Tablet PC Ink Support

ESRI
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Windows XP Tablet PC Edition

Windows XP Tablet PC Edition is a superset of Windows XP Professional. This operating system offers the features and capabilities of Windows XP Professional, plus additional features specific to a Tablet PC.

These additional features allow you to:
- Control your Tablet PC and windows using a digital pen.
- Create and save handwritten documents (text and drawings) on your notebook.
- Convert your handwritten notes into typed text for use in other applications.
- Annotate documents imported from other applications.
- Dictate text or control your computer using your voice.

Tablet PC users will be able to operate their computers using a digital pen in addition to traditional input methods, such as a keyboard or mouse. The pen can also be used for the same functions as a mouse, including navigating user interfaces, selecting tools from menu bars, moving and resizing objects, and activating programs. As with physical pens, users can select the color and thickness of the digital ink and use emphasis tools, such as bolding and highlighting.

Tablet PC users can use the Tablet PC Input Panel to enter information.

![Writing Pad used with Ink](image1)
![Keyboard used with the Pen](image2)

**Digital Ink and Pen-based Technology**

The ink used in Windows XP Tablet PC Edition is far more advanced than a simple image file, such as a Windows bitmap, and is the product of significant research by Microsoft. Ink is stored as a series of complex equations called Bézier curves. This allows digital ink to have a very small file size and facilitates efficient storage of ink files.

The writing surface of the Tablet PC is roughly the size of a standard paper notebook and users can rest their hand on the screen while writing or running software applications. This is a natural way to use a Tablet PC, but requires careful design to enable a great user experience. Tablet PCs have been designed to operate with an electromagnetic digitizer instead of a resistive-touch screen such as those typically found in personal digital assistants (PDAs) and other devices with small screens. An electromagnetic digitizer accepts input from a special pen containing an electromagnetic coil.

The electromagnetic digitizer enhances the inking experience by preventing contact between the user's hand and the screen from inadvertently moving the cursor. It also enhances screen life by enabling the user to move the cursor without making direct physical contact.
with the screen surface. This "hovering" ability also lets the user move the cursor quickly and easily.

From a technical perspective, the process of inking and pen-based input occurs in the following steps: Windows XP Tablet PC Edition operating system captures pen motion coordinates on the screen, renders and stores the pen motion as "ink," and passes these groups of pen strokes to a "recognizer" that interprets them as writing.

**Gestures**

Tablet PC also includes support for gestures. By making a gesture on the screen with the pen, the user can execute many different commands. Gestures can be used for a variety of common actions or commands and can be invoked by making an ink mark with the pen in one or more locations on the Tablet PC screen.

There are two types of gestures—**system gestures** and **application gestures**.

**System gestures** map to traditional mouse messages. Microsoft Windows XP Tablet PC Edition supports pen input gestures of left-click, double-click, right-click, left-drag, right-drag, and hover mouse messages. These gestures allow a Tablet PC user to use a Tablet PC more easily.

**Application gestures** are defined as gestures that are supported by a specific application. The Microsoft gesture recognizer is built to recognize these gestures. The Tablet PC Platform APIs allow applications to implement a subset of these gestures and query for specific properties such as number of strokes, hot point, and other properties, as well as alternates and their confidence values.

The following table lists application gestures supported by the Microsoft gesture recognizer. To ensure consistency of gestures used for common actions between applications, applications should adhere to the following suggestions:

- **Action** is the suggested semantic behavior associated with the gesture.
- For the gestures labeled as **Fixed** in the following table, Microsoft recommends that you not change the suggested semantic behavior. If an application does not have a need for the specified semantic behavior, Microsoft recommends that you not reuse the gesture for another action or semantic behavior.
- For the gestures labeled as **Application-specific** and have a suggested semantic behavior, Microsoft recommends that you support the suggested semantic behavior if that functionality exists in your application. To maintain consistency across applications, do not choose a different semantic behavior for such a gesture if the functionality corresponding to the suggested semantic exists in your application. However, if your application does not have functionality that corresponds to the suggested semantic, you should feel free to associate relevant semantic behaviors to the gesture. This also applies to all gestures that are **Application-specific** and do not have a suggested semantic.
- The hot point of a gesture is a distinguishing point in the geometry of the gesture. The hot point can be used to determine where the gesture was performed. The gestures APIs, specifically the **HotPoint** property of the **Gesture** event, make it possible to determine the hot point for a given gesture. However, not all gestures have a specific distinguishing

<table>
<thead>
<tr>
<th>Gesture Type</th>
<th>Suggested Semantic Behavior</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Action</strong></td>
<td></td>
<td>As defined by the gesture type</td>
</tr>
<tr>
<td><strong>Fixed</strong></td>
<td></td>
<td>Not change the suggested semantic behavior</td>
</tr>
<tr>
<td><strong>Application-specific</strong></td>
<td></td>
<td>Support the suggested semantic behavior if functionality exists</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do not choose a different semantic behavior unless functionality corresponds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>to the suggested semantic behavior in your application</td>
</tr>
</tbody>
</table>

The hot point of a gesture is a distinguishing point in the geometry of the gesture. The hot point can be used to determine where the gesture was performed. The gestures APIs, specifically the **HotPoint** property of the **Gesture** event, make it possible to determine the hot point for a given gesture. However, not all gestures have a specific distinguishing
hot point. For those that do not have a specific distinguishing hot point, the starting point is reported as the hot point.

**Application Gestures**

The Tablet PC tools for ArcMap support the following application gestures.

<table>
<thead>
<tr>
<th>Gesture</th>
<th>Gesture name</th>
<th>Action</th>
<th>Fixed or application-specific</th>
<th>Hot point</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scratch-out</td>
<td>Erase content</td>
<td>Fixed</td>
<td>None</td>
<td></td>
<td>Make the strokes as horizontal as possible, and draw at least three strokes. If the height of the gesture increases, the number of back and forth strokes also needs to increase.</td>
</tr>
<tr>
<td>Down-left</td>
<td>To be determined by application</td>
<td>Application-specific</td>
<td>Point of direction change</td>
<td></td>
<td>Draw this gesture in a single stroke starting with the down stroke. Make sure that the two sides are equal in length and at a right angle.</td>
</tr>
<tr>
<td>Right-up</td>
<td>Input Method Editor (IME) convert</td>
<td>Fixed</td>
<td>Point of direction change</td>
<td></td>
<td>Draw this gesture in a single stroke starting with the right stroke. Make sure that the two sides are equal in length and at a right angle.</td>
</tr>
</tbody>
</table>

For a list of all application gestures that Ink technology supports go to [http://www.microsoft.com/windowsxp/tabletpc/](http://www.microsoft.com/windowsxp/tabletpc/).

**Speech Recognition**

With Tablet PC speech recognition technology, you can use your voice instead of a mouse, keyboard, or pen to control applications. Speech can also be used to input text. Speech can be combined with other input methods, such as handwriting, for a more natural computing experience.

Speech recognition is accessed through the Tablet PC Input Panel. With a microphone, you can speak into your Tablet PC, giving commands to drive Windows-based programs or
dictating text to be entered into programs. Voice commands can be used to correct errors, format dictated text, or control Windows XP-compatible programs. Speech can sometimes be an easier and quicker method of input than entering text with the digital pen, and it frees up your hands for other activities, such as reviewing printed documents while you dictate.

Speech Recognition process flow

**Mobile Computing and GIS**

With the Tablet PC, mobile workers can access powerful, versatile computing that enhances the role of the traditional notebook PC. The Tablet PC runs Windows XP Tablet PC Edition, which is built on the Windows XP Professional operating system and is powered by the same processors found on other business-class notebook PCs.

This enabling technology will transcend mobile GIS from its current, limited capabilities to a fully functional GIS in the field.

Traditional mobile GIS applications fall into two basic categories:
1. Light-weight applications running on personal devices such as a pocket PC.
2. Vehicle-mounted workstations or ruggedized notebooks are used so existing windows-based GIS applications (like ArcGIS) could be used in the field.

Pocket PC-based applications like ArcPad require that the user learn more than one GIS application in order to integrate field mapping with an enterprise GIS. These devices were handicapped by their size and lack of computing power. The Windows CE operating system and the devices themselves will not support large COM applications like ArcGIS.

Vehicle-mounted workstations and notebooks do not work well in the field. They require the use of a keyboard and are not very versatile.
The Tablet PC digital pen and Ink technology, text and voice recognition, and the Windows XP operating system enables ArcGIS as a mobile computing solution for GIS.

**ArcGIS and Windows XP Tablet PC Edition**

With the addition of the Tablet PC, ArcGIS is now a mobile computing solution for GIS. ArcGIS users can now update their enterprise GIS databases in the field using the same tools and applications (like ArcMap and ArcCatalog) that are used in the office.

**4 ways to use the Tablet PC with ArcGIS**

Essentially, there are 4 different ways that you can use ArcGIS applications on a Tablet PC:

*Tablet PC as a notebook computer*

The Windows XP Tablet PC Edition is a new operating system from Microsoft and is based upon the existing Windows XP Professional operating system. Windows XP-compliant applications are fully supported by the Tablet PC edition of XP. For this reason, ArcGIS is certified and fully supported with the Tablet PC edition.

ArcGIS applications also work on Tablet PC devices. Since all Windows XP-compliant applications are fully supported, all COM-based extensions to the ArcGIS architecture will work. This now enables developers of GIS applications to build ArcObjects-based mobile extensions to ArcGIS.

*Tablet PC Pen-based technology*

The pen-based technology that comes with a Tablet PC lets you drive the Windows XP Operating System and all Windows-based applications using a digital pen instead of a mouse.

The digital pen can be used to press buttons on toolbars in ArcGIS and to draw on the map. Essentially, the pen takes over the movement of the cursor and acts as a mouse. The Tablet PC Input Panel docks to ArcMap and contains a keyboard and writing pad for entering textual information into any dialog box inside ArcMap.

The digital pen is calibrated to the Tablet PC’s screen and does not require any additional calibration or coordinate registration to function within a map display.

*Windows XP Speech Recognition*

With Tablet PC speech recognition technology, you can use your voice instead of a mouse, keyboard, or pen to control applications. The Tablet PC uses the Microsoft® Speech SDK version 5.1. The speech recognition functionality is embedded within the Tablet PC input panel and can be used with ArcGIS as it is used with other applications.

*Note: Because of our custom menu implementation, standard speech recognition commands will not work. Dictation, however, does work.*

*Tablet PC Digital Ink technology*

With the Windows XP Tablet PC edition comes the introduction of Digital Ink technology. Ink is drawn on the tablet using a pen and is stored as a series of complex equations called Bézier curves. The ink technology is customizable and can be applied to any application using COM.
The ArcGIS Tablet toolbar provides tools that allow you interact with the ArcMap display using a digital pen and ink on a Tablet PC. The tools and commands on the Tablet toolbar let you add digital ink on top of your map and store this ink inside the map document or in a geodatabase.

The Tablet toolbar is designed especially for use with a Tablet PC, although the Tablet toolbar can be used on any Windows 2000 or Windows XP computer. However, text recognition is only available when using a Tablet PC. To access the Tablet toolbar, run the ArcGIS setup program on Windows 2000 or Windows XP, then add the Tablet toolbar to ArcMap as you would add any other toolbar.

The following illustrates an ink graphic that was drawn using the Pen tool:

![Ink graphics drawn using the Pen tool](image)

The following section describes the Tablet toolbar in detail.
**Tablet Toolbar**

The Tablet toolbar contains a series of tools and commands that let you interact with the map canvas using ink.

**Pen Tool**

The Pen tool, also referred to as the Ink tool, is used to create ink graphics on the map. You apply ink on the map as a collection of strokes. Each stroke can then be combined to create a single graphic element or recognized to create a text element—either of which is stored in the active annotation target layer. The Drawing menu on the Draw toolbar allows you to view and change the active annotation target.

You can choose from several styles of pen ink from the Pen tool palette. If you choose Use Map Settings, the pen style will be the same as the default line symbol style used to create line graphics on the map. To change the default graphic line symbol, tap Drawing on the Draw toolbar and tap Default Symbol Properties. Only simple line symbols can be used effectively with digital ink—other types of line symbols (cartographic, hash, and so on) may produce unexpected ink symbology.

To create an ink graphic, tap the Pen tool button on the Tablet toolbar and start drawing or writing on the map display. You can use a gesture or tap the Finish Ink Sketch button on the Tablet toolbar to end your ink sketch. In addition, any action that takes the focus away from your ink, such as tapping a button on another ArcMap toolbar, will automatically prompt you to commit or discard your ink sketch.

You can work with ink graphics as you would any other graphic element. Once you have committed your ink as a graphic or as recognized text, you can use the tools on the Draw toolbar to change its appearance. The Draw toolbar allows you to apply quick symbology changes, such as changing the line color for graphics or the font, font size, color, and so on for text. You can also select ink graphics using the Select Elements tool on the Draw toolbar and drag the selection handles to move or resize them, or you can use the Ink Graphic Properties dialog box to scale and position ink graphics by specifying a particular size and location on your map. To open the Ink Graphic Properties dialog box, right-click a selected ink graphic and tap Properties.

In addition, many operations on the Drawing menu of the Draw toolbar, such as Align, Group, and Rotate or Flip, are available for use with ink graphics. To access these functions, you can tap Drawing on the Draw toolbar or right-click selected ink graphics.
The Pen tool contains the following application gestures—movements with your pen that complete common tasks in ArcMap:

<table>
<thead>
<tr>
<th>Gesture</th>
<th>Gesture name</th>
<th>Action</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scratch-out</td>
<td>Erases all connected strokes</td>
<td>Make the strokes as horizontal as possible, and draw at least three strokes. If the height of the gesture increases, the number of back and forth strokes also needs to increase.</td>
<td></td>
</tr>
<tr>
<td>Down-left</td>
<td>Commits ink to the active graphics layer as an Ink Element.</td>
<td>Draw this gesture in a single stroke starting with the down stroke. Make sure that the two sides are equal in length and at a right angle.</td>
<td></td>
</tr>
<tr>
<td>Right-up</td>
<td>Initiates text recognition and will create a text element in the graphics layer</td>
<td>Draw this gesture in a single stroke starting with the right stroke. Make sure that the two sides are equal in length and at a right angle.</td>
<td></td>
</tr>
</tbody>
</table>

By default, the active annotation layer is set to the default graphic layer of the map document. If you want to store ink graphics inside the geodatabase, change the active annotation target on the Drawing menu of the Draw toolbar to the map layer representing the annotation class in the geodatabase.

The Highlighter tool can be used to emphasize areas on the map. Highlighter ink is semitransparent so that you can see the features underneath your highlighting, much like using a marker on a sheet of paper.

You can choose from several styles of highlighter ink from the Highlight tool palette. If you choose Use Map Settings, the highlighter style will be the same as the default fill symbol style used to create filled graphics on the map. To change the default graphic fill symbol, tap Drawing on the Draw toolbar and tap Default Symbol Properties. Only simple fill symbols can be used effectively with digital ink—other fill symbol types (cartographic, gradient, and so on) may produce unexpected ink symbology.

To highlight a feature on the map, tap the Highlighter tool and color on top of the feature you want to highlight—just as you would do with a marker on a sheet of paper.
Once you have finished adding your highlighter ink, you can tap the Finish Ink Sketch button or use the Down-left finish gesture to create a new highlight graphic. In addition, any action that takes the focus away from your ink, such as tapping a button on another ArcMap toolbar, will automatically prompt you to commit or discard your ink sketch.

The Highlighter tool contains the following gesture:

<table>
<thead>
<tr>
<th>Gesture</th>
<th>Gesture name</th>
<th>Action</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Down-left</td>
<td>Commits ink to the active graphics layer as an Ink Element.</td>
<td>Draw this gesture in a single stroke starting with the down stroke. Make sure that the two sides are equal in length and at a right angle.</td>
<td></td>
</tr>
</tbody>
</table>

Once you have committed your Highlighter tool ink as a graphic, you can use the tools on the Draw toolbar to change its appearance. You can use the Draw toolbar to apply quick symbology changes, such as tapping the Fill Color button to change the color of your highlighting. You can also select ink graphics using the Select Elements tool on the Draw toolbar and drag the selection handles to resize them. In addition, many operations on the Drawing menu of the Draw toolbar, such as Align, Group, and Rotate or Flip, are available for use with ink graphics. To access these functions, you can tap Drawing on the Draw toolbar or right-click selected ink graphics.
**Eraser Tool**

The Eraser tool removes all connected pieces of ink that you touch with your pen. You can choose a different eraser width from the Eraser tool palette.

If you choose Small, Medium, or Large, the size of the eraser changes. To erase ink using one of these widths, drag the eraser across the ink you want to erase. If you tap the Stroke Erase tool, you can remove connected strokes of ink by brushing the eraser across the ink stroke you want to erase.

If your pen has a digital “eraser” on its top, you can use it with the Pen or Highlighter tools instead of the Eraser tool.

**Finish Ink Sketch Command**

Once you have created or edited ink, you can tap the Finish Ink Sketch button to create the ink graphic element. Tapping the Finish Ink Sketch button is the same function as using the Down-left commit gesture with the Pen or Highlighter tools. You can also use the auto finish functions in the Tablet Options dialog box to commit an ink sketch automatically as recognized text or as a graphic after a particular amount of time.

**Clear Ink Sketch Command**

The Clear Ink Sketch command removes any ink strokes from the current ink collection. This tool is only enabled when you are inking and have not yet committed your ink as recognized text or graphics.

**Add Ink To Edit Sketch Command**

The Add Ink to Edit Sketch command converts collected ink to polyline or polygon geometry, places it in the edit sketch, and completes the current editing task. This tool may be especially helpful if you are in the field and need to update the geometry for some roads or parcel boundaries, for example. You must be in an editing session for the Add Ink to Edit Sketch button to be available. You also need to make sure that editing task or target requirements are met. For example, if the current task is Create New Feature, the target layer needs to contain a polyline or polygon feature class.

Each stroke is considered a part in the polyline or polygon geometry. If you are creating polygon shapes and the strokes do not form a closed polygon, the stroke will close itself at each end.

The edit sketch geometry is constructed using the control points from the Bézier curves within the ink geometry. If you checked the Generalize option in the Tablet Options dialog box, the edit sketch geometry is generalized using the Douglas-Poiker algorithm.
Recognize Ink Graphic Command

The Recognize Ink Graphic command converts selected ink graphic elements into text elements and stores them in the active annotation or target layer. To create text elements using the Recognize Ink Graphic button, select the ink using the Select Elements tool and tap the Recognize Ink Graphic button on the Tablet toolbar. A new text element is created and stored in the active target layer.

If the recognition confidence is low, a Poor Recognition Confidence dialog box will appear so you can correct the text before creating a new text element. If you want the Poor Recognition Confidence dialog box to appear for each ink graphic that is recognized, regardless of its confidence level, tap the Tablet Options button on the Tablet toolbar to open the Tablet Options dialog box. On the Tablet Options dialog box, uncheck Do not show alternates dialog if recognition confidence is high. This will allow you to ensure that each piece of text has been recognized properly before it is added to ArcMap.

Poorly recognized text is highlighted in yellow in the Text box on the left side of the dialog box. You can accept the recognition, use a suggested word from the Alternative box on the right side of the dialog box, or type your own new text in the Text box.

You can tap any piece of text in the Text box on the left side of the Poor Recognition Confidence dialog box and view a preview of the ink and a list of suggested words for the text on the right side of the dialog box. You can tap a word from the Alternative list and tap Change to replace the poorly recognized text. If you decide to use a word from the Alternative list, you need to tap Change before tapping OK for the text to be updated. You can also tap Copy text to clipboard to copy the recognized text to the clipboard for use in another application.

If you have selected a number of ink graphics to recognize and do not want to recognize all of them, tap Skip to cancel text recognition for that ink graphic and proceed with recognition of other graphics. If you tap Cancel All, the ink graphics that you have not recognized yet will be skipped. When you are done, tap OK to commit the ink as a text element in the graphic layer or annotation feature class.
**Reactivate the Selected Ink Graphic Command**

The Reactivate Ink command re-creates an ink sketch from a selected ink graphic element. You can reactivate an ink graphic and then use the Pen or Highlighter tools to alter the graphic.

To reactivate an ink graphic, select a single ink element and tap the Reactivate button on the Tablet toolbar. The graphic will be converted back to an ink sketch so you can modify it with the Pen tool. Tapping Reactivate zooms your map to the original scale that the ink element was created in and centers the map display on the ink element.

When you're done modifying your ink, you can tap the Finish Ink Sketch button or use the commit gesture to store the ink as a graphic element again.

**Find Ink Graphic Command**

The Find Ink Graphic tool can be used to locate ink graphic elements on the map using text recognition. If you capture ink elements across disperse geography or use ink graphics across an enterprise geodatabase, the Find Ink Graphic dialog box is helpful to use to locate and zoom to ink graphics using text recognition. Tap the Find tool to open the Find Ink Graphic dialog box, then type a word or phrase that is contained in the ink graphic that you want to locate. The Look For dropdown list shows previous searches that you have done since you opened the dialog box.

If you tap the Zoom To Graphic button, the map zooms to the extent of the first match when you tap Find. You can check the Whole word only box to limit the search to match whole words. For example, typing "spring" will not find Springfield.

You can use the Find Ink Graphic dialog box on a non-Tablet PC to locate ink graphics if you have turned on the option to automatically generate recognition text when collecting ink on your Tablet PC. If you did not check this option, then you should first search for ink graphics on a Tablet PC using the Find Ink Graphic dialog box. This search generates recognition text for all elements in the active graphic layer. You can then save the changes to those graphics and check them into the geodatabase for use with a non-Tablet PC. To change the automatic text recognition settings, tap the Tablet Options button on the Tablet toolbar and...
check Automatically generate recognition text when Ink Graphics are updated on the Tablet Options dialog box.

**Tablet PC Options**

Tapping the Tablet PC Options button displays the Tablet Options dialog box, which allows you to set options that control inking.

![Tablet Options Dialog Box](image)

- **Use pressure sensitive pen tip**
  - If you check this option, the Pen tool recognizes the pressure sensitivity of the digital pen when collecting ink. Pressure sensitivity is controlled by how hard you press on the tablet screen—the width of the ink graphic depicts the pressure changes.

  ![Pressure Sensitivity](image)

- **Enable scratch-out gesture**
  - Scratch-out is a gesture that erases connected strokes of ink. The scratch-out gesture can only be used with the Pen tool and is enabled by default. Since it is possible to apply the scratch-out gesture by accident, this option can be used to disable the gesture.
Automatically generate recognition text when Ink Graphics are updated
When you create a new ink graphic, you have the option of automatically recognizing the ink as text. The recognized text is then stored as property of the ink element itself. If you plan to use ink that is captured on a Tablet PC with a non-Tablet PC, turning on this option is very important. For example, the Find Ink Graphic dialog box uses the recognized text to locate ink elements. If you store ink in the geodatabase and use it across a large GIS, it is recommended that you turn on this option before collecting ink.

Generalize Ink strokes before adding to the edit sketch
The Generalize option applies a Douglas-Poiker generalization to the ink geometry when you create edit sketch geometry from ink. The ink geometry contains a series of points that are Bézier curve control points. The number of points in the geometry is dependent on the amount of care and detail that is applied to the construction of ink strokes. If you are sketching a geographic shape, you will spend more time collecting detailed strokes of ink. In this situation, the control points might be dense and often contains unnecessary points in the ink graphic or edit sketch geometry. Using the Generalize option, you can compress the shape and remove unwanted vertices.

Render Ink Graphics as lines when projecting on-the-fly in ArcMap
When projecting ink graphics on the fly in ArcMap, it may be difficult to re-create the ink strokes, depending on the transformation that needs to be applied. For example, if you capture ink for use with a world projection such as Mercator and try to project the map’s data frame to display the ink using a Robinson projection, the ink will look distorted. If you render ink as lines when not in its native projection, it may produce a result that better resembles the collected ink than projecting on the fly.

Do not show Alternates dialog if recognition confidence is high
When recognizing ink as text, the text recognition engine will rate the confidence of the recognition. If the confidence of the recognition is low, a list of alternate words for the recognized text can be displayed at the time of recognition. However, sometimes text that is recognized with high confidence may be incorrect. By default, all text recognized with a high confidence level will be converted automatically. If you uncheck this option, the list of alternate recognition text appears every time text recognition occurs.

Ink Sketch Auto Finish
The Ink Sketch Auto Finish options control how you commit an ink sketch during an edit session. The default choice is to commit the ink sketch manually. With this option, you need to finish an ink sketch by tapping the Finish Ink Sketch button or by using a gesture. With the Ink Sketch Auto Finish options, you can automatically commit the ink sketch as a graphic or recognize the ink sketch as text after a time delay that you set with the slider. If you choose to commit ink and recognize it as text automatically, all strokes convert to text even if they are supposed to be graphics.
The following is a breakdown of the paths you can follow in the Tablet PC state diagram you see above.
Using the Pen tool

Using the Highlighter tool
Using the Reactivate Command

1. Use the Pen Tool
2. Commit the Ink Sketch
3. Reactivate the selected Ink Graphic Element

Using the Recognize Command

1. Recognize the selected Ink Graphic Element
2. YES
Tablet PC Object Model

**Model Overview**

The Tablet tools are architected as an extension to ArcMap. The extension has two modes: Collecting/Not Collecting. If the Pen tool or the Highlighter tool is the active tool, then the extension is in collection mode. The ITabletExt interface is used to start and stop ink collection and provides a reference to the Microsoft InkCollection object. Using the ITabletExtEvents interface you can listen to the OnGesture event. The OnGesture event fires when a limited number of ink event types occur (see the ESRITPCGestures enumeration for details).

The Tablet Extension introduces a new kind of graphic element called an InkGraphic. An InkGraphic inherits from the IElement interface and you can use the IIinkGraphic interface to get Ink specific properties for the element. Ink graphics are one of two types—Pen Ink or Highlight Ink. You can get the InkType using the IIinkGraphic interface. The IIinkGraphic interface exposes the stroke geometry as polyline geometry.

Using the IIInkGraphicTool interface you can control the properties of the Pen tool. Properties like the width, tip type, and color of the ink that is drawn or you can create your own Pen tool. See the code example below for details.

**Code Samples**

1. **You can obtain a reference to the TabletExtension object in VB like this:**

   ```vbnet
   Public Sub GetTabletExtension()
   Dim pTablet As ITabletExt
   Dim u As new UID
   u = "TABLETPCEXT.TabletExt"
   Set pTablet = Application.FindExtensionByName("TabletPC Support")
   End Sub
   
   2. **You can create your own Pen tool in VBA like this:**

   ```vba
   Private m_geom As IGeometry
   Private WithEvents m_extension As TabletExt
   Private m_active As Boolean

   Public Sub DrawInkSketchGeometry(geom As IGeometry)
   Dim pMXDoc As IMxDocument
   Set pMXDoc = Application.Document

   Dim pAV As IActiveView
   Set pAV = pMXDoc.ActivatedView

   Dim pSD As IScreenDisplay
   Set pSD = pAV.ScreenDisplay

   Dim pSym As ILineSymbol
   Set pSym = New SimpleLineSymbol
   pSym.Width = 2
   ```
Dim c As IColor
Set c = pSym.Color
c.RGB = RGB(255, 0, 0)
pSym.Color = c

pSD.StartDrawing pSD.WindowDC, esriNoScreenCache
pSD.SetSymbol pSym
pSD.DrawPolyline geom
pSD.FinishDrawing
End Sub

Private Sub m_extension_OnGesture(ByVal gestureType As TABLETPCEXTLib.ESRITPCGestures)
    If m_active Then
        If gestureType = ETPC_DownLeft Then
            Set m_geom = m_extension.InkGeometry

            m_extension.Stop True

            ' Allow background to re-paint
            DoEvents

            DrawInkSketchGeometry m_geom

            UIToolControl1_Deactivate
            Set Application.CurrentTool = Nothing
        End If
    End If
End Sub

Private Function UIToolControl1_Deactivate() As Boolean
    UIToolControl1_Deactivate = True
    m_active = False
End Function

Private Sub UIToolControl1_Select()
    Set m_extension = Application.FindExtensionByName("TabletPC Support")
    m_extension.Start
    m_active = True
End Sub

3. You can listen to the OnGesture event to zoom/pan inside of a tool control:

Dim WithEvents tpe As TabletExt

Private Sub tpe_OnGesture(ByVal gestureType As TABLETPCEXTLib.ESRITPCGestures)
    Dim c As ICommandItem

    If gestureType = ETPC_SemiCircleLeft Then
        Set c = ThisDocument.CommandBars.Find(ArcID.PanZoom_ZoomOutFixed)
ElseIf gestureType = ETPC_SemiCircleRight Then
    Set c = ThisDocument.CommandBars.Find(ArcID.PanZoom_ZoomInFixed)
ElseIf gestureType = ETPC_ChevronLeft Then
    Set c = ThisDocument.CommandBars.Find(ArcID.PanZoom_Left)
ElseIf gestureType = ETPC_ChevronRight Then
    Set c = ThisDocument.CommandBars.Find(ArcID.PanZoom_Right)
ElseIf gestureType = ETPC_ChevronUp Then
    Set c = ThisDocument.CommandBars.Find(ArcID.PanZoom_Up)
ElseIf gestureType = ETPC_ChevronDown Then
    Set c = ThisDocument.CommandBars.Find(ArcID.PanZoom_Down)
End If

If Not c Is Nothing Then
    c.Execute
End If

End Sub

Private Function UIToolControl1_Deactivate() As Boolean
    If Not tpe Is Nothing Then tpe.Stop
    UIToolControl1_Deactivate = True
End Function

Private Sub UIToolControl1_Select()
    Set tpe = Application.FindExtensionByName("TabletPC Support")
    tpe.Start True
End Sub
Tablet PC Object Model Diagram

TabletPC Object Model

ArcGIS™ draft v1.0.0.40

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Enumerations

TabletExt

IExtension

ITabletExtensionEvents

TabletExtEvents

InkGraphic

IInkGraphic

InkGraphicEvents

InkGraphicTool

IInkGraphicTool

Tablet PC Object Model Diagram (v 1.0.0.31)
Use case scenarios for the Tablet PC

The Tablet PC can be used for a variety of field-based applications. The following is a brief description of some of the uses for the Tablet PC and ArcGIS:

Asset Management and Planning

Local government organizations can use the Tablet PC to complete tasks like construction/inspection reporting, sign/infrastructure inventory, storm water inventory, and facility planning.

Fictitious facility planning using Ink

Joe is a city engineer. He is about to head out into the field to evaluate a proposed design for a new subdivision that is planned for the City. In the field, the proposed residential lots have been surveyed and leveled and the curbs have already been poured. Joe is going to design the layout of the water and wastewater facilities that will serve all new homes in the subdivision.

Before Joe hops into the truck, he connects his Tablet PC to the network and pulls up a map of the proposed subdivision using ArcMap. Using the Checkout button, Joe extracts the landbase and facilities for the new subdivision and the exterior water network that he needs to tie into with his design.

When Joe arrives at the site, he opens that map document once again. Right on top of the map, Joe lays out a plan for the new water facilities by sketching out some graphics using the Pen tool. He also scratches out some notes about the materials that will be required to complete the job (pipe sizes and so on).

These rough sketches of his new design provide him with the information necessary to accurately design the new subdivision. The graphics that Joe makes in the field are stored within a graphic annotation layer in the geodatabase that he checked out.

Once Joe has finished making notes and has a rough design for the new services in place, he returns to the office and connects his Tablet PC to the City’s network. Connecting to the proposed version for the subdivision, Joe checks-in his changes so that other notes he has made in previous versions are combined together with the new notes.

Using the notes, Joe then starts to edit the water facilities layers inside of his proposed version and uses his ink-based notes, which were stored as elements in a graphic annotation feature class, to construct new facilities.

Environmental and Conservation Applications

Conservation organizations, universities, and environmental companies can use the Tablet PC to perform tasks like wetland delineation, emergency watershed protection, cultural site survey, fish and wildlife inventory, forestry management and inventory, and river/stream management.

Fictitious stream management scenario

I am contracting my services as a stream technician to a nonprofit organization involved with mapping and inventorying streams and wetlands. The primary objective is to map and
inventory all of the streams and wetlands and make the information available to federal, state, and municipal land planners to aid them in making better land use decisions. Anyone who has worked with government topographic maps knows how often small streams and wetlands are not shown.

We intend to place all of the small streams and wetlands that are not represented on the existing maps on our maps at a 1:5,000 scale. This work is very labor intensive involving many hours of ground truthing, entering field data, drawing the maps, and walking the mapped streams a second time to insure accuracy.

There are literally hundreds of these small, unmapped streams in our study area and the project will take a great deal of time to complete. Any equipment that can assist in increasing production is an asset. The Tablet PC has made our mapping and inventory project much easier and has increased our production. Our field crew works five days per week; we record hundreds of entries every day on the tablet. The majority of the work is walking along the stream boundary with the Tablet and a GPS device, capturing the stream directly into our GIS and capturing stream properties using the Pen tool directly on top of the map. That ink is text that is recognized automatically and stored as annotation in the stream database.

Before purchasing the Tablet PC we would spend on average 21.5 hours each day entering the stream data manually into our database. Now that we are using the Tablet PC, we can capture digitally all the information we need from the field and upload the data into our database in less than two minutes.