Begin all ARC/INFO sessions this way. Non-bold text represents what you see on the screen. Bold text indicates what you should type to initiate an action.

Go to the UGIS workspace in your local directory.

Arc: \WORKSPACE <drive>\username\GIS

Use the CREATEWORKSPACE command to create a new workspace for your land use coverages. Name it LAND. This is where you will create the new coverages.

Arc: \CREATEWORKSPACE LAND

Finally, move to the LAND workspace.

Arc: \WORKSPACE LAND

Starting ARCEDIT

Before starting ARCEDIT, use your station configuration file to specify the display device and the digitizer you’ll use. You can do this either from ARC, as shown here, or after you start ARCEDIT. If you don’t yet have a station file, have your system administrator create one for you. Refer to the Introduction of the workbook for a discussion of station files.

Arc: \Station <name> D1SP 7974

Now start ARCEDIT by typing

Arc: Arcedit

The Arcedit prompt and graphics window appear.

You’ll digitize during this session, so use the COORDINATE command as the Arcedit prompt to specify the DIGITIZER as your coordinate input device.

Arcedit: COORDINATE DIGITIZER
create a new coverage

New coverages are created with the CREATE command. If the new coverage does not copy tics from another coverage, CREATE begins with a dialog to identify the tic locations and the extent of the coverage. Tics are reference points identified by known coordinates on a map and are used to orient the coverage. It’s important to digitize tics as accurately as possible. They’re used in subsequent editing sessions and to orient the coverage to related coverages captured at other times. Accurately digitized tics also allow you to resume digitizing if you are unable to complete a map in one session or if you need to reposition the map on the digitizing table between sessions. You must digitize at least four tics to register the coverage correctly.

Using more than four tics increases accuracy. Additional tic locations should be spaced evenly across the map.

Specify the name of the new coverage, TICCOV, with the CREATE command:

```
create TICCOV
```

Digitize a minimum of 4 tics (from digitizer).

**FYI**

TICCOV is an empty coverage. Once created, no other coverage can have the same name. Prompts now ask you to enter the tics. These tics will be used to perform all subsequent transformations.

While digitizing, responses are entered from the either keyboard attached to the terminal or the keypad attached to the digitizing table. When using the keyboard, remember to press a carriage return (cCR) after entering a response. When using the keypad, note that some responses are made using only the buttons, while others combine a button with a location identified by the keypad crosshairs.
To establish registration coordinates for the new coverage, you must
digitize the Tic-ID values and their corresponding locations using the
digitizing table and keypad. You’ll use the land use manuscript to
create the master tic. Digitizing ASCII is a two-step process.

1) Enter a Tic-ID value with the numeric buttons on the keypad.
2) Enter the corresponding tic location by positioning the
digitizing table and pressing any active button.

HELP

Sometimes, when the button is pressed, no value
is received. Remember to keep the keypad in contact with the map on
the table. When entering point locations, hold the keypad firmly and
always look directly over the crosshairs. Also, make sure your map
lies completely within the active area of the digitizing table.

HELP

Use the keypad to enter tics. Before digitizing the location of tic
number 22, enter its Tic-ID value. Press the 2 button on the keypad
twice, and then verify that the correct value was received by looking at
the screen. If it’s correct, press the A or # button to indicate you’ve
finished entering the Tic-ID number. Pressing A or # is like entering a
carriage return. (When entering Tic-IDs, the keypad must be on the
table, but the crosshairs don’t have to be centered on the tic.)

Tic-ID: 22* WARNING: the map extent is not defined

HELP

Don’t panic if you enter the wrong Tic-ID.
If you make a mistake entering the Tic-ID and haven’t yet pressed
the A or # button, use the B or # button to backspace over the error.
Then enter the correct Tic-ID followed by the A or # button.
Now you're ready to enter the tic location. Position the keypad crosshairs at the location of tic number 22. When you're sure that the position is as accurate as possible, press any button on the keypad.

Once you've digitized the first tic, you're prompted for the next Tic-ID.

Tic-ID:
Enter the remaining tics. Note that these Tic-ID values are 23, 24, 32, 33, and 34. Be careful to digitize each Tic-ID with the correct tic location.

Tic-ID: 23*
Tic-ID: 24*
Tic-ID: 32*
Tic-ID: 33*
Tic-ID: 34*

To stop digitizing tics, enter a Tic-ID of 0, followed by A or *.
(When the zero is entered, the keypad can be positioned anywhere on the table.)

Tic-ID: 0*
After the entry is ended, the following instructions appear:

**Data Initial Boundary**

Define the box (from digitizer).

Typically, this boundary is slightly larger than the data being digitized. Because your tic mark the boundary of the data, use the keypad and place the crosshairs below and to the left of the lower left corner of the map—beyond the features to be digitized (including the tic)—and press any key.

Repeat this for the upper right corner. Position the crosshairs beyond the features and press any button on the keypad.

The edit coverage is now \texttt{\textbackslash y\textbackslash yourname\textbackslash GPS\textbackslash EDIT\textbackslash TICCOV}

Defaulting the map extent to the BGR of <drive>:/\textbackslash yourname\textbackslash GIS\textbackslash TICCOV

TICCOV is now the coverage being edited. Any features that you add will be added to TICCOV.
You've just created the initial boundary file, a coverage INFO file named TICCOCY.BND. This boundary, also known as the coverage extent, contains the minimum and maximum x- and y-coordinates. Note that you could have entered any two diagonally opposing corners to define these extreme values.

Entering the boundary doesn't add points to the coverage being digitized—it defines a window containing all the data. The boundary locations entered are stored as the minimum and maximum x- and y-coordinates. Note that you could have entered any two diagonally opposing corners to define these extreme values.

You've just finished creating the master tic coverage. Now save the changes.

Arcedit: SAVE
Setting changes for <drive>:\yourname\ARC\LIB\TICCOCY
BB replaced into <drive>:\yourname\ARC\LIB\TICCOCY

Until you save, you are working on a temporary copy of the original coverage. SAVE updates the original coverage with all the changes you have made. It's a good idea to save on a regular basis. Pathnames displayed by the SAVE command depend on your operating system and the location of your data.

Unsaved changes can be undone in ARCEDIT using the OOPS command. OOPS restores the coverage to the way it was before the last command was entered. You can enter OOPS any number of times to keep stepping back through each command. Some commands cannot be undone. CREATE is one of these commands.

Now draw the tic to check your work so far. Before you issue the DRAW command, you must first tell ARCEDIT which features you want to draw using the DRAWENVIRONMENT command. You can specify features, or features along with options such as their User-ID. The DRAW command clears the graphics window and fluxes only those features specified with DRAWENVIRONMENT.

Arcedit: DRAWENVIRONMENT TIC ID;
Arcedit: DRAW
Your tic coverage should look like this:

\[ e^{22} \quad e^{23} \quad e^{24} \]

Make sure the Tic-IDs displayed on your screen match those marked on the map.

Tic-ID: 22: WARNING, the map extent is not defined.

HELP

If you do not see all of the tics, then reset the display area by typing the MAPEXTENT command.

Arcedit: MAPEXTENT Tic modify

Arcedit: DRAW

The master tic coverage for a study area is typically created and verified before digitizing any of the map sheets. In this case, we demonstrated how to create tics using the digitizer. It's important that these tic locations be as accurate as possible.

Although not shown in this exercise, the next step is to generate a hardcopy plot of the tic locations at the same scale as your map sheet. This plot is laid over the original map sheets to verify that the locations are accurate. Once accurate Tic locations are verified, these tics should be used to create every digitized coverage for the study area.

At this point, you have a master tic coverage for the area to be digitized. You're now ready to create the missing portion of the land use map by digitizing from the map manuscript. Because you'll be digitizing polygons, do the following:

- Enter the tics
- Digitize areas
- Digitize label points

digitizing from a map manuscript

Understanding GIS—The ARC/INFO Method
Continue by creating a new coverage, LANDDOG1. Specify that its initial tic should be copied from the master tic coverage, TICCOV.

Arcedit: CREATE LANDDOG1 TICCOV
Creating <drive>\lyons\ Users\Land\LANDDOG1
The edit coverage is now <drive>\lyons\ Users\Land\LANDDOG1
Use COORDINATE DIGITIZER DEFAULT to orient.
<drive>\lyons\ Users\Land\LANDDOG1
if required.

Orient the map manuscript on the digitizer using the COORDINATE DIGITIZER command with the DEFAULT option. When ARECDIT prompts you, digitize the same Tic-IDs and tic locations you used for TICCOV. Enter them with the digitizing keypad and cursors.

Arcedit: COORDINATE DIGITIZER DEFAULT
Defaulting transform/rotation coverage to <drive>\lyons\ Users\Land\LANDDOG1
Digitize a minimum of 4 clous.
Signal end of tic input with Tic-ID = 0
Tic-ID: 22
Tic-ID: 23
Tic-ID: 24
Tic-ID: 25
Tic-ID: 33
Tic-ID: 34
Tic-ID: 0
Scale (X,Y) = (1.00,1.000) Error (degrees) = 1.015
Rotation (degrees) = (0.06) Translation = (-0.06, -0.207)
RMS error (Input, output) = (0.002, 0.002)

Notice the RMS error displayed in the dialog area after the tics are entered. Calculated in both digitizer units and map units, this value tells you how well you matched the previous set of tics. At this point in the process, because the digitizer units and the map units are the same, the error values are the same. In our example, the RMS is 0.002 and the digitizer units are inches.

You must set your own value for an acceptable RMS error and then match that value to ensure that the quality of the data entered is maintained at the desired level of accuracy. Perfect registration, an RMS of 0.000, is highly improbable. When digitizing in inches, we usually set the limit at 0.002 or 0.004. Your value depends on the nature of the data, the scale of the base map, and the material from which the data is digitized—parcel boundaries are more precise than soil boundaries; large-scale maps (1:10,000) are more precise than small-scale maps (1:250,000); and data on MYLAR is more stable than on paper maps. The more precise the data, the lower the acceptable RMS. These exercises use paper maps, so you must need to accept an RMS value as high as 0.005 or 0.006 inches.
If your RMS is too high, reenter the "COORDINATE" command with the name of the coverage whose data will be digitized.

ARCEdit: COORDINATE DIGITIZE LANTOCO2

You will again be prompted to enter the Tic-IDs and their locations. A new RMS error will result, hopefully a value that you can accept.

Setting editing environments

ARCEdit lets you control what happens as you add and edit coverages. The following sections discuss ARCEdit commands that control the editing environment.

Setting the node snapping environment

Before adding arcs to the new coverage, it helps to establish a node snapping environment.

As each new arc is added, the starting node may fall within a given distance (e.g., 0.05 inches) of an existing node. This new node location will snap to the existing node if it is within the node snap tolerance.

This helps you to ensure that arcs connect correctly to adjoining arcs. The default node snapping tolerance is quite small. To change this value, use the NODESNAP command.

ARCEdit: NODESNAP CLOSEST .05

Setting the drawing environment

Previously, you set the drawing environment to include ticks and their IDs. Now that you are about to digitize, you should add arcs, nodes, and label points to the drawing environment. Also, specify that the IDs will be displayed for label points.

ARCEdit: DRAWENVIRONMENT ARC NODE LABELS IDSP

Understanding GIS—the ArcINFO Method
**ARCEDIT** is feature-oriented editing. This means that edits are made to one type of feature at a time. This speeds up editing because editing operations can be executed by a single word command such as ADD, MOVE, SELECT. You must always specify the type of feature before starting to edit.

Specify that arcs will be edited:

**ARCEDIT**: REDUCE FEATURE ARC

0 element(s) for edit feature ARC

Now type ADD to open the menu for adding arcs:

**ARCEDIT**: ADD

- - - - - - - - - - - Options - - - - - - - - - - -

1) Vertex  2) Hole  3) Curve
4) Delete vertex  5) Delete arc  6) Spline on/off
7) Square on/off  8) Digitizing Options  9) Quit

(Lines), (Measure), 1 Points 0

The following examples correspond to the lower right corner of your map sheet. The next several pages show you how to digitize the arcs numbered 1 through 6. After following these instructions, you'll then need to apply these same procedures to the rest of the manuscript.
Arc number 1 is a two-point arc. Position the curve on the node (represented by a solid circle) and enter the button numbers as shown. The 2 button on the keypad sets ARCDEF that you are beginning or ending an arc.

Once digitized, the number 1 should appear on your graphic display screen.

Arc number 2 is curved. You'll need to enter enough vertices to construct the smooth shape of the curve. Imagine a connect-the-dots drawing: the closer the points are together the smoother the resulting line. The diagram below shows where the nodes of the arc should be located (solid black circles) using the 2 button. Between the nodes, use the 1 button to enter the vertices (marked with hollow circles). As you digitize the arc, use your best judgment to determine where to place the vertices. Your locations do not have to exactly match the ones in the diagram; these points are only examples.

There are no hard-and-fast rules about how many vertices you should digitize to represent a curve. Generating more vertices is not always better. Too many vertices increase the amount of stored data. Use your judgment. The goal is to digitize enough vertices so that a plot of your coverage will accurately overlay your manuscript.
Position the keypad crosshairs and enter the button numbers as shown. Carefully trace the shape of the arc with the keypad crosshairs, pressing the 1 button repeatedly to enter vertices as you go.

Notice that, as before, nothing appears on the screen until the ending node is entered; then, the entire arc is shown.

**HELP**

You might make errors while digitizing an arc.

If you digitize an erroneous vertex, use the 4 button on the keypad to remove it (the last vertex entered). If you lose your place along the arc, use the 0 button to display the position of the cursor on the terminal screen. Each time you press the 0 button, a cross appears on the screen showing the position of the keypad crosshairs.

If you want to restart the arc from the beginning, the 5 button will remove the arc currently being digitized. If you have already ended the arc with a node, the 5 button cannot remove it. See the HELP section on page 4-33 for instructions on removing an arc.