. The (space-bar) will blank a block Any other key will darken a block. When finished editing or to escape use (fctn)(9). (fctn)(9) will move you to fields called FG (foreground color) and BG (background color). Enter any number from 0...9-A...F to change colors. Move up or down with (fctn)(E) or (fctn)(X). Move back to the individual palette entries with (fctn)(9). You may move among each of the sixteen shades changing the number to change the pattern. When finished, press (fctn)(9) to get the Object Editing Menu.

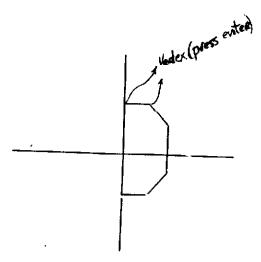


Diagram 1. The above diagram was directly printed from the Vertex Editing Screen. The arrows point to two of the vertices created by pressing the kenter key. The diagram was was created from the top in a clockwise fashion.

Overview TGA-99/4A edition.

The Geometer's Apprentice(TGA) for the 99/4A has three operational parts.

The TGA CAD system, the TGA Slides Creation Language(SCL) and the TGA Print Utility system. The TGA CAD system is a menu driven 3D CAD object editor. The Slides Creation Language is an interactive program interpreter which uses the features of the TGA CAD system in a programming environment for creating screen image slides and slide shows. The TGA Print Utility system is a general purpose art printing utility. The Print Utility system also contains a Jotter program editor for creating and editing program files for the TGA SCL interpreter.

There are three basic data structure types used in TGA. They are Object files, Picture files and Source files. The Object files contain the data to render 3D objects. Object files are unique to, created by and edited with the TGA CAD system. By convention, these files are stored on disk with a "10" as the last two characters of their filename. Object files are Internal Fixed 128 (I/F 128) files in the 99/4A filing system.

Picture files are common to many 99/4A art programs especially TI-Artist(tm) and Draw-n-Plot(tm). By convention, Picture files are stored on disk with a "P" as the last two characters of their filename. Picture files are Program files (PGM) in the 99/4A filing system, normally 25 sectors in length.

The third data type is called Source files and used by the TGA Slides Creation Language. By convention, source files are stored on disk with a "S" as the last two characters of their filename. Source files are Display Fixed 80 in the 99/4A filing system and are of any length.

Εx

Object file: DSK1.SPHERE\_0 I/F 128 5
 Picture file: DSK1.PICTURE\_P PGM 25
 Source file: DSK1.CODE\_S D/F 80 11

#### \*\*\*\*\*\*\*

f-e: Is an abbreviation for pressing the keys (fctn)(e). f-e moves the cursor up from its present position.
f-x: Is an abbreviation for pressing the keys (fctn)(x). f-x moves the cursor down from its present position.
f-9: Is an abbreviation for pressing the keys (fctn)(9). f-9 escapes from the directory utility to the menu below.
Act: Is an abbreviation for Activate, done by pressing the (A) key. Act will copy the filename adjacent to the cursor to the filename field at the bottom of the screen.

## \*

Load object file. Pressing  $\langle L\rangle$  will load the file named in the Objfile  $\langle \text{object}\_\text{filename}\rangle$  field.

#### Information:

If an error occurs on loading the system will "drop" to the TGA SCL interpretor. Simiply type TGA<enter> to re-start the menu system. The Object\_File type is Internal Fixed 128(I/F 128). The Object\_File used by the 99/4A version of TGA is of size 5 sectors. It is recommended that the last two letters of the filename be <\_O> as a convention (i.e. DSK1.FILENAME\_O).

## 

Save\_ojb: Is an abbreviation for Save object file. Pressing <S> will save the file named in the Objfile (object\_filename) field. For file type information, see Load\_obj above.

## 

New will enter the Object Editing menu for creating a new 3D object. Since there are two basic types of 3D objects (Spin or Extrude), you will be asked: Spin or Extrude?

## 

The proper responses are:  $\langle S \rangle$  for spin type objects;  $\langle E \rangle$  for extrude type objects; or  $\langle fctn \rangle \langle 9 \rangle$  to escape back to the TGA main menu. Pressing  $\langle S \rangle$  or  $\langle E \rangle$  takes you to the Object Editing Menu.

## 

New Edit Vars Tog Blank Palette (  $\langle fctn \rangle \langle g \rangle$  escapes from this menu) Auto Wire Faces Color Solid ( back to the TGA Main Menu. )

#### \*\*\*\*\*\*\*\*\*NEW\*\*\*\*\*\*\*\*\*\*

New does two things, it removes any vertex data from the object memory and enters the Vertex Drawing Screen. See the section on vertex drawing.

#### \*\*\*\*\*\*\*\*\*\*Edit\*\*\*\*\*\*\*\*\*\*\*

Edit enters the Vertex Drawing Screen which is used to create the vertices used for creating a 3D object. Edit and New efase any

previously drawn 3D object from the screen.

## \*\*\*\*\*Vertex Drawing Screen\*\*\*\*

The Vertex Drawing Screen is on the bit map screen. A vertical axis and horizontal axis is drawn and a cursor appears when this screen is called up by New or Edit. If an existing set of vertices is in the object memory a line will be drawn connecting each set of vertices to create an outline of the object shape. The object shape may now be edited by creating or removing vertices. Six simple commands control the creation and removal of vertices.

```
<fctn:<E> moves the cursor up.
<fctn:<X: moves the cursor down.
<fctn:<S> moves the cursor left.
<fctn:<D> moves the cursor right.
fctn:<9> returns to the Object Editing Menu.
fctn:<1> removes the last drawn vertex.
<enter> creates a vertex at the current cursor position.
```

For Spin objects, the cursor will only operate to the right of the vertical axis since a spin object is symmetric about that axis. For Extrude objects the cursor will operate throughout the editing screen.

Notes on creating objects: Although a vertex may be located at any point, a certain order for vertices was designed into the object creation system. If an object is created from top to bottom and clockwise, the shading and rendering will be more "true". Additionally, "inside" surfaces may not be shaded properly. Ideally objects should be like a ball with no pockets or holes. Complex objects may be represented better by two or more objects. The diagram just after the "Getting Started with TGA" page may help you see the idea of a vertex and an object with no "pockets".

#### \*

Vars is an abbreviation for Variables. Pressing  $\langle V \rangle$  will enter the variables editing screen.

#### \*\*\*\*\*\*3D Variable Editing Screen

The following display of values are shown when  $\langle V \rangle$  is selected. Values may be entered for each of these variables to control—the display—of the 3D objects.

```
Xaspect
Yaspect
X
Y
Z
Roll
Pitch
Yaw
L Roll
L Ptch
L Yaw
#Deg/Seg
```

General cursor action in the above menu: <fctn><X> move down a field. <fctn><E> move up a field. <enter> move down a field. leave the Variables Editing Screen and return to Object <fctn>(9) Editing Menu. <fctn><S> move left in field. <fctn><D> move right in field. Variable definitions and values. \*\*\*\*\* Xaspect: Controls the apparent horizontal size. Valid values 1...8192 \*\*\*\*\* Yaspect: Controls the apparent vertical size.
Valid values 1...8192 \*\*\*\*\* X: Controls the relative horizontal position (right/left).

Valid values -8192...8192

\*\*\*\*\* Y: Controls the relative vertical position (down/up). Valid values -8192...8192

\*\*\*\*\* Z: Controls the relative depth of the object (back/forward). Valid values -8192...8192

\*\*\*\*\* Roll: Controls the right/left tilt of the object. Valid values -360...360 in degrees.

\*\*\*\*\* Pitch: Controls the forward/back tilt of the object. Valid values -360...360 in degrees.

\*\*\*\*\* Yaw: Controls the right/left spin of the object.
Valid values -360...360 in degrees.

\*\*\*\*\* Lroll, Lpitch, Lyaw: These control the apparent location in space of the light source for shading. These values are not as easy to observe as Roll, Pitch and Yaw, but experimentation may yield the desired effect. For example, if the light source is behind the object, the dark face will be the only part visible to the viewer. values are most easily observed. The negative values especially in the range -135 to -160 for each of the illumnination varibles can be thought of as directing light from the area of the view screen toward

## 

#Deg/Seg is an abbreviation for Number of Degrees per Segment. This is used in three different ways depending on whether you are using Spin, Extrude or Auto.

#Deg/Seg (Spin): When an object is spun, the outline of vertices from the vertex editing screen is moved by degrees around the vertical axis. This is like taking equal vertical clices cut out of an apple (not an Apple II or Mac) and putting them back together to make a whole apple. The horizontal size of the slice could be measured in degrees. instance, a quartered apple has slices of ninety degrees each since the total circumference of the apple is 360 degrees. With the #Deg/Seg you can control the number of degrees in each slice in your object. Valid values are 1...180. Values which divide into 360 evenly give the best 2,3,4,5,6,8,9,10,12,15,18,20,24,30,36,40,45,60,72,90,180) (i.e.

#Deg/Seg (Extrude): There is only one end surface in an Extrude. We use the #deg/seg for the "depth" of the extruded element. Valid values are 1...8192. though values over 200 may be impractical.

## \*

Tog is an abbreviation for Toggle Screen. Pressing (T) will dioplay the bit map screen, where the 3D images are drawn, until any key is pressed.

#### \*\*\*\*\*\*\*\*\*Blank\*\*\*\*\*\*\*\*\*\*

Pressing <B> for Blank will erase any image on the bit map screen. This is where 3D images are drawn and where the vertex drawing screen is located.

## \*\*\*\*\*\*\*\*\*Palette\*\*\*\*\*\*\*\*

Pressing (P) for Palette will enter the Palette Editing screen.

#### \*\*\*\*\*Shade Table Editor\*\*

```
ХX
   ХX
       XX
                 xx....
            ХX
ХX
                xx....
    λĶ
        ΧХ
            ХX
        2
    1
             3
                 4 . . . . .
n
             0
                 0 ....
```

The shade table displays each of the sixteen possible shading or hatching patterns which are used in shading objects in TGA. Patterns are arranged in two rows and progress from left to right in each row from darkest shade (numbered <0>) to the lightest shade (numbered <F>) The top number below the shade pattern is the intensity number. The second number below the shade pattern is the pattern number. Each intensity may be assigned any of sixteen pattern numbers (0..9,A..F). One keystroke values were chosen for ease of use Each pattern is defined in the Fixel Editor. To edit a pattern enter the pattern number then press enter. The cursor moves to the pixel editor which will allow changes to be made to the pattern. will allow changes to be made to the pattern. After exiting from the pixel editor, the user may select the Background and Foreground colors for both the text and bitmap screen.

#### \*\*\*\*\*Pixel Editor\*\*\*\*\*\* Ex.

The pixel editor is in an 8x8 grid. Each block in the grid XXXX XXXX is XXXX XXX is either darkened or not, representing a pixel or dot in the XXXX XX

hatching pattern to be used in shading 3D objects. The cursor may be moved to any position in the 8x8 grid to X XXXX X XX XXXX change the pattern by turning on or off a block.

Cursor operations are: XXXX XX XXX XXX

<fctn><S>=left,<fctn><D>=right,<fctn><E>=up,<fctn><X>=down. <fctn><9>=escape, <space bar>=off, <any other key>=on XX XX XX

#### \*\*\*\*\*Screen Colors\*\*\*\*\* EX.

To change the foreground color enter number (0..9-A..F) FG 1 BG E To change the background color enter number (0..9-A..F)

Use  $\langle fctn \rangle \langle g \rangle$  and  $\langle fcnt \rangle \langle \chi \rangle$  to move between FG and BG fields. <fctn><9> returns to the pattern with intensity 0. The background and foreground colors are enumerated in TI-BASIC and other manuals. Sometimes they are numbered (1..16).

\*\*\*\*\*\*\*\*\*\*\*

Auto is an abbreviation for Automatic Object Creation will automatically generate the vertices which, when Extruded or Spun, Pressing Auto will make a regular 3D object. Auto requires some procedures to be followed for good results.

Auto procedure for Spin objects: Auto done in the Spin mode will create a sphere. The number of faces on the sphere and the size is determined by two variables. The X variable controls the sphere radius and the #Deg/Seg variable controls the number of vertices in the longitudinal ажів. À short script for Spin Auto follows:

Fress V to enter Variables Editing Menu.

Use (fctn)(e) or (fctn)(x) to move through the variables

Set Xaspect, Yaspect and Z at 1200.

4. Set X at 80. X controls the radius of the sphere. 5. #Deg/Seg at 30. This controls vertices in the longitudinal axis. Set value of 30 means there will be a vertex every thirty degrees.
longitudinal axis has 360 degrees like a circle. The The

6. Press (fctn)(9) to escape to the Object Editing Menu.

7. Press (A) for Auto.

Press (B) to Blank the bit map screen

9. Press (W) for Wire. Your first wire frame object will be draawn.

Auto procedure for Extrude objects: Auto done in the Extrude mode will create a regular polygonal extrusion. The number of faces on the edge of the extrude and its size are determined by two variables. The X variable controls the "radius" and the #Deg/Seg variable controls the number of vertices around the edge. You can basically follow the above script to generate the extrude but you will need to go back to the Main Menu, select (N) for New, choose (E) for Extrude then follow the script above. Note: Extrude objects have an additional use for #Deg/Seg. After Auto is done #Deg/Seg may be set to determine the depth of the

## \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Pressing <W> for Wire will draw a wire frame rendering of the vertex data slored in the object memory.

## \*\*\*\*\*\*\*\*\*Faces\*\*\*\*\*\*\*\*\*\*

Pressing <F> for Faces will draw a wire frame of only the visible faces of the vertex data stored in the object memory.

## \*\*\*\*\*\*\*\*\*\*Color\*\*\*\*\*\*\*\*\*\*

Pressing (C) for Color will draw each visible face rendered in the shading determined by the palette and by the values of the illumination

## \*\*\*\*\*\*\*\*\*\*Solid\*\*\*\*\*\*\*\*\*\*

Pressing (5) for Solid will draw each visible face outlined in the foreground color and rendered in the shading determined by the palette and by the values of the illumination variables.

Edit will enter the Object Editing menu for modifying or displaying a object that is already in memory.

Information:

If the Spin or Extrude? prompt appears, you will know that there is not a previously created object in memory. You may answer the prompt and proceed, or escape  $\{fctn\} < 9 \}$  to load an object before editing.

Pies is an abbreviation for Picture\_File\_Loader. Pressing  $\langle P \rangle$  will cause the Pics menu to appear.

\*\*\*\*\*\*\*\*\*\*\*\*\*Picture File Menu\*\*\*\*\*\*\*\*\*

Dir Load Save Tog

(note: <fctn><9> escapes)

Picfile: <Picture\_Filename>

See the Directory information previously given in these documents.

Pressing  $\langle A \rangle$  will activate the adjacent filename copying that name to the  $\langle Picture\_Filename \rangle$  field.

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Pressing  $\langle L \rangle$  will load the file named in the Picfile <Picture\_Filename> field.

Information:

If an error occurs on loading the system will "drop" to the TGA interpreter. Simiply type TGA<a href="TGA">TGA</a> Picture File type is Program (PGM).

The Picture File size is 25 sectors.

It is recommended that the last two letters of the filename be < P> as a convention (i.e. DSK1.FILENAME\_P).

\*

Processing <S> will Save the file named in the Picfile <Picture\_Filename> field. See Load above for further file and error information.

Tog is an abbreviation for Toggle Screen. Pressing  $\langle T \rangle$  will display the bit map screen (where the picture files are loaded) until any key is pressed, returning you to the main menu.

\*\*\*\*\*\*\*\*\*\*\*\*\*\*Picfile\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Picfile is an abbreviation for Picture Filename. Pressing  $\langle P \rangle$  will move the cursor to the field where a picture filename may be entered

edited.

Zapfile means to Delete File From Diskette. Pressing  $\langle Z \rangle$  will delete the file named in the  $\langle Object_i|$  Filename $\rangle$  field from the diskette. The message "Sure?(Y/N)" will appear before the file is deleted. Proper response to this message is  $\langle Y \rangle$  to delete the file or  $\langle N \rangle$  to return to the menu without deleting the file.

Objfile is an abbreviation for Object Filename. Pressing <0> will move the cursor to the <object\_filename> field where an object file name may be entered or edited. See Load\_Obj section earlier in these documents for filename explanation.

To access the Print Menu System while in the TGA Menu System follow this procedure. First, press (fctn><9>. Insert the TGA system diskette in drive 1 then type PRINT(enter>. Once you have loaded the Print System and the cursor is flashing you have three choices. You may type PRINT(enter> to enter the Print Menu System. You may type TGA(enter> to reload the TGA Menu System and the TGA Slide Creation Lanugage interpreter. You may type MON(enter> to return to the TI Title Screen.

Variables Pixel Shape

Goprint Variables Cpixel Size Directory Jotter Loadpicture Toggle

E Printer (filename or printername)

Goprint is an abbreviation for Start Frinting. Pressing  $\langle G \rangle$  will begin sending data to either the Printer or Extrn file depending on which filename is showing at the time.

Note: If you wish to stop printing press (fctn><4> until the printing stops. If this causes an output error you may have to type PRINT(enter> to restart the Print Menu. Following an error, you must reset <on and off> your printer to clear it of any remaining data.

ATTENTION: If nothing seems to be printing check to see if you set the Size. Additionally, make sure you have a valid filename Extrnfile

field or a valid printer name (e.g. PIO.CR) in the Printer field.

Pressing  $\langle V \rangle$  will move the cursor up to the four variables shown on the left side of the screen.

General cursor action in the Variables:

move down a field.  $\langle fctn \rangle \langle X \rangle$ 

<fctn>:E> move up a field.

<enter> move down a field.

<fctn><9> leave the Variables.

Variable definitions and values.

\*\*\*\*\*Prntr Type/Eps--Gem\*\*\*\*\*\*\*\*

Enter (E) here if you have an Epson type printer. Enter (G) here if you have a Gemini 10% printer or compatible. If you are uncertain try a little of each.

\*\*\*\*\*Density/Sd Dd-Qd\*\*\*\*\*\*\*\*\*\*\*

Enter (S), (D) or (Q) respectively for Single, Double or Quad density printing. In order to use the Double or Quad options successfully your printer must support this type of printing. Consult your printer manual to see if Double or Quad density printing is supported.

\*\*\*\*\*Extra Dark? (Y/N)\*\*\*\*\*\*\*\*\*

Enter  $\langle Y \rangle$  for yes or  $\langle N \rangle$  for no. Extra dark means that the printer will make two passes across the page printing the data twice to darken the image. Pressing  $\langle N \rangle$  indicates a single printing of the data.

\*\*\*\*\*Landsc/Portrait\*\*\*\*\*\*\*\*\*\*

Enter  $\langle L \rangle$  for Landscape or  $\langle P \rangle$  for Portrait type printing. Portrait is the "normal" way of looking at a 8x11 page. Landscape prints the picture "sideways".

XXX XXX The Cpixel editor is an 3x8 grid. Each block in the grid XXXX XXX is either darkened or not representing a pixel or dot used XXXXX XX in the printing of the picture.

X XXXX X The cursor may be moved to any position in the 8x8 grid to change the pattern by turning on or off a block. XX XXXX

XX XXXX Cursor operations are:

<fotn><S>=left,<fotn><D>=right,<fotn><E>=up,<fotn><X>=down, X XX XXX <fctn><9>=escape, <apace bar =off, <any other key>=on

Example: If you wish to double the width of a printed picture you would place a darkened block in the second column of the first row of the Pixel Shape block Similarly, vertical size can be enlarged. Similarly, vertical size can be enlarged. Additionally, creating a pattern of the blocks will cause a pattern to be printed for each dot in the picture. Caution should be used however, as using all eight blocks in either direction enlarges the picture eight times! This may well be larger than the paper. (P.S.

Kids love happy face pixels.)

# 

The Size function lets you choose the portion of the picture you wish to print. Pressing <S> for size will display the picture screen and a cursor. Cursor functions are as follows:

```
<fctn><E> cursor up
<fctn><X> cursor down
<fctn><S> cursor left
<fctn><D> cursor right
fctn><9> back to the print menu
<enter> place the upper left corner of the bounding box.
```

To operate the Size function use the cursor keys to move the cursor to the upper left corner of the piece of the picture you wish to print. Next. Press 'enter' this "anchors" a bounding box. When you then move the cursor to the right and down, the bounding box expands showing the size and shape of the rectangle that will be printed. Pressing (enter) again will move the "anchor" to the new cursor position. When you are satisfied with the bounded area to print, press (fctn)(9). The bounding box will remain in place until the box is changed or you leave the Print Menu System.

Pressing <D> will bring up the following prompt:

Please enter drive number:

The correct response is either  $\langle fctn \rangle \langle 9 \rangle$  to escape back to the Print Menu, or the number (1..10) of the drive from which you wish to read a

Directory Menu

After the Directory function has been selected and the number of the disk drive entered; the diskette directory is read and the following menu apprears:

DSKn.FILENAME Used xxxx Free xxxx

FILENAME1 I/F 128 61 FILENAME2 D/F 80 33 FILENAME3 PGM 25

f-e,f-x,f 0,Act

\*\*\*\*\*\*\*

The purpose of the directory feature is twofold. First, using the up and down arrow keys you may move through the entire directory on the diskette using the scrolling window. Second, by pressing <a>A></a> (Activate) the filename adjacent to the cursor is automatically copied, along with the drive information (DSK1.) into the filename area on the

screen. This saves keystrokes and possible filename errors. "f-e,f-x,f-9,Act" is a little reminder of what keys are available on this screen.

## \*\*\*\*\*\*\*

fie: Is an abbreviation for preceing the keys  $\langle fctn \rangle \langle e \rangle$ . fie moves the cursor up from its present position.

 $f\text{-}x\colon$  Is an abbreviation for pressing the keys  $\langle fctn\rangle\langle x\rangle$  . f-x moves the cursor down from its present position.

f-9: Is an abbreviation for pressing the keys <fctn><9>. from the directory utility to the menu below. f-9 escapes

Act: Is an abbreviation for Activate, done by pressing the <A> key. Act will copy the filename adjacent to the cursor to the filename field

# 

The Jotter is a small program editor for creating program files to run through the TGA Slides Creation Language interpreter. The Jotter uses forty columns (just what you can see on the screen). It uses Display Fixed 30 files (just what you need for TGA SCL).

# \*\*\*\*\*\*\*\*\*\*\*\*\*Jotter Menu\*\*\*\*\*\*\*

Dir LoadF SaveF PrintF Edit Clear ( <fctn><9> escapes)

Note: when you leave the Jotter you are asked Sure?(Y/N) to remind you to save your work before you use the Print Menu or load TGA since the memory where the Jotter's text buffer resides is used by other parts of the program. Please save your data before leaving. Fress  $\langle Y \rangle$  to leave the Jotter. Press  $\langle N \rangle$  to return to Jotter menu.

## Function Key usage in Jotter:

```
(fotn)<E> oursor up
```

<fraction :X> cursor down

(foth) 3> cursor left

(fetn D. cursor right

(fent) (1) delete character under cursor and close line left.

<fcnt><2> insert blank character under cursor open line right.

<fcnt><3> delete line under cursor line saved to line buffer

<fent><4> move cursor up 8 lines

<fent><5> tab right 5 characters.

<fcnt><6> move cursor down 8 lines.

<fcnt><7> erase from cursor to end of line--characters to line buffer.

<fcnt><8> insert line under cursor from save buffer

<fcnt><9> escape back to Jotter Menu.

(enter) moves to the beginning of the next line.

## \*\*\*\*\*\*\*\*\*\*\*\*\*\*Dir\*\*\*\*\*\*\*\*\*\*

Directory (see directory function previously in these Function documents.)

## 

LoadF is an abbreviation for Load File. Pressing <L> for Load File moves the cursor down to the LoadF <filename> field. You may type a valid filename here; pressing <enter> will load the file from the diskette. You may escape without loading by pressing <fctn><9>.

## \*

SaveF is an abbreviation for SaveFile. Pressing (S) for SaveFile moves the cursor down to the SaveF (filename) field. You may type a valid filename here; pressing (enter) will save the contents of the Jotter's buffer to the file. You may escape without saving by pressing (fctn)(9).

## \*\*\*\*\*\*\*\*\*\*\*\*\*\*PrintF\*\*\*\*\*\*\*\*\*\*

PrintF is an abbreviation for Print File. Pressing <P> for Print File moves the cursor down to the PrintF <filename> field. You may enter a valid device or filename here and pressing <enter> will print the contents of the Jotter's buffer to the device named.

## 

Pressing (E) for Edit will move to the Jotter's buffer where you may enter up to 120 forty column lines of text. See the key usage table t

Pressing  $\langle C \rangle$  for Clear will clear all characters from the Jotter's text buffer. The warning message SURE?(Y/N) will allow you to change your mind (answer Y to erase or N to escape the Clear function).

# \*\*\*\*\*\*\*\*\*\*\*\*\*\*Loadpicture\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Pressing <L> will display the Picture file field for editing. Input <DSKx. filename>. Pressing <enter> will load the Picture file named in the field. Pressing <fctn><9> will escape from this field without loading.

#### Information:

If an error occurs on loading the system will "drop" to the system interpreter. Type PRINT <enter> to re-start the menu system. The Picture File type is Program (PGM). The Picture File size is 25 sectors

The Picture File size is 25 sectors.

It is recommended that the last two letters of the filename be < P> as a convention (i.e. DSK1.FILENAME P).

## 

Toggle is an abbreviation for Toggle Screen. Pressing  $\langle T \rangle$  will display the bit map screen (where the 3D images are drawn) until any key is pressed, returning you to the Print Menu

## \*\*\*\*\*\*\*\*\*\*\*\*\*E Printer/P Extrnfile\*\*\*\*\*\*\*\*

RS232.BA=4800.CR.DA=8). The Extrnfile field should contain the name of a diskette file to which you wish to send a TPA extrn file. TPA(The Printer's Apprentice) is a page creation system by McCann Software in which Extrn files are used to combine pictures and text into interesting pages. The extrn files produced by this product are fully compatible with the TPA Scheduler.

In TGA a blide is defined as one 99/4A screen size picture. To create a series of slides showing the rotation of a moon around a planet takes a little planning, some knowledge of the path the moon will take as it crosses the planet, and when the planet will obscure the moon (i.e. the planet will have to be shaded after the moon in order to obscure all or part of it). It also takes a while to get the shading just right and to decide things like if you need or want a shadow on the planet, cast by the moon, in relation to the viewpoint. If vou need stars for reference you may wish to create these on a separate picture file to be loaded before each slide is drawn. If you are a good planner you will write this procedure down before you start. However, once you draw a few slides, I'll bet you think of another thing to add to subtract from your scene. It not, you probably work as a production engineer in the motion picture or other technical business. Since I am not a production engineer, I tend to like to experiment as I go when involved in a project like that described above. I decided a short procedural language would make slide creation not only automated, but increase the amount of detail that could be included in each slide, since the computer could be used to do the grunt work as it should. I wanted the language to be as short as possible, powerful and integrated into the environment of TGA. I wrote the TGA SCL as an interpreter running within the TGA environment which will read a disk file containing a "program" and use the tools already in the TGA package to allow slides to be created and saved to disk. program would be saved on disk (allowing a large procedure if necessary), a program editor version of the TPA Jotter environment is provided as well. With this program editor you can write a program of 120, forty column lines which can later be loaded into TI-Writer for sombining into a larger procedure. This same language can be used to replay the slides using DELAY or UKEY between slides. The slides can also be modified by TI Artist (tm), Draw 'n Plot(tm) or other tools which can modify 25 sector PGM type art files (slides).

The commands of TGA SCL are as follows:

```
RUN cprogram_filename>
                                Run program file (not used in a program)
RESUME (program filename)
                                Resume program execution at ZCNT (not
used in
                                        a program.
LDO <object_filename>
                                Load Object File
SVO <object filename>
                                Save Object File
LDP (picture_filename)
                                Load Picture File
SVP <picture_filename>
                                Save Picture File
LDC <color_filename>
                                Load Color File
T > G
                                Move from TEXT to Graphics bit map mode
\mathbb{C} > \mathbb{T}
                                Move from Graphics bit map to TEXT mode
CLS
                                Clear TEXT screen
CLP
                                Clear Picture screen
CLC
                                Clear Color Screen
COLOR
                                Shade visible faces of the object
```

SOLID Shade and outline visible faces of object WIRES Draw wire frame rendering of object FACES Draw wire frame of visible faces of object <n> DELAY Delay n time intervals values 0..n..10000)<fctn><4> exits from delay UKEY Suspends execution until a key is pressed Object control variables ZONT Record number where program is executing ROLL Roll Variable PITCH Pitch Variable YAW Yaw Variable TX Left/Right location variable ΤY Up/Down location variable TZDepth variable LR Light source roll control LΓ Light source pitch control LΥ Light source yaw control DX(delta X) X aspect variable
(delta Y) Y aspect variable
(x increment) #DEG/SEG variable DYKINC VR7 Video Reg. 7 (for pros only-> 1E VR7 !) Words for Manipulating Variables (just like their Forth counterparts) ! means "store" +! means "plus store" To make TX equal to forty five you would enter the following line in your program. 45 TX ! (means forty five TX store) To increase the value of TX by 10. 10 TX +! (means ten TX plus store) A good way of thinking about the way to put values in variables in Forth type languages is this. Take your money (the value 45), go to the bank ( the variable TX) and open an account (!) or add to your account (+!). Other goodies available for use: Literals ( i.e. 0.38,-33) in the range -32767...32766math Operators +,-,\*,/, (used in RFN format: 3 3 + , instead of 3 + 3) Trig Operators SIN, COS (used in the form n SIN where -360..n..360) Source code comments form (Be careful! The syntax is critical to avoid crashes.): blank:left-paren:blank:comment:right-paren:blank ( just like this) .

Damage control word: P<enter> for Panic (if you seem stuck somewhere, try this before shutting off the machine).

Please do not attempt to use any Forth compiler words, variable or constant defining words as the SCL interpreter is not Forth and will choke if any of these are used in an SCL program.

Don't forget, by simply typing TGA you can jump right up from the interpreter to the TGA menu system to see what is going on.

Program Example 1.

LDO DSK1.GLOBE\_O T>G CLC CLP WIRES 40 TX ! -40 TY ! SOLID UKEY G>T

Explanation:

Line 1. Load Object DSK1.GLOBE\_O

Line 2. Text to Graphice, Clear Color, Clear Sicture, Draw Wire Frame, Forty TX store, minus forty TY store, Shade Solid Object, Wait for UKEY, Graphics to Text

To run this program type RUN DSK1.EX1.S at the TGA SCL cursor. Make sure the diskette with the file EX1.S is in drive 1. When the program has executed press enter to return to the Text screen. You may now type TGA<enter>, PRINT<enter>, RUN<enter> (for another program) or MON<enter> to go to the TI Title screen.

## 

RUN (filename). The RUN command is entered at the TGA SCL cursor. There are three ways get to the TGA SCL cursor. First, just load up the TGA package from E/A or ExBASIC, when the cursor appears you may use RUN. Second, if you have been using the TGA CAD system just press (fcnt) (9) at the TGA Main Menu; you will see the prompts (TGA, PRINT, RUN, MON). At this prompt you are in the TGA SCL interpreter and may use RUN. Finally if you have been using the TGA PRINT utility type TGA to reload the TGA CAD system and TGA SCL interpreter then you can use

RUN requires the <filename> file to be a valid diskette file name and for the file to be of Display Fixed 80(D/F-80) type. The program file will be interpreted one line at a time by the TGA SCL interpreter. Every word in the file must be a valid word in TGA SCL any other words will cause the interpreter to stop running. To interrupt the program before it runs through all the lines of the program you may press the <fcnt><4> keys. At the end of each line the interpreter checks to see if you are pressing the <fctn><4> key.

\*\*\*\*\*\*\*\*\*\*\*\*File Format File Format File Format\*\*\*\*\*\*\*\*\*

RUN will interpret a full 80 column line for each line in the program file. The TGA Jotter is available in the TGA PRINT utility for producing program files. The TGA Jotter lets you use the first 40 of the 80 columns and 120 lines of code. This is no problem for short programs, but if you wish to create longer programs, you may use TI-Writer(tm) or other suitable editor which will produce the D/F 80 format. In TI-Writer instead of using the SF (SaveFile) command, use

PF (PrintFile). Use the Fixed File Format prefix (F) so your PF filename would look like <F DSK1.FIXEDFILE>. This will create the proper type of file for TGA SCL.

#### \*

RESUME <filename> You may use RESUME to start execution of the TGA SCL at any particular existing line in the file. You must store the line number in the variable ZCNT. ZCNT is an abbreviation for Ze Count of Ze Line currently being interpreted in Ze CCL interpreter. See why I call it ZCNT? To store the line number 11 enter < 11 ZCNT !> means eleven ZNCT store. To check the current value of ZCNT enter < ZCNT ?> means what the heck is in ZCNT. Incidentally, the first line in the file is line number sero.

#### 

LDO is an abbreviation for Lond Object file. Object files are fully described in the TGA CAD system does. In a program, an LDO should be done before the COLOR, WIRES, FACES or SOLID commands are executed. The «filename» object file must be in the named disk drive when the command is executed. Since this command may be executed while picture files are on screen, no warning message is given if the file is not found; the interpreter just stops running.

#### 

SVO is an abbreviation for Save Object file. In a program SVO is used to save the object data from the object memory. This could be useful if you are creating motion slides where two or more objects are in different positions on consecutive slides. The SVO command can save the intermediate "state" of the object while another object is loaded, updated and displayed. There must be sufficient room on the named diskette when the SVO command is used since it can be called while pictures are on the screen; no warning is given the interpreter just stops running. Remember, ZCNT has the current line being interpreted so you can fix up the environment and re-start the process.

#### \*

LDP is an abbreviation for Load Picture file. Picture files are "alides" and are fully described in the TGA CAD system documents. (filename) must be a valid filename and in the named disk drive when the LDP command is executed. The TGA SCL issues no warning; if the file is not found, the program interpretation just stops. Additionally, it would be a good idea to be in Graphics mode (T>G) before you execute LDP.

## 

SVP is an abbreviation for Save Picture file. Picture files are "slides". You may save a slide you have created to diskette using the SVP command. There must be at least 25 sectors free on the diskette to which the file is to be saved. TGA SCL will give no warning if there is not enough room or if the diskette is protected program. Program execution will just stop.

#### \*

LDC is an abbreviation for Load Color file. Some art programs such as TI-Artist(tm) create "color" files which are the color portion of the Picture Files. If you have created a color file you wish to display or G>T commands are executed after LDC the color file data is erased.

\*

 $\mathsf{.T}\mathsf{>}\mathsf{G}$  is an abbreviation of Text to Graphics. Text mode is where text based programs like TI-Writer(tm) or the Menu portions of TGA run. Graphics mode is where pictures like TGA Slides are seen. T>O switches from the Text mode to the Graphics mode. ToG will erase any characters

\*

G>T is an abbreviation of Graphics to Text Graphics mode is where pictures like TGA Slides are seen. Text mode is where text based programs run. G>T will not erase your TGA Slide.

\*

CLS means Clear Screen. This command clears the Text Mode Screen. can be used in an SCL program or in the TGA SCL interpreter by typing

\*

CLP means Clear Picture. This command clears the Slide picture screen

\*

CLC means Clear Color. This command clears the color portion of the

\*

COLOR is explained in the TGA CAD system documents. TCA SCL, the vertices must be recalculated before the COLOR stuff will be seen on the screen so, please be patient. Remember also that if you have an all blank palette (no defined shades), COLOR will not show

\*

SOLID is explained in the TGA CAD system documents.

\*

WIRES is explained in the TGA CAD system documents.

\*

FACES is explained in the TGA CAD system documents.

Writing a procedure or program in any language including TGA SCL is an adventure. As with any adventure, you won't really know what you've got until you get there. If you write a huge procedure but forget to do something, your all day slide creation project may need a little debugging. If you write a bunch of short programs in the Jotter and debug each one, you can load up TI-Writer, load in all of the small procedures then PF the entire file to disk, and run the whole procedure. Sometimes you will find that although all the individual small files work just fine, there is still a little debugging to be done when all of the pieces are together. So, by all means, write lots of SCL programs, but remember its an adventure.

#### Rules of the SCL Road:

- 1. Patience is a virtue. Anytime you execute COLOR, SOLID, WIRES or FACES every vertex, maybe many hundreds of them, must be calculated before drawing. TGA SCL does not display the CALCULATING sign as TGA CAD does, so you may have to wait a while before the picture is drawn 2. Anytime a picture drawing command is issued, be sure the graphics mode is on (i.e. T>G has been previously executed and G>T has not intervened).
- 3. Exceed the recommended range of variables at your own risk than only positive or negative integers and zero (i.e. no decimal points or fractions).
- 4. Remember that you need to determine which object should be shaded first. For example, if the moon is behind the planet, the moon should be shaded first.
- 5. All of the commands used in TGA SCL may be executed interactively. They may be typed at the TGA SCL cursor and when you press enter they will be executed. Care must be taken so that if you want to come back to the Text screen to see what you are typing the last command must be G > T. If you are "left in the dark", typing  $\langle P \rangle \langle \text{enter} \rangle$  (for Panic) will usually get you back.
- 6. You may investigate the contents of any of the Variables by using the <<> function in the form <ROLL <<> enter> which will display the value currently in ROLL.
- 7. Cheating—The whole point is to make interesting slides. If you can figure out a way of "cheating" to make a picture look right, by all means so do. Unlike real life, in slide creation the ends always justify the means.

```
******** TGA Geneve Version Organization Chart ********
  TGA Title Screen
  TGA Main Menu
  I.
II.
          (Dir Activate)
         (Load Choose)
  III.
        Graphics
             A. Draw
             B,
                 View
                 Globals
                   1.
                       Xaspect
                       Yaspoot
                       X
                   4.
                        Y
                   5.
                        2
                   6.
                        Roll
                   7.
                        Pitch
                   8.
                        Yaw
                   9.
                        L Roll
                   10
                       L Ptch
                  11.
                      L Yaw
                Manage
                  1.
                       > FR Bk Tp Un Lf Rt >
                  3
2.
                       Wire
                      Objs
                       Object Selection Scrolling Window
                       Object Editing Menu
                        a. New (Vertex Drafting Screen)
                            Edit (Vertex Drafting Screen)
                        Ъ.
                        \mathcal{C} .
                            Vars
                              3D Variable Editing Screen
                            Wire
                        ₫.
                        ÷
                            Paces
                        f.
                            Color
                            Solid
                            Auto
                            Palette
                              i Global Palette Editor
                              li Object Shading Palette
                              iii Pixel Hatching Editor
                            Toggle
IV.
       (Browse Save)
V.
VI.
      Palette
      Erase
VII.
      Hardcopy
TGA Print Menu
           A. Goprint
          В.
               Variables
          Ĉ.
               Cpixel
              Size
          D.
          Ξ.
              Tga
              R Printer /filename/
VIIIV
       Objfile
```

\*\*\*\*\*\*\* A FLYING TOUR OF TGA GENEVE(tm) VERSION \*\*\*\*\*\*\*\*\*\*\*\*

- Load the Geneve version of TGA system from your backup copy of the distribution diskette.
- Press (D) for Directory. When it says (Please Enter Drive Number), with your TGA system disk still in drive 1, type <1><enter>.
- When the Directory menu system comes up, use your arrow keys to move the cursor to the left of the <MOLECULE\_O, filename. Press <A> to activate this filename. You will notice your cursor has moved back to the main menu and the filename <DSK1.MOLECULE\_0> is now in the Objfile field.
- Press (L) for Load. When the drive stops you will see your cursor 4. is now in the (Load Choose) scrolling window.
- 5. Press  $\langle L \rangle$  so that an  $\langle L \rangle$  is to the left of each and every object name in the file. The window moves if there are more objects to load past the bottom of the window. Now press (F6). The drive will run and all the objects will be loaded into memory. Note that one filename,

- MCLECULE\_O, had several objects in it.

  6. Press <P> for Palette to load the MOLECULE\_O palette information.

  7. Press <G> for Graphics. The Graphics system menu will appear.

  8. Press <D> for Draw. TGA will now take a couple minutes to calculate all of the vertices, visible faces and illumination values for all the objects just loaded in to memory. The MOLECULE, O will then be drawn on the Picture screen. The 4A system colors were used to shade the object. yeeech! Lets change those colors!
- 9. To load the MOLECOLE O Palette, press any key to return to the Graphics menu screen. Press (M) for Manage. (still with us?) Press (0) for Objects. You are now in the Object selection menu. Use the down arrow key or  $\langle alt \rangle \langle X \rangle$  to move down to the second GLOBE on the menu. Press  $\langle enter \rangle$  to move to the Object Editing Menu. Now press  $\langle P \rangle$  for Palette to load the MOLECULE palette. Press  $\langle F9 \rangle$  to get back to the editing menu.
- 10. Press .T> for Toggle to see the MOLECULE's true colors. to return to the Object Editing Menu.
- 11. While you are here, press <W> to see the Globe's wireframe on the drafting screen. Press any key to return to the Object Editing Menu.
- 12. While you are at it, try (C) for Color, (F) for Faces and (S) for Solid.
- 13. Press (E) for Edit to see the Vertex Drafting screen and the cross section of the Globe. < F9> escapes to the Object Editing Menu.
- 14. Now press (F9) to leave the Object Editing Menu, (F9) to leave the Object Selection scrolling window, (F9) to leave the Object Manager, then (F9) to return to the TGA Main Menu.

McCann Software Presents The Geometer's Apprentice

Version 1 00 Copyright 1989 Mike McCann

When TGA Geneve version is first loaded the TGA Main Menu Screen  $\,$  looks like the following:

(Dir Activate) (Load Choose) Graphica The Geometer's Apprentice (Browse Save) Palette Erase Hardcopy Copyright 1989 Mike McCann

Objfile <filename>

(Dir Activate), (Load Choose), and (Browse Save) are the menu choices which control three scrolling windows which can be called up to the

NOTE: In all keystroke specifications "arrow" (cursor pad) keys may be substituted for <code>salt>sS></code>, <code>salt+D></code>, <code>salt+E></code>, and <code>salt>sX></code>.

Dir: is an abbreviation for Directory – Pressing  $\langle D \rangle$  will bring up – the following prompt:

Flease enter drive number:

The correct response is either  $\times F9^\circ$  to escape back to the previous menu, or entering the number (1...10) of the drive from which you wish to read a directory.

\*\*\*\*\*Directory Menu\*\*\*\*

After the Directory function has been selected and the number of the disk drive entered, the diskette directory is read and the following menu apprears:

DSKn.DISKNAME Used xxxx Free xxxx

FILENAME1 I/F 128 61 FILENAME2 D/F 80 33 FILENAME3 PGM 25

fre,f=z,f=9,Act

\*\*\*\*\*\*\*\*\*\*\*\*\*

The purpose of the directory feature is twofold. First, using the up and down arrow keys you may move through the entire directory on the diskette using the scrolling window. Second, by pressing  $\langle A \rangle$ 

(Activate) the filename adjacent to the cursor is automatically copied, with the drive information (DSK1.) Into the filename area on the screen. This saves keystrokes and possible filename errors. The "f-e,f-x,f-9,Act" is a little reminder of what keys are available on this screen.

#### \*\*\*\*\*\*\*\*\*\*\*\*

cursor up from its present position.

 $f_{-x}$ . Is an abbreviation for pressing the keys (alt)(x).  $f_{-x}$  moves the cursor down from its present position.

f-9: Is an abbreviation for pressing the keys  $\langle F9 \rangle$ . f-9 escapes from

the directory utility to the menu below.

Act: Is an abbreviation for Activate. Pressing the (A) key activates a filename. Act will copy the filename and disk drive information adjacent to the cursor to the filename field at the bottom of the screen.

## \*\*\*\*\*\*\*\*\*\*\*\*\*Activate\*\*\*\*\*\*\*\*

As long as the Directory window is visible on the screen you may press < A > for Activate to scroll through the diskette Directory and Activate any filename.

## 

In the Geneve version of TGA more than one object may be stored under one filename. Pressing  $\langle L \rangle$  for Load will load all of the object names from the file named in the Objfile (filename) field. These object names will appear in a scrolling window in the center of the screen along with the cursor. The window is similar to the example below:

| OBJECT1 OBJECT2 OBJECTS OBJECT4 OBJECT5 f-e, f-9, Lodf-x f-6 Clr

The small reminder menu below the window shows abbreviations for the kevs

f-e stands for <alt><E> which is cursor up. f-x stands for  $\langle alt \rangle \langle X \rangle$  which is cursor down. f--9 stands for  $\langle F9\rangle$  which will return you to the main menu. stands for Load. Pressing (L) will mark the adjacent object for loading by placing an <br/> <br/>b next to the marked object. Clr stands for Clear. Pressing (C) will unmark an object previously marked for loading. f-6 stands for (F6). f-6 will cause all of the objects marked with an (L) to be loaded from the Objfile (filename) into memory.

As long as the (Load Choose) window is visible on the screen you may re-enter the window by proposing (C) for Choose.

\*\*\*\*\*\*\*\*\*\*\*\*\*\*(Browse Save)\*\*\*\*\*\*\*\*

Once you have a number of objects in memory you may wish to save all, or some of them to a file. You may also wish to duplicate an object in (Browse Save) option will move your cursor to a scrolling window that will move you to the scrolling window. Pressing (B) for Browse all the object names you have marked with an (S) in the window into the file named in the Objfile (filename) field.

\*\*\*\*\*Window Options\*\*\*\*\*

OBJECT1 OBJECT2 OBJECT3 OBJECT4 OBJECT5

f-e, ,f-9 f-x,Sav,f-6 Dat,Pal,Obj, Mas,Clr,Zap,

The small reminder menu below the window shows abbreviations for the keys that are active and will operate in this window.

f-e stands for the keys calture, cursor up f-x stands for the keys calture, cursor lown

f=9 stands for the keys  $\langle F9 \rangle$  which escape from (Browse) to the Main Menu.

Mas -pressing (M) for (Master Object) will move the object adjacent to the cursor to the top of the window and make it the master object. Object to the marked object.

PalsePressing <Pe for <Palette> will mark the object adjacent to the cursor with <Pe. This means you wish to copy the palette from the Master object to the marked object.

Obj--Fressing (O) for (Object Data) will mark the object adjacent to the cursor with (O). This means you wish to copy the entire object data including palette and object data from the master object to the marked object.

Zap--Pressing  $\langle Z \rangle$  for  $\langle Z$ ap Object, will mark the object adjacent to the cursor with  $\langle Z \rangle$  for deletion. This will free up the object space for further use.

operations. Objects marked <D> will execute the Master to Object object including name, vertex data, and variables. Objects marked <P> will get the palette data and name of the Master object. Objects marked <O> will get both the data and palette from the Master object. Objects Objects Marked <Z> will be deleted. Objects with any other mark, and other mark, will not be changed.

Clr--Pressing (C) for Clr or the (space-bar ( will remove any mark (from the object.

Save Pressing <S> for Save will mark the object as one to be saved into the diskette file named in Objfile <filename. After you have marked all the objects with <S> that are to be saved, press <F9> to return

Main Menu At the Main Menu press (S) for Save. Make sure that there is a valid filename in Objfile (filename) and a diskette in the drive. Press (S) for Save at the Main Menu.

#### 

Pressing  $\langle G \rangle$  for Graphics will move to the Graphics Editing and Viewing Screen where objects may be created, edited and viewed.

#### 

Pressing (P) for Palette will load the Global Palette data from the file named in the Objfile (filename) field. Each object has its own shading palette. There is a Global palette which selects the badic colors used in the Graphics Mode. You may wish to load object files without necessarily changing the Global Palette this is the reason for this option. For the Global Palette to be activated, you must enter any object and choose the Palette option(see below).

## \*

Pressing (E) for Erase is the option to erase or delete the file named in the Objfile (F) filename field from the diskette drive. The Sure (Y/N) warning message will allow you to escape from the Erase option.

#### 

Pressing  $\langle H \rangle$  for Hardcopy will move you to the Hardcopy (printing options) screen. This is used for printing the pictures to a dot matrix printer.

## 

Draw View Globals Manage ((F9) escapes)

#### 

Pressing (D) for Draw will draw all of the objects in the memory onto the Picture Screen. Please remember that each object must be recalculated. This may mean many thousands of vertex calculations which may take some time to complete. Please be patient.

#### 

Pressing <V> for View will display the Picture Screen until another key is pressed.

## \*Globals\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Pressing  $\langle G \rangle$  for Globals will move you to the Global Variable Editing Menu. The Global variables adjust the viewing point on the screen its relative size and distance and the direction of the illumination.

```
*****Global Variable Editing Screen
 Xaspect
 Yaspect
 Υ
 Roll
 Pitch
 Yaw
 Lroll
 Lptch
 Lyaw
 General cursor action in the above menu:
 <alt><X> move down a field.
 <alt><E> move up a field.
 kenters move down a field.
(F9) leave the Variables Editing Screen.
 salt><S> move left in field.
 -alt><D> move right in field.
Variable definitions and values
 ***** Xaspect: Controls the apparent horizontal size of the picture.
           Valid values 1...8192
**** Yaspect: Controls the apparent vertical size of the picture.
           Valid values 1...8192
***** X: Controls the relative horizontal position (left/right).
           Valid values -8192...8192
***** Y: Controls the relative vertical position (down/up).
           Valid values -8192 8192
***** Z: Controls the relative depth of the picture (zoom).
           Valid values -8192...8192
***** Roll: Controls the left/right tilt of the camera.
          Valid values -360. 360 in degrees.
***** Pitch: Controls the forward/back tilt of the camera.
          Valid values -360...360 in degrees.
***** Yaw: Controls the left/right spin of the camera.
          Valid values -360 360 in degrees.
***** Lroll, Lpitch, Lyaw: These control the apparent location in space of the light source for shading. Negative values, especially in the
range -135 to -160 are most easily observed and can be thought of as
directing light from the observer toward the object.
Pressing (M) will move to the Object Editor Main Menu:
Fr Bk Tp Un Lf Rt Objs Wire
```

Fressing  $\langle F_2,\langle B_2,\langle T_2,\langle B_2,\langle B_2,\langle B_2,\langle T_2,\langle B_2,\langle B_2,\langle$ 

When one of the views is selected, all the objects must be recalculated. The faces of each of the objects will be displayed. A cursor will appear on the currently selected object. Moving the cursor up, down, left or right with  $\langle alt \rangle \langle E \rangle$ ,  $\langle alt \rangle \langle X \rangle$ ,  $\langle alt \rangle \langle S \rangle$ , or  $\langle alt \rangle \langle D \rangle$ 

to the desired location for the object. Pressing kenters will cause the object to be relocated to the new place. For fastest editing, make all the object changes in one view so no recalculation will have to be done to change views. You may press (F9) to escape from the editing screen. Press (O) for Object to go to the object selection scrolling window, choose another object, press (F9) to return to the Manage Menu then select the same (or another) view to work in. In this way, you may manipulate objects in space without having to manipulate the object variables directly.

\*

Pressing  $\langle 0 \rangle$  for Objs will move to the Object selection scrolling window.

Object Names

OBJECT1
OBJECT2
OBJECT3
OBJECT4

ent, Spn, Ext

The Object selection scrolling window serves several functions. The  $\langle alt \rangle \langle E \rangle$  and  $\langle alt \rangle \langle X \rangle$  keys will scroll the object names up and down. The object name directly adjacent to the cursor indicates the currently selected object. If there is an object name to the right of the cursor you may press enter to access all of the editing functions for this object. If no name is adjacent to the cursor, and you have not left the name field of a previously defined object blank, you may create a new object by pressing  $\langle S \rangle$  for Spin object or  $\langle E \rangle$  for Extrude object. The editing function menu will appear. This scrolling window is also used by the Object Manager screen to select which object the cursor is attached to for moving the object in one of the six views.

\*\*\*\*\*\*\*\*\*\*

Wire will force a recalculation of the entire object memory and display all objects in wireframe according to the Global Variables.

New
Edit
Vars
Wire
Faces
Color
Solid
Auto
Palette
Toggle

\*

New does two things, it removes any vertex data from the object memory and enters the Vertex Drawing Screen. See the section on vertex drawing.

## \*

Edit enters the Vertex Drafting Screen which is used to create the vertices used for creating a 3D object. Edit and New erase any previously drawn 3D object from the screen.

## \*\*\*\*\*Vertex Drafting Screen\*\*\*

The Vertex Drafting Screen is on the bit map screen. A vertical axis and horizontal axis is drawn and a cursor appears when this screen is called up by New or Edit. If an existing set of vertices is in the object memory a line will be drawn connecting each set of vertices to create an outline of the object shape. The object shape may now be edited by creating or removing vertices. Six simple commands control the creation and removal of vertices

```
<fctn><E> moves the cursor up.
<fctn><X> moves the cursor down.
<fctn><S> moves the cursor left.
<fctn><D> moves the cursor right.
<fctn><9> returns to the Object Editing Menu.
<fctn><1> removes the last drawn vertex.
<enter> creates a vertex at the current cursor position.
```

For Spin objects, the cursor will only operate to the right of the vertical axis since a spin object is symmetric about that axis. For Extrude objects the cursor will operate throughout the editing screen.

Notes on creating objects: Although a vertex may be located at any point, a certain order for vertices was designed into the object creation system. If an object is created from top to bottom and clockwise, the shading and rendering will be more "true". Additionally, "inside" surfaces may not be shaded properly. Ideally objects should be like a ball with no pockets or holes. Complex objects may be represented better by two or more objects. The diagram just after the "Getting Started with TGA" page may help you see the idea of a vertex and an object with no "pockets".

#### \*

Vars is an abbreviation for Variables. Pressing  $\langle V \rangle$  will enter the variables editing screen.

## \*\*\*\*\*3D Variable Editing Screen

The following display of values are shown when  $\cdot V$ ) is selected. Values may be entered for each of these variables to control the display of the 3D objects.

```
Xaspect
Yaspect
X
Y
```

```
Ro 11
Fitch
Yaw
L Roll
L Ptch
L Yaw
#Deg/Seg
General cursor action in the above menu:
<fctn><X> move down a field.
\langle fctn \rangle \langle E \rangle move up a field.
<enter> move down a field.
\langle fctn \rangle \langle 9 \rangle leave the Variables Editing Screen and return to Object Editing Menu. \langle fctn \rangle \langle 9 \rangle move left in field.
<fctn><D> move right in field.
Variable definitions and values.
***** Xaspect. Controls the apparent horizontal size.
            Valid values 1...8192
***** Yaspect: Controls the apparent vertical size.
            Valid valúes 1...8192
***** X: Controls the relative horizontal position (right/left).
            Valid values -8192...8192
***** Y: Controls the relative vertical position (down/up).
            Valid values -8192...8192
***** Z: Controls the relative depth of the object (back/forward).
            Valid values -8192...8192
***** Roll: Controls the right/left tilt of the object.
            Valid values -360...360 in degrees.
***** Pitch: Controls the forward/back Lilt of the object.
            Valid values -360...360 in degrees.
***** Yaw: Controls the right/left spin of the object.
            Valid values -360...360 in degrees.
***** Lroll, Lpitch, Lyaw. These control the apparent location in space
of the light source for shading. These values are not as easy to observe as Roll, Pitch and Yaw, but experimentation may yield the desired effect. For example, if the light source is behind the object,
the dark face will be the only part visible to the viewer.
                                                                               Negative
values are most easily observed. The negative values especially in the range -135 to -160 for each of the illumnination varibles can be
thought of as directing light from the area of the view screen toward
```

#### 

the object.:

\*Deg/Seg is an abbreviation for Number of Degrees per Segment. This is used in three different ways depending on whether you are using Spin, Extrude or Auto.

#Deg/Seg (Spin): When an object is spun, the outline of vertices from the vertex editing screen is moved by degrees around the vertical axis. This is like taking equal vertical slices cut out of an apple (not an Apple II or Mac) and putting them back together to make a whole apple. The horizontal size of the slice could be measured in degrees. For instance, a quartered apple has slices of ninety degrees each since the total circumference of the apple is 360 degrees. With the #Deg/Seg you can control the number of degrees in each slice in your object. Valid values are 1...180. Values which divide into 360 evenly give the best

results

2,3,4,5,6,8,9,10,12,15,18,20,24,30,36,40,45,60,72,90,180)

(i.e.

#Deg/Seg (Extrude): There is only one end surface in an Extrude. We use the #deg/seg for the "depth" of the extruded element. Valid values are 1...8192, though values over 200 may be impractical.

\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Pressing (W) for Wire will draw a wire frame rendering of the vertex data stored in the object memory.

\*\*\*\*\*\*\*\*\*\*\*Faces\*\*\*\*\*\*\*\*\*\*

Pressing  $\langle F \rangle$  for Faces will draw a wire frame of only the visible faces of vertex data stored in the object memory.

\*\*\*\*\*\*\*\*\*\*CO102\*\*\*\*\*\*\*\*\*\*

Fressing  $\langle C \rangle$  for Color will draw each visible face rendered in the shading determined by the palette and values of the luminance

\*

Pressing (3) for Solid will draw each visible face outlined in the forground color and rendered in the shading determined by the palette and values of the luminance variables.

Auto is an abbreviation for Automatic Object Creation. will automatically generate the vertices which, when Extruded or Spun, Pressing Auto will make a regular 3D object. Auto requires some procedures to be followed for good results.

Auto procedure for Spin objects: Auto done in the Spin mode will create a sphere. The number of faces on the sphere and the size is determined by two variables. The X variable controls the sphere radius and the #Deg/Seg variable controls the number of vertices in the longitudinal axis. A short script for Spin Auto follows:

Press V to enter Variables Editing Memu

2. Use (fctn>(e) or (ictn>(x) to move through the variables

Set Maspect, Maspect and Z at 1200.

4. Set X at 80. X controls the radius of the sphere.

- 5. Set #Deg/Seg at 30. This controls vertices in the longitudinal axis. The value of 30 means there will be a vertex every thirty degrees. The longitudinal axis has 360 degrees like a circle.
- Press (fctn)(9) to escape to the Object Editing Menu.

Press :A> for Auto

8. Press (B) to Blank the bit map screen.

9. Press (W) for Wire. Your first wire frame object will be draawn.

Auto procedure for Extrude objects: Auto done in the Extrude mode will create a regular polygonal extrusion. The number of faces on the edge of the extrude and its size are determined by two variables. The X variable controls the "radius" and the #Deg/Seg variable controls the

number of vertices around the edge. You can basically follow the above script to generate the extrude but you will need to go back to the Main Menu, select <N> for New, choose <E> for Extrude then follow the script above. Note: Extrude objects have an additional use for #Deg/Seg. After Auto is done #Deg/Seg may be set to determine the depth of the object.

#### \*\*\*\*\*\*\*\*\*Palette\*\*\*\*\*\*\*\*\*

Pressing <Po for Palette will enter the Palette Editing screen. The Palette consists of three parts: the Global Palette, the Object Shading Palette and the Pixel or Hatching Pattern. The Global Palette controls the RGB values of the sixteen color values which may be displayed in the Geneve's 512x212 bit map mode. The Object Shading Palette is a mixing palette which allows the choice of a foreground color, background color and hatching pattern for each of the sixteen values used in shading an object. The left most block in the Object Shading Falette represents the least illuminated surfaces and the right most block represents the most illuminated surfaces. The spectrum of illuminations represented by the blocks inbetween. The Pixel editor determines the pattern of foreground and background pixels that make up the shading pattern.

#### \*\*\*\*\*Global Palette Editor\*\*\*

The top 3 lines of numbers and color block represented here by XX are the Global Palette Editor. When the cursor is in the middle of the screen pressing <code><alt><E></code> will move the cursor up to the Global Palette Editor area. Cursor control uses <code><alt><E></code>, <code><alt><X></code>, <code><alt><X></code> and <code><alt><D></code>. Pressing one of the keys 0 through 7 will change the value of the color in the block below. Note that each of the sixteen blocks has three numbers controlling the Red, Blue and Green component of the color. Pressing <code><F9></code> will move the cursor back to the center of the screen. The numbers under the color blocks indicate the color numbers of the blocks.

#### \*\*\*\*\*\*Object Shading Palette\*\*\*

The top 3 lines of numbers and color blocks represented here by XX are the Object Palette Editor. When the cursor is in the middle of the screen pressing <alt><X> will move the cursor down to the Object Palette Editor area. Cursor control uses <alt><E>, <alt><X>, <alt><X>>, <alt><X>> and <alt><D>. Pressing one of the keys 0...9-A...F will change the value under the cursor. The top row of numbers control the foreground color. The middle row of numbers control the background color. The bottom row of numbers chooses the pixel or hatching pattern. The colors correspond to the color numbers in the Global Palette which appear under the color blocks. To change the pixel pattern, you may press <enter> while in the bottom row and the Pixel editor will appear. The pattern showing in the Pixel Editor will be the pattern of the number that was under the cursor when <enter> was present. Pressing <re><re><re><re> will move the cursor back to the center of the screen.

\*\*\*\*\*Pixel/Hatching Editor\*\*\*

xxx xxxx...The pixel editor is an 8x8 grid each block in the grid xxxx xxx...is either darkened or not representing a pixel or dot in xxxx xx...the hatching pattern to be used in shading 3D objects xxxxx x...The cursor may be moved to any position in the 8x8 grid to oper-

xx xxxx...ations are:

x xx xxx... <alt><S>=left <alt><D>=right <alt><E>=up <alt><X>=down xx xx xx... <F9>=escape <apace bar>=off <aup other key>=on

To escape from the Palette Editing Screen, press  $\langle F9 \rangle$  when the cursor is in the middle of the screen.

NOTE: Several of the Global Palette colors have assigned functions. First, color 0 is always the background color since it is locked in transparent by the system. Next, color 1 is the foreground color for outlining and for text. Making color 1 same as the background makes the menus difficult to read. Color E is the background color. Making the background color the same as the text and the outline color 1 also makes menus difficult to use. Finally, color F is the cursor color.

## \*\*\*\*\*\*\*\*\*Toggle\*\*\*\*\*\*\*\*\*\*

Toggle is an abbreviation for Toggle Screen. Pressing  $\langle T \rangle$  will display the picture screen where the 3D views of all objects in memory are drawn until any key is pressed.

A menu item was added after the menu structures were in place. It is accessable but does not show on the menu. Pressing  $\langle L\rangle$  at the Object Editing Menu will toggle a software setting on or off for the object to be logically "or"ed into the picture. Each pixel rather than overwriting the background will do a logical or with it. This is a feature of the 9933A VDP and is probably for advanced users. It works well in black and white to make transparent surfaces.

Goprint Variables Cpixel Size Tga

E Printer (filename)

Variables Pixel Shape XXXXXXXX Frntr Type/Eps--Gem Е XXXXXXXX Density/Sd-Dd-Qd  $\mathfrak{S}$ XXXXXXXX Extra Dark? (Y/N) N XXXXXXXX Landsc/Portrait L XXXXXXXX XXXXXXXX XXXXXXXX

Note: Printing objects that were originally shaded in color, on a dot matrix printer loses something in the translation. Good results can be

obtained by making a special shading palette using only color 1 as the foreground color and color R as the background. You may save the palette as a "dummy" object. Save your colorized scene to diskette and write down your globals. Load the dummy object and make it the Master object in the Browser. Copy its Palette to all other objects, Zap the dummy from memory, reset the globals and redraw your object.

## 

Goprint is an abbreviation for Start Printing. Pressing (G) will begin sending data to either the Printer or Extrn file depending on whether Printer (filename) or Extrnfile (filename) is showing at the time.

Note: If you wish to stop printing pross salt><4> until the printing stops. If this causes an output error you may have to type TGA<enter> to restart the Print Menu. Following an error you must reset <on and off> your printer to clear it of any remaining data.

## 

Pressing  $\langle V \rangle$  will move the cursor down to the four variables, shown on the left side of the screen.

General cursor action in the variables:

>alt><E> move up a fiwld.

senter> move down a field.

F9> leave the Variables.

Variable definitions and values.

#### \*\*\*\*\*Prntr Type/Eps--Gem\*\*\*\*\*\*\*\*

Enter (E) here if you have an Epoon type printer. Enter (G) here if you have a Gemini 10X printer or compatible. If you are uncertain try a little of each.

#### \*\*\*\*\*Density/Sd-Dd-Qd\*\*\*\*\*\*\*\*\*\*

Enter  $\langle S \rangle$ ,  $\langle D \rangle$  or  $\langle Q \rangle$  respectively for Single, Double or Quad density printing. In order to use the Double or Quad options successfully your printer must support this type of printing. Consult your printer manual to see if Double or Quad density printing is supported

#### \*\*\*\*\*Extra Dark? (Y/N)\*\*\*\*\*\*\*\*\*\*

Enter  $\langle Y \rangle$  for yes or  $\langle N \rangle$  for no. Extra dark means that the printer will make two passes across the page printing the data twice to darken the image. Pressing  $\langle N \rangle$  indicates a single printing of the data.

#### \*\*\* \*\* Landsc/Portrait \*\*\* \*\*\* \*\*\* \*\*\*

Enter (L) for Landscape or (P) for Portrait type printing. Portrait is the "normal" way of looking at a  $9\times11$  page. Landscape prints the

picture "sideways"

# 

The Cpixel editor is an 8x8 grid. Each block in the grid XXXX XXX is either darkened or not representing a pixel or dot used XXXX XXX XXXX XX in the printing of the picture The cursor may be moved to any position in the 8x8 grid to X XXXX X change the pattern by turning on or off a block. XX XXXX XX XXXX Cursor operations are: calt><3>=left <alt><D>=right <alt><E>=up <alt><X>=down X XX XXX (F9) rescape (space bar) roff (any other key) ron XX XX XX

Example: If you wish to double the width of a printed picture you would place a darkened block both in the first and second column of the first row of the Pixel Shape grid. Similarly, vertical size can be enlarged. Additionally, creating a pattern of the blocks will cause a pattern to be printed for each dot in the picture. Caution should be used however, as using all eight blocks in either direction enlarges the picture eight times! This may well be larger than the paper. (P.S. Kids love happy face pixels).

# 

The size function lets you choose the portion of the picture you wish to print. Pressing (3) for size will display the picture screen and a cursor. Cursor functions are as follows:

calt> E> cursor up
{alt> X = cursor down
{alt> Coursor left
{alt> D = cursor right
{F9> back to the print menu
{enter> place the upper left corner of the bounding box.

To operate the Size function use the cursor keys to move the cursor to the upper left corner of the piece of the picture you wish to print. Next, press (enter) this "anchors" a bounding box. When you then move the cursor to the right and down, the bounding box expands, showing the size and shape of the rectangle that will be printed. Pressing (enter) again will move the "anchor" to the new cursor position. When you are satisfied with the bounded area to print simply press (F9). The bounding box will remain in place until changed or the program is changed.

## \*\*\*\*\*\*\*\*\*\*\*\*\* Printer/P Extrnfile\*\*\*\*\*\*\*\*

<P> and <E> will toggle this field between the Printfile field and the Extrnfile field. The Printfile field should contain the name of the printer you are going to send data to (i.e. PIO.CR or RS232.BA=4800.CR.DA=8). The Extrnfile field should contain the name of a diskette file to which you wish to send a TPA extrn file. TPA(The Printer's Apprentice) is a page creation system by McCann Software in which Extrn files are used to combine pictures and text into interesting pages. The extrn files produced by this product are fully useable by the TPA Scheduler.

\*\*\*\*\*\*\*\*\*\*\*\*\*\* Updates and Warranty \*\*\*\*\*\*\*\*\*\*\*\*

The enclosed registration card is your ticket to future updates and warranty service on The Geometer's Apprentice(TGA). You must complete the card and return it to us in order to become a registered user. If you buy TGA from a registered user, you may write to us and apply for a registered user status.

- 1. Update policy: All registered users (see above) are eligible for any updates of The Geometer's Apprentice. To receive your update, you will be required to return your original TGA system diskette with its serial number label intact. A small amount will be charged to cover shipping, materials handling and the upgrade fee itself.
- 2. Warranty: Any defective diskette or booklet will be repaired or replaced if returned to McCann Software within 90 days. McCann Software will make the judgement as to whether the diskette or software is defective and will either repair or replace it at our option. If you accidentally erase or damage the original TGA system diskette, return it with \$10 for replacement. PLEASE MAKE AND USE A BACK UP COPY! This software is like a do-it-yourself book. It is for your personal use. You are the sole judge of its usefulness and accuracy. McCann Software is not responsible for any damage incurred by you, your associates, or customers as a result of the use of The Goometer's Apprentice.
- 3. Fair Use Agreement: Your purchase of this software is not a license to make copies or distribute copies to any other person. Under the copyright laws this software is like a book. You may lend the original TGA system to a friend for use on his machine, but you and your machine cannot run a copy at the same time. You may sell your original copy of the software, but you cannot retain even one copy. You may use it on any computer, but not on more than one computer at a time. You may not put your name on any part of the software as its author.
- 4. The ugly stuff: There are now persons advocating, in print, the piracy of software, even though it is against Federal Law. Software piracy is when someone other than the software author makes a copy, even one copy, of a copyrighted software product and gives or sells it to someone else without written permission from the author. Since we make our living trying to write good software, we feel that piracy is very much a crime against us. We would like to cooperate with any person, user group, or law enforcement agency in the prosecution of anyone that pirates any of McCann Software's products. We will pay a modest reward for information leading to the arrest and conviction of, or recovery of damages from, any software pirate engaged in pirating McCann Software products. Please write us if you have any questions about this or any of our products

McCann Software P.O. Box 34160 Omaha, NE 68134