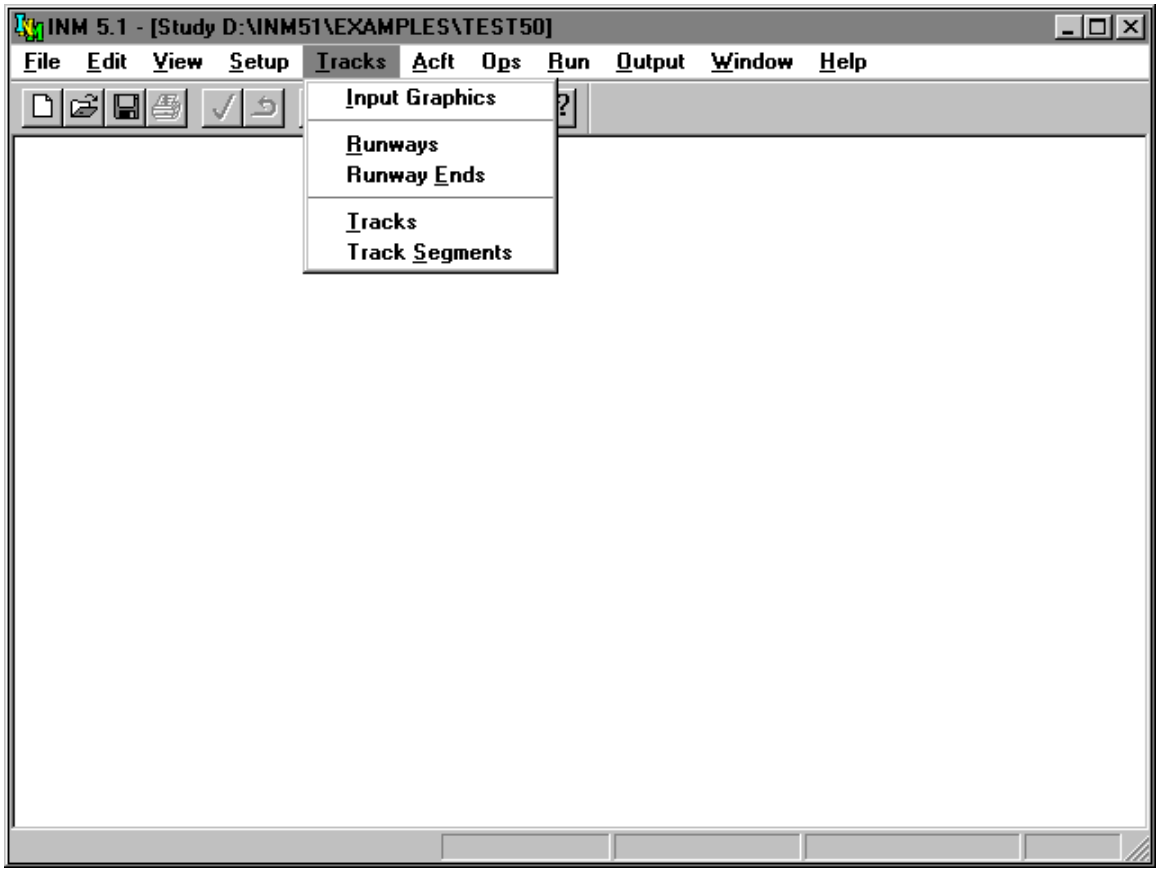
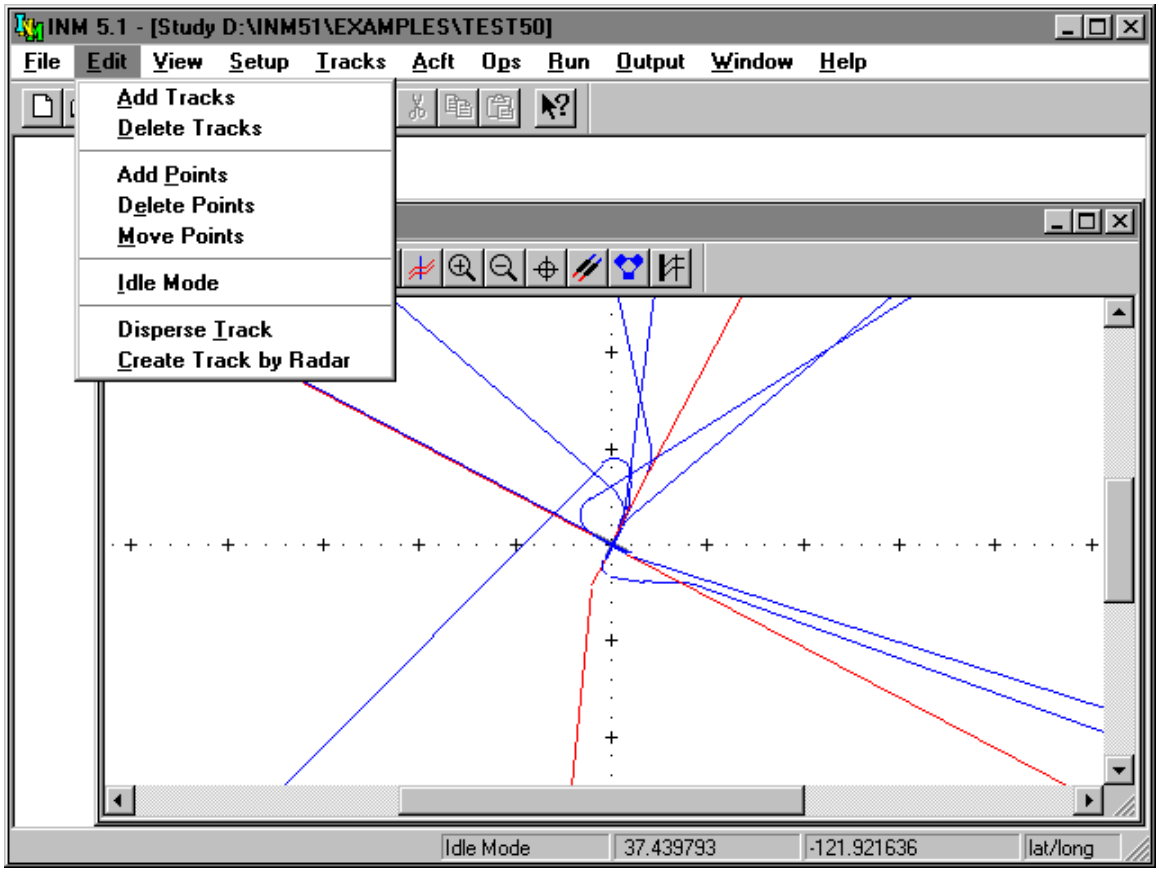


7. TRACKS MENU

You use the Tracks menu to create runways and tracks for your Study. Points-type Tracks can be added by point-and-click graphical methods, and vector-type Tracks can be added by typing in data.

You should create Runways and Runway Ends before using the Input Graphics function. This is easily done by using the Setup // Study "View Airport" function at the time you create your Study. Or, you can manually create runway data in the Runway and Runway End windows.



7.1. Input Graphics

Menu Item: Track // Input Graphics

You use the Input Graphics function to graphically create and edit INM tracks. A graphically produced track is called a "points-type" track, or "P-track". It is an ordered sequence of X,Y points.

The other kind of track is called a "vectors-type" track, or "V-track". It is created in the Track and Track Segments DBF windows by typing in data values.

During the noise calculation process, INM converts V-tracks into sequences of X,Y points, so nothing is lost by creating P-tracks at the beginning.

You cannot edit V-tracks in the Input Graphics window, and you cannot edit P-tracks in the DBF windows.

The Input Graphics function starts in an "idle" input mode. You change the input mode by using the Edit menu (note that the Edit menu is different when you focus on the Input Graphics window).

For example, you can change to the "add tracks" input mode by pressing the Add Tracks function under the Edit menu. When you change input mode, the name of the new mode is displayed on the status bar at the bottom of the main window.

You can go directly from one input mode to another, without having to go into the "idle" mode first.

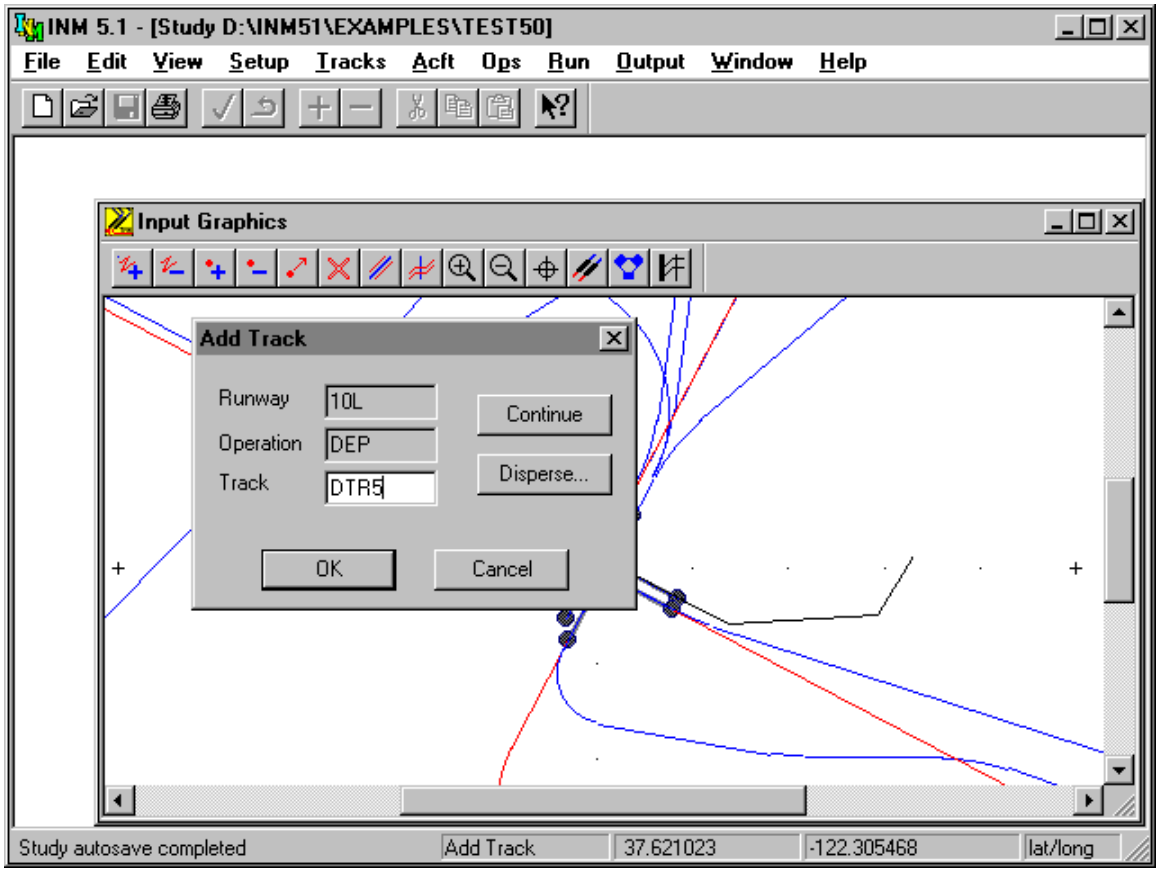
The mouse behaves differently in different input modes. For example, in the "add tracks" mode, a left-button click creates a track point, a double-click creates the last track point, and a right-button click brings up an "Input Track Point" dialog box for typing in coordinates.

In all of the input modes, you can move the graphics scene left, right, up, or down by two methods:

- Use the "scroll bars" on the bottom and right side of the Input Graphics window. You can click on the arrowheads located at the two ends of a scroll bar, or you can drag the "slider" along the bar.

- Press the right mouse button, hold it down, stretch the "rubber band", and release the button at a new position. INM translates the scene in the direction, and for the distance, that you specified. The right mouse button does not always behave this way, but it does if you have not started a sequence of operations, such as adding points.

A graphics toolbar is displayed at the top of the Input Graphics window. You can turn it on or off by using the Windows // Toolbar toggle function. The graphics toolbar provides a short-cut method to access functions on both the Edit and View menus. The name of the function is displayed under the toolbar when you leave the mouse pointer on the button for a second. The function name also appears on the status bar at the bottom of the screen.



7.1.1. Edit // Add Tracks

Toolbar: Zigzag with plus sign

You can create new tracks using this function:

1) Start a track by clicking the left mouse button where you want the first track point.

2) Click the left mouse button for each track point. Track points are always created in the order that an airplane flies along the track. Try to keep the angle between adjacent track segments to less than 30 degrees.

3) The last point is made by double-clicking with the left mouse button.

There are some special uses of the mouse and keys:

- When you add points to a track, the right mouse button can be used to pop-up a dialog box to type in the point coordinates, instead of clicking on the point. When you click the right mouse button, the "Input Track Point" dialog box pops up with default point data. If you previously set geo-units to "lat/long", you fill out the latitude and longitude values that you want. If you set geo-units to "nautical miles", you fill out X,Y values, and similarly for "kilometers".

- Use the "Esc" key to undo the previous step.

- Since the zoom functions are not accessible while in the Add Track function, use the "+" or "=" key to zoom in, and use the "–" key to zoom out. The center of the zoom is the position of the mouse.

If you want to create a **Departure track**, click on the circle at the end of the runway from which the takeoff starts. For example, if runway 33L is used for departures, you make the first track point in the circle designating runway end 33L. Create the next point such that the departure track goes straight down the runway. Continue clicking with the left button to define the track. Double-click to finish the track, thus bringing up the dialog box.

In the Add Track dialog box, fill out the 4-character track identifier. The full name of the track is formed from three identifiers: the Runway End identifier, the operation type (in this case, DEP for departure), and the name that you type in. Although you do not have to, it is a good idea to make the identifier unique across all tracks in the Study.

You can exit the "Add Track" dialog box by pressing one of four buttons:

"OK"	Commit the new track to the Study database.
"Disperse"	Commit the track and immediately go to the Disperse Track function, where you can create multiple sub-tracks (see Section 7.1.7, below).
"Continue"	Continue adding points (for example, you made a mistake in double-clicking to finish the track).
"Cancel"	Delete the track (for example, you want to start over again).

If you want to create an **Approach track**, start your track out in the terminal area, and add points toward the touchdown end of the runway. The last line segment should line up with the runway. Make the last point on the end of the

runway by double-clicking inside the circle. Fill out the dialog box, as you did for departures.

A **Touch-and-Go track** is a closed loop. It starts in a runway circle and finishes in the same circle. Make sure that the first and last track segments line up with the runway.

An **Overflight track** starts somewhere in the terminal area and finishes in the terminal area. It must not start or end inside a runway circle. INM automatically assigns "OVF" as the runway identifier to all overflight tracks. The Edit // Add Tracks function is the only way available to create overflight tracks.

You can stay in the "add track" mode and add as many tracks of different operational types as you want.

7.1.2. Edit // Delete Tracks

Toolbar: Zigzag with minus sign

You can delete existing tracks using this function. Click on the track that you want to delete. INM changes the color of the selected track to black and presents a confirmation message box.

After you press the "OK" button, INM checks to see if the track is associated with any Group Percents or Flight Operations records. This may take several seconds if the flight operations are not already in memory.

If the track is associated with an operation, INM will not allow the track to be deleted. If you really want to delete the track, you must first delete all of the operations that use the track, and then delete the track.

7.1.3. Edit // Add Points

Toolbar: Point with plus sign

You can add new points to existing tracks using this function. Click on a track segment. INM draws a black segment over the current segment. The black segment becomes a triangle that is anchored by the original two points defining the segment. There are two ways of defining the new point:

- Drag the apex of the triangle to a new position, and then click once more to release the new point. INM takes a moment to commit the new set of points.

- Use the right mouse button to bring up a dialog box to input the coordinates of the new point.

To add points to the end of a track, add them in between the last two points, and then move the last point to where you want it.

7.1.4. Edit // Delete Points

Toolbar: Point with minus sign

You can delete existing points in tracks using this function. When you activate the "delete point" mode, INM displays little squares at the point positions. Click on the point that you want to delete. INM colors the point black and then requests confirmation. After you press the "Yes" button, INM takes a moment to commit the new set of points.

7.1.5. Edit // Move Points

Toolbar: Point with arrow

You can move existing points in tracks using this function. When you activate the "move point" input mode, INM displays little squares on point positions. Click on the point that you want to move. INM creates a black triangle using the two neighboring points as anchor points.

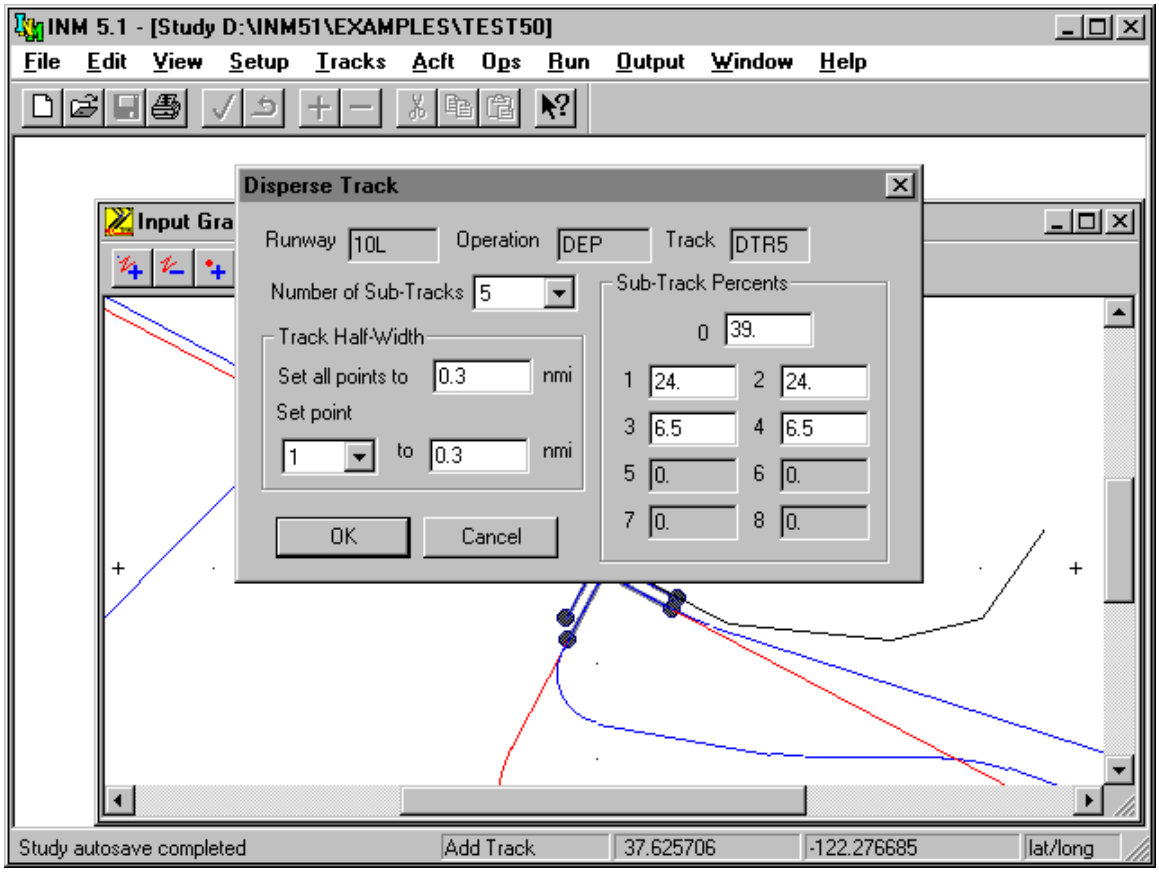
There are two ways of defining the new point:

- Drag the apex of the triangle and click at the new position.
- Use the right mouse button to bring up a dialog box to input the coordinates of the new point.

7.1.6. Edit // Idle Mode

Toolbar: X sign

You can change to the "idle" input mode by using this function. This may be useful when you want to deactivate the behavior of the mouse. You do not have to go through the idle mode to change from one mode to another.



7.1.7. Edit // Disperse Track

Toolbar: 3 straight lines

You can use this mode to create sub-tracks along side of a backbone track. The backbone track and its sub-tracks are collectively called a "dispersed" track.

A dispersed track is used to model deviations from a nominal flight path, thus distributing noise over a larger area than provided by a single track. INM automatically distributes flight operations across sub-tracks, so all you do is assign operations to a single object (the dispersed track) and INM takes care of the details.

When you activate the Dispersed Track input mode, INM displays little squares on point positions. Click on the track that you want to disperse, and INM displays the "Disperse Track" dialog box.

Another way to disperse a new track is from the "Add Track" dialog box. When you press the "Disperse" button, INM displays the same "Disperse Track" dialog box.

In the Disperse Track dialog box, you edit the following input parameters:

1) Number of dispersed tracks — the backbone track plus sub-tracks. This is a number from 1 to 9. A large number of sub-tracks will cause INM to run slower than with fewer sub-tracks, or none at all.

2) Sub-track percentages — these data are used to distribute flight operations across the backbone track and its sub-tracks. INM sets default percentages. You can change these percentages, but please make sure that the new numbers add up to 100 percent.

3) In the INM naming convention, sub-tracks always occur in pairs (for example, 1 and 2, 3 and 4, etc.), where sub-tracks to the left of the backbone track are odd numbers and to the right are even numbers:

   Left 7 5 3 1 0 2 4 6 8 Right

   Left and right are determined by facing in the direction of flight along the backbone track. The backbone track is identified by "0".

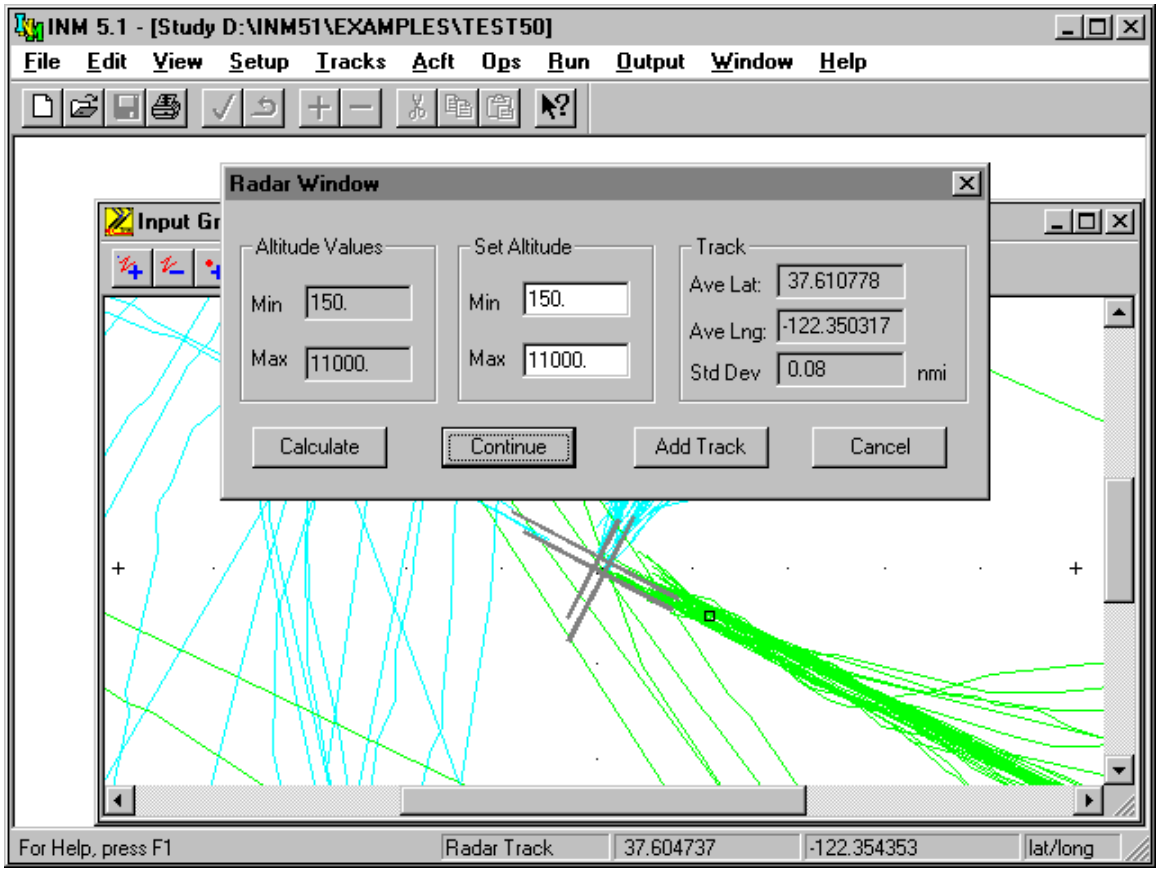
4) Dispersed-track half-width — this is the distance from the backbone track to the outside sub-track. Twice this parameter is the total width of the dispersed track.

A half-width parameter is associated with each backbone point. Thus you can change the shape of the dispersed track, point by point. When you first create a dispersed track, you can quickly set all of the points by using the "Set all points" box. Or, you can set each point by selecting the point by number in the drop-down list box, and typing the value in the half-width box.

Once a track is dispersed and while you are still in the "disperse track" mode, you can change individual half-widths. Click on a backbone point (clicking on a segment produces no action). INM displays the "Disperse Track" dialog box with the point that you selected showing in the "Set point" drop-down box. Type in a new half-width value for the point.

When you disperse an approach, departure, or touch-and-go track, you need to adjust the dispersion half-widths at each point to properly model the operation.

For example, departure sub-tracks should have zero width at the first and second points so that all sub-tracks are on the runway. You need to change the half-widths on point-3 and greater. If possible, you should base track dispersion on radar data. If radar data are not available, you should increase the dispersion width in proportion to the distance from the runway.



7.1.8. Edit // Create Track by Radar

Toolbar: Line crossing 2 wavy lines

You must be able to see radar tracks in the Input Graphics window to use this function. Section 3.5.2 explains how to bring radar track data into your Study. The View // Tracks function (see Section 7.1.14, below) can be used to enable (make visible) the radar tracks.

The way you create a track "by radar" is to specify a set of "radar windows" along a bundle of radar tracks.

1) Click to the side of a bundle.
2) Pull a line across the bundle (perpendicular to the radar tracks).
3) Click again. The line defines the horizontal extent of the radar window.

Start a Departure track near the takeoff end of a runway, where radar data start, and work outward along a bundle of radar tracks. Start an Approach track in terminal airspace and work inward toward the touch-down end of a runway. You define the type of operation (for example, Approach) later.

After you draw a line across a bundle of radar tracks, INM pops up the Radar Window dialog box:

- The "Altitude Values" box shows the lowest and highest altitudes of all the radar tracks that cross the line that you just specified.

- The "Set Altitude" box is where you can input the vertical extent of the radar window. The default values are the lowest and highest radar track altitudes, thus allowing all radar tracks through the radar window.

- After you reset the altitude values, press the "Calculate" button. INM then calculates the mean and standard deviation of the radar-track crossing points, which lie on the horizontal line. These statistics are displayed in the "Track" box. The statistics are in the geo-units that you specified in the Setup Geo Units function. The track-point mean value is also displayed in the Input Graphics window as a small square.

If you do not change the altitude values, you do not need to press "Calculate" because the default values are already calculated.

You can exit the "Radar Window" by one of three ways:

"Continue"	Continue inputting points.
"Add Track"	Finish specifying the track.
"Cancel"	Delete the track and start over.

Continue creating points by pressing the "Continue" button. You create an INM track by repeating the "Radar Window" calculation at strategic places along the bundle of radar tracks. The radar points must be created in the same order that an airplane would fly along the track. You should choose places where the radar-track bundle changes size or where it turns.

To finish the track, press the "Add Track" button. INM then displays the Add Radar Track dialog box:

1) Choose the operation that you had in mind when you specified the points (APP=approach, DEP=depart, TGO=touch-and-go, OVF=overflight).

2) Select a Runway End.

3) Input the track identifier that you want.

4) Select the number of dispersed tracks (the backbone track plus sub-tracks). Notice that when you change the point index number on the right, the dispersion half-width changes. This is because INM uses the calculated standard deviation to determine the track half-width.

You can exit the Add Radar Track dialog box by one of three buttons:

"OK" Commit the track to the database. You can change a radar-created track after it is committed by using the Edit // Disperse Track function.

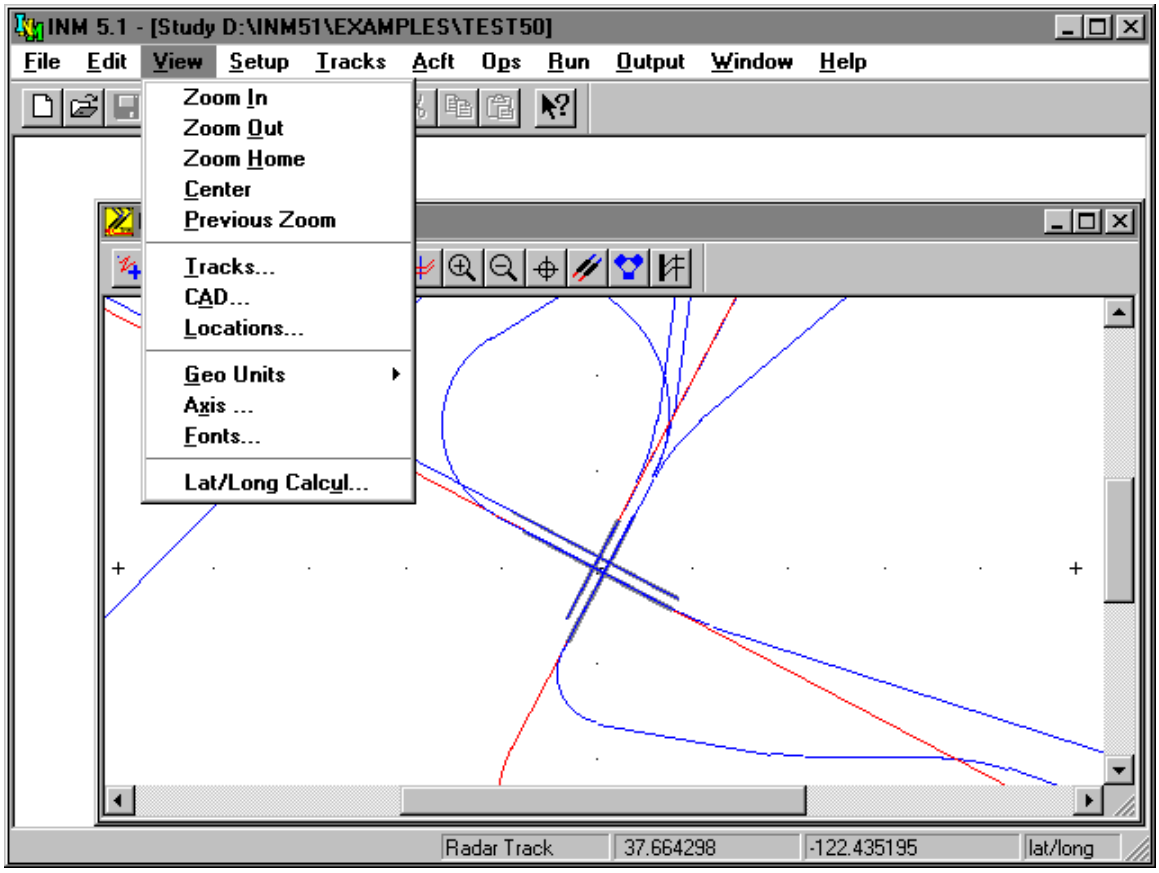
"Continue" Continue "Radar Window" input (for example, you made a mistake and did not want to finish the radar track).

"Cancel" Delete the track and start over.

The table below shows default distances from the backbone track to individual sub-tracks. The distance is in terms of the number of standard deviations. The track half-width is the standard deviation at the point times the multiplier for the outside sub-track. For example, a 3-track half-width is 1.41 times the standard deviation at a point, and a 5-track half-width is 2 times the standard deviation.

The table also shows the default percentages that INM assigns to the sub-tracks. INM uses a binomial probability distribution for the percentages, except for the 5-track case, which uses the ICAO dispersion percentages (but they are very close to binomial). The backbone track is assigned a sub-track identifier of "0".

Number of Tracks	Sub-track Identifier	Std Dev Multiplier	Percent on Sub-track
1	0	0.00	100.00
3	0	0.00	68.26
	1 & 2	1.41	15.87
5	0	0.00	39.00
	1 & 2	1.00	24.00
	3 & 4	2.00	6.50
7	0	0.00	31.24
	1 & 2	0.67	23.44
	3 & 4	1.33	9.38
	5 & 6	2.00	1.56
9	0	0.00	27.32
	1 & 2	0.50	21.88
	3 & 4	1.00	10.94
	5 & 6	1.50	3.13
	7 & 8	2.00	0.39



7.1.9. View // Zoom In

Toolbar: Magnifier with plus sign

To zoom in:

1) Click with the left mouse button at the position where you want the new center of the window.

2) Move the mouse to create a rectangle that represents the border of the new window.

3) Click with the left mouse button again to enable the zoom operation. INM redraws the scene in a larger scale, making it appear that you are closer to the airport.

You can change the center of the zoom area by holding the right mouse button down and dragging the rectangle to a new position. Do this after establishing the rectangle, but before finalizing the zoom operation with the second left-mouse-button click.

7.1.10. View // Zoom Out

Toolbar: Magnifier with minus sign

To zoom out:

1) Click with the left mouse button at the position where you want the new center of the window.

2) Move the mouse to create a rectangle that represents the area into which you want the old window to be displayed. Make a small rectangle to zoom out a long way.

3) Click with the left mouse button again to initiate the zoom operation. INM redraws the scene in a smaller scale, making it appear that you are farther away from the airport.

You can change the center of the zoom area by holding the right mouse button down and dragging the rectangle to a new position. Do this after establishing the rectangle, but before finalizing the zoom operation with the second left-mouse-button click.

7.1.11. View // Zoom Home

Toolbar: Circle and plus sign

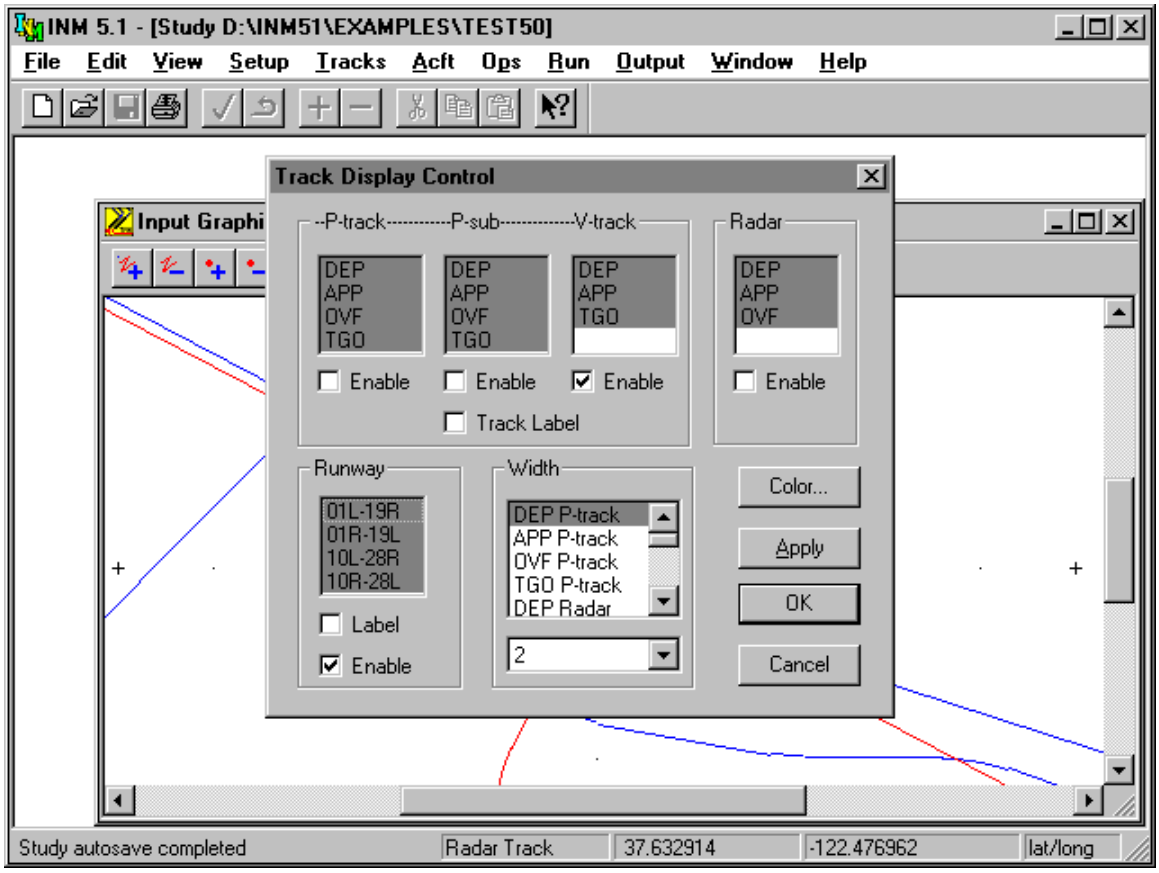
The Zoom Home function centers the display on the origin of the Study coordinate system and resets the scale to the default value, which displays about ±20 nautical miles of the X-axis.

7.1.12. View // Center

The Center function re-centers the scene so that the origin of coordinates is in the center of the window. The current zoom scale is not changed.

7.1.13. View // Previous Zoom

The Previous Zoom function returns the graphics scene to the scale that was used previous to the current zoom scale.



7.1.14. View // Tracks

Toolbar: Runway and tracks

You use the Track Display Control function to turn on or turn off tracks and runways, label tracks and runways, and define colors.

Across the top of the dialog box, there are four list boxes containing four categories of tracks:

- P-track Points-type backbone tracks
- P-sub Points-type sub-tracks
- V-track Vector-type tracks (both backbone and sub-tracks)
- Radar Radar tracks.

Each list box has three or four operation types:

- DEP Departure tracks
- APP Approach tracks
- TGO Touch-and-Go tracks
- OVF Overflight tracks.

You click on an operation type to select (highlight) or de-select the type of track.

A check mark in an "Enable" box means that the highlighted tracks in the associated list box are turned on. For example, you can display only approach P-tracks by:

1) selecting APP in the P-track list,
2) de-selecting all other operation types in that list,
3) putting a check mark in the P-track "Enable" box,
4) removing check marks from the other "Enable" boxes.

If you want to display track identifiers, put a check in the "Track Label" box.

You can change the width of tracks by selecting a track type (for example, DEP P-track) and then selecting a width number from the drop-down list box.

You can control runways by enabling or disabling them as a group and/or by selecting and de-selecting individual runways. If you de-select a runway, the runway and its associated tracks are not displayed. If you simply disable all runways (but leave individual runways selected), all the runways disappear but the tracks stay. Runway identifiers can be turned on or off with the associated "Label" box.

The four buttons operate as follows:

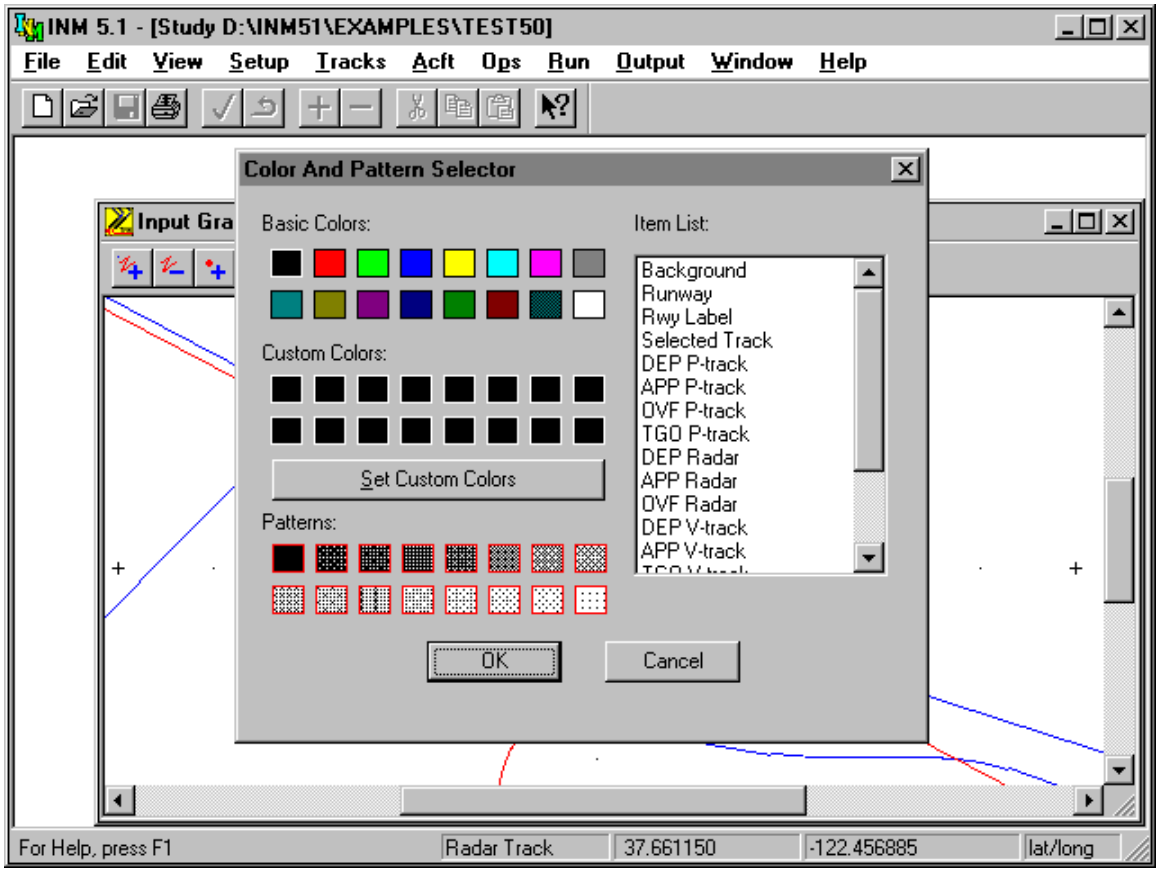
"Color" Go to the Color dialog box (see Section 7.1.15, below).

"Apply" Display changes without committing them, and leave the dialog box up.

"OK" Commit the current control settings and quit.

"Cancel" Quit the "Display Control" dialog box without saving changes.

If you use "Apply" to display your changes, remember to exit by using "OK" because the "Cancel" button reverts any display changes to their original state.



7.1.15. View // Tracks "Color"

You use the Color function to change the colors of classes of objects; in this case, tracks, runways, labels, and the graphics window background.

To change colors, press the "Color" button on the "Display Control" dialog box. The Color and Pattern Selector dialog box is displayed, letting you select an object to color.

1) Highlight an object.

2) Select its color by clicking on one of the colored boxes on the left. A black square in the box designates the current color (sometimes the square is hard to see).

You can create your own colors by pressing the "Set Custom Colors" button. In the new dialog box:

1) Click on a "Custom Color" box.

2) Click somewhere in the large multicolored box on the right.

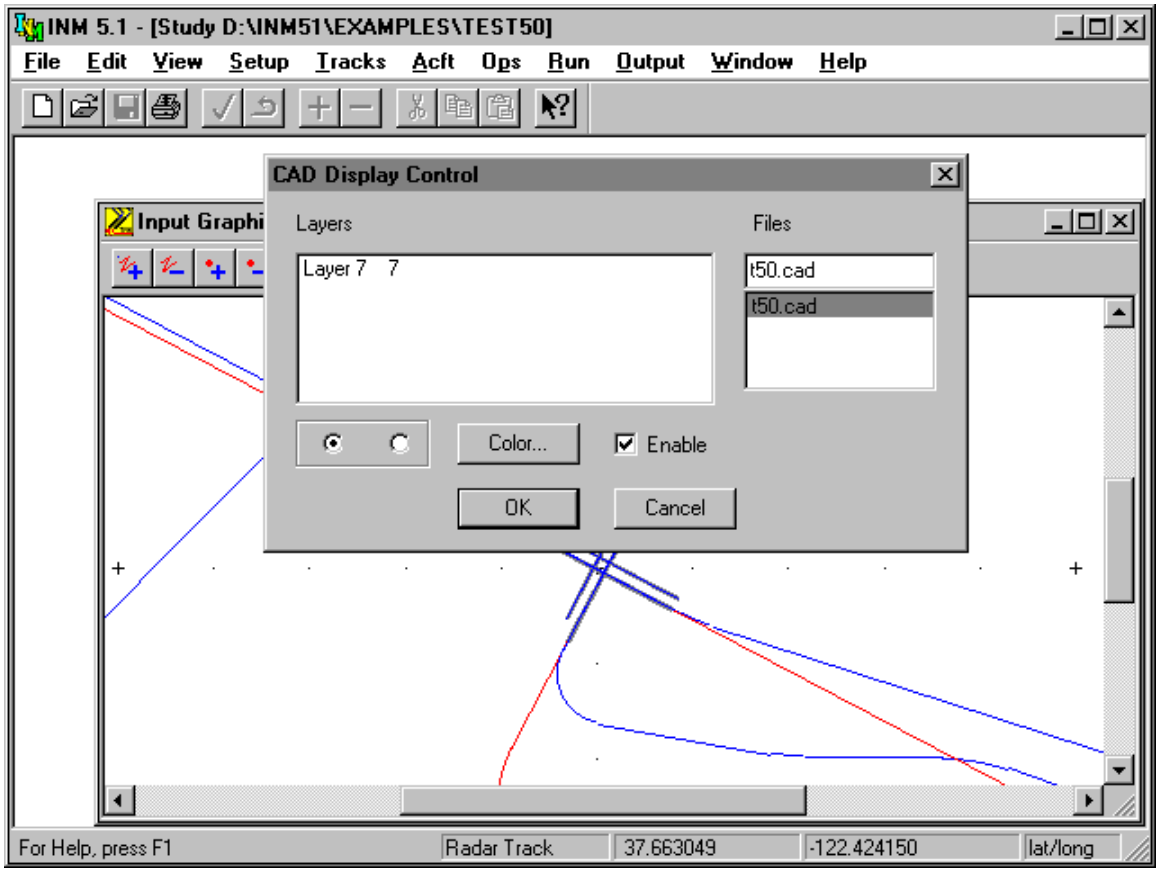
3) Drag the slider-pointer on the far right to change the luminosity.

4) Press the "Add to Custom Colors" button.

After you press "OK" and return to the "Color Selector" dialog box, you will see that your new color is now in one of the boxes directly below the "basic colors" sequence. You can now select the new color.

After coloring objects, press "OK" in the "Color" dialog box and then again in the "Display Control" dialog box to enable and save the new colors.

Color data are saved in option (OPT) files in the Study directory and the Output subdirectories.



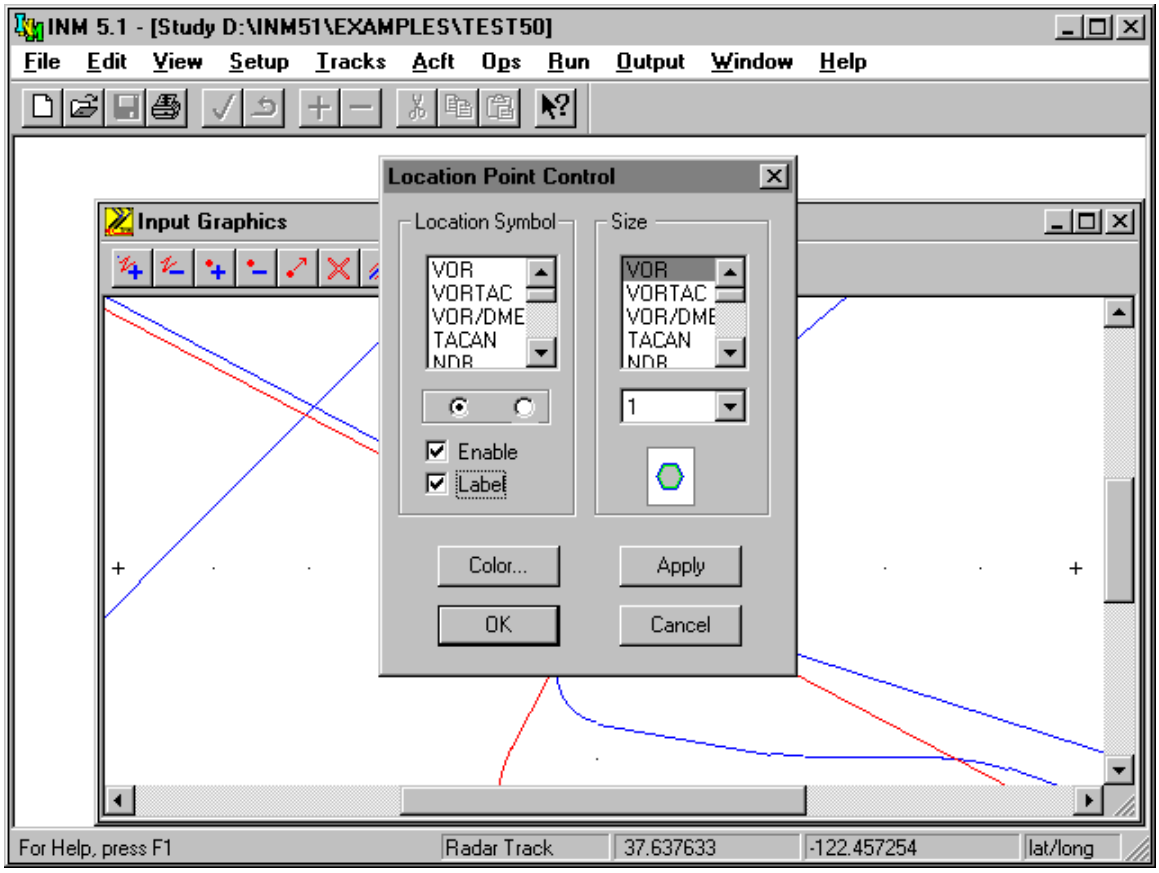
7.1.16. View // CAD

Toolbar: Runway-taxiway diagram

The CAD Display Control lets you display INM-formatted CAD files, typically a diagram of an airport. You must first process a DXF-formatted file before this function will work (see Section 14.5).

The INM-formatted CAD files have a "CAD" extension and they are placed in the Study directory. Select a CAD file out of the list on the right, and then select the layers within the file that you want to display.

You can color individual layers with the Color function.



7.1.17. View // Locations

Toolbar: VORTAC symbol

Use this function to display various kinds of location points, including navaids and fixes. You must have a LOC_PTS DBF file in your Study directory to display points in the Input or Output Graphics functions.

If you have a LOC_PTS file, and if you enable the "Location Points" box in the Run // Run Options window, INM calculates noise levels at all location points (not just the ones selected for display) and presents tabular results in the Output // Noise at Location Points window.

You can create a LOC_PTS file by a variety of methods:

- Automatically, by using the Setup // Study Setup function (Section 6.1).
- Interactively, by using the Locations Points DBF window (Section 6.7).
- From a text file, by using the File // Import // Text-to-DBF function (Section 3.5.1).

- With a DBMS program, by using the LOC_PTS template file in the SYS_DBF system subdirectory.

The various types of location points have preprogrammed graphic symbols. The "Text" type does not have an associated graphic symbol. You can use this type of point to place a six-character label on your graphic.

You can select all types of location points by clicking on the left circular button under the symbol list, and you can deselect all symbols by clicking on the right button. Also, you can select or deselect individual symbols by clicking on items in the list box (for example, you can turn off all fixes by clicking on "Fix").

You can change the size of the symbols by selecting a symbol item in the "Size" list box, and then selecting a relative size number in the drop-down list box.

After you select one or more location symbols, turn them on for display by putting a check in the "Enable" box. You can display the six-character point identifiers by putting a check in the "Labels" box.

The buttons at the bottom are:

"Color" Sets the color of text labels, but not the color of the symbols themselves.

"Apply" Applies your selections without closing the "Location Point Control" dialog box.

"OK" Applies your selections and closes the dialog box.

"Cancel" Reverts the display settings to the state that they were in when you opened the Location Point Control dialog box, and then closes the dialog box.

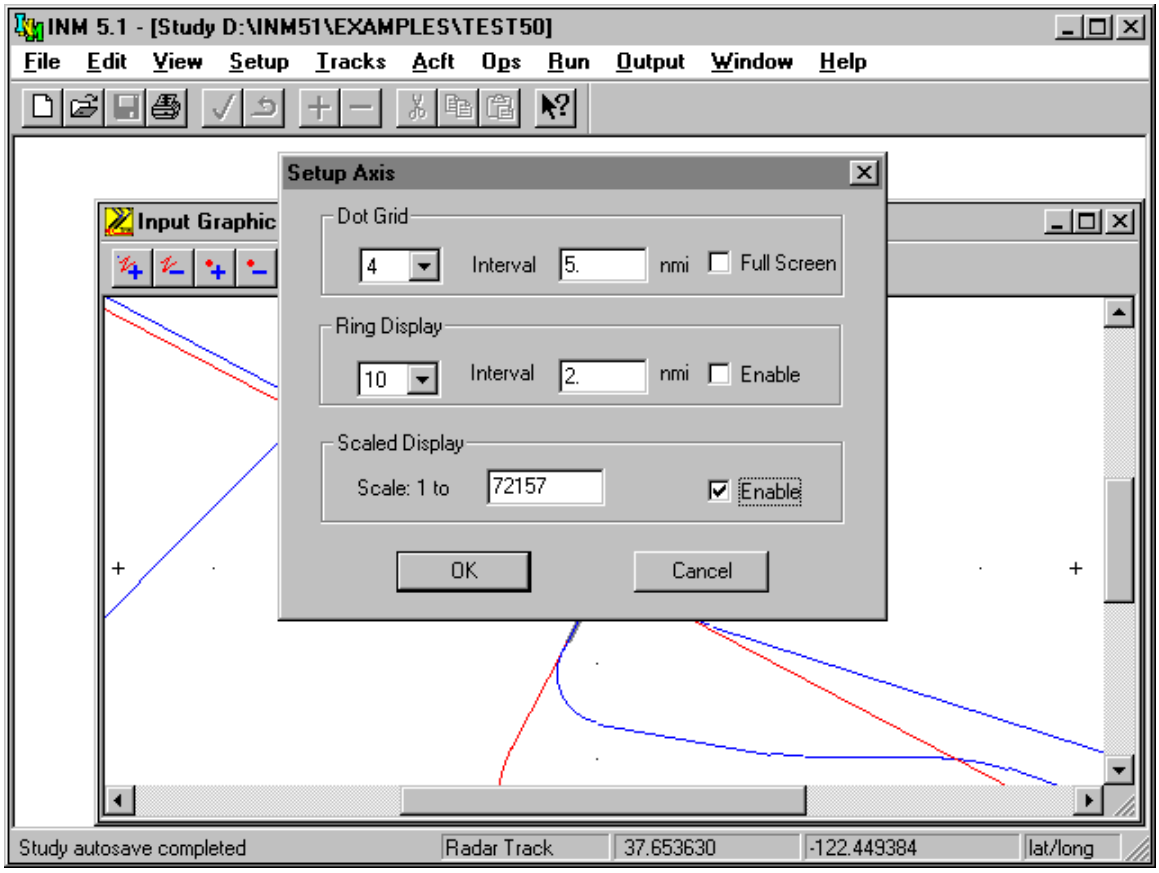
7.1.18. View // Geo Units

INM displays the geographical position of the mouse on the right-hand part of the status bar, below the main window.

You can use the Geo Units function to specify the kind of units that appear on the status bar. The choices are:

- X and Y in nautical miles
- X and Y in kilometers
- Latitude and longitude.

After selecting new units with this function, the Track Input Point data input window in the Add Track function will also use the new units.



7.1.19. View // Axis

The Axis function lets you display two kinds of distance-measuring marks to help define the X,Y coordinates. The functions are called "Dot Grid" and "Ring Display". A third display function, "Scaled Display", lets you set the zoom factor to a given scale.

Using Dot Grid, you can change the distance between the major divisions marks (the plus signs) on the X and Y axes. For example, you can set the axis "Interval" value to 1.0 to make the distance between plus signs 1.0 nautical mile, if you had previously set geo-units to "nautical miles" (see Section 7.1.18, above). If you are using "kilometers", the axis distance is entered as kilometers.

You can also specify the number of dots displayed between the plus signs. For example, to make the minor division marks 0.2 nmi apart (assuming that the major divisions are 1.0 nmi apart), you select 4 dots because 4 dots makes 5 intervals.

If you check the "Full Screen" box, grid marks are displayed in the four quadrants, in addition to being displayed on the X and Y axes.

Using Ring Display, you can display range rings around the origin of coordinates. For example, you can set the "Interval" value to 5.0 to make the distance between rings 5.0 nautical miles. You can also specify the number of rings displayed. For example, to make 5 rings (at 5, 10, 15, 20, 25 nmi), select 5 in the drop-down list box. Check the "Enable" box to display the range rings. If you zoom in or out, the range rings get bigger or smaller, depending on the scale of the graphic scene.

You can set a given zoom factor by using the Scaled Display function. You might want to do this to make two windows display at the same scale. Type a value in the edit box, put a check mark in the enable box, and press "OK". The window zooms (in or out) to the requested scale. The width of the INM window (typically, about 12 inches) is used in calculating the zoom factor.

If you use the Zoom function, the zoom factor will change. The current value of the window scale is shown in the Scaled Display edit box.

7.1.20. View // Fonts

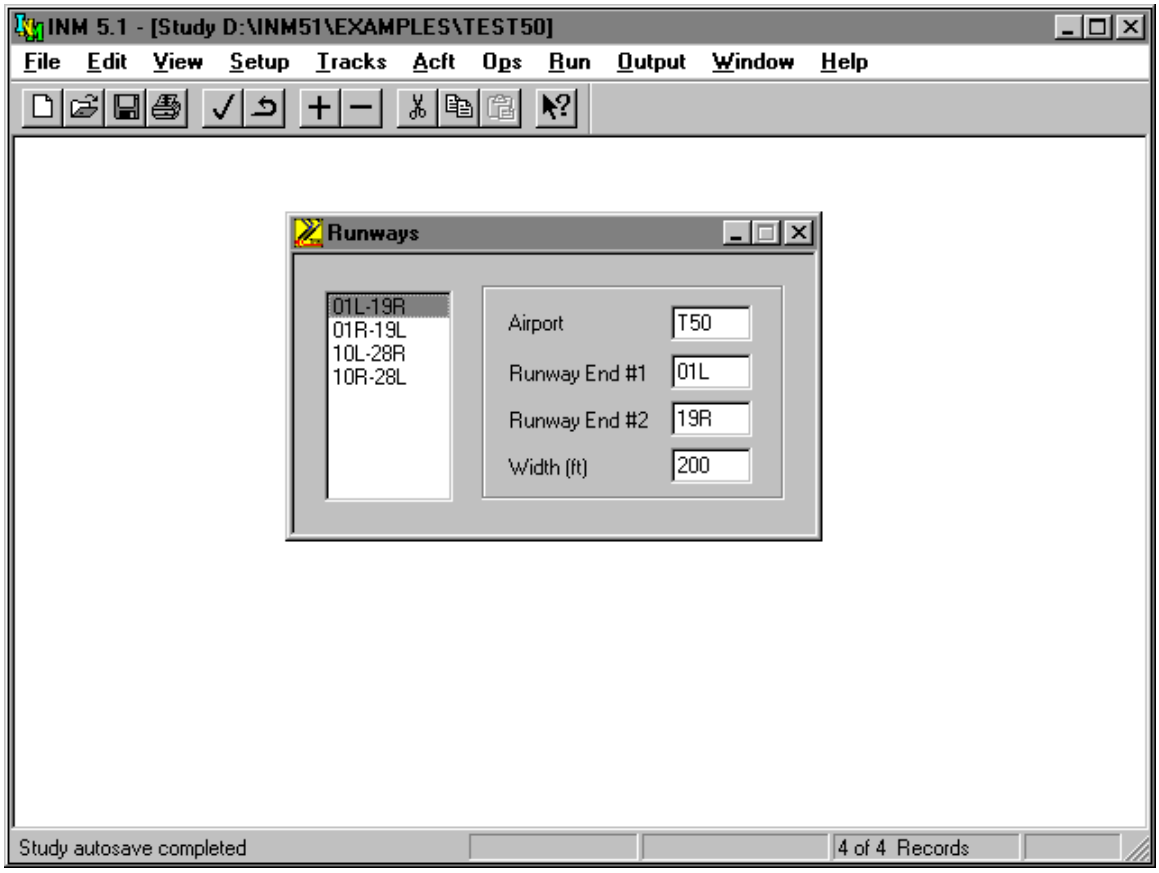
You can use this function to change the font style and point size of text labels (names, identifiers) that are displayed in a graphics scene.

This is a standard Microsoft function that is connected to your Windows operating system. Therefore, the list of available fonts and sizes depend on your computer system. You can experiment to see which font looks best on your display, it depends on the screen resolution that you are using.

You may have to change the font setting before printing if your printer uses a different resolution.

7.1.21. View // Lat/Long Calculate

You can use this function to calculate the latitude and longitude of a given X,Y point. It is the same function as described in Section 5.2.



7.2. Runway Data

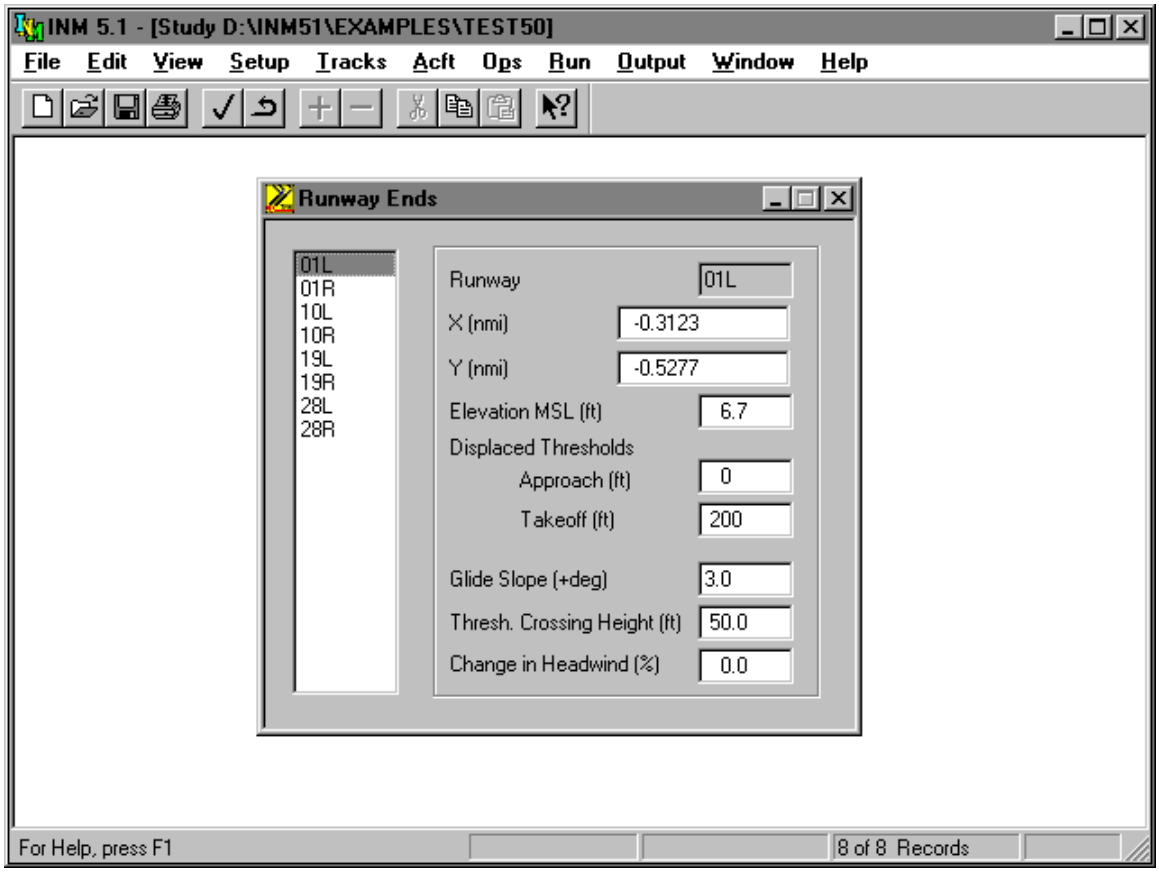
Menu Item: Track // Runways

You use this menu item to declare a pair of Runway End identifiers. Runways must be declared in this window before they are available for use in other windows. Each runway end must be uniquely named.

You can declare Runways for one or more airports. The purpose of the airport identifier is to indicate which airport owns the Runway. INM does not use the airport identifier in distinguishing Runway Ends, so if you have two identical Runway End identifiers, you need to change one of them.

If you use the Setup // Study "View Airports" function (see Section 6.1), then Runway and Runway End records are automatically created for you. You can then edit these records, if you wish.

The Runway width parameter is used when drawing the runway in the Input and Output Graphics windows. Runway length is calculated using the X,Y values assigned to the Runway Ends, and the length is listed in the Case Echo Report.



7.3. Runway End Data

Menu Item: Track // Runway Ends

After declaring Runway End identifiers in the Runways window (see Section 7.2, above), you can input data that are relevant to one end of a runway by using this function.

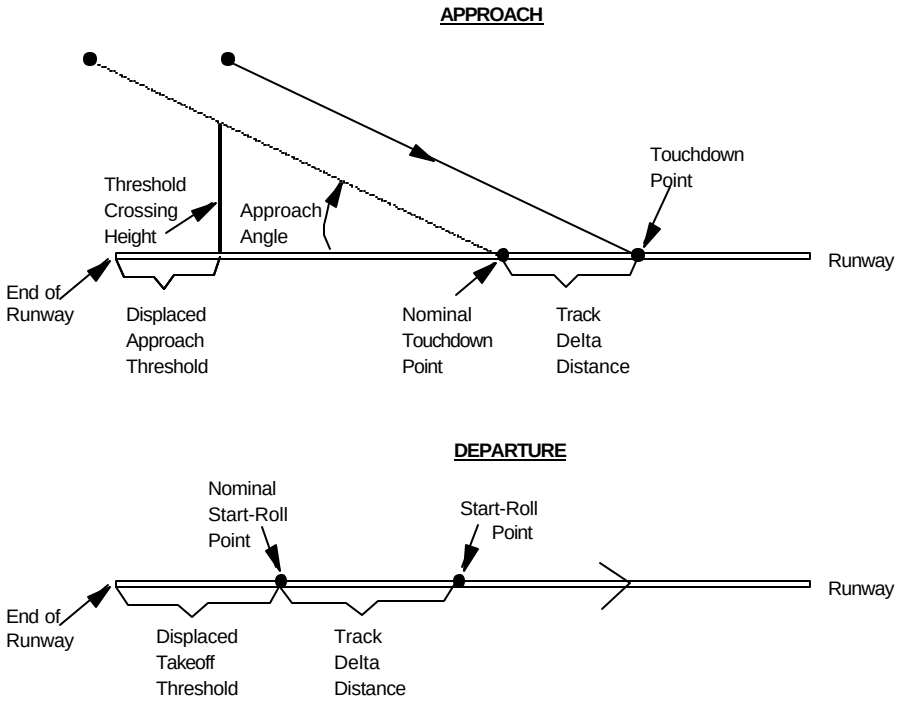
The list on the left contains the declared Runway End identifiers, and the data-input form on the right allows you to input data. A Runway End identifier cannot be changed in this window; use the Runways window instead.

The geographical position of the Runway End is input as X,Y values relative to the origin of coordinates.

It is very important to correctly input runway end points because the geometry of the whole Study depends on them. Even when INM supplies the NFDC geographical positions of the runway end points, it is your responsibility to verify them. The lat/long values that correspond to the displayed X,Y values are in the file USR_DATA \ SYS_RWY.DBF.

Suspected errors in the FAA NFDC database (as of August 15, 1996) are recorded in the BAD_RWY.TXT file, which is in the system USR_DATA subdirectory. This file lists runways for which the difference between the computed length and the database length is more than 5 feet.

The elevation of a Runway End is its height above mean sea level. If this value is different for the two ends of the Runway, INM computes a runway gradient (an uphill or downhill slope) and uses it to adjust takeoff-roll distance for profiles that are calculated from Procedure Steps (see Section 8.9).



A Runway End can have displaced approach and takeoff thresholds. A displaced approach threshold is measured from the physical end of the runway to the threshold-crossing point (the point at which the "threshold crossing height" is measured). The threshold crossing point is usually at the end of the runway, so the displaced approach threshold is usually set to zero.

A displaced takeoff threshold is also measured from the physical end of the runway. It should be set to the average position of noise-producing engines at the start of takeoff roll, which is usually 100-200 feet from the physical end of the runway.

The glide slope is an approach angle for aircraft flying along an instrument landing system (ILS) electronic beam. INM does not use this parameter in calculations; however, you can refer to it when designing approach Procedure Steps for aircraft that make ILS approaches. Instead, INM uses a calculated approach angle that is determined by the altitude and distance of the approach descent step just prior to touchdown.

The threshold crossing height (TCH) is the height above the runway at the runway approach threshold. TCH and glide slope are ILS parameters. TCH is nominally 50 feet and glide slope is nominally 3 degrees, but a specific ILS may use different values. INM uses the TCH parameter to calculate a nominal touchdown point, as illustrated in the diagram. An approach track can be set up to deviate from the nominal touchdown point by using "track delta distance" (see Section 7.4).

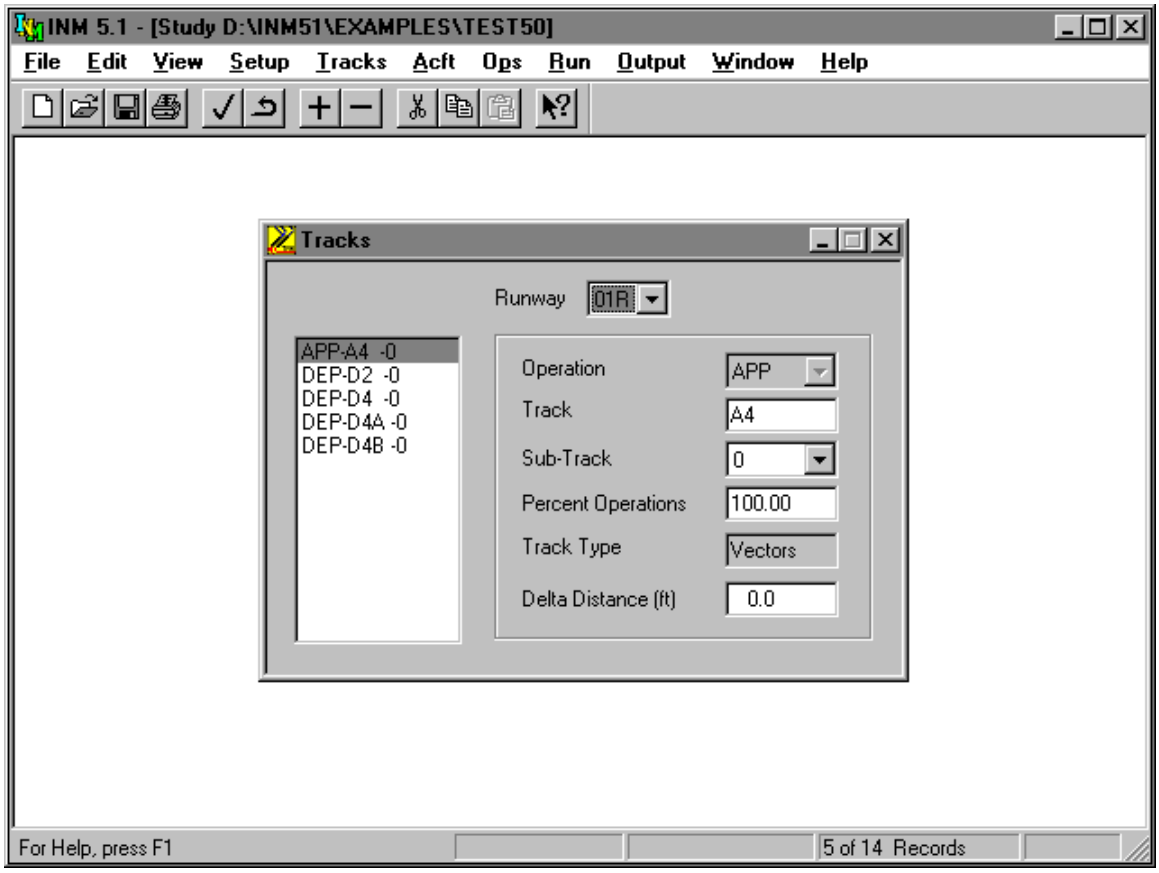
The percent-change in headwind parameter is used to modify the airport-average headwind value to allow for a variation in average headwind for each Runway End. The airport-average headwind is a Case parameter (see Section 6.5). By changing one value on a Case record, the headwinds for all runway ends are changed according to their percent-change parameters.

INM calculates the headwind for a particular Runway End by:

```
(Runway-end headwind)  =
       (Airport-average headwind) (1 + Percent-change / 100)
```

The Percent-change value is limited to −500% to 500%, and usually you should use values between −50% and 50% . A value of −100% means there is no average headwind on the runway, and a value of −200% means there is a average tail wind equal to the Airport-average headwind. Normally, no runway would exhibit an average tail wind (averaged over flight operations, not time), but INM can compute a tail wind, if you wish.

The SAE-AIR-1845 equations that are used to calculate profiles from Procedure Steps are based on a nominal headwind of 8 knots. If the Runway End headwind is different than 8 knots, INM adjusts the calculated profiles accordingly (for example, climb angles are larger for a headwind greater than 8 knots).



7.4. Track Data

Menu Item: Track // Tracks

This function is used to create ground tracks. INM uses ground tracks and vertical profiles to compute a three-dimensional flight path. There are two kinds of tracks in INM:

- Vectors-type track (V-track) is equivalent to an INM 4.11 track. It is represented by an ordered list of Track Segments. Track Segments are flight vectoring instructions, such as "fly straight", "turn left", etc.

- Points-type Track (P-track) is represented by an ordered list of X,Y-points. These points are also encoded as Track Segments.

You create V-tracks in the Tracks and Track Segments DBF windows, and you create P-tracks in the Input Graphics window.

Both V-tracks and P-tracks are shown in the Tracks DBF window. You have full editing control over V-tracks in DBF windows, but you can only edit a couple of data fields for P-tracks. To edit P-track X,Y values, you must work in the Input Graphics window.

A full track identifier consists of a Runway End identifier, an operation type, a four-character track identifier, and a sub-track number. For example: "16R-DEP-TK08(2)".

The operation types are abbreviated as follows:

A	APP	Approach
D	DEP	Depart
T	TGO	Touch-and-Go
V	OVF	Overflight

The single-letter codes are used in DBF files, and the three-letter identifiers are used in dialog boxes and windows.

The four-character track identifier must be unique for those tracks that are associated with a specific Runway End and operation type.

The reason for creating sub-tracks is so that you can assign operations to the group of sub-tracks as a whole, instead of specifying operations along each one. The sub-track function is primarily for P-tracks, and sub-track creation and naming is controlled in the Input Graphics window.

You can create V-sub-tracks if you wish. They do not have to be created in pairs nor follow the left/right numbering scheme, as done for P-sub-tracks. V-sub-tracks are displayed in the Tracks // Input Graphics window as normal tracks.

The Input Graphics function assigns default sub-track percentages, which are based on a binomial probability distribution. You can change these default values in either the Tracks DBF window or the Input Graphics window.

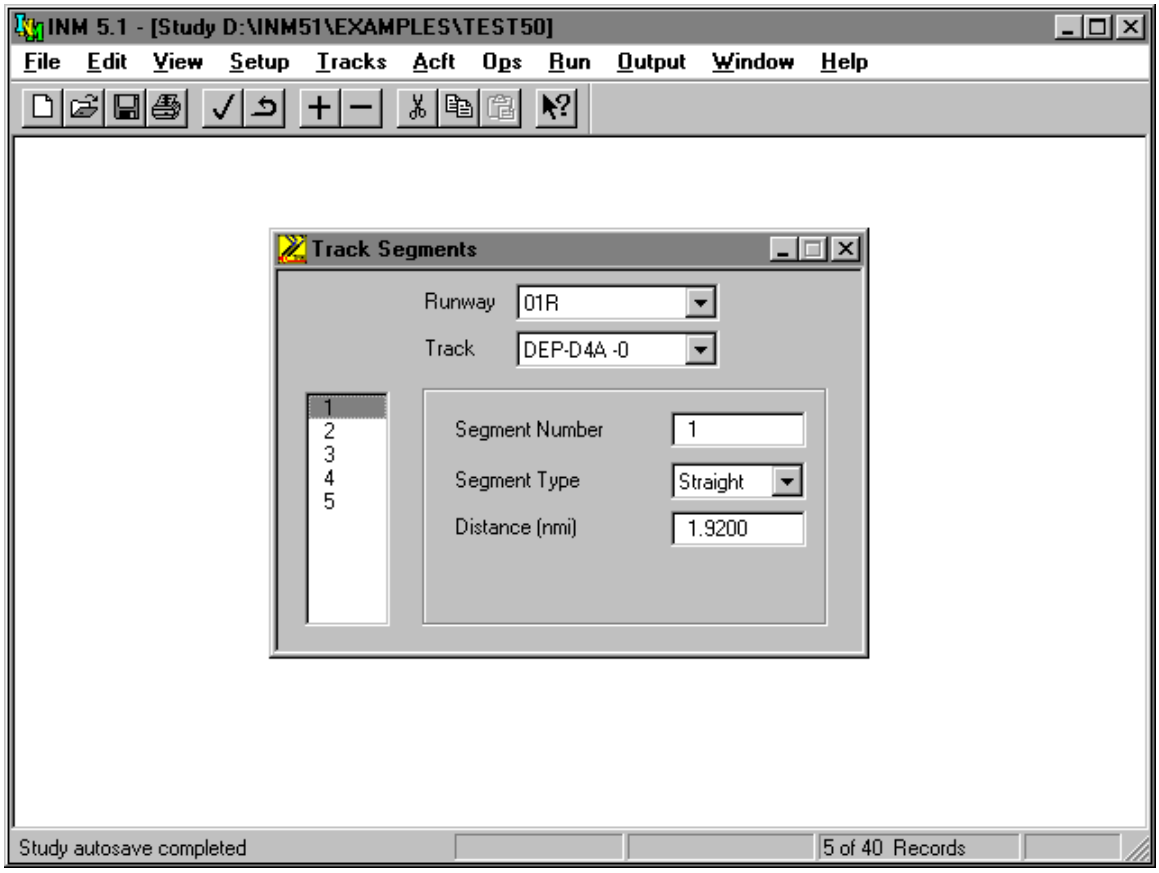
The percentage of operations assigned to sub-tracks must add up to 100 percent for all sub-tracks in a group. If there is only one Track in the group (with sub-track number "0"), then make the value 100 percent.

INM uses the delta distance parameter to adjust the takeoff start-roll point or the touchdown point on the runway for a particular Track. The nominal start-roll or touchdown point is determined by parameters in a Runway End record. This nominal point is used by all Tracks that are associated with the Runway End. You can override the Runway End nominal point by using a non-zero track delta distance parameter. The start-roll or touchdown point is moved relative to the nominal point, down the runway for positive delta, and back toward the end of the runway for negative delta. Usually, you will use positive deltas.

Example uses of the delta distance parameter are wake turbulence avoidance and intersection takeoffs:

- If light aircraft use the same runway as heavier jets, they will usually land further down the runway than the jets to avoid dangerous wake turbulence. The problem is that INM creates a nominal touchdown point before jet touchdown because light VFR aircraft use a steeper approach angle over the threshold. In this case, you would input a positive delta distance on the approach track used by light aircraft to move the touchdown point further down the runway.

- For the case of intersection takeoffs, input a positive delta distance equal to the distance from the physical end of the runway to the intersection, less the nominal start-roll distance.



7.5. Track Segment Data

Menu Item: Track // Track Segments

Use this function to specify or view the details of ground tracks. You can view (but not edit) P-track segments, which are really individual X,Y points. And, you can create and edit V-track segments, which are similar to the track input data in previous versions of INM.

You must first declare a V-track in the Tracks window, and then specify its segments with this function. Use the Edit // Add Record function to create a new Track Segment with the next segment number in the sequence. You can create from 1 to 999 Track Segments to define a track.

There are three kinds of V-track segments: straight, left turn, and right turn.

- For a straight segment, input the distance the aircraft moves along the segment.

- For a left or right turn segment, input the angle of the turn and the radius of the turn. You can follow a turn by another turn. You do not have to use a turn-straight-turn sequence.

You can start and end a track with any kind of Track Segment, and follow any segment with any other (however, turning while taking-off, or following a straight segment with another one, does not make a lot of sense).

The previous INM method of using aircraft headings instead of turn angles is not supported in INM 5. This is because INM now uses an X,Y coordinate system aligned on true north, whereas aircraft headings are typically specified relative to magnetic north. To avoid confusion about what is north, and to simplify data input, the heading function was removed from INM.

A departure track starts at the displaced takeoff threshold on the runway, and it finishes in terminal airspace. The first segment should be a straight segment, and INM automatically lines it up with the runway.

An approach track starts in terminal airspace and finishes at the displaced approach threshold on the runway. The last segment should be a straight segment, and INM automatically lines it up with the runway. Please note that approach Track Segments are input in the order that they are flown, and they are never presented in reverse order.

A touch-and-go track both starts and finishes at the displaced approach threshold on a runway. Usually, there are five Track Segments in a touch-and-go track:

1) start with a straight segment,
2) turn left or right 180 degrees,
3) go downwind on a straight segment,
4) turn again 180 degrees onto final,
5) finish with a straight segment.

Make sure that the sum of the starting and finishing straight segment distances equals the down-wind straight segment distance, so that the TGO track is a closed loop.

An overflight track starts and finishes in terminal airspace. Overflight tracks are created only in the Input Graphics function, because they are exclusively points-type tracks. This is because there is no physical runway to reference when computing X,Y points from vector parameters.

INM adds a 100-nmi straight segment to the last defined track segment so that tracks are made long enough for calculation purposes. Typically, the last two points are used as a straight line on which a new last point is created. Thus,

departure and overflight tracks are extended out of the terminal area, and approach and touch-and-go tracks are extended straight down the runway.